

SBML Model Report

Model name: “Sasagawa2005_MAPK”



May 5, 2016

1 General Overview

This is a document in SBML Level 2 Version 1 format. This model was created by the following two authors: Lu Li¹ and Shinya Kuroda² at December 21st 2005 at 10:59 a. m. and last time modified at April fourth 2014 at 1:27 p. m. Table 1 gives an overview of the quantities of all components of this model.

Table 1: Number of components in this model, which are described in the following sections.

Element	Quantity	Element	Quantity
compartment types	0	compartments	2
species types	0	species	99
events	0	constraints	0
reactions	150	function definitions	0
global parameters	0	unit definitions	1
rules	0	initial assignments	0

Model Notes

This a model from the article:

Prediction and validation of the distinct dynamics of transient and sustained ERK activation.

Sasagawa S, Ozaki Y, Fujita K, Kuroda S Nat. Cell Biol.[2005 Apr; Volume: 7 (Issue: 4)]: 365-73 [15793571](#),

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Abstract:

To elucidate the hidden dynamics of extracellular-signal-regulated kinase (ERK) signalling networks, we developed a simulation model of ERK signalling networks by constraining in silico dynamics based on in vivo dynamics in PC12 cells. We predicted and validated that transient ERK activation depends on rapid increases of epidermal growth factor and nerve growth factor (NGF) but not on their final concentrations, whereas sustained ERK activation depends on the final concentration of NGF but not on the temporal rate of increase. These ERK dynamics depend on Ras and Rap1 dynamics, the inactivation processes of which are growth-factor-dependent and -independent, respectively. Therefore, the Ras and Rap1 systems capture the temporal rate and concentration of growth factors, and encode these distinct physical properties into transient and sustained ERK activation, respectively.

Dynamics of active Ras, active Rap1 and phosphorylated ERK were correctly reproduced with CellDesigner 3.0

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To cite BioModels Database, please use: [Li C, Donizelli M, Rodriguez N, Dharuri H, Endler L, Chelliah V, Li L, He E, Henry A, Stefan MI, Snoep JL, Hucka M, Le Novre N, Laibe C \(2010\) BioModels Database: An enhanced, curated and annotated resource for published quantitative kinetic models. BMC Syst Biol., 4:92.](#)

2 Unit Definitions

This is an overview of five unit definitions of which four are predefined by SBML and not mentioned in the model.

2.1 Unit `substance`

Name microMole

Definition μmol

2.2 Unit `volume`

Notes Litre is the predefined SBML unit for volume.

Definition 1

2.3 Unit `area`

Notes Square metre is the predefined SBML unit for area since SBML Level 2 Version 1.

Definition m^2

2.4 Unit `length`

Notes Metre is the predefined SBML unit for `length` since SBML Level 2 Version 1.

Definition `m`

2.5 Unit `time`

Notes Second is the predefined SBML unit for `time`.

Definition `s`

3 Compartments

This model contains two compartments.

Table 2: Properties of all compartments.

Id	Name	SBO	Spatial Dimensions	Size	Unit	Constant	Outside
<code>compartment</code>			3	1	litre	<input checked="" type="checkbox"/>	
<code>c1</code>			3	1	litre	<input checked="" type="checkbox"/>	<code>compartment</code>

3.1 Compartment `compartment`

This is a three dimensional compartment with a constant size of one litre.

3.2 Compartment `c1`

This is a three dimensional compartment with a constant size of one litre, which is surrounded by `compartment`.

4 Species

This model contains 99 species. The boundary condition of five of these species is set to true so that these species' amount cannot be changed by any reaction. Section 6 provides further details and the derived rates of change of each species.

Table 3: Properties of each species.

Id	Name	Compartment	Derived Unit	Constant	Boundary Condi- tion
EGFR		compartment	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
L_EGFR		compartment	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
L_EGFR_dimer		compartment	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
SOS		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
L_dpEGFR		compartment	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
pSOS		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
SOS_Grb2		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Grb2		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Dok		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
pDok		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Crk		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
FRS2		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Shc		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
pSOS_Grb2		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Rap1_GDP		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
MEK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
MKP3		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
pShc_dpEGFR		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
dpEGFR_c_Cbl		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
B_Raf_Rap1_GTP		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
pShc_dpEGFR_c_Cbl		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>

Id	Name	Compartment	Derived Unit	Constant	Boundary Condi- tion
pFRS2_dpEGFR_c_Cbl		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Shc_dpEGFR		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
c_Cbl		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
RasGAP		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
c_Raf		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
B_Raf		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
ERK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
PP2A		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Ras_GDP		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Rap1GAP		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
C3G		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
NGFR		compartment	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
pShc		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
pFRS2_dpEGFR		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
pTrkA_endo		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
MEK_ERK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
pMEK_ERK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
FRS2_dpEGFR_c_Cbl- _ubiq		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Crk_C3G_pFRS2- _dpEGFR_c_Cbl		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
pShc_dpEGFR_c_Cbl- _ubiq		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Crk_C3G_pFRS2- _dpEGFR		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Grb2_SOS_pShc- _dpEGFR_c_Cbl_ubiq		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
Grb2_SOS_pShc-_dpEGFR_c_Cbl	proteasome	c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
Shc_dpEGFR_c_Cbl-_ubiq		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
dpEGFR_c_Cbl_ubiq		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
proteosome		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
Grb2_SOS_pShc		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
Shc_dpEGFR_c_Cbl		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
Grb2_SOS_pShc-_dpEGFR		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
pFRS2		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
FRS2_dpEGFR		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
pDok_RasGAP		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
pMEK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
FRS2_dpEGFR_c_Cbl		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
pFRS2_dpEGFR_c-_Cbl_ubiq		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
Ras_GTP		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
Crk_C3G_pFRS2-_dpEGFR_c_Cbl_ubiq		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
c_Raf_Ras_GTP		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
B_Raf_Ras_GTP		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
ppMEK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
ppERK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
pTrkA		compartment	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
Crk_C3G		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus
Rap1_GTP		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	\boxplus	\boxplus

Id	Name	Compartment	Derived Unit	Constant	Boundary Condi- tion
L_NGFR		compartment	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
ppMEK_ERK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
dppERK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Shc_pTrkA		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Shc_pTrkA_endo		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
pShc_pTrkA		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
pFRS2_pTrkA		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
FRS2_pTrkA		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
pShc_pTrkA_endo		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
FRS2_pTrkA_endo		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
pFRS2_pTrkA_endo		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Crk_C3G_pFRS2- _pTrkA_endo		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Grb2_SOS_pShc- _pTrkA		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Crk_C3G_pFRS2- _pTrkA		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Grb2_SOS_pShc- _pTrkA_endo		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
c_Raf_Ras_GTP_MEK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
c_Raf_Ras_GTP_pMEK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
c_Raf_Ras_GTP_MEK- _ERK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
c_Raf_Ras_GTP- _pMEK_ERK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
B_Raf_Ras_GTP_MEK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
B_Raf_Ras_GTP_pMEK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
B_Raf_Ras_GTP_MEK- _ERK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
B_Raf_Ras_GTP- _pMEK_ERK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
B_Raf_Rap1_GTP_MEK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
B_Raf_Rap1_GTP- _pMEK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
B_Raf_Rap1_GTP- _MEK_ERK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
B_Raf_Rap1_GTP- _pMEK_ERK		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
ppERK_MKP3		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
dppERK_MKP3		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
pro_TrkA		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input checked="" type="checkbox"/>
NGF		compartment	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input checked="" type="checkbox"/>
EGF		compartment	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input checked="" type="checkbox"/>
pro_EGFR		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input checked="" type="checkbox"/>
degradation		c1	$\mu\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input checked="" type="checkbox"/>

5 Reactions

This model contains 150 reactions. All reactions are listed in the following table and are subsequently described in detail. If a reaction is affected by a modifier, the identifier of this species is written above the reaction arrow.

Table 4: Overview of all reactions

Nº	Id	Name	Reaction Equation	SBO
1	re1	form_EGFreceptor	$\text{pro_EGFR} \rightleftharpoons \text{EGFR}$	
2	re2	EGFbinding	$\text{EGF} + \text{EGFR} \rightleftharpoons \text{L_EGFR}$	
3	re8	dimerization	$2 \text{L_EGFR} \rightleftharpoons \text{L_EGFR_dimer}$	
4	J3	binding_SOS_Grb2	$\text{SOS} + \text{Grb2} \rightleftharpoons \text{SOS_Grb2}$	
5	J4	binding_pSOS_Grb2	$\text{Grb2} + \text{pSOS} \rightleftharpoons \text{pSOS_Grb2}$	
6	J5	EGFRphosphorylation	$\text{L_EGFR_dimer} \rightleftharpoons \text{L_dpEGFR}$	
7	J6	binding_cCbl_dpEGFR	$\text{L_dpEGFR} + \text{c_Cbl} \rightleftharpoons \text{dpEGFR_c_Cbl}$	
8	J7	binding_pShc_LdpEGFR	$\text{L_dpEGFR} + \text{pShc} \rightleftharpoons \text{pShc_dpEGFR}$	
9	J8	pDOKdephosphorylation	$\text{pDok} \rightleftharpoons \text{Dok}$	
10	J9	binding_cCbl_pShc_dpEGFR	$\text{c_Cbl} + \text{pShc_dpEGFR} \rightleftharpoons \text{pShc_dpEGFR_c_Cbl}$	
11	J10	SOSdephosphorylation	$\text{pSOS} \longrightarrow \text{SOS}$	
12	J11	pSOS_Grb2_dephosphorylation	$\text{pSOS_Grb2} \longrightarrow \text{SOS_Grb2}$	
13	J12	binding_Shc_LdpEGFR	$\text{L_dpEGFR} + \text{Shc} \rightleftharpoons \text{Shc_dpEGFR}$	
14	J13	Shc_dpEGFR_phosphorylation	$\text{Shc_dpEGFR} \longrightarrow \text{pShc_dpEGFR}$	
15	J14	dpEGFR_c_Cbl_ubiquitination	$\text{dpEGFR_c_Cbl} \longrightarrow \text{dpEGFR_c_Cbl_ubiq}$	
16	J15	dpEGFR_cCbl_degrad	$\text{dpEGFR_c_Cbl_ubiq} \longrightarrow \text{proteosome} + \text{c_Cbl}$	
17	J16	binding_cCbl_Shc_dpEGFR	$\text{c_Cbl} + \text{Shc_dpEGFR} \rightleftharpoons \text{Shc_dpEGFR_c_Cbl}$	
18	J17	Shc_dpEGFR_c_Cbl_Ubiquitination	$\text{Shc_dpEGFR_c_Cbl} \longrightarrow \text{Shc_dpEGFR_c_Cbl_ubiq}$	
19	J18	Shc_dpEGFR_c_Cbl_ubiq_Degradation	$\text{Shc_dpEGFR_c_Cbl_ubiq} \longrightarrow \text{proteosome} + \text{c_Cbl} + \text{Shc}$	
20	J19	pShc_dpEGFR_c_Cbl_ubiquitination	$\text{pShc_dpEGFR_c_Cbl} \longrightarrow \text{pShc_dpEGFR_c_Cbl_ubiq}$	
21	J20	pShc_dpEGFR_c_Cbl_ubiq_degradation	$\text{pShc_dpEGFR_c_Cbl_ubiq} \longrightarrow \text{proteosome} + \text{c_Cbl} + \text{pShc}$	

Nº	Id	Name	Reaction Equation	SBO
22	J21	Shc_dpEGFR_c_Cblphosphorylation	$\text{Shc_dpEGFR_c_Cbl} \longrightarrow \text{pShc_dpEGFR_c_Cbl}$	
23	J22	binding_Grb2_SOS_pShc	$\text{pShc} + \text{SOS_Grb2} \rightleftharpoons \text{Grb2_SOS_pShc}$	
24	J23	binding_Grb2_SOS_pShc_dpEGFR	$\text{L_dpEGFR} + \text{Grb2_SOS_pShc} \rightleftharpoons \text{Grb2_SOS_pShc_dpEGFR}$	
25	J24	binding_Grb2_SOS_pShc_dpEGFR	$\text{pShc_dpEGFR} + \text{SOS_Grb2} \rightleftharpoons \text{Grb2_SOS_pShc_dpEGFR}$	
26	J25	binding_c_Cbl_Grb2_SOS_pShc_dpEGFR	$\text{c_Cbl} + \text{Grb2_SOS_pShc_dpEGFR} \rightleftharpoons \text{Grb2_SOS_pShc_dpEGFR_c_Cbl}$	
27	J27	binding_Grb2_SOS_pShc_to_dpEGFR_c_Cbl	$\text{dpEGFR_c_Cbl} + \text{Grb2_SOS_pShc} \rightleftharpoons \text{Grb2_SOS_pShc_dpEGFR_c_Cbl}$	
28	J28	Grb2_SOS_pShc_dpEGFR_c_Cbl- _ubiquitination	$\text{Grb2_SOS_pShc_dpEGFR_c_Cbl} \longrightarrow \text{Grb2_SOS_pShc_dpEGFR_c_Cbl_ubiq}$	
29	J29	Grb2_SOS_pShc_dpEGFR_c_Cbl_ubiq- _degradation	$\text{Grb2_SOS_pShc_dpEGFR_c_Cbl_ubiq} \longrightarrow \text{proteosome} + \text{c_Cbl} + \text{Grb2_SOS_pShc}$	
30	J30	Grb2_SOS_pShc_Dissociation	$\text{Grb2_SOS_pShc} \longrightarrow \text{Shc} + \text{SOS_Grb2}$	
31	J31		$\text{L_dpEGFR, Shc_dpEGFR, pShc_dpEGFR, Grb2_SOS_pShc_dpEGFR_c_Cbl, Grb2_SOS_pShc_dpEGFR_c_Cbl_ubiq} \xrightarrow{\text{Dok}}$	
32	J32	pShc_dephosphorylation	$\text{pShc} \longrightarrow \text{Shc}$	
33	J33	pFRS2_dephosphorylation	$\text{pFRS2} \longrightarrow \text{FRS2}$	
34	J34	binding_Crk_to_C3G	$\text{Crk} + \text{C3G} \rightleftharpoons \text{Crk_C3G}$	
35	J35	binding_L_dpEGFR_to_FRS2	$\text{L_dpEGFR} + \text{FRS2} \rightleftharpoons \text{FRS2_dpEGFR}$	
36	J36	binding_pFRS2_to_L_dpEGFR	$\text{L_dpEGFR} + \text{pFRS2} \rightleftharpoons \text{pFRS2_dpEGFR}$	
37	J37	FRS2_dpEGFRphosphorylation	$\text{FRS2_dpEGFR} \longrightarrow \text{pFRS2_dpEGFR}$	
38	J38	binding_Crk_C3G_to_pFRS2_pRTK	$\text{pFRS2_dpEGFR} + \text{Crk_C3G} \rightleftharpoons \text{Crk_C3G_pFRS2_dpEGFR}$	
39	J39	binding_c_Cbl_to_FRS2_dpEGFR	$\text{FRS2_dpEGFR} + \text{c_Cbl} \rightleftharpoons \text{FRS2_dpEGFR_c_Cbl}$	
40	J40	binding_c_Cbl_to_pFRS2_dpEGFR	$\text{c_Cbl} + \text{pFRS2_dpEGFR} \rightleftharpoons \text{pFRS2_dpEGFR_c_Cbl}$	
41	J41	pFRS2_dpEGFR_c_Cbl_ubiquitiation	$\text{pFRS2_dpEGFR_c_Cbl} \longrightarrow \text{pFRS2_dpEGFR_c_Cbl_ubiq}$	
42	J42	FRS2_dpEGFR_c_Cbl_ubiquitination	$\text{FRS2_dpEGFR_c_Cbl} \longrightarrow \text{FRS2_dpEGFR_c_Cbl_ubiq}$	
43	J43	FRS2_dpEGFR_c_Cbl_phosphorylation	$\text{FRS2_dpEGFR_c_Cbl} \longrightarrow \text{pFRS2_dpEGFR_c_Cbl}$	
44	J44	binding_Crk_C3G_to_pFRS2_pFRS2- _dpEGFR_c_Cbl	$\text{pFRS2_dpEGFR_c_Cbl} + \text{Crk_C3G} \rightleftharpoons \text{Crk_C3G_pFRS2_dpEGFR_c_Cbl}$	
45	J45	Crk_C3G_pFRS2_dpEGFR_c_Cbl- _ubiquitination	$\text{Crk_C3G_pFRS2_dpEGFR_c_Cbl} \longrightarrow \text{Crk_C3G_pFRS2_dpEGFR_c_Cbl_ubiq}$	

Nº	Id	Name	Reaction Equation	SBO
69	J76	binding_pShc_to_pTrkA	$\text{pShc} + \text{pTrkA} \rightleftharpoons \text{pShc_pTrkA}$	
70	J77	binding_FRS2_to_pTrkA	$\text{FRS2} + \text{pTrkA} \rightleftharpoons \text{FRS2_pTrkA}$	
71	J78	binding_pFRS2_to_pTrkA	$\text{pFRS2} + \text{pTrkA} \rightleftharpoons \text{pFRS2_pTrkA}$	
72	J79	binding_Shc_to_pTrkA_endo	$\text{pTrkA_endo} + \text{Shc} \rightleftharpoons \text{Shc_pTrkA_endo}$	
73	J80	binding_pShc_to_pTrkA_endo	$\text{pTrkA_endo} + \text{pShc} \rightleftharpoons \text{pShc_pTrkA_endo}$	
74	J81	Shc_pTrkA_endo_phosphorylation	$\text{Shc_pTrkA_endo} \longrightarrow \text{pShc_pTrkA_endo}$	
75	J82	Shc_pTrkA_phosphorylation	$\text{Shc_pTrkA} \longrightarrow \text{pShc_pTrkA}$	
76	J83	pFRS2_pTrkA_phosphorylation	$\text{FRS2_pTrkA} \longrightarrow \text{pFRS2_pTrkA}$	
77	J84	binding_FRS2_to_pTrkA_endo	$\text{pTrkA_endo} + \text{FRS2} \rightleftharpoons \text{FRS2_pTrkA_endo}$	
78	J85	binding_pFRS2_to_pTrkA_endo	$\text{pTrkA_endo} + \text{pFRS2} \rightleftharpoons \text{pFRS2_pTrkA_endo}$	
79	J86	FRS2_pTrkA_endo_phosphorylation	$\text{FRS2_pTrkA_endo} \longrightarrow \text{pFRS2_pTrkA_endo}$	
80	J87	FRS2_pTrkA_degradation	$\text{FRS2_pTrkA} \longrightarrow \text{degradation} + \text{FRS2}$	
81	J88	pFRS2_pTrkA_degradation	$\text{pFRS2_pTrkA} \longrightarrow \text{degradation} + \text{pFRS2}$	
82	J89	Shc_pTrkA_degradation	$\text{Shc_pTrkA} \longrightarrow \text{degradation} + \text{Shc}$	
83	J90	pShc_pTrkA_degradation	$\text{pShc_pTrkA} \longrightarrow \text{degradation} + \text{pShc}$	
84	J92	FRS2_pTrkA_endo_degradation	$\text{FRS2_pTrkA_endo} \longrightarrow \text{degradation} + \text{FRS2}$	
85	J93	Shc_pTrkA_endo_degradation	$\text{Shc_pTrkA_endo} \longrightarrow \text{degradation} + \text{Shc}$	
86	J94	pShc_pTrkA_endo_degradation	$\text{pShc_pTrkA_endo} \longrightarrow \text{degradation} + \text{pShc}$	
87	J95	binding_Grb2_SOS_to_pShc_pTrkA_endo	$\text{SOS_Grb2} + \text{pShc_pTrkA_endo} \rightleftharpoons \text{Grb2_SOS_pShc_pTrkA_endo}$	
88	J96	binding_Grb2_SOS_to_pShc_pTrkA	$\text{SOS_Grb2} + \text{pShc_pTrkA} \rightleftharpoons \text{Grb2_SOS_pShc_pTrkA}$	
89	J97	Grb2_SOS_pShc_pTrkA_ubiquitination	$\text{Grb2_SOS_pShc_pTrkA} \longrightarrow \text{Grb2_SOS_pShc_pTrkA_endo}$	
90	J98	Crk_C3G_pFRS2_pTrkA_ubiquitination	$\text{Crk_C3G_pFRS2_pTrkA} \longrightarrow \text{Crk_C3G_pFRS2_pTrkA_endo}$	
91	J99	pFRS2_pTrkA_ubiquitination	$\text{pFRS2_pTrkA} \longrightarrow \text{pFRS2_pTrkA_endo}$	
92	J100	FRS2_pTrkA_ubiquitination	$\text{FRS2_pTrkA} \longrightarrow \text{FRS2_pTrkA_endo}$	
93	J101	pShc_pTrkA_ubiquitination	$\text{pShc_pTrkA} \longrightarrow \text{pShc_pTrkA_endo}$	
94	J102	Shc_pTrkA_ubiquitination	$\text{Shc_pTrkA} \longrightarrow \text{Shc_pTrkA_endo}$	
95	J103	binding_Crk_C3G_to_pFRS2_pTrkA	$\text{Crk_C3G} + \text{pFRS2_pTrkA} \rightleftharpoons \text{Crk_C3G_pFRS2_pTrkA}$	
96	J104	binding_Crk_C3G_to_pFRS2_pTrkA_endo	$\text{Crk_C3G} + \text{pFRS2_pTrkA_endo} \rightleftharpoons \text{Crk_C3G_pFRS2_pTrkA_endo}$	

