



wwPDB EM Validation Summary Report ⓘ

Mar 20, 2024 – 04:51 AM JST

PDB ID : 6KE6
EMDB ID : EMD-9964
Title : 3.4 angstrom cryo-EM structure of yeast 90S small subunit preribosome
Authors : Du, Y.; Ye, K.; An, W.
Deposited on : 2019-07-03
Resolution : 3.40 Å(reported)
Based on initial models : 5WYJ, 5WLC

This is a wwPDB EM Validation Summary Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

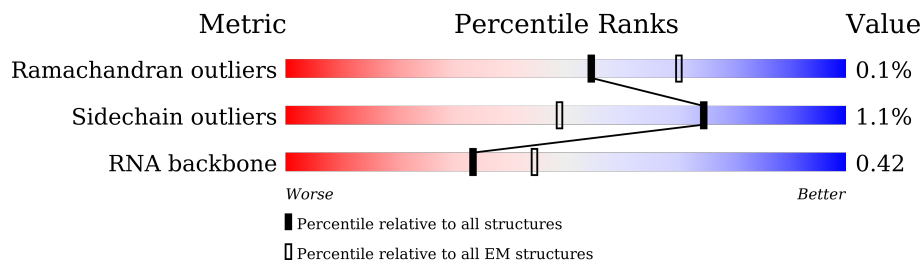
EMDB validation analysis : 0.0.1.dev70
Mogul : 1.8.5 (274361), CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36

1 Overall quality at a glance

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 3.40 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	EM structures (#Entries)
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826
RNA backbone	4643	859

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion $< 40\%$). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	3A	333	
2	5A	700	
3	SA	1807	
4	SC	255	
5	SF	261	
6	SG	225	
7	SH	236	
8	SI	190	

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Mol	Chain	Length	Quality of chain
9	SJ	200	78% 82% 17%
10	SK	197	85% 13%
11	SM	156	72% 78% 21%
12	SN	143	83% 83% 17%
13	SO	151	87% 11%
14	SP	137	84% 14%
15	SR	143	87% 13%
16	ST	146	51% 77% 23%
17	SX	130	98%
18	SY	145	70% 29%
19	SZ	135	24% 73% 24%
20	Sc	82	96%
21	Sd	67	94% 6%
22	3B	327	72% 27%
22	3C	327	14% 69% 31%
23	3D	504	71% 27%
24	3E	511	17% 83% 16%
25	3F	573	9% 74% 24%
26	3G	126	91%
26	3H	126	95%
27	A4	776	10% 84% 15%
28	A5	643	8% 79% 20%
29	A8	713	64% 76% 23%
30	A9	575	14% 22% 78%
31	AE	1769	23% 43% 56%

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Mol	Chain	Length	Quality of chain
32	AF	513	94%
33	AG	896	91% 8%
34	B1	923	88% 10%
35	B2	943	88% 10%
36	B3	817	90% 7%
37	B8	594	78% 20%
38	BE	939	90% 8%
39	B6	440	83% 15%
40	5B	214	28% 72%
41	5C	554	94%
42	5D	250	92% 6%
43	5E	593	33% 66%
44	5F	183	97%
45	5G	290	96%
46	5H	610	22% 78%
47	5I	489	92% 6%
48	5J	217	66% 34%
49	5K	189	90% 7%
50	RA	707	48% 52%
51	RB	357	37% 62%
52	RC	316	88% 12%
53	RE	1237	86% 13%
54	RF	297	78% 19%
55	RG	252	85% 14%
55	RH	252	90% 9%

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Mol	Chain	Length	Quality of chain
56	RI	274	90% 7% 8%
57	RJ	1183	67% 7% 33%
58	RK	367	98% 7%
59	RL	1056	72% 76% 24%
59	RM	1056	72% 72% 28%
60	RN	810	49% 72% 28%
61	RO	552	46% 94% 5%
62	RP	2493	78% 82% 18%
63	RQ	899	10% 25% 75%
64	RS	483	52% 51% 48%
65	RT	326	5% 51% 48%
66	RV	346	9% 54% 45%
67	X1	347	25% 37% 63%

2 Entry composition

There are 70 unique types of molecules in this entry. The entry contains 224791 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a RNA chain called U3 snoRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
1	3A	175	3711	1661	648	1227	175	0	0

- Molecule 2 is a RNA chain called 5' ETS.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
2	5A	522	11143	4979	1982	3660	522	0	0

- Molecule 3 is a RNA chain called 18S rRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
3	SA	1310	27940	12487	4981	9162	1310	0	0

- Molecule 4 is a protein called 40S ribosomal protein S1-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	SC	219	1751	1109	321	317	4	0	0

- Molecule 5 is a protein called 40S ribosomal protein S4-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	SF	229	1815	1161	331	320	3	0	0

- Molecule 6 is a protein called 40S ribosomal protein S5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	SG	213	1669	1045	307	314	3	0	0

- Molecule 7 is a protein called 40S ribosomal protein S6-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
7	SH	112	879	562	155	160	2	0	0

- Molecule 8 is a protein called 40S ribosomal protein S7-A.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
8	SI	165	1321	853	226	242	0	0

- Molecule 9 is a protein called 40S ribosomal protein S8-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
9	SJ	166	1324	824	262	236	2	0	0

- Molecule 10 is a protein called 40S ribosomal protein S9-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
10	SK	171	1388	879	268	240	1	0	0

- Molecule 11 is a protein called 40S ribosomal protein S11-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
11	SM	123	997	641	189	164	3	0	0

- Molecule 12 is a protein called 40S ribosomal protein S12.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
12	SN	119	865	545	151	167	2	0	0

- Molecule 13 is a protein called 40S ribosomal protein S13.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
13	SO	134	1087	698	202	186	1	0	0

- Molecule 14 is a protein called 40S ribosomal protein S14-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
14	SP	118	868	536	164	165	3	0	0

- Molecule 15 is a protein called 40S ribosomal protein S16-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
15	SR	125	973	625	174	174		0	0

- Molecule 16 is a protein called 40S ribosomal protein S18-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
16	ST	113	918	578	174	164	2	0	0

- Molecule 17 is a protein called 40S ribosomal protein S22-B.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
17	SX	127	1003	640	183	177	3	0	0

- Molecule 18 is a protein called 40S ribosomal protein S23-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
18	SY	103	786	503	144	137	2	0	0

- Molecule 19 is a protein called 40S ribosomal protein S24-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
19	SZ	102	809	517	148	144		0	0

- Molecule 20 is a protein called 40S ribosomal protein S27-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
20	Sc	80	603	377	109	112	5	0	0

- Molecule 21 is a protein called 40S ribosomal protein S28-A.

Mol	Chain	Residues	Atoms					AltConf	Trace
21	Sd	63	Total	C	N	O	S	0	0
			497	306	99	91	1		

- Molecule 22 is a protein called rRNA 2'-O-methyltransferase fibrillar.

Mol	Chain	Residues	Atoms					AltConf	Trace
22	3B	240	Total	C	N	O	S	0	0
			1865	1184	333	338	10		
22	3C	225	Total	C	N	O	S	0	0
			1763	1120	316	317	10		

- Molecule 23 is a protein called Nucleolar protein 56.

Mol	Chain	Residues	Atoms					AltConf	Trace
23	3D	369	Total	C	N	O	S	0	0
			2848	1811	489	540	8		

- Molecule 24 is a protein called Nucleolar protein 58.

Mol	Chain	Residues	Atoms					AltConf	Trace
24	3E	431	Total	C	N	O	S	0	0
			3028	1888	543	588	9		

- Molecule 25 is a protein called Ribosomal RNA-processing protein 9.

Mol	Chain	Residues	Atoms					AltConf	Trace
25	3F	434	Total	C	N	O	S	0	0
			3473	2211	603	649	10		

- Molecule 26 is a protein called 13 kDa ribonucleoprotein-associated protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
26	3G	121	Total	C	N	O	S	0	0
			916	583	158	171	4		
26	3H	121	Total	C	N	O	S	0	0
			916	583	158	171	4		

- Molecule 27 is a protein called U3 small nucleolar RNA-associated protein 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
27	A4	662	Total	C	N	O	S	0	0
			5226	3309	910	986	21		

- Molecule 28 is a protein called U3 small nucleolar RNA-associated protein 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
28	A5	514	3976	2520	688	755	13	0	0

- Molecule 29 is a protein called U3 small nucleolar RNA-associated protein 8.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
29	A8	548	3307	2054	608	642	3	0	0

- Molecule 30 is a protein called U3 small nucleolar RNA-associated protein 9.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
30	A9	128	939	594	173	170	2	0	0

- Molecule 31 is a protein called U3 small nucleolar RNA-associated protein 10.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
31	AE	777	6197	3998	1014	1166	19	0	0

- Molecule 32 is a protein called U3 small nucleolar RNA-associated protein 15.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
32	AF	493	3911	2462	702	735	12	0	0

- Molecule 33 is a protein called NET1-associated nuclear protein 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
33	AG	826	6570	4181	1111	1259	19	0	0

- Molecule 34 is a protein called Periodic tryptophan protein 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
34	B1	834	6635	4223	1140	1253	19	0	0

- Molecule 35 is a protein called U3 small nucleolar RNA-associated protein 12.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
35	B2	851	6723	4294	1133	1269	27	0	0

- Molecule 36 is a protein called U3 small nucleolar RNA-associated protein 13.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
36	B3	757	5919	3769	993	1130	27	0	0

- Molecule 37 is a protein called U3 small nucleolar RNA-associated protein 18.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
37	B8	477	3764	2387	662	705	10	0	0

- Molecule 38 is a protein called U3 small nucleolar RNA-associated protein 21.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
38	BE	865	6810	4322	1175	1292	21	0	0

- Molecule 39 is a protein called U3 small nucleolar RNA-associated protein 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
39	B6	374	2800	1782	501	505	12	0	0

- Molecule 40 is a protein called Bud site selection protein 21.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
40	5B	60	495	310	101	84	0	0

- Molecule 41 is a protein called U3 small nucleolar RNA-associated protein 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
41	5C	535	4237	2656	762	807	12	0	0

- Molecule 42 is a protein called U3 small nucleolar RNA-associated protein 11.

Mol	Chain	Residues	Atoms					AltConf	Trace
42	5D	235	Total	C	N	O	S	0	0
			1972	1226	380	359	7		

- Molecule 43 is a protein called U3 small nucleolar RNA-associated protein MPP10.

Mol	Chain	Residues	Atoms					AltConf	Trace
43	5E	204	Total	C	N	O	S	0	0
			1647	1021	294	328	4		

- Molecule 44 is a protein called U3 small nucleolar ribonucleoprotein protein IMP3.

Mol	Chain	Residues	Atoms					AltConf	Trace
44	5F	182	Total	C	N	O	S	0	0
			1530	967	287	269	7		

- Molecule 45 is a protein called U3 small nucleolar ribonucleoprotein protein IMP4.

Mol	Chain	Residues	Atoms					AltConf	Trace
45	5G	282	Total	C	N	O	S	0	0
			2296	1441	430	418	7		

- Molecule 46 is a protein called Something about silencing protein 10.

Mol	Chain	Residues	Atoms				AltConf	Trace
46	5H	136	Total	C	N	O	0	0
			1065	658	211	196		

- Molecule 47 is a protein called Protein SOF1.

Mol	Chain	Residues	Atoms					AltConf	Trace
47	5I	461	Total	C	N	O	S	0	0
			3765	2354	686	709	16		

- Molecule 48 is a protein called rRNA-processing protein FCF2.

Mol	Chain	Residues	Atoms					AltConf	Trace
48	5J	144	Total	C	N	O	S	0	0
			1219	769	230	215	5		

- Molecule 49 is a protein called rRNA-processing protein FCF1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
49	5K	175	1403	896	256	241	10	0	0

- Molecule 50 is a protein called Ribosome biogenesis protein ENP2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
50	RA	338	2709	1713	463	524	9	0	0

- Molecule 51 is a protein called U3 small nucleolar ribonucleoprotein protein LCP5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
51	RB	134	1108	664	227	214	3	0	0

- Molecule 52 is a protein called KRR1 small subunit processome component.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
52	RC	278	2207	1408	391	395	13	0	0

- Molecule 53 is a protein called U3 small nucleolar RNA-associated protein 22.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
53	RE	1079	8716	5666	1437	1589	24	0	0

- Molecule 54 is a protein called Ribosomal RNA-processing protein 7.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
54	RF	241	1963	1253	335	367	8	0	0

- Molecule 55 is a protein called Ribosomal RNA small subunit methyltransferase NEP1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
55	RG	216	1701	1079	296	315	11	0	0
55	RH	230	1799	1142	313	333	11	0	0

- Molecule 56 is a protein called Ribosome biogenesis protein UTP30.

Mol	Chain	Residues	Atoms					AltConf	Trace
56	RI	252	Total	C	N	O	S	0	0
			2045	1309	362	366	8		

- Molecule 57 is a protein called Ribosome biogenesis protein BMS1.

Mol	Chain	Residues	Atoms					AltConf	Trace
57	RJ	796	Total	C	N	O	S	0	0
			6379	4086	1136	1128	29		

- Molecule 58 is a protein called RNA 3'-terminal phosphate cyclase-like protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
58	RK	360	Total	C	N	O	S	0	0
			2781	1781	473	516	11		

- Molecule 59 is a protein called RNA cytidine acetyltransferase.

Mol	Chain	Residues	Atoms					AltConf	Trace
59	RL	805	Total	C	N	O	S	0	0
			4539	2760	885	887	7		
59	RM	765	Total	C	N	O		0	0
			3774	2244	765	765			

- Molecule 60 is a protein called Nucleolar complex protein 14.

Mol	Chain	Residues	Atoms					AltConf	Trace
60	RN	587	Total	C	N	O	S	0	0
			4363	2758	791	803	11		

- Molecule 61 is a protein called Nucleolar complex protein 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
61	RO	525	Total	C	N	O	S	0	0
			3766	2412	646	696	12		

- Molecule 62 is a protein called U3 small nucleolar RNA-associated protein 20.

Mol	Chain	Residues	Atoms				AltConf	Trace
62	RP	2052	Total	C	N	O	0	0
			10202	6098	2052	2052		

- Molecule 63 is a protein called U3 small nucleolar RNA-associated protein 14.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
63	RQ	226	1651	1023	313	313	2	0	0

- Molecule 64 is a protein called Essential nuclear protein 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
64	RS	251	2051	1340	349	359	3	0	0

- Molecule 65 is a protein called Pre-rRNA-processing protein PNO1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
65	RT	171	1357	864	249	240	4	0	0

- Molecule 66 is a protein called Protein FAF1.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
66	RV	190	1448	891	290	264	3	0	0

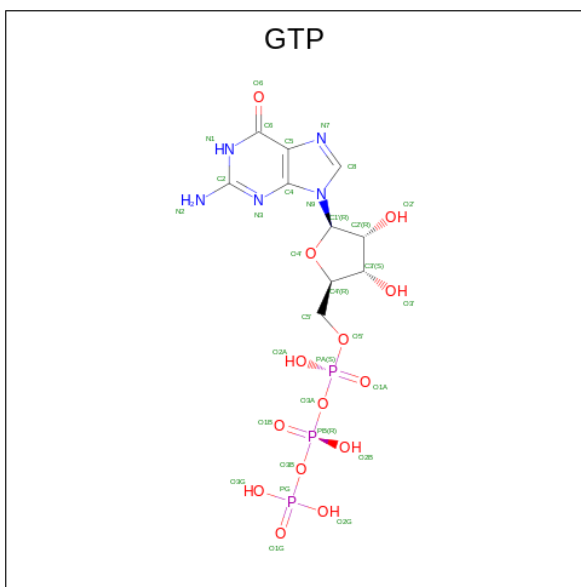
- Molecule 67 is a protein called Unassigned helices.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
67	X1	127	635	381	127	127	0	0

- Molecule 68 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		AltConf
			Total	Zn	
68	Sc	1	1	1	0
68	5K	1	1	1	0

- Molecule 69 is GUANOSINE-5'-TRIPHOSPHATE (three-letter code: GTP) (formula: C₁₀H₁₆N₅O₁₄P₃).



Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
69	RJ	1	32	10	5	14	3	0

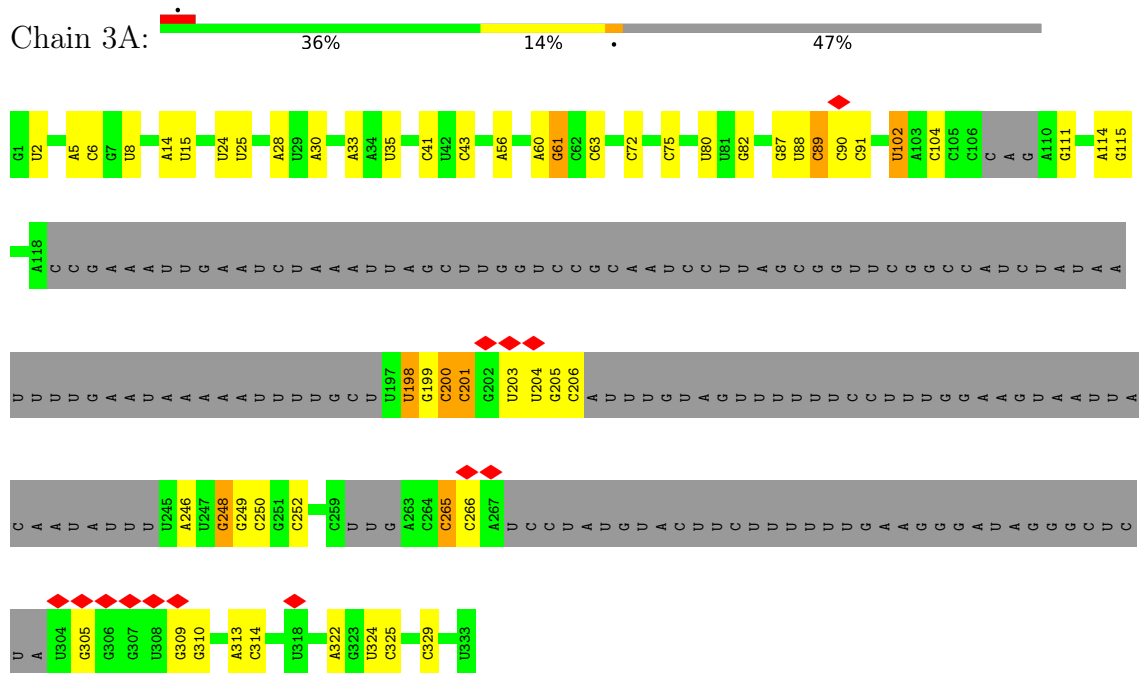
- Molecule 70 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
			Total	Mg	
70	RJ	1	1	1	0

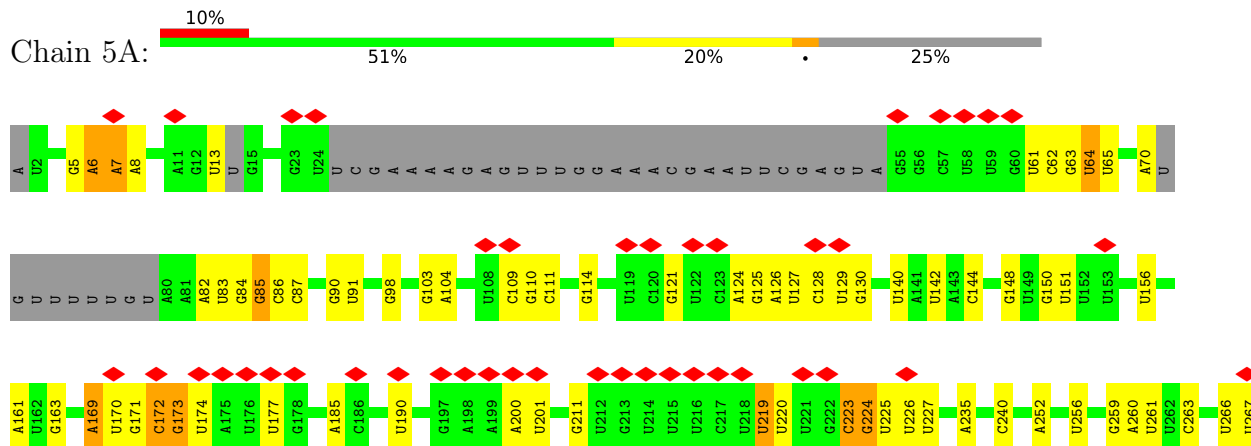
3 Residue-property plots [i](#)

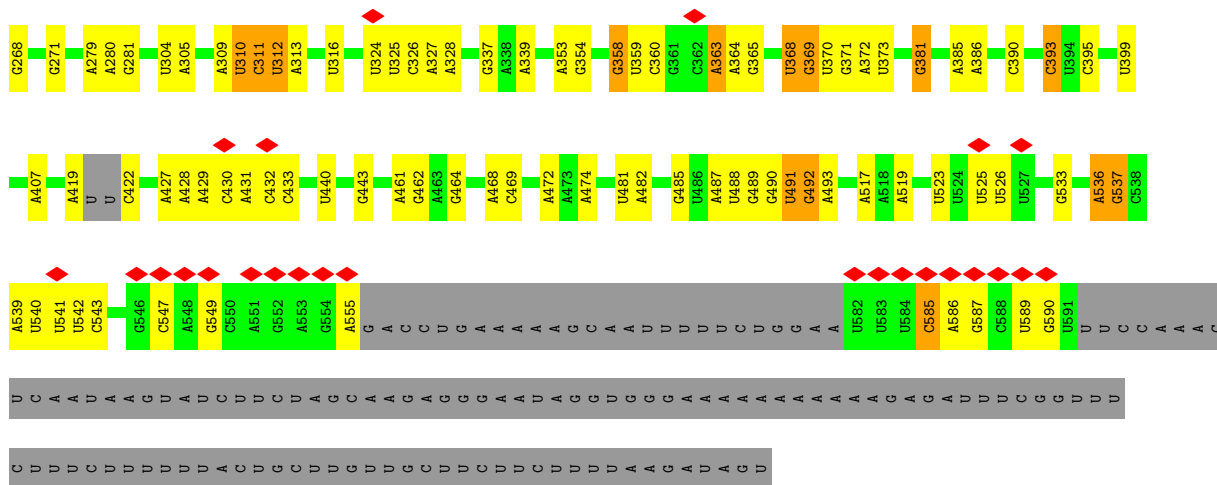
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

