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Parameter Optimisation for *FCϵRIγ* Pathway to Two Different Datasets Using Least-Squares Optimisation

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ABSTRACT

Syk is a tyrosine kinase important to bridge the receptor ligation and downstream signallings such as Ca^{2+} and PI3K. Once the cell receptor binds with the ligand, FCϵRIγ (ITAM receptor) is recruited and phosphorylated by Lyn. The phosphorylated ITAM then recruits protein tyrosine kinase (Syk). The previously developed FCϵRIγ (FCϵ) model contained a greater level of complexity. This study aims to build a simple model of signalling of FCϵ that still represents biological understanding. The parameter estimation is addressed using least-squares optimisation, which implements the Levenburg-Marquardt gradient method (greedy algorithm) to minimise an objective function. More importantly, this model was fitted to two data sets that captured a temporal FCϵ, Syk and Grb2 phosphorylation. Model uncertainty often has done as an analysis that is carried out after model construction and calibration have been completed. This study assessed for sensitivity to parameter choices and model uncertainty to perform the analysis. The modular design principles are applied to the construction of the model. The model is designed to be reproducible. In other words, the model can be effectively applied in simulation conditions or optimised to new datasets for new experimental situations.

Keywords: FCϵRIγ pathway, mathematical model, modular, parameter optimisation, reproducible

INTRODUCTION

The high-affinity IgE receptor (FCϵRIγ) is a highly important receptor found in many immune cells, including natural killer cells, mast cells, monocytes, eosinophils, and dendritic cells (Maurer, et al., 1996; Lantz, et al., 1997). FCϵRIγ (FCϵ) involves determining immune cells' response toward target cells by secreting cytokines (Benhamou et al., 2019). For years, many

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in vivo and *in silico* studies have been done to understand the FCϵ downstream signalling pathway once the receptor has been activated (Faeder et al., 2003; Lantz et al., 1997; Maurer et al., 1996; Tsang et al., 2008; Blank et al., 2021; Gregorio, 2019; Benhamou et al., 2019).

Activation of FCϵ by Lyn-catalysed phosphorylation recruits Syk. Syk binding to FCϵ is activated via phosphorylation by Lyn. Phosphorylated Syk then phosphorylates GRB2-associated binding protein 2 (GAB2), which leads to activation of the phosphoinositide 3-kinase (PI3K) signalling cascade. FCϵ exists in tetrameric form, which has an α-chain, a β-chain, and two disulfide-linked γ-chain (Faeder et al., 2003). The α subunit can be bound to a ligand or unbound, a β-chain has four possible states of phosphorylation, and two disulfide-linked γ-chain has six states of phosphorylations.

Previously Faeder et al. (2003) developed a model of early signalling of *FC*ϵ. However, this model contained a greater level of complexity. In total, there are 300 possible states of receptor subunits for FCϵ (Faeder et al., 2003). Faeder's model focuses on the early events in FCϵ signalling, consisting of 3 components, 15 reaction classes and 21 rate constants. The parameters in Faeder's model were modified to fit the model to experimental data.

In this model, this study aims to build a simple model of signalling of FCϵ that still represents biological understanding and can fit different experimental data sets. The idea is to develop a simple model with fewer unknown parameters that need to be predicted during optimisation. Further, the uncertainty in the model can be reduced. The model was built in component that can be mobilised and reusable to be included in larger pathway model. As described in Faeder et al. (2003), the early events in FCϵ signalling can be described as a linear sequence. Here, a model that consists of 4 components, 7 reaction classes and 7 rate constants is developed. The model was optimised using the Levenburg-Marquardt gradient method (greedy algorithm) to minimise an objective function described later in Methodology.

This study assumed that FCϵ is in an aggregated state and ready for binding with other reactants to avoid complexity. First, the activated FCϵ receptor is transphosphorylated by pLyn, available at the cell surface. Then, the recruitment of Syk follows it to the membrane surface, which is subsequently transautophosporylated by phosphorylated FCϵ. Finally, inactive Grb2 binds to phosphorylated Syk and becomes phosphorylated (Figure 1).

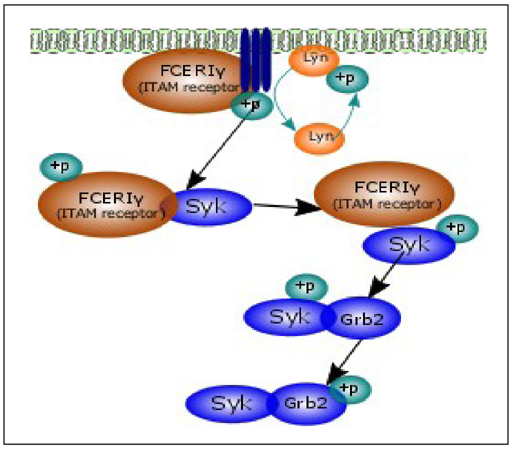

Figure 1. Schematic diagram of the FCϵRIγ signalling pathway

Previous studies have shown that ITAM phosphorylation increases Syk activity and modulates Syk potency (Tsang et al., 2008). It must be noted that concentration above 10 μM ITAM can inhibit Syk activity (Tsang et al., 2008). Phosphorylated Syk then phosphorylates Grb2 (growth-factor-receptor-bound protein 2). Phosphorylation of Grb2 leads to the activation of PI3K downstream signalling. In order to match the available experimental data, this study assumed that the Lyn kinase is rephosphorylated for recruitment of additional pLyn into the system to ensure that the system has enough supply of phosphorylated Lyn. The equation associated with this reaction is in Equation 1

$$Lyn + Pi \overset{k_3}{\rightarrow} pA = \pi r^2 Lyn \quad [1]$$

where Pi denotes a phosphate, k denotes a forward reaction, and pLyn denotes a phosphorylated Lyn.

The flux associated with this reaction is in Equation 2

$$J3 = k_3[Pi][Lyn] \quad [2]$$

where J denotes a flux, k denotes kinetic constant, and P_i denotes a phosphate.

The model was fitted to two published sets of experimental data. One was published by Tsang et al. (2008) and the other by Faeder et al. (2003). Experimental detail on Syk activity in B cells is presented in the study by Tsang et al. (2008), which captures the molecular mechanism of Syk activation in vitro. The studies explore Syk activity under various conditions: activities of phosphorylated and non-phosphorylated Syk; activation of Syk by different receptors; and whether Syk is an OR-gate type of molecular switch. Syk activity is required for more than one hour to induce activation of downstream reactions, so the experiment was run for 3600 s. For that reason, the model simulation time was set for 3600 s. For the FCϵ model, there are 10 unknown parameters to fit this data.

In one of the observations, Tsang looked at the activity of Syk when bound to FCϵ. The experimental data fitted the model for temporal Grb2 phosphorylation by dephosphorylated Syk with 1 μM FCϵ. The Syk concentration used in the experiment was 0.005 μM. Experimental data points were digitised from Supplementary Data 2 in Tsang et al. (2008). The observed experimental data points were from spectrophotometrical measurements of phosphorylation in a single representative experiment (Tsang et al., 2008). The binding of Syk to the receptor eliminated the lag phase in Grb2 phosphorylation.

The second data set was adapted from Faeder et al. (2003). In their simulation, Faeder et al. (2003) looked at the pathway in rat basophilic leukaemia (RBL) cells. The cell density and volume were assumed to be 1×10^6 cells/ml and 1.4×10^9 ml. The observed experimental data points were from densitometric phosphorylation measurements in a single representative experiment (Faeder et al., 2003; Wofsy et al., 1995). In addition, experimental data points were digitised from Faeder et al. (2003). The setup of the two experiments is listed in Table 1.

Table 1
Comparison of experimental setting between Tsang et al. (2008) and Faeder et al. (2003)

Item	Tsang et al. (2008)	Faeder et al. (2003)
Cell type	B cell	RBL cell (rat basophilic cell)
Ligand	nil	IgE dimer
Receptor	$FC\epsilon RI\gamma$	$FC\epsilon RI\gamma$
Experiment temperature	37°C	27°C
Simulation time	3600 s	4200 s
Measurement method	Spectrophotometer	Flourescence plate
Concentration of Syk	0.005 μM	0.403 μM
Concentration of $FC\epsilon RI\gamma$	1 μM	0.474 μM
Concentration of Lyn	nil	0.0332 μM

The signalling pathway was built in CellML components (Cooling et al., 2008; Cooling et al., 2016), where component/s is built up using equations and variables related to a specific reaction. A good reproducible model needs a proper protocol for its users. Documentation of the equations, model optimisation to experimental data, and validation against other experimental data are not enough to make the model able to be reproduced (Waltemath et al., 2011). In such a protocol, the simulation conditions for a model are recorded, including how the model is used to simulate certain experiments and how the model generates a published output. Through its cross-platform modelling environment, OpenCOR, CellML, provides this facility where users can generate Simulation Experiment Description Markup Language (SED-ML) from the CellML model that they have built. SED-ML maintains the simulation protocol and records the simulation output (Waltemath et al., 2011). Users can easily know the simulation protocols such as the underlying mathematical equations, parameters used, type of solver algorithm, simulation time, and time steps taken for a particular experiment from a SED-ML format. When SED-ML is provided, other users can reference a model and publish figures accurately (Cooling et al., 2016). By using SED-ML, the model can be mobilised and re-used in other pathways that consist of the $FC\epsilon RI\gamma$ pathway.

MATERIALS AND METHODS

The cell's signalling pathways are represented using ordinary differential equations (ODEs). An ODE describes the concentration changes of a compound over time. In this model, flux is defined, J_1 for each reaction in the comprehensive pathway, which helps to simplify the description of the equations. The flux typically comprises the concentration of species (denoted by [...] throughout this study) and rate constants k_f (forward reaction) and k_r (reverse reaction) in the law of mass action.

The reactions associated with this model are as in Equations 3-6

$$FC\varepsilon + pLyn \overset{k_1}{\leftrightarrow} pFC\varepsilon Lyn \overset{k_2}{\rightarrow} pFC\varepsilon + Lyn, \quad [3]$$

$$Lyn + Pi \overset{k_3}{\rightarrow} pLyn, \quad [4]$$

$$pFC\varepsilon + Syk \overset{k_4}{\leftrightarrow} pFC\varepsilon Syk \overset{k_5}{\rightarrow} FC\varepsilon + pSyk, \quad [5]$$

$$pSyk + Grb2 \overset{k_6}{\leftrightarrow} pSykGrb2 \overset{k_7}{\rightarrow} Syk + pGrb2. \quad [6]$$

The fluxes associated with these reactions are as in Equations 7-13

$$J1 = k_1[FC\varepsilon][pLyn] - k_{-1}[pFC\varepsilon Lyn], \quad [7]$$

$$J2 = k_2[pFC\varepsilon Lyn], \quad [8]$$

$$J3 = k_3[Pi][Lyn], \quad [9]$$

$$J4 = k_4[pFC\varepsilon][Syk] - k_{-4}[pFC\varepsilon Syk], \quad [10]$$

$$J5 = k_5[pFC\varepsilon Syk], \quad [11]$$

$$J6 = k_6[pSyk][Grb2] - k_{-6}[pSykGrb2], \quad [12]$$

$$J7 = k_7[pSykGrb2]. \quad [13]$$

The ODEs associated with these reactions are as in Equations 14-24

$$\frac{pFC}{dt} = -J1 + J5, \quad [14]$$

$$\frac{pLyn}{dt} = -J1 + J3, \quad [15]$$

$$\frac{pFCLyn}{dt} = J1 - J2, \quad [16]$$

$$\frac{pFC}{dt} = J2 - J4, \quad [17]$$

$$\frac{pLyn}{dt} = J2 - J3, \quad [18]$$

$$\frac{pSyk}{dt} = -J4 + J7, \quad [19]$$

$$\frac{pFCSyk}{dt} = J4 - J5, \quad [20]$$

$$\frac{pSyk}{dt} = J5 - J6, \quad [21]$$

$$\frac{Grb2}{dt} = -J6, \quad [22]$$

$$\frac{pSykGrb2}{dt} = J6 - J7, \quad [23]$$

$$\frac{pGrb2}{dt} = J7. \quad [24]$$

Model Optimisation and Sensitivity Analysis

In this study, the model parameter optimisation of CellML models was done using Python inside the OpenCOR tool. The parameter estimation implements the Levenburg-Marquardt gradient method (greedy algorithm) to minimise an objective function (Moré, 1978). The first step is to define the objective function to minimise. This study, therefore, aims to randomly sample parameter space with suitable coverage to be able to assure that a solution can be found close to a global minimum (Saltelli et al., 2004). This study uses a sampling method to create a random sample of parameters within identified boundaries. The parameter samples were generated using the Saltelli sample function stored in Python modules.

In general, sensitivity analysis is the study of the changes of the optimal solution when there are changes in the constant parameters (Wallace, 2000). A sensitivity analysis was performed to determine the sensitivity of constant rate parameters in the model. Each of these parameters determines changes in the model. Therefore, each of these parameters determines changes in the model. This study initialised the model with the best fit values for each parameter and ran it multiple times over the parameter range. Each parameter was varied from its best fit value over a range of values. The error was defined as the difference between the model solution and experimental data values at each time point. The sum of the squared errors was used to quantify overall error over time (Sobol, 2001; Saltelli et al., 2010).

The sum of the squared errors was used to quantify the overall error over time. A dip in error shows the parameters sit at or very close to the minimum. However, the minimum can also be right at the edge of the parameter space. It means this parameter value needs to be around the ’minimum’.

Model Parameters and Initial Conditions for Fitting to Experimental Data Set 1 [Tsang et al. (2008)]

This study first estimates B cell experimental data parameters from Tsang et al. (2008). Then, experimental data points were digitised from Supplementary Data 2 in Tsang et al. (2008).

The observed experimental data points were from spectrophotometrical measurements of phosphorylation in a single representative experiment (Tsang et al., 2008). The binding of Syk to the receptor eliminated the lag phase in Grb2 phosphorylation.

For the model, this study adapted the recruitment of additional Lyn to the phosphorylated ITAMs. The boundary conditions used in this fitting are between 10^{-3} and 10^{2} for the lower and upper bound (Cooling, 2007). However, the range expands when optimisation error potentially decreases with a larger boundary. The number of samples used for the fitting is 500, generating 12000 samples. The parameters to be fitted are k_{f1}, k_{f2}, k_{f3}, k_{f4}, k_{f5}, k_{f6}, k_{f7}, k_{r1}, k_{r4}, and k_{r6}.

The initial conditions adapted from the experiment are shown in Table 2. This study estimated the concentration of Grb2 and pLyn at 6.47 μM and 6.5 μM. The phosphorylated (except Lyn) and complex reactants are assumed to be 0 at time 0 s. The URL link for the Python script that runs fitting to Tsang data for this model, the sensitivity analysis code for the fitted parameter and the model it runs can be found in Supplementary Data 1.

Table 2
Initial conditions for the FCϵRIγ signalling model in parameter fitting to experimental data from Tsang et al. (2008)

Parameter	Value	Units	Source
FCε	1	μM	(Tsang et al., 2008)
Syk	0.005	μM	(Tsang et al., 2008)
Grb2	6.47	μM	Estimation
pLyn	6.5	μM	Estimation

Model Parameters and Initial Conditions for Fitting to Experimental Data Set 2 [Faeder et al. (2003)]

The observed experimental data points were from densitometric phosphorylation measurements in a single representative experiment. Experimental data points were digitised from Faeder et al. (2003). Tsang et al. (2008) and Faeder et al. (2003) used different experimental protocols, so the initial conditions in this model representing these protocols differed. Some initial conditions were derived from the experimental protocol reported, and others were estimated during model fitting. In order to achieve the fit, several estimated initial conditions had to be changed from those estimated in Tsang's model. For fitting to Faeder's data, the concentration of FCε is 0.0474 μM, the concentration of Syk is 0.025 μM, and the concentration of pLyn is 0.0474 μM. These changes are listed in Table 3. Parameter fitting was then performed by fixing the previously fitted model's parameters. This study fixed the value of k_{f2}, k_{f4}, k_{f6} and k_{f7} (Table 4). In this subsequent fitting, for constant forward rate parameters kf1 and reverse rate parameters k_{r1}, k_{r4} and k_{r6} that showed distinct changes in model behaviour on one side of the minimum, this study varied the parameters only over the range that model predictions for the Tsang data were not sensitive to these parameters. The parameter that is going to fit and the boundaries are listed in Table 5. The URL link for the Python script that runs fitting to Faeder data for this

Table 3
Initial conditions for the FCϵRIγ signalling model in parameter fitting to experimental data from Faeder et al. (2003)

Parameter	Estimation 1	Source	Estimation 2	Units
$FC\epsilon$	0.474	(Faeder et al., 2003)	0.0474	μM
pLyn	0.0332	(Faeder et al., 2003)	0.0474	μM
Syk	0.432	(Faeder et al., 2003)	0.025	μM
Grb2	nil	nil	0.01	μM

model, the sensitivity analysis code for the fitted parameter and the model it runs can be found in Supplementary Data 1.

Model Uncertainty

Parameter optimisation sought a 'best fit' solution, that is, the set of parameters that provides the minimum error. However, this best fit may not be the only feasible model parameterisation closely similar to the experimental data. There may be alternate sets of parameters that provide solutions close to that data.

This study reconsiders the experimental data to determine whether any 'worse' fits still meet sensible criteria. This study searches for physiologically feasible parameter combinations to replicate the model function. To do that, this study search for other solutions within the parameter space that predicts concentrations of pGrb2, which is the end output of the pathway, that lie within 0.01µM but may not be the 'best fit' returned by an optimiser.

Table 4
Fixed kinetic parameters in the subsequence fitting

Parameter	Value	Units
k_{f2}	0.0081	s^{-1}
k_{f4}	10.5797	$\mu M^{-1}.s^{-1}$
k_{f6}	0.4143	$\mu M^{-1}.s^{-1}$
k_{f7}	11.4185	s^{-1}

Table 5
Kinetic parameters to fit data in Faeder et al. (2003) and the boundaries condition

Parameter	Lower bound	Upper bound
k_{f1}	$10^{-1.5}$	10^{2}
k_{f3}	10^{-3}	10^{2}
k_{f5}	10^{1}	10^{2}
k_{r1}	10^{-3}	10^{1}
k_{r4}	10^{-3}	$10^{0.5}$
k_{r6}	10^{-3}	10^{0}
Pi	10^{-3}	10^{2}

This study sample parameter space to cover the range of feasible parameter combinations without requiring an unfeasibly large number of model runs. This study achieves this by using the inbuilt Saltelli sampling function in the python SALib library. The Saltelli sampling function generates N × (2D + 2) samples, where N is a user-defined number, and D is the number of unknown parameters (the dimension of the parameter space which is aim to sample (Saltelli, 2002). To adequately cover the parameter space, based on the parameter swipe of the model, the N was set at 100, resulting in 1800 simulations.

RESULTS AND DISCUSSION

Parameter Fitting to Data from Tsang et al. (2008) and Sensitivity Analysis

The repository associated with this model can be found at https://github.com/Nurulizza/FCepsilonRI.git and the SED-ML for the fitted model can be found at https://github.com/Nurulizza/FCepsilonRI/blob/master/FCepsilonRI_Tsangdata.sedml. The simulated Grb2 phosphorylation was a good fit with the experimental observations of Tsang et al. (2008). The model and observed experimental kinetics of phosphorylation of Grb2 are shown in Figure 2. The root mean square (RMS) error for the model is 0.0695 μM. The RMSE is 1.07% of the peak concentration. Visual inspection of the graph confirms this. The best fit to this data set was achieved with the parameters listed in Table 6.

