

Comparator Rxn Network Model: Try #1

Sketched Network Reactions:

λ CI DNA w/ TetR promoter \rightarrow λ CI mRNA \rightarrow λ CI 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/ λ CI:LacI promoter \rightarrow GFP mRNA \rightarrow GFP reporter protein

*Doubly repressed by λ CI 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. λ CI DNA \rightarrow λ CI protein

Name	Reaction	K	Source
1	RNAp + tetR2P:tetR2O1:tetR2O2 \rightarrow RNAp:tetR2P:tetR2O1:tetR2O2	8.6e5	2
2	RNAp:tetR2P \rightarrow RNAp:tetR2P*	0.13	2
3	RNAp:tetR2P:tetR2O1:tetR2O2 \rightarrow RNAp + tetR2P:tetR2O1:tetR2O2	.1	2
4	RNAp:tetR2P* \rightarrow RNAp: λ CIcodeDNA + tetR2P:tetR2O1:tetR2O2	30 nt/s	2
5	RNAp: λ CIcodeDNA \rightarrow RNAp + λ CI_mRNA_RBS	30 nt/s, 708 nt	2
6	λ CI mRNA_RBS + rib \rightarrow rib: λ CI mRNA_RBS	1.0e5	2
7	rib: λ CI mRNA_RBS \rightarrow rib: λ CI mRNA_1 + λ CI mRNA_RBS	33 aa/s	2
8	rib: λ CI mRNA_1 \rightarrow rib + λ CI	33 aa/s, 236 aa	2
Repression at O1			
9	tetR2 + aTc \rightarrow tetR2:aTc	100000000	1
10	tetR2:aTc \rightarrow tetR2 + aTc	0.001	1
11	tetR2:aTc + aTc \rightarrow tetR2:aTc2	100000000	1
12	tetR2:aTc2 \rightarrow tetR2:aTc + aTc	0.001	1
13	tetR2 + tetO1 \rightarrow tetR2:tetO1	100000000	1
14	tetR2:tetO1 \rightarrow tetR2 tetO1	.001	1
15	tetR2:aTc + tetO1 \rightarrow tetR2:tetO1:aTc	100000000	1
16	tetR2:tetO1:aTc \rightarrow tetR2:aTc + tetO1	1	1
17	tetR2:aTc2 + tetO1 \rightarrow tetR2:tetO1:aTc2	100000000	1
18	tetR2:tetO1:aTc2 \rightarrow tetR2:aTc2 + tetO1	100000	1
19	tetR2:tetO1 + aTc \rightarrow tetR2:tetO1:aTc	100000000	1
20	tetR2:tetO1:aTc \rightarrow tetR2:tetO1 + aTc	.001	1
21	tetR2:tetO1:aTc + aTc \rightarrow tetR2:tetO1:aTc2	100000000	1
22	tetR2:tetO1:aTc2 \rightarrow tetR2:tetO1:aTc + aTc	.001	1

Repression at O2			
23	tetR2 + tetO2 → tetR2:tetO2	100000000	1
24	tetR2:tetO2 → tetR2 tetO2	.001	1
25	tetR2:aTc + tetO2 → tetR2:tetO2:aTc	100000000	1
26	tetR2:tetO2:aTc → tetR2:aTc + tetO2	1	1
27	tetR2:aTc2 + tetO2 → tetR2:tetO2:aTc2	100000000	1
28	tetR2:tetO2:aTc2 → tetR2:aTc2 + tetO2	100000	1
29	tetR2:tetO2 + aTc → tetR2:tetO2:aTc	100000000	1
30	tetR2:tetO2:aTc → tetR2:tetO2 + aTc	.001	1
31	tetR2:tetO2:aTc + aTc → tetR2:tetO2:aTc2	100000000	1
32	tetR2:tetO2:aTc2 → tetR2:tetO2:aTc + aTc	.001	1

