



wwPDB EM Validation Summary Report ⓘ

Jun 21, 2026 – 08:01 am BST

PDB ID : 7OJ0 / pdb_00007oj0
EMDB ID : EMD-12937
Title : Cryo-EM structure of 70S ribosome stalled with TnaC peptide and RF2
Authors : Su, T.; Kudva, R.; Becker, T.; Berninghausen, O.; Heijne, G.; Cheng, J.; Beckmann, R.
Deposited on : 2021-05-13
Resolution : 3.50 Å(reported)

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

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

A user guide is available at

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

The types of validation reports are described at

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

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

EMDB validation analysis : 0.0.1.dev132
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDb archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

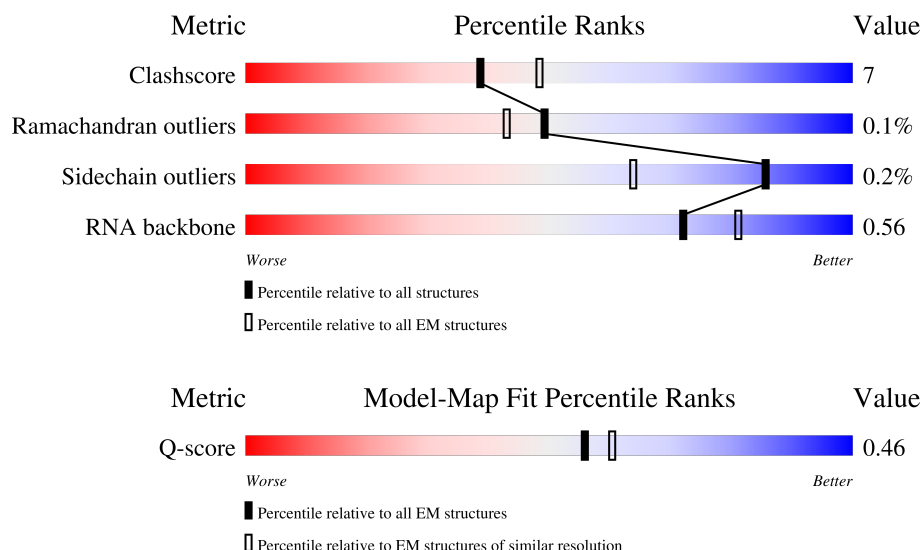
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.50 Å.

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



Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
RNA backbone	8273	3508	-
Q-score	-	25397	13950 (3.00 - 4.00)

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	1519	
2	B	241	
3	C	233	

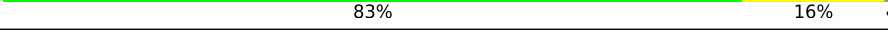
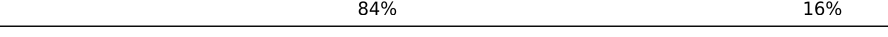
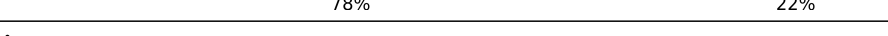
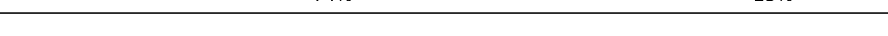
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Mol	Chain	Length	Quality of chain
4	D	206	
5	E	167	
6	F	135	
7	G	179	
8	H	130	
9	I	130	
10	J	103	
11	K	129	
12	L	124	
13	M	118	
14	N	101	
15	O	89	
16	P	82	
17	Q	84	
18	R	75	
19	S	92	
20	T	87	
21	U	71	
22	a	2807	
23	b	119	
24	c	273	
25	d	209	
26	e	201	
27	f	179	
28	g	177	

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Mol	Chain	Length	Quality of chain
29	h	149	
30	i	142	
31	j	123	
32	k	144	
33	l	136	
34	m	127	
35	n	117	
36	o	115	
37	p	118	
38	q	103	
39	r	110	
40	s	100	
41	t	104	
42	u	94	
43	v	85	
44	w	78	
45	x	63	
46	y	59	
47	z	57	
48	0	55	
49	1	46	
50	2	65	
51	3	38	
52	4	66	
53	X	5	

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Mol	Chain	Length	Quality of chain
54	7	16	75% 25%
55	V	75	56% 39% 5%
56	6	46	35% 72% 28%
57	8	365	34% 75% 21%
58	5	130	17% 64% 36%
59	9	134	18% 78% 22%



2 Entry composition

There are 62 unique types of molecules in this entry. The entry contains 146507 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	1519	Total	C	N	O	P	0	0
			32612	14552	5986	10555	1519		

- Molecule 2 is a protein called 30S ribosomal protein S2.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	224	Total	C	N	O	S	0	0
			1753	1109	315	321	8		

- Molecule 3 is a protein called 30S ribosomal protein S3.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	206	Total	C	N	O	S	0	0
			1624	1028	305	288	3		

- Molecule 4 is a protein called 30S ribosomal protein S4.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	205	Total	C	N	O	S	0	0
			1643	1026	315	298	4		

- Molecule 5 is a protein called 30S ribosomal protein S5.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	E	156	Total	C	N	O	S	0	0
			1152	717	217	212	6		

- Molecule 6 is a protein called 30S ribosomal protein S6, fully modified isoform.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	F	103	Total	C	N	O	S	0	0
			839	530	151	151	7		

- Molecule 7 is a protein called 30S ribosomal protein S7.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	G	153	Total	C	N	O	S	0	0
			1203	750	231	218	4		

- Molecule 8 is a protein called 30S ribosomal protein S8.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	H	129	Total	C	N	O	S	0	0
			979	616	173	184	6		

- Molecule 9 is a protein called 30S ribosomal protein S9.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	I	127	Total	C	N	O	S	0	0
			1022	634	206	179	3		

- Molecule 10 is a protein called 30S ribosomal protein S10.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	J	98	Total	C	N	O	S	0	0
			786	493	150	142	1		

- Molecule 11 is a protein called 30S ribosomal protein S11.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	K	117	Total	C	N	O	S	0	0
			877	540	173	161	3		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
K	119	ASP	ASN	conflict	UNP A0A6D2X4T2

- Molecule 12 is a protein called 30S ribosomal protein S12.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	L	123	Total	C	N	O	S	0	0
			952	589	195	164	4		

- Molecule 13 is a protein called 30S ribosomal protein S13.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	M	115	Total	C	N	O	S	0	0
			891	552	179	157	3		

- Molecule 14 is a protein called 30S ribosomal protein S14.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	N	100	Total	C	N	O	S	0	0
			805	499	164	139	3		

- Molecule 15 is a protein called 30S ribosomal protein S15.

Mol	Chain	Residues	Atoms					AltConf	Trace
15	O	88	Total	C	N	O	S	0	0
			714	439	144	130	1		

- Molecule 16 is a protein called 30S ribosomal protein S16.

Mol	Chain	Residues	Atoms					AltConf	Trace
16	P	81	Total	C	N	O	S	0	0
			643	403	127	112	1		

- Molecule 17 is a protein called 30S ribosomal protein S17.

Mol	Chain	Residues	Atoms					AltConf	Trace
17	Q	79	Total	C	N	O	S	0	0
			641	406	120	112	3		

- Molecule 18 is a protein called 30S ribosomal protein S18.

Mol	Chain	Residues	Atoms					AltConf	Trace
18	R	66	Total	C	N	O	S	0	0
			544	345	102	96	1		

- Molecule 19 is a protein called 30S ribosomal protein S19.

Mol	Chain	Residues	Atoms					AltConf	Trace
19	S	84	Total	C	N	O	S	0	0
			668	427	127	112	2		

- Molecule 20 is a protein called 30S ribosomal protein S20.

Mol	Chain	Residues	Atoms					AltConf	Trace
20	T	86	Total	C	N	O	S	0	0
			670	414	138	115	3		

- Molecule 21 is a protein called 30S ribosomal protein S21.

Mol	Chain	Residues	Atoms					AltConf	Trace
21	U	70	Total	C	N	O	S	0	0
			589	366	125	97	1		

- Molecule 22 is a RNA chain called 23S rRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
22	a	2807	Total	C	N	O	P	0	0
			60285	26901	11108	19469	2807		

- Molecule 23 is a RNA chain called 5S rRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
23	b	119	Total	C	N	O	P	0	0
			2549	1135	466	829	119		

- Molecule 24 is a protein called 50S ribosomal protein L2.

Mol	Chain	Residues	Atoms					AltConf	Trace
24	c	271	Total	C	N	O	S	0	0
			2082	1288	423	364	7		

- Molecule 25 is a protein called 50S ribosomal protein L3.

Mol	Chain	Residues	Atoms					AltConf	Trace
25	d	209	Total	C	N	O	S	0	0
			1566	980	288	294	4		

- Molecule 26 is a protein called 50S ribosomal protein L4.

Mol	Chain	Residues	Atoms					AltConf	Trace
26	e	201	Total	C	N	O	S	0	0
			1552	974	283	290	5		

- Molecule 27 is a protein called 50S ribosomal protein L5.

Mol	Chain	Residues	Atoms					AltConf	Trace
27	f	177	Total	C	N	O	S	0	0
			1410	899	249	256	6		

- Molecule 28 is a protein called 50S ribosomal protein L6.

Mol	Chain	Residues	Atoms					AltConf	Trace
28	g	176	Total	C	N	O	S	0	0
			1323	832	243	246	2		

- Molecule 29 is a protein called 50S ribosomal protein L9.

Mol	Chain	Residues	Atoms					AltConf	Trace
29	h	41	Total	C	N	O	S	0	0
			303	194	54	54	1		

- Molecule 30 is a protein called 50S ribosomal protein L13.

Mol	Chain	Residues	Atoms					AltConf	Trace
30	i	142	Total	C	N	O	S	0	0
			1129	714	212	199	4		

- Molecule 31 is a protein called 50S ribosomal protein L14.

Mol	Chain	Residues	Atoms					AltConf	Trace
31	j	123	Total	C	N	O	S	0	0
			946	593	181	166	6		

- Molecule 32 is a protein called 50S ribosomal protein L15.

Mol	Chain	Residues	Atoms					AltConf	Trace
32	k	144	Total	C	N	O	S	0	0
			1053	654	207	190	2		

- Molecule 33 is a protein called 50S ribosomal protein L16.

Mol	Chain	Residues	Atoms					AltConf	Trace
33	l	136	Total	C	N	O	S	0	0
			1074	686	205	177	6		

- Molecule 34 is a protein called 50S ribosomal protein L17.

Mol	Chain	Residues	Atoms					AltConf	Trace
34	m	118	Total	C	N	O	S	0	0
			945	585	194	161	5		

- Molecule 35 is a protein called 50S ribosomal protein L18.

Mol	Chain	Residues	Atoms					AltConf	Trace
35	n	116	Total	C	N	O		0	0
			892	552	178	162			

- Molecule 36 is a protein called 50S ribosomal protein L19.

Mol	Chain	Residues	Atoms					AltConf	Trace
36	o	114	Total	C	N	O	S	0	0
			917	574	179	163	1		

- Molecule 37 is a protein called 50S ribosomal protein L20.

Mol	Chain	Residues	Atoms					AltConf	Trace
37	p	117	Total	C	N	O		0	0
			947	604	192	151			

- Molecule 38 is a protein called 50S ribosomal protein L21.

Mol	Chain	Residues	Atoms					AltConf	Trace
38	q	103	Total	C	N	O	S	0	0
			816	516	153	145	2		

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

Mol	Chain	Residues	Atoms					AltConf	Trace
39	r	110	Total	C	N	O	S	0	0
			857	532	166	156	3		

- Molecule 40 is a protein called 50S ribosomal protein L23.

Mol	Chain	Residues	Atoms					AltConf	Trace
40	s	93	Total	C	N	O	S	0	0
			738	466	139	131	2		

- Molecule 41 is a protein called 50S ribosomal protein L24.

Mol	Chain	Residues	Atoms				AltConf	Trace
41	t	102	Total	C	N	O	0	0
			779	492	146	141		

- Molecule 42 is a protein called 50S ribosomal protein L25.

Mol	Chain	Residues	Atoms					AltConf	Trace
42	u	94	Total	C	N	O	S	0	0
			753	479	137	134	3		

- Molecule 43 is a protein called 50S ribosomal protein L27.

Mol	Chain	Residues	Atoms					AltConf	Trace
43	v	78	Total	C	N	O	S	0	0
			586	362	116	107	1		

- Molecule 44 is a protein called 50S ribosomal protein L28.

Mol	Chain	Residues	Atoms					AltConf	Trace
44	w	77	Total	C	N	O	S	0	0
			625	388	129	106	2		

- Molecule 45 is a protein called 50S ribosomal protein L29.

Mol	Chain	Residues	Atoms					AltConf	Trace
45	x	62	Total	C	N	O	S	0	0
			501	308	98	94	1		

- Molecule 46 is a protein called 50S ribosomal protein L30.

Mol	Chain	Residues	Atoms					AltConf	Trace
46	y	58	Total	C	N	O	S	0	0
			449	281	87	79	2		

- Molecule 47 is a protein called 50S ribosomal protein L32.

Mol	Chain	Residues	Atoms					AltConf	Trace
47	z	56	Total	C	N	O	S	0	0
			444	269	94	80	1		

- Molecule 48 is a protein called 50S ribosomal protein L33.

