



Full wwPDB EM Validation Report ⓘ

Apr 1, 2023 – 09:26 am BST

PDB ID : 8C92
EMDB ID : EMD-16499
Title : Cryo-EM captures early ribosome assembly in action
Authors : Lauer, S.; Nikolay, R.; Qin, B.
Deposited on : 2023-01-21
Resolution : 3.79 Å (reported)

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

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

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.dev50
MolProbity : 4.02b-467
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.9
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.32.2

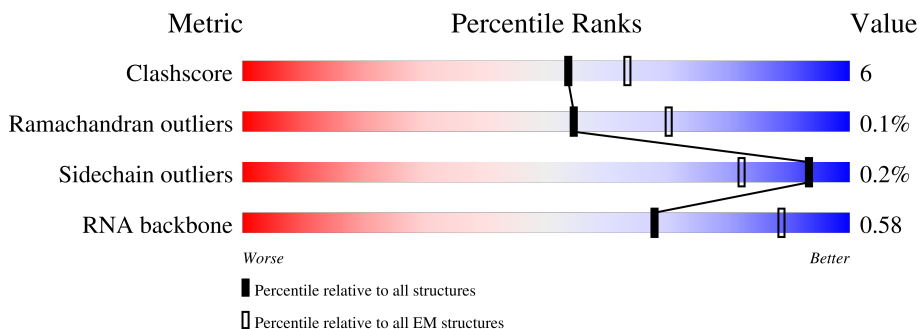
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.79 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	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826
RNA backbone	4643	859

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 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	2904	8% (poor fit), 43% (0 outliers), 19% (1 outlier), 36% (2+ outliers)
2	D	209	7% (poor fit), 67% (0 outliers), 17% (1 outlier), 16% (2+ outliers)
3	E	201	6% (poor fit), 79% (0 outliers), 14% (1 outlier), 7% (2+ outliers)
4	J	142	8% (poor fit), 83% (0 outliers), 16% (1 outlier)
5	K	123	53% (poor fit), 79% (0 outliers), 20% (1 outlier)
6	L	144	47% (poor fit), 62% (0 outliers), 13% (1 outlier), 24% (2+ outliers)
7	N	127	73% (0 outliers), 20% (1 outlier), 6% (2+ outliers)

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Mol	Chain	Length	Quality of chain
8	P	115	
9	Q	118	
10	R	103	
11	S	110	
12	T	100	
13	U	104	
14	Y	63	
15	0	57	
16	2	46	
17	Z	59	

2 Entry composition [i](#)

There are 17 unique types of molecules in this entry. The entry contains 53489 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 23S rRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
1	A	1873	40250	17955	7457	12965	1873	0	0

- Molecule 2 is a protein called 50S ribosomal protein L3.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	D	175	1306	820	235	247	4	0	0

- Molecule 3 is a protein called 50S ribosomal protein L4.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	E	187	1438	904	255	274	5	0	0

- Molecule 4 is a protein called 50S ribosomal protein L13.

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

- Molecule 5 is a protein called 50S ribosomal protein L14.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
5	K	122	938	587	180	165	6	0	0

- Molecule 6 is a protein called 50S ribosomal protein L15.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
6	L	109	778	483	149	146	0	0

- Molecule 7 is a protein called 50S ribosomal protein L17.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
7	N	120	960	593	196	166	5	0	0

- Molecule 8 is a protein called 50S ribosomal protein L19.

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

- Molecule 9 is a protein called 50S ribosomal protein L20.

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

- Molecule 10 is a protein called 50S ribosomal protein L21.

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

- Molecule 11 is a protein called 50S ribosomal protein L22.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
11	S	101	789	492	150	145	2	0	0

- Molecule 12 is a protein called 50S ribosomal protein L23.

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

- Molecule 13 is a protein called 50S ribosomal protein L24.

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

- Molecule 14 is a protein called 50S ribosomal protein L29.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	Y	63	Total	C	N	O	S	0	0
			509	313	99	95	2		

- Molecule 15 is a protein called 50S ribosomal protein L32.

Mol	Chain	Residues	Atoms					AltConf	Trace
15	0	56	Total	C	N	O	S	0	0
			444	269	94	80	1		

- Molecule 16 is a protein called 50S ribosomal protein L34.

Mol	Chain	Residues	Atoms					AltConf	Trace
16	2	39	Total	C	N	O	S	0	0
			312	187	77	47	1		

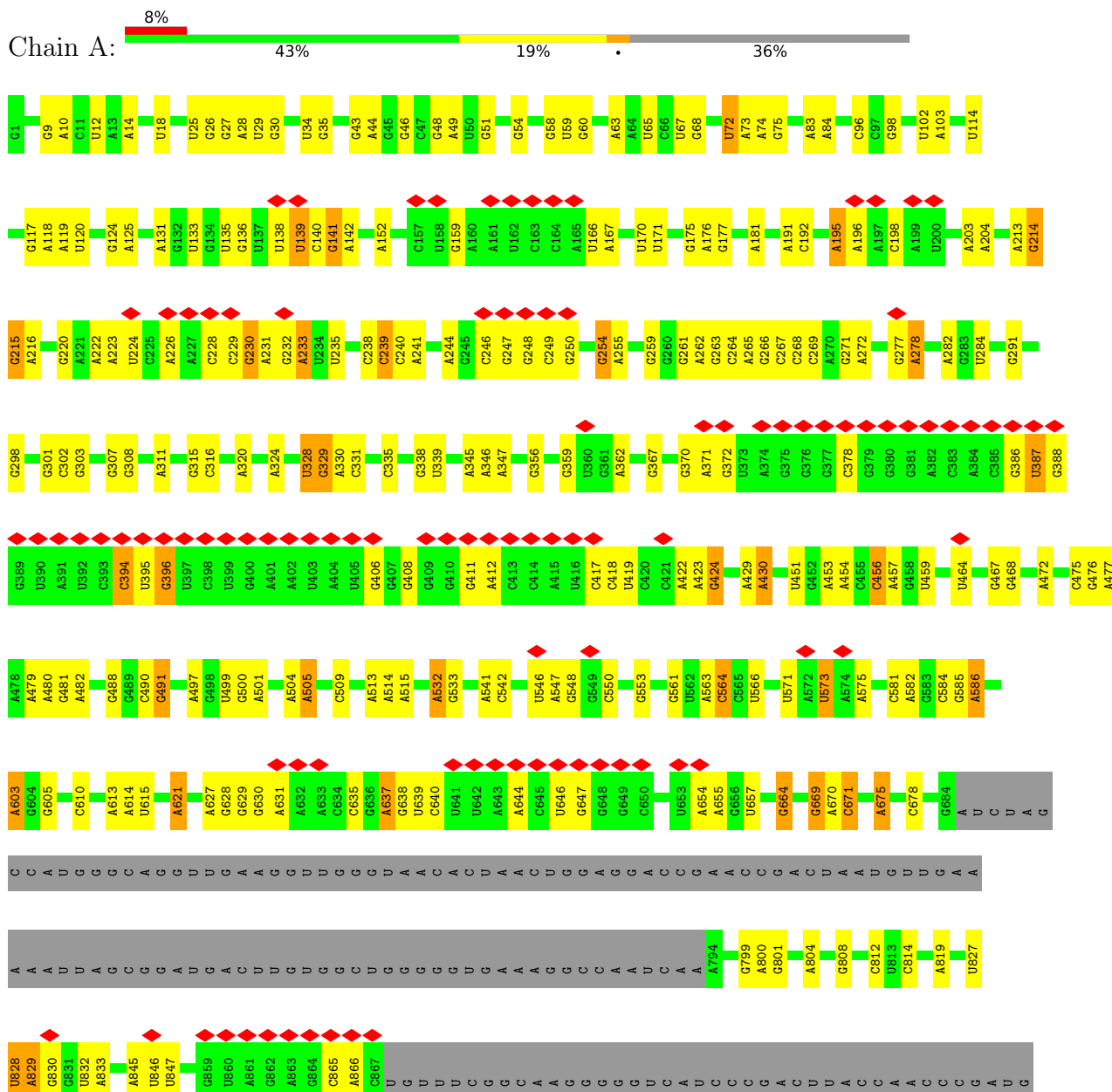
- Molecule 17 is a protein called 50S ribosomal protein L30.

Mol	Chain	Residues	Atoms					AltConf	Trace
17	Z	57	Total	C	N	O	S	0	0
			439	276	86	75	2		

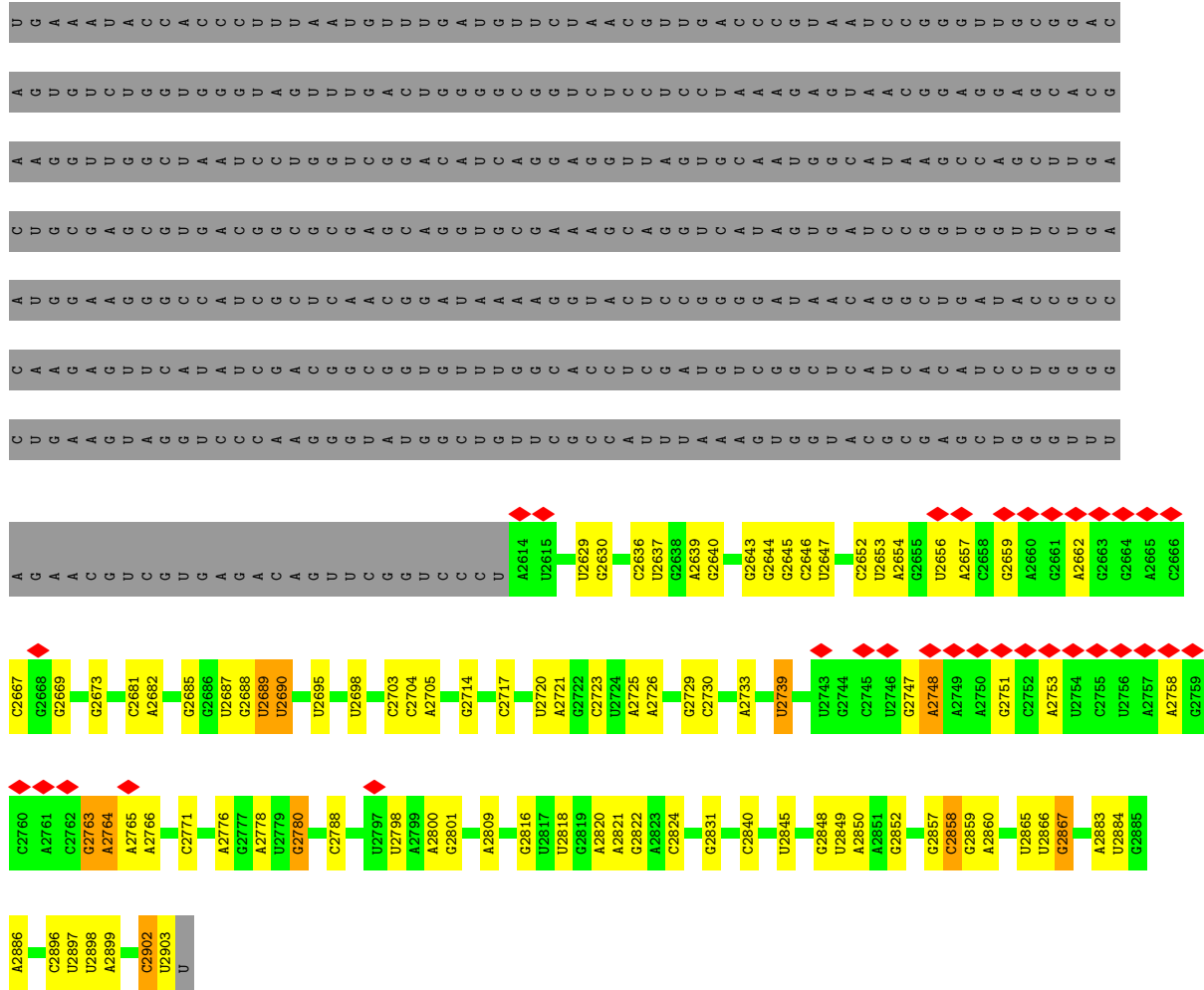
3 Residue-property plots [i](#)

