



## Full wwPDB EM Validation Report ⓘ

Jul 23, 2024 – 12:44 am BST

PDB ID : 7QI6  
EMDB ID : EMD-13982  
Title : Human mitochondrial ribosome in complex with mRNA, A/P- and P/E-tRNAs at 2.98 Å resolution  
Authors : Singh, V.; Itoh, Y.; Amunts, A.  
Deposited on : 2021-12-14  
Resolution : 2.98 Å (reported)

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

We welcome your comments at [validation@mail.wwpdb.org](mailto: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>.

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

EMDB validation analysis : 0.0.1.dev92  
Mogul : 1.8.4, 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) : 2.37.1

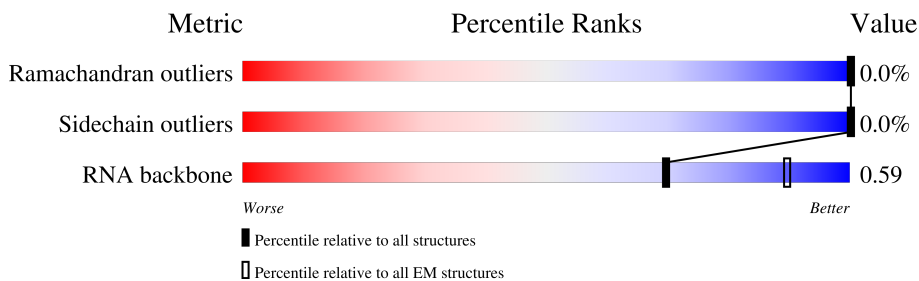
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 2.98 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.






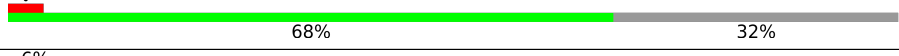
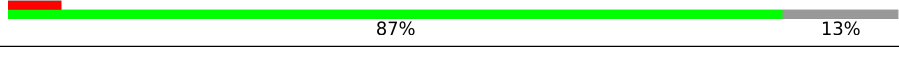



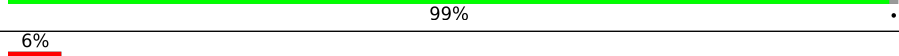
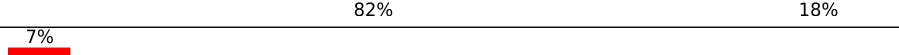
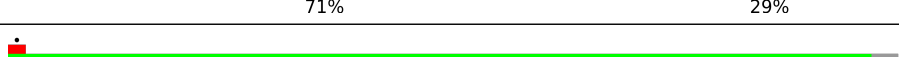
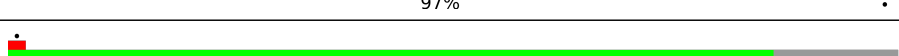

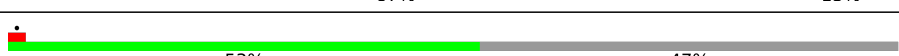
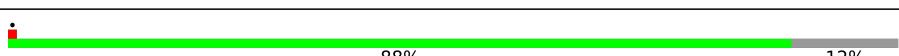

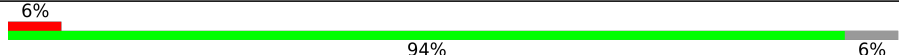
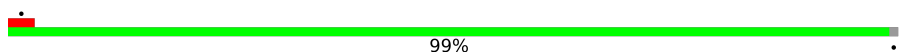

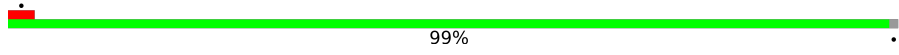

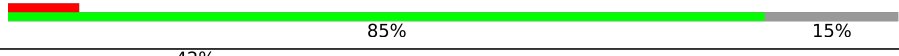



Metric	Whole archive (#Entries)	EM structures (#Entries)
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826
RNA backbone	4643	859

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  $\geq 3$ , 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	AA	954	 85% 15%
2	AB	296	 76% 24%
3	AC	167	 79% 21%
4	AD	430	 79% 21%
5	AE	125	 98% .
6	AF	242	 86% 14%
7	AG	396	 83% 17%
8	AH	201	 69% 30%

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Mol	Chain	Length	Quality of chain
9	AI	194	 70% 29%
10	AJ	138	 78% 22%
11	AK	128	 79% 21%
12	AL	257	 68% 32%
13	AM	137	 6% 87% 13%
14	AN	130	 85% 15%
15	AO	258	 75% 25%
16	AP	142	 68% 32%
17	AQ	87	 99%
18	AR	360	 6% 82% 18%
19	AS	190	 7% 71% 29%
20	AT	173	 97%
21	AU	205	 86% 14%
22	AV	414	 39% 87% 13%
23	AW	187	 53% 47%
24	AX	398	 88% 12%
25	AY	395	 5% 38% 62%
26	AZ	106	 6% 94% 6%
27	A0	217	 99%
28	A1	323	 86% 14%
29	A2	118	 99%
30	A3	199	 35% 65%
31	A4	689	 8% 85% 15%
32	Az	33	 42% 45% 55%
33	Aw	68	 24% 43% 57%

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Mol	Chain	Length	Quality of chain
34	Ax	71	39% 54% 46%
35	A	1561	84% 16%
36	B	72	78% 22%
37	D	305	78% 22%
38	E	348	88% 12%
39	F	311	81% 19%
40	I	261	48% 81% 19%
41	J	192	77% 91% 9%
42	K	178	99%
43	L	145	79% 21%
44	M	296	98%
45	N	251	88% 12%
46	O	175	88% 12%
47	P	180	80% 20%
48	R	149	94% 6%
49	S	205	79% 21%
50	T	206	81% 19%
51	U	153	16% 99%
52	V	216	12% 95% 5%
53	W	148	76% 24%
54	X	256	5% 95% 5%
55	Y	250	72% 28%
56	Z	161	76% 24%
57	0	188	59% 41%
58	1	65	6% 86% 14%

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Mol	Chain	Length	Quality of chain
59	2	92	50% 50%
60	3	188	51% 49%
61	4	103	37% 63%
62	5	423	93% 7%
63	6	380	93% 7%
64	7	338	9% 87% 13%
65	8	206	17% 73% 27%
66	9	137	9% 91% 9%
67	a	142	8% 70% 30%
68	b	215	70% 30%
69	c	332	5% 86% 14%
70	d	306	16% 79% 21%
71	e	279	10% 82% 18%
72	f	212	15% 74% 26%
73	g	166	81% 19%
74	h	158	13% 70% 30%
75	i	128	76% 24%
76	j	123	7% 76% 24%
77	k	112	29% 90% 10%
78	l	138	39% 59% 41%
79	m	128	20% 72% 28%
80	o	102	92% 8%
81	p	206	13% 71% 29%
82	q	222	23% 75% 25%
83	r	196	83% 17%

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Mol	Chain	Length	Quality of chain
84	s	439	 88% 12%
85	t	198	 23% 77%
85	u	198	 16% 84%
85	v	198	 16% 84%
85	w	198	 16% 84%
85	x	198	 16% 84%
85	y	198	 16% 84%
86	Q	292	 9% 82% 18%
87	H	267	 42% 76% 24%
88	z	325	 43% 77% 22%

## 2 Entry composition [i](#)

There are 100 unique types of molecules in this entry. The entry contains 336523 atoms, of which 153004 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 12S mitochondrial rRNA.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	P		
1	AA	954	30565	9088	10305	3647	6571	954	0	0

- Molecule 2 is a protein called 28S ribosomal protein S2, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
2	AB	225	3644	1164	1816	331	323	10	0	0

- Molecule 3 is a protein called 28S ribosomal protein S24, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
3	AC	132	2172	699	1089	195	185	4	0	0

- Molecule 4 is a protein called 28S ribosomal protein S5, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
4	AD	339	5469	1695	2769	510	482	13	0	0

- Molecule 5 is a protein called 28S ribosomal protein S6, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
5	AE	122	1972	614	1000	177	177	4	0	0

- Molecule 6 is a protein called 28S ribosomal protein S7, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
6	AF	208	3495	1104	1770	312	298	11	0	0

- Molecule 7 is a protein called 28S ribosomal protein S9, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
7	AG	328	5390	1714	2695	478	489	14	0	0

- Molecule 8 is a protein called 28S ribosomal protein S10, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
8	AH	140	2336	745	1184	194	210	3	0	0

- Molecule 9 is a protein called 28S ribosomal protein S11, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
9	AI	137	2081	642	1061	192	182	4	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
AI	184	5F0	ASN	conflict	UNP P82912

- Molecule 10 is a protein called 28S ribosomal protein S12, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
10	AJ	108	1727	521	888	169	143	6	0	0

- Molecule 11 is a protein called 28S ribosomal protein S14, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
11	AK	101	1748	537	886	179	141	5	0	0

- Molecule 12 is a protein called 28S ribosomal protein S15, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
12	AL	174	2994	925	1541	270	251	7	0	0

- Molecule 13 is a protein called 28S ribosomal protein S16, mitochondrial.



Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
13	AM	119	1908	594	966	185	157	6	0	0

- Molecule 14 is a protein called 28S ribosomal protein S17, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
14	AN	110	1797	562	929	156	147	3	0	0

- Molecule 15 is a protein called 28S ribosomal protein S18b, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
15	AO	193	3153	1014	1561	294	277	7	0	0

- Molecule 16 is a protein called 28S ribosomal protein S18c, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
16	AP	97	1588	501	807	134	138	8	0	0

- Molecule 17 is a protein called MRPS21 isoform 1.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
17	AQ	86	1501	460	757	150	126	8	0	0

- Molecule 18 is a protein called 28S ribosomal protein S22, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
18	AR	295	4839	1533	2430	413	455	8	0	0

- Molecule 19 is a protein called 28S ribosomal protein S23, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
19	AS	135	2227	716	1116	198	196	1	0	0

- Molecule 20 is a protein called 28S ribosomal protein S25, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
20	AT	168	2764	877	1393	239	244	11	0	0

- Molecule 21 is a protein called 28S ribosomal protein S26, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
21	AU	176	2989	916	1501	301	267	4	0	0

- Molecule 22 is a protein called 28S ribosomal protein S27, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
22	AV	362	5933	1904	2964	495	558	12	0	0

- Molecule 23 is a protein called 28S ribosomal protein S28, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
23	AW	100	1592	498	803	141	146	4	0	0

- Molecule 24 is a protein called 28S ribosomal protein S29, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
24	AX	352	5694	1822	2845	499	517	11	0	0

- Molecule 25 is a protein called 28S ribosomal protein S31, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
25	AY	149	2444	801	1198	207	234	4	0	0

- Molecule 26 is a protein called 28S ribosomal protein S33, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
26	AZ	100	1698	534	859	153	148	4	0	0

- Molecule 27 is a protein called 28S ribosomal protein S34, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
27	A0	215	3584	1130	1797	339	313	5	0	0

- Molecule 28 is a protein called 28S ribosomal protein S35, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
28	A1	279	4561	1435	2296	387	432	11	0	0

- Molecule 29 is a protein called Coiled-coil-helix-coiled-coil-helix domain-containing protein 1.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
29	A2	117	1905	579	970	182	166	8	0	0

- Molecule 30 is a protein called Aurora kinase A-interacting protein.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
30	A3	70	1326	401	701	134	89	1	0	0

- Molecule 31 is a protein called Pentatricopeptide repeat domain-containing protein 3, mitochondrial.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
31	A4	588	9538	3053	4770	808	879	28	0	0

- Molecule 32 is a RNA chain called mRNA.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	P		
32	Az	33	1052	316	351	124	228	33	0	0

- Molecule 33 is a RNA chain called A/P-tRNA.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	P		
33	Aw	68	2161	646	726	249	472	68	0	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
Aw	35	A	C	conflict	GB 1896813690
Aw	36	C	G	conflict	GB 1896813690
Aw	44	C	A	conflict	GB 1896813690

- Molecule 34 is a RNA chain called P/E-tRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O	P		
34	Ax	71	2262	672	763	260	496	71	0	0

- Molecule 35 is a RNA chain called 16S mitochondrial rRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O	P		
35	A	1558	49872	14843	16802	5963	10706	1558	0	0

- Molecule 36 is a RNA chain called mitochondrial tRNA<sup>Val</sup>.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O	P		
36	B	72	2303	685	779	269	498	72	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	74	C	G	conflict	GB NC_012920.1
B	76	A	U	conflict	GB NC_012920.1

- Molecule 37 is a protein called 39S ribosomal protein L2, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O	S		
37	D	238	3780	1157	1921	376	317	9	0	0

- Molecule 38 is a protein called 39S ribosomal protein L3, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O	S		
38	E	305	4822	1545	2416	418	432	11	0	0

- Molecule 39 is a protein called 39S ribosomal protein L4, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
39	F	252	4097	1305	2066	370	350	6	0	0

- Molecule 40 is a protein called 39S ribosomal protein L10, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
40	I	212	3481	1088	1786	304	292	11	0	0

- Molecule 41 is a protein called 39S ribosomal protein L11, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
41	J	175	2738	847	1408	237	244	2	0	0

- Molecule 42 is a protein called 39S ribosomal protein L13, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
42	K	177	2906	936	1451	259	253	7	0	0

- Molecule 43 is a protein called 39S ribosomal protein L14, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
43	L	115	1832	559	942	171	155	5	0	0

- Molecule 44 is a protein called 39S ribosomal protein L15, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
44	M	291	4723	1483	2396	430	408	6	0	0

- Molecule 45 is a protein called 39S ribosomal protein L16, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
45	N	222	3604	1143	1818	326	307	10	0	0

- Molecule 46 is a protein called 39S ribosomal protein L17, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
46	O	154	2554	792	1295	241	219	7	0	0

- Molecule 47 is a protein called 39S ribosomal protein L18, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
47	P	144	2339	733	1166	224	211	5	0	0

- Molecule 48 is a protein called 39S ribosomal protein L20, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
48	R	140	2369	732	1215	231	187	4	0	0

- Molecule 49 is a protein called 39S ribosomal protein L21, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
49	S	161	2659	835	1366	227	227	4	0	0

- Molecule 50 is a protein called 39S ribosomal protein L22, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
50	T	166	2781	875	1412	254	233	7	0	0

- Molecule 51 is a protein called 39S ribosomal protein L23, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
51	U	152	2482	788	1231	234	226	3	0	0

- Molecule 52 is a protein called 39S ribosomal protein L24, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
52	V	205	3365	1068	1689	298	302	8	0	0

- Molecule 53 is a protein called 39S ribosomal protein L27, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
53	W	113	1785	562	905	166	149	3	0	0

- Molecule 54 is a protein called 39S ribosomal protein L28, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
54	X	244	4105	1322	2061	352	365	5	0	0

- Molecule 55 is a protein called 39S ribosomal protein L47, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
55	Y	181	3154	995	1598	298	259	4	0	0

- Molecule 56 is a protein called 39S ribosomal protein L30, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
56	Z	122	2041	636	1045	186	171	3	0	0

- Molecule 57 is a protein called 39S ribosomal protein L32, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
57	0	110	1815	554	917	176	162	6	0	0

- Molecule 58 is a protein called 39S ribosomal protein L33, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
58	1	56	977	296	513	89	77	2	0	0

- Molecule 59 is a protein called 39S ribosomal protein L34, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
59	2	46	784	233	407	83	60	1	0	0

- Molecule 60 is a protein called 39S ribosomal protein L35, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
60	3	95	1716	539	884	162	128	3	0	0

- Molecule 61 is a protein called 39S ribosomal protein L36, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
61	4	38	704	217	362	72	49	4	0	0

- Molecule 62 is a protein called 39S ribosomal protein L37, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
62	5	393	6402	2067	3202	557	565	11	0	0

- Molecule 63 is a protein called 39S ribosomal protein L38, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
63	6	354	5792	1881	2844	525	533	9	0	0

- Molecule 64 is a protein called 39S ribosomal protein L39, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
64	7	294	4789	1529	2399	405	438	18	0	0

- Molecule 65 is a protein called 39S ribosomal protein L40, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
65	8	150	2566	806	1297	224	237	2	0	0

- Molecule 66 is a protein called 39S ribosomal protein L41, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
66	9	124	1985	644	988	170	181	2	0	0

- Molecule 67 is a protein called 39S ribosomal protein L42, mitochondrial.



Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
67	a	100	1652	529	812	152	154	5	0	0

- Molecule 68 is a protein called Large ribosomal subunit protein mL43.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
68	b	151	2391	744	1195	231	218	3	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
b	2	ACE	-	acetylation	UNP Q8N983

- Molecule 69 is a protein called 39S ribosomal protein L44, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
69	c	286	4621	1470	2322	397	423	9	0	0

- Molecule 70 is a protein called 39S ribosomal protein L45, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
70	d	241	3965	1273	1980	340	359	13	0	0

- Molecule 71 is a protein called 39S ribosomal protein L46, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
71	e	230	3736	1185	1870	329	346	6	0	0

- Molecule 72 is a protein called 39S ribosomal protein L48, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
72	f	157	2523	799	1271	207	242	4	0	0

- Molecule 73 is a protein called 39S ribosomal protein L49, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
73	g	134	2210	719	1097	193	199	2	0	0

- Molecule 74 is a protein called 39S ribosomal protein L50, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
74	h	110	1777	568	882	156	168	3	0	0

- Molecule 75 is a protein called 39S ribosomal protein L51, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
75	i	97	1687	532	859	165	127	4	0	0

- Molecule 76 is a protein called 39S ribosomal protein L52, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
76	j	94	1492	463	747	144	136	2	0	0

- Molecule 77 is a protein called 39S ribosomal protein L53, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
77	k	101	1558	479	784	148	142	5	0	0

- Molecule 78 is a protein called 39S ribosomal protein L54, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
78	l	82	1363	437	675	120	128	3	0	0

- Molecule 79 is a protein called 39S ribosomal protein L55, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
79	m	92	1552	488	761	159	142	2	0	0

- Molecule 80 is a protein called Ribosomal protein 63, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
80	o	94	1604	501	806	165	129	3	0	0

- Molecule 81 is a protein called Peptidyl-tRNA hydrolase ICT1, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
81	p	147	2431	748	1226	228	225	4	0	0

- Molecule 82 is a protein called Growth arrest and DNA damage-inducible proteins-interacting protein 1.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
82	q	166	2726	870	1328	272	251	5	0	0

- Molecule 83 is a protein called 39S ribosomal protein S18a, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
83	r	162	2671	839	1349	252	223	8	0	0

- Molecule 84 is a protein called 39S ribosomal protein S30, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
84	s	386	6298	2023	3143	559	559	14	0	0

- Molecule 85 is a protein called 39S ribosomal protein L12, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	H	N	O		
85	t	46	732	228	378	56	70	0	0
85	u	32	541	168	284	40	49	0	0
85	v	32	541	168	284	40	49	0	0
85	w	31	520	159	275	39	47	0	0
85	x	31	520	159	275	39	47	0	0
85	y	31	520	159	275	39	47	0	0

- Molecule 86 is a protein called 39S ribosomal protein L19, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
86	Q	239	Total	C	H	N	O	S	0	0
			4021	1277	2031	353	351	9		

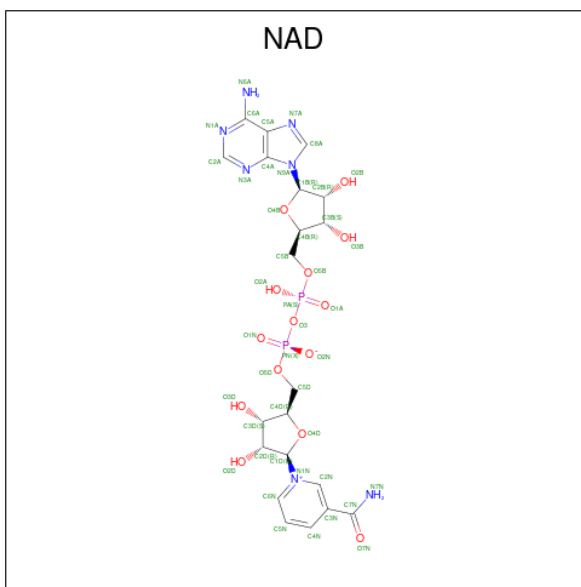
- Molecule 87 is a protein called 39S ribosomal protein L9, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
87	H	202	Total	C	H	N	O	S	0	0
			3398	1067	1737	304	286	4		

- Molecule 88 is a protein called 39S ribosomal protein L1, mitochondrial.

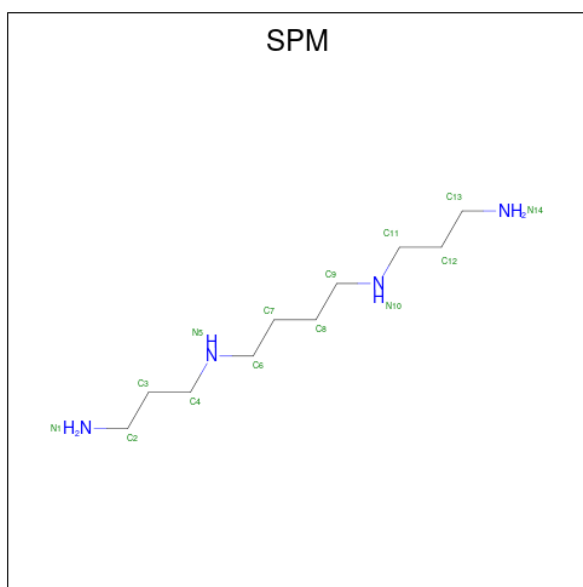
Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
88	z	252	Total	C	H	N	O	S	0	0
			4104	1304	2077	336	381	6		

- Molecule 89 is NICOTINAMIDE-ADENINE-DINUCLEOTIDE (three-letter code: NAD) (formula:  $C_{21}H_{27}N_7O_{14}P_2$ ).



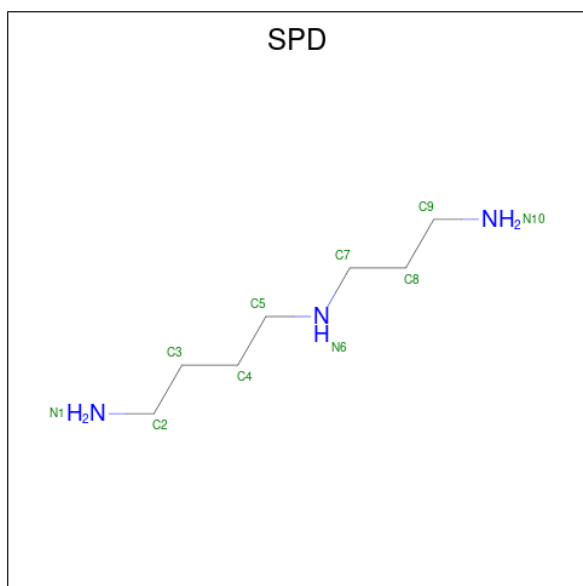
Mol	Chain	Residues	Atoms					AltConf	
			Total	C	H	N	O		P
89	AA	1	Total	C	H	N	O	P	0
			70	21	26	7	14	2	

- Molecule 90 is SPERMINE (three-letter code: SPM) (formula:  $C_{10}H_{26}N_4$ ).



Mol	Chain	Residues	Atoms				AltConf
			Total	C	H	N	
90	AA	1	44	10	30	4	0

- Molecule 91 is SPERMIDINE (three-letter code: SPD) (formula:  $C_7H_{19}N_3$ ).



Mol	Chain	Residues	Atoms				AltConf
			Total	C	H	N	
91	AA	1	32	7	22	3	0
91	A	1	32	7	22	3	0
91	A	1	32	7	22	3	0

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Mol	Chain	Residues	Atoms				AltConf
			Total	C	H	N	
91	A	1	32	7	22	3	0

- Molecule 92 is POTASSIUM ION (three-letter code: K) (formula: K).

