



wwPDB EM Validation Summary Report ⓘ

Apr 1, 2025 – 09:19 pm BST

PDB ID : 7O9M / pdb_00007o9m
EMDB ID : EMD-12764
Title : Human mitochondrial ribosome large subunit assembly intermediate with MTERF4-NSUN4, MRM2, MTG1 and the MALSU module
Authors : Valentin Gese, G.; Hallberg, B.M.
Deposited on : 2021-04-16
Resolution : 2.60 Å(reported)
Based on initial model : 5OOL

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

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

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

EMDB validation analysis : 0.0.1.dev117
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.42

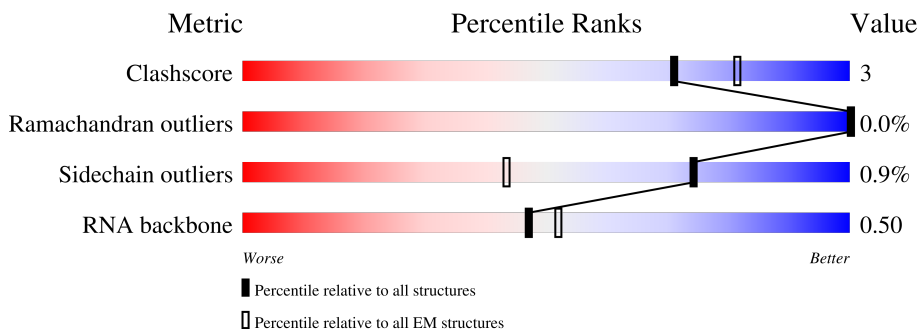
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 2.60 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)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415
RNA backbone	6643	2191

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

Mol	Chain	Length	Quality of chain
1	A	1559	
2	B	69	
3	C	333	
4	D	305	
5	E	348	
6	F	311	
7	H	267	

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
8	I	261	
9	J	192	
10	K	178	
11	L	145	
12	M	296	
13	N	251	
14	O	175	
15	P	179	
16	Q	292	
17	R	149	
18	S	205	
19	T	212	
20	U	153	
21	V	216	
22	W	148	
23	X	256	
24	Y	250	
25	Z	161	
26	a	142	
27	0	188	
28	1	65	
29	2	92	
30	3	188	
31	4	103	
32	5	423	

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
33	6	380	
34	7	338	
35	8	206	
36	9	137	
37	b	215	
38	c	332	
39	d	302	
40	e	279	
41	f	212	
42	g	166	
43	h	158	
44	i	128	
45	j	123	
46	k	112	
47	l	138	
48	m	128	
49	o	102	
50	p	205	
51	q	222	
52	r	196	
53	s	439	
54	n	246	
55	A1	384	
56	A2	381	
57	v	70	

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
58	u	234	
59	t1	198	
59	t2	198	
59	t3	198	
59	t4	198	
59	t5	198	
59	t6	198	
60	w	156	
61	UNK	26	

2 Entry composition

There are 66 unique types of molecules in this entry. The entry contains 110342 atoms, of which 0 are hydrogens and 0 are deuteriums.

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

- Molecule 1 is a RNA chain called 16S rRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	1454	Total	C	N	O	P	0	0
			30864	13851	5568	9991	1454		

- Molecule 2 is a RNA chain called MT-TRNAVAL.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	60	Total	C	N	O	P	0	0
			1275	572	230	413	60		

- Molecule 3 is a protein called Mitochondrial ribosome-associated GTPase 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	240	Total	C	N	O	S	0	0
			1878	1195	330	342	11		

- Molecule 4 is a protein called 39S ribosomal protein L2, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	238	Total	C	N	O	S	0	0
			1859	1157	376	317	9		

- Molecule 5 is a protein called 39S ribosomal protein L3, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	E	304	Total	C	N	O	S	0	0
			2396	1539	416	430	11		

- Molecule 6 is a protein called 39S ribosomal protein L4, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	F	250	Total	C	N	O	S	0	0
			2013	1294	365	348	6		

- Molecule 7 is a protein called 39S ribosomal protein L9, mitochondrial.

Mol	Chain	Residues	Atoms				AltConf	Trace
7	H	90	Total	C	N	O	0	0
			749	477	146	126		

- Molecule 8 is a protein called 39S ribosomal protein L10, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	I	205	Total	C	N	O	S	0	0
			1646	1059	293	283	11		

- Molecule 9 is a protein called 39S ribosomal protein L11, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	J	140	Total	C	N	O	S	0	0
			1061	680	192	187	2		

- Molecule 10 is a protein called 39S ribosomal protein L13, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	K	177	Total	C	N	O	S	0	0
			1451	934	259	251	7		

- Molecule 11 is a protein called 39S ribosomal protein L14, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	L	115	Total	C	N	O	S	0	0
			889	559	171	154	5		

- Molecule 12 is a protein called 39S ribosomal protein L15, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	M	287	Total	C	N	O	S	0	0
			2305	1472	425	402	6		

- Molecule 13 is a protein called 39S ribosomal protein L16, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	N	206	Total	C	N	O	S	0	0
			1676	1076	302	289	9		

- Molecule 14 is a protein called 39S ribosomal protein L17, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	O	152	Total	C	N	O	S	0	0
			1245	784	239	215	7		

- Molecule 15 is a protein called Mitochondrial ribosomal protein L18, isoform CRA_b.

Mol	Chain	Residues	Atoms					AltConf	Trace
15	P	141	Total	C	N	O	S	0	0
			1148	719	221	203	5		

- Molecule 16 is a protein called 39S ribosomal protein L19, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
16	Q	217	Total	C	N	O	S	0	0
			1805	1159	317	320	9		

- Molecule 17 is a protein called 39S ribosomal protein L20, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
17	R	140	Total	C	N	O	S	0	0
			1153	732	231	186	4		

- Molecule 18 is a protein called 39S ribosomal protein L21, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
18	S	156	Total	C	N	O	S	0	0
			1251	806	222	219	4		

- Molecule 19 is a protein called 39S ribosomal protein L22, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
19	T	166	Total	C	N	O	S	0	0
			1368	875	254	232	7		

- Molecule 20 is a protein called 39S ribosomal protein L23, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
20	U	139	Total	C	N	O	S	0	0
			1154	734	220	197	3		

- Molecule 21 is a protein called 39S ribosomal protein L24, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
21	V	202	Total	C	N	O	S	0	0
			1652	1053	294	297	8		

- Molecule 22 is a protein called 39S ribosomal protein L27, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
22	W	101	Total	C	N	O	S	0	0
			805	520	151	131	3		

- Molecule 23 is a protein called 39S ribosomal protein L28, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
23	X	243	Total	C	N	O	S	0	0
			2035	1317	351	362	5		

- Molecule 24 is a protein called 39S ribosomal protein L47, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
24	Y	176	Total	C	N	O	S	0	0
			1517	970	291	252	4		

- Molecule 25 is a protein called 39S ribosomal protein L30, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
25	Z	120	Total	C	N	O	S	0	0
			978	626	183	166	3		

- Molecule 26 is a protein called 39S ribosomal protein L42, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
26	a	82	Total	C	N	O	S	0	0
			686	434	124	123	5		

- Molecule 27 is a protein called 39S ribosomal protein L32, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
27	0	108	Total	C	N	O	S	0	0
			880	545	172	157	6		

- Molecule 28 is a protein called 39S ribosomal protein L33, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
28	1	52	Total	C	N	O	S	0	0
			433	278	83	70	2		

- Molecule 29 is a protein called 39S ribosomal protein L34, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
29	2	45	Total	C	N	O	S	0	0
			367	227	81	58	1		

- Molecule 30 is a protein called 39S ribosomal protein L35, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
30	3	95	Total	C	N	O	S	0	0
			831	539	162	127	3		

- Molecule 31 is a protein called 39S ribosomal protein L36, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
31	4	38	Total	C	N	O	S	0	0
			342	217	72	49	4		

- Molecule 32 is a protein called 39S ribosomal protein L37, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
32	5	392	Total	C	N	O	S	0	0
			3199	2067	558	563	11		

- Molecule 33 is a protein called 39S ribosomal protein L38, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
33	6	324	Total	C	N	O	S	0	0
			2723	1743	488	484	8		

- Molecule 34 is a protein called 39S ribosomal protein L39, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
34	7	287	Total	C	N	O	S	0	0
			2334	1495	397	425	17		

- Molecule 35 is a protein called 39S ribosomal protein L40, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
35	8	85	Total	C	N	O	S	0	0
			719	454	129	134	2		

- Molecule 36 is a protein called 39S ribosomal protein L41, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
36	9	123	Total	C	N	O	S	0	0
			992	642	169	179	2		

- Molecule 37 is a protein called 39S ribosomal protein L43, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
37	b	148	Total	C	N	O	S	0	0
			1178	733	229	213	3		

- Molecule 38 is a protein called 39S ribosomal protein L44, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
38	c	286	Total	C	N	O	S	0	0
			2300	1469	396	426	9		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
39	d	220	Total	C	N	O	S	0	0
			1819	1170	310	327	12		

- Molecule 40 is a protein called 39S ribosomal protein L46, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
40	e	217	Total	C	N	O	S	0	0
			1762	1124	310	323	5		

- Molecule 41 is a protein called 39S ribosomal protein L48, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
41	f	130	Total	C	N	O	S	0	0
			1044	669	172	200	3		

- Molecule 42 is a protein called 39S ribosomal protein L49, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
42	g	131	Total	C	N	O	S	0	0
			1085	701	190	192	2		

- Molecule 43 is a protein called 39S ribosomal protein L50, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
43	h	105	Total	C	N	O	S	0	0
			862	548	151	160	3		

- Molecule 44 is a protein called 39S ribosomal protein L51, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
44	i	97	Total	C	N	O	S	0	0
			827	532	165	126	4		

- Molecule 45 is a protein called 39S ribosomal protein L52, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
45	j	85	Total	C	N	O	S	0	0
			684	423	133	126	2		

- Molecule 46 is a protein called 39S ribosomal protein L53, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
46	k	95	Total	C	N	O	S	0	0
			732	456	139	132	5		

- Molecule 47 is a protein called 39S ribosomal protein L54, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
47	l	44	Total	C	N	O	S	0	0
			395	251	76	67	1		

- Molecule 48 is a protein called 39S ribosomal protein L55, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
48	m	42	Total	C	N	O	S	0	0
			345	216	70	57	2		

- Molecule 49 is a protein called Ribosomal protein 63, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
49	o	80	Total	C	N	O	S	0	0
			670	423	131	113	3		

- Molecule 50 is a protein called Peptidyl-tRNA hydrolase ICT1, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
50	p	127	Total	C	N	O	S	0	0
			1058	661	201	192	4		

- Molecule 51 is a protein called Growth arrest and DNA damage-inducible proteins-interacting protein 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
51	q	135	Total	C	N	O	S	0	0
			1134	705	222	202	5		

- Molecule 52 is a protein called 39S ribosomal protein S18a, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
52	r	157	Total	C	N	O	S	0	0
			1283	817	245	213	8		

- Molecule 53 is a protein called 39S ribosomal protein S30, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
53	s	372	Total	C	N	O	S	0	0
			3052	1956	544	538	14		

- Molecule 54 is a protein called rRNA methyltransferase 2, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
54	n	215	Total	C	N	O	S	0	0
			1667	1055	303	303	6		

- Molecule 55 is a protein called 5-methylcytosine rRNA methyltransferase NSUN4.

Mol	Chain	Residues	Atoms					AltConf	Trace
55	A1	335	Total	C	N	O	S	0	0
			2652	1690	463	482	17		

- Molecule 56 is a protein called Transcription termination factor 4, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
56	A2	238	Total	C	N	O	S	0	0
			1942	1244	336	350	12		

- Molecule 57 is a protein called MIEF1 upstream open reading frame protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
57	v	69	Total	C	N	O		0	0
			589	372	116	101			

- Molecule 58 is a protein called Mitochondrial assembly of ribosomal large subunit protein 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
58	u	129	Total	C	N	O	S	0	0
			1064	685	175	194	10		

- Molecule 59 is a protein called 39S ribosomal protein L12, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
59	t1	46	Total	C	N	O		0	0
			354	228	56	70			
59	t2	30	Total	C	N	O		0	0
			238	154	38	46			
59	t3	30	Total	C	N	O		0	0
			238	154	38	46			
59	t4	29	Total	C	N	O		0	0
			229	148	36	45			
59	t6	27	Total	C	N	O		0	0
			214	137	34	43			
59	t5	29	Total	C	N	O		0	0
			229	148	36	45			

- Molecule 60 is a protein called Acyl carrier protein, mitochondrial.

Mol	Chain	Residues	Atoms					AltConf	Trace
60	w	87	Total	C	N	O	S	0	0
			705	452	103	144	6		

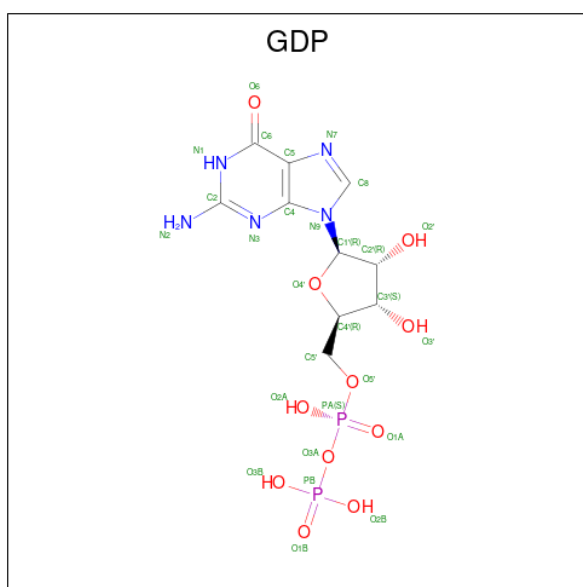
- Molecule 61 is a protein called Unknown residues.

Mol	Chain	Residues	Atoms					AltConf	Trace
61	UNK	26	Total	C	N	O		0	0
			130	78	26	26			

- Molecule 62 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
62	A	101	Total	Mg	0
			101	101	
62	D	1	Total	Mg	0
			1	1	
62	F	1	Total	Mg	0
			1	1	
62	n	1	Total	Mg	0
			1	1	

- Molecule 63 is GUANOSINE-5'-DIPHOSPHATE (CCD ID: GDP) (formula: C₁₀H₁₅N₅O₁₁P₂).

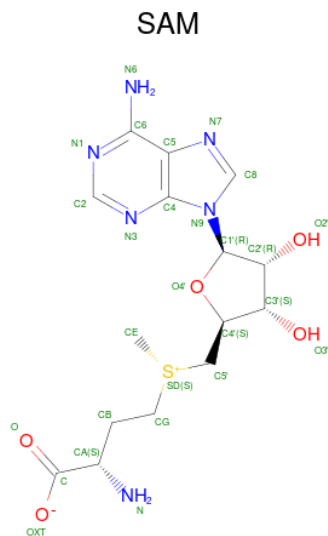


Mol	Chain	Residues	Atoms					AltConf
63	C	1	Total	C	N	O	P	0
			28	10	5	11	2	

- Molecule 64 is ZINC ION (CCD ID: ZN) (formula: Zn).

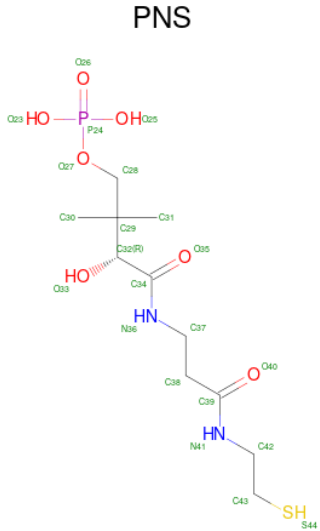
Mol	Chain	Residues	Atoms		AltConf
64	0	1	Total	Zn	0
			1	1	
64	4	1	Total	Zn	0
			1	1	

- Molecule 65 is S-ADENOSYLMETHIONINE (CCD ID: SAM) (formula: C₁₅H₂₂N₆O₅S).

