wwPDB EM Validation Summary Report

Jan 11, 2026 – 02:52 am GMT

PDB ID	:	9HYM / pdb_00009hym
EMDB ID	:	EMD-52512
Title	:	Structure of WT E.coli ribosome with complexed filament nascent chain at length 34, with mRNA, P-site and A-site tRNAs, and mRNA
Authors	:	Mitropoulou, A.; Wlodarski, T.; Plessa, E.; Cabrita, L.D.; Christodoulou, J.
Deposited on	:	2025-01-10
Resolution	:	2.20 Å(reported)

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

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

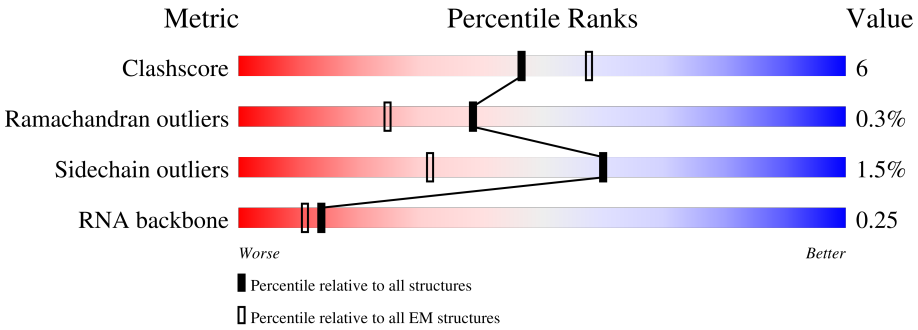
EMDB validation analysis	:	0.0.1.dev129
MolProbity	:	4-5-2 with Phenix2.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics	:	202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.47

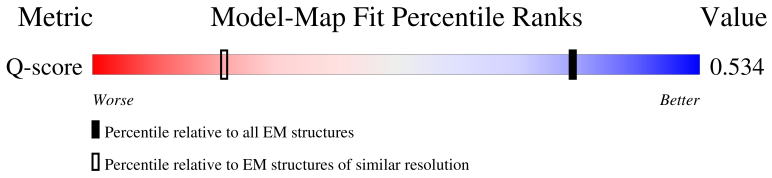
1 Overall quality at a glance

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

The reported resolution of this entry is 2.20 Å.

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





Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	210492	15764	-
Ramachandran outliers	207382	16835	-
Sidechain outliers	206894	16415	-
RNA backbone	6643	2191	-
Q-score	-	25397	3184 (1.71 - 2.70)

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 <=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	0	78	85% 14%
2	1	63	67% 30%
3	2	59	80% 17%

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Mol	Chain	Length	Quality of chain
4	3	57	68% 28%
5	4	55	65% 25% 9%
6	6	46	98%
7	7	65	92% 6%
8	8	50	66% 10% 24%
9	a	120	69% 23% 6%
10	c	273	84% 16%
11	d	209	89% 11%
12	e	201	81% 18%
13	f	179	64% 33%
14	g	177	75% 24%
15	h	149	15% 11% 74%
16	j	142	80% 20%
17	k	123	71% 28%
18	l	144	83% 15%
19	m	136	91% 9%
20	n	127	73% 21% 6%
21	o	117	78% 19%
22	p	115	78% 20%
23	q	118	86% 14%
24	r	103	88% 9%
25	s	110	82% 17%
26	t	100	80% 11% 7%
27	u	104	69% 29%
28	w	94	88% 12%

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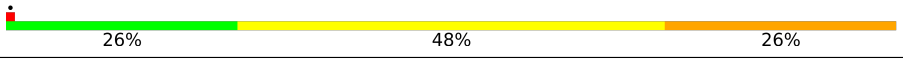
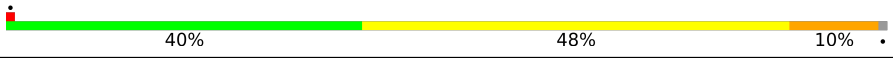
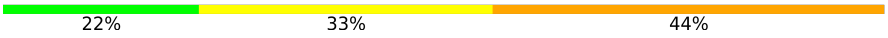
Mol	Chain	Length	Quality of chain
29	y	85	
30	v	77	
31	A	77	
32	X	9	
33	z	148	
34	b	2904	

2 Entry composition (i)

There are 34 unique types of molecules in this entry. The entry contains 92691 atoms, of which 0 are hydrogens and 0 are deuteriums.

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

- Molecule 1 is a protein called Large ribosomal subunit protein bL28.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	0	77	625	388	129	106	2	0	0

- Molecule 2 is a protein called Large ribosomal subunit protein uL29.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	1	61	495	305	97	92	1	0	0

- Molecule 3 is a protein called Large ribosomal subunit protein uL30.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	2	57	439	276	86	75	2	0	0

- Molecule 4 is a protein called Large ribosomal subunit protein bL32.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	3	55	434	263	92	78	1	0	0

- Molecule 5 is a protein called Large ribosomal subunit protein bL33.

Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
5	4	50	409	263	75	71	0	0

- Molecule 6 is a protein called Large ribosomal subunit protein bL34.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
6	6	46	377	228	90	57	2	0	0

- Molecule 7 is a protein called Large ribosomal subunit protein bL35.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	7	64	Total	C	N	O	S	0	0
			504	323	105	74	2		

- Molecule 8 is a protein called 50S ribosomal protein L36.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	8	38	Total	C	N	O	S	0	0
			301	185	65	47	4		

- Molecule 9 is a RNA chain called 5S rRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	a	118	Total	C	N	O	P	0	0
			2529	1126	464	821	118		

- Molecule 10 is a protein called Large ribosomal subunit protein uL2.

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

- Molecule 11 is a protein called 50S ribosomal protein L3.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	d	209	Total	C	N	O	S	0	0
			1565	979	288	294	4		

- Molecule 12 is a protein called Large ribosomal subunit protein uL4.

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

- Molecule 13 is a protein called Large ribosomal subunit protein uL5.

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

- Molecule 14 is a protein called Large ribosomal subunit protein uL6.

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

- Molecule 15 is a protein called Large ribosomal subunit protein bL9.

Mol	Chain	Residues	Atoms					AltConf	Trace
15	h	39	Total	C	N	O	S	0	0
			287	184	51	51	1		

- Molecule 16 is a protein called Large ribosomal subunit protein uL13.

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

- Molecule 17 is a protein called Large ribosomal subunit protein uL14.

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

- Molecule 18 is a protein called Large ribosomal subunit protein uL15.

Mol	Chain	Residues	Atoms					AltConf	Trace
18	l	143	Total	C	N	O	S	0	0
			1043	649	206	186	2		

- Molecule 19 is a protein called 50S ribosomal protein L16.

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

- Molecule 20 is a protein called Large ribosomal subunit protein bL17.

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

- Molecule 21 is a protein called Large ribosomal subunit protein uL18.

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

- Molecule 22 is a protein called Large ribosomal subunit protein bL19.

Mol	Chain	Residues	Atoms					AltConf	Trace
22	p	113	Total 908	C 570	N 177	O 160	S 1	0	0

- Molecule 23 is a protein called Large ribosomal subunit protein bL20.

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

- Molecule 24 is a protein called Large ribosomal subunit protein bL21.

Mol	Chain	Residues	Atoms					AltConf	Trace
24	r	102	Total 810	C 513	N 152	O 143	S 2	0	0

- Molecule 25 is a protein called Large ribosomal subunit protein uL22.

Mol	Chain	Residues	Atoms					AltConf	Trace
25	s	109	Total 845	C 526	N 162	O 154	S 3	0	0

- Molecule 26 is a protein called Large ribosomal subunit protein uL23.

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

- Molecule 27 is a protein called Large ribosomal subunit protein uL24.

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

- Molecule 28 is a protein called Large ribosomal subunit protein bL25.

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

- Molecule 29 is a protein called Large ribosomal subunit protein bL27.

Mol	Chain	Residues	Atoms					AltConf	Trace
29	y	82	Total	C	N	O	S	0	0
			619	383	127	108	1		

- Molecule 30 is a RNA chain called Peptidyl Pro-tRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
30	v	77	Total	C	N	O	P	0	0
			1646	733	295	541	77		

- Molecule 31 is a RNA chain called Acetyl Pro-tRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
31	A	76	Total	C	N	O	P	0	0
			1626	724	291	535	76		

- Molecule 32 is a RNA chain called mRNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
32	X	9	Total	C	N	O	P	0	0
			190	84	32	65	9		

- Molecule 33 is a protein called Gelation factor.

Mol	Chain	Residues	Atoms				AltConf	Trace
33	z	20	Total	C	N	O	0	0
			181	126	30	25		

There are 28 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
z	1	MET	-	initiating methionine	UNP P13466
z	2	HIS	-	expression tag	UNP P13466
z	3	HIS	-	expression tag	UNP P13466
z	4	HIS	-	expression tag	UNP P13466
z	5	HIS	-	expression tag	UNP P13466
z	6	HIS	-	expression tag	UNP P13466

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Chain	Residue	Modelled	Actual	Comment	Reference
z	7	HIS	-	expression tag	UNP P13466
z	8	ALA	-	expression tag	UNP P13466
z	9	SER	-	expression tag	UNP P13466
z	130	GLU	-	expression tag	UNP P13466
z	131	LEU	-	expression tag	UNP P13466
z	132	PHE	-	expression tag	UNP P13466
z	133	SER	-	expression tag	UNP P13466
z	134	THR	-	expression tag	UNP P13466
z	135	PRO	-	expression tag	UNP P13466
z	136	VAL	-	expression tag	UNP P13466
z	137	TRP	-	expression tag	UNP P13466
z	138	ILE	-	expression tag	UNP P13466
z	139	TRP	-	expression tag	UNP P13466
z	140	TRP	-	expression tag	UNP P13466
z	141	TRP	-	expression tag	UNP P13466
z	142	PRO	-	expression tag	UNP P13466
z	143	ARG	-	expression tag	UNP P13466
z	144	ILE	-	expression tag	UNP P13466
z	145	ARG	-	expression tag	UNP P13466
z	146	GLY	-	expression tag	UNP P13466
z	147	PRO	-	expression tag	UNP P13466
z	148	PRO	-	expression tag	UNP P13466

- Molecule 34 is a RNA chain called 23S rRNA.

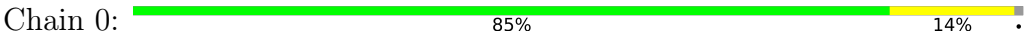
Mol	Chain	Residues	Atoms					AltConf	Trace
34	b	2901	Total	C	N	O	P	0	0
			62281	27784	11464	20132	2901		

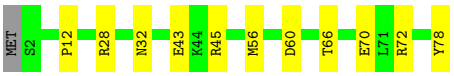
3 Residue-property plots (i)

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: Large ribosomal subunit protein bL28

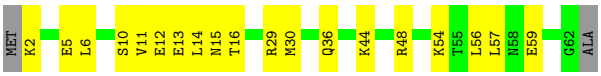
Chain 0:





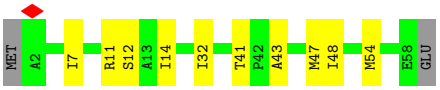
• Molecule 2: Large ribosomal subunit protein uL29

Chain 1:



• Molecule 3: Large ribosomal subunit protein uL30

Chain 2:

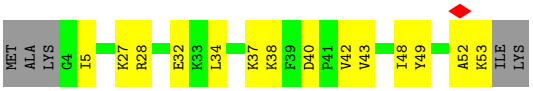


• Molecule 4: Large ribosomal subunit protein bL32

Chain 3:

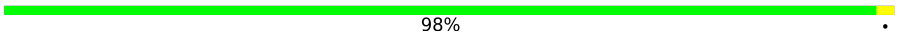
• Molecule 5: Large ribosomal subunit protein bL33

Chain 4:



• Molecule 6: Large ribosomal subunit protein bL34

Chain 6:

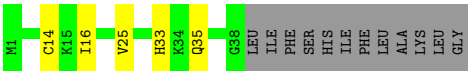


• Molecule 7: Large ribosomal subunit protein bL35

Chain 7:

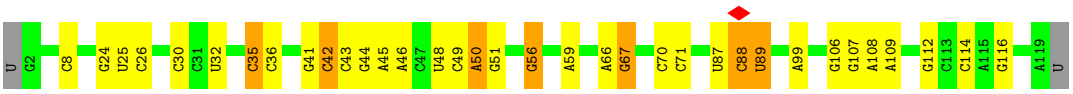
• Molecule 8: 50S ribosomal protein L36

Chain 8:



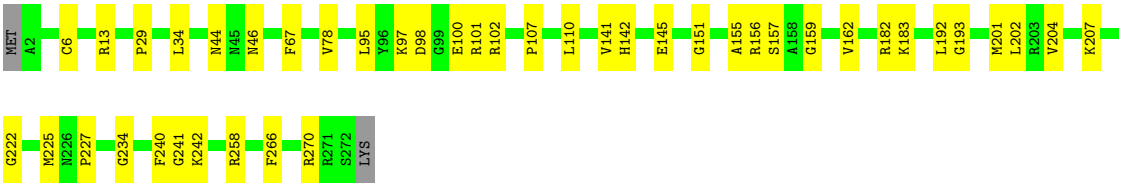
• Molecule 9: 5S rRNA

Chain a:



• Molecule 10: Large ribosomal subunit protein uL2

Chain c:



• Molecule 11: 50S ribosomal protein L3

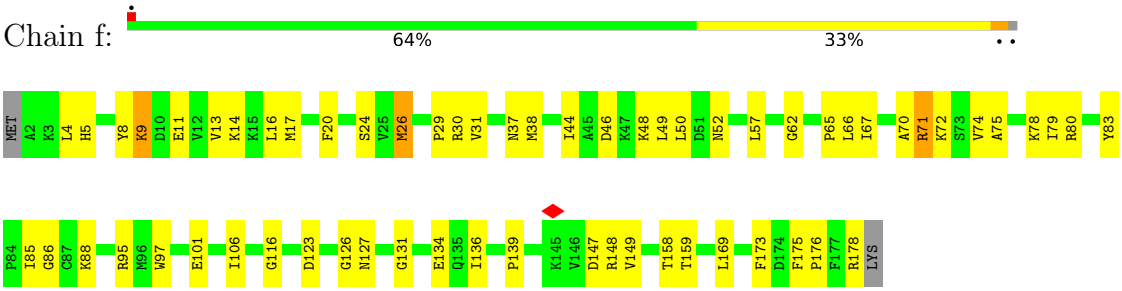
Chain d:

• Molecule 12: Large ribosomal subunit protein uL4

Chain e:

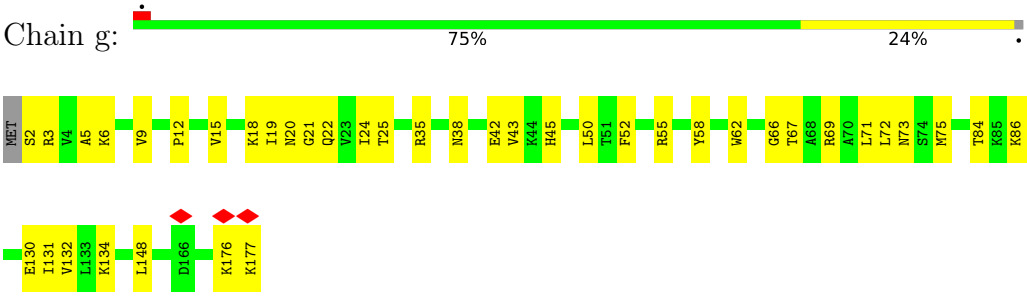
• Molecule 13: Large ribosomal subunit protein uL5

Chain f:



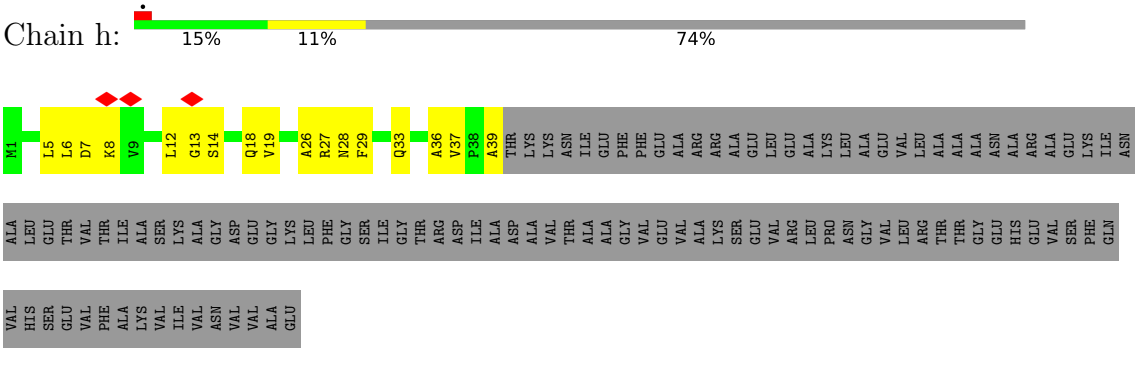
• Molecule 14: Large ribosomal subunit protein uL6

Chain g:



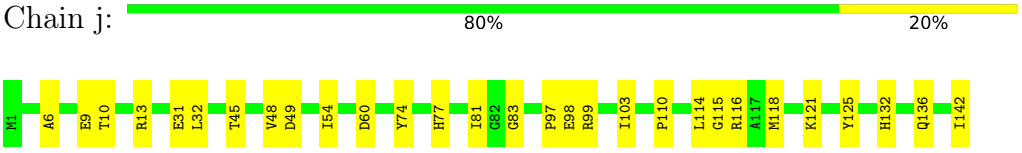
• Molecule 15: Large ribosomal subunit protein bL9

Chain h:



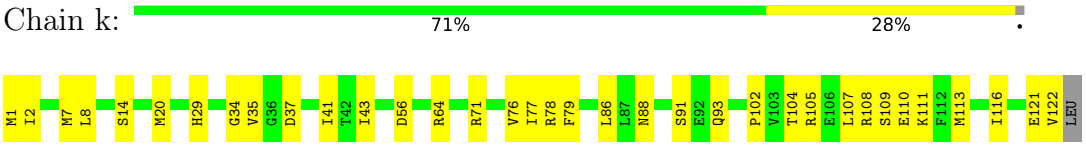
• Molecule 16: Large ribosomal subunit protein uL13

Chain j:



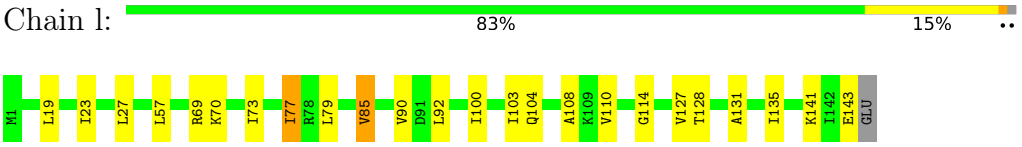
• Molecule 17: Large ribosomal subunit protein uL14

Chain k:



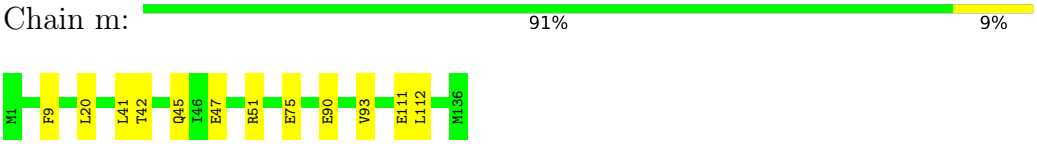
• Molecule 18: Large ribosomal subunit protein uL15

Chain l:



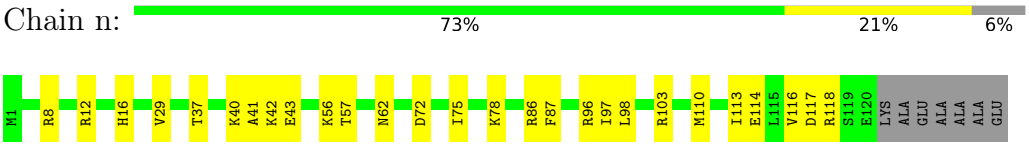
• Molecule 19: 50S ribosomal protein L16

Chain m:



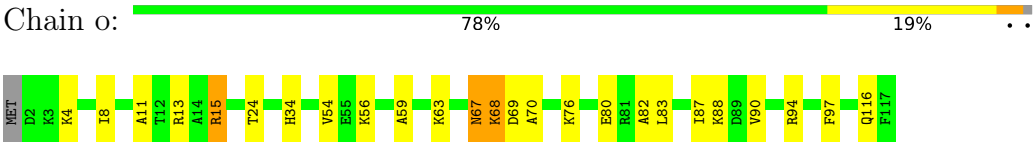
• Molecule 20: Large ribosomal subunit protein bL17

Chain n:



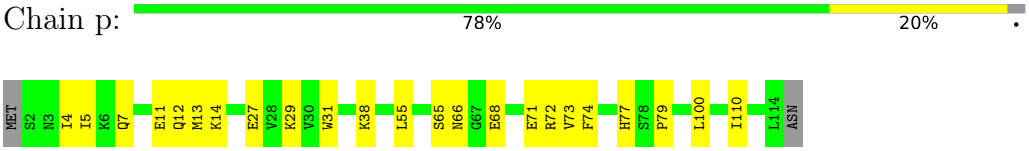
• Molecule 21: Large ribosomal subunit protein uL18

Chain o:



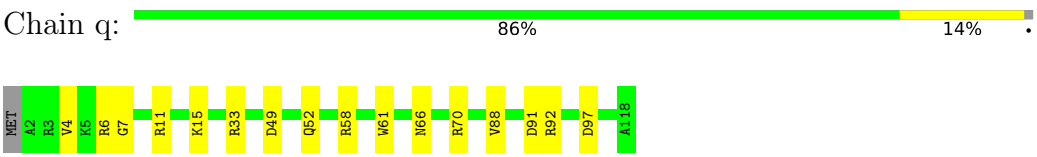
• Molecule 22: Large ribosomal subunit protein bL19

Chain p:



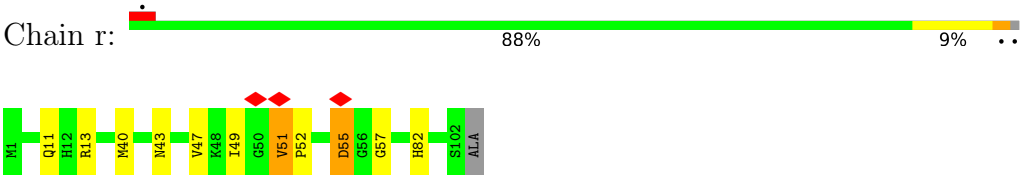
• Molecule 23: Large ribosomal subunit protein bL20

Chain q:



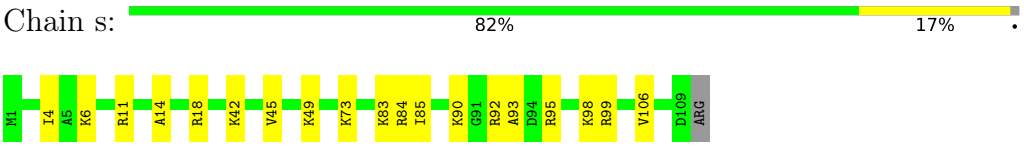
• Molecule 24: Large ribosomal subunit protein bL21

Chain r:



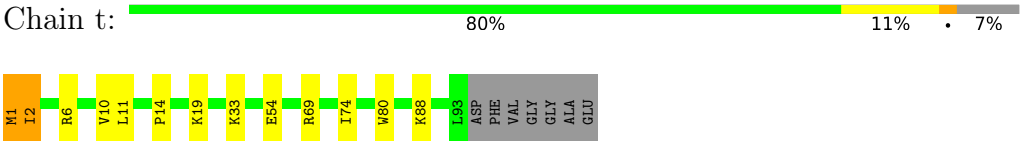
• Molecule 25: Large ribosomal subunit protein uL22

Chain s:



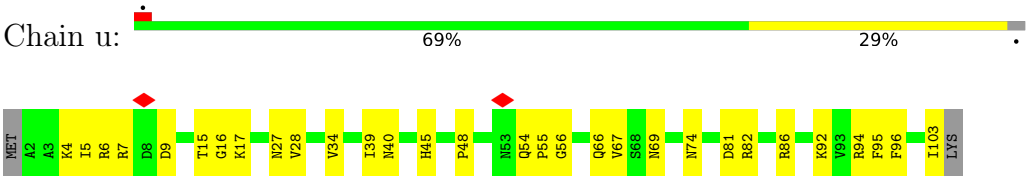
• Molecule 26: Large ribosomal subunit protein uL23

Chain t:



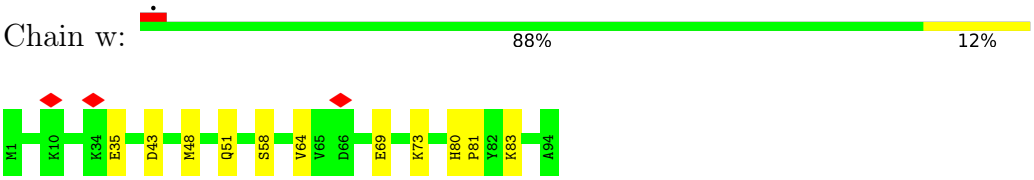
• Molecule 27: Large ribosomal subunit protein uL24

Chain u:



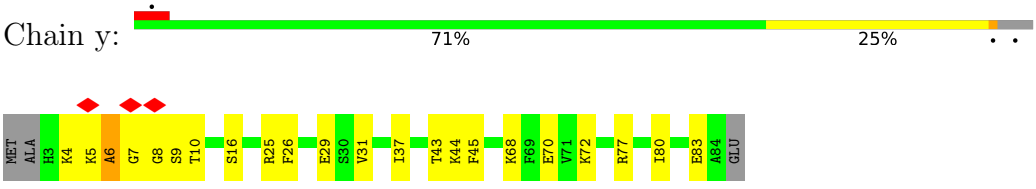
• Molecule 28: Large ribosomal subunit protein bL25

Chain w:



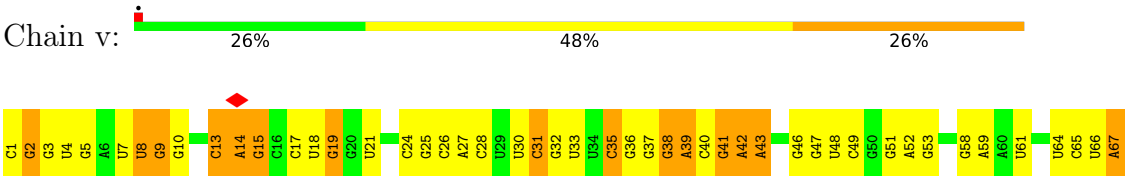
• Molecule 29: Large ribosomal subunit protein bL27

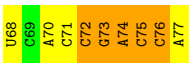
Chain y:



• Molecule 30: Peptidyl Pro-tRNA

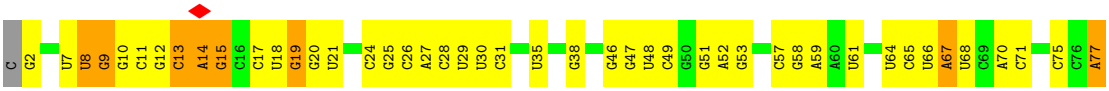
Chain v:





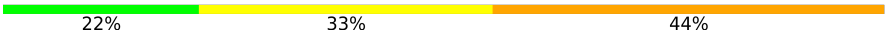
• Molecule 31: Acetyl Pro-tRNA

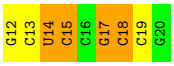
Chain A:



• Molecule 32: mRNA

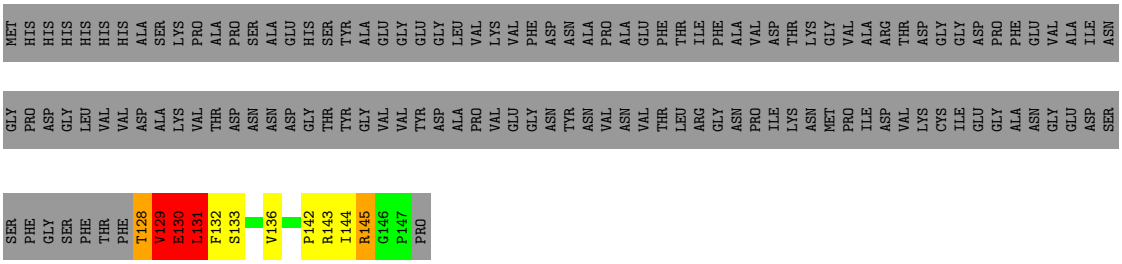
Chain X:





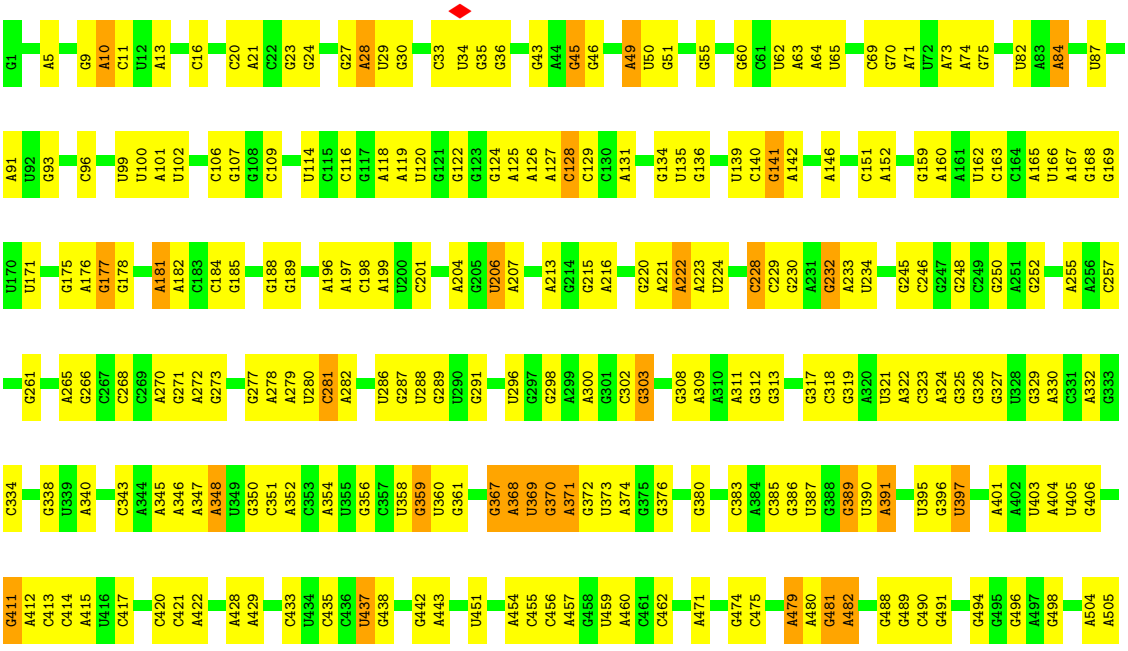
• Molecule 33: Gelation factor

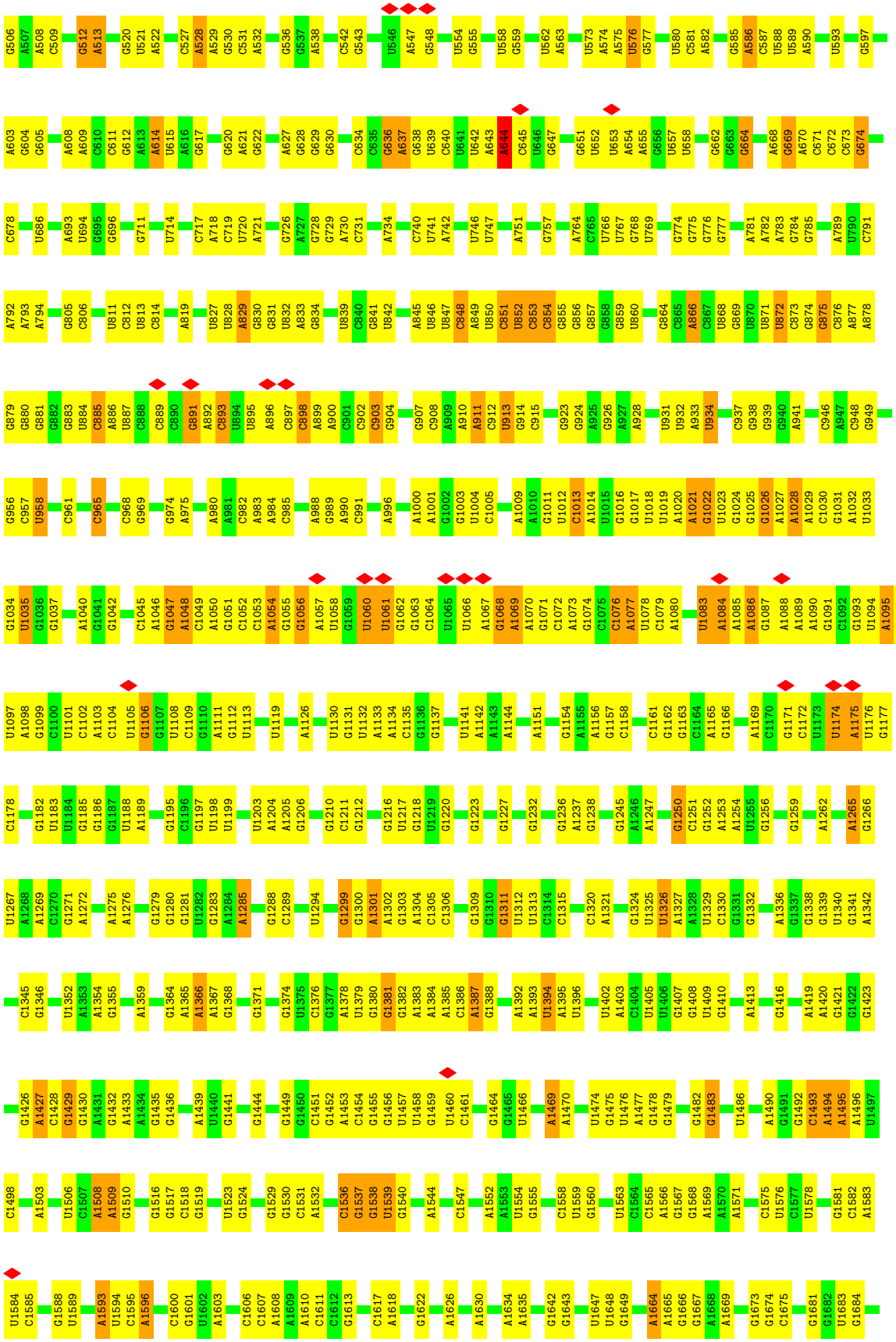
Chain z:

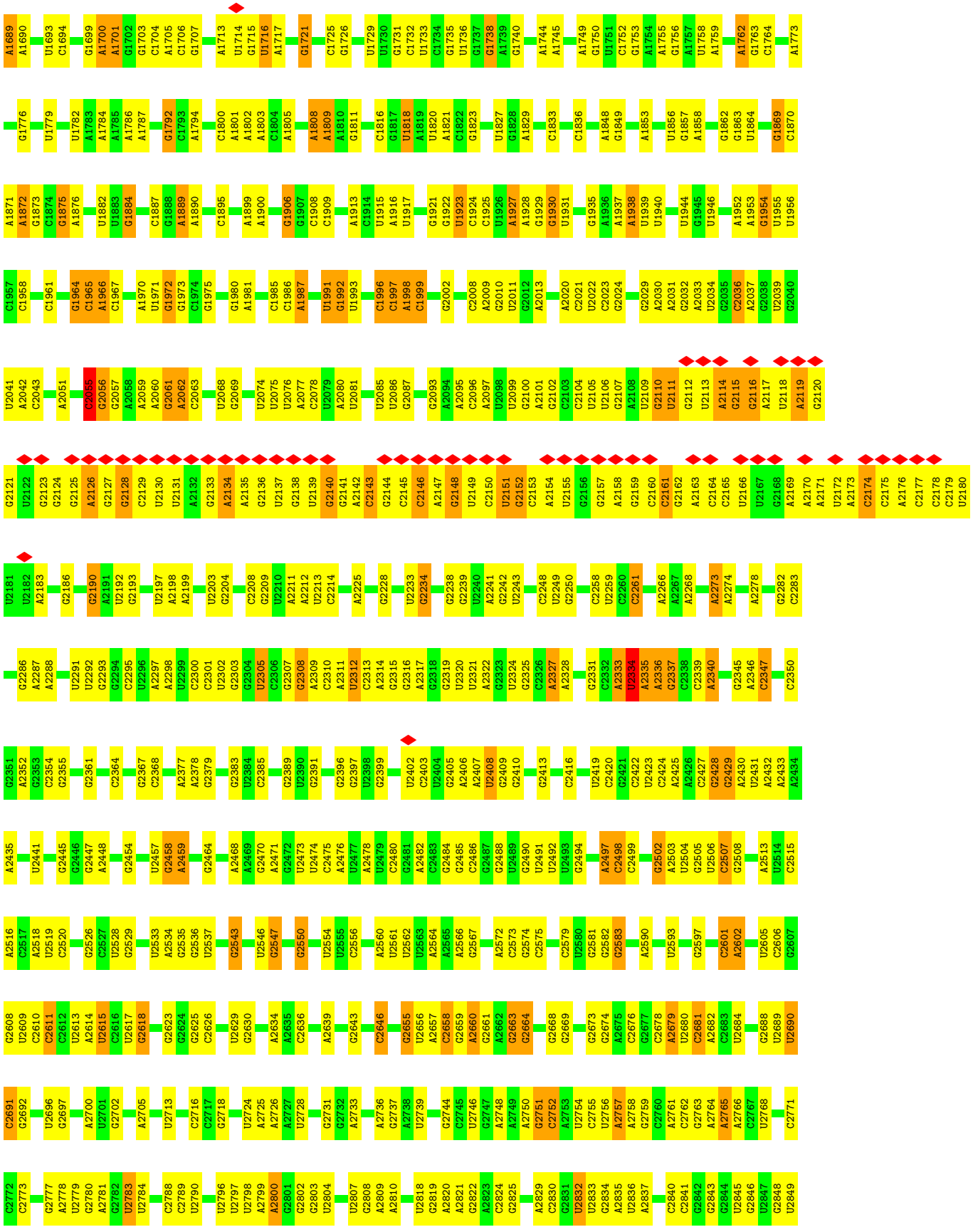


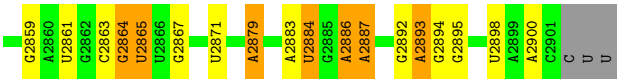
• Molecule 34: 23S rRNA

Chain b:




