Comparator Rxn Network Model: Try #1

Sketched Network Reactions:
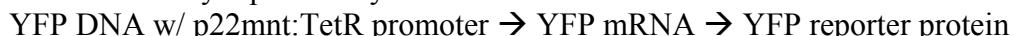
λCI DNA w/ TetR promoter → λCI mRNA → λCI repressor protein
    *Repressed by TetR protein (constitutively produced in DH5alphaPro)
p22 mnt DNA w/ LacI promoter → p22 mnt mRNA → p22 mnt repressor protein
    *Repressed by LacI protein (constitutively produced in DH5alphaPro)
GFP DNA w/ λCI:LacI promoter → GFP mRNA → GFP reporter protein
    *Doubly repressed by λCI and LacI
YFP DNA w/ p22mnt:TetR promoter → YFP mRNA → YFP reporter protein
    *Doubly repressed by p22 mnt and TetR
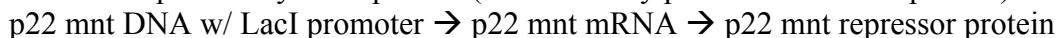
Single Network Elements:

1. λCI DNA → λCI protein

Name	Reaction	K	Source
1	RNAp + tetR2P:tetR2O1:tetR2O2 → RNAp:tetR2P: tetR2O1:tetR2O2	8.6e5	2
2	RNAp:tetR2P → RNAp:tetR2P*	0.13	2
3	RNAp:tetR2P:tetR2O1:tetR2O2 → RNAp + tetR2P:tetR2O1:tetR2O2	.1	2
4	RNAp:tetR2P* → RNAp: λcIcodeDNA + tetR2P:tetR2O1:tetR2O2	30 nt/s	2
5	RNAp: λcIcodeDNA → RNAp + λcI_mRNA	30 nt/s, 708 nt	2
6	λcI_mRNA_RBS + rib → rib: λcI_mRNA_RBS	1.0e5	2
7	rib: λcI_mRNA_RBS → rib: λcI_mRNA_1 + RBS	33 aa/s	2
8	rib: λcI_mRNA_1 → rib + λcI + **DλcI**	33 aa/s, 236 aa	2
	Repression at O1		
9	tetR2 +aTc → tetR2:aTc	100000000	1
10	tetR2:aTc → tetR2 +aTc	0.001	1
11	tetR2:aTc + aTc → tetR2:aTc2	100000000	1
12	tetR2:aTc2 → tetR2:aTc + aTc	0.001	1
13	tetR2 + tetO1 → tetR2:tetO1	100000000	1
14	tetR2:tetO1 → tetR2 tetO1	.001	1
15	tetR2:aTc + tetO1 → tetR2:tetO1:aTc	100000000	1
16	tetR2:tetO1:aTc → tetR2:aTc + tetO1	1	1
17	tetR2:aTc2 + tetO1 → tetR2:tetO1:aTc2	100000000	1
18	tetR2:tetO1:aTc2 → tetR2:aTc2 + tetO1	100000	1
19	tetR2:tetO1 + aTc → tetR2:tetO1:aTc	100000000	1
20	tetR2:tetO1:aTc → tetR2:tetO1 + aTc	.001	1
21	tetR2:tetO1:aTc + aTc → tetR2:tetO1:aTc2	100000000	1
22	tetR2:tetO1:aTc2 → 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	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 + RBS	33 aa/s	2
40	rib: p22mnt_mRNA_1 → rib + p22mnt + **Dp22mnt**	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	30 nt/s, 720 nt	2

54	GFP_mRNA_RBS + rib → rib:GFP_mRNA_RBS	1.0e5	2
55	rib:GFP_mRNA_RBS → rib:GFP_mRNA_1 + RBS	33 aa/s	2
56	rib:GFP_mRNA_1 → rib + GFP + **DGFP**	33 aa/s, 240 aa	2
	Repression at λcIO1		
57	λcI2 + λcIO1 → λcI2: λcIO1	1.2e7	Vershon
58	λcI2: λcIO1 → λcI2 + λcIO1	2.4e-4	Vershon
	Repression at λcIO2		
59	λcI2 + λcIO2 → λcI2: λcIO2	1.2e7	Vershon
60	λcI2: λcIO2 → λcI2 + λcIO2	2.4e-4	Vershon
	Repression at lacIO1_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	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 + RBS	33 aa/s	2
76	rib:RFP_mRNA_1 → rib + RFP + **DRFP**	33 aa/s, 237 aa	2
	Repression at tetRO1_2		
77	tetR2 +aTc → tetR2:aTc	100000000	1
78	tetR2:aTc → tetR2 +aTc	0.001	1
79	tetR2:aTc + aTc → tetR2:aTc2	100000000	1
80	tetR2:aTc2 → tetR2:aTc + aTc	0.001	1

81	tetR2 + tetO1_2 → tetR2:tetO1_2	100000000	1
82	tetR2:tetO1_2 → tetR2 tetO1_2	.001	1
83	tetR2:aTc + tetO1_2 → tetR2:tetO1_2:aTc	100000000	1
84	tetR2:tetO1_2:aTc → tetR2:aTc + tetO1_2	1	1
85	tetR2:aTc2 + tetO1_2 → tetR2:tetO1_2:aTc2	100000000	1
86	tetR2:tetO1_2:aTc2 → tetR2:aTc2 + tetO1_2	100000	1
87	tetR2:tetO1_2 + aTc → tetR2:tetO1_2:aTc	100000000	1
88	tetR2:tetO1_2:aTc → tetR2:tetO1_2 + aTc	.001	1
89	tetR2:tetO1_2:aTc + aTc → tetR2:tetO1_2:aTc2	100000000	1
90	tetR2:tetO1_2:aTc2 → tetR2:tetO1_2:aTc + aTc	.001	1
	Repression at p22mntO1		
91	p22mnt2 + p22mntO1 → p22mnt2:p22mntO1	1.2e7	Vershon
92	p22mnt2:p22mntO1 → p22mnt2 + p22mntO1	2.4e-4	Vershon

5. Dimerization

Name	Reaction	K	Source
	Dimerization of λcI		
X	2 λcI → λcI2	1.0e9X?	2
X	λcI2 → 2 λcI	10X?	2
	Dimerization of p22 mnt		
X	2 p22mnt → p22mnt2	1.0e9 X?	2
X	p22mnt2 → 2 p22mnt	10 X?	2

6. Degradation

Name	Reaction	K	Source
93	λcI_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			
X	λcI →	X?	
X	p22mnt →	X?	
98	GFP →	3.21E-05	1
99	RFP →	3.21E-05	1
100	λcI2 →	3e-04	2
101	p22mnt2 →	3e-04	2