W O R L D W I D E
wwPDB
P R O T E I N   D A T A   B A N K

wwPDB EM Validation Summary Report ⓘ

Nov 3, 2022 – 08:18 AM EDT

PDB ID	:	5UZ4
EMDB ID	:	EMD-8621
Title	:	The cryo-EM structure of YjeQ bound to the 30S subunit suggests a fidelity checkpoint function for this protein in ribosome assembly
Authors	:	Razi, A.; Guarne, A.; Ortega, J.
Deposited on	:	2017-02-24
Resolution	:	5.80 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:

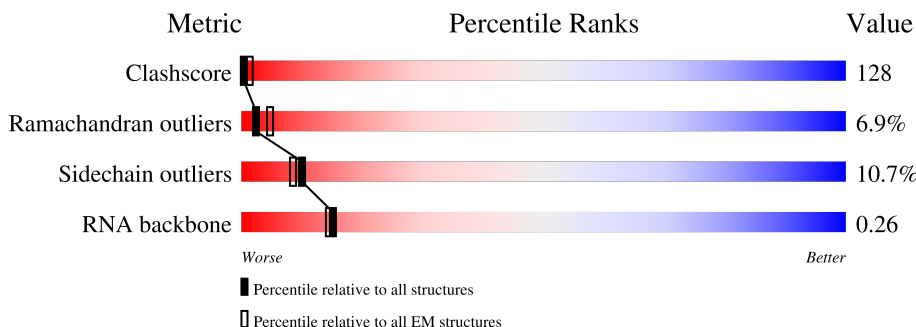|		
EMDB validation analysis	:	0.0.1.dev43
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4.02b-467
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ	:	1.9.9
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.31.2

1   Overall quality at a glance ⓘ

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

The reported resolution of this entry is 5.80 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.
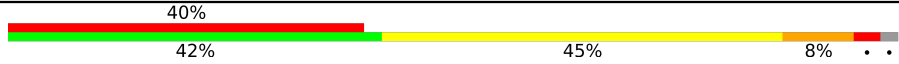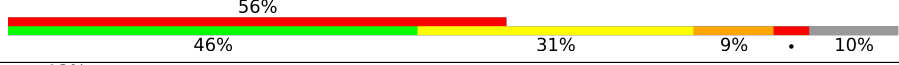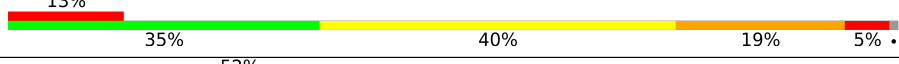
Metric	Percentile Ranks	Value
Clashscore		128
Ramachandran outliers		6.9%
Sidechain outliers		10.7%
RNA backbone		0.26

Worse   *Better*

▮ Percentile relative to all structures
▯ Percentile relative to all EM structures
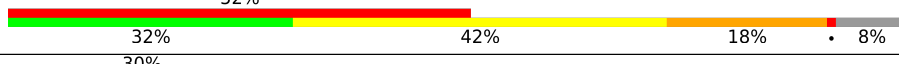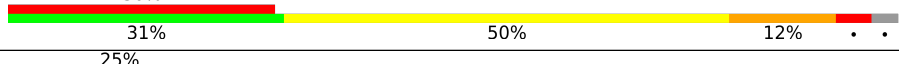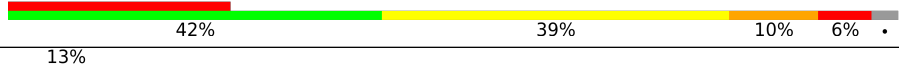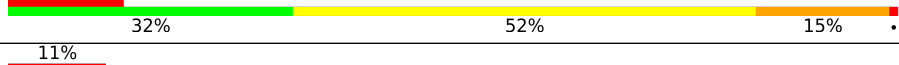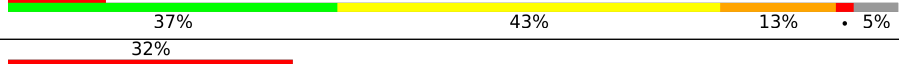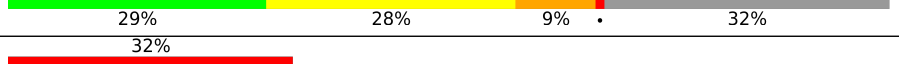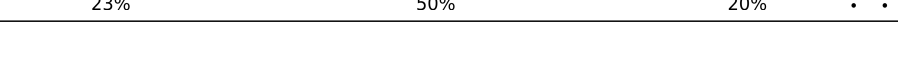
Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826
RNA backbone	4643	859

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 <=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.

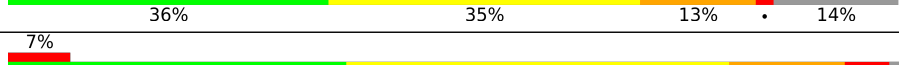| Mol	Chain	Length	Quality of chain
1	A	1527	• 39% 51% 8%
2	C	233	21% 39% 35% 11% • 12%
3	D	206	15% 38% 37% 17% 8%
4	E	167	7% 37% 37% 16% • 10%
5	F	131	48% 34% 32% 7% • 24%
6	G	179	70% 49% 27% 7% • 17%
7	H	130	15% 48% 32% 17% ••

Continued on next page...

WORLDWIDE PDB
PROTEIN DATA BANK

Continued from previous page...

Mol	Chain	Length	Quality of chain
8	I	130	40% 42% 45% 8%
9	J	103	44% 48% 24% 20% 5%
10	K	129	56% 46% 31% 9% 10%
11	L	124	13% 35% 40% 19% 5%
12	M	118	52% 32% 42% 18% 8%
13	N	101	30% 31% 50% 12%
14	O	89	25% 42% 39% 10% 6%
15	P	82	13% 32% 52% 15%
16	Q	84	11% 37% 43% 13% 5%
17	R	75	32% 29% 28% 9% 32%
18	S	92	32% 36% 35% 13% 14%
19	T	87	7% 38% 43% 13% 5%
20	B	241	55% 69% 25%
21	Z	334	62% 23% 50% 20%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
23	GGM	Z	402	-	-	X	-

2　Entry composition ⓘ

There are 23 unique types of molecules in this entry. The entry contains 53225 atoms, of which 0 are hydrogens and 0 are deuteriums.

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

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

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	1527	Total 32767	C 14614	N 6014	O 10613	P 1526	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	645	A	G	conflict	GB 1095872043

- Molecule 2 is a protein called 30S ribosomal protein S3.

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

- Molecule 3 is a protein called 30S ribosomal protein S4.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	D	205	Total 1639	C 1023	N 314	O 298	S 4	0	0

- Molecule 4 is a protein called 30S ribosomal protein S5.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	E	150	Total 1105	C 687	N 211	O 201	S 6	0	0

- Molecule 5 is a protein called 30S ribosomal protein S6.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	F	100	Total 817	C 515	N 148	O 148	S 6	0	0

- Molecule 6 is a protein called 30S ribosomal protein S7.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	G	149	Total	C	N	O	S	0	0
			1160	721	222	213	4		

- Molecule 7 is a protein called 30S ribosomal protein S8.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	H	129	Total	C	N	O	S	0	0
			975	613	172	184	6		

- Molecule 8 is a protein called 30S ribosomal protein S9.

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

- Molecule 9 is a protein called 30S ribosomal protein S10.

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

- Molecule 10 is a protein called 30S ribosomal protein S11.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	K	116	Total	C	N	O	S	0	0
			869	535	173	158	3		

- Molecule 11 is a protein called 30S ribosomal protein S12.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	L	123	Total	C	N	O	S	0	0
			951	587	195	165	4		

- Molecule 12 is a protein called 30S ribosomal protein S13.

Mol	Chain	Residues	Atoms					AltConf	Trace
12	M	109	Total	C	N	O	S	0	0
			845	522	169	151	3		

- Molecule 13 is a protein called 30S ribosomal protein S14.

Mol	Chain	Residues	Atoms					AltConf	Trace
13	N	98	Total 759	C 472	N 157	O 127	S 3	0	0

- Molecule 14 is a protein called 30S ribosomal protein S15.

Mol	Chain	Residues	Atoms					AltConf	Trace
14	O	86	Total 700	C 431	N 144	O 124	S 1	0	0

- Molecule 15 is a protein called 30S ribosomal protein S16.

Mol	Chain	Residues	Atoms					AltConf	Trace
15	P	82	Total 649	C 406	N 128	O 114	S 1	0	0

- Molecule 16 is a protein called 30S ribosomal protein S17.

Mol	Chain	Residues	Atoms					AltConf	Trace
16	Q	80	Total 648	C 411	N 121	O 113	S 3	0	0

- Molecule 17 is a protein called 30S ribosomal protein S18.

Mol	Chain	Residues	Atoms				AltConf	Trace
17	R	51	Total 414	C 264	N 77	O 73	0	0

- Molecule 18 is a protein called 30S ribosomal protein S19.

Mol	Chain	Residues	Atoms					AltConf	Trace
18	S	79	Total 619	C 393	N 117	O 107	S 2	0	0

- Molecule 19 is a protein called 30S ribosomal protein S20.

Mol	Chain	Residues	Atoms					AltConf	Trace
19	T	85	Total 665	C 411	N 137	O 114	S 3	0	0

- Molecule 20 is a protein called 30S ribosomal protein S2.

Mol	Chain	Residues	Atoms					AltConf	Trace
20	B	233	Total 1830	C 1154	N 328	O 340	S 8	2	0

- Molecule 21 is a protein called Small ribosomal subunit biogenesis GTPase RsgA.

