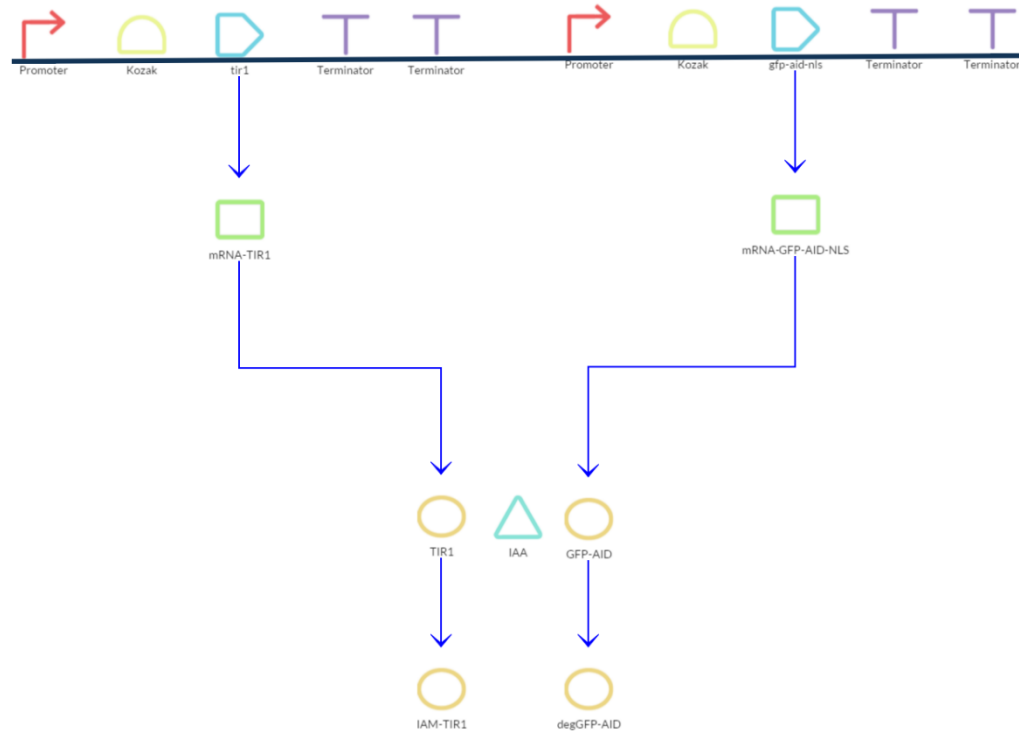


## Biosensor-Auxin



### Formulae for two certain parts

MRNA-TIR1:

$$\frac{d[\text{mRNA-TIR1}]}{dt} = p_r - d_{\text{mRNA}}[\text{mRNA-TIR1}]$$

MRNA-GFP:

$$\frac{d[\text{mRNA-GFP}]}{dt} = p_r - d_{\text{mRNA}}[\text{mRNA-GFP}]$$

DIAA:

$$\frac{d[\text{dIAA}]}{dt} = -p[\text{IAA}]$$

TIR1 and mRNA-TIR1

$$\frac{d[\text{TIR1}]}{dt} = k_z[\text{mRNA-TIR1}] - \frac{k_{cat}[\text{TIR1}]}{\frac{k_{-A}}{k_A} \frac{k_{cat}}{k_G} + k_{-G}} - d_{\text{protein}}[\text{TIR1}]$$

GFP-AID1 and Mrna-GFP

$$\frac{d[\text{GFP-AID}]}{dt} = k_z[\text{mRNA-GFP}] - \frac{k_{cat}[\text{GFP-AID}]}{\frac{k_{-A}}{k_A} \frac{k_{cat}}{k_G} + k_{-G}} - d_{\text{protein}}[\text{GFP-AID}]$$

IAA1 and dIAA

$$\frac{d[\text{IAA}]}{dt} = p[\text{dIAA}] - \frac{k_{cat}[\text{IAA}]}{\frac{k_{-A}}{k_A} \frac{k_{cat}}{k_G} + k_{-G}} - d_{compound}[\text{IAA}]$$