Mol	Chain	Residues	Atoms		AltConf
92	AA	20	Total 20	K 20	0
92	A	27	Total 27	K 27	0
92	D	1	Total 1	K 1	0
92	M	1	Total 1	K 1	0
92	N	1	Total 1	K 1	0
92	3	1	Total 1	K 1	0
92	6	1	Total 1	K 1	0
92	i	1	Total 1	K 1	0
92	o	1	Total 1	K 1	0

- Molecule 93 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
93	AA	57	Total 57	Mg 57	0
93	AB	1	Total 1	Mg 1	0
93	AX	1	Total 1	Mg 1	0
93	A3	1	Total 1	Mg 1	0
93	A	137	Total 137	Mg 137	0
93	D	2	Total 2	Mg 2	0
93	E	1	Total 1	Mg 1	0

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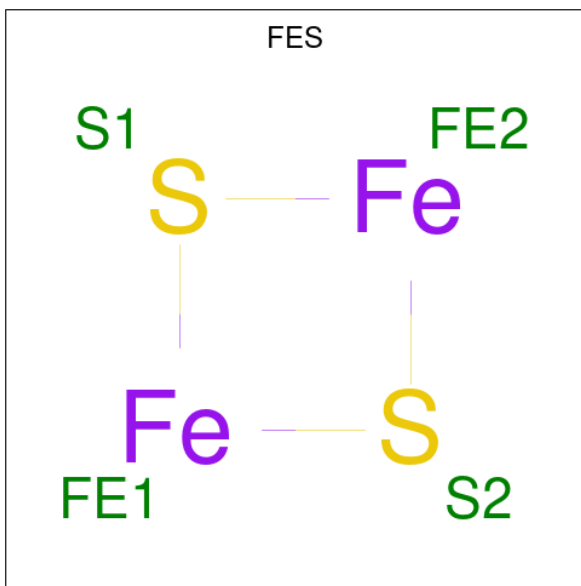
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Mol	Chain	Residues	Atoms	AltConf
93	8	1	Total Mg 1 1	0
93	g	1	Total Mg 1 1	0

- Molecule 94 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	AltConf
94	AO	1	Total Zn 1 1	0
94	0	1	Total Zn 1 1	0
94	4	1	Total Zn 1 1	0

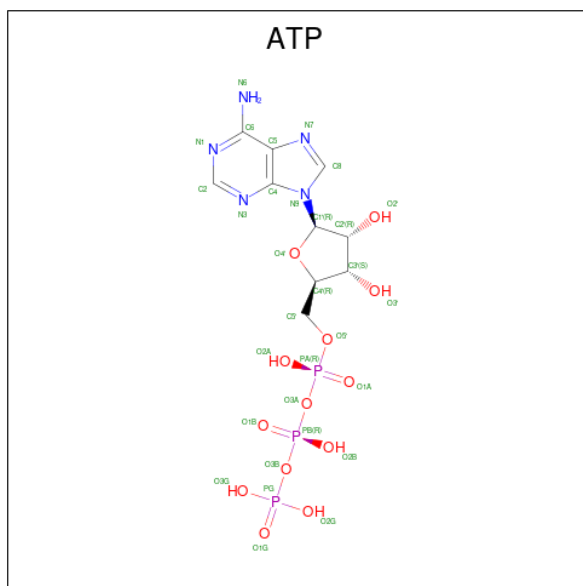
- Molecule 95 is FE2/S2 (INORGANIC) CLUSTER (three-letter code: FES) (formula: Fe<sub>2</sub>S<sub>2</sub>).



Mol	Chain	Residues	Atoms	AltConf
95	AP	1	Total Fe S 4 2 2	0
95	AT	1	Total Fe S 4 2 2	0
95	r	1	Total Fe S 4 2 2	0

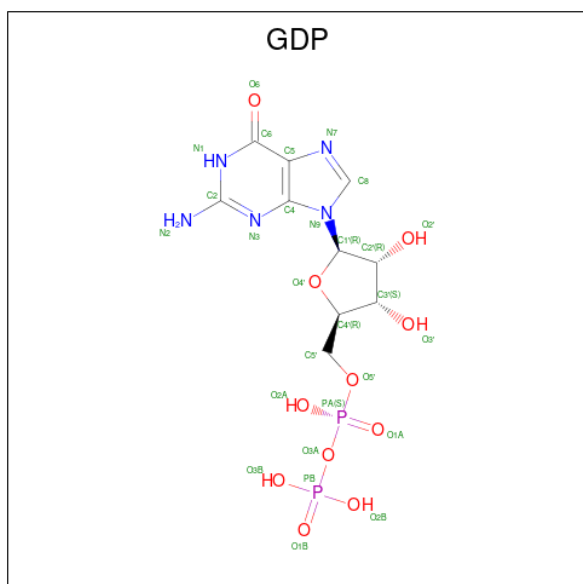
- Molecule 96 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula:

$C_{10}H_{16}N_5O_{13}P_3$ ).



Mol	Chain	Residues	Atoms					AltConf	
			Total	C	H	N	O		P
96	AX	1	43	10	12	5	13	3	0

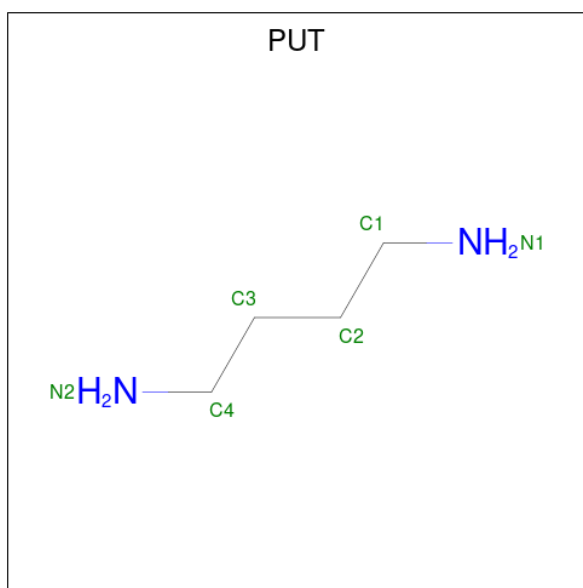
- Molecule 97 is GUANOSINE-5'-DIPHOSPHATE (three-letter code: GDP) (formula:  $C_{10}H_{15}N_5O_{11}P_2$ ).



Mol	Chain	Residues	Atoms					AltConf	
			Total	C	H	N	O		P
97	AX	1	40	10	12	5	11	2	0

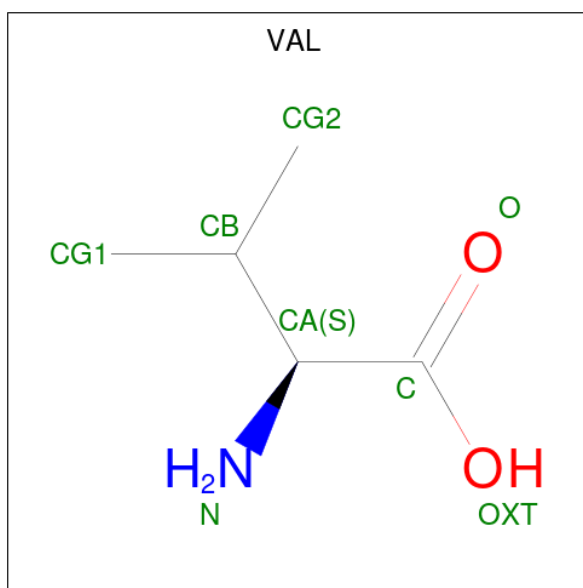


- Molecule 98 is 1,4-DIAMINOBTANE (three-letter code: PUT) (formula:  $C_4H_{12}N_2$ ).



Mol	Chain	Residues	Atoms				AltConf
			Total	C	H	N	
98	A	1	20	4	14	2	0

- Molecule 99 is VALINE (three-letter code: VAL) (formula:  $C_5H_{11}NO_2$ ).



Mol	Chain	Residues	Atoms					AltConf
			Total	C	H	N	O	
99	B	1	18	5	11	1	1	0

- Molecule 100 is water.

Mol	Chain	Residues	Atoms		AltConf
100	AA	649	Total 649	O 649	0
100	AB	11	Total 11	O 11	0
100	AC	20	Total 20	O 20	0
100	AD	20	Total 20	O 20	0
100	AE	4	Total 4	O 4	0
100	AF	5	Total 5	O 5	0
100	AG	6	Total 6	O 6	0
100	AH	14	Total 14	O 14	0
100	AI	13	Total 13	O 13	0
100	AJ	11	Total 11	O 11	0
100	AK	11	Total 11	O 11	0
100	AL	15	Total 15	O 15	0
100	AM	1	Total 1	O 1	0
100	AN	6	Total 6	O 6	0
100	AO	4	Total 4	O 4	0
100	AP	9	Total 9	O 9	0
100	AQ	22	Total 22	O 22	0
100	AS	2	Total 2	O 2	0
100	AT	4	Total 4	O 4	0
100	AW	1	Total 1	O 1	0
100	AX	1	Total 1	O 1	0
100	AY	2	Total 2	O 2	0

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Mol	Chain	Residues	Atoms		AltConf
100	AZ	8	Total 8	O 8	0
100	A1	4	Total 4	O 4	0
100	A2	8	Total 8	O 8	0
100	A3	15	Total 15	O 15	0
100	Az	3	Total 3	O 3	0
100	Aw	2	Total 2	O 2	0
100	Ax	1	Total 1	O 1	0
100	A	1824	Total 1824	O 1824	0
100	B	3	Total 3	O 3	0
100	D	31	Total 31	O 31	0
100	E	33	Total 33	O 33	0
100	F	53	Total 53	O 53	0
100	I	7	Total 7	O 7	0
100	K	33	Total 33	O 33	0
100	L	7	Total 7	O 7	0
100	M	36	Total 36	O 36	0
100	N	18	Total 18	O 18	0
100	O	9	Total 9	O 9	0
100	P	12	Total 12	O 12	0
100	R	38	Total 38	O 38	0
100	S	29	Total 29	O 29	0

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<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>AltConf</b>
100	T	22	Total 22	O 22	0
100	U	9	Total 9	O 9	0
100	V	3	Total 3	O 3	0
100	W	14	Total 14	O 14	0
100	X	1	Total 1	O 1	0
100	Y	12	Total 12	O 12	0
100	Z	18	Total 18	O 18	0
100	0	19	Total 19	O 19	0
100	2	26	Total 26	O 26	0
100	3	22	Total 22	O 22	0
100	4	1	Total 1	O 1	0
100	5	4	Total 4	O 4	0
100	6	11	Total 11	O 11	0
100	7	1	Total 1	O 1	0
100	9	11	Total 11	O 11	0
100	a	4	Total 4	O 4	0
100	b	21	Total 21	O 21	0
100	c	7	Total 7	O 7	0
100	f	1	Total 1	O 1	0
100	g	5	Total 5	O 5	0
100	i	27	Total 27	O 27	0

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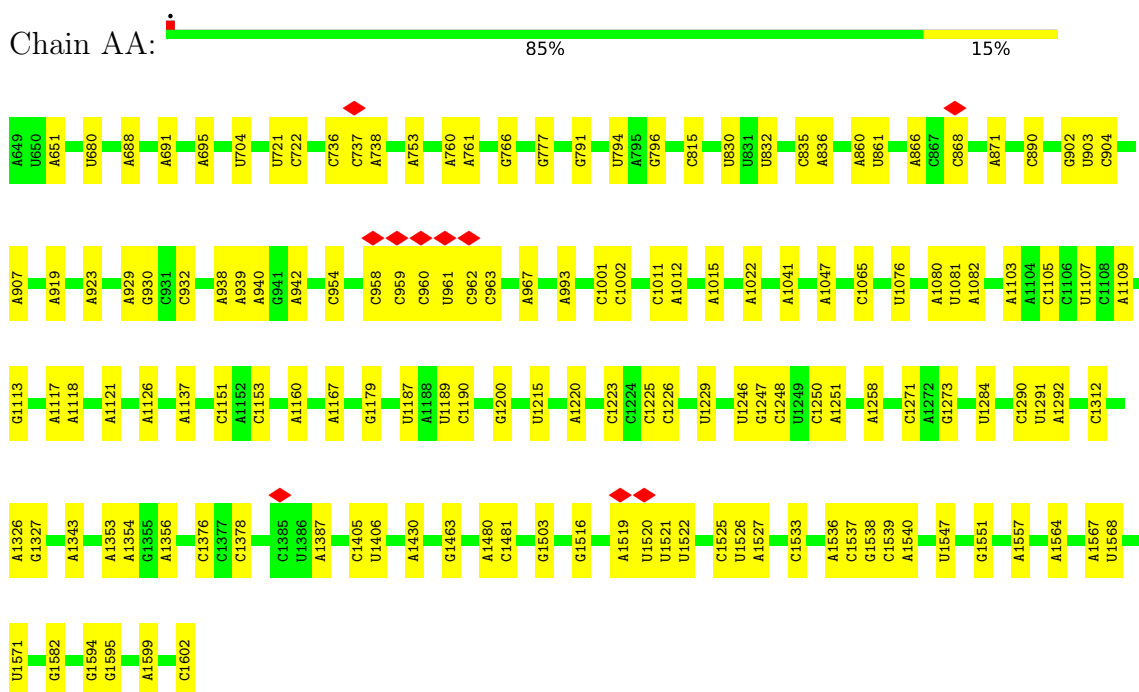
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Mol	Chain	Residues	Atoms		AltConf
100	j	6	Total 6	O 6	0
100	o	16	Total 16	O 16	0
100	p	1	Total 1	O 1	0
100	r	7	Total 7	O 7	0
100	s	18	Total 18	O 18	0
100	Q	6	Total 6	O 6	0
100	H	6	Total 6	O 6	0

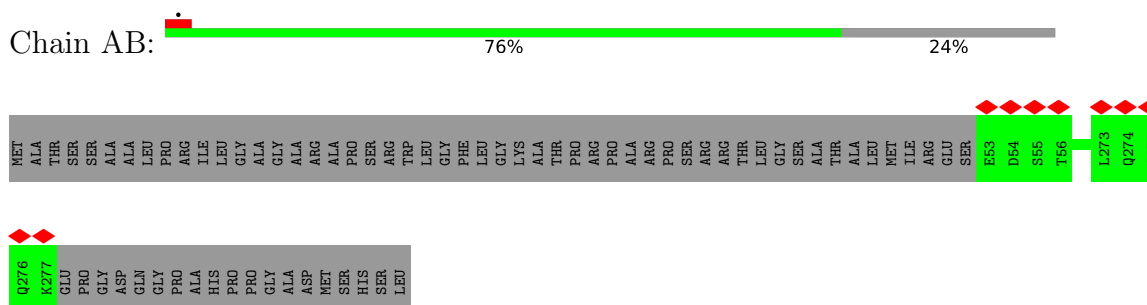
### 3 Residue-property plots [i](#)

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.

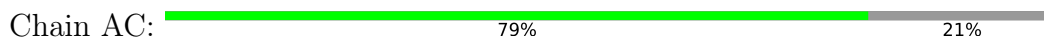
- Molecule 1: 12S mitochondrial rRNA

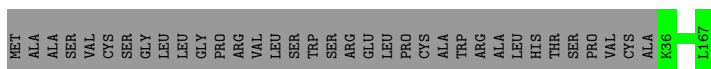


- Molecule 2: 28S ribosomal protein S2, mitochondrial

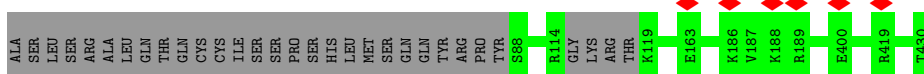
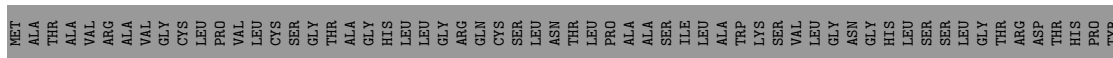
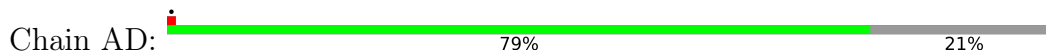


- Molecule 3: 28S ribosomal protein S24, mitochondrial

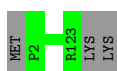




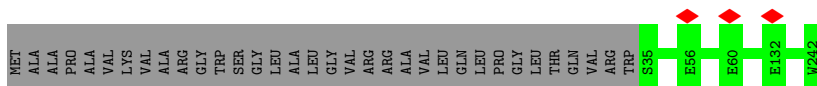
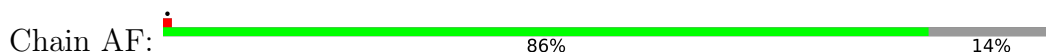
- Molecule 4: 28S ribosomal protein S5, mitochondrial



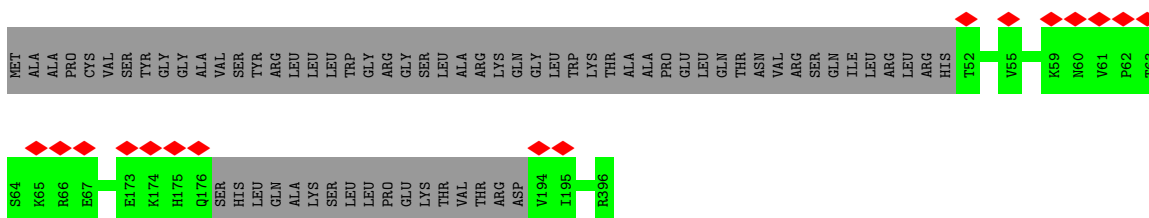
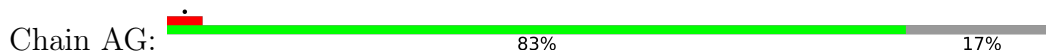
- Molecule 5: 28S ribosomal protein S6, mitochondrial



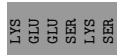
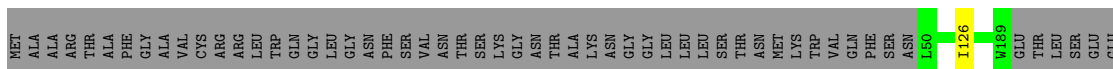
- Molecule 6: 28S ribosomal protein S7, mitochondrial



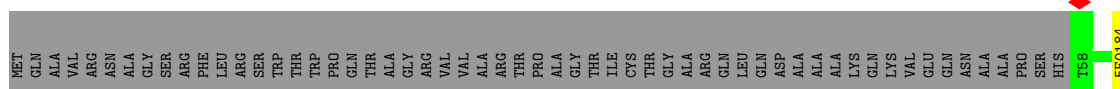
- Molecule 7: 28S ribosomal protein S9, mitochondrial



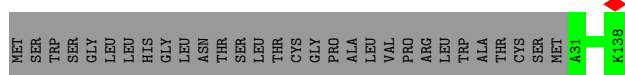
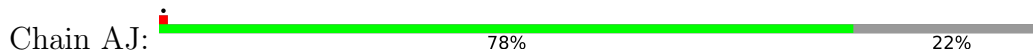
- Molecule 8: 28S ribosomal protein S10, mitochondrial



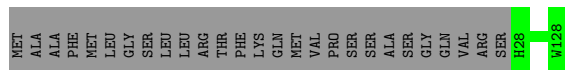
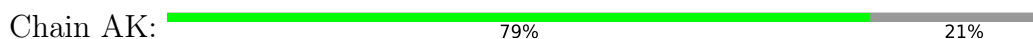
- Molecule 9: 28S ribosomal protein S11, mitochondrial



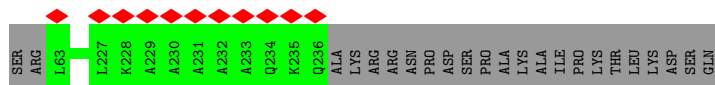
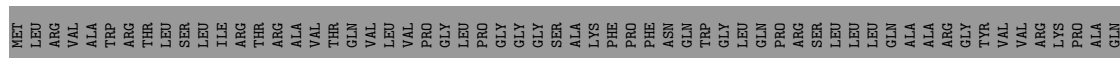
- Molecule 10: 28S ribosomal protein S12, mitochondrial



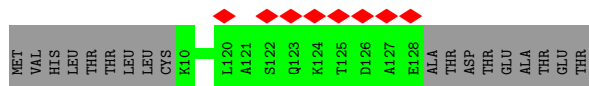
- Molecule 11: 28S ribosomal protein S14, mitochondrial



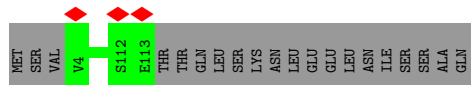
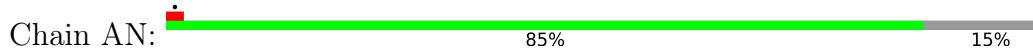
- Molecule 12: 28S ribosomal protein S15, mitochondrial



- Molecule 13: 28S ribosomal protein S16, mitochondrial

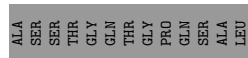
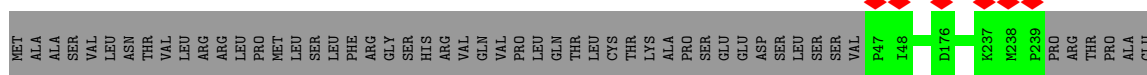
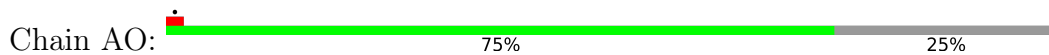


- Molecule 14: 28S ribosomal protein S17, mitochondrial

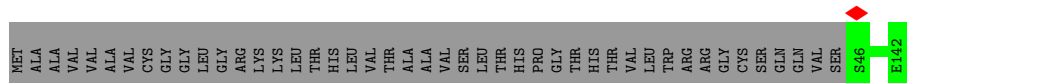


- Molecule 15: 28S ribosomal protein S18b, mitochondrial





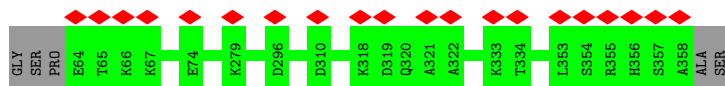
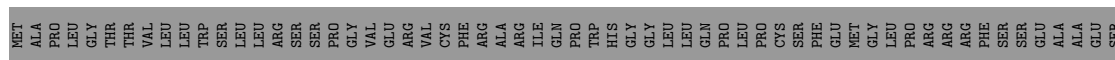
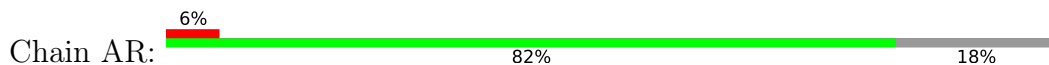
- Molecule 16: 28S ribosomal protein S18c, mitochondrial



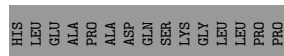
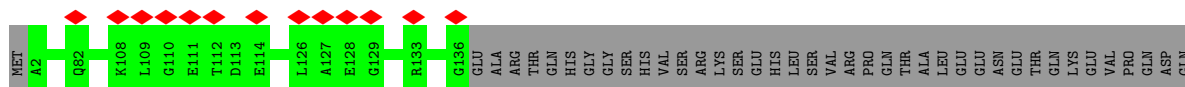
- Molecule 17: MRPS21 isoform 1



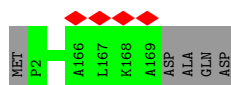
- Molecule 18: 28S ribosomal protein S22, mitochondrial



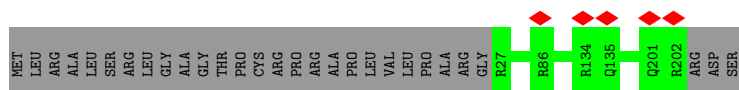
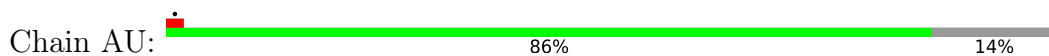
- Molecule 19: 28S ribosomal protein S23, mitochondrial



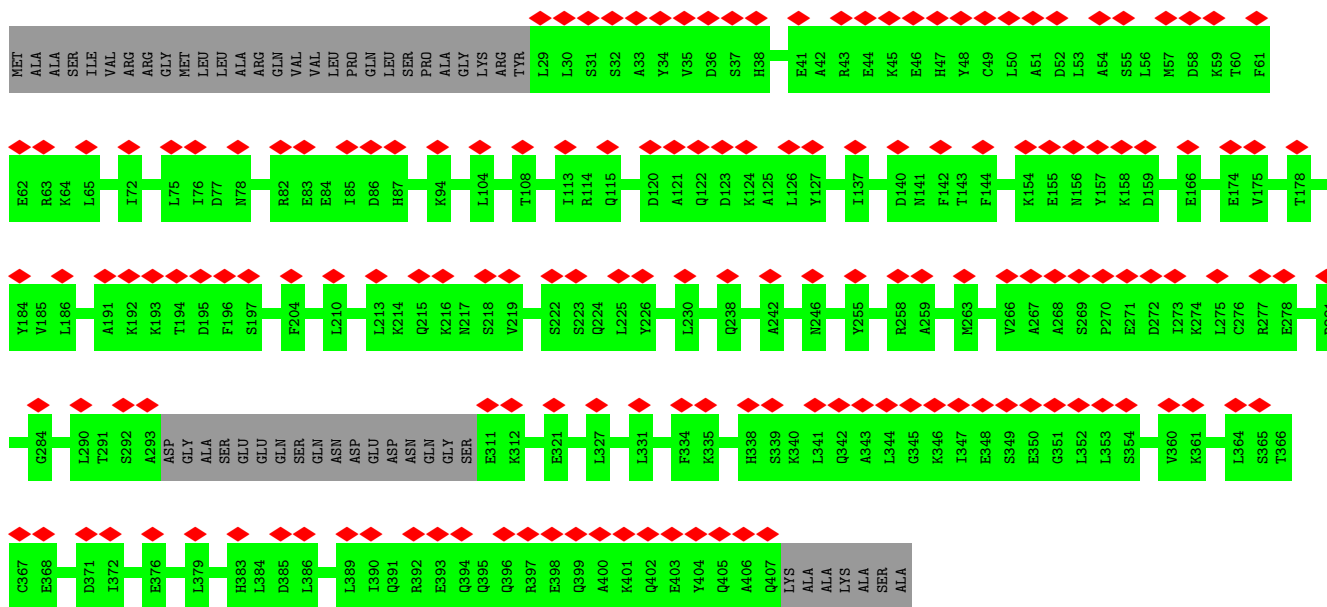
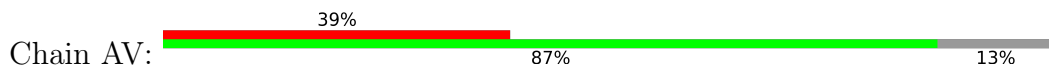
- Molecule 20: 28S ribosomal protein S25, mitochondrial



