SBML Model Report

Model name: "Birtwistle2007_ErbB_Signalling"

May 6, 2016

1 General Overview

This is a document in SBML Level 2 Version 3 format. This model was created by Lukas Endler[1] at July 17th 2008 at 1:46 p. m. and last time modified at April eighth 2016 at 3:42 p. m. Table 1 provides 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	1
species types	0	species	120
events	0	constraints	0
reactions	102	function definitions	0
global parameters	240	unit definitions	1
rules	2	initial assignments	0

Model Notes

This model originates from BioModels Database: A Database of Annotated Published Models.
It is copyright (c) 2005-2009 The BioModels Team.
For more information see the terms of use.
To cite BioModels Database, please use Le Novre N., Bornstein B., Broicher A., Courtot M., Donizelli M., Dharuri H., Li L., Sauro H., Schilstra M., Shapiro B., Snoep J.L., Hucka M. (2006)

[1]EMBL-EBI, lukas@ebi.ac.uk

BioModels Database: A Free, Centralized Database of Curated, Published, Quantitative Kinetic Models of Biochemical and Cellular Systems Nucleic Acids Res., 34: D689-D691.

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 nanomole

Definition nmol

2.2 Unit `volume`

Notes Litre is the predefined SBML unit for `volume`.

Definition l

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 Compartment

This model contains one compartment.

Table 2: Properties of all compartments.

Id	Name	SBO	Spatial Dimensions	Size	Unit	Constant	Outside
`membrane`	membrane		2	1	m^2	☑	

3.1 Compartment `membrane`

This is a two dimensional compartment with a constant size of one m^2.

Name membrane

4 Species

This model contains 120 species. The boundary condition of two of these species is set to `true` so that these species' amount cannot be changed by any reaction. Section 8 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 Condition
E1	ErbB1	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E2	ErbB2	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E3	ErbB3	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E4	ErbB4	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E_E1	EGF-ErbB1	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
H_E3	HRG-ErbB3	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
H_E4	HRG-ErbB4	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E11	(EGF-ErbB1)2	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E12	EGF-ErbB1-ErbB2	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E23	HRG-ErbB3-ErbB2	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E34	(HRG-ErbB3/4)2	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E24	HRG-Erb4-ErbB2	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E44	(HRG-Erb4)2	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E11P	E11_p	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E12P	E12_p	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E23P	E23_p	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E34P	E34_p	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E24P	E24_p	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E44P	E44_p	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
G	Grb2	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
S	Shc	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
I	PI-3K	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
R	RasGAP	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
O	SOS	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
A	Gab1	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E11G	E11-Grb2	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E11S	E11-Shc	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E11R	E11-RasGAP	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E12G	E12-Grb2	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E12S	E12-Shc	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E12R	E12-RasGAP	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E23G	E23-Grb2	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E23S	E23-Shc	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E23I	E23-PI-3K	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E23R	E23-RasGAP	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E34G	E34-Grb2	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E34S	E34-Shc	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E34I	E34-PI-3K	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E34R	E34-RasGAP	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E24G	E24-Grb2	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E24S	E24-Shc	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E24I	E24-PI-3K	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E24R	E24-RasGAP	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E44G	E44-Grb2	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E44S	E44-Shc	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E44I	E44-PI-3K	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
E44R	E44-RasGAP	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟
SigG	Sum Grb2	membrane	$\mathrm{nmol} \cdot \mathrm{m}^{-2}$	⊟	⊟

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
SigS	Sum Shc	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
SigI	Sum PI-3K	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
SigR	Sum RasGAP	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
SigA	Sum Gab1	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
SigSP	Sum Shc_p	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
SigAP	Sum Gab1_p	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
SigG_O	Sum Grb2-SOS	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
SigG_A	Sum Grb2-Gab1	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
SigSP_G	Sum Shc_p-Grb2	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
SigAP_S	Sum Gab1_p-Shc	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
SigAP_I	Sum Gab1_p-PI-3K	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
SigAP_R	Sum Gab1_p-RasGAP	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
Empty	Empty	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
P3_A	PIP3-Gab1	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
P2	PIP2	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
P3	PIP3	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
Akt	Akt	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
RsD	RasGDP	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
RsT	RasGTP	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
SigRP	Sum RasGAP_p	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
Raf	Raf	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
Rafstar	Raf*	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
MEK	MEK	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
MEKstar	MEK*	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
ERK	ERK	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
ERKstar	ERK*	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
OP	SOS_p	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
AP	Gab1_p	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
A_SigG_O	Gab1_SumGrb2-SOS	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
SigA_G	Sum PIP3-Gab1-Grb2	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
SigA_G_O	Sum PIP3-Gab1-Grb2_SOS	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
SigO	Sum SOS	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E13	ErbB1-ErbB3	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E14	ErbB1-ErbB4	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E13P	ErbB1-ErbB3_p	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E14P	ErbB1-ErbB3_p	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E13G	E13-Grb2	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E13S	E13-Shc	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E13I	E13-PI-3K	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E13R	E13-RasGAP	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E14G	E14-Grb2	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E14S	E14-Shc	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E14I	E14-PI-3K	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E14R	E14-RasGAP	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
T	PTP-1B	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E11T	E11-PTP-1B	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E12T	E12-PTP-1B	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E23T	E23-PTP-1B	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E34T	E34-PTP-1B	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E24T	E24-PTP-1B	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E44T	E44-PTP-1B	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E13T	E13-PTP-1B	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E14T	E14-PTP-1B	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
SigT	Sig-PTP-1B	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
E1_PT	E1_p-PTP-1B	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E2_PT	E2_p-PTP-1B	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E4_PT	E4_p-PTP-1B	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E_E1_PT	E_E1_p-PTP-1B	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
H_E4_PT	H_E4_p-PTP-1B	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
Aktstar	Aktstar	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
SigAP_T	SumGab1_p-PTP-1B	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
E	EGF	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
H	HRG	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
fint	fint	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
pERK	p_ERK	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
ERK_MEKstar	ERK-MEK*	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
pERK_MEKstar	p_ERK-MEK*	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
pERK_ERKpase	p_ERK-ERKpase	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
ERKpase	ERKpase	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
ERKstar_ERKpase	ERK*-ERKpase	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	⊟
norm_Akt_star	normalized Akt*	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	☑
norm_Erk_star	normalized Erk*	membrane	$\mathrm{nmol \cdot m^{-2}}$	⊟	☑

5 Parameters

This model contains 240 global parameters.

Table 4: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
ErbB1_Abund	ErbB1_Abund		274.000		☑
ErbB2_Abund	ErbB2_Abund		158.000		☑
ErbB3_Abund	ErbB3_Abund		294.000		☑
ErbB4_Abund	ErbB4_Abund		399.000		☑
Grb2_Abund	Grb2_Abund		82.400		☑
Shc_Abund	Shc_Abund		11.500		☑
PI3K_Abund	PI3K_Abund		46.400		☑
RasGAP_Abund	RasGAP_Abund		93.600		☑
SOS_Abund	SOS_Abund		82.300		☑
Gab1_Abund	Gab1_Abund		43.100		☑
PIP2_Abund	PIP2_Abund		197.000		☑
Akt_Abund	Akt_Abund		444.292		☑
Ras_Abund	Ras_Abund		95.700		☑
Raf_Abund	Raf_Abund		743.000		☑
MEK_Abund	MEK_Abund		772.000		☑
ERK_Abund	ERK_Abund		749.972		☑
VmaxPY	VmaxPY		223.878		☑
KmPY	KmPY		486.140		☑
kdeg	kdeg		0.026		☑
kf47	kf47		24.605		☑
Vmaxr47	Vmaxr47		590.506		☑
Kmf47	Kmf47		698.602		☑
Kmr47	Kmr47		483.862		☑
kf48	kf48		16.833		☑
Kmf48	Kmf48		715.569		☑
Kmr48	Kmr48		324.929		☑
PTEN	PTEN		693.579		☑
kf49	kf49		44.350		☑
kr49	kr49		552.675		☑
Kmf49	Kmf49		343.248		☑
Kmr49	Kmr49		753.167		☑
Kmr49b	Kmr49b		381.221		☑
kr49b	kr49b		640.821		☑
kf51	kf51		3.652		☑
kr51	kr51		0.000		☑
Vmaxr51	Vmaxr51		16.737		☑
Kmf51	Kmf51		599.708		☑

Id	Name	SBO	Value	Unit	Constant
Kmr51	Kmr51		346.478		☑
Kmrb51	Kmrb51		988.450		☑
kf52	kf52		0.775		☑
Vmaxr52	Vmaxr52		199.277		☑
Kmf52	Kmf52		545.441		☑
Kmr52	Kmr52		675.299		☑
kf53	kf53		0.609		☑
Vmaxr53	Vmaxr53		59.231		☑
Kmf53	Kmf53		812.254		☑
Kmr53	Kmr53		944.769		☑
kf54	kf54		0.054		☑
Vmaxr54	Vmaxr54		588.267		☑
Kmf54	Kmf54		457.965		☑
Kmr54	Kmr54		336.183		☑
kf55	kf55		0.226		☑
Vmaxr55	Vmaxr55		646.900		☑
Kmf55	Kmf55		460.945		☑
Kmr55	Kmr55		643.925		☑
kf38	kf38		279.993		☑
kf39	kf39		385.743		☑
kf50	kf50		389.106		☑
a98	a98		0.085		☑
b98	b98		0.183		☑
koff46	koff46		0.519		☑
EGF_off	EGF_off		0.018		☑
HRGoff_3	HRGoff_3		$9 \cdot 10^{-4}$		☑
HRGoff_4	HRGoff_4		0.097		☑
koff4	koff4		0.172		☑
koff5	koff5		4.399		☑
koff6	koff6		2.662		☑
koff7	koff7		8.056		☑
koff8	koff8		9.103		☑
koff9	koff9		5.543		☑
koff57	koff57		0.453		☑
koff16	koff16		0.574		☑
koff17	koff17		4.687		☑
koff18	koff18		2.277		☑
koff19	koff19		2.336		☑
koff20	koff20		0.676		☑
koff21	koff21		4.729		☑
koff22	koff22		3.696		☑
koff23	koff23		2.362		☑

Id	Name	SBO	Value	Unit	Constant
koff24	koff24		4.423		☑
koff25	koff25		2.225		☑
koff26	koff26		0.010		☑
koff27	koff27		1.892		☑
koff28	koff28		4.643		☑
koff29	koff29		2.015		☑
koff30	koff30		4.994		☑
koff31	koff31		1.220		☑
koff32	koff32		3.875		☑
koff33	koff33		1.282		☑
koff34	koff34		3.204		☑
koff35	koff35		1.870		☑
koff36	koff36		1.257		☑
koff37	koff37		0.406		☑
koff65	koff65		0.119		☑
koff66	koff66		2.299		☑
koff67	koff67		1.614		☑
koff40	koff40		3.105		☑
koff41	koff41		7.049		☑
koff42	koff42		3.520		☑
koff43	koff43		0.544		☑
koff44	koff44		0.427		☑
koff45	koff45		3.997		☑
koff58	koff58		6.306		☑
koff59	koff59		9.172		☑
koff68	koff68		2.887		☑
PTP1B_Abund	PTP1B_Abund		500.000		☑
kPTP10	kPTP10		29.853		☑
kPTP11	kPTP11		78.204		☑
kPTP12	kPTP12		11.421		☑
kPTP13	kPTP13		55.210		☑
kPTP14	kPTP14		57.751		☑
kPTP15	kPTP15		60.263		☑
kPTP63	kPTP63		7.477		☑
kPTP64	kPTP64		48.634		☑
koff73	koff73		3.005		☑
koff74	koff74		1.250		☑
koff75	koff75		1.432		☑
koff76	koff76		2.154		☑
koff77	koff77		1.224		☑
koff78	koff78		0.201		☑
koff79	koff79		1.185		☑

Id	Name	SBO	Value	Unit	Constant
koff80	koff80		2.937		☑
kPTP38	kPTP38		83.447		☑
kPTP39	kPTP39		79.613		☑
koff88	koff88		3.926		☑
kPTP50	kPTP50		96.572		☑
kf81	kf81		1.361		☑
Vmaxr81	Vmaxr81		242.603		☑
Kmf81	Kmf81		485.263		☑
Kmr81	Kmr81		323.401		☑
kf82	kf82		6.999		☑
Vmaxr82	Vmaxr82		398.193		☑
Kmf82	Kmf82		781.437		☑
Kmr82	Kmr82		595.840		☑
kf83	kf83		1.763		☑
Vmaxr83	Vmaxr83		534.053		☑
Kmf83	Kmf83		609.477		☑
Kmr83	Kmr83		653.518		☑
kf84	kf84		4.689		☑
Vmaxr84	Vmaxr84		634.163		☑
Kmf84	Kmf84		622.385		☑
Kmr84	Kmr84		258.464		☑
kf85	kf85		6.759		☑
Vmaxr85	Vmaxr85		369.226		☑
Kmf85	Kmf85		179.649		☑
Kmr85	Kmr85		290.767		☑
kcon49	kcon49		9.978		☑
kon1	kon1		$1.0086 \cdot 10^{-4}$		☑
kon86	kon86		0.004		☑
kon2	kon2		0.006		☑
kon3	kon3		0.033		☑
kon87	kon87		$8 \cdot 10^{-4}$		☑
kon4	kon4		0.501		☑
kon5	kon5		2.543		☑
kon6	kon6		0.228		☑
kon7	kon7		1.061		☑
kon8	kon8		1.026		☑
kon9	kon9		2.287		☑
kon57	kon57		0.004		☑
kf10	kf10		0.650		☑
kf11	kf11		0.372		☑
kf12	kf12		1.801		☑
kf13	kf13		0.888		☑

Id	Name	SBO	Value	Unit	Constant
kf14	kf14		6.173		☑
kf15	kf15		1.357		☑
kf63	kf63		0.930		☑
kf64	kf64		1.208		☑
kon16	kon16		0.010		☑
kon17	kon17		0.005		☑
kon18	kon18		0.012		☑
kon73	kon73		0.012		☑
kon19	kon19		0.090		☑
kon20	kon20		0.048		☑
kon21	kon21		0.011		☑
kon74	kon74		0.013		☑
kon22	kon22		$7 \cdot 10^{-4}$		☑
kon23	kon23		0.014		☑
kon24	kon24		0.005		☑
kon25	kon25		0.100		☑
kon75	kon75		0.014		☑
kon26	kon26		0.036		☑
kon27	kon27		0.020		☑
kon28	kon28		0.007		☑
kon29	kon29		0.035		☑
kon76	kon76		0.005		☑
kon30	kon30		0.002		☑
kon31	kon31		0.003		☑
kon32	kon32		$9 \cdot 10^{-4}$		☑
kon33	kon33		0.034		☑
kon77	kon77		0.010		☑
kon34	kon34		10^{-4}		☑
kon35	kon35		0.060		☑
kon36	kon36		0.004		☑
kon37	kon37		0.079		☑
kon78	kon78		0.008		☑
kon79	kon79		0.008		☑
kon65	kon65		0.012		☑
kon66	kon66		$1.9264 \cdot 10^{-4}$		☑
kon67	kon67		$6.6667 \cdot 10^{-5}$		☑
kon80	kon80		$2 \cdot 10^{-4}$		☑
kon40	kon40		0.019		☑
kon41	kon41		0.005		☑
kon42	kon42		0.002		☑
kon43	kon43		0.013		☑
kon44	kon44		0.012		☑

Id	Name	SBO	Value	Unit	Constant
kon45	kon45		0.003		☑
kon88	kon88		0.011		☑
kon46	kon46		0.015		☑
kon58	kon58		0.022		☑
kon59	kon59		0.008		☑
kon60	kon60		$1.1994 \cdot 10^{-4}$		☑
VeVc	VeVc		33.300		☑
koff60	koff60		4.998		☑
koff61	koff61		5.229		☑
kon61	kon61		0.805		☑
kon62	kon62		1.782		☑
koff62	koff62		5.514		☑
kon68	kon68		0.005		☑
kon69	kon69		0.008		☑
koff69	koff69		3.970		☑
kon70	kon70		0.012		☑
koff70	koff70		2.607		☑
kon71	kon71		0.008		☑
koff71	koff71		2.299		☑
kon72	kon72		0.036		☑
koff72	koff72		0.907		☑
eps	eps		10^{-16}		☑
kon89	kon89		0.200		☑
koff89	koff89		99.964		☑
kcat90	kcat90		20.004		☑
kon91	kon91		0.197		☑
koff91	koff91		99.998		☑
kcat92	kcat92		0.200		☑
kon93	kon93		0.200		☑
koff93	koff93		100.004		☑
kcat94	kcat94		0.997		☑
kon95	kon95		0.199		☑
koff95	koff95		100.002		☑
kcat96	kcat96		19.985		☑
ERKPpase_Abund	ERKPpase_Abund		35.005		☑

6 Rules

This is an overview of two rules.

6.1 Rule norm_Akt_star

Rule norm_Akt_star is an assignment rule for species norm_Akt_star:

$$\text{norm\_Akt\_star} = \frac{[\text{Aktstar}]}{18.8} \tag{1}$$

6.2 Rule norm_Erk_star

Rule norm_Erk_star is an assignment rule for species norm_Erk_star:

$$\text{norm\_Erk\_star} = \frac{[\text{ERKstar}] + [\text{ERKstar\_ERKpase}]}{589.5} \tag{2}$$

7 Reactions

This model contains 102 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 5: Overview of all reactions

№	Id	Name	Reaction Equation	SBO
1	EGF_Binding_to-_ErbB1	EGF Binding to ErbB1	$E1 \overset{E}{\rightleftharpoons} E\_E1$	
2	HRG_Binding_to-_ErbB3	HRG Binding to ErbB3	$E3 \overset{H}{\rightleftharpoons} H\_E3$	
3	HRG_Binding_to-_ErbB4	HRG Binding to ErbB4	$E4 \overset{H}{\rightleftharpoons} H\_E4$	
4	ErbB1-_Dimerization	ErbB1 Dimerization	$E\_E1 + E\_E1 \rightleftharpoons E11$	
5	ErbB1ErbB2-_Heterodimerization	ErbB1/ErbB2 Heterodimerization	$E\_E1 + E2 \rightleftharpoons E12$	
6	ErbB2ErbB3-_Heterodimerization	ErbB2/ErbB3 Heterodimerization	$H\_E3 + E2 \rightleftharpoons E23$	
7	ErbB3ErbB4-_Heterodimerization	ErbB3/ErbB4 Heterodimerization	$H\_E3 + H\_E4 \rightleftharpoons E34$	
8	ErbB2ErbB4-_Heterodimerization	ErbB2/ErbB4 Heterodimerization	$H\_E4 + E2 \rightleftharpoons E24$	
9	ErbB4-_Homodimerization	ErbB4 Homodimerization	$H\_E4 + H\_E4 \rightleftharpoons E44$	
10	Net_E11-_Phosphorylation	Net E11 Phosphorylation	$E11 \overset{SigT}{\rightleftharpoons} E11P$	

№	Id	Name	Reaction Equation	SBO
11	Net_E12-_Phosphorylation	Net E12 Phosphorylation	$\mathrm{E12} \overset{\mathrm{SigT}}{\rightleftharpoons} \mathrm{E12P}$	
12	Net_E23-_Phosphorylation	Net E23 Phosphorylation	$\mathrm{E23} \overset{\mathrm{SigT}}{\rightleftharpoons} \mathrm{E23P}$	
13	Net_E34-_Phosphorylation	Net E34 Phosphorylation	$\mathrm{E34} \overset{\mathrm{SigT}}{\rightleftharpoons} \mathrm{E34P}$	
14	Net_E24-_Phosphorylation	Net E24 Phosphorylation	$\mathrm{E24} \overset{\mathrm{SigT}}{\rightleftharpoons} \mathrm{E24P}$	
15	Net_E44-_Phosphorylation	Net E44 Phosphorylation	$\mathrm{E44} \overset{\mathrm{SigT}}{\rightleftharpoons} \mathrm{E44P}$	
16	Net_E11PGrb2-_binding	Net E11P/Grb2 binding	$\mathrm{E11P} + \mathrm{G} \overset{\mathrm{SigG\_A,\ SigG\_O,\ A\_SigG\_O}}{\rightleftharpoons} \mathrm{E11G} + \mathrm{SigG}$	
17	Net_E11PShc-_binding	Net E11P/Shc binding	$\mathrm{E11P} + \mathrm{S} \overset{\mathrm{SigSP,\ SigSP\_G}}{\rightleftharpoons} \mathrm{E11S} + \mathrm{SigS}$	
18	Net_E11PRasGAP-_binding	Net E11P/RasGAP binding	$\mathrm{E11P} + \mathrm{R} \overset{\mathrm{SigRP}}{\rightleftharpoons} \mathrm{E11R} + \mathrm{SigR}$	
19	Net_E12PGrb2-_binding	Net E12P/Grb2 binding	$\mathrm{E12P} + \mathrm{G} \overset{\mathrm{SigG\_A,\ SigG\_O,\ A\_SigG\_O}}{\rightleftharpoons} \mathrm{E12G} + \mathrm{SigG}$	
20	Net_E12PShc-_binding	Net E12P/Shc binding	$\mathrm{E12P} + \mathrm{S} \overset{\mathrm{SigSP,\ SigSP\_G}}{\rightleftharpoons} \mathrm{E12S} + \mathrm{SigS}$	
21	Net_E12PRasGAP-_binding	Net E12P/RasGAP binding	$\mathrm{E12P} + \mathrm{R} \overset{\mathrm{SigRP}}{\rightleftharpoons} \mathrm{E12R} + \mathrm{SigR}$	

