# wwPDB EM Validation Summary Report

Dec 4, 2024 – 06:21 am GMT

| | | |
|---|---|---|
| PDB ID | : | 9GUV |
| EMDB ID | : | EMD-51621 |
| Title | : | 30S mRNA delivery complex (closed-head) |
| Authors | : | Rahil, H.; Webster, M.W.; Weixlbaumer, A. |
| Deposited on | : | 2024-09-20 |
| Resolution | : | 3.00 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:

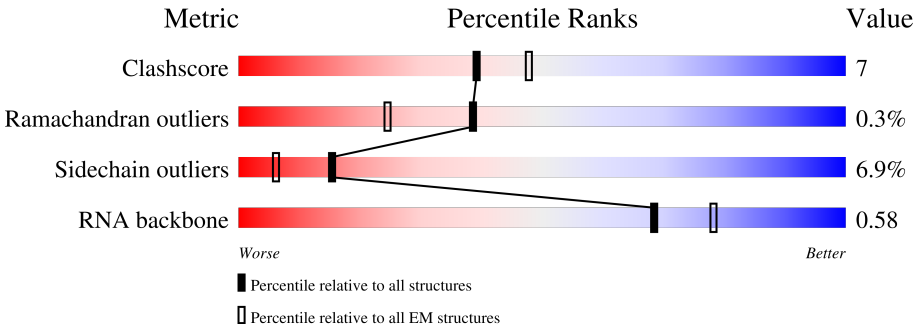
| | | |
|---|---|---|
| EMDB validation analysis | : | 0.0.1.dev113 |
| Mogul | : | 1.8.4, CSD as541be (2020) |
| MolProbity | : | 4.02b-467 |
| Percentile statistics | : | 20231227.v01 (using entries in the PDB archive December 27th 2023) |
| MapQ | : | 1.9.13 |
| Ideal geometry (proteins) | : | Engh & Huber (2001) |
| Ideal geometry (DNA, RNA) | : | Parkinson et al. (1996) |
| Validation Pipeline (wwPDB-VP) | : | 2.40 |

# 1 Overall quality at a glance

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

The reported resolution of this entry is 3.00 Å.

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




| Metric | Whole archive (#Entries) | EM structures (#Entries) |
|---|---|---|
| Clashscore | 210492 | 15764 |
| Ramachandran outliers | 207382 | 16835 |
| Sidechain outliers | 206894 | 16415 |
| RNA backbone | 6643 | 2191 |

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=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 | 1541 | 65% 29% 5% |
| 2 | B | 557 | 54% 7% 37% |
| 3 | C | 241 | 76% 16% 6% |
| 4 | D | 233 | 71% 18% 9% |
| 5 | E | 206 | 68% 29% |
| 6 | F | 165 | 76% 18% 5% |
| 7 | G | 131 | 54% 24% 21% |

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| Mol | Chain | Length | Quality of chain |
|---|---|---|---|
| 8 | H | 156 |   |
| 9 | I | 130 |   |
| 10 | J | 130 |   |
| 11 | K | 103 |   |
| 12 | L | 129 |   |
| 13 | M | 124 |   |
| 14 | N | 118 |   |
| 15 | O | 101 |   |
| 16 | P | 89 |   |
| 17 | Q | 82 |   |
| 18 | R | 84 |   |
| 19 | S | 75 |   |
| 20 | T | 92 |   |
| 21 | U | 87 |   |
| 22 | V | 71 |   |
| 23 | W | 77 |   |
| 24 | X | 53 |   |

# 2 Entry composition (i)

There are 25 unique types of molecules in this entry. The entry contains 55998 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 |
|---|---|---|---|---|---|---|---|---|---|
| | | | Total | C | N | O | P | | |
| 1 | A | 1539 | 33023 | 14736 | 6046 | 10702 | 1539 | 0 | 0 |

- Molecule 2 is a protein called 30S ribosomal protein S1.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| | | | Total | C | N | O | S | | |
| 2 | B | 352 | 1797 | 1001 | 379 | 416 | 1 | 0 | 0 |

- Molecule 3 is a protein called 30S ribosomal protein S2.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| | | | Total | C | N | O | S | | |
| 3 | C | 226 | 1765 | 1116 | 317 | 324 | 8 | 0 | 0 |

- Molecule 4 is a protein called Small ribosomal subunit protein uS3.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| | | | Total | C | N | O | S | | |
| 4 | D | 211 | 1653 | 1046 | 310 | 293 | 4 | 0 | 0 |

- Molecule 5 is a protein called Small ribosomal subunit protein uS4.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| | | | Total | C | N | O | S | | |
| 5 | E | 205 | 1643 | 1026 | 315 | 298 | 4 | 0 | 0 |

- Molecule 6 is a protein called Small ribosomal subunit protein uS5.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| | | | Total | C | N | O | S | | |
| 6 | F | 156 | 1152 | 717 | 217 | 212 | 6 | 0 | 0 |

There is a discrepancy between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment | Reference |
|---|---|---|---|---|---|
| F | 9 | CYS | GLY | conflict | UNP C3SR27 |

- Molecule 7 is a protein called Small ribosomal subunit protein bS6.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 7 | G | 104 | Total | C | N | O | S | 0 | 0 |
| | | | 848 | 536 | 153 | 152 | 7 | | |

- Molecule 8 is a protein called 30S ribosomal protein S7.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 8 | H | 152 | Total | C | N | O | S | 0 | 0 |
| | | | 1191 | 741 | 230 | 216 | 4 | | |

- Molecule 9 is a protein called 30S ribosomal protein S8.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 9 | I | 129 | Total | C | N | O | S | 0 | 0 |
| | | | 979 | 616 | 173 | 184 | 6 | | |

- Molecule 10 is a protein called 30S ribosomal protein S9.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 10 | J | 128 | Total | C | N | O | S | 0 | 0 |
| | | | 1031 | 639 | 207 | 182 | 3 | | |

- Molecule 11 is a protein called 30S ribosomal protein S10.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 11 | K | 101 | Total | C | N | O | S | 0 | 0 |
| | | | 808 | 504 | 155 | 148 | 1 | | |

- Molecule 12 is a protein called 30S ribosomal protein S11.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 12 | L | 117 | Total | C | N | O | S | 0 | 0 |
| | | | 877 | 540 | 174 | 160 | 3 | | |

- Molecule 13 is a protein called 30S ribosomal protein S12.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 13 | M | 122 | Total | C | N | O | S | 0 | 0 |
| | | | 951 | 588 | 195 | 163 | 5 | | |

- Molecule 14 is a protein called 30S ribosomal protein S13.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 14 | N | 115 | Total | C | N | O | S | 0 | 0 |
| | | | 891 | 552 | 179 | 157 | 3 | | |

- Molecule 15 is a protein called 30S ribosomal protein S14.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 15 | O | 100 | Total | C | N | O | S | 0 | 0 |
| | | | 805 | 499 | 164 | 139 | 3 | | |

- Molecule 16 is a protein called Small ribosomal subunit protein uS15.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 16 | P | 88 | Total | C | N | O | S | 0 | 0 |
| | | | 714 | 439 | 144 | 130 | 1 | | |

- Molecule 17 is a protein called 30S ribosomal protein S16.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 17 | Q | 82 | Total | C | N | O | S | 0 | 0 |
| | | | 649 | 406 | 128 | 114 | 1 | | |

- Molecule 18 is a protein called 30S ribosomal protein S17.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 18 | R | 80 | Total | C | N | O | S | 0 | 0 |
| | | | 648 | 411 | 121 | 113 | 3 | | |

- Molecule 19 is a protein called 30S ribosomal protein S18.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 19 | S | 67 | Total | C | N | O | S | 0 | 0 |
| | | | 554 | 350 | 104 | 99 | 1 | | |

- Molecule 20 is a protein called 30S ribosomal protein S19.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 20 | T | 83 | Total<br>663 | C<br>424 | N<br>126 | O<br>111 | S<br>2 | 0 | 0 |

- Molecule 21 is a protein called 30S ribosomal protein S20.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 21 | U | 86 | Total<br>670 | C<br>414 | N<br>138 | O<br>115 | S<br>3 | 0 | 0 |

- Molecule 22 is a protein called 30S ribosomal protein S21.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 22 | V | 70 | Total<br>590 | C<br>366 | N<br>125 | O<br>98 | S<br>1 | 0 | 0 |

- Molecule 23 is a RNA chain called tRNA(fmet) P-site.

| Mol | Chain | Residues | Atoms | | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|---|
| 23 | W | 77 | Total<br>1645 | C<br>734 | N<br>297 | O<br>536 | P<br>77 | S<br>1 | 0 | 0 |

- Molecule 24 is a RNA chain called mRNA.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|
| 24 | X | 17 | Total<br>365 | C<br>163 | N<br>65 | O<br>120 | P<br>17 | 0 | 0 |