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

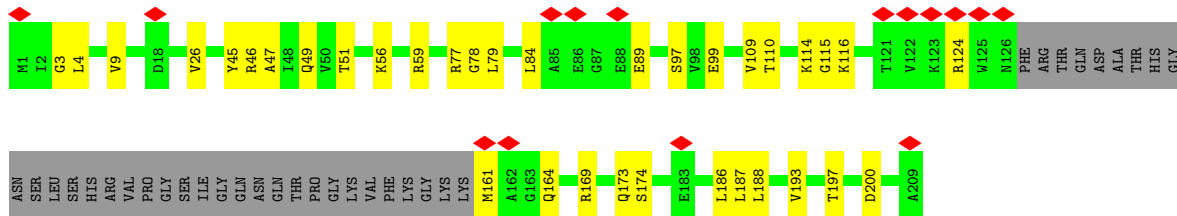
- Molecule 1: 23S rRNA



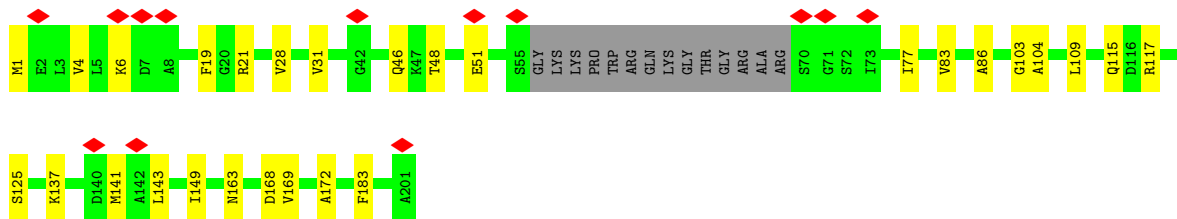
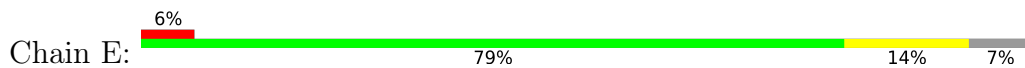
C908	U1012	A1253	G1137	A1373	U1487	C1582	A	G1984	A2005	G2012	G2029	C2043
A909	U1013	A1254	G1138	C1376	C1488	A1583	U	C1985	G2013	A2013	A2030	A
A910	C1013	U1255	G1139	C1377	C1489	C1584	C	U1986	A2014	A2014	A2031	U
A911	A1021	G1256	C1140	A1378	C1490	C1585	A	G1990	G2015	A2015	G2032	U
C912	U1022	U1263	U1141	U1379	G1492	A1586	C	U1991	A2021	C2021	A2033	U
U913	U1023	A1264	A1142	G1491	C1493	G1587	C	U1992	U2022	U2022	G2034	U
G914	G1024	U1265	A1143	A1383	C1494	G1601	A	U1993	A2023	C2023	A2035	U
G915	G1025	A1266	A1144	A1384	A1494	A1608	C	U1994	G2029	A2029	G2036	U
C916	U1026	U1267	G1149	A1385	A1495	A1608	C	U1995	A2030	A2030	U2036	U
G916	A1027	A1268	A1151	C1386	A1496	A1614	A	C1996	A2031	A2031	C2036	U
A917	U1028	G1271	A1151	A1387	U1497	C1615	C	U1997	G2032	G2032	U	U
A918	A1029	A1272	G1157	U1391	C1498	C1616	C	U1998	A2033	A2033	U	U
U919	C1030	A1273	C1167	A1392	G1514	A1616	C	U1999	U2034	U2034	U	U
A920	G1031	G	G1168	A1395	A1515	A1617	C	U2000	G2035	G2035	U	U
C922	A	U	U1286	U1396	A1521	A1618	C	U2001	C2036	C2036	U	U
		U	A1287	U1396	A1522	A1622	C	U2002			U	U
		U	G1171	G1401	U1523	G1622	C	U2003			U	U
		U	C1172	U1402	G1524	C1625	C	U2004			U	U
		U	U1173	U1403	U1525	A1626	C	U2005			U	U
		U	U1174	A1403	C1526	U1629	C	U2006			U	U
		U	A1175	C1404	G1527	A1630	C	U2007			U	U
		U	U1176	U1415	A1528	A1631	C	U2008			U	U
		U	C	G1416	A1532	G1631	C	U2009			U	U
		U	C	C1417	U1533	A1634	C	U2010			U	U
		U	C	G1418	C1533	U1634	C	U2011			U	U
		U	C	A1419	U1534	C1638	C	U2012			U	U
		U	U	A1420	A1535	U1639	C	U2013			U	U
		U	U	G1421	U1536	A1640	C	U2014			U	U
		U	U	G1422	G1537	U1646	C	U2015			U	U
		U	U	G1423	G1537	U1647	C	U2016			U	U
		U	U	G1424	G1543	U1648	C	U2017			U	U
		U	U	G1425	A1544	U1648	C	U2018			U	U
		U	U	A1427	A1545	U1652	C	U2019			U	U
		U	U	C1447	A1546	A1652	C	U2020			U	U
		U	U	G1452	G1555	G1653	C	U2021			U	U
		U	U	U1458	C1556	U1662	C	U2022			U	U
		U	U	G1459	C1557	A1663	C	U2023			U	U
		U	U	U1460	U1558	A1664	C	U2024			U	U
		U	U	U1466	U1559	A1665	C	U2025			U	U
		U	U	A1469	U1560	G1666	C	U2026			U	U
		U	U	C1472	C1561	A1668	C	U2027			U	U
		U	U	G1473	U1562	U1671	C	U2028			U	U
		U	U	U1474	G1565	A1672	C	U2029			U	U
		U	U	U1475	A1566	G1673	C	U2030			U	U
		U	U	U1476	U1567	G1674	C	U2031			U	U
		U	U	A1477	U1570	C1675	C	U2032			U	U
		U	U	G1482	A1571	A1676	C	U2033			U	U
		U	U	U1486	A1572	U1680	C	U2034			U	U
		U	U		C1577	G1681	C	U2035			U	U
		U	U		U1578	G1682	C	U2036			U	U
		U	U		A1579	U1685	C				U	U
		U	U		A1580	C1686	C				U	U
		U	U		G1581		C				U	U



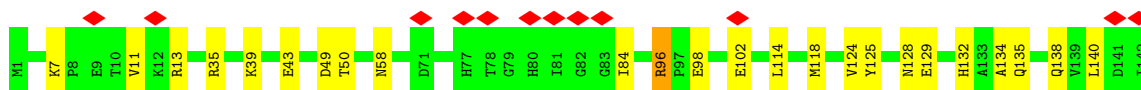
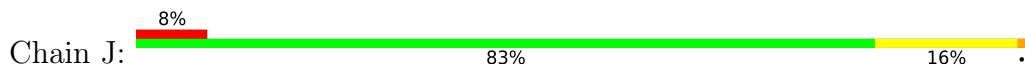
• Molecule 2: 50S ribosomal protein L3



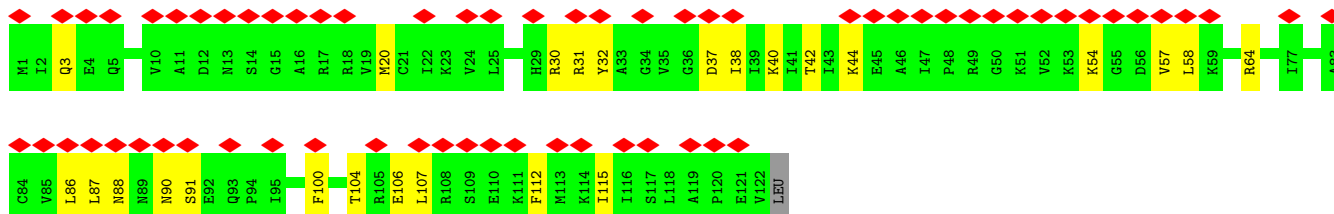
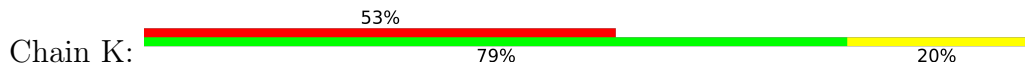
• Molecule 3: 50S ribosomal protein L4



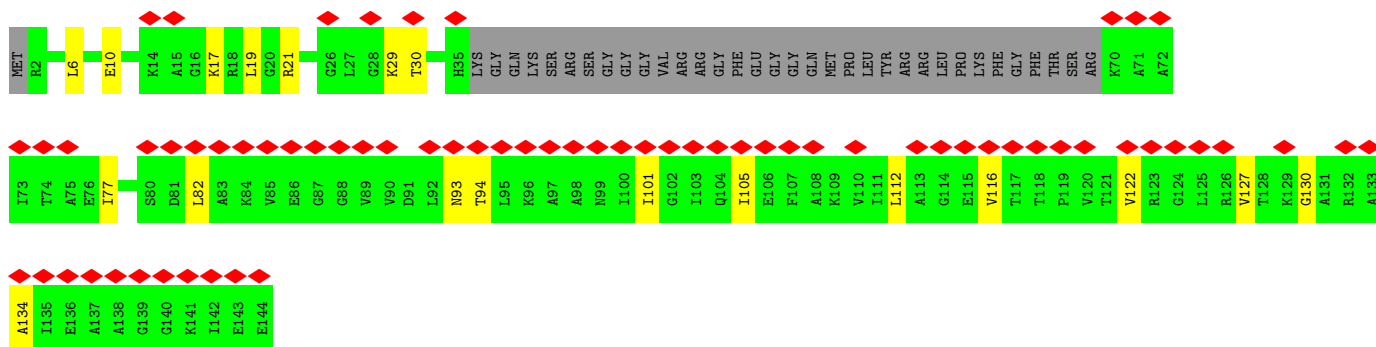
• Molecule 4: 50S ribosomal protein L13



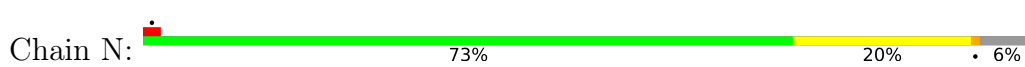
• Molecule 5: 50S ribosomal protein L14



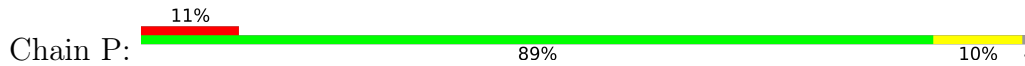
• Molecule 6: 50S ribosomal protein L15




• Molecule 7: 50S ribosomal protein L17



• Molecule 8: 50S ribosomal protein L19




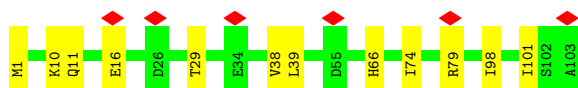
• Molecule 9: 50S ribosomal protein L20

Chain Q:  82% 17%




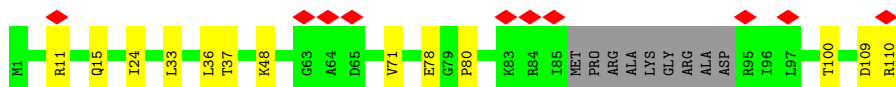
• Molecule 10: 50S ribosomal protein L21

Chain R:  6% 88% 12%




• Molecule 11: 50S ribosomal protein L22

Chain S:  9% 80% 12% 8%




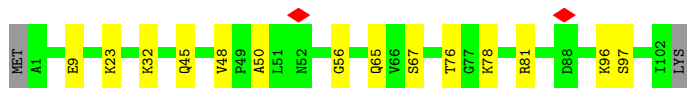
• Molecule 12: 50S ribosomal protein L23

Chain T:  78% 15% 7%




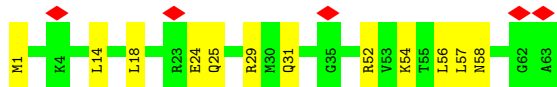
• Molecule 13: 50S ribosomal protein L24

Chain U:  85% 13%




• Molecule 14: 50S ribosomal protein L29

Chain Y:  8% 81% 19%

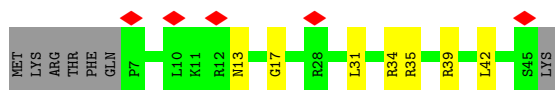


• Molecule 15: 50S ribosomal protein L32

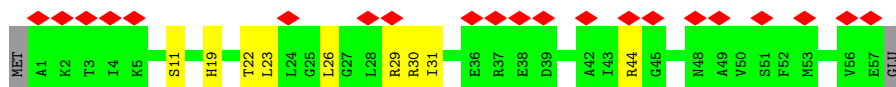
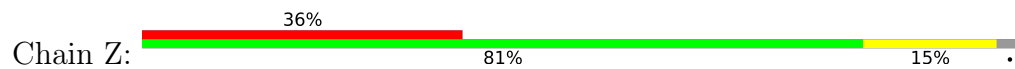
Chain O:  14% 77% 21%



• Molecule 16: 50S ribosomal protein L34



• Molecule 17: 50S ribosomal protein L30



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	17988	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI POLARA 300	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	62	Depositor
Minimum defocus (nm)	500	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	31000	Depositor
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	1.836	Depositor
Minimum map value	-0.682	Depositor
Average map value	0.002	Depositor
Map value standard deviation	0.076	Depositor
Recommended contour level	0.35	Depositor
Map size (Å)	375.0, 375.0, 375.0	wwPDB
Map dimensions	300, 300, 300	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.25, 1.25, 1.25	Depositor

5 Model quality i

5.1 Standard geometry i

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	0.18	1/45087 (0.0%)	0.72	6/70332 (0.0%)
2	D	0.24	0/1320	0.51	0/1776
3	E	0.24	0/1453	0.47	0/1956
4	J	0.25	0/1152	0.50	0/1551
5	K	0.24	0/947	0.53	0/1268
6	L	0.24	0/780	0.54	0/1041
7	N	0.25	0/973	0.61	0/1301
8	P	0.24	0/929	0.55	0/1242
9	Q	0.25	0/960	0.51	0/1278
10	R	0.26	0/829	0.54	0/1107
11	S	0.24	0/794	0.50	0/1062
12	T	0.24	0/744	0.51	0/994
13	U	0.26	0/787	0.49	0/1051
14	Y	0.25	0/510	0.52	0/677
15	0	0.24	0/450	0.54	0/599
16	2	0.23	0/314	0.65	0/413
17	Z	0.24	0/443	0.55	0/593
All	All	0.19	1/58472 (0.0%)	0.68	6/88241 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	827	U	C1'-N1	5.92	1.57	1.48

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	2771	C	N3-C2-O2	-6.13	117.61	121.90
1	A	1313	U	C2-N1-C1'	5.79	124.65	117.70
1	A	635	C	N3-C2-O2	-5.76	117.87	121.90
1	A	1319	C	N1-C2-O2	5.31	122.08	118.90
1	A	1675	C	C2-N1-C1'	5.22	124.54	118.80
1	A	1726	C	N1-C2-O2	5.21	122.02	118.90

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	40250	0	20252	304	0
2	D	1306	0	1355	26	0
3	E	1438	0	1494	17	0
4	J	1129	0	1162	19	0
5	K	938	0	1012	16	0
6	L	778	0	841	16	0
7	N	960	0	1000	23	0
8	P	917	0	965	9	0
9	Q	947	0	1022	16	0
10	R	816	0	839	10	0
11	S	789	0	849	9	0
12	T	738	0	807	11	0
13	U	779	0	834	8	0
14	Y	509	0	543	9	0
15	0	444	0	461	13	0
16	2	312	0	344	6	0
17	Z	439	0	485	6	0
All	All	53489	0	34265	456	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 6.