Mol	Chain	Residues	Atoms					AltConf	Trace
21	Z	323	Total 2348	C 1463	N 397	O 479	S 9	0	0

- Molecule 22 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		AltConf
22	Z	1	Total 1	Zn 1	0

- Molecule 23 is 3'-O-(N-methylanthraniloyl)-beta:gamma-imidoguanosine-5'-triphosphate (three-letter code: GGM) (formula: $C_{18}H_{24}N_7O_{14}P_3$).
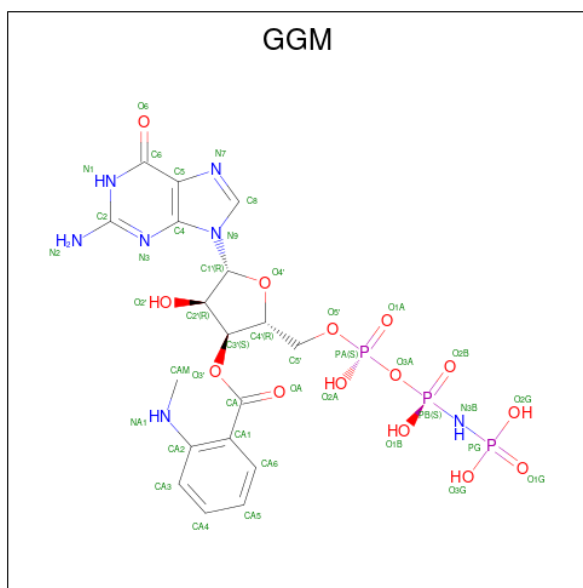
Mol	Chain	Residues	Atoms					AltConf
23	Z	1	Total 32	C 10	N 6	O 13	P 3	0

3 Residue-property plots ⓘ

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.
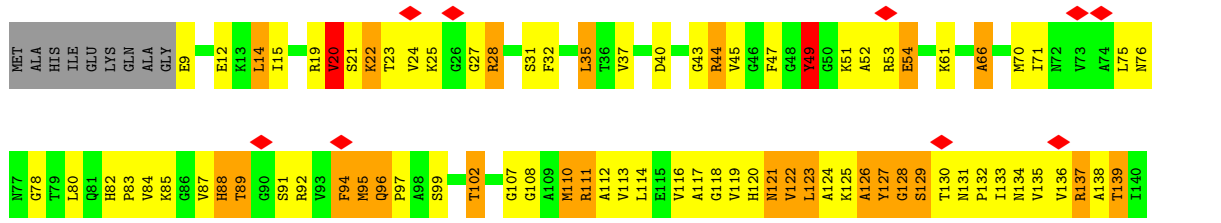
• Molecule 1: 16S RIBOSOMAL RNA

G1516 G1517 A1518 A1519 C1520 C1521 U1522 G1523 C1524 G1525 G1526 U1527 U1528 G1529 G1530 A1531 U1532
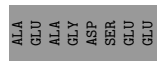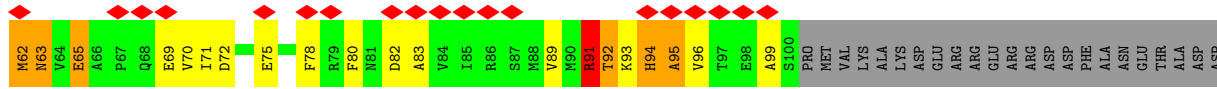
• Molecule 2: 30S ribosomal protein S3

Chain C:

MET G1 Q2 K3 V4 H5 P6 N7 G8 I9 R10 L11 G12 I13 V14 K15 P16 W17 N18 S19 T20 W21 F22 A23 N24 T25 K26 E27 F28 N31 L32 D33 S34 D35 F36 R39 Q40 Y41 E45 L46 A47 K48 V51 I54 V55 I56 E57 R58 P59 A60 K61 S62 I63 R64 V65

T66 I67 H68 I74 V75 I76 G77 K78 K79 G80 E81 E84 K85 L86 R87 K88 V89 V90 A91 D92 I93 A94 G95 V96 P97 A98 Q99 I100 N101 I102 A103 E104 V105 R106 K107 P108 E109 A112 K113 L114 V115 A116 D117 R125 R126 F129 R130 M133 A136 V137 Q138 N139 A140

M141 R142 L143 G144 A145 K146 G147 I148 K149 V150 E151 V152 S153 G154 R155 L156 G157 G158 A159 E160 I161 A162 R163 T164 E165 W166 Y167 R168 E169 G170 R171 V172 P173 L174 H175 T176 L177 R178 A179 Y183 M184 T185 S186 E187 A188 H189 T190 T191 Y192 I195 G196 V197 K198 V199 W200 I201 F202 K203

G204 E205 I206 LEU GLY GLY MET ALA ALA VAL GLU GLN PRO GLU LYS PRO ALA ALA GLN PRO LYS LYS GLN GLN ARG LYS GLY ARG LYS

• Molecule 3: 30S ribosomal protein S4

Chain D:

MET A1 R2 Y3 L4 G5 P6 K7 L8 K9 R12 R13 E14 D17 L20 K21 S22 G23 V24 R25 A26 I27 D28 T29 K30 C31 K32 I33 E34 Q35 A36 P37 G38 Q39 H40 G41 A42 R43 K44 P45 R46 L47 S48 D49 Y50 G51 V52 Q53 L54 R55 E56 K57 Q58 R61 R62 I63

Y64 G65 V66 L67 E68 R69 Q70 F71 R72 N73 Y74 Y75 R80 L81 K82 G83 N84 T85 G86 L89 L90 L93 R96 L97 D98 Y102 R103 M104 G105 F106 G107 A108 T109 R110 A111 E112 A113 R114 Q115 L116 V117 S118 H119 K120 M123 V124 N125 G126 R127 V128 V129 N130 I131 A132

S133 Y134 Q135 P138 V141 V142 E146 K147 A148 Q151 S152 R153 V154 K155 A156 A157 L158 E159 L160 A161 E162 Q163 R164 E165 K166 W169 L170 E171 V172 D173 A174 G175 K176 M177 E178 D179 T180 F181 K182 R183 K184 P185 E186 R187 S188 D189 D193 I194 N195 E196 H197 L198 I199 V200

E201 L202 Y203 S204 K205

• Molecule 4: 30S ribosomal protein S5

Chain E:

MET ALA HIS ILE GLU LYS GLN ALA GLY E9 E12 K13 L14 I15 R19 V20 S21 K22 T23 V24 K25 G26 G27 R28 S31 F32 L35 T36 V37 D40 G43 R44 V45 G46 F47 G48 Y49 G50 K51 A52 R53 E54 K61 A66 M70 I71 N72 V73 A74 L75 N76

N77 G78 T79 L80 Q81 H82 P83 V84 K85 G86 V87 H88 T89 G90 S91 R92 V93 F94 M95 Q96 P97 A98 S99 T102 G107 G108 A109 M110 R111 A112 V113 L114 E115 V116 A117 G118 V119 H120 N121 V122 L123 A124 K125 A126 Y127 G128 S129 T130 N131 P132 I133 N134 V135 V136 R137 A138 T139 I140

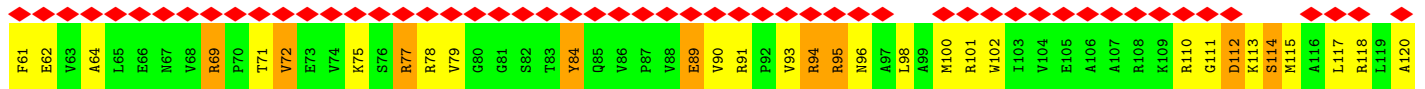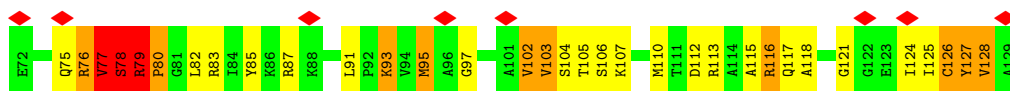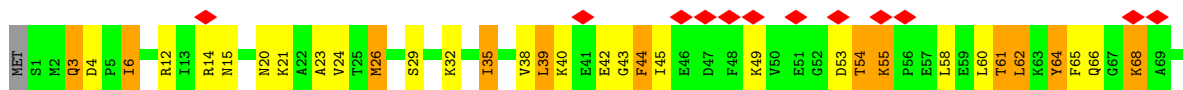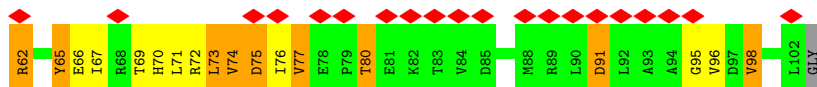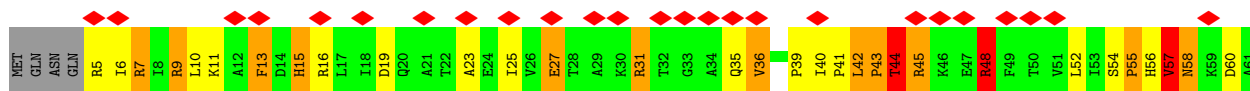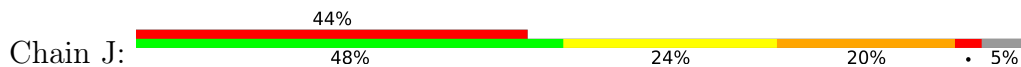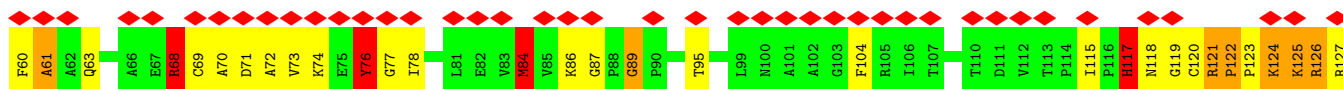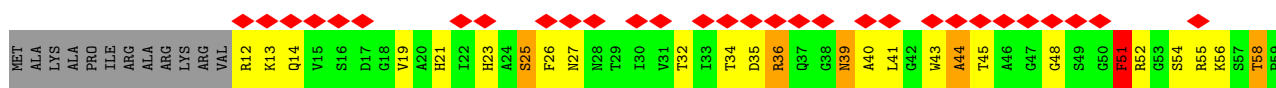D141 G142 L143 M146 N147 A153 A154 K155 R156 G157 K158 SER VAL GLU GLU ILE LEU GLY LYS

• Molecule 5: 30S ribosomal protein S6

Chain F:

48%
34% 32% 7% • 24%

M1 R2 H3 Y4 E5 I6 V7 F8 M9 V10 H11 P12 D13 Q14 S15 E16 Q17 V18 P19 G20 M21 I22 E23 R24 Y25 A28 I29 T30 G31 A32 E33 G34 K35 I36 H37 R38 L39 E40 D41 D42 W42 G43 R44 R45 Q46 L47 A48 Y49 P50 I51 N52 K53 L54 H55 K56 A57 H58 Y59 V60 I61

M62 N63 V64 E65 A66 P67 Q68 E69 V70 I71 D72 E75 F78 R79 F80 N81 D82 A83 V84 I85 R86 S87 M88 V89 M90 R91 T92 K93 H94 A95 V96 T97 E98 A99 S100 PRO MET VAL LYS ALA LYS ASP GLU ARG ARG GLU ARG ASP ASP PHE ALA ASN GLU THR ALA ASP ASP