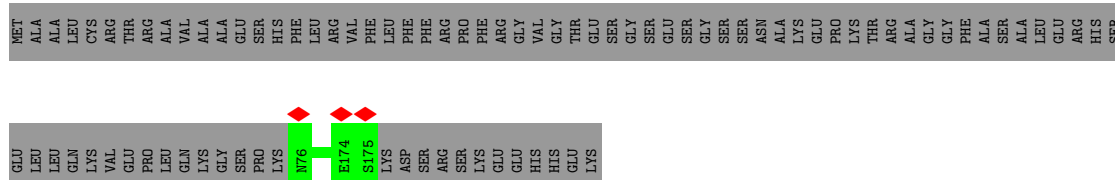
• Molecule 21: 28S ribosomal protein S26, mitochondrial



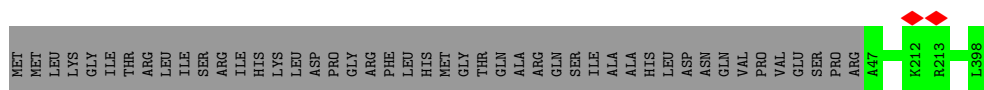
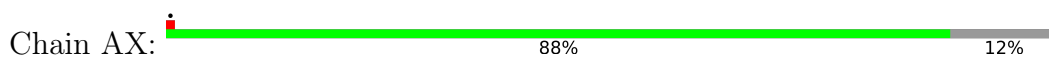
• Molecule 22: 28S ribosomal protein S27, mitochondrial



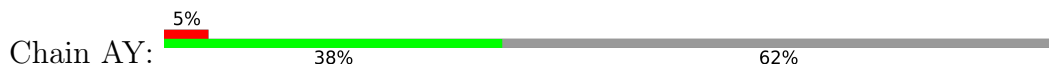
• Molecule 23: 28S ribosomal protein S28, mitochondrial



• Molecule 24: 28S ribosomal protein S29, mitochondrial

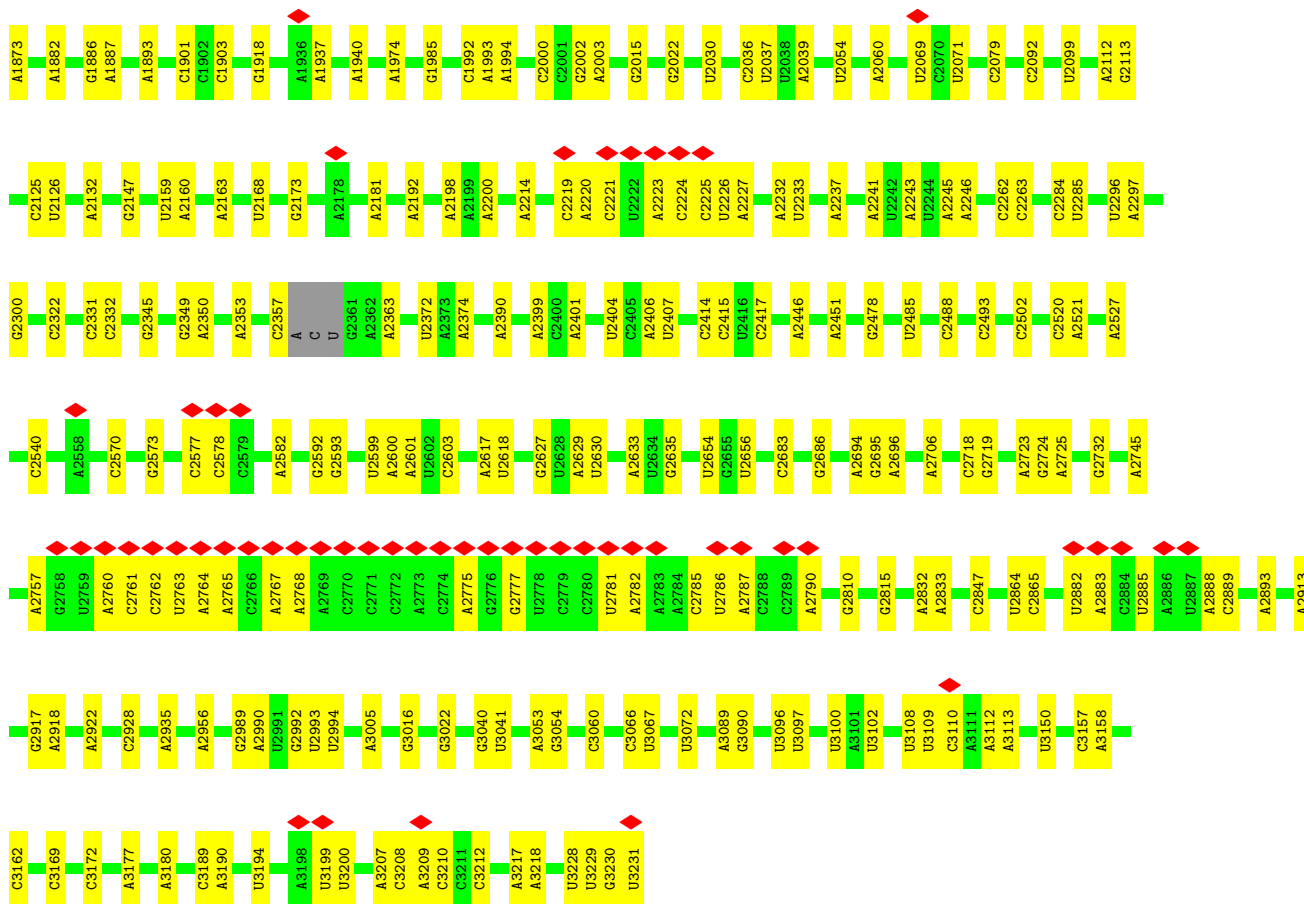


• Molecule 25: 28S ribosomal protein S31, mitochondrial

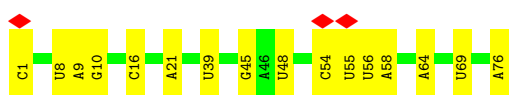
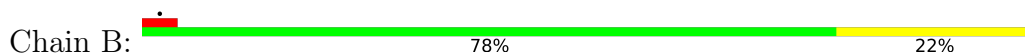




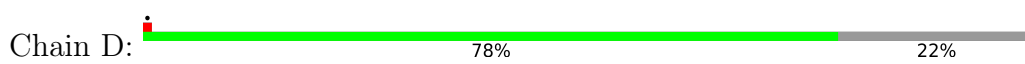




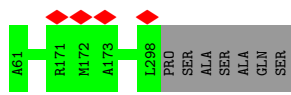
• Molecule 36: mitochondrial tRNAVal



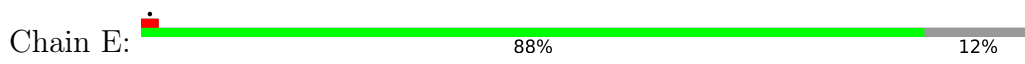
• Molecule 37: 39S ribosomal protein L2, mitochondrial

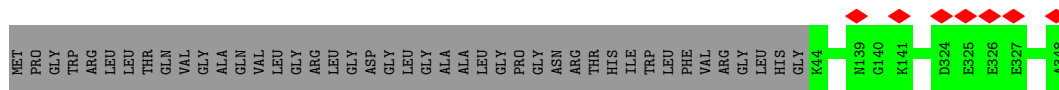


MET	ALA	LEU	CYS	ALA	LEU	THR	ARG	ALA	ALA	LEU	LEU	SER	SER	LEU	ASN	LEU	ALA	PRO	PRO	THR	VAL	ALA	ALA	ALA	PRO	PRO	ALA	ALA	GLN	GLN	MET	MET	ASN	ASN	GLY	LEU	LEU	LEU	GLN	GLN	PRO	SER	SER	ALA	LEU	LEU	MET	LEU	LEU	PRO	PRO	CYS	ARG	PRO	VAL	LEU	THR	SER	VAL	ALA	LEU	ASN
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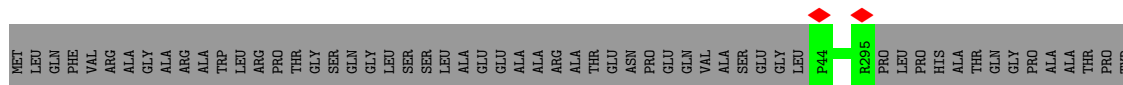
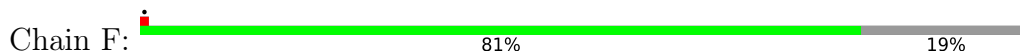


• Molecule 38: 39S ribosomal protein L3, mitochondrial



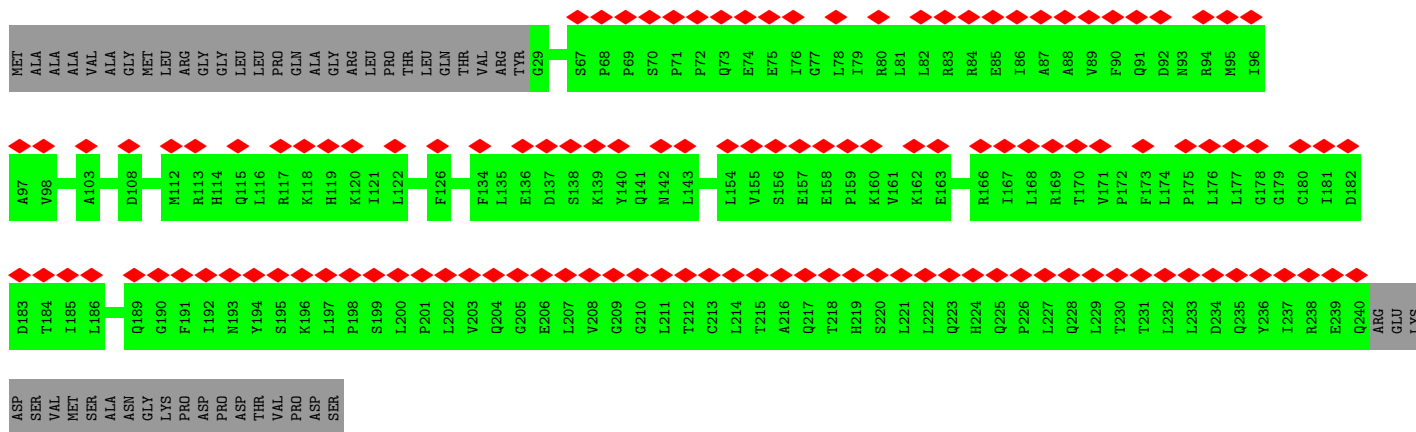
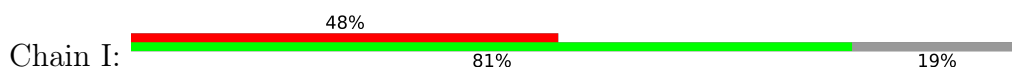


• Molecule 39: 39S ribosomal protein L4, mitochondrial

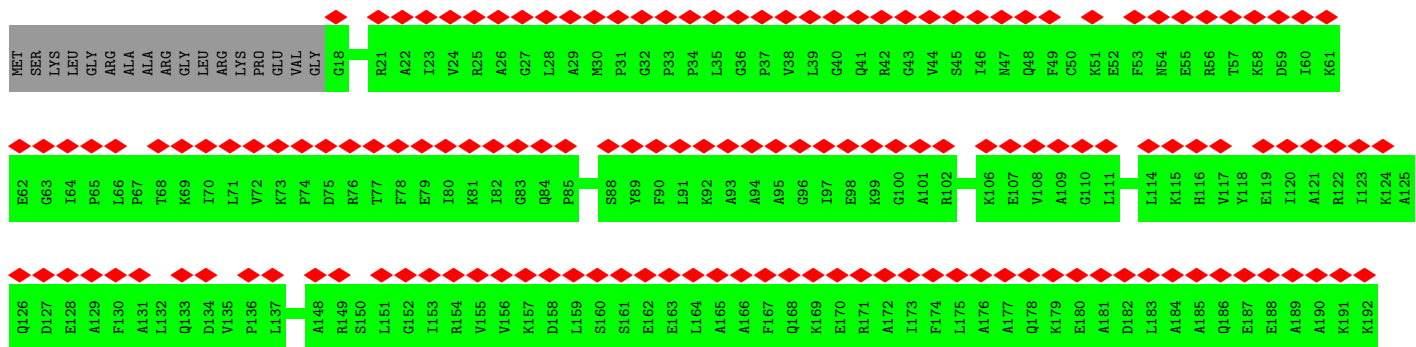
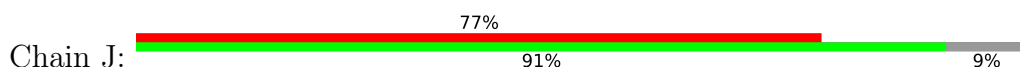


HIS  
CYS

• Molecule 40: 39S ribosomal protein L10, mitochondrial



• Molecule 41: 39S ribosomal protein L11, mitochondrial



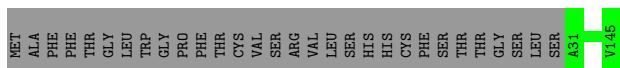
• Molecule 42: 39S ribosomal protein L13, mitochondrial





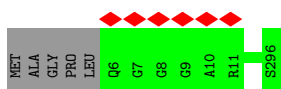
- Molecule 43: 39S ribosomal protein L14, mitochondrial

Chain L: 79% 21%



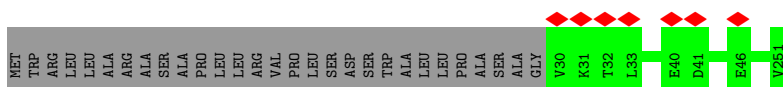
- Molecule 44: 39S ribosomal protein L15, mitochondrial

Chain M: 98%



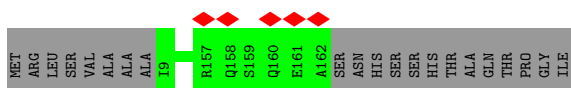
- Molecule 45: 39S ribosomal protein L16, mitochondrial

Chain N: 88% 12%



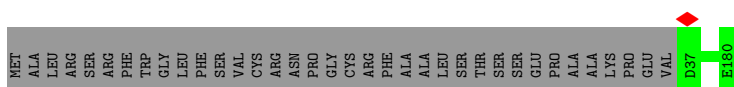
- Molecule 46: 39S ribosomal protein L17, mitochondrial

Chain O: 88% 12%



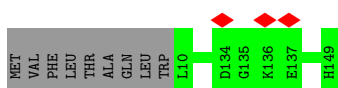
- Molecule 47: 39S ribosomal protein L18, mitochondrial

Chain P: 80% 20%

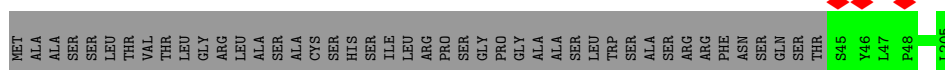
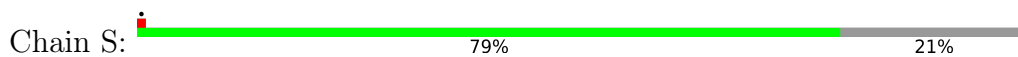


- Molecule 48: 39S ribosomal protein L20, mitochondrial

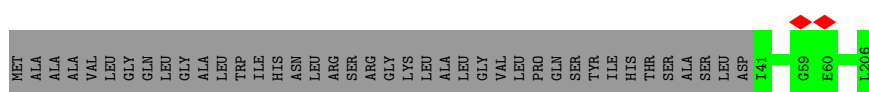
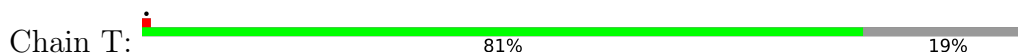
Chain R: 94% 6%



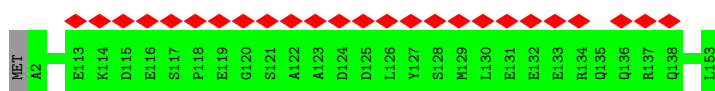
- Molecule 49: 39S ribosomal protein L21, mitochondrial



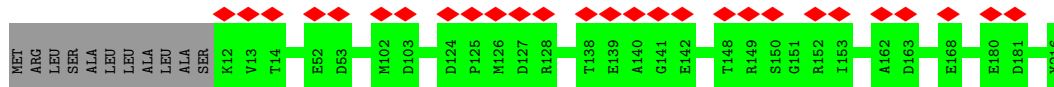
- Molecule 50: 39S ribosomal protein L22, mitochondrial



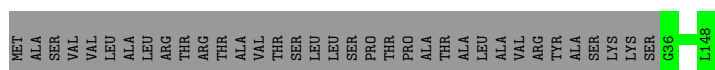
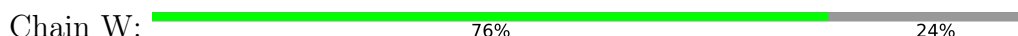
- Molecule 51: 39S ribosomal protein L23, mitochondrial



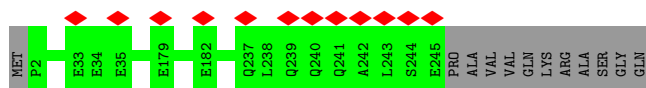
- Molecule 52: 39S ribosomal protein L24, mitochondrial



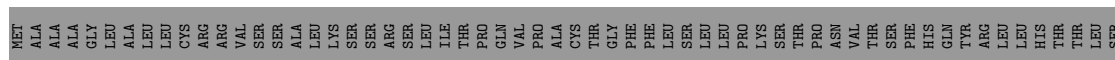
- Molecule 53: 39S ribosomal protein L27, mitochondrial



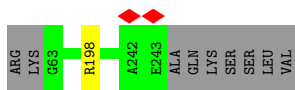
- Molecule 54: 39S ribosomal protein L28, mitochondrial



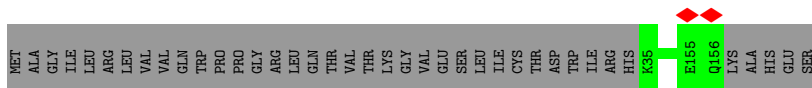
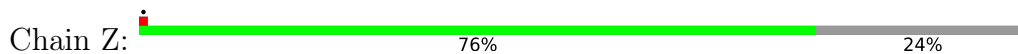
- Molecule 55: 39S ribosomal protein L47, mitochondrial



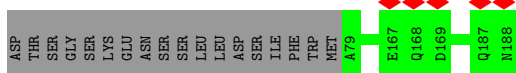




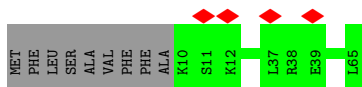
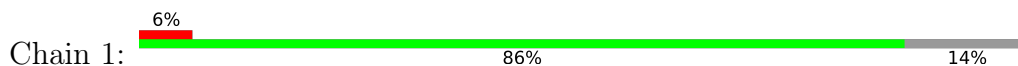
- Molecule 56: 39S ribosomal protein L30, mitochondrial



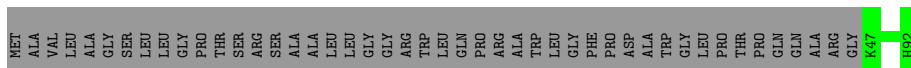
- Molecule 57: 39S ribosomal protein L32, mitochondrial



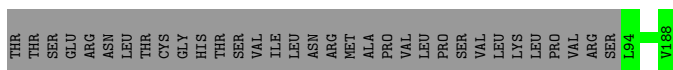
- Molecule 58: 39S ribosomal protein L33, mitochondrial



- Molecule 59: 39S ribosomal protein L34, mitochondrial



- Molecule 60: 39S ribosomal protein L35, mitochondrial



- Molecule 61: 39S ribosomal protein L36, mitochondrial



MET ALA ASN PHE ILE ARG LYS MET VAL ASN PRO LEU LEU TYR LEU ARG ARG HIS THR VAL LYS PRO ARG ALA LEU SER PHE LEU PHE GLY SER ILE ARG ARG ILE ARG GLY ALA ALA PRO VAL VAL VAL VAL GLU PRO GLY ALA VAL ARG ARG SER LEU SER SER PRO PRO GLY LEU LEU HIS LEU

LEU PRO ALA LEU LEU LEU P66 H103

- Molecule 62: 39S ribosomal protein L37, mitochondrial

Chain 5:  93% 7%


MET ALA LEU ALA LEU SER LEU PRO ALA ARG ARG ALA LEU LEU LEU GLY SER GLY GLN LEU LEU LEU LEU GLY GLY PHE ALA GLY PRO ARG ARG GLY A30 E56 F107 HIS H109 D141 R144 E246 R395 A423

- Molecule 63: 39S ribosomal protein L38, mitochondrial

Chain 6:  93% 7%

MET ALA ALA PRO TRP ARG ALA ALA CYS CYS ARG TRP TRP ARG ARG LEU PHE TRP VAL LEU GLY R27 R47 K81 T82 D83 E86 E181 Y360

- Molecule 64: 39S ribosomal protein L39, mitochondrial

Chain 7:  9% 87% 13%

MET GLU ALA LEU ALA MET MET GLY SER ARG ALA LEU LEU ARG LEU TRP LEU VAL VAL PRO PRO GLY GLY ILE LYS TRP ARG PHE ILE ALA THR SER ALA SER Q34 L35 S36 R50 L56 S57 L58 T59 P60 R61 D160 E161 T162 M163 K188 L189 D190 E191 E197 K236

E242 K243 A244 S245 Q246 N247 P248 R249 Q287 P288 T289 Q290 P291 S292 L293 E326 D327 GLN SER LYS THR GLU CYS THR THR

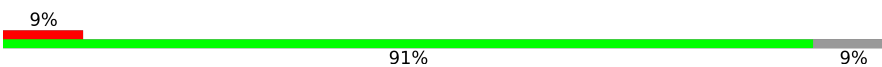
- Molecule 65: 39S ribosomal protein L40, mitochondrial

Chain 8:  17% 73% 27%

MET THR ALA SER VAL LEU ARG SER ILE SER LEU LEU LEU ARG ARG PRO THR SER GLY LEU LEU LEU GLY THR TRP GLN THR GLN ARG ALA THR THR THR THR LEU LEU SER TRP PHE T200 LEU ILE PRO MET ARG S47 E48 P49 L50 R51 K52 LYS LYS VAL ASP PRO LYS K60

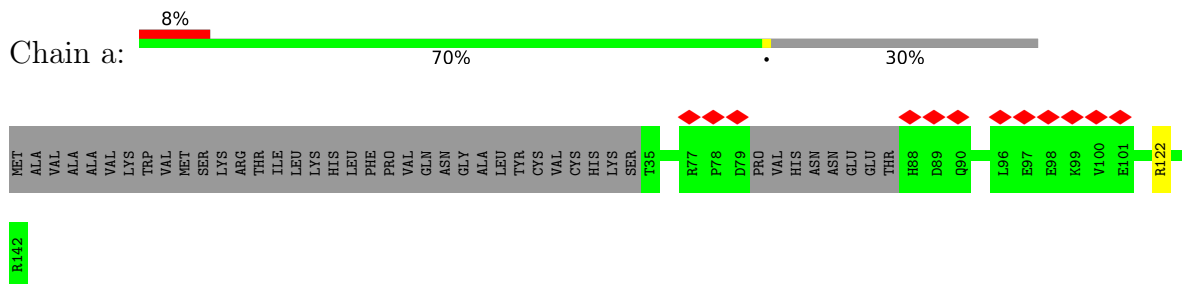
D61 Q62 E63 A64 K65 E66 R67 L68 K69 R70 K71 I72 R73 K74 L75 E76 A77 K78 T79 L92 L95 D96 K97 A98 E105 E153 Y199 T200 Q201 V202 E203 PHE LYS ARG

- Molecule 66: 39S ribosomal protein L41, mitochondrial

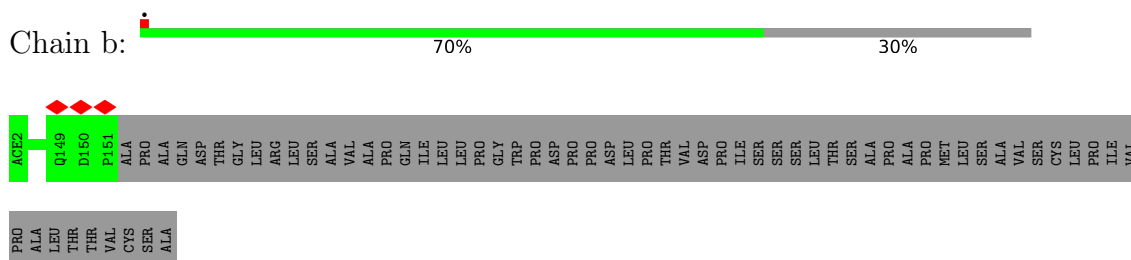
Chain 9:  9% 91% 9%

MET GLY VAL LEU ALA ALA ALA ARG CYS VAL ARG G14 E101 K102 D103 F104 K105 D106 G107 T108 F109 D110 P111 D112 N113 K116 R137