- Molecule 1: U3 snoRNA

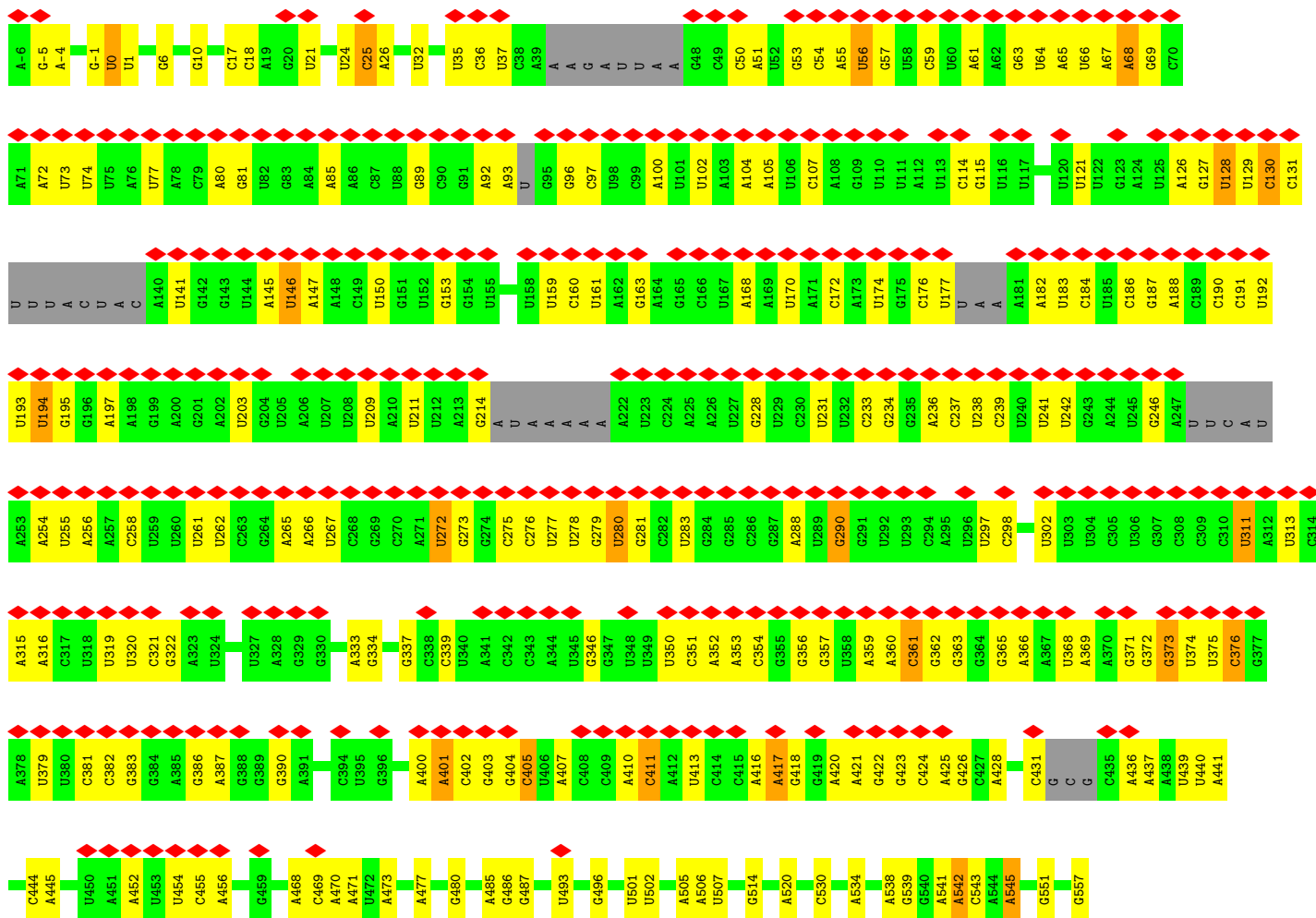
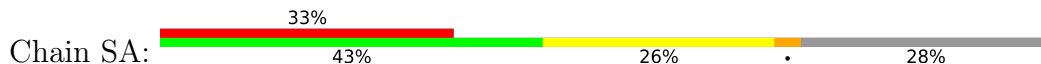


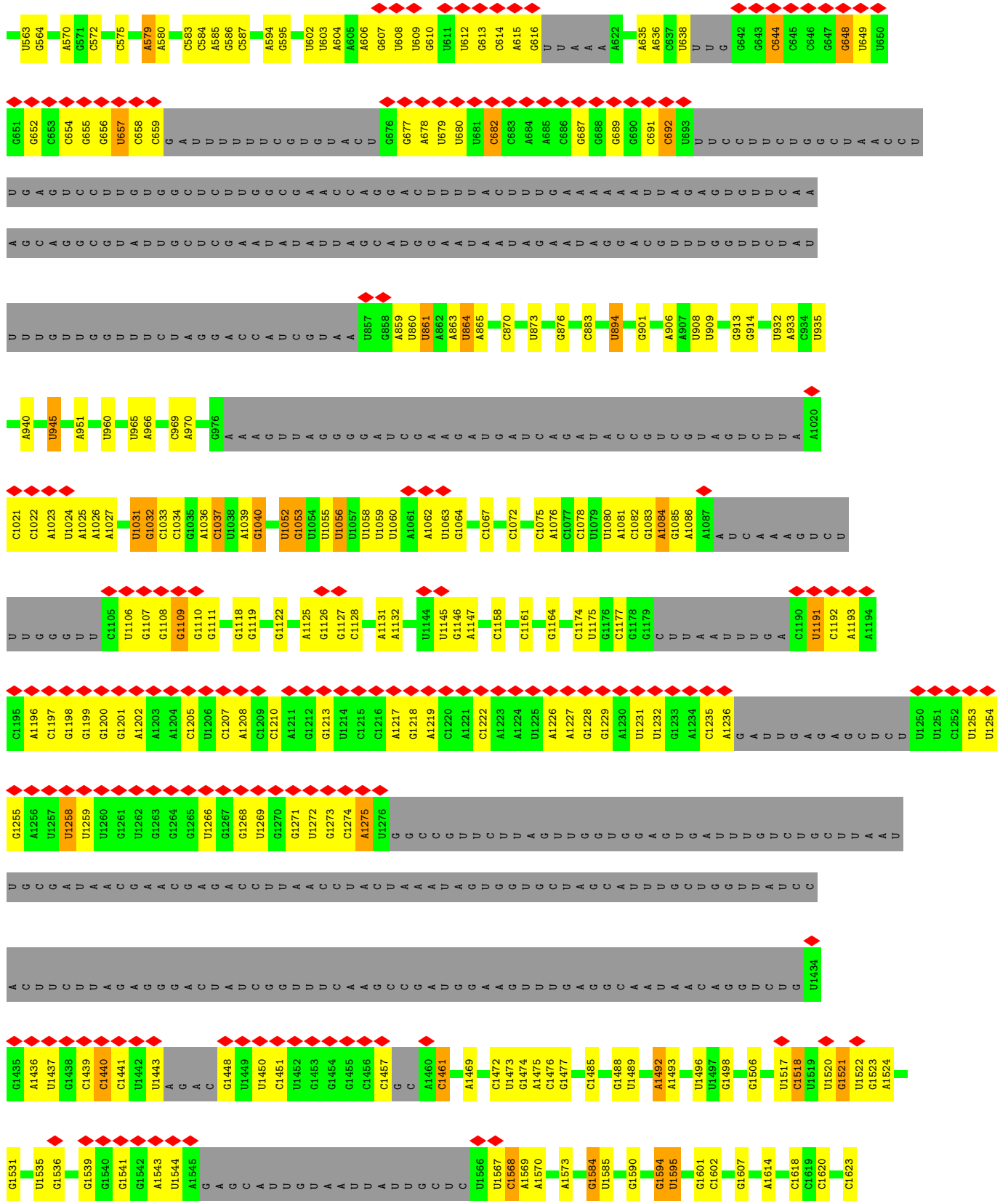
- Molecule 2: 5' ETS

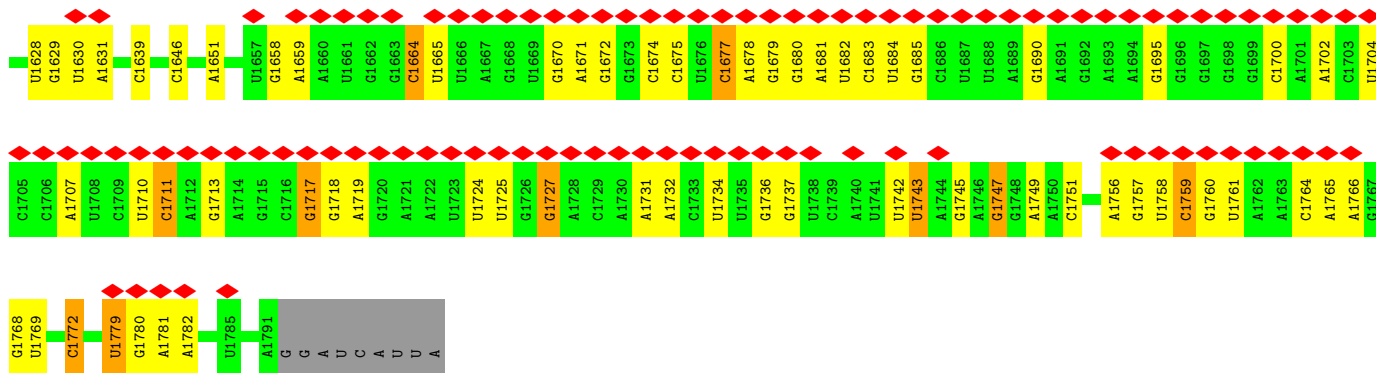




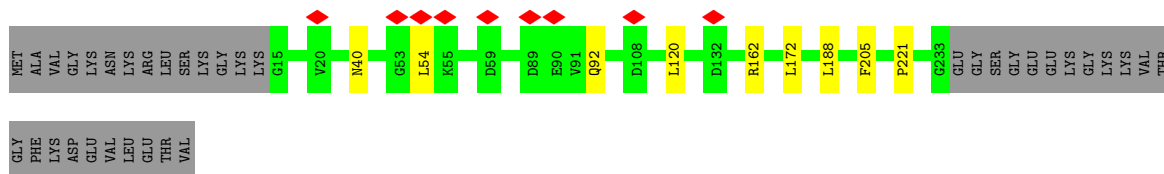
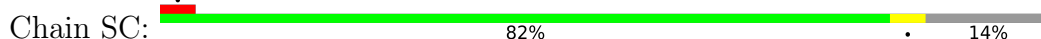
• Molecule 3: 18S rRNA



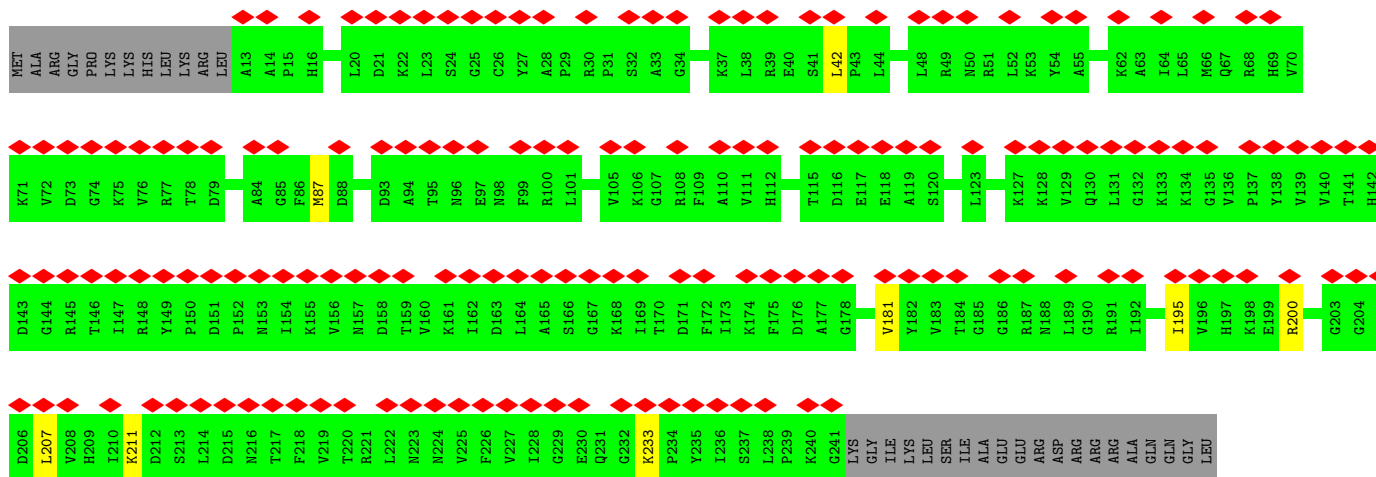
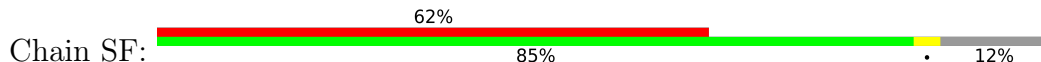




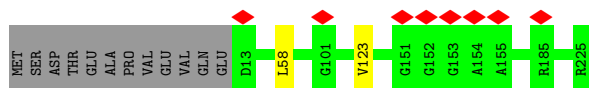
• Molecule 4: 40S ribosomal protein S1-A



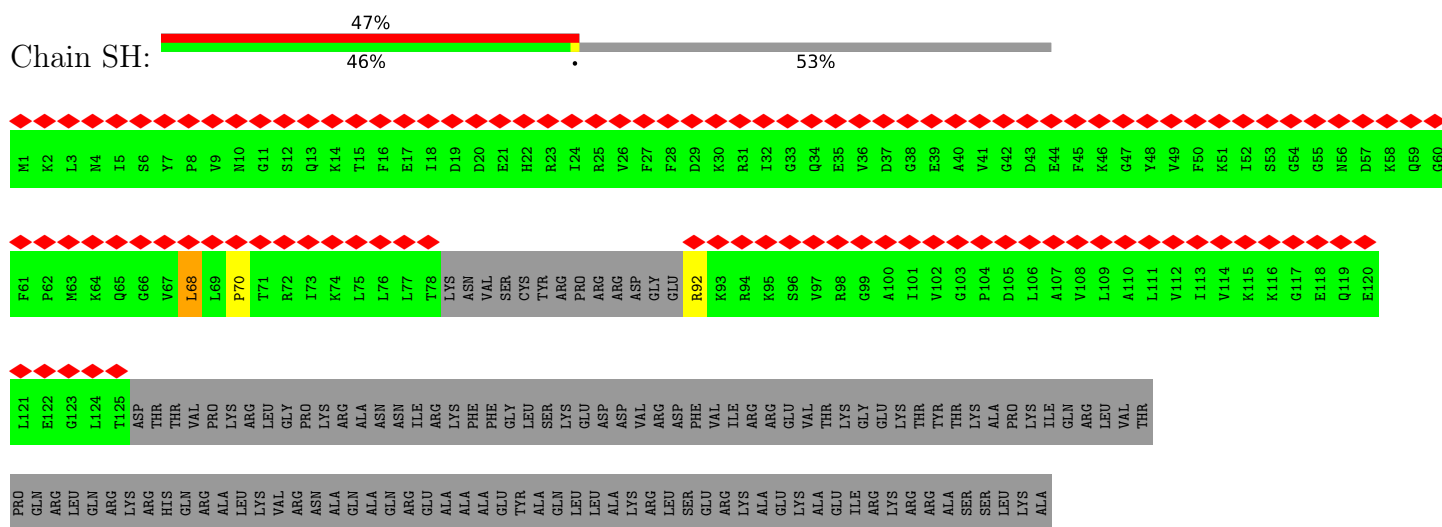
• Molecule 5: 40S ribosomal protein S4-A



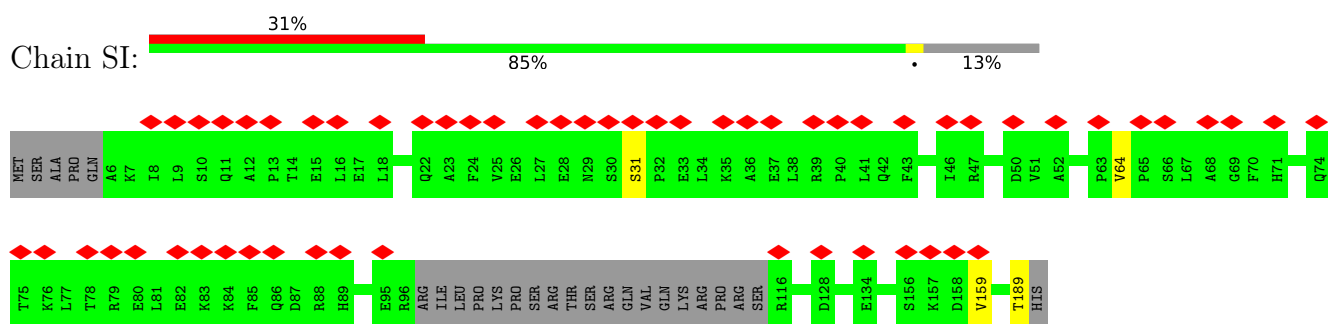
• Molecule 6: 40S ribosomal protein S5



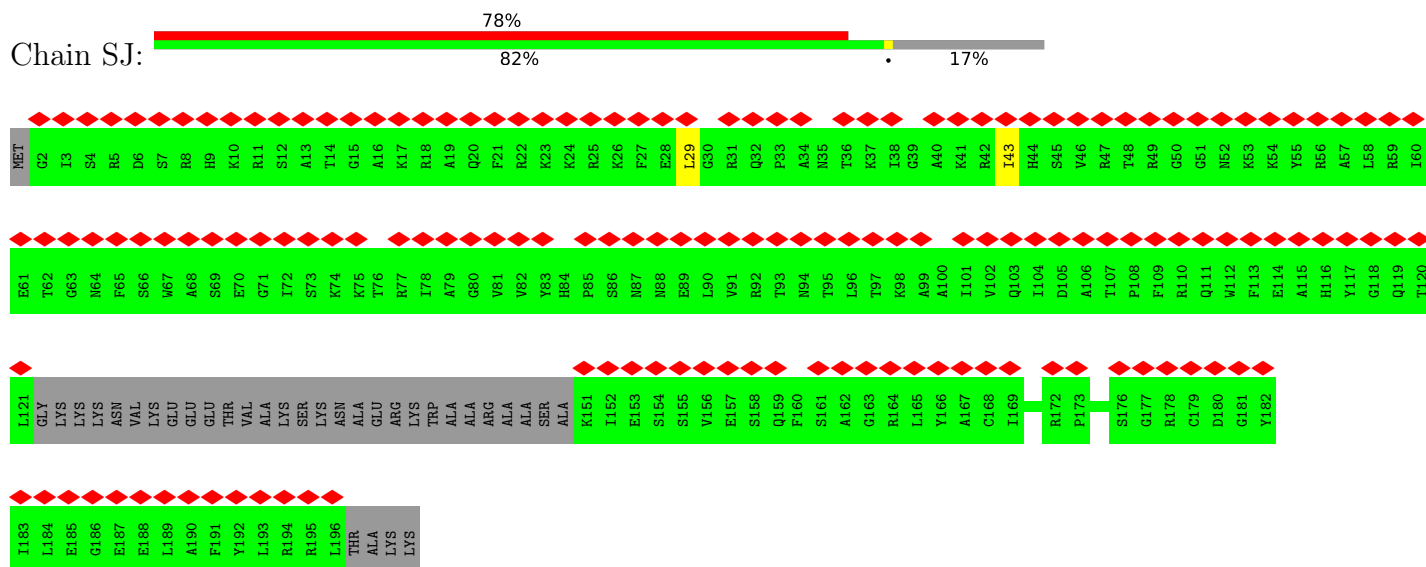
• Molecule 7: 40S ribosomal protein S6-A



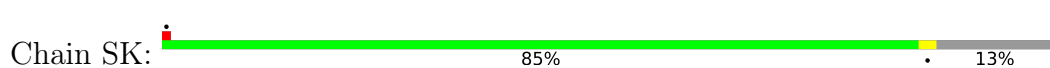
● Molecule 8: 40S ribosomal protein S7-A



● Molecule 9: 40S ribosomal protein S8-A

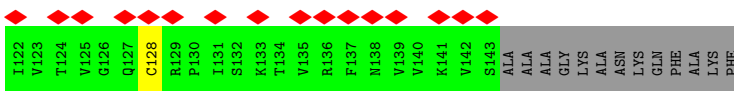
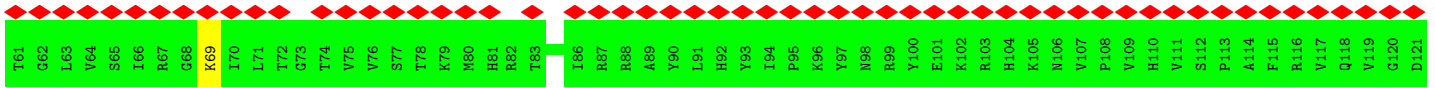
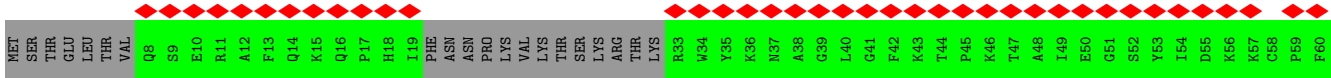
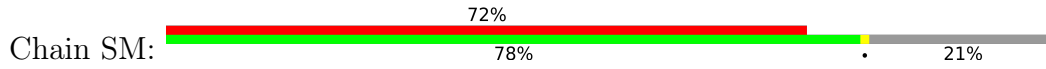


● Molecule 10: 40S ribosomal protein S9-A

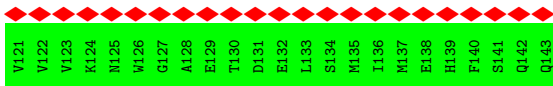
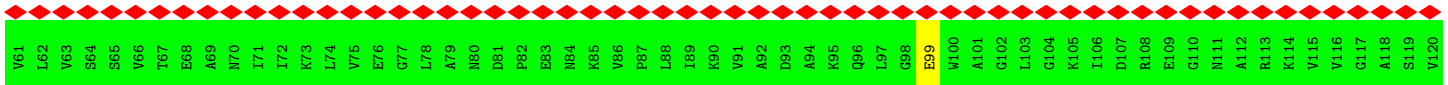
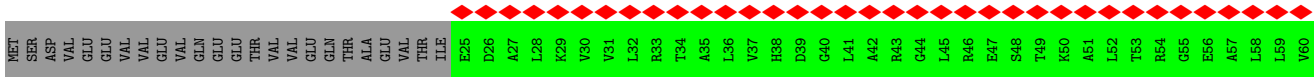
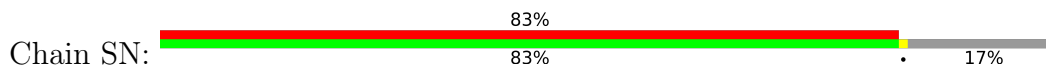




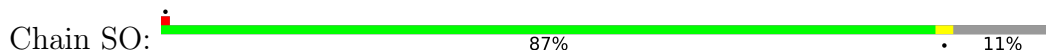
- Molecule 11: 40S ribosomal protein S11-A



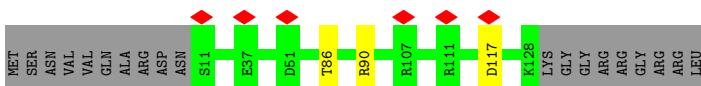
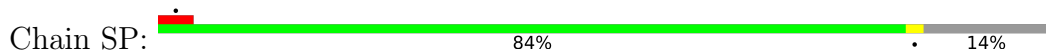
- Molecule 12: 40S ribosomal protein S12



