



# wwPDB EM Validation Summary Report ⓘ

Apr 16, 2024 – 06:30 am BST

PDB ID : 8OIS  
EMDB ID : EMD-16898  
Title : 28S human mitochondrial small ribosomal subunit with mtRF1 and P-site tRNA  
Authors : Saurer, M.; Leibundgut, M.; Scaiola, A.; Schoenhut, T.; Ban, N.  
Deposited on : 2023-03-23  
Resolution : 3.00 Å (reported)  
Based on initial models : ., 7QI4

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

We welcome your comments at [validation@mail.wwpdb.org](mailto: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>.

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

EMDB validation analysis : 0.0.1.dev92  
Mogul : 1.8.4, CSD as541be (2020)  
MolProbity : 4.02b-467  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : **FAILED**  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

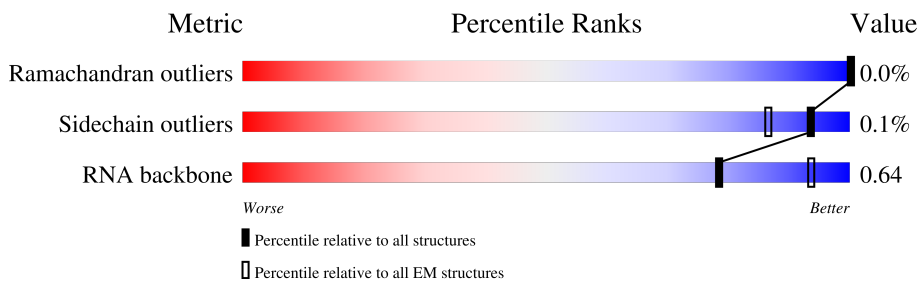
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.00 Å.

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



| Metric                | Whole archive (#Entries) | EM structures (#Entries) |
|-----------------------|--------------------------|--------------------------|
| Ramachandran outliers | 154571                   | 4023                     |
| Sidechain outliers    | 154315                   | 3826                     |
| RNA backbone          | 4643                     | 859                      |

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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  $\leq 5\%$ .

| Mol | Chain | Length | Quality of chain |
|-----|-------|--------|------------------|
| 1   | BX    | 292    | 5% 95%           |
| 2   | Bd    | 128    | 20% 80%          |
| 3   | AA    | 955    | 87% 13%          |
| 4   | AB    | 323    | 86% 14%          |
| 5   | AC    | 167    | 79% 21%          |
| 6   | AD    | 199    | 35% 65%          |
| 7   | AE    | 125    | 97% ..           |
| 8   | AF    | 242    | 86% 14%          |
| 9   | AG    | 71     | 80% 20%          |


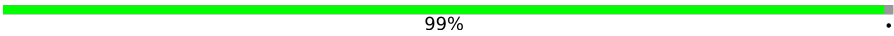
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| Mol | Chain | Length | Quality of chain |     |
|-----|-------|--------|------------------|-----|
| 10  | AH    | 201    | 69%              | 30% |
| 11  | AI    | 33     | 97%              | .   |
| 12  | AJ    | 138    | 78%              | 22% |
| 13  | AK    | 128    | 79%              | 21% |
| 14  | AL    | 257    | 67%              | 32% |
| 15  | AM    | 137    | 87%              | 13% |
| 16  | AN    | 130    | 85%              | 15% |
| 17  | AO    | 258    | 75%              | 25% |
| 18  | AP    | 142    | 68%              | 32% |
| 19  | AQ    | 87     | 99%              | .   |
| 20  | AR    | 360    | 82%              | 18% |
| 21  | AS    | 190    | 71%              | 29% |
| 22  | AT    | 173    | 97%              | .   |
| 23  | AU    | 205    | 86%              | 14% |
| 24  | AV    | 414    | 87%              | 13% |
| 25  | AW    | 187    | 53%              | 47% |
| 26  | AX    | 398    | 88%              | 12% |
| 27  | AY    | 395    | 38%              | 62% |
| 28  | AZ    | 106    | 94%              | 6%  |
| 29  | Aa    | 484    | 79%              | 21% |
| 30  | Ab    | 296    | 76%              | 24% |
| 31  | Ac    | 118    | 99%              | .   |
| 32  | Ad    | 430    | 80%              | 20% |
| 33  | Ae    | 689    | 85%              | 15% |
| 34  | Ag    | 396    | 82%              | 17% |

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| Mol | Chain | Length | Quality of chain  |
|-----|-------|--------|---|
| 35  | Ai    | 194    | <br>70% 29% |
| 36  | Aj    | 218    | <br>99%     |

## 2 Entry composition [i](#)

There are 44 unique types of molecules in this entry. The entry contains 72671 atoms, of which 0 are hydrogens and 0 are deuteriums.

