Examples of FM/TBM target analysis

Jimin Pei

Summary

- Poor-quality regions: N- and C-terminal regions.
- Poor-quality regions: loops and regions near flexible segments.
- Group 427 has overall better quality than other methods for many FM targets.
- Group 427 fixed poor-quality regions by other programs.
- Group 427 underperformed in only a couple of targets (T1029 and T1047s2_D3).

Local Accuracy plot of models (CASP14 accessor website)

Model-Target CA-CA distances

(0; 1)	(1; 2)	(2; 4)	(4; 8)	>8	N/A

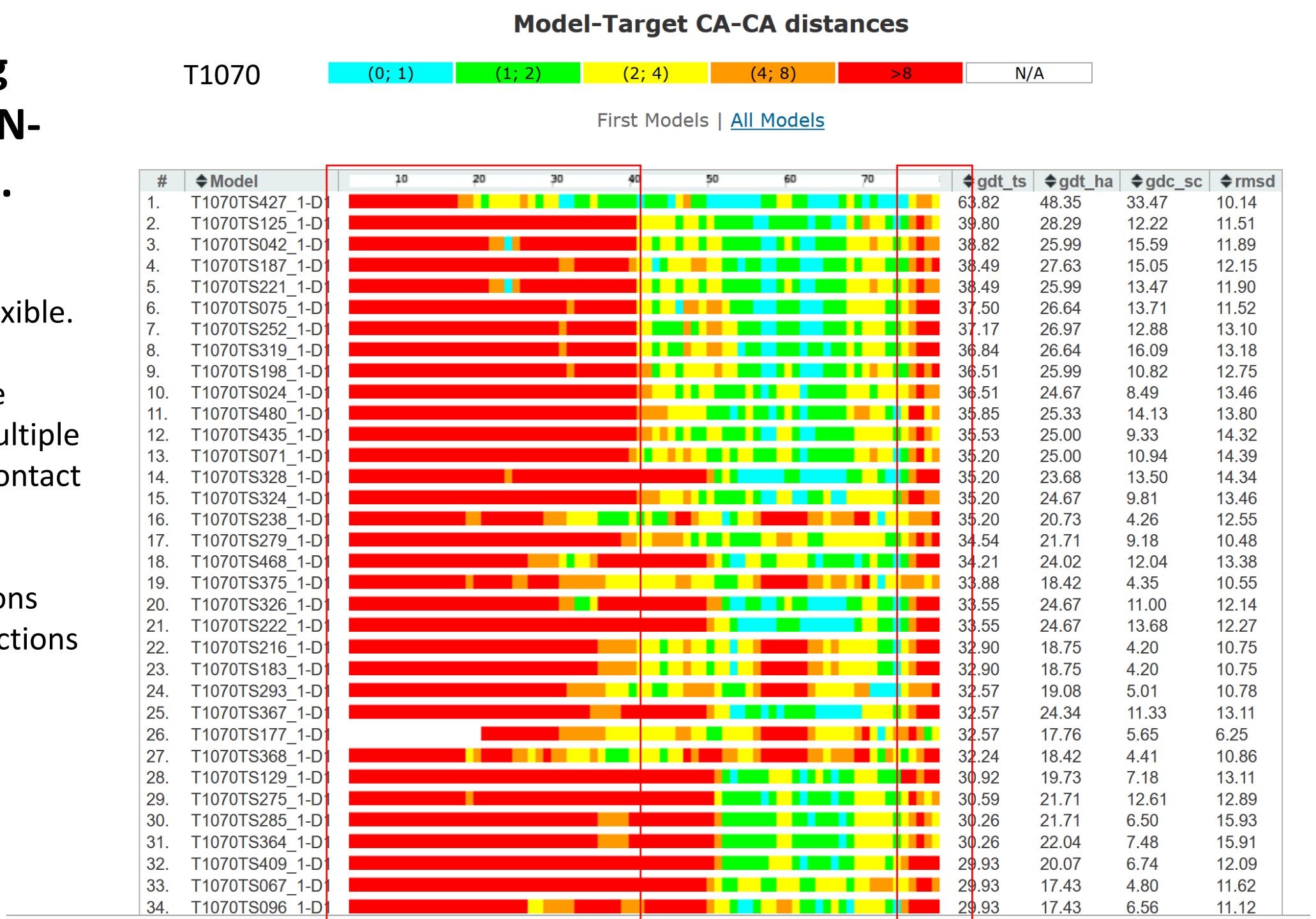
First Models | All Models

#	Model	10 20 30 40 50 60 70 80 90 100 110 120	gdt_ts	gdt_ha	gdc_sc	rmsd
1.	T1029TS364_1-D1		45.80	27.20	11.20	6.72
2.	T1029TS071_1-D1		45.80	27.80	11.23	7.39
3.	T1029TS427_1-D1		44.60	25.60	8.11	7.12
4.	T1029TS460_1-D1		44.00	24.60	7.84	6.59
5.	T1029TS192_1-D1		43.80	24.80	9.31	6.25
6.	T1029TS342_1-D1		43.60	24.40	8.72	6.20
7.	T1029TS026_1-D1		43.60	24.80	8.47	6.83
8.	T1029TS339_1-D1		43.60	24.80	8.69	6.83
9.	T1029TS209_1-D1		43.60	24.80	8.69	6.83
10.	T1029TS061_1-D1		43.40	24.40	11.31	6.22
11.	T1029TS448_1-D1		43.40	24.40	8.75	6.27
12.	T1029TS288_1-D1		43.40	24.40	8.84	6.47
13.	T1029TS377_1-D1		43.20	24.60	8.82	6.82
14.	T1029TS250_1-D1		43.00	24.00	9.11	6.57
15.	T1029TS488_1-D1		42.80	23.80	8.77	7.12
16.	T1029TS257_1-D1		42.80	23.80	8.77	7.12
17.	T1029TS351_1-D1		42.80	23.80	8.77	7.12
18.	T1029TS352_1-D1		42.40	23.60	7.93	7.85
19.	T1029TS032_1-D1		42.40	23.60	7.29	6.85
20.	T1029TS062_1-D1		42.40	23.60	7.49	6.58
21.	T1029TS005_1-D1		42.40	23.60	7.49	6.58
22.	T1029TS198_1-D1		42.00	23.60	8.33	6.86
23.	T1029TS183_1-D1		41.80	23.60	9.71	7.06

Poor modeling quality at the N- and C- termini.

Possible causes:

- They are more flexible.
- They tend to have problems with multiple alignments and contact predictions.
- Their conformations depend on interactions with other domains/chains.