№	Id	Name	Reaction Equation	SBO
22	Net_E23PGrb2_binding	Net E23P/Grb2 binding	$\mathrm{E23P} + \mathrm{G} \overset{\text{SigG\_A, SigG\_O, A\_SigG\_O}}{\rightleftharpoons} \mathrm{E23G} + \mathrm{SigG}$	
23	Net_E23PShc_binding	Net E23P/Shc binding	$\mathrm{E23P} + \mathrm{S} \overset{\text{SigSP, SigSP\_G}}{\rightleftharpoons} \mathrm{E23S} + \mathrm{SigS}$	
24	Net_E23PPI3K_binding	Net E23P/PI3K binding	$\mathrm{E23P} + \mathrm{I} \rightleftharpoons \mathrm{E23I} + \mathrm{SigI}$	
25	Net_E23PRasGAP_binding	Net E23P/RasGAP binding	$\mathrm{E23P} + \mathrm{R} \overset{\text{SigRP}}{\rightleftharpoons} \mathrm{E23R} + \mathrm{SigR}$	
26	Net_E34PGrb2_binding	Net E34P/Grb2 binding	$\mathrm{E34P} + \mathrm{G} \overset{\text{SigG\_A, SigG\_O, A\_SigG\_O}}{\rightleftharpoons} \mathrm{E34G} + \mathrm{SigG}$	
27	Net_E34PShc_binding	Net E34P/Shc binding	$\mathrm{E34P} + \mathrm{S} \overset{\text{SigSP, SigSP\_G}}{\rightleftharpoons} \mathrm{E34S} + \mathrm{SigS}$	
28	Net_E34PPI3K_binding	Net E34P/PI3K binding	$\mathrm{E34P} + \mathrm{I} \rightleftharpoons \mathrm{E34I} + \mathrm{SigI}$	
29	Net_E34PRasGAP_binding	Net E34P/RasGAP binding	$\mathrm{E34P} + \mathrm{R} \overset{\text{SigRP}}{\rightleftharpoons} \mathrm{E34R} + \mathrm{SigR}$	
30	Net_E24PGrb2_binding	Net E24P/Grb2 binding	$\mathrm{E24P} + \mathrm{G} \overset{\text{SigG\_A, SigG\_O, A\_SigG\_O}}{\rightleftharpoons} \mathrm{E24G} + \mathrm{SigG}$	
31	Net_E24PShc_binding	Net E24P/Shc binding	$\mathrm{E24P} + \mathrm{S} \overset{\text{SigSP, SigSP\_G}}{\rightleftharpoons} \mathrm{E24S} + \mathrm{SigS}$	
32	Net_E24PPI3K_binding	Net E24P/PI3K binding	$\mathrm{E24P} + \mathrm{I} \rightleftharpoons \mathrm{E24I} + \mathrm{SigI}$	
33	Net_E24PRasGAP_binding	Net E24P/RasGAP binding	$\mathrm{E24P} + \mathrm{R} \overset{\text{SigRP}}{\rightleftharpoons} \mathrm{E24R} + \mathrm{SigR}$	

№	Id	Name	Reaction Equation	SBO
34	Net_E44PRasGAP-_binding_1	Net E44P/RasGAP binding	$\mathrm{E44P} + \mathrm{G} \overset{\text{SigG\_A, SigG\_O, A\_SigG\_O}}{\rightleftharpoons} \mathrm{E44G} + \mathrm{SigG}$	
35	Net_E44PShc-_binding	Net E44P/Shc binding	$\mathrm{E44P} + \mathrm{S} \overset{\text{SigSP, SigSP\_G}}{\rightleftharpoons} \mathrm{E44S} + \mathrm{SigS}$	
36	Net_E44PPI3K-_binding	Net E44P/PI3K binding	$\mathrm{E44P} + \mathrm{I} \rightleftharpoons \mathrm{E44I} + \mathrm{SigI}$	
37	Net_E44PRasGAP-_binding_2	Net E44P/RasGAP binding	$\mathrm{E44P} + \mathrm{R} \overset{\text{SigRP}}{\rightleftharpoons} \mathrm{E44R} + \mathrm{SigR}$	
38	Net_Shc-_Phosphorylation	Net Shc Phosphorylation	$\mathrm{SigS} \overset{\text{E11P, E12P, E23P, E24P, E34P, E44P, E13P, E14P, SigT}}{\rightleftharpoons} \mathrm{SigSP}$	
39	Net_Gab1-_Phosphorylation	Net Gab1 Phosphorylation	$\mathrm{SigA} \overset{\text{E11P, E12P, E23P, E24P, E34P, E44P, E13P, E14P, SigT}}{\rightleftharpoons} \mathrm{SigAP}$	
40	Net_Grb2SOS-_binding	Net Grb2/SOS binding	$\mathrm{SigG} + \mathrm{O} \rightleftharpoons \mathrm{SigG\_O} + \mathrm{SigO}$	
41	Net_Grb2Gab1-_binding	Net Grb2/Gab1 binding	$\mathrm{SigG} + \mathrm{A} \overset{\text{SigAP, SigAP\_S, SigAP\_R, SigAP\_I, SigAP\_T}}{\rightleftharpoons} \mathrm{SigG\_A} + \mathrm{SigA}$	
42	Net_ShcGrb2-_binding	Net Shc/Grb2 binding	$\mathrm{SigSP} + \mathrm{G} \overset{\text{SigG\_A, SigG\_O, A\_SigG\_O}}{\rightleftharpoons} \mathrm{SigSP\_G} + \mathrm{SigG}$	
43	Net_Gab1Shc-_binding	Net Gab1/Shc binding	$\mathrm{SigAP} + \mathrm{S} \overset{\text{SigSP, SigSP\_G}}{\rightleftharpoons} \mathrm{SigAP\_S} + \mathrm{SigS}$	
44	Net_Gab1PI3K-_binding	Net Gab1/PI3K binding	$\mathrm{SigAP} + \mathrm{I} \rightleftharpoons \mathrm{SigAP\_I} + \mathrm{SigI}$	
45	Net_Gab1RasGAP-_binding	Net Gab1/RasGAP binding	$\mathrm{SigAP} + \mathrm{R} \overset{\text{SigRP}}{\rightleftharpoons} \mathrm{SigAP\_R} + \mathrm{SigR}$	

№	Id	Name	Reaction Equation	SBO
46	Net_Gab1PIP3-_binding	Net Gab1/PIP3 binding	$P3 + A \xrightleftharpoons{SigAP,\ SigAP\_S,\ SigAP\_R,\ SigAP\_I,\ SigAP\_T} P3\_A + SigA$	
47	Net_Akt-_Activation	Net Akt Activation	$Akt \xrightleftharpoons{P3} Aktstar$	
48	Net_PIP3-_Production	Net PIP3 Production	$P2 \xrightleftharpoons{fint,\ E11P,\ E12P,\ E23P,\ E24P,\ E34P,\ E44P,\ E13P,\ E14P,\ SigI} P3$	
49	Net_RasGTP-_Production	Net RasGTP Production	$RsD \xrightleftharpoons{SigO,\ SigR,\ SigRP} RsT$	
50	Net_RasGAP-_Phosphorylation	Net RasGAP Phosphorylation	$SigR \xrightleftharpoons{E11P,\ E12P,\ E23P,\ E24P,\ E34P,\ E44P,\ E13P,\ E14P,\ SigT} SigRP$	
51	Net_Raf-_Activation	Net Raf Activation	$Raf \xrightleftharpoons{RsT} Rafstar$	
52	Net_MEK-_Activation	Net MEK Activation	$MEK \xrightleftharpoons{Rafstar} MEKstar$	
53	Net_SOS_ST-_Phosphorylation	Net SOS S/T Phosphorylation	$O \xrightleftharpoons{ERKstar} OP$	
54	Net_Gab1_ST-_Phosphorylation	Net Gab1 S/T Phosphorylation	$A \xrightleftharpoons{ERKstar} AP$	
55	Grb2_binding-_to_P3_A	Grb2 binding to P3_A	$G + P3\_A \rightleftharpoons SigA\_G$	
56	SOS_binding_to-_SigAG	SOS binding to SigA-G	$SigA\_G + O \rightleftharpoons SigA\_G\_O + SigO$	
57	Gab1_binding-_to_SigGO	Gab1 binding to SigG-O	$SigG\_O + A \xrightleftharpoons{SigAP,\ SigAP\_S,\ SigAP\_R,\ SigAP\_I,\ SigAP\_T} A\_SigG\_O + SigA$	

№	Id	Name	Reaction Equation	SBO
58	SOS_binding_to_SigGA	SOS binding to SigG-A	$\mathrm{SigG\_A} + \mathrm{O} \rightleftharpoons \mathrm{A\_SigG\_O} + \mathrm{SigO}$	
59	ErbB1ErbB3_Heterodimerization	ErbB1/ErbB3 Heterodimerization	$\mathrm{H\_E3} + \mathrm{E\_E1} \rightleftharpoons \mathrm{E13}$	
60	ErbB1ErbB4_Heterodimerization	ErbB1/ErbB4 Heterodimerization	$\mathrm{H\_E4} + \mathrm{E\_E1} \rightleftharpoons \mathrm{E14}$	
61	Net_E13_Phosphorylation	Net E13 Phosphorylation	$\mathrm{E13} \overset{\mathrm{SigT}}{\rightleftharpoons} \mathrm{E13P}$	
62	Net_E14_Phosphorylation	Net E14 Phosphorylation	$\mathrm{E14} \overset{\mathrm{SigT}}{\rightleftharpoons} \mathrm{E14P}$	
63	Net_E13Grb2_Binding	Net E13/Grb2 Binding	$\mathrm{E13P} + \mathrm{G} \overset{\mathrm{SigG\_A,\ SigG\_O,\ A\_SigG\_O}}{\rightleftharpoons} \mathrm{E13G} + \mathrm{SigG}$	
64	Net_E13Shc_Binding	Net E13/Shc Binding	$\mathrm{E13P} + \mathrm{S} \overset{\mathrm{SigSP,\ SigSP\_G}}{\rightleftharpoons} \mathrm{E13S} + \mathrm{SigS}$	
65	Net_E13PI3K_Binding	Net E13/PI3K Binding	$\mathrm{E13P} + \mathrm{I} \rightleftharpoons \mathrm{E13I} + \mathrm{SigI}$	
66	Net_E13RasGAP_Binding	Net E13/RasGAP Binding	$\mathrm{E13P} + \mathrm{R} \overset{\mathrm{SigRP}}{\rightleftharpoons} \mathrm{E13R} + \mathrm{SigR}$	
67	Net_E14Grb2_Binding	Net E14/Grb2 Binding	$\mathrm{E14P} + \mathrm{G} \overset{\mathrm{SigG\_A,\ SigG\_O,\ A\_SigG\_O}}{\rightleftharpoons} \mathrm{E14G} + \mathrm{SigG}$	
68	Net_E14Shc_Binding	Net E14/Shc Binding	$\mathrm{E14P} + \mathrm{S} \overset{\mathrm{SigSP,\ SigSP\_G}}{\rightleftharpoons} \mathrm{E14S} + \mathrm{SigS}$	
69	Net_E14PI3K_Binding	Net E14/PI3K Binding	$\mathrm{E14P} + \mathrm{I} \rightleftharpoons \mathrm{E14I} + \mathrm{SigI}$	

№	Id	Name	Reaction Equation	SBO
70	Net_E14RasGAP-_Binding	Net E14/RasGAP Binding	$\mathrm{E14P} + \mathrm{R} \overset{\mathrm{SigRP}}{\rightleftharpoons} \mathrm{E14R} + \mathrm{SigR}$	
71	Net_E11PTP1B-_Binding	Net E11/PTP1B Binding	$\mathrm{E11P} + \mathrm{T} \rightleftharpoons \mathrm{E11T} + \mathrm{SigT}$	
72	Net_E12PTP1B-_Binding	Net E12/PTP1B Binding	$\mathrm{E12P} + \mathrm{T} \rightleftharpoons \mathrm{E12T} + \mathrm{SigT}$	
73	Net_E23PTP1B-_Binding	Net E23/PTP1B Binding	$\mathrm{E23P} + \mathrm{T} \rightleftharpoons \mathrm{E23T} + \mathrm{SigT}$	
74	Net_E34PTP1B-_Binding	Net E34/PTP1B Binding	$\mathrm{E34P} + \mathrm{T} \rightleftharpoons \mathrm{E34T} + \mathrm{SigT}$	
75	Net_E24PTP1B-_Binding	Net E24/PTP1B Binding	$\mathrm{E24P} + \mathrm{T} \rightleftharpoons \mathrm{E24T} + \mathrm{SigT}$	
76	Net_E44PTP1B-_Binding	Net E44/PTP1B Binding	$\mathrm{E44P} + \mathrm{T} \rightleftharpoons \mathrm{E44T} + \mathrm{SigT}$	
77	Net_E13PTP1B-_Binding	Net E13/PTP1B Binding	$\mathrm{E13P} + \mathrm{T} \rightleftharpoons \mathrm{E13T} + \mathrm{SigT}$	
78	Net_E14PTP1B-_Binding	Net E14/PTP1B Binding	$\mathrm{E14P} + \mathrm{T} \rightleftharpoons \mathrm{E14T} + \mathrm{SigT}$	
79	Net_E1_ST-_Phosphorylation	Net E1 S/T Phosphorylation	$\mathrm{E1} \overset{\mathrm{ERKstar}}{\rightleftharpoons} \mathrm{E1\_PT}$	
80	Net_E2_ST-_Phosphorylation	Net E2 S/T Phosphorylation	$\mathrm{E2} \overset{\mathrm{ERKstar}}{\rightleftharpoons} \mathrm{E2\_PT}$	
81	Net_E4_ST-_Phosphorylation	Net E4 S/T Phosphorylation	$\mathrm{E4} \overset{\mathrm{ERKstar}}{\rightleftharpoons} \mathrm{E4\_PT}$	
82	Net_E_E1_ST-_Phosphorylation	Net E_E1 S/T Phosphorylation	$\mathrm{E\_E1} \overset{\mathrm{ERKstar}}{\rightleftharpoons} \mathrm{E\_E1\_PT}$	

№	Id	Name	Reaction Equation	SBO
83	Net_H_E4_ST-_Phosphorylation	Net H_E4 S/T Phosphorylation	$\text{H\_E4} \overset{\text{ERKstar}}{\rightleftharpoons} \text{H\_E4\_PT}$	
84	EGF_binding_to-_E1PT	EGF binding to E1-PT	$\text{E1\_PT} \overset{\text{E}}{\rightleftharpoons} \text{E\_E1\_PT}$	
85	HRG_binding_to-_E4PT	HRG binding to E4-PT	$\text{E4\_PT} \overset{\text{H}}{\rightleftharpoons} \text{H\_E4\_PT}$	
86	PTP1B_binding-_to_SigAP	PTP1B binding to SigAP	$\text{SigAP} + \text{T} \rightleftharpoons \text{SigAP\_T} + \text{SigT}$	
87	E11P-_Degradation	E11P Degradation	$\text{E11P} \longrightarrow \text{Empty}$	
88	E11G-_Degradation	E11G Degradation	$\text{E11G} + \text{SigG} \longrightarrow \text{G}$	
89	E11S-_Degradation	E11S Degradation	$\text{E11S} + \text{SigS} \longrightarrow \text{S}$	
90	E11R-_Degradation	E11R Degradation	$\text{E11R} + \text{SigR} \longrightarrow \text{R}$	
91	E11T-_Degradation	E11T Degradation	$\text{E11T} + \text{SigT} \longrightarrow \text{T}$	
92	mwbbde76d1-_155c-_4264_8447-_4457527547cb	1-1 Dimer Internalization Fraction	$\text{Empty} \longrightarrow \text{fint}$	
93	EGF_in_EC-_compartment	EGF in EC compartment	$\text{E} \overset{\text{E1, E\_E1, E1\_PT, E\_E1\_PT}}{\rightleftharpoons} \text{Empty}$	
94	HRG_in_EC-_compartment	HRG in EC compartment	$\text{H} \overset{\text{E4\_PT, H\_E4\_PT, E3, H\_E3, E4, H\_E4}}{\rightleftharpoons} \text{Empty}$	

№	Id	Name	Reaction Equation	SBO
95	ERK_binding_to_MEKstar_1	ERK binding to MEKstar	$\mathrm{ERK} + \mathrm{MEKstar} \rightleftharpoons \mathrm{ERK\_MEKstar}$	
96	pERK_production	pERK production	$\mathrm{ERK\_MEKstar} \longrightarrow \mathrm{pERK} + \mathrm{MEKstar}$	
97	ERK_binding_to_MEKstar_2	ERK binding to MEKstar	$\mathrm{pERK} + \mathrm{MEKstar} \rightleftharpoons \mathrm{pERK\_MEKstar}$	
98	ERKstar_production	ERKstar production	$\mathrm{pERK\_MEKstar} \longrightarrow \mathrm{ERKstar} + \mathrm{MEKstar}$	
99	ERKstar_binding_to_Phosphatase	ERKstar binding to Phosphatase	$\mathrm{ERKstar} + \mathrm{ERKpase} \rightleftharpoons \mathrm{ERKstar\_ERKpase}$	
100	ERKstar_dephosphorylation	ERKstar dephosphorylation	$\mathrm{ERKstar\_ERKpase} \longrightarrow \mathrm{pERK} + \mathrm{ERKpase}$	
101	pERK_binding_to_Phosphatase	pERK binding to Phosphatase	$\mathrm{pERK} + \mathrm{ERKpase} \rightleftharpoons \mathrm{pERK\_ERKpase}$	
102	pERK_dephosphorylation	pERK dephosphorylation	$\mathrm{pERK\_ERKpase} \longrightarrow \mathrm{ERK} + \mathrm{ERKpase}$	

7.1 Reaction EGF_Binding_to_ErbB1

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name EGF Binding to ErbB1

Reaction equation

$$\mathrm{E1} \overset{\mathrm{E}}{\rightleftharpoons} \mathrm{E\_E1} \tag{3}$$

Reactant

Table 6: Properties of each reactant.

Id	Name	SBO
E1	ErbB1	

Modifier

Table 7: Properties of each modifier.

Id	Name	SBO
E	EGF	

Product

Table 8: Properties of each product.

Id	Name	SBO
E_E1	EGF-ErbB1	

Kinetic Law

Derived unit contains undeclared units

$$v_1 = \mathrm{area}\,(\mathrm{membrane}) \cdot (\mathrm{kon1} \cdot [\mathrm{E}] \cdot [\mathrm{E1}] - \mathrm{EGF\_off} \cdot [\mathrm{E\_E1}]) \tag{4}$$

7.2 Reaction HRG_Binding_to_ErbB3

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name HRG Binding to ErbB3

Reaction equation

$$\mathrm{E3} \overset{\mathrm{H}}{\rightleftharpoons} \mathrm{H\_E3} \tag{5}$$

Reactant

Table 9: Properties of each reactant.

Id	Name	SBO
E3	ErbB3	

Modifier

Table 10: Properties of each modifier.

Id	Name	SBO
H	HRG	

Product

Table 11: Properties of each product.

Id	Name	SBO
H_E3	HRG-ErbB3	

Kinetic Law

Derived unit contains undeclared units

$$v_2 = \mathrm{area}\,(\mathrm{membrane}) \cdot (\mathrm{kon2} \cdot [\mathrm{H}] \cdot [\mathrm{E3}] - \mathrm{HRGoff\_3} \cdot [\mathrm{H\_E3}]) \tag{6}$$

7.3 Reaction HRG_Binding_to_ErbB4

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name HRG Binding to ErbB4

Reaction equation

$$\mathrm{E4} \overset{\mathrm{H}}{\rightleftharpoons} \mathrm{H\_E4} \tag{7}$$

Reactant

Table 12: Properties of each reactant.

Id	Name	SBO
E4	ErbB4	

Modifier

Table 13: Properties of each modifier.

Id	Name	SBO
H	HRG	

Product

Table 14: Properties of each product.

Id	Name	SBO
H_E4	HRG-ErbB4	

Kinetic Law

Derived unit contains undeclared units

$$v_3 = \text{area}\,(\text{membrane}) \cdot (\text{kon3} \cdot [\text{H}] \cdot [\text{E4}] - \text{HRGoff\_4} \cdot [\text{H\_E4}]) \tag{8}$$

7.4 Reaction ErbB1_Dimerization

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

Name ErbB1 Dimerization

Reaction equation

$$\text{E\_E1} + \text{E\_E1} \rightleftharpoons \text{E11} \tag{9}$$

Reactants

Table 15: Properties of each reactant.

Id	Name	SBO
E_E1	EGF-ErbB1	
E_E1	EGF-ErbB1	

Product

Table 16: Properties of each product.

Id	Name	SBO
E11	(EGF-ErbB1)2	

Kinetic Law

Derived unit contains undeclared units

$$v_4 = \text{area}\,(\text{membrane}) \cdot (\text{kon4} \cdot [\text{E\_E1}] \cdot [\text{E\_E1}] - \text{koff4} \cdot [\text{E11}]) \tag{10}$$

7.5 Reaction ErbB1ErbB2_Heterodimerization

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

Name ErbB1/ErbB2 Heterodimerization

Reaction equation

$$\text{E\_E1} + \text{E2} \rightleftharpoons \text{E12} \tag{11}$$

Reactants

Table 17: Properties of each reactant.

Id	Name	SBO
E_E1	EGF-ErbB1	
E2	ErbB2	

Product

Table 18: Properties of each product.

Id	Name	SBO
E12	EGF-ErbB1-ErbB2	

Kinetic Law

Derived unit contains undeclared units

$$v_5 = \text{area}\,(\text{membrane}) \cdot (\text{kon5} \cdot [\text{E\_E1}] \cdot [\text{E2}] - \text{koff5} \cdot [\text{E12}]) \tag{12}$$

7.6 Reaction ErbB2ErbB3_Heterodimerization

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

Name ErbB2/ErbB3 Heterodimerization

Reaction equation

$$\mathrm{H\_E3} + \mathrm{E2} \rightleftharpoons \mathrm{E23} \tag{13}$$

Reactants

Table 19: Properties of each reactant.

Id	Name	SBO
H_E3	HRG-ErbB3	
E2	ErbB2	

Product

Table 20: Properties of each product.

Id	Name	SBO
E23	HRG-ErbB3-ErbB2	

Kinetic Law

Derived unit contains undeclared units

$$v_6 = \mathrm{area}\,(\mathrm{membrane}) \cdot (\mathrm{kon6} \cdot [\mathrm{H\_E3}] \cdot [\mathrm{E2}] - \mathrm{koff6} \cdot [\mathrm{E23}]) \tag{14}$$

7.7 Reaction ErbB3ErbB4_Heterodimerization

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

Name ErbB3/ErbB4 Heterodimerization

Reaction equation

$$\mathrm{H\_E3} + \mathrm{H\_E4} \rightleftharpoons \mathrm{E34} \tag{15}$$

Reactants

Table 21: Properties of each reactant.

Id	Name	SBO
H_E3	HRG-ErbB3	
H_E4	HRG-ErbB4	

Product

Table 22: Properties of each product.

Id	Name	SBO
E34	(HRG-ErbB3/4)2	

Kinetic Law

Derived unit contains undeclared units

$$v_7 = \text{area}\,(\text{membrane}) \cdot (\text{kon7} \cdot [\text{H\_E3}] \cdot [\text{H\_E4}] - \text{koff7} \cdot [\text{E34}]) \tag{16}$$

7.8 Reaction ErbB2ErbB4_Heterodimerization

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

Name ErbB2/ErbB4 Heterodimerization

Reaction equation

$$\text{H\_E4} + \text{E2} \rightleftharpoons \text{E24} \tag{17}$$

Reactants

Table 23: Properties of each reactant.