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

- Molecule 1 is a protein called 39S ribosomal protein L19, mitochondrial.

| Mol | Chain | Residues | Atoms |    |    |    | AltConf | Trace |
|-----|-------|----------|-------|----|----|----|---------|-------|
|     |       |          | Total | C  | N  | O  |         |       |
| 1   | BX    | 14       | 113   | 74 | 22 | 17 | 0       | 0     |

- Molecule 2 is a protein called 39S ribosomal protein L55, mitochondrial.

| Mol | Chain | Residues | Atoms |     |    |    | AltConf | Trace |
|-----|-------|----------|-------|-----|----|----|---------|-------|
|     |       |          | Total | C   | N  | O  |         |       |
| 2   | Bd    | 26       | 241   | 150 | 45 | 46 | 0       | 0     |

- Molecule 3 is a RNA chain called 12S rRNA.

| Mol | Chain | Residues | Atoms |      |      |      |     | AltConf | Trace |
|-----|-------|----------|-------|------|------|------|-----|---------|-------|
|     |       |          | Total | C    | N    | O    | P   |         |       |
| 3   | AA    | 955      | 20283 | 9098 | 3652 | 6578 | 955 | 0       | 0     |

There is a discrepancy between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment | Reference     |
|-------|---------|----------|--------|---------|---------------|
| AA    | 62      | G        | A      | variant | GB OM714795.1 |

- Molecule 4 is a protein called 28S ribosomal protein S35, mitochondrial.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 4   | AB    | 279      | 2265  | 1435 | 387 | 432 | 11 | 0       | 0     |

- Molecule 5 is a protein called 28S ribosomal protein S24, mitochondrial.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 5   | AC    | 132      | 1083  | 699 | 195 | 185 | 4 | 0       | 0     |

- Molecule 6 is a protein called Aurora kinase A-interacting protein.

| Mol | Chain | Residues | Atoms |     |     |    |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|----|---|---------|-------|
| 6   | AD    | 70       | Total | C   | N   | O  | S | 0       | 0     |
|     |       |          | 625   | 401 | 134 | 89 | 1 |         |       |

- Molecule 7 is a protein called 28S ribosomal protein S6, mitochondrial.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
| 7   | AE    | 122      | Total | C   | N   | O   | S | 0       | 0     |
|     |       |          | 972   | 614 | 177 | 177 | 4 |         |       |

- Molecule 8 is a protein called 28S ribosomal protein S7, mitochondrial.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
| 8   | AF    | 208      | Total | C    | N   | O   | S  | 0       | 0     |
|     |       |          | 1725  | 1104 | 312 | 298 | 11 |         |       |

- Molecule 9 is a RNA chain called P-site Met-tRNA(Met).

| Mol | Chain | Residues | Atoms |     |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|----|---------|-------|
| 9   | AG    | 71       | Total | C   | N   | O   | P  | 0       | 0     |
|     |       |          | 1504  | 674 | 264 | 495 | 71 |         |       |

There are 2 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment   | Reference      |
|-------|---------|----------|--------|-----------|----------------|
| AG    | 69      | C        | -      | insertion | GB NC_012920.1 |
| AG    | 70      | C        | -      | insertion | GB NC_012920.1 |

- Molecule 10 is a protein called 28S ribosomal protein S10, mitochondrial.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
| 10  | AH    | 140      | Total | C   | N   | O   | S | 0       | 0     |
|     |       |          | 1152  | 745 | 194 | 210 | 3 |         |       |

- Molecule 11 is a RNA chain called mRNA.

