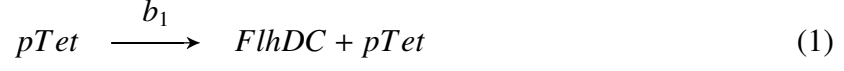
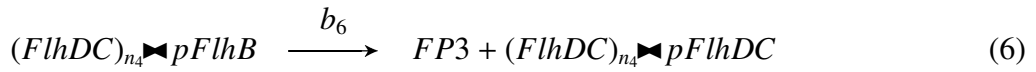
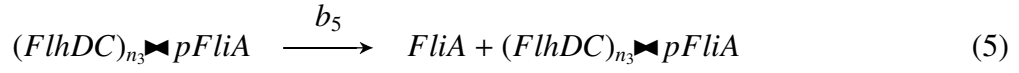
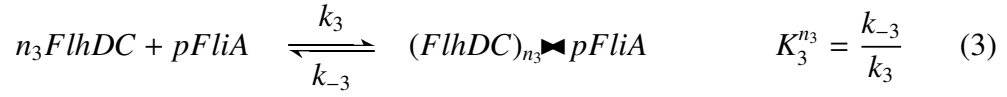


Equations for the
“*Oscillation Module*”

specific to pTet-circuit



specific to pFlhDC-circuit



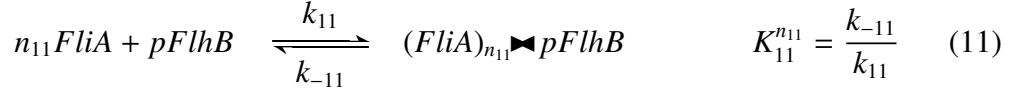
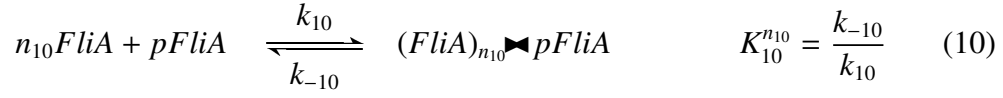
specific to pTet-circuit



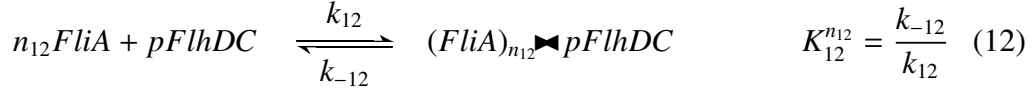
specific to pFlhDC/OmpR*-circuit



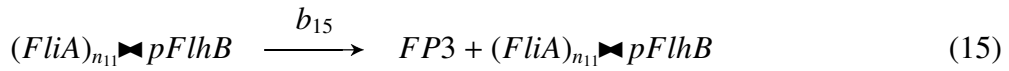
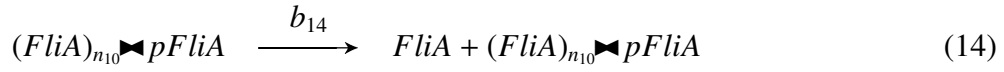
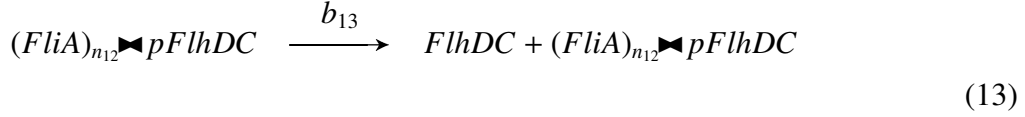
specific to pFlhDC/EnvZ-circuit