ALA GLU ALA GLY ASP SER GLU GLU

• Molecule 6: 30S ribosomal protein S7

Chain G:

70%
49% 27% 7% • 17%

MET PRO ARG R3 R4 V5 I6 G7 Q8 R9 K10 I11 L12 P13 D14 P15 K16 F17 G18 S19 E20 L21 L22 A23 K24 F25 V26 N27 I28 L29 M30 V31 D32 G33 K34 K35 A38 E39 S40 I41 V42 Y43 S44 A45 L46 E47 T48 L49 A50 Q51 R52 S53 G54 K55 S56 E57 L58 E59 A60

F61 E62 V63 A64 L65 E66 N67 V68 R69 P70 T71 V72 E73 V74 K75 S76 R77 R78 V79 G80 G81 S82 T83 Y84 Q85 V86 P87 V88 E89 V90 R91 P92 V93 R94 R95 N96 A97 L98 A99 M100 R101 W102 I103 V104 E105 A106 A107 R108 K109 R110 G111 D112 K113 S114 M115 A116 L117 R118 L119 A120

N121 E122 L123 S124 D125 A126 A127 E128 N129 K130 G131 T132 A133 V134 K135 K136 R137 E138 D139 V140 H141 R142 M143 A144 E145 A146 N147 K148 A149 F150 A151 HIS TYR ARG TRP LEU SER LEU ARG SER PHE SER HIS GLN ALA GLY ALA SER LYS GLN PRO ALA LEU LEU GLY TYR LEU ASN

• Molecule 7: 30S ribosomal protein S8

Chain H:
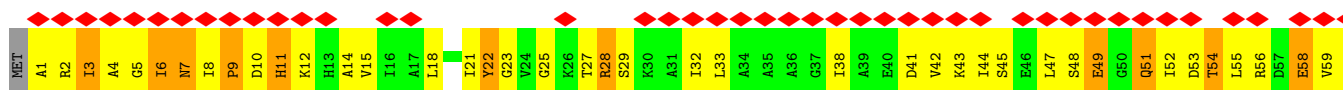
15%
48% 32% 17% ••

MET S1 M2 Q3 D4 P5 I6 R12 I13 R14 N15 N20 K21 A22 A23 V24 T25 M26 S29 K32 I35 V38 L39 K40 E41 E42 G43 F44 I45 E46 D47 F48 K49 V50 E51 G52 D53 T54 K55 P56 E57 L58 E59 L60 T61 L62 K63 Y64 F65 Q66 G67 K68 A69

E72 Q75 R76 V77 S78 R79 P80 G81 L82 R83 I84 Y85 K86 R87 K88 L91 P92 K93 V94 M95 A96 G97 A101 V102 V103 S104 T105 S106 K107 M110 T111 D112 R113 A114 A115 R116 Q117 A118 G121 G122 E123 I124 I125 C126 Y127 V128 A129

• Molecule 8: 30S ribosomal protein S9

Chain I:

40%
42% 45% 8% ••

MET ALA GLU N3 Q4 Y5 Y6 G9 R10 R11 K12 A15 A16 R17 V18 F19 I20 K21 N24 G25 K26 I27 V28 I29 N30 Q31 R32 S33 L34 E35 Q36 Y37 F38 G39 R40 E41 R44 M45 V46 V47 R48 Q49 P50 L51 E52 L53 M56 V57 E58 K59 L60 D61 L62 Y63 I64

T65 V66 K67 G68 G69 G70 I71 Q74 R79 I82 T83 L86 M87 E88 Y89 D90 E91 S92 L93 R94 S95 E96 L97 R98 K99 A100 G101 F102 V103 T104 R105 D106 A107 R108 Q109 V110 E111 R112 K113 K114 V115 G116 L117 R118 K119 A120 R121 R122 R123 P124 Q125 F126 S127 K128 R129

• Molecule 9: 30S ribosomal protein S10

Chain J:

44%

48%   24%   20%   • 5%

MET GLN ASN GLN R5 I6 R7 I8 R9 L10 K11 A12 F13 D14 H15 R16 L17 I18 D19 Q20 A21 T22 A23 E24 I25 V26 E27 T28 A29 K30 R31 T32 G33 A34 Q35 V36 P39 I40 P41 L42 P43 T44 R45 K46 E47 R48 F49 I50 V51 L52 I53 S54 P55 H56 V57 N58 K59 D60 A61

R62 Y65 E66 I67 R68 T69 H70 L71 R72 L73 V74 D75 I76 V77 E78 P79 T80 E81 K82 T83 V84 D85 M88 R89 L90 D91 L92 A93 A94 G95 V96 D97 V98 L102 GLY

• Molecule 10: 30S ribosomal protein S11

Chain K:

56%

46%   31%   9%   •   10%

MET ALA LYS ALA PRO ILE ARG ARG ALA ARG LYS VAL R12 K13 Q14 V15 S16 D17 G18 V19 A20 H21 I22 H23 A24 S25 F26 N27 N28 T29 I30 V31 T32 I33 T34 D35 R36 Q37 G38 N39 A40 L41 G42 W43 A44 T45 A46 G47 G48 S49 G50 F51 R52 G53 S54 R55 K56 S57 T58 P59

F60 A61 A62 Q63 A66 E67 R68 C69 A70 D71 A72 V73 K74 E75 Y76 G77 I78 L81 E82 V83 M84 V85 K86 G87 P88 G89 P90 T95 L99 N100 A101 A102 G103 F104 R105 I106 T107 T110 D111 V112 T113 P114 I115 P116 H117 N118 G119 C120 R121 P122 P123 K124 K125 R126 R127

VAL

• Molecule 11: 30S ribosomal protein S12

Chain L:

13%

35%   40%   19%   5% •

MET A1 T2 V3 N4 Q5 L6 V7 R8 R11 A12 R13 K14 V15 A16 K17 S18 N19 V20 P21 A22 L23 E24 A25 C26 P27 Q28 K29 R30 G31 V32 C33 T34 R35 V36 Y37 T40 P41 P44 N45 S46 A47 L48 R49 K50 V51 C52 R53 V54 R55 F60 E61 V62 T63 S64 Y65

I66 G67 G68 E69 G70 H71 N72 L73 S77 V78 I79 L80 I81 R82 G83 G84 R85 V86 K87 D88 L89 P90 G91 V92 R93 Y94 H95 T96 V97 R98 G99 D102 G105 R109 K110 Q111 A112 R113 Y116 G117 V118 K119 R120 P121 K122 A123

• Molecule 12: 30S ribosomal protein S13

Chain M:

52%

32%   42%   18%   •   8%

MET A1 R2 I3 A4 G5 I6 N7 I8 P9 D10 H11 K12 H13 A14 V15 I16 A17 L18 I21 Y22 G23 V24 G25 K26 T27 R28 S29 K30 A31 I32 L33 A34 A35 A36 G37 I38 A39 E40 D41 V42 K43 I44 S45 E46 L47 S48 E49 G50 Q51 I52 D53 T54 L55 R56 D57 E58 V59 A60

K61 F62 V63 V64 E65 G66 D67 L68 R69 R70 E71 M74 R78 L79 M80 D81 L82 G83 C84 Y95 R86 G87 L88 R89 H90 R91 G92 G93 L94 P95 V96 R97 G98 Q99 R100 T101 K102 T103 N104 A105 R106 T107 R108 K109 GLY PRO ARG LYS PRO ILE LYS LYS

• Molecule 13: 30S ribosomal protein S14

Chain N:

• Molecule 14: 30S ribosomal protein S15

Chain O:

• Molecule 15: 30S ribosomal protein S16

Chain P:

• Molecule 16: 30S ribosomal protein S17

Chain Q:
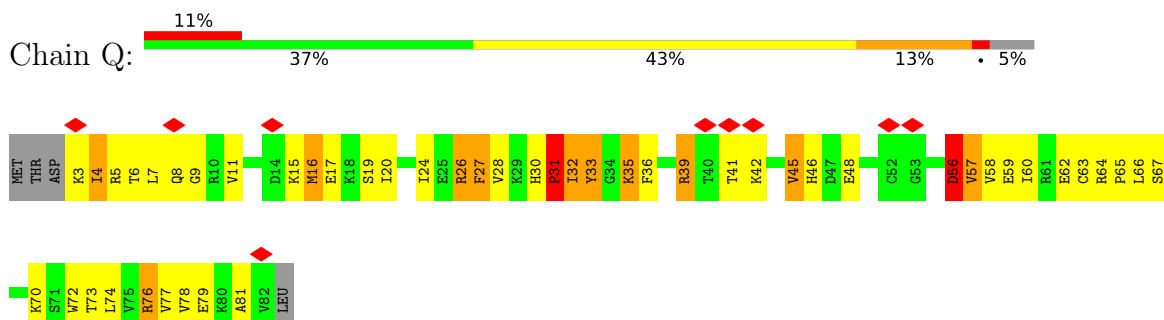
• Molecule 17: 30S ribosomal protein S18

Chain R:

MET ALA ARG TYR PHE ARG ARG LYS PHE CYS ARG PHE THR ALA GLU GLY VAL GLN GLU I20 D21 Y22 K23 D24 I25 A26 T27 L28 K29 N30 Y31 I32 T33 E34 S35 G36 K37 I38 V39 P40 S41 R42 I43 T44 G45 T46 R47 A48 K49 Y50 Q51 R52 R56 A57 I58 K59 R60 A61

R62 Y63 L66 L67 P68 N69 T70 ASP ARG HIS GLN
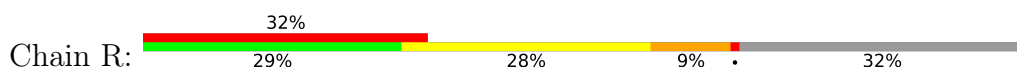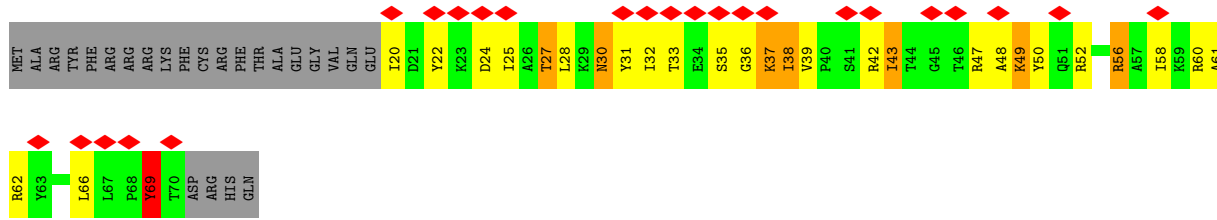
• Molecule 18: 30S ribosomal protein S19