- Molecule 25 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

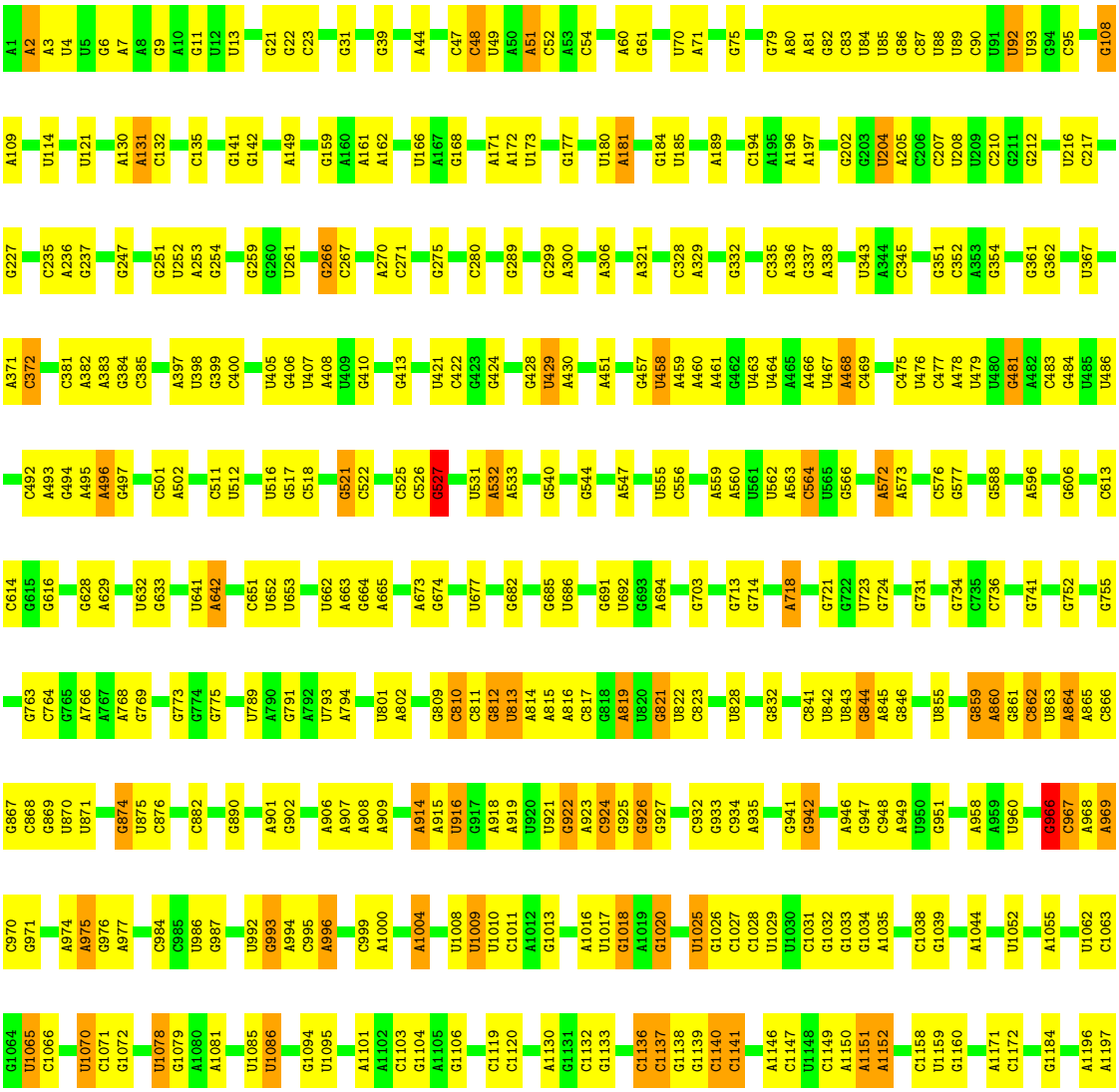
| Mol | Chain | Residues | Atoms | | AltConf |
|---|---|---|---|---|---|
| 25 | A | 85 | Total<br>85 | Mg<br>85 | 0 |
| 25 | O | 1 | Total<br>1 | Mg<br>1 | 0 |

# 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.

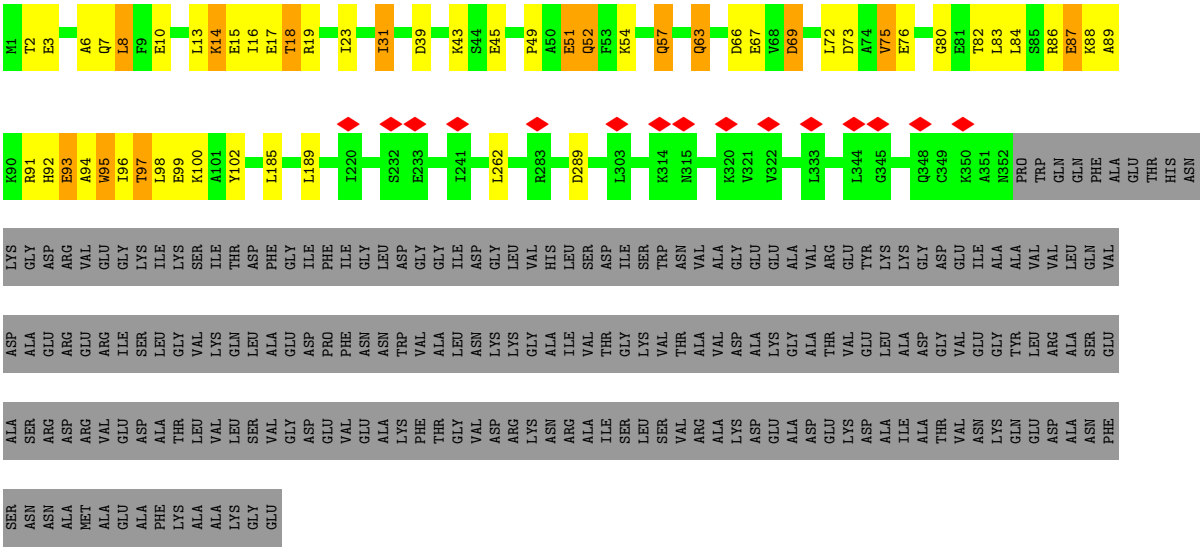
- Molecule 1: 16S ribosomal RNA

Chain A:

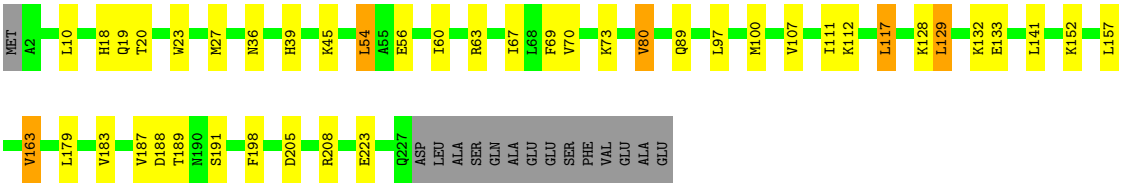
• Molecule 2: 30S ribosomal protein S1

Chain B:

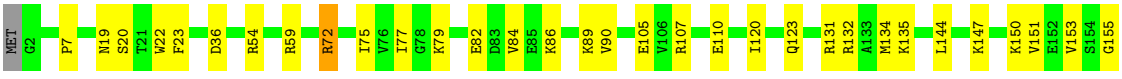
• Molecule 3: 30S ribosomal protein S2

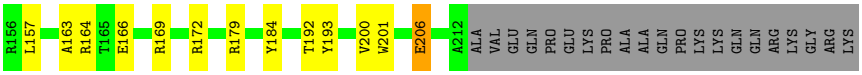
Chain C:

• Molecule 4: Small ribosomal subunit protein uS3

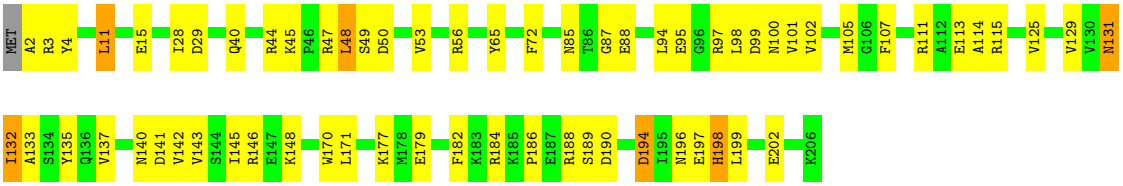
Chain D:



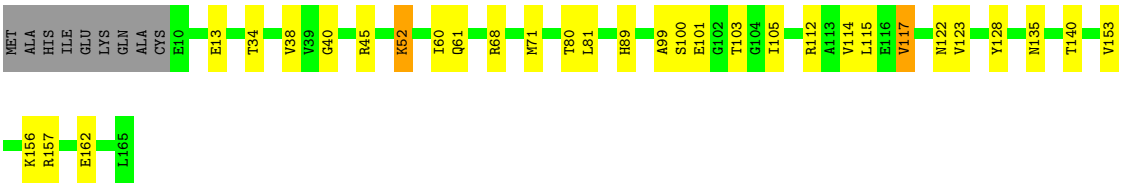

• Molecule 5: Small ribosomal subunit protein uS4

Chain E:


• Molecule 6: Small ribosomal subunit protein uS5

Chain F:


• Molecule 7: Small ribosomal subunit protein bS6

Chain G:



• Molecule 8: 30S ribosomal protein S7

Chain H:



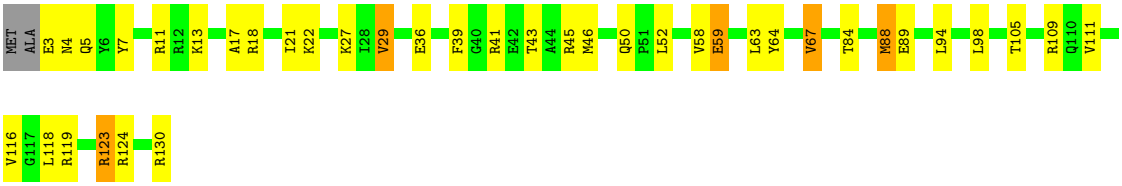
• Molecule 9: 30S ribosomal protein S8

Chain I:

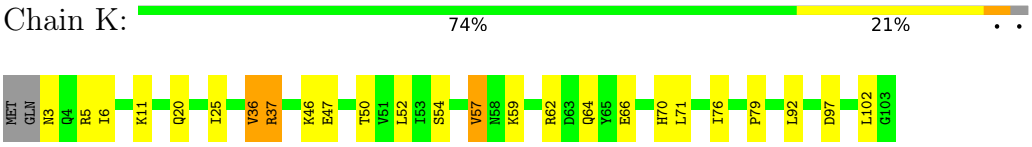


• Molecule 10: 30S ribosomal protein S9

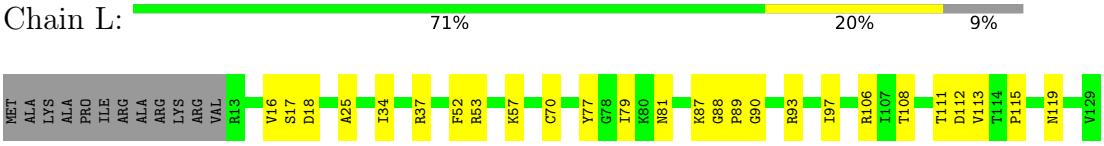
Chain J:



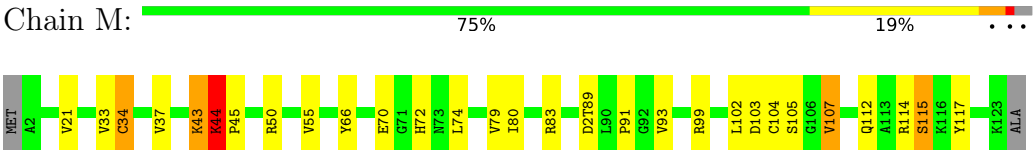

• Molecule 11: 30S ribosomal protein S10



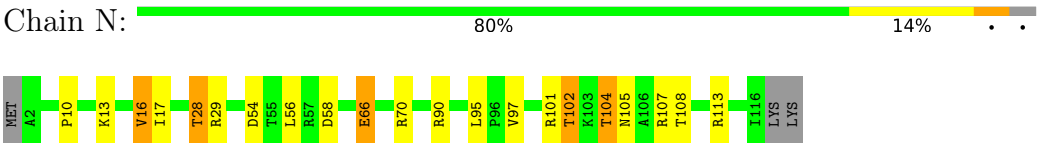

• Molecule 12: 30S ribosomal protein S11



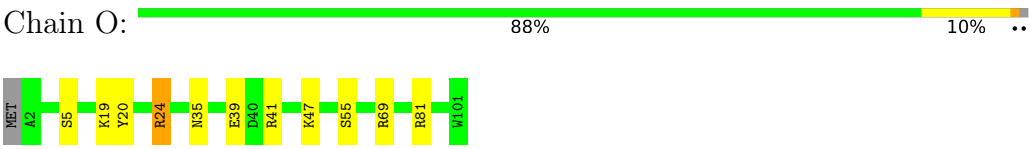

• Molecule 13: 30S ribosomal protein S12



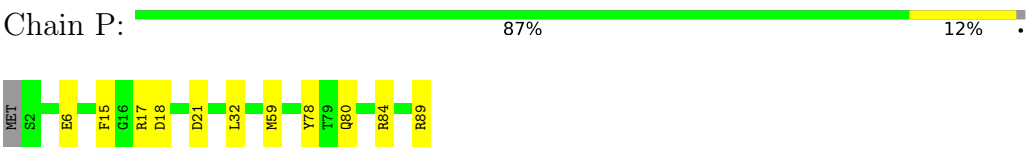

• Molecule 14: 30S ribosomal protein S13




• Molecule 15: 30S ribosomal protein S14

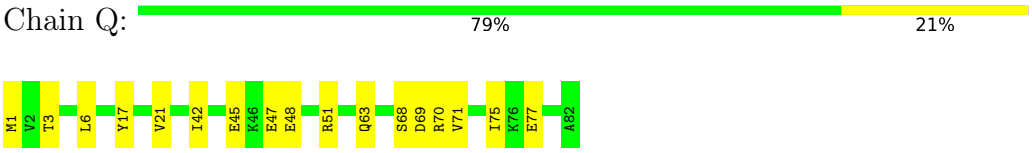



• Molecule 16: Small ribosomal subunit protein uS15



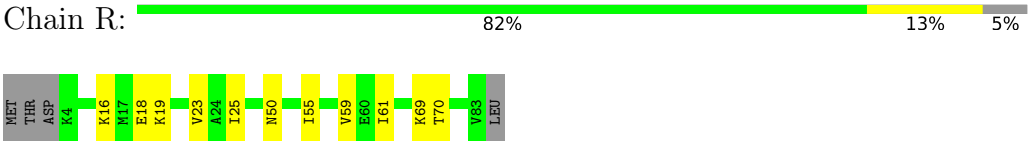

• Molecule 17: 30S ribosomal protein S16

Chain Q:



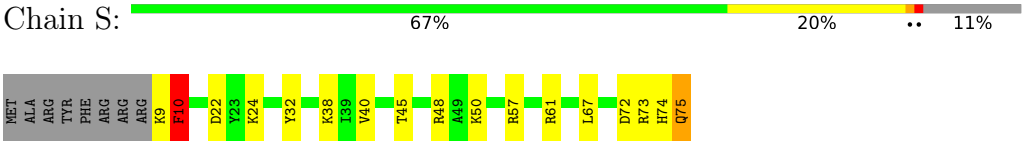

• Molecule 18: 30S ribosomal protein S17

Chain R:



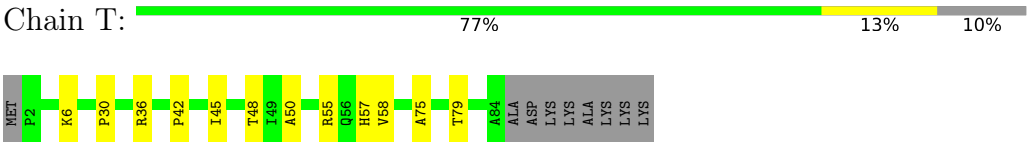

• Molecule 19: 30S ribosomal protein S18

Chain S:



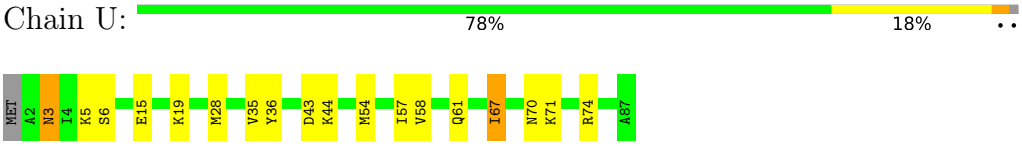

• Molecule 20: 30S ribosomal protein S19

Chain T:



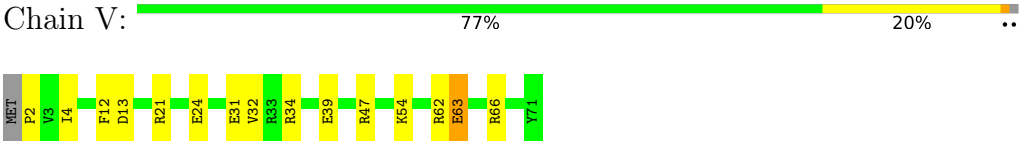

• Molecule 21: 30S ribosomal protein S20

Chain U:



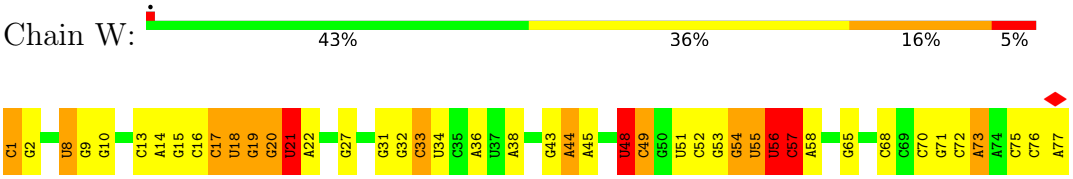

• Molecule 22: 30S ribosomal protein S21

Chain V:



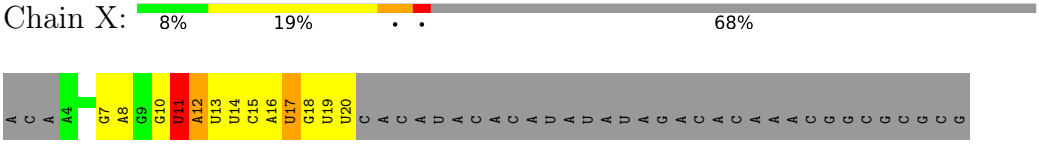

• Molecule 23: tRNA(fmet) P-site

Chain W:




• Molecule 24: mRNA

Chain X:


8%
19%
68%
A C A A4 G7 A8 G9 G10 U11 A12 U13 U14 C15 A16 U17 G18 U19 U20 C A C A U A C A C A U A U A U A G A C A C A A A C G G C G C G C G

# 4 Experimental information (i)

| Property | Value | Source |
|---|---|---|
| EM reconstruction method | SINGLE PARTICLE | Depositor |
| Imposed symmetry | POINT, Not provided | |
| Number of particles used | 112399 | 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 ($e^-/Å^2$) | 49.95 | Depositor |
| Minimum defocus (nm) | 800 | Depositor |
| Maximum defocus (nm) | 2000 | Depositor |
| Magnification | Not provided | |
| Image detector | GATAN K2 QUANTUM (4k x 4k) | Depositor |
| Maximum map value | 10.643 | Depositor |
| Minimum map value | -4.354 | Depositor |
| Average map value | 0.000 | Depositor |
| Map value standard deviation | 0.179 | Depositor |
| Recommended contour level | 0.193 | Depositor |
| Map size (Å) | 503.99997, 503.99997, 503.99997 | wwPDB |
| Map dimensions | 600, 600, 600 | wwPDB |
| Map angles (°) | 90.0, 90.0, 90.0 | wwPDB |
| Pixel spacing (Å) | 0.84, 0.84, 0.84 | Depositor |