Mol	Chain	Residues	Atoms				AltConf	Trace
48	0	51	Total	C	N	O	0	0
			417	269	76	72		

- Molecule 49 is a protein called 50S ribosomal protein L34.

Mol	Chain	Residues	Atoms					AltConf	Trace
49	1	46	Total	C	N	O	S	0	0
			377	228	90	57	2		

- Molecule 50 is a protein called 50S ribosomal protein L35.

Mol	Chain	Residues	Atoms					AltConf	Trace
50	2	64	Total	C	N	O	S	0	0
			504	323	105	74	2		

- Molecule 51 is a protein called 50S ribosomal protein L36.

Mol	Chain	Residues	Atoms					AltConf	Trace
51	3	38	Total	C	N	O	S	0	0
			302	185	65	48	4		

- Molecule 52 is a protein called 50S ribosomal protein L31.

Mol	Chain	Residues	Atoms					AltConf	Trace
52	4	60	Total	C	N	O	S	0	0
			480	299	90	85	6		

- Molecule 53 is a RNA chain called mRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
53	X	5	Total	C	N	O	P	0	0
			103	46	16	36	5		

- Molecule 54 is a protein called TnaC.

Mol	Chain	Residues	Atoms				AltConf	Trace
54	7	16	Total	C	N	O	0	0
			139	89	26	24		

- Molecule 55 is a RNA chain called tRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
55	V	75	Total	C	N	O	P	0	0
			1609	715	292	527	75		

- Molecule 56 is a protein called Alternative ribosome-rescue factor A.

Mol	Chain	Residues	Atoms					AltConf	Trace
56	6	46	Total	C	N	O	S	0	0
			377	234	77	64	2		

- Molecule 57 is a protein called Peptide chain release factor RF2.

Mol	Chain	Residues	Atoms					AltConf	Trace
57	8	353	Total	C	N	O	S	0	0
			2800	1726	485	579	10		

- Molecule 58 is a protein called 50S ribosomal protein L10.

Mol	Chain	Residues	Atoms					AltConf	Trace
58	5	130	Total	C	N	O	S	0	0
			980	620	174	182	4		

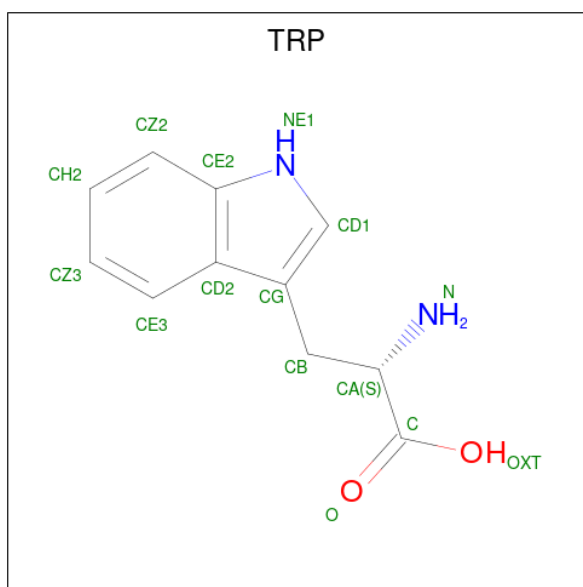
- Molecule 59 is a protein called 50S ribosomal protein L11.

Mol	Chain	Residues	Atoms					AltConf	Trace
59	9	133	Total	C	N	O	S	0	0
			966	611	167	182	6		

- Molecule 60 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
60	A	93	Total	Mg	0
			93	93	
60	a	208	Total	Mg	0
			208	208	
60	b	5	Total	Mg	0
			5	5	
60	c	1	Total	Mg	0
			1	1	
60	V	1	Total	Mg	0
			1	1	

- Molecule 61 is TRYPTOPHAN (CCD ID: TRP) (formula: C₁₁H₁₂N₂O₂).



Mol	Chain	Residues	Atoms				AltConf
61	a	1	Total	C	N	O	0
			15	11	2	2	

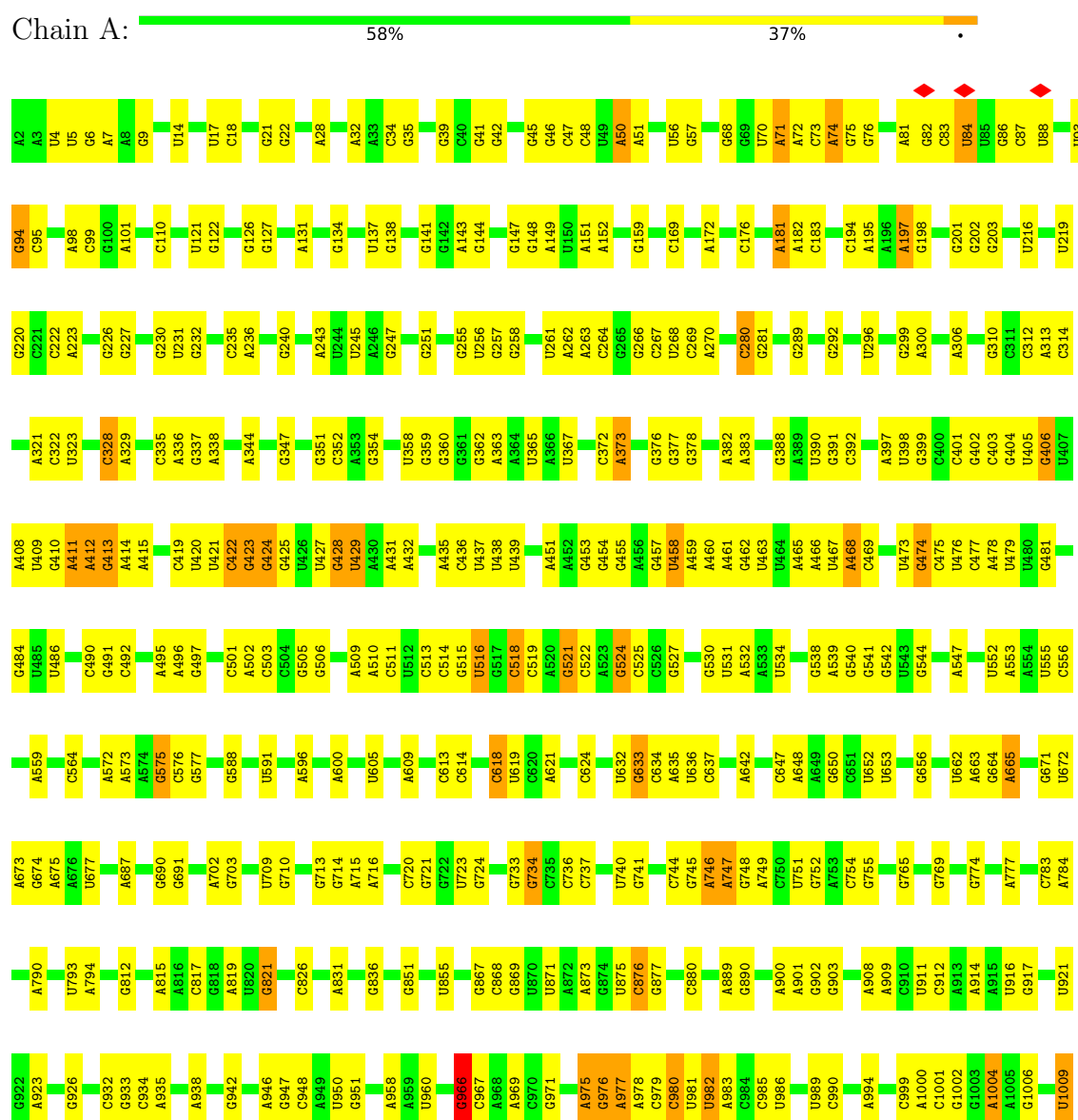
- Molecule 62 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		AltConf
62	3	1	Total	Zn	0
			1	1	
62	4	1	Total	Zn	0
			1	1	

3 Residue-property plots

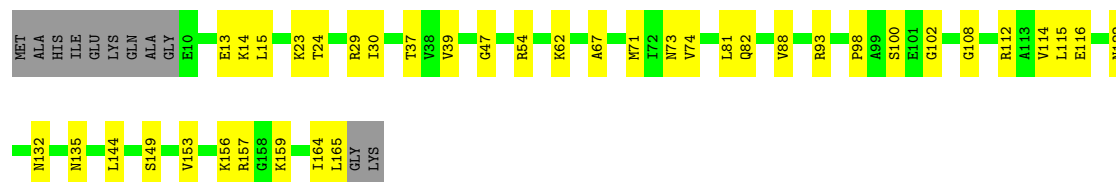
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion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

• Molecule 1: 16S rRNA





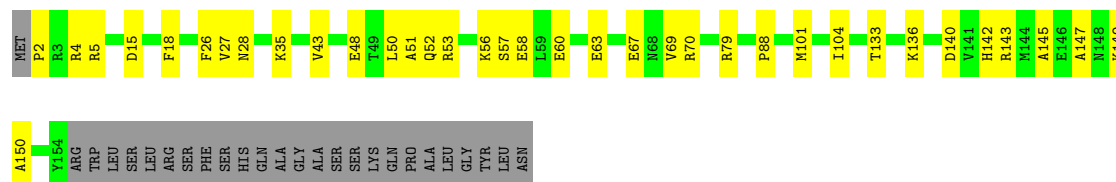
- Molecule 5: 30S ribosomal protein S5



- Molecule 6: 30S ribosomal protein S6, fully modified isoform



- Molecule 7: 30S ribosomal protein S7

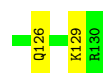


- Molecule 8: 30S ribosomal protein S8



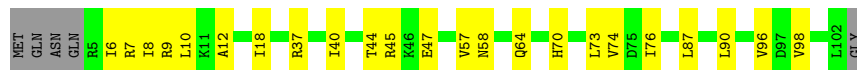
- Molecule 9: 30S ribosomal protein S9





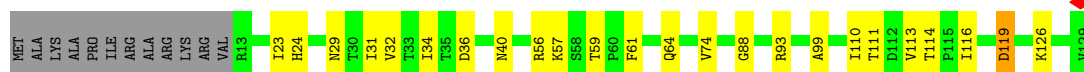
- Molecule 10: 30S ribosomal protein S10

Chain J: 73% 22% 5%



- Molecule 11: 30S ribosomal protein S11

Chain K: 72% 18% 9%



- Molecule 12: 30S ribosomal protein S12

Chain L: 81% 18%



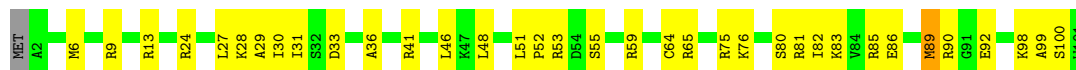
- Molecule 13: 30S ribosomal protein S13

Chain M: 83% 14%



- Molecule 14: 30S ribosomal protein S14

Chain N: 64% 34%



- Molecule 15: 30S ribosomal protein S15

Chain O: 73% 26%

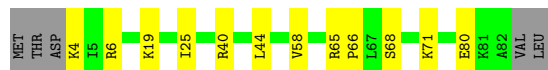
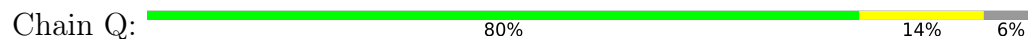


- Molecule 16: 30S ribosomal protein S16

Chain P: 66% 33%



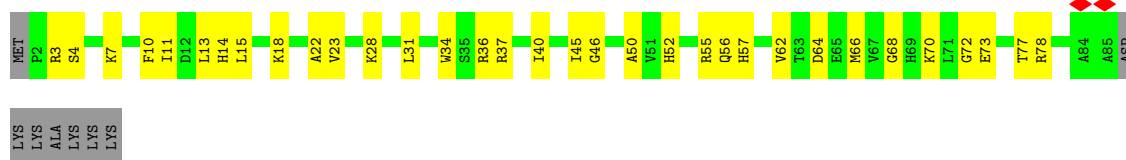
- Molecule 17: 30S ribosomal protein S17



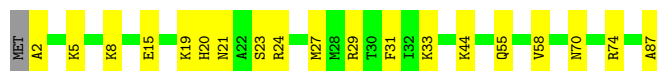
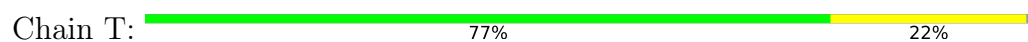
- Molecule 18: 30S ribosomal protein S18



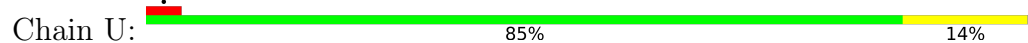
- Molecule 19: 30S ribosomal protein S19



