



Full wwPDB EM Validation Report ⓘ

Oct 6, 2024 – 12:50 pm BST

PDB ID : 8BF7
EMDB ID : EMD-16015
Title : Elongating E. coli 70S ribosome containing deacylated tRNA(iMet) in the P-site and AAA mRNA codon with cognate dipeptidyl-tRNA(Lys) in the A-site
Authors : Koziej, L.; Glatt, S.
Deposited on : 2022-10-24
Resolution : 2.33 Å(reported)

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

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

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

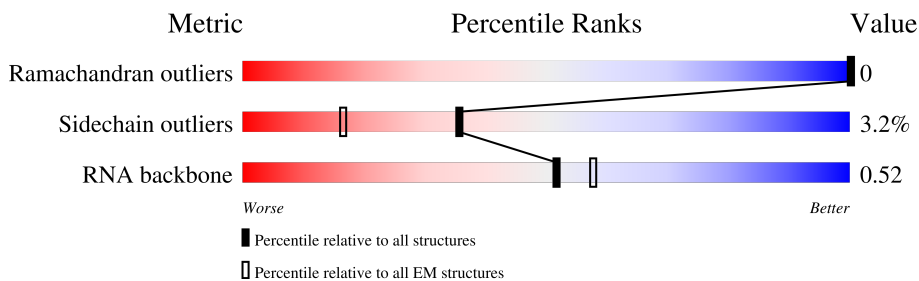
EMDB validation analysis : 0.0.1.dev113
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4.02b-467
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.39

1 Overall quality at a glance i

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

The reported resolution of this entry is 2.33 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.



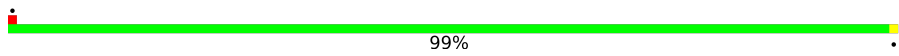
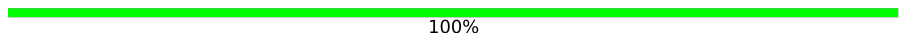
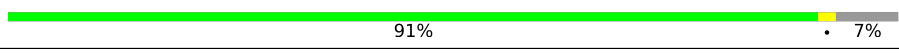
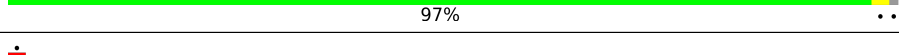
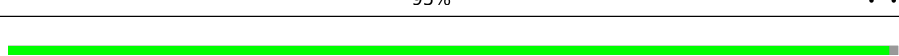
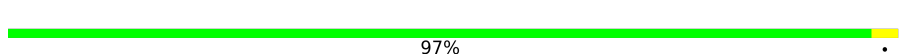
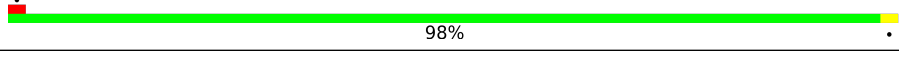
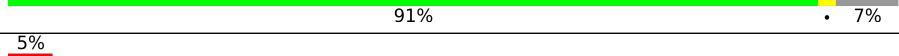
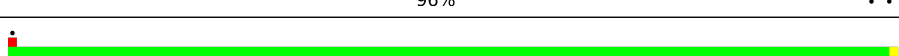

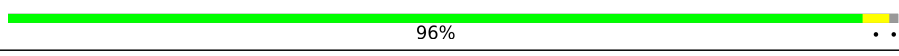
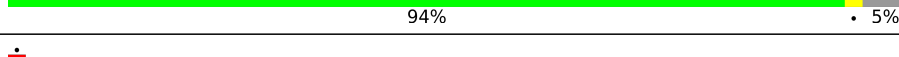
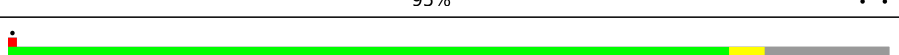
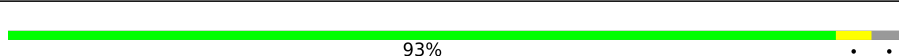
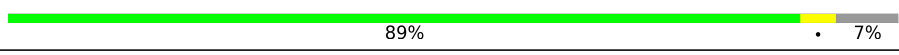
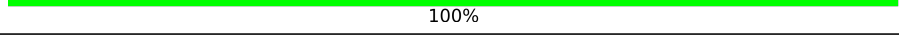
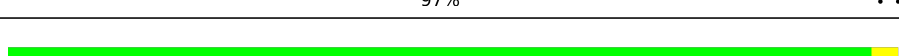
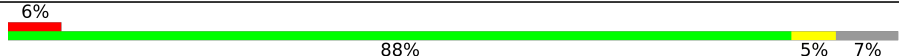
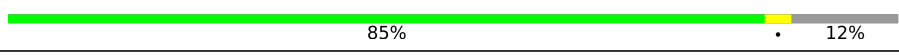
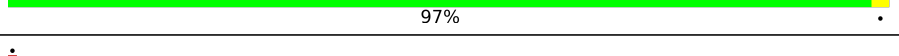
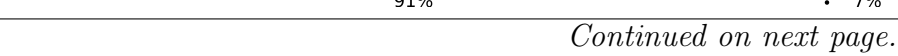


| Metric | Whole archive (#Entries) | EM structures (#Entries) |
|-----------------------|-----------------------------|-----------------------------|
| Ramachandran outliers | 207382 | 16835 |
| Sidechain outliers | 206894 | 16415 |
| RNA backbone | 6643 | 2191 |

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 $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion $< 40\%$). The numeric value is given above the bar.

| Mol | Chain | Length | Quality of chain |
|-----|-------|--------|------------------|
| 1 | A | 273 | 98% .. |
| 2 | B | 209 | 98% . |
| 3 | C | 201 | 97% . |
| 4 | D | 179 | 94% 5% . |
| 5 | E | 177 | 94% .. |
| 6 | F | 149 | 28% 97% . |
| 7 | G | 142 | 97% . |
| 8 | H | 123 | 98% . |



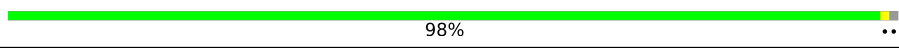
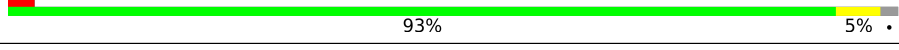
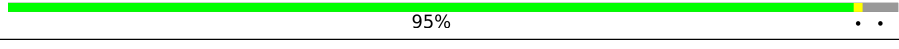

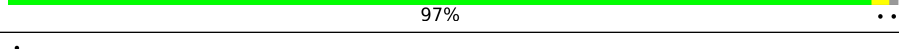
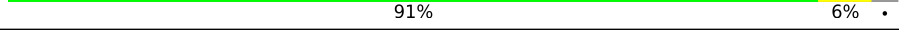
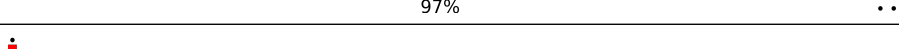
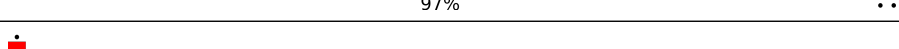
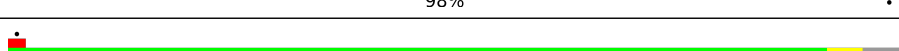
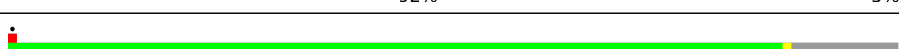

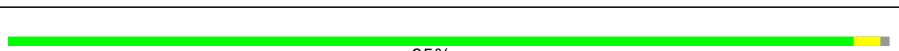
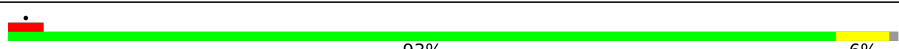

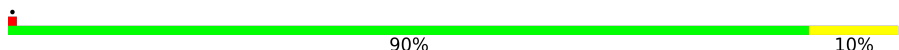



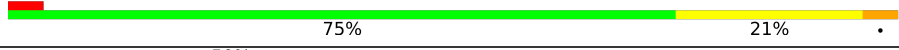
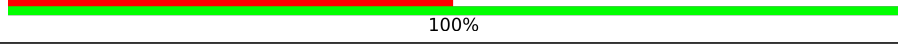

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| Mol | Chain | Length | Quality of chain |
|-----|-------|--------|---|
| 9 | I | 144 |  99% |
| 10 | J | 136 |  100% |
| 11 | K | 127 |  91% 7% |
| 12 | L | 117 |  97% |
| 13 | M | 115 |  95% |
| 14 | N | 118 |  99% |
| 15 | O | 103 |  97% |
| 16 | P | 110 |  98% |
| 17 | Q | 100 |  91% 7% |
| 18 | R | 104 |  5% 96% |
| 19 | S | 94 |  99% |
| 20 | T | 85 |  87% 12% |
| 21 | U | 78 |  96% |
| 22 | V | 63 |  94% 5% |
| 23 | W | 59 |  95% |
| 24 | X | 70 |  81% 14% |
| 25 | a | 57 |  93% |
| 26 | b | 55 |  89% 7% |
| 27 | c | 46 |  100% |
| 28 | d | 65 |  97% |
| 29 | e | 38 |  97% |
| 30 | f | 241 |  6% 88% 5% 7% |
| 31 | g | 233 |  85% 12% |
| 32 | h | 206 | 97% |
| 33 | i | 167 | 91% 7% |

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| Mol | Chain | Length | Quality of chain |
|-----|-------|--------|--|
| 34 | j | 131 |  79% 19% 6% |
| 35 | k | 179 |  82% 16% 6% |
| 36 | l | 130 |  98% |
| 37 | m | 130 |  93% 5% 6% |
| 38 | n | 103 |  95% |
| 39 | o | 129 |  89% 9% 6% |
| 40 | p | 124 |  97% 5% 6% |
| 41 | q | 118 |  91% 6% 6% |
| 42 | r | 101 |  97% |
| 43 | s | 89 |  97% 5% 6% |
| 44 | t | 82 |  98% 5% 6% |
| 45 | u | 84 |  92% 5% 6% |
| 46 | v | 75 |  87% 12% 6% |
| 47 | w | 92 |  80% 14% 6% |
| 48 | x | 87 |  95% |
| 49 | y | 71 |  93% 6% 6% |
| 50 | 0 | 2904 |  83% 12% 5% |
| 51 | 1 | 120 |  90% 10% |
| 52 | 2 | 1542 |  78% 21% 6% |
| 53 | 3 | 30 |  23% 10% 67% |
| 54 | 4 | 77 |  27% 81% 19% |
| 55 | 5 | 76 |  75% 21% 6% |
| 56 | 6 | 2 |  50% 100% |

2 Entry composition [i](#)

There are 56 unique types of molecules in this entry. The entry contains 238685 atoms, of which 96010 are hydrogens and 0 are deuteriums.

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

- Molecule 1 is a protein called 50S ribosomal protein L2.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|------|------|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 1 | A | 271 | 4236 | 1288 | 2154 | 423 | 364 | 7 | 0 | 0 |

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

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|------|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 2 | B | 208 | 3170 | 976 | 1611 | 287 | 292 | 4 | 0 | 0 |

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

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|------|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 3 | C | 201 | 3171 | 974 | 1619 | 283 | 290 | 5 | 0 | 0 |

- Molecule 4 is a protein called 50S ribosomal protein L5.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|------|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 4 | D | 177 | 2854 | 899 | 1444 | 249 | 256 | 6 | 0 | 0 |

- Molecule 5 is a protein called 50S ribosomal protein L6.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|------|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 5 | E | 173 | 2627 | 814 | 1332 | 237 | 242 | 2 | 0 | 0 |

- Molecule 6 is a protein called 50S ribosomal protein L9.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|------|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 6 | F | 149 | 2259 | 699 | 1148 | 197 | 214 | 1 | 0 | 0 |

- Molecule 7 is a protein called 50S ribosomal protein L13.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|------|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 7 | G | 142 | 2291 | 714 | 1162 | 212 | 199 | 4 | 0 | 0 |

- Molecule 8 is a protein called 50S ribosomal protein L14.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|------|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 8 | H | 123 | 1970 | 593 | 1023 | 181 | 167 | 6 | 0 | 0 |

- Molecule 9 is a protein called 50S ribosomal protein L15.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|------|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 9 | I | 144 | 2182 | 654 | 1129 | 207 | 190 | 2 | 0 | 0 |

- Molecule 10 is a protein called 50S ribosomal protein L16.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|------|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 10 | J | 136 | 2231 | 686 | 1157 | 205 | 177 | 6 | 0 | 0 |

- Molecule 11 is a protein called 50S ribosomal protein L17.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 11 | K | 118 | 1934 | 585 | 989 | 194 | 161 | 5 | 0 | 0 |

- Molecule 12 is a protein called 50S ribosomal protein L18.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|
| | | | Total | C | H | N | O | | |
| 12 | L | 116 | 1815 | 552 | 923 | 178 | 162 | 0 | 0 |

- Molecule 13 is a protein called 50S ribosomal protein L19.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 13 | M | 114 | 1879 | 574 | 962 | 179 | 163 | 1 | 0 | 0 |

- Molecule 14 is a protein called 50S ribosomal protein L20.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|-----|-------|----------|-------|-----|------|-----|-----|---------|-------|
| 14 | N | 117 | Total | C | H | N | O | 0 | 0 |
| | | | 1966 | 604 | 1019 | 192 | 151 | | |

- Molecule 15 is a protein called 50S ribosomal protein L21.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| 15 | O | 103 | Total | C | H | N | O | S | 0 | 0 |
| | | | 1655 | 516 | 839 | 153 | 145 | 2 | | |

- Molecule 16 is a protein called 50S ribosomal protein L22.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| 16 | P | 110 | Total | C | H | N | O | S | 0 | 0 |
| | | | 1779 | 532 | 922 | 166 | 156 | 3 | | |

- Molecule 17 is a protein called 50S ribosomal protein L23.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| 17 | Q | 93 | Total | C | H | N | O | S | 0 | 0 |
| | | | 1545 | 466 | 807 | 139 | 131 | 2 | | |

- Molecule 18 is a protein called 50S ribosomal protein L24.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|
| 18 | R | 102 | Total | C | H | N | O | 0 | 0 |
| | | | 1610 | 492 | 831 | 146 | 141 | | |

- Molecule 19 is a protein called 50S ribosomal protein L25.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| 19 | S | 94 | Total | C | H | N | O | S | 0 | 0 |
| | | | 1533 | 479 | 780 | 137 | 134 | 3 | | |

- Molecule 20 is a protein called 50S ribosomal protein L27.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| 20 | T | 75 | Total | C | H | N | O | S | 0 | 0 |
| | | | 1165 | 355 | 593 | 116 | 100 | 1 | | |

- Molecule 21 is a protein called 50S ribosomal protein L28.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 21 | U | 77 | 1277 | 388 | 652 | 129 | 106 | 2 | 0 | 0 |

- Molecule 22 is a protein called 50S ribosomal protein L29.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|----|----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 22 | V | 60 | 1014 | 303 | 523 | 96 | 91 | 1 | 0 | 0 |

- Molecule 23 is a protein called 50S ribosomal protein L30.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|----|----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 23 | W | 57 | 921 | 276 | 482 | 86 | 75 | 2 | 0 | 0 |

- Molecule 24 is a protein called 50S ribosomal protein L31.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|----|----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 24 | X | 60 | 962 | 299 | 482 | 90 | 85 | 6 | 0 | 0 |

- Molecule 25 is a protein called 50S ribosomal protein L32.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|----|----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 25 | a | 55 | 879 | 263 | 445 | 92 | 78 | 1 | 0 | 0 |

- Molecule 26 is a protein called 50S ribosomal protein L33.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|----|----|---------|-------|
| | | | Total | C | H | N | O | | |
| 26 | b | 51 | 868 | 269 | 451 | 76 | 72 | 0 | 0 |

- Molecule 27 is a protein called 50S ribosomal protein L34.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|----|----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 27 | c | 46 | 795 | 228 | 418 | 90 | 57 | 2 | 0 | 0 |

- Molecule 28 is a protein called 50S ribosomal protein L35.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|----|---------|-------|---|
| 28 | d | 64 | Total | C | H | N | O | S | 0 | 0 |
| | | | 1077 | 323 | 573 | 105 | 74 | 2 | | |

- Molecule 29 is a protein called 50S ribosomal protein L36.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|----|----|---------|-------|---|
| 29 | e | 38 | Total | C | H | N | O | S | 0 | 0 |
| | | | 645 | 185 | 343 | 65 | 48 | 4 | | |

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

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|------|------|-----|-----|---------|-------|---|
| 30 | f | 224 | Total | C | H | N | O | S | 0 | 0 |
| | | | 3533 | 1109 | 1780 | 315 | 321 | 8 | | |

- Molecule 31 is a protein called 30S ribosomal protein S3.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|------|------|-----|-----|---------|-------|---|
| 31 | g | 206 | Total | C | H | N | O | S | 0 | 0 |
| | | | 3320 | 1028 | 1696 | 305 | 288 | 3 | | |

- Molecule 32 is a protein called 30S ribosomal protein S4.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|------|------|-----|-----|---------|-------|---|
| 32 | h | 205 | Total | C | H | N | O | S | 0 | 0 |
| | | | 3350 | 1026 | 1707 | 315 | 298 | 4 | | |

- Molecule 33 is a protein called 30S ribosomal protein S5.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|------|-----|-----|---------|-------|---|
| 33 | i | 155 | Total | C | H | N | O | S | 0 | 0 |
| | | | 2329 | 711 | 1185 | 216 | 211 | 6 | | |

- Molecule 34 is a protein called 30S ribosomal protein S6.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| 34 | j | 106 | Total | C | H | N | O | S | 0 | 0 |
| | | | 1726 | 545 | 864 | 156 | 154 | 7 | | |

- Molecule 35 is a protein called 30S ribosomal protein S7.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|------|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 35 | k | 151 | 2419 | 735 | 1238 | 227 | 215 | 4 | 0 | 0 |

- Molecule 36 is a protein called 30S ribosomal protein S8.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|------|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 36 | l | 129 | 2010 | 616 | 1031 | 173 | 184 | 6 | 0 | 0 |

- Molecule 37 is a protein called 30S ribosomal protein S9.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|------|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 37 | m | 127 | 2092 | 634 | 1070 | 206 | 179 | 3 | 0 | 0 |

- Molecule 38 is a protein called 30S ribosomal protein S10.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 38 | n | 99 | 1631 | 498 | 836 | 152 | 144 | 1 | 0 | 0 |

- Molecule 39 is a protein called 30S ribosomal protein S11.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 39 | o | 117 | 1764 | 540 | 887 | 174 | 160 | 3 | 0 | 0 |

- Molecule 40 is a protein called 30S ribosomal protein S12.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|------|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 40 | p | 123 | 1971 | 590 | 1016 | 196 | 165 | 4 | 0 | 0 |

- Molecule 41 is a protein called 30S ribosomal protein S13.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 41 | q | 114 | 1824 | 546 | 941 | 178 | 156 | 3 | 0 | 0 |

- Molecule 42 is a protein called 30S ribosomal protein S14.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 42 | r | 100 | 1649 | 499 | 844 | 164 | 139 | 3 | 0 | 0 |

- Molecule 43 is a protein called 30S ribosomal protein S15.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 43 | s | 88 | 1448 | 439 | 734 | 144 | 130 | 1 | 0 | 0 |

- Molecule 44 is a protein called 30S ribosomal protein S16.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 44 | t | 82 | 1315 | 406 | 666 | 128 | 114 | 1 | 0 | 0 |

- Molecule 45 is a protein called 30S ribosomal protein S17.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 45 | u | 80 | 1339 | 411 | 691 | 121 | 113 | 3 | 0 | 0 |

- Molecule 46 is a protein called 30S ribosomal protein S18.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 46 | v | 66 | 1109 | 345 | 565 | 102 | 96 | 1 | 0 | 0 |

- Molecule 47 is a protein called 30S ribosomal protein S19.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 47 | w | 79 | 1302 | 408 | 665 | 120 | 107 | 2 | 0 | 0 |

- Molecule 48 is a protein called 30S ribosomal protein S20.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|-----|-----|-----|-----|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 48 | x | 86 | 1389 | 414 | 719 | 138 | 115 | 3 | 0 | 0 |