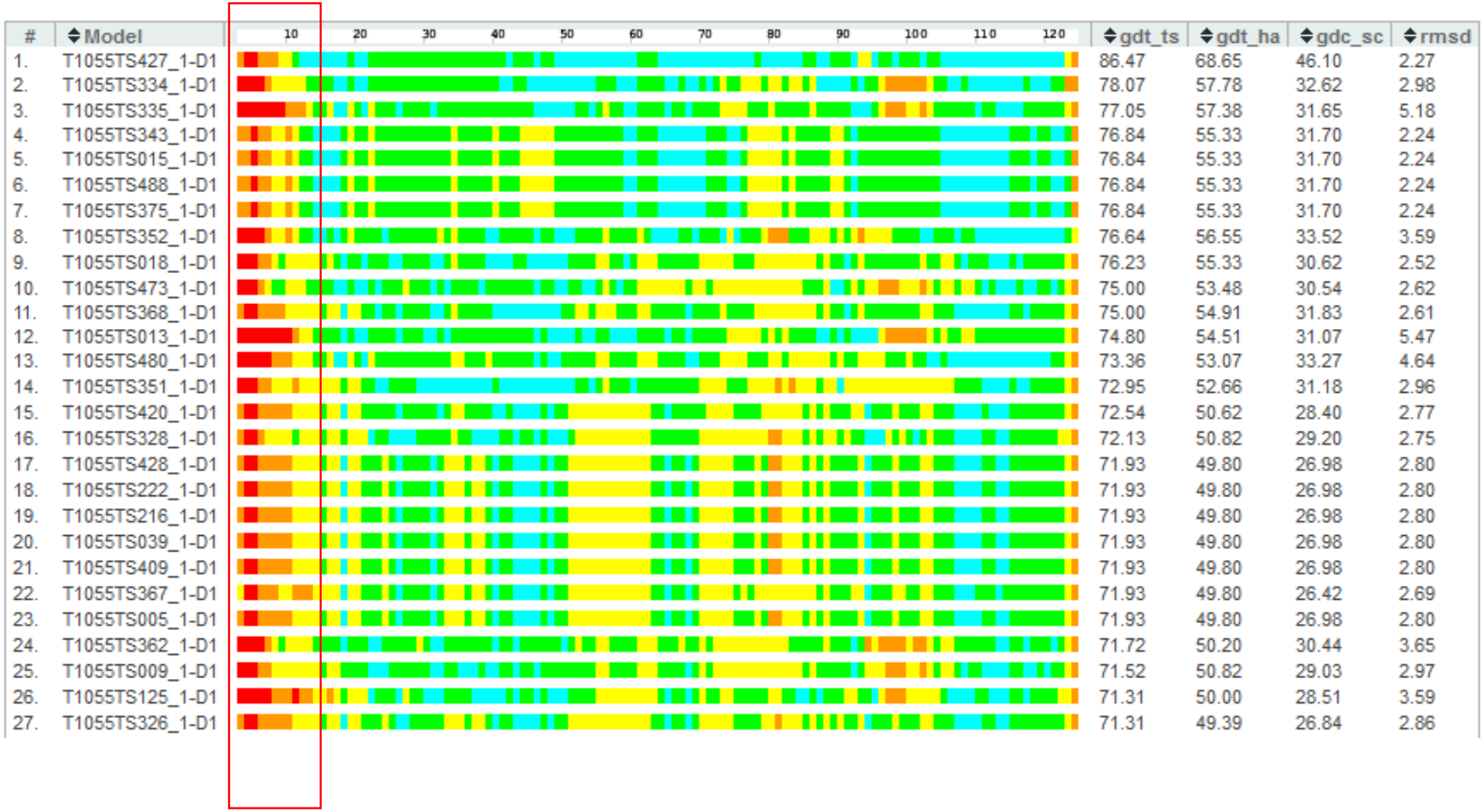
#	Model	gdt_ts	gdt_ha	gdc_sc	rmsd
1.	T1070TS427_1-D1	63.82	48.35	33.47	10.14
2.	T1070TS125_1-D1	39.80	28.29	12.22	11.51
3.	T1070TS042_1-D1	38.82	25.99	15.59	11.89
4.	T1070TS187_1-D1	38.49	27.63	15.05	12.15
5.	T1070TS221_1-D1	38.49	25.99	13.47	11.90
6.	T1070TS075_1-D1	37.50	26.64	13.71	11.52
7.	T1070TS252_1-D1	37.17	26.97	12.88	13.10
8.	T1070TS319_1-D1	36.84	26.64	16.09	13.18
9.	T1070TS198_1-D1	36.51	25.99	10.82	12.75
10.	T1070TS024_1-D1	36.51	24.67	8.49	13.46
11.	T1070TS480_1-D1	35.85	25.33	14.13	13.80
12.	T1070TS435_1-D1	35.53	25.00	9.33	14.32
13.	T1070TS071_1-D1	35.20	25.00	10.94	14.39
14.	T1070TS328_1-D1	35.20	23.68	13.50	14.34
15.	T1070TS324_1-D1	35.20	24.67	9.81	13.46
16.	T1070TS238_1-D1	35.20	20.73	4.26	12.55
17.	T1070TS279_1-D1	34.54	21.71	9.18	10.48
18.	T1070TS468_1-D1	34.21	24.02	12.04	13.38
19.	T1070TS375_1-D1	33.88	18.42	4.35	10.55
20.	T1070TS326_1-D1	33.55	24.67	11.00	12.14
21.	T1070TS222_1-D1	33.55	24.67	13.68	12.27
22.	T1070TS216_1-D1	32.90	18.75	4.20	10.75
23.	T1070TS183_1-D1	32.90	18.75	4.20	10.75
24.	T1070TS293_1-D1	32.57	19.08	5.01	10.78
25.	T1070TS367_1-D1	32.57	24.34	11.33	13.11
26.	T1070TS177_1-D1	32.57	17.76	5.65	6.25
27.	T1070TS368_1-D1	32.24	18.42	4.41	10.86
28.	T1070TS129_1-D1	30.92	19.73	7.18	13.11
29.	T1070TS275_1-D1	30.59	21.71	12.61	12.89
30.	T1070TS285_1-D1	30.26	21.71	6.50	15.93
31.	T1070TS364_1-D1	30.26	22.04	7.48	15.91
32.	T1070TS409_1-D1	29.93	20.07	6.74	12.09
33.	T1070TS067_1-D1	29.93	17.43	4.80	11.62
34.	T1070TS096_1-D1	29.93	17.43	6.56	11.12

T1055(NMR)

Model-Target CA-CA distances

(0; 1) (1; 2) (2; 4) (4; 8) >8 N/A

First Models | All Models



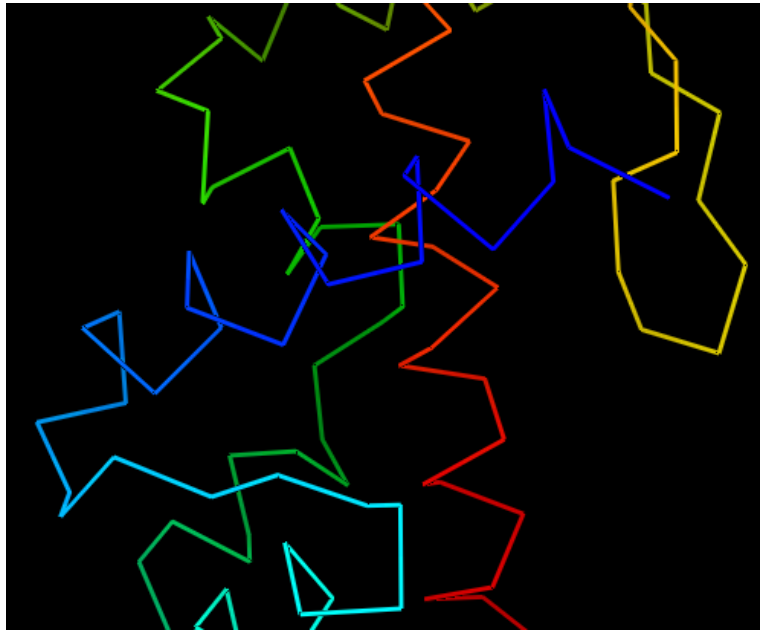
#	Model	gdt_ts	gdt_ha	gdc_sc	rmsd
1.	T1055TS427_1-D1	86.47	68.65	46.10	2.27
2.	T1055TS334_1-D1	78.07	57.78	32.62	2.98
3.	T1055TS335_1-D1	77.05	57.38	31.65	5.18
4.	T1055TS343_1-D1	76.84	55.33	31.70	2.24
5.	T1055TS015_1-D1	76.84	55.33	31.70	2.24
6.	T1055TS488_1-D1	76.84	55.33	31.70	2.24
7.	T1055TS375_1-D1	76.84	55.33	31.70	2.24
8.	T1055TS352_1-D1	76.64	56.55	33.52	3.59
9.	T1055TS018_1-D1	76.23	55.33	30.62	2.52
10.	T1055TS473_1-D1	75.00	53.48	30.54	2.62
11.	T1055TS368_1-D1	75.00	54.91	31.83	2.61
12.	T1055TS013_1-D1	74.80	54.51	31.07	5.47
13.	T1055TS480_1-D1	73.36	53.07	33.27	4.64
14.	T1055TS351_1-D1	72.95	52.66	31.18	2.96
15.	T1055TS420_1-D1	72.54	50.62	28.40	2.77
16.	T1055TS328_1-D1	72.13	50.82	29.20	2.75
17.	T1055TS428_1-D1	71.93	49.80	26.98	2.80
18.	T1055TS222_1-D1	71.93	49.80	26.98	2.80
19.	T1055TS216_1-D1	71.93	49.80	26.98	2.80
20.	T1055TS039_1-D1	71.93	49.80	26.98	2.80
21.	T1055TS409_1-D1	71.93	49.80	26.98	2.80
22.	T1055TS367_1-D1	71.93	49.80	26.42	2.69
23.	T1055TS005_1-D1	71.93	49.80	26.98	2.80
24.	T1055TS362_1-D1	71.72	50.20	30.44	3.65
25.	T1055TS009_1-D1	71.52	50.82	29.03	2.97
26.	T1055TS125_1-D1	71.31	50.00	28.51	3.59
27.	T1055TS326_1-D1	71.31	49.39	26.84	2.86

T1055: DNA polymerase processivity factor from Vaccinia virus; NMR structure

T1055 (DNA polymerase processivity factor from Vaccinia virus; NMR structure)