# 5 Model quality

## 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: 4SU, MG, H2U, 4OC, D2T, 5MU, MA6, OMC, PSU, 5MC, UR3, 2MG, G7M

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

| Mol | Chain | Bond lengths | | Bond angles | |
|---|---|---|---|---|---|
| | | RMSZ | #$\|Z\|$ >5 | RMSZ | #$\|Z\|$ >5 |
| 1 | A | 0.74 | 4/36692 (0.0%) | 0.76 | 2/57230 (0.0%) |
| 2 | B | 0.25 | 0/1806 | 0.51 | 0/2338 |
| 3 | C | 0.32 | 0/1796 | 0.47 | 0/2420 |
| 4 | D | 0.37 | 0/1680 | 0.49 | 0/2263 |
| 5 | E | 0.33 | 0/1665 | 0.46 | 0/2227 |
| 6 | F | 0.41 | 0/1165 | 0.53 | 0/1568 |
| 7 | G | 0.34 | 0/867 | 0.47 | 0/1171 |
| 8 | H | 0.33 | 0/1206 | 0.49 | 0/1617 |
| 9 | I | 0.39 | 0/989 | 0.49 | 0/1326 |
| 10 | J | 0.35 | 0/1043 | 0.47 | 0/1387 |
| 11 | K | 0.35 | 0/818 | 0.52 | 0/1105 |
| 12 | L | 0.33 | 0/893 | 0.49 | 0/1205 |
| 13 | M | 0.40 | 0/954 | 0.52 | 0/1279 |
| 14 | N | 0.29 | 0/900 | 0.50 | 0/1204 |
| 15 | O | 0.33 | 0/817 | 0.44 | 0/1088 |
| 16 | P | 0.32 | 0/722 | 0.45 | 0/964 |
| 17 | Q | 0.36 | 0/659 | 0.48 | 0/884 |
| 18 | R | 0.35 | 0/657 | 0.48 | 0/881 |
| 19 | S | 0.39 | 0/563 | 0.47 | 0/754 |
| 20 | T | 0.32 | 0/680 | 0.45 | 0/915 |
| 21 | U | 0.28 | 0/676 | 0.38 | 0/895 |
| 22 | V | 0.34 | 0/598 | 0.40 | 0/792 |
| 23 | W | 0.36 | 1/1725 (0.1%) | 0.82 | 2/2687 (0.1%) |
| 24 | X | 0.28 | 0/408 | 0.80 | 1/634 (0.2%) |
| All | All | 0.61 | 5/59979 (0.0%) | 0.69 | 5/88834 (0.0%) |

All (5) bond length outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|---|---|---|---|---|---|---|---|
| 23 | W | 1 | C | OP3-P | -7.54 | 1.52 | 1.61 |
| 1 | A | 2 | A | O3'-P | -7.19 | 1.52 | 1.61 |

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| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|---|---|---|---|---|---|---|---|
| 1 | A | 907 | A | O3'-P | -6.29 | 1.53 | 1.61 |
| 1 | A | 860 | A | O3'-P | -5.86 | 1.54 | 1.61 |
| 1 | A | 855 | U | O3'-P | -5.23 | 1.54 | 1.61 |

All (5) bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed($^o$) | Ideal($^o$) |
|---|---|---|---|---|---|---|---|
| 1 | A | 1065 | U | C2'-C3'-O3' | 8.78 | 128.82 | 109.50 |
| 1 | A | 1078 | U | C2'-C3'-O3' | 6.45 | 124.03 | 113.70 |
| 24 | X | 11 | U | P-O3'-C3' | 5.56 | 126.38 | 119.70 |
| 23 | W | 48 | U | P-O3'-C3' | 5.43 | 126.22 | 119.70 |
| 23 | W | 57 | C | C6-N1-C2 | -5.07 | 118.27 | 120.30 |

There are no chirality outliers.

There are no planarity outliers.

## 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 | A | 33023 | 0 | 16643 | 289 | 0 |
| 2 | B | 1797 | 0 | 1082 | 32 | 0 |
| 3 | C | 1765 | 0 | 1792 | 25 | 0 |
| 4 | D | 1653 | 0 | 1727 | 27 | 0 |
| 5 | E | 1643 | 0 | 1707 | 39 | 0 |
| 6 | F | 1152 | 0 | 1196 | 24 | 0 |
| 7 | G | 848 | 0 | 846 | 18 | 0 |
| 8 | H | 1191 | 0 | 1245 | 25 | 0 |
| 9 | I | 979 | 0 | 1031 | 14 | 0 |
| 10 | J | 1031 | 0 | 1076 | 22 | 0 |
| 11 | K | 808 | 0 | 845 | 17 | 0 |
| 12 | L | 877 | 0 | 887 | 19 | 0 |
| 13 | M | 951 | 0 | 1012 | 18 | 0 |
| 14 | N | 891 | 0 | 952 | 14 | 0 |
| 15 | O | 805 | 0 | 844 | 9 | 0 |
| 16 | P | 714 | 0 | 734 | 5 | 0 |
| 17 | Q | 649 | 0 | 666 | 8 | 0 |

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| Mol | Chain | Non-H | H(model) | H(added) | Clashes | Symm-Clashes |
|---|---|---|---|---|---|---|
| 18 | R | 648 | 0 | 691 | 7 | 0 |
| 19 | S | 554 | 0 | 573 | 12 | 0 |
| 20 | T | 663 | 0 | 688 | 7 | 0 |
| 21 | U | 670 | 0 | 719 | 11 | 0 |
| 22 | V | 590 | 0 | 629 | 9 | 0 |
| 23 | W | 1645 | 0 | 842 | 32 | 0 |
| 24 | X | 365 | 0 | 182 | 12 | 0 |
| 25 | A | 85 | 0 | 0 | 0 | 0 |
| 25 | O | 1 | 0 | 0 | 0 | 0 |
| All | All | 55998 | 0 | 38609 | 614 | 0 |

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 7.

The worst 5 of 614 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) |
|---|---|---|---|
| 8:H:2:PRO:HG2 | 8:H:5:ARG:HA | 1.42 | 1.00 |
| 23:W:33:OMC:HM22 | 23:W:34:U:H5' | 1.45 | 0.99 |
| 1:A:823:C:HO2' | 9:I:2:SER:N | 1.76 | 0.84 |
| 8:H:5:ARG:HG2 | 8:H:6:VAL:N | 1.91 | 0.84 |
| 8:H:79:ARG:HA | 8:H:83:SER:HA | 1.64 | 0.79 |

There are no symmetry-related clashes.

## 5.3 Torsion angles (i)

### 5.3.1 Protein backbone (i)

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

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

| Mol | Chain | Analysed | Favoured | Allowed | Outliers | Percentiles |
|---|---|---|---|---|---|---|
| 2 | B | 350/557 (63%) | 312 (89%) | 37 (11%) | 1 (0%) | 37 70 |
| 3 | C | 224/241 (93%) | 219 (98%) | 5 (2%) | 0 | 100 100 |

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| Mol | Chain | Analysed | Favoured | Allowed | Outliers | Percentiles | |
|---|---|---|---|---|---|---|---|
| 4 | D | 209/233 (90%) | 204 (98%) | 5 (2%) | 0 | 100 | 100 |
| 5 | E | 203/206 (98%) | 198 (98%) | 5 (2%) | 0 | 100 | 100 |
| 6 | F | 154/165 (93%) | 145 (94%) | 9 (6%) | 0 | 100 | 100 |
| 7 | G | 102/131 (78%) | 99 (97%) | 3 (3%) | 0 | 100 | 100 |
| 8 | H | 150/156 (96%) | 142 (95%) | 7 (5%) | 1 (1%) | 19 | 54 |
| 9 | I | 127/130 (98%) | 122 (96%) | 5 (4%) | 0 | 100 | 100 |
| 10 | J | 126/130 (97%) | 122 (97%) | 3 (2%) | 1 (1%) | 16 | 51 |
| 11 | K | 99/103 (96%) | 95 (96%) | 3 (3%) | 1 (1%) | 13 | 46 |
| 12 | L | 115/129 (89%) | 107 (93%) | 8 (7%) | 0 | 100 | 100 |
| 13 | M | 119/124 (96%) | 112 (94%) | 6 (5%) | 1 (1%) | 16 | 51 |
| 14 | N | 113/118 (96%) | 111 (98%) | 1 (1%) | 1 (1%) | 14 | 49 |
| 15 | O | 98/101 (97%) | 96 (98%) | 2 (2%) | 0 | 100 | 100 |
| 16 | P | 86/89 (97%) | 84 (98%) | 2 (2%) | 0 | 100 | 100 |
| 17 | Q | 80/82 (98%) | 78 (98%) | 2 (2%) | 0 | 100 | 100 |
| 18 | R | 78/84 (93%) | 76 (97%) | 2 (3%) | 0 | 100 | 100 |
| 19 | S | 65/75 (87%) | 62 (95%) | 1 (2%) | 2 (3%) | 3 | 19 |
| 20 | T | 81/92 (88%) | 80 (99%) | 1 (1%) | 0 | 100 | 100 |
| 21 | U | 84/87 (97%) | 84 (100%) | 0 | 0 | 100 | 100 |
| 22 | V | 68/71 (96%) | 67 (98%) | 1 (2%) | 0 | 100 | 100 |
| All | All | 2731/3104 (88%) | 2615 (96%) | 108 (4%) | 8 (0%) | 38 | 70 |

5 of 8 Ramachandran outliers are listed below:

| Mol | Chain | Res | Type |
|---|---|---|---|
| 8 | H | 5 | ARG |
| 11 | K | 57 | VAL |
| 14 | N | 66 | GLU |
| 2 | B | 262 | LEU |
| 13 | M | 44 | LYS |

### 5.3.2 Protein sidechains (i)

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

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

| Mol | Chain | Analysed | Rotameric | Outliers | Percentiles |
|---|---|---|---|---|---|
| 2 | B | 86/461 (19%) | 62 (72%) | 24 (28%) | 0 1 |
| 3 | C | 187/199 (94%) | 175 (94%) | 12 (6%) | 14 44 |
| 4 | D | 172/190 (90%) | 168 (98%) | 4 (2%) | 45 75 |
| 5 | E | 172/173 (99%) | 157 (91%) | 15 (9%) | 8 32 |
| 6 | F | 119/126 (94%) | 114 (96%) | 5 (4%) | 25 59 |
| 7 | G | 91/112 (81%) | 84 (92%) | 7 (8%) | 10 37 |
| 8 | H | 125/129 (97%) | 114 (91%) | 11 (9%) | 8 31 |
| 9 | I | 104/105 (99%) | 100 (96%) | 4 (4%) | 28 62 |
| 10 | J | 106/107 (99%) | 94 (89%) | 12 (11%) | 4 21 |
| 11 | K | 88/90 (98%) | 82 (93%) | 6 (7%) | 13 42 |
| 12 | L | 90/99 (91%) | 88 (98%) | 2 (2%) | 47 76 |
| 13 | M | 102/103 (99%) | 94 (92%) | 8 (8%) | 10 36 |
| 14 | N | 93/96 (97%) | 86 (92%) | 7 (8%) | 11 38 |
| 15 | O | 83/84 (99%) | 81 (98%) | 2 (2%) | 44 74 |
| 16 | P | 76/77 (99%) | 74 (97%) | 2 (3%) | 41 72 |
| 17 | Q | 65/65 (100%) | 60 (92%) | 5 (8%) | 10 37 |
| 18 | R | 74/78 (95%) | 73 (99%) | 1 (1%) | 62 83 |
| 19 | S | 58/65 (89%) | 52 (90%) | 6 (10%) | 6 24 |
| 20 | T | 72/79 (91%) | 70 (97%) | 2 (3%) | 38 70 |
| 21 | U | 65/66 (98%) | 61 (94%) | 4 (6%) | 15 45 |
| 22 | V | 60/61 (98%) | 55 (92%) | 5 (8%) | 9 34 |
| All | All | 2088/2565 (81%) | 1944 (93%) | 144 (7%) | 15 42 |