- Molecule 49 is a protein called 30S ribosomal protein S21.

| Mol | Chain | Residues | Atoms | | | | | | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|----|---|---------|-------|
| | | | Total | C | H | N | O | S | | |
| 49 | y | 70 | 1219 | 366 | 629 | 125 | 98 | 1 | 0 | 0 |

- Molecule 50 is a RNA chain called 23S rRNA RRLG-RRNA.

| Mol | Chain | Residues | Atoms | | | | | | AltConf | Trace |
|-----|-------|----------|-------|-------|-------|-------|-------|------|---------|-------|
| | | | Total | C | H | N | O | P | | |
| 50 | 0 | 2758 | 89005 | 26417 | 29786 | 10911 | 19134 | 2757 | 0 | 0 |

- Molecule 51 is a RNA chain called 5S rRNA.

| Mol | Chain | Residues | Atoms | | | | | | AltConf | Trace |
|-----|-------|----------|-------|------|------|-----|-----|-----|---------|-------|
| | | | Total | C | H | N | O | P | | |
| 51 | 1 | 120 | 3868 | 1144 | 1302 | 468 | 835 | 119 | 0 | 0 |

- Molecule 52 is a RNA chain called 16S rRNA RRSB-RRNA.

| Mol | Chain | Residues | Atoms | | | | | | AltConf | Trace |
|-----|-------|----------|-------|-------|-------|------|-------|------|---------|-------|
| | | | Total | C | H | N | O | P | | |
| 52 | 2 | 1534 | 49480 | 14681 | 16563 | 6041 | 10661 | 1534 | 0 | 0 |

- Molecule 53 is a RNA chain called mRNA.

| Mol | Chain | Residues | Atoms | | | | | | AltConf | Trace |
|-----|-------|----------|-------|----|-----|----|----|----|---------|-------|
| | | | Total | C | H | N | O | P | | |
| 53 | 3 | 10 | 322 | 97 | 107 | 41 | 67 | 10 | 0 | 0 |

- Molecule 54 is a RNA chain called Deacylated P-site tRNA(fMet).

| Mol | Chain | Residues | Atoms | | | | | | | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|-----|----|---|---------|-------|
| | | | Total | C | H | N | O | P | S | | |
| 54 | 4 | 77 | 2468 | 734 | 826 | 297 | 534 | 76 | 1 | 0 | 0 |

- Molecule 55 is a RNA chain called Dipeptidyl A-site tRNA(Lys).

| Mol | Chain | Residues | Atoms | | | | | | | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|-----|----|---|---------|-------|
| | | | Total | C | H | N | O | P | S | | |
| 55 | 5 | 76 | 2456 | 729 | 831 | 283 | 537 | 75 | 1 | 0 | 0 |

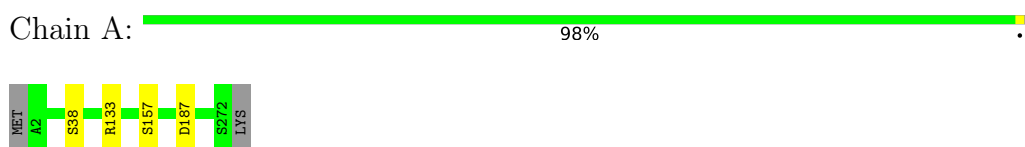
- Molecule 56 is a protein called fMet-Lys dipeptide.

| Mol | Chain | Residues | Atoms | | | | | AltConf | Trace | |
|-----|-------|----------|-------|----|----|---|---|---------|-------|---|
| | | | Total | C | H | N | O | | | S |
| 56 | 6 | 2 | 37 | 12 | 18 | 3 | 3 | 1 | 0 | 0 |

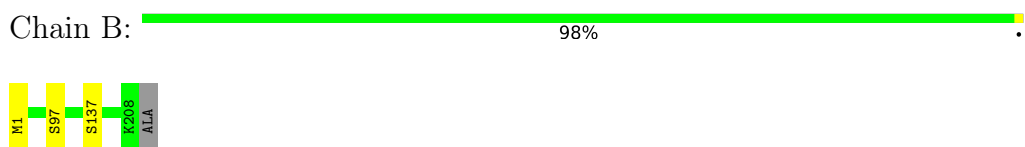
3 Residue-property plots [i](#)

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.

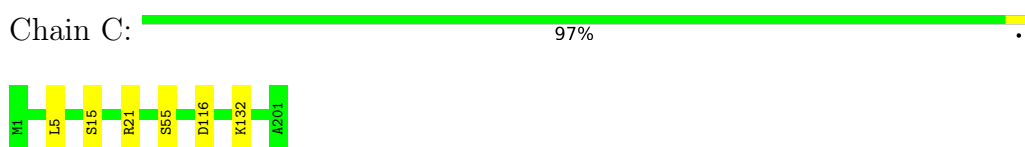
- Molecule 1: 50S ribosomal protein L2



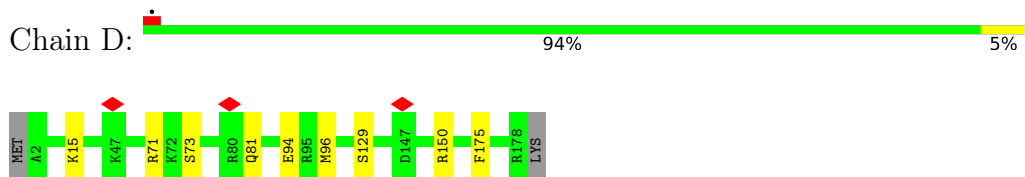
- Molecule 2: 50S ribosomal protein L3



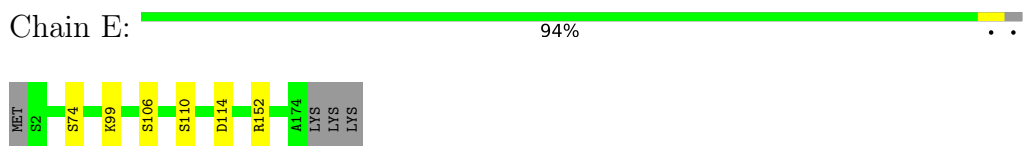
- Molecule 3: 50S ribosomal protein L4



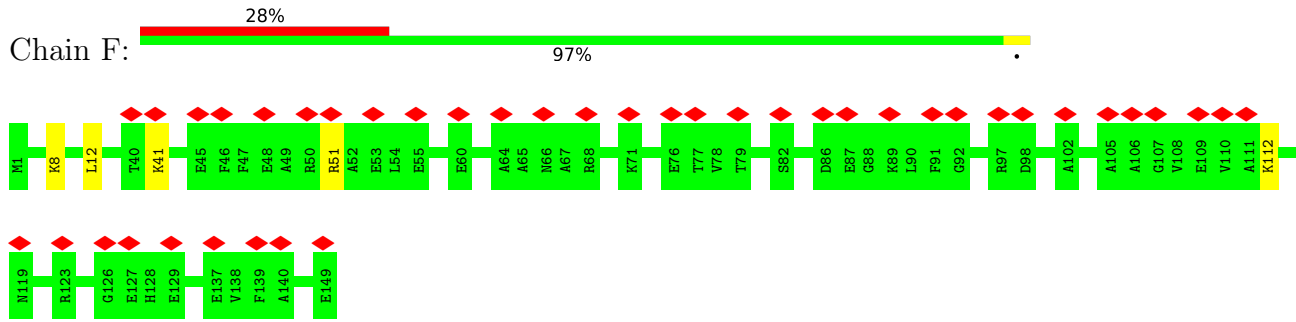
- Molecule 4: 50S ribosomal protein L5



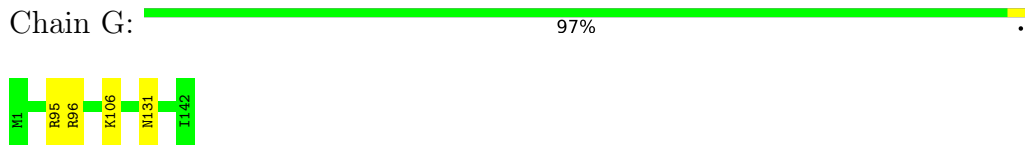
- Molecule 5: 50S ribosomal protein L6



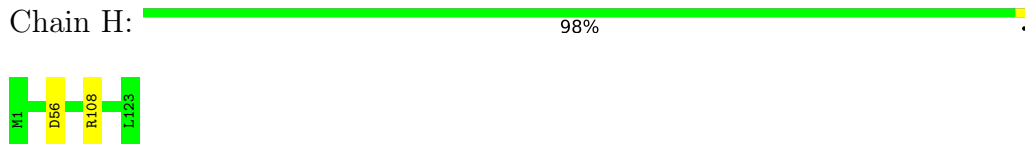
- Molecule 6: 50S ribosomal protein L9



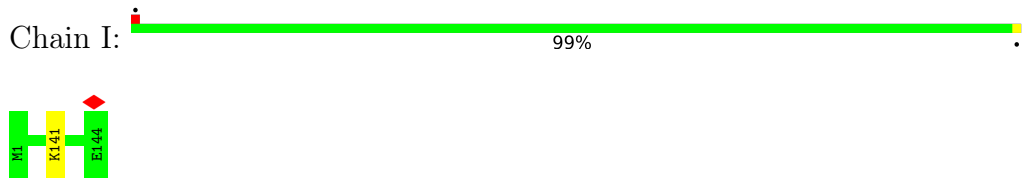
- Molecule 7: 50S ribosomal protein L13



- Molecule 8: 50S ribosomal protein L14



- Molecule 9: 50S ribosomal protein L15

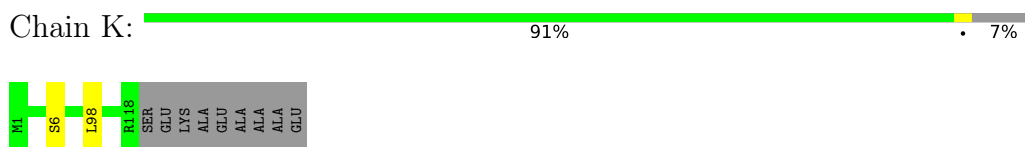


- Molecule 10: 50S ribosomal protein L16

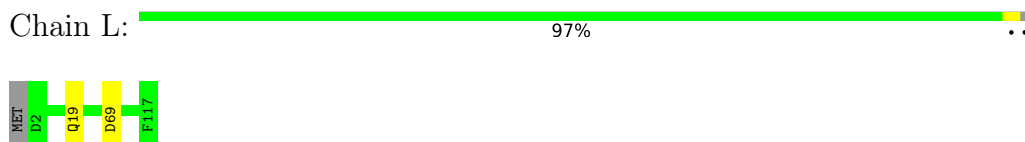


There are no outlier residues recorded for this chain.

- Molecule 11: 50S ribosomal protein L17

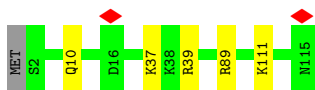


- Molecule 12: 50S ribosomal protein L18



- Molecule 13: 50S ribosomal protein L19

Chain M:  95%



- Molecule 14: 50S ribosomal protein L20

Chain N:  99%



- Molecule 15: 50S ribosomal protein L21

Chain O:  97%




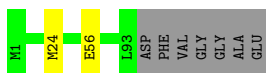
- Molecule 16: 50S ribosomal protein L22

Chain P:  98%



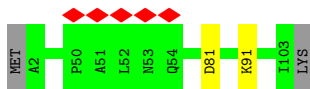
- Molecule 17: 50S ribosomal protein L23

Chain Q:  91% 7%



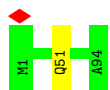
- Molecule 18: 50S ribosomal protein L24

Chain R:  5% 96%

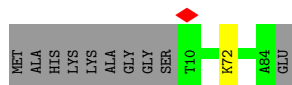
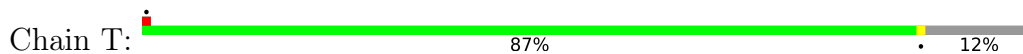


- Molecule 19: 50S ribosomal protein L25

Chain S:  99%



- Molecule 20: 50S ribosomal protein L27



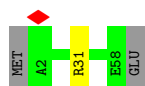
- Molecule 21: 50S ribosomal protein L28



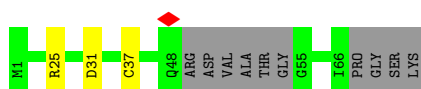
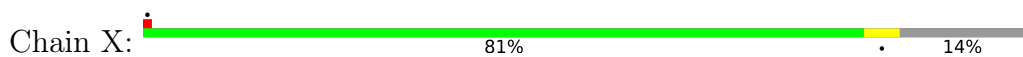
- Molecule 22: 50S ribosomal protein L29



- Molecule 23: 50S ribosomal protein L30




- Molecule 24: 50S ribosomal protein L31



- Molecule 25: 50S ribosomal protein L32



- Molecule 26: 50S ribosomal protein L33

Chain b:  89% 7%



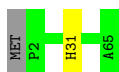
- Molecule 27: 50S ribosomal protein L34

Chain c:  100%



- Molecule 28: 50S ribosomal protein L35

Chain d:  97%




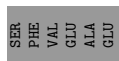
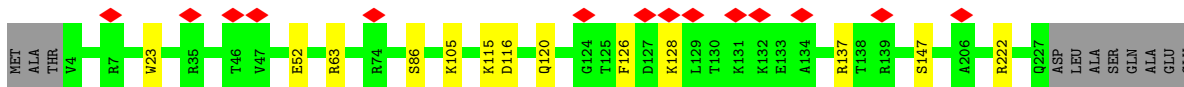
- Molecule 29: 50S ribosomal protein L36

Chain e:  97%




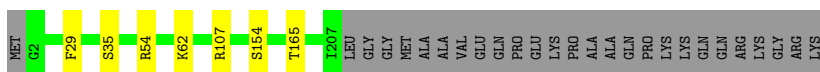
- Molecule 30: 30S ribosomal protein S2

Chain f:  6% 88% 5% 7%



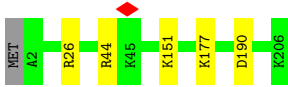
- Molecule 31: 30S ribosomal protein S3

Chain g:  85% 12%

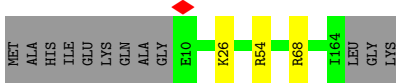
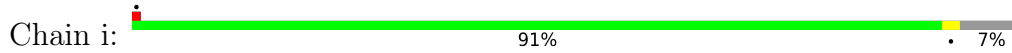


- Molecule 32: 30S ribosomal protein S4

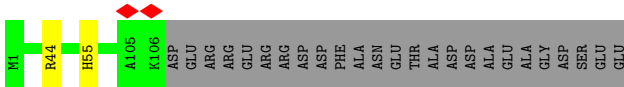
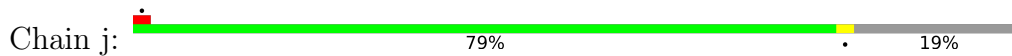
Chain h:  97%



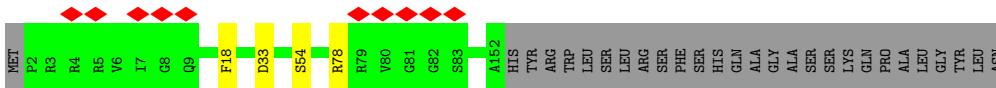
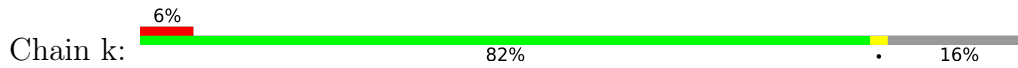
- Molecule 33: 30S ribosomal protein S5



- Molecule 34: 30S ribosomal protein S6



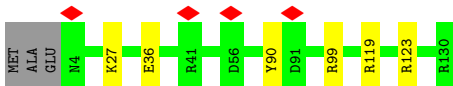
- Molecule 35: 30S ribosomal protein S7



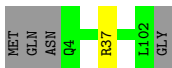
- Molecule 36: 30S ribosomal protein S8




- Molecule 37: 30S ribosomal protein S9

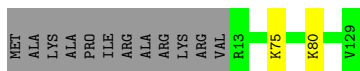


- Molecule 38: 30S ribosomal protein S10



- Molecule 39: 30S ribosomal protein S11

Chain o:  89% 9%

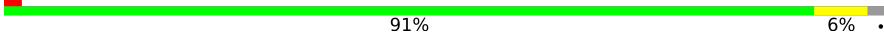


- Molecule 40: 30S ribosomal protein S12

Chain p:  97%



- Molecule 41: 30S ribosomal protein S13

Chain q:  91% 6%



- Molecule 42: 30S ribosomal protein S14

Chain r:  97%



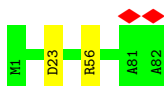
- Molecule 43: 30S ribosomal protein S15

Chain s:  97%



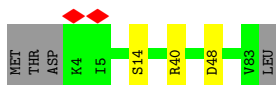
- Molecule 44: 30S ribosomal protein S16

Chain t:  98%

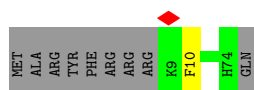
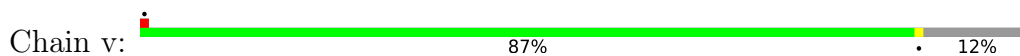


- Molecule 45: 30S ribosomal protein S17

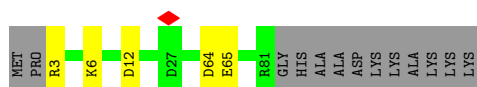
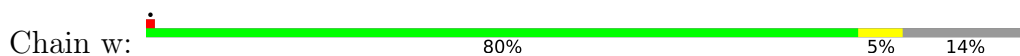
Chain u:  92% 5%



• Molecule 46: 30S ribosomal protein S18



• Molecule 47: 30S ribosomal protein S19



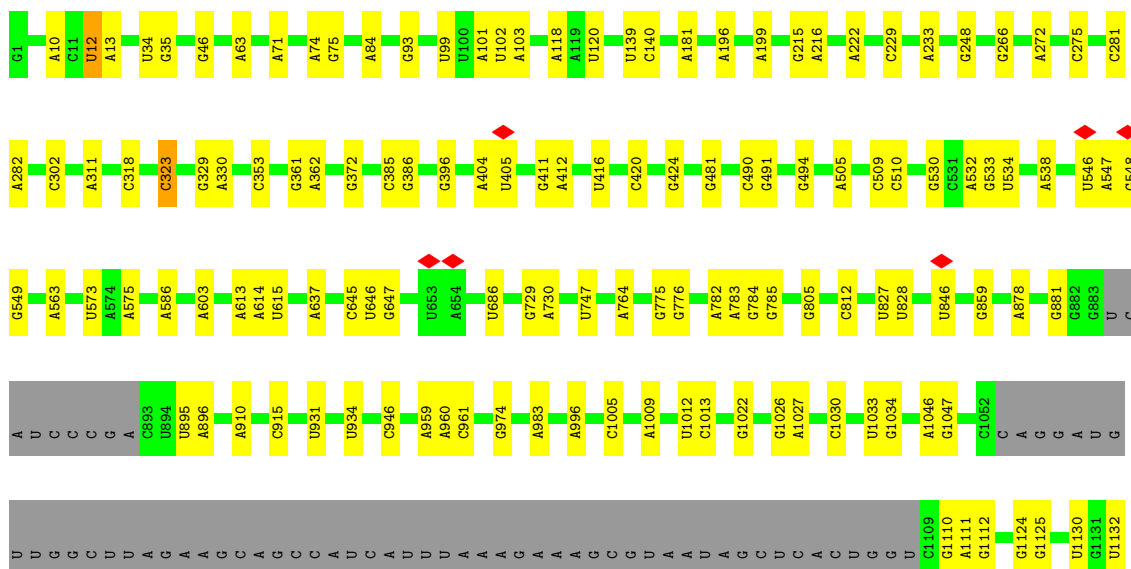
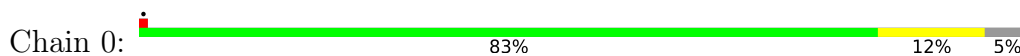
• Molecule 48: 30S ribosomal protein S20