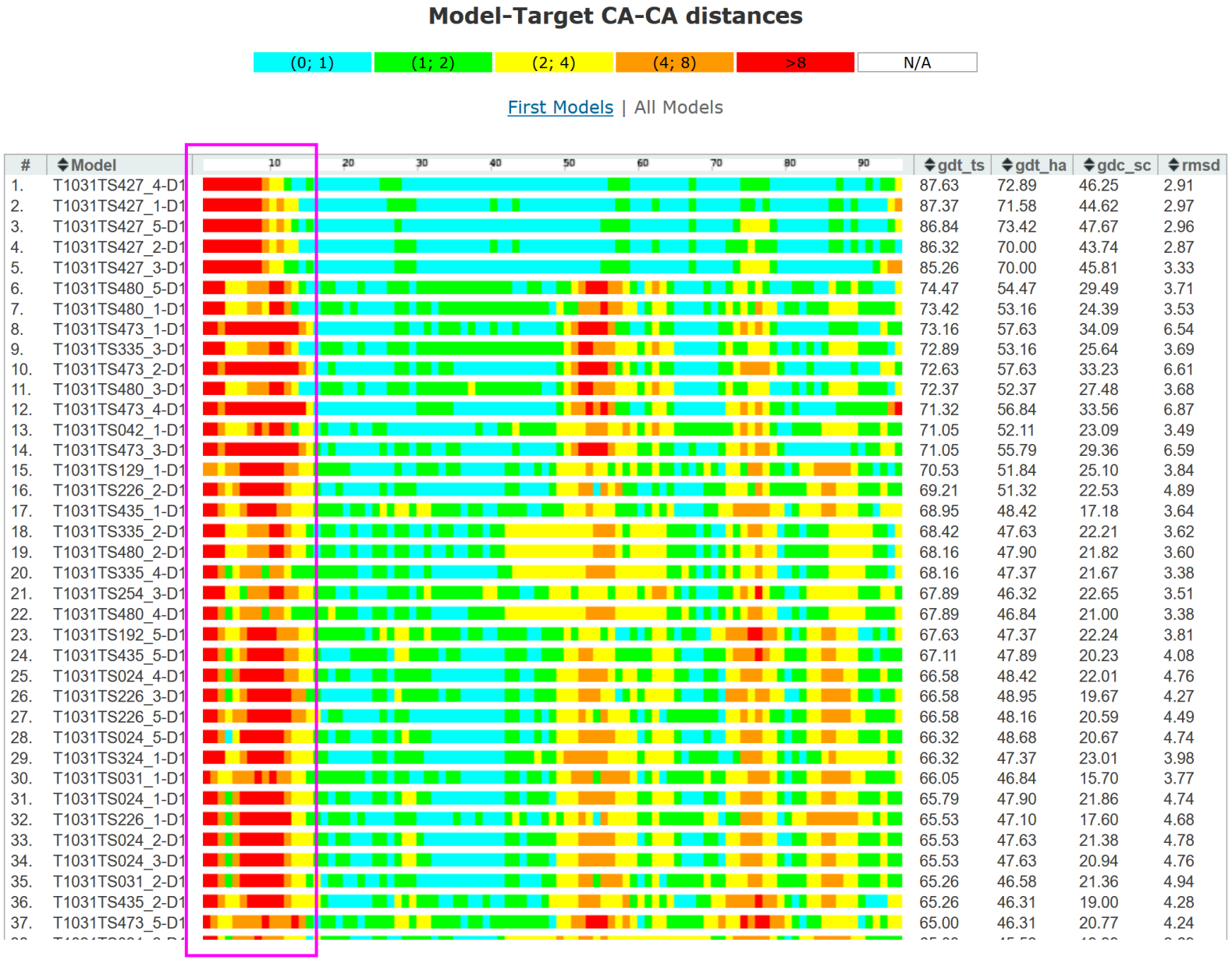
- N-terminal segment is more flexible and was not modeled right.
- FSKV formed a beta-bulge to bury F and V.
- 427 modeled it as a continuous helix, other methods modeled it as loops in different positions.

Experimental structure



Group 427

T1031 N-terminus



#	Model	gdt_ts	gdt_ha	gdc_sc	rmsd
1.	T1031TS427_4-D1	87.63	72.89	46.25	2.91
2.	T1031TS427_1-D1	87.37	71.58	44.62	2.97
3.	T1031TS427_5-D1	86.84	73.42	47.67	2.96
4.	T1031TS427_2-D1	86.32	70.00	43.74	2.87
5.	T1031TS427_3-D1	85.26	70.00	45.81	3.33
6.	T1031TS480_5-D1	74.47	54.47	29.49	3.71
7.	T1031TS480_1-D1	73.42	53.16	24.39	3.53
8.	T1031TS473_1-D1	73.16	57.63	34.09	6.54
9.	T1031TS335_3-D1	72.89	53.16	25.64	3.69
10.	T1031TS473_2-D1	72.63	57.63	33.23	6.61
11.	T1031TS480_3-D1	72.37	52.37	27.48	3.68
12.	T1031TS473_4-D1	71.32	56.84	33.56	6.87
13.	T1031TS042_1-D1	71.05	52.11	23.09	3.49
14.	T1031TS473_3-D1	71.05	55.79	29.36	6.59
15.	T1031TS129_1-D1	70.53	51.84	25.10	3.84
16.	T1031TS226_2-D1	69.21	51.32	22.53	4.89
17.	T1031TS435_1-D1	68.95	48.42	17.18	3.64
18.	T1031TS335_2-D1	68.42	47.63	22.21	3.62
19.	T1031TS480_2-D1	68.16	47.90	21.82	3.60
20.	T1031TS335_4-D1	68.16	47.37	21.67	3.38
21.	T1031TS254_3-D1	67.89	46.32	22.65	3.51
22.	T1031TS480_4-D1	67.89	46.84	21.00	3.38
23.	T1031TS192_5-D1	67.63	47.37	22.24	3.81
24.	T1031TS435_5-D1	67.11	47.89	20.23	4.08
25.	T1031TS024_4-D1	66.58	48.42	22.01	4.76
26.	T1031TS226_3-D1	66.58	48.95	19.67	4.27
27.	T1031TS226_5-D1	66.58	48.16	20.59	4.49
28.	T1031TS024_5-D1	66.32	48.68	20.67	4.74
29.	T1031TS324_1-D1	66.32	47.37	23.01	3.98
30.	T1031TS031_1-D1	66.05	46.84	15.70	3.77
31.	T1031TS024_1-D1	65.79	47.90	21.86	4.74
32.	T1031TS226_1-D1	65.53	47.10	17.60	4.68
33.	T1031TS024_2-D1	65.53	47.63	21.38	4.78
34.	T1031TS024_3-D1	65.53	47.63	20.94	4.76
35.	T1031TS031_2-D1	65.26	46.58	21.36	4.94
36.	T1031TS435_2-D1	65.26	46.31	19.00	4.28
37.	T1031TS473_5-D1	65.00	46.31	20.77	4.24

T1031: first domain of virion-packaged DNA-dependent RNA polymerase of crAss-like phage phi14:2, X-ray resolution: 3.5Å

T1031 N-terminus

```
Experimental: ---ACKIENIKYKGKEVE
Group 427:    ACKIENIKYK---GKEVE
```

- Group 427 modeled N-terminal loop with overall correct conformation.
- However, it misaligned by three residues.
- Other top groups do not model the overall shape of the N-terminal loop as well as group 427.

Group 427 (magenta)

Groups 473, 335, 042

T1031: first domain of virion-packaged DNA-dependent RNA polymerase of crAss-like phage phi14:2, X-ray resolution: 3.5Å

Poor modeling quality in loops.

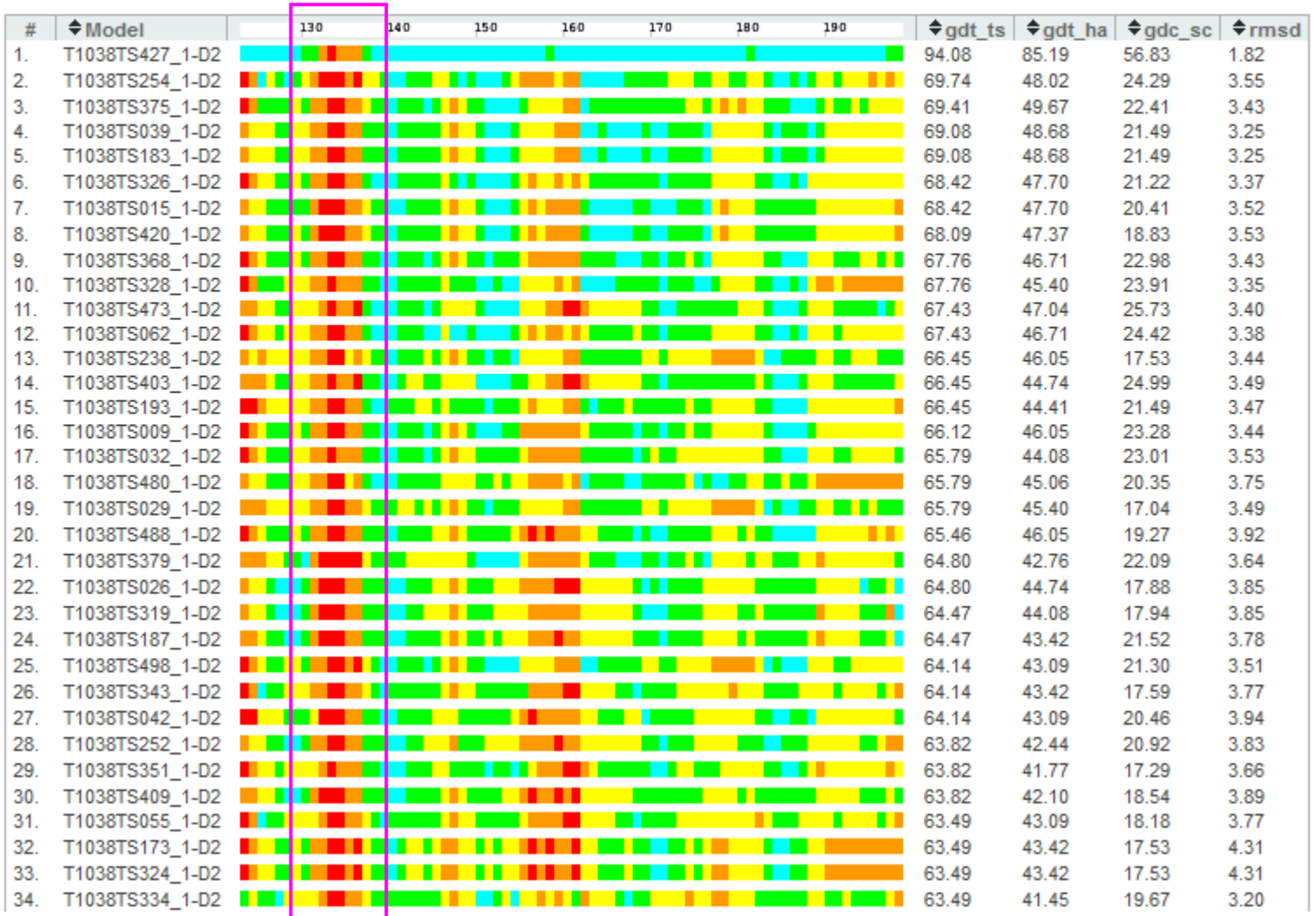
Example: T1038_D2

(TSWV glycoprotein; X-ray structure with resolution: 2.5Å)

