SBML Model Report

Model identifier: “AMPA16_v3”

February 25, 2016

1 General Overview

This is a document in SBML Level 2 Version 4 format. Table 1 gives an overview of the quantities of all components of this model.

Table 1: The SBML components in this model.
All components are described in more detail in the following sections.

Element	Quantity	Element	Quantity
compartment types	0	compartments	1
species types	0	species	19
events	0	constraints	0
reactions	21	function definitions	0
global parameters	25	unit definitions	11
rules	5	initial assignments	0

Model Notes

2 Unit Definitions

This is an overview of eleven unit definitions.

2.1 Unit `per_mM_per_msec`

Name per_mM_per_msec

Definition $\mathrm{mmol}^{-1} \cdot 1 \cdot \mathrm{ms}^{-1}$

2.2 Unit per_msec

Name per_msec

Definition ms^{-1}

2.3 Unit pS

Name pS

Definition pS

2.4 Unit mV

Name mV

Definition mV

2.5 Unit pA

Name pA

Definition pA

2.6 Unit percent

Name percent

2.7 Unit substance

Name substance

Definition mol

2.8 Unit volume

Name volume

Definition l

2.9 Unit area

Name area

Definition m^2

2.10 Unit `length`

Name length

Definition m

2.11 Unit `time`

Name 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
`default`			3	1	litre	☑	

3.1 Compartment `default`

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

4 Species

This model contains 19 species. The boundary condition of three 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
R0	R0	default	mol	☐	☐
R1	R1	default	mol	☐	☐
R2	R2	default	mol	☐	☐
R3	R3	default	mol	☐	☐
R4	R4	default	mol	☐	☐
Glu	Glu	default	mol	☐	☑
D0	D0	default	mol	☐	☐
D1	D1	default	mol	☐	☐
D2	D2	default	mol	☐	☐
D3	D3	default	mol	☐	☐
D4	D4	default	mol	☐	☐
E2	E2	default	mol	☐	☐
E3	E3	default	mol	☐	☐
E4	E4	default	mol	☐	☐
O2	O2	default	mol	☐	☐
O3	O3	default	mol	☐	☐
O4	O4	default	mol	☐	☐
Vm	Vm	default	mol	☐	☑
LTP_ampaNbModFactor	LTP_ampaNbModFactor	default	mol	☐	☑

5 Parameters

This model contains 25 global parameters.

Table 4: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kass_re1			10.000	$\mathrm{mmol}^{-1} \cdot 1 \cdot \mathrm{ms}^{-1}$	☑
kdiss_re1			7.000	ms^{-1}	☑
kass_re5			10.000	$\mathrm{mmol}^{-1} \cdot 1 \cdot \mathrm{ms}^{-1}$	☑
kdiss_re5			$4.1 \cdot 10^{-4}$	ms^{-1}	☑
kass_re11			$3.3 \cdot 10^{-6}$	ms^{-1}	☑
kdiss_re11			0.001	ms^{-1}	☑
kass_re12			0.420	ms^{-1}	☑
kdiss_re12			0.017	ms^{-1}	☑
kass_re16			0.550	ms^{-1}	☑
kdiss_re16			0.300	ms^{-1}	☑
kass_re19			0.200	ms^{-1}	☑
kdiss_re19			0.035	ms^{-1}	☑
conduc_O2	conductance for state O2		9.000	pS	☑
conduc_O3	conductance for state O3		15.000	pS	☑
conduc_O4	conductance for state 04		21.000	pS	☑
Erev_AMPA	AMPA reversal potential		0.000	mV	☑
current_AMPA	AMPA current		0.000	pA	⊟
sumOpen	sumOpen = O2+O3+O4		0.000	dimensionless	⊟
PNa	Permeability for Sodium (Na)		50.000		☑
PK	Permeability for Potassium (K)		49.500		☑
PCa	Permeability for Calcium (Ca)		0.500		☑
ICa_AMPA	AMPA mediated current by Ca		0.000	pA	⊟
INa_AMPA	AMPA mediated current by Na		0.000	pA	⊟
IK_AMPA	AMPA mediated current by K		0.000	pA	⊟
nbAMPAR	nbAMPAR		1.000	dimensionless	☑

Id	Name	SBO	Value	Unit	Constant

6 Rules

This is an overview of five rules.

