



## wwPDB EM Validation Summary Report ⓘ

Nov 20, 2022 – 02:32 am GMT

PDB ID : 6GB2  
EMDB ID : EMD-4370  
Title : Unique features of mammalian mitochondrial translation initiation revealed by cryo-EM. This file contains the 39S ribosomal subunit.  
Authors : Kummer, E.; Leibundgut, M.; Boehringer, D.; Ban, N.  
Deposited on : 2018-04-13  
Resolution : 3.20 Å(reported)

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

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

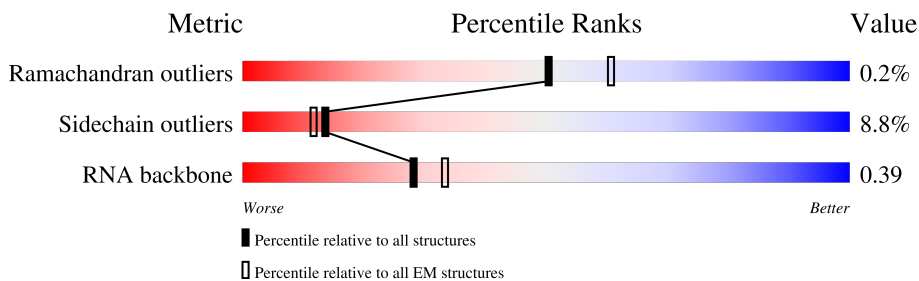
EMDB validation analysis : 0.0.1.dev43  
Mogul : 1.8.4, CSD as541be (2020)  
MolProbity : 4.02b-467  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : 1.9.9  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.31.2

# 1 Overall quality at a glance

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

The reported resolution of this entry is 3.20 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	BL	198	
1	CL	198	
1	DL	198	
1	EL	198	
1	FL	198	
1	GL	198	
1	HL	198	
2	B0	148	

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Mol	Chain	Length	Quality of chain
3	B1	256	
4	B2	252	
5	B3	161	
6	B4	126	
7	B5	188	
8	B6	65	
9	B7	95	
10	B8	188	
11	B9	100	
12	BA	1571	
13	BB	73	
14	BC	657	
15	BD	306	
16	BE	348	
17	BF	294	
18	BI	268	
19	BJ	262	
20	BK	192	
21	BN	178	
22	BO	145	
23	BP	296	
24	BQ	251	
25	BR	169	
26	BS	180	
27	BT	292	

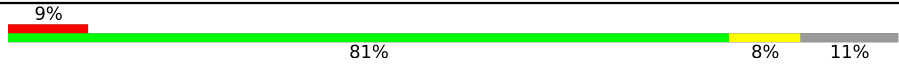

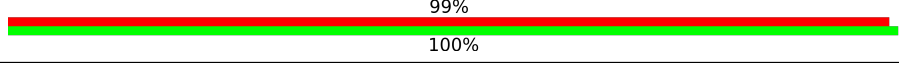
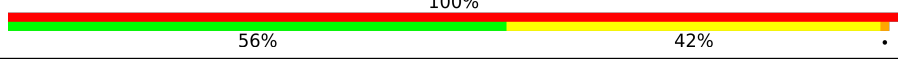
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Mol	Chain	Length	Quality of chain
28	BU	149	8% 91% 6%
29	BV	209	69% 5% 26%
30	BW	210	6% 73% 6% 21%
31	BX	150	20% 92% 7%
32	BY	216	43% 85% 11% 5%
33	Ba	423	12% 84% 9% 7%
34	Bb	380	14% 85% 8% 7%
35	Bc	334	14% 84% 12%
36	Bd	206	34% 44% 52%
37	Be	135	21% 79% 11% 10%
38	Bf	142	21% 66% 8% 24%
39	Bg	159	5% 83% 10% 7%
40	Bh	332	11% 79% 8% 13%
41	Bi	306	47% 81% 15%
42	Bj	279	67% 72% 6% 22%
43	Bk	212	44% 60% 36%
44	Bl	166	72% 8% 20%
45	Bm	159	50% 65% 31%
46	Bn	128	5% 67% 9% 24%
47	Bo	124	10% 71% 6% 22%
48	Bp	112	43% 82% 13%
49	Bq	138	36% 46% 51%
50	Bt	102	76% 16% 8%
51	Bu	205	32% 67% 6% 26%
52	Bv	222	21% 59% 39%

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Mol	Chain	Length	Quality of chain
53	Bw	433	
54	Bx	196	
55	Bz	82	
56	AV	71	

## 2 Entry composition [i](#)

There are 64 unique types of molecules in this entry. The entry contains 111109 atoms, of which 0 are hydrogens and 0 are deuteriums.

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

- Molecule 1 is a protein called Mitochondrial ribosomal protein L12.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
1	CL	45	317	203	52	62	0	0
1	DL	27	213	137	33	43	0	0
1	EL	28	222	143	35	44	0	0
1	FL	27	213	137	33	43	0	0
1	GL	27	213	137	33	43	0	0
1	HL	26	205	131	32	42	0	0
1	BL	70	537	346	93	98	0	0

- Molecule 2 is a protein called Mitochondrial ribosomal protein L27.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B0	110	857	553	156	145	3	0	0

- Molecule 3 is a protein called Mitochondrial ribosomal protein L28.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	B1	244	2036	1315	363	353	5	0	0

- Molecule 4 is a protein called Mitochondrial ribosomal protein L47.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	B2	179	1548	992	290	260	6	0	0

- Molecule 5 is a protein called 'Mitochondrial ribosomal protein L30.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	B3	118	968	622	178	165	3	0	0

- Molecule 6 is a protein called 'Mitochondrial ribosomal protein L55.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	B4	45	381	239	77	62	3	0	0

- Molecule 7 is a protein called Mitochondrial ribosomal protein L32.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
7	B5	110	902	553	181	162	6	0	0

- Molecule 8 is a protein called Mitochondrial ribosomal protein L33.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
8	B6	52	425	274	78	71	2	0	0

- Molecule 9 is a protein called Mitochondrial ribosomal protein L34.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
9	B7	46	387	239	89	58	1	0	0

- Molecule 10 is a protein called Mitochondrial ribosomal protein L35.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
10	B8	95	833	539	163	129	2	0	0

- Molecule 11 is a protein called Ribosomal protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
11	B9	38	335	214	70	47	4	0	0

- Molecule 12 is a RNA chain called 16S ribosomal RNA, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
12	BA	1549	32950	14798	5993	10610	1549	0	0

- Molecule 13 is a RNA chain called CP tRNAPhe, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
13	BB	67	1427	640	261	459	67	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
BB	72	C	-	insertion	GB 76262549
BB	73	A	-	insertion	GB 76262549

- Molecule 14 is a protein called Translation initiation factor IF-2, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
14	BC	571	4364	2743	765	839	17	0	0

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
BC	71	SER	-	expression tag	UNP P46199
BC	72	GLY	-	expression tag	UNP P46199
BC	73	GLY	-	expression tag	UNP P46199
BC	74	SER	-	expression tag	UNP P46199
BC	75	GLY	-	expression tag	UNP P46199
BC	76	SER	-	expression tag	UNP P46199
BC	77	GLY	-	expression tag	UNP P46199

- Molecule 15 is a protein called Mitochondrial ribosomal protein L2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
15	BD	240	1860	1160	371	319	10	0	0

- Molecule 16 is a protein called ICT1.



Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
16	BE	307	2420	1554	426	430	10	0	0

- Molecule 17 is a protein called Mitochondrial ribosomal protein L4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
17	BF	250	2011	1294	367	344	6	0	0

- Molecule 18 is a protein called Mitochondrial ribosomal protein L9.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
18	BI	98	805	509	155	141	0	0

- Molecule 19 is a protein called Mitochondrial ribosomal protein L10.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
19	BJ	212	1705	1100	306	290	9	0	0

- Molecule 20 is a protein called Mitochondrial ribosomal protein L11.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
20	BK	176	1303	830	236	235	2	0	0

- Molecule 21 is a protein called Mitochondrial ribosomal protein L13.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
21	BN	177	1444	926	258	253	7	0	0

- Molecule 22 is a protein called Mitochondrial ribosomal protein L14.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
22	BO	115	896	562	176	154	4	0	0

- Molecule 23 is a protein called Mitochondrial ribosomal protein L15.

Mol	Chain	Residues	Atoms					AltConf	Trace
23	BP	288	Total	C	N	O	S	0	0
			2312	1473	430	403	6		

- Molecule 24 is a protein called Mitochondrial ribosomal protein L16.

Mol	Chain	Residues	Atoms					AltConf	Trace
24	BQ	222	Total	C	N	O	S	0	0
			1803	1156	331	306	10		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
BQ	237	HIS	TYR	conflict	UNP F1RI89

- Molecule 25 is a protein called Mitochondrial ribosomal protein L17.

Mol	Chain	Residues	Atoms					AltConf	Trace
25	BR	153	Total	C	N	O	S	0	0
			1240	777	236	222	5		

- Molecule 26 is a protein called Mitochondrial ribosomal protein L18.

Mol	Chain	Residues	Atoms					AltConf	Trace
26	BS	143	Total	C	N	O	S	0	0
			1168	733	227	204	4		

- Molecule 27 is a protein called Mitochondrial ribosomal protein L19.

Mol	Chain	Residues	Atoms					AltConf	Trace
27	BT	223	Total	C	N	O	S	0	0
			1845	1181	319	336	9		

- Molecule 28 is a protein called Mitochondrial ribosomal protein L20.

Mol	Chain	Residues	Atoms					AltConf	Trace
28	BU	140	Total	C	N	O	S	0	0
			1159	732	239	185	3		

- Molecule 29 is a protein called Mitochondrial ribosomal protein L21.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
29	BV	155	1231	789	219	219	4	0	0

- Molecule 30 is a protein called Mitochondrial ribosomal protein L22.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
30	BW	166	1374	876	258	234	6	0	0

- Molecule 31 is a protein called Mitochondrial ribosomal protein L23.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
31	BX	149	1181	752	227	200	2	0	0

- Molecule 32 is a protein called Mitochondrial ribosomal protein L24.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
32	BY	206	1678	1056	308	309	5	0	0

- Molecule 33 is a protein called Mitochondrial ribosomal protein L37.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
33	Ba	393	3173	2040	556	565	12	0	0

- Molecule 34 is a protein called Mitochondrial ribosomal protein L38.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
34	Bb	354	2952	1876	542	525	9	0	0

- Molecule 35 is a protein called Mitochondrial ribosomal protein L39.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
35	Bc	295	2408	1541	410	441	16	0	0

- Molecule 36 is a protein called Mitochondrial ribosomal protein L40.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
36	Bd	99	832	528	148	155	1	0	0

- Molecule 37 is a protein called Mitochondrial ribosomal protein L41.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
37	Be	122	972	628	168	173	3	0	0

- Molecule 38 is a protein called Mitochondrial ribosomal protein L42.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
38	Bf	108	827	519	154	150	4	0	0

- Molecule 39 is a protein called Mitochondrial ribosomal protein L43.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
39	Bg	148	1167	727	225	212	3	0	0

- Molecule 40 is a protein called Mitochondrial ribosomal protein L44.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
40	Bh	289	2319	1486	399	426	8	0	0

- Molecule 41 is a protein called Mitochondrial ribosomal protein L45.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
41	Bi	260	2138	1370	379	379	10	0	0

- Molecule 42 is a protein called Mitochondrial ribosomal protein L46.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
42	Bj	217	1775	1137	311	321	6	0	0

- Molecule 43 is a protein called Mitochondrial ribosomal protein L48.

Mol	Chain	Residues	Atoms					AltConf	Trace
43	Bk	136	Total	C	N	O	S	0	0
			1087	692	185	205	5		

- Molecule 44 is a protein called Mrpl34.

Mol	Chain	Residues	Atoms					AltConf	Trace
44	Bl	133	Total	C	N	O	S	0	0
			1097	709	192	194	2		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
Bl	59	ARG	LYS	conflict	UNP A0A0R4J8D6

- Molecule 45 is a protein called Mitochondrial ribosomal protein L50.

Mol	Chain	Residues	Atoms					AltConf	Trace
45	Bm	109	Total	C	N	O	S	0	0
			893	568	160	162	3		

- Molecule 46 is a protein called Mitochondrial ribosomal protein L51.

Mol	Chain	Residues	Atoms					AltConf	Trace
46	Bn	97	Total	C	N	O	S	0	0
			837	539	166	128	4		

- Molecule 47 is a protein called Mitochondrial ribosomal protein L52.

Mol	Chain	Residues	Atoms					AltConf	Trace
47	Bo	97	Total	C	N	O	S	0	0
			772	481	148	141	2		

- Molecule 48 is a protein called mL53, MRPL53.

Mol	Chain	Residues	Atoms					AltConf	Trace
48	Bp	97	Total	C	N	O	S	0	0
			742	459	143	134	6		

- Molecule 49 is a protein called Uncharacterized protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
49	Bq	68	542	344	102	95	1	0	0

- Molecule 50 is a protein called Mitochondrial ribosomal protein L57.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
50	Bt	94	780	485	168	126	1	0	0

- Molecule 51 is a protein called Mitochondrial ribosomal protein L58.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
51	Bu	151	1198	738	233	222	5	0	0

- Molecule 52 is a protein called 'Mitochondrial ribosomal protein L59.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
52	Bv	135	1131	692	223	211	5	0	0

- Molecule 53 is a protein called mL65, MRPS30.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
53	Bw	387	3126	2011	548	555	12	0	0

- Molecule 54 is a protein called Mitochondrial ribosomal protein S18A.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
54	Bx	162	1325	845	249	224	7	0	0

- Molecule 55 is a protein called unassigned secondary structure elements.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
55	Bz	82	410	246	82	82	0	0

- Molecule 56 is a RNA chain called P-site fMet-tRNAMet, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
56	AV	71	1498	673	264	491	70	0	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
AV	69	C	-	insertion	GB 1208989970
AV	70	C	-	insertion	GB 1208989970
AV	71	A	-	insertion	GB 1208989970

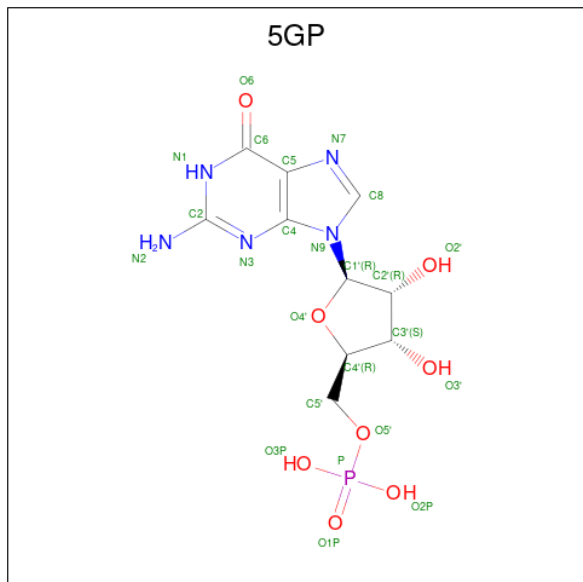
- Molecule 57 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
57	B3	1	Total 1	Mg 1	0
57	BA	203	Total 203	Mg 203	0
57	BB	1	Total 1	Mg 1	0
57	BC	1	Total 1	Mg 1	0
57	BD	3	Total 3	Mg 3	0
57	BP	2	Total 2	Mg 2	0
57	BQ	1	Total 1	Mg 1	0
57	Be	2	Total 2	Mg 2	0
57	Bl	1	Total 1	Mg 1	0
57	Bt	1	Total 1	Mg 1	0

- Molecule 58 is ZINC ION (three-letter code: ZN) (formula: Zn).

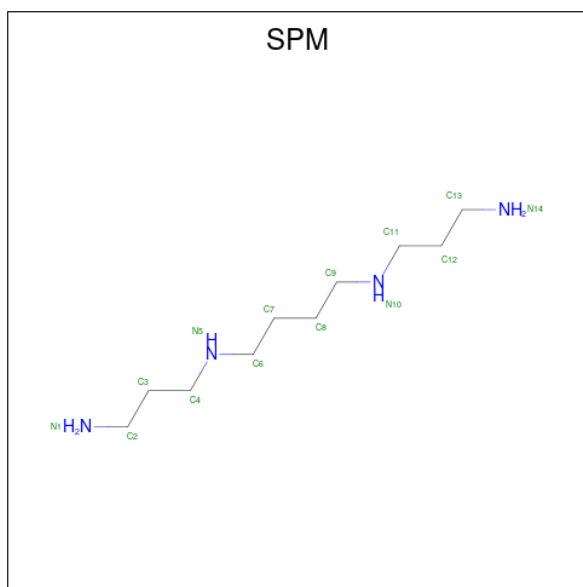
Mol	Chain	Residues	Atoms		AltConf
58	B5	1	Total 1	Zn 1	0
58	B9	1	Total 1	Zn 1	0
58	BJ	1	Total 1	Zn 1	0

- Molecule 59 is GUANOSINE-5'-MONOPHOSPHATE (three-letter code: 5GP) (formula:  $C_{10}H_{14}N_5O_8P$ ).



Mol	Chain	Residues	Atoms				AltConf	
			Total	C	N	O		P
59	BA	1	48	20	10	16	2	0
59	BA	1	Total	C	N	O	P	0
			48	20	10	16	2	

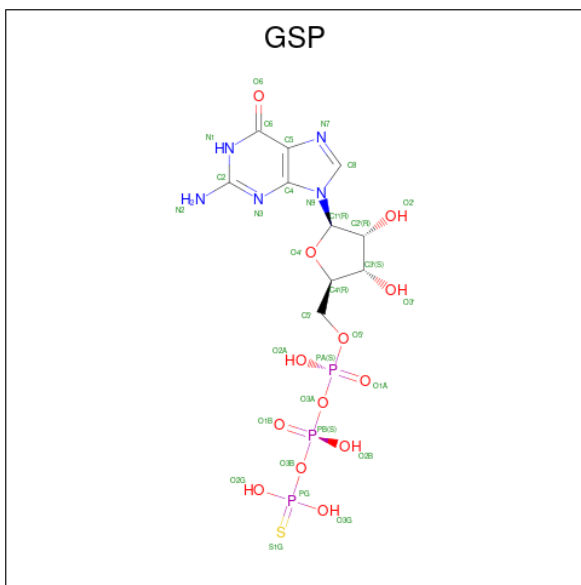
- Molecule 60 is SPERMINE (three-letter code: SPM) (formula:  $C_{10}H_{26}N_4$ ).





Mol	Chain	Residues	Atoms			AltConf
60	BA	1	Total	C	N	0
			14	10	4	
60	BR	1	Total	C	N	0
			14	10	4	

- Molecule 61 is 5'-GUANOSINE-DIPHOSPHATE-MONOTHIOPHOSPHATE (three-letter code: GSP) (formula: C<sub>10</sub>H<sub>16</sub>N<sub>5</sub>O<sub>13</sub>P<sub>3</sub>S) (labeled as "Ligand of Interest" by depositor).

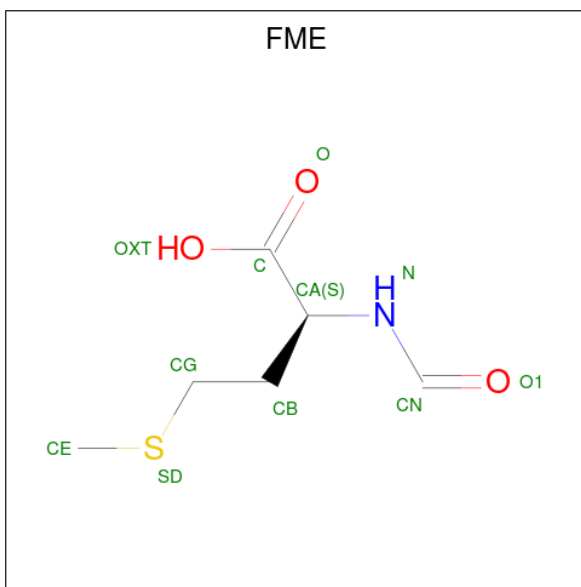


Mol	Chain	Residues	Atoms						AltConf
61	BC	1	Total	C	N	O	P	S	0
			32	10	5	13	3	1	

- Molecule 62 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		AltConf
62	BC	1	Total	Na	0
			1	1	

- Molecule 63 is N-FORMYLMETHIONINE (three-letter code: FME) (formula: C<sub>6</sub>H<sub>11</sub>NO<sub>3</sub>S) (labeled as "Ligand of Interest" by depositor).