Model-Target CA-CA distances

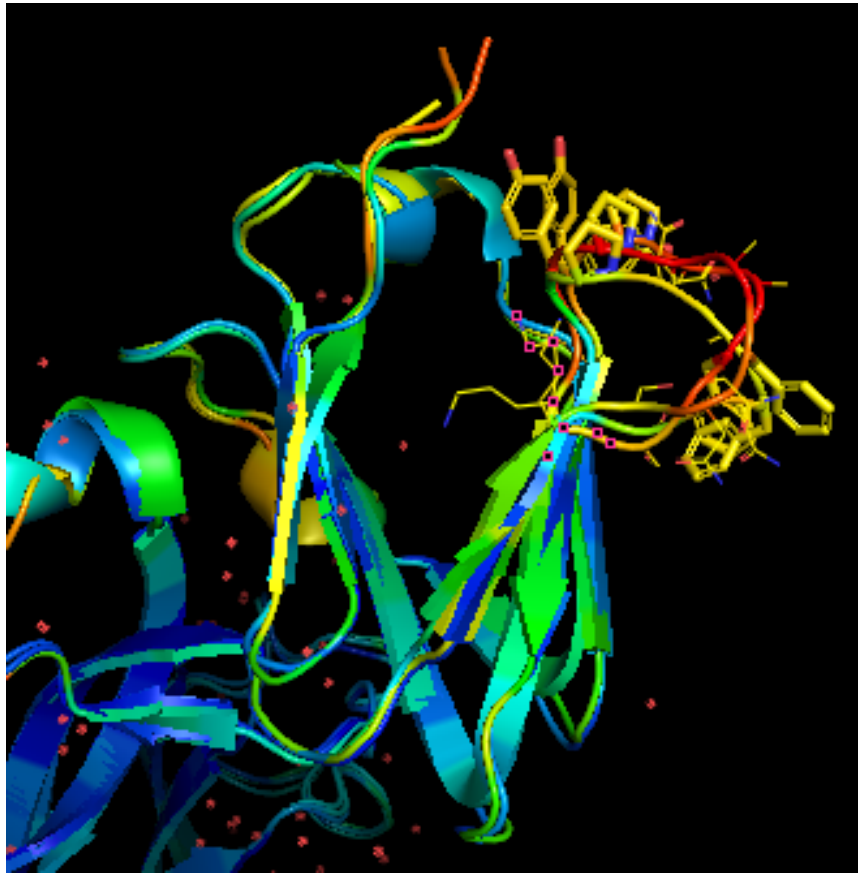
(0; 1) (1; 2) (2; 4) (4; 8) >8 N/A

First Models | All Models

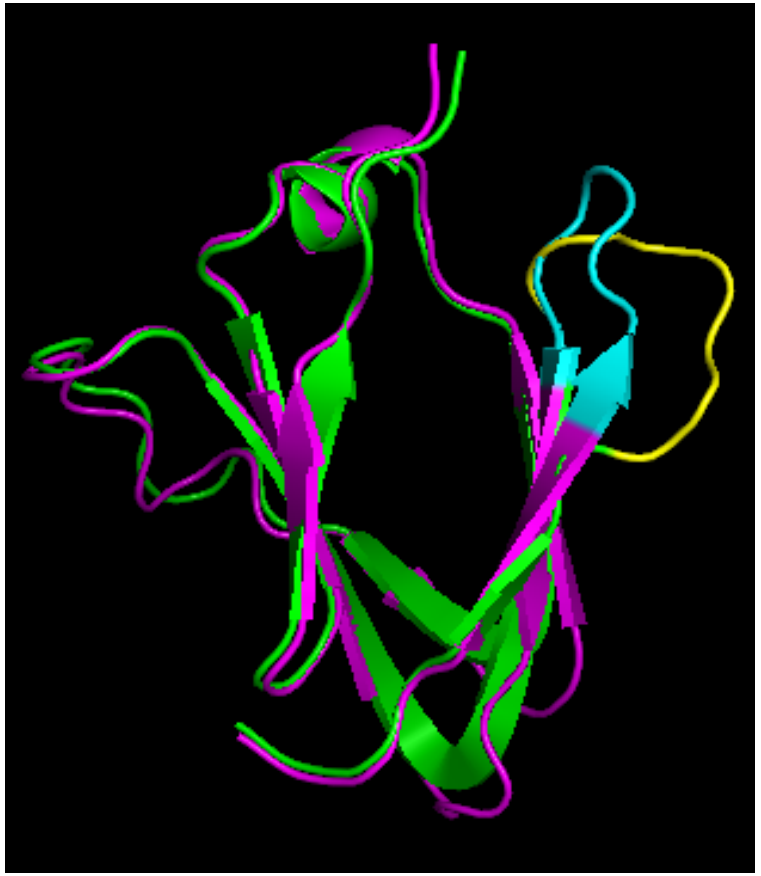


#	Model	gdt_ts	gdt_ha	gdc_sc	rmsd
1.	T1038TS427_1-D2	94.08	85.19	56.83	1.82
2.	T1038TS254_1-D2	69.74	48.02	24.29	3.55
3.	T1038TS375_1-D2	69.41	49.67	22.41	3.43
4.	T1038TS039_1-D2	69.08	48.68	21.49	3.25
5.	T1038TS183_1-D2	69.08	48.68	21.49	3.25
6.	T1038TS326_1-D2	68.42	47.70	21.22	3.37
7.	T1038TS015_1-D2	68.42	47.70	20.41	3.52
8.	T1038TS420_1-D2	68.09	47.37	18.83	3.53
9.	T1038TS368_1-D2	67.76	46.71	22.98	3.43
10.	T1038TS328_1-D2	67.76	45.40	23.91	3.35
11.	T1038TS473_1-D2	67.43	47.04	25.73	3.40
12.	T1038TS062_1-D2	67.43	46.71	24.42	3.38
13.	T1038TS238_1-D2	66.45	46.05	17.53	3.44
14.	T1038TS403_1-D2	66.45	44.74	24.99	3.49
15.	T1038TS193_1-D2	66.45	44.41	21.49	3.47
16.	T1038TS009_1-D2	66.12	46.05	23.28	3.44
17.	T1038TS032_1-D2	65.79	44.08	23.01	3.53
18.	T1038TS480_1-D2	65.79	45.06	20.35	3.75
19.	T1038TS029_1-D2	65.79	45.40	17.04	3.49
20.	T1038TS488_1-D2	65.46	46.05	19.27	3.92
21.	T1038TS379_1-D2	64.80	42.76	22.09	3.64
22.	T1038TS026_1-D2	64.80	44.74	17.88	3.85
23.	T1038TS319_1-D2	64.47	44.08	17.94	3.85
24.	T1038TS187_1-D2	64.47	43.42	21.52	3.78
25.	T1038TS498_1-D2	64.14	43.09	21.30	3.51
26.	T1038TS343_1-D2	64.14	43.42	17.59	3.77
27.	T1038TS042_1-D2	64.14	43.09	20.46	3.94
28.	T1038TS252_1-D2	63.82	42.44	20.92	3.83
29.	T1038TS351_1-D2	63.82	41.77	17.29	3.66
30.	T1038TS409_1-D2	63.82	42.10	18.54	3.89
31.	T1038TS055_1-D2	63.49	43.09	18.18	3.77
32.	T1038TS173_1-D2	63.49	43.42	17.53	4.31
33.	T1038TS324_1-D2	63.49	43.42	17.53	4.31
34.	T1038TS334_1-D2	63.49	41.45	19.67	3.20

T1038_D2 loop region 230-238 has large B-factors in all three chains.