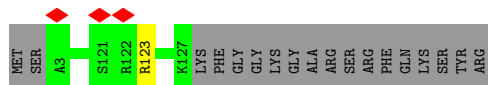
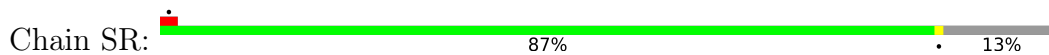
- Molecule 13: 40S ribosomal protein S13



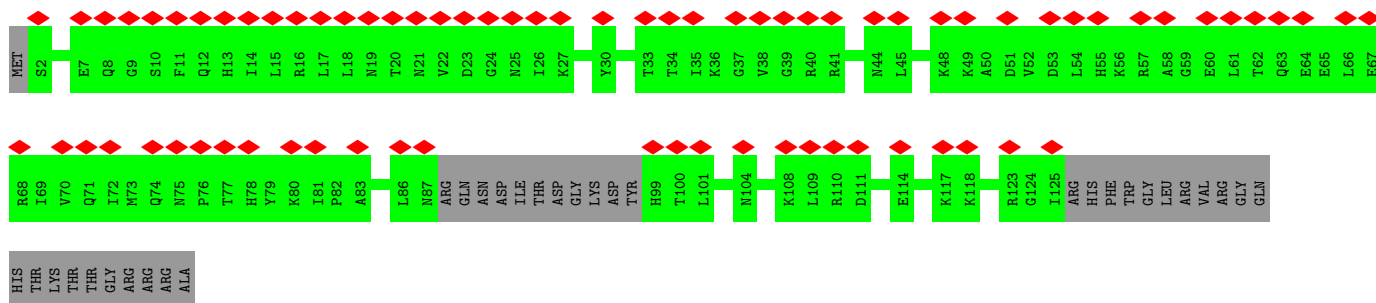
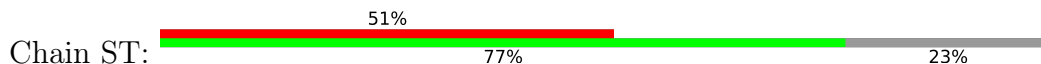
- Molecule 14: 40S ribosomal protein S14-A



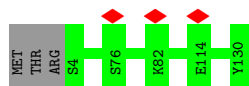
- Molecule 15: 40S ribosomal protein S16-A



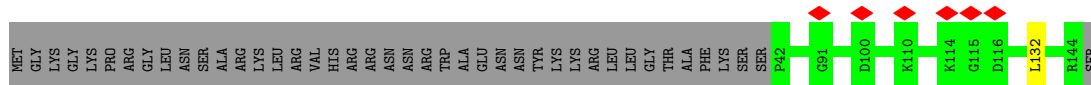
- Molecule 16: 40S ribosomal protein S18-A



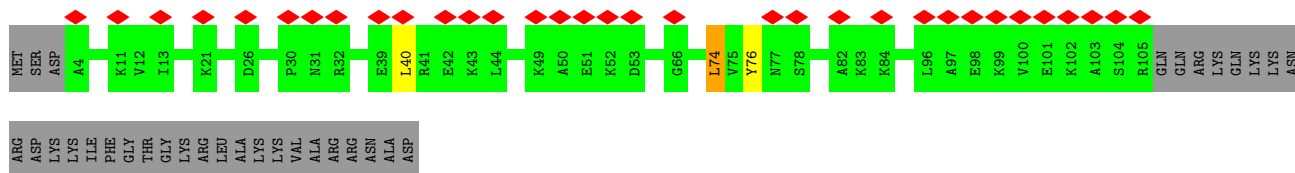
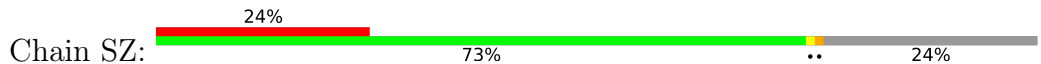
- Molecule 17: 40S ribosomal protein S22-B



- Molecule 18: 40S ribosomal protein S23-A

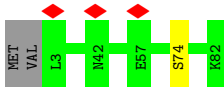


- Molecule 19: 40S ribosomal protein S24-A

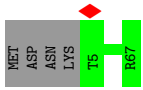


- Molecule 20: 40S ribosomal protein S27-A

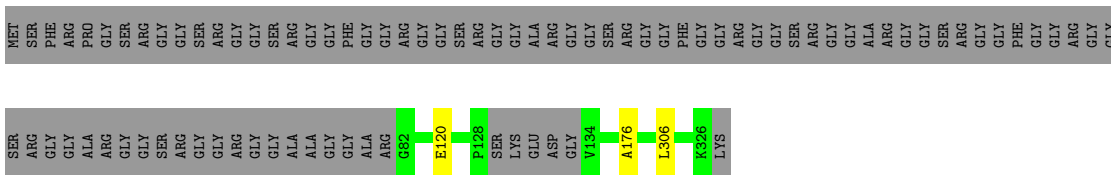




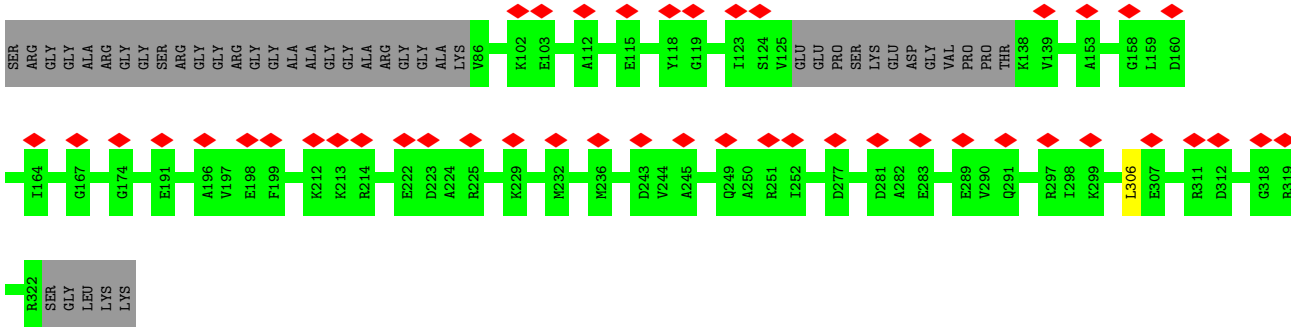
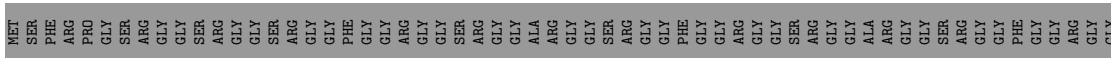
• Molecule 21: 40S ribosomal protein S28-A



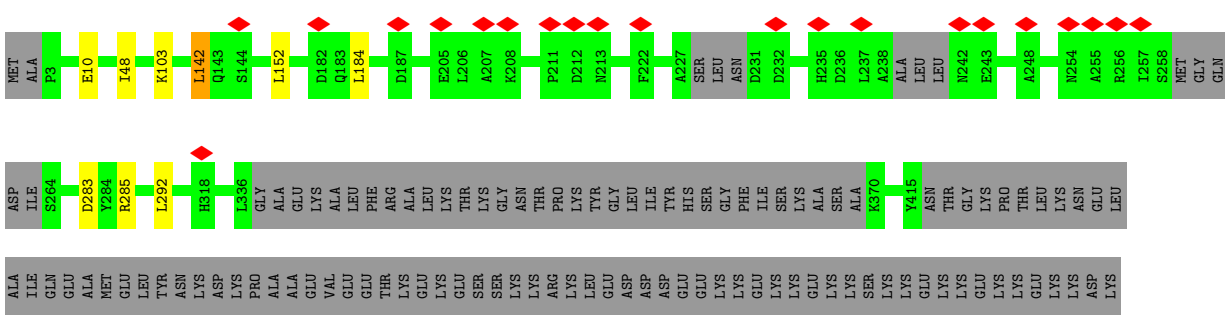
• Molecule 22: rRNA 2'-O-methyltransferase fibrillar



• Molecule 22: rRNA 2'-O-methyltransferase fibrillar

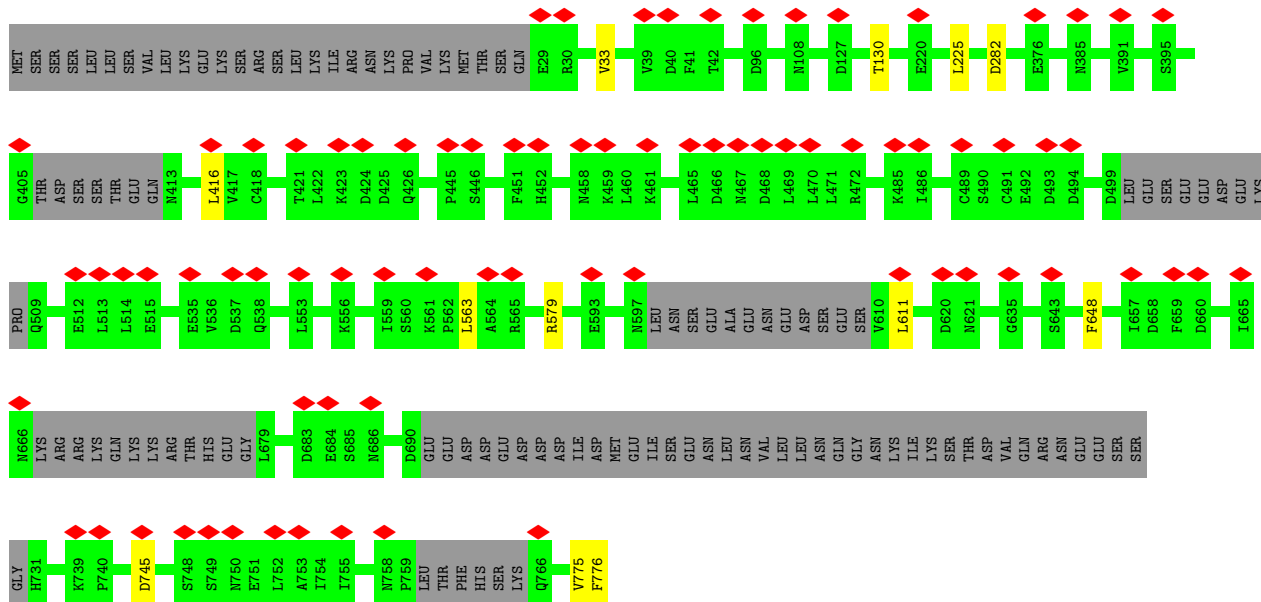
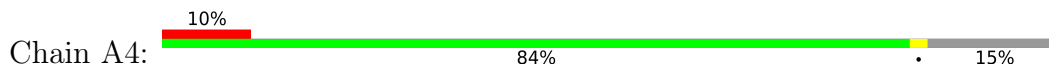


• Molecule 23: Nucleolar protein 56

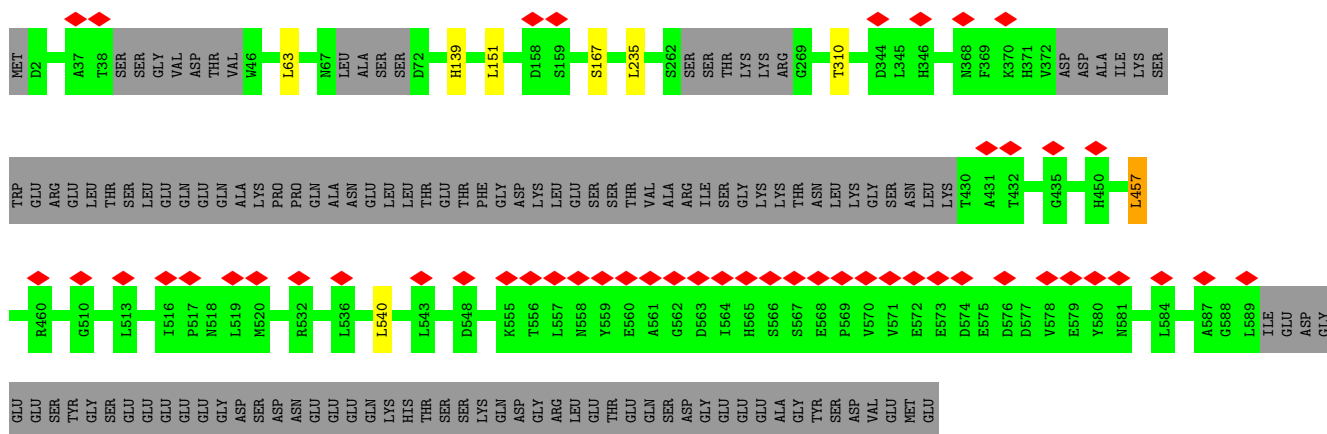
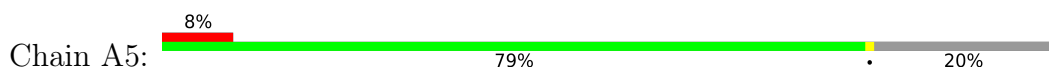




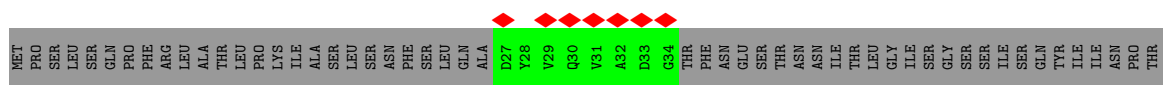
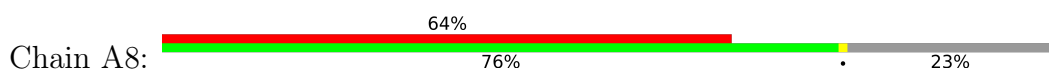
• Molecule 27: U3 small nucleolar RNA-associated protein 4

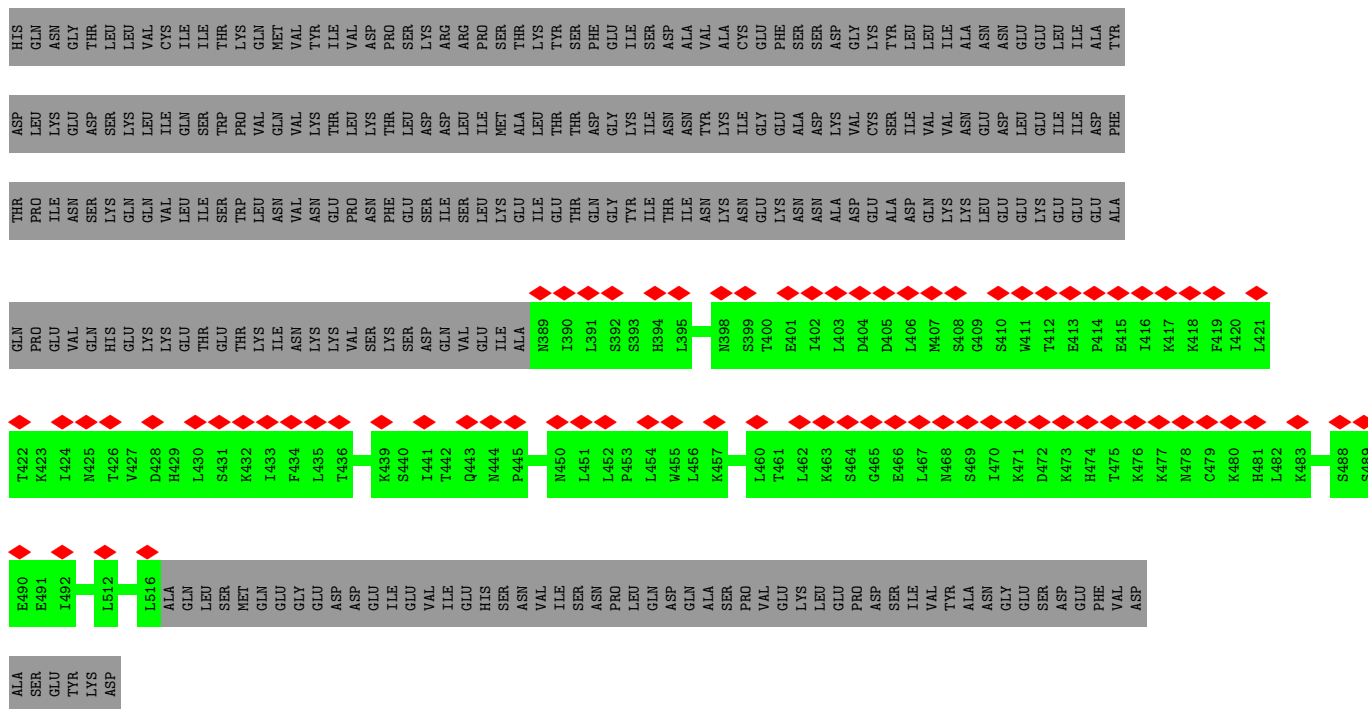


• Molecule 28: U3 small nucleolar RNA-associated protein 5

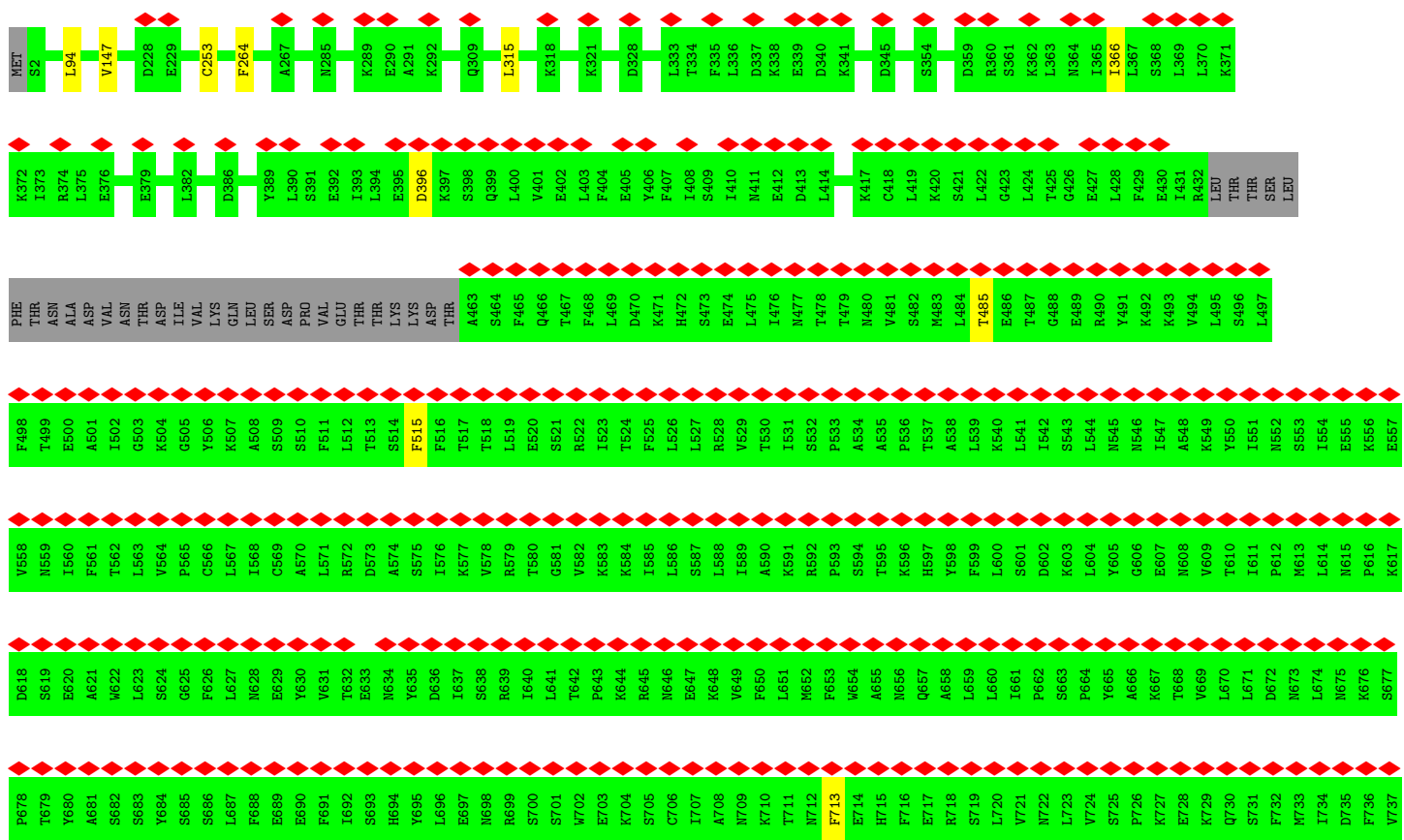
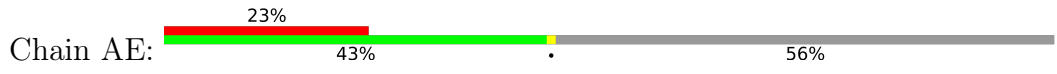


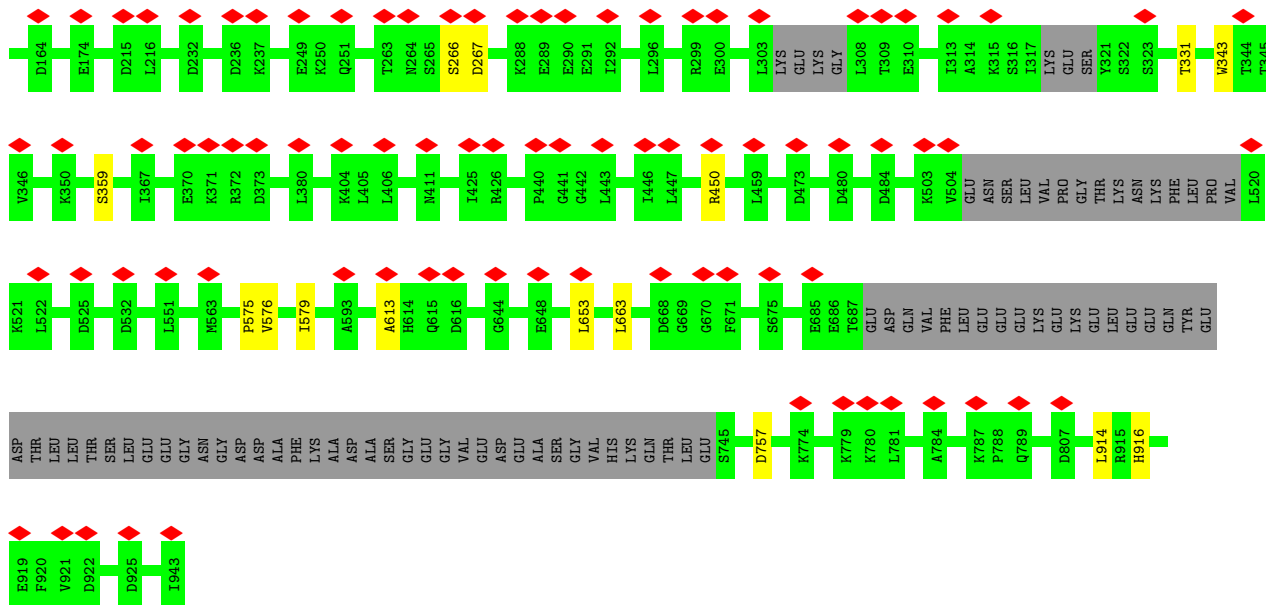
• Molecule 29: U3 small nucleolar RNA-associated protein 8