Id	Name	SBO
H_E4	HRG-ErbB4	
E2	ErbB2	

Product

Table 24: Properties of each product.

Id	Name	SBO
E24	HRG-Erb4-ErbB2	

Kinetic Law

Derived unit contains undeclared units

$$v_8 = \text{kon8} \cdot [\text{H\_E4}] \cdot [\text{E2}] - \text{koff8} \cdot [\text{E24}] \tag{18}$$

7.9 Reaction ErbB4_Homodimerization

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

Name ErbB4 Homodimerization

Reaction equation

$$\text{H\_E4} + \text{H\_E4} \rightleftharpoons \text{E44} \tag{19}$$

Reactants

Table 25: Properties of each reactant.

Id	Name	SBO
H_E4	HRG-ErbB4	
H_E4	HRG-ErbB4	

Product

Table 26: Properties of each product.

Id	Name	SBO
E44	(HRG-Erb4)2	

Kinetic Law

Derived unit contains undeclared units

$$v_9 = \text{area}(\text{membrane}) \cdot (\text{kon9} \cdot [\text{H\_E4}] \cdot [\text{H\_E4}] - \text{koff9} \cdot [\text{E44}]) \tag{20}$$

7.10 Reaction Net_E11_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net E11 Phosphorylation

Reaction equation

$$\mathrm{E11} \overset{\mathrm{SigT}}{\rightleftharpoons} \mathrm{E11P} \tag{21}$$

Reactant

Table 27: Properties of each reactant.

Id	Name	SBO
E11	(EGF-ErbB1)2	

Modifier

Table 28: Properties of each modifier.

Id	Name	SBO
SigT	Sig-PTP-1B	

Product

Table 29: Properties of each product.

Id	Name	SBO
E11P	E11_p	

Kinetic Law

Derived unit contains undeclared units

$$v_{10} = \mathrm{area}\,(\mathrm{membrane}) \cdot \left(\mathrm{kf10} \cdot [\mathrm{E11}] - \frac{\mathrm{VmaxPY} \cdot [\mathrm{E11P}]}{\mathrm{KmPY} + [\mathrm{E11P}]} - \mathrm{kPTP10} \cdot [\mathrm{SigT}] \cdot [\mathrm{E11P}] \right) \tag{22}$$

7.11 Reaction Net_E12_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net E12 Phosphorylation

Reaction equation

$$\mathrm{E12} \overset{\mathrm{SigT}}{\rightleftharpoons} \mathrm{E12P} \tag{23}$$

Reactant

Table 30: Properties of each reactant.

Id	Name	SBO
E12	EGF-ErbB1-ErbB2	

Modifier

Table 31: Properties of each modifier.

Id	Name	SBO
SigT	Sig-PTP-1B	

Product

Table 32: Properties of each product.

Id	Name	SBO
E12P	E12_p	

Kinetic Law

Derived unit contains undeclared units

$$v_{11} = \mathrm{area}\,(\mathrm{membrane}) \cdot \left(\mathrm{kf11} \cdot [\mathrm{E12}] - \frac{\mathrm{VmaxPY} \cdot [\mathrm{E12P}]}{\mathrm{KmPY} + [\mathrm{E12P}]} - \mathrm{kPTP11} \cdot [\mathrm{SigT}] \cdot [\mathrm{E12P}] \right) \tag{24}$$

7.12 Reaction Net_E23_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net E23 Phosphorylation

Reaction equation

$$\mathrm{E23} \overset{\mathrm{SigT}}{\rightleftharpoons} \mathrm{E23P} \tag{25}$$

Reactant

Table 33: Properties of each reactant.

Id	Name	SBO
E23	HRG-ErbB3-ErbB2	

Modifier

Table 34: Properties of each modifier.

Id	Name	SBO
SigT	Sig-PTP-1B	

Product

Table 35: Properties of each product.

Id	Name	SBO
E23P	E23_p	

Kinetic Law

Derived unit contains undeclared units

$$v_{12} = \text{area}\,(\text{membrane}) \cdot \left(\text{kf12} \cdot [\text{E23}] - \frac{\text{VmaxPY} \cdot [\text{E23P}]}{\text{KmPY} + [\text{E23P}]} - \text{kPTP12} \cdot [\text{SigT}] \cdot [\text{E23P}] \right) \quad (26)$$

7.13 Reaction Net_E34_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net E34 Phosphorylation

Reaction equation

$$\text{E34} \underset{\longleftarrow}{\overset{\text{SigT}}{\longrightarrow}} \text{E34P} \quad (27)$$

Reactant

Table 36: Properties of each reactant.

Id	Name	SBO
E34	(HRG-ErbB3/4)2	

Modifier

Table 37: Properties of each modifier.

Id	Name	SBO
SigT	Sig-PTP-1B	

Product

Table 38: Properties of each product.

Id	Name	SBO
E34P	E34_p	

Kinetic Law

Derived unit contains undeclared units

$$v_{13} = \text{area}\,(\text{membrane}) \cdot \left(\text{kf13} \cdot [\text{E34}] - \frac{\text{VmaxPY} \cdot [\text{E34P}]}{\text{KmPY} + [\text{E34P}]} - \text{kPTP13} \cdot [\text{SigT}] \cdot [\text{E34P}] \right) \quad (28)$$

7.14 Reaction Net_E24_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net E24 Phosphorylation

Reaction equation

$$\text{E24} \overset{\text{SigT}}{\rightleftharpoons} \text{E24P} \quad (29)$$

Reactant

Table 39: Properties of each reactant.

Id	Name	SBO
E24	HRG-Erb4-ErbB2	

Modifier

Table 40: Properties of each modifier.

Id	Name	SBO
SigT	Sig-PTP-1B	

Product

Table 41: Properties of each product.

Id	Name	SBO
E24P	E24_p	

Kinetic Law

Derived unit contains undeclared units

$$v_{14} = \text{area}\,(\text{membrane}) \cdot \left(\text{kf14} \cdot [\text{E24}] - \frac{\text{VmaxPY} \cdot [\text{E24P}]}{\text{KmPY} + [\text{E24P}]} - \text{kPTP14} \cdot [\text{SigT}] \cdot [\text{E24P}] \right) \quad (30)$$

7.15 Reaction Net_E44_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net E44 Phosphorylation

Reaction equation

$$\text{E44} \underset{\rightleftharpoons}{\overset{\text{SigT}}{\rightleftharpoons}} \text{E44P} \quad (31)$$

Reactant

Table 42: Properties of each reactant.

Id	Name	SBO
E44	(HRG-Erb4)2	

Modifier

Table 43: Properties of each modifier.

Id	Name	SBO
SigT	Sig-PTP-1B	

Product

Table 44: Properties of each product.

Id	Name	SBO
E44P	E44_p	

Kinetic Law

Derived unit contains undeclared units

$$v_{15} = \text{area}\,(\text{membrane}) \cdot \left(\text{kf15} \cdot [\text{E44}] - \frac{\text{VmaxPY} \cdot [\text{E44P}]}{\text{KmPY} + [\text{E44P}]} - \text{kPTP15} \cdot [\text{SigT}] \cdot [\text{E44P}] \right) \quad (32)$$

7.16 Reaction Net_E11PGrb2_binding

This is a reversible reaction of two reactants forming two products influenced by three modifiers.

Name Net E11P/Grb2 binding

Reaction equation

$$\text{E11P} + \text{G} \underset{}{\overset{\text{SigG\_A, SigG\_O, A\_SigG\_O}}{\rightleftharpoons}} \text{E11G} + \text{SigG} \quad (33)$$

Reactants

Table 45: Properties of each reactant.

Id	Name	SBO
E11P	E11_p	
G	Grb2	

Modifiers

Table 46: Properties of each modifier.

Id	Name	SBO
SigG_A	Sum Grb2-Gab1	
SigG_O	Sum Grb2-SOS	
A_SigG_O	Gab1_SumGrb2-SOS	

Products

Table 47: Properties of each product.

Id	Name	SBO
E11G	E11-Grb2	
SigG	Sum Grb2	

Kinetic Law

Derived unit contains undeclared units

$$v_{16} = \text{area}\,(\text{membrane}) \cdot \left(4 \cdot \text{kon16} \cdot [\text{E11P}] \cdot [\text{G}] - \text{koff16} \cdot \frac{[\text{SigG}]}{[\text{SigG}] + [\text{SigG\_A}] + [\text{SigG\_O}] + [\text{A\_SigG\_O}] + \text{eps}} \cdot [\text{E11G}] \right) \tag{34}$$

7.17 Reaction Net_E11PShc_binding

This is a reversible reaction of two reactants forming two products influenced by two modifiers.

Name Net E11P/Shc binding

Reaction equation

$$\text{E11P} + \text{S} \underset{}{\overset{\text{SigSP, SigSP\_G}}{\rightleftharpoons}} \text{E11S} + \text{SigS} \tag{35}$$

Reactants

Table 48: Properties of each reactant.

Id	Name	SBO
E11P	E11_p	
S	Shc	

Modifiers

Table 49: Properties of each modifier.

Id	Name	SBO
SigSP	Sum Shc_p	
SigSP_G	Sum Shc_p-Grb2	

Products

Table 50: Properties of each product.

Id	Name	SBO
E11S	E11-Shc	
SigS	Sum Shc	

Kinetic Law

Derived unit contains undeclared units

$$v_{17} = \text{area}\,(\text{membrane}) \cdot \left(8 \cdot \text{kon17} \cdot [\text{E11P}] \cdot [\text{S}] - \text{koff17} \cdot \frac{[\text{SigS}]}{[\text{SigS}] + [\text{SigSP}] + [\text{SigSP\_G}] + \text{eps}} \cdot [\text{E11S}]\right) \tag{36}$$

7.18 Reaction Net_E11PRasGAP_binding

This is a reversible reaction of two reactants forming two products influenced by one modifier.

Name Net E11P/RasGAP binding

Reaction equation

$$\text{E11P} + \text{R} \underset{}{\overset{\text{SigRP}}{\rightleftharpoons}} \text{E11R} + \text{SigR} \tag{37}$$

Reactants

Table 51: Properties of each reactant.

Id	Name	SBO
E11P	E11_p	
R	RasGAP	

Modifier

Table 52: Properties of each modifier.

Id	Name	SBO
SigRP	Sum RasGAP_p	

Products

Table 53: Properties of each product.

Id	Name	SBO
E11R	E11-RasGAP	
SigR	Sum RasGAP	

Kinetic Law

Derived unit contains undeclared units

$$v_{18} = \text{area}\,(\text{membrane}) \cdot \left(2 \cdot \text{kon18} \cdot [\text{E11P}] \cdot [\text{R}] - \text{koff18} \cdot \frac{[\text{SigR}]}{[\text{SigR}] + [\text{SigRP}] + \text{eps}} \cdot [\text{E11R}]\right) \tag{38}$$

7.19 Reaction Net_E12PGrb2_binding

This is a reversible reaction of two reactants forming two products influenced by three modifiers.

Name Net E12P/Grb2 binding

Reaction equation

$$\text{E12P} + \text{G} \underset{}{\overset{\text{SigG\_A, SigG\_O, A\_SigG\_O}}{\rightleftharpoons}} \text{E12G} + \text{SigG} \tag{39}$$

Reactants

Table 54: Properties of each reactant.

Id	Name	SBO
E12P	E12_p	
G	Grb2	

Modifiers

Table 55: Properties of each modifier.

Id	Name	SBO
SigG_A	Sum Grb2-Gab1	
SigG_O	Sum Grb2-SOS	
A_SigG_O	Gab1_SumGrb2-SOS	

Products

Table 56: Properties of each product.

Id	Name	SBO
E12G	E12-Grb2	
SigG	Sum Grb2	

Kinetic Law

Derived unit contains undeclared units

$$v_{19} = \text{area}\,(\text{membrane}) \cdot \left(3 \cdot \text{kon19} \cdot [\text{E12P}] \cdot [\text{G}] - \text{koff19} \cdot \frac{[\text{SigG}]}{[\text{SigG}] + [\text{SigG\_A}] + [\text{SigG\_O}] + [\text{A\_SigG\_O}] + \text{eps}} \cdot [\text{E12G}] \right) \tag{40}$$

7.20 Reaction Net_E12PShc_binding

This is a reversible reaction of two reactants forming two products influenced by two modifiers.

Name Net E12P/Shc binding

Reaction equation

$$\text{E12P} + \text{S} \underset{}{\overset{\text{SigSP, SigSP\_G}}{\rightleftharpoons}} \text{E12S} + \text{SigS} \tag{41}$$

Reactants

Table 57: Properties of each reactant.

Id	Name	SBO
E12P	E12_p	
S	Shc	

Modifiers

Table 58: Properties of each modifier.

Id	Name	SBO
SigSP	Sum Shc_p	
SigSP_G	Sum Shc_p-Grb2	

Products

Table 59: Properties of each product.

Id	Name	SBO
E12S	E12-Shc	
SigS	Sum Shc	

Kinetic Law

Derived unit contains undeclared units

$$v_{20} = \text{area}\,(\text{membrane}) \cdot \left(6 \cdot \text{kon20} \cdot [\text{E12P}] \cdot [\text{S}] - \text{koff20} \cdot \frac{[\text{SigS}]}{[\text{SigS}] + [\text{SigSP}] + [\text{SigSP\_G}] + \text{eps}} \cdot [\text{E12S}]\right) \tag{42}$$

7.21 Reaction Net_E12PRasGAP_binding

This is a reversible reaction of two reactants forming two products influenced by one modifier.

Name Net E12P/RasGAP binding

Reaction equation

$$\text{E12P} + \text{R} \overset{\text{SigRP}}{\rightleftharpoons} \text{E12R} + \text{SigR} \tag{43}$$

Reactants

Table 60: Properties of each reactant.

Id	Name	SBO
E12P	E12_p	
R	RasGAP	

Modifier

Table 61: Properties of each modifier.

Id	Name	SBO
SigRP	Sum RasGAP_p	

Products

Table 62: Properties of each product.

Id	Name	SBO
E12R	E12-RasGAP	
SigR	Sum RasGAP	

Kinetic Law

Derived unit contains undeclared units

$$v_{21} = \text{area}\,(\text{membrane}) \cdot \left(2 \cdot \text{kon21} \cdot [\text{E12P}] \cdot [\text{R}] - \text{koff21} \cdot \frac{[\text{SigR}]}{[\text{SigR}] + [\text{SigRP}] + \text{eps}} \cdot [\text{E12R}]\right) \tag{44}$$

7.22 Reaction Net_E23PGrb2_binding

This is a reversible reaction of two reactants forming two products influenced by three modifiers.

Name Net E23P/Grb2 binding

Reaction equation

$$\text{E23P} + \text{G} \underset{}{\overset{\text{SigG\_A, SigG\_O, A\_SigG\_O}}{\rightleftharpoons}} \text{E23G} + \text{SigG} \tag{45}$$

Reactants

Table 63: Properties of each reactant.

Id	Name	SBO
E23P	E23_p	
G	Grb2	

Modifiers

Table 64: Properties of each modifier.

Id	Name	SBO
SigG_A	Sum Grb2-Gab1	
SigG_O	Sum Grb2-SOS	
A_SigG_O	Gab1_SumGrb2-SOS	

Products

Table 65: Properties of each product.

Id	Name	SBO
E23G	E23-Grb2	
SigG	Sum Grb2	

Kinetic Law

Derived unit contains undeclared units

$$v_{22} = \text{area}\,(\text{membrane}) \cdot \left(3 \cdot \text{kon22} \cdot [\text{E23P}] \cdot [\text{G}] - \text{koff22} \cdot \frac{[\text{SigG}]}{[\text{SigG}] + [\text{SigG\_A}] + [\text{SigG\_O}] + [\text{A\_SigG\_O}] + \text{eps}} \cdot [\text{E23G}] \right) \tag{46}$$

7.23 Reaction Net_E23PShc_binding

This is a reversible reaction of two reactants forming two products influenced by two modifiers.

Name Net E23P/Shc binding

Reaction equation

$$\text{E23P} + \text{S} \underset{}{\overset{\text{SigSP, SigSP\_G}}{\rightleftharpoons}} \text{E23S} + \text{SigS} \tag{47}$$

Reactants

Table 66: Properties of each reactant.

Id	Name	SBO
E23P	E23_p	
S	Shc	

Modifiers

Table 67: Properties of each modifier.

Id	Name	SBO
SigSP	Sum Shc_p	
SigSP_G	Sum Shc_p-Grb2	

Products

Table 68: Properties of each product.

Id	Name	SBO
E23S	E23-Shc	
SigS	Sum Shc	

Kinetic Law

Derived unit contains undeclared units

$$v_{23} = \text{area}\,(\text{membrane}) \cdot \left(3 \cdot \text{kon23} \cdot [\text{E23P}] \cdot [\text{S}] - \text{koff23} \cdot \frac{[\text{SigS}]}{[\text{SigS}] + [\text{SigSP}] + [\text{SigSP\_G}] + \text{eps}} \cdot [\text{E23S}]\right) \tag{48}$$

7.24 Reaction Net_E23PPI3K_binding

This is a reversible reaction of two reactants forming two products.

Name Net E23P/PI3K binding

Reaction equation

$$\text{E23P} + \text{I} \rightleftharpoons \text{E23I} + \text{SigI} \tag{49}$$

Reactants

Table 69: Properties of each reactant.

Id	Name	SBO
E23P	E23_p	
I	PI-3K	

Products

Table 70: Properties of each product.

Id	Name	SBO
E23I	E23-PI-3K	
SigI	Sum PI-3K	

Kinetic Law

Derived unit contains undeclared units

$$v_{24} = \text{area}\,(\text{membrane}) \cdot (3 \cdot \text{kon24} \cdot [\text{E23P}] \cdot [\text{I}] - \text{koff24} \cdot [\text{E23I}]) \tag{50}$$

7.25 Reaction Net_E23PRasGAP_binding

This is a reversible reaction of two reactants forming two products influenced by one modifier.

Name Net E23P/RasGAP binding

Reaction equation

$$\text{E23P} + \text{R} \overset{\text{SigRP}}{\rightleftharpoons} \text{E23R} + \text{SigR} \tag{51}$$

Reactants

Table 71: Properties of each reactant.

Id	Name	SBO
E23P	E23_p	
R	RasGAP	

Modifier

Table 72: Properties of each modifier.

Id	Name	SBO
SigRP	Sum RasGAP_p	

Products

Table 73: Properties of each product.

Id	Name	SBO
E23R	E23-RasGAP	
SigR	Sum RasGAP	

Kinetic Law

Derived unit contains undeclared units

$$v_{25} = \text{area}\,(\text{membrane}) \cdot \left(2 \cdot \text{kon25} \cdot [\text{E23P}] \cdot [\text{R}] - \text{koff25} \cdot \frac{[\text{SigR}]}{[\text{SigR}] + [\text{SigRP}] + \text{eps}} \cdot [\text{E23R}]\right) \tag{52}$$

7.26 Reaction Net_E34PGrb2_binding

This is a reversible reaction of two reactants forming two products influenced by three modifiers.

Name Net E34P/Grb2 binding

Reaction equation

$$\text{E34P} + \text{G} \underset{}{\overset{\text{SigG\_A, SigG\_O, A\_SigG\_O}}{\rightleftharpoons}} \text{E34G} + \text{SigG} \tag{53}$$

Reactants

Table 74: Properties of each reactant.

Id	Name	SBO
E34P	E34_p	
G	Grb2	

Modifiers

Table 75: Properties of each modifier.

Id	Name	SBO
SigG_A	Sum Grb2-Gab1	
SigG_O	Sum Grb2-SOS	
A_SigG_O	Gab1_SumGrb2-SOS	

Products

Table 76: Properties of each product.

Id	Name	SBO
E34G	E34-Grb2	
SigG	Sum Grb2	

Kinetic Law

Derived unit contains undeclared units

$$v_{26} = \text{area}\,(\text{membrane}) \cdot \left(4 \cdot \text{kon26} \cdot [\text{E34P}] \cdot [\text{G}] - \text{koff26} \cdot \frac{[\text{SigG}]}{[\text{SigG}] + [\text{SigG\_A}] + [\text{SigG\_O}] + [\text{A\_SigG\_O}] + \text{eps}} \cdot [\text{E34G}]\right) \tag{54}$$

7.27 Reaction Net_E34PShc_binding

This is a reversible reaction of two reactants forming two products influenced by two modifiers.

Name Net E34P/Shc binding

Reaction equation

$$\text{E34P} + \text{S} \underset{}{\overset{\text{SigSP, SigSP\_G}}{\rightleftharpoons}} \text{E34S} + \text{SigS} \tag{55}$$

Reactants

Table 77: Properties of each reactant.

Id	Name	SBO
E34P	E34_p	
S	Shc	

Modifiers

Table 78: Properties of each modifier.

Id	Name	SBO
SigSP	Sum Shc_p	
SigSP_G	Sum Shc_p-Grb2	

Products

Table 79: Properties of each product.

Id	Name	SBO
E34S	E34-Shc	
SigS	Sum Shc	

Kinetic Law

Derived unit contains undeclared units

$$v_{27} = \text{area}(\text{membrane}) \cdot \left(3 \cdot \text{kon27} \cdot [\text{E34P}] \cdot [\text{S}] - \text{koff27} \cdot \frac{[\text{SigS}]}{[\text{SigS}] + [\text{SigSP}] + [\text{SigSP\_G}] + \text{eps}} \cdot [\text{E34S}]\right) \tag{56}$$

7.28 Reaction Net_E34PPI3K_binding

This is a reversible reaction of two reactants forming two products.

Name Net E34P/PI3K binding

Reaction equation

$$\text{E34P} + \text{I} \rightleftharpoons \text{E34I} + \text{SigI} \tag{57}$$

Reactants

Table 80: Properties of each reactant.

Id	Name	SBO
E34P	E34_p	
I	PI-3K	

Products

Table 81: Properties of each product.

Id	Name	SBO
E34I	E34-PI-3K	
SigI	Sum PI-3K	

Kinetic Law

Derived unit contains undeclared units

$$v_{28} = \text{area}\,(\text{membrane}) \cdot (4 \cdot \text{kon28} \cdot [\text{E34P}] \cdot [\text{I}] - \text{koff28} \cdot [\text{E34I}]) \tag{58}$$

7.29 Reaction Net_E34PRasGAP_binding

This is a reversible reaction of two reactants forming two products influenced by one modifier.