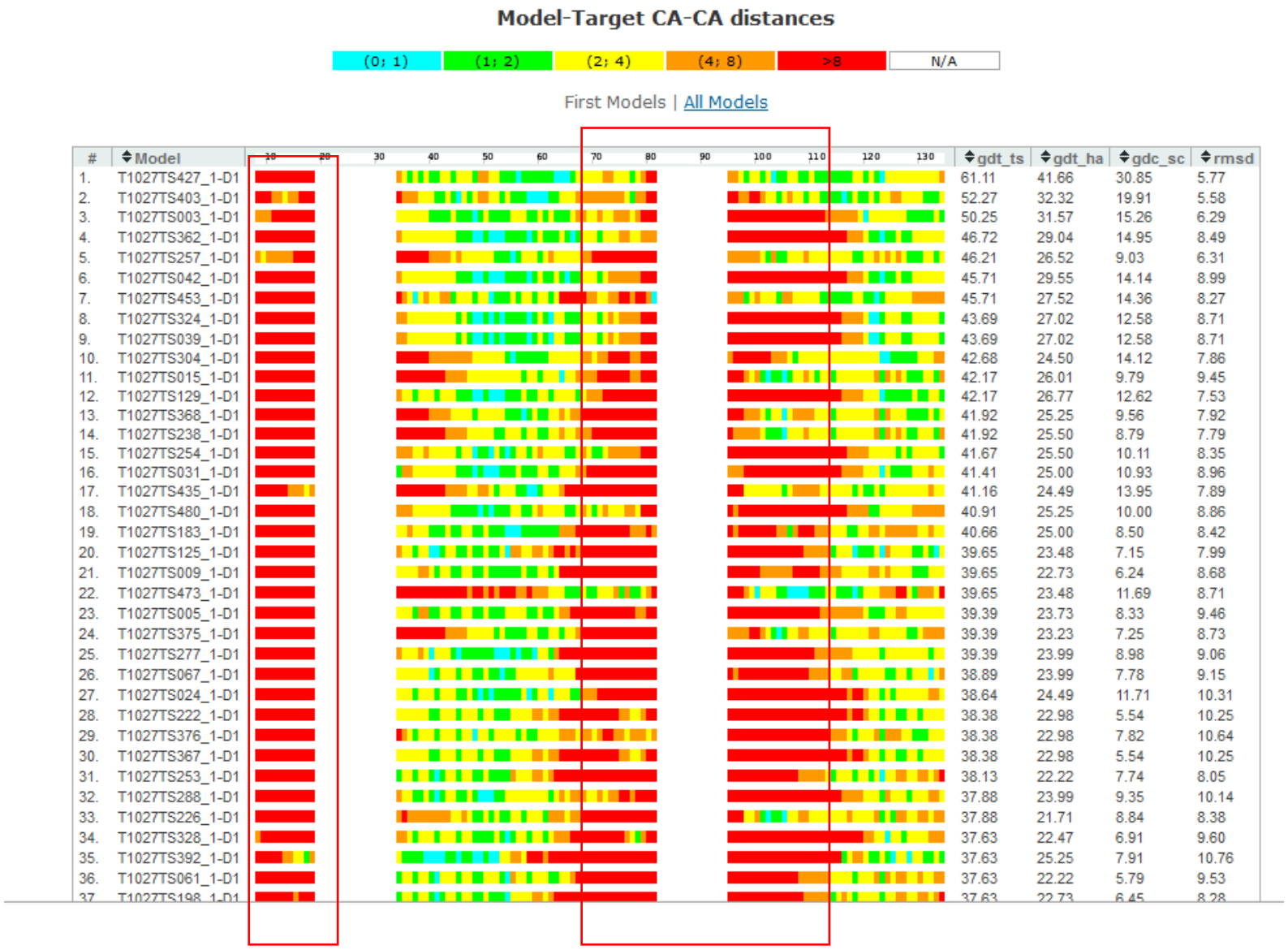
Three chains in experimental structure superimposed.



Group 427 model (magenta+cyan) aligned to experimental structure (green+yellow)

Poor quality around flexible (disordered) regions.

Example: T1027 (
Gaussia luciferase;
NMR structure)



#	Model	gdt_ts	gdt_ha	gdc_sc	rmsd
1.	T1027TS427_1-D1	61.11	41.66	30.85	5.77
2.	T1027TS403_1-D1	52.27	32.32	19.91	5.58
3.	T1027TS003_1-D1	50.25	31.57	15.26	6.29
4.	T1027TS362_1-D1	46.72	29.04	14.95	8.49
5.	T1027TS257_1-D1	46.21	26.52	9.03	6.31
6.	T1027TS042_1-D1	45.71	29.55	14.14	8.99
7.	T1027TS453_1-D1	45.71	27.52	14.36	8.27
8.	T1027TS324_1-D1	43.69	27.02	12.58	8.71
9.	T1027TS039_1-D1	43.69	27.02	12.58	8.71
10.	T1027TS304_1-D1	42.68	24.50	14.12	7.86
11.	T1027TS015_1-D1	42.17	26.01	9.79	9.45
12.	T1027TS129_1-D1	42.17	26.77	12.62	7.53
13.	T1027TS368_1-D1	41.92	25.25	9.56	7.92
14.	T1027TS238_1-D1	41.92	25.50	8.79	7.79
15.	T1027TS254_1-D1	41.67	25.50	10.11	8.35
16.	T1027TS031_1-D1	41.41	25.00	10.93	8.96
17.	T1027TS435_1-D1	41.16	24.49	13.95	7.89
18.	T1027TS480_1-D1	40.91	25.25	10.00	8.86
19.	T1027TS183_1-D1	40.66	25.00	8.50	8.42
20.	T1027TS125_1-D1	39.65	23.48	7.15	7.99
21.	T1027TS009_1-D1	39.65	22.73	6.24	8.68
22.	T1027TS473_1-D1	39.65	23.48	11.69	8.71
23.	T1027TS005_1-D1	39.39	23.73	8.33	9.46
24.	T1027TS375_1-D1	39.39	23.23	7.25	8.73
25.	T1027TS277_1-D1	39.39	23.99	8.98	9.06
26.	T1027TS067_1-D1	38.89	23.99	7.78	9.15
27.	T1027TS024_1-D1	38.64	24.49	11.71	10.31
28.	T1027TS222_1-D1	38.38	22.98	5.54	10.25
29.	T1027TS376_1-D1	38.38	22.98	7.82	10.64
30.	T1027TS367_1-D1	38.38	22.98	5.54	10.25
31.	T1027TS253_1-D1	38.13	22.22	7.74	8.05
32.	T1027TS288_1-D1	37.88	23.99	9.35	10.14
33.	T1027TS226_1-D1	37.88	21.71	8.84	8.38
34.	T1027TS328_1-D1	37.63	22.47	6.91	9.60
35.	T1027TS392_1-D1	37.63	25.25	7.91	10.76
36.	T1027TS061_1-D1	37.63	22.22	5.79	9.53
37.	T1027TS198_1-D1	37.63	22.73	6.45	8.28

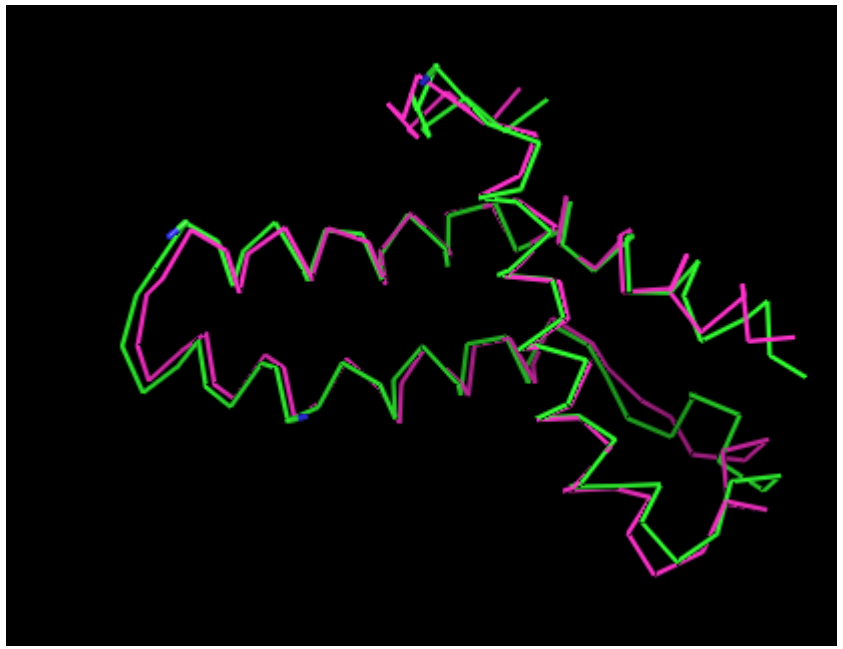
T1027 (Gaussia luciferase; NMR structure) – the N-terminal helix is modeled incorrectly by most programs.

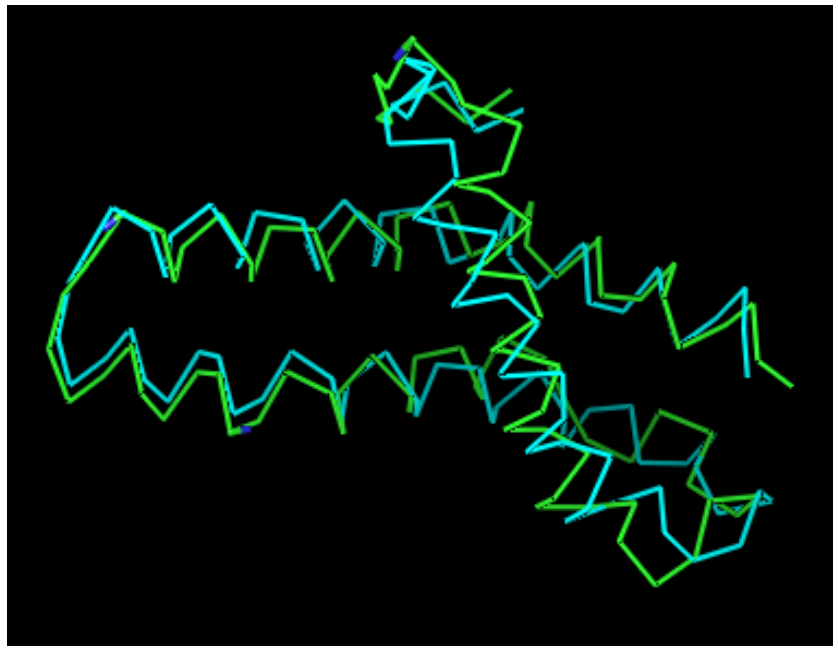
- N-terminal helix (residues 8-18; **DFNIVAVASNF**) is made up of mainly hydrophobic residues.
- It is in the core of the real structure, surrounded by other helices.
- It has a parallel orientation to the second helix.
- However, most programs modeled it on the outside and forming a helix hairpin with the second helix.