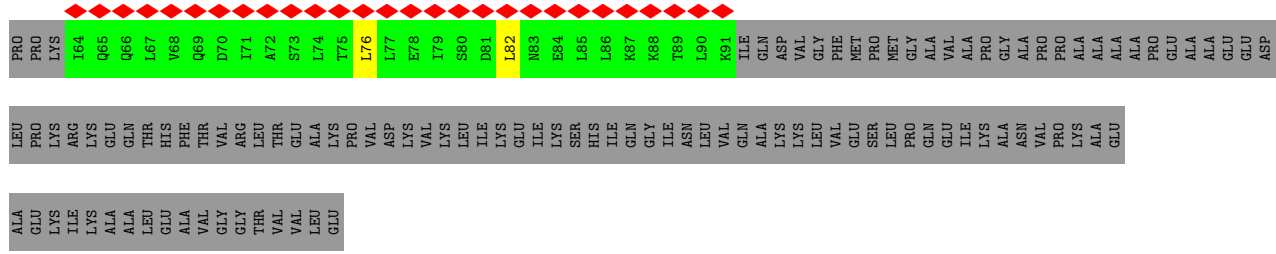


Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	S	
63	AV	1	10	6	1	2	1	0

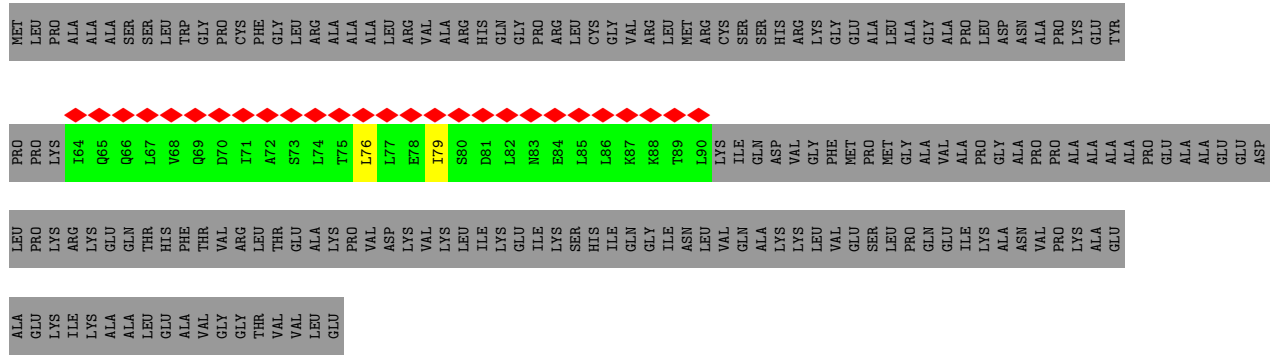
- Molecule 64 is water.

Mol	Chain	Residues	Atoms		AltConf
			Total	O	
64	BC	2	2	2	0

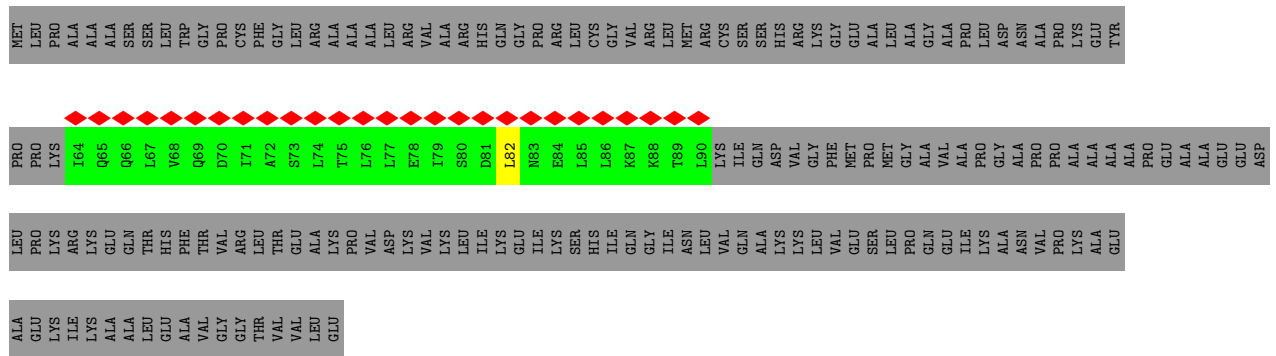




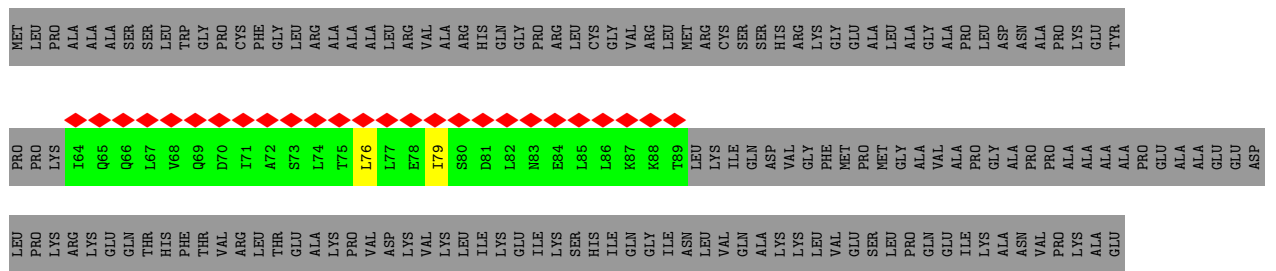
• Molecule 1: Mitochondrial ribosomal protein L12



• Molecule 1: Mitochondrial ribosomal protein L12



• Molecule 1: Mitochondrial ribosomal protein L12



ALA  
GLU  
LYS  
ILE  
LYS  
ALA  
ALA  
LEU  
LEU  
GLU

• Molecule 1: Mitochondrial ribosomal protein L12



MET  
LEU  
LEU  
PRO  
ALA  
ALA  
GLN  
GLY  
SER  
SER  
LEU  
LEU  
TRP  
ASP  
GLY  
PRO  
CYS  
PHE  
GLY  
LEU  
ARG  
ALA  
ALA  
ALA  
LEU  
ARG  
VAL  
VAL  
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GLU  
ARG  
HIS  
GLN  
GLY  
LEU  
PRO  
ARG  
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LEU  
CYS  
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GLY  
ALA  
HIS  
VAL  
LYS  
GLY  
GLU  
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LEU  
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LYS  
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PRO  
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F130  
T131  
V132  
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T135  
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P139  
V140  
D141  
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I146  
K147  
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K150  
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I156  
I157  
L158  
V159  
Q160  
A161  
K162  
K163  
L164  
V165  
E166  
S167  
L168  
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E180

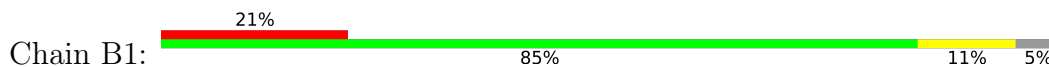
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L188  
E189  
A190  
V191  
G192  
G193  
T194  
V195  
V196  
E198

• Molecule 2: Mitochondrial ribosomal protein L27



MET  
ALA  
LEU  
VAL  
ALA  
LEU  
ARG  
THR  
ALA  
ALA  
VAL  
LEU  
ALA  
LEU  
THR  
ALA  
LEU  
SER  
PRO  
GLN  
ALA  
ALA  
LEU  
ALA  
VAL  
TYR  
ALA  
SER  
LYS  
LYS  
THR  
GLY  
SER  
S39  
K40  
R50  
I53  
M56  
V61  
I66  
V117  
T141  
L148

• Molecule 3: Mitochondrial ribosomal protein L28



MET  
F2  
V6  
K12  
Q13  
L14  
L16  
W17  
E18  
R30  
S31  
L32  
E33  
E34  
A35  
R36  
R44  
P45  
H46  
G47  
A48  
K49  
F50  
K51  
R55  
E56  
W62  
E63  
D64  
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G76  
L77  
G78  
L79  
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V104  
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T126  
V127  
T128  
D136

E151  
D152  
L153  
C154  
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L161  
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D173  
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Q175  
H176  
P178  
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D180  
D189  
R190  
Y191  
K192  
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D209  
R216  
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K221  
D222  
P223  
I224  
E232  
E233  
L234  
L235  
Q236  
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Q241  
A242  
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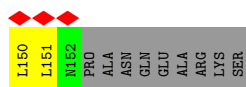
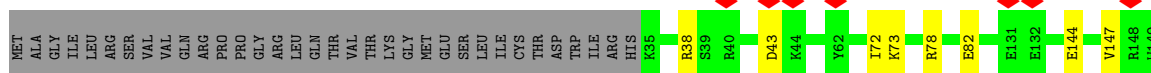
• Molecule 4: Mitochondrial ribosomal protein L47



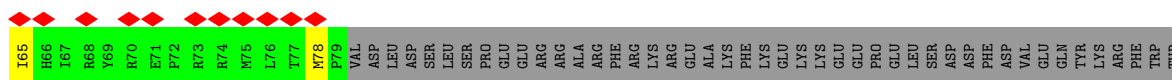
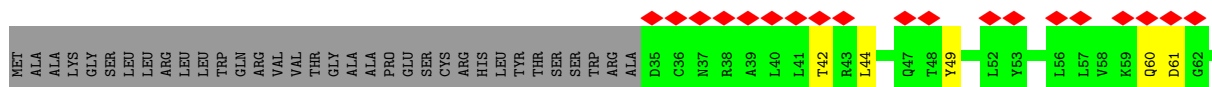
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LEU  
LEU  
LYS  
ALA  
CYS  
ARG  
LEU  
LEU  
ILE  
ARG  
PRO  
GLN  
ALA  
PRO  
PRO  
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GLN  
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PHE  
HIS  
THR  
THR

PHE  
SER  
ARG  
G65  
L66  
E67  
D72  
P73  
K74  
E79  
R80  
L126  
L144  
D145  
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L158  
R171  
I174  
K184  
M197  
Q218  
L228  
E229  
R230  
K234  
F235  
E238  
K239  
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HIS  
VAL

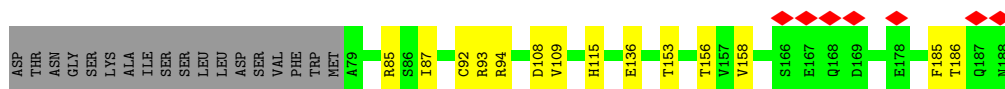
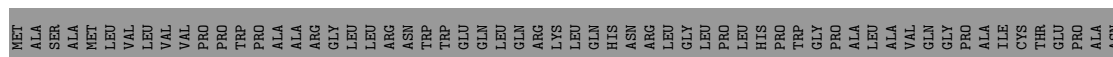
- Molecule 5: 'Mitochondrial ribosomal protein L30



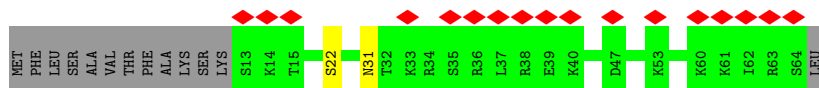
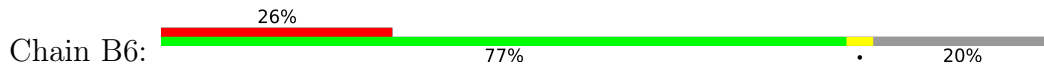
- Molecule 6: 'Mitochondrial ribosomal protein L55



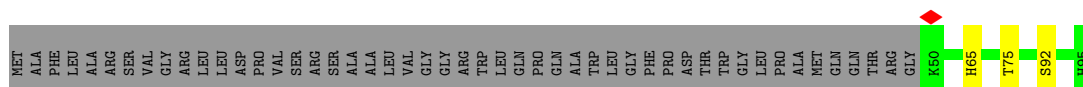
- Molecule 7: Mitochondrial ribosomal protein L32



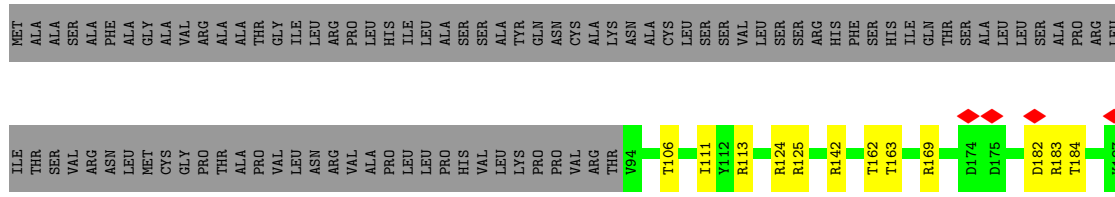
- Molecule 8: Mitochondrial ribosomal protein L33



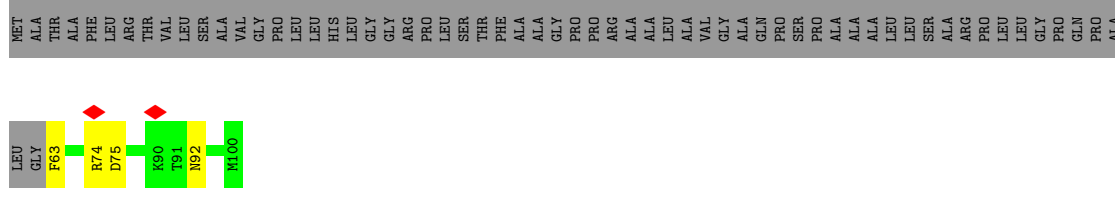
- Molecule 9: Mitochondrial ribosomal protein L34



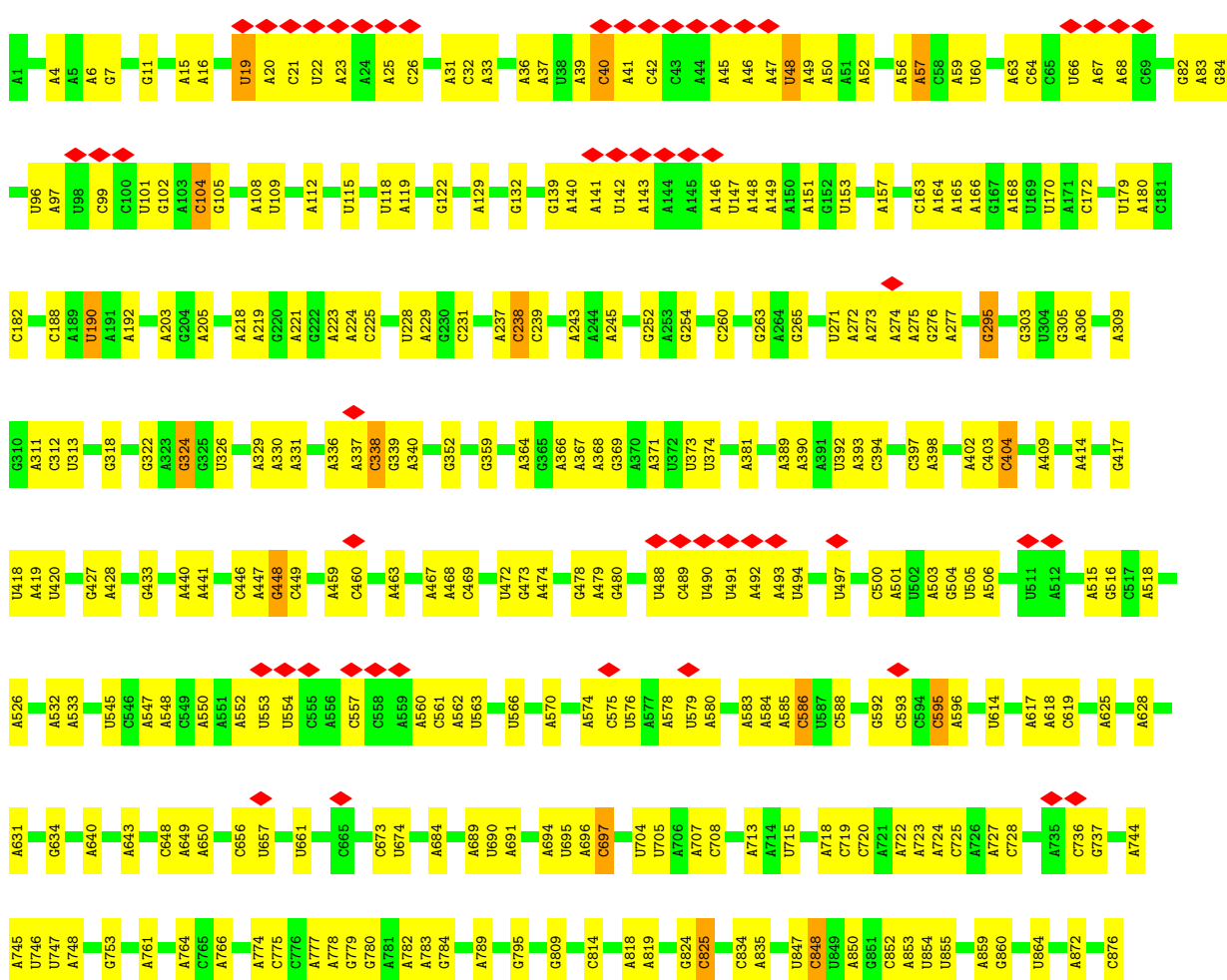
- Molecule 10: Mitochondrial ribosomal protein L35

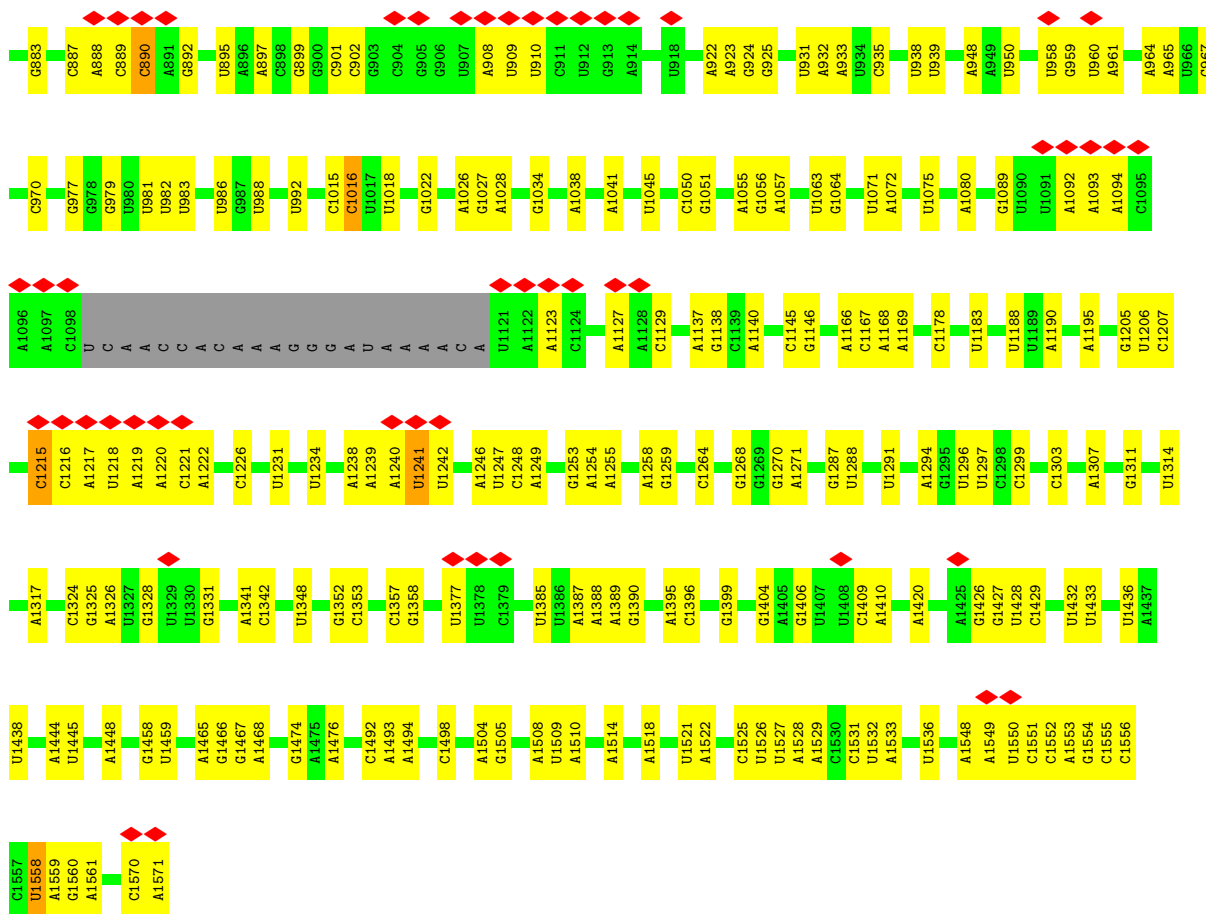


• Molecule 11: Ribosomal protein

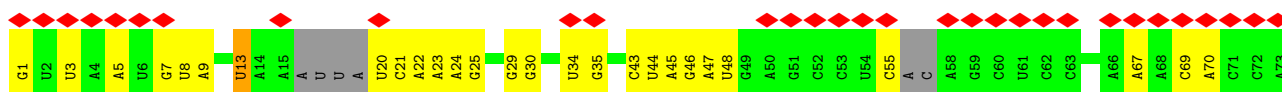
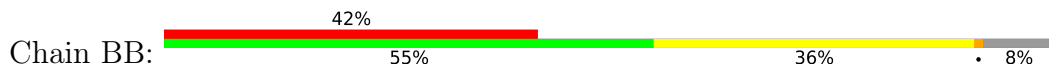