specific to pFlhDC-circuit



specific to pFlhDC-circuit



specific to pTet-circuit



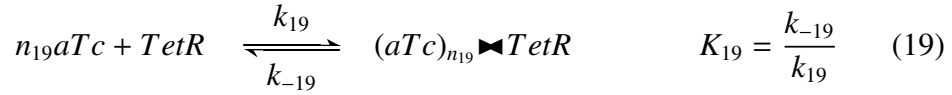
specific to pFlhDC-circuit



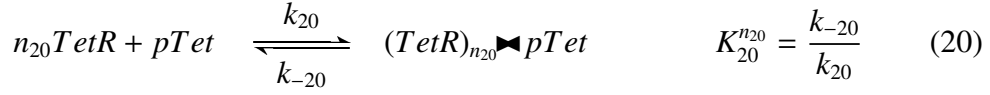
specific to pFlhDC/EnvZ-circuit



specific to pTet-circuit



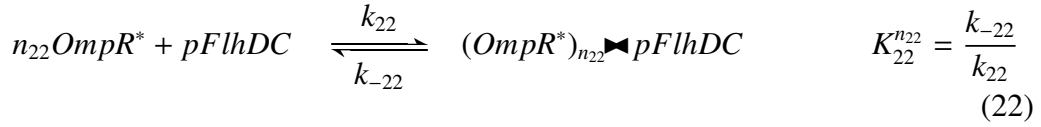
specific to pTet-circuit



specific to pFlhDC/EnvZ-circuit

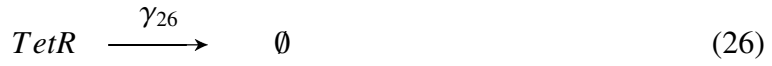


specific to pFlhDC-circuit

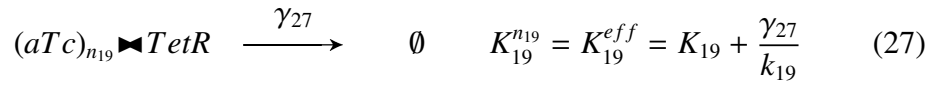




specific to pTet-circuit



specific to pTet-circuit



specific to pFlhDC/EnvZ-circuit



specific to pFlhDC-circuit



$$(3) \Rightarrow [(FlhDC)_{n_3} \blacktriangleright pFlhA]_{eq} = \frac{[FlhDC]^{n_3}}{K_3^{n_3} + [FlhDC]^{n_3}} \cdot [pFlhA^{total}] \quad (30)$$

$$(4) \Rightarrow [(FlhDC)_{n_4} \blacktriangleright pFlhB]_{eq} = \frac{[FlhDC]^{n_4}}{K_4^{n_4} + [FlhDC]^{n_4}} \cdot [pFlhB^{total}] \quad (31)$$

$$(10) \Rightarrow [(FlhA)_{n_{10}} \blacktriangleright pFlhA]_{eq} = \frac{[FlhA]^{n_{10}}}{K_{10}^{n_{10}} + [FlhA]^{n_{10}}} \cdot [pFlhA^{total}] \quad (32)$$

$$(11) \Rightarrow [(FlhA)_{n_{11}} \blacktriangleright pFlhB]_{eq} = \frac{[FlhA]^{n_{11}}}{K_{11}^{n_{11}} + [FlhA]^{n_{11}}} \cdot [pFlhB^{total}] \quad (33)$$

specific to pFlhDC-circuit

$$(12) \Rightarrow [(FlhA)_{n_{12}} \blacktriangleright pFlhDC]_{eq} = \frac{[FlhA]^{n_{12}}}{K_{12}^{n_{12}} + [FlhA]^{n_{12}}} \cdot [pFlhDC^{total}] \quad (34)$$

specific to pTet-circuit

$$(19) \Rightarrow [TetR^{free}] = \frac{K_{19}^{n_{aTc}}}{K_{19}^{n_{aTc}} + [aTc]_i^{n_{aTc}}} \cdot [TetR^{total}] \quad (35)$$

specific to pTet-circuit

$$(20) \Rightarrow [pTet]_{eq} = \frac{K_{20}^{n_{20}}}{K_{20}^{n_{20}} + [TetR^{free}]^{n_{20}}} \cdot [pTet^{total}] \quad (36)$$