6.1 Rule 1

Rule is an assignment rule for parameter current_AMPA:

$$\begin{aligned} \mathtt{current\_AMPA} = (&\mathtt{conduc\_O2} \cdot [\mathtt{O2}] + \mathtt{conduc\_O3} \cdot [\mathtt{O3}] + \mathtt{conduc\_O4} \cdot [\mathtt{O4}]) \\ &\cdot (\mathtt{Vm} - \mathtt{Erev\_AMPA}) \cdot 0.001 \cdot \mathtt{nbAMPAR} \cdot \mathtt{LTP\_ampaNbModFactor} \end{aligned} \tag{1}$$

6.2 Rule 2

Rule is an assignment rule for parameter sumOpen:

$$\mathtt{sumOpen} = [\mathtt{O2}] + [\mathtt{O3}] + [\mathtt{O4}] \tag{2}$$

6.3 Rule 3

Rule is an assignment rule for parameter INa_AMPA:

$$\mathtt{INa\_AMPA} = \frac{\mathtt{PNa}}{100} \cdot \mathtt{current\_AMPA} \tag{3}$$

6.4 Rule 4

Rule is an assignment rule for parameter IK_AMPA:

$$\mathtt{IK\_AMPA} = \frac{\mathtt{PK}}{100} \cdot \mathtt{current\_AMPA} \tag{4}$$

6.5 Rule 5

Rule is an assignment rule for parameter ICa_AMPA:

$$\mathtt{ICa\_AMPA} = \frac{\mathtt{PCa}}{100} \cdot \mathtt{current\_AMPA} \tag{5}$$

7 Reactions

This model contains 21 reactions. All reactions are listed in the following table and are subsequently described in detail. If a reaction is affected by one or more modifiers, the identifiers of the modifier species are written above the reaction arrow.

Table 5: Overview of all reactions

№	Id	Name	Reaction Equation	SBO
1	re1		$\mathtt{R0} + \mathtt{Glu} \rightleftharpoons \mathtt{R1}$	
2	re2		$\mathtt{R1} + \mathtt{Glu} \rightleftharpoons \mathtt{R2}$	
3	re3		$\mathtt{R2} + \mathtt{Glu} \rightleftharpoons \mathtt{R3}$	
4	re4		$\mathtt{R3} + \mathtt{Glu} \rightleftharpoons \mathtt{R4}$	
5	re5		$\mathtt{D0} + \mathtt{Glu} \rightleftharpoons \mathtt{D1}$	
6	re6		$\mathtt{D1} + \mathtt{Glu} \rightleftharpoons \mathtt{D2}$	
7	re7		$\mathtt{D2} + \mathtt{Glu} \rightleftharpoons \mathtt{D3}$	
8	re8		$\mathtt{D3} + \mathtt{Glu} \rightleftharpoons \mathtt{D4}$	
9	re9		$\mathtt{E2} + \mathtt{Glu} \rightleftharpoons \mathtt{E3}$	
10	re10		$\mathtt{E3} + \mathtt{Glu} \rightleftharpoons \mathtt{E4}$	
11	re11		$\mathtt{R0} \rightleftharpoons \mathtt{D0}$	
12	re12		$\mathtt{R1} \rightleftharpoons \mathtt{D1}$	
13	re13		$\mathtt{R2} \rightleftharpoons \mathtt{D2}$	
14	re14		$\mathtt{R3} \rightleftharpoons \mathtt{D3}$	
15	re15		$\mathtt{R4} \rightleftharpoons \mathtt{D4}$	
16	re16		$\mathtt{R2} \rightleftharpoons \mathtt{O2}$	
17	re17		$\mathtt{R3} \rightleftharpoons \mathtt{O3}$	
18	re18		$\mathtt{R4} \rightleftharpoons \mathtt{O4}$	
19	re19		$\mathtt{D2} \rightleftharpoons \mathtt{E2}$	
20	re20		$\mathtt{D3} \rightleftharpoons \mathtt{E3}$	
21	re21		$\mathtt{D4} \rightleftharpoons \mathtt{E4}$	

7.1 Reaction re1

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

Notes

Reaction equation

$$\mathtt{R0} + \mathtt{Glu} \rightleftharpoons \mathtt{R1} \tag{6}$$

Reactants

Table 6: Properties of each reactant.

Id	Name	SBO
R0	R0	
Glu	Glu	

Product

Table 7: Properties of each product.