| Mol | Chain | Residues | Atoms |     |    |     |    | AltConf | Trace |
|-----|-------|----------|-------|-----|----|-----|----|---------|-------|
| 11  | AI    | 33       | Total | C   | N  | O   | P  | 0       | 0     |
|     |       |          | 463   | 198 | 29 | 203 | 33 |         |       |

- Molecule 12 is a protein called 28S ribosomal protein S12, mitochondrial.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 12  | AJ    | 108      | 839   | 521 | 169 | 143 | 6 | 0       | 0     |

- Molecule 13 is a protein called 28S ribosomal protein S14, mitochondrial.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 13  | AK    | 101      | 862   | 537 | 179 | 141 | 5 | 0       | 0     |

- Molecule 14 is a protein called 28S ribosomal protein S15, mitochondrial.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 14  | AL    | 174      | 1453  | 925 | 270 | 251 | 7 | 0       | 0     |

- Molecule 15 is a protein called 28S ribosomal protein S16, mitochondrial.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 15  | AM    | 119      | 942   | 594 | 185 | 157 | 6 | 0       | 0     |

- Molecule 16 is a protein called 28S ribosomal protein S17, mitochondrial.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 16  | AN    | 110      | 868   | 562 | 156 | 147 | 3 | 0       | 0     |

- Molecule 17 is a protein called 28S ribosomal protein S18b, mitochondrial.

| Mol | Chain | Residues | Atoms |      |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|---|---------|-------|
|     |       |          | Total | C    | N   | O   | S |         |       |
| 17  | AO    | 193      | 1592  | 1014 | 294 | 277 | 7 | 0       | 0     |

- Molecule 18 is a protein called 28S ribosomal protein S18c, mitochondrial.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 18  | AP    | 97       | 781   | 501 | 134 | 138 | 8 | 0       | 0     |

- Molecule 19 is a protein called 28S ribosomal protein S21, mitochondrial.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 19  | AQ    | 86       | 744   | 460 | 150 | 126 | 8 | 0       | 0     |

There is a discrepancy between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment | Reference  |
|-------|---------|----------|--------|---------|------------|
| AQ    | 50      | ARG      | CYS    | variant | UNP P82921 |

- Molecule 20 is a protein called 28S ribosomal protein S22, mitochondrial.

| Mol | Chain | Residues | Atoms |      |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|---|---------|-------|
|     |       |          | Total | C    | N   | O   | S |         |       |
| 20  | AR    | 295      | 2409  | 1533 | 413 | 455 | 8 | 0       | 0     |

- Molecule 21 is a protein called 28S ribosomal protein S23, mitochondrial.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 21  | AS    | 135      | 1111  | 716 | 198 | 196 | 1 | 0       | 0     |

- Molecule 22 is a protein called 28S ribosomal protein S25, mitochondrial.

| Mol | Chain | Residues | Atoms |     |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|----|---------|-------|
|     |       |          | Total | C   | N   | O   | S  |         |       |
| 22  | AT    | 168      | 1371  | 877 | 239 | 244 | 11 | 0       | 0     |

- Molecule 23 is a protein called 28S ribosomal protein S26, mitochondrial.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 23  | AU    | 176      | 1488  | 916 | 301 | 267 | 4 | 0       | 0     |

- Molecule 24 is a protein called 28S ribosomal protein S27, mitochondrial.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 24  | AV    | 362      | 2969  | 1904 | 495 | 558 | 12 | 0       | 0     |

- Molecule 25 is a protein called 28S ribosomal protein S28, mitochondrial.



| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 25  | AW    | 100      | 789   | 498 | 141 | 146 | 4 | 0       | 0     |

- Molecule 26 is a protein called 28S ribosomal protein S29, mitochondrial.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 26  | AX    | 352      | 2849  | 1822 | 499 | 517 | 11 | 0       | 0     |

- Molecule 27 is a protein called 28S ribosomal protein S31, mitochondrial.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 27  | AY    | 149      | 1246  | 801 | 207 | 234 | 4 | 0       | 0     |

- Molecule 28 is a protein called 28S ribosomal protein S33, mitochondrial.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 28  | AZ    | 100      | 839   | 534 | 153 | 148 | 4 | 0       | 0     |

- Molecule 29 is a protein called Peptide chain release factor 1, mitochondrial,mtRF1(AAQ).