All (456) 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)
1:A:214:G:O2'	1:A:215:G:O4'	1.87	0.90
1:A:395:U:O2'	1:A:396:G:N7	2.06	0.88
1:A:320:A:N3	3:E:163:ASN:ND2	2.23	0.87
1:A:1521:G:OP2	1:A:1522:A:O2'	1.92	0.86
1:A:475:C:O2	1:A:479:A:N6	2.09	0.85
16:2:34:ARG:NH1	16:2:42:LEU:O	2.08	0.85

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:989:G:OP2	17:Z:11:SER:OG	1.94	0.84
1:A:378:C:O2	1:A:396:G:N2	2.08	0.84
1:A:1666:G:O2'	1:A:1667:G:O4'	1.97	0.83
1:A:135:U:O4	1:A:136:G:O6	1.96	0.82
1:A:2831:G:OP1	2:D:56:LYS:NZ	2.12	0.82
1:A:2730:C:O3'	2:D:174:SER:OG	1.97	0.81
1:A:117:G:OP2	1:A:119:A:O2'	1.98	0.81
1:A:235:U:O4	1:A:263:G:N2	2.13	0.81
1:A:2763:G:O2'	1:A:2764:A:OP1	1.97	0.80
1:A:1415:U:O2	1:A:1587:G:O6	2.00	0.80
14:Y:1:MET:SD	14:Y:52:ARG:NH1	2.55	0.80
8:P:38:ARG:NH1	8:P:40:GLN:OE1	2.15	0.80
1:A:467:G:OP2	16:2:34:ARG:NH2	2.15	0.79
1:A:1322:A:OP2	11:S:11:ARG:NH2	2.16	0.79
1:A:2865:U:OP2	1:A:2866:U:O2'	1.98	0.79
1:A:1203:U:OP2	1:A:1204:A:O2'	2.01	0.78
1:A:2645:G:OP2	1:A:2645:G:N2	2.15	0.78
1:A:1475:G:O2'	1:A:1514:G:O6	2.01	0.78
1:A:1315:C:O2'	1:A:1392:A:N3	2.15	0.78
1:A:2647:U:O2	1:A:2673:G:O6	2.03	0.77
1:A:1528:A:N6	1:A:1543:G:O2'	2.18	0.77
1:A:195:A:N6	1:A:198:C:OP2	2.18	0.77
1:A:244:A:H62	1:A:254:G:N2	1.83	0.76
1:A:2857:G:N2	1:A:2860:A:OP2	2.19	0.76
2:D:116:LYS:O	2:D:164:GLN:NE2	2.19	0.76
1:A:2659:G:N2	1:A:2662:A:OP2	2.19	0.75
1:A:1582:C:O2'	1:A:1585:C:N3	2.18	0.75
1:A:1248:G:OP1	9:Q:1:ALA:N	2.19	0.75
1:A:135:U:C4	1:A:136:G:O6	2.40	0.75
1:A:1135:C:N4	1:A:1138:G:OP2	2.19	0.74
7:N:77:ALA:O	7:N:81:ASN:ND2	2.20	0.74
1:A:1024:G:OP2	1:A:1025:G:O2'	2.04	0.74
1:A:1007:C:OP1	4:J:39:LYS:NZ	2.20	0.74
1:A:1392:A:N6	12:T:18:GLU:OE2	2.21	0.74
1:A:605:G:O2'	1:A:657:U:O2	2.06	0.73
1:A:324:A:OP2	1:A:1205:A:N6	2.22	0.72
1:A:1028:A:OP2	1:A:1126:A:N6	2.22	0.72
1:A:1024:G:O2'	1:A:1144:A:O2'	2.06	0.72
1:A:1385:A:O2'	1:A:1396:U:O2	2.04	0.72
1:A:1266:G:N7	11:S:15:GLN:NE2	2.37	0.72
5:K:30:ARG:NH1	5:K:37:ASP:OD2	2.23	0.72

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:191:A:O2'	1:A:678:C:O2	2.06	0.71
3:E:21:ARG:NH2	3:E:103:GLY:O	2.22	0.71
1:A:244:A:N6	1:A:254:G:H21	1.87	0.71
12:T:10:VAL:HG13	12:T:11:LEU:HD12	1.71	0.71
1:A:240:C:OP2	1:A:241:A:O2'	2.02	0.71
1:A:58:G:O2'	1:A:73:A:N1	2.22	0.71
1:A:514:A:N3	1:A:581:C:O2'	2.24	0.71
1:A:244:A:N6	1:A:254:G:N2	2.39	0.70
1:A:974:G:O2'	1:A:989:G:N2	2.23	0.70
11:S:33:LEU:O	11:S:37:THR:HG23	1.90	0.70
1:A:83:A:O2'	1:A:103:A:N6	2.24	0.70
1:A:2821:A:OP2	2:D:115:GLY:N	2.25	0.70
14:Y:25:GLN:OE1	14:Y:29:ARG:NH2	2.25	0.70
1:A:1447:C:O2'	1:A:1544:A:N3	2.25	0.69
1:A:1527:G:H21	1:A:1545:A:H62	1.38	0.69
15:0:35:GLU:OE1	15:0:35:GLU:N	2.25	0.69
1:A:195:A:O2'	1:A:250:G:N2	2.23	0.69
1:A:2822:G:OP1	2:D:164:GLN:NE2	2.26	0.69
5:K:44:LYS:O	5:K:54:LYS:NZ	2.26	0.69
7:N:69:ARG:O	7:N:70:THR:OG1	2.09	0.69
1:A:566:U:O2'	1:A:808:G:OP1	2.11	0.68
1:A:1477:A:N1	1:A:1557:C:O2'	2.27	0.68
1:A:247:G:O2'	1:A:250:G:O6	2.09	0.67
1:A:1422:G:O6	1:A:1577:C:N4	2.26	0.67
1:A:9:G:O2'	1:A:2800:A:N6	2.28	0.67
1:A:284:U:O2	1:A:356:G:O6	2.12	0.67
1:A:301:G:OP2	13:U:81:ARG:NH1	2.27	0.67
1:A:35:G:O2'	1:A:454:A:O4'	2.11	0.67
1:A:956:G:N2	1:A:960:A:OP2	2.28	0.67
1:A:1469:A:OP2	1:A:1522:A:N6	2.29	0.66
1:A:177:G:OP2	1:A:177:G:N2	2.27	0.66
1:A:482:A:O2'	1:A:497:A:N1	2.28	0.66
1:A:1999:C:O2	1:A:2687:U:O2'	2.13	0.66
1:A:1009:A:O2'	1:A:1010:A:O4'	2.06	0.66
1:A:505:A:HO2'	1:A:509:C:HO2'	1.43	0.66
6:L:10:GLU:N	6:L:10:GLU:OE1	2.29	0.66
1:A:220:G:HO2'	1:A:233:A:HO2'	1.41	0.66
1:A:630:G:O2'	1:A:640:C:O2'	2.12	0.66
1:A:675:A:N7	1:A:804:A:N6	2.44	0.65
4:J:84:ILE:O	4:J:84:ILE:HG22	1.96	0.65
1:A:1625:C:N4	1:A:1626:A:N1	2.45	0.65