Nº	Id	Name	Reaction Equation	SBO
97	J105	binding_Grb2_SOS_pShc_to_pTrkA	$\text{Grb2_SOS_pShc} + \text{pTrkA} \rightleftharpoons \text{Grb2_SOS_pShc_pTrkA}$	+
98	J106	binding_Grb2_SOS_pShc_to_pTrkA_endo	$\text{Grb2_SOS_pShc} + \text{pTrkA_endo} \rightleftharpoons \text{Grb2_SOS_pShc_pTrkA_endo}$	+
99	J107	Crk_C3G_pFRS2_pTrkA_degradation	$\text{Crk_C3G_pFRS2_pTrkA} \longrightarrow \text{degradation}$ $\text{pFRS2} + \text{Crk_C3G}$	+
100	J108	Crk_C3G_pFRS2_pTrkA_endo_degradation	$\text{Crk_C3G_pFRS2_pTrkA_endo} \longrightarrow \text{degradation}$ $\text{Crk_C3G} + \text{pFRS2}$	+
101	J109	Grb2_SOS_pShc_pTrkA_degradation	$\text{Grb2_SOS_pShc_pTrkA} \longrightarrow \text{degradation}$ Grb2_SOS_pShc	+
102	J110	Grb2_SOS_pShc_pTrkA_endo_degradation	$\text{Grb2_SOS_pShc_pTrkA_endo} \longrightarrow \text{degradation}$ Grb2_SOS_pShc	+
103	J112	pFRS2_pTrkA_endo_degradation	$\text{pFRS2_pTrkA_endo} \longrightarrow \text{degradation} + \text{pFRS2}$	
104	J113	form_NGFreceptor	$\text{pro_TrkA} \rightleftharpoons \text{NGFR}$	
105	J115	binding_Shc_to_dpEGFR_c_Cbl	$\text{Shc} + \text{dpEGFR_c_Cbl} \rightleftharpoons \text{Shc_dpEGFR_c_Cbl}$	
106	J116	binding_pShc_to_dpEGFR_c_Cbl	$\text{dpEGFR_c_Cbl} + \text{pShc} \rightleftharpoons \text{pShc_dpEGFR_c_Cbl}$	
107	J117	binding_SOS_Grb2_to_pShc_dpEGFR_c_Cbl	$\text{pShc_dpEGFR_c_Cbl} + \text{SOS_Grb2} \rightleftharpoons \text{Grb2_SOS_pShc_dpEGFR_c_Cbl}$	+
108	J119	binding_c_Cbl_to_Crk_C3G_pFRS2_dpEGFR	$\text{c_Cbl} + \text{Crk_C3G_pFRS2_dpEGFR} \rightleftharpoons \text{Crk_C3G_pFRS2_dpEGFR_c_Cbl}$	
109	J118	binding_FRS2_to_dpEGFR_c_Cbl	$\text{dpEGFR_c_Cbl} + \text{FRS2} \rightleftharpoons \text{FRS2_dpEGFR_c_Cbl}$	
110	J120	binding_pFRS2_to_dpEGFR_c_Cbl	$\text{dpEGFR_c_Cbl} + \text{pFRS2} \rightleftharpoons \text{pFRS2_dpEGFR_c_Cbl}$	
111	J121	Ras_GTP_dephosphorylation	$\text{Ras_GTP} \xrightarrow{\text{pDok_RasGAP}} \text{Ras_GDP}$	
112	J122	RAP1_GTP_dephosphorylation	$\text{Rap1_GTP} \xrightarrow{\text{Rap1GAP}} \text{Rap1_GDP}$	
113	J123	Dok_phosphorylation	$\text{Dok} \xrightarrow{\text{pTrkA, Shc_pTrkA, pShc_pTrkA, Grb2_SOS_pShc_pTrkA, FRS2_pTrkA, pFRS2_pTrkA}} \text{pDok}$	
114	J124	Grb1_SOS_pShc_dissociation	$\text{Grb2_SOS_pShc} \xrightarrow{\text{dppERK}} \text{pShc} + \text{pSOS_Grb2}$	
115	J133	binding_MEK_to_ERK	$\text{ERK} + \text{MEK} \rightleftharpoons \text{MEK_ERK}$	
116	J134	binding_ERK_to_pMEK	$\text{ERK} + \text{pMEK} \rightleftharpoons \text{pMEK_ERK}$	

Nº	Id	Name	Reaction Equation	SBO
117	J135	binding_ERK_to_ppMEK	$\text{ERK} + \text{ppMEK} \rightleftharpoons \text{ppMEK_ERK}$	
118	J136	ppMEK_ERK_dissociation	$\text{ppMEK_ERK} \longrightarrow \text{ppERK} + \text{ppMEK}$	
119	J137	c_Raf_Ras_GTP_dissociation	$\text{c_Raf_Ras_GTP} \xrightarrow{\text{pDok_RasGAP}} \text{c_Raf} + \text{Ras_GDP}$	
120	J138	B_Raf_Ras_GTP_dissociation	$\text{B_Raf_Ras_GTP} \xrightarrow{\text{pDok_RasGAP}} \text{B_Raf} + \text{Ras_GDP}$	
121	J139	B_Raf_Rap1_GTP_dissociation	$\text{B_Raf_Rap1_GTP} \xrightarrow{\text{Rap1GAP}} \text{B_Raf} + \text{Rap1_GDP}$	
122	J140		$\text{c_Raf_Ras_GTP} + \text{MEK} \longrightarrow \text{c_Raf_Ras_GTP_MEK}$	
123	J141		$\text{c_Raf_Ras_GTP} + \text{pMEK} \rightleftharpoons \text{c_Raf_Ras_GTP_pMEK}$	
124	J142		$\text{c_Raf_Ras_GTP} + \text{MEK_ERK} \rightleftharpoons \text{c_Raf_Ras_GTP_MEK_ERK}$	
125	J143		$\text{c_Raf_Ras_GTP} + \text{pMEK_ERK} \rightleftharpoons \text{c_Raf_Ras_GTP_pMEK_ERK}$	
126	J144		$\text{B_Raf_Ras_GTP} + \text{MEK} \rightleftharpoons \text{B_Raf_Ras_GTP_MEK}$	
127	J145		$\text{B_Raf_Ras_GTP} + \text{pMEK} \rightleftharpoons \text{B_Raf_Ras_GTP_pMEK}$	
128	J146		$\text{B_Raf_Ras_GTP} + \text{MEK_ERK} \rightleftharpoons \text{B_Raf_Ras_GTP_MEK_ERK}$	
129	J147		$\text{B_Raf_Ras_GTP} + \text{pMEK_ERK} \rightleftharpoons \text{B_Raf_Ras_GTP_pMEK_ERK}$	
130	J148		$\text{B_Raf_Rap1_GTP} \rightleftharpoons \text{B_Raf_Rap1_GTP_MEK}$	+
131	J149		$\text{B_Raf_Rap1_GTP} \rightleftharpoons \text{B_Raf_Rap1_GTP_pMEK}$	+
132	J150		$\text{B_Raf_Rap1_GTP} \rightleftharpoons \text{B_Raf_Rap1_GTP_MEK_ERK}$	+
133	J151		$\text{B_Raf_Rap1_GTP} \rightleftharpoons \text{B_Raf_Rap1_GTP_pMEK_ERK}$	+
134	J152		$\text{c_Raf_Ras_GTP_MEK} \longrightarrow \text{c_Raf_Ras_GTP} + \text{pMEK}$	+
135	J153		$\text{c_Raf_Ras_GTP_pMEK} \longrightarrow \text{c_Raf_Ras_GTP} + \text{ppMEK}$	+
136	J154		$\text{c_Raf_Ras_GTP_MEK_ERK} \longrightarrow \text{c_Raf_Ras_GTP} + \text{pMEK_ERK}$	

Nº	Id	Name	Reaction Equation	SBO
137	J155		$\text{c_Raf_Ras_GTP_pMEK_ERK} \longrightarrow \text{c_Raf_Ras_GTP} + \text{ppMEK_ERK}$	
138	J156		$\text{B_Raf_Ras_GTP_MEK} \longrightarrow \text{B_Raf_Ras_GTP} + \text{pMEK}$	
139	J157		$\text{B_Raf_Ras_GTP_pMEK} \longrightarrow \text{B_Raf_Ras_GTP} + \text{ppMEK}$	
140	J158		$\text{B_Raf_Ras_GTP_MEK_ERK} \longrightarrow \text{B_Raf_Ras_GTP} + \text{pMEK_ERK}$	
141	J159		$\text{B_Raf_Ras_GTP_pMEK_ERK} \longrightarrow \text{B_Raf_Ras_GTP} + \text{ppMEK_ERK}$	
142	J160		$\text{B_Raf_Rap1_GTP_MEK} \longrightarrow \text{B_Raf_Rap1_GTP} + \text{pMEK}$	
143	J161		$\text{B_Raf_Rap1_GTP_pMEK} \longrightarrow \text{B_Raf_Rap1_GTP} + \text{ppMEK}$	
144	J162		$\text{B_Raf_Rap1_GTP_MEK_ERK} \longrightarrow \text{B_Raf_Rap1_GTP} + \text{pMEK_ERK}$	
145	J163		$\text{B_Raf_Rap1_GTP_pMEK_ERK} \longrightarrow \text{B_Raf_Rap1_GTP} + \text{ppMEK_ERK}$	
146	J164		$\text{Crk_C3G_pFRS2_dpEGFR_c_Cbl_ubiq} \longrightarrow \text{c_Cbl} + \text{pFRS2} + \text{Crk_C3G}$	
147	J165		$\text{MKP3} + \text{dppERK} \longrightarrow \text{dppERK_MKP3}$	
148	J166		$\text{MKP3} + \text{ppERK} \rightleftharpoons \text{ppERK_MKP3}$	
149	J167		$\text{ppERK_MKP3} \longrightarrow \text{ERK} + \text{MKP3}$	
150	J168		$\text{dppERK_MKP3} \longrightarrow \text{ppERK} + \text{ERK} + \text{MKP3}$	

5.1 Reaction re1

This is a reversible reaction of one reactant forming one product.

Name form_EGFreceptor

Reaction equation



Reactant

Table 5: Properties of each reactant.

Id	Name	SBO
pro_EGFR		

Product

Table 6: Properties of each product.

Id	Name	SBO
EGFR		

Kinetic Law

Derived unit contains undeclared units

$$v_1 = \text{vol}(\text{compartment}) \cdot (\text{re1_k1} \cdot [\text{pro_EGFR}] - \text{re1_k2} \cdot [\text{EGFR}]) \quad (2)$$

Table 7: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
re1_k1			10^{-4}		<input checked="" type="checkbox"/>
re1_k2			10^{-4}		<input checked="" type="checkbox"/>

5.2 Reaction re2

This is a reversible reaction of two reactants forming one product.

Name EGFbinding

Reaction equation



Reactants

Table 8: Properties of each reactant.

Id	Name	SBO
EGF		
EGFR		

Product

Table 9: Properties of each product.

Id	Name	SBO
L_EGFR		

Kinetic Law

Derived unit contains undeclared units

$$v_2 = \text{vol}(\text{compartment}) \cdot (\text{re2_k1} \cdot [\text{EGF}] \cdot [\text{EGFR}] - \text{re2_k2} \cdot [\text{L_EGFR}]) \quad (4)$$

Table 10: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
re2_k1			2.283		<input checked="" type="checkbox"/>
re2_k2			0.003		<input checked="" type="checkbox"/>

5.3 Reaction re8

This is a reversible reaction of one reactant forming one product.

Name dimerization

Reaction equation



Reactant

Table 11: Properties of each reactant.

Id	Name	SBO
L_EGFR		

Product

Table 12: Properties of each product.

Id	Name	SBO
L_EGFR_dimer		

Kinetic Law

Derived unit contains undeclared units

$$v_3 = \text{vol}(\text{compartment}) \cdot (\text{re8_k1} \cdot [\text{L_EGFR}] \cdot [\text{L_EGFR}] - \text{re8_k2} \cdot [\text{L_EGFR_dimer}]) \quad (6)$$

Table 13: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
re8_k1			10.00		<input checked="" type="checkbox"/>
re8_k2			0.02		<input checked="" type="checkbox"/>

5.4 Reaction J3

This is a reversible reaction of two reactants forming one product.

Name binding_SOS_Grb2

Reaction equation



Reactants

Table 14: Properties of each reactant.

Id	Name	SBO
SOS		
Grb2		

Product

Table 15: Properties of each product.

Id	Name	SBO
SOS_Grb2		

Kinetic Law

Derived unit contains undeclared units

$$v_4 = \text{vol}(c1) \cdot (J3_k1 \cdot [\text{SOS}] \cdot [\text{Grb2}] - J3_k2 \cdot [\text{SOS_Grb2}]) \quad (8)$$

Table 16: Properties of each parameter.

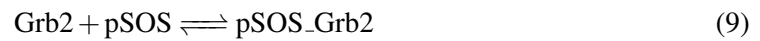
Id	Name	SBO	Value	Unit	Constant
J3_k1			0.030		<input checked="" type="checkbox"/>
J3_k2			0.017		<input checked="" type="checkbox"/>

5.5 Reaction J4

This is a reversible reaction of two reactants forming one product.

Name binding_pSOS_Grb2

Reaction equation



Reactants

Table 17: Properties of each reactant.

Id	Name	SBO
Grb2		

Id	Name	SBO
pSOS		

Product

Table 18: Properties of each product.

Id	Name	SBO
pSOS_Grb2		

Kinetic Law

Derived unit contains undeclared units

$$v_5 = \text{vol}(c1) \cdot (J4_k1 \cdot [\text{Grb2}] \cdot [\text{pSOS}] - J4_k2 \cdot [\text{pSOS_Grb2}]) \quad (10)$$

Table 19: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J4_k1			0.030		<input checked="" type="checkbox"/>
J4_k2			0.017		<input checked="" type="checkbox"/>

5.6 Reaction J5

This is a reversible reaction of one reactant forming one product.

Name EGFRphosphorylation

Reaction equation



Reactant

Table 20: Properties of each reactant.

Id	Name	SBO
L_EGFR_dimer		

Product

Table 21: Properties of each product.

Id	Name	SBO
L_dpEGFR		

Kinetic Law

Derived unit contains undeclared units

$$v_6 = \text{vol}(\text{compartment}) \cdot (J5_k1 \cdot [\text{L_EGFR_dimer}] - J5_k2 \cdot [\text{L_dpEGFR}]) \quad (12)$$

Table 22: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J5_k1			4.000		<input checked="" type="checkbox"/>
J5_k2			0.001		<input checked="" type="checkbox"/>

5.7 Reaction J6

This is a reversible reaction of two reactants forming one product.

Name binding_cCbl_dpEGFR

Reaction equation



Reactants

Table 23: Properties of each reactant.

Id	Name	SBO
L_dpEGFR		
c_Cbl		

Product

Table 24: Properties of each product.

Id	Name	SBO
dpEGFR_c_Cbl		

Kinetic Law

Derived unit contains undeclared units

$$v_7 = \text{vol}(c1) \cdot (J6_k1 \cdot [L_dpEGFR] \cdot [c_Cbl] - J6_k2 \cdot [dpEGFR_c_Cbl]) \quad (14)$$

Table 25: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J6_k1			0.5		<input checked="" type="checkbox"/>
J6_k2			0.2		<input checked="" type="checkbox"/>

5.8 Reaction J7

This is a reversible reaction of two reactants forming one product.

Name binding_pShc_LdpEGFR

Reaction equation



Reactants

Table 26: Properties of each reactant.

Id	Name	SBO
L_dpEGFR		
pShc		

Product

Table 27: Properties of each product.

Id	Name	SBO
pShc_dpEGFR		

Kinetic Law

Derived unit contains undeclared units

$$v_8 = \text{vol}(c1) \cdot (J7_k1 \cdot [L_dpEGFR] \cdot [pShc] - J7_k2 \cdot [pShc_dpEGFR]) \quad (16)$$

Table 28: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J7_k1			10.0		<input checked="" type="checkbox"/>
J7_k2			0.2		<input checked="" type="checkbox"/>

5.9 Reaction J8

This is a reversible reaction of one reactant forming one product.

Name pDOKdephosphorylation

Reaction equation



Reactant

Table 29: Properties of each reactant.

Id	Name	SBO
pDok		

Product

Table 30: Properties of each product.

Id	Name	SBO
Dok		

Kinetic Law

Derived unit contains undeclared units

$$v_9 = \text{vol}(c1) \cdot (J8_k1 \cdot [\text{pDok}] - J8_k2 \cdot [\text{Dok}]) \quad (18)$$

Table 31: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J8_k1			0.002		<input checked="" type="checkbox"/>
J8_k2			10^{-5}		<input checked="" type="checkbox"/>

5.10 Reaction J9

This is a reversible reaction of two reactants forming one product.

Name binding_cCbl_pShc_dpEGFR

Reaction equation



Reactants

Table 32: Properties of each reactant.

Id	Name	SBO
c_Cbl		
pShc_dpEGFR		

Product

Table 33: Properties of each product.

Id	Name	SBO
pShc_dpEGFR_c_Cbl		

Kinetic Law

Derived unit contains undeclared units

$$v_{10} = \text{vol}(c1) \cdot (J9_k1 \cdot [c_Cbl] \cdot [pShc_dpEGFR] - J9_k2 \cdot [pShc_dpEGFR_c_Cbl]) \quad (20)$$

Table 34: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J9_k1			0.5		<input checked="" type="checkbox"/>
J9_k2			0.2		<input checked="" type="checkbox"/>

5.11 Reaction J10

This is an irreversible reaction of one reactant forming one product.

Name SOSdephosphorylation

Reaction equation



Reactant

Table 35: Properties of each reactant.

Id	Name	SBO
pSOS		

Product

Table 36: Properties of each product.

Id	Name	SBO
SOS		

Kinetic Law

Derived unit contains undeclared units

$$v_{11} = \text{vol}(c1) \cdot J10_k \cdot [\text{pSOS}] \quad (22)$$

Table 37: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J10_k			0.002		<input checked="" type="checkbox"/>

5.12 Reaction J11

This is an irreversible reaction of one reactant forming one product.

Name pSOS_Grb2_dephosphorylation

Reaction equation



Reactant

Table 38: Properties of each reactant.

Id	Name	SBO
pSOS_Grb2		

Product

Table 39: Properties of each product.

Id	Name	SBO
SOS_Grb2		

Kinetic Law

Derived unit contains undeclared units

$$v_{12} = \text{vol}(c1) \cdot J11_k \cdot [\text{pSOS_Grb2}] \quad (24)$$

Table 40: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J11_k			0.002		<input checked="" type="checkbox"/>

5.13 Reaction J12

This is a reversible reaction of two reactants forming one product.

Name binding_Shc_LdpEGFR

Reaction equation



Reactants

Table 41: Properties of each reactant.

Id	Name	SBO
L_dpEGFR		
Shc		

Product

Table 42: Properties of each product.

Id	Name	SBO
Shc_dpEGFR		

Kinetic Law

Derived unit contains undeclared units

$$v_{13} = \text{vol}(c1) \cdot (J12_k1 \cdot [L_dpEGFR] \cdot [Shc] - J12_k2 \cdot [Shc_dpEGFR]) \quad (26)$$

Table 43: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J12_k1			10.0		<input checked="" type="checkbox"/>
J12_k2			0.2		<input checked="" type="checkbox"/>

5.14 Reaction J13

This is an irreversible reaction of one reactant forming one product.

Name Shc_dpEGFR_phosphorylation

Reaction equation



Reactant

Table 44: Properties of each reactant.

Id	Name	SBO
Shc_dpEGFR		

Product

Table 45: Properties of each product.

Id	Name	SBO
pShc_dpEGFR		

Kinetic Law

Derived unit contains undeclared units

$$v_{14} = \text{vol}(c1) \cdot J13_k \cdot [\text{Shc_dpEGFR}] \quad (28)$$

Table 46: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J13_k			1.0		<input checked="" type="checkbox"/>

5.15 Reaction J14

This is an irreversible reaction of one reactant forming one product.

Name dpEGFR_c_Cbl_ubiquitination

Reaction equation



Reactant

Table 47: Properties of each reactant.

Id	Name	SBO
dpEGFR_c_Cbl		

Product

Table 48: Properties of each product.

Id	Name	SBO
dpEGFR_c_Cbl_ubiq		

Kinetic Law

Derived unit contains undeclared units

$$v_{15} = \text{vol}(c1) \cdot J14_k \cdot [\text{dpEGFR_c_Cbl}] \quad (30)$$

Table 49: Properties of each parameter.

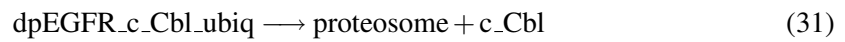
Id	Name	SBO	Value	Unit	Constant
J14_k			0.05		<input checked="" type="checkbox"/>

5.16 Reaction J15

This is an irreversible reaction of one reactant forming two products.

Name dpEGFR_cCbl_degrad

Reaction equation



Reactant

Table 50: Properties of each reactant.

Id	Name	SBO
dpEGFR_c_Cbl_ubiq		

Products

Table 51: Properties of each product.

Id	Name	SBO
proteosome	proteosome	
c_Cbl		

Kinetic Law

Derived unit contains undeclared units

$$v_{16} = \text{vol}(c1) \cdot J15_k \cdot [\text{dpEGFR_c_Cbl_ubiq}] \quad (32)$$

Table 52: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J15_k			0.001		<input checked="" type="checkbox"/>

5.17 Reaction J16

This is a reversible reaction of two reactants forming one product.

Name binding_cCbl_Shc_dpEGFR

Reaction equation



Reactants

Table 53: Properties of each reactant.

Id	Name	SBO
c_Cbl		
Shc_dpEGFR		

Product

Table 54: Properties of each product.

Id	Name	SBO
Shc_dpEGFR_c_Cbl		

Kinetic Law

Derived unit contains undeclared units

$$v_{17} = vol(c1) \cdot (J16_k1 \cdot [c_Cbl] \cdot [Shc_dpEGFR] - J16_k2 \cdot [Shc_dpEGFR_c_Cbl]) \quad (34)$$

Table 55: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J16_k1			0.5		<input checked="" type="checkbox"/>
J16_k2			0.2		<input checked="" type="checkbox"/>

5.18 Reaction J17

This is an irreversible reaction of one reactant forming one product.

Name Shc_dpEGFR_c_Cbl_Ubiquitination

Reaction equation



Reactant

Table 56: Properties of each reactant.

Id	Name	SBO
Shc_dpEGFR_c_Cbl		

Product

Table 57: Properties of each product.

Id	Name	SBO
Shc_dpEGFR_c_Cbl_ubiq		

Kinetic Law

Derived unit contains undeclared units

$$v_{18} = \text{vol}(c1) \cdot J17_k \cdot [\text{Shc_dpEGFR_c_Cbl}] \quad (36)$$

Table 58: Properties of each parameter.

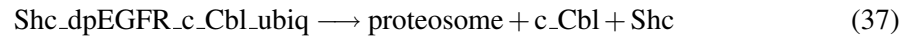
Id	Name	SBO	Value	Unit	Constant
J17_k			0.05		<input checked="" type="checkbox"/>

5.19 Reaction J18

This is an irreversible reaction of one reactant forming three products.

Name Shc_dpEGFR_c_Cbl_ubiq_Degradation

Reaction equation



Reactant

Table 59: Properties of each reactant.

Id	Name	SBO
Shc_dpEGFR_c_Cbl_ubiq		

Products

Table 60: Properties of each product.

Id	Name	SBO
proteosome c_Cbl Shc	proteosome	

Kinetic Law

Derived unit contains undeclared units

$$v_{19} = \text{vol}(c1) \cdot J18_k \cdot [\text{Shc_dpEGFR_c_Cbl_ubiq}] \quad (38)$$

Table 61: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J18_k			0.001		<input checked="" type="checkbox"/>

5.20 Reaction J19

This is an irreversible reaction of one reactant forming one product.

Name pShc_dpEGFR_c_Cbl_ubiquitination

Reaction equation



Reactant

Table 62: Properties of each reactant.

Id	Name	SBO
pShc_dpEGFR_c_Cbl		

Product

Table 63: Properties of each product.