Group 427

Experimental structure

Group 427 just has overall better quality than other methods. Example – T1033





T1033 is the second domain from T1044 with resolution 3.5A

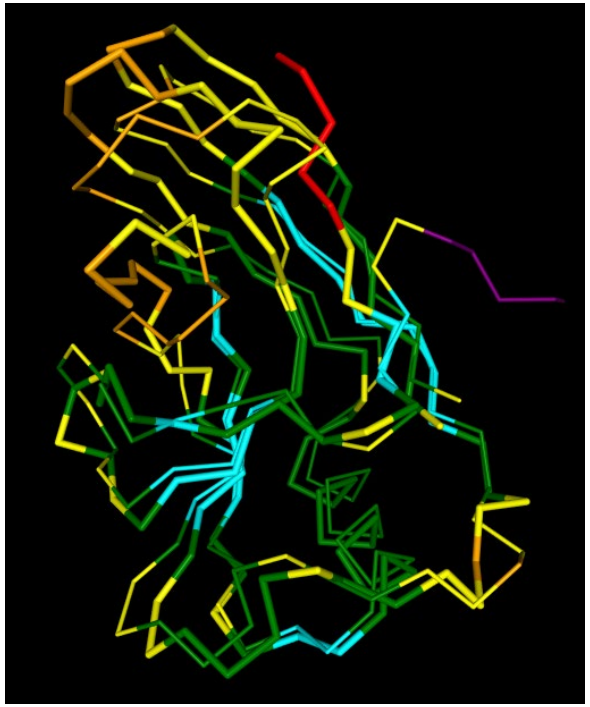
Group 427 GDT: 87.5

Group 473 GDT: 77.5

#	Model	gdt_ts	gdt_ha	gdc_sc	rmsd
1.	T1033TS427_1-D1	87.50	71.25	51.06	1.58
2.	T1033TS473_1-D1	75.50	54.50	32.38	2.21
3.	T1033TS403_1-D1	67.50	46.00	25.45	3.14
4.	T1033TS009_1-D1	63.75	42.50	14.53	3.31
5.	T1033TS376_1-D1	59.00	37.75	21.47	3.77
6.	T1033TS288_1-D1	53.00	33.00	12.30	4.71

Group 427 just has overall better quality than other methods. Example – T1049

Group 427 GDT: 93.1



Group 498 GDT: 71.3

T1049 has a resolution of 1.75A (pdb: 6y4F)

#	Model	gdt_ts	gdt_ha	gdc_sc	rmsd
1.	T1049TS427_1-D1	93.10	83.39	65.06	3.68
2.	T1049TS498_1-D1	71.27	50.93	28.15	4.27
3.	T1049TS488_1-D1	71.27	50.93	28.15	4.27
4.	T1049TS473_1-D1	71.27	52.98	34.45	4.61
5.	T1049TS351_1-D1	71.27	50.93	28.15	4.27
6.	T1049TS375_1-D1	71.27	50.93	28.15	4.27
7.	T1049TS039_1-D1	71.27	50.93	28.15	4.27
8.	T1049TS334_1-D1	70.34	49.63	26.47	4.35

Group 427 fixed a region that is modeled poorly by other programs

T1046s1 (antiholin from *Escherichia* phage ECML-134, X-ray resolution: 1.65Å**)**
N-terminal region

Model-Target CA-CA distances

(0; 1) (1; 2) (2; 4) (4; 8) >8 N/A

First Models | All Models

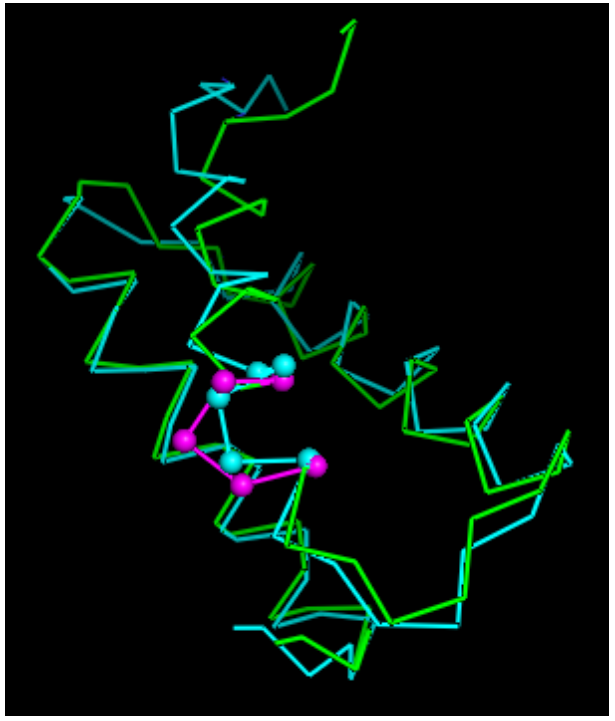
#	Model	gdt_ts	gdt_ha	gdc_sc	rmsd
1.	T1046s1TS427_1-D1	97.22	90.97	60.60	1.07
2.	T1046s1TS473_1-D1	80.90	63.54	30.29	3.08
3.	T1046s1TS352_1-D1	79.51	60.77	29.09	3.34
4.	T1046s1TS066_1-D1	78.47	59.37	24.99	2.89
5.	T1046s1TS403_1-D1	78.12	59.38	27.54	3.27
6.	T1046s1TS336_1-D1	77.78	57.98	23.34	2.94
7.	T1046s1TS277_1-D1	77.43	60.76	25.27	2.87
8.	T1046s1TS472_1-D1	77.43	58.33	21.76	3.22
9.	T1046s1TS101_1-D1	77.43	59.03	21.25	3.23
10.	T1046s1TS339_1-D1	77.08	58.68	20.65	3.27
11.	T1046s1TS335_1-D1	77.08	58.33	25.78	3.25
12.	T1046s1TS375_1-D1	77.08	58.68	20.65	3.27
13.	T1046s1TS238_1-D1	77.08	58.68	20.65	3.27
14.	T1046s1TS209_1-D1	76.74	56.94	21.52	2.95
15.	T1046s1TS173_1-D1	76.39	55.55	22.36	2.93
16.	T1046s1TS217_1-D1	76.04	56.25	0.00	2.92
17.	T1046s1TS342_1-D1	76.04	58.68	21.55	2.77
18.	T1046s1TS362_1-D1	76.04	57.98	23.28	3.25
19.	T1046s1TS222_1-D1	76.04	56.60	21.79	2.92
20.	T1046s1TS409_1-D1	76.04	56.60	21.79	2.92
21.	T1046s1TS487_1-D1	75.69	57.99	22.66	2.92
22.	T1046s1TS039_1-D1	75.69	57.99	22.66	2.92
23.	T1046s1TS005_1-D1	75.69	56.60	23.55	2.96
24.	T1046s1TS376_1-D1	75.69	55.90	18.34	2.52
25.	T1046s1TS326_1-D1	75.69	56.60	21.17	3.02
26.	T1046s1TS420_1-D1	75.69	56.95	20.84	3.01
27.	T1046s1TS480_1-D1	75.69	54.86	23.72	3.12
28.	T1046s1TS193_1-D1	75.35	56.25	22.31	3.09
29.	T1046s1TS337_1-D1	75.35	55.90	22.01	3.12
30.	T1046s1TS009_1-D1	75.35	55.90	20.19	3.00
31.	T1046s1TS129_1-D1	75.35	57.29	21.93	2.93
32.	T1046s1TS377_1-D1	75.00	55.90	20.19	3.13
33.	T1046s1TS220_1-D1	75.00	56.95	23.42	3.34
34.	T1046s1TS216_1-D1	75.00	55.91	22.61	2.96
35.	T1046s1TS368_1-D1	75.00	55.55	23.61	3.08
36.	T1046s1TS328_1-D1	75.00	55.56	21.60	3.09
37.	T1046s1TS367_1-D1	75.00	55.91	22.61	2.96
38.	T1046s1TS200_1-D1	75.00	55.91	22.61	2.96
39.	T1046s1TS140_1-D1	74.65	55.21	22.12	3.12
40.	T1046s1TS125_1-D1	74.65	57.30	19.86	3.36
41.	T1046s1TS448_1-D1	74.65	56.25	18.10	2.97

T1046s1 – group 427 fixed the problem in a particular element.

- A pi(π)-helix conformation is present near the C-terminal end of the first helical segment.

- Group 427 modeled it correctly. Other groups modeled it as part of a regular alpha-helix.

