$PtSe_2$ and $HfSe_2$: New Transition Metal Dichalcogenides for Switching Device Applications

by

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

Recently, silicon-based complementary metal-oxide-semiconductor (CMOS) technology has been struggling in keeping the continuous improvement predicted by Moore's Law. Hence, significant efforts have been made to find alternatives to the conventional silicon technology. Nanoelectronics based on two-dimensional (2D) materials, such as black phosphorus (BP) and molybdenum disulfide (MoS_2), have demonstrated great potential for electronic devices due to their intriguing mechanical, optical and electrical properties. In this thesis, two of novel 2D materials among the transition metal dichalcogenides (TMDs) family have been explored for the use in nanoelectronic devices – platinum diselenide ($PtSe_2$) and hafnium diselenide ($HfSe_2$). It was reported earlier that $PtSe_2$ and $HfSe_2$ exhibit higher carrier mobilities among PtX_2 and HfX_2 families. First-principle simulations and atomistic quantum transport simulations based on the non-equilibrium Green's function (NEGF) method within a tight-binding (TB) approximation are used to study $PtSe_2$ and $HfSe_2$ and their device applications.

Despite the fact that $PtSe_2$ has a relatively small electron effective mass ($0.21m_0$), its six conduction valleys in the first Brillouin zone give rise to relativity large density of states (DOS). As a result, compared to its molybdenum diselenide ($MoSe_2$) counterpart, $PtSe_2$ field-effect transistors (FETs) exhibit better on-states characteristics (>30%) while maintaining a near-ideal subthreshold swing (SS) of ~64 mV/dec. The scaling study of the channel length (L_{ch}) and the equivalent oxide thickness (EOT) show that a near ideal SS can be persevered with channel lengths longer than 15 nm or through aggressive scaling of the gate oxide (e.g., EOT = 0.4 nm).

On the other hand, $HfSe_2$ FETs exhibit nearly identical symmetric transfer characteristics for n-type (NMOS) and p-type transistors (PMOS) despite its asymmetrical effective mass and DOS in the conduction and the valence band. Both exhibits steep switching (<70 mV/dec) with exceptional on-current (~1 mA/μm). Through the scaling study, it was revealed that $HfSe_2$ FETs exhibit great immunity to short-channel effects (SCE) at $L_{ch} \geq 15$ nm, but show significant degradations in subthreshold swing and drain-induced barrier lowering at sub-10 nm channel even with a thin gate dielectric. Finally, both NMOS and PMOS $HfSe_2$ devices exhibited excellent intrinsic device performance, making them promising candidates for future logic device applications.

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Dedication

This thesis is dedicated to Islam, parents and my siblings.

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Chapter 1
Introduction

Complementary metal-oxide-semiconductor (CMOS) technology has been the backbone of the recent advances in the electronics industry. This significant contribution is the result of the fact that density of integrated transistors has been doubling regularly in the past decays as shown in Fig. 1.1. This is famously known as Moore's Law [1]. However, CMOS, thus far, depends mainly on silicon (Si). While Si has been robust material for electronics, it is approaching its physical limits. At this small scale and dense arrangement, Si-based electronics performance is hindered by the quantum mechanical effects like quantum tunneling. Hence, industry start exploring alternative materials that exhibits better performance or provide novel functionality in the nanoscale regime [2].

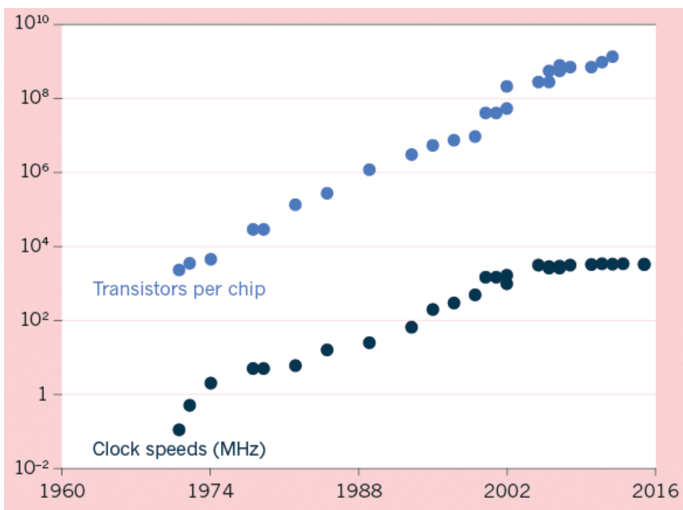


Figure 1.1: Transistors number per chip for the past few decays and their clock speeds in MHz. It displays great deal of agreement with Moore's law. However, clock speeds have been saturated since 2004 [3]**.**

In 2004, Andre Geim and Konstantin Novoselov, from the University of Manchester, synthesized an isolated layer of graphene, which is a single layer of carbon atoms arranged in a hexagonal shape [4]. Graphene showed a great deal of potential for electronic devices due it high carrier mobility [4]–[6]. However, the fact that graphene has no band gap (E_g) makes it impractical for switching devices application. Nonetheless, such discovery paved the road for more exploration in the field of two-dimensional (2D) materials.

Since then, a large number of 2D materials have been discovered such as molybdenum disulfide (MoS_2), black phosphorus (BP), and germanane (GeH). These materials have demonstrated great mechanical and electrical properties, which make them useful for a wide range of applications. For example, recently, multilayer BP has demonstrated great potential for a channel material in field-effect transistors (FET). It exhibited a mobility of ~1000 cm^2/V-s. In addition, it showed ambipolar behavior with ~ 10^5 drain current modulation as shown in Fig. 1.2 [7].

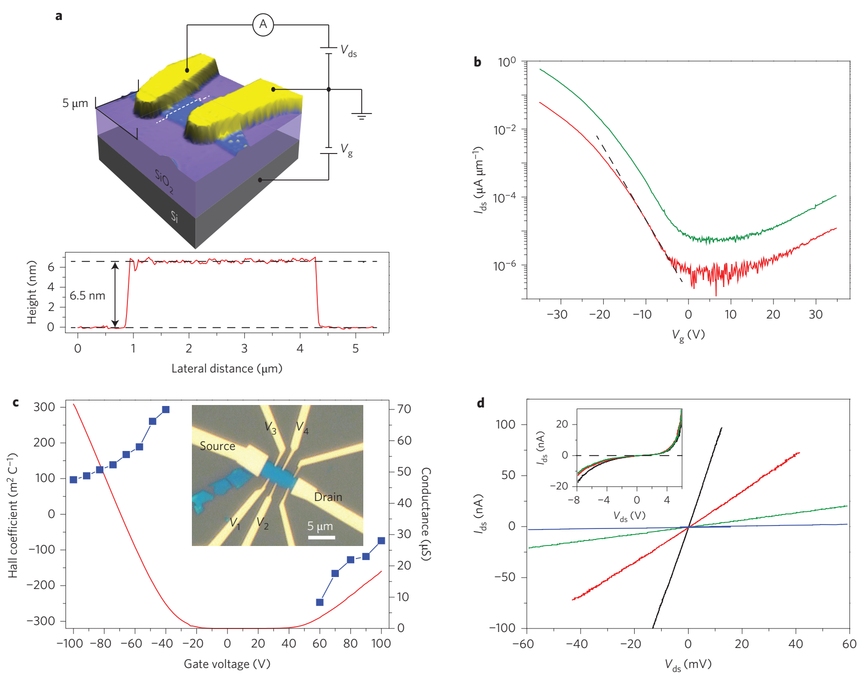
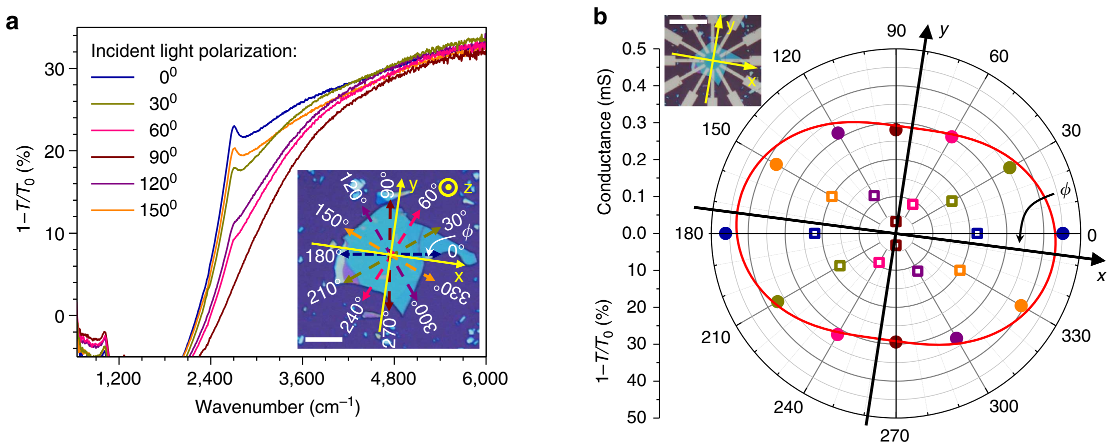


Figure 1.2: (a) Schematic of the multilayer BP device used in the work based on the 3D atomic force microscope (AFM) scan (top) and the cross-sectional thickness of the channel (bottom). (b) Transfer characteristics (In log scale) of the multilayer BP FET at drain voltage V_D = 10mV (red) and V_D = 100mV (green). (c) Hall coefficient (blue) and conductance (red) vs. gate voltage (V_g) inset: Optical image of the multiterminal apparatus used. (d) the p-type transport characteristics of BP FET for V_g = -30V (black), V_g = -25V (red), V_g = -20V (green), and V_g = -15V (blue). Inset is the n-type transport characteristics showing high nonlinearity. (V_g = 30V, 25 V and 20 V in black, red and green, respectively) [7].

In fact, BP's versatility arises from the fact that it has strong interlayer interaction, which allows for bandgap modulation by adjusting the number of layers. Moreover, it presents an anisotropic conductance behavior due to its anisotropic electron and hole effective masses as shown in Fig. 1.3. Thus, Hall mobility exhibits directional dependency; the mobility along the small effective mass direction is ~1.8x higher than the large one [8].



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Furthermore, BP FETs have shown high suitability for radio frequency applications such as voltage and power amplifiers in multi-GHz frequency analogue and digital electronics. Indeed, the BP FET fabricated along the light effective mass direction can operate at in the GHz frequency range with a 12 GHz peak short-circuit current gain cutoff frequency and a maximum oscillation frequency of 20 GHz as shown in Fig. 1.4. In addition, the short-circuit current gain of the BP FET can be ~20 dB/dec [9].

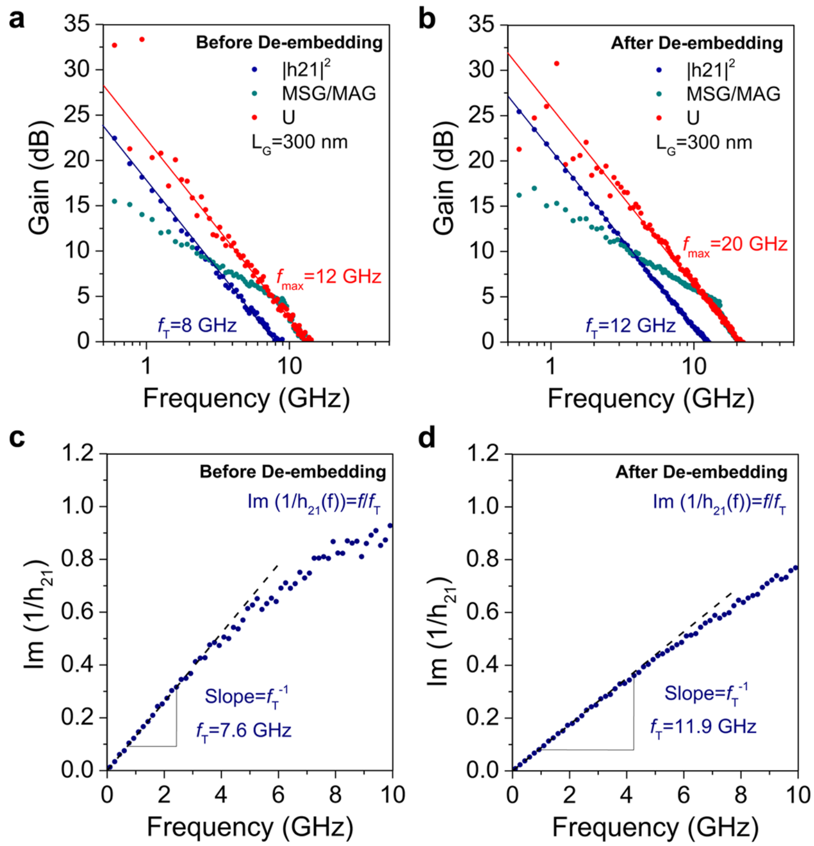

Figure 1.4: the (a) before and (b) after de-embedding current and power in BP FET where h_{21} is the short-circuit current gain, MSG/MAG is the maximum stable gain/maximum available gain, and U is the unilateral power gain. (c) and (d) is the before and after de-embedding imaginary part of 1/ h_{21} as a function of frequency [9]**.**

On the other hand, a group of 2D materials known as transition metal dichalcogenides (TMDs) have been in the center of attention due to their extraordinary electrical and mechanical properties [10]. The basic structure of this family is MX_2, in which M is the transition metal and X is a chalcogen atom. They are generally ordered mainly in three different phases: 1T octahedral with tetragonal symmetry, and two trigonal prismatic one with hexagonal symmetry (2H) and the other with rhombohedral symmetry (3R). The number before the letter identifying the phase represents the number of layers needed before the crystal pattern repeats itself as shown in Fig. 1.5 [11].

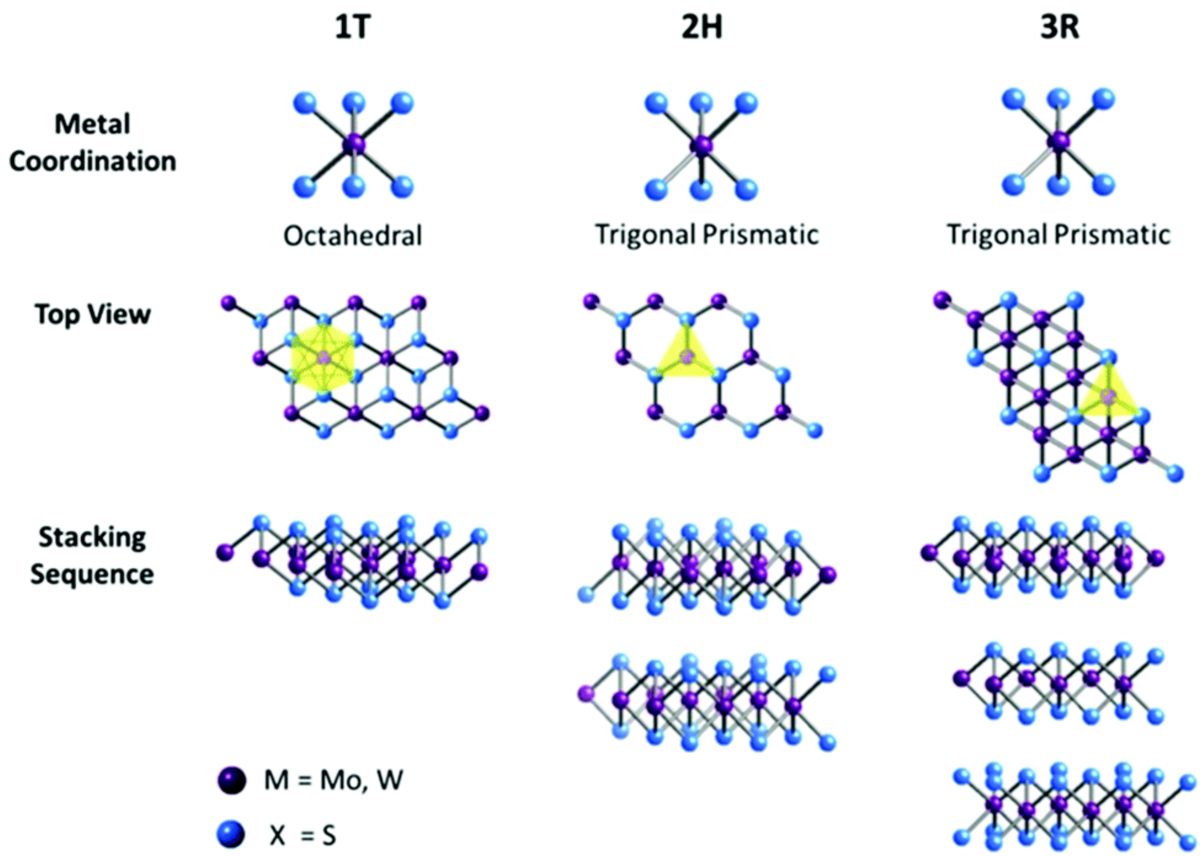

Figure 1.5: Schematics of the 3 main phases of TMDCs where 1T has tetragonal symmetry, 2H has hexagonal symmetry, and 3R has rhombohedral symmetry [11]**.**

In fact, TMDs based on the molybdenum (MoX_2) and tungsten (WX_2) structure have been extensively studied due to the fact that there are well-established methods to synthesis these materials out of which electronic devices fabricated [12]–[15]. One of the major reasons making the 2D materials popular for electronic devices is that they have exceptional immunity to short channel effects (SHE). It was demonstrated that FET with MoS_2 channel can operate with a 1 nm physical gate, which is unachievable with Si-based technology, while maintaining a near-ideal subthreshold swing of ~65 mV/dec and on/off current ratio of ~10^6 (Fig. 1.6) [16].

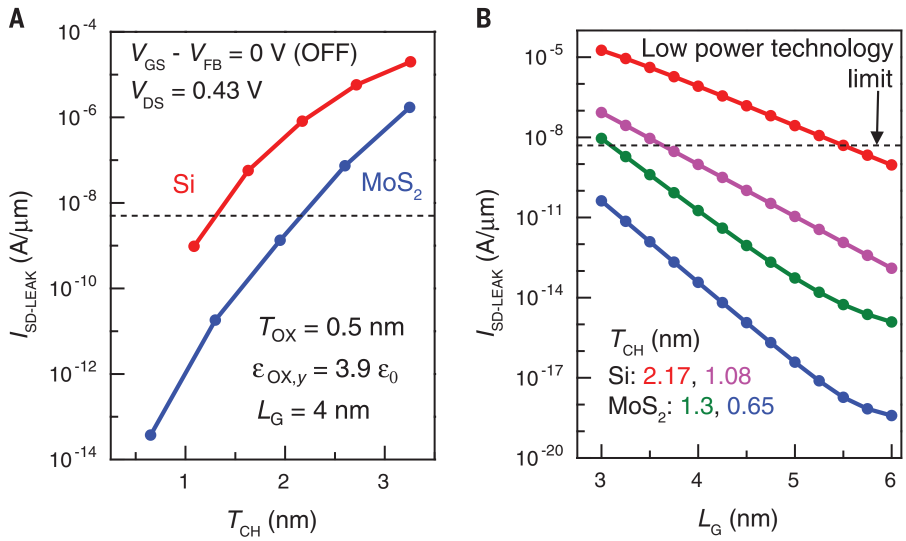

Figure 1.6: Normalized direct source-drain tunneling current (A) as a function of the channel thickness and (B) a function of the gate length; based on the Wentzel-Kramers-Brillouin (WKB) approximation for Si and MoS_2 based devices [16]**.**

Due the excellent performance of MoS_2 FET, the logical next step is to test its capability in the field of CMOS technology. As shown in Fig. 1.7, an MoS_2-based inverter was fabricated as part of a microprocessor unit. It was observed that using the same width/length (W/L) ratio for both n-type and p-type MoS_2 FET results in switching voltage below 1 V. Therefore, low noise margin is expected for such device. Nonetheless, asymmetrical transistors with a 45/2 (µm/µm) W/L for the pull-up devices and 7/5 for the pull-down ones can allow for switching voltage close to the midpoint of the power supply voltage ($V_{DD}/2$). Furthermore, the voltage gain exhibited by the asymmetrical MoS_2 inverter is ~60 with noise margin of ~0.59x($V_{DD}/2$), which is sufficient for multi-stage logic circuits. Finally, it was concluded that such microprocessor could operate in 2-20 kHz maximum frequency [17].

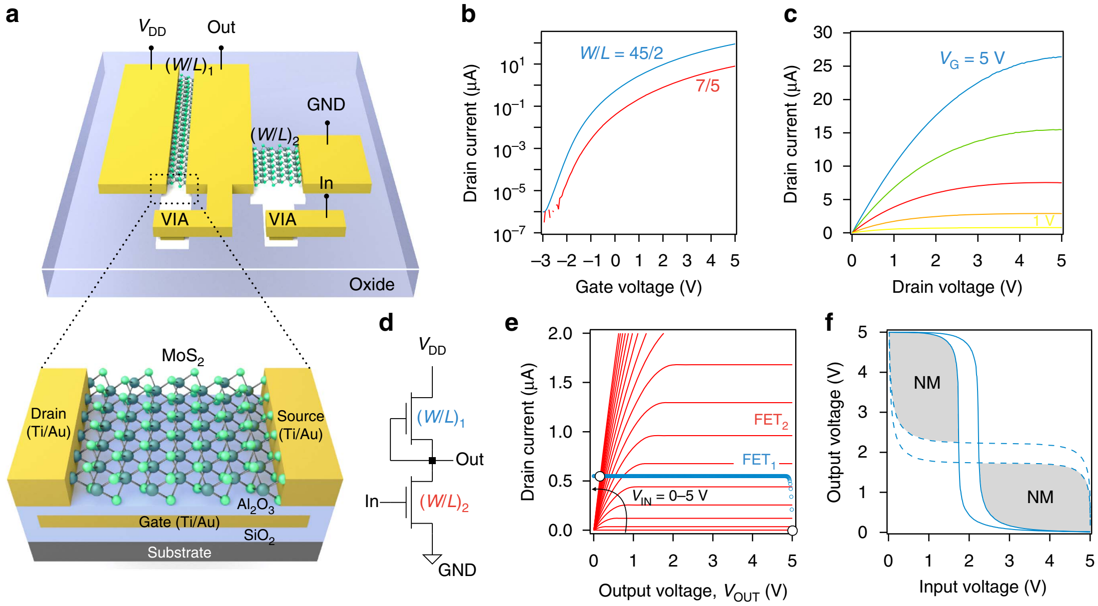

Figure 1.7: (a) Schematic of the gate first technology based MoS_2 invertor. (b) Transfer characteristics of the asymmetrical pull-up (45/2) and pull-down (7/5) transistors. (c) Output characteristics for gate voltages ranging from 1 to 5 V with step size of 1 V. (d) Schematic of the n-type invertor. (e) Demonstration of the method to determine the output voltage (V_{OUT}) of an inverter at a given input voltage (V_{IN}). (f) Butterfly graph of the MoS_2 invertor to determine the maximum noise margin (NM) achievable [17]**.**

As part of this exploration of the TMDs family, new materials based on platinum (PtX_2) and hafnium (HfX_2) have been recently synthesized [18]–[20]. The PtX_2 family, unlike their MoX_2 and WX_2 counterparts, favor 1T structure instead of the common 2H [18], [19], [21], [22]. In addition, the PtX_2 family have an indirect band gap, in which the minimum of the conduction valley is in-between the high symmetry points Γ and M, whereas the top of the valence valley is on the Γ point in heavy and light hole configuration. In fact, they exhibit strong interlayer interaction and layer dependency, stronger than the layer dependency in BP, where the band gap of platinum disulfide PtS_2, for example, drops from 1.6 eV in the monolayer to 0.25 eV in the bulk, while platinum diselenide $PtSe_2$ changes from a semiconductor (E_g = 1.13 eV) to a metal [19], [22]. Among the PtX_2 family, $PtSe_2$ demonstrates the highest mobility, making it suitable for electronic devices as shown in Fig. 1.8 [23], [24].

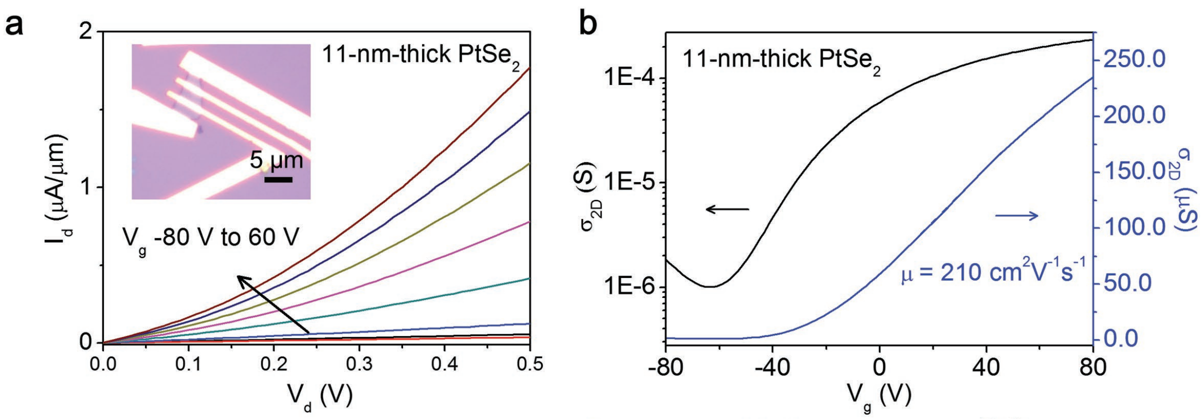

Figure 1.8: (a) The output characteristics (b) the transfer characteristics of 11nm thick $PtSe_2$ FET [19]**.**

Similarly, 1T crystal structure is the most stable structure for the HfX_2 family. In general, HfX_2 family exhibit high mobility. In fact, theoretical study of the TMDs reported that hafnium diselenide $HfSe_2$ exhibits the highest carrier mobility [24]. More importantly, unlike most other 2D materials, HfX_2 family have a compatible native high-κ oxide of hafnium dioxide HfO_2. This is beneficial for electronic devices since it will reduce leakage effect without introducing external mechanical stress on the channel material [25]. HfX_2 family have an indirect band gap where the conduction valley minimum is located at the M point, whereas the valence band maximum is located at Γ point [25]. Due to its high mobility and high compatibility with HfO_2, $HfSe_2$ becames a great candidate for FET applications (Fig. 1.9).

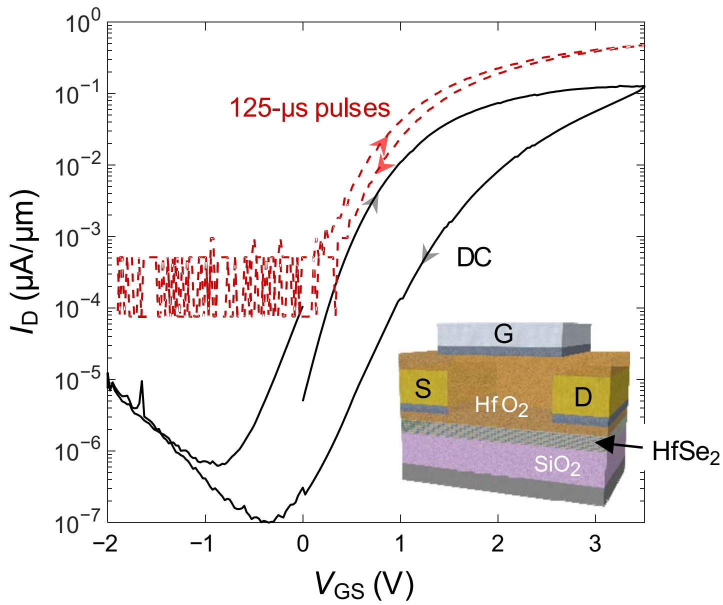

Figure 1.9: Transfer characteristics top gated multilayer $HfSe_2$ FET (In black). Pulsed measurement with 125 µs pulse width (In red). The pulsed case show reduction in the hysteresis and increase in the on current; however, it comes with the cost of low-current resolution [25]**.**

In this thesis, the focus will be given to $PtSe_2$ and $HfSe_2$ due to fact that they exhibits better electrical properties among their corresponding families (PtX_2 and HfX_2). Theoretical study based on the first principle calculation and non-equilibrium Green's function (NEGF) quantum transport simulation will be conducted on each of these two materials to explore their performance limit in field-effect transistors and to optimize the device performance through engineering and design.

The outline of the following chapter is

- Chapter 2 discusses the tight-binding parameterization for $PtSe_2$ and $HfSe_2$ to be used in NEGF. In addition, it covers a brief background discussion on the simulation tools used.
- Chapter 3 is dedicated to the study of $PtSe_2$ FET along with the scaling assessment of both channel length and the equivalent oxide thickness (EOT).
- Chapter 4 contains the investigation of both n-type and p-type $HfSe_2$ FET and their intrinsic properties in addition to channel length and EOT scaling limits.
- Chapter 5 concludes and summarizes the findings of the $PtSe_2$ and $HfSe_2$ devices assessments and discusses future work to enrich our understanding of $PtSe_2$ and $HfSe_2$ potentials.

Chapter 2

Parameterization for Non-Equilibrium Green's Function (NEGF) Simulation

2.1 Density Functional Theory (DFT)

Density functional theory (DFT), similar to other quantum mechanical based tools, has the goal of finding an approximate solution of the time-independent, non-relativistic, multibody Schrödinger equation [26], [27]

$$\hat{H}\Psi_{\mathrm{i}}\left(\vec{\mathrm{x}}_1,\vec{\mathrm{x}}_2,\dots,\vec{\mathrm{x}}_{\mathrm{N}},\vec{\mathrm{R}}_1,\vec{\mathrm{R}}_2,\dots,\vec{\mathrm{R}}_{\mathrm{M}}\right) = E_i\Psi_{\mathrm{i}}\left(\vec{\mathrm{x}}_1,\vec{\mathrm{x}}_2,\dots,\vec{\mathrm{x}}_{\mathrm{N}},\vec{\mathrm{R}}_1,\vec{\mathrm{R}}_2,\dots,\vec{\mathrm{R}}_{\mathrm{M}}\right) \tag{2.1}$$

where $\vec{\mathrm{x}}_{\mathrm{i}}$ and $\vec{\mathrm{R}}_{\mathrm{A}}$ are the position of i-th electron and A-th nucleus, respectively, and $\hat{H}$ is the Hamiltonian of the system including N number of electrons and M number of nuclei. $\hat{H}$ is a representation of the total energy using a differentiable operator including electron-electron interaction, nucleus-nucleus interaction and electron-nucleus interaction [26], [27], and has the form of

$$\hat{H} = -\frac{1}{2}\sum_{i=1}^{N}\nabla_i^2 - \frac{1}{2}\sum_{A=1}^{M}\frac{1}{\mathrm{M_A}}\nabla_A^2 - \sum_{i=1}^{N}\sum_{A=1}^{M}\frac{Z_A}{r_{iA}} + \sum_{i=1}^{N}\sum_{j>i}^{N}\frac{1}{r_{ij}} + \sum_{A=1}^{M}\sum_{B>A}^{M}\frac{Z_A Z_B}{R_{AB}} \tag{2.2}$$

Here, $\mathrm{M_A}$ and Z_A are the atomistic mass and number of the nuclei, correspondingly. The kinetic energy of the electrons and nuclei are captured by the first two terms of $\hat{H}$, while the last three terms represent the attractive electrostatic interaction between the nuclei and the electrons, and the repulsive potential among electrons and among nuclei, respectively. It is important to note that the atomic unit system was utilized here to create this compact form [26], [27].

Born-Oppenheimer approximation employs the fact that there is a significant difference in masses between electrons and nuclei to simplify Schrödinger equation. The approximation views the system as electrons moving in a field of fixed nuclei. Hence, the nuclei kinetic term in equation (2.2) can be omitted, while the repulsive potential energy of the nucleus-nucleus interaction can be considered as a constant number. The result of this approximation is a Schrödinger equation with a Hamiltonian that considers only interactions involving electrons (called the electronic Hamiltonian $\hat{H}_{\mathrm{elec}}$) and its solution is the electronic wavefunction Ψ_{elec} as shown below [26]–[28].

$$\hat{H}_{\mathrm{elec}} = -\frac{1}{2}\sum_{i=1}^{N}\nabla_i^2 - \sum_{i=1}^{N}\sum_{A=1}^{M}\frac{Z_A}{r_{iA}} + \sum_{i=1}^{N}\sum_{j>i}^{N}\frac{1}{r_{ij}} = \hat{T} + \hat{V}_{Ne} + \hat{V}_{ee} \tag{2.3}$$

$$\widehat{H}_{\mathrm{elec}}\Psi_{\mathrm{elec}} = E_{\mathrm{elec}}\Psi_{\mathrm{elec}} \tag{2.4}$$

Here, the total energy of the system ($\mathrm{E_{tot}}$) can be calculated by summing the electronic energy E_{elec} and the nuclei repulsive energy E_{nuc}

$$\mathrm{E_{tot}} = E_{\mathrm{elec}} + E_{\mathrm{nuc}} \tag{2.5}$$

where

$$E_{\mathrm{nuc}} = \sum_{A=1}^{M}\sum_{B>A}^{M}\frac{Z_A Z_B}{R_{AB}}. \tag{2.6}$$

It is of a significant importance to point out that, due to the fact that electron is a fermion particle, it has an antisymmetric wavefunction with a spin of half. Hence, Ψ is antisymmetric when the spatial and spin coordinates of any two electrons are interchanged [26] as

$$\Psi(\vec{\mathrm{x}}_1,\vec{\mathrm{x}}_2,\dots,\vec{\mathrm{x}}_\mathrm{i},\vec{\mathrm{x}}_\mathrm{j},\dots,\vec{\mathrm{x}}_\mathrm{N}) = -\Psi(\vec{\mathrm{x}}_1,\vec{\mathrm{x}}_2,\dots,\vec{\mathrm{x}}_\mathrm{j},\vec{\mathrm{x}}_\mathrm{i},\dots,\vec{\mathrm{x}}_\mathrm{N}). \tag{2.7}$$

On the other hand, the probability of the wavefunction is unchanged by changing the coordinates since electrons are indistinguishable.

$$\left|\Psi(\vec{\mathrm{x}}_1,\vec{\mathrm{x}}_2,\dots,\vec{\mathrm{x}}_\mathrm{i},\vec{\mathrm{x}}_\mathrm{j},\dots,\vec{\mathrm{x}}_\mathrm{N})\right|^2 = \left|\Psi(\vec{\mathrm{x}}_1,\vec{\mathrm{x}}_2,\dots,\vec{\mathrm{x}}_\mathrm{j},\vec{\mathrm{x}}_\mathrm{i},\dots,\vec{\mathrm{x}}_\mathrm{N})\right|^2 \tag{2.8}$$

A central concept that has to be mentioned here is wavefunction normalization. To be called normalized, the wavefunction probability $|\Psi|^2$ over the entire space has to be unity. This can be represented by an integration of the probability, across all variables, that equals to 1 as shown below [26], [27].

$$\int \dots \int |\Psi(\vec{\mathrm{x}}_1,\vec{\mathrm{x}}_2,\dots,\vec{\mathrm{x}}_\mathrm{N})|^2 d\vec{\mathrm{x}}_1 d\vec{\mathrm{x}}_2 \dots d\vec{\mathrm{x}}_\mathrm{N} = 1 \tag{2.9}$$

Here, we face our first challenge. Obtaining a solution to Schrödinger equation that satisfies the previous conditions and is the true ground states, is not as straightforward as it might appear. However, one might utilize the variational principle to compute the energy of the system. The variational principle of this system suggests that using a trail wavefunction Ψ_{trial} to find the expectation value of $\widehat{H}$ will produce and energy E_{trail} which can be considered as the upper bound to the true ground state [26]

$$\langle\Psi_{\mathrm{trial}}|\widehat{H}|\Psi_{\mathrm{trial}}\rangle = E_{trail} \geq E_0 = \langle\Psi_0|\widehat{H}|\Psi_0\rangle \tag{2.10}$$

To find the true ground state, full minimization of the functional $E[\Psi]$ with respect to all N-electrons wavefunctions is needed

$$\mathrm{E}_0 = \min_{\Psi \to \mathrm{N}} E[\Psi] = \min_{\Psi \to \mathrm{N}} \langle \Psi | \hat{H}_{\mathrm{elec}} | \Psi \rangle \tag{2.11}$$

where the new ground state E_0 is a function of the number of electron N and the nuclear potential $\hat{V}_{ext}$.

An important idea that needs to be explained before covering the theorems for solving Schrödinger equation is electron density $n(\vec{r})$. The definition of $n(\vec{r})$ is linked to the probability equation in eqn. (2.9) where $n(\vec{r})$ can be thought of as a probability density (The probability of finding N electrons in a volume $d\vec{\mathrm{r}}$) [26], [27]. It has the form of

$$n(\vec{r}) = N \int \dots \int |\Psi(\vec{\mathrm{x}}_1, \vec{\mathrm{x}}_2, \dots, \vec{\mathrm{x}}_\mathrm{N})|^2 d\mathrm{s}_1 d\vec{\mathrm{x}}_2 \dots d\vec{\mathrm{x}}_\mathrm{N} \tag{2.12}$$

where the integral is done over the spin coordinates of all electrons and over all but one of the spatial variables ($\vec{\mathrm{x}}_i \equiv \vec{\mathrm{r}}_i, s_i$). In fact, the electron density is a non-negative function, with only three spatial variables, that approaches zero when $\vec{\mathrm{r}} \to \infty$, and its integral over the whole space returns the total number electrons [26].

$$n(\vec{\mathrm{r}} \to \infty) = 0 \tag{2.13}$$

$$\int n(\vec{r}) d\vec{\mathrm{r}} = N \tag{2.14}$$

Nowadays, the two most fundamental theorems in DFT are the two theorems by Hohenberg-Kohn [29]. These two theorems are:

- The ground-state energy E_0 is a unique function of the electron density $n(\vec{r})$.
- The true electron density $\tilde{n}(\vec{r})$ is the electron density that minimizes the energy of the overall functional.

Using a similar method as the one shown in eqns. (2.10) and (2.11), an approach called the Constrained-Search (developed by Levy [30]) is employed to find the minimum energy E_0 described by Hohenberg-Kohn. The Constrained-Search approach break the search into two separate steps. First, A search over the infinite space of antisymmetric wavefunctions Ψ to find a Ψ at which a particular trail electron density $n_{trail}(\vec{r})$ has its lowest energy ($n_{trail}(\vec{r})$ has to satisfy the requirement in eqn. (2.14)). Second, a search over all electron densities $n(\vec{r})$ is done to find the true minimum energy E_0 [26], [28], [29].

$$\mathrm{E_0} = \min_{\mathrm{n}\to\mathrm{N}} \left(\min_{\Psi\to\mathrm{n}} \langle \Psi | \widehat{H}_{\mathrm{elec}} | \Psi \rangle\right) \tag{2.15}$$

The fact that the energy term associated with the external potential $\hat{V}_{ext}$ does not depend on the wavefunction Ψ of the system and only depends on the electron density $n(\vec{r})$ allows us to modify eqn. (2.15) to

$$\mathrm{E_0} = \min_{\mathrm{n}\to\mathrm{N}} \left(\mathrm{F}[n(\vec{r})] + \int n(\vec{r}) \hat{V}_{ext} d\vec{\mathrm{r}}\right) \tag{2.16}$$

where

$$\mathrm{F}[n(\vec{r})] = \min_{\Psi\to\mathrm{n}} \langle \Psi | \hat{T} + \hat{V}_{ee} | \Psi \rangle. \tag{2.17}$$

It is simpler to use the single electron wavefunction Ψ_{i} to represent a functional that is described by the Hohenberg-Kohn.

$$\mathrm{E}[\Psi_{\mathrm{i}}] = E_{tot}[\Psi_{\mathrm{i}}] + E_{XC}[\Psi_{\mathrm{i}}] \tag{2.18}$$

Here, E_{XC} is the exchange-correlation function used to describe the energy of the quantum mechanical properties not described by eqns. (2.3) - (2.6) and are unknown. In addition, it takes into account the fact that defining the kinetic energy described by the single electron picture is not the true kinetic energy for which it compensates [26]–[28].

While Hohenberg-Kohn theorems presented us with a new point view to solve Schrödinger equation, it is still a challenging task. Kohn and Sham provided a systematic approach to solve Schrödinger equation through a set of single electron based equations [31]. The Kohn-Sham equation have the from

$$[T + V_{Ne} + V_H + V_{XC}]\Psi_{\mathrm{i}} = E_i \Psi_i \tag{2.19}$$

where

$$T = -\frac{1}{2}\nabla_i^2 \tag{2.20}$$

$$V_{Ne} = -\frac{Z_A}{r_{iA}} \tag{2.21}$$

$$V_H = \int \frac{n(\vec{r}_j)}{r_{ij}} d\vec{r}_j \tag{2.22}$$

$$V_{XC} = \frac{\delta E_{XC}}{\delta n} \tag{2.23}$$

Here, T is the kinetic energy term of the single electron Hamiltonian, V_{Ne} is the interaction potential of the electron and the collection of atomic nuclei, V_H is the Hartree potential describing the repulsive interaction of the single electron considered and total electron density of the system, and V_{XC} is functional derivative of the exchange-correlation function taking into account all the interactions not included in the previous terms [26]–[28], [31].

Now, one can use the following self-consistent iterative algorithm to find the solution of the single electron Kohn-Sham equations (Fig. 2.1):

1. Define a trail electron density $n_{trail}(\vec{r})$.
2. Using $n_{trail}(\vec{r})$, solve eqns. (2.19)-(2.23) to find the single-electron wavefunction Ψ_i.
3. Using the obtained Ψ_i, a new electron density $n_{KS}(\vec{r})$ using eqn. (2.12).
4. Check if $n_{trail}(\vec{r}) = n_{KS}(\vec{r})$. If yes, calculate the ground state energy E_0. If No, adjust $n_{trail}(\vec{r})$ using a weighted average of $n_{KS}(\vec{r})$ and $n_{trail}(\vec{r})$ to create a new $n_{trail}(\vec{r})$.

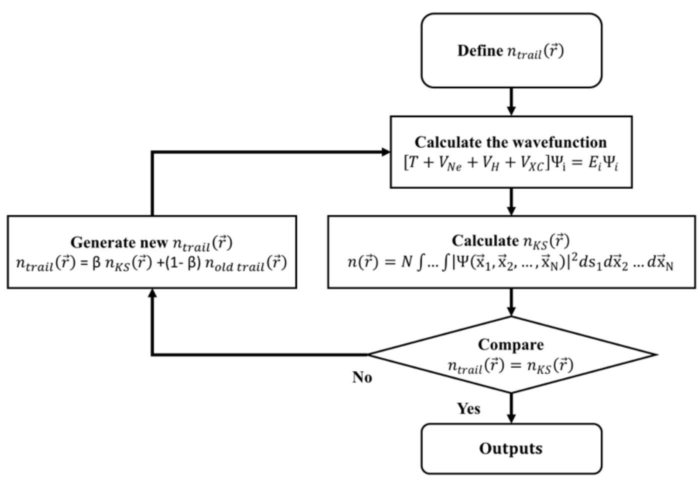

Figure 2.1: Flowchart of the main DFT self-consistent loop.

As shown above, the self-consistent Kohn-Sham approach provides a compact and simple method to approximate the solution of the single electron wavefunction. However, the challenging part is defining E_{XC} due to the fact that its true from is unknown. To approximate E_{XC}, it is assumed that the system has a uniform electron gas behavior. Indeed, several methods have been developed to approximate E_{XC} having in their cores the uniform gas approximation. The simplest one is called the local density approximation (LDA) method. LDA assumes that the electrons are moving in background of positive charge distribution and the total ensemble is charge neutral [26], [28], [31] . The form of the E_{XC} suggested by LDA is

$$E_{XC}^{LDA} = \int \epsilon_{xc}(n(\vec{r}))n(\vec{r})d\vec{r} \tag{2.24}$$

$$\epsilon_{xc}\big(n(\vec{r})\big) = \epsilon_{x}\big(n(\vec{r})\big) + \epsilon_{c}(n(\vec{r})) \tag{2.25}$$

$$\epsilon_{x}\big(n(\vec{r})\big) = -\frac{3}{4}\sqrt[3]{\frac{3n(\vec{r})}{\pi}} \tag{2.26}$$

where $\epsilon_{xc}(n(\vec{r}))$ is exchange-correlation energy per electron in the uniform gas of density n, which can be calculated as the sum of the exchange energy ϵ_x and the correlation part ϵ_c as shown in eqn. (2.25). While the ϵ_x has the form shown in eqn. (2.26), ϵ_c has no explicit form and multiple estimations can be found in the following references [32]–[34].

Generally, LDA has an exchange energy accuracy of around 10%; however, it shines when studying bonds length in crystal where the bond length accuracy is ~ 2%. Nonetheless, LDA still suffers when it comes to a system of heavy fermions or a system where the band gap E_g information is of a great deal of importance [26]–[28].

To overcome most of the limitation the LDA has, the generalized gradient approximation (GGA) has been developed. To address the reality that the true electron gas is inhomogeneous, GGA use not only the electron density information in its exchange-correlation function, but also the gradient of the electron density $\nabla n(\vec{r})$ as shown below [26], [28].

$$E_{XC}^{GGA} = \int \epsilon_{xc}(n(\vec{r}), \nabla n(\vec{r}))n(\vec{r})d\vec{r} \tag{2.27}$$

The most commonly used GGA functional in research these days are Perdew-Wang functional (PW91) [35] and Perdew-Burke-Ernzerhof functional (PBE) [36]. GGA paved the way for hybrid functional that provides better approximations, such as Becke-Lee-Yang-Parr (BLYP) [37], [38].

$$E_{XC}^{hyb} = \alpha E_{X}^{KS} + (1-\alpha)E_{XC}^{GGA} \tag{2.28}$$

Here, $E_X^{KS}$is the exact Kohn-Sham wavefunction exchange energy, and α is a fitting parameter.

Thus far, the focus of the discussion was the Hamiltonian operator $\widehat{H}$. Now, we need determine which representation we use for the wavefunction Ψ. First, there is a linear combination of atomic orbitals (LCAO) expression. In this approach, the Kohn-Sham orbitals Ψ_i are expanded using an L predefined basis function φ_μ

$$\Psi_i(\vec{r}) = \sum_{\mu=1}^{L} c_{\mu i}\varphi_\mu(\vec{r}) \tag{2.29}$$

$$\varphi_\mu(\vec{r}) = \varphi_\mu(r)Y_{lm}(\Theta,\phi) \tag{2.30}$$

Substituting eqn. (2.29) in eqn. (2.19), the LCAO based Kohn-Sham equation becomes

$$\mathrm{H}^{\mathrm{KS}} \sum_{\mu=1}^{L} c_{\mu i}\varphi_\mu(\vec{r}) = E_i \sum_{\mu=1}^{L} c_{\mu i}\varphi_\mu(\vec{r}) \tag{2.31}$$

By multiplying eqn. (2.31) by an arbitrary basis function φ_ν and integrating over all space $\vec{r}$, we get

$$\sum_\mu H_{\nu\mu}^{KS} c_{\mu i} = \sum_\mu S_{\nu\mu} c_{\mu i}\epsilon_i \tag{2.32}$$

where $H_{\nu\mu}^{KS}$ is the Kohn-Sham matrix and $S_{\nu\mu}$ is the overlap matrix [26].

The other method to describe the wavefunction Ψ is called the plane wave (PW) method. Due to the periodic nature of crystals, Ψ has to obey a fundamental property of waves described by Bloch's theorem

$$\phi_k(\vec{r}) = u_k(r)e^{ik\cdot\vec{r}} \tag{2.33}$$

Here, k is the wave vector, $u_k(r)$ is a periodic potential and has the same periodicity as the cell studied. PW method, as the name suggests, chooses to use plane waves basis functions that are periodic with respect to the Brillouin zone (BZ)

$$\varphi_\mu(\vec{r}) = \frac{1}{\sqrt{\Omega}}\sum_G C_G e^{iG\cdot\vec{r}} \tag{2.34}$$

$$\Psi_k(\vec{r}) = \frac{1}{\sqrt{\Omega}}\sum_G C_{k+G} e^{i(G+k)\cdot\vec{r}} \tag{2.35}$$

where $G$is the vector of the reciprocal lattice. Similarly, all other functions become periodic

$$\mathrm{n}(\vec{r}) = \sum_G n_G e^{iG\cdot\vec{r}} \tag{2.36}$$

$$\mathrm{V}(\vec{r}) = \sum_G V_G e^{iG\cdot\vec{r}} \tag{2.37}$$

PW have a lot of advantages; for example, the fact that it orthogonal, independent of the atomic position, and it works for any atomic type. In addition, the approximation can be improved by simply increasing the kinetic cutoff energy (E_{cutoff}). The minimum E_{cutoff} can by derived by looking into the kinetic term of the Kohn-Sham equation. By applying the kinetic operator on the wavefunction Ψ_k, we obtain

$$\mathrm{E} = \frac{1}{2}|\mathrm{G} + \mathrm{k}|^2 \tag{2.38}$$

Hence,

$$E_{cutoff} > \frac{1}{2}|\mathrm{G} + \mathrm{k}|^2 \tag{2.39}$$

One disadvantage of the plane-wave basis is that its Ψ has sharp feature and node due to core electrons. This is proven to be challenging and expensive to represent. These core electrons, and by extension their wave-functions, play insignificant role in chemical and electronic properties of the materials if compared to the valence electrons. Therefore, it would be more efficient to omit (freeze) these electrons and focus on the valence electrons as long as the screening effect is reproduced. This is accomplished through replacing the strong Coulomb potential with a modified potential called pseudopotential as shown in Fig. 2.2.

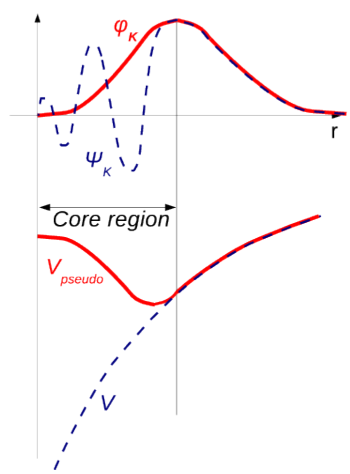

Figure 2.2: Plot of the Coulomb potential ($V = \frac{Z}{r}$) and the wavefunction Ψ_k of the all-electron case and the pseudopotential V_{pseudo} and pseudo-wavefunction φ_k in real space. [39].

There are three main pseudopotentials which are the norm-conserving pseudopotential (NCPP) [40], the ultrasoft pseudopotential (USPP) [41], and the projector augmented-wave pseudopotential (PAW) [42]. All the pseudopotential freezes the core electron by adjusting the core radius r_c (the vertical line shown in the right edge of Fig. 2.2) to be away from the core region. The difference among them, however, arises from the cutoff-energy E_{cutoff} requirement; if it requires higher E_{cutoff}, then it is hard; while soft pseudopotential requires smaller E_{cutoff}. PAW has a special feature that is its capability of reconstructing the all-electron wavefunctions from the pseudo-wavefunction using a linear transformation. This allows for better representation of the results without excessively increase the computational time [27].

In addition, the BZ idea minimizes the calculation requirement since the reciprocal space is periodic outside the 1st BZ. However, a large number of quantities calculated using DFT (e.g charge density, density of state, … etc.) require an integral over all k-points in the BZ

$$\langle F \rangle = \frac{1}{\Omega_{\mathrm{BZ}}} \int F(k) dk \tag{2.40}$$

Clearly, an integration over an infinite k-points is impractical for computational simulations. Hence, the integration in eqn. (2.40) can be approximated using a weighted sum. This method is called the Gaussian quadrature method

$$\langle F \rangle = \frac{1}{\Omega_{\mathrm{BZ}}} \int F(k) dk = \sum_i^q \omega_i F(k_i) \tag{2.41}$$

where ω is the weight associated with each k-point.

Monkhorst and Pack have developed an efficient method to solve eqn. (2.41), which made it widely used in DFT calculation nowadays [43]. It works by first determining the number of k-points needed in all the three reciprocal lattice vectors ($b_i \quad i = 1,2,3$) and creating a uniformly distributed k-points over the irreducible 1st BZ (IBZ)

$$\mathrm{k_{prs}} = u_p b_1 + u_r b_2 + u_s b_3 \tag{2.42}$$

$$\mathrm{u_r} = \frac{2r - q_r - 1}{2q_r} \qquad r = 1,2, \dots, q_r \tag{2.43}$$

Those k-points can be further reduced using symmetrical operation to determine the unique points and their weights. For example, in Fig. 2.3, a simple quadratic 2D lattice is plotted with 16 k-points ($q_1 = q_2 = 4$). As shown in Fig 2.3, there are only 3 unique k-points within IBZ (shown green dashed line).

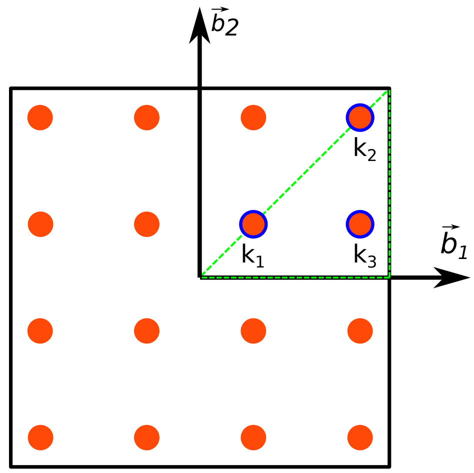

Figure 2.3: Scheme of a simple quadratic 2D lattice showing the 1BZ and 16 equally spaced k-points.

To determine the weight of each k-points, the number of copies it has in the rest of the BZ is counted. Note that if the k-point is on the edge of the IBZ, it is considered to be part of two adjacent IBZ cells. For example, point k_1 has 4 equivalent point in the 1st BZ. Thus, its weight is 1/4. Similarly,

$$4 \times \mathrm{k}_1 \Longrightarrow \omega_1 = \frac{4}{16} = \frac{1}{4}$$

$$4 \times \mathrm{k}_2 \Longrightarrow \omega_2 = \frac{4}{16} = \frac{1}{4}$$

$$8 \times \mathrm{k}_3 \Longrightarrow \omega_3 = \frac{8}{16} = \frac{1}{2}$$

Therefore, the sum that represents the integral will be

$$\frac{1}{\Omega_{\mathrm{BZ}}} \int F(k)dk \Longrightarrow \frac{1}{4}F(k_1) + \frac{1}{4}F(k_2) + \frac{1}{2}F(k_3)$$

Finally, DFT for 2D materials requires special treatment. The Monkhorst-Pack k-points has the form $\mathrm{M} \times \mathrm{N} \times 1$ since there is no periodicity in the z-direction. Moreover, since the periodic images is inherent in the DFT calculation, one must leave enough space in the z-direction to eliminate any unwanted interaction between the images. Usually, 15 – 20 Å is enough.

2.1.1 DFT Simulation for Platinum Diselenide ($PtSe_2$)

Electronic states are calculated based on plane wave DFT calculations using Quantum ESPRESSO [44] with generalized gradient approximation (GGA) and projector augmented wave (PAW) pseudopotential. The kinetic energy cutoff of the wavefunction is 50 Ry. The structures are relaxed until the total force becomes less than 0.001 Ry/a.u. and the stress is less than 10^{-7} Ry/a_0^3 (a_0 being bohr) in all directions. The unit cell contains one Pt and two Se atoms (dashed diamond in Fig. 2.4(a)). The band structure is plotted along the high symmetry points of the first Brillouin zone (BZ) in Fig. 2.4(b).

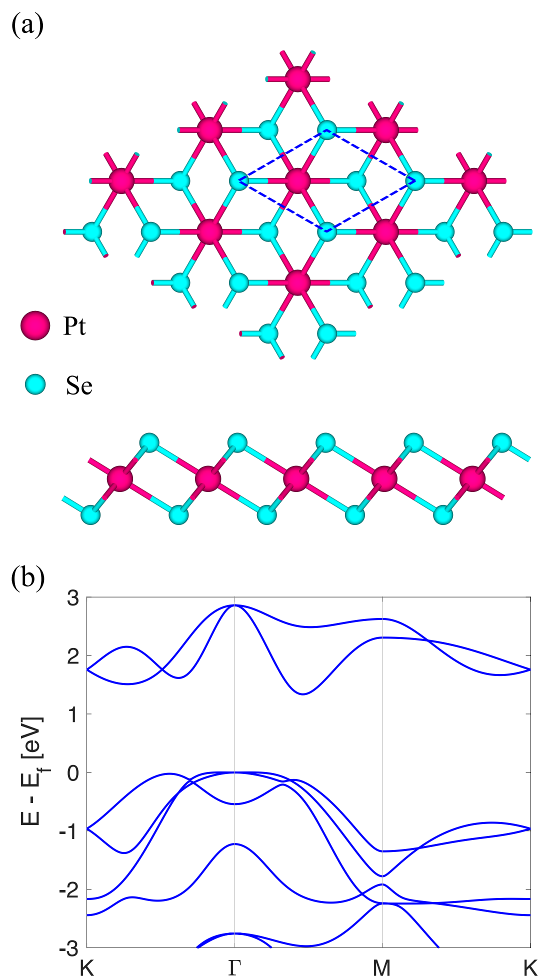

Figure 2.4: (a) 1T $PtSe_2$ crystal structure (Top panel) top view; (bottom) side view. (b) DFT band structure of $PtSe_2$ showing (E_c) between Γ and M points.