Chain S:

32%

36% 35% 13% • 14%

MET PRO R2 S3 L4 K5 K6 G7 P8 F9 I10 D11 L12 H13 L14 L15 K16 K17 V18 E19 K20 A21 V22 E23 S24 G25 D26 K27 K28 P29 L30 R31 T32 R35 R36 S37 T38 I39 F40 P41 N42 M43 L46 T47 I48 A49 V50 H51 R54 Q55 H56 V57 P58 T62 D63 E64

M65 V66 K69 E72 F73 A74 P75 T76 R77 T78 Y79 R80 GLY HIS ALA ASP LYS ALA LYS LYS LYS
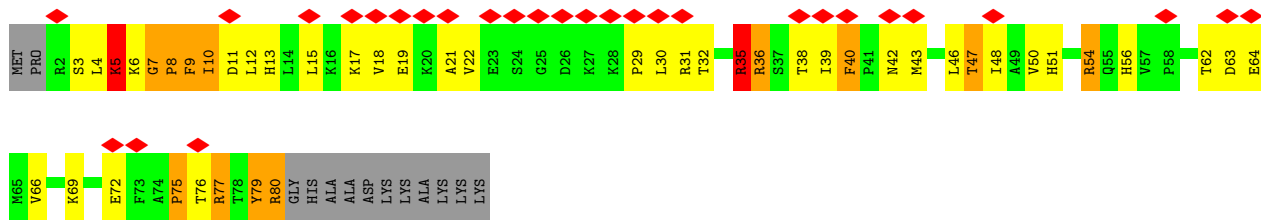
• Molecule 19: 30S ribosomal protein S20

Chain T:

7%

38% 43% 13% 5% •

MET ALA N2 I3 K4 S5 A6 K7 K8 R9 A10 I11 Q12 S13 E14 K15 A16 R17 N20 R23 R24 S25 M26 M27 R28 T29 F30 I31 V34 Y35 G41 D42 K43 A46 Q47 K48 A49 F50 N51 E52 M53 Q54 P55 I56 V57 D58 R59 Q60 A61 A62 K63 I66 H67 K68

N69 K70 R73 H74 L78 I82 L85 A86
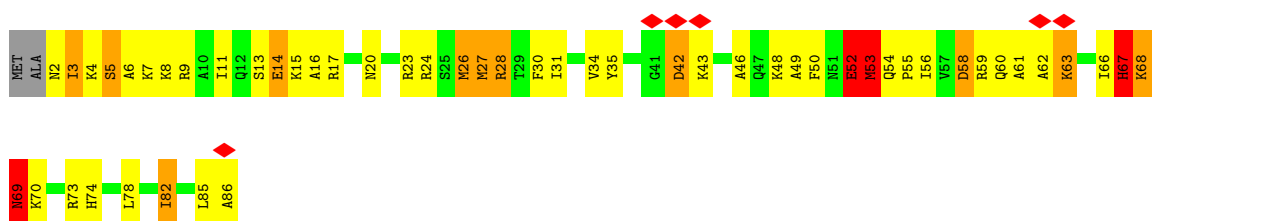
• Molecule 20: 30S ribosomal protein S2

Chain B:

55%

69% 25% • •

MET A2 T3 V4 S5 M6 R7 D8 M9 L10 K11 A12 G13 V14 H15 F16 G17 H18 Q19 T20 R21 Y22 W23 N24 M27 K28 P29 F30 I31 F32 R35 N36 K37 V38 H39 I40 I41 N42 L43 V47 P48 M49 F50 N51 N58 K59 I60 A61 S62 R63 K64 F69 V70 G71 T72

K73 R74 A75 D82 A83 A84 L85 S86 C87 D88 Q89 H94 R95 W96 L97 G98 G99 M100 N103 R108 Q109 S110 I111 K112 R113 L114 K115 D116 L117 E118 T119 Q120 S121 Q122 D123 G124 T125 F126 D127 K128 L129 T130 K131 K132 E133 A134 L135 M136 R137 T138 R139 E140 L141 E142 K143 L144

E145 N146 S147 L148 G149 K152 D153 M154 G155 G156 L157 P158 D159 A160 L161 F162 V163 I164 D165 A166 D167 H168 E169 A172 I173 K174 E175 A176 N177 N178 L179 F184 A185 I186 N190 S191 D192 P193 D194 G195 V196 D197 F198 V199 I200 P201 G202 N203 D204 D205 A206 I207 R208 T211 L212

A216 A219 T220 V221 R222 E223 G224 R225 S226 Q227 ASP LEU ALA SER GLN ALA GLU E235 S236 F237 V238 E239 A240 E241

• Molecule 21: Small ribosomal subunit biogenesis GTPase RsgA

Chain Z:

4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	130462	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TECNAI F20	Depositor
Voltage (kV)	200	Depositor
Electron dose $(e^-/\text{Å}^2)$	1	Depositor
Minimum defocus (nm)	500	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	34482	Depositor
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	0.100	Depositor
Minimum map value	-0.034	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.006	Depositor
Recommended contour level	0.0309	Depositor
Map size (Å)	319.0, 319.0, 319.0	wwPDB
Map dimensions	220, 220, 220	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.45, 1.45, 1.45	Depositor

5　Model quality ⓘ

5.1　Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: GGM, ZN

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

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#$\|Z\|$ >5	RMSZ	#$\|Z\|$ >5
1	A	2.66	229/36645 (0.6%)	1.59	597/57061 (1.0%)
2	C	1.47	1/1651 (0.1%)	1.59	23/2225 (1.0%)
3	D	1.67	6/1661 (0.4%)	1.66	27/2223 (1.2%)
4	E	1.78	5/1118 (0.4%)	1.72	21/1504 (1.4%)
5	F	1.33	0/835	1.61	10/1128 (0.9%)
6	G	1.30	1/1173 (0.1%)	1.58	13/1573 (0.8%)
7	H	1.65	3/985 (0.3%)	1.71	15/1322 (1.1%)
8	I	1.44	0/1034	1.65	12/1375 (0.9%)
9	J	1.41	1/796 (0.1%)	1.66	19/1077 (1.8%)
10	K	1.32	0/885	1.53	15/1195 (1.3%)
11	L	1.76	6/965 (0.6%)	1.79	23/1296 (1.8%)
12	M	1.31	0/851	1.44	9/1136 (0.8%)
13	N	1.67	2/769 (0.3%)	1.36	5/1026 (0.5%)
14	O	1.51	0/708	1.55	11/946 (1.2%)
15	P	1.68	0/659	1.72	12/884 (1.4%)
16	Q	1.57	0/657	1.70	10/881 (1.1%)
17	R	1.16	0/420	1.27	4/565 (0.7%)
18	S	1.15	0/633	1.35	6/853 (0.7%)
19	T	1.60	0/671	1.60	7/888 (0.8%)
20	B	0.54	2/1864 (0.1%)	0.92	6/2511 (0.2%)
21	Z	0.79	16/2388 (0.7%)	1.28	60/3259 (1.8%)
All	All	2.28	272/57368 (0.5%)	1.57	905/84928 (1.1%)

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
1	A	1	7
2	C	0	20

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Mol	Chain	#Chirality outliers	#Planarity outliers
3	D	0	17
4	E	0	9
5	F	0	6
6	G	0	6
7	H	0	5
8	I	0	10
9	J	0	7
10	K	0	2
11	L	0	7
12	M	0	2
13	N	0	3
14	O	0	6
15	P	0	5
16	Q	0	2
17	R	0	2
18	S	0	4
19	T	0	4
21	Z	0	11
All	All	1	135

The worst 5 of 272 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	801	U	O3'-P	-90.89	0.52	1.61
1	A	1012	A	O3'-P	-90.78	0.52	1.61
1	A	901	A	O3'-P	-87.79	0.55	1.61
1	A	1310	G	O3'-P	-83.62	0.60	1.61
1	A	354	G	O3'-P	-82.82	0.61	1.61

The worst 5 of 905 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	801	U	P-O3'-C3'	-77.19	27.07	119.70
1	A	639	G	OP2-P-O3'	-41.14	14.70	105.20
1	A	944	G	P-O3'-C3'	40.49	168.28	119.70
1	A	804	U	P-O3'-C3'	37.59	164.81	119.70
1	A	1508	A	P-O3'-C3'	35.20	161.94	119.70

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	A	1243	C	C3'

5 of 135 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	187	G	Sidechain
1	A	437	U	Sidechain
1	A	438	U	Sidechain
1	A	496	A	Sidechain
1	A	521	G	Sidechain

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	32767	0	16531	9892	0
2	C	1624	0	1699	134	0
3	D	1639	0	1699	141	0
4	E	1105	0	1148	92	0
5	F	817	0	808	114	0
6	G	1160	0	1207	89	0
7	H	975	0	1023	77	0
8	I	1022	0	1070	103	0
9	J	786	0	828	62	0
10	K	869	0	877	116	0
11	L	951	0	1007	125	0
12	M	845	0	900	135	0
13	N	759	0	789	179	0
14	O	700	0	723	68	0
15	P	649	0	665	50	0
16	Q	648	0	690	79	0
17	R	414	0	439	85	0
18	S	619	0	628	155	0
19	T	665	0	710	54	0
20	B	1830	0	1839	147	0
21	Z	2348	0	2103	553	0
22	Z	1	0	0	0	0
23	Z	32	0	12	32	0
All	All	53225	0	37395	11485	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 128.