DegGFP and GFP-AID1

$$\frac{d[\text{degGFP}]}{dt} = d_{GFP}[\text{GFP-AID}]$$

IAM-TIR11 and TIR11

$$\frac{d[\text{IAM-TIR1}]}{dt} = k_{IAM-TIR1}[\text{TIR1}]$$

**Formulae for numerical simulation**

$$\frac{d[\text{TIR1}_1]}{dt} = k_z[\text{mRNA-TIR1}] - \frac{k_{cat}[\text{TIR1}][\text{IAA}][\text{GFP-AID}]}{\frac{k_{-A}}{k_A} \frac{k_{cat}}{k_G} + k_{-G}} - d_{protein}[\text{TIR1}]$$

$$\frac{d[\text{GFP-AID}_1]}{dt} = k_z[\text{mRNA-GFP}] - \frac{k_{cat}[\text{GFP-AID}][\text{TIR1}][\text{IAA}]}{\frac{k_{-A}}{k_A} \frac{k_{cat}}{k_G} + k_{-G}} - d_{protein}[\text{GFP-AID}]$$

$$\frac{d[\text{IAA}]}{dt} = p[\text{dIAA}] - \frac{k_{cat}[\text{IAA}][\text{TIR1}][\text{GFP-AID}]}{\frac{k_{-A}}{k_A} \frac{k_{cat}}{k_G} + k_{-G}} - d_{compound}[\text{IAA}]$$

$$\frac{d[\text{degGFP}]}{dt} = d_{protein}[\text{degGFP}] - \frac{k_{cat}[\text{IAA}][\text{TIR1}][\text{GFP-AID}]}{\frac{k_{-A}}{k_A} \frac{k_{cat}}{k_G} + k_{-G}}$$

$$\frac{d[\text{IAM-TIR1}]}{dt} = k_{IAM-TIR1}[\text{TIR1}] - \frac{k_{cat}[\text{IAA}][\text{TIR1}][\text{GFP-AID}]}{\frac{k_{-A}}{k_A} \frac{k_{cat}}{k_G} + k_{-G}}$$

**Parameter Table**

<b>Symbols</b>	<b>Parameters</b>	<b>Values</b>	<b>Units</b>
P <sub>r</sub>	Transcription rate for iaaM and iaaH	1	uM*min <sup>-1</sup>
d <sub>mRNA</sub>	Degradation rate of mRNA for IAAM and IAAH	0.017	min <sup>-1</sup>
K <sub>z</sub>	Translation rate constant for mRNA-IAAM and mRNA-IAAH	1	min <sup>-1</sup>
d <sub>protein</sub>	Degradation rate of IAAM and IAAH	0.0017	min <sup>-1</sup>
d <sub>compound</sub>	Degradation rate constant of compounds Trp, IAM and IAA	0.0013	min <sup>-1</sup>
k <sub>IAAM</sub>	Turnover number: the maximum number of Trp converted to IAM	0.2202	min <sup>-1</sup>
K <sub>m</sub> <sub>IAAM</sub>	Michaelis constant from Trp consumption to form IAM	50	uM
K <sub>i</sub> <sub>IAM</sub>	Enzyme inhibition equilibrium constant for IAM	7	uM
K <sub>i</sub> <sub>IAA</sub>	Enzyme inhibition equilibrium constant for IAM	225	uM
K <sub>IAAH</sub>	Turnover number, the maximum of IAM converted to IAA	0.2202	min <sup>-1</sup>
K <sub>m</sub> <sub>IAAH</sub>	Michaelis constant from IAM consumption to form IAA	80	uM
p	Permeability of plasma membrane for IAA	6*10 <sup>-5</sup>	cm*min <sup>-1</sup>
K <sub>IAM_TIR1</sub>	Translation rate constant for IAM_TIR1	1	min <sup>-1</sup>

**Reference:** <http://2012.igem.org/Team:Evry>