• Molecule 12: 16S ribosomal RNA, mitochondrial

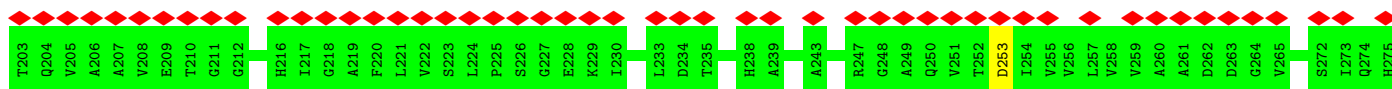
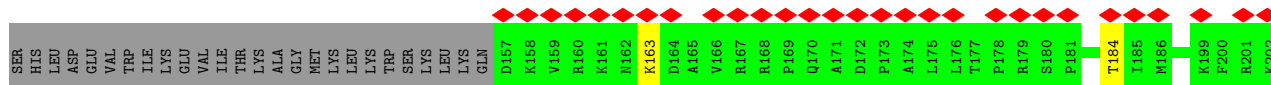
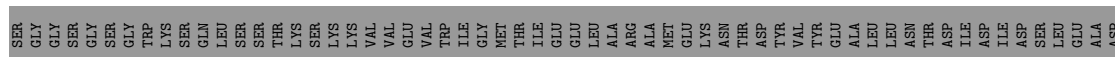
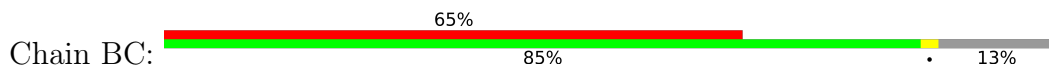




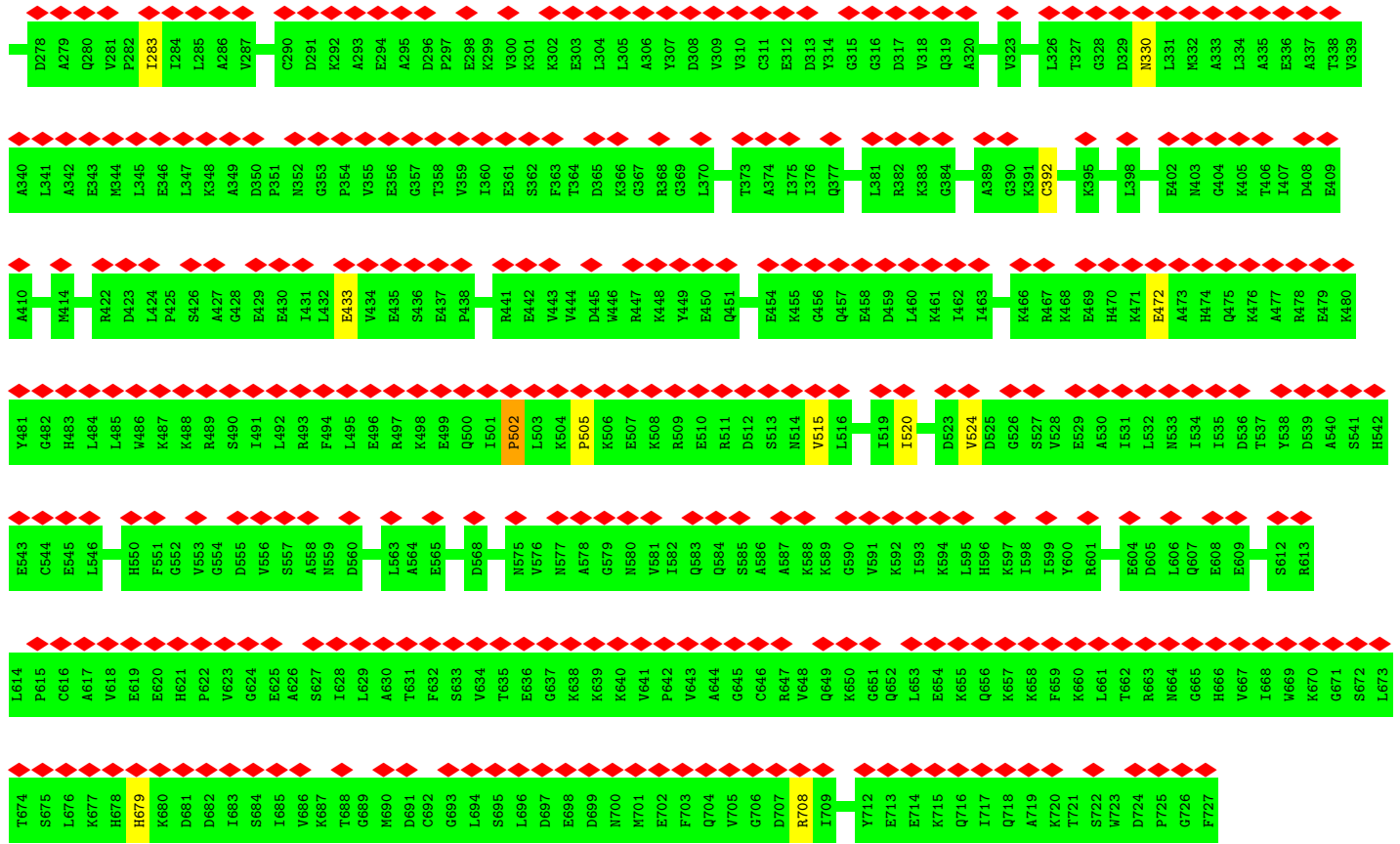
• Molecule 13: CP tRNAPhe, mitochondrial



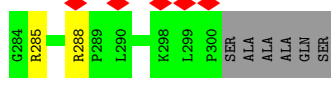
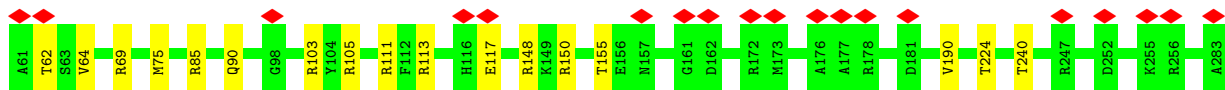
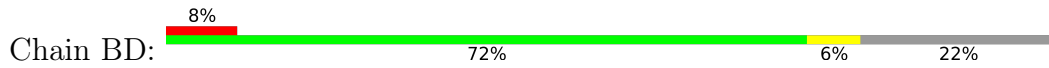
• Molecule 14: Translation initiation factor IF-2, mitochondrial



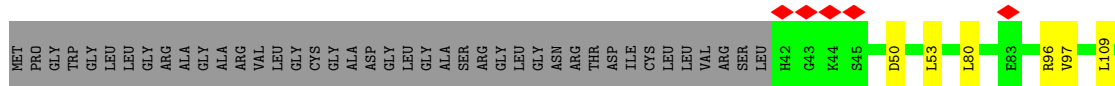
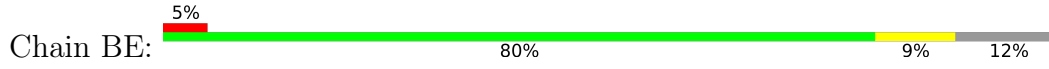




• Molecule 15: Mitochondrial ribosomal protein L2

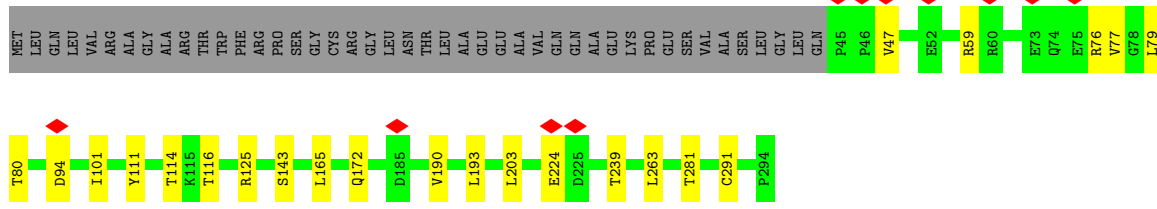


• Molecule 16: ICT1



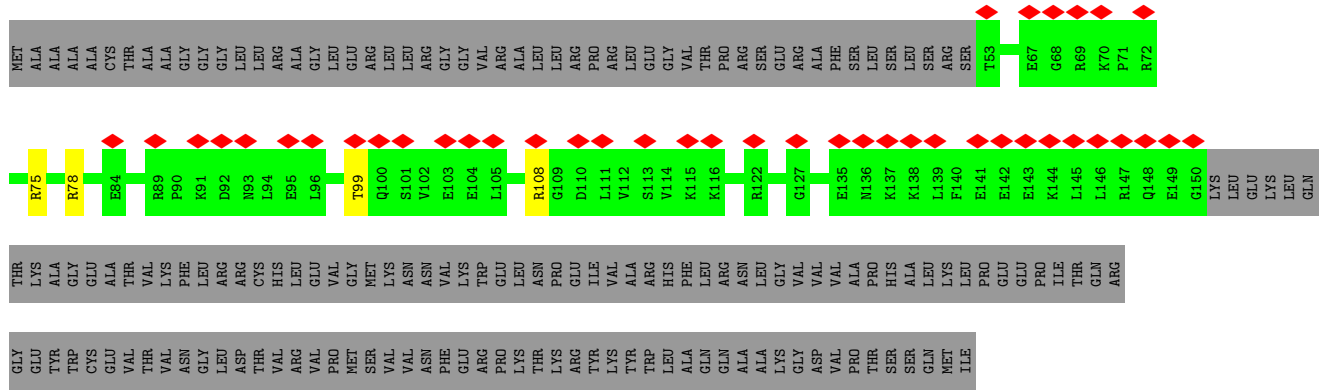
• Molecule 17: Mitochondrial ribosomal protein L4

Chain BF:



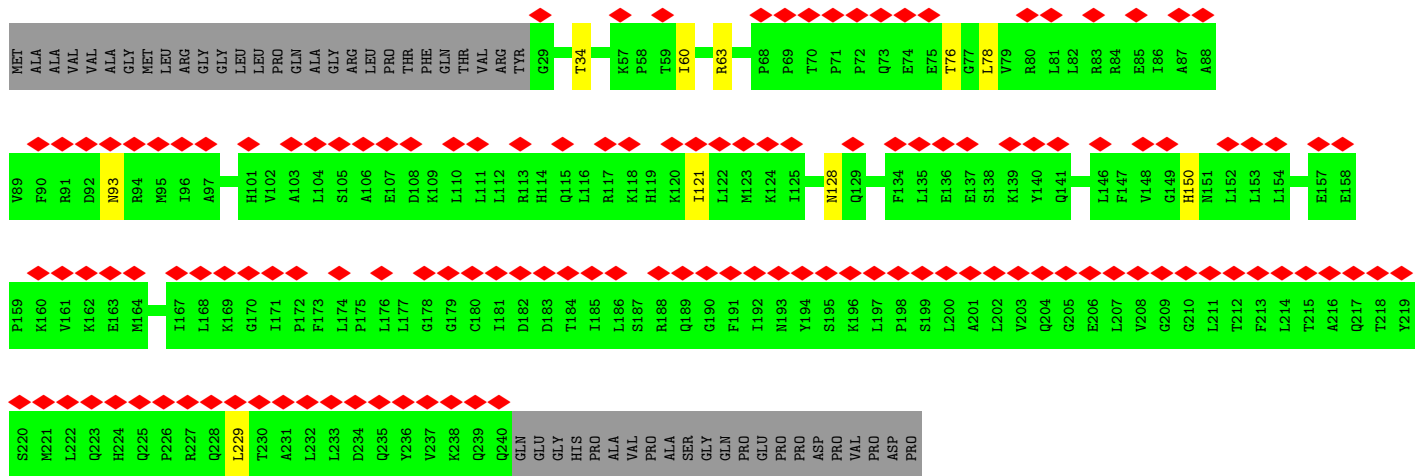
• Molecule 18: Mitochondrial ribosomal protein L9

Chain BI:



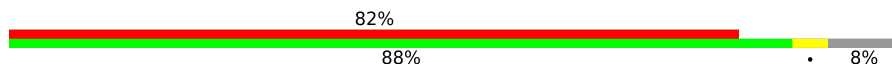
• Molecule 19: Mitochondrial ribosomal protein L10

Chain BJ:



• Molecule 20: Mitochondrial ribosomal protein L11

Chain BK:

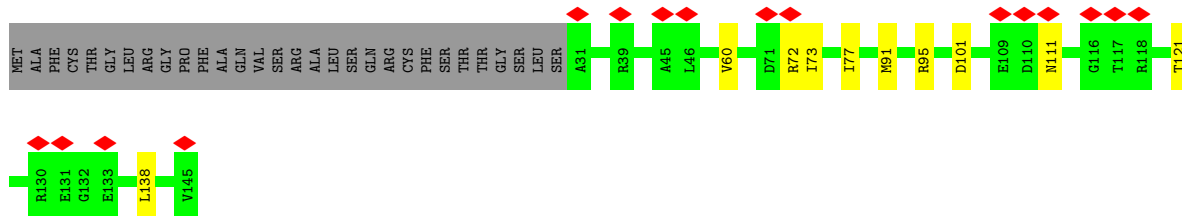
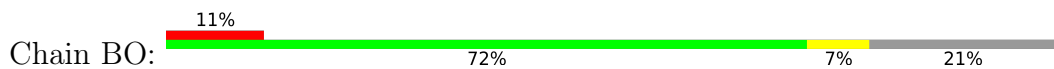




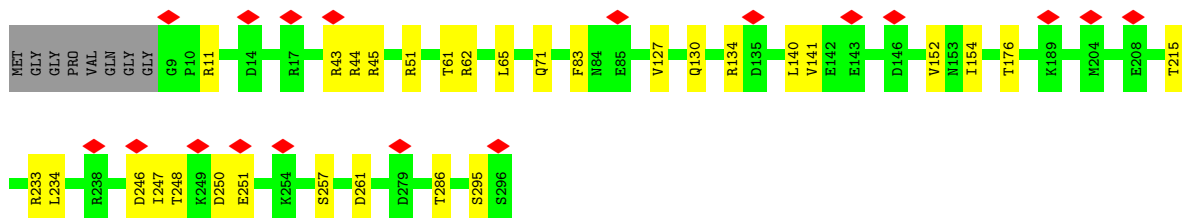
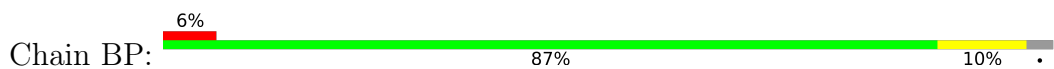
• Molecule 21: Mitochondrial ribosomal protein L13



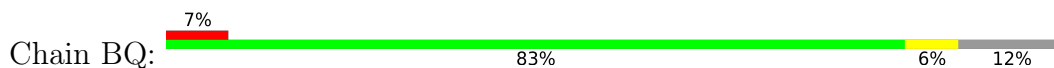
• Molecule 22: Mitochondrial ribosomal protein L14

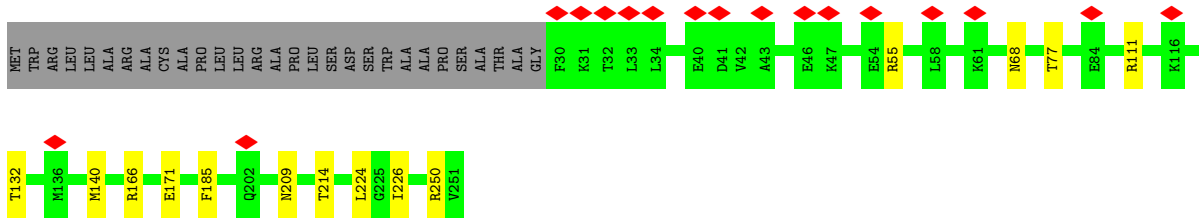


• Molecule 23: Mitochondrial ribosomal protein L15

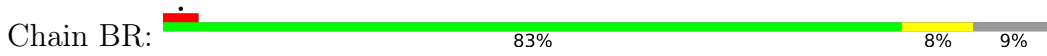


• Molecule 24: Mitochondrial ribosomal protein L16

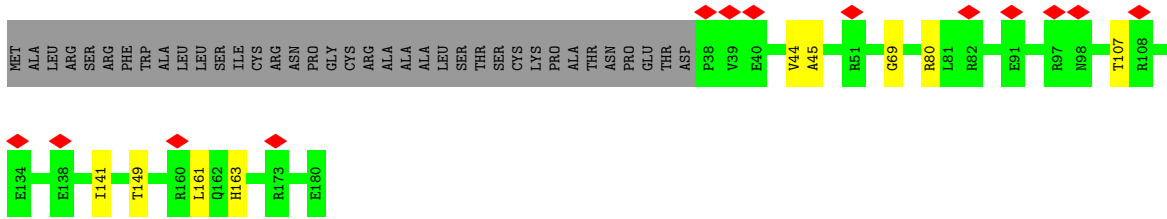
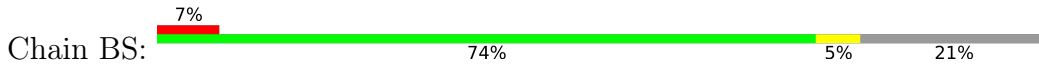




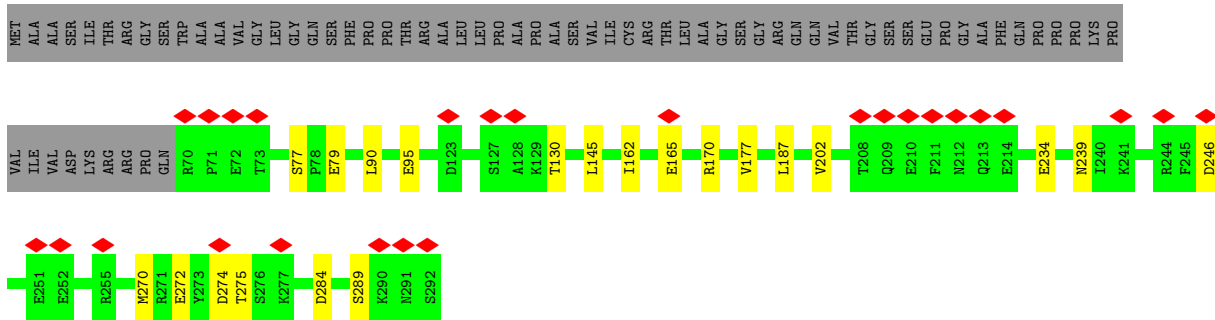
• Molecule 25: Mitochondrial ribosomal protein L17



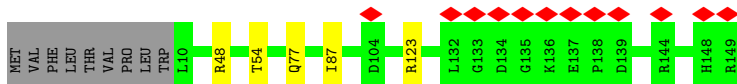
• Molecule 26: Mitochondrial ribosomal protein L18



• Molecule 27: Mitochondrial ribosomal protein L19

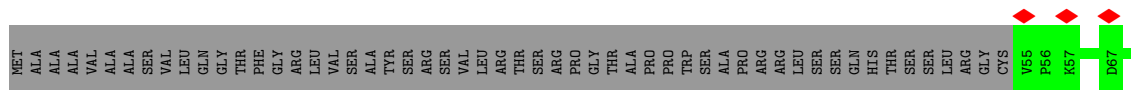


• Molecule 28: Mitochondrial ribosomal protein L20

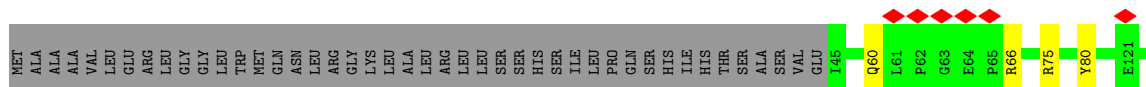
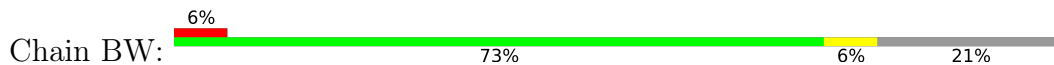


• Molecule 29: Mitochondrial ribosomal protein L21

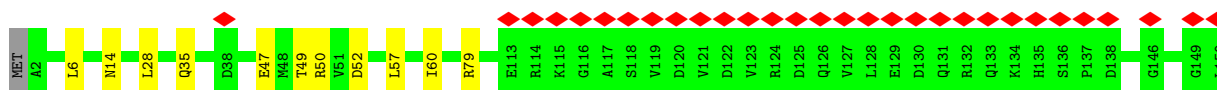




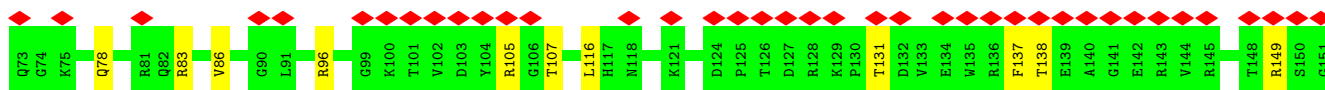
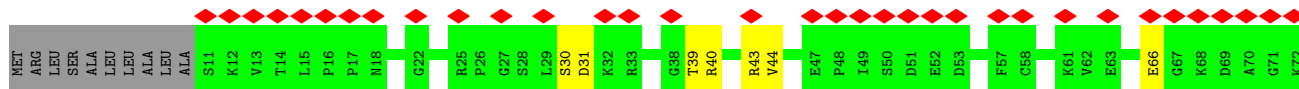
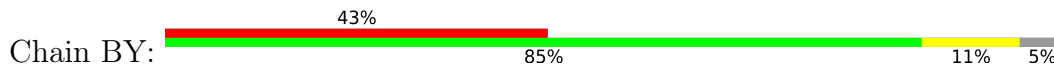
• Molecule 30: Mitochondrial ribosomal protein L22