Name Net E34P/RasGAP binding

Reaction equation

$$\text{E34P} + \text{R} \overset{\text{SigRP}}{\rightleftharpoons} \text{E34R} + \text{SigR} \tag{59}$$

Reactants

Table 82: Properties of each reactant.

Id	Name	SBO
E34P	E34_p	
R	RasGAP	

Modifier

Table 83: Properties of each modifier.

Id	Name	SBO
SigRP	Sum RasGAP_p	

Products

Table 84: Properties of each product.

Id	Name	SBO
E34R	E34-RasGAP	
SigR	Sum RasGAP	

Kinetic Law

Derived unit contains undeclared units

$$v_{29} = \text{area}\,(\text{membrane}) \cdot \left(2 \cdot \text{kon29} \cdot [\text{E34P}] \cdot [\text{R}] - \text{koff29} \cdot \frac{[\text{SigR}]}{[\text{SigR}] + [\text{SigRP}] + \text{eps}} \cdot [\text{E34R}]\right) \tag{60}$$

7.30 Reaction Net_E24PGrb2_binding

This is a reversible reaction of two reactants forming two products influenced by three modifiers.

Name Net E24P/Grb2 binding

Reaction equation

$$\text{E24P} + \text{G} \underset{}{\overset{\text{SigG\_A, SigG\_O, A\_SigG\_O}}{\rightleftharpoons}} \text{E24G} + \text{SigG} \tag{61}$$

Reactants

Table 85: Properties of each reactant.

Id	Name	SBO
E24P	E24_p	
G	Grb2	

Modifiers

Table 86: Properties of each modifier.

Id	Name	SBO
SigG_A	Sum Grb2-Gab1	
SigG_O	Sum Grb2-SOS	
A_SigG_O	Gab1_SumGrb2-SOS	

Products

Table 87: Properties of each product.

Id	Name	SBO
E24G	E24-Grb2	
SigG	Sum Grb2	

Kinetic Law

Derived unit contains undeclared units

$$v_{30} = \text{area}\,(\text{membrane}) \cdot \left(3 \cdot \text{kon30} \cdot [\text{E24P}] \cdot [\text{G}] - \text{koff30} \cdot \frac{[\text{SigG}]}{[\text{SigG}] + [\text{SigG\_A}] + [\text{SigG\_O}] + [\text{A\_SigG\_O}] + \text{eps}} \cdot [\text{E24G}] \right) \tag{62}$$

7.31 Reaction Net_E24PShc_binding

This is a reversible reaction of two reactants forming two products influenced by two modifiers.

Name Net E24P/Shc binding

Reaction equation

$$\text{E24P} + \text{S} \underset{}{\overset{\text{SigSP, SigSP\_G}}{\rightleftharpoons}} \text{E24S} + \text{SigS} \tag{63}$$

Reactants

Table 88: Properties of each reactant.

Id	Name	SBO
E24P	E24_p	
S	Shc	

Modifiers

Table 89: Properties of each modifier.

Id	Name	SBO
SigSP	Sum Shc_p	

Id	Name	SBO
SigSP_G	Sum Shc_p-Grb2	

Products

Table 90: Properties of each product.

Id	Name	SBO
E24S	E24-Shc	
SigS	Sum Shc	

Kinetic Law

Derived unit contains undeclared units

$$v_{31} = \text{area}(\text{membrane}) \cdot \left(4 \cdot \text{kon31} \cdot [\text{E24P}] \cdot [\text{S}] - \text{koff31} \cdot \frac{[\text{SigS}]}{[\text{SigS}] + [\text{SigSP}] + [\text{SigSP\_G}] + \text{eps}} \cdot [\text{E24S}]\right) \quad (64)$$

7.32 Reaction Net_E24PPI3K_binding

This is a reversible reaction of two reactants forming two products.

Name Net E24P/PI3K binding

Reaction equation

$$\text{E24P} + \text{I} \rightleftharpoons \text{E24I} + \text{SigI} \quad (65)$$

Reactants

Table 91: Properties of each reactant.

Id	Name	SBO
E24P	E24_p	
I	PI-3K	

Products

Table 92: Properties of each product.

Id	Name	SBO
E24I	E24-PI-3K	
SigI	Sum PI-3K	

Kinetic Law

Derived unit contains undeclared units

$$v_{32} = \text{area}\,(\text{membrane}) \cdot (1 \cdot \text{kon32} \cdot [\text{E24P}] \cdot [\text{I}] - \text{koff32} \cdot [\text{E24I}]) \tag{66}$$

7.33 Reaction Net_E24PRasGAP_binding

This is a reversible reaction of two reactants forming two products influenced by one modifier.

Name Net E24P/RasGAP binding

Reaction equation

$$\text{E24P} + \text{R} \overset{\text{SigRP}}{\rightleftharpoons} \text{E24R} + \text{SigR} \tag{67}$$

Reactants

Table 93: Properties of each reactant.

Id	Name	SBO
E24P	E24_p	
R	RasGAP	

Modifier

Table 94: Properties of each modifier.

Id	Name	SBO
SigRP	Sum RasGAP_p	

Products

Table 95: Properties of each product.

Id	Name	SBO
E24R	E24-RasGAP	
SigR	Sum RasGAP	

Kinetic Law

Derived unit contains undeclared units

$$v_{33} = \text{area}\,(\text{membrane}) \cdot \left(2 \cdot \text{kon33} \cdot [\text{E24P}] \cdot [\text{R}] - \text{koff33} \cdot \frac{[\text{SigR}]}{[\text{SigR}] + [\text{SigRP}] + \text{eps}} \cdot [\text{E24R}]\right) \tag{68}$$

7.34 Reaction Net_E44PRasGAP_binding_1

This is a reversible reaction of two reactants forming two products influenced by three modifiers.

Name Net E44P/RasGAP binding

Reaction equation

$$\text{E44P} + \text{G} \underset{}{\overset{\text{SigG\_A, SigG\_O, A\_SigG\_O}}{\rightleftharpoons}} \text{E44G} + \text{SigG} \tag{69}$$

Reactants

Table 96: Properties of each reactant.

Id	Name	SBO
E44P	E44_p	
G	Grb2	

Modifiers

Table 97: Properties of each modifier.

Id	Name	SBO
SigG_A	Sum Grb2-Gab1	
SigG_O	Sum Grb2-SOS	
A_SigG_O	Gab1_SumGrb2-SOS	

Products

Table 98: Properties of each product.

Id	Name	SBO
E44G	E44-Grb2	
SigG	Sum Grb2	

Kinetic Law

Derived unit contains undeclared units

$$v_{34} = \text{area}\,(\text{membrane}) \cdot \left(4 \cdot \text{kon34} \cdot [\text{E44P}] \cdot [\text{G}] - \text{koff34} \cdot \frac{[\text{SigG}]}{[\text{SigG}] + [\text{SigG\_A}] + [\text{SigG\_O}] + [\text{A\_SigG\_O}] + \text{eps}} \cdot [\text{E44G}]\right) \tag{70}$$

7.35 Reaction Net_E44PShc_binding

This is a reversible reaction of two reactants forming two products influenced by two modifiers.

Name Net E44P/Shc binding

Reaction equation

$$\text{E44P} + \text{S} \underset{}{\overset{\text{SigSP, SigSP\_G}}{\rightleftharpoons}} \text{E44S} + \text{SigS} \tag{71}$$

Reactants

Table 99: Properties of each reactant.

Id	Name	SBO
E44P	E44_p	
S	Shc	

Modifiers

Table 100: Properties of each modifier.

Id	Name	SBO
SigSP	Sum Shc_p	

Id	Name	SBO
SigSP_G	Sum Shc_p-Grb2	

Products

Table 101: Properties of each product.

Id	Name	SBO
E44S	E44-Shc	
SigS	Sum Shc	

Kinetic Law

Derived unit contains undeclared units

$$v_{35} = \text{area}(\text{membrane}) \cdot \left(4 \cdot \text{kon35} \cdot [\text{E44P}] \cdot [\text{S}] - \text{koff35} \cdot \frac{[\text{SigS}]}{[\text{SigS}] + [\text{SigSP}] + [\text{SigSP\_G}] + \text{eps}} \cdot [\text{E44S}]\right) \quad (72)$$

7.36 Reaction Net_E44PPI3K_binding

This is a reversible reaction of two reactants forming two products.

Name Net E44P/PI3K binding

Reaction equation

$$\text{E44P} + \text{I} \rightleftharpoons \text{E44I} + \text{SigI} \quad (73)$$

Reactants

Table 102: Properties of each reactant.

Id	Name	SBO
E44P	E44_p	
I	PI-3K	

Products

Table 103: Properties of each product.

Id	Name	SBO
E44I	E44-PI-3K	
SigI	Sum PI-3K	

Kinetic Law

Derived unit contains undeclared units

$$v_{36} = \text{area}\,(\text{membrane}) \cdot (2 \cdot \text{kon36} \cdot [\text{E44P}] \cdot [\text{I}] - \text{koff36} \cdot [\text{E44I}]) \tag{74}$$

7.37 Reaction Net_E44PRasGAP_binding_2

This is a reversible reaction of two reactants forming two products influenced by one modifier.

Name Net E44P/RasGAP binding

Reaction equation

$$\text{E44P} + \text{R} \overset{\text{SigRP}}{\rightleftharpoons} \text{E44R} + \text{SigR} \tag{75}$$

Reactants

Table 104: Properties of each reactant.

Id	Name	SBO
E44P	E44_p	
R	RasGAP	

Modifier

Table 105: Properties of each modifier.

Id	Name	SBO
SigRP	Sum RasGAP_p	

Products

Table 106: Properties of each product.

Id	Name	SBO
E44R	E44-RasGAP	
SigR	Sum RasGAP	

Kinetic Law

Derived unit contains undeclared units

$$v_{37} = \text{area}\,(\text{membrane}) \cdot \left(2 \cdot \text{kon37} \cdot [\text{E44P}] \cdot [\text{R}] - \text{koff37} \cdot \frac{[\text{SigR}]}{[\text{SigR}] + [\text{SigRP}] + \text{eps}} \cdot [\text{E44R}]\right) \tag{76}$$

7.38 Reaction Net_Shc_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by nine modifiers.

Name Net Shc Phosphorylation

Reaction equation

$$\text{SigS} \xrightleftharpoons{\text{E11P, E12P, E23P, E24P, E34P, E44P, E13P, E14P, SigT}} \text{SigSP} \tag{77}$$

Reactant

Table 107: Properties of each reactant.

Id	Name	SBO
SigS	Sum Shc	

Modifiers

Table 108: Properties of each modifier.

Id	Name	SBO
E11P	E11_p	
E12P	E12_p	
E23P	E23_p	
E24P	E24_p	
E34P	E34_p	
E44P	E44_p	

Id	Name	SBO
E13P	ErbB1-ErbB3_p	
E14P	ErbB1-ErbB3_p	
SigT	Sig-PTP-1B	

Product

Table 109: Properties of each product.

Id	Name	SBO
SigSP	Sum Shc_p	

Kinetic Law

Derived unit contains undeclared units

$$v_{38} = \text{area}(\text{membrane}) \cdot \left(\text{kf38} \cdot [\text{SigS}] \cdot ([\text{E11P}] + [\text{E12P}] + [\text{E23P}] + [\text{E24P}] + [\text{E34P}] + [\text{E44P}] + [\text{E13P}] + [\text{E14P}]) - \frac{\text{VmaxPY} \cdot [\text{SigSP}]}{\text{KmPY} + [\text{SigSP}]} - \text{kPTP38} \cdot [\text{SigT}] \cdot [\text{SigSP}] \right) \tag{78}$$

7.39 Reaction Net_Gab1_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by nine modifiers.

Name Net Gab1 Phosphorylation

Reaction equation

$$\text{SigA} \underset{}{\overset{\text{E11P, E12P, E23P, E24P, E34P, E44P, E13P, E14P, SigT}}{\rightleftharpoons}} \text{SigAP} \tag{79}$$

Reactant

Table 110: Properties of each reactant.

Id	Name	SBO
SigA	Sum Gab1	

Modifiers

Table 111: Properties of each modifier.

Id	Name	SBO
E11P	E11_p	
E12P	E12_p	
E23P	E23_p	
E24P	E24_p	
E34P	E34_p	
E44P	E44_p	
E13P	ErbB1-ErbB3_p	
E14P	ErbB1-ErbB3_p	
SigT	Sig-PTP-1B	

Product

Table 112: Properties of each product.

Id	Name	SBO
SigAP	Sum Gab1_p	

Kinetic Law

Derived unit contains undeclared units

$$v_{39} = \text{area}(\text{membrane}) \cdot \left(\text{kf39} \cdot [\text{SigA}] \cdot ([\text{E11P}] + [\text{E12P}] + [\text{E23P}] + [\text{E24P}] + [\text{E34P}] + [\text{E44P}] + [\text{E13P}] + [\text{E14P}]) - \frac{\text{VmaxPY} \cdot [\text{SigAP}]}{\text{KmPY} + [\text{SigAP}]} - \text{kPTP39} \cdot [\text{SigT}] \cdot [\text{SigAP}] \right) \tag{80}$$

7.40 Reaction Net_Grb2SOS_binding

This is a reversible reaction of two reactants forming two products.

Name Net Grb2/SOS binding

Reaction equation

$$\text{SigG} + \text{O} \rightleftharpoons \text{SigG\_O} + \text{SigO} \tag{81}$$

Reactants

Table 113: Properties of each reactant.

Id	Name	SBO
SigG	Sum Grb2	
O	SOS	

Products

Table 114: Properties of each product.

Id	Name	SBO
SigG_O	Sum Grb2-SOS	
SigO	Sum SOS	

Kinetic Law

Derived unit contains undeclared units

$$v_{40} = \text{area}\,(\text{membrane}) \cdot (\text{kon40} \cdot [\text{SigG}] \cdot [\text{O}] - \text{koff40} \cdot [\text{SigG\_O}]) \tag{82}$$

7.41 Reaction Net_Grb2Gab1_binding

This is a reversible reaction of two reactants forming two products influenced by five modifiers.

Name Net Grb2/Gab1 binding

Reaction equation

$$\text{SigG} + \text{A} \xrightleftharpoons{\text{SigAP, SigAP\_S, SigAP\_R, SigAP\_I, SigAP\_T}} \text{SigG\_A} + \text{SigA} \tag{83}$$

Reactants

Table 115: Properties of each reactant.

Id	Name	SBO
SigG	Sum Grb2	
A	Gab1	

Modifiers

Table 116: Properties of each modifier.

Id	Name	SBO
SigAP	Sum Gab1_p	
SigAP_S	Sum Gab1_p-Shc	
SigAP_R	Sum Gab1_p-RasGAP	
SigAP_I	Sum Gab1_p-PI-3K	
SigAP_T	SumGab1_p-PTP-1B	

Products

Table 117: Properties of each product.

Id	Name	SBO
SigG_A	Sum Grb2-Gab1	
SigA	Sum Gab1	

Kinetic Law

Derived unit contains undeclared units

$$v_{41} = \text{area}\,(\text{membrane}) \cdot \left(\text{kon41} \cdot [\text{SigG}] \cdot [\text{A}] - \text{koff41} \cdot [\text{SigG\_A}] \cdot \frac{[\text{SigA}]}{\text{eps} + [\text{SigA}] + [\text{SigAP}] + [\text{SigAP\_S}] + [\text{SigAP\_R}] + [\text{SigAP\_I}] + [\text{SigAP\_T}]} \right) \tag{84}$$

7.42 Reaction Net_ShcGrb2_binding

This is a reversible reaction of two reactants forming two products influenced by three modifiers.

Name Net Shc/Grb2 binding

Reaction equation

$$\text{SigSP} + \text{G} \underset{}{\overset{\text{SigG\_A, SigG\_O, A\_SigG\_O}}{\rightleftharpoons}} \text{SigSP\_G} + \text{SigG} \tag{85}$$

Reactants

Table 118: Properties of each reactant.

Id	Name	SBO
SigSP	Sum Shc_p	
G	Grb2	

Modifiers

Table 119: Properties of each modifier.

Id	Name	SBO
SigG_A	Sum Grb2-Gab1	
SigG_O	Sum Grb2-SOS	
A_SigG_O	Gab1_SumGrb2-SOS	

Products

Table 120: Properties of each product.

Id	Name	SBO
SigSP_G	Sum Shc_p-Grb2	
SigG	Sum Grb2	

Kinetic Law

Derived unit contains undeclared units

$$v_{42} = \text{area}\,(\text{membrane}) \cdot \left(\text{kon42} \cdot [\text{SigSP}] \cdot [\text{G}] - \text{koff42} \cdot [\text{SigSP\_G}] \cdot \frac{[\text{SigG}]}{[\text{SigG}] + [\text{SigG\_A}] + [\text{SigG\_O}] + [\text{A\_SigG\_O}] + \text{eps}} \right) \tag{86}$$

7.43 Reaction Net_Gab1Shc_binding

This is a reversible reaction of two reactants forming two products influenced by two modifiers.

Name Net Gab1/Shc binding

Reaction equation

$$\text{SigAP} + \text{S} \underset{\text{SigSP, SigSP\_G}}{\rightleftharpoons} \text{SigAP\_S} + \text{SigS} \tag{87}$$

Reactants

Table 121: Properties of each reactant.

Id	Name	SBO
SigAP	Sum Gab1_p	
S	Shc	

Modifiers

Table 122: Properties of each modifier.

Id	Name	SBO
SigSP	Sum Shc_p	
SigSP_G	Sum Shc_p-Grb2	

Products

Table 123: Properties of each product.

Id	Name	SBO
SigAP_S	Sum Gab1_p-Shc	
SigS	Sum Shc	

Kinetic Law

Derived unit contains undeclared units

$$v_{43} = \text{area}\,(\text{membrane}) \cdot \left(3 \cdot \text{kon43} \cdot [\text{SigAP}] \cdot [\text{S}] - \text{koff43} \cdot [\text{SigAP\_S}] \cdot \frac{[\text{SigS}]}{[\text{SigS}] + [\text{SigSP}] + [\text{SigSP\_G}] + \text{eps}} \right) \tag{88}$$

7.44 Reaction Net_Gab1PI3K_binding

This is a reversible reaction of two reactants forming two products.

Name Net Gab1/PI3K binding

Reaction equation

$$\text{SigAP} + \text{I} \rightleftharpoons \text{SigAP\_I} + \text{SigI} \tag{89}$$

Reactants

Table 124: Properties of each reactant.

Id	Name	SBO
SigAP	Sum Gab1_p	
I	PI-3K	

Products

Table 125: Properties of each product.

Id	Name	SBO
SigAP_I	Sum Gab1_p-PI-3K	
SigI	Sum PI-3K	

Kinetic Law

Derived unit contains undeclared units

$$v_{44} = \text{area}\,(\text{membrane}) \cdot (3 \cdot \text{kon44} \cdot [\text{SigAP}] \cdot [\text{I}] - \text{koff44} \cdot [\text{SigAP\_I}]) \tag{90}$$

7.45 Reaction Net_Gab1RasGAP_binding

This is a reversible reaction of two reactants forming two products influenced by one modifier.

Name Net Gab1/RasGAP binding

Reaction equation

$$\text{SigAP} + \text{R} \underset{}{\overset{\text{SigRP}}{\rightleftharpoons}} \text{SigAP\_R} + \text{SigR} \tag{91}$$

Reactants

Table 126: Properties of each reactant.

Id	Name	SBO
SigAP	Sum Gab1_p	
R	RasGAP	

Modifier

Table 127: Properties of each modifier.

Id	Name	SBO
SigRP	Sum RasGAP_p	

Products

Table 128: Properties of each product.

Id	Name	SBO
SigAP_R	Sum Gab1_p-RasGAP	
SigR	Sum RasGAP	

Kinetic Law

Derived unit contains undeclared units

$$v_{45} = \text{area}\,(\text{membrane}) \cdot \left(2 \cdot \text{kon45} \cdot [\text{SigAP}] \cdot [\text{R}] - \text{koff45} \cdot [\text{SigAP\_R}] \cdot \frac{[\text{SigR}]}{[\text{SigR}] + [\text{SigRP}] + \text{eps}}\right) \tag{92}$$

7.46 Reaction Net_Gab1PIP3_binding

This is a reversible reaction of two reactants forming two products influenced by five modifiers.

Name Net Gab1/PIP3 binding

Reaction equation

$$\text{P3} + \text{A} \xrightleftharpoons{\text{SigAP, SigAP\_S, SigAP\_R, SigAP\_I, SigAP\_T}} \text{P3\_A} + \text{SigA} \tag{93}$$

Reactants

Table 129: Properties of each reactant.

Id	Name	SBO
P3	PIP3	
A	Gab1	

Modifiers

Table 130: Properties of each modifier.

Id	Name	SBO
SigAP	Sum Gab1_p	
SigAP_S	Sum Gab1_p-Shc	
SigAP_R	Sum Gab1_p-RasGAP	
SigAP_I	Sum Gab1_p-PI-3K	
SigAP_T	SumGab1_p-PTP-1B	

Products

Table 131: Properties of each product.

Id	Name	SBO
P3_A	PIP3-Gab1	
SigA	Sum Gab1	

Kinetic Law

Derived unit contains undeclared units

$$v_{46} = \text{area}\,(\text{membrane}) \cdot \left(\text{kon46} \cdot [\text{P3}] \cdot [\text{A}] - \text{koff46} \cdot [\text{P3\_A}] \cdot \frac{[\text{SigA}]}{\text{eps} + [\text{SigA}] + [\text{SigAP}] + [\text{SigAP\_S}] + [\text{SigAP\_R}] + [\text{SigAP\_I}] + [\text{SigAP\_T}]}\right) \tag{94}$$

7.47 Reaction Net_Akt_Activation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net Akt Activation

Reaction equation

$$\text{Akt} \overset{\text{P3}}{\rightleftharpoons} \text{Aktstar} \tag{95}$$

Reactant

Table 132: Properties of each reactant.

Id	Name	SBO
Akt	Akt	

Modifier

Table 133: Properties of each modifier.

Id	Name	SBO
P3	PIP3	

Product

Table 134: Properties of each product.

Id	Name	SBO
Aktstar	Aktstar	

Kinetic Law

Derived unit contains undeclared units

$$v_{47} = \text{area}\,(\text{membrane}) \cdot \left(\frac{\text{kf47} \cdot [\text{P3}] \cdot [\text{Akt}]}{\text{Kmf47} + [\text{Akt}]} - \frac{\text{Vmaxr47} \cdot [\text{Aktstar}]}{\text{Kmr47} + [\text{Aktstar}]} \right) \tag{96}$$

7.48 Reaction Net_PIP3_Production

This is a reversible reaction of one reactant forming one product influenced by ten modifiers.