The worst 5 of 11485 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:1088:G:C2	1:A:1098:C:N3	1.67	1.59
1:A:714:G:H2'	1:A:715:A:C8	1.08	1.58
1:A:510:A:O3'	1:A:511:C:P	1.16	1.54
1:A:317:U:C4	1:A:337:G:C2	1.98	1.51
1:A:253:A:N6	1:A:274:A:C6	1.79	1.51

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	C	204/233 (88%)	149 (73%)	40 (20%)	15 (7%)	1	13
3	D	203/206 (98%)	162 (80%)	25 (12%)	16 (8%)	1	12
4	E	148/167 (89%)	119 (80%)	23 (16%)	6 (4%)	3	22
5	F	98/131 (75%)	76 (78%)	10 (10%)	12 (12%)	0	5
6	G	147/179 (82%)	115 (78%)	25 (17%)	7 (5%)	2	20
7	H	127/130 (98%)	104 (82%)	18 (14%)	5 (4%)	3	23
8	I	125/130 (96%)	93 (74%)	22 (18%)	10 (8%)	1	12
9	J	96/103 (93%)	70 (73%)	16 (17%)	10 (10%)	0	8
10	K	114/129 (88%)	86 (75%)	19 (17%)	9 (8%)	1	12
11	L	121/124 (98%)	81 (67%)	26 (22%)	14 (12%)	0	6
12	M	105/118 (89%)	78 (74%)	18 (17%)	9 (9%)	1	11
13	N	96/101 (95%)	61 (64%)	24 (25%)	11 (12%)	0	6
14	O	84/89 (94%)	68 (81%)	13 (16%)	3 (4%)	3	25
15	P	80/82 (98%)	64 (80%)	9 (11%)	7 (9%)	1	10

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
16	Q	78/84 (93%)	50 (64%)	22 (28%)	6 (8%)	1	12
17	R	49/75 (65%)	35 (71%)	12 (24%)	2 (4%)	3	22
18	S	77/92 (84%)	55 (71%)	15 (20%)	7 (9%)	1	10
19	T	83/87 (95%)	72 (87%)	4 (5%)	7 (8%)	1	11
20	B	231/241 (96%)	218 (94%)	11 (5%)	2 (1%)	17	56
21	Z	319/334 (96%)	259 (81%)	41 (13%)	19 (6%)	1	16
All	All	2585/2835 (91%)	2015 (78%)	393 (15%)	177 (7%)	2	14

5 of 177 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	C	62	SER
2	C	158	GLY
2	C	174	LEU
2	C	178	ARG
2	C	195	ILE

5.3.2   Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	C	170/190 (90%)	156 (92%)	14 (8%)	11	34
3	D	171/173 (99%)	141 (82%)	30 (18%)	2	11
4	E	113/126 (90%)	100 (88%)	13 (12%)	5	21
5	F	87/112 (78%)	81 (93%)	6 (7%)	15	40
6	G	121/147 (82%)	109 (90%)	12 (10%)	8	26
7	H	103/105 (98%)	92 (89%)	11 (11%)	6	23
8	I	105/107 (98%)	94 (90%)	11 (10%)	7	24
9	J	86/90 (96%)	75 (87%)	11 (13%)	4	18
10	K	89/99 (90%)	77 (86%)	12 (14%)	4	17
11	L	102/104 (98%)	92 (90%)	10 (10%)	8	26

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
12	M	88/96 (92%)	77 (88%)	11 (12%)	4	19
13	N	74/84 (88%)	67 (90%)	7 (10%)	8	28
14	O	74/77 (96%)	68 (92%)	6 (8%)	11	35
15	P	65/65 (100%)	54 (83%)	11 (17%)	2	12
16	Q	74/78 (95%)	68 (92%)	6 (8%)	11	35
17	R	43/65 (66%)	37 (86%)	6 (14%)	3	17
18	S	66/79 (84%)	62 (94%)	4 (6%)	18	44
19	T	65/66 (98%)	55 (85%)	10 (15%)	2	14
20	B	194/199 (98%)	189 (97%)	5 (3%)	46	66
21	Z	234/286 (82%)	204 (87%)	30 (13%)	4	18
All	All	2124/2348 (90%)	1898 (89%)	226 (11%)	10	24

5 of 226 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
10	K	84	MET
21	Z	302	CYS
13	N	49	THR
21	Z	289	GLU
21	Z	65	ASN

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

Mol	Chain	Res	Type
12	M	90	HIS
19	T	60	GLN
13	N	48	GLN
15	P	29	ASN
20	B	168	HIS

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	A	1486/1527 (97%)	735 (49%)	92 (6%)

5 of 735 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	A	7	A
1	A	8	A
1	A	9	G
1	A	10	A
1	A	14	U

5 of 92 RNA pucker outliers are listed below:

Mol	Chain	Res	Type
1	A	882	C
1	A	1243	C
1	A	910	C
1	A	1065	U
1	A	1313	U

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

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

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 2 ligands modelled in this entry, 1 is monoatomic - leaving 1 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#|Z| > 2$	Counts	RMSZ	$\#|Z| > 2$
23	GGM	Z	402	21	29,34,45	2.12	7 (24%)	32,54,69	3.48	12 (37%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns.

'-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
23	GGM	Z	402	21	-	3/14/38/48	0/3/3/4

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

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
23	Z	402	GGM	O4'-C1'	5.40	1.48	1.41
23	Z	402	GGM	C2'-C1'	-4.33	1.47	1.53
23	Z	402	GGM	C5-C6	-3.99	1.39	1.47
23	Z	402	GGM	C3'-C2'	-2.95	1.45	1.53
23	Z	402	GGM	C6-N1	2.47	1.41	1.37

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

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
23	Z	402	GGM	C3'-C2'-C1'	14.74	123.17	100.98
23	Z	402	GGM	O4'-C1'-C2'	-6.88	96.87	106.93
23	Z	402	GGM	O1G-PG-N3B	-4.54	105.09	111.77
23	Z	402	GGM	C2'-C3'-C4'	-4.47	93.95	102.64
23	Z	402	GGM	O1B-PB-O2B	3.45	117.15	109.92

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
23	Z	402	GGM	PG-N3B-PB-O2B
23	Z	402	GGM	PB-N3B-PG-O1G
23	Z	402	GGM	PG-N3B-PB-O3A

There are no ring outliers.

1 monomer is involved in 32 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
23	Z	402	GGM	32	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be

highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand GGM Z 402

Bond lengths   Bond angles

Torsions   Rings
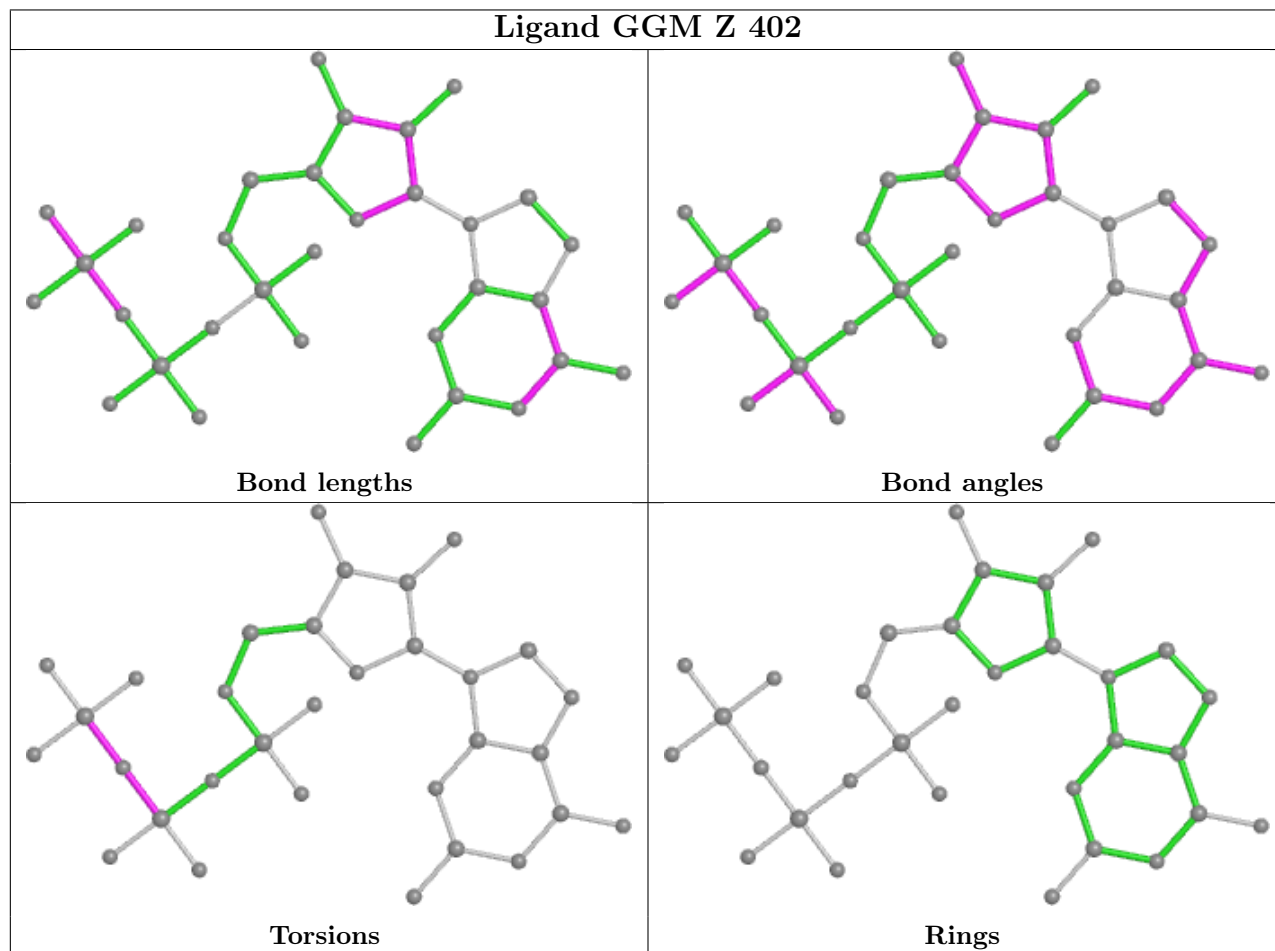
5.7 Other polymers (i)

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
1	A	195
21	Z	4
12	M	1

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Mol	Chain	Number of breaks
13	N	1
20	B	1

The worst 5 of 202 chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	1249:C	O3'	1250:A	P	3.76
1	A	646:G	O3'	647:C	P	3.66
1	A	886:G	O3'	887:G	P	3.56
1	A	1309:G	O3'	1310:G	P	3.30
1	A	317:U	O3'	318:G	P	3.28

6   Map visualisation   ⓘ

This section contains visualisations of the EMDB entry EMD-8621. These allow visual inspection of the internal detail of the map and identification of artifacts.