The conduction band minimum in $PtSe_2$ is located between the Γ and M symmetry points. The abnormal flat valence band maximum shown in Fig. 2.4(b) can be corrected by including the spin-orbit coupling (SOC) effect in the DFT calculation as demonstrated in Fig 2.5(b). However, considering SOC effect is computationally more expensive. In addition, due to the fact that the focus of the $PtSe_2$ study in this thesis is on its n-type transfer characteristics and the fact that SOC effect is minimal for the conduction band, it was decided that the DFT band structure for the reference is the one without the SOC effect.

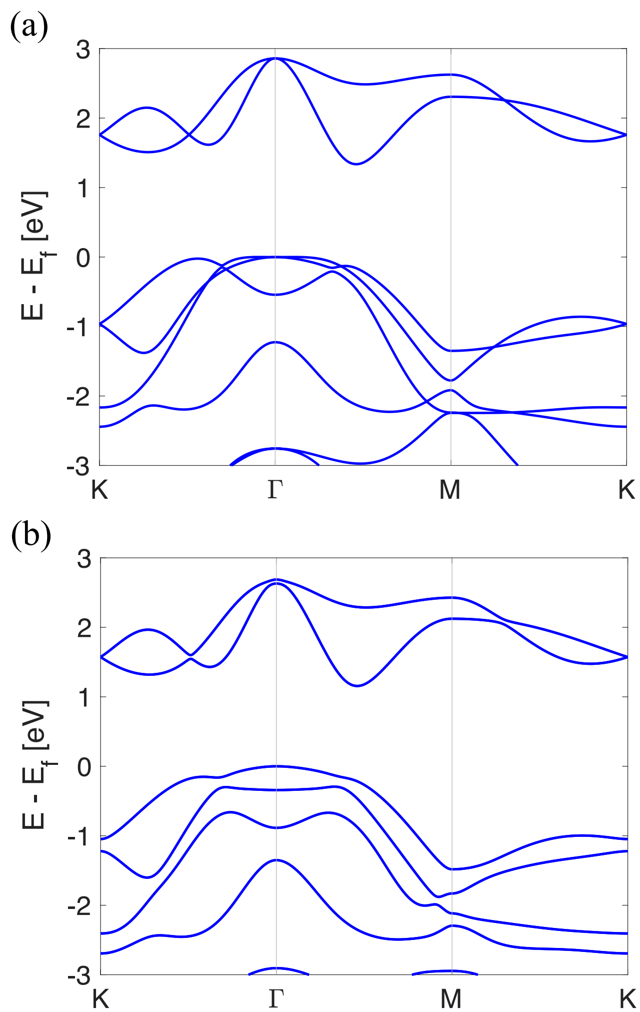

Figure 2.5: $PtSe_2$ band structure (a) without (b) with spin-orbit coupling (SOC) effect considered (The band structure without SOC effect is repeated here for ease of comparison).

2.1.2 DFT Simulation for Hafnium Diselenide ($HfSe_2$)

The electronics states of $HfSe_2$ are calculated by DFT based on the plane wave approximation using Quantum ESPRESSO [45]. Projector augmented wave (PAW) pseudopotential within the generalized gradient approximation (GGA) is used with the kinetic energy cutoff of the wavefunction being 50 Ry. A unit cell containing one Hf atom and two Se atoms (Fig. 2.6(a)) is taken for the calculation. The most stable crystal structure for $HfSe_2$ is the 1T configuration. The structure is relaxed until the total forces reach less than 0.001 Ry/a.u. and the stress is less than 10^{-7} Ry/a_0^3 in all directions. The band structure along the high symmetry points of the first Brillouin zone (BZ) of $HfSe_2$ is plotted in Fig. 2.6(b).

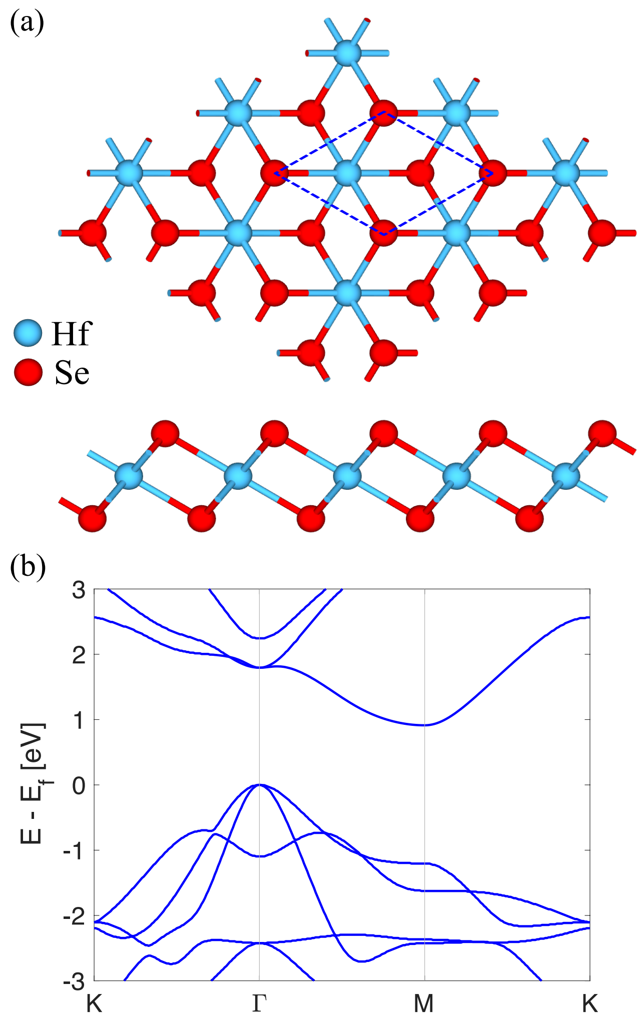

Figure 2.6: (a) Crystal structure of $HfSe_2$ obtained from DFT. (Top panel) top view; (bottom) side view. The unit cell is shown by a dashed diamond. (b) DFT band structure of $HfSe_2$.

2.2 Tight-Binding (TB) Approximation

While DFT can produce more accurate results, it is computationally expensive to be used as a means to generate the Hamiltonian for other calculation like NEGF. Multiple approaches have been suggested such as effective mass approximation and k.p method. However, such methods only capture the minimal features needed in NEGF; for example, the effective mass of the conduction and valence bands or the band gap. On the other hand, the tight-Binding (TB) method can provide a better approximation of the DFT result. The Hamiltonian in the TB approximation is based on atomic-like basis sets. In addition, instead of using the multi-body Hamiltonian operator shown in eqn. (2.19), a parametrized Hamiltonian is used. Those parameters will maintain features like the effect symmetry and distance without significantly increasing the computational time. This is accomplished by limiting the parameters to a minimal number within the energy range of interest [46], [47]. There are two main approaches to construct the TB Hamiltonian, which are Slater-Koster TB parametrization and maximally localized Wannier's Function (MLWF).

2.2.1 Slater-Koster Tight-Binding Parametrization

Slater-Koster TB method populates the Hamiltonian using hopping integral-based parameters [48]. These hopping integrals originate from the electronic Hamiltonian in eqn. (2.19). If one neglects V_H and V_{XC}, the new Hamiltonian will have the form of

$$\hat{H}_{elec}(r) = T + V_{Ne} = -\frac{1}{2}\nabla^2 + \sum_{i,\alpha} v(r - T_i - R_\alpha) = -\frac{1}{2}\nabla^2 + v_R(r) \tag{2.44}$$

where T_i is lattice vector and R_α is the position of the basis α. The Bloch wavefunction of each atomic orbital with quantum numbers lm will be

$$\Psi_{lm}^{\alpha}(k, r) = \frac{1}{\sqrt{N}} \sum_i e^{iT_i \cdot k}\, \Psi_{lm}(r - T_i - R_\alpha). \tag{2.45}$$

The Hamiltonian and the overlap matrix for the Bloch wavefunction are calculated using

$$\mathrm{H}_{lm,l'm'}^{\alpha,\alpha'}(k) = \left\langle \Psi_{lm}^{\alpha}(k) \middle| \hat{H}_{elec} \middle| \Psi_{l'm'}^{\alpha'}(k) \right\rangle \tag{2.46}$$

$$\mathrm{S}_{lm,l'm'}^{\alpha,\alpha'}(k) = \left\langle \Psi_{lm}^{\alpha}(k) \middle| \Psi_{l'm'}^{\alpha'}(k) \right\rangle. \tag{2.47}$$

Eqns. (2.46) and (2.47) can be used to define a generalized eigenvalue problem, from which the eigenvalues of the wavefunction can be obtained. The new Hamiltonian $\mathrm{H}_{lm,l'm'}^{\alpha,\alpha'}$ can be written in a different form, which utilizes the atomic energy level $\varepsilon^{0}_{l'\alpha'}$, the crystal-field matrix $\Delta\varepsilon^{\alpha}_{lm,l'm'}$, and the hopping integral $t^{i\alpha,i'\alpha'}_{lm,l'm'}$ as follows

$$\mathrm{H}^{\alpha,\alpha'}_{lm,l'm'}(k) = \varepsilon^{0}_{l'\alpha'}\mathrm{S}^{\alpha,\alpha'}_{lm,l'm'}(k) + \Delta\varepsilon^{\alpha}_{lm,l'm'}\delta_{\alpha,\alpha'} - \frac{1}{N}\sum_{i\alpha\neq i'\alpha'} e^{i(T_{i'}-T_i)\cdot k}\, t^{i\alpha,i'\alpha'}_{lm,l'm'} \tag{2.48}$$

$$\Delta\varepsilon^{\alpha}_{lm,l'm'} = \int dr\Psi_{lm}(r-R_\alpha)[\nu_R(r) - \nu(r-R_\alpha)]\Psi_{l'm'}(r-R_\alpha)] \tag{2.49}$$

$$t^{i\alpha,i'\alpha'}_{lm,l'm'} = \int dr\Psi_{lm}(r-T_i-R_\alpha)[\nu_R(r) - \nu(r-T_i-R_\alpha)]\Psi_{l'm'}(r-T_i-R_\alpha)]\,. \tag{2.50}$$

The hopping integral $t^{i\alpha,i'\alpha'}_{lm,l'm'}$, shown in eqn. (2.50), has both two-center and three-center terms. The Three-center term can be neglected if the basis are localized [47]. Hence, it can be assumed that $t^{i\alpha,i'\alpha'}_{lm,l'm'} \sim -V^{i\alpha,i'\alpha'}_{lm,l'm'}$

$$V^{i\alpha,i'\alpha'}_{lm,l'm'} = \int dr\Psi_{lm}(r-T_i-R_\alpha)\nu(r-T_i-R_\alpha)\Psi_{l'm'}(r-T_i-R_\alpha)] \tag{2.51}$$

Slater-Koster simplified the previous integrals using cubic harmonic orbitals [48]. Now, the integral describing the interaction between two atomic bases can be approximated using a combination of bonds integrals. Below listed some examples of the energy integrals terms of the two-center approximation (More terms are provided in refs. [47], [48])

$$\begin{aligned}
E_{s,s} &= V_{ss\sigma} \\
E_{s,x} &= lV_{sp\sigma} \\
E_{x,x} &= l^2V_{pp\sigma} + (1-l^2)V_{pp\pi} \\
E_{x,y} &= lmV_{pp\sigma} - lmV_{pp\pi} \\
E_{x,z} &= lnV_{pp\sigma} - lnV_{pp\pi} \\
E_{s,xy} &= \sqrt{3}lmV_{sd\sigma} \\
E_{x,xy} &= \sqrt{3}l^2mV_{pd\sigma} + m(1-2l^2)V_{pd\pi} \\
E_{xy,xy} &= 3l^2m^2V_{dd\sigma} + (l^2+m^2-4l^2m^2)V_{dd\pi} + (n^2+l^2m^2)V_{dd\delta}
\end{aligned}$$

Here, l , m and n are the direction cosines, defined as (d is the distance between the two basis)

$$l = (R_j - R_i) \cdot \frac{\hat{x}}{d} \text{ , } m = (R_j - R_i) \cdot \frac{\hat{y}}{d}, n = (R_j - R_i) \cdot \frac{\hat{z}}{d}$$

The previous terms account for all type of bonds starting from the σ bond which is the strongest. Then the π bond for orbitals in which the bond axis belongs to a shared nodal plane. Finally, there is the δ bond, where the bond axis belongs to shared nodal planes as shown in Fig. 2.7 [47].

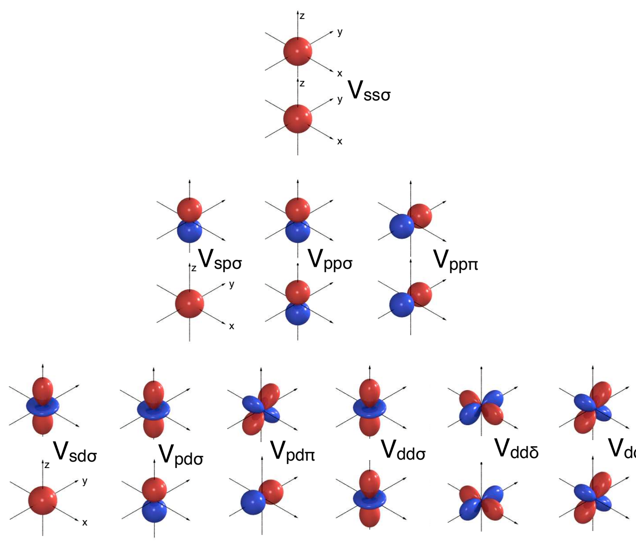

Figure 2.7: The two-centre Slater-Koster integrals for atomic orbital s, p, and d demonstrating the type of bonds that can be formed such as $\boldsymbol{\sigma}, \boldsymbol{\pi}$ and $\boldsymbol{\delta}$ [47].

A simple and common method to find the value of the Slater-Koster integral is to use empirical fitting of the eigenvalues provided by DFT. This can be done using the following algorithm:

1. Create an initial guess for all integrals $V_{lm,l'm'}^{i\alpha,i'\alpha'}$, the atomic energy levels $\varepsilon_{l'\alpha'}^{0}$, and crystal-field matrix $\Delta\varepsilon_{lm,l'm'}^{\alpha}$.
2. Solve the eigenvalue problem using the $\mathrm{H}_{lm,l'm'}^{\alpha,\alpha'}$.
3. Compare TB eigenvalue $\mathrm{E_i^{TB}}$with DFT ones $\mathrm{E_i^{DFT}}$. If the mean square error (MSE) is below the desire criteria, then finish. Otherwise, update $V_{lm,l'm'}^{i\alpha,i'\alpha'}$, $\varepsilon_{l'\alpha'}^{0}$, and $\Delta\varepsilon_{lm,l'm'}^{\alpha}$

2.2.2 Maximally Localized Wannier Functions (MLWFs) Tight-Binding

To understand the maximally localized Wannier functions (MLWFs), it is better to start by discussing the transformation of Bloch functions to Wannier functions (WF). As was shown in eqn. (2.33), the wavefunction Ψ_{nk} shows periodicity similar to the lattice it represents. Due to the fact that each Bloch functions, at a specific k-point, have its envelop function ($e^{ik\cdot R}$), it is possible to construct a localized "wave packet" Bloch function by superposing Bloch functions with different k-points. For simplicity, a single isolate band picture can be used here as shown in Fig. 2.8 [49].

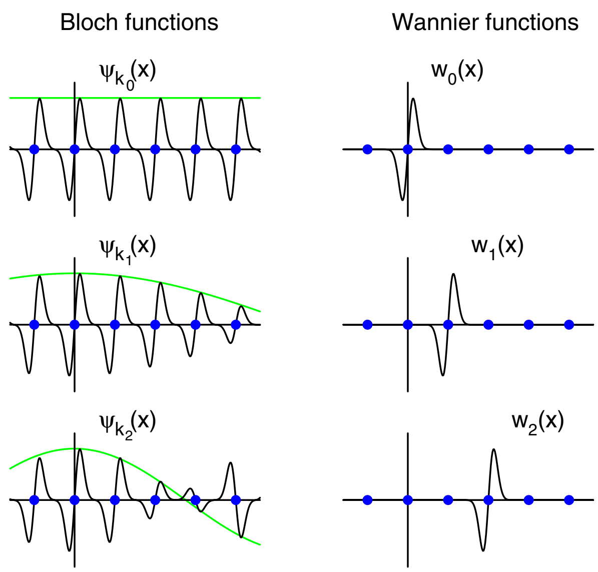

Figure 2.8: A single band toy model of the transformation from Bloch functions to Wannier functions (WF). The Bloch wavefunction Ψ_{k_0} , Ψ_{k_1} , *and* Ψ_{k_2} represent a real-space form of the Bloch function at different k-points. Each is associated with the WF transformation of it [49]**.**

Generally, to obtain a well-localized wave packet, a very broad superposition of k space is needed, which is challenging since k space is part of the periodic BZ. Hence, it would be simpler to select k-points with equal amplitudes throughout the BZ. The result is a localized WF in the home unit cell as shown in Fig. 2.8

$$w_0(r) = \frac{V}{(2\pi)^3}\int dk\Psi_{nk}(r) \tag{2.52}$$

Here, V is the volume of the real-space primitive cell. Eqn. (2.52) can be generalized through introducing a phase factor $e^{-ik\cdot R}$. This allows the translation of WF in real-space (as shown in Fig. 2.8 as w_1 and w_2) [49]. Hence, the new form will be

$$|R_n\rangle = \frac{V}{(2\pi)^3}\int dk\, e^{-ik\cdot R}|\Psi_{nk}\rangle. \tag{2.53}$$

It is evident that eqn. (2.53) has the form of a Fourier transform. More importantly, its inverse is in the form of

$$|\Psi_{nk}\rangle = \sum_R e^{ik\cdot R}|R_n\rangle. \tag{2.54}$$

Therefore, any Bloch function can be constructed using a linear superposition of multiple WF as long as the suitable phases $e^{ik\cdot R}$ are used. Despite the fact that WFs are not the Hamiltonian eigenstates, it still provides a valid description of the band subspace similar to the one done by the Bloch functions due to the coupling of eqns. (2.53) and (2.54) via a unitary transformation [50]. The band projection P is a clear example of this likeness between Bloch functions and WFs representation

$$P = \frac{V}{(2\pi)^3}\int dk|\Psi_{nk}\rangle\langle\Psi_{nk}| = \sum_R|R_n\rangle\langle R_n|. \tag{2.55}$$

The complexity of WF arises from the concept of gauge freedom that is inherent in the definition of wavefunction Ψ_{nk}. Gauge freedom necessitates that we can replace

$$|\widetilde{\Psi}_{nk}\rangle = e^{i\varphi(k)}|\Psi_{nk}\rangle \tag{2.56}$$

with

$$|\tilde{u}_{nk}\rangle = e^{i\varphi(k)}|u_{nk}\rangle \tag{2.57}$$

without any change to the physical description of the system. Here, $\varphi(k)$ is any periodic function over the BZ. To achieve a localize WFs, the Bloch functions in eqn. (2.53) have to be smooth, that is, $\nabla_k|u_{nk}\rangle$ has to be well defined at all k (smooth gauge) points. This brings one of the features of WFs, which is its nonuniqueness where different smooth gauge in eqn. (2.53) will give different WFs [50].

Up until now, the discussion was on the simplified single isolated band picture. In the case of the J number of bands, providing that they do not interact with other bands in higher or lower energy, a general gauge transformation of the following form can be used

$$|\widetilde{\Psi}_{nk}\rangle = \sum_{m=1}^{J} U_{mn}^{(k)}|\Psi_{mk}\rangle \tag{2.58}$$

Here, $U_{mn}^{(k)}$ is a unitary matrix with a dimension of J. Using eqn. (2.58), a general formulation of the band project in eqn. (2.55) can be derived

$$P_k = \sum_{n=1}^{J} |\Psi_{nk}\rangle\langle\Psi_{nk}| = \sum_{n=1}^{J} |\widetilde{\Psi}_{nk}\rangle\langle\widetilde{\Psi}_{nk}| \tag{2.59}$$

where the trace over the band is invariant. Eqn. (2.58) also provides a general guideline to obtain a well-localized WFs from a Bloch function. One can start with a $|\Psi_{mk}\rangle$ that is not fully smooth in the k space and utilizes a rotational $U_{mn}^{(k)}$ to restore the smoothness needed [50]. Therefore, well-localized WFs must have the form

$$|R_n\rangle = \frac{V}{(2\pi)^3} \int dk e^{-ik\cdot R} \sum_{m=1}^{J} U_{mn}^{(k)} |\Psi_{mk}\rangle. \tag{2.60}$$

It is noteworthy to remember that Bloch function is normalized within a unit cell that. Nonetheless, the results of $\langle\Psi_{nk}|\Psi_{mk'}\rangle$ is not unity, but it diverges according to

$$\langle\Psi_{nk}|\Psi_{mk'}\rangle = \frac{(2\pi)^3}{V} \delta_{mn} \delta^3(k-k'). \tag{2.61}$$

On the other hand, the WFs is properly normalized as follows

$$\langle R_n|R'_m\rangle = \delta_{mn}\delta_{RR'} \tag{2.62}$$

Similar to the case in DFT, it is more convenient to work with a discretized number of k-points instead of the continuous k space. Thus, the Fourier transform pairs in eqns. (2.53) and (2.54) can be rewritten in the form of

$$|\Psi_{nk}\rangle = \frac{1}{\sqrt{N}} \sum_R e^{ik\cdot R} |R_n\rangle \qquad \Leftrightarrow \qquad |R_n\rangle = \frac{1}{\sqrt{N}} \sum_k e^{-ik\cdot R} |\Psi_{nk}\rangle \tag{2.63}$$

where N is the number of unit cells in the periodic supercell [50].

The building of the smooth gauge can be simply achieved using projection. One can start with J conventional cubic harmonic atom centered (or bonds centered) trail orbitals $g_n(r)$ [50], [51]. These trail orbitals $g_n(r)$ are projected on the Bloch functions to obtain

$$|\phi_{nk}\rangle = \sum_{m=1}^{J} |\Psi_{nk}\rangle\langle\Psi_{mk}|g_n\rangle. \tag{2.64}$$

The projection in eqn. (2.64) meets the requirement of smoothness needed for the localization. Nonetheless, such projection can be accomplished, in practice, by calculating the matrix $(A_k)_{mn}$, which is the inner product matrix, and use it to calculate the overlap matrix $(S_k)_{mn}$ as follows [50], [51]

$$(A_k)_{mn} = \langle \Psi_{mk} | g_n \rangle \tag{2.65}$$

$$(S_k)_{mn} = \left(A_k^{\dagger} A_k\right)_{mn}. \tag{2.66}$$

In fact, The Löwdin-orthonormalized Bloch-like states $|\widetilde{\Psi}_{nk}\rangle$ can be built using $(S_k)_{mn}$ and the non-orthonormal states $|\phi_{nk}\rangle$

$$|\phi_{nk}\rangle = \sum_{m=1}^{J} |\Psi_{nk}\rangle (A_k)_{mn} \tag{2.67}$$

$$|\widetilde{\Psi}_{nk}\rangle = \sum_{m=1}^{J} |\phi_{nk}\rangle (S_k)_{mn} \tag{2.68}$$

where $|\widetilde{\Psi}_{nk}\rangle$ and $|\Psi_{nk}\rangle$ are connected by a unitary transformation [50]–[52].

Thus far, the focus was on generating a smooth Bloch-like function that can be used in eqns. (2.60) or (2.63). Now, the attention will be focused toward enforcing the localization. The maximal localization is achieved through distinct localization criterion, from which the unitary matrix $U_{mn}^{(k)}$ can be refined [50]–[52]. The localization function has the form of

$$\Omega = \sum_n [\langle w_{0n} | r^2 | w_{0n} \rangle - \langle w_{0n} | r | w_{0n} \rangle^2] = \sum_n [\langle r^2 \rangle_n - \bar{r}_n^2] \tag{2.69}$$

where Ω is the sum of the quadratic spreads of the chosen J WFs around their centers. Eqn. (2.69) can be rewritten as

$$\Omega = \Omega_{\mathrm{I}} + \widetilde{\Omega} \tag{2.70}$$

$$\Omega_{\mathrm{I}} = \sum_n [\langle w_{0n} | r^2 | w_{0n} \rangle - \sum_{Rm} \langle w_{Rm} | r | w_{0n} \rangle^2] \tag{2.71}$$

$$\widetilde{\Omega} = \sum_n \sum_{Rm \neq 0n} \langle w_{Rm} | r | w_{0n} \rangle^2 \tag{2.72}$$

where both of Ω_{I} and $\widetilde{\Omega}$ are positive. More importantly, Ω_{I} is gauge invariant which makes it insensitive to the changes in the unitary matrix $U_{mn}^{(k)}$. Hence, the minimization of the spread (and by extension the improvement of localization) for the J WFs depends only on the minimization of $\widetilde{\Omega}$ [50]–[52].

In reciprocal space, the position operators can be expressed as

$$\langle w_{Rm} | r | w_{0n} \rangle = i \frac{V}{(2\pi)^3} \int dk \, e^{ik\cdot R} \langle u_{Rm} | \nabla_k | u_{0n} \rangle \tag{2.73}$$

$$\langle w_{Rm} | r^2 | w_{0n} \rangle = -\frac{V}{(2\pi)^3} \int dk \, e^{ik\cdot R} \langle u_{Rm} | \nabla_k^2 | u_{0n} \rangle. \tag{2.74}$$

Using a discretized BZ via a uniform Monkhorst-Pack mesh, the gradient ∇_k and Laplacian ∇_k^2 can be approximated as

$$\nabla_k = \sum_b \omega_b b[f(k+b) - f(k)] \tag{2.75}$$

$$|\nabla_k f(k)|^2 = \sum_b \omega_b [f(k+b) - f(k)]^2 \tag{2.76}$$

assuming that $f(k)$ is a smooth function. Here, $\{b\}$ are the vectors connecting the k-points with their neighbors, while ω_b is a weighted average [50], [52]. The only needed information that is left is the overlap matrix of the Bloch functions

$$M_{mn}^{(k,b)} = \langle u_{mk} | u_{n,k+b} \rangle. \tag{2.77}$$

Using eqns. (2.73) - (2.77) in eqns. (2.71) and (2.72), the new form of the gauge invariant and variant spreads is

$$\Omega_{\mathrm{I}} = \frac{1}{N_{kp}} \sum_{k,b} \omega_b \sum_{m=1}^{J} [1 - \sum_{n=1}^{J} \left| M_{mn}^{(k,b)} \right|^2] \tag{2.78}$$

$$\widetilde{\Omega} = \frac{1}{N_{kp}} \sum_{k,b} \omega_b [\sum_{n=1}^{J} \left(-Im \ln M_{nn}^{(k,b)} - b \cdot \bar{r}_n \right)^2 + \sum_{m \neq n}^{J} \left| M_{mn}^{(k,b)} \right|^2] \tag{2.79}$$

where N_{kp} is the number of Monkhorst-Pack k-pints and $\bar{r}_n$ is the center of the Wannier function at the nth position and can be calculated using

$$\bar{r}_n = \frac{1}{N_{kp}} \sum_{k,b} \omega_b \, b \, Im \ln M_{nn}^{(k,b)}. \tag{2.80}$$

It is noteworthy that $\widetilde{\Omega}$ itself can be split into a sum of band-diagonal Ω_{D} and band-off-diagonal Ω_{OD} terms

$$\widetilde{\Omega} = \Omega_{\mathrm{D}} + \Omega_{\mathrm{OD}} \tag{2.81}$$

$$\Omega_{\mathrm{D}} = \frac{1}{N_{kp}} \sum_{k,b} \omega_b \sum_{n=1}^{J} \left(-Im \ln M_{nn}^{(k,b)} - b \cdot \bar{r}_n \right)^2 \tag{2.82}$$

$$\Omega_{\mathrm{OD}} = \frac{1}{N_{kp}} \sum_{k,b} \omega_b \sum_{n=1}^{J} \sum_{m \neq n}^{J} \left| M_{mn}^{(k,b)} \right|^2. \tag{2.83}$$

The gradient of the spread, therefore, can be calculated with respect to the infinitesimal unitary rotation of the Ψ_{nk} as a function of $M_{mn}^{(k,b)}$, and minimization can be achieve using steepest-decent of conjugate-gradient methods.

In reality, having a perfect isolated set of bands is rare; hence, in the case of entangled bands, one needs to define an energy window in which there are $N_{win}^{(k)} \geq N$ states within this window for each k-point. Consequently, N Bloch states, in the subspace $\mathcal{S}(k)$, that are orthonormal can be obtained using unitary transformation $U^{dis(k)}$ among the $N_{win}^{(k)}$ states as follows [52]

$$|u_{nk}\rangle = \sum_{m\in N_{win}^{(k)}} U_{mn}^{dis(k)} |u_{mk}\rangle. \tag{2.84}$$

Within the subspace $\mathcal{S}(k)$, Ω_{I} can be minimized with respect to $U^{dis(k)}$ using

$$\Omega_{\mathrm{I}} = \frac{1}{N_{kp}} \sum_{k,b} \omega_b Tr[\hat{P}_k \hat{Q}_{k+b}] \tag{2.85}$$

where

$$\hat{P}_k = \sum_{n=1}^{N} |u_{nk}\rangle\langle u_{nk}| \tag{2.86}$$

$$\hat{Q}_k = 1 - \hat{P}_k. \tag{2.87}$$

After finding the unitary transformation $U_{mn}^{(k)}$ that minimize the WFs spreading, the MLWF Hamiltonian $\mathrm{H}^{\mathrm{W}}(k)$ can be constructed using the Bloch Hamiltonian $H(k)$

$$\mathrm{H}^{\mathrm{W}}(k) = U^{(k)\dagger} U^{dis(k)\dagger} H(k) U^{dis(k)} U^{(k)}. \tag{2.88}$$

Then, the Fourier sum of $\mathrm{H}^{\mathrm{W}}(k)$ is

$$H_{nm}(R) = \frac{1}{N_0} \sum_k e^{-ik\cdot R} \mathrm{H}^{\mathrm{W}}(k) \tag{2.89}$$

where N_0 number of the lattice vector R. $H_{nm}(R)$ is similar to Slater-Koster Hamiltonian in the fact that the element of the Hamiltonian decays rapidly with R. $H_{nm}(R)$ is the TB Hamiltonian needed for NEGF [49], [52].

2.2.3 TB parametrization for Platinum Diselenide ($PtSe_2$)

To preform device simulations, input material parameters are required. The tight-binding (TB) parameters for $PtSe_2$ have not been reported yet, and therefore, I have created TB parameters. For this, maximum localized Wannier function (MWLF) approach has been employed using Wannier90 [53]. Wannierization was done using 11 initial projections reflecting five *d*-orbitals of Pt atom and three *p*-orbitals of Se atom. As shown in Figs. 2.9 (a) and (b), the first nearest neighbor (1st NN) and the second nearest neighbor (2nd NN) TB parameters exhibits poor fitting to the DFT band structure; hence, the third nearest neighbor (3rd NN) TB parameters have been used since it can provide a high level of accuracy, and at the same time, it is computationally manageable. The parameters exhibit excellent matching to the DFT results as shown in Fig. 2.9(c). The supercell chosen for the quantum transport calculation contain 4 of the unit cell. Thus, the number of basis in the supercell Hamiltonian is 44 bases. The tight-binding Hamiltonian for the $PtSe_2$ supercell is in the form of

$$H\left(k_x, k_y\right) = \alpha + \beta e^{i(k_x \cdot dx)} + \gamma e^{i\left(k_y \cdot dy\right)} + \delta_1 e^{i\left(k_x \cdot dx + k_y \cdot dy\right)} + \delta_2 e^{i\left(k_x \cdot dx - k_y \cdot dy\right)} + \left(\beta e^{i(k_x \cdot dx)} + \gamma e^{i\left(k_y \cdot dy\right)} + \delta_1 e^{i\left(k_x \cdot dx + k_y \cdot dy\right)} + \delta_2 e^{i\left(k_x \cdot dx - k_y \cdot dy\right)}\right)^{\dagger}$$

where $dx = 6.49088 \times 10^{-10}$ m and $dy = 7.49504 \times 10^{-10}$ m. Due to the large size of the matrices $\alpha, \beta, \gamma, \delta_1,$ and δ_2, the TB parameters for these sub-matrices are provided in Appendix A.

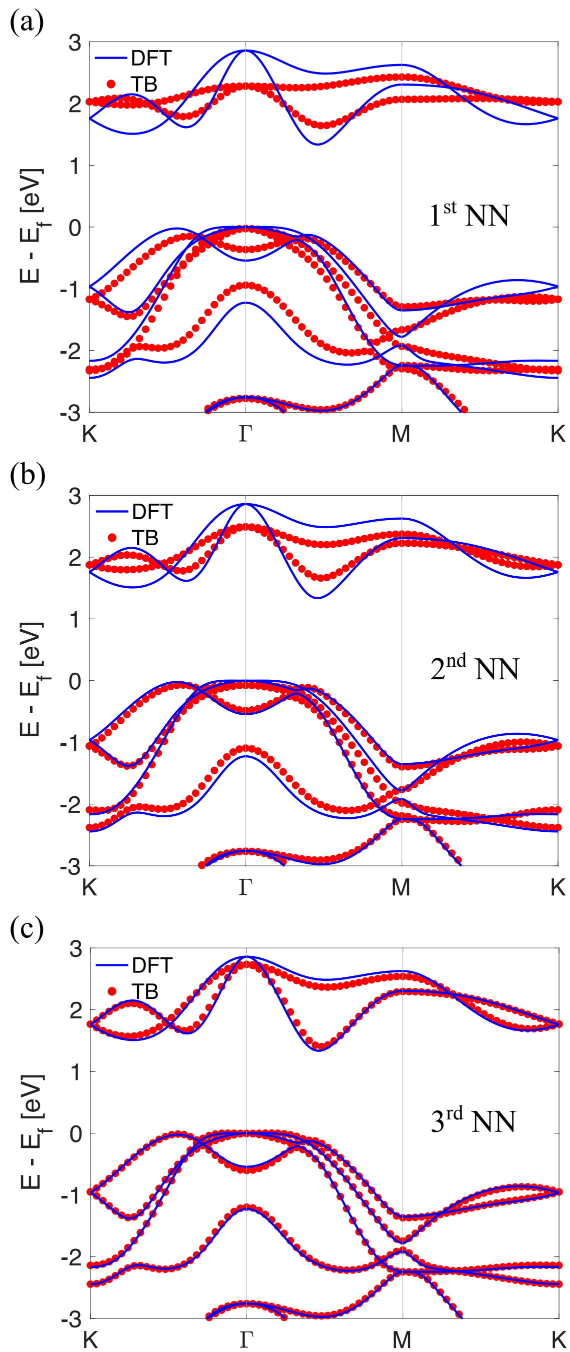

Figure 2.9: $PtSe_2$ band structures based on the density functional theory (DFT) (blue solid lines) and tight-binding (TB) using (a) 1st NN, (b) 2nd NN, and 3rd NN approximations (red dots).

2.2.4 TB parametrization for Hafnium Diselenide ($HfSe_2$)

To obtain the tight-binding parameters of $HfSe_2$, maximally-localized Wannier function (MLWF) approach is employed using Wannier90 [49]. The Wannierization is done using 11 initial projections. Those 11 projections are based on five *d*-orbitals of Hf atom and three *p*-orbitals of Se atom. To achieve a better fit, the conduction bands are disentangled. Similar to the case of $PtSe_2$, as shown in Figs. 2.10 (a) and (b), the 1st NN and the 2nd NN approximations provides poor description of the DFT band structure. Therefore, the 3rd NN approximation is used. As shown in Fig. 2.10(c), our TB bands are in great agreement with the DFT results. A rectangular supercell contain 4 unit cells was also chosen for the quantum transport calculation. The tight-binding Hamiltonian for the $HfSe_2$ supercell is in the form of

$$H(k_x, k_y) = \alpha + \beta e^{i(k_x \cdot dx)} + \gamma e^{i(k_y \cdot dy)} + \delta_1 e^{i(k_x \cdot dx + k_y \cdot dy)} + \delta_2 e^{i(k_x \cdot dx - k_y \cdot dy)} + \left(\beta e^{i(k_x \cdot dx)} + \gamma e^{i(k_y \cdot dy)} + \delta_1 e^{i(k_x \cdot dx + k_y \cdot dy)} + \delta_2 e^{i(k_x \cdot dx - k_y \cdot dy)}\right)^{\dagger}$$

where $dx = 6.57872 \times 10^{-10}$ m and $dy = 7.59644 \times 10^{-10}$ m. The TB parameters for the supercell are provided in Appendix B.

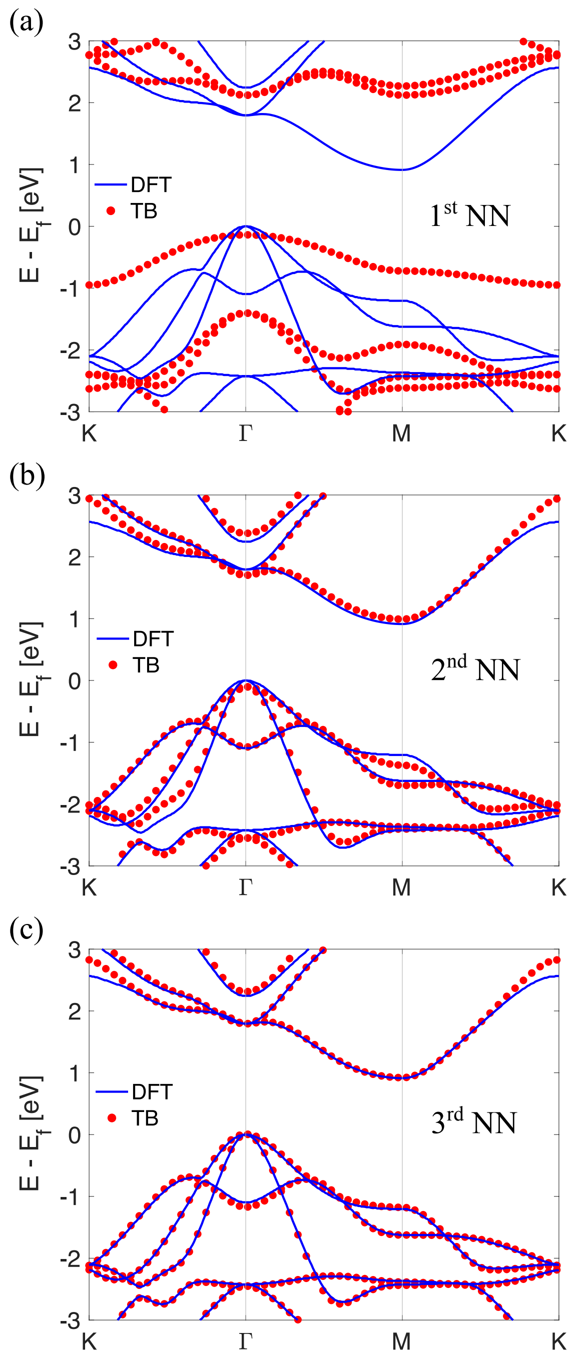

Figure 2.10: $HfSe_2$ band structures based on the density functional theory (DFT) (blue solid lines) and tight-binding (TB) using (a) 1^{st} NN, (b) 2^{nd} NN, and 3^{rd} NN approximations (red dots).

2.3 Non-Equilibrium Green's Function

The non-equilibrium Green's function (NEGF) method, despite being complicated, has been the most powerful method to calculate charge transport in nanoelectronic devices. This is due to the fact it can capture underlying physics such as quantum tunneling as well as interference and scattering effects [54], [55]. In the context of electronic devices, the desired information to be obtained are mainly charge density and current. To accomplish that, first one needs to calculate Green's function $G(E)$ which has the form of

$$G(E) = [(E + i0^{+})I - H - U - \Sigma_s - \Sigma_d]^{-1} \,. \tag{2.90}$$

Here, E is the energy level at which $G(E)$ is calculated, $i0^{+}$ is an infinitesimally small positive imaginary number, I is the identity matrix, H is the Hamiltonian matrix (which was discussed in detail in section 2.2), U is the potential profile through the device, and Σ_s and Σ_d are the self-energy terms for the source and drain, respectively. The reason to why Σ_s and Σ_d are needed is a result of the significant size difference between the channel and the electrodes. Hence, it is more efficient computationally to replace the large Hamiltonian of the reservoir (electrodes) H_R with a self-energy term Σ as shown in Fig 2.11 [54]–[56]. For convenience, Σ_s and Σ_d will be addressed as Σ_{Lead} henceforth. Σ_{Lead} is calculated using

$$\Sigma_{Lead}(E) = \tau g_s \tau^{\dagger} \tag{2.91}$$

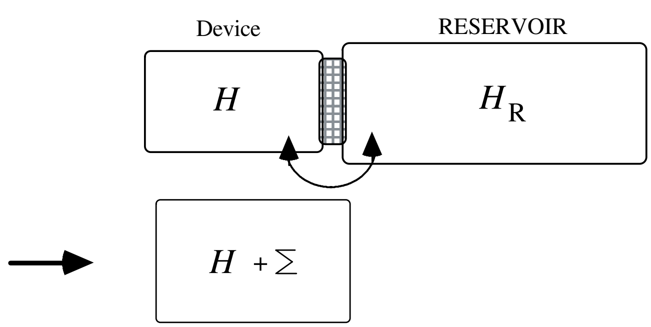

Figure 2.11: A schematic demonstrating the benefit of replacing the large Hamiltonian of the reservoir H_R with a self-energy term Σ [56].

where τ is the coupling matrix between the channel and the contacts, and g_s is the surface green function.

Due to the fact that the focus of this thesis is on ohmic contact based devices, no discussion will be provided for the Schottky type contact. In the case of the ohmic contact, we can assume a semi-infinite contact, in which the contact material is the same as the channel, but with heavy doping. There are multiple methods to approximate g_s for a semi-infinite contact; however, the most popular methods are the recursive surface Green's function (SGF) [57], [58] and the Sancho-Rubio methods [59], [60].

The Recursive SGF depends on solving g_s in a recursive manner, in which one starts with an initial guess ($g_s = H_{00}^{-1}$), and use this g_s as g_s^{old} in the following equation

$$g_s^{new} = \left[(E + i0^+)I - H_{00} - U - H_{01} g_s^{old} H_{01}^\dagger\right]^{-1} \tag{2.92}$$

where H_{00} is the part of the Hamiltonian that consider the interactions within the cell and H_{01} is the Hamiltonian part for the interaction with the neighboring cell. This iteration will continue until the following condition is achieved:

$$g_s^{new} \cong g_s^{old} \tag{2.93}$$

In term of the Sancho-Rubio methods, here I will focus one of the method reported in a previous work [59], [60], where all the derivation is provided. It works by first defining $\omega = (E + i0^+)I$, $\varepsilon_0 = \varepsilon_0^s = H_{00}$, $a_0 = H_{01}$, and $\beta_0 = a_0^\dagger = H_{01}^\dagger$. Then, the following 4 equations are solved i number times

$$\alpha_i = a_{i-1}(\omega - \varepsilon_{i-1})^{-1} a_{i-1} \tag{2.94}$$

$$\beta_i = \beta_{i-1}(\omega - \varepsilon_{i-1})^{-1} \beta_{i-1} \tag{2.95}$$

$$\varepsilon_i^s = \varepsilon_{i-1}^s + \alpha_{i-1}(\omega - \varepsilon_{i-1})^{-1} \beta_{i-1} \tag{2.96}$$

$$\varepsilon_i = \varepsilon_{i-1} + \alpha_{i-1}(\omega - \varepsilon_{i-1})^{-1} \beta_{i-1} + \beta_{i-1}(\omega - \varepsilon_{i-1})^{-1} \alpha_{i-1} \tag{2.97}$$

Alternatively, it can be solved iteratively until α_i, β_i become as small as desirable, in which

$$\varepsilon_i^s \cong \varepsilon_{i-1}^s. \tag{2.98}$$

Then, the surface Green's function g_s can be obtained using

$$g_s = (\omega - \varepsilon^s)^{-1}\,. \tag{2.99}$$

Generally, the Sancho-Rubio methods perform better than the recursive SGF due to the fact that N number iteration in the recursive SGF accounts for only N successive layers of the device. On the other hand, N number of iteration in the Sancho-Rubio methods takes into account 2^N layers. Therefore, the Sancho-Rubio method is relatively faster as shown in Fig. 2.12 [61].

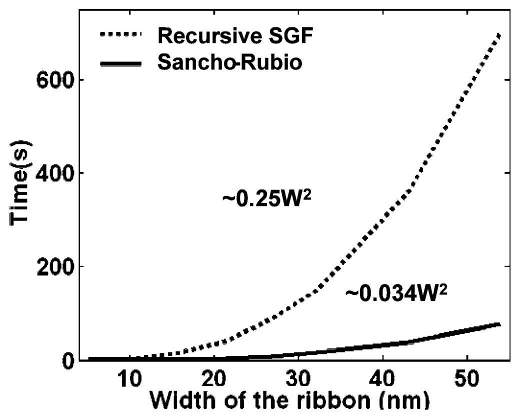

Figure 2.12: Computational time for Graphene nanoribbons as a function of the width of the ribbon demonstrating that the Sancho-Rubio method is more efficient [61]**.**

Having calculated the self-energy terms, $\Gamma(E)$ can be calculated, which contains the information of the rate of charge injection from the leads to the channel

$$\Gamma_{Lead}(E) = i\left[\Sigma_{Lead}(E) - \Sigma_{Lead}(E)^{\dagger}\right] = -2Im[\Sigma_{Lead}(E)] \tag{2.100}$$

Using Γ, the in-scattering self-energy Σ_{α}^{in} and the out-scattering Σ_{α}^{out} of the electrode α (= S, D) can be computed. Σ_{α}^{in} and Σ_{α}^{out} plays a major role in providing information about the occupancy of the contacts, and can be calculated using

$$\Sigma_{\alpha}^{in}(E) = \Gamma_{\alpha}\,(E) f_{\alpha} \tag{2.101}$$

$$\Sigma_{\alpha}^{out}(E) = \Gamma_{\alpha}\,(E)(1 - f_{\alpha}) \tag{2.102}$$

where f_{α} is the Fermi-Dirac factor

$$f_{\alpha} = \frac{1}{1+e^{\frac{E-E_f}{k_B T}}}\,. \tag{2.103}$$

Here, E_f is the fermi level, k_B is Boltzmann constant and T is the temperature.

By solving the Green's function $G(E)$, we can calculate the electron G^n and hole G^p spectral functions. They provide the information of charge occupancy in the energy-space at every point in the device [62]. Both can be obtained from the Green's function and the in-scattering/out-scattering self-energy term as follows

$$G^n(E) = G(E)\Sigma_\alpha^{in}(E)G^\dagger(E) \tag{2.104}$$

$$G^p(E) = G(E)\Sigma_\alpha^{out}(E)G^\dagger(E) \; . \tag{2.105}$$

The local density of states (LDOS) can be also approximated using $G(E)$

$$LDOS(E) = A(E) = i\left[G(E) - G(E)^\dagger\right] = -2Im[G(E)] = G^n(E) + G^p(E) \tag{2.106}$$

As was mentioned earlier, for electronic devices, the charge densities are of a great importance. Hence, the electron n and the hole p densities are calculated by integrating G^n and G^p, respectively, over the entire energy-space. This leaves only the charge density as a function of the spatial position as shown below

$$n(\vec{r}) = 2\int \frac{dE}{2\pi} G^n(E) \tag{2.107}$$

$$p(\vec{r}) = 2\int \frac{dE}{2\pi} G^p(E) \; . \tag{2.108}$$

Finally, the current density can be computed using

$$J_\alpha = \frac{2e}{\hbar}\int \frac{dE}{2\pi} Tr[\Sigma_\alpha^{in}(E)A(E) - \Gamma_\alpha G^n(E)] \; . \tag{2.109}$$

It should be noted that NEGF described so far is only half of the entire picture. For the device simulation, NEGF has to be solved self-consistently with the electrostatic Poisson's equation, where NEGF provides the charges density ρ and the electrostatic Poisson's equation returns the potential profile U as shown in Fig. 2.13.

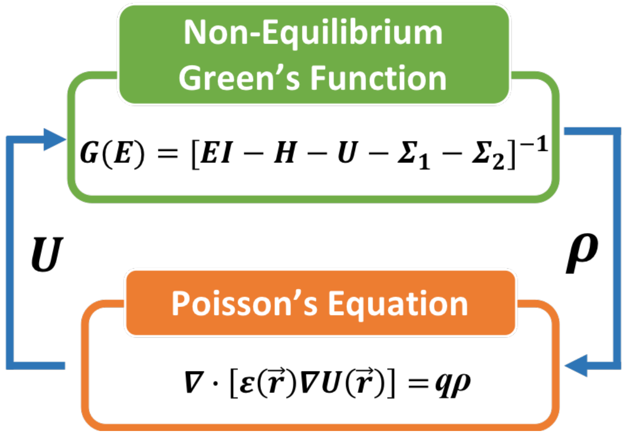

Figure 2.13: Schematic of self-consistent loop between NEGF and the electrostatic equation [63]**.**

The electrostatic Poisson's equation has the form

$$\nabla \cdot [\varepsilon_r(\vec{r})\nabla U(\vec{r})] = \frac{q}{\varepsilon_0}[N_D - N_A - n + p] \tag{2.110}$$

where ε_r is the permittivity of the material, ε_0 is the permittivity of free space, and N_D and N_A are donor and acceptor doping concentrations, respectively. Commonly, the electrostatic Poisson's equation is solved using finite difference method (FDM), in which the device is discretized using an $N_x \times N_z$ grid. This will allow for the creation of a system of linear equation that can be solved using simple methods. Nonetheless, a different algorithm, with a high convergence efficiency, can be used to solve the electrostatic Poisson's equation. The mechanism of the new algorithm relays on variable change in the charge densities n and p. The charges will be expressed in terms of their respective quasi-Fermi energy F_n and F_p as follows

$$F_n = U_{old} + k_B T \cdot \mathfrak{F}_j^{-1}(\frac{n_{NEGF}}{N_c}) \tag{2.111}$$

$$F_p = U_{old} - k_B T \cdot \mathfrak{F}_j^{-1}(\frac{p_{NEGF}}{N_v}) \tag{2.112}$$

where U_{old} is the potential of the previous iteration (in eV), $\mathfrak{F}_j^{-1}$ is the inverse Fermi-Dirac integral of order j ($j = -1, -\frac{1}{2}, 0, \frac{1}{2}, 1$ depends on the dimension of the channel material), n_{NEGF} and p_{NEGF} are charge densities provided by the NEGF calculation, and N_c and N_v are the effective density of states for the conduction and valence bands, respectively. Using F_n and F_p, the new charge densities will be

$$n = N_c \mathfrak{F}_j\left(\frac{F_n - U}{k_B T}\right) \tag{2.113}$$

$$p = N_v \mathfrak{F}_j\left(\frac{U - F_p}{k_B T}\right). \tag{2.114}$$

By substituting eqns. (2.113) and (2.114) in eqn. (2.110), it is clear that the problem is no longer a linear problem. Instead, on the same $N_x \times N_z$ grid, we will have a system of non-linear equations. The system of non-linear equations can be solved by utilizing the Newton-Raphson method. For that, an array F with size $N_{total} \times 1$ ($N_{total} = N_x \cdot N_z$) needs to be constructed. It will contain all the non-linear equations. In addition, the Jacobian matrix J with size $N_{total} \times N_{total}$ containing the gradients is needed. The problem will have the form of

$$U_{i+1} = U_i - [\,\mathrm{J}\,]_i^{-1} F_i \tag{2.115}$$

$$\begin{bmatrix} U_1 \\ \vdots \\ U_{N_{total}} \end{bmatrix}_{i+1} = \begin{bmatrix} U_1 \\ \vdots \\ U_{N_{total}} \end{bmatrix}_i - \begin{bmatrix} \frac{\partial F_1}{\partial U_1} & \cdots & \frac{\partial F_1}{\partial U_{N_{total}}} \\ \vdots & \ddots & \vdots \\ \frac{\partial F_{N_{total}}}{\partial U_1} & \cdots & \frac{\partial F_{N_{total}}}{\partial U_{N_{total}}} \end{bmatrix}_i^{-1} \begin{bmatrix} F_1 \\ \vdots \\ F_{N_{total}} \end{bmatrix}_i \tag{2.116}$$

where i is the iteration number. The previous equation is solved iteratively until $U_{i+1} \cong U_i$ is achieved [64].

Chapter 3
Platinum Diselenide ($PtSe_2$)

3.1 Motivation

Recently, a new family of transition metal dichalcogenides (TMDs), namely PtX_2, based on group-10 transition metal has emerged [18], [19]. Platinum diselenide ($PtSe_2$) has been synthesized using direct deposition of Se atoms on a Pt substrate [18], and it was predicted that $PtSe_2$ has the highest mobility among PtX_2 family [19], [22], [24]. PtX_2 family favors 1T crystal structure, unlike molybdenum MoX_2 and tungsten WX_2 in which 2H structure is known to be stable (Figs. 3.1(a) and (b)). In addition, bulk PtX_2 is metallic in nature which is not the case of MoX_2 and WX_2 [23].

In this chapter, I, for the first time, investigated the potential and the ultimate performance limit of monolayer $PtSe_2$ field-effect transistors (FETs) using atomistic quantum transport simulations. To do this, I calculated the electronic states of $PtSe_2$ using density functional theory (DFT), from which tight-binding parameters are extracted for non-equilibrium Green's function (NEGF) device simulation. Transfer characteristics of $PtSe_2$ devices are investigated, and the on and off-state characteristics are thoroughly examined by scaling channel length and equivalent oxide thickness (EOT). Moreover, the performance of $PtSe_2$ FET is compared with its 2H-$MoSe_2$ counterpart, and the superior on-state characteristics of $PtSe_2$ are discussed based on the unique material properties of 1T-PtX_2 family.

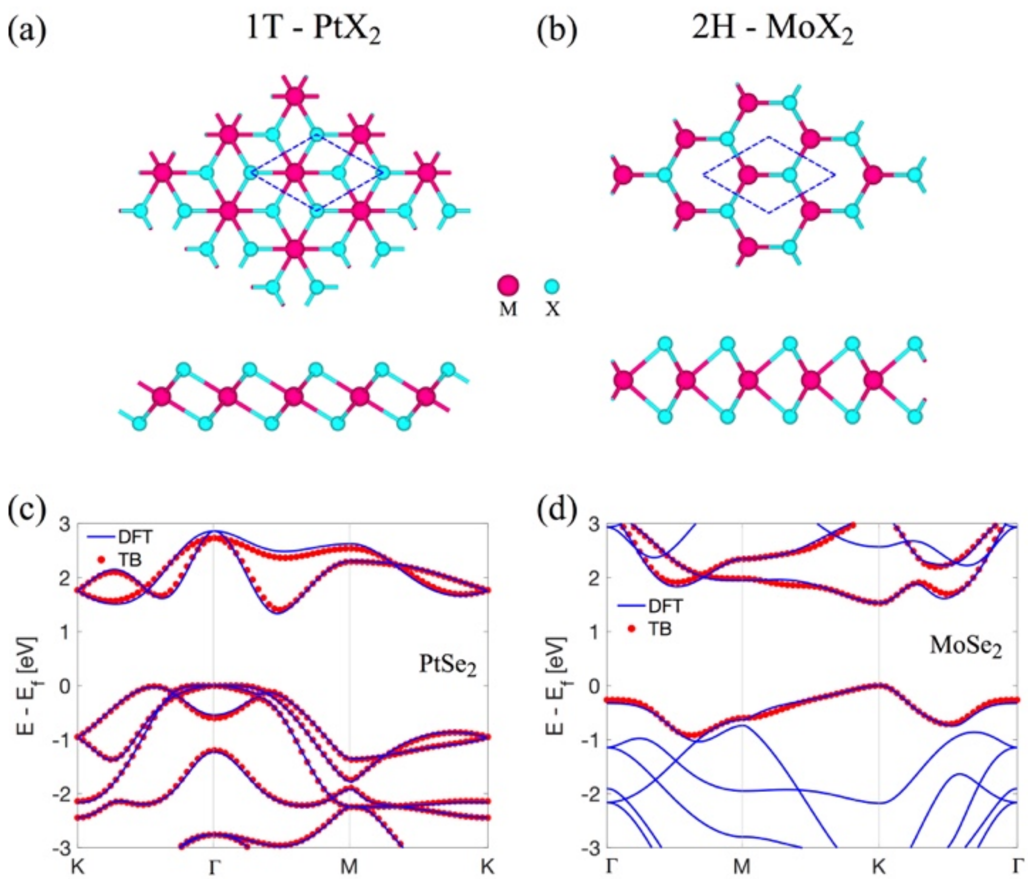

Figure 3.1: (a) 1T-PtX_2 (X = Se, S, Te) and (b) 2H-MoX_2 crystalline structure. (Top panel) top view; (bottom) side view. M represents Pt or Mo atom. Dashed diamonds illustrate unit cells. Density functional theory (DFT) band structures for monolayer (c) $PtSe_2$ and (d) $MoSe_2$ (blue solid lines). Third nearest neighbour tight-binding (TB) band structures are also shown in (c) and (d) with red dots, exhibiting excellent matching with the DFT bands [65]**.**

3.2 Simulation Approach

As was mentioned in Ch. 2.1.1, DFT simulation based on the GGA approximation with PAW pseudopotential was used to obtain the band structure of $PtSe_2$. To preform device simulations, input material parameters are required. Unlike $MoSe_2$, tight-binding (TB) parameters for $PtSe_2$ have not been reported yet, and therefore, I have created TB parameters as described in Ch. 2.2.3. The TB parameters of $MoSe_2$ were adopted from a previous report [66]. For both materials, third nearest neighbor TB parameters have been used since it can provide a high level of accuracy, and at the same time, it is computationally manageable. The parameters exhibit excellent matching to the DFT results as shown in Figs. 3.1(c) and (d). The TB parameters for the supercell are provided in Appendix A.