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 29  | Aa    | 381      | 3114  | 1940 | 569 | 592 | 13 | 0       | 0     |

There are 2 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment             | Reference  |
|-------|---------|----------|--------|---------------------|------------|
| Aa    | 311     | ALA      | GLY    | engineered mutation | UNP O75570 |
| Aa    | 312     | ALA      | GLY    | engineered mutation | UNP O75570 |

- Molecule 30 is a protein called 28S ribosomal protein S2, mitochondrial.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 30  | Ab    | 225      | 1828  | 1164 | 331 | 323 | 10 | 0       | 0     |

- Molecule 31 is a protein called Coiled-coil-helix-coiled-coil-helix domain-containing protein 1.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 31  | Ac    | 117      | 935   | 579 | 182 | 166 | 8 | 0       | 0     |

- Molecule 32 is a protein called 28S ribosomal protein S5, mitochondrial.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 32  | Ad    | 343      | 2731  | 1713 | 518 | 487 | 13 | 0       | 0     |

- Molecule 33 is a protein called Pentatricopeptide repeat domain-containing protein 3, mitochondrial.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 33  | Ae    | 588      | 4768  | 3053 | 808 | 879 | 28 | 0       | 0     |

- Molecule 34 is a protein called 28S ribosomal protein S9, mitochondrial.

| Mol | Chain | Residues | Atoms |      |     |     |    | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|-------|
|     |       |          | Total | C    | N   | O   | S  |         |       |
| 34  | Ag    | 327      | 2688  | 1710 | 477 | 487 | 14 | 0       | 0     |

- Molecule 35 is a protein called 28S ribosomal protein S11, mitochondrial.

| Mol | Chain | Residues | Atoms |     |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|-------|
|     |       |          | Total | C   | N   | O   | S |         |       |
| 35  | Ai    | 137      | 1020  | 642 | 192 | 182 | 4 | 0       | 0     |

There is a discrepancy between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment | Reference  |
|-------|---------|----------|--------|---------|------------|
| Ai    | 184     | 5F0      | ASN    | variant | UNP P82912 |

- Molecule 36 is a protein called 28S ribosomal protein S34, mitochondrial.

| Mol | Chain | Residues | Atoms |      |     |     |   | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|---|---------|-------|
|     |       |          | Total | C    | N   | O   | S |         |       |
| 36  | Aj    | 215      | 1787  | 1130 | 339 | 313 | 5 | 0       | 0     |

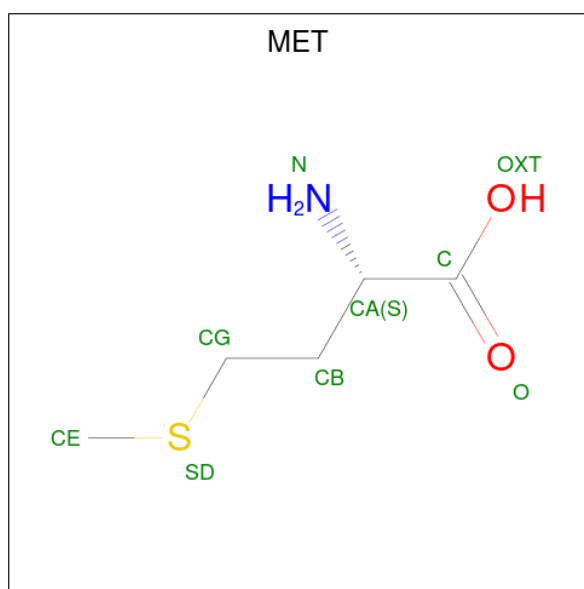
- Molecule 37 is POTASSIUM ION (three-letter code: K) (formula: K).

| Mol | Chain | Residues | Atoms            | AltConf |
|-----|-------|----------|------------------|---------|
| 37  | AA    | 16       | Total K<br>16 16 | 0       |
| 37  | Ae    | 1        | Total K<br>1 1   | 0       |

- Molecule 38 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

| Mol | Chain | Residues | Atoms               | AltConf |
|-----|-------|----------|---------------------|---------|
| 38  | AA    | 120      | Total Mg<br>120 120 | 0       |
| 38  | AD    | 1        | Total Mg<br>1 1     | 0       |
| 38  | AG    | 1        | Total Mg<br>1 1     | 0       |
| 38  | AU    | 1        | Total Mg<br>1 1     | 0       |
| 38  | AX    | 1        | Total Mg<br>1 1     | 0       |
| 38  | Ab    | 1        | Total Mg<br>1 1     | 0       |
| 38  | Ad    | 1        | Total Mg<br>1 1     | 0       |

- Molecule 39 is METHIONINE (three-letter code: MET) (formula: C<sub>5</sub>H<sub>11</sub>NO<sub>2</sub>S).