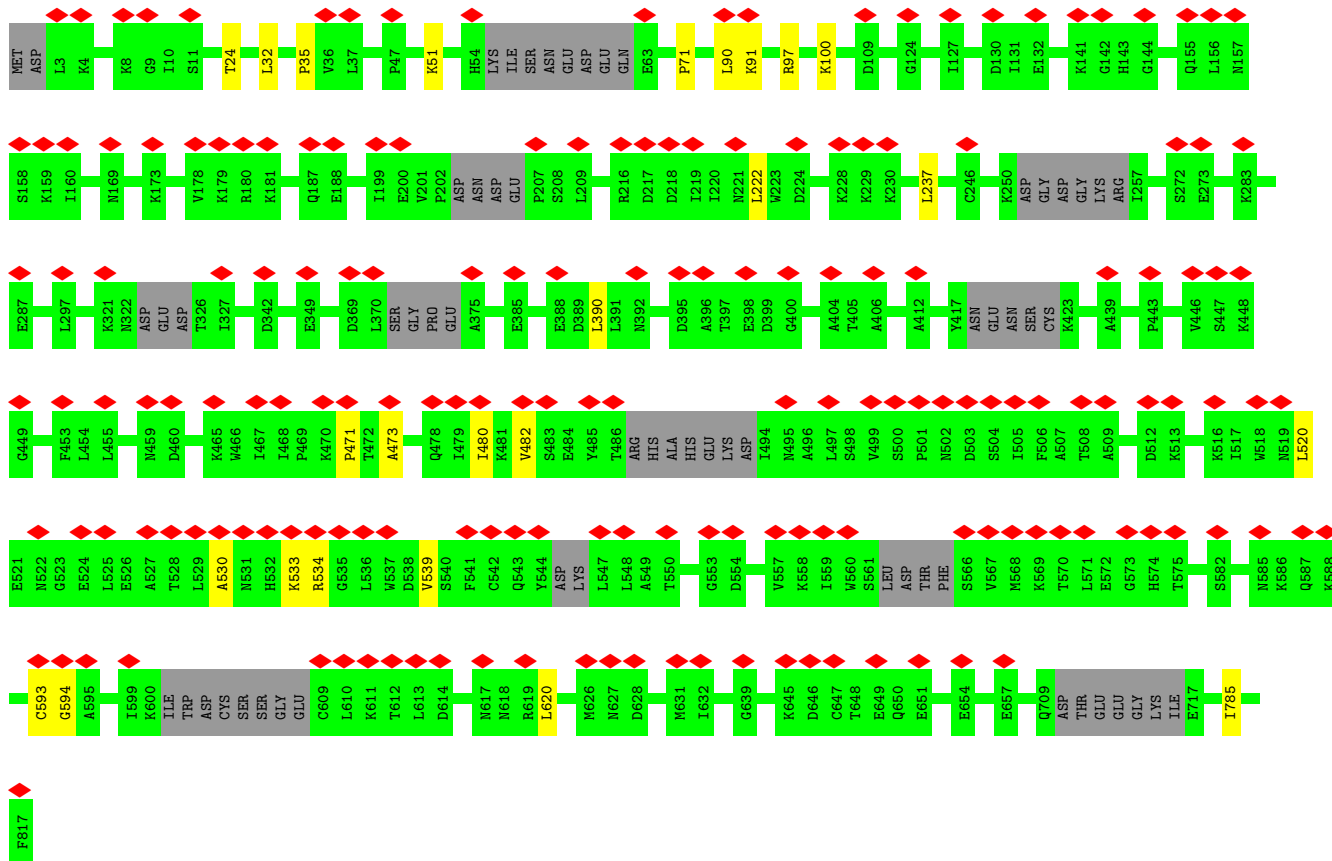
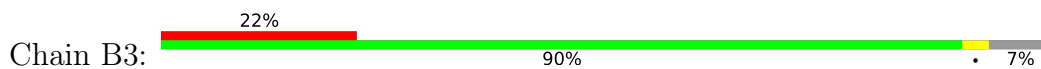


• Molecule 31: U3 small nucleolar RNA-associated protein 10

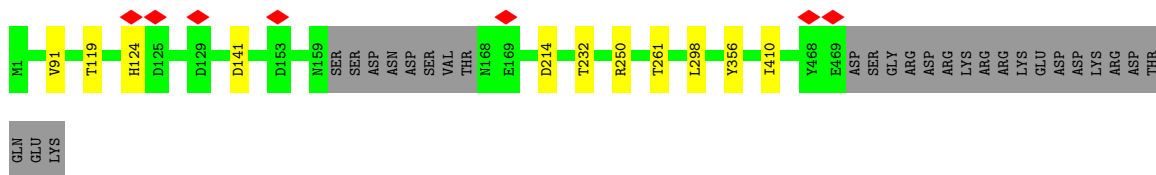
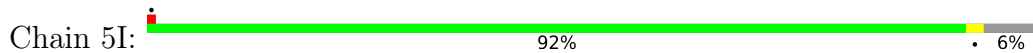




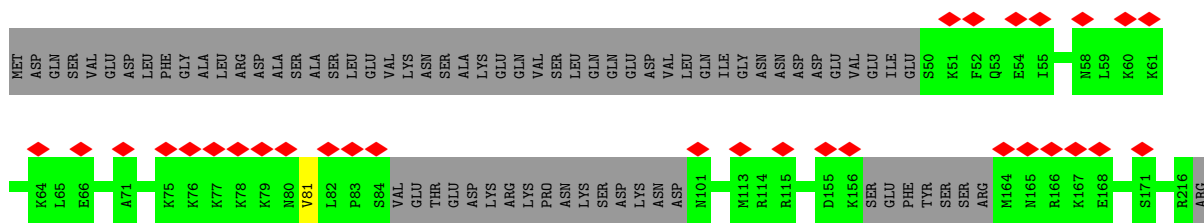
• Molecule 36: U3 small nucleolar RNA-associated protein 13



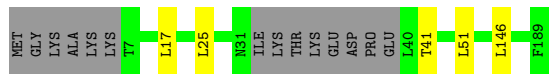
• Molecule 37: U3 small nucleolar RNA-associated protein 18



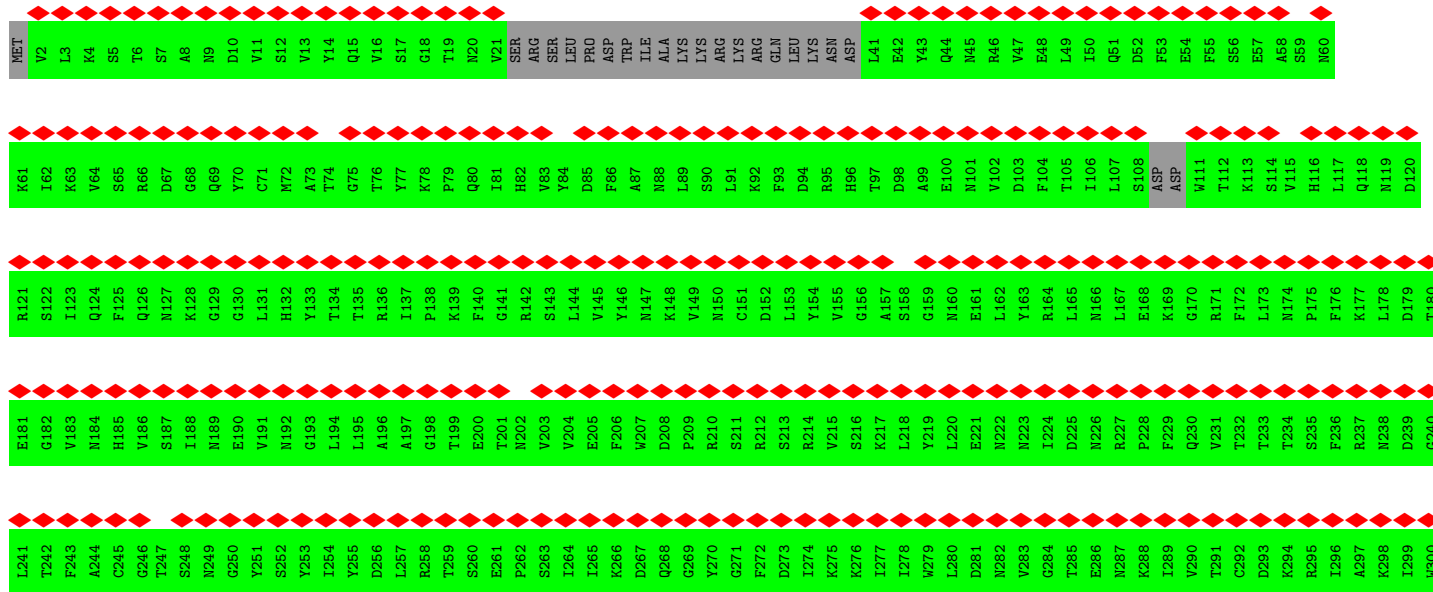
• Molecule 48: rRNA-processing protein FCF2

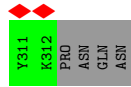


• Molecule 49: rRNA-processing protein FCF1

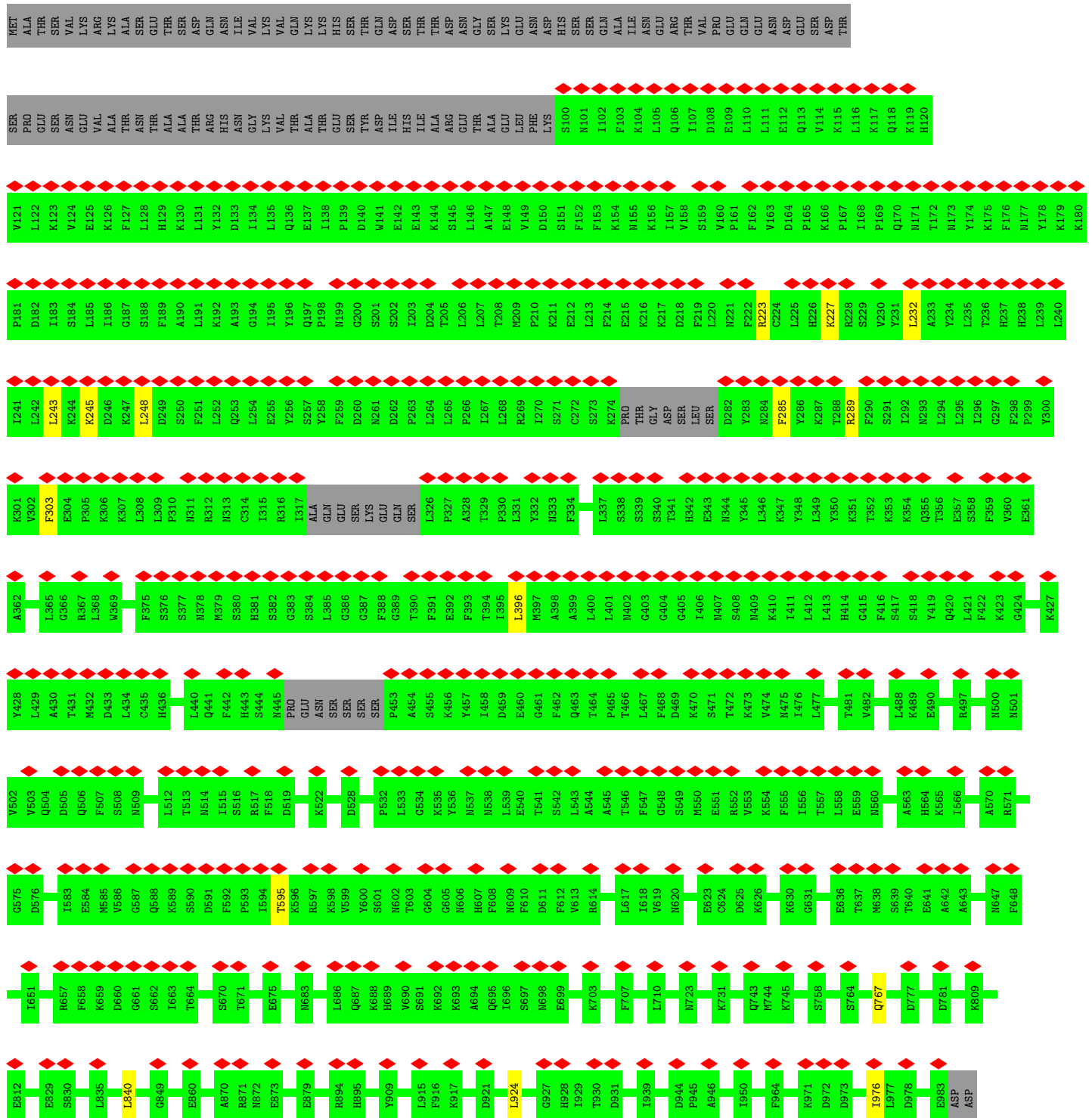
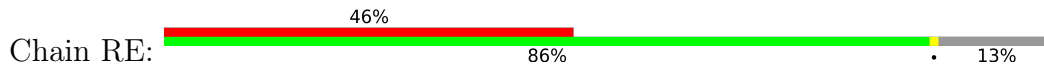


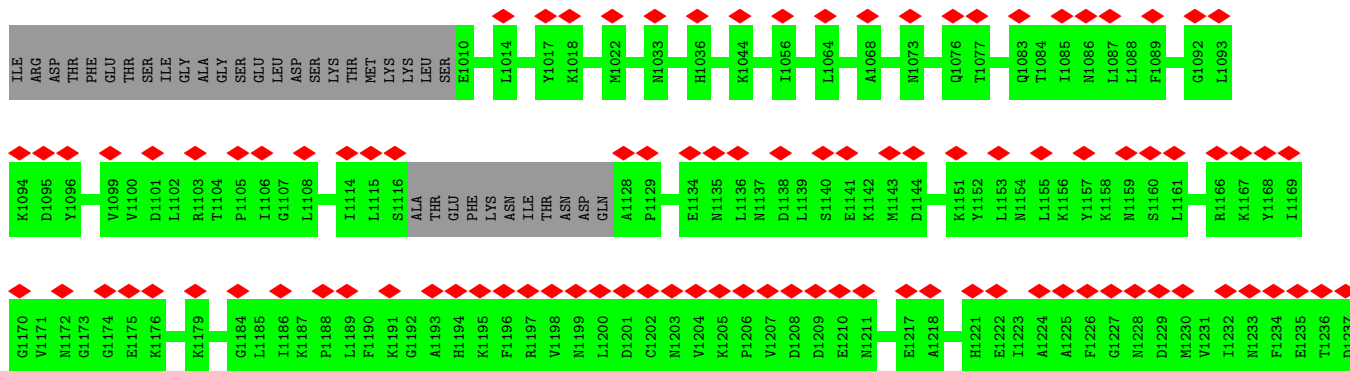
• Molecule 50: Ribosome biogenesis protein ENP2



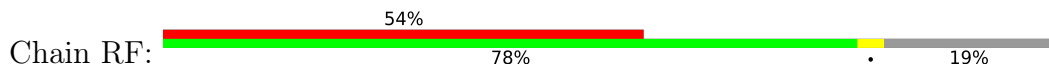


● Molecule 53: U3 small nucleolar RNA-associated protein 22

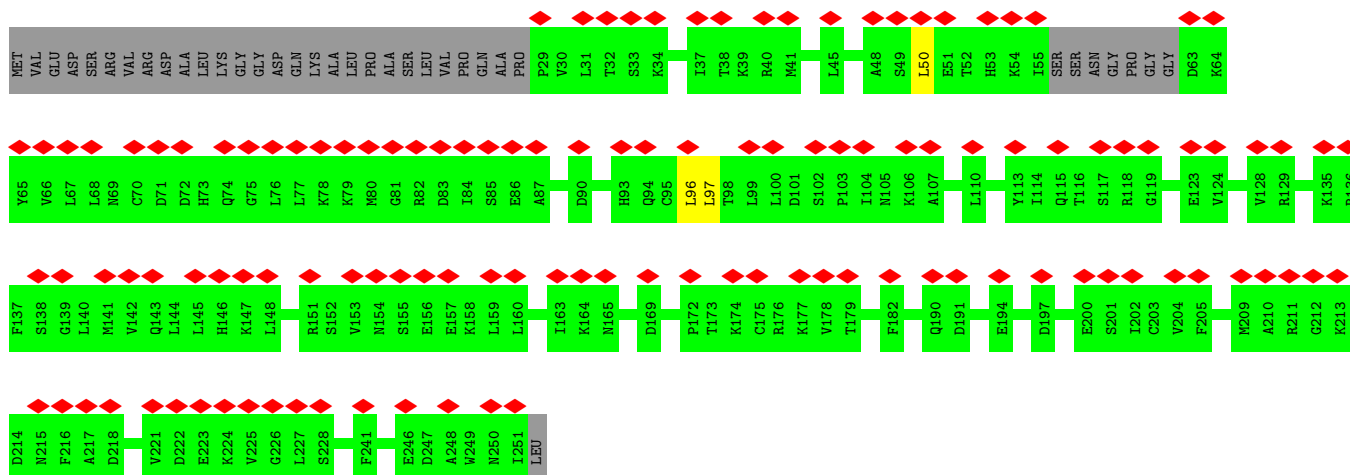
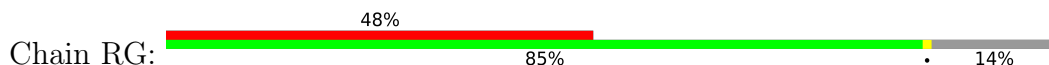


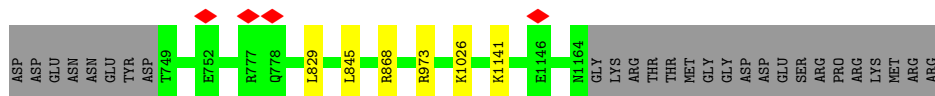


• Molecule 54: Ribosomal RNA-processing protein 7

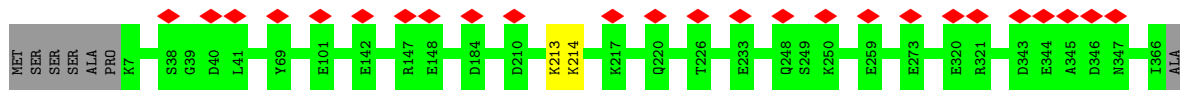


• Molecule 55: Ribosomal RNA small subunit methyltransferase NEP1

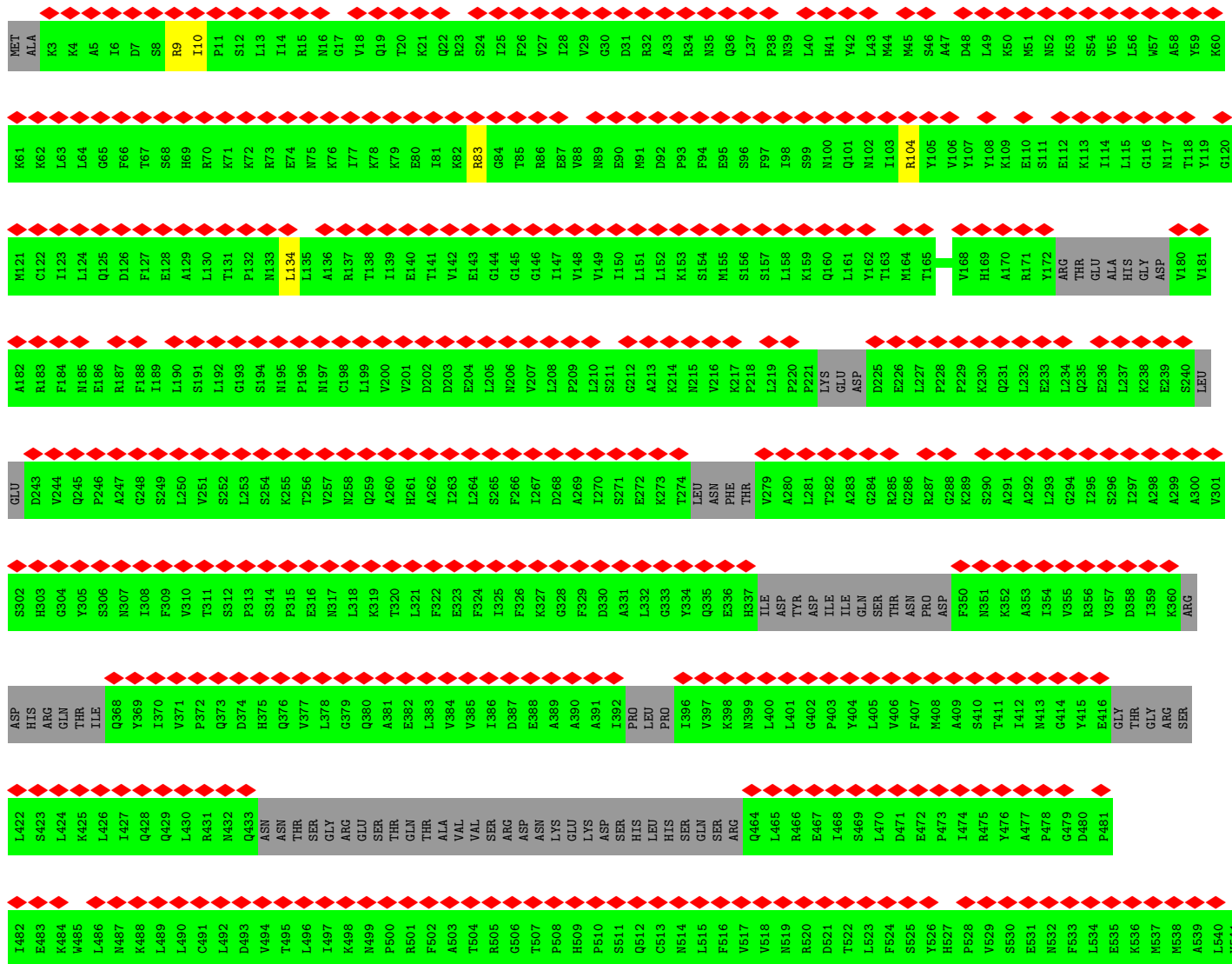
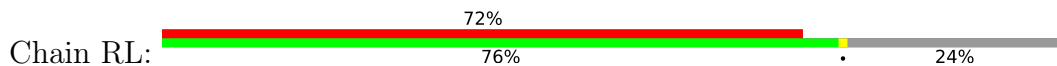