Id	Name	SBO
pShc_dpEGFR_c_Cbl_ubiq		

Kinetic Law

Derived unit contains undeclared units

$$v_{20} = \text{vol}(c1) \cdot J19_k \cdot [\text{pShc_dpEGFR_c_Cbl}] \quad (40)$$

Table 64: Properties of each parameter.

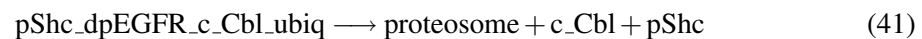
Id	Name	SBO	Value	Unit	Constant
J19_k			0.05		<input checked="" type="checkbox"/>

5.21 Reaction J20

This is an irreversible reaction of one reactant forming three products.

Name pShc_dpEGFR_c_Cbl_ubiq_degradation

Reaction equation



Reactant

Table 65: Properties of each reactant.

Id	Name	SBO
pShc_dpEGFR_c_Cbl_ubiq		

Products

Table 66: Properties of each product.

Id	Name	SBO
proteosome	proteosome	
c_Cbl		
pShc		

Kinetic Law

Derived unit contains undeclared units

$$v_{21} = \text{vol}(c1) \cdot J20_k \cdot [\text{pShc_dpEGFR_c_Cbl_ubiq}] \quad (42)$$

Table 67: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J20_k			0.001		<input checked="" type="checkbox"/>

5.22 Reaction J21

This is an irreversible reaction of one reactant forming one product.

Name Shc_dpEGFR_c_Cblphosphorylation

Reaction equation



Reactant

Table 68: Properties of each reactant.

Id	Name	SBO
Shc_dpEGFR_c_Cbl		

Product

Table 69: Properties of each product.

Id	Name	SBO
pShc_dpEGFR_c_Cbl		

Kinetic Law

Derived unit contains undeclared units

$$v_{22} = \text{vol}(c1) \cdot J21_k \cdot [\text{Shc_dpEGFR_c_Cbl}] \quad (44)$$

Table 70: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J21_k			1.0		<input checked="" type="checkbox"/>

5.23 Reaction J22

This is a reversible reaction of two reactants forming one product.

Name binding_Grb2_SOS_pShc

Reaction equation



Reactants

Table 71: Properties of each reactant.

Id	Name	SBO
pShc		
SOS_Grb2		

Product

Table 72: Properties of each product.

Id	Name	SBO
Grb2_SOS_pShc		

Kinetic Law

Derived unit contains undeclared units

$$v_{23} = \text{vol}(c1) \cdot (J22_k1 \cdot [\text{pShc}] \cdot [\text{SOS_Grb2}] - J22_k2 \cdot [\text{Grb2_SOS_pShc}]) \quad (46)$$

Table 73: Properties of each parameter.

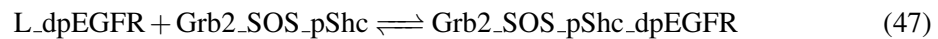
Id	Name	SBO	Value	Unit	Constant
J22_k1			10.0		<input checked="" type="checkbox"/>
J22_k2			0.2		<input checked="" type="checkbox"/>

5.24 Reaction J23

This is a reversible reaction of two reactants forming one product.

Name binding_Grb2_SOS_pShc_dpEGFR

Reaction equation



Reactants

Table 74: Properties of each reactant.

Id	Name	SBO
L_dpEGFR		
Grb2_SOS_pShc		

Product

Table 75: Properties of each product.

Id	Name	SBO
Grb2_SOS_pShc_dpEGFR		

Kinetic Law

Derived unit contains undeclared units

$$v_{24} = \text{vol}(c1) \cdot (J23_k1 \cdot [L_dpEGFR] \cdot [Grb2_SOS_pShc] - J23_k2 \cdot [Grb2_SOS_pShc_dpEGFR]) \quad (48)$$

Table 76: Properties of each parameter.

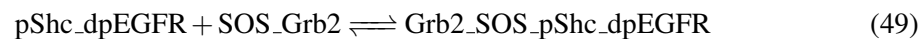
Id	Name	SBO	Value	Unit	Constant
J23_k1			10.0		<input checked="" type="checkbox"/>
J23_k2			0.2		<input checked="" type="checkbox"/>

5.25 Reaction J24

This is a reversible reaction of two reactants forming one product.

Name binding_Grb2.SOS_pShc_dpEGFR

Reaction equation



Reactants

Table 77: Properties of each reactant.

Id	Name	SBO
pShc_dpEGFR		
SOS_Grb2		

Product

Table 78: Properties of each product.

Id	Name	SBO
Grb2_SOS_pShc_dpEGFR		

Kinetic Law

Derived unit contains undeclared units

$$v_{25} = \text{vol}(c1) \cdot (J24_k1 \cdot [pShc_dpEGFR] \cdot [SOS_Grb2] - J24_k2 \cdot [Grb2_SOS_pShc_dpEGFR]) \quad (50)$$

Table 79: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J24_k1			10.0		<input checked="" type="checkbox"/>
J24_k2			0.2		<input checked="" type="checkbox"/>

5.26 Reaction J25

This is a reversible reaction of two reactants forming one product.

Name binding_c_Cbl_Grb2_SOS_pShc_dpEGFR

Reaction equation



Reactants

Table 80: Properties of each reactant.

Id	Name	SBO
c_Cbl		
Grb2_SOS_pShc_dpEGFR		

Product

Table 81: Properties of each product.

Id	Name	SBO
Grb2_SOS_pShc_dpEGFR_c_Cbl		

Kinetic Law

Derived unit contains undeclared units

$$v_{26} = \text{vol}(c1) \cdot (J25_k1 \cdot [\text{c_Cbl}] \cdot [\text{Grb2_SOS_pShc_dpEGFR}] - J25_k2 \cdot [\text{Grb2_SOS_pShc_dpEGFR_c_Cbl}]) \quad (52)$$

Table 82: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J25_k1			0.5		<input checked="" type="checkbox"/>
J25_k2			0.2		<input checked="" type="checkbox"/>

5.27 Reaction J27

This is a reversible reaction of two reactants forming one product.

Name binding_Grb2_SOS_pShc_to_dpEGFR_c_Cbl

Reaction equation



Reactants

Table 83: Properties of each reactant.

Id	Name	SBO
	dpEGFR_c_Cbl	
	Grb2_SOS_pShc	

Product

Table 84: Properties of each product.

Id	Name	SBO
	Grb2_SOS_pShc_dpEGFR_c_Cbl	

Kinetic Law

Derived unit contains undeclared units

$$v_{27} = \text{vol}(c1) \cdot (J27_k1 \cdot [\text{dpEGFR_c_Cbl}] \cdot [\text{Grb2_SOS_pShc}] - J27_k2 \cdot [\text{Grb2_SOS_pShc_dpEGFR_c_Cbl}]) \quad (54)$$

Table 85: Properties of each parameter.

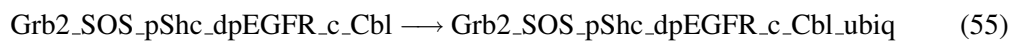
Id	Name	SBO	Value	Unit	Constant
J27_k1			10.0		<input checked="" type="checkbox"/>
J27_k2			0.2		<input checked="" type="checkbox"/>

5.28 Reaction J28

This is an irreversible reaction of one reactant forming one product.

Name Grb2_SOS_pShc_dpEGFR_c_Cbl_ubiquitination

Reaction equation



Reactant

Table 86: Properties of each reactant.

Id	Name	SBO
Grb2_SOS_pShc_dpEGFR_c_Cbl		

Product

Table 87: Properties of each product.

Id	Name	SBO
Grb2_SOS_pShc_dpEGFR_c_Cbl_ubiq		

Kinetic Law

Derived unit contains undeclared units

$$v_{28} = \text{vol}(c1) \cdot J28_k \cdot [\text{Grb2_SOS_pShc_dpEGFR_c_Cbl}] \quad (56)$$

Table 88: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J28_k			0.05		<input checked="" type="checkbox"/>

5.29 Reaction J29

This is an irreversible reaction of one reactant forming three products.

Name Grb2_SOS_pShc_dpEGFR_c_Cbl_ubiq_degradation

Reaction equation



Reactant

Table 89: Properties of each reactant.

Id	Name	SBO
Grb2_SOS_pShc_dpEGFR_c_Cbl_ubiq		

Products

Table 90: Properties of each product.

Id	Name	SBO
proteosome	proteosome	
c_Cbl		
Grb2_SOS_pShc		

Kinetic Law

Derived unit contains undeclared units

$$v_{29} = \text{vol}(c1) \cdot J29_k \cdot [\text{Grb2_SOS_pShc_dpEGFR_c_Cbl_ubiq}] \quad (58)$$

Table 91: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J29_k			0.001		<input checked="" type="checkbox"/>

5.30 Reaction J30

This is an irreversible reaction of one reactant forming two products.

Name Grb2_SOS_pShc_Dissociation

Reaction equation



Reactant

Table 92: Properties of each reactant.

Id	Name	SBO
Grb2_SOS_pShc		

Products

Table 93: Properties of each product.

Id	Name	SBO
Shc		
SOS_Grb2		

Kinetic Law

Derived unit contains undeclared units

$$v_{30} = J30_k \cdot [\text{Grb2_SOS_pShc}] \quad (60)$$

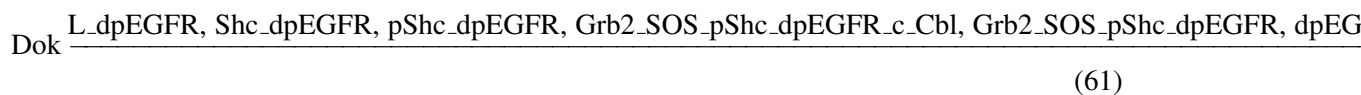
Table 94: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J30_k			0.005		<input checked="" type="checkbox"/>

5.31 Reaction J31

This is an irreversible reaction of one reactant forming one product influenced by 13 modifiers.

Reaction equation



Reactant

Table 95: Properties of each reactant.

Id	Name	SBO
Dok		

Modifiers

Table 96: Properties of each modifier.

Id	Name	SBO
L_dpEGFR		
Shc_dpEGFR		
pShc_dpEGFR		
Grb2_SOS_pShc_dpEGFR_c_Cbl		
Grb2_SOS_pShc_dpEGFR		
dpEGFR_c_Cbl		
Shc_dpEGFR_c_Cbl		
pShc_dpEGFR_c_Cbl		
FRS2_dpEGFR		
pFRS2_dpEGFR		
Crk_C3G_pFRS2_dpEGFR		
FRS2_dpEGFR_c_Cbl		
Crk_C3G_pFRS2_dpEGFR_c_Cbl		

Product

Table 97: Properties of each product.

Id	Name	SBO
pDok		

Kinetic Law

Derived unit contains undeclared units

$$v_{31} = \text{vol}(c1) \cdot \frac{J31_Vmax \cdot [\text{Dok}] \cdot ([\text{L_dpEGFR}] + [\text{Shc_dpEGFR}] + [\text{pShc_dpEGFR}] + [\text{Grb2_SOS_pShc_dpEGFR}] + [\text{dpEGFR_c_Cbl}] + [\text{Shc_dpEGFR_c_Cbl}] + [\text{pShc_dpEGFR_c_Cbl}] + [\text{FRS2_dpEGFR}] + [\text{pFRS2_dpEGFR}] + [\text{Crk_C3G_pFRS2_dpEGFR}] + [\text{FRS2_dpEGFR_c_Cbl}] + [\text{Crk_C3G_pFRS2_dpEGFR_c_Cbl}])}{K_{31} + ([\text{L_dpEGFR}] + [\text{Shc_dpEGFR}] + [\text{pShc_dpEGFR}] + [\text{Grb2_SOS_pShc_dpEGFR}] + [\text{dpEGFR_c_Cbl}] + [\text{Shc_dpEGFR_c_Cbl}] + [\text{pShc_dpEGFR_c_Cbl}] + [\text{FRS2_dpEGFR}] + [\text{pFRS2_dpEGFR}] + [\text{Crk_C3G_pFRS2_dpEGFR}] + [\text{FRS2_dpEGFR_c_Cbl}] + [\text{Crk_C3G_pFRS2_dpEGFR_c_Cbl}])} \quad (62)$$

Table 98: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J31_Vmax			0.2		<input checked="" type="checkbox"/>
J31_Km1			0.1		<input checked="" type="checkbox"/>

5.32 Reaction J32

This is an irreversible reaction of one reactant forming one product.

Name pShc_dephosphorylation

Reaction equation



Reactant

Table 99: Properties of each reactant.

Id	Name	SBO
pShc		

Product

Table 100: Properties of each product.

Id	Name	SBO
Shc		

Kinetic Law

Derived unit contains undeclared units

$$v_{32} = \text{vol}(c1) \cdot J32_k \cdot [\text{pShc}] \quad (64)$$

Table 101: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J32_k			0.005		<input checked="" type="checkbox"/>

5.33 Reaction J33

This is an irreversible reaction of one reactant forming one product.

Name pFRS2.dephosphorylation

Reaction equation



Reactant

Table 102: Properties of each reactant.

Id	Name	SBO
pFRS2		

Product

Table 103: Properties of each product.

Id	Name	SBO
FRS2		

Kinetic Law

Derived unit contains undeclared units

$$v_{33} = \text{vol}(c1) \cdot J33_k \cdot [\text{pFRS2}] \quad (66)$$

Table 104: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J33_k			0.005		<input checked="" type="checkbox"/>

5.34 Reaction J34

This is a reversible reaction of two reactants forming one product.

Name binding_Crk.to_C3G

Reaction equation



Reactants

Table 105: Properties of each reactant.

Id	Name	SBO
Crk		
C3G		

Product

Table 106: Properties of each product.

Id	Name	SBO
Crk_C3G		

Kinetic Law

Derived unit contains undeclared units

$$v_{34} = \text{vol}(\text{c1}) \cdot (\text{J34_k1} \cdot [\text{Crk}] \cdot [\text{C3G}] - \text{J34_k2} \cdot [\text{Crk_C3G}]) \quad (68)$$

Table 107: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J34_k1			1.000		<input checked="" type="checkbox"/>
J34_k2			0.002		<input checked="" type="checkbox"/>

5.35 Reaction J35

This is a reversible reaction of two reactants forming one product.

Name binding_L_dpEGFR_to_FRS2

Reaction equation



Reactants

Table 108: Properties of each reactant.

Id	Name	SBO
L_dpEGFR		
FRS2		

Product

Table 109: Properties of each product.

Id	Name	SBO
FRS2_dpEGFR		

Kinetic Law

Derived unit contains undeclared units

$$v_{35} = \text{vol}(c1) \cdot (J35_k1 \cdot [L_dpEGFR] \cdot [FRS2] - J35_k2 \cdot [FRS2_dpEGFR]) \quad (70)$$

Table 110: Properties of each parameter.

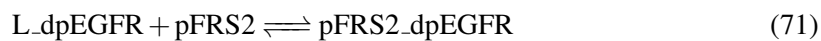
Id	Name	SBO	Value	Unit	Constant
J35_k1			1.0		<input checked="" type="checkbox"/>
J35_k2			0.2		<input checked="" type="checkbox"/>

5.36 Reaction J36

This is a reversible reaction of two reactants forming one product.

Name binding_pFRS2_to_L_dpEGFR

Reaction equation



Reactants

Table 111: Properties of each reactant.

Id	Name	SBO
L_dpEGFR		
pFRS2		

Product

Table 112: Properties of each product.

Id	Name	SBO
pFRS2_dpEGFR		

Kinetic Law

Derived unit contains undeclared units

$$v_{36} = \text{vol}(c1) \cdot (J36_k1 \cdot [L_dpEGFR] \cdot [pFRS2] - J36_k2 \cdot [pFRS2_dpEGFR]) \quad (72)$$

Table 113: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J36_k1			1.0		<input checked="" type="checkbox"/>
J36_k2			0.2		<input checked="" type="checkbox"/>

5.37 Reaction J37

This is an irreversible reaction of one reactant forming one product.

Name FRS2_dpEGFRphosphorylation

Reaction equation



Reactant

Table 114: Properties of each reactant.

Id	Name	SBO
FRS2_dpEGFR		

Product

Table 115: Properties of each product.

Id	Name	SBO
pFRS2_dpEGFR		

Kinetic Law

Derived unit contains undeclared units

$$v_{37} = \text{vol}(c1) \cdot J37_k \cdot [\text{FRS2_dpEGFR}] \quad (74)$$

Table 116: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J37_k			1.0		<input checked="" type="checkbox"/>

5.38 Reaction J38

This is a reversible reaction of two reactants forming one product.

Name binding_Crk_C3G.to_pFRS2_pRTK

Reaction equation



Reactants

Table 117: Properties of each reactant.

Id	Name	SBO
pFRS2_dpEGFR		
Crk_C3G		

Product

Table 118: Properties of each product.

Id	Name	SBO
Crk_C3G_pFRS2_dpEGFR		

Kinetic Law

Derived unit contains undeclared units

$$v_{38} = \text{vol}(c1) \cdot (J38_k1 \cdot [\text{pFRS2_dpEGFR}] \cdot [\text{Crk_C3G}] - J38_k2 \cdot [\text{Crk_C3G_pFRS2_dpEGFR}]) \quad (76)$$

Table 119: Properties of each parameter.

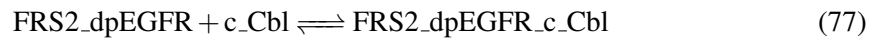
Id	Name	SBO	Value	Unit	Constant
J38_k1			1.0		<input checked="" type="checkbox"/>
J38_k2			0.2		<input checked="" type="checkbox"/>

5.39 Reaction J39

This is a reversible reaction of two reactants forming one product.

Name binding_c_Cbl_to_FRS2_dpEGFR

Reaction equation



Reactants

Table 120: Properties of each reactant.

Id	Name	SBO
FRS2_dpEGFR		
c_Cbl		

Product

Table 121: Properties of each product.

Id	Name	SBO
	FRS2_dpEGFR_c_Cb1	

Kinetic Law

Derived unit contains undeclared units

$$v_{39} = \text{vol}(c1) \cdot (J39_k1 \cdot [\text{FRS2_dpEGFR}] \cdot [c_Cb1] - J39_k2 \cdot [\text{FRS2_dpEGFR_c_Cb1}]) \quad (78)$$

Table 122: Properties of each parameter.

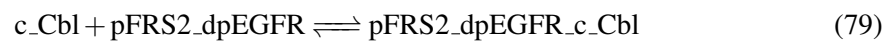
Id	Name	SBO	Value	Unit	Constant
J39_k1			0.5		<input checked="" type="checkbox"/>
J39_k2			0.2		<input checked="" type="checkbox"/>

5.40 Reaction J40

This is a reversible reaction of two reactants forming one product.

Name binding_c_Cb1_to_pFRS2_dpEGFR

Reaction equation



Reactants

Table 123: Properties of each reactant.

Id	Name	SBO
	c_Cb1	
	pFRS2_dpEGFR	

Product

Table 124: Properties of each product.

Id	Name	SBO
	pFRS2_dpEGFR_c_Cb1	

Kinetic Law

Derived unit contains undeclared units

$$v_{40} = \text{vol}(c1) \cdot (J40_k1 \cdot [c_Cbl] \cdot [pFRS2_dpEGFR] - J40_k2 \cdot [pFRS2_dpEGFR_c_Cbl]) \quad (80)$$

Table 125: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J40_k1			0.5		<input checked="" type="checkbox"/>
J40_k2			0.2		<input checked="" type="checkbox"/>

5.41 Reaction J41

This is an irreversible reaction of one reactant forming one product.

Name pFRS2_dpEGFR_c_Cbl_ubiquitiation

Reaction equation



Reactant

Table 126: Properties of each reactant.

Id	Name	SBO
pFRS2_dpEGFR_c_Cbl		

Product

Table 127: Properties of each product.

Id	Name	SBO
pFRS2_dpEGFR_c_Cbl_ubiq		

Kinetic Law

Derived unit contains undeclared units

$$v_{41} = \text{vol}(c1) \cdot J41_k \cdot [pFRS2_dpEGFR_c_Cbl] \quad (82)$$

Table 128: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J41_k			0.05		<input checked="" type="checkbox"/>

5.42 Reaction J42

This is an irreversible reaction of one reactant forming one product.

Name FRS2_dpEGFR_c_Cbl_ubiquitination

Reaction equation



Reactant

Table 129: Properties of each reactant.

Id	Name	SBO
FRS2_dpEGFR_c_Cbl		

Product

Table 130: Properties of each product.

Id	Name	SBO
FRS2_dpEGFR_c_Cbl_ubiq		

Kinetic Law

Derived unit contains undeclared units

$$v_{42} = \text{vol}(c1) \cdot J42_k \cdot [\text{FRS2_dpEGFR_c_Cbl}] \quad (84)$$

Table 131: Properties of each parameter.

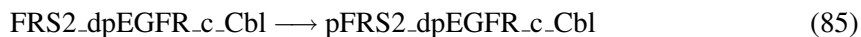
Id	Name	SBO	Value	Unit	Constant
J42_k			0.05		<input checked="" type="checkbox"/>

5.43 Reaction J43

This is an irreversible reaction of one reactant forming one product.

Name FRS2_dpEGFR_c_Cbl_phosphorylation

Reaction equation



Reactant

Table 132: Properties of each reactant.

Id	Name	SBO
FRS2_dpEGFR_c_Cbl		

Product

Table 133: Properties of each product.

Id	Name	SBO
pFRS2_dpEGFR_c_Cbl		

Kinetic Law

Derived unit contains undeclared units

$$v_{43} = \text{vol}(c1) \cdot J43_k \cdot [\text{FRS2_dpEGFR_c_Cbl}] \quad (86)$$

Table 134: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J43_k			1.0		<input checked="" type="checkbox"/>

5.44 Reaction J44

This is a reversible reaction of two reactants forming one product.

Name binding_Crk_C3G_to_pFRS2_pFRS2_dpEGFR_c_Cbl

Reaction equation



Reactants

Table 135: Properties of each reactant.

Id	Name	SBO
pFRS2_dpEGFR_c_Cbl		
Crk_C3G		

Product

Table 136: Properties of each product.

Id	Name	SBO
Crk_C3G_pFRS2_dpEGFR_c_Cbl		

Kinetic Law

Derived unit contains undeclared units

$$v_{44} = \text{vol}(c1) \cdot (J44_k1 \cdot [\text{pFRS2_dpEGFR_c_Cbl}] \cdot [\text{Crk_C3G}] - J44_k2 \cdot [\text{Crk_C3G_pFRS2_dpEGFR_c_Cbl}]) \quad (88)$$

Table 137: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J44_k1			1.0		✓
J44_k2			0.2		✓

5.45 Reaction J45

This is an irreversible reaction of one reactant forming one product.

Name Crk_C3G_pFRS2_dpEGFR_c_Cbl_ubiquitination

Reaction equation



Reactant

Table 138: Properties of each reactant.