Id	Name	SBO
R1	R1	

Kinetic Law

Derived unit contains undeclared units

$$v_1 = 4 \cdot \mathtt{kass\_re1} \cdot [\mathtt{R0}] \cdot [\mathtt{Glu}] - 1 \cdot \mathtt{kdiss\_re1} \cdot [\mathtt{R1}] \tag{7}$$

7.2 Reaction re2

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

Notes

Reaction equation

$$\mathtt{R1} + \mathtt{Glu} \rightleftharpoons \mathtt{R2} \tag{8}$$

Reactants

Table 8: Properties of each reactant.

Id	Name	SBO
R1	R1	
Glu	Glu	

Product

Table 9: Properties of each product.

Id	Name	SBO
R2	R2	

Kinetic Law

Derived unit contains undeclared units

$$v_2 = 3 \cdot \texttt{kass\_re1} \cdot [\texttt{R1}] \cdot [\texttt{Glu}] - 2 \cdot \texttt{kdiss\_re1} \cdot [\texttt{R2}] \tag{9}$$

7.3 Reaction re3

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

Notes

Reaction equation

$$\texttt{R2} + \texttt{Glu} \rightleftharpoons \texttt{R3} \tag{10}$$

Reactants

Table 10: Properties of each reactant.

Id	Name	SBO
R2	R2	
Glu	Glu	

Product

Table 11: Properties of each product.

Id	Name	SBO
R3	R3	

Kinetic Law

Derived unit contains undeclared units

$$v_3 = 2 \cdot \texttt{kass\_re1} \cdot [\texttt{R2}] \cdot [\texttt{Glu}] - 3 \cdot \texttt{kdiss\_re1} \cdot [\texttt{R3}] \tag{11}$$

7.4 Reaction re4

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

Notes

Reaction equation

$$\texttt{R3} + \texttt{Glu} \rightleftharpoons \texttt{R4} \tag{12}$$

Reactants

Table 12: Properties of each reactant.

Id	Name	SBO
R3	R3	
Glu	Glu	

Product

Table 13: Properties of each product.

Id	Name	SBO
R4	R4	

Kinetic Law

Derived unit contains undeclared units

$$v_4 = 1 \cdot \texttt{kass\_re1} \cdot [\texttt{R3}] \cdot [\texttt{Glu}] - 4 \cdot \texttt{kdiss\_re1} \cdot [\texttt{R4}] \tag{13}$$

7.5 Reaction re5

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

Notes

Reaction equation

$$\mathtt{D0} + \mathtt{Glu} \rightleftharpoons \mathtt{D1} \tag{14}$$

Reactants

Table 14: Properties of each reactant.

Id	Name	SBO
D0	D0	
Glu	Glu	

Product

Table 15: Properties of each product.

Id	Name	SBO
D1	D1	

Kinetic Law

Derived unit contains undeclared units

$$v_5 = 3 \cdot \mathtt{kass\_re5} \cdot [\mathtt{D0}] \cdot [\mathtt{Glu}] - \mathtt{kdiss\_re5} \cdot [\mathtt{D1}] \tag{15}$$

7.6 Reaction re6

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

Notes

Reaction equation

$$\mathtt{D1} + \mathtt{Glu} \rightleftharpoons \mathtt{D2} \tag{16}$$

Reactants

Table 16: Properties of each reactant.

Id	Name	SBO
D1	D1	
Glu	Glu	

Product

Table 17: Properties of each product.

Id	Name	SBO
D2	D2	

Kinetic Law

Derived unit contains undeclared units

$$v_6 = 3 \cdot \texttt{kass\_re1} \cdot [\texttt{D1}] \cdot [\texttt{Glu}] - \texttt{kdiss\_re1} \cdot [\texttt{D2}] \tag{17}$$

7.7 Reaction re7

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

Notes

Reaction equation

$$\texttt{D2} + \texttt{Glu} \rightleftharpoons \texttt{D3} \tag{18}$$

Reactants

Table 18: Properties of each reactant.

Id	Name	SBO
D2	D2	
Glu	Glu	

Product

Table 19: Properties of each product.