5 of 144 residues with a non-rotameric sidechain are listed below:

| Mol | Chain | Res | Type |
|---|---|---|---|
| 14 | N | 102 | THR |
| 22 | V | 63 | GLU |
| 16 | P | 6 | GLU |
| 19 | S | 67 | LEU |
| 5 | E | 132 | ILE |

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 26

such sidechains are listed below:

| Mol | Chain | Res | Type |
|---|---|---|---|
| 11 | K | 58 | ASN |
| 15 | O | 35 | ASN |
| 21 | U | 52 | ASN |
| 15 | O | 4 | GLN |
| 15 | O | 66 | GLN |

### 5.3.3 RNA (i)

| Mol | Chain | Analysed | Backbone Outliers | Pucker Outliers |
|---|---|---|---|---|
| 1 | A | 1534/1541 (99%) | 236 (15%) | 9 (0%) |
| 23 | W | 76/77 (98%) | 22 (28%) | 3 (3%) |
| 24 | X | 16/53 (30%) | 3 (18%) | 1 (6%) |
| All | All | 1626/1671 (97%) | 261 (16%) | 13 (0%) |

5 of 261 RNA backbone outliers are listed below:

| Mol | Chain | Res | Type |
|---|---|---|---|
| 1 | A | 2 | A |
| 1 | A | 3 | A |
| 1 | A | 4 | U |
| 1 | A | 6 | G |
| 1 | A | 9 | G |

5 of 13 RNA pucker outliers are listed below:

| Mol | Chain | Res | Type |
|---|---|---|---|
| 1 | A | 1065 | U |
| 1 | A | 1078 | U |
| 24 | X | 11 | U |
| 23 | W | 48 | U |
| 23 | W | 57 | C |

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

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

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond

length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

| Mol | Type | Chain | Res | Link | Bond lengths | | | Bond angles | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Counts | RMSZ | $\#\|Z\| > 2$ | Counts | RMSZ | $\#\|Z\| > 2$ |
| 1 | 4OC | A | 1402 | 1 | 20,23,24 | 0.79 | 0 | 26,32,35 | 1.41 | 2 (7%) |
| 23 | H2U | W | 21 | 23 | 18,21,22 | 1.33 | 3 (16%) | 21,30,33 | 2.20 | 2 (9%) |
| 1 | 2MG | A | 966 | 1 | 18,26,27 | 1.03 | 2 (11%) | 16,38,41 | 1.31 | 2 (12%) |
| 1 | PSU | A | 516 | 25,1 | 18,21,22 | 1.08 | 2 (11%) | 22,30,33 | 1.99 | 5 (22%) |
| 1 | 5MC | A | 967 | 1 | 18,22,23 | 0.98 | 2 (11%) | 26,32,35 | 1.24 | 3 (11%) |
| 23 | 5MU | W | 55 | 23 | 19,22,23 | 1.45 | 5 (26%) | 28,32,35 | 2.22 | 6 (21%) |
| 1 | MA6 | A | 1519 | 1 | 18,26,27 | 0.74 | 1 (5%) | 19,38,41 | 0.84 | 0 |
| 13 | D2T | M | 89 | 13 | 7,9,10 | 1.04 | 0 | 6,11,13 | 2.36 | 3 (50%) |
| 1 | 2MG | A | 1207 | 1 | 18,26,27 | 1.06 | 2 (11%) | 16,38,41 | 1.30 | 2 (12%) |
| 1 | 5MC | A | 1407 | 1 | 18,22,23 | 0.98 | 2 (11%) | 26,32,35 | 1.31 | 4 (15%) |
| 23 | PSU | W | 56 | 23 | 18,21,22 | 1.34 | 2 (11%) | 22,30,33 | 2.13 | 5 (22%) |
| 1 | MA6 | A | 1518 | 1 | 18,26,27 | 0.76 | 1 (5%) | 19,38,41 | 0.52 | 0 |
| 23 | OMC | W | 33 | 23 | 19,22,23 | 0.82 | 0 | 26,31,34 | 0.91 | 1 (3%) |
| 1 | UR3 | A | 1498 | 1 | 19,22,23 | 0.98 | 0 | 26,32,35 | 1.81 | 5 (19%) |
| 1 | 2MG | A | 1516 | 1 | 18,26,27 | 1.03 | 1 (5%) | 16,38,41 | 1.16 | 2 (12%) |
| 23 | 4SU | W | 8 | 23 | 18,21,22 | 1.70 | 4 (22%) | 26,30,33 | 2.34 | 6 (23%) |
| 1 | G7M | A | 527 | 1 | 20,26,27 | 1.11 | 2 (10%) | 17,39,42 | 0.34 | 0 |

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

| Mol | Type | Chain | Res | Link | Chirals | Torsions | Rings |
|---|---|---|---|---|---|---|---|
| 1 | 4OC | A | 1402 | 1 | - | 0/9/29/30 | 0/2/2/2 |
| 23 | H2U | W | 21 | 23 | - | 2/7/38/39 | 0/2/2/2 |
| 1 | 2MG | A | 966 | 1 | - | 3/5/27/28 | 0/3/3/3 |
| 1 | PSU | A | 516 | 25,1 | - | 0/7/25/26 | 0/2/2/2 |
| 1 | 5MC | A | 967 | 1 | - | 0/7/25/26 | 0/2/2/2 |
| 23 | 5MU | W | 55 | 23 | - | 2/7/25/26 | 0/2/2/2 |
| 1 | MA6 | A | 1519 | 1 | - | 7/7/29/30 | 0/3/3/3 |
| 13 | D2T | M | 89 | 13 | - | 2/7/12/14 | - |
| 1 | 2MG | A | 1207 | 1 | - | 2/5/27/28 | 0/3/3/3 |

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| Mol | Type | Chain | Res | Link | Chirals | Torsions | Rings |
|---|---|---|---|---|---|---|---|
| 1 | 5MC | A | 1407 | 1 | - | 0/7/25/26 | 0/2/2/2 |
| 23 | PSU | W | 56 | 23 | - | 3/7/25/26 | 0/2/2/2 |
| 1 | MA6 | A | 1518 | 1 | - | 3/7/29/30 | 0/3/3/3 |
| 23 | OMC | W | 33 | 23 | - | 0/9/27/28 | 0/2/2/2 |
| 1 | UR3 | A | 1498 | 1 | - | 0/7/25/26 | 0/2/2/2 |
| 1 | 2MG | A | 1516 | 1 | - | 0/5/27/28 | 0/3/3/3 |
| 23 | 4SU | W | 8 | 23 | - | 1/7/25/26 | 0/2/2/2 |
| 1 | G7M | A | 527 | 1 | - | 3/3/25/26 | 0/3/3/3 |

The worst 5 of 29 bond length outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|---|---|---|---|---|---|---|---|
| 23 | W | 8 | 4SU | C4-S4 | -4.44 | 1.60 | 1.68 |
| 1 | A | 527 | G7M | C8-N9 | 3.43 | 1.39 | 1.33 |
| 23 | W | 21 | H2U | C2-N3 | -3.09 | 1.32 | 1.38 |
| 23 | W | 55 | 5MU | C4-N3 | -3.01 | 1.33 | 1.38 |
| 23 | W | 56 | PSU | C6-C5 | 2.94 | 1.38 | 1.35 |

The worst 5 of 48 bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed($^o$) | Ideal($^o$) |
|---|---|---|---|---|---|---|---|
| 23 | W | 21 | H2U | C4-N3-C2 | -8.66 | 118.61 | 125.79 |
| 23 | W | 8 | 4SU | C4-N3-C2 | -6.90 | 120.64 | 127.34 |
| 23 | W | 56 | PSU | N1-C2-N3 | 6.26 | 122.23 | 115.13 |
| 1 | A | 1498 | UR3 | C4-N3-C2 | -6.26 | 118.67 | 124.56 |
| 23 | W | 8 | 4SU | C5-C4-N3 | 5.97 | 120.23 | 114.69 |

There are no chirality outliers.

5 of 28 torsion outliers are listed below:

| Mol | Chain | Res | Type | Atoms |
|---|---|---|---|---|
| 1 | A | 527 | G7M | C3'-C4'-C5'-O5' |
| 1 | A | 966 | 2MG | O4'-C4'-C5'-O5' |
| 1 | A | 966 | 2MG | C3'-C4'-C5'-O5' |
| 1 | A | 1207 | 2MG | N3-C2-N2-CM2 |
| 1 | A | 1518 | MA6 | C5-C6-N6-C10 |

There are no ring outliers.