G506 A507 A508 C509 G512 A513 G520 U521 A522 C527 A528 A529 G530 C531 A532 G536 G537 A538 C542 G543 U546 A547 G548 U554 G555 U558 G559 U562 A563 U573 A574 A575 U576 G577 U580 C581 A582 G585 A586 C587 U588 U589 A590 U593 G597
A603 G604 G605 A608 A609 C610 C611 G612 A613 A614 U615 A616 G617 G620 A621 G622 A627 G628 G629 G630 C634 C635 G636 A637 G638 U639 C640 U641 U642 A643 A644 C645 U646 G647 G651 U652 U653 A654 A655 G656 U657 U658 G662 G663 G664 A668 G669 A670 C671 C672 C673 G674
C678 U686 A693 U694 G695 G696 G711 U714 C717 A718 C719 U720 A721 G726 A727 G728 G729 A730 C731 A734 C740 U741 A742 U746 U747 A751 G757 A764 C765 U766 U767 G768 U769 G774 G775 G776 G777 A781 A782 A783 G784 G785 A789 U790 C791
A792 A793 A794 G805 C806 U811 C812 U813 C814 A819 U827 U828 A829 G830 G831 U832 A833 G834 U839 C840 G841 U842 A845 U846 U847 C848 A849 U850 C851 U852 C853 C854 G855 G856 G857 C858 G859 U860 G864 C865 A866 C867 U868 G869 U870 U871 U872 C873 G874 G875 C876 A877 A878
G879 G880 C881 G882 G883 U884 C885 A886 U887 C888 C889 C890 G891 A892 C893 U894 U895 A896 C897 C898 A899 A900 C901 C902 C903 G904 G907 C908 A909 A910 A911 C912 U913 G914 C915 G923 G924 A925 G926 A927 A928 U931 U932 A933 U934 C937 G938 G939 G940 A941 C946 A947 C948 G949
G956 C957 U958 C961 C965 C968 G969 G974 A975 A980 A981 C982 A983 A984 C985 A988 G989 A990 C991 A996 A1000 A1001 G1002 G1003 U1004 C1005 A1009 A1010 G1011 U1012 C1013 A1014 U1015 G1016 G1017 U1018 U1019 A1020 A1021 G1022 U1023 G1024 G1025 G1026 A1027 A1028 A1029 C1030 G1031 A1032 U1033
G1034 U1035 G1036 G1037 A1040 G1041 G1042 C1045 A1046 G1047 A1048 C1049 A1050 G1051 C1052 C1053 A1054 G1055 G1056 A1057 U1058 G1059 U1060 U1061 G1062 G1063 C1064 U1065 U1066 A1067 G1068 A1069 A1070 G1071 C1072 A1073 A1074 C1075 C1076 A1077 U1078 C1079 A1080 U1083 A1084 A1085 A1086 G1087 A1088 A1089 A1090 G1091 C1092 G1093 U1094 A1095 A1096
U1097 A1098 G1099 C1100 U1101 C1102 A1103 C1104 U1105 G1106 G1107 U1108 C1109 G1110 A1111 G1112 U1113 U1119 A1126 U1130 G1131 U1132 A1133 A1134 C1135 G1136 G1137 U1141 A1142 A1143 A1144 A1151 G1154 A1155 A1156 G1157 C1158 C1161 G1162 G1163 C1164 A1165 G1166 A1169 C1170 G1171 C1172 U1173 U1174 A1175 U1176 G1177
C1178 G1182 U1183 U1184 G1185 G1186 G1187 U1188 A1189 G1195 C1196 G1197 U1198 U1199 U1203 A1204 A1205 G1206 G1210 C1211 G1212 G1216 U1217 G1218 U1219 G1220 G1223 G1227 G1232 G1236 A1237 G1238 G1245 A1246 A1247 G1250 C1251 G1252 A1253 A1254 U1255 G1256 G1259 A1262 A1265 G1266
U1267 A1268 A1269 C1270 G1271 A1272 A1275 A1276 G1279 G1280 G1281 U1282 G1283 A1284 A1285 G1288 C1289 U1294 G1299 G1300 A1301 A1302 G1303 A1304 C1305 C1306 G1309 G1310 G1311 U1312 U1313 C1314 C1315 C1320 A1321 G1324 U1325 U1326 A1327 A1328 U1329 C1330 G1331 G1332 A1336 G1337 G1338 G1339 U1340 G1341 A1342
C1345 C1346 U1352 A1353 A1354 G1355 A1359 G1364 A1365 A1366 A1367 G1368 C1371 G1374 U1375 C1376 G1377 A1378 U1379 G1380 G1381 G1382 A1383 A1384 A1385 C1386 A1387 G1388 A1392 A1393 U1394 A1395 U1396 U1402 A1403 C1404 U1405 U1406 G1407 G1408 U1409 G1410 A1413 G1416 A1419 A1420 G1421 G1422 G1423
G1426 A1427 C1428 G1429 G1430 A1431 G1432 A1433 A1434 G1435 G1436 A1439 U1440 G1441 G1444 G1449 G1450 C1451 G1452 A1453 C1454 G1455 G1456 U1457 U1458 G1459 U1460 C1461 G1464 G1465 U1466 A1469 A1470 U1474 G1475 U1476 A1477 G1478 G1479 G1482 G1483 U1486 A1490 G1491 G1492 C1493 A1494 A1495 A1496 U1497
C1498 A1503 U1506 C1507 A1508 A1509 G1510 G1516 G1517 C1518 G1519 U1523 G1524 G1529 G1530 C1531 A1532 C1536 G1537 G1538 U1539 G1540 A1544 C1547 A1552 A1553 U1554 G1555 C1558 U1559 G1560 U1563 C1564 C1565 A1566 G1567 G1568 A1569 A1570 A1571 C1575 U1576 C1577 U1578 G1581 C1582 A1583
U1584 C1585 G1588 U1589 A1593 U1594 C1595 A1596 C1600 G1601 U1602 A1603 C1606 C1607 A1608 A1609 A1610 C1611 C1612 G1613 C1617 A1618 G1622 A1626 A1630 A1634 A1635 G1642 G1643 U1647 U1648 G1649 A1664 A1665 G1666 G1667 A1668 A1669 G1673 C1674 C1675 G1681 G1682 U1683 G1684




G2859
A2860
U2861
G2862
C2863
G2864
U2865
U2866
G2867
U2871
A2879
A2883
U2884
G2885
A2886
A2887
G2892
A2893
G2894
G2895
U2898
A2899
A2900
C2901
C
U
U

4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	281242	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	14.45	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	2400	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.103	Depositor
Minimum map value	-0.023	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.004	Depositor
Recommended contour level	0.011	Depositor
Map size (Å)	411.648, 411.648, 411.648	wwPDB
Map dimensions	384, 384, 384	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.072, 1.072, 1.072	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	0	0.39	0/635	0.52	0/848
2	1	0.31	0/496	0.46	0/660
3	2	0.35	0/443	0.40	0/593
4	3	0.47	0/440	0.72	0/588
5	4	0.47	0/416	0.66	0/554
6	6	0.39	0/380	0.48	0/498
7	7	0.46	0/513	0.57	0/676
8	8	0.39	0/302	0.48	0/397
9	a	0.38	0/2828	0.36	0/4410
10	c	0.37	0/2121	0.48	0/2852
11	d	0.40	0/1586	0.48	0/2134
12	e	0.33	0/1571	0.43	1/2113 (0.0%)
13	f	0.40	0/1434	0.62	0/1926
14	g	0.35	0/1343	0.52	0/1816
15	h	0.28	0/290	0.63	0/392
16	j	0.42	0/1152	0.47	1/1551 (0.1%)
17	k	0.40	0/947	0.47	0/1268
18	l	0.63	0/1052	0.82	1/1401 (0.1%)
19	m	0.36	0/1093	0.50	0/1460
20	n	0.40	0/973	0.52	0/1301
21	o	0.42	0/902	0.60	0/1209
22	p	0.38	0/920	0.43	0/1231
23	q	0.41	0/960	0.47	0/1278
24	r	0.53	0/823	0.65	0/1100
25	s	0.37	0/852	0.41	0/1142
26	t	0.39	0/744	0.53	0/994
27	u	0.39	0/787	0.57	0/1051
28	w	0.33	0/766	0.43	0/1025
29	y	0.50	0/627	0.60	0/829
30	v	0.46	0/1839	0.52	0/2866
31	A	0.42	0/1817	0.41	0/2832
32	X	0.59	0/210	0.81	0/323
33	z	1.96	3/192 (1.6%)	2.13	5/267 (1.9%)
34	b	0.51	0/69757	0.72	14/108827 (0.0%)

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\#\|Z\|>5$	RMSZ	$\#\|Z\|>5$
All	All	0.49	3/101211 (0.0%)	0.67	22/152412 (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
33	z	0	4

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
33	z	131	LEU	C-N	-16.48	1.11	1.33
33	z	130	GLU	C-N	14.87	1.59	1.33
33	z	130	GLU	N-CA	7.40	1.55	1.46

The worst 5 of 22 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
33	z	130	GLU	O-C-N	-26.05	87.95	122.59
34	b	2832	U	C4'-C3'-O3'	7.78	121.06	109.40
34	b	228	C	C4'-C3'-O3'	6.95	119.82	109.40
33	z	130	GLU	CA-C-N	6.81	133.22	123.14
33	z	130	GLU	C-N-CA	6.81	133.22	123.14

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
33	z	130	GLU	Mainchain
33	z	131	LEU	Mainchain
33	z	143	ARG	Sidechain
33	z	145	ARG	Sidechain

5.2 Too-close contacts (i)

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	0	625	0	652	7	0
2	1	495	0	526	15	0
3	2	439	0	482	6	0
4	3	434	0	445	12	0
5	4	409	0	440	8	0
6	6	377	0	418	1	0
7	7	504	0	572	3	0
8	8	301	0	341	3	0
9	a	2529	0	1281	15	0
10	c	2082	0	2154	27	0
11	d	1565	0	1616	21	0
12	e	1552	0	1619	23	0
13	f	1410	0	1444	51	0
14	g	1323	0	1371	26	0
15	h	287	0	307	12	0
16	j	1129	0	1162	21	0
17	k	938	0	1012	25	0
18	l	1043	0	1123	10	0
19	m	1074	0	1157	9	0
20	n	960	0	1000	19	0
21	o	892	0	923	18	0
22	p	908	0	956	21	0
23	q	947	0	1019	15	0
24	r	810	0	834	6	0
25	s	845	0	909	29	0
26	t	738	0	807	9	0
27	u	779	0	831	23	0
28	w	753	0	780	7	0
29	y	619	0	642	16	0
30	v	1646	0	832	61	0
31	A	1626	0	819	51	0
32	X	190	0	99	6	0
33	z	181	0	173	19	0
34	b	62281	0	31323	428	0
All	All	92691	0	60069	904	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.