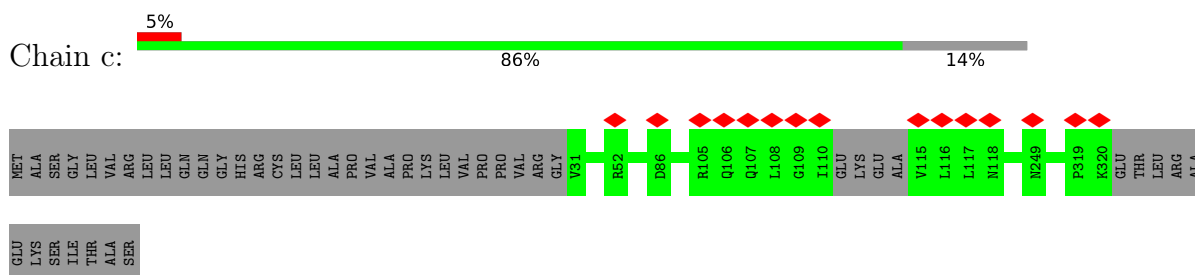
• Molecule 67: 39S ribosomal protein L42, mitochondrial



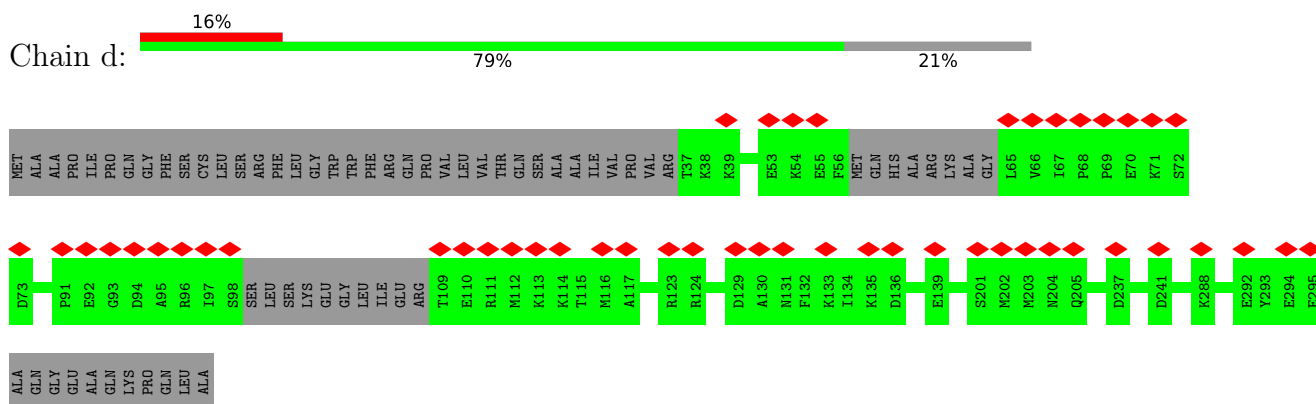
• Molecule 68: Large ribosomal subunit protein mL43



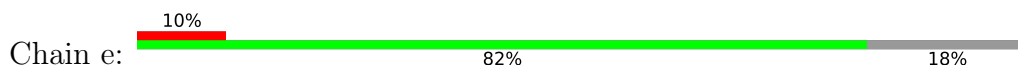
• Molecule 69: 39S ribosomal protein L44, mitochondrial

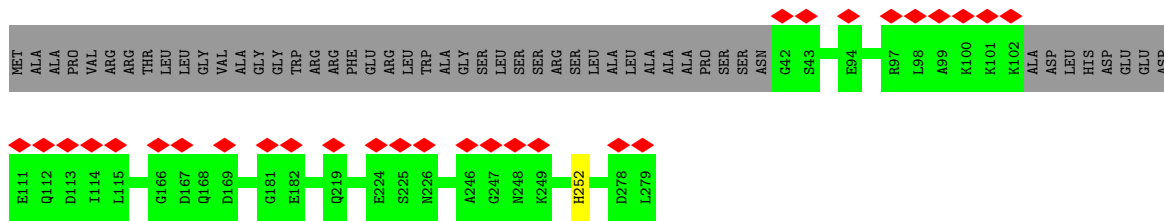


• Molecule 70: 39S ribosomal protein L45, mitochondrial

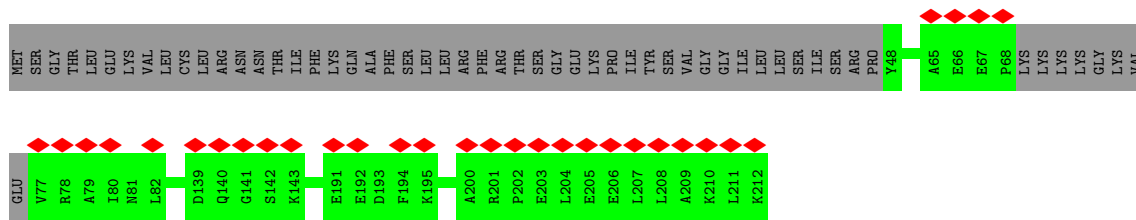


• Molecule 71: 39S ribosomal protein L46, mitochondrial

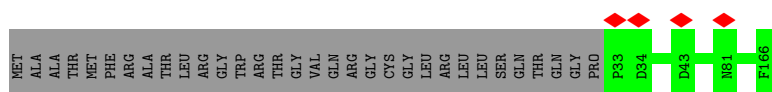
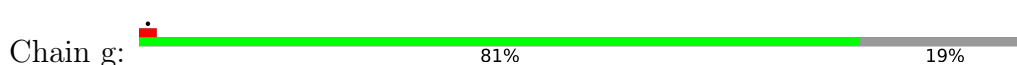




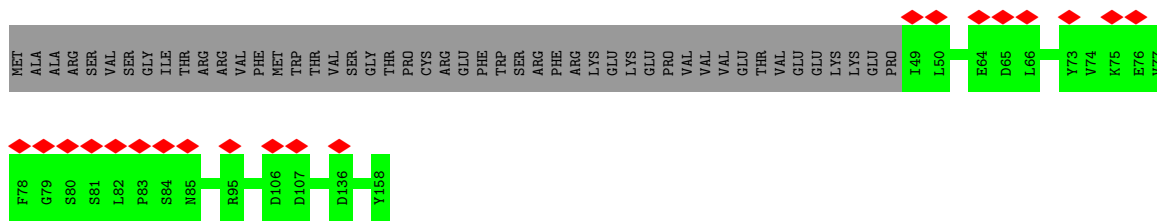
• Molecule 72: 39S ribosomal protein L48, mitochondrial



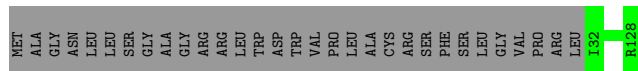
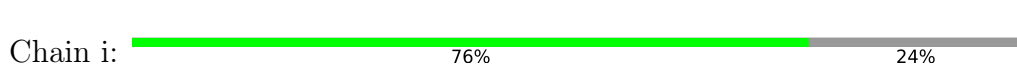
• Molecule 73: 39S ribosomal protein L49, mitochondrial



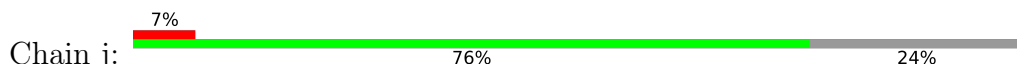
• Molecule 74: 39S ribosomal protein L50, mitochondrial

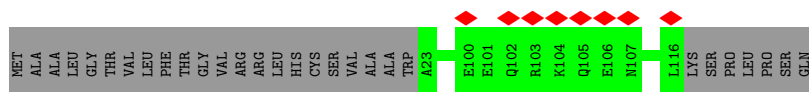


• Molecule 75: 39S ribosomal protein L51, mitochondrial

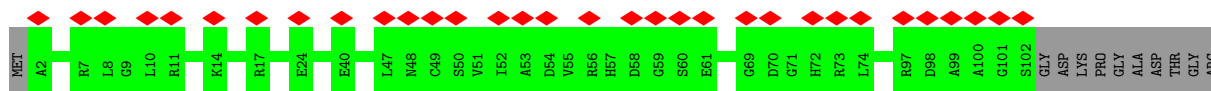
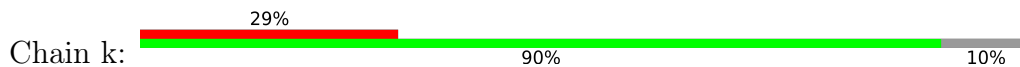


• Molecule 76: 39S ribosomal protein L52, mitochondrial

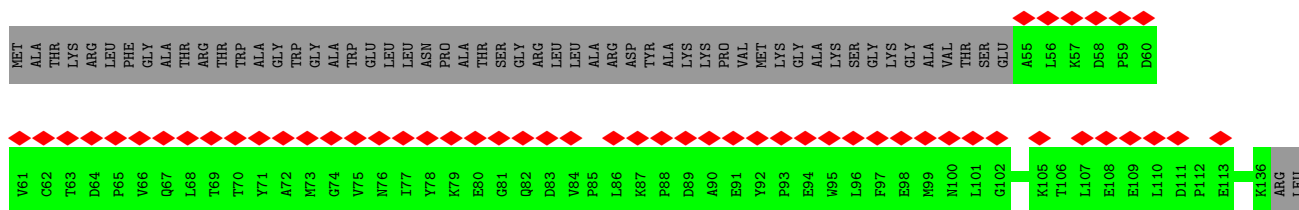
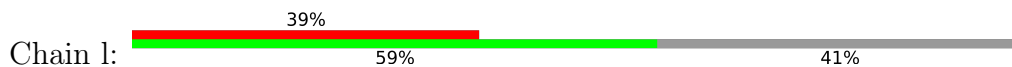




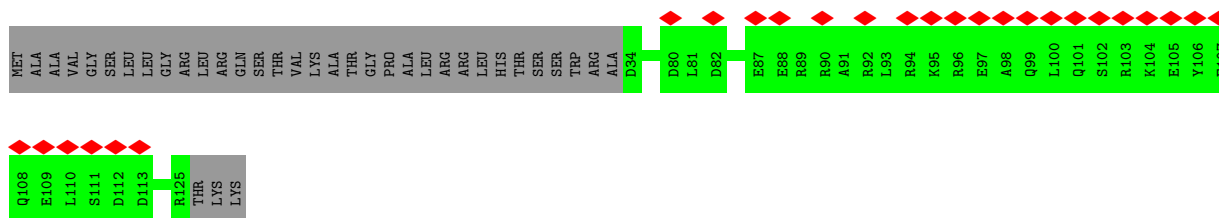
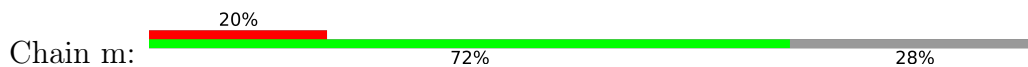
• Molecule 77: 39S ribosomal protein L53, mitochondrial



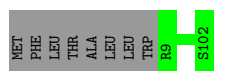
• Molecule 78: 39S ribosomal protein L54, mitochondrial



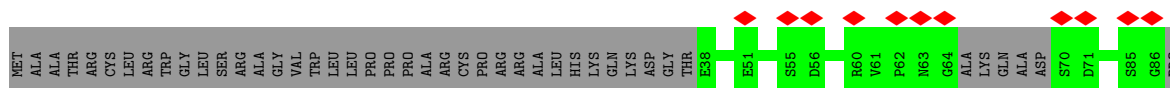
• Molecule 79: 39S ribosomal protein L55, mitochondrial



• Molecule 80: Ribosomal protein 63, mitochondrial

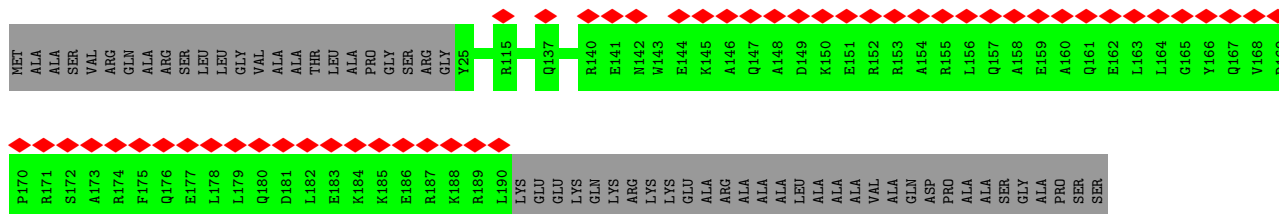
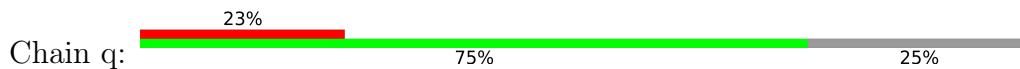


• Molecule 81: Peptidyl-tRNA hydrolase ICT1, mitochondrial

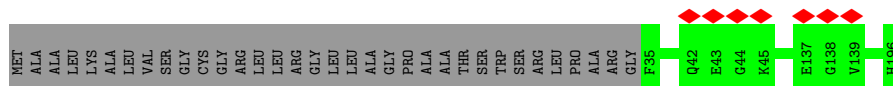
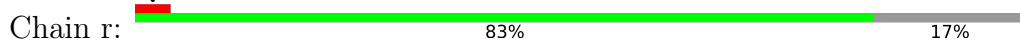




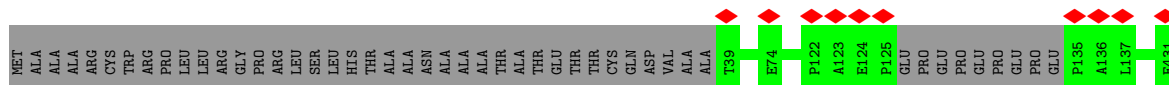
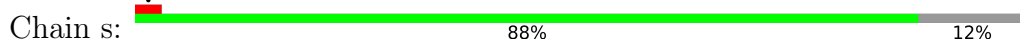
- Molecule 82: Growth arrest and DNA damage-inducible proteins-interacting protein 1



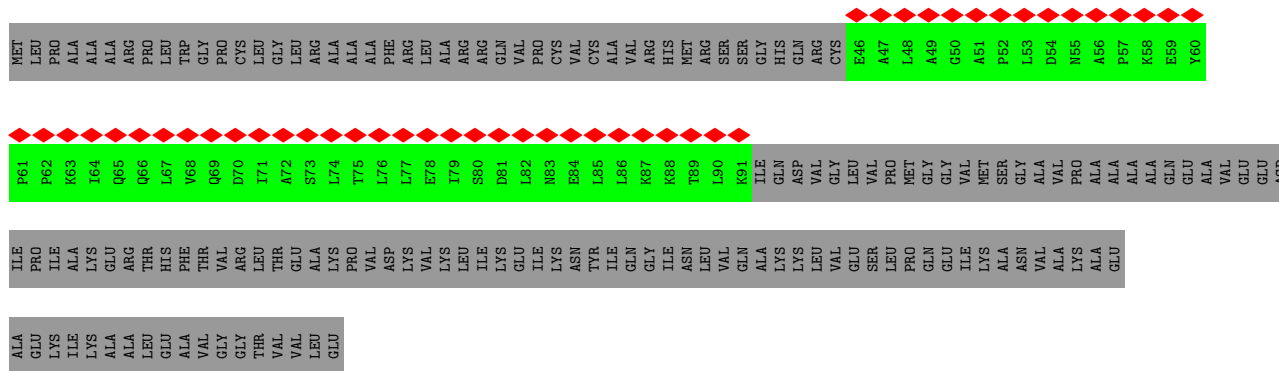
- Molecule 83: 39S ribosomal protein S18a, mitochondrial



- Molecule 84: 39S ribosomal protein S30, mitochondrial

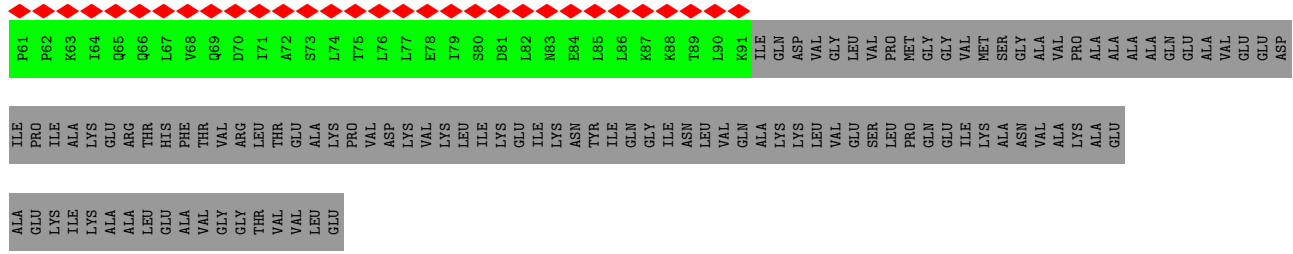


- Molecule 85: 39S ribosomal protein L12, mitochondrial

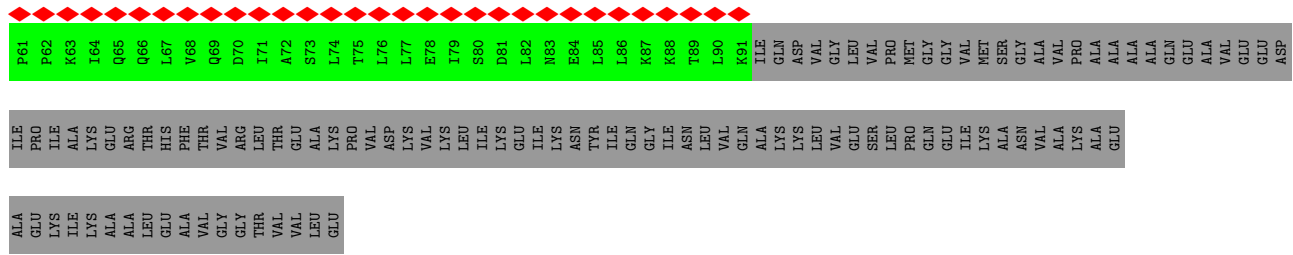


- Molecule 85: 39S ribosomal protein L12, mitochondrial

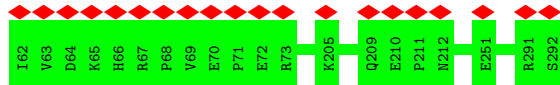
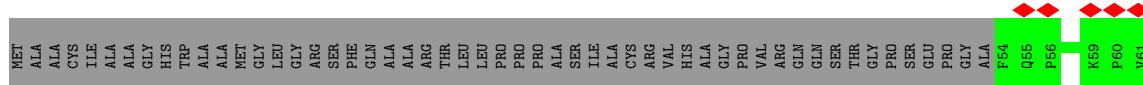
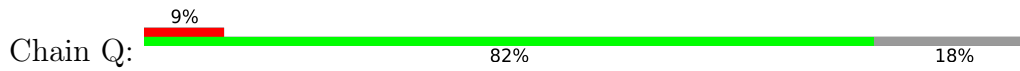




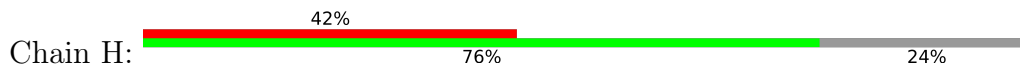
• Molecule 85: 39S ribosomal protein L12, mitochondrial



• Molecule 86: 39S ribosomal protein L19, mitochondrial



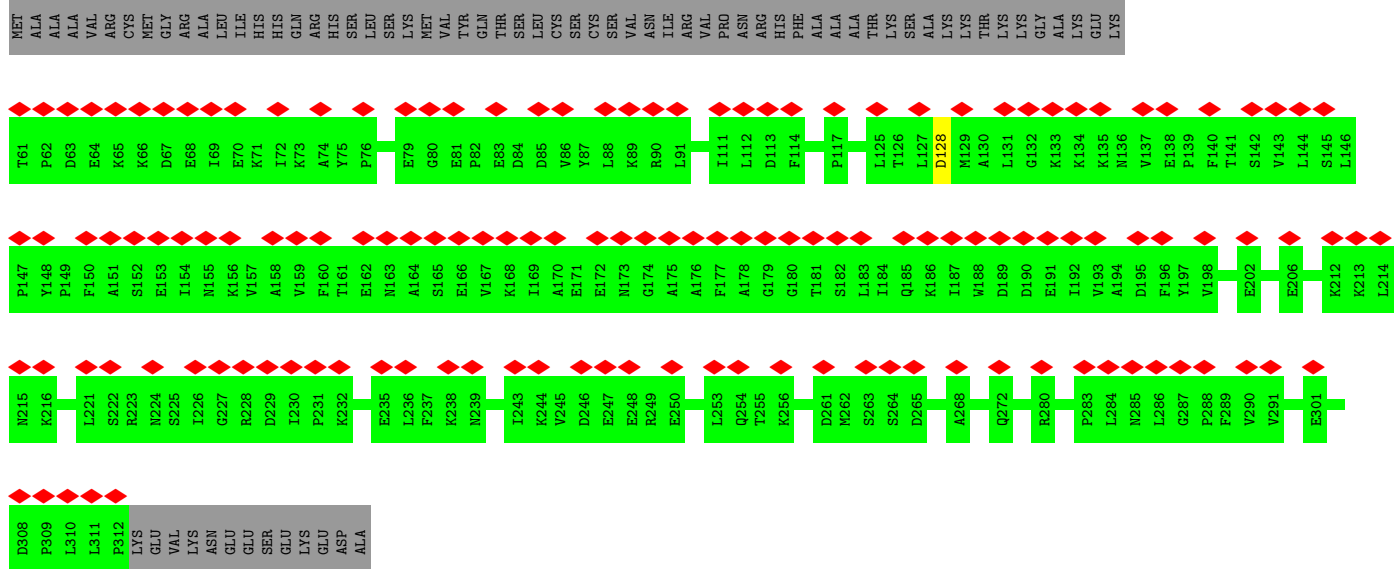
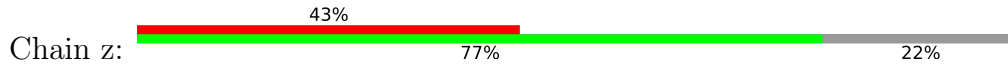
• Molecule 87: 39S ribosomal protein L9, mitochondrial





GLN  
ILE

• Molecule 88: 39S ribosomal protein L1, mitochondrial



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	20143	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 ( $e^-/\text{\AA}^2$ )	30	Depositor
Minimum defocus (nm)	600	Depositor
Maximum defocus (nm)	2600	Depositor
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	60.865	Depositor
Minimum map value	-27.488	Depositor
Average map value	-0.002	Depositor
Map value standard deviation	1.287	Depositor
Recommended contour level	3.8	Depositor
Map size ( $\text{\AA}$ )	448.19998, 448.19998, 448.19998	wwPDB
Map dimensions	540, 540, 540	wwPDB
Map angles ( $^\circ$ )	90.0, 90.0, 90.0	wwPDB
Pixel spacing ( $\text{\AA}$ )	0.83, 0.83, 0.83	Depositor

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: 2MG, ACE, OMG, MG, PUT, ATP, 5MC, NAD, 5F0, 5MU, OMU, SPM, FES, B8T, ZN, GDP, MA6, AYA, SPD, PSU, SAC, K, 1MA

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	AA	0.21	0/22537	0.66	0/35085
2	AB	0.24	0/1871	0.49	0/2531
3	AC	0.25	0/1113	0.48	0/1505
4	AD	0.24	0/2751	0.50	0/3681
5	AE	0.24	0/989	0.51	0/1335
6	AF	0.24	0/1767	0.46	0/2373
7	AG	0.25	0/2753	0.49	0/3691
8	AH	0.24	0/1178	0.46	0/1598
9	AI	0.25	0/1030	0.50	0/1386
10	AJ	0.25	0/855	0.54	0/1148
11	AK	0.23	0/880	0.57	0/1182
12	AL	0.24	0/1477	0.47	0/1974
13	AM	0.24	0/963	0.53	0/1295
14	AN	0.24	0/886	0.50	0/1199
15	AO	0.24	0/1648	0.48	0/2243
16	AP	0.25	0/798	0.44	0/1070
17	AQ	0.24	0/748	0.56	0/994
18	AR	0.24	0/2456	0.44	0/3317
19	AS	0.24	0/1138	0.50	0/1533
20	AT	0.25	0/1402	0.46	0/1883
21	AU	0.23	0/1510	0.53	0/2025
22	AV	0.23	0/3030	0.40	0/4093
23	AW	0.25	0/801	0.50	0/1079
24	AX	0.24	0/2921	0.44	0/3954
25	AY	0.24	0/1280	0.39	0/1725
26	AZ	0.25	0/857	0.50	0/1141
27	A0	0.23	0/1834	0.53	0/2484
28	A1	0.24	0/2313	0.45	0/3129
29	A2	0.23	0/941	0.52	0/1257
30	A3	0.23	0/636	0.57	0/839
31	A4	0.24	0/4877	0.43	0/6598