2. p22 mnt DNA → p22 mnt Protein

Name	Reaction	K	Source
33	RNAp + lacIP:lacIO1 → RNAp:lacIP:lacIO1	2e6	2
34	RNAp:lacIP → RNAp:lacIP*	.01	2
35	RNAp:lacIP:lacIO1 → RNAp + lacIP:lacIO1	.06	2
36	RNAp:lacIP* → RNAp: p22mnt_codeDNA + lacIP:lacIO1	30 nt/s	2
37	RNAp: p22mnt_codeDNA → RNAp + p22mnt_mRNA_RBS	30 nt/s, 249 nt	2
38	p22mnt_mRNA_RBS + rib → rib: p22mnt_mRNA_RBS	1.0e5	2
39	rib: p22mnt_mRNA_RBS → rib: p22mnt_mRNA_1 + p22mnt_mRNA_RBS	33 aa/s	2
40	rib: p22mnt_mRNA_1 → rib + p22mnt	33 aa/s, 83 aa	2
Repression at LacO1			
41	lacI4 + lacO1 → lacI4:lacO1	2E+09	1
42	lacI4:lacO1 → lacI4 + lacO1	4.00E-04	1
43	lacI4 + IPTG → lacI4:IPTG	4.60E+06	1
44	lacI4:IPTG → lacI4 + IPTG	0.2	1
45	lacI4:lacO1 + IPTG → lacI4:lacO1:IPTG	1.00E+06	1
46	lacI4:lacO1:IPTG → lacI4:lacO1 + IPTG	0.8	1
47	lacI4:IPTG + lacO1 → lacI4:lacO1:IPTG	2E+09	1
48	lacI4:lacO1:IPTG → lacI4:IPTG + lacO1	0.4	1

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

Name	Reaction	K	Source
49	RNAp + λcI/LacIP: λcIO1: λcIO2:lacIO1_1 → RNAp:λcI/LacIP: λcIO1:λcIO2:lacIO1_1	1e6	2
50	RNAp: λcI/lacIP → RNAp: λcI/lacIP*	.075	2
51	RNAp:λcI/LacIP:λcIO1:λcIO2:lacIO1_1 → RNAp + λcI/LacIP: λcIO1:λcIO2:lacIO1_1	.075	2
52	RNAp: λcI/lacIP* → RNAp:GFP_codeDNA + λcI/LacIP: λcIO1: λcIO2:lacIO1_1	30 nt/s	2
53	RNAp:GFP_codeDNA → RNAp + GFP_mRNA_RBS	30 nt/s,	2

		720 nt	
54	GFP_mRNA_RBS + rib → rib:GFP_mRNA_RBS	1.0e5	2
55	rib:GFP_mRNA_RBS → rib:GFP_mRNA_1 + GFP_mRNA_RBS	33 aa/s	2
56	rib:GFP_mRNA_1 → rib + GFP	33 aa/s, 240 aa	2
Repression at λcI01			
57	λcI2 + λcI01 → λcI2: λcI01	1.2e7	Vershon
58	λcI2: λcI01 → λcI2 + λcI01	2.4e-4	Vershon
Repression at λcI02			
59	λcI2 + λcI02 → λcI2: λcI02	1.2e7	Vershon
60	λcI2: λcI02 → λcI2 + λcI02	2.4e-4	Vershon
Repression at lacI01 2			
61	lacI4 + lacO1_2 → lacI4: lacO1_2	2E+09	1
62	lacI4: lacO1_2 → lacI4 + lacO1_2	4.00E-04	1
63	lacI4 + IPTG → lacI4: IPTG	4.60E+06	1
64	lacI4: IPTG → lacI4 + IPTG	0.2	1
65	lacI4: lacO1_2 + IPTG → lacI4: lacO1_2: IPTG	1.00E+06	1
66	lacI4: lacO1_2: IPTG → lacI4: lacO1_2 + IPTG	0.8	1
67	lacI4: IPTG + lacO1_2 → lacI4: lacO1_2: IPTG	2E+09	1
68	lacI4: lacO1_2: IPTG → lacI4: IPTG + lacO1_2	0.4	1