Name Net PIP3 Production

Reaction equation

$$\text{P2} \underset{}{\overset{\text{fint, E11P, E12P, E23P, E24P, E34P, E44P, E13P, E14P, SigI}}{\rightleftharpoons}} \text{P3} \tag{97}$$

Reactant

Table 135: Properties of each reactant.

Id	Name	SBO
P2	PIP2	

Modifiers

Table 136: Properties of each modifier.

Id	Name	SBO
fint	fint	
E11P	E11_p	
E12P	E12_p	
E23P	E23_p	
E24P	E24_p	
E34P	E34_p	
E44P	E44_p	
E13P	ErbB1-ErbB3_p	
E14P	ErbB1-ErbB3_p	
SigI	Sum PI-3K	

Product

Table 137: Properties of each product.

Id	Name	SBO
P3	PIP3	

Kinetic Law

Derived unit contains undeclared units

$$v_{48} = \text{area}(\text{membrane}) \cdot \left(\frac{\text{kf48} \cdot \left(1 - [\text{fint}] \cdot \frac{[\text{E11P}]}{[\text{E11P}]+[\text{E12P}]+[\text{E23P}]+[\text{E24P}]+[\text{E34P}]+[\text{E44P}]+[\text{E13P}]+[\text{E14P}]+\text{eps}}\right) \cdot [\text{SigI}] \cdot [\text{P2}]}{\text{Kmf48} + [\text{P2}]} - \frac{3 \cdot \text{PTEN} \cdot [\text{P3}]}{\text{Kmr48} + [\text{P3}]} \right) \tag{98}$$

7.49 Reaction Net_RasGTP_Production

This is a reversible reaction of one reactant forming one product influenced by three modifiers.

Name Net RasGTP Production

Reaction equation

$$\text{RsD} \overset{\text{SigO, SigR, SigRP}}{\rightleftharpoons} \text{RsT} \tag{99}$$

Reactant

Table 138: Properties of each reactant.

Id	Name	SBO
RsD	RasGDP	

Modifiers

Table 139: Properties of each modifier.

Id	Name	SBO
SigO	Sum SOS	
SigR	Sum RasGAP	
SigRP	Sum RasGAP_p	

Product

Table 140: Properties of each product.

Id	Name	SBO
RsT	RasGTP	

Kinetic Law

Derived unit contains undeclared units

$$v_{49} = \text{area}\,(\text{membrane}) \cdot \left(\frac{\text{kf49} \cdot [\text{SigO}] \cdot [\text{RsD}]}{\text{Kmf49} + [\text{RsD}]} - \frac{\text{kr49} \cdot [\text{SigR}] \cdot [\text{RsT}]}{\text{Kmr49} + [\text{RsT}]} - \frac{\text{kr49b} \cdot [\text{SigRP}] \cdot [\text{RsT}]}{\text{Kmr49b} + [\text{RsT}]} - \text{kcon49} \cdot [\text{RsT}] \right) \tag{100}$$

7.50 Reaction Net_RasGAP_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by nine modifiers.

Name Net RasGAP Phosphorylation

Reaction equation

$$\text{SigR} \xrightleftharpoons{\text{E11P, E12P, E23P, E24P, E34P, E44P, E13P, E14P, SigT}} \text{SigRP} \tag{101}$$

Reactant

Table 141: Properties of each reactant.

Id	Name	SBO
SigR	Sum RasGAP	

Modifiers

Table 142: Properties of each modifier.

Id	Name	SBO
E11P	E11_p	
E12P	E12_p	
E23P	E23_p	
E24P	E24_p	
E34P	E34_p	
E44P	E44_p	
E13P	ErbB1-ErbB3_p	
E14P	ErbB1-ErbB3_p	
SigT	Sig-PTP-1B	

Product

Table 143: Properties of each product.

Id	Name	SBO
SigRP	Sum RasGAP_p	

Kinetic Law

Derived unit contains undeclared units

$$v_{50} = \text{area}\,(\text{membrane}) \cdot \left(\text{kf50} \cdot [\text{SigR}] \cdot ([\text{E11P}] + [\text{E12P}] + [\text{E23P}] + [\text{E24P}] + [\text{E34P}] + [\text{E44P}] + [\text{E13P}] + [\text{E14P}]) - \frac{\text{VmaxPY} \cdot [\text{SigRP}]}{\text{KmPY} + [\text{SigRP}]} - \text{kPTP50} \cdot [\text{SigT}] \cdot [\text{SigRP}] \right) \tag{102}$$

7.51 Reaction Net_Raf_Activation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net Raf Activation

Reaction equation

$$\text{Raf} \overset{\text{RsT}}{\rightleftharpoons} \text{Rafstar} \tag{103}$$

Reactant

Table 144: Properties of each reactant.

Id	Name	SBO
Raf	Raf	

Modifier

Table 145: Properties of each modifier.

Id	Name	SBO
RsT	RasGTP	

Product

Table 146: Properties of each product.

Id	Name	SBO
Rafstar	Raf*	

Kinetic Law

Derived unit contains undeclared units

$$v_{51} = \text{area}\,(\text{membrane}) \cdot \left(\frac{\text{kf51} \cdot [\text{RsT}] \cdot [\text{Raf}]}{\text{Kmf51} + [\text{Raf}]} - \frac{\text{Vmaxr51} \cdot [\text{Rafstar}]}{\text{Kmrb51} + [\text{Rafstar}]} \right) \tag{104}$$

7.52 Reaction Net_MEK_Activation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net MEK Activation

Reaction equation

$$\mathrm{MEK} \overset{\mathrm{Rafstar}}{\rightleftharpoons} \mathrm{MEKstar} \tag{105}$$

Reactant

Table 147: Properties of each reactant.

Id	Name	SBO
MEK	MEK	

Modifier

Table 148: Properties of each modifier.

Id	Name	SBO
Rafstar	Raf*	

Product

Table 149: Properties of each product.

Id	Name	SBO
MEKstar	MEK*	

Kinetic Law

Derived unit contains undeclared units

$$v_{52} = \mathrm{area}\,(\mathrm{membrane}) \cdot \left(\frac{\mathrm{kf52} \cdot [\mathrm{Rafstar}] \cdot [\mathrm{MEK}]}{\mathrm{Kmf52} + [\mathrm{MEK}]} - \frac{\mathrm{Vmaxr52} \cdot [\mathrm{MEKstar}]}{\mathrm{Kmr52} + [\mathrm{MEKstar}]} \right) \tag{106}$$

7.53 Reaction Net_SOS_ST_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net SOS S/T Phosphorylation

Reaction equation

$$\mathrm{O} \overset{\mathrm{ERKstar}}{\rightleftharpoons} \mathrm{OP} \tag{107}$$

Reactant

Table 150: Properties of each reactant.

Id	Name	SBO
O	SOS	

Modifier

Table 151: Properties of each modifier.

Id	Name	SBO
ERKstar	ERK*	

Product

Table 152: Properties of each product.

Id	Name	SBO
OP	SOS_p	

Kinetic Law

Derived unit contains undeclared units

$$v_{53} = \text{area}\,(\text{membrane}) \cdot \left(\frac{\text{kf54} \cdot [\text{O}] \cdot [\text{ERKstar}]}{\text{Kmf54} + [\text{O}]} - \frac{\text{Vmaxr54} \cdot [\text{OP}]}{\text{Kmr54} + [\text{OP}]} \right) \tag{108}$$

7.54 Reaction Net_Gab1_ST_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net Gab1 S/T Phosphorylation

Reaction equation

$$\text{A} \underset{}{\overset{\text{ERKstar}}{\rightleftharpoons}} \text{AP} \tag{109}$$

Reactant

Table 153: Properties of each reactant.

Id	Name	SBO
A	Gab1	

Modifier

Table 154: Properties of each modifier.

Id	Name	SBO
ERKstar	ERK*	

Product

Table 155: Properties of each product.

Id	Name	SBO
AP	Gab1_p	

Kinetic Law

Derived unit contains undeclared units

$$v_{54} = \text{area}\,(\text{membrane}) \cdot \left(\frac{\text{kf55} \cdot [\text{A}] \cdot [\text{ERKstar}]}{\text{Kmf55} + [\text{A}]} - \frac{\text{Vmaxr55} \cdot [\text{AP}]}{\text{Kmr55} + [\text{AP}]} \right) \tag{110}$$

7.55 Reaction Grb2_binding_to_P3_A

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

Name Grb2 binding to P3_A

Reaction equation

$$\text{G} + \text{P3\_A} \rightleftharpoons \text{SigA\_G} \tag{111}$$

Reactants

Table 156: Properties of each reactant.

Id	Name	SBO
G	Grb2	
P3_A	PIP3-Gab1	

Product

Table 157: Properties of each product.

Id	Name	SBO
SigA_G	Sum PIP3-Gab1-Grb2	

Kinetic Law

Derived unit contains undeclared units

$$v_{55} = \text{area}\,(\text{membrane}) \cdot (\text{kon57} \cdot [\text{P3\_A}] \cdot [\text{G}] - \text{koff57} \cdot [\text{SigA\_G}]) \tag{112}$$

7.56 Reaction SOS_binding_to_SigAG

This is a reversible reaction of two reactants forming two products.

Name SOS binding to SigA-G

Reaction equation

$$\text{SigA\_G} + \text{O} \rightleftharpoons \text{SigA\_G\_O} + \text{SigO} \tag{113}$$

Reactants

Table 158: Properties of each reactant.

Id	Name	SBO
SigA_G	Sum PIP3-Gab1-Grb2	
O	SOS	

Products

Table 159: Properties of each product.

Id	Name	SBO
SigA_G_O	Sum PIP3-Gab1-Grb2_SOS	
SigO	Sum SOS	

Kinetic Law

Derived unit contains undeclared units

$$v_{56} = \text{area}\,(\text{membrane}) \cdot (\text{kon58} \cdot [\text{SigA\_G}] \cdot [\text{O}] - \text{koff58} \cdot [\text{SigA\_G\_O}]) \qquad (114)$$

7.57 Reaction Gab1_binding_to_SigGO

This is a reversible reaction of two reactants forming two products influenced by five modifiers.

Name Gab1 binding to SigG-O

Reaction equation

$$\text{SigG\_O} + \text{A} \underset{}{\overset{\text{SigAP, SigAP\_S, SigAP\_R, SigAP\_I, SigAP\_T}}{\rightleftharpoons}} \text{A\_SigG\_O} + \text{SigA} \qquad (115)$$

Reactants

Table 160: Properties of each reactant.

Id	Name	SBO
SigG_O	Sum Grb2-SOS	
A	Gab1	

Modifiers

Table 161: Properties of each modifier.

Id	Name	SBO
SigAP	Sum Gab1_p	
SigAP_S	Sum Gab1_p-Shc	
SigAP_R	Sum Gab1_p-RasGAP	
SigAP_I	Sum Gab1_p-PI-3K	
SigAP_T	SumGab1_p-PTP-1B	

Products

Table 162: Properties of each product.

Id	Name	SBO
A_SigG_O	Gab1_SumGrb2-SOS	
SigA	Sum Gab1	

Kinetic Law

Derived unit contains undeclared units

$$v_{57} = \text{area}\,(\text{membrane}) \cdot \left(\text{kon59} \cdot [\text{SigG\_O}] \cdot [\text{A}] - \text{koff59} \cdot [\text{A\_SigG\_O}] \cdot \frac{[\text{SigA}]}{\text{eps} + [\text{SigA}] + [\text{SigAP}] + [\text{SigAP\_S}] + [\text{SigAP\_R}] + [\text{SigAP\_I}] + [\text{SigAP\_T}]} \right) \tag{116}$$

7.58 Reaction SOS_binding_to_SigGA

This is a reversible reaction of two reactants forming two products.

Name SOS binding to SigG-A

Reaction equation

$$\text{SigG\_A} + \text{O} \rightleftharpoons \text{A\_SigG\_O} + \text{SigO} \tag{117}$$

Reactants

Table 163: Properties of each reactant.

Id	Name	SBO
SigG_A	Sum Grb2-Gab1	
O	SOS	

Products

Table 164: Properties of each product.

Id	Name	SBO
A_SigG_O	Gab1_SumGrb2-SOS	
SigO	Sum SOS	

Kinetic Law

Derived unit contains undeclared units

$$v_{58} = \text{area}\,(\text{membrane}) \cdot (\text{kon60} \cdot [\text{SigG\_A}] \cdot [\text{O}] - \text{koff60} \cdot [\text{A\_SigG\_O}]) \tag{118}$$

7.59 Reaction ErbB1ErbB3_Heterodimerization

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

Name ErbB1/ErbB3 Heterodimerization

Reaction equation

$$\mathrm{H\_E3} + \mathrm{E\_E1} \rightleftharpoons \mathrm{E13} \tag{119}$$

Reactants

Table 165: Properties of each reactant.

Id	Name	SBO
H_E3	HRG-ErbB3	
E_E1	EGF-ErbB1	

Product

Table 166: Properties of each product.

Id	Name	SBO
E13	ErbB1-ErbB3	

Kinetic Law

Derived unit contains undeclared units

$$v_{59} = \mathrm{area}\,(\mathrm{membrane}) \cdot (\mathrm{kon61} \cdot [\mathrm{H\_E3}] \cdot [\mathrm{E\_E1}] - \mathrm{koff61} \cdot [\mathrm{E13}]) \tag{120}$$

7.60 Reaction ErbB1ErbB4_Heterodimerization

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

Name ErbB1/ErbB4 Heterodimerization

Reaction equation

$$\mathrm{H\_E4} + \mathrm{E\_E1} \rightleftharpoons \mathrm{E14} \tag{121}$$

Reactants

Table 167: Properties of each reactant.

Id	Name	SBO
H_E4	HRG-ErbB4	
E_E1	EGF-ErbB1	

Product

Table 168: Properties of each product.

Id	Name	SBO
E14	ErbB1-ErbB4	

Kinetic Law

Derived unit contains undeclared units

$$v_{60} = \text{area}\,(\text{membrane}) \cdot (\text{kon62} \cdot [\text{H\_E4}] \cdot [\text{E\_E1}] - \text{koff62} \cdot [\text{E14}]) \tag{122}$$

7.61 Reaction Net_E13_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net E13 Phosphorylation

Reaction equation

$$\text{E13} \overset{\text{SigT}}{\rightleftharpoons} \text{E13P} \tag{123}$$

Reactant

Table 169: Properties of each reactant.

Id	Name	SBO
E13	ErbB1-ErbB3	

Modifier

Table 170: Properties of each modifier.

Id	Name	SBO
SigT	Sig-PTP-1B	

Product

Table 171: Properties of each product.

Id	Name	SBO
E13P	ErbB1-ErbB3_p	

Kinetic Law

Derived unit contains undeclared units

$$v_{61} = \text{area}\,(\text{membrane}) \cdot \left(\text{kf63} \cdot [\text{E13}] - \frac{\text{VmaxPY} \cdot [\text{E13P}]}{\text{KmPY} + [\text{E13P}]} - \text{kPTP63} \cdot [\text{SigT}] \cdot [\text{E13P}] \right) \quad (124)$$

7.62 Reaction Net_E14_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net E14 Phosphorylation

Reaction equation

$$\text{E14} \overset{\text{SigT}}{\rightleftharpoons} \text{E14P} \quad (125)$$

Reactant

Table 172: Properties of each reactant.

Id	Name	SBO
E14	ErbB1-ErbB4	

Modifier

Table 173: Properties of each modifier.

Id	Name	SBO
SigT	Sig-PTP-1B	

Product

Table 174: Properties of each product.

Id	Name	SBO
E14P	ErbB1-ErbB3_p	

Kinetic Law

Derived unit contains undeclared units

$$v_{62} = \text{area}\,(\text{membrane}) \cdot \left(\text{kf64} \cdot [\text{E14}] - \frac{\text{VmaxPY} \cdot [\text{E14P}]}{\text{KmPY} + [\text{E14P}]} - \text{kPTP64} \cdot [\text{SigT}] \cdot [\text{E14P}] \right) \quad (126)$$

7.63 Reaction Net_E13Grb2_Binding

This is a reversible reaction of two reactants forming two products influenced by three modifiers.

Name Net E13/Grb2 Binding

Reaction equation

$$\text{E13P} + \text{G} \overset{\text{SigG\_A, SigG\_O, A\_SigG\_O}}{\rightleftharpoons} \text{E13G} + \text{SigG} \quad (127)$$

Reactants

Table 175: Properties of each reactant.

Id	Name	SBO
E13P	ErbB1-ErbB3_p	
G	Grb2	

Modifiers

Table 176: Properties of each modifier.

Id	Name	SBO
SigG_A	Sum Grb2-Gab1	
SigG_O	Sum Grb2-SOS	
A_SigG_O	Gab1_SumGrb2-SOS	

Products

Table 177: Properties of each product.

Id	Name	SBO
E13G	E13-Grb2	
SigG	Sum Grb2	

Kinetic Law

Derived unit contains undeclared units

$$v_{63} = \text{area}\,(\text{membrane}) \cdot \left(4 \cdot \text{kon65} \cdot [\text{E13P}] \cdot [\text{G}] - \text{koff65} \cdot \frac{[\text{SigG}]}{[\text{SigG}] + [\text{SigG\_A}] + [\text{SigG\_O}] + [\text{A\_SigG\_O}] + \text{eps}} \cdot [\text{E13G}]\right) \tag{128}$$

7.64 Reaction Net_E13Shc_Binding

This is a reversible reaction of two reactants forming two products influenced by two modifiers.

Name Net E13/Shc Binding

Reaction equation

$$\text{E13P} + \text{S} \underset{}{\overset{\text{SigSP, SigSP\_G}}{\rightleftharpoons}} \text{E13S} + \text{SigS} \tag{129}$$

Reactants

Table 178: Properties of each reactant.

Id	Name	SBO
E13P	ErbB1-ErbB3_p	
S	Shc	

Modifiers

Table 179: Properties of each modifier.

Id	Name	SBO
SigSP	Sum Shc_p	
SigSP_G	Sum Shc_p-Grb2	

Products

Table 180: Properties of each product.

Id	Name	SBO
E13S	E13-Shc	
SigS	Sum Shc	

Kinetic Law

Derived unit contains undeclared units

$$v_{64} = \text{area}(\text{membrane}) \cdot \left(5 \cdot \text{kon66} \cdot [\text{E13P}] \cdot [\text{S}] - \text{koff66} \cdot \frac{[\text{SigS}]}{[\text{SigS}] + [\text{SigSP}] + [\text{SigSP\_G}] + \text{eps}} \cdot [\text{E13S}]\right) \tag{130}$$

7.65 Reaction Net_E13PI3K_Binding

This is a reversible reaction of two reactants forming two products.

Name Net E13/PI3K Binding

Reaction equation

$$\text{E13P} + \text{I} \rightleftharpoons \text{E13I} + \text{SigI} \tag{131}$$

Reactants

Table 181: Properties of each reactant.

Id	Name	SBO
E13P	ErbB1-ErbB3_p	
I	PI-3K	

Products

Table 182: Properties of each product.

Id	Name	SBO
E13I	E13-PI-3K	
SigI	Sum PI-3K	

Kinetic Law

Derived unit contains undeclared units

$$v_{65} = \text{area}\,(\text{membrane}) \cdot (3 \cdot \text{kon67} \cdot [\text{E13P}] \cdot [\text{I}] - \text{koff67} \cdot [\text{E13I}]) \tag{132}$$

7.66 Reaction Net_E13RasGAP_Binding

This is a reversible reaction of two reactants forming two products influenced by one modifier.

Name Net E13/RasGAP Binding

Reaction equation

$$\text{E13P} + \text{R} \overset{\text{SigRP}}{\rightleftharpoons} \text{E13R} + \text{SigR} \tag{133}$$

Reactants

Table 183: Properties of each reactant.

Id	Name	SBO
E13P	ErbB1-ErbB3_p	
R	RasGAP	

Modifier

Table 184: Properties of each modifier.

Id	Name	SBO
SigRP	Sum RasGAP_p	

Products

Table 185: Properties of each product.

Id	Name	SBO
E13R	E13-RasGAP	
SigR	Sum RasGAP	

Kinetic Law

Derived unit contains undeclared units

$$v_{66} = \text{area}\,(\text{membrane}) \cdot \left(2 \cdot \text{kon68} \cdot [\text{E13P}] \cdot [\text{R}] - \text{koff68} \cdot \frac{[\text{SigR}]}{[\text{SigR}] + [\text{SigRP}] + \text{eps}} \cdot [\text{E13R}] \right) \tag{134}$$

7.67 Reaction Net_E14Grb2_Binding

This is a reversible reaction of two reactants forming two products influenced by three modifiers.

Name Net E14/Grb2 Binding

Reaction equation

$$\text{E14P} + \text{G} \overset{\text{SigG\_A, SigG\_O, A\_SigG\_O}}{\rightleftharpoons} \text{E14G} + \text{SigG} \tag{135}$$

Reactants

Table 186: Properties of each reactant.

Id	Name	SBO
E14P	ErbB1-ErbB3_p	
G	Grb2	

Modifiers

Table 187: Properties of each modifier.

Id	Name	SBO
SigG_A	Sum Grb2-Gab1	
SigG_O	Sum Grb2-SOS	
A_SigG_O	Gab1_SumGrb2-SOS	

Products

Table 188: Properties of each product.

Id	Name	SBO
E14G	E14-Grb2	
SigG	Sum Grb2	

Kinetic Law

Derived unit contains undeclared units

$$v_{67} = \text{area}\,(\text{membrane}) \cdot \left(4 \cdot \text{kon69} \cdot [\text{E14P}] \cdot [\text{G}] - \text{koff69} \cdot \frac{[\text{SigG}]}{[\text{SigG}] + [\text{SigG\_A}] + [\text{SigG\_O}] + [\text{A\_SigG\_O}] + \text{eps}} \cdot [\text{E14G}] \right) \tag{136}$$

7.68 Reaction Net_E14Shc_Binding

This is a reversible reaction of two reactants forming two products influenced by two modifiers.

Name Net E14/Shc Binding

Reaction equation

$$\text{E14P} + \text{S} \overset{\text{SigSP, SigSP\_G}}{\rightleftharpoons} \text{E14S} + \text{SigS} \tag{137}$$

Reactants

Table 189: Properties of each reactant.

Id	Name	SBO
E14P	ErbB1-ErbB3_p	
S	Shc	

Modifiers

Table 190: Properties of each modifier.