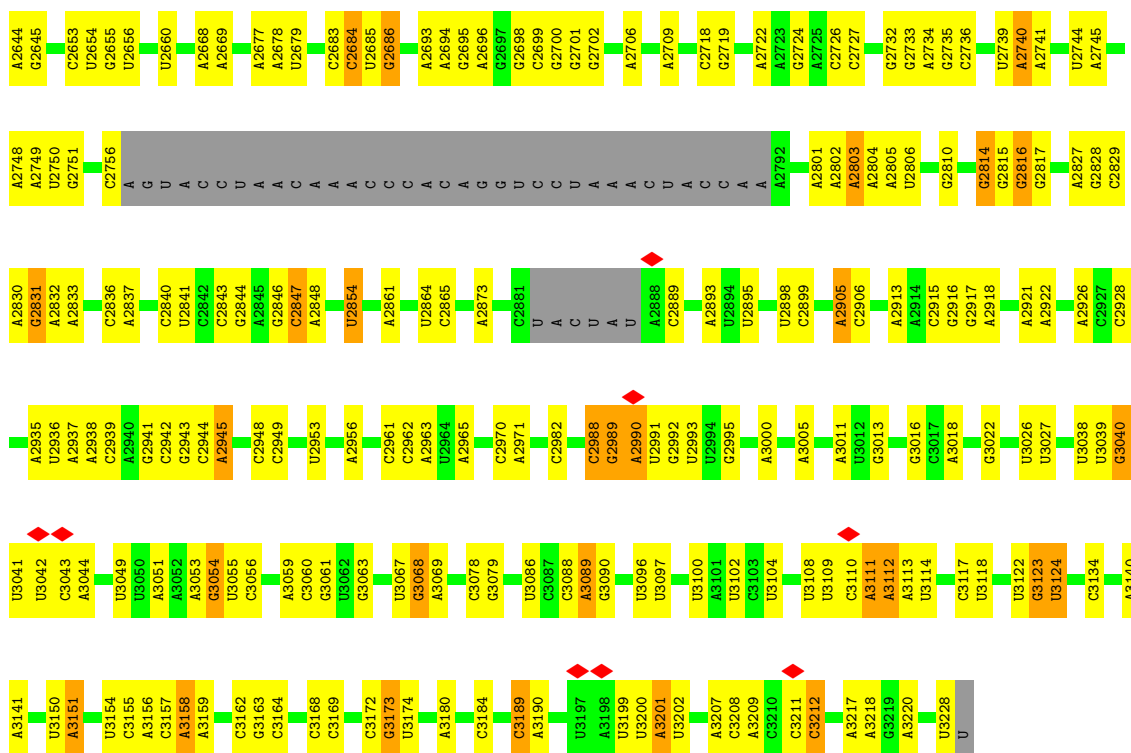


Mol	Chain	Residues	Atoms					AltConf
65	A1	1	Total 27	C 15	N 6	O 5	S 1	0

- Molecule 66 is 4'-PHOSPHOPANTETHEINE (CCD ID: PNS) (formula: $C_{11}H_{23}N_2O_7PS$).



Mol	Chain	Residues	Atoms						AltConf
66	w	1	Total 21	C 11	N 2	O 6	P 1	S 1	0



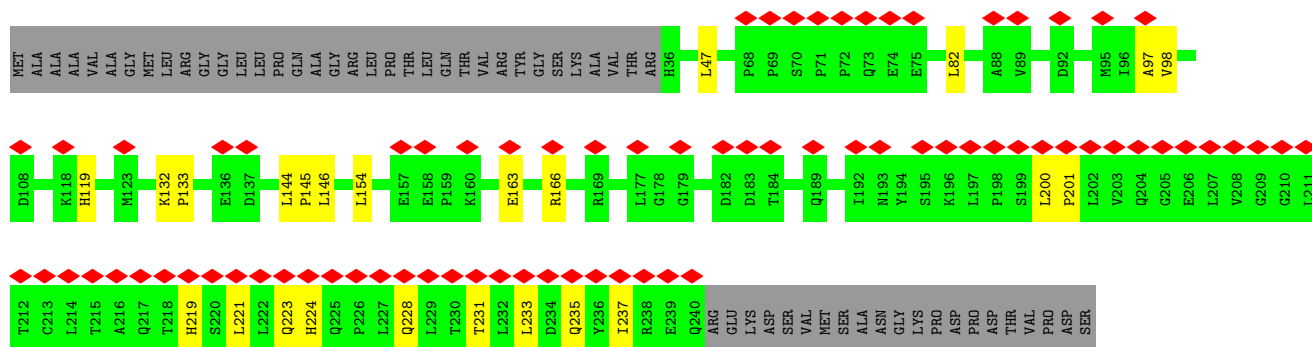
• Molecule 2: MT-TRNAVAL



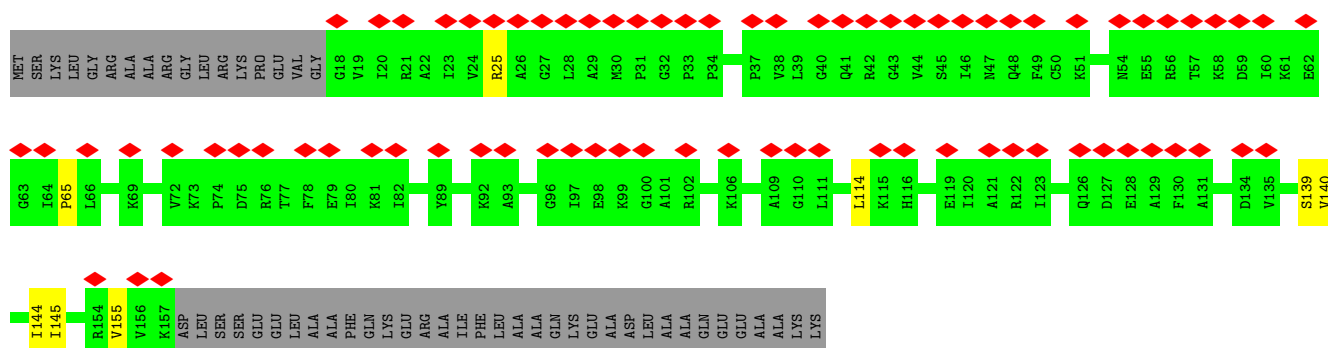
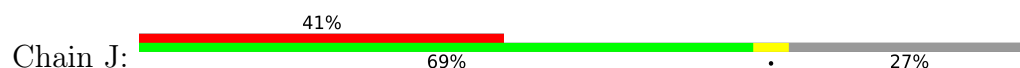
• Molecule 3: Mitochondrial ribosome-associated GTPase 1



- Molecule 8: 39S ribosomal protein L10, mitochondrial



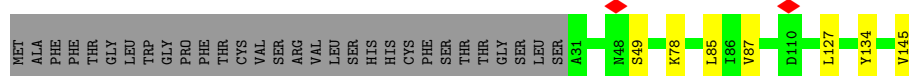
- Molecule 9: 39S ribosomal protein L11, mitochondrial




- Molecule 10: 39S ribosomal protein L13, mitochondrial



- Molecule 11: 39S ribosomal protein L14, mitochondrial




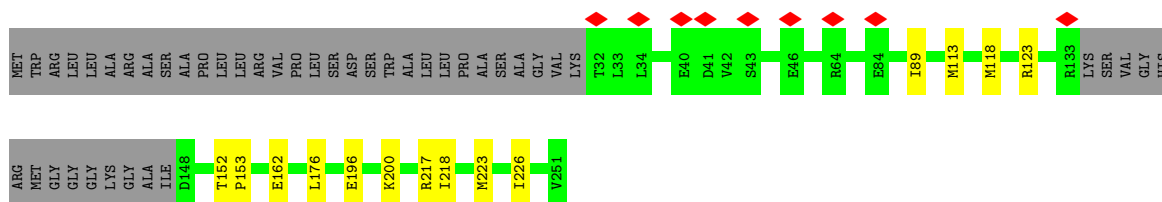
- Molecule 12: 39S ribosomal protein L15, mitochondrial

Chain M:  87% 10%




- Molecule 13: 39S ribosomal protein L16, mitochondrial

Chain N:  76% 6% 18%



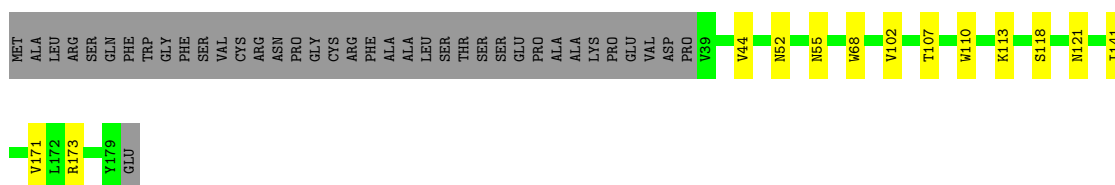
- Molecule 14: 39S ribosomal protein L17, mitochondrial

Chain O:  79% 7% 13%



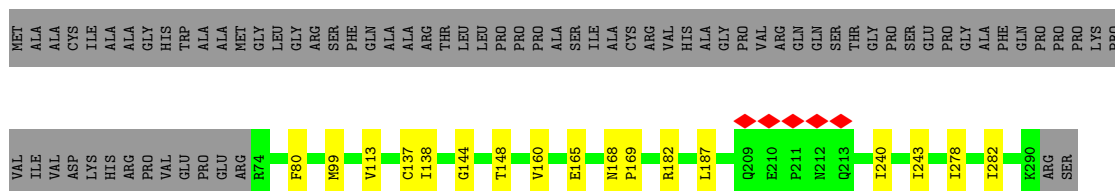
- Molecule 15: Mitochondrial ribosomal protein L18, isoform CRA_b

Chain P:  72% 7% 21%




- Molecule 16: 39S ribosomal protein L19, mitochondrial

Chain Q:  68% 6% 26%



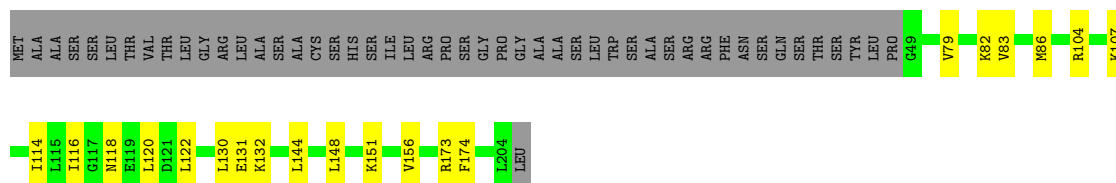
- Molecule 17: 39S ribosomal protein L20, mitochondrial

Chain R:  87% 7% • 6%



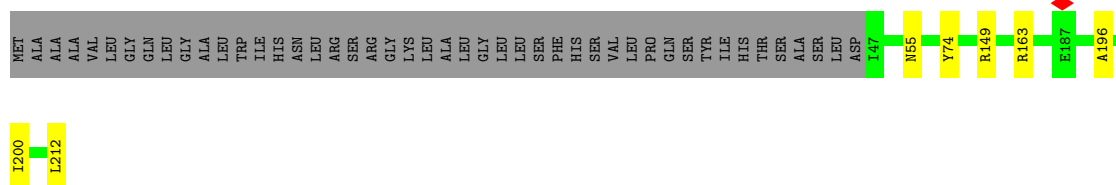
- Molecule 18: 39S ribosomal protein L21, mitochondrial

Chain S:  66% 10% 24%




- Molecule 19: 39S ribosomal protein L22, mitochondrial

Chain T:  75% 22%




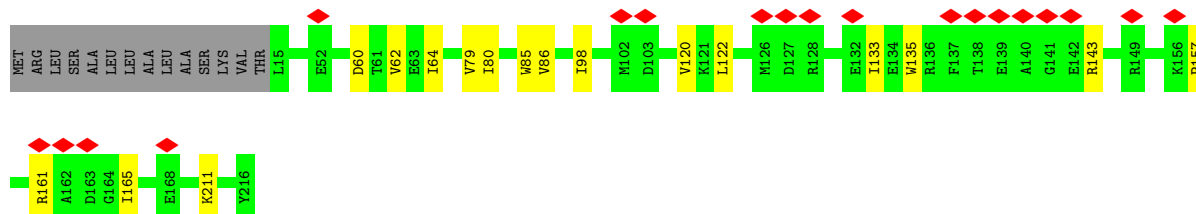
- Molecule 20: 39S ribosomal protein L23, mitochondrial

Chain U:  82% 8% • 9%



- Molecule 21: 39S ribosomal protein L24, mitochondrial

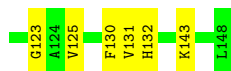
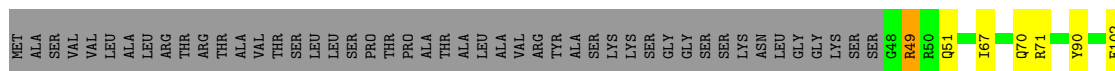
Chain V:  9% 86% 8% 6%



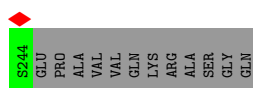
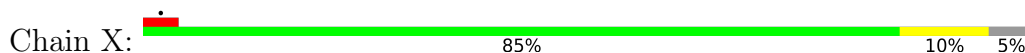
- Molecule 22: 39S ribosomal protein L27, mitochondrial

Chain W:  59% 8% 32%

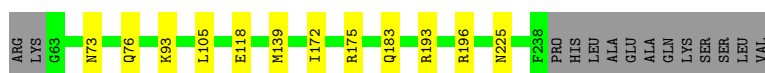
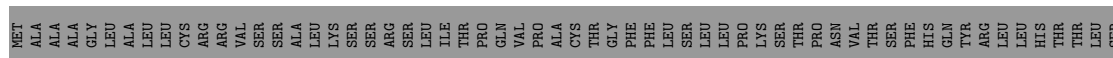
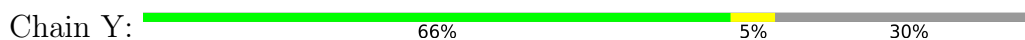




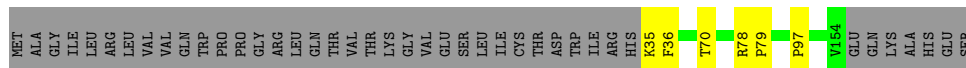
- Molecule 23: 39S ribosomal protein L28, mitochondrial



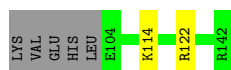
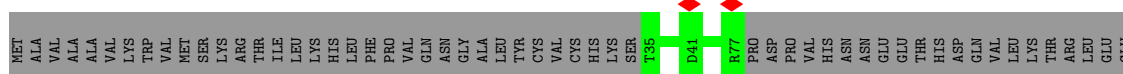
- Molecule 24: 39S ribosomal protein L47, mitochondrial