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
32	Az	0.17	0/785	0.66	0/1219
33	Aw	0.33	1/1604 (0.1%)	0.73	0/2490
34	Ax	0.32	1/1673 (0.1%)	0.70	0/2599
35	A	0.21	1/36876 (0.0%)	0.67	0/57402
36	B	0.31	1/1627 (0.1%)	0.66	0/2527
37	D	0.24	0/1896	0.56	0/2549
38	E	0.25	0/2475	0.46	0/3355
39	F	0.24	0/2090	0.50	0/2842
40	I	0.24	0/1731	0.48	0/2345
41	J	0.25	0/1348	0.48	0/1813
42	K	0.24	0/1490	0.47	0/2021
43	L	0.24	0/905	0.54	0/1218
44	M	0.25	0/2381	0.53	0/3212
45	N	0.24	0/1833	0.50	0/2468
46	O	0.23	0/1283	0.53	0/1727
47	P	0.24	0/1199	0.53	0/1623
48	R	0.23	0/1175	0.53	0/1572
49	S	0.23	0/1320	0.51	0/1789
50	T	0.25	0/1403	0.50	0/1886
51	U	0.25	0/1274	0.54	0/1723
52	V	0.24	0/1721	0.51	0/2333
53	W	0.26	0/902	0.50	0/1214
54	X	0.25	0/2099	0.47	0/2837
55	Y	0.23	0/1593	0.49	0/2136
56	Z	0.23	0/1021	0.46	0/1378
57	0	0.23	0/913	0.52	0/1224
58	1	0.25	0/469	0.55	0/621
59	2	0.23	0/383	0.58	0/507
60	3	0.24	0/853	0.53	0/1136
61	4	0.24	0/350	0.55	0/461
62	5	0.24	0/3293	0.48	0/4484
63	6	0.25	0/3043	0.51	0/4140
64	7	0.24	0/2447	0.47	0/3310
65	8	0.24	0/1294	0.48	0/1739
66	9	0.26	0/1025	0.48	0/1379
67	a	0.25	0/866	0.50	0/1174
68	b	0.24	0/1219	0.53	0/1651
69	c	0.24	0/2347	0.47	0/3171
70	d	0.24	0/2039	0.47	0/2759
71	e	0.24	0/1903	0.48	0/2565
72	f	0.24	0/1273	0.44	0/1716
73	g	0.25	0/1151	0.49	0/1569
74	h	0.23	0/918	0.46	0/1249

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
75	i	0.24	0/850	0.53	0/1135
76	j	0.24	0/760	0.50	0/1023
77	k	0.24	0/777	0.53	0/1048
78	l	0.23	0/707	0.48	0/960
79	m	0.23	0/805	0.57	0/1081
80	o	0.24	0/819	0.56	0/1097
81	p	0.23	0/1223	0.50	0/1641
82	q	0.24	0/1432	0.51	0/1931
83	r	0.24	0/1362	0.52	0/1846
84	s	0.24	0/3239	0.50	0/4400
85	t	0.23	0/358	0.35	0/486
85	u	0.22	0/259	0.34	0/350
85	v	0.22	0/259	0.34	0/350
85	w	0.22	0/246	0.35	0/331
85	x	0.22	0/246	0.34	0/331
85	y	0.22	0/246	0.34	0/331
86	Q	0.24	0/2039	0.51	0/2750
87	H	0.24	0/1698	0.51	0/2292
88	z	0.25	0/2067	0.49	0/2793
All	All	0.24	4/189122 (0.0%)	0.56	0/268656

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
35	A	1671	G	OP3-P	-10.82	1.48	1.61
36	B	1	C	OP3-P	-10.61	1.48	1.61
33	Aw	1	U	OP3-P	-10.59	1.48	1.61
34	Ax	1	U	OP3-P	-10.51	1.48	1.61

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

## 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

### 5.3.1 Protein backbone

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	AB	223/296 (75%)	221 (99%)	2 (1%)	0	100	100
3	AC	130/167 (78%)	124 (95%)	6 (5%)	0	100	100
4	AD	335/430 (78%)	326 (97%)	9 (3%)	0	100	100
5	AE	120/125 (96%)	119 (99%)	1 (1%)	0	100	100
6	AF	206/242 (85%)	205 (100%)	1 (0%)	0	100	100
7	AG	324/396 (82%)	317 (98%)	7 (2%)	0	100	100
8	AH	138/201 (69%)	136 (99%)	1 (1%)	1 (1%)	22	58
9	AI	134/194 (69%)	133 (99%)	1 (1%)	0	100	100
10	AJ	106/138 (77%)	103 (97%)	3 (3%)	0	100	100
11	AK	99/128 (77%)	99 (100%)	0	0	100	100
12	AL	172/257 (67%)	170 (99%)	2 (1%)	0	100	100
13	AM	117/137 (85%)	117 (100%)	0	0	100	100
14	AN	108/130 (83%)	106 (98%)	2 (2%)	0	100	100
15	AO	191/258 (74%)	186 (97%)	5 (3%)	0	100	100
16	AP	95/142 (67%)	94 (99%)	1 (1%)	0	100	100
17	AQ	84/87 (97%)	81 (96%)	3 (4%)	0	100	100
18	AR	293/360 (81%)	285 (97%)	8 (3%)	0	100	100
19	AS	133/190 (70%)	131 (98%)	2 (2%)	0	100	100
20	AT	166/173 (96%)	164 (99%)	2 (1%)	0	100	100
21	AU	174/205 (85%)	174 (100%)	0	0	100	100
22	AV	358/414 (86%)	352 (98%)	6 (2%)	0	100	100
23	AW	98/187 (52%)	95 (97%)	3 (3%)	0	100	100
24	AX	350/398 (88%)	343 (98%)	7 (2%)	0	100	100
25	AY	147/395 (37%)	145 (99%)	2 (1%)	0	100	100
26	AZ	98/106 (92%)	97 (99%)	1 (1%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
27	A0	213/217 (98%)	208 (98%)	5 (2%)	0	100	100
28	A1	277/323 (86%)	274 (99%)	3 (1%)	0	100	100
29	A2	115/118 (98%)	114 (99%)	1 (1%)	0	100	100
30	A3	68/199 (34%)	67 (98%)	1 (2%)	0	100	100
31	A4	584/689 (85%)	579 (99%)	5 (1%)	0	100	100
37	D	236/305 (77%)	231 (98%)	5 (2%)	0	100	100
38	E	303/348 (87%)	298 (98%)	5 (2%)	0	100	100
39	F	250/311 (80%)	246 (98%)	4 (2%)	0	100	100
40	I	210/261 (80%)	203 (97%)	7 (3%)	0	100	100
41	J	173/192 (90%)	173 (100%)	0	0	100	100
42	K	175/178 (98%)	175 (100%)	0	0	100	100
43	L	113/145 (78%)	111 (98%)	2 (2%)	0	100	100
44	M	289/296 (98%)	284 (98%)	5 (2%)	0	100	100
45	N	220/251 (88%)	218 (99%)	2 (1%)	0	100	100
46	O	152/175 (87%)	149 (98%)	3 (2%)	0	100	100
47	P	142/180 (79%)	142 (100%)	0	0	100	100
48	R	138/149 (93%)	138 (100%)	0	0	100	100
49	S	159/205 (78%)	157 (99%)	2 (1%)	0	100	100
50	T	164/206 (80%)	162 (99%)	2 (1%)	0	100	100
51	U	150/153 (98%)	147 (98%)	3 (2%)	0	100	100
52	V	203/216 (94%)	197 (97%)	6 (3%)	0	100	100
53	W	111/148 (75%)	110 (99%)	1 (1%)	0	100	100
54	X	242/256 (94%)	241 (100%)	1 (0%)	0	100	100
55	Y	179/250 (72%)	177 (99%)	2 (1%)	0	100	100
56	Z	120/161 (74%)	120 (100%)	0	0	100	100
57	0	108/188 (57%)	108 (100%)	0	0	100	100
58	1	54/65 (83%)	54 (100%)	0	0	100	100
59	2	44/92 (48%)	43 (98%)	1 (2%)	0	100	100
60	3	93/188 (50%)	92 (99%)	1 (1%)	0	100	100
61	4	36/103 (35%)	36 (100%)	0	0	100	100
62	5	389/423 (92%)	380 (98%)	9 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
63	6	352/380 (93%)	343 (97%)	9 (3%)	0	100	100
64	7	292/338 (86%)	285 (98%)	7 (2%)	0	100	100
65	8	146/206 (71%)	143 (98%)	3 (2%)	0	100	100
66	9	122/137 (89%)	121 (99%)	1 (1%)	0	100	100
67	a	96/142 (68%)	96 (100%)	0	0	100	100
68	b	149/215 (69%)	147 (99%)	2 (1%)	0	100	100
69	c	282/332 (85%)	279 (99%)	3 (1%)	0	100	100
70	d	235/306 (77%)	230 (98%)	5 (2%)	0	100	100
71	e	226/279 (81%)	218 (96%)	7 (3%)	1 (0%)	34	70
72	f	153/212 (72%)	151 (99%)	2 (1%)	0	100	100
73	g	132/166 (80%)	129 (98%)	3 (2%)	0	100	100
74	h	108/158 (68%)	108 (100%)	0	0	100	100
75	i	95/128 (74%)	94 (99%)	1 (1%)	0	100	100
76	j	92/123 (75%)	90 (98%)	2 (2%)	0	100	100
77	k	99/112 (88%)	99 (100%)	0	0	100	100
78	l	80/138 (58%)	80 (100%)	0	0	100	100
79	m	90/128 (70%)	88 (98%)	2 (2%)	0	100	100
80	o	92/102 (90%)	92 (100%)	0	0	100	100
81	p	141/206 (68%)	141 (100%)	0	0	100	100
82	q	164/222 (74%)	163 (99%)	1 (1%)	0	100	100
83	r	160/196 (82%)	159 (99%)	1 (1%)	0	100	100
84	s	382/439 (87%)	374 (98%)	8 (2%)	0	100	100
85	t	44/198 (22%)	44 (100%)	0	0	100	100
85	u	30/198 (15%)	30 (100%)	0	0	100	100
85	v	30/198 (15%)	30 (100%)	0	0	100	100
85	w	29/198 (15%)	29 (100%)	0	0	100	100
85	x	29/198 (15%)	29 (100%)	0	0	100	100
85	y	29/198 (15%)	29 (100%)	0	0	100	100
86	Q	237/292 (81%)	235 (99%)	2 (1%)	0	100	100
87	H	200/267 (75%)	193 (96%)	7 (4%)	0	100	100
88	z	250/325 (77%)	237 (95%)	12 (5%)	1 (0%)	34	70

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	14675/19484 (75%)	14443 (98%)	229 (2%)	3 (0%)	100	100

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
8	AH	126	ILE
71	e	252	HIS
88	z	128	ASP

### 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	
2	AB	198/249 (80%)	198 (100%)	0	100	100
3	AC	115/143 (80%)	115 (100%)	0	100	100
4	AD	283/357 (79%)	283 (100%)	0	100	100
5	AE	104/107 (97%)	104 (100%)	0	100	100
6	AF	185/209 (88%)	185 (100%)	0	100	100
7	AG	286/342 (84%)	286 (100%)	0	100	100
8	AH	130/180 (72%)	130 (100%)	0	100	100
9	AI	104/146 (71%)	104 (100%)	0	100	100
10	AJ	93/118 (79%)	93 (100%)	0	100	100
11	AK	91/113 (80%)	91 (100%)	0	100	100
12	AL	158/226 (70%)	158 (100%)	0	100	100
13	AM	97/113 (86%)	97 (100%)	0	100	100
14	AN	96/115 (84%)	96 (100%)	0	100	100
15	AO	174/230 (76%)	174 (100%)	0	100	100
16	AP	88/123 (72%)	88 (100%)	0	100	100
17	AQ	78/79 (99%)	78 (100%)	0	100	100
18	AR	264/318 (83%)	264 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
19	AS	116/164 (71%)	116 (100%)	0	100	100
20	AT	153/157 (98%)	153 (100%)	0	100	100
21	AU	152/174 (87%)	152 (100%)	0	100	100
22	AV	325/364 (89%)	325 (100%)	0	100	100
23	AW	87/158 (55%)	87 (100%)	0	100	100
24	AX	311/351 (89%)	311 (100%)	0	100	100
25	AY	137/357 (38%)	137 (100%)	0	100	100
26	AZ	90/95 (95%)	90 (100%)	0	100	100
27	A0	188/189 (100%)	188 (100%)	0	100	100
28	A1	257/291 (88%)	257 (100%)	0	100	100
29	A2	100/101 (99%)	100 (100%)	0	100	100
30	A3	65/166 (39%)	65 (100%)	0	100	100
31	A4	526/609 (86%)	526 (100%)	0	100	100
37	D	192/245 (78%)	192 (100%)	0	100	100
38	E	260/290 (90%)	260 (100%)	0	100	100
39	F	219/262 (84%)	219 (100%)	0	100	100
40	I	194/232 (84%)	194 (100%)	0	100	100
41	J	138/150 (92%)	138 (100%)	0	100	100
42	K	154/155 (99%)	154 (100%)	0	100	100
43	L	98/124 (79%)	98 (100%)	0	100	100
44	M	246/249 (99%)	246 (100%)	0	100	100
45	N	189/211 (90%)	189 (100%)	0	100	100
46	O	134/150 (89%)	134 (100%)	0	100	100
47	P	126/155 (81%)	126 (100%)	0	100	100
48	R	118/126 (94%)	118 (100%)	0	100	100
49	S	146/180 (81%)	146 (100%)	0	100	100
50	T	146/176 (83%)	146 (100%)	0	100	100
51	U	134/135 (99%)	134 (100%)	0	100	100
52	V	183/191 (96%)	183 (100%)	0	100	100
53	W	91/119 (76%)	91 (100%)	0	100	100
54	X	220/229 (96%)	220 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
55	Y	163/223 (73%)	162 (99%)	1 (1%)	86	94
56	Z	113/147 (77%)	113 (100%)	0	100	100
57	0	99/164 (60%)	99 (100%)	0	100	100
58	1	53/60 (88%)	53 (100%)	0	100	100
59	2	40/72 (56%)	40 (100%)	0	100	100
60	3	88/166 (53%)	88 (100%)	0	100	100
61	4	37/89 (42%)	37 (100%)	0	100	100
62	5	352/368 (96%)	351 (100%)	1 (0%)	92	97
63	6	313/332 (94%)	313 (100%)	0	100	100
64	7	270/303 (89%)	270 (100%)	0	100	100
65	8	139/190 (73%)	139 (100%)	0	100	100
66	9	104/112 (93%)	104 (100%)	0	100	100
67	a	96/133 (72%)	95 (99%)	1 (1%)	76	91
68	b	132/185 (71%)	132 (100%)	0	100	100
69	c	251/288 (87%)	251 (100%)	0	100	100
70	d	223/274 (81%)	223 (100%)	0	100	100
71	e	200/236 (85%)	200 (100%)	0	100	100
72	f	139/188 (74%)	139 (100%)	0	100	100
73	g	124/148 (84%)	124 (100%)	0	100	100
74	h	104/148 (70%)	104 (100%)	0	100	100
75	i	86/110 (78%)	86 (100%)	0	100	100
76	j	74/97 (76%)	74 (100%)	0	100	100
77	k	83/90 (92%)	83 (100%)	0	100	100
78	l	76/116 (66%)	76 (100%)	0	100	100
79	m	85/113 (75%)	85 (100%)	0	100	100
80	o	80/87 (92%)	80 (100%)	0	100	100
81	p	135/181 (75%)	135 (100%)	0	100	100
82	q	143/178 (80%)	143 (100%)	0	100	100
83	r	147/169 (87%)	147 (100%)	0	100	100
84	s	340/381 (89%)	340 (100%)	0	100	100
85	t	40/158 (25%)	40 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
85	u	31/158 (20%)	31 (100%)	0	100	100
85	v	31/158 (20%)	31 (100%)	0	100	100
85	w	30/158 (19%)	30 (100%)	0	100	100
85	x	30/158 (19%)	30 (100%)	0	100	100
85	y	30/158 (19%)	30 (100%)	0	100	100
86	Q	221/256 (86%)	221 (100%)	0	100	100
87	H	182/228 (80%)	182 (100%)	0	100	100
88	z	226/287 (79%)	226 (100%)	0	100	100
All	All	13149/16790 (78%)	13146 (100%)	3 (0%)	100	100

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
55	Y	198	ARG
62	5	395	ARG
67	a	122	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (56) such sidechains are listed below:

Mol	Chain	Res	Type
2	AB	167	HIS
3	AC	64	HIS
4	AD	155	GLN
6	AF	127	HIS
7	AG	127	HIS
7	AG	175	HIS
8	AH	109	HIS
8	AH	125	HIS
9	AI	129	GLN
10	AJ	105	HIS
12	AL	162	GLN
13	AM	50	GLN
18	AR	288	GLN
21	AU	188	ASN
22	AV	380	GLN
23	AW	106	HIS
24	AX	140	HIS
24	AX	250	GLN

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Mol	Chain	Res	Type
26	AZ	63	GLN
26	AZ	76	GLN
27	A0	111	HIS
27	A0	145	HIS
28	A1	185	HIS
31	A4	306	ASN
37	D	221	ASN
38	E	125	GLN
38	E	281	ASN
39	F	98	GLN
40	I	36	HIS
40	I	150	HIS
46	O	100	GLN
49	S	118	ASN
51	U	84	ASN
57	0	120	HIS
58	1	52	GLN
62	5	302	HIS
62	5	331	ASN
62	5	338	GLN
62	5	367	ASN
62	5	384	GLN
63	6	320	GLN
68	b	58	ASN
68	b	90	HIS
68	b	131	HIS
71	e	150	ASN
71	e	212	HIS
75	i	124	HIS
80	o	21	HIS
80	o	94	HIS
82	q	107	GLN
82	q	142	ASN
84	s	87	GLN
86	Q	139	GLN
87	H	192	HIS
88	z	95	GLN
88	z	266	GLN

### 5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	AA	950/954 (99%)	144 (15%)	1 (0%)
32	Az	32/33 (96%)	18 (56%)	0
33	Aw	67/68 (98%)	38 (56%)	0
34	Ax	70/71 (98%)	32 (45%)	0
35	A	1556/1561 (99%)	246 (15%)	2 (0%)
36	B	71/72 (98%)	12 (16%)	0
All	All	2746/2759 (99%)	490 (17%)	3 (0%)

All (490) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	AA	651	A
1	AA	680	U
1	AA	688	A
1	AA	691	A
1	AA	695	A
1	AA	704	U
1	AA	721	U
1	AA	722	C
1	AA	736	C
1	AA	737	C
1	AA	738	A
1	AA	753	A
1	AA	760	A
1	AA	761	A
1	AA	766	G
1	AA	777	G
1	AA	791	G
1	AA	794	U
1	AA	796	G
1	AA	815	C
1	AA	830	U
1	AA	832	U
1	AA	835	C
1	AA	836	A
1	AA	860	A
1	AA	861	U
1	AA	866	A
1	AA	868	C
1	AA	871	A
1	AA	890	C
1	AA	902	G
1	AA	903	U

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	AA	904	C
1	AA	907	A
1	AA	919	A
1	AA	923	A
1	AA	929	A
1	AA	930	G
1	AA	932	C
1	AA	938	A
1	AA	939	A
1	AA	940	A
1	AA	942	A
1	AA	954	C
1	AA	958	C
1	AA	959	C
1	AA	960	C
1	AA	961	U
1	AA	962	C
1	AA	963	C
1	AA	967	A
1	AA	993	A
1	AA	1001	C
1	AA	1002	C
1	AA	1011	C
1	AA	1012	A
1	AA	1015	A
1	AA	1022	A
1	AA	1041	A
1	AA	1047	A
1	AA	1065	C
1	AA	1080	A
1	AA	1081	U
1	AA	1082	A
1	AA	1103	A
1	AA	1105	C
1	AA	1107	U
1	AA	1109	A
1	AA	1113	G
1	AA	1117	A
1	AA	1118	A
1	AA	1121	A
1	AA	1126	A
1	AA	1137	A

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	AA	1151	C
1	AA	1153	C
1	AA	1160	A
1	AA	1167	A
1	AA	1179	G
1	AA	1187	U
1	AA	1189	U
1	AA	1190	C
1	AA	1200	G
1	AA	1215	U
1	AA	1220	A
1	AA	1223	C
1	AA	1225	C
1	AA	1226	C
1	AA	1229	U
1	AA	1246	U
1	AA	1247	G
1	AA	1248	C
1	AA	1250	C
1	AA	1251	A
1	AA	1258	A
1	AA	1271	C
1	AA	1273	G
1	AA	1284	U
1	AA	1290	C
1	AA	1291	U
1	AA	1292	A
1	AA	1312	C
1	AA	1326	A
1	AA	1327	G
1	AA	1343	A
1	AA	1353	A
1	AA	1354	A
1	AA	1356	A
1	AA	1376	C
1	AA	1378	C
1	AA	1387	A
1	AA	1405	C
1	AA	1406	U
1	AA	1430	A
1	AA	1463	G
1	AA	1480	A

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	AA	1481	C
1	AA	1503	G
1	AA	1516	G
1	AA	1519	A
1	AA	1520	U
1	AA	1521	U
1	AA	1522	U
1	AA	1525	C
1	AA	1526	U
1	AA	1527	A
1	AA	1533	C
1	AA	1536	A
1	AA	1537	C
1	AA	1538	G
1	AA	1539	C
1	AA	1540	A
1	AA	1547	U
1	AA	1551	G
1	AA	1557	A
1	AA	1564	A
1	AA	1567	A
1	AA	1568	U
1	AA	1571	U
1	AA	1582	G
1	AA	1594	G
1	AA	1595	G
1	AA	1599	A
1	AA	1602	C
32	Az	1	U
32	Az	3	A
32	Az	4	A
32	Az	10	G
32	Az	12	U
32	Az	13	U
32	Az	14	A
32	Az	15	U
32	Az	16	A
32	Az	18	A
32	Az	21	A
32	Az	22	A
32	Az	23	U
32	Az	24	U

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
32	Az	25	U
32	Az	26	A
32	Az	27	C
32	Az	32	A
33	Aw	2	G
33	Aw	4	U
33	Aw	5	A
33	Aw	6	U
33	Aw	7	A
33	Aw	8	U
33	Aw	9	A
33	Aw	11	U
33	Aw	12	U
33	Aw	13	U
33	Aw	14	A
33	Aw	16	A
33	Aw	21	A
33	Aw	22	A
33	Aw	23	A
33	Aw	28	A
33	Aw	30	G
33	Aw	32	U
33	Aw	34	U
33	Aw	41	A
33	Aw	44	C
33	Aw	48	U
33	Aw	49	U
33	Aw	50	A
33	Aw	51	U
33	Aw	54	U
33	Aw	55	A
33	Aw	56	A
33	Aw	61	U
33	Aw	63	A
33	Aw	65	A
33	Aw	68	U
33	Aw	70	C
33	Aw	71	C
33	Aw	72	A
33	Aw	73	A
33	Aw	74	C
33	Aw	76	A

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
34	Ax	2	A
34	Ax	3	G
34	Ax	4	G
34	Ax	7	A
34	Ax	8	U
34	Ax	9	A
34	Ax	11	U
34	Ax	12	U
34	Ax	13	U
34	Ax	14	A
34	Ax	15	A
34	Ax	17	A
34	Ax	22	A
34	Ax	23	A
34	Ax	30	G
34	Ax	33	U
34	Ax	35	A
34	Ax	41	A
34	Ax	42	G
34	Ax	43	G
34	Ax	44	A
34	Ax	45	G
34	Ax	46	A
34	Ax	48	U
34	Ax	49	G
34	Ax	50	G
34	Ax	51	A
34	Ax	54	U
34	Ax	59	U
34	Ax	62	C
34	Ax	74	C
34	Ax	76	A
35	A	1689	C
35	A	1692	A
35	A	1694	U
35	A	1700	U
35	A	1704	U
35	A	1708	A
35	A	1711	C
35	A	1724	A
35	A	1727	A
35	A	1728	U

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
35	A	1737	A
35	A	1748	G
35	A	1765	C
35	A	1777	A
35	A	1780	U
35	A	1805	A
35	A	1807	U
35	A	1809	U
35	A	1810	A
35	A	1817	C
35	A	1821	A
35	A	1827	C
35	A	1828	A
35	A	1829	A
35	A	1832	A
35	A	1836	A
35	A	1844	A
35	A	1854	U
35	A	1856	A
35	A	1869	A
35	A	1871	A
35	A	1873	A
35	A	1882	A
35	A	1886	G
35	A	1887	A
35	A	1893	A
35	A	1901	C
35	A	1903	C
35	A	1918	G
35	A	1937	A
35	A	1940	A
35	A	1974	A
35	A	1985	G
35	A	1992	C
35	A	1993	A
35	A	1994	A
35	A	2000	C
35	A	2002	G
35	A	2003	A
35	A	2015	G
35	A	2022	G
35	A	2030	U

