



wwPDB EM Validation Summary Report ⓘ

Mar 25, 2026 – 11:54 PM UTC

PDB ID : 5MRC / pdb_00005mrc
EMDB ID : EMD-3551
Title : Structure of the yeast mitochondrial ribosome - Class A
Authors : Desai, N.; Brown, A.; Amunts, A.; Ramakrishnan, V.
Deposited on : 2016-12-22
Resolution : 3.25 Å(reported)

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.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

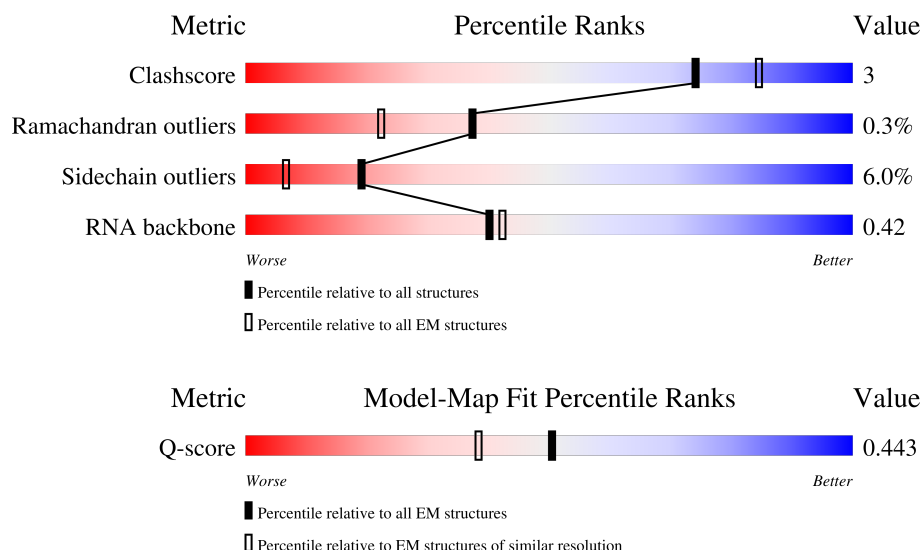
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.25 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)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
RNA backbone	8273	3508	-
Q-score	-	25397	14599 (2.75 - 3.75)

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	A	3296	
2	B	393	
3	C	249	

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Mol	Chain	Length	Quality of chain
4	D	252	
5	E	274	
6	F	196	
7	G	74	
8	H	160	
9	I	138	
10	J	220	
11	K	195	
12	L	237	
13	M	151	
14	N	118	
15	O	225	
16	P	207	
17	Q	296	
18	R	337	
19	S	216	
20	T	225	
21	U	82	
22	V	177	
23	W	112	
24	X	64	
25	Y	46	
26	Z	62	
27	0	38	
28	1	348	

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Mol	Chain	Length	Quality of chain
29	2	113	
30	3	130	
31	4	138	
32	5	324	
33	6	281	
34	7	106	
35	8	264	
36	9	215	
37	a	177	
38	b	155	
39	c	119	
40	d	215	
41	AA	344	
42	BB	266	
43	CC	398	
44	DD	486	
45	EE	293	
46	FF	125	
47	GG	161	
48	HH	154	
49	II	244	
50	JJ	186	
51	KK	148	
52	LL	124	
53	MM	120	

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Mol	Chain	Length	Quality of chain
54	NN	115	
55	OO	253	
56	PP	119	
57	QQ	237	
58	RR	99	
59	SS	80	
60	TT	92	
61	UU	233	
62	VV	233	
63	WW	401	
64	XX	96	
65	YY	273	
66	ZZ	91	
67	11	34	
68	22	99	
69	33	255	
70	44	321	
71	55	339	
72	66	319	
73	77	165	
74	88	457	
75	aa	1649	
76	bb	76	
77	cc	94	
78	dd	151	

2 Entry composition

There are 82 unique types of molecules in this entry. The entry contains 201462 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 21S ribosomal RNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	2709	Total	C	N	O	P	0	0
			57598	25914	10252	18729	2703		

- Molecule 2 is a protein called uL2m.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	321	Total	C	N	O	S	0	0
			2527	1575	507	436	9		

- Molecule 3 is a protein called uL3m.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	249	Total	C	N	O	S	0	0
			1932	1218	360	344	10		

- Molecule 4 is a protein called uL4m.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	252	Total	C	N	O	S	0	0
			1991	1264	355	369	3		

- Molecule 5 is a protein called uL5m.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	E	274	Total	C	N	O	S	0	0
			2187	1396	391	394	6		

- Molecule 6 is a protein called uL6m.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	F	196	Total	C	N	O	S	0	0
			1524	967	273	280	4		

- Molecule 7 is a protein called bL9m.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	G	74	Total	C	N	O	S	0	0
			617	393	110	113	1		

- Molecule 8 is a protein called uL13m.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	H	160	Total	C	N	O	S	0	0
			1275	807	240	224	4		

- Molecule 9 is a protein called uL14m.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	I	127	Total	C	N	O	S	0	0
			956	595	180	170	11		

- Molecule 10 is a protein called uL15m.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	J	220	Total	C	N	O	S	0	0
			1746	1119	326	298	3		

- Molecule 11 is a protein called uL16m.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	K	195	Total	C	N	O	S	0	0
			1573	1001	297	270	5		

- Molecule 12 is a protein called bL17m.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	L	229	Total	C	N	O	S	0	0
			1817	1140	333	336	8		

- Molecule 13 is a protein called bL19m.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	M	151	Total	C	N	O	S	0	0
			1206	766	220	217	3		

- Molecule 14 is a protein called bL21m.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	N	118	Total	C	N	O	S	0	0
			948	598	177	171	2		

- Molecule 15 is a protein called uL22m.

Mol	Chain	Residues	Atoms					AltConf	Trace
15	O	225	Total	C	N	O	S	0	0
			1826	1169	332	320	5		

- Molecule 16 is a protein called uL23m.

Mol	Chain	Residues	Atoms					AltConf	Trace
16	P	207	Total	C	N	O	S	0	0
			1729	1104	310	309	6		

- Molecule 17 is a protein called uL24m.

Mol	Chain	Residues	Atoms					AltConf	Trace
17	Q	284	Total	C	N	O	S	0	0
			2272	1451	396	417	8		

- Molecule 18 is a protein called bL27m.

Mol	Chain	Residues	Atoms					AltConf	Trace
18	R	331	Total	C	N	O	S	0	0
			2738	1728	497	509	4		

- Molecule 19 is a protein called bL28m.

Mol	Chain	Residues	Atoms					AltConf	Trace
19	S	185	Total	C	N	O	S	0	0
			1543	994	281	265	3		

- Molecule 20 is a protein called uL29m.

Mol	Chain	Residues	Atoms					AltConf	Trace
20	T	216	Total	C	N	O	S	0	0
			1792	1139	324	325	4		

- Molecule 21 is a protein called uL30m.

Mol	Chain	Residues	Atoms				AltConf	Trace
21	U	82	Total	C	N	O	0	0
			639	410	116	113		

- Molecule 22 is a protein called bL31m.

Mol	Chain	Residues	Atoms					AltConf	Trace
22	V	93	Total	C	N	O	S	0	0
			729	456	145	127	1		

- Molecule 23 is a protein called bL32m.

Mol	Chain	Residues	Atoms					AltConf	Trace
23	W	112	Total	C	N	O	S	0	0
			937	587	181	163	6		

- Molecule 24 is a protein called bL33m.

Mol	Chain	Residues	Atoms				AltConf	Trace
24	X	64	Total	C	N	O	0	0
			512	330	96	86		

- Molecule 25 is a protein called bL34m.

Mol	Chain	Residues	Atoms				AltConf	Trace
25	Y	46	Total	C	N	O	0	0
			385	245	82	58		

- Molecule 26 is a protein called bL35m.

Mol	Chain	Residues	Atoms					AltConf	Trace
26	Z	62	Total	C	N	O	S	0	0
			508	322	111	74	1		

- Molecule 27 is a protein called bL36m.

Mol	Chain	Residues	Atoms					AltConf	Trace
27	0	38	Total	C	N	O	S	0	0
			324	205	66	50	3		

- Molecule 28 is a protein called mL38.

Mol	Chain	Residues	Atoms					AltConf	Trace
28	1	348	Total	C	N	O	S	0	0
			2875	1847	499	523	6		

- Molecule 29 is a protein called mL40.

Mol	Chain	Residues	Atoms					AltConf	Trace
29	2	113	Total	C	N	O	S	0	0
			944	597	174	168	5		

- Molecule 30 is a protein called mL41.

Mol	Chain	Residues	Atoms					AltConf	Trace
30	3	130	Total	C	N	O	S	0	0
			1046	671	189	183	3		

- Molecule 31 is a protein called mL43.

Mol	Chain	Residues	Atoms					AltConf	Trace
31	4	138	Total	C	N	O	S	0	0
			1117	700	219	193	5		

- Molecule 32 is a protein called mL44.

Mol	Chain	Residues	Atoms					AltConf	Trace
32	5	324	Total	C	N	O	S	0	0
			2552	1630	431	480	11		

- Molecule 33 is a protein called mL46.

Mol	Chain	Residues	Atoms					AltConf	Trace
33	6	234	Total	C	N	O	S	0	0
			1932	1250	327	353	2		

- Molecule 34 is a protein called mL49.

Mol	Chain	Residues	Atoms					AltConf	Trace
34	7	106	Total	C	N	O	S	0	0
			858	553	151	152	2		

- Molecule 35 is a protein called mL50.

Mol	Chain	Residues	Atoms					AltConf	Trace
35	8	199	Total	C	N	O	S	0	0
			1629	1032	278	315	4		

- Molecule 36 is a protein called mL57.

Mol	Chain	Residues	Atoms					AltConf	Trace
36	9	202	Total	C	N	O	S	0	0
			1587	1014	279	289	5		

- Molecule 37 is a protein called mL58.

Mol	Chain	Residues	Atoms					AltConf	Trace
37	a	177	Total	C	N	O	S	0	0
			1440	907	267	260	6		

- Molecule 38 is a protein called mL59.

Mol	Chain	Residues	Atoms					AltConf	Trace
38	b	155	Total	C	N	O	S	0	0
			1299	850	225	221	3		

- Molecule 39 is a protein called mL60.

Mol	Chain	Residues	Atoms					AltConf	Trace
39	c	119	Total	C	N	O	S	0	0
			1004	645	191	164	4		

- Molecule 40 is a protein called mL67.

Mol	Chain	Residues	Atoms					AltConf	Trace
40	d	206	Total	C	N	O	S	0	0
			1746	1117	318	304	7		

- Molecule 41 is a protein called bS1m.

Mol	Chain	Residues	Atoms					AltConf	Trace
41	AA	203	Total	C	N	O	S	0	0
			1610	1032	285	288	5		

- Molecule 42 is a protein called uS2m.

Mol	Chain	Residues	Atoms					AltConf	Trace
42	BB	266	Total	C	N	O	S	0	0
			2085	1313	366	404	2		

- Molecule 43 is a protein called uS3m.

Mol	Chain	Residues	Atoms					AltConf	Trace
43	CC	339	Total	C	N	O	S	0	0
			2821	1772	502	517	30		

- Molecule 44 is a protein called uS4m.

Mol	Chain	Residues	Atoms					AltConf	Trace
44	DD	287	Total	C	N	O	S	0	0
			2369	1542	420	403	4		

- Molecule 45 is a protein called uS5m.

Mol	Chain	Residues	Atoms					AltConf	Trace
45	EE	288	Total	C	N	O	S	0	0
			2306	1473	408	417	8		

- Molecule 46 is a protein called bS6m.

Mol	Chain	Residues	Atoms					AltConf	Trace
46	FF	125	Total	C	N	O	S	0	0
			1002	639	182	177	4		

- Molecule 47 is a protein called uS7m.

Mol	Chain	Residues	Atoms					AltConf	Trace
47	GG	161	Total	C	N	O	S	0	0
			1282	811	238	228	5		

- Molecule 48 is a protein called uS8m.

Mol	Chain	Residues	Atoms					AltConf	Trace
48	HH	154	Total	C	N	O	S	0	0
			1213	767	217	220	9		

- Molecule 49 is a protein called uS9m.

Mol	Chain	Residues	Atoms					AltConf	Trace
49	II	226	Total	C	N	O	S	0	0
			1820	1167	332	316	5		

- Molecule 50 is a protein called uS10m.

Mol	Chain	Residues	Atoms					AltConf	Trace
50	JJ	186	Total	C	N	O	S	0	0
			1508	964	259	281	4		

- Molecule 51 is a protein called uS11m.

Mol	Chain	Residues	Atoms					AltConf	Trace
51	KK	142	Total	C	N	O	S	0	0
			1121	717	195	203	6		

- Molecule 52 is a protein called uS12m.

Mol	Chain	Residues	Atoms					AltConf	Trace
52	LL	124	Total	C	N	O	S	0	0
			948	585	194	165	4		

- Molecule 53 is a protein called uS13m.

Mol	Chain	Residues	Atoms					AltConf	Trace
53	MM	120	Total	C	N	O	S	0	0
			942	596	179	161	6		

- Molecule 54 is a protein called uS14m.

Mol	Chain	Residues	Atoms					AltConf	Trace
54	NN	115	Total	C	N	O	S	0	0
			953	612	182	154	5		

- Molecule 55 is a protein called uS15m.

Mol	Chain	Residues	Atoms					AltConf	Trace
55	OO	238	Total	C	N	O	S	0	0
			1962	1227	371	356	8		

- Molecule 56 is a protein called bS16m.

Mol	Chain	Residues	Atoms					AltConf	Trace
56	PP	116	Total	C	N	O	S	0	0
			919	586	172	159	2		

- Molecule 57 is a protein called uS17m.

Mol	Chain	Residues	Atoms					AltConf	Trace
57	QQ	204	Total	C	N	O	S	0	0
			1683	1055	315	308	5		

- Molecule 58 is a protein called bS18m.

Mol	Chain	Residues	Atoms					AltConf	Trace
58	RR	91	Total	C	N	O	S	0	0
			738	463	143	128	4		

- Molecule 59 is a protein called uS19m.

Mol	Chain	Residues	Atoms					AltConf	Trace
59	SS	80	Total	C	N	O	S	0	0
			636	408	115	111	2		

- Molecule 60 is a protein called bS21m.

Mol	Chain	Residues	Atoms					AltConf	Trace
60	TT	92	Total	C	N	O	S	0	0
			760	475	150	130	5		

- Molecule 61 is a protein called mS23.

Mol	Chain	Residues	Atoms					AltConf	Trace
61	UU	233	Total	C	N	O	S	0	0
			1907	1211	331	358	7		

- Molecule 62 is a protein called mS26.

Mol	Chain	Residues	Atoms					AltConf	Trace
62	VV	233	Total	C	N	O	S	0	0
			1872	1189	338	342	3		

- Molecule 63 is a protein called mS29.

Mol	Chain	Residues	Atoms					AltConf	Trace
63	WW	401	Total	C	N	O	S	0	0
			3216	2072	540	596	8		

- Molecule 64 is a protein called mS33.

Mol	Chain	Residues	Atoms					AltConf	Trace
64	XX	96	Total	C	N	O	S	0	0
			774	496	140	135	3		

- Molecule 65 is a protein called mS35.

Mol	Chain	Residues	Atoms					AltConf	Trace
65	YY	269	Total	C	N	O	S	0	0
			2258	1429	404	421	4		

- Molecule 66 is a protein called mS37.

Mol	Chain	Residues	Atoms					AltConf	Trace
66	ZZ	87	Total	C	N	O	S	0	0
			687	435	128	118	6		

- Molecule 67 is a protein called mS38.

Mol	Chain	Residues	Atoms					AltConf	Trace
67	11	34	Total	C	N	O	S	0	0
			303	183	75	43	2		

- Molecule 68 is a protein called mS41.

Mol	Chain	Residues	Atoms					AltConf	Trace
68	22	99	Total	C	N	O	S	0	0
			833	530	156	146	1		

- Molecule 69 is a protein called mS42.

Mol	Chain	Residues	Atoms					AltConf	Trace
69	33	244	Total	C	N	O	S	0	0
			1953	1261	328	359	5		

- Molecule 70 is a protein called mS43.

Mol	Chain	Residues	Atoms					AltConf	Trace
70	44	270	Total	C	N	O	S	0	0
			2169	1380	370	412	7		

- Molecule 71 is a protein called mS44.

Mol	Chain	Residues	Atoms				AltConf	Trace
71	55	59	Total	C	N	O	0	0
			508	338	84	86		

- Molecule 72 is a protein called mS45.

Mol	Chain	Residues	Atoms					AltConf	Trace
72	66	305	Total	C	N	O	S	0	0
			2488	1587	445	450	6		

- Molecule 73 is a protein called mS46.

Mol	Chain	Residues	Atoms					AltConf	Trace
73	77	165	Total	C	N	O	S	0	0
			1330	854	214	259	3		

- Molecule 74 is a protein called mS47.

Mol	Chain	Residues	Atoms					AltConf	Trace
74	88	452	Total	C	N	O	S	0	0
			3573	2272	600	681	20		

- Molecule 75 is a RNA chain called 15S ribosomal RNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
75	aa	1501	Total	C	N	O	P	0	0
			31883	14338	5633	10411	1501		

- Molecule 76 is a RNA chain called tRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
76	bb	76	Total	C	N	O	P	0	0
			1615	723	289	528	75		

- Molecule 77 is a protein called unknown protein sequence 1.

Mol	Chain	Residues	Atoms				AltConf	Trace
77	cc	94	Total	C	N	O	0	0
			470	282	94	94		

- Molecule 78 is a protein called unknown protein sequence 2.

Mol	Chain	Residues	Atoms				AltConf	Trace
78	dd	151	Total	C	N	O	0	0
			755	453	151	151		

- Molecule 79 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
79	A	180	Total	Mg	0
			180	180	
79	N	1	Total	Mg	0
			1	1	
79	3	1	Total	Mg	0
			1	1	
79	d	1	Total	Mg	0
			1	1	
79	BB	1	Total	Mg	0
			1	1	
79	EE	1	Total	Mg	0
			1	1	
79	MM	1	Total	Mg	0
			1	1	
79	NN	1	Total	Mg	0
			1	1	
79	WW	1	Total	Mg	0
			1	1	
79	aa	111	Total	Mg	0
			111	111	

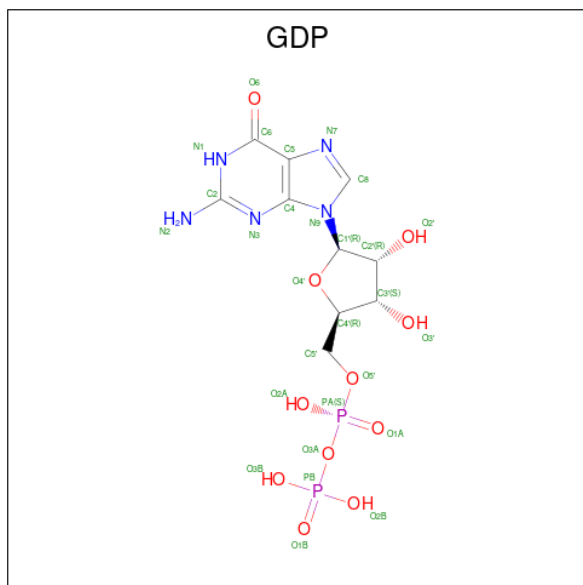
- Molecule 80 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms		AltConf
80	B	1	Total	Na	0
			1	1	

- Molecule 81 is ZINC ION (CCD ID: ZN) (formula: Zn).

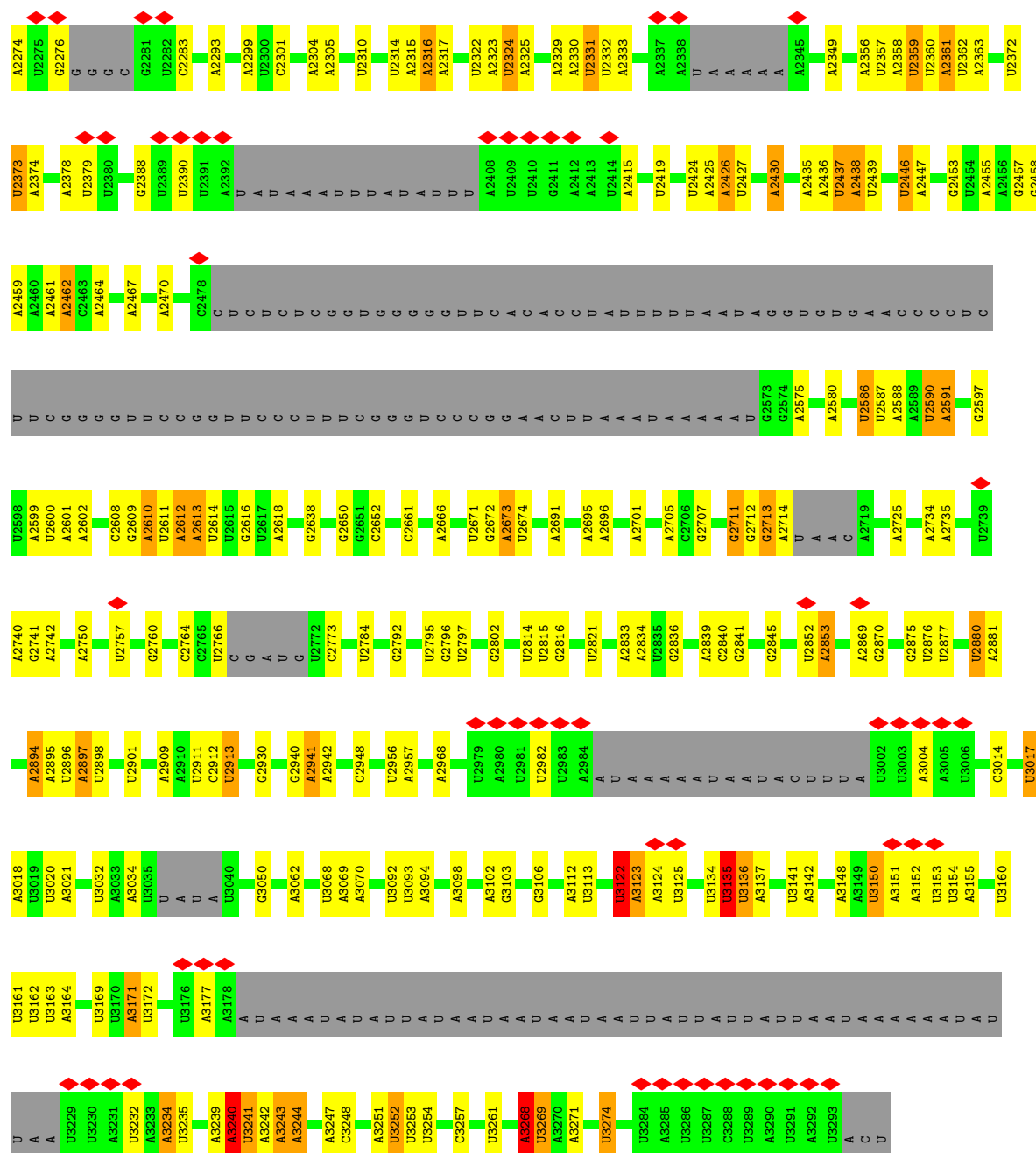
Mol	Chain	Residues	Atoms		AltConf
81	W	1	Total	Zn	0
			1	1	
81	0	1	Total	Zn	0
			1	1	

- Molecule 82 is GUANOSINE-5'-DIPHOSPHATE (CCD ID: GDP) (formula: $C_{10}H_{15}N_5O_{11}P_2$).