- Molecule 25: 39S ribosomal protein L30, mitochondrial



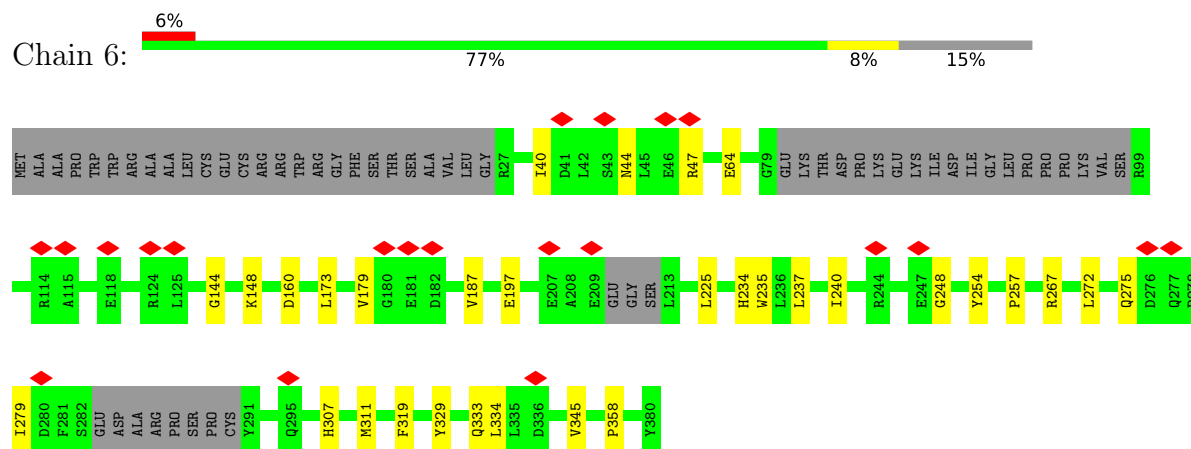
- Molecule 26: 39S ribosomal protein L42, mitochondrial



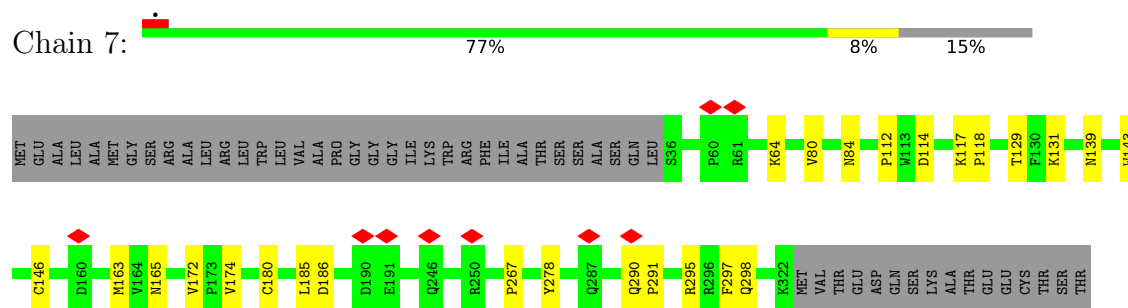
- Molecule 27: 39S ribosomal protein L32, mitochondrial



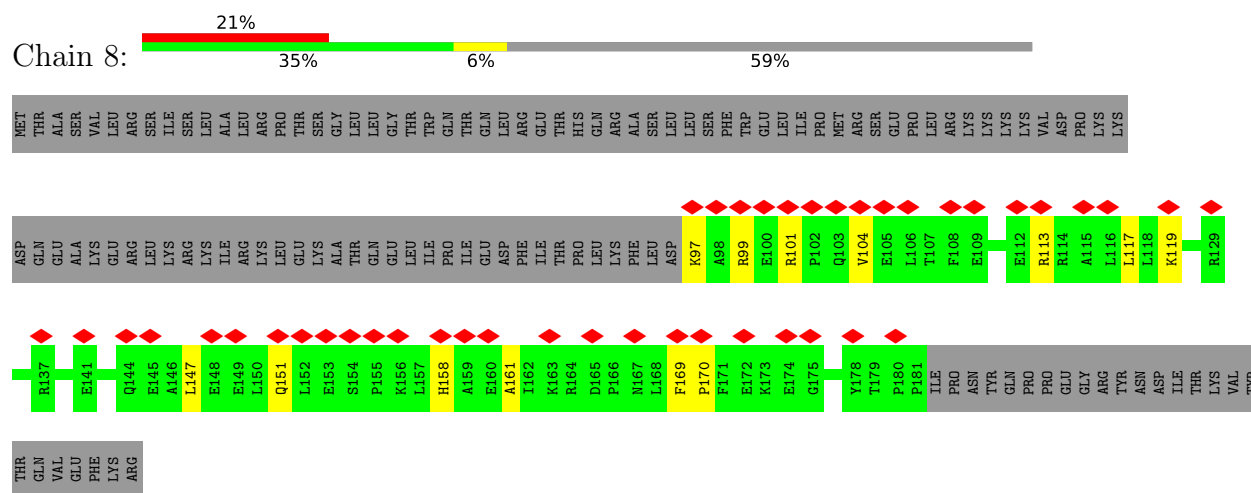
- Molecule 33: 39S ribosomal protein L38, mitochondrial



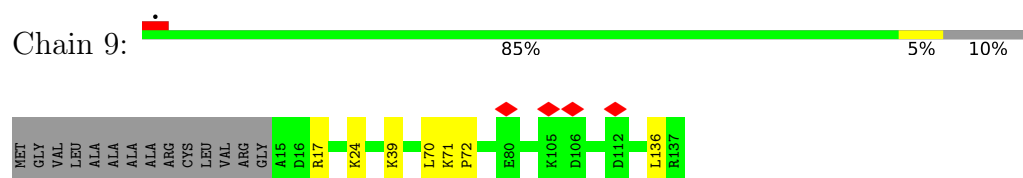
- Molecule 34: 39S ribosomal protein L39, mitochondrial



- Molecule 35: 39S ribosomal protein L40, mitochondrial

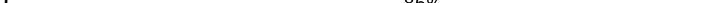


- Molecule 36: 39S ribosomal protein L41, mitochondrial




- Molecule 37: 39S ribosomal protein L43, mitochondrial

PRO	ILE	VAL	PRO	PRO	ALA	LEU	THR	THR	VAL	CYS	SER	ALA																																																
MET	T2		V72	Q149	ASP	PRO	PRO	ALA	PRO	ALA	GLN	GLN	THR	THR	GLY	LEU	ARG	LEU	SER	ALA	VAL	ALA	PRO	GLN	ILE	LEU	CYS	LEU	PRO	GLY	TRP	ASP	PRO	PRO	ASP	LEU	PRO	THR	THR	VAL	ASP	PRO	ILE	SER	SER	SER	LEU	THR	SER	ALA	ALA	PRO	PRO	MET	LEU	SER	ALA	VAL	SER	CYS

- Chain c:  5% 86% 14%

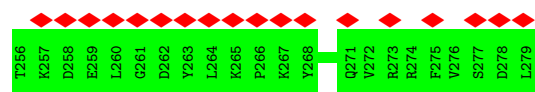
[illegible]

- Chain d:  7% 73% 27%

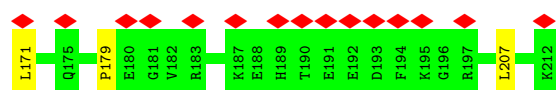
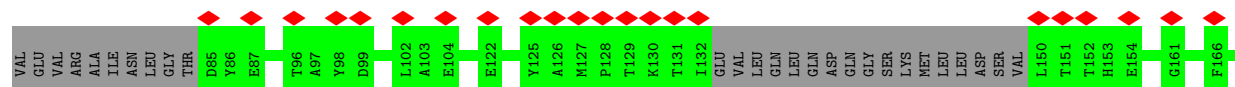
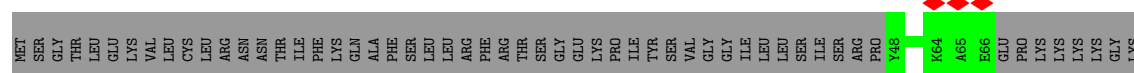
[illegible]

- Chain e:  64% 77% 22%

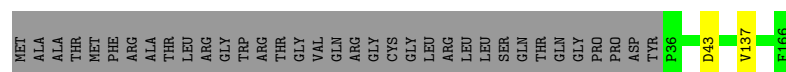
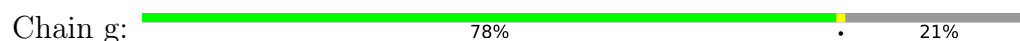
L195	L196	L197	L198	L199	M200	E201	A202	K203	F204	L205	G206	N207	A208	P209	C210	G211	H212	Y213	T214	F215	K216	F217	P218	G219	L220	K221	A222	K223	V224	F225	K226	K227	G228	A229	K230	V231	F232	K233	K234	A235	L236	L237	L238	L239	T240	G241	D242	F243	S244	Q245	A246	G247	N248	K249	G250	H251	H252	V253	V254	V255
G134	A135	R136	I137	T138	E139	A140	D141	E142	K143	N144	D145	R146	T147	S148	L149	N150	R151	Y152	L153	N156	L157	V158	L159	L160	V161	R162	E163	K164	F165	G166	D167	Q168	D169	V170	W171	I172	L173	P174	Q175	A176	E177	W178	Q179	P180	G181	E182	T183	L184	R185	G186	T187	A188	E189	R190	T191	L192	A193			
Q67	E68	Q75	I79	R81	S82	L83	Y84	S85	D86	H87	E88	L89	R90	A91	L92	D93	E94	N95	Q96	R97	L98	A99	K100	K101	K102	A103	D104	L105	H106	ASP	GLU	ASP	GLU	GLN	ASP	ILE	L116	A117	Q118	D119	L120	E121	D122	M123	W124	E125	Q126	K127	F128	L129	Q130	F131	K132	L133						
MET	ALA	PRO	VAL	ARG	ARG	LEU	LEU	GLY	VAL	ALA	GLY	TRP	ARG	ARG	PHE	GLU	ARG	LEU	TRP	ALA	GLY	SER	LEU	SER	SER	ARG	LEU	LEU	ALA	ALA	ALA	PRO	SER	SER	ASN	GLY	S43	P44	W45	R46	L47	L48	G49	A50	L51	C52	L53	Q54	P62	L63	T64	P65	L66							



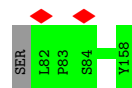
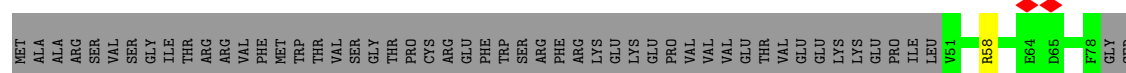
- Molecule 41: 39S ribosomal protein L48, mitochondrial



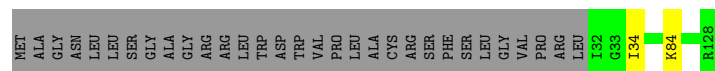
- Molecule 42: 39S ribosomal protein L49, mitochondrial



- Molecule 43: 39S ribosomal protein L50, mitochondrial

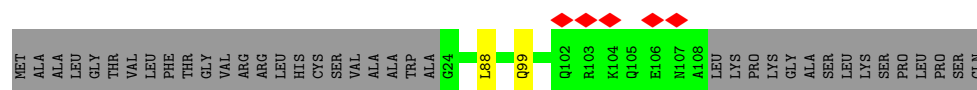


- Molecule 44: 39S ribosomal protein L51, mitochondrial

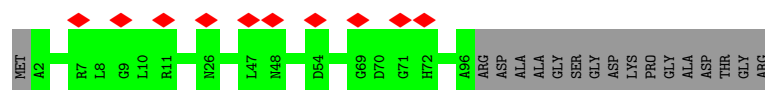
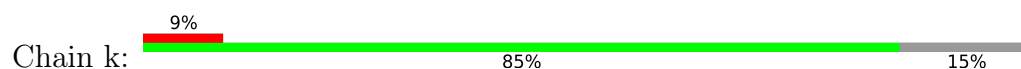


- Molecule 45: 39S ribosomal protein L52, mitochondrial

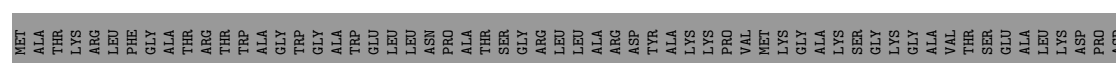




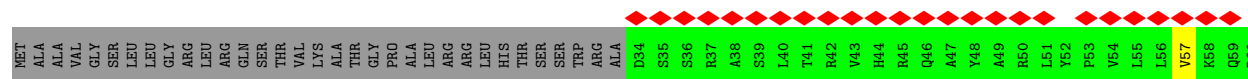
- Molecule 46: 39S ribosomal protein L53, mitochondrial



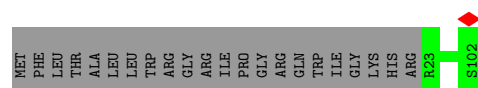
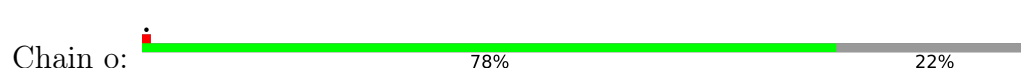
- Molecule 47: 39S ribosomal protein L54, mitochondrial



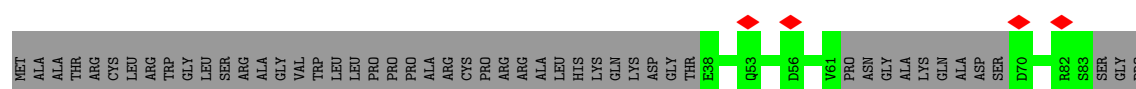
- Molecule 48: 39S ribosomal protein L55, mitochondrial



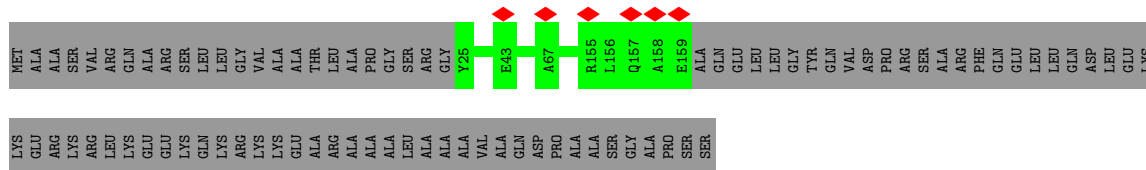
- Molecule 49: Ribosomal protein 63, mitochondrial



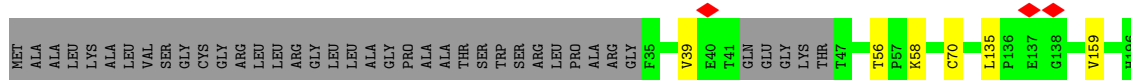
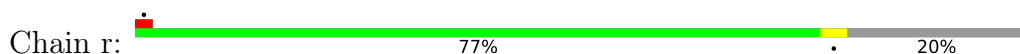
- Molecule 50: Peptidyl-tRNA hydrolase ICT1, mitochondrial



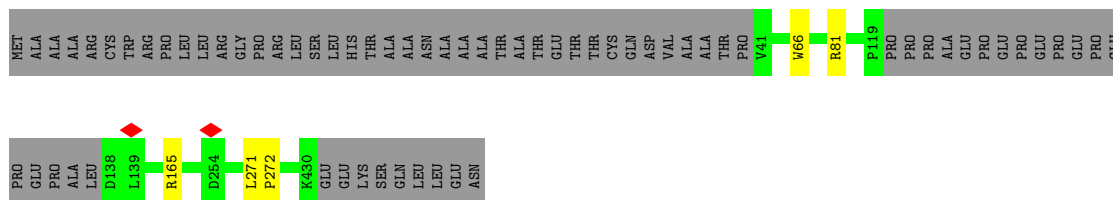
- Molecule 51: Growth arrest and DNA damage-inducible proteins-interacting protein 1