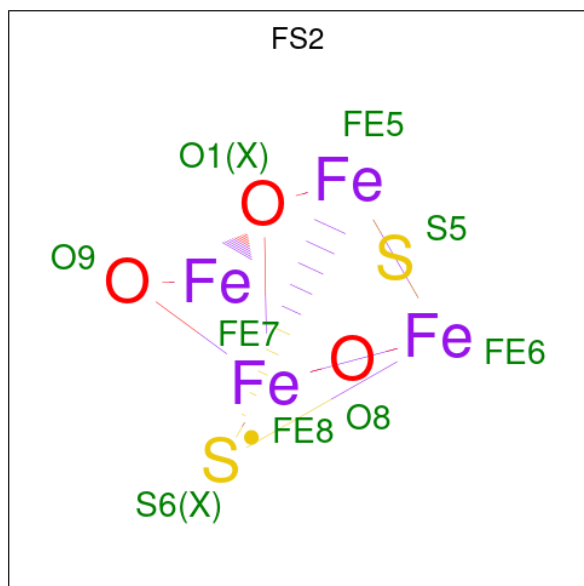


| Mol | Chain | Residues | Atoms                      | AltConf |
|-----|-------|----------|----------------------------|---------|
| 39  | AG    | 1        | Total C N O S<br>8 5 1 1 1 | 0       |

- Molecule 40 is ZINC ION (three-letter code: ZN) (formula: Zn).

| Mol | Chain | Residues | Atoms |    | AltConf |
|-----|-------|----------|-------|----|---------|
|     |       |          | Total | Zn |         |
| 40  | AO    | 1        | 1     | 1  | 0       |

- Molecule 41 is FE-S-O HYBRID CLUSTER (three-letter code: FS2) (formula: Fe<sub>4</sub>O<sub>3</sub>S<sub>2</sub>).



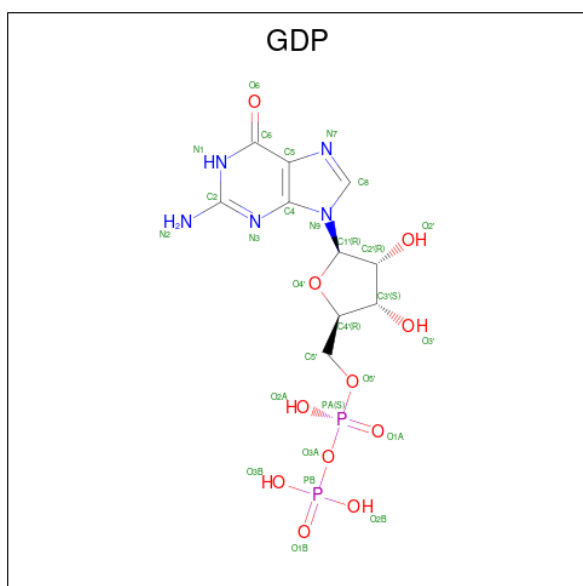
| Mol | Chain | Residues | Atoms |    |   | AltConf |
|-----|-------|----------|-------|----|---|---------|
|     |       |          | Total | Fe | S |         |
| 41  | AP    | 1        | 4     | 2  | 2 | 0       |
| 41  | AT    | 1        | 4     | 2  | 2 | 0       |

- Molecule 42 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula: C<sub>10</sub>H<sub>16</sub>N<sub>5</sub>O<sub>13</sub>P<sub>3</sub>).



| Mol | Chain | Residues | Atoms |    |   |    |   | AltConf |
|-----|-------|----------|-------|----|---|----|---|---------|
| 42  | AX    | 1        | Total | C  | N | O  | P | 0       |
|     |       |          | 31    | 10 | 5 | 13 | 3 |         |

- Molecule 43 is GUANOSINE-5'-DIPHOSPHATE (three-letter code: GDP) (formula:  $C_{10}H_{15}N_5O_{11}P_2$ ).