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:E:19:PHE:HE1	3:E:109:LEU:HD23	1.62	0.65
1:A:1327:A:O2'	1:A:1328:A:O4'	2.14	0.65
3:E:48:THR:OG1	3:E:51:GLU:OE1	2.13	0.65
1:A:1426:G:OP2	1:A:1427:A:O2'	2.13	0.65
1:A:1629:U:O4	1:A:1630:A:N6	2.30	0.64
10:R:11:GLN:N	10:R:11:GLN:OE1	2.30	0.64
1:A:1681:G:N2	1:A:1763:G:OP2	2.29	0.64
1:A:468:G:N7	16:2:39:ARG:NH2	2.46	0.64
1:A:931:U:O2	1:A:1167:C:O2'	2.13	0.63
1:A:48:G:H22	1:A:177:G:P	2.22	0.63
1:A:2013:A:O2'	1:A:2014:A:O4'	2.16	0.63
1:A:2831:G:OP2	2:D:59:ARG:NH2	2.31	0.63
14:Y:31:GLN:OE1	14:Y:31:GLN:N	2.31	0.63
1:A:220:G:O2'	1:A:233:A:O2'	2.11	0.63
4:J:129:GLU:N	4:J:129:GLU:OE1	2.32	0.62
13:U:96:LYS:O	13:U:97:SER:OG	2.15	0.62
1:A:1202:G:O6	1:A:1244:A:N6	2.31	0.62
1:A:1264:A:N6	1:A:2014:A:OP2	2.32	0.62
1:A:124:G:OP1	1:A:1376:C:O2'	2.18	0.61
1:A:308:G:O2'	1:A:329:G:N2	2.31	0.61
1:A:1653:G:OP1	7:N:5:LYS:NZ	2.28	0.61
1:A:2688:G:N1	1:A:2720:U:OP2	2.31	0.61
1:A:477:A:N6	1:A:501:A:OP1	2.33	0.61
1:A:996:A:OP2	10:R:10:LYS:NZ	2.29	0.61
1:A:2689:U:O2'	1:A:2690:U:OP1	2.18	0.61
3:E:51:GLU:OE1	3:E:51:GLU:N	2.34	0.61
1:A:1418:G:H21	1:A:1580:A:H62	1.48	0.61
1:A:261:G:O2'	1:A:610:C:O2'	1.97	0.61
1:A:226:A:N6	1:A:230:G:C6	2.69	0.61
2:D:49:GLN:HG2	2:D:79:LEU:HD12	1.81	0.61
12:T:37:ASP:OD1	12:T:38:ALA:N	2.26	0.61
1:A:1527:G:N2	1:A:1545:A:H62	1.98	0.60
1:A:1527:G:H21	1:A:1545:A:N6	1.99	0.60
1:A:1753:G:N2	1:A:1756:G:O5'	2.34	0.60
1:A:457:A:N7	1:A:472:A:N6	2.49	0.60
1:A:2816:G:N3	1:A:2883:A:O2'	2.32	0.60
1:A:1252:G:N2	9:Q:32:ARG:O	2.35	0.60
1:A:1466:U:O2'	1:A:1546:G:O2'	2.17	0.60
3:E:149:ILE:HD11	3:E:172:ALA:HA	1.84	0.60
1:A:1728:C:N4	1:A:1731:G:H22	2.00	0.60
1:A:2840:C:H5''	7:N:53:THR:HG21	1.83	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:49:A:N1	1:A:177:G:N2	2.50	0.59
8:P:33:GLU:N	8:P:33:GLU:OE1	2.36	0.59
1:A:1662:U:O2'	1:A:2687:U:OP1	2.19	0.59
1:A:1319:C:O2'	1:A:1320:C:O4'	2.19	0.59
3:E:117:ARG:NH2	3:E:183:PHE:O	2.36	0.59
1:A:629:G:N2	1:A:639:U:O2'	2.26	0.59
1:A:1668:A:H61	1:A:1676:A:H61	1.49	0.58
1:A:987:C:O2'	1:A:1000:A:N3	2.32	0.58
1:A:799:G:OP2	1:A:800:A:O2'	2.10	0.58
1:A:1472:C:N4	1:A:1473:G:O6	2.37	0.58
1:A:224:U:O4	1:A:232:G:N2	2.36	0.58
1:A:1313:U:O2'	1:A:1314:C:OP1	2.18	0.58
10:R:16:GLU:OE1	10:R:16:GLU:N	2.36	0.57
4:J:7:LYS:O	4:J:11:VAL:HG13	2.05	0.57
1:A:1358:G:C2'	1:A:1373:A:H61	2.18	0.57
1:A:1638:C:O2	1:A:2698:U:O2'	2.21	0.57
1:A:2788:C:O2'	1:A:2809:A:N3	2.34	0.57
4:J:125:TYR:OH	4:J:132:HIS:NE2	2.38	0.57
7:N:8:ARG:N	7:N:43:GLU:OE2	2.38	0.57
1:A:2748:A:N7	1:A:2753:A:N6	2.53	0.57
1:A:1426:G:O2'	1:A:1572:A:N6	2.34	0.57
4:J:58:ASN:ND2	4:J:128:ASN:OD1	2.35	0.57
6:L:116:VAL:O	6:L:116:VAL:HG13	2.04	0.56
13:U:76:THR:HG23	13:U:78:LYS:H	1.68	0.56
1:A:573:U:O4	1:A:2029:G:O2'	2.10	0.56
5:K:37:ASP:OD1	5:K:38:ILE:N	2.38	0.56
1:A:139:U:O2'	1:A:141:G:N1	2.34	0.56
1:A:630:G:HO2'	1:A:640:C:HO2'	1.50	0.56
1:A:1668:A:OP2	1:A:1990:C:N4	2.39	0.56
1:A:1168:G:O6	1:A:1181:U:O2	2.24	0.56
13:U:45:GLN:NE2	13:U:56:GLY:O	2.38	0.56
1:A:1157:G:O2'	17:Z:31:ILE:HG21	2.04	0.56
1:A:1416:G:O2'	1:A:1417:C:OP2	2.19	0.56
15:0:52:LYS:NZ	15:0:53:VAL:O	2.37	0.56
1:A:159:G:O2'	1:A:167:A:N6	2.38	0.56
1:A:974:G:O4'	1:A:990:A:N6	2.39	0.56
13:U:48:VAL:HG23	13:U:50:ALA:O	2.06	0.56
1:A:1992:G:N2	1:A:1996:C:O2'	2.36	0.55
7:N:100:CYS:HB3	15:0:42:ILE:HD11	1.88	0.55
1:A:226:A:N6	1:A:230:G:N1	2.53	0.55
1:A:2636:C:O2'	2:D:45:TYR:OH	2.21	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:E:115:GLN:OE1	3:E:117:ARG:HG3	2.06	0.55
5:K:104:THR:HG23	5:K:106:GLU:HG3	1.87	0.55
1:A:1250:G:OP2	6:L:21:ARG:NE	2.39	0.55
1:A:1184:U:OP2	17:Z:30:ARG:NH2	2.40	0.55
1:A:814:C:O2'	1:A:1225:G:N2	2.40	0.55
1:A:72:U:OP1	14:Y:54:LYS:NZ	2.40	0.55
1:A:2845:U:O3'	8:P:52:ARG:NH1	2.39	0.54
12:T:65:GLY:N	12:T:79:ASP:OD1	2.41	0.54
1:A:586:A:O2'	1:A:671:C:O2'	2.25	0.54
1:A:1183:U:O3'	17:Z:29:ARG:NH2	2.37	0.54
1:A:1286:A:N6	1:A:1329:U:O2	2.40	0.54
2:D:97:SER:OG	2:D:99:GLU:OE1	2.15	0.54
1:A:378:C:N3	1:A:396:G:N1	2.43	0.54
1:A:59:U:O2	1:A:68:G:O6	2.26	0.54
1:A:139:U:HO2'	1:A:141:G:H1	1.53	0.54
1:A:532:A:N7	1:A:2021:C:O2'	2.36	0.54
15:O:37:HIS:HB3	15:O:43:THR:HG22	1.90	0.54
6:L:93:ASN:OD1	6:L:94:THR:HG23	2.07	0.53
1:A:541:A:N6	1:A:553:G:O6	2.41	0.53
4:J:50:THR:O	4:J:50:THR:HG22	2.09	0.53
6:L:101:ILE:HG13	6:L:101:ILE:O	2.09	0.53
1:A:1652:A:OP1	7:N:8:ARG:NE	2.41	0.53
5:K:58:LEU:HD23	5:K:86:LEU:HD21	1.90	0.53
1:A:1565:C:O2'	1:A:1566:A:O5'	2.26	0.53
1:A:1726:C:H2'	1:A:1727:C:C1'	2.39	0.53
1:A:1728:C:H42	1:A:1731:G:H22	1.57	0.53
2:D:99:GLU:OE1	2:D:99:GLU:N	2.42	0.53
7:N:112:TYR:CE1	15:O:54:ILE:HD11	2.44	0.52
7:N:24:MET:CE	7:N:36:THR:HG21	2.39	0.52
1:A:1007:C:OP2	1:A:1008:A:O2'	2.04	0.52
1:A:1264:A:N3	1:A:2015:A:N6	2.55	0.52
1:A:277:G:O2'	1:A:278:A:N1	2.42	0.52
1:A:2780:G:N2	4:J:102:GLU:OE2	2.43	0.52
1:A:1264:A:OP1	15:O:15:ARG:NH2	2.41	0.52
1:A:1422:G:N2	1:A:1498:C:O2	2.42	0.52
1:A:571:U:O4	1:A:575:A:N7	2.43	0.52
1:A:238:C:H2'	1:A:239:C:C1'	2.40	0.52
7:N:37:THR:OG1	7:N:40:LYS:NZ	2.37	0.52
1:A:48:G:N1	1:A:177:G:OP1	2.40	0.51
2:D:77:ARG:NH2	2:D:200:ASP:OD1	2.43	0.51
8:P:26:GLU:OE2	8:P:42:PHE:N	2.43	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:E:83:VAL:HB	3:E:86:ALA:HB2	1.93	0.51
9:Q:78:PHE:O	9:Q:82:LEU:HD23	2.09	0.51
6:L:82:LEU:HD12	6:L:82:LEU:O	2.10	0.51
1:A:1754:A:N6	1:A:2717:C:O4'	2.43	0.51
6:L:29:LYS:O	6:L:30:THR:OG1	2.19	0.51
1:A:2739:U:O2	1:A:2764:A:N7	2.44	0.51
1:A:2637:U:O4	1:A:2776:A:N7	2.45	0.50
1:A:2747:G:N3	1:A:2758:A:N6	2.60	0.50
5:K:64:ARG:NH1	5:K:100:PHE:O	2.44	0.50
1:A:1758:U:N3	1:A:2695:U:O2'	2.45	0.50
1:A:1557:C:OP2	1:A:1558:C:O2'	2.15	0.50
1:A:2763:G:HO2'	1:A:2764:A:P	2.29	0.50
1:A:2643:G:C6	1:A:2644:G:O6	2.64	0.50
1:A:2848:G:H22	1:A:2867:G:H1'	1.77	0.49
8:P:30:TRP:NE1	8:P:81:ASP:OD2	2.45	0.49
4:J:43:GLU:N	4:J:43:GLU:OE1	2.45	0.49
1:A:72:U:O4	14:Y:58:ASN:ND2	2.46	0.49
1:A:152:A:N6	1:A:175:G:O6	2.45	0.49
3:E:46:GLN:HB2	3:E:86:ALA:HB1	1.94	0.49
1:A:228:C:O2	1:A:417:C:O2'	2.31	0.49
2:D:187:LEU:HD23	2:D:188:LEU:N	2.28	0.49
1:A:1024:G:P	1:A:1025:G:HO2'	2.31	0.49
4:J:135:GLN:N	4:J:135:GLN:OE1	2.46	0.49
1:A:268:C:H2'	1:A:269:C:C1'	2.42	0.49
1:A:488:G:H22	1:A:491:G:H5''	1.77	0.49
1:A:828:U:O2'	1:A:829:A:OP1	2.31	0.49
1:A:2822:G:N2	1:A:2824:C:OP1	2.45	0.49
1:A:65:U:O2'	1:A:456:C:N3	2.42	0.49
1:A:2898:U:O2'	4:J:134:ALA:O	2.20	0.49
5:K:90:ASN:O	5:K:91:SER:OG	2.28	0.49
1:A:246:C:OP2	1:A:249:C:N4	2.46	0.48
10:R:1:MET:HE3	10:R:1:MET:HA	1.95	0.48
1:A:1615:C:OP2	1:A:1617:C:N4	2.38	0.48
1:A:1738:G:O2'	1:A:1739:A:O5'	2.31	0.48
1:A:2681:C:OP2	2:D:114:LYS:NZ	2.45	0.48
5:K:20:MET:O	5:K:42:THR:HG22	2.13	0.48
5:K:112:PHE:HD2	5:K:115:ILE:HG21	1.78	0.48
1:A:18:U:OP1	9:Q:25:GLY:N	2.47	0.48
4:J:35:ARG:NE	4:J:140:LEU:HD11	2.29	0.48
1:A:637:A:OP1	6:L:130:GLY:N	2.45	0.48
1:A:1353:A:OP2	1:A:1377:G:N2	2.45	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:2705:A:O2'	1:A:2852:G:OP1	2.30	0.48
1:A:2840:C:C5'	7:N:53:THR:HG21	2.43	0.48
1:A:664:G:O2'	1:A:940:G:OP1	2.29	0.48
1:A:1266:G:O2'	1:A:2012:G:O6	2.31	0.48
1:A:345:A:N3	1:A:347:A:N6	2.62	0.48
1:A:1021:A:N6	1:A:1142:A:H61	2.11	0.48
1:A:226:A:C6	1:A:230:G:N1	2.82	0.48
1:A:324:A:N6	1:A:338:G:O2'	2.47	0.48
13:U:9:GLU:OE2	13:U:23:LYS:NZ	2.29	0.48
1:A:1418:G:N2	1:A:1580:A:H62	2.12	0.47
11:S:80:PRO:O	11:S:100:THR:OG1	2.19	0.47
6:L:77:ILE:HG21	6:L:82:LEU:HD23	1.96	0.47
11:S:24:ILE:CG2	11:S:71:VAL:HG11	2.45	0.47
1:A:1268:A:C6	1:A:2013:A:N1	2.83	0.47
1:A:2640:G:OP1	4:J:96:ARG:NH1	2.47	0.47
14:Y:56:LEU:O	14:Y:57:LEU:HB3	2.15	0.47
1:A:476:G:N1	1:A:479:A:OP2	2.40	0.47
1:A:582:A:OP1	9:Q:13:HIS:ND1	2.46	0.47
1:A:865:C:N4	1:A:908:C:OP2	2.46	0.47
1:A:1712:U:OP2	1:A:1713:A:O2'	2.12	0.47
2:D:78:GLY:C	2:D:79:LEU:HD22	2.35	0.47
15:O:35:GLU:OE2	15:O:43:THR:HG21	2.14	0.47
7:N:34:ILE:HG22	7:N:35:LYS:N	2.29	0.47
1:A:9:G:H1'	1:A:2800:A:H61	1.80	0.47
10:R:98:ILE:HG21	10:R:101:ILE:HD11	1.97	0.47
1:A:175:G:H2'	1:A:176:A:C8	2.50	0.47
1:A:1151:A:O2'	9:Q:80:ASN:OD1	2.30	0.47
1:A:1521:G:P	1:A:1522:A:HO2'	2.26	0.47
4:J:125:TYR:HH	4:J:132:HIS:CD2	2.33	0.47
7:N:19:ALA:O	7:N:23:ASN:ND2	2.44	0.47
9:Q:16:ILE:HD11	9:Q:38:VAL:HG11	1.97	0.47
14:Y:24:GLU:N	14:Y:24:GLU:OE1	2.46	0.46
2:D:110:THR:HG21	2:D:169:ARG:NH1	2.31	0.46
6:L:19:LEU:HD23	6:L:19:LEU:H	1.80	0.46
1:A:1721:G:O2'	1:A:1739:A:N6	2.48	0.46
5:K:30:ARG:NE	5:K:32:TYR:O	2.46	0.46
1:A:262:A:H2'	1:A:263:G:O4'	2.16	0.46
1:A:282:A:N6	1:A:359:G:O6	2.49	0.46
6:L:93:ASN:O	6:L:94:THR:OG1	2.23	0.46
12:T:24:MET:SD	12:T:30:ILE:HG22	2.55	0.46
12:T:56:GLU:OE1	12:T:56:GLU:N	2.44	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1386:C:H2'	1:A:1387:A:C8	2.51	0.46
1:A:1417:C:H2'	1:A:1418:G:O4'	2.15	0.46
1:A:1653:G:H21	1:A:2005:A:H62	1.62	0.46
1:A:259:G:N3	1:A:621:A:O2'	2.49	0.46
1:A:997:G:OP2	9:Q:57:ARG:NH1	2.49	0.46
1:A:1263:U:O2	15:0:3:GLN:NE2	2.46	0.46
1:A:231:A:H2'	1:A:232:G:O4'	2.16	0.46
5:K:3:GLN:OE1	5:K:3:GLN:N	2.48	0.46
7:N:107:ASN:O	7:N:107:ASN:ND2	2.49	0.46
11:S:24:ILE:HD11	11:S:36:LEU:CD2	2.46	0.46
17:Z:22:THR:O	17:Z:26:LEU:HD23	2.16	0.45
1:A:564:C:OP1	10:R:79:ARG:NH1	2.49	0.45
9:Q:78:PHE:CZ	9:Q:82:LEU:HD21	2.51	0.45
12:T:38:ALA:HB1	12:T:43:ILE:HD11	1.97	0.45
1:A:2688:G:O2'	1:A:2721:A:N6	2.50	0.45
2:D:109:VAL:HG11	2:D:193:VAL:HB	1.99	0.45
1:A:26:G:H1'	1:A:515:A:H61	1.81	0.45
7:N:24:MET:HE3	7:N:36:THR:HG21	1.98	0.45
11:S:109:ASP:OD1	11:S:110:ARG:N	2.49	0.45
1:A:1359:A:OP2	1:A:1371:G:N2	2.47	0.45
2:D:26:VAL:HG13	2:D:186:LEU:CD1	2.47	0.45
6:L:112:LEU:HD22	6:L:134:ALA:CB	2.46	0.45
8:P:85:VAL:HG13	8:P:85:VAL:O	2.17	0.45
1:A:1666:G:HO2'	1:A:1667:G:C4'	2.23	0.45
1:A:2865:U:P	1:A:2866:U:HO2'	2.30	0.45
1:A:1384:A:O2'	1:A:1404:C:O2	2.29	0.45
1:A:1427:A:N6	1:A:1571:A:OP2	2.44	0.45
16:2:13:ASN:O	16:2:17:GLY:N	2.50	0.45
17:Z:19:HIS:O	17:Z:23:LEU:HD23	2.16	0.45
1:A:192:C:H42	1:A:203:A:H2'	1.81	0.44
1:A:561:G:HO2'	9:Q:44:TYR:HH	1.63	0.44
1:A:30:G:OP2	9:Q:4:LYS:NZ	2.35	0.44
1:A:1319:C:C2'	1:A:1320:C:O4'	2.66	0.44
7:N:28:LEU:N	7:N:34:ILE:HD11	2.32	0.44
1:A:328:U:HO2'	1:A:329:G:P	2.39	0.44
1:A:2703:C:N4	1:A:2704:C:N4	2.66	0.44
1:A:585:G:H21	1:A:1254:A:H62	1.64	0.44
1:A:1386:C:H2'	1:A:1387:A:H8	1.83	0.44
1:A:664:G:OP1	6:L:17:LYS:NZ	2.41	0.44
1:A:1358:G:HO2'	1:A:1373:A:N6	2.16	0.44
1:A:2717:C:O2'	8:P:93:LYS:NZ	2.41	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:N:33:ILE:HD13	15:0:54:ILE:HD13	2.00	0.44
1:A:1149:G:H2'	1:A:1150:C:C6	2.53	0.44
1:A:1346:G:C6	1:A:1601:G:O6	2.71	0.44
13:U:32:LYS:NZ	13:U:65:GLN:OE1	2.40	0.44
15:0:24:VAL:HG23	15:0:25:THR:N	2.33	0.44
1:A:28:A:H2'	1:A:29:U:O4'	2.18	0.44
1:A:170:U:C2	1:A:171:U:C5	3.06	0.44
1:A:335:C:O2	13:U:67:SER:OG	2.22	0.44
1:A:1208:C:H2'	1:A:1209:U:O4'	2.18	0.43
1:A:1351:C:O2'	1:A:1571:A:O2'	2.07	0.43
2:D:3:GLY:C	2:D:4:LEU:HD22	2.39	0.43
3:E:141:MET:SD	3:E:143:LEU:HD12	2.58	0.43
1:A:499:U:H2'	1:A:500:G:O4'	2.19	0.43
14:Y:57:LEU:HD23	14:Y:57:LEU:O	2.18	0.43
2:D:47:ALA:HA	2:D:84:LEU:HD23	1.99	0.43
1:A:584:C:N4	1:A:585:G:O6	2.52	0.43
12:T:12:ARG:HA	12:T:12:ARG:NE	2.34	0.43
1:A:1561:C:C2	1:A:1562:U:C5	3.06	0.43
4:J:138:GLN:OE1	4:J:138:GLN:N	2.50	0.43
1:A:72:U:OP2	12:T:9:LYS:NZ	2.52	0.43
1:A:84:A:N1	1:A:98:G:O2'	2.40	0.43
5:K:40:LYS:HE2	5:K:57:VAL:HG12	2.00	0.43
1:A:43:G:H2'	1:A:44:A:O4'	2.19	0.43
15:0:42:ILE:HG22	15:0:48:TYR:HB2	2.01	0.43
1:A:968:C:H2'	1:A:969:G:H8	1.83	0.43
1:A:1319:C:H2'	1:A:1320:C:O4'	2.18	0.43
2:D:173:GLN:O	2:D:174:SER:OG	2.36	0.43
1:A:2643:G:H2'	1:A:2644:G:C8	2.54	0.43
1:A:948:C:O2	1:A:984:A:O2'	2.30	0.42
1:A:35:G:H1'	1:A:454:A:N3	2.34	0.42
1:A:54:G:O2'	16:2:35:ARG:NH1	2.49	0.42
1:A:628:G:H2'	1:A:629:G:C1'	2.49	0.42
6:L:122:VAL:HG11	6:L:127:VAL:CG2	2.50	0.42
9:Q:89:ILE:HD11	9:Q:93:ILE:HG21	2.00	0.42
1:A:298:G:N1	1:A:339:U:OP2	2.39	0.42
4:J:13:ARG:NH2	4:J:49:ASP:OD2	2.52	0.42
5:K:107:LEU:N	5:K:107:LEU:HD12	2.35	0.42
8:P:12:MET:HE2	8:P:12:MET:HA	2.01	0.42
1:A:669:G:C6	1:A:801:G:C6	3.08	0.42
3:E:4:VAL:HG22	3:E:6:LYS:H	1.84	0.42
7:N:72:ASP:OD2	7:N:75:ILE:HD12	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:459:U:O3'	12:T:73:ARG:NH2	2.52	0.42
1:A:1217:U:OP2	9:Q:14:LYS:NZ	2.33	0.42
9:Q:71:ASN:O	9:Q:113:LYS:NZ	2.49	0.42
1:A:1566:A:HO2'	1:A:1568:G:N2	2.18	0.42
2:D:46:ARG:NE	2:D:89:GLU:OE2	2.47	0.42
1:A:262:A:N3	1:A:430:A:O2'	2.35	0.42
1:A:387:U:OP2	1:A:388:G:N2	2.48	0.42
1:A:423:A:H3'	1:A:424:G:H5'	2.01	0.42
1:A:2033:A:HO2'	1:A:2035:G:P	2.41	0.42
1:A:2703:C:C4	1:A:2704:C:N4	2.87	0.42
2:D:51:THR:HB	2:D:79:LEU:HD13	2.02	0.42
5:K:58:LEU:HD21	5:K:88:ASN:CG	2.40	0.42
10:R:74:ILE:HG23	10:R:74:ILE:O	2.19	0.42
1:A:1996:C:OP2	5:K:31:ARG:NH1	2.53	0.42
14:Y:14:LEU:O	14:Y:18:LEU:HD23	2.20	0.42
1:A:1022:G:N7	1:A:1140:C:N4	2.67	0.41
1:A:1313:U:O2	1:A:1313:U:H2'	2.20	0.41
1:A:1418:G:H21	1:A:1580:A:N6	2.13	0.41
3:E:168:ASP:OD1	3:E:169:VAL:N	2.53	0.41
10:R:38:VAL:C	10:R:39:LEU:HD12	2.40	0.41
1:A:1358:G:HO2'	1:A:1373:A:H61	1.67	0.41
1:A:1525:A:H2'	1:A:1526:C:O4'	2.20	0.41
1:A:2647:U:O2	1:A:2673:G:C6	2.70	0.41
9:Q:64:ILE:HD11	9:Q:95:ALA:N	2.35	0.41
1:A:418:C:H2'	1:A:419:U:C6	2.55	0.41
1:A:1566:A:O2'	1:A:1568:G:N2	2.52	0.41
2:D:9:VAL:O	2:D:197:THR:HG23	2.20	0.41
7:N:33:ILE:CD1	15:O:54:ILE:HD13	2.51	0.41
7:N:34:ILE:CG2	7:N:35:LYS:N	2.83	0.41
7:N:44:LEU:O	7:N:48:VAL:HG12	2.20	0.41
1:A:2723:C:OP1	2:D:114:LYS:NZ	2.50	0.41
1:A:2902:C:H2'	1:A:2903:U:O4'	2.20	0.41
3:E:125:SER:O	3:E:137:LYS:NZ	2.52	0.41
1:A:1726:C:H2'	1:A:1727:C:N1	2.36	0.41
1:A:2896:C:C2	1:A:2897:U:C5	3.09	0.41
1:A:2898:U:H2'	1:A:2899:A:H8	1.86	0.41
11:S:37:THR:HG22	11:S:48:LYS:CE	2.50	0.41
1:A:603:A:N6	1:A:655:A:O4'	2.53	0.41
1:A:965:C:O2	1:A:965:C:H2'	2.20	0.41
4:J:98:GLU:HB3	4:J:124:VAL:HG13	2.02	0.41
1:A:67:U:C2	1:A:68:G:C8	3.09	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1026:G:OP1	1:A:1134:A:O2'	2.23	0.41
1:A:1204:A:O4'	1:A:1206:G:C8	2.73	0.41
1:A:1667:G:H22	1:A:1994:C:H42	1.68	0.41
3:E:31:VAL:HG21	3:E:104:ALA:CB	2.50	0.41
5:K:58:LEU:HG	5:K:87:LEU:O	2.20	0.41
7:N:100:CYS:CB	15:O:42:ILE:HD11	2.49	0.41
1:A:394:C:H2'	1:A:395:U:O4'	2.21	0.41
1:A:541:A:N6	1:A:553:G:C6	2.89	0.41
1:A:541:A:H2'	1:A:542:C:C6	2.56	0.41
1:A:1009:A:P	4:J:39:LYS:HZ3	2.43	0.41
1:A:1299:G:N1	1:A:1640:A:OP2	2.50	0.41
1:A:1327:A:C2'	1:A:1328:A:O4'	2.69	0.41
1:A:2036:C:O2	1:A:2036:C:H2'	2.20	0.41
1:A:2047:C:H2'	1:A:2048:G:C8	2.56	0.41
1:A:2652:C:H2'	1:A:2653:U:O4'	2.20	0.41
6:L:101:ILE:HD12	6:L:105:ILE:HG21	2.02	0.41
10:R:29:THR:HG22	10:R:66:HIS:CD2	2.56	0.41
1:A:423:A:H3'	1:A:424:G:C5'	2.52	0.41
1:A:1256:G:H1'	3:E:77:ILE:HD11	2.03	0.41
1:A:1319:C:H2'	1:A:1320:C:C6	2.56	0.41
1:A:2857:G:H3'	1:A:2858:C:C5'	2.51	0.41
2:D:9:VAL:HG11	8:P:3:ILE:HD11	2.03	0.41
4:J:114:LEU:HD11	4:J:118:MET:HE1	2.03	0.41
2:D:124:ARG:NH1	2:D:161:MET:O	2.54	0.40
3:E:28:VAL:HG13	6:L:6:LEU:CD1	2.50	0.40
1:A:451:U:O2	1:A:453:A:N6	2.54	0.40
1:A:1423:G:H2'	1:A:1424:G:C8	2.57	0.40
1:A:2687:U:H2'	1:A:2688:G:O4'	2.21	0.40
16:2:31:LEU:HD13	16:2:42:LEU:HD12	2.03	0.40
1:A:968:C:H2'	1:A:969:G:C8	2.57	0.40
1:A:2656:U:O2	1:A:2657:A:C8	2.74	0.40
9:Q:46:TYR:CD1	10:R:74:ILE:HD11	2.56	0.40
12:T:12:ARG:HB2	12:T:33:LYS:O	2.21	0.40
1:A:223:A:H2'	1:A:408:G:H21	1.87	0.40
1:A:303:G:C4	1:A:315:G:N2	2.90	0.40
1:A:1385:A:H4'	1:A:1386:C:OP1	2.21	0.40
1:A:1401:G:H2'	1:A:1402:U:O4'	2.22	0.40
1:A:135:U:N3	1:A:136:G:O6	2.55	0.40
7:N:29:VAL:O	7:N:78:LYS:NZ	2.49	0.40
11:S:78:GLU:OE1	11:S:78:GLU:HA	2.22	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	D	171/209 (82%)	166 (97%)	5 (3%)	0	100	100
3	E	183/201 (91%)	178 (97%)	5 (3%)	0	100	100
4	J	140/142 (99%)	134 (96%)	6 (4%)	0	100	100
5	K	120/123 (98%)	115 (96%)	5 (4%)	0	100	100
6	L	105/144 (73%)	93 (89%)	12 (11%)	0	100	100
7	N	118/127 (93%)	109 (92%)	8 (7%)	1 (1%)	19	57
8	P	112/115 (97%)	110 (98%)	2 (2%)	0	100	100
9	Q	115/118 (98%)	112 (97%)	3 (3%)	0	100	100
10	R	101/103 (98%)	97 (96%)	4 (4%)	0	100	100
11	S	97/110 (88%)	93 (96%)	4 (4%)	0	100	100
12	T	91/100 (91%)	86 (94%)	5 (6%)	0	100	100
13	U	100/104 (96%)	94 (94%)	6 (6%)	0	100	100
14	Y	61/63 (97%)	57 (93%)	4 (7%)	0	100	100
15	0	54/57 (95%)	52 (96%)	2 (4%)	0	100	100
16	2	37/46 (80%)	35 (95%)	2 (5%)	0	100	100
17	Z	55/59 (93%)	53 (96%)	2 (4%)	0	100	100
All	All	1660/1821 (91%)	1584 (95%)	75 (4%)	1 (0%)	54	83