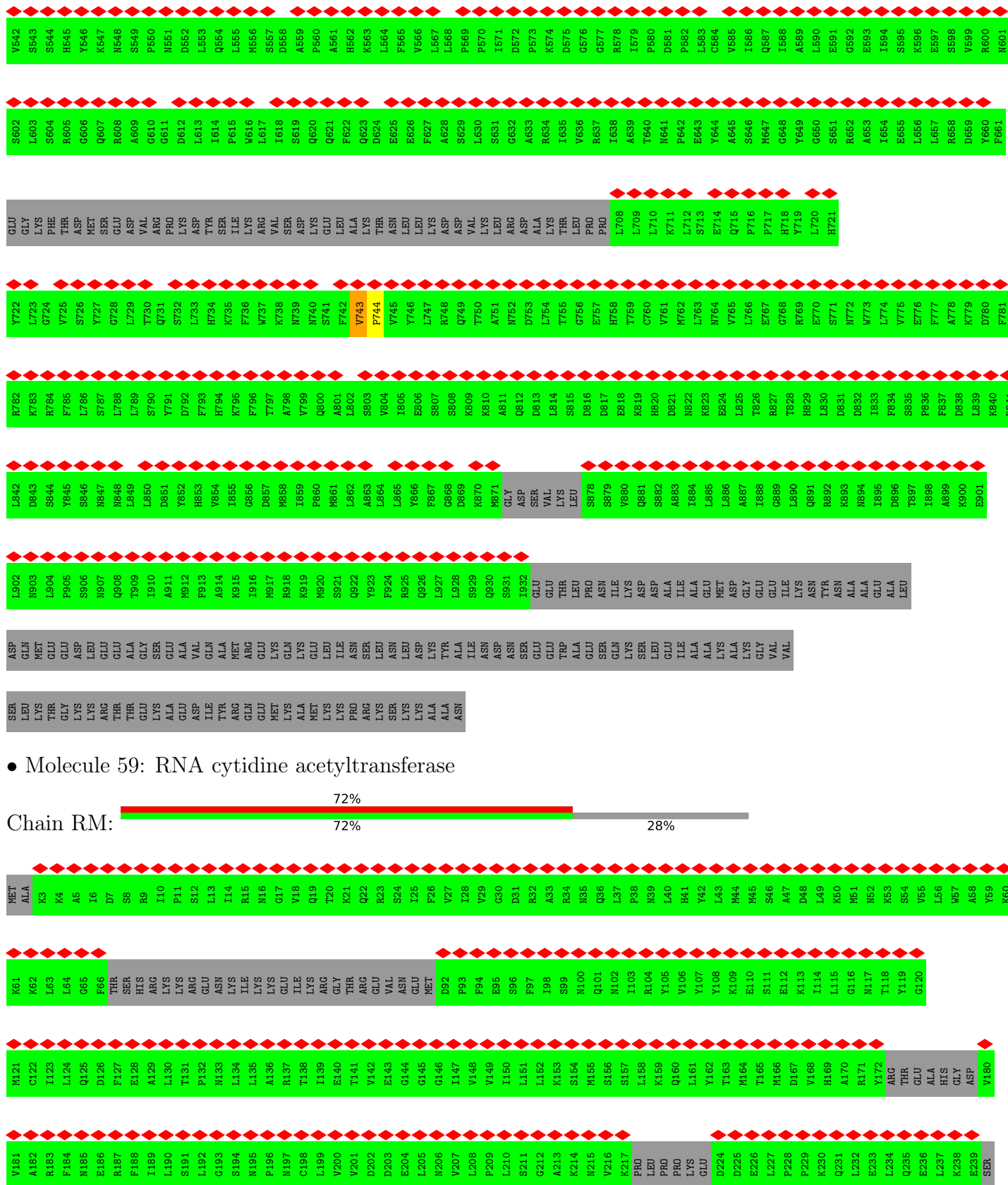


• Molecule 58: RNA 3'-terminal phosphate cyclase-like protein

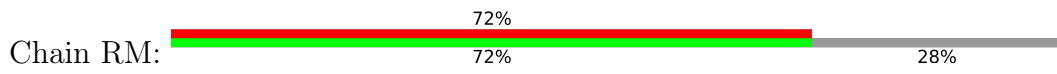


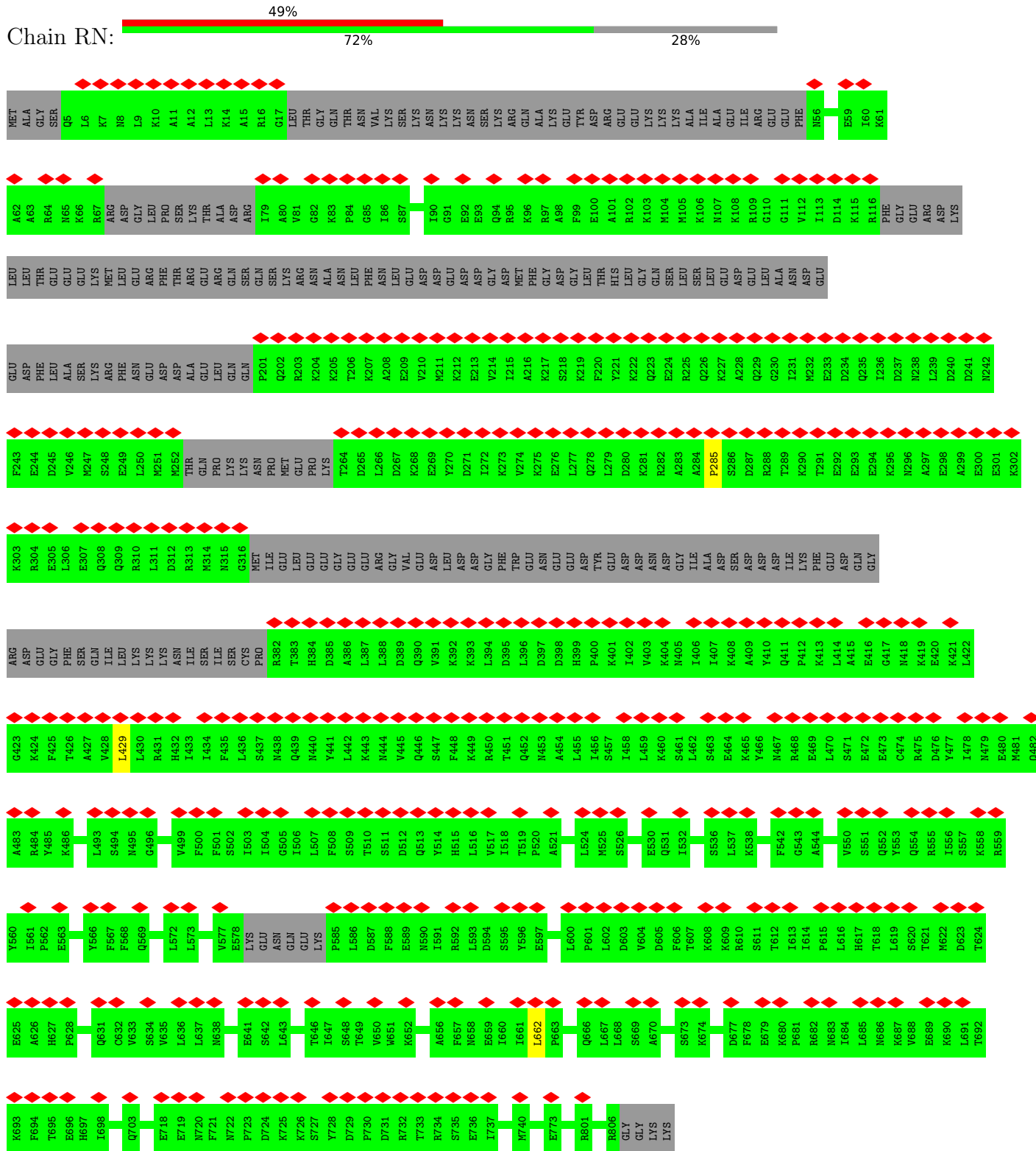
• Molecule 59: RNA cytidine acetyltransferase



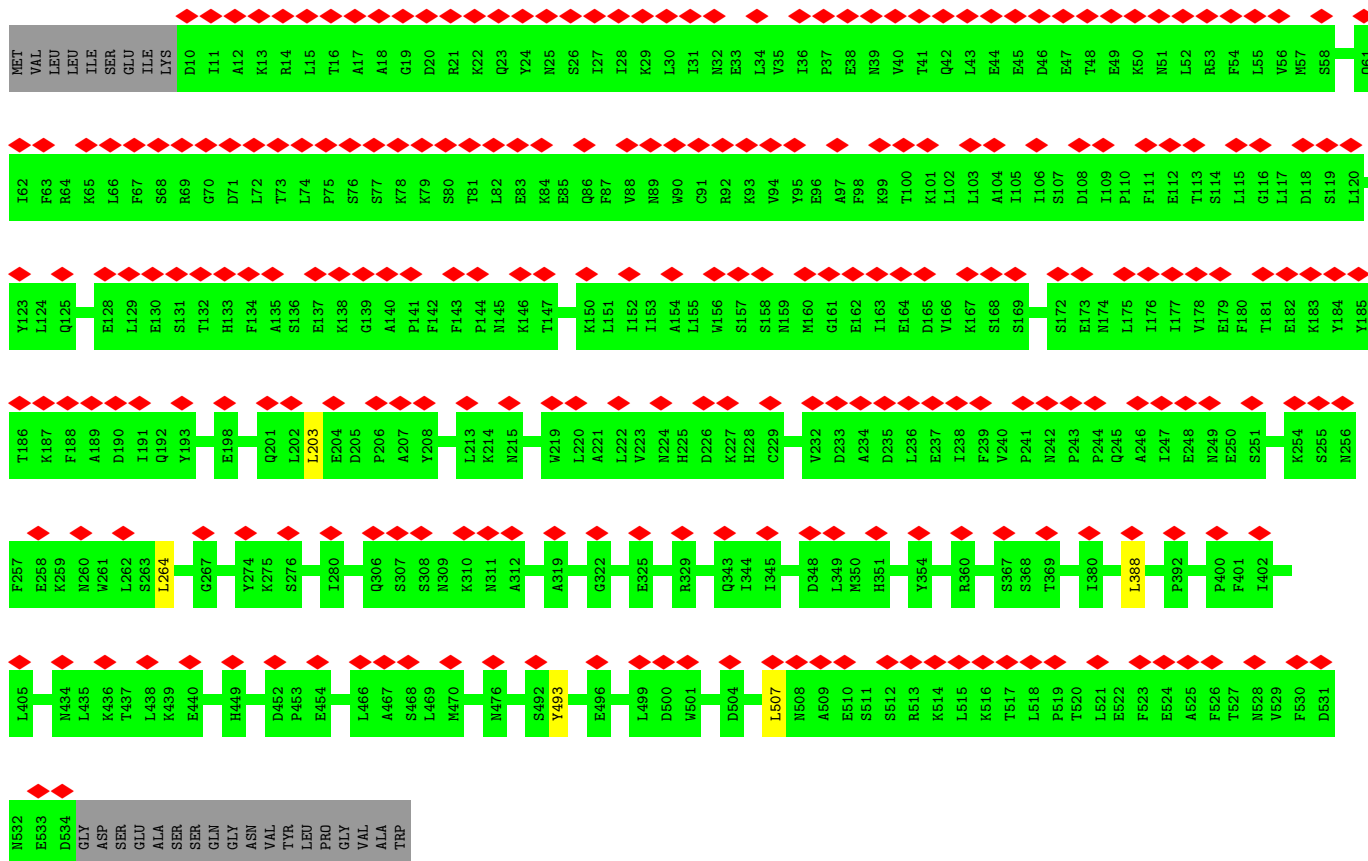


● Molecule 59: RNA cytidine acetyltransferase

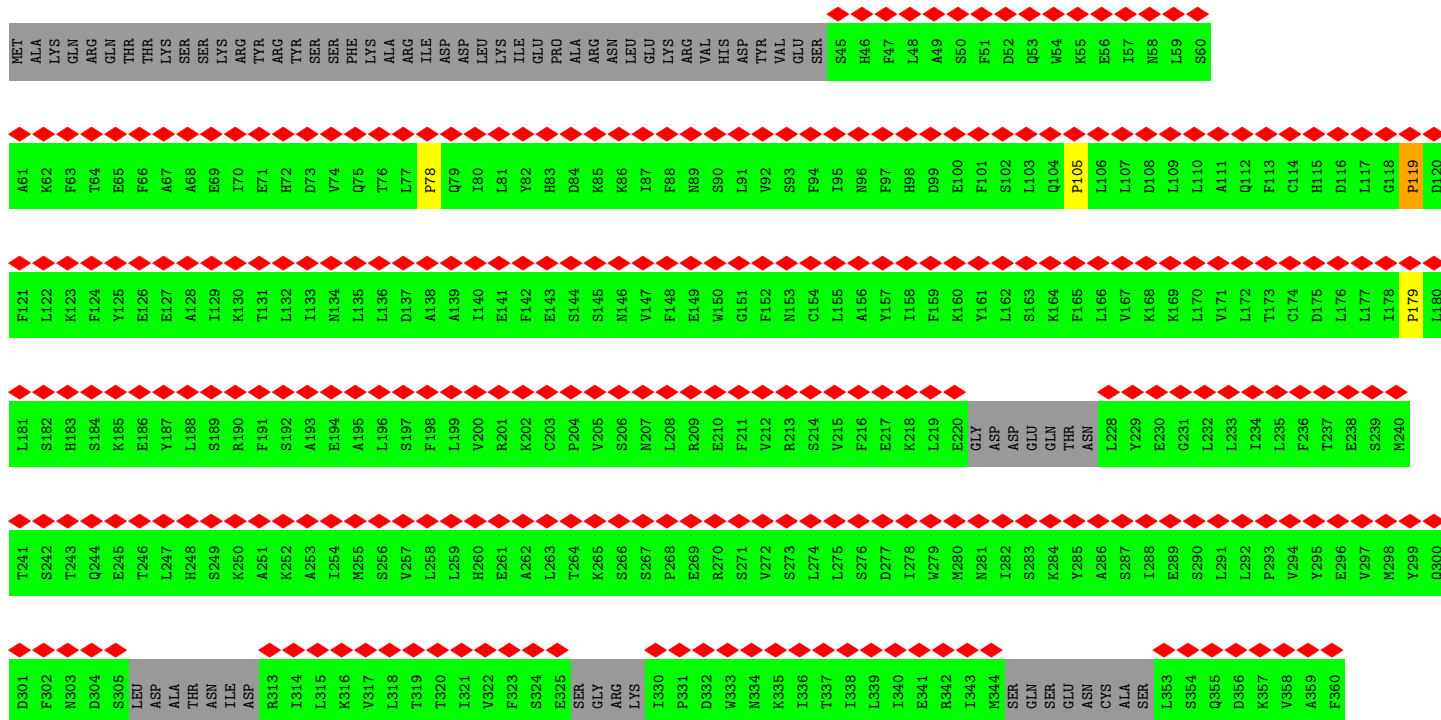
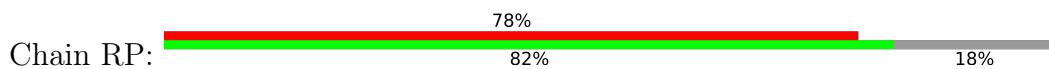




● Molecule 61: Nucleolar complex protein 4

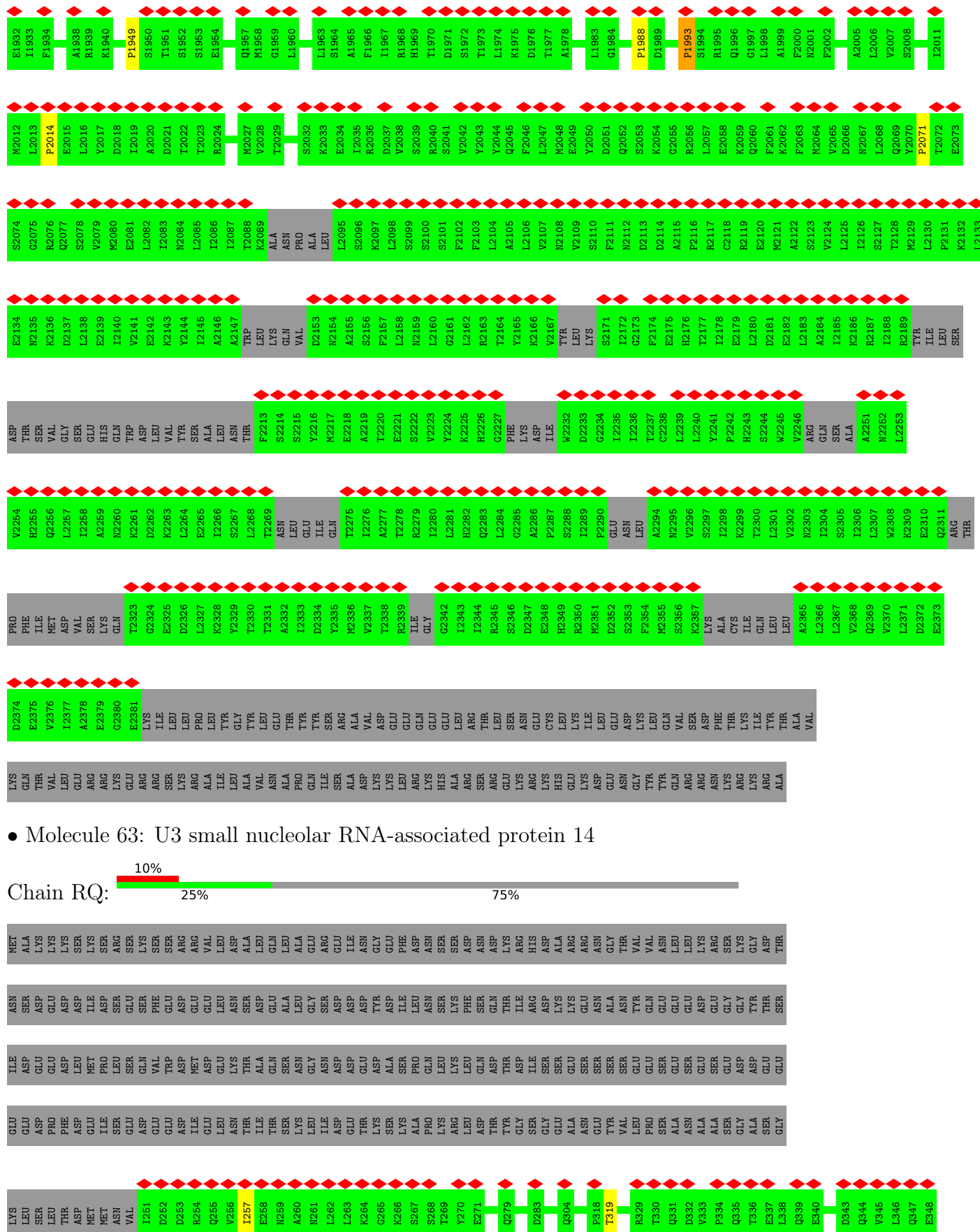


• Molecule 62: U3 small nucleolar RNA-associated protein 20



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S1021	V1022	L1023	Q1024	P1025	L1026	I1027	Y1028	S1029	I1030	A1031	M1032	A1033	Y1034	Y1035	V1036	L1037	D1038	T1039	E1040	S1041	T1042	E1043	E1044	V1045	H1046	L1047	R1048	K1049	M1050	A1051	S1052	M1053	L1054	R1055	Q1056	Q1057	G1058	L1059	K1060	C1061	L1062	S1063	S1064	V1065	F1066	E1067	F1068	G1070	M1071	T1072	F1073	D1074	W1075	S1076	T1077	M1078	E1080											
I841	K842	N843	V844	Y845	S846	A847	T848	E849	L850	H851	D852	H853	L854	M855	V856	L857	L858	G859	S860	R861	N862	T863	D864	H865	Q866	K867	L868	A869	L870	D871	A872	L873	L874	A875	Y876	K877	N878	P879	T880	L881	N882	K883	Y884	R885	D886	N887	L888	K889	N890	L891	L892	D893	D894	T895	L896	F897	K898	D899	E900									
V781	M782	L783	S784	I785	P786	Q787	V788	A789	E790	M791	H792	F793	V794	D795	I796	A797	P798	F799	V800	Y801	N802	D803	F804	K805	T806	Y807	K808	D809	E810	E811	D812	M813	E814	N815	E816	R817	V818	I819	T820	G821	S822	M823	T824	E825	V826	D827	R828	N829	V830	F831	L832	K833	T834	L835	S836	K837	F838	K839	N840									
E721	D722	G723	A724	M725	K726	V727	L728	M729	D730	S731	S732	V733	V734	R735	L736	D737	D738	I739	I740	D741	T742	F743	S744	H745	H746	M747	S748	K749	V750	S751	T752	M753	Q754	N755	S756	I757	L758	S759	T760	I761	I762	E763	R764	R765	L766	P767	T768	V769	Q770	P771	I772	L773	D774	R775	N776	Q777	L778	L779	K780									
F662	L663	K664	Y665	L666	F667	G668	L669	L670	Q611	G612	M613	Q614	V615	P616	D617	L618	L619	S620	S621	C622	M623	V624	I625	E626	E627	I628	P629	L630	T631	L632	Q633	M634	A635	R636	D637	L638	T639	I640	R641	I642	K643	AS	VAL	G520	T521	L522	L523	K524	I525	Y526	R527	K528	E529	D530	A531	A532	S533	GLY	ASN	ASN	LEU	L538	K539	T540	Y598	GLU	THR	L720
L361	F362	A363	L364	F365	I366	R367	N368	S369	D370	V371	K372	T373	L374	T375	L376	F377	H378	Q379	K380	L381	F382	N383	Y384	A385	L386	T387	N388	I389	S390	D391	C392	F393	L394	E395	F396	F397	Q398	F399	A400	L401	R402	L403	S404	Y405	E406	R407	V408	F409	S410	F411	ASN	GLY	LEU	LYS	PHE	LEU	GLN	L419	F420									
L421	K422	K423	N424	W425	Q426	S427	Q428	G429	K430	K431	I432	A433	L434	F435	F436	L437	E438	V439	D440	D441	K442	P443	E444	A445	L446	K447	V448	R449	E450	V451	N452	F453	P454	E455	E456	F457	F458	L459	S460	I461	R462	D463	F464	F465	Y466	T467	A468	E469	I470	N471	D472	S473	N474	D475	L476	F477	E478	I479	TYR									
I541	L542	D543	N544	Y545	E546	N547	Y548	K549	E550	S551	L552	ASN	PHE	LEU	ARG	G557	W558	N559	K560	L561	V562	S563	N564	L565	H566	P567	S568	E569	S570	L571	K572	G573	L574	M575	S576	H577	Y578	P579	S580	L581	L582	L583	S584	L585	T586	D587	N588	F589	M590	L591	P592	D593	G594	K595	I596	R597	Y598	GLU	THR									
LEU	GLU	LEU	MET	K605	T606	L607	M608	I609	L610	Q611	G612	M613	Q614	V615	P616	D617	L618	L619	S620	S621	C622	M623	V624	I625	E626	E627	I628	P629	L630	T631	L632	Q633	M634	A635	R636	D637	L638	T639	I640	R641	I642	K643	ASN	VAL	GLY	ALA	GLU	PHE	GLY	LYS	T652	K653	T654	D655	K656	L657	V658	S659	S660									