- Molecule 20: 30S ribosomal protein S20



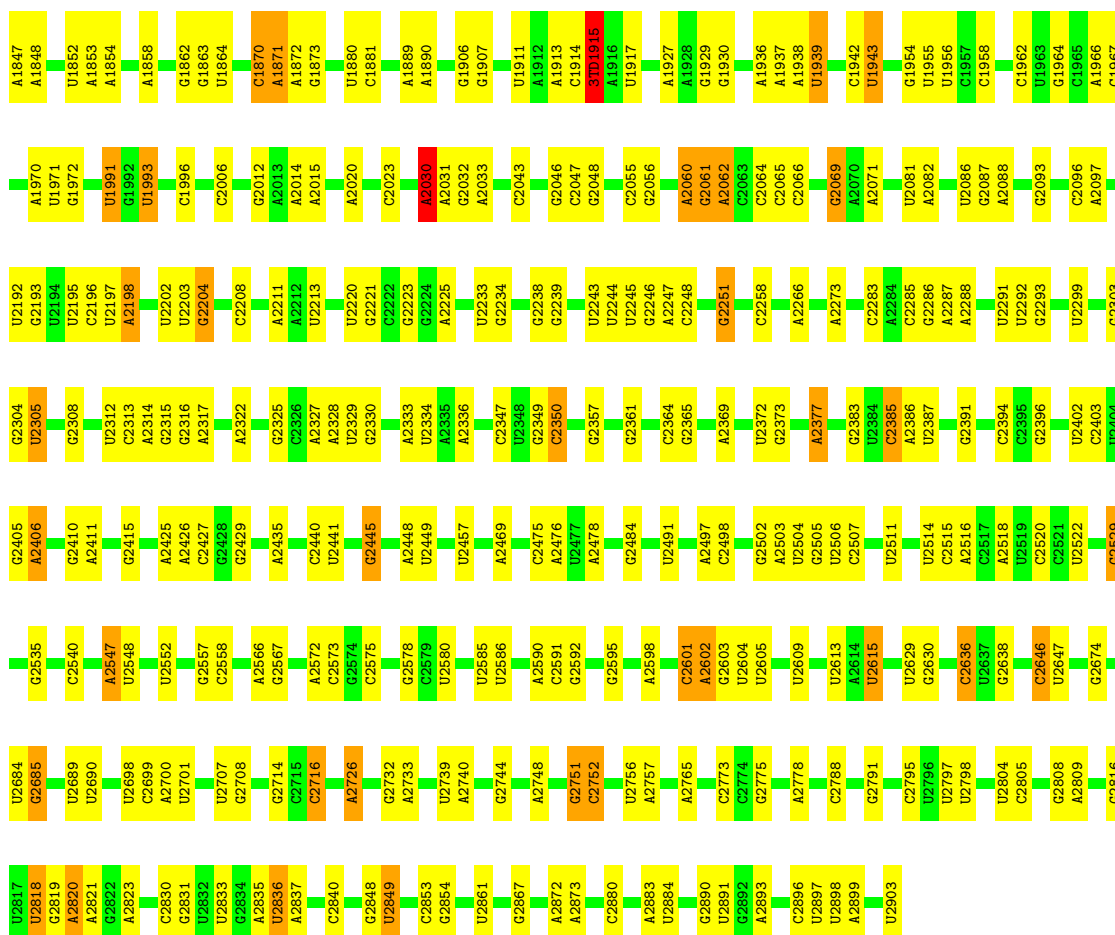
- Molecule 21: 30S ribosomal protein S21



- Molecule 22: 23S rRNA

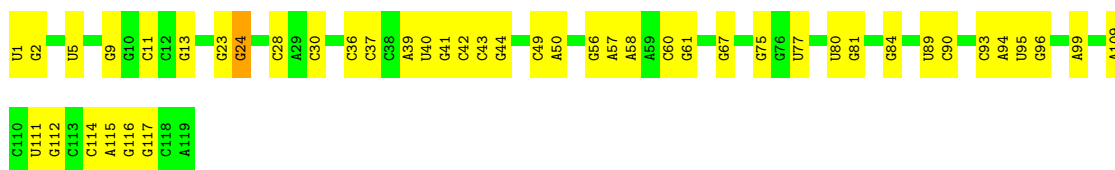


G1715	A1590	A1463	A1321	U1181	G1076	C994	U895	A789	C671	A582	G491	U869	A270	U135
G1724	C1592	A1469	U1340	G1182	U1077	C995	A896	U790	C672	A586	G495	G370	G271	U139
U1729	U1593	A1470	G1341	G1190	C1078	A996	C897	A792	C673	C587	U495	A371	A272	U142
C1730	U1594	G1471	U1080	U1081	U1082	A1000	C898	A793	U686	U588	U499	G372	G277	A143
G1731	C1595	G1472	U1352	A1204	U1083	A1009	A899	G805	C691	U589	G500	A374	A278	A144
G1734	A1596	G1473	A1353	U1212	U1084	U1012	C903	G806	C692	U591	A503	G375	A279	A145
A1735	U1597	A1476	A1365	G1212	A1085	U1013	G904	G808	C693	U592	A504	G376	A282	A146
U1736	C1599	A1477	A1378	A1214	A1086	C1013	G907	G809	C694	U593	A505	G377	A285	U149
G1737	U1596	G1482	U1379	G1218	U1087	U1015	C908	C812	C699	U594	C509	G386	G285	U150
G1738	A1607	G1483	G1380	U1234	U1088	G1016	A909	G820	G700	U598	C510	U391	G286	U151
A1744	A1608	A1490	A1383	U1235	A1089	U1019	A910	A820	G704	U599	U511	A391	U293	C151
A1745	A1618	C1493	A1384	G1236	U1094	G1022	G916	U827	G713	A603	G512	G396	A294	U152
A1754	G1622	A1508	C1385	U1248	A1095	G1025	A917	U828	U714	G604	A514	G400	G298	A299
A1755	A1509	U1249	A1387	U1249	A1096	G1026	A918	A829	A715	U615	C517	U403	A300	A155
G1756	G1632	U1250	A1392	U1250	U1097	U1032	U919	U832	A716	G620	G518	A404	G302	A156
A1760	G1633	A1253	A1393	A1253	C1102	U1033	A920	A833	C717	U621	U521	U405	G303	A160
U1761	A1635	A1254	A1394	U1254	A1103	A1028	G923	A834	C718	G620	A522	U406	U304	U171
C1764	U1637	U1255	A1395	U1255	G1104	A1029	G924	G835	C719	U621	A538	G410	C305	A172
U1769	C1638	G1256	U1396	G1256	U1105	A1032	A925	G836	A721	C624	A529	A412	U306	A173
A1773	U1647	A1262	U1400	A1262	G1107	U1034	G927	G843	G726	A627	A532	C413	G307	G177
U1781	G1648	U1263	G1401	U1263	G1110	U1035	A928	A844	C727	G628	G533	C414	G308	U177
A1786	U1649	A1264	A1403	U1264	G1111	A1038	U929	A845	A730	G629	A538	A415	U310	A181
U1786	G1654	U1265	A1404	U1265	G1112	A1039	U931	U846	A731	G630	A538	A416	A311	U196
U1796	G1659	A1271	U1406	G1271	C1114	U1041	G932	U847	A734	U632	G543	G424	G312	A199
G1797	G1666	U1272	U1411	U1272	G1115	C1043	C935	G857	G738	G636	C544	U429	G313	A199
U1798	G1667	U1273	G1416	U1273	U1132	C1044	A936	G858	A742	A637	U546	A429	U321	A204
G1799	A1668	C1278	G1419	C1278	A1133	C1045	A945	G859	A743	G638	U547	A430	A322	G205
C1800	A1669	G1279	A1427	G1279	A1134	A1046	C946	A863	U744	U639	G548	G438	U322	C208
A1801	G1674	U1280	C1427	G1280	G1135	U1047	G953	G864	U745	C640	C550	U439	A330	C209
A1802	C1675	G1281	C1428	G1281	U1141	A1054	U955	G869	U746	A643	U552	G450	G329	C210
A1808	C1564	U1282	G1429	U1282	U1142	G1055	U955	U870	G748	C645	G553	A457	A345	G215
A1809	C1565	A1287	C1430	A1287	U1143	G1059	U958	C873	A752	U646	U558	U459	A346	A216
U1812	A1566	G1288	A1431	G1288	A1147	U1060	C961	G874	U754	C647	G559	A460	A347	A219
G1813	G1567	C1290	G1432	C1290	A1151	U1061	C964	G879	A753	U652	A563	G465	U349	A222
C1816	A1568	G1300	A1433	G1300	G1063	C1064	C964	G881	C765	A654	U568	A466	G350	A223
A1819	A1571	A1301	G1436	A1301	C1152	U1065	A973	G882	G775	A655	U569	G467	C351	U224
A1829	U1572	C1306	C1437	C1306	G1153	U1066	G974	G883	G776	U656	A572	A471	A352	G234
C1830	G1573	A1307	G1441	A1307	U1154	A1067	A980	U884	G776	U657	U573	C475	G356	C357
G1831	U1578	G1311	U1441	G1311	A1155	G1068	A980	C885	A781	U658	U573	C476	U358	G247
C1832	A1583	C1315	U1443	C1315	A1156	A1069	A983	A896	A782	G659	A574	C477	G359	G248
C1833	U1584	U1316	G1444	U1316	A1165	G1071	C987	A897	A783	U663	A575	A478	U360	C249
U1834	C1585	G1317	C1447	G1317	G1072	C1072	C987	C888	G784	A668	U576	A479	A361	G263
G1835	U1589	A1169	G1452	A1169	A1073	C1075	C992	C890	G785	G669	U580	A481	A362	A264
					G1074		C993	G891	A788	A670	C581	G481	G363	A265
								A892					U365	



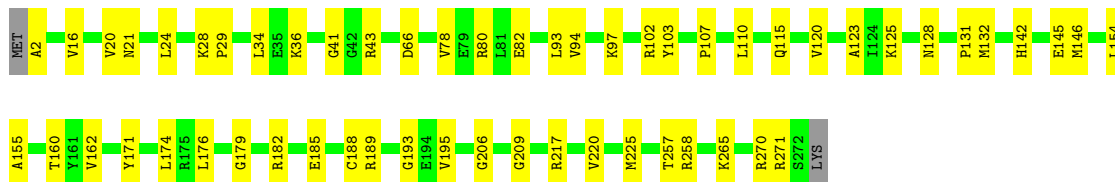
• Molecule 23: 5S rRNA

Chain b: 62% 37% .



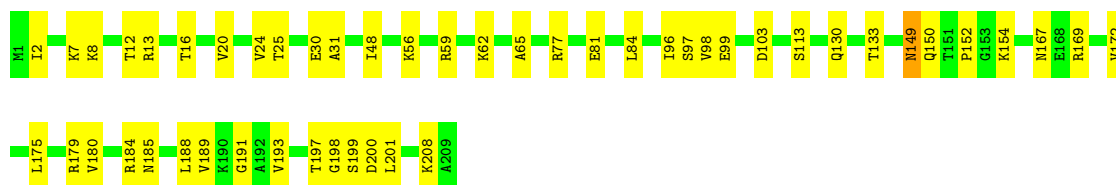
• Molecule 24: 50S ribosomal protein L2

Chain c: 79% 21% .



• Molecule 25: 50S ribosomal protein L3

Chain d: 77% 23%



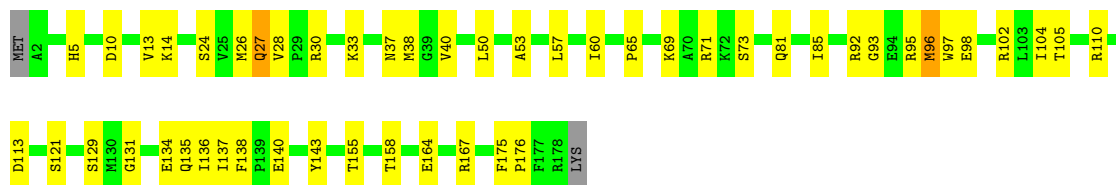
- Molecule 26: 50S ribosomal protein L4

Chain e: 81% 19%



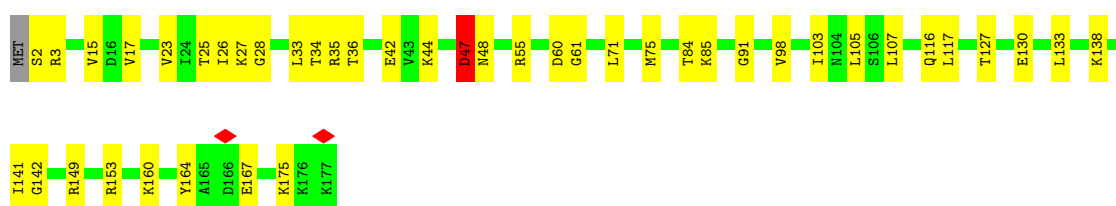
- Molecule 27: 50S ribosomal protein L5

Chain f: 71% 27% ..



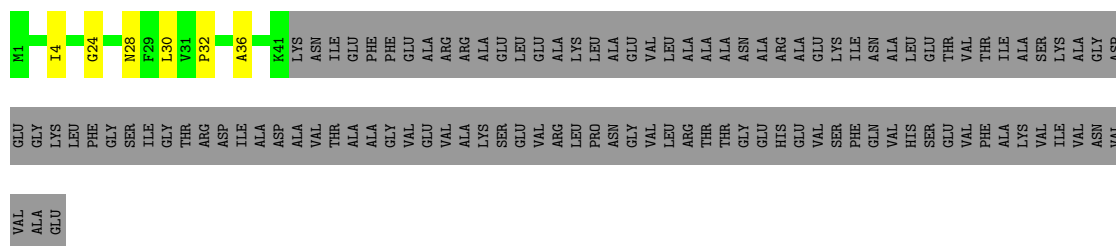
- Molecule 28: 50S ribosomal protein L6

Chain g: 75% 24% ..