Id	Name	SBO
Crk_C3G_pFRS2_dpEGFR_c_Cbl		

Product

Table 139: Properties of each product.

Id	Name	SBO
Crk_C3G_pFRS2_dpEGFR_c_Cbl_ubiq		

Kinetic Law

Derived unit contains undeclared units

$$v_{45} = \text{vol}(c1) \cdot J45_k \cdot [\text{Crk_C3G_pFRS2_dpEGFR_c_Cbl}] \quad (90)$$

Table 140: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J45_k			0.05		<input checked="" type="checkbox"/>

5.46 Reaction J46

This is an irreversible reaction of one reactant forming three products.

Name FRS2_dpEGFR_c_Cbl_ubiq_dissociation

Reaction equation



Reactant

Table 141: Properties of each reactant.

Id	Name	SBO
FRS2_dpEGFR_c_Cbl_ubiq		

Products

Table 142: Properties of each product.

Id	Name	SBO
proteosome	proteosome	
c_Cbl		
FRS2		

Kinetic Law

Derived unit contains undeclared units

$$v_{46} = \text{vol}(c1) \cdot J46_k \cdot [\text{FRS2_dpEGFR_c_Cbl_ubiq}] \quad (92)$$

Table 143: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J46_k			0.001		<input checked="" type="checkbox"/>

5.47 Reaction J47

This is an irreversible reaction of one reactant forming three products.

Name pFRS2_dpEGFR_c_Cbl_ubiq_dissociation

Reaction equation



Reactant

Table 144: Properties of each reactant.

Id	Name	SBO
pFRS2_dpEGFR_c_Cbl_ubiq		

Products

Table 145: Properties of each product.

Id	Name	SBO
proteosome	proteosome	
c_Cbl		
pFRS2		

Kinetic Law

Derived unit contains undeclared units

$$v_{47} = \text{vol}(c1) \cdot J47_k \cdot [\text{pFRS2_dpEGFR_c_Cbl_ubiq}] \quad (94)$$

Table 146: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J47_k			0.001		<input checked="" type="checkbox"/>

5.48 Reaction J49

This is a reversible reaction of two reactants forming one product.

Name binding_RasGAP_to_pDOK

Reaction equation



Reactants

Table 147: Properties of each reactant.

Id	Name	SBO
pDok		
RasGAP		

Product

Table 148: Properties of each product.

Id	Name	SBO
	pDok_RasGAP	

Kinetic Law

Derived unit contains undeclared units

$$v_{48} = \text{vol}(c1) \cdot (J49_k1 \cdot [\text{pDok}] \cdot [\text{RasGAP}] - J49_k2 \cdot [\text{pDok_RasGAP}]) \quad (96)$$

Table 149: Properties of each parameter.

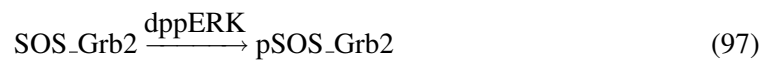
Id	Name	SBO	Value	Unit	Constant
J49_k1			0.12		<input checked="" type="checkbox"/>
J49_k2			0.01		<input checked="" type="checkbox"/>

5.49 Reaction J50

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Name SOS_Grb2_phosphorylation

Reaction equation



Reactant

Table 150: Properties of each reactant.

Id	Name	SBO
	SOS_Grb2	

Modifier

Table 151: Properties of each modifier.

Id	Name	SBO
	dppERK	

Product

Table 152: Properties of each product.

Id	Name	SBO
pSOS_Grb2		

Kinetic Law

Derived unit contains undeclared units

$$v_{49} = \text{vol}(c1) \cdot \frac{J50_Vmax \cdot [SOS_Grb2] \cdot [dppERK]}{J50_Km1 + [SOS_Grb2]} \quad (98)$$

Table 153: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J50_Vmax			1.000		<input checked="" type="checkbox"/>
J50_Km1			25.641		<input checked="" type="checkbox"/>

5.50 Reaction J51

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Name SOS_phosphorylation

Reaction equation



Reactant

Table 154: Properties of each reactant.

Id	Name	SBO
SOS		

Modifier

Table 155: Properties of each modifier.

Id	Name	SBO
	dppERK	

Product

Table 156: Properties of each product.

Id	Name	SBO
	pSOS	

Kinetic Law

Derived unit contains undeclared units

$$v_{50} = \text{vol}(c1) \cdot \frac{J51_Vmax \cdot [SOS] \cdot [dppERK]}{J51_Km1 + [SOS]} \quad (100)$$

Table 157: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
	J51_Vmax		1.000		<input checked="" type="checkbox"/>
	J51_Km1		25.641		<input checked="" type="checkbox"/>

5.51 Reaction J52

This is a reversible reaction of two reactants forming one product.

Name binding_c_Raf_to_Ras_GTP

Reaction equation



Reactants

Table 158: Properties of each reactant.

Id	Name	SBO
	c_Raf	

Id	Name	SBO
	Ras_GTP	

Product

Table 159: Properties of each product.

Id	Name	SBO
	c_Raf_Ras_GTP	

Kinetic Law

Derived unit contains undeclared units

$$v_{51} = \text{vol}(c1) \cdot (J52_k1 \cdot [c_Raf] \cdot [Ras_GTP] - J52_k2 \cdot [c_Raf_Ras_GTP]) \quad (102)$$

Table 160: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J52_k1			60.0		<input checked="" type="checkbox"/>
J52_k2			0.5		<input checked="" type="checkbox"/>

5.52 Reaction J53

This is a reversible reaction of two reactants forming one product.

Name binding_B_Raf_to_Rap1_GTP

Reaction equation



Reactants

Table 161: Properties of each reactant.

Id	Name	SBO
	Rap1_GTP	
	B_Raf	

Product

Table 162: Properties of each product.

Id	Name	SBO
	B_Raf_Rap1_GTP	

Kinetic Law

Derived unit contains undeclared units

$$v_{52} = \text{vol}(c1) \cdot (J53_k1 \cdot [\text{Rap1_GTP}] \cdot [\text{B_Raf}] - J53_k2 \cdot [\text{B_Raf_Rap1_GTP}]) \quad (104)$$

Table 163: Properties of each parameter.

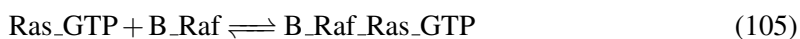
Id	Name	SBO	Value	Unit	Constant
J53_k1			60.0		<input checked="" type="checkbox"/>
J53_k2			0.5		<input checked="" type="checkbox"/>

5.53 Reaction J54

This is a reversible reaction of two reactants forming one product.

Name binding_B_Raf_to_Ras_GTP

Reaction equation



Reactants

Table 164: Properties of each reactant.

Id	Name	SBO
	Ras_GTP	
	B_Raf	

Product

Table 165: Properties of each product.

Id	Name	SBO
	B_Raf_Ras_GTP	

Kinetic Law

Derived unit contains undeclared units

$$v_{53} = \text{vol}(c1) \cdot (J54_k1 \cdot [\text{Ras_GTP}] \cdot [\text{B_Raf}] - J54_k2 \cdot [\text{B_Raf_Ras_GTP}]) \quad (106)$$

Table 166: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J54_k1			60.0		<input checked="" type="checkbox"/>
J54_k2			0.5		<input checked="" type="checkbox"/>

5.54 Reaction J57

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Name ppMEK_dephosphorylation

Reaction equation



Reactant

Table 167: Properties of each reactant.

Id	Name	SBO
	ppMEK	

Modifier

Table 168: Properties of each modifier.

Id	Name	SBO
	PP2A	

Product

Table 169: Properties of each product.

Id	Name	SBO
	pMEK	

Kinetic Law

Derived unit contains undeclared units

$$v_{54} = \frac{J57_Vmax \cdot [ppMEK] \cdot [PP2A]}{J57_Km1 + [ppMEK]} \quad (108)$$

Table 170: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J57_Vmax			3.000		<input checked="" type="checkbox"/>
J57_Km1			15.657		<input checked="" type="checkbox"/>

5.55 Reaction J58

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Name pMEK.dephosphorylation

Reaction equation



Reactant

Table 171: Properties of each reactant.

Id	Name	SBO
	pMEK	

Modifier

Table 172: Properties of each modifier.

Id	Name	SBO
PP2A		

Product

Table 173: Properties of each product.

Id	Name	SBO
MEK		

Kinetic Law

Derived unit contains undeclared units

$$v_{55} = \text{vol}(c1) \cdot \frac{J58_Vmax \cdot [pMEK] \cdot [PP2A]}{J58_Km1 + [pMEK]} \quad (110)$$

Table 174: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J58_Vmax			3.000		<input checked="" type="checkbox"/>
J58_Km1			15.657		<input checked="" type="checkbox"/>

5.56 Reaction J61

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Name ppMEK_ERK

Reaction equation



Reactant

Table 175: Properties of each reactant.

Id	Name	SBO
ppMEK_ERK		

Modifier

Table 176: Properties of each modifier.

Id	Name	SBO
PP2A		

Product

Table 177: Properties of each product.

Id	Name	SBO
pMEK_ERK		

Kinetic Law

Derived unit contains undeclared units

$$v_{56} = \text{vol}(c1) \cdot \frac{J61_Vmax \cdot [\text{ppMEK_ERK}] \cdot [\text{PP2A}]}{J61_Km1 + [\text{ppMEK_ERK}]} \quad (112)$$

Table 178: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J61_Vmax			3.000		✓
J61_Km1			15.657		✓

5.57 Reaction J62

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Name pMEK_ERK_dephosphorylation

Reaction equation



Reactant

Table 179: Properties of each reactant.

Id	Name	SBO
pMEK_ERK		

Modifier

Table 180: Properties of each modifier.

Id	Name	SBO
PP2A		

Product

Table 181: Properties of each product.

Id	Name	SBO
MEK_ERK		

Kinetic Law

Derived unit contains undeclared units

$$v_{57} = \text{vol}(c1) \cdot \frac{J62_V_{\max} \cdot [\text{pMEK_ERK}] \cdot [\text{PP2A}]}{J62_K_{m1} + [\text{pMEK_ERK}]} \quad (114)$$

Table 182: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J62_Vmax			3.000		<input checked="" type="checkbox"/>
J62_Km1			15.657		<input checked="" type="checkbox"/>

5.58 Reaction J63

This is a reversible reaction of one reactant forming one product.

Name ppERK_dimerization

Reaction equation



Reactant

Table 183: Properties of each reactant.

Id	Name	SBO
ppERK		

Product

Table 184: Properties of each product.

Id	Name	SBO
dppERK		

Kinetic Law

Derived unit contains undeclared units

$$v_{58} = \text{vol}(c1) \cdot (J63_k1 \cdot [\text{ppERK}] \cdot [\text{ppERK}] - J63_k2 \cdot [\text{dppERK}]) \quad (116)$$

Table 185: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J63_k1			10.000		<input checked="" type="checkbox"/>
J63_k2			0.075		<input checked="" type="checkbox"/>

5.59 Reaction J66

This is an irreversible reaction of one reactant forming one product.

Name Ras_GTP_dephosphorylation

Reaction equation



Reactant

Table 186: Properties of each reactant.

Id	Name	SBO
Ras_GTP		

Product

Table 187: Properties of each product.

Id	Name	SBO
Ras_GDP		

Kinetic Law

Derived unit contains undeclared units

$$v_{59} = \text{vol}(c1) \cdot J66.k \cdot [\text{Ras_GTP}] \quad (118)$$

Table 188: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J66_k			$1.667 \cdot 10^{-4}$		<input checked="" type="checkbox"/>

5.60 Reaction J67

This is an irreversible reaction of one reactant forming one product.

Name Rap1_GTP_dephosphorylation

Reaction equation



Reactant

Table 189: Properties of each reactant.

Id	Name	SBO
Rap1_GTP		

Product

Table 190: Properties of each product.

Id	Name	SBO
Rap1_GDP		

Kinetic Law

Derived unit contains undeclared units

$$v_{60} = \text{vol}(c1) \cdot J67_k \cdot [\text{Rap1_GTP}] \quad (120)$$

Table 191: Properties of each parameter.

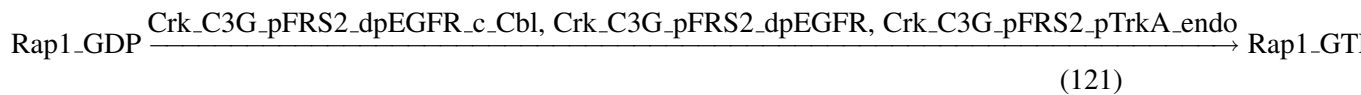
Id	Name	SBO	Value	Unit	Constant
J67_k			$1.166 \cdot 10^{-4}$		<input checked="" type="checkbox"/>

5.61 Reaction J68

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

Name Rap1_GTP_phosphorylation

Reaction equation



Reactant

Table 192: Properties of each reactant.

Id	Name	SBO
Rap1_GDP		

Modifiers

Table 193: Properties of each modifier.

Id	Name	SBO
Crk_C3G_pFRS2_dpEGFR_c_Cbl		
Crk_C3G_pFRS2_dpEGFR		
Crk_C3G_pFRS2_pTrkA_endo		

Product

Table 194: Properties of each product.

Id	Name	SBO
Rap1_GTP		

Kinetic Law

Derived unit contains undeclared units

$$v_{61} = \text{vol}(c1) \cdot \frac{J68_Vmax \cdot [Rap1_GDP] \cdot ([Crk_C3G_pFRS2_dpEGFR] + [Crk_C3G_pFRS2_dpEGFR_c_Cbl] + [Crk_C3G_pFRS2_dpEGFR_pTrkA_endo])}{J68_Km1 + [Rap1_GDP]} \quad (122)$$

Table 195: Properties of each parameter.

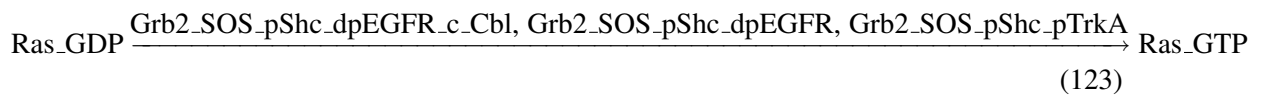
Id	Name	SBO	Value	Unit	Constant
J68_Vmax			0.024		<input checked="" type="checkbox"/>
J68_Km1			0.010		<input checked="" type="checkbox"/>

5.62 Reaction J69

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

Name Ras_GDP_phosphorylation

Reaction equation



Reactant

Table 196: Properties of each reactant.

Id	Name	SBO
Ras_GDP		

Modifiers

Table 197: Properties of each modifier.

Id	Name	SBO
Grb2_SOS_pShc_dpEGFR_c_Cbl		
Grb2_SOS_pShc_dpEGFR		
Grb2_SOS_pShc_pTrkA		

Product

Table 198: Properties of each product.

Id	Name	SBO
Ras_GTP		

Kinetic Law

Derived unit contains undeclared units

$$v_{62} = \text{vol}(c1) \cdot \frac{J69_V_{\max} \cdot [\text{Ras_GDP}] \cdot ([\text{Grb2_SOS_pShc_dpEGFR}] + [\text{Grb2_SOS_pShc_dpEGFR_c_Cbl}] + [\text{Grb2_SOS_pShc_dpEGFR_pTrkA}])}{J69_K_{m1} + [\text{Ras_GDP}]} \quad (124)$$

Table 199: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J69_Vmax			2.00		<input checked="" type="checkbox"/>
J69_Km1			0.02		<input checked="" type="checkbox"/>

5.63 Reaction J70

This is a reversible reaction of two reactants forming one product.

Name binding_NGF_to_NGFR

Reaction equation



Reactants

Table 200: Properties of each reactant.

Id	Name	SBO
NGF		
NGFR		

Product

Table 201: Properties of each product.

Id	Name	SBO
L_NGFR		

Kinetic Law

Derived unit contains undeclared units

$$v_{63} = \text{vol}(\text{compartment}) \cdot (J70_k1 \cdot [\text{NGF}] \cdot [\text{NGFR}] - J70_k2 \cdot [\text{L_NGFR}]) \quad (126)$$

Table 202: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J70_k1			6.200		<input checked="" type="checkbox"/>
J70_k2			$6.4 \cdot 10^{-5}$		<input checked="" type="checkbox"/>

5.64 Reaction J71

This is an irreversible reaction of one reactant forming one product.

Name TrkA_phosphorylation

Reaction equation



Reactant

Table 203: Properties of each reactant.

Id	Name	SBO
L_NGFR		

Product

Table 204: Properties of each product.

Id	Name	SBO
pTrkA		

Kinetic Law

Derived unit contains undeclared units

$$v_{64} = \text{vol}(\text{compartment}) \cdot J71_k \cdot [\text{L_NGFR}] \quad (128)$$

Table 205: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J71_k			1.0		<input checked="" type="checkbox"/>

5.65 Reaction J72

This is an irreversible reaction of one reactant forming one product.

Name pTrkA_intermalization

Reaction equation



Reactant

Table 206: Properties of each reactant.

Id	Name	SBO
pTrkA		

Product

Table 207: Properties of each product.

Id	Name	SBO
pTrkA_endo		

Kinetic Law

Derived unit contains undeclared units

$$v_{65} = \text{vol}(c1) \cdot J72_k \cdot [\text{pTrkA}] \quad (130)$$

Table 208: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J72_k			$6.3 \cdot 10^{-4}$		<input checked="" type="checkbox"/>

5.66 Reaction J73

This is an irreversible reaction of one reactant forming one product.

Name pTrkA_endo_degradation

Reaction equation



Reactant

Table 209: Properties of each reactant.

Id	Name	SBO
pTrkA_endo		

Product

Table 210: Properties of each product.

Id	Name	SBO
degradation		

Id	Name	SBO
----	------	-----

Kinetic Law

Derived unit contains undeclared units

$$v_{66} = \text{vol}(c1) \cdot J73_k \cdot [\text{pTrkA_endo}] \quad (132)$$

Table 211: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J73_k			$4.2 \cdot 10^{-4}$		<input checked="" type="checkbox"/>

5.67 Reaction J74

This is an irreversible reaction of one reactant forming one product.

Name pTrkA_degradation

Reaction equation



Reactant

Table 212: Properties of each reactant.

Id	Name	SBO
pTrkA		

Product

Table 213: Properties of each product.

Id	Name	SBO
degradation		

Kinetic Law

Derived unit contains undeclared units

$$v_{67} = \text{vol}(c1) \cdot J74_k \cdot [\text{pTrkA}] \quad (134)$$

Table 214: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J74_k			0.002		<input checked="" type="checkbox"/>

5.68 Reaction J75

This is a reversible reaction of two reactants forming one product.

Name binding_Shc_to_pTrkA

Reaction equation



Reactants

Table 215: Properties of each reactant.

Id	Name	SBO
Shc		
pTrkA		

Product

Table 216: Properties of each product.

Id	Name	SBO
Shc_pTrkA		

Kinetic Law

Derived unit contains undeclared units

$$v_{68} = \text{vol}(c1) \cdot (J75_k1 \cdot [\text{Shc}] \cdot [\text{pTrkA}] - J75_k2 \cdot [\text{Shc_pTrkA}]) \quad (136)$$

Table 217: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J75_k1			10.0		<input checked="" type="checkbox"/>
J75_k2			0.2		<input checked="" type="checkbox"/>

5.69 Reaction J76

This is a reversible reaction of two reactants forming one product.

Name binding_pShc_to_pTrkA

Reaction equation



Reactants

Table 218: Properties of each reactant.

Id	Name	SBO
pShc		
pTrkA		

Product

Table 219: Properties of each product.

Id	Name	SBO
pShc_pTrkA		

Kinetic Law

Derived unit contains undeclared units

$$v_{69} = \text{vol}(c1) \cdot (J76_k1 \cdot [\text{pShc}] \cdot [\text{pTrkA}] - J76_k2 \cdot [\text{pShc_pTrkA}]) \quad (138)$$

Table 220: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J76_k1			10.0		<input checked="" type="checkbox"/>
J76_k2			0.2		<input checked="" type="checkbox"/>

5.70 Reaction J77

This is a reversible reaction of two reactants forming one product.

Name binding_FRS2_to_pTrkA

Reaction equation



Reactants

Table 221: Properties of each reactant.

Id	Name	SBO
FRS2		
pTrkA		

Product

Table 222: Properties of each product.

Id	Name	SBO
FRS2_pTrkA		

Kinetic Law

Derived unit contains undeclared units

$$v_{70} = \text{vol}(c1) \cdot (J77_k1 \cdot [\text{FRS2}] \cdot [\text{pTrkA}] - J77_k2 \cdot [\text{FRS2_pTrkA}]) \quad (140)$$

Table 223: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J77_k1			5.0		<input checked="" type="checkbox"/>
J77_k2			0.1		<input checked="" type="checkbox"/>

5.71 Reaction J78

This is a reversible reaction of two reactants forming one product.

Name binding_pFRS2_to_pTrkA

Reaction equation



Reactants

Table 224: Properties of each reactant.

Id	Name	SBO
pFRS2		
pTrkA		

Product

Table 225: Properties of each product.

Id	Name	SBO
pFRS2.pTrkA		

Kinetic Law

Derived unit contains undeclared units

$$v_{71} = \text{vol}(c1) \cdot (J78_k1 \cdot [\text{pFRS2}] \cdot [\text{pTrkA}] - J78_k2 \cdot [\text{pFRS2.pTrkA}]) \quad (142)$$

Table 226: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J78_k1			5.0		<input checked="" type="checkbox"/>
J78_k2			0.1		<input checked="" type="checkbox"/>

5.72 Reaction J79

This is a reversible reaction of two reactants forming one product.

Name binding_Shc_to_pTrkA_endo

Reaction equation



Reactants

Table 227: Properties of each reactant.

Id	Name	SBO
pTrkA_endo		
Shc		

Product

Table 228: Properties of each product.

Id	Name	SBO
Shc_pTrkA_endo		

Kinetic Law

Derived unit contains undeclared units

$$v_{72} = \text{vol}(c1) \cdot (J79_k1 \cdot [\text{pTrkA_endo}] \cdot [\text{Shc}] - J79_k2 \cdot [\text{Shc_pTrkA_endo}]) \quad (144)$$

Table 229: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J79_k1			10.0		<input checked="" type="checkbox"/>
J79_k2			0.2		<input checked="" type="checkbox"/>

5.73 Reaction J80

This is a reversible reaction of two reactants forming one product.

Name binding_pShc_to_pTrkA_endo

Reaction equation



Reactants

Table 230: Properties of each reactant.

Id	Name	SBO
pTrkA_endo		
pShc		

Product

Table 231: Properties of each product.