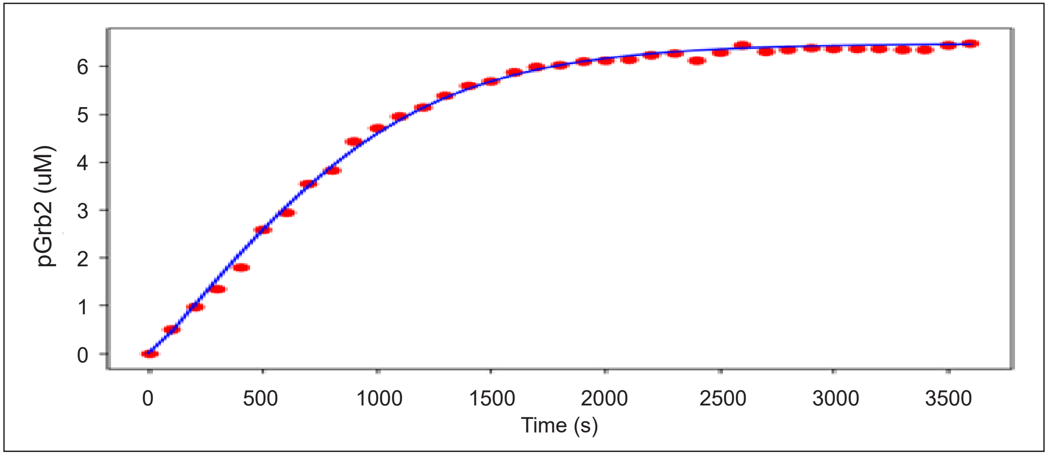

Figure 2. The best fit for phosphorylation of Grb2
Note. The best fit for phosphorylation of Grb2. Blue curves show model predictions, and red points are observed experimental data in Tsang et al. (2008). The SED-ML is available at https://github.com/Nurulizza/FCepsilonRI/blob/master/FCepsilonRI_Tsangdata.sedml.

Table 6
Fitted parameters to experimental data from Tsang et al. (2008)

Parameter	Description	Value	Source
k_{f1}	FC-pLyn binding rate	58.3902 $\mu M^{-1}.s^{-1}$	Fitted value
k_{f2}	FC phosphorylation rate	0.00817889 s^{-1}	Fitted value
k_{f3}	Lyn phosphorylation rate	1.0887 $\mu M^{-1}.s^{-1}$	Fitted value
k_{f4}	pFC-Syk binding rate	10.5797 $\mu M^{-1}.s^{-1}$	Fitted value
k_{f5}	Syk phosphorylation rate	63.6727 s^{-1}	Fitted value
k_{f6}	pSyk-Grb2 binding rate	0.414288 $\mu M^{-1}.s^{-1}$	Fitted value
k_{f7}	Grb2 phosphorylation rate	11.4185 s^{-1}	Fitted value
k_{r1}	FC-pLyn dissociation rate	0.013548 s^{-1}	Fitted value
k_{r4}	pFC-Syk dissociation rate	0.0806961 s^{-1}	Fitted value
k_{r6}	pSyk-Grb2 dissociation rate	0.731255 s^{-1}	Fitted value

Knowledge of which parameters the model is sensitive to helped establish which parameters needed to be fixed when this study tried to predict another set of data (e.g. the phosphorylation of Grb2). Figure 3 present the differences in pSyk solutions within the feasible parameter range for all rate constants in this model. This study varied each parameter, one at a time, over the feasible parameter range to check how much they affected the solutions while keeping other rate constant parameters fixed.

For forwarding constants k_{f2}, k_{f4}, k_{f6}, and k_{f7}, there is a minimum error corresponding to the fitted parameter value, which showed the fitting had converged to something appropriate where most parameters were very close to at least a local minimum in the parameter space. It means the

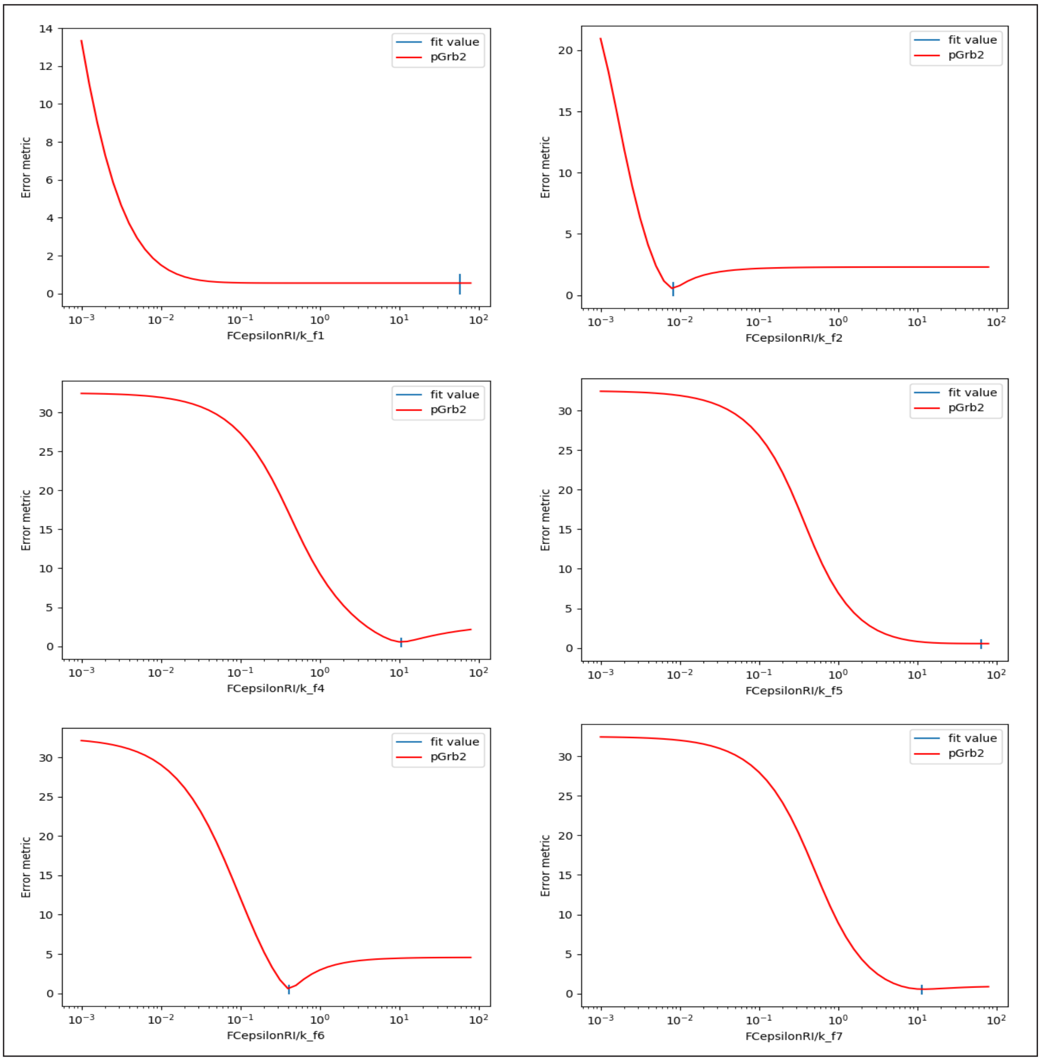

Figure 3. The sensitivity of the FCϵRIγ model solutions around the 'best fit' to a selection of parameters
Note. The model was initialised with the best fit values for each parameter (fit value) and run multiple times over the parameter range as assumed (shown on the x-axis). Error is shown in red.

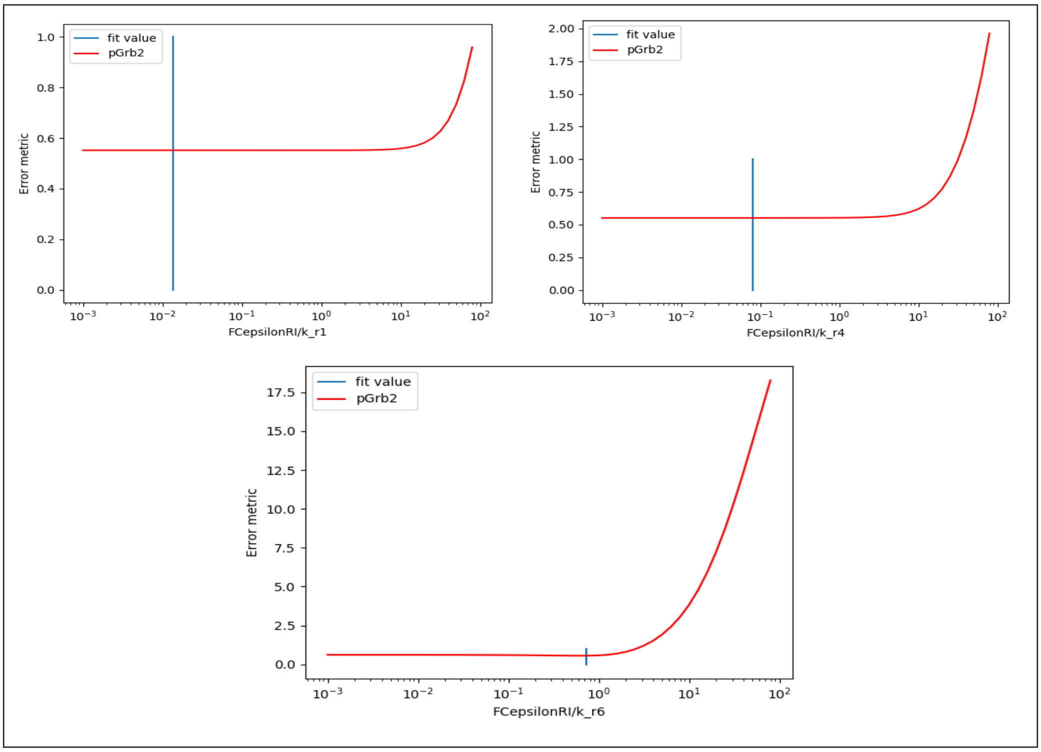

Figure 3 (continue). The sensitivity of the FCϵRIγ model solutions around the 'best fit' to a selection of parameters
Note. The model was initialised with the best fit values for each parameter (fit value) and run multiple times over the parameter range as assumed (shown on the x-axis). Error is shown in red.

model is sensitive to those parameters. The sensitive parameters are the dissociation rate of phosphorylated FCϵ and Lyn complex, k_{f2}, an association of phosphorylated FCϵ and Syk, k_{f4}, an association of pSyk and Grb2, k_{f6}, and dissociation of pSyk and Grb2 complex, k_{f7}. These parameters remained fixed in subsequent simulations. Constant forward rate parameters k_{f1} and reverse rate parameters k_{r1}, $k_{r4,}$ and k_{r6} showed distinct changes in model behaviour on one side of the minimum. In this case, these parameters can vary when fitting to another set of data in the range around the minimum the line is flat. A flat line was found for k_{f1} and Pi, showing that the model is not sensitive to those parameters (data not shown). Therefore, the latter two types of parameters could be varied over the whole defined range in fitting to subsequent data sets.

Multi-Objective Parameter Fitting to Data Set from Faeder et al. (2003) and Sensitivity Analysis

The repository associated with this model can be found at https://github.com/Nurulizza/FCepsilonRI.git and the SED-ML for the fitted model can be found at https://github.com/Nurulizza/FCepsilonRI/blob/master/FCepsilonRI_Faederdata.sedml. In this subsequent parameter fitting, the concentration of FCϵ is 0.0474 μM, the concentration of Syk is 0.025 μM, and the concentration of pLyn is 0.0474 μM, as listed in Table 2. Parameter fitting was then performed by fixing parameters k_{f2}, k_{f4} k_{f6}, and k_{f7} (Figure 5 and Table 7). The list of kinetic rate constants and the boundaries are given in Tables 4 and 5. Finally, the best fit was achieved with the parameters listed in Table 6. The model and the observed experimental Faeder et al. (2003) kinetics of phosphorylation of FC and Syk are shown in Figure 4. The RMSEs are 0.0089 μM for FC phosphorylation and 0.0022 μM for Syk phosphorylation. These RMS errors are approximately 10% of the peak values for pFC and pSyk. Along with Figure 4, these best fits are not perfect representations of the data. However, the available data are relatively sparse in time and appear to contain more noise, so it may not be possible to obtain a better fit for these data points.

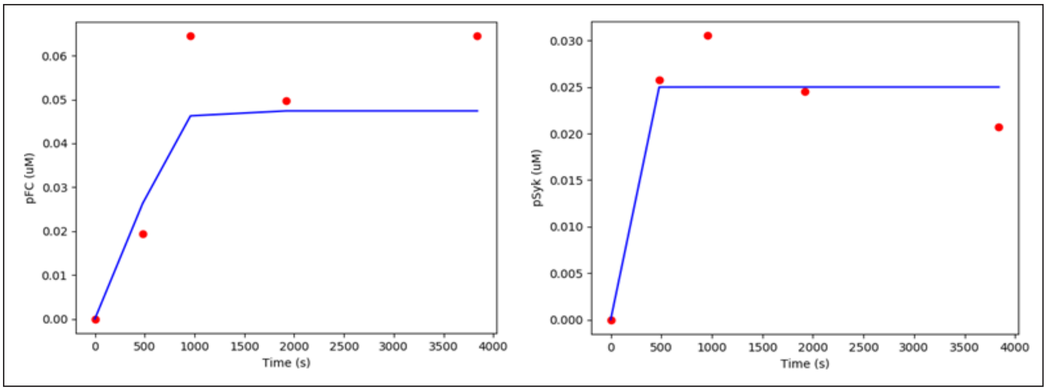

Figure 4. The best fit for phosphorylation of FCϵ (left) and phosphorylation of Syk (right)
Note. Blue curves show model predictions, and red points are observed experimental data from Faeder et al. (2003). The SED-ML is available at https://github.com/Nurulizza/FCepsilonRI/blob/master/FCepsilonRI_Faederdata.sedml.

Table 7
The parameters for the FCϵRIγ model fitted to the data set from Tsang et al. (2008) and Faeder et al. (2003)

Parameter	Description	Value	Source	Status
k_{f1}	FC-pLyn binding rate	54.7678 $\mu M^{-1}.s^{-1}$	Fitted to Faeder et al. (2003)	Fit
k_{f2}	FC phosphorylation rate	0.00817889 s^{-1}	Fitted to Tsang et al. (2008)	Fix
k_{f3}	Lyn phosphorylation rate	0.0035 $\mu M^{-1}.s^{-1}$	Fitted to Faeder et al. (2003)	Fix
k_{f4}	pFC-Syk binding rate	10.5797 $\mu M^{-1}.s^{-1}$	Fitted to Tsang et al. (2008)	Fit
k_{f5}	Syk phosphorylation rate	33.7157 s^{-1}	Fitted to Faeder et al. (2003)	Fit
k_{f6}	pSyk-Grb2 binding rate	0.414288 $\mu M^{-1}.s^{-1}$	Fitted to Tsang et al. (2008)	Fit
k_{f7}	Grb2 phosphorylation rate	11.4185 s^{-1}	Fitted to Tsang et al. (2008)	Fix
k_{r1}	FC-pLyn dissociation rate	0.0031 s^{-1}	Fitted to Faeder et al. (2003)	Fit
k_{r4}	pFC-Syk dissociation rate	0.1174 s^{-1}	Fitted to Faeder et al. (2003)	Fit
k_{r6}	pSyk-Grb2 dissociation rate	0.481 s^{-1}	Fitted to Faeder et al. (2003)	Fit

The fifth column listed parameters that can be fitted or fixed in the calibration of subsequent components due to the sensitivity analysis.

However, the model predictions shown in Figure 4 does not predict the experimentally observed drop in pSyk after 1000 s due to the formation of the pSyk-Grb2 complex. It may be because the concentration of Grb2 in the model was low (0.01 μM), which limited its impact on pSyk. Therefore, the initial condition of Grb2 was fitted at 0.01 μM to get a good fit to the experimental data. The sensitivity analysis of the model is shown in Figure 5.

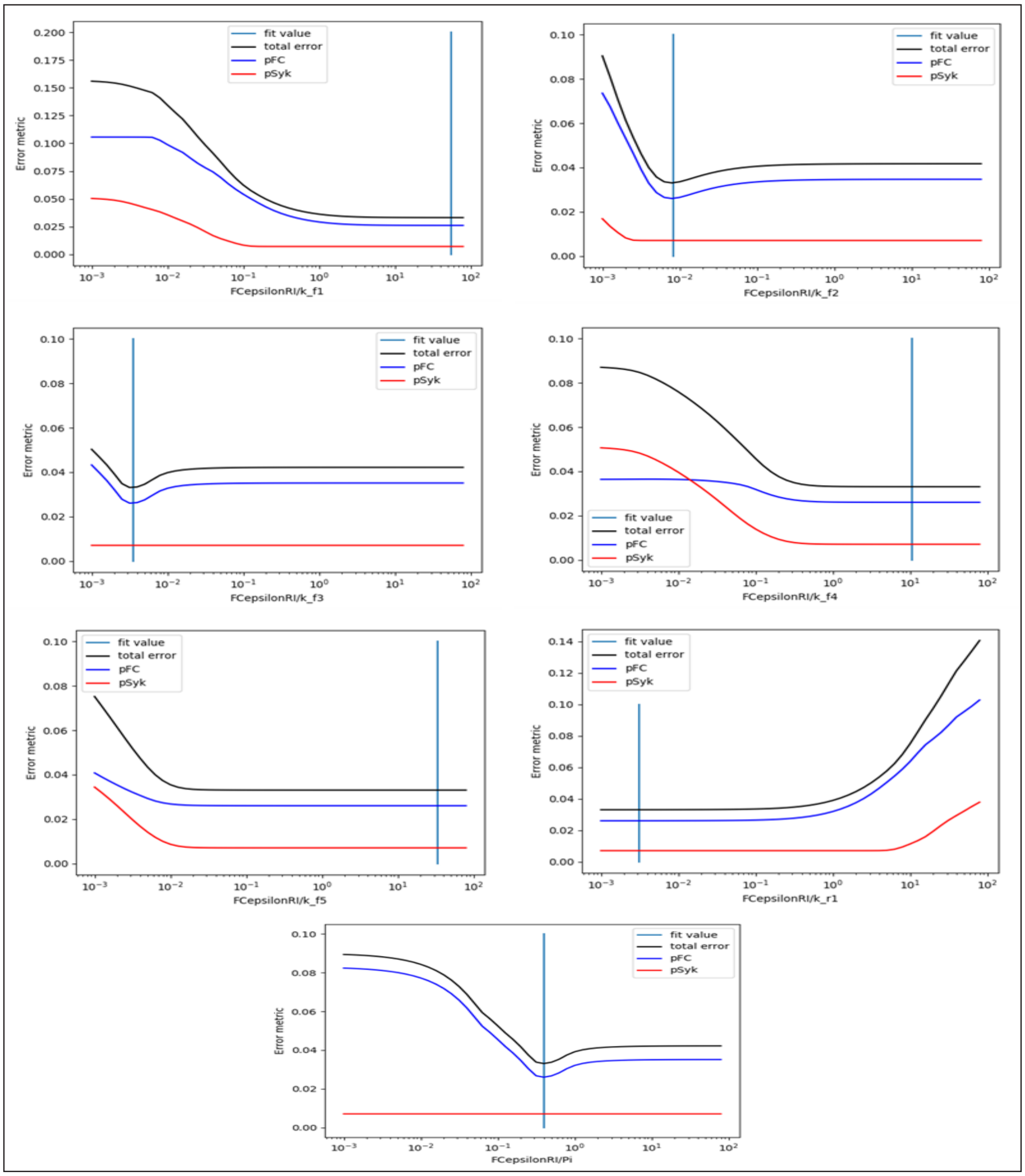

Figure 5. The sensitivity of the FCϵRIγ model solutions around the 'best fit' to a selection of parameters
Note. The sensitivity of the FCϵRIγ model solutions around the 'best fit' to a selection of parameters. The model was initialised with the best fit values for each parameter (fit value) and run multiple times over the parameter range as assumed (shown on the x-axis). Error is shown in red.