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
7	N	70	THR

5.3.2 Protein sidechains [i](#)

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

entries.

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	D	136/164 (83%)	136 (100%)	0	100	100
3	E	155/165 (94%)	154 (99%)	1 (1%)	86	92
4	J	116/116 (100%)	115 (99%)	1 (1%)	78	88
5	K	103/104 (99%)	103 (100%)	0	100	100
6	L	76/103 (74%)	76 (100%)	0	100	100
7	N	100/103 (97%)	100 (100%)	0	100	100
8	P	99/100 (99%)	99 (100%)	0	100	100
9	Q	89/90 (99%)	89 (100%)	0	100	100
10	R	84/84 (100%)	84 (100%)	0	100	100
11	S	87/93 (94%)	87 (100%)	0	100	100
12	T	80/84 (95%)	80 (100%)	0	100	100
13	U	83/85 (98%)	83 (100%)	0	100	100
14	Y	55/55 (100%)	55 (100%)	0	100	100
15	0	47/48 (98%)	47 (100%)	0	100	100
16	2	31/38 (82%)	31 (100%)	0	100	100
17	Z	47/49 (96%)	46 (98%)	1 (2%)	53	74
All	All	1388/1481 (94%)	1385 (100%)	3 (0%)	93	97

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

Mol	Chain	Res	Type
3	E	1	MET
4	J	96	ARG
17	Z	44	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
2	D	67	HIS
10	R	82	HIS
11	S	15	GLN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	A	1866/2904 (64%)	284 (15%)	8 (0%)

All (284) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	A	10	A
1	A	12	U
1	A	14	A
1	A	25	U
1	A	27	G
1	A	34	U
1	A	46	G
1	A	51	G
1	A	60	G
1	A	63	A
1	A	72	U
1	A	74	A
1	A	75	G
1	A	96	C
1	A	102	U
1	A	114	U
1	A	118	A
1	A	120	U
1	A	125	A
1	A	131	A
1	A	133	U
1	A	138	U
1	A	139	U
1	A	140	C
1	A	141	G
1	A	142	A
1	A	166	U
1	A	181	A
1	A	195	A
1	A	196	A
1	A	204	A
1	A	213	A
1	A	214	G
1	A	215	G
1	A	216	A
1	A	222	A

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Mol	Chain	Res	Type
1	A	229	C
1	A	230	G
1	A	233	A
1	A	239	C
1	A	248	G
1	A	254	G
1	A	255	A
1	A	264	C
1	A	265	A
1	A	266	G
1	A	267	C
1	A	271	G
1	A	272	A
1	A	278	A
1	A	291	G
1	A	302	C
1	A	307	G
1	A	311	A
1	A	316	C
1	A	329	G
1	A	330	A
1	A	331	C
1	A	346	A
1	A	362	A
1	A	367	G
1	A	370	G
1	A	371	A
1	A	372	G
1	A	386	G
1	A	387	U
1	A	394	C
1	A	396	G
1	A	406	G
1	A	411	G
1	A	412	A
1	A	422	A
1	A	424	G
1	A	429	A
1	A	430	A
1	A	456	C
1	A	464	U
1	A	480	A

Continued on next page...

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Mol	Chain	Res	Type
1	A	481	G
1	A	490	C
1	A	491	G
1	A	504	A
1	A	505	A
1	A	513	A
1	A	532	A
1	A	533	G
1	A	546	U
1	A	547	A
1	A	548	G
1	A	550	C
1	A	563	A
1	A	564	C
1	A	573	U
1	A	586	A
1	A	603	A
1	A	613	A
1	A	614	A
1	A	615	U
1	A	621	A
1	A	627	A
1	A	631	A
1	A	637	A
1	A	638	G
1	A	644	A
1	A	646	U
1	A	647	G
1	A	654	A
1	A	664	G
1	A	669	G
1	A	670	A
1	A	671	C
1	A	675	A
1	A	812	C
1	A	819	A
1	A	828	U
1	A	829	A
1	A	830	G
1	A	832	U
1	A	833	A
1	A	845	A

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Mol	Chain	Res	Type
1	A	846	U
1	A	847	U
1	A	866	A
1	A	910	A
1	A	931	U
1	A	932	U
1	A	945	A
1	A	957	C
1	A	959	A
1	A	960	A
1	A	974	G
1	A	983	A
1	A	985	C
1	A	995	C
1	A	996	A
1	A	1005	C
1	A	1009	A
1	A	1012	U
1	A	1013	C
1	A	1022	G
1	A	1026	G
1	A	1131	G
1	A	1132	U
1	A	1133	A
1	A	1135	C
1	A	1136	G
1	A	1142	A
1	A	1157	G
1	A	1168	G
1	A	1171	G
1	A	1172	C
1	A	1173	U
1	A	1174	U
1	A	1176	U
1	A	1177	G
1	A	1182	G
1	A	1186	G
1	A	1212	G
1	A	1225	G
1	A	1236	G
1	A	1238	G
1	A	1247	A

Continued on next page...

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Mol	Chain	Res	Type
1	A	1248	G
1	A	1253	A
1	A	1255	U
1	A	1256	G
1	A	1266	G
1	A	1271	G
1	A	1272	A
1	A	1287	A
1	A	1300	G
1	A	1301	A
1	A	1312	U
1	A	1314	C
1	A	1321	A
1	A	1325	U
1	A	1327	A
1	A	1328	A
1	A	1329	U
1	A	1345	C
1	A	1353	A
1	A	1365	A
1	A	1376	C
1	A	1378	A
1	A	1379	U
1	A	1383	A
1	A	1391	U
1	A	1395	A
1	A	1403	A
1	A	1416	G
1	A	1417	C
1	A	1419	A
1	A	1421	G
1	A	1427	A
1	A	1452	G
1	A	1458	U
1	A	1475	G
1	A	1482	G
1	A	1490	A
1	A	1491	G
1	A	1493	C
1	A	1495	A
1	A	1496	A
1	A	1497	U

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Mol	Chain	Res	Type
1	A	1515	A
1	A	1523	U
1	A	1527	G
1	A	1528	A
1	A	1532	A
1	A	1535	A
1	A	1555	G
1	A	1556	C
1	A	1560	G
1	A	1569	A
1	A	1579	A
1	A	1585	C
1	A	1608	A
1	A	1616	A
1	A	1622	G
1	A	1631	G
1	A	1634	A
1	A	1646	C
1	A	1647	U
1	A	1648	U
1	A	1664	A
1	A	1666	G
1	A	1674	G
1	A	1682	G
1	A	1715	G
1	A	1730	C
1	A	1732	C
1	A	1733	G
1	A	1738	G
1	A	1739	A
1	A	1757	A
1	A	1764	C
1	A	1991	U
1	A	1992	G
1	A	1993	U
1	A	1994	C
1	A	1997	C
1	A	2022	U
1	A	2023	C
1	A	2030	A
1	A	2031	A
1	A	2043	C

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Mol	Chain	Res	Type
1	A	2049	G
1	A	2052	A
1	A	2629	U
1	A	2630	G
1	A	2639	A
1	A	2646	C
1	A	2654	A
1	A	2667	C
1	A	2669	G
1	A	2682	A
1	A	2685	G
1	A	2689	U
1	A	2690	U
1	A	2714	G
1	A	2725	A
1	A	2726	A
1	A	2729	G
1	A	2733	A
1	A	2739	U
1	A	2748	A
1	A	2751	G
1	A	2764	A
1	A	2765	A
1	A	2766	A
1	A	2778	A
1	A	2780	G
1	A	2798	U
1	A	2801	G
1	A	2818	U
1	A	2820	A
1	A	2849	U
1	A	2850	A
1	A	2858	C
1	A	2859	G
1	A	2867	G
1	A	2884	U
1	A	2886	A
1	A	2902	C

All (8) RNA pucker outliers are listed below:

Continued on next page...

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Mol	Chain	Res	Type
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Mol	Chain	Res	Type
1	A	271	G
1	A	328	U
1	A	828	U
1	A	1313	U
1	A	1420	A
1	A	1738	G
1	A	2763	G
1	A	2858	C

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

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

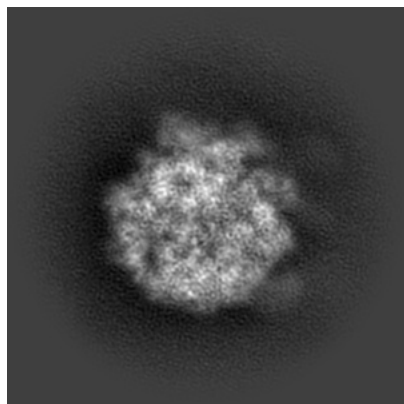
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-16499. These allow visual inspection of the internal detail of the map and identification of artifacts.