Id	Name	SBO
pShc_pTrkA_endo		

Kinetic Law

Derived unit contains undeclared units

$$v_{73} = \text{vol}(c1) \cdot (J80_k1 \cdot [\text{pTrkA_endo}] \cdot [\text{pShc}] - J80_k2 \cdot [\text{pShc_pTrkA_endo}]) \quad (146)$$

Table 232: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J80_k1			10.0		<input checked="" type="checkbox"/>
J80_k2			0.2		<input checked="" type="checkbox"/>

5.74 Reaction J81

This is an irreversible reaction of one reactant forming one product.

Name Shc_pTrkA_endo_phosphorylation

Reaction equation



Reactant

Table 233: Properties of each reactant.

Id	Name	SBO
Shc_pTrkA_endo		

Product

Table 234: Properties of each product.

Id	Name	SBO
	pShc_pTrkA_endo	

Kinetic Law

Derived unit contains undeclared units

$$v_{74} = \text{vol}(c1) \cdot J81_k \cdot [\text{Shc_pTrkA_endo}] \quad (148)$$

Table 235: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J81_k			0.1		<input checked="" type="checkbox"/>

5.75 Reaction J82

This is an irreversible reaction of one reactant forming one product.

Name Shc_pTrkA_phosphorylation

Reaction equation



Reactant

Table 236: Properties of each reactant.

Id	Name	SBO
	Shc_pTrkA	

Product

Table 237: Properties of each product.

Id	Name	SBO
	pShc_pTrkA	

Id	Name	SBO
----	------	-----

Kinetic Law

Derived unit contains undeclared units

$$v_{75} = \text{vol}(c1) \cdot J82_k \cdot [\text{Shc_pTrkA}] \quad (150)$$

Table 238: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J82_k			0.1		<input checked="" type="checkbox"/>

5.76 Reaction J83

This is an irreversible reaction of one reactant forming one product.

Name pFRS2_pTrkA_phosphorylation

Reaction equation



Reactant

Table 239: Properties of each reactant.

Id	Name	SBO
FRS2_pTrkA		

Product

Table 240: Properties of each product.

Id	Name	SBO
pFRS2_pTrkA		

Kinetic Law

Derived unit contains undeclared units

$$v_{76} = \text{vol}(c1) \cdot J83_k \cdot [\text{FRS2_pTrkA}] \quad (152)$$

Table 241: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J83_k			2.0		<input checked="" type="checkbox"/>

5.77 Reaction J84

This is a reversible reaction of two reactants forming one product.

Name binding_FRS2_to_pTrkA_endo

Reaction equation



Reactants

Table 242: Properties of each reactant.

Id	Name	SBO
	pTrkA_endo	
	FRS2	

Product

Table 243: Properties of each product.

Id	Name	SBO
	FRS2_pTrkA_endo	

Kinetic Law

Derived unit contains undeclared units

$$v_{77} = \text{vol}(c1) \cdot (J84_k1 \cdot [\text{pTrkA_endo}] \cdot [\text{FRS2}] - J84_k2 \cdot [\text{FRS2_pTrkA_endo}]) \quad (154)$$

Table 244: Properties of each parameter.

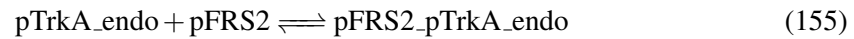
Id	Name	SBO	Value	Unit	Constant
J84_k1			5.0		<input checked="" type="checkbox"/>
J84_k2			0.1		<input checked="" type="checkbox"/>

5.78 Reaction J85

This is a reversible reaction of two reactants forming one product.

Name binding_pFRS2_to_pTrkA_endo

Reaction equation



Reactants

Table 245: Properties of each reactant.

Id	Name	SBO
	pTrkA_endo	
	pFRS2	

Product

Table 246: Properties of each product.

Id	Name	SBO
	pFRS2_pTrkA_endo	

Kinetic Law

Derived unit contains undeclared units

$$v_{78} = \text{vol}(c1) \cdot (J85_k1 \cdot [\text{pTrkA_endo}] \cdot [\text{pFRS2}] - J85_k2 \cdot [\text{pFRS2_pTrkA_endo}]) \quad (156)$$

Table 247: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J85_k1			5.0		<input checked="" type="checkbox"/>
J85_k2			0.1		<input checked="" type="checkbox"/>

5.79 Reaction J86

This is an irreversible reaction of one reactant forming one product.

Name FRS2_pTrkA_endo_phosphorylation

Reaction equation



Reactant

Table 248: Properties of each reactant.

Id	Name	SBO
FRS2_pTrkA_endo		

Product

Table 249: Properties of each product.

Id	Name	SBO
pFRS2_pTrkA_endo		

Kinetic Law

Derived unit contains undeclared units

$$v_{79} = \text{vol}(c1) \cdot J86_k \cdot [\text{FRS2_pTrkA_endo}] \quad (158)$$

Table 250: Properties of each parameter.

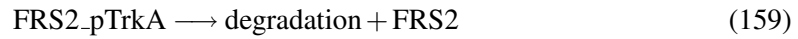
Id	Name	SBO	Value	Unit	Constant
J86_k			2.0		<input checked="" type="checkbox"/>

5.80 Reaction J87

This is an irreversible reaction of one reactant forming two products.

Name FRS2_pTrkA_degradation

Reaction equation



Reactant

Table 251: Properties of each reactant.

Id	Name	SBO
FRS2_pTrkA		

Products

Table 252: Properties of each product.

Id	Name	SBO
degradation		
FRS2		

Kinetic Law

Derived unit contains undeclared units

$$v_{80} = \text{vol}(c1) \cdot J87_k \cdot [\text{FRS2_pTrkA}] \quad (160)$$

Table 253: Properties of each parameter.

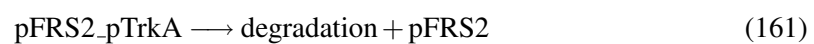
Id	Name	SBO	Value	Unit	Constant
J87_k			0.002		<input checked="" type="checkbox"/>

5.81 Reaction J88

This is an irreversible reaction of one reactant forming two products.

Name pFRS2_pTrkA_degradation

Reaction equation



Reactant

Table 254: Properties of each reactant.

Id	Name	SBO
pFRS2_pTrkA		

Products

Table 255: Properties of each product.

Id	Name	SBO
degradation		
pFRS2		

Kinetic Law

Derived unit contains undeclared units

$$v_{81} = \text{vol}(c1) \cdot J88_k \cdot [\text{pFRS2_pTrkA}] \quad (162)$$

Table 256: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J88_k			0.002		<input checked="" type="checkbox"/>

5.82 Reaction J89

This is an irreversible reaction of one reactant forming two products.

Name Shc_pTrkA_degradation

Reaction equation



Reactant

Table 257: Properties of each reactant.

Id	Name	SBO
Shc_pTrkA		

Products

Table 258: Properties of each product.

Id	Name	SBO
	degradation	
	Shc	

Kinetic Law

Derived unit contains undeclared units

$$v_{82} = \text{vol}(c1) \cdot J89_k \cdot [\text{Shc_pTrkA}] \quad (164)$$

Table 259: Properties of each parameter.

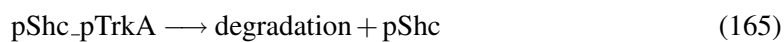
Id	Name	SBO	Value	Unit	Constant
J89_k			0.002		<input checked="" type="checkbox"/>

5.83 Reaction J90

This is an irreversible reaction of one reactant forming two products.

Name pShc_pTrkA_degradation

Reaction equation



Reactant

Table 260: Properties of each reactant.

Id	Name	SBO
	pShc_pTrkA	

Products

Table 261: Properties of each product.

Id	Name	SBO
	degradation	
	pShc	

Kinetic Law

Derived unit contains undeclared units

$$v_{83} = \text{vol}(c1) \cdot J90_k \cdot [\text{pShc_pTrkA}] \quad (166)$$

Table 262: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J90_k			0.002		<input checked="" type="checkbox"/>

5.84 Reaction J92

This is an irreversible reaction of one reactant forming two products.

Name FRS2_pTrkA_endo_degradation

Reaction equation



Reactant

Table 263: Properties of each reactant.

Id	Name	SBO
	FRS2_pTrkA_endo	

Products

Table 264: Properties of each product.

Id	Name	SBO
	degradation	
	FRS2	

Kinetic Law

Derived unit contains undeclared units

$$v_{84} = \text{vol}(c1) \cdot J92_k \cdot [\text{FRS2_pTrkA_endo}] \quad (168)$$

Table 265: Properties of each parameter.

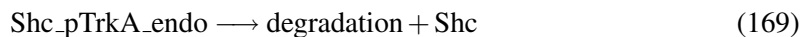
Id	Name	SBO	Value	Unit	Constant
J92_k			$4.2 \cdot 10^{-4}$		<input checked="" type="checkbox"/>

5.85 Reaction J93

This is an irreversible reaction of one reactant forming two products.

Name Shc_pTrkA_endo_degradation

Reaction equation



Reactant

Table 266: Properties of each reactant.

Id	Name	SBO
Shc_pTrkA_endo		

Products

Table 267: Properties of each product.

Id	Name	SBO
degradation		
Shc		

Kinetic Law

Derived unit contains undeclared units

$$v_{85} = \text{vol}(c1) \cdot J93_k \cdot [\text{Shc_pTrkA_endo}] \quad (170)$$

Table 268: Properties of each parameter.

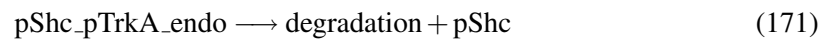
Id	Name	SBO	Value	Unit	Constant
J93_k			$4.2 \cdot 10^{-4}$		<input checked="" type="checkbox"/>

5.86 Reaction J94

This is an irreversible reaction of one reactant forming two products.

Name pShc_pTrkA_endo_degradation

Reaction equation



Reactant

Table 269: Properties of each reactant.

Id	Name	SBO
pShc_pTrkA_endo		

Products

Table 270: Properties of each product.

Id	Name	SBO
degradation		
pShc		

Kinetic Law

Derived unit contains undeclared units

$$v_{86} = \text{vol}(c1) \cdot J94_k \cdot [\text{pShc_pTrkA_endo}] \quad (172)$$

Table 271: Properties of each parameter.

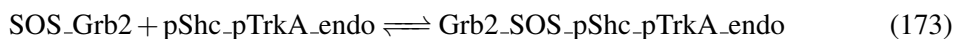
Id	Name	SBO	Value	Unit	Constant
J94_k			$4.2 \cdot 10^{-4}$		<input checked="" type="checkbox"/>

5.87 Reaction J95

This is a reversible reaction of two reactants forming one product.

Name binding_Grb2_SOS_to_pShc_pTrkA_endo

Reaction equation



Reactants

Table 272: Properties of each reactant.

Id	Name	SBO
SOS_Grb2		
pShc_pTrkA_endo		

Product

Table 273: Properties of each product.

Id	Name	SBO
Grb2_SOS_pShc_pTrkA_endo		

Kinetic Law

Derived unit contains undeclared units

$$v_{87} = \text{vol}(c1) \cdot (J95_k1 \cdot [\text{SOS_Grb2}] \cdot [\text{pShc_pTrkA_endo}] - J95_k2 \cdot [\text{Grb2_SOS_pShc_pTrkA_endo}]) \quad (174)$$

Table 274: Properties of each parameter.

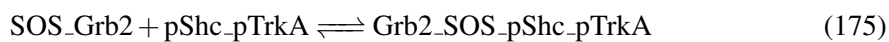
Id	Name	SBO	Value	Unit	Constant
J95_k1			10.0		<input checked="" type="checkbox"/>
J95_k2			0.2		<input checked="" type="checkbox"/>

5.88 Reaction J96

This is a reversible reaction of two reactants forming one product.

Name binding_Grb2_SOS_to_pShc_pTrkA

Reaction equation



Reactants

Table 275: Properties of each reactant.

Id	Name	SBO
SOS_Grb2		
pShc_pTrkA		

Product

Table 276: Properties of each product.

Id	Name	SBO
Grb2_SOS_pShc_pTrkA		

Kinetic Law

Derived unit contains undeclared units

$$v_{88} = \text{vol}(c1) \cdot (J96_k1 \cdot [\text{SOS_Grb2}] \cdot [\text{pShc_pTrkA}] - J96_k2 \cdot [\text{Grb2_SOS_pShc_pTrkA}]) \quad (176)$$

Table 277: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J96_k1			10.0		✓
J96_k2			0.2		✓

5.89 Reaction J97

This is an irreversible reaction of one reactant forming one product.

Name Grb2_SOS_pShc_pTrkA_ubiquitination

Reaction equation



Reactant

Table 278: Properties of each reactant.

Id	Name	SBO
	Grb2_SOS_pShc_pTrkA	

Product

Table 279: Properties of each product.

Id	Name	SBO
	Grb2_SOS_pShc_pTrkA_endo	

Kinetic Law

Derived unit contains undeclared units

$$v_{89} = \text{vol}(c1) \cdot J97_k \cdot [\text{Grb2_SOS_pShc_pTrkA}] \quad (178)$$

Table 280: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J97_k			$6.3 \cdot 10^{-4}$		<input checked="" type="checkbox"/>

5.90 Reaction J98

This is an irreversible reaction of one reactant forming one product.

Name Crk_C3G_pFRS2_pTrkA_ubiquitination

Reaction equation



Reactant

Table 281: Properties of each reactant.

Id	Name	SBO
	Crk_C3G_pFRS2_pTrkA	

Product

Table 282: Properties of each product.

Id	Name	SBO
	Crk_C3G_pFRS2_pTrkA_endo	

Kinetic Law

Derived unit contains undeclared units

$$v_{90} = \text{vol}(c1) \cdot J98_k \cdot [\text{Crk_C3G_pFRS2_pTrkA}] \quad (180)$$

Table 283: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J98_k			$6.3 \cdot 10^{-4}$		<input checked="" type="checkbox"/>

5.91 Reaction J99

This is an irreversible reaction of one reactant forming one product.

Name pFRS2_pTrkA_ubiquitination

Reaction equation



Reactant

Table 284: Properties of each reactant.

Id	Name	SBO
	pFRS2_pTrkA	

Product

Table 285: Properties of each product.

Id	Name	SBO
	pFRS2_pTrkA_endo	

Id	Name	SBO
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Kinetic Law

Derived unit contains undeclared units

$$v_{91} = \text{vol}(c1) \cdot J99_k \cdot [\text{pFRS2_pTrkA}] \quad (182)$$

Table 286: Properties of each parameter.

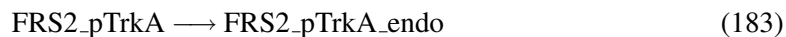
Id	Name	SBO	Value	Unit	Constant
J99_k			$6.3 \cdot 10^{-4}$		<input checked="" type="checkbox"/>

5.92 Reaction J100

This is an irreversible reaction of one reactant forming one product.

Name FRS2_pTrkA_ubiquitination

Reaction equation



Reactant

Table 287: Properties of each reactant.

Id	Name	SBO
FRS2_pTrkA		

Product

Table 288: Properties of each product.

Id	Name	SBO
FRS2_pTrkA_endo		

Kinetic Law

Derived unit contains undeclared units

$$v_{92} = \text{vol}(c1) \cdot J100_k \cdot [\text{FRS2_pTrkA}] \quad (184)$$

Table 289: Properties of each parameter.

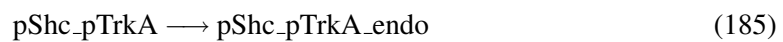
Id	Name	SBO	Value	Unit	Constant
J100_k			$6.3 \cdot 10^{-4}$		<input checked="" type="checkbox"/>

5.93 Reaction J101

This is an irreversible reaction of one reactant forming one product.

Name pShc_pTrkA_ubiquitination

Reaction equation



Reactant

Table 290: Properties of each reactant.

Id	Name	SBO
pShc_pTrkA		

Product

Table 291: Properties of each product.

Id	Name	SBO
pShc_pTrkA_endo		

Kinetic Law

Derived unit contains undeclared units

$$v_{93} = \text{vol}(c1) \cdot J101_k \cdot [\text{pShc_pTrkA}] \quad (186)$$

Table 292: Properties of each parameter.

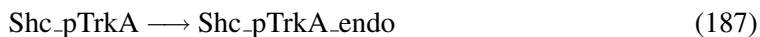
Id	Name	SBO	Value	Unit	Constant
J101_k			$6.3 \cdot 10^{-4}$		<input checked="" type="checkbox"/>

5.94 Reaction J102

This is an irreversible reaction of one reactant forming one product.

Name Shc_pTrkA_ubiquitination

Reaction equation



Reactant

Table 293: Properties of each reactant.

Id	Name	SBO
Shc_pTrkA		

Product

Table 294: Properties of each product.

Id	Name	SBO
Shc_pTrkA_endo		

Kinetic Law

Derived unit contains undeclared units

$$v_{94} = \text{vol}(c1) \cdot J102_k \cdot [\text{Shc_pTrkA}] \quad (188)$$

Table 295: Properties of each parameter.

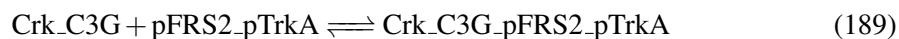
Id	Name	SBO	Value	Unit	Constant
J102_k			$6.3 \cdot 10^{-4}$		✓

5.95 Reaction J103

This is a reversible reaction of two reactants forming one product.

Name binding_Crk_C3G_to_pFRS2_pTrkA

Reaction equation



Reactants

Table 296: Properties of each reactant.

Id	Name	SBO
Crk_C3G		
pFRS2_pTrkA		

Product

Table 297: Properties of each product.

Id	Name	SBO
Crk_C3G_pFRS2_pTrkA		

Kinetic Law

Derived unit contains undeclared units

$$v_{95} = \text{vol}(c1) \cdot (J103_k1 \cdot [\text{Crk_C3G}] \cdot [\text{pFRS2_pTrkA}] - J103_k2 \cdot [\text{Crk_C3G_pFRS2_pTrkA}]) \quad (190)$$

Table 298: Properties of each parameter.

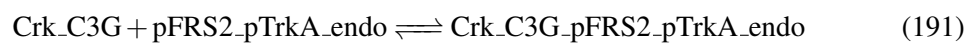
Id	Name	SBO	Value	Unit	Constant
J103_k1			1.0		<input checked="" type="checkbox"/>
J103_k2			0.2		<input checked="" type="checkbox"/>

5.96 Reaction J104

This is a reversible reaction of two reactants forming one product.

Name binding_Crk_C3G_to_pFRS2_pTrkA_endo

Reaction equation



Reactants

Table 299: Properties of each reactant.

Id	Name	SBO
Crk_C3G		
pFRS2_pTrkA_endo		

Product

Table 300: Properties of each product.

Id	Name	SBO
Crk_C3G_pFRS2_pTrkA_endo		

Kinetic Law

Derived unit contains undeclared units

$$v_{96} = \text{vol}(c1) \cdot (J104_k1 \cdot [\text{Crk_C3G}] \cdot [\text{pFRS2_pTrkA_endo}] - J104_k2 \cdot [\text{Crk_C3G_pFRS2_pTrkA_endo}]) \quad (192)$$

Table 301: Properties of each parameter.

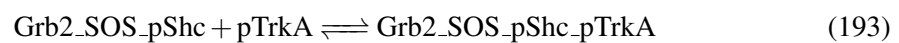
Id	Name	SBO	Value	Unit	Constant
J104_k1			1.0		<input checked="" type="checkbox"/>
J104_k2			0.2		<input checked="" type="checkbox"/>

5.97 Reaction J105

This is a reversible reaction of two reactants forming one product.

Name binding_Grb2_SOS_pShc_to_pTrkA

Reaction equation



Reactants

Table 302: Properties of each reactant.

Id	Name	SBO
Grb2_SOS_pShc		
pTrkA		

Product

Table 303: Properties of each product.

Id	Name	SBO
Grb2_SOS_pShc_pTrkA		

Kinetic Law

Derived unit contains undeclared units

$$v_{97} = \text{vol}(c1) \cdot (J105_k1 \cdot [\text{Grb2_SOS_pShc}] \cdot [\text{pTrkA}] - J105_k2 \cdot [\text{Grb2_SOS_pShc_pTrkA}]) \quad (194)$$

Table 304: Properties of each parameter.

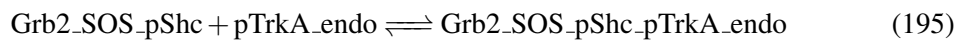
Id	Name	SBO	Value	Unit	Constant
J105_k1			10.0		<input checked="" type="checkbox"/>
J105_k2			0.2		<input checked="" type="checkbox"/>

5.98 Reaction J106

This is a reversible reaction of two reactants forming one product.

Name binding_Grb2_SOS_pShc_to_pTrkA_endo

Reaction equation



Reactants

Table 305: Properties of each reactant.

Id	Name	SBO
Grb2_SOS_pShc		
pTrkA_endo		

Product

Table 306: Properties of each product.

Id	Name	SBO
Grb2_SOS_pShc_pTrkA_endo		

Kinetic Law

Derived unit contains undeclared units

$$v_{98} = \text{vol}(c1) \cdot (J106_k1 \cdot [\text{Grb2_SOS_pShc}] \cdot [\text{pTrkA_endo}] - J106_k2 \cdot [\text{Grb2_SOS_pShc_pTrkA_endo}]) \quad (196)$$

Table 307: Properties of each parameter.

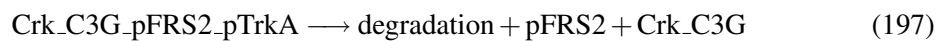
Id	Name	SBO	Value	Unit	Constant
J106_k1			10.0		<input checked="" type="checkbox"/>
J106_k2			0.2		<input checked="" type="checkbox"/>

5.99 Reaction J107

This is an irreversible reaction of one reactant forming three products.

Name Crk_C3G_pFRS2_pTrkA_degradation

Reaction equation



Reactant

Table 308: Properties of each reactant.

Id	Name	SBO
Crk_C3G_pFRS2_pTrkA		

Products

Table 309: Properties of each product.

Id	Name	SBO
degradation		
pFRS2		
Crk_C3G		

Kinetic Law

Derived unit contains undeclared units

$$v_{99} = \text{vol}(c1) \cdot J107_k \cdot [\text{Crk_C3G_pFRS2_pTrkA}] \quad (198)$$

Table 310: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J107_k			0.002		<input checked="" type="checkbox"/>

5.100 Reaction J108

This is an irreversible reaction of one reactant forming three products.

Name Crk_C3G_pFRS2_pTrkA_endo_degradation

Reaction equation



Reactant

Table 311: Properties of each reactant.

Id	Name	SBO
Crk_C3G_pFRS2_pTrkA_endo		

Products

Table 312: Properties of each product.

Id	Name	SBO
degradation	Crk_C3G	pFRS2

Kinetic Law

Derived unit contains undeclared units

$$v_{100} = \text{vol}(c1) \cdot J108_k \cdot [\text{Crk_C3G_pFRS2_pTrkA_endo}] \quad (200)$$

Table 313: Properties of each parameter.