Id	Name	SBO
D3	D3	

Kinetic Law

Derived unit contains undeclared units

$$v_7 = 2 \cdot \texttt{kass\_re1} \cdot [\texttt{D2}] \cdot [\texttt{Glu}] - 2 \cdot \texttt{kdiss\_re1} \cdot [\texttt{D3}] \tag{19}$$

7.8 Reaction re8

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

Notes

Reaction equation

$$\texttt{D3} + \texttt{Glu} \rightleftharpoons \texttt{D4} \tag{20}$$

Reactants

Table 20: Properties of each reactant.

Id	Name	SBO
D3	D3	
Glu	Glu	

Product

Table 21: Properties of each product.

Id	Name	SBO
D4	D4	

Kinetic Law

Derived unit contains undeclared units

$$v_8 = 1 \cdot \texttt{kass\_re1} \cdot [\texttt{D3}] \cdot [\texttt{Glu}] - 3 \cdot \texttt{kdiss\_re1} \cdot [\texttt{D4}] \tag{21}$$

7.9 Reaction re9

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

Notes

Reaction equation

$$\mathtt{E2} + \mathtt{Glu} \rightleftharpoons \mathtt{E3} \tag{22}$$

Reactants

Table 22: Properties of each reactant.

Id	Name	SBO
E2	E2	
Glu	Glu	

Product

Table 23: Properties of each product.

Id	Name	SBO
E3	E3	

Kinetic Law

Derived unit contains undeclared units

$$v_9 = 2 \cdot \mathtt{kass\_re1} \cdot [\mathtt{E2}] \cdot [\mathtt{Glu}] - \mathtt{kdiss\_re1} \cdot [\mathtt{E3}] \tag{23}$$

7.10 Reaction re10

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

Notes

Reaction equation

$$\mathtt{E3} + \mathtt{Glu} \rightleftharpoons \mathtt{E4} \tag{24}$$

Reactants

Table 24: Properties of each reactant.

Id	Name	SBO
E3	E3	
Glu	Glu	

Product

Table 25: Properties of each product.

Id	Name	SBO
E4	E4	

Kinetic Law

Derived unit contains undeclared units

$$v_{10} = \texttt{kass\_re1} \cdot [\texttt{E3}] \cdot [\texttt{Glu}] - 2 \cdot \texttt{kdiss\_re1} \cdot [\texttt{E4}] \tag{25}$$

7.11 Reaction re11

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

Notes

Reaction equation

$$\texttt{R0} \rightleftharpoons \texttt{D0} \tag{26}$$

Reactant

Table 26: Properties of each reactant.

Id	Name	SBO
R0	R0	

Product

Table 27: Properties of each product.

Id	Name	SBO
D0	D0	

Kinetic Law

Derived unit contains undeclared units

$$v_{11} = 4 \cdot \texttt{kass\_re11} \cdot [\texttt{R0}] - \texttt{kdiss\_re11} \cdot [\texttt{D0}] \tag{27}$$

7.12 Reaction re12

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

Notes

Reaction equation

$$\texttt{R1} \rightleftharpoons \texttt{D1} \tag{28}$$

Reactant

Table 28: Properties of each reactant.

Id	Name	SBO
R1	R1	

Product

Table 29: Properties of each product.

Id	Name	SBO
D1	D1	

Kinetic Law

Derived unit contains undeclared units

$$v_{12} = 1 \cdot \texttt{kass\_re12} \cdot [\texttt{R1}] - \texttt{kdiss\_re12} \cdot [\texttt{D1}] \tag{29}$$

7.13 Reaction re13

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

Notes

Reaction equation

$$\mathtt{R2} \rightleftharpoons \mathtt{D2} \tag{30}$$

Reactant

Table 30: Properties of each reactant.

Id	Name	SBO
R2	R2	

Product

Table 31: Properties of each product.

Id	Name	SBO
D2	D2	

Kinetic Law

Derived unit contains undeclared units

$$v_{13} = 2 \cdot \mathtt{kass\_re12} \cdot [\mathtt{R2}] - \mathtt{kdiss\_re12} \cdot [\mathtt{D2}] \tag{31}$$

7.14 Reaction re14

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

Notes

Reaction equation

$$\mathtt{R3} \rightleftharpoons \mathtt{D3} \tag{32}$$

Reactant

Table 32: Properties of each reactant.

Id	Name	SBO
R3	R3	

Product

Table 33: Properties of each product.