The sensitivity analysis showed that the model fitted to the data measured by Faeder et al. (2003) is sensitive to the dissociation rate of phosphorylated FCϵ and Lyn complex, k_{f2}, the phosphorylation rate of Lyn, k_{f3}, and Pi for the pFC. The same parameters, especially k_{f3} and Pi, however, do not contribute to pSyk variability. The model fitted the experimental data well with large values of parameters k_{f1}, k_{f4}, and k_{f5}. Sensitivity analysis showed that the model converges toward minimum error for both FC and Syk phosphorylation on the right region of the parameter space. In contrast, parameters k_{r1} gave the best fit with small values when the model converges toward minimum error for FC and Syk phosphorylation on the left region of the parameter space. The pathway can be calibrated around the regions within the minimum error of parameters space. The model was not sensitive to the dissociation rate of pFC and Syk, k_{r4}, an association of pSyk and Grb2, k_{f6}, dissociation of pSyk and Grb2, k_{r6}, and phosphorylation of Grb2, k_{f7} (data not shown). Those parameters are therefore free to be varied in the calibration of subsequent model components that incorporate this pathway.

Model Uncertainty

This custom script exported solution/s into a file within 0.01μM pGrb2. After the script ran until the end of 1800 simulations, 228 alternate solutions were outputted to give different model behaviour predictions. The ssq of the alternate solutions range from 7.89e-31 to 0.0033. It means that over the range of parameter space assessed, the 'best fit' solution obtained from parameter fitting was not the only solution that provided physiological concentrations of cytokines. It means that the 'best fit' solution is not unique. It gives some confidence that the model provides many satisfactory solutions. The list of the alternate solutions is provided in Supplementary Data 3.

CONCLUSION

This study developed and implemented a minimal and modular FCϵ model in CellML. The results for phosphorylation of Grb2 for a data set from Tsang et al. (2008) were presented to validate and test for phosphorylation of FCϵ and Syk in a data set from Faeder et al. (2003). In addition, a basic sensitivity analysis was performed to study the effect of the model constants' parameters on the model. The minimal and modular model allows modularity and increases the re-usability of the model in future work.

Lyn kinase phosphorylates FCϵ into phosphorylated FC. Re-phosphorylation of Lyn then occurs. Due to a lack of quantitative information about the aggregation rate of FCϵ in the literature, this study constructed a simple model of the system, in which the FCϵ was in the aggregation state. The model neglects aspects of the complex dynamics of the FCϵ system, which has previously been incorporated into mathematical descriptions. It means that although it captures the dynamics of the available experimental data adequately, it may be shown in the future to neglect important dynamics as more experimental data become available. The modular structure of this modelling approach would allow the component of the model to be replaced with a more detailed in the future, if necessary.

Phosphorylated FCϵ activates Syk through binding activity. The activation of Syk eliminates the lag phase in Syk activity and results in a linear rate of Grb2 phosphorylation, indicating that FCϵ binding activates Syk. Observations using the model displayed qualitatively similar pFC-Syk binding behaviour to the available experimental data.

Experimental work by Tsang et al. (2008) showed that Syk is an OR-gate switch, meaning that it can reach full activation either by ITAM binding or autophosphorylation activation. Tsang et al. (2008) demonstrated that activation by both stimuli works through the same mechanism, and the application of both stimuli is expected to give only a small increase in activity. The study's model supports this and implies that ITAM binding is sufficient to cause full activation of Syk. Phosphorylated Syk sustains activity over time to facilitate longer-term changes in cell signalling.

In this model, the Syk is an OR-gate switch, meaning that it can reach full activation with one factor by ITAM binding. The ability of Syk to reach full activation with a single stimulus helps to define the ability of Syk to sustain its activity over time, although after transient activation of ITAM to facilitate longer-term changes in cell signalling. For example, Syk activity is required for more than 1 hour to induce activation of NFAT transcription Tsang et al. (2008).

Phosphorylation of Grb2 is dependent on the available concentration of Syk and Grb2 in the cell. The simulation results showed that the model could produce quantitatively similar kinetic behaviour in the phosphorylation of Grb2 to the experimental data. Phosphorylation of Grb2 was initially linear with time and then plateaued after all the Grb2 was completely phosphorylated. The lag in the reaction time was eliminated.

The parameter space sampling could provide an alternate physiological solution. There are equally valid solutions based on the input data (large range of parameter bound) that give different predictions of the model behaviour. Considering the uncertainty of the model parameters prediction helps us understand more of the model behaviour. The alternate solution could be better than the 'best fit' models, although it is not 'optimal'. The alternate solution might help find systematic misfits to the data and constrain the range for each parameter value. It can be equally good predictions, which might be more robustly estimated.

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SUPPLEMENTARY DATA 1

The python script that runs fitting to Tsang data for this model can be found at https://github.com/Nurulizza/FCepsilonRI/blob/master/parameter_sweep_fcepsilonri_tsangdata.py

The model it runs is https://github.com/Nurulizza/FCepsilonRI/blob/master/FCepsilonRI_Tsangdata.cellml

The sensitivity analysis code for the fitted parameter can be found at https://github.com/Nurulizza/FCepsilonRI/blob/master/sweep_sensitivity_analysis_fcepsilonri_fittedtsang.py

The python script that runs fitting to Faeder data for this model can be found at

https://github.com/Nurulizza/FCepsilonRI/blob/master/parameter_sweep_fcepsilonri_faederdata.py

The model it runs is

https://github.com/Nurulizza/FCepsilonRI/blob/master/FCepsilonRI_Faederdata.cellml

The sensitivity analysis code for the fitted parameter can be found at

https://github.com/Nurulizza/FCepsilonRI/blob/master/sweep_sensitivity_analysis_fcepsilonri_fittedfaeder.py

SUPPLEMENTARY DATA 2

Code for model fitted to Tsang et al. (2008)

```
def model FCepsilonRI as
   //
   //*****************************************************
   //***        U N I T S                  ***
   //*****************************************************
   //

   def unit s as
      unit second;
   enddef;

   def unit uM as
      unit mole {pref: micro};
      unit liter {expo: -1};
   enddef;

   def unit per_s as
      unit s {expo: -1};
   enddef;

   def unit uM_per_s as
      unit uM;
      unit s {expo: -1};
   enddef;

   def unit per_uM_per_s as
      unit uM {expo: -1};
      unit s {expo: -1};
   enddef;

   //
   //*****************************************************
   //***    C O M P O N E N T S    ***
   //*****************************************************
   //

   def comp environment as
      var t: s {pub: out};
   enddef;

   def comp FCepsilonRI as
      var t: s {pub: in};
      var J1: uM_per_s;
      var J2: uM_per_s;
      var J3: uM_per_s;
      var J4: uM_per_s;
      var J5: uM_per_s;
      var J6: uM_per_s;
      var J7: uM_per_s;
      var Lyn: uM {init: 0};
      var FC: uM {init: 1};
      var pFC: uM {init: 0};
      var Syk: uM {init: 0.005};
      var pSyk: uM {init: 0};
      var pGrb2: uM {init: 0};
      var pFCLyn: uM {init: 0};
      var pFCSyk: uM {init: 0};
      var pSykGrb2: uM {init: 0};
      var Pi: uM {init: 1.89585};
      var Grb2: uM {init: 6.47};
      var pLyn: uM {init: 6.5};

      //var k_f1: per_uM_per_s {init: 58.3902};
      //var k_r1: per_s {init: 0.013548};
```

```
    //var k_f2: per_s {init: 0.00817889};
    //var k_f3: per_uM_per_s {init: 1.0887};
    //var k_f4: per_uM_per_s {init: 10.5797};
    //var k_r4: per_s {init: 0.0806961};
    //var k_f5: per_s {init: 63.6727};
    //var k_f6: per_uM_per_s {init: 0.414288};
    //var k_r6: per_s {init: 0.731255};
    //var k_f7: per_s {init: 11.4185};

    var k_f1: per_uM_per_s {init: 58.69};
    var k_r1: per_s {init: 0.03};
    var k_f2: per_s {init: 0.00817889};
    var k_f3: per_uM_per_s {init: 1.0887};
    var k_f4: per_uM_per_s {init: 4.6};
    var k_r4: per_s {init: 44.26};
    var k_f5: per_s {init: 10.89};
    var k_f6: per_uM_per_s {init: 19.70};
    var k_r6: per_s {init: 0.0016};
    var k_f7: per_s {init: 29.53};

    J1 = k_f1*FC*pLyn-k_r1*pFCLyn;
    J2 = k_f2*pFCLyn;
    J3 = k_f3*Pi*Lyn;
    J4 = k_f4*pFC*Syk-k_r4*pFCSyk;
    J5 = k_f5*pFCSyk;
    J6 = k_f6*pSyk*Grb2-k_r6*pSykGrb2;
    J7 = k_f7*pSykGrb2;
    ode(FC, t) = -J1+J5;
    ode(pFC, t) = J2-J4;
    ode(Syk, t) = -J4+J7;
    ode(pSyk, t) = J5-J6;
    ode(Lyn, t) = J2-J3;
    ode(pLyn, t) = -J1+J3;
    ode(pFCLyn, t) = J1-J2;
    ode(pFCSyk, t) = J4-J5;
    ode(pSykGrb2, t) = J6-J7;
    ode(Grb2, t) = -J6;
    ode(pGrb2, t) = J7;
  enddef;

  def map between environment and FCepsilonRI for
    vars t and t;
  enddef;
enddef;
```

Code for model fitted to Faeder et al. (2003)

```
def model FCepsilonRI as
  //
  //*************************************
***************
  //***     U N I T S          ***
  //*************************************
***************
  //

  def unit s as
    unit second;
  enddef;

  def unit uM as
    unit mole {pref: micro};
    unit liter {expo: -1};
  enddef;

  def unit per_s as
    unit s {expo: -1};
  enddef;

  def unit uM_per_s as
    unit uM;
    unit s {expo: -1};
  enddef;

  def unit per_uM_per_s as
    unit uM {expo: -1};
    unit s {expo: -1};
  enddef;

  //
  //*************************************
*****************
  //***   C O M P O N E N T S   ***
  //*************************************
*****************
  //

  def comp environment as
    var t: s {pub: out};
  enddef;

  def comp FCepsilonRI as
    var t: s {pub: in};
    var J1: uM_per_s;
    var J2: uM_per_s;
    var J3: uM_per_s;
    var J4: uM_per_s;
    var J5: uM_per_s;
    var J6: uM_per_s;
    var J7: uM_per_s;
    var Lyn: uM {init: 0};
    var FC: uM {init: 0.0474};
    var pFC: uM {init: 0};
```

```
var Syk: uM {init: 0.025};
var pSyk: uM {init: 0};
var pGrb2: uM {init: 0};
var pFCLyn: uM {init: 0};
var pFCSyk: uM {init: 0};
var pSykGrb2: uM {init: 0};
var Pi: uM {init: 0.4027};
var Grb2: uM {init: 0.01};
var pLyn: uM {init: 0.0474};
var k_f1: per_uM_per_s {init: 54.7678};
var k_r1: per_s {init: 0.0031};
var k_f2: per_s {init: 0.00817889};
var k_f3: per_uM_per_s {init: 0.0035};
var k_f4: per_uM_per_s {init: 10.5797};
var k_r4: per_s {init: 0.1174};
var k_f5: per_s {init: 33.7157};
var k_f6: per_uM_per_s {init: 0.4143};
var k_r6: per_s {init: 0.481};
var k_f7: per_s {init: 11.4185};

J1 = k_f1*FC*pLyn-k_r1*pFCLyn;
J2 = k_f2*pFCLyn;
J3 = k_f3*Pi*Lyn;
J4 = k_f4*pFC*Syk-k_r4*pFCSyk;
J5 = k_f5*pFCSyk;
J6 = k_f6*pSyk*Grb2-k_r6*pSykGrb2;
J7 = k_f7*pSykGrb2;
ode(FC, t) = -J1+J5;
ode(pFC, t) = J2-J4;
ode(Syk, t) = -J4+J7;
ode(pSyk, t) = J5-J6;
ode(Lyn, t) = J2-J3;
ode(pLyn, t) = -J1+J3;
ode(pFCLyn, t) = J1-J2;
ode(pFCSyk, t) = J4-J5;
ode(pSykGrb2, t) = J6-J7;
ode(Grb2, t) = -J6;
ode(pGrb2, t) = J7;
enddef;

def map between environment and FCepsilonRI for
vars t and t;
enddef;
enddef;
```

1.FCepsilonRI/k_f1: 27.5076

SUPPLEMENTARY DATA 3

FCepsilonRI/k_f4: 22.5946
FCepsilonRI/k_f5: 2.18697
FCepsilonRI/k_f6: 5.94859
FCepsilonRI/k_f7: 2.02145
FCepsilonRI/k_r1: 0.0585569
FCepsilonRI/k_r4: 1.6511
FCepsilonRI/k_r6: 22.4174
Ssq[0.00086292 0.00086292]

2.FCepsilonRI/k_f1: 1.00451
FCepsilonRI/k_f4: 24.8324
FCepsilonRI/k_f5: 2.18697
FCepsilonRI/k_f6: 5.94859
FCepsilonRI/k_f7: 2.02145
FCepsilonRI/k_r1: 0.0585569
FCepsilonRI/k_r4: 1.6511
FCepsilonRI/k_r6: 22.4174
Ssq[0.00080923 0.00080923]

3.FCepsilonRI/k_f1: 1.00451
FCepsilonRI/k_f4: 22.5946
FCepsilonRI/k_f5: 2.18697
FCepsilonRI/k_f6: 5.94859
FCepsilonRI/k_f7: 7.96833
FCepsilonRI/k_r1: 0.0585569
FCepsilonRI/k_r4: 1.6511
FCepsilonRI/k_r6: 22.4174
Ssq[2.37725953e-15 2.37725953e-15]

4.FCepsilonRI/k_f1: 1.00451
FCepsilonRI/k_f4: 22.5946
FCepsilonRI/k_f5: 2.18697
FCepsilonRI/k_f6: 5.94859
FCepsilonRI/k_f7: 2.02145
FCepsilonRI/k_r1: 0.00652309
FCepsilonRI/k_r4: 1.6511
FCepsilonRI/k_r6: 22.4174
Ssq[0.00086435 0.00086435]

5.FCepsilonRI/k_f1: 1.00451
FCepsilonRI/k_f4: 22.5946
FCepsilonRI/k_f5: 2.18697
FCepsilonRI/k_f6: 5.94859
FCepsilonRI/k_f7: 2.02145
FCepsilonRI/k_r1: 0.0585569
FCepsilonRI/k_r4: 0.536404
FCepsilonRI/k_r6: 22.4174
Ssq[0.00068929 0.00068929]

6.FCepsilonRI/k_f1: 1.00451
FCepsilonRI/k_f4: 22.5946
FCepsilonRI/k_f5: 2.18697
FCepsilonRI/k_f6: 5.94859
FCepsilonRI/k_f7: 2.02145
FCepsilonRI/k_r1: 0.0585569
FCepsilonRI/k_r4: 1.6511
FCepsilonRI/k_r6: 0.0993277
Ssq[6.5012958e-21 6.5012958e-21]

7.FCepsilonRI/k_f1: 1.00451
FCepsilonRI/k_f4: 22.5946
FCepsilonRI/k_f5: 2.18697
FCepsilonRI/k_f6: 5.94859
FCepsilonRI/k_f7: 2.02145
FCepsilonRI/k_r1: 0.0585569
FCepsilonRI/k_r4: 1.6511
FCepsilonRI/k_r6: 22.4174
Ssq[0.0008684 0.0008684]

8.FCepsilonRI/k_f1: 86.9868
FCepsilonRI/k_f4: 10.4718
FCepsilonRI/k_f5: 11.8637
FCepsilonRI/k_f6: 43.0318
FCepsilonRI/k_f7: 0.448092
FCepsilonRI/k_r1: 0.00206278
FCepsilonRI/k_r4: 0.0301642
FCepsilonRI/k_r6: 0.00558561
Ssq[2.01998882e-22 2.01998882e-22]

9.FCepsilonRI/k_f1: 3.17653
FCepsilonRI/k_f4: 10.4718
FCepsilonRI/k_f5: 11.8637
FCepsilonRI/k_f6: 43.0318
FCepsilonRI/k_f7: 0.448092
FCepsilonRI/k_r1: 0.00206278
FCepsilonRI/k_r4: 0.0301642
FCepsilonRI/k_r6: 0.00558561
Ssq[2.90032855e-21 2.90032855e-21]

10.FCepsilonRI/k_f1: 86.9868
FCepsilonRI/k_f4: 53.5801
FCepsilonRI/k_f5: 11.8637
FCepsilonRI/k_f6: 43.0318
FCepsilonRI/k_f7: 0.448092
FCepsilonRI/k_r1: 0.00206278
FCepsilonRI/k_r4: 0.0301642
FCepsilonRI/k_r6: 0.00558561
Ssq[4.31725751e-19 4.31725751e-19]

11.FCepsilonRI/k_f1: 86.9868
FCepsilonRI/k_f4: 10.4718
FCepsilonRI/k_f5: 21.8697
FCepsilonRI/k_f6: 43.0318
FCepsilonRI/k_f7: 0.448092
FCepsilonRI/k_r1: 0.00206278
FCepsilonRI/k_r4: 0.0301642
FCepsilonRI/k_r6: 0.00558561
Ssq[3.46636391e-20 3.46636391e-20]

12.FCepsilonRI/k_f1: 86.9868
FCepsilonRI/k_f4: 10.4718
FCepsilonRI/k_f5: 11.8637
FCepsilonRI/k_f6: 43.0318
FCepsilonRI/k_f7: 0.448092
FCepsilonRI/k_r1: 0.00185173
FCepsilonRI/k_r4: 0.0301642
FCepsilonRI/k_r6: 0.00558561
Ssq[1.88627345e-17 1.88627345e-17]

13.FCepsilonRI/k_f1: 86.9868
FCepsilonRI/k_f4: 10.4718
FCepsilonRI/k_f5: 11.8637
FCepsilonRI/k_f6: 43.0318
FCepsilonRI/k_f7: 0.448092
FCepsilonRI/k_r1: 0.00206278
FCepsilonRI/k_r4: 29.3612
FCepsilonRI/k_r6: 0.00558561
Ssq[0.00065352 0.00065352]

14.FCepsilonRI/k_f1: 86.9868
FCepsilonRI/k_f4: 10.4718
FCepsilonRI/k_f5: 11.8637
FCepsilonRI/k_f6: 43.0318
FCepsilonRI/k_f7: 0.448092
FCepsilonRI/k_r1: 0.00206278
FCepsilonRI/k_r4: 0.0301642
FCepsilonRI/k_r6: 0.00398645
Ssq[1.22238094e-20 1.22238094e-20]