specific to pFlhDC/EnvZ-circuit

$$(21) \Rightarrow \begin{cases} ([EnvZ^{total}] - n_{21} OmpR_{eq}^*)^{n_{21}} ([OmpR^{total}] - OmpR_{eq}^*) - K_{21}^{eff} OmpR_{eq}^* = 0 \\ 0 < n_{21} OmpR_{eq}^* \quad ; \quad 0 < OmpR_{eq}^* < [OmpR^{total}] \end{cases} \quad (37)$$

specific to pFlhDC-circuit

$$(22) \Rightarrow [pFlhDC]_{eq} = \frac{K_{22}^{n_{22}}}{K_{22}^{n_{22}} + [OmpR^*]^{n_{22}}} \cdot [pFlhDC^{total}] \quad (38)$$

specific to pTet-circuit

$$(1) \Rightarrow \frac{d[FlhDC]}{dt} = b_1[pTet]_{eq} - \gamma_{23}[FlhDC] \quad (39a)$$

$$(35) \Rightarrow \frac{d[FlhDC]}{dt} = \beta_1 \cdot \frac{K_{20}^{n_{20}}}{K_{20}^{n_{20}} + \left(\frac{K_{19}^{n_{aTc}}}{K_{19}^{n_{aTc}} + [aTc]_i^{n_{aTc}}} \cdot [TetR] \right)^{n_{20}}} - \gamma_{23}[FlhDC] \quad (39)$$

specific to pFlhDC-circuit

$$(2) \Rightarrow \frac{d[FlhDC]}{dt} = b_2[pFlhDC^{free}]_{eq} + b_{13}[(FliA)_{n_{12}} \blacktriangleright pFlhDC]_{eq} - \gamma_{23}[FlhDC] \quad (40a)$$

$$(34) \Rightarrow \frac{d[FlhDC]}{dt} = \frac{K_{22}^{n_{22}}}{K_{22}^{n_{22}} + [OmpR^*]^{n_{22}}} \left(\beta_2 \cdot \frac{K_{12}^{n_{12}}}{K_{12}^{n_{12}} + [FliA]^{n_{12}}} + \beta_{13} \cdot \frac{[FliA]^{n_{12}}}{K_{12}^{n_{12}} + [FliA]^{n_{12}}} \right) - \gamma_{23}[FlhDC] \quad (40)$$

$$(5) \Rightarrow \frac{d[FliA]}{dt} = b_5[(FlhDC)_{n_3} \blacktriangleright pFliA]_{eq} + b_{14}[(FliA)_{n_{10}} \blacktriangleright pFliA]_{eq} - \gamma_{24}[FliA] \quad (41a)$$

$$(30) \Rightarrow \frac{d[FliA]}{dt} = \beta_5 \cdot \frac{[FlhDC]^{n_3}}{K_3^{n_3} + [FlhDC]^{n_3}} + \beta_{14} \cdot \frac{[FliA]^{n_{10}}}{K_{10}^{n_{10}} + [FliA]^{n_{10}}} - \gamma_{24}[FliA] \quad (41)$$

$$(6) \Rightarrow \frac{d[FP3]}{dt} = b_6[(FlhDC)_{n_4} \blacktriangleright pFlhB]_{eq} + b_{15}[(FliA)_{n_{11}} \blacktriangleright pFlhB]_{eq} - \gamma_{25}[FP3] \quad (42a)$$

$$(31) \Rightarrow \frac{d[FP3]}{dt} = \beta_6 \cdot \frac{[FlhDC]^{n_4}}{K_4^{n_4} + [FlhDC]^{n_4}} + \beta_{15} \cdot \frac{[FliA]^{n_{11}}}{K_{11}^{n_{11}} + [FliA]^{n_{11}}} - \gamma_{25}[FP3] \quad (42)$$