To assess the carrier transport in FETs based on these two materials, NEGF method within a tight-binding approximation has been utilized. The transport equation was solved self-consistently with Poisson's equation [55]. Ballistic transport is assumed due to the relatively short channel length considered in this study. Periodic boundary condition is used in the transverse direction with 400 k_y sampling points (k_y being the wavenumber in the transverse direction). A rectangular supercell shown in Fig. 3.2(a) has been chosen to construct the Hamiltonian matrix (H) for the sake of simplicity. X (transport) direction is chosen to be equivalent to $\Gamma \rightarrow M$ direction for the unit cell; Y (transverse) direction is perpendicular to it. The band structure of the $PtSe_2$ supercell is shown in Fig. 3.2(b). On the other hand, for $MoSe_2$, transport direction is defined in $K \rightarrow \Gamma$ following previous studies [12]. The simulated device structure is shown in Fig. 3.2(c) and parameters for a nominal device are as follows: channel length L_{ch} = 15 nm; Al_2O_3 (dielectric constant κ = 9) gate dielectric thickness t_{ox} = 2.5 nm; source/drain doping concentration of $1.5\text{x}10^{13}$ cm^{-2}; power supply voltage V_{DD} = 0.5 V.

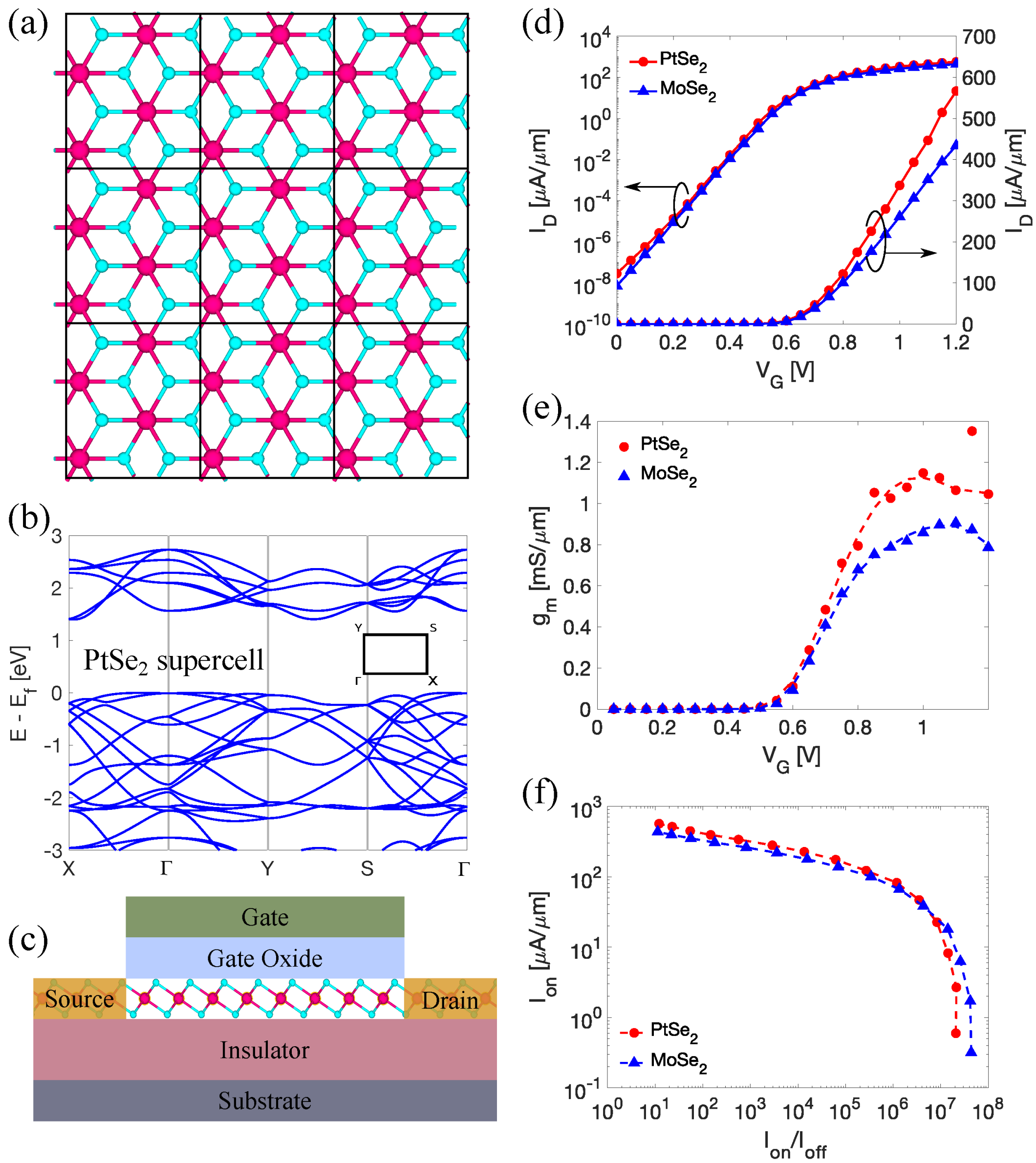

Figure 3.2: (a) Nine supercells of $PtSe_2$ chosen for NEGF device simulations. Solid black box shows one supercell, which includes four unit cells of $PtSe_2$. (b) Band structure of the supercell where the transport direction is in Γ→X, which is equivalent to Γ→M direction for the unit cell. (Inset) The high symmetry points of the supercell. (c) Simulated device structure. (d) Transfer characteristics, (e) transconductance, g_m vs. V_G, and (f) I_{on} vs. I_{on}/I_{off} of $PtSe_2$ and $MoSe_2$ FETs [65]**.**

3.3 Results

As shown in Fig. 3.1(c), $PtSe_2$ exhibits conduction band minimum (E_c) between Γ and M points, whereas $MoSe_2$ has its minimum at K point (Fig. 3.1(d)). The electron effective mass m_e* of $PtSe_2$ (0.21 m_0) is smaller than that of $MoSe_2$ (0.56 m_0). In contrary to the case of $MoSe_2$, $PtSe_2$ exhibits significant anisotropic effective mass for electrons as shown in Fig. 3.3(a).

Figure 3.2(d) shows the transfer characteristic of $PtSe_2$ FET, which is compared with $MoSe_2$ counterpart. While both devices show near-identical off-state characteristics with subthreshold swing (SS = $\partial V_G/\partial log_{10}(I_D)$; V_G and I_D are gate voltage and drain current, respectively) of ~64 mV/dec, on-state characteristics of $PtSe_2$ surpass that of $MoSe_2$, resulting in 30% higher on current (I_{on}) and transconductance ($g_m = \partial I_D/\partial V_G$) as shown in Figs. 3.2(d) and 3.2(e). The overall performance of the device can be evaluated by plotting I_{on} vs. on/off current ratio (I_{on}/I_{off}) as shown in Fig. 3.2(f), where $PtSe_2$ shows superior performance than $MoSe_2$. For instance, at a common I_{on} of 250 µA/µm, I_{on}/I_{off} of $PtSe_2$ is 6.7×10^3, which is ~5 times larger than that of $MoSe_2$ (1.4×10^3). In addition, for a common I_{on}/I_{off} of 10^4, $PtSe_2$ shows I_{on} = 236 µA/µm, which is 25% greater than the $MoSe_2$ value.

The superior on-state characteristics of $PtSe_2$ result mainly from its large density of states (DOS). In contrary to the general belief that smaller effective mass leads to lower DOS, $PtSe_2$ with relatively small effective mass has larger DOS than $MoSe_2$. This is attributed to the fact that $PtSe_2$ has six conduction band valleys within the first BZ, whereas $MoSe_2$ has only two valleys as clearly seen in Figs. 3.3(c) and 3.3(d). Therefore, $PtSe_2$ has higher DOS than $MoSe_2$ near the conduction band edge ($E - E_c < 0.2$ eV) as shown in Fig. 3.3(b). Notably, this is the energy range of interest for electron transport. Although $MoSe_2$ has higher DOS at the energy range of 0.2 eV < $E - E_c$ < 0.4 eV, it has only negligible contribution to the current flow. It should be noted that having six valleys in the conduction band may increase the possibility of intervalley scattering, which can result in current degradation to some extent. However, the detailed investigation of the effect of scattering is beyond the scope of this study.

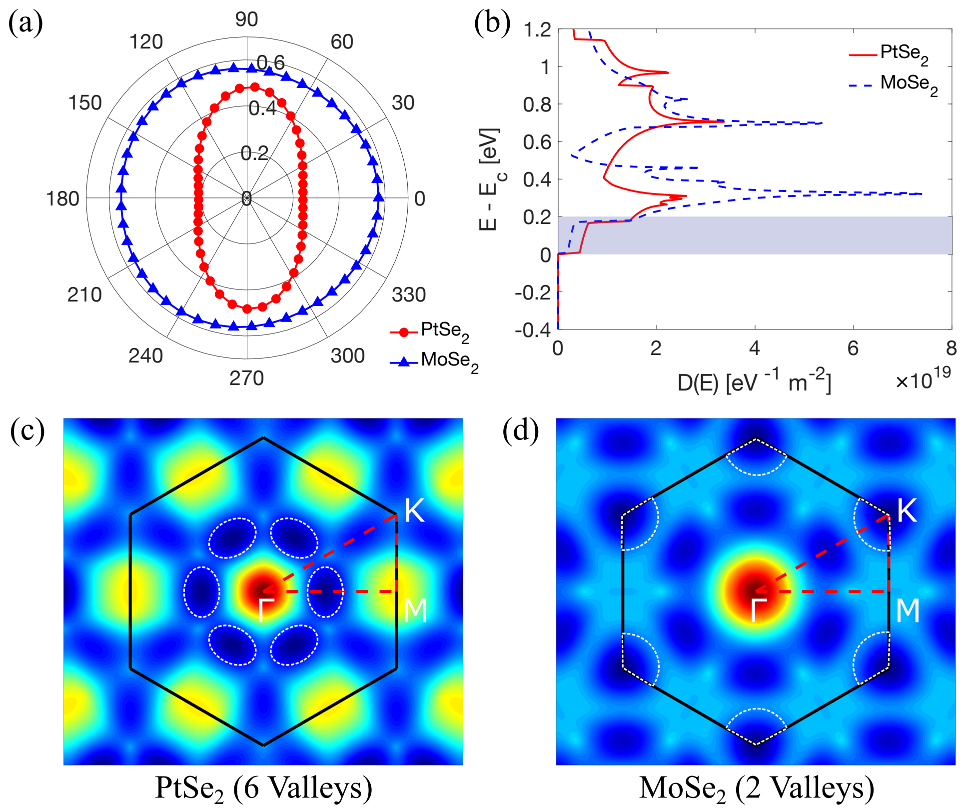

Figure 3.3: (a) Polar plot of effective mass for electrons (m_e*) for $PtSe_2$ and $MoSe_2$. $PtSe_2$ exhibits significant anisotropic effective mass near E_c, unlike $MoSe_2$. 0^o represents Γ→M direction for $PtSe_2$; K→ Γ for $MoSe_2$. (b) Density of states (DOS) in the conduction band of $PtSe_2$ and $MoSe_2$. Notably, $PtSe_2$ exhibits larger DOS than $MoSe_2$ near the bottom of the conduction band ($E - E_c < 0.2$ eV), which is the most relevant energy range for electron transport. Surface plot of the conduction band edge in k-space for (c) $PtSe_2$ and (d) $MoSe_2$. The first Brillouin zone (BZ) is shown with hexagons (black solid lines) and the irreducible BZ with triangles (red dashed lines) [65].

In general, 2D material devices are known for their high immunity to short-channel effect (SCE). However, due to the unique electronic properties of $PtSe_2$, a careful investigation should be given. Thus, I explore the effect of channel length scaling on SS and drain-induced barrier lowering (DIBL $= \Delta V_{TH}/\Delta V_D$; ΔV_{TH} and ΔV_D being the changes in threshold voltage and drain voltage, respectively) by varying L_{ch} from 6 to 25 nm with a nominal EOT of 1.1 nm. Figure 3.4(a) shows that SS is close to the theoretical limit of 60 mV/dec for $L_{ch} \geq 15$ nm. However, with sub-10 nm channel, it exhibits significant degradation, leading to 91 mV/dec in case of L_{ch} = 8 nm, which is similar to that of $MoSe_2$ device (89 mV/dec). DIBL also shows a similar trend as SS as it can be seen in Fig. 3.4(b). With a nominal EOT, DIBL is 160 mV/V for $L_{ch} \geq 15$ nm, while it increases to 270 mV/V at L_{ch} = 8 nm, which is larger than that of $MoSe_2$ device (200 mV/V) at the same channel length. Nonetheless, both SS and DIBL of $PtSe_2$ FET can be improved by using thinner EOT, particularly for short-channel devices, as discussed next.

Finally, I have done an EOT scaling study to further engineer device performance of $PtSe_2$ FETs. Besides the nominal EOT (2.5 nm-thick Al_2O_3), I have adopted one thicker (SiO_2; $\kappa = 3.9$) and one thinner EOT (HfO_2; $\kappa = 25$). Figure 3.4(c) shows that, with an EOT of 0.4 nm, SS can be as low as 61 mV/dec and g_m can be as large as 1.49 mS/µm with L_{ch} = 15 nm. In addition, sub-100 mV/V DIBL can be achievable with the reduced EOT (Fig. 3.4(d)), allowing further optimization of novel $PtSe_2$ device performance. Notably, the scaling of EOT can significantly suppress the SCE as it can be seen in Figs. 3.4(a) and (b) (open markers).

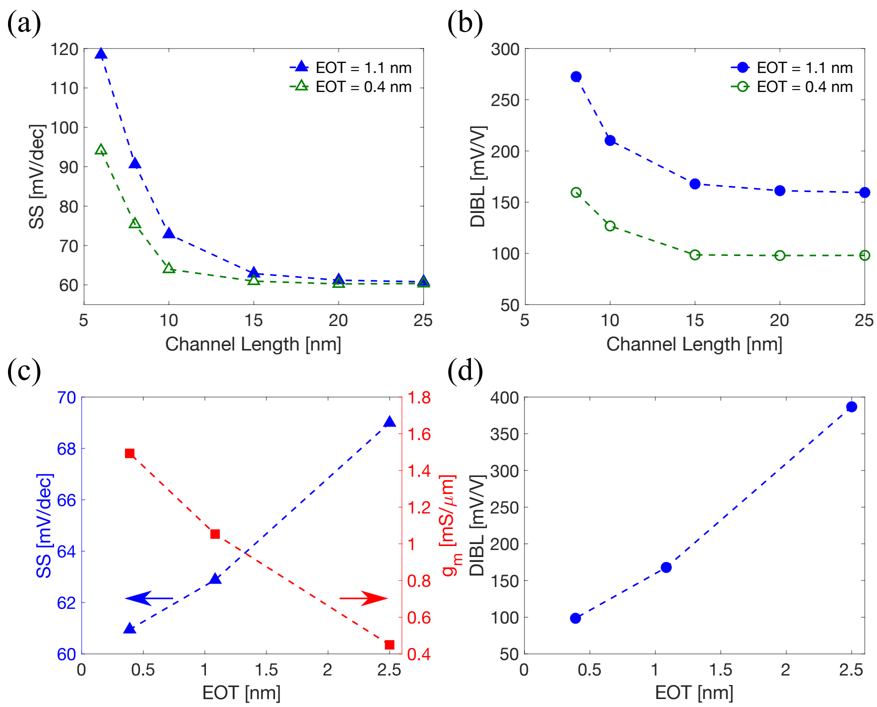

Figure 3.4: (a) Subthreshold swing (SS) and (b) drain-induced barrier lowering (DIBL) of $PtSe_2$ FETs for L_{ch} = 6–25 nm with EOTs of 1.1 nm (filled markers) and 0.4 nm (open markers). (c) SS (blue triangles) and g_m (red squares) and (d) DIBL as a function of EOT (with L_{ch} = 15 nm) for $PtSe_2$ FETs [65].

3.4 Summary

Material properties and device characteristics of a new TMD family of $PtSe_2$ have been studied. Electronic band structures are plotted using DFT, from which third nearest neighbor TB parameters are extracted for NEGF device simulations. DFT results reveal that 1T-PtX_2 has the conduction band minima between Γ and M points, thereby forming six conduction band valleys within the first BZ, unlike 2H-MoX_2. Therefore, $PtSe_2$ exhibits significantly larger DOS near the E_c despite relatively small effective mass, compared to $MoSe_2$. This allows it to have superior on-state characteristics (I_{on} and g_m) as compared with the $MoSe_2$ counterpart. I also performed a scaling study by varying L_{ch} and EOT. Despite the fact that short-channel effect has been observed, it can be suppressed significantly with a channel longer than 15 nm or an EOT less than 1 nm. Although significant anisotropic effective mass is observed within each conduction band valley, it is expected that current level would remain almost same for both armchair and zigzag directions, since the total current is determined by the overall contribution from the six valleys with rotational symmetry, which is in agreement with experiment [23].

Chapter 4
Hafnium Diselenide ($HfSe_2$)

4.1 Motivation

Despite their promising transport properties, many 2D semiconductors, such as molybdenum disulfide (MoS_2) and black phosphorus (BP) [9], [67], suffer from the lack of natively compatible dielectric materials for gate oxide in field-effect transistors (FETs). Considering the fact that the existence of SiO_2 is one of the reasons why silicon became so popular in electronics, hafnium diselenide ($HfSe_2$), a new family of transition metal dichalcogenides (TMDs), can hold a unique position for electronics applications among many 2D semiconductors since it can be highly compatible with hafnium dioxide (HfO_2), a well-known high-κ dielectric material [25]. Recently, $HfSe_2$ has been grown using molecular beam epitaxy (MBE) on highly ordered crystals [20], and a theoretical study predicted its exceptional electron mobility compared with other TMDs [24].

In this chapter, I investigated the performance limit of novel $HfSe_2$ field-effect transistors (FETs) based on self-consistent atomistic quantum transport simulation. To accomplish this, first, density functional theory (DFT) is utilized to calculate the electronic structure of $HfSe_2$, from which tight-binding (TB) parameters are obtained. Then, the characteristics of $HfSe_2$ FETs are simulated for both n-type (NMOS) and p-type devices (PMOS) using the non-equilibrium Green's function (NEGF) method. A scaling study is conducted by varying equivalent oxide thickness (EOT) and channel length (L_{ch}) to investigate the performance limit and short-channel effects. Finally, I calculated the intrinsic performance, such as intrinsic delay (τ) and power-delay product (PDP), of the $HfSe_2$ FETs, and benchmark it against similar devices based on other 2D materials.

4.2 Simulation Approach

As explained in Chs. 2.1.2 and 2.2.4, PW based DFT simulation using GGA approximation was used in conjunction with MLWF method to obtain the tight-binding parameters of $HfSe_2$. To achieve a better fit, the conduction bands are disentangled. The third nearest neighbor approximation is used. As shown in Fig. 4.1(b), our TB bands are in great agreement with the DFT results. The TB parameters for the supercell are provided in Appendix B.

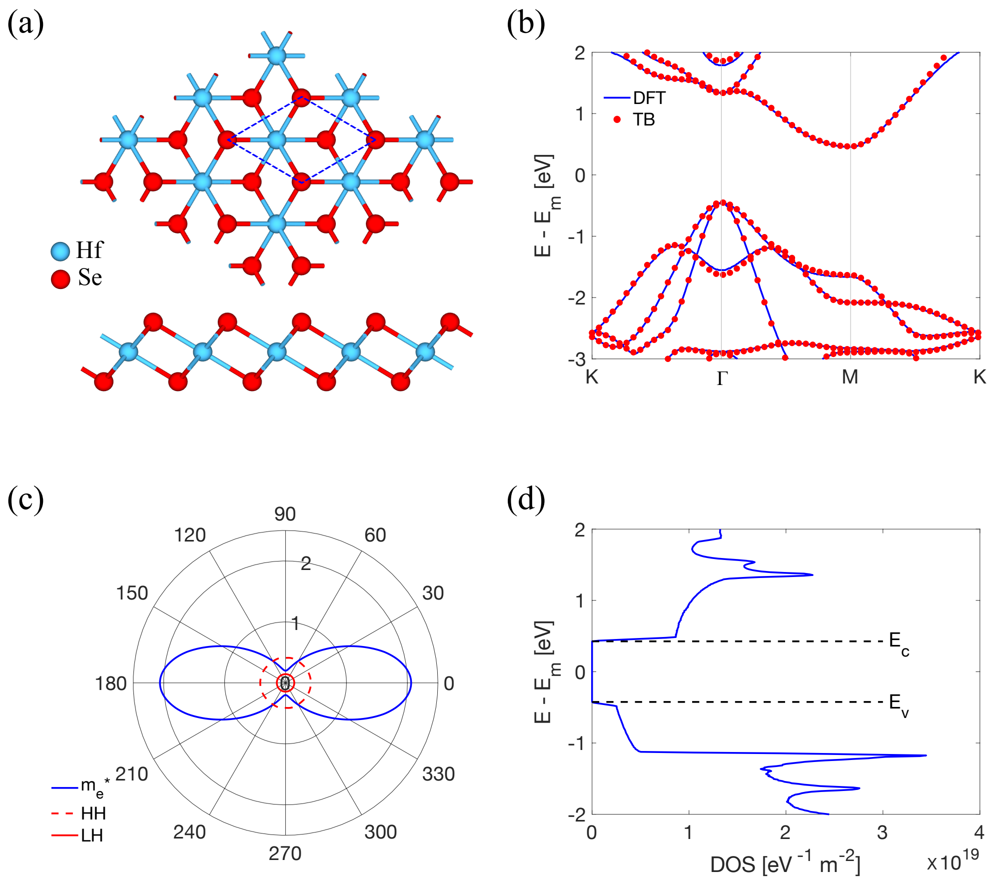

Figure 4.1: (a) Crystal structure of $HfSe_2$ showing the 1T configuration. (Top panel) top view; (bottom) side view. The unit cell is shown by a dashed diamond. (b) $HfSe_2$ band structures based on the density functional theory (DFT) (blue solid lines) and tight-binding (TB) approach (red dots), exhibiting excellent matching between the two. (c) Polar plot of effective masses for electrons ($\boldsymbol{m_e^*}$) in blue and holes in red. HH (red dashed line) and LH (red solid line) indicate the heavy holes and light holes, respectively. (d) Density of states (DOS) showing considerable difference near the conduction band and the valence band edges. [68].

Figure 4.2(a) shows a schematic of our nominal device, which includes 15 nm $HfSe_2$ channel with a top-gated structure. The source and drain are doped with a concentration of 2.5×10^{13} cm^{-2}. For a gate dielectric, 5 nm-thick HfO_2 (κ = 25) is employed, considering its high compatibility with the $HfSe_2$ channel. Power supply voltage V_{DD} = 0.5 V is used. I simulated the transport properties of $HfSe_2$ FETs using the NEGF method [55] within a tight-binding approximation. Ballistic transport is assumed due to the short channel length considered in this study. Periodic boundary conditions are used in the transvers direction. The transport equation is solved iteratively with the Poisson's equation until the electrostatic potential is converged self-consistently with the charge density [55].

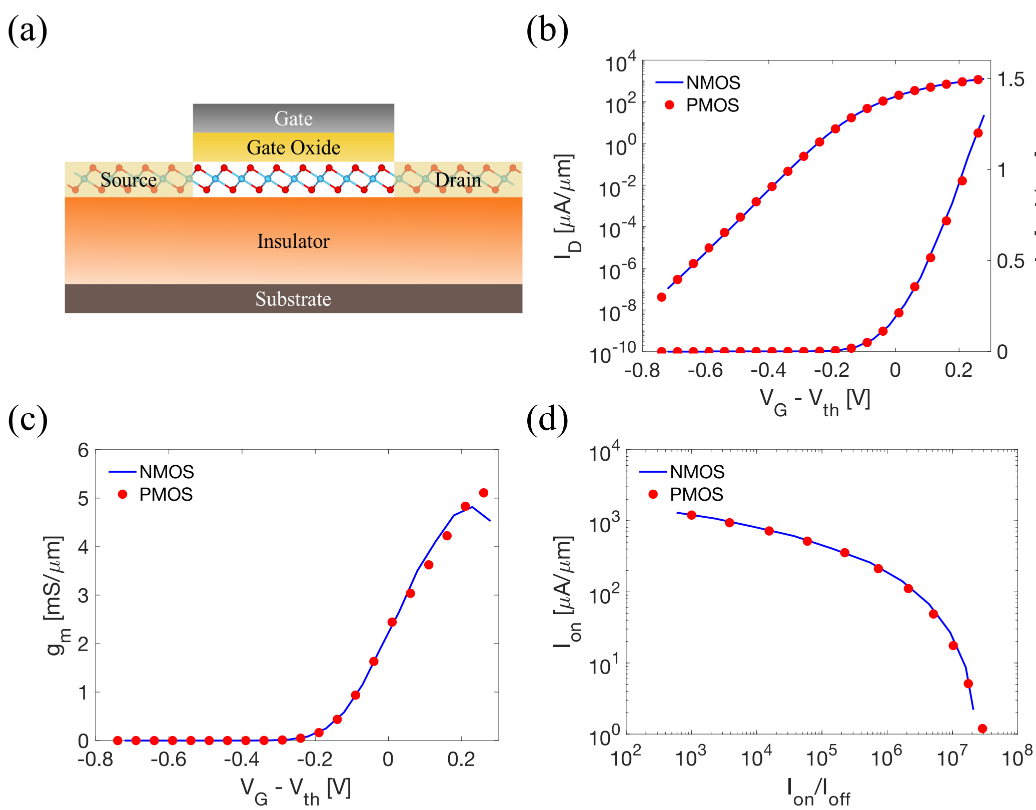

Figure 4.2: (a) A schematic of the $HfSe_2$ FET simulated in this study. (b) Transfer characteristics and (c) transconductance (g_m) vs. gate voltage. (d) I_{on} vs. I_{on}/I_{off} plot [68].

4.3 Results

Figure 4.1(b) shows that the conduction band edge of $HfSe_2$ is located at the M point, which indicates that $HfSe_2$ has three conduction band valleys (half valley at each M point; six M points in total) within the first Brillouin zone. These valleys show a significantly anisotropic electron effective mass as shown in Fig. 4.1(c). On the other hand, the valence band exhibits isotropic heavy hole (HH) and light hole (LH) effective masses (Fig. 4.1(c)) at the Γ point (Fig. 4.1(b)). The density of states (DOS) of $HfSe_2$ is plotted in Fig. 4.1 (d), which shows significantly larger DOS at the conduction band edge by ~4 times, as compared to that at the valence band edge.

The transfer characteristics of the nominal $HfSe_2$ NMOS and PMOS are shown in Fig. 4.2(b). Interestingly, both NMOS and PMOS exhibit near-identical transfer characteristics, including subthreshold swing (SS = $\partial V_G/\partial log_{10}(I_D)$) and on-current ($I_{ON}$), despite the considerable difference in DOS. The reason for such behaviors can be understood by self-consistent charging effects. Due to the larger DOS for NMOS, it undergoes a more significant charging effect particularly in the on-state, rendering the gate control less efficient. On the other hand, the charging effect of PMOS is relatively insignificant, which means higher efficiency in the gate control, making compensation for its lower DOS. Consequently, I_{ON} (Fig. 4.2(b)) and transconductance ($g_m = \partial I_D/\partial V_G$, Fig. 4.2(c)) become more or less same for both devices. These transfer characteristics can result in several advantages such as savings of engineering steps in circuit design to compensate for the asymmetry, or the reduction of side effects from having different parasitic capacitances in NMOS and PMOS. To assess the ON and OFF states simultaneously, I have further plotted I_{ON} vs. ON/OFF current ratio (I_{ON}/I_{OFF}) in Fig. 4.2(d), which demonstrates the excellent performance of $HfSe_2$ FETs. For example, both devices can have 800 μA/μm of ON current at $I_{ON}/I_{OFF} = 10^4$.

Next, I performed a scaling study, considering EOT first, and then L_{ch}. Due to the fact that $HfSe_2$ NMOS and PMOS exhibit similar performance, I have used the NMOS for the scaling test. A range of EOT from 0.75 nm to 1.5 nm has been chosen by varying the physical thickness of HfO_2 from 5 nm to 10 nm for a given channel length of 15 nm. Figure 4.3(a) shows that both SS and g_m improve linearly by scaling down EOT from 1.5 nm to 0.75 nm. At EOT = 0.75 nm, SS becomes 67 mV/dec, and g_m can be as large as 4.8 mS/μm. The same trend is observed with drain-induced barrier lowering (DIBL = $\Delta V_{th}/\Delta V_D$) in Fig. 4.3(b). For the EOT scaling from 1.5 nm to 0.75 nm, DIBL decreases significantly from 225 mV/V to 50 mV/V. Next, I have varied L_{ch} from 8 nm to 25 nm, using two different EOTs of 0.75 nm and 1 nm, to investigate short-channel effects (SCE). As shown in Figs. 4.3(c) and 4.3(d), at an EOT of 0.75 nm, devices with $L_{ch} \geq 15$ nm exhibit great immunity to SCE with SS ≤ 70 mV/dec and DIBL ≤ 50 mV/V. However, they suffer from significant SCE at sub-10 nm channel length. For instance, at L_{ch} = 8 nm, SS and DIBL become ~100 mV/dec and 200 mV/V, respectively. For the case of a larger EOT, it can be seen from Figs. 4.3(c) and 3(d) that SCE becomes even more significant for the same channel length scaling.

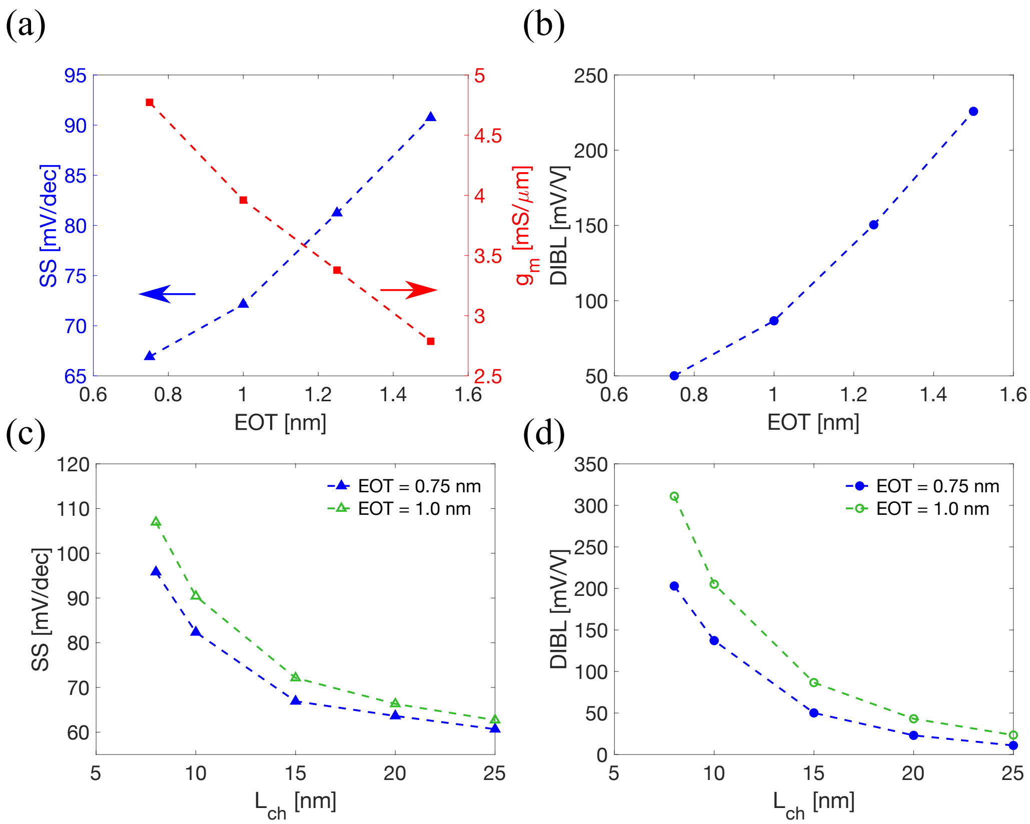

Figure 4.3: (a) Subthreshold swing (SS) (blue tringles; left axis) and g_m (red squares; right axis) and (b) drain-induced barrier lowering (DIBL) as a function of EOT at L_{ch} = 15 nm. (c) SS and (d) DIBL as a function of L_{ch} at EOTs of 0.75 nm (blue solid markers) and 1.0 nm (green open markers) [68]**.**

Finally, I evaluated intrinsic performance of $HfSe_2$ NMOS and PMOS. Intrinsic delay, which specifies an intrinsic limit of switching speed, is calculated by $\tau = (Q_{ON} - Q_{OFF})/I_{ON}$, and power-delay product indicating dynamic power dissipation is obtained by PDP = $(Q_{ON} - Q_{OFF})V_{DD}$, where Q_{ON} and Q_{OFF} are the charges in the on- and off-state, respectively. Figure 4.4(a) shows τ vs. I_{ON}/I_{OFF} at V_{DD} = 0.5 V, where it can be seen that the delay of $HfSe_2$ FETs decreases (*i.e.*, the switching speed increases) as the devices are operated at higher voltages (*i.e.*, as I_{on}/I_{off} decreases). Unlike most other 2D material FETs [69], $HfSe_2$ devices show a balanced delay for NMOS and PMOS (Fig. 4.4(a)) partly due to the symmetrical transfer characteristics as observed in Fig. 4.2(b). Figure 4.4(b) shows PDP vs. I_{on}/I_{off} for $HfSe_2$ FETs. The results show monotonic increases in switching energy for both devices as the V_{DD} window shifts to the higher gate voltage region. These results indicate that there exists a clear trade-off between switching speed and energy, and therefore, in order to better understand the overall performance, PDP-delay trade-off curves are plotted in Fig. 4.4(c). Here, I found the optimal operational condition by seeking the minimum energy-delay product (EDP = PDP × τ), which is a figure-of-merit considering both performance (speed) and energy dissipation simultaneously. The optimal points found for $HfSe_2$ NMOS and PMOS are shown in Fig. 4.4(d) and compared with other FETs based on germanane (GeH) [69], black phosphorus (BP) [70], and molybdenum disulfide (MoS_2) [71]. The minimum EDP of $HfSe_2$ FETs is 3.16×10^{-30} J·s/μm, which is quite close to the values reported for BP FETs (2.16–3.59×10^{-30} J·s/μm) [70]. Among the compared devices, GeH exhibits the lowest EDP and MoS_2 the worst.

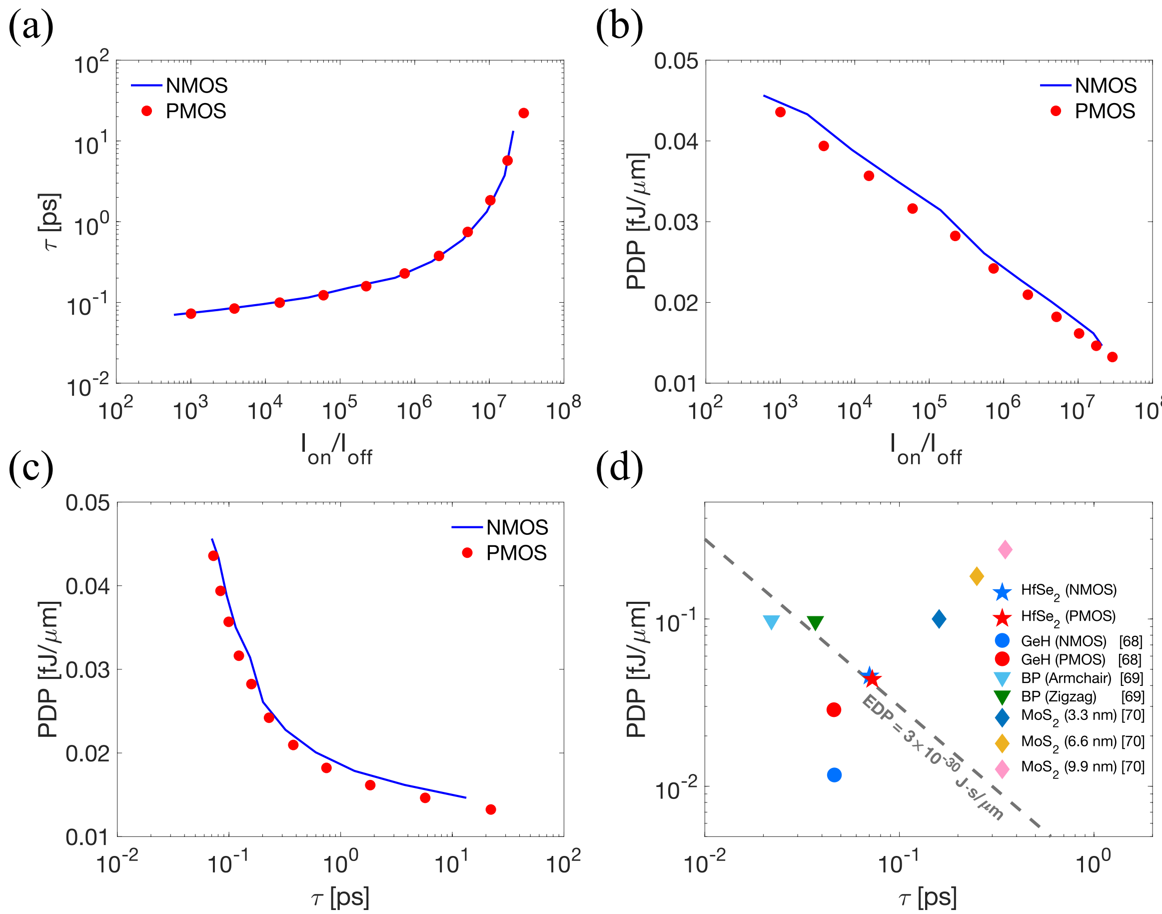

Figure 4.4: Intrinsic device performance metrics of $HfSe_2$ FET. (a) Intrinsic delay (τ) and (b) power-delay product (PDP) as a function of I_{on}/I_{off}. (c) PDP–τ trade-off curves. (d) Benchmark of $HfSe_2$ FETs against the FETs based on other 2D materials [68]**.**

4.4 Summary

Material and device characteristics of novel $HfSe_2$ have been studied for FET applications using atomistic simulations. Although the electronic structure of $HfSe_2$ shows substantial difference between the conduction and valence bands, the NMOS and PMOS devices exhibit symmetrical transfer characteristics. Both devices show outstanding ON and OFF-state performance such as large I_{ON} (>1 mA/μm) and high I_{ON}/I_{OFF} (>10^7). $HfSe_2$ FETs are robust at $L_{ch} \geq 15$ nm, however they become susceptible to short-channel effects at sub-10 nm channel even with a thin EOT. Our assessment on the intrinsic performance of $HfSe_2$ devices revealed that they can have similar EDP as BP FETs. Overall, our study demonstrates great potential of $HfSe_2$ for FET applications; however, circuit-level analyses are suggested for a future work to evaluate $HfSe_2$ FETs for the CMOS technology.

Chapter 5
Conclusions and Future Work

5.1 Conclusions

Nanoelectronics based on 2D materials have added great potential to the conventional silicon-based electronics due to their extraordinary mechanical and electrical properties. In this thesis, two novel 2D materials of $PtSe_2$ and $HfSe_2$, which belong to the transition metal dichalcogenides (TMDs) family, and their application in electronic devices applications have been explored. To assess their transfer characteristics, atomistic quantum transport simulation based on the non-equilibrium Green's function (NEGF) method within the tight-binding (TB) approximation was conducted. The study was motivated by previous theoretical works, which showed that both $PtSe_2$ and $HfSe_2$ exhibits higher carrier mobility than other TMD families. Indeed, other studies concluded that $HfSe_2$ has the highest mobility among the known TMDs family.

Our investigation of $PtSe_2$ FET showed that, despite the relatively small effective mass (m_e^* is as low as $0.21m_0$), it exhibits excellent on-state performance compared to its molybdenum diselenide $MoSe_2$ counterpart due to the fact that $PtSe_2$ has six conduction valleys in the its first Brillouin zone, resulting in relatively large density of states (DOS) near the conduction band minimum. In fact, the on-state current and the transconductance (g_m) of $PtSe_2$ is 30% higher than that of $MoSe_2$. In addition, it maintained a near ideal off-state characteristics with a subthreshold swing (SS) of around 64 mV/dec. Finally, our simulation showed that, for the channels longer than 15nm, $PtSe_2$ device exhibits near-ideal SS, and that sub-100 mV/V of drain-induced barrier lowering (DIBL) can be achieved using aggressive scaling of the gate oxide.

In the case of $HfSe_2$, n-type (NMOS) and p-type (PMOS) transistor exhibited near-identical transfer characteristics despite the fact that they have very different DOS. Both NMOS and PMOS $HfSe_2$ have demonstrated exceptional on-state properties, while maintaining near-ideal SS of around 67 mV/dec. The scaling study of the equivalent oxide thickness (EOT) and the channel length showed that short channel effects (SCE) is insignificant for devices with channel length of 15 nm or larger, or for devices with thin EOT. Finally, the intrinsic device performance of NMOS and PMOS revealed the promising potential of $HfSe_2$ for logic devices considering both speed and power dissipation simultaneously.

5.2 Future Work

As shown in this thesis, $PtSe_2$ and $HfSe_2$ are great candidates for the nanoelectronics devices applications. However, more work is suggested to further investigate their capabilities and practical limitation. The following could be the topics for future work.

$PtSe_2$:

- As was mentioned earlier, $PtSe_2$ experiences one of the strongest interlayer interactions. Therefore, the investigation of multilayer and homojunction (monolayer and multilayer junctions) $PtSe_2$ will be needed to understand the interlayer interactions and their possible applications in electronic devices.
- In addition, $PtSe_2$ experiences strong spin-orbit coupling. Hence, a study of the spin-orbit coupling effect on the quantum transport process will provide an in-depth understanding of this exotic material.
- Finally, investigation of $PtSe_2$ PMOS will allow for the comprehensive assessment of $PtSe_2$ devices for CMOS technology.

$HfSe_2$:

- Having studied the intrinsic device performance, a study of $HfSe_2$ devices for the CMOS technology will be needed to assess its practicality for electronic circuits.
- Due to the fact that Schottky contact is the dominant type of contacts in the nanoelectronics, it will be beneficial to investigate the effect of Schottky contact on the device performance of $HfSe_2$ FET.

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Appendix A
$PtSe_2$ Tight-Binding Parameters

The tight-binding Hamiltonian for the $PtSe_2$ supercell is of the form:

$$H(k_x,k_y) = \alpha + \beta e^{i(k_x\cdot dx)} + \gamma e^{i(k_y\cdot dy)} + \delta_1 e^{i(k_x\cdot dx + k_y\cdot dy)} + \delta_2 e^{i(k_x\cdot dx - k_y\cdot dy)}$$
$$+ \left(\beta e^{i(k_x\cdot dx)} + \gamma e^{i(k_y\cdot dy)} + \delta_1 e^{i(k_x\cdot dx + k_y\cdot dy)} + \delta_2 e^{i(k_x\cdot dx - k_y\cdot dy)}\right)^{\dagger}$$

where $dx = 6.49088 \times 10^{-10}$ m and $dy = 7.49504 \times 10^{-10}$ m.

The size of H is 44×44. Only non-zero elements of the α, β, γ, δ_1, and δ_2 matrices are provided below:

α(1,1) = -3.2141	α(1,3) = -0.0011	α(1,4) = -0.0006	α(1,6) = -0.0158
α(1,7) = 0.0599	α(1,8) = 0.0339	α(1,9) = -0.0276	α(1,10) = -0.0467
α(1,11) = -0.0158	α(1,12) = -0.0599	α(1,13) = 0.0339	α(1,14) = -0.0276
α(1,15) = 0.0467	α(1,16) = -0.0066	α(1,18) = -0.0030	α(1,19) = -0.0066
α(1,21) = 0.5004	α(1,23) = 0.1951	α(1,24) = -0.0119	α(1,25) = 0.0023
α(1,26) = 0.0273	α(1,27) = -0.0477	α(1,28) = 0.0322	α(1,29) = 0.0188
α(1,30) = -0.0119	α(1,31) = -0.0023	α(1,32) = 0.0273	α(1,33) = -0.4999
α(1,34) = 0.1689	α(1,35) = 0.0981	α(1,36) = 0.0480	α(1,38) = 0.0371
α(1,39) = 0.0120	α(1,40) = 0.0246	α(1,41) = 0.0112	α(2,2) = -2.6876
α(2,5) = 0.4958	α(2,6) = 0.0599	α(2,7) = -0.0576	α(2,8) = 0.0377
α(2,9) = 0.1053	α(2,10) = 0.0294	α(2,11) = -0.0599	α(2,12) = -0.0576
α(2,13) = -0.0377	α(2,14) = -0.1053	α(2,15) = 0.0294	α(2,17) = 0.0033
α(2,20) = -0.0034	α(2,22) = 0.4231	α(2,24) = 0.0111	α(2,25) = -0.0067
α(2,26) = -0.0163	α(2,27) = 0.0102	α(2,28) = -0.0094	α(2,29) = -0.0116
α(2,30) = -0.0111	α(2,31) = -0.0067	α(2,32) = 0.0163	α(2,33) = 0.3272
α(2,34) = 0.8861	α(2,35) = 0.7546	α(2,37) = -0.0107	α(2,39) = -0.0041
α(2,40) = 0.0176	α(2,41) = 0.0332	α(3,1) = -0.0011	α(3,3) = -2.6928
α(3,4) = 0.4951	α(3,6) = 0.0339	α(3,7) = 0.0377	α(3,8) = -0.1002

α(3,9) = -0.0914	α(3,10) = 0.1033	α(3,11) = 0.0339	α(3,12) = -0.0377
α(3,13) = -0.1002	α(3,14) = -0.0914	α(3,15) = -0.1033	α(3,16) = -0.0030
α(3,18) = 0.0010	α(3,19) = -0.0036	α(3,21) = 0.3737	α(3,23) = -1.3227
α(3,24) = -0.0112	α(3,25) = 0.0268	α(3,26) = -0.0271	α(3,27) = 0.0063
α(3,28) = -0.0116	α(3,29) = 0.0035	α(3,30) = -0.0112	α(3,31) = -0.0268
α(3,32) = -0.0271	α(3,33) = 0.1882	α(3,34) = 0.7557	α(3,35) = 0.0126
α(3,36) = 0.0126	α(3,38) = 0.0166	α(3,39) = -0.0151	α(3,40) = -0.0099
α(3,41) = 0.0167	α(4,1) = -0.0006	α(4,3) = 0.4951	α(4,4) = -2.9845
α(4,6) = -0.0276	α(4,7) = 0.1053	α(4,8) = -0.0914	α(4,9) = -0.0548
α(4,10) = 0.0079	α(4,11) = -0.0276	α(4,12) = -0.1053	α(4,13) = -0.0914
α(4,14) = -0.0548	α(4,15) = -0.0079	α(4,16) = -0.0066	α(4,18) = -0.0036
α(4,19) = -0.0052	α(4,21) = 0.8049	α(4,23) = -0.8045	α(4,24) = -0.0264
α(4,25) = 0.0189	α(4,26) = 0.0042	α(4,27) = 0.0158	α(4,28) = 0.0291
α(4,29) = -0.0673	α(4,30) = -0.0264	α(4,31) = -0.0189	α(4,32) = 0.0042
α(4,33) = 0.4033	α(4,34) = 0.1212	α(4,35) = 0.5890	α(4,36) = 0.0335
α(4,38) = 0.0184	α(4,39) = -0.0003	α(4,40) = 0.0266	α(4,41) = 0.0370
α(5,2) = 0.4958	α(5,5) = -2.9845	α(5,6) = -0.0467	α(5,7) = 0.0294
α(5,8) = 0.1033	α(5,9) = 0.0079	α(5,10) = -0.0442	α(5,11) = 0.0467
α(5,12) = 0.0294	α(5,13) = -0.1033	α(5,14) = -0.0079	α(5,15) = -0.0442
α(5,17) = -0.0034	α(5,20) = 0.0125	α(5,22) = -0.5209	α(5,24) = -0.0146
α(5,25) = -0.0106	α(5,26) = 0.0499	α(5,27) = 0.0285	α(5,28) = -0.0346
α(5,29) = 0.0291	α(5,30) = 0.0146	α(5,31) = -0.0106	α(5,32) = -0.0499
α(5,33) = 0.6979	α(5,34) = 0.7308	α(5,35) = 0.1219	α(5,37) = 0.0838
α(5,39) = -0.0302	α(5,40) = -0.0298	α(5,41) = -0.0038	α(6,1) = -0.0158
α(6,2) = 0.0599	α(6,3) = 0.0339	α(6,4) = -0.0276	α(6,5) = -0.0467
α(6,6) = -3.2141	α(6,8) = -0.0011	α(6,9) = -0.0006	α(6,11) = -0.0160
α(6,13) = -0.0687	α(6,14) = 0.0534	α(6,16) = -0.0158	α(6,17) = -0.0599
α(6,18) = 0.0339	α(6,19) = -0.0276	α(6,20) = 0.0467	α(6,21) = 0.4999
α(6,22) = 0.1689	α(6,23) = -0.0981	α(6,24) = 0.5004	α(6,26) = 0.1951
α(6,27) = -0.0120	α(6,28) = 0.0222	α(6,29) = -0.0156	α(6,30) = -0.0477
α(6,31) = 0.0322	α(6,32) = 0.0188	α(6,33) = 0.0477	α(6,34) = 0.0322
α(6,35) = -0.0188	α(6,36) = -0.4999	α(6,37) = 0.1689	α(6,38) = 0.0981

α(6,39) = 0.0120	α(6,40) = 0.0222	α(6,41) = 0.0156	α(6,42) = 0.0120
α(6,43) = 0.0246	α(6,44) = 0.0112	α(7,1) = 0.0599	α(7,2) = -0.0576
α(7,3) = 0.0377	α(7,4) = 0.1053	α(7,5) = 0.0294	α(7,7) = -2.6876
α(7,10) = 0.4958	α(7,12) = -0.1220	α(7,15) = -0.1535	α(7,16) = -0.0599
α(7,17) = -0.0576	α(7,18) = -0.0377	α(7,19) = -0.1053	α(7,20) = 0.0294
α(7,21) = 0.3272	α(7,22) = -0.8861	α(7,23) = 0.7546	α(7,25) = 0.4231
α(7,27) = -0.0152	α(7,28) = -0.0270	α(7,29) = -0.0151	α(7,30) = 0.0102
α(7,31) = -0.0094	α(7,32) = -0.0116	α(7,33) = 0.0102	α(7,34) = 0.0094
α(7,35) = -0.0116	α(7,36) = 0.3272	α(7,37) = 0.8861	α(7,38) = 0.7546
α(7,39) = -0.0152	α(7,40) = 0.0270	α(7,41) = -0.0151	α(7,42) = -0.0041
α(7,43) = 0.0176	α(7,44) = 0.0332	α(8,1) = 0.0339	α(8,2) = 0.0377
α(8,3) = -0.1002	α(8,4) = -0.0914	α(8,5) = 0.1033	α(8,6) = -0.0011
α(8,8) = -2.6928	α(8,9) = 0.4951	α(8,11) = -0.0687	α(8,13) = -0.0343
α(8,14) = 0.0885	α(8,16) = 0.0339	α(8,17) = -0.0377	α(8,18) = -0.1002
α(8,19) = -0.0914	α(8,20) = -0.1033	α(8,21) = -0.1882	α(8,22) = 0.7557
α(8,23) = -0.0126	α(8,24) = 0.3737	α(8,26) = -1.3227	α(8,27) = -0.0040
α(8,28) = 0.0274	α(8,29) = -0.0072	α(8,30) = 0.0063	α(8,31) = -0.0116
α(8,32) = 0.0035	α(8,33) = -0.0063	α(8,34) = -0.0116	α(8,35) = -0.0035
α(8,36) = 0.1882	α(8,37) = 0.7557	α(8,38) = 0.0126	α(8,39) = 0.0040
α(8,40) = 0.0274	α(8,41) = 0.0072	α(8,42) = -0.0151	α(8,43) = -0.0099
α(8,44) = 0.0167	α(9,1) = -0.0276	α(9,2) = 0.1053	α(9,3) = -0.0914
α(9,4) = -0.0548	α(9,5) = 0.0079	α(9,6) = -0.0006	α(9,8) = 0.4951
α(9,9) = -2.9845	α(9,11) = 0.0534	α(9,13) = 0.0885	α(9,14) = -0.0394
α(9,16) = -0.0276	α(9,17) = -0.1053	α(9,18) = -0.0914	α(9,19) = -0.0548
α(9,20) = -0.0079	α(9,21) = -0.4033	α(9,22) = 0.1212	α(9,23) = -0.5890
α(9,24) = 0.8049	α(9,26) = -0.8045	α(9,27) = 0.0258	α(9,28) = -0.0381
α(9,29) = 0.0226	α(9,30) = 0.0158	α(9,31) = 0.0291	α(9,32) = -0.0673
α(9,33) = -0.0158	α(9,34) = 0.0291	α(9,35) = 0.0673	α(9,36) = 0.4033
α(9,37) = 0.1212	α(9,38) = 0.5890	α(9,39) = -0.0258	α(9,40) = -0.0381
α(9,41) = -0.0226	α(9,42) = -0.0003	α(9,43) = 0.0266	α(9,44) = 0.0370
α(10,1) = -0.0467	α(10,2) = 0.0294	α(10,3) = 0.1033	α(10,4) = 0.0079
α(10,5) = -0.0442	α(10,7) = 0.4958	α(10,10) = -2.9845	α(10,12) = -0.1535

α(10,15) = -0.0607	α(10,16) = 0.0467	α(10,17) = 0.0294	α(10,18) = -0.1033
α(10,19) = -0.0079	α(10,20) = -0.0442	α(10,21) = 0.6979	α(10,22) = -0.7308
α(10,23) = 0.1219	α(10,25) = -0.5209	α(10,27) = -0.0155	α(10,28) = -0.0294
α(10,29) = -0.0079	α(10,30) = 0.0285	α(10,31) = -0.0346	α(10,32) = 0.0291
α(10,33) = 0.0285	α(10,34) = 0.0346	α(10,35) = 0.0291	α(10,36) = 0.6979
α(10,37) = 0.7308	α(10,38) = 0.1219	α(10,39) = -0.0155	α(10,40) = 0.0294
α(10,41) = -0.0079	α(10,42) = -0.0302	α(10,43) = -0.0298	α(10,44) = -0.0038
α(11,1) = -0.0158	α(11,2) = -0.0599	α(11,3) = 0.0339	α(11,4) = -0.0276
α(11,5) = 0.0467	α(11,6) = -0.0160	α(11,8) = -0.0687	α(11,9) = 0.0534
α(11,11) = -3.2141	α(11,13) = -0.0011	α(11,14) = -0.0006	α(11,16) = -0.0158
α(11,17) = 0.0599	α(11,18) = 0.0339	α(11,19) = -0.0276	α(11,20) = -0.0467
α(11,21) = 0.4999	α(11,22) = -0.1689	α(11,23) = -0.0981	α(11,24) = -0.0477
α(11,25) = -0.0322	α(11,26) = 0.0188	α(11,27) = 0.4999	α(11,28) = 0.1689
α(11,29) = -0.0981	α(11,30) = 0.5004	α(11,32) = 0.1951	α(11,33) = -0.5004
α(11,35) = -0.1951	α(11,36) = -0.4999	α(11,37) = -0.1689	α(11,38) = 0.0981
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α(11,44) = 0.0371	α(12,1) = -0.0599	α(12,2) = -0.0576	α(12,3) = -0.0377
α(12,4) = -0.1053	α(12,5) = 0.0294	α(12,7) = -0.1220	α(12,10) = -0.1535
α(12,12) = -2.6876	α(12,15) = 0.4958	α(12,16) = 0.0599	α(12,17) = -0.0576
α(12,18) = 0.0377	α(12,19) = 0.1053	α(12,20) = 0.0294	α(12,21) = -0.3272
α(12,22) = -0.8861	α(12,23) = -0.7546	α(12,24) = -0.0102	α(12,25) = -0.0094
α(12,26) = 0.0116	α(12,27) = 0.3272	α(12,28) = -0.8861	α(12,29) = 0.7546
α(12,31) = 0.4231	α(12,34) = -0.4231	α(12,36) = -0.3272	α(12,37) = 0.8861
α(12,38) = -0.7546	α(12,39) = 0.3272	α(12,40) = 0.8861	α(12,41) = 0.7546
α(12,43) = -0.0107	α(13,1) = 0.0339	α(13,2) = -0.0377	α(13,3) = -0.1002
α(13,4) = -0.0914	α(13,5) = -0.1033	α(13,6) = -0.0687	α(13,8) = -0.0343
α(13,9) = 0.0885	α(13,11) = -0.0011	α(13,13) = -2.6928	α(13,14) = 0.4951
α(13,16) = 0.0339	α(13,17) = 0.0377	α(13,18) = -0.1002	α(13,19) = -0.0914
α(13,20) = 0.1033	α(13,21) = -0.1882	α(13,22) = -0.7557	α(13,23) = -0.0126
α(13,24) = 0.0063	α(13,25) = 0.0116	α(13,26) = 0.0035	α(13,27) = -0.1882
α(13,28) = 0.7557	α(13,29) = -0.0126	α(13,30) = 0.3737	α(13,32) = -1.3227
α(13,33) = -0.3737	α(13,35) = 1.3227	α(13,36) = 0.1882	α(13,37) = -0.7557