The worst 5 of 904 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)
34:b:892:A:C8	34:b:893:C:C6	1.96	1.54
34:b:892:A:H8	34:b:893:C:C6	1.26	1.52
34:b:892:A:C8	34:b:893:C:C5	2.13	1.34
34:b:370:G:OP2	34:b:370:G:C8	1.81	1.30
25:s:85:ILE:CD1	33:z:131:LEU:HD23	1.60	1.29

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	
1	0	75/78 (96%)	74 (99%)	1 (1%)	0	100	100
2	1	59/63 (94%)	56 (95%)	3 (5%)	0	100	100
3	2	55/59 (93%)	52 (94%)	3 (6%)	0	100	100
4	3	53/57 (93%)	49 (92%)	4 (8%)	0	100	100
5	4	48/55 (87%)	45 (94%)	3 (6%)	0	100	100
6	6	44/46 (96%)	43 (98%)	1 (2%)	0	100	100
7	7	62/65 (95%)	59 (95%)	3 (5%)	0	100	100
8	8	36/50 (72%)	35 (97%)	1 (3%)	0	100	100
10	c	269/273 (98%)	258 (96%)	11 (4%)	0	100	100
11	d	207/209 (99%)	197 (95%)	10 (5%)	0	100	100
12	e	199/201 (99%)	196 (98%)	3 (2%)	0	100	100
13	f	175/179 (98%)	164 (94%)	10 (6%)	1 (1%)	22	23
14	g	174/177 (98%)	159 (91%)	15 (9%)	0	100	100
15	h	37/149 (25%)	32 (86%)	5 (14%)	0	100	100
16	j	140/142 (99%)	138 (99%)	2 (1%)	0	100	100
17	k	120/123 (98%)	116 (97%)	4 (3%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
18	l	141/144 (98%)	132 (94%)	9 (6%)	0	100	100
19	m	134/136 (98%)	133 (99%)	1 (1%)	0	100	100
20	n	118/127 (93%)	111 (94%)	7 (6%)	0	100	100
21	o	114/117 (97%)	109 (96%)	5 (4%)	0	100	100
22	p	111/115 (96%)	110 (99%)	1 (1%)	0	100	100
23	q	115/118 (98%)	115 (100%)	0	0	100	100
24	r	100/103 (97%)	93 (93%)	5 (5%)	2 (2%)	6	4
25	s	107/110 (97%)	100 (94%)	7 (6%)	0	100	100
26	t	91/100 (91%)	87 (96%)	4 (4%)	0	100	100
27	u	100/104 (96%)	83 (83%)	17 (17%)	0	100	100
28	w	92/94 (98%)	91 (99%)	1 (1%)	0	100	100
29	y	80/85 (94%)	71 (89%)	6 (8%)	3 (4%)	2	1
33	z	18/148 (12%)	15 (83%)	1 (6%)	2 (11%)	0	0
All	All	3074/3427 (90%)	2923 (95%)	143 (5%)	8 (0%)	38	42

5 of 8 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
24	r	52	PRO
29	y	9	SER
29	y	6	ALA
33	z	130	GLU
24	r	51	VAL

5.3.2 Protein sidechains (i)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	0	67/68 (98%)	67 (100%)	0	100	100
2	1	54/55 (98%)	54 (100%)	0	100	100
3	2	47/49 (96%)	47 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
4	3	46/48 (96%)	44 (96%)	2 (4%)	25 32
5	4	45/49 (92%)	44 (98%)	1 (2%)	47 61
6	6	38/38 (100%)	38 (100%)	0	100 100
7	7	51/52 (98%)	51 (100%)	0	100 100
8	8	34/44 (77%)	34 (100%)	0	100 100
10	c	216/218 (99%)	216 (100%)	0	100 100
11	d	164/164 (100%)	164 (100%)	0	100 100
12	e	165/165 (100%)	165 (100%)	0	100 100
13	f	148/150 (99%)	144 (97%)	4 (3%)	40 53
14	g	137/138 (99%)	136 (99%)	1 (1%)	81 90
15	h	30/114 (26%)	30 (100%)	0	100 100
16	j	116/116 (100%)	116 (100%)	0	100 100
17	k	103/104 (99%)	103 (100%)	0	100 100
18	l	102/103 (99%)	94 (92%)	8 (8%)	10 11
19	m	109/109 (100%)	109 (100%)	0	100 100
20	n	100/103 (97%)	100 (100%)	0	100 100
21	o	86/87 (99%)	82 (95%)	4 (5%)	22 29
22	p	98/100 (98%)	98 (100%)	0	100 100
23	q	89/90 (99%)	89 (100%)	0	100 100
24	r	84/84 (100%)	79 (94%)	5 (6%)	16 19
25	s	92/93 (99%)	92 (100%)	0	100 100
26	t	80/84 (95%)	78 (98%)	2 (2%)	42 56
27	u	83/85 (98%)	82 (99%)	1 (1%)	67 80
28	w	78/78 (100%)	78 (100%)	0	100 100
29	y	61/63 (97%)	58 (95%)	3 (5%)	21 27
33	z	19/121 (16%)	13 (68%)	6 (32%)	0 0
All	All	2542/2772 (92%)	2505 (98%)	37 (2%)	60 75

5 of 37 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
29	y	4	LYS
33	z	144	ILE

Continued on next page...

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Mol	Chain	Res	Type
29	y	5	LYS
33	z	129	VAL
18	l	85	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 43 such sidechains are listed below:

Mol	Chain	Res	Type
21	o	98	GLN
23	q	81	ASN
21	o	116	GLN
22	p	66	ASN
25	s	7	HIS

5.3.3 RNA (i)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
30	v	76/77 (98%)	28 (36%)	0
31	A	75/77 (97%)	16 (21%)	3 (4%)
32	X	9/9 (100%)	5 (55%)	3 (33%)
34	b	2900/2904 (99%)	1196 (41%)	0
9	a	117/120 (97%)	21 (17%)	0
All	All	3177/3187 (99%)	1266 (39%)	6 (0%)

5 of 1266 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
9	a	25	U
9	a	26	C
9	a	30	C
9	a	32	U
9	a	35	C

5 of 6 RNA pucker outliers are listed below:

Mol	Chain	Res	Type
32	X	12	G
32	X	14	U
32	X	17	G
31	A	14	A
31	A	9	G

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 oligosaccharides 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)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
33	z	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	z	131:LEU	C	132:PHE	N	1.11

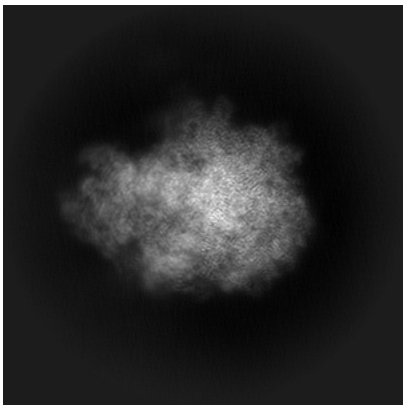
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-52512. These allow visual inspection of the internal detail of the map and identification of artifacts.

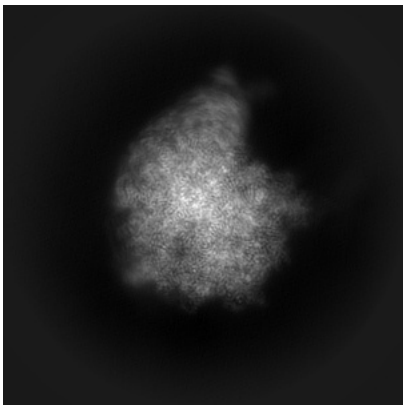
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections

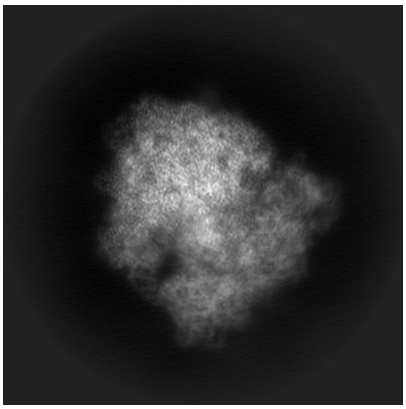
6.1.1 Primary map



X

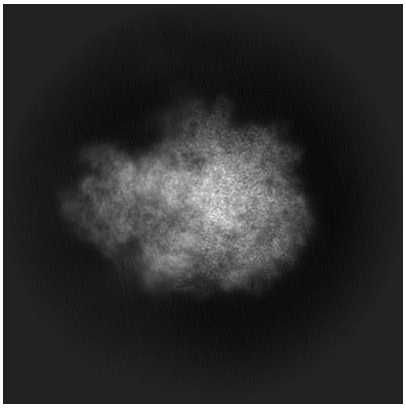


Y

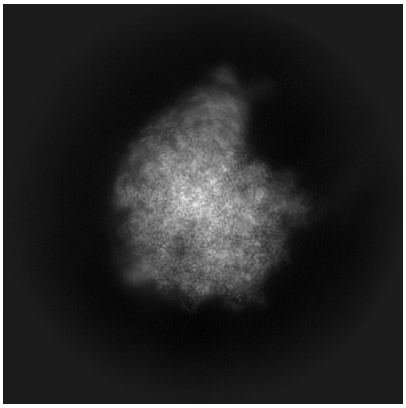


Z

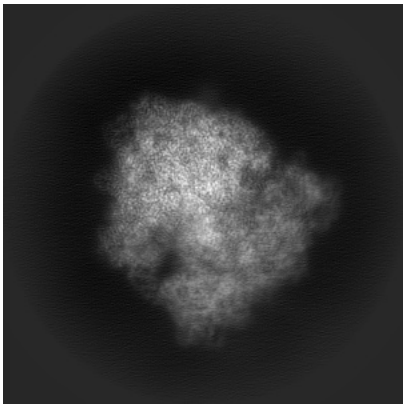
6.1.2 Raw map



X



Y

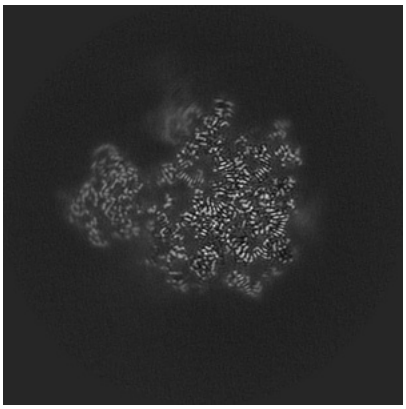


Z

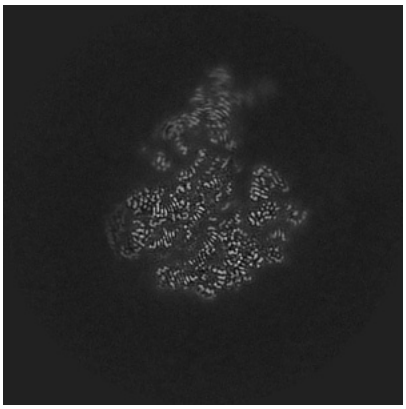
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

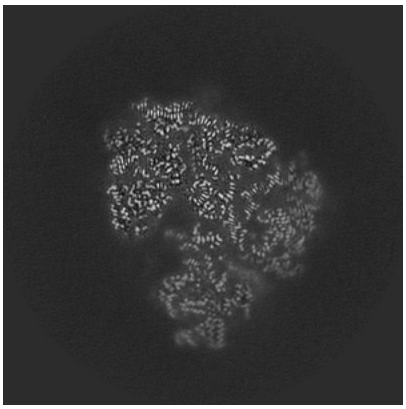
6.2.1 Primary map



X Index: 192

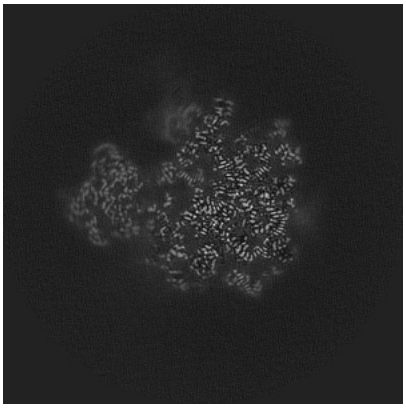


Y Index: 192

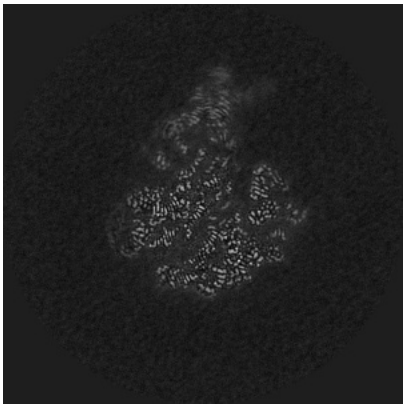


Z Index: 192

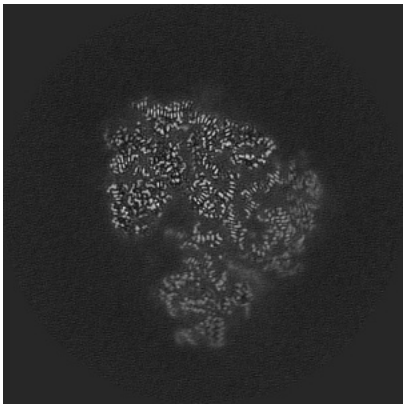
6.2.2 Raw map



X Index: 192



Y Index: 192

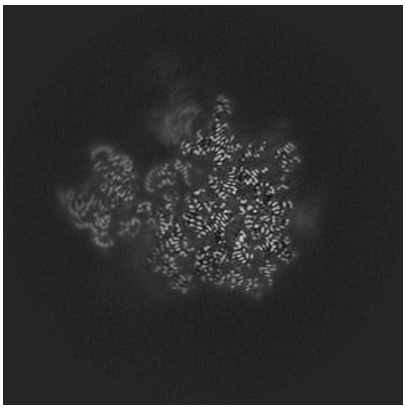


Z Index: 192

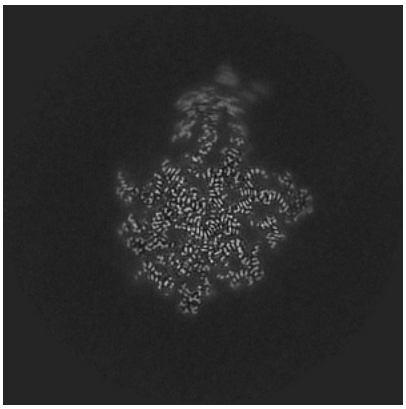
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