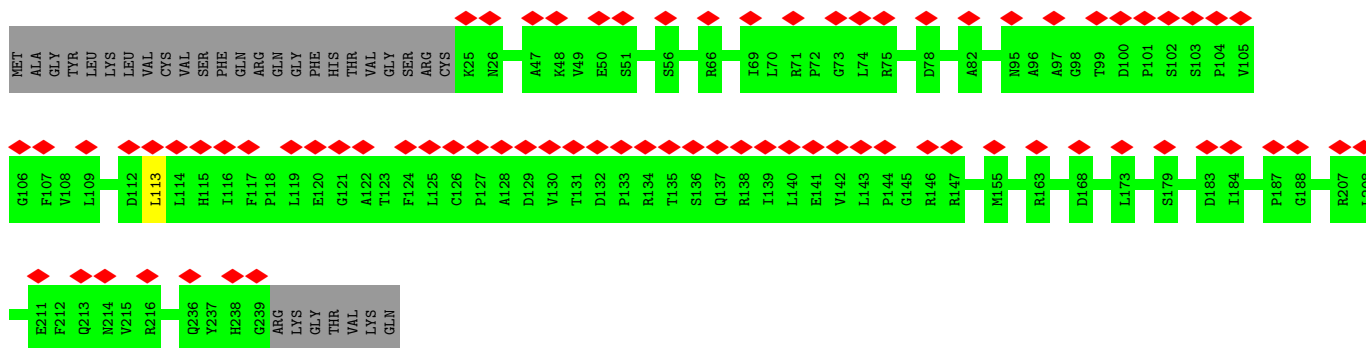
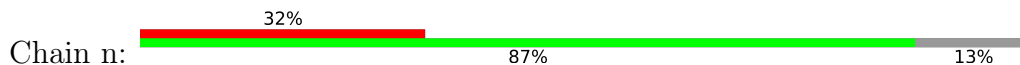
- Molecule 52: 39S ribosomal protein S18a, mitochondrial



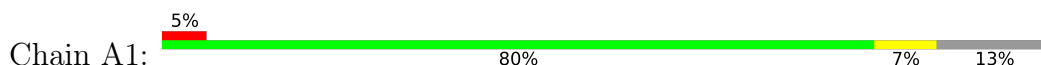
- Molecule 53: 39S ribosomal protein S30, mitochondrial

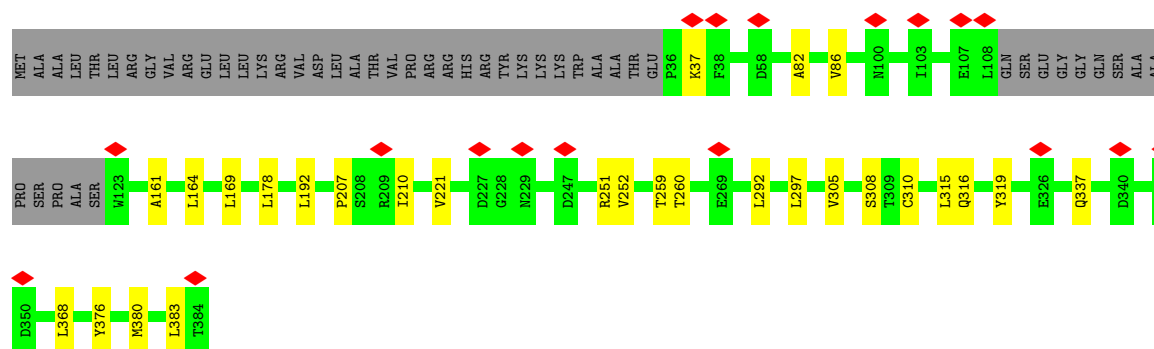


- Molecule 54: rRNA methyltransferase 2, mitochondrial



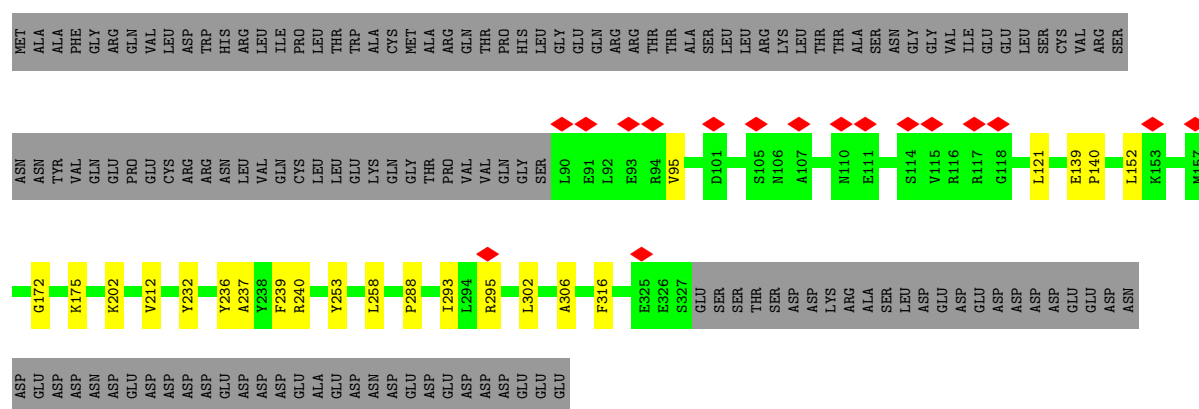
- Molecule 55: 5-methylcytosine rRNA methyltransferase NSUN4





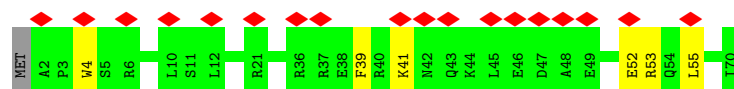
- Molecule 56: Transcription termination factor 4, mitochondrial

Chain A2: 57% 6% 38%



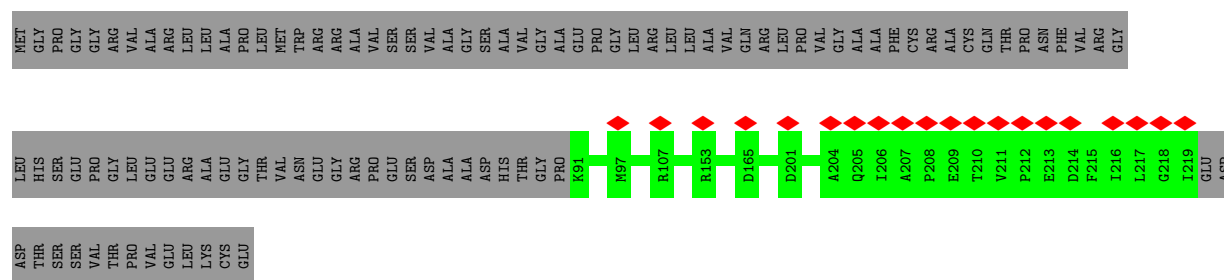
- Molecule 57: MIEF1 upstream open reading frame protein

Chain v: 26% 90% 9%



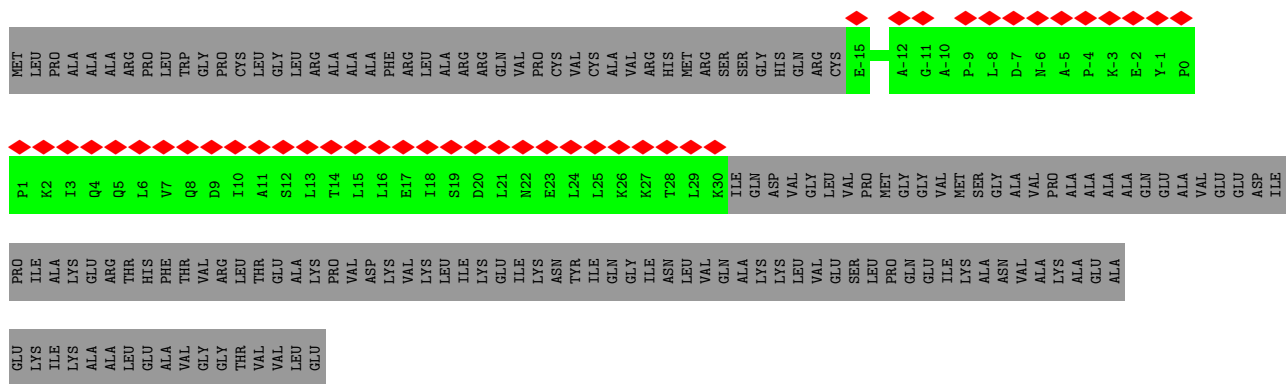
- Molecule 58: Mitochondrial assembly of ribosomal large subunit protein 1

Chain u: 9% 55% 45%

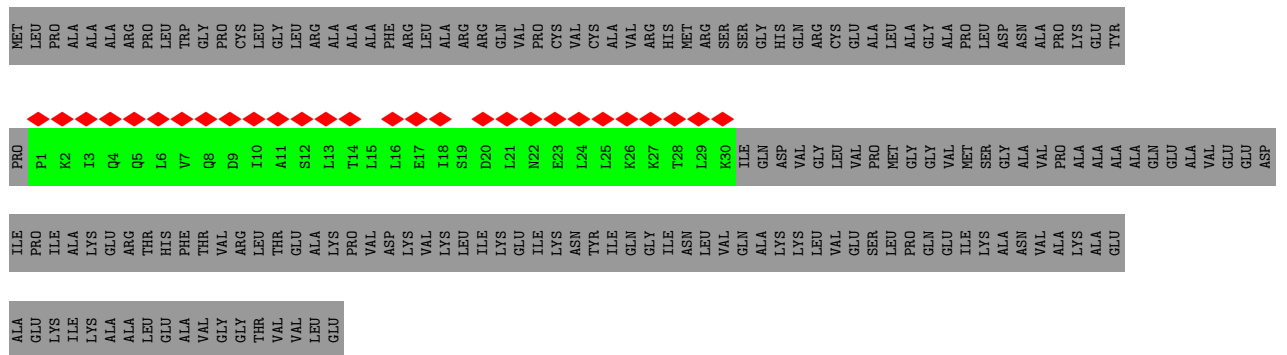


- Molecule 59: 39S ribosomal protein L12, mitochondrial

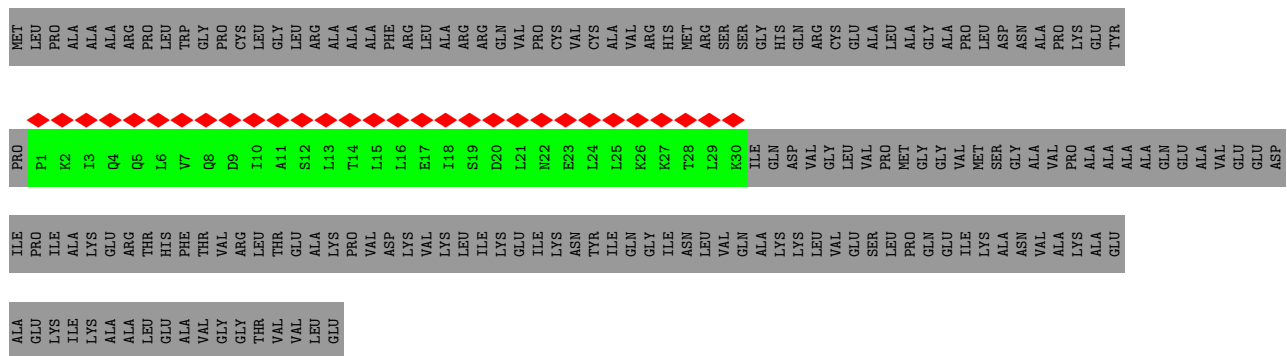
Chain t1: 22% 23% 77%



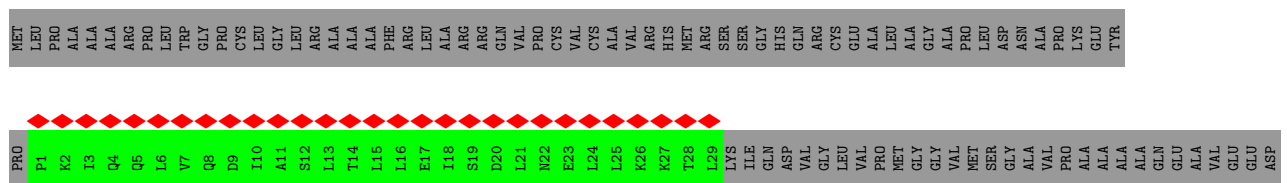
- Molecule 59: 39S ribosomal protein L12, mitochondrial



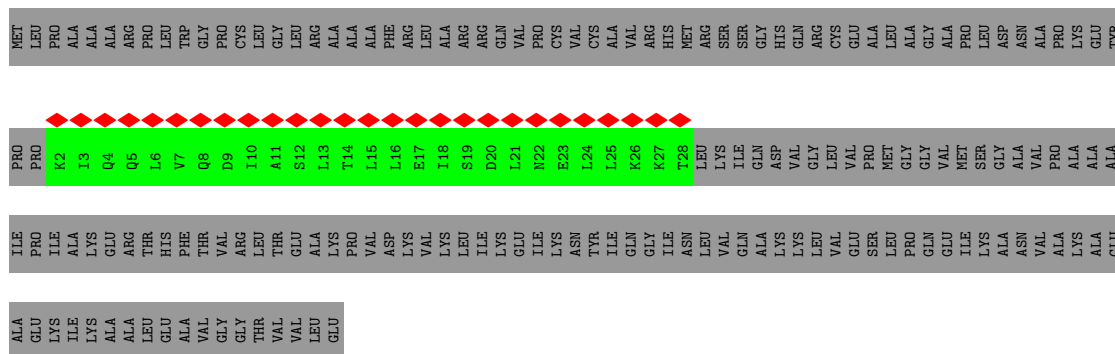
- Molecule 59: 39S ribosomal protein L12, mitochondrial



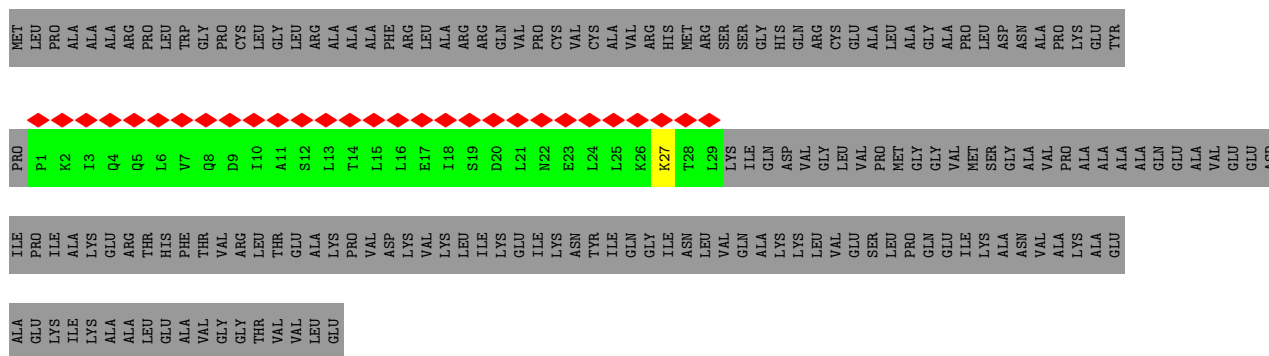
- Molecule 59: 39S ribosomal protein L12, mitochondrial



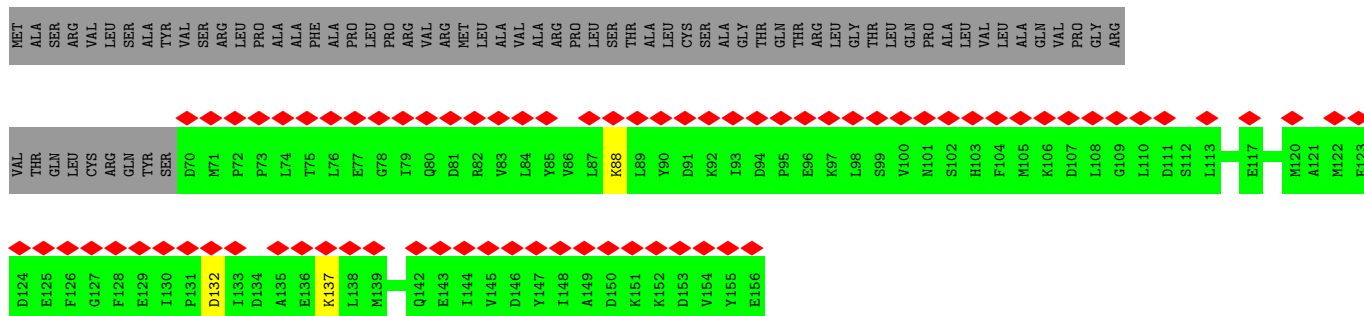
- Molecule 59: 39S ribosomal protein L12, mitochondrial