14 monomers are involved in 25 short contacts:

| Mol | Chain | Res | Type | Clashes | Symm-Clashes |
|---|---|---|---|---|---|
| 1 | A | 1402 | 4OC | 1 | 0 |
| 23 | W | 21 | H2U | 2 | 0 |
| 1 | A | 966 | 2MG | 2 | 0 |
| 1 | A | 967 | 5MC | 3 | 0 |
| 23 | W | 55 | 5MU | 1 | 0 |
| 1 | A | 1519 | MA6 | 4 | 0 |
| 1 | A | 1207 | 2MG | 1 | 0 |
| 1 | A | 1407 | 5MC | 1 | 0 |
| 23 | W | 56 | PSU | 2 | 0 |
| 1 | A | 1518 | MA6 | 2 | 0 |
| 23 | W | 33 | OMC | 5 | 0 |
| 1 | A | 1498 | UR3 | 2 | 0 |
| 1 | A | 1516 | 2MG | 1 | 0 |
| 1 | A | 527 | G7M | 1 | 0 |

## 5.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry (i)

Of 86 ligands modelled in this entry, 86 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 5.7 Other polymers (i)

There are no such residues in this entry.

## 5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

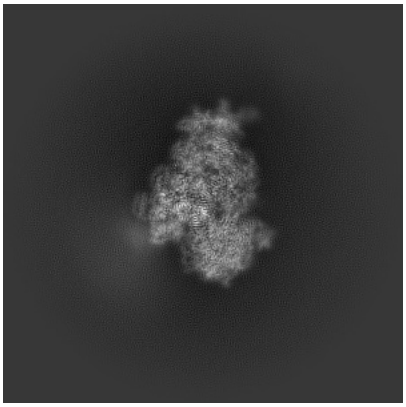
# 6 Map visualisation

This section contains visualisations of the EMDB entry EMD-51621. These allow visual inspection of the internal detail of the map and identification of artifacts.

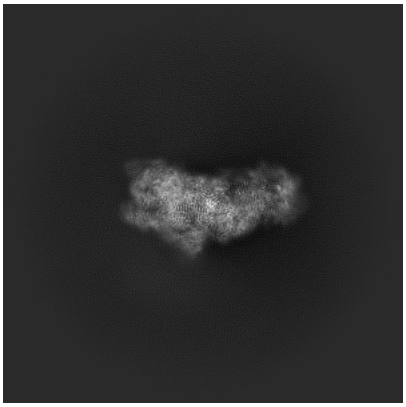
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

## 6.1 Orthogonal projections

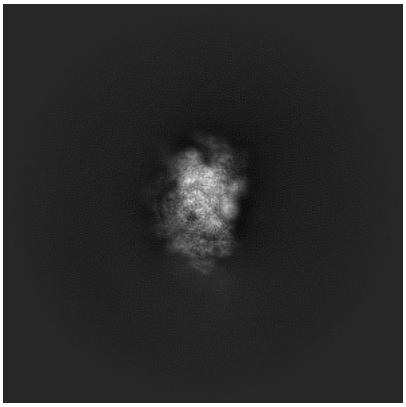
### 6.1.1 Primary map



X



Y

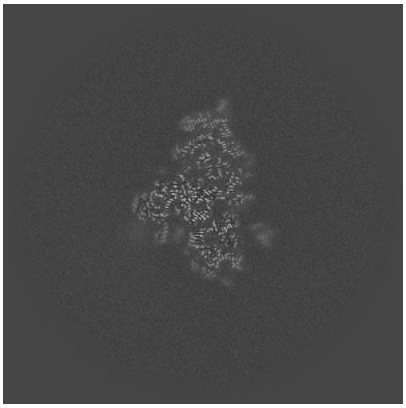


Z

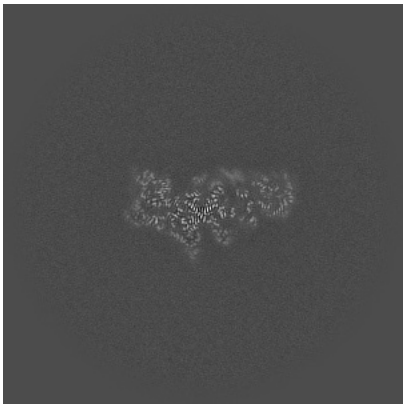
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices

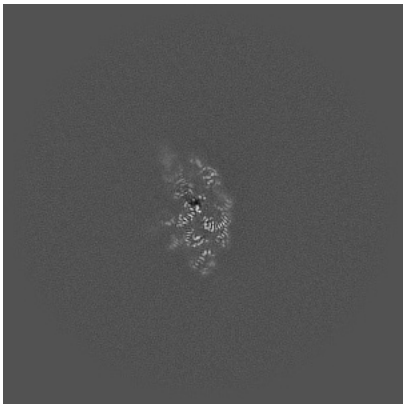
### 6.2.1 Primary map



X Index: 300



Y Index: 300

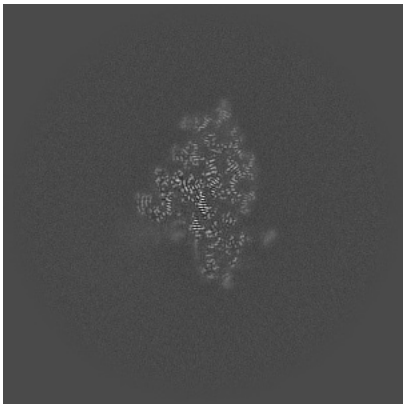


Z Index: 300

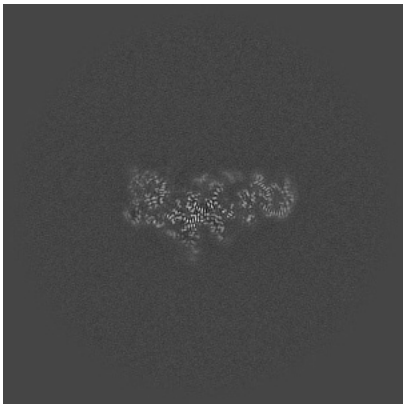
The images above show central slices of the map in three orthogonal directions.

## 6.3 Largest variance slices (i)

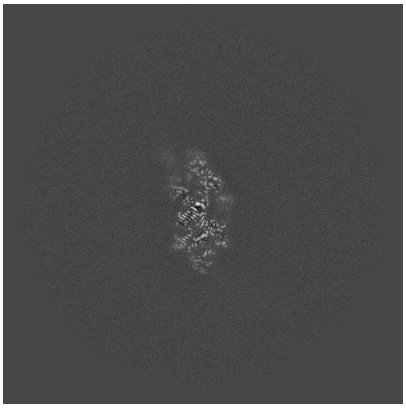
### 6.3.1 Primary map



X Index: 292



Y Index: 303

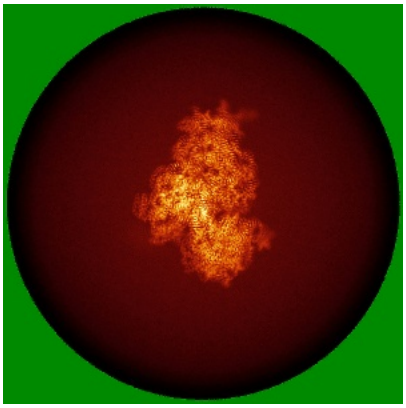


Z Index: 306

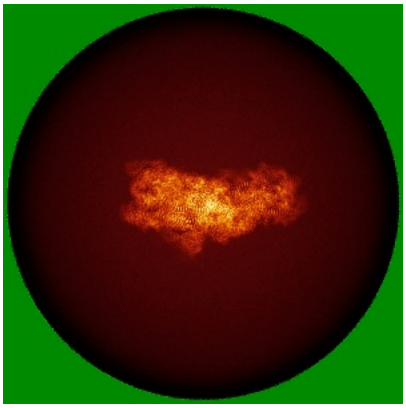
The images above show the largest variance slices of the map in three orthogonal directions.

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

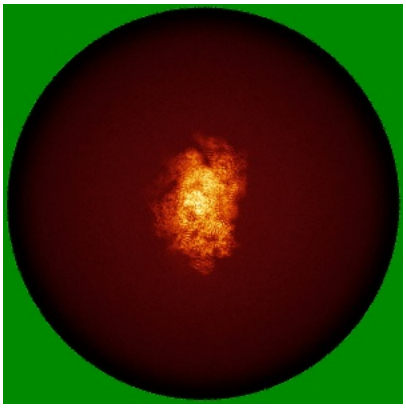
### 6.4.1 Primary map



X



Y



Z

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

## 6.5 Orthogonal surface views (i)

### 6.5.1 Primary map

X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.193. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