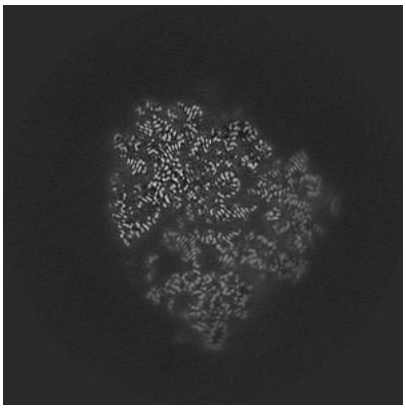
6.3.1 Primary map



X Index: 197

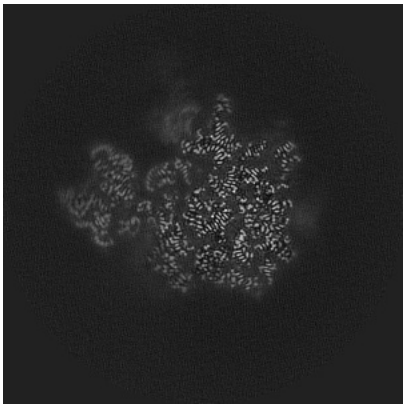


Y Index: 211

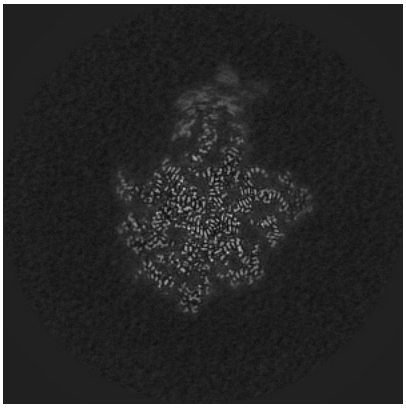


Z Index: 198

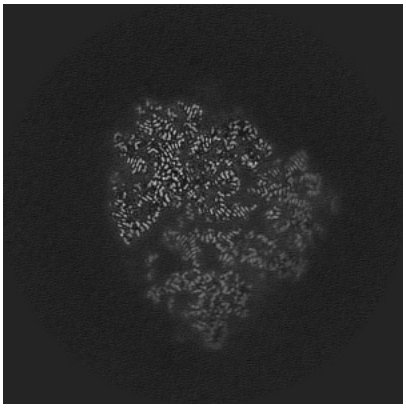
6.3.2 Raw map



X Index: 197



Y Index: 211

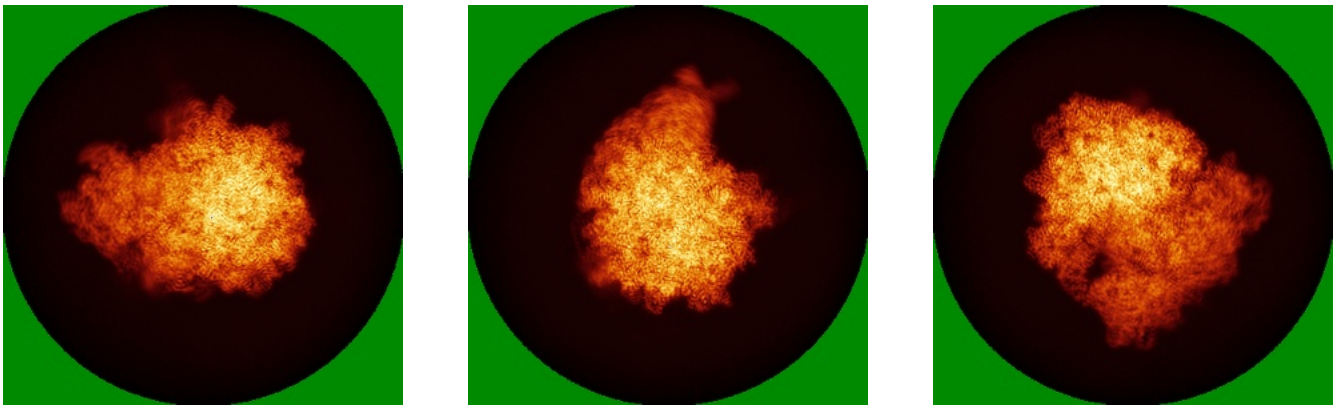


Z Index: 198

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

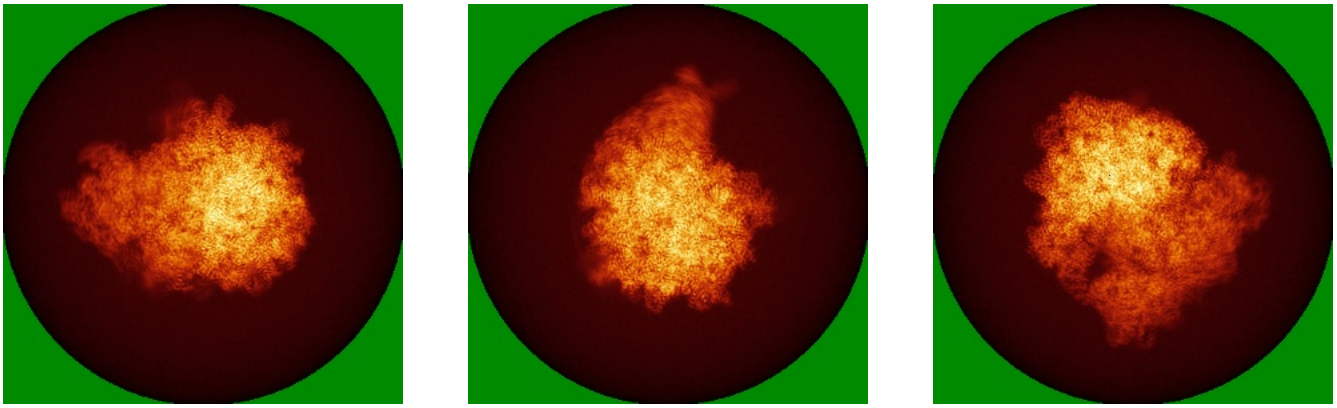
6.4 Orthogonal standard-deviation projections (False-color) (i)

6.4.1 Primary map



X Y Z

6.4.2 Raw map

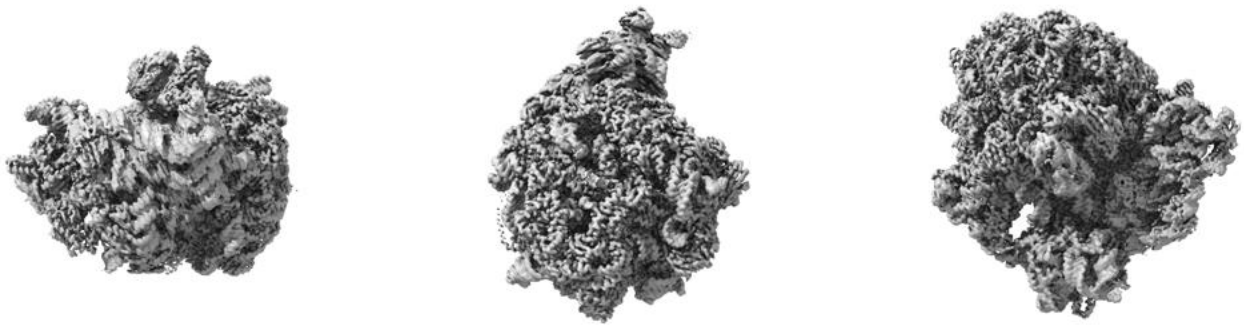


X Y Z

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

6.5 Orthogonal surface views (i)

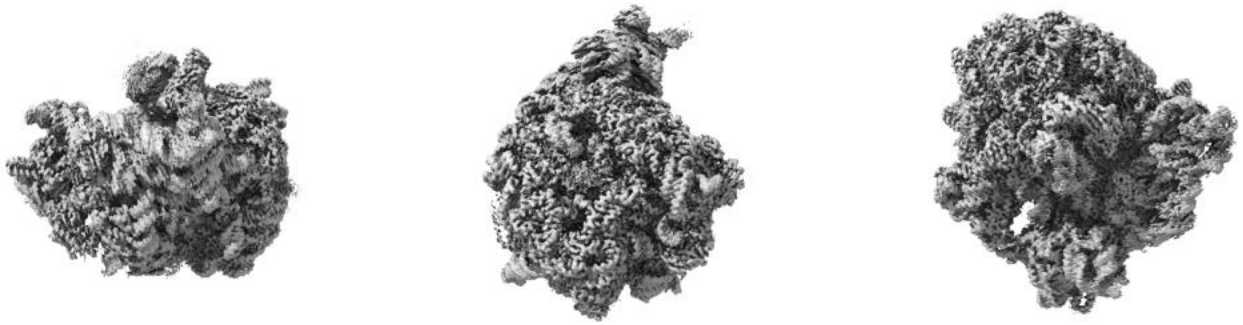
6.5.1 Primary map



X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.011. 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



X Y Z

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.

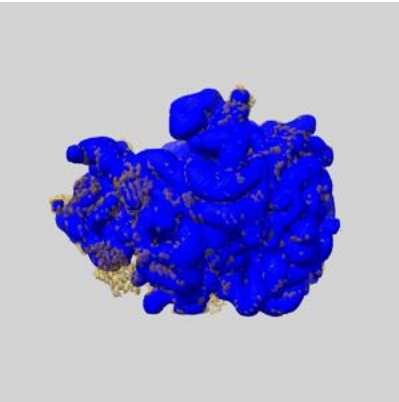
6.6 Mask visualisation (i)

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

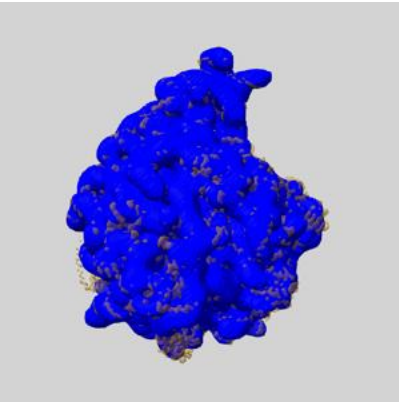
A mask typically either:

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

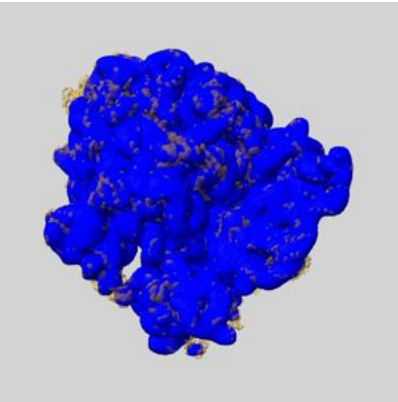
6.6.1 emd_52512_msk_1.map (i)