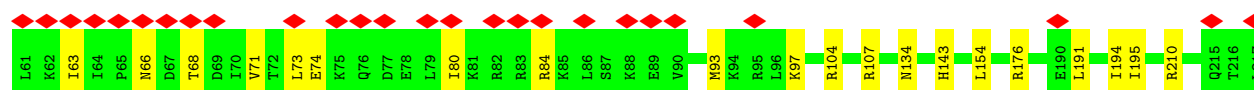
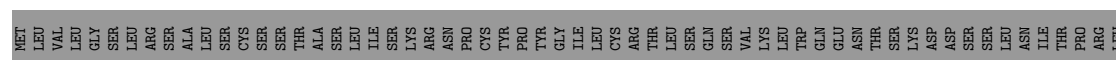
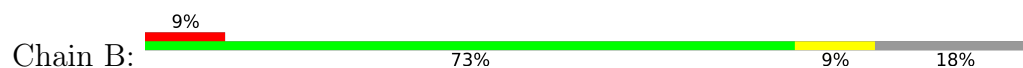


Mol	Chain	Residues	Atoms					AltConf
82	WW	1	Total	C	N	O	P	0
			28	10	5	11	2	



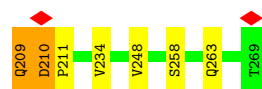
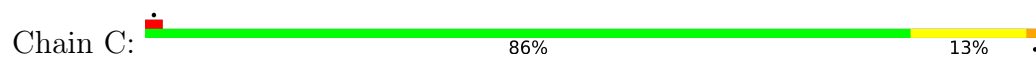


• Molecule 2: uL2m

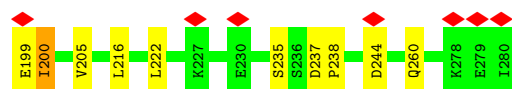
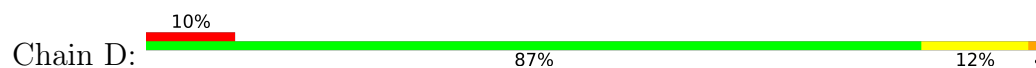




• Molecule 3: uL3m



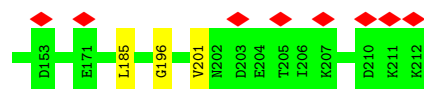
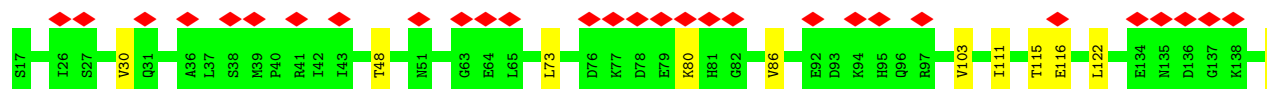
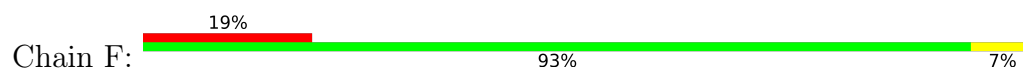
• Molecule 4: uL4m



• Molecule 5: uL5m

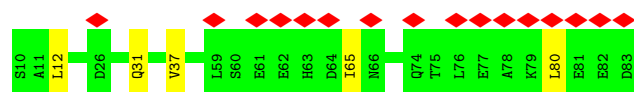


• Molecule 6: uL6m

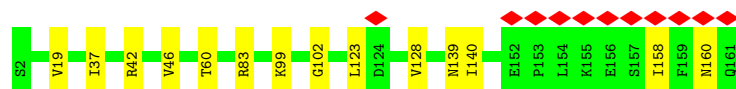


• Molecule 7: bL9m

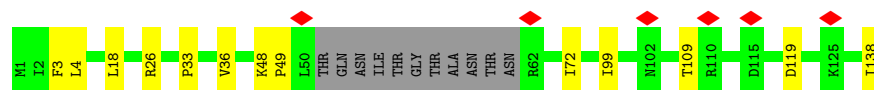
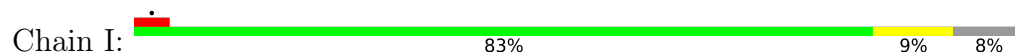




• Molecule 8: uL13m



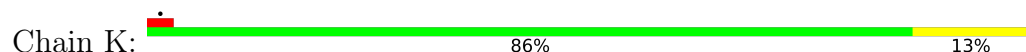
• Molecule 9: uL14m



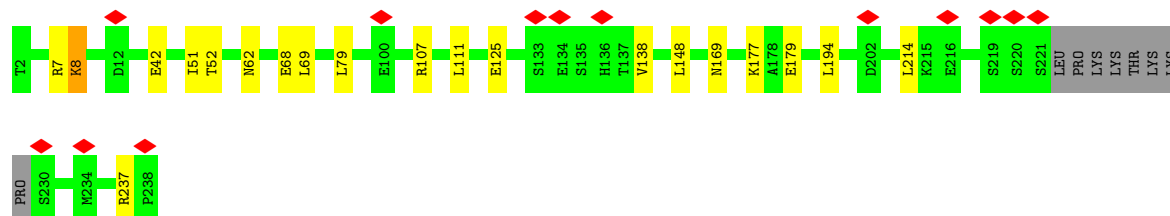
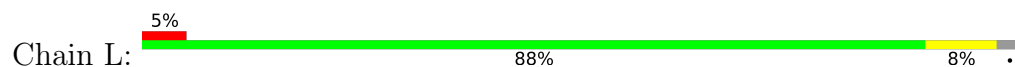
• Molecule 10: uL15m



• Molecule 11: uL16m



• Molecule 12: bL17m

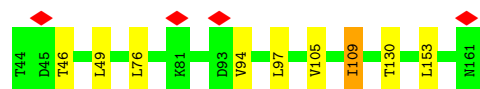
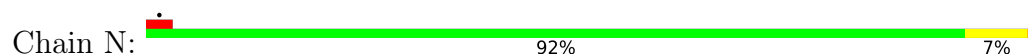


• Molecule 13: bL19m

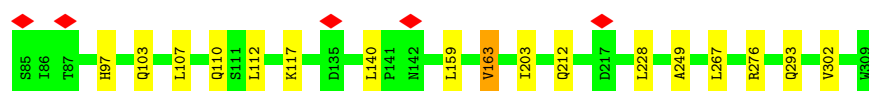
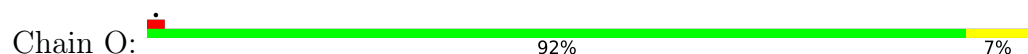




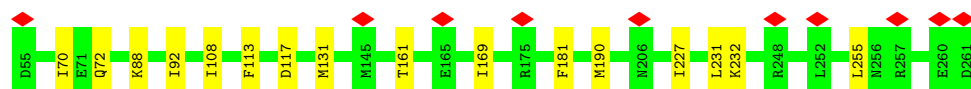
• Molecule 14: bL21m



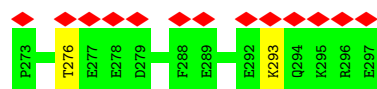
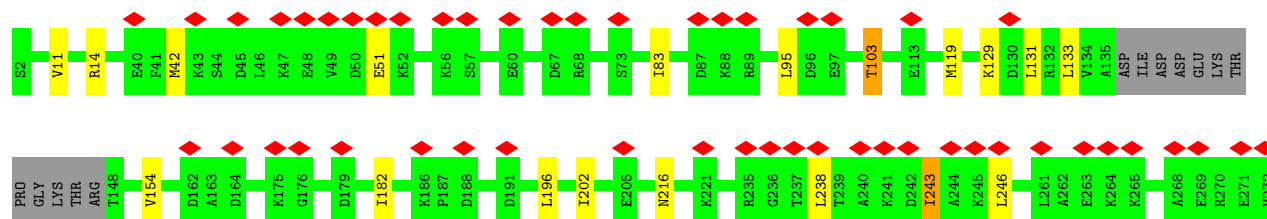
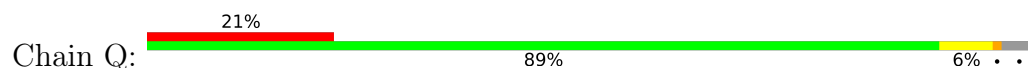
• Molecule 15: uL22m



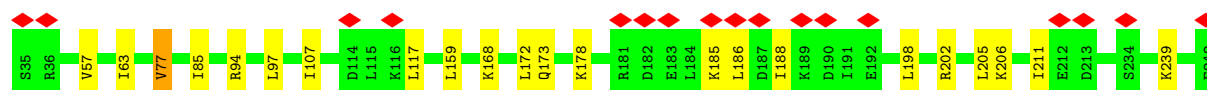
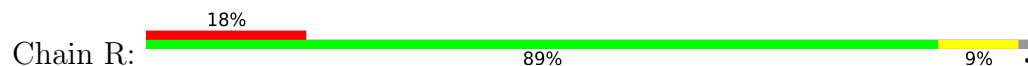
• Molecule 16: uL23m

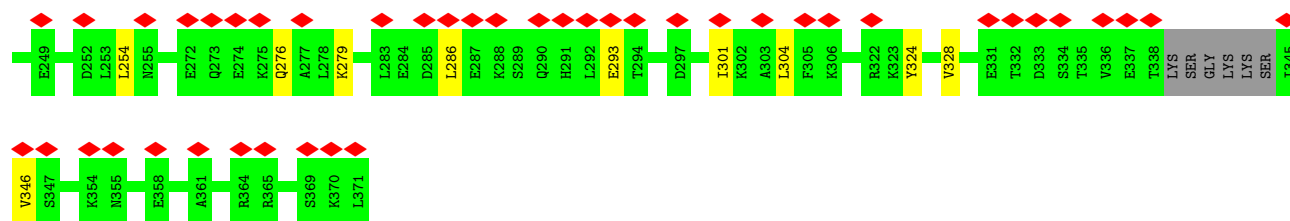


• Molecule 17: uL24m

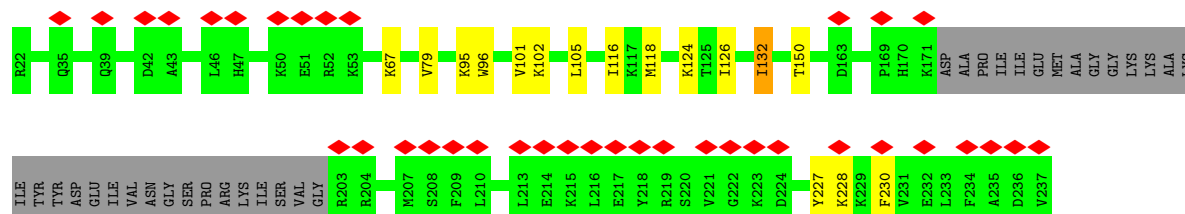
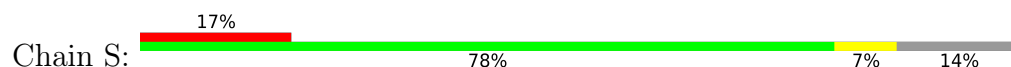


• Molecule 18: bL27m

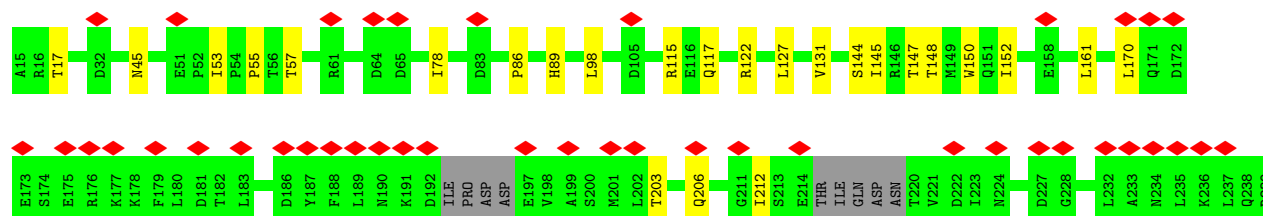
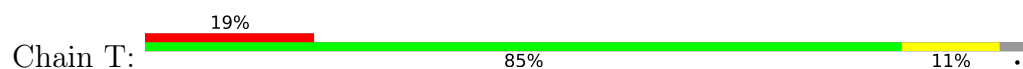




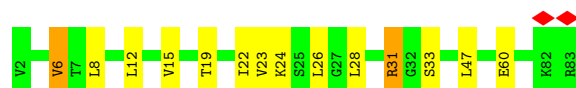
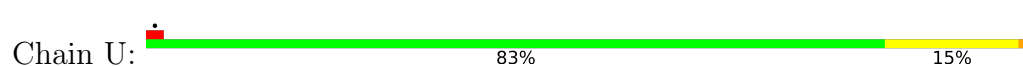
• Molecule 19: bL28m



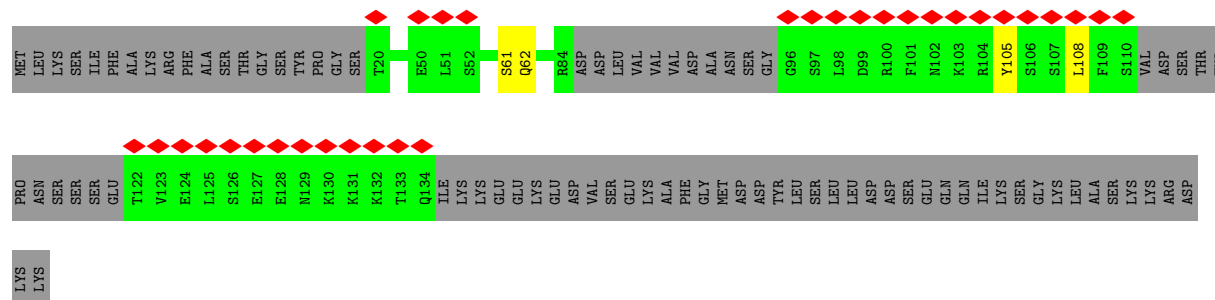
• Molecule 20: uL29m



• Molecule 21: uL30m



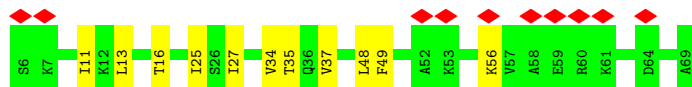
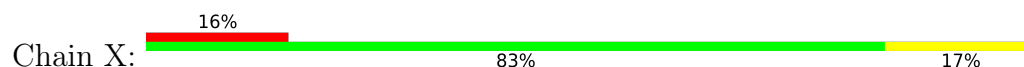
• Molecule 22: bL31m



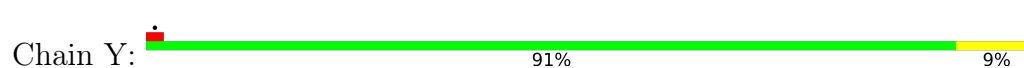
- Molecule 23: bL32m



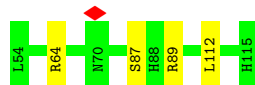
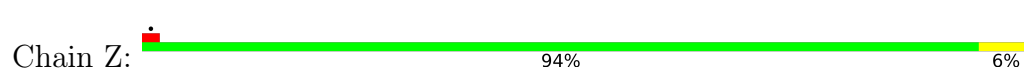
- Molecule 24: bL33m



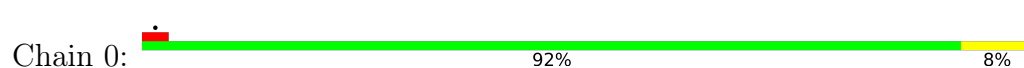
- Molecule 25: bL34m



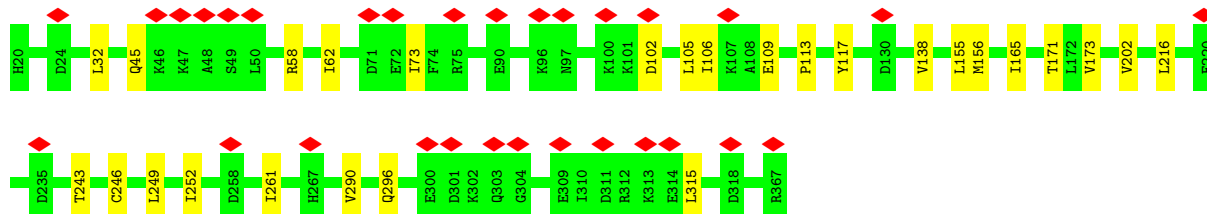
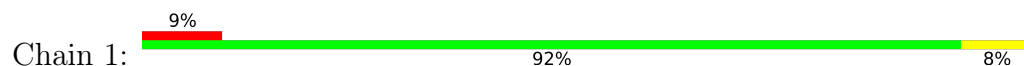
- Molecule 26: bL35m



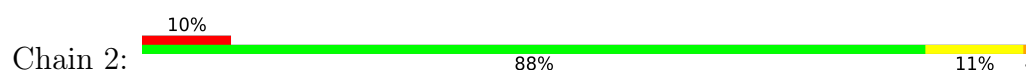
- Molecule 27: bL36m



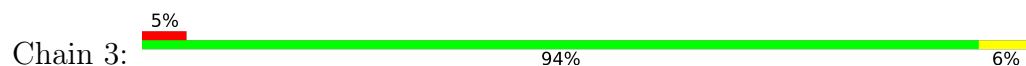
- Molecule 28: mL38



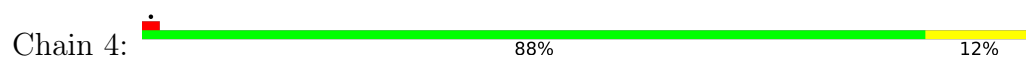
- Molecule 29: mL40



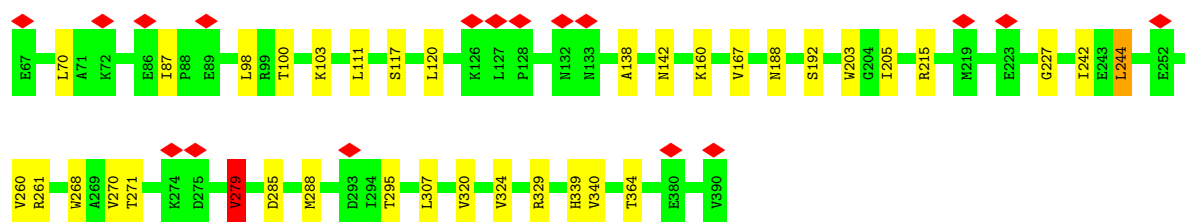
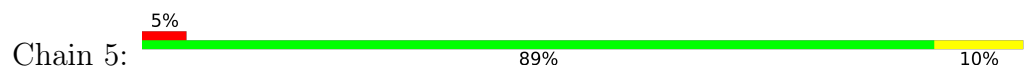
• Molecule 30: mL41