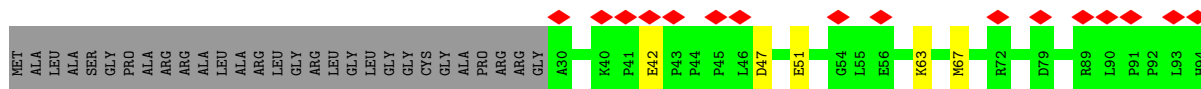
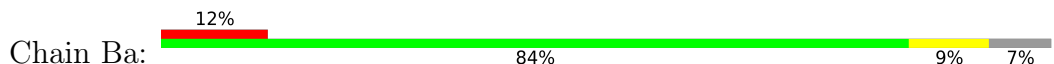
• Molecule 31: Mitochondrial ribosomal protein L23

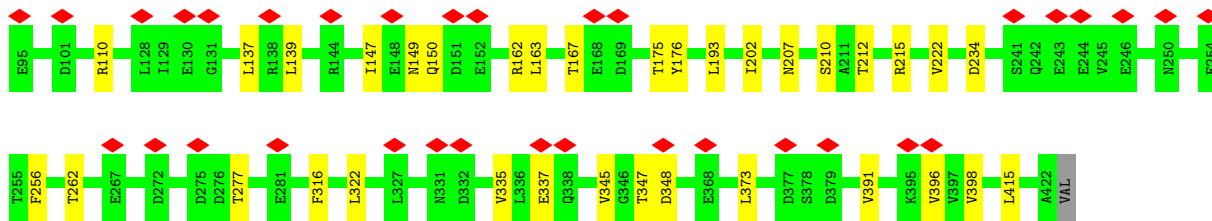


• Molecule 32: Mitochondrial ribosomal protein L24

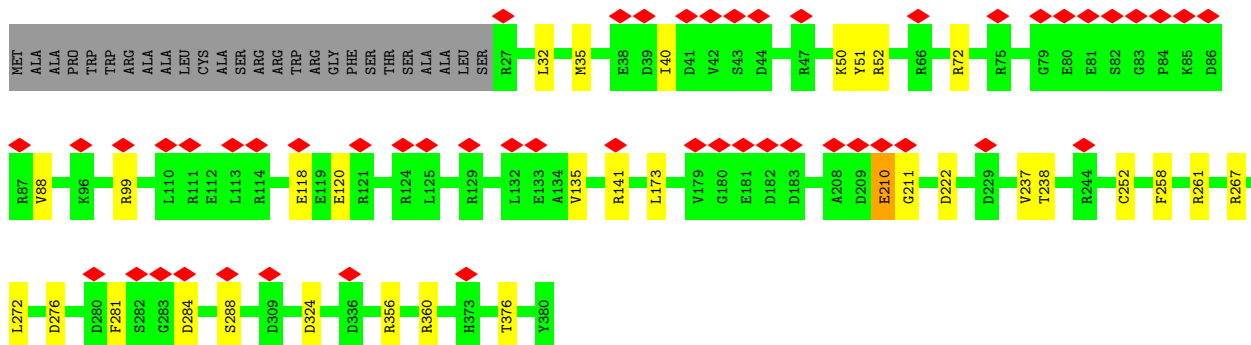
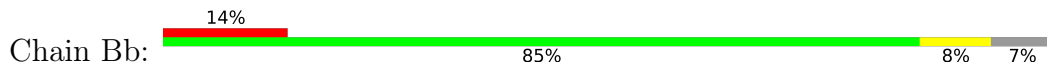


• Molecule 33: Mitochondrial ribosomal protein L37

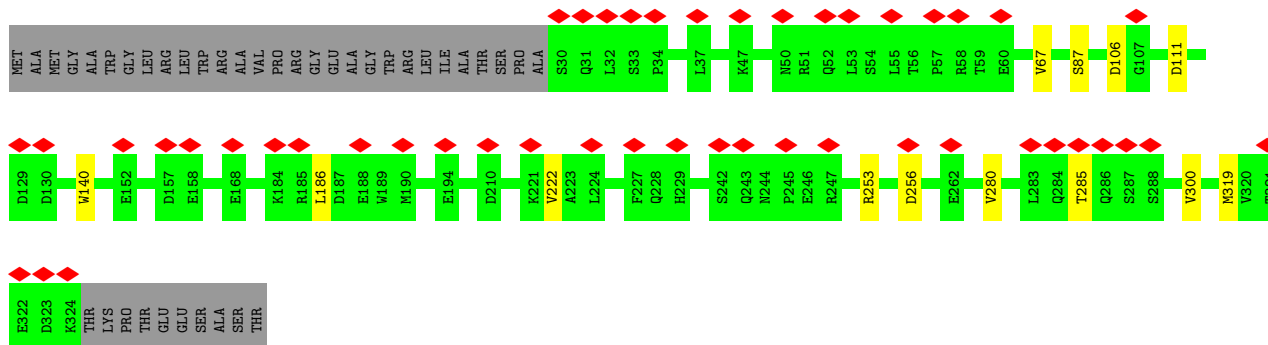
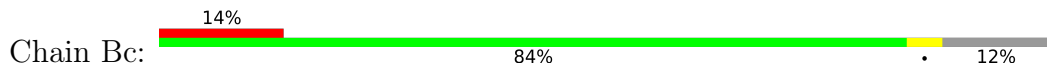




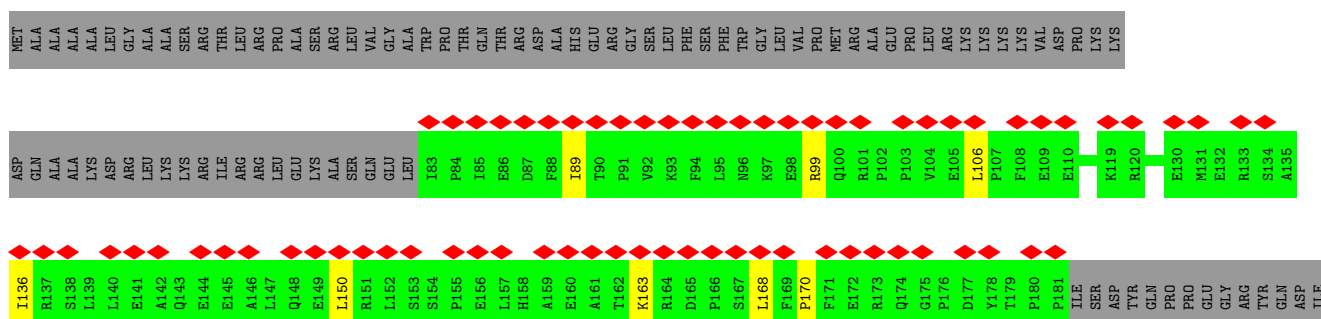
• Molecule 34: Mitochondrial ribosomal protein L38



• Molecule 35: Mitochondrial ribosomal protein L39



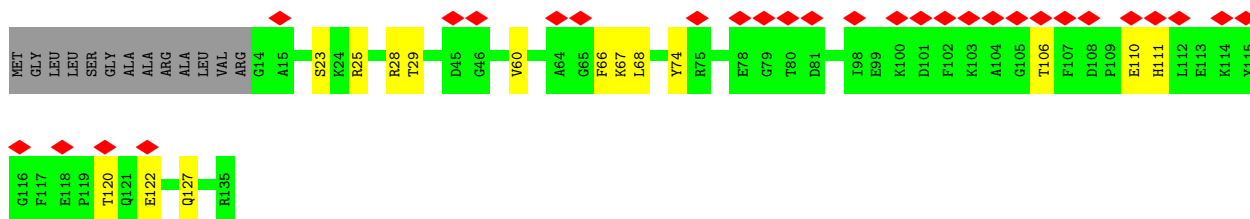
• Molecule 36: Mitochondrial ribosomal protein L40



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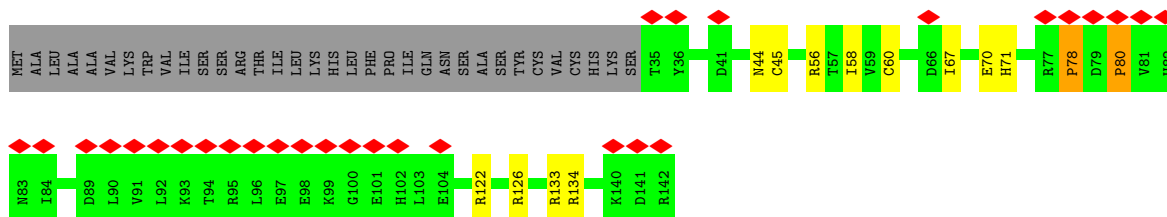
- Molecule 37: Mitochondrial ribosomal protein L41

Chain Be:



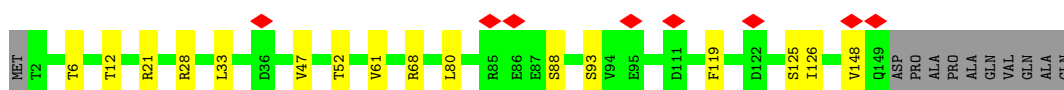
- Molecule 38: Mitochondrial ribosomal protein L42

Chain Bf:



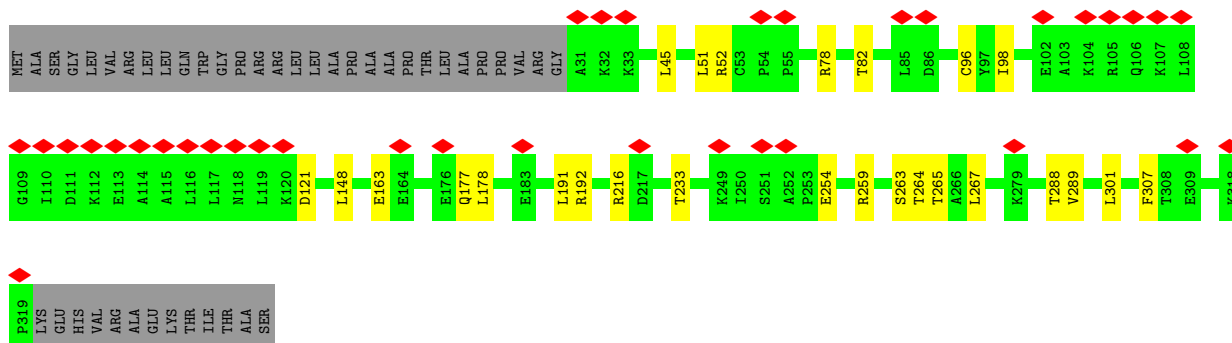
- Molecule 39: Mitochondrial ribosomal protein L43

Chain Bg:

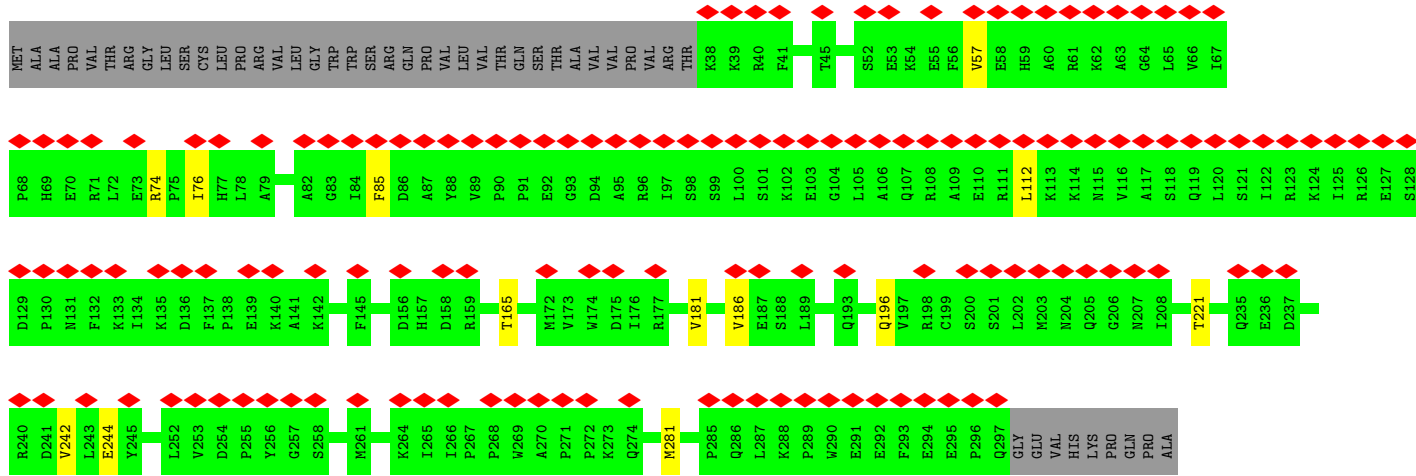
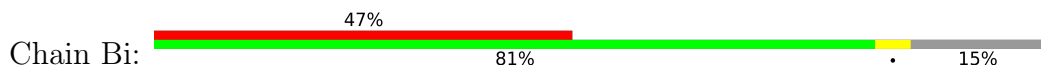


- Molecule 40: Mitochondrial ribosomal protein L44

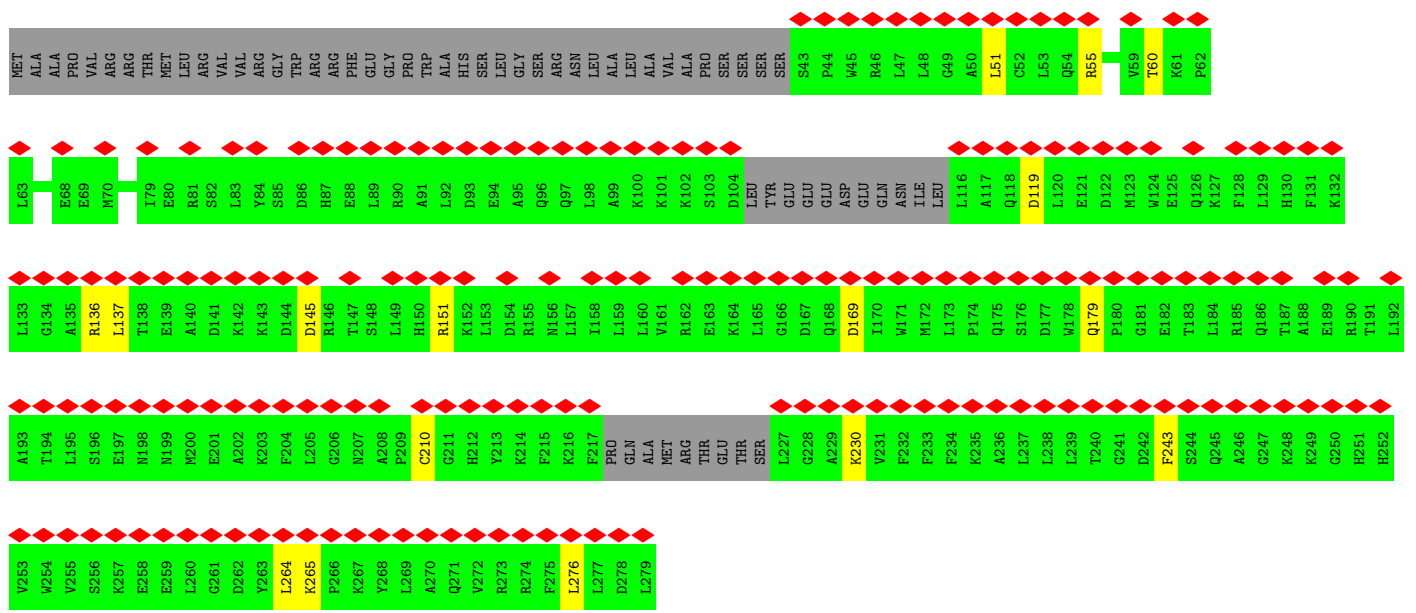
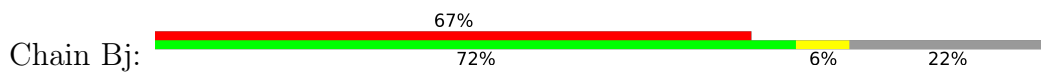
Chain Bh:



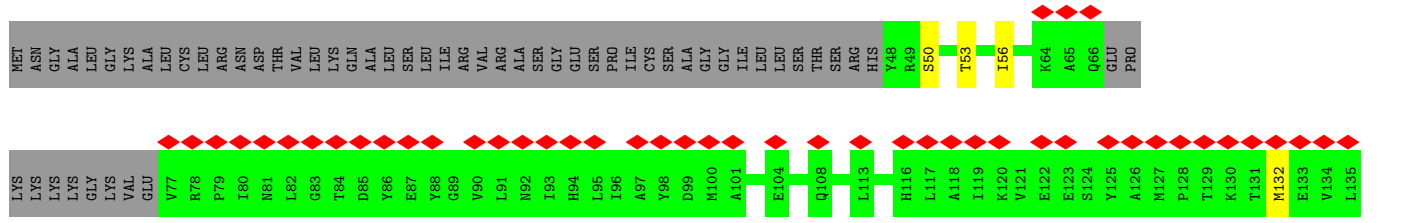
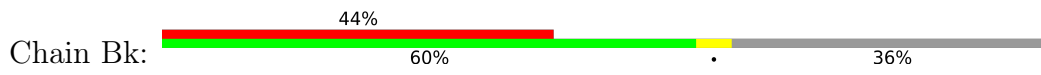
- Molecule 41: Mitochondrial ribosomal protein L45



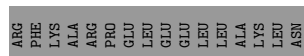
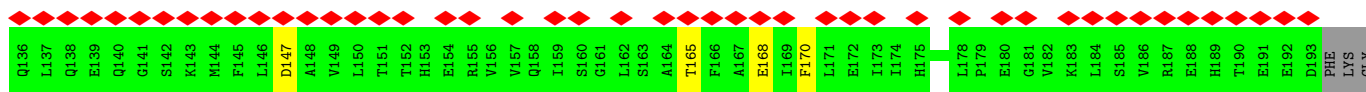
• Molecule 42: Mitochondrial ribosomal protein L46



• Molecule 43: Mitochondrial ribosomal protein L48

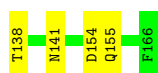






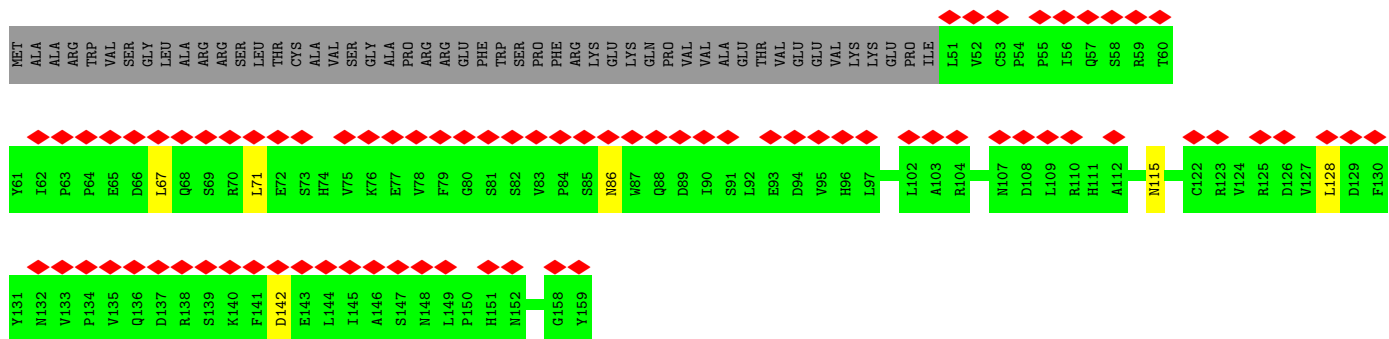
- Molecule 44: Mrpl34

Chain Bl: 72% 8% 20%



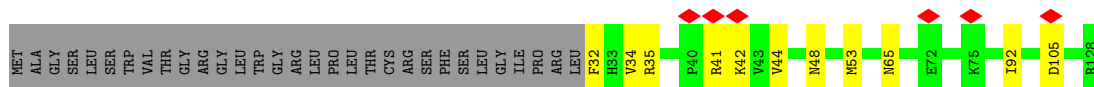
- Molecule 45: Mitochondrial ribosomal protein L50