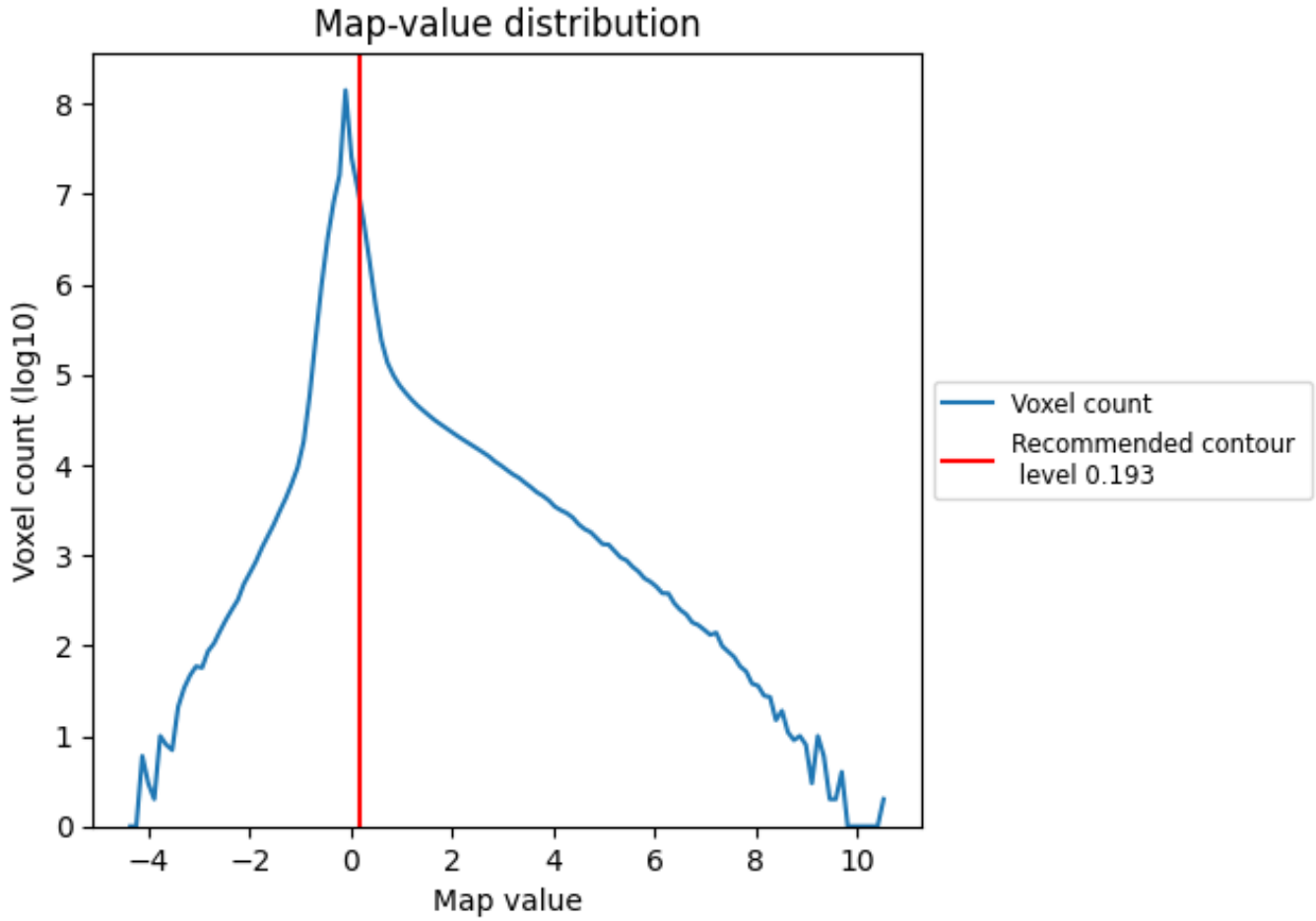
## 6.6 Mask visualisation (i)

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

# 7 Map analysis

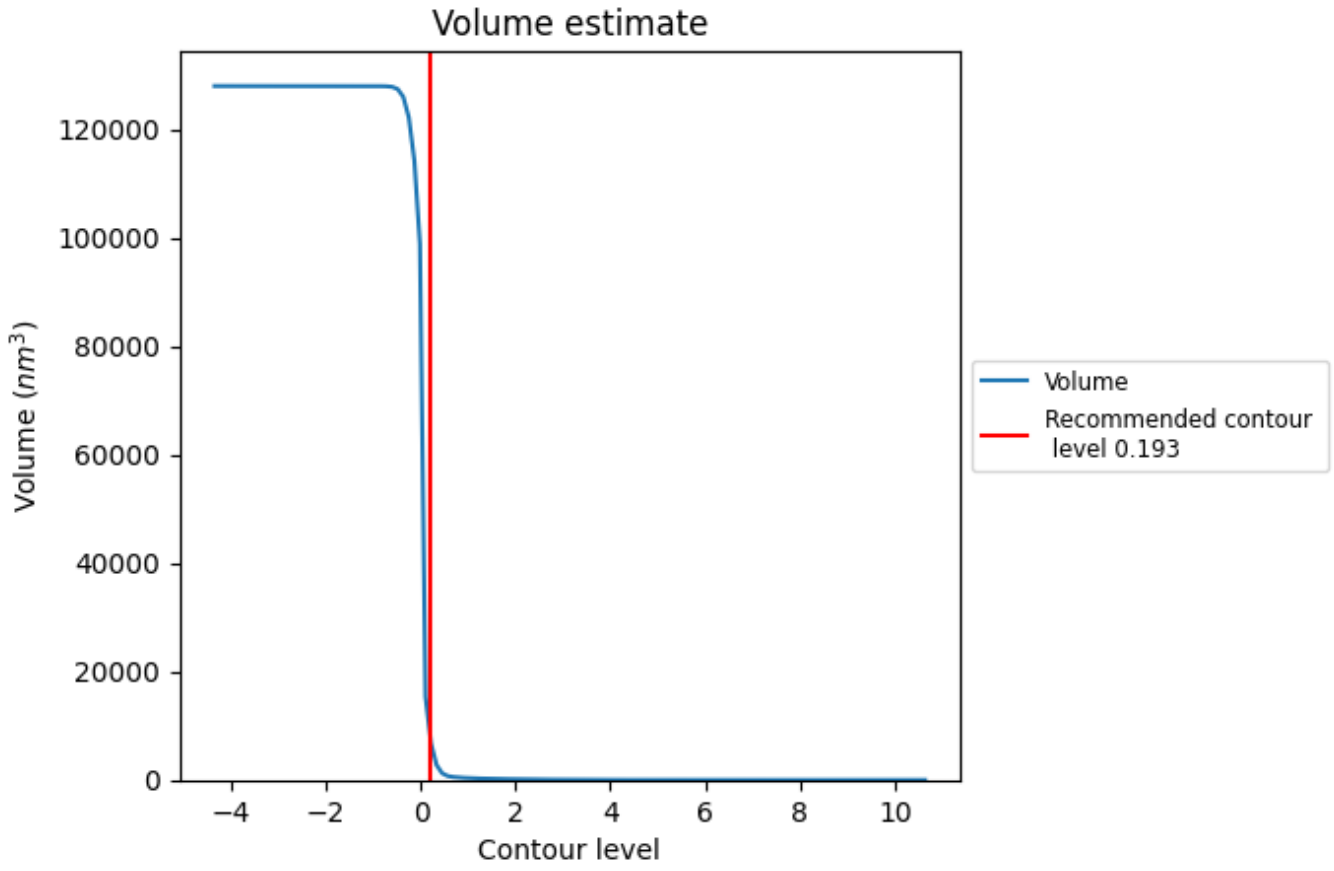
This section contains the results of statistical analysis of the map.

## 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.

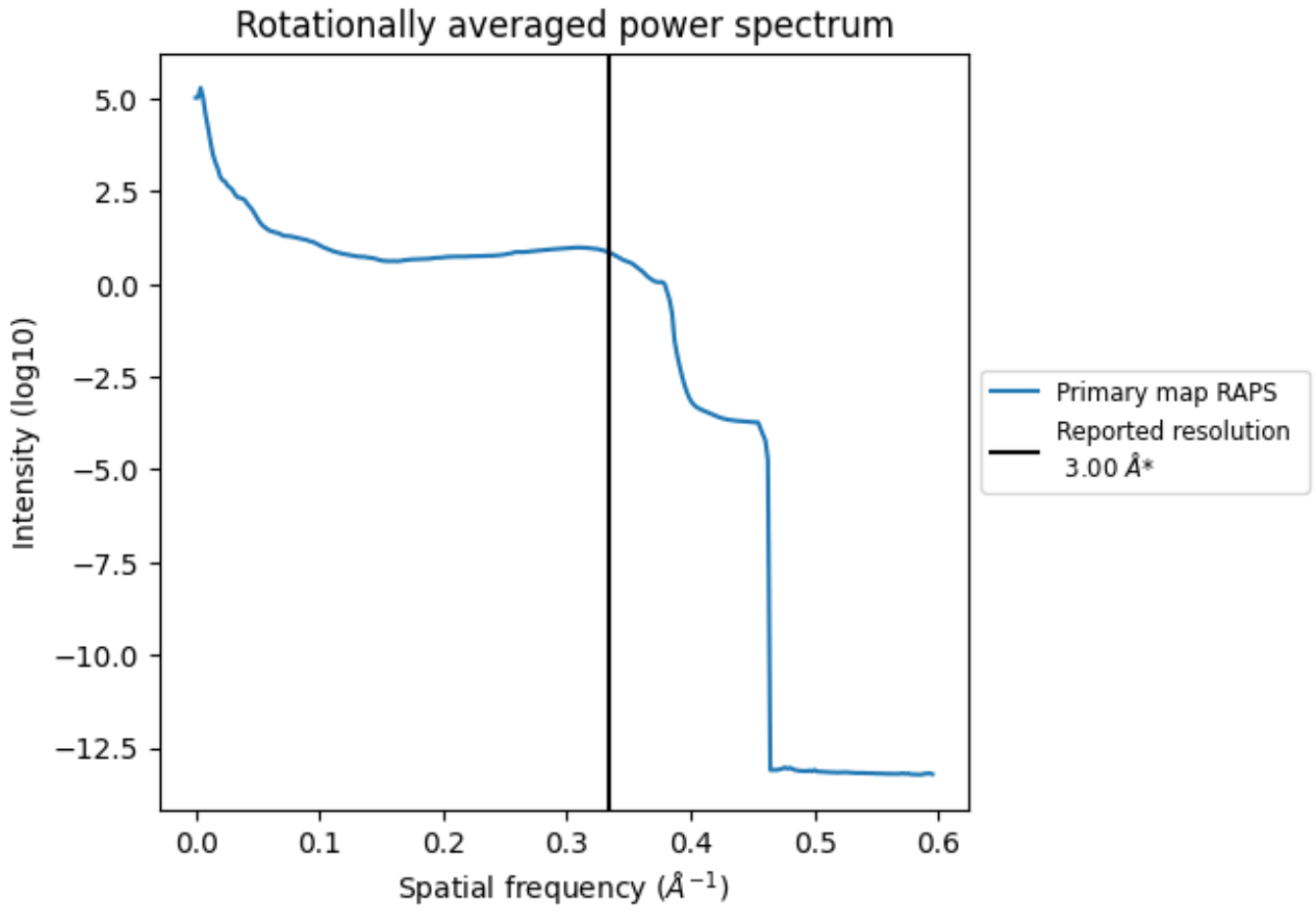
## 7.2 Volume estimate (i)




The volume at the recommended contour level is 8343 $nm^3$; this corresponds to an approximate mass of 7537 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 0.333 Å$^{-1}$

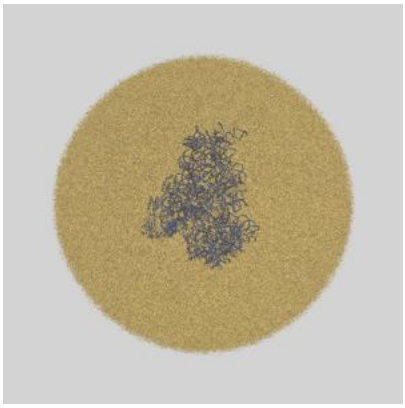
# 8 Fourier-Shell correlation (i)

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

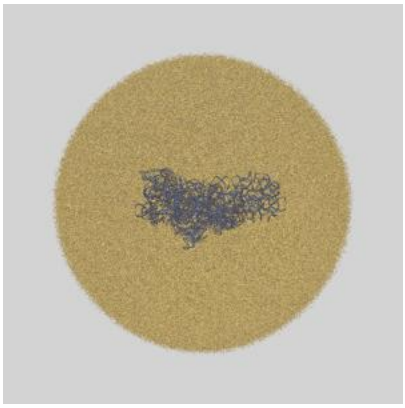
# 9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-51621 and PDB model 9GUV. Per-residue inclusion information can be found in section 3 on page 8.