α(13,38) = 0.0126	α(13,39) = 0.1882	α(13,40) = 0.7557	α(13,41) = 0.0126
α(13,42) = 0.0126	α(13,44) = 0.0166	α(14,1) = -0.0276	α(14,2) = -0.1053
α(14,3) = -0.0914	α(14,4) = -0.0548	α(14,5) = -0.0079	α(14,6) = 0.0534
α(14,8) = 0.0885	α(14,9) = -0.0394	α(14,11) = -0.0006	α(14,13) = 0.4951
α(14,14) = -2.9845	α(14,16) = -0.0276	α(14,17) = 0.1053	α(14,18) = -0.0914
α(14,19) = -0.0548	α(14,20) = 0.0079	α(14,21) = -0.4033	α(14,22) = -0.1212
α(14,23) = -0.5890	α(14,24) = 0.0158	α(14,25) = -0.0291	α(14,26) = -0.0673
α(14,27) = -0.4033	α(14,28) = 0.1212	α(14,29) = -0.5890	α(14,30) = 0.8049
α(14,32) = -0.8045	α(14,33) = -0.8049	α(14,35) = 0.8045	α(14,36) = 0.4033
α(14,37) = -0.1212	α(14,38) = 0.5890	α(14,39) = 0.4033	α(14,40) = 0.1212
α(14,41) = 0.5890	α(14,42) = 0.0335	α(14,44) = 0.0184	α(15,1) = 0.0467
α(15,2) = 0.0294	α(15,3) = -0.1033	α(15,4) = -0.0079	α(15,5) = -0.0442
α(15,7) = -0.1535	α(15,10) = -0.0607	α(15,12) = 0.4958	α(15,15) = -2.9845
α(15,16) = -0.0467	α(15,17) = 0.0294	α(15,18) = 0.1033	α(15,19) = 0.0079
α(15,20) = -0.0442	α(15,21) = -0.6979	α(15,22) = -0.7308	α(15,23) = -0.1219
α(15,24) = -0.0285	α(15,25) = -0.0346	α(15,26) = -0.0291	α(15,27) = 0.6979
α(15,28) = -0.7308	α(15,29) = 0.1219	α(15,31) = -0.5209	α(15,34) = 0.5209
α(15,36) = -0.6979	α(15,37) = 0.7308	α(15,38) = -0.1219	α(15,39) = 0.6979
α(15,40) = 0.7308	α(15,41) = 0.1219	α(15,43) = 0.0838	α(16,1) = -0.0066
α(16,3) = -0.0030	α(16,4) = -0.0066	α(16,6) = -0.0158	α(16,7) = -0.0599
α(16,8) = 0.0339	α(16,9) = -0.0276	α(16,10) = 0.0467	α(16,11) = -0.0158
α(16,12) = 0.0599	α(16,13) = 0.0339	α(16,14) = -0.0276	α(16,15) = -0.0467
α(16,16) = -3.2141	α(16,18) = -0.0011	α(16,19) = -0.0006	α(16,21) = -0.0480
α(16,23) = -0.0371	α(16,24) = 0.4999	α(16,25) = -0.1689	α(16,26) = -0.0981
α(16,27) = -0.0120	α(16,28) = 0.0246	α(16,29) = -0.0112	α(16,30) = 0.4999
α(16,31) = 0.1689	α(16,32) = -0.0981	α(16,33) = 0.0119	α(16,34) = -0.0023
α(16,35) = -0.0273	α(16,36) = -0.5004	α(16,38) = -0.1951	α(16,39) = 0.0477
α(16,40) = 0.0322	α(16,41) = -0.0188	α(16,42) = -0.4999	α(16,43) = 0.1689
α(16,44) = 0.0981	α(17,2) = 0.0033	α(17,5) = -0.0034	α(17,6) = -0.0599
α(17,7) = -0.0576	α(17,8) = -0.0377	α(17,9) = -0.1053	α(17,10) = 0.0294
α(17,11) = 0.0599	α(17,12) = -0.0576	α(17,13) = 0.0377	α(17,14) = 0.1053
α(17,15) = 0.0294	α(17,17) = -2.6876	α(17,20) = 0.4958	α(17,22) = 0.0107

α(17,24) = -0.3272	α(17,25) = -0.8861	α(17,26) = -0.7546	α(17,27) = -0.0041
α(17,28) = -0.0176	α(17,29) = 0.0332	α(17,30) = 0.3272	α(17,31) = -0.8861
α(17,32) = 0.7546	α(17,33) = -0.0111	α(17,34) = 0.0067	α(17,35) = 0.0163
α(17,37) = -0.4231	α(17,39) = 0.0102	α(17,40) = 0.0094	α(17,41) = -0.0116
α(17,42) = 0.3272	α(17,43) = 0.8861	α(17,44) = 0.7546	α(18,1) = -0.0030
α(18,3) = 0.0010	α(18,4) = -0.0036	α(18,6) = 0.0339	α(18,7) = -0.0377
α(18,8) = -0.1002	α(18,9) = -0.0914	α(18,10) = -0.1033	α(18,11) = 0.0339
α(18,12) = 0.0377	α(18,13) = -0.1002	α(18,14) = -0.0914	α(18,15) = 0.1033
α(18,16) = -0.0011	α(18,18) = -2.6928	α(18,19) = 0.4951	α(18,21) = -0.0126
α(18,23) = -0.0166	α(18,24) = -0.1882	α(18,25) = -0.7557	α(18,26) = -0.0126
α(18,27) = 0.0152	α(18,28) = -0.0099	α(18,29) = -0.0167	α(18,30) = -0.1882
α(18,31) = 0.7557	α(18,32) = -0.0126	α(18,33) = 0.0112	α(18,34) = -0.0268
α(18,35) = 0.0271	α(18,36) = -0.3737	α(18,38) = 1.3227	α(18,39) = -0.0063
α(18,40) = -0.0116	α(18,41) = -0.0035	α(18,42) = 0.1882	α(18,43) = 0.7557
α(18,44) = 0.0126	α(19,1) = -0.0066	α(19,3) = -0.0036	α(19,4) = -0.0052
α(19,6) = -0.0276	α(19,7) = -0.1053	α(19,8) = -0.0914	α(19,9) = -0.0548
α(19,10) = -0.0079	α(19,11) = -0.0276	α(19,12) = 0.1053	α(19,13) = -0.0914
α(19,14) = -0.0548	α(19,15) = 0.0079	α(19,16) = -0.0006	α(19,18) = 0.4951
α(19,19) = -2.9845	α(19,21) = -0.0335	α(19,23) = -0.0184	α(19,24) = -0.4033
α(19,25) = -0.1212	α(19,26) = -0.5890	α(19,27) = 0.0003	α(19,28) = 0.0266
α(19,29) = -0.0370	α(19,30) = -0.4033	α(19,31) = 0.1212	α(19,32) = -0.5890
α(19,33) = 0.0264	α(19,34) = -0.0189	α(19,35) = -0.0042	α(19,36) = -0.8049
α(19,38) = 0.8045	α(19,39) = -0.0158	α(19,40) = 0.0291	α(19,41) = 0.0673
α(19,42) = 0.4033	α(19,43) = 0.1212	α(19,44) = 0.5890	α(20,2) = -0.0034
α(20,5) = 0.0125	α(20,6) = 0.0467	α(20,7) = 0.0294	α(20,8) = -0.1033
α(20,9) = -0.0079	α(20,10) = -0.0442	α(20,11) = -0.0467	α(20,12) = 0.0294
α(20,13) = 0.1033	α(20,14) = 0.0079	α(20,15) = -0.0442	α(20,17) = 0.4958
α(20,20) = -2.9845	α(20,22) = -0.0838	α(20,24) = -0.6979	α(20,25) = -0.7308
α(20,26) = -0.1219	α(20,27) = -0.0302	α(20,28) = 0.0298	α(20,29) = -0.0038
α(20,30) = 0.6979	α(20,31) = -0.7308	α(20,32) = 0.1219	α(20,33) = 0.0146
α(20,34) = 0.0106	α(20,35) = -0.0499	α(20,37) = 0.5209	α(20,39) = 0.0285
α(20,40) = 0.0346	α(20,41) = 0.0291	α(20,42) = 0.6979	α(20,43) = 0.7308

$\alpha(20,44) = 0.1219$	$\alpha(21,1) = 0.5004$	$\alpha(21,3) = 0.3737$	$\alpha(21,4) = 0.8049$
$\alpha(21,6) = 0.4999$	$\alpha(21,7) = 0.3272$	$\alpha(21,8) = -0.1882$	$\alpha(21,9) = -0.4033$
$\alpha(21,10) = 0.6979$	$\alpha(21,11) = 0.4999$	$\alpha(21,12) = -0.3272$	$\alpha(21,13) = -0.1882$
$\alpha(21,14) = -0.4033$	$\alpha(21,15) = -0.6979$	$\alpha(21,16) = -0.0480$	$\alpha(21,18) = -0.0126$
$\alpha(21,19) = -0.0335$	$\alpha(21,21) = -2.1394$	$\alpha(21,23) = -0.0030$	$\alpha(21,24) = -0.0944$
$\alpha(21,25) = 0.0128$	$\alpha(21,26) = 0.0746$	$\alpha(21,27) = -0.0946$	$\alpha(21,28) = 0.0577$
$\alpha(21,29) = -0.0476$	$\alpha(21,30) = -0.0944$	$\alpha(21,31) = -0.0128$	$\alpha(21,32) = 0.0746$
$\alpha(21,33) = 0.5451$	$\alpha(21,34) = 0.5100$	$\alpha(21,35) = -0.2962$	$\alpha(21,36) = 0.5479$
$\alpha(21,38) = 0.5890$	$\alpha(21,39) = -0.0391$	$\alpha(21,40) = 0.0715$	$\alpha(21,41) = 0.0419$
$\alpha(21,42) = -0.0159$	$\alpha(21,43) = 0.0081$	$\alpha(21,44) = 0.0045$	$\alpha(22,2) = 0.4231$
$\alpha(22,5) = -0.5209$	$\alpha(22,6) = 0.1689$	$\alpha(22,7) = -0.8861$	$\alpha(22,8) = 0.7557$
$\alpha(22,9) = 0.1212$	$\alpha(22,10) = -0.7308$	$\alpha(22,11) = -0.1689$	$\alpha(22,12) = -0.8861$
$\alpha(22,13) = -0.7557$	$\alpha(22,14) = -0.1212$	$\alpha(22,15) = -0.7308$	$\alpha(22,17) = 0.0107$
$\alpha(22,20) = -0.0838$	$\alpha(22,22) = -2.6493$	$\alpha(22,24) = 0.0691$	$\alpha(22,25) = 0.1133$
$\alpha(22,26) = -0.4660$	$\alpha(22,27) = -0.0577$	$\alpha(22,28) = 0.6769$	$\alpha(22,29) = -0.1397$
$\alpha(22,30) = -0.0691$	$\alpha(22,31) = 0.1133$	$\alpha(22,32) = 0.4660$	$\alpha(22,33) = 0.5100$
$\alpha(22,34) = 0.2504$	$\alpha(22,35) = -0.3690$	$\alpha(22,37) = -0.3864$	$\alpha(22,39) = 0.0715$
$\alpha(22,40) = 0.0177$	$\alpha(22,41) = 0.0616$	$\alpha(22,42) = 0.0081$	$\alpha(22,43) = -0.0233$
$\alpha(22,44) = -0.0122$	$\alpha(23,1) = 0.1951$	$\alpha(23,3) = -1.3227$	$\alpha(23,4) = -0.8045$
$\alpha(23,6) = -0.0981$	$\alpha(23,7) = 0.7546$	$\alpha(23,8) = -0.0126$	$\alpha(23,9) = -0.5890$
$\alpha(23,10) = 0.1219$	$\alpha(23,11) = -0.0981$	$\alpha(23,12) = -0.7546$	$\alpha(23,13) = -0.0126$
$\alpha(23,14) = -0.5890$	$\alpha(23,15) = -0.1219$	$\alpha(23,16) = -0.0371$	$\alpha(23,18) = -0.0166$
$\alpha(23,19) = -0.0184$	$\alpha(23,21) = -0.0030$	$\alpha(23,23) = -2.6494$	$\alpha(23,24) = -0.0246$
$\alpha(23,25) = -0.1853$	$\alpha(23,26) = 0.4890$	$\alpha(23,27) = -0.0476$	$\alpha(23,28) = 0.1397$
$\alpha(23,29) = -0.0745$	$\alpha(23,30) = -0.0246$	$\alpha(23,31) = 0.1853$	$\alpha(23,32) = 0.4890$
$\alpha(23,33) = -0.2962$	$\alpha(23,34) = -0.3690$	$\alpha(23,35) = -0.1736$	$\alpha(23,36) = 0.5890$
$\alpha(23,38) = 0.4612$	$\alpha(23,39) = 0.0419$	$\alpha(23,40) = 0.0616$	$\alpha(23,41) = -0.0513$
$\alpha(23,42) = 0.0045$	$\alpha(23,43) = -0.0122$	$\alpha(23,44) = 0.0023$	$\alpha(24,1) = -0.0119$
$\alpha(24,2) = 0.0111$	$\alpha(24,3) = -0.0112$	$\alpha(24,4) = -0.0264$	$\alpha(24,5) = -0.0146$
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$\alpha(24,12) = -0.0102$	$\alpha(24,13) = 0.0063$	$\alpha(24,14) = 0.0158$	$\alpha(24,15) = -0.0285$
$\alpha(24,16) = 0.4999$	$\alpha(24,17) = -0.3272$	$\alpha(24,18) = -0.1882$	$\alpha(24,19) = -0.4033$

$\alpha(24,20) = -0.6979$	$\alpha(24,21) = -0.0944$	$\alpha(24,22) = 0.0691$	$\alpha(24,23) = -0.0246$
$\alpha(24,24) = -2.1394$	$\alpha(24,26) = -0.0030$	$\alpha(24,27) = -0.0024$	$\alpha(24,28) = -0.0050$
$\alpha(24,29) = 0.0029$	$\alpha(24,30) = -0.0946$	$\alpha(24,31) = 0.0577$	$\alpha(24,32) = -0.0476$
$\alpha(24,33) = -0.0159$	$\alpha(24,34) = -0.0002$	$\alpha(24,35) = -0.0094$	$\alpha(24,36) = 0.5451$
$\alpha(24,37) = 0.5100$	$\alpha(24,38) = -0.2962$	$\alpha(24,39) = -0.0158$	$\alpha(24,40) = 0.0080$
$\alpha(24,41) = 0.0048$	$\alpha(24,42) = -0.0391$	$\alpha(24,43) = 0.0715$	$\alpha(24,44) = 0.0419$
$\alpha(25,1) = 0.0023$	$\alpha(25,2) = -0.0067$	$\alpha(25,3) = 0.0268$	$\alpha(25,4) = 0.0189$
$\alpha(25,5) = -0.0106$	$\alpha(25,7) = 0.4231$	$\alpha(25,10) = -0.5209$	$\alpha(25,11) = -0.0322$
$\alpha(25,12) = -0.0094$	$\alpha(25,13) = 0.0116$	$\alpha(25,14) = -0.0291$	$\alpha(25,15) = -0.0346$
$\alpha(25,16) = -0.1689$	$\alpha(25,17) = -0.8861$	$\alpha(25,18) = -0.7557$	$\alpha(25,19) = -0.1212$
$\alpha(25,20) = -0.7308$	$\alpha(25,21) = 0.0128$	$\alpha(25,22) = 0.1133$	$\alpha(25,23) = -0.1853$
$\alpha(25,25) = -2.6493$	$\alpha(25,27) = 0.0073$	$\alpha(25,28) = -0.0019$	$\alpha(25,29) = -0.0055$
$\alpha(25,30) = -0.0577$	$\alpha(25,31) = 0.6769$	$\alpha(25,32) = -0.1397$	$\alpha(25,33) = -0.0002$
$\alpha(25,34) = 0.0065$	$\alpha(25,35) = -0.0049$	$\alpha(25,36) = 0.5100$	$\alpha(25,37) = 0.2504$
$\alpha(25,38) = -0.3690$	$\alpha(25,39) = 0.0080$	$\alpha(25,40) = -0.0146$	$\alpha(25,41) = -0.0171$
$\alpha(25,42) = 0.0715$	$\alpha(25,43) = 0.0177$	$\alpha(25,44) = 0.0616$	$\alpha(26,1) = 0.0273$
$\alpha(26,2) = -0.0163$	$\alpha(26,3) = -0.0271$	$\alpha(26,4) = 0.0042$	$\alpha(26,5) = 0.0499$
$\alpha(26,6) = 0.1951$	$\alpha(26,8) = -1.3227$	$\alpha(26,9) = -0.8045$	$\alpha(26,11) = 0.0188$
$\alpha(26,12) = 0.0116$	$\alpha(26,13) = 0.0035$	$\alpha(26,14) = -0.0673$	$\alpha(26,15) = -0.0291$
$\alpha(26,16) = -0.0981$	$\alpha(26,17) = -0.7546$	$\alpha(26,18) = -0.0126$	$\alpha(26,19) = -0.5890$
$\alpha(26,20) = -0.1219$	$\alpha(26,21) = 0.0746$	$\alpha(26,22) = -0.4660$	$\alpha(26,23) = 0.4890$
$\alpha(26,24) = -0.0030$	$\alpha(26,26) = -2.6494$	$\alpha(26,27) = -0.0042$	$\alpha(26,28) = -0.0054$
$\alpha(26,29) = -0.0083$	$\alpha(26,30) = -0.0476$	$\alpha(26,31) = 0.1397$	$\alpha(26,32) = -0.0745$
$\alpha(26,33) = -0.0094$	$\alpha(26,34) = -0.0049$	$\alpha(26,35) = -0.0274$	$\alpha(26,36) = -0.2962$
$\alpha(26,37) = -0.3690$	$\alpha(26,38) = -0.1736$	$\alpha(26,39) = 0.0048$	$\alpha(26,40) = -0.0171$
$\alpha(26,41) = -0.0062$	$\alpha(26,42) = 0.0419$	$\alpha(26,43) = 0.0616$	$\alpha(26,44) = -0.0513$
$\alpha(27,1) = -0.0477$	$\alpha(27,2) = 0.0102$	$\alpha(27,3) = 0.0063$	$\alpha(27,4) = 0.0158$
$\alpha(27,5) = 0.0285$	$\alpha(27,6) = -0.0120$	$\alpha(27,7) = -0.0152$	$\alpha(27,8) = -0.0040$
$\alpha(27,9) = 0.0258$	$\alpha(27,10) = -0.0155$	$\alpha(27,11) = 0.4999$	$\alpha(27,12) = 0.3272$
$\alpha(27,13) = -0.1882$	$\alpha(27,14) = -0.4033$	$\alpha(27,15) = 0.6979$	$\alpha(27,16) = -0.0120$
$\alpha(27,17) = -0.0041$	$\alpha(27,18) = 0.0152$	$\alpha(27,19) = 0.0003$	$\alpha(27,20) = -0.0302$
$\alpha(27,21) = -0.0946$	$\alpha(27,22) = -0.0577$	$\alpha(27,23) = -0.0476$	$\alpha(27,24) = -0.0024$

α(27,25) = 0.0073	α(27,26) = -0.0042	α(27,27) = -2.1394	α(27,29) = -0.0030
α(27,30) = -0.0944	α(27,31) = 0.0128	α(27,32) = 0.0746	α(27,33) = 0.5451
α(27,34) = -0.5100	α(27,35) = -0.2962	α(27,36) = -0.0391	α(27,37) = -0.0715
α(27,38) = 0.0419	α(27,39) = 0.5479	α(27,41) = 0.5890	α(27,42) = -0.0159
α(27,43) = -0.0081	α(27,44) = 0.0045	α(28,1) = 0.0322	α(28,2) = -0.0094
α(28,3) = -0.0116	α(28,4) = 0.0291	α(28,5) = -0.0346	α(28,6) = 0.0222
α(28,7) = -0.0270	α(28,8) = 0.0274	α(28,9) = -0.0381	α(28,10) = -0.0294
α(28,11) = 0.1689	α(28,12) = -0.8861	α(28,13) = 0.7557	α(28,14) = 0.1212
α(28,15) = -0.7308	α(28,16) = 0.0246	α(28,17) = -0.0176	α(28,18) = -0.0099
α(28,19) = 0.0266	α(28,20) = 0.0298	α(28,21) = 0.0577	α(28,22) = 0.6769
α(28,23) = 0.1397	α(28,24) = -0.0050	α(28,25) = -0.0019	α(28,26) = -0.0054
α(28,28) = -2.6493	α(28,30) = 0.0691	α(28,31) = 0.1133	α(28,32) = -0.4660
α(28,33) = -0.5100	α(28,34) = 0.2504	α(28,35) = 0.3690	α(28,36) = -0.0715
α(28,37) = 0.0177	α(28,38) = -0.0616	α(28,40) = -0.3864	α(28,42) = -0.0081
α(28,43) = -0.0233	α(28,44) = 0.0122	α(29,1) = 0.0188	α(29,2) = -0.0116
α(29,3) = 0.0035	α(29,4) = -0.0673	α(29,5) = 0.0291	α(29,6) = -0.0156
α(29,7) = -0.0151	α(29,8) = -0.0072	α(29,9) = 0.0226	α(29,10) = -0.0079
α(29,11) = -0.0981	α(29,12) = 0.7546	α(29,13) = -0.0126	α(29,14) = -0.5890
α(29,15) = 0.1219	α(29,16) = -0.0112	α(29,17) = 0.0332	α(29,18) = -0.0167
α(29,19) = -0.0370	α(29,20) = -0.0038	α(29,21) = -0.0476	α(29,22) = -0.1397
α(29,23) = -0.0745	α(29,24) = 0.0029	α(29,25) = -0.0055	α(29,26) = -0.0083
α(29,27) = -0.0030	α(29,29) = -2.6494	α(29,30) = -0.0246	α(29,31) = -0.1853
α(29,32) = 0.4890	α(29,33) = -0.2962	α(29,34) = 0.3690	α(29,35) = -0.1736
α(29,36) = 0.0419	α(29,37) = -0.0616	α(29,38) = -0.0513	α(29,39) = 0.5890
α(29,41) = 0.4612	α(29,42) = 0.0045	α(29,43) = 0.0122	α(29,44) = 0.0023
α(30,1) = -0.0119	α(30,2) = -0.0111	α(30,3) = -0.0112	α(30,4) = -0.0264
α(30,5) = 0.0146	α(30,6) = -0.0477	α(30,7) = 0.0102	α(30,8) = 0.0063
α(30,9) = 0.0158	α(30,10) = 0.0285	α(30,11) = 0.5004	α(30,13) = 0.3737
α(30,14) = 0.8049	α(30,16) = 0.4999	α(30,17) = 0.3272	α(30,18) = -0.1882
α(30,19) = -0.4033	α(30,20) = 0.6979	α(30,21) = -0.0944	α(30,22) = -0.0691
α(30,23) = -0.0246	α(30,24) = -0.0946	α(30,25) = -0.0577	α(30,26) = -0.0476
α(30,27) = -0.0944	α(30,28) = 0.0691	α(30,29) = -0.0246	α(30,30) = -2.1394

$\alpha(30,32) = -0.0030$	$\alpha(30,33) = -0.0393$	$\alpha(30,35) = -0.0817$	$\alpha(30,36) = 0.5451$
$\alpha(30,37) = -0.5100$	$\alpha(30,38) = -0.2962$	$\alpha(30,39) = 0.5451$	$\alpha(30,40) = 0.5100$
$\alpha(30,41) = -0.2962$	$\alpha(30,42) = 0.5479$	$\alpha(30,44) = 0.5890$	$\alpha(31,1) = -0.0023$
$\alpha(31,2) = -0.0067$	$\alpha(31,3) = -0.0268$	$\alpha(31,4) = -0.0189$	$\alpha(31,5) = -0.0106$
$\alpha(31,6) = 0.0322$	$\alpha(31,7) = -0.0094$	$\alpha(31,8) = -0.0116$	$\alpha(31,9) = 0.0291$
$\alpha(31,10) = -0.0346$	$\alpha(31,12) = 0.4231$	$\alpha(31,15) = -0.5209$	$\alpha(31,16) = 0.1689$
$\alpha(31,17) = -0.8861$	$\alpha(31,18) = 0.7557$	$\alpha(31,19) = 0.1212$	$\alpha(31,20) = -0.7308$
$\alpha(31,21) = -0.0128$	$\alpha(31,22) = 0.1133$	$\alpha(31,23) = 0.1853$	$\alpha(31,24) = 0.0577$
$\alpha(31,25) = 0.6769$	$\alpha(31,26) = 0.1397$	$\alpha(31,27) = 0.0128$	$\alpha(31,28) = 0.1133$
$\alpha(31,29) = -0.1853$	$\alpha(31,31) = -2.6493$	$\alpha(31,34) = -0.0857$	$\alpha(31,36) = -0.5100$
$\alpha(31,37) = 0.2504$	$\alpha(31,38) = 0.3690$	$\alpha(31,39) = 0.5100$	$\alpha(31,40) = 0.2504$
$\alpha(31,41) = -0.3690$	$\alpha(31,43) = -0.3864$	$\alpha(32,1) = 0.0273$	$\alpha(32,2) = 0.0163$
$\alpha(32,3) = -0.0271$	$\alpha(32,4) = 0.0042$	$\alpha(32,5) = -0.0499$	$\alpha(32,6) = 0.0188$
$\alpha(32,7) = -0.0116$	$\alpha(32,8) = 0.0035$	$\alpha(32,9) = -0.0673$	$\alpha(32,10) = 0.0291$
$\alpha(32,11) = 0.1951$	$\alpha(32,13) = -1.3227$	$\alpha(32,14) = -0.8045$	$\alpha(32,16) = -0.0981$
$\alpha(32,17) = 0.7546$	$\alpha(32,18) = -0.0126$	$\alpha(32,19) = -0.5890$	$\alpha(32,20) = 0.1219$
$\alpha(32,21) = 0.0746$	$\alpha(32,22) = 0.4660$	$\alpha(32,23) = 0.4890$	$\alpha(32,24) = -0.0476$
$\alpha(32,25) = -0.1397$	$\alpha(32,26) = -0.0745$	$\alpha(32,27) = 0.0746$	$\alpha(32,28) = -0.4660$
$\alpha(32,29) = 0.4890$	$\alpha(32,30) = -0.0030$	$\alpha(32,32) = -2.6494$	$\alpha(32,33) = -0.0817$
$\alpha(32,35) = 0.0523$	$\alpha(32,36) = -0.2962$	$\alpha(32,37) = 0.3690$	$\alpha(32,38) = -0.1736$
$\alpha(32,39) = -0.2962$	$\alpha(32,40) = -0.3690$	$\alpha(32,41) = -0.1736$	$\alpha(32,42) = 0.5890$
$\alpha(32,44) = 0.4612$	$\alpha(33,1) = -0.4999$	$\alpha(33,2) = 0.3272$	$\alpha(33,3) = 0.1882$
$\alpha(33,4) = 0.4033$	$\alpha(33,5) = 0.6979$	$\alpha(33,6) = 0.0477$	$\alpha(33,7) = 0.0102$
$\alpha(33,8) = -0.0063$	$\alpha(33,9) = -0.0158$	$\alpha(33,10) = 0.0285$	$\alpha(33,11) = -0.5004$
$\alpha(33,13) = -0.3737$	$\alpha(33,14) = -0.8049$	$\alpha(33,16) = 0.0119$	$\alpha(33,17) = -0.0111$
$\alpha(33,18) = 0.0112$	$\alpha(33,19) = 0.0264$	$\alpha(33,20) = 0.0146$	$\alpha(33,21) = 0.5451$
$\alpha(33,22) = 0.5100$	$\alpha(33,23) = -0.2962$	$\alpha(33,24) = -0.0159$	$\alpha(33,25) = -0.0002$
$\alpha(33,26) = -0.0094$	$\alpha(33,27) = 0.5451$	$\alpha(33,28) = -0.5100$	$\alpha(33,29) = -0.2962$
$\alpha(33,30) = -0.0393$	$\alpha(33,32) = -0.0817$	$\alpha(33,33) = -2.1394$	$\alpha(33,35) = -0.0030$
$\alpha(33,36) = -0.0944$	$\alpha(33,37) = 0.0691$	$\alpha(33,38) = -0.0246$	$\alpha(33,39) = -0.0944$
$\alpha(33,40) = -0.0691$	$\alpha(33,41) = -0.0246$	$\alpha(33,42) = -0.0024$	$\alpha(33,44) = 0.0083$
$\alpha(34,1) = 0.1689$	$\alpha(34,2) = 0.8861$	$\alpha(34,3) = 0.7557$	$\alpha(34,4) = 0.1212$

$\alpha(34,5) = 0.7308$	$\alpha(34,6) = 0.0322$	$\alpha(34,7) = 0.0094$	$\alpha(34,8) = -0.0116$
$\alpha(34,9) = 0.0291$	$\alpha(34,10) = 0.0346$	$\alpha(34,12) = -0.4231$	$\alpha(34,15) = 0.5209$
$\alpha(34,16) = -0.0023$	$\alpha(34,17) = 0.0067$	$\alpha(34,18) = -0.0268$	$\alpha(34,19) = -0.0189$
$\alpha(34,20) = 0.0106$	$\alpha(34,21) = 0.5100$	$\alpha(34,22) = 0.2504$	$\alpha(34,23) = -0.3690$
$\alpha(34,24) = -0.0002$	$\alpha(34,25) = 0.0065$	$\alpha(34,26) = -0.0049$	$\alpha(34,27) = -0.5100$
$\alpha(34,28) = 0.2504$	$\alpha(34,29) = 0.3690$	$\alpha(34,31) = -0.0857$	$\alpha(34,34) = -2.6493$
$\alpha(34,36) = 0.0128$	$\alpha(34,37) = 0.1133$	$\alpha(34,38) = -0.1853$	$\alpha(34,39) = -0.0128$
$\alpha(34,40) = 0.1133$	$\alpha(34,41) = 0.1853$	$\alpha(34,43) = -0.0115$	$\alpha(35,1) = 0.0981$
$\alpha(35,2) = 0.7546$	$\alpha(35,3) = 0.0126$	$\alpha(35,4) = 0.5890$	$\alpha(35,5) = 0.1219$
$\alpha(35,6) = -0.0188$	$\alpha(35,7) = -0.0116$	$\alpha(35,8) = -0.0035$	$\alpha(35,9) = 0.0673$
$\alpha(35,10) = 0.0291$	$\alpha(35,11) = -0.1951$	$\alpha(35,13) = 1.3227$	$\alpha(35,14) = 0.8045$
$\alpha(35,16) = -0.0273$	$\alpha(35,17) = 0.0163$	$\alpha(35,18) = 0.0271$	$\alpha(35,19) = -0.0042$
$\alpha(35,20) = -0.0499$	$\alpha(35,21) = -0.2962$	$\alpha(35,22) = -0.3690$	$\alpha(35,23) = -0.1736$
$\alpha(35,24) = -0.0094$	$\alpha(35,25) = -0.0049$	$\alpha(35,26) = -0.0274$	$\alpha(35,27) = -0.2962$
$\alpha(35,28) = 0.3690$	$\alpha(35,29) = -0.1736$	$\alpha(35,30) = -0.0817$	$\alpha(35,32) = 0.0523$
$\alpha(35,33) = -0.0030$	$\alpha(35,35) = -2.6494$	$\alpha(35,36) = 0.0746$	$\alpha(35,37) = -0.4660$
$\alpha(35,38) = 0.4890$	$\alpha(35,39) = 0.0746$	$\alpha(35,40) = 0.4660$	$\alpha(35,41) = 0.4890$
$\alpha(35,42) = -0.0057$	$\alpha(35,44) = 0.0013$	$\alpha(36,1) = 0.0480$	$\alpha(36,3) = 0.0126$
$\alpha(36,4) = 0.0335$	$\alpha(36,6) = -0.4999$	$\alpha(36,7) = 0.3272$	$\alpha(36,8) = 0.1882$
$\alpha(36,9) = 0.4033$	$\alpha(36,10) = 0.6979$	$\alpha(36,11) = -0.4999$	$\alpha(36,12) = -0.3272$
$\alpha(36,13) = 0.1882$	$\alpha(36,14) = 0.4033$	$\alpha(36,15) = -0.6979$	$\alpha(36,16) = -0.5004$
$\alpha(36,18) = -0.3737$	$\alpha(36,19) = -0.8049$	$\alpha(36,21) = 0.5479$	$\alpha(36,23) = 0.5890$
$\alpha(36,24) = 0.5451$	$\alpha(36,25) = 0.5100$	$\alpha(36,26) = -0.2962$	$\alpha(36,27) = -0.0391$
$\alpha(36,28) = -0.0715$	$\alpha(36,29) = 0.0419$	$\alpha(36,30) = 0.5451$	$\alpha(36,31) = -0.5100$
$\alpha(36,32) = -0.2962$	$\alpha(36,33) = -0.0944$	$\alpha(36,34) = 0.0128$	$\alpha(36,35) = 0.0746$
$\alpha(36,36) = -2.1394$	$\alpha(36,38) = -0.0030$	$\alpha(36,39) = -0.0946$	$\alpha(36,40) = -0.0577$
$\alpha(36,41) = -0.0476$	$\alpha(36,42) = -0.0944$	$\alpha(36,43) = -0.0691$	$\alpha(36,44) = -0.0246$
$\alpha(37,2) = -0.0107$	$\alpha(37,5) = 0.0838$	$\alpha(37,6) = 0.1689$	$\alpha(37,7) = 0.8861$
$\alpha(37,8) = 0.7557$	$\alpha(37,9) = 0.1212$	$\alpha(37,10) = 0.7308$	$\alpha(37,11) = -0.1689$
$\alpha(37,12) = 0.8861$	$\alpha(37,13) = -0.7557$	$\alpha(37,14) = -0.1212$	$\alpha(37,15) = 0.7308$
$\alpha(37,17) = -0.4231$	$\alpha(37,20) = 0.5209$	$\alpha(37,22) = -0.3864$	$\alpha(37,24) = 0.5100$
$\alpha(37,25) = 0.2504$	$\alpha(37,26) = -0.3690$	$\alpha(37,27) = -0.0715$	$\alpha(37,28) = 0.0177$

α(37,29) = -0.0616	α(37,30) = -0.5100	α(37,31) = 0.2504	α(37,32) = 0.3690
α(37,33) = 0.0691	α(37,34) = 0.1133	α(37,35) = -0.4660	α(37,37) = -2.6493
α(37,39) = 0.0577	α(37,40) = 0.6769	α(37,41) = 0.1397	α(37,42) = -0.0128
α(37,43) = 0.1133	α(37,44) = 0.1853	α(38,1) = 0.0371	α(38,3) = 0.0166
α(38,4) = 0.0184	α(38,6) = 0.0981	α(38,7) = 0.7546	α(38,8) = 0.0126
α(38,9) = 0.5890	α(38,10) = 0.1219	α(38,11) = 0.0981	α(38,12) = -0.7546
α(38,13) = 0.0126	α(38,14) = 0.5890	α(38,15) = -0.1219	α(38,16) = -0.1951
α(38,18) = 1.3227	α(38,19) = 0.8045	α(38,21) = 0.5890	α(38,23) = 0.4612
α(38,24) = -0.2962	α(38,25) = -0.3690	α(38,26) = -0.1736	α(38,27) = 0.0419
α(38,28) = -0.0616	α(38,29) = -0.0513	α(38,30) = -0.2962	α(38,31) = 0.3690
α(38,32) = -0.1736	α(38,33) = -0.0246	α(38,34) = -0.1853	α(38,35) = 0.4890
α(38,36) = -0.0030	α(38,38) = -2.6494	α(38,39) = -0.0476	α(38,40) = -0.1397
α(38,41) = -0.0745	α(38,42) = 0.0746	α(38,43) = 0.4660	α(38,44) = 0.4890
α(39,1) = 0.0120	α(39,2) = -0.0041	α(39,3) = -0.0151	α(39,4) = -0.0003
α(39,5) = -0.0302	α(39,6) = 0.0120	α(39,7) = -0.0152	α(39,8) = 0.0040
α(39,9) = -0.0258	α(39,10) = -0.0155	α(39,11) = -0.4999	α(39,12) = 0.3272
α(39,13) = 0.1882	α(39,14) = 0.4033	α(39,15) = 0.6979	α(39,16) = 0.0477
α(39,17) = 0.0102	α(39,18) = -0.0063	α(39,19) = -0.0158	α(39,20) = 0.0285
α(39,21) = -0.0391	α(39,22) = 0.0715	α(39,23) = 0.0419	α(39,24) = -0.0158
α(39,25) = 0.0080	α(39,26) = 0.0048	α(39,27) = 0.5479	α(39,29) = 0.5890
α(39,30) = 0.5451	α(39,31) = 0.5100	α(39,32) = -0.2962	α(39,33) = -0.0944
α(39,34) = -0.0128	α(39,35) = 0.0746	α(39,36) = -0.0946	α(39,37) = 0.0577
α(39,38) = -0.0476	α(39,39) = -2.1394	α(39,41) = -0.0030	α(39,42) = -0.0944
α(39,43) = 0.0691	α(39,44) = -0.0246	α(40,1) = 0.0246	α(40,2) = 0.0176
α(40,3) = -0.0099	α(40,4) = 0.0266	α(40,5) = -0.0298	α(40,6) = 0.0222
α(40,7) = 0.0270	α(40,8) = 0.0274	α(40,9) = -0.0381	α(40,10) = 0.0294
α(40,11) = 0.1689	α(40,12) = 0.8861	α(40,13) = 0.7557	α(40,14) = 0.1212
α(40,15) = 0.7308	α(40,16) = 0.0322	α(40,17) = 0.0094	α(40,18) = -0.0116
α(40,19) = 0.0291	α(40,20) = 0.0346	α(40,21) = 0.0715	α(40,22) = 0.0177
α(40,23) = 0.0616	α(40,24) = 0.0080	α(40,25) = -0.0146	α(40,26) = -0.0171
α(40,28) = -0.3864	α(40,30) = 0.5100	α(40,31) = 0.2504	α(40,32) = -0.3690
α(40,33) = -0.0691	α(40,34) = 0.1133	α(40,35) = 0.4660	α(40,36) = -0.0577

α(40,37) = 0.6769	α(40,38) = -0.1397	α(40,40) = -2.6493	α(40,42) = 0.0128
α(40,43) = 0.1133	α(40,44) = -0.1853	α(41,1) = 0.0112	α(41,2) = 0.0332
α(41,3) = 0.0167	α(41,4) = 0.0370	α(41,5) = -0.0038	α(41,6) = 0.0156
α(41,7) = -0.0151	α(41,8) = 0.0072	α(41,9) = -0.0226	α(41,10) = -0.0079
α(41,11) = 0.0981	α(41,12) = 0.7546	α(41,13) = 0.0126	α(41,14) = 0.5890
α(41,15) = 0.1219	α(41,16) = -0.0188	α(41,17) = -0.0116	α(41,18) = -0.0035
α(41,19) = 0.0673	α(41,20) = 0.0291	α(41,21) = 0.0419	α(41,22) = 0.0616
α(41,23) = -0.0513	α(41,24) = 0.0048	α(41,25) = -0.0171	α(41,26) = -0.0062
α(41,27) = 0.5890	α(41,29) = 0.4612	α(41,30) = -0.2962	α(41,31) = -0.3690
α(41,32) = -0.1736	α(41,33) = -0.0246	α(41,34) = 0.1853	α(41,35) = 0.4890
α(41,36) = -0.0476	α(41,37) = 0.1397	α(41,38) = -0.0745	α(41,39) = -0.0030
α(41,41) = -2.6494	α(41,42) = 0.0746	α(41,43) = -0.4660	α(41,44) = 0.4890
α(42,6) = 0.0120	α(42,7) = -0.0041	α(42,8) = -0.0151	α(42,9) = -0.0003
α(42,10) = -0.0302	α(42,11) = 0.0480	α(42,13) = 0.0126	α(42,14) = 0.0335
α(42,16) = -0.4999	α(42,17) = 0.3272	α(42,18) = 0.1882	α(42,19) = 0.4033
α(42,20) = 0.6979	α(42,21) = -0.0159	α(42,22) = 0.0081	α(42,23) = 0.0045
α(42,24) = -0.0391	α(42,25) = 0.0715	α(42,26) = 0.0419	α(42,27) = -0.0159
α(42,28) = -0.0081	α(42,29) = 0.0045	α(42,30) = 0.5479	α(42,32) = 0.5890
α(42,33) = -0.0024	α(42,35) = -0.0057	α(42,36) = -0.0944	α(42,37) = -0.0128
α(42,38) = 0.0746	α(42,39) = -0.0944	α(42,40) = 0.0128	α(42,41) = 0.0746
α(42,42) = -2.1394	α(42,44) = -0.0030	α(43,6) = 0.0246	α(43,7) = 0.0176
α(43,8) = -0.0099	α(43,9) = 0.0266	α(43,10) = -0.0298	α(43,12) = -0.0107
α(43,15) = 0.0838	α(43,16) = 0.1689	α(43,17) = 0.8861	α(43,18) = 0.7557
α(43,19) = 0.1212	α(43,20) = 0.7308	α(43,21) = 0.0081	α(43,22) = -0.0233
α(43,23) = -0.0122	α(43,24) = 0.0715	α(43,25) = 0.0177	α(43,26) = 0.0616
α(43,27) = -0.0081	α(43,28) = -0.0233	α(43,29) = 0.0122	α(43,31) = -0.3864
α(43,34) = -0.0115	α(43,36) = -0.0691	α(43,37) = 0.1133	α(43,38) = 0.4660
α(43,39) = 0.0691	α(43,40) = 0.1133	α(43,41) = -0.4660	α(43,43) = -2.6493
α(44,6) = 0.0112	α(44,7) = 0.0332	α(44,8) = 0.0167	α(44,9) = 0.0370
α(44,10) = -0.0038	α(44,11) = 0.0371	α(44,13) = 0.0166	α(44,14) = 0.0184
α(44,16) = 0.0981	α(44,17) = 0.7546	α(44,18) = 0.0126	α(44,19) = 0.5890
α(44,20) = 0.1219	α(44,21) = 0.0045	α(44,22) = -0.0122	α(44,23) = 0.0023

α(44,24) = 0.0419	α(44,25) = 0.0616	α(44,26) = -0.0513	α(44,27) = 0.0045
α(44,28) = 0.0122	α(44,29) = 0.0023	α(44,30) = 0.5890	α(44,32) = 0.4612
α(44,33) = 0.0083	α(44,35) = 0.0013	α(44,36) = -0.0246	α(44,37) = 0.1853
α(44,38) = 0.4890	α(44,39) = -0.0246	α(44,40) = -0.1853	α(44,41) = 0.4890
α(44,42) = -0.0030	α(44,44) = -2.6494		

β(1,1) = -0.0066	β(1,2) = 0.0025	β(1,3) = 0.0015	β(1,4) = 0.0032
β(1,5) = 0.0056	β(1,6) = -0.0020	β(1,7) = -0.0003	β(1,8) = 0.0001
β(1,9) = -0.0024	β(1,10) = 0.0040	β(2,1) = 0.0025	β(2,2) = 0.0016
β(2,3) = -0.0010	β(2,5) = -0.0035	β(2,6) = -0.0003	β(2,7) = -0.0020
β(2,8) = 0.0081	β(2,9) = 0.0048	β(2,10) = 0.0030	β(3,1) = 0.0015
β(3,2) = -0.0010	β(3,3) = 0.0027	β(3,4) = -0.0035	β(3,6) = 0.0001
β(3,7) = 0.0081	β(3,8) = 0.0074	β(3,9) = 0.0085	β(3,10) = 0.0048
β(4,1) = 0.0032	β(4,3) = -0.0035	β(4,4) = 0.0082	β(4,5) = -0.0076
β(4,6) = -0.0024	β(4,7) = 0.0048	β(4,8) = 0.0085	β(4,9) = 0.0053
β(4,10) = 0.0086	β(5,1) = 0.0056	β(5,2) = -0.0035	β(5,4) = -0.0076
β(5,5) = -0.0007	β(5,6) = 0.0040	β(5,7) = 0.0030	β(5,8) = 0.0048
β(5,9) = 0.0086	β(5,10) = -0.0045	β(6,1) = -0.0020	β(6,3) = -0.0003
β(6,4) = 0.0046	β(6,6) = -0.0066	β(6,7) = 0.0025	β(6,8) = 0.0015
β(6,9) = 0.0032	β(6,10) = 0.0056	β(7,2) = 0.0121	β(7,5) = 0.0113
β(7,6) = 0.0025	β(7,7) = 0.0016	β(7,8) = -0.0010	β(7,10) = -0.0035
β(8,1) = -0.0003	β(8,3) = -0.0066	β(8,4) = 0.0002	β(8,6) = 0.0015
β(8,7) = -0.0010	β(8,8) = 0.0027	β(8,9) = -0.0035	β(9,1) = 0.0046
β(9,3) = 0.0002	β(9,4) = -0.0095	β(9,6) = 0.0032	β(9,8) = -0.0035
β(9,9) = 0.0082	β(9,10) = -0.0076	β(10,2) = 0.0113	β(10,5) = 0.0103
β(10,6) = 0.0056	β(10,7) = -0.0035	β(10,9) = -0.0076	β(10,10) = -0.0007
β(11,1) = -0.0160	β(11,3) = -0.0687	β(11,4) = 0.0534	β(11,6) = -0.0158
β(11,7) = -0.0599	β(11,8) = 0.0339	β(11,9) = -0.0276	β(11,10) = 0.0467
β(11,11) = -0.0066	β(11,12) = 0.0025	β(11,13) = 0.0015	β(11,14) = 0.0032
β(11,15) = 0.0056	β(11,16) = -0.0020	β(11,17) = -0.0003	β(11,18) = 0.0001
β(11,19) = -0.0024	β(11,20) = 0.0040	β(11,21) = -0.0477	β(11,22) = 0.0322

β(11,23) = 0.0188	β(11,24) = -0.0119	β(11,25) = -0.0023	β(11,26) = 0.0273
β(11,33) = 0.0120	β(11,34) = 0.0222	β(11,35) = 0.0156	β(11,36) = 0.0120
β(11,37) = 0.0246	β(11,38) = 0.0112	β(12,2) = -0.1220	β(12,5) = -0.1535
β(12,6) = -0.0599	β(12,7) = -0.0576	β(12,8) = -0.0377	β(12,9) = -0.1053
β(12,10) = 0.0294	β(12,11) = 0.0025	β(12,12) = 0.0016	β(12,13) = -0.0010
β(12,15) = -0.0035	β(12,16) = -0.0003	β(12,17) = -0.0020	β(12,18) = 0.0081
β(12,19) = 0.0048	β(12,20) = 0.0030	β(12,21) = 0.0102	β(12,22) = -0.0094
β(12,23) = -0.0116	β(12,24) = -0.0111	β(12,25) = -0.0067	β(12,26) = 0.0163
β(12,33) = -0.0152	β(12,34) = 0.0270	β(12,35) = -0.0151	β(12,36) = -0.0041
β(12,37) = 0.0176	β(12,38) = 0.0332	β(13,1) = -0.0687	β(13,3) = -0.0343
β(13,4) = 0.0885	β(13,6) = 0.0339	β(13,7) = -0.0377	β(13,8) = -0.1002
β(13,9) = -0.0914	β(13,10) = -0.1033	β(13,11) = 0.0015	β(13,12) = -0.0010
β(13,13) = 0.0027	β(13,14) = -0.0035	β(13,16) = 0.0001	β(13,17) = 0.0081
β(13,18) = 0.0074	β(13,19) = 0.0085	β(13,20) = 0.0048	β(13,21) = 0.0063
β(13,22) = -0.0116	β(13,23) = 0.0035	β(13,24) = -0.0112	β(13,25) = -0.0268
β(13,26) = -0.0271	β(13,33) = 0.0040	β(13,34) = 0.0274	β(13,35) = 0.0072
β(13,36) = -0.0151	β(13,37) = -0.0099	β(13,38) = 0.0167	β(14,1) = 0.0534
β(14,3) = 0.0885	β(14,4) = -0.0394	β(14,6) = -0.0276	β(14,7) = -0.1053
β(14,8) = -0.0914	β(14,9) = -0.0548	β(14,10) = -0.0079	β(14,11) = 0.0032
β(14,13) = -0.0035	β(14,14) = 0.0082	β(14,15) = -0.0076	β(14,16) = -0.0024
β(14,17) = 0.0048	β(14,18) = 0.0085	β(14,19) = 0.0053	β(14,20) = 0.0086
β(14,21) = 0.0158	β(14,22) = 0.0291	β(14,23) = -0.0673	β(14,24) = -0.0264
β(14,25) = -0.0189	β(14,26) = 0.0042	β(14,33) = -0.0258	β(14,34) = -0.0381
β(14,35) = -0.0226	β(14,36) = -0.0003	β(14,37) = 0.0266	β(14,38) = 0.0370
β(15,2) = -0.1535	β(15,5) = -0.0607	β(15,6) = 0.0467	β(15,7) = 0.0294
β(15,8) = -0.1033	β(15,9) = -0.0079	β(15,10) = -0.0442	β(15,11) = 0.0056
β(15,12) = -0.0035	β(15,14) = -0.0076	β(15,15) = -0.0007	β(15,16) = 0.0040
β(15,17) = 0.0030	β(15,18) = 0.0048	β(15,19) = 0.0086	β(15,20) = -0.0045
β(15,21) = 0.0285	β(15,22) = -0.0346	β(15,23) = 0.0291	β(15,24) = 0.0146
β(15,25) = -0.0106	β(15,26) = -0.0499	β(15,33) = -0.0155	β(15,34) = 0.0294
β(15,35) = -0.0079	β(15,36) = -0.0302	β(15,37) = -0.0298	β(15,38) = -0.0038
β(16,1) = -0.0066	β(16,2) = -0.0025	β(16,3) = 0.0015	β(16,4) = 0.0032

$\beta(16,5) = -0.0056$	$\beta(16,6) = -0.0160$	$\beta(16,8) = -0.0687$	$\beta(16,9) = 0.0534$
$\beta(16,11) = -0.0020$	$\beta(16,13) = -0.0003$	$\beta(16,14) = 0.0046$	$\beta(16,16) = -0.0066$
$\beta(16,17) = 0.0025$	$\beta(16,18) = 0.0015$	$\beta(16,19) = 0.0032$	$\beta(16,20) = 0.0056$
$\beta(16,21) = -0.0120$	$\beta(16,22) = 0.0222$	$\beta(16,23) = -0.0156$	$\beta(16,24) = -0.0477$
$\beta(16,25) = 0.0322$	$\beta(16,26) = 0.0188$	$\beta(16,36) = 0.0120$	$\beta(16,37) = 0.0222$
$\beta(16,38) = 0.0156$	$\beta(17,1) = -0.0025$	$\beta(17,2) = 0.0016$	$\beta(17,3) = 0.0010$
$\beta(17,5) = -0.0035$	$\beta(17,7) = -0.1220$	$\beta(17,10) = -0.1535$	$\beta(17,12) = 0.0121$
$\beta(17,15) = 0.0113$	$\beta(17,16) = 0.0025$	$\beta(17,17) = 0.0016$	$\beta(17,18) = -0.0010$
$\beta(17,20) = -0.0035$	$\beta(17,21) = -0.0152$	$\beta(17,22) = -0.0270$	$\beta(17,23) = -0.0151$
$\beta(17,24) = 0.0102$	$\beta(17,25) = -0.0094$	$\beta(17,26) = -0.0116$	$\beta(17,36) = -0.0152$
$\beta(17,37) = 0.0270$	$\beta(17,38) = -0.0151$	$\beta(18,1) = 0.0015$	$\beta(18,2) = 0.0010$
$\beta(18,3) = 0.0027$	$\beta(18,4) = -0.0035$	$\beta(18,6) = -0.0687$	$\beta(18,8) = -0.0343$
$\beta(18,9) = 0.0885$	$\beta(18,11) = -0.0003$	$\beta(18,13) = -0.0066$	$\beta(18,14) = 0.0002$
$\beta(18,16) = 0.0015$	$\beta(18,17) = -0.0010$	$\beta(18,18) = 0.0027$	$\beta(18,19) = -0.0035$
$\beta(18,21) = -0.0040$	$\beta(18,22) = 0.0274$	$\beta(18,23) = -0.0072$	$\beta(18,24) = 0.0063$
$\beta(18,25) = -0.0116$	$\beta(18,26) = 0.0035$	$\beta(18,36) = 0.0040$	$\beta(18,37) = 0.0274$
$\beta(18,38) = 0.0072$	$\beta(19,1) = 0.0032$	$\beta(19,3) = -0.0035$	$\beta(19,4) = 0.0082$
$\beta(19,5) = 0.0076$	$\beta(19,6) = 0.0534$	$\beta(19,8) = 0.0885$	$\beta(19,9) = -0.0394$
$\beta(19,11) = 0.0046$	$\beta(19,13) = 0.0002$	$\beta(19,14) = -0.0095$	$\beta(19,16) = 0.0032$
$\beta(19,18) = -0.0035$	$\beta(19,19) = 0.0082$	$\beta(19,20) = -0.0076$	$\beta(19,21) = 0.0258$
$\beta(19,22) = -0.0381$	$\beta(19,23) = 0.0226$	$\beta(19,24) = 0.0158$	$\beta(19,25) = 0.0291$
$\beta(19,26) = -0.0673$	$\beta(19,36) = -0.0258$	$\beta(19,37) = -0.0381$	$\beta(19,38) = -0.0226$
$\beta(20,1) = -0.0056$	$\beta(20,2) = -0.0035$	$\beta(20,4) = 0.0076$	$\beta(20,5) = -0.0007$
$\beta(20,7) = -0.1535$	$\beta(20,10) = -0.0607$	$\beta(20,12) = 0.0113$	$\beta(20,15) = 0.0103$
$\beta(20,16) = 0.0056$	$\beta(20,17) = -0.0035$	$\beta(20,19) = -0.0076$	$\beta(20,20) = -0.0007$
$\beta(20,21) = -0.0155$	$\beta(20,22) = -0.0294$	$\beta(20,23) = -0.0079$	$\beta(20,24) = 0.0285$
$\beta(20,25) = -0.0346$	$\beta(20,26) = 0.0291$	$\beta(20,36) = -0.0155$	$\beta(20,37) = 0.0294$
$\beta(20,38) = -0.0079$	$\beta(21,1) = -0.0120$	$\beta(21,2) = 0.0152$	$\beta(21,3) = -0.0040$
$\beta(21,4) = 0.0258$	$\beta(21,5) = 0.0155$	$\beta(21,6) = -0.0120$	$\beta(21,7) = 0.0041$
$\beta(21,8) = 0.0151$	$\beta(21,9) = 0.0003$	$\beta(21,10) = 0.0302$	$\beta(21,21) = -0.0024$
$\beta(21,22) = -0.0073$	$\beta(21,23) = -0.0042$	$\beta(21,24) = -0.0020$	$\beta(21,25) = 0.0068$
$\beta(21,26) = 0.0037$	$\beta(22,1) = -0.0222$	$\beta(22,2) = -0.0270$	$\beta(22,3) = -0.0274$