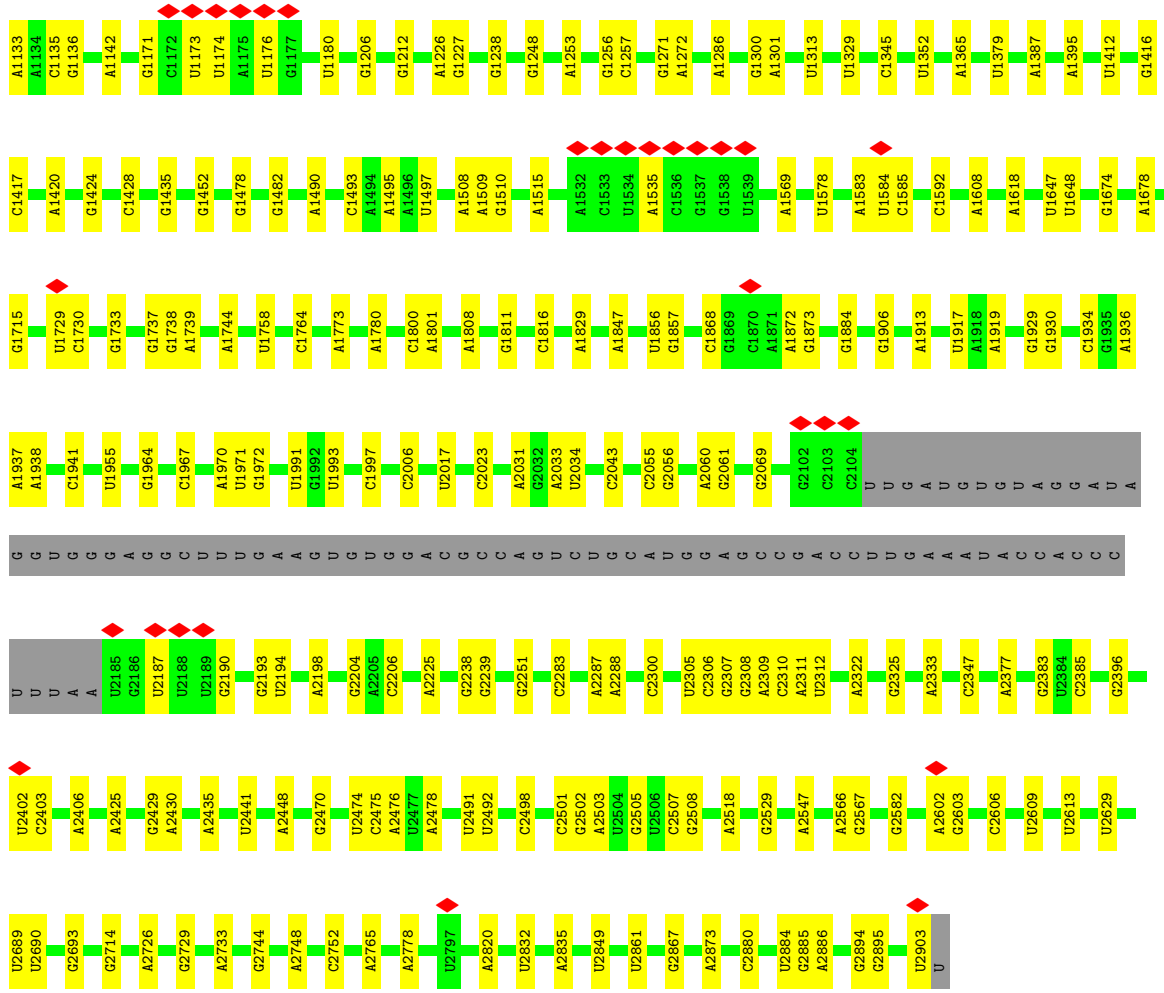


• Molecule 49: 30S ribosomal protein S21

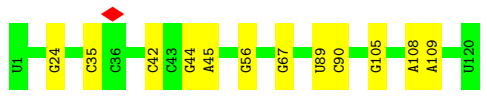
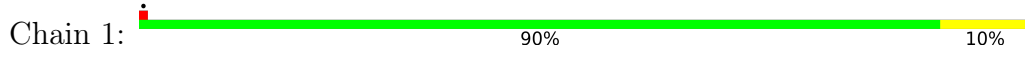


• Molecule 50: 23S rRNA RRLG-RRNA

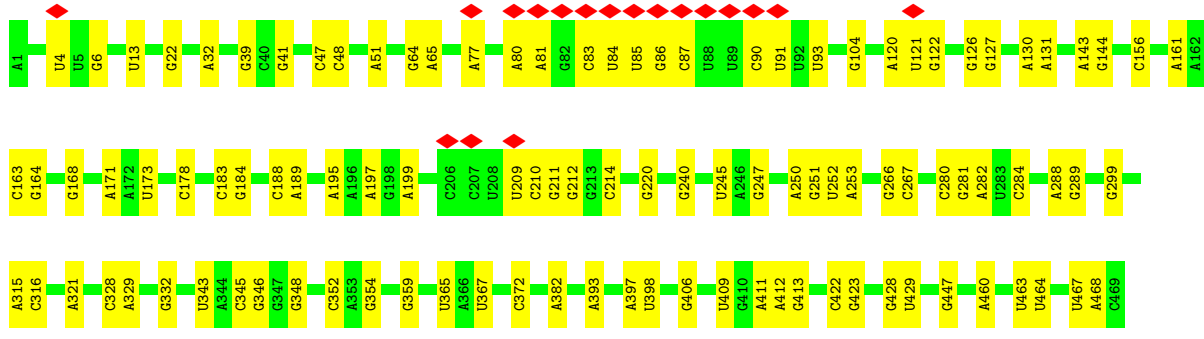
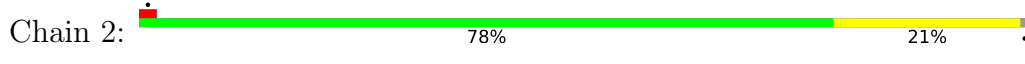


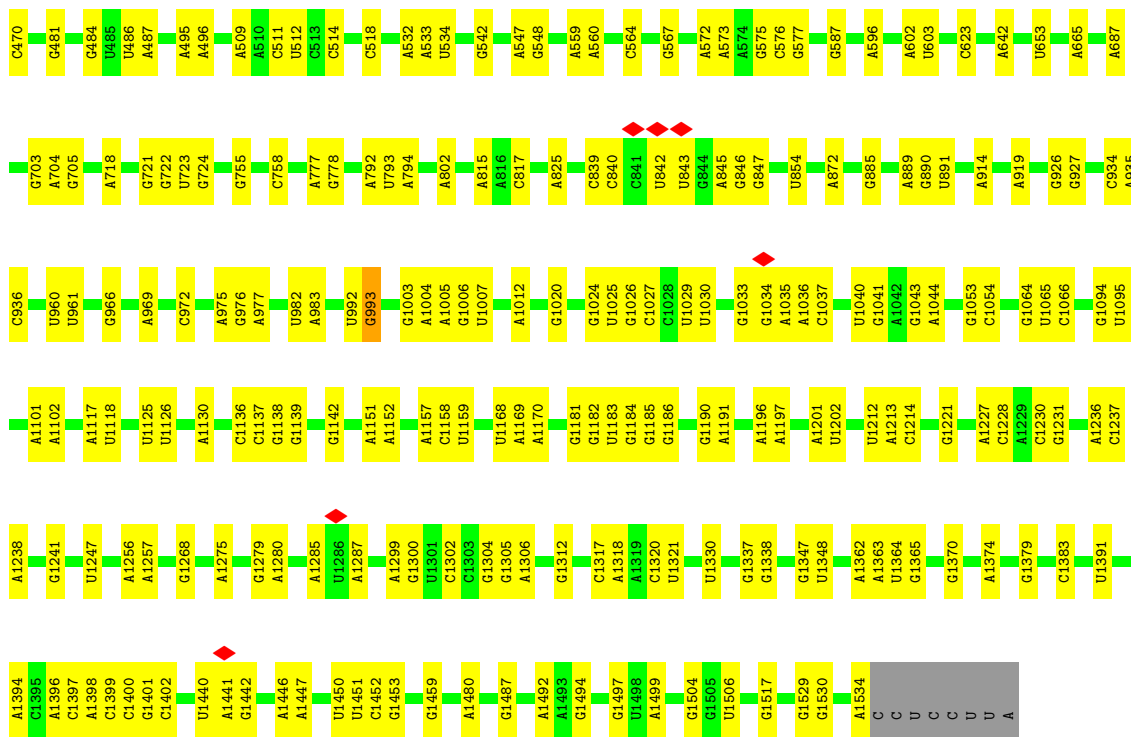


• Molecule 51: 5S rRNA

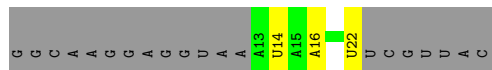


• Molecule 52: 16S rRNA RRSB-RRNA

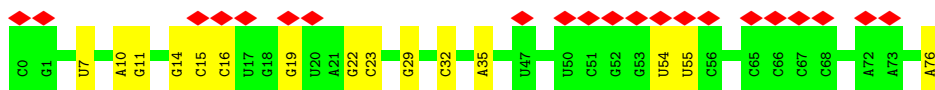
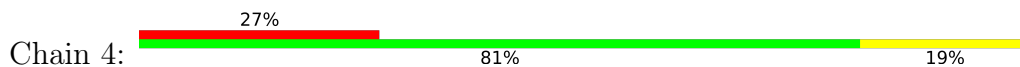




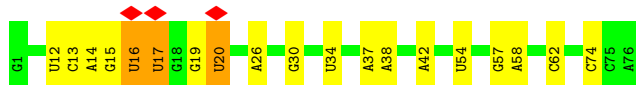
• Molecule 53: mRNA



• Molecule 54: Deacylated P-site tRNA(fMet)



• Molecule 55: Dipeptidyl A-site tRNA(Lys)



• Molecule 56: fMet-Lys dipeptide



4 Experimental information

| Property | Value | Source |
|--------------------------------------|---|-----------|
| EM reconstruction method | SINGLE PARTICLE | Depositor |
| Imposed symmetry | POINT, C1 | Depositor |
| Number of particles used | 103992 | 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 ($e^-/\text{\AA}^2$) | 40 | Depositor |
| Minimum defocus (nm) | 900 | Depositor |
| Maximum defocus (nm) | 2100 | Depositor |
| Magnification | 105000 | Depositor |
| Image detector | GATAN K3 BIOQUANTUM (6k x 4k) | Depositor |
| Maximum map value | 2.465 | Depositor |
| Minimum map value | -0.039 | Depositor |
| Average map value | 0.004 | Depositor |
| Map value standard deviation | 0.044 | Depositor |
| Recommended contour level | 0.0806 | Depositor |
| Map size (Å) | 440.32, 440.32, 440.32 | wwPDB |
| Map dimensions | 512, 512, 512 | wwPDB |
| Map angles (°) | 90.0, 90.0, 90.0 | wwPDB |
| Pixel spacing (Å) | 0.86, 0.86, 0.86 | Depositor |

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: FME, 5MU, H2U, OMC, 4SU, U8U, T6A

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 | 0.28 | 0/2121 | 0.60 | 0/2852 |
| 2 | B | 0.27 | 0/1580 | 0.54 | 0/2127 |
| 3 | C | 0.27 | 0/1571 | 0.52 | 0/2113 |
| 4 | D | 0.29 | 0/1434 | 0.56 | 0/1926 |
| 5 | E | 0.28 | 0/1315 | 0.52 | 0/1783 |
| 6 | F | 0.25 | 0/1122 | 0.50 | 0/1515 |
| 7 | G | 0.28 | 0/1152 | 0.54 | 0/1551 |
| 8 | H | 0.26 | 0/956 | 0.59 | 0/1279 |
| 9 | I | 0.28 | 0/1062 | 0.60 | 0/1413 |
| 10 | J | 0.29 | 0/1093 | 0.61 | 0/1460 |
| 11 | K | 0.27 | 0/958 | 0.61 | 0/1281 |
| 12 | L | 0.28 | 0/902 | 0.58 | 0/1209 |
| 13 | M | 0.28 | 0/929 | 0.57 | 0/1242 |
| 14 | N | 0.31 | 0/960 | 0.58 | 0/1278 |
| 15 | O | 0.28 | 0/829 | 0.57 | 0/1107 |
| 16 | P | 0.26 | 0/864 | 0.56 | 0/1156 |
| 17 | Q | 0.26 | 0/744 | 0.54 | 0/994 |
| 18 | R | 0.27 | 0/787 | 0.53 | 0/1051 |
| 19 | S | 0.27 | 0/766 | 0.51 | 0/1025 |
| 20 | T | 0.27 | 0/579 | 0.58 | 0/767 |
| 21 | U | 0.25 | 0/635 | 0.60 | 0/848 |
| 22 | V | 0.27 | 0/492 | 0.54 | 0/655 |
| 23 | W | 0.25 | 0/443 | 0.57 | 0/593 |
| 24 | X | 0.28 | 0/488 | 0.50 | 0/649 |
| 25 | a | 0.26 | 0/440 | 0.60 | 0/588 |
| 26 | b | 0.24 | 0/424 | 0.49 | 0/565 |
| 27 | c | 0.27 | 0/380 | 0.69 | 0/498 |
| 28 | d | 0.27 | 0/513 | 0.59 | 0/676 |
| 29 | e | 0.29 | 0/303 | 0.62 | 0/397 |
| 30 | f | 0.27 | 0/1784 | 0.50 | 0/2403 |
| 31 | g | 0.30 | 0/1651 | 0.57 | 0/2225 |
| 32 | h | 0.29 | 0/1665 | 0.56 | 0/2227 |

| Mol | Chain | Bond lengths | | Bond angles | |
|-----|-------|--------------|----------|-------------|-----------------|
| | | RMSZ | # Z >5 | RMSZ | # Z >5 |
| 33 | i | 0.29 | 0/1157 | 0.54 | 0/1557 |
| 34 | j | 0.28 | 0/881 | 0.53 | 0/1189 |
| 35 | k | 0.27 | 0/1195 | 0.54 | 0/1602 |
| 36 | l | 0.29 | 0/989 | 0.55 | 0/1326 |
| 37 | m | 0.29 | 0/1034 | 0.62 | 0/1375 |
| 38 | n | 0.26 | 0/805 | 0.60 | 0/1089 |
| 39 | o | 0.27 | 0/893 | 0.58 | 0/1205 |
| 40 | p | 0.27 | 0/969 | 0.60 | 0/1300 |
| 41 | q | 0.27 | 0/892 | 0.61 | 0/1193 |
| 42 | r | 0.30 | 0/817 | 0.60 | 0/1088 |
| 43 | s | 0.28 | 0/722 | 0.58 | 0/964 |
| 44 | t | 0.28 | 0/659 | 0.59 | 0/884 |
| 45 | u | 0.26 | 0/657 | 0.55 | 0/881 |
| 46 | v | 0.29 | 0/553 | 0.58 | 0/742 |
| 47 | w | 0.28 | 0/652 | 0.56 | 0/877 |
| 48 | x | 0.30 | 0/676 | 0.56 | 0/895 |
| 49 | y | 0.29 | 0/598 | 0.61 | 0/792 |
| 50 | 0 | 0.42 | 0/66326 | 0.84 | 5/103471 (0.0%) |
| 51 | 1 | 0.41 | 0/2869 | 0.81 | 0/4474 |
| 52 | 2 | 0.44 | 0/36859 | 0.85 | 2/57501 (0.0%) |
| 53 | 3 | 0.89 | 0/241 | 0.81 | 0/373 |
| 54 | 4 | 0.54 | 0/1766 | 0.73 | 0/2753 |
| 55 | 5 | 0.71 | 0/1663 | 0.75 | 0/2588 |
| 56 | 6 | 0.24 | 0/8 | 0.20 | 0/8 |
| All | All | 0.40 | 0/154823 | 0.78 | 7/231580 (0.0%) |

There are no bond length outliers.

All (7) bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(°) | Ideal(°) |
|-----|-------|------|------|------------|-------|-------------|----------|
| 52 | 2 | 993 | G | C4-N9-C1' | 5.92 | 134.20 | 126.50 |
| 50 | 0 | 1313 | U | C2-N1-C1' | 5.67 | 124.51 | 117.70 |
| 50 | 0 | 323 | C | C2-N1-C1' | 5.66 | 125.03 | 118.80 |
| 50 | 0 | 2501 | C | C6-N1-C2 | -5.34 | 118.17 | 120.30 |
| 50 | 0 | 12 | U | C2-N1-C1' | 5.33 | 124.10 | 117.70 |
| 52 | 2 | 993 | G | C8-N9-C1' | -5.25 | 120.17 | 127.00 |
| 50 | 0 | 729 | G | O4'-C1'-N9 | 5.22 | 112.38 | 108.20 |

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

Due to software issues we are unable to calculate clashes - this section is therefore empty.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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

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

| Mol | Chain | Analysed | Favoured | Allowed | Outliers | Percentiles | |
|-----|-------|---------------|-----------|----------|----------|-------------|-----|
| 1 | A | 269/273 (98%) | 257 (96%) | 12 (4%) | 0 | 100 | 100 |
| 2 | B | 206/209 (99%) | 195 (95%) | 11 (5%) | 0 | 100 | 100 |
| 3 | C | 199/201 (99%) | 192 (96%) | 7 (4%) | 0 | 100 | 100 |
| 4 | D | 175/179 (98%) | 161 (92%) | 14 (8%) | 0 | 100 | 100 |
| 5 | E | 171/177 (97%) | 160 (94%) | 11 (6%) | 0 | 100 | 100 |
| 6 | F | 147/149 (99%) | 132 (90%) | 15 (10%) | 0 | 100 | 100 |
| 7 | G | 140/142 (99%) | 139 (99%) | 1 (1%) | 0 | 100 | 100 |
| 8 | H | 121/123 (98%) | 115 (95%) | 6 (5%) | 0 | 100 | 100 |
| 9 | I | 142/144 (99%) | 136 (96%) | 6 (4%) | 0 | 100 | 100 |
| 10 | J | 134/136 (98%) | 122 (91%) | 12 (9%) | 0 | 100 | 100 |
| 11 | K | 116/127 (91%) | 107 (92%) | 9 (8%) | 0 | 100 | 100 |
| 12 | L | 114/117 (97%) | 109 (96%) | 5 (4%) | 0 | 100 | 100 |
| 13 | M | 112/115 (97%) | 109 (97%) | 3 (3%) | 0 | 100 | 100 |
| 14 | N | 115/118 (98%) | 114 (99%) | 1 (1%) | 0 | 100 | 100 |
| 15 | O | 101/103 (98%) | 99 (98%) | 2 (2%) | 0 | 100 | 100 |
| 16 | P | 108/110 (98%) | 105 (97%) | 3 (3%) | 0 | 100 | 100 |
| 17 | Q | 91/100 (91%) | 87 (96%) | 4 (4%) | 0 | 100 | 100 |
| 18 | R | 100/104 (96%) | 93 (93%) | 7 (7%) | 0 | 100 | 100 |
| 19 | S | 92/94 (98%) | 90 (98%) | 2 (2%) | 0 | 100 | 100 |
| 20 | T | 73/85 (86%) | 71 (97%) | 2 (3%) | 0 | 100 | 100 |
| 21 | U | 75/78 (96%) | 74 (99%) | 1 (1%) | 0 | 100 | 100 |