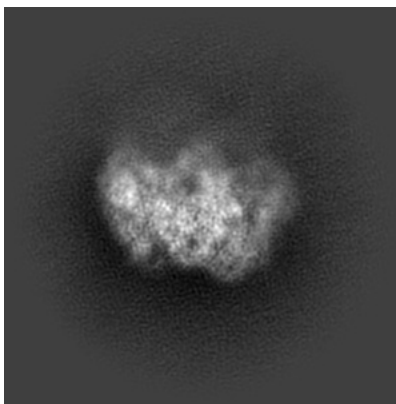
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

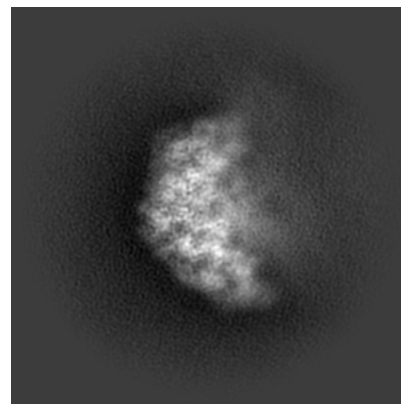
6.1.1 Primary map



X

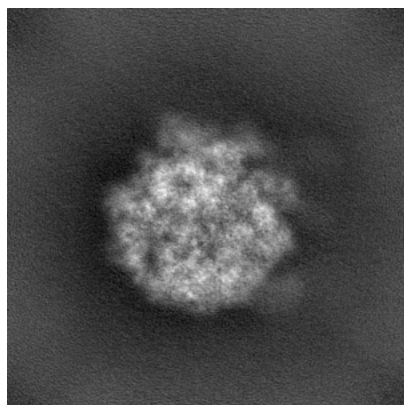


Y

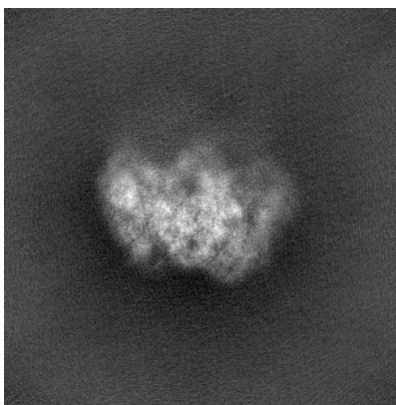


Z

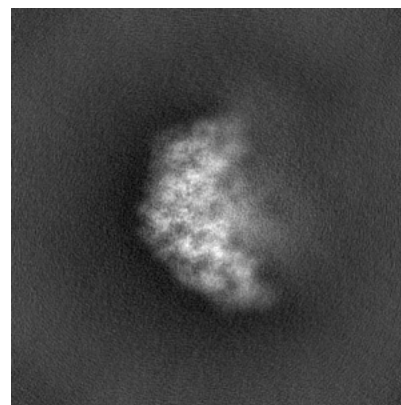
6.1.2 Raw map



X



Y

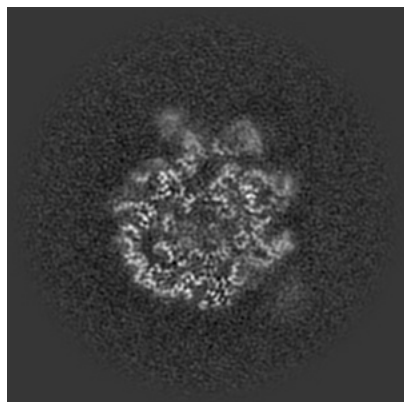


Z

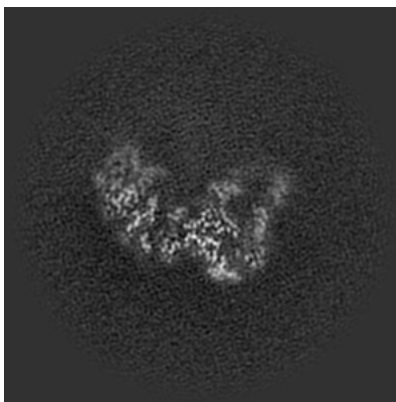
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

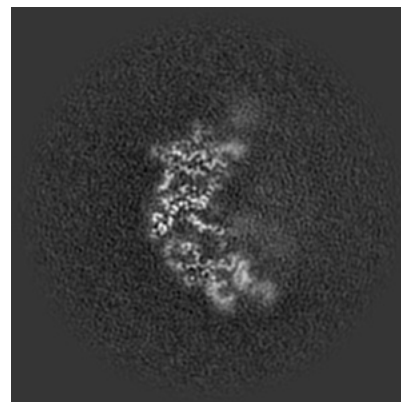
6.2.1 Primary map



X Index: 150

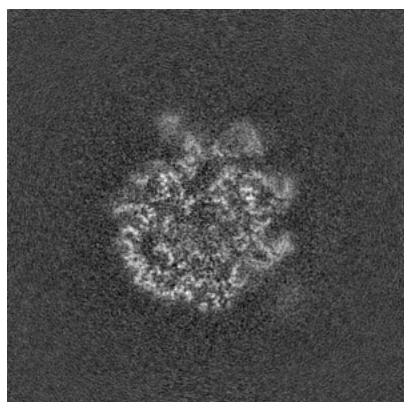


Y Index: 150

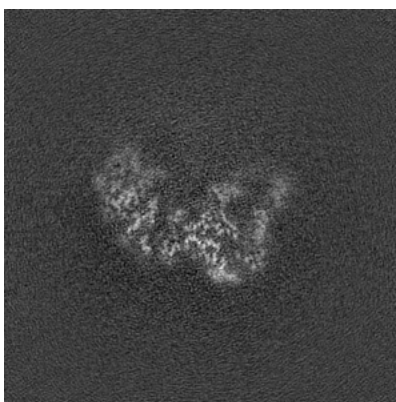


Z Index: 150

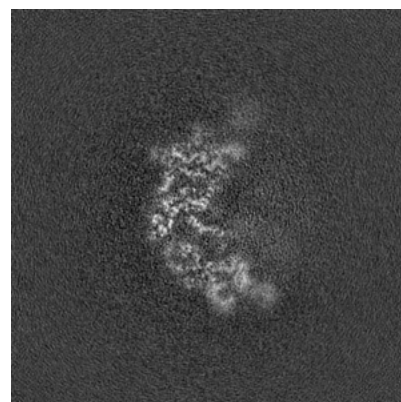
6.2.2 Raw map



X Index: 150



Y Index: 150

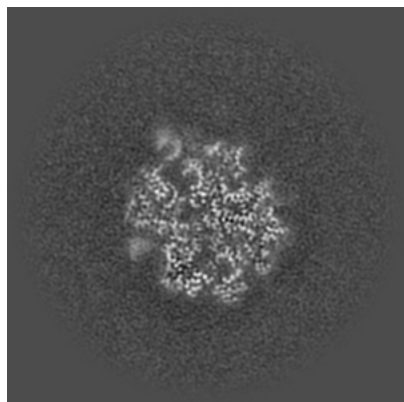


Z Index: 150

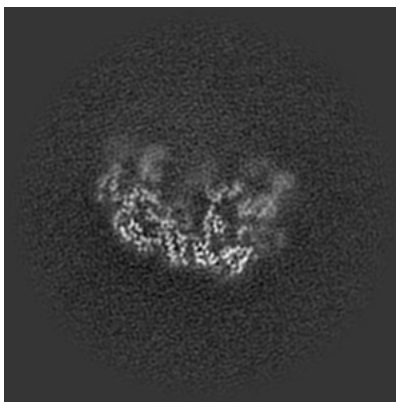
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

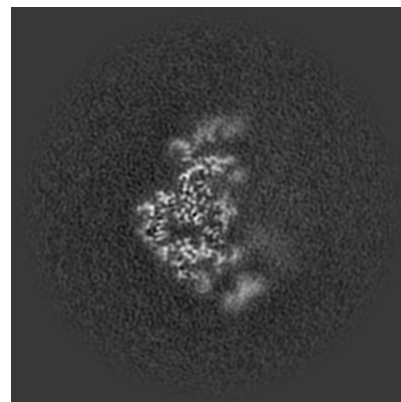
6.3.1 Primary map



X Index: 134

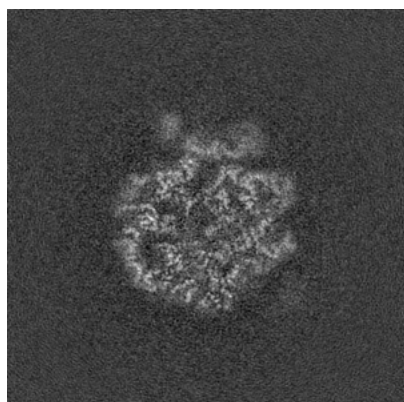


Y Index: 140

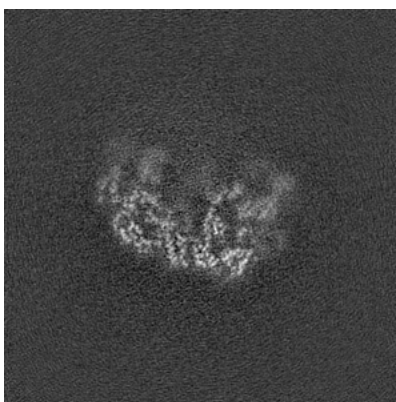


Z Index: 162

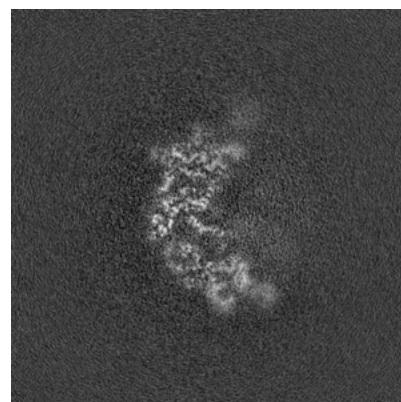
6.3.2 Raw map



X Index: 148



Y Index: 140

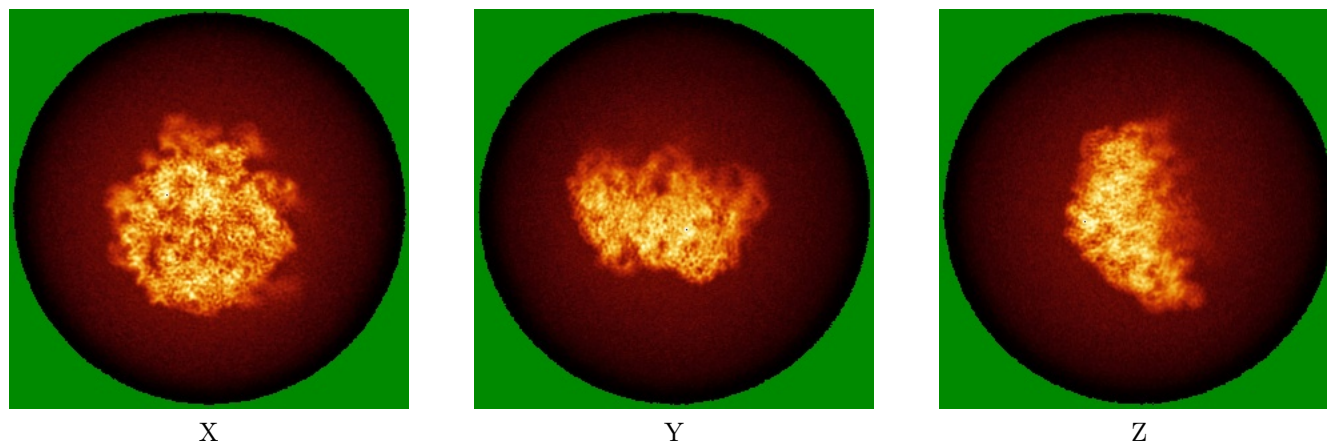


Z Index: 150

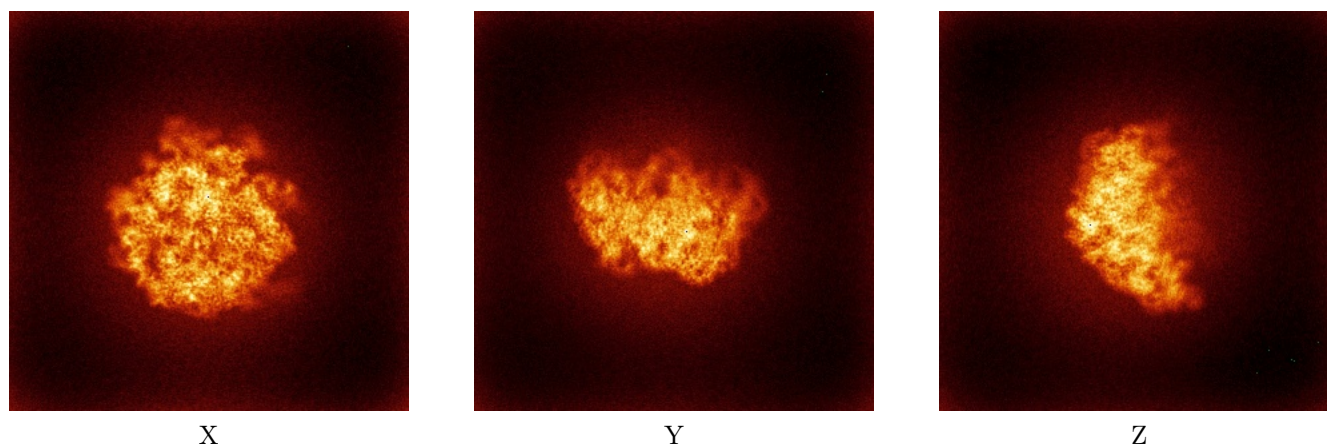
The images above show the largest variance slices of the map in three orthogonal directions.

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

6.4.1 Primary map



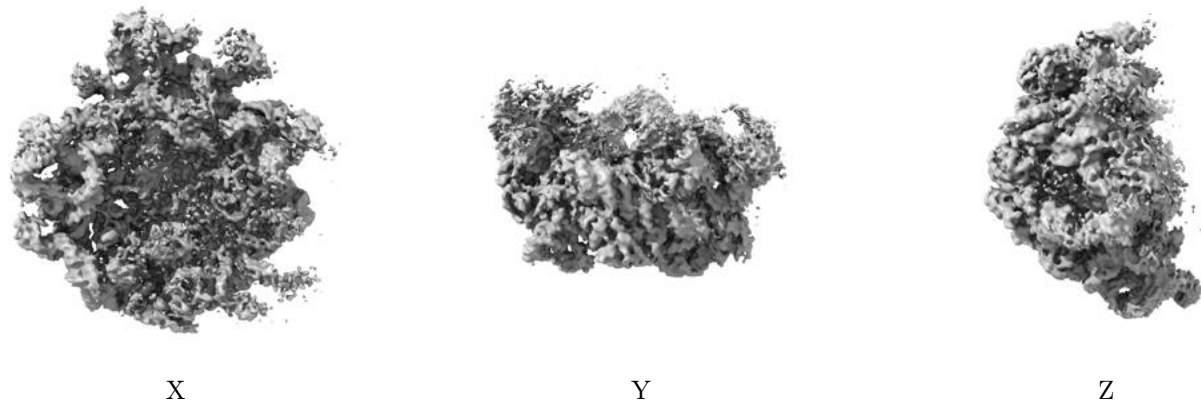
6.4.2 Raw map



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.