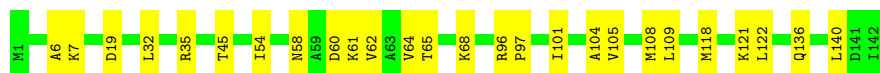
- Molecule 29: 50S ribosomal protein L9

Chain h: 23% 72%



- Molecule 30: 50S ribosomal protein L13

Chain i:  82% 18%



- Molecule 31: 50S ribosomal protein L14

Chain j:  81% 19%



- Molecule 32: 50S ribosomal protein L15

Chain k:  85% 15%



- Molecule 33: 50S ribosomal protein L16

Chain l:  82% 18%



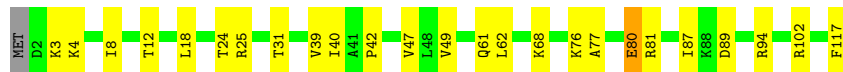
- Molecule 34: 50S ribosomal protein L17

Chain m:  69% 24% 7%



- Molecule 35: 50S ribosomal protein L18

Chain n:  78% 21% ..



- Molecule 36: 50S ribosomal protein L19

Chain o:  82% 17%



- Molecule 37: 50S ribosomal protein L20

Chain p:  83% 16%



- Molecule 38: 50S ribosomal protein L21

Chain q:  72% 28%



- Molecule 39: 50S ribosomal protein L22

Chain r:  84% 16%



- Molecule 40: 50S ribosomal protein L23

Chain s:  69% 24% 7%



- Molecule 41: 50S ribosomal protein L24

Chain t:  73% 24% 3%



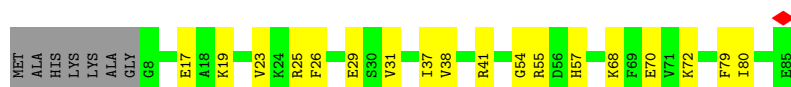
- Molecule 42: 50S ribosomal protein L25

Chain u:  78% 22%



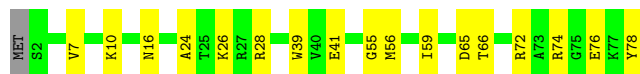
- Molecule 43: 50S ribosomal protein L27

Chain v:  71% 21% 8%



- Molecule 44: 50S ribosomal protein L28

Chain w:  77% 22%



- Molecule 45: 50S ribosomal protein L29

Chain x:  81% 17%



- Molecule 46: 50S ribosomal protein L30

Chain y:  66% 32%



- Molecule 47: 50S ribosomal protein L32

Chain z:  74% 25%



- Molecule 48: 50S ribosomal protein L33

Chain 0:  76% 16% 7%



- Molecule 49: 50S ribosomal protein L34

Chain 1:  91% 9%



- Molecule 50: 50S ribosomal protein L35

Chain 2:  77% 22%



- Molecule 51: 50S ribosomal protein L36

Chain 3:  68% 32%



- Molecule 52: 50S ribosomal protein L31

Chain 4:  76% 15% 9%



- Molecule 53: mRNA

Chain X:  60% 40%



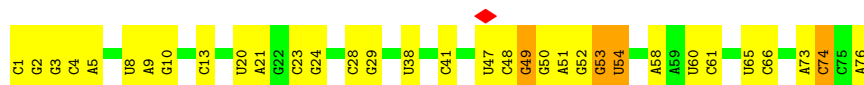
- Molecule 54: TnaC

Chain 7:  75% 25%



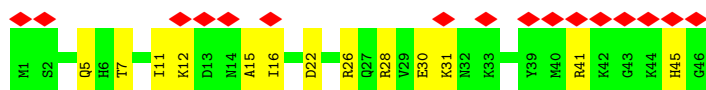
- Molecule 55: tRNA

Chain V:  56% 39% 5%



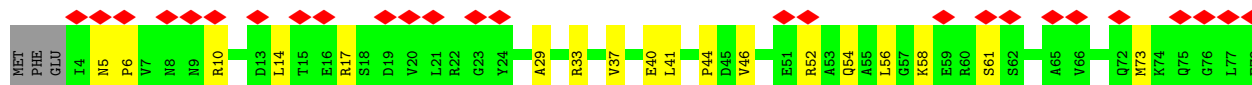
- Molecule 56: Alternative ribosome-rescue factor A

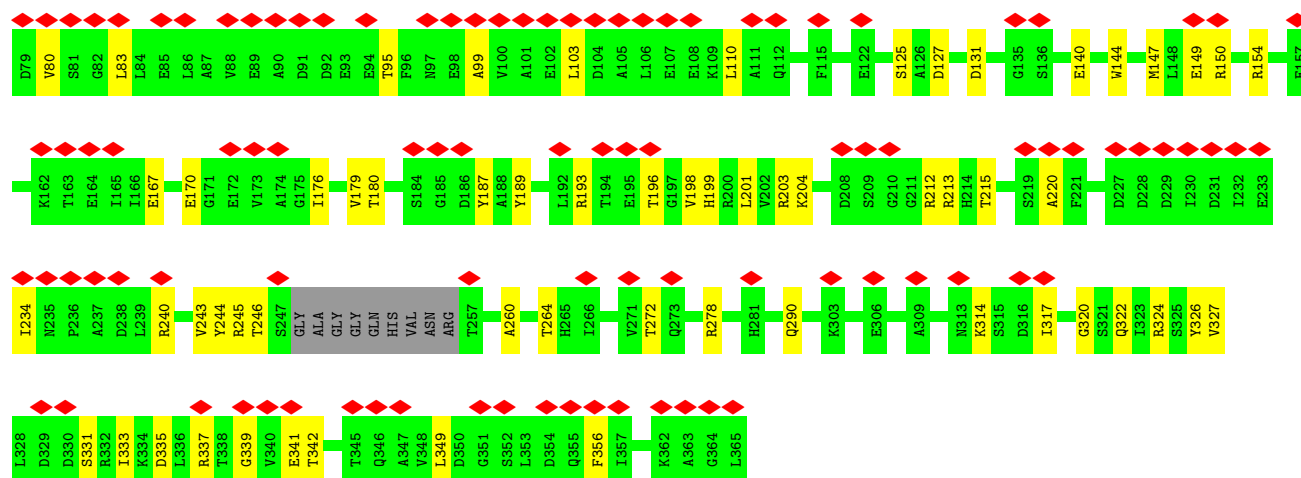
Chain 6:  35% 72% 28%



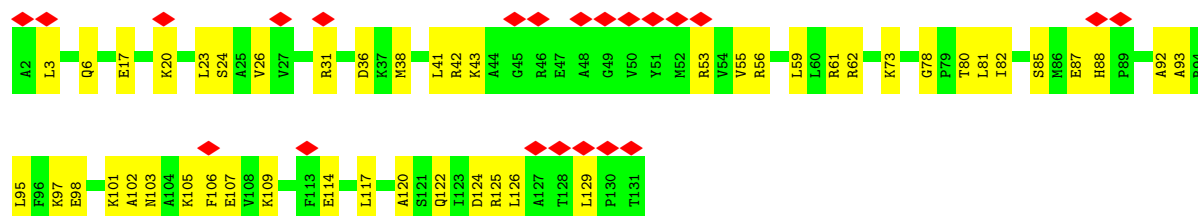
- Molecule 57: Peptide chain release factor RF2

Chain 8:  34% 75% 21%

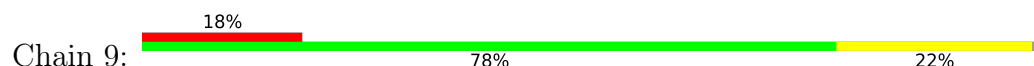




• Molecule 58: 50S ribosomal protein L10



• Molecule 59: 50S ribosomal protein L11



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	27026	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	28	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	FEI FALCON II (4k x 4k)	Depositor
Maximum map value	0.404	Depositor
Minimum map value	-0.190	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.016	Depositor
Recommended contour level	0.025	Depositor
Map size ($\text{\AA}$)	398.912, 398.912, 398.912	wwPDB
Map dimensions	368, 368, 368	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	1.084, 1.084, 1.084	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: G7M, 2MA, 1MG, 5MC, OMG, 2MG, UR3, MA6, PSU, 6MZ, MG, 5MU, MEQ, 4OC, 3TD, ZN, OMC, OMU

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	0.25	0/36236	0.32	0/56520
2	B	0.25	0/1784	0.64	0/2403
3	C	0.26	0/1651	0.65	0/2225
4	D	0.26	0/1665	0.59	1/2227 (0.0%)
5	E	0.31	0/1165	0.70	0/1568
6	F	0.29	0/858	0.71	0/1160
7	G	0.31	0/1219	0.81	0/1635
8	H	0.32	0/989	0.69	0/1326
9	I	0.27	0/1034	0.62	0/1375
10	J	0.28	0/796	0.72	0/1077
11	K	0.35	0/893	0.72	0/1205
12	L	0.37	0/966	0.61	0/1296
13	M	0.24	0/900	0.61	0/1204
14	N	0.30	0/817	0.80	1/1088 (0.1%)
15	O	0.30	0/722	0.69	2/964 (0.2%)
16	P	0.31	0/653	0.70	0/877
17	Q	0.26	0/650	0.63	0/871
18	R	0.32	0/553	0.68	0/742
19	S	0.29	0/685	0.77	2/922 (0.2%)
20	T	0.27	0/676	0.62	0/895
21	U	0.18	0/597	0.43	0/792
22	a	0.32	2/66968 (0.0%)	0.34	0/104468
23	b	0.25	0/2850	0.31	0/4444
24	c	0.32	0/2121	0.53	0/2852
25	d	0.33	0/1576	0.61	0/2119
26	e	0.28	0/1571	0.54	2/2113 (0.1%)
27	f	0.29	0/1434	0.75	3/1926 (0.2%)
28	g	0.26	0/1343	0.72	2/1816 (0.1%)
29	h	0.27	0/306	0.76	0/413
30	i	0.31	0/1152	0.52	0/1551
31	j	0.32	0/955	0.50	0/1279

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
32	k	0.33	0/1062	0.57	0/1413
33	l	0.38	0/1093	0.60	0/1460
34	m	0.35	0/958	0.64	0/1281
35	n	0.27	0/902	0.68	1/1209 (0.1%)
36	o	0.30	0/929	0.56	0/1242
37	p	0.34	0/960	0.55	1/1278 (0.1%)
38	q	0.31	0/829	0.68	0/1107
39	r	0.31	0/864	0.55	0/1156
40	s	0.28	0/744	0.68	0/994
41	t	0.26	0/787	0.71	2/1051 (0.2%)
42	u	0.28	0/766	0.62	0/1025
43	v	0.33	0/593	0.50	0/785
44	w	0.33	0/635	0.56	0/848
45	x	0.30	0/502	0.80	0/667
46	y	0.31	0/453	0.63	0/605
47	z	0.31	0/450	0.55	0/599
48	0	0.28	0/424	0.54	0/565
49	1	0.34	0/380	0.46	0/498
50	2	0.34	0/513	0.60	0/676
51	3	0.38	0/303	0.66	0/397
52	4	0.24	0/488	0.69	0/649
53	X	0.18	0/113	0.28	0/173
54	7	0.28	0/143	0.49	0/193
55	V	0.21	0/1775	0.35	0/2764
56	6	0.20	0/383	0.55	0/504
57	8	0.23	0/2838	0.57	0/3825
58	5	0.32	0/993	0.84	0/1340
59	9	0.22	0/979	0.59	0/1322
All	All	0.29	2/157644 (0.0%)	0.44	17/234979 (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
11	K	0	1
25	d	0	1
27	f	0	1
28	g	0	2
30	i	0	1
38	q	0	1

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Mol	Chain	#Chirality outliers	#Planarity outliers
41	t	0	1
58	5	0	2
All	All	0	10

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
22	a	2449	U	C5-C6	7.73	1.49	1.34
22	a	2449	U	C2-N3	5.48	1.48	1.37

The worst 5 of 17 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
27	f	96	MET	CA-CB-CG	8.38	130.86	114.10
14	N	89	MET	CA-CB-CG	7.35	128.81	114.10
41	t	98	SER	CA-C-N	6.92	138.36	126.32
41	t	98	SER	C-N-CA	6.92	138.36	126.32
28	g	48	ASN	CA-C-N	6.20	135.20	121.81

There are no chirality outliers.