X



Y

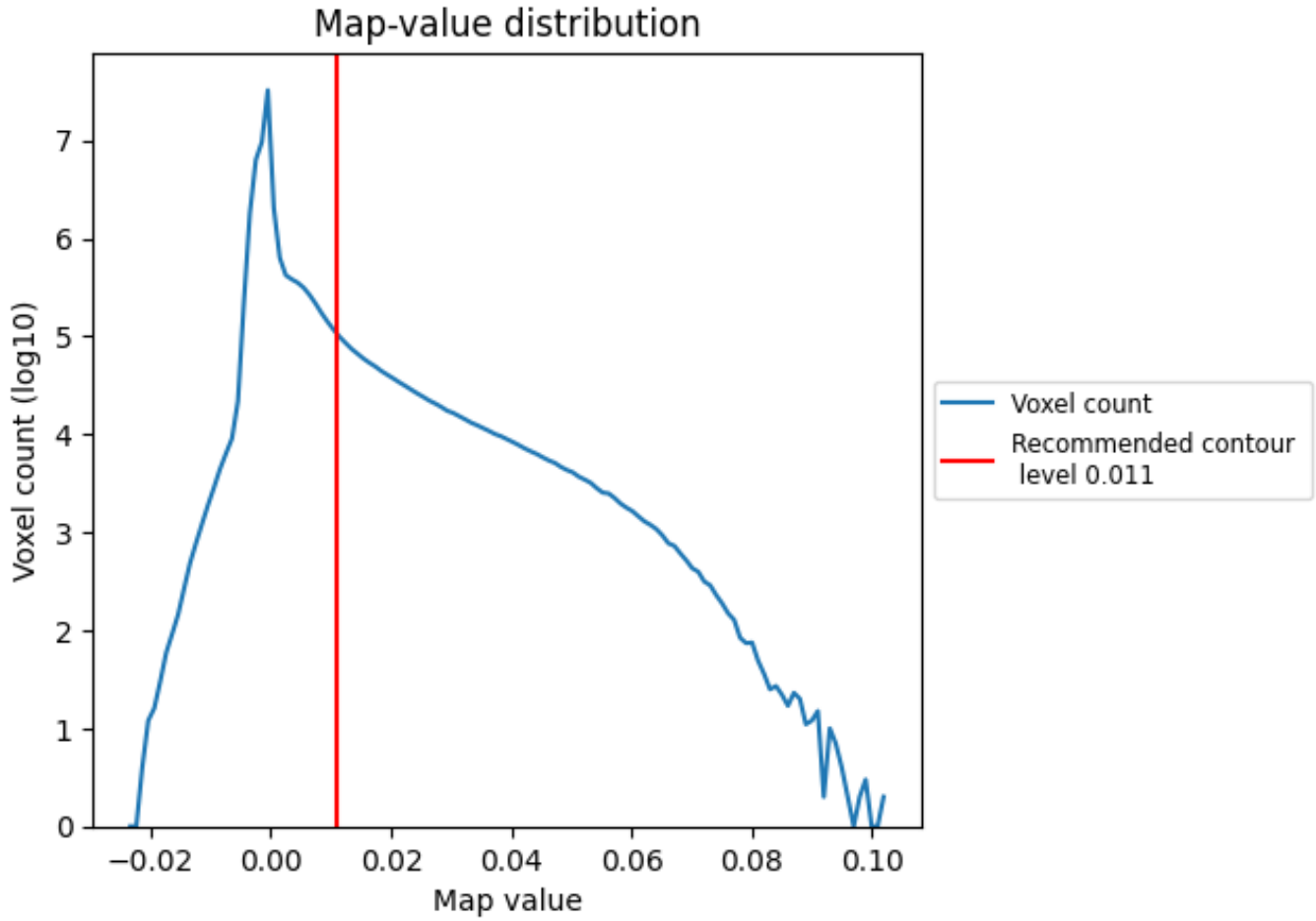


Z

7 Map analysis

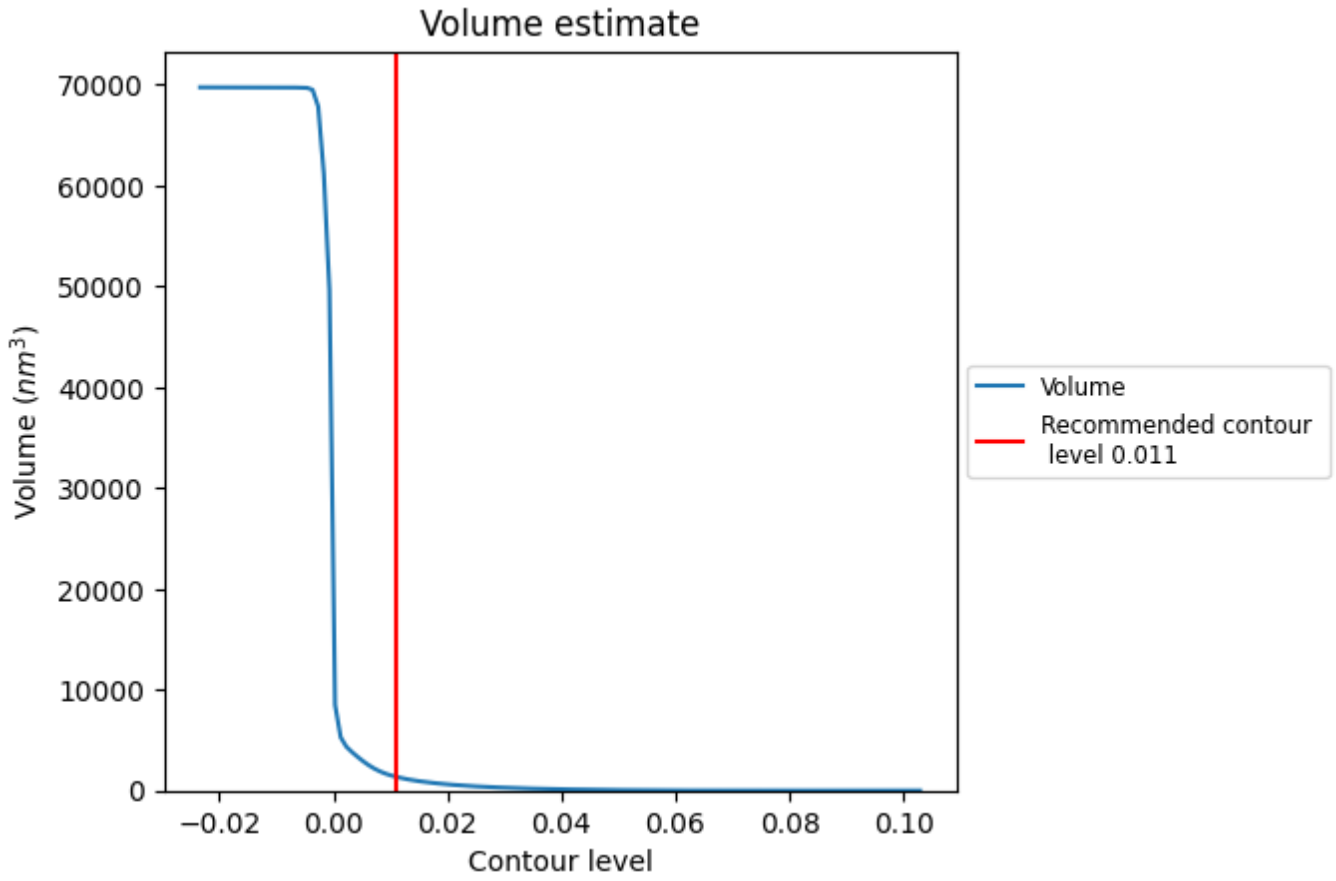
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution



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.

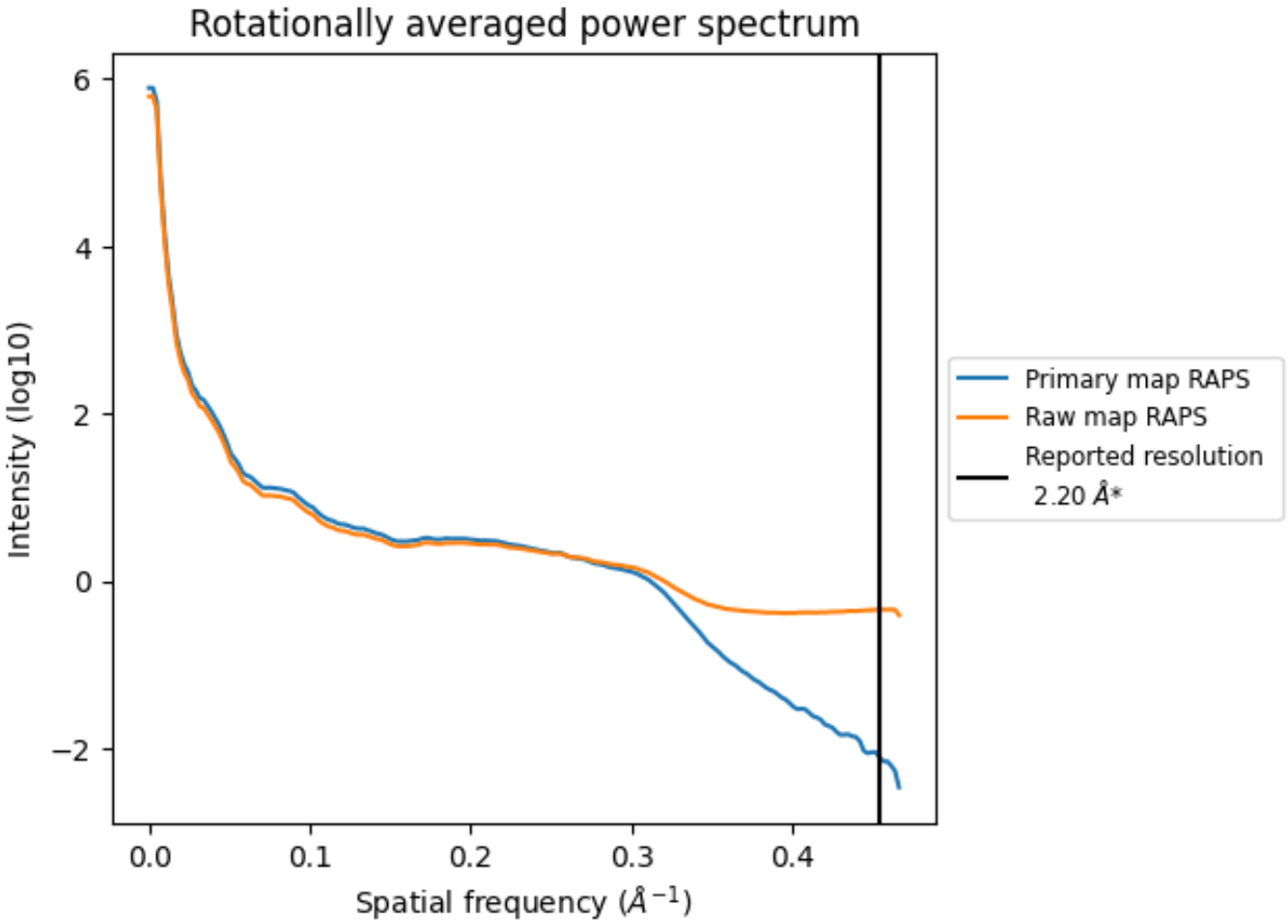
7.2 Volume estimate (i)



The volume at the recommended contour level is 1365 nm^3; this corresponds to an approximate mass of 1233 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)

