Table 1 Variables and parameters of the mathematical model

$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		Description		Value	Units
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	I	IPTG concentration			mM
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	G	Concentration of GFP protein			molecules per cell
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	L ^F	Free LacI molecules, i.e. not bound to operator sites or IPTG molecule			molecules per cell
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	L'	LacI molecules bound to IPTG			molecules per cell
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	M_{G}	mRNA molecules of GFP			molecules per cell
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	M _L	mRNA molecules of Laci			molecules per cell
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$D_{G/L}^F$	Free Repressor/Reporter plasmids			plasmids per cell
$\lambda_{G/L}$ Protein degradation rate 0.0214^9 min^{-1} $\lambda_{G/L}^{N}$ mRNA degradation rate $0.271 [39]$ min^{-1} α_G GFP rate of synthesis $540\lambda_G = 11.54[40]$ min^{-1} A_L Lacl rate of synthesis $\alpha_G/4 = 2.88$ min^{-1} α_G^M GFP transcription rate 0.56^{\dagger} min^{-1} α_L^M Lacl transcription rate $\alpha_G^M/1.23^{\circ} = 0.45$ min^{-1} K_x^L Equilibrium binding constant of the complex Lacl- O_X K_1^L $0.13 [41]$ molecules per cell K_x^L 1.63 [41]molecules per cell K_x^L 0.0394 † molecules per cell K_x^L 0.0394 † molecules per cell K_x^L 25336 † molecules per cell K_x^L 25336 † molecules per cell K_x^L 313 † molecules per cell K_x^L 313 † molecules per cell K_x^L 313 † molecules per cell K_x^L Equilibrium binding constant for the binding IPTG-Lacl0.2890 † mM K_x^L Equilibrium binding constant for the binding to the operator sequences0.02 [43]min K_x^L Time constant of Lacl binding to the operator sequences*min	$D_{G/L}^{L}$	Repressor/Reporter plasmids bound to LacI molecules			plasmids per cell
$\lambda_{G/L}$ Protein degradation rate 0.0214^9 min^{-1} $\lambda_{G/L}^{N}$ mRNA degradation rate $0.271 [39]$ min^{-1} α_G GFP rate of synthesis $540\lambda_G = 11.54[40]$ min^{-1} A_L Lacl rate of synthesis $\alpha_G/4 = 2.88$ min^{-1} α_G^M GFP transcription rate 0.56^{\dagger} min^{-1} α_L^M Lacl transcription rate $\alpha_G^M/1.23^{\circ} = 0.45$ min^{-1} K_x^L Equilibrium binding constant of the complex Lacl- O_X K_1^L $0.13 [41]$ molecules per cell K_x^L 1.63 [41]molecules per cell K_x^L 0.0394 † molecules per cell K_x^L 0.0394 † molecules per cell K_x^L 25336 † molecules per cell K_x^L 25336 † molecules per cell K_x^L 313 † molecules per cell K_x^L 313 † molecules per cell K_x^L 313 † molecules per cell K_x^L Equilibrium binding constant for the binding IPTG-Lacl0.2890 † mM K_x^L Equilibrium binding constant for the binding to the operator sequences0.02 [43]min K_x^L Time constant of Lacl binding to the operator sequences*min	$D_{G/L}^{I}$	Repressor/Reporter plasmids bound to induced LacI molecules			plasmids per cell
$\lambda_{G/L}$ Protein degradation rate 0.0214^9 min^{-1} $\lambda_{G/L}^{N}$ mRNA degradation rate $0.271 [39]$ min^{-1} α_G GFP rate of synthesis $540\lambda_G = 11.54[40]$ min^{-1} A_L Lacl rate of synthesis $\alpha_G/4 = 2.88$ min^{-1} α_G^M GFP transcription rate 0.56^{\dagger} min^{-1} α_L^M Lacl transcription rate $\alpha_G^M/1.23^{\circ} = 0.45$ min^{-1} K_x^L Equilibrium binding constant of the complex Lacl- O_X K_1^L $0.13 [41]$ molecules per cell K_x^L 1.63 [41]molecules per cell K_x^L 0.0394 † molecules per cell K_x^L 0.0394 † molecules per cell K_x^L 25336 † molecules per cell K_x^L 25336 † molecules per cell K_x^L 313 † molecules per cell K_x^L 313 † molecules per cell K_x^L 313 † molecules per cell K_x^L Equilibrium binding constant for the binding IPTG-Lacl0.2890 † mM K_x^L Equilibrium binding constant for the binding to the operator sequences0.02 [43]min K_x^L Time constant of Lacl binding to the operator sequences*min	D_G^0	Number of <i>Reporter</i> plasmids per cell		80	plasmids per cell