5 of 10 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
11	K	119	ASP	Peptide
25	d	16	THR	Peptide
27	f	26	MET	Peptide
28	g	175	LYS	Peptide
28	g	47	ASP	Peptide

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	32612	0	16432	430	0
2	B	1753	0	1780	29	0
3	C	1624	0	1696	34	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	D	1643	0	1707	42	0
5	E	1152	0	1196	35	0
6	F	839	0	833	16	0
7	G	1203	0	1254	25	0
8	H	979	0	1031	33	0
9	I	1022	0	1070	29	0
10	J	786	0	828	17	0
11	K	877	0	885	16	0
12	L	952	0	1012	16	0
13	M	891	0	952	14	0
14	N	805	0	844	29	0
15	O	714	0	734	15	0
16	P	643	0	661	22	0
17	Q	641	0	682	9	0
18	R	544	0	565	11	0
19	S	668	0	693	25	0
20	T	670	0	719	14	0
21	U	589	0	629	7	0
22	a	60285	0	30344	517	0
23	b	2549	0	1291	31	0
24	c	2082	0	2154	39	0
25	d	1566	0	1618	34	0
26	e	1552	0	1619	27	0
27	f	1410	0	1444	35	0
28	g	1323	0	1371	24	0
29	h	303	0	327	4	0
30	i	1129	0	1162	17	0
31	j	946	0	1023	16	0
32	k	1053	0	1129	17	0
33	l	1074	0	1157	18	0
34	m	945	0	989	23	0
35	n	892	0	923	15	0
36	o	917	0	962	14	0
37	p	947	0	1019	17	0
38	q	816	0	839	20	0
39	r	857	0	922	14	0
40	s	738	0	807	16	0
41	t	779	0	831	16	0
42	u	753	0	780	15	0
43	v	586	0	596	13	0
44	w	625	0	652	12	0
45	x	501	0	531	8	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
46	y	449	0	488	13	0
47	z	444	0	458	11	0
48	0	417	0	451	7	0
49	1	377	0	418	4	0
50	2	504	0	572	12	0
51	3	302	0	340	10	0
52	4	480	0	478	9	0
53	X	103	0	55	1	0
54	7	139	0	134	3	0
55	V	1609	0	812	17	0
56	6	377	0	393	13	0
57	8	2800	0	2700	59	0
58	5	980	0	1013	38	0
59	9	966	0	1013	20	0
60	A	93	0	0	0	0
60	V	1	0	0	0	0
60	a	208	0	0	0	0
60	b	5	0	0	0	0
60	c	1	0	0	0	0
61	a	15	0	9	1	0
62	3	1	0	0	0	0
62	4	1	0	0	0	0
All	All	146507	0	100027	1736	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 7.

The worst 5 of 1736 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
22:a:747:5MU:C4	22:a:747:5MU:C5	1.78	1.70
22:a:1939:5MU:C4	22:a:1939:5MU:C5	1.79	1.64
55:V:54:5MU:C5	55:V:54:5MU:C4	1.80	1.64
1:A:1441:A:N6	1:A:1461:G:H21	1.55	1.02
1:A:243:A:C5	1:A:281:G:N2	2.32	0.97

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	B	222/241 (92%)	209 (94%)	13 (6%)	0	100	100
3	C	204/233 (88%)	197 (97%)	6 (3%)	1 (0%)	24	57
4	D	203/206 (98%)	200 (98%)	3 (2%)	0	100	100
5	E	154/167 (92%)	148 (96%)	6 (4%)	0	100	100
6	F	101/135 (75%)	98 (97%)	3 (3%)	0	100	100
7	G	151/179 (84%)	142 (94%)	9 (6%)	0	100	100
8	H	127/130 (98%)	120 (94%)	7 (6%)	0	100	100
9	I	125/130 (96%)	122 (98%)	3 (2%)	0	100	100
10	J	96/103 (93%)	89 (93%)	6 (6%)	1 (1%)	12	44
11	K	115/129 (89%)	108 (94%)	7 (6%)	0	100	100
12	L	121/124 (98%)	114 (94%)	7 (6%)	0	100	100
13	M	113/118 (96%)	109 (96%)	4 (4%)	0	100	100
14	N	98/101 (97%)	96 (98%)	2 (2%)	0	100	100
15	O	86/89 (97%)	83 (96%)	3 (4%)	0	100	100
16	P	79/82 (96%)	75 (95%)	4 (5%)	0	100	100
17	Q	77/84 (92%)	76 (99%)	1 (1%)	0	100	100
18	R	64/75 (85%)	56 (88%)	8 (12%)	0	100	100
19	S	82/92 (89%)	76 (93%)	6 (7%)	0	100	100
20	T	84/87 (97%)	81 (96%)	3 (4%)	0	100	100
21	U	68/71 (96%)	68 (100%)	0	0	100	100
24	c	269/273 (98%)	258 (96%)	11 (4%)	0	100	100
25	d	206/209 (99%)	197 (96%)	8 (4%)	1 (0%)	24	57
26	e	199/201 (99%)	197 (99%)	2 (1%)	0	100	100
27	f	175/179 (98%)	166 (95%)	9 (5%)	0	100	100
28	g	174/177 (98%)	159 (91%)	14 (8%)	1 (1%)	21	54

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
29	h	39/149 (26%)	34 (87%)	5 (13%)	0	100	100
30	i	140/142 (99%)	135 (96%)	5 (4%)	0	100	100
31	j	121/123 (98%)	116 (96%)	5 (4%)	0	100	100
32	k	142/144 (99%)	135 (95%)	7 (5%)	0	100	100
33	l	134/136 (98%)	130 (97%)	4 (3%)	0	100	100
34	m	116/127 (91%)	109 (94%)	6 (5%)	1 (1%)	14	47
35	n	114/117 (97%)	108 (95%)	6 (5%)	0	100	100
36	o	112/115 (97%)	109 (97%)	3 (3%)	0	100	100
37	p	115/118 (98%)	114 (99%)	1 (1%)	0	100	100
38	q	101/103 (98%)	97 (96%)	4 (4%)	0	100	100
39	r	108/110 (98%)	108 (100%)	0	0	100	100
40	s	91/100 (91%)	85 (93%)	6 (7%)	0	100	100
41	t	100/104 (96%)	94 (94%)	6 (6%)	0	100	100
42	u	92/94 (98%)	90 (98%)	2 (2%)	0	100	100
43	v	76/85 (89%)	72 (95%)	4 (5%)	0	100	100
44	w	75/78 (96%)	75 (100%)	0	0	100	100
45	x	60/63 (95%)	56 (93%)	4 (7%)	0	100	100
46	y	56/59 (95%)	54 (96%)	2 (4%)	0	100	100
47	z	54/57 (95%)	53 (98%)	1 (2%)	0	100	100
48	0	49/55 (89%)	49 (100%)	0	0	100	100
49	1	44/46 (96%)	41 (93%)	3 (7%)	0	100	100
50	2	62/65 (95%)	58 (94%)	4 (6%)	0	100	100
51	3	36/38 (95%)	36 (100%)	0	0	100	100
52	4	56/66 (85%)	54 (96%)	2 (4%)	0	100	100
54	7	14/16 (88%)	12 (86%)	2 (14%)	0	100	100
56	6	44/46 (96%)	42 (96%)	2 (4%)	0	100	100
57	8	349/365 (96%)	337 (97%)	12 (3%)	0	100	100
58	5	128/130 (98%)	106 (83%)	21 (16%)	1 (1%)	16	49
59	9	129/134 (96%)	119 (92%)	10 (8%)	0	100	100
All	All	6150/6600 (93%)	5872 (96%)	272 (4%)	6 (0%)	49	79

5 of 6 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
34	m	70	THR
10	J	57	VAL
25	d	149	ASN
28	g	47	ASP
58	5	55	VAL

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	B	186/199 (94%)	185 (100%)	1 (0%)	81	80
3	C	170/190 (90%)	170 (100%)	0	100	100
4	D	172/173 (99%)	172 (100%)	0	100	100
5	E	119/126 (94%)	119 (100%)	0	100	100
6	F	90/116 (78%)	90 (100%)	0	100	100
7	G	126/147 (86%)	126 (100%)	0	100	100
8	H	104/105 (99%)	104 (100%)	0	100	100
9	I	105/107 (98%)	104 (99%)	1 (1%)	68	75
10	J	86/90 (96%)	86 (100%)	0	100	100
11	K	90/99 (91%)	88 (98%)	2 (2%)	45	65
12	L	102/104 (98%)	99 (97%)	3 (3%)	37	60
13	M	93/96 (97%)	93 (100%)	0	100	100
14	N	83/84 (99%)	83 (100%)	0	100	100
15	O	76/77 (99%)	76 (100%)	0	100	100
16	P	65/65 (100%)	65 (100%)	0	100	100
17	Q	73/78 (94%)	73 (100%)	0	100	100
18	R	57/65 (88%)	57 (100%)	0	100	100
19	S	72/79 (91%)	72 (100%)	0	100	100
20	T	65/66 (98%)	65 (100%)	0	100	100
21	U	60/61 (98%)	60 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
24	c	216/218 (99%)	216 (100%)	0	100	100
25	d	163/163 (100%)	163 (100%)	0	100	100
26	e	165/165 (100%)	165 (100%)	0	100	100
27	f	148/150 (99%)	148 (100%)	0	100	100
28	g	137/138 (99%)	137 (100%)	0	100	100
29	h	32/114 (28%)	32 (100%)	0	100	100
30	i	116/116 (100%)	116 (100%)	0	100	100
31	j	104/104 (100%)	104 (100%)	0	100	100
32	k	103/103 (100%)	103 (100%)	0	100	100
33	l	109/109 (100%)	109 (100%)	0	100	100
34	m	98/103 (95%)	98 (100%)	0	100	100
35	n	86/87 (99%)	86 (100%)	0	100	100
36	o	99/100 (99%)	99 (100%)	0	100	100
37	p	89/90 (99%)	89 (100%)	0	100	100
38	q	84/84 (100%)	83 (99%)	1 (1%)	63	73
39	r	93/93 (100%)	93 (100%)	0	100	100
40	s	80/84 (95%)	80 (100%)	0	100	100
41	t	83/85 (98%)	83 (100%)	0	100	100
42	u	78/78 (100%)	78 (100%)	0	100	100
43	v	58/63 (92%)	58 (100%)	0	100	100
44	w	67/68 (98%)	67 (100%)	0	100	100
45	x	54/55 (98%)	54 (100%)	0	100	100
46	y	48/49 (98%)	48 (100%)	0	100	100
47	z	47/48 (98%)	47 (100%)	0	100	100
48	0	46/49 (94%)	46 (100%)	0	100	100
49	1	38/38 (100%)	38 (100%)	0	100	100
50	2	51/52 (98%)	51 (100%)	0	100	100
51	3	34/34 (100%)	34 (100%)	0	100	100
52	4	55/59 (93%)	55 (100%)	0	100	100
54	7	16/16 (100%)	16 (100%)	0	100	100
56	6	39/39 (100%)	39 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
57	8	302/311 (97%)	302 (100%)	0	100	100
58	5	99/99 (100%)	99 (100%)	0	100	100
59	9	102/103 (99%)	102 (100%)	0	100	100
All	All	5133/5394 (95%)	5125 (100%)	8 (0%)	85	85

5 of 8 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
38	q	43	ASN
12	L	90	LEU
12	L	87	VAL
11	K	119	ASP
12	L	88	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 50 such sidechains are listed below:

Mol	Chain	Res	Type
33	l	13	HIS
38	q	43	ASN
59	9	93	ASN
35	n	100	HIS
36	o	12	GLN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	A	1516/1519 (99%)	230 (15%)	5 (0%)
22	a	2804/2807 (99%)	378 (13%)	0
23	b	118/119 (99%)	14 (11%)	0
53	X	4/5 (80%)	1 (25%)	0
55	V	73/75 (97%)	17 (23%)	0
All	All	4515/4525 (99%)	640 (14%)	5 (0%)

5 of 640 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	A	4	U
1	A	5	U
1	A	6	G

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Mol	Chain	Res	Type
1	A	7	A
1	A	9	G

All (5) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
1	A	5	U
1	A	411	A
1	A	1026	G
1	A	1035	A
1	A	1078	U