$\beta(22,4) = 0.0381$	$\beta(22,5) = -0.0294$	$\beta(22,6) = -0.0246$	$\beta(22,7) = -0.0176$
$\beta(22,8) = 0.0099$	$\beta(22,9) = -0.0266$	$\beta(22,10) = 0.0298$	$\beta(22,21) = 0.0050$
$\beta(22,22) = -0.0019$	$\beta(22,23) = 0.0054$	$\beta(22,24) = 0.0003$	$\beta(22,25) = 0.0104$
$\beta(22,26) = 0.0379$	$\beta(23,1) = -0.0156$	$\beta(23,2) = 0.0151$	$\beta(23,3) = -0.0072$
$\beta(23,4) = 0.0226$	$\beta(23,5) = 0.0079$	$\beta(23,6) = -0.0112$	$\beta(23,7) = -0.0332$
$\beta(23,8) = -0.0167$	$\beta(23,9) = -0.0370$	$\beta(23,10) = 0.0038$	$\beta(23,21) = 0.0029$
$\beta(23,22) = 0.0055$	$\beta(23,23) = -0.0083$	$\beta(23,24) = -0.0077$	$\beta(23,25) = 0.0218$
$\beta(23,26) = 0.0448$	$\beta(24,6) = -0.0120$	$\beta(24,7) = 0.0152$	$\beta(24,8) = -0.0040$
$\beta(24,9) = 0.0258$	$\beta(24,10) = 0.0155$	$\beta(24,21) = -0.0020$	$\beta(24,22) = 0.0066$
$\beta(24,23) = 0.0041$	$\beta(24,24) = -0.0024$	$\beta(24,25) = -0.0073$	$\beta(24,26) = -0.0042$
$\beta(25,6) = -0.0222$	$\beta(25,7) = -0.0270$	$\beta(25,8) = -0.0274$	$\beta(25,9) = 0.0381$
$\beta(25,10) = -0.0294$	$\beta(25,21) = -0.0066$	$\beta(25,22) = 0.0620$	$\beta(25,23) = -0.0080$
$\beta(25,24) = 0.0050$	$\beta(25,25) = -0.0019$	$\beta(25,26) = 0.0054$	$\beta(26,6) = -0.0156$
$\beta(26,7) = 0.0151$	$\beta(26,8) = -0.0072$	$\beta(26,9) = 0.0226$	$\beta(26,10) = 0.0079$
$\beta(26,21) = 0.0041$	$\beta(26,22) = 0.0080$	$\beta(26,23) = -0.0068$	$\beta(26,24) = 0.0029$
$\beta(26,25) = 0.0055$	$\beta(26,26) = -0.0083$	$\beta(27,1) = 0.4999$	$\beta(27,2) = -0.3272$
$\beta(27,3) = -0.1882$	$\beta(27,4) = -0.4033$	$\beta(27,5) = -0.6979$	$\beta(27,6) = -0.0480$
$\beta(27,8) = -0.0126$	$\beta(27,9) = -0.0335$	$\beta(27,11) = -0.0120$	$\beta(27,12) = 0.0041$
$\beta(27,13) = 0.0151$	$\beta(27,14) = 0.0003$	$\beta(27,15) = 0.0302$	$\beta(27,21) = -0.0944$
$\beta(27,22) = -0.0128$	$\beta(27,23) = 0.0746$	$\beta(27,24) = -0.0024$	$\beta(27,26) = -0.0057$
$\beta(27,27) = -0.0024$	$\beta(27,28) = -0.0073$	$\beta(27,29) = -0.0042$	$\beta(27,30) = -0.0020$
$\beta(27,31) = 0.0068$	$\beta(27,32) = 0.0037$	$\beta(27,33) = -0.0391$	$\beta(27,34) = 0.0715$
$\beta(27,35) = 0.0419$	$\beta(27,36) = -0.0159$	$\beta(27,37) = 0.0081$	$\beta(27,38) = 0.0045$
$\beta(28,1) = -0.1689$	$\beta(28,2) = -0.8861$	$\beta(28,3) = -0.7557$	$\beta(28,4) = -0.1212$
$\beta(28,5) = -0.7308$	$\beta(28,7) = 0.0107$	$\beta(28,10) = -0.0838$	$\beta(28,11) = -0.0246$
$\beta(28,12) = -0.0176$	$\beta(28,13) = 0.0099$	$\beta(28,14) = -0.0266$	$\beta(28,15) = 0.0298$
$\beta(28,21) = -0.0691$	$\beta(28,22) = 0.1133$	$\beta(28,23) = 0.4660$	$\beta(28,25) = -0.0115$
$\beta(28,27) = 0.0050$	$\beta(28,28) = -0.0019$	$\beta(28,29) = 0.0054$	$\beta(28,30) = 0.0003$
$\beta(28,31) = 0.0104$	$\beta(28,32) = 0.0379$	$\beta(28,33) = 0.0715$	$\beta(28,34) = 0.0177$
$\beta(28,35) = 0.0616$	$\beta(28,36) = 0.0081$	$\beta(28,37) = -0.0233$	$\beta(28,38) = -0.0122$
$\beta(29,1) = -0.0981$	$\beta(29,2) = -0.7546$	$\beta(29,3) = -0.0126$	$\beta(29,4) = -0.5890$
$\beta(29,5) = -0.1219$	$\beta(29,6) = -0.0371$	$\beta(29,8) = -0.0166$	$\beta(29,9) = -0.0184$

β(29,11) = -0.0112	β(29,12) = -0.0332	β(29,13) = -0.0167	β(29,14) = -0.0370
β(29,15) = 0.0038	β(29,21) = -0.0246	β(29,22) = 0.1853	β(29,23) = 0.4890
β(29,24) = 0.0083	β(29,26) = 0.0013	β(29,27) = 0.0029	β(29,28) = 0.0055
β(29,29) = -0.0083	β(29,30) = -0.0077	β(29,31) = 0.0218	β(29,32) = 0.0448
β(29,33) = 0.0419	β(29,34) = 0.0616	β(29,35) = -0.0513	β(29,36) = 0.0045
β(29,37) = -0.0122	β(29,38) = 0.0023	β(30,1) = -0.0477	β(30,2) = -0.0102
β(30,3) = 0.0063	β(30,4) = 0.0158	β(30,5) = -0.0285	β(30,6) = 0.4999
β(30,7) = -0.3272	β(30,8) = -0.1882	β(30,9) = -0.4033	β(30,10) = -0.6979
β(30,11) = -0.0120	β(30,12) = 0.0152	β(30,13) = -0.0040	β(30,14) = 0.0258
β(30,15) = 0.0155	β(30,16) = -0.0120	β(30,17) = 0.0041	β(30,18) = 0.0151
β(30,19) = 0.0003	β(30,20) = 0.0302	β(30,21) = -0.0946	β(30,22) = 0.0577
β(30,23) = -0.0476	β(30,24) = -0.0944	β(30,25) = -0.0128	β(30,26) = 0.0746
β(30,27) = -0.0020	β(30,28) = 0.0066	β(30,29) = 0.0041	β(30,30) = -0.0024
β(30,31) = -0.0073	β(30,32) = -0.0042	β(30,33) = -0.0158	β(30,34) = 0.0080
β(30,35) = 0.0048	β(30,36) = -0.0391	β(30,37) = 0.0715	β(30,38) = 0.0419
β(31,1) = -0.0322	β(31,2) = -0.0094	β(31,3) = 0.0116	β(31,4) = -0.0291
β(31,5) = -0.0346	β(31,6) = -0.1689	β(31,7) = -0.8861	β(31,8) = -0.7557
β(31,9) = -0.1212	β(31,10) = -0.7308	β(31,11) = -0.0222	β(31,12) = -0.0270
β(31,13) = -0.0274	β(31,14) = 0.0381	β(31,15) = -0.0294	β(31,16) = -0.0246
β(31,17) = -0.0176	β(31,18) = 0.0099	β(31,19) = -0.0266	β(31,20) = 0.0298
β(31,21) = -0.0577	β(31,22) = 0.6769	β(31,23) = -0.1397	β(31,24) = -0.0691
β(31,25) = 0.1133	β(31,26) = 0.4660	β(31,27) = -0.0066	β(31,28) = 0.0620
β(31,29) = -0.0080	β(31,30) = 0.0050	β(31,31) = -0.0019	β(31,32) = 0.0054
β(31,33) = 0.0080	β(31,34) = -0.0146	β(31,35) = -0.0171	β(31,36) = 0.0715
β(31,37) = 0.0177	β(31,38) = 0.0616	β(32,1) = 0.0188	β(32,2) = 0.0116
β(32,3) = 0.0035	β(32,4) = -0.0673	β(32,5) = -0.0291	β(32,6) = -0.0981
β(32,7) = -0.7546	β(32,8) = -0.0126	β(32,9) = -0.5890	β(32,10) = -0.1219
β(32,11) = -0.0156	β(32,12) = 0.0151	β(32,13) = -0.0072	β(32,14) = 0.0226
β(32,15) = 0.0079	β(32,16) = -0.0112	β(32,17) = -0.0332	β(32,18) = -0.0167
β(32,19) = -0.0370	β(32,20) = 0.0038	β(32,21) = -0.0476	β(32,22) = 0.1397
β(32,23) = -0.0745	β(32,24) = -0.0246	β(32,25) = 0.1853	β(32,26) = 0.4890
β(32,27) = 0.0041	β(32,28) = 0.0080	β(32,29) = -0.0068	β(32,30) = 0.0029

β(32,31) = 0.0055	β(32,32) = -0.0083	β(32,33) = 0.0048	β(32,34) = -0.0171
β(32,35) = -0.0062	β(32,36) = 0.0419	β(32,37) = 0.0616	β(32,38) = -0.0513
β(33,1) = 0.0477	β(33,2) = -0.0102	β(33,3) = -0.0063	β(33,4) = -0.0158
β(33,5) = -0.0285	β(33,6) = 0.0119	β(33,7) = 0.0111	β(33,8) = 0.0112
β(33,9) = 0.0264	β(33,10) = -0.0146	β(33,21) = -0.0159	β(33,22) = 0.0002
β(33,23) = -0.0094	β(33,33) = -0.0024	β(33,34) = 0.0050	β(33,35) = 0.0029
β(33,36) = -0.0020	β(33,37) = 0.0003	β(33,38) = -0.0077	β(34,1) = -0.0322
β(34,2) = 0.0094	β(34,3) = 0.0116	β(34,4) = -0.0291	β(34,5) = 0.0346
β(34,6) = 0.0023	β(34,7) = 0.0067	β(34,8) = 0.0268	β(34,9) = 0.0189
β(34,10) = 0.0106	β(34,21) = 0.0002	β(34,22) = 0.0065	β(34,23) = 0.0049
β(34,33) = -0.0073	β(34,34) = -0.0019	β(34,35) = 0.0055	β(34,36) = 0.0068
β(34,37) = 0.0104	β(34,38) = 0.0218	β(35,1) = -0.0188	β(35,2) = 0.0116
β(35,3) = -0.0035	β(35,4) = 0.0673	β(35,5) = -0.0291	β(35,6) = -0.0273
β(35,7) = -0.0163	β(35,8) = 0.0271	β(35,9) = -0.0042	β(35,10) = 0.0499
β(35,21) = -0.0094	β(35,22) = 0.0049	β(35,23) = -0.0274	β(35,33) = -0.0042
β(35,34) = 0.0054	β(35,35) = -0.0083	β(35,36) = 0.0037	β(35,37) = 0.0379
β(35,38) = 0.0448	β(36,1) = 0.0120	β(36,2) = 0.0152	β(36,3) = 0.0040
β(36,4) = -0.0258	β(36,5) = 0.0155	β(36,6) = 0.0477	β(36,7) = -0.0102
β(36,8) = -0.0063	β(36,9) = -0.0158	β(36,10) = -0.0285	β(36,21) = -0.0158
β(36,22) = -0.0080	β(36,23) = 0.0048	β(36,24) = -0.0159	β(36,25) = 0.0002
β(36,26) = -0.0094	β(36,33) = -0.0020	β(36,34) = -0.0066	β(36,35) = 0.0041
β(36,36) = -0.0024	β(36,37) = 0.0050	β(36,38) = 0.0029	β(37,1) = -0.0222
β(37,2) = 0.0270	β(37,3) = -0.0274	β(37,4) = 0.0381	β(37,5) = 0.0294
β(37,6) = -0.0322	β(37,7) = 0.0094	β(37,8) = 0.0116	β(37,9) = -0.0291
β(37,10) = 0.0346	β(37,21) = -0.0080	β(37,22) = -0.0146	β(37,23) = 0.0171
β(37,24) = 0.0002	β(37,25) = 0.0065	β(37,26) = 0.0049	β(37,33) = 0.0066
β(37,34) = 0.0620	β(37,35) = 0.0080	β(37,36) = -0.0073	β(37,37) = -0.0019
β(37,38) = 0.0055	β(38,1) = 0.0156	β(38,2) = 0.0151	β(38,3) = 0.0072
β(38,4) = -0.0226	β(38,5) = 0.0079	β(38,6) = -0.0188	β(38,7) = 0.0116
β(38,8) = -0.0035	β(38,9) = 0.0673	β(38,10) = -0.0291	β(38,21) = 0.0048
β(38,22) = 0.0171	β(38,23) = -0.0062	β(38,24) = -0.0094	β(38,25) = 0.0049
β(38,26) = -0.0274	β(38,33) = 0.0041	β(38,34) = -0.0080	β(38,35) = -0.0068

β(38,36) = -0.0042	β(38,37) = 0.0054	β(38,38) = -0.0083	β(39,1) = -0.4999
β(39,2) = -0.3272	β(39,3) = 0.1882	β(39,4) = 0.4033	β(39,5) = -0.6979
β(39,6) = -0.5004	β(39,8) = -0.3737	β(39,9) = -0.8049	β(39,11) = 0.0477
β(39,12) = -0.0102	β(39,13) = -0.0063	β(39,14) = -0.0158	β(39,15) = -0.0285
β(39,16) = 0.0119	β(39,17) = 0.0111	β(39,18) = 0.0112	β(39,19) = 0.0264
β(39,20) = -0.0146	β(39,21) = 0.5451	β(39,22) = -0.5100	β(39,23) = -0.2962
β(39,24) = -0.0393	β(39,26) = -0.0817	β(39,27) = -0.0158	β(39,28) = -0.0080
β(39,29) = 0.0048	β(39,30) = -0.0159	β(39,31) = 0.0002	β(39,32) = -0.0094
β(39,33) = -0.0946	β(39,34) = -0.0577	β(39,35) = -0.0476	β(39,36) = -0.0944
β(39,37) = -0.0691	β(39,38) = -0.0246	β(39,39) = -0.0024	β(39,40) = 0.0050
β(39,41) = 0.0029	β(39,42) = -0.0020	β(39,43) = 0.0003	β(39,44) = -0.0077
β(40,1) = -0.1689	β(40,2) = 0.8861	β(40,3) = -0.7557	β(40,4) = -0.1212
β(40,5) = 0.7308	β(40,7) = -0.4231	β(40,10) = 0.5209	β(40,11) = -0.0322
β(40,12) = 0.0094	β(40,13) = 0.0116	β(40,14) = -0.0291	β(40,15) = 0.0346
β(40,16) = 0.0023	β(40,17) = 0.0067	β(40,18) = 0.0268	β(40,19) = 0.0189
β(40,20) = 0.0106	β(40,21) = -0.5100	β(40,22) = 0.2504	β(40,23) = 0.3690
β(40,25) = -0.0857	β(40,27) = -0.0080	β(40,28) = -0.0146	β(40,29) = 0.0171
β(40,30) = 0.0002	β(40,31) = 0.0065	β(40,32) = 0.0049	β(40,33) = 0.0577
β(40,34) = 0.6769	β(40,35) = 0.1397	β(40,36) = -0.0128	β(40,37) = 0.1133
β(40,38) = 0.1853	β(40,39) = -0.0073	β(40,40) = -0.0019	β(40,41) = 0.0055
β(40,42) = 0.0068	β(40,43) = 0.0104	β(40,44) = 0.0218	β(41,1) = 0.0981
β(41,2) = -0.7546	β(41,3) = 0.0126	β(41,4) = 0.5890	β(41,5) = -0.1219
β(41,6) = -0.1951	β(41,8) = 1.3227	β(41,9) = 0.8045	β(41,11) = -0.0188
β(41,12) = 0.0116	β(41,13) = -0.0035	β(41,14) = 0.0673	β(41,15) = -0.0291
β(41,16) = -0.0273	β(41,17) = -0.0163	β(41,18) = 0.0271	β(41,19) = -0.0042
β(41,20) = 0.0499	β(41,21) = -0.2962	β(41,22) = 0.3690	β(41,23) = -0.1736
β(41,24) = -0.0817	β(41,26) = 0.0523	β(41,27) = 0.0048	β(41,28) = 0.0171
β(41,29) = -0.0062	β(41,30) = -0.0094	β(41,31) = 0.0049	β(41,32) = -0.0274
β(41,33) = -0.0476	β(41,34) = -0.1397	β(41,35) = -0.0745	β(41,36) = 0.0746
β(41,37) = 0.4660	β(41,38) = 0.4890	β(41,39) = -0.0042	β(41,40) = 0.0054
β(41,41) = -0.0083	β(41,42) = 0.0037	β(41,43) = 0.0379	β(41,44) = 0.0448
β(42,1) = 0.0120	β(42,2) = 0.0041	β(42,3) = -0.0151	β(42,4) = -0.0003

$\beta(42,5) = 0.0302$	$\beta(42,6) = -0.4999$	$\beta(42,7) = -0.3272$	$\beta(42,8) = 0.1882$
$\beta(42,9) = 0.4033$	$\beta(42,10) = -0.6979$	$\beta(42,11) = 0.0120$	$\beta(42,12) = 0.0152$
$\beta(42,13) = 0.0040$	$\beta(42,14) = -0.0258$	$\beta(42,15) = 0.0155$	$\beta(42,16) = 0.0477$
$\beta(42,17) = -0.0102$	$\beta(42,18) = -0.0063$	$\beta(42,19) = -0.0158$	$\beta(42,20) = -0.0285$
$\beta(42,21) = -0.0391$	$\beta(42,22) = -0.0715$	$\beta(42,23) = 0.0419$	$\beta(42,24) = 0.5451$
$\beta(42,25) = -0.5100$	$\beta(42,26) = -0.2962$	$\beta(42,30) = -0.0158$	$\beta(42,31) = -0.0080$
$\beta(42,32) = 0.0048$	$\beta(42,33) = -0.0024$	$\beta(42,34) = 0.0073$	$\beta(42,35) = -0.0042$
$\beta(42,36) = -0.0946$	$\beta(42,37) = -0.0577$	$\beta(42,38) = -0.0476$	$\beta(42,39) = -0.0020$
$\beta(42,40) = -0.0066$	$\beta(42,41) = 0.0041$	$\beta(42,42) = -0.0024$	$\beta(42,43) = 0.0050$
$\beta(42,44) = 0.0029$	$\beta(43,1) = -0.0246$	$\beta(43,2) = 0.0176$	$\beta(43,3) = 0.0099$
$\beta(43,4) = -0.0266$	$\beta(43,5) = -0.0298$	$\beta(43,6) = -0.1689$	$\beta(43,7) = 0.8861$
$\beta(43,8) = -0.7557$	$\beta(43,9) = -0.1212$	$\beta(43,10) = 0.7308$	$\beta(43,11) = -0.0222$
$\beta(43,12) = 0.0270$	$\beta(43,13) = -0.0274$	$\beta(43,14) = 0.0381$	$\beta(43,15) = 0.0294$
$\beta(43,16) = -0.0322$	$\beta(43,17) = 0.0094$	$\beta(43,18) = 0.0116$	$\beta(43,19) = -0.0291$
$\beta(43,20) = 0.0346$	$\beta(43,21) = -0.0715$	$\beta(43,22) = 0.0177$	$\beta(43,23) = -0.0616$
$\beta(43,24) = -0.5100$	$\beta(43,25) = 0.2504$	$\beta(43,26) = 0.3690$	$\beta(43,30) = -0.0080$
$\beta(43,31) = -0.0146$	$\beta(43,32) = 0.0171$	$\beta(43,33) = -0.0050$	$\beta(43,34) = -0.0019$
$\beta(43,35) = -0.0054$	$\beta(43,36) = 0.0577$	$\beta(43,37) = 0.6769$	$\beta(43,38) = 0.1397$
$\beta(43,39) = 0.0066$	$\beta(43,40) = 0.0620$	$\beta(43,41) = 0.0080$	$\beta(43,42) = -0.0073$
$\beta(43,43) = -0.0019$	$\beta(43,44) = 0.0055$	$\beta(44,1) = 0.0112$	$\beta(44,2) = -0.0332$
$\beta(44,3) = 0.0167$	$\beta(44,4) = 0.0370$	$\beta(44,5) = 0.0038$	$\beta(44,6) = 0.0981$
$\beta(44,7) = -0.7546$	$\beta(44,8) = 0.0126$	$\beta(44,9) = 0.5890$	$\beta(44,10) = -0.1219$
$\beta(44,11) = 0.0156$	$\beta(44,12) = 0.0151$	$\beta(44,13) = 0.0072$	$\beta(44,14) = -0.0226$
$\beta(44,15) = 0.0079$	$\beta(44,16) = -0.0188$	$\beta(44,17) = 0.0116$	$\beta(44,18) = -0.0035$
$\beta(44,19) = 0.0673$	$\beta(44,20) = -0.0291$	$\beta(44,21) = 0.0419$	$\beta(44,22) = -0.0616$
$\beta(44,23) = -0.0513$	$\beta(44,24) = -0.2962$	$\beta(44,25) = 0.3690$	$\beta(44,26) = -0.1736$
$\beta(44,30) = 0.0048$	$\beta(44,31) = 0.0171$	$\beta(44,32) = -0.0062$	$\beta(44,33) = 0.0029$
$\beta(44,34) = -0.0055$	$\beta(44,35) = -0.0083$	$\beta(44,36) = -0.0476$	$\beta(44,37) = -0.1397$
$\beta(44,38) = -0.0745$	$\beta(44,39) = 0.0041$	$\beta(44,40) = -0.0080$	$\beta(44,41) = -0.0068$
$\beta(44,42) = -0.0042$	$\beta(44,43) = 0.0054$	$\beta(44,44) = -0.0083$	

$\gamma(1,1) = -0.0020$	$\gamma(1,2) = 0.0003$	$\gamma(1,3) = 0.0001$	$\gamma(1,4) = -0.0024$
$\gamma(1,5) = -0.0040$	$\gamma(2,1) = 0.0003$	$\gamma(2,2) = -0.0020$	$\gamma(2,3) = -0.0081$
$\gamma(2,4) = -0.0048$	$\gamma(2,5) = 0.0030$	$\gamma(3,1) = 0.0001$	$\gamma(3,2) = -0.0081$
$\gamma(3,3) = 0.0074$	$\gamma(3,4) = 0.0085$	$\gamma(3,5) = -0.0048$	$\gamma(4,1) = -0.0024$
$\gamma(4,2) = -0.0048$	$\gamma(4,3) = 0.0085$	$\gamma(4,4) = 0.0053$	$\gamma(4,5) = -0.0086$
$\gamma(5,1) = -0.0040$	$\gamma(5,2) = 0.0030$	$\gamma(5,3) = -0.0048$	$\gamma(5,4) = -0.0086$
$\gamma(5,5) = -0.0045$	$\gamma(6,1) = -0.0158$	$\gamma(6,2) = 0.0599$	$\gamma(6,3) = 0.0339$
$\gamma(6,4) = -0.0276$	$\gamma(6,5) = -0.0467$	$\gamma(6,6) = -0.0020$	$\gamma(6,7) = 0.0003$
$\gamma(6,8) = 0.0001$	$\gamma(6,9) = -0.0024$	$\gamma(6,10) = -0.0040$	$\gamma(6,11) = -0.0066$
$\gamma(6,13) = -0.0030$	$\gamma(6,14) = -0.0066$	$\gamma(6,21) = -0.0119$	$\gamma(6,22) = 0.0023$
$\gamma(6,23) = 0.0273$	$\gamma(6,27) = -0.0119$	$\gamma(6,28) = -0.0023$	$\gamma(6,29) = 0.0273$
$\gamma(6,33) = 0.0480$	$\gamma(6,35) = 0.0371$	$\gamma(7,1) = 0.0599$	$\gamma(7,2) = -0.0576$
$\gamma(7,3) = 0.0377$	$\gamma(7,4) = 0.1053$	$\gamma(7,5) = 0.0294$	$\gamma(7,6) = 0.0003$
$\gamma(7,7) = -0.0020$	$\gamma(7,8) = -0.0081$	$\gamma(7,9) = -0.0048$	$\gamma(7,10) = 0.0030$
$\gamma(7,12) = 0.0033$	$\gamma(7,15) = -0.0034$	$\gamma(7,21) = 0.0111$	$\gamma(7,22) = -0.0067$
$\gamma(7,23) = -0.0163$	$\gamma(7,27) = -0.0111$	$\gamma(7,28) = -0.0067$	$\gamma(7,29) = 0.0163$
$\gamma(7,34) = -0.0107$	$\gamma(8,1) = 0.0339$	$\gamma(8,2) = 0.0377$	$\gamma(8,3) = -0.1002$
$\gamma(8,4) = -0.0914$	$\gamma(8,5) = 0.1033$	$\gamma(8,6) = 0.0001$	$\gamma(8,7) = -0.0081$
$\gamma(8,8) = 0.0074$	$\gamma(8,9) = 0.0085$	$\gamma(8,10) = -0.0048$	$\gamma(8,11) = -0.0030$
$\gamma(8,13) = 0.0010$	$\gamma(8,14) = -0.0036$	$\gamma(8,21) = -0.0112$	$\gamma(8,22) = 0.0268$
$\gamma(8,23) = -0.0271$	$\gamma(8,27) = -0.0112$	$\gamma(8,28) = -0.0268$	$\gamma(8,29) = -0.0271$
$\gamma(8,33) = 0.0126$	$\gamma(8,35) = 0.0166$	$\gamma(9,1) = -0.0276$	$\gamma(9,2) = 0.1053$
$\gamma(9,3) = -0.0914$	$\gamma(9,4) = -0.0548$	$\gamma(9,5) = 0.0079$	$\gamma(9,6) = -0.0024$
$\gamma(9,7) = -0.0048$	$\gamma(9,8) = 0.0085$	$\gamma(9,9) = 0.0053$	$\gamma(9,10) = -0.0086$
$\gamma(9,11) = -0.0066$	$\gamma(9,13) = -0.0036$	$\gamma(9,14) = -0.0052$	$\gamma(9,21) = -0.0264$
$\gamma(9,22) = 0.0189$	$\gamma(9,23) = 0.0042$	$\gamma(9,27) = -0.0264$	$\gamma(9,28) = -0.0189$
$\gamma(9,29) = 0.0042$	$\gamma(9,33) = 0.0335$	$\gamma(9,35) = 0.0184$	$\gamma(10,1) = -0.0467$
$\gamma(10,2) = 0.0294$	$\gamma(10,3) = 0.1033$	$\gamma(10,4) = 0.0079$	$\gamma(10,5) = -0.0442$
$\gamma(10,6) = -0.0040$	$\gamma(10,7) = 0.0030$	$\gamma(10,8) = -0.0048$	$\gamma(10,9) = -0.0086$
$\gamma(10,10) = -0.0045$	$\gamma(10,12) = -0.0034$	$\gamma(10,15) = 0.0125$	$\gamma(10,21) = -0.0146$
$\gamma(10,22) = -0.0106$	$\gamma(10,23) = 0.0499$	$\gamma(10,27) = 0.0146$	$\gamma(10,28) = -0.0106$
$\gamma(10,29) = -0.0499$	$\gamma(10,34) = 0.0838$	$\gamma(11,1) = -0.0066$	$\gamma(11,2) = -0.0025$

$\gamma(11,3) = 0.0015$	$\gamma(11,4) = 0.0032$	$\gamma(11,5) = -0.0056$	$\gamma(11,11) = -0.0020$
$\gamma(11,12) = 0.0003$	$\gamma(11,13) = 0.0001$	$\gamma(11,14) = -0.0024$	$\gamma(11,15) = -0.0040$
$\gamma(11,27) = -0.0119$	$\gamma(11,28) = 0.0023$	$\gamma(11,29) = 0.0273$	$\gamma(11,33) = 0.0120$
$\gamma(11,34) = -0.0246$	$\gamma(11,35) = 0.0112$	$\gamma(12,1) = -0.0025$	$\gamma(12,2) = 0.0016$
$\gamma(12,3) = 0.0010$	$\gamma(12,5) = -0.0035$	$\gamma(12,11) = 0.0003$	$\gamma(12,12) = -0.0020$
$\gamma(12,13) = -0.0081$	$\gamma(12,14) = -0.0048$	$\gamma(12,15) = 0.0030$	$\gamma(12,27) = 0.0111$
$\gamma(12,28) = -0.0067$	$\gamma(12,29) = -0.0163$	$\gamma(12,33) = 0.0041$	$\gamma(12,34) = 0.0176$
$\gamma(12,35) = -0.0332$	$\gamma(13,1) = 0.0015$	$\gamma(13,2) = 0.0010$	$\gamma(13,3) = 0.0027$
$\gamma(13,4) = -0.0035$	$\gamma(13,11) = 0.0001$	$\gamma(13,12) = -0.0081$	$\gamma(13,13) = 0.0074$
$\gamma(13,14) = 0.0085$	$\gamma(13,15) = -0.0048$	$\gamma(13,27) = -0.0112$	$\gamma(13,28) = 0.0268$
$\gamma(13,29) = -0.0271$	$\gamma(13,33) = -0.0151$	$\gamma(13,34) = 0.0099$	$\gamma(13,35) = 0.0167$
$\gamma(14,1) = 0.0032$	$\gamma(14,3) = -0.0035$	$\gamma(14,4) = 0.0082$	$\gamma(14,5) = 0.0076$
$\gamma(14,11) = -0.0024$	$\gamma(14,12) = -0.0048$	$\gamma(14,13) = 0.0085$	$\gamma(14,14) = 0.0053$
$\gamma(14,15) = -0.0086$	$\gamma(14,27) = -0.0264$	$\gamma(14,28) = 0.0189$	$\gamma(14,29) = 0.0042$
$\gamma(14,33) = -0.0003$	$\gamma(14,34) = -0.0266$	$\gamma(14,35) = 0.0370$	$\gamma(15,1) = -0.0056$
$\gamma(15,2) = -0.0035$	$\gamma(15,4) = 0.0076$	$\gamma(15,5) = -0.0007$	$\gamma(15,11) = -0.0040$
$\gamma(15,12) = 0.0030$	$\gamma(15,13) = -0.0048$	$\gamma(15,14) = -0.0086$	$\gamma(15,15) = -0.0045$
$\gamma(15,27) = -0.0146$	$\gamma(15,28) = -0.0106$	$\gamma(15,29) = 0.0499$	$\gamma(15,33) = 0.0302$
$\gamma(15,34) = -0.0298$	$\gamma(15,35) = 0.0038$	$\gamma(16,1) = -0.0160$	$\gamma(16,3) = -0.0687$
$\gamma(16,4) = 0.0534$	$\gamma(16,6) = -0.0066$	$\gamma(16,7) = -0.0025$	$\gamma(16,8) = 0.0015$
$\gamma(16,9) = 0.0032$	$\gamma(16,10) = -0.0056$	$\gamma(16,11) = -0.0158$	$\gamma(16,12) = 0.0599$
$\gamma(16,13) = 0.0339$	$\gamma(16,14) = -0.0276$	$\gamma(16,15) = -0.0467$	$\gamma(16,16) = -0.0020$
$\gamma(16,17) = 0.0003$	$\gamma(16,18) = 0.0001$	$\gamma(16,19) = -0.0024$	$\gamma(16,20) = -0.0040$
$\gamma(16,21) = -0.0477$	$\gamma(16,22) = -0.0322$	$\gamma(16,23) = 0.0188$	$\gamma(16,27) = 0.5004$
$\gamma(16,29) = 0.1951$	$\gamma(16,30) = -0.0119$	$\gamma(16,31) = 0.0023$	$\gamma(16,32) = 0.0273$
$\gamma(16,33) = -0.4999$	$\gamma(16,34) = -0.1689$	$\gamma(16,35) = 0.0981$	$\gamma(16,36) = 0.0120$
$\gamma(16,37) = -0.0246$	$\gamma(16,38) = 0.0112$	$\gamma(16,39) = 0.0480$	$\gamma(16,41) = 0.0371$
$\gamma(17,2) = -0.1220$	$\gamma(17,5) = -0.1535$	$\gamma(17,6) = -0.0025$	$\gamma(17,7) = 0.0016$
$\gamma(17,8) = 0.0010$	$\gamma(17,10) = -0.0035$	$\gamma(17,11) = 0.0599$	$\gamma(17,12) = -0.0576$
$\gamma(17,13) = 0.0377$	$\gamma(17,14) = 0.1053$	$\gamma(17,15) = 0.0294$	$\gamma(17,16) = 0.0003$
$\gamma(17,17) = -0.0020$	$\gamma(17,18) = -0.0081$	$\gamma(17,19) = -0.0048$	$\gamma(17,20) = 0.0030$
$\gamma(17,21) = -0.0102$	$\gamma(17,22) = -0.0094$	$\gamma(17,23) = 0.0116$	$\gamma(17,28) = 0.4231$

$\gamma(17,30) = 0.0111$	$\gamma(17,31) = -0.0067$	$\gamma(17,32) = -0.0163$	$\gamma(17,33) = -0.3272$
$\gamma(17,34) = 0.8861$	$\gamma(17,35) = -0.7546$	$\gamma(17,36) = 0.0041$	$\gamma(17,37) = 0.0176$
$\gamma(17,38) = -0.0332$	$\gamma(17,40) = -0.0107$	$\gamma(18,1) = -0.0687$	$\gamma(18,3) = -0.0343$
$\gamma(18,4) = 0.0885$	$\gamma(18,6) = 0.0015$	$\gamma(18,7) = 0.0010$	$\gamma(18,8) = 0.0027$
$\gamma(18,9) = -0.0035$	$\gamma(18,11) = 0.0339$	$\gamma(18,12) = 0.0377$	$\gamma(18,13) = -0.1002$
$\gamma(18,14) = -0.0914$	$\gamma(18,15) = 0.1033$	$\gamma(18,16) = 0.0001$	$\gamma(18,17) = -0.0081$
$\gamma(18,18) = 0.0074$	$\gamma(18,19) = 0.0085$	$\gamma(18,20) = -0.0048$	$\gamma(18,21) = 0.0063$
$\gamma(18,22) = 0.0116$	$\gamma(18,23) = 0.0035$	$\gamma(18,27) = 0.3737$	$\gamma(18,29) = -1.3227$
$\gamma(18,30) = -0.0112$	$\gamma(18,31) = 0.0268$	$\gamma(18,32) = -0.0271$	$\gamma(18,33) = 0.1882$
$\gamma(18,34) = -0.7557$	$\gamma(18,35) = 0.0126$	$\gamma(18,36) = -0.0151$	$\gamma(18,37) = 0.0099$
$\gamma(18,38) = 0.0167$	$\gamma(18,39) = 0.0126$	$\gamma(18,41) = 0.0166$	$\gamma(19,1) = 0.0534$
$\gamma(19,3) = 0.0885$	$\gamma(19,4) = -0.0394$	$\gamma(19,6) = 0.0032$	$\gamma(19,8) = -0.0035$
$\gamma(19,9) = 0.0082$	$\gamma(19,10) = 0.0076$	$\gamma(19,11) = -0.0276$	$\gamma(19,12) = 0.1053$
$\gamma(19,13) = -0.0914$	$\gamma(19,14) = -0.0548$	$\gamma(19,15) = 0.0079$	$\gamma(19,16) = -0.0024$
$\gamma(19,17) = -0.0048$	$\gamma(19,18) = 0.0085$	$\gamma(19,19) = 0.0053$	$\gamma(19,20) = -0.0086$
$\gamma(19,21) = 0.0158$	$\gamma(19,22) = -0.0291$	$\gamma(19,23) = -0.0673$	$\gamma(19,27) = 0.8049$
$\gamma(19,29) = -0.8045$	$\gamma(19,30) = -0.0264$	$\gamma(19,31) = 0.0189$	$\gamma(19,32) = 0.0042$
$\gamma(19,33) = 0.4033$	$\gamma(19,34) = -0.1212$	$\gamma(19,35) = 0.5890$	$\gamma(19,36) = -0.0003$
$\gamma(19,37) = -0.0266$	$\gamma(19,38) = 0.0370$	$\gamma(19,39) = 0.0335$	$\gamma(19,41) = 0.0184$
$\gamma(20,2) = -0.1535$	$\gamma(20,5) = -0.0607$	$\gamma(20,6) = -0.0056$	$\gamma(20,7) = -0.0035$
$\gamma(20,9) = 0.0076$	$\gamma(20,10) = -0.0007$	$\gamma(20,11) = -0.0467$	$\gamma(20,12) = 0.0294$
$\gamma(20,13) = 0.1033$	$\gamma(20,14) = 0.0079$	$\gamma(20,15) = -0.0442$	$\gamma(20,16) = -0.0040$
$\gamma(20,17) = 0.0030$	$\gamma(20,18) = -0.0048$	$\gamma(20,19) = -0.0086$	$\gamma(20,20) = -0.0045$
$\gamma(20,21) = -0.0285$	$\gamma(20,22) = -0.0346$	$\gamma(20,23) = -0.0291$	$\gamma(20,28) = -0.5209$
$\gamma(20,30) = -0.0146$	$\gamma(20,31) = -0.0106$	$\gamma(20,32) = 0.0499$	$\gamma(20,33) = -0.6979$
$\gamma(20,34) = 0.7308$	$\gamma(20,35) = -0.1219$	$\gamma(20,36) = 0.0302$	$\gamma(20,37) = -0.0298$
$\gamma(20,38) = 0.0038$	$\gamma(20,40) = 0.0838$	$\gamma(21,1) = -0.0120$	$\gamma(21,2) = -0.0041$
$\gamma(21,3) = 0.0152$	$\gamma(21,4) = 0.0003$	$\gamma(21,5) = -0.0302$	$\gamma(21,21) = -0.0020$
$\gamma(21,22) = -0.0068$	$\gamma(21,23) = 0.0037$	$\gamma(21,27) = -0.0024$	$\gamma(21,29) = -0.0057$
$\gamma(21,33) = -0.0159$	$\gamma(21,34) = -0.0081$	$\gamma(21,35) = 0.0045$	$\gamma(22,1) = 0.0246$
$\gamma(22,2) = -0.0176$	$\gamma(22,3) = -0.0099$	$\gamma(22,4) = 0.0266$	$\gamma(22,5) = 0.0298$
$\gamma(22,21) = -0.0003$	$\gamma(22,22) = 0.0104$	$\gamma(22,23) = -0.0379$	$\gamma(22,28) = -0.0115$

$\gamma(22,33) = -0.0081$	$\gamma(22,34) = -0.0233$	$\gamma(22,35) = 0.0122$	$\gamma(23,1) = -0.0112$
$\gamma(23,2) = 0.0332$	$\gamma(23,3) = -0.0167$	$\gamma(23,4) = -0.0370$	$\gamma(23,5) = -0.0038$
$\gamma(23,21) = -0.0077$	$\gamma(23,22) = -0.0218$	$\gamma(23,23) = 0.0448$	$\gamma(23,27) = 0.0083$
$\gamma(23,29) = 0.0013$	$\gamma(23,33) = 0.0045$	$\gamma(23,34) = 0.0122$	$\gamma(23,35) = 0.0023$
$\gamma(24,1) = 0.4999$	$\gamma(24,2) = 0.3272$	$\gamma(24,3) = -0.1882$	$\gamma(24,4) = -0.4033$
$\gamma(24,5) = 0.6979$	$\gamma(24,6) = -0.0120$	$\gamma(24,7) = -0.0041$	$\gamma(24,8) = 0.0152$
$\gamma(24,9) = 0.0003$	$\gamma(24,10) = -0.0302$	$\gamma(24,11) = -0.0480$	$\gamma(24,13) = -0.0126$
$\gamma(24,14) = -0.0335$	$\gamma(24,21) = -0.0944$	$\gamma(24,22) = 0.0128$	$\gamma(24,23) = 0.0746$
$\gamma(24,24) = -0.0020$	$\gamma(24,25) = -0.0068$	$\gamma(24,26) = 0.0037$	$\gamma(24,27) = -0.0944$
$\gamma(24,28) = -0.0128$	$\gamma(24,29) = 0.0746$	$\gamma(24,30) = -0.0024$	$\gamma(24,32) = -0.0057$
$\gamma(24,33) = 0.5479$	$\gamma(24,35) = 0.5890$	$\gamma(24,36) = -0.0159$	$\gamma(24,37) = -0.0081$
$\gamma(24,38) = 0.0045$	$\gamma(24,39) = -0.0159$	$\gamma(24,40) = 0.0081$	$\gamma(24,41) = 0.0045$
$\gamma(25,1) = 0.1689$	$\gamma(25,2) = -0.8861$	$\gamma(25,3) = 0.7557$	$\gamma(25,4) = 0.1212$
$\gamma(25,5) = -0.7308$	$\gamma(25,6) = 0.0246$	$\gamma(25,7) = -0.0176$	$\gamma(25,8) = -0.0099$
$\gamma(25,9) = 0.0266$	$\gamma(25,10) = 0.0298$	$\gamma(25,12) = 0.0107$	$\gamma(25,15) = -0.0838$
$\gamma(25,21) = 0.0691$	$\gamma(25,22) = 0.1133$	$\gamma(25,23) = -0.4660$	$\gamma(25,24) = -0.0003$
$\gamma(25,25) = 0.0104$	$\gamma(25,26) = -0.0379$	$\gamma(25,27) = -0.0691$	$\gamma(25,28) = 0.1133$
$\gamma(25,29) = 0.4660$	$\gamma(25,31) = -0.0115$	$\gamma(25,34) = -0.3864$	$\gamma(25,36) = -0.0081$
$\gamma(25,37) = -0.0233$	$\gamma(25,38) = 0.0122$	$\gamma(25,39) = 0.0081$	$\gamma(25,40) = -0.0233$
$\gamma(25,41) = -0.0122$	$\gamma(26,1) = -0.0981$	$\gamma(26,2) = 0.7546$	$\gamma(26,3) = -0.0126$
$\gamma(26,4) = -0.5890$	$\gamma(26,5) = 0.1219$	$\gamma(26,6) = -0.0112$	$\gamma(26,7) = 0.0332$
$\gamma(26,8) = -0.0167$	$\gamma(26,9) = -0.0370$	$\gamma(26,10) = -0.0038$	$\gamma(26,11) = -0.0371$
$\gamma(26,13) = -0.0166$	$\gamma(26,14) = -0.0184$	$\gamma(26,21) = -0.0246$	$\gamma(26,22) = -0.1853$
$\gamma(26,23) = 0.4890$	$\gamma(26,24) = -0.0077$	$\gamma(26,25) = -0.0218$	$\gamma(26,26) = 0.0448$
$\gamma(26,27) = -0.0246$	$\gamma(26,28) = 0.1853$	$\gamma(26,29) = 0.4890$	$\gamma(26,30) = 0.0083$
$\gamma(26,32) = 0.0013$	$\gamma(26,33) = 0.5890$	$\gamma(26,35) = 0.4612$	$\gamma(26,36) = 0.0045$
$\gamma(26,37) = 0.0122$	$\gamma(26,38) = 0.0023$	$\gamma(26,39) = 0.0045$	$\gamma(26,40) = -0.0122$
$\gamma(26,41) = 0.0023$	$\gamma(27,27) = -0.0020$	$\gamma(27,28) = -0.0068$	$\gamma(27,29) = 0.0037$
$\gamma(28,27) = -0.0003$	$\gamma(28,28) = 0.0104$	$\gamma(28,29) = -0.0379$	$\gamma(29,27) = -0.0077$
$\gamma(29,28) = -0.0218$	$\gamma(29,29) = 0.0448$	$\gamma(30,1) = -0.0120$	$\gamma(30,2) = -0.0152$
$\gamma(30,3) = -0.0040$	$\gamma(30,4) = 0.0258$	$\gamma(30,5) = -0.0155$	$\gamma(30,11) = -0.0120$
$\gamma(30,12) = -0.0041$	$\gamma(30,13) = 0.0152$	$\gamma(30,14) = 0.0003$	$\gamma(30,15) = -0.0302$

$\gamma(30,21) = -0.0024$	$\gamma(30,22) = 0.0073$	$\gamma(30,23) = -0.0042$	$\gamma(30,27) = -0.0944$
$\gamma(30,28) = 0.0128$	$\gamma(30,29) = 0.0746$	$\gamma(30,30) = -0.0020$	$\gamma(30,31) = -0.0068$
$\gamma(30,32) = 0.0037$	$\gamma(30,33) = -0.0391$	$\gamma(30,34) = -0.0715$	$\gamma(30,35) = 0.0419$
$\gamma(30,39) = -0.0159$	$\gamma(30,40) = -0.0081$	$\gamma(30,41) = 0.0045$	$\gamma(31,1) = 0.0222$
$\gamma(31,2) = -0.0270$	$\gamma(31,3) = 0.0274$	$\gamma(31,4) = -0.0381$	$\gamma(31,5) = -0.0294$
$\gamma(31,11) = 0.0246$	$\gamma(31,12) = -0.0176$	$\gamma(31,13) = -0.0099$	$\gamma(31,14) = 0.0266$
$\gamma(31,15) = 0.0298$	$\gamma(31,21) = -0.0050$	$\gamma(31,22) = -0.0019$	$\gamma(31,23) = -0.0054$
$\gamma(31,27) = 0.0691$	$\gamma(31,28) = 0.1133$	$\gamma(31,29) = -0.4660$	$\gamma(31,30) = -0.0003$
$\gamma(31,31) = 0.0104$	$\gamma(31,32) = -0.0379$	$\gamma(31,33) = -0.0715$	$\gamma(31,34) = 0.0177$
$\gamma(31,35) = -0.0616$	$\gamma(31,39) = -0.0081$	$\gamma(31,40) = -0.0233$	$\gamma(31,41) = 0.0122$
$\gamma(32,1) = -0.0156$	$\gamma(32,2) = -0.0151$	$\gamma(32,3) = -0.0072$	$\gamma(32,4) = 0.0226$
$\gamma(32,5) = -0.0079$	$\gamma(32,11) = -0.0112$	$\gamma(32,12) = 0.0332$	$\gamma(32,13) = -0.0167$
$\gamma(32,14) = -0.0370$	$\gamma(32,15) = -0.0038$	$\gamma(32,21) = 0.0029$	$\gamma(32,22) = -0.0055$
$\gamma(32,23) = -0.0083$	$\gamma(32,27) = -0.0246$	$\gamma(32,28) = -0.1853$	$\gamma(32,29) = 0.4890$
$\gamma(32,30) = -0.0077$	$\gamma(32,31) = -0.0218$	$\gamma(32,32) = 0.0448$	$\gamma(32,33) = 0.0419$
$\gamma(32,34) = -0.0616$	$\gamma(32,35) = -0.0513$	$\gamma(32,39) = 0.0045$	$\gamma(32,40) = 0.0122$
$\gamma(32,41) = 0.0023$	$\gamma(33,33) = -0.0020$	$\gamma(33,34) = -0.0003$	$\gamma(33,35) = -0.0077$
$\gamma(34,33) = -0.0068$	$\gamma(34,34) = 0.0104$	$\gamma(34,35) = -0.0218$	$\gamma(35,33) = 0.0037$
$\gamma(35,34) = -0.0379$	$\gamma(35,35) = 0.0448$	$\gamma(36,1) = 0.0477$	$\gamma(36,2) = 0.0102$
$\gamma(36,3) = -0.0063$	$\gamma(36,4) = -0.0158$	$\gamma(36,5) = 0.0285$	$\gamma(36,11) = 0.0119$
$\gamma(36,12) = -0.0111$	$\gamma(36,13) = 0.0112$	$\gamma(36,14) = 0.0264$	$\gamma(36,15) = 0.0146$
$\gamma(36,21) = -0.0159$	$\gamma(36,22) = -0.0002$	$\gamma(36,23) = -0.0094$	$\gamma(36,27) = -0.0393$
$\gamma(36,29) = -0.0817$	$\gamma(36,33) = -0.0944$	$\gamma(36,34) = 0.0691$	$\gamma(36,35) = -0.0246$
$\gamma(36,36) = -0.0020$	$\gamma(36,37) = -0.0003$	$\gamma(36,38) = -0.0077$	$\gamma(36,39) = -0.0024$
$\gamma(36,41) = 0.0083$	$\gamma(37,1) = 0.0322$	$\gamma(37,2) = 0.0094$	$\gamma(37,3) = -0.0116$
$\gamma(37,4) = 0.0291$	$\gamma(37,5) = 0.0346$	$\gamma(37,11) = -0.0023$	$\gamma(37,12) = 0.0067$
$\gamma(37,13) = -0.0268$	$\gamma(37,14) = -0.0189$	$\gamma(37,15) = 0.0106$	$\gamma(37,21) = -0.0002$
$\gamma(37,22) = 0.0065$	$\gamma(37,23) = -0.0049$	$\gamma(37,28) = -0.0857$	$\gamma(37,33) = 0.0128$
$\gamma(37,34) = 0.1133$	$\gamma(37,35) = -0.1853$	$\gamma(37,36) = -0.0068$	$\gamma(37,37) = 0.0104$
$\gamma(37,38) = -0.0218$	$\gamma(37,40) = -0.0115$	$\gamma(38,1) = -0.0188$	$\gamma(38,2) = -0.0116$
$\gamma(38,3) = -0.0035$	$\gamma(38,4) = 0.0673$	$\gamma(38,5) = 0.0291$	$\gamma(38,11) = -0.0273$
$\gamma(38,12) = 0.0163$	$\gamma(38,13) = 0.0271$	$\gamma(38,14) = -0.0042$	$\gamma(38,15) = -0.0499$

$\gamma(38,21) = -0.0094$	$\gamma(38,22) = -0.0049$	$\gamma(38,23) = -0.0274$	$\gamma(38,27) = -0.0817$
$\gamma(38,29) = 0.0523$	$\gamma(38,33) = 0.0746$	$\gamma(38,34) = -0.4660$	$\gamma(38,35) = 0.4890$
$\gamma(38,36) = 0.0037$	$\gamma(38,37) = -0.0379$	$\gamma(38,38) = 0.0448$	$\gamma(38,39) = -0.0057$
$\gamma(38,41) = 0.0013$	$\gamma(39,27) = -0.0159$	$\gamma(39,28) = -0.0002$	$\gamma(39,29) = -0.0094$
$\gamma(39,33) = -0.0024$	$\gamma(39,34) = -0.0050$	$\gamma(39,35) = 0.0029$	$\gamma(39,39) = -0.0020$
$\gamma(39,40) = -0.0003$	$\gamma(39,41) = -0.0077$	$\gamma(40,27) = -0.0002$	$\gamma(40,28) = 0.0065$
$\gamma(40,29) = -0.0049$	$\gamma(40,33) = 0.0073$	$\gamma(40,34) = -0.0019$	$\gamma(40,35) = -0.0055$
$\gamma(40,39) = -0.0068$	$\gamma(40,40) = 0.0104$	$\gamma(40,41) = -0.0218$	$\gamma(41,27) = -0.0094$
$\gamma(41,28) = -0.0049$	$\gamma(41,29) = -0.0274$	$\gamma(41,33) = -0.0042$	$\gamma(41,34) = -0.0054$
$\gamma(41,35) = -0.0083$	$\gamma(41,39) = 0.0037$	$\gamma(41,40) = -0.0379$	$\gamma(41,41) = 0.0448$
$\gamma(42,1) = 0.0120$	$\gamma(42,2) = -0.0152$	$\gamma(42,3) = 0.0040$	$\gamma(42,4) = -0.0258$
$\gamma(42,5) = -0.0155$	$\gamma(42,11) = 0.0477$	$\gamma(42,12) = 0.0102$	$\gamma(42,13) = -0.0063$
$\gamma(42,14) = -0.0158$	$\gamma(42,15) = 0.0285$	$\gamma(42,21) = -0.0158$	$\gamma(42,22) = 0.0080$
$\gamma(42,23) = 0.0048$	$\gamma(42,27) = 0.5451$	$\gamma(42,28) = 0.5100$	$\gamma(42,29) = -0.2962$
$\gamma(42,30) = -0.0159$	$\gamma(42,31) = -0.0002$	$\gamma(42,32) = -0.0094$	$\gamma(42,33) = -0.0946$
$\gamma(42,34) = 0.0577$	$\gamma(42,35) = -0.0476$	$\gamma(42,36) = -0.0024$	$\gamma(42,37) = -0.0050$
$\gamma(42,38) = 0.0029$	$\gamma(42,39) = -0.0944$	$\gamma(42,40) = 0.0691$	$\gamma(42,41) = -0.0246$
$\gamma(42,42) = -0.0020$	$\gamma(42,43) = -0.0003$	$\gamma(42,44) = -0.0077$	$\gamma(43,1) = 0.0222$
$\gamma(43,2) = 0.0270$	$\gamma(43,3) = 0.0274$	$\gamma(43,4) = -0.0381$	$\gamma(43,5) = 0.0294$
$\gamma(43,11) = 0.0322$	$\gamma(43,12) = 0.0094$	$\gamma(43,13) = -0.0116$	$\gamma(43,14) = 0.0291$
$\gamma(43,15) = 0.0346$	$\gamma(43,21) = 0.0080$	$\gamma(43,22) = -0.0146$	$\gamma(43,23) = -0.0171$
$\gamma(43,27) = 0.5100$	$\gamma(43,28) = 0.2504$	$\gamma(43,29) = -0.3690$	$\gamma(43,30) = -0.0002$
$\gamma(43,31) = 0.0065$	$\gamma(43,32) = -0.0049$	$\gamma(43,33) = -0.0577$	$\gamma(43,34) = 0.6769$
$\gamma(43,35) = -0.1397$	$\gamma(43,36) = 0.0073$	$\gamma(43,37) = -0.0019$	$\gamma(43,38) = -0.0055$
$\gamma(43,39) = 0.0128$	$\gamma(43,40) = 0.1133$	$\gamma(43,41) = -0.1853$	$\gamma(43,42) = -0.0068$
$\gamma(43,43) = 0.0104$	$\gamma(43,44) = -0.0218$	$\gamma(44,1) = 0.0156$	$\gamma(44,2) = -0.0151$
$\gamma(44,3) = 0.0072$	$\gamma(44,4) = -0.0226$	$\gamma(44,5) = -0.0079$	$\gamma(44,11) = -0.0188$
$\gamma(44,12) = -0.0116$	$\gamma(44,13) = -0.0035$	$\gamma(44,14) = 0.0673$	$\gamma(44,15) = 0.0291$
$\gamma(44,21) = 0.0048$	$\gamma(44,22) = -0.0171$	$\gamma(44,23) = -0.0062$	$\gamma(44,27) = -0.2962$
$\gamma(44,28) = -0.3690$	$\gamma(44,29) = -0.1736$	$\gamma(44,30) = -0.0094$	$\gamma(44,31) = -0.0049$
$\gamma(44,32) = -0.0274$	$\gamma(44,33) = -0.0476$	$\gamma(44,34) = 0.1397$	$\gamma(44,35) = -0.0745$
$\gamma(44,36) = -0.0042$	$\gamma(44,37) = -0.0054$	$\gamma(44,38) = -0.0083$	$\gamma(44,39) = 0.0746$

γ(44,40) = -0.4660	γ(44,41) = 0.4890	γ(44,42) = 0.0037	γ(44,43) = -0.0379
γ(44,44) = 0.0448			