Chain Bm: 50% 65% 31%



- Molecule 46: Mitochondrial ribosomal protein L51

Chain Bn: 5% 67% 9% 24%

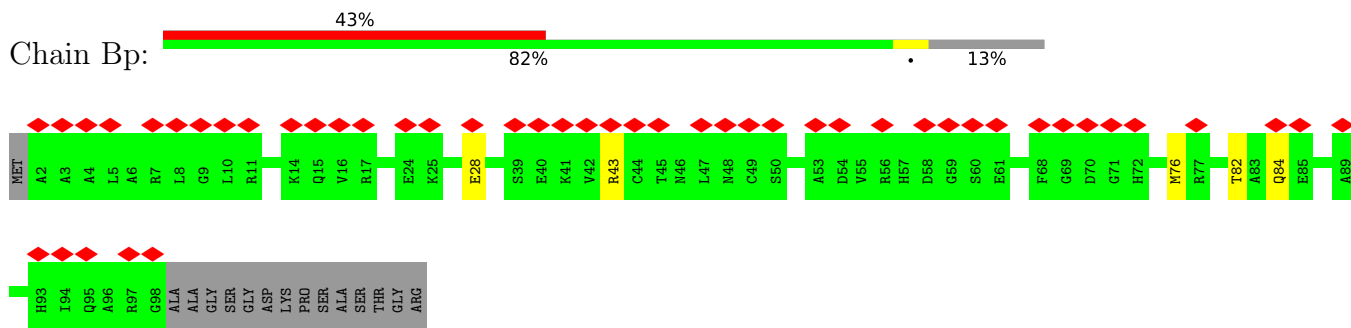


- Molecule 47: Mitochondrial ribosomal protein L52

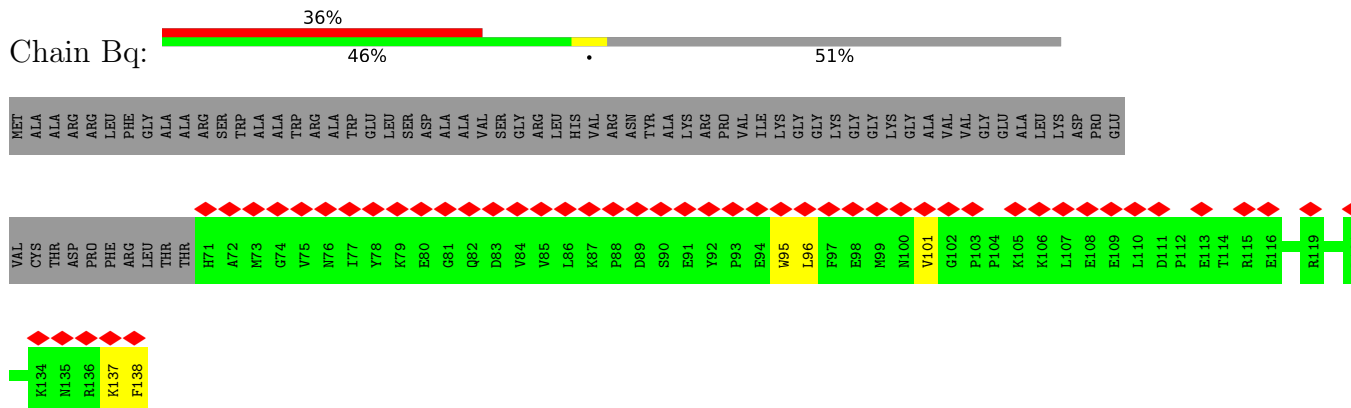
Chain Bo: 10% 71% 6% 22%



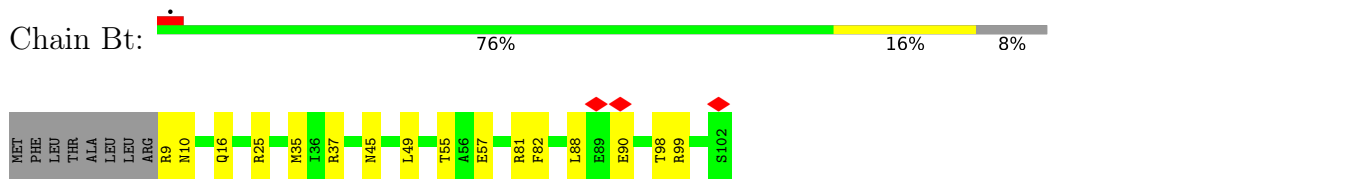
- Molecule 48: mL53, MRPL53



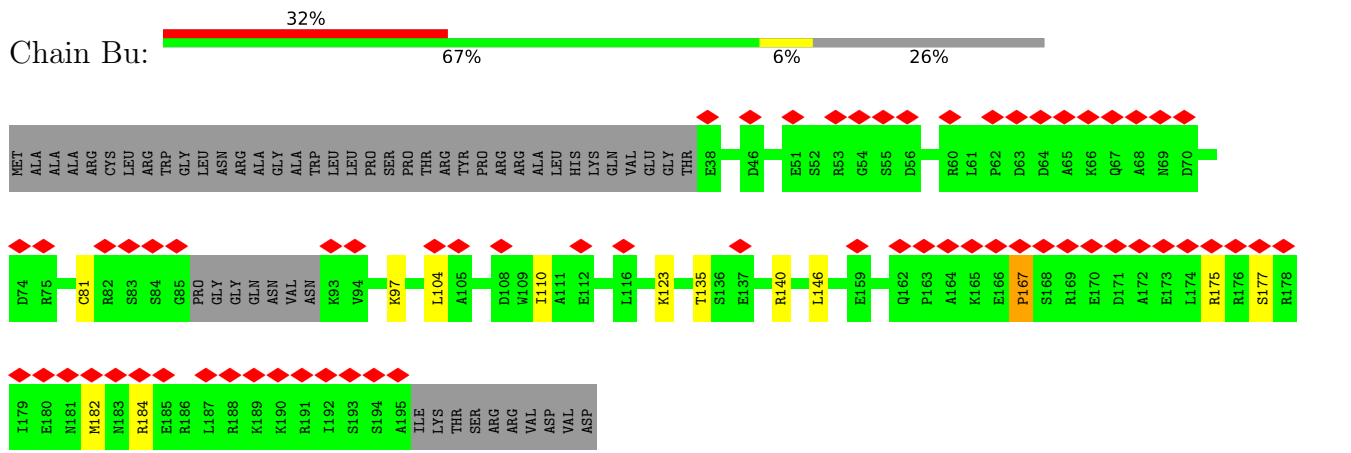
• Molecule 49: Uncharacterized protein



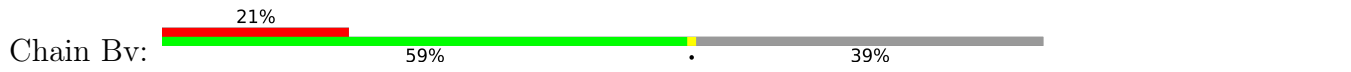
• Molecule 50: Mitochondrial ribosomal protein L57

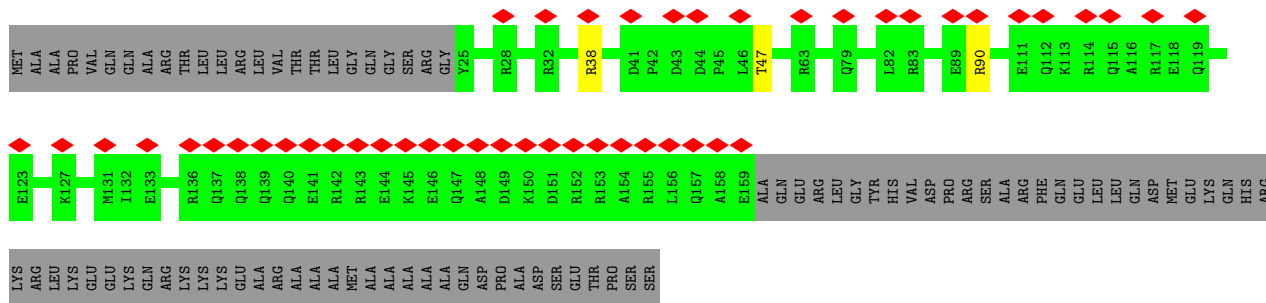


• Molecule 51: Mitochondrial ribosomal protein L58

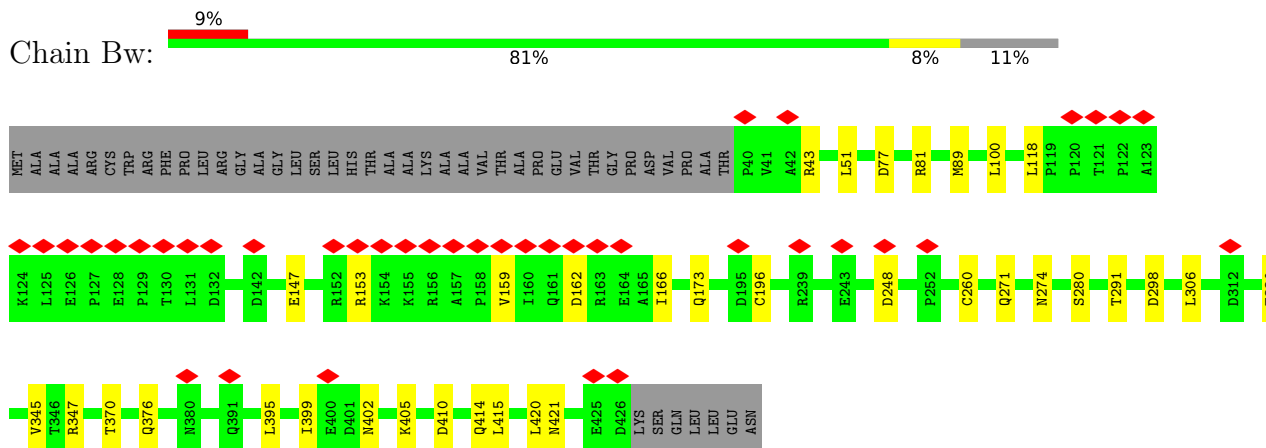


• Molecule 52: 'Mitochondrial ribosomal protein L59

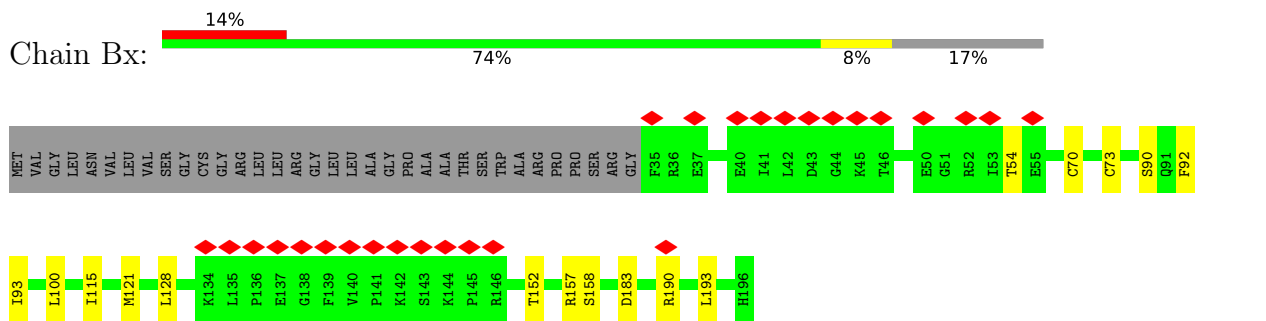




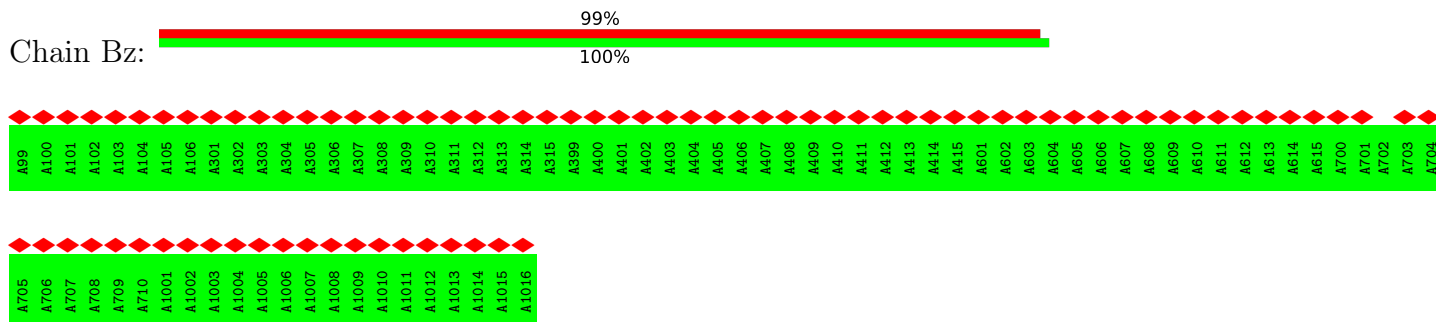
• Molecule 53: mL65, MRPS30



• Molecule 54: Mitochondrial ribosomal protein S18A



• Molecule 55: unassigned secondary structure elements



• Molecule 56: P-site fMet-tRNA<sup>Met</sup>, mitochondrial



A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	A22	A23	A24	A25	A26	A27	A28	A29	A30	A31	A32	A33	A34	A35	A36	A37	A38	A39	A40	A41	A42	A43	A44	A45	A46	A47	A48	A49	A50	A51	A52	A53	A54	A55	A56	A57	A58	A59	A60
C61	C62	G63	U64	A65	C66	U67	A68	C69	C70	A71																																																	

## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	75666	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 ( $e^-/\text{\AA}^2$ )	40	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	FEI FALCON III (4k x 4k)	Depositor
Maximum map value	0.658	Depositor
Minimum map value	-0.328	Depositor
Average map value	0.002	Depositor
Map value standard deviation	0.024	Depositor
Recommended contour level	0.12	Depositor
Map size ( $\text{\AA}$ )	390.59, 390.59, 390.59	wwPDB
Map dimensions	281, 281, 281	wwPDB
Map angles ( $^\circ$ )	90.0, 90.0, 90.0	wwPDB
Pixel spacing ( $\text{\AA}$ )	1.39, 1.39, 1.39	Depositor

## 5 Model quality i

### 5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: 5GP, MG, GSP, ZN, SPM, NA, FME

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	BL	0.35	0/542	0.50	0/729
1	CL	0.44	0/319	0.71	2/435 (0.5%)
1	DL	0.37	0/212	0.48	0/286
1	EL	0.43	0/221	0.53	0/297
1	FL	0.40	0/212	0.53	0/286
1	GL	0.40	0/212	0.49	0/286
1	HL	0.46	0/204	0.55	0/275
2	B0	0.45	0/880	0.53	0/1189
3	B1	0.33	0/2093	0.50	0/2835
4	B2	0.37	0/1586	0.53	0/2123
5	B3	0.38	0/993	0.57	0/1341
6	B4	0.27	0/388	0.51	0/523
7	B5	0.37	0/917	0.54	0/1227
8	B6	0.38	0/430	0.54	0/570
9	B7	0.44	0/395	0.56	0/524
10	B8	0.43	0/853	0.58	0/1136
11	B9	0.42	0/342	0.54	0/450
12	BA	0.60	0/36903	1.01	45/57455 (0.1%)
13	BB	0.50	1/1595 (0.1%)	0.92	1/2475 (0.0%)
14	BC	0.33	0/4432	0.52	2/5989 (0.0%)
15	BD	0.35	0/1898	0.57	0/2555
16	BE	0.39	0/2493	0.62	1/3387 (0.0%)
17	BF	0.41	0/2069	0.57	0/2816
18	BI	0.35	0/819	0.54	0/1101
19	BJ	0.34	0/1742	0.50	0/2358
20	BK	0.32	0/1323	0.51	0/1785
21	BN	0.39	0/1487	0.55	0/2017
22	BO	0.34	0/912	0.56	0/1231
23	BP	0.38	0/2368	0.54	0/3198
24	BQ	0.37	0/1850	0.54	0/2491
25	BR	0.39	0/1262	0.57	0/1700
26	BS	0.37	0/1197	0.56	0/1624

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
27	BT	0.37	0/1888	0.55	0/2548
28	BU	0.47	0/1179	0.59	0/1578
29	BV	0.43	0/1256	0.60	0/1706
30	BW	0.42	0/1407	0.58	0/1891
31	BX	0.38	0/1211	0.56	0/1646
32	BY	0.30	0/1719	0.51	0/2329
33	Ba	0.33	0/3267	0.54	0/4455
34	Bb	0.34	0/3047	0.54	1/4139 (0.0%)
35	Bc	0.33	0/2464	0.50	0/3330
36	Bd	0.32	0/853	0.52	0/1153
37	Be	0.36	0/1000	0.58	0/1345
38	Bf	0.36	0/851	0.57	2/1159 (0.2%)
39	Bg	0.39	0/1191	0.56	0/1614
40	Bh	0.37	0/2372	0.55	0/3211
41	Bi	0.33	0/2199	0.51	0/2980
42	Bj	0.30	0/1811	0.49	0/2436
43	Bk	0.31	0/1108	0.50	0/1499
44	Bl	0.37	0/1135	0.51	0/1549
45	Bm	0.28	0/917	0.46	0/1248
46	Bn	0.41	0/860	0.63	0/1150
47	Bo	0.36	0/787	0.53	1/1056 (0.1%)
48	Bp	0.31	0/752	0.52	0/1013
49	Bq	0.35	0/558	0.49	0/756
50	Bt	0.38	0/798	0.56	0/1073
51	Bu	0.29	0/1214	0.48	1/1630 (0.1%)
52	Bv	0.28	0/1157	0.40	0/1560
53	Bw	0.38	0/3206	0.55	0/4354
54	Bx	0.40	0/1364	0.60	1/1849 (0.1%)
55	Bz	0.35	0/404	0.30	0/556
56	AV	0.45	0/1673	0.97	5/2602 (0.2%)
All	All	0.45	1/116797 (0.0%)	0.75	62/166109 (0.0%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
6	B4	0	1
16	BE	0	1
26	BS	0	1
34	Bb	0	1

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Mol	Chain	#Chirality outliers	#Planarity outliers
46	Bn	0	1
All	All	0	5

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
13	BB	1	G	OP3-P	-10.38	1.48	1.61

The worst 5 of 62 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
12	BA	448	G	O5'-P-OP2	-8.78	97.80	105.70
12	BA	52	A	O4'-C1'-N9	7.63	114.30	108.20
56	AV	9	C	C2-N1-C1'	7.62	127.18	118.80
12	BA	697	C	C2-N1-C1'	7.51	127.06	118.80
56	AV	9	C	N1-C2-O2	7.33	123.30	118.90

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
6	B4	61	ASP	Peptide
16	BE	316	PHE	Peptide
26	BS	69	GLY	Peptide
34	Bb	210	GLU	Peptide
46	Bn	65	ASN	Peptide