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

6.1   Orthogonal projections   ⓘ

6.1.1   Primary map

| X | Y | Z |
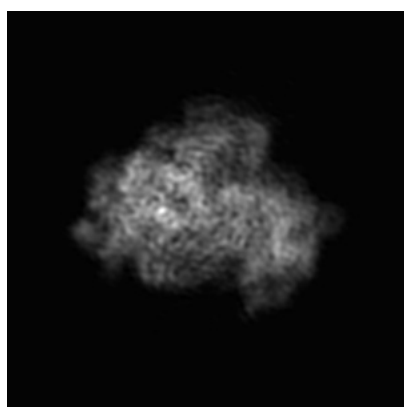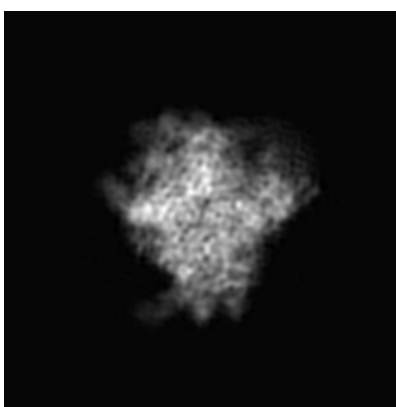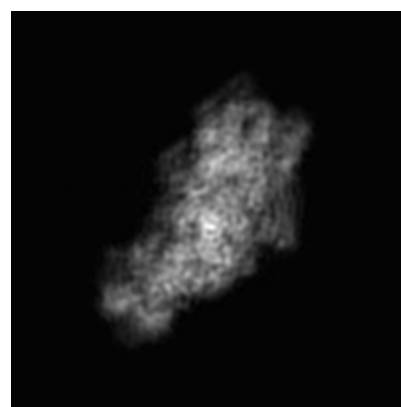
The images above show the map projected in three orthogonal directions.

6.2   Central slices   ⓘ
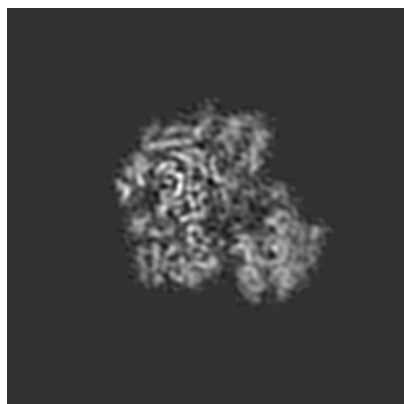
6.2.1   Primary map

| X Index: 110 | Y Index: 110 | Z Index: 110 |
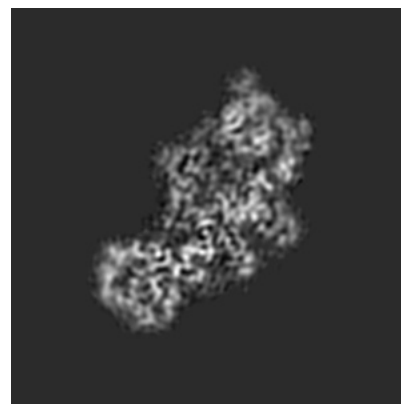
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices ⓘ
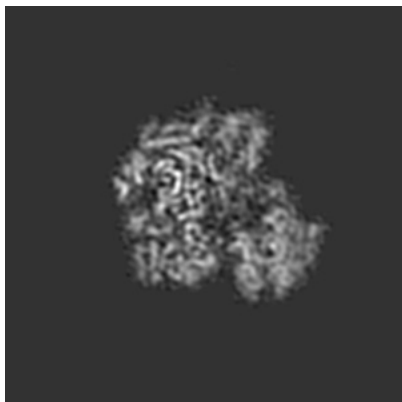
6.3.1 Primary map
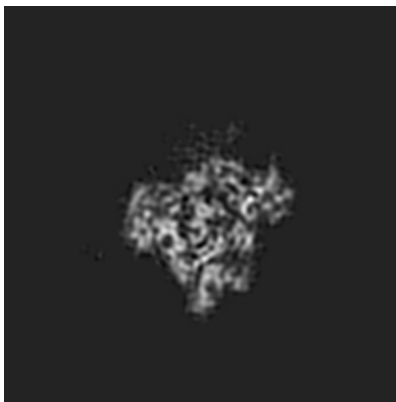
| X Index: 110 | Y Index: 84 | Z Index: 103 |
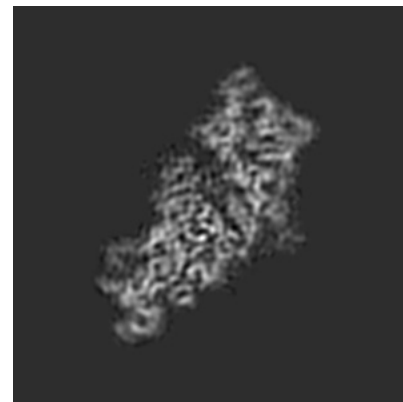
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal surface views ⓘ
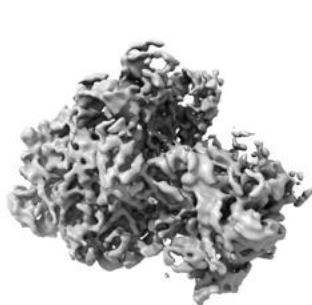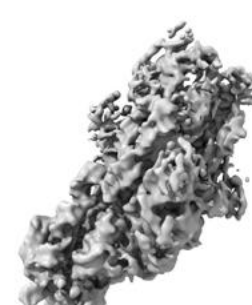
6.4.1 Primary map

| X | Y | Z |

The images above show the 3D surface view of the map at the recommended contour level 0.0309. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5 Mask visualisation ⓘ

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

7   Map analysis ⓘ

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

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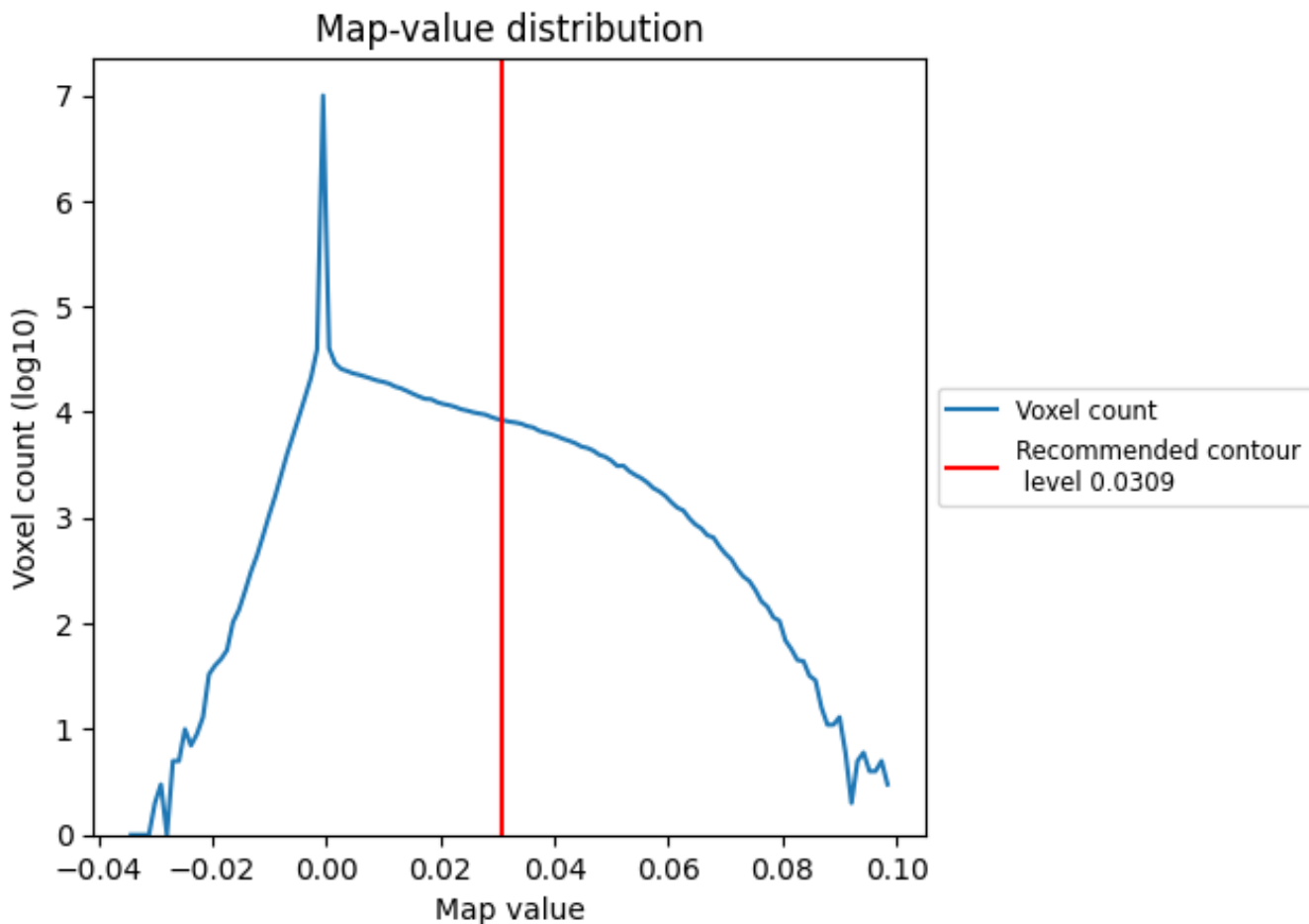
The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2   Volume estimate ⓘ
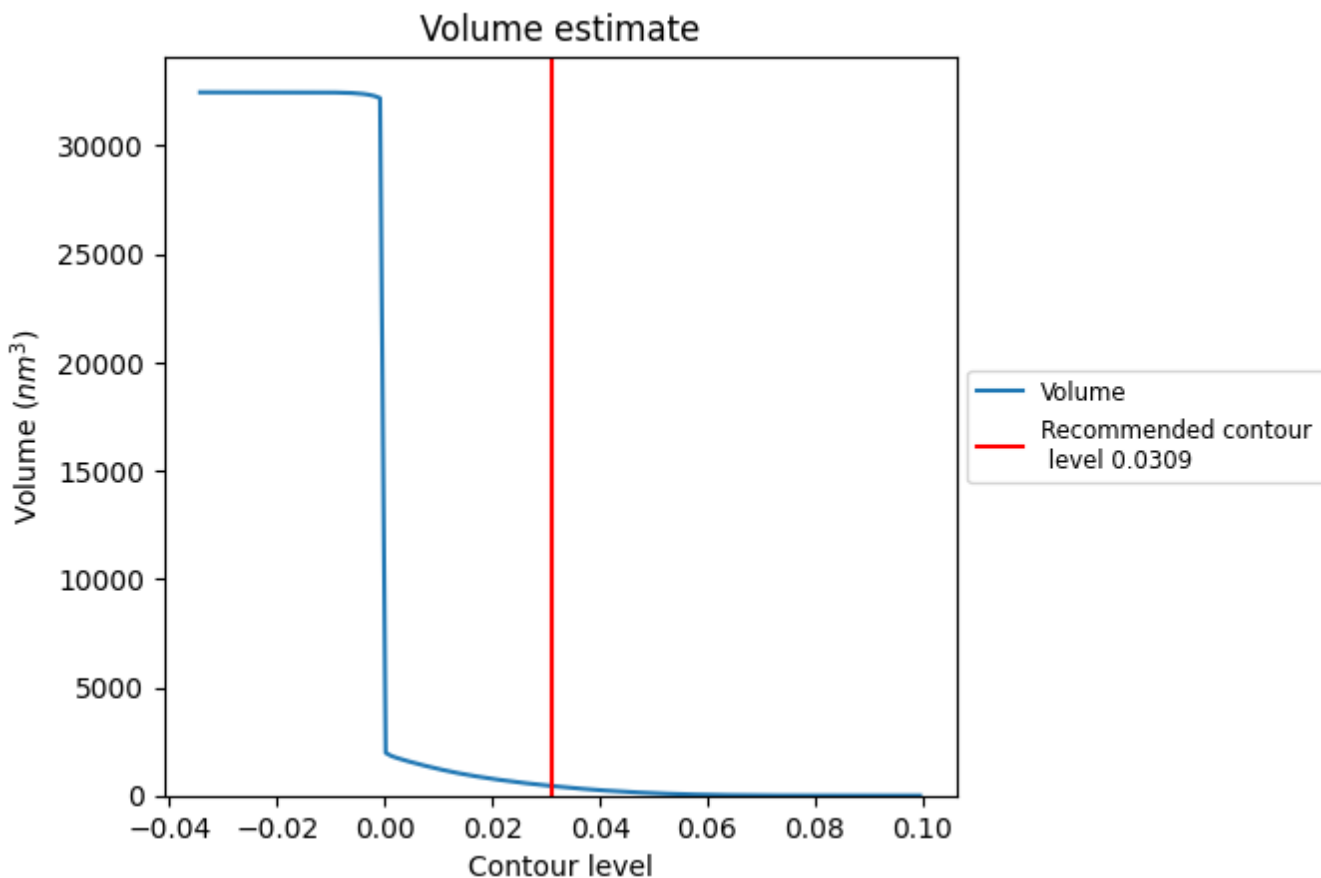
The volume at the recommended contour level is 446 nm^3; this corresponds to an approximate mass of 403 kDa.