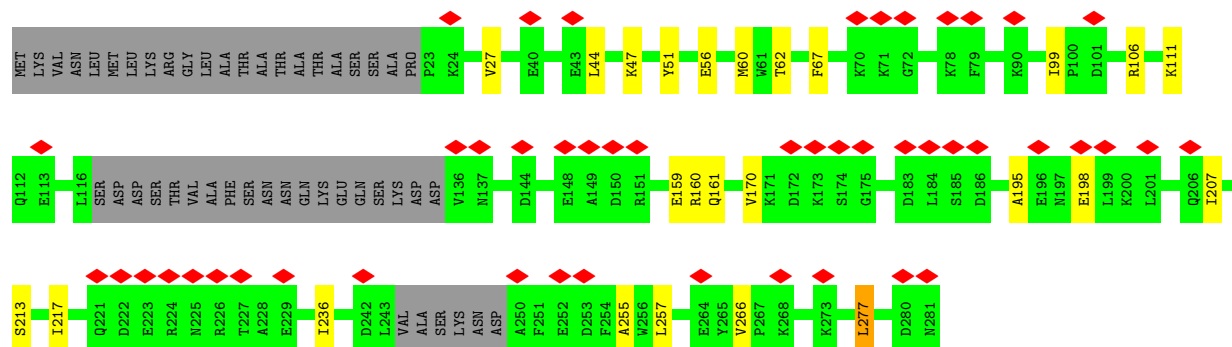
• Molecule 31: mL43



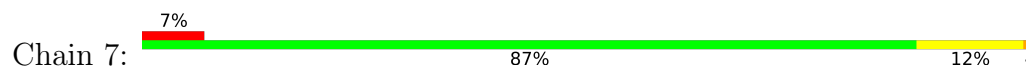
• Molecule 32: mL44



• Molecule 33: mL46

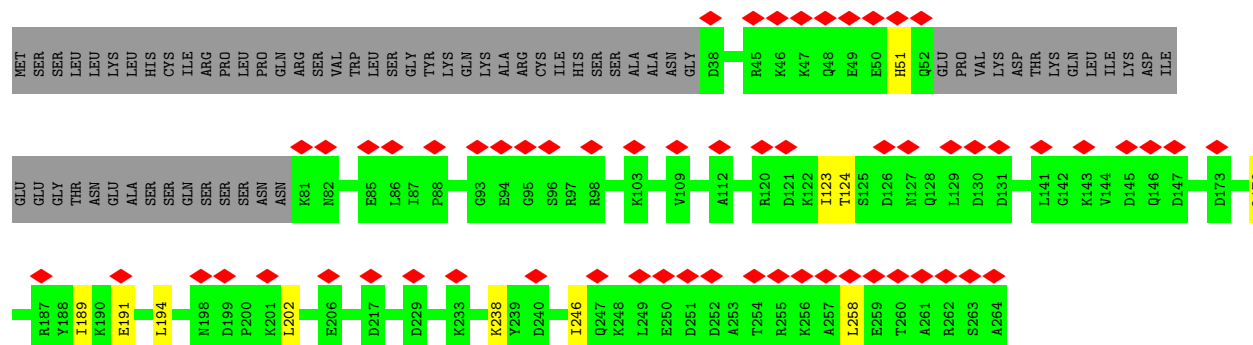


• Molecule 34: mL49

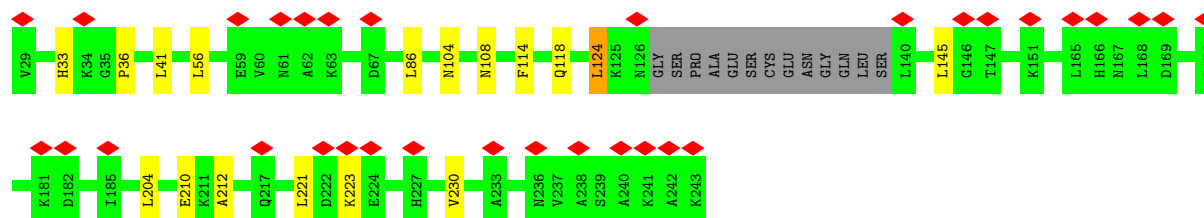
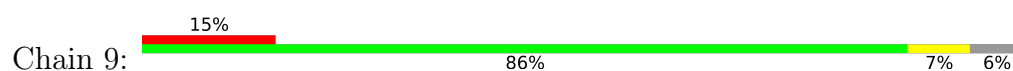




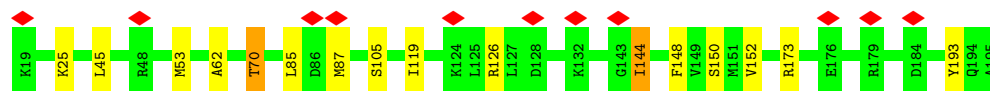
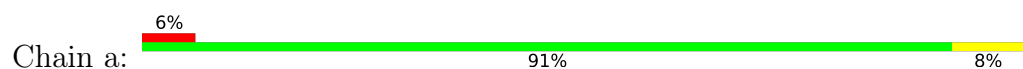
- Molecule 35: mL50



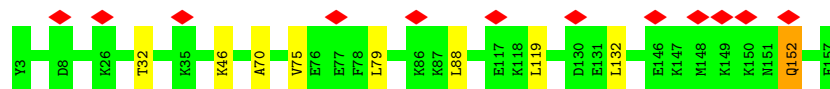
- Molecule 36: mL57



- Molecule 37: mL58



- Molecule 38: mL59

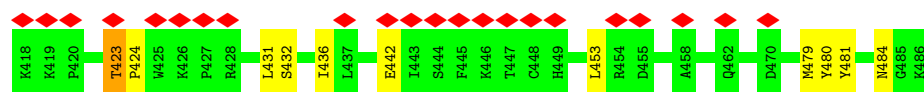


- Molecule 39: mL60

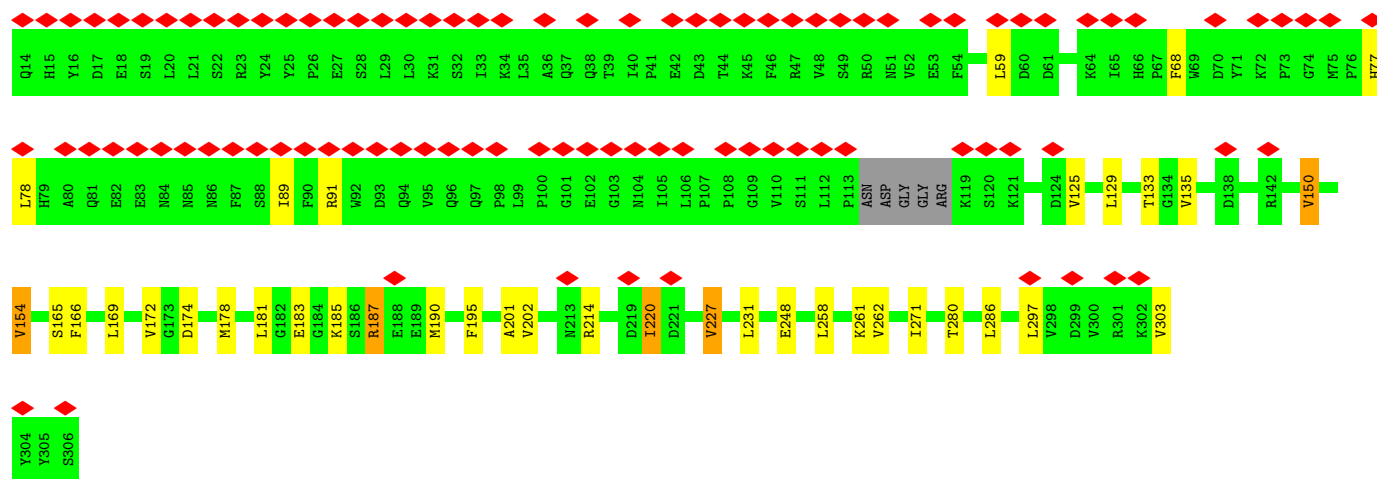
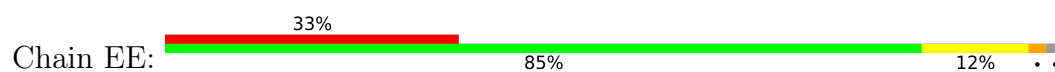


Chain CC:

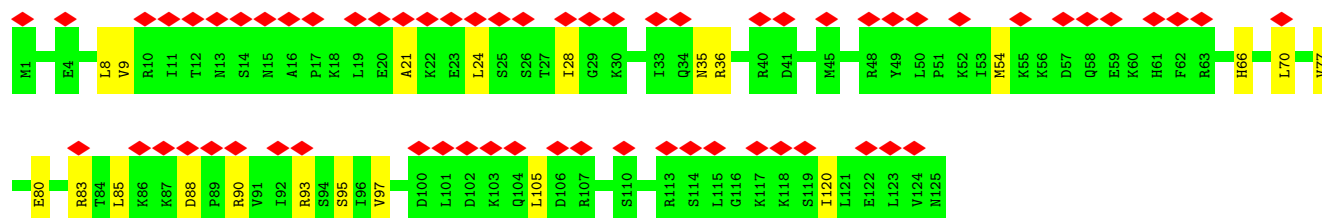
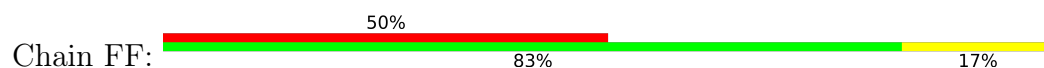




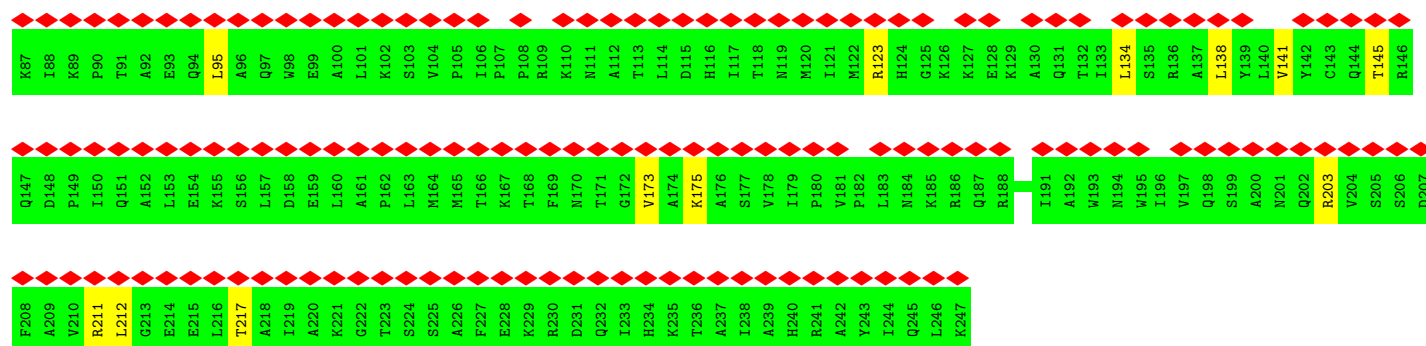
• Molecule 45: uS5m



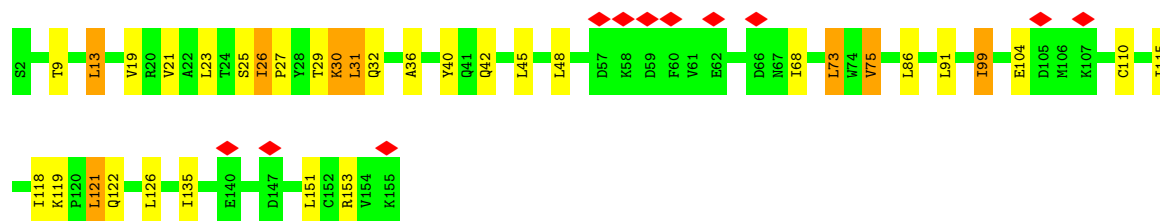
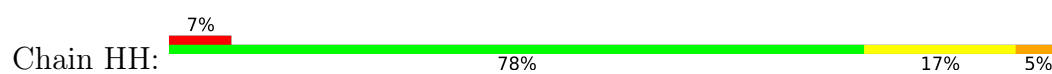
• Molecule 46: bS6m



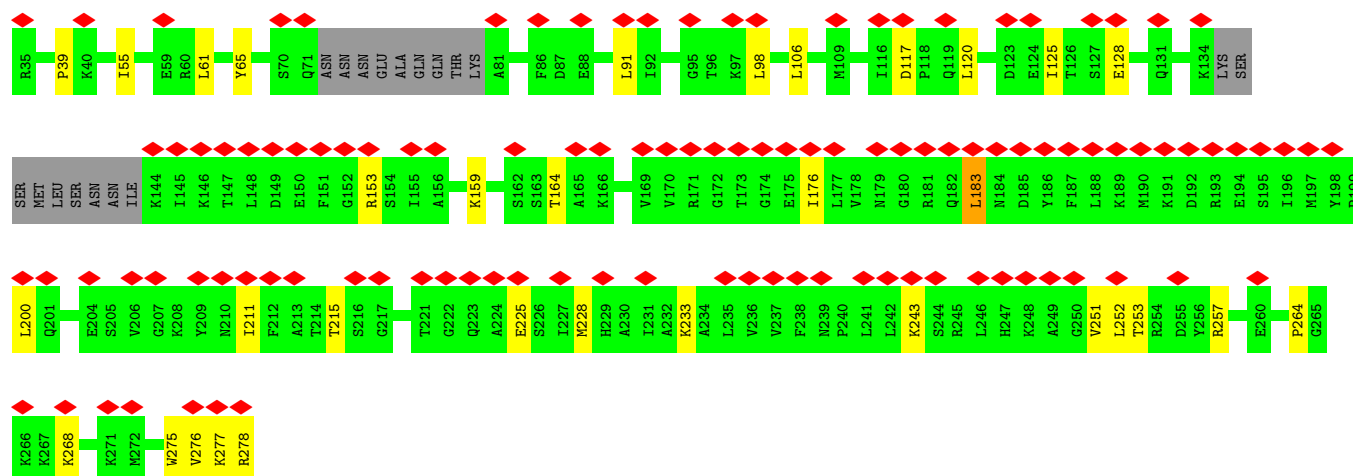
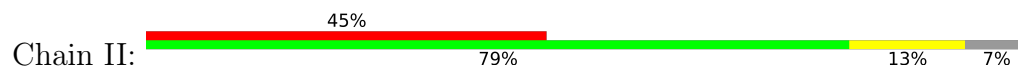
• Molecule 47: uS7m



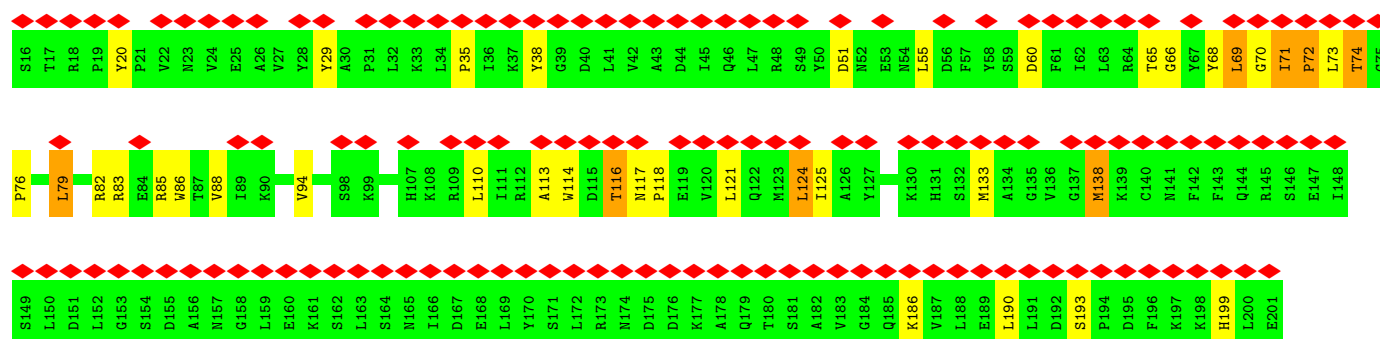
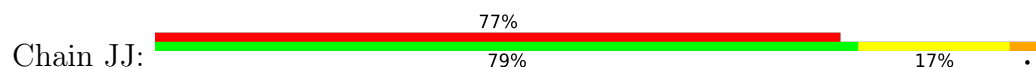
• Molecule 48: uS8m



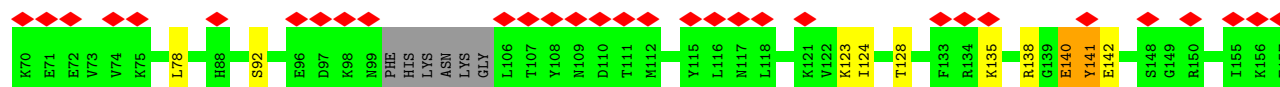
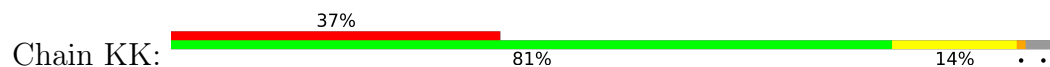
- Molecule 49: uS9m

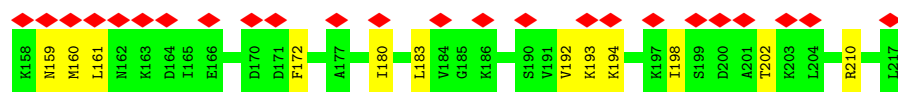


- Molecule 50: uS10m

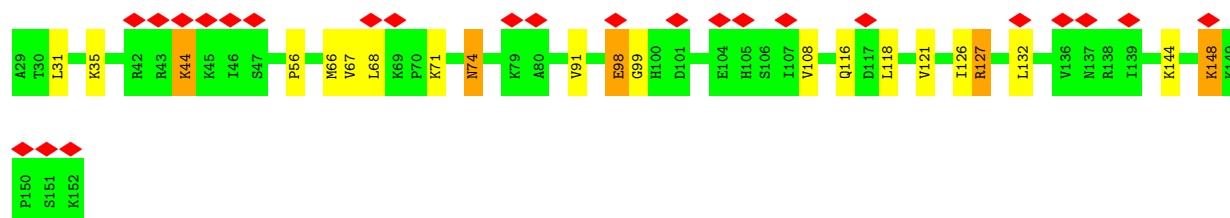
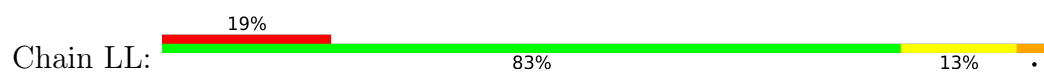


- Molecule 51: uS11m

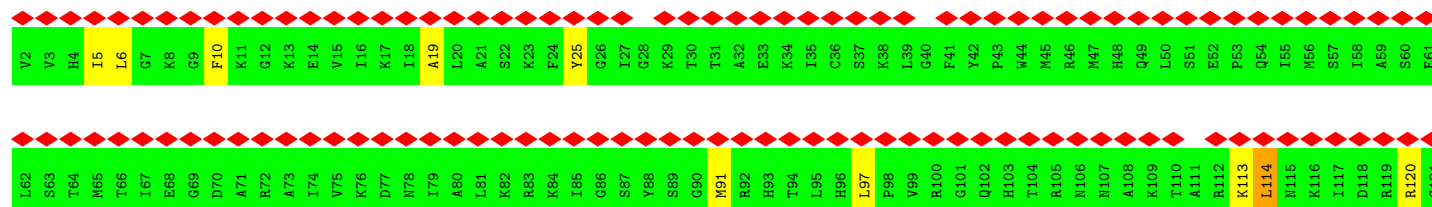




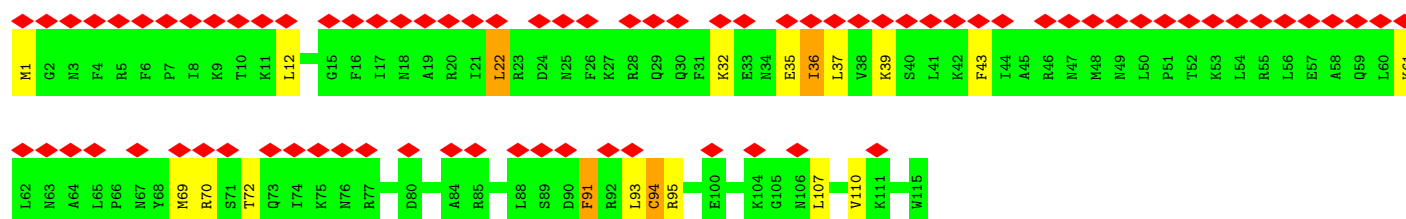
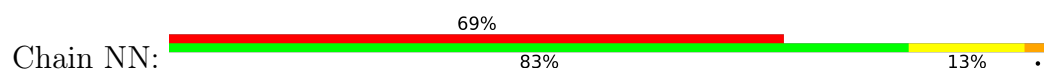
• Molecule 52: uS12m



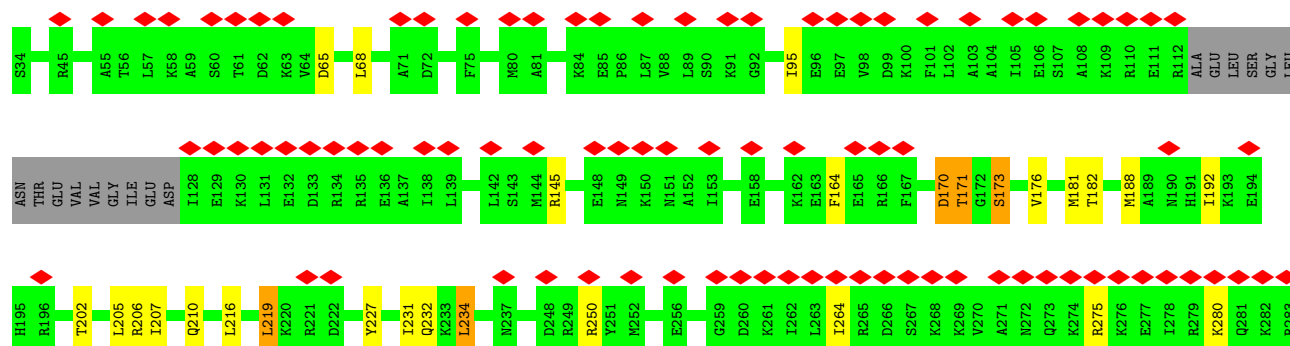
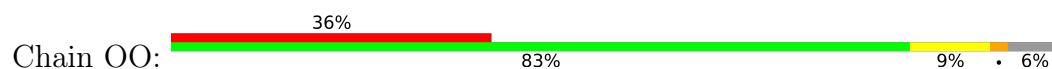
• Molecule 53: uS13m



• Molecule 54: uS14m

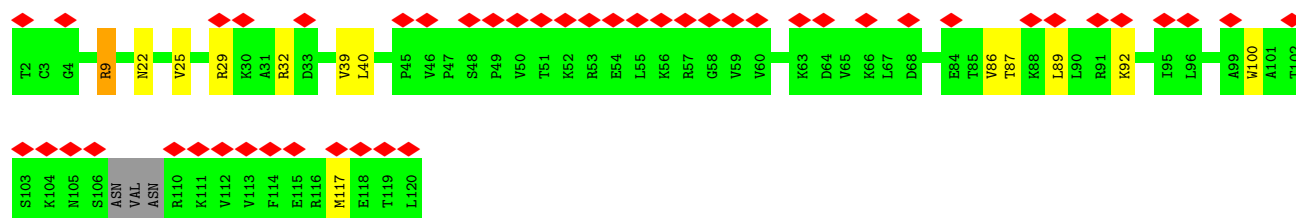
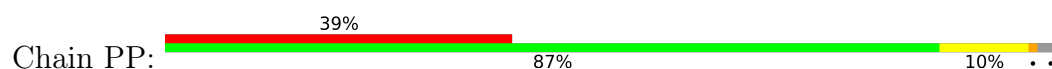