15.FCepsilonRI/k_f1: 48.9162
FCepsilonRI/k_f4: 90.6817
FCepsilonRI/k_f5: 3.75162
FCepsilonRI/k_f6: 10.2044
FCepsilonRI/k_f7: 1.88959
FCepsilonRI/k_r1: 0.0036682
FCepsilonRI/k_r4: 40.2246
FCepsilonRI/k_r6: 0.418861
Ssq[3.15544362e-30 3.15544362e-30]

16.FCepsilonRI/k_f1: 56.4876
FCepsilonRI/k_f4: 90.6817
FCepsilonRI/k_f5: 3.75162
FCepsilonRI/k_f6: 10.2044
FCepsilonRI/k_f7: 1.88959
FCepsilonRI/k_r1: 0.0036682
FCepsilonRI/k_r4: 40.2246
FCepsilonRI/k_r6: 0.418861
Ssq[1.45264713e-24 1.45264713e-24]

17.FCepsilonRI/k_f1: 48.9162
FCepsilonRI/k_f4: 90.6817
FCepsilonRI/k_f5: 3.75162
FCepsilonRI/k_f6: 1.41063
FCepsilonRI/k_f7: 1.88959
FCepsilonRI/k_r1: 0.0036682
FCepsilonRI/k_r4: 40.2246
FCepsilonRI/k_r6: 0.418861
Ssq[2.90191857e-10 2.90191857e-10]

18.FCepsilonRI/k_f1: 48.9162
FCepsilonRI/k_f4: 90.6817
FCepsilonRI/k_f5: 3.75162
FCepsilonRI/k_f6: 10.2044
FCepsilonRI/k_f7: 8.5244
FCepsilonRI/k_r1: 0.0036682
FCepsilonRI/k_r4: 40.2246
FCepsilonRI/k_r6: 0.418861
Ssq[7.88860905e-31 7.88860905e-31]

19.FCepsilonRI/k_f1: 48.9162
FCepsilonRI/k_f4: 90.6817
FCepsilonRI/k_f5: 3.75162
FCepsilonRI/k_f6: 10.2044
FCepsilonRI/k_f7: 1.88959
FCepsilonRI/k_r1: 0.0032929
FCepsilonRI/k_r4: 40.2246
FCepsilonRI/k_r6: 0.418861
Ssq[9.71955521e-27 9.71955521e-27]

20.FCepsilonRI/k_f1: 48.9162
FCepsilonRI/k_f4: 90.6817
FCepsilonRI/k_f5: 3.75162
FCepsilonRI/k_f6: 10.2044
FCepsilonRI/k_f7: 1.88959
FCepsilonRI/k_r1: 0.0036682
FCepsilonRI/k_r4: 6.96263
FCepsilonRI/k_r6: 0.418861
Ssq[1.37409475e-22 1.37409475e-22]

21.FCepsilonRI/k_f1: 48.9162
FCepsilonRI/k_f4: 90.6817
FCepsilonRI/k_f5: 3.75162
FCepsilonRI/k_f6: 10.2044
FCepsilonRI/k_f7: 1.88959
FCepsilonRI/k_r1: 0.0036682
FCepsilonRI/k_r4: 40.2246
FCepsilonRI/k_r6: 0.0168107
Ssq[4.82654163e-23 4.82654163e-23]

22.FCepsilonRI/k_f1: 56.4876
FCepsilonRI/k_f4: 90.6817
FCepsilonRI/k_f5: 0.691582
FCepsilonRI/k_f6: 1.41063
FCepsilonRI/k_f7: 8.5244
FCepsilonRI/k_r1: 0.0032929
FCepsilonRI/k_r4: 6.96263
FCepsilonRI/k_r6: 0.0168107
Ssq[3.41867967e-07 3.41867967e-07]

23.FCepsilonRI/k_f1: 56.4876
FCepsilonRI/k_f4: 6.18734
FCepsilonRI/k_f5: 3.75162

FCepsilonRI/k_f6: 1.41063
FCepsilonRI/k_f7: 8.5244
FCepsilonRI/k_r1: 0.0032929
FCepsilonRI/k_r4: 6.96263
FCepsilonRI/k_r6: 0.0168107
Ssq[1.7995195e-11 1.7995195e-11]

24.FCepsilonRI/k_f1: 13.3953
FCepsilonRI/k_f4: 34.3277
FCepsilonRI/k_f5: 1.58204
FCepsilonRI/k_f6: 61.665
FCepsilonRI/k_f7: 51.5127
FCepsilonRI/k_r1: 0.0317653
FCepsilonRI/k_r4: 0.182281
FCepsilonRI/k_r6: 0.0337536
Ssq[2.83989926e-29 2.83989926e-29]

25.FCepsilonRI/k_f1: 11.5999
FCepsilonRI/k_f4: 74.0677
FCepsilonRI/k_f5: 1.58204
FCepsilonRI/k_f6: 4.15111
FCepsilonRI/k_f7: 51.5127
FCepsilonRI/k_r1: 0.0285153
FCepsilonRI/k_r4: 0.0074821
FCepsilonRI/k_r6: 0.00571263
Ssq[3.91577661e-19 3.91577661e-19]

26.FCepsilonRI/k_f1: 4.23597
FCepsilonRI/k_f4: 81.4038
FCepsilonRI/k_f5: 15.8204
FCepsilonRI/k_f6: 3.46768
FCepsilonRI/k_f7: 23.4486
FCepsilonRI/k_r1: 0.00100451
FCepsilonRI/k_r4: 0.0102504
FCepsilonRI/k_r6: 0.600234
Ssq[2.18427381e-24 2.18427381e-24]

27.FCepsilonRI/k_f1: 3.6682
FCepsilonRI/k_f4: 81.4038
FCepsilonRI/k_f5: 15.8204
FCepsilonRI/k_f6: 3.46768
FCepsilonRI/k_f7: 23.4486
FCepsilonRI/k_r1: 0.00100451
FCepsilonRI/k_r4: 0.0102504
FCepsilonRI/k_r6: 0.600234
Ssq[3.63566289e-22 3.63566289e-22]

28.FCepsilonRI/k_f1: 4.23597
FCepsilonRI/k_f4: 5.55429
FCepsilonRI/k_f5: 15.8204
FCepsilonRI/k_f6: 3.46768
FCepsilonRI/k_f7: 23.4486
FCepsilonRI/k_r1: 0.00100451
FCepsilonRI/k_r4: 0.0102504
FCepsilonRI/k_r6: 0.600234
Ssq[6.76648457e-21 6.76648457e-21]

29.FCepsilonRI/k_f1: 4.23597
FCepsilonRI/k_f4: 81.4038
FCepsilonRI/k_f5: 92.224
FCepsilonRI/k_f6: 3.46768
FCepsilonRI/k_f7: 23.4486
FCepsilonRI/k_r1: 0.00100451
FCepsilonRI/k_r4: 0.0102504
FCepsilonRI/k_r6: 0.600234
Ssq[6.91168371e-26 6.91168371e-26]

30.FCepsilonRI/k_f1: 4.23597
FCepsilonRI/k_f4: 81.4038
FCepsilonRI/k_f5: 15.8204
FCepsilonRI/k_f6: 3.46768
FCepsilonRI/k_f7: 2.89677
FCepsilonRI/k_r1: 0.00100451
FCepsilonRI/k_r4: 0.0102504
FCepsilonRI/k_r6: 0.600234
Ssq[5.19285516e-19 5.19285516e-19]

31.FCepsilonRI/k_f1: 4.23597
FCepsilonRI/k_f4: 81.4038
FCepsilonRI/k_f5: 15.8204
FCepsilonRI/k_f6: 3.46768
FCepsilonRI/k_f7: 23.4486
FCepsilonRI/k_r1: 0.0901733
FCepsilonRI/k_r4: 0.0102504
FCepsilonRI/k_r6: 0.600234
Ssq[3.73898049e-20 3.73898049e-20]

32.FCepsilonRI/k_f1: 4.23597
FCepsilonRI/k_f4: 81.4038
FCepsilonRI/k_f5: 15.8204
FCepsilonRI/k_f6: 3.46768
FCepsilonRI/k_f7: 23.4486
FCepsilonRI/k_r1: 0.00100451
FCepsilonRI/k_r4: 42.0749
FCepsilonRI/k_r6: 0.600234
Ssq[3.0589111e-20 3.0589111e-20]

33.FCepsilonRI/k_f1: 4.23597
FCepsilonRI/k_f4: 81.4038
FCepsilonRI/k_f5: 15.8204
FCepsilonRI/k_f6: 3.46768
FCepsilonRI/k_f7: 23.4486
FCepsilonRI/k_r1: 0.00100451
FCepsilonRI/k_r4: 0.0102504
FCepsilonRI/k_r6: 0.101586
Ssq[2.3304837e-20 2.3304837e-20]

34.FCepsilonRI/k_f1: 3.6682
FCepsilonRI/k_f4: 5.55429
FCepsilonRI/k_f5: 92.224
FCepsilonRI/k_f6: 3.46768
FCepsilonRI/k_f7: 2.89677
FCepsilonRI/k_r1: 0.0901733
FCepsilonRI/k_r4: 42.0749
FCepsilonRI/k_r6: 0.101586
Ssq[6.11801147e-20 6.11801147e-20]

35.FCepsilonRI/k_f1: 7.53274
FCepsilonRI/k_f4: 9.40036
FCepsilonRI/k_f5: 5.00286
FCepsilonRI/k_f6: 0.822317
FCepsilonRI/k_f7: 98.882
FCepsilonRI/k_r1: 0.00564876
FCepsilonRI/k_r4: 0.768674
FCepsilonRI/k_r6: 0.00800424
Ssq[2.60516451e-09 2.60516451e-09]

36.FCepsilonRI/k_f1: 65.2309
FCepsilonRI/k_f4: 9.40036
FCepsilonRI/k_f5: 5.00286
FCepsilonRI/k_f6: 0.822317
FCepsilonRI/k_f7: 98.882
FCepsilonRI/k_r1: 0.00564876
FCepsilonRI/k_r4: 0.768674
FCepsilonRI/k_r6: 0.00800424
Ssq[2.62352062e-09 2.62352062e-09]

37.FCepsilonRI/k_f1: 7.53274
FCepsilonRI/k_f4: 48.0982
FCepsilonRI/k_f5: 5.00286
FCepsilonRI/k_f6: 0.822317
FCepsilonRI/k_f7: 98.882

FCepsilonRI/k_r1: 0.00564876
FCepsilonRI/k_r4: 0.768674
FCepsilonRI/k_r6: 0.00800424
Ssq[3.18138982e-10 3.18138982e-10]

38.FCepsilonRI/k_f1: 7.53274
FCepsilonRI/k_f4: 9.40036
FCepsilonRI/k_f5: 5.00286
FCepsilonRI/k_f6: 0.822317
FCepsilonRI/k_f7: 98.882
FCepsilonRI/k_r1: 0.0160353
FCepsilonRI/k_r4: 0.768674
FCepsilonRI/k_r6: 0.00800424
Ssq[2.66170979e-09 2.66170979e-09]

39.FCepsilonRI/k_f1: 7.53274
FCepsilonRI/k_f4: 9.40036
FCepsilonRI/k_f5: 5.00286
FCepsilonRI/k_f6: 0.822317
FCepsilonRI/k_f7: 98.882
FCepsilonRI/k_r1: 0.00564876
FCepsilonRI/k_r4: 9.97754
FCepsilonRI/k_r6: 0.00800424
Ssq[5.57380022e-08 5.57380022e-08]

40.FCepsilonRI/k_f1: 7.53274
FCepsilonRI/k_f4: 9.40036
FCepsilonRI/k_f5: 5.00286
FCepsilonRI/k_f6: 0.822317
FCepsilonRI/k_f7: 98.882
FCepsilonRI/k_r1: 0.00564876
FCepsilonRI/k_r4: 0.768674
FCepsilonRI/k_r6: 0.02409
Ssq[2.72340003e-09 2.72340003e-09]

41.FCepsilonRI/k_f1: 75.3274
FCepsilonRI/k_f4: 8.55321
FCepsilonRI/k_f5: 29.1638
FCepsilonRI/k_f6: 17.5051
FCepsilonRI/k_f7: 0.686932
FCepsilonRI/k_r1: 0.00160353
FCepsilonRI/k_r4: 0.0315517
FCepsilonRI/k_r6: 7.61791
Ssq[5.33566783e-08 5.33566783e-08]

42.FCepsilonRI/k_f1: 6.52309
FCepsilonRI/k_f4: 52.8621
FCepsilonRI/k_f5: 29.1638
FCepsilonRI/k_f6: 17.5051
FCepsilonRI/k_f7: 0.686932
FCepsilonRI/k_r1: 0.00160353
FCepsilonRI/k_r4: 0.0315517
FCepsilonRI/k_r6: 7.61791
Ssq[3.04776291e-09 3.04776291e-09]

43.FCepsilonRI/k_f1: 6.52309
FCepsilonRI/k_f4: 8.55321
FCepsilonRI/k_f5: 29.1638
FCepsilonRI/k_f6: 17.5051
FCepsilonRI/k_f7: 0.686932
FCepsilonRI/k_r1: 0.0564876
FCepsilonRI/k_r4: 0.0315517
FCepsilonRI/k_r6: 7.61791
Ssq[5.35305033e-08 5.35305033e-08]

44.FCepsilonRI/k_f1: 6.52309
FCepsilonRI/k_f4: 8.55321
FCepsilonRI/k_f5: 29.1638
FCepsilonRI/k_f6: 17.5051
FCepsilonRI/k_f7: 0.686932
FCepsilonRI/k_r1: 0.00160353
FCepsilonRI/k_r4: 0.00243076
FCepsilonRI/k_r6: 7.61791
Ssq[5.32152659e-08 5.32152659e-08]

45.FCepsilonRI/k_f1: 6.52309
FCepsilonRI/k_f4: 8.55321
FCepsilonRI/k_f5: 29.1638
FCepsilonRI/k_f6: 17.5051
FCepsilonRI/k_f7: 0.686932
FCepsilonRI/k_r1: 0.00160353
FCepsilonRI/k_r4: 0.0315517
FCepsilonRI/k_r6: 2.53116
Ssq[1.61545619e-21 1.61545619e-21]

46.FCepsilonRI/k_f1: 6.52309
FCepsilonRI/k_f4: 8.55321
FCepsilonRI/k_f5: 29.1638
FCepsilonRI/k_f6: 17.5051
FCepsilonRI/k_f7: 0.686932
FCepsilonRI/k_r1: 0.00160353
FCepsilonRI/k_r4: 0.0315517
FCepsilonRI/k_r6: 7.61791
Ssq[5.34167049e-08 5.34167049e-08]

47.FCepsilonRI/k_f1: 56.4876
FCepsilonRI/k_f4: 4.9192
FCepsilonRI/k_f5: 8.89649
FCepsilonRI/k_f6: 35.9471
FCepsilonRI/k_f7: 11.4187
FCepsilonRI/k_r1: 0.0423597
FCepsilonRI/k_r4: 6.65644
FCepsilonRI/k_r6: 92.4316
Ssq[2.70111999e-18 2.70111999e-18]

48.FCepsilonRI/k_f1: 56.4876
FCepsilonRI/k_f4: 91.9134
FCepsilonRI/k_f5: 16.4
FCepsilonRI/k_f6: 35.9471
FCepsilonRI/k_f7: 5.94859
FCepsilonRI/k_r1: 0.0120248
FCepsilonRI/k_r4: 4.85874
FCepsilonRI/k_r6: 0.00278186
Ssq[3.86541844e-29 3.86541844e-29]

49.FCepsilonRI/k_f1: 2.75076
FCepsilonRI/k_f4: 4.9192
FCepsilonRI/k_f5: 16.4
FCepsilonRI/k_f6: 35.9471
FCepsilonRI/k_f7: 5.94859
FCepsilonRI/k_r1: 0.0120248
FCepsilonRI/k_r4: 4.85874
FCepsilonRI/k_r6: 0.00278186
Ssq[7.88860905e-29 7.88860905e-29]

50.FCepsilonRI/k_f1: 2.75076
FCepsilonRI/k_f4: 91.9134
FCepsilonRI/k_f5: 8.89649
FCepsilonRI/k_f6: 35.9471
FCepsilonRI/k_f7: 5.94859
FCepsilonRI/k_r1: 0.0120248
FCepsilonRI/k_r4: 4.85874
FCepsilonRI/k_r6: 0.00278186
Ssq[7.88860905e-31 7.88860905e-31]

51.FCepsilonRI/k_f1: 2.75076
FCepsilonRI/k_f4: 91.9134
FCepsilonRI/k_f5: 16.4
FCepsilonRI/k_f6: 35.9471
FCepsilonRI/k_f7: 11.4187
FCepsilonRI/k_r1: 0.0120248
FCepsilonRI/k_r4: 4.85874
FCepsilonRI/k_r6: 0.00278186

Ssq[1.97215226e-29 1.97215226e-29]

52.FCepsilonRI/k_f1: 2.75076
FCepsilonRI/k_f4: 91.9134
FCepsilonRI/k_f5: 16.4
FCepsilonRI/k_f6: 35.9471
FCepsilonRI/k_f7: 5.94859
FCepsilonRI/k_r1: 0.0423597
FCepsilonRI/k_r4: 4.85874
FCepsilonRI/k_r6: 0.00278186
Ssq[3.86541844e-29 3.86541844e-29]

53.FCepsilonRI/k_f1: 2.75076
FCepsilonRI/k_f4: 91.9134
FCepsilonRI/k_f5: 16.4
FCepsilonRI/k_f6: 35.9471
FCepsilonRI/k_f7: 5.94859
FCepsilonRI/k_r1: 0.0120248
FCepsilonRI/k_r4: 6.65644
FCepsilonRI/k_r6: 0.00278186
Ssq[9.54521695e-29 9.54521695e-29]

54.FCepsilonRI/k_f1: 2.75076
FCepsilonRI/k_f4: 91.9134
FCepsilonRI/k_f5: 16.4
FCepsilonRI/k_f6: 35.9471
FCepsilonRI/k_f7: 5.94859
FCepsilonRI/k_r1: 0.0120248
FCepsilonRI/k_r4: 4.85874
FCepsilonRI/k_r6: 92.4316
Ssq[3.57584162e-18 3.57584162e-18]

55.FCepsilonRI/k_f1: 2.75076
FCepsilonRI/k_f4: 91.9134
FCepsilonRI/k_f5: 16.4
FCepsilonRI/k_f6: 35.9471
FCepsilonRI/k_f7: 5.94859
FCepsilonRI/k_r1: 0.0120248
FCepsilonRI/k_r4: 4.85874
FCepsilonRI/k_r6: 0.00278186
Ssq[7.09974815e-30 7.09974815e-30]

56.FCepsilonRI/k_f1: 1.54687
FCepsilonRI/k_f4: 25.1698
FCepsilonRI/k_f5: 51.8613
FCepsilonRI/k_f6: 30.0289
FCepsilonRI/k_f7: 25.085
FCepsilonRI/k_r1: 0.00676205
FCepsilonRI/k_r4: 0.00364354
FCepsilonRI/k_r6: 3.70968
Ssq[1.26217745e-29 1.26217745e-29]

57.FCepsilonRI/k_f1: 31.7653
FCepsilonRI/k_f4: 17.9636
FCepsilonRI/k_f5: 28.1332
FCepsilonRI/k_f6: 8.5244
FCepsilonRI/k_f7: 48.1523
FCepsilonRI/k_r1: 0.0238206
FCepsilonRI/k_r4: 0.0887651
FCepsilonRI/k_r6: 0.0693139
Ssq[1.26217745e-29 1.26217745e-29]