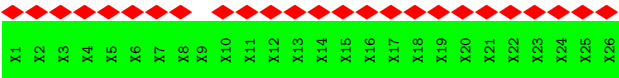
- Molecule 59: 39S ribosomal protein L12, mitochondrial



- Molecule 60: Acyl carrier protein, mitochondrial



- Molecule 61: Unknown residues



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	48646	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	48.2	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	1.254	Depositor
Minimum map value	-0.513	Depositor
Average map value	0.008	Depositor
Map value standard deviation	0.081	Depositor
Recommended contour level	0.15	Depositor
Map size (\AA)	215.22, 279.47998, 250.92	wwPDB
Map dimensions	246, 274, 211	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (\AA)	1.02, 1.02, 1.02	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

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

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

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	0.43	0/34501	0.73	8/53693 (0.0%)
2	B	0.45	0/1423	0.72	1/2206 (0.0%)
3	C	0.28	0/1905	0.56	3/2573 (0.1%)
4	D	0.27	0/1896	0.63	0/2549
5	E	0.27	0/2465	0.58	0/3344
6	F	0.26	0/2071	0.59	0/2817
7	H	0.27	0/762	0.66	0/1022
8	I	0.28	0/1682	0.59	0/2280
9	J	0.28	0/1077	0.65	0/1452
10	K	0.26	0/1495	0.57	0/2029
11	L	0.26	0/904	0.62	0/1218
12	M	0.27	0/2359	0.62	0/3185
13	N	0.27	0/1721	0.60	0/2322
14	O	0.26	0/1269	0.59	0/1708
15	P	0.26	0/1173	0.61	0/1588
16	Q	0.25	0/1846	0.61	0/2487
17	R	0.25	0/1174	0.60	0/1572
18	S	0.26	0/1276	0.62	0/1729
19	T	0.26	0/1402	0.61	0/1886
20	U	0.27	0/1183	0.63	0/1600
21	V	0.26	0/1697	0.62	0/2302
22	W	0.27	0/827	0.60	0/1118
23	X	0.25	0/2090	0.59	0/2825
24	Y	0.25	0/1552	0.58	0/2079
25	Z	0.26	0/1003	0.62	0/1354
26	a	0.29	0/709	0.60	0/963
27	0	0.32	0/895	0.62	0/1201
28	1	0.25	0/438	0.63	0/583
29	2	0.28	0/373	0.60	0/496
30	3	0.25	0/852	0.60	0/1136
31	4	0.35	0/350	0.63	0/461
32	5	0.26	0/3294	0.59	0/4488

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
33	6	0.27	0/2809	0.60	0/3818
34	7	0.26	0/2391	0.59	0/3234
35	8	0.27	0/734	0.62	0/986
36	9	0.28	0/1020	0.61	0/1374
37	b	0.28	0/1202	0.61	0/1626
38	c	0.26	0/2348	0.59	0/3174
39	d	0.26	0/1872	0.61	0/2536
40	e	0.27	0/1797	0.62	0/2422
41	f	0.27	0/1063	0.63	0/1430
42	g	0.26	0/1121	0.60	0/1528
43	h	0.28	0/884	0.60	0/1203
44	i	0.26	0/849	0.58	0/1135
45	j	0.29	0/698	0.58	0/940
46	k	0.27	0/743	0.62	0/1003
47	l	0.26	0/407	0.59	0/547
48	m	0.29	0/350	0.66	0/469
49	o	0.26	0/687	0.57	0/924
50	p	0.27	0/1071	0.61	0/1433
51	q	0.27	0/1165	0.58	0/1575
52	r	0.27	0/1322	0.61	0/1793
53	s	0.26	0/3130	0.59	0/4247
54	n	0.27	0/1703	0.60	0/2314
55	A1	0.26	0/2713	0.58	0/3681
56	A2	0.25	0/1973	0.58	0/2651
57	v	0.26	0/598	0.63	0/796
58	u	0.25	0/1089	0.60	0/1474
59	t1	0.24	0/358	0.37	0/486
59	t2	0.22	0/238	0.36	0/319
59	t3	0.22	0/238	0.37	0/319
59	t4	0.22	0/229	0.32	0/308
59	t5	0.22	0/229	0.45	0/308
59	t6	0.22	0/213	0.33	0/286
60	w	0.26	0/717	0.61	0/967
All	All	0.33	0/115625	0.64	12/163572 (0.0%)

There are no bond length outliers.

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	1855	A	C2'-C3'-O3'	7.38	125.74	109.50
1	A	2457	A	C2'-C3'-O3'	6.78	124.55	113.70
1	A	1973	G	C2'-C3'-O3'	6.71	124.44	113.70

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	209	PRO	C-N-CA	-6.51	105.42	121.70
1	A	2209	G	C2'-C3'-O3'	6.25	123.70	113.70

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	30864	0	15681	157	0
2	B	1275	0	650	8	0
3	C	1878	0	1949	18	0
4	D	1859	0	1920	18	0
5	E	2396	0	2402	15	0
6	F	2013	0	2043	15	0
7	H	749	0	798	6	0
8	I	1646	0	1731	14	0
9	J	1061	0	1141	4	0
10	K	1451	0	1448	8	0
11	L	889	0	941	4	0
12	M	2305	0	2378	16	0
13	N	1676	0	1694	8	0
14	O	1245	0	1283	8	0
15	P	1148	0	1148	8	0
16	Q	1805	0	1841	11	0
17	R	1153	0	1214	8	0
18	S	1251	0	1322	11	0
19	T	1368	0	1410	4	0
20	U	1154	0	1154	10	0
21	V	1652	0	1658	11	0
22	W	805	0	829	10	0
23	X	2035	0	2054	15	0
24	Y	1517	0	1561	10	0
25	Z	978	0	1030	4	0
26	a	686	0	658	0	0
27	0	880	0	902	7	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
28	1	433	0	475	3	0
29	2	367	0	393	3	0
30	3	831	0	883	5	0
31	4	342	0	361	5	0
32	5	3199	0	3196	34	0
33	6	2723	0	2615	19	0
34	7	2334	0	2343	13	0
35	8	719	0	723	6	0
36	9	992	0	984	6	0
37	b	1178	0	1180	0	0
38	c	2300	0	2313	0	0
39	d	1819	0	1793	0	0
40	e	1762	0	1767	0	0
41	f	1044	0	1046	0	0
42	g	1085	0	1077	0	0
43	h	862	0	845	0	0
44	i	827	0	857	0	0
45	j	684	0	673	0	0
46	k	732	0	745	0	0
47	l	395	0	391	0	0
48	m	345	0	360	0	0
49	o	670	0	665	0	0
50	p	1058	0	1083	0	0
51	q	1134	0	1110	0	0
52	r	1283	0	1310	0	0
53	s	3052	0	3037	0	0
54	n	1667	0	1673	0	0
55	A1	2652	0	2632	14	0
56	A2	1942	0	2035	11	0
57	v	589	0	604	0	0
58	u	1064	0	1060	0	0
59	t1	354	0	380	0	0
59	t2	238	0	270	0	0
59	t3	238	0	270	0	0
59	t4	229	0	257	0	0
59	t5	229	0	257	0	0
59	t6	214	0	236	0	0
60	w	705	0	691	0	0
61	UNK	130	0	28	0	0
62	A	101	0	0	0	0
62	D	1	0	0	0	0
62	F	1	0	0	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
62	n	1	0	0	0	0
63	C	28	0	12	0	0
64	0	1	0	0	0	0
64	4	1	0	0	0	0
65	A1	27	0	22	0	0
66	w	21	0	21	0	0
All	All	110342	0	95513	463	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 3.

The worst 5 of 463 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
32:5:126:THR:HG22	32:5:372:ASN:HB2	1.46	0.95
20:U:24:PHE:HB2	20:U:45:PRO:HG3	1.60	0.84
24:Y:93:LYS:HD2	36:9:70:LEU:HD21	1.65	0.79
27:0:179:ARG:HH12	27:0:182:PRO:HG3	1.48	0.79
8:I:221:LEU:HA	8:I:224:HIS:HD2	1.52	0.75

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	C	234/333 (70%)	231 (99%)	3 (1%)	0	100	100
4	D	236/305 (77%)	229 (97%)	6 (2%)	1 (0%)	30	52
5	E	302/348 (87%)	290 (96%)	12 (4%)	0	100	100
6	F	248/311 (80%)	243 (98%)	5 (2%)	0	100	100
7	H	86/267 (32%)	85 (99%)	1 (1%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
8	I	203/261 (78%)	196 (97%)	7 (3%)	0	100	100
9	J	138/192 (72%)	134 (97%)	4 (3%)	0	100	100
10	K	175/178 (98%)	172 (98%)	3 (2%)	0	100	100
11	L	113/145 (78%)	109 (96%)	4 (4%)	0	100	100
12	M	285/296 (96%)	280 (98%)	5 (2%)	0	100	100
13	N	202/251 (80%)	201 (100%)	1 (0%)	0	100	100
14	O	150/175 (86%)	150 (100%)	0	0	100	100
15	P	139/179 (78%)	135 (97%)	4 (3%)	0	100	100
16	Q	215/292 (74%)	210 (98%)	5 (2%)	0	100	100
17	R	138/149 (93%)	137 (99%)	1 (1%)	0	100	100
18	S	154/205 (75%)	151 (98%)	3 (2%)	0	100	100
19	T	164/212 (77%)	160 (98%)	4 (2%)	0	100	100
20	U	135/153 (88%)	132 (98%)	3 (2%)	0	100	100
21	V	200/216 (93%)	196 (98%)	4 (2%)	0	100	100
22	W	99/148 (67%)	94 (95%)	5 (5%)	0	100	100
23	X	241/256 (94%)	235 (98%)	6 (2%)	0	100	100
24	Y	174/250 (70%)	171 (98%)	3 (2%)	0	100	100
25	Z	118/161 (73%)	114 (97%)	4 (3%)	0	100	100
26	a	78/142 (55%)	76 (97%)	2 (3%)	0	100	100
27	0	106/188 (56%)	102 (96%)	4 (4%)	0	100	100
28	1	50/65 (77%)	50 (100%)	0	0	100	100
29	2	43/92 (47%)	42 (98%)	1 (2%)	0	100	100
30	3	93/188 (50%)	91 (98%)	2 (2%)	0	100	100
31	4	36/103 (35%)	36 (100%)	0	0	100	100
32	5	390/423 (92%)	381 (98%)	9 (2%)	0	100	100
33	6	316/380 (83%)	310 (98%)	6 (2%)	0	100	100
34	7	285/338 (84%)	268 (94%)	17 (6%)	0	100	100
35	8	83/206 (40%)	80 (96%)	3 (4%)	0	100	100
36	9	121/137 (88%)	120 (99%)	1 (1%)	0	100	100
37	b	146/215 (68%)	139 (95%)	7 (5%)	0	100	100
38	c	284/332 (86%)	279 (98%)	5 (2%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
39	d	214/302 (71%)	208 (97%)	6 (3%)	0	100	100
40	e	211/279 (76%)	200 (95%)	11 (5%)	0	100	100
41	f	124/212 (58%)	121 (98%)	2 (2%)	1 (1%)	16	34
42	g	129/166 (78%)	125 (97%)	4 (3%)	0	100	100
43	h	101/158 (64%)	100 (99%)	1 (1%)	0	100	100
44	i	95/128 (74%)	91 (96%)	4 (4%)	0	100	100
45	j	83/123 (68%)	83 (100%)	0	0	100	100
46	k	93/112 (83%)	90 (97%)	3 (3%)	0	100	100
47	l	42/138 (30%)	41 (98%)	0	1 (2%)	5	9
48	m	38/128 (30%)	35 (92%)	3 (8%)	0	100	100
49	o	78/102 (76%)	78 (100%)	0	0	100	100
50	p	119/205 (58%)	115 (97%)	4 (3%)	0	100	100
51	q	133/222 (60%)	132 (99%)	1 (1%)	0	100	100
52	r	153/196 (78%)	152 (99%)	1 (1%)	0	100	100
53	s	368/439 (84%)	359 (98%)	8 (2%)	1 (0%)	37	59
54	n	213/246 (87%)	211 (99%)	2 (1%)	0	100	100
55	A1	331/384 (86%)	328 (99%)	3 (1%)	0	100	100
56	A2	236/381 (62%)	233 (99%)	3 (1%)	0	100	100
57	v	67/70 (96%)	63 (94%)	4 (6%)	0	100	100
58	u	127/234 (54%)	125 (98%)	2 (2%)	0	100	100
59	t1	44/198 (22%)	43 (98%)	1 (2%)	0	100	100
59	t2	28/198 (14%)	28 (100%)	0	0	100	100
59	t3	28/198 (14%)	28 (100%)	0	0	100	100
59	t4	27/198 (14%)	27 (100%)	0	0	100	100
59	t5	27/198 (14%)	27 (100%)	0	0	100	100
59	t6	25/198 (13%)	25 (100%)	0	0	100	100
60	w	85/156 (54%)	82 (96%)	3 (4%)	0	100	100
All	All	9399/13661 (69%)	9179 (98%)	216 (2%)	4 (0%)	100	100

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
47	l	102	GLY

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
53	s	272	PRO
4	D	220	VAL
41	f	179	PRO

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
3	C	211/286 (74%)	208 (99%)	3 (1%)	62	82
4	D	192/245 (78%)	190 (99%)	2 (1%)	73	88
5	E	259/290 (89%)	259 (100%)	0	100	100
6	F	217/262 (83%)	216 (100%)	1 (0%)	86	95
7	H	82/228 (36%)	82 (100%)	0	100	100
8	I	189/232 (82%)	188 (100%)	1 (0%)	86	95
9	J	113/150 (75%)	112 (99%)	1 (1%)	75	90
10	K	155/156 (99%)	153 (99%)	2 (1%)	65	84
11	L	98/124 (79%)	98 (100%)	0	100	100
12	M	245/249 (98%)	242 (99%)	3 (1%)	67	85
13	N	179/211 (85%)	179 (100%)	0	100	100
14	O	133/150 (89%)	133 (100%)	0	100	100
15	P	123/154 (80%)	123 (100%)	0	100	100
16	Q	199/256 (78%)	199 (100%)	0	100	100
17	R	118/126 (94%)	115 (98%)	3 (2%)	42	68
18	S	141/180 (78%)	138 (98%)	3 (2%)	48	73
19	T	146/182 (80%)	145 (99%)	1 (1%)	81	93
20	U	124/135 (92%)	122 (98%)	2 (2%)	58	79
21	V	180/191 (94%)	180 (100%)	0	100	100
22	W	83/119 (70%)	82 (99%)	1 (1%)	67	85
23	X	219/229 (96%)	219 (100%)	0	100	100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
24	Y	159/223 (71%)	159 (100%)	0	100	100
25	Z	111/147 (76%)	110 (99%)	1 (1%)	75	90
26	a	78/133 (59%)	76 (97%)	2 (3%)	41	67
27	0	97/164 (59%)	97 (100%)	0	100	100
28	1	49/60 (82%)	49 (100%)	0	100	100
29	2	39/72 (54%)	39 (100%)	0	100	100
30	3	88/166 (53%)	88 (100%)	0	100	100
31	4	37/89 (42%)	37 (100%)	0	100	100
32	5	353/368 (96%)	351 (99%)	2 (1%)	84	94
33	6	286/332 (86%)	286 (100%)	0	100	100
34	7	263/303 (87%)	262 (100%)	1 (0%)	89	96
35	8	77/190 (40%)	75 (97%)	2 (3%)	41	67
36	9	104/112 (93%)	104 (100%)	0	100	100
37	b	130/186 (70%)	129 (99%)	1 (1%)	79	91
38	c	250/288 (87%)	249 (100%)	1 (0%)	89	96
39	d	204/271 (75%)	203 (100%)	1 (0%)	86	95
40	e	188/236 (80%)	186 (99%)	2 (1%)	70	86
41	f	114/188 (61%)	112 (98%)	2 (2%)	54	77
42	g	121/148 (82%)	119 (98%)	2 (2%)	56	78
43	h	100/148 (68%)	99 (99%)	1 (1%)	73	88
44	i	86/110 (78%)	84 (98%)	2 (2%)	45	71
45	j	68/97 (70%)	66 (97%)	2 (3%)	37	64
46	k	80/90 (89%)	80 (100%)	0	100	100
47	l	43/116 (37%)	40 (93%)	3 (7%)	12	27
48	m	37/113 (33%)	35 (95%)	2 (5%)	18	39
49	o	68/87 (78%)	68 (100%)	0	100	100
50	p	117/180 (65%)	116 (99%)	1 (1%)	75	90
51	q	115/178 (65%)	115 (100%)	0	100	100
52	r	143/169 (85%)	137 (96%)	6 (4%)	25	50
53	s	328/381 (86%)	324 (99%)	4 (1%)	67	85
54	n	179/209 (86%)	178 (99%)	1 (1%)	84	94