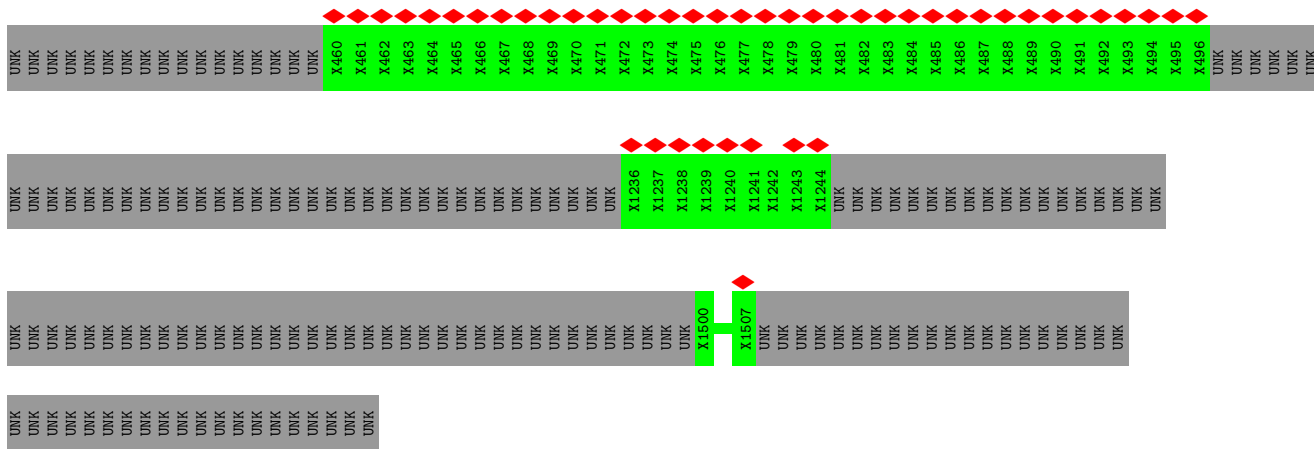
H1141	V1142	K1143	E1144	A1145	V1146	I1147	G1148	F1149	I1150	I1151	E1152	A1153	A1154	D1155	S1156	I1157	I1158	R1159	M1160	P1161	M1162	M1163	D1164	D1165	H1166	V1167	V1168	D1169	L1170	V1171	T1172	L1173	I1174	C1175	T1176	S1177	C1178	L1179	K1180	I1181	L1182	F1183	S1184	L1185	V1186	V1187	K1188	L1189	S1190	D1191	M1192	M1193	S1194	I1195	S1196	F1197	L1198	L1199	M1200
L1201	L1202	S1203	L1204	T1205	L1206	E1207	M1208	K1209	F1210	I1211	Q1212	D1213	D1214	H1215	V1216	R1217	S1218	R1219	L1220	I1221	S1222	S1223	L1224	I1225	H1226	S1227	V1228	K1229	G1230	K1231	L1232	K1233	K1234	L1235	Q1236	E1237	M1238	D1239	T1240	Q1241	L1242	I1243	L1244	L1245	I1246	L1247	K1248	L1249	S1250	V1251	F1252	M1253	S1254	N1255	C1256	S1257	W1258	S1259	D1260
I1261	E1262	E1263	L1264	Y1265	T1266	L1267	I1268	S1269	S1270	L1271	F1272	M1273	T1274	F1275	D1276	E1277	R1278	M1279	L1280	M1281	V1282	S1283	L1284	P1285	E1286	L1287	F1288	L1289	E1290	L1291	G1292	K1293	K1294	V1295	P1296	E1297	L1298	E1299	S1300	I1301	S1302	K1303	L1304	V1305	A1306	D1307	L1308	M1309	L1310	Y1311	S1312	S1313	L1314	R1315	M1316	E1317	Y1318	D1320	
F1321	P1322	ARG	ILE	LEU	SER	THR	PHE	LYS	GLY	LEU	ASP	GLY	TYR	LYS	SER	GLN	LEU	LEU	TRP	PRO	LEU	LEU	PHE	THR	HIS	PHE	ASN	ASN	LYS	GLU	GLU	LEU	ALA	LEU	ARG	THR	ASN	ALA	SER	HIS	ALA	ILE	MET	LYS	PHE	ILE	D1376	F1377	I1378	M1379	E1380								
K1381	P1382	M1383	L1384	M1385	E1386	A1387	S1388	K1389	S1390	I1391	S1392	M1393	L1394	K1395	D1396	I1397	L1398	L1399	P1400	M1401	V1402	R1403	I1404	P1405	L1406	R1407	D1408	S1409	L1410	E1411	G1412	V1413	GLN	SER	GLU	TYR	VAL	SER	V1420	L1421	Y1423	M1424	L1425	K1426	M1427	T1428	K1429	Y1430	F1431	T1432	D1433	F1434	E1435	D1436	M1437	A1438	L1439	L1440	
L1441	Y1442	M1443	G1444	D1445	E1446	A1447	A1448	L1449	PHE	THR	ASN	VAL	ASN	HIS	ILE	GLN	HIS	R1461	M1462	Q1463	M1464	A1465	I1466	K1467	M1468	L1469	G1470	E1471	H1472	A1473	H1474	Q1475	L1476	K1477	D1478	M1479	S1480	I1481	H1482	S1483	Y1484	Q1485	I1486	A1487	M1488	L1489	E1490	H1491	Y1492	V1493	F1494	S1495	D1496	D1497	E1498	R1499	Y1500		
R1501	M1502	I1503	G1504	M1505	E1506	T1507	Q1508	I1509	A1510	I1511	G1512	G1513	L1514	A1515	Q1516	H1517	M1518	S1519	M1520	M1521	Q1522	Y1523	K1524	A1525	L1526	L1527	R1528	R1529	H1530	I1531	S1532	M1533	L1534	K1535	T1536	K1537	P1538	M1539	Q1540	M1541	K1542	Q1543	I1544	P1545	Q1546	L1547	I1548	VAL	GLN	LEU	SER	VAL	PRO	LEU	ARG	GLU	T1558	L1559	R1560
I1561	V1562	R1563	D1564	G1565	A1566	E1567	S1568	K1569	L1570	T1571	L1572	S1573	K1574	F1575	P1576	ASN	LEU	ASP	GLU	PRO	SER	ASN	PHE	ILE	LYS	GLN	GLU	TYR	PRO	THR	LEU	LYS	ILE	GLY	THR	ARG	ASP	GLU	THR	ILE	ILE	E1608	R1609	M1610	P1611	I1612	A1613	E1614	A1615	L1616	V1617	M1618	I1619	V1620					
L1621	G1622	L1623	T1624	D1625	D1626	D1627	I1628	T1629	M1630	F1631	L1632	P1633	S1634	I1635	L1636	T1637	M1638	I1639	C1640	Q1641	L1642	L1643	R1644	S1645	K1646	S1647	E1648	E1649	L1650	R1651	D1652	A1653	V1654	R1655	V1656	L1657	L1658	G1659	K1660	I1661	S1662	I1663	I1664	L1665	G1666	A1667	E1668	Y1669	L1670	V1671	F1672	V1673	K1674	I1675	E1676	L1677	M1678	A1679	T1680
L1681	K1682	R1683	G1684	S1685	Q1686	L1687	H1688	V1689	L1690	S1691	T1692	T1693	V1694	H1695	Y1696	I1697	L1698	K1699	S1700	M1701	H1702	G1703	E1704	L1705	K1706	H1707	S1708	D1709	L1710	D1711	T1712	S1713	S1714	S1715	R1716	I1717	V1718	M1719	I1720	I1721	M1722	E1723	M1724	I1725	F1726	G1727	G1728	A1729	G1730	E1731	E1732	K1733	D1734	S1735	E1736	M1737	Y1738	H1739	T1740
K1741	V1742	K1743	E1744	I1745	K1746	K1749	S1750	Y1751	D1752	A1753	G1754	E1755	I1756	L1757	A1758	S1759	M1760	I1761	S1762	L1763	T1764	E1765	F1766	G1767	T1768	L1769	L1770	S1771	P1772	V1773	K1774	A1775	M1778	V1779	R1780	I1781	M1782	L1783	R1784	N1787	K1788	L1789	S1790	E1791	L1792	L1793	R1794	R1795	Y1796	L1797	L1798	G1799	L1800	M1801	H1802	M1803			
S1804	E1807	S1808	E1809	S1810	K1813	F1814	C1815	L1816	Q1817	L1818	F1819	Q1820	E1821	S1822	E1823	MET	SER	ASN	SER	GLN	PRO	ILE	PRO	LYS	LYS	VAL	LYS	ASP	VAL	GLU	GLU	GLU	PHE	LEU	VAL	ASN	LEU	GLU	SER	LYS	SER	THR	THR	ILE	ASN	SER	S1861	L1862	L1863	L1864	M1865								
S1866	T1867	L1868	F1871	A1872	L1873	D1874	M1878	V1879	I1880	T1881	M1882	H1883	M1884	S1885	F1886	L1887	T1888	V1889	S1890	H1891	L1892	E1893	G1894	P1897	F1898	R1899	L1900	D1901	S1902	L1903	L1904	S1905	E1906	M1907	E1908	V1911	I1912	L1915	R1916	I1917	L1918	I1919	T1920	L1921	R1922	I1923	L1924	D1925	F1926	S1927	D1928	E1929	S1930	S1931					



● Molecule 63: U3 small nucleolar RNA-associated protein 14



MET	ALA	LYS	THR	LEU	GLY	VAL	ASP	ARG	GLN	ASP	THR	GLY	LEU	ASP	GLY	THR	GLY	THR	THR	
ASN	ASP	GLY	PRO	PHE	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP
ILE	ASP	GLY	PRO	PHE	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP
GLU	GLY	PRO	PHE	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP
LYS	LEU	THR	VAL	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP	ASP



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	121139	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	1500	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	25000	Depositor
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	0.130	Depositor
Minimum map value	-0.073	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.003	Depositor
Recommended contour level	0.016	Depositor
Map size (\AA)	542.72, 542.72, 542.72	wwPDB
Map dimensions	512, 512, 512	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (\AA)	1.06, 1.06, 1.06	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: MG, GTP, ZN

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	3A	1.23	0/4141	1.27	34/6433 (0.5%)
2	5A	1.10	0/12462	1.20	78/19411 (0.4%)
3	SA	0.85	0/31237	1.22	263/48637 (0.5%)
4	SC	0.56	0/1777	0.77	4/2388 (0.2%)
5	SF	0.35	0/1854	0.69	2/2504 (0.1%)
6	SG	0.67	0/1690	0.65	0/2285
7	SH	0.36	0/890	0.67	1/1189 (0.1%)
8	SI	0.43	0/1341	0.70	0/1806
9	SJ	0.33	0/1347	0.59	1/1801 (0.1%)
10	SK	0.62	0/1410	0.66	1/1888 (0.1%)
11	SM	0.36	0/1020	0.63	0/1374
12	SN	0.29	0/873	0.66	0/1185
13	SO	0.50	0/1109	0.65	0/1495
14	SP	0.55	0/879	0.66	0/1186
15	SR	0.84	0/990	0.79	2/1335 (0.1%)
16	ST	0.37	0/930	0.64	0/1251
17	SX	0.63	0/1020	0.69	0/1371
18	SY	0.65	0/798	0.74	1/1065 (0.1%)
19	SZ	0.42	0/822	0.69	2/1103 (0.2%)
20	Sc	0.51	0/613	0.68	0/828
21	Sd	0.71	0/499	0.71	0/670
22	3B	0.81	0/1901	0.74	1/2567 (0.0%)
22	3C	0.46	0/1796	0.64	1/2424 (0.0%)
23	3D	0.55	0/2891	0.67	5/3895 (0.1%)
24	3E	0.50	0/3059	0.65	2/4153 (0.0%)
25	3F	0.47	0/3544	0.68	2/4775 (0.0%)
26	3G	0.67	0/928	0.77	2/1262 (0.2%)
26	3H	0.56	0/928	0.71	0/1262
27	A4	0.49	0/5321	0.68	4/7207 (0.1%)
28	A5	0.57	0/4044	0.70	4/5493 (0.1%)
29	A8	0.30	0/3328	0.64	1/4565 (0.0%)
30	A9	0.32	0/951	0.61	0/1287

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
31	AE	0.48	0/6308	0.67	3/8543 (0.0%)
32	AF	0.54	0/3993	0.68	3/5413 (0.1%)
33	AG	0.46	0/6699	0.66	5/9077 (0.1%)
34	B1	0.87	0/6780	0.75	6/9175 (0.1%)
35	B2	0.45	0/6853	0.69	2/9256 (0.0%)
36	B3	0.45	0/6014	0.72	5/8137 (0.1%)
37	B8	0.72	0/3848	0.71	4/5218 (0.1%)
38	BE	0.75	0/6948	0.70	7/9391 (0.1%)
39	B6	0.53	0/2849	0.60	2/3853 (0.1%)
40	5B	0.36	0/499	0.66	0/659
41	5C	0.79	0/4321	0.72	3/5832 (0.1%)
42	5D	0.67	0/1998	0.71	2/2644 (0.1%)
43	5E	0.58	0/1665	0.66	1/2233 (0.0%)
44	5F	0.96	0/1559	0.85	3/2097 (0.1%)
45	5G	0.72	0/2337	0.71	3/3148 (0.1%)
46	5H	0.57	0/1074	0.58	0/1422
47	5I	0.80	0/3844	0.72	1/5174 (0.0%)
48	5J	0.58	0/1238	0.62	1/1641 (0.1%)
49	5K	0.76	0/1426	0.74	1/1917 (0.1%)
50	RA	0.35	0/2769	0.66	0/3753
51	RB	0.40	0/1121	0.65	0/1487
52	RC	0.55	0/2245	0.63	0/3021
53	RE	0.39	0/8924	0.64	5/12070 (0.0%)
54	RF	0.37	0/2004	0.66	3/2697 (0.1%)
55	RG	0.36	0/1727	0.71	2/2329 (0.1%)
55	RH	0.43	0/1828	0.64	0/2470
56	RI	0.54	0/2080	0.67	0/2797
57	RJ	0.60	0/6514	0.63	2/8768 (0.0%)
58	RK	0.45	0/2832	0.65	0/3825
59	RL	0.29	0/4549	0.52	0/6241
59	RM	0.25	0/3760	0.47	0/5211
60	RN	0.37	0/4423	0.61	2/5965 (0.0%)
61	RO	0.38	0/3849	0.62	2/5261 (0.0%)
62	RP	0.25	0/10172	0.46	11/14158 (0.1%)
63	RQ	0.52	0/1678	0.61	0/2282
64	RS	0.34	0/2104	0.69	1/2854 (0.0%)
65	RT	0.42	0/1379	0.62	1/1853 (0.1%)
66	RV	0.60	0/1456	0.69	2/1937 (0.1%)
All	All	0.65	0/232060	0.82	494/323904 (0.2%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a

sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
4	SC	0	1
5	SF	0	1
6	SG	0	1
7	SH	0	1
8	SI	0	2
11	SM	0	1
12	SN	0	1
13	SO	0	1
14	SP	0	1
19	SZ	0	1
20	Sc	0	1
22	3B	0	1
23	3D	0	1
24	3E	0	2
26	3G	0	3
26	3H	0	1
28	A5	0	2
29	A8	0	4
33	AG	0	3
34	B1	0	3
35	B2	0	9
36	B3	0	8
37	B8	0	3
38	BE	0	3
39	B6	0	1
41	5C	0	3
42	5D	0	1
43	5E	0	1
44	5F	0	1
47	5I	0	1
49	5K	0	2
51	RB	0	1
53	RE	0	1
54	RF	0	1
56	RI	0	1
57	RJ	0	2
59	RL	0	1
59	RM	0	1
62	RP	0	1
63	RQ	0	1
66	RV	0	1
All	All	0	76

There are no bond length outliers.

The worst 5 of 494 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
44	5F	13	LEU	CA-CB-CG	10.94	140.47	115.30
3	SA	1034	C	C5-C6-N1	10.38	126.19	121.00
3	SA	1254	U	C2-N1-C1'	10.13	129.85	117.70
2	5A	312	U	O4'-C1'-N1	9.96	116.17	108.20
2	5A	310	U	N3-C2-O2	-9.45	115.59	122.20

There are no chirality outliers.

5 of 76 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
4	SC	40	ASN	Peptide
5	SF	195	ILE	Peptide
6	SG	58	LEU	Peptide
7	SH	68	LEU	Peptide
8	SI	31	SER	Peptide

5.2 Too-close contacts [i](#)

Due to software issues we are unable to calculate clashes - this section is therefore empty.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
4	SC	217/255 (85%)	186 (86%)	30 (14%)	1 (0%)	29	61
5	SF	227/261 (87%)	192 (85%)	35 (15%)	0	100	100
6	SG	211/225 (94%)	197 (93%)	14 (7%)	0	100	100
7	SH	108/236 (46%)	98 (91%)	9 (8%)	1 (1%)	17	49
8	SI	161/190 (85%)	139 (86%)	22 (14%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
9	SJ	162/200 (81%)	141 (87%)	21 (13%)	0	100	100
10	SK	169/197 (86%)	163 (96%)	6 (4%)	0	100	100
11	SM	119/156 (76%)	99 (83%)	20 (17%)	0	100	100
12	SN	117/143 (82%)	96 (82%)	21 (18%)	0	100	100
13	SO	132/151 (87%)	125 (95%)	7 (5%)	0	100	100
14	SP	116/137 (85%)	102 (88%)	14 (12%)	0	100	100
15	SR	123/143 (86%)	113 (92%)	10 (8%)	0	100	100
16	ST	109/146 (75%)	100 (92%)	9 (8%)	0	100	100
17	SX	125/130 (96%)	115 (92%)	10 (8%)	0	100	100
18	SY	101/145 (70%)	91 (90%)	10 (10%)	0	100	100
19	SZ	100/135 (74%)	86 (86%)	14 (14%)	0	100	100
20	Sc	78/82 (95%)	68 (87%)	10 (13%)	0	100	100
21	Sd	61/67 (91%)	55 (90%)	6 (10%)	0	100	100
22	3B	236/327 (72%)	222 (94%)	14 (6%)	0	100	100
22	3C	221/327 (68%)	203 (92%)	18 (8%)	0	100	100
23	3D	359/504 (71%)	344 (96%)	15 (4%)	0	100	100
24	3E	427/511 (84%)	394 (92%)	33 (8%)	0	100	100
25	3F	428/573 (75%)	384 (90%)	43 (10%)	1 (0%)	47	78
26	3G	119/126 (94%)	109 (92%)	9 (8%)	1 (1%)	19	51
26	3H	119/126 (94%)	110 (92%)	9 (8%)	0	100	100
27	A4	648/776 (84%)	576 (89%)	72 (11%)	0	100	100
28	A5	504/643 (78%)	460 (91%)	44 (9%)	0	100	100
29	A8	534/713 (75%)	407 (76%)	124 (23%)	3 (1%)	25	57
30	A9	126/575 (22%)	119 (94%)	7 (6%)	0	100	100
31	AE	773/1769 (44%)	710 (92%)	63 (8%)	0	100	100
32	AF	489/513 (95%)	437 (89%)	51 (10%)	1 (0%)	47	78
33	AG	812/896 (91%)	730 (90%)	82 (10%)	0	100	100
34	B1	830/923 (90%)	752 (91%)	76 (9%)	2 (0%)	47	78
35	B2	839/943 (89%)	750 (89%)	88 (10%)	1 (0%)	51	82
36	B3	733/817 (90%)	599 (82%)	132 (18%)	2 (0%)	41	72
37	B8	469/594 (79%)	423 (90%)	46 (10%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
38	BE	857/939 (91%)	792 (92%)	65 (8%)	0	100	100
39	B6	368/440 (84%)	337 (92%)	31 (8%)	0	100	100
40	5B	58/214 (27%)	55 (95%)	3 (5%)	0	100	100
41	5C	531/554 (96%)	472 (89%)	58 (11%)	1 (0%)	47	78
42	5D	231/250 (92%)	204 (88%)	27 (12%)	0	100	100
43	5E	200/593 (34%)	187 (94%)	11 (6%)	2 (1%)	15	46
44	5F	180/183 (98%)	169 (94%)	11 (6%)	0	100	100
45	5G	278/290 (96%)	249 (90%)	29 (10%)	0	100	100
46	5H	132/610 (22%)	121 (92%)	11 (8%)	0	100	100
47	5I	457/489 (94%)	420 (92%)	37 (8%)	0	100	100
48	5J	138/217 (64%)	129 (94%)	9 (6%)	0	100	100
49	5K	171/189 (90%)	160 (94%)	11 (6%)	0	100	100
50	RA	332/707 (47%)	287 (86%)	45 (14%)	0	100	100
51	RB	132/357 (37%)	116 (88%)	16 (12%)	0	100	100
52	RC	276/316 (87%)	260 (94%)	16 (6%)	0	100	100
53	RE	1067/1237 (86%)	984 (92%)	83 (8%)	0	100	100
54	RF	233/297 (78%)	214 (92%)	19 (8%)	0	100	100
55	RG	212/252 (84%)	186 (88%)	26 (12%)	0	100	100
55	RH	226/252 (90%)	212 (94%)	14 (6%)	0	100	100
56	RI	250/274 (91%)	228 (91%)	22 (9%)	0	100	100
57	RJ	784/1183 (66%)	723 (92%)	61 (8%)	0	100	100
58	RK	358/367 (98%)	335 (94%)	23 (6%)	0	100	100
59	RL	781/1056 (74%)	670 (86%)	109 (14%)	2 (0%)	41	72
59	RM	737/1056 (70%)	640 (87%)	93 (13%)	4 (0%)	29	61
60	RN	573/810 (71%)	524 (91%)	48 (8%)	1 (0%)	47	78
61	RO	523/552 (95%)	457 (87%)	66 (13%)	0	100	100
62	RP	1992/2493 (80%)	1801 (90%)	189 (10%)	2 (0%)	51	82
63	RQ	220/899 (24%)	197 (90%)	23 (10%)	0	100	100
64	RS	247/483 (51%)	223 (90%)	23 (9%)	1 (0%)	34	67
65	RT	165/326 (51%)	151 (92%)	14 (8%)	0	100	100
66	RV	184/346 (53%)	168 (91%)	16 (9%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	23995/32886 (73%)	21566 (90%)	2403 (10%)	26 (0%)	54	82

5 of 26 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
43	5E	454	VAL
59	RL	744	PRO
59	RM	744	PRO
62	RP	119	PRO
29	A8	309	PRO