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
35	A	2036	C
35	A	2037	U
35	A	2039	A
35	A	2054	U
35	A	2060	A
35	A	2069	U
35	A	2071	U
35	A	2079	C
35	A	2092	C
35	A	2099	U
35	A	2113	G
35	A	2125	C
35	A	2126	U
35	A	2132	A
35	A	2147	G
35	A	2159	U
35	A	2160	A
35	A	2163	A
35	A	2168	U
35	A	2173	G
35	A	2181	A
35	A	2192	A
35	A	2198	A
35	A	2200	A
35	A	2214	A
35	A	2219	C
35	A	2220	A
35	A	2221	C
35	A	2223	A
35	A	2224	C
35	A	2225	C
35	A	2226	U
35	A	2227	A
35	A	2232	A
35	A	2233	U
35	A	2237	A
35	A	2241	A
35	A	2243	A
35	A	2245	A
35	A	2246	A
35	A	2262	C
35	A	2263	C

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
35	A	2284	C
35	A	2285	U
35	A	2297	A
35	A	2300	G
35	A	2322	C
35	A	2331	C
35	A	2332	C
35	A	2345	G
35	A	2349	G
35	A	2350	A
35	A	2353	A
35	A	2357	C
35	A	2363	A
35	A	2372	U
35	A	2374	A
35	A	2390	A
35	A	2399	A
35	A	2401	A
35	A	2404	U
35	A	2406	A
35	A	2407	U
35	A	2414	C
35	A	2415	C
35	A	2417	C
35	A	2446	A
35	A	2451	A
35	A	2478	G
35	A	2485	U
35	A	2488	C
35	A	2493	C
35	A	2502	C
35	A	2520	C
35	A	2521	A
35	A	2527	A
35	A	2540	C
35	A	2570	C
35	A	2573	G
35	A	2577	C
35	A	2578	C
35	A	2582	A
35	A	2592	G
35	A	2593	G

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
35	A	2599	U
35	A	2600	A
35	A	2601	A
35	A	2603	C
35	A	2618	U
35	A	2627	G
35	A	2629	A
35	A	2630	U
35	A	2633	A
35	A	2635	G
35	A	2654	U
35	A	2656	U
35	A	2683	C
35	A	2686	G
35	A	2694	A
35	A	2695	G
35	A	2696	A
35	A	2706	A
35	A	2718	C
35	A	2719	G
35	A	2723	A
35	A	2724	G
35	A	2725	A
35	A	2732	G
35	A	2745	A
35	A	2757	A
35	A	2760	A
35	A	2761	C
35	A	2762	C
35	A	2763	U
35	A	2764	A
35	A	2765	A
35	A	2767	A
35	A	2768	A
35	A	2775	A
35	A	2777	G
35	A	2781	U
35	A	2782	A
35	A	2785	C
35	A	2786	U
35	A	2787	A
35	A	2790	A

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
35	A	2810	G
35	A	2832	A
35	A	2833	A
35	A	2847	C
35	A	2864	U
35	A	2865	C
35	A	2882	U
35	A	2883	A
35	A	2885	U
35	A	2888	A
35	A	2889	C
35	A	2893	A
35	A	2913	A
35	A	2917	G
35	A	2918	A
35	A	2922	A
35	A	2928	C
35	A	2935	A
35	A	2956	A
35	A	2989	G
35	A	2990	A
35	A	2992	G
35	A	2993	U
35	A	2994	U
35	A	3005	A
35	A	3016	G
35	A	3022	G
35	A	3041	U
35	A	3053	A
35	A	3054	G
35	A	3060	C
35	A	3066	C
35	A	3072	U
35	A	3089	A
35	A	3090	G
35	A	3096	U
35	A	3097	U
35	A	3100	U
35	A	3102	U
35	A	3108	U
35	A	3109	U
35	A	3110	C

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
35	A	3112	A
35	A	3113	A
35	A	3150	U
35	A	3157	C
35	A	3158	A
35	A	3162	C
35	A	3169	C
35	A	3172	C
35	A	3177	A
35	A	3180	A
35	A	3189	C
35	A	3190	A
35	A	3194	U
35	A	3199	U
35	A	3200	U
35	A	3207	A
35	A	3208	C
35	A	3209	A
35	A	3210	C
35	A	3212	C
35	A	3217	A
35	A	3218	A
35	A	3228	U
35	A	3229	U
35	A	3230	G
35	A	3231	U
36	B	8	U
36	B	16	C
36	B	21	A
36	B	45	G
36	B	48	U
36	B	54	C
36	B	55	U
36	B	56	U
36	B	58	A
36	B	64	A
36	B	69	U
36	B	76	A

All (3) RNA pucker outliers are listed below:

*Continued on next page...*

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Mol	Chain	Res	Type
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Mol	Chain	Res	Type
1	AA	1539	C
35	A	2112	A
35	A	2296	U

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

19 non-standard protein/DNA/RNA residues are modelled in this entry.

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
77	AYA	k	2	77	6,7,8	0.82	0	5,8,10	0.56	0
35	1MA	A	2617	35	16,25,26	1.17	3 (18%)	18,37,40	0.92	1 (5%)
36	PSU	B	39	36	18,21,22	0.75	0	22,30,33	2.57	4 (18%)
36	2MG	B	10	36	18,26,27	1.13	2 (11%)	16,38,41	0.88	1 (6%)
17	AYA	AQ	2	17	6,7,8	0.79	0	5,8,10	0.36	0
1	5MU	AA	1076	1	19,22,23	0.64	0	28,32,35	1.21	3 (10%)
1	5MC	AA	1488	1	18,22,23	0.31	0	26,32,35	0.44	0
35	PSU	A	3067	35	18,21,22	0.79	0	22,30,33	2.57	5 (22%)
35	OMG	A	3040	35	18,26,27	0.92	1 (5%)	19,38,41	0.60	0
42	SAC	K	2	42	7,8,9	0.24	0	8,9,11	0.55	0
35	OMG	A	2815	33,35,92	18,26,27	0.93	1 (5%)	19,38,41	0.61	0
1	B8T	AA	1486	93,1	19,22,23	0.30	0	26,31,34	0.32	0
9	5F0	AI	184	9	8,8,9	0.59	0	7,9,11	1.19	1 (14%)
36	1MA	B	9	36	16,25,26	1.16	3 (18%)	18,37,40	0.87	1 (5%)
35	OMU	A	3039	35,92	19,22,23	0.27	0	26,31,34	0.43	0
1	MA6	AA	1584	1	18,26,27	0.75	0	19,38,41	0.59	0
51	AYA	U	2	51	6,7,8	0.80	0	5,8,10	0.45	0
29	AYA	A2	2	29	6,7,8	0.80	0	5,8,10	0.55	0
1	MA6	AA	1583	1	18,26,27	0.75	0	19,38,41	0.58	0

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
77	AYA	k	2	77	-	0/4/6/8	-
35	1MA	A	2617	35	-	0/3/25/26	0/3/3/3
36	PSU	B	39	36	-	1/7/25/26	0/2/2/2
36	2MG	B	10	36	-	0/5/27/28	0/3/3/3
17	AYA	AQ	2	17	-	1/4/6/8	-
1	5MU	AA	1076	1	-	0/7/25/26	0/2/2/2
1	5MC	AA	1488	1	-	0/7/25/26	0/2/2/2
35	PSU	A	3067	35	-	0/7/25/26	0/2/2/2
35	OMG	A	3040	35	-	0/5/27/28	0/3/3/3
42	SAC	K	2	42	-	0/7/8/10	-
35	OMG	A	2815	33,35,92	-	0/5/27/28	0/3/3/3
1	B8T	AA	1486	93,1	-	2/7/27/28	0/2/2/2
9	5F0	AI	184	9	-	0/9/9/10	-
36	1MA	B	9	36	-	0/3/25/26	0/3/3/3
35	OMU	A	3039	35,92	-	0/9/27/28	0/2/2/2
1	MA6	AA	1584	1	-	2/7/29/30	0/3/3/3
51	AYA	U	2	51	-	0/4/6/8	-
29	AYA	A2	2	29	-	0/4/6/8	-
1	MA6	AA	1583	1	-	0/7/29/30	0/3/3/3

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
35	A	2617	1MA	C6-N6	3.12	1.35	1.27
36	B	9	1MA	C6-N6	3.12	1.35	1.27
36	B	10	2MG	C8-N7	-2.88	1.30	1.35
36	B	10	2MG	C5-C6	-2.32	1.42	1.47
35	A	2815	OMG	C5-C6	-2.28	1.42	1.47
35	A	3040	OMG	C5-C6	-2.25	1.42	1.47
35	A	2617	1MA	C5-C4	-2.13	1.37	1.43
36	B	9	1MA	C5-C4	-2.10	1.37	1.43
35	A	2617	1MA	C8-N7	-2.01	1.31	1.35
36	B	9	1MA	C8-N7	-2.00	1.31	1.35

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
36	B	39	PSU	N1-C2-N3	8.14	124.35	115.13
35	A	3067	PSU	N1-C2-N3	8.11	124.32	115.13

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
36	B	39	PSU	C4-N3-C2	-6.58	116.86	126.34
35	A	3067	PSU	C4-N3-C2	-6.56	116.89	126.34
1	AA	1076	5MU	C4-N3-C2	-4.80	121.13	127.35
36	B	39	PSU	O2-C2-N1	-3.74	118.67	122.79
35	A	3067	PSU	O2-C2-N1	-3.73	118.68	122.79
9	AI	184	5F0	O-C-CB	-2.77	117.37	125.43
1	AA	1076	5MU	C5-C4-N3	2.60	117.53	115.31
36	B	39	PSU	O2-C2-N3	-2.56	116.98	121.82
35	A	3067	PSU	O2-C2-N3	-2.56	117.00	121.82
1	AA	1076	5MU	N3-C2-N1	2.25	117.87	114.89
36	B	10	2MG	O6-C6-C5	2.22	128.70	124.37
36	B	9	1MA	N1-C6-N6	2.15	125.24	119.77
35	A	3067	PSU	O4'-C1'-C2'	2.10	108.10	105.14
35	A	2617	1MA	N1-C6-N6	2.10	125.10	119.77

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	AA	1584	MA6	C5-C6-N6-C9
1	AA	1486	B8T	O4'-C4'-C5'-O5'
17	AQ	2	AYA	C-CA-N-CT
1	AA	1584	MA6	C4'-C5'-O5'-P
36	B	39	PSU	O4'-C4'-C5'-O5'
1	AA	1486	B8T	C3'-C4'-C5'-O5'

There are no ring outliers.

No monomer is involved in short contacts.

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 272 ligands modelled in this entry, 259 are monoatomic - leaving 13 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
91	SPD	AA	1703	-	9,9,9	0.27	0	8,8,8	1.25	1 (12%)
97	GDP	AX	503	-	24,30,30	0.87	1 (4%)	30,47,47	0.63	0
95	FES	AT	201	13,20	0,4,4	-	-	-	-	-
98	PUT	A	3304	-	5,5,5	0.24	0	4,4,4	0.51	0
91	SPD	A	3301	-	9,9,9	0.29	0	8,8,8	1.20	0
99	VAL	B	101	36	4,6,7	0.54	0	6,7,9	0.83	0
91	SPD	A	3302	-	9,9,9	0.30	0	8,8,8	1.17	0
95	FES	r	201	83,40	0,4,4	-	-	-	-	-
96	ATP	AX	501	93	26,33,33	0.74	0	31,52,52	0.66	0
89	NAD	AA	1701	93	42,48,48	0.56	0	50,73,73	0.66	1 (2%)
90	SPM	AA	1702	-	13,13,13	0.29	0	12,12,12	0.96	0
91	SPD	A	3303	-	9,9,9	0.31	0	8,8,8	1.15	0
95	FES	AP	201	16,5	0,4,4	-	-	-	-	-

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
91	SPD	AA	1703	-	-	0/7/7/7	-
97	GDP	AX	503	-	-	0/12/32/32	0/3/3/3
98	PUT	A	3304	-	-	0/3/3/3	-
99	VAL	B	101	36	-	0/5/6/8	-
91	SPD	A	3301	-	-	1/7/7/7	-
95	FES	AT	201	13,20	-	-	0/1/1/1
91	SPD	A	3302	-	-	0/7/7/7	-
95	FES	r	201	83,40	-	-	0/1/1/1
96	ATP	AX	501	93	-	0/18/38/38	0/3/3/3
89	NAD	AA	1701	93	-	5/26/62/62	0/5/5/5
90	SPM	AA	1702	-	-	1/11/11/11	-
91	SPD	A	3303	-	-	2/7/7/7	-
95	FES	AP	201	16,5	-	-	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
97	AX	503	GDP	C5-C6	-2.13	1.43	1.47

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
89	AA	1701	NAD	C5A-C6A-N6A	2.35	123.92	120.35
91	AA	1703	SPD	C4-C5-N6	-2.03	106.67	112.14

There are no chirality outliers.

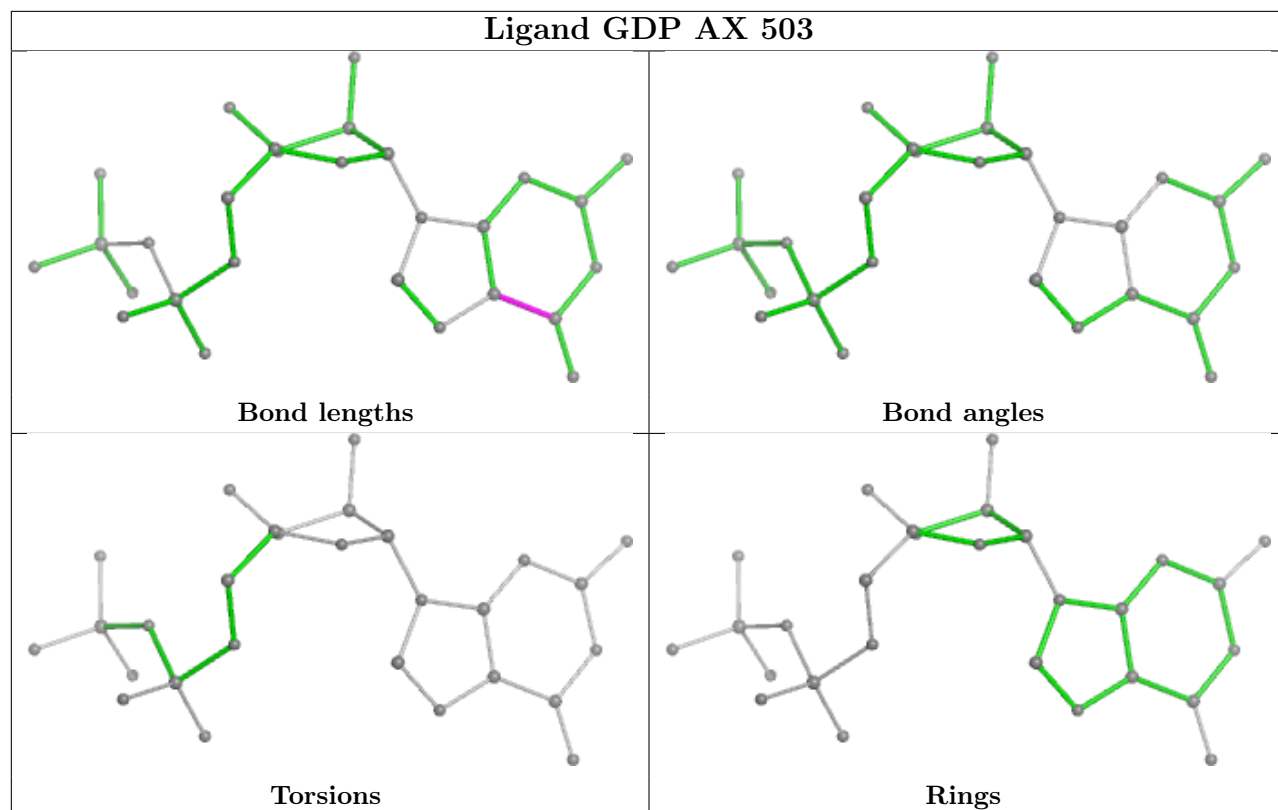
All (9) torsion outliers are listed below:

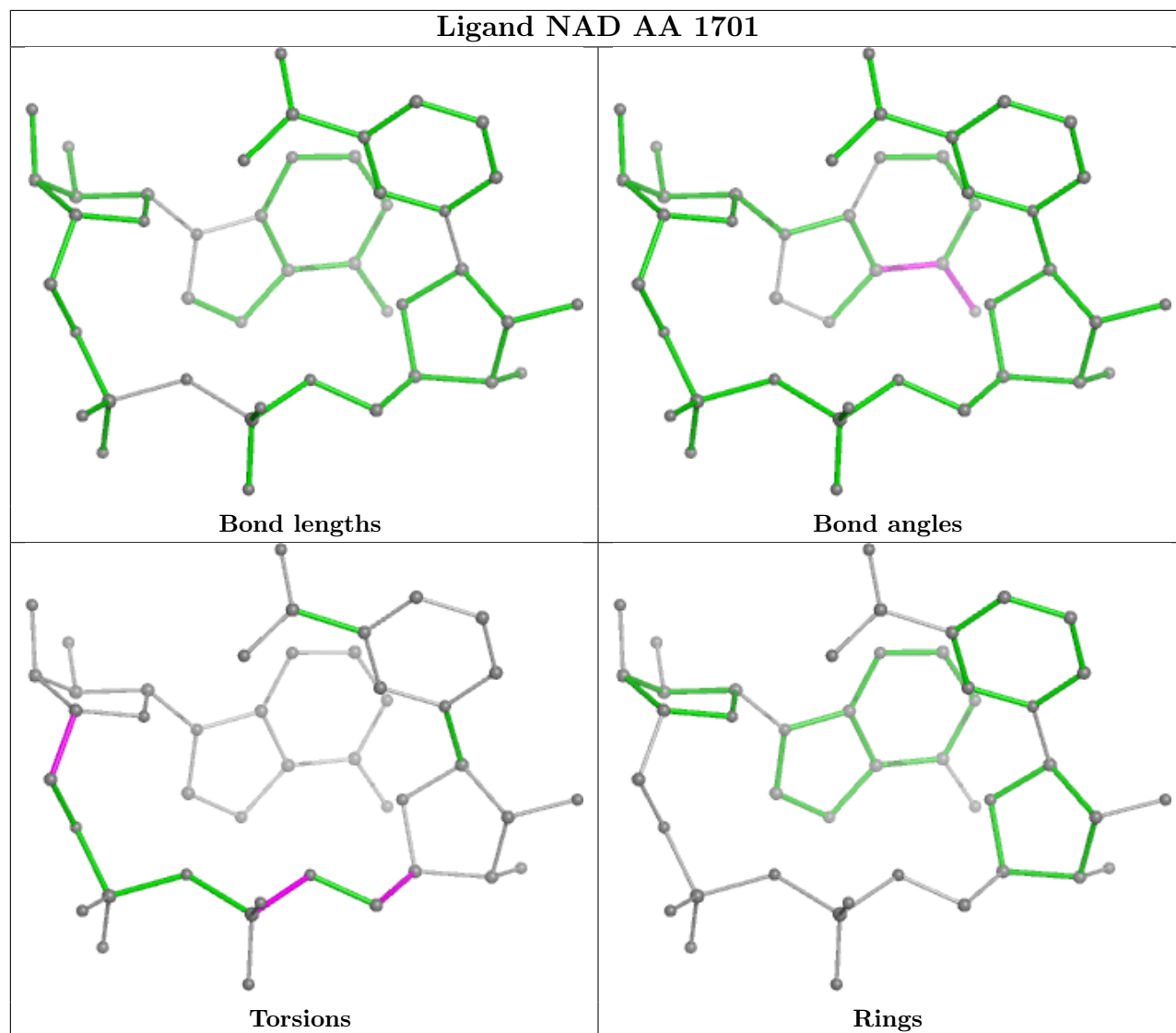
Mol	Chain	Res	Type	Atoms
89	AA	1701	NAD	C3D-C4D-C5D-O5D
89	AA	1701	NAD	O4B-C4B-C5B-O5B
91	A	3303	SPD	C4-C5-N6-C7
91	A	3301	SPD	N6-C7-C8-C9
90	AA	1702	SPM	N10-C11-C12-C13
89	AA	1701	NAD	C3B-C4B-C5B-O5B
89	AA	1701	NAD	O4D-C4D-C5D-O5D
91	A	3303	SPD	C8-C7-N6-C5
89	AA	1701	NAD	C5D-O5D-PN-O3

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 [i](#)

There are no chain breaks in this entry.



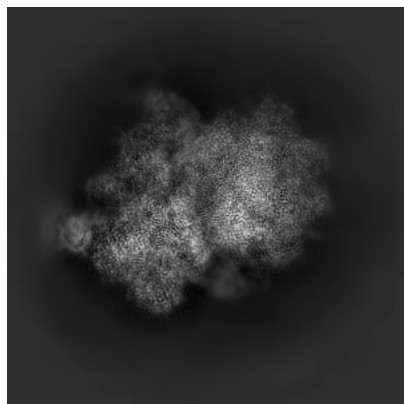
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-13982. These allow visual inspection of the internal detail of the map and identification of artifacts.

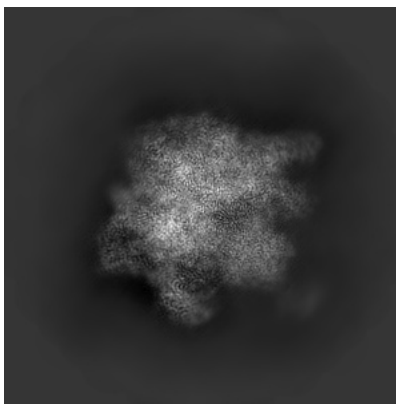
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

### 6.1 Orthogonal projections [i](#)

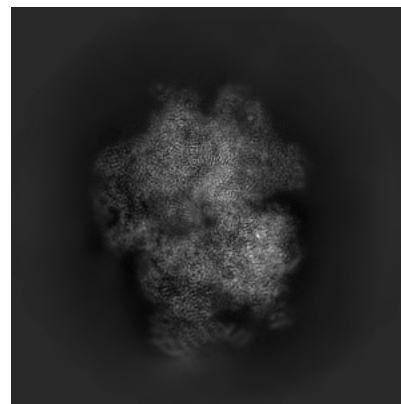
#### 6.1.1 Primary map



X

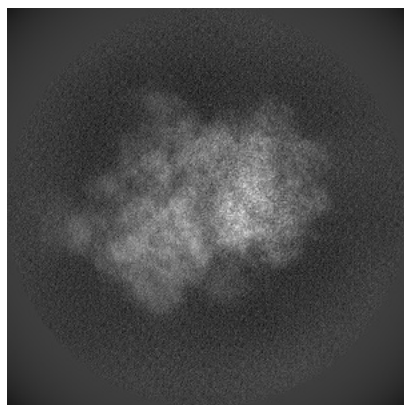


Y

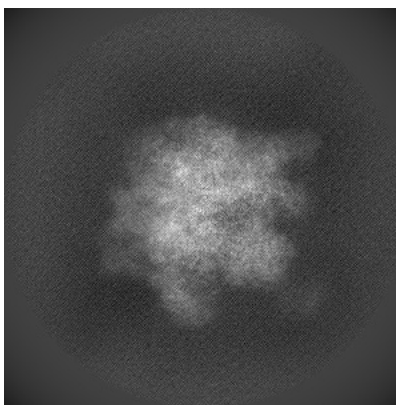


Z

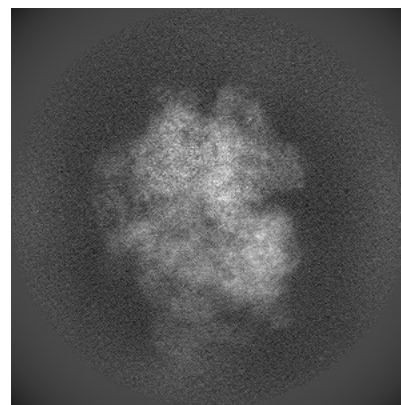
#### 6.1.2 Raw map



X



Y

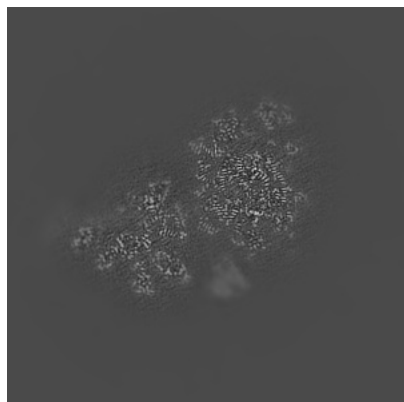


Z

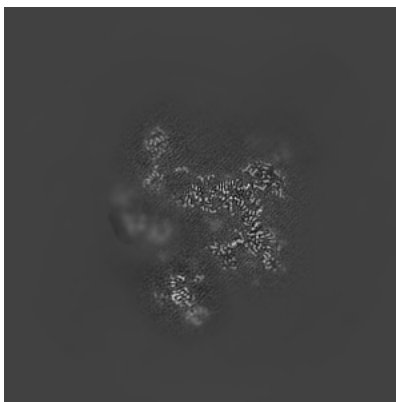
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

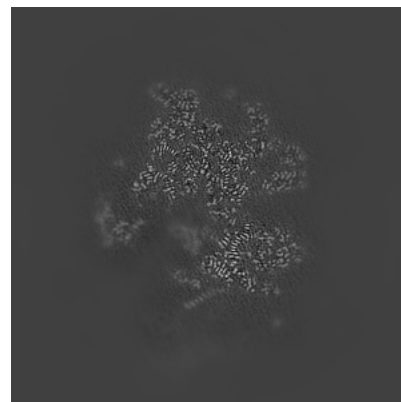
### 6.2.1 Primary map



X Index: 270

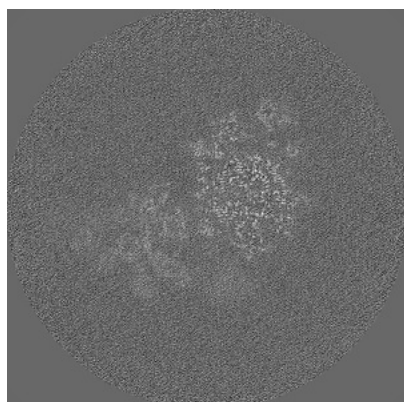


Y Index: 270

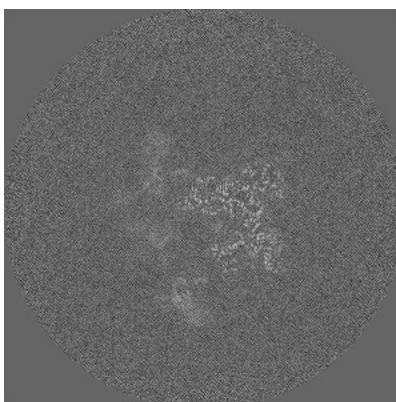


Z Index: 270

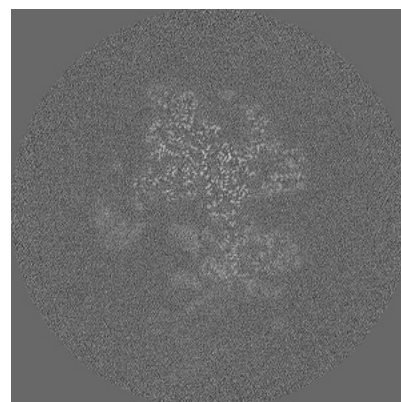
### 6.2.2 Raw map



X Index: 270



Y Index: 270

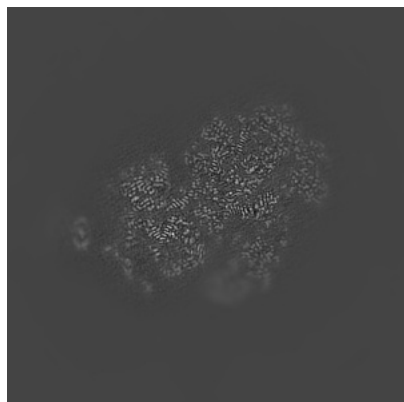


Z Index: 270

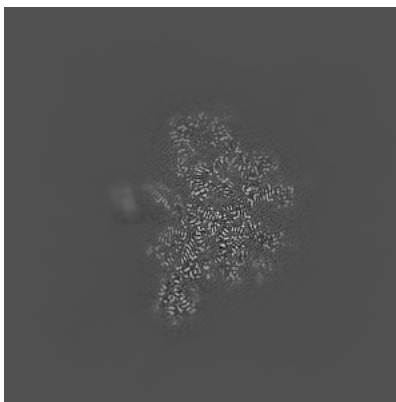
The images above show central slices of the map in three orthogonal directions.