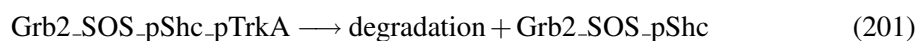
Id	Name	SBO	Value	Unit	Constant
J108_k			$4.2 \cdot 10^{-4}$		<input checked="" type="checkbox"/>

5.101 Reaction J109

This is an irreversible reaction of one reactant forming two products.

Name Grb2_SOS_pShc_pTrkA_degradation

Reaction equation



Reactant

Table 314: Properties of each reactant.

Id	Name	SBO
Grb2_SOS_pShc_pTrkA		

Products

Table 315: Properties of each product.

Id	Name	SBO
	degradation	
	Grb2_SOS_pShc	

Kinetic Law

Derived unit contains undeclared units

$$v_{101} = \text{vol}(c1) \cdot J109_k \cdot [\text{Grb2_SOS_pShc_pTrkA}] \quad (202)$$

Table 316: Properties of each parameter.

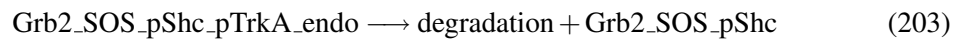
Id	Name	SBO	Value	Unit	Constant
J109_k			0.002		<input checked="" type="checkbox"/>

5.102 Reaction J110

This is an irreversible reaction of one reactant forming two products.

Name Grb2_SOS_pShc_pTrkA_endo_degradation

Reaction equation



Reactant

Table 317: Properties of each reactant.

Id	Name	SBO
	Grb2_SOS_pShc_pTrkA_endo	

Products

Table 318: Properties of each product.

Id	Name	SBO
	degradation	
	Grb2_SOS_pShc	

Kinetic Law

Derived unit contains undeclared units

$$v_{102} = \text{vol}(c1) \cdot J110_k \cdot [\text{Grb2_SOS_pShc_pTrkA_endo}] \quad (204)$$

Table 319: Properties of each parameter.

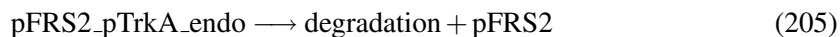
Id	Name	SBO	Value	Unit	Constant
J110_k			$4.2 \cdot 10^{-4}$		✓

5.103 Reaction J112

This is an irreversible reaction of one reactant forming two products.

Name pFRS2_pTrkA_endo_degradation

Reaction equation



Reactant

Table 320: Properties of each reactant.

Id	Name	SBO
pFRS2_pTrkA_endo		

Products

Table 321: Properties of each product.

Id	Name	SBO
degradation		
pFRS2		

Kinetic Law

Derived unit contains undeclared units

$$v_{103} = J112_k \cdot [\text{pFRS2_pTrkA_endo}] \quad (206)$$

Table 322: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J112_k			$4.2 \cdot 10^{-4}$		<input checked="" type="checkbox"/>

5.104 Reaction J113

This is a reversible reaction of one reactant forming one product.

Name form_NGFreceptor

Reaction equation



Reactant

Table 323: Properties of each reactant.

Id	Name	SBO
pro_TrkA		

Product

Table 324: Properties of each product.

Id	Name	SBO
NGFR		

Kinetic Law

Derived unit contains undeclared units

$$v_{104} = \text{vol}(\text{compartment}) \cdot (J113_k1 \cdot [\text{pro_TrkA}] - J113_k2 \cdot [\text{NGFR}]) \quad (208)$$

Table 325: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J113_k1			$8.333 \cdot 10^{-4}$		<input checked="" type="checkbox"/>
J113_k2			$2.7778 \cdot 10^{-4}$		<input checked="" type="checkbox"/>

5.105 Reaction J115

This is a reversible reaction of two reactants forming one product.

Name binding_Shc_to_dpEGFR_c_Cbl

Reaction equation



Reactants

Table 326: Properties of each reactant.

Id	Name	SBO
Shc		
dpEGFR_c_Cbl		

Product

Table 327: Properties of each product.

Id	Name	SBO
Shc_dpEGFR_c_Cbl		

Kinetic Law

Derived unit contains undeclared units

$$v_{105} = \text{vol}(c1) \cdot (J115_k1 \cdot [\text{Shc}] \cdot [\text{dpEGFR_c_Cbl}] - J115_k2 \cdot [\text{Shc_dpEGFR_c_Cbl}]) \quad (210)$$

Table 328: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J115_k1			10.0		<input checked="" type="checkbox"/>
J115_k2			0.2		<input checked="" type="checkbox"/>

5.106 Reaction J116

This is a reversible reaction of two reactants forming one product.

Name binding_pShc_to_dpEGFR_c_Cbl

Reaction equation



Reactants

Table 329: Properties of each reactant.

Id	Name	SBO
dpEGFR_c_Cbl		
pShc		

Product

Table 330: Properties of each product.

Id	Name	SBO
pShc_dpEGFR_c_Cbl		

Kinetic Law

Derived unit contains undeclared units

$$v_{106} = \text{vol}(c1) \cdot (J116_k1 \cdot [\text{dpEGFR_c_Cbl}] \cdot [\text{pShc}] - J116_k2 \cdot [\text{pShc_dpEGFR_c_Cbl}]) \quad (212)$$

Table 331: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J116_k1			10.0		<input checked="" type="checkbox"/>
J116_k2			0.2		<input checked="" type="checkbox"/>

5.107 Reaction J117

This is a reversible reaction of two reactants forming one product.

Name binding_SOS_Grb2_to_pShc_dpEGFR_c_Cbl

Reaction equation



Reactants

Table 332: Properties of each reactant.

Id	Name	SBO
pShc_dpEGFR_c_Cbl		
SOS_Grb2		

Product

Table 333: Properties of each product.

Id	Name	SBO
Grb2_SOS_pShc_dpEGFR_c_Cbl		

Kinetic Law

Derived unit contains undeclared units

$$v_{107} = \text{vol}(c1) \cdot (J117_k1 \cdot [\text{pShc_dpEGFR_c_Cbl}] \cdot [\text{SOS_Grb2}] - J117_k2 \cdot [\text{Grb2_SOS_pShc_dpEGFR_c_Cbl}]) \quad (214)$$

Table 334: Properties of each parameter.

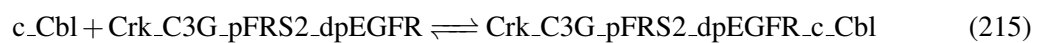
Id	Name	SBO	Value	Unit	Constant
J117_k1			10.0		<input checked="" type="checkbox"/>
J117_k2			0.2		<input checked="" type="checkbox"/>

5.108 Reaction J119

This is a reversible reaction of two reactants forming one product.

Name binding_c_Cbl_to_Crk_C3G_pFRS2_dpEGFR

Reaction equation



Reactants

Table 335: Properties of each reactant.

Id	Name	SBO
c_Cbl		
Crk_C3G_pFRS2_dpEGFR		

Product

Table 336: Properties of each product.

Id	Name	SBO
Crk_C3G_pFRS2_dpEGFR_c_Cbl		

Kinetic Law

Derived unit contains undeclared units

$$v_{108} = \text{vol}(c1) \cdot (J119_k1 \cdot [c_Cbl] \cdot [Crk_C3G_pFRS2_dpEGFR] - J119_k2 \cdot [Crk_C3G_pFRS2_dpEGFR_c_Cbl]) \quad (216)$$

Table 337: Properties of each parameter.

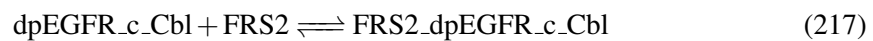
Id	Name	SBO	Value	Unit	Constant
J119_k1			0.5		<input checked="" type="checkbox"/>
J119_k2			0.2		<input checked="" type="checkbox"/>

5.109 Reaction J118

This is a reversible reaction of two reactants forming one product.

Name binding_FRS2_to_dpEGFR_c_Cbl

Reaction equation



Reactants

Table 338: Properties of each reactant.

Id	Name	SBO
dpEGFR_c_Cbl		
FRS2		

Product

Table 339: Properties of each product.

Id	Name	SBO
FRS2_dpEGFR_c_Cbl		

Kinetic Law

Derived unit contains undeclared units

$$v_{109} = \text{vol}(c1) \cdot (J118_k1 \cdot [\text{dpEGFR_c_Cbl}] \cdot [\text{FRS2}] - J118_k2 \cdot [\text{FRS2_dpEGFR_c_Cbl}]) \quad (218)$$

Table 340: Properties of each parameter.

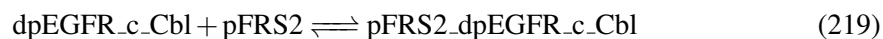
Id	Name	SBO	Value	Unit	Constant
J118_k1			1.0		<input checked="" type="checkbox"/>
J118_k2			0.2		<input checked="" type="checkbox"/>

5.110 Reaction J120

This is a reversible reaction of two reactants forming one product.

Name binding_pFRS2.to_dpEGFR_c_Cbl

Reaction equation



Reactants

Table 341: Properties of each reactant.

Id	Name	SBO
dpEGFR_c_Cbl		

Id	Name	SBO
pFRS2		

Product

Table 342: Properties of each product.

Id	Name	SBO
pFRS2_dpEGFR_c_Cbl		

Kinetic Law

Derived unit contains undeclared units

$$v_{110} = \text{vol}(c1) \cdot (J120_k1 \cdot [\text{dpEGFR_c_Cbl}] \cdot [\text{pFRS2}] - J120_k2 \cdot [\text{pFRS2_dpEGFR_c_Cbl}]) \quad (220)$$

Table 343: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J120_k1			1.0		<input checked="" type="checkbox"/>
J120_k2			0.2		<input checked="" type="checkbox"/>

5.111 Reaction J121

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Name Ras_GTP_dephosphorylation

Reaction equation



Reactant

Table 344: Properties of each reactant.

Id	Name	SBO
Ras_GTP		

Modifier

Table 345: Properties of each modifier.

Id	Name	SBO
pDok_RasGAP		

Product

Table 346: Properties of each product.

Id	Name	SBO
Ras_GDP		

Kinetic Law

Derived unit contains undeclared units

$$v_{111} = \text{vol}(c1) \cdot \frac{J121_Vmax \cdot [\text{Ras_GTP}] \cdot [\text{pDok_RasGAP}]}{J121_Km1 + [\text{Ras_GTP}]} \quad (222)$$

Table 347: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J121_Vmax			10.0		<input checked="" type="checkbox"/>
J121_Km1			1.0		<input checked="" type="checkbox"/>

5.112 Reaction J122

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Name RAP1_GTP_dephosphorylation

Reaction equation



Reactant

Table 348: Properties of each reactant.

Id	Name	SBO
Rap1_GTP		

Modifier

Table 349: Properties of each modifier.

Id	Name	SBO
Rap1GAP		

Product

Table 350: Properties of each product.

Id	Name	SBO
Rap1_GDP		

Kinetic Law

Derived unit contains undeclared units

$$v_{112} = \text{vol}(c1) \cdot \frac{J122_Vmax \cdot [Rap1_GTP] \cdot [Rap1GAP]}{J122_Km1 + [Rap1_GTP]} \quad (224)$$

Table 351: Properties of each parameter.

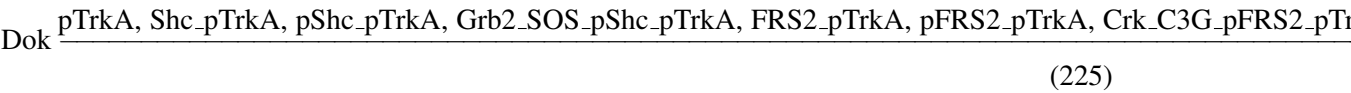
Id	Name	SBO	Value	Unit	Constant
J122_Vmax			2.0		<input checked="" type="checkbox"/>
J122_Km1			1.0		<input checked="" type="checkbox"/>

5.113 Reaction J123

This is an irreversible reaction of one reactant forming one product influenced by seven modifiers.

Name Dok_phosphorylation

Reaction equation



Reactant

Table 352: Properties of each reactant.

Id	Name	SBO
Dok		

Modifiers

Table 353: Properties of each modifier.

Id	Name	SBO
pTrkA		
Shc_pTrkA		
pShc_pTrkA		
Grb2_SOS_pShc_pTrkA		
FRS2_pTrkA		
pFRS2_pTrkA		
Crk_C3G_pFRS2_pTrkA		

Product

Table 354: Properties of each product.

Id	Name	SBO
pDok		

Kinetic Law

Derived unit contains undeclared units

$$v_{113} = \text{vol}(c1) \cdot \frac{\text{J123_Vmax} \cdot [\text{Dok}] \cdot ([\text{pTrkA}] + [\text{Shc_pTrkA}] + [\text{pShc_pTrkA}] + [\text{Grb2_SOS_pShc_pTrkA}] + [\text{FRS2_pTrkA}] + [\text{pFRS2_pTrkA}] + [\text{Crk_C3G_pFRS2_pTrkA}])}{\text{J123_Km1} + [\text{Dok}]}$$
 (226)

Table 355: Properties of each parameter.

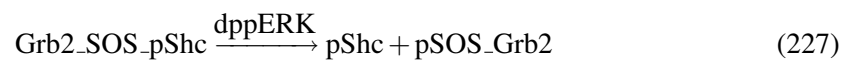
Id	Name	SBO	Value	Unit	Constant
J123_Vmax			0.02		<input checked="" type="checkbox"/>
J123_Km1			0.10		<input checked="" type="checkbox"/>

5.114 Reaction J124

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Name Grb1_SOS_pShc_dissociation

Reaction equation



Reactant

Table 356: Properties of each reactant.

Id	Name	SBO
Grb2_SOS_pShc		

Modifier

Table 357: Properties of each modifier.

Id	Name	SBO
dppERK		

Products

Table 358: Properties of each product.

Id	Name	SBO
pShc		
pSOS_Grb2		

Kinetic Law

Derived unit contains undeclared units

$$v_{114} = \text{vol}(c1) \cdot \frac{J124_Vmax \cdot [\text{Grb2_SOS_pShc}] \cdot [\text{dppERK}]}{J124_Km1 + [\text{Grb2_SOS_pShc}]} \quad (228)$$

Table 359: Properties of each parameter.

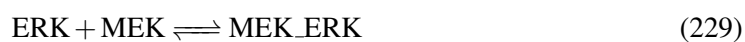
Id	Name	SBO	Value	Unit	Constant
J124_Vmax			1.000		<input checked="" type="checkbox"/>
J124_Km1			25.641		<input checked="" type="checkbox"/>

5.115 Reaction J133

This is a reversible reaction of two reactants forming one product.

Name binding_MEK_to_ERK

Reaction equation



Reactants

Table 360: Properties of each reactant.

Id	Name	SBO
ERK		
MEK		

Product

Table 361: Properties of each product.

Id	Name	SBO
MEK_ERK		

Kinetic Law

Derived unit contains undeclared units

$$v_{115} = \text{vol}(c1) \cdot (J133_k1 \cdot [\text{ERK}] \cdot [\text{MEK}] - J133_k2 \cdot [\text{MEK_ERK}]) \quad (230)$$

Table 362: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J133_k1			16.304		<input checked="" type="checkbox"/>
J133_k2			0.600		<input checked="" type="checkbox"/>

5.116 Reaction J134

This is a reversible reaction of two reactants forming one product.

Name binding_ERK_to_pMEK

Reaction equation



Reactants

Table 363: Properties of each reactant.

Id	Name	SBO
	ERK	
	pMEK	

Product

Table 364: Properties of each product.

Id	Name	SBO
	pMEK_ERK	

Kinetic Law

Derived unit contains undeclared units

$$v_{116} = \text{vol}(c1) \cdot (J134_k1 \cdot [\text{ERK}] \cdot [\text{pMEK}] - J134_k2 \cdot [\text{pMEK_ERK}]) \quad (232)$$

Table 365: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J134_k1			16.304		<input checked="" type="checkbox"/>
J134_k2			0.600		<input checked="" type="checkbox"/>

5.117 Reaction J135

This is a reversible reaction of two reactants forming one product.

Name binding_ERK_to_ppMEK

Reaction equation



Reactants

Table 366: Properties of each reactant.

Id	Name	SBO
ERK		
ppMEK		

Product

Table 367: Properties of each product.

Id	Name	SBO
ppMEK_ERK		

Kinetic Law

Derived unit contains undeclared units

$$v_{117} = \text{vol}(c1) \cdot (J135_k1 \cdot [\text{ERK}] \cdot [\text{ppMEK}] - J135_k2 \cdot [\text{ppMEK_ERK}]) \quad (234)$$

Table 368: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J135_k1			16.304		<input checked="" type="checkbox"/>
J135_k2			0.600		<input checked="" type="checkbox"/>

5.118 Reaction J136

This is an irreversible reaction of one reactant forming two products.

Name ppMEK_ERK_dissociation

Reaction equation



Reactant

Table 369: Properties of each reactant.

Id	Name	SBO
ppMEK_ERK		

Products

Table 370: Properties of each product.

Id	Name	SBO
ppERK		
ppMEK		

Kinetic Law

Derived unit contains undeclared units

$$v_{118} = \text{vol}(c1) \cdot J136_k \cdot [\text{ppMEK_ERK}] \quad (236)$$

Table 371: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J136_k			0.15		<input checked="" type="checkbox"/>

5.119 Reaction J137

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Name c_Raf_Ras_GTP_dissociation

Reaction equation



Reactant

Table 372: Properties of each reactant.

Id	Name	SBO
c_Raf_Ras_GTP		

Modifier

Table 373: Properties of each modifier.

Id	Name	SBO
pDok_RasGAP		

Products

Table 374: Properties of each product.

Id	Name	SBO
c_Raf		
Ras_GDP		

Kinetic Law

Derived unit contains undeclared units

$$v_{119} = \text{vol}(c1) \cdot \frac{J137_Vmax \cdot [c_Raf_Ras_GTP] \cdot [pDok_RasGAP]}{J137_Km1 + [c_Raf_Ras_GTP]} \quad (238)$$

Table 375: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J137_Vmax			10.0		<input checked="" type="checkbox"/>
J137_Km1			1.0		<input checked="" type="checkbox"/>

5.120 Reaction J138

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Name B_Raf_Ras_GTP_dissociation

Reaction equation



Reactant

Table 376: Properties of each reactant.

Id	Name	SBO
B_Raf_Ras_GTP		

Modifier

Table 377: Properties of each modifier.

Id	Name	SBO
pDok_RasGAP		

Products

Table 378: Properties of each product.

Id	Name	SBO
B_Raf		
Ras_GDP		

Kinetic Law

Derived unit contains undeclared units

$$v_{120} = \text{vol}(c1) \cdot \frac{J138_Vmax \cdot [\text{B_Raf_Ras_GTP}] \cdot [\text{pDok_RasGAP}]}{J138_Km1 + [\text{B_Raf_Ras_GTP}]} \quad (240)$$

Table 379: Properties of each parameter.

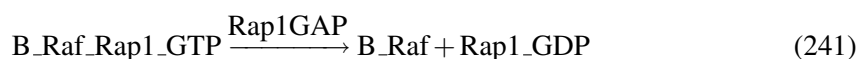
Id	Name	SBO	Value	Unit	Constant
J138_Vmax			10.0		<input checked="" type="checkbox"/>
J138_Km1			1.0		<input checked="" type="checkbox"/>

5.121 Reaction J139

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Name B_Raf_Rap1_GTP_dissociation

Reaction equation



Reactant

Table 380: Properties of each reactant.

Id	Name	SBO
B_Raf_Rap1_GTP		

Modifier

Table 381: Properties of each modifier.

Id	Name	SBO
Rap1GAP		

Products

Table 382: Properties of each product.

Id	Name	SBO
B_Raf		
Rap1_GDP		

Kinetic Law

Derived unit contains undeclared units

$$v_{121} = \text{vol}(c1) \cdot \frac{J139_Vmax \cdot [\text{B_Raf_Rap1_GTP}] \cdot [\text{Rap1GAP}]}{J139_Km1 + [\text{B_Raf_Rap1_GTP}]} \quad (242)$$

Table 383: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J139_Vmax			2.0		<input checked="" type="checkbox"/>
J139_Km1			1.0		<input checked="" type="checkbox"/>

5.122 Reaction J140

This is an irreversible reaction of two reactants forming one product.

Reaction equation



Reactants

Table 384: Properties of each reactant.

Id	Name	SBO
c_Raf_Ras_GTP		
MEK		

Product

Table 385: Properties of each product.

Id	Name	SBO
c_Raf_Ras_GTP_MEK		

Kinetic Law

Derived unit contains undeclared units

$$v_{122} = \text{vol}(c1) \cdot (J140_k1 \cdot [c_Raf_Ras_GTP] \cdot [MEK] - J140_k2 \cdot [c_Raf_Ras_GTP_MEK]) \quad (244)$$

Table 386: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J140_k1			15.625		<input checked="" type="checkbox"/>
J140_k2			2.000		<input checked="" type="checkbox"/>

5.123 Reaction J141

This is a reversible reaction of two reactants forming one product.

Reaction equation



Reactants

Table 387: Properties of each reactant.

Id	Name	SBO
c_Raf_Ras_GTP		
pMEK		

Product

Table 388: Properties of each product.

Id	Name	SBO
c_Raf_Ras_GTP_pMEK		

Kinetic Law

Derived unit contains undeclared units

$$v_{123} = \text{vol}(c1) \cdot (J141_k1 \cdot [\text{c_Raf_Ras_GTP}] \cdot [\text{pMEK}] - J141_k2 \cdot [\text{c_Raf_Ras_GTP_pMEK}]) \quad (246)$$

Table 389: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J141_k1			15.625		<input checked="" type="checkbox"/>
J141_k2			2.000		<input checked="" type="checkbox"/>

5.124 Reaction J142

This is a reversible reaction of two reactants forming one product.

Reaction equation



Reactants

Table 390: Properties of each reactant.

Id	Name	SBO
c_Raf_Ras_GTP		
MEK_ERK		

Product

Table 391: Properties of each product.

Id	Name	SBO
c_Raf_Ras_GTP_MEK_ERK		

Kinetic Law

Derived unit contains undeclared units

$$v_{124} = \text{vol}(c1) \cdot (J142_k1 \cdot [c_Raf_Ras_GTP] \cdot [MEK_ERK] - J142_k2 \cdot [c_Raf_Ras_GTP_MEK_ERK]) \quad (248)$$

Table 392: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J142_k1			15.625		<input checked="" type="checkbox"/>
J142_k2			2.000		<input checked="" type="checkbox"/>

5.125 Reaction J143

This is a reversible reaction of two reactants forming one product.

Reaction equation



Reactants

Table 393: Properties of each reactant.

Id	Name	SBO
c_Raf_Ras_GTP		
pMEK_ERK		

Product

Table 394: Properties of each product.