58.FCepsilonRI/k_f1: 1.00677
FCepsilonRI/k_f4: 32.1425
FCepsilonRI/k_f5: 19.3691
FCepsilonRI/k_f6: 40.4514
FCepsilonRI/k_f7: 3.40969
FCepsilonRI/k_r1: 0.0047507
FCepsilonRI/k_r4: 0.00458798
FCepsilonRI/k_r6: 19.2605
Ssq[7.88860905e-31 7.88860905e-31]

59.FCepsilonRI/k_f1: 24.7488
FCepsilonRI/k_f4: 11.6064
FCepsilonRI/k_f5: 19.3691
FCepsilonRI/k_f6: 40.4514
FCepsilonRI/k_f7: 3.40969
FCepsilonRI/k_r1: 0.0047507
FCepsilonRI/k_r4: 0.00458798
FCepsilonRI/k_r6: 19.2605
Ssq[1.17928547e-20 1.17928547e-20]

60.FCepsilonRI/k_f1: 24.7488
FCepsilonRI/k_f4: 32.1425
FCepsilonRI/k_f5: 0.618039
FCepsilonRI/k_f6: 40.4514
FCepsilonRI/k_f7: 3.40969
FCepsilonRI/k_r1: 0.0047507
FCepsilonRI/k_r4: 0.00458798
FCepsilonRI/k_r6: 19.2605
Ssq[1.73989226e-18 1.73989226e-18]

61.FCepsilonRI/k_f1: 24.7488
FCepsilonRI/k_f4: 32.1425
FCepsilonRI/k_f5: 19.3691
FCepsilonRI/k_f6: 40.4514
FCepsilonRI/k_f7: 0.610442
FCepsilonRI/k_r1: 0.0047507
FCepsilonRI/k_r4: 0.00458798
FCepsilonRI/k_r6: 19.2605
Ssq[2.55843815e-06 2.55843815e-06]

62.FCepsilonRI/k_f1: 24.7488
FCepsilonRI/k_f4: 32.1425
FCepsilonRI/k_f5: 19.3691
FCepsilonRI/k_f6: 40.4514
FCepsilonRI/k_f7: 3.40969
FCepsilonRI/k_r1: 0.0488064
FCepsilonRI/k_r4: 0.00458798
FCepsilonRI/k_r6: 19.2605
Ssq[5.04870979e-29 5.04870979e-29]

63.FCepsilonRI/k_f1: 24.7488
FCepsilonRI/k_f4: 32.1425
FCepsilonRI/k_f5: 19.3691
FCepsilonRI/k_f6: 40.4514
FCepsilonRI/k_f7: 3.40969
FCepsilonRI/k_r1: 0.0047507
FCepsilonRI/k_r4: 0.016162
FCepsilonRI/k_r6: 19.2605
Ssq[1.19985744e-27 1.19985744e-27]

64.FCepsilonRI/k_f1: 24.7488
FCepsilonRI/k_f4: 32.1425
FCepsilonRI/k_f5: 19.3691
FCepsilonRI/k_f6: 40.4514
FCepsilonRI/k_f7: 3.40969
FCepsilonRI/k_r1: 0.0047507
FCepsilonRI/k_r4: 0.00458798
FCepsilonRI/k_r6: 0.864991
Ssq[4.17307419e-28 4.17307419e-28]

65.FCepsilonRI/k_f1: 24.7488
FCepsilonRI/k_f4: 32.1425
FCepsilonRI/k_f5: 19.3691
FCepsilonRI/k_f6: 40.4514
FCepsilonRI/k_f7: 3.40969
FCepsilonRI/k_r1: 0.0047507
FCepsilonRI/k_r4: 0.00458798
FCepsilonRI/k_r6: 19.2605
Ssq[1.29934049e-19 1.29934049e-19]

66.FCepsilonRI/k_f1: 3.18368
FCepsilonRI/k_f4: 27.5231
FCepsilonRI/k_f5: 6.18039
FCepsilonRI/k_f6: 4.8315
FCepsilonRI/k_f7: 10.8554
FCepsilonRI/k_r1: 0.0154339
FCepsilonRI/k_r4: 90.8858
FCepsilonRI/k_r6: 15.382
Ssq[1.20442332e-15 1.20442332e-15]

67.FCepsilonRI/k_f1: 78.2627
FCepsilonRI/k_f4: 27.5231
FCepsilonRI/k_f5: 6.18039
FCepsilonRI/k_f6: 4.8315
FCepsilonRI/k_f7: 10.8554
FCepsilonRI/k_r1: 0.0154339
FCepsilonRI/k_r4: 90.8858
FCepsilonRI/k_r6: 15.382
Ssq[4.73978457e-16 4.73978457e-16]

68.FCepsilonRI/k_f1: 3.18368
FCepsilonRI/k_f4: 76.222
FCepsilonRI/k_f5: 6.18039
FCepsilonRI/k_f6: 4.8315
FCepsilonRI/k_f7: 10.8554
FCepsilonRI/k_r1: 0.0154339
FCepsilonRI/k_r4: 90.8858
FCepsilonRI/k_r6: 15.382
Ssq[1.5939609e-18 1.5939609e-18]

69.FCepsilonRI/k_f1: 3.18368
FCepsilonRI/k_f4: 27.5231
FCepsilonRI/k_f5: 6.18039
FCepsilonRI/k_f6: 2.27475
FCepsilonRI/k_f7: 10.8554
FCepsilonRI/k_r1: 0.0154339
FCepsilonRI/k_r4: 90.8858
FCepsilonRI/k_r6: 15.382
Ssq[2.42546642e-07 2.42546642e-07]

70.FCepsilonRI/k_f1: 3.18368
FCepsilonRI/k_f4: 27.5231
FCepsilonRI/k_f5: 6.18039
FCepsilonRI/k_f6: 4.8315
FCepsilonRI/k_f7: 10.8554
FCepsilonRI/k_r1: 0.015023
FCepsilonRI/k_r4: 90.8858
FCepsilonRI/k_r6: 15.382
Ssq[6.27501046e-16 6.27501046e-16]

71.FCepsilonRI/k_f1: 3.18368
FCepsilonRI/k_f4: 27.5231
FCepsilonRI/k_f5: 6.18039
FCepsilonRI/k_f6: 4.8315
FCepsilonRI/k_f7: 10.8554
FCepsilonRI/k_r1: 0.0154339
FCepsilonRI/k_r4: 0.081587
FCepsilonRI/k_r6: 15.382
Ssq[6.37312305e-16 6.37312305e-16]

72.FCepsilonRI/k_f1: 3.18368
FCepsilonRI/k_f4: 27.5231
FCepsilonRI/k_f5: 6.18039
FCepsilonRI/k_f6: 4.8315
FCepsilonRI/k_f7: 10.8554
FCepsilonRI/k_r1: 0.0154339
FCepsilonRI/k_r4: 90.8858
FCepsilonRI/k_r6: 0.00342506
Ssq[1.44132215e-18 1.44132215e-18]

73.FCepsilonRI/k_f1: 78.2627
FCepsilonRI/k_f4: 76.222
FCepsilonRI/k_f5: 1.93691
FCepsilonRI/k_f6: 2.27475
FCepsilonRI/k_f7: 10.8554
FCepsilonRI/k_r1: 0.015023
FCepsilonRI/k_r4: 0.081587
FCepsilonRI/k_r6: 0.00342506
Ssq[1.96094275e-17 1.96094275e-17]

74.FCepsilonRI/k_f1: 5.66148
FCepsilonRI/k_f4: 3.17832
FCepsilonRI/k_f5: 19.5441
FCepsilonRI/k_f6: 1.14573
FCepsilonRI/k_f7: 45.7767
FCepsilonRI/k_r1: 0.0867914
FCepsilonRI/k_r4: 0.0681547
FCepsilonRI/k_r6: 0.205122
Ssq[8.87719195e-12 8.87719195e-12]

75.FCepsilonRI/k_f1: 4.40103
FCepsilonRI/k_f4: 3.17832
FCepsilonRI/k_f5: 19.5441
FCepsilonRI/k_f6: 1.14573
FCepsilonRI/k_f7: 45.7767
FCepsilonRI/k_r1: 0.0867914
FCepsilonRI/k_r4: 0.0681547
FCepsilonRI/k_r6: 0.205122
Ssq[8.97145383e-12 8.97145383e-12]

76.FCepsilonRI/k_f1: 5.66148
FCepsilonRI/k_f4: 3.71176
FCepsilonRI/k_f5: 19.5441
FCepsilonRI/k_f6: 1.14573
FCepsilonRI/k_f7: 45.7767
FCepsilonRI/k_r1: 0.0867914
FCepsilonRI/k_r4: 0.0681547
FCepsilonRI/k_r6: 0.205122
Ssq[3.78804545e-12 3.78804545e-12]

77.FCepsilonRI/k_f1: 5.66148
FCepsilonRI/k_f4: 3.17832
FCepsilonRI/k_f5: 19.5441
FCepsilonRI/k_f6: 0.539428
FCepsilonRI/k_f7: 45.7767
FCepsilonRI/k_r1: 0.0867914
FCepsilonRI/k_r4: 0.0681547
FCepsilonRI/k_r6: 0.205122
Ssq[2.26971278e-05 2.26971278e-05]

78.FCepsilonRI/k_f1: 5.66148
FCepsilonRI/k_f4: 3.17832
FCepsilonRI/k_f5: 19.5441
FCepsilonRI/k_f6: 1.14573
FCepsilonRI/k_f7: 14.3785
FCepsilonRI/k_r1: 0.0867914
FCepsilonRI/k_r4: 0.0681547
FCepsilonRI/k_r6: 0.205122
Ssq[1.79317405e-11 1.79317405e-11]

79.FCepsilonRI/k_f1: 5.66148
FCepsilonRI/k_f4: 3.17832
FCepsilonRI/k_f5: 19.5441
FCepsilonRI/k_f6: 1.14573
FCepsilonRI/k_f7: 45.7767
FCepsilonRI/k_r1: 0.0844808
FCepsilonRI/k_r4: 0.0681547
FCepsilonRI/k_r6: 0.205122
Ssq[9.67879811e-12 9.67879811e-12]

80.FCepsilonRI/k_f1: 5.66148
FCepsilonRI/k_f4: 3.17832

FCepsilonRI/k_f5: 19.5441
FCepsilonRI/k_f6: 1.14573
FCepsilonRI/k_f7: 45.7767
FCepsilonRI/k_r1: 0.0867914
FCepsilonRI/k_r4: 0.0193473
FCepsilonRI/k_r6: 0.205122
Ssq[9.67911183e-12 9.67911183e-12]

81.FCepsilonRI/k_f1: 5.66148
FCepsilonRI/k_f4: 3.17832
FCepsilonRI/k_f5: 19.5441
FCepsilonRI/k_f6: 1.14573
FCepsilonRI/k_f7: 45.7767
FCepsilonRI/k_r1: 0.0867914
FCepsilonRI/k_r4: 0.0681547
FCepsilonRI/k_r6: 0.0144434
Ssq[8.53483166e-12 8.53483166e-12]

82.FCepsilonRI/k_f1: 4.40103
FCepsilonRI/k_f4: 3.71176
FCepsilonRI/k_f5: 19.5441
FCepsilonRI/k_f6: 0.539428
FCepsilonRI/k_f7: 14.3785
FCepsilonRI/k_r1: 0.0844808
FCepsilonRI/k_r4: 0.0193473
FCepsilonRI/k_r6: 0.0144434
Ssq[1.7878053e-05 1.7878053e-05]

83.FCepsilonRI/k_f1: 17.9032
FCepsilonRI/k_f4: 7.53698
FCepsilonRI/k_f5: 1.95441
FCepsilonRI/k_f6: 20.3743
FCepsilonRI/k_f7: 0.808565
FCepsilonRI/k_r1: 0.00274458
FCepsilonRI/k_r4: 0.00383262
FCepsilonRI/k_r6: 3.64764
Ssq[3.42937424e-15 3.42937424e-15]

84.FCepsilonRI/k_f1: 13.9173
FCepsilonRI/k_f4: 49.4971
FCepsilonRI/k_f5: 61.2505
FCepsilonRI/k_f6: 20.3743
FCepsilonRI/k_f7: 0.808565
FCepsilonRI/k_r1: 0.0267152
FCepsilonRI/k_r4: 0.34405
FCepsilonRI/k_r6: 0.256843
Ssq[1.61167438e-23 1.61167438e-23]

85.FCepsilonRI/k_f1: 33.0031
FCepsilonRI/k_f4: 16.8202
FCepsilonRI/k_f5: 34.4437
FCepsilonRI/k_f6: 0.557933
FCepsilonRI/k_f7: 7.00188
FCepsilonRI/k_r1: 0.00200335
FCepsilonRI/k_r4: 0.167541
FCepsilonRI/k_r6: 2.22417
Ssq[6.84180211e-05 6.84180211e-05]

86.FCepsilonRI/k_f1: 1.34255
FCepsilonRI/k_f4: 4.60607
FCepsilonRI/k_f5: 10.892
FCepsilonRI/k_f6: 19.6985
FCepsilonRI/k_f7: 29.5267
FCepsilonRI/k_r1: 0.0356252
FCepsilonRI/k_r4: 12.5638
FCepsilonRI/k_r6: 0.00166789
Ssq[1.54616737e-28 1.54616737e-28]

87.FCepsilonRI/k_f1: 58.6887
FCepsilonRI/k_f4: 22.1793
FCepsilonRI/k_f5: 10.892
FCepsilonRI/k_f6: 19.6985
FCepsilonRI/k_f7: 29.5267
FCepsilonRI/k_r1: 0.0356252
FCepsilonRI/k_r4: 12.5638
FCepsilonRI/k_r6: 0.00166789
Ssq[3.15544362e-30 3.15544362e-30]

88.FCepsilonRI/k_f1: 58.6887
FCepsilonRI/k_f4: 4.60607
FCepsilonRI/k_f5: 34.7549
FCepsilonRI/k_f6: 19.6985
FCepsilonRI/k_f7: 29.5267
FCepsilonRI/k_r1: 0.0356252
FCepsilonRI/k_r4: 12.5638
FCepsilonRI/k_r6: 0.00166789
Ssq[3.15544362e-30 3.15544362e-30]

89.FCepsilonRI/k_f1: 58.6887
FCepsilonRI/k_f4: 4.60607
FCepsilonRI/k_f5: 10.892
FCepsilonRI/k_f6: 19.6985
FCepsilonRI/k_f7: 29.5267
FCepsilonRI/k_r1: 0.0650843
FCepsilonRI/k_r4: 12.5638
FCepsilonRI/k_r6: 0.00166789
Ssq[9.25923594e-24 9.25923594e-24]

90.FCepsilonRI/k_f1: 58.6887
FCepsilonRI/k_f4: 4.60607
FCepsilonRI/k_f5: 10.892
FCepsilonRI/k_f6: 19.6985
FCepsilonRI/k_f7: 29.5267
FCepsilonRI/k_r1: 0.0356252
FCepsilonRI/k_r4: 44.2584
FCepsilonRI/k_r6: 0.00166789
Ssq[2.79586722e-22 2.79586722e-22]

91.FCepsilonRI/k_f1: 58.6887
FCepsilonRI/k_f4: 4.60607
FCepsilonRI/k_f5: 10.892
FCepsilonRI/k_f6: 19.6985
FCepsilonRI/k_f7: 29.5267
FCepsilonRI/k_r1: 0.0356252
FCepsilonRI/k_r4: 12.5638
FCepsilonRI/k_r6: 7.49052
Ssq[7.88860905e-29 7.88860905e-29]

92.FCepsilonRI/k_f1: 58.6887
FCepsilonRI/k_f4: 4.60607
FCepsilonRI/k_f5: 10.892
FCepsilonRI/k_f6: 19.6985
FCepsilonRI/k_f7: 29.5267
FCepsilonRI/k_r1: 0.0356252
FCepsilonRI/k_r4: 12.5638
FCepsilonRI/k_r6: 0.00166789
Ssq[2.27980802e-28 2.27980802e-28]

93.FCepsilonRI/k_f1: 1.55035
FCepsilonRI/k_f4: 4.39362
FCepsilonRI/k_f5: 14.5248
FCepsilonRI/k_f6: 14.2178
FCepsilonRI/k_f7: 7.57521
FCepsilonRI/k_r1: 0.00178228
FCepsilonRI/k_r4: 3.56653
FCepsilonRI/k_r6: 0.0339439
Ssq[7.88860905e-29 7.88860905e-29]

94.FCepsilonRI/k_f1: 4.90264
FCepsilonRI/k_f4: 58.5898
FCepsilonRI/k_f5: 14.656
FCepsilonRI/k_f6: 6.69397
FCepsilonRI/k_f7: 0.425985

FCepsilonRI/k_r1: 0.00563607
FCepsilonRI/k_r4: 0.200561
FCepsilonRI/k_r6: 0.00190881
Ssq[1.08825569e-11 1.08825569e-11]

95.FCepsilonRI/k_f1: 4.90264
FCepsilonRI/k_f4: 44.4329
FCepsilonRI/k_f5: 1.45248
FCepsilonRI/k_f6: 6.69397
FCepsilonRI/k_f7: 20.6046
FCepsilonRI/k_r1: 0.00308502
FCepsilonRI/k_r4: 0.0135012
FCepsilonRI/k_r6: 0.00239011
Ssq[8.27603521e-24 8.27603521e-24]

96.FCepsilonRI/k_f1: 12.0519
FCepsilonRI/k_f4: 58.5898
FCepsilonRI/k_f5: 1.45248
FCepsilonRI/k_f6: 6.69397
FCepsilonRI/k_f7: 20.6046
FCepsilonRI/k_r1: 0.00308502
FCepsilonRI/k_r4: 0.0135012
FCepsilonRI/k_r6: 0.00239011
Ssq[1.52723471e-25 1.52723471e-25]

97.FCepsilonRI/k_f1: 12.0519
FCepsilonRI/k_f4: 44.4329
FCepsilonRI/k_f5: 14.656
FCepsilonRI/k_f6: 6.69397
FCepsilonRI/k_f7: 20.6046
FCepsilonRI/k_r1: 0.00308502
FCepsilonRI/k_r4: 0.0135012
FCepsilonRI/k_r6: 0.00239011
Ssq[1.19985744e-27 1.19985744e-27]

98.FCepsilonRI/k_f1: 12.0519
FCepsilonRI/k_f4: 44.4329
FCepsilonRI/k_f5: 1.45248
FCepsilonRI/k_f6: 6.69397
FCepsilonRI/k_f7: 20.6046
FCepsilonRI/k_r1: 0.00563607
FCepsilonRI/k_r4: 0.0135012
FCepsilonRI/k_r6: 0.00239011
Ssq[2.95521056e-21 2.95521056e-21]

99.FCepsilonRI/k_f1: 12.0519
FCepsilonRI/k_f4: 44.4329
FCepsilonRI/k_f5: 1.45248
FCepsilonRI/k_f6: 6.69397
FCepsilonRI/k_f7: 20.6046
FCepsilonRI/k_r1: 0.00308502
FCepsilonRI/k_r4: 0.200561
FCepsilonRI/k_r6: 0.00239011
Ssq[2.25573277e-24 2.25573277e-24]

