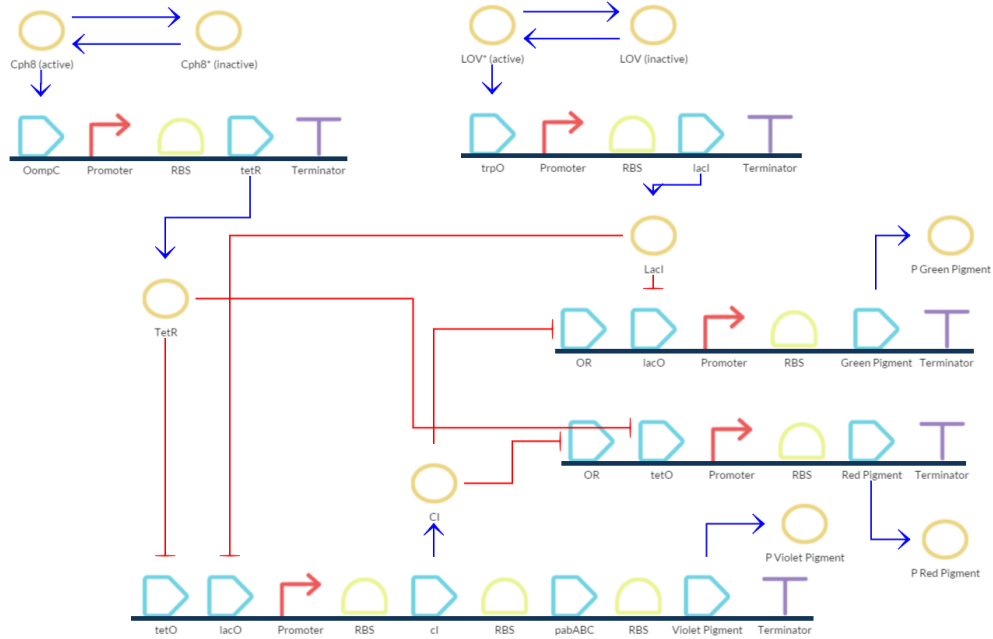


Biosensor- four different light conditions



Formulae for two certain parts

Cph8 and Cph8*

$$\frac{d[\text{Cph } 8]}{dt} = k_{decay}^{Cph8} [\text{Cph } 8^*] - k_{hv}^{Cph8} [\text{Cph } 8]$$

$$\frac{d[\text{Cph } 8^*]}{dt} = -k_{decay}^{Cph8} [\text{Cph } 8^*] + k_{hv}^{Cph8} [\text{Cph } 8]$$

LOV, LOV*

$$\frac{d[\text{LOV}]}{dt} = k_{decay}^{LOV} [\text{LOV}^*] - k_{hv}^{LOV} [\text{LOV}]$$

$$\frac{d[\text{LOV}^*]}{dt} = -k_{decay}^{LOV} [\text{LOV}^*] + k_{hv}^{LOV} [\text{LOV}]$$

TetR and tetR

$$\frac{d[\text{TetR}]}{dt} = \chi_{promoter1} k_{PompC} [\text{tetR}^F] - k_{deg} [\text{TetR}]$$

$$[\text{tetR}^F] = \frac{[\text{tetR}][\text{Cph } 8]^{n_{Cph8}}}{\chi_{OompC1} K M_{Cph8}^n + [\text{Cph } 8]^{n_{Cph8}}}$$

LacI and lacI

$$\frac{d[\text{LacI}]}{dt} = \chi_{promoter2} k_{Ptp} [\text{lacI}^F] - k_{deg} [\text{LacI}]$$

$$[\text{lacI}^F] = [\text{lacI}] \frac{1}{1 + \chi_{trpO} \left(\frac{[\text{Lov}^*]}{KM_{Lov}} \right)^{n_{Lov}}}$$

CI and cI

$$\frac{d[\text{CI}]}{dt} = \chi_{Promoter3} k_{PL} [\text{cI}^F] - k_{deg} [\text{CI}]$$

Assume

$$k_1 = \frac{1}{1 + \chi_{LacO} \left(\frac{[\text{LacI}]}{KM_{LacI}} \right)^{n_{LacI}}}$$

$$k_2 = \frac{1}{1 + \chi_{TetO} \left(\frac{[\text{TetR}]}{KM_{TetR}} \right)^{n_{TetR}}}$$

$$[\text{cI}^F] = k_1 k_2 [\text{cI}]$$

Green and Green pigment

$$\frac{d[\text{Green}]}{dt} = \chi_{Promoter5} k_{PR} [\text{greenpigment}^F] - k_{deg} [\text{Green}]$$

Assume

$$k_3 = \frac{1}{1 + \chi_{OR_2} \left(\frac{[\text{cI}]}{KM_{cl}} \right)^{n_{CI}}}$$

$$k_4 = \frac{1}{1 + \chi_{lacO_2} \left(\frac{[\text{LacI}]}{KM_{LacI}} \right)^{n_{LacI}}}$$

$$[\text{greenpigment}^F] = k_3 k_4 [\text{greenpigment}]$$

Red and redpigment

$$\frac{d[\text{Red}]}{dt} = \chi_{promoter4} k_{PR} [\text{redpigment}^F] - k_{deg} [\text{Red}]$$

Assume

$$k_5 = \frac{1}{1 + \chi_{OR} \left(\frac{[\text{CI}]}{KM_{CI}} \right)^{n_{CI}}}$$

$$k_6 = \frac{1}{1 + \chi_{tetO} \left(\frac{[\text{TetR}]}{KM_{TetR}} \right)^{n_{TetR}}}$$

$$[\text{redpigment}^F] = k_5 k_6 [\text{redpigment}]$$

Violet and violet pigment

$$\frac{d[\text{Violet}]}{dt} = \chi_{\text{Promoter3}} k_{PL} [\text{violetpigment}^F] - k_{\text{deg}} [\text{Violet}]$$

$$[\text{violetpigment}^F] = k_1 k_2 [\text{violetpigment}]$$

Parameter Table

Symbols	Parameters	Values and Units
K_Cph8_decay	Dark decay rate of active Cph8	$5.8 \cdot 10^{-3} \text{ s}^{-1}$
K_Cph8_hv	Light dependent activation rate	$3 \cdot 10^{-3} \text{ s}^{-1}$
K_Lov_decay	Dark decay rate of active Lov	$5.8 \cdot 10^{-3} \text{ s}^{-1}$
K_Lov_hv	Light dependent activation rate	$3 \cdot 10^{-3} \text{ s}^{-1}$
K_PompC	OmpC promoter expression strength	$3.454 \cdot 10^{-1} \text{ nM s}^{-1}$
KM_Cph8	Cph8 activation coefficient	1000nM
N_Cph8	Cph8 cooperativity coefficient	1
K_Ptrp	Trp promoter expression strength	2.23nM s ⁻¹
KM_Lov	Lov repression coefficient	142nM
N_Lov	Lov cooperativity coefficient	1
K_PL	Lambda Pl expression strength	$3.0 \cdot 10^{-2} \text{ nM s}^{-1}$
KM_LacI	LacI repression coefficient	800nM
N_LacI	LacI cooperativity coefficient	2

Reference: http://2012.igem.org/Team:ETH_Zurich