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

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

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
1	5MC	A	1407	1	18,22,23	3.47	7 (38%)	26,32,35	1.02	1 (3%)
22	G7M	a	2069	22	23,26,27	2.75	8 (34%)	35,39,42	1.81	9 (25%)
22	PSU	a	2604	22	18,21,22	0.98	1 (5%)	22,30,33	1.75	3 (13%)
25	MEQ	d	150	25	8,9,10	0.99	0	5,10,12	0.69	0
22	PSU	a	2605	22	18,21,22	0.95	1 (5%)	22,30,33	1.71	3 (13%)
1	2MG	A	966	1	23,26,27	2.63	9 (39%)	32,38,41	2.36	12 (37%)
22	PSU	a	746	22,60	18,21,22	1.05	2 (11%)	22,30,33	1.78	3 (13%)
22	PSU	a	2580	22	18,21,22	1.06	2 (11%)	22,30,33	1.81	5 (22%)
1	5MC	A	967	1	18,22,23	3.52	7 (38%)	26,32,35	1.05	1 (3%)
1	MA6	A	1519	1	23,26,27	1.37	4 (17%)	34,38,41	4.34	13 (38%)
22	PSU	a	1911	22	18,21,22	1.07	1 (5%)	22,30,33	1.81	4 (18%)
22	1MG	a	745	22	22,26,27	2.59	7 (31%)	33,39,42	1.82	8 (24%)
1	UR3	A	1498	1	19,22,23	2.58	6 (31%)	26,32,35	1.29	1 (3%)
22	OMG	a	2251	22,55	23,26,27	2.32	8 (34%)	33,38,41	2.02	9 (27%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
22	2MG	a	1835	22	23,26,27	2.55	9 (39%)	32,38,41	2.34	12 (37%)
22	PSU	a	955	22	18,21,22	1.01	1 (5%)	22,30,33	1.79	4 (18%)
22	PSU	a	2504	22	18,21,22	1.04	1 (5%)	22,30,33	1.62	4 (18%)
22	PSU	a	1917	22	18,21,22	0.97	1 (5%)	22,30,33	1.65	4 (18%)
1	G7M	A	527	1	23,26,27	2.72	8 (34%)	35,39,42	1.72	8 (22%)
1	2MG	A	1516	1	23,26,27	2.54	9 (39%)	32,38,41	2.21	12 (37%)
22	6MZ	a	1618	22	22,25,26	2.69	4 (18%)	30,36,39	2.44	11 (36%)
22	OMU	a	2552	22	19,22,23	2.74	6 (31%)	26,31,34	1.74	5 (19%)
22	3TD	a	1915	22	18,22,23	3.96	6 (33%)	22,32,35	1.49	2 (9%)
22	PSU	a	2457	22	18,21,22	0.98	1 (5%)	22,30,33	1.74	5 (22%)
22	2MA	a	2503	22,60	22,25,26	3.43	8 (36%)	33,37,40	2.04	8 (24%)
1	PSU	A	516	1,60	18,21,22	0.93	1 (5%)	22,30,33	1.62	4 (18%)
1	MA6	A	1518	1	23,26,27	1.40	5 (21%)	34,38,41	4.43	13 (38%)
1	2MG	A	1207	1	23,26,27	2.63	9 (39%)	32,38,41	2.33	12 (37%)
22	5MU	a	1939	22	19,22,23	7.17	8 (42%)	28,32,35	3.55	10 (35%)
22	2MG	a	2445	22	23,26,27	2.47	9 (39%)	32,38,41	2.35	11 (34%)
22	5MU	a	747	22	19,22,23	7.15	8 (42%)	28,32,35	3.52	10 (35%)
22	6MZ	a	2030	22	22,25,26	2.69	4 (18%)	30,36,39	2.53	10 (33%)
1	4OC	A	1402	1	20,23,24	3.03	8 (40%)	26,32,35	0.84	1 (3%)
22	OMC	a	2498	22,60	19,22,23	2.83	8 (42%)	26,31,34	0.90	1 (3%)
22	5MC	a	1962	22	18,22,23	3.48	7 (38%)	26,32,35	1.06	1 (3%)
55	5MU	V	54	55	18,21,23	5.93	8 (44%)	26,30,35	2.44	7 (26%)

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	5MC	A	1407	1	-	0/7/25/26	0/2/2/2
22	G7M	a	2069	22	-	2/7/25/26	0/3/3/3
22	PSU	a	2604	22	-	0/7/25/26	0/2/2/2
25	MEQ	d	150	25	-	2/8/9/11	-
22	PSU	a	2605	22	-	0/7/25/26	0/2/2/2
1	2MG	A	966	1	-	2/9/27/28	0/3/3/3
22	PSU	a	746	22,60	-	1/7/25/26	0/2/2/2
22	PSU	a	2580	22	-	0/7/25/26	0/2/2/2

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	5MC	A	967	1	-	0/7/25/26	0/2/2/2
1	MA6	A	1519	1	-	3/11/29/30	0/3/3/3
22	PSU	a	1911	22	-	0/7/25/26	0/2/2/2
22	1MG	a	745	22	-	0/7/25/26	0/3/3/3
1	UR3	A	1498	1	-	2/7/25/26	0/2/2/2
22	OMG	a	2251	22,55	-	1/9/27/28	0/3/3/3
22	2MG	a	1835	22	-	0/9/27/28	0/3/3/3
22	PSU	a	955	22	-	0/7/25/26	0/2/2/2
22	PSU	a	2504	22	-	2/7/25/26	0/2/2/2
22	PSU	a	1917	22	-	0/7/25/26	0/2/2/2
1	G7M	A	527	1	-	2/7/25/26	0/3/3/3
1	2MG	A	1516	1	-	0/9/27/28	0/3/3/3
22	6MZ	a	1618	22	-	2/9/27/28	0/3/3/3
22	OMU	a	2552	22	-	1/9/27/28	0/2/2/2
22	3TD	a	1915	22	-	4/7/25/26	0/2/2/2
22	PSU	a	2457	22	-	0/7/25/26	0/2/2/2
22	2MA	a	2503	22,60	-	2/7/25/26	0/3/3/3
1	PSU	A	516	1,60	-	0/7/25/26	0/2/2/2
1	MA6	A	1518	1	-	1/11/29/30	0/3/3/3
1	2MG	A	1207	1	-	0/9/27/28	0/3/3/3
22	5MU	a	1939	22	-	0/7/25/26	0/2/2/2
22	2MG	a	2445	22	-	2/9/27/28	0/3/3/3
22	5MU	a	747	22	-	1/7/25/26	0/2/2/2
22	6MZ	a	2030	22	-	2/9/27/28	0/3/3/3
1	4OC	A	1402	1	-	2/9/29/30	0/2/2/2
22	OMC	a	2498	22,60	-	0/9/27/28	0/2/2/2
22	5MC	a	1962	22	-	2/7/25/26	0/2/2/2
55	5MU	V	54	55	-	0/7/25/26	0/2/2/2

The worst 5 of 192 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
22	a	1939	5MU	C4-C5	20.77	1.79	1.44
22	a	747	5MU	C4-C5	20.57	1.78	1.44
55	V	54	5MU	C5-C4	16.43	1.80	1.43
22	a	1939	5MU	C6-N1	15.97	1.65	1.38
22	a	747	5MU	C6-N1	15.88	1.65	1.38

The worst 5 of 227 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	1519	MA6	N1-C6-N6	-16.99	98.51	117.08
1	A	1518	MA6	N1-C6-N6	-16.93	98.58	117.08
22	a	1939	5MU	C5-C4-N3	10.85	124.57	115.31
22	a	747	5MU	C5-C4-N3	10.28	124.09	115.31
1	A	1518	MA6	C5-C6-N6	9.72	142.24	125.30

There are no chirality outliers.

5 of 36 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
25	d	150	MEQ	N-CA-CB-CG
25	d	150	MEQ	C-CA-CB-CG
1	A	966	2MG	C3'-C4'-C5'-O5'
1	A	1519	MA6	O4'-C4'-C5'-O5'
22	a	1618	6MZ	C5-C6-N6-C9

There are no ring outliers.

11 monomers are involved in 14 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
25	d	150	MEQ	1	0
1	A	966	2MG	1	0
22	a	745	1MG	1	0
1	A	1498	UR3	1	0
22	a	2251	OMG	2	0
22	a	1915	3TD	1	0
1	A	516	PSU	1	0
22	a	1939	5MU	1	0
22	a	747	5MU	1	0
22	a	2030	6MZ	1	0
55	V	54	5MU	3	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 311 ligands modelled in this entry, 310 are monoatomic - leaving 1 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
61	TRP	a	6209	-	14,16,16	0.59	0	20,22,22	0.63	1 (5%)

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	TRP	a	6209	-	-	0/8/8/8	0/2/2/2

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
61	a	6209	TRP	CA-CB-CG	2.00	117.31	113.50

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
61	a	6209	TRP	1	0

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
22	a	2
1	A	2
55	V	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	a	2098:U	O3'	2191:A	P	17.24
1	A	840:C	O3'	846:G	P	16.92
1	A	204:G	O3'	214:C	P	16.48
1	a	1172:C	O3'	1177:G	P	16.30
1	V	16:C	O3'	18:G	P	5.36

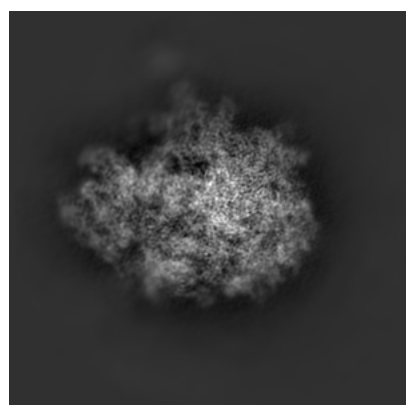
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-12937. These allow visual inspection of the internal detail of the map and identification of artifacts.

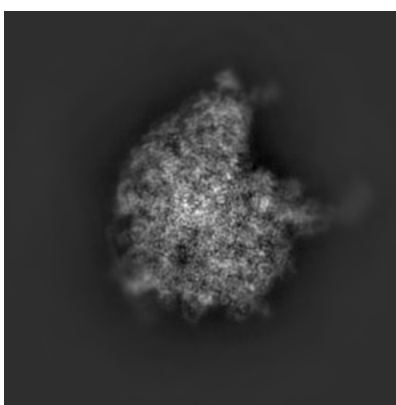
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

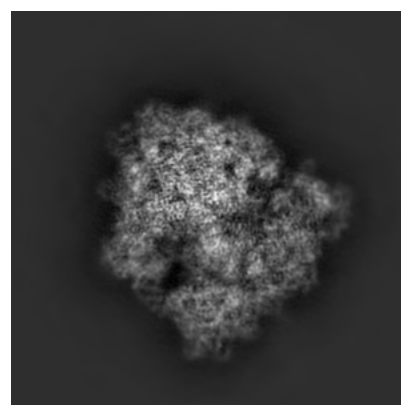
6.1.1 Primary map



X



Y

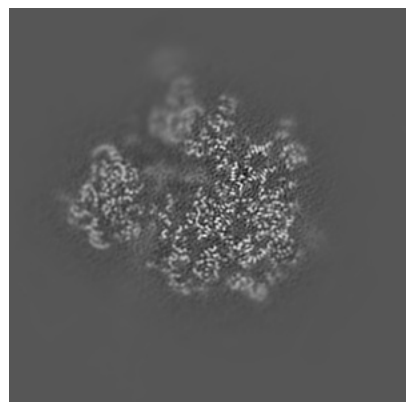


Z

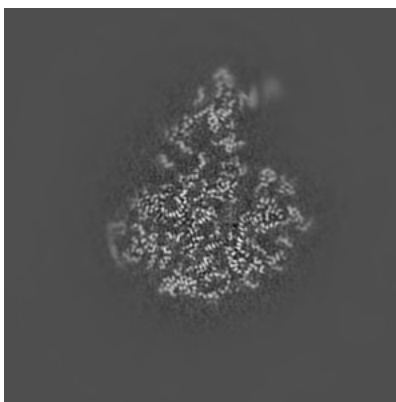
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

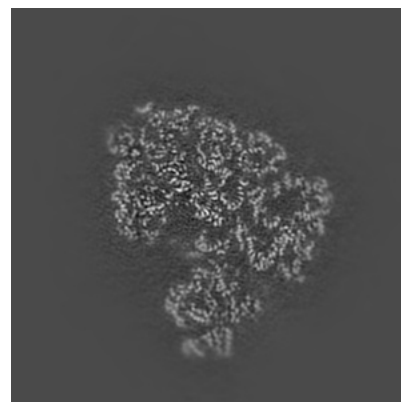
6.2.1 Primary map



X Index: 184



Y Index: 184

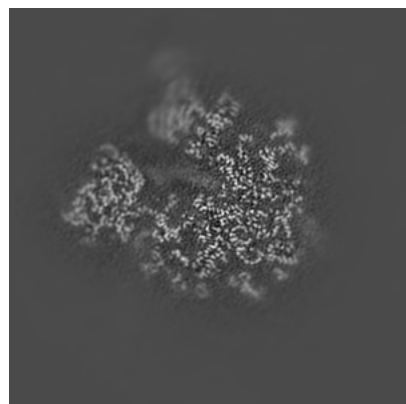


Z Index: 184

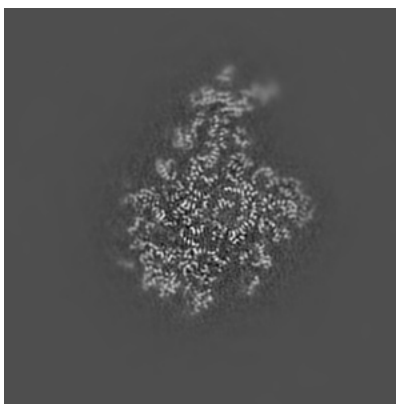
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

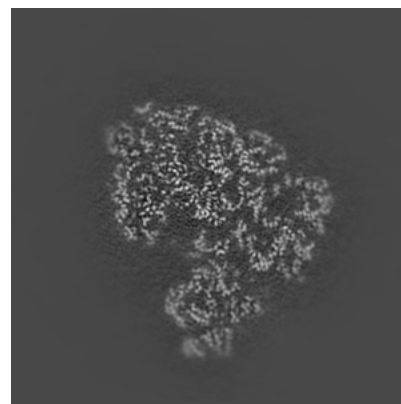
6.3.1 Primary map



X Index: 180



Y Index: 193

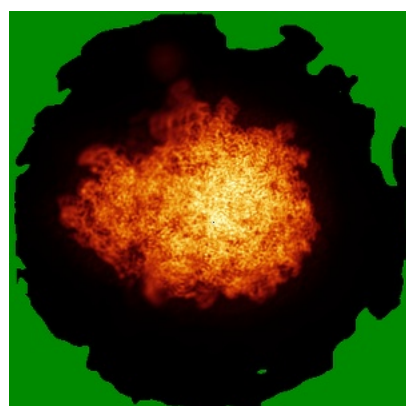


Z Index: 183

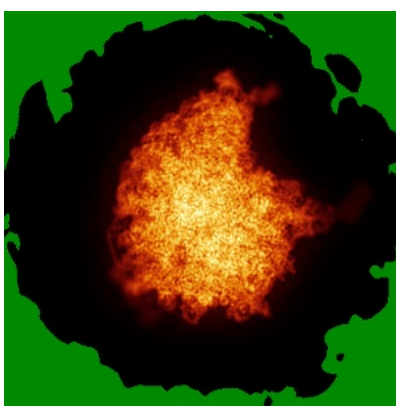
The images above show the largest variance slices of the map in three orthogonal directions.