specific to pTet-circuit

$$(7) \Rightarrow \frac{d[TetR]}{dt} = b_6[(FlhDC)_{n_4} \blacktriangleright pFlhB]_{eq} + b_{15}[(FliA)_{n_{11}} \blacktriangleright pFlhB]_{eq} - \gamma_{26}[TetR] \quad (43a)$$

$$(31) \Rightarrow \frac{d[TetR]}{dt} = \beta_6 \cdot \frac{[FlhDC]^{n_4}}{K_4^{n_4} + [FlhDC]^{n_4}} + \beta_{15} \cdot \frac{[FliA]^{n_{11}}}{K_{11}^{n_{11}} + [FliA]^{n_{11}}} - \gamma_{26}[TetR] \quad (43)$$

eqn.(35) gives then $[TetR^{free}]$ in function of $[TetR^{total}] := [TetR]$

specific to pFlhDC/EnvZ-circuit

$$(9) \Rightarrow \frac{d[EnvZ]}{dt} = b_6[(FlhDC)_{n_4} \blacktriangleleft pFlhB]_{eq} + b_{15}[(FliA)_{n_{11}} \blacktriangleleft pFlhB]_{eq} - \gamma_{28}[OmpR^*] \quad (44a)$$

$$(31) \Rightarrow \frac{d[EnvZ]}{dt} = \beta_6 \cdot \frac{[FlhDC]^{n_4}}{K_4^{n_4} + [FlhDC]^{n_4}} + \beta_{15} \cdot \frac{[FliA]^{n_{11}}}{K_{11}^{n_{11}} + [FliA]^{n_{11}}} - \gamma_{28}[EnvZ] \quad (44b)$$

$$[EnvZ^{total}] = [EnvZ_b] + [EnvZ] \quad (44)$$

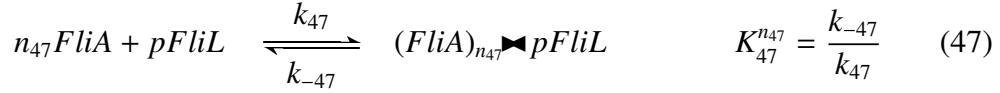
Solve then eqn.(37) to get $[OmpR^*]$ in function of $[OmpR^{total}] := [OmpR_b]$

specific to pFlhDC/OmpR*-circuit

$$(8) \Rightarrow \frac{d[OmpR^*]}{dt} = b_6[(FlhDC)_{n_4} \blacktriangleleft pFlhB]_{eq} + b_{15}[(FliA)_{n_{11}} \blacktriangleleft pFlhB]_{eq} - \gamma_{29}[OmpR^*] \quad (45a)$$

$$(31) \Rightarrow \frac{d[OmpR^*]}{dt} = \beta_6 \cdot \frac{[FlhDC]^{n_4}}{K_4^{n_4} + [FlhDC]^{n_4}} + \beta_{15} \cdot \frac{[FliA]^{n_{11}}}{K_{11}^{n_{11}} + [FliA]^{n_{11}}} - \gamma_{29}[OmpR^*] \quad (45)$$

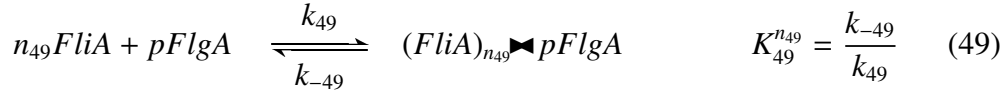
Added Equations for the
“*FIFO module*”