Id	Name	SBO
c_Raf_Ras_GTP_pMEK_ERK		

Kinetic Law

Derived unit contains undeclared units

$$v_{125} = \text{vol}(c1) \cdot (J143_k1 \cdot [c_Raf_Ras_GTP] \cdot [pMEK_ERK] - J143_k2 \cdot [c_Raf_Ras_GTP_pMEK_ERK]) \quad (250)$$

Table 395: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J143_k1			15.625		<input checked="" type="checkbox"/>
J143_k2			2.000		<input checked="" type="checkbox"/>

5.126 Reaction J144

This is a reversible reaction of two reactants forming one product.

Reaction equation



Reactants

Table 396: Properties of each reactant.

Id	Name	SBO
	B_Raf_Ras_GTP	
	MEK	

Product

Table 397: Properties of each product.

Id	Name	SBO
	B_Raf_Ras_GTP_MEK	

Kinetic Law

Derived unit contains undeclared units

$$v_{126} = \text{vol}(c1) \cdot (J144_k1 \cdot [\text{B_Raf_Ras_GTP}] \cdot [\text{MEK}] - J144_k2 \cdot [\text{B_Raf_Ras_GTP_MEK}]) \quad (252)$$

Table 398: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J144_k1			6.25		<input checked="" type="checkbox"/>
J144_k2			0.80		<input checked="" type="checkbox"/>

5.127 Reaction J145

This is a reversible reaction of two reactants forming one product.

Reaction equation



Reactants

Table 399: Properties of each reactant.

Id	Name	SBO
	B_Raf_Ras_GTP	
	pMEK	

Id	Name	SBO
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Product

Table 400: Properties of each product.

Id	Name	SBO
	B_Raf_Ras_GTP_pMEK	

Kinetic Law

Derived unit contains undeclared units

$$v_{127} = \text{vol}(c1) \cdot (J145_k1 \cdot [\text{B_Raf_Ras_GTP}] \cdot [\text{pMEK}] - J145_k2 \cdot [\text{B_Raf_Ras_GTP_pMEK}]) \quad (254)$$

Table 401: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J145_k1			6.25		<input checked="" type="checkbox"/>
J145_k2			0.80		<input checked="" type="checkbox"/>

5.128 Reaction J146

This is a reversible reaction of two reactants forming one product.

Reaction equation



Reactants

Table 402: Properties of each reactant.

Id	Name	SBO
	B_Raf_Ras_GTP	
	MEK_ERK	

Product

Table 403: Properties of each product.

Id	Name	SBO
	B_Raf_Ras_GTP_MEK_ERK	

Kinetic Law

Derived unit contains undeclared units

$$v_{128} = \text{vol}(c1) \cdot (J146_k1 \cdot [\text{B_Raf_Ras_GTP}] \cdot [\text{MEK_ERK}] - J146_k2 \cdot [\text{B_Raf_Ras_GTP_MEK_ERK}]) \quad (256)$$

Table 404: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J146_k1			6.25		<input checked="" type="checkbox"/>
J146_k2			0.80		<input checked="" type="checkbox"/>

5.129 Reaction J147

This is a reversible reaction of two reactants forming one product.

Reaction equation



Reactants

Table 405: Properties of each reactant.

Id	Name	SBO
	B_Raf_Ras_GTP	
	pMEK_ERK	

Product

Table 406: Properties of each product.

Id	Name	SBO
	B_Raf_Ras_GTP_pMEK_ERK	

Kinetic Law

Derived unit contains undeclared units

$$v_{129} = \text{vol}(c1) \cdot (J147_k1 \cdot [\text{B_Raf_Ras_GTP}] \cdot [\text{pMEK_ERK}] - J147_k2 \cdot [\text{B_Raf_Ras_GTP_pMEK_ERK}]) \quad (258)$$

Table 407: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J147_k1			6.25		<input checked="" type="checkbox"/>
J147_k2			0.80		<input checked="" type="checkbox"/>

5.130 Reaction J148

This is a reversible reaction of two reactants forming one product.

Reaction equation



Reactants

Table 408: Properties of each reactant.

Id	Name	SBO
	B_Raf_Rap1_GTP	
	MEK	

Product

Table 409: Properties of each product.

Id	Name	SBO
	B_Raf_Rap1_GTP_MEK	

Kinetic Law

Derived unit contains undeclared units

$$v_{130} = \text{vol}(c1) \cdot (J148_k1 \cdot [\text{B_Raf_Rap1_GTP}] \cdot [\text{MEK}] - J148_k2 \cdot [\text{B_Raf_Rap1_GTP_MEK}]) \quad (260)$$

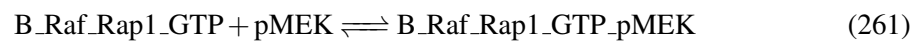
Table 410: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J148_k1			9.375		<input checked="" type="checkbox"/>
J148_k2			1.200		<input checked="" type="checkbox"/>

5.131 Reaction J149

This is a reversible reaction of two reactants forming one product.

Reaction equation



Reactants

Table 411: Properties of each reactant.

Id	Name	SBO
	B_Raf_Rap1_GTP	
	pMEK	

Product

Table 412: Properties of each product.

Id	Name	SBO
	B_Raf_Rap1_GTP_pMEK	

Kinetic Law

Derived unit contains undeclared units

$$v_{131} = \text{vol}(c1) \cdot (J149_k1 \cdot [\text{B_Raf_Rap1_GTP}] \cdot [\text{pMEK}] - J149_k2 \cdot [\text{B_Raf_Rap1_GTP_pMEK}]) \quad (262)$$

Table 413: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J149_k1			9.375		<input checked="" type="checkbox"/>
J149_k2			1.200		<input checked="" type="checkbox"/>

5.132 Reaction J150

This is a reversible reaction of two reactants forming one product.

Reaction equation



Reactants

Table 414: Properties of each reactant.

Id	Name	SBO
	B_Raf_Rap1_GTP	
	MEK_ERK	

Product

Table 415: Properties of each product.

Id	Name	SBO
	B_Raf_Rap1_GTP_MEK_ERK	

Kinetic Law

Derived unit contains undeclared units

$$v_{132} = \text{vol}(c1) \cdot (J150_k1 \cdot [\text{B_Raf_Rap1_GTP}] \cdot [\text{MEK_ERK}] - J150_k2 \cdot [\text{B_Raf_Rap1_GTP_MEK_ERK}]) \quad (264)$$

Table 416: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J150_k1			9.375		<input checked="" type="checkbox"/>
J150_k2			1.200		<input checked="" type="checkbox"/>

5.133 Reaction J151

This is a reversible reaction of two reactants forming one product.

Reaction equation



Reactants

Table 417: Properties of each reactant.

Id	Name	SBO
B_Raf_Rap1_GTP		
pMEK_ERK		

Product

Table 418: Properties of each product.

Id	Name	SBO
B_Raf_Rap1_GTP_pMEK_ERK		

Kinetic Law

Derived unit contains undeclared units

$$v_{133} = \text{vol}(c1) \cdot (J151_k1 \cdot [\text{B_Raf_Rap1_GTP}] \cdot [\text{pMEK_ERK}] - J151_k2 \cdot [\text{B_Raf_Rap1_GTP_pMEK_ERK}]) \quad (266)$$

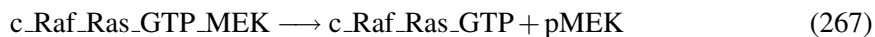
Table 419: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J151_k1			9.375		✓
J151_k2			1.200		✓

5.134 Reaction J152

This is an irreversible reaction of one reactant forming two products.

Reaction equation



Reactant

Table 420: Properties of each reactant.

Id	Name	SBO
c_Raf_Ras_GTP_MEK		

Products

Table 421: Properties of each product.

Id	Name	SBO
c_Raf_Ras_GTP		
pMEK		

Kinetic Law

Derived unit contains undeclared units

$$v_{134} = \text{vol}(c1) \cdot J152_k \cdot [\text{c_Raf_Ras_GTP_MEK}] \quad (268)$$

Table 422: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J152_k			0.5		<input checked="" type="checkbox"/>

5.135 Reaction J153

This is an irreversible reaction of one reactant forming two products.

Reaction equation



Reactant

Table 423: Properties of each reactant.

Id	Name	SBO
c_Raf_Ras_GTP_pMEK		

Products

Table 424: Properties of each product.

Id	Name	SBO
c_Raf_Ras_GTP ppMEK		

Kinetic Law

Derived unit contains undeclared units

$$v_{135} = \text{vol}(c1) \cdot J153_k \cdot [c_Raf_Ras_GTP_pMEK] \quad (270)$$

Table 425: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J153_k			0.5		<input checked="" type="checkbox"/>

5.136 Reaction J154

This is an irreversible reaction of one reactant forming two products.

Reaction equation



Reactant

Table 426: Properties of each reactant.

Id	Name	SBO
c_Raf_Ras_GTP_MEK_ERK		

Products

Table 427: Properties of each product.

Id	Name	SBO
c_Raf_Ras_GTP		
pMEK_ERK		

Kinetic Law

Derived unit contains undeclared units

$$v_{136} = \text{vol}(c1) \cdot J154_k \cdot [c_Raf_Ras_GTP_MEK_ERK] \quad (272)$$

Table 428: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J154_k			0.5		<input checked="" type="checkbox"/>

5.137 Reaction J155

This is an irreversible reaction of one reactant forming two products.

Reaction equation



Reactant

Table 429: Properties of each reactant.

Id	Name	SBO
c_Raf_Ras_GTP_pMEK_ERK		

Products

Table 430: Properties of each product.

Id	Name	SBO
c_Raf_Ras_GTP		
ppMEK_ERK		

Kinetic Law

Derived unit contains undeclared units

$$v_{137} = \text{vol}(c1) \cdot J155_k \cdot [c_Raf_Ras_GTP_pMEK_ERK] \quad (274)$$

Table 431: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J155_k			0.5		<input checked="" type="checkbox"/>

5.138 Reaction J156

This is an irreversible reaction of one reactant forming two products.

Reaction equation



Reactant

Table 432: Properties of each reactant.

Id	Name	SBO
B_Raf_Ras_GTP_MEK		

Products

Table 433: Properties of each product.

Id	Name	SBO
B_Raf_Ras_GTP		
pMEK		

Kinetic Law

Derived unit contains undeclared units

$$v_{138} = \text{vol}(c1) \cdot J156_k \cdot [B_Raf_Ras_GTP_MEK] \quad (276)$$

Table 434: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J156_k			0.2		<input checked="" type="checkbox"/>

5.139 Reaction J157

This is an irreversible reaction of one reactant forming two products.

Reaction equation



Reactant

Table 435: Properties of each reactant.

Id	Name	SBO
B_Raf_Ras_GTP_pMEK		

Products

Table 436: Properties of each product.

Id	Name	SBO
B_Raf_Ras_GTP		
ppMEK		

Kinetic Law

Derived unit contains undeclared units

$$v_{139} = \text{vol}(c1) \cdot J157_k \cdot [\text{B_Raf_Ras_GTP_pMEK}] \quad (278)$$

Table 437: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J157_k			0.2		<input checked="" type="checkbox"/>

5.140 Reaction J158

This is an irreversible reaction of one reactant forming two products.

Reaction equation



Reactant

Table 438: Properties of each reactant.

Id	Name	SBO
B_Raf_Ras_GTP_MEK_ERK		

Products

Table 439: Properties of each product.

Id	Name	SBO
B_Raf_Ras_GTP		
pMEK_ERK		

Kinetic Law

Derived unit contains undeclared units

$$v_{140} = \text{vol}(c1) \cdot \text{J158_k} \cdot [\text{B_Raf_Ras_GTP_MEK_ERK}] \quad (280)$$

Table 440: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J158_k			0.2		<input checked="" type="checkbox"/>

5.141 Reaction J159

This is an irreversible reaction of one reactant forming two products.

Reaction equation



Reactant

Table 441: Properties of each reactant.

Id	Name	SBO
B_Raf_Ras_GTP_pMEK_ERK		

Products

Table 442: Properties of each product.

Id	Name	SBO
B_Raf_Ras_GTP ppMEK_ERK		

Kinetic Law

Derived unit contains undeclared units

$$v_{141} = \text{vol}(c1) \cdot J159_k \cdot [\text{B_Raf_Ras_GTP_pMEK_ERK}] \quad (282)$$

Table 443: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J159_k			0.2		<input checked="" type="checkbox"/>

5.142 Reaction J160

This is an irreversible reaction of one reactant forming two products.

Reaction equation



Reactant

Table 444: Properties of each reactant.

Id	Name	SBO
B_Raf_Rap1_GTP_MEK		

Products

Table 445: Properties of each product.

Id	Name	SBO
B_Raf_Rap1_GTP		
pMEK		

Kinetic Law

Derived unit contains undeclared units

$$v_{142} = \text{vol}(c1) \cdot J160_k \cdot [\text{B_Raf_Rap1_GTP_MEK}] \quad (284)$$

Table 446: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J160_k			0.3		<input checked="" type="checkbox"/>

5.143 Reaction J161

This is an irreversible reaction of one reactant forming two products.

Reaction equation



Reactant

Table 447: Properties of each reactant.

Id	Name	SBO
B_Raf_Rap1_GTP_pMEK		

Products

Table 448: Properties of each product.

Id	Name	SBO
B_Raf_Rap1_GTP		

Id	Name	SBO
	ppMEK	

Kinetic Law

Derived unit contains undeclared units

$$v_{143} = \text{vol}(c1) \cdot J161_k \cdot [\text{B_Raf_Rap1_GTP_pMEK}] \quad (286)$$

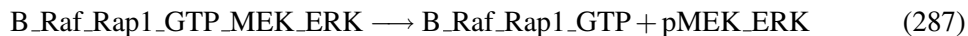
Table 449: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J161_k			0.3		<input checked="" type="checkbox"/>

5.144 Reaction J162

This is an irreversible reaction of one reactant forming two products.

Reaction equation



Reactant

Table 450: Properties of each reactant.

Id	Name	SBO
	B_Raf_Rap1_GTP_MEK_ERK	

Products

Table 451: Properties of each product.

Id	Name	SBO
	B_Raf_Rap1_GTP	
	pMEK_ERK	

Kinetic Law

Derived unit contains undeclared units

$$v_{144} = \text{vol}(c1) \cdot J162_k \cdot [\text{B_Raf_Rap1_GTP_MEK_ERK}] \quad (288)$$

Table 452: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J162_k			0.3		<input checked="" type="checkbox"/>

5.145 Reaction J163

This is an irreversible reaction of one reactant forming two products.

Reaction equation



Reactant

Table 453: Properties of each reactant.

Id	Name	SBO
	B_Raf_Rap1_GTP_pMEK_ERK	

Products

Table 454: Properties of each product.

Id	Name	SBO
	B_Raf_Rap1_GTP	
	ppMEK_ERK	

Kinetic Law

Derived unit contains undeclared units

$$v_{145} = \text{vol}(c1) \cdot J163_k \cdot [\text{B_Raf_Rap1_GTP_pMEK_ERK}] \quad (290)$$

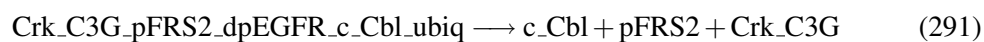
Table 455: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J163_k			0.3		<input checked="" type="checkbox"/>

5.146 Reaction J164

This is an irreversible reaction of one reactant forming three products.

Reaction equation



Reactant

Table 456: Properties of each reactant.

Id	Name	SBO
Crk_C3G_pFRS2_dpEGFR_c_Cbl_ubiq		

Products

Table 457: Properties of each product.

Id	Name	SBO
c_Cbl		
pFRS2		
Crk_C3G		

Kinetic Law

Derived unit contains undeclared units

$$v_{146} = \text{vol}(\text{c1}) \cdot \text{J164_k} \cdot [\text{Crk_C3G_pFRS2_dpEGFR_c_Cbl_ubiq}] \quad (292)$$

Table 458: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J164_k			0.001		<input checked="" type="checkbox"/>

5.147 Reaction J165

This is an irreversible reaction of two reactants forming one product.

Reaction equation



Reactants

Table 459: Properties of each reactant.

Id	Name	SBO
	MKP3	
	dppERK	

Product

Table 460: Properties of each product.

Id	Name	SBO
	dppERK_MKP3	

Kinetic Law

Derived unit contains undeclared units

$$v_{147} = \text{vol}(c1) \cdot (\text{J165_k1} \cdot [\text{MKP3}] \cdot [\text{dppERK}] - \text{J165_k2} \cdot [\text{dppERK_MKP3}]) \quad (294)$$

Table 461: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J165_k1			15.00		<input checked="" type="checkbox"/>
J165_k2			0.24		<input checked="" type="checkbox"/>

5.148 Reaction J166

This is a reversible reaction of two reactants forming one product.

Reaction equation



Reactants

Table 462: Properties of each reactant.

Id	Name	SBO
	MKP3	
	ppERK	

Product

Table 463: Properties of each product.

Id	Name	SBO
	ppERK_MKP3	

Kinetic Law

Derived unit contains undeclared units

$$v_{148} = \text{vol}(c1) \cdot (J166_k1 \cdot [\text{MKP3}] \cdot [\text{ppERK}] - J166_k2 \cdot [\text{ppERK_MKP3}]) \quad (296)$$

Table 464: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J166_k1			15.00		<input checked="" type="checkbox"/>
J166_k2			0.24		<input checked="" type="checkbox"/>

5.149 Reaction J167

This is an irreversible reaction of one reactant forming two products.

Reaction equation



Reactant

Table 465: Properties of each reactant.

Id	Name	SBO
	ppERK_MKP3	

Products

Table 466: Properties of each product.

Id	Name	SBO
ERK		
MKP3		

Kinetic Law

Derived unit contains undeclared units

$$v_{149} = \text{vol}(c1) \cdot J167_k \cdot [\text{ppERK_MKP3}] \quad (298)$$

Table 467: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J167_k			0.06		<input checked="" type="checkbox"/>

5.150 Reaction J168

This is an irreversible reaction of one reactant forming three products.

Reaction equation



Reactant

Table 468: Properties of each reactant.

Id	Name	SBO
dppERK_MKP3		

Products

Table 469: Properties of each product.

Id	Name	SBO
ppERK		

Id	Name	SBO
ERK		
MKP3		

Kinetic Law

Derived unit contains undeclared units

$$v_{150} = \text{vol}(c1) \cdot J168_k \cdot [\text{dppERK_MKP3}] \quad (300)$$

Table 470: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
J168_k			0.06		<input checked="" type="checkbox"/>

6 Derived Rate Equations

When interpreted as an ordinary differential equation framework, this model implies the following set of equations for the rates of change of each species.

Identifiers for kinetic laws highlighted in gray cannot be verified to evaluate to units of SBML substance per time. As a result, some SBML interpreters may not be able to verify the consistency of the units on quantities in the model. Please check if

- parameters without an unit definition are involved or
- volume correction is necessary because the `hasOnlySubstanceUnits` flag may be set to `false` and `spacialDimensions` > 0 for certain species.

6.1 Species EGFR

Initial concentration $0.3 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in [re2](#) and as a product in [re1](#)).

$$\frac{d}{dt}\text{EGFR} = v_1 - v_2 \quad (301)$$

6.2 Species L_EGFR

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in [re8](#) and as a product in [re2](#)).

$$\frac{d}{dt}\text{L_EGFR} = v_2 - 2 v_3 \quad (302)$$

6.3 Species L_EGFR_dimer

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J5 and as a product in re8).

$$\frac{d}{dt} \text{L_EGFR_dimer} = v_3 - v_6 \quad (303)$$

6.4 Species SOS

Initial concentration $0.1 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in three reactions (as a reactant in J3, J51 and as a product in J10).

$$\frac{d}{dt} \text{SOS} = v_{11} - v_4 - v_{50} \quad (304)$$

6.5 Species L_dpEGFR

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in eight reactions (as a reactant in J6, J7, J12, J23, J35, J36 and as a product in J5 and as a modifier in J31).

$$\frac{d}{dt} \text{L_dpEGFR} = v_6 - v_7 - v_8 - v_{13} - v_{24} - v_{35} - v_{36} \quad (305)$$

6.6 Species pSOS

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in three reactions (as a reactant in J4, J10 and as a product in J51).

$$\frac{d}{dt} \text{pSOS} = v_{50} - v_5 - v_{11} \quad (306)$$

6.7 Species SOS_Grb2

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in nine reactions (as a reactant in J22, J24, J50, J95, J96, J117 and as a product in J3, J11, J30).

$$\frac{d}{dt} \text{SOS_Grb2} = v_4 + v_{12} + v_{30} - v_{23} - v_{25} - v_{49} - v_{87} - v_{88} - v_{107} \quad (307)$$

6.8 Species Grb2

Initial concentration $1 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J3, J4).

$$\frac{d}{dt}\text{Grb2} = -v_4 - v_5 \quad (308)$$

6.9 Species Dok

Initial concentration $0.3 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in three reactions (as a reactant in J31, J123 and as a product in J8).

$$\frac{d}{dt}\text{Dok} = v_9 - v_{31} - v_{113} \quad (309)$$

6.10 Species pDok

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in J8, J49 and as a product in J31, J123).

$$\frac{d}{dt}\text{pDok} = v_{31} + v_{113} - v_9 - v_{48} \quad (310)$$

6.11 Species Crk

Initial concentration $1 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in one reaction (as a reactant in J34).

$$\frac{d}{dt}\text{Crk} = -v_{34} \quad (311)$$

6.12 Species FRS2

Initial concentration $1 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in eight reactions (as a reactant in J35, J77, J84, J118 and as a product in J33, J46, J87, J92).

$$\frac{d}{dt}\text{FRS2} = v_{33} + v_{46} + v_{80} + v_{84} - v_{35} - v_{70} - v_{77} - v_{109} \quad (312)$$

6.13 Species Shc

Initial concentration $1 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in nine reactions (as a reactant in J12, J75, J79, J115 and as a product in J18, J30, J32, J89, J93).

$$\frac{d}{dt}\text{Shc} = v_{19} + v_{30} + v_{32} + v_{82} + v_{85} - v_{13} - v_{68} - v_{72} - v_{105} \quad (313)$$

6.14 Species pSOS_Grb2

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in J11 and as a product in J4, J50, J124).

$$\frac{d}{dt}\text{pSOS_Grb2} = v_5 + v_{49} + v_{114} - v_{12} \quad (314)$$

6.15 Species Rap1_GDP

Initial concentration $0.2 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in J68 and as a product in J67, J122, J139).

$$\frac{d}{dt}\text{Rap1_GDP} = v_{60} + v_{112} + v_{121} - v_{61} \quad (315)$$

6.16 Species MEK

Initial concentration $0.68 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in J133, J140, J144, J148 and as a product in J58).

$$\frac{d}{dt}\text{MEK} = v_{55} - v_{115} - v_{122} - v_{126} - v_{130} \quad (316)$$

6.17 Species MKP3

Initial concentration $0.018 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in J165, J166 and as a product in J167, J168).