## 6.3 Largest variance slices [i](#)

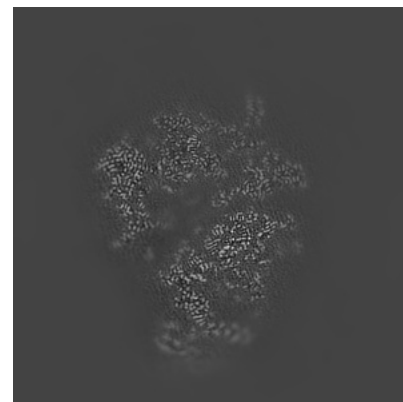
### 6.3.1 Primary map



X Index: 289

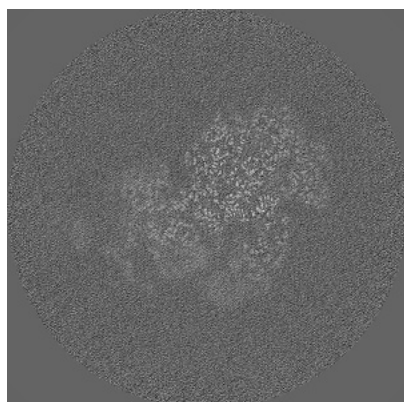


Y Index: 318

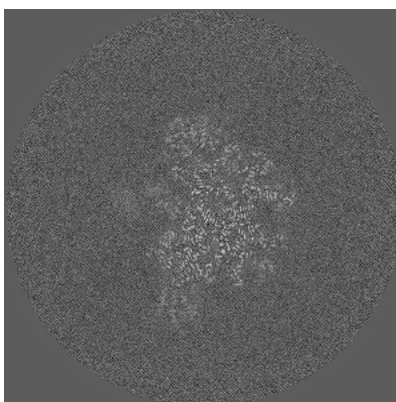


Z Index: 235

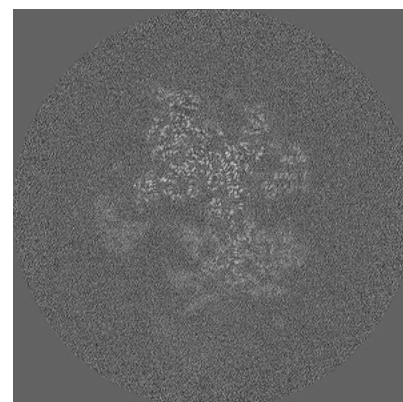
### 6.3.2 Raw map



X Index: 289



Y Index: 316

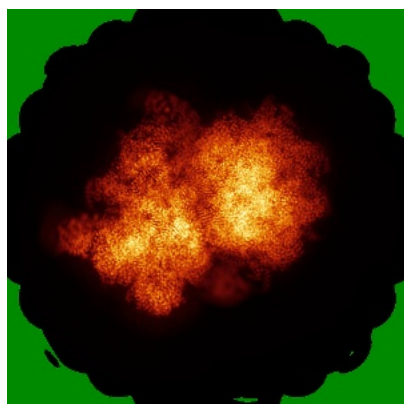


Z Index: 267

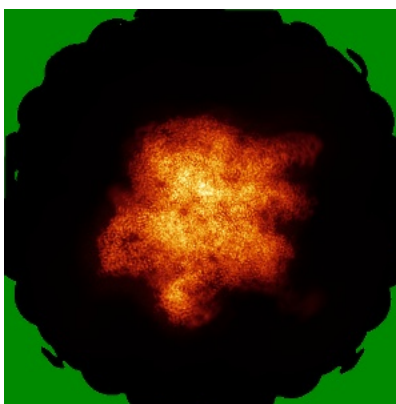
The images above show the largest variance slices of the map in three orthogonal directions.

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

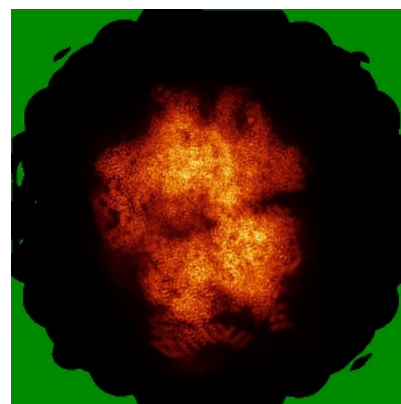
### 6.4.1 Primary map



X

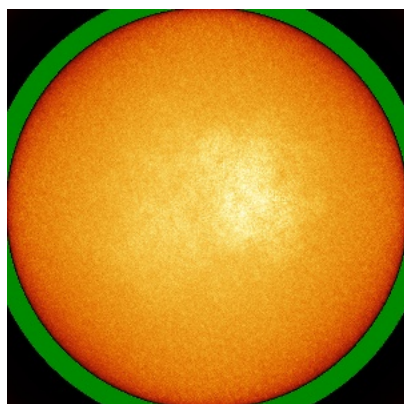


Y

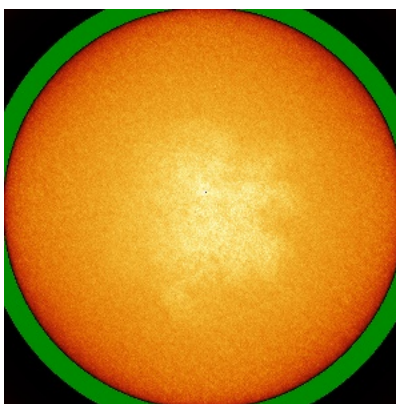


Z

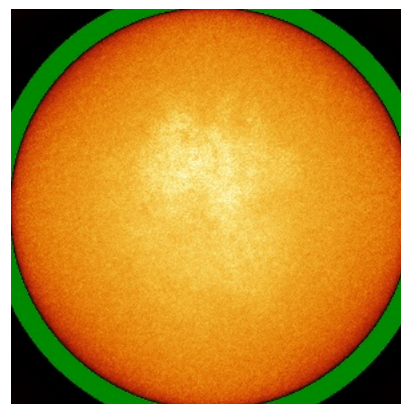
### 6.4.2 Raw map



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.

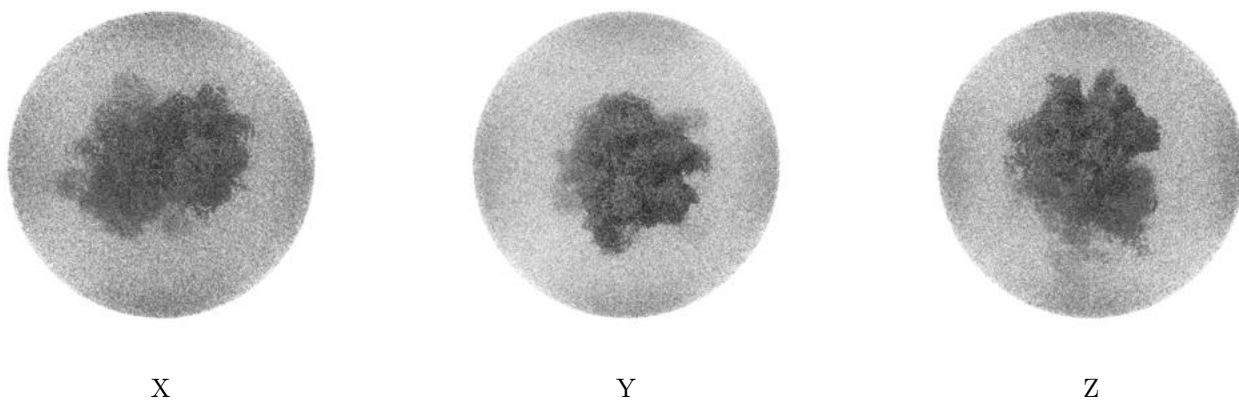
## 6.5 Orthogonal surface views [i](#)

### 6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 3.8. 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



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.

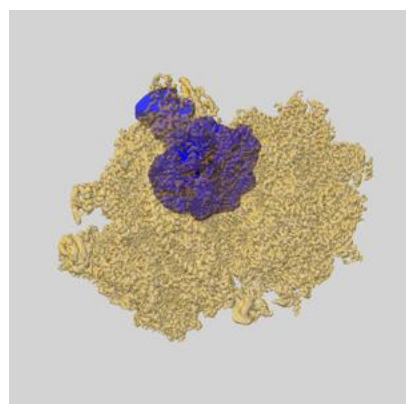
## 6.6 Mask visualisation [i](#)

This section shows the 3D surface view of the primary map at 50% transparency overlaid with the specified mask at 0% transparency

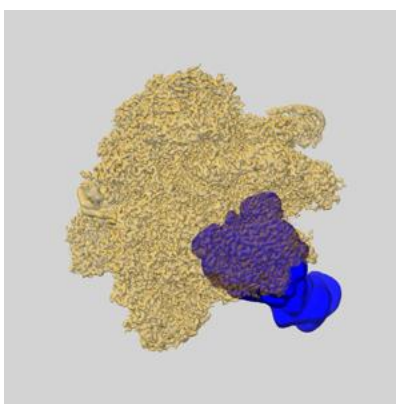
A mask typically either:

- Encompasses the whole structure
- Separates out a domain, a functional unit, a monomer or an area of interest from a larger structure

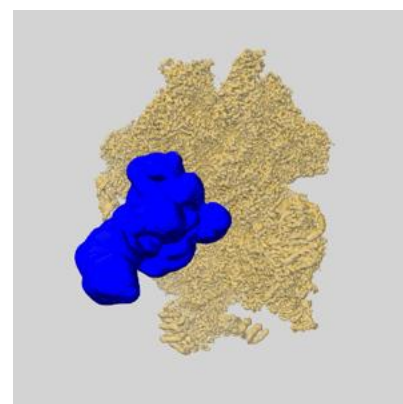
### 6.6.1 emd\_13982\_msk\_1.map [i](#)



X

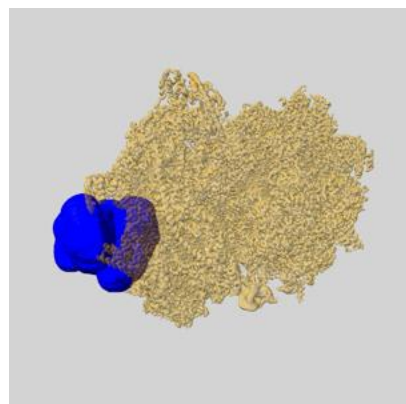


Y

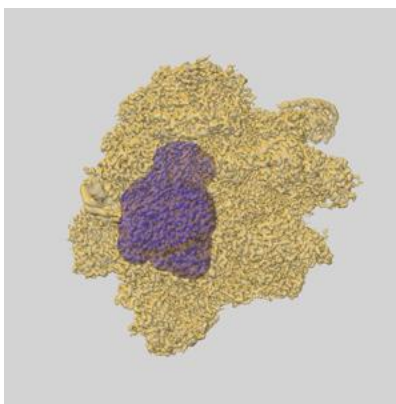


Z

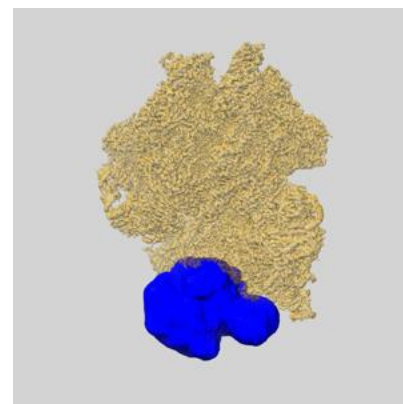
### 6.6.2 emd\_13982\_msk\_2.map [i](#)



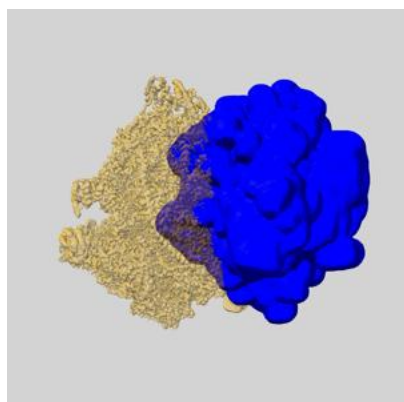
X



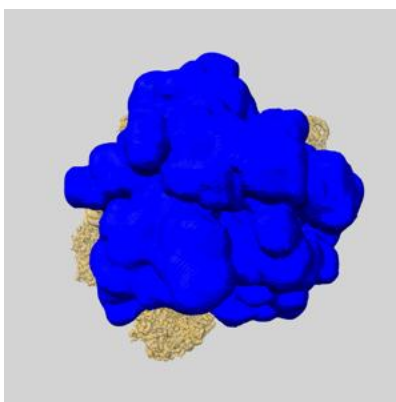
Y



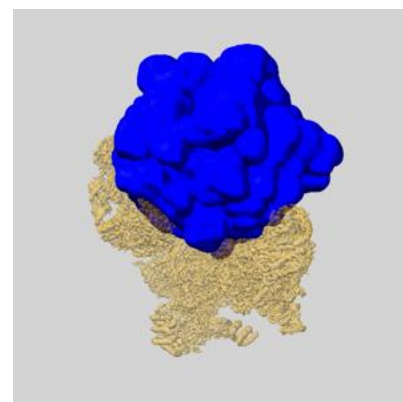
Z

6.6.3 emd\_13982\_msk\_3.map [i](#)

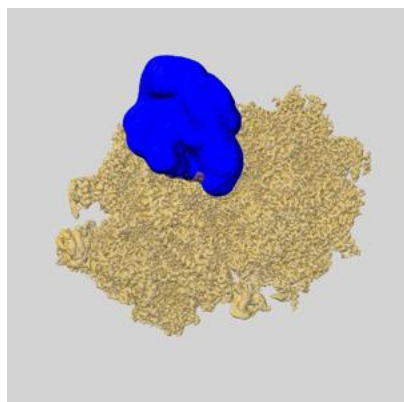
X



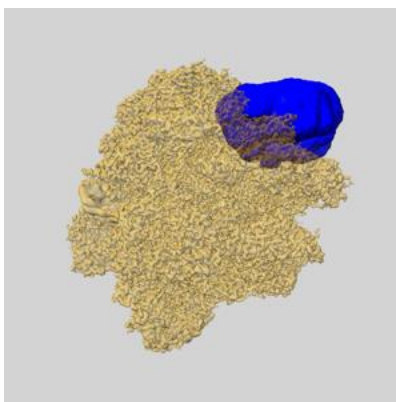
Y



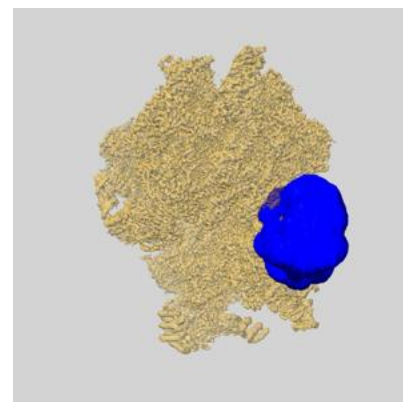
Z

6.6.4 emd\_13982\_msk\_4.map [i](#)

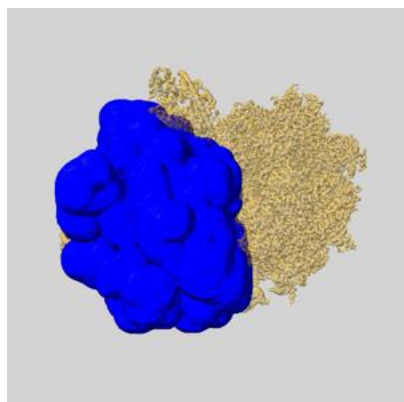
X



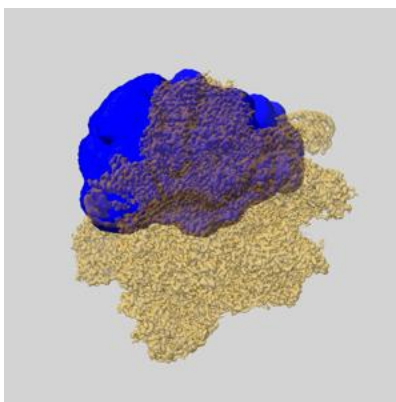
Y



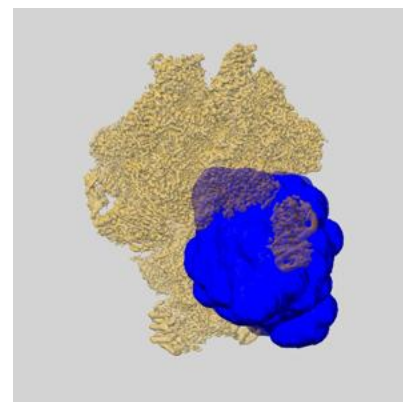
Z

6.6.5 emd\_13982\_msk\_5.map [i](#)

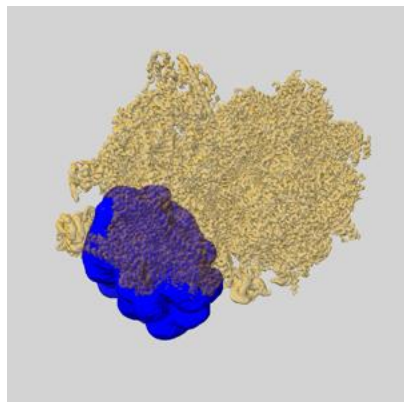
X



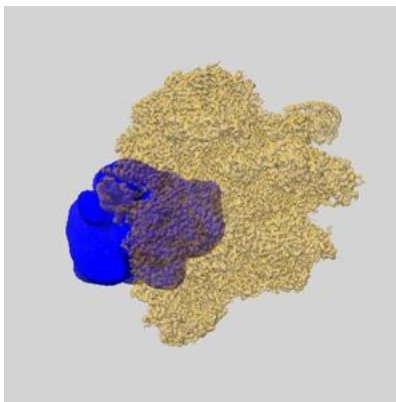
Y



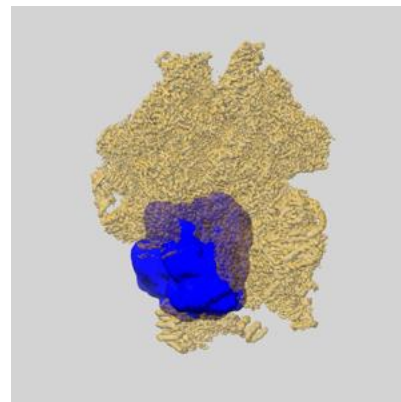
Z

6.6.6 emd\_13982\_msk\_6.map [i](#)