specific to pFlgA-circuit



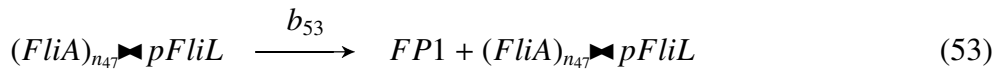
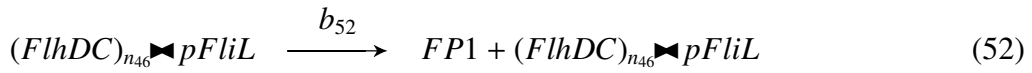
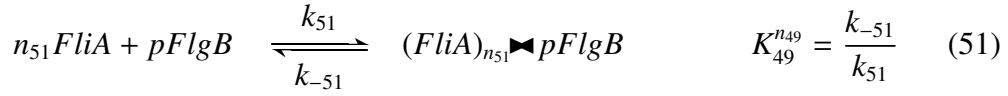
specific to pFlgA-circuit



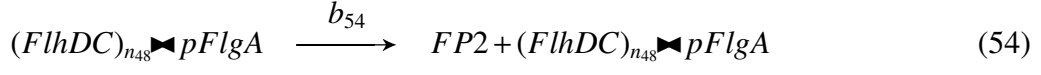
specific to pFlgB-circuit



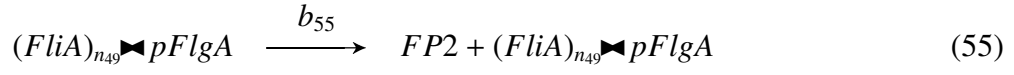
specific to pFlgB-circuit



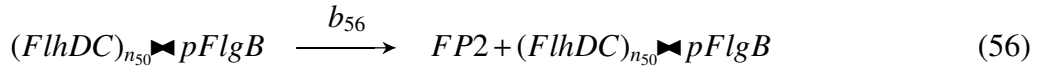
specific to pFlgA-circuit



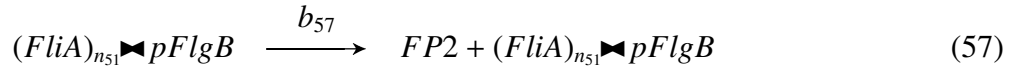
specific to pFlgA-circuit



specific to pFlgB-circuit



specific to pFlgB-circuit



$$(46) \Rightarrow [(FlhDC)_{n_{46}} \blacktriangleright pFliL]_{eq} = \frac{[FlhDC]^{n_{46}}}{K_{46}^{n_{46}} + [FlhDC]^{n_{46}}} \cdot [pFliL^{total}] \quad (60)$$

$$(47) \Rightarrow [(FliA)_{n_{47}} \blacktriangleright pFliL]_{eq} = \frac{[FliA]^{n_{47}}}{K_{47}^{n_{47}} + [FliA]^{n_{47}}} \cdot [pFliL^{total}] \quad (61)$$

specific to pFlgA-circuit

$$(48) \Rightarrow [(FlhDC)_{n_{48}} \blacktriangleright pFlgA]_{eq} = \frac{[FlhDC]^{n_{48}}}{K_{48}^{n_{48}} + [FlhDC]^{n_{48}}} \cdot [pFlgA^{total}] \quad (62)$$

specific to pFlgA-circuit

$$(49) \Rightarrow [(FliA)_{n_{49}} \blacktriangleright pFlgA]_{eq} = \frac{[FliA]^{n_{49}}}{K_{49}^{n_{49}} + [FliA]^{n_{49}}} \cdot [pFlgA^{total}] \quad (63)$$

specific to pFlgB-circuit

$$(50) \Rightarrow [(FlhDC)_{n_{50}} \blacktriangleright pFlgB]_{eq} = \frac{[FlhDC]^{n_{50}}}{K_{50}^{n_{50}} + [FlhDC]^{n_{50}}} \cdot [pFlgB^{total}] \quad (64)$$

specific to pFlgB-circuit

$$(51) \Rightarrow [(FliA)_{n_{51}} \blacktriangleright pFlgB]_{eq} = \frac{[FliA]^{n_{51}}}{K_{51}^{n_{51}} + [FliA]^{n_{51}}} \cdot [pFlgB^{total}] \quad (65)$$

$$\begin{aligned}
(52) & \\
(53) \Rightarrow \frac{d[FP1]}{dt} &= b_{52}[(FlhDC)_{n_{46}} \blacktriangleright pFlL]_{eq} + b_{53}[(FlIA)_{n_{47}} \blacktriangleright pFlL]_{eq} - \gamma_{58}[FP1] \\
(58) &
\end{aligned}$$