Id	Name	SBO
D3	D3	

Kinetic Law

Derived unit contains undeclared units

$$v_{14} = 3 \cdot \texttt{kass\_re12} \cdot [\texttt{R3}] - \texttt{kdiss\_re12} \cdot [\texttt{D3}] \tag{33}$$

7.15 Reaction re15

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

Notes

Reaction equation

$$\texttt{R4} \rightleftharpoons \texttt{D4} \tag{34}$$

Reactant

Table 34: Properties of each reactant.

Id	Name	SBO
R4	R4	

Product

Table 35: Properties of each product.

Id	Name	SBO
D4	D4	

Kinetic Law

Derived unit contains undeclared units

$$v_{15} = 4 \cdot \texttt{kass\_re12} \cdot [\texttt{R4}] - \texttt{kdiss\_re12} \cdot [\texttt{D4}] \tag{35}$$

7.16 Reaction re16

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

Notes

Reaction equation

$$\texttt{R2} \rightleftharpoons \texttt{O2} \tag{36}$$

Reactant

Table 36: Properties of each reactant.

Id	Name	SBO
R2	R2	

Product

Table 37: Properties of each product.

Id	Name	SBO
O2	O2	

Kinetic Law

Derived unit contains undeclared units

$$v_{16} = 2 \cdot \texttt{kass\_re16} \cdot [\texttt{R2}] - \texttt{kdiss\_re16} \cdot [\texttt{O2}] \tag{37}$$

7.17 Reaction re17

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

Notes

Reaction equation

$$\mathrm{R3} \rightleftharpoons \mathrm{O3} \tag{38}$$

Reactant

Table 38: Properties of each reactant.

Id	Name	SBO
R3	R3	

Product

Table 39: Properties of each product.

Id	Name	SBO
O3	O3	

Kinetic Law

Derived unit contains undeclared units

$$v_{17} = 3 \cdot \mathtt{kass\_re16} \cdot [\mathrm{R3}] - \mathtt{kdiss\_re16} \cdot [\mathrm{O3}] \tag{39}$$

7.18 Reaction re18

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

Notes

Reaction equation

$$\mathrm{R4} \rightleftharpoons \mathrm{O4} \tag{40}$$

Reactant

Table 40: Properties of each reactant.

Id	Name	SBO
R4	R4	

Product

Table 41: Properties of each product.

Id	Name	SBO
O4	O4	

Kinetic Law

Derived unit contains undeclared units

$$v_{18} = 4 \cdot \texttt{kass\_re16} \cdot [\texttt{R4}] - \texttt{kdiss\_re16} \cdot [\texttt{O4}] \tag{41}$$

7.19 Reaction re19

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

Notes

Reaction equation

$$\texttt{D2} \rightleftharpoons \texttt{E2} \tag{42}$$

Reactant

Table 42: Properties of each reactant.

Id	Name	SBO
D2	D2	

Product

Table 43: Properties of each product.

Id	Name	SBO
E2	E2	

Kinetic Law

Derived unit contains undeclared units

$$v_{19} = 1 \cdot \texttt{kass\_re19} \cdot [\texttt{D2}] - \texttt{kdiss\_re19} \cdot [\texttt{E2}] \tag{43}$$

7.20 Reaction re20

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

Notes

Reaction equation

$$\texttt{D3} \rightleftharpoons \texttt{E3} \tag{44}$$

Reactant

Table 44: Properties of each reactant.

Id	Name	SBO
D3	D3	

Product

Table 45: Properties of each product.

Id	Name	SBO
E3	E3	

Kinetic Law

Derived unit contains undeclared units

$$v_{20} = 2 \cdot \texttt{kass\_re19} \cdot [\texttt{D3}] - \texttt{kdiss\_re19} \cdot [\texttt{E3}] \tag{45}$$

7.21 Reaction re21

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

Notes

Reaction equation

$$\mathtt{D4} \rightleftharpoons \mathtt{E4} \tag{46}$$

Reactant

Table 46: Properties of each reactant.

Id	Name	SBO
D4	D4	

Product

Table 47: Properties of each product.