Id	Name	SBO
SigSP	Sum Shc_p	
SigSP_G	Sum Shc_p-Grb2	

Products

Table 191: Properties of each product.

Id	Name	SBO
E14S	E14-Shc	
SigS	Sum Shc	

Kinetic Law

Derived unit contains undeclared units

$$v_{68} = \text{area}\,(\text{membrane}) \cdot \left(6 \cdot \text{kon70} \cdot [\text{E14P}] \cdot [\text{S}] - \text{koff70} \cdot \frac{[\text{SigS}]}{[\text{SigS}] + [\text{SigSP}] + [\text{SigSP\_G}] + \text{eps}} \cdot [\text{E14S}]\right) \tag{138}$$

7.69 Reaction Net_E14PI3K_Binding

This is a reversible reaction of two reactants forming two products.

Name Net E14/PI3K Binding

Reaction equation

$$\text{E14P} + \text{I} \rightleftharpoons \text{E14I} + \text{SigI} \tag{139}$$

Reactants

Table 192: Properties of each reactant.

Id	Name	SBO
E14P	ErbB1-ErbB3_p	
I	PI-3K	

Products

Table 193: Properties of each product.

Id	Name	SBO
E14I	E14-PI-3K	
SigI	Sum PI-3K	

Kinetic Law

Derived unit contains undeclared units

$$v_{69} = \text{area}\,(\text{membrane}) \cdot (1 \cdot \text{kon71} \cdot [\text{E14P}] \cdot [\text{I}] - \text{koff71} \cdot [\text{E14I}]) \tag{140}$$

7.70 Reaction Net_E14RasGAP_Binding

This is a reversible reaction of two reactants forming two products influenced by one modifier.

Name Net E14/RasGAP Binding

Reaction equation

$$\mathrm{E14P} + \mathrm{R} \underset{}{\overset{\mathrm{SigRP}}{\rightleftharpoons}} \mathrm{E14R} + \mathrm{SigR} \tag{141}$$

Reactants

Table 194: Properties of each reactant.

Id	Name	SBO
E14P	ErbB1-ErbB3_p	
R	RasGAP	

Modifier

Table 195: Properties of each modifier.

Id	Name	SBO
SigRP	Sum RasGAP_p	

Products

Table 196: Properties of each product.

Id	Name	SBO
E14R	E14-RasGAP	
SigR	Sum RasGAP	

Kinetic Law

Derived unit contains undeclared units

$$v_{70} = \mathrm{area}\,(\mathrm{membrane}) \cdot \left(2 \cdot \mathrm{kon72} \cdot [\mathrm{E14P}] \cdot [\mathrm{R}] - \mathrm{koff72} \cdot \frac{[\mathrm{SigR}]}{[\mathrm{SigR}] + [\mathrm{SigRP}] + \mathrm{eps}} \cdot [\mathrm{E14R}]\right) \tag{142}$$

7.71 Reaction Net_E11PTP1B_Binding

This is a reversible reaction of two reactants forming two products.

Name Net E11/PTP1B Binding

Reaction equation

$$\mathrm{E11P} + \mathrm{T} \rightleftharpoons \mathrm{E11T} + \mathrm{SigT} \tag{143}$$

Reactants

Table 197: Properties of each reactant.

Id	Name	SBO
E11P	E11_p	
T	PTP-1B	

Products

Table 198: Properties of each product.

Id	Name	SBO
E11T	E11-PTP-1B	
SigT	Sig-PTP-1B	

Kinetic Law

Derived unit contains undeclared units

$$v_{71} = \mathrm{area}\,(\mathrm{membrane}) \cdot (4 \cdot \mathrm{kon73} \cdot [\mathrm{E11P}] \cdot [\mathrm{T}] - \mathrm{koff73} \cdot [\mathrm{E11T}]) \tag{144}$$

7.72 Reaction Net_E12PTP1B_Binding

This is a reversible reaction of two reactants forming two products.

Name Net E12/PTP1B Binding

Reaction equation

$$\mathrm{E12P} + \mathrm{T} \rightleftharpoons \mathrm{E12T} + \mathrm{SigT} \tag{145}$$

Reactants

Table 199: Properties of each reactant.

Id	Name	SBO
E12P	E12_p	
T	PTP-1B	

Products

Table 200: Properties of each product.

Id	Name	SBO
E12T	E12-PTP-1B	
SigT	Sig-PTP-1B	

Kinetic Law

Derived unit contains undeclared units

$$v_{72} = \text{area}\,(\text{membrane}) \cdot (3 \cdot \text{kon74} \cdot [\text{E12P}] \cdot [\text{T}] - \text{koff74} \cdot [\text{E12T}]) \tag{146}$$

7.73 Reaction Net_E23PTP1B_Binding

This is a reversible reaction of two reactants forming two products.

Name Net E23/PTP1B Binding

Reaction equation

$$\text{E23P} + \text{T} \rightleftharpoons \text{E23T} + \text{SigT} \tag{147}$$

Reactants

Table 201: Properties of each reactant.

Id	Name	SBO
E23P	E23_p	
T	PTP-1B	

Products

Table 202: Properties of each product.

Id	Name	SBO
E23T	E23-PTP-1B	
SigT	Sig-PTP-1B	

Kinetic Law

Derived unit contains undeclared units

$$v_{73} = \text{area}\,(\text{membrane}) \cdot (2 \cdot \text{kon75} \cdot [\text{E23P}] \cdot [\text{T}] - \text{koff75} \cdot [\text{E23T}]) \tag{148}$$

7.74 Reaction Net_E34PTP1B_Binding

This is a reversible reaction of two reactants forming two products.

Name Net E34/PTP1B Binding

Reaction equation

$$\text{E34P} + \text{T} \rightleftharpoons \text{E34T} + \text{SigT} \tag{149}$$

Reactants

Table 203: Properties of each reactant.

Id	Name	SBO
E34P	E34_p	
T	PTP-1B	

Products

Table 204: Properties of each product.

Id	Name	SBO
E34T	E34-PTP-1B	
SigT	Sig-PTP-1B	

Kinetic Law

Derived unit contains undeclared units

$$v_{74} = \text{area}\,(\text{membrane}) \cdot (2 \cdot \text{kon76} \cdot [\text{E34P}] \cdot [\text{T}] - \text{koff76} \cdot [\text{E34T}]) \tag{150}$$

7.75 Reaction Net_E24PTP1B_Binding

This is a reversible reaction of two reactants forming two products.

Name Net E24/PTP1B Binding

Reaction equation

$$\mathrm{E24P} + \mathrm{T} \rightleftharpoons \mathrm{E24T} + \mathrm{SigT} \tag{151}$$

Reactants

Table 205: Properties of each reactant.

Id	Name	SBO
E24P	E24_p	
T	PTP-1B	

Products

Table 206: Properties of each product.

Id	Name	SBO
E24T	E24-PTP-1B	
SigT	Sig-PTP-1B	

Kinetic Law

Derived unit contains undeclared units

$$v_{75} = \mathrm{area}\,(\mathrm{membrane}) \cdot (2 \cdot \mathrm{kon77} \cdot [\mathrm{E24P}] \cdot [\mathrm{T}] - \mathrm{koff77} \cdot [\mathrm{E24T}]) \tag{152}$$

7.76 Reaction Net_E44PTP1B_Binding

This is a reversible reaction of two reactants forming two products.

Name Net E44/PTP1B Binding

Reaction equation

$$\mathrm{E44P} + \mathrm{T} \rightleftharpoons \mathrm{E44T} + \mathrm{SigT} \tag{153}$$

Reactants

Table 207: Properties of each reactant.

Id	Name	SBO
E44P	E44_p	
T	PTP-1B	

Products

Table 208: Properties of each product.

Id	Name	SBO
E44T	E44-PTP-1B	
SigT	Sig-PTP-1B	

Kinetic Law

Derived unit contains undeclared units

$$v_{76} = \text{area}\,(\text{membrane}) \cdot (2 \cdot \text{kon78} \cdot [\text{E44P}] \cdot [\text{T}] - \text{koff78} \cdot [\text{E44T}]) \tag{154}$$

7.77 Reaction Net_E13PTP1B_Binding

This is a reversible reaction of two reactants forming two products.

Name Net E13/PTP1B Binding

Reaction equation

$$\text{E13P} + \text{T} \rightleftharpoons \text{E13T} + \text{SigT} \tag{155}$$

Reactants

Table 209: Properties of each reactant.

Id	Name	SBO
E13P	ErbB1-ErbB3_p	
T	PTP-1B	

Products

Table 210: Properties of each product.

Id	Name	SBO
E13T	E13-PTP-1B	
SigT	Sig-PTP-1B	

Kinetic Law

Derived unit contains undeclared units

$$v_{77} = \text{area}\,(\text{membrane}) \cdot (3 \cdot \text{kon79} \cdot [\text{E13P}] \cdot [\text{T}] - \text{koff79} \cdot [\text{E13T}]) \tag{156}$$

7.78 Reaction Net_E14PTP1B_Binding

This is a reversible reaction of two reactants forming two products.

Name Net E14/PTP1B Binding

Reaction equation

$$\text{E14P} + \text{T} \rightleftharpoons \text{E14T} + \text{SigT} \tag{157}$$

Reactants

Table 211: Properties of each reactant.

Id	Name	SBO
E14P	ErbB1-ErbB3_p	
T	PTP-1B	

Products

Table 212: Properties of each product.

Id	Name	SBO
E14T	E14-PTP-1B	
SigT	Sig-PTP-1B	

Kinetic Law

Derived unit contains undeclared units

$$v_{78} = \text{area}\,(\text{membrane}) \cdot (3 \cdot \text{kon80} \cdot [\text{E14P}] \cdot [\text{T}] - \text{koff80} \cdot [\text{E14T}]) \tag{158}$$

7.79 Reaction Net_E1_ST_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net E1 S/T Phosphorylation

Reaction equation

$$\mathrm{E1} \underset{}{\overset{\mathrm{ERKstar}}{\rightleftharpoons}} \mathrm{E1\_PT} \tag{159}$$

Reactant

Table 213: Properties of each reactant.

Id	Name	SBO
E1	ErbB1	

Modifier

Table 214: Properties of each modifier.

Id	Name	SBO
ERKstar	ERK*	

Product

Table 215: Properties of each product.

Id	Name	SBO
E1_PT	E1_p-PTP-1B	

Kinetic Law

Derived unit contains undeclared units

$$v_{79} = \mathrm{area}\,(\mathrm{membrane}) \cdot \left(\frac{\mathrm{kf81} \cdot [\mathrm{E1}] \cdot [\mathrm{ERKstar}]}{\mathrm{Kmf81} + [\mathrm{E1}]} - \frac{\mathrm{Vmaxr81} \cdot [\mathrm{E1\_PT}]}{\mathrm{Kmr81} + [\mathrm{E1\_PT}]} \right) \tag{160}$$

7.80 Reaction Net_E2_ST_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net E2 S/T Phosphorylation

Reaction equation

$$\mathrm{E2} \underset{}{\overset{\mathrm{ERKstar}}{\rightleftharpoons}} \mathrm{E2\_PT} \tag{161}$$

Reactant

Table 216: Properties of each reactant.

Id	Name	SBO
E2	ErbB2	

Modifier

Table 217: Properties of each modifier.

Id	Name	SBO
ERKstar	ERK*	

Product

Table 218: Properties of each product.

Id	Name	SBO
E2_PT	E2_p-PTP-1B	

Kinetic Law

Derived unit contains undeclared units

$$v_{80} = \text{area}\,(\text{membrane}) \cdot \left(\frac{\text{kf82} \cdot [\text{E2}] \cdot [\text{ERKstar}]}{\text{Kmf82} + [\text{E2}]} - \frac{\text{Vmaxr82} \cdot [\text{E2\_PT}]}{\text{Kmr82} + [\text{E2\_PT}]} \right) \tag{162}$$

7.81 Reaction Net_E4_ST_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net E4 S/T Phosphorylation

Reaction equation

$$\text{E4} \overset{\text{ERKstar}}{\rightleftharpoons} \text{E4\_PT} \tag{163}$$

Reactant

Table 219: Properties of each reactant.

Id	Name	SBO
E4	ErbB4	

Modifier

Table 220: Properties of each modifier.

Id	Name	SBO
ERKstar	ERK*	

Product

Table 221: Properties of each product.

Id	Name	SBO
E4_PT	E4_p-PTP-1B	

Kinetic Law

Derived unit contains undeclared units

$$v_{81} = \text{area}\,(\text{membrane}) \cdot \left(\frac{\text{kf83} \cdot [\text{E4}] \cdot [\text{ERKstar}]}{\text{Kmf83} + [\text{E4}]} - \frac{\text{Vmaxr83} \cdot [\text{E4\_PT}]}{\text{Kmr83} + [\text{E4\_PT}]} \right) \tag{164}$$

7.82 Reaction Net_E_E1_ST_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net E_E1 S/T Phosphorylation

Reaction equation

$$\text{E\_E1} \overset{\text{ERKstar}}{\rightleftharpoons} \text{E\_E1\_PT} \tag{165}$$

Reactant

Table 222: Properties of each reactant.

Id	Name	SBO
E_E1	EGF-ErbB1	

Modifier

Table 223: Properties of each modifier.

Id	Name	SBO
ERKstar	ERK*	

Product

Table 224: Properties of each product.

Id	Name	SBO
E_E1_PT	E_E1_p-PTP-1B	

Kinetic Law

Derived unit contains undeclared units

$$v_{82} = \text{area}\,(\text{membrane}) \cdot \left(\frac{\text{kf84} \cdot [\text{E\_E1}] \cdot [\text{ERKstar}]}{\text{Kmf84} + [\text{E\_E1}]} - \frac{\text{Vmaxr84} \cdot [\text{E\_E1\_PT}]}{\text{Kmr84} + [\text{E\_E1\_PT}]} \right) \quad (166)$$

7.83 Reaction Net_H_E4_ST_Phosphorylation

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name Net H_E4 S/T Phosphorylation

Reaction equation

$$\text{H\_E4} \xrightleftharpoons{\text{ERKstar}} \text{H\_E4\_PT} \quad (167)$$

Reactant

Table 225: Properties of each reactant.

Id	Name	SBO
H_E4	HRG-ErbB4	

Modifier

Table 226: Properties of each modifier.

Id	Name	SBO
ERKstar	ERK*	

Product

Table 227: Properties of each product.

Id	Name	SBO
H_E4_PT	H_E4_p-PTP-1B	

Kinetic Law

Derived unit contains undeclared units

$$v_{83} = \text{area}\,(\text{membrane}) \cdot \left(\frac{\text{kf85} \cdot [\text{H\_E4}] \cdot [\text{ERKstar}]}{\text{Kmf85} + [\text{H\_E4}]} - \frac{\text{Vmaxr85} \cdot [\text{H\_E4\_PT}]}{\text{Kmr85} + [\text{H\_E4\_PT}]} \right) \quad (168)$$

7.84 Reaction EGF_binding_to_E1PT

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name EGF binding to E1-PT

Reaction equation

$$\text{E1\_PT} \overset{\text{E}}{\rightleftharpoons} \text{E\_E1\_PT} \quad (169)$$

Reactant

Table 228: Properties of each reactant.

Id	Name	SBO
E1_PT	E1_p-PTP-1B	

Modifier

Table 229: Properties of each modifier.

Id	Name	SBO
E	EGF	

Product

Table 230: Properties of each product.

Id	Name	SBO
E_E1_PT	E_E1_p-PTP-1B	

Kinetic Law

Derived unit contains undeclared units

$$v_{84} = \text{area}\,(\text{membrane}) \cdot (\text{kon86} \cdot [\text{E}] \cdot [\text{E1\_PT}] - \text{EGF\_off} \cdot [\text{E\_E1\_PT}]) \tag{170}$$

7.85 Reaction HRG_binding_to_E4PT

This is a reversible reaction of one reactant forming one product influenced by one modifier.

Name HRG binding to E4-PT

Reaction equation

$$\text{E4\_PT} \overset{\text{H}}{\rightleftharpoons} \text{H\_E4\_PT} \tag{171}$$

Reactant

Table 231: Properties of each reactant.

Id	Name	SBO
E4_PT	E4_p-PTP-1B	

Modifier

Table 232: Properties of each modifier.

Id	Name	SBO
H	HRG	

Product

Table 233: Properties of each product.

Id	Name	SBO
H_E4_PT	H_E4_p-PTP-1B	

Kinetic Law

Derived unit contains undeclared units

$$v_{85} = \text{area}(\text{membrane}) \cdot (\text{kon87} \cdot [\text{H}] \cdot [\text{E4\_PT}] - \text{HRGoff\_4} \cdot [\text{H\_E4\_PT}]) \tag{172}$$

7.86 Reaction PTP1B_binding_to_SigAP

This is a reversible reaction of two reactants forming two products.

Name PTP1B binding to SigAP

Reaction equation

$$\text{SigAP} + \text{T} \rightleftharpoons \text{SigAP\_T} + \text{SigT} \tag{173}$$

Reactants

Table 234: Properties of each reactant.

Id	Name	SBO
SigAP	Sum Gab1_p	
T	PTP-1B	

Products

Table 235: Properties of each product.

Id	Name	SBO
SigAP_T	SumGab1_p-PTP-1B	
SigT	Sig-PTP-1B	

Kinetic Law

Derived unit contains undeclared units

$$v_{86} = \text{area}\,(\text{membrane}) \cdot (2 \cdot \text{kon88} \cdot [\text{SigAP}] \cdot [\text{T}] - \text{koff88} \cdot [\text{SigAP\_T}]) \tag{174}$$

7.87 Reaction E11P_Degradation

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

Name E11P Degradation

Reaction equation

$$\text{E11P} \longrightarrow \text{Empty} \tag{175}$$

Reactant

Table 236: Properties of each reactant.

Id	Name	SBO
E11P	E11_p	

Product

Table 237: Properties of each product.

Id	Name	SBO
Empty	Empty	

Kinetic Law

Derived unit contains undeclared units

$$v_{87} = \text{area}\,(\text{membrane}) \cdot \text{kdeg} \cdot [\text{E11P}] \tag{176}$$

7.88 Reaction E11G_Degradation

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

Name E11G Degradation

Reaction equation

$$\mathrm{E11G} + \mathrm{SigG} \longrightarrow \mathrm{G} \tag{177}$$

Reactants

Table 238: Properties of each reactant.

Id	Name	SBO
E11G	E11-Grb2	
SigG	Sum Grb2	

Product

Table 239: Properties of each product.

Id	Name	SBO
G	Grb2	

Kinetic Law

Derived unit contains undeclared units

$$v_{88} = \mathrm{area}\,(\mathrm{membrane}) \cdot \mathrm{kdeg} \cdot [\mathrm{E11G}] \tag{178}$$

7.89 Reaction E11S_Degradation

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

Name E11S Degradation

Reaction equation

$$\mathrm{E11S} + \mathrm{SigS} \longrightarrow \mathrm{S} \tag{179}$$

Reactants

Table 240: Properties of each reactant.

Id	Name	SBO
E11S	E11-Shc	
SigS	Sum Shc	

Product

Table 241: Properties of each product.

Id	Name	SBO
S	Shc	

Kinetic Law

Derived unit contains undeclared units

$$v_{89} = \text{area}\,(\text{membrane}) \cdot \text{kdeg} \cdot [\text{E11S}] \tag{180}$$

7.90 Reaction E11R_Degradation

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

Name E11R Degradation

Reaction equation

$$\text{E11R} + \text{SigR} \longrightarrow \text{R} \tag{181}$$

Reactants

Table 242: Properties of each reactant.

Id	Name	SBO
E11R	E11-RasGAP	
SigR	Sum RasGAP	

Product

Table 243: Properties of each product.

Id	Name	SBO
R	RasGAP	

Kinetic Law

Derived unit contains undeclared units

$$v_{90} = \text{area}\,(\text{membrane}) \cdot \text{kdeg} \cdot [\text{E11R}] \tag{182}$$

7.91 Reaction E11T_Degradation

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

Name E11T Degradation

Reaction equation

$$\text{E11T} + \text{SigT} \longrightarrow \text{T} \tag{183}$$

Reactants

Table 244: Properties of each reactant.

Id	Name	SBO
E11T	E11-PTP-1B	
SigT	Sig-PTP-1B	

Product

Table 245: Properties of each product.

Id	Name	SBO
T	PTP-1B	

Kinetic Law

Derived unit contains undeclared units

$$v_{91} = \text{area}\,(\text{membrane}) \cdot \text{kdeg} \cdot [\text{E11T}] \tag{184}$$

7.92 Reaction mwbbde76d1_155c_4264_8447_4457527547cb

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

Name 1-1 Dimer Internalization Fraction

Reaction equation

$$\text{Empty} \longrightarrow \text{fint} \tag{185}$$

Reactant

Table 246: Properties of each reactant.

Id	Name	SBO
Empty	Empty	

Product

Table 247: Properties of each product.

Id	Name	SBO
fint	fint	

Kinetic Law

Derived unit contains undeclared units

$$v_{92} = \text{area}\,(\text{membrane}) \cdot \text{a98} \cdot ([\text{fint}] + \text{b98}) \tag{186}$$

7.93 Reaction EGF_in_EC_compartment

This is a reversible reaction of one reactant forming one product influenced by four modifiers.

Name EGF in EC compartment

Reaction equation

$$\text{E} \underset{\text{E1, E\_E1, E1\_PT, E\_E1\_PT}}{\rightleftharpoons} \text{Empty} \tag{187}$$

Reactant

Table 248: Properties of each reactant.

Id	Name	SBO
E	EGF	

Modifiers

Table 249: Properties of each modifier.

Id	Name	SBO
E1	ErbB1	
E_E1	EGF-ErbB1	
E1_PT	E1_p-PTP-1B	
E_E1_PT	E_E1_p-PTP-1B	

Product

Table 250: Properties of each product.

Id	Name	SBO
Empty	Empty	

Kinetic Law

Derived unit contains undeclared units

$$v_{93} = \text{area}\,(\text{membrane}) \cdot \frac{\text{kon1} \cdot [\text{E}] \cdot [\text{E1}] - \text{EGF\_off} \cdot [\text{E\_E1}] + \text{kon86} \cdot [\text{E}] \cdot [\text{E1\_PT}] - \text{EGF\_off} \cdot [\text{E\_E1\_PT}]}{\text{VeVc}} \tag{188}$$

7.94 Reaction HRG_in_EC_compartment

This is a reversible reaction of one reactant forming one product influenced by six modifiers.