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| Mol | Chain | Analysed | Favoured | Allowed | Outliers | Percentiles | |
|-----|-------|-----------------|------------|----------|----------|-------------|-----|
| 22 | V | 58/63 (92%) | 57 (98%) | 1 (2%) | 0 | 100 | 100 |
| 23 | W | 55/59 (93%) | 54 (98%) | 1 (2%) | 0 | 100 | 100 |
| 24 | X | 56/70 (80%) | 50 (89%) | 6 (11%) | 0 | 100 | 100 |
| 25 | a | 53/57 (93%) | 51 (96%) | 2 (4%) | 0 | 100 | 100 |
| 26 | b | 49/55 (89%) | 48 (98%) | 1 (2%) | 0 | 100 | 100 |
| 27 | c | 44/46 (96%) | 43 (98%) | 1 (2%) | 0 | 100 | 100 |
| 28 | d | 62/65 (95%) | 58 (94%) | 4 (6%) | 0 | 100 | 100 |
| 29 | e | 36/38 (95%) | 36 (100%) | 0 | 0 | 100 | 100 |
| 30 | f | 222/241 (92%) | 195 (88%) | 27 (12%) | 0 | 100 | 100 |
| 31 | g | 204/233 (88%) | 193 (95%) | 11 (5%) | 0 | 100 | 100 |
| 32 | h | 203/206 (98%) | 197 (97%) | 6 (3%) | 0 | 100 | 100 |
| 33 | i | 153/167 (92%) | 146 (95%) | 7 (5%) | 0 | 100 | 100 |
| 34 | j | 104/131 (79%) | 101 (97%) | 3 (3%) | 0 | 100 | 100 |
| 35 | k | 149/179 (83%) | 143 (96%) | 6 (4%) | 0 | 100 | 100 |
| 36 | l | 127/130 (98%) | 123 (97%) | 4 (3%) | 0 | 100 | 100 |
| 37 | m | 125/130 (96%) | 116 (93%) | 9 (7%) | 0 | 100 | 100 |
| 38 | n | 97/103 (94%) | 91 (94%) | 6 (6%) | 0 | 100 | 100 |
| 39 | o | 115/129 (89%) | 108 (94%) | 7 (6%) | 0 | 100 | 100 |
| 40 | p | 121/124 (98%) | 114 (94%) | 7 (6%) | 0 | 100 | 100 |
| 41 | q | 112/118 (95%) | 100 (89%) | 12 (11%) | 0 | 100 | 100 |
| 42 | r | 98/101 (97%) | 90 (92%) | 8 (8%) | 0 | 100 | 100 |
| 43 | s | 86/89 (97%) | 84 (98%) | 2 (2%) | 0 | 100 | 100 |
| 44 | t | 80/82 (98%) | 78 (98%) | 2 (2%) | 0 | 100 | 100 |
| 45 | u | 78/84 (93%) | 73 (94%) | 5 (6%) | 0 | 100 | 100 |
| 46 | v | 64/75 (85%) | 61 (95%) | 3 (5%) | 0 | 100 | 100 |
| 47 | w | 77/92 (84%) | 72 (94%) | 5 (6%) | 0 | 100 | 100 |
| 48 | x | 84/87 (97%) | 83 (99%) | 1 (1%) | 0 | 100 | 100 |
| 49 | y | 68/71 (96%) | 65 (96%) | 3 (4%) | 0 | 100 | 100 |
| All | All | 5581/5909 (94%) | 5297 (95%) | 284 (5%) | 0 | 100 | 100 |

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

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

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

| Mol | Chain | Analysed | Rotameric | Outliers | Percentiles | |
|-----|-------|----------------|------------|----------|-------------|-----|
| 1 | A | 216/218 (99%) | 212 (98%) | 4 (2%) | 52 | 64 |
| 2 | B | 164/164 (100%) | 161 (98%) | 3 (2%) | 54 | 66 |
| 3 | C | 165/165 (100%) | 159 (96%) | 6 (4%) | 30 | 39 |
| 4 | D | 148/150 (99%) | 139 (94%) | 9 (6%) | 15 | 17 |
| 5 | E | 134/138 (97%) | 128 (96%) | 6 (4%) | 23 | 29 |
| 6 | F | 114/114 (100%) | 109 (96%) | 5 (4%) | 24 | 30 |
| 7 | G | 116/116 (100%) | 112 (97%) | 4 (3%) | 32 | 41 |
| 8 | H | 104/104 (100%) | 102 (98%) | 2 (2%) | 52 | 64 |
| 9 | I | 103/103 (100%) | 102 (99%) | 1 (1%) | 73 | 83 |
| 10 | J | 109/109 (100%) | 109 (100%) | 0 | 100 | 100 |
| 11 | K | 98/103 (95%) | 96 (98%) | 2 (2%) | 50 | 62 |
| 12 | L | 86/87 (99%) | 84 (98%) | 2 (2%) | 45 | 56 |
| 13 | M | 99/100 (99%) | 94 (95%) | 5 (5%) | 20 | 24 |
| 14 | N | 89/90 (99%) | 89 (100%) | 0 | 100 | 100 |
| 15 | O | 84/84 (100%) | 81 (96%) | 3 (4%) | 30 | 39 |
| 16 | P | 93/93 (100%) | 91 (98%) | 2 (2%) | 47 | 58 |
| 17 | Q | 80/84 (95%) | 78 (98%) | 2 (2%) | 42 | 53 |
| 18 | R | 83/85 (98%) | 81 (98%) | 2 (2%) | 44 | 54 |
| 19 | S | 78/78 (100%) | 77 (99%) | 1 (1%) | 65 | 77 |
| 20 | T | 57/63 (90%) | 56 (98%) | 1 (2%) | 54 | 66 |
| 21 | U | 67/68 (98%) | 65 (97%) | 2 (3%) | 36 | 45 |
| 22 | V | 54/55 (98%) | 53 (98%) | 1 (2%) | 52 | 64 |
| 23 | W | 47/49 (96%) | 46 (98%) | 1 (2%) | 48 | 60 |
| 24 | X | 55/62 (89%) | 52 (94%) | 3 (6%) | 18 | 21 |
| 25 | a | 46/48 (96%) | 44 (96%) | 2 (4%) | 25 | 31 |
| 26 | b | 46/49 (94%) | 44 (96%) | 2 (4%) | 25 | 31 |

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| Mol | Chain | Analysed | Rotameric | Outliers | Percentiles | |
|-----|-------|-----------------|------------|----------|-------------|-----|
| 27 | c | 38/38 (100%) | 38 (100%) | 0 | 100 | 100 |
| 28 | d | 51/52 (98%) | 50 (98%) | 1 (2%) | 50 | 62 |
| 29 | e | 34/34 (100%) | 33 (97%) | 1 (3%) | 37 | 47 |
| 30 | f | 186/199 (94%) | 173 (93%) | 13 (7%) | 12 | 13 |
| 31 | g | 170/190 (90%) | 163 (96%) | 7 (4%) | 26 | 33 |
| 32 | h | 172/173 (99%) | 167 (97%) | 5 (3%) | 37 | 47 |
| 33 | i | 118/126 (94%) | 115 (98%) | 3 (2%) | 42 | 53 |
| 34 | j | 92/112 (82%) | 90 (98%) | 2 (2%) | 47 | 58 |
| 35 | k | 124/147 (84%) | 120 (97%) | 4 (3%) | 34 | 42 |
| 36 | l | 104/105 (99%) | 103 (99%) | 1 (1%) | 73 | 83 |
| 37 | m | 105/107 (98%) | 99 (94%) | 6 (6%) | 17 | 20 |
| 38 | n | 87/90 (97%) | 86 (99%) | 1 (1%) | 70 | 81 |
| 39 | o | 90/99 (91%) | 88 (98%) | 2 (2%) | 47 | 58 |
| 40 | p | 103/104 (99%) | 100 (97%) | 3 (3%) | 37 | 47 |
| 41 | q | 92/96 (96%) | 85 (92%) | 7 (8%) | 11 | 11 |
| 42 | r | 83/84 (99%) | 81 (98%) | 2 (2%) | 44 | 54 |
| 43 | s | 76/77 (99%) | 74 (97%) | 2 (3%) | 41 | 51 |
| 44 | t | 65/65 (100%) | 63 (97%) | 2 (3%) | 35 | 44 |
| 45 | u | 74/78 (95%) | 71 (96%) | 3 (4%) | 26 | 33 |
| 46 | v | 57/65 (88%) | 56 (98%) | 1 (2%) | 54 | 66 |
| 47 | w | 70/79 (89%) | 65 (93%) | 5 (7%) | 12 | 12 |
| 48 | x | 65/66 (98%) | 62 (95%) | 3 (5%) | 23 | 28 |
| 49 | y | 60/61 (98%) | 56 (93%) | 4 (7%) | 13 | 14 |
| 56 | 6 | 1/1 (100%) | 1 (100%) | 0 | 100 | 100 |
| All | All | 4652/4827 (96%) | 4503 (97%) | 149 (3%) | 36 | 42 |

All (149) residues with a non-rotameric sidechain are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 1 | A | 38 | SER |
| 1 | A | 133 | ARG |
| 1 | A | 157 | SER |
| 1 | A | 187 | ASP |
| 2 | B | 1 | MET |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 2 | B | 97 | SER |
| 2 | B | 137 | SER |
| 3 | C | 5 | LEU |
| 3 | C | 15 | SER |
| 3 | C | 21 | ARG |
| 3 | C | 55 | SER |
| 3 | C | 116 | ASP |
| 3 | C | 132 | LYS |
| 4 | D | 15 | LYS |
| 4 | D | 71 | ARG |
| 4 | D | 73 | SER |
| 4 | D | 81 | GLN |
| 4 | D | 94 | GLU |
| 4 | D | 96 | MET |
| 4 | D | 129 | SER |
| 4 | D | 150 | ARG |
| 4 | D | 175 | PHE |
| 5 | E | 74 | SER |
| 5 | E | 99 | LYS |
| 5 | E | 106 | SER |
| 5 | E | 110 | SER |
| 5 | E | 114 | ASP |
| 5 | E | 152 | ARG |
| 6 | F | 8 | LYS |
| 6 | F | 12 | LEU |
| 6 | F | 41 | LYS |
| 6 | F | 51 | ARG |
| 6 | F | 112 | LYS |
| 7 | G | 95 | ARG |
| 7 | G | 96 | ARG |
| 7 | G | 106 | LYS |
| 7 | G | 131 | ASN |
| 8 | H | 56 | ASP |
| 8 | H | 108 | ARG |
| 9 | I | 141 | LYS |
| 11 | K | 6 | SER |
| 11 | K | 98 | LEU |
| 12 | L | 19 | GLN |
| 12 | L | 69 | ASP |
| 13 | M | 10 | GLN |
| 13 | M | 37 | LYS |
| 13 | M | 39 | ARG |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 13 | M | 89 | ARG |
| 13 | M | 111 | LYS |
| 15 | O | 55 | ASP |
| 15 | O | 85 | LYS |
| 15 | O | 95 | ASP |
| 16 | P | 7 | HIS |
| 16 | P | 70 | LYS |
| 17 | Q | 24 | MET |
| 17 | Q | 56 | GLU |
| 18 | R | 81 | ASP |
| 18 | R | 91 | LYS |
| 19 | S | 51 | GLN |
| 20 | T | 72 | LYS |
| 21 | U | 35 | SER |
| 21 | U | 54 | LYS |
| 22 | V | 8 | GLU |
| 23 | W | 31 | ARG |
| 24 | X | 25 | ARG |
| 24 | X | 31 | ASP |
| 24 | X | 37 | CYS |
| 25 | a | 10 | ARG |
| 25 | a | 40 | ARG |
| 26 | b | 28 | ARG |
| 26 | b | 33 | LYS |
| 28 | d | 31 | HIS |
| 29 | e | 36 | ARG |
| 30 | f | 23 | TRP |
| 30 | f | 52 | GLU |
| 30 | f | 63 | ARG |
| 30 | f | 86 | SER |
| 30 | f | 105 | LYS |
| 30 | f | 115 | LYS |
| 30 | f | 116 | ASP |
| 30 | f | 120 | GLN |
| 30 | f | 126 | PHE |
| 30 | f | 128 | LYS |
| 30 | f | 137 | ARG |
| 30 | f | 147 | SER |
| 30 | f | 222 | ARG |
| 31 | g | 29 | PHE |
| 31 | g | 35 | SER |
| 31 | g | 54 | ARG |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 31 | g | 62 | LYS |
| 31 | g | 107 | ARG |
| 31 | g | 154 | SER |
| 31 | g | 165 | THR |
| 32 | h | 26 | ARG |
| 32 | h | 44 | ARG |
| 32 | h | 151 | LYS |
| 32 | h | 177 | LYS |
| 32 | h | 190 | ASP |
| 33 | i | 26 | LYS |
| 33 | i | 54 | ARG |
| 33 | i | 68 | ARG |
| 34 | j | 44 | ARG |
| 34 | j | 55 | HIS |
| 35 | k | 18 | PHE |
| 35 | k | 33 | ASP |
| 35 | k | 54 | SER |
| 35 | k | 78 | ARG |
| 36 | l | 77 | ARG |
| 37 | m | 27 | LYS |
| 37 | m | 36 | GLU |
| 37 | m | 90 | TYR |
| 37 | m | 99 | ARG |
| 37 | m | 119 | ARG |
| 37 | m | 123 | ARG |
| 38 | n | 37 | ARG |
| 39 | o | 75 | LYS |
| 39 | o | 80 | LYS |
| 40 | p | 19 | SER |
| 40 | p | 103 | ASP |
| 40 | p | 115 | SER |
| 41 | q | 8 | ASN |
| 41 | q | 11 | ASP |
| 41 | q | 31 | LYS |
| 41 | q | 49 | SER |
| 41 | q | 50 | GLU |
| 41 | q | 62 | LYS |
| 41 | q | 69 | LEU |
| 42 | r | 37 | SER |
| 42 | r | 43 | ASN |
| 43 | s | 61 | SER |
| 43 | s | 88 | ARG |

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| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 44 | t | 23 | ASP |
| 44 | t | 56 | ARG |
| 45 | u | 14 | SER |
| 45 | u | 40 | ARG |
| 45 | u | 48 | ASP |
| 46 | v | 10 | PHE |
| 47 | w | 3 | ARG |
| 47 | w | 6 | LYS |
| 47 | w | 12 | ASP |
| 47 | w | 64 | ASP |
| 47 | w | 65 | GLU |
| 48 | x | 24 | ARG |
| 48 | x | 26 | SER |
| 48 | x | 52 | ASN |
| 49 | y | 5 | LYS |
| 49 | y | 33 | ARG |
| 49 | y | 44 | GLU |
| 49 | y | 59 | LYS |

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 45 | u | 47 | HIS |

5.3.3 RNA [i](#)

| Mol | Chain | Analysed | Backbone Outliers | Pucker Outliers |
|-----|-------|-----------------|-------------------|-----------------|
| 50 | 0 | 2754/2904 (94%) | 337 (12%) | 10 (0%) |
| 51 | 1 | 119/120 (99%) | 12 (10%) | 0 |
| 52 | 2 | 1533/1542 (99%) | 300 (19%) | 57 (3%) |
| 53 | 3 | 9/30 (30%) | 3 (33%) | 0 |
| 54 | 4 | 76/77 (98%) | 10 (13%) | 2 (2%) |
| 55 | 5 | 74/76 (97%) | 14 (18%) | 2 (2%) |
| All | All | 4565/4749 (96%) | 676 (14%) | 71 (1%) |