4. RFP DNA → RFP Protein (E+ reporter)

Name	Reaction	K	Source
69	RNAp + p22mnt/tetRP: tetRO1: p22mntO1 → RNAp: p22mnt/ tetRP: tetRO1: p22mntO1	1e6	2
70	RNAp: p22mnt/ tetRP → RNAp: p22mnt/ tetRP *	.075	2
71	RNAp: p22mnt/ tetRP: tetRO1: p22mntO1 → RNAp + p22mnt/ tetRP: tetRO1: p22mntO1	.075	2
72	RNAp: p22mnt/ tetRP * → RNAp: RFP_codeDNA + p22mnt/ tetRP: tetRO1: p22mntO1	30 nt/s	2
73	RNAp: RFP_codeDNA → RNAp + RFP_mRNA_RBS	30 nt/s, 711 nt	2
74	RFP_mRNA_RBS + rib → rib: RFP_mRNA_RBS	1.0e5	2
75	rib: RFP_mRNA_RBS → rib: RFP_mRNA_1 + RFP_mRNA_RBS	33 aa/s	2
76	rib: RFP_mRNA_1 → rib + RFP	33 aa/s, 237 aa	2
Repression at tetRO1 2			
77	tetR2 + aTc → tetR2: aTc	10000000 0	1
78	tetR2: aTc → tetR2 + aTc	0.001	1

79	$\text{tetR2:aTc} + \text{aTc} \rightarrow \text{tetR2:aTc}_2$	10000000 0	1
80	$\text{tetR2:aTc}_2 \rightarrow \text{tetR2:aTc} + \text{aTc}$	0.001	1
81	$\text{tetR2} + \text{tetO1_2} \rightarrow \text{tetR2:tetO1_2}$	10000000 0	1
82	$\text{tetR2:tetO1_2} \rightarrow \text{tetR2 tetO1_2}$.001	1
83	$\text{tetR2:aTc} + \text{tetO1_2} \rightarrow \text{tetR2:tetO1_2:aTc}$	10000000 0	1
84	$\text{tetR2:tetO1_2:aTc} \rightarrow \text{tetR2:aTc} + \text{tetO1_2}$	1	1
85	$\text{tetR2:aTc}_2 + \text{tetO1_2} \rightarrow \text{tetR2:tetO1_2:aTc}_2$	10000000 0	1
86	$\text{tetR2:tetO1_2:aTc}_2 \rightarrow \text{tetR2:aTc}_2 + \text{tetO1_2}$	100000	1
87	$\text{tetR2:tetO1_2} + \text{aTc} \rightarrow \text{tetR2:tetO1_2:aTc}$	10000000 0	1
88	$\text{tetR2:tetO1_2:aTc} \rightarrow \text{tetR2:tetO1_2} + \text{aTc}$.001	1
89	$\text{tetR2:tetO1_2:aTc} + \text{aTc} \rightarrow \text{tetR2:tetO1_2:aTc}_2$	10000000 0	1
90	$\text{tetR2:tetO1_2:aTc}_2 \rightarrow \text{tetR2:tetO1_2:aTc} + \text{aTc}$.001	1
Repression at p22mntO1			
91	$\text{p22mnt2} + \text{p22mntO1} \rightarrow \text{p22mnt2:p22mntO1}$	1.2e7	Vershon
92	$\text{p22mnt2:p22mntO1} \rightarrow \text{p22mnt2} + \text{p22mntO1}$	2.4e-4	Vershon

5. Dimerization

Name	Reaction	K	Source
Dimerization of λcI			
X	$2 \lambda\text{cI} \rightarrow \lambda\text{cI}_2$	1.0e9X?	2
X	$\lambda\text{cI}_2 \rightarrow 2 \lambda\text{cI}$	10X?	2
Dimerization of p22 mnt			
X	$2 \text{p22mnt} \rightarrow \text{p22mnt}_2$	1.0e9 X?	2
X	$\text{p22mnt}_2 \rightarrow 2 \text{p22mnt}$	10 X?	2

6. Degradation

Name	Reaction	K	Source
93	$\lambda\text{cI mRNA} \rightarrow$	2.0e-03	2
94	$\text{p22mnt mRNA} \rightarrow$	2.0e-03	1
95	$\text{GFP mRNA} \rightarrow$	1.16e-03	1
96	$\text{RFP mRNA} \rightarrow$	1.16e-03	1
97			
X	$\lambda\text{cI} \rightarrow$	X?	
X	$\text{p22mnt} \rightarrow$	X?	
98	$\text{GFP} \rightarrow$	3.21E-05	1
99	$\text{RFP} \rightarrow$	3.21E-05	1
100	$\lambda\text{cI}_2 \rightarrow$	3e-04	2
101	$\text{p22mnt}_2 \rightarrow$	3e-04	2