## 5.2 Too-close contacts [i](#)

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

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

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

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



Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	BL	68/198 (34%)	65 (96%)	3 (4%)	0	100	100
1	CL	43/198 (22%)	41 (95%)	1 (2%)	1 (2%)	6	34
1	DL	25/198 (13%)	25 (100%)	0	0	100	100
1	EL	26/198 (13%)	25 (96%)	1 (4%)	0	100	100
1	FL	25/198 (13%)	25 (100%)	0	0	100	100
1	GL	25/198 (13%)	25 (100%)	0	0	100	100
1	HL	24/198 (12%)	24 (100%)	0	0	100	100
2	B0	108/148 (73%)	105 (97%)	3 (3%)	0	100	100
3	B1	242/256 (94%)	238 (98%)	4 (2%)	0	100	100
4	B2	177/252 (70%)	171 (97%)	6 (3%)	0	100	100
5	B3	116/161 (72%)	114 (98%)	2 (2%)	0	100	100
6	B4	43/126 (34%)	40 (93%)	3 (7%)	0	100	100
7	B5	108/188 (57%)	107 (99%)	1 (1%)	0	100	100
8	B6	50/65 (77%)	49 (98%)	1 (2%)	0	100	100
9	B7	44/95 (46%)	43 (98%)	1 (2%)	0	100	100
10	B8	93/188 (50%)	91 (98%)	2 (2%)	0	100	100
11	B9	36/100 (36%)	36 (100%)	0	0	100	100
14	BC	569/657 (87%)	545 (96%)	23 (4%)	1 (0%)	47	79
15	BD	238/306 (78%)	225 (94%)	13 (6%)	0	100	100
16	BE	305/348 (88%)	282 (92%)	20 (7%)	3 (1%)	15	54
17	BF	248/294 (84%)	237 (96%)	11 (4%)	0	100	100
18	BI	96/268 (36%)	91 (95%)	5 (5%)	0	100	100
19	BJ	210/262 (80%)	203 (97%)	7 (3%)	0	100	100
20	BK	174/192 (91%)	164 (94%)	9 (5%)	1 (1%)	25	64
21	BN	175/178 (98%)	172 (98%)	3 (2%)	0	100	100
22	BO	113/145 (78%)	108 (96%)	5 (4%)	0	100	100
23	BP	286/296 (97%)	276 (96%)	10 (4%)	0	100	100
24	BQ	220/251 (88%)	218 (99%)	2 (1%)	0	100	100
25	BR	151/169 (89%)	146 (97%)	5 (3%)	0	100	100
26	BS	141/180 (78%)	128 (91%)	12 (8%)	1 (1%)	22	61
27	BT	221/292 (76%)	214 (97%)	7 (3%)	0	100	100
28	BU	138/149 (93%)	134 (97%)	4 (3%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
29	BV	153/209 (73%)	147 (96%)	6 (4%)	0	100	100
30	BW	164/210 (78%)	159 (97%)	5 (3%)	0	100	100
31	BX	147/150 (98%)	146 (99%)	1 (1%)	0	100	100
32	BY	204/216 (94%)	192 (94%)	12 (6%)	0	100	100
33	Ba	391/423 (92%)	375 (96%)	16 (4%)	0	100	100
34	Bb	352/380 (93%)	330 (94%)	22 (6%)	0	100	100
35	Bc	293/334 (88%)	279 (95%)	14 (5%)	0	100	100
36	Bd	97/206 (47%)	89 (92%)	7 (7%)	1 (1%)	15	54
37	Be	120/135 (89%)	114 (95%)	6 (5%)	0	100	100
38	Bf	106/142 (75%)	102 (96%)	2 (2%)	2 (2%)	8	39
39	Bg	146/159 (92%)	137 (94%)	9 (6%)	0	100	100
40	Bh	287/332 (86%)	274 (96%)	13 (4%)	0	100	100
41	Bi	258/306 (84%)	250 (97%)	8 (3%)	0	100	100
42	Bj	211/279 (76%)	200 (95%)	10 (5%)	1 (0%)	29	67
43	Bk	132/212 (62%)	126 (96%)	6 (4%)	0	100	100
44	Bl	131/166 (79%)	127 (97%)	4 (3%)	0	100	100
45	Bm	107/159 (67%)	103 (96%)	4 (4%)	0	100	100
46	Bn	95/128 (74%)	89 (94%)	6 (6%)	0	100	100
47	Bo	95/124 (77%)	91 (96%)	4 (4%)	0	100	100
48	Bp	95/112 (85%)	89 (94%)	6 (6%)	0	100	100
49	Bq	66/138 (48%)	64 (97%)	1 (2%)	1 (2%)	10	44
50	Bt	92/102 (90%)	86 (94%)	6 (6%)	0	100	100
51	Bu	147/205 (72%)	137 (93%)	9 (6%)	1 (1%)	22	61
52	Bv	133/222 (60%)	132 (99%)	1 (1%)	0	100	100
53	Bw	385/433 (89%)	364 (94%)	20 (5%)	1 (0%)	41	74
54	Bx	160/196 (82%)	156 (98%)	3 (2%)	1 (1%)	25	64
55	Bz	70/82 (85%)	70 (100%)	0	0	100	100
All	All	9175/12712 (72%)	8795 (96%)	365 (4%)	15 (0%)	50	79

5 of 15 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	CL	21	PRO

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Mol	Chain	Res	Type
38	Bf	78	PRO
38	Bf	80	PRO
51	Bu	167	PRO
16	BE	202	GLN

### 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	
1	BL	59/157 (38%)	59 (100%)	0	100	100
1	CL	30/157 (19%)	29 (97%)	1 (3%)	38	71
1	DL	26/157 (17%)	24 (92%)	2 (8%)	13	44
1	EL	27/157 (17%)	25 (93%)	2 (7%)	13	46
1	FL	26/157 (17%)	24 (92%)	2 (8%)	13	44
1	GL	26/157 (17%)	25 (96%)	1 (4%)	33	67
1	HL	25/157 (16%)	23 (92%)	2 (8%)	12	42
2	B0	90/115 (78%)	83 (92%)	7 (8%)	12	43
3	B1	219/229 (96%)	192 (88%)	27 (12%)	4	21
4	B2	164/228 (72%)	148 (90%)	16 (10%)	8	31
5	B3	110/147 (75%)	100 (91%)	10 (9%)	9	34
6	B4	42/114 (37%)	36 (86%)	6 (14%)	3	15
7	B5	99/163 (61%)	85 (86%)	14 (14%)	3	16
8	B6	49/60 (82%)	47 (96%)	2 (4%)	30	66
9	B7	41/78 (53%)	38 (93%)	3 (7%)	14	46
10	B8	87/162 (54%)	75 (86%)	12 (14%)	3	16
11	B9	36/77 (47%)	32 (89%)	4 (11%)	6	25
14	BC	464/556 (84%)	451 (97%)	13 (3%)	43	74
15	BD	193/248 (78%)	174 (90%)	19 (10%)	8	31
16	BE	263/290 (91%)	238 (90%)	25 (10%)	8	32

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
17	BF	217/251 (86%)	194 (89%)	23 (11%)	6	27
18	BI	88/228 (39%)	84 (96%)	4 (4%)	27	63
19	BJ	192/230 (84%)	182 (95%)	10 (5%)	23	59
20	BK	129/151 (85%)	123 (95%)	6 (5%)	26	62
21	BN	156/157 (99%)	142 (91%)	14 (9%)	9	34
22	BO	99/123 (80%)	89 (90%)	10 (10%)	7	29
23	BP	245/249 (98%)	215 (88%)	30 (12%)	5	22
24	BQ	190/210 (90%)	176 (93%)	14 (7%)	13	46
25	BR	132/143 (92%)	119 (90%)	13 (10%)	8	31
26	BS	123/153 (80%)	116 (94%)	7 (6%)	20	56
27	BT	204/258 (79%)	183 (90%)	21 (10%)	7	29
28	BU	118/127 (93%)	113 (96%)	5 (4%)	30	65
29	BV	136/178 (76%)	126 (93%)	10 (7%)	13	46
30	BW	144/180 (80%)	132 (92%)	12 (8%)	11	40
31	BX	116/134 (87%)	105 (90%)	11 (10%)	8	32
32	BY	185/192 (96%)	162 (88%)	23 (12%)	4	21
33	Ba	348/365 (95%)	309 (89%)	39 (11%)	6	25
34	Bb	310/328 (94%)	279 (90%)	31 (10%)	7	30
35	Bc	271/299 (91%)	258 (95%)	13 (5%)	25	61
36	Bd	92/181 (51%)	85 (92%)	7 (8%)	13	45
37	Be	100/108 (93%)	85 (85%)	15 (15%)	3	14
38	Bf	80/133 (60%)	68 (85%)	12 (15%)	3	14
39	Bg	128/136 (94%)	112 (88%)	16 (12%)	4	21
40	Bh	251/284 (88%)	225 (90%)	26 (10%)	7	28
41	Bi	236/275 (86%)	223 (94%)	13 (6%)	21	57
42	Bj	190/242 (78%)	175 (92%)	15 (8%)	12	43
43	Bk	119/181 (66%)	111 (93%)	8 (7%)	16	50
44	Bl	122/147 (83%)	109 (89%)	13 (11%)	6	27
45	Bm	103/145 (71%)	97 (94%)	6 (6%)	20	55
46	Bn	88/113 (78%)	78 (89%)	10 (11%)	5	24
47	Bo	77/97 (79%)	68 (88%)	9 (12%)	5	23

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
48	Bp	79/88 (90%)	74 (94%)	5 (6%)	18	52
49	Bq	50/114 (44%)	46 (92%)	4 (8%)	12	42
50	Bt	75/82 (92%)	59 (79%)	16 (21%)	1	5
51	Bu	126/177 (71%)	114 (90%)	12 (10%)	8	32
52	Bv	115/183 (63%)	112 (97%)	3 (3%)	46	76
53	Bw	340/373 (91%)	305 (90%)	35 (10%)	7	29
54	Bx	149/173 (86%)	135 (91%)	14 (9%)	8	33
All	All	7999/10754 (74%)	7296 (91%)	703 (9%)	13	36

5 of 703 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
35	Bc	319	MET
43	Bk	165	THR
37	Be	66	PHE
35	Bc	300	VAL
40	Bh	98	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 158 such sidechains are listed below:

Mol	Chain	Res	Type
41	Bi	115	ASN
51	Bu	145	ASN
42	Bj	87	HIS
46	Bn	59	ASN
53	Bw	271	GLN

### 5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
12	BA	1547/1571 (98%)	509 (32%)	10 (0%)
13	BB	65/73 (89%)	25 (38%)	1 (1%)
56	AV	70/71 (98%)	31 (44%)	0
All	All	1682/1715 (98%)	565 (33%)	11 (0%)

5 of 565 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
12	BA	4	A
12	BA	6	A
12	BA	7	G
12	BA	11	G
12	BA	15	A

5 of 11 RNA pucker outliers are listed below:

Mol	Chain	Res	Type
12	BA	1220	A
12	BA	1240	A
13	BB	20	U
12	BA	1241	U
12	BA	1093	A

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

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

#### 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

#### 5.6 Ligand geometry [i](#)

Of 226 ligands modelled in this entry, 220 are monoatomic - leaving 6 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
61	GSP	BC	901	62,57	26,34,34	2.17	3 (11%)	27,54,54	1.51	6 (22%)
59	5GP	BA	3204	-	22,26,26	1.07	1 (4%)	26,40,40	1.29	3 (11%)
59	5GP	BA	3203	-	22,26,26	1.07	2 (9%)	26,40,40	1.46	4 (15%)
63	FME	AV	101	56	8,9,10	0.96	0	7,9,11	0.67	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
60	SPM	BA	3205	-	13,13,13	0.37	0	12,12,12	0.81	0
60	SPM	BR	201	-	13,13,13	0.48	0	12,12,12	0.77	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
61	GSP	BC	901	62,57	-	0/17/38/38	0/3/3/3
59	5GP	BA	3204	-	-	5/6/26/26	0/3/3/3
59	5GP	BA	3203	-	-	5/6/26/26	0/3/3/3
63	FME	AV	101	56	-	4/7/9/11	-
60	SPM	BA	3205	-	-	6/11/11/11	-
60	SPM	BR	201	-	-	7/11/11/11	-

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
61	BC	901	GSP	PG-S1G	-9.35	1.70	1.90
61	BC	901	GSP	C5-C6	-3.70	1.39	1.47
59	BA	3204	5GP	C5-C6	-3.24	1.40	1.47
59	BA	3203	5GP	C6-N1	-2.73	1.33	1.37
59	BA	3203	5GP	C5-C6	-2.45	1.42	1.47

The worst 5 of 13 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
59	BA	3203	5GP	C5-C6-N1	3.66	120.42	113.95
59	BA	3203	5GP	O6-C6-N1	-3.21	116.86	120.65
59	BA	3203	5GP	C8-N7-C5	3.18	109.06	102.99
61	BC	901	GSP	C5-C6-N1	3.12	119.46	113.95
61	BC	901	GSP	C8-N7-C5	3.05	108.80	102.99

There are no chirality outliers.

5 of 27 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
59	BA	3203	5GP	C5'-O5'-P-O1P
59	BA	3203	5GP	C5'-O5'-P-O2P

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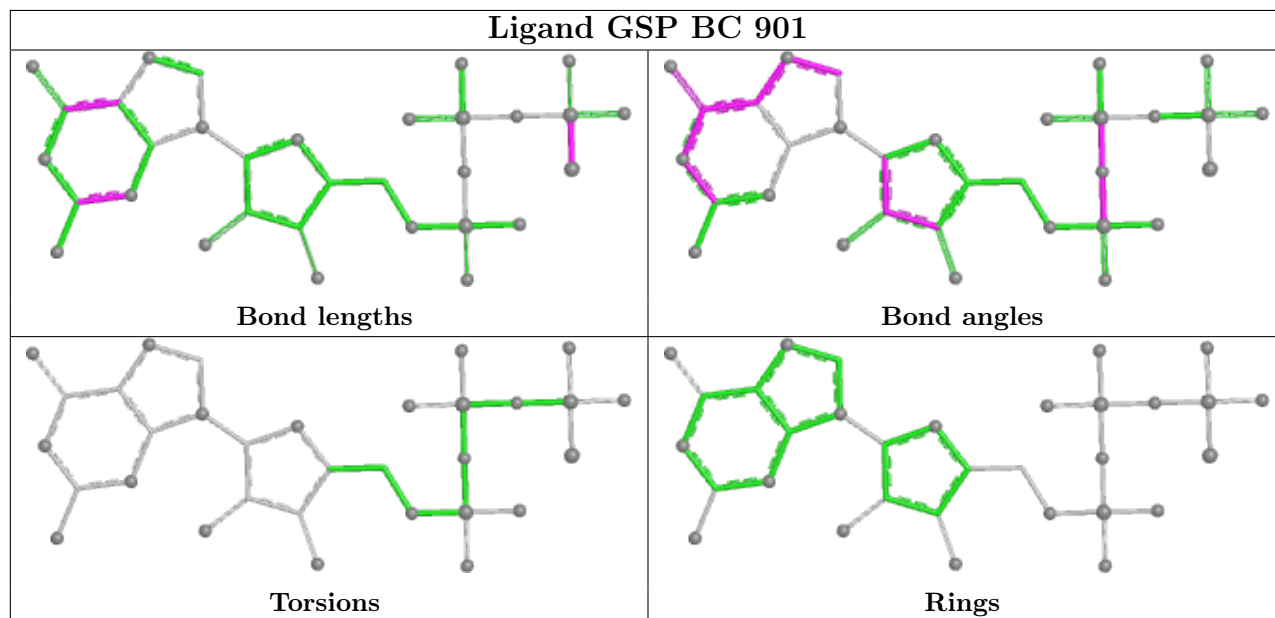
Continued from previous page...

Mol	Chain	Res	Type	Atoms
59	BA	3203	5GP	C5'-O5'-P-O3P
59	BA	3204	5GP	C5'-O5'-P-O1P
59	BA	3204	5GP	C5'-O5'-P-O2P

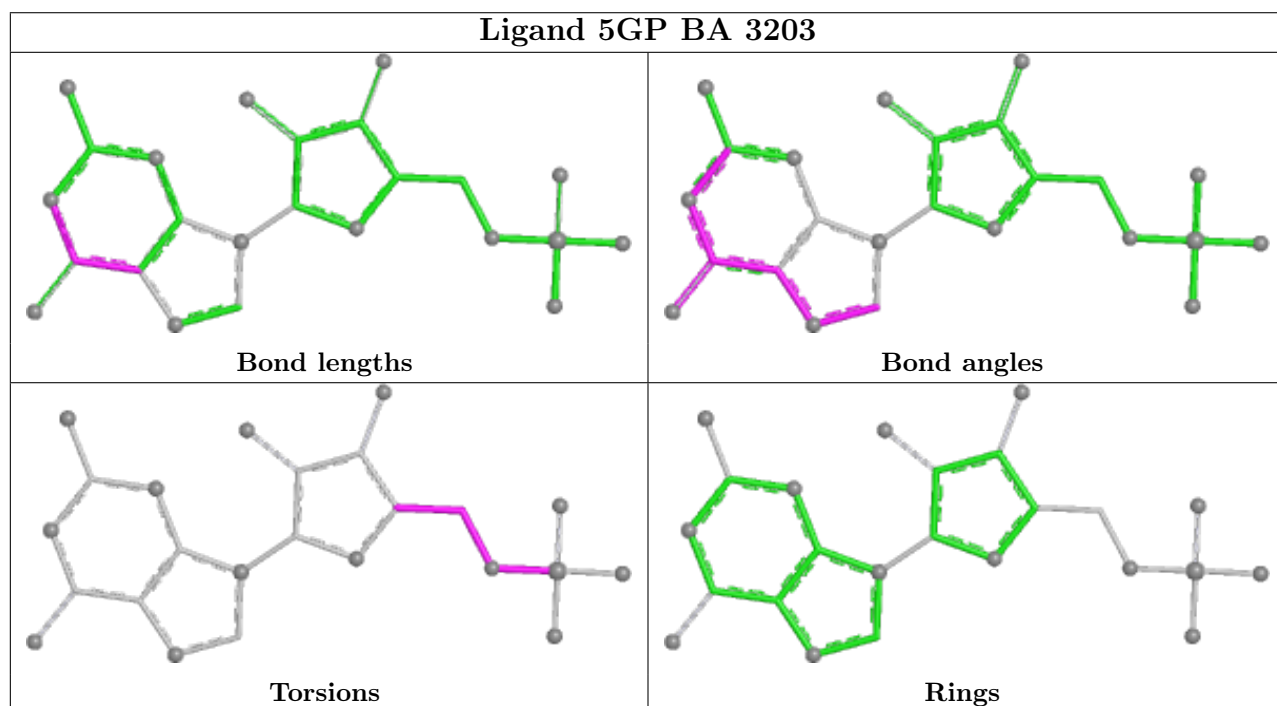
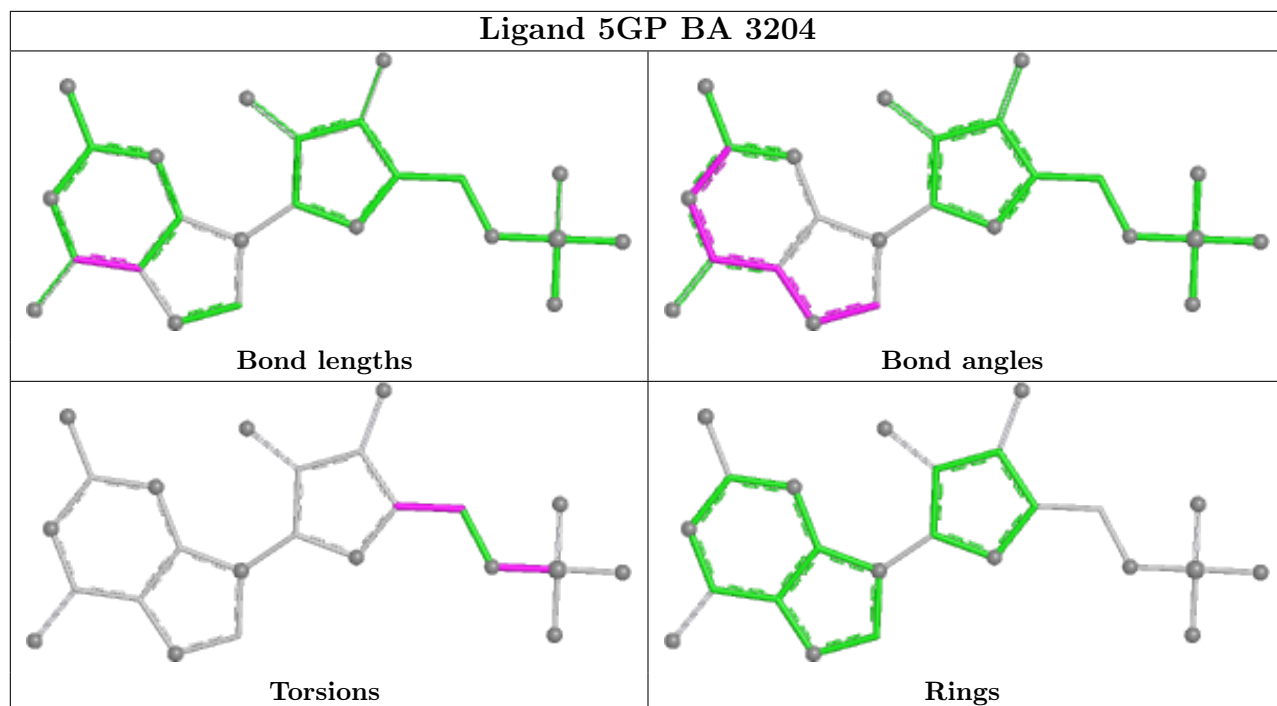
There are no ring outliers.