100.FCepsilonRI/k_f1: 12.0519
FCepsilonRI/k_f4: 44.4329
FCepsilonRI/k_f5: 1.45248
FCepsilonRI/k_f6: 6.69397
FCepsilonRI/k_f7: 20.6046
FCepsilonRI/k_r1: 0.00308502
FCepsilonRI/k_r4: 0.0135012
FCepsilonRI/k_r6: 0.00190881
Ssq[3.15544362e-30 3.15544362e-30]

101.FCepsilonRI/k_f1: 12.0519
FCepsilonRI/k_f4: 44.4329
FCepsilonRI/k_f5: 1.45248
FCepsilonRI/k_f6: 6.69397
FCepsilonRI/k_f7: 20.6046
FCepsilonRI/k_r1: 0.00308502
FCepsilonRI/k_r4: 0.0135012
FCepsilonRI/k_r6: 0.00239011
Ssq[1.31046722e-21 1.31046722e-21]

102.FCepsilonRI/k_f1: 8.71826
FCepsilonRI/k_f4: 16.0444
FCepsilonRI/k_f5: 4.63464
FCepsilonRI/k_f6: 28.2282
FCepsilonRI/k_f7: 1.79636
FCepsilonRI/k_r1: 0.00100225
FCepsilonRI/k_r4: 15.0399
FCepsilonRI/k_r6: 2.54543
Ssq[7.37655155e-25 7.37655155e-25]

103.FCepsilonRI/k_f1: 21.4316
FCepsilonRI/k_f4: 28.8539
FCepsilonRI/k_f5: 4.59314
FCepsilonRI/k_f6: 3.37157
FCepsilonRI/k_f7: 86.889
FCepsilonRI/k_r1: 0.0548603
FCepsilonRI/k_r4: 1.01244
FCepsilonRI/k_r6: 3.18726
Ssq[2.09287049e-16 2.09287049e-16]

104.FCepsilonRI/k_f1: 2.75696
FCepsilonRI/k_f4: 38.0472
FCepsilonRI/k_f5: 0.463464
FCepsilonRI/k_f6: 59.9559
FCepsilonRI/k_f7: 31.9444
FCepsilonRI/k_r1: 0.0031694
FCepsilonRI/k_r4: 0.00267452
FCepsilonRI/k_r6: 45.2649
Ssq[3.69756856e-22 3.69756856e-22]

105.FCepsilonRI/k_f1: 6.77727
FCepsilonRI/k_f4: 38.0472
FCepsilonRI/k_f5: 0.463464
FCepsilonRI/k_f6: 59.9559
FCepsilonRI/k_f7: 31.9444
FCepsilonRI/k_r1: 0.0031694
FCepsilonRI/k_r4: 0.00267452
FCepsilonRI/k_r6: 45.2649
Ssq[1.33317493e-28 1.33317493e-28]

106.FCepsilonRI/k_f1: 2.75696
FCepsilonRI/k_f4: 12.1676
FCepsilonRI/k_f5: 0.463464
FCepsilonRI/k_f6: 59.9559
FCepsilonRI/k_f7: 31.9444
FCepsilonRI/k_r1: 0.0031694
FCepsilonRI/k_r4: 0.00267452
FCepsilonRI/k_r6: 45.2649
Ssq[1.4101433e-24 1.4101433e-24]

107.FCepsilonRI/k_f1: 2.75696
FCepsilonRI/k_f4: 38.0472
FCepsilonRI/k_f5: 0.459314
FCepsilonRI/k_f6: 59.9559
FCepsilonRI/k_f7: 31.9444
FCepsilonRI/k_r1: 0.0031694
FCepsilonRI/k_r4: 0.00267452
FCepsilonRI/k_r6: 45.2649
Ssq[2.56300908e-27 2.56300908e-27]

108.FCepsilonRI/k_f1: 2.75696
FCepsilonRI/k_f4: 38.0472
FCepsilonRI/k_f5: 0.463464
FCepsilonRI/k_f6: 59.9559
FCepsilonRI/k_f7: 4.88613
FCepsilonRI/k_r1: 0.0031694
FCepsilonRI/k_r4: 0.00267452
FCepsilonRI/k_r6: 45.2649

Ssq[1.86000225e-11 1.86000225e-11]

109.FCepsilonRI/k_f1: 2.75696
FCepsilonRI/k_f4: 38.0472
FCepsilonRI/k_f5: 0.463464
FCepsilonRI/k_f6: 59.9559
FCepsilonRI/k_f7: 31.9444
FCepsilonRI/k_r1: 0.0173483
FCepsilonRI/k_r4: 0.00267452
FCepsilonRI/k_r6: 45.2649
Ssq[2.55590933e-28 2.55590933e-28]

110.FCepsilonRI/k_f1: 2.75696
FCepsilonRI/k_f4: 38.0472
FCepsilonRI/k_f5: 0.463464
FCepsilonRI/k_f6: 59.9559
FCepsilonRI/k_f7: 31.9444
FCepsilonRI/k_r1: 0.0031694
FCepsilonRI/k_r4: 0.0569339
FCepsilonRI/k_r6: 45.2649
Ssq[1.33317493e-28 1.33317493e-28]

111.FCepsilonRI/k_f1: 2.75696
FCepsilonRI/k_f4: 38.0472
FCepsilonRI/k_f5: 0.463464
FCepsilonRI/k_f6: 59.9559
FCepsilonRI/k_f7: 31.9444
FCepsilonRI/k_r1: 0.0031694
FCepsilonRI/k_r4: 0.00267452
FCepsilonRI/k_r6: 56.6785
Ssq[3.12396807e-26 3.12396807e-26]

112.FCepsilonRI/k_f1: 6.77727
FCepsilonRI/k_f4: 12.1676
FCepsilonRI/k_f5: 0.459314
FCepsilonRI/k_f6: 59.9559
FCepsilonRI/k_f7: 4.88613
FCepsilonRI/k_r1: 0.0173483
FCepsilonRI/k_r4: 0.0569339
FCepsilonRI/k_r6: 56.6785
Ssq[3.7629008e-06 3.7629008e-06]

113.FCepsilonRI/k_f1: 2.06742
FCepsilonRI/k_f4: 8.396
FCepsilonRI/k_f5: 82.4168
FCepsilonRI/k_f6: 1.64184
FCepsilonRI/k_f7: 42.3121
FCepsilonRI/k_r1: 0.00751582
FCepsilonRI/k_r4: 7.32396
FCepsilonRI/k_r6: 5.22711
Ssq[8.47840165e-15 8.47840165e-15]

114.FCepsilonRI/k_f1: 2.06742
FCepsilonRI/k_f4: 55.1385
FCepsilonRI/k_f5: 0.816788
FCepsilonRI/k_f6: 0.773007
FCepsilonRI/k_f7: 42.3121
FCepsilonRI/k_r1: 0.00130094
FCepsilonRI/k_r4: 2.07908
FCepsilonRI/k_r6: 0.00490815
Ssq[2.8092583e-05 2.8092583e-05]

115.FCepsilonRI/k_f1: 2.85795
FCepsilonRI/k_f4: 8.396
FCepsilonRI/k_f5: 0.816788
FCepsilonRI/k_f6: 0.773007
FCepsilonRI/k_f7: 42.3121
FCepsilonRI/k_r1: 0.00130094
FCepsilonRI/k_r4: 2.07908
FCepsilonRI/k_r6: 0.00490815
Ssq[0.00354825 0.00354825]

116.FCepsilonRI/k_f1: 2.85795
FCepsilonRI/k_f4: 55.1385
FCepsilonRI/k_f5: 82.4168
FCepsilonRI/k_f6: 0.773007
FCepsilonRI/k_f7: 42.3121
FCepsilonRI/k_r1: 0.00130094
FCepsilonRI/k_r4: 2.07908
FCepsilonRI/k_r6: 0.00490815
Ssq[4.71501571e-10 4.71501571e-10]

117.FCepsilonRI/k_f1: 2.85795
FCepsilonRI/k_f4: 55.1385
FCepsilonRI/k_f5: 0.816788
FCepsilonRI/k_f6: 1.64184
FCepsilonRI/k_f7: 42.3121
FCepsilonRI/k_r1: 0.00130094
FCepsilonRI/k_r4: 2.07908
FCepsilonRI/k_r6: 0.00490815
Ssq[3.97293324e-12 3.97293324e-12]

118.FCepsilonRI/k_f1: 2.85795
FCepsilonRI/k_f4: 55.1385
FCepsilonRI/k_f5: 0.816788
FCepsilonRI/k_f6: 0.773007
FCepsilonRI/k_f7: 42.3121
FCepsilonRI/k_r1: 0.00751582
FCepsilonRI/k_r4: 2.07908
FCepsilonRI/k_r6: 0.00490815
Ssq[2.80565546e-05 2.80565546e-05]

119.FCepsilonRI/k_f1: 2.85795
FCepsilonRI/k_f4: 55.1385
FCepsilonRI/k_f5: 0.816788
FCepsilonRI/k_f6: 0.773007
FCepsilonRI/k_f7: 42.3121
FCepsilonRI/k_r1: 0.00130094
FCepsilonRI/k_r4: 7.32396
FCepsilonRI/k_r6: 0.00490815
Ssq[0.0001586 0.0001586]

120.FCepsilonRI/k_f1: 2.85795
FCepsilonRI/k_f4: 55.1385
FCepsilonRI/k_f5: 0.816788
FCepsilonRI/k_f6: 0.773007
FCepsilonRI/k_f7: 42.3121
FCepsilonRI/k_r1: 0.00130094
FCepsilonRI/k_r4: 2.07908
FCepsilonRI/k_r6: 5.22711
Ssq[0.00013054 0.00013054]

121.FCepsilonRI/k_f1: 2.85795
FCepsilonRI/k_f4: 55.1385
FCepsilonRI/k_f5: 0.816788
FCepsilonRI/k_f6: 0.773007
FCepsilonRI/k_f7: 42.3121
FCepsilonRI/k_r1: 0.00130094
FCepsilonRI/k_r4: 2.07908
FCepsilonRI/k_r6: 0.00490815
Ssq[2.80551691e-05 2.80551691e-05]

122.FCepsilonRI/k_f1: 65.3777
FCepsilonRI/k_f4: 3.54056
FCepsilonRI/k_f5: 8.24168
FCepsilonRI/k_f6: 29.1966
FCepsilonRI/k_f7: 0.874771
FCepsilonRI/k_r1: 0.0237671
FCepsilonRI/k_r4: 0.411857
FCepsilonRI/k_r6: 0.293942
Ssq[2.99964359e-24 2.99964359e-24]

123.FCepsilonRI/k_f1: 90.3763
FCepsilonRI/k_f4: 3.54056

FCepsilonRI/k_f5: 8.24168
FCepsilonRI/k_f6: 29.1966
FCepsilonRI/k_f7: 0.874771
FCepsilonRI/k_r1: 0.0237671
FCepsilonRI/k_r4: 0.411857
FCepsilonRI/k_r6: 0.293942
Ssq[1.47220378e-25 1.47220378e-25]

124.FCepsilonRI/k_f1: 65.3777
FCepsilonRI/k_f4: 4.13481
FCepsilonRI/k_f5: 8.24168
FCepsilonRI/k_f6: 29.1966
FCepsilonRI/k_f7: 0.874771
FCepsilonRI/k_r1: 0.0237671
FCepsilonRI/k_r4: 0.411857
FCepsilonRI/k_r6: 0.293942
Ssq[1.04036756e-22 1.04036756e-22]

125.FCepsilonRI/k_f1: 65.3777
FCepsilonRI/k_f4: 3.54056
FCepsilonRI/k_f5: 8.16788
FCepsilonRI/k_f6: 29.1966
FCepsilonRI/k_f7: 0.874771
FCepsilonRI/k_r1: 0.0237671
FCepsilonRI/k_r4: 0.411857
FCepsilonRI/k_r6: 0.293942
Ssq[1.26217745e-29 1.26217745e-29]

126.FCepsilonRI/k_f1: 65.3777
FCepsilonRI/k_f4: 3.54056
FCepsilonRI/k_f5: 8.24168
FCepsilonRI/k_f6: 29.1966
FCepsilonRI/k_f7: 2.37939
FCepsilonRI/k_r1: 0.0237671
FCepsilonRI/k_r4: 0.411857
FCepsilonRI/k_r6: 0.293942
Ssq[2.27980802e-28 2.27980802e-28]

127.FCepsilonRI/k_f1: 65.3777
FCepsilonRI/k_f4: 3.54056
FCepsilonRI/k_f5: 8.24168
FCepsilonRI/k_f6: 29.1966
FCepsilonRI/k_f7: 0.874771
FCepsilonRI/k_r1: 0.00411394
FCepsilonRI/k_r4: 0.411857
FCepsilonRI/k_r6: 0.293942
Ssq[7.62994156e-26 7.62994156e-26]

128.FCepsilonRI/k_f1: 65.3777
FCepsilonRI/k_f4: 3.54056
FCepsilonRI/k_f5: 8.24168
FCepsilonRI/k_f6: 29.1966
FCepsilonRI/k_f7: 0.874771
FCepsilonRI/k_r1: 0.0237671
FCepsilonRI/k_r4: 0.116915
FCepsilonRI/k_r6: 0.293942
Ssq[2.01948392e-28 2.01948392e-28]

129.FCepsilonRI/k_f1: 65.3777
FCepsilonRI/k_f4: 3.54056
FCepsilonRI/k_f5: 8.24168
FCepsilonRI/k_f6: 29.1966
FCepsilonRI/k_f7: 0.874771
FCepsilonRI/k_r1: 0.0237671
FCepsilonRI/k_r4: 0.411857
FCepsilonRI/k_r6: 0.0872806
Ssq[3.12396807e-26 3.12396807e-26]

130.FCepsilonRI/k_f1: 90.3763
FCepsilonRI/k_f4: 4.13481
FCepsilonRI/k_f5: 8.16788
FCepsilonRI/k_f6: 29.1966
FCepsilonRI/k_f7: 2.37939
FCepsilonRI/k_r1: 0.00411394
FCepsilonRI/k_r4: 0.116915
FCepsilonRI/k_r6: 0.0872806
Ssq[7.88860905e-31 7.88860905e-31]

131.FCepsilonRI/k_f1: 3.67646
FCepsilonRI/k_f4: 15.0992
FCepsilonRI/k_f5: 2.58291
FCepsilonRI/k_f6: 57.9674
FCepsilonRI/k_f7: 0.564241
FCepsilonRI/k_r1: 0.0231344
FCepsilonRI/k_r4: 8.76741
FCepsilonRI/k_r6: 6.54513
Ssq[0.00010716 0.00010716]

132.FCepsilonRI/k_f1: 50.8223
FCepsilonRI/k_f4: 15.0992
FCepsilonRI/k_f5: 2.58291
FCepsilonRI/k_f6: 57.9674
FCepsilonRI/k_f7: 0.564241
FCepsilonRI/k_r1: 0.00422646
FCepsilonRI/k_r4: 8.76741
FCepsilonRI/k_r6: 6.54513
Ssq[0.00010604 0.00010604]

133.FCepsilonRI/k_f1: 50.8223
FCepsilonRI/k_f4: 15.0992
FCepsilonRI/k_f5: 2.58291
FCepsilonRI/k_f6: 57.9674
FCepsilonRI/k_f7: 0.564241
FCepsilonRI/k_r1: 0.0231344
FCepsilonRI/k_r4: 1.73679
FCepsilonRI/k_r6: 6.54513
Ssq[1.23133272e-10 1.23133272e-10]

134.FCepsilonRI/k_f1: 50.8223
FCepsilonRI/k_f4: 15.0992
FCepsilonRI/k_f5: 2.58291
FCepsilonRI/k_f6: 57.9674
FCepsilonRI/k_f7: 0.564241
FCepsilonRI/k_r1: 0.0231344
FCepsilonRI/k_r4: 8.76741
FCepsilonRI/k_r6: 0.0697046
Ssq[3.69203708e-20 3.69203708e-20]

135.FCepsilonRI/k_f1: 50.8223
FCepsilonRI/k_f4: 15.0992
FCepsilonRI/k_f5: 2.58291
FCepsilonRI/k_f6: 57.9674
FCepsilonRI/k_f7: 0.564241
FCepsilonRI/k_r1: 0.0231344
FCepsilonRI/k_r4: 8.76741
FCepsilonRI/k_r6: 6.54513
Ssq[0.00010605 0.00010605]

136.FCepsilonRI/k_f1: 36.7646
FCepsilonRI/k_f4: 30.66
FCepsilonRI/k_f5: 26.0625
FCepsilonRI/k_f6: 6.9236
FCepsilonRI/k_f7: 3.68888
FCepsilonRI/k_r1: 0.0422646
FCepsilonRI/k_r4: 0.0054922
FCepsilonRI/k_r6: 22.0425
Ssq[6.837851e-12 6.837851e-12]

137.FCepsilonRI/k_f1: 5.08223
FCepsilonRI/k_f4: 30.66
FCepsilonRI/k_f5: 26.0625
FCepsilonRI/k_f6: 6.9236
FCepsilonRI/k_f7: 3.68888
FCepsilonRI/k_r1: 0.0422646
FCepsilonRI/k_r4: 0.0054922
FCepsilonRI/k_r6: 22.0425
Ssq[7.31491555e-12 7.31491555e-12]

138.FCepsilonRI/k_f1: 36.7646
FCepsilonRI/k_f4: 84.9093
FCepsilonRI/k_f5: 26.0625
FCepsilonRI/k_f6: 6.9236
FCepsilonRI/k_f7: 3.68888
FCepsilonRI/k_r1: 0.0422646
FCepsilonRI/k_r4: 0.0054922
FCepsilonRI/k_r6: 22.0425
Ssq[2.09378037e-12 2.09378037e-12]

139.FCepsilonRI/k_f1: 36.7646
FCepsilonRI/k_f4: 30.66
FCepsilonRI/k_f5: 26.0625
FCepsilonRI/k_f6: 6.9236
FCepsilonRI/k_f7: 3.68888
FCepsilonRI/k_r1: 0.00231344
FCepsilonRI/k_r4: 0.0054922
FCepsilonRI/k_r6: 22.0425
Ssq[6.03567335e-12 6.03567335e-12]

140.FCepsilonRI/k_f1: 36.7646
FCepsilonRI/k_f4: 30.66
FCepsilonRI/k_f5: 26.0625
FCepsilonRI/k_f6: 6.9236
FCepsilonRI/k_f7: 3.68888
FCepsilonRI/k_r1: 0.0422646
FCepsilonRI/k_r4: 0.027725
FCepsilonRI/k_r6: 22.0425
Ssq[6.23161005e-12 6.23161005e-12]

141.FCepsilonRI/k_f1: 36.7646
FCepsilonRI/k_f4: 30.66
FCepsilonRI/k_f5: 26.0625
FCepsilonRI/k_f6: 6.9236
FCepsilonRI/k_f7: 3.68888
FCepsilonRI/k_r1: 0.0422646
FCepsilonRI/k_r4: 0.0054922
FCepsilonRI/k_r6: 0.0206975
Ssq[4.17307419e-28 4.17307419e-28]

142.FCepsilonRI/k_f1: 1.24934
FCepsilonRI/k_f4: 5.16577
FCepsilonRI/k_f5: 12.6916
FCepsilonRI/k_f6: 50.0849
FCepsilonRI/k_f7: 2.1504
FCepsilonRI/k_r1: 0.00255403
FCepsilonRI/k_r4: 52.9811
FCepsilonRI/k_r6: 0.0138082
Ssq[1.33449777e-23 1.33449777e-23]