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

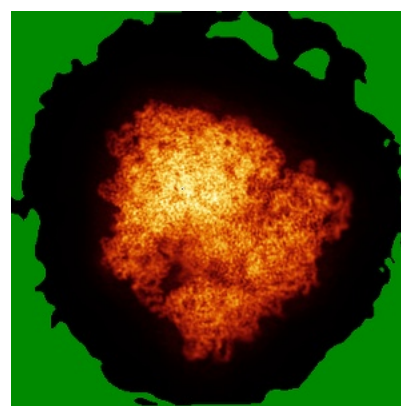
6.4.1 Primary map



X



Y

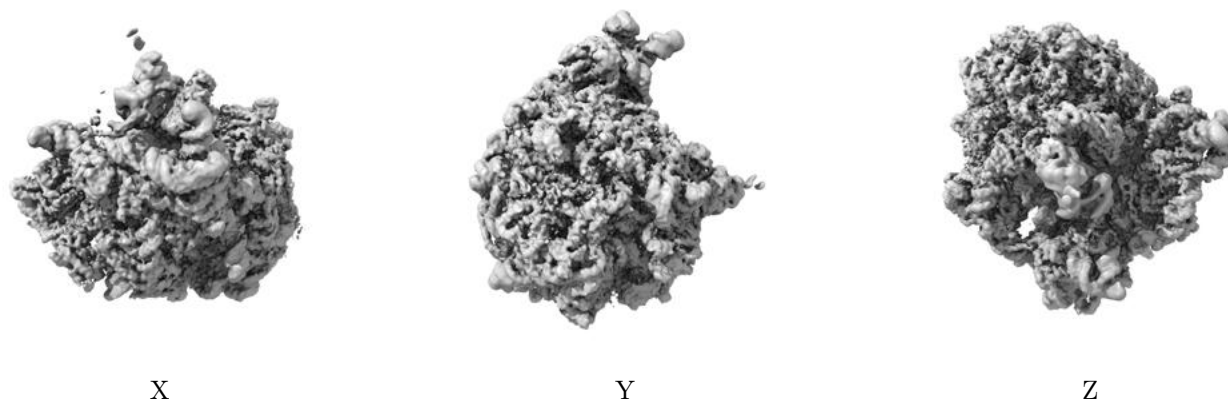


Z

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

6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.025. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

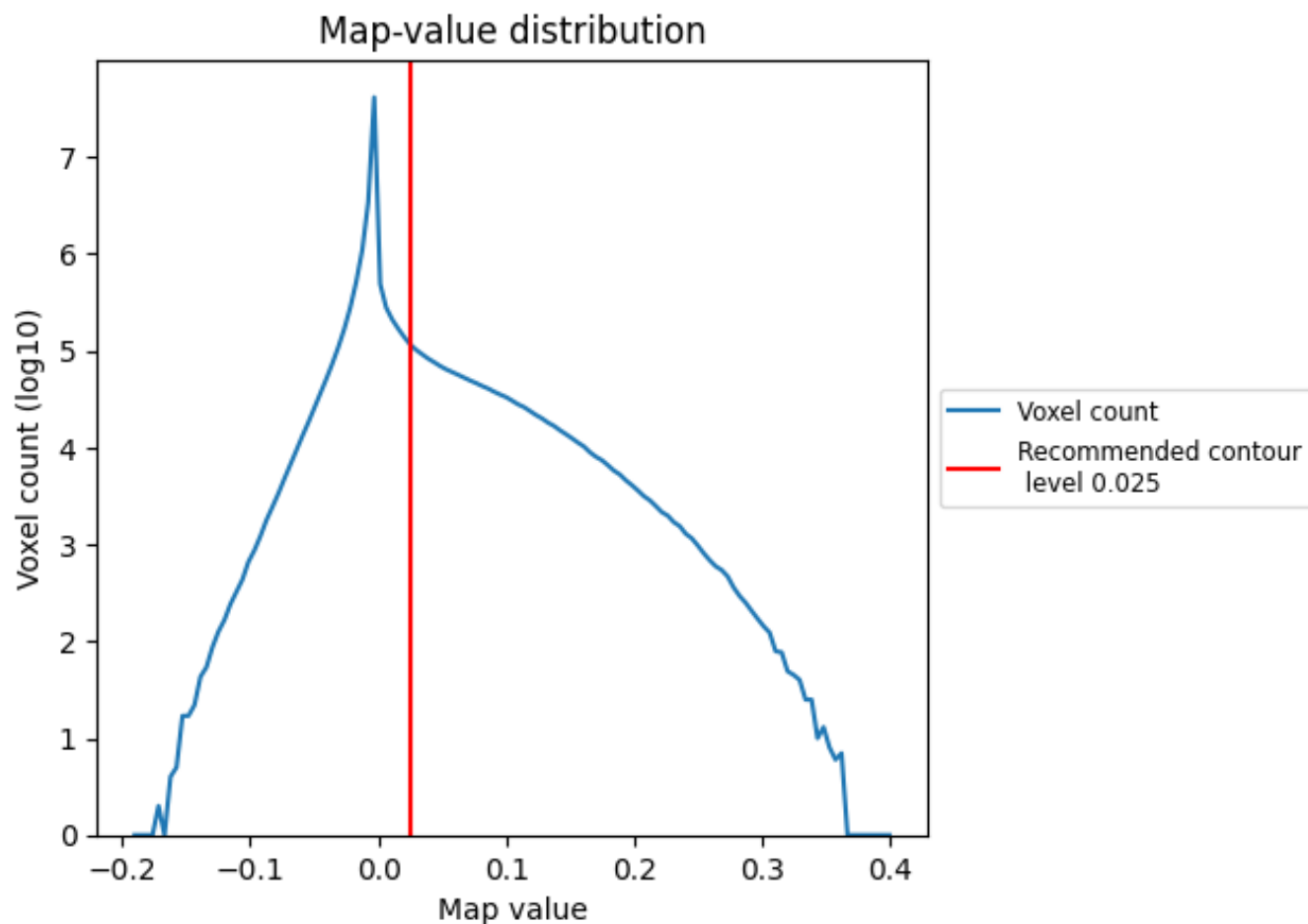
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

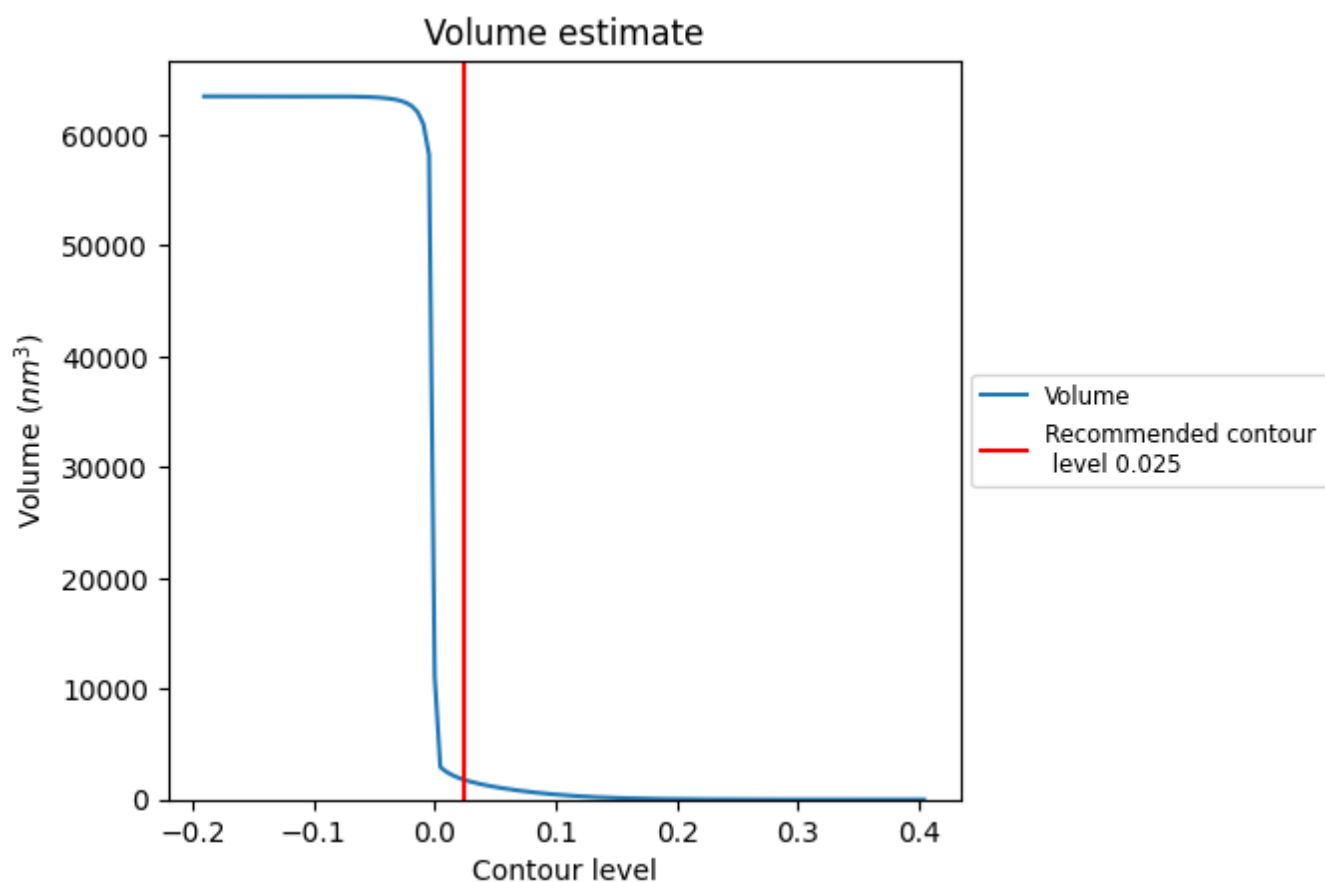
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

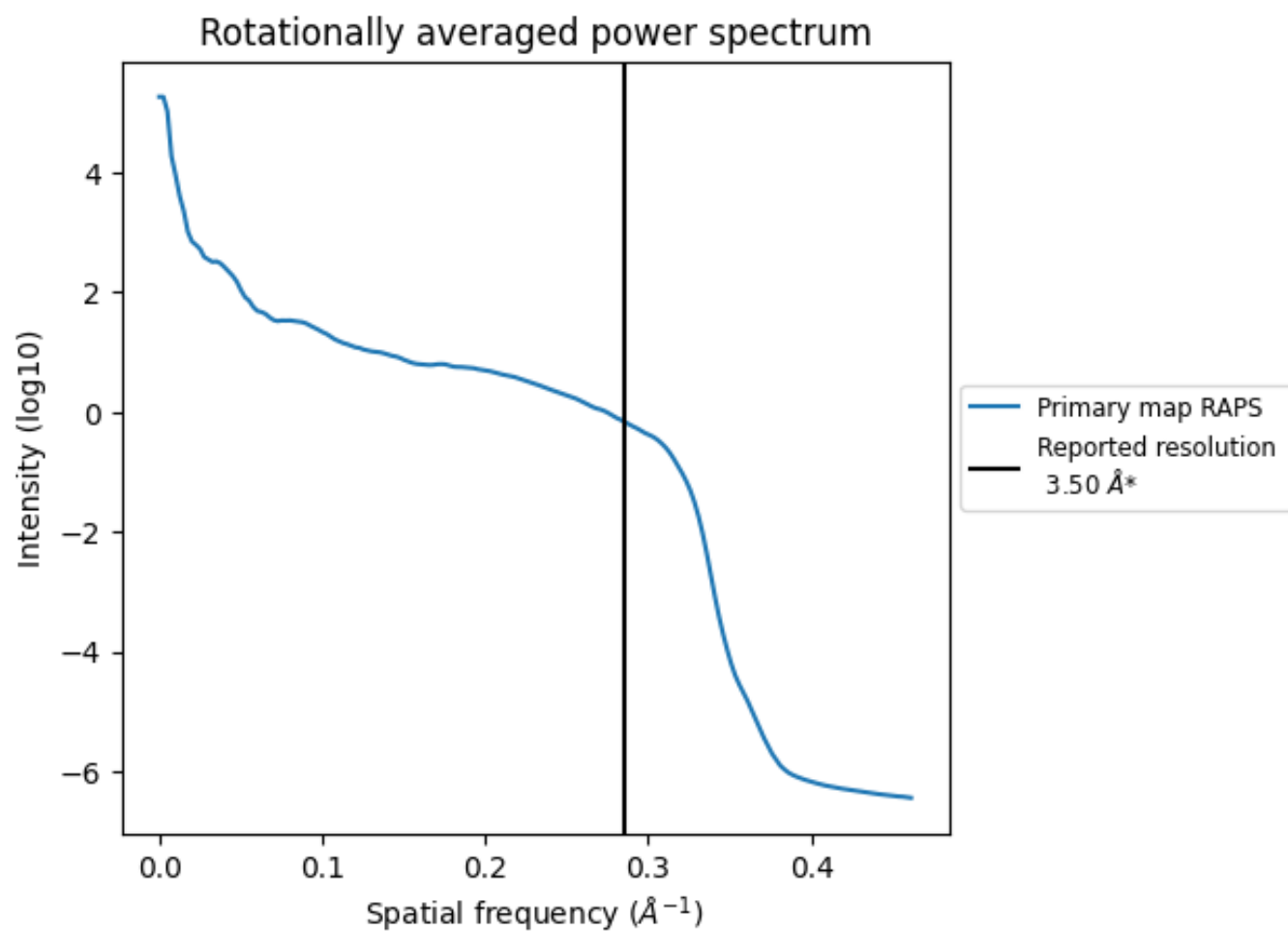
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 1768 nm³; this corresponds to an approximate mass of 1597 kDa.