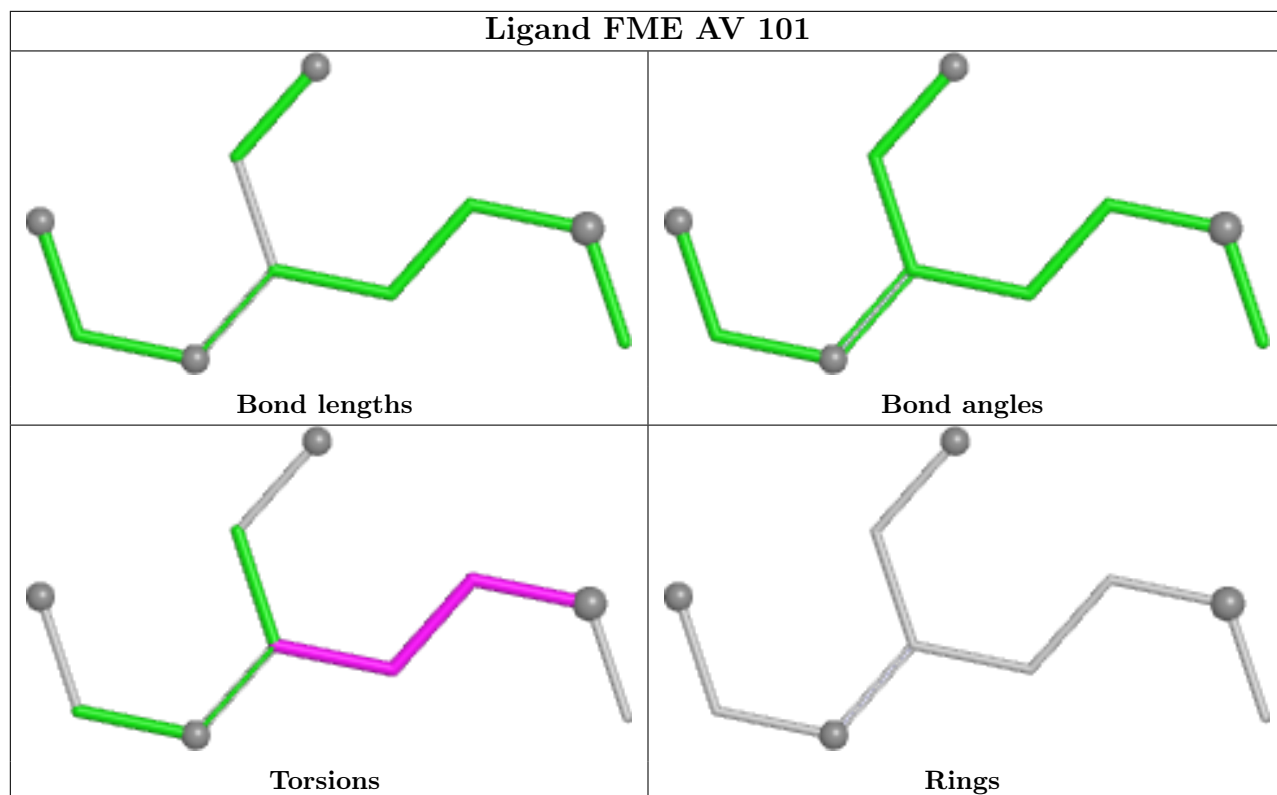
No monomer is involved in short contacts.

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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
55	Bz	5

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	Bz	710:ALA	C	1001:ALA	N	60.04
1	Bz	415:ALA	C	601:ALA	N	51.34
1	Bz	106:ALA	C	301:ALA	N	30.40
1	Bz	615:ALA	C	700:ALA	N	17.65
1	Bz	315:ALA	C	399:ALA	N	16.53

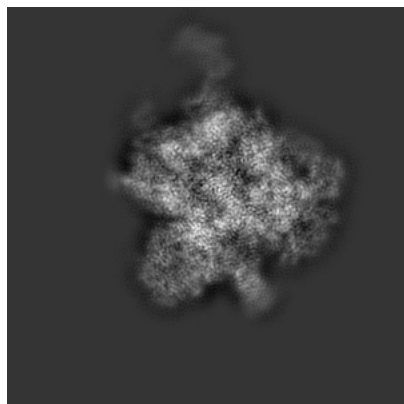
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-4370. These allow visual inspection of the internal detail of the map and identification of artifacts.

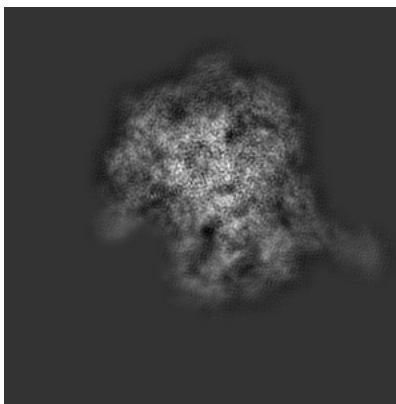
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

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

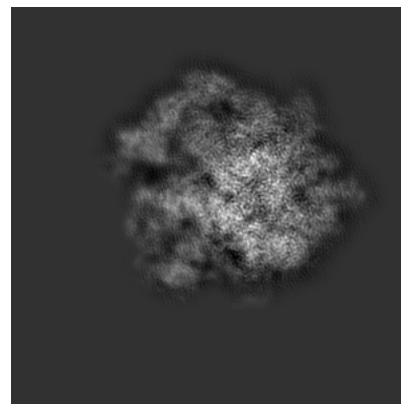
#### 6.1.1 Primary map



X

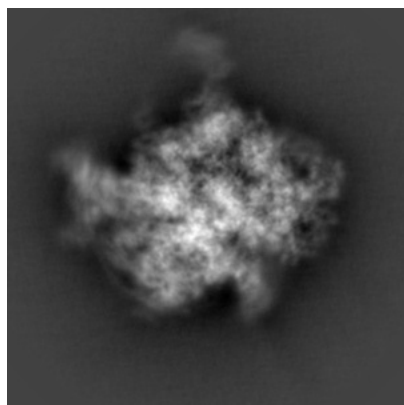


Y

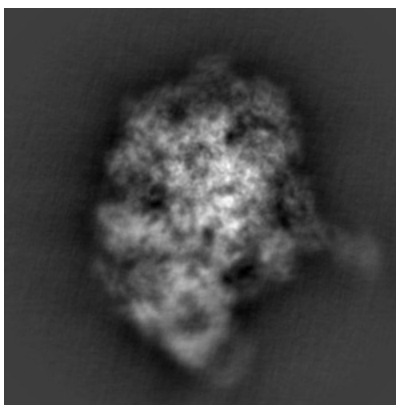


Z

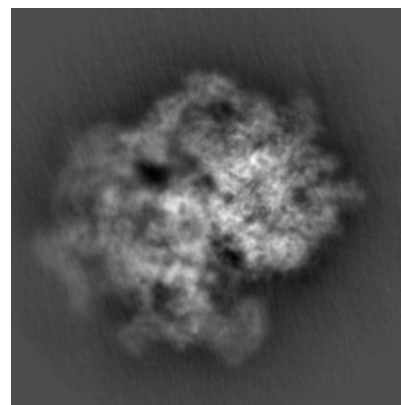
#### 6.1.2 Raw map



X



Y

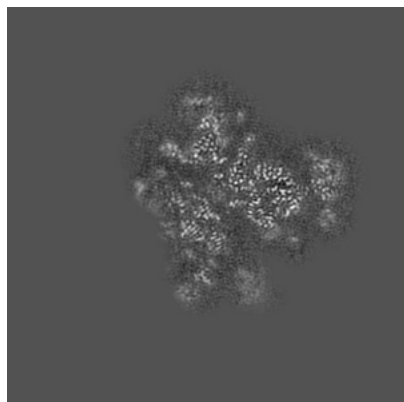


Z

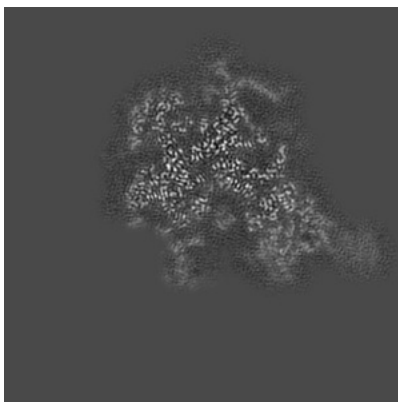
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

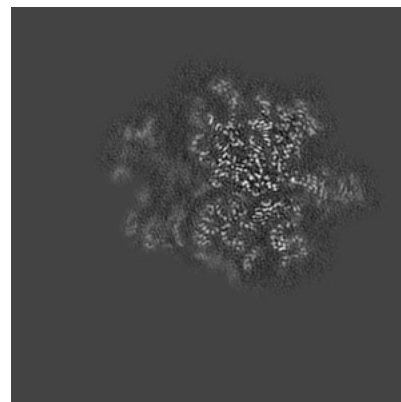
### 6.2.1 Primary map



X Index: 140

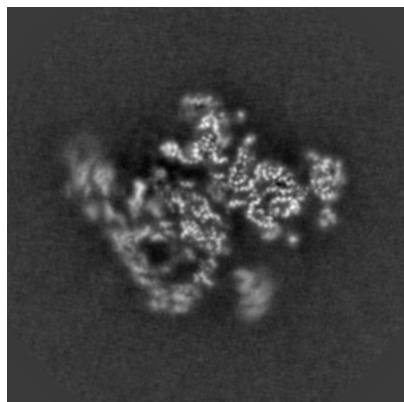


Y Index: 140

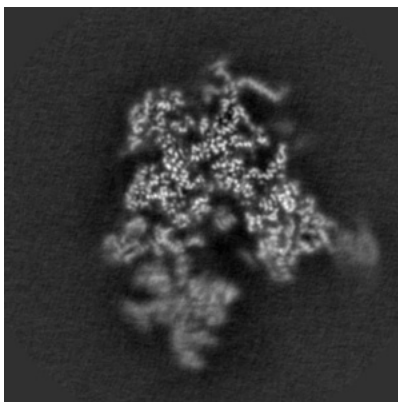


Z Index: 140

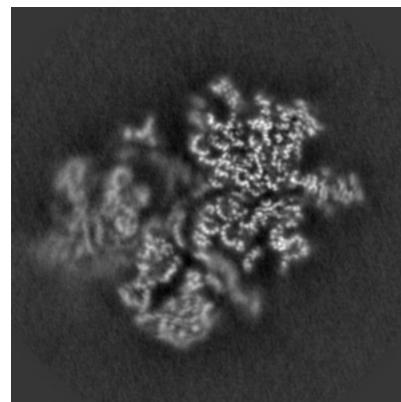
### 6.2.2 Raw map



X Index: 140



Y Index: 140

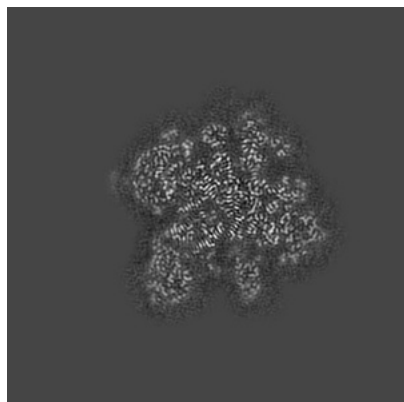


Z Index: 140

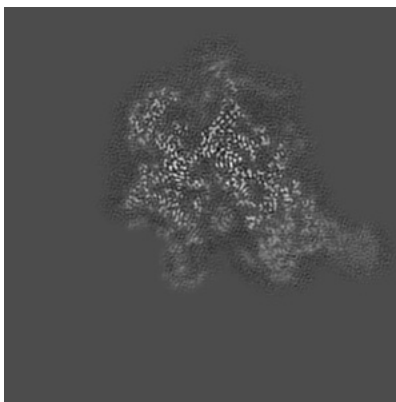
The images above show central slices of the map in three orthogonal directions.

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

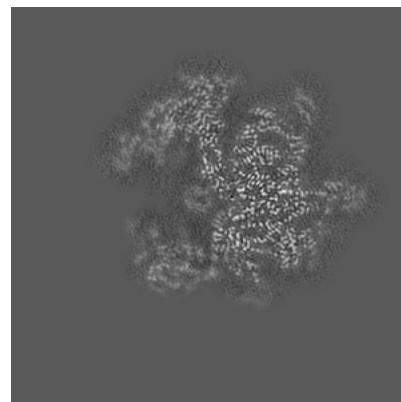
### 6.3.1 Primary map



X Index: 169

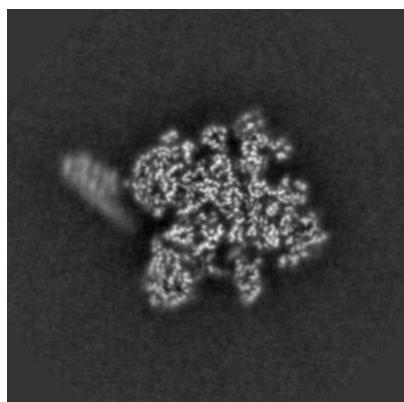


Y Index: 142

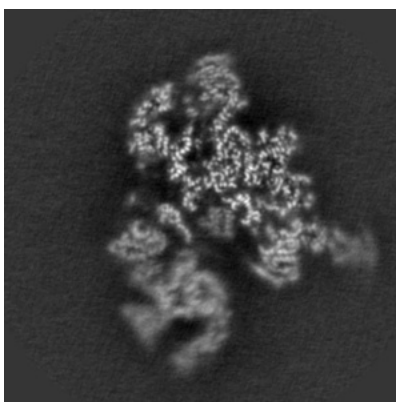


Z Index: 153

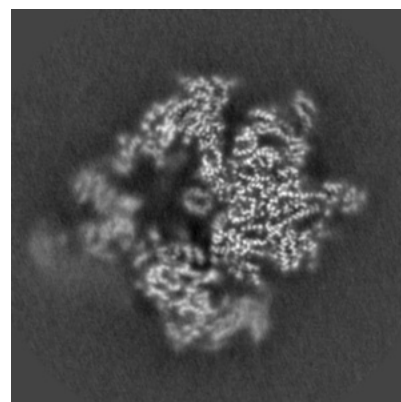
### 6.3.2 Raw map



X Index: 169



Y Index: 148



Z Index: 153

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

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

### 6.4.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.12. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

### 6.4.2 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.

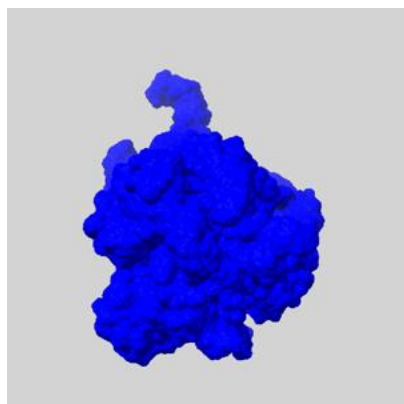
## 6.5 Mask visualisation [i](#)

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

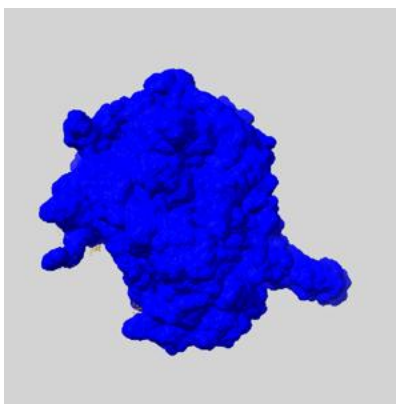
A mask typically either:

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

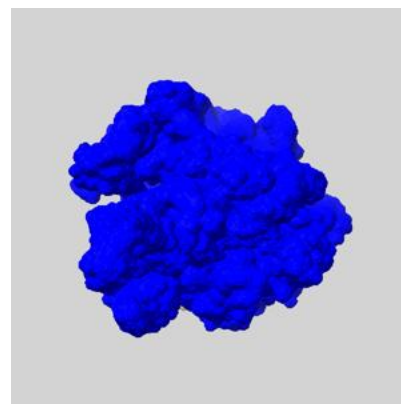
### 6.5.1 emd\_4370\_msk\_1.map [i](#)



X



Y

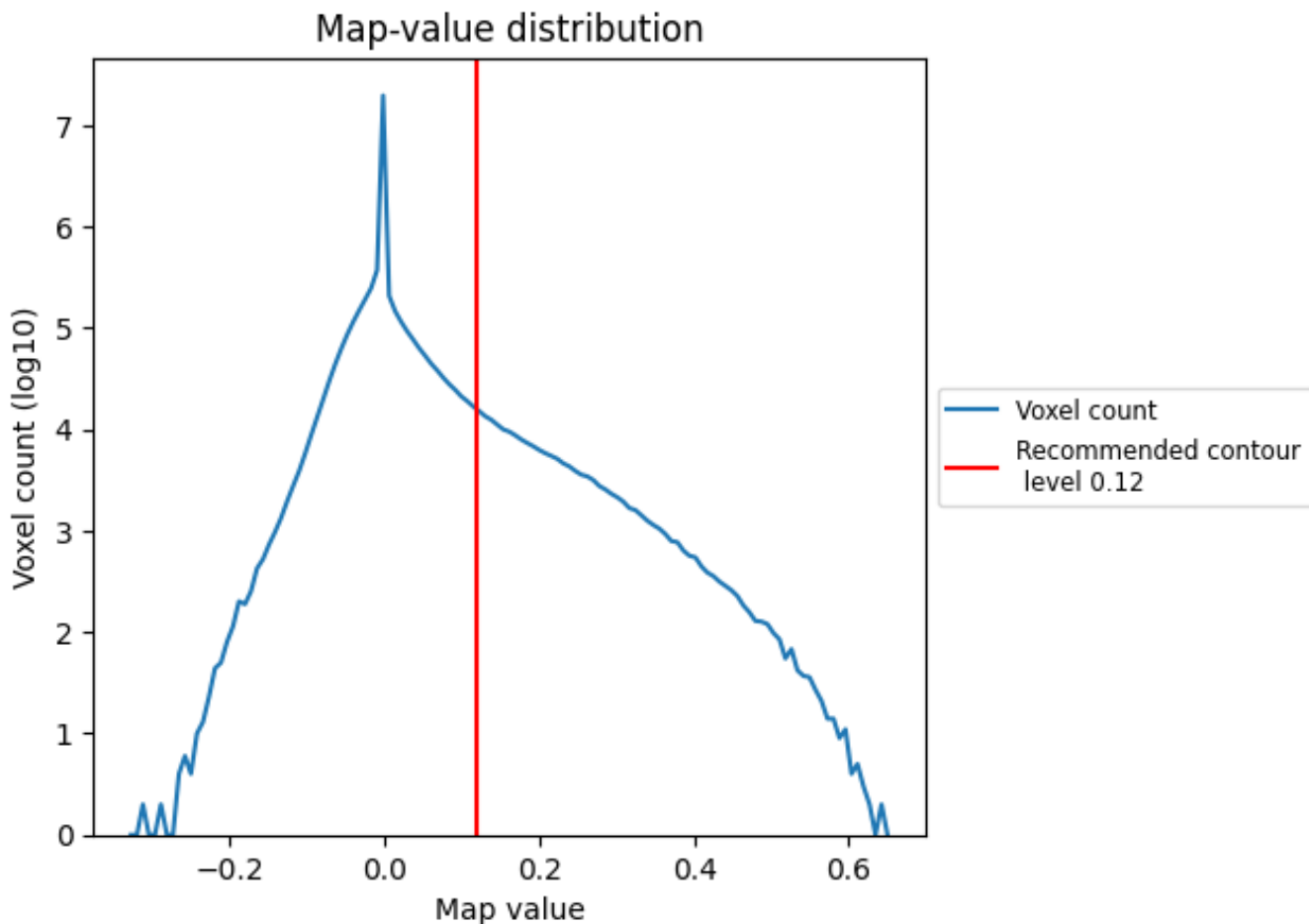


Z

## 7 Map analysis [i](#)

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

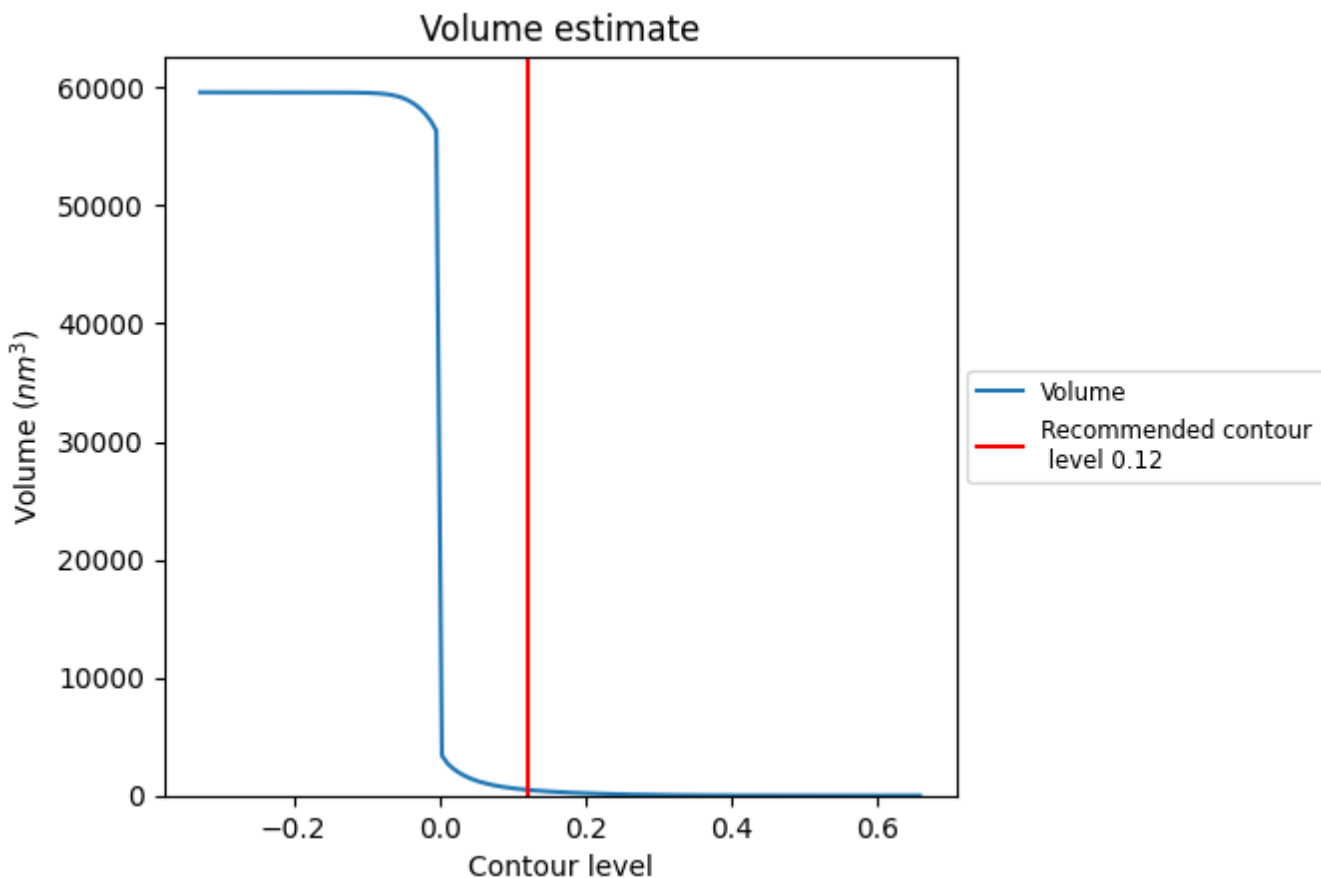
### 7.1 Map-value distribution [i](#)



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.