143.FCepsilonRI/k_f1: 4.09548
FCepsilonRI/k_f4: 5.16577
FCepsilonRI/k_f5: 12.6916
FCepsilonRI/k_f6: 50.0849
FCepsilonRI/k_f7: 2.1504
FCepsilonRI/k_r1: 0.00255403
FCepsilonRI/k_r4: 52.9811
FCepsilonRI/k_r6: 0.0138082
Ssq[1.26217745e-29 1.26217745e-29]

144.FCepsilonRI/k_f1: 1.24934
FCepsilonRI/k_f4: 30.4539
FCepsilonRI/k_f5: 12.6916
FCepsilonRI/k_f6: 50.0849
FCepsilonRI/k_f7: 2.1504
FCepsilonRI/k_r1: 0.00255403
FCepsilonRI/k_r4: 52.9811
FCepsilonRI/k_r6: 0.0138082
Ssq[2.84778787e-28 2.84778787e-28]

145.FCepsilonRI/k_f1: 1.24934
FCepsilonRI/k_f4: 5.16577
FCepsilonRI/k_f5: 7.07309
FCepsilonRI/k_f6: 50.0849
FCepsilonRI/k_f7: 2.1504
FCepsilonRI/k_r1: 0.00255403
FCepsilonRI/k_r4: 52.9811
FCepsilonRI/k_r6: 0.0138082
Ssq[0.00325315 0.00325315]

146.FCepsilonRI/k_f1: 1.24934
FCepsilonRI/k_f4: 5.16577
FCepsilonRI/k_f5: 12.6916
FCepsilonRI/k_f6: 50.0849
FCepsilonRI/k_f7: 5.84911
FCepsilonRI/k_r1: 0.00255403
FCepsilonRI/k_r4: 52.9811
FCepsilonRI/k_r6: 0.0138082
Ssq[1.81753553e-27 1.81753553e-27]

147.FCepsilonRI/k_f1: 1.24934
FCepsilonRI/k_f4: 5.16577
FCepsilonRI/k_f5: 12.6916
FCepsilonRI/k_f6: 50.0849
FCepsilonRI/k_f7: 2.1504
FCepsilonRI/k_r1: 0.0215282
FCepsilonRI/k_r4: 52.9811
FCepsilonRI/k_r6: 0.0138082
Ssq[5.1757164e-27 5.1757164e-27]

148.FCepsilonRI/k_f1: 1.24934
FCepsilonRI/k_f4: 5.16577
FCepsilonRI/k_f5: 12.6916
FCepsilonRI/k_f6: 50.0849
FCepsilonRI/k_f7: 2.1504
FCepsilonRI/k_r1: 0.00255403
FCepsilonRI/k_r4: 21.5524
FCepsilonRI/k_r6: 0.0138082
Ssq[3.64650953e-26 3.64650953e-26]

149.FCepsilonRI/k_f1: 1.24934
FCepsilonRI/k_f4: 5.16577
FCepsilonRI/k_f5: 12.6916
FCepsilonRI/k_f6: 50.0849
FCepsilonRI/k_f7: 2.1504
FCepsilonRI/k_r1: 0.00255403
FCepsilonRI/k_r4: 52.9811
FCepsilonRI/k_r6: 7.83507
Ssq[5.79432853e-22 5.79432853e-22]

150.FCepsilonRI/k_f1: 4.09548
FCepsilonRI/k_f4: 30.4539
FCepsilonRI/k_f5: 7.07309
FCepsilonRI/k_f6: 50.0849
FCepsilonRI/k_f7: 5.84911
FCepsilonRI/k_r1: 0.0215282
FCepsilonRI/k_r4: 21.5524
FCepsilonRI/k_r6: 7.83507
Ssq[1.77493704e-28 1.77493704e-28]

151.FCepsilonRI/k_f1: 22.2167
FCepsilonRI/k_f4: 46.8967
FCepsilonRI/k_f5: 2.23671
FCepsilonRI/k_f6: 5.59189
FCepsilonRI/k_f7: 24.6655
FCepsilonRI/k_r1: 0.00382832
FCepsilonRI/k_r4: 0.287406
FCepsilonRI/k_r6: 0.104482
Ssq[1.30802478e-23 1.30802478e-23]

152.FCepsilonRI/k_f1: 7.28291
FCepsilonRI/k_f4: 3.35455
FCepsilonRI/k_f5: 2.23671

FCepsilonRI/k_f6: 5.59189
FCepsilonRI/k_f7: 24.6655
FCepsilonRI/k_r1: 0.00382832
FCepsilonRI/k_r4: 0.287406
FCepsilonRI/k_r6: 0.104482
Ssq[6.20810505e-22 6.20810505e-22]

153.FCepsilonRI/k_f1: 7.28291
FCepsilonRI/k_f4: 46.8967
FCepsilonRI/k_f5: 2.23671
FCepsilonRI/k_f6: 5.59189
FCepsilonRI/k_f7: 24.6655
FCepsilonRI/k_r1: 0.0454178
FCepsilonRI/k_r4: 0.287406
FCepsilonRI/k_r6: 0.104482
Ssq[1.06149123e-26 1.06149123e-26]

154.FCepsilonRI/k_f1: 7.28291
FCepsilonRI/k_f4: 46.8967
FCepsilonRI/k_f5: 2.23671
FCepsilonRI/k_f6: 5.59189
FCepsilonRI/k_f7: 24.6655
FCepsilonRI/k_r1: 0.00382832
FCepsilonRI/k_r4: 12.5638
FCepsilonRI/k_r6: 0.104482
Ssq[4.65814476e-24 4.65814476e-24]

155.FCepsilonRI/k_f1: 7.28291
FCepsilonRI/k_f4: 46.8967
FCepsilonRI/k_f5: 2.23671
FCepsilonRI/k_f6: 5.59189
FCepsilonRI/k_f7: 24.6655
FCepsilonRI/k_r1: 0.00382832
FCepsilonRI/k_r4: 0.287406
FCepsilonRI/k_r6: 0.00327444
Ssq[7.27595522e-24 7.27595522e-24]

156.FCepsilonRI/k_f1: 7.28291
FCepsilonRI/k_f4: 46.8967
FCepsilonRI/k_f5: 2.23671
FCepsilonRI/k_f6: 5.59189
FCepsilonRI/k_f7: 24.6655
FCepsilonRI/k_r1: 0.00382832
FCepsilonRI/k_r4: 0.287406
FCepsilonRI/k_r6: 0.104482
Ssq[7.94119439e-22 7.94119439e-22]

157.FCepsilonRI/k_f1: 2.22167
FCepsilonRI/k_f4: 18.864
FCepsilonRI/k_f5: 4.01343
FCepsilonRI/k_f6: 11.877
FCepsilonRI/k_f7: 0.509941
FCepsilonRI/k_r1: 0.00454178
FCepsilonRI/k_r4: 0.0397302
FCepsilonRI/k_r6: 1.03547
Ssq[1.07713044e-09 1.07713044e-09]

158.FCepsilonRI/k_f1: 72.8291
FCepsilonRI/k_f4: 18.864
FCepsilonRI/k_f5: 4.01343
FCepsilonRI/k_f6: 11.877
FCepsilonRI/k_f7: 0.509941
FCepsilonRI/k_r1: 0.00454178
FCepsilonRI/k_r4: 0.0397302
FCepsilonRI/k_r6: 1.03547
Ssq[1.07498391e-09 1.07498391e-09]

159.FCepsilonRI/k_f1: 2.22167
FCepsilonRI/k_f4: 8.33955
FCepsilonRI/k_f5: 4.01343
FCepsilonRI/k_f6: 11.877
FCepsilonRI/k_f7: 0.509941
FCepsilonRI/k_r1: 0.00454178
FCepsilonRI/k_r4: 0.0397302
FCepsilonRI/k_r6: 1.03547
Ssq[1.21324993e-07 1.21324993e-07]

160.FCepsilonRI/k_f1: 2.22167
FCepsilonRI/k_f4: 18.864
FCepsilonRI/k_f5: 4.01343
FCepsilonRI/k_f6: 11.877
FCepsilonRI/k_f7: 0.509941
FCepsilonRI/k_r1: 0.0382832
FCepsilonRI/k_r4: 0.0397302
FCepsilonRI/k_r6: 1.03547
Ssq[1.08099162e-09 1.08099162e-09]

161.FCepsilonRI/k_f1: 29.6265
FCepsilonRI/k_f4: 85.484
FCepsilonRI/k_f5: 7.137
FCepsilonRI/k_f6: 0.645741
FCepsilonRI/k_f7: 4.4159
FCepsilonRI/k_r1: 0.0605657
FCepsilonRI/k_r4: 0.00108798
FCepsilonRI/k_r6: 0.0283555
Ssq[1.32029181e-07 1.32029181e-07]

162.FCepsilonRI/k_f1: 3.07118
FCepsilonRI/k_f4: 15.9365
FCepsilonRI/k_f5: 1.25779
FCepsilonRI/k_f6: 0.645741
FCepsilonRI/k_f7: 2.84833
FCepsilonRI/k_r1: 0.0510514
FCepsilonRI/k_r4: 0.590196
FCepsilonRI/k_r6: 0.0283555
Ssq[0.00020196 0.00020196]

163.FCepsilonRI/k_f1: 93.6871
FCepsilonRI/k_f4: 6.41039
FCepsilonRI/k_f5: 12.5779
FCepsilonRI/k_f6: 5.78372
FCepsilonRI/k_f7: 78.5271
FCepsilonRI/k_r1: 0.0191525
FCepsilonRI/k_r4: 6.11816
FCepsilonRI/k_r6: 0.00159454
Ssq[1.28118111e-25 1.28118111e-25]

164.FCepsilonRI/k_f1: 9.71191
FCepsilonRI/k_f4: 6.72036
FCepsilonRI/k_f5: 12.5779
FCepsilonRI/k_f6: 11.4831
FCepsilonRI/k_f7: 78.5271
FCepsilonRI/k_r1: 0.00161439
FCepsilonRI/k_r4: 10.4953
FCepsilonRI/k_r6: 0.214557
Ssq[3.15544362e-30 3.15544362e-30]

165.FCepsilonRI/k_f1: 52.6841
FCepsilonRI/k_f4: 23.4091
FCepsilonRI/k_f5: 0.397749
FCepsilonRI/k_f6: 24.3897
FCepsilonRI/k_f7: 18.6217
FCepsilonRI/k_r1: 0.0340586
FCepsilonRI/k_r4: 0.081587
FCepsilonRI/k_r6: 2.12636
Ssq[6.45732348e-18 6.45732348e-18]

166.FCepsilonRI/k_f1: 54.6141
FCepsilonRI/k_f4: 58.1959
FCepsilonRI/k_f5: 0.397749
FCepsilonRI/k_f6: 48.4238
FCepsilonRI/k_f7: 12.0113

FCepsilonRI/k_r1: 0.00907837
FCepsilonRI/k_r4: 0.081587
FCepsilonRI/k_r6: 0.0508795
Ssq[7.02982352e-25 7.02982352e-25]

167.FCepsilonRI/k_f1: 1.72705
FCepsilonRI/k_f4: 4.36408
FCepsilonRI/k_f5: 3.97749
FCepsilonRI/k_f6: 1.37154
FCepsilonRI/k_f7: 0.675445
FCepsilonRI/k_r1: 0.00287083
FCepsilonRI/k_r4: 0.00787039
FCepsilonRI/k_r6: 0.00286117
Ssq[0.00013549 0.00013549]

168.FCepsilonRI/k_f1: 4.56226
FCepsilonRI/k_f4: 26.0771
FCepsilonRI/k_f5: 53.0407
FCepsilonRI/k_f6: 0.957099
FCepsilonRI/k_f7: 1.50062
FCepsilonRI/k_r1: 0.0124373
FCepsilonRI/k_r4: 4.26944
FCepsilonRI/k_r6: 1.48384
Ssq[0.00015616 0.00015616]

169.FCepsilonRI/k_f1: 4.56226
FCepsilonRI/k_f4: 26.0771
FCepsilonRI/k_f5: 0.951734
FCepsilonRI/k_f6: 0.957099
FCepsilonRI/k_f7: 1.50062
FCepsilonRI/k_r1: 0.0124373
FCepsilonRI/k_r4: 4.26944
FCepsilonRI/k_r6: 0.00199661
Ssq[0.00295047 0.00295047]

170.FCepsilonRI/k_f1: 8.41017
FCepsilonRI/k_f4: 52.2417
FCepsilonRI/k_f5: 53.0407
FCepsilonRI/k_f6: 0.957099
FCepsilonRI/k_f7: 1.98765
FCepsilonRI/k_r1: 0.0331519
FCepsilonRI/k_r4: 7.32396
FCepsilonRI/k_r6: 0.00199661
Ssq[8.99195234e-11 8.99195234e-11]

171.FCepsilonRI/k_f1: 19.2389
FCepsilonRI/k_f4: 21.0141
FCepsilonRI/k_f5: 16.9245
FCepsilonRI/k_f6: 1.96543
FCepsilonRI/k_f7: 54.7986
FCepsilonRI/k_r1: 0.00165854
FCepsilonRI/k_r4: 0.493027
FCepsilonRI/k_r6: 0.722581
Ssq[2.88159643e-18 2.88159643e-18]

172.FCepsilonRI/k_f1: 3.54654
FCepsilonRI/k_f4: 21.0141
FCepsilonRI/k_f5: 16.9245
FCepsilonRI/k_f6: 1.96543
FCepsilonRI/k_f7: 54.7986
FCepsilonRI/k_r1: 0.00165854
FCepsilonRI/k_r4: 0.493027
FCepsilonRI/k_r6: 0.722581
Ssq[7.42143246e-18 7.42143246e-18]

173.FCepsilonRI/k_f1: 19.2389
FCepsilonRI/k_f4: 11.5284
FCepsilonRI/k_f5: 16.9245
FCepsilonRI/k_f6: 1.96543
FCepsilonRI/k_f7: 54.7986
FCepsilonRI/k_r1: 0.00165854
FCepsilonRI/k_r4: 0.493027
FCepsilonRI/k_r6: 0.722581
Ssq[4.75858649e-19 4.75858649e-19]

174.FCepsilonRI/k_f1: 19.2389
FCepsilonRI/k_f4: 21.0141
FCepsilonRI/k_f5: 2.9827
FCepsilonRI/k_f6: 1.96543
FCepsilonRI/k_f7: 54.7986
FCepsilonRI/k_r1: 0.00165854
FCepsilonRI/k_r4: 0.493027
FCepsilonRI/k_r6: 0.722581
Ssq[8.89186667e-17 8.89186667e-17]

175.FCepsilonRI/k_f1: 19.2389
FCepsilonRI/k_f4: 21.0141
FCepsilonRI/k_f5: 16.9245
FCepsilonRI/k_f6: 33.7916
FCepsilonRI/k_f7: 54.7986
FCepsilonRI/k_r1: 0.00165854
FCepsilonRI/k_r4: 0.493027
FCepsilonRI/k_r6: 0.722581
Ssq[9.54521695e-29 9.54521695e-29]

176.FCepsilonRI/k_f1: 19.2389
FCepsilonRI/k_f4: 21.0141
FCepsilonRI/k_f5: 16.9245
FCepsilonRI/k_f6: 1.96543
FCepsilonRI/k_f7: 54.7986
FCepsilonRI/k_r1: 0.00786154
FCepsilonRI/k_r4: 0.493027
FCepsilonRI/k_r6: 0.722581
Ssq[2.89805296e-16 2.89805296e-16]

177.FCepsilonRI/k_f1: 19.2389
FCepsilonRI/k_f4: 21.0141
FCepsilonRI/k_f5: 16.9245
FCepsilonRI/k_f6: 1.96543
FCepsilonRI/k_f7: 54.7986
FCepsilonRI/k_r1: 0.00165854
FCepsilonRI/k_r4: 15.0399
FCepsilonRI/k_r6: 0.722581
Ssq[2.24398265e-17 2.24398265e-17]

178.FCepsilonRI/k_f1: 19.2389
FCepsilonRI/k_f4: 21.0141
FCepsilonRI/k_f5: 16.9245
FCepsilonRI/k_f6: 1.96543
FCepsilonRI/k_f7: 54.7986
FCepsilonRI/k_r1: 0.00165854
FCepsilonRI/k_r4: 0.493027
FCepsilonRI/k_r6: 5.46755
Ssq[1.15640772e-14 1.15640772e-14]

179.FCepsilonRI/k_f1: 3.54654
FCepsilonRI/k_f4: 11.5284
FCepsilonRI/k_f5: 2.9827
FCepsilonRI/k_f6: 33.7916
FCepsilonRI/k_f7: 54.7986
FCepsilonRI/k_r1: 0.00786154
FCepsilonRI/k_r4: 15.0399
FCepsilonRI/k_r6: 5.46755
Ssq[1.26217745e-29 1.26217745e-29]

180.FCepsilonRI/k_f1: 60.8387
FCepsilonRI/k_f4: 4.86147
FCepsilonRI/k_f5: 29.827
FCepsilonRI/k_f6: 1.90024
FCepsilonRI/k_f7: 17.2123
FCepsilonRI/k_r1: 0.0248604
FCepsilonRI/k_r4: 0.845758
FCepsilonRI/k_r6: 0.307463
Ssq[2.50960344e-20 2.50960344e-20]

181.FCepsilonRI/k_f1: 1.12151
FCepsilonRI/k_f4: 8.86155
FCepsilonRI/k_f5: 29.827
FCepsilonRI/k_f6: 1.90024
FCepsilonRI/k_f7: 17.2123
FCepsilonRI/k_r1: 0.0248604
FCepsilonRI/k_r4: 0.845758
FCepsilonRI/k_r6: 0.307463
Ssq[3.01534572e-17 3.01534572e-17]

182.FCepsilonRI/k_f1: 1.12151
FCepsilonRI/k_f4: 4.86147
FCepsilonRI/k_f5: 29.827
FCepsilonRI/k_f6: 1.90024
FCepsilonRI/k_f7: 3.08155
FCepsilonRI/k_r1: 0.0248604
FCepsilonRI/k_r4: 0.845758
FCepsilonRI/k_r6: 0.307463
Ssq[1.61450554e-15 1.61450554e-15]

183.FCepsilonRI/k_f1: 1.12151
FCepsilonRI/k_f4: 4.86147
FCepsilonRI/k_f5: 29.827
FCepsilonRI/k_f6: 1.90024
FCepsilonRI/k_f7: 17.2123
FCepsilonRI/k_r1: 0.00524477
FCepsilonRI/k_r4: 0.845758
FCepsilonRI/k_r6: 0.307463
Ssq[3.79866906e-15 3.79866906e-15]

184.FCepsilonRI/k_f1: 1.12151
FCepsilonRI/k_f4: 4.86147
FCepsilonRI/k_f5: 29.827
FCepsilonRI/k_f6: 1.90024
FCepsilonRI/k_f7: 17.2123
FCepsilonRI/k_r1: 0.0248604
FCepsilonRI/k_r4: 0.027725
FCepsilonRI/k_r6: 0.307463
Ssq[2.54376432e-19 2.54376432e-19]

185.FCepsilonRI/k_f1: 1.12151
FCepsilonRI/k_f4: 4.86147
FCepsilonRI/k_f5: 29.827
FCepsilonRI/k_f6: 1.90024
FCepsilonRI/k_f7: 17.2123
FCepsilonRI/k_r1: 0.0248604
FCepsilonRI/k_r4: 0.845758
FCepsilonRI/k_r6: 12.8495
Ssq[4.59479476e-12 4.59479476e-12]