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

7.3   Rotationally averaged power spectrum ⓘ
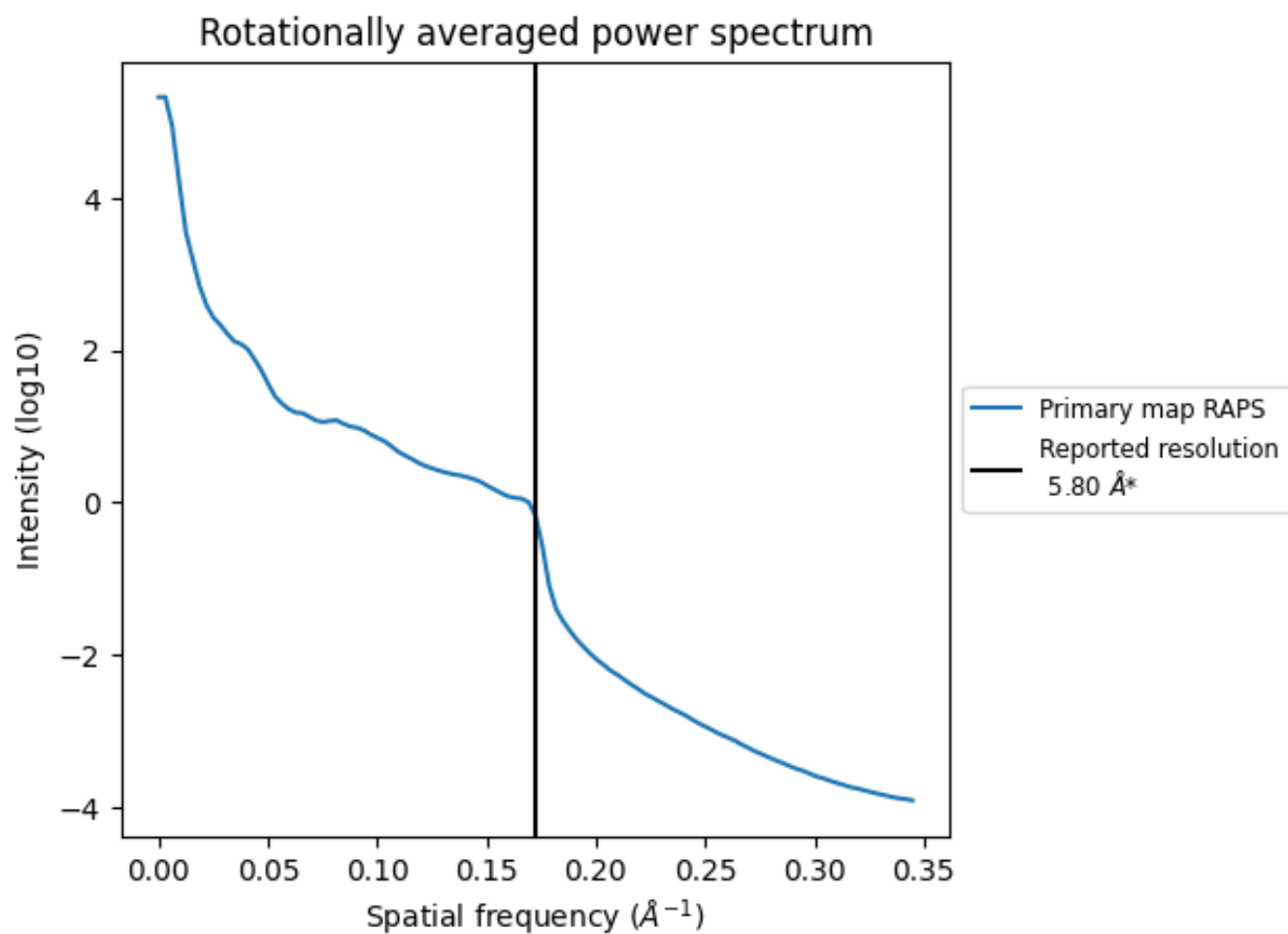
*Reported resolution corresponds to spatial frequency of 0.172 Å^{-1}

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 ⓘ
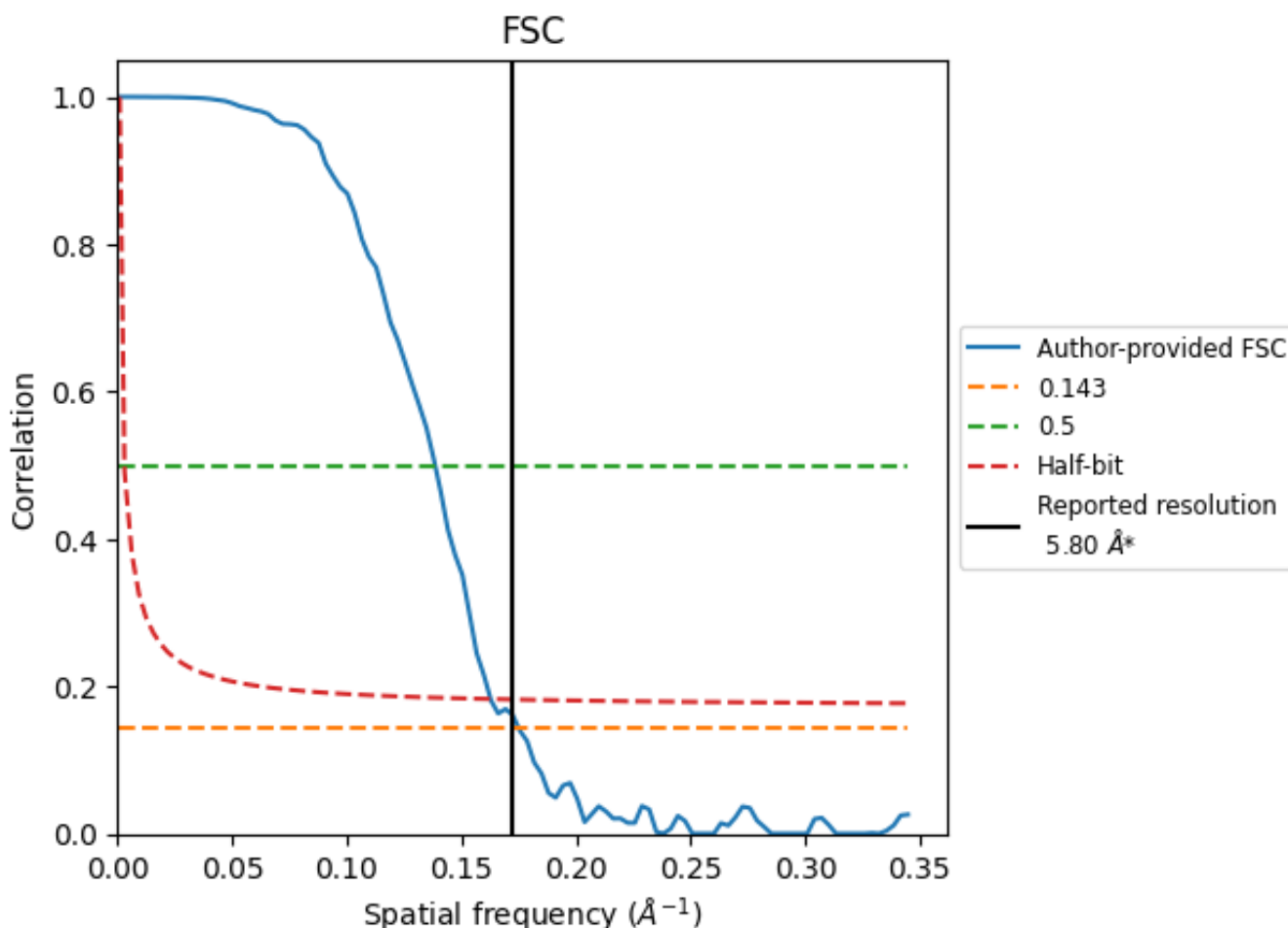
*Reported resolution corresponds to spatial frequency of 0.172 Å^{-1}

8.2 Resolution estimates ⓘ

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	5.80	-	-
Author-provided FSC curve	5.71	7.22	6.14
Unmasked-calculated*	-	-	-

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps.