Name HRG in EC compartment

Reaction equation

$$\text{H} \underset{\text{E4\_PT, H\_E4\_PT, E3, H\_E3, E4, H\_E4}}{\rightleftharpoons} \text{Empty} \tag{189}$$

Reactant

Table 251: Properties of each reactant.

Id	Name	SBO
H	HRG	

Modifiers

Table 252: Properties of each modifier.

Id	Name	SBO
E4_PT	E4_p-PTP-1B	
H_E4_PT	H_E4_p-PTP-1B	
E3	ErbB3	
H_E3	HRG-ErbB3	
E4	ErbB4	
H_E4	HRG-ErbB4	

Product

Table 253: Properties of each product.

Id	Name	SBO
Empty	Empty	

Kinetic Law

Derived unit contains undeclared units

$$v_{94} = \text{area}\,(\text{membrane}) \cdot \frac{\text{kon87} \cdot [\text{H}] \cdot [\text{E4\_PT}] - \text{HRGoff\_4} \cdot [\text{H\_E4\_PT}] + \text{kon2} \cdot [\text{H}] \cdot [\text{E3}] - \text{HRGoff\_3} \cdot [\text{H\_E3}] + \text{kon3} \cdot [\text{H}] \cdot [\text{E4}] - \text{HI}}{\text{VeVc}} \tag{190}$$

7.95 Reaction ERK_binding_to_MEKstar_1

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

Name ERK binding to MEKstar

Reaction equation

$$\text{ERK} + \text{MEKstar} \rightleftharpoons \text{ERK\_MEKstar} \tag{191}$$

Reactants

Table 254: Properties of each reactant.

Id	Name	SBO
ERK	ERK	
MEKstar	MEK*	

Product

Table 255: Properties of each product.

Id	Name	SBO
ERK_MEKstar	ERK-MEK*	

Kinetic Law

Derived unit contains undeclared units

$$v_{95} = \text{area}\,(\text{membrane}) \cdot (\text{kon89} \cdot [\text{ERK}] \cdot [\text{MEKstar}] - \text{koff89} \cdot [\text{ERK\_MEKstar}]) \quad (192)$$

7.96 Reaction pERK_production

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

Name pERK production

Reaction equation

$$\text{ERK\_MEKstar} \longrightarrow \text{pERK} + \text{MEKstar} \quad (193)$$

Reactant

Table 256: Properties of each reactant.

Id	Name	SBO
ERK_MEKstar	ERK-MEK*	

Products

Table 257: Properties of each product.

Id	Name	SBO
pERK	p_ERK	

Id	Name	SBO
MEKstar	MEK*	

Kinetic Law

Derived unit contains undeclared units

$$v_{96} = \text{area}\,(\text{membrane}) \cdot \text{kcat90} \cdot [\text{ERK\_MEKstar}] \tag{194}$$

7.97 Reaction ERK_binding_to_MEKstar_2

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

Name ERK binding to MEKstar

Reaction equation

$$\text{pERK} + \text{MEKstar} \rightleftharpoons \text{pERK\_MEKstar} \tag{195}$$

Reactants

Table 258: Properties of each reactant.

Id	Name	SBO
pERK	p_ERK	
MEKstar	MEK*	

Product

Table 259: Properties of each product.

Id	Name	SBO
pERK_MEKstar	p_ERK-MEK*	

Kinetic Law

Derived unit contains undeclared units

$$v_{97} = \text{area}\,(\text{membrane}) \cdot (\text{kon91} \cdot [\text{pERK}] \cdot [\text{MEKstar}] - \text{koff91} \cdot [\text{pERK\_MEKstar}]) \tag{196}$$

7.98 Reaction ERKstar_production

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

Name ERKstar production

Reaction equation

$$\text{pERK\_MEKstar} \longrightarrow \text{ERKstar} + \text{MEKstar} \tag{197}$$

Reactant

Table 260: Properties of each reactant.

Id	Name	SBO
pERK_MEKstar	p_ERK-MEK*	

Products

Table 261: Properties of each product.

Id	Name	SBO
ERKstar	ERK*	
MEKstar	MEK*	

Kinetic Law

Derived unit contains undeclared units

$$v_{98} = \text{area}\,(\text{membrane}) \cdot \text{kcat92} \cdot [\text{pERK\_MEKstar}] \tag{198}$$

7.99 Reaction ERKstar_binding_to_Phosphatase

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

Name ERKstar binding to Phosphatase

Reaction equation

$$\text{ERKstar} + \text{ERKpase} \rightleftharpoons \text{ERKstar\_ERKpase} \tag{199}$$

Reactants

Table 262: Properties of each reactant.

Id	Name	SBO
ERKstar	ERK*	

Id	Name	SBO
ERKpase	ERKpase	

Product

Table 263: Properties of each product.

Id	Name	SBO
ERKstar_ERKpase	ERK*-ERKpase	

Kinetic Law

Derived unit contains undeclared units

$$v_{99} = \text{area}\,(\text{membrane}) \cdot (\text{kon93} \cdot [\text{ERKstar}] \cdot [\text{ERKpase}] - \text{koff93} \cdot [\text{ERKstar\_ERKpase}]) \quad (200)$$

7.100 Reaction ERKstar_dephosphorylation

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

Name ERKstar dephosphorylation

Reaction equation

$$\text{ERKstar\_ERKpase} \longrightarrow \text{pERK} + \text{ERKpase} \quad (201)$$

Reactant

Table 264: Properties of each reactant.

Id	Name	SBO
ERKstar_ERKpase	ERK*-ERKpase	

Products

Table 265: Properties of each product.

Id	Name	SBO
pERK	p_ERK	
ERKpase	ERKpase	

Kinetic Law

Derived unit contains undeclared units

$$v_{100} = \text{area}\,(\text{membrane}) \cdot \text{kcat94} \cdot [\text{ERKstar\_ERKpase}] \tag{202}$$

7.101 Reaction pERK_binding_to_Phosphatase

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

Name pERK binding to Phosphatase

Reaction equation

$$\text{pERK} + \text{ERKpase} \rightleftharpoons \text{pERK\_ERKpase} \tag{203}$$

Reactants

Table 266: Properties of each reactant.

Id	Name	SBO
pERK	p_ERK	
ERKpase	ERKpase	

Product

Table 267: Properties of each product.

Id	Name	SBO
pERK_ERKpase	p_ERK-ERKpase	

Kinetic Law

Derived unit contains undeclared units

$$v_{101} = \text{area}\,(\text{membrane}) \cdot (\text{kon95} \cdot [\text{pERK}] \cdot [\text{ERKpase}] - \text{koff95} \cdot [\text{pERK\_ERKpase}]) \tag{204}$$

7.102 Reaction pERK_dephosphorylation

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

Name pERK dephosphorylation

Reaction equation

$$\text{pERK\_ERKpase} \longrightarrow \text{ERK} + \text{ERKpase} \tag{205}$$

Reactant

Table 268: Properties of each reactant.

Id	Name	SBO
pERK_ERKpase	p_ERK-ERKpase	

Products

Table 269: Properties of each product.

Id	Name	SBO
ERK	ERK	
ERKpase	ERKpase	

Kinetic Law

Derived unit contains undeclared units

$$v_{102} = \text{area}\,(\text{membrane}) \cdot \text{kcat96} \cdot [\text{pERK\_ERKpase}] \tag{206}$$

8 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.

8.1 Species E1

Name ErbB1

Initial amount 274 nmol

This species takes part in three reactions (as a reactant in EGF_Binding_to_ErbB1, Net_E1_ST-_Phosphorylation and as a modifier in EGF_in_EC_compartment).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E1} = -\,v_{1} - v_{79} \tag{207}$$

8.2 Species E2

Name ErbB2

Initial amount 158 nmol

This species takes part in four reactions (as a reactant in ErbB1ErbB2_Heterodimerization, ErbB2ErbB3_Heterodimerization, ErbB2ErbB4_Heterodimerization, Net_E2_ST_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E2} = -\,v_{5} - v_{6} - v_{8} - v_{80} \tag{208}$$

8.3 Species E3

Name ErbB3

Initial amount 294 nmol

This species takes part in two reactions (as a reactant in HRG_Binding_to_ErbB3 and as a modifier in HRG_in_EC_compartment).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E3} = -\,v_{2} \tag{209}$$

8.4 Species E4

Name ErbB4

Initial amount 399 nmol

This species takes part in three reactions (as a reactant in HRG_Binding_to_ErbB4, Net_E4_ST-_Phosphorylation and as a modifier in HRG_in_EC_compartment).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E4} = -\,v_{3} - v_{81} \tag{210}$$

8.5 Species E_E1

Name EGF-ErbB1

Initial amount 0 nmol

This species takes part in eight reactions (as a reactant in ErbB1_Dimerization, ErbB1_Dimerization, ErbB1ErbB2_Heterodimerization, ErbB1ErbB3_Heterodimerization, ErbB1ErbB4_Heterodimerization, Net_E_E1_ST_Phosphorylation and as a product in EGF_Binding_to_ErbB1 and as a modifier in EGF_in_EC_compartment).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E\_E1} = v_1 - v_4 - v_4 - v_5 - v_{59} - v_{60} - v_{82} \tag{211}$$

8.6 Species H_E3

Name HRG-ErbB3

Initial amount 0 nmol

This species takes part in five reactions (as a reactant in ErbB2ErbB3_Heterodimerization, ErbB3ErbB4_Heterodimerization, ErbB1ErbB3_Heterodimerization and as a product in HRG_Binding_to_ErbB3 and as a modifier in HRG_in_EC_compartment).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{H\_E3} = v_2 - v_6 - v_7 - v_{59} \tag{212}$$

8.7 Species H_E4

Name HRG-ErbB4

Initial amount 0 nmol

This species takes part in eight reactions (as a reactant in ErbB3ErbB4_Heterodimerization, ErbB2ErbB4_Heterodimerization, ErbB4_Homodimerization, ErbB4_Homodimerization, ErbB1ErbB4_Heterodimerization, Net_H_E4_ST_Phosphorylation and as a product in HRG_Binding_to_ErbB4 and as a modifier in HRG_in_EC_compartment).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{H\_E4} = v_3 - v_7 - v_8 - v_9 - v_9 - v_{60} - v_{83} \tag{213}$$

8.8 Species E11

Name (EGF-ErbB1)2

Initial amount 0 nmol

This species takes part in two reactions (as a reactant in Net_E11_Phosphorylation and as a product in ErbB1_Dimerization).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E11} = v_4 - v_{10} \tag{214}$$

8.9 Species E12

Name EGF-ErbB1-ErbB2

Initial amount 0 nmol

This species takes part in two reactions (as a reactant in Net_E12_Phosphorylation and as a product in ErbB1ErbB2_Heterodimerization).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E12} = v_5 - v_{11} \tag{215}$$

8.10 Species E23

Name HRG-ErbB3-ErbB2

Initial amount 0 nmol

This species takes part in two reactions (as a reactant in Net_E23_Phosphorylation and as a product in ErbB2ErbB3_Heterodimerization).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E23} = v_6 - v_{12} \tag{216}$$

8.11 Species E34

Name (HRG-ErbB3/4)2

Initial amount 0 nmol

This species takes part in two reactions (as a reactant in Net_E34_Phosphorylation and as a product in ErbB3ErbB4_Heterodimerization).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E34} = v_7 - v_{13} \tag{217}$$

8.12 Species E24

Name HRG-Erb4-ErbB2

Initial amount 0 nmol

This species takes part in two reactions (as a reactant in Net_E24_Phosphorylation and as a product in ErbB2ErbB4_Heterodimerization).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E24} = v_8 - v_{14} \tag{218}$$

8.13 Species E44

Name (HRG-Erb4)2

Initial amount 0 nmol

This species takes part in two reactions (as a reactant in Net_E44_Phosphorylation and as a product in ErbB4_Homodimerization).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E44} = v_{9} - v_{15} \tag{219}$$

8.14 Species E11P

Name E11_p

Initial amount 0 nmol

This species takes part in ten reactions (as a reactant in Net_E11PGrb2_binding, Net_E11PShc-_binding, Net_E11PRasGAP_binding, Net_E11PTP1B_Binding, E11P_Degradation and as a product in Net_E11_Phosphorylation and as a modifier in Net_Shc_Phosphorylation, Net_Gab1_Phosphorylation, Net_PIP3_Production, Net_RasGAP_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E11P} = v_{10} - v_{16} - v_{17} - v_{18} - v_{71} - v_{87} \tag{220}$$

8.15 Species E12P

Name E12_p

Initial amount 0 nmol

This species takes part in nine reactions (as a reactant in Net_E12PGrb2_binding, Net_E12PShc-_binding, Net_E12PRasGAP_binding, Net_E12PTP1B_Binding and as a product in Net_E12-_Phosphorylation and as a modifier in Net_Shc_Phosphorylation, Net_Gab1_Phosphorylation, Net_PIP3_Production, Net_RasGAP_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E12P} = v_{11} - v_{19} - v_{20} - v_{21} - v_{72} \tag{221}$$

8.16 Species E23P

Name E23_p

Initial amount 0 nmol

This species takes part in ten reactions (as a reactant in Net_E23PGrb2_binding, Net_E23PShc-_binding, Net_E23PPI3K_binding, Net_E23PRasGAP_binding, Net_E23PTP1B_Binding and as a product in Net_E23_Phosphorylation and as a modifier in Net_Shc_Phosphorylation, Net_Gab1_Phosphorylation, Net_PIP3_Production, Net_RasGAP_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E23P} = v_{12} - v_{22} - v_{23} - v_{24} - v_{25} - v_{73} \tag{222}$$

8.17 Species E34P

Name E34_p

Initial amount 0 nmol

This species takes part in ten reactions (as a reactant in Net_E34PGrb2_binding, Net_E34PShc_binding, Net_E34PPI3K_binding, Net_E34PRasGAP_binding, Net_E34PTP1B_Binding and as a product in Net_E34_Phosphorylation and as a modifier in Net_Shc_Phosphorylation, Net_Gab1_Phosphorylation, Net_PIP3_Production, Net_RasGAP_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E34P} = v_{13} - v_{26} - v_{27} - v_{28} - v_{29} - v_{74} \tag{223}$$

8.18 Species E24P

Name E24_p

Initial amount 0 nmol

This species takes part in ten reactions (as a reactant in Net_E24PGrb2_binding, Net_E24PShc_binding, Net_E24PPI3K_binding, Net_E24PRasGAP_binding, Net_E24PTP1B_Binding and as a product in Net_E24_Phosphorylation and as a modifier in Net_Shc_Phosphorylation, Net_Gab1_Phosphorylation, Net_PIP3_Production, Net_RasGAP_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E24P} = v_{14} - v_{30} - v_{31} - v_{32} - v_{33} - v_{75} \tag{224}$$

8.19 Species E44P

Name E44_p

Initial amount 0 nmol

This species takes part in ten reactions (as a reactant in Net_E44PRasGAP_binding_1, Net_E44PShc_binding, Net_E44PPI3K_binding, Net_E44PRasGAP_binding_2, Net_E44PTP1B_Binding and as a product in Net_E44_Phosphorylation and as a modifier in Net_Shc_Phosphorylation, Net_Gab1_Phosphorylation, Net_PIP3_Production, Net_RasGAP_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E44P} = v_{15} - v_{34} - v_{35} - v_{36} - v_{37} - v_{76} \tag{225}$$

8.20 Species G

Name Grb2

Initial amount 82.4 nmol

This species takes part in eleven reactions (as a reactant in Net_E11PGrb2_binding, Net_E12PGrb2_binding, Net_E23PGrb2_binding, Net_E34PGrb2_binding, Net_E24PGrb2_binding, Net_E44PRasGAP_binding_1, Net_ShcGrb2_binding, Grb2_binding_to_P3_A, Net_E13Grb2_Binding, Net_E14Grb2_Binding and as a product in E11G_Degradation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{G} = v_{88} - v_{16} - v_{19} - v_{22} - v_{26} - v_{30} - v_{34} - v_{42} - v_{55} - v_{63} - v_{67} \quad (226)$$

8.21 Species S

Name Shc

Initial amount 11.5 nmol

This species takes part in ten reactions (as a reactant in Net_E11PShc_binding, Net_E12PShc_binding, Net_E23PShc_binding, Net_E34PShc_binding, Net_E24PShc_binding, Net_E44PShc_binding, Net_Gab1Shc_binding, Net_E13Shc_Binding, Net_E14Shc_Binding and as a product in E11S_Degradation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{S} = v_{89} - v_{17} - v_{20} - v_{23} - v_{27} - v_{31} - v_{35} - v_{43} - v_{64} - v_{68} \quad (227)$$

8.22 Species I

Name PI-3K

Initial amount 46.4 nmol

This species takes part in seven reactions (as a reactant in Net_E23PPI3K_binding, Net_E34PPI3K_binding, Net_E24PPI3K_binding, Net_E44PPI3K_binding, Net_Gab1PI3K_binding, Net_E13PI3K_Binding, Net_E14PI3K_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{I} = -v_{24} - v_{28} - v_{32} - v_{36} - v_{44} - v_{65} - v_{69} \quad (228)$$

8.23 Species R

Name RasGAP

Initial amount 93.6 nmol

This species takes part in ten reactions (as a reactant in Net_E11PRasGAP_binding, Net_E12PRasGAP_binding, Net_E23PRasGAP_binding, Net_E34PRasGAP_binding, Net_E24PRasGAP_binding, Net_E44PRasGAP_binding_2, Net_Gab1RasGAP_binding, Net_E13RasGAP_Binding, Net_E14RasGAP_Binding and as a product in E11R_Degradation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{R} = v_{90} - v_{18} - v_{21} - v_{25} - v_{29} - v_{33} - v_{37} - v_{45} - v_{66} - v_{70} \quad (229)$$

8.24 Species O

Name SOS

Initial amount 82.3 nmol

This species takes part in four reactions (as a reactant in Net_Grb2SOS_binding, Net_SOS_ST-_Phosphorylation, SOS_binding_to_SigAG, SOS_binding_to_SigGA).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{O} = -v_{40} - v_{53} - v_{56} - v_{58} \tag{230}$$

8.25 Species A

Name Gab1

Initial amount 43.1 nmol

This species takes part in four reactions (as a reactant in Net_Grb2Gab1_binding, Net_Gab1PIP3-_binding, Net_Gab1_ST_Phosphorylation, Gab1_binding_to_SigGO).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{A} = -v_{41} - v_{46} - v_{54} - v_{57} \tag{231}$$

8.26 Species E11G

Name E11-Grb2

Initial amount 0 nmol

This species takes part in two reactions (as a reactant in E11G_Degradation and as a product in Net_E11PGrb2_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E11G} = v_{16} - v_{88} \tag{232}$$

8.27 Species E11S

Name E11-Shc

Initial amount 0 nmol

This species takes part in two reactions (as a reactant in E11S_Degradation and as a product in Net_E11PShc_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E11S} = v_{17} - v_{89} \tag{233}$$

8.28 Species E11R

Name E11-RasGAP

Initial amount 0 nmol

This species takes part in two reactions (as a reactant in E11R_Degradation and as a product in Net_E11PRasGAP_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E11R} = v_{18} - v_{90} \tag{234}$$

8.29 Species E12G

Name E12-Grb2

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E12PGrb2_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E12G} = v_{19} \tag{235}$$

8.30 Species E12S

Name E12-Shc

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E12PShc_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E12S} = v_{20} \tag{236}$$

8.31 Species E12R

Name E12-RasGAP

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E12PRasGAP_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E12R} = v_{21} \tag{237}$$

8.32 Species E23G

Name E23-Grb2

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E23PGrb2_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E23G} = v_{22} \tag{238}$$

8.33 Species E23S

Name E23-Shc

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E23PShc_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E23S} = v_{23} \tag{239}$$

8.34 Species E23I

Name E23-PI-3K

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E23PPI3K_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E23I} = v_{24} \tag{240}$$

8.35 Species E23R

Name E23-RasGAP

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E23PRasGAP_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E23R} = v_{25} \tag{241}$$

8.36 Species E34G

Name E34-Grb2

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E34PGrb2_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E34G} = v_{26} \tag{242}$$

8.37 Species E34S

Name E34-Shc

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E34PShc_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E34S} = v_{27} \tag{243}$$

8.38 Species E34I

Name E34-PI-3K

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E34PPI3K_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E34I} = v_{28} \tag{244}$$

8.39 Species E34R

Name E34-RasGAP

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E34PRasGAP_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E34R} = v_{29} \tag{245}$$

8.40 Species E24G

Name E24-Grb2

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E24PGrb2_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E24G} = v_{30} \tag{246}$$

8.41 Species E24S

Name E24-Shc

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E24PShc_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E24S} = v_{31} \tag{247}$$

8.42 Species E24I

Name E24-PI-3K

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E24PPI3K_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E24I} = v_{32} \tag{248}$$

8.43 Species E24R

Name E24-RasGAP

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E24PRasGAP_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E24R} = v_{33} \tag{249}$$

8.44 Species E44G

Name E44-Grb2

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E44PRasGAP_binding_1).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E44G} = v_{34} \tag{250}$$

8.45 Species E44S

Name E44-Shc

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E44PShc_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E44S} = v_{35} \tag{251}$$

8.46 Species E44I

Name E44-PI-3K

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E44PPI3K_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E44I} = v_{36} \tag{252}$$

8.47 Species E44R

Name E44-RasGAP

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E44PRasGAP_binding_2).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E44R} = v_{37} \tag{253}$$

8.48 Species SigG

Name Sum Grb2

Initial amount 0 nmol

This species takes part in twelve reactions (as a reactant in Net_Grb2SOS_binding, Net_Grb2Gab1_binding, E11G_Degradation and as a product in Net_E11PGrb2_binding, Net_E12PGrb2_binding, Net_E23PGrb2_binding, Net_E34PGrb2_binding, Net_E24PGrb2_binding, Net_E44PRasGAP_binding_1, Net_ShcGrb2_binding, Net_E13Grb2_Binding, Net_E14Grb2_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigG} = v_{16} + v_{19} + v_{22} + v_{26} + v_{30} + v_{34} + v_{42} + v_{63} + v_{67} - v_{40} - v_{41} - v_{88} \tag{254}$$

8.49 Species SigS

Name Sum Shc

Initial amount 0 nmol

This species takes part in eleven reactions (as a reactant in Net_Shc_Phosphorylation, E11S_Degradation and as a product in Net_E11PShc_binding, Net_E12PShc_binding, Net_E23PShc_binding, Net_E34PShc_binding, Net_E24PShc_binding, Net_E44PShc_binding, Net_Gab1Shc_binding, Net_E13Shc_Binding, Net_E14Shc_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigS} = v_{17} + v_{20} + v_{23} + v_{27} + v_{31} + v_{35} + v_{43} + v_{64} + v_{68} - v_{38} - v_{89} \tag{255}$$