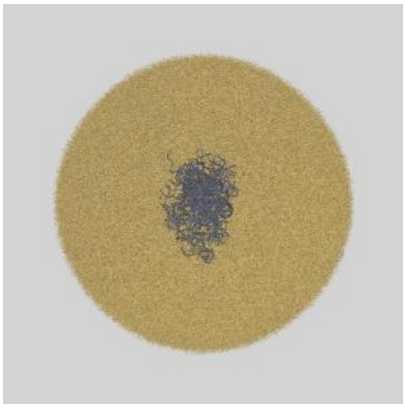
## 9.1 Map-model overlay



X



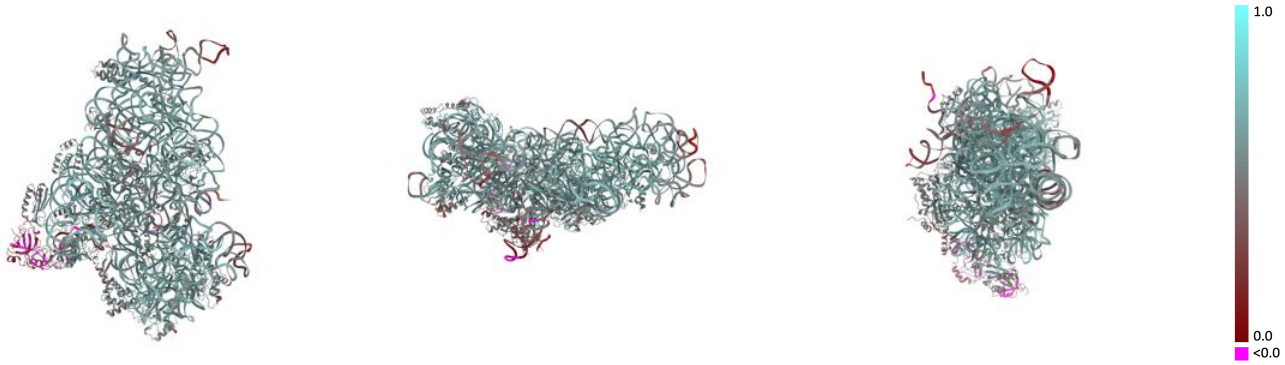
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.193 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

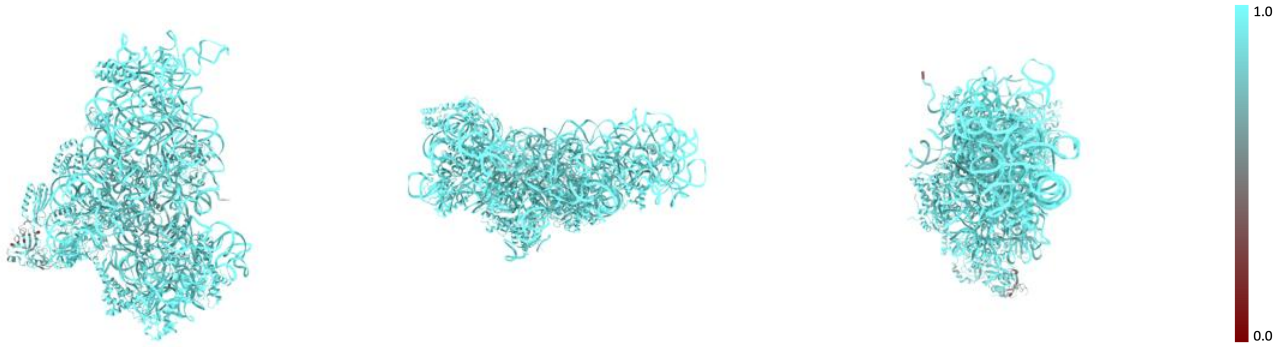
## 9.2 Q-score mapped to coordinate model (i)




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.

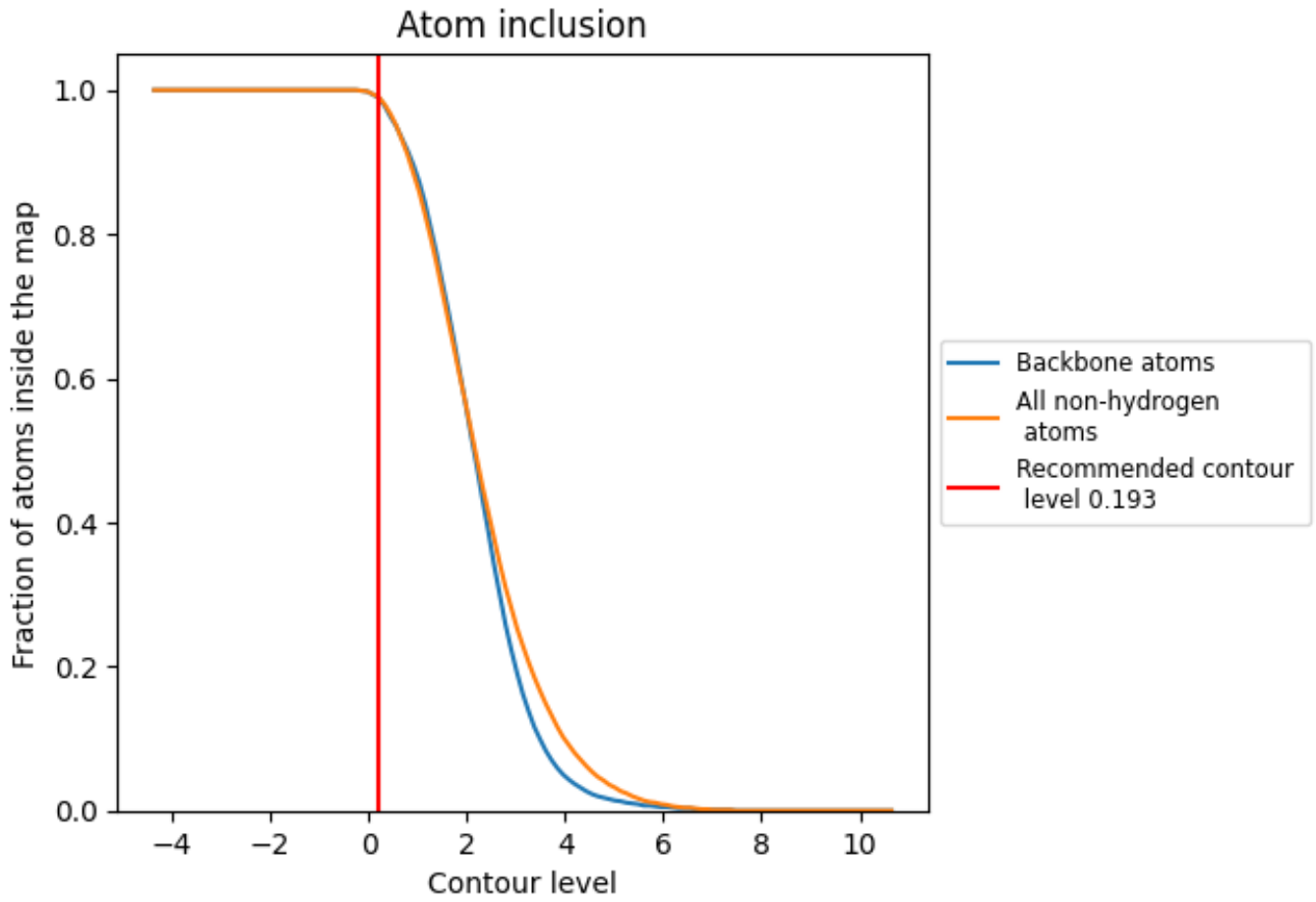
## 9.3 Atom inclusion mapped to coordinate model (i)




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 (0.193).

## 9.4 Atom inclusion (i)




At the recommended contour level, 99% of all backbone atoms, 99% 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 (0.193) and Q-score for the entire model and for each chain.

| Chain | Atom inclusion | Q-score |
|---|---|---|
| All | 0.9910 | 0.5610 |
| A | 1.0000 | 0.6000 |
| B | 0.8940 | 0.2140 |
| C | 0.9900 | 0.5240 |
| D | 0.9910 | 0.5780 |
| E | 0.9860 | 0.5540 |
| F | 0.9790 | 0.5770 |
| G | 0.9810 | 0.5230 |
| H | 0.9810 | 0.4960 |
| I | 0.9900 | 0.5870 |
| J | 0.9860 | 0.5650 |
| K | 0.9860 | 0.5250 |
| L | 0.9880 | 0.5540 |
| M | 0.9880 | 0.5880 |
| N | 0.9950 | 0.5540 |
| O | 0.9910 | 0.5840 |
| P | 0.9900 | 0.5730 |
| Q | 0.9860 | 0.5910 |
| R | 0.9890 | 0.5540 |
| S | 0.9930 | 0.5790 |
| T | 0.9910 | 0.5770 |
| U | 0.9940 | 0.5740 |
| V | 0.9890 | 0.5000 |
| W | 0.9630 | 0.3020 |
| X | 0.9810 | 0.1610 |