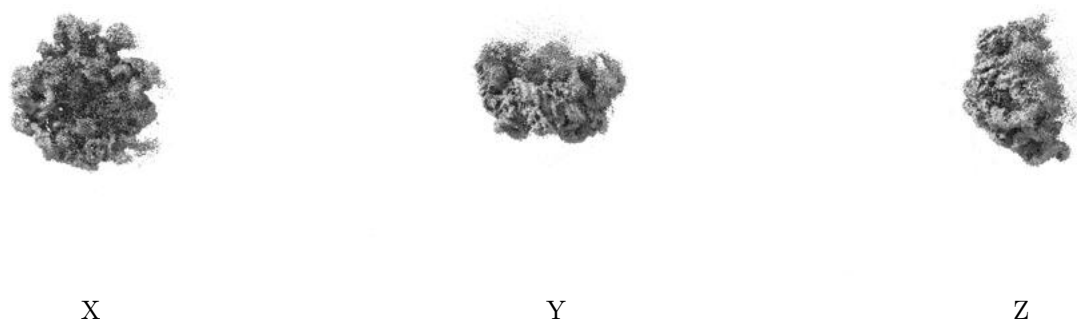
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.35. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



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

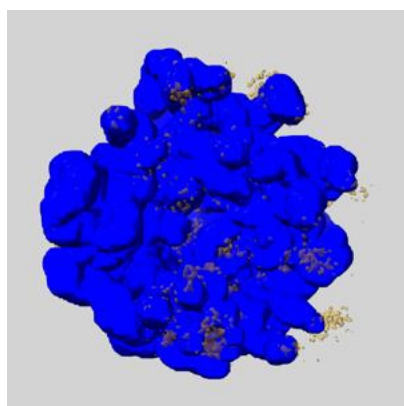
6.6 Mask visualisation [i](#)

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

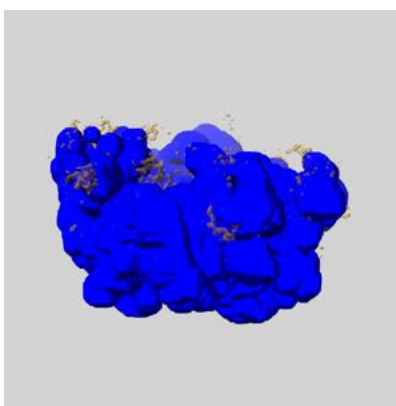
A mask typically either:

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

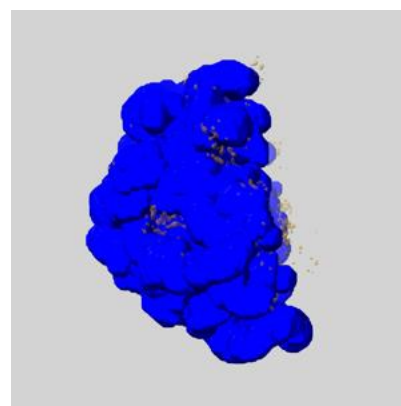
6.6.1 emd_16499_msk_1.map [i](#)



X



Y

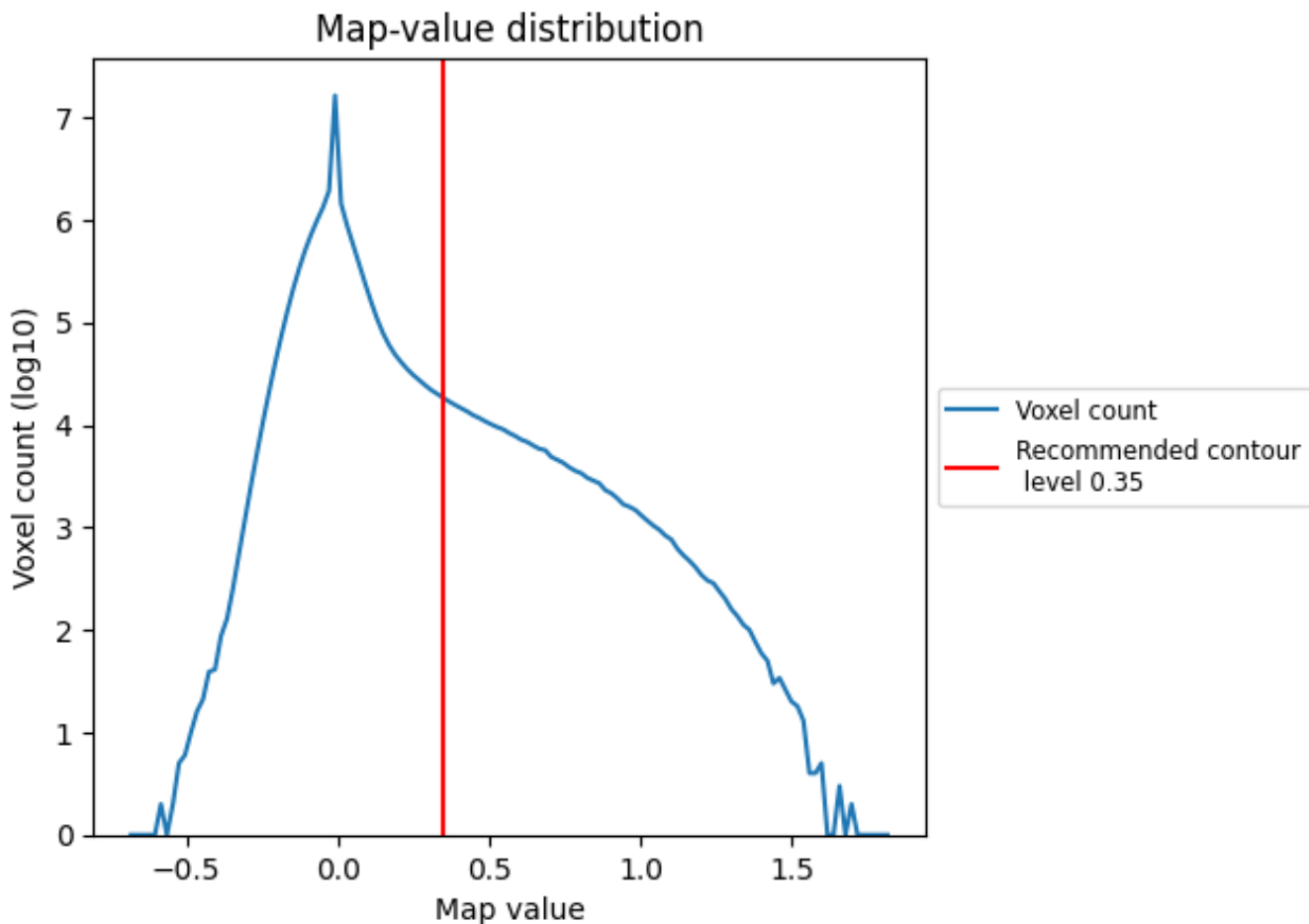


Z

7 Map analysis [i](#)

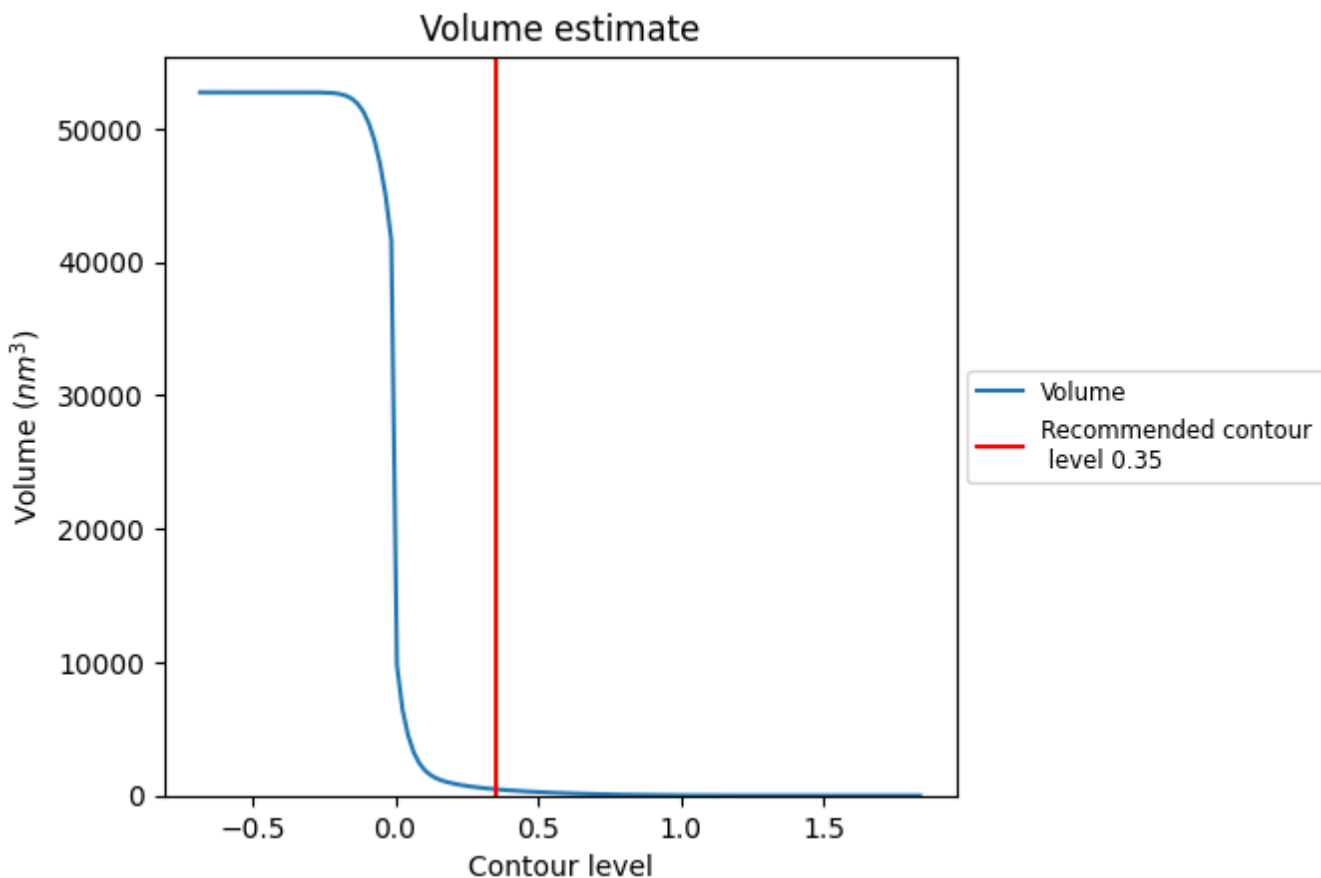
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

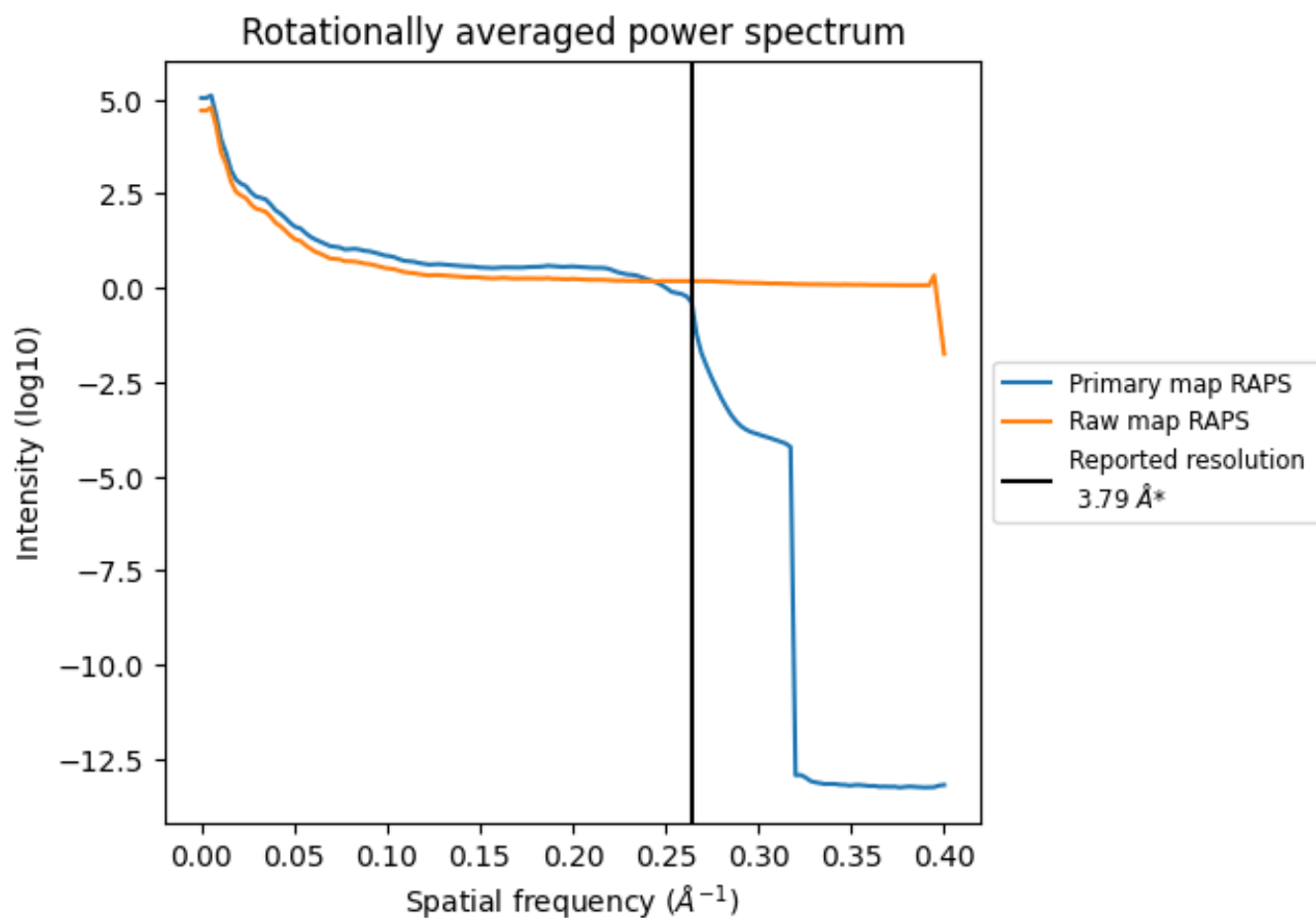
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 476 nm³; this corresponds to an approximate mass of 430 kDa.