(66a)

$$\begin{aligned}
(60) & \\
(61) \Rightarrow \frac{d[FP1]}{dt} &= \beta_{52} \cdot \frac{[FlhDC]^{n_{46}}}{K_{46}^{n_{46}} + [FlhDC]^{n_{46}}} + \beta_{53} \cdot \frac{[FlIA]^{n_{47}}}{K_{47}^{n_{47}} + [FlIA]^{n_{47}}} - \gamma_{58}[FP1] \\
&
\end{aligned}$$

(66)

specific to pFlgA-circuit

$$\begin{aligned}
(54) & \\
(55) \Rightarrow \frac{d[FP2]}{dt} &= b_{54}[(FlhDC)_{n_{48}} \blacktriangleright pFlgA]_{eq} + b_{55}[(FlIA)_{n_{49}} \blacktriangleright pFlgA]_{eq} - \gamma_{59}[FP2] \\
(59) &
\end{aligned}$$

(67a)

$$\begin{aligned}
(62) & \\
(65) \Rightarrow \frac{d[FP2]}{dt} &= \beta_{54} \cdot \frac{[FlhDC]^{n_{48}}}{K_{48}^{n_{48}} + [FlhDC]^{n_{48}}} + \beta_{55} \cdot \frac{[FlIA]^{n_{49}}}{K_{49}^{n_{49}} + [FlIA]^{n_{49}}} - \gamma_{59}[FP2] \\
&
\end{aligned}$$

(67)

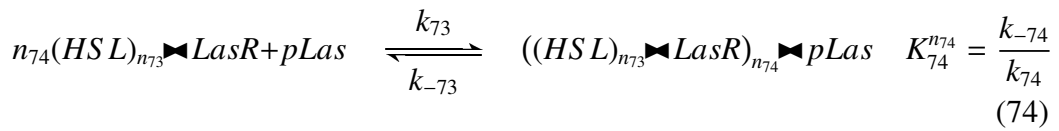
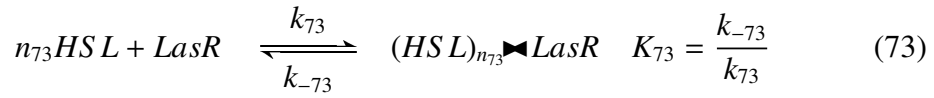
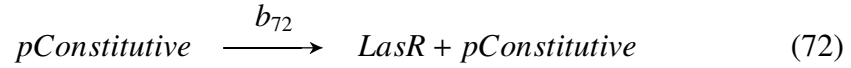
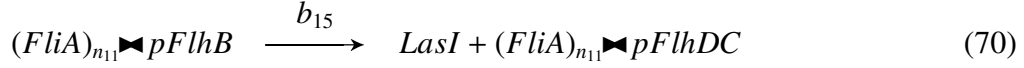
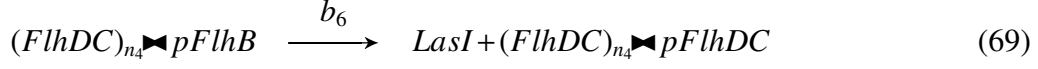
$$\begin{aligned}
(56) & \\
(57) \Rightarrow \frac{d[FP2]}{dt} &= b_{56}[(FlhDC)_{n_{50}} \blacktriangleright pFlgB]_{eq} + b_{57}[(FlIA)_{n_{51}} \blacktriangleright pFlgB]_{eq} - \gamma_{59}[FP2] \\
(59) &
\end{aligned}$$