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
4	SC	195/224 (87%)	192 (98%)	3 (2%)	65	82
5	SF	196/222 (88%)	191 (97%)	5 (3%)	46	72
6	SG	180/191 (94%)	179 (99%)	1 (1%)	86	94
7	SH	95/201 (47%)	94 (99%)	1 (1%)	73	86
8	SI	146/170 (86%)	144 (99%)	2 (1%)	67	83
9	SJ	136/161 (84%)	135 (99%)	1 (1%)	84	92
10	SK	147/166 (89%)	144 (98%)	3 (2%)	55	77
11	SM	110/137 (80%)	109 (99%)	1 (1%)	78	90
12	SN	88/119 (74%)	88 (100%)	0	100	100
13	SO	117/128 (91%)	115 (98%)	2 (2%)	60	80
14	SP	90/105 (86%)	88 (98%)	2 (2%)	52	75
15	SR	105/119 (88%)	105 (100%)	0	100	100
16	ST	101/129 (78%)	101 (100%)	0	100	100
17	SX	108/111 (97%)	108 (100%)	0	100	100
18	SY	85/120 (71%)	85 (100%)	0	100	100
19	SZ	85/113 (75%)	84 (99%)	1 (1%)	71	85

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
20	Sc	69/71 (97%)	69 (100%)	0	100	100
21	Sd	56/60 (93%)	56 (100%)	0	100	100
22	3B	201/240 (84%)	200 (100%)	1 (0%)	88	94
22	3C	190/240 (79%)	190 (100%)	0	100	100
23	3D	296/435 (68%)	292 (99%)	4 (1%)	67	83
24	3E	262/433 (60%)	260 (99%)	2 (1%)	81	91
25	3F	378/503 (75%)	373 (99%)	5 (1%)	69	84
26	3G	100/104 (96%)	99 (99%)	1 (1%)	76	88
26	3H	100/104 (96%)	100 (100%)	0	100	100
27	A4	591/713 (83%)	583 (99%)	8 (1%)	67	83
28	A5	433/574 (75%)	430 (99%)	3 (1%)	84	92
29	A8	174/657 (26%)	173 (99%)	1 (1%)	86	94
30	A9	89/533 (17%)	89 (100%)	0	100	100
31	AE	708/1633 (43%)	700 (99%)	8 (1%)	73	86
32	AF	437/454 (96%)	432 (99%)	5 (1%)	73	86
33	AG	750/826 (91%)	743 (99%)	7 (1%)	78	90
34	B1	730/812 (90%)	719 (98%)	11 (2%)	65	82
35	B2	736/832 (88%)	729 (99%)	7 (1%)	76	88
36	B3	665/719 (92%)	654 (98%)	11 (2%)	60	80
37	B8	421/529 (80%)	417 (99%)	4 (1%)	76	88
38	BE	757/819 (92%)	748 (99%)	9 (1%)	71	85
39	B6	251/414 (61%)	246 (98%)	5 (2%)	55	77
40	5B	57/196 (29%)	56 (98%)	1 (2%)	59	79
41	5C	465/480 (97%)	457 (98%)	8 (2%)	60	80
42	5D	221/234 (94%)	219 (99%)	2 (1%)	78	90
43	5E	185/535 (35%)	183 (99%)	2 (1%)	73	86
44	5F	171/172 (99%)	171 (100%)	0	100	100
45	5G	251/258 (97%)	249 (99%)	2 (1%)	81	91
46	5H	107/538 (20%)	106 (99%)	1 (1%)	78	90
47	5I	416/443 (94%)	407 (98%)	9 (2%)	52	75
48	5J	133/200 (66%)	133 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
49	5K	157/169 (93%)	155 (99%)	2 (1%)	69	84
50	RA	303/636 (48%)	303 (100%)	0	100	100
51	RB	117/315 (37%)	115 (98%)	2 (2%)	60	80
52	RC	231/289 (80%)	230 (100%)	1 (0%)	91	95
53	RE	984/1125 (88%)	975 (99%)	9 (1%)	78	90
54	RF	221/274 (81%)	217 (98%)	4 (2%)	59	79
55	RG	195/222 (88%)	194 (100%)	1 (0%)	88	94
55	RH	206/222 (93%)	203 (98%)	3 (2%)	65	82
56	RI	235/256 (92%)	231 (98%)	4 (2%)	60	80
57	RJ	683/1039 (66%)	679 (99%)	4 (1%)	86	94
58	RK	307/312 (98%)	305 (99%)	2 (1%)	84	92
59	RL	164/934 (18%)	159 (97%)	5 (3%)	41	68
60	RN	406/732 (56%)	406 (100%)	0	100	100
61	RO	329/506 (65%)	326 (99%)	3 (1%)	78	90
63	RQ	148/808 (18%)	147 (99%)	1 (1%)	84	92
64	RS	225/424 (53%)	221 (98%)	4 (2%)	59	79
65	RT	148/282 (52%)	145 (98%)	3 (2%)	55	77
66	RV	141/304 (46%)	140 (99%)	1 (1%)	84	92
All	All	17584/26026 (68%)	17396 (99%)	188 (1%)	74	86

5 of 188 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
41	5C	153	THR
52	RC	62	ARG
41	5C	347	LEU
47	5I	91	VAL
53	RE	595	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 285 such sidechains are listed below:

Mol	Chain	Res	Type
55	RG	105	ASN
56	RI	186	ASN
60	RN	771	ASN

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Mol	Chain	Res	Type
32	AF	250	ASN
32	AF	72	GLN

5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	3A	169/333 (50%)	46 (27%)	2 (1%)
2	5A	516/700 (73%)	146 (28%)	10 (1%)
3	SA	1290/1807 (71%)	461 (35%)	16 (1%)
All	All	1975/2840 (69%)	653 (33%)	28 (1%)

5 of 653 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	3A	2	U
1	3A	5	A
1	3A	14	A
1	3A	15	U
1	3A	24	U

5 of 28 RNA pucker outliers are listed below:

Mol	Chain	Res	Type
3	SA	68	A
3	SA	1594	G
3	SA	401	A
3	SA	1052	U
3	SA	372	G

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 4 ligands modelled in this entry, 3 are monoatomic - leaving 1 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
69	GTP	RJ	1201	70	26,34,34	1.23	1 (3%)	32,54,54	1.65	6 (18%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
69	GTP	RJ	1201	70	-	2/18/38/38	0/3/3/3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
69	RJ	1201	GTP	C5-C6	-4.38	1.38	1.47

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
69	RJ	1201	GTP	PA-O3A-PB	-4.27	118.18	132.83
69	RJ	1201	GTP	PB-O3B-PG	-3.72	120.06	132.83
69	RJ	1201	GTP	C5-C6-N1	3.41	119.98	113.95
69	RJ	1201	GTP	C8-N7-C5	3.09	108.88	102.99
69	RJ	1201	GTP	C2-N1-C6	-3.06	119.46	125.10

There are no chirality outliers.

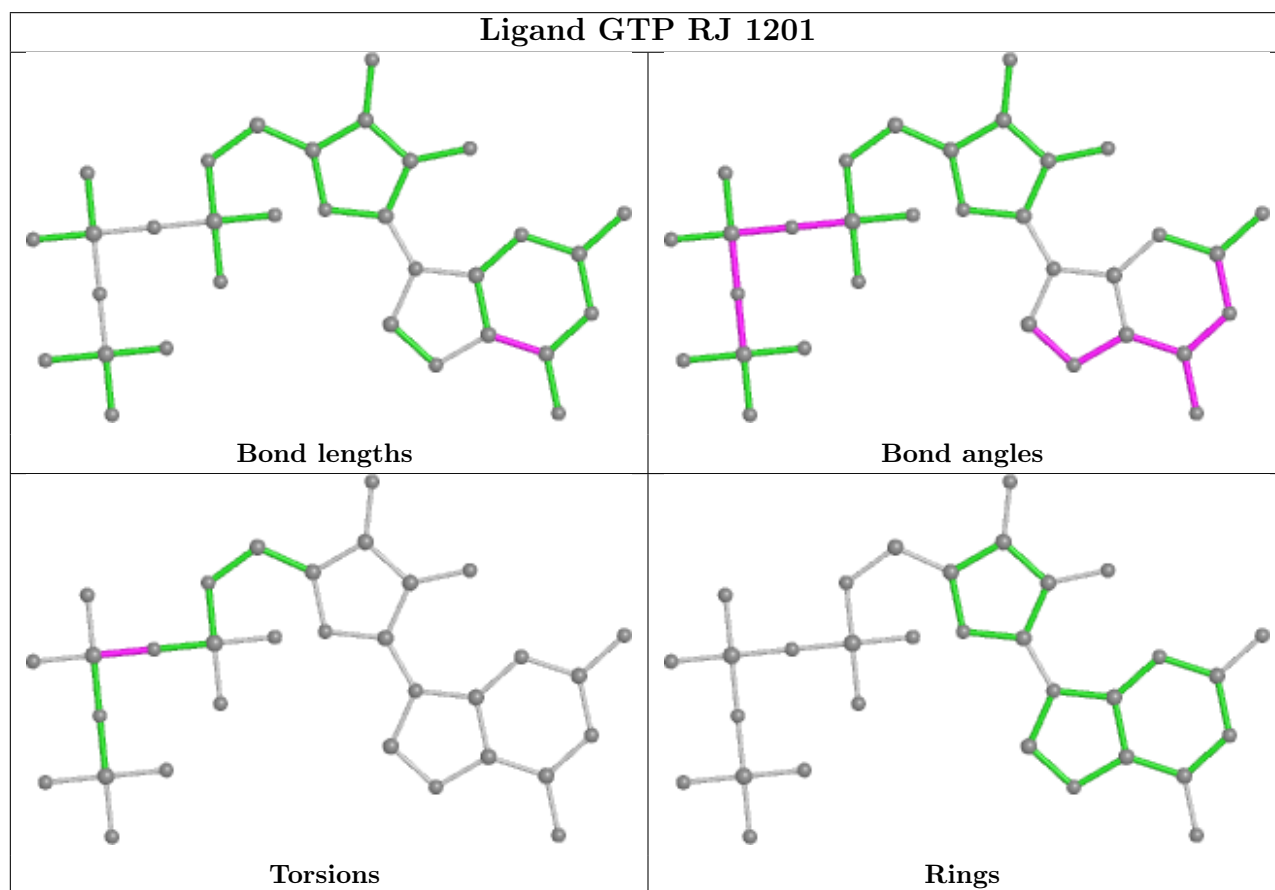
All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
69	RJ	1201	GTP	PA-O3A-PB-O2B
69	RJ	1201	GTP	PA-O3A-PB-O1B

There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

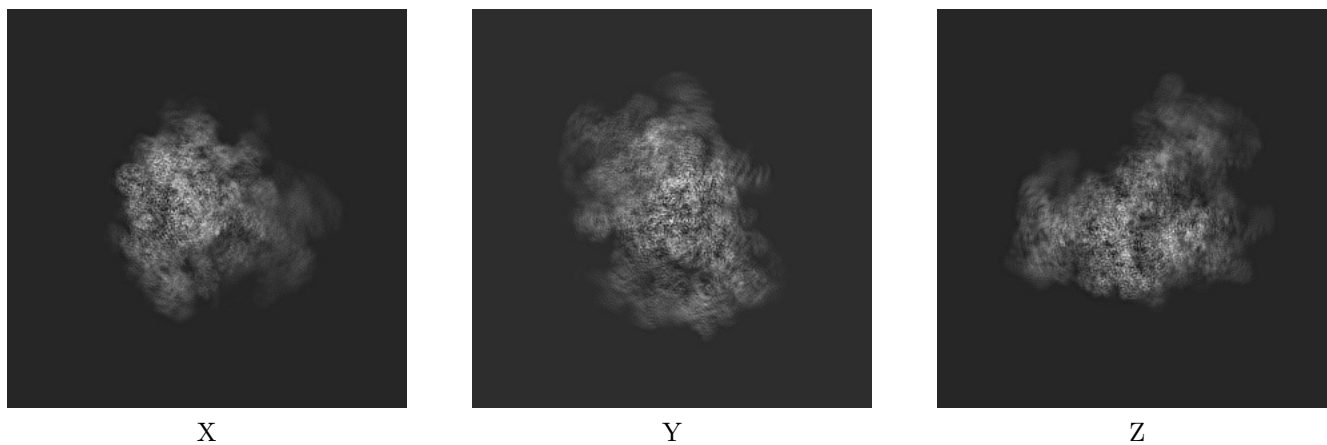
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-9964. These allow visual inspection of the internal detail of the map and identification of artifacts.

No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

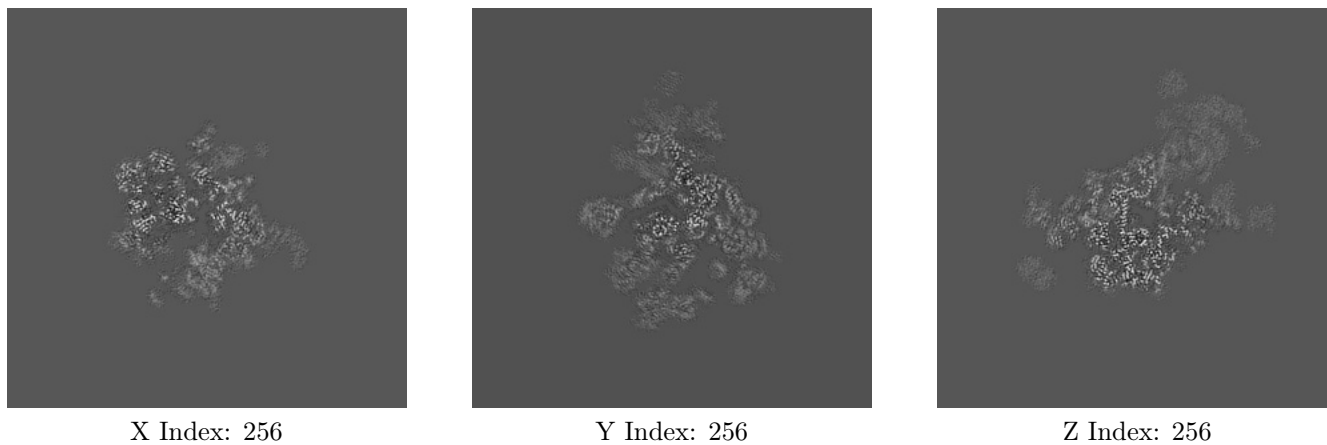
6.1.1 Primary map



The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

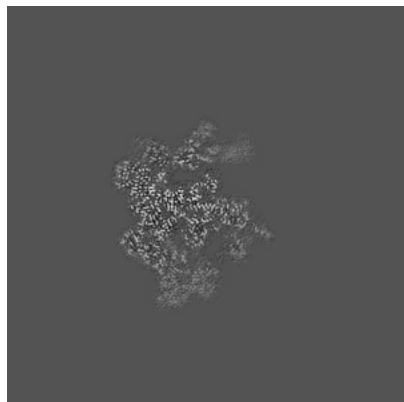
6.2.1 Primary map



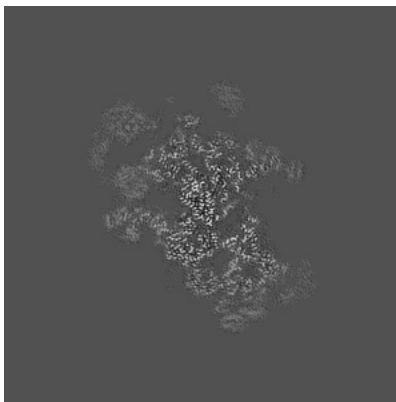
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

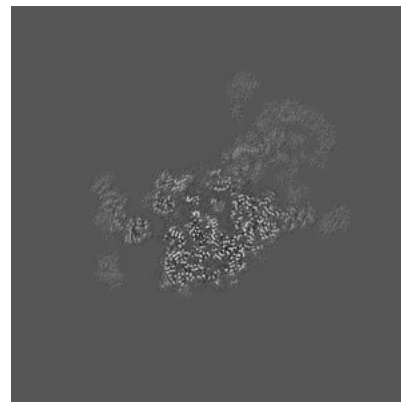
6.3.1 Primary map



X Index: 240



Y Index: 216

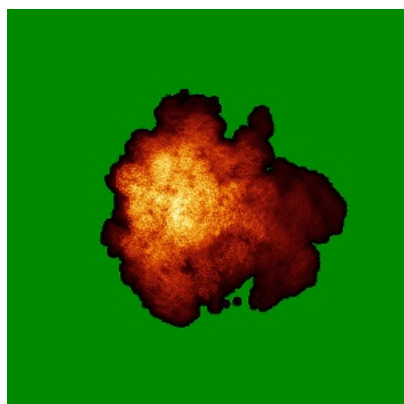


Z Index: 267

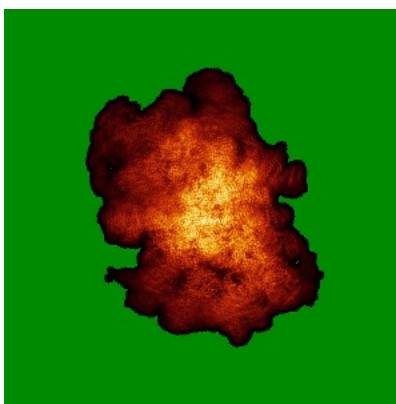
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) [i](#)

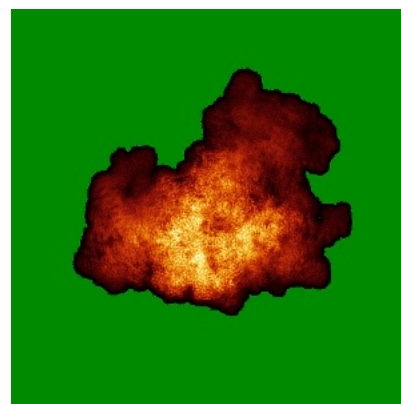
6.4.1 Primary map



X



Y



Z

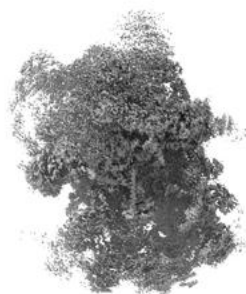
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views [i](#)

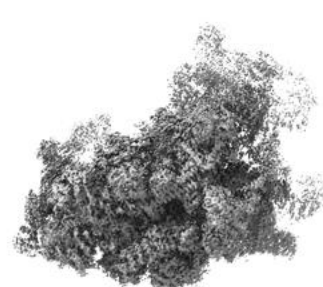
6.5.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.016. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

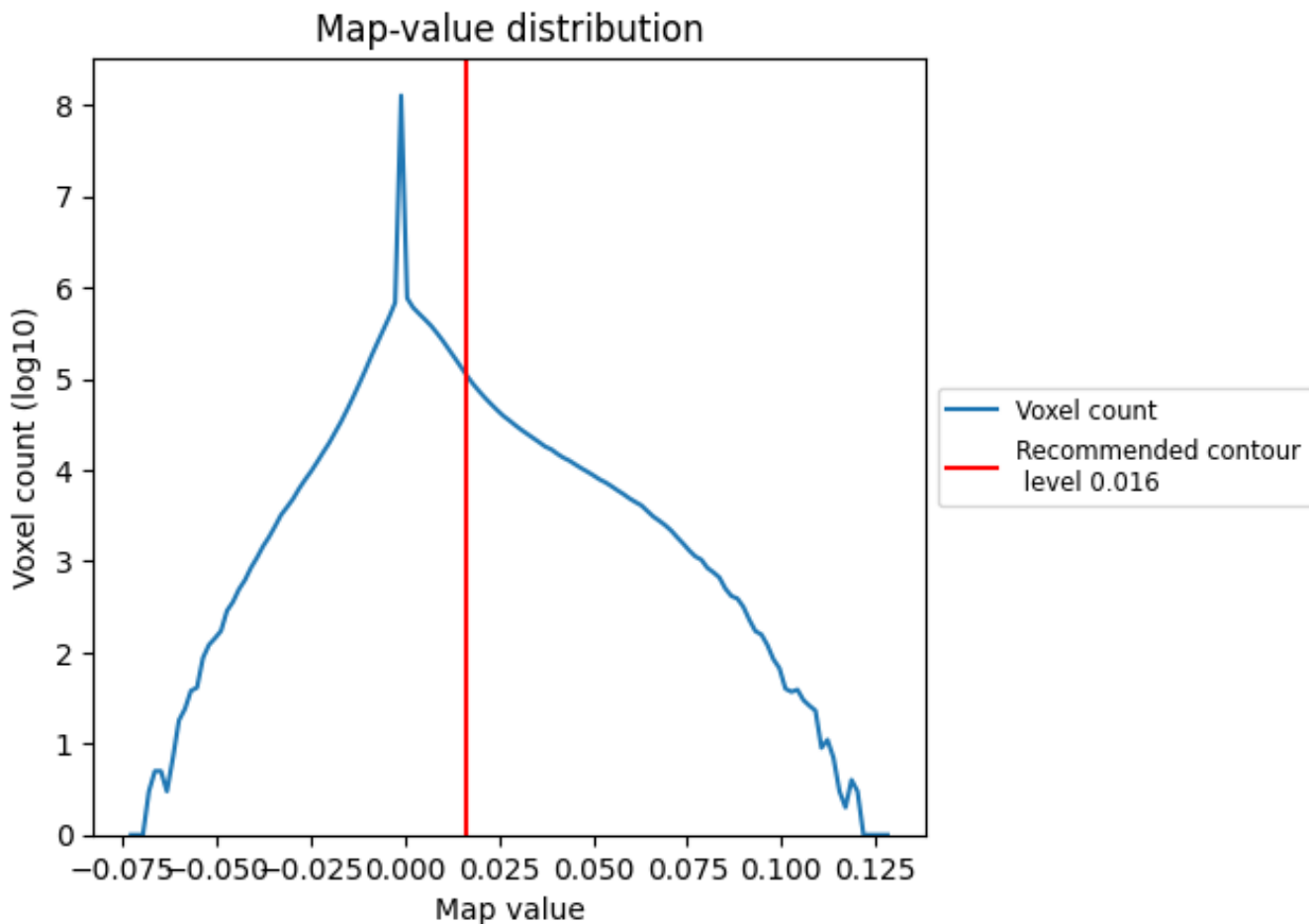
6.6 Mask visualisation [i](#)

This section was not generated. No masks/segmentation were deposited.