δ1(6,1) = -0.0020	δ1(6,2) = -0.0003	δ1(6,3) = 0.0001	δ1(6,4) = -0.0024
δ1(6,5) = 0.0040	δ1(7,1) = -0.0003	δ1(7,2) = -0.0020	δ1(7,3) = 0.0081
δ1(7,4) = 0.0048	δ1(7,5) = 0.0030	δ1(8,1) = 0.0001	δ1(8,2) = 0.0081
δ1(8,3) = 0.0074	δ1(8,4) = 0.0085	δ1(8,5) = 0.0048	δ1(9,1) = -0.0024
δ1(9,2) = 0.0048	δ1(9,3) = 0.0085	δ1(9,4) = 0.0053	δ1(9,5) = 0.0086
δ1(10,1) = 0.0040	δ1(10,2) = 0.0030	δ1(10,3) = 0.0048	δ1(10,4) = 0.0086
δ1(10,5) = -0.0045	δ1(11,1) = -0.0066	δ1(11,3) = -0.0030	δ1(11,4) = -0.0066
δ1(12,2) = 0.0033	δ1(12,5) = -0.0034	δ1(13,1) = -0.0030	δ1(13,3) = 0.0010
δ1(13,4) = -0.0036	δ1(14,1) = -0.0066	δ1(14,3) = -0.0036	δ1(14,4) = -0.0052
δ1(15,2) = -0.0034	δ1(15,5) = 0.0125	δ1(16,1) = -0.0158	δ1(16,2) = -0.0599
δ1(16,3) = 0.0339	δ1(16,4) = -0.0276	δ1(16,5) = 0.0467	δ1(16,6) = -0.0066
δ1(16,8) = -0.0030	δ1(16,9) = -0.0066	δ1(16,11) = -0.0020	δ1(16,12) = -0.0003
δ1(16,13) = 0.0001	δ1(16,14) = -0.0024	δ1(16,15) = 0.0040	δ1(16,21) = -0.0119
δ1(16,22) = -0.0023	δ1(16,23) = 0.0273	δ1(16,33) = 0.0120	δ1(16,34) = 0.0246
δ1(16,35) = 0.0112	δ1(17,1) = -0.0599	δ1(17,2) = -0.0576	δ1(17,3) = -0.0377
δ1(17,4) = -0.1053	δ1(17,5) = 0.0294	δ1(17,7) = 0.0033	δ1(17,10) = -0.0034
δ1(17,11) = -0.0003	δ1(17,12) = -0.0020	δ1(17,13) = 0.0081	δ1(17,14) = 0.0048
δ1(17,15) = 0.0030	δ1(17,21) = -0.0111	δ1(17,22) = -0.0067	δ1(17,23) = 0.0163
δ1(17,33) = -0.0041	δ1(17,34) = 0.0176	δ1(17,35) = 0.0332	δ1(18,1) = 0.0339
δ1(18,2) = -0.0377	δ1(18,3) = -0.1002	δ1(18,4) = -0.0914	δ1(18,5) = -0.1033
δ1(18,6) = -0.0030	δ1(18,8) = 0.0010	δ1(18,9) = -0.0036	δ1(18,11) = 0.0001
δ1(18,12) = 0.0081	δ1(18,13) = 0.0074	δ1(18,14) = 0.0085	δ1(18,15) = 0.0048
δ1(18,21) = -0.0112	δ1(18,22) = -0.0268	δ1(18,23) = -0.0271	δ1(18,33) = -0.0151
δ1(18,34) = -0.0099	δ1(18,35) = 0.0167	δ1(19,1) = -0.0276	δ1(19,2) = -0.1053
δ1(19,3) = -0.0914	δ1(19,4) = -0.0548	δ1(19,5) = -0.0079	δ1(19,6) = -0.0066
δ1(19,8) = -0.0036	δ1(19,9) = -0.0052	δ1(19,11) = -0.0024	δ1(19,12) = 0.0048
δ1(19,13) = 0.0085	δ1(19,14) = 0.0053	δ1(19,15) = 0.0086	δ1(19,21) = -0.0264
δ1(19,22) = -0.0189	δ1(19,23) = 0.0042	δ1(19,33) = -0.0003	δ1(19,34) = 0.0266

δ1(19,35) = 0.0370	δ1(20,1) = 0.0467	δ1(20,2) = 0.0294	δ1(20,3) = -0.1033
δ1(20,4) = -0.0079	δ1(20,5) = -0.0442	δ1(20,7) = -0.0034	δ1(20,10) = 0.0125
δ1(20,11) = 0.0040	δ1(20,12) = 0.0030	δ1(20,13) = 0.0048	δ1(20,14) = 0.0086
δ1(20,15) = -0.0045	δ1(20,21) = 0.0146	δ1(20,22) = -0.0106	δ1(20,23) = -0.0499
δ1(20,33) = -0.0302	δ1(20,34) = -0.0298	δ1(20,35) = -0.0038	δ1(24,1) = -0.0120
δ1(24,2) = 0.0041	δ1(24,3) = 0.0151	δ1(24,4) = 0.0003	δ1(24,5) = 0.0302
δ1(24,21) = -0.0020	δ1(24,22) = 0.0068	δ1(24,23) = 0.0037	δ1(25,1) = -0.0246
δ1(25,2) = -0.0176	δ1(25,3) = 0.0099	δ1(25,4) = -0.0266	δ1(25,5) = 0.0298
δ1(25,21) = 0.0003	δ1(25,22) = 0.0104	δ1(25,23) = 0.0379	δ1(26,1) = -0.0112
δ1(26,2) = -0.0332	δ1(26,3) = -0.0167	δ1(26,4) = -0.0370	δ1(26,5) = 0.0038
δ1(26,21) = -0.0077	δ1(26,22) = 0.0218	δ1(26,23) = 0.0448	δ1(30,1) = -0.0480
δ1(30,3) = -0.0126	δ1(30,4) = -0.0335	δ1(30,21) = -0.0024	δ1(30,23) = -0.0057
δ1(30,27) = -0.0020	δ1(30,28) = 0.0068	δ1(30,29) = 0.0037	δ1(30,33) = -0.0159
δ1(30,34) = 0.0081	δ1(30,35) = 0.0045	δ1(31,2) = 0.0107	δ1(31,5) = -0.0838
δ1(31,22) = -0.0115	δ1(31,27) = 0.0003	δ1(31,28) = 0.0104	δ1(31,29) = 0.0379
δ1(31,33) = 0.0081	δ1(31,34) = -0.0233	δ1(31,35) = -0.0122	δ1(32,1) = -0.0371
δ1(32,3) = -0.0166	δ1(32,4) = -0.0184	δ1(32,21) = 0.0083	δ1(32,23) = 0.0013
δ1(32,27) = -0.0077	δ1(32,28) = 0.0218	δ1(32,29) = 0.0448	δ1(32,33) = 0.0045
δ1(32,34) = -0.0122	δ1(32,35) = 0.0023	δ1(36,1) = 0.0119	δ1(36,2) = 0.0111
δ1(36,3) = 0.0112	δ1(36,4) = 0.0264	δ1(36,5) = -0.0146	δ1(36,33) = -0.0020
δ1(36,34) = 0.0003	δ1(36,35) = -0.0077	δ1(37,1) = 0.0023	δ1(37,2) = 0.0067
δ1(37,3) = 0.0268	δ1(37,4) = 0.0189	δ1(37,5) = 0.0106	δ1(37,33) = 0.0068
δ1(37,34) = 0.0104	δ1(37,35) = 0.0218	δ1(38,1) = -0.0273	δ1(38,2) = -0.0163
δ1(38,3) = 0.0271	δ1(38,4) = -0.0042	δ1(38,5) = 0.0499	δ1(38,33) = 0.0037
δ1(38,34) = 0.0379	δ1(38,35) = 0.0448	δ1(39,1) = 0.0119	δ1(39,2) = -0.0111
δ1(39,3) = 0.0112	δ1(39,4) = 0.0264	δ1(39,5) = 0.0146	δ1(39,33) = -0.0024
δ1(39,35) = 0.0083	δ1(40,1) = -0.0023	δ1(40,2) = 0.0067	δ1(40,3) = -0.0268
δ1(40,4) = -0.0189	δ1(40,5) = 0.0106	δ1(40,34) = -0.0115	δ1(41,1) = -0.0273
δ1(41,2) = 0.0163	δ1(41,3) = 0.0271	δ1(41,4) = -0.0042	δ1(41,5) = -0.0499
δ1(41,33) = -0.0057	δ1(41,35) = 0.0013	δ1(42,1) = -0.5004	δ1(42,3) = -0.3737
δ1(42,4) = -0.8049	δ1(42,6) = 0.0119	δ1(42,7) = -0.0111	δ1(42,8) = 0.0112
δ1(42,9) = 0.0264	δ1(42,10) = 0.0146	δ1(42,11) = 0.0119	δ1(42,12) = 0.0111

δ1(42,13) = 0.0112	δ1(42,14) = 0.0264	δ1(42,15) = -0.0146	δ1(42,21) = -0.0393
δ1(42,23) = -0.0817	δ1(42,27) = -0.0159	δ1(42,28) = 0.0002	δ1(42,29) = -0.0094
δ1(42,33) = -0.0944	δ1(42,34) = -0.0691	δ1(42,35) = -0.0246	δ1(42,36) = -0.0024
δ1(42,38) = 0.0083	δ1(42,39) = -0.0020	δ1(42,40) = 0.0003	δ1(42,41) = -0.0077
δ1(43,2) = -0.4231	δ1(43,5) = 0.5209	δ1(43,6) = -0.0023	δ1(43,7) = 0.0067
δ1(43,8) = -0.0268	δ1(43,9) = -0.0189	δ1(43,10) = 0.0106	δ1(43,11) = 0.0023
δ1(43,12) = 0.0067	δ1(43,13) = 0.0268	δ1(43,14) = 0.0189	δ1(43,15) = 0.0106
δ1(43,22) = -0.0857	δ1(43,27) = 0.0002	δ1(43,28) = 0.0065	δ1(43,29) = 0.0049
δ1(43,33) = -0.0128	δ1(43,34) = 0.1133	δ1(43,35) = 0.1853	δ1(43,37) = -0.0115
δ1(43,39) = 0.0068	δ1(43,40) = 0.0104	δ1(43,41) = 0.0218	δ1(44,1) = -0.1951
δ1(44,3) = 1.3227	δ1(44,4) = 0.8045	δ1(44,6) = -0.0273	δ1(44,7) = 0.0163
δ1(44,8) = 0.0271	δ1(44,9) = -0.0042	δ1(44,10) = -0.0499	δ1(44,11) = -0.0273
δ1(44,12) = -0.0163	δ1(44,13) = 0.0271	δ1(44,14) = -0.0042	δ1(44,15) = 0.0499
δ1(44,21) = -0.0817	δ1(44,23) = 0.0523	δ1(44,27) = -0.0094	δ1(44,28) = 0.0049
δ1(44,29) = -0.0274	δ1(44,33) = 0.0746	δ1(44,34) = 0.4660	δ1(44,35) = 0.4890
δ1(44,36) = -0.0057	δ1(44,38) = 0.0013	δ1(44,39) = 0.0037	δ1(44,40) = 0.0379
δ1(44,41) = 0.0448			

δ2(1,6) = -0.0020	δ2(1,8) = -0.0003	δ2(1,9) = 0.0046	δ2(2,7) = 0.0121
δ2(2,10) = 0.0113	δ2(3,6) = -0.0003	δ2(3,8) = -0.0066	δ2(3,9) = 0.0002
δ2(4,6) = 0.0046	δ2(4,8) = 0.0002	δ2(4,9) = -0.0095	δ2(5,7) = 0.0113
δ2(5,10) = 0.0103	δ2(11,6) = -0.0066	δ2(11,7) = -0.0025	δ2(11,8) = 0.0015
δ2(11,9) = 0.0032	δ2(11,10) = -0.0056	δ2(11,16) = -0.0020	δ2(11,18) = -0.0003
δ2(11,19) = 0.0046	δ2(11,24) = -0.0120	δ2(11,25) = 0.0222	δ2(11,26) = -0.0156
δ2(12,6) = -0.0025	δ2(12,7) = 0.0016	δ2(12,8) = 0.0010	δ2(12,10) = -0.0035
δ2(12,17) = 0.0121	δ2(12,20) = 0.0113	δ2(12,24) = -0.0152	δ2(12,25) = -0.0270
δ2(12,26) = -0.0151	δ2(13,6) = 0.0015	δ2(13,7) = 0.0010	δ2(13,8) = 0.0027
δ2(13,9) = -0.0035	δ2(13,16) = -0.0003	δ2(13,18) = -0.0066	δ2(13,19) = 0.0002
δ2(13,24) = -0.0040	δ2(13,25) = 0.0274	δ2(13,26) = -0.0072	δ2(14,6) = 0.0032
δ2(14,8) = -0.0035	δ2(14,9) = 0.0082	δ2(14,10) = 0.0076	δ2(14,16) = 0.0046
δ2(14,18) = 0.0002	δ2(14,19) = -0.0095	δ2(14,24) = 0.0258	δ2(14,25) = -0.0381

δ2(14,26) = 0.0226	δ2(15,6) = -0.0056	δ2(15,7) = -0.0035	δ2(15,9) = 0.0076
δ2(15,10) = -0.0007	δ2(15,17) = 0.0113	δ2(15,20) = 0.0103	δ2(15,24) = -0.0155
δ2(15,25) = -0.0294	δ2(15,26) = -0.0079	δ2(21,24) = -0.0020	δ2(21,25) = 0.0066
δ2(21,26) = 0.0041	δ2(22,24) = -0.0066	δ2(22,25) = 0.0620	δ2(22,26) = -0.0080
δ2(23,24) = 0.0041	δ2(23,25) = 0.0080	δ2(23,26) = -0.0068	δ2(27,6) = -0.0477
δ2(27,7) = -0.0102	δ2(27,8) = 0.0063	δ2(27,9) = 0.0158	δ2(27,10) = -0.0285
δ2(27,16) = -0.0120	δ2(27,17) = 0.0152	δ2(27,18) = -0.0040	δ2(27,19) = 0.0258
δ2(27,20) = 0.0155	δ2(27,21) = -0.0024	δ2(27,22) = -0.0050	δ2(27,23) = 0.0029
δ2(27,24) = -0.0946	δ2(27,25) = 0.0577	δ2(27,26) = -0.0476	δ2(27,30) = -0.0020
δ2(27,31) = 0.0066	δ2(27,32) = 0.0041	δ2(27,36) = -0.0158	δ2(27,37) = 0.0080
δ2(27,38) = 0.0048	δ2(28,6) = -0.0322	δ2(28,7) = -0.0094	δ2(28,8) = 0.0116
δ2(28,9) = -0.0291	δ2(28,10) = -0.0346	δ2(28,16) = -0.0222	δ2(28,17) = -0.0270
δ2(28,18) = -0.0274	δ2(28,19) = 0.0381	δ2(28,20) = -0.0294	δ2(28,21) = 0.0073
δ2(28,22) = -0.0019	δ2(28,23) = -0.0055	δ2(28,24) = -0.0577	δ2(28,25) = 0.6769
δ2(28,26) = -0.1397	δ2(28,30) = -0.0066	δ2(28,31) = 0.0620	δ2(28,32) = -0.0080
δ2(28,36) = 0.0080	δ2(28,37) = -0.0146	δ2(28,38) = -0.0171	δ2(29,6) = 0.0188
δ2(29,7) = 0.0116	δ2(29,8) = 0.0035	δ2(29,9) = -0.0673	δ2(29,10) = -0.0291
δ2(29,16) = -0.0156	δ2(29,17) = 0.0151	δ2(29,18) = -0.0072	δ2(29,19) = 0.0226
δ2(29,20) = 0.0079	δ2(29,21) = -0.0042	δ2(29,22) = -0.0054	δ2(29,23) = -0.0083
δ2(29,24) = -0.0476	δ2(29,25) = 0.1397	δ2(29,26) = -0.0745	δ2(29,30) = 0.0041
δ2(29,31) = 0.0080	δ2(29,32) = -0.0068	δ2(29,36) = 0.0048	δ2(29,37) = -0.0171
δ2(29,38) = -0.0062	δ2(30,24) = -0.0024	δ2(30,25) = -0.0050	δ2(30,26) = 0.0029
δ2(31,24) = 0.0073	δ2(31,25) = -0.0019	δ2(31,26) = -0.0055	δ2(32,24) = -0.0042
δ2(32,25) = -0.0054	δ2(32,26) = -0.0083	δ2(33,6) = 0.0120	δ2(33,7) = 0.0152
δ2(33,8) = 0.0040	δ2(33,9) = -0.0258	δ2(33,10) = 0.0155	δ2(33,24) = -0.0158
δ2(33,25) = -0.0080	δ2(33,26) = 0.0048	δ2(33,36) = -0.0020	δ2(33,37) = -0.0066
δ2(33,38) = 0.0041	δ2(34,6) = -0.0222	δ2(34,7) = 0.0270	δ2(34,8) = -0.0274
δ2(34,9) = 0.0381	δ2(34,10) = 0.0294	δ2(34,24) = -0.0080	δ2(34,25) = -0.0146
δ2(34,26) = 0.0171	δ2(34,36) = 0.0066	δ2(34,37) = 0.0620	δ2(34,38) = 0.0080
δ2(35,6) = 0.0156	δ2(35,7) = 0.0151	δ2(35,8) = 0.0072	δ2(35,9) = -0.0226
δ2(35,10) = 0.0079	δ2(35,24) = 0.0048	δ2(35,25) = 0.0171	δ2(35,26) = -0.0062
δ2(35,36) = 0.0041	δ2(35,37) = -0.0080	δ2(35,38) = -0.0068	δ2(39,6) = 0.0120

$\delta 2(39,7) = 0.0041$	$\delta 2(39,8) = -0.0151$	$\delta 2(39,9) = -0.0003$	$\delta 2(39,10) = 0.0302$
$\delta 2(39,16) = 0.0120$	$\delta 2(39,17) = 0.0152$	$\delta 2(39,18) = 0.0040$	$\delta 2(39,19) = -0.0258$
$\delta 2(39,20) = 0.0155$	$\delta 2(39,24) = -0.0391$	$\delta 2(39,25) = -0.0715$	$\delta 2(39,26) = 0.0419$
$\delta 2(39,36) = -0.0024$	$\delta 2(39,37) = 0.0073$	$\delta 2(39,38) = -0.0042$	$\delta 2(39,42) = -0.0020$
$\delta 2(39,43) = -0.0066$	$\delta 2(39,44) = 0.0041$	$\delta 2(40,6) = -0.0246$	$\delta 2(40,7) = 0.0176$
$\delta 2(40,8) = 0.0099$	$\delta 2(40,9) = -0.0266$	$\delta 2(40,10) = -0.0298$	$\delta 2(40,16) = -0.0222$
$\delta 2(40,17) = 0.0270$	$\delta 2(40,18) = -0.0274$	$\delta 2(40,19) = 0.0381$	$\delta 2(40,20) = 0.0294$
$\delta 2(40,24) = -0.0715$	$\delta 2(40,25) = 0.0177$	$\delta 2(40,26) = -0.0616$	$\delta 2(40,36) = -0.0050$
$\delta 2(40,37) = -0.0019$	$\delta 2(40,38) = -0.0054$	$\delta 2(40,42) = 0.0066$	$\delta 2(40,43) = 0.0620$
$\delta 2(40,44) = 0.0080$	$\delta 2(41,6) = 0.0112$	$\delta 2(41,7) = -0.0332$	$\delta 2(41,8) = 0.0167$
$\delta 2(41,9) = 0.0370$	$\delta 2(41,10) = 0.0038$	$\delta 2(41,16) = 0.0156$	$\delta 2(41,17) = 0.0151$
$\delta 2(41,18) = 0.0072$	$\delta 2(41,19) = -0.0226$	$\delta 2(41,20) = 0.0079$	$\delta 2(41,24) = 0.0419$
$\delta 2(41,25) = -0.0616$	$\delta 2(41,26) = -0.0513$	$\delta 2(41,36) = 0.0029$	$\delta 2(41,37) = -0.0055$
$\delta 2(41,38) = -0.0083$	$\delta 2(41,42) = 0.0041$	$\delta 2(41,43) = -0.0080$	$\delta 2(41,44) = -0.0068$

Appendix B

$HfSe_2$ Tight-Binding Parameters

The tight-binding Hamiltonian for the $HfSe_2$ supercell is of the form:

$$H(k_x, k_y) = \alpha + \beta e^{i(k_x \cdot dx)} + \gamma e^{i(k_y \cdot dy)} + \delta_1 e^{i(k_x \cdot dx + k_y \cdot dy)} + \delta_2 e^{i(k_x \cdot dx - k_y \cdot dy)}$$
$$+ \left(\beta e^{i(k_x \cdot dx)} + \gamma e^{i(k_y \cdot dy)} + \delta_1 e^{i(k_x \cdot dx + k_y \cdot dy)} + \delta_2 e^{i(k_x \cdot dx - k_y \cdot dy)}\right)^{\dagger}$$

where $dx = 6.57872 \times 10^{-10}$ m and $dy = 7.59644 \times 10^{-10}$ m.

The size of H is 44×44. Only non-zero elements of the α, β, γ, δ_1, and δ_2 matrices are provided below:

α(1,1) = 1.7342	α(1,3) = -0.0006	α(1,4) = 0.0007	α(1,6) = -0.1192
α(1,7) = -0.1246	α(1,8) = -0.0711	α(1,9) = -0.1485	α(1,10) = -0.2573
α(1,11) = -0.1192	α(1,12) = 0.1246	α(1,13) = -0.0711	α(1,14) = -0.1485
α(1,15) = 0.2573	α(1,16) = -0.0114	α(1,18) = 0.0032	α(1,19) = -0.0107
α(1,21) = -0.5752	α(1,23) = 0.5506	α(1,24) = 0.0244	α(1,25) = 0.0181
α(1,26) = 0.0246	α(1,27) = 0.0161	α(1,28) = -0.0148	α(1,29) = -0.0088
α(1,30) = 0.0244	α(1,31) = -0.0181	α(1,32) = 0.0246	α(1,33) = 0.5730
α(1,34) = 0.4779	α(1,35) = 0.2770	α(1,36) = -0.0161	α(1,38) = -0.0173
α(1,39) = -0.0242	α(1,40) = 0.0303	α(1,41) = -0.0034	α(2,2) = 2.1779
α(2,5) = -0.4288	α(2,6) = -0.1246	α(2,7) = -0.0911	α(2,8) = 0.0275
α(2,9) = -0.2018	α(2,10) = -0.0639	α(2,11) = 0.1246	α(2,12) = -0.0911
α(2,13) = -0.0275	α(2,14) = 0.2018	α(2,15) = -0.0639	α(2,17) = -0.0151
α(2,20) = -0.0125	α(2,22) = -0.5649	α(2,24) = 0.0322	α(2,25) = 0.0122
α(2,26) = 0.0145	α(2,27) = 0.0575	α(2,28) = 0.0154	α(2,29) = 0.0036
α(2,30) = -0.0322	α(2,31) = 0.0122	α(2,32) = -0.0145	α(2,33) = 0.4874
α(2,34) = -0.9200	α(2,35) = -0.8578	α(2,37) = -0.0092	α(2,39) = -0.0108
α(2,40) = -0.0092	α(2,41) = -0.0342	α(3,1) = -0.0006	α(3,3) = 2.1753
α(3,4) = -0.4290	α(3,6) = -0.0711	α(3,7) = 0.0275	α(3,8) = -0.1226
α(3,9) = 0.1693	α(3,10) = -0.2015	α(3,11) = -0.0711	α(3,12) = -0.0275
α(3,13) = -0.1226	α(3,14) = 0.1693	α(3,15) = 0.2015	α(3,16) = 0.0032

$\alpha(3,18) = -0.0105$	$\alpha(3,19) = 0.0100$	$\alpha(3,21) = 0.5652$	$\alpha(3,23) = 1.4152$
$\alpha(3,24) = -0.0310$	$\alpha(3,25) = -0.0359$	$\alpha(3,26) = 0.0205$	$\alpha(3,27) = 0.0333$
$\alpha(3,28) = 0.0036$	$\alpha(3,29) = 0.0114$	$\alpha(3,30) = -0.0310$	$\alpha(3,31) = 0.0359$
$\alpha(3,32) = 0.0205$	$\alpha(3,33) = 0.2823$	$\alpha(3,34) = -0.8583$	$\alpha(3,35) = 0.0703$
$\alpha(3,36) = 0.0665$	$\alpha(3,38) = -0.0176$	$\alpha(3,39) = -0.0434$	$\alpha(3,40) = 0.0162$
$\alpha(3,41) = -0.0236$	$\alpha(4,1) = 0.0007$	$\alpha(4,3) = -0.4290$	$\alpha(4,4) = 1.8279$
$\alpha(4,6) = -0.1485$	$\alpha(4,7) = -0.2018$	$\alpha(4,8) = 0.1693$	$\alpha(4,9) = -0.0308$
$\alpha(4,10) = -0.1698$	$\alpha(4,11) = -0.1485$	$\alpha(4,12) = 0.2018$	$\alpha(4,13) = 0.1693$
$\alpha(4,14) = -0.0308$	$\alpha(4,15) = 0.1698$	$\alpha(4,16) = -0.0107$	$\alpha(4,18) = 0.0100$
$\alpha(4,19) = 0.0122$	$\alpha(4,21) = -0.8964$	$\alpha(4,23) = -0.5626$	$\alpha(4,24) = 0.0460$
$\alpha(4,25) = 0.0389$	$\alpha(4,26) = 0.0027$	$\alpha(4,27) = 0.0056$	$\alpha(4,28) = 0.0481$
$\alpha(4,29) = -0.0418$	$\alpha(4,30) = 0.0460$	$\alpha(4,31) = -0.0389$	$\alpha(4,32) = 0.0027$
$\alpha(4,33) = -0.4486$	$\alpha(4,34) = -0.0946$	$\alpha(4,35) = 0.7208$	$\alpha(4,36) = 0.0110$
$\alpha(4,38) = -0.0413$	$\alpha(4,39) = -0.0021$	$\alpha(4,40) = 0.0004$	$\alpha(4,41) = 0.0187$
$\alpha(5,2) = -0.4288$	$\alpha(5,5) = 1.8279$	$\alpha(5,6) = -0.2573$	$\alpha(5,7) = -0.0639$
$\alpha(5,8) = -0.2015$	$\alpha(5,9) = -0.1698$	$\alpha(5,10) = -0.2275$	$\alpha(5,11) = 0.2573$
$\alpha(5,12) = -0.0639$	$\alpha(5,13) = 0.2015$	$\alpha(5,14) = 0.1698$	$\alpha(5,15) = -0.2275$
$\alpha(5,17) = -0.0125$	$\alpha(5,20) = 0.0016$	$\alpha(5,22) = -0.7740$	$\alpha(5,24) = 0.0290$
$\alpha(5,25) = 0.0040$	$\alpha(5,26) = 0.0128$	$\alpha(5,27) = 0.0097$	$\alpha(5,28) = 0.0136$
$\alpha(5,29) = 0.0482$	$\alpha(5,30) = -0.0290$	$\alpha(5,31) = 0.0040$	$\alpha(5,32) = -0.0128$
$\alpha(5,33) = -0.7767$	$\alpha(5,34) = 0.6151$	$\alpha(5,35) = -0.0921$	$\alpha(5,37) = 0.0695$
$\alpha(5,39) = 0.0544$	$\alpha(5,40) = -0.0255$	$\alpha(5,41) = 0.0268$	$\alpha(6,1) = -0.1192$
$\alpha(6,2) = -0.1246$	$\alpha(6,3) = -0.0711$	$\alpha(6,4) = -0.1485$	$\alpha(6,5) = -0.2573$
$\alpha(6,6) = 1.7342$	$\alpha(6,8) = -0.0006$	$\alpha(6,9) = 0.0007$	$\alpha(6,11) = -0.1177$
$\alpha(6,13) = 0.1426$	$\alpha(6,14) = 0.2961$	$\alpha(6,16) = -0.1192$	$\alpha(6,17) = 0.1246$
$\alpha(6,18) = -0.0711$	$\alpha(6,19) = -0.1485$	$\alpha(6,20) = 0.2573$	$\alpha(6,21) = -0.5730$
$\alpha(6,22) = 0.4780$	$\alpha(6,23) = -0.2770$	$\alpha(6,24) = -0.5752$	$\alpha(6,26) = 0.5506$
$\alpha(6,27) = 0.0241$	$\alpha(6,28) = 0.0121$	$\alpha(6,29) = -0.0279$	$\alpha(6,30) = 0.0161$
$\alpha(6,31) = -0.0148$	$\alpha(6,32) = -0.0088$	$\alpha(6,33) = -0.0161$	$\alpha(6,34) = -0.0148$
$\alpha(6,35) = 0.0088$	$\alpha(6,36) = 0.5730$	$\alpha(6,37) = 0.4779$	$\alpha(6,38) = 0.2770$
$\alpha(6,39) = -0.0241$	$\alpha(6,40) = 0.0121$	$\alpha(6,41) = 0.0279$	$\alpha(6,42) = -0.0242$
$\alpha(6,43) = 0.0303$	$\alpha(6,44) = -0.0034$	$\alpha(7,1) = -0.1246$	$\alpha(7,2) = -0.0911$

$\alpha(7,3) = 0.0275$	$\alpha(7,4) = -0.2018$	$\alpha(7,5) = -0.0639$	$\alpha(7,7) = 2.1779$
$\alpha(7,10) = -0.4288$	$\alpha(7,12) = -0.1386$	$\alpha(7,15) = 0.2864$	$\alpha(7,16) = 0.1246$
$\alpha(7,17) = -0.0911$	$\alpha(7,18) = -0.0275$	$\alpha(7,19) = 0.2018$	$\alpha(7,20) = -0.0639$
$\alpha(7,21) = 0.4874$	$\alpha(7,22) = 0.9200$	$\alpha(7,23) = -0.8578$	$\alpha(7,25) = -0.5649$
$\alpha(7,27) = -0.0430$	$\alpha(7,28) = 0.0278$	$\alpha(7,29) = 0.0269$	$\alpha(7,30) = 0.0575$
$\alpha(7,31) = 0.0154$	$\alpha(7,32) = 0.0036$	$\alpha(7,33) = 0.0575$	$\alpha(7,34) = -0.0154$
$\alpha(7,35) = 0.0036$	$\alpha(7,36) = 0.4874$	$\alpha(7,37) = -0.9200$	$\alpha(7,38) = -0.8578$
$\alpha(7,39) = -0.0430$	$\alpha(7,40) = -0.0278$	$\alpha(7,41) = 0.0269$	$\alpha(7,42) = -0.0108$
$\alpha(7,43) = -0.0092$	$\alpha(7,44) = -0.0342$	$\alpha(8,1) = -0.0711$	$\alpha(8,2) = 0.0275$
$\alpha(8,3) = -0.1226$	$\alpha(8,4) = 0.1693$	$\alpha(8,5) = -0.2015$	$\alpha(8,6) = -0.0006$
$\alpha(8,8) = 2.1753$	$\alpha(8,9) = -0.4290$	$\alpha(8,11) = 0.1426$	$\alpha(8,13) = -0.0744$
$\alpha(8,14) = -0.1800$	$\alpha(8,16) = -0.0711$	$\alpha(8,17) = -0.0275$	$\alpha(8,18) = -0.1226$
$\alpha(8,19) = 0.1693$	$\alpha(8,20) = 0.2015$	$\alpha(8,21) = -0.2823$	$\alpha(8,22) = -0.8583$
$\alpha(8,23) = -0.0703$	$\alpha(8,24) = 0.5652$	$\alpha(8,26) = 1.4152$	$\alpha(8,27) = -0.0123$
$\alpha(8,28) = -0.0233$	$\alpha(8,29) = 0.0050$	$\alpha(8,30) = 0.0333$	$\alpha(8,31) = 0.0036$
$\alpha(8,32) = 0.0114$	$\alpha(8,33) = -0.0333$	$\alpha(8,34) = 0.0036$	$\alpha(8,35) = -0.0114$
$\alpha(8,36) = 0.2823$	$\alpha(8,37) = -0.8583$	$\alpha(8,38) = 0.0703$	$\alpha(8,39) = 0.0123$
$\alpha(8,40) = -0.0233$	$\alpha(8,41) = -0.0050$	$\alpha(8,42) = -0.0434$	$\alpha(8,43) = 0.0162$
$\alpha(8,44) = -0.0236$	$\alpha(9,1) = -0.1485$	$\alpha(9,2) = -0.2018$	$\alpha(9,3) = 0.1693$
$\alpha(9,4) = -0.0308$	$\alpha(9,5) = -0.1698$	$\alpha(9,6) = 0.0007$	$\alpha(9,8) = -0.4290$
$\alpha(9,9) = 1.8279$	$\alpha(9,11) = 0.2961$	$\alpha(9,13) = -0.1800$	$\alpha(9,14) = -0.3267$
$\alpha(9,16) = -0.1485$	$\alpha(9,17) = 0.2018$	$\alpha(9,18) = 0.1693$	$\alpha(9,19) = -0.0308$
$\alpha(9,20) = 0.1698$	$\alpha(9,21) = 0.4486$	$\alpha(9,22) = -0.0946$	$\alpha(9,23) = -0.7209$
$\alpha(9,24) = -0.8964$	$\alpha(9,26) = -0.5626$	$\alpha(9,27) = -0.0481$	$\alpha(9,28) = 0.0010$
$\alpha(9,29) = 0.0262$	$\alpha(9,30) = 0.0056$	$\alpha(9,31) = 0.0481$	$\alpha(9,32) = -0.0418$
$\alpha(9,33) = -0.0056$	$\alpha(9,34) = 0.0481$	$\alpha(9,35) = 0.0418$	$\alpha(9,36) = -0.4486$
$\alpha(9,37) = -0.0946$	$\alpha(9,38) = 0.7208$	$\alpha(9,39) = 0.0481$	$\alpha(9,40) = 0.0010$
$\alpha(9,41) = -0.0262$	$\alpha(9,42) = -0.0021$	$\alpha(9,43) = 0.0004$	$\alpha(9,44) = 0.0187$
$\alpha(10,1) = -0.2573$	$\alpha(10,2) = -0.0639$	$\alpha(10,3) = -0.2015$	$\alpha(10,4) = -0.1698$
$\alpha(10,5) = -0.2275$	$\alpha(10,7) = -0.4288$	$\alpha(10,10) = 1.8279$	$\alpha(10,12) = 0.2864$
$\alpha(10,15) = 0.0667$	$\alpha(10,16) = 0.2573$	$\alpha(10,17) = -0.0639$	$\alpha(10,18) = 0.2015$
$\alpha(10,19) = 0.1698$	$\alpha(10,20) = -0.2275$	$\alpha(10,21) = -0.7767$	$\alpha(10,22) = -0.6151$

α(10,23) = -0.0921	α(10,25) = -0.7740	α(10,27) = 0.0253	α(10,28) = -0.0193
α(10,29) = -0.0255	α(10,30) = 0.0097	α(10,31) = 0.0136	α(10,32) = 0.0482
α(10,33) = 0.0097	α(10,34) = -0.0136	α(10,35) = 0.0482	α(10,36) = -0.7767
α(10,37) = 0.6151	α(10,38) = -0.0921	α(10,39) = 0.0253	α(10,40) = 0.0193
α(10,41) = -0.0255	α(10,42) = 0.0544	α(10,43) = -0.0255	α(10,44) = 0.0268
α(11,1) = -0.1192	α(11,2) = 0.1246	α(11,3) = -0.0711	α(11,4) = -0.1485
α(11,5) = 0.2573	α(11,6) = -0.1177	α(11,8) = 0.1426	α(11,9) = 0.2961
α(11,11) = 1.7342	α(11,13) = -0.0006	α(11,14) = 0.0007	α(11,16) = -0.1192
α(11,17) = -0.1246	α(11,18) = -0.0711	α(11,19) = -0.1485	α(11,20) = -0.2573
α(11,21) = -0.5730	α(11,22) = -0.4779	α(11,23) = -0.2770	α(11,24) = 0.0161
α(11,25) = 0.0148	α(11,26) = -0.0088	α(11,27) = -0.5730	α(11,28) = 0.4780
α(11,29) = -0.2770	α(11,30) = -0.5752	α(11,32) = 0.5506	α(11,33) = 0.5752
α(11,35) = -0.5506	α(11,36) = 0.5730	α(11,37) = -0.4780	α(11,38) = 0.2770
α(11,39) = 0.5730	α(11,40) = 0.4779	α(11,41) = 0.2770	α(11,42) = -0.0161
α(11,44) = -0.0173	α(12,1) = 0.1246	α(12,2) = -0.0911	α(12,3) = -0.0275
α(12,4) = 0.2018	α(12,5) = -0.0639	α(12,7) = -0.1386	α(12,10) = 0.2864
α(12,12) = 2.1779	α(12,15) = -0.4288	α(12,16) = -0.1246	α(12,17) = -0.0911
α(12,18) = 0.0275	α(12,19) = -0.2018	α(12,20) = -0.0639	α(12,21) = -0.4874
α(12,22) = 0.9200	α(12,23) = 0.8578	α(12,24) = -0.0575	α(12,25) = 0.0154
α(12,26) = -0.0036	α(12,27) = 0.4874	α(12,28) = 0.9200	α(12,29) = -0.8578
α(12,31) = -0.5649	α(12,34) = 0.5649	α(12,36) = -0.4874	α(12,37) = -0.9200
α(12,38) = 0.8578	α(12,39) = 0.4874	α(12,40) = -0.9200	α(12,41) = -0.8578
α(12,43) = -0.0092	α(13,1) = -0.0711	α(13,2) = -0.0275	α(13,3) = -0.1226
α(13,4) = 0.1693	α(13,5) = 0.2015	α(13,6) = 0.1426	α(13,8) = -0.0744
α(13,9) = -0.1800	α(13,11) = -0.0006	α(13,13) = 2.1753	α(13,14) = -0.4290
α(13,16) = -0.0711	α(13,17) = 0.0275	α(13,18) = -0.1226	α(13,19) = 0.1693
α(13,20) = -0.2015	α(13,21) = -0.2823	α(13,22) = 0.8583	α(13,23) = -0.0703
α(13,24) = 0.0333	α(13,25) = -0.0036	α(13,26) = 0.0114	α(13,27) = -0.2823
α(13,28) = -0.8583	α(13,29) = -0.0703	α(13,30) = 0.5652	α(13,32) = 1.4152
α(13,33) = -0.5652	α(13,35) = -1.4152	α(13,36) = 0.2823	α(13,37) = 0.8583
α(13,38) = 0.0703	α(13,39) = 0.2823	α(13,40) = -0.8583	α(13,41) = 0.0703
α(13,42) = 0.0665	α(13,44) = -0.0176	α(14,1) = -0.1485	α(14,2) = 0.2018

α(14,3) = 0.1693	α(14,4) = -0.0308	α(14,5) = 0.1698	α(14,6) = 0.2961
α(14,8) = -0.1800	α(14,9) = -0.3267	α(14,11) = 0.0007	α(14,13) = -0.4290
α(14,14) = 1.8279	α(14,16) = -0.1485	α(14,17) = -0.2018	α(14,18) = 0.1693
α(14,19) = -0.0308	α(14,20) = -0.1698	α(14,21) = 0.4486	α(14,22) = 0.0946
α(14,23) = -0.7208	α(14,24) = 0.0056	α(14,25) = -0.0481	α(14,26) = -0.0418
α(14,27) = 0.4486	α(14,28) = -0.0946	α(14,29) = -0.7209	α(14,30) = -0.8964
α(14,32) = -0.5626	α(14,33) = 0.8964	α(14,35) = 0.5626	α(14,36) = -0.4486
α(14,37) = 0.0946	α(14,38) = 0.7209	α(14,39) = -0.4486	α(14,40) = -0.0946
α(14,41) = 0.7208	α(14,42) = 0.0110	α(14,44) = -0.0413	α(15,1) = 0.2573
α(15,2) = -0.0639	α(15,3) = 0.2015	α(15,4) = 0.1698	α(15,5) = -0.2275
α(15,7) = 0.2864	α(15,10) = 0.0667	α(15,12) = -0.4288	α(15,15) = 1.8279
α(15,16) = -0.2573	α(15,17) = -0.0639	α(15,18) = -0.2015	α(15,19) = -0.1698
α(15,20) = -0.2275	α(15,21) = 0.7767	α(15,22) = -0.6151	α(15,23) = 0.0921
α(15,24) = -0.0097	α(15,25) = 0.0136	α(15,26) = -0.0482	α(15,27) = -0.7767
α(15,28) = -0.6151	α(15,29) = -0.0921	α(15,31) = -0.7740	α(15,34) = 0.7740
α(15,36) = 0.7767	α(15,37) = 0.6151	α(15,38) = 0.0921	α(15,39) = -0.7767
α(15,40) = 0.6151	α(15,41) = -0.0921	α(15,43) = 0.0695	α(16,1) = -0.0114
α(16,3) = 0.0032	α(16,4) = -0.0107	α(16,6) = -0.1192	α(16,7) = 0.1246
α(16,8) = -0.0711	α(16,9) = -0.1485	α(16,10) = 0.2573	α(16,11) = -0.1192
α(16,12) = -0.1246	α(16,13) = -0.0711	α(16,14) = -0.1485	α(16,15) = -0.2573
α(16,16) = 1.7342	α(16,18) = -0.0006	α(16,19) = 0.0007	α(16,21) = 0.0161
α(16,23) = 0.0173	α(16,24) = -0.5730	α(16,25) = -0.4779	α(16,26) = -0.2770
α(16,27) = 0.0242	α(16,28) = 0.0303	α(16,29) = 0.0034	α(16,30) = -0.5730
α(16,31) = 0.4780	α(16,32) = -0.2770	α(16,33) = -0.0244	α(16,34) = -0.0181
α(16,35) = -0.0246	α(16,36) = 0.5752	α(16,38) = -0.5506	α(16,39) = -0.0161
α(16,40) = -0.0148	α(16,41) = 0.0088	α(16,42) = 0.5730	α(16,43) = 0.4779
α(16,44) = 0.2770	α(17,2) = -0.0151	α(17,5) = -0.0125	α(17,6) = 0.1246
α(17,7) = -0.0911	α(17,8) = -0.0275	α(17,9) = 0.2018	α(17,10) = -0.0639
α(17,11) = -0.1246	α(17,12) = -0.0911	α(17,13) = 0.0275	α(17,14) = -0.2018
α(17,15) = -0.0639	α(17,17) = 2.1779	α(17,20) = -0.4288	α(17,22) = 0.0092
α(17,24) = -0.4874	α(17,25) = 0.9200	α(17,26) = 0.8578	α(17,27) = -0.0108
α(17,28) = 0.0092	α(17,29) = -0.0342	α(17,30) = 0.4874	α(17,31) = 0.9200

$\alpha(17,32) = -0.8578$	$\alpha(17,33) = -0.0322$	$\alpha(17,34) = -0.0122$	$\alpha(17,35) = -0.0145$
$\alpha(17,37) = 0.5649$	$\alpha(17,39) = 0.0575$	$\alpha(17,40) = -0.0154$	$\alpha(17,41) = 0.0036$
$\alpha(17,42) = 0.4874$	$\alpha(17,43) = -0.9200$	$\alpha(17,44) = -0.8578$	$\alpha(18,1) = 0.0032$
$\alpha(18,3) = -0.0105$	$\alpha(18,4) = 0.0100$	$\alpha(18,6) = -0.0711$	$\alpha(18,7) = -0.0275$
$\alpha(18,8) = -0.1226$	$\alpha(18,9) = 0.1693$	$\alpha(18,10) = 0.2015$	$\alpha(18,11) = -0.0711$
$\alpha(18,12) = 0.0275$	$\alpha(18,13) = -0.1226$	$\alpha(18,14) = 0.1693$	$\alpha(18,15) = -0.2015$
$\alpha(18,16) = -0.0006$	$\alpha(18,18) = 2.1753$	$\alpha(18,19) = -0.4290$	$\alpha(18,21) = -0.0665$
$\alpha(18,23) = 0.0176$	$\alpha(18,24) = -0.2823$	$\alpha(18,25) = 0.8583$	$\alpha(18,26) = -0.0703$
$\alpha(18,27) = 0.0434$	$\alpha(18,28) = 0.0162$	$\alpha(18,29) = 0.0236$	$\alpha(18,30) = -0.2823$
$\alpha(18,31) = -0.8583$	$\alpha(18,32) = -0.0703$	$\alpha(18,33) = 0.0310$	$\alpha(18,34) = 0.0359$
$\alpha(18,35) = -0.0205$	$\alpha(18,36) = -0.5652$	$\alpha(18,38) = -1.4152$	$\alpha(18,39) = -0.0333$
$\alpha(18,40) = 0.0036$	$\alpha(18,41) = -0.0114$	$\alpha(18,42) = 0.2823$	$\alpha(18,43) = -0.8583$
$\alpha(18,44) = 0.0703$	$\alpha(19,1) = -0.0107$	$\alpha(19,3) = 0.0100$	$\alpha(19,4) = 0.0122$
$\alpha(19,6) = -0.1485$	$\alpha(19,7) = 0.2018$	$\alpha(19,8) = 0.1693$	$\alpha(19,9) = -0.0308$
$\alpha(19,10) = 0.1698$	$\alpha(19,11) = -0.1485$	$\alpha(19,12) = -0.2018$	$\alpha(19,13) = 0.1693$
$\alpha(19,14) = -0.0308$	$\alpha(19,15) = -0.1698$	$\alpha(19,16) = 0.0007$	$\alpha(19,18) = -0.4290$
$\alpha(19,19) = 1.8279$	$\alpha(19,21) = -0.0110$	$\alpha(19,23) = 0.0413$	$\alpha(19,24) = 0.4486$
$\alpha(19,25) = 0.0946$	$\alpha(19,26) = -0.7208$	$\alpha(19,27) = 0.0021$	$\alpha(19,28) = 0.0004$
$\alpha(19,29) = -0.0187$	$\alpha(19,30) = 0.4486$	$\alpha(19,31) = -0.0946$	$\alpha(19,32) = -0.7209$
$\alpha(19,33) = -0.0460$	$\alpha(19,34) = -0.0389$	$\alpha(19,35) = -0.0027$	$\alpha(19,36) = 0.8964$
$\alpha(19,38) = 0.5626$	$\alpha(19,39) = -0.0056$	$\alpha(19,40) = 0.0481$	$\alpha(19,41) = 0.0418$
$\alpha(19,42) = -0.4486$	$\alpha(19,43) = -0.0946$	$\alpha(19,44) = 0.7208$	$\alpha(20,2) = -0.0125$
$\alpha(20,5) = 0.0016$	$\alpha(20,6) = 0.2573$	$\alpha(20,7) = -0.0639$	$\alpha(20,8) = 0.2015$
$\alpha(20,9) = 0.1698$	$\alpha(20,10) = -0.2275$	$\alpha(20,11) = -0.2573$	$\alpha(20,12) = -0.0639$
$\alpha(20,13) = -0.2015$	$\alpha(20,14) = -0.1698$	$\alpha(20,15) = -0.2275$	$\alpha(20,17) = -0.4288$
$\alpha(20,20) = 1.8279$	$\alpha(20,22) = -0.0695$	$\alpha(20,24) = 0.7767$	$\alpha(20,25) = -0.6151$
$\alpha(20,26) = 0.0921$	$\alpha(20,27) = 0.0544$	$\alpha(20,28) = 0.0255$	$\alpha(20,29) = 0.0268$
$\alpha(20,30) = -0.7767$	$\alpha(20,31) = -0.6151$	$\alpha(20,32) = -0.0921$	$\alpha(20,33) = -0.0290$
$\alpha(20,34) = -0.0040$	$\alpha(20,35) = -0.0128$	$\alpha(20,37) = 0.7740$	$\alpha(20,39) = 0.0097$
$\alpha(20,40) = -0.0136$	$\alpha(20,41) = 0.0482$	$\alpha(20,42) = -0.7767$	$\alpha(20,43) = 0.6151$
$\alpha(20,44) = -0.0921$	$\alpha(21,1) = -0.5752$	$\alpha(21,3) = 0.5652$	$\alpha(21,4) = -0.8964$
$\alpha(21,6) = -0.5730$	$\alpha(21,7) = 0.4874$	$\alpha(21,8) = -0.2823$	$\alpha(21,9) = 0.4486$

$\alpha(21,10) = -0.7767$	$\alpha(21,11) = -0.5730$	$\alpha(21,12) = -0.4874$	$\alpha(21,13) = -0.2823$
$\alpha(21,14) = 0.4486$	$\alpha(21,15) = 0.7767$	$\alpha(21,16) = 0.0161$	$\alpha(21,18) = -0.0665$
$\alpha(21,19) = -0.0110$	$\alpha(21,21) = -1.9869$	$\alpha(21,23) = 0.0009$	$\alpha(21,24) = -0.1225$
$\alpha(21,25) = 0.0091$	$\alpha(21,26) = -0.1030$	$\alpha(21,27) = -0.1224$	$\alpha(21,28) = -0.0945$
$\alpha(21,29) = 0.0435$	$\alpha(21,30) = -0.1225$	$\alpha(21,31) = -0.0091$	$\alpha(21,32) = -0.1030$
$\alpha(21,33) = 0.4621$	$\alpha(21,34) = -0.3252$	$\alpha(21,35) = 0.1872$	$\alpha(21,36) = 0.4608$
$\alpha(21,38) = -0.3753$	$\alpha(21,39) = -0.0690$	$\alpha(21,40) = -0.0633$	$\alpha(21,41) = -0.0369$
$\alpha(21,42) = -0.0198$	$\alpha(21,43) = 0.0059$	$\alpha(21,44) = -0.0035$	$\alpha(22,2) = -0.5649$
$\alpha(22,5) = -0.7740$	$\alpha(22,6) = 0.4780$	$\alpha(22,7) = 0.9200$	$\alpha(22,8) = -0.8583$
$\alpha(22,9) = -0.0946$	$\alpha(22,10) = -0.6151$	$\alpha(22,11) = -0.4779$	$\alpha(22,12) = 0.9200$
$\alpha(22,13) = 0.8583$	$\alpha(22,14) = 0.0946$	$\alpha(22,15) = -0.6151$	$\alpha(22,17) = 0.0092$
$\alpha(22,20) = -0.0695$	$\alpha(22,22) = -1.9694$	$\alpha(22,24) = -0.0853$	$\alpha(22,25) = 0.0965$
$\alpha(22,26) = -0.3807$	$\alpha(22,27) = 0.0945$	$\alpha(22,28) = 0.6012$	$\alpha(22,29) = -0.0890$
$\alpha(22,30) = 0.0853$	$\alpha(22,31) = 0.0965$	$\alpha(22,32) = 0.3807$	$\alpha(22,33) = -0.3252$
$\alpha(22,34) = 0.1264$	$\alpha(22,35) = -0.1603$	$\alpha(22,37) = -0.1509$	$\alpha(22,39) = -0.0633$
$\alpha(22,40) = -0.0629$	$\alpha(22,41) = 0.0376$	$\alpha(22,42) = 0.0059$	$\alpha(22,43) = -0.0180$
$\alpha(22,44) = -0.0082$	$\alpha(23,1) = 0.5506$	$\alpha(23,3) = 1.4152$	$\alpha(23,4) = -0.5626$
$\alpha(23,6) = -0.2770$	$\alpha(23,7) = -0.8578$	$\alpha(23,8) = -0.0703$	$\alpha(23,9) = -0.7209$
$\alpha(23,10) = -0.0921$	$\alpha(23,11) = -0.2770$	$\alpha(23,12) = 0.8578$	$\alpha(23,13) = -0.0703$
$\alpha(23,14) = -0.7208$	$\alpha(23,15) = 0.0921$	$\alpha(23,16) = 0.0173$	$\alpha(23,18) = 0.0176$
$\alpha(23,19) = 0.0413$	$\alpha(23,21) = 0.0009$	$\alpha(23,23) = -1.9696$	$\alpha(23,24) = 0.0606$
$\alpha(23,25) = -0.2026$	$\alpha(23,26) = 0.4331$	$\alpha(23,27) = 0.0435$	$\alpha(23,28) = 0.0890$
$\alpha(23,29) = -0.0720$	$\alpha(23,30) = 0.0606$	$\alpha(23,31) = 0.2026$	$\alpha(23,32) = 0.4331$
$\alpha(23,33) = 0.1872$	$\alpha(23,34) = -0.1603$	$\alpha(23,35) = -0.0593$	$\alpha(23,36) = -0.3753$
$\alpha(23,38) = 0.2203$	$\alpha(23,39) = -0.0369$	$\alpha(23,40) = 0.0376$	$\alpha(23,41) = -0.1052$
$\alpha(23,42) = -0.0035$	$\alpha(23,43) = -0.0082$	$\alpha(23,44) = 0.0112$	$\alpha(24,1) = 0.0244$
$\alpha(24,2) = 0.0322$	$\alpha(24,3) = -0.0310$	$\alpha(24,4) = 0.0460$	$\alpha(24,5) = 0.0290$
$\alpha(24,6) = -0.5752$	$\alpha(24,8) = 0.5652$	$\alpha(24,9) = -0.8964$	$\alpha(24,11) = 0.0161$
$\alpha(24,12) = -0.0575$	$\alpha(24,13) = 0.0333$	$\alpha(24,14) = 0.0056$	$\alpha(24,15) = -0.0097$
$\alpha(24,16) = -0.5730$	$\alpha(24,17) = -0.4874$	$\alpha(24,18) = -0.2823$	$\alpha(24,19) = 0.4486$
$\alpha(24,20) = 0.7767$	$\alpha(24,21) = -0.1225$	$\alpha(24,22) = -0.0853$	$\alpha(24,23) = 0.0606$
$\alpha(24,24) = -1.9869$	$\alpha(24,26) = 0.0009$	$\alpha(24,27) = 0.0004$	$\alpha(24,28) = -0.0063$

$\alpha(24,29) = 0.0036$	$\alpha(24,30) = -0.1224$	$\alpha(24,31) = -0.0945$	$\alpha(24,32) = 0.0435$
$\alpha(24,33) = -0.0198$	$\alpha(24,34) = -0.0060$	$\alpha(24,35) = -0.0033$	$\alpha(24,36) = 0.4621$
$\alpha(24,37) = -0.3252$	$\alpha(24,38) = 0.1872$	$\alpha(24,39) = -0.0198$	$\alpha(24,40) = -0.0002$
$\alpha(24,41) = 0.0069$	$\alpha(24,42) = -0.0690$	$\alpha(24,43) = -0.0633$	$\alpha(24,44) = -0.0369$
$\alpha(25,1) = 0.0181$	$\alpha(25,2) = 0.0122$	$\alpha(25,3) = -0.0359$	$\alpha(25,4) = 0.0389$
$\alpha(25,5) = 0.0040$	$\alpha(25,7) = -0.5649$	$\alpha(25,10) = -0.7740$	$\alpha(25,11) = 0.0148$
$\alpha(25,12) = 0.0154$	$\alpha(25,13) = -0.0036$	$\alpha(25,14) = -0.0481$	$\alpha(25,15) = 0.0136$
$\alpha(25,16) = -0.4779$	$\alpha(25,17) = 0.9200$	$\alpha(25,18) = 0.8583$	$\alpha(25,19) = 0.0946$
$\alpha(25,20) = -0.6151$	$\alpha(25,21) = 0.0091$	$\alpha(25,22) = 0.0965$	$\alpha(25,23) = -0.2026$
$\alpha(25,25) = -1.9694$	$\alpha(25,27) = -0.0128$	$\alpha(25,28) = -0.0011$	$\alpha(25,29) = -0.0081$
$\alpha(25,30) = 0.0945$	$\alpha(25,31) = 0.6012$	$\alpha(25,32) = -0.0890$	$\alpha(25,33) = -0.0060$
$\alpha(25,34) = 0.0110$	$\alpha(25,35) = -0.0085$	$\alpha(25,36) = -0.3252$	$\alpha(25,37) = 0.1264$
$\alpha(25,38) = -0.1603$	$\alpha(25,39) = -0.0002$	$\alpha(25,40) = -0.0032$	$\alpha(25,41) = -0.0167$
$\alpha(25,42) = -0.0633$	$\alpha(25,43) = -0.0629$	$\alpha(25,44) = 0.0376$	$\alpha(26,1) = 0.0246$
$\alpha(26,2) = 0.0145$	$\alpha(26,3) = 0.0205$	$\alpha(26,4) = 0.0027$	$\alpha(26,5) = 0.0128$
$\alpha(26,6) = 0.5506$	$\alpha(26,8) = 1.4152$	$\alpha(26,9) = -0.5626$	$\alpha(26,11) = -0.0088$
$\alpha(26,12) = -0.0036$	$\alpha(26,13) = 0.0114$	$\alpha(26,14) = -0.0418$	$\alpha(26,15) = -0.0482$
$\alpha(26,16) = -0.2770$	$\alpha(26,17) = 0.8578$	$\alpha(26,18) = -0.0703$	$\alpha(26,19) = -0.7208$
$\alpha(26,20) = 0.0921$	$\alpha(26,21) = -0.1030$	$\alpha(26,22) = -0.3807$	$\alpha(26,23) = 0.4331$
$\alpha(26,24) = 0.0009$	$\alpha(26,26) = -1.9696$	$\alpha(26,27) = 0.0074$	$\alpha(26,28) = -0.0081$
$\alpha(26,29) = -0.0104$	$\alpha(26,30) = 0.0435$	$\alpha(26,31) = 0.0890$	$\alpha(26,32) = -0.0720$
$\alpha(26,33) = -0.0033$	$\alpha(26,34) = -0.0085$	$\alpha(26,35) = -0.0178$	$\alpha(26,36) = 0.1872$
$\alpha(26,37) = -0.1603$	$\alpha(26,38) = -0.0593$	$\alpha(26,39) = 0.0069$	$\alpha(26,40) = -0.0167$
$\alpha(26,41) = -0.0036$	$\alpha(26,42) = -0.0369$	$\alpha(26,43) = 0.0376$	$\alpha(26,44) = -0.1052$
$\alpha(27,1) = 0.0161$	$\alpha(27,2) = 0.0575$	$\alpha(27,3) = 0.0333$	$\alpha(27,4) = 0.0056$
$\alpha(27,5) = 0.0097$	$\alpha(27,6) = 0.0241$	$\alpha(27,7) = -0.0430$	$\alpha(27,8) = -0.0123$
$\alpha(27,9) = -0.0481$	$\alpha(27,10) = 0.0253$	$\alpha(27,11) = -0.5730$	$\alpha(27,12) = 0.4874$
$\alpha(27,13) = -0.2823$	$\alpha(27,14) = 0.4486$	$\alpha(27,15) = -0.7767$	$\alpha(27,16) = 0.0242$
$\alpha(27,17) = -0.0108$	$\alpha(27,18) = 0.0434$	$\alpha(27,19) = 0.0021$	$\alpha(27,20) = 0.0544$
$\alpha(27,21) = -0.1224$	$\alpha(27,22) = 0.0945$	$\alpha(27,23) = 0.0435$	$\alpha(27,24) = 0.0004$
$\alpha(27,25) = -0.0128$	$\alpha(27,26) = 0.0074$	$\alpha(27,27) = -1.9869$	$\alpha(27,29) = 0.0009$
$\alpha(27,30) = -0.1225$	$\alpha(27,31) = 0.0091$	$\alpha(27,32) = -0.1030$	$\alpha(27,33) = 0.4621$