$$\frac{d}{dt}\text{MKP3} = v_{149} + v_{150} - v_{147} - v_{148} \quad (317)$$

6.18 Species pShc_dpEGFR

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in J9, J24 and as a product in J7, J13 and as a modifier in J31).

$$\frac{d}{dt} \text{pShc_dpEGFR} = v_8 + v_{14} - v_{10} - v_{25} \quad (318)$$

6.19 Species dpEGFR_c_Cbl

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in eight reactions (as a reactant in J14, J27, J115, J116, J118, J120 and as a product in J6 and as a modifier in J31).

$$\frac{d}{dt} \text{dpEGFR_c_Cbl} = v_7 - v_{15} - v_{27} - v_{105} - v_{106} - v_{109} - v_{110} \quad (319)$$

6.20 Species B_Raf_Rap1_GTP

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in ten reactions (as a reactant in J139, J148, J149, J150, J151 and as a product in J53, J160, J161, J162, J163).

$$\begin{aligned} \frac{d}{dt} \text{B_Raf_Rap1_GTP} = & v_{52} + v_{142} + v_{143} + v_{144} + v_{145} \\ & - v_{121} - v_{130} - v_{131} - v_{132} - v_{133} \end{aligned} \quad (320)$$

6.21 Species pShc_dpEGFR_c_Cbl

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in six reactions (as a reactant in J19, J117 and as a product in J9, J21, J116 and as a modifier in J31).

$$\frac{d}{dt} \text{pShc_dpEGFR_c_Cbl} = v_{10} + v_{22} + v_{106} - v_{20} - v_{107} \quad (321)$$

6.22 Species pFRS2_dpEGFR_c_Cbl

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in J41, J44 and as a product in J40, J43, J120).

$$\frac{d}{dt} \text{pFRS2_dpEGFR_c_Cbl} = v_{40} + v_{43} + v_{110} - v_{41} - v_{44} \quad (322)$$

6.23 Species Shc_dpEGFR

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in J13, J16 and as a product in J12 and as a modifier in J31).

$$\frac{d}{dt}\text{Shc_dpEGFR} = v_{13} - v_{14} - v_{17} \quad (323)$$

6.24 Species c_Cbl

Initial concentration $0.5 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in 14 reactions (as a reactant in J6, J9, J16, J25, J39, J40, J119 and as a product in J15, J18, J20, J29, J46, J47, J164).

$$\begin{aligned} \frac{d}{dt}c_Cbl = & v_{16} + v_{19} + v_{21} + v_{29} + v_{46} + v_{47} + v_{146} \\ & - v_7 - v_{10} - v_{17} - v_{26} - v_{39} - v_{40} - v_{108} \end{aligned} \quad (324)$$

6.25 Species RasGAP

Initial concentration $0.1 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in one reaction (as a reactant in J49).

$$\frac{d}{dt}\text{RasGAP} = -v_{48} \quad (325)$$

6.26 Species c_Raf

Initial concentration $0.5 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J52 and as a product in J137).

$$\frac{d}{dt}c_Raf = v_{119} - v_{51} \quad (326)$$

6.27 Species B_Raf

Initial concentration $0.2 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in J53, J54 and as a product in J138, J139).

$$\frac{d}{dt}B_Raf = v_{120} + v_{121} - v_{52} - v_{53} \quad (327)$$

6.28 Species ERK

Initial concentration $0.26 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in J133, J134, J135 and as a product in J167, J168).

$$\frac{d}{dt}\text{ERK} = v_{149} + v_{150} - v_{115} - v_{116} - v_{117} \quad (328)$$

6.29 Species PP2A

Initial concentration $0.24 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a modifier in J57, J58, J61, J62).

$$\frac{d}{dt}\text{PP2A} = 0 \quad (329)$$

6.30 Species Ras_GDP

Initial concentration $0.1 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in J69 and as a product in J66, J121, J137, J138).

$$\frac{d}{dt}\text{Ras_GDP} = v_{59} + v_{111} + v_{119} + v_{120} - v_{62} \quad (330)$$

6.31 Species Rap1GAP

Initial concentration $0.012 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a modifier in J122, J139).

$$\frac{d}{dt}\text{Rap1GAP} = 0 \quad (331)$$

6.32 Species C3G

Initial concentration $0.5 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in one reaction (as a reactant in J34).

$$\frac{d}{dt}\text{C3G} = -v_{34} \quad (332)$$

6.33 Species NGFR

Initial concentration $0.061894 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J70 and as a product in J113).

$$\frac{d}{dt}\text{NGFR} = v_{104} - v_{63} \quad (333)$$

6.34 Species pShc

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in ten reactions (as a reactant in J7, J22, J32, J76, J80, J116 and as a product in J20, J90, J94, J124).

$$\frac{d}{dt}\text{pShc} = v_{21} + v_{83} + v_{86} + v_{114} - v_8 - v_{23} - v_{32} - v_{69} - v_{73} - v_{106} \quad (334)$$

6.35 Species pFRS2_dpEGFR

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in J38, J40 and as a product in J36, J37 and as a modifier in J31).

$$\frac{d}{dt}\text{pFRS2_dpEGFR} = v_{36} + v_{37} - v_{38} - v_{40} \quad (335)$$

6.36 Species pTrkA_endo

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in seven reactions (as a reactant in J73, J79, J80, J84, J85, J106 and as a product in J72).

$$\frac{d}{dt}\text{pTrkA_endo} = v_{65} - v_{66} - v_{72} - v_{73} - v_{77} - v_{78} - v_{98} \quad (336)$$

6.37 Species MEK_ERK

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in J142, J146, J150 and as a product in J62, J133).

$$\frac{d}{dt}\text{MEK_ERK} = v_{57} + v_{115} - v_{124} - v_{128} - v_{132} \quad (337)$$

6.38 Species pMEK_ERK

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in nine reactions (as a reactant in J62, J143, J147, J151 and as a product in J61, J134, J154, J158, J162).

$$\frac{d}{dt} \text{pMEK_ERK} = v_{56} + v_{116} + v_{136} + v_{140} + v_{144} - v_{57} - v_{125} - v_{129} - v_{133} \quad (338)$$

6.39 Species FRS2_dpEGFR_c_Cbl_ubiq

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J46 and as a product in J42).

$$\frac{d}{dt} \text{FRS2_dpEGFR_c_Cbl_ubiq} = v_{42} - v_{46} \quad (339)$$

6.40 Species Crk_C3G_pFRS2_dpEGFR_c_Cbl

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in J45 and as a product in J44, J119 and as a modifier in J31, J68).

$$\frac{d}{dt} \text{Crk_C3G_pFRS2_dpEGFR_c_Cbl} = v_{44} + v_{108} - v_{45} \quad (340)$$

6.41 Species pShc_dpEGFR_c_Cbl_ubiq

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J20 and as a product in J19).

$$\frac{d}{dt} \text{pShc_dpEGFR_c_Cbl_ubiq} = v_{20} - v_{21} \quad (341)$$

6.42 Species Crk_C3G_pFRS2_dpEGFR

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in J119 and as a product in J38 and as a modifier in J31, J68).

$$\frac{d}{dt} \text{Crk_C3G_pFRS2_dpEGFR} = v_{38} - v_{108} \quad (342)$$

6.43 Species Grb2_SOS_pShc_dpEGFR_c_Cbl_ubiq

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J29 and as a product in J28).

$$\frac{d}{dt} \text{Grb2_SOS_pShc_dpEGFR_c_Cbl_ubiq} = v_{28} - v_{29} \quad (343)$$

6.44 Species Grb2_SOS_pShc_dpEGFR_c_Cbl

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in six reactions (as a reactant in J28 and as a product in J25, J27, J117 and as a modifier in J31, J69).

$$\frac{d}{dt} \text{Grb2_SOS_pShc_dpEGFR_c_Cbl} = v_{26} + v_{27} + v_{107} - v_{28} \quad (344)$$

6.45 Species Shc_dpEGFR_c_Cbl_ubiq

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J18 and as a product in J17).

$$\frac{d}{dt} \text{Shc_dpEGFR_c_Cbl_ubiq} = v_{18} - v_{19} \quad (345)$$

6.46 Species dpEGFR_c_Cbl_ubiq

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J15 and as a product in J14).

$$\frac{d}{dt} \text{dpEGFR_c_Cbl_ubiq} = v_{15} - v_{16} \quad (346)$$

6.47 Species proteasome

Name proteasome

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in six reactions (as a product in J15, J18, J20, J29, J46, J47).

$$\frac{d}{dt} \text{proteasome} = v_{16} + v_{19} + v_{21} + v_{29} + v_{46} + v_{47} \quad (347)$$

6.48 Species Grb2_SOS_pShc

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in ten reactions (as a reactant in J23, J27, J30, J105, J106, J124 and as a product in J22, J29, J109, J110).

$$\frac{d}{dt}\text{Grb2_SOS_pShc} = v_{23} + v_{29} + v_{101} + v_{102} - v_{24} - v_{27} - v_{30} - v_{97} - v_{98} - v_{114} \quad (348)$$

6.49 Species Shc_dpEGFR_c_Cbl

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in J17, J21 and as a product in J16, J115 and as a modifier in J31).

$$\frac{d}{dt}\text{Shc_dpEGFR_c_Cbl} = v_{17} + v_{105} - v_{18} - v_{22} \quad (349)$$

6.50 Species Grb2_SOS_pShc_dpEGFR

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in J25 and as a product in J23, J24 and as a modifier in J31, J69).

$$\frac{d}{dt}\text{Grb2_SOS_pShc_dpEGFR} = v_{24} + v_{25} - v_{26} \quad (350)$$

6.51 Species pFRS2

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in eleven reactions (as a reactant in J33, J36, J78, J85, J120 and as a product in J47, J88, J107, J108, J112, J164).

$$\frac{d}{dt}\text{pFRS2} = v_{47} + v_{81} + v_{99} + v_{100} + v_{103} + v_{146} - v_{33} - v_{36} - v_{71} - v_{78} - v_{110} \quad (351)$$

6.52 Species FRS2_dpEGFR

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in J37, J39 and as a product in J35 and as a modifier in J31).

$$\frac{d}{dt}\text{FRS2_dpEGFR} = v_{35} - v_{37} - v_{39} \quad (352)$$

6.53 Species pDok_RasGAP

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a product in J49 and as a modifier in J121, J137, J138).

$$\frac{d}{dt} \text{pDok_RasGAP} = v_{48} \quad (353)$$

6.54 Species pMEK

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in nine reactions (as a reactant in J58, J134, J141, J145, J149 and as a product in J57, J152, J156, J160).

$$\frac{d}{dt} \text{pMEK} = v_{54} + v_{134} + v_{138} + v_{142} - v_{55} - v_{116} - v_{123} - v_{127} - v_{131} \quad (354)$$

6.55 Species FRS2_dpEGFR_c_Cbl

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in J42, J43 and as a product in J39, J118 and as a modifier in J31).

$$\frac{d}{dt} \text{FRS2_dpEGFR_c_Cbl} = v_{39} + v_{109} - v_{42} - v_{43} \quad (355)$$

6.56 Species pFRS2_dpEGFR_c_Cbl_ubiq

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J47 and as a product in J41).

$$\frac{d}{dt} \text{pFRS2_dpEGFR_c_Cbl_ubiq} = v_{41} - v_{47} \quad (356)$$

6.57 Species Ras_GTP

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in J52, J54, J66, J121 and as a product in J69).

$$\frac{d}{dt} \text{Ras_GTP} = v_{62} - v_{51} - v_{53} - v_{59} - v_{111} \quad (357)$$

6.58 Species Crk_C3G_pFRS2_dpEGFR_c_Cbl_ubiq

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J164 and as a product in J45).

$$\frac{d}{dt} \text{Crk_C3G_pFRS2_dpEGFR_c_Cbl_ubiq} = v_{45} - v_{146} \quad (358)$$

6.59 Species c_Raf_Ras_GTP

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in ten reactions (as a reactant in J137, J140, J141, J142, J143 and as a product in J52, J152, J153, J154, J155).

$$\begin{aligned} \frac{d}{dt} \text{c_Raf_Ras_GTP} = & v_{51} + v_{134} + v_{135} + v_{136} + v_{137} \\ & - v_{119} - v_{122} - v_{123} - v_{124} - v_{125} \end{aligned} \quad (359)$$

6.60 Species B_Raf_Ras_GTP

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in ten reactions (as a reactant in J138, J144, J145, J146, J147 and as a product in J54, J156, J157, J158, J159).

$$\begin{aligned} \frac{d}{dt} \text{B_Raf_Ras_GTP} = & v_{53} + v_{138} + v_{139} + v_{140} + v_{141} \\ & - v_{120} - v_{126} - v_{127} - v_{128} - v_{129} \end{aligned} \quad (360)$$

6.61 Species ppMEK

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in six reactions (as a reactant in J57, J135 and as a product in J136, J153, J157, J161).

$$\frac{d}{dt} \text{ppMEK} = v_{118} + v_{135} + v_{139} + v_{143} - v_{54} - v_{117} \quad (361)$$

6.62 Species ppERK

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in J63, J166 and as a product in J136, J168).

$$\frac{d}{dt} \text{ppERK} = v_{118} + v_{150} - 2 v_{58} - v_{148} \quad (362)$$

6.63 Species pTrkA

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in nine reactions (as a reactant in J72, J74, J75, J76, J77, J78, J105 and as a product in J71 and as a modifier in J123).

$$\frac{d}{dt}\text{pTrkA} = v_{64} - v_{65} - v_{67} - v_{68} - v_{69} - v_{70} - v_{71} - v_{97} \quad (363)$$

6.64 Species Crk_C3G

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in eight reactions (as a reactant in J38, J44, J103, J104 and as a product in J34, J107, J108, J164).

$$\frac{d}{dt}\text{Crk_C3G} = v_{34} + v_{99} + v_{100} + v_{146} - v_{38} - v_{44} - v_{95} - v_{96} \quad (364)$$

6.65 Species Rap1_GTP

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in J53, J67, J122 and as a product in J68).

$$\frac{d}{dt}\text{Rap1_GTP} = v_{61} - v_{52} - v_{60} - v_{112} \quad (365)$$

6.66 Species L_NGFR

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J71 and as a product in J70).

$$\frac{d}{dt}\text{L_NGFR} = v_{63} - v_{64} \quad (366)$$

6.67 Species ppMEK_ERK

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in six reactions (as a reactant in J61, J136 and as a product in J135, J155, J159, J163).

$$\frac{d}{dt}\text{ppMEK_ERK} = v_{117} + v_{137} + v_{141} + v_{145} - v_{56} - v_{118} \quad (367)$$

6.68 Species dppERK

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in J165 and as a product in J63 and as a modifier in J50, J51, J124).

$$\frac{d}{dt}\text{dppERK} = v_{58} - v_{147} \quad (368)$$

6.69 Species Shc_pTrkA

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in J82, J89, J102 and as a product in J75 and as a modifier in J123).

$$\frac{d}{dt}\text{Shc_pTrkA} = v_{68} - v_{75} - v_{82} - v_{94} \quad (369)$$

6.70 Species Shc_pTrkA_endo

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in J81, J93 and as a product in J79, J102).

$$\frac{d}{dt}\text{Shc_pTrkA_endo} = v_{72} + v_{94} - v_{74} - v_{85} \quad (370)$$

6.71 Species pShc_pTrkA

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in six reactions (as a reactant in J90, J96, J101 and as a product in J76, J82 and as a modifier in J123).

$$\frac{d}{dt}\text{pShc_pTrkA} = v_{69} + v_{75} - v_{83} - v_{88} - v_{93} \quad (371)$$

6.72 Species pFRS2_pTrkA

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in six reactions (as a reactant in J88, J99, J103 and as a product in J78, J83 and as a modifier in J123).

$$\frac{d}{dt}\text{pFRS2_pTrkA} = v_{71} + v_{76} - v_{81} - v_{91} - v_{95} \quad (372)$$

6.73 Species FRS2_pTrkA

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in J83, J87, J100 and as a product in J77 and as a modifier in J123).

$$\frac{d}{dt}\text{FRS2_pTrkA} = v_{70} - v_{76} - v_{80} - v_{92} \quad (373)$$

6.74 Species pShc_pTrkA_endo

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in J94, J95 and as a product in J80, J81, J101).

$$\frac{d}{dt}\text{pShc_pTrkA_endo} = v_{73} + v_{74} + v_{93} - v_{86} - v_{87} \quad (374)$$

6.75 Species FRS2_pTrkA_endo

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in J86, J92 and as a product in J84, J100).

$$\frac{d}{dt}\text{FRS2_pTrkA_endo} = v_{77} + v_{92} - v_{79} - v_{84} \quad (375)$$

6.76 Species pFRS2_pTrkA_endo

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in five reactions (as a reactant in J104, J112 and as a product in J85, J86, J99).

$$\frac{d}{dt}\text{pFRS2_pTrkA_endo} = v_{78} + v_{79} + v_{91} - v_{96} - v_{103} \quad (376)$$

6.77 Species Crk_C3G_pFRS2_pTrkA_endo

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in J108 and as a product in J98, J104 and as a modifier in J68).

$$\frac{d}{dt}\text{Crk_C3G_pFRS2_pTrkA_endo} = v_{90} + v_{96} - v_{100} \quad (377)$$

6.78 Species Grb2_SOS_pShc_pTrkA

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in six reactions (as a reactant in J97, J109 and as a product in J96, J105 and as a modifier in J69, J123).

$$\frac{d}{dt}\text{Grb2_SOS_pShc_pTrkA} = v_{88} + v_{97} - v_{89} - v_{101} \quad (378)$$

6.79 Species Crk_C3G_pFRS2_pTrkA

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in J98, J107 and as a product in J103 and as a modifier in J123).

$$\frac{d}{dt}\text{Crk_C3G_pFRS2_pTrkA} = v_{95} - v_{90} - v_{99} \quad (379)$$

6.80 Species Grb2_SOS_pShc_pTrkA_endo

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in J110 and as a product in J95, J97, J106).

$$\frac{d}{dt}\text{Grb2_SOS_pShc_pTrkA_endo} = v_{87} + v_{89} + v_{98} - v_{102} \quad (380)$$

6.81 Species c_Raf_Ras_GTP_MEK

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J152 and as a product in J140).

$$\frac{d}{dt}\text{c_Raf_Ras_GTP_MEK} = v_{122} - v_{134} \quad (381)$$

6.82 Species c_Raf_Ras_GTP_pMEK

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J153 and as a product in J141).

$$\frac{d}{dt}\text{c_Raf_Ras_GTP_pMEK} = v_{123} - v_{135} \quad (382)$$

6.83 Species `c_Raf_Ras_GTP_MEK_ERK`

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in [J154](#) and as a product in [J142](#)).

$$\frac{d}{dt}c_Raf_Ras_GTP_MEK_ERK = v_{124} - v_{136} \quad (383)$$

6.84 Species `c_Raf_Ras_GTP_pMEK_ERK`

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in [J155](#) and as a product in [J143](#)).

$$\frac{d}{dt}c_Raf_Ras_GTP_pMEK_ERK = v_{125} - v_{137} \quad (384)$$

6.85 Species `B_Raf_Ras_GTP_MEK`

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in [J156](#) and as a product in [J144](#)).

$$\frac{d}{dt}B_Raf_Ras_GTP_MEK = v_{126} - v_{138} \quad (385)$$

6.86 Species `B_Raf_Ras_GTP_pMEK`

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in [J157](#) and as a product in [J145](#)).

$$\frac{d}{dt}B_Raf_Ras_GTP_pMEK = v_{127} - v_{139} \quad (386)$$

6.87 Species `B_Raf_Ras_GTP_MEK_ERK`

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in [J158](#) and as a product in [J146](#)).

$$\frac{d}{dt}B_Raf_Ras_GTP_MEK_ERK = v_{128} - v_{140} \quad (387)$$

6.88 Species `B_Raf_Ras_GTP_pMEK_ERK`

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in [J159](#) and as a product in [J147](#)).

$$\frac{d}{dt}B_Raf_Ras_GTP_pMEK_ERK = v_{129} - v_{141} \quad (388)$$

6.89 Species B_Raf_Rap1_GTP_MEK

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J160 and as a product in J148).

$$\frac{d}{dt} \text{B_Raf_Rap1_GTP_MEK} = v_{130} - v_{142} \quad (389)$$

6.90 Species B_Raf_Rap1_GTP_pMEK

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J161 and as a product in J149).

$$\frac{d}{dt} \text{B_Raf_Rap1_GTP_pMEK} = v_{131} - v_{143} \quad (390)$$

6.91 Species B_Raf_Rap1_GTP_MEK_ERK

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J162 and as a product in J150).

$$\frac{d}{dt} \text{B_Raf_Rap1_GTP_MEK_ERK} = v_{132} - v_{144} \quad (391)$$

6.92 Species B_Raf_Rap1_GTP_pMEK_ERK

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J163 and as a product in J151).

$$\frac{d}{dt} \text{B_Raf_Rap1_GTP_pMEK_ERK} = v_{133} - v_{145} \quad (392)$$

6.93 Species ppERK_MKP3

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J167 and as a product in J166).

$$\frac{d}{dt} \text{ppERK_MKP3} = v_{148} - v_{149} \quad (393)$$

6.94 Species dppERK_MKP3

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in J168 and as a product in J165).

$$\frac{d}{dt} \text{dppERK_MKP3} = v_{147} - v_{150} \quad (394)$$

6.95 Species `pro_TrkA`

Initial concentration $0.020631 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in one reaction (as a reactant in [J113](#)), which does not influence its rate of change because this species is on the boundary of the reaction system:

$$\frac{d}{dt}\text{pro_TrkA} = 0 \quad (395)$$

6.96 Species `NGF`

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in one reaction (as a reactant in [J70](#)), which does not influence its rate of change because this species is on the boundary of the reaction system:

$$\frac{d}{dt}\text{NGF} = 0 \quad (396)$$

6.97 Species `EGF`

Initial concentration $0.001613 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in one reaction (as a reactant in [re2](#)), which does not influence its rate of change because this species is on the boundary of the reaction system:

$$\frac{d}{dt}\text{EGF} = 0 \quad (397)$$

6.98 Species `pro_EGFR`

Initial concentration $0.3 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in one reaction (as a reactant in [re1](#)), which does not influence its rate of change because this species is on the boundary of the reaction system:

$$\frac{d}{dt}\text{pro_EGFR} = 0 \quad (398)$$

6.99 Species `degradation`

Initial concentration $0 \mu\text{mol} \cdot \text{l}^{-1}$

This species takes part in 14 reactions (as a product in [J73](#), [J74](#), [J87](#), [J88](#), [J89](#), [J90](#), [J92](#), [J93](#), [J94](#), [J107](#), [J108](#), [J109](#), [J110](#), [J112](#)), which do not influence its rate of change because this species is on the boundary of the reaction system:

$$\frac{d}{dt}\text{degradation} = 0 \quad (399)$$

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