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

7.3 Rotationally averaged power spectrum ⓘ



*Reported resolution corresponds to spatial frequency of 0.286 Å⁻¹

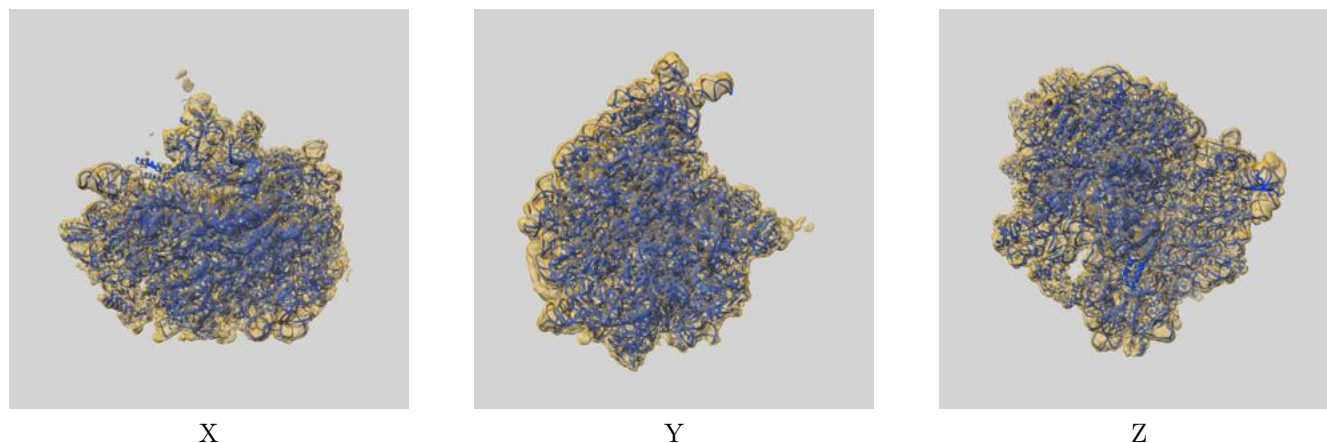
8 Fourier-Shell correlation

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

9 Map-model fit [i](#)

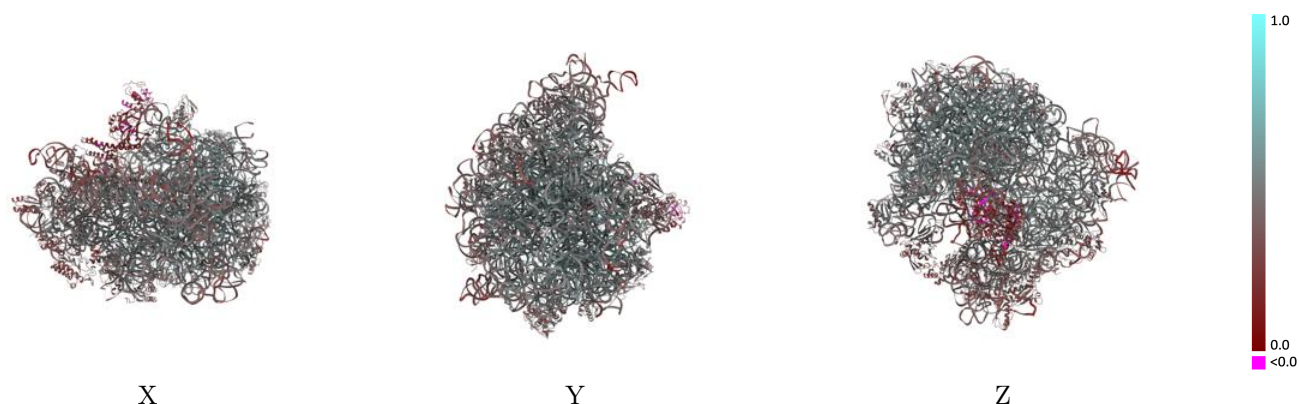
This section contains information regarding the fit between EMDB map EMD-12937 and PDB model 7OJ0. Per-residue inclusion information can be found in section [3](#) on page [16](#).

9.1 Map-model overlay [i](#)



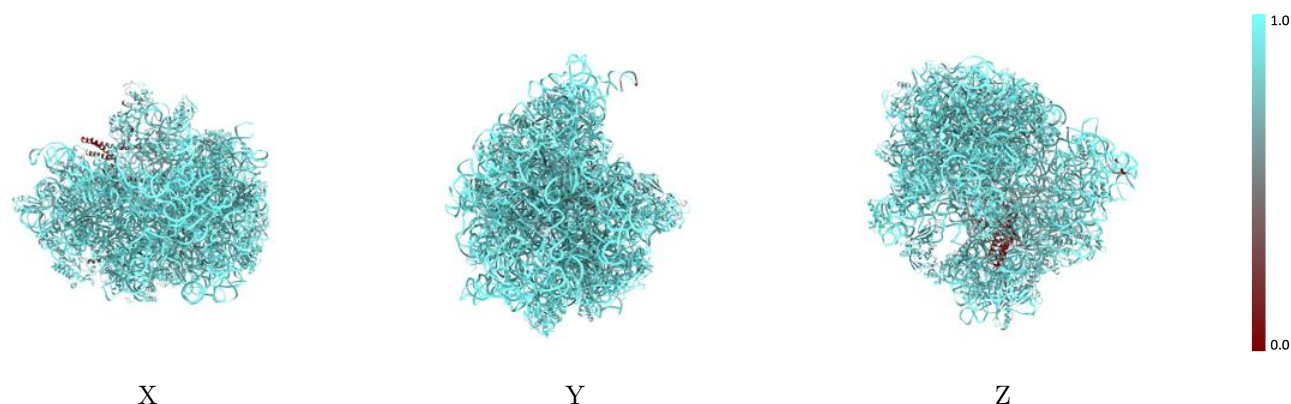
The images above show the 3D surface view of the map at the recommended contour level 0.025 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



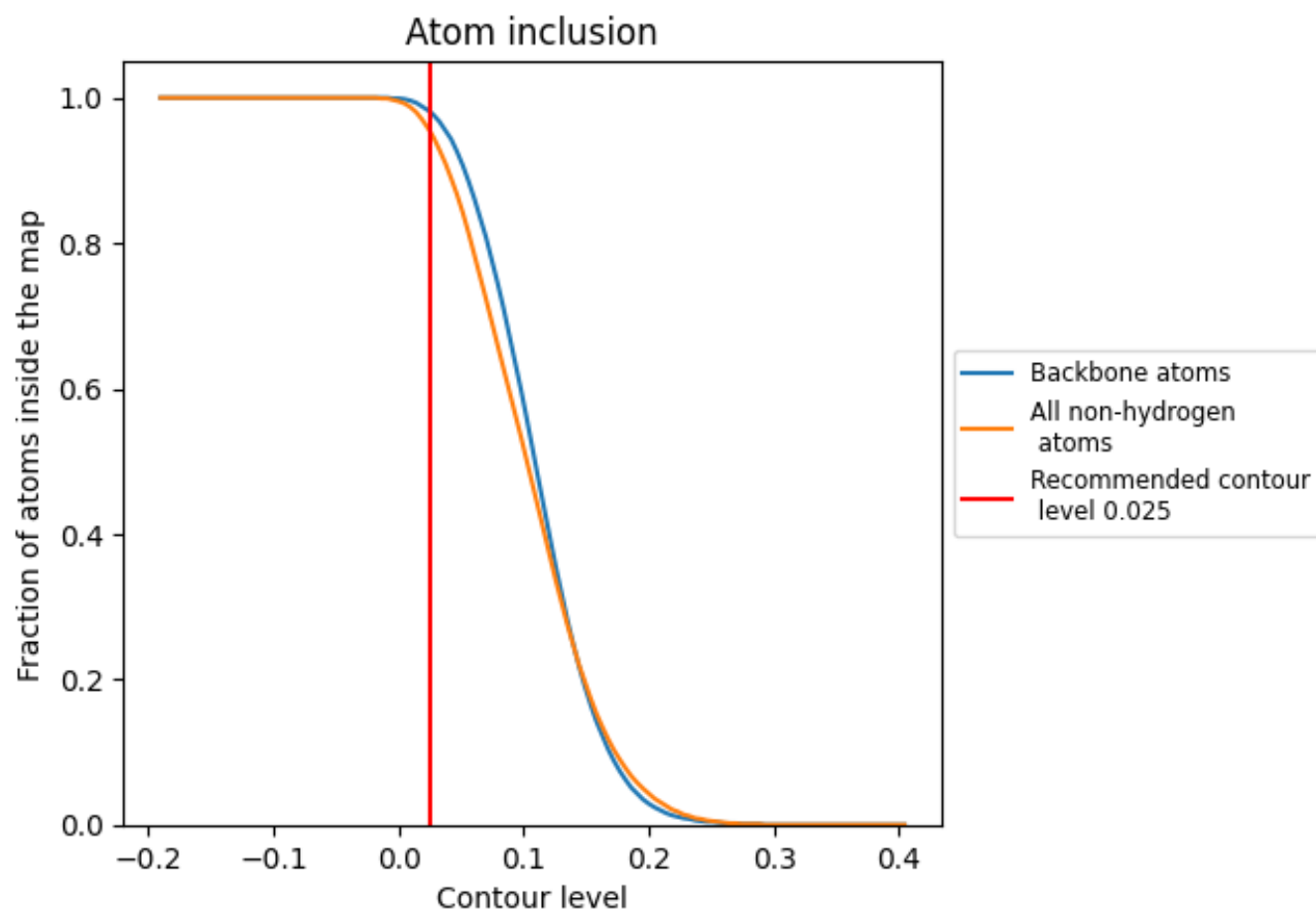
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.025).

9.4 Atom inclusion [i](#)



At the recommended contour level, 98% of all backbone atoms, 95% 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 (0.025) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.9540	 0.4600
0	 0.9460	 0.4960
1	 0.9380	 0.5450
2	 0.9430	 0.5430
3	 0.9210	 0.5190
4	 0.8710	 0.3250
5	 0.7250	 0.1230
6	 0.4900	 0.3380
7	 0.8530	 0.5040
8	 0.5270	 0.2750
9	 0.7300	 0.1480
A	 0.9890	 0.4480
B	 0.8650	 0.3490
C	 0.8860	 0.4140
D	 0.8920	 0.4000
E	 0.9110	 0.4480
F	 0.8910	 0.3990
G	 0.8810	 0.3700
H	 0.8960	 0.4450
I	 0.9070	 0.3900
J	 0.8480	 0.3640
K	 0.9110	 0.4300
L	 0.9070	 0.4890
M	 0.9020	 0.3830
N	 0.8820	 0.4050
O	 0.9230	 0.4280
P	 0.9260	 0.4430
Q	 0.9120	 0.4490
R	 0.9120	 0.4210
S	 0.8830	 0.3780
T	 0.9010	 0.4140
U	 0.7460	 0.3700
V	 0.9440	 0.4110
X	 0.7960	 0.3980
a	 0.9940	 0.4980



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Chain	Atom inclusion	Q-score
b	 0.9970	 0.4490
c	 0.9370	 0.5210
d	 0.9400	 0.5090
e	 0.9330	 0.4610
f	 0.8730	 0.3850
g	 0.8970	 0.4050
h	 0.9370	 0.4030
i	 0.9390	 0.5010
j	 0.9210	 0.5070
k	 0.9250	 0.4840
l	 0.9210	 0.5110
m	 0.9430	 0.4980
n	 0.9340	 0.4290
o	 0.9080	 0.4890
p	 0.9440	 0.5090
q	 0.9250	 0.4640
r	 0.9290	 0.5060
s	 0.9220	 0.4650
t	 0.9450	 0.4320
u	 0.9230	 0.4640
v	 0.9490	 0.5380
w	 0.9430	 0.5080
x	 0.8940	 0.3750
y	 0.9240	 0.4860
z	 0.9230	 0.4900