X



Y



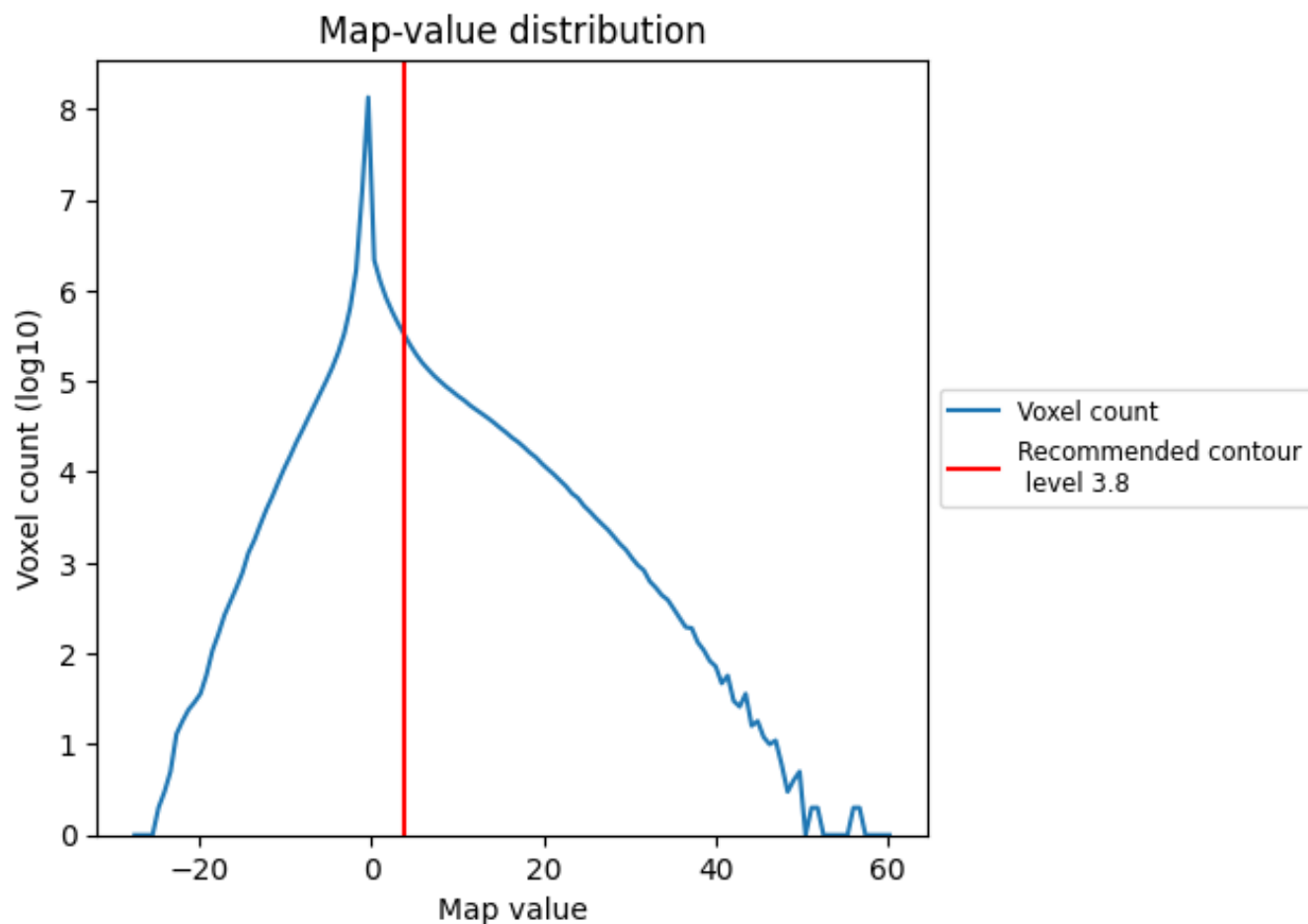
Z



## 7 Map analysis [i](#)

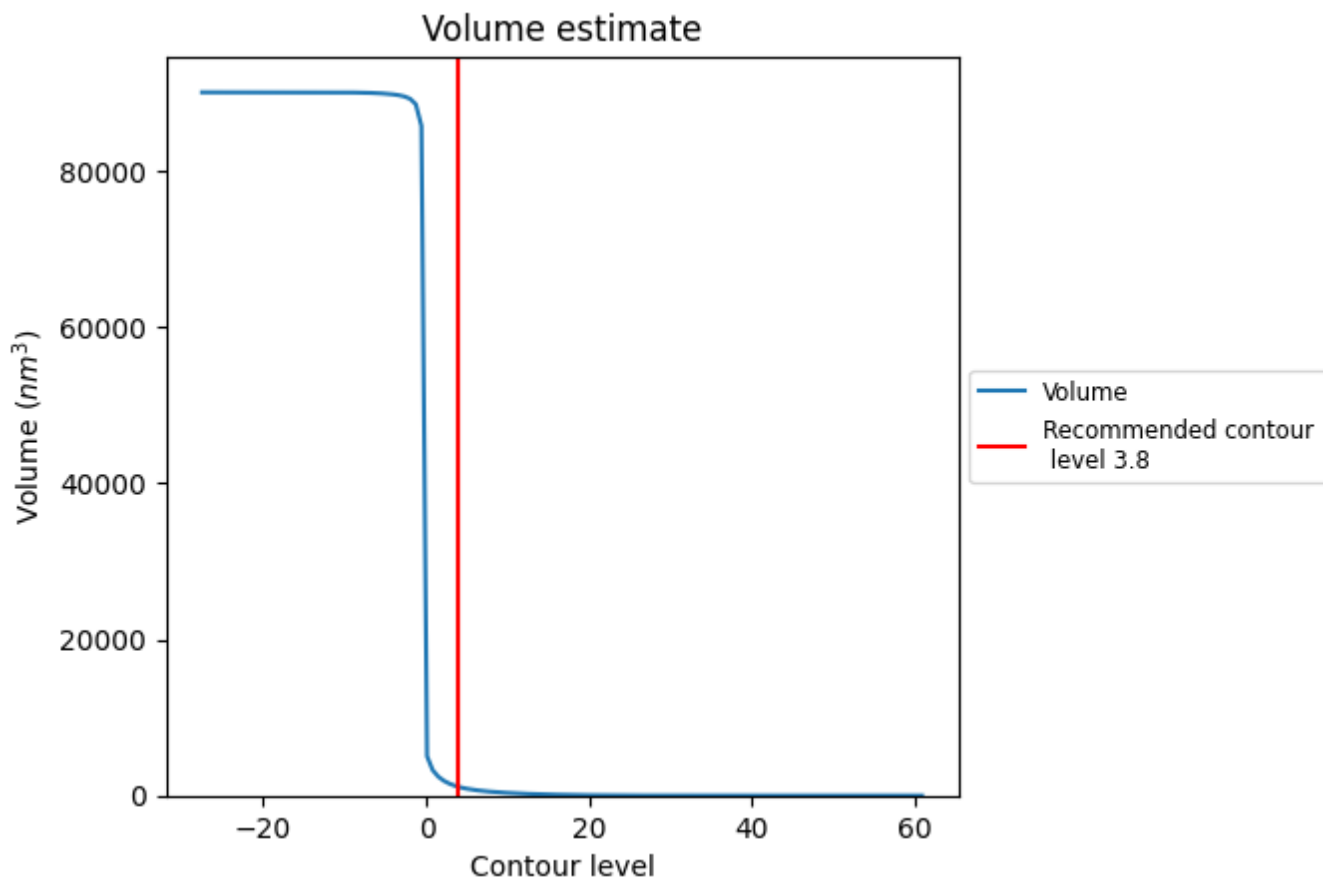
This section contains the results of statistical analysis of the map.

### 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.

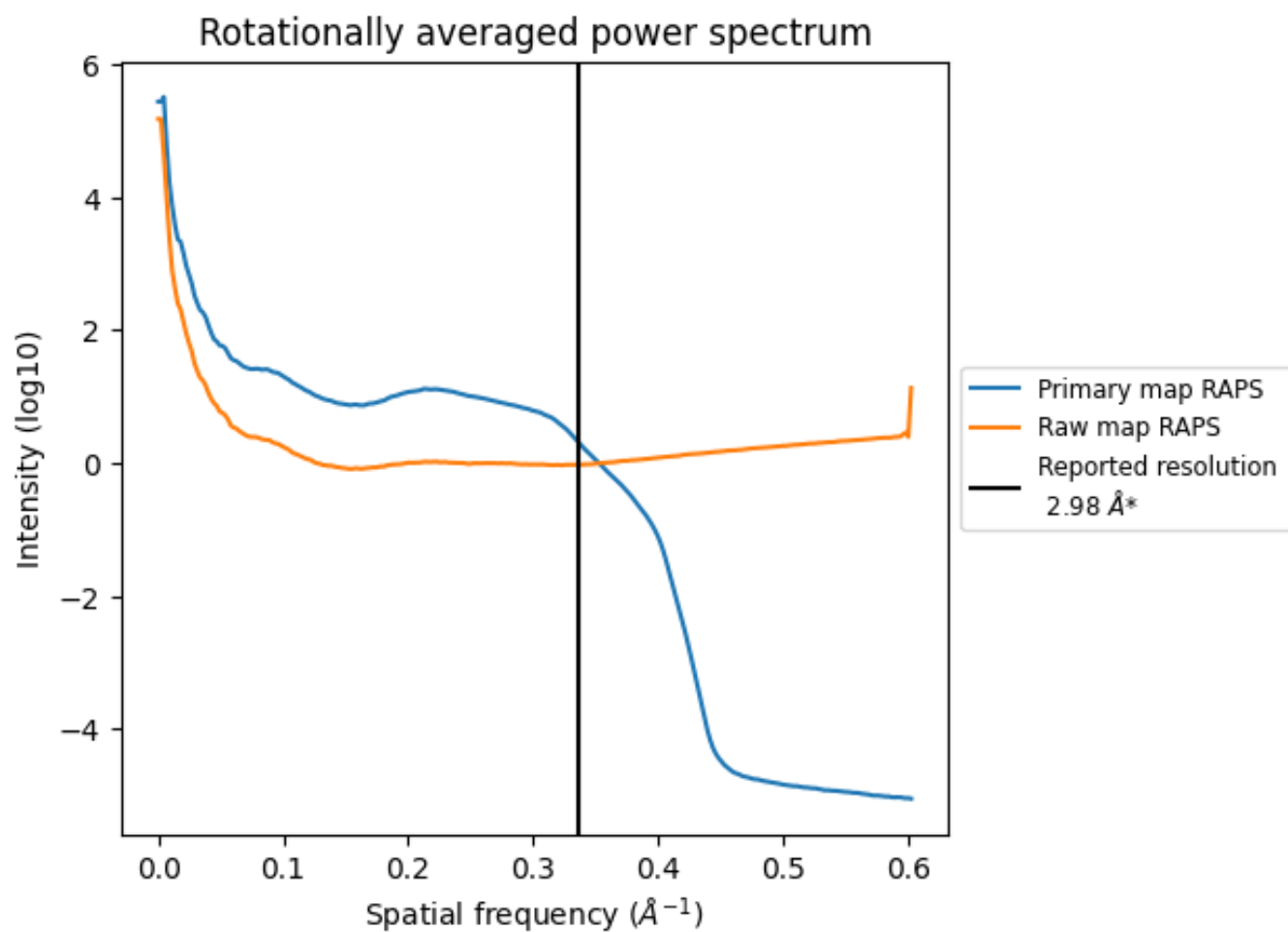
## 7.2 Volume estimate [i](#)



The volume at the recommended contour level is 1179  $\text{nm}^3$ ; this corresponds to an approximate mass of 1065 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

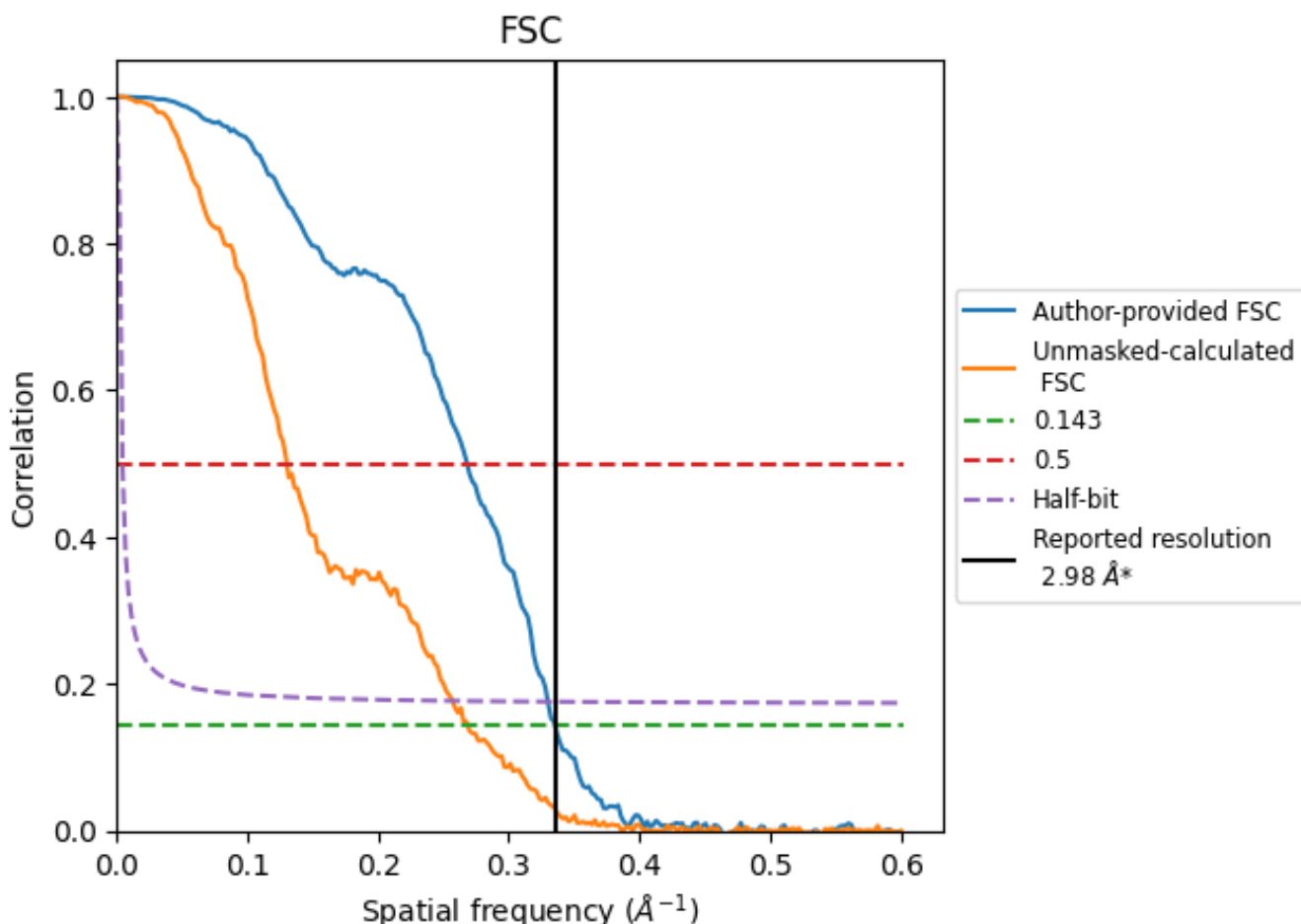


\*Reported resolution corresponds to spatial frequency of 0.336 Å<sup>-1</sup>

## 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  $0.336 \text{\AA}^{-1}$

## 8.2 Resolution estimates [i](#)

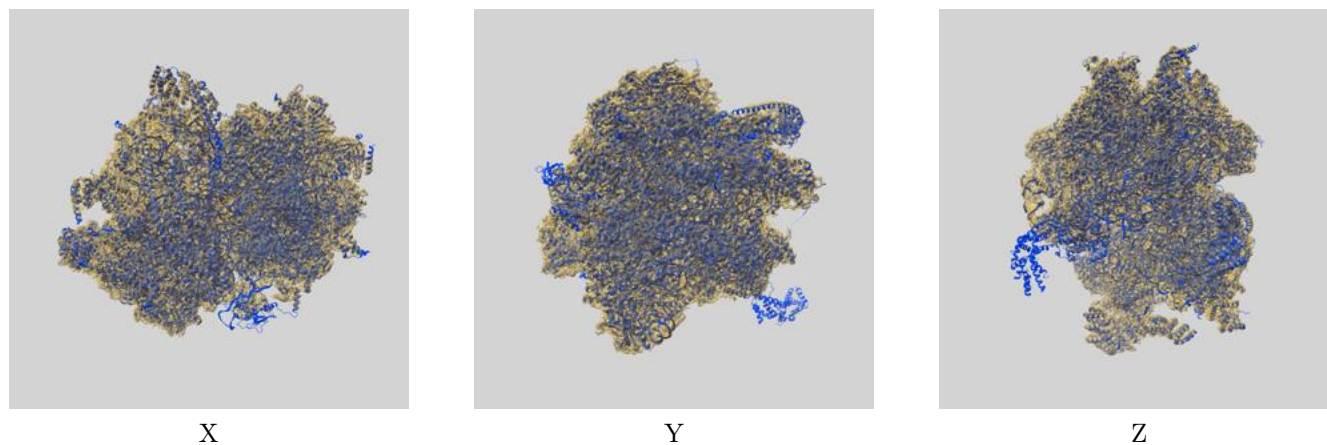
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.98	-	-
Author-provided FSC curve	2.98	3.73	3.03
Unmasked-calculated*	3.72	7.69	3.89

\*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 3.72 differs from the reported value 2.98 by more than 10 %

## 9 Map-model fit [i](#)

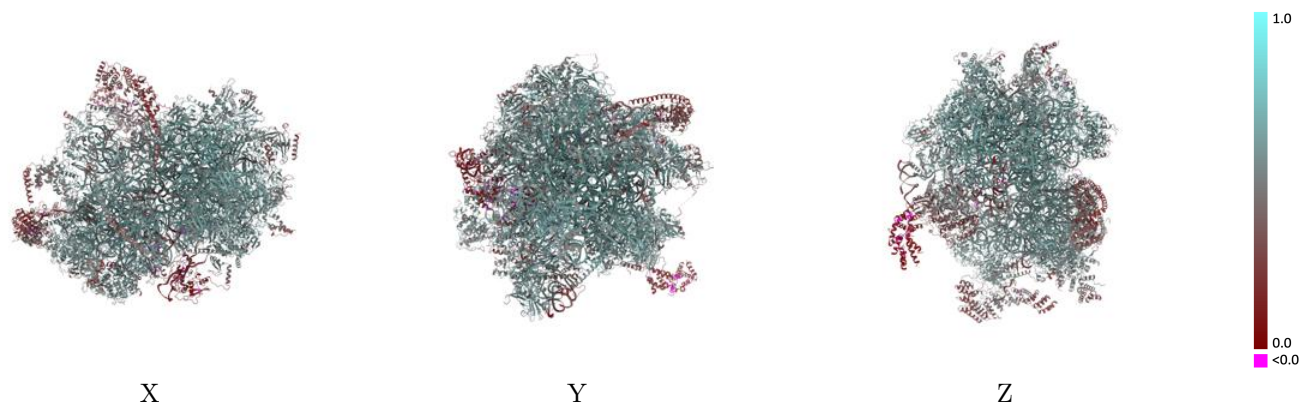
This section contains information regarding the fit between EMDB map EMD-13982 and PDB model 7QI6. Per-residue inclusion information can be found in section 3 on page 30.

### 9.1 Map-model overlay [i](#)



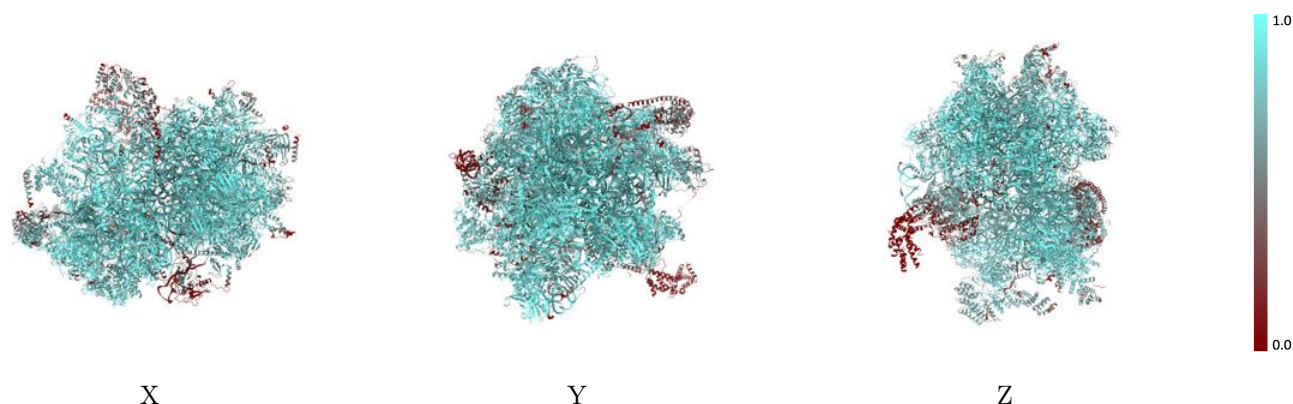
The images above show the 3D surface view of the map at the recommended contour level 3.8 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



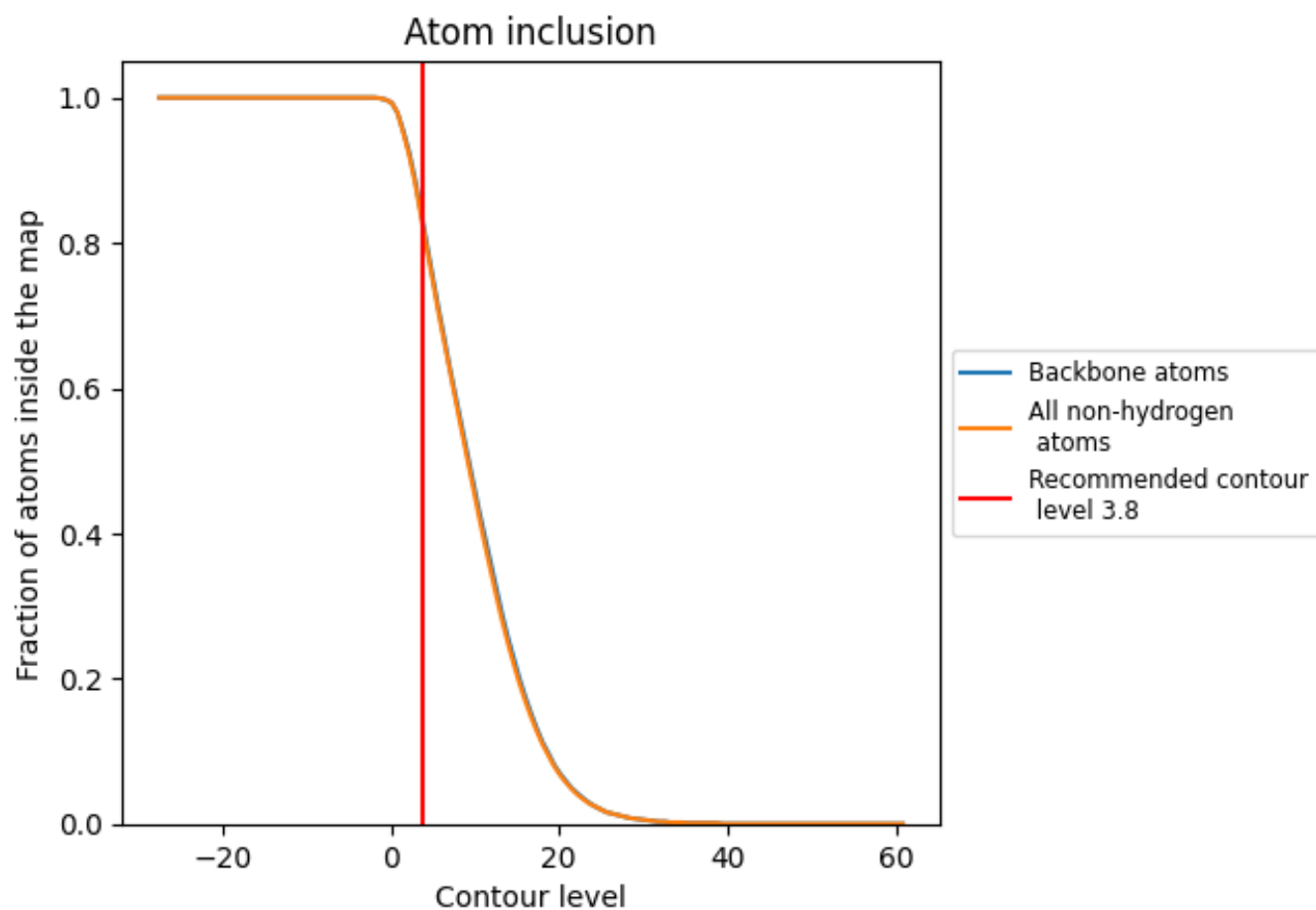
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (3.8).

## 9.4 Atom inclusion [i](#)









































































At the recommended contour level, 83% of all backbone atoms, 82% 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 (3.8) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8240	 0.5390
0	 0.8510	 0.5830
1	 0.8050	 0.5610
2	 0.9950	 0.6800
3	 0.9750	 0.6550
4	 0.9360	 0.6180
5	 0.8370	 0.5620
6	 0.9000	 0.5580
7	 0.7140	 0.5240
8	 0.6050	 0.3960
9	 0.7810	 0.5530
A	 0.9350	 0.6140
A0	 0.7740	 0.4760
A1	 0.8590	 0.5260
A2	 0.8240	 0.4980
A3	 0.9080	 0.5920
A4	 0.7100	 0.3630
AA	 0.9700	 0.6030
AB	 0.8920	 0.5590
AC	 0.9580	 0.6090
AD	 0.8690	 0.5460
AE	 0.9030	 0.5670
AF	 0.8980	 0.5480
AG	 0.8500	 0.5260
AH	 0.9120	 0.5640
AI	 0.9090	 0.5650
AJ	 0.8850	 0.5410
AK	 0.9570	 0.6120
AL	 0.8340	 0.5360
AM	 0.8720	 0.5490
AN	 0.9140	 0.5800
AO	 0.8670	 0.5360
AP	 0.9080	 0.5720
AQ	 0.9390	 0.5960
AR	 0.7610	 0.4710





































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Chain	Atom inclusion	Q-score
AS	 0.7970	 0.4770
AT	 0.8860	 0.5490
AU	 0.7750	 0.4690
AV	 0.4290	 0.2850
AW	 0.8830	 0.5290
AX	 0.8950	 0.5400
AY	 0.7530	 0.4710
AZ	 0.8660	 0.5520
Aw	 0.6130	 0.3250
Ax	 0.5340	 0.2470
Az	 0.5350	 0.3310
B	 0.8800	 0.4590
D	 0.8990	 0.6120
E	 0.9120	 0.6160
F	 0.9210	 0.6240
H	 0.3620	 0.3170
I	 0.3780	 0.3770
J	 0.1870	 0.3140
K	 0.9360	 0.6280
L	 0.9140	 0.6100
M	 0.9100	 0.6130
N	 0.8680	 0.5850
O	 0.9090	 0.6100
P	 0.9410	 0.5920
Q	 0.7960	 0.5570
R	 0.9430	 0.6400
S	 0.9080	 0.6120
T	 0.9260	 0.6140
U	 0.8060	 0.5560
V	 0.7310	 0.5180
W	 0.9500	 0.6270
X	 0.8250	 0.5650
Y	 0.8900	 0.5950
Z	 0.9120	 0.6140
a	 0.7850	 0.5470
b	 0.9170	 0.6110
c	 0.8100	 0.5570
d	 0.6180	 0.4600
e	 0.7060	 0.4010
f	 0.6560	 0.4380
g	 0.8770	 0.5880
h	 0.6640	 0.5140

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Chain	Atom inclusion	Q-score
i	 0.9560	 0.6530
j	 0.8260	 0.5510
k	 0.5090	 0.4460
l	 0.3110	 0.3750
m	 0.6270	 0.4050
o	 0.9530	 0.6340
p	 0.6670	 0.4820
q	 0.5520	 0.4300
r	 0.8470	 0.5760
s	 0.8680	 0.5840
t	 0.0060	 0.2170
u	 0.0000	 0.1720
v	 0.0000	 0.1070
w	 0.0000	 0.0340
x	 0.0000	 0.0660
y	 0.0000	 0.0730
z	 0.3880	 0.1360