• Molecule 55: uS15m

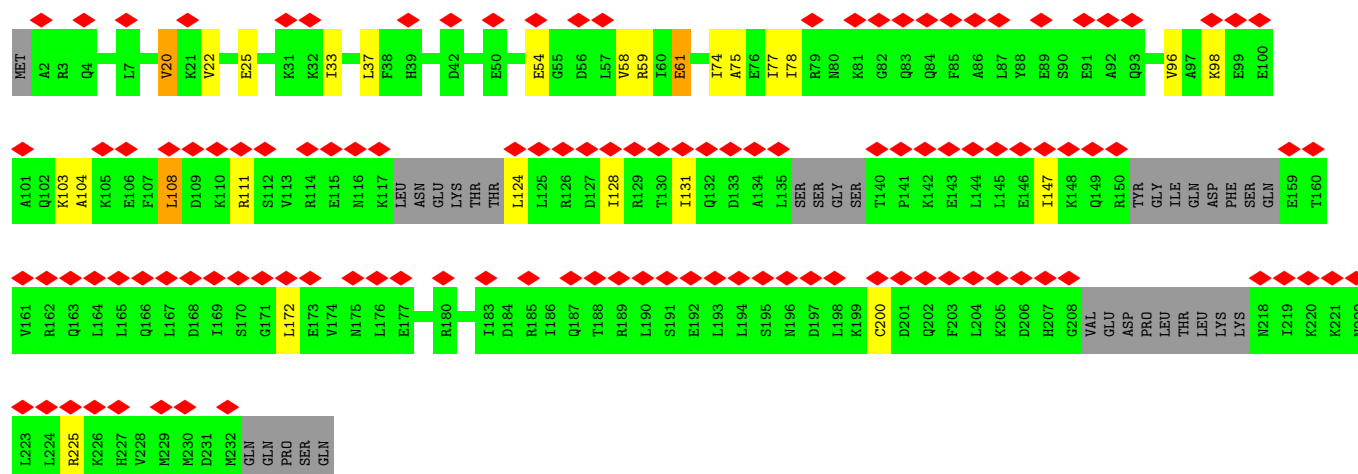
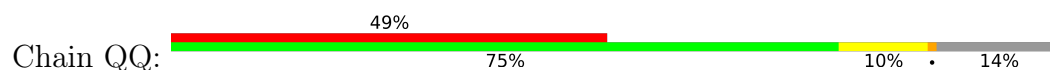




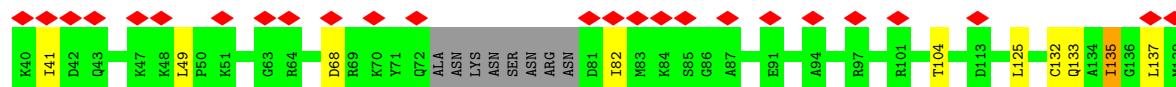
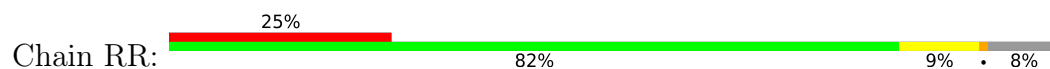
• Molecule 56: bS16m



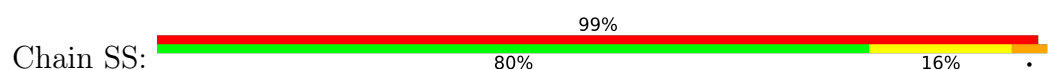
• Molecule 57: uS17m



• Molecule 58: bS18m

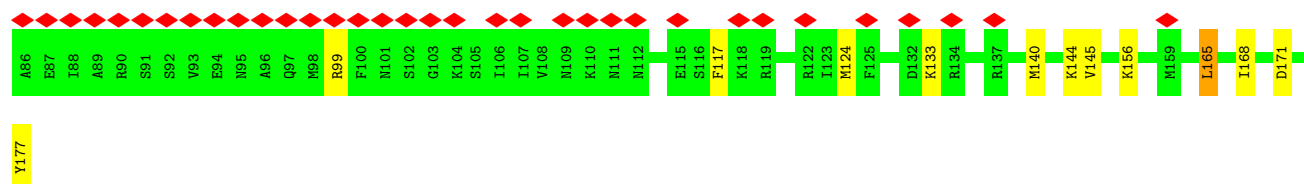


• Molecule 59: uS19m



- Molecule 60: bS21m

Chain TT: 

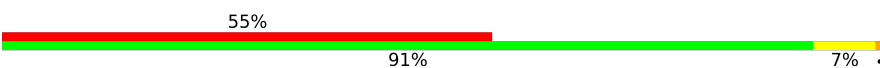


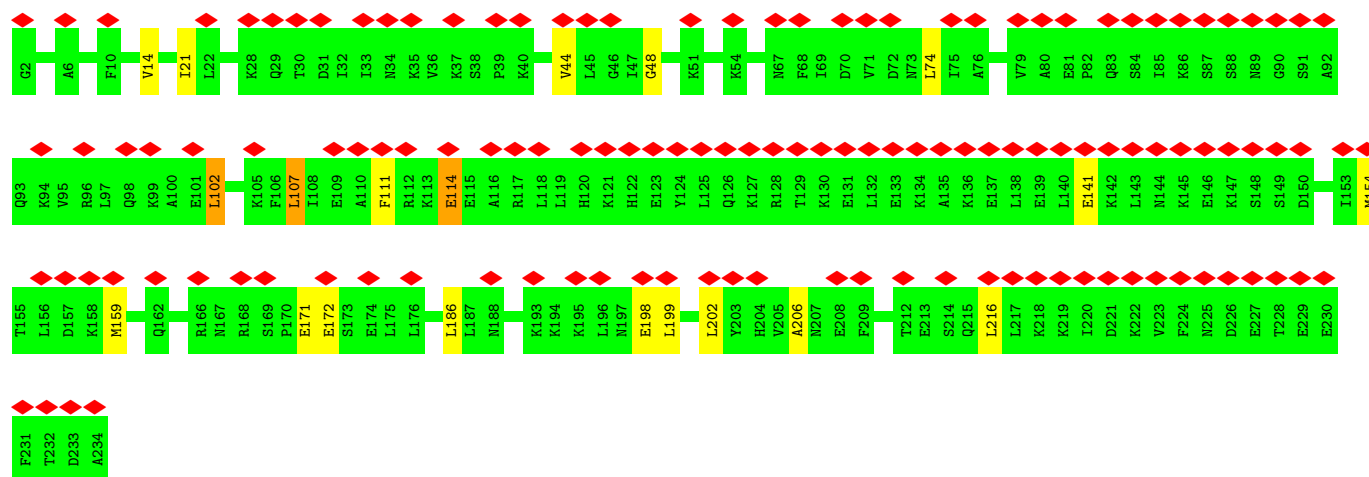
- Molecule 61: mS23

Chain UU: 

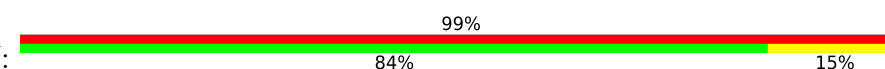


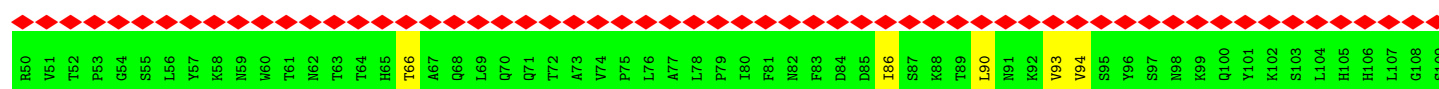
- Molecule 62: mS26

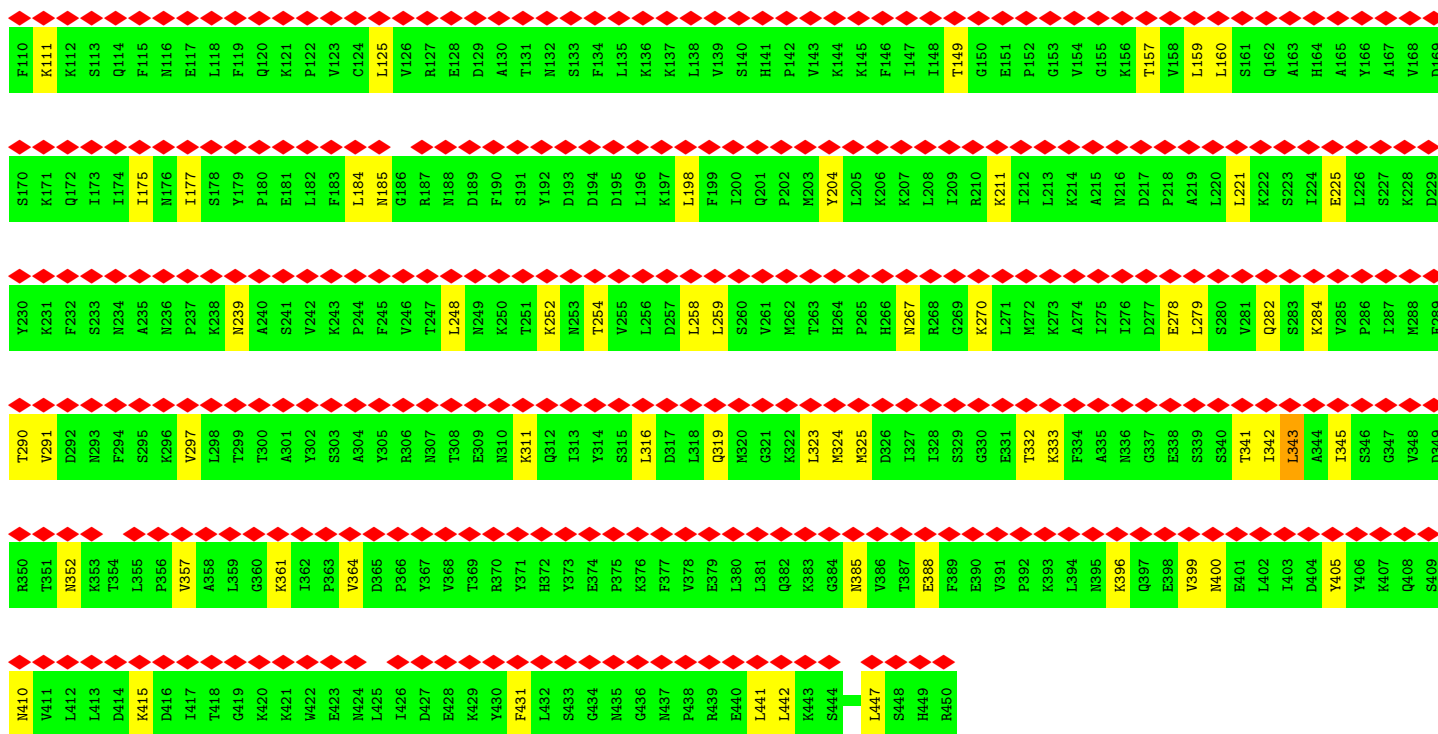
Chain VV: 



- Molecule 63: mS29

Chain WW: 

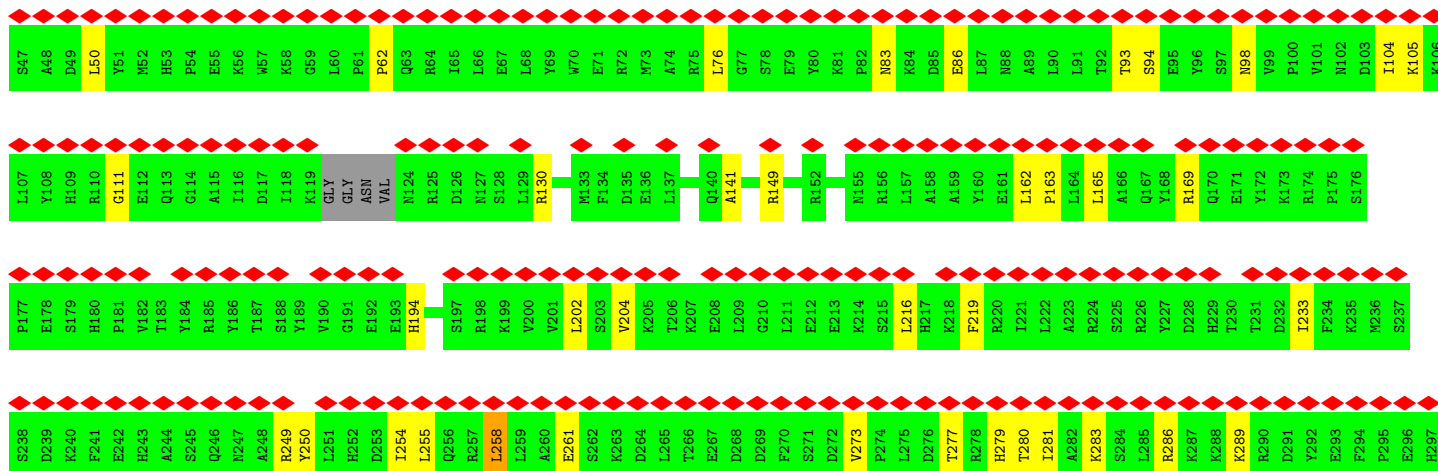
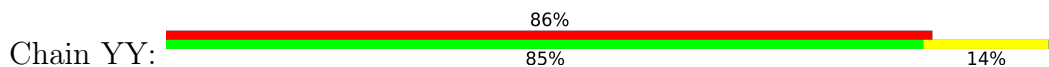




• Molecule 64: mS33

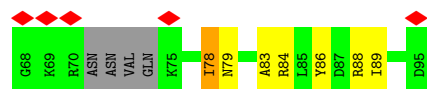
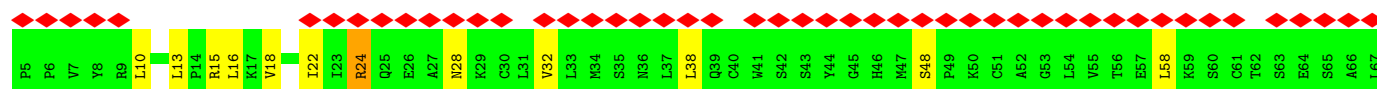


• Molecule 65: mS35

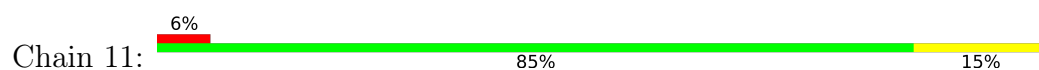




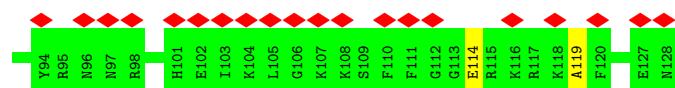
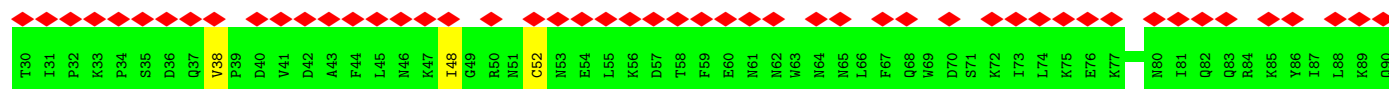
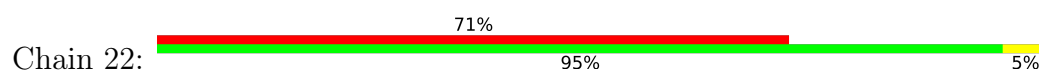
• Molecule 66: mS37



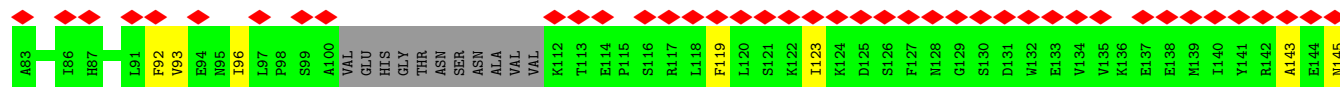
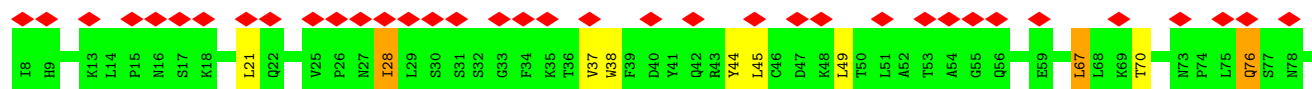
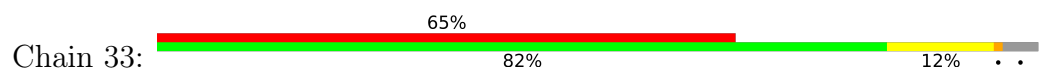
• Molecule 67: mS38

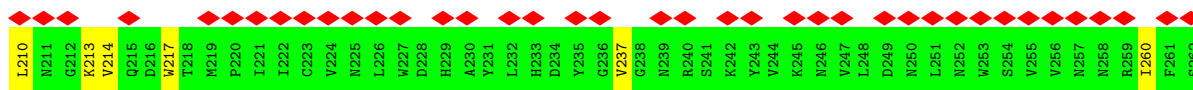


• Molecule 68: mS41

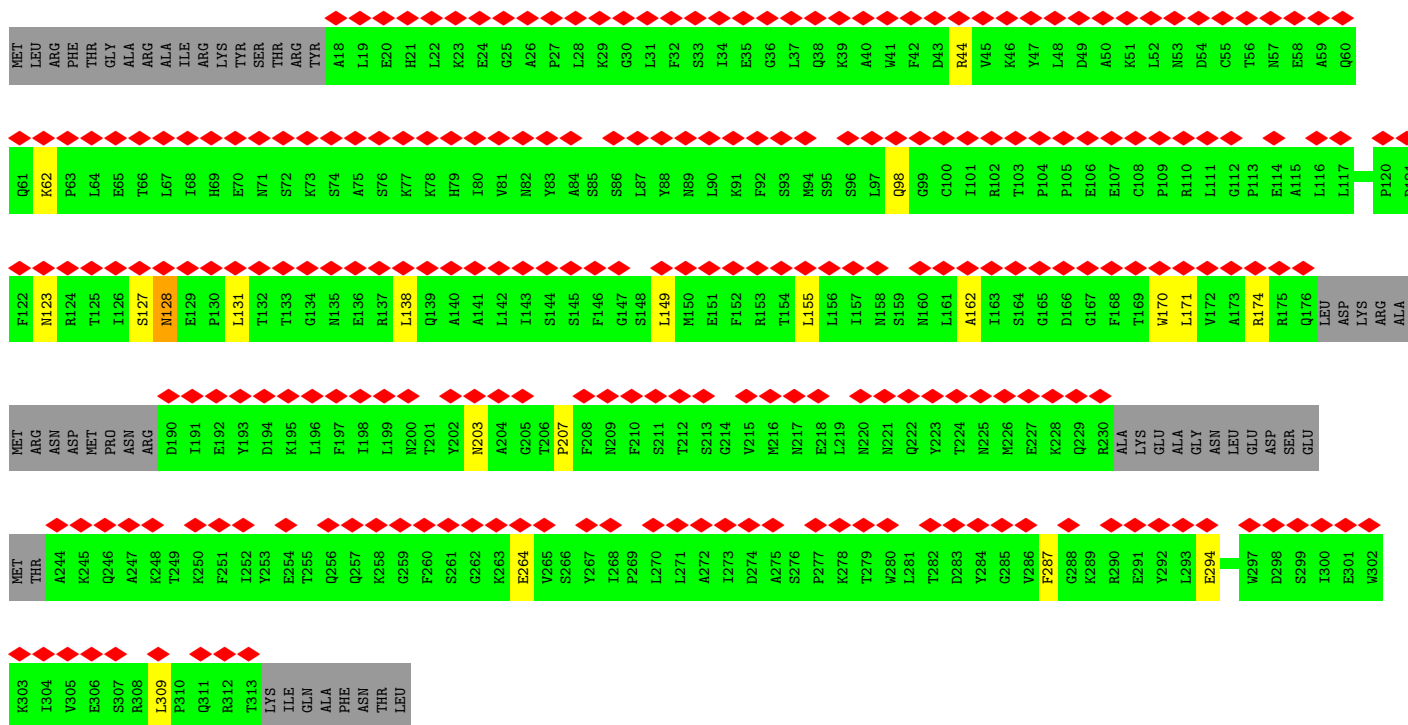
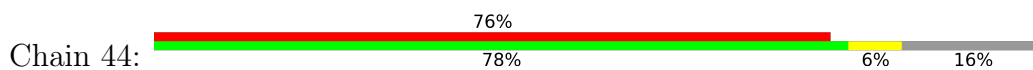