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
55	A1	290/328 (88%)	288 (99%)	2 (1%)	81	93
56	A2	221/350 (63%)	219 (99%)	2 (1%)	75	90
57	v	59/60 (98%)	53 (90%)	6 (10%)	6	12
58	u	120/200 (60%)	120 (100%)	0	100	100
59	t1	40/158 (25%)	40 (100%)	0	100	100
59	t2	29/158 (18%)	29 (100%)	0	100	100
59	t3	29/158 (18%)	29 (100%)	0	100	100
59	t4	28/158 (18%)	28 (100%)	0	100	100
59	t5	28/158 (18%)	27 (96%)	1 (4%)	30	56
59	t6	26/158 (16%)	26 (100%)	0	100	100
60	w	81/136 (60%)	78 (96%)	3 (4%)	29	55
All	All	8469/11731 (72%)	8393 (99%)	76 (1%)	74	90

5 of 76 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
53	s	66	TRP
57	v	55	LEU
53	s	165	ARG
56	A2	295	ARG
60	w	137	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 44 such sidechains are listed below:

Mol	Chain	Res	Type
37	b	129	GLN
51	q	120	HIS
38	c	65	ASN
43	h	67	GLN
53	s	420	GLN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	A	1447/1559 (92%)	363 (25%)	48 (3%)
2	B	56/69 (81%)	13 (23%)	2 (3%)

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
All	All	1503/1628 (92%)	376 (25%)	50 (3%)

5 of 376 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	A	1672	C
1	A	1678	C
1	A	1679	U
1	A	1681	G
1	A	1685	C

5 of 50 RNA pucker outliers are listed below:

Mol	Chain	Res	Type
1	A	2605	C
1	A	2744	U
2	B	1620	A
1	A	2620	G
1	A	2653	C

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

1 non-standard protein/DNA/RNA residue is 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	$\# Z > 2$
1	OMG	A	3040	1	18,26,27	1.02	1 (5%)	19,38,41	1.21	3 (15%)

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
1	OMG	A	3040	1	-	1/5/27/28	0/3/3/3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	3040	OMG	C6-N1	-2.04	1.34	1.37

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	3040	OMG	C5-C6-N1	2.47	118.31	113.95
1	A	3040	OMG	C8-N7-C5	2.24	107.26	102.99
1	A	3040	OMG	O2'-C2'-C1'	2.12	113.30	109.09

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	3040	OMG	C1'-C2'-O2'-CM2

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	A	3040	OMG	1	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 109 ligands modelled in this entry, 106 are monoatomic - leaving 3 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
65	SAM	A1	401	-	24,29,29	0.70	1 (4%)	23,42,42	1.11	3 (13%)
66	PNS	w	201	60	13,20,21	0.30	0	18,26,29	0.78	0
63	GDP	C	401	-	24,30,30	0.93	1 (4%)	30,47,47	1.26	4 (13%)

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
65	SAM	A1	401	-	-	1/12/33/33	0/3/3/3
66	PNS	w	201	60	-	11/24/26/27	-
63	GDP	C	401	-	-	3/12/32/32	0/3/3/3

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
63	C	401	GDP	C6-N1	-2.35	1.34	1.37
65	A1	401	SAM	OXT-C	-2.09	1.23	1.30

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
65	A1	401	SAM	OXT-C-O	-2.88	117.55	124.09
63	C	401	GDP	C3'-C2'-C1'	2.73	105.09	100.98
63	C	401	GDP	PA-O3A-PB	-2.59	123.94	132.83
63	C	401	GDP	C8-N7-C5	2.53	107.81	102.99
65	A1	401	SAM	OXT-C-CA	2.35	121.40	113.38

There are no chirality outliers.

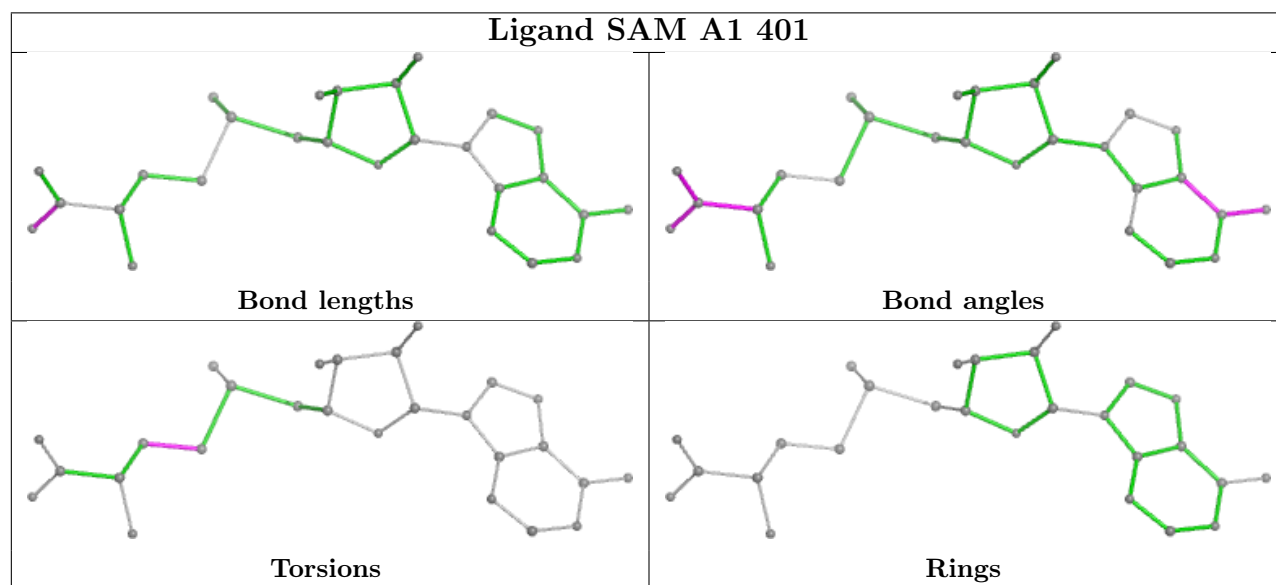
5 of 15 torsion outliers are listed below:

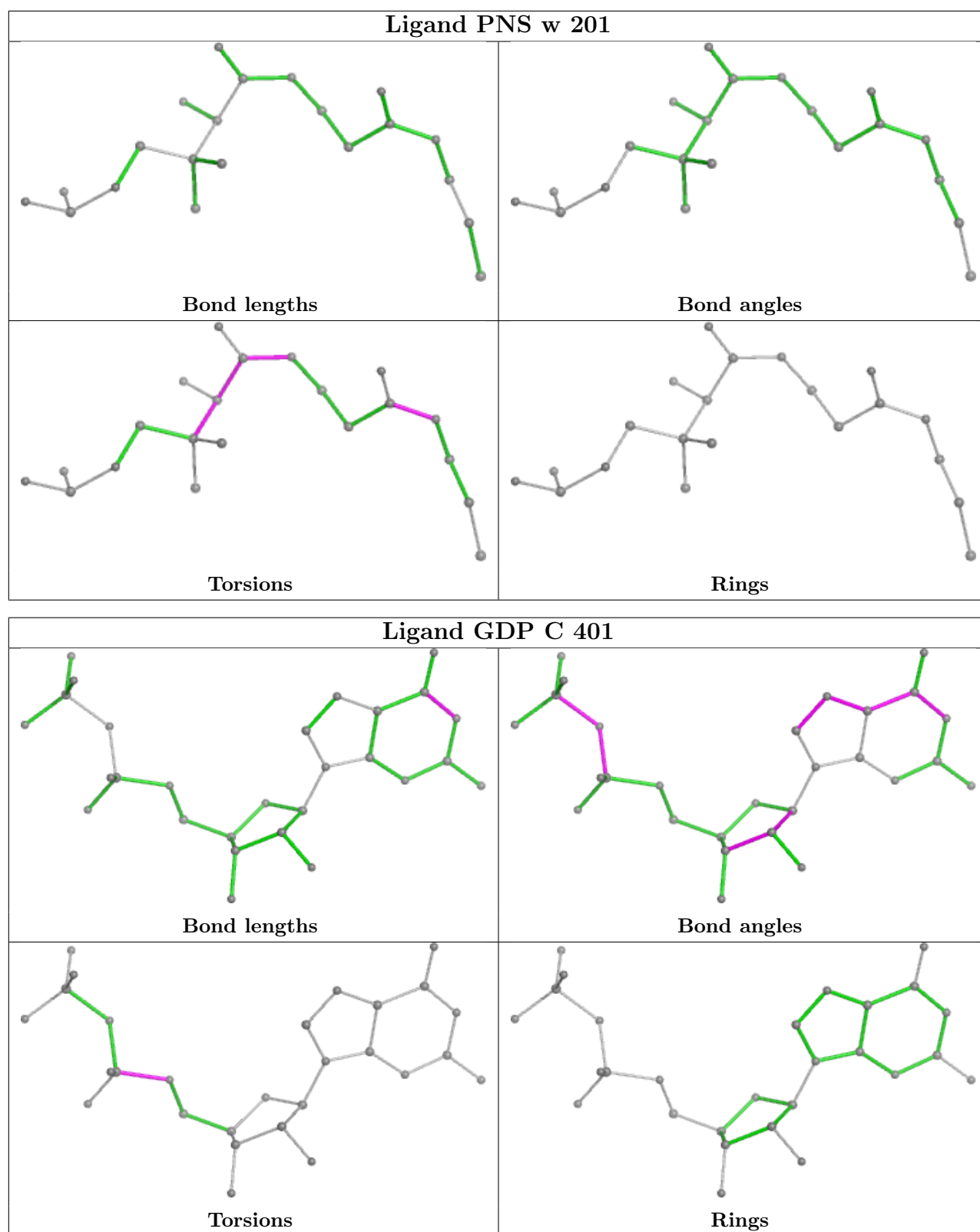
Mol	Chain	Res	Type	Atoms
63	C	401	GDP	C5'-O5'-PA-O1A
63	C	401	GDP	C5'-O5'-PA-O2A
66	w	201	PNS	C28-C29-C32-O33
66	w	201	PNS	C28-C29-C32-C34
66	w	201	PNS	C30-C29-C32-C34

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 ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

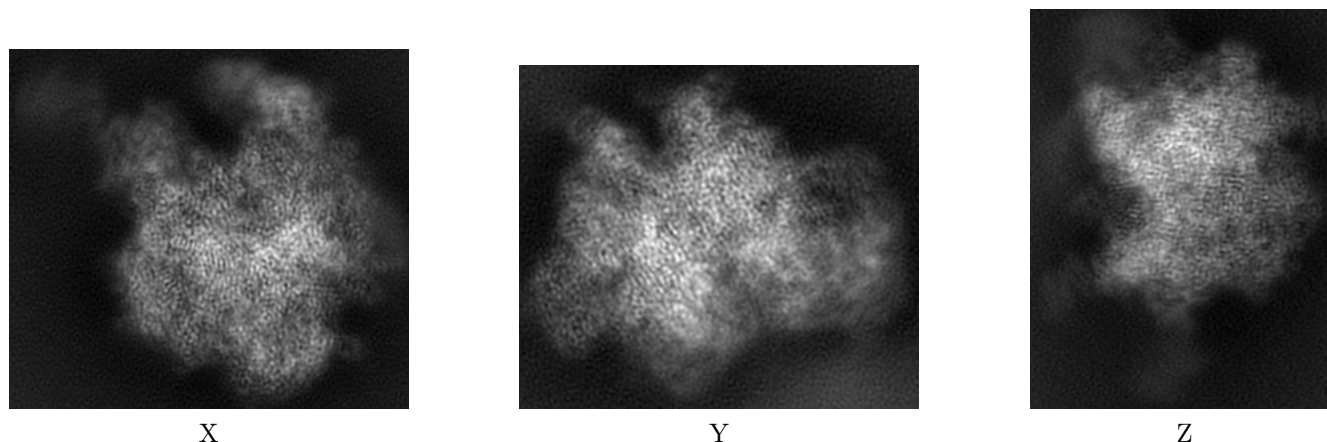
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-12764. These allow visual inspection of the internal detail of the map and identification of artifacts.

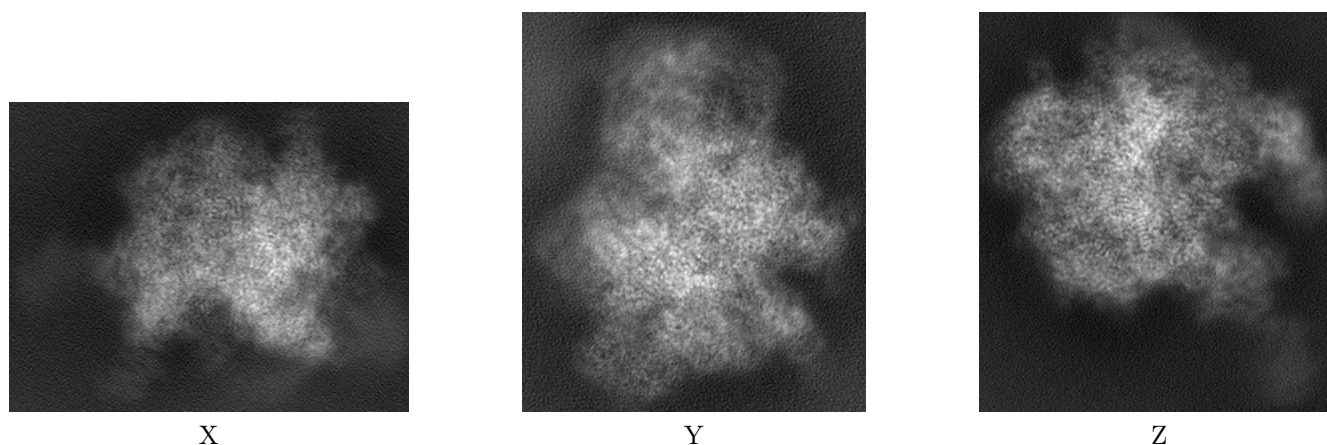
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

6.1.1 Primary map



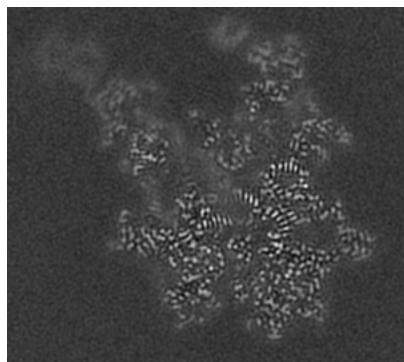
6.1.2 Raw map



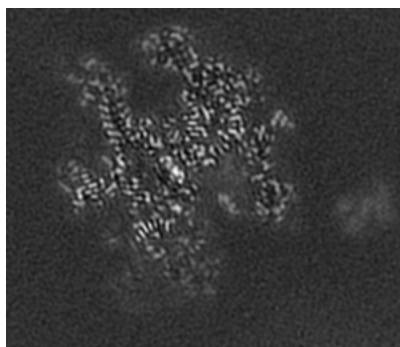
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