All (676) RNA backbone outliers are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 50 | 0 | 10 | A |
| 50 | 0 | 12 | U |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 50 | 0 | 13 | A |
| 50 | 0 | 34 | U |
| 50 | 0 | 35 | G |
| 50 | 0 | 46 | G |
| 50 | 0 | 63 | A |
| 50 | 0 | 71 | A |
| 50 | 0 | 74 | A |
| 50 | 0 | 75 | G |
| 50 | 0 | 84 | A |
| 50 | 0 | 93 | G |
| 50 | 0 | 99 | U |
| 50 | 0 | 101 | A |
| 50 | 0 | 102 | U |
| 50 | 0 | 103 | A |
| 50 | 0 | 118 | A |
| 50 | 0 | 120 | U |
| 50 | 0 | 139 | U |
| 50 | 0 | 140 | C |
| 50 | 0 | 181 | A |
| 50 | 0 | 196 | A |
| 50 | 0 | 199 | A |
| 50 | 0 | 215 | G |
| 50 | 0 | 216 | A |
| 50 | 0 | 222 | A |
| 50 | 0 | 229 | C |
| 50 | 0 | 233 | A |
| 50 | 0 | 248 | G |
| 50 | 0 | 266 | G |
| 50 | 0 | 272 | A |
| 50 | 0 | 275 | C |
| 50 | 0 | 281 | C |
| 50 | 0 | 282 | A |
| 50 | 0 | 302 | C |
| 50 | 0 | 311 | A |
| 50 | 0 | 318 | C |
| 50 | 0 | 323 | C |
| 50 | 0 | 329 | G |
| 50 | 0 | 330 | A |
| 50 | 0 | 353 | C |
| 50 | 0 | 361 | G |
| 50 | 0 | 362 | A |
| 50 | 0 | 372 | G |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 50 | 0 | 385 | C |
| 50 | 0 | 386 | G |
| 50 | 0 | 396 | G |
| 50 | 0 | 404 | A |
| 50 | 0 | 405 | U |
| 50 | 0 | 411 | G |
| 50 | 0 | 412 | A |
| 50 | 0 | 416 | U |
| 50 | 0 | 420 | C |
| 50 | 0 | 424 | G |
| 50 | 0 | 481 | G |
| 50 | 0 | 490 | C |
| 50 | 0 | 491 | G |
| 50 | 0 | 494 | G |
| 50 | 0 | 505 | A |
| 50 | 0 | 509 | C |
| 50 | 0 | 510 | C |
| 50 | 0 | 530 | G |
| 50 | 0 | 532 | A |
| 50 | 0 | 533 | G |
| 50 | 0 | 534 | U |
| 50 | 0 | 538 | A |
| 50 | 0 | 547 | A |
| 50 | 0 | 548 | G |
| 50 | 0 | 549 | G |
| 50 | 0 | 563 | A |
| 50 | 0 | 573 | U |
| 50 | 0 | 575 | A |
| 50 | 0 | 586 | A |
| 50 | 0 | 603 | A |
| 50 | 0 | 613 | A |
| 50 | 0 | 614 | A |
| 50 | 0 | 615 | U |
| 50 | 0 | 637 | A |
| 50 | 0 | 645 | C |
| 50 | 0 | 646 | U |
| 50 | 0 | 647 | G |
| 50 | 0 | 686 | U |
| 50 | 0 | 730 | A |
| 50 | 0 | 747 | U |
| 50 | 0 | 764 | A |
| 50 | 0 | 775 | G |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 50 | 0 | 776 | G |
| 50 | 0 | 782 | A |
| 50 | 0 | 783 | A |
| 50 | 0 | 784 | G |
| 50 | 0 | 785 | G |
| 50 | 0 | 805 | G |
| 50 | 0 | 812 | C |
| 50 | 0 | 827 | U |
| 50 | 0 | 828 | U |
| 50 | 0 | 846 | U |
| 50 | 0 | 859 | G |
| 50 | 0 | 878 | A |
| 50 | 0 | 881 | G |
| 50 | 0 | 895 | U |
| 50 | 0 | 896 | A |
| 50 | 0 | 910 | A |
| 50 | 0 | 915 | C |
| 50 | 0 | 931 | U |
| 50 | 0 | 934 | U |
| 50 | 0 | 946 | C |
| 50 | 0 | 959 | A |
| 50 | 0 | 961 | C |
| 50 | 0 | 974 | G |
| 50 | 0 | 983 | A |
| 50 | 0 | 996 | A |
| 50 | 0 | 1005 | C |
| 50 | 0 | 1009 | A |
| 50 | 0 | 1012 | U |
| 50 | 0 | 1013 | C |
| 50 | 0 | 1022 | G |
| 50 | 0 | 1026 | G |
| 50 | 0 | 1027 | A |
| 50 | 0 | 1030 | C |
| 50 | 0 | 1033 | U |
| 50 | 0 | 1034 | G |
| 50 | 0 | 1046 | A |
| 50 | 0 | 1047 | G |
| 50 | 0 | 1110 | G |
| 50 | 0 | 1111 | A |
| 50 | 0 | 1112 | G |
| 50 | 0 | 1124 | G |
| 50 | 0 | 1125 | G |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 50 | 0 | 1130 | U |
| 50 | 0 | 1132 | U |
| 50 | 0 | 1133 | A |
| 50 | 0 | 1135 | C |
| 50 | 0 | 1136 | G |
| 50 | 0 | 1142 | A |
| 50 | 0 | 1171 | G |
| 50 | 0 | 1173 | U |
| 50 | 0 | 1174 | U |
| 50 | 0 | 1176 | U |
| 50 | 0 | 1180 | U |
| 50 | 0 | 1206 | G |
| 50 | 0 | 1212 | G |
| 50 | 0 | 1226 | A |
| 50 | 0 | 1227 | G |
| 50 | 0 | 1238 | G |
| 50 | 0 | 1248 | G |
| 50 | 0 | 1253 | A |
| 50 | 0 | 1256 | G |
| 50 | 0 | 1257 | C |
| 50 | 0 | 1271 | G |
| 50 | 0 | 1272 | A |
| 50 | 0 | 1286 | A |
| 50 | 0 | 1300 | G |
| 50 | 0 | 1301 | A |
| 50 | 0 | 1329 | U |
| 50 | 0 | 1345 | C |
| 50 | 0 | 1352 | U |
| 50 | 0 | 1365 | A |
| 50 | 0 | 1379 | U |
| 50 | 0 | 1387 | A |
| 50 | 0 | 1395 | A |
| 50 | 0 | 1412 | U |
| 50 | 0 | 1416 | G |
| 50 | 0 | 1417 | C |
| 50 | 0 | 1420 | A |
| 50 | 0 | 1424 | G |
| 50 | 0 | 1428 | C |
| 50 | 0 | 1435 | G |
| 50 | 0 | 1452 | G |
| 50 | 0 | 1478 | G |
| 50 | 0 | 1482 | G |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 50 | 0 | 1490 | A |
| 50 | 0 | 1493 | C |
| 50 | 0 | 1495 | A |
| 50 | 0 | 1497 | U |
| 50 | 0 | 1509 | A |
| 50 | 0 | 1510 | G |
| 50 | 0 | 1515 | A |
| 50 | 0 | 1535 | A |
| 50 | 0 | 1569 | A |
| 50 | 0 | 1578 | U |
| 50 | 0 | 1583 | A |
| 50 | 0 | 1584 | U |
| 50 | 0 | 1585 | C |
| 50 | 0 | 1592 | C |
| 50 | 0 | 1608 | A |
| 50 | 0 | 1618 | A |
| 50 | 0 | 1647 | U |
| 50 | 0 | 1648 | U |
| 50 | 0 | 1674 | G |
| 50 | 0 | 1678 | A |
| 50 | 0 | 1715 | G |
| 50 | 0 | 1729 | U |
| 50 | 0 | 1730 | C |
| 50 | 0 | 1733 | G |
| 50 | 0 | 1737 | G |
| 50 | 0 | 1738 | G |
| 50 | 0 | 1739 | A |
| 50 | 0 | 1744 | A |
| 50 | 0 | 1758 | U |
| 50 | 0 | 1764 | C |
| 50 | 0 | 1773 | A |
| 50 | 0 | 1780 | A |
| 50 | 0 | 1800 | C |
| 50 | 0 | 1801 | A |
| 50 | 0 | 1808 | A |
| 50 | 0 | 1811 | G |
| 50 | 0 | 1816 | C |
| 50 | 0 | 1829 | A |
| 50 | 0 | 1847 | A |
| 50 | 0 | 1856 | U |
| 50 | 0 | 1857 | G |
| 50 | 0 | 1868 | C |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 50 | 0 | 1872 | A |
| 50 | 0 | 1873 | G |
| 50 | 0 | 1884 | G |
| 50 | 0 | 1906 | G |
| 50 | 0 | 1913 | A |
| 50 | 0 | 1917 | U |
| 50 | 0 | 1919 | A |
| 50 | 0 | 1929 | G |
| 50 | 0 | 1930 | G |
| 50 | 0 | 1934 | C |
| 50 | 0 | 1936 | A |
| 50 | 0 | 1937 | A |
| 50 | 0 | 1938 | A |
| 50 | 0 | 1941 | C |
| 50 | 0 | 1955 | U |
| 50 | 0 | 1964 | G |
| 50 | 0 | 1967 | C |
| 50 | 0 | 1970 | A |
| 50 | 0 | 1971 | U |
| 50 | 0 | 1972 | G |
| 50 | 0 | 1991 | U |
| 50 | 0 | 1993 | U |
| 50 | 0 | 1997 | C |
| 50 | 0 | 2006 | C |
| 50 | 0 | 2017 | U |
| 50 | 0 | 2023 | C |
| 50 | 0 | 2031 | A |
| 50 | 0 | 2033 | A |
| 50 | 0 | 2034 | U |
| 50 | 0 | 2043 | C |
| 50 | 0 | 2055 | C |
| 50 | 0 | 2056 | G |
| 50 | 0 | 2060 | A |
| 50 | 0 | 2061 | G |
| 50 | 0 | 2069 | G |
| 50 | 0 | 2187 | U |
| 50 | 0 | 2190 | G |
| 50 | 0 | 2194 | U |
| 50 | 0 | 2198 | A |
| 50 | 0 | 2204 | G |
| 50 | 0 | 2206 | C |
| 50 | 0 | 2225 | A |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 50 | 0 | 2238 | G |
| 50 | 0 | 2239 | G |
| 50 | 0 | 2251 | G |
| 50 | 0 | 2283 | C |
| 50 | 0 | 2287 | A |
| 50 | 0 | 2288 | A |
| 50 | 0 | 2300 | C |
| 50 | 0 | 2305 | U |
| 50 | 0 | 2306 | C |
| 50 | 0 | 2307 | G |
| 50 | 0 | 2308 | G |
| 50 | 0 | 2309 | A |
| 50 | 0 | 2310 | C |
| 50 | 0 | 2311 | A |
| 50 | 0 | 2312 | U |
| 50 | 0 | 2322 | A |
| 50 | 0 | 2325 | G |
| 50 | 0 | 2333 | A |
| 50 | 0 | 2347 | C |
| 50 | 0 | 2377 | A |
| 50 | 0 | 2383 | G |
| 50 | 0 | 2385 | C |
| 50 | 0 | 2396 | G |
| 50 | 0 | 2402 | U |
| 50 | 0 | 2403 | C |
| 50 | 0 | 2406 | A |
| 50 | 0 | 2425 | A |
| 50 | 0 | 2429 | G |
| 50 | 0 | 2430 | A |
| 50 | 0 | 2435 | A |
| 50 | 0 | 2441 | U |
| 50 | 0 | 2448 | A |
| 50 | 0 | 2470 | G |
| 50 | 0 | 2474 | U |
| 50 | 0 | 2475 | C |
| 50 | 0 | 2476 | A |
| 50 | 0 | 2478 | A |
| 50 | 0 | 2491 | U |
| 50 | 0 | 2492 | U |
| 50 | 0 | 2498 | C |
| 50 | 0 | 2502 | G |
| 50 | 0 | 2503 | A |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 50 | 0 | 2505 | G |
| 50 | 0 | 2507 | C |
| 50 | 0 | 2508 | G |
| 50 | 0 | 2518 | A |
| 50 | 0 | 2529 | G |
| 50 | 0 | 2547 | A |
| 50 | 0 | 2566 | A |
| 50 | 0 | 2567 | G |
| 50 | 0 | 2582 | G |
| 50 | 0 | 2602 | A |
| 50 | 0 | 2603 | G |
| 50 | 0 | 2606 | C |
| 50 | 0 | 2609 | U |
| 50 | 0 | 2613 | U |
| 50 | 0 | 2629 | U |
| 50 | 0 | 2689 | U |
| 50 | 0 | 2690 | U |
| 50 | 0 | 2693 | G |
| 50 | 0 | 2714 | G |
| 50 | 0 | 2726 | A |
| 50 | 0 | 2729 | G |
| 50 | 0 | 2733 | A |
| 50 | 0 | 2744 | G |
| 50 | 0 | 2748 | A |
| 50 | 0 | 2752 | C |
| 50 | 0 | 2765 | A |
| 50 | 0 | 2778 | A |
| 50 | 0 | 2820 | A |
| 50 | 0 | 2832 | U |
| 50 | 0 | 2835 | A |
| 50 | 0 | 2849 | U |
| 50 | 0 | 2861 | U |
| 50 | 0 | 2867 | G |
| 50 | 0 | 2873 | A |
| 50 | 0 | 2880 | C |
| 50 | 0 | 2884 | U |
| 50 | 0 | 2885 | G |
| 50 | 0 | 2886 | A |
| 50 | 0 | 2894 | G |
| 50 | 0 | 2895 | G |
| 50 | 0 | 2903 | U |
| 51 | 1 | 24 | G |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 51 | 1 | 35 | C |
| 51 | 1 | 42 | C |
| 51 | 1 | 44 | G |
| 51 | 1 | 45 | A |
| 51 | 1 | 56 | G |
| 51 | 1 | 67 | G |
| 51 | 1 | 89 | U |
| 51 | 1 | 90 | C |
| 51 | 1 | 105 | G |
| 51 | 1 | 108 | A |
| 51 | 1 | 109 | A |
| 52 | 2 | 4 | U |
| 52 | 2 | 6 | G |
| 52 | 2 | 13 | U |
| 52 | 2 | 22 | G |
| 52 | 2 | 32 | A |
| 52 | 2 | 39 | G |
| 52 | 2 | 41 | G |
| 52 | 2 | 47 | C |
| 52 | 2 | 48 | C |
| 52 | 2 | 51 | A |
| 52 | 2 | 64 | G |
| 52 | 2 | 65 | A |
| 52 | 2 | 77 | A |
| 52 | 2 | 81 | A |
| 52 | 2 | 84 | U |
| 52 | 2 | 85 | U |
| 52 | 2 | 86 | G |
| 52 | 2 | 87 | C |
| 52 | 2 | 90 | C |
| 52 | 2 | 91 | U |
| 52 | 2 | 93 | U |
| 52 | 2 | 104 | G |
| 52 | 2 | 120 | A |
| 52 | 2 | 121 | U |
| 52 | 2 | 122 | G |
| 52 | 2 | 126 | G |
| 52 | 2 | 127 | G |
| 52 | 2 | 130 | A |
| 52 | 2 | 131 | A |
| 52 | 2 | 143 | A |
| 52 | 2 | 144 | G |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 52 | 2 | 156 | C |
| 52 | 2 | 161 | A |
| 52 | 2 | 163 | C |
| 52 | 2 | 164 | G |
| 52 | 2 | 168 | G |
| 52 | 2 | 171 | A |
| 52 | 2 | 173 | U |
| 52 | 2 | 178 | C |
| 52 | 2 | 183 | C |
| 52 | 2 | 184 | G |
| 52 | 2 | 188 | C |
| 52 | 2 | 189 | A |
| 52 | 2 | 195 | A |
| 52 | 2 | 197 | A |
| 52 | 2 | 199 | A |
| 52 | 2 | 209 | U |
| 52 | 2 | 210 | C |
| 52 | 2 | 211 | G |
| 52 | 2 | 212 | G |
| 52 | 2 | 214 | C |
| 52 | 2 | 220 | G |
| 52 | 2 | 240 | G |
| 52 | 2 | 245 | U |
| 52 | 2 | 247 | G |
| 52 | 2 | 251 | G |
| 52 | 2 | 252 | U |
| 52 | 2 | 253 | A |
| 52 | 2 | 266 | G |
| 52 | 2 | 267 | C |
| 52 | 2 | 280 | C |
| 52 | 2 | 282 | A |
| 52 | 2 | 284 | C |
| 52 | 2 | 288 | A |
| 52 | 2 | 289 | G |
| 52 | 2 | 299 | G |
| 52 | 2 | 316 | C |
| 52 | 2 | 321 | A |
| 52 | 2 | 328 | C |
| 52 | 2 | 329 | A |
| 52 | 2 | 332 | G |
| 52 | 2 | 343 | U |
| 52 | 2 | 346 | G |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 52 | 2 | 348 | G |
| 52 | 2 | 352 | C |
| 52 | 2 | 354 | G |
| 52 | 2 | 359 | G |
| 52 | 2 | 365 | U |
| 52 | 2 | 367 | U |
| 52 | 2 | 372 | C |
| 52 | 2 | 382 | A |
| 52 | 2 | 393 | A |
| 52 | 2 | 397 | A |
| 52 | 2 | 398 | U |
| 52 | 2 | 406 | G |
| 52 | 2 | 409 | U |
| 52 | 2 | 411 | A |
| 52 | 2 | 412 | A |
| 52 | 2 | 413 | G |
| 52 | 2 | 422 | C |
| 52 | 2 | 423 | G |
| 52 | 2 | 429 | U |
| 52 | 2 | 447 | G |
| 52 | 2 | 460 | A |
| 52 | 2 | 463 | U |
| 52 | 2 | 464 | U |
| 52 | 2 | 468 | A |
| 52 | 2 | 470 | C |
| 52 | 2 | 481 | G |
| 52 | 2 | 484 | G |
| 52 | 2 | 486 | U |
| 52 | 2 | 487 | A |
| 52 | 2 | 495 | A |
| 52 | 2 | 496 | A |
| 52 | 2 | 509 | A |
| 52 | 2 | 511 | C |
| 52 | 2 | 512 | U |
| 52 | 2 | 514 | C |
| 52 | 2 | 518 | C |
| 52 | 2 | 532 | A |
| 52 | 2 | 533 | A |
| 52 | 2 | 534 | U |
| 52 | 2 | 542 | G |
| 52 | 2 | 547 | A |
| 52 | 2 | 548 | G |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 52 | 2 | 559 | A |
| 52 | 2 | 560 | A |
| 52 | 2 | 564 | C |
| 52 | 2 | 567 | G |
| 52 | 2 | 572 | A |
| 52 | 2 | 573 | A |
| 52 | 2 | 576 | C |
| 52 | 2 | 577 | G |
| 52 | 2 | 587 | G |
| 52 | 2 | 596 | A |
| 52 | 2 | 603 | U |
| 52 | 2 | 623 | C |
| 52 | 2 | 642 | A |
| 52 | 2 | 653 | U |
| 52 | 2 | 665 | A |
| 52 | 2 | 687 | A |
| 52 | 2 | 703 | G |
| 52 | 2 | 704 | A |
| 52 | 2 | 705 | G |
| 52 | 2 | 718 | A |
| 52 | 2 | 721 | G |
| 52 | 2 | 722 | G |
| 52 | 2 | 723 | U |
| 52 | 2 | 724 | G |
| 52 | 2 | 755 | G |
| 52 | 2 | 758 | C |
| 52 | 2 | 777 | A |
| 52 | 2 | 778 | G |
| 52 | 2 | 793 | U |
| 52 | 2 | 794 | A |
| 52 | 2 | 802 | A |
| 52 | 2 | 815 | A |
| 52 | 2 | 817 | C |
| 52 | 2 | 825 | A |
| 52 | 2 | 840 | C |
| 52 | 2 | 842 | U |
| 52 | 2 | 843 | U |
| 52 | 2 | 845 | A |
| 52 | 2 | 846 | G |
| 52 | 2 | 847 | G |
| 52 | 2 | 854 | U |
| 52 | 2 | 872 | A |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 52 | 2 | 885 | G |
| 52 | 2 | 889 | A |
| 52 | 2 | 890 | G |
| 52 | 2 | 891 | U |
| 52 | 2 | 914 | A |
| 52 | 2 | 919 | A |
| 52 | 2 | 926 | G |
| 52 | 2 | 927 | G |
| 52 | 2 | 934 | C |
| 52 | 2 | 935 | A |
| 52 | 2 | 936 | C |
| 52 | 2 | 960 | U |
| 52 | 2 | 961 | U |
| 52 | 2 | 966 | G |
| 52 | 2 | 969 | A |
| 52 | 2 | 972 | C |
| 52 | 2 | 975 | A |
| 52 | 2 | 976 | G |
| 52 | 2 | 977 | A |
| 52 | 2 | 983 | A |
| 52 | 2 | 992 | U |
| 52 | 2 | 993 | G |
| 52 | 2 | 1004 | A |
| 52 | 2 | 1005 | A |
| 52 | 2 | 1006 | G |
| 52 | 2 | 1007 | U |
| 52 | 2 | 1012 | A |
| 52 | 2 | 1020 | G |
| 52 | 2 | 1024 | G |
| 52 | 2 | 1025 | U |
| 52 | 2 | 1026 | G |
| 52 | 2 | 1027 | C |
| 52 | 2 | 1029 | U |
| 52 | 2 | 1030 | U |
| 52 | 2 | 1033 | G |
| 52 | 2 | 1034 | G |
| 52 | 2 | 1035 | A |
| 52 | 2 | 1036 | A |
| 52 | 2 | 1037 | C |
| 52 | 2 | 1041 | G |
| 52 | 2 | 1043 | G |
| 52 | 2 | 1044 | A |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 52 | 2 | 1053 | G |
| 52 | 2 | 1054 | C |
| 52 | 2 | 1064 | G |
| 52 | 2 | 1065 | U |
| 52 | 2 | 1066 | C |
| 52 | 2 | 1094 | G |
| 52 | 2 | 1095 | U |
| 52 | 2 | 1101 | A |
| 52 | 2 | 1102 | A |
| 52 | 2 | 1117 | A |
| 52 | 2 | 1118 | U |
| 52 | 2 | 1126 | U |
| 52 | 2 | 1130 | A |
| 52 | 2 | 1136 | C |
| 52 | 2 | 1137 | C |
| 52 | 2 | 1138 | G |
| 52 | 2 | 1139 | G |
| 52 | 2 | 1142 | G |
| 52 | 2 | 1152 | A |
| 52 | 2 | 1158 | C |
| 52 | 2 | 1159 | U |
| 52 | 2 | 1168 | U |
| 52 | 2 | 1169 | A |
| 52 | 2 | 1170 | A |
| 52 | 2 | 1181 | G |
| 52 | 2 | 1183 | U |
| 52 | 2 | 1184 | G |
| 52 | 2 | 1185 | G |
| 52 | 2 | 1186 | G |
| 52 | 2 | 1191 | A |
| 52 | 2 | 1196 | A |
| 52 | 2 | 1197 | A |
| 52 | 2 | 1202 | U |
| 52 | 2 | 1212 | U |
| 52 | 2 | 1213 | A |
| 52 | 2 | 1214 | C |
| 52 | 2 | 1221 | G |
| 52 | 2 | 1227 | A |
| 52 | 2 | 1228 | C |
| 52 | 2 | 1231 | G |
| 52 | 2 | 1236 | A |
| 52 | 2 | 1237 | C |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 52 | 2 | 1238 | A |
| 52 | 2 | 1241 | G |
| 52 | 2 | 1247 | U |
| 52 | 2 | 1257 | A |
| 52 | 2 | 1268 | G |
| 52 | 2 | 1275 | A |
| 52 | 2 | 1279 | G |
| 52 | 2 | 1280 | A |
| 52 | 2 | 1285 | A |
| 52 | 2 | 1287 | A |
| 52 | 2 | 1299 | A |
| 52 | 2 | 1300 | G |
| 52 | 2 | 1302 | C |
| 52 | 2 | 1304 | G |
| 52 | 2 | 1306 | A |
| 52 | 2 | 1312 | G |
| 52 | 2 | 1317 | C |
| 52 | 2 | 1318 | A |
| 52 | 2 | 1320 | C |
| 52 | 2 | 1321 | U |
| 52 | 2 | 1330 | U |
| 52 | 2 | 1337 | G |
| 52 | 2 | 1338 | G |
| 52 | 2 | 1347 | G |
| 52 | 2 | 1348 | U |
| 52 | 2 | 1362 | A |
| 52 | 2 | 1363 | A |
| 52 | 2 | 1365 | G |
| 52 | 2 | 1370 | G |
| 52 | 2 | 1374 | A |
| 52 | 2 | 1379 | G |
| 52 | 2 | 1383 | C |
| 52 | 2 | 1391 | U |
| 52 | 2 | 1394 | A |
| 52 | 2 | 1397 | C |
| 52 | 2 | 1398 | A |
| 52 | 2 | 1400 | C |
| 52 | 2 | 1401 | G |
| 52 | 2 | 1402 | C |
| 52 | 2 | 1441 | A |
| 52 | 2 | 1442 | G |
| 52 | 2 | 1446 | A |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 52 | 2 | 1447 | A |
| 52 | 2 | 1450 | U |
| 52 | 2 | 1452 | C |
| 52 | 2 | 1453 | G |
| 52 | 2 | 1459 | G |
| 52 | 2 | 1480 | A |
| 52 | 2 | 1487 | G |
| 52 | 2 | 1492 | A |
| 52 | 2 | 1494 | G |
| 52 | 2 | 1497 | G |
| 52 | 2 | 1499 | A |
| 52 | 2 | 1504 | G |
| 52 | 2 | 1506 | U |
| 52 | 2 | 1517 | G |
| 52 | 2 | 1529 | G |
| 52 | 2 | 1530 | G |
| 52 | 2 | 1534 | A |
| 53 | 3 | 14 | U |
| 53 | 3 | 16 | A |
| 53 | 3 | 22 | U |
| 54 | 4 | 11 | G |
| 54 | 4 | 15 | C |
| 54 | 4 | 16 | C |
| 54 | 4 | 19 | G |
| 54 | 4 | 22 | G |
| 54 | 4 | 23 | C |
| 54 | 4 | 29 | G |
| 54 | 4 | 35 | A |
| 54 | 4 | 55 | U |
| 54 | 4 | 76 | A |
| 55 | 5 | 12 | U |
| 55 | 5 | 14 | A |
| 55 | 5 | 16 | H2U |
| 55 | 5 | 17 | H2U |
| 55 | 5 | 19 | G |
| 55 | 5 | 20 | H2U |
| 55 | 5 | 26 | A |
| 55 | 5 | 30 | G |
| 55 | 5 | 38 | A |
| 55 | 5 | 42 | A |
| 55 | 5 | 57 | G |
| 55 | 5 | 58 | A |