• Molecule 69: mS42

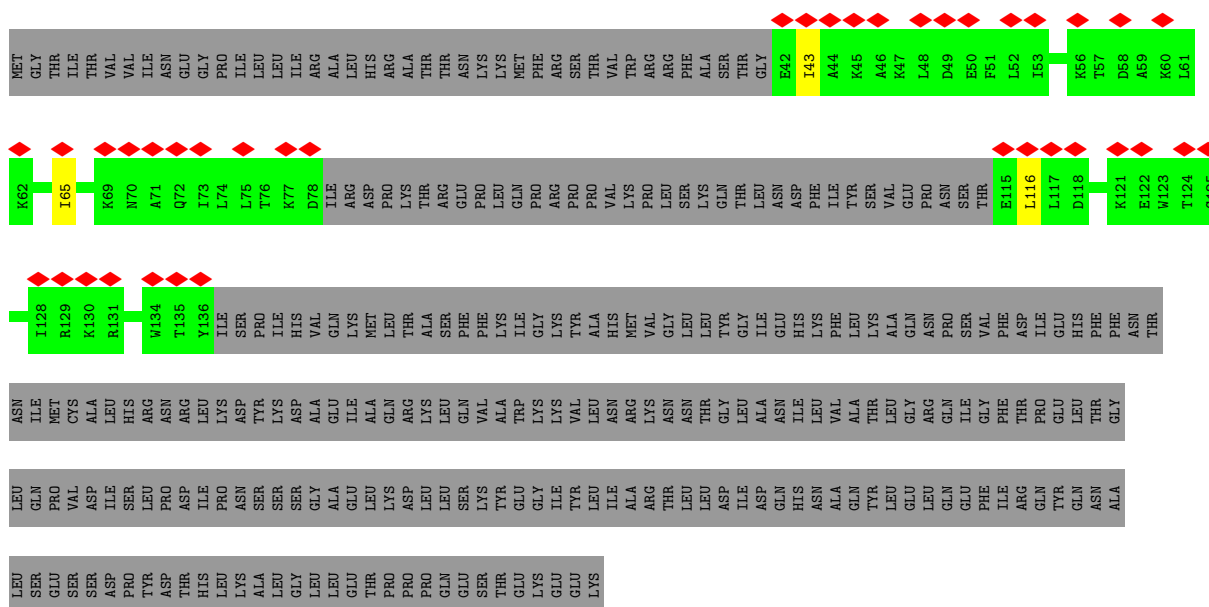




• Molecule 70: mS43

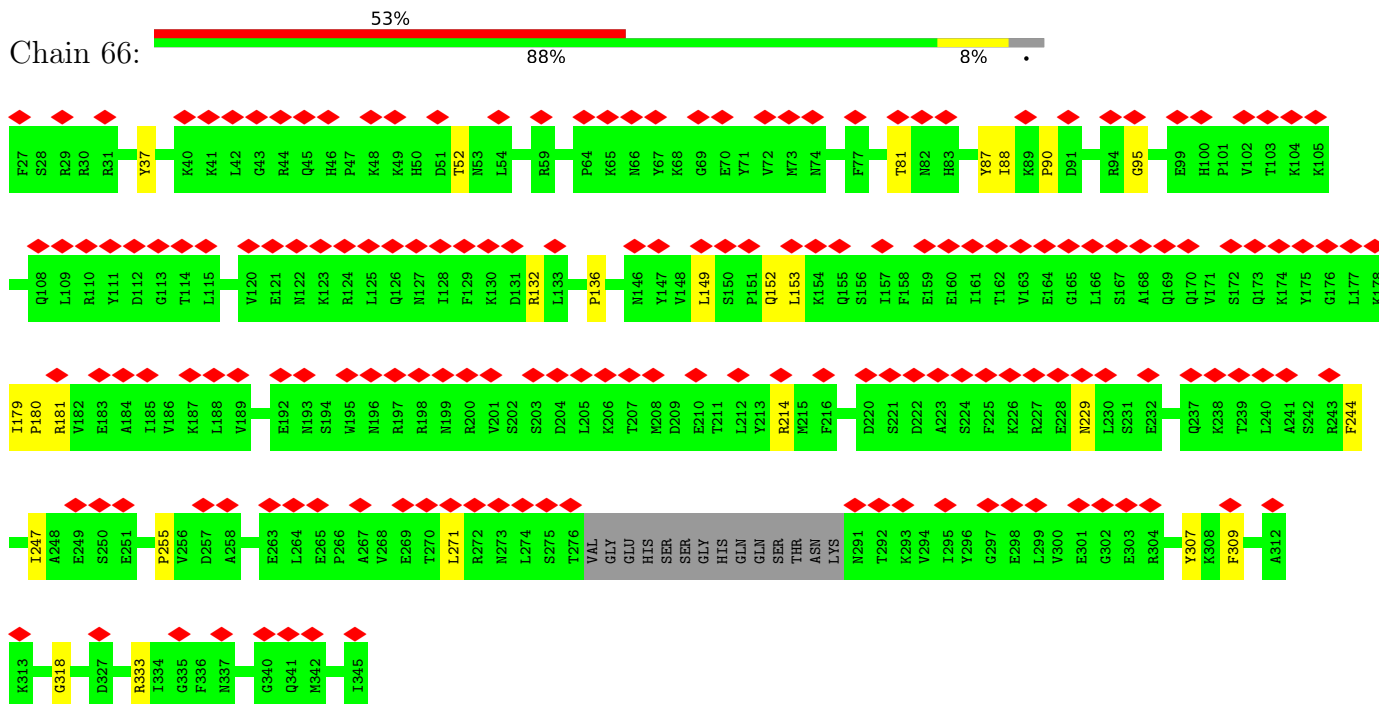


• Molecule 71: mS44



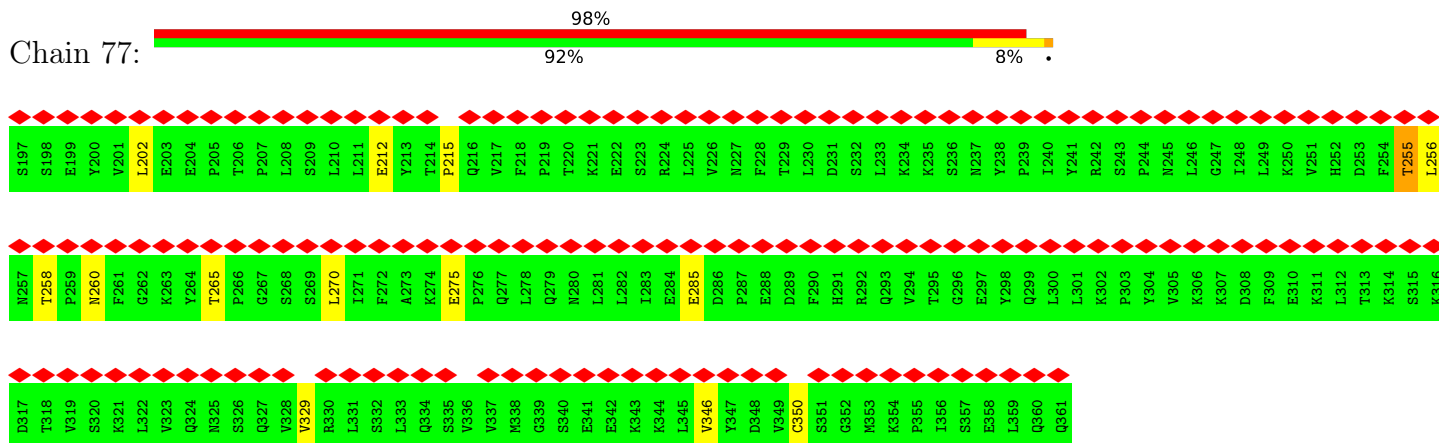
- Molecule 72: mS45

Chain 66:



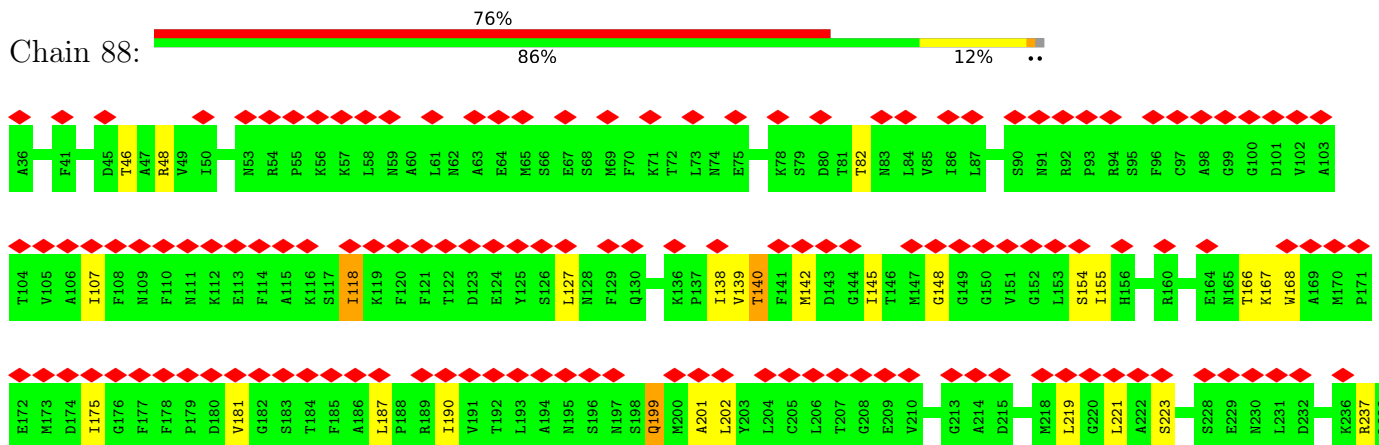
- Molecule 73: mS46

Chain 77:

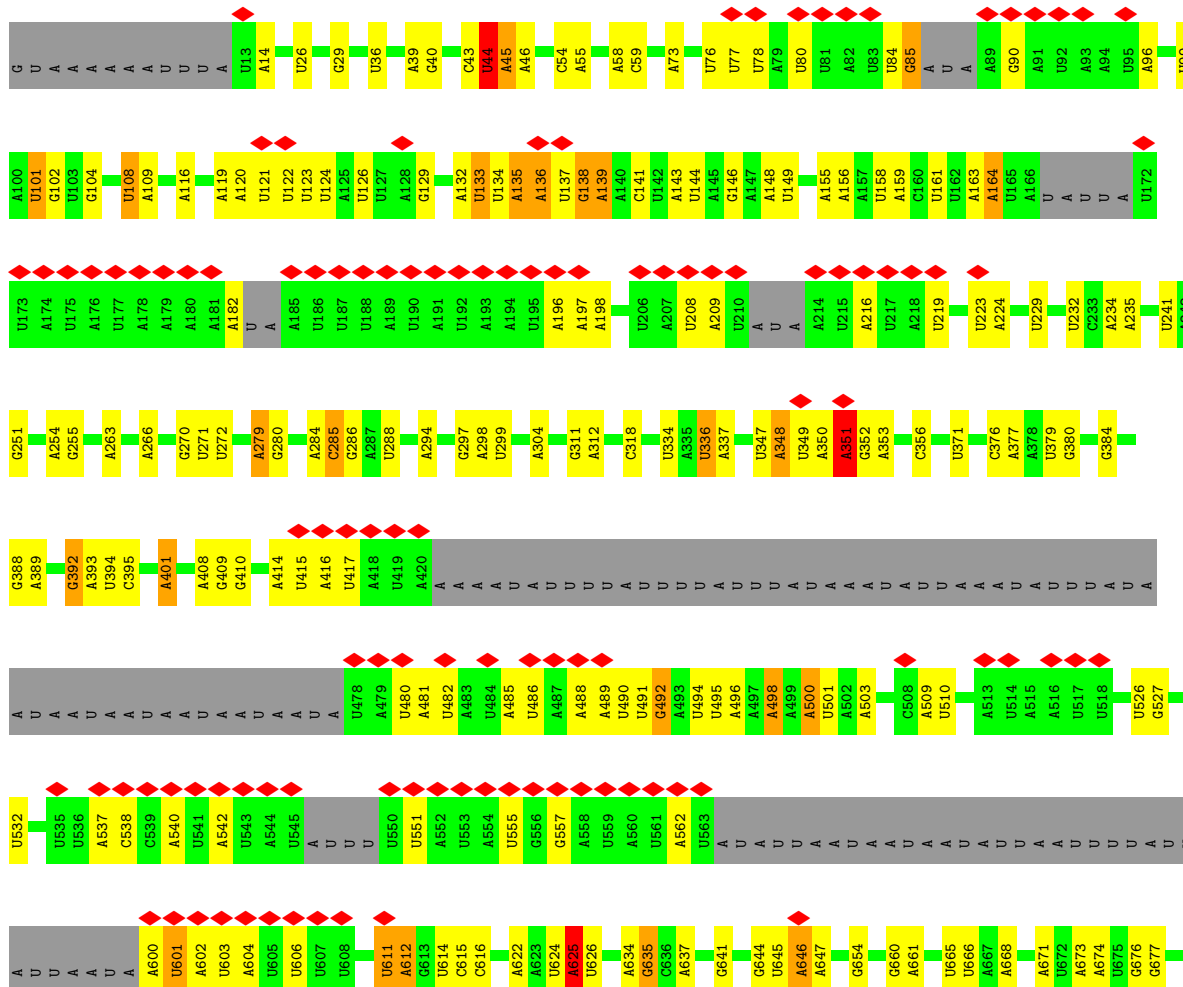


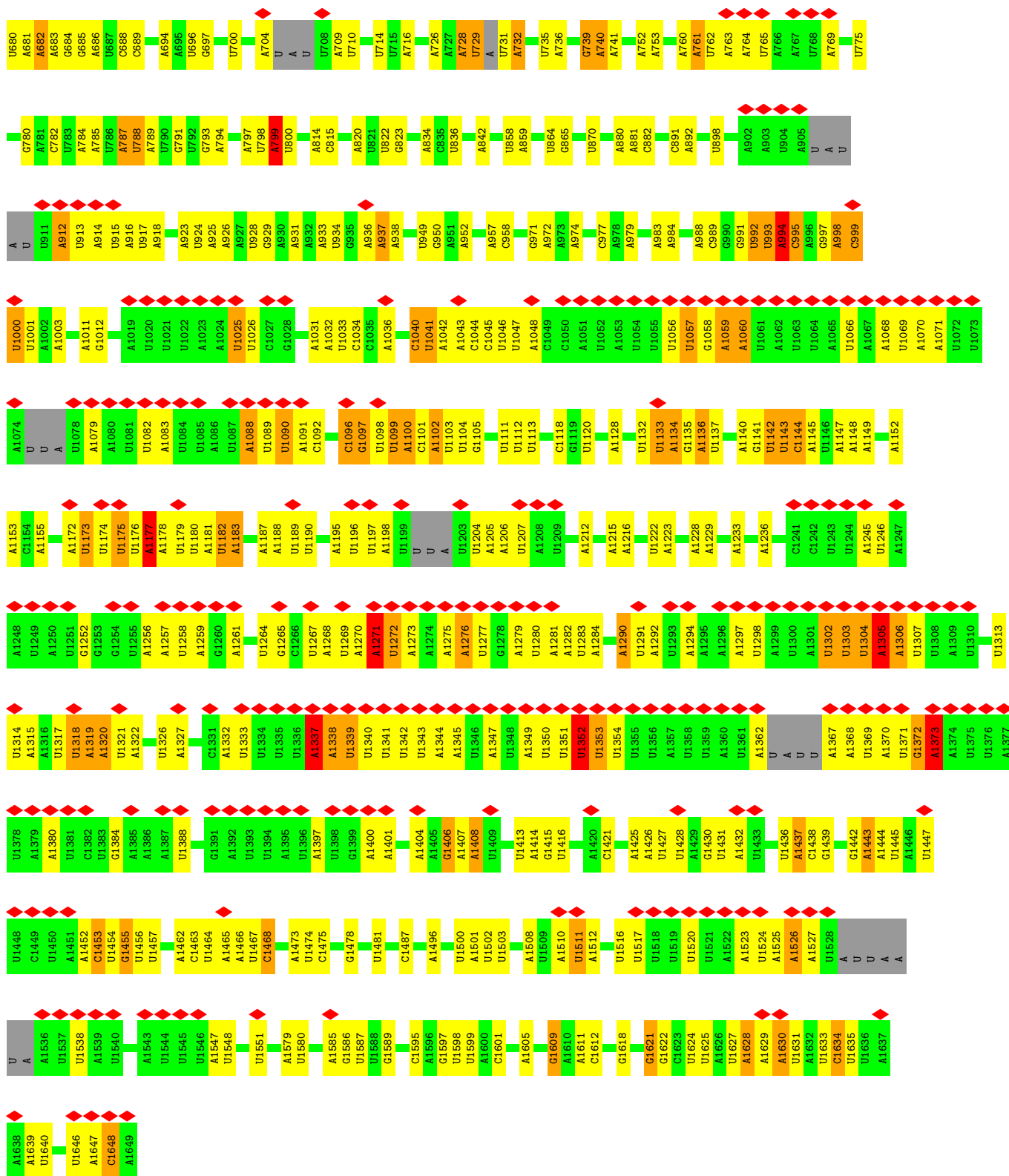
- Molecule 74: mS47

Chain 88:

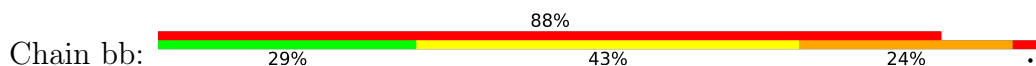


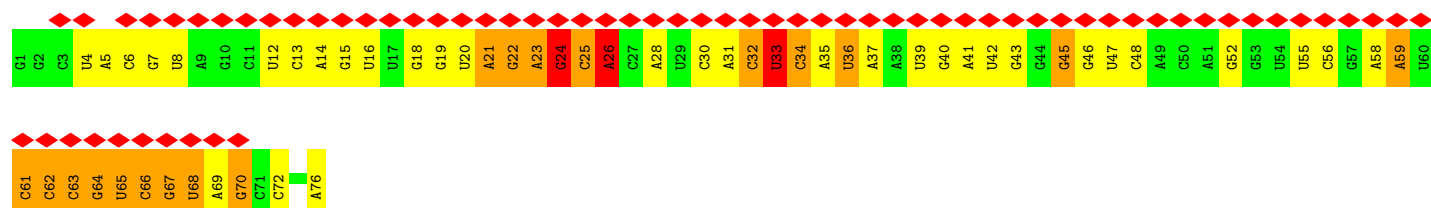
- Molecule 75: 15S ribosomal RNA





• Molecule 76: tRNA

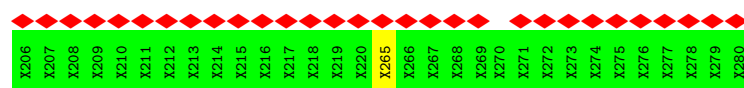




- Molecule 77: unknown protein sequence 1



- Molecule 78: unknown protein sequence 2



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	141795	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 ($e^-/\text{\AA}^2$)	23.5	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	FEI FALCON II (4k x 4k)	Depositor
Maximum map value	1.044	Depositor
Minimum map value	-0.667	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.047	Depositor
Recommended contour level	0.146	Depositor
Map size (Å)	442.2, 442.2, 442.2	wwPDB
Map dimensions	330, 330, 330	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.34, 1.34, 1.34	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

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

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	A	0.36	1/64517 (0.0%)	0.71	57/100359 (0.1%)
2	B	0.49	0/2573	0.82	0/3456
3	C	0.44	0/1975	0.79	3/2657 (0.1%)
4	D	0.51	0/2031	0.91	0/2751
5	E	0.45	0/2244	0.80	0/3033
6	F	0.50	0/1551	0.82	0/2093
7	G	0.43	0/628	0.88	0/844
8	H	0.47	0/1302	0.90	0/1749
9	I	0.46	0/962	0.80	0/1285
10	J	0.46	0/1783	0.86	0/2384
11	K	0.48	0/1606	0.88	0/2148
12	L	0.44	0/1845	0.95	0/2489
13	M	0.51	0/1224	0.83	0/1651
14	N	0.46	0/961	0.75	0/1295
15	O	0.45	0/1859	0.89	0/2495
16	P	0.43	0/1773	0.88	0/2390
17	Q	0.50	0/2323	0.83	0/3135
18	R	0.44	0/2783	0.91	0/3723
19	S	0.47	0/1576	0.88	0/2104
20	T	0.48	0/1837	0.95	0/2486
21	U	0.60	0/648	0.89	2/870 (0.2%)
22	V	0.47	0/741	0.76	0/995
23	W	0.44	0/955	0.84	0/1273
24	X	0.44	0/520	0.70	0/696
25	Y	0.42	0/392	0.98	0/515
26	Z	0.47	0/522	0.85	0/695
27	0	0.41	0/329	0.57	0/432
28	1	0.47	0/2949	0.84	0/3998
29	2	0.44	0/963	0.94	0/1295
30	3	0.48	0/1072	0.79	0/1442
31	4	0.46	0/1138	0.88	0/1526
32	5	0.45	0/2604	0.92	1/3526 (0.0%)

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
33	6	0.47	0/1978	0.83	0/2664
34	7	0.51	0/873	0.84	0/1170
35	8	0.46	0/1659	0.95	0/2230
36	9	0.48	0/1616	0.95	0/2177
37	a	0.47	0/1471	0.96	0/1976
38	b	0.45	0/1333	0.92	0/1783
39	c	0.46	0/1028	0.91	0/1372
40	d	0.44	0/1791	0.90	0/2415
41	AA	0.46	0/1645	0.79	0/2218
42	BB	0.52	0/2128	0.94	0/2892
43	CC	0.45	0/2864	0.90	0/3853
44	DD	0.47	0/2434	0.91	0/3281
45	EE	0.47	0/2360	0.87	0/3180
46	FF	0.45	0/1014	0.87	0/1358
47	GG	0.50	0/1305	1.00	0/1763
48	HH	0.46	0/1232	0.92	0/1660
49	II	0.48	0/1855	0.92	0/2492
50	JJ	0.45	0/1544	0.99	8/2091 (0.4%)
51	KK	0.50	0/1136	0.91	2/1515 (0.1%)
52	LL	0.52	0/963	0.89	0/1292
53	MM	0.45	0/957	0.97	0/1277
54	NN	0.45	0/972	0.94	0/1300
55	OO	0.45	0/1985	1.09	2/2647 (0.1%)
56	PP	0.48	0/934	0.87	0/1260
57	QQ	0.42	0/1694	0.96	0/2252
58	RR	0.53	0/749	0.94	0/998
59	SS	0.50	0/652	0.80	1/882 (0.1%)
60	TT	0.47	0/771	1.01	0/1019
61	UU	0.46	0/1950	0.93	0/2636
62	VV	0.44	0/1900	0.97	1/2540 (0.0%)
63	WW	0.47	0/3282	0.88	0/4438
64	XX	0.49	0/786	0.95	0/1046
65	YY	0.49	0/2313	0.90	0/3119
66	ZZ	0.58	2/702 (0.3%)	0.93	1/945 (0.1%)
67	11	0.42	0/303	1.08	0/386
68	22	0.44	0/852	0.92	0/1142
69	33	0.47	0/2002	0.94	0/2721
70	44	0.47	0/2214	0.94	0/2990
71	55	0.47	0/521	0.93	0/701
72	66	0.46	0/2547	0.87	0/3438
73	77	0.49	0/1358	0.91	0/1839
74	88	0.49	0/3646	0.93	1/4935 (0.0%)
75	aa	0.37	0/35686	0.77	76/55477 (0.1%)