7 Map analysis [i](#)

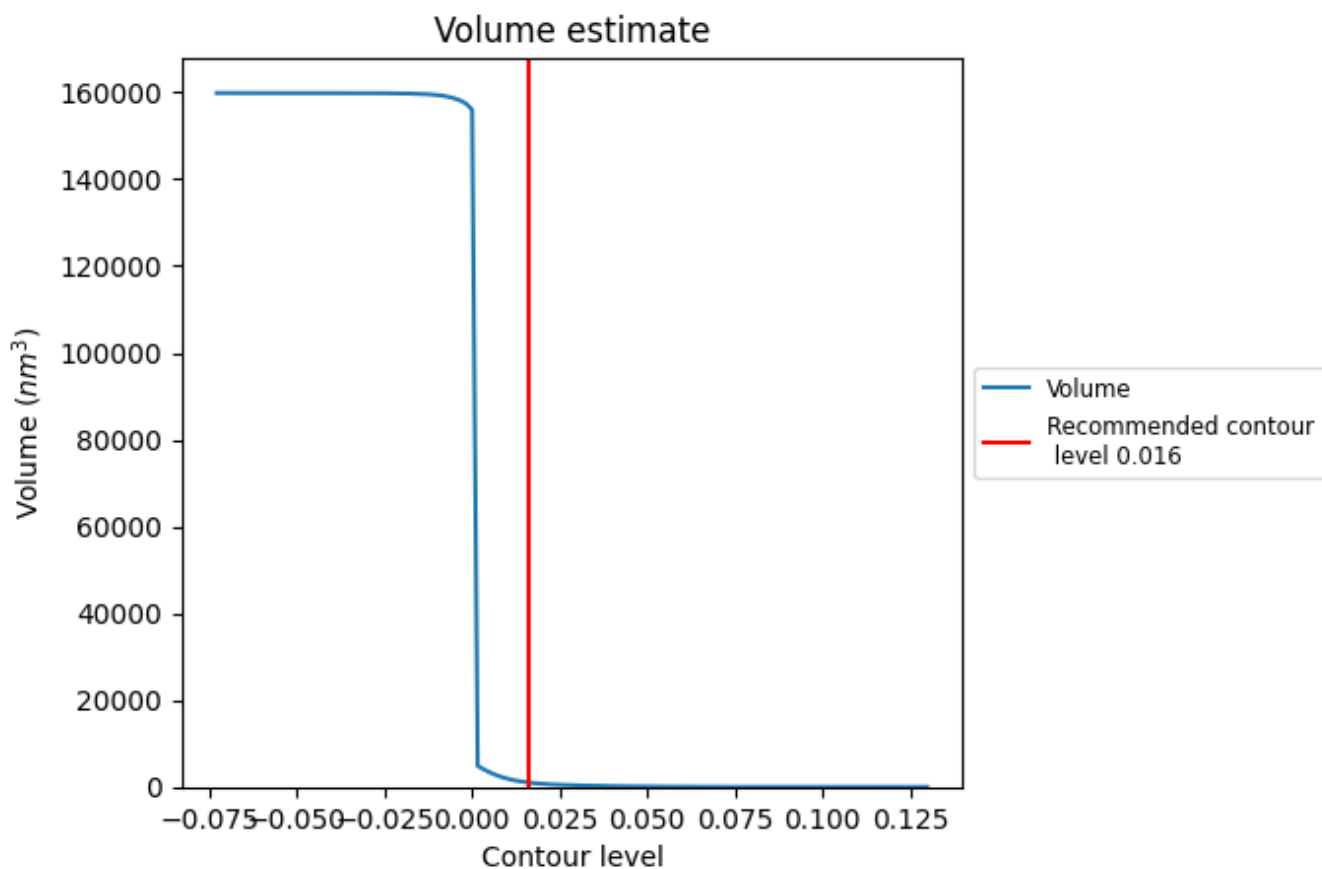
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

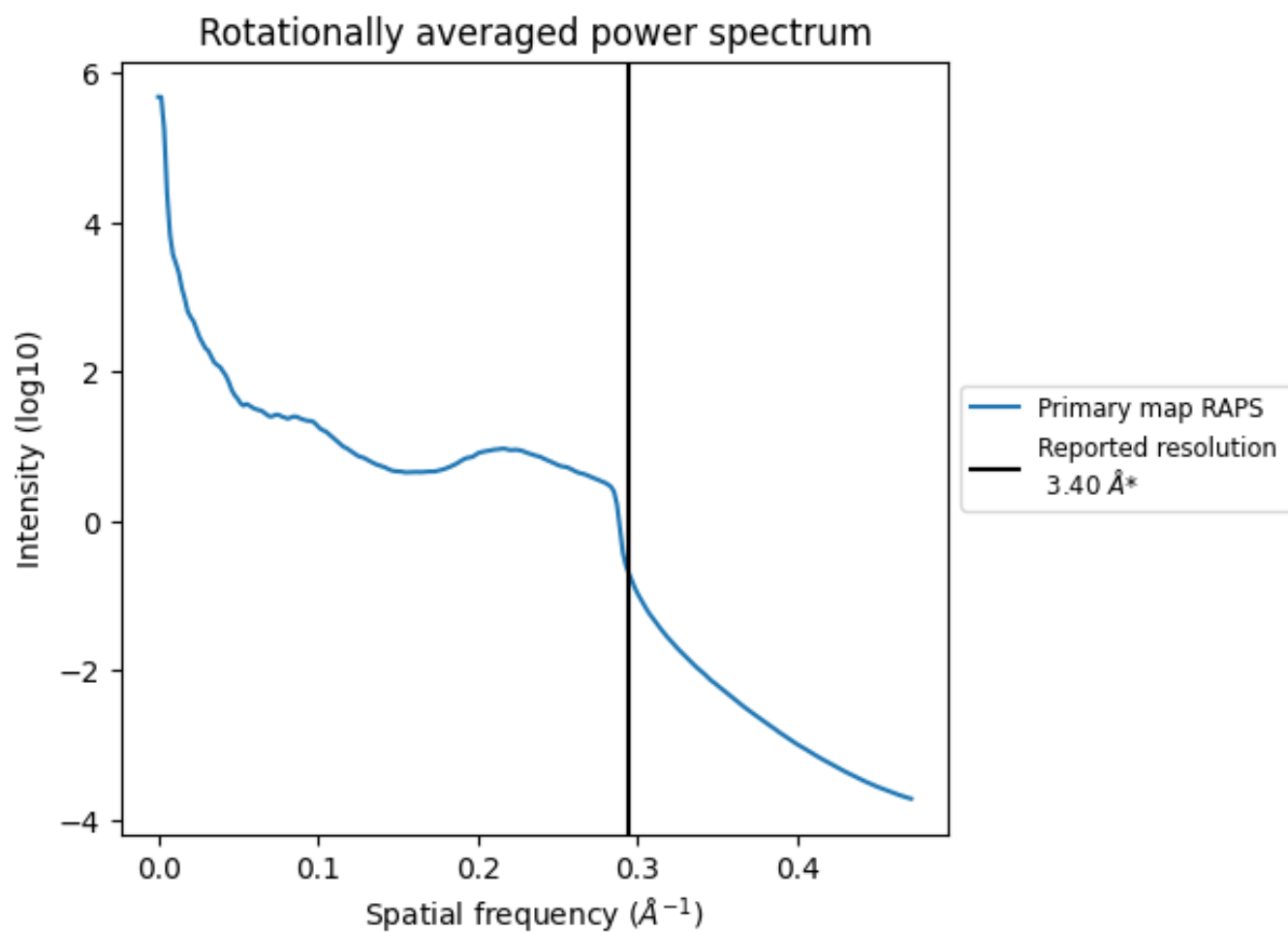
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 1022 nm³; this corresponds to an approximate mass of 923 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

7.3 Rotationally averaged power spectrum [i](#)

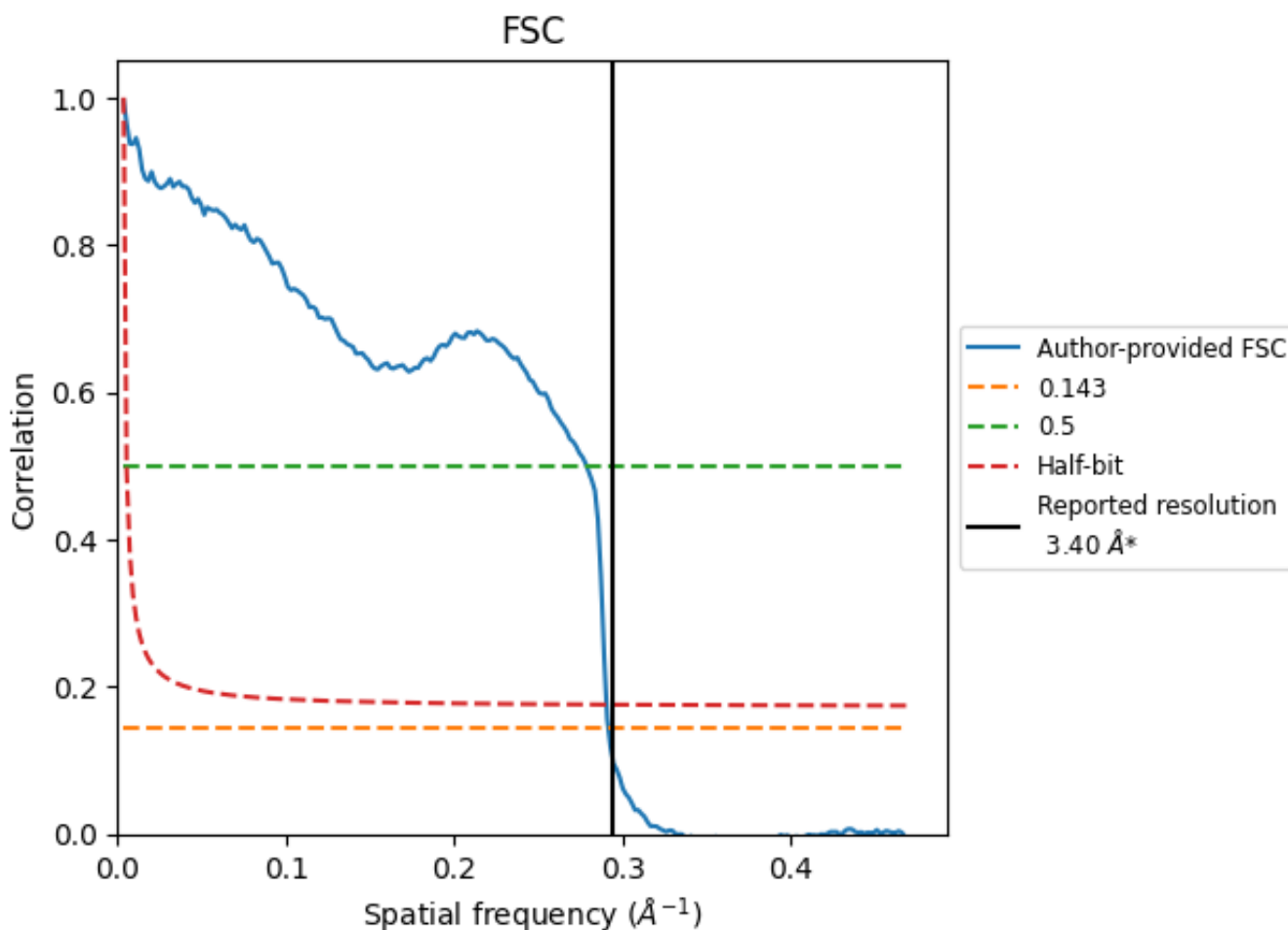


*Reported resolution corresponds to spatial frequency of 0.294\AA^{-1}

8 Fourier-Shell correlation [\(i\)](#)

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

8.1 FSC [\(i\)](#)



*Reported resolution corresponds to spatial frequency of 0.294 Å⁻¹

8.2 Resolution estimates [i](#)

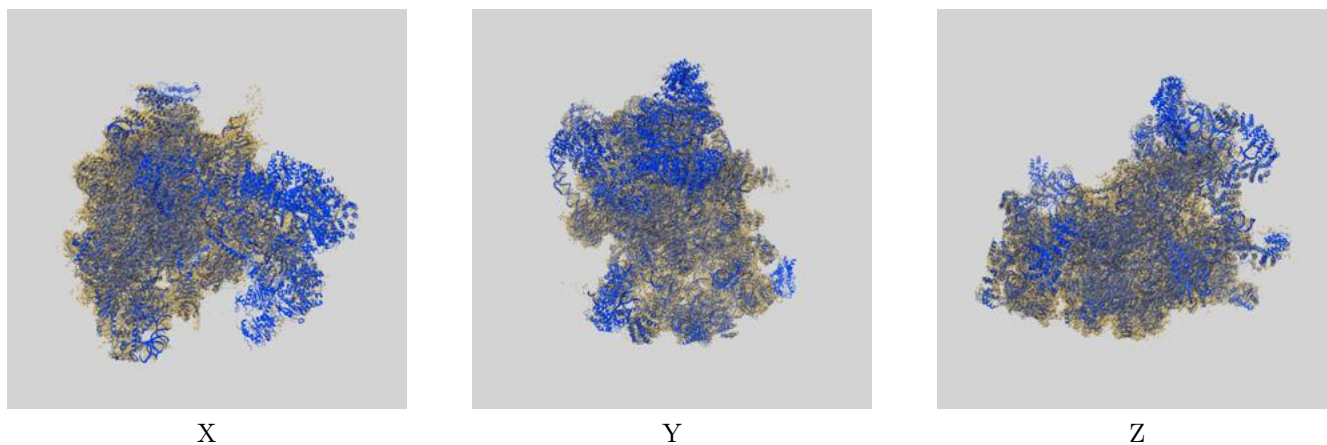
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.40	-	-
Author-provided FSC curve	3.43	3.59	3.44
Unmasked-calculated*	-	-	-

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps.

9 Map-model fit [i](#)

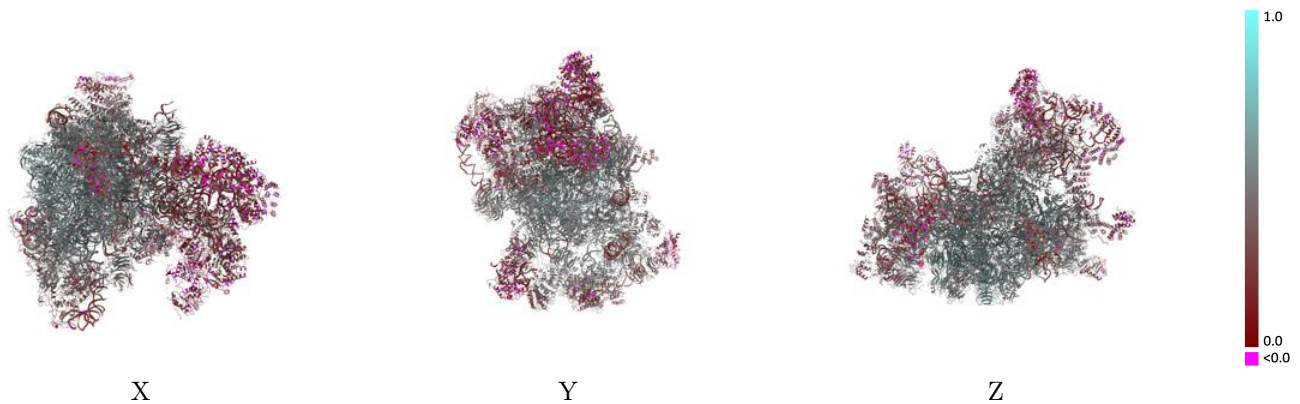
This section contains information regarding the fit between EMDB map EMD-9964 and PDB model 6KE6. Per-residue inclusion information can be found in section 3 on page 17.

9.1 Map-model overlay [i](#)



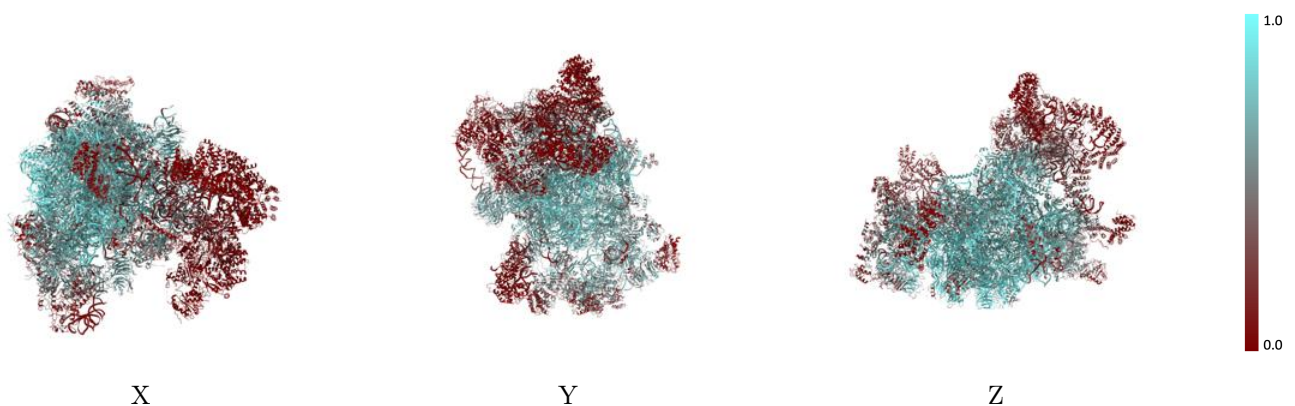
The images above show the 3D surface view of the map at the recommended contour level 0.016 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2 Q-score mapped to coordinate model [i](#)



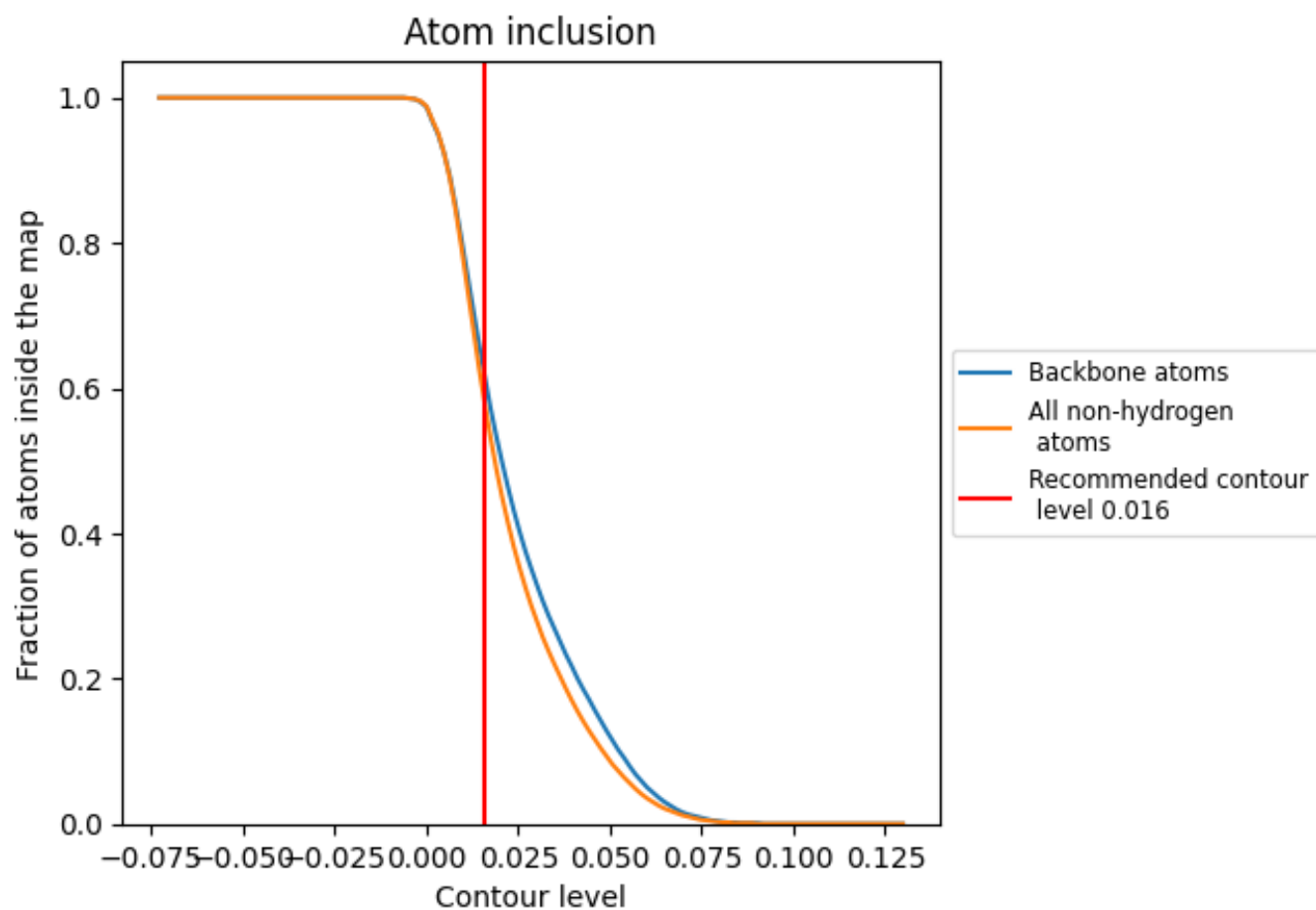
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

9.3 Atom inclusion mapped to coordinate model [i](#)



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.016).







































































9.4 Atom inclusion [i](#)



At the recommended contour level, 61% of all backbone atoms, 57% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary











































































The table lists the average atom inclusion at the recommended contour level (0.016) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.5740	 0.4270
3A	 0.8270	 0.4550
3B	 0.8620	 0.5570
3C	 0.5800	 0.4410
3D	 0.7370	 0.4890
3E	 0.6830	 0.4590
3F	 0.6610	 0.4530
3G	 0.8340	 0.5450
3H	 0.7580	 0.5110
5A	 0.7640	 0.4290
5B	 0.4040	 0.3970
5C	 0.8460	 0.5510
5D	 0.7550	 0.5110
5E	 0.7530	 0.5240
5F	 0.8870	 0.5690
5G	 0.8110	 0.5500
5H	 0.7230	 0.5000
5I	 0.8630	 0.5500
5J	 0.6630	 0.4970
5K	 0.8570	 0.5580
A4	 0.6830	 0.4510
A5	 0.7530	 0.4910
A8	 0.2280	 0.3060
A9	 0.3970	 0.3630
AE	 0.3780	 0.3480
AF	 0.7590	 0.5060
AG	 0.6910	 0.4690
B1	 0.8810	 0.5590
B2	 0.6660	 0.4520
B3	 0.5920	 0.4230
B6	 0.6690	 0.4400
B8	 0.8480	 0.5430
BE	 0.8700	 0.5550
RA	 0.0960	 0.2760
RB	 0.4640	 0.4280



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Chain	Atom inclusion	Q-score
RC	 0.6170	 0.4820
RE	 0.3870	 0.4000
RF	 0.2960	 0.3630
RG	 0.3630	 0.3870
RH	 0.5720	 0.4780
RI	 0.7660	 0.4930
RJ	 0.7420	 0.5030
RK	 0.6830	 0.4860
RL	 0.1200	 0.3130
RM	 0.0190	 0.1970
RN	 0.3310	 0.3780
RO	 0.4480	 0.3860
RP	 0.0910	 0.2260
RQ	 0.5790	 0.4680
RS	 0.0370	 0.2090
RT	 0.6790	 0.4800
RV	 0.7190	 0.5180
SA	 0.5130	 0.3620
SC	 0.7480	 0.5170
SF	 0.2900	 0.3660
SG	 0.8170	 0.5350
SH	 0.0940	 0.3450
SI	 0.5210	 0.4250
SJ	 0.1430	 0.2790
SK	 0.8060	 0.5300
SM	 0.1530	 0.2840
SN	 0.0050	 0.1060
SO	 0.7580	 0.5080
SP	 0.7590	 0.5120
SR	 0.8490	 0.5530
ST	 0.3320	 0.4150
SX	 0.7840	 0.5300
SY	 0.7750	 0.5270
SZ	 0.4900	 0.4280
Sc	 0.7680	 0.5200
Sd	 0.8410	 0.5500
X1	 0.3290	 0.3770