

Comparator Rxn Network Model: Try #1

Sketched Network Reactions:

LAMCI DNA w/ TetR promoter \rightarrow LAMCI mRNA \rightarrow LAMCI repressor protein

*Repressed by TetR protein (constitutively produced in DH5alphaPro)

p22 mnt DNA w/ LacI promoter \rightarrow p22 mnt mRNA \rightarrow p22 mnt repressor protein

*Repressed by LacI protein (constitutively produced in DH5alphaPro)

GFP DNA w/ LAMCI:LacI promoter \rightarrow GFP mRNA \rightarrow GFP reporter protein

*Doubly repressed by LAMCI and LacI

YFP DNA w/ p22mnt:TetR promoter \rightarrow YFP mRNA \rightarrow YFP reporter protein

*Doubly repressed by p22 mnt and TetR

Single Network Elements:

1. LAMcI DNA \rightarrow LAMcI protein

Name	Reaction	K	Source
1	$\text{RNAP} + \text{tetO1} + \text{tetO2} \rightarrow \text{RNAP:tetP}$	8.6e5	2
2	$\text{RNAP:tetP} \rightarrow \text{RNAP:tetP}^*$	0.13	2
3	$\text{RNAP:tetP} \rightarrow \text{RNAP} + \text{tetO1} + \text{tetO2}$	.1	2
4	$\text{RNAP:tetP}^* \rightarrow \text{RNAP:LAMcI_DNA} + \text{tetO1} + \text{tetO2}$	30 nt/s	2
5	$\text{RNAP:LAMcI_DNA} \rightarrow \text{RNAP} + \text{LAMcI_mRNA}$	30 nt/s, 708 nt	2
6	$\text{LAMcI_mRNA} + \text{rib} \rightarrow \text{rib:LAMcI_mRNA}$	1.0e5	2
7	$\text{rib:LAMcI_mRNA} \rightarrow \text{rib:LAMcI_mRNA_1} + \text{LAMcI_mRNA}$	33 aa/s	2
8	$\text{rib:LAMcI_mRNA_1} \rightarrow \text{rib} + \text{LAMcI}$	33 aa/s, 236 aa	2
Repression at tetO1			
9	$\text{tetR} + \text{aTc} \rightarrow \text{tetR:aTc}$	100000000	1
10	$\text{tetR:aTc} \rightarrow \text{tetR} + \text{aTc}$	0.001	1
11	$\text{tetR:aTc} + \text{aTc} \rightarrow \text{tetR:aTc2}$	100000000	1
12	$\text{tetR:aTc2} \rightarrow \text{tetR:aTc} + \text{aTc}$	0.001	1
13	$\text{tetR} + \text{tetO1} \rightarrow \text{tetR:tetO1}$	100000000	1
14	$\text{tetR:tetO1} \rightarrow \text{tetR} + \text{tetO1}$	.001	1
15	$\text{tetR:aTc} + \text{tetO1} \rightarrow \text{tetR:tetO1:aTc}$	100000000	1
16	$\text{tetR:tetO1:aTc} \rightarrow \text{tetR:aTc} + \text{tetO1}$	1	1
17	$\text{tetR:aTc2} + \text{tetO1} \rightarrow \text{tetR:tetO1:aTc2}$	100000000	1
18	$\text{tetR:tetO1:aTc2} \rightarrow \text{tetR:aTc2} + \text{tetO1}$	100000	1
19	$\text{tetR:tetO1} + \text{aTc} \rightarrow \text{tetR:tetO1:aTc}$	100000000	1
20	$\text{tetR:tetO1:aTc} \rightarrow \text{tetR:tetO1} + \text{aTc}$	.001	1
21	$\text{tetR:tetO1:aTc} + \text{aTc} \rightarrow \text{tetR:tetO1:aTc2}$	100000000	1
22	$\text{tetR:tetO1:aTc2} \rightarrow \text{tetR:tetO1:aTc} + \text{aTc}$	.001	1
Repression at tetO2			
23	$\text{tetR} + \text{tetO2} \rightarrow \text{tetR:tetO2}$	100000000	1
24	$\text{tetR:tetO2} \rightarrow \text{tetR} + \text{tetO2}$	.001	1