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
76	bb	0.46	0/1805	0.94	4/2811 (0.1%)
All	All	0.42	3/212996 (0.0%)	0.82	159/307971 (0.1%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
66	ZZ	24	ARG	NE-CZ	5.88	1.39	1.33
66	ZZ	24	ARG	CD-NE	5.52	1.53	1.46
1	A	127	A	C1'-N9	-5.09	1.40	1.48

The worst 5 of 159 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	2897	A	C2'-C3'-O3'	12.18	127.76	109.50
1	A	3241	U	C1'-C2'-O2'	-11.76	90.76	108.40
76	bb	63	C	C1'-C2'-O2'	-10.13	93.20	108.40
75	aa	392	G	C2'-C3'-O3'	9.75	124.12	109.50
1	A	1892	G	C2'-C3'-O3'	9.71	124.07	109.50

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	57598	0	28892	209	0
2	B	2527	0	2649	39	0
3	C	1932	0	1969	22	0
4	D	1991	0	2032	12	0
5	E	2187	0	2203	8	0
6	F	1524	0	1587	4	0
7	G	617	0	626	1	0
8	H	1275	0	1310	6	0
9	I	956	0	1037	5	0
10	J	1746	0	1840	5	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
11	K	1573	0	1629	8	0
12	L	1817	0	1878	11	0
13	M	1206	0	1283	22	0
14	N	948	0	1006	3	0
15	O	1826	0	1933	5	0
16	P	1729	0	1724	10	0
17	Q	2272	0	2334	9	0
18	R	2738	0	2811	6	0
19	S	1543	0	1621	7	0
20	T	1792	0	1782	14	0
21	U	639	0	699	6	0
22	V	729	0	711	12	0
23	W	937	0	975	6	0
24	X	512	0	563	6	0
25	Y	385	0	423	3	0
26	Z	508	0	539	0	0
27	0	324	0	344	3	0
28	1	2875	0	2881	12	0
29	2	944	0	969	9	0
30	3	1046	0	1071	6	0
31	4	1117	0	1142	8	0
32	5	2552	0	2600	20	0
33	6	1932	0	1950	12	0
34	7	858	0	908	6	0
35	8	1629	0	1633	2	0
36	9	1587	0	1628	8	0
37	a	1440	0	1473	9	0
38	b	1299	0	1367	4	0
39	c	1004	0	1065	6	0
40	d	1746	0	1743	11	0
41	AA	1610	0	1639	7	0
42	BB	2085	0	2094	20	0
43	CC	2821	0	2829	30	0
44	DD	2369	0	2436	24	0
45	EE	2306	0	2323	21	0
46	FF	1002	0	1086	28	0
47	GG	1282	0	1339	5	0
48	HH	1213	0	1277	15	0
49	II	1820	0	1906	17	0
50	JJ	1508	0	1505	68	0
51	KK	1121	0	1172	11	0
52	LL	948	0	1005	14	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
53	MM	942	0	1001	3	0
54	NN	953	0	1007	10	0
55	OO	1962	0	2036	25	0
56	PP	919	0	982	5	0
57	QQ	1683	0	1769	17	0
58	RR	738	0	771	3	0
59	SS	636	0	654	28	0
60	TT	760	0	791	5	0
61	UU	1907	0	1898	24	0
62	VV	1872	0	1978	10	0
63	WW	3216	0	3315	16	0
64	XX	774	0	821	6	0
65	YY	2258	0	2229	47	0
66	ZZ	687	0	719	27	0
67	11	303	0	357	4	0
68	22	833	0	839	2	0
69	33	1953	0	1913	17	0
70	44	2169	0	2155	7	0
71	55	508	0	524	0	0
72	66	2488	0	2520	11	0
73	77	1330	0	1350	6	0
74	88	3573	0	3576	23	0
75	aa	31883	0	16010	257	0
76	bb	1615	0	821	85	0
77	cc	470	0	102	0	0
78	dd	755	0	167	2	0
79	3	1	0	0	0	0
79	A	180	0	0	0	0
79	BB	1	0	0	0	0
79	EE	1	0	0	0	0
79	MM	1	0	0	0	0
79	N	1	0	0	0	0
79	NN	1	0	0	0	0
79	WW	1	0	0	0	0
79	aa	111	0	0	0	0
79	d	1	0	0	0	0
80	B	1	0	0	0	0
81	0	1	0	0	0	0
81	W	1	0	0	0	0
82	WW	28	0	12	1	0
All	All	201462	0	157758	1138	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including

hydrogen atoms). The all-atom clashscore for this structure is 3.

The worst 5 of 1138 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
22:V:105:TYR:CE2	59:SS:16:PRO:HG3	1.09	1.60
50:JJ:71:ILE:HG12	50:JJ:116:THR:CG2	1.18	1.57
22:V:105:TYR:CE2	59:SS:16:PRO:CG	1.93	1.50
49:II:278:ARG:NH1	76:bb:33:U:C5	1.84	1.44
66:ZZ:24:ARG:CD	75:aa:1630:A:C2	1.96	1.43

There are no symmetry-related clashes.

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	
2	B	317/393 (81%)	303 (96%)	14 (4%)	0	100	100
3	C	247/249 (99%)	233 (94%)	13 (5%)	1 (0%)	30	59
4	D	250/252 (99%)	236 (94%)	10 (4%)	4 (2%)	7	30
5	E	272/274 (99%)	254 (93%)	16 (6%)	2 (1%)	18	48
6	F	194/196 (99%)	183 (94%)	10 (5%)	1 (0%)	24	55
7	G	72/74 (97%)	70 (97%)	2 (3%)	0	100	100
8	H	158/160 (99%)	152 (96%)	6 (4%)	0	100	100
9	I	123/138 (89%)	114 (93%)	9 (7%)	0	100	100
10	J	218/220 (99%)	202 (93%)	15 (7%)	1 (0%)	24	55
11	K	193/195 (99%)	184 (95%)	9 (5%)	0	100	100
12	L	225/237 (95%)	217 (96%)	8 (4%)	0	100	100
13	M	149/151 (99%)	139 (93%)	10 (7%)	0	100	100
14	N	116/118 (98%)	106 (91%)	10 (9%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
15	O	223/225 (99%)	211 (95%)	12 (5%)	0	100	100
16	P	205/207 (99%)	196 (96%)	9 (4%)	0	100	100
17	Q	280/296 (95%)	268 (96%)	12 (4%)	0	100	100
18	R	327/337 (97%)	314 (96%)	12 (4%)	1 (0%)	36	66
19	S	181/216 (84%)	171 (94%)	10 (6%)	0	100	100
20	T	210/225 (93%)	199 (95%)	11 (5%)	0	100	100
21	U	80/82 (98%)	78 (98%)	2 (2%)	0	100	100
22	V	87/177 (49%)	83 (95%)	4 (5%)	0	100	100
23	W	110/112 (98%)	105 (96%)	5 (4%)	0	100	100
24	X	62/64 (97%)	59 (95%)	3 (5%)	0	100	100
25	Y	44/46 (96%)	41 (93%)	3 (7%)	0	100	100
26	Z	60/62 (97%)	56 (93%)	4 (7%)	0	100	100
27	0	36/38 (95%)	33 (92%)	3 (8%)	0	100	100
28	1	346/348 (99%)	330 (95%)	16 (5%)	0	100	100
29	2	111/113 (98%)	106 (96%)	5 (4%)	0	100	100
30	3	128/130 (98%)	122 (95%)	6 (5%)	0	100	100
31	4	136/138 (99%)	130 (96%)	6 (4%)	0	100	100
32	5	322/324 (99%)	306 (95%)	16 (5%)	0	100	100
33	6	228/281 (81%)	221 (97%)	7 (3%)	0	100	100
34	7	104/106 (98%)	97 (93%)	7 (7%)	0	100	100
35	8	195/264 (74%)	192 (98%)	3 (2%)	0	100	100
36	9	198/215 (92%)	186 (94%)	12 (6%)	0	100	100
37	a	175/177 (99%)	163 (93%)	12 (7%)	0	100	100
38	b	153/155 (99%)	146 (95%)	7 (5%)	0	100	100
39	c	117/119 (98%)	112 (96%)	4 (3%)	1 (1%)	14	42
40	d	202/215 (94%)	189 (94%)	13 (6%)	0	100	100
41	AA	197/344 (57%)	190 (96%)	7 (4%)	0	100	100
42	BB	264/266 (99%)	247 (94%)	15 (6%)	2 (1%)	16	44
43	CC	331/398 (83%)	302 (91%)	27 (8%)	2 (1%)	21	51
44	DD	281/486 (58%)	265 (94%)	15 (5%)	1 (0%)	30	59
45	EE	284/293 (97%)	262 (92%)	20 (7%)	2 (1%)	18	48

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
46	FF	123/125 (98%)	113 (92%)	10 (8%)	0	100	100
47	GG	159/161 (99%)	149 (94%)	9 (6%)	1 (1%)	21	51
48	HH	152/154 (99%)	144 (95%)	8 (5%)	0	100	100
49	II	220/244 (90%)	205 (93%)	13 (6%)	2 (1%)	14	42
50	JJ	184/186 (99%)	166 (90%)	13 (7%)	5 (3%)	4	21
51	KK	138/148 (93%)	126 (91%)	11 (8%)	1 (1%)	18	48
52	LL	122/124 (98%)	110 (90%)	12 (10%)	0	100	100
53	MM	118/120 (98%)	109 (92%)	9 (8%)	0	100	100
54	NN	113/115 (98%)	109 (96%)	4 (4%)	0	100	100
55	OO	234/253 (92%)	226 (97%)	8 (3%)	0	100	100
56	PP	112/119 (94%)	105 (94%)	7 (6%)	0	100	100
57	QQ	194/237 (82%)	184 (95%)	9 (5%)	1 (0%)	24	55
58	RR	87/99 (88%)	81 (93%)	6 (7%)	0	100	100
59	SS	78/80 (98%)	71 (91%)	6 (8%)	1 (1%)	9	34
60	TT	90/92 (98%)	86 (96%)	4 (4%)	0	100	100
61	UU	231/233 (99%)	223 (96%)	8 (4%)	0	100	100
62	VV	231/233 (99%)	220 (95%)	11 (5%)	0	100	100
63	WW	399/401 (100%)	368 (92%)	28 (7%)	3 (1%)	16	44
64	XX	91/96 (95%)	88 (97%)	3 (3%)	0	100	100
65	YY	265/273 (97%)	244 (92%)	18 (7%)	3 (1%)	11	38
66	ZZ	83/91 (91%)	73 (88%)	10 (12%)	0	100	100
67	11	32/34 (94%)	31 (97%)	1 (3%)	0	100	100
68	22	97/99 (98%)	89 (92%)	7 (7%)	1 (1%)	12	40
69	33	240/255 (94%)	225 (94%)	14 (6%)	1 (0%)	30	59
70	44	264/321 (82%)	251 (95%)	10 (4%)	3 (1%)	11	38
71	55	55/339 (16%)	53 (96%)	2 (4%)	0	100	100
72	66	301/319 (94%)	291 (97%)	10 (3%)	0	100	100
73	77	163/165 (99%)	146 (90%)	16 (10%)	1 (1%)	21	51
74	88	448/457 (98%)	414 (92%)	31 (7%)	3 (1%)	18	48
All	All	13235/14689 (90%)	12473 (94%)	718 (5%)	44 (0%)	37	66

5 of 44 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
44	DD	423	THR
4	D	52	LEU
4	D	195	VAL
42	BB	303	GLU
45	EE	89	ILE

5.3.2 Protein sidechains ⓘ

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	
2	B	272/337 (81%)	257 (94%)	15 (6%)	19	46
3	C	210/210 (100%)	197 (94%)	13 (6%)	16	43
4	D	218/218 (100%)	196 (90%)	22 (10%)	7	26
5	E	242/242 (100%)	233 (96%)	9 (4%)	30	55
6	F	172/172 (100%)	167 (97%)	5 (3%)	37	60
7	G	68/68 (100%)	65 (96%)	3 (4%)	25	52
8	H	138/138 (100%)	131 (95%)	7 (5%)	21	49
9	I	108/117 (92%)	104 (96%)	4 (4%)	30	55
10	J	181/181 (100%)	167 (92%)	14 (8%)	12	36
11	K	167/167 (100%)	151 (90%)	16 (10%)	8	28
12	L	203/211 (96%)	195 (96%)	8 (4%)	28	54
13	M	136/136 (100%)	131 (96%)	5 (4%)	30	55
14	N	107/107 (100%)	102 (95%)	5 (5%)	23	51
15	O	200/200 (100%)	187 (94%)	13 (6%)	15	42
16	P	185/185 (100%)	180 (97%)	5 (3%)	39	61
17	Q	256/267 (96%)	244 (95%)	12 (5%)	23	51
18	R	303/308 (98%)	283 (93%)	20 (7%)	15	42
19	S	167/191 (87%)	157 (94%)	10 (6%)	17	44
20	T	204/213 (96%)	197 (97%)	7 (3%)	32	57
21	U	73/73 (100%)	68 (93%)	5 (7%)	14	41

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
22	V	74/161 (46%)	72 (97%)	2 (3%)	39	61
23	W	104/104 (100%)	102 (98%)	2 (2%)	50	67
24	X	56/56 (100%)	53 (95%)	3 (5%)	20	47
25	Y	40/40 (100%)	39 (98%)	1 (2%)	42	63
26	Z	50/50 (100%)	46 (92%)	4 (8%)	11	35
27	0	36/36 (100%)	36 (100%)	0	100	100
28	1	323/323 (100%)	307 (95%)	16 (5%)	22	49
29	2	106/106 (100%)	100 (94%)	6 (6%)	18	46
30	3	112/112 (100%)	110 (98%)	2 (2%)	51	69
31	4	121/121 (100%)	116 (96%)	5 (4%)	27	53
32	5	284/284 (100%)	278 (98%)	6 (2%)	47	66
33	6	213/252 (84%)	203 (95%)	10 (5%)	23	51
34	7	95/95 (100%)	90 (95%)	5 (5%)	20	48
35	8	182/240 (76%)	174 (96%)	8 (4%)	25	52
36	9	176/186 (95%)	168 (96%)	8 (4%)	24	52
37	a	158/158 (100%)	150 (95%)	8 (5%)	21	49
38	b	144/144 (100%)	138 (96%)	6 (4%)	26	53
39	c	110/110 (100%)	108 (98%)	2 (2%)	51	69
40	d	191/199 (96%)	186 (97%)	5 (3%)	40	62
41	AA	177/309 (57%)	167 (94%)	10 (6%)	19	46
42	BB	233/233 (100%)	204 (88%)	29 (12%)	4	19
43	CC	328/385 (85%)	295 (90%)	33 (10%)	7	26
44	DD	256/437 (59%)	230 (90%)	26 (10%)	7	25
45	EE	249/252 (99%)	236 (95%)	13 (5%)	21	48
46	FF	114/114 (100%)	108 (95%)	6 (5%)	20	48
47	GG	138/138 (100%)	132 (96%)	6 (4%)	26	52
48	HH	141/141 (100%)	122 (86%)	19 (14%)	4	16
49	II	196/215 (91%)	180 (92%)	16 (8%)	10	34
50	JJ	167/167 (100%)	149 (89%)	18 (11%)	6	23
51	KK	122/127 (96%)	113 (93%)	9 (7%)	13	38
52	LL	103/103 (100%)	89 (86%)	14 (14%)	3	16

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
53	MM	100/100 (100%)	95 (95%)	5 (5%)	22	49
54	NN	103/103 (100%)	90 (87%)	13 (13%)	4	19
55	OO	208/220 (94%)	199 (96%)	9 (4%)	26	52
56	PP	101/104 (97%)	93 (92%)	8 (8%)	11	35
57	QQ	187/218 (86%)	177 (95%)	10 (5%)	20	48
58	RR	80/87 (92%)	72 (90%)	8 (10%)	7	26
59	SS	69/69 (100%)	65 (94%)	4 (6%)	18	45
60	TT	81/81 (100%)	74 (91%)	7 (9%)	10	32
61	UU	208/208 (100%)	197 (95%)	11 (5%)	20	48
62	VV	208/210 (99%)	197 (95%)	11 (5%)	20	48
63	WW	368/368 (100%)	330 (90%)	38 (10%)	7	25
64	XX	84/84 (100%)	78 (93%)	6 (7%)	13	39
65	YY	248/250 (99%)	229 (92%)	19 (8%)	12	36
66	ZZ	78/82 (95%)	72 (92%)	6 (8%)	12	36
67	11	32/32 (100%)	31 (97%)	1 (3%)	35	59
68	22	90/90 (100%)	89 (99%)	1 (1%)	65	75
69	33	216/231 (94%)	200 (93%)	16 (7%)	13	38
70	44	238/281 (85%)	228 (96%)	10 (4%)	26	53
71	55	53/303 (18%)	50 (94%)	3 (6%)	18	46
72	66	277/289 (96%)	270 (98%)	7 (2%)	42	63
73	77	158/158 (100%)	152 (96%)	6 (4%)	29	55
74	88	401/404 (99%)	375 (94%)	26 (6%)	15	42
All	All	11997/13111 (92%)	11276 (94%)	721 (6%)	19	44

5 of 721 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
50	JJ	83	ARG
62	VV	102	LEU
51	KK	159	ASN
50	JJ	82	ARG
55	OO	219	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 168 such sidechains are listed below:

Mol	Chain	Res	Type
45	EE	213	ASN
63	WW	266	HIS
48	HH	41	GLN
55	OO	187	ASN
65	YY	170	GLN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	A	2677/3296 (81%)	617 (23%)	104 (3%)
75	aa	1485/1649 (90%)	455 (30%)	0
76	bb	75/76 (98%)	42 (56%)	0
All	All	4237/5021 (84%)	1114 (26%)	104 (2%)

5 of 1114 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	A	26	A
1	A	27	A
1	A	28	U
1	A	30	U
1	A	34	U

5 of 104 RNA pucker outliers are listed below:

Mol	Chain	Res	Type
1	A	1727	A
1	A	2357	U
1	A	3171	A
1	A	1892	G
1	A	2322	U

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry

Of 303 ligands modelled in this entry, 302 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
82	GDP	WW	501	79	29,30,30	1.22	3 (10%)	45,47,47	1.86	8 (17%)

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
82	GDP	WW	501	79	-	7/16/32/32	0/3/3/3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
82	WW	501	GDP	C5-C4	3.39	1.48	1.38
82	WW	501	GDP	C6-N1	-2.32	1.34	1.38
82	WW	501	GDP	C5-N7	-2.28	1.34	1.39

The worst 5 of 8 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
82	WW	501	GDP	C5-C4-N3	-6.64	117.81	128.39
82	WW	501	GDP	C2-N3-C4	5.17	121.21	112.30
82	WW	501	GDP	N9-C4-N3	5.09	136.13	125.95
82	WW	501	GDP	C6-C5-N7	2.77	135.33	130.29
82	WW	501	GDP	O4'-C1'-N9	2.72	114.51	108.36

There are no chirality outliers.

5 of 7 torsion outliers are listed below:

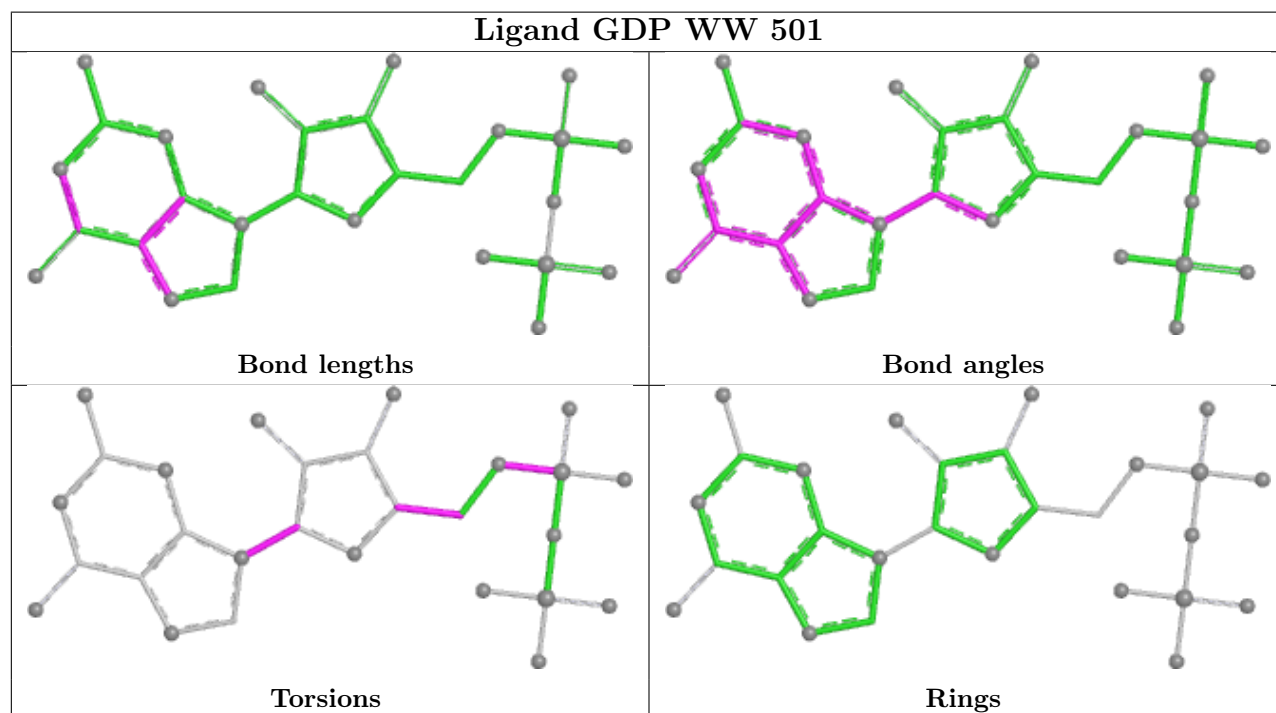
Mol	Chain	Res	Type	Atoms
82	WW	501	GDP	C5'-O5'-PA-O3A
82	WW	501	GDP	C5'-O5'-PA-O2A
82	WW	501	GDP	C3'-C4'-C5'-O5'
82	WW	501	GDP	O4'-C4'-C5'-O5'
82	WW	501	GDP	O4'-C1'-N9-C4

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
82	WW	501	GDP	1	0

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 [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
75	aa	13
78	dd	7
77	cc	3
64	XX	2

The worst 5 of 25 chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	dd	115:UNK	C	151:UNK	N	40.49
1	dd	220:UNK	C	265:UNK	N	35.53
1	dd	170:UNK	C	202:UNK	N	27.03
1	cc	59:UNK	C	76:UNK	N	22.66
1	cc	93:UNK	C	105:UNK	N	20.49

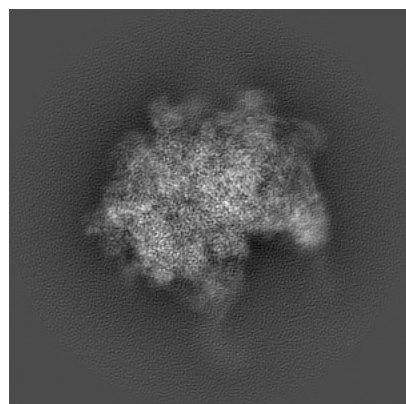
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-3551. These allow visual inspection of the internal detail of the map and identification of artifacts.