(68a)

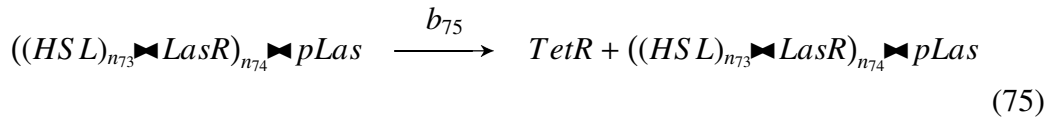
$$\begin{aligned}
(64) & \\
(65) \Rightarrow \frac{d[FP2]}{dt} &= \beta_{56} \cdot \frac{[FlhDC]^{n_{50}}}{K_{50}^{n_{50}} + [FlhDC]^{n_{50}}} + \beta_{57} \cdot \frac{[FlIA]^{n_{51}}}{K_{51}^{n_{51}} + [FlIA]^{n_{51}}} - \gamma_{59}[FP2] \\
&
\end{aligned}$$

(68)

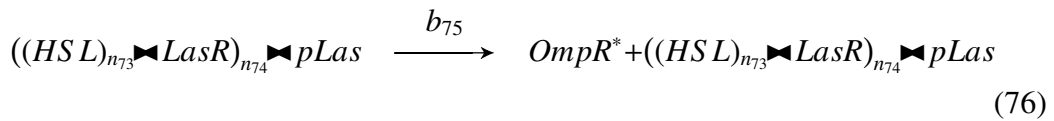
Equations for the
“*Synchronisation Module*”



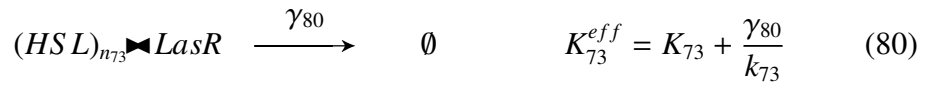
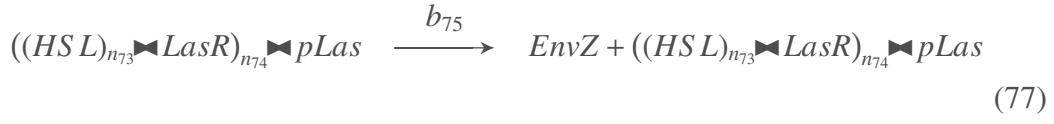
specific to pTet-circuit



specific to pFlhDC/OmpR*-circuit



specific to pFlhDC/EnvZ-circuit



$$(74) \Rightarrow \left[((HSL)_{n_{73}} \blacktriangleright LasR)_{n_{74}} \blacktriangleright pLas \right]_{eq} = \frac{[(HSL)_{n_{73}} \blacktriangleright LasR]^{n_{74}}}{K_{74}^{n_{74}} + [(HSL)_{n_{73}} \blacktriangleright LasR]^{n_{74}}} \cdot [pLas^{total}] \quad (81)$$

$$\begin{aligned}
(69) & \\
(70) & \Rightarrow \frac{d[LasI]}{dt} = b_6[(FlhDC)_{n_4} \blacktriangleleft pFlhB]_{eq} + b_{15}[(FliA)_{n_{11}} \blacktriangleleft pFlhB]_{eq} - \gamma_{78}[LasI] \\
(78) & \hspace{20em} (82a)
\end{aligned}$$

$$\begin{aligned}
(31) & \Rightarrow \frac{d[LasI]}{dt} = \beta_6 \cdot \frac{[FlhDC]^{n_4}}{K_4^{n_4} + [FlhDC]^{n_4}} + \beta_{15} \cdot \frac{[FliA]^{n_{11}}}{K_{11}^{n_{11}} + [FliA]^{n_{11}}} - \gamma_{78}[LasI] \quad (82) \\
(33) &
\end{aligned}$$