25	tetR:aTc + tetO2 → tetR:tetO2:aTc	100000000	1
26	tetR:tetO2:aTc → tetR:aTc + tetO2	1	1
27	tetR:aTc2 + tetO2 → tetR:tetO2:aTc2	100000000	1
28	tetR:tetO2:aTc2 → tetR:aTc2 + tetO2	100000	1
29	tetR:tetO2 + aTc → tetR:tetO2:aTc	100000000	1
30	tetR:tetO2:aTc → tetR:tetO2 + aTc	.001	1
31	tetR:tetO2:aTc + aTc → tetR:tetO2:aTc2	100000000	1
32	tetR:tetO2:aTc2 → tetR:tetO2:aTc + aTc	.001	1

2. p22 mnt DNA → p22 mnt Protein

Name	Reaction	K	Source
33	RNAP + lacO1 → RNAP:lacP	2e6	2
34	RNAP:lacP → RNAP:lacP*	.01	2
35	RNAP:lacP → RNAP + lacO1	.06	2
36	RNAP:lacP* → RNAP:p22mnt_DNA + lacO1	30 nt/s	2
37	RNAP:p22mnt_DNA → RNAP + p22mnt_mRNA	30 nt/s, 249 nt	2
38	p22mnt_mRNA + rib → rib:p22mnt_mRNA	1.0e5	2
39	rib:p22mnt_mRNA → rib:p22mnt_mRNA_1 + p22mnt_mRNA	33 aa/s	2
40	rib:p22mnt_mRNA_1 → rib + p22mnt	33 aa/s, 83 aa	2
Repression at LacO1			
41	lacI + lacO1 → lacI:lacO1	2E+09	1
42	lacI:lacO1 → lacI + lacO1	4.00E-04	1
43	lacI + IPTG → lacI:IPTG	4.60E+06	1
44	lacI:IPTG → lacI + IPTG	0.2	1
45	lacI:lacO1 + IPTG → lacI:lacO1:IPTG	1.00E+06	1
46	lacI:lacO1:IPTG → lacI:lacO1 + IPTG	0.8	1
47	lacI:IPTG + lacO1 → lacI:lacO1:IPTG	2E+09	1
48	lacI:lacO1:IPTG → lacI:IPTG + lacO1	0.4	1

3. GFP DNA → GFP Protein (E- Reporter)

Name	Reaction	K	Source
49	RNAP + LAMO1 + LAMO2 + lacO2_1 → RNAP:LAM/lacP	1e6	2
50	RNAP:LAM/lacP → RNAP:LAM/lacP*	.075	2
51	RNAP:LAM/lacP → RNAP + LAMO1 + LAMO2 + lacO2_1	.075	2
52	RNAP:LAM/lacP* → RNAP:GFP_DNA + LAMO1 + LAMO2 + lacO2_1	30 nt/s	2
53	RNAP:GFP_DNA → RNAP + GFP_mRNA	30 nt/s, 720 nt	2
54	GFP_mRNA + rib → rib:GFP_mRNA	1.0e5	2
55	rib:GFP_mRNA → rib:GFP_mRNA_1 + GFP_mRNA	33 aa/s	2
56	rib:GFP_mRNA_1 → rib + GFP	33 aa/s, 240 aa	2
Repression at LAMO1			