$\alpha(27,34) = 0.3252$	$\alpha(27,35) = 0.1872$	$\alpha(27,36) = -0.0690$	$\alpha(27,37) = 0.0633$
$\alpha(27,38) = -0.0369$	$\alpha(27,39) = 0.4608$	$\alpha(27,41) = -0.3753$	$\alpha(27,42) = -0.0198$
$\alpha(27,43) = -0.0059$	$\alpha(27,44) = -0.0035$	$\alpha(28,1) = -0.0148$	$\alpha(28,2) = 0.0154$
$\alpha(28,3) = 0.0036$	$\alpha(28,4) = 0.0481$	$\alpha(28,5) = 0.0136$	$\alpha(28,6) = 0.0121$
$\alpha(28,7) = 0.0278$	$\alpha(28,8) = -0.0233$	$\alpha(28,9) = 0.0010$	$\alpha(28,10) = -0.0193$
$\alpha(28,11) = 0.4780$	$\alpha(28,12) = 0.9200$	$\alpha(28,13) = -0.8583$	$\alpha(28,14) = -0.0946$
$\alpha(28,15) = -0.6151$	$\alpha(28,16) = 0.0303$	$\alpha(28,17) = 0.0092$	$\alpha(28,18) = 0.0162$
$\alpha(28,19) = 0.0004$	$\alpha(28,20) = 0.0255$	$\alpha(28,21) = -0.0945$	$\alpha(28,22) = 0.6012$
$\alpha(28,23) = 0.0890$	$\alpha(28,24) = -0.0063$	$\alpha(28,25) = -0.0011$	$\alpha(28,26) = -0.0081$
$\alpha(28,28) = -1.9694$	$\alpha(28,30) = -0.0853$	$\alpha(28,31) = 0.0965$	$\alpha(28,32) = -0.3807$
$\alpha(28,33) = 0.3252$	$\alpha(28,34) = 0.1264$	$\alpha(28,35) = 0.1603$	$\alpha(28,36) = 0.0633$
$\alpha(28,37) = -0.0629$	$\alpha(28,38) = -0.0376$	$\alpha(28,40) = -0.1509$	$\alpha(28,42) = -0.0059$
$\alpha(28,43) = -0.0180$	$\alpha(28,44) = 0.0082$	$\alpha(29,1) = -0.0088$	$\alpha(29,2) = 0.0036$
$\alpha(29,3) = 0.0114$	$\alpha(29,4) = -0.0418$	$\alpha(29,5) = 0.0482$	$\alpha(29,6) = -0.0279$
$\alpha(29,7) = 0.0269$	$\alpha(29,8) = 0.0050$	$\alpha(29,9) = 0.0262$	$\alpha(29,10) = -0.0255$
$\alpha(29,11) = -0.2770$	$\alpha(29,12) = -0.8578$	$\alpha(29,13) = -0.0703$	$\alpha(29,14) = -0.7209$
$\alpha(29,15) = -0.0921$	$\alpha(29,16) = 0.0034$	$\alpha(29,17) = -0.0342$	$\alpha(29,18) = 0.0236$
$\alpha(29,19) = -0.0187$	$\alpha(29,20) = 0.0268$	$\alpha(29,21) = 0.0435$	$\alpha(29,22) = -0.0890$
$\alpha(29,23) = -0.0720$	$\alpha(29,24) = 0.0036$	$\alpha(29,25) = -0.0081$	$\alpha(29,26) = -0.0104$
$\alpha(29,27) = 0.0009$	$\alpha(29,29) = -1.9696$	$\alpha(29,30) = 0.0606$	$\alpha(29,31) = -0.2026$
$\alpha(29,32) = 0.4331$	$\alpha(29,33) = 0.1872$	$\alpha(29,34) = 0.1603$	$\alpha(29,35) = -0.0593$
$\alpha(29,36) = -0.0369$	$\alpha(29,37) = -0.0376$	$\alpha(29,38) = -0.1052$	$\alpha(29,39) = -0.3753$
$\alpha(29,41) = 0.2203$	$\alpha(29,42) = -0.0035$	$\alpha(29,43) = 0.0082$	$\alpha(29,44) = 0.0112$
$\alpha(30,1) = 0.0244$	$\alpha(30,2) = -0.0322$	$\alpha(30,3) = -0.0310$	$\alpha(30,4) = 0.0460$
$\alpha(30,5) = -0.0290$	$\alpha(30,6) = 0.0161$	$\alpha(30,7) = 0.0575$	$\alpha(30,8) = 0.0333$
$\alpha(30,9) = 0.0056$	$\alpha(30,10) = 0.0097$	$\alpha(30,11) = -0.5752$	$\alpha(30,13) = 0.5652$
$\alpha(30,14) = -0.8964$	$\alpha(30,16) = -0.5730$	$\alpha(30,17) = 0.4874$	$\alpha(30,18) = -0.2823$
$\alpha(30,19) = 0.4486$	$\alpha(30,20) = -0.7767$	$\alpha(30,21) = -0.1225$	$\alpha(30,22) = 0.0853$
$\alpha(30,23) = 0.0606$	$\alpha(30,24) = -0.1224$	$\alpha(30,25) = 0.0945$	$\alpha(30,26) = 0.0435$
$\alpha(30,27) = -0.1225$	$\alpha(30,28) = -0.0853$	$\alpha(30,29) = 0.0606$	$\alpha(30,30) = -1.9869$
$\alpha(30,32) = 0.0009$	$\alpha(30,33) = -0.0687$	$\alpha(30,35) = 0.0729$	$\alpha(30,36) = 0.4621$
$\alpha(30,37) = 0.3252$	$\alpha(30,38) = 0.1872$	$\alpha(30,39) = 0.4621$	$\alpha(30,40) = -0.3252$

$\alpha(30,41) = 0.1872$	$\alpha(30,42) = 0.4608$	$\alpha(30,44) = -0.3753$	$\alpha(31,1) = -0.0181$
$\alpha(31,2) = 0.0122$	$\alpha(31,3) = 0.0359$	$\alpha(31,4) = -0.0389$	$\alpha(31,5) = 0.0040$
$\alpha(31,6) = -0.0148$	$\alpha(31,7) = 0.0154$	$\alpha(31,8) = 0.0036$	$\alpha(31,9) = 0.0481$
$\alpha(31,10) = 0.0136$	$\alpha(31,12) = -0.5649$	$\alpha(31,15) = -0.7740$	$\alpha(31,16) = 0.4780$
$\alpha(31,17) = 0.9200$	$\alpha(31,18) = -0.8583$	$\alpha(31,19) = -0.0946$	$\alpha(31,20) = -0.6151$
$\alpha(31,21) = -0.0091$	$\alpha(31,22) = 0.0965$	$\alpha(31,23) = 0.2026$	$\alpha(31,24) = -0.0945$
$\alpha(31,25) = 0.6012$	$\alpha(31,26) = 0.0890$	$\alpha(31,27) = 0.0091$	$\alpha(31,28) = 0.0965$
$\alpha(31,29) = -0.2026$	$\alpha(31,31) = -1.9694$	$\alpha(31,34) = -0.1264$	$\alpha(31,36) = 0.3252$
$\alpha(31,37) = 0.1264$	$\alpha(31,38) = 0.1603$	$\alpha(31,39) = -0.3252$	$\alpha(31,40) = 0.1264$
$\alpha(31,41) = -0.1603$	$\alpha(31,43) = -0.1509$	$\alpha(32,1) = 0.0246$	$\alpha(32,2) = -0.0145$
$\alpha(32,3) = 0.0205$	$\alpha(32,4) = 0.0027$	$\alpha(32,5) = -0.0128$	$\alpha(32,6) = -0.0088$
$\alpha(32,7) = 0.0036$	$\alpha(32,8) = 0.0114$	$\alpha(32,9) = -0.0418$	$\alpha(32,10) = 0.0482$
$\alpha(32,11) = 0.5506$	$\alpha(32,13) = 1.4152$	$\alpha(32,14) = -0.5626$	$\alpha(32,16) = -0.2770$
$\alpha(32,17) = -0.8578$	$\alpha(32,18) = -0.0703$	$\alpha(32,19) = -0.7209$	$\alpha(32,20) = -0.0921$
$\alpha(32,21) = -0.1030$	$\alpha(32,22) = 0.3807$	$\alpha(32,23) = 0.4331$	$\alpha(32,24) = 0.0435$
$\alpha(32,25) = -0.0890$	$\alpha(32,26) = -0.0720$	$\alpha(32,27) = -0.1030$	$\alpha(32,28) = -0.3807$
$\alpha(32,29) = 0.4331$	$\alpha(32,30) = 0.0009$	$\alpha(32,32) = -1.9696$	$\alpha(32,33) = 0.0729$
$\alpha(32,35) = -0.0415$	$\alpha(32,36) = 0.1872$	$\alpha(32,37) = 0.1603$	$\alpha(32,38) = -0.0593$
$\alpha(32,39) = 0.1872$	$\alpha(32,40) = -0.1603$	$\alpha(32,41) = -0.0593$	$\alpha(32,42) = -0.3753$
$\alpha(32,44) = 0.2203$	$\alpha(33,1) = 0.5730$	$\alpha(33,2) = 0.4874$	$\alpha(33,3) = 0.2823$
$\alpha(33,4) = -0.4486$	$\alpha(33,5) = -0.7767$	$\alpha(33,6) = -0.0161$	$\alpha(33,7) = 0.0575$
$\alpha(33,8) = -0.0333$	$\alpha(33,9) = -0.0056$	$\alpha(33,10) = 0.0097$	$\alpha(33,11) = 0.5752$
$\alpha(33,13) = -0.5652$	$\alpha(33,14) = 0.8964$	$\alpha(33,16) = -0.0244$	$\alpha(33,17) = -0.0322$
$\alpha(33,18) = 0.0310$	$\alpha(33,19) = -0.0460$	$\alpha(33,20) = -0.0290$	$\alpha(33,21) = 0.4621$
$\alpha(33,22) = -0.3252$	$\alpha(33,23) = 0.1872$	$\alpha(33,24) = -0.0198$	$\alpha(33,25) = -0.0060$
$\alpha(33,26) = -0.0033$	$\alpha(33,27) = 0.4621$	$\alpha(33,28) = 0.3252$	$\alpha(33,29) = 0.1872$
$\alpha(33,30) = -0.0687$	$\alpha(33,32) = 0.0729$	$\alpha(33,33) = -1.9869$	$\alpha(33,35) = 0.0009$
$\alpha(33,36) = -0.1225$	$\alpha(33,37) = -0.0853$	$\alpha(33,38) = 0.0606$	$\alpha(33,39) = -0.1225$
$\alpha(33,40) = 0.0853$	$\alpha(33,41) = 0.0606$	$\alpha(33,42) = 0.0003$	$\alpha(33,44) = -0.0148$
$\alpha(34,1) = 0.4779$	$\alpha(34,2) = -0.9200$	$\alpha(34,3) = -0.8583$	$\alpha(34,4) = -0.0946$
$\alpha(34,5) = 0.6151$	$\alpha(34,6) = -0.0148$	$\alpha(34,7) = -0.0154$	$\alpha(34,8) = 0.0036$
$\alpha(34,9) = 0.0481$	$\alpha(34,10) = -0.0136$	$\alpha(34,12) = 0.5649$	$\alpha(34,15) = 0.7740$

$\alpha(34,16) = -0.0181$	$\alpha(34,17) = -0.0122$	$\alpha(34,18) = 0.0359$	$\alpha(34,19) = -0.0389$
$\alpha(34,20) = -0.0040$	$\alpha(34,21) = -0.3252$	$\alpha(34,22) = 0.1264$	$\alpha(34,23) = -0.1603$
$\alpha(34,24) = -0.0060$	$\alpha(34,25) = 0.0110$	$\alpha(34,26) = -0.0085$	$\alpha(34,27) = 0.3252$
$\alpha(34,28) = 0.1264$	$\alpha(34,29) = 0.1603$	$\alpha(34,31) = -0.1264$	$\alpha(34,34) = -1.9694$
$\alpha(34,36) = 0.0091$	$\alpha(34,37) = 0.0965$	$\alpha(34,38) = -0.2026$	$\alpha(34,39) = -0.0091$
$\alpha(34,40) = 0.0965$	$\alpha(34,41) = 0.2026$	$\alpha(34,43) = -0.0151$	$\alpha(35,1) = 0.2770$
$\alpha(35,2) = -0.8578$	$\alpha(35,3) = 0.0703$	$\alpha(35,4) = 0.7208$	$\alpha(35,5) = -0.0921$
$\alpha(35,6) = 0.0088$	$\alpha(35,7) = 0.0036$	$\alpha(35,8) = -0.0114$	$\alpha(35,9) = 0.0418$
$\alpha(35,10) = 0.0482$	$\alpha(35,11) = -0.5506$	$\alpha(35,13) = -1.4152$	$\alpha(35,14) = 0.5626$
$\alpha(35,16) = -0.0246$	$\alpha(35,17) = -0.0145$	$\alpha(35,18) = -0.0205$	$\alpha(35,19) = -0.0027$
$\alpha(35,20) = -0.0128$	$\alpha(35,21) = 0.1872$	$\alpha(35,22) = -0.1603$	$\alpha(35,23) = -0.0593$
$\alpha(35,24) = -0.0033$	$\alpha(35,25) = -0.0085$	$\alpha(35,26) = -0.0178$	$\alpha(35,27) = 0.1872$
$\alpha(35,28) = 0.1603$	$\alpha(35,29) = -0.0593$	$\alpha(35,30) = 0.0729$	$\alpha(35,32) = -0.0415$
$\alpha(35,33) = 0.0009$	$\alpha(35,35) = -1.9696$	$\alpha(35,36) = -0.1030$	$\alpha(35,37) = -0.3807$
$\alpha(35,38) = 0.4331$	$\alpha(35,39) = -0.1030$	$\alpha(35,40) = 0.3807$	$\alpha(35,41) = 0.4331$
$\alpha(35,42) = -0.0073$	$\alpha(35,44) = 0.0036$	$\alpha(36,1) = -0.0161$	$\alpha(36,3) = 0.0665$
$\alpha(36,4) = 0.0110$	$\alpha(36,6) = 0.5730$	$\alpha(36,7) = 0.4874$	$\alpha(36,8) = 0.2823$
$\alpha(36,9) = -0.4486$	$\alpha(36,10) = -0.7767$	$\alpha(36,11) = 0.5730$	$\alpha(36,12) = -0.4874$
$\alpha(36,13) = 0.2823$	$\alpha(36,14) = -0.4486$	$\alpha(36,15) = 0.7767$	$\alpha(36,16) = 0.5752$
$\alpha(36,18) = -0.5652$	$\alpha(36,19) = 0.8964$	$\alpha(36,21) = 0.4608$	$\alpha(36,23) = -0.3753$
$\alpha(36,24) = 0.4621$	$\alpha(36,25) = -0.3252$	$\alpha(36,26) = 0.1872$	$\alpha(36,27) = -0.0690$
$\alpha(36,28) = 0.0633$	$\alpha(36,29) = -0.0369$	$\alpha(36,30) = 0.4621$	$\alpha(36,31) = 0.3252$
$\alpha(36,32) = 0.1872$	$\alpha(36,33) = -0.1225$	$\alpha(36,34) = 0.0091$	$\alpha(36,35) = -0.1030$
$\alpha(36,36) = -1.9869$	$\alpha(36,38) = 0.0009$	$\alpha(36,39) = -0.1224$	$\alpha(36,40) = 0.0945$
$\alpha(36,41) = 0.0435$	$\alpha(36,42) = -0.1225$	$\alpha(36,43) = 0.0853$	$\alpha(36,44) = 0.0606$
$\alpha(37,2) = -0.0092$	$\alpha(37,5) = 0.0695$	$\alpha(37,6) = 0.4779$	$\alpha(37,7) = -0.9200$
$\alpha(37,8) = -0.8583$	$\alpha(37,9) = -0.0946$	$\alpha(37,10) = 0.6151$	$\alpha(37,11) = -0.4780$
$\alpha(37,12) = -0.9200$	$\alpha(37,13) = 0.8583$	$\alpha(37,14) = 0.0946$	$\alpha(37,15) = 0.6151$
$\alpha(37,17) = 0.5649$	$\alpha(37,20) = 0.7740$	$\alpha(37,22) = -0.1509$	$\alpha(37,24) = -0.3252$
$\alpha(37,25) = 0.1264$	$\alpha(37,26) = -0.1603$	$\alpha(37,27) = 0.0633$	$\alpha(37,28) = -0.0629$
$\alpha(37,29) = -0.0376$	$\alpha(37,30) = 0.3252$	$\alpha(37,31) = 0.1264$	$\alpha(37,32) = 0.1603$
$\alpha(37,33) = -0.0853$	$\alpha(37,34) = 0.0965$	$\alpha(37,35) = -0.3807$	$\alpha(37,37) = -1.9694$

α(37,39) = -0.0945	α(37,40) = 0.6012	α(37,41) = 0.0890	α(37,42) = -0.0091
α(37,43) = 0.0965	α(37,44) = 0.2026	α(38,1) = -0.0173	α(38,3) = -0.0176
α(38,4) = -0.0413	α(38,6) = 0.2770	α(38,7) = -0.8578	α(38,8) = 0.0703
α(38,9) = 0.7208	α(38,10) = -0.0921	α(38,11) = 0.2770	α(38,12) = 0.8578
α(38,13) = 0.0703	α(38,14) = 0.7209	α(38,15) = 0.0921	α(38,16) = -0.5506
α(38,18) = -1.4152	α(38,19) = 0.5626	α(38,21) = -0.3753	α(38,23) = 0.2203
α(38,24) = 0.1872	α(38,25) = -0.1603	α(38,26) = -0.0593	α(38,27) = -0.0369
α(38,28) = -0.0376	α(38,29) = -0.1052	α(38,30) = 0.1872	α(38,31) = 0.1603
α(38,32) = -0.0593	α(38,33) = 0.0606	α(38,34) = -0.2026	α(38,35) = 0.4331
α(38,36) = 0.0009	α(38,38) = -1.9696	α(38,39) = 0.0435	α(38,40) = -0.0890
α(38,41) = -0.0720	α(38,42) = -0.1030	α(38,43) = 0.3807	α(38,44) = 0.4331
α(39,1) = -0.0242	α(39,2) = -0.0108	α(39,3) = -0.0434	α(39,4) = -0.0021
α(39,5) = 0.0544	α(39,6) = -0.0241	α(39,7) = -0.0430	α(39,8) = 0.0123
α(39,9) = 0.0481	α(39,10) = 0.0253	α(39,11) = 0.5730	α(39,12) = 0.4874
α(39,13) = 0.2823	α(39,14) = -0.4486	α(39,15) = -0.7767	α(39,16) = -0.0161
α(39,17) = 0.0575	α(39,18) = -0.0333	α(39,19) = -0.0056	α(39,20) = 0.0097
α(39,21) = -0.0690	α(39,22) = -0.0633	α(39,23) = -0.0369	α(39,24) = -0.0198
α(39,25) = -0.0002	α(39,26) = 0.0069	α(39,27) = 0.4608	α(39,29) = -0.3753
α(39,30) = 0.4621	α(39,31) = -0.3252	α(39,32) = 0.1872	α(39,33) = -0.1225
α(39,34) = -0.0091	α(39,35) = -0.1030	α(39,36) = -0.1224	α(39,37) = -0.0945
α(39,38) = 0.0435	α(39,39) = -1.9869	α(39,41) = 0.0009	α(39,42) = -0.1225
α(39,43) = -0.0853	α(39,44) = 0.0606	α(40,1) = 0.0303	α(40,2) = -0.0092
α(40,3) = 0.0162	α(40,4) = 0.0004	α(40,5) = -0.0255	α(40,6) = 0.0121
α(40,7) = -0.0278	α(40,8) = -0.0233	α(40,9) = 0.0010	α(40,10) = 0.0193
α(40,11) = 0.4779	α(40,12) = -0.9200	α(40,13) = -0.8583	α(40,14) = -0.0946
α(40,15) = 0.6151	α(40,16) = -0.0148	α(40,17) = -0.0154	α(40,18) = 0.0036
α(40,19) = 0.0481	α(40,20) = -0.0136	α(40,21) = -0.0633	α(40,22) = -0.0629
α(40,23) = 0.0376	α(40,24) = -0.0002	α(40,25) = -0.0032	α(40,26) = -0.0167
α(40,28) = -0.1509	α(40,30) = -0.3252	α(40,31) = 0.1264	α(40,32) = -0.1603
α(40,33) = 0.0853	α(40,34) = 0.0965	α(40,35) = 0.3807	α(40,36) = 0.0945
α(40,37) = 0.6012	α(40,38) = -0.0890	α(40,40) = -1.9694	α(40,42) = 0.0091
α(40,43) = 0.0965	α(40,44) = -0.2026	α(41,1) = -0.0034	α(41,2) = -0.0342

$\alpha(41,3) = -0.0236$	$\alpha(41,4) = 0.0187$	$\alpha(41,5) = 0.0268$	$\alpha(41,6) = 0.0279$
$\alpha(41,7) = 0.0269$	$\alpha(41,8) = -0.0050$	$\alpha(41,9) = -0.0262$	$\alpha(41,10) = -0.0255$
$\alpha(41,11) = 0.2770$	$\alpha(41,12) = -0.8578$	$\alpha(41,13) = 0.0703$	$\alpha(41,14) = 0.7208$
$\alpha(41,15) = -0.0921$	$\alpha(41,16) = 0.0088$	$\alpha(41,17) = 0.0036$	$\alpha(41,18) = -0.0114$
$\alpha(41,19) = 0.0418$	$\alpha(41,20) = 0.0482$	$\alpha(41,21) = -0.0369$	$\alpha(41,22) = 0.0376$
$\alpha(41,23) = -0.1052$	$\alpha(41,24) = 0.0069$	$\alpha(41,25) = -0.0167$	$\alpha(41,26) = -0.0036$
$\alpha(41,27) = -0.3753$	$\alpha(41,29) = 0.2203$	$\alpha(41,30) = 0.1872$	$\alpha(41,31) = -0.1603$
$\alpha(41,32) = -0.0593$	$\alpha(41,33) = 0.0606$	$\alpha(41,34) = 0.2026$	$\alpha(41,35) = 0.4331$
$\alpha(41,36) = 0.0435$	$\alpha(41,37) = 0.0890$	$\alpha(41,38) = -0.0720$	$\alpha(41,39) = 0.0009$
$\alpha(41,41) = -1.9696$	$\alpha(41,42) = -0.1030$	$\alpha(41,43) = -0.3807$	$\alpha(41,44) = 0.4331$
$\alpha(42,6) = -0.0242$	$\alpha(42,7) = -0.0108$	$\alpha(42,8) = -0.0434$	$\alpha(42,9) = -0.0021$
$\alpha(42,10) = 0.0544$	$\alpha(42,11) = -0.0161$	$\alpha(42,13) = 0.0665$	$\alpha(42,14) = 0.0110$
$\alpha(42,16) = 0.5730$	$\alpha(42,17) = 0.4874$	$\alpha(42,18) = 0.2823$	$\alpha(42,19) = -0.4486$
$\alpha(42,20) = -0.7767$	$\alpha(42,21) = -0.0198$	$\alpha(42,22) = 0.0059$	$\alpha(42,23) = -0.0035$
$\alpha(42,24) = -0.0690$	$\alpha(42,25) = -0.0633$	$\alpha(42,26) = -0.0369$	$\alpha(42,27) = -0.0198$
$\alpha(42,28) = -0.0059$	$\alpha(42,29) = -0.0035$	$\alpha(42,30) = 0.4608$	$\alpha(42,32) = -0.3753$
$\alpha(42,33) = 0.0003$	$\alpha(42,35) = -0.0073$	$\alpha(42,36) = -0.1225$	$\alpha(42,37) = -0.0091$
$\alpha(42,38) = -0.1030$	$\alpha(42,39) = -0.1225$	$\alpha(42,40) = 0.0091$	$\alpha(42,41) = -0.1030$
$\alpha(42,42) = -1.9869$	$\alpha(42,44) = 0.0009$	$\alpha(43,6) = 0.0303$	$\alpha(43,7) = -0.0092$
$\alpha(43,8) = 0.0162$	$\alpha(43,9) = 0.0004$	$\alpha(43,10) = -0.0255$	$\alpha(43,12) = -0.0092$
$\alpha(43,15) = 0.0695$	$\alpha(43,16) = 0.4779$	$\alpha(43,17) = -0.9200$	$\alpha(43,18) = -0.8583$
$\alpha(43,19) = -0.0946$	$\alpha(43,20) = 0.6151$	$\alpha(43,21) = 0.0059$	$\alpha(43,22) = -0.0180$
$\alpha(43,23) = -0.0082$	$\alpha(43,24) = -0.0633$	$\alpha(43,25) = -0.0629$	$\alpha(43,26) = 0.0376$
$\alpha(43,27) = -0.0059$	$\alpha(43,28) = -0.0180$	$\alpha(43,29) = 0.0082$	$\alpha(43,31) = -0.1509$
$\alpha(43,34) = -0.0151$	$\alpha(43,36) = 0.0853$	$\alpha(43,37) = 0.0965$	$\alpha(43,38) = 0.3807$
$\alpha(43,39) = -0.0853$	$\alpha(43,40) = 0.0965$	$\alpha(43,41) = -0.3807$	$\alpha(43,43) = -1.9694$
$\alpha(44,6) = -0.0034$	$\alpha(44,7) = -0.0342$	$\alpha(44,8) = -0.0236$	$\alpha(44,9) = 0.0187$
$\alpha(44,10) = 0.0268$	$\alpha(44,11) = -0.0173$	$\alpha(44,13) = -0.0176$	$\alpha(44,14) = -0.0413$
$\alpha(44,16) = 0.2770$	$\alpha(44,17) = -0.8578$	$\alpha(44,18) = 0.0703$	$\alpha(44,19) = 0.7208$
$\alpha(44,20) = -0.0921$	$\alpha(44,21) = -0.0035$	$\alpha(44,22) = -0.0082$	$\alpha(44,23) = 0.0112$
$\alpha(44,24) = -0.0369$	$\alpha(44,25) = 0.0376$	$\alpha(44,26) = -0.1052$	$\alpha(44,27) = -0.0035$
$\alpha(44,28) = 0.0082$	$\alpha(44,29) = 0.0112$	$\alpha(44,30) = -0.3753$	$\alpha(44,32) = 0.2203$

α(44,33) = -0.0148	α(44,35) = 0.0036	α(44,36) = 0.0606	α(44,37) = 0.2026
α(44,38) = 0.4331	α(44,39) = 0.0606	α(44,40) = -0.2026	α(44,41) = 0.4331
α(44,42) = 0.0009	α(44,44) = -1.9696		

β(1,1) = -0.0114	β(1,2) = -0.0027	β(1,3) = -0.0016	β(1,4) = 0.0054
β(1,5) = 0.0093	β(1,6) = 0.0104	β(1,7) = -0.0026	β(1,8) = 0.0015
β(1,9) = 0.0083	β(1,10) = -0.0144	β(2,1) = -0.0027	β(2,2) = -0.0117
β(2,3) = 0.0019	β(2,4) = 0.0098	β(2,5) = 0.0044	β(2,6) = -0.0026
β(2,7) = 0.0040	β(2,8) = 0.0268	β(2,9) = -0.0202	β(2,10) = 0.0094
β(3,1) = -0.0016	β(3,2) = 0.0019	β(3,3) = -0.0140	β(3,4) = -0.0068
β(3,5) = 0.0098	β(3,6) = 0.0015	β(3,7) = 0.0268	β(3,8) = 0.0349
β(3,9) = -0.0139	β(3,10) = -0.0202	β(4,1) = 0.0054	β(4,2) = 0.0098
β(4,3) = -0.0068	β(4,4) = 0.0042	β(4,5) = 0.0046	β(4,6) = 0.0083
β(4,7) = -0.0202	β(4,8) = -0.0139	β(4,9) = 0.0252	β(4,10) = 0.0078
β(5,1) = 0.0093	β(5,2) = 0.0044	β(5,3) = 0.0098	β(5,4) = 0.0046
β(5,5) = 0.0095	β(5,6) = -0.0144	β(5,7) = 0.0094	β(5,8) = -0.0202
β(5,9) = 0.0078	β(5,10) = 0.0163	β(6,1) = 0.0103	β(6,3) = -0.0029
β(6,4) = -0.0166	β(6,6) = -0.0114	β(6,7) = -0.0027	β(6,8) = -0.0016
β(6,9) = 0.0054	β(6,10) = 0.0093	β(7,2) = 0.0505	β(7,5) = -0.0256
β(7,6) = -0.0027	β(7,7) = -0.0117	β(7,8) = 0.0019	β(7,9) = 0.0098
β(7,10) = 0.0044	β(8,1) = -0.0029	β(8,3) = -0.0115	β(8,4) = 0.0211
β(8,6) = -0.0016	β(8,7) = 0.0019	β(8,8) = -0.0140	β(8,9) = -0.0068
β(8,10) = 0.0098	β(9,1) = -0.0166	β(9,3) = 0.0211	β(9,4) = 0.0118
β(9,6) = 0.0054	β(9,7) = 0.0098	β(9,8) = -0.0068	β(9,9) = 0.0042
β(9,10) = 0.0046	β(10,2) = -0.0256	β(10,5) = 0.0297	β(10,6) = 0.0093
β(10,7) = 0.0044	β(10,8) = 0.0098	β(10,9) = 0.0046	β(10,10) = 0.0095
β(11,1) = -0.1177	β(11,3) = 0.1426	β(11,4) = 0.2961	β(11,6) = -0.1192
β(11,7) = 0.1246	β(11,8) = -0.0711	β(11,9) = -0.1485	β(11,10) = 0.2573
β(11,11) = -0.0114	β(11,12) = -0.0027	β(11,13) = -0.0016	β(11,14) = 0.0054
β(11,15) = 0.0093	β(11,16) = 0.0104	β(11,17) = -0.0026	β(11,18) = 0.0015

β(11,19) = 0.0083	β(11,20) = -0.0144	β(11,21) = 0.0161	β(11,22) = -0.0148
β(11,23) = -0.0088	β(11,24) = 0.0244	β(11,25) = -0.0181	β(11,26) = 0.0246
β(11,33) = -0.0241	β(11,34) = 0.0121	β(11,35) = 0.0279	β(11,36) = -0.0242
β(11,37) = 0.0303	β(11,38) = -0.0034	β(12,2) = -0.1386	β(12,5) = 0.2864
β(12,6) = 0.1246	β(12,7) = -0.0911	β(12,8) = -0.0275	β(12,9) = 0.2018
β(12,10) = -0.0639	β(12,11) = -0.0027	β(12,12) = -0.0117	β(12,13) = 0.0019
β(12,14) = 0.0098	β(12,15) = 0.0044	β(12,16) = -0.0026	β(12,17) = 0.0040
β(12,18) = 0.0268	β(12,19) = -0.0202	β(12,20) = 0.0094	β(12,21) = 0.0575
β(12,22) = 0.0154	β(12,23) = 0.0036	β(12,24) = -0.0322	β(12,25) = 0.0122
β(12,26) = -0.0145	β(12,33) = -0.0430	β(12,34) = -0.0278	β(12,35) = 0.0269
β(12,36) = -0.0108	β(12,37) = -0.0092	β(12,38) = -0.0342	β(13,1) = 0.1426
β(13,3) = -0.0744	β(13,4) = -0.1800	β(13,6) = -0.0711	β(13,7) = -0.0275
β(13,8) = -0.1226	β(13,9) = 0.1693	β(13,10) = 0.2015	β(13,11) = -0.0016
β(13,12) = 0.0019	β(13,13) = -0.0140	β(13,14) = -0.0068	β(13,15) = 0.0098
β(13,16) = 0.0015	β(13,17) = 0.0268	β(13,18) = 0.0349	β(13,19) = -0.0139
β(13,20) = -0.0202	β(13,21) = 0.0333	β(13,22) = 0.0036	β(13,23) = 0.0114
β(13,24) = -0.0310	β(13,25) = 0.0359	β(13,26) = 0.0205	β(13,33) = 0.0123
β(13,34) = -0.0233	β(13,35) = -0.0050	β(13,36) = -0.0434	β(13,37) = 0.0162
β(13,38) = -0.0236	β(14,1) = 0.2961	β(14,3) = -0.1800	β(14,4) = -0.3267
β(14,6) = -0.1485	β(14,7) = 0.2018	β(14,8) = 0.1693	β(14,9) = -0.0308
β(14,10) = 0.1698	β(14,11) = 0.0054	β(14,12) = 0.0098	β(14,13) = -0.0068
β(14,14) = 0.0042	β(14,15) = 0.0046	β(14,16) = 0.0083	β(14,17) = -0.0202
β(14,18) = -0.0139	β(14,19) = 0.0252	β(14,20) = 0.0078	β(14,21) = 0.0056
β(14,22) = 0.0481	β(14,23) = -0.0418	β(14,24) = 0.0460	β(14,25) = -0.0389
β(14,26) = 0.0027	β(14,33) = 0.0481	β(14,34) = 0.0010	β(14,35) = -0.0262
β(14,36) = -0.0021	β(14,37) = 0.0004	β(14,38) = 0.0187	β(15,2) = 0.2864
β(15,5) = 0.0667	β(15,6) = 0.2573	β(15,7) = -0.0639	β(15,8) = 0.2015
β(15,9) = 0.1698	β(15,10) = -0.2275	β(15,11) = 0.0093	β(15,12) = 0.0044
β(15,13) = 0.0098	β(15,14) = 0.0046	β(15,15) = 0.0095	β(15,16) = -0.0144
β(15,17) = 0.0094	β(15,18) = -0.0202	β(15,19) = 0.0078	β(15,20) = 0.0163
β(15,21) = 0.0097	β(15,22) = 0.0136	β(15,23) = 0.0482	β(15,24) = -0.0290
β(15,25) = 0.0040	β(15,26) = -0.0128	β(15,33) = 0.0253	β(15,34) = 0.0193

β(15,35) = -0.0255	β(15,36) = 0.0544	β(15,37) = -0.0255	β(15,38) = 0.0268
β(16,1) = -0.0114	β(16,2) = 0.0027	β(16,3) = -0.0016	β(16,4) = 0.0054
β(16,5) = -0.0093	β(16,6) = -0.1177	β(16,8) = 0.1426	β(16,9) = 0.2961
β(16,11) = 0.0103	β(16,13) = -0.0029	β(16,14) = -0.0166	β(16,16) = -0.0114
β(16,17) = -0.0027	β(16,18) = -0.0016	β(16,19) = 0.0054	β(16,20) = 0.0093
β(16,21) = 0.0241	β(16,22) = 0.0121	β(16,23) = -0.0279	β(16,24) = 0.0161
β(16,25) = -0.0148	β(16,26) = -0.0088	β(16,36) = -0.0241	β(16,37) = 0.0121
β(16,38) = 0.0279	β(17,1) = 0.0027	β(17,2) = -0.0117	β(17,3) = -0.0019
β(17,4) = -0.0098	β(17,5) = 0.0044	β(17,7) = -0.1386	β(17,10) = 0.2864
β(17,12) = 0.0505	β(17,15) = -0.0256	β(17,16) = -0.0027	β(17,17) = -0.0117
β(17,18) = 0.0019	β(17,19) = 0.0098	β(17,20) = 0.0044	β(17,21) = -0.0430
β(17,22) = 0.0278	β(17,23) = 0.0269	β(17,24) = 0.0575	β(17,25) = 0.0154
β(17,26) = 0.0036	β(17,36) = -0.0430	β(17,37) = -0.0278	β(17,38) = 0.0269
β(18,1) = -0.0016	β(18,2) = -0.0019	β(18,3) = -0.0140	β(18,4) = -0.0068
β(18,5) = -0.0098	β(18,6) = 0.1426	β(18,8) = -0.0744	β(18,9) = -0.1800
β(18,11) = -0.0029	β(18,13) = -0.0115	β(18,14) = 0.0211	β(18,16) = -0.0016
β(18,17) = 0.0019	β(18,18) = -0.0140	β(18,19) = -0.0068	β(18,20) = 0.0098
β(18,21) = -0.0123	β(18,22) = -0.0233	β(18,23) = 0.0050	β(18,24) = 0.0333
β(18,25) = 0.0036	β(18,26) = 0.0114	β(18,36) = 0.0123	β(18,37) = -0.0233
β(18,38) = -0.0050	β(19,1) = 0.0054	β(19,2) = -0.0098	β(19,3) = -0.0068
β(19,4) = 0.0042	β(19,5) = -0.0046	β(19,6) = 0.2961	β(19,8) = -0.1800
β(19,9) = -0.3267	β(19,11) = -0.0166	β(19,13) = 0.0211	β(19,14) = 0.0118
β(19,16) = 0.0054	β(19,17) = 0.0098	β(19,18) = -0.0068	β(19,19) = 0.0042
β(19,20) = 0.0046	β(19,21) = -0.0481	β(19,22) = 0.0010	β(19,23) = 0.0262
β(19,24) = 0.0056	β(19,25) = 0.0481	β(19,26) = -0.0418	β(19,36) = 0.0481
β(19,37) = 0.0010	β(19,38) = -0.0262	β(20,1) = -0.0093	β(20,2) = 0.0044
β(20,3) = -0.0098	β(20,4) = -0.0046	β(20,5) = 0.0095	β(20,7) = 0.2864
β(20,10) = 0.0667	β(20,12) = -0.0256	β(20,15) = 0.0297	β(20,16) = 0.0093
β(20,17) = 0.0044	β(20,18) = 0.0098	β(20,19) = 0.0046	β(20,20) = 0.0095
β(20,21) = 0.0253	β(20,22) = -0.0193	β(20,23) = -0.0255	β(20,24) = 0.0097
β(20,25) = 0.0136	β(20,26) = 0.0482	β(20,36) = 0.0253	β(20,37) = 0.0193
β(20,38) = -0.0255	β(21,1) = 0.0241	β(21,2) = 0.0430	β(21,3) = -0.0123

β(21,4) = -0.0481	β(21,5) = -0.0253	β(21,6) = 0.0242	β(21,7) = 0.0108
β(21,8) = 0.0434	β(21,9) = 0.0021	β(21,10) = -0.0544	β(21,21) = 0.0004
β(21,22) = 0.0128	β(21,23) = 0.0074	β(21,24) = 0.0039	β(21,25) = -0.0041
β(21,26) = 0.0027	β(22,1) = -0.0121	β(22,2) = 0.0278	β(22,3) = 0.0233
β(22,4) = -0.0010	β(22,5) = -0.0193	β(22,6) = -0.0303	β(22,7) = 0.0092
β(22,8) = -0.0162	β(22,9) = -0.0004	β(22,10) = 0.0255	β(22,21) = 0.0063
β(22,22) = -0.0011	β(22,23) = 0.0081	β(22,24) = -0.0044	β(22,25) = 0.0105
β(22,26) = 0.0177	β(23,1) = -0.0279	β(23,2) = -0.0269	β(23,3) = 0.0050
β(23,4) = 0.0262	β(23,5) = 0.0255	β(23,6) = 0.0034	β(23,7) = 0.0342
β(23,8) = 0.0236	β(23,9) = -0.0187	β(23,10) = -0.0268	β(23,21) = 0.0036
β(23,22) = 0.0081	β(23,23) = -0.0104	β(23,24) = 0.0023	β(23,25) = 0.0207
β(23,26) = 0.0327	β(24,6) = 0.0241	β(24,7) = 0.0430	β(24,8) = -0.0123
β(24,9) = -0.0481	β(24,10) = -0.0253	β(24,21) = 0.0038	β(24,22) = 0.0002
β(24,23) = -0.0049	β(24,24) = 0.0004	β(24,25) = 0.0128	β(24,26) = 0.0074
β(25,6) = -0.0121	β(25,7) = 0.0278	β(25,8) = 0.0233	β(25,9) = -0.0010
β(25,10) = -0.0193	β(25,21) = -0.0002	β(25,22) = 0.0438	β(25,23) = 0.0015
β(25,24) = 0.0063	β(25,25) = -0.0011	β(25,26) = 0.0081	β(26,6) = -0.0279
β(26,7) = -0.0269	β(26,8) = 0.0050	β(26,9) = 0.0262	β(26,10) = 0.0255
β(26,21) = -0.0049	β(26,22) = -0.0015	β(26,23) = -0.0006	β(26,24) = 0.0036
β(26,25) = 0.0081	β(26,26) = -0.0104	β(27,1) = -0.5730	β(27,2) = -0.4874
β(27,3) = -0.2823	β(27,4) = 0.4486	β(27,5) = 0.7767	β(27,6) = 0.0161
β(27,8) = -0.0665	β(27,9) = -0.0110	β(27,11) = 0.0242	β(27,12) = 0.0108
β(27,13) = 0.0434	β(27,14) = 0.0021	β(27,15) = -0.0544	β(27,21) = -0.1225
β(27,22) = -0.0091	β(27,23) = -0.1030	β(27,24) = 0.0003	β(27,26) = -0.0073
β(27,27) = 0.0004	β(27,28) = 0.0128	β(27,29) = 0.0074	β(27,30) = 0.0039
β(27,31) = -0.0041	β(27,32) = 0.0027	β(27,33) = -0.0690	β(27,34) = -0.0633
β(27,35) = -0.0369	β(27,36) = -0.0198	β(27,37) = 0.0059	β(27,38) = -0.0035
β(28,1) = -0.4779	β(28,2) = 0.9200	β(28,3) = 0.8583	β(28,4) = 0.0946
β(28,5) = -0.6151	β(28,7) = 0.0092	β(28,10) = -0.0695	β(28,11) = -0.0303
β(28,12) = 0.0092	β(28,13) = -0.0162	β(28,14) = -0.0004	β(28,15) = 0.0255
β(28,21) = 0.0853	β(28,22) = 0.0965	β(28,23) = 0.3807	β(28,25) = -0.0151
β(28,27) = 0.0063	β(28,28) = -0.0011	β(28,29) = 0.0081	β(28,30) = -0.0044

$\beta(28,31) = 0.0105$	$\beta(28,32) = 0.0177$	$\beta(28,33) = -0.0633$	$\beta(28,34) = -0.0629$
$\beta(28,35) = 0.0376$	$\beta(28,36) = 0.0059$	$\beta(28,37) = -0.0180$	$\beta(28,38) = -0.0082$
$\beta(29,1) = -0.2770$	$\beta(29,2) = 0.8578$	$\beta(29,3) = -0.0703$	$\beta(29,4) = -0.7208$
$\beta(29,5) = 0.0921$	$\beta(29,6) = 0.0173$	$\beta(29,8) = 0.0176$	$\beta(29,9) = 0.0413$
$\beta(29,11) = 0.0034$	$\beta(29,12) = 0.0342$	$\beta(29,13) = 0.0236$	$\beta(29,14) = -0.0187$
$\beta(29,15) = -0.0268$	$\beta(29,21) = 0.0606$	$\beta(29,22) = 0.2026$	$\beta(29,23) = 0.4331$
$\beta(29,24) = -0.0148$	$\beta(29,26) = 0.0036$	$\beta(29,27) = 0.0036$	$\beta(29,28) = 0.0081$
$\beta(29,29) = -0.0104$	$\beta(29,30) = 0.0023$	$\beta(29,31) = 0.0207$	$\beta(29,32) = 0.0327$
$\beta(29,33) = -0.0369$	$\beta(29,34) = 0.0376$	$\beta(29,35) = -0.1052$	$\beta(29,36) = -0.0035$
$\beta(29,37) = -0.0082$	$\beta(29,38) = 0.0112$	$\beta(30,1) = 0.0161$	$\beta(30,2) = -0.0575$
$\beta(30,3) = 0.0333$	$\beta(30,4) = 0.0056$	$\beta(30,5) = -0.0097$	$\beta(30,6) = -0.5730$
$\beta(30,7) = -0.4874$	$\beta(30,8) = -0.2823$	$\beta(30,9) = 0.4486$	$\beta(30,10) = 0.7767$
$\beta(30,11) = 0.0241$	$\beta(30,12) = 0.0430$	$\beta(30,13) = -0.0123$	$\beta(30,14) = -0.0481$
$\beta(30,15) = -0.0253$	$\beta(30,16) = 0.0242$	$\beta(30,17) = 0.0108$	$\beta(30,18) = 0.0434$
$\beta(30,19) = 0.0021$	$\beta(30,20) = -0.0544$	$\beta(30,21) = -0.1224$	$\beta(30,22) = -0.0945$
$\beta(30,23) = 0.0435$	$\beta(30,24) = -0.1225$	$\beta(30,25) = -0.0091$	$\beta(30,26) = -0.1030$
$\beta(30,27) = 0.0038$	$\beta(30,28) = 0.0002$	$\beta(30,29) = -0.0049$	$\beta(30,30) = 0.0004$
$\beta(30,31) = 0.0128$	$\beta(30,32) = 0.0074$	$\beta(30,33) = -0.0198$	$\beta(30,34) = -0.0002$
$\beta(30,35) = 0.0069$	$\beta(30,36) = -0.0690$	$\beta(30,37) = -0.0633$	$\beta(30,38) = -0.0369$
$\beta(31,1) = 0.0148$	$\beta(31,2) = 0.0154$	$\beta(31,3) = -0.0036$	$\beta(31,4) = -0.0481$
$\beta(31,5) = 0.0136$	$\beta(31,6) = -0.4779$	$\beta(31,7) = 0.9200$	$\beta(31,8) = 0.8583$
$\beta(31,9) = 0.0946$	$\beta(31,10) = -0.6151$	$\beta(31,11) = -0.0121$	$\beta(31,12) = 0.0278$
$\beta(31,13) = 0.0233$	$\beta(31,14) = -0.0010$	$\beta(31,15) = -0.0193$	$\beta(31,16) = -0.0303$
$\beta(31,17) = 0.0092$	$\beta(31,18) = -0.0162$	$\beta(31,19) = -0.0004$	$\beta(31,20) = 0.0255$
$\beta(31,21) = 0.0945$	$\beta(31,22) = 0.6012$	$\beta(31,23) = -0.0890$	$\beta(31,24) = 0.0853$
$\beta(31,25) = 0.0965$	$\beta(31,26) = 0.3807$	$\beta(31,27) = -0.0002$	$\beta(31,28) = 0.0438$
$\beta(31,29) = 0.0015$	$\beta(31,30) = 0.0063$	$\beta(31,31) = -0.0011$	$\beta(31,32) = 0.0081$
$\beta(31,33) = -0.0002$	$\beta(31,34) = -0.0032$	$\beta(31,35) = -0.0167$	$\beta(31,36) = -0.0633$
$\beta(31,37) = -0.0629$	$\beta(31,38) = 0.0376$	$\beta(32,1) = -0.0088$	$\beta(32,2) = -0.0036$
$\beta(32,3) = 0.0114$	$\beta(32,4) = -0.0418$	$\beta(32,5) = -0.0482$	$\beta(32,6) = -0.2770$
$\beta(32,7) = 0.8578$	$\beta(32,8) = -0.0703$	$\beta(32,9) = -0.7208$	$\beta(32,10) = 0.0921$
$\beta(32,11) = -0.0279$	$\beta(32,12) = -0.0269$	$\beta(32,13) = 0.0050$	$\beta(32,14) = 0.0262$

β(32,15) = 0.0255	β(32,16) = 0.0034	β(32,17) = 0.0342	β(32,18) = 0.0236
β(32,19) = -0.0187	β(32,20) = -0.0268	β(32,21) = 0.0435	β(32,22) = 0.0890
β(32,23) = -0.0720	β(32,24) = 0.0606	β(32,25) = 0.2026	β(32,26) = 0.4331
β(32,27) = -0.0049	β(32,28) = -0.0015	β(32,29) = -0.0006	β(32,30) = 0.0036
β(32,31) = 0.0081	β(32,32) = -0.0104	β(32,33) = 0.0069	β(32,34) = -0.0167
β(32,35) = -0.0036	β(32,36) = -0.0369	β(32,37) = 0.0376	β(32,38) = -0.1052
β(33,1) = -0.0161	β(33,2) = -0.0575	β(33,3) = -0.0333	β(33,4) = -0.0056
β(33,5) = -0.0097	β(33,6) = -0.0244	β(33,7) = 0.0322	β(33,8) = 0.0310
β(33,9) = -0.0460	β(33,10) = 0.0290	β(33,21) = -0.0198	β(33,22) = 0.0060
β(33,23) = -0.0033	β(33,33) = 0.0004	β(33,34) = 0.0063	β(33,35) = 0.0036
β(33,36) = 0.0039	β(33,37) = -0.0044	β(33,38) = 0.0023	β(34,1) = 0.0148
β(34,2) = -0.0154	β(34,3) = -0.0036	β(34,4) = -0.0481	β(34,5) = -0.0136
β(34,6) = 0.0181	β(34,7) = -0.0122	β(34,8) = -0.0359	β(34,9) = 0.0389
β(34,10) = -0.0040	β(34,21) = 0.0060	β(34,22) = 0.0110	β(34,23) = 0.0085
β(34,33) = 0.0128	β(34,34) = -0.0011	β(34,35) = 0.0081	β(34,36) = -0.0041
β(34,37) = 0.0105	β(34,38) = 0.0207	β(35,1) = 0.0088	β(35,2) = -0.0036
β(35,3) = -0.0114	β(35,4) = 0.0418	β(35,5) = -0.0482	β(35,6) = -0.0246
β(35,7) = 0.0145	β(35,8) = -0.0205	β(35,9) = -0.0027	β(35,10) = 0.0128
β(35,21) = -0.0033	β(35,22) = 0.0085	β(35,23) = -0.0178	β(35,33) = 0.0074
β(35,34) = 0.0081	β(35,35) = -0.0104	β(35,36) = 0.0027	β(35,37) = 0.0177
β(35,38) = 0.0327	β(36,1) = -0.0241	β(36,2) = 0.0430	β(36,3) = 0.0123
β(36,4) = 0.0481	β(36,5) = -0.0253	β(36,6) = -0.0161	β(36,7) = -0.0575
β(36,8) = -0.0333	β(36,9) = -0.0056	β(36,10) = -0.0097	β(36,21) = -0.0198
β(36,22) = 0.0002	β(36,23) = 0.0069	β(36,24) = -0.0198	β(36,25) = 0.0060
β(36,26) = -0.0033	β(36,33) = 0.0038	β(36,34) = -0.0002	β(36,35) = -0.0049
β(36,36) = 0.0004	β(36,37) = 0.0063	β(36,38) = 0.0036	β(37,1) = -0.0121
β(37,2) = -0.0278	β(37,3) = 0.0233	β(37,4) = -0.0010	β(37,5) = 0.0193
β(37,6) = 0.0148	β(37,7) = -0.0154	β(37,8) = -0.0036	β(37,9) = -0.0481
β(37,10) = -0.0136	β(37,21) = 0.0002	β(37,22) = -0.0032	β(37,23) = 0.0167
β(37,24) = 0.0060	β(37,25) = 0.0110	β(37,26) = 0.0085	β(37,33) = 0.0002
β(37,34) = 0.0438	β(37,35) = -0.0015	β(37,36) = 0.0128	β(37,37) = -0.0011
β(37,38) = 0.0081	β(38,1) = 0.0279	β(38,2) = -0.0269	β(38,3) = -0.0050

β(38,4) = -0.0262	β(38,5) = 0.0255	β(38,6) = 0.0088	β(38,7) = -0.0036
β(38,8) = -0.0114	β(38,9) = 0.0418	β(38,10) = -0.0482	β(38,21) = 0.0069
β(38,22) = 0.0167	β(38,23) = -0.0036	β(38,24) = -0.0033	β(38,25) = 0.0085
β(38,26) = -0.0178	β(38,33) = -0.0049	β(38,34) = 0.0015	β(38,35) = -0.0006
β(38,36) = 0.0074	β(38,37) = 0.0081	β(38,38) = -0.0104	β(39,1) = 0.5730
β(39,2) = -0.4874	β(39,3) = 0.2823	β(39,4) = -0.4486	β(39,5) = 0.7767
β(39,6) = 0.5752	β(39,8) = -0.5652	β(39,9) = 0.8964	β(39,11) = -0.0161
β(39,12) = -0.0575	β(39,13) = -0.0333	β(39,14) = -0.0056	β(39,15) = -0.0097
β(39,16) = -0.0244	β(39,17) = 0.0322	β(39,18) = 0.0310	β(39,19) = -0.0460
β(39,20) = 0.0290	β(39,21) = 0.4621	β(39,22) = 0.3252	β(39,23) = 0.1872
β(39,24) = -0.0687	β(39,26) = 0.0729	β(39,27) = -0.0198	β(39,28) = 0.0002
β(39,29) = 0.0069	β(39,30) = -0.0198	β(39,31) = 0.0060	β(39,32) = -0.0033
β(39,33) = -0.1224	β(39,34) = 0.0945	β(39,35) = 0.0435	β(39,36) = -0.1225
β(39,37) = 0.0853	β(39,38) = 0.0606	β(39,39) = 0.0004	β(39,40) = 0.0063
β(39,41) = 0.0036	β(39,42) = 0.0039	β(39,43) = -0.0044	β(39,44) = 0.0023
β(40,1) = -0.4780	β(40,2) = -0.9200	β(40,3) = 0.8583	β(40,4) = 0.0946
β(40,5) = 0.6151	β(40,7) = 0.5649	β(40,10) = 0.7740	β(40,11) = 0.0148
β(40,12) = -0.0154	β(40,13) = -0.0036	β(40,14) = -0.0481	β(40,15) = -0.0136
β(40,16) = 0.0181	β(40,17) = -0.0122	β(40,18) = -0.0359	β(40,19) = 0.0389
β(40,20) = -0.0040	β(40,21) = 0.3252	β(40,22) = 0.1264	β(40,23) = 0.1603
β(40,25) = -0.1264	β(40,27) = 0.0002	β(40,28) = -0.0032	β(40,29) = 0.0167
β(40,30) = 0.0060	β(40,31) = 0.0110	β(40,32) = 0.0085	β(40,33) = -0.0945
β(40,34) = 0.6012	β(40,35) = 0.0890	β(40,36) = -0.0091	β(40,37) = 0.0965
β(40,38) = 0.2026	β(40,39) = 0.0128	β(40,40) = -0.0011	β(40,41) = 0.0081
β(40,42) = -0.0041	β(40,43) = 0.0105	β(40,44) = 0.0207	β(41,1) = 0.2770
β(41,2) = 0.8578	β(41,3) = 0.0703	β(41,4) = 0.7209	β(41,5) = 0.0921
β(41,6) = -0.5506	β(41,8) = -1.4152	β(41,9) = 0.5626	β(41,11) = 0.0088
β(41,12) = -0.0036	β(41,13) = -0.0114	β(41,14) = 0.0418	β(41,15) = -0.0482
β(41,16) = -0.0246	β(41,17) = 0.0145	β(41,18) = -0.0205	β(41,19) = -0.0027
β(41,20) = 0.0128	β(41,21) = 0.1872	β(41,22) = 0.1603	β(41,23) = -0.0593
β(41,24) = 0.0729	β(41,26) = -0.0415	β(41,27) = 0.0069	β(41,28) = 0.0167
β(41,29) = -0.0036	β(41,30) = -0.0033	β(41,31) = 0.0085	β(41,32) = -0.0178