186.FCepsilonRI/k_f1: 1.12151
FCepsilonRI/k_f4: 4.86147
FCepsilonRI/k_f5: 29.827
FCepsilonRI/k_f6: 1.90024
FCepsilonRI/k_f7: 17.2123
FCepsilonRI/k_r1: 0.0248604
FCepsilonRI/k_r4: 0.845758
FCepsilonRI/k_r6: 0.307463
Ssq[2.71878141e-19 2.71878141e-19]

187.FCepsilonRI/k_f1: 3.42121
FCepsilonRI/k_f4: 13.6461
FCepsilonRI/k_f5: 53.5199
FCepsilonRI/k_f6: 8.28814
FCepsilonRI/k_f7: 72.5838
FCepsilonRI/k_r1: 0.0294935
FCepsilonRI/k_r4: 0.116915
FCepsilonRI/k_r6: 54.186
Ssq[4.81868672e-20 4.81868672e-20]

188.FCepsilonRI/k_f1: 1.99437
FCepsilonRI/k_f4: 17.7528
FCepsilonRI/k_f5: 94.3212
FCepsilonRI/k_f6: 8.28814
FCepsilonRI/k_f7: 72.5838
FCepsilonRI/k_r1: 0.00442087
FCepsilonRI/k_r4: 0.0112784
FCepsilonRI/k_r6: 23.0565
Ssq[5.56447085e-22 5.56447085e-22]

189.FCepsilonRI/k_f1: 10.8188
FCepsilonRI/k_f4: 5.75453
FCepsilonRI/k_f5: 5.35199
FCepsilonRI/k_f6: 0.466076
FCepsilonRI/k_f7: 12.9948
FCepsilonRI/k_r1: 0.00932667
FCepsilonRI/k_r4: 0.00657463
FCepsilonRI/k_r6: 0.00963578
Ssq[9.70114578e-05 9.70114578e-05]

190.FCepsilonRI/k_f1: 63.0674
FCepsilonRI/k_f4: 5.75453
FCepsilonRI/k_f5: 5.35199
FCepsilonRI/k_f6: 0.466076
FCepsilonRI/k_f7: 12.9948
FCepsilonRI/k_r1: 0.00932667
FCepsilonRI/k_r4: 0.00657463
FCepsilonRI/k_r6: 0.00963578
Ssq[9.69710319e-05 9.69710319e-05]

191.FCepsilonRI/k_f1: 10.8188
FCepsilonRI/k_f4: 42.0986
FCepsilonRI/k_f5: 5.35199
FCepsilonRI/k_f6: 0.466076
FCepsilonRI/k_f7: 12.9948
FCepsilonRI/k_r1: 0.00932667
FCepsilonRI/k_r4: 0.00657463
FCepsilonRI/k_r6: 0.00963578
Ssq[1.83982672e-05 1.83982672e-05]

192.FCepsilonRI/k_f1: 10.8188
FCepsilonRI/k_f4: 5.75453
FCepsilonRI/k_f5: 5.35199
FCepsilonRI/k_f6: 8.01325
FCepsilonRI/k_f7: 12.9948
FCepsilonRI/k_r1: 0.00932667
FCepsilonRI/k_r4: 0.00657463
FCepsilonRI/k_r6: 0.00963578
Ssq[4.16935865e-25 4.16935865e-25]

193.FCepsilonRI/k_f1: 10.8188
FCepsilonRI/k_f4: 5.75453
FCepsilonRI/k_f5: 5.35199
FCepsilonRI/k_f6: 0.466076
FCepsilonRI/k_f7: 4.08169
FCepsilonRI/k_r1: 0.00932667
FCepsilonRI/k_r4: 0.00657463
FCepsilonRI/k_r6: 0.00963578
Ssq[0.00022661 0.00022661]

194.FCepsilonRI/k_f1: 10.8188
FCepsilonRI/k_f4: 5.75453
FCepsilonRI/k_f5: 5.35199
FCepsilonRI/k_f6: 0.466076
FCepsilonRI/k_f7: 12.9948
FCepsilonRI/k_r1: 0.001398
FCepsilonRI/k_r4: 0.00657463
FCepsilonRI/k_r6: 0.00963578
Ssq[9.70043196e-05 9.70043196e-05]

195.FCepsilonRI/k_f1: 10.8188
FCepsilonRI/k_f4: 5.75453
FCepsilonRI/k_f5: 5.35199

FCepsilonRI/k_f6: 0.466076
FCepsilonRI/k_f7: 12.9948
FCepsilonRI/k_r1: 0.00932667
FCepsilonRI/k_r4: 0.00657463
FCepsilonRI/k_r6: 1.29656
Ssq[0.00029399 0.00029399]

196.FCepsilonRI/k_f1: 63.0674
FCepsilonRI/k_f4: 42.0986
FCepsilonRI/k_f5: 5.35199
FCepsilonRI/k_f6: 8.01325
FCepsilonRI/k_f7: 4.08169
FCepsilonRI/k_r1: 0.001398
FCepsilonRI/k_r4: 63.4229
FCepsilonRI/k_r6: 1.29656
Ssq[3.55111137e-20 3.55111137e-20]

197.FCepsilonRI/k_f1: 1.12151
FCepsilonRI/k_f4: 3.4463
FCepsilonRI/k_f5: 3.23419
FCepsilonRI/k_f6: 2.1504
FCepsilonRI/k_f7: 18.8323
FCepsilonRI/k_r1: 0.0213354
FCepsilonRI/k_r4: 0.925355
FCepsilonRI/k_r6: 1.3562
Ssq[5.26062148e-17 5.26062148e-17]

198.FCepsilonRI/k_f1: 1.24934
FCepsilonRI/k_f4: 36.7853
FCepsilonRI/k_f5: 3.23419
FCepsilonRI/k_f6: 12.5638
FCepsilonRI/k_f7: 18.8323
FCepsilonRI/k_r1: 0.0426464
FCepsilonRI/k_r4: 48.4238
FCepsilonRI/k_r6: 0.055668
Ssq[1.1359597e-28 1.1359597e-28]

199.FCepsilonRI/k_f1: 35.4654
FCepsilonRI/k_f4: 8.17247
FCepsilonRI/k_f5: 32.3419
FCepsilonRI/k_f6: 38.2401
FCepsilonRI/k_f7: 34.9508
FCepsilonRI/k_r1: 0.00674686
FCepsilonRI/k_r4: 16.4554
FCepsilonRI/k_r6: 0.0762648
Ssq[1.97215226e-29 1.97215226e-29]

200.FCepsilonRI/k_f1: 39.5075
FCepsilonRI/k_f4: 8.17247
FCepsilonRI/k_f5: 32.3419
FCepsilonRI/k_f6: 38.2401
FCepsilonRI/k_f7: 34.9508
FCepsilonRI/k_r1: 0.00674686
FCepsilonRI/k_r4: 16.4554
FCepsilonRI/k_r6: 0.0762648
Ssq[7.88860905e-31 7.88860905e-31]

201.FCepsilonRI/k_f1: 35.4654
FCepsilonRI/k_f4: 15.5122
FCepsilonRI/k_f5: 32.3419
FCepsilonRI/k_f6: 38.2401
FCepsilonRI/k_f7: 34.9508
FCepsilonRI/k_r1: 0.00674686
FCepsilonRI/k_r4: 16.4554
FCepsilonRI/k_r6: 0.0762648
Ssq[2.55590933e-28 2.55590933e-28]

202.FCepsilonRI/k_f1: 35.4654
FCepsilonRI/k_f4: 8.17247
FCepsilonRI/k_f5: 32.0523
FCepsilonRI/k_f6: 38.2401
FCepsilonRI/k_f7: 34.9508
FCepsilonRI/k_r1: 0.00674686
FCepsilonRI/k_r4: 16.4554
FCepsilonRI/k_r6: 0.0762648
Ssq[3.86541844e-29 3.86541844e-29]

203.FCepsilonRI/k_f1: 35.4654
FCepsilonRI/k_f4: 8.17247
FCepsilonRI/k_f5: 32.3419
FCepsilonRI/k_f6: 38.2401
FCepsilonRI/k_f7: 1.05902
FCepsilonRI/k_r1: 0.00674686
FCepsilonRI/k_r4: 16.4554
FCepsilonRI/k_r6: 0.0762648
Ssq[1.77493704e-28 1.77493704e-28]

204.FCepsilonRI/k_f1: 35.4654
FCepsilonRI/k_f4: 8.17247
FCepsilonRI/k_f5: 32.3419
FCepsilonRI/k_f6: 38.2401
FCepsilonRI/k_f7: 34.9508
FCepsilonRI/k_r1: 0.013486
FCepsilonRI/k_r4: 16.4554
FCepsilonRI/k_r6: 0.0762648
Ssq[3.15544362e-30 3.15544362e-30]

205.FCepsilonRI/k_f1: 35.4654
FCepsilonRI/k_f4: 8.17247
FCepsilonRI/k_f5: 32.3419
FCepsilonRI/k_f6: 38.2401
FCepsilonRI/k_f7: 34.9508
FCepsilonRI/k_r1: 0.00674686
FCepsilonRI/k_r4: 0.0086111
FCepsilonRI/k_r6: 0.0762648
Ssq[7.88860905e-29 7.88860905e-29]

206.FCepsilonRI/k_f1: 35.4654
FCepsilonRI/k_f4: 8.17247
FCepsilonRI/k_f5: 32.3419
FCepsilonRI/k_f6: 38.2401
FCepsilonRI/k_f7: 34.9508
FCepsilonRI/k_r1: 0.00674686
FCepsilonRI/k_r4: 16.4554
FCepsilonRI/k_r6: 0.00313044
Ssq[2.55590933e-28 2.55590933e-28]

207.FCepsilonRI/k_f1: 39.5075
FCepsilonRI/k_f4: 15.5122
FCepsilonRI/k_f5: 32.0523
FCepsilonRI/k_f6: 38.2401
FCepsilonRI/k_f7: 1.05902
FCepsilonRI/k_r1: 0.013486
FCepsilonRI/k_r4: 0.0086111
FCepsilonRI/k_r6: 0.00313044
Ssq[6.38977333e-29 6.38977333e-29]

208.FCepsilonRI/k_f1: 6.30674
FCepsilonRI/k_f4: 4.2479
FCepsilonRI/k_f5: 10.1358
FCepsilonRI/k_f6: 2.97935
FCepsilonRI/k_f7: 4.46583
FCepsilonRI/k_r1: 0.00758373
FCepsilonRI/k_r4: 0.645741
FCepsilonRI/k_r6: 4.17451
Ssq[2.9945846e-15 2.9945846e-15]

209.FCepsilonRI/k_f1: 70.2554
FCepsilonRI/k_f4: 12.585
FCepsilonRI/k_f5: 10.1358
FCepsilonRI/k_f6: 2.97935
FCepsilonRI/k_f7: 4.46583
FCepsilonRI/k_r1: 0.00758373

FCepsilonRI/k_r4: 0.645741
FCepsilonRI/k_r6: 4.17451
Ssq[2.53686513e-13 2.53686513e-13]

210.FCepsilonRI/k_f1: 70.2554
FCepsilonRI/k_f4: 4.2479
FCepsilonRI/k_f5: 10.1358
FCepsilonRI/k_f6: 2.97935
FCepsilonRI/k_f7: 4.46583
FCepsilonRI/k_r1: 0.0119978
FCepsilonRI/k_r4: 0.645741
FCepsilonRI/k_r6: 4.17451
Ssq[3.55906457e-14 3.55906457e-14]

211.FCepsilonRI/k_f1: 70.2554
FCepsilonRI/k_f4: 4.2479
FCepsilonRI/k_f5: 10.1358
FCepsilonRI/k_f6: 2.97935
FCepsilonRI/k_f7: 4.46583
FCepsilonRI/k_r1: 0.00758373
FCepsilonRI/k_r4: 0.645741
FCepsilonRI/k_r6: 0.0180852
Ssq[3.02964301e-21 3.02964301e-21]

212.FCepsilonRI/k_f1: 70.2554
FCepsilonRI/k_f4: 4.2479
FCepsilonRI/k_f5: 10.1358
FCepsilonRI/k_f6: 2.97935
FCepsilonRI/k_f7: 4.46583
FCepsilonRI/k_r1: 0.00758373
FCepsilonRI/k_r4: 0.645741
FCepsilonRI/k_r6: 4.17451
Ssq[1.89072327e-15 1.89072327e-15]

213.FCepsilonRI/k_f1: 63.0674
FCepsilonRI/k_f4: 70.7707
FCepsilonRI/k_f5: 1.02274
FCepsilonRI/k_f6: 9.06817
FCepsilonRI/k_f7: 8.28814
FCepsilonRI/k_r1: 0.00119978
FCepsilonRI/k_r4: 0.219436
FCepsilonRI/k_r6: 5.71905
Ssq[2.1825888e-25 2.1825888e-25]

214.FCepsilonRI/k_f1: 7.02554
FCepsilonRI/k_f4: 70.7707
FCepsilonRI/k_f5: 1.02274
FCepsilonRI/k_f6: 9.06817
FCepsilonRI/k_f7: 8.28814
FCepsilonRI/k_r1: 0.00119978
FCepsilonRI/k_r4: 0.219436
FCepsilonRI/k_r6: 5.71905
Ssq[1.01290234e-20 1.01290234e-20]

215.FCepsilonRI/k_f1: 63.0674
FCepsilonRI/k_f4: 23.8877
FCepsilonRI/k_f5: 1.02274
FCepsilonRI/k_f6: 9.06817
FCepsilonRI/k_f7: 8.28814
FCepsilonRI/k_r1: 0.00119978
FCepsilonRI/k_r4: 0.219436
FCepsilonRI/k_r6: 5.71905
Ssq[6.41393527e-23 6.41393527e-23]

216.FCepsilonRI/k_f1: 63.0674
FCepsilonRI/k_f4: 70.7707
FCepsilonRI/k_f5: 1.02274
FCepsilonRI/k_f6: 9.06817
FCepsilonRI/k_f7: 8.28814
FCepsilonRI/k_r1: 0.0758373
FCepsilonRI/k_r4: 0.219436
FCepsilonRI/k_r6: 5.71905
Ssq[2.10853842e-21 2.10853842e-21]

217.FCepsilonRI/k_f1: 63.0674
FCepsilonRI/k_f4: 70.7707
FCepsilonRI/k_f5: 1.02274
FCepsilonRI/k_f6: 9.06817
FCepsilonRI/k_f7: 8.28814
FCepsilonRI/k_r1: 0.00119978
FCepsilonRI/k_r4: 0.00204201
FCepsilonRI/k_r6: 5.71905
Ssq[3.33710223e-19 3.33710223e-19]

218.FCepsilonRI/k_f1: 63.0674
FCepsilonRI/k_f4: 70.7707
FCepsilonRI/k_f5: 1.02274
FCepsilonRI/k_f6: 9.06817
FCepsilonRI/k_f7: 8.28814
FCepsilonRI/k_r1: 0.00119978
FCepsilonRI/k_r4: 0.219436
FCepsilonRI/k_r6: 0.013201
Ssq[1.1359597e-28 1.1359597e-28]

219.FCepsilonRI/k_f1: 93.6871
FCepsilonRI/k_f4: 70.2949
FCepsilonRI/k_f5: 1.80243
FCepsilonRI/k_f6: 6.11816
FCepsilonRI/k_f7: 4.03605
FCepsilonRI/k_r1: 0.00179839
FCepsilonRI/k_r4: 0.0176831
FCepsilonRI/k_r6: 2.03285
Ssq[1.37174234e-25 1.37174234e-25]

220.FCepsilonRI/k_f1: 8.41017
FCepsilonRI/k_f4: 24.0494
FCepsilonRI/k_f5: 1.81872
FCepsilonRI/k_f6: 0.34405
FCepsilonRI/k_f7: 71.7723
FCepsilonRI/k_r1: 0.0284513
FCepsilonRI/k_r4: 0.00600909
FCepsilonRI/k_r6: 0.00208845
Ssq[0.00310188 0.00310188]

221.FCepsilonRI/k_f1: 8.41017
FCepsilonRI/k_f4: 29.6431
FCepsilonRI/k_f5: 18.0243
FCepsilonRI/k_f6: 0.34405
FCepsilonRI/k_f7: 38.6725
FCepsilonRI/k_r1: 0.0568699
FCepsilonRI/k_r4: 0.314455
FCepsilonRI/k_r6: 0.114316
Ssq[0.00044038 0.00044038]

222.FCepsilonRI/k_f1: 29.6265
FCepsilonRI/k_f4: 24.0494
FCepsilonRI/k_f5: 18.0243
FCepsilonRI/k_f6: 0.34405
FCepsilonRI/k_f7: 38.6725
FCepsilonRI/k_r1: 0.0568699
FCepsilonRI/k_r4: 0.314455
FCepsilonRI/k_r6: 0.114316
Ssq[0.00047591 0.00047591]

223.FCepsilonRI/k_f1: 29.6265
FCepsilonRI/k_f4: 29.6431
FCepsilonRI/k_f5: 1.81872
FCepsilonRI/k_f6: 0.34405
FCepsilonRI/k_f7: 38.6725
FCepsilonRI/k_r1: 0.0568699
FCepsilonRI/k_r4: 0.314455
FCepsilonRI/k_r6: 0.114316
Ssq[0.00329041 0.00329041]

224.FCepsilonRI/k_f1: 29.6265

FCepsilonRI/k_f4: 29.6431
FCepsilonRI/k_f5: 18.0243
FCepsilonRI/k_f6: 0.34405
FCepsilonRI/k_f7: 71.7723
FCepsilonRI/k_r1: 0.0568699
FCepsilonRI/k_r4: 0.314455
FCepsilonRI/k_r6: 0.114316
Ssq[0.00041535 0.00041535]

225.FCepsilonRI/k_f1: 29.6265
FCepsilonRI/k_f4: 29.6431
FCepsilonRI/k_f5: 18.0243
FCepsilonRI/k_f6: 0.34405
FCepsilonRI/k_f7: 38.6725
FCepsilonRI/k_r1: 0.0284513
FCepsilonRI/k_r4: 0.314455
FCepsilonRI/k_r6: 0.114316
Ssq[0.00044001 0.00044001]

226.FCepsilonRI/k_f1: 29.6265
FCepsilonRI/k_f4: 29.6431
FCepsilonRI/k_f5: 18.0243
FCepsilonRI/k_f6: 0.34405
FCepsilonRI/k_f7: 38.6725
FCepsilonRI/k_r1: 0.0568699
FCepsilonRI/k_r4: 0.00600909
FCepsilonRI/k_r6: 0.114316
Ssq[0.00043743 0.00043743]

227.FCepsilonRI/k_f1: 29.6265
FCepsilonRI/k_f4: 29.6431
FCepsilonRI/k_f5: 18.0243
FCepsilonRI/k_f6: 0.34405
FCepsilonRI/k_f7: 38.6725
FCepsilonRI/k_r1: 0.0568699
FCepsilonRI/k_r4: 0.314455
FCepsilonRI/k_r6: 0.00208845
Ssq[0.00042624 0.00042624]

228.FCepsilonRI/k_f1: 29.6265
FCepsilonRI/k_f4: 29.6431
FCepsilonRI/k_f5: 18.0243
FCepsilonRI/k_f6: 0.34405
FCepsilonRI/k_f7: 38.6725
FCepsilonRI/k_r1: 0.0568699
FCepsilonRI/k_r4: 0.314455
FCepsilonRI/k_r6: 0.114316
Ssq[0.00044002 0.00044002]