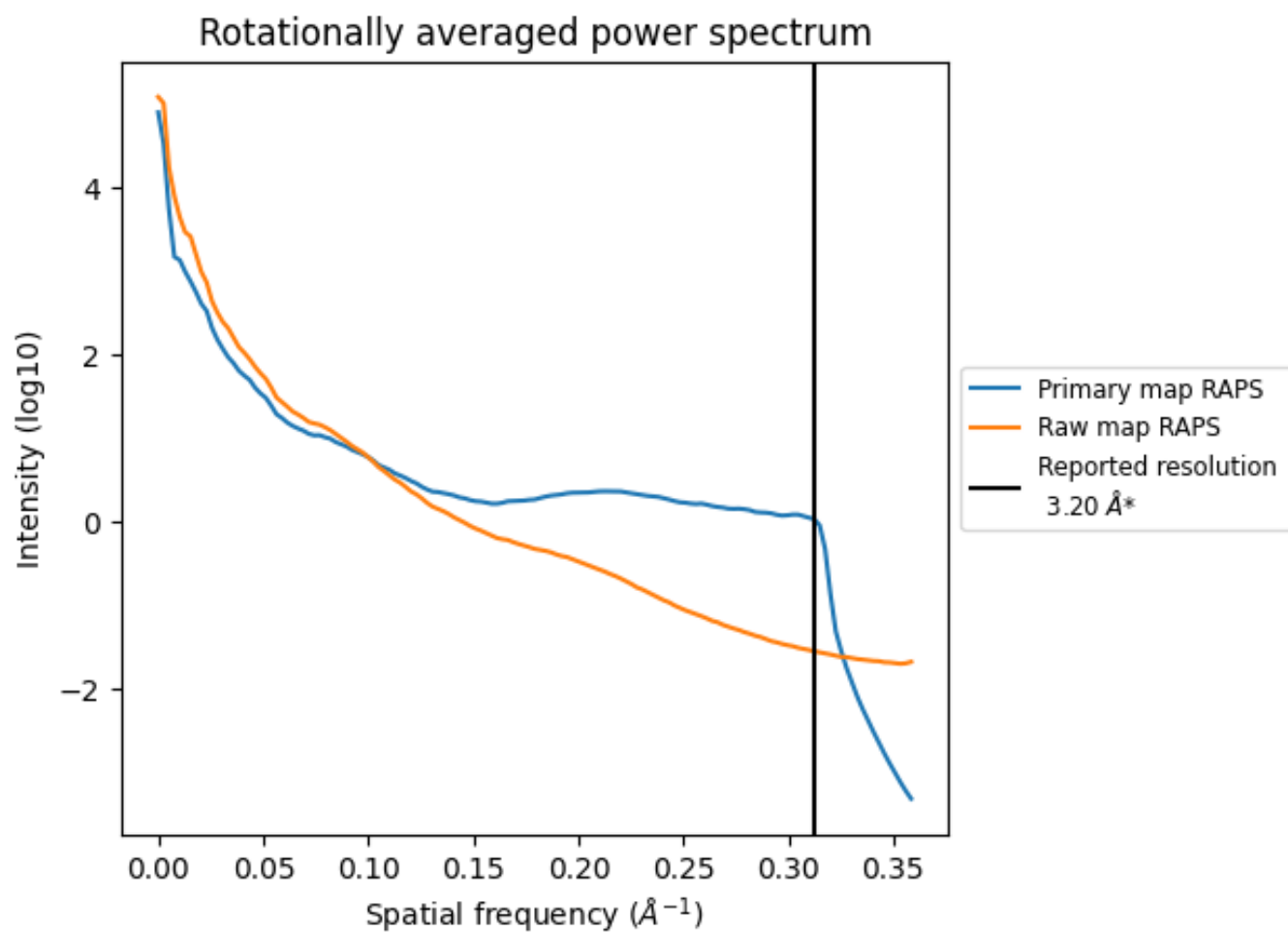
## 7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 485 nm<sup>3</sup>; this corresponds to an approximate mass of 438 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

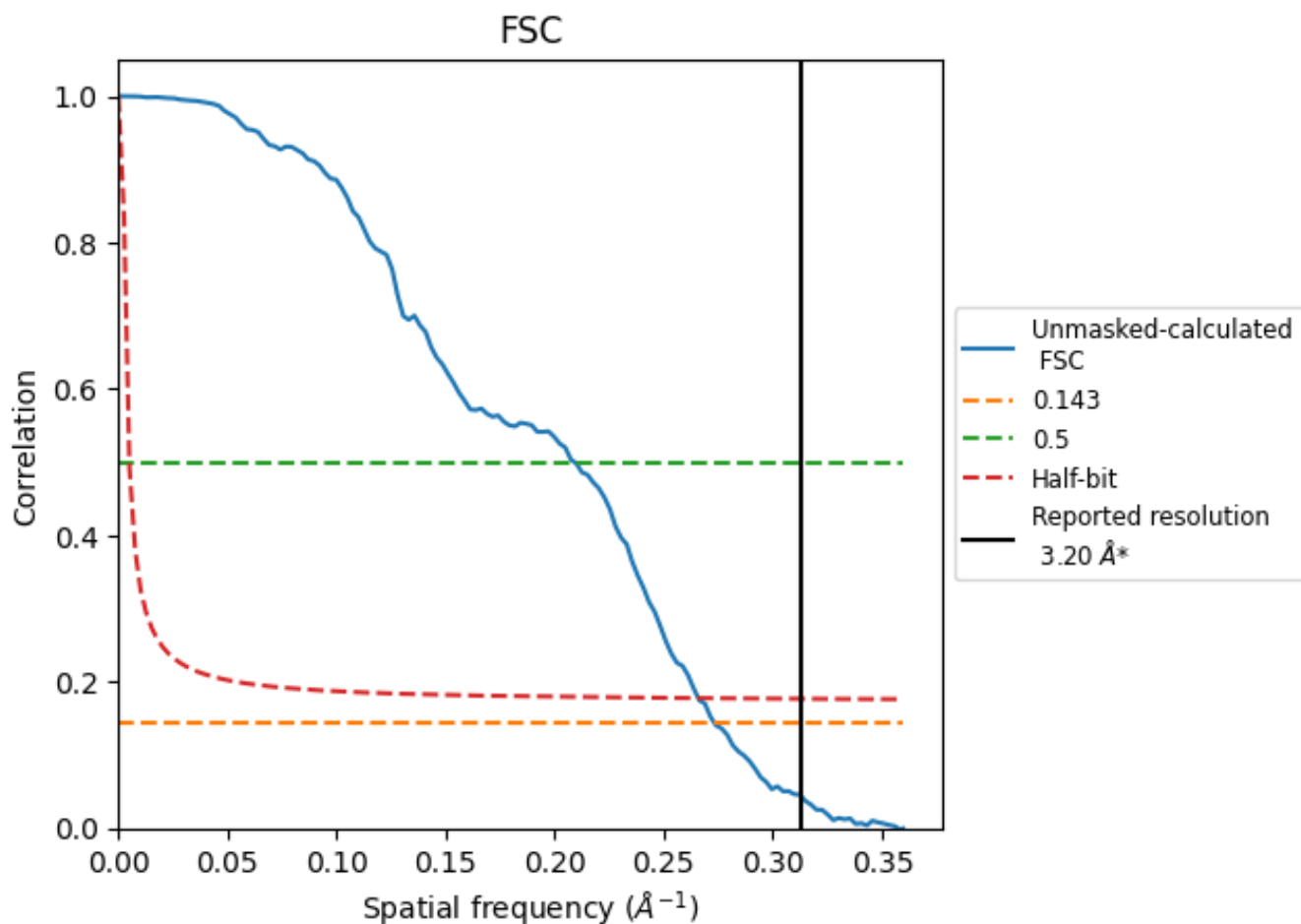


\*Reported resolution corresponds to spatial frequency of 0.312 Å<sup>-1</sup>

## 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 0.312 Å<sup>-1</sup>

## 8.2 Resolution estimates [i](#)

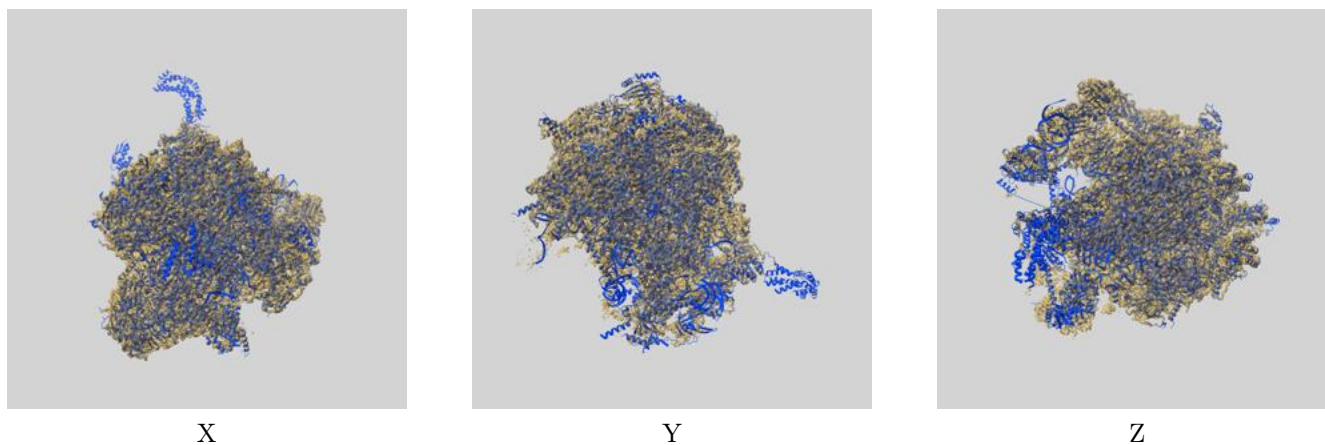
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.20	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.66	4.78	3.76

\*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 3.66 differs from the reported value 3.2 by more than 10 %

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

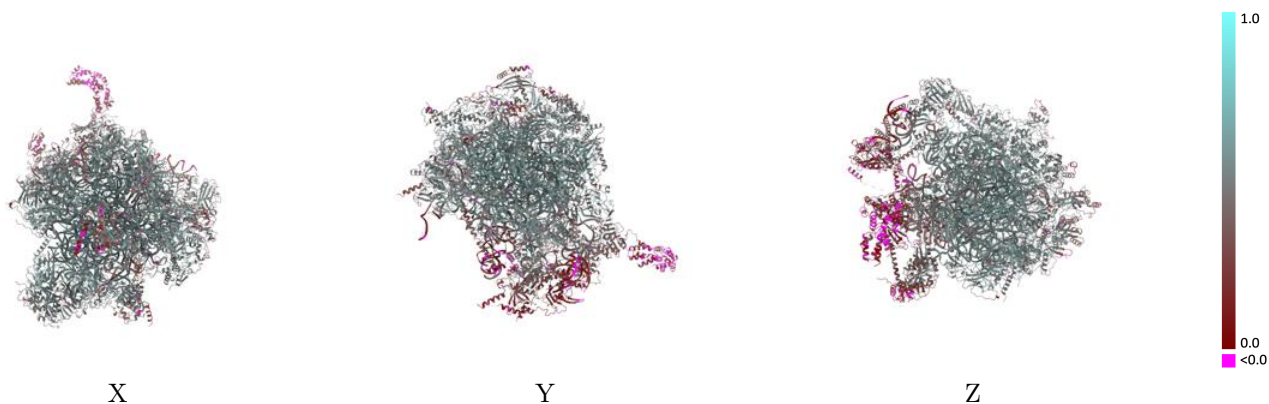
This section contains information regarding the fit between EMDB map EMD-4370 and PDB model 6GB2. Per-residue inclusion information can be found in section 3 on page 19.

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



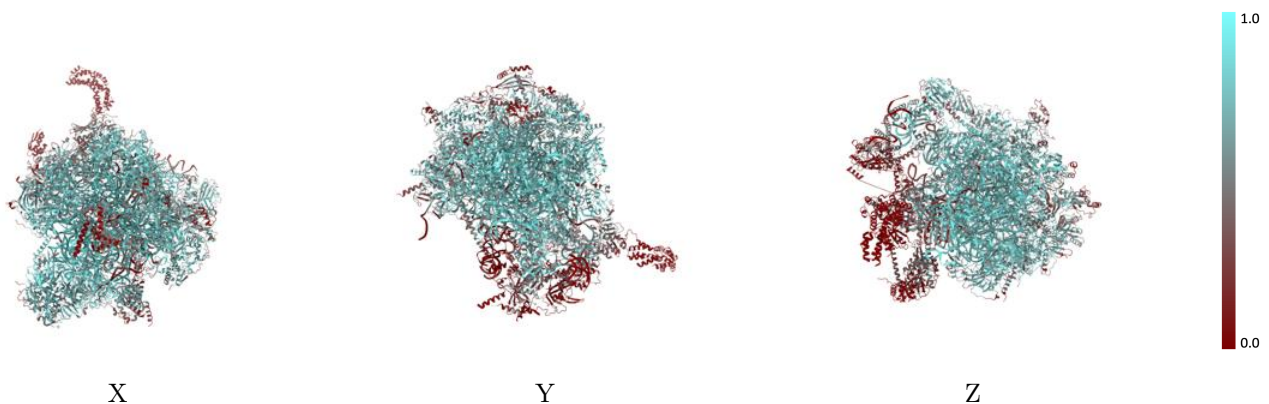
The images above show the 3D surface view of the map at the recommended contour level 0.12 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



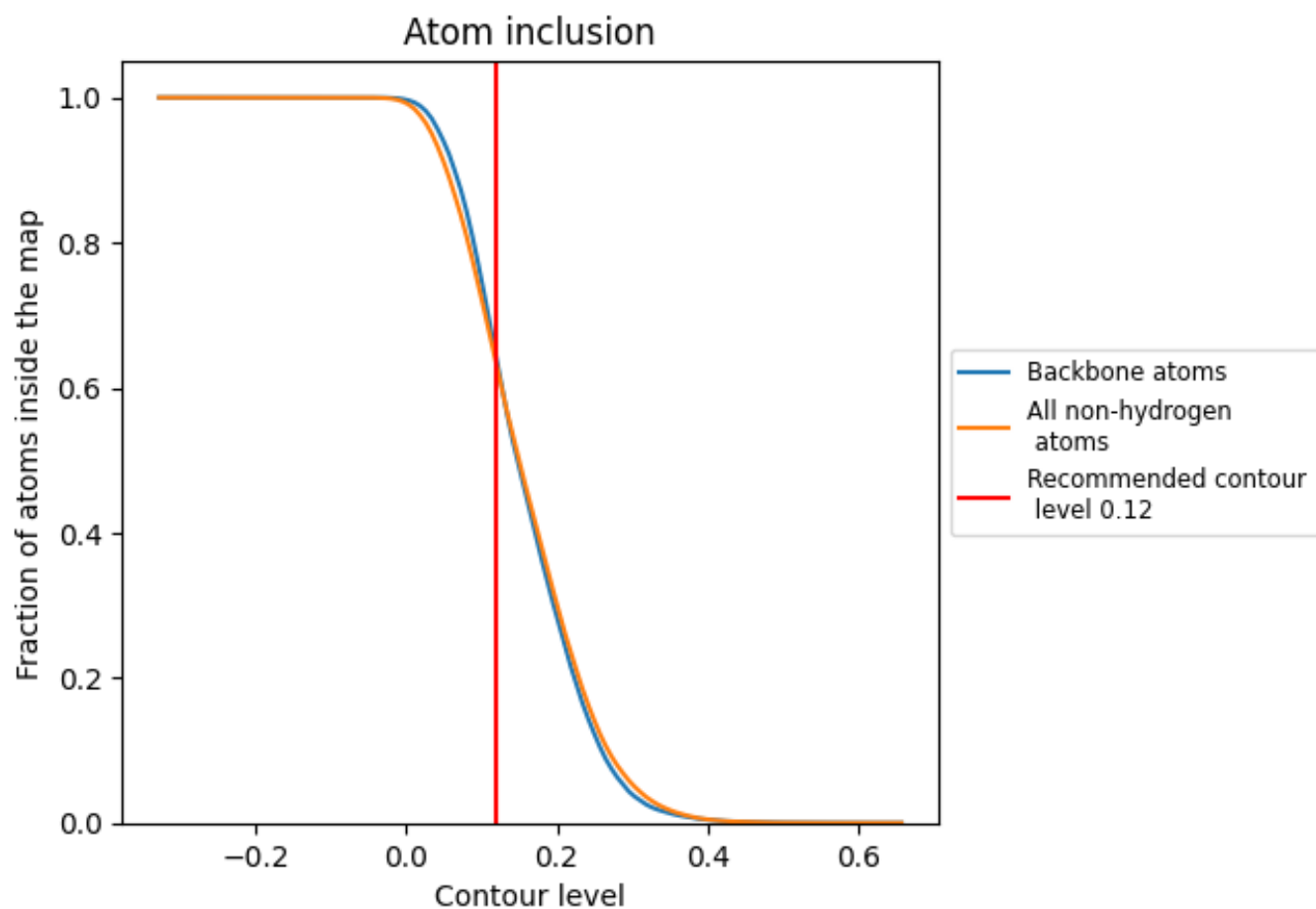
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

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



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.12).







































































## 9.4 Atom inclusion [i](#)



At the recommended contour level, 64% of all backbone atoms, 63% of all non-hydrogen atoms, are inside the map.

## 9.5 Map-model fit summary

The table lists the average atom inclusion at the recommended contour level (0.12) and Q-score for the entire model and for each chain.

























































Chain	Atom inclusion	Q-score
All	 0.6311	 0.4810
AV	 0.0438	 0.1900
B0	 0.7586	 0.5630
B1	 0.6001	 0.4850
B2	 0.7181	 0.5260
B3	 0.7274	 0.5410
B4	 0.3343	 0.2940
B5	 0.6980	 0.5220
B6	 0.4808	 0.4760
B7	 0.8022	 0.5900
B8	 0.7716	 0.5710
B9	 0.7819	 0.5530
BA	 0.8424	 0.5520
BB	 0.4944	 0.2870
BC	 0.2591	 0.3620
BD	 0.6689	 0.5360
BE	 0.7181	 0.5320
BF	 0.7373	 0.5480
BI	 0.4801	 0.4340
BJ	 0.3393	 0.3300
BK	 0.1665	 0.2330
BL	 0.0037	 0.1550
BN	 0.7753	 0.5590
BO	 0.6184	 0.5250
BP	 0.7332	 0.5470
BQ	 0.6825	 0.5310
BR	 0.7364	 0.5470
BS	 0.6812	 0.5090
BT	 0.6411	 0.5130
BU	 0.7543	 0.5500
BV	 0.7222	 0.5330
BW	 0.7246	 0.5520
BX	 0.6799	 0.5080
BY	 0.4295	 0.4340
Ba	 0.6584	 0.4990



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Chain	Atom inclusion	Q-score
Bb	 0.6589	 0.4740
Bc	 0.6016	 0.4650
Bd	 0.2788	 0.2660
Be	 0.5853	 0.4820
Bf	 0.6393	 0.4810
Bg	 0.7219	 0.5470
Bh	 0.6648	 0.4940
Bi	 0.3581	 0.3980
Bj	 0.1741	 0.1960
Bk	 0.3152	 0.3150
Bl	 0.7222	 0.5250
Bm	 0.2810	 0.3950
Bn	 0.7643	 0.5620
Bo	 0.6578	 0.5030
Bp	 0.3785	 0.3700
Bq	 0.3295	 0.3570
Bt	 0.7463	 0.5540
Bu	 0.4533	 0.3870
Bv	 0.4931	 0.4090
Bw	 0.6908	 0.5090
Bx	 0.6750	 0.5040
Bz	 0.0146	 0.0900
CL	 0.0095	 0.1490
DL	 0.0047	 0.1210
EL	 0.0000	 0.0300
FL	 0.0047	 0.0730
GL	 0.0000	 0.0360
HL	 0.0000	 0.0780