Group 427 (yellow) to real structure (green) GDT-TS: 96.5



Group 473 (cyan) to real structure (green) GDT-TS: 81.4

T1046s1 (antiholin from *Escherichia* phage ECML-134, X-ray resolution: 1.65Å**)**

Indication that a one-residue insertion in an alpha-helix is reflected in BLAST alignments of T0146's homologs.

hypothetical protein SP18_gp107 [Shigella phage SP18]

Sequence ID: YP_003934732.1 **Length:** 97 **Number of Matches:** 1

See 2 more title(s) ▾ See all Identical Proteins(IPG)

Range 1: 25 to 96 GenPept Graphics ▼ Next Match ▲ Prev

Score	Expect	Method	Identities	Positives	Gaps
52.8 bits(125)	8e-07	Compositional matrix adjust.	25/73(34%)	43/73(58%)	2/73(2%)

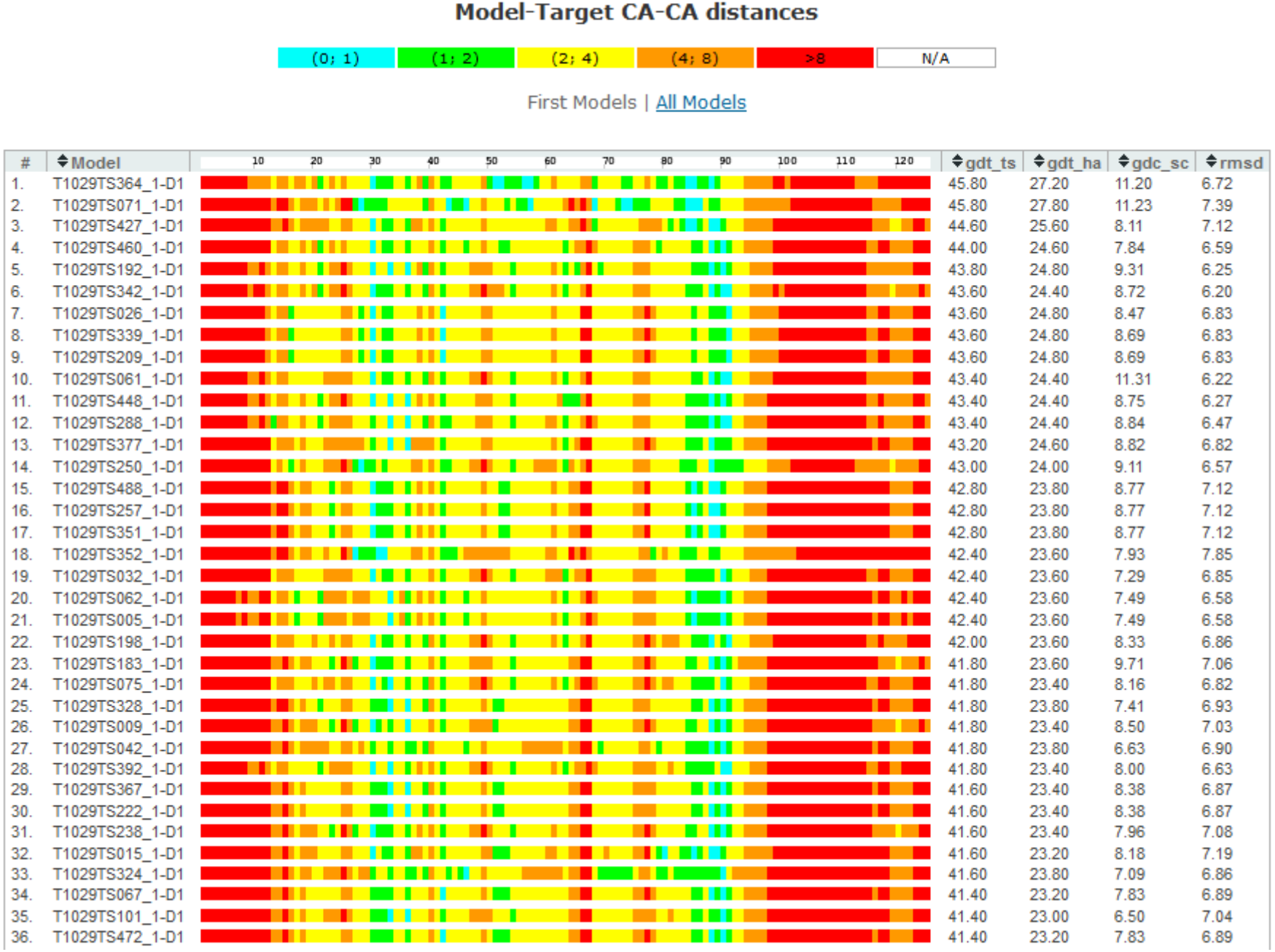
```
Query   3    VDPHFDKFMESGIRHVYMLFENKSVESSEQFYSFMRTTYKNDP-CSSDFECIERGAEMAQ   61
             D  F ++ +S ++ +Y  F+  SV  SEQF++F++T + N   C ++  C   G   A+
Sbjct   25   TDGKFTQYADSAMK-IYSQFKEPSVHQSEQFWAFIKTEWNNKSQCETEITCKSDGKAAAR   83

Query   62   SYARIMNIKLETE  74
              YA++M +KLE E
Sbjct   84   EYAKLMKVKLEDE  96
```

Group 427 only underperformed in two FM and FM/TBM targets

- T1029

- T1047s2_D3

T1029 (NMR): group 427 underperformed by a small margin.

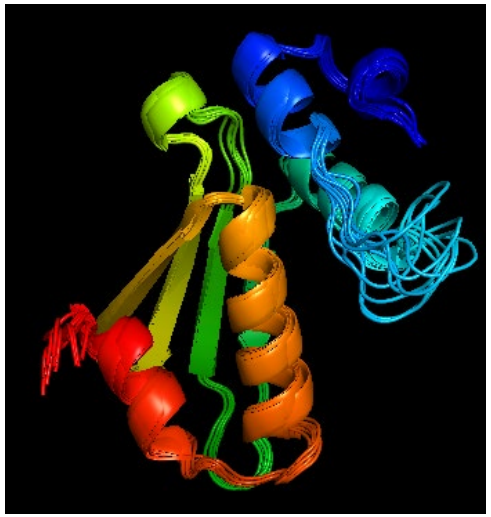


#	Model	gdt_ts	gdt_ha	gdc_sc	rmsd
1.	T1029TS364_1-D1	45.80	27.20	11.20	6.72
2.	T1029TS071_1-D1	45.80	27.80	11.23	7.39
3.	T1029TS427_1-D1	44.60	25.60	8.11	7.12
4.	T1029TS460_1-D1	44.00	24.60	7.84	6.59
5.	T1029TS192_1-D1	43.80	24.80	9.31	6.25
6.	T1029TS342_1-D1	43.60	24.40	8.72	6.20
7.	T1029TS026_1-D1	43.60	24.80	8.47	6.83
8.	T1029TS339_1-D1	43.60	24.80	8.69	6.83
9.	T1029TS209_1-D1	43.60	24.80	8.69	6.83
10.	T1029TS061_1-D1	43.40	24.40	11.31	6.22
11.	T1029TS448_1-D1	43.40	24.40	8.75	6.27
12.	T1029TS288_1-D1	43.40	24.40	8.84	6.47
13.	T1029TS377_1-D1	43.20	24.60	8.82	6.82
14.	T1029TS250_1-D1	43.00	24.00	9.11	6.57
15.	T1029TS488_1-D1	42.80	23.80	8.77	7.12
16.	T1029TS257_1-D1	42.80	23.80	8.77	7.12
17.	T1029TS351_1-D1	42.80	23.80	8.77	7.12
18.	T1029TS352_1-D1	42.40	23.60	7.93	7.85
19.	T1029TS032_1-D1	42.40	23.60	7.29	6.85
20.	T1029TS062_1-D1	42.40	23.60	7.49	6.58
21.	T1029TS005_1-D1	42.40	23.60	7.49	6.58
22.	T1029TS198_1-D1	42.00	23.60	8.33	6.86
23.	T1029TS183_1-D1	41.80	23.60	9.71	7.06
24.	T1029TS075_1-D1	41.80	23.40	8.16	6.82
25.	T1029TS328_1-D1	41.80	23.80	7.41	6.93
26.	T1029TS009_1-D1	41.80	23.40	8.50	7.03
27.	T1029TS042_1-D1	41.80	23.80	6.63	6.90
28.	T1029TS392_1-D1	41.80	23.40	8.00	6.63
29.	T1029TS367_1-D1	41.60	23.40	8.38	6.87
30.	T1029TS222_1-D1	41.60	23.40	8.38	6.87
31.	T1029TS238_1-D1	41.60	23.40	7.96	7.08
32.	T1029TS015_1-D1	41.60	23.20	8.18	7.19
33.	T1029TS324_1-D1	41.60	23.80	7.09	6.86
34.	T1029TS067_1-D1	41.40	23.20	7.83	6.89
35.	T1029TS101_1-D1	41.40	23.00	6.50	7.04
36.	T1029TS472_1-D1	41.40	23.20	7.83	6.89

T1029: NMR structure of biofilm-related Se0862 from *Synechococcus elongatus*

T1029 is the one of the least accurately modeled FM targets

- NMR structure.
- Overall fold is correctly predicted by top models.
- No groups with GDT-TS better than 0.5.
- Not much GDT-TS difference between group 427 and other top groups.