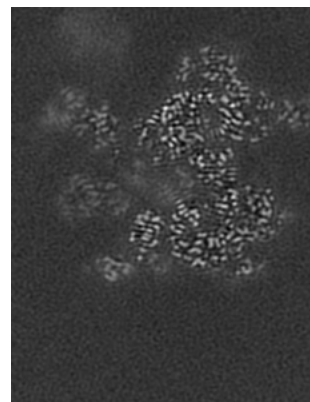
6.2.1 Primary map



X Index: 105

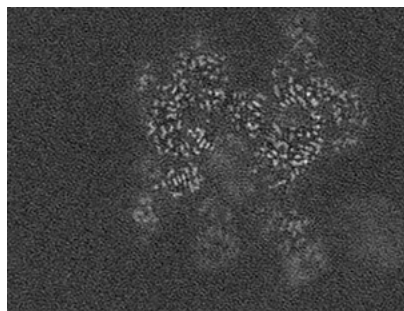


Y Index: 137

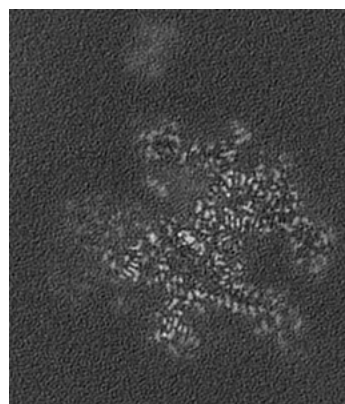


Z Index: 123

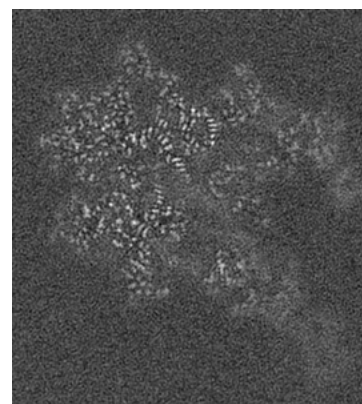
6.2.2 Raw map



X Index: 123



Y Index: 137

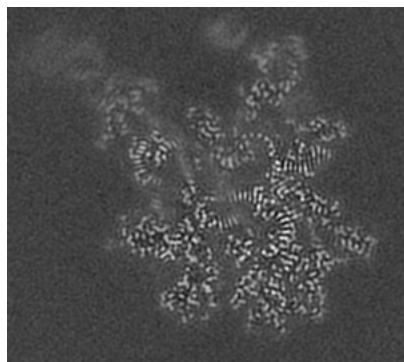


Z Index: 105

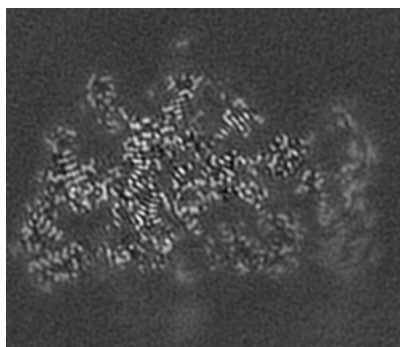
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

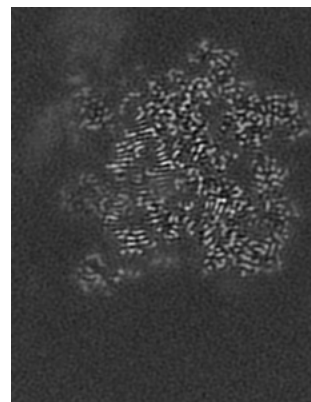
6.3.1 Primary map



X Index: 102

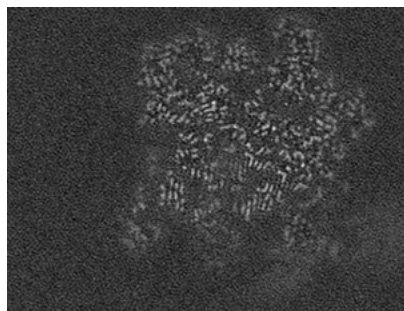


Y Index: 181

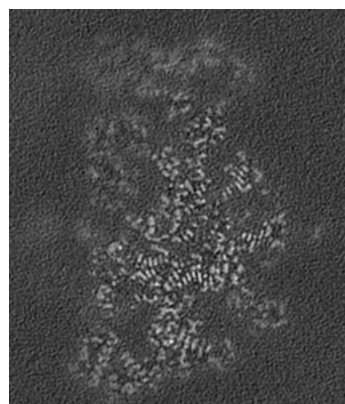


Z Index: 114

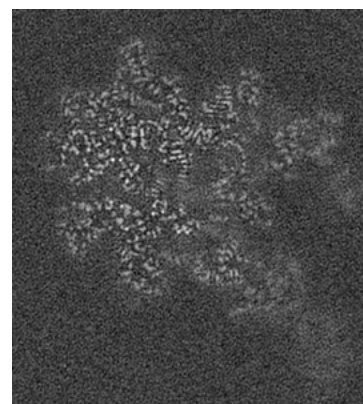
6.3.2 Raw map



X Index: 114



Y Index: 181

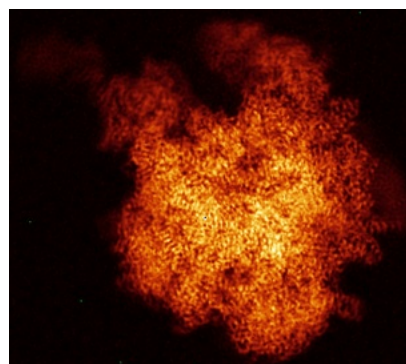


Z Index: 101

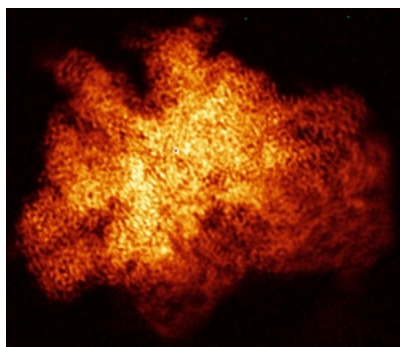
The images above show the largest variance slices of the map in three orthogonal directions.

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

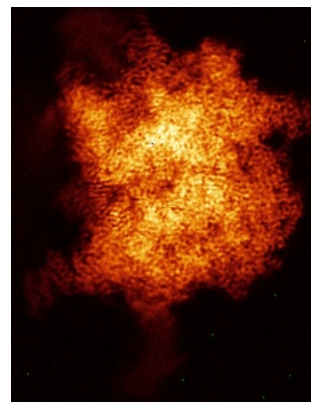
6.4.1 Primary map



X

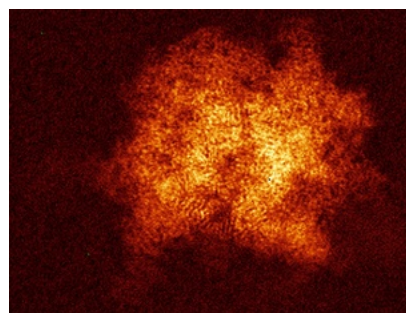


Y

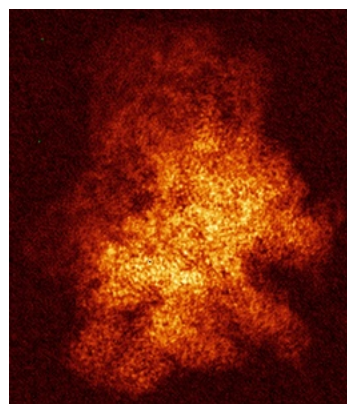


Z

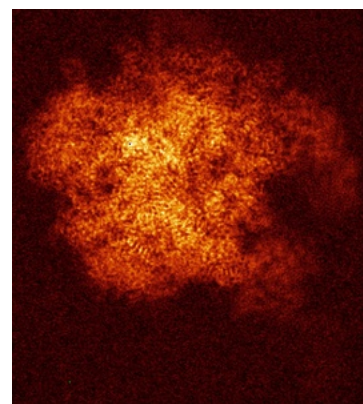
6.4.2 Raw map



X



Y

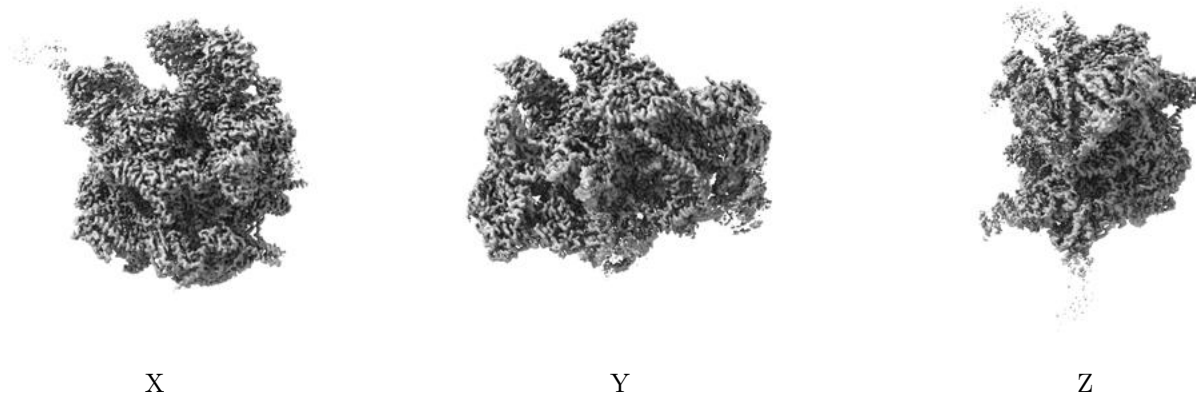


Z

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.

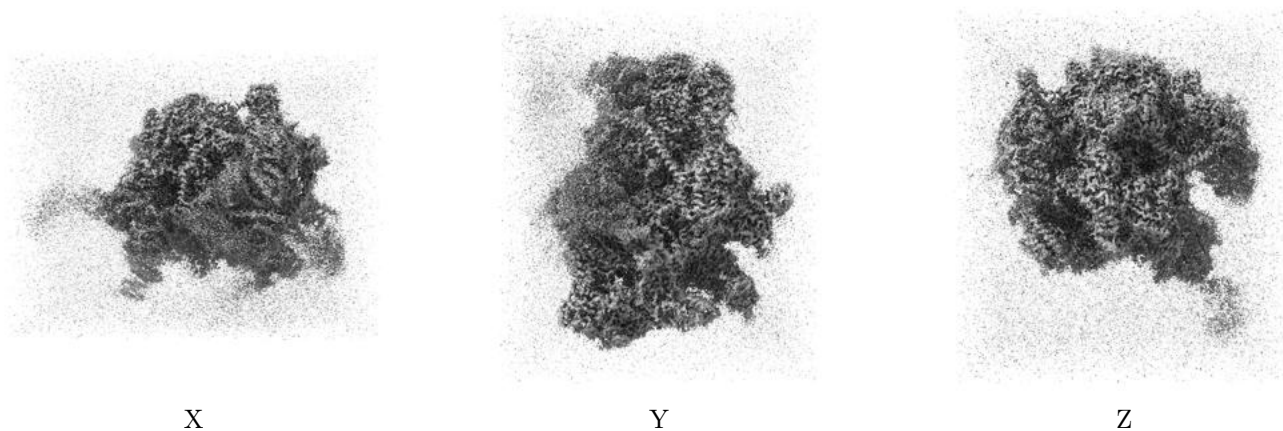
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.15. 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.

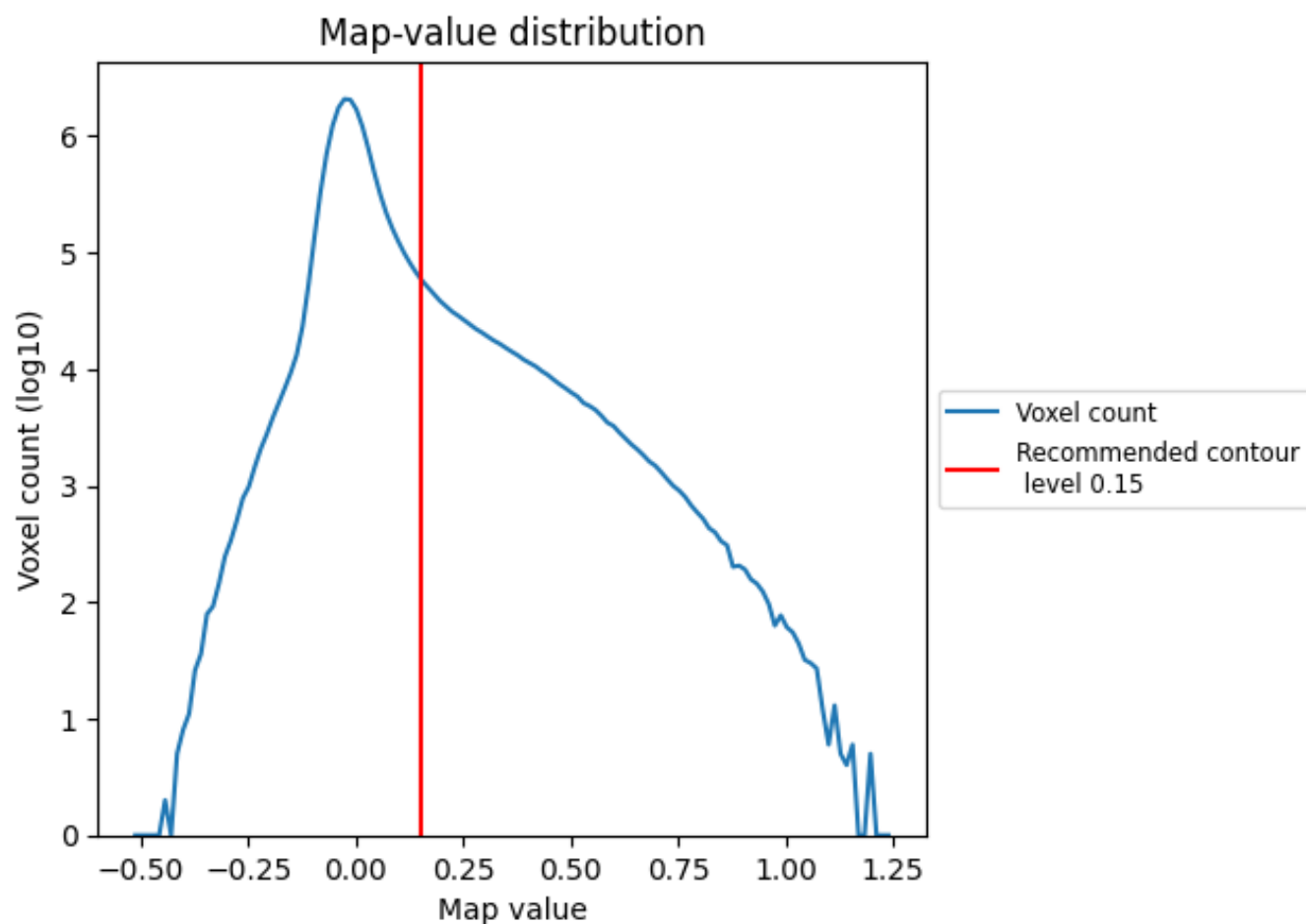
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