$\lambda_{G/L}$ Protein degradation rate 0.0214^9 min^{-1} $\lambda_{G/L}^{N}$ mRNA degradation rate $0.271 [39]$ min^{-1} α_G GFP rate of synthesis $540\lambda_G = 11.54[40]$ min^{-1} A_L Lacl rate of synthesis $\alpha_G/4 = 2.88$ min^{-1} α_G^M GFP transcription rate 0.56^{\dagger} min^{-1} α_L^M Lacl transcription rate $\alpha_G^M/1.23^{\circ} = 0.45$ min^{-1} K_x^L Equilibrium binding constant of the complex Lacl- O_X K_1^L $0.13 [41]$ molecules per cell K_x^L 1.63 [41]molecules per cell K_x^L 0.0394 † molecules per cell K_x^L 0.0394 † molecules per cell K_x^L 25336 † molecules per cell K_x^L 25336 † molecules per cell K_x^L 313 † molecules per cell K_x^L 313 † molecules per cell K_x^L 313 † molecules per cell K_x^L Equilibrium binding constant for the binding IPTG-Lacl0.2890 † mM K_x^L Equilibrium binding constant for the binding to the operator sequences0.02 [43]min K_x^L Time constant of Lacl binding to the operator sequences*min	D_L^0	Number of <i>Repressor</i> plasmids per cell		$D_G^0 / 3.75^{\circ} = 21.33$	plasmids per cell
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$\lambda_{G/L}$	Protein degradation rate		0.0214 [§]	min ⁻¹
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$\lambda_{G/L}^{M}$	mRNA degradation rate		0.271 [39]	min ⁻¹
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\alpha_{\scriptscriptstyle G}$	GFP rate of synthesis		$540\lambda_G = 11.54[40]$	min ⁻¹
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	A_L	LacI rate of synthesis		$\alpha_{G}/4 = 2.88$	min ⁻¹
$\frac{K_{x}^{L}}{K_{x}^{R}} = \frac{1.63 \text{ [41]}}{1.63 \text{ [41]}} = \frac{\text{molecules per cell}}{\text{molecules per cell}}$ $\frac{K_{x}^{L}}{K_{x}^{R}} = \frac{\text{Equilibrium binding constant for the binding of induced Lacl molecule}}{\text{to the operator sequence O}_{x}} = \frac{K_{x}^{L}}{K_{x}^{L}} = \frac{25336^{+}}{25336^{+}} = \frac{\text{molecules per cell}}{\text{molecules per cell}}$ $\frac{K_{x}^{L}}{K_{x}^{L}} = \frac{8}{313^{+}} = \frac{\text{molecules per cell}}{\text{molecules per cell}}$ $\frac{K^{L}}{K_{x}^{R}} = \frac{1336^{+}}{1313^{+}} = \frac{18688^{+}}{18688^{+}}$ $\frac{K^{L}}{K^{L}} = \frac{18688^{+}}{18688^{+}} = \frac{18688^{+}}{18688^{+}}$ $\frac{K^{L}}{K^{L}} = \frac{18688^{+}}{18688^{+}} = \frac{18688^{+}}{18688^{+}}$ $\frac{K^{L}}{K^{L}} = \frac{18688^{+}}{18688^{+}} = \frac{18688^{+}}{18688^{+}} = \frac{18688^{+}}{18688^{+}}$ $\frac{K^{L}}{K^{L}} = \frac{18688^{+}}{18688^{+}} = \frac$	α_G^M	GFP transcription rate		0.56 [†]	min ⁻¹
$\frac{K_{x}^{L}}{K_{x}^{R}} = \frac{1.63 \text{ [41]}}{1.63 \text{ [41]}} = \frac{\text{molecules per cell}}{\text{molecules per cell}}$ $\frac{K_{x}^{L}}{K_{x}^{R}} = \frac{\text{Equilibrium binding constant for the binding of induced Lacl molecule}}{\text{to the operator sequence O}_{x}} = \frac{K_{x}^{L}}{K_{x}^{L}} = \frac{25336^{+}}{25336^{+}} = \frac{\text{molecules per cell}}{\text{molecules per cell}}$ $\frac{K_{x}^{L}}{K_{x}^{L}} = \frac{8}{313^{+}} = \frac{\text{molecules per cell}}{\text{molecules per cell}}$ $\frac{K^{L}}{K_{x}^{R}} = \frac{1336^{+}}{1313^{+}} = \frac{18688^{+}}{18688^{+}}$ $\frac{K^{L}}{K^{L}} = \frac{18688^{+}}{18688^{+}} = \frac{18688^{+}}{18688^{+}}$ $\frac{K^{L}}{K^{L}} = \frac{18688^{+}}{18688^{+}} = \frac{18688^{+}}{18688^{+}}$ $\frac{K^{L}}{K^{L}} = \frac{18688^{+}}{18688^{+}} = \frac{18688^{+}}{18688^{+}} = \frac{18688^{+}}{18688^{+}}$ $\frac{K^{L}}{K^{L}} = \frac{18688^{+}}{18688^{+}} = \frac$	α_L^M	LacI transcription rate		$\alpha_G^M / 1.23^{\S} = 0.45$	min ⁻¹