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| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 55 | 5 | 62 | C |
| 55 | 5 | 74 | C |

All (71) RNA pucker outliers are listed below:

| Mol | Chain | Res | Type |
|------------|--------------|------------|-------------|
| 50 | 0 | 546 | U |
| 50 | 0 | 895 | U |
| 50 | 0 | 960 | A |
| 50 | 0 | 1026 | G |
| 50 | 0 | 1046 | A |
| 50 | 0 | 1111 | A |
| 50 | 0 | 1508 | A |
| 50 | 0 | 1738 | G |
| 50 | 0 | 2193 | G |
| 50 | 0 | 2307 | G |
| 52 | 2 | 64 | G |
| 52 | 2 | 80 | A |
| 52 | 2 | 83 | C |
| 52 | 2 | 130 | A |
| 52 | 2 | 188 | C |
| 52 | 2 | 210 | C |
| 52 | 2 | 250 | A |
| 52 | 2 | 251 | G |
| 52 | 2 | 281 | G |
| 52 | 2 | 315 | A |
| 52 | 2 | 345 | C |
| 52 | 2 | 422 | C |
| 52 | 2 | 428 | G |
| 52 | 2 | 463 | U |
| 52 | 2 | 467 | U |
| 52 | 2 | 495 | A |
| 52 | 2 | 533 | A |
| 52 | 2 | 559 | A |
| 52 | 2 | 575 | G |
| 52 | 2 | 602 | A |
| 52 | 2 | 703 | G |
| 52 | 2 | 792 | A |
| 52 | 2 | 839 | C |
| 52 | 2 | 842 | U |
| 52 | 2 | 845 | A |
| 52 | 2 | 890 | G |

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| Mol | Chain | Res | Type |
|-----|-------|------|------|
| 52 | 2 | 960 | U |
| 52 | 2 | 982 | U |
| 52 | 2 | 992 | U |
| 52 | 2 | 1003 | G |
| 52 | 2 | 1006 | G |
| 52 | 2 | 1024 | G |
| 52 | 2 | 1040 | U |
| 52 | 2 | 1053 | G |
| 52 | 2 | 1117 | A |
| 52 | 2 | 1125 | U |
| 52 | 2 | 1136 | C |
| 52 | 2 | 1137 | C |
| 52 | 2 | 1151 | A |
| 52 | 2 | 1157 | A |
| 52 | 2 | 1182 | G |
| 52 | 2 | 1183 | U |
| 52 | 2 | 1190 | G |
| 52 | 2 | 1201 | A |
| 52 | 2 | 1230 | C |
| 52 | 2 | 1256 | A |
| 52 | 2 | 1305 | G |
| 52 | 2 | 1317 | C |
| 52 | 2 | 1320 | C |
| 52 | 2 | 1337 | G |
| 52 | 2 | 1347 | G |
| 52 | 2 | 1364 | U |
| 52 | 2 | 1396 | A |
| 52 | 2 | 1399 | C |
| 52 | 2 | 1440 | U |
| 52 | 2 | 1451 | U |
| 52 | 2 | 1452 | C |
| 54 | 4 | 10 | A |
| 54 | 4 | 14 | G |
| 55 | 5 | 13 | C |
| 55 | 5 | 15 | G |

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

10 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 |
| 54 | 4SU | 4 | 7 | 54 | 18,21,22 | 1.80 | 4 (22%) | 26,30,33 | 2.30 | 5 (19%) |
| 55 | H2U | 5 | 16 | 55 | 18,21,22 | 0.97 | 2 (11%) | 21,30,33 | 1.34 | 3 (14%) |
| 55 | T6A | 5 | 37 | 55 | 27,34,35 | 0.90 | 0 | 29,49,52 | 2.65 | 7 (24%) |
| 55 | H2U | 5 | 20 | 55 | 18,21,22 | 0.96 | 2 (11%) | 21,30,33 | 1.34 | 3 (14%) |
| 54 | 5MU | 4 | 54 | 54 | 19,22,23 | 1.39 | 5 (26%) | 28,32,35 | 2.03 | 6 (21%) |
| 55 | 5MU | 5 | 54 | 55 | 19,22,23 | 1.34 | 4 (21%) | 28,32,35 | 2.08 | 6 (21%) |
| 55 | U8U | 5 | 34 | 53,55 | 19,24,25 | 1.64 | 3 (15%) | 23,34,37 | 1.08 | 2 (8%) |
| 55 | H2U | 5 | 17 | 55 | 18,21,22 | 0.98 | 2 (11%) | 21,30,33 | 1.38 | 3 (14%) |
| 54 | OMC | 4 | 32 | 54 | 19,22,23 | 0.85 | 1 (5%) | 26,31,34 | 0.79 | 1 (3%) |
| 56 | FME | 6 | 1 | 56 | 8,9,10 | 0.94 | 0 | 7,9,11 | 0.94 | 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 |
|-----|------|-------|-----|-------|---------|------------|---------|
| 54 | 4SU | 4 | 7 | 54 | - | 0/7/25/26 | 0/2/2/2 |
| 55 | H2U | 5 | 16 | 55 | - | 1/7/38/39 | 0/2/2/2 |
| 55 | T6A | 5 | 37 | 55 | - | 7/19/41/42 | 0/3/3/3 |
| 55 | H2U | 5 | 20 | 55 | - | 2/7/38/39 | 0/2/2/2 |
| 54 | 5MU | 4 | 54 | 54 | - | 0/7/25/26 | 0/2/2/2 |
| 55 | 5MU | 5 | 54 | 55 | - | 0/7/25/26 | 0/2/2/2 |
| 55 | U8U | 5 | 34 | 53,55 | - | 0/9/28/29 | 0/2/2/2 |
| 55 | H2U | 5 | 17 | 55 | - | 3/7/38/39 | 0/2/2/2 |
| 54 | OMC | 4 | 32 | 54 | - | 0/9/27/28 | 0/2/2/2 |
| 56 | FME | 6 | 1 | 56 | - | 4/7/9/11 | - |

All (23) bond length outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|-----|-------|-----|------|-------|-------|-------------|----------|
| 55 | 5 | 34 | U8U | C2-S2 | -5.12 | 1.59 | 1.67 |
| 54 | 4 | 7 | 4SU | C4-S4 | -4.67 | 1.59 | 1.68 |
| 54 | 4 | 7 | 4SU | C4-N3 | -3.40 | 1.34 | 1.37 |
| 55 | 5 | 34 | U8U | C4-N3 | -3.14 | 1.33 | 1.38 |

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| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|-----|-------|-----|------|-------|-------|-------------|----------|
| 54 | 4 | 7 | 4SU | C5-C4 | -3.00 | 1.38 | 1.42 |
| 55 | 5 | 54 | 5MU | C4-N3 | -2.95 | 1.33 | 1.38 |
| 54 | 4 | 54 | 5MU | C4-N3 | -2.72 | 1.33 | 1.38 |
| 54 | 4 | 54 | 5MU | C6-C5 | 2.69 | 1.39 | 1.34 |
| 55 | 5 | 54 | 5MU | C6-N1 | -2.52 | 1.33 | 1.38 |
| 55 | 5 | 16 | H2U | C2-N3 | -2.50 | 1.33 | 1.38 |
| 55 | 5 | 54 | 5MU | C2-N3 | -2.50 | 1.33 | 1.38 |
| 55 | 5 | 17 | H2U | C2-N3 | -2.47 | 1.33 | 1.38 |
| 55 | 5 | 20 | H2U | C2-N3 | -2.46 | 1.33 | 1.38 |
| 55 | 5 | 34 | U8U | C6-N1 | -2.36 | 1.34 | 1.38 |
| 54 | 4 | 54 | 5MU | C6-N1 | -2.29 | 1.34 | 1.38 |
| 55 | 5 | 54 | 5MU | C6-C5 | 2.24 | 1.38 | 1.34 |
| 54 | 4 | 54 | 5MU | C4-C5 | 2.24 | 1.48 | 1.44 |
| 54 | 4 | 7 | 4SU | C2-N3 | -2.21 | 1.34 | 1.38 |
| 54 | 4 | 54 | 5MU | C2-N3 | -2.12 | 1.34 | 1.38 |
| 55 | 5 | 17 | H2U | C4-N3 | -2.10 | 1.34 | 1.37 |
| 55 | 5 | 20 | H2U | C4-N3 | -2.08 | 1.34 | 1.37 |
| 55 | 5 | 16 | H2U | C4-N3 | -2.07 | 1.34 | 1.37 |
| 54 | 4 | 32 | OMC | C5-C4 | -2.04 | 1.38 | 1.42 |

All (36) bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(°) | Ideal(°) |
|-----|-------|-----|------|------------|-------|-------------|----------|
| 55 | 5 | 37 | T6A | N6-C10-N11 | 8.24 | 125.26 | 113.76 |
| 55 | 5 | 37 | T6A | C2-N1-C6 | 7.61 | 123.12 | 116.59 |
| 54 | 4 | 7 | 4SU | C4-N3-C2 | -7.10 | 120.44 | 127.34 |
| 54 | 4 | 7 | 4SU | C5-C4-N3 | 5.79 | 120.06 | 114.69 |
| 55 | 5 | 54 | 5MU | N3-C2-N1 | 5.25 | 121.86 | 114.89 |
| 54 | 4 | 54 | 5MU | C4-N3-C2 | -5.12 | 120.72 | 127.35 |
| 55 | 5 | 54 | 5MU | C4-N3-C2 | -5.10 | 120.74 | 127.35 |
| 54 | 4 | 54 | 5MU | N3-C2-N1 | 4.97 | 121.48 | 114.89 |
| 55 | 5 | 37 | T6A | N6-C6-N1 | 4.87 | 125.24 | 118.72 |
| 54 | 4 | 7 | 4SU | C5-C4-S4 | -4.57 | 118.58 | 124.47 |
| 54 | 4 | 54 | 5MU | C5-C4-N3 | 4.33 | 119.00 | 115.31 |
| 55 | 5 | 54 | 5MU | C5-C4-N3 | 4.28 | 118.97 | 115.31 |
| 54 | 4 | 7 | 4SU | N3-C2-N1 | 4.21 | 120.48 | 114.89 |
| 55 | 5 | 17 | H2U | C4-N3-C2 | -4.15 | 122.35 | 125.79 |
| 55 | 5 | 54 | 5MU | O4-C4-C5 | -4.04 | 120.22 | 124.90 |
| 55 | 5 | 20 | H2U | C4-N3-C2 | -4.03 | 122.45 | 125.79 |
| 55 | 5 | 16 | H2U | C4-N3-C2 | -3.95 | 122.51 | 125.79 |
| 54 | 4 | 54 | 5MU | C5-C6-N1 | -3.79 | 119.44 | 123.34 |
| 54 | 4 | 54 | 5MU | O4-C4-C5 | -3.73 | 120.58 | 124.90 |

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| Mol | Chain | Res | Type | Atoms | Z | Observed(°) | Ideal(°) |
|-----|-------|-----|------|-------------|-------|-------------|----------|
| 55 | 5 | 37 | T6A | O10-C10-N6 | -3.70 | 117.37 | 123.62 |
| 55 | 5 | 37 | T6A | N3-C2-N1 | -3.59 | 123.06 | 128.68 |
| 55 | 5 | 34 | U8U | O4-C4-C5 | -3.19 | 120.22 | 124.96 |
| 55 | 5 | 54 | 5MU | C5-C6-N1 | -3.04 | 120.21 | 123.34 |
| 55 | 5 | 37 | T6A | C4-C5-N7 | -2.94 | 106.33 | 109.40 |
| 55 | 5 | 54 | 5MU | O2-C2-N1 | -2.91 | 118.92 | 122.79 |
| 55 | 5 | 37 | T6A | O10-C10-N11 | -2.90 | 117.34 | 122.62 |
| 55 | 5 | 17 | H2U | C5-C4-N3 | 2.83 | 119.83 | 116.65 |
| 55 | 5 | 16 | H2U | C5-C4-N3 | 2.82 | 119.81 | 116.65 |
| 55 | 5 | 20 | H2U | C5-C4-N3 | 2.63 | 119.60 | 116.65 |
| 55 | 5 | 34 | U8U | C5-C4-N3 | 2.61 | 118.63 | 114.97 |
| 54 | 4 | 54 | 5MU | O2-C2-N1 | -2.58 | 119.35 | 122.79 |
| 54 | 4 | 7 | 4SU | O2-C2-N1 | -2.24 | 119.80 | 122.79 |
| 55 | 5 | 17 | H2U | C5-C6-N1 | -2.22 | 104.29 | 111.61 |
| 55 | 5 | 20 | H2U | C5-C6-N1 | -2.17 | 104.46 | 111.61 |
| 54 | 4 | 32 | OMC | O2-C2-N3 | -2.02 | 119.05 | 122.33 |
| 55 | 5 | 16 | H2U | C5-C6-N1 | -2.01 | 104.98 | 111.61 |

There are no chirality outliers.

All (17) torsion outliers are listed below:

| Mol | Chain | Res | Type | Atoms |
|-----|-------|-----|------|-----------------|
| 55 | 5 | 17 | H2U | O4'-C1'-N1-C2 |
| 55 | 5 | 17 | H2U | O4'-C1'-N1-C6 |
| 55 | 5 | 20 | H2U | O4'-C1'-N1-C2 |
| 55 | 5 | 20 | H2U | O4'-C1'-N1-C6 |
| 55 | 5 | 37 | T6A | N11-C12-C14-O14 |
| 55 | 5 | 37 | T6A | N11-C12-C14-C15 |
| 55 | 5 | 37 | T6A | C13-C12-C14-O14 |
| 55 | 5 | 37 | T6A | C13-C12-C14-C15 |
| 56 | 6 | 1 | FME | O1-CN-N-CA |
| 56 | 6 | 1 | FME | CA-CB-CG-SD |
| 55 | 5 | 37 | T6A | C13-C12-N11-C10 |
| 56 | 6 | 1 | FME | N-CA-CB-CG |
| 55 | 5 | 37 | T6A | N11-C12-C13-ODB |
| 55 | 5 | 37 | T6A | N11-C12-C13-ODA |
| 56 | 6 | 1 | FME | CB-CA-N-CN |
| 55 | 5 | 16 | H2U | C4'-C5'-O5'-P |
| 55 | 5 | 17 | H2U | O4'-C4'-C5'-O5' |

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

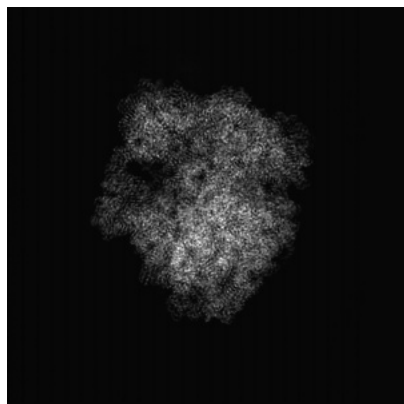
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-16015. These allow visual inspection of the internal detail of the map and identification of artifacts.

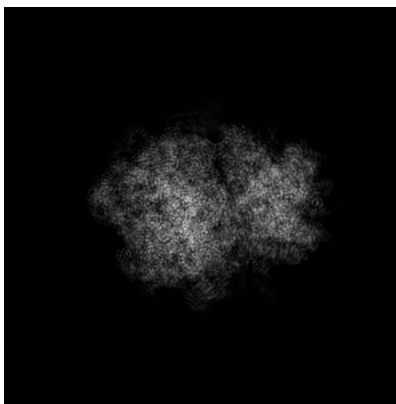
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

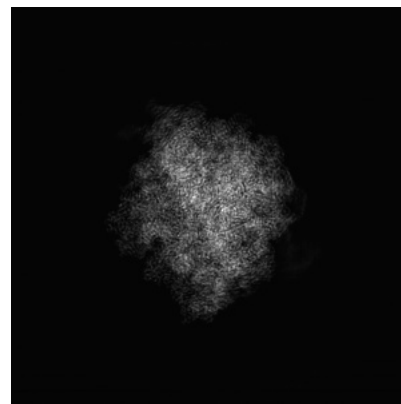
6.1.1 Primary map



X

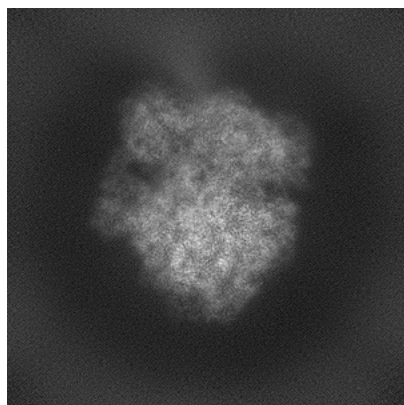


Y

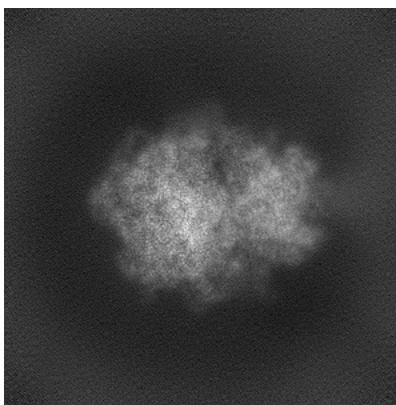


Z

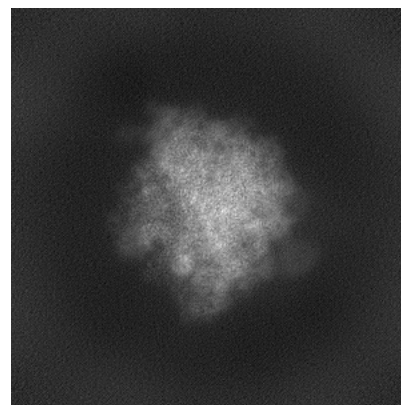
6.1.2 Raw map



X



Y



Z

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

6.2 Central slices [i](#)

6.2.1 Primary map



X Index: 256

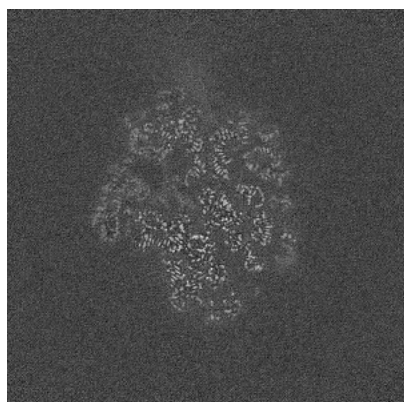


Y Index: 256

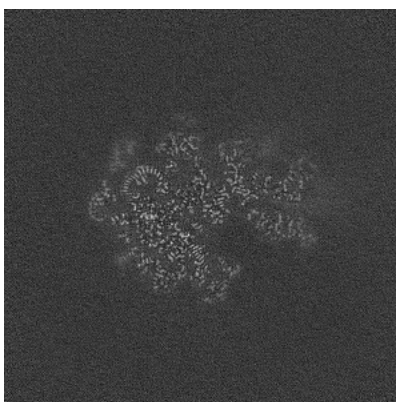


Z Index: 256

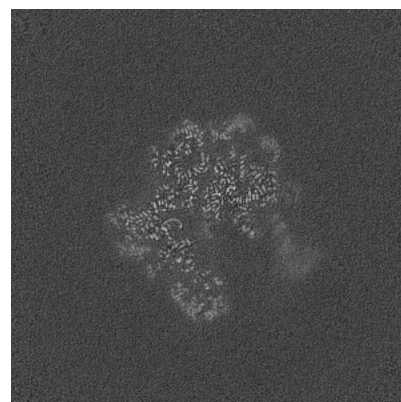
6.2.2 Raw map



X Index: 256



Y Index: 256



Z Index: 256

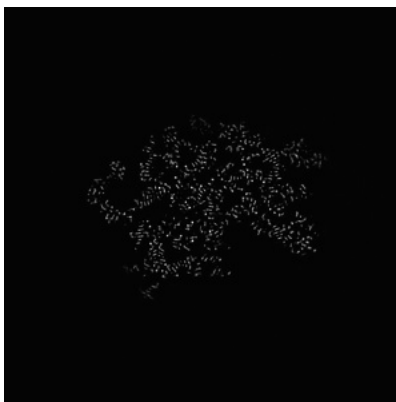
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