β(41,33) = 0.0435	β(41,34) = -0.0890	β(41,35) = -0.0720	β(41,36) = -0.1030
β(41,37) = 0.3807	β(41,38) = 0.4331	β(41,39) = 0.0074	β(41,40) = 0.0081
β(41,41) = -0.0104	β(41,42) = 0.0027	β(41,43) = 0.0177	β(41,44) = 0.0327
β(42,1) = -0.0242	β(42,2) = 0.0108	β(42,3) = -0.0434	β(42,4) = -0.0021
β(42,5) = -0.0544	β(42,6) = 0.5730	β(42,7) = -0.4874	β(42,8) = 0.2823
β(42,9) = -0.4486	β(42,10) = 0.7767	β(42,11) = -0.0241	β(42,12) = 0.0430
β(42,13) = 0.0123	β(42,14) = 0.0481	β(42,15) = -0.0253	β(42,16) = -0.0161
β(42,17) = -0.0575	β(42,18) = -0.0333	β(42,19) = -0.0056	β(42,20) = -0.0097
β(42,21) = -0.0690	β(42,22) = 0.0633	β(42,23) = -0.0369	β(42,24) = 0.4621
β(42,25) = 0.3252	β(42,26) = 0.1872	β(42,30) = -0.0198	β(42,31) = 0.0002
β(42,32) = 0.0069	β(42,33) = 0.0004	β(42,34) = -0.0128	β(42,35) = 0.0074
β(42,36) = -0.1224	β(42,37) = 0.0945	β(42,38) = 0.0435	β(42,39) = 0.0038
β(42,40) = -0.0002	β(42,41) = -0.0049	β(42,42) = 0.0004	β(42,43) = 0.0063
β(42,44) = 0.0036	β(43,1) = -0.0303	β(43,2) = -0.0092	β(43,3) = -0.0162
β(43,4) = -0.0004	β(43,5) = -0.0255	β(43,6) = -0.4780	β(43,7) = -0.9200
β(43,8) = 0.8583	β(43,9) = 0.0946	β(43,10) = 0.6151	β(43,11) = -0.0121
β(43,12) = -0.0278	β(43,13) = 0.0233	β(43,14) = -0.0010	β(43,15) = 0.0193
β(43,16) = 0.0148	β(43,17) = -0.0154	β(43,18) = -0.0036	β(43,19) = -0.0481
β(43,20) = -0.0136	β(43,21) = 0.0633	β(43,22) = -0.0629	β(43,23) = -0.0376
β(43,24) = 0.3252	β(43,25) = 0.1264	β(43,26) = 0.1603	β(43,30) = 0.0002
β(43,31) = -0.0032	β(43,32) = 0.0167	β(43,33) = -0.0063	β(43,34) = -0.0011
β(43,35) = -0.0081	β(43,36) = -0.0945	β(43,37) = 0.6012	β(43,38) = 0.0890
β(43,39) = 0.0002	β(43,40) = 0.0438	β(43,41) = -0.0015	β(43,42) = 0.0128
β(43,43) = -0.0011	β(43,44) = 0.0081	β(44,1) = -0.0034	β(44,2) = 0.0342
β(44,3) = -0.0236	β(44,4) = 0.0187	β(44,5) = -0.0268	β(44,6) = 0.2770
β(44,7) = 0.8578	β(44,8) = 0.0703	β(44,9) = 0.7209	β(44,10) = 0.0921
β(44,11) = 0.0279	β(44,12) = -0.0269	β(44,13) = -0.0050	β(44,14) = -0.0262
β(44,15) = 0.0255	β(44,16) = 0.0088	β(44,17) = -0.0036	β(44,18) = -0.0114
β(44,19) = 0.0418	β(44,20) = -0.0482	β(44,21) = -0.0369	β(44,22) = -0.0376
β(44,23) = -0.1052	β(44,24) = 0.1872	β(44,25) = 0.1603	β(44,26) = -0.0593
β(44,30) = 0.0069	β(44,31) = 0.0167	β(44,32) = -0.0036	β(44,33) = 0.0036
β(44,34) = -0.0081	β(44,35) = -0.0104	β(44,36) = 0.0435	β(44,37) = -0.0890

$\beta(44,38) = -0.0720$	$\beta(44,39) = -0.0049$	$\beta(44,40) = 0.0015$	$\beta(44,41) = -0.0006$
$\beta(44,42) = 0.0074$	$\beta(44,43) = 0.0081$	$\beta(44,44) = -0.0104$	

$\gamma(1,1) = 0.0104$	$\gamma(1,2) = 0.0026$	$\gamma(1,3) = 0.0015$	$\gamma(1,4) = 0.0083$
$\gamma(1,5) = 0.0144$	$\gamma(2,1) = 0.0026$	$\gamma(2,2) = 0.0040$	$\gamma(2,3) = -0.0268$
$\gamma(2,4) = 0.0202$	$\gamma(2,5) = 0.0094$	$\gamma(3,1) = 0.0015$	$\gamma(3,2) = -0.0268$
$\gamma(3,3) = 0.0349$	$\gamma(3,4) = -0.0139$	$\gamma(3,5) = 0.0202$	$\gamma(4,1) = 0.0083$
$\gamma(4,2) = 0.0202$	$\gamma(4,3) = -0.0139$	$\gamma(4,4) = 0.0252$	$\gamma(4,5) = -0.0078$
$\gamma(5,1) = 0.0144$	$\gamma(5,2) = 0.0094$	$\gamma(5,3) = 0.0202$	$\gamma(5,4) = -0.0078$
$\gamma(5,5) = 0.0163$	$\gamma(6,1) = -0.1192$	$\gamma(6,2) = -0.1246$	$\gamma(6,3) = -0.0711$
$\gamma(6,4) = -0.1485$	$\gamma(6,5) = -0.2573$	$\gamma(6,6) = 0.0104$	$\gamma(6,7) = 0.0026$
$\gamma(6,8) = 0.0015$	$\gamma(6,9) = 0.0083$	$\gamma(6,10) = 0.0144$	$\gamma(6,11) = -0.0114$
$\gamma(6,13) = 0.0032$	$\gamma(6,14) = -0.0107$	$\gamma(6,21) = 0.0244$	$\gamma(6,22) = 0.0181$
$\gamma(6,23) = 0.0246$	$\gamma(6,27) = 0.0244$	$\gamma(6,28) = -0.0181$	$\gamma(6,29) = 0.0246$
$\gamma(6,33) = -0.0161$	$\gamma(6,35) = -0.0173$	$\gamma(7,1) = -0.1246$	$\gamma(7,2) = -0.0911$
$\gamma(7,3) = 0.0275$	$\gamma(7,4) = -0.2018$	$\gamma(7,5) = -0.0639$	$\gamma(7,6) = 0.0026$
$\gamma(7,7) = 0.0040$	$\gamma(7,8) = -0.0268$	$\gamma(7,9) = 0.0202$	$\gamma(7,10) = 0.0094$
$\gamma(7,12) = -0.0151$	$\gamma(7,15) = -0.0125$	$\gamma(7,21) = 0.0322$	$\gamma(7,22) = 0.0122$
$\gamma(7,23) = 0.0145$	$\gamma(7,27) = -0.0322$	$\gamma(7,28) = 0.0122$	$\gamma(7,29) = -0.0145$
$\gamma(7,34) = -0.0092$	$\gamma(8,1) = -0.0711$	$\gamma(8,2) = 0.0275$	$\gamma(8,3) = -0.1226$
$\gamma(8,4) = 0.1693$	$\gamma(8,5) = -0.2015$	$\gamma(8,6) = 0.0015$	$\gamma(8,7) = -0.0268$
$\gamma(8,8) = 0.0349$	$\gamma(8,9) = -0.0139$	$\gamma(8,10) = 0.0202$	$\gamma(8,11) = 0.0032$
$\gamma(8,13) = -0.0105$	$\gamma(8,14) = 0.0100$	$\gamma(8,21) = -0.0310$	$\gamma(8,22) = -0.0359$
$\gamma(8,23) = 0.0205$	$\gamma(8,27) = -0.0310$	$\gamma(8,28) = 0.0359$	$\gamma(8,29) = 0.0205$
$\gamma(8,33) = 0.0665$	$\gamma(8,35) = -0.0176$	$\gamma(9,1) = -0.1485$	$\gamma(9,2) = -0.2018$
$\gamma(9,3) = 0.1693$	$\gamma(9,4) = -0.0308$	$\gamma(9,5) = -0.1698$	$\gamma(9,6) = 0.0083$
$\gamma(9,7) = 0.0202$	$\gamma(9,8) = -0.0139$	$\gamma(9,9) = 0.0252$	$\gamma(9,10) = -0.0078$
$\gamma(9,11) = -0.0107$	$\gamma(9,13) = 0.0100$	$\gamma(9,14) = 0.0122$	$\gamma(9,21) = 0.0460$
$\gamma(9,22) = 0.0389$	$\gamma(9,23) = 0.0027$	$\gamma(9,27) = 0.0460$	$\gamma(9,28) = -0.0389$
$\gamma(9,29) = 0.0027$	$\gamma(9,33) = 0.0110$	$\gamma(9,35) = -0.0413$	$\gamma(10,1) = -0.2573$

$\gamma(10,2) = -0.0639$	$\gamma(10,3) = -0.2015$	$\gamma(10,4) = -0.1698$	$\gamma(10,5) = -0.2275$
$\gamma(10,6) = 0.0144$	$\gamma(10,7) = 0.0094$	$\gamma(10,8) = 0.0202$	$\gamma(10,9) = -0.0078$
$\gamma(10,10) = 0.0163$	$\gamma(10,12) = -0.0125$	$\gamma(10,15) = 0.0016$	$\gamma(10,21) = 0.0290$
$\gamma(10,22) = 0.0040$	$\gamma(10,23) = 0.0128$	$\gamma(10,27) = -0.0290$	$\gamma(10,28) = 0.0040$
$\gamma(10,29) = -0.0128$	$\gamma(10,34) = 0.0695$	$\gamma(11,1) = -0.0114$	$\gamma(11,2) = 0.0027$
$\gamma(11,3) = -0.0016$	$\gamma(11,4) = 0.0054$	$\gamma(11,5) = -0.0093$	$\gamma(11,11) = 0.0104$
$\gamma(11,12) = 0.0026$	$\gamma(11,13) = 0.0015$	$\gamma(11,14) = 0.0083$	$\gamma(11,15) = 0.0144$
$\gamma(11,27) = 0.0244$	$\gamma(11,28) = 0.0181$	$\gamma(11,29) = 0.0246$	$\gamma(11,33) = -0.0242$
$\gamma(11,34) = -0.0303$	$\gamma(11,35) = -0.0034$	$\gamma(12,1) = 0.0027$	$\gamma(12,2) = -0.0117$
$\gamma(12,3) = -0.0019$	$\gamma(12,4) = -0.0098$	$\gamma(12,5) = 0.0044$	$\gamma(12,11) = 0.0026$
$\gamma(12,12) = 0.0040$	$\gamma(12,13) = -0.0268$	$\gamma(12,14) = 0.0202$	$\gamma(12,15) = 0.0094$
$\gamma(12,27) = 0.0322$	$\gamma(12,28) = 0.0122$	$\gamma(12,29) = 0.0145$	$\gamma(12,33) = 0.0108$
$\gamma(12,34) = -0.0092$	$\gamma(12,35) = 0.0342$	$\gamma(13,1) = -0.0016$	$\gamma(13,2) = -0.0019$
$\gamma(13,3) = -0.0140$	$\gamma(13,4) = -0.0068$	$\gamma(13,5) = -0.0098$	$\gamma(13,11) = 0.0015$
$\gamma(13,12) = -0.0268$	$\gamma(13,13) = 0.0349$	$\gamma(13,14) = -0.0139$	$\gamma(13,15) = 0.0202$
$\gamma(13,27) = -0.0310$	$\gamma(13,28) = -0.0359$	$\gamma(13,29) = 0.0205$	$\gamma(13,33) = -0.0434$
$\gamma(13,34) = -0.0162$	$\gamma(13,35) = -0.0236$	$\gamma(14,1) = 0.0054$	$\gamma(14,2) = -0.0098$
$\gamma(14,3) = -0.0068$	$\gamma(14,4) = 0.0042$	$\gamma(14,5) = -0.0046$	$\gamma(14,11) = 0.0083$
$\gamma(14,12) = 0.0202$	$\gamma(14,13) = -0.0139$	$\gamma(14,14) = 0.0252$	$\gamma(14,15) = -0.0078$
$\gamma(14,27) = 0.0460$	$\gamma(14,28) = 0.0389$	$\gamma(14,29) = 0.0027$	$\gamma(14,33) = -0.0021$
$\gamma(14,34) = -0.0004$	$\gamma(14,35) = 0.0187$	$\gamma(15,1) = -0.0093$	$\gamma(15,2) = 0.0044$
$\gamma(15,3) = -0.0098$	$\gamma(15,4) = -0.0046$	$\gamma(15,5) = 0.0095$	$\gamma(15,11) = 0.0144$
$\gamma(15,12) = 0.0094$	$\gamma(15,13) = 0.0202$	$\gamma(15,14) = -0.0078$	$\gamma(15,15) = 0.0163$
$\gamma(15,27) = 0.0290$	$\gamma(15,28) = 0.0040$	$\gamma(15,29) = 0.0128$	$\gamma(15,33) = -0.0544$
$\gamma(15,34) = -0.0255$	$\gamma(15,35) = -0.0268$	$\gamma(16,1) = -0.1177$	$\gamma(16,3) = 0.1426$
$\gamma(16,4) = 0.2961$	$\gamma(16,6) = -0.0114$	$\gamma(16,7) = 0.0027$	$\gamma(16,8) = -0.0016$
$\gamma(16,9) = 0.0054$	$\gamma(16,10) = -0.0093$	$\gamma(16,11) = -0.1192$	$\gamma(16,12) = -0.1246$
$\gamma(16,13) = -0.0711$	$\gamma(16,14) = -0.1485$	$\gamma(16,15) = -0.2573$	$\gamma(16,16) = 0.0104$
$\gamma(16,17) = 0.0026$	$\gamma(16,18) = 0.0015$	$\gamma(16,19) = 0.0083$	$\gamma(16,20) = 0.0144$
$\gamma(16,21) = 0.0161$	$\gamma(16,22) = 0.0148$	$\gamma(16,23) = -0.0088$	$\gamma(16,27) = -0.5752$
$\gamma(16,29) = 0.5506$	$\gamma(16,30) = 0.0244$	$\gamma(16,31) = 0.0181$	$\gamma(16,32) = 0.0246$
$\gamma(16,33) = 0.5730$	$\gamma(16,34) = -0.4780$	$\gamma(16,35) = 0.2770$	$\gamma(16,36) = -0.0242$

γ(16,37) = -0.0303	γ(16,38) = -0.0034	γ(16,39) = -0.0161	γ(16,41) = -0.0173
γ(17,2) = -0.1386	γ(17,5) = 0.2864	γ(17,6) = 0.0027	γ(17,7) = -0.0117
γ(17,8) = -0.0019	γ(17,9) = -0.0098	γ(17,10) = 0.0044	γ(17,11) = -0.1246
γ(17,12) = -0.0911	γ(17,13) = 0.0275	γ(17,14) = -0.2018	γ(17,15) = -0.0639
γ(17,16) = 0.0026	γ(17,17) = 0.0040	γ(17,18) = -0.0268	γ(17,19) = 0.0202
γ(17,20) = 0.0094	γ(17,21) = -0.0575	γ(17,22) = 0.0154	γ(17,23) = -0.0036
γ(17,28) = -0.5649	γ(17,30) = 0.0322	γ(17,31) = 0.0122	γ(17,32) = 0.0145
γ(17,33) = -0.4874	γ(17,34) = -0.9200	γ(17,35) = 0.8578	γ(17,36) = 0.0108
γ(17,37) = -0.0092	γ(17,38) = 0.0342	γ(17,40) = -0.0092	γ(18,1) = 0.1426
γ(18,3) = -0.0744	γ(18,4) = -0.1800	γ(18,6) = -0.0016	γ(18,7) = -0.0019
γ(18,8) = -0.0140	γ(18,9) = -0.0068	γ(18,10) = -0.0098	γ(18,11) = -0.0711
γ(18,12) = 0.0275	γ(18,13) = -0.1226	γ(18,14) = 0.1693	γ(18,15) = -0.2015
γ(18,16) = 0.0015	γ(18,17) = -0.0268	γ(18,18) = 0.0349	γ(18,19) = -0.0139
γ(18,20) = 0.0202	γ(18,21) = 0.0333	γ(18,22) = -0.0036	γ(18,23) = 0.0114
γ(18,27) = 0.5652	γ(18,29) = 1.4152	γ(18,30) = -0.0310	γ(18,31) = -0.0359
γ(18,32) = 0.0205	γ(18,33) = 0.2823	γ(18,34) = 0.8583	γ(18,35) = 0.0703
γ(18,36) = -0.0434	γ(18,37) = -0.0162	γ(18,38) = -0.0236	γ(18,39) = 0.0665
γ(18,41) = -0.0176	γ(19,1) = 0.2961	γ(19,3) = -0.1800	γ(19,4) = -0.3267
γ(19,6) = 0.0054	γ(19,7) = -0.0098	γ(19,8) = -0.0068	γ(19,9) = 0.0042
γ(19,10) = -0.0046	γ(19,11) = -0.1485	γ(19,12) = -0.2018	γ(19,13) = 0.1693
γ(19,14) = -0.0308	γ(19,15) = -0.1698	γ(19,16) = 0.0083	γ(19,17) = 0.0202
γ(19,18) = -0.0139	γ(19,19) = 0.0252	γ(19,20) = -0.0078	γ(19,21) = 0.0056
γ(19,22) = -0.0481	γ(19,23) = -0.0418	γ(19,27) = -0.8964	γ(19,29) = -0.5626
γ(19,30) = 0.0460	γ(19,31) = 0.0389	γ(19,32) = 0.0027	γ(19,33) = -0.4486
γ(19,34) = 0.0946	γ(19,35) = 0.7209	γ(19,36) = -0.0021	γ(19,37) = -0.0004
γ(19,38) = 0.0187	γ(19,39) = 0.0110	γ(19,41) = -0.0413	γ(20,2) = 0.2864
γ(20,5) = 0.0667	γ(20,6) = -0.0093	γ(20,7) = 0.0044	γ(20,8) = -0.0098
γ(20,9) = -0.0046	γ(20,10) = 0.0095	γ(20,11) = -0.2573	γ(20,12) = -0.0639
γ(20,13) = -0.2015	γ(20,14) = -0.1698	γ(20,15) = -0.2275	γ(20,16) = 0.0144
γ(20,17) = 0.0094	γ(20,18) = 0.0202	γ(20,19) = -0.0078	γ(20,20) = 0.0163
γ(20,21) = -0.0097	γ(20,22) = 0.0136	γ(20,23) = -0.0482	γ(20,28) = -0.7740
γ(20,30) = 0.0290	γ(20,31) = 0.0040	γ(20,32) = 0.0128	γ(20,33) = 0.7767

$\gamma(20,34) = 0.6151$	$\gamma(20,35) = 0.0921$	$\gamma(20,36) = -0.0544$	$\gamma(20,37) = -0.0255$
$\gamma(20,38) = -0.0268$	$\gamma(20,40) = 0.0695$	$\gamma(21,1) = 0.0242$	$\gamma(21,2) = -0.0108$
$\gamma(21,3) = 0.0434$	$\gamma(21,4) = 0.0021$	$\gamma(21,5) = 0.0544$	$\gamma(21,21) = 0.0039$
$\gamma(21,22) = 0.0041$	$\gamma(21,23) = 0.0027$	$\gamma(21,27) = 0.0003$	$\gamma(21,29) = -0.0073$
$\gamma(21,33) = -0.0198$	$\gamma(21,34) = -0.0059$	$\gamma(21,35) = -0.0035$	$\gamma(22,1) = 0.0303$
$\gamma(22,2) = 0.0092$	$\gamma(22,3) = 0.0162$	$\gamma(22,4) = 0.0004$	$\gamma(22,5) = 0.0255$
$\gamma(22,21) = 0.0044$	$\gamma(22,22) = 0.0105$	$\gamma(22,23) = -0.0177$	$\gamma(22,28) = -0.0151$
$\gamma(22,33) = -0.0059$	$\gamma(22,34) = -0.0180$	$\gamma(22,35) = 0.0082$	$\gamma(23,1) = 0.0034$
$\gamma(23,2) = -0.0342$	$\gamma(23,3) = 0.0236$	$\gamma(23,4) = -0.0187$	$\gamma(23,5) = 0.0268$
$\gamma(23,21) = 0.0023$	$\gamma(23,22) = -0.0207$	$\gamma(23,23) = 0.0327$	$\gamma(23,27) = -0.0148$
$\gamma(23,29) = 0.0036$	$\gamma(23,33) = -0.0035$	$\gamma(23,34) = 0.0082$	$\gamma(23,35) = 0.0112$
$\gamma(24,1) = -0.5730$	$\gamma(24,2) = 0.4874$	$\gamma(24,3) = -0.2823$	$\gamma(24,4) = 0.4486$
$\gamma(24,5) = -0.7767$	$\gamma(24,6) = 0.0242$	$\gamma(24,7) = -0.0108$	$\gamma(24,8) = 0.0434$
$\gamma(24,9) = 0.0021$	$\gamma(24,10) = 0.0544$	$\gamma(24,11) = 0.0161$	$\gamma(24,13) = -0.0665$
$\gamma(24,14) = -0.0110$	$\gamma(24,21) = -0.1225$	$\gamma(24,22) = 0.0091$	$\gamma(24,23) = -0.1030$
$\gamma(24,24) = 0.0039$	$\gamma(24,25) = 0.0041$	$\gamma(24,26) = 0.0027$	$\gamma(24,27) = -0.1225$
$\gamma(24,28) = -0.0091$	$\gamma(24,29) = -0.1030$	$\gamma(24,30) = 0.0003$	$\gamma(24,32) = -0.0073$
$\gamma(24,33) = 0.4608$	$\gamma(24,35) = -0.3753$	$\gamma(24,36) = -0.0198$	$\gamma(24,37) = -0.0059$
$\gamma(24,38) = -0.0035$	$\gamma(24,39) = -0.0198$	$\gamma(24,40) = 0.0059$	$\gamma(24,41) = -0.0035$
$\gamma(25,1) = 0.4780$	$\gamma(25,2) = 0.9200$	$\gamma(25,3) = -0.8583$	$\gamma(25,4) = -0.0946$
$\gamma(25,5) = -0.6151$	$\gamma(25,6) = 0.0303$	$\gamma(25,7) = 0.0092$	$\gamma(25,8) = 0.0162$
$\gamma(25,9) = 0.0004$	$\gamma(25,10) = 0.0255$	$\gamma(25,12) = 0.0092$	$\gamma(25,15) = -0.0695$
$\gamma(25,21) = -0.0853$	$\gamma(25,22) = 0.0965$	$\gamma(25,23) = -0.3807$	$\gamma(25,24) = 0.0044$
$\gamma(25,25) = 0.0105$	$\gamma(25,26) = -0.0177$	$\gamma(25,27) = 0.0853$	$\gamma(25,28) = 0.0965$
$\gamma(25,29) = 0.3807$	$\gamma(25,31) = -0.0151$	$\gamma(25,34) = -0.1509$	$\gamma(25,36) = -0.0059$
$\gamma(25,37) = -0.0180$	$\gamma(25,38) = 0.0082$	$\gamma(25,39) = 0.0059$	$\gamma(25,40) = -0.0180$
$\gamma(25,41) = -0.0082$	$\gamma(26,1) = -0.2770$	$\gamma(26,2) = -0.8578$	$\gamma(26,3) = -0.0703$
$\gamma(26,4) = -0.7209$	$\gamma(26,5) = -0.0921$	$\gamma(26,6) = 0.0034$	$\gamma(26,7) = -0.0342$
$\gamma(26,8) = 0.0236$	$\gamma(26,9) = -0.0187$	$\gamma(26,10) = 0.0268$	$\gamma(26,11) = 0.0173$
$\gamma(26,13) = 0.0176$	$\gamma(26,14) = 0.0413$	$\gamma(26,21) = 0.0606$	$\gamma(26,22) = -0.2026$
$\gamma(26,23) = 0.4331$	$\gamma(26,24) = 0.0023$	$\gamma(26,25) = -0.0207$	$\gamma(26,26) = 0.0327$
$\gamma(26,27) = 0.0606$	$\gamma(26,28) = 0.2026$	$\gamma(26,29) = 0.4331$	$\gamma(26,30) = -0.0148$

$\gamma(26,32) = 0.0036$	$\gamma(26,33) = -0.3753$	$\gamma(26,35) = 0.2203$	$\gamma(26,36) = -0.0035$
$\gamma(26,37) = 0.0082$	$\gamma(26,38) = 0.0112$	$\gamma(26,39) = -0.0035$	$\gamma(26,40) = -0.0082$
$\gamma(26,41) = 0.0112$	$\gamma(27,27) = 0.0039$	$\gamma(27,28) = 0.0041$	$\gamma(27,29) = 0.0027$
$\gamma(28,27) = 0.0044$	$\gamma(28,28) = 0.0105$	$\gamma(28,29) = -0.0177$	$\gamma(29,27) = 0.0023$
$\gamma(29,28) = -0.0207$	$\gamma(29,29) = 0.0327$	$\gamma(30,1) = 0.0241$	$\gamma(30,2) = -0.0430$
$\gamma(30,3) = -0.0123$	$\gamma(30,4) = -0.0481$	$\gamma(30,5) = 0.0253$	$\gamma(30,11) = 0.0242$
$\gamma(30,12) = -0.0108$	$\gamma(30,13) = 0.0434$	$\gamma(30,14) = 0.0021$	$\gamma(30,15) = 0.0544$
$\gamma(30,21) = 0.0004$	$\gamma(30,22) = -0.0128$	$\gamma(30,23) = 0.0074$	$\gamma(30,27) = -0.1225$
$\gamma(30,28) = 0.0091$	$\gamma(30,29) = -0.1030$	$\gamma(30,30) = 0.0039$	$\gamma(30,31) = 0.0041$
$\gamma(30,32) = 0.0027$	$\gamma(30,33) = -0.0690$	$\gamma(30,34) = 0.0633$	$\gamma(30,35) = -0.0369$
$\gamma(30,39) = -0.0198$	$\gamma(30,40) = -0.0059$	$\gamma(30,41) = -0.0035$	$\gamma(31,1) = 0.0121$
$\gamma(31,2) = 0.0278$	$\gamma(31,3) = -0.0233$	$\gamma(31,4) = 0.0010$	$\gamma(31,5) = -0.0193$
$\gamma(31,11) = 0.0303$	$\gamma(31,12) = 0.0092$	$\gamma(31,13) = 0.0162$	$\gamma(31,14) = 0.0004$
$\gamma(31,15) = 0.0255$	$\gamma(31,21) = -0.0063$	$\gamma(31,22) = -0.0011$	$\gamma(31,23) = -0.0081$
$\gamma(31,27) = -0.0853$	$\gamma(31,28) = 0.0965$	$\gamma(31,29) = -0.3807$	$\gamma(31,30) = 0.0044$
$\gamma(31,31) = 0.0105$	$\gamma(31,32) = -0.0177$	$\gamma(31,33) = 0.0633$	$\gamma(31,34) = -0.0629$
$\gamma(31,35) = -0.0376$	$\gamma(31,39) = -0.0059$	$\gamma(31,40) = -0.0180$	$\gamma(31,41) = 0.0082$
$\gamma(32,1) = -0.0279$	$\gamma(32,2) = 0.0269$	$\gamma(32,3) = 0.0050$	$\gamma(32,4) = 0.0262$
$\gamma(32,5) = -0.0255$	$\gamma(32,11) = 0.0034$	$\gamma(32,12) = -0.0342$	$\gamma(32,13) = 0.0236$
$\gamma(32,14) = -0.0187$	$\gamma(32,15) = 0.0268$	$\gamma(32,21) = 0.0036$	$\gamma(32,22) = -0.0081$
$\gamma(32,23) = -0.0104$	$\gamma(32,27) = 0.0606$	$\gamma(32,28) = -0.2026$	$\gamma(32,29) = 0.4331$
$\gamma(32,30) = 0.0023$	$\gamma(32,31) = -0.0207$	$\gamma(32,32) = 0.0327$	$\gamma(32,33) = -0.0369$
$\gamma(32,34) = -0.0376$	$\gamma(32,35) = -0.1052$	$\gamma(32,39) = -0.0035$	$\gamma(32,40) = 0.0082$
$\gamma(32,41) = 0.0112$	$\gamma(33,33) = 0.0039$	$\gamma(33,34) = 0.0044$	$\gamma(33,35) = 0.0023$
$\gamma(34,33) = 0.0041$	$\gamma(34,34) = 0.0105$	$\gamma(34,35) = -0.0207$	$\gamma(35,33) = 0.0027$
$\gamma(35,34) = -0.0177$	$\gamma(35,35) = 0.0327$	$\gamma(36,1) = -0.0161$	$\gamma(36,2) = 0.0575$
$\gamma(36,3) = -0.0333$	$\gamma(36,4) = -0.0056$	$\gamma(36,5) = 0.0097$	$\gamma(36,11) = -0.0244$
$\gamma(36,12) = -0.0322$	$\gamma(36,13) = 0.0310$	$\gamma(36,14) = -0.0460$	$\gamma(36,15) = -0.0290$
$\gamma(36,21) = -0.0198$	$\gamma(36,22) = -0.0060$	$\gamma(36,23) = -0.0033$	$\gamma(36,27) = -0.0687$
$\gamma(36,29) = 0.0729$	$\gamma(36,33) = -0.1225$	$\gamma(36,34) = -0.0853$	$\gamma(36,35) = 0.0606$
$\gamma(36,36) = 0.0039$	$\gamma(36,37) = 0.0044$	$\gamma(36,38) = 0.0023$	$\gamma(36,39) = 0.0003$
$\gamma(36,41) = -0.0148$	$\gamma(37,1) = -0.0148$	$\gamma(37,2) = -0.0154$	$\gamma(37,3) = 0.0036$

$\gamma(37,4) = 0.0481$	$\gamma(37,5) = -0.0136$	$\gamma(37,11) = -0.0181$	$\gamma(37,12) = -0.0122$
$\gamma(37,13) = 0.0359$	$\gamma(37,14) = -0.0389$	$\gamma(37,15) = -0.0040$	$\gamma(37,21) = -0.0060$
$\gamma(37,22) = 0.0110$	$\gamma(37,23) = -0.0085$	$\gamma(37,28) = -0.1264$	$\gamma(37,33) = 0.0091$
$\gamma(37,34) = 0.0965$	$\gamma(37,35) = -0.2026$	$\gamma(37,36) = 0.0041$	$\gamma(37,37) = 0.0105$
$\gamma(37,38) = -0.0207$	$\gamma(37,40) = -0.0151$	$\gamma(38,1) = 0.0088$	$\gamma(38,2) = 0.0036$
$\gamma(38,3) = -0.0114$	$\gamma(38,4) = 0.0418$	$\gamma(38,5) = 0.0482$	$\gamma(38,11) = -0.0246$
$\gamma(38,12) = -0.0145$	$\gamma(38,13) = -0.0205$	$\gamma(38,14) = -0.0027$	$\gamma(38,15) = -0.0128$
$\gamma(38,21) = -0.0033$	$\gamma(38,22) = -0.0085$	$\gamma(38,23) = -0.0178$	$\gamma(38,27) = 0.0729$
$\gamma(38,29) = -0.0415$	$\gamma(38,33) = -0.1030$	$\gamma(38,34) = -0.3807$	$\gamma(38,35) = 0.4331$
$\gamma(38,36) = 0.0027$	$\gamma(38,37) = -0.0177$	$\gamma(38,38) = 0.0327$	$\gamma(38,39) = -0.0073$
$\gamma(38,41) = 0.0036$	$\gamma(39,27) = -0.0198$	$\gamma(39,28) = -0.0060$	$\gamma(39,29) = -0.0033$
$\gamma(39,33) = 0.0004$	$\gamma(39,34) = -0.0063$	$\gamma(39,35) = 0.0036$	$\gamma(39,39) = 0.0039$
$\gamma(39,40) = 0.0044$	$\gamma(39,41) = 0.0023$	$\gamma(40,27) = -0.0060$	$\gamma(40,28) = 0.0110$
$\gamma(40,29) = -0.0085$	$\gamma(40,33) = -0.0128$	$\gamma(40,34) = -0.0011$	$\gamma(40,35) = -0.0081$
$\gamma(40,39) = 0.0041$	$\gamma(40,40) = 0.0105$	$\gamma(40,41) = -0.0207$	$\gamma(41,27) = -0.0033$
$\gamma(41,28) = -0.0085$	$\gamma(41,29) = -0.0178$	$\gamma(41,33) = 0.0074$	$\gamma(41,34) = -0.0081$
$\gamma(41,35) = -0.0104$	$\gamma(41,39) = 0.0027$	$\gamma(41,40) = -0.0177$	$\gamma(41,41) = 0.0327$
$\gamma(42,1) = -0.0241$	$\gamma(42,2) = -0.0430$	$\gamma(42,3) = 0.0123$	$\gamma(42,4) = 0.0481$
$\gamma(42,5) = 0.0253$	$\gamma(42,11) = -0.0161$	$\gamma(42,12) = 0.0575$	$\gamma(42,13) = -0.0333$
$\gamma(42,14) = -0.0056$	$\gamma(42,15) = 0.0097$	$\gamma(42,21) = -0.0198$	$\gamma(42,22) = -0.0002$
$\gamma(42,23) = 0.0069$	$\gamma(42,27) = 0.4621$	$\gamma(42,28) = -0.3252$	$\gamma(42,29) = 0.1872$
$\gamma(42,30) = -0.0198$	$\gamma(42,31) = -0.0060$	$\gamma(42,32) = -0.0033$	$\gamma(42,33) = -0.1224$
$\gamma(42,34) = -0.0945$	$\gamma(42,35) = 0.0435$	$\gamma(42,36) = 0.0004$	$\gamma(42,37) = -0.0063$
$\gamma(42,38) = 0.0036$	$\gamma(42,39) = -0.1225$	$\gamma(42,40) = -0.0853$	$\gamma(42,41) = 0.0606$
$\gamma(42,42) = 0.0039$	$\gamma(42,43) = 0.0044$	$\gamma(42,44) = 0.0023$	$\gamma(43,1) = 0.0121$
$\gamma(43,2) = -0.0278$	$\gamma(43,3) = -0.0233$	$\gamma(43,4) = 0.0010$	$\gamma(43,5) = 0.0193$
$\gamma(43,11) = -0.0148$	$\gamma(43,12) = -0.0154$	$\gamma(43,13) = 0.0036$	$\gamma(43,14) = 0.0481$
$\gamma(43,15) = -0.0136$	$\gamma(43,21) = -0.0002$	$\gamma(43,22) = -0.0032$	$\gamma(43,23) = -0.0167$
$\gamma(43,27) = -0.3252$	$\gamma(43,28) = 0.1264$	$\gamma(43,29) = -0.1603$	$\gamma(43,30) = -0.0060$
$\gamma(43,31) = 0.0110$	$\gamma(43,32) = -0.0085$	$\gamma(43,33) = 0.0945$	$\gamma(43,34) = 0.6012$
$\gamma(43,35) = -0.0890$	$\gamma(43,36) = -0.0128$	$\gamma(43,37) = -0.0011$	$\gamma(43,38) = -0.0081$
$\gamma(43,39) = 0.0091$	$\gamma(43,40) = 0.0965$	$\gamma(43,41) = -0.2026$	$\gamma(43,42) = 0.0041$

$\gamma(43,43) = 0.0105$	$\gamma(43,44) = -0.0207$	$\gamma(44,1) = 0.0279$	$\gamma(44,2) = 0.0269$
$\gamma(44,3) = -0.0050$	$\gamma(44,4) = -0.0262$	$\gamma(44,5) = -0.0255$	$\gamma(44,11) = 0.0088$
$\gamma(44,12) = 0.0036$	$\gamma(44,13) = -0.0114$	$\gamma(44,14) = 0.0418$	$\gamma(44,15) = 0.0482$
$\gamma(44,21) = 0.0069$	$\gamma(44,22) = -0.0167$	$\gamma(44,23) = -0.0036$	$\gamma(44,27) = 0.1872$
$\gamma(44,28) = -0.1603$	$\gamma(44,29) = -0.0593$	$\gamma(44,30) = -0.0033$	$\gamma(44,31) = -0.0085$
$\gamma(44,32) = -0.0178$	$\gamma(44,33) = 0.0435$	$\gamma(44,34) = 0.0890$	$\gamma(44,35) = -0.0720$
$\gamma(44,36) = 0.0074$	$\gamma(44,37) = -0.0081$	$\gamma(44,38) = -0.0104$	$\gamma(44,39) = -0.1030$
$\gamma(44,40) = -0.3807$	$\gamma(44,41) = 0.4331$	$\gamma(44,42) = 0.0027$	$\gamma(44,43) = -0.0177$
$\gamma(44,44) = 0.0327$			

$\delta1(6,1) = 0.0104$	$\delta1(6,2) = -0.0026$	$\delta1(6,3) = 0.0015$	$\delta1(6,4) = 0.0083$
$\delta1(6,5) = -0.0144$	$\delta1(7,1) = -0.0026$	$\delta1(7,2) = 0.0040$	$\delta1(7,3) = 0.0268$
$\delta1(7,4) = -0.0202$	$\delta1(7,5) = 0.0094$	$\delta1(8,1) = 0.0015$	$\delta1(8,2) = 0.0268$
$\delta1(8,3) = 0.0349$	$\delta1(8,4) = -0.0139$	$\delta1(8,5) = -0.0202$	$\delta1(9,1) = 0.0083$
$\delta1(9,2) = -0.0202$	$\delta1(9,3) = -0.0139$	$\delta1(9,4) = 0.0252$	$\delta1(9,5) = 0.0078$
$\delta1(10,1) = -0.0144$	$\delta1(10,2) = 0.0094$	$\delta1(10,3) = -0.0202$	$\delta1(10,4) = 0.0078$
$\delta1(10,5) = 0.0163$	$\delta1(11,1) = -0.0114$	$\delta1(11,3) = 0.0032$	$\delta1(11,4) = -0.0107$
$\delta1(12,2) = -0.0151$	$\delta1(12,5) = -0.0125$	$\delta1(13,1) = 0.0032$	$\delta1(13,3) = -0.0105$
$\delta1(13,4) = 0.0100$	$\delta1(14,1) = -0.0107$	$\delta1(14,3) = 0.0100$	$\delta1(14,4) = 0.0122$
$\delta1(15,2) = -0.0125$	$\delta1(15,5) = 0.0016$	$\delta1(16,1) = -0.1192$	$\delta1(16,2) = 0.1246$
$\delta1(16,3) = -0.0711$	$\delta1(16,4) = -0.1485$	$\delta1(16,5) = 0.2573$	$\delta1(16,6) = -0.0114$
$\delta1(16,8) = 0.0032$	$\delta1(16,9) = -0.0107$	$\delta1(16,11) = 0.0104$	$\delta1(16,12) = -0.0026$
$\delta1(16,13) = 0.0015$	$\delta1(16,14) = 0.0083$	$\delta1(16,15) = -0.0144$	$\delta1(16,21) = 0.0244$
$\delta1(16,22) = -0.0181$	$\delta1(16,23) = 0.0246$	$\delta1(16,33) = -0.0242$	$\delta1(16,34) = 0.0303$
$\delta1(16,35) = -0.0034$	$\delta1(17,1) = 0.1246$	$\delta1(17,2) = -0.0911$	$\delta1(17,3) = -0.0275$
$\delta1(17,4) = 0.2018$	$\delta1(17,5) = -0.0639$	$\delta1(17,7) = -0.0151$	$\delta1(17,10) = -0.0125$
$\delta1(17,11) = -0.0026$	$\delta1(17,12) = 0.0040$	$\delta1(17,13) = 0.0268$	$\delta1(17,14) = -0.0202$
$\delta1(17,15) = 0.0094$	$\delta1(17,21) = -0.0322$	$\delta1(17,22) = 0.0122$	$\delta1(17,23) = -0.0145$
$\delta1(17,33) = -0.0108$	$\delta1(17,34) = -0.0092$	$\delta1(17,35) = -0.0342$	$\delta1(18,1) = -0.0711$
$\delta1(18,2) = -0.0275$	$\delta1(18,3) = -0.1226$	$\delta1(18,4) = 0.1693$	$\delta1(18,5) = 0.2015$
$\delta1(18,6) = 0.0032$	$\delta1(18,8) = -0.0105$	$\delta1(18,9) = 0.0100$	$\delta1(18,11) = 0.0015$

$\delta 1(18,12) = 0.0268$	$\delta 1(18,13) = 0.0349$	$\delta 1(18,14) = -0.0139$	$\delta 1(18,15) = -0.0202$
$\delta 1(18,21) = -0.0310$	$\delta 1(18,22) = 0.0359$	$\delta 1(18,23) = 0.0205$	$\delta 1(18,33) = -0.0434$
$\delta 1(18,34) = 0.0162$	$\delta 1(18,35) = -0.0236$	$\delta 1(19,1) = -0.1485$	$\delta 1(19,2) = 0.2018$
$\delta 1(19,3) = 0.1693$	$\delta 1(19,4) = -0.0308$	$\delta 1(19,5) = 0.1698$	$\delta 1(19,6) = -0.0107$
$\delta 1(19,8) = 0.0100$	$\delta 1(19,9) = 0.0122$	$\delta 1(19,11) = 0.0083$	$\delta 1(19,12) = -0.0202$
$\delta 1(19,13) = -0.0139$	$\delta 1(19,14) = 0.0252$	$\delta 1(19,15) = 0.0078$	$\delta 1(19,21) = 0.0460$
$\delta 1(19,22) = -0.0389$	$\delta 1(19,23) = 0.0027$	$\delta 1(19,33) = -0.0021$	$\delta 1(19,34) = 0.0004$
$\delta 1(19,35) = 0.0187$	$\delta 1(20,1) = 0.2573$	$\delta 1(20,2) = -0.0639$	$\delta 1(20,3) = 0.2015$
$\delta 1(20,4) = 0.1698$	$\delta 1(20,5) = -0.2275$	$\delta 1(20,7) = -0.0125$	$\delta 1(20,10) = 0.0016$
$\delta 1(20,11) = -0.0144$	$\delta 1(20,12) = 0.0094$	$\delta 1(20,13) = -0.0202$	$\delta 1(20,14) = 0.0078$
$\delta 1(20,15) = 0.0163$	$\delta 1(20,21) = -0.0290$	$\delta 1(20,22) = 0.0040$	$\delta 1(20,23) = -0.0128$
$\delta 1(20,33) = 0.0544$	$\delta 1(20,34) = -0.0255$	$\delta 1(20,35) = 0.0268$	$\delta 1(24,1) = 0.0242$
$\delta 1(24,2) = 0.0108$	$\delta 1(24,3) = 0.0434$	$\delta 1(24,4) = 0.0021$	$\delta 1(24,5) = -0.0544$
$\delta 1(24,21) = 0.0039$	$\delta 1(24,22) = -0.0041$	$\delta 1(24,23) = 0.0027$	$\delta 1(25,1) = -0.0303$
$\delta 1(25,2) = 0.0092$	$\delta 1(25,3) = -0.0162$	$\delta 1(25,4) = -0.0004$	$\delta 1(25,5) = 0.0255$
$\delta 1(25,21) = -0.0044$	$\delta 1(25,22) = 0.0105$	$\delta 1(25,23) = 0.0177$	$\delta 1(26,1) = 0.0034$
$\delta 1(26,2) = 0.0342$	$\delta 1(26,3) = 0.0236$	$\delta 1(26,4) = -0.0187$	$\delta 1(26,5) = -0.0268$
$\delta 1(26,21) = 0.0023$	$\delta 1(26,22) = 0.0207$	$\delta 1(26,23) = 0.0327$	$\delta 1(30,1) = 0.0161$
$\delta 1(30,3) = -0.0665$	$\delta 1(30,4) = -0.0110$	$\delta 1(30,21) = 0.0003$	$\delta 1(30,23) = -0.0073$
$\delta 1(30,27) = 0.0039$	$\delta 1(30,28) = -0.0041$	$\delta 1(30,29) = 0.0027$	$\delta 1(30,33) = -0.0198$
$\delta 1(30,34) = 0.0059$	$\delta 1(30,35) = -0.0035$	$\delta 1(31,2) = 0.0092$	$\delta 1(31,5) = -0.0695$
$\delta 1(31,22) = -0.0151$	$\delta 1(31,27) = -0.0044$	$\delta 1(31,28) = 0.0105$	$\delta 1(31,29) = 0.0177$
$\delta 1(31,33) = 0.0059$	$\delta 1(31,34) = -0.0180$	$\delta 1(31,35) = -0.0082$	$\delta 1(32,1) = 0.0173$
$\delta 1(32,3) = 0.0176$	$\delta 1(32,4) = 0.0413$	$\delta 1(32,21) = -0.0148$	$\delta 1(32,23) = 0.0036$
$\delta 1(32,27) = 0.0023$	$\delta 1(32,28) = 0.0207$	$\delta 1(32,29) = 0.0327$	$\delta 1(32,33) = -0.0035$
$\delta 1(32,34) = -0.0082$	$\delta 1(32,35) = 0.0112$	$\delta 1(36,1) = -0.0244$	$\delta 1(36,2) = 0.0322$
$\delta 1(36,3) = 0.0310$	$\delta 1(36,4) = -0.0460$	$\delta 1(36,5) = 0.0290$	$\delta 1(36,33) = 0.0039$
$\delta 1(36,34) = -0.0044$	$\delta 1(36,35) = 0.0023$	$\delta 1(37,1) = 0.0181$	$\delta 1(37,2) = -0.0122$
$\delta 1(37,3) = -0.0359$	$\delta 1(37,4) = 0.0389$	$\delta 1(37,5) = -0.0040$	$\delta 1(37,33) = -0.0041$
$\delta 1(37,34) = 0.0105$	$\delta 1(37,35) = 0.0207$	$\delta 1(38,1) = -0.0246$	$\delta 1(38,2) = 0.0145$
$\delta 1(38,3) = -0.0205$	$\delta 1(38,4) = -0.0027$	$\delta 1(38,5) = 0.0128$	$\delta 1(38,33) = 0.0027$
$\delta 1(38,34) = 0.0177$	$\delta 1(38,35) = 0.0327$	$\delta 1(39,1) = -0.0244$	$\delta 1(39,2) = -0.0322$

δ1(39,3) = 0.0310	δ1(39,4) = -0.0460	δ1(39,5) = -0.0290	δ1(39,33) = 0.0003
δ1(39,35) = -0.0148	δ1(40,1) = -0.0181	δ1(40,2) = -0.0122	δ1(40,3) = 0.0359
δ1(40,4) = -0.0389	δ1(40,5) = -0.0040	δ1(40,34) = -0.0151	δ1(41,1) = -0.0246
δ1(41,2) = -0.0145	δ1(41,3) = -0.0205	δ1(41,4) = -0.0027	δ1(41,5) = -0.0128
δ1(41,33) = -0.0073	δ1(41,35) = 0.0036	δ1(42,1) = 0.5752	δ1(42,3) = -0.5652
δ1(42,4) = 0.8964	δ1(42,6) = -0.0244	δ1(42,7) = -0.0322	δ1(42,8) = 0.0310
δ1(42,9) = -0.0460	δ1(42,10) = -0.0290	δ1(42,11) = -0.0244	δ1(42,12) = 0.0322
δ1(42,13) = 0.0310	δ1(42,14) = -0.0460	δ1(42,15) = 0.0290	δ1(42,21) = -0.0687
δ1(42,23) = 0.0729	δ1(42,27) = -0.0198	δ1(42,28) = 0.0060	δ1(42,29) = -0.0033
δ1(42,33) = -0.1225	δ1(42,34) = 0.0853	δ1(42,35) = 0.0606	δ1(42,36) = 0.0003
δ1(42,38) = -0.0148	δ1(42,39) = 0.0039	δ1(42,40) = -0.0044	δ1(42,41) = 0.0023
δ1(43,2) = 0.5649	δ1(43,5) = 0.7740	δ1(43,6) = -0.0181	δ1(43,7) = -0.0122
δ1(43,8) = 0.0359	δ1(43,9) = -0.0389	δ1(43,10) = -0.0040	δ1(43,11) = 0.0181
δ1(43,12) = -0.0122	δ1(43,13) = -0.0359	δ1(43,14) = 0.0389	δ1(43,15) = -0.0040
δ1(43,22) = -0.1264	δ1(43,27) = 0.0060	δ1(43,28) = 0.0110	δ1(43,29) = 0.0085
δ1(43,33) = -0.0091	δ1(43,34) = 0.0965	δ1(43,35) = 0.2026	δ1(43,37) = -0.0151
δ1(43,39) = -0.0041	δ1(43,40) = 0.0105	δ1(43,41) = 0.0207	δ1(44,1) = -0.5506
δ1(44,3) = -1.4152	δ1(44,4) = 0.5626	δ1(44,6) = -0.0246	δ1(44,7) = -0.0145
δ1(44,8) = -0.0205	δ1(44,9) = -0.0027	δ1(44,10) = -0.0128	δ1(44,11) = -0.0246
δ1(44,12) = 0.0145	δ1(44,13) = -0.0205	δ1(44,14) = -0.0027	δ1(44,15) = 0.0128
δ1(44,21) = 0.0729	δ1(44,23) = -0.0415	δ1(44,27) = -0.0033	δ1(44,28) = 0.0085
δ1(44,29) = -0.0178	δ1(44,33) = -0.1030	δ1(44,34) = 0.3807	δ1(44,35) = 0.4331
δ1(44,36) = -0.0073	δ1(44,38) = 0.0036	δ1(44,39) = 0.0027	δ1(44,40) = 0.0177
δ1(44,41) = 0.0327			

δ2(1,6) = 0.0103	δ2(1,8) = -0.0029	δ2(1,9) = -0.0166	δ2(2,7) = 0.0505
δ2(2,10) = -0.0256	δ2(3,6) = -0.0029	δ2(3,8) = -0.0115	δ2(3,9) = 0.0211
δ2(4,6) = -0.0166	δ2(4,8) = 0.0211	δ2(4,9) = 0.0118	δ2(5,7) = -0.0256
δ2(5,10) = 0.0297	δ2(11,6) = -0.0114	δ2(11,7) = 0.0027	δ2(11,8) = -0.0016
δ2(11,9) = 0.0054	δ2(11,10) = -0.0093	δ2(11,16) = 0.0103	δ2(11,18) = -0.0029
δ2(11,19) = -0.0166	δ2(11,24) = 0.0241	δ2(11,25) = 0.0121	δ2(11,26) = -0.0279

δ2(12,6) = 0.0027	δ2(12,7) = -0.0117	δ2(12,8) = -0.0019	δ2(12,9) = -0.0098
δ2(12,10) = 0.0044	δ2(12,17) = 0.0505	δ2(12,20) = -0.0256	δ2(12,24) = -0.0430
δ2(12,25) = 0.0278	δ2(12,26) = 0.0269	δ2(13,6) = -0.0016	δ2(13,7) = -0.0019
δ2(13,8) = -0.0140	δ2(13,9) = -0.0068	δ2(13,10) = -0.0098	δ2(13,16) = -0.0029
δ2(13,18) = -0.0115	δ2(13,19) = 0.0211	δ2(13,24) = -0.0123	δ2(13,25) = -0.0233
δ2(13,26) = 0.0050	δ2(14,6) = 0.0054	δ2(14,7) = -0.0098	δ2(14,8) = -0.0068
δ2(14,9) = 0.0042	δ2(14,10) = -0.0046	δ2(14,16) = -0.0166	δ2(14,18) = 0.0211
δ2(14,19) = 0.0118	δ2(14,24) = -0.0481	δ2(14,25) = 0.0010	δ2(14,26) = 0.0262
δ2(15,6) = -0.0093	δ2(15,7) = 0.0044	δ2(15,8) = -0.0098	δ2(15,9) = -0.0046
δ2(15,10) = 0.0095	δ2(15,17) = -0.0256	δ2(15,20) = 0.0297	δ2(15,24) = 0.0253
δ2(15,25) = -0.0193	δ2(15,26) = -0.0255	δ2(21,24) = 0.0038	δ2(21,25) = 0.0002
δ2(21,26) = -0.0049	δ2(22,24) = -0.0002	δ2(22,25) = 0.0438	δ2(22,26) = 0.0015
δ2(23,24) = -0.0049	δ2(23,25) = -0.0015	δ2(23,26) = -0.0006	δ2(27,6) = 0.0161
δ2(27,7) = -0.0575	δ2(27,8) = 0.0333	δ2(27,9) = 0.0056	δ2(27,10) = -0.0097
δ2(27,16) = 0.0241	δ2(27,17) = 0.0430	δ2(27,18) = -0.0123	δ2(27,19) = -0.0481
δ2(27,20) = -0.0253	δ2(27,21) = 0.0004	δ2(27,22) = -0.0063	δ2(27,23) = 0.0036
δ2(27,24) = -0.1224	δ2(27,25) = -0.0945	δ2(27,26) = 0.0435	δ2(27,30) = 0.0038
δ2(27,31) = 0.0002	δ2(27,32) = -0.0049	δ2(27,36) = -0.0198	δ2(27,37) = -0.0002
δ2(27,38) = 0.0069	δ2(28,6) = 0.0148	δ2(28,7) = 0.0154	δ2(28,8) = -0.0036
δ2(28,9) = -0.0481	δ2(28,10) = 0.0136	δ2(28,16) = -0.0121	δ2(28,17) = 0.0278
δ2(28,18) = 0.0233	δ2(28,19) = -0.0010	δ2(28,20) = -0.0193	δ2(28,21) = -0.0128
δ2(28,22) = -0.0011	δ2(28,23) = -0.0081	δ2(28,24) = 0.0945	δ2(28,25) = 0.6012
δ2(28,26) = -0.0890	δ2(28,30) = -0.0002	δ2(28,31) = 0.0438	δ2(28,32) = 0.0015
δ2(28,36) = -0.0002	δ2(28,37) = -0.0032	δ2(28,38) = -0.0167	δ2(29,6) = -0.0088
δ2(29,7) = -0.0036	δ2(29,8) = 0.0114	δ2(29,9) = -0.0418	δ2(29,10) = -0.0482
δ2(29,16) = -0.0279	δ2(29,17) = -0.0269	δ2(29,18) = 0.0050	δ2(29,19) = 0.0262
δ2(29,20) = 0.0255	δ2(29,21) = 0.0074	δ2(29,22) = -0.0081	δ2(29,23) = -0.0104
δ2(29,24) = 0.0435	δ2(29,25) = 0.0890	δ2(29,26) = -0.0720	δ2(29,30) = -0.0049
δ2(29,31) = -0.0015	δ2(29,32) = -0.0006	δ2(29,36) = 0.0069	δ2(29,37) = -0.0167
δ2(29,38) = -0.0036	δ2(30,24) = 0.0004	δ2(30,25) = -0.0063	δ2(30,26) = 0.0036
δ2(31,24) = -0.0128	δ2(31,25) = -0.0011	δ2(31,26) = -0.0081	δ2(32,24) = 0.0074
δ2(32,25) = -0.0081	δ2(32,26) = -0.0104	δ2(33,6) = -0.0241	δ2(33,7) = 0.0430

δ2(33,8) = 0.0123	δ2(33,9) = 0.0481	δ2(33,10) = -0.0253	δ2(33,24) = -0.0198
δ2(33,25) = 0.0002	δ2(33,26) = 0.0069	δ2(33,36) = 0.0038	δ2(33,37) = -0.0002
δ2(33,38) = -0.0049	δ2(34,6) = -0.0121	δ2(34,7) = -0.0278	δ2(34,8) = 0.0233
δ2(34,9) = -0.0010	δ2(34,10) = 0.0193	δ2(34,24) = 0.0002	δ2(34,25) = -0.0032
δ2(34,26) = 0.0167	δ2(34,36) = 0.0002	δ2(34,37) = 0.0438	δ2(34,38) = -0.0015
δ2(35,6) = 0.0279	δ2(35,7) = -0.0269	δ2(35,8) = -0.0050	δ2(35,9) = -0.0262
δ2(35,10) = 0.0255	δ2(35,24) = 0.0069	δ2(35,25) = 0.0167	δ2(35,26) = -0.0036
δ2(35,36) = -0.0049	δ2(35,37) = 0.0015	δ2(35,38) = -0.0006	δ2(39,6) = -0.0242
δ2(39,7) = 0.0108	δ2(39,8) = -0.0434	δ2(39,9) = -0.0021	δ2(39,10) = -0.0544
δ2(39,16) = -0.0241	δ2(39,17) = 0.0430	δ2(39,18) = 0.0123	δ2(39,19) = 0.0481
δ2(39,20) = -0.0253	δ2(39,24) = -0.0690	δ2(39,25) = 0.0633	δ2(39,26) = -0.0369
δ2(39,36) = 0.0004	δ2(39,37) = -0.0128	δ2(39,38) = 0.0074	δ2(39,42) = 0.0038
δ2(39,43) = -0.0002	δ2(39,44) = -0.0049	δ2(40,6) = -0.0303	δ2(40,7) = -0.0092
δ2(40,8) = -0.0162	δ2(40,9) = -0.0004	δ2(40,10) = -0.0255	δ2(40,16) = -0.0121
δ2(40,17) = -0.0278	δ2(40,18) = 0.0233	δ2(40,19) = -0.0010	δ2(40,20) = 0.0193
δ2(40,24) = 0.0633	δ2(40,25) = -0.0629	δ2(40,26) = -0.0376	δ2(40,36) = -0.0063
δ2(40,37) = -0.0011	δ2(40,38) = -0.0081	δ2(40,42) = 0.0002	δ2(40,43) = 0.0438
δ2(40,44) = -0.0015	δ2(41,6) = -0.0034	δ2(41,7) = 0.0342	δ2(41,8) = -0.0236
δ2(41,9) = 0.0187	δ2(41,10) = -0.0268	δ2(41,16) = 0.0279	δ2(41,17) = -0.0269
δ2(41,18) = -0.0050	δ2(41,19) = -0.0262	δ2(41,20) = 0.0255	δ2(41,24) = -0.0369
δ2(41,25) = -0.0376	δ2(41,26) = -0.1052	δ2(41,36) = 0.0036	δ2(41,37) = -0.0081
δ2(41,38) = -0.0104	δ2(41,42) = -0.0049	δ2(41,43) = 0.0015	δ2(41,44) = -0.0006