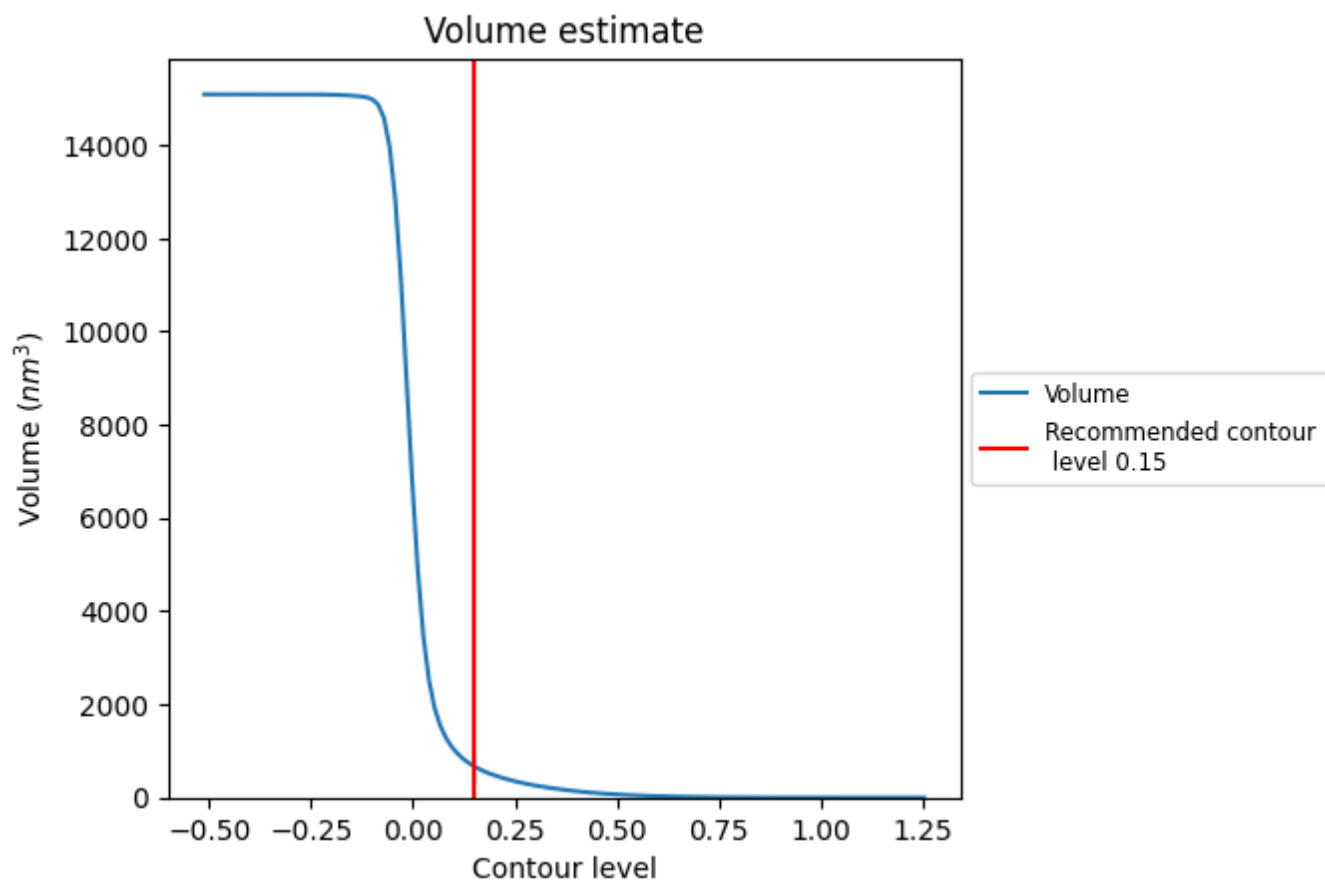
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

7.2 Volume estimate [i](#)



The volume at the recommended contour level is 671 nm³; this corresponds to an approximate mass of 606 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](#)

This section was not generated. The rotationally averaged power spectrum is only generated for cubic maps.

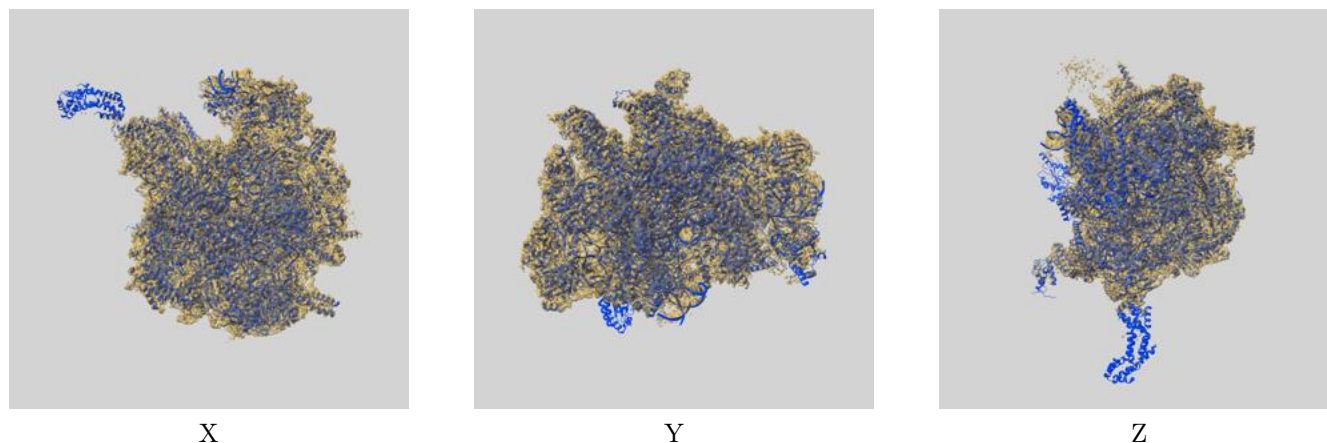
8 Fourier-Shell correlation

This section was not generated. No FSC curve or half-maps provided.

9 Map-model fit [i](#)

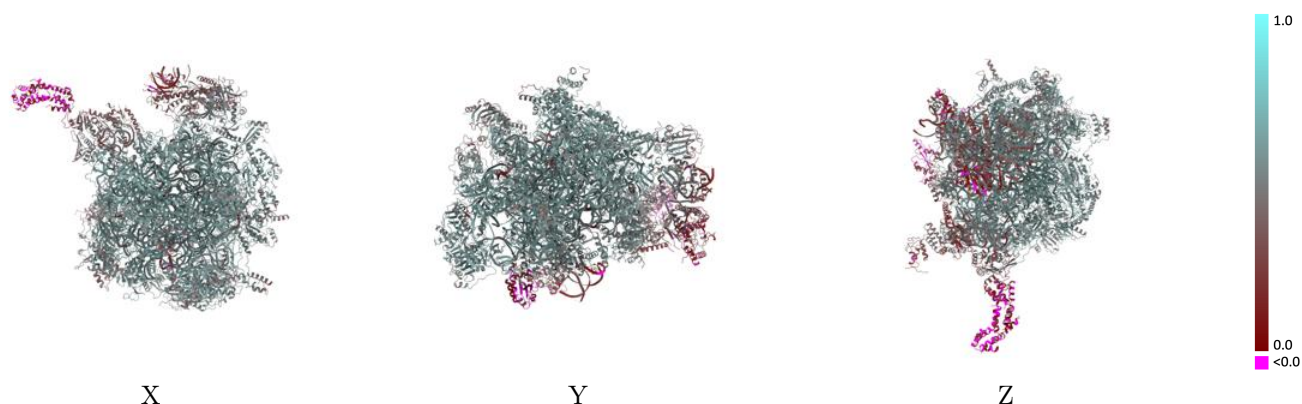
This section contains information regarding the fit between EMDB map EMD-12764 and PDB model 7O9M. Per-residue inclusion information can be found in section 3 on page 17.

9.1 Map-model overlay [i](#)



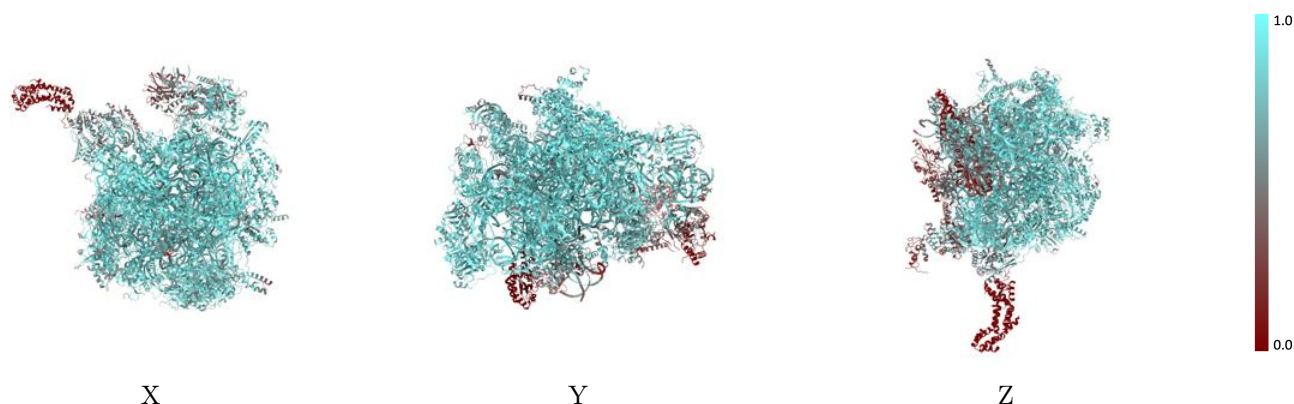
The images above show the 3D surface view of the map at the recommended contour level 0.15 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



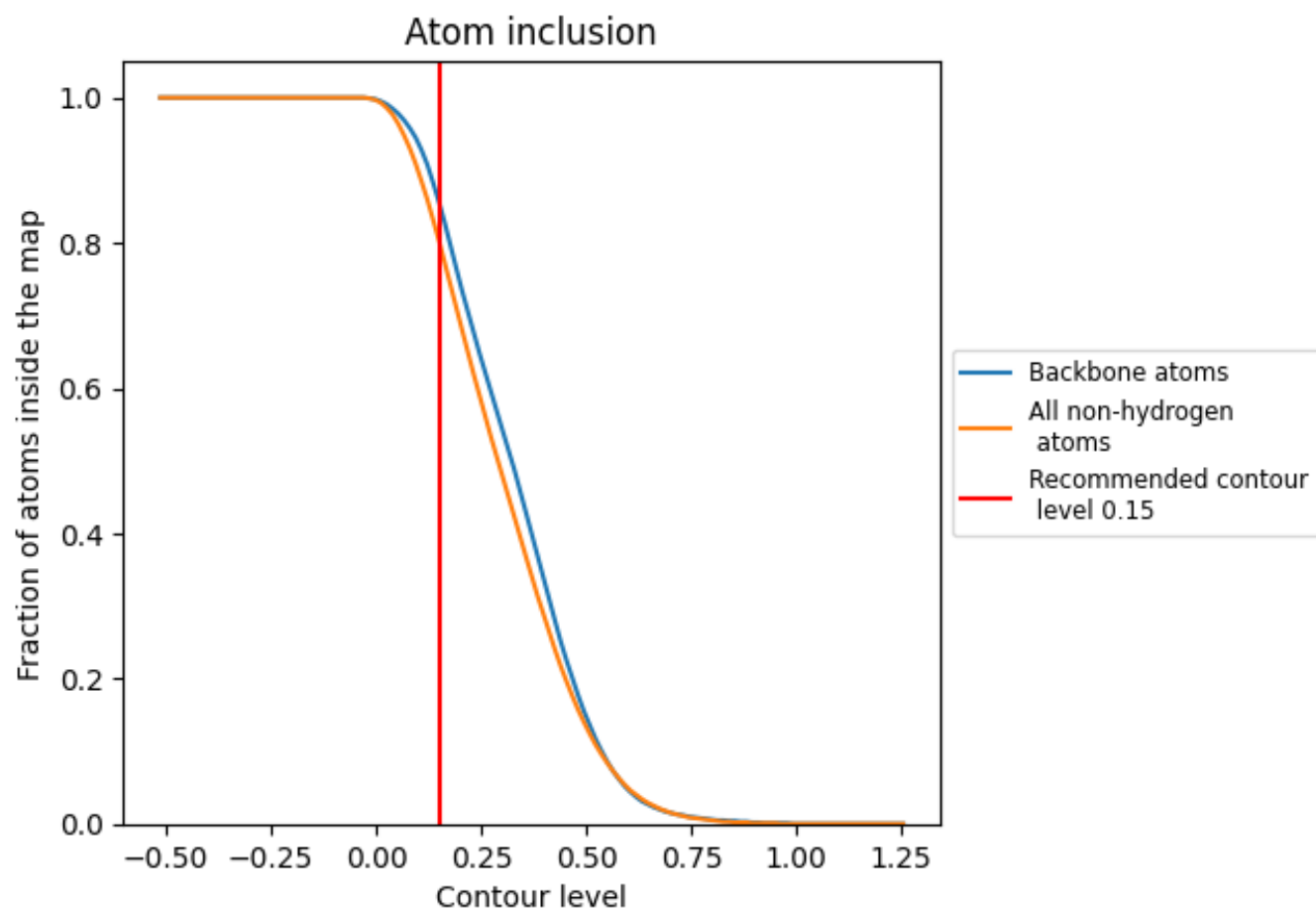
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

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



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.15).







































































9.4 Atom inclusion [i](#)



At the recommended contour level, 86% of all backbone atoms, 80% 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 (0.15) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8030	 0.5200
0	 0.8640	 0.5660
1	 0.8210	 0.5560
2	 0.9740	 0.6290
3	 0.9540	 0.6120
4	 0.9170	 0.6030
5	 0.8650	 0.5590
6	 0.7810	 0.4920
7	 0.7830	 0.5180
8	 0.3910	 0.2560
9	 0.8300	 0.5560
A	 0.9370	 0.5640
A1	 0.7350	 0.5280
A2	 0.7040	 0.4950
B	 0.7660	 0.3510
C	 0.0400	 0.1520
D	 0.8710	 0.5690
E	 0.8980	 0.5820
F	 0.9070	 0.5880
H	 0.7750	 0.5140
I	 0.4740	 0.3300
J	 0.3600	 0.2510
K	 0.9290	 0.5980
L	 0.8710	 0.5710
M	 0.9090	 0.5830
N	 0.8090	 0.5500
O	 0.8990	 0.5900
P	 0.8350	 0.5340
Q	 0.8560	 0.5670
R	 0.9190	 0.5940
S	 0.9010	 0.5880
T	 0.9180	 0.5960
U	 0.8880	 0.5780
UNK	 0.2850	 0.2430
V	 0.7450	 0.5060



Continued on next page...

Continued from previous page...

Chain	Atom inclusion	Q-score
W	 0.9250	 0.5930
X	 0.8400	 0.5550
Y	 0.8720	 0.5770
Z	 0.9010	 0.5930
a	 0.8860	 0.5800
b	 0.9200	 0.5940
c	 0.8110	 0.5460
d	 0.7490	 0.5080
e	 0.1970	 0.1870
f	 0.5390	 0.3900
g	 0.8990	 0.5760
h	 0.7840	 0.5250
i	 0.9360	 0.6050
j	 0.8290	 0.5630
k	 0.6640	 0.4360
l	 0.6410	 0.4200
m	 0.1800	 0.2060
n	 0.4930	 0.4950
o	 0.9010	 0.5850
p	 0.7490	 0.5070
q	 0.7550	 0.5150
r	 0.8740	 0.5600
s	 0.8910	 0.5790
t1	 0.0680	 0.0990
t2	 0.0500	 0.1070
t3	 0.0000	 0.0380
t4	 0.0000	 0.0660
t5	 0.0000	 0.0150
t6	 0.0000	 0.0170
u	 0.6970	 0.5090
v	 0.5950	 0.4160
w	 0.1510	 0.2180