Id	Name	SBO
E4	E4	

Kinetic Law

Derived unit contains undeclared units

$$v_{21} = 3 \cdot \mathtt{kass\_re19} \cdot [\mathtt{D4}] - \mathtt{kdiss\_re19} \cdot [\mathtt{E4}] \tag{47}$$

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 a 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 R0

Name R0

Initial amount 1 mol

Charge 0

This species takes part in two reactions (as a reactant in re1, re11).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathtt{R0} = -v_1 - v_{11} \tag{48}$$

8.2 Species R1

Name R1

Initial amount 0 mol

Charge 0

This species takes part in three reactions (as a reactant in re2, re12 and as a product in re1).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathtt{R1} = v_1 - v_2 - v_{12} \tag{49}$$

8.3 Species R2

Name R2

Initial amount 0 mol

Charge 0

This species takes part in four reactions (as a reactant in re3, re13, re16 and as a product in re2).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathtt{R2} = v_2 - v_3 - v_{13} - v_{16} \tag{50}$$

8.4 Species R3

Name R3

Initial amount 0 mol

Charge 0

This species takes part in four reactions (as a reactant in re4, re14, re17 and as a product in re3).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathtt{R3} = v_3 - v_4 - v_{14} - v_{17} \tag{51}$$

8.5 Species R4

Name R4

Initial amount 0 mol

Charge 0

This species takes part in three reactions (as a reactant in re15, re18 and as a product in re4).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathtt{R4} = v_4 - v_{15} - v_{18} \tag{52}$$

8.6 Species Glu

Name Glu

Initial amount 0 mol

Charge 0

This species takes part in ten reactions (as a reactant in re1, re2, re3, re4, re5, re6, re7, re8, re9, re10), which do not influence its rate of change because this species is on the boundary of the reaction system:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathtt{Glu} = 0 \tag{53}$$

8.7 Species D0

Name D0

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in re5 and as a product in re11).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathtt{D0} = v_{11} - v_5 \tag{54}$$

8.8 Species D1

Name D1

Initial amount 0 mol

Charge 0

This species takes part in three reactions (as a reactant in re6 and as a product in re5, re12).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathtt{D1} = v_5 + v_{12} - v_6 \tag{55}$$

8.9 Species D2

Name D2

Initial amount 0 mol

Charge 0

This species takes part in four reactions (as a reactant in re7, re19 and as a product in re6, re13).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D2} = v_6 + v_{13} - v_7 - v_{19} \tag{56}$$

8.10 Species D3

Name D3

Initial amount 0 mol

Charge 0

This species takes part in four reactions (as a reactant in re8, re20 and as a product in re7, re14).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D3} = v_7 + v_{14} - v_8 - v_{20} \tag{57}$$

8.11 Species D4

Name D4

Initial amount 0 mol

Charge 0

This species takes part in three reactions (as a reactant in re21 and as a product in re8, re15).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{D4} = v_8 + v_{15} - v_{21} \tag{58}$$

8.12 Species E2

Name E2

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in re9 and as a product in re19).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E2} = v_{19} - v_9 \tag{59}$$

8.13 Species E3

Name E3

Initial amount 0 mol

Charge 0

This species takes part in three reactions (as a reactant in re10 and as a product in re9, re20).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E3} = v_{9} + v_{20} - v_{10} \tag{60}$$

8.14 Species E4

Name E4

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a product in re10, re21).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E4} = v_{10} + v_{21} \tag{61}$$

8.15 Species O2

Name O2

Initial amount 0 mol

Charge 0

This species takes part in one reaction (as a product in re16).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{O2} = v_{16} \tag{62}$$

8.16 Species O3

Name O3

Initial amount 0 mol

Charge 0

This species takes part in one reaction (as a product in re17).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{O3} = v_{17} \tag{63}$$

8.17 Species O4

Name O4

Initial amount 0 mol

Charge 0

This species takes part in one reaction (as a product in re18).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathtt{O4} = v_{18} \tag{64}$$

8.18 Species Vm

Name Vm

Initial amount −60 mol

Charge 0

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathtt{Vm} = 0 \tag{65}$$

8.19 Species LTP_ampaNbModFactor

Name LTP_ampaNbModFactor

Initial amount 1 mol

Charge 0

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathtt{LTP\_ampaNbModFactor} = 0 \tag{66}$$

References

Dräger, A., Planatscher, H., Wouamba, D. M., Schröder, A., Hucka, M., Endler, L., Golebiewski, M., Müller, W., and Zell, A. (2009). SBML2LaTeX: Conversion of SBML files into human-readable reports. Bioinformatics, **25**(11), 1455–1456. 10.1093/bioinformatics/btp170.