6.3.1 Primary map



X Index: 270

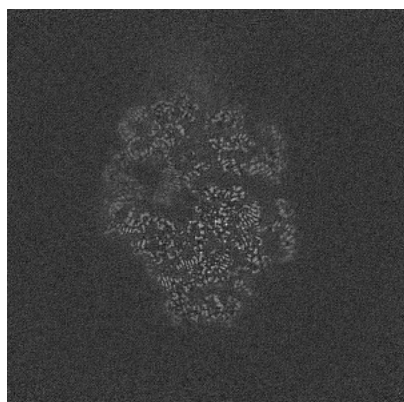


Y Index: 279

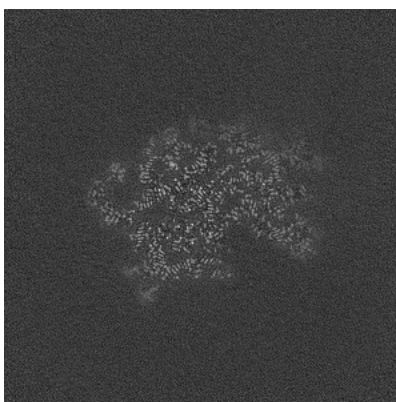


Z Index: 213

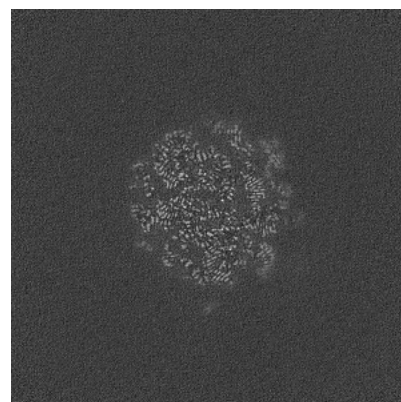
6.3.2 Raw map



X Index: 267



Y Index: 279

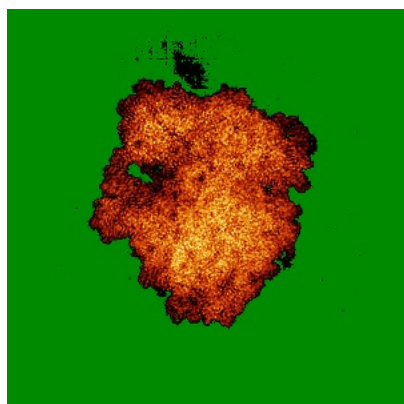


Z Index: 213

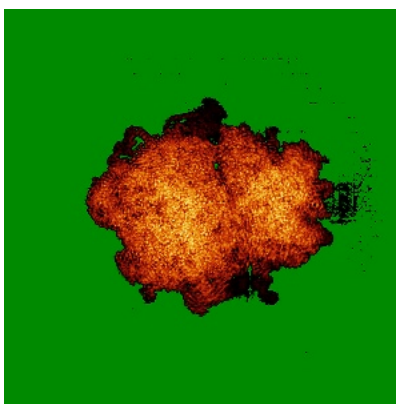
The images above show the largest variance slices of the map in three orthogonal directions.

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

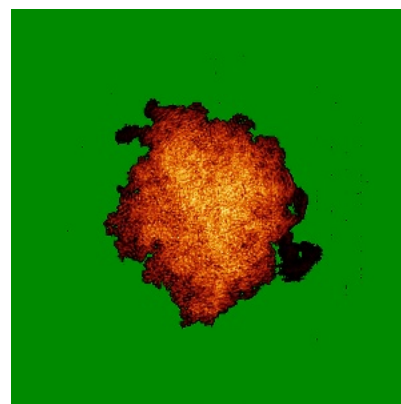
6.4.1 Primary map



X

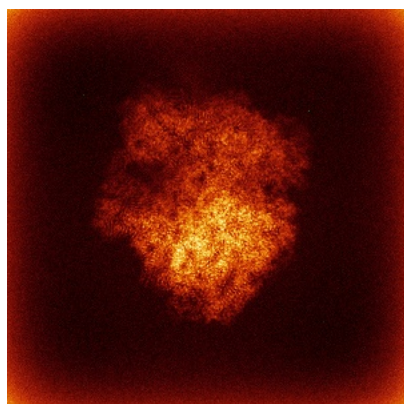


Y

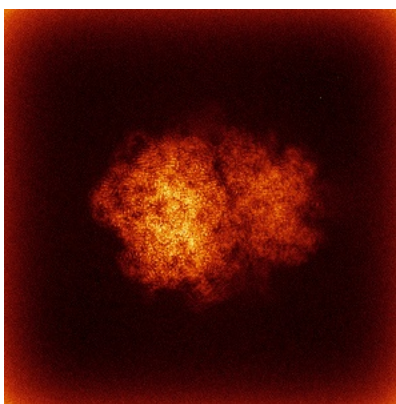


Z

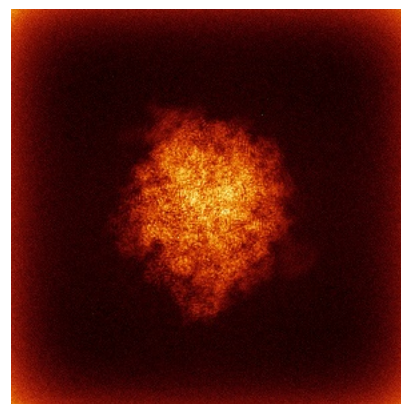
6.4.2 Raw map



X



Y

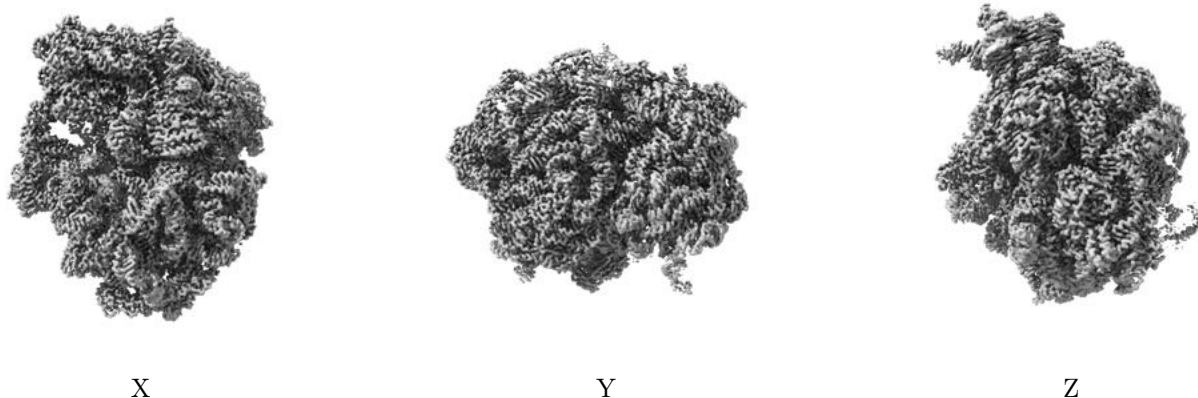


Z

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

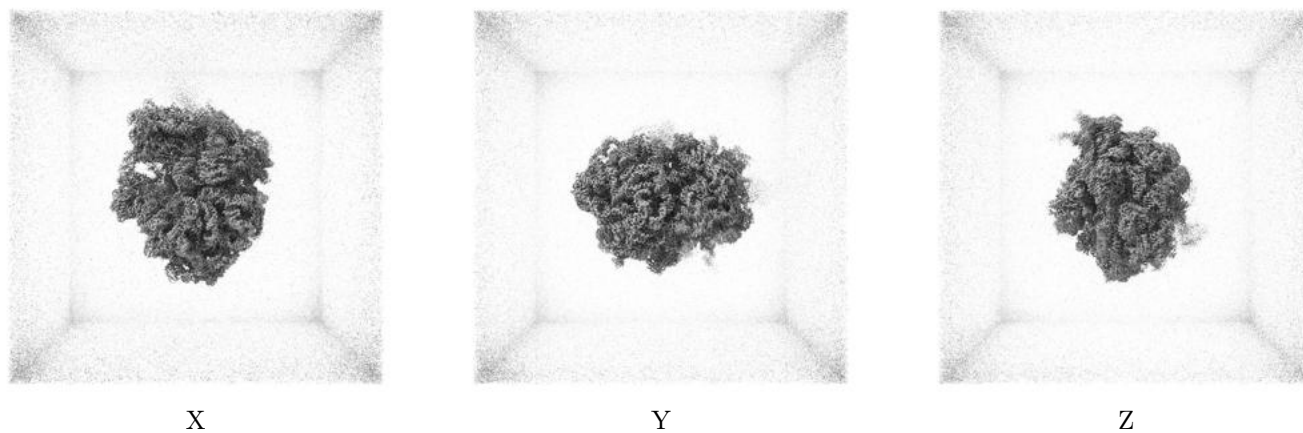
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.0806. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



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

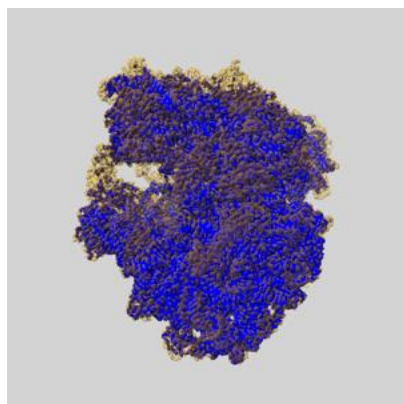
6.6 Mask visualisation [i](#)

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

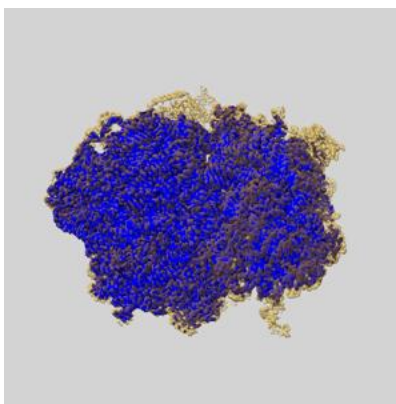
A mask typically either:

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

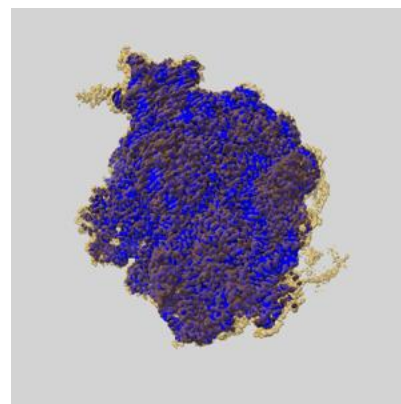
6.6.1 emd_16015_msk_1.map [i](#)



X



Y

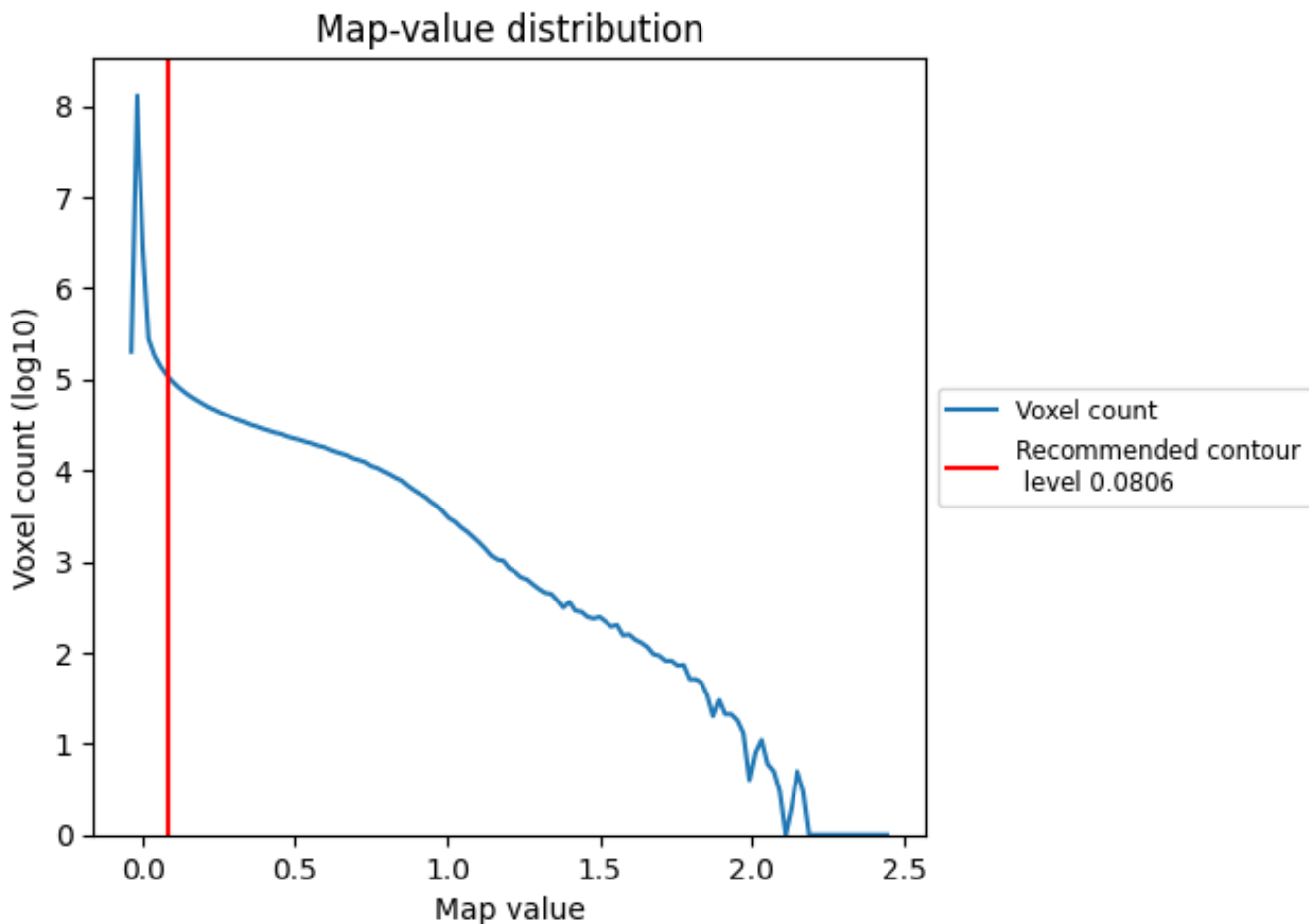


Z

7 Map analysis [i](#)

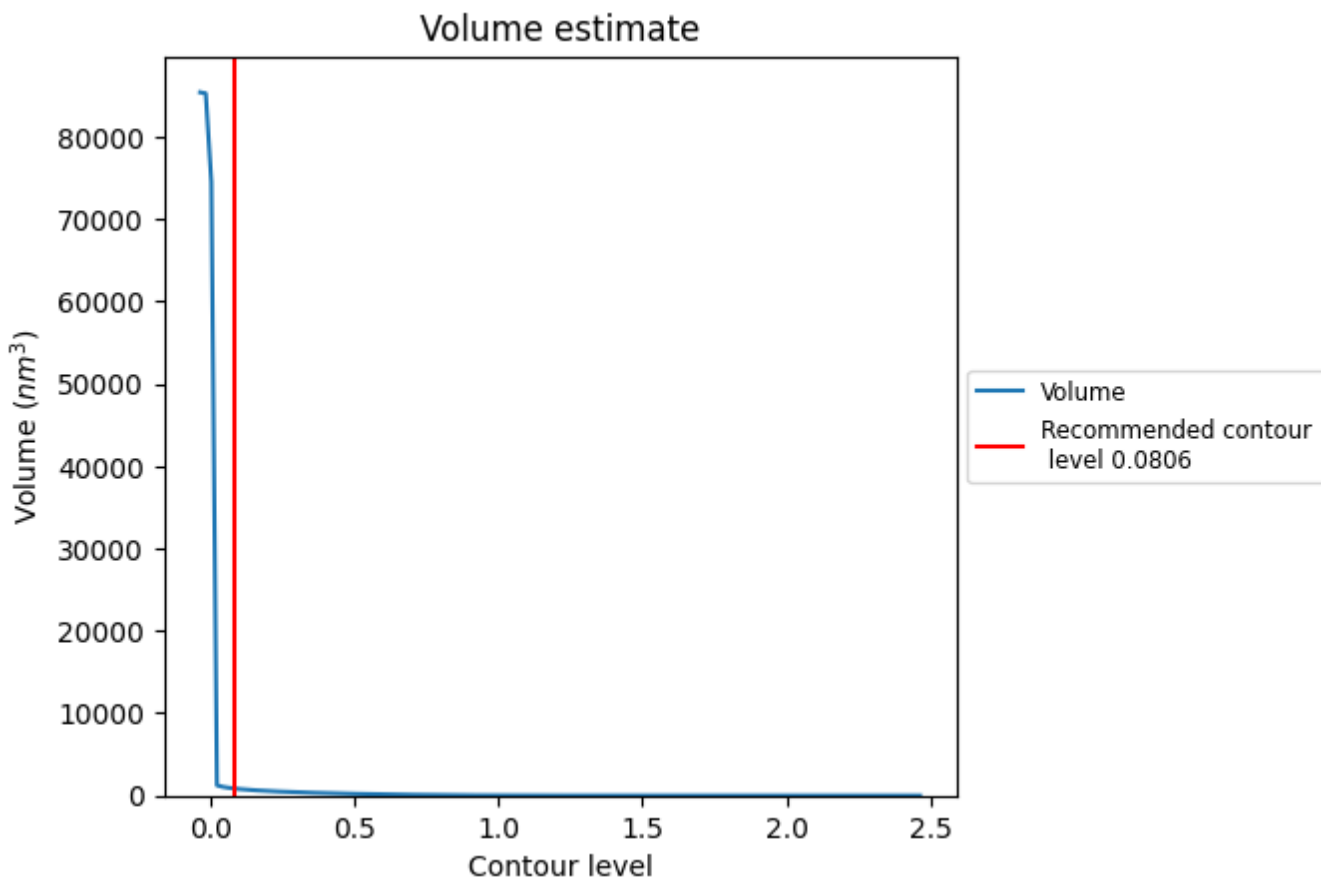
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