(diffusion)
(renewal)

$$\Rightarrow \begin{cases}
(71) & \frac{d[HS L]_{int}}{dt} = b_{71} \cdot [lasI] + \eta_{int} ([HS L]_{ext} - [HS L]_{int}) + n_{73} k_{73} (K_{73} [(HS L)_{n_{73}} \blacktriangleleft LasR] - [HS L]_{int}^{n_{73}} [LasR]) \\
(73) & \frac{d[HS L]_{ext}}{dt} = \eta_{ext} ([HS L]_{int} - [HS L]_{ext}) - rnw[HS L]_{ext} \\
(72) & \frac{d[LasR]}{dt} = \beta_{72} - \gamma_{79}[LasR] - k_{73} (K_{73} [(HS L)_{n_{73}} \blacktriangleleft LasR] - [HS L]_{int}^{n_{73}} [LasR]) \\
& \frac{d[(HS L)_{n_{73}} \blacktriangleleft LasR]}{dt} = k_{73} ([HS L]_{int}^{n_{73}} [LasR] - K_{73} [(HS L)_{n_{73}} \blacktriangleleft LasR]) - \gamma_{80} [(HS L)_{n_{73}} \blacktriangleleft LasR]
\end{cases} \quad (83)$$

specific to pTet-circuit

$$\begin{aligned}
(75) & \Rightarrow \frac{d[TetR]}{dt} = b_{75} [((HS L)_{n_{73}} \blacktriangleleft LasR)_{n_{74}} \blacktriangleleft pLas]_{eq} - \gamma_{26}[TetR] \quad (84a) \\
(26) &
\end{aligned}$$

$$(81) \Rightarrow \frac{d[TetR]}{dt} = \beta_{75} \cdot \frac{[(HS L)_{n_{73}} \blacktriangleleft LasR]^{n_{74}}}{K_{74}^{n_{74}} + [(HS L)_{n_{73}} \blacktriangleleft LasR]^{n_{74}}} - \gamma_{26}[TetR] \quad (84)$$

eqn.(35) gives then $[TetR^{free}]$ in function of $[TetR^{total}] := [TetR]$

specific to pFlhDC/OmpR*-circuit

$$\begin{aligned}
(75) & \Rightarrow \frac{d[OmpR^*]}{dt} = b_{75} [((HS L)_{n_{73}} \blacktriangleleft LasR)_{n_{74}} \blacktriangleleft pLas]_{eq} - \gamma_{29}[OmpR^*] \quad (85a) \\
(29) &
\end{aligned}$$

$$(81) \Rightarrow \frac{d[OmpR^*]}{dt} = \beta_{75} \cdot \frac{[(HS L)_{n_{73}} \blacktriangleleft LasR]^{n_{74}}}{K_{74}^{n_{74}} + [(HS L)_{n_{73}} \blacktriangleleft LasR]^{n_{74}}} - \gamma_{29}[OmpR^*] \quad (85)$$

specific to pFlhDC/EnvZ-circuit

$$\begin{aligned}
(75) & \Rightarrow \frac{d[EnvZ]}{dt} = b_{75} [((HS L)_{n_{73}} \blacktriangleleft LasR)_{n_{74}} \blacktriangleleft pLas]_{eq} - \gamma_{28}[EnvZ] \quad (86a) \\
(28) &
\end{aligned}$$

$$(81) \Rightarrow \frac{d[EnvZ]}{dt} = \beta_{75} \cdot \frac{[(HSL)_{n73} \blacktriangleright LasR]^{n74}}{K_{74}^{n74} + [(HSL)_{n73} \blacktriangleright LasR]^{n74}} - \gamma_{28}[EnvZ] \quad (86b)$$

$$[EnvZ^{total}] = [EnvZ_b] + [EnvZ] \quad (86)$$

Solve then eqn.(37) to get $[OmpR^*]$ in function of $[OmpR^{total}] := [OmpR_b]$