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

7.3 Rotationally averaged power spectrum [i](#)

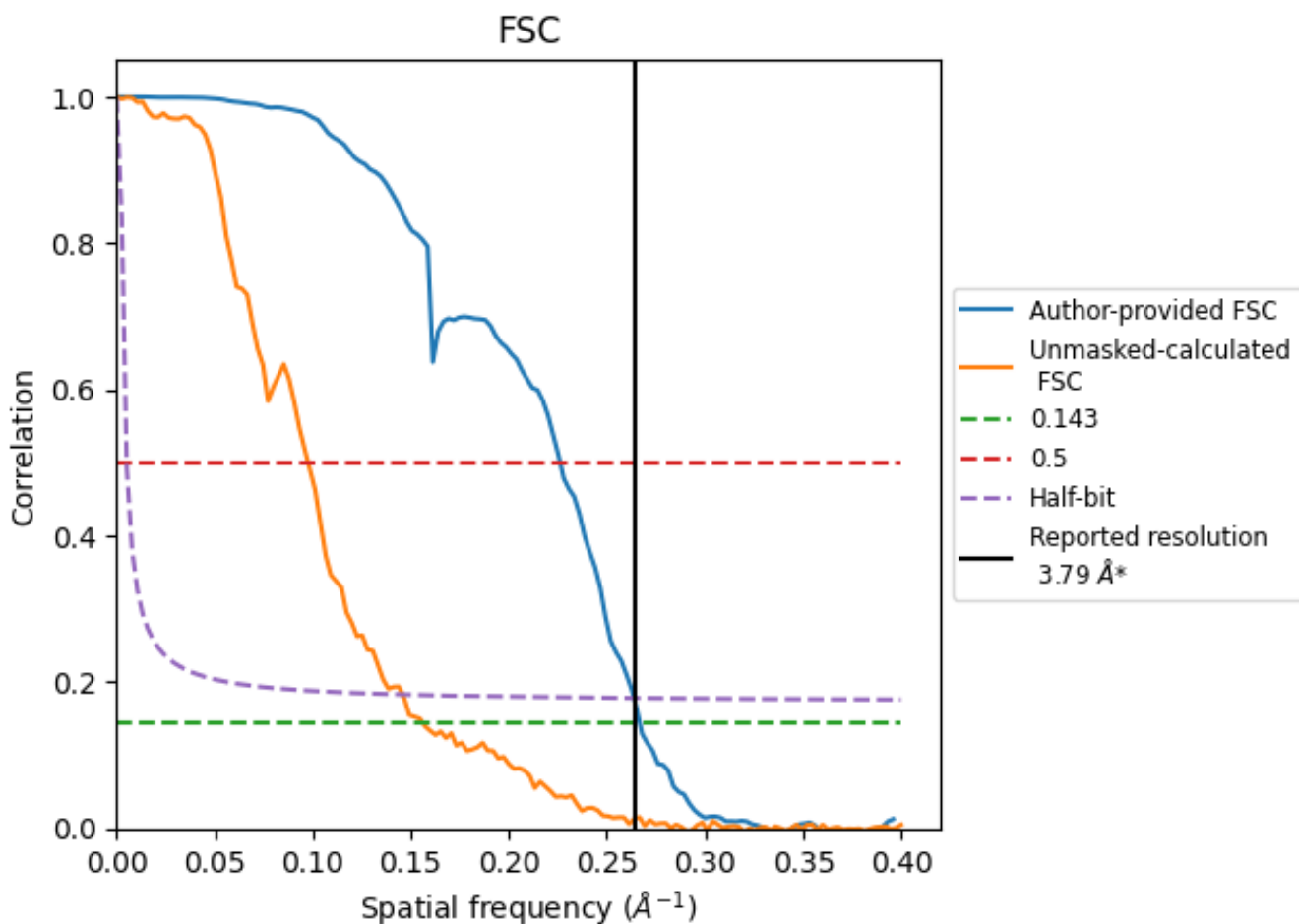


*Reported resolution corresponds to spatial frequency of 0.264 \AA^{-1}

8 Fourier-Shell correlation [i](#)

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of 0.264 \AA^{-1}

8.2 Resolution estimates [i](#)

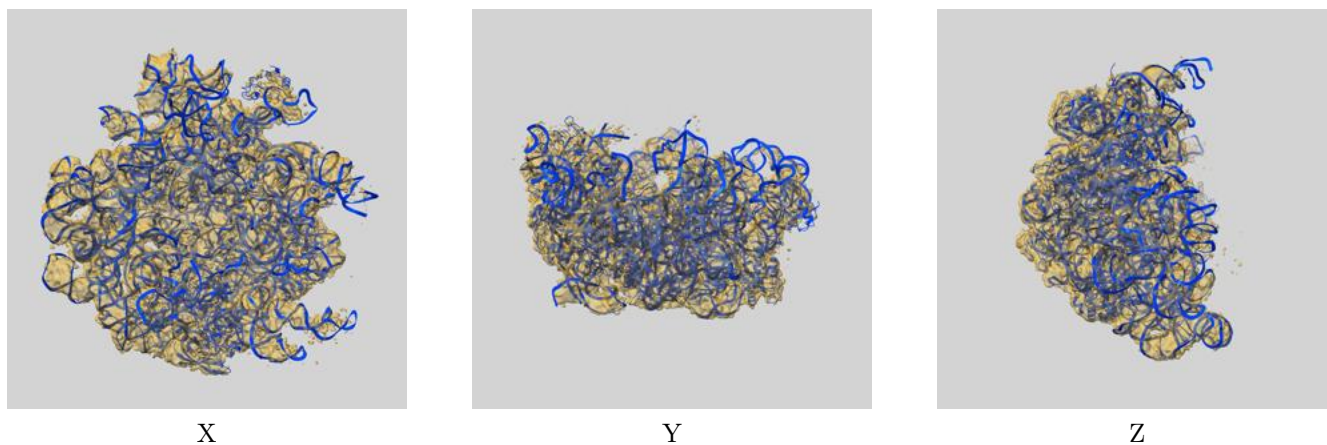
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.79	-	-
Author-provided FSC curve	3.75	4.42	3.79
Unmasked-calculated*	6.40	10.24	6.86

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 6.40 differs from the reported value 3.79 by more than 10 %

9 Map-model fit [i](#)

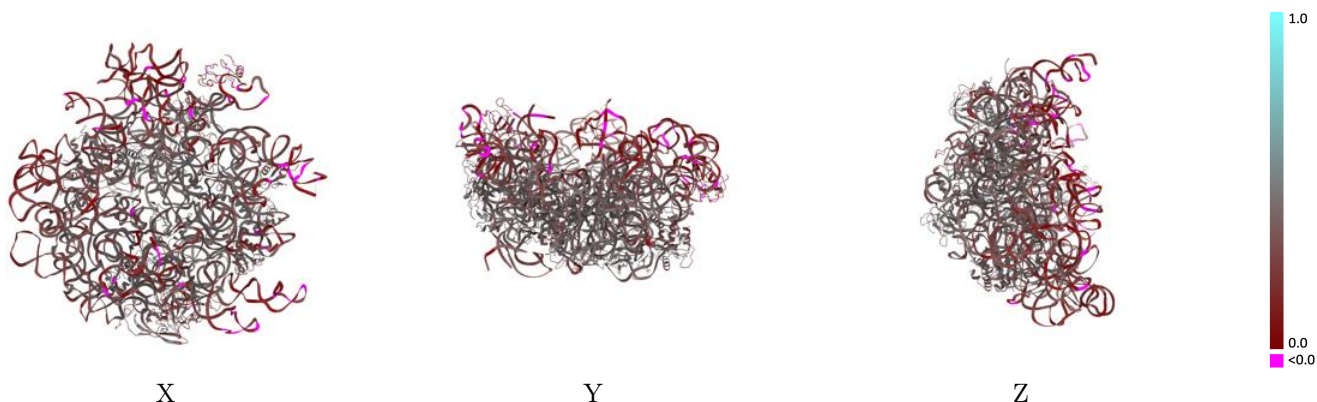
This section contains information regarding the fit between EMDB map EMD-16499 and PDB model 8C92. Per-residue inclusion information can be found in section 3 on page 7.

9.1 Map-model overlay [i](#)



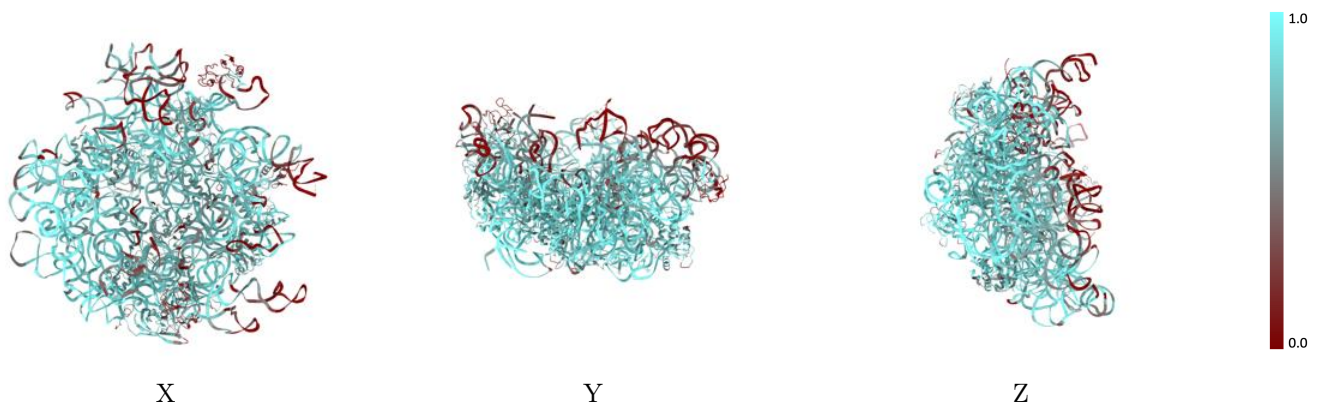
The images above show the 3D surface view of the map at the recommended contour level 0.35 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



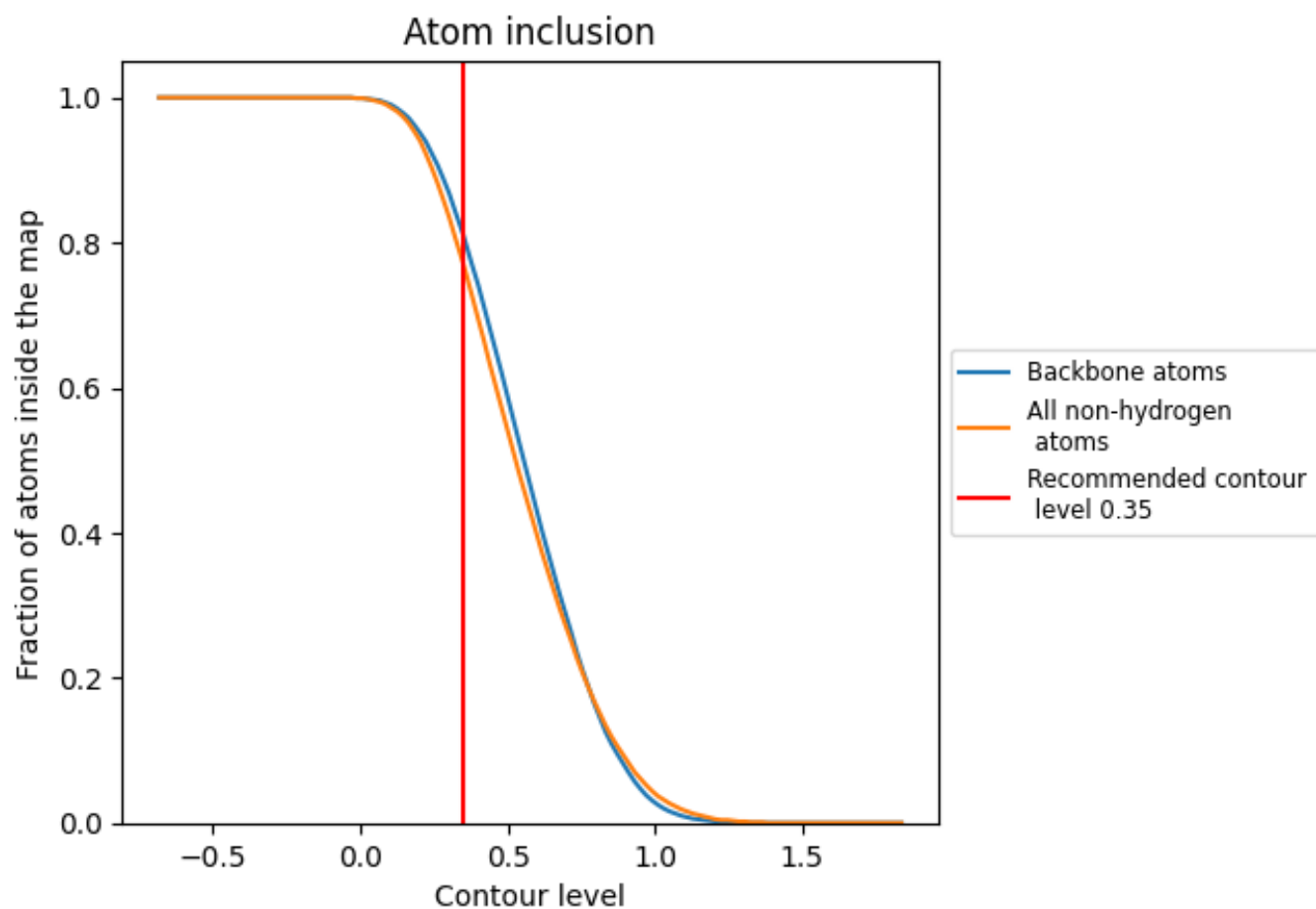
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.35).





































9.4 Atom inclusion [i](#)



At the recommended contour level, 81% of all backbone atoms, 77% 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 (0.35) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.7700	 0.3340
0	 0.6940	 0.4390
2	 0.6950	 0.4220
A	 0.7930	 0.3170
D	 0.7430	 0.4200
E	 0.7580	 0.3920
J	 0.7700	 0.3990
K	 0.3690	 0.2670
L	 0.3080	 0.2240
N	 0.8360	 0.4320
P	 0.7140	 0.3770
Q	 0.8290	 0.4180
R	 0.7380	 0.4170
S	 0.7230	 0.4290
T	 0.7480	 0.4170
U	 0.8450	 0.4310
Y	 0.7730	 0.3600
Z	 0.4610	 0.3470