57	LAMcI + LAMO1 \rightarrow LAMcI:LAMO1	1.2e7	Vershon
58	LAMcI:LAMO1 \rightarrow LAMcI + LAMO1	2.4e-4	Vershon
Repression at LAMO2			
59	LAMcI + LAMO2 \rightarrow LAMcI:LAMO2	1.2e7	Vershon
60	LAMcI:LAMO2 \rightarrow LAMcI + LAMO2	2.4e-4	Vershon
Repression at lacO2_1			
61	lacI + lacO2_1 \rightarrow lacI:lacO2_1	2E+09	1
62	lacI:lacO2_1 \rightarrow lacI + lacO2_1	4.00E-04	1
63	lacI + IPTG \rightarrow lacI:IPTG	4.60E+06	1
64	lacI:IPTG \rightarrow lacI + IPTG	0.2	1
65	lacI:lacO2_1 + IPTG \rightarrow lacI:lacO2_1:IPTG	1.00E+06	1
66	lacI:lacO2_1:IPTG \rightarrow lacI:lacO2_1 + IPTG	0.8	1
67	lacI:IPTG + lacO2_1 \rightarrow lacI:lacO2_1:IPTG	2E+09	1
68	lacI:lacO2_1:IPTG \rightarrow lacI:IPTG + lacO2_1	0.4	1

4. RFP DNA \rightarrow RFP Protein (E+ reporter)

Name	Reaction	K	Source
69	RNAP + tetO2_1 + p22O1 \rightarrow RNAP:p22/tetP	1e6	2
70	RNAP:p22/tetP \rightarrow RNAP:p22/tetP*	.075	2
71	RNAP:p22/tetP \rightarrow RNAP + tetO2_1 + p22O1	.075	2
72	RNAP:p22/tetP* \rightarrow RNAP:RFP_DNA + tetO2_1 + p22O1	30 nt/s	2
73	RNAP:RFP_DNA \rightarrow RNAP + RFP_mRNA	30 nt/s, 711 nt	2
74	RFP_mRNA + rib \rightarrow rib:RFP_mRNA	1.0e5	2
75	rib:RFP_mRNA \rightarrow rib:RFP_mRNA_1 + RFP_mRNA	33 aa/s	2
76	rib:RFP_mRNA_1 \rightarrow rib + RFP	33 aa/s, 237 aa	2
Repression at tetO2_1			
77	tetR + aTc \rightarrow tetR:aTc	100000000	1
78	tetR:aTc \rightarrow tetR + aTc	0.001	1
79	tetR:aTc + aTc \rightarrow tetR:aTc2	100000000	1
80	tetR:aTc2 \rightarrow tetR:aTc + aTc	0.001	1
81	tetR + tetO2_1 \rightarrow tetR:tetO2_1	100000000	1
82	tetR:tetO2_1 \rightarrow tetR + tetO2_1	.001	1
83	tetR:aTc + tetO2_1 \rightarrow tetR:tetO2_1:aTc	100000000	1
84	tetR:tetO2_1:aTc \rightarrow tetR:aTc + tetO2_1	1	1
85	tetR:aTc2 + tetO2_1 \rightarrow tetR:tetO2_1:aTc2	100000000	1
86	tetR:tetO2_1:aTc2 \rightarrow tetR:aTc2 + tetO2_1	100000	1
87	tetR:tetO2_1 + aTc \rightarrow tetR:tetO2_1:aTc	100000000	1
88	tetR:tetO2_1:aTc \rightarrow tetR:tetO2_1 + aTc	.001	1
89	tetR:tetO2_1:aTc + aTc \rightarrow tetR:tetO2_1:aTc2	100000000	1
90	tetR:tetO2_1:aTc2 \rightarrow tetR:tetO2_1:aTc + aTc	.001	1
Repression at p22O1			
91	p22mnt + p22O1 \rightarrow p22mnt:p22O1	1.2e7	Vershon
92	p22mnt:p22O1 \rightarrow p22mnt + p22O1	2.4e-4	Vershon

6. Degradation

Name	Reaction	K	Source
93	LAMcI_mRNA →	2.0e-03	2
94	p22mnt_mRNA →	2.0e-03	1
95	GFP_mRNA →	1.16e-03	1
96	RFP_mRNA →	1.16e-03	1
97	GFP →	3.21E-05	1
98	RFP →	3.21E-05	1
99	LAMcI →	3e-04	2
100	p22mnt →	3e-04	2