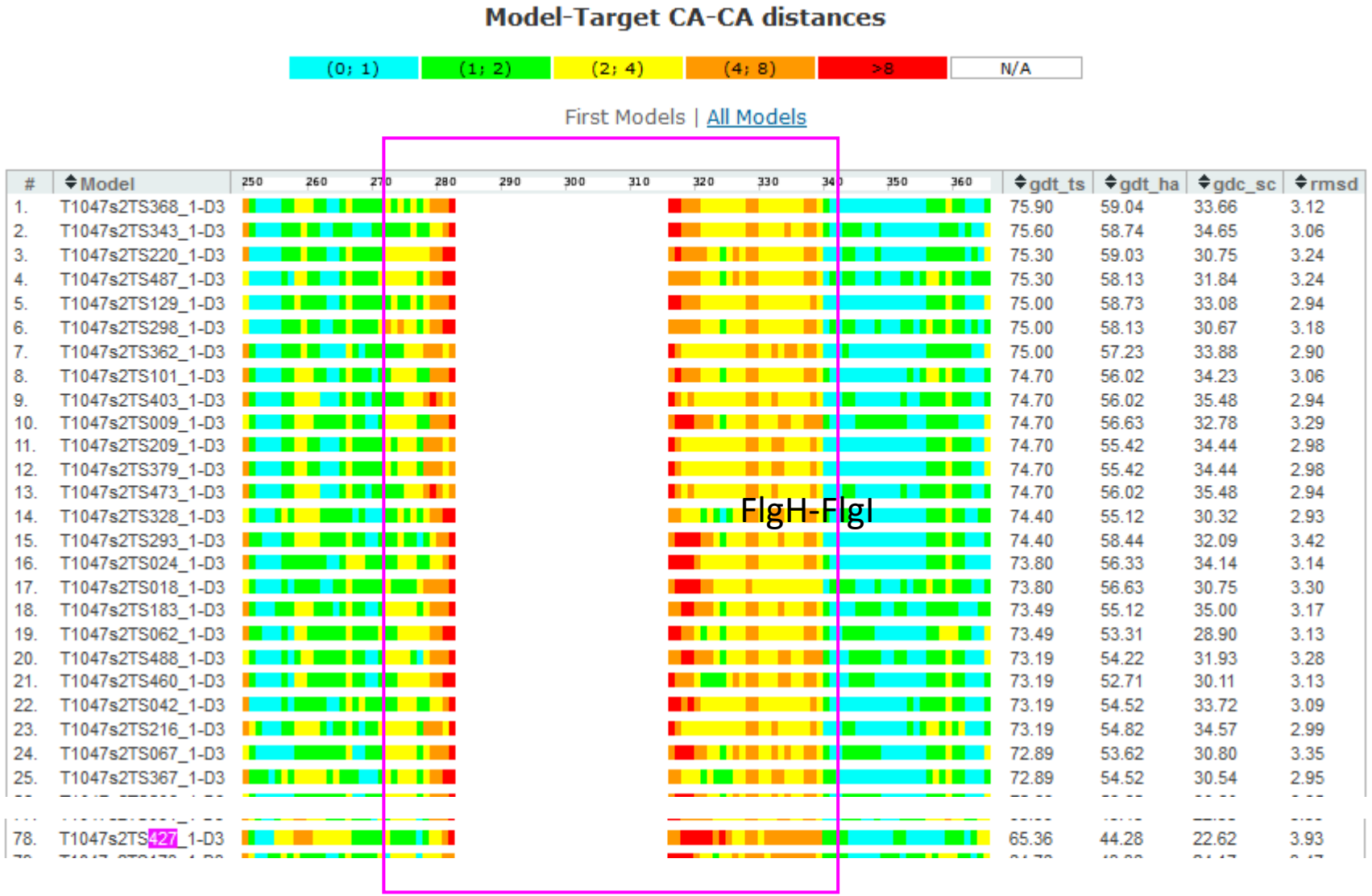


T1029

Group 427 GDT-TS: **44.6**

Group 364 GDT-TS: **45.8**

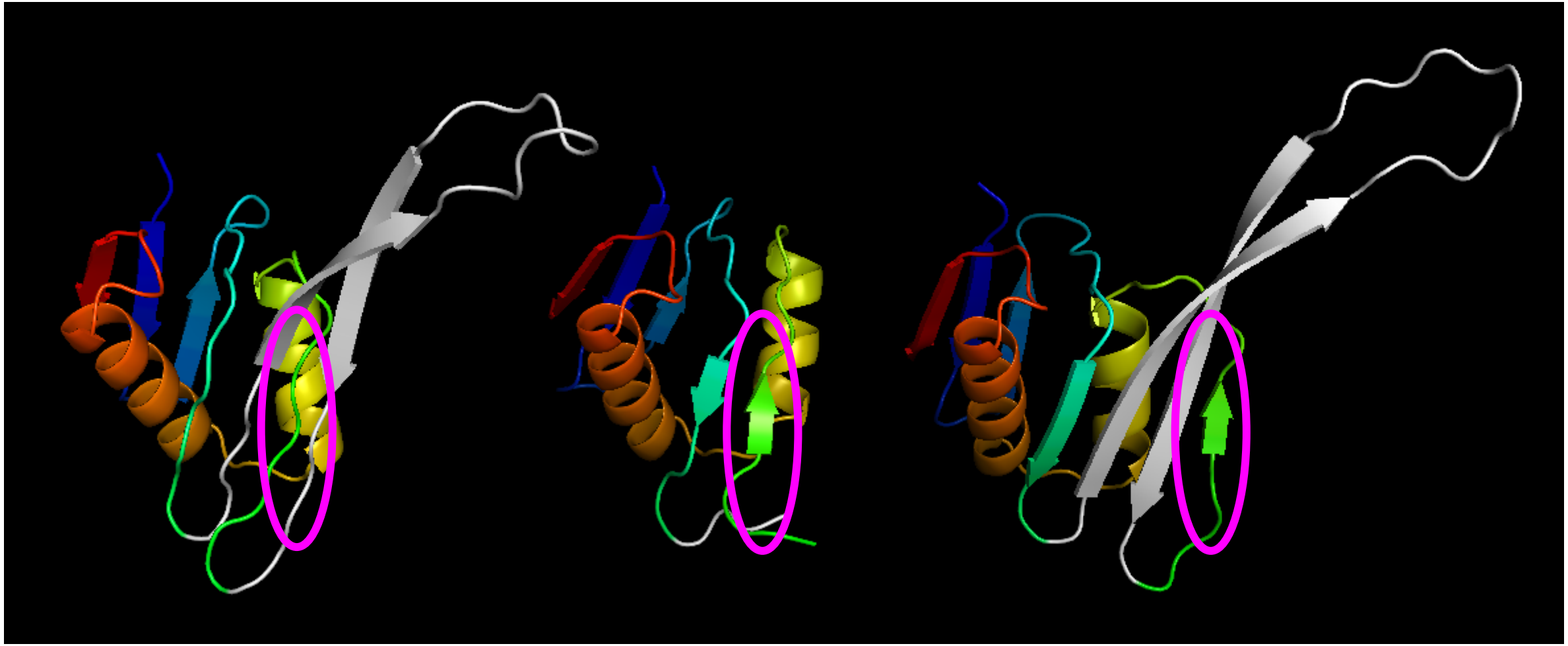
Group 427 underperformed – T1047S2_D3



#	Model	gdt_ts	gdt_ha	gdc_sc	rmsd
1.	T1047s2TS368_1-D3	75.90	59.04	33.66	3.12
2.	T1047s2TS343_1-D3	75.60	58.74	34.65	3.06
3.	T1047s2TS220_1-D3	75.30	59.03	30.75	3.24
4.	T1047s2TS487_1-D3	75.30	58.13	31.84	3.24
5.	T1047s2TS129_1-D3	75.00	58.73	33.08	2.94
6.	T1047s2TS298_1-D3	75.00	58.13	30.67	3.18
7.	T1047s2TS362_1-D3	75.00	57.23	33.88	2.90
8.	T1047s2TS101_1-D3	74.70	56.02	34.23	3.06
9.	T1047s2TS403_1-D3	74.70	56.02	35.48	2.94
10.	T1047s2TS009_1-D3	74.70	56.63	32.78	3.29
11.	T1047s2TS209_1-D3	74.70	55.42	34.44	2.98
12.	T1047s2TS379_1-D3	74.70	55.42	34.44	2.98
13.	T1047s2TS473_1-D3	74.70	56.02	35.48	2.94
14.	T1047s2TS328_1-D3	74.40	55.12	30.32	2.93
15.	T1047s2TS293_1-D3	74.40	58.44	32.09	3.42
16.	T1047s2TS024_1-D3	73.80	56.33	34.14	3.14
17.	T1047s2TS018_1-D3	73.80	56.63	30.75	3.30
18.	T1047s2TS183_1-D3	73.49	55.12	35.00	3.17
19.	T1047s2TS062_1-D3	73.49	53.31	28.90	3.13
20.	T1047s2TS488_1-D3	73.19	54.22	31.93	3.28
21.	T1047s2TS460_1-D3	73.19	52.71	30.11	3.13
22.	T1047s2TS042_1-D3	73.19	54.52	33.72	3.09
23.	T1047s2TS216_1-D3	73.19	54.82	34.57	2.99
24.	T1047s2TS067_1-D3	72.89	53.62	30.80	3.35
25.	T1047s2TS367_1-D3	72.89	54.52	30.54	2.95
78.	T1047s2TS427_1-D3	65.36	44.28	22.62	3.93

T1047S2 – EM structure of a >20-mer FlgH-FlgI complex

T1047s2D3 – group 427 modeled disordered region as a beta-hairpin inserted in two strands that are neighbors in real structure.



Group 326 | Experimental structure | Group 427

Conclusions of manual analysis

- Poor modeling quality often occurs in N- and C-termini, loops and near flexible regions.
- Group 427 generates overall better quality models for FM and FM/TBM hard targets, some of which are very close to solving the protein folding problems (GDT-TS > 90).
- Group 427 is able to fix some low-quality regions by other methods.
- Group 427 underperformed in only a couple of targets (T1029 (NMR)) and T1047s2_D3 (disordered region and oligomer)).

Acknowledgements

- Nick Grishin
- Lisa Kinch
- Dustin Schaeffer
- Ming Tang
- CASP14 organizers
- CASP14 participants