$\frac{K_{x}^{L}}{K_{x}^{R}} = \frac{1.63 \text{ [41]}}{1.63 \text{ [41]}} = \frac{\text{molecules per cell}}{\text{molecules per cell}}$ $\frac{K_{x}^{L}}{K_{x}^{R}} = \frac{\text{Equilibrium binding constant for the binding of induced Lacl molecule}}{\text{to the operator sequence O}_{x}} = \frac{K_{x}^{L}}{K_{x}^{L}} = \frac{25336^{+}}{25336^{+}} = \frac{\text{molecules per cell}}{\text{molecules per cell}}$ $\frac{K_{x}^{L}}{K_{x}^{L}} = \frac{8}{313^{+}} = \frac{\text{molecules per cell}}{\text{molecules per cell}}$ $\frac{K^{L}}{K_{x}^{R}} = \frac{1336^{+}}{1313^{+}} = \frac{18688^{+}}{18688^{+}}$ $\frac{K^{L}}{K^{L}} = \frac{18688^{+}}{18688^{+}} = \frac{18688^{+}}{18688^{+}}$ $\frac{K^{L}}{K^{L}} = \frac{18688^{+}}{18688^{+}} = \frac{18688^{+}}{18688^{+}}$ $\frac{K^{L}}{K^{L}} = \frac{18688^{+}}{18688^{+}} = \frac{18688^{+}}{18688^{+}} = \frac{18688^{+}}{18688^{+}}$ $\frac{K^{L}}{K^{L}} = \frac{18688^{+}}{18688^{+}} = \frac$	K_x^L	Equilibrium binding constant of the complex LacI-O _x	K_1^L	0.13 [41]	molecules per cell
K_x^l Equilibrium binding constant for the binding of induced LacI molecule to the operator sequence O_x K_x^l Equilibrium binding constant for the binding of induced LacI molecule to the operator sequence O_x K_x^l 25336 † molecules per cell K_z^l ∞ molecules per cell K_z^l ∞ molecules per cell K_z^l ∞ molecules per cell ∞ ∞ ∞ ∞ molecules per cell ∞ ∞ ∞ ∞ ∞ molecules per cell ∞ ∞ ∞ ∞ ∞ ∞ molecules per cell ∞ ∞ ∞ ∞ molecules per cell ∞			K_2^L	1.63 [41]	molecules per cell
to the operator sequence O_x $\frac{K_2^I}{K_s^I} = \infty \qquad \text{molecules per cell}$ $K_s^I = 313^{\dagger} \qquad \text{molecules per cell}$ $K^I = \text{Equilibrium binding constant for the binding IPTG-Lacl} \qquad 0.2890^{\dagger} \qquad \text{mM}$ $N = \text{Cooperativity of the binding LacI-IPTG} \qquad 1.8688^{\dagger}$ $Time constant of LacI binding to the operator sequences \qquad 0.02 [43] \qquad \text{min}$ $T^{DI} = \text{Constant of induced-LacI binding to the operator sequences} \qquad * \qquad \text{min}$				0.0394 [†]	molecules per cell
K^{I} 313^{\dagger} molecules per cell K^{I} Equilibrium binding constant for the binding IPTG-Lacl 0.2890^{\dagger} mM n Cooperativity of the binding LacI-IPTG 1.8688^{\dagger} t^{II} Time constant of LacI binding to the operator sequences 0.02 [43] min t^{II} Time constant of induced-LacI binding to the operator sequences * min	K_x^I		K_1^I	25336 [†]	molecules per cell
K^I_s 313^{\dagger} molecules per cell K^I_s Equilibrium binding constant for the binding IPTG-Lacl 0.2890^{\dagger} mM I_s Cooperativity of the binding LacI-IPTG 1.8688^{\dagger} I_s Time constant of LacI binding to the operator sequences 0.02 [43] min I_s Time constant of induced-LacI binding to the operator sequences * min			K_2^I	∞	molecules per cell
Cooperativity of the binding LacI-IPTG 1.8688^{\dagger} Time constant of LacI binding to the operator sequences 0.02 [43] min Time constant of induced-LacI binding to the operator sequences * min			K_s^I	313 [†]	molecules per cell
Time constant of LacI binding to the operator sequences 0.02 [43] min t^{DI} Time constant of induced-LacI binding to the operator sequences * min	K ^{LI}	Equilibrium binding constant for the binding IPTG-LacI		0.2890 [†]	mM
Time constant of induced-Lacl binding to the operator sequences * min	n	Cooperativity of the binding LacI-IPTG		1.8688 [†]	
and the second of the second o	τ^{LI}	Time constant of LacI binding to the operator sequences		0.02 [43]	min
$ au^{DL}$ Time constant of the binding LacHPTG * min	τ^{DI}	Time constant of induced-Lacl binding to the operator sequences		*	min
	τ^{DL}	Time constant of the binding LacI-IPTG		*	min

^{*} Only the steady-state behaviors of the gene circuits are analyzed, thus arbitrary values can be used for these time constants. †Values defined through the fitting procedure. 5Values obtained by experimental measurements. References are included for the values retrieved from the literature.