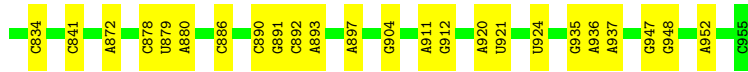


| Mol | Chain | Residues | Atoms |    |   |    |   | AltConf |
|-----|-------|----------|-------|----|---|----|---|---------|
| 43  | AX    | 1        | Total | C  | N | O  | P | 0       |
|     |       |          | 28    | 10 | 5 | 11 | 2 |         |

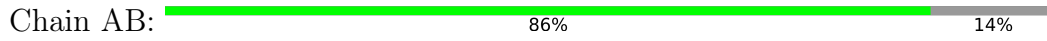
- Molecule 44 is water.

| <b>Mol</b> | <b>Chain</b> | <b>Residues</b> | <b>Atoms</b> |        | <b>AltConf</b> |
|------------|--------------|-----------------|--------------|--------|----------------|
| 44         | AX           | 3               | Total<br>3   | O<br>3 | 0              |

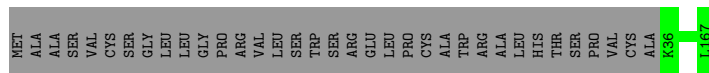
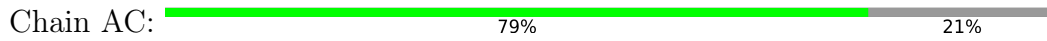




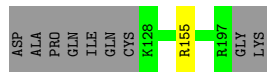
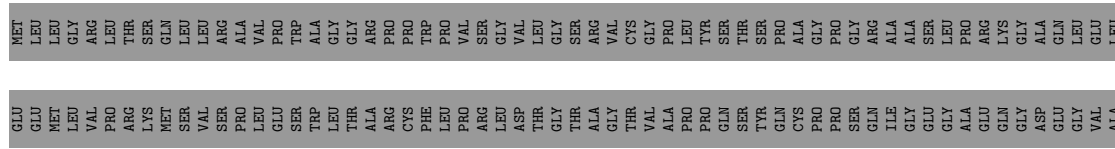
• Molecule 4: 28S ribosomal protein S35, mitochondrial



• Molecule 5: 28S ribosomal protein S24, mitochondrial



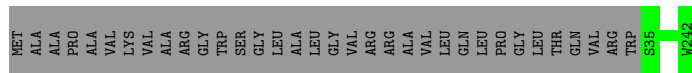
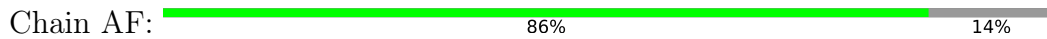
• Molecule 6: Aurora kinase A-interacting protein



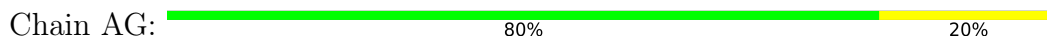
• Molecule 7: 28S ribosomal protein S6, mitochondrial



• Molecule 8: 28S ribosomal protein S7, mitochondrial



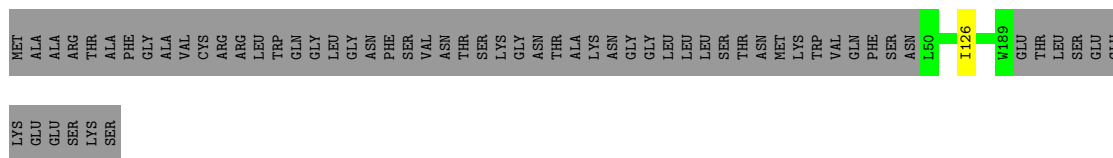
• Molecule 9: P-site Met-tRNA(Met)





- Molecule 10: 28S ribosomal protein S10, mitochondrial

Chain AH:  69% 30%




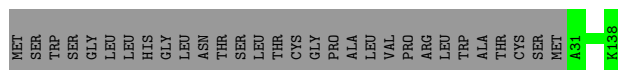
- Molecule 11: mRNA

Chain AI:  97%