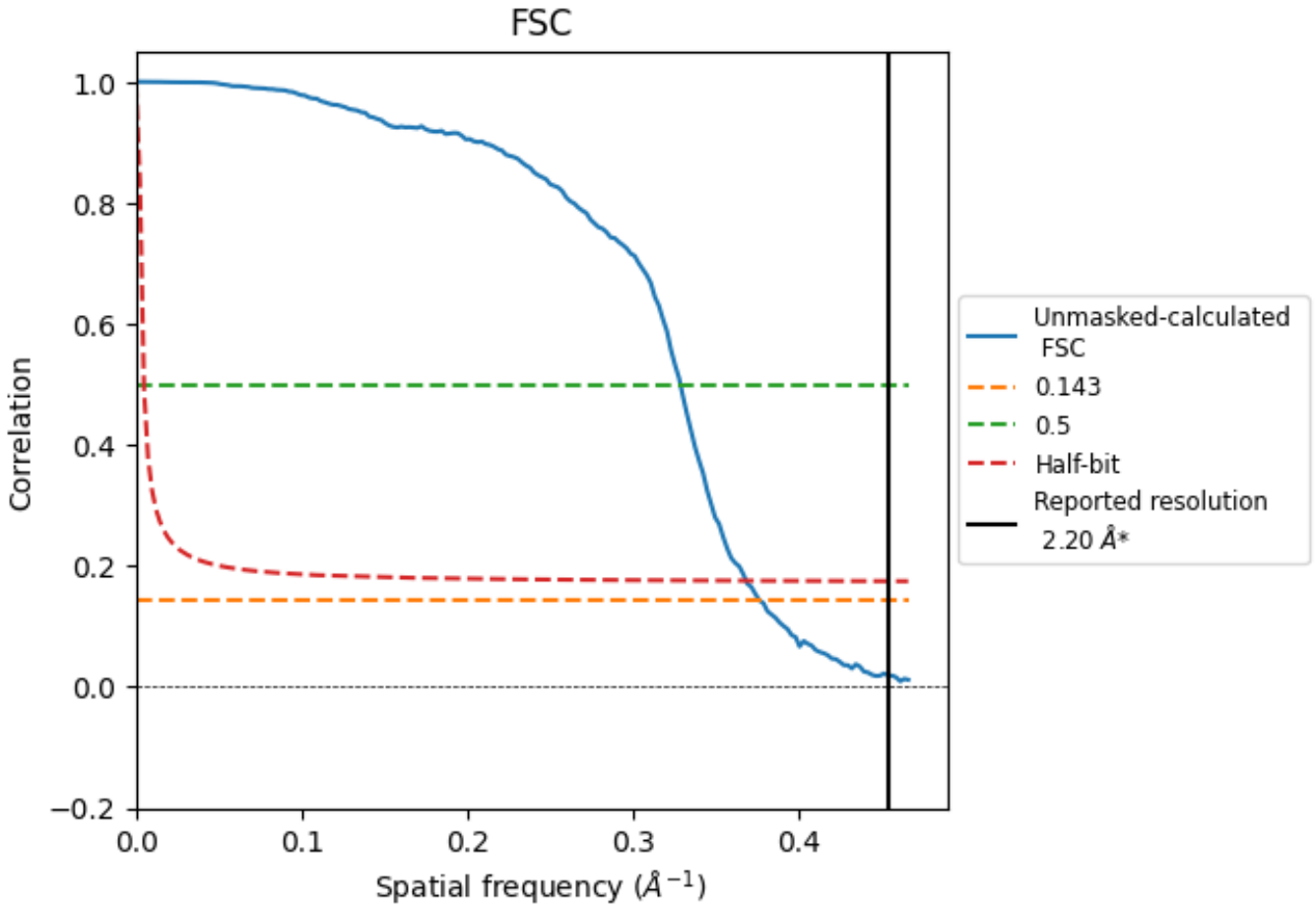


*Reported resolution corresponds to spatial frequency of 0.455 $Å^{-1}$

8 Fourier-Shell correlation

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



*Reported resolution corresponds to spatial frequency of 0.455 Å^{-1}

8.2 Resolution estimates (i)

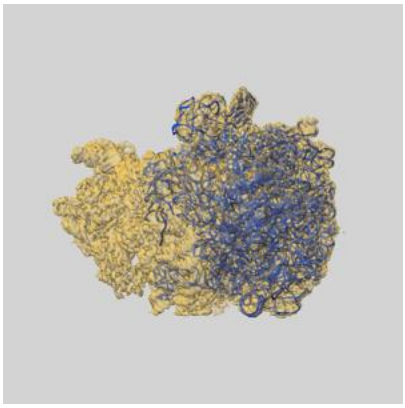
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.20	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	2.66	3.04	2.71

*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 2.66 differs from the reported value 2.2 by more than 10 %

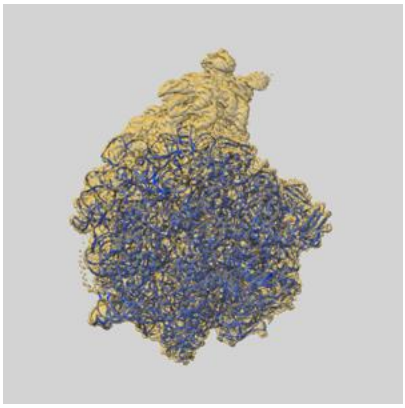
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-52512 and PDB model 9HYM. Per-residue inclusion information can be found in section 3 on page 11.

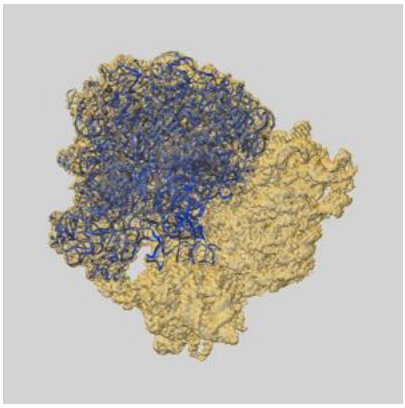
9.1 Map-model overlay



X



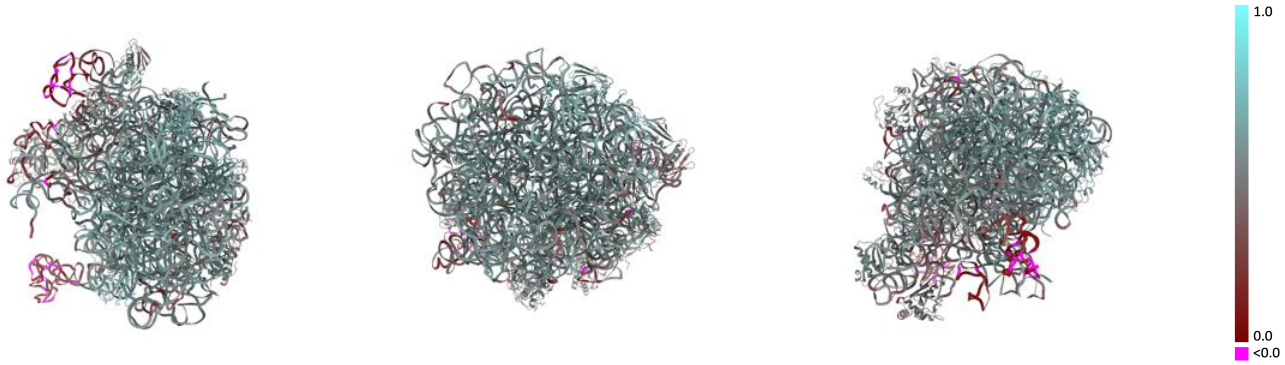
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.011 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.

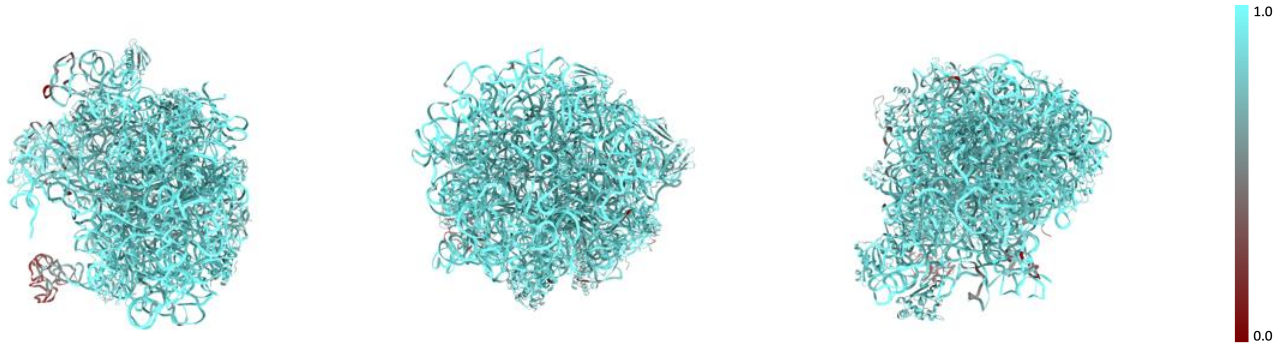
9.2 Q-score mapped to coordinate model



X Y Z

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

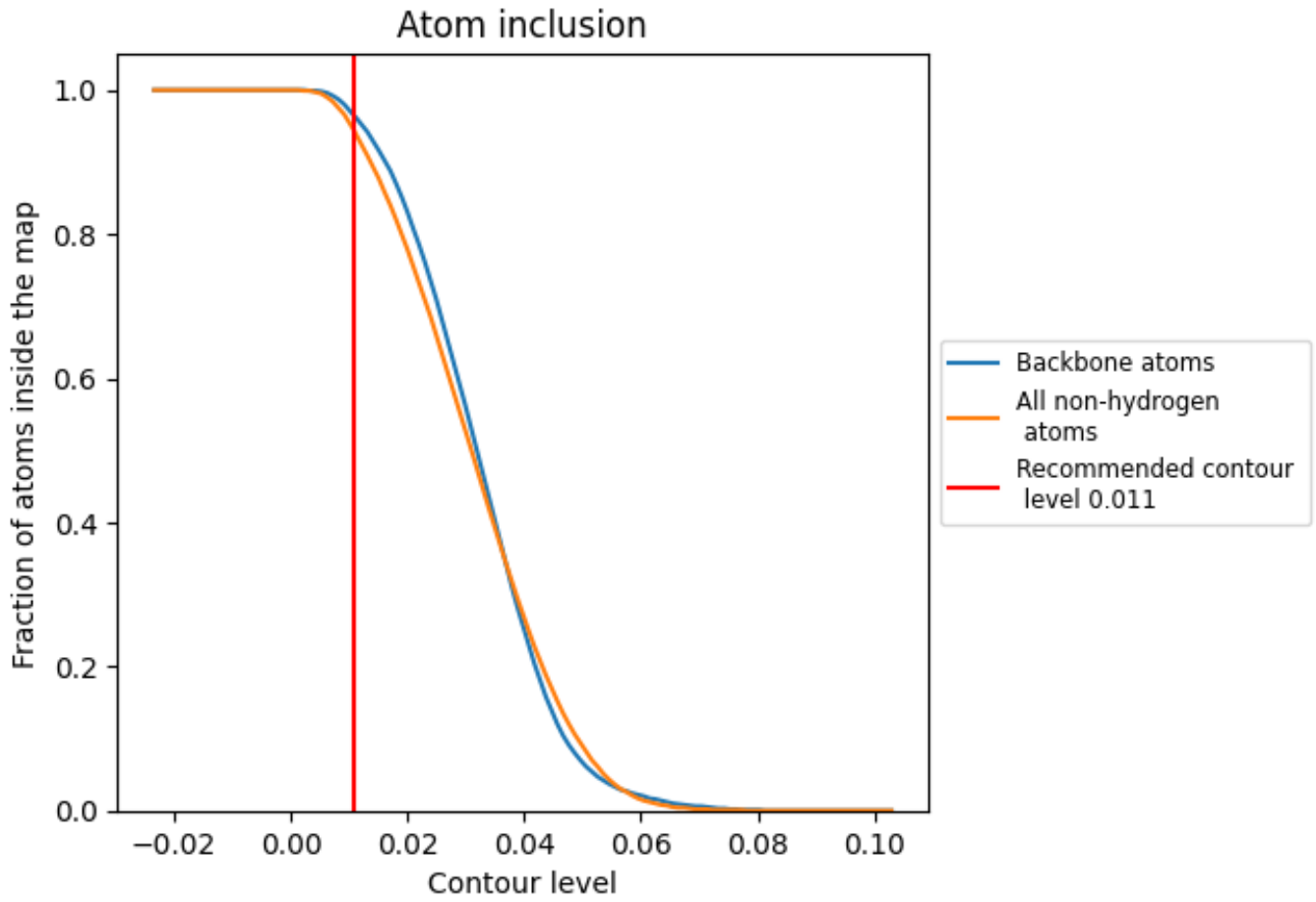
9.3 Atom inclusion mapped to coordinate model



X Y Z

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 (0.011).

9.4 Atom inclusion (i)



At the recommended contour level, 96% of all backbone atoms, 94% 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 (0.011) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.9420	0.5340
0	0.9720	0.6330
1	0.8760	0.5140
2	0.9180	0.5320
3	0.9620	0.5960
4	0.9100	0.5540
6	0.9890	0.6540
7	0.9880	0.6340
8	0.9520	0.5510
A	0.9660	0.5060
X	0.9580	0.4690
a	0.9700	0.5010
b	0.9470	0.5260
c	0.9830	0.6400
d	0.9650	0.6350
e	0.8720	0.5490
f	0.8410	0.4520
g	0.8390	0.4970
h	0.7820	0.5150
j	0.9560	0.5950
k	0.9560	0.5900
l	0.9430	0.5900
m	0.9120	0.4960
n	0.9810	0.6210
o	0.8790	0.5110
p	0.9360	0.5860
q	0.9710	0.5950
r	0.8760	0.5290
s	0.9590	0.6100
t	0.9220	0.5520
u	0.8640	0.4990
v	0.9530	0.4850
w	0.8430	0.4430
y	0.9100	0.5290
z	0.9420	0.5670