8.50 Species SigI

Name Sum PI-3K

Initial amount 0 nmol

This species takes part in eight reactions (as a product in Net_E23PPI3K_binding, Net_E34PPI3K_binding, Net_E24PPI3K_binding, Net_E44PPI3K_binding, Net_Gab1PI3K_binding, Net_E13PI3K_Binding, Net_E14PI3K_Binding and as a modifier in Net_PIP3_Production).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigI} = v_{24} + v_{28} + v_{32} + v_{36} + v_{44} + v_{65} + v_{69} \tag{256}$$

8.51 Species SigR

Name Sum RasGAP

Initial amount 0 nmol

This species takes part in twelve reactions (as a reactant in Net_RasGAP_Phosphorylation, E11R_Degradation and as a product in Net_E11PRasGAP_binding, Net_E12PRasGAP_binding, Net_E23PRasGAP_binding, Net_E34PRasGAP_binding, Net_E24PRasGAP_binding, Net_E44PRasGAP_binding_2, Net_Gab1RasGAP_binding, Net_E13RasGAP_Binding, Net_E14RasGAP_Binding and as a modifier in Net_RasGTP_Production).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigR} = v_{18} + v_{21} + v_{25} + v_{29} + v_{33} + v_{37} + v_{45} + v_{66} + v_{70} - v_{50} - v_{90} \quad (257)$$

8.52 Species SigA

Name Sum Gab1

Initial amount 0 nmol

This species takes part in four reactions (as a reactant in Net_Gab1_Phosphorylation and as a product in Net_Grb2Gab1_binding, Net_Gab1PIP3_binding, Gab1_binding_to_SigGO).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigA} = v_{41} + v_{46} + v_{57} - v_{39} \quad (258)$$

8.53 Species SigSP

Name Sum Shc_p

Initial amount 0 nmol

This species takes part in eleven reactions (as a reactant in Net_ShcGrb2_binding and as a product in Net_Shc_Phosphorylation and as a modifier in Net_E11PShc_binding, Net_E12PShc_binding, Net_E23PShc_binding, Net_E34PShc_binding, Net_E24PShc_binding, Net_E44PShc_binding, Net_Gab1Shc_binding, Net_E13Shc_Binding, Net_E14Shc_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigSP} = v_{38} - v_{42} \quad (259)$$

8.54 Species SigAP

Name Sum Gab1_p

Initial amount 0 nmol

This species takes part in eight reactions (as a reactant in Net_Gab1Shc_binding, Net_Gab1PI3K-_binding, Net_Gab1RasGAP_binding, PTP1B_binding_to_SigAP and as a product in Net-_Gab1_Phosphorylation and as a modifier in Net_Grb2Gab1_binding, Net_Gab1PIP3_binding, Gab1_binding_to_SigGO).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigAP} = v_{39} - v_{43} - v_{44} - v_{45} - v_{86} \tag{260}$$

8.55 Species SigG_O

Name Sum Grb2-SOS

Initial amount 0 nmol

This species takes part in eleven reactions (as a reactant in Gab1_binding_to_SigGO and as a product in Net_Grb2SOS_binding and as a modifier in Net_E11PGrb2_binding, Net_E12PGrb2-_binding, Net_E23PGrb2_binding, Net_E34PGrb2_binding, Net_E24PGrb2_binding, Net-_E44PRasGAP_binding_1, Net_ShcGrb2_binding, Net_E13Grb2_Binding, Net_E14Grb2-_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigG\_O} = v_{40} - v_{57} \tag{261}$$

8.56 Species SigG_A

Name Sum Grb2-Gab1

Initial amount 0 nmol

This species takes part in eleven reactions (as a reactant in SOS_binding_to_SigGA and as a product in Net_Grb2Gab1_binding and as a modifier in Net_E11PGrb2_binding, Net-_E12PGrb2_binding, Net_E23PGrb2_binding, Net_E34PGrb2_binding, Net_E24PGrb2_binding, Net_E44PRasGAP_binding_1, Net_ShcGrb2_binding, Net_E13Grb2_Binding, Net_E14Grb2-_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigG\_A} = v_{41} - v_{58} \tag{262}$$

8.57 Species SigSP_G

Name Sum Shc_p-Grb2

Initial amount 0 nmol

This species takes part in ten reactions (as a product in Net_ShcGrb2_binding and as a modifier in Net_E11PShc_binding, Net_E12PShc_binding, Net_E23PShc_binding, Net_E34PShc-_binding, Net_E24PShc_binding, Net_E44PShc_binding, Net_Gab1Shc_binding, Net_E13Shc-_Binding, Net_E14Shc_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigSP\_G} = v_{42} \tag{263}$$

8.58 Species SigAP_S

Name Sum Gab1_p-Shc

Initial amount 0 nmol

This species takes part in four reactions (as a product in Net_Gab1Shc_binding and as a modifier in Net_Grb2Gab1_binding, Net_Gab1PIP3_binding, Gab1_binding_to_SigGO).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigAP\_S} = v_{43} \tag{264}$$

8.59 Species SigAP_I

Name Sum Gab1_p-PI-3K

Initial amount 0 nmol

This species takes part in four reactions (as a product in Net_Gab1PI3K_binding and as a modifier in Net_Grb2Gab1_binding, Net_Gab1PIP3_binding, Gab1_binding_to_SigGO).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigAP\_I} = v_{44} \tag{265}$$

8.60 Species SigAP_R

Name Sum Gab1_p-RasGAP

Initial amount 0 nmol

This species takes part in four reactions (as a product in Net_Gab1RasGAP_binding and as a modifier in Net_Grb2Gab1_binding, Net_Gab1PIP3_binding, Gab1_binding_to_SigGO).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigAP\_R} = v_{45} \tag{266}$$

8.61 Species Empty

Name Empty

Initial amount 0 nmol

This species takes part in four reactions (as a reactant in mwbbde76d1_155c_4264_8447_4457527547cb and as a product in E11P_Degradation, EGF_in_EC_compartment, HRG_in_EC_compartment).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{Empty} = v_{87} + v_{93} + v_{94} - v_{92} \tag{267}$$

8.62 Species P3_A

Name PIP3-Gab1

Initial amount 0 nmol

This species takes part in two reactions (as a reactant in Grb2_binding_to_P3_A and as a product in Net_Gab1PIP3_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{P3\_A} = v_{46} - v_{55} \tag{268}$$

8.63 Species P2

Name PIP2

Initial amount 197 nmol

This species takes part in one reaction (as a reactant in Net_PIP3_Production).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{P2} = -v_{48} \tag{269}$$

8.64 Species P3

Name PIP3

Initial amount 0 nmol

This species takes part in three reactions (as a reactant in Net_Gab1PIP3_binding and as a product in Net_PIP3_Production and as a modifier in Net_Akt_Activation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{P3} = v_{48} - v_{46} \tag{270}$$

8.65 Species Akt

Name Akt

Initial amount 444 nmol

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

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{Akt} = -v_{47} \tag{271}$$

8.66 Species RsD

Name RasGDP

Initial amount 95.7 nmol

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

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{RsD} = -v_{49} \tag{272}$$

8.67 Species RsT

Name RasGTP

Initial amount 0 nmol

This species takes part in two reactions (as a product in Net_RasGTP_Production and as a modifier in Net_Raf_Activation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{RsT} = v_{49} \tag{273}$$

8.68 Species SigRP

Name Sum RasGAP_p

Initial amount 0 nmol

This species takes part in eleven reactions (as a product in Net_RasGAP_Phosphorylation and as a modifier in Net_E11PRasGAP_binding, Net_E12PRasGAP_binding, Net_E23PRasGAP_binding, Net_E34PRasGAP_binding, Net_E24PRasGAP_binding, Net_E44PRasGAP_binding_2, Net_Gab1RasGAP_binding, Net_RasGTP_Production, Net_E13RasGAP_Binding, Net_E14RasGAP_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigRP} = v_{50} \tag{274}$$

8.69 Species Raf

Name Raf

Initial amount 743 nmol

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

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{Raf} = -v_{51} \tag{275}$$

8.70 Species Rafstar

Name Raf*

Initial amount 0 nmol

This species takes part in two reactions (as a product in Net_Raf_Activation and as a modifier in Net_MEK_Activation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{Rafstar} = v_{51} \tag{276}$$

8.71 Species MEK

Name MEK

Initial amount 772 nmol

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

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{MEK} = -v_{52} \tag{277}$$

8.72 Species MEKstar

Name MEK*

Initial amount 0 nmol

This species takes part in five reactions (as a reactant in ERK_binding_to_MEKstar_1, ERK_binding_to_MEKstar_2 and as a product in Net_MEK_Activation, pERK_production, ERKstar_production).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{MEKstar} = v_{52} + v_{96} + v_{98} - v_{95} - v_{97} \tag{278}$$

8.73 Species ERK

Name ERK

Initial amount 750 nmol

This species takes part in two reactions (as a reactant in ERK_binding_to_MEKstar_1 and as a product in pERK_dephosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{ERK} = v_{102} - v_{95} \tag{279}$$

8.74 Species ERKstar

Name ERK*

Initial amount 0 nmol

This species takes part in nine reactions (as a reactant in ERKstar_binding_to_Phosphatase and as a product in ERKstar_production and as a modifier in Net_SOS_ST_Phosphorylation, Net_Gab1_ST_Phosphorylation, Net_E1_ST_Phosphorylation, Net_E2_ST_Phosphorylation, Net_E4_ST_Phosphorylation, Net_E_E1_ST_Phosphorylation, Net_H_E4_ST_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{ERKstar} = v_{98} - v_{99} \tag{280}$$

8.75 Species OP

Name SOS_p

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_SOS_ST_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{OP} = v_{53} \tag{281}$$

8.76 Species AP

Name Gab1_p

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_Gab1_ST_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{AP} = v_{54} \tag{282}$$

8.77 Species A_SigG_O

Name Gab1_SumGrb2-SOS

Initial amount 0 nmol

This species takes part in eleven reactions (as a product in Gab1_binding_to_SigGO, SOS-_binding_to_SigGA and as a modifier in Net_E11PGrb2_binding, Net_E12PGrb2_binding, Net_E23PGrb2_binding, Net_E34PGrb2_binding, Net_E24PGrb2_binding, Net_E44PRasGAP-_binding_1, Net_ShcGrb2_binding, Net_E13Grb2_Binding, Net_E14Grb2_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{A\_SigG\_O} = v_{57} + v_{58} \tag{283}$$

8.78 Species SigA_G

Name Sum PIP3-Gab1-Grb2

Initial amount 0 nmol

This species takes part in two reactions (as a reactant in SOS_binding_to_SigAG and as a product in Grb2_binding_to_P3_A).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigA\_G} = v_{55} - v_{56} \tag{284}$$

8.79 Species SigA_G_O

Name Sum PIP3-Gab1-Grb2_SOS

Initial amount 0 nmol

This species takes part in one reaction (as a product in SOS_binding_to_SigAG).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigA\_G\_O} = v_{56} \tag{285}$$

8.80 Species SigO

Name Sum SOS

Initial amount 0 nmol

This species takes part in four reactions (as a product in Net_Grb2SOS_binding, SOS_binding_to_SigAG, SOS_binding_to_SigGA and as a modifier in Net_RasGTP_Production).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigO} = v_{40} + v_{56} + v_{58} \tag{286}$$

8.81 Species E13

Name ErbB1-ErbB3

Initial amount 0 nmol

This species takes part in two reactions (as a reactant in Net_E13_Phosphorylation and as a product in ErbB1ErbB3_Heterodimerization).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E13} = v_{59} - v_{61} \tag{287}$$

8.82 Species E14

Name ErbB1-ErbB4

Initial amount 0 nmol

This species takes part in two reactions (as a reactant in Net_E14_Phosphorylation and as a product in ErbB1ErbB4_Heterodimerization).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E14} = v_{60} - v_{62} \tag{288}$$

8.83 Species E13P

Name ErbB1-ErbB3_p

Initial amount 0 nmol

This species takes part in ten reactions (as a reactant in Net_E13Grb2_Binding, Net_E13Shc-_Binding, Net_E13PI3K_Binding, Net_E13RasGAP_Binding, Net_E13PTP1B_Binding and as a product in Net_E13_Phosphorylation and as a modifier in Net_Shc_Phosphorylation, Net_Gab1_Phosphorylation, Net_PIP3_Production, Net_RasGAP_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E13P} = v_{61} - v_{63} - v_{64} - v_{65} - v_{66} - v_{77} \tag{289}$$

8.84 Species E14P

Name ErbB1-ErbB3_p

Initial amount 0 nmol

This species takes part in ten reactions (as a reactant in Net_E14Grb2_Binding, Net_E14Shc-_Binding, Net_E14PI3K_Binding, Net_E14RasGAP_Binding, Net_E14PTP1B_Binding and as a product in Net_E14_Phosphorylation and as a modifier in Net_Shc_Phosphorylation, Net_Gab1_Phosphorylation, Net_PIP3_Production, Net_RasGAP_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E14P} = v_{62} - v_{67} - v_{68} - v_{69} - v_{70} - v_{78} \tag{290}$$

8.85 Species E13G

Name E13-Grb2

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E13Grb2_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E13G} = v_{63} \tag{291}$$

8.86 Species E13S

Name E13-Shc

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E13Shc_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E13S} = v_{64} \tag{292}$$

8.87 Species E13I

Name E13-PI-3K

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E13PI3K_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E13I} = v_{65} \tag{293}$$

8.88 Species E13R

Name E13-RasGAP

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E13RasGAP_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E13R} = v_{66} \tag{294}$$

8.89 Species E14G

Name E14-Grb2

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E14Grb2_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E14G} = v_{67} \tag{295}$$

8.90 Species E14S

Name E14-Shc

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E14Shc_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E14S} = v_{68} \tag{296}$$

8.91 Species E14I

Name E14-PI-3K

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E14PI3K_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E14I} = v_{69} \tag{297}$$

8.92 Species E14R

Name E14-RasGAP

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E14RasGAP_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E14R} = v_{70} \tag{298}$$

8.93 Species T

Name PTP-1B

Initial amount 500 nmol

This species takes part in ten reactions (as a reactant in Net_E11PTP1B_Binding, Net_E12PTP1B_Binding, Net_E23PTP1B_Binding, Net_E34PTP1B_Binding, Net_E24PTP1B_Binding, Net_E44PTP1B_Binding, Net_E13PTP1B_Binding, Net_E14PTP1B_Binding, PTP1B_binding_to_SigAP and as a product in E11T_Degradation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{T} = v_{91} - v_{71} - v_{72} - v_{73} - v_{74} - v_{75} - v_{76} - v_{77} - v_{78} - v_{86} \tag{299}$$

8.94 Species E11T

Name E11-PTP-1B

Initial amount 0 nmol

This species takes part in two reactions (as a reactant in E11T_Degradation and as a product in Net_E11PTP1B_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E11T} = v_{71} - v_{91} \tag{300}$$

8.95 Species E12T

Name E12-PTP-1B

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E12PTP1B_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E12T} = v_{72} \tag{301}$$

8.96 Species E23T

Name E23-PTP-1B

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E23PTP1B_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E23T} = v_{73} \tag{302}$$

8.97 Species E34T

Name E34-PTP-1B

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E34PTP1B_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E34T} = v_{74} \tag{303}$$

8.98 Species E24T

Name E24-PTP-1B

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E24PTP1B_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E24T} = v_{75} \tag{304}$$

8.99 Species E44T

Name E44-PTP-1B

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E44PTP1B_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E44T} = v_{76} \tag{305}$$

8.100 Species E13T

Name E13-PTP-1B

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E13PTP1B_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E13T} = v_{77} \tag{306}$$

8.101 Species E14T

Name E14-PTP-1B

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E14PTP1B_Binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E14T} = v_{78} \tag{307}$$

8.102 Species SigT

Name Sig-PTP-1B

Initial amount 0 nmol

This species takes part in 21 reactions (as a reactant in E11T_Degradation and as a product in Net_E11PTP1B_Binding, Net_E12PTP1B_Binding, Net_E23PTP1B_Binding, Net_E34PTP1B_Binding, Net_E24PTP1B_Binding, Net_E44PTP1B_Binding, Net_E13PTP1B_Binding, Net_E14PTP1B_Binding, PTP1B_binding_to_SigAP and as a modifier in Net_E11_Phosphorylation, Net_E12_Phosphorylation, Net_E23_Phosphorylation, Net_E34_Phosphorylation, Net_E24_Phosphorylation, Net_E44_Phosphorylation, Net_Shc_Phosphorylation, Net_Gab1_Phosphorylation, Net_RasGAP_Phosphorylation, Net_E13_Phosphorylation, Net_E14_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigT} = v_{71} + v_{72} + v_{73} + v_{74} + v_{75} + v_{76} + v_{77} + v_{78} + v_{86} - v_{91} \tag{308}$$

8.103 Species E1_PT

Name E1_p-PTP-1B

Initial amount 0 nmol

This species takes part in three reactions (as a reactant in EGF_binding_to_E1PT and as a product in Net_E1_ST_Phosphorylation and as a modifier in EGF_in_EC_compartment).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E1\_PT} = v_{79} - v_{84} \tag{309}$$

8.104 Species E2_PT

Name E2_p-PTP-1B

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_E2_ST_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E2\_PT} = v_{80} \tag{310}$$

8.105 Species E4_PT

Name E4_p-PTP-1B

Initial amount 0 nmol

This species takes part in three reactions (as a reactant in HRG_binding_to_E4PT and as a product in Net_E4_ST_Phosphorylation and as a modifier in HRG_in_EC_compartment).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E4\_PT} = v_{81} - v_{85} \tag{311}$$

8.106 Species E_E1_PT

Name E_E1_p-PTP-1B

Initial amount 0 nmol

This species takes part in three reactions (as a product in Net_E_E1_ST_Phosphorylation, EGF_binding_to_E1PT and as a modifier in EGF_in_EC_compartment).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E\_E1\_PT} = v_{82} + v_{84} \tag{312}$$

8.107 Species H_E4_PT

Name H_E4_p-PTP-1B

Initial amount 0 nmol

This species takes part in three reactions (as a product in Net_H_E4_ST_Phosphorylation, HRG_binding_to_E4PT and as a modifier in HRG_in_EC_compartment).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{H\_E4\_PT} = v_{83} + v_{85} \tag{313}$$

8.108 Species Aktstar

Name Aktstar

Initial amount 0 nmol

This species takes part in one reaction (as a product in Net_Akt_Activation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{Aktstar} = v_{47} \tag{314}$$

8.109 Species SigAP_T

Name SumGab1_p-PTP-1B

Initial amount 0 nmol

This species takes part in four reactions (as a product in PTP1B_binding_to_SigAP and as a modifier in Net_Grb2Gab1_binding, Net_Gab1PIP3_binding, Gab1_binding_to_SigGO).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SigAP\_T} = v_{86} \tag{315}$$

8.110 Species E

Name EGF

Initial amount 10 nmol

This species takes part in three reactions (as a reactant in EGF_in_EC_compartment and as a modifier in EGF_Binding_to_ErbB1, EGF_binding_to_E1PT).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E} = -v_{93} \tag{316}$$

8.111 Species H

Name HRG

Initial amount 10 nmol

This species takes part in four reactions (as a reactant in HRG_in_EC_compartment and as a modifier in HRG_Binding_to_ErbB3, HRG_Binding_to_ErbB4, HRG_binding_to_E4PT).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{H} = -v_{94} \tag{317}$$

8.112 Species fint

Name fint

Initial amount 0 nmol

This species takes part in two reactions (as a product in mwbbde76d1_155c_4264_8447_4457527547cb and as a modifier in Net_PIP3_Production).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{fint} = v_{92} \tag{318}$$

8.113 Species pERK

Name p_ERK

Initial amount 0 nmol

This species takes part in four reactions (as a reactant in ERK_binding_to_MEKstar_2, pERK_binding_to_Phosphatase and as a product in pERK_production, ERKstar_dephosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{pERK} = v_{96} + v_{100} - v_{97} - v_{101} \tag{319}$$

8.114 Species ERK_MEKstar

Name ERK-MEK*

Initial amount 0 nmol

This species takes part in two reactions (as a reactant in pERK_production and as a product in ERK_binding_to_MEKstar_1).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{ERK\_MEKstar} = v_{95} - v_{96} \tag{320}$$

8.115 Species pERK_MEKstar

Name p_ERK-MEK*

Initial amount 0 nmol

This species takes part in two reactions (as a reactant in ERKstar_production and as a product in ERK_binding_to_MEKstar_2).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{pERK\_MEKstar} = v_{97} - v_{98} \tag{321}$$

8.116 Species pERK_ERKpase

Name p_ERK-ERKpase

Initial amount 0 nmol

This species takes part in two reactions (as a reactant in pERK_dephosphorylation and as a product in pERK_binding_to_Phosphatase).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{pERK\_ERKpase} = v_{101} - v_{102} \tag{322}$$

8.117 Species ERKpase

Name ERKpase

Initial amount 0 nmol

This species takes part in four reactions (as a reactant in ERKstar_binding_to_Phosphatase, pERK_binding_to_Phosphatase and as a product in ERKstar_dephosphorylation, pERK-_dephosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{ERKpase} = v_{100} + v_{102} - v_{99} - v_{101} \tag{323}$$

8.118 Species ERKstar_ERKpase

Name ERK*-ERKpase

Initial amount 35 nmol

This species takes part in two reactions (as a reactant in ERKstar_dephosphorylation and as a product in ERKstar_binding_to_Phosphatase).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{ERKstar\_ERKpase} = v_{99} - v_{100} \tag{324}$$

8.119 Species norm_Akt_star

Name normalized Akt*

Involved in rule norm_Akt_star

One rule determines the species' quantity.

8.120 Species norm_Erk_star

Name normalized Erk*

Involved in rule norm_Erk_star

One rule determines the species' quantity.

SBML2LaTeX was developed by Andreas Dräger[a], Hannes Planatscher[a], Dieudonné M Wouamba[a], Adrian Schröder[a], Michael Hucka[b], Lukas Endler[c], Martin Golebiewski[d] and Andreas Zell[a]. Please see http://www.ra.cs.uni-tuebingen.de/software/SBML2LaTeX for more information.

[a]Center for Bioinformatics Tübingen (ZBIT), Germany
[b]California Institute of Technology, Beckman Institute BNMC, Pasadena, United States
[c]European Bioinformatics Institute, Wellcome Trust Genome Campus, Hinxton, United Kingdom
[d]EML Research gGmbH, Heidelberg, Germany