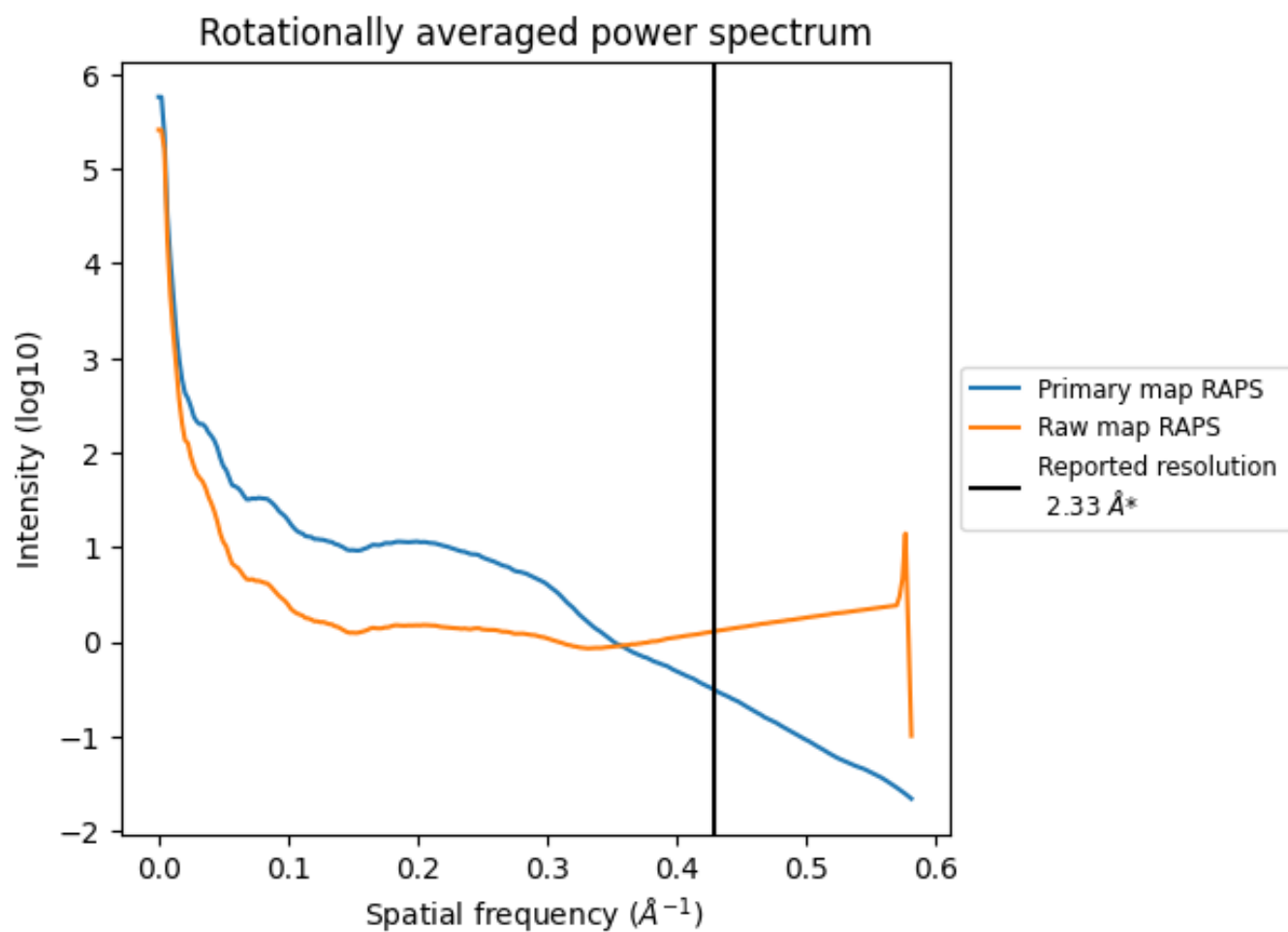
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 853 nm^3 ; this corresponds to an approximate mass of 771 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](#)

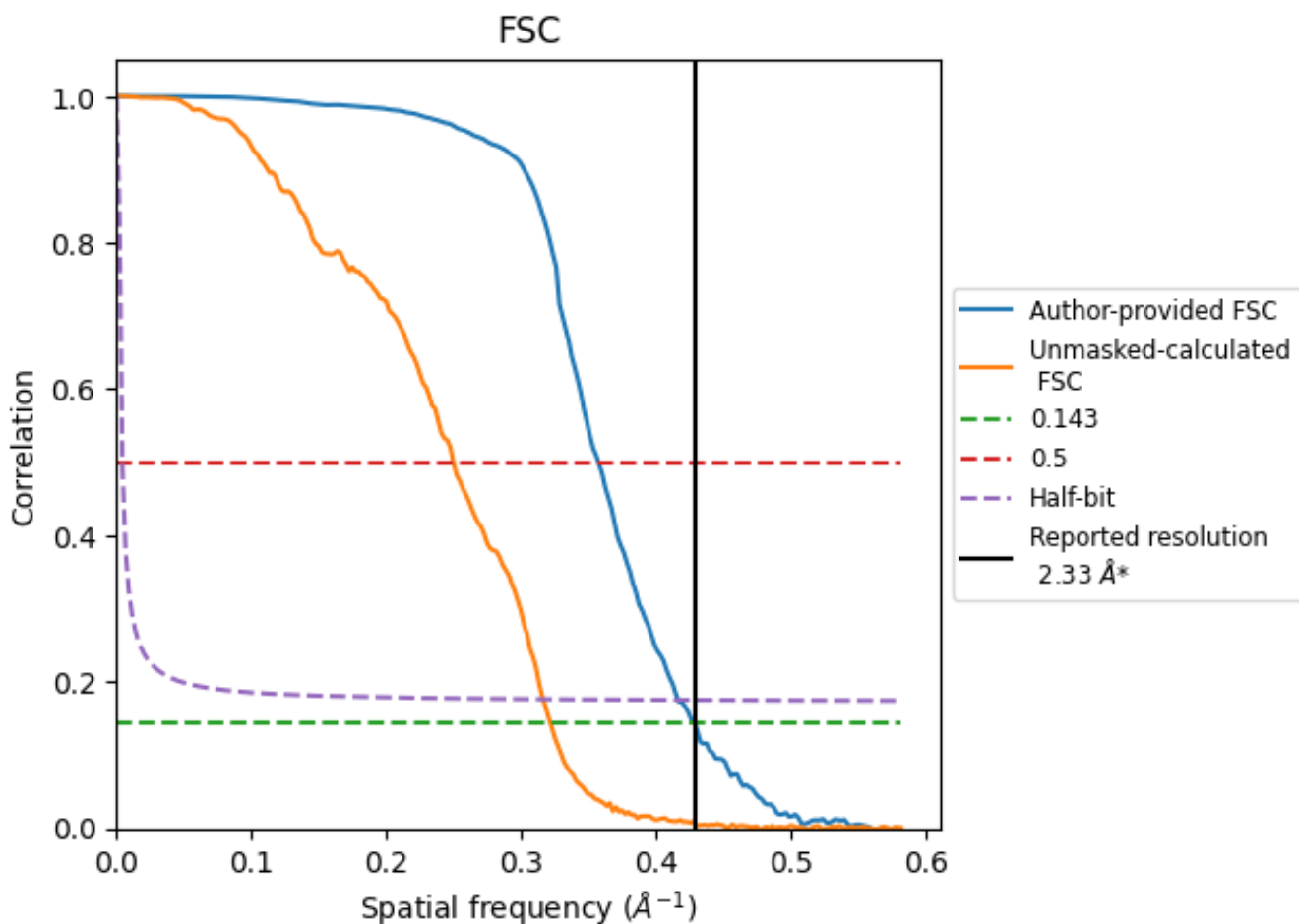


*Reported resolution corresponds to spatial frequency of 0.429 Å⁻¹

8 Fourier-Shell correlation [i](#)

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

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of 0.429 Å⁻¹

8.2 Resolution estimates [i](#)

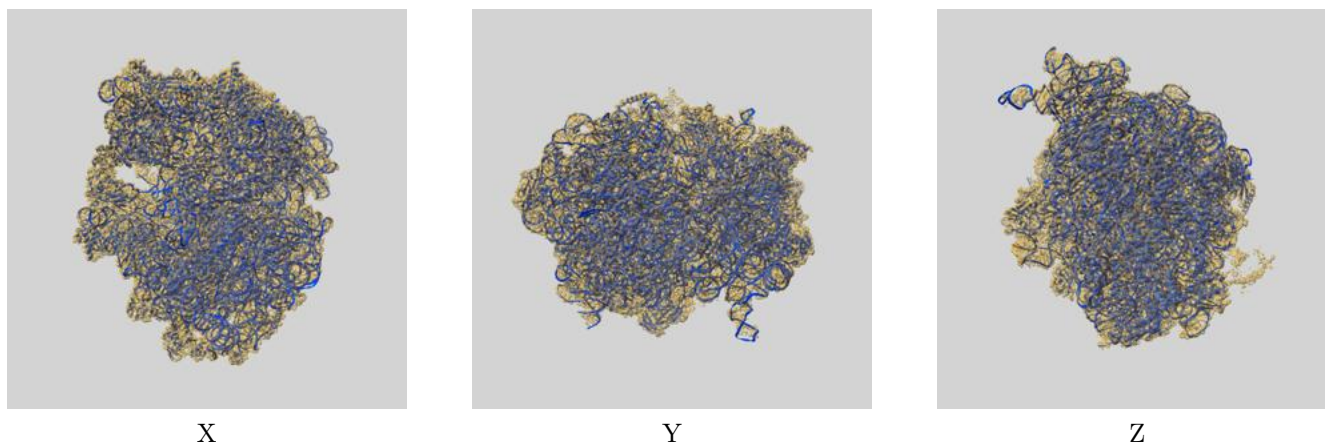
| Resolution estimate (Å) | Estimation criterion (FSC cut-off) | | |
|---------------------------|------------------------------------|------|----------|
| | 0.143 | 0.5 | Half-bit |
| Reported by author | 2.33 | - | - |
| Author-provided FSC curve | 2.33 | 2.80 | 2.40 |
| Unmasked-calculated* | 3.11 | 4.01 | 3.16 |

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 3.11 differs from the reported value 2.33 by more than 10 %

9 Map-model fit [i](#)

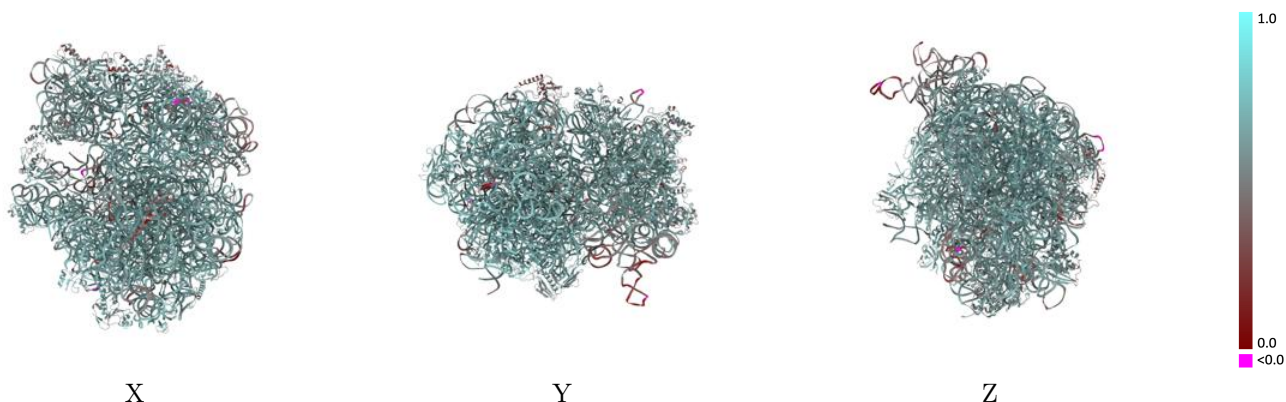
This section contains information regarding the fit between EMDB map EMD-16015 and PDB model 8BF7. Per-residue inclusion information can be found in section 3 on page 14.

9.1 Map-model overlay [i](#)



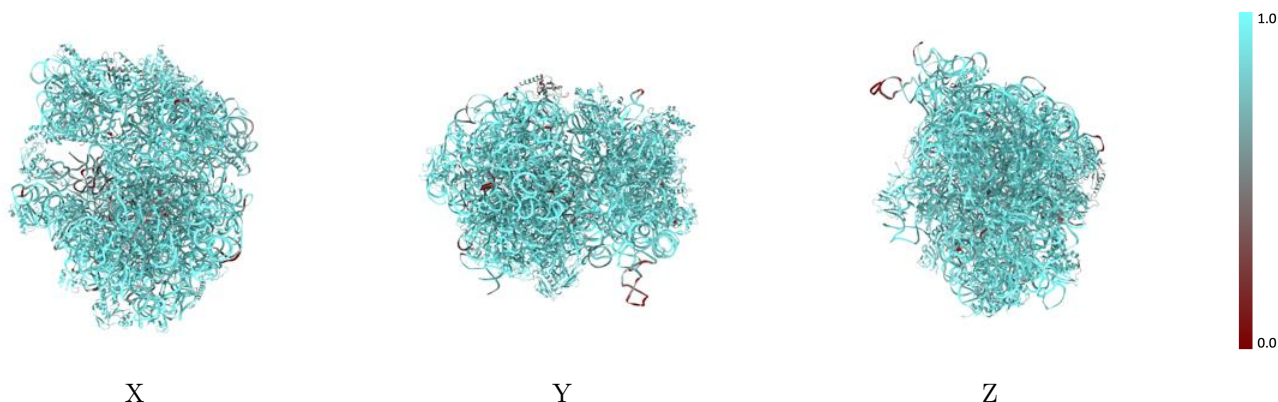
The images above show the 3D surface view of the map at the recommended contour level 0.0806 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



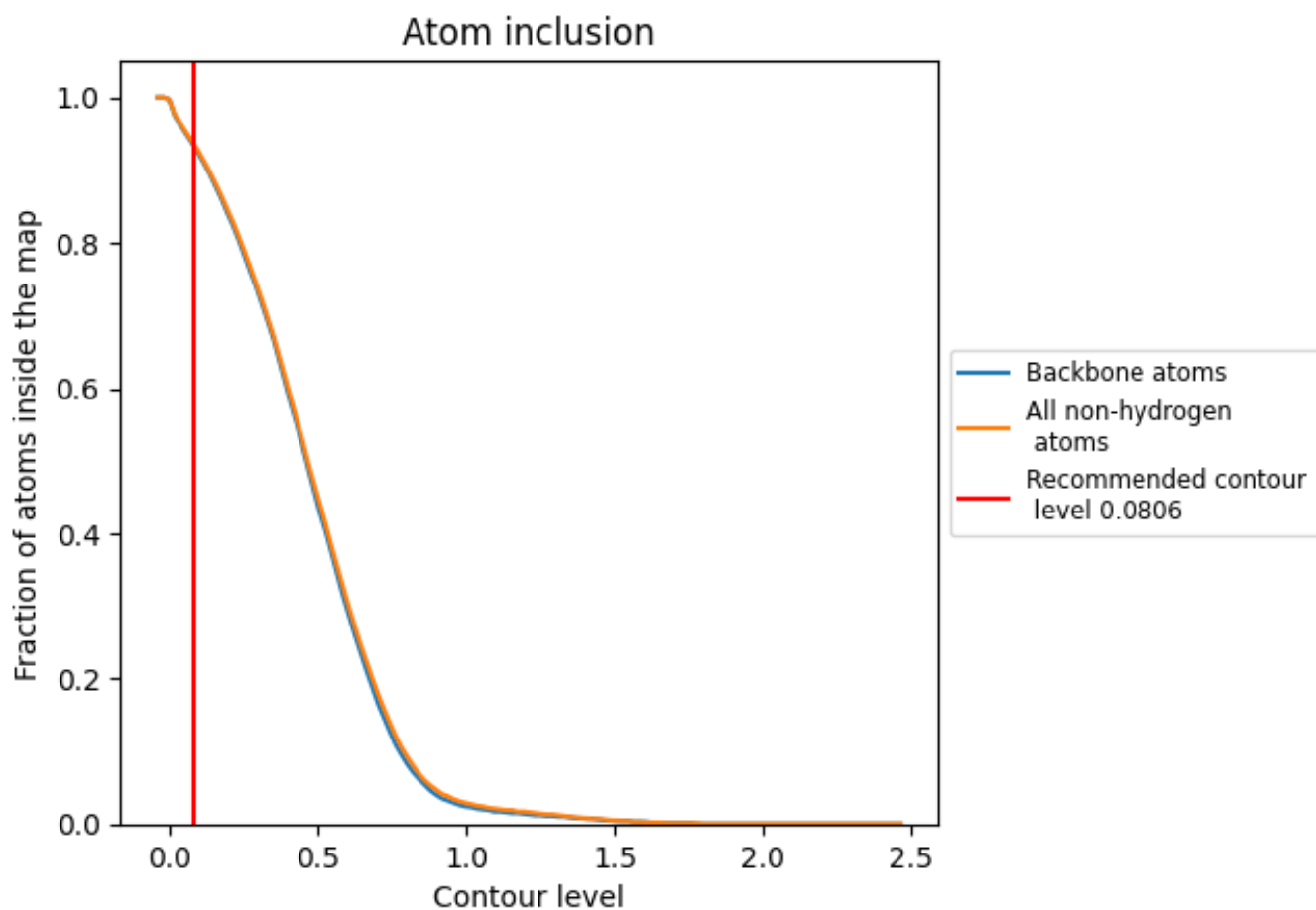
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

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



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.0806).







































































9.4 Atom inclusion [i](#)



At the recommended contour level, 94% of all backbone atoms, 94% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary













































The table lists the average atom inclusion at the recommended contour level (0.0806) and Q-score for the entire model and for each chain.

| Chain | Atom inclusion | Q-score |
|-------|--|--|
| All |  0.9380 |  0.6220 |
| 0 |  0.9700 |  0.6460 |
| 1 |  0.9620 |  0.6180 |
| 2 |  0.9400 |  0.5910 |
| 3 |  0.9630 |  0.6570 |
| 4 |  0.6460 |  0.4800 |
| 5 |  0.9050 |  0.5960 |
| 6 |  0.6840 |  0.5250 |
| A |  0.9680 |  0.6860 |
| B |  0.9530 |  0.6730 |
| C |  0.9400 |  0.6500 |
| D |  0.8500 |  0.5430 |
| E |  0.9020 |  0.5930 |
| F |  0.6000 |  0.4260 |
| G |  0.9520 |  0.6670 |
| H |  0.9570 |  0.6740 |
| I |  0.9450 |  0.6660 |
| J |  0.9550 |  0.6660 |
| K |  0.9800 |  0.6940 |
| L |  0.9220 |  0.6160 |
| M |  0.9270 |  0.6530 |
| N |  0.9700 |  0.6890 |
| O |  0.9470 |  0.6580 |
| P |  0.9310 |  0.6580 |
| Q |  0.9210 |  0.6420 |
| R |  0.9020 |  0.6380 |
| S |  0.9090 |  0.6340 |
| T |  0.9550 |  0.6750 |
| U |  0.9500 |  0.6740 |
| V |  0.9040 |  0.6250 |
| W |  0.9300 |  0.6550 |
| X |  0.8340 |  0.5390 |
| a |  0.9570 |  0.6840 |
| b |  0.8680 |  0.6190 |
| c |  0.9610 |  0.6830 |



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| Chain | Atom inclusion | Q-score |
|-------|--|--|
| d |  0.9720 |  0.6810 |
| e |  0.9450 |  0.6700 |
| f |  0.8130 |  0.5230 |
| g |  0.9340 |  0.6230 |
| h |  0.8960 |  0.5890 |
| i |  0.9410 |  0.6370 |
| j |  0.8920 |  0.5820 |
| k |  0.8250 |  0.5270 |
| l |  0.9340 |  0.6420 |
| m |  0.9000 |  0.5810 |
| n |  0.8770 |  0.5550 |
| o |  0.9180 |  0.6170 |
| p |  0.9210 |  0.6390 |
| q |  0.8950 |  0.5720 |
| r |  0.9070 |  0.6010 |
| s |  0.8910 |  0.5980 |
| t |  0.8850 |  0.5900 |
| u |  0.8990 |  0.6130 |
| v |  0.9100 |  0.6130 |
| w |  0.8950 |  0.5730 |
| x |  0.9080 |  0.5860 |
| y |  0.7820 |  0.5070 |