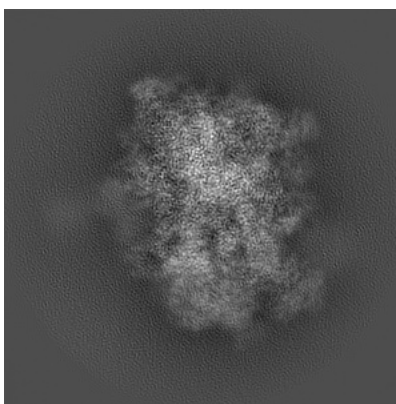
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

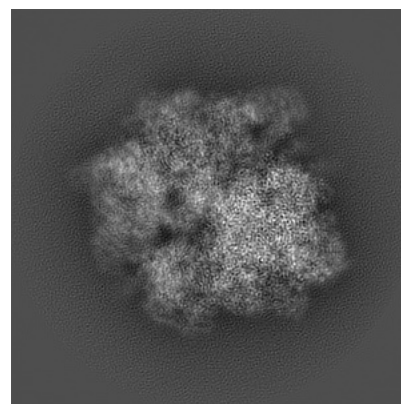
6.1.1 Primary map



X

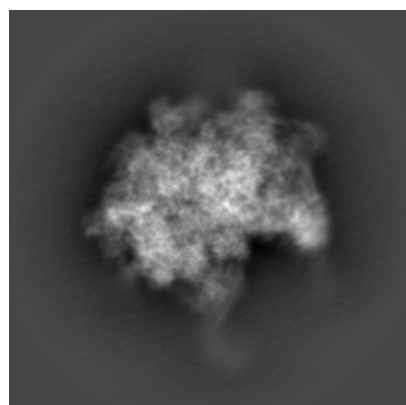


Y

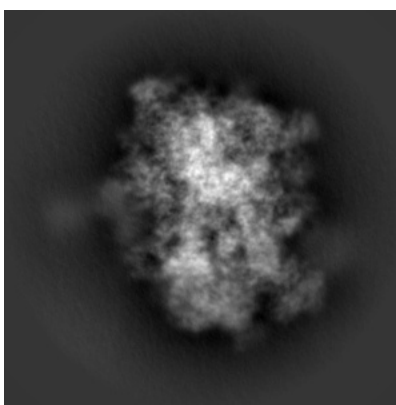


Z

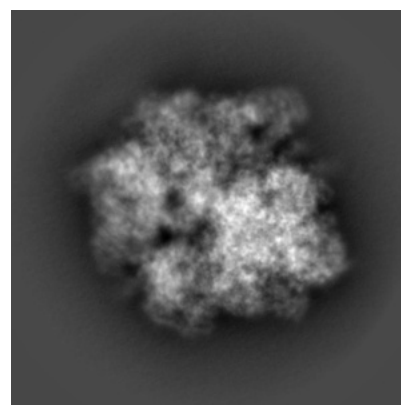
6.1.2 Raw map



X



Y

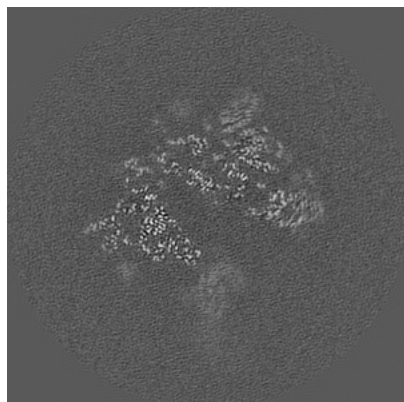


Z

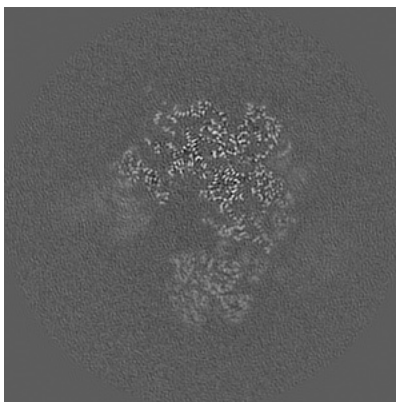
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

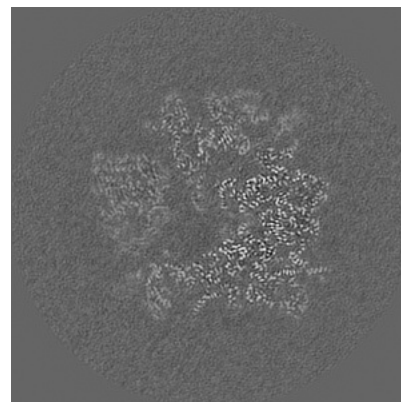
6.2.1 Primary map



X Index: 165

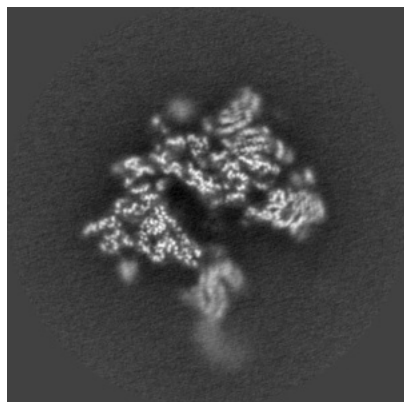


Y Index: 165

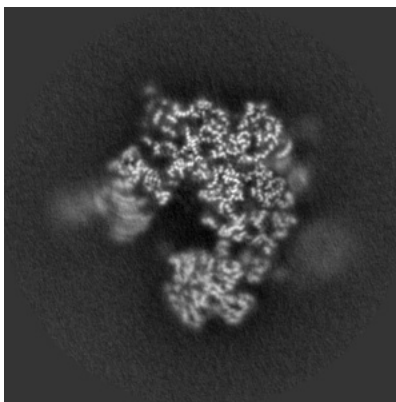


Z Index: 165

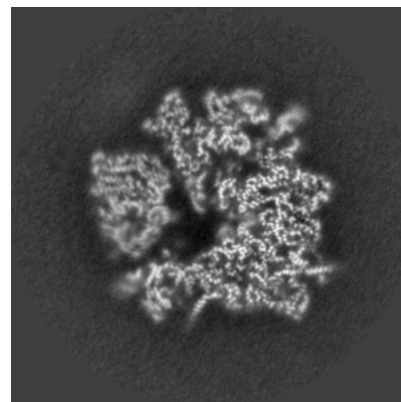
6.2.2 Raw map



X Index: 165



Y Index: 165

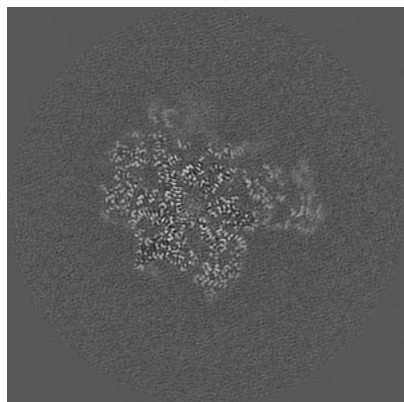


Z Index: 165

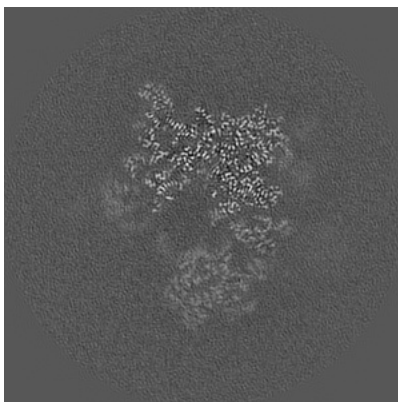
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

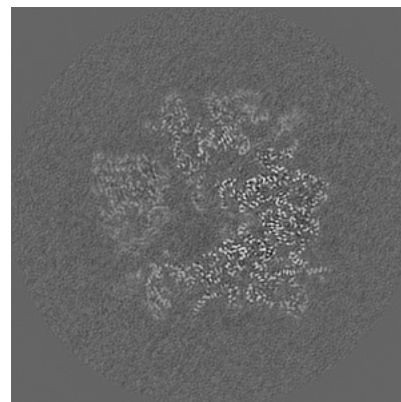
6.3.1 Primary map



X Index: 196

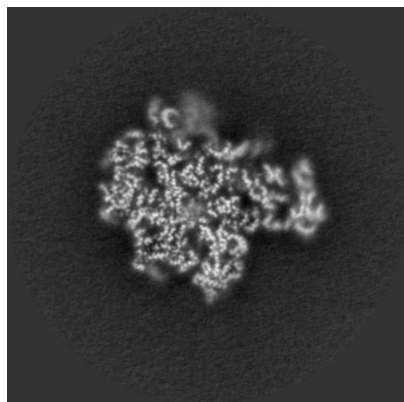


Y Index: 159

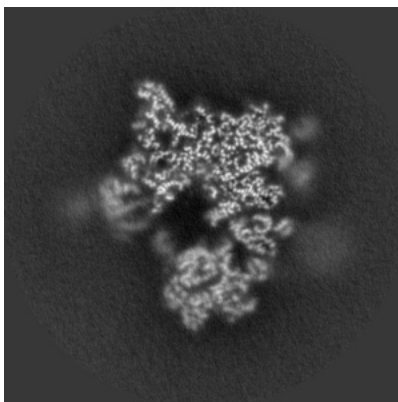


Z Index: 165

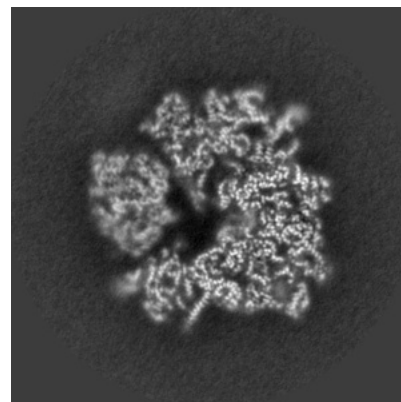
6.3.2 Raw map



X Index: 196



Y Index: 159

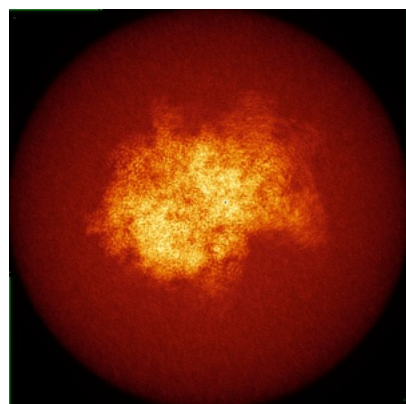


Z Index: 163

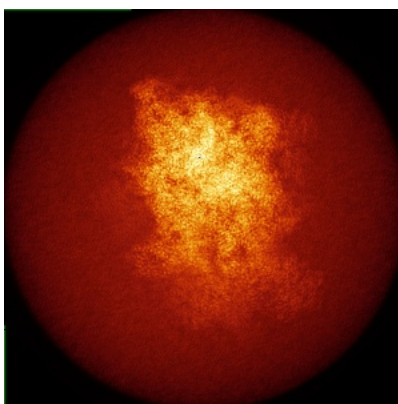
The images above show the largest variance slices of the map in three orthogonal directions.

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

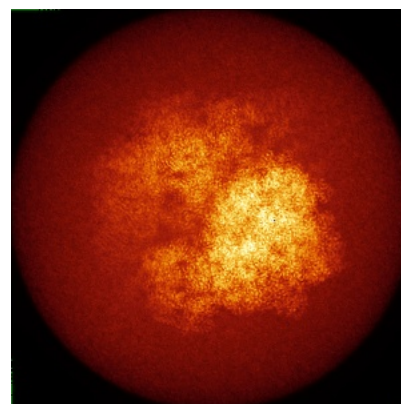
6.4.1 Primary map



X

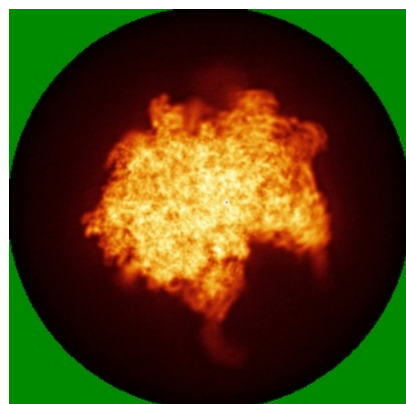


Y

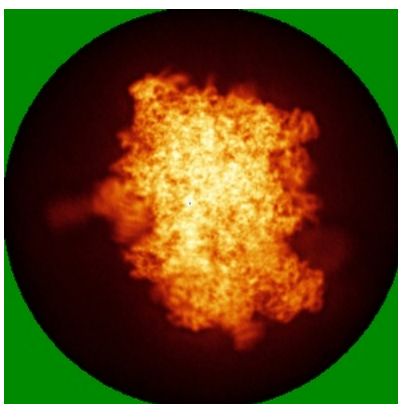


Z

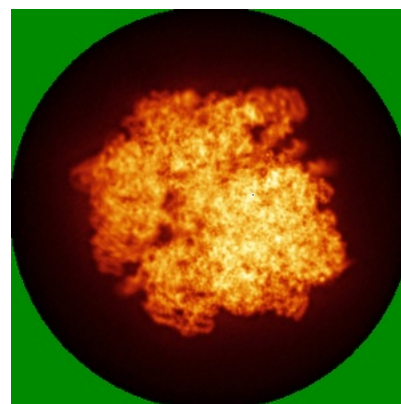
6.4.2 Raw map



X



Y



Z

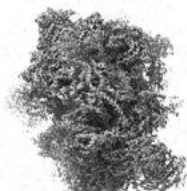
The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views [i](#)

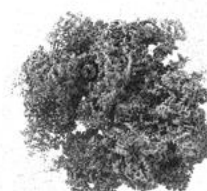
6.5.1 Primary map



X



Y



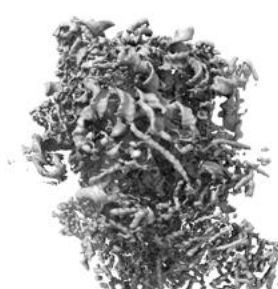
Z

The images above show the 3D surface view of the map at the recommended contour level 0.146. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



X



Y



Z

These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

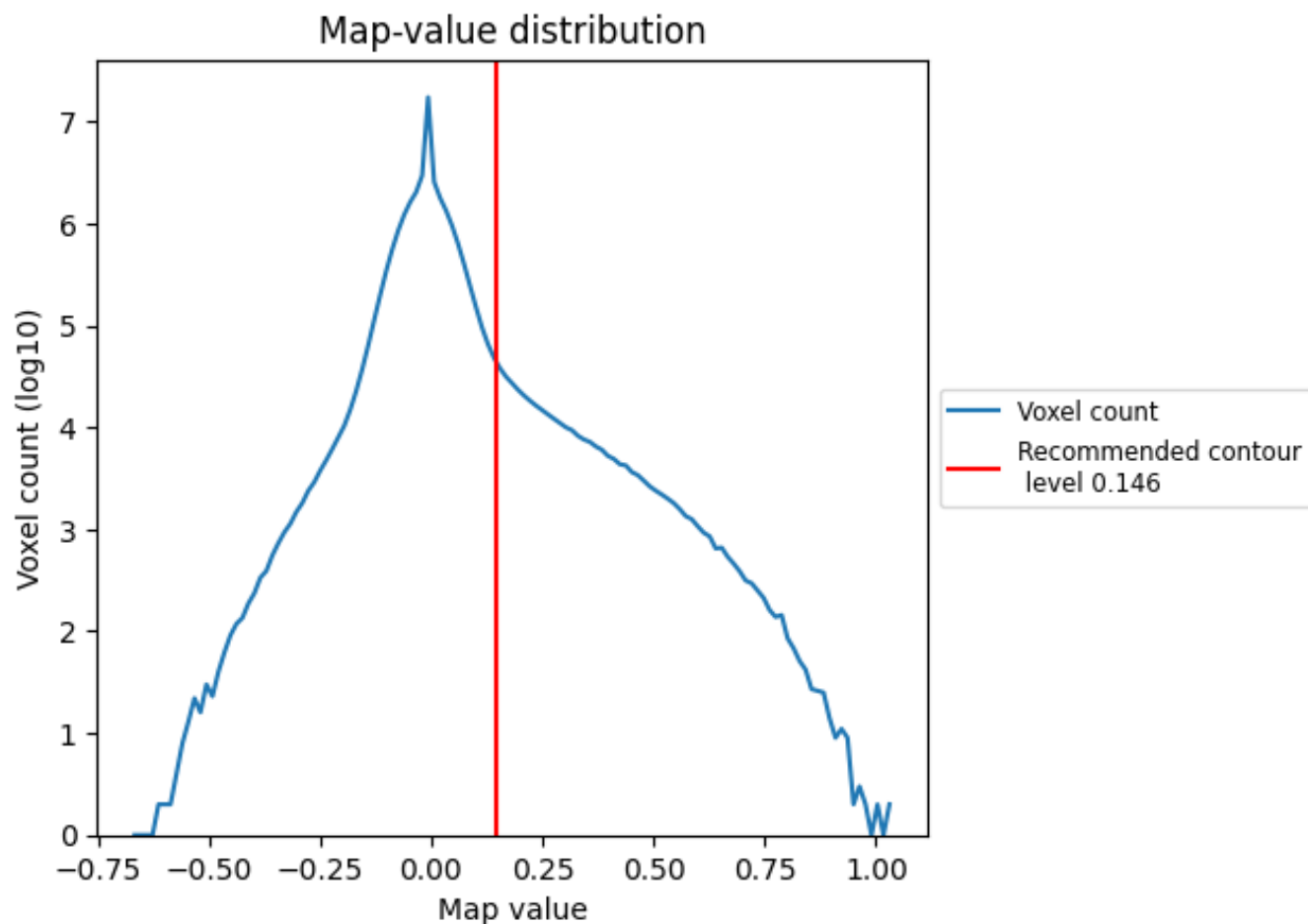
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

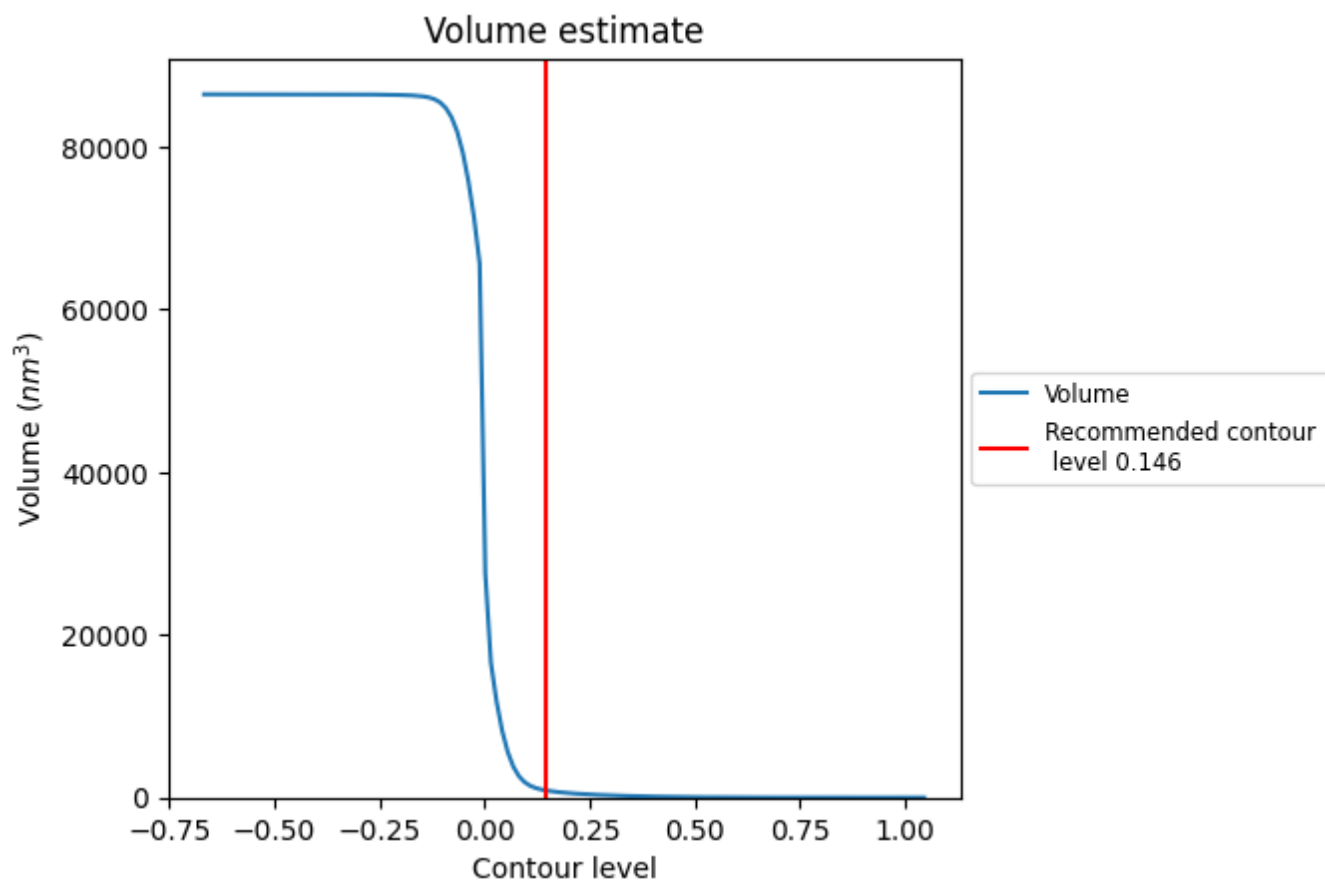
This section contains the results of statistical analysis of the map.