9 Map-model fit ⓘ

This section contains information regarding the fit between EMDB map EMD-8621 and PDB model 5UZ4. Per-residue inclusion information can be found in section 3 on page 8.

9.1 Map-model overlay ⓘ
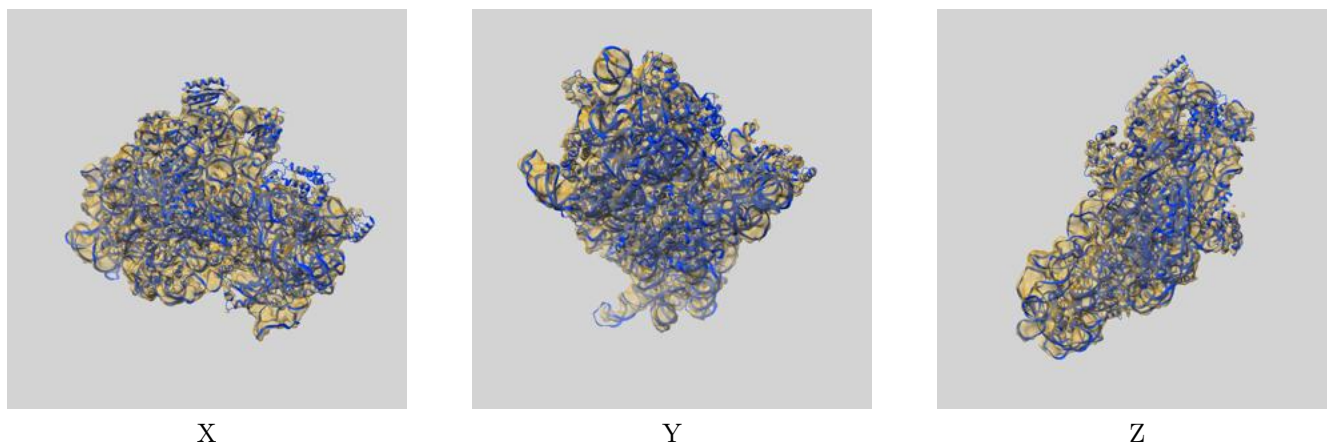
| X | Y | Z |

The images above show the 3D surface view of the map at the recommended contour level 0.0309 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 ⓘ
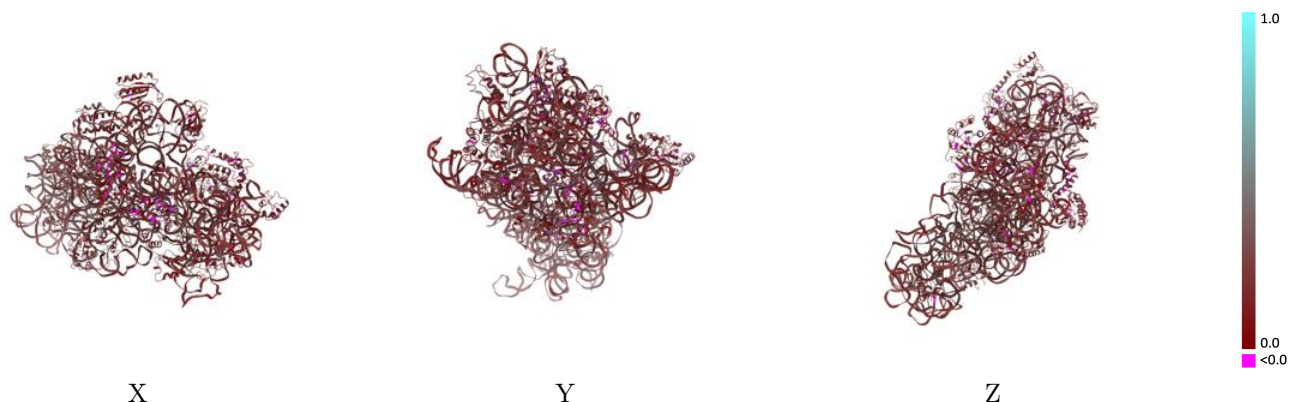
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 ⓘ
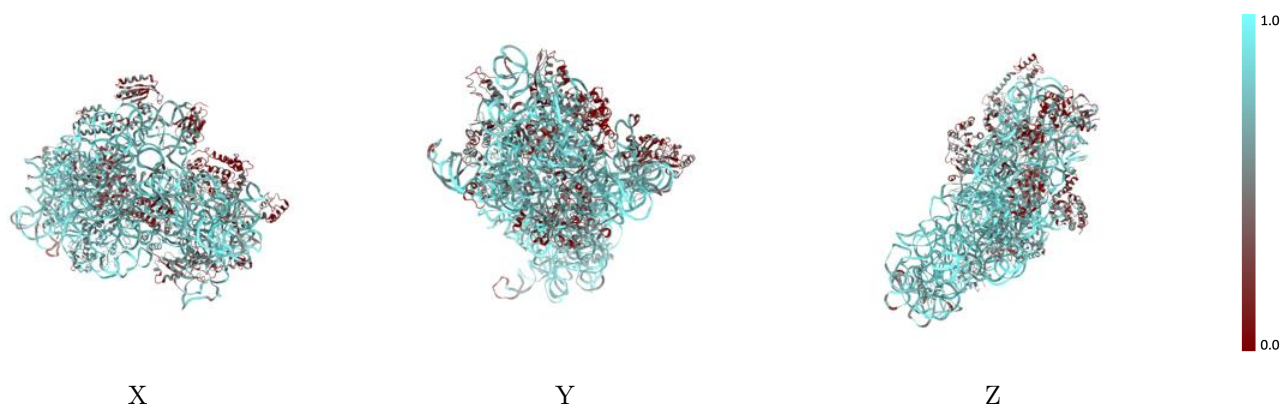
The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.0309).

9.4　Atom inclusion　ⓘ
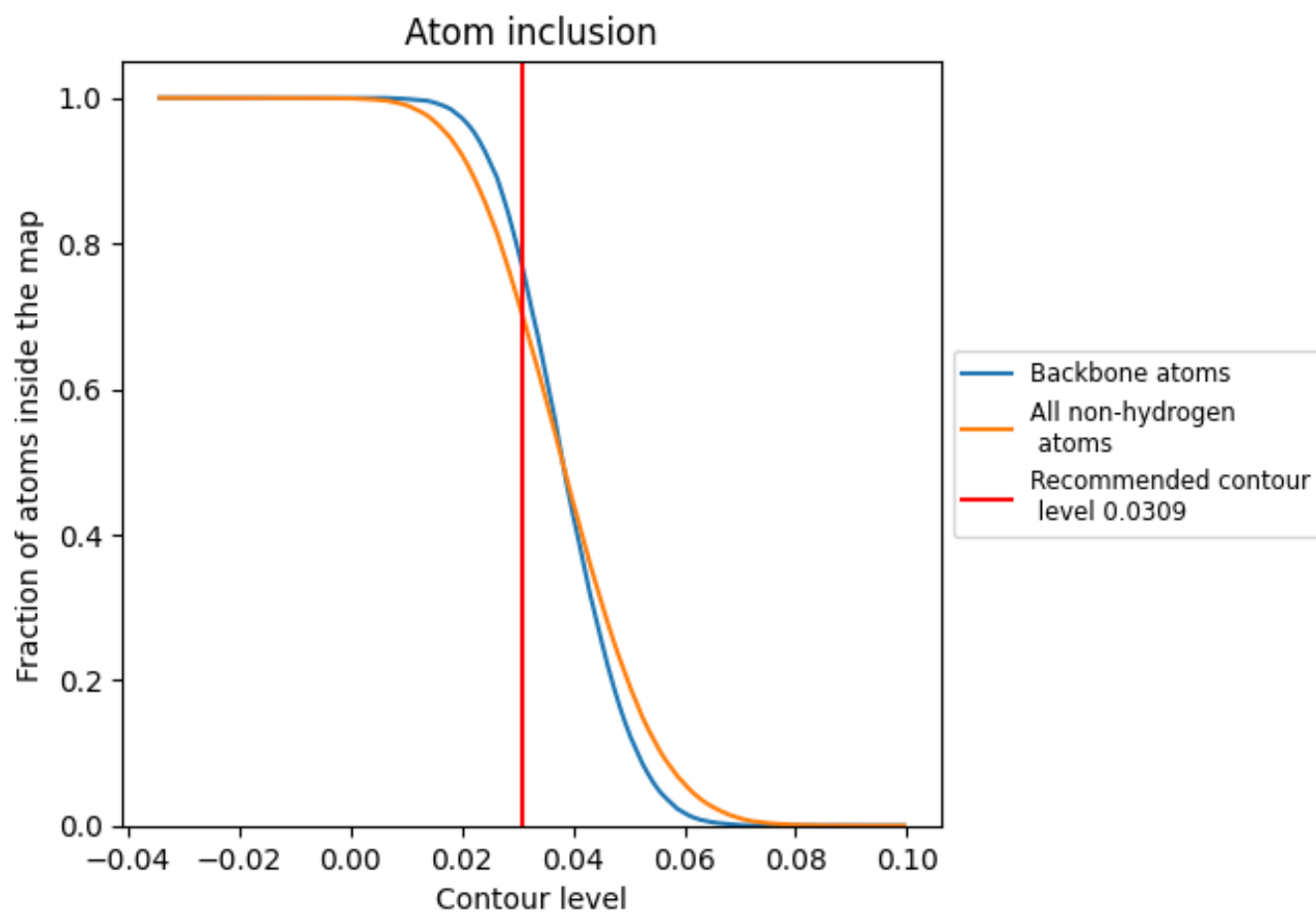
At the recommended contour level, 77% of all backbone atoms, 70% of all non-hydrogen atoms, are inside the map.

9.5   Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.0309) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.7025	0.2320
A	0.8417	0.2390
B	0.3459	0.1380
C	0.5475	0.2460
D	0.6274	0.2430
E	0.6630	0.2670
F	0.3204	0.2100
G	0.1600	0.2100
H	0.6412	0.2650
I	0.4556	0.2130
J	0.4074	0.2360
K	0.3231	0.2140
L	0.6848	0.2930
M	0.3644	0.2070
N	0.5185	0.1930
O	0.5519	0.2220
P	0.6683	0.2600
Q	0.6361	0.2610
R	0.4156	0.1950
S	0.4926	0.2000
T	0.6308	0.2190
Z	0.3285	0.1930

1.0

0.0
<0.0