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.

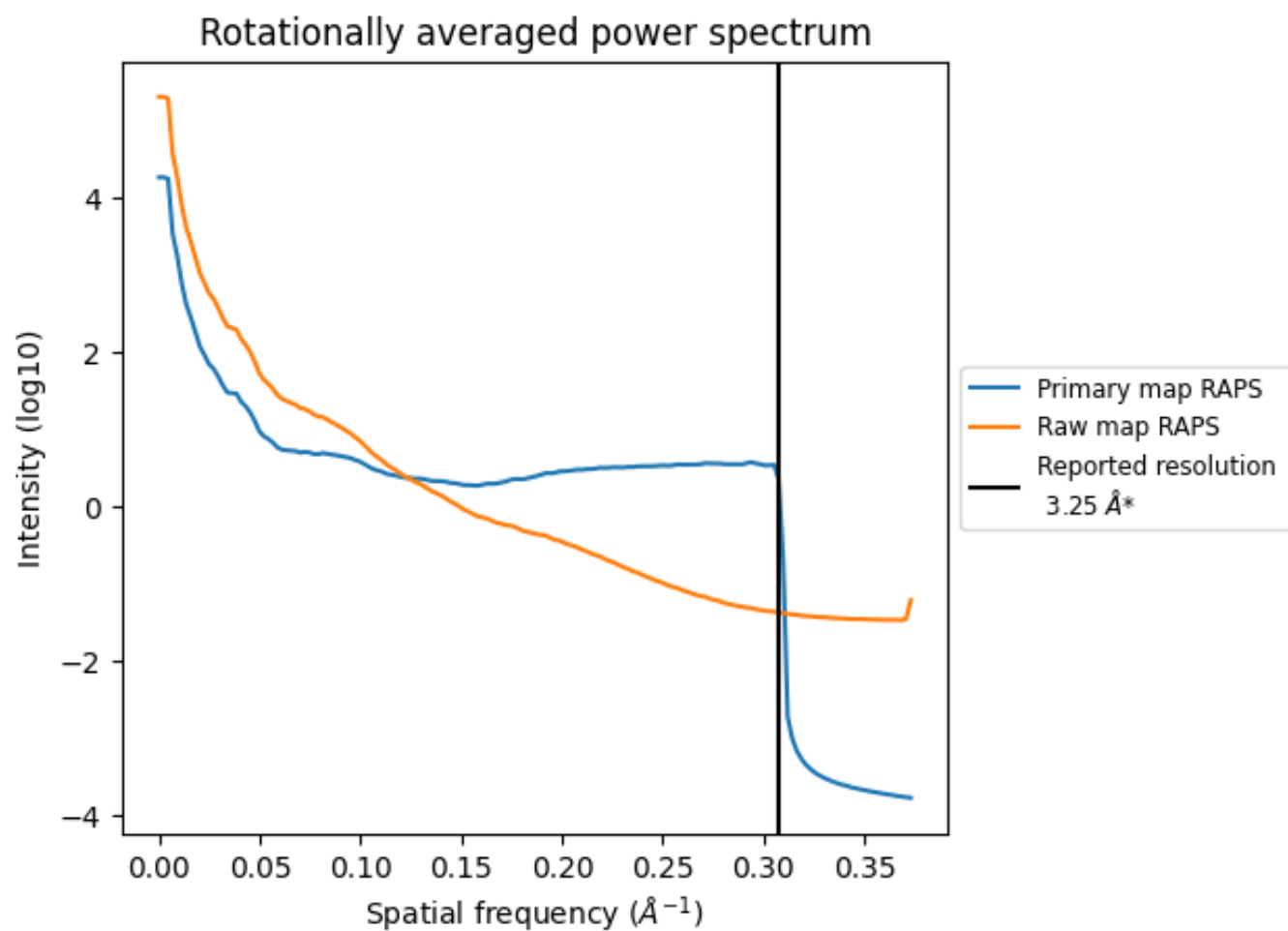
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 877 nm³; this corresponds to an approximate mass of 792 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 ⓘ

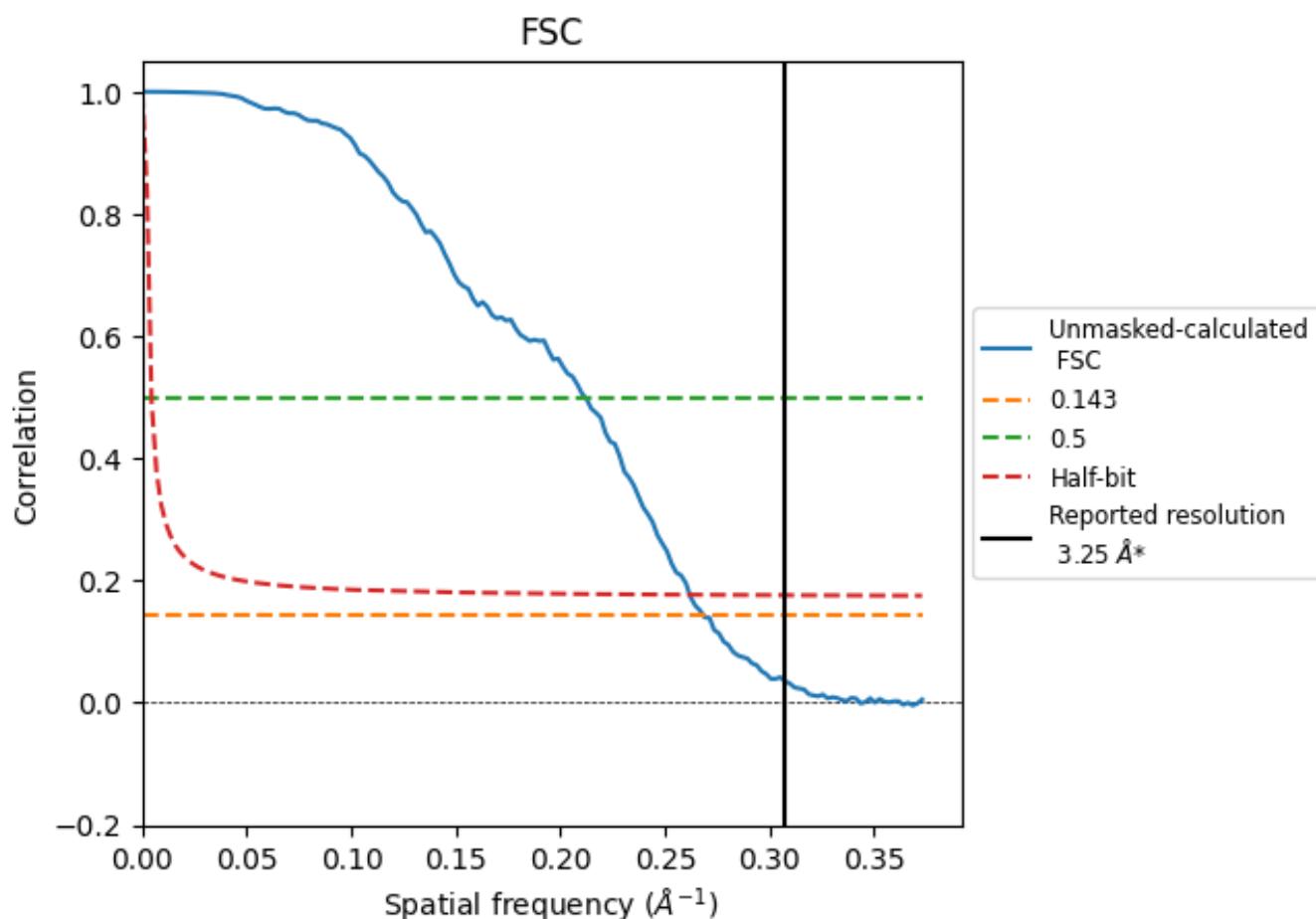


*Reported resolution corresponds to spatial frequency of 0.308 Å⁻¹

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 0.308 Å⁻¹

8.2 Resolution estimates [i](#)

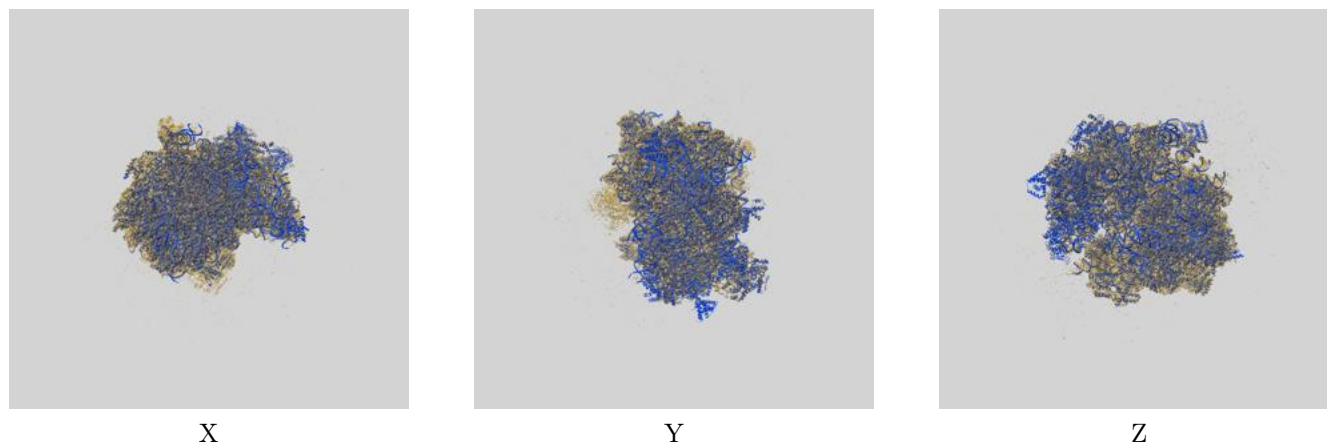
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.25	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.73	4.72	3.82

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 3.73 differs from the reported value 3.25 by more than 10 %

9 Map-model fit [i](#)

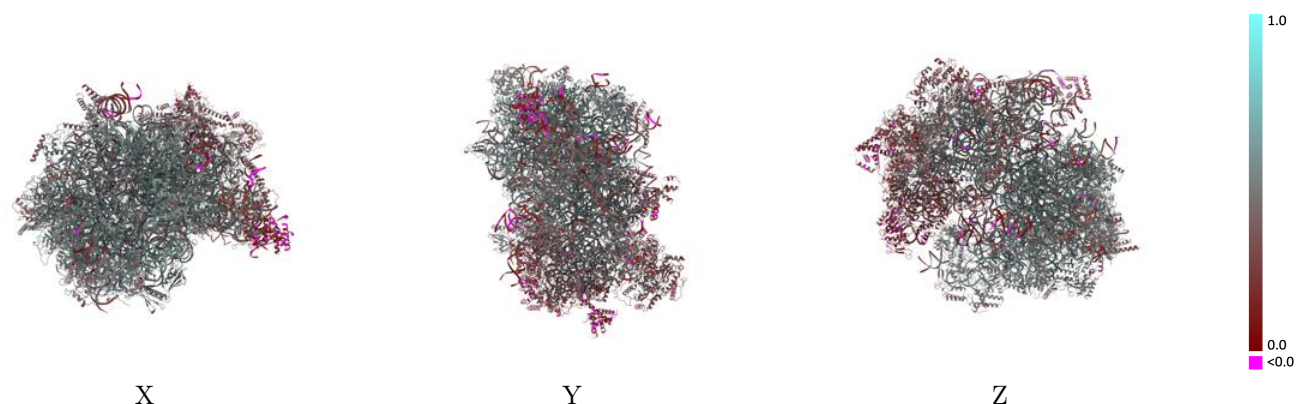
This section contains information regarding the fit between EMDB map EMD-3551 and PDB model 5MRC. Per-residue inclusion information can be found in [section 3](#) on [page 19](#).

9.1 Map-model overlay [i](#)



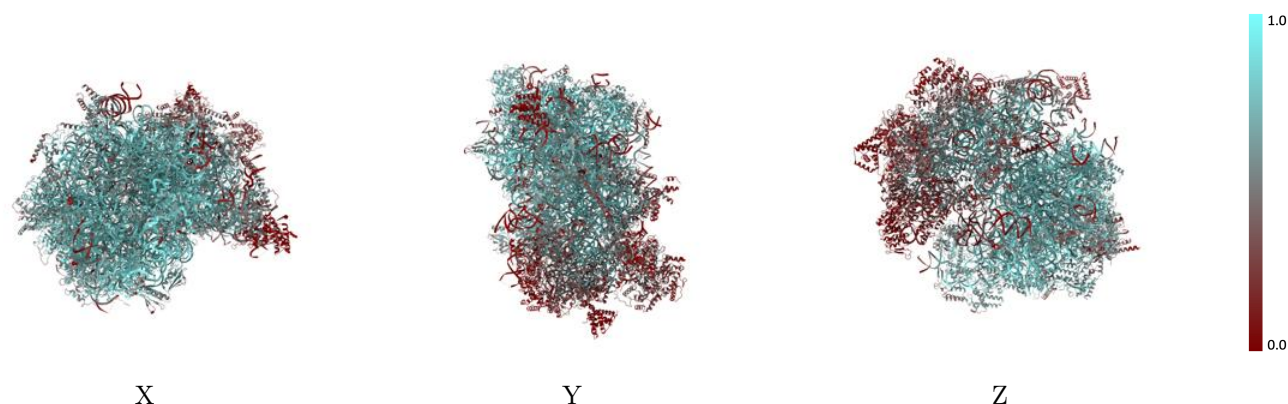
The images above show the 3D surface view of the map at the recommended contour level 0.146 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



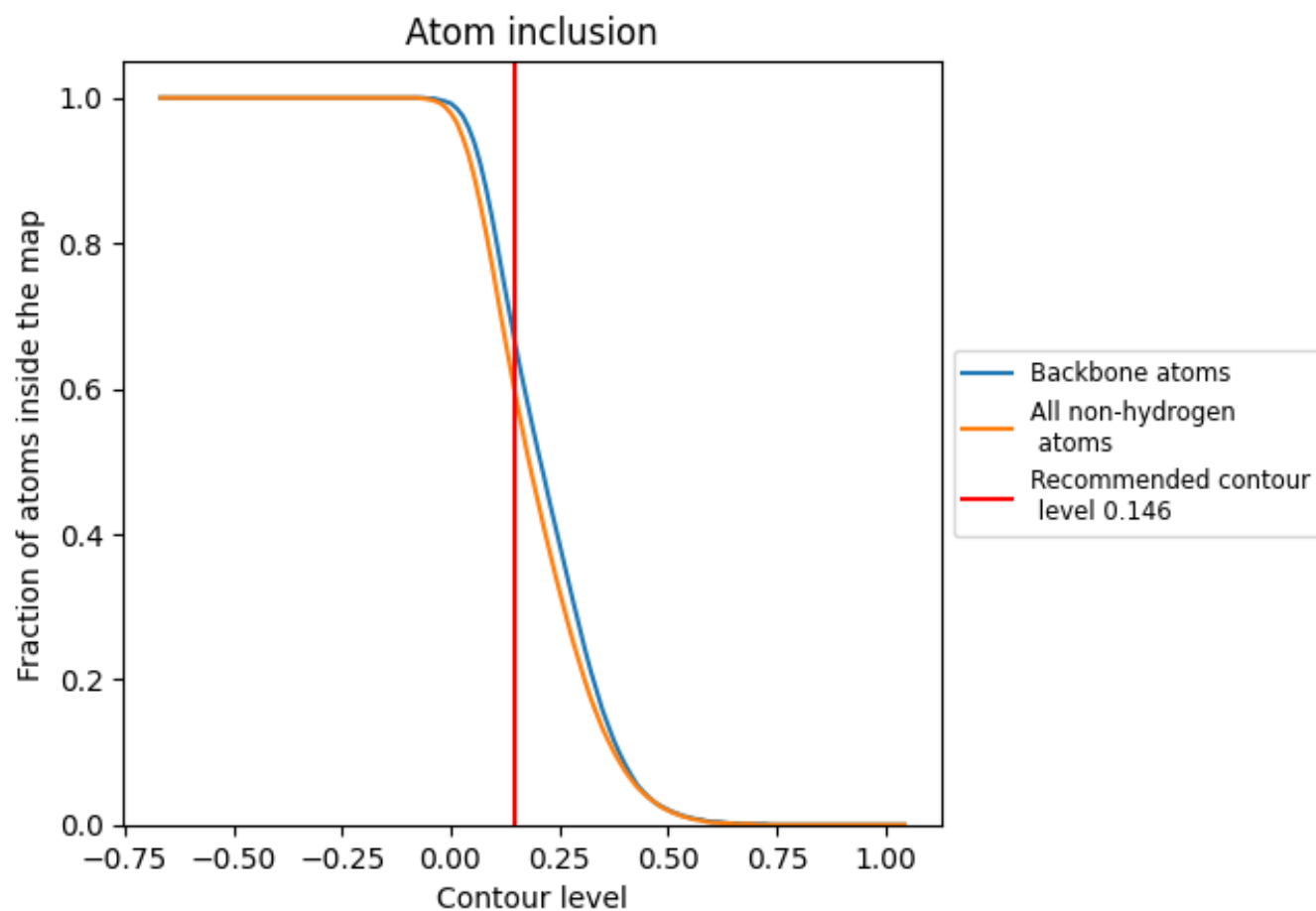
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.146).

9.4 Atom inclusion [i](#)



At the recommended contour level, 67% of all backbone atoms, 60% 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 (0.146) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.6010	 0.4430
0	 0.7880	 0.5480
1	 0.6820	 0.4930
11	 0.6700	 0.5190
2	 0.6390	 0.4710
22	 0.2980	 0.3270
3	 0.6890	 0.5170
33	 0.3370	 0.3590
4	 0.7490	 0.5380
44	 0.1770	 0.2790
5	 0.6890	 0.4990
55	 0.3330	 0.3280
6	 0.5720	 0.4470
66	 0.3830	 0.3890
7	 0.6630	 0.5110
77	 0.0620	 0.2150
8	 0.5120	 0.4130
88	 0.2330	 0.3520
9	 0.5830	 0.4440
A	 0.7890	 0.5020
AA	 0.3950	 0.4120
B	 0.6940	 0.5130
BB	 0.5770	 0.4680
C	 0.7650	 0.5420
CC	 0.3400	 0.3640
D	 0.6550	 0.4910
DD	 0.4620	 0.4260
E	 0.7030	 0.5110
EE	 0.4920	 0.4270
F	 0.5690	 0.4630
FF	 0.4090	 0.4060
G	 0.5800	 0.4680
GG	 0.1720	 0.2570
H	 0.7290	 0.5320
HH	 0.6270	 0.4840



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Chain	Atom inclusion	Q-score
I	 0.6860	 0.5210
II	 0.4170	 0.4000
J	 0.7320	 0.5300
JJ	 0.2310	 0.3070
K	 0.7450	 0.5310
KK	 0.4440	 0.4230
L	 0.7030	 0.5080
LL	 0.5850	 0.4800
M	 0.7170	 0.5220
MM	 0.0700	 0.1740
N	 0.7490	 0.5460
NN	 0.2710	 0.3360
O	 0.7150	 0.5200
OO	 0.4650	 0.4080
P	 0.7050	 0.5110
PP	 0.4600	 0.3860
Q	 0.5450	 0.4530
QQ	 0.3780	 0.3420
R	 0.6080	 0.4490
RR	 0.5060	 0.4420
S	 0.6090	 0.4790
SS	 0.0790	 0.1890
T	 0.6160	 0.4590
TT	 0.4700	 0.4000
U	 0.7320	 0.5330
UU	 0.4890	 0.4190
V	 0.5020	 0.3980
VV	 0.3900	 0.3580
W	 0.7320	 0.5270
WW	 0.0710	 0.1790
X	 0.6580	 0.5130
XX	 0.1280	 0.2880
Y	 0.7430	 0.5320
YY	 0.1880	 0.2500
Z	 0.7620	 0.5550
ZZ	 0.3510	 0.3580
a	 0.6980	 0.4920
aa	 0.6100	 0.4140
b	 0.6580	 0.4870
bb	 0.1860	 0.2190
c	 0.7670	 0.5300
cc	 0.0130	 0.1410

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Chain	Atom inclusion	Q-score
d	 0.7030	 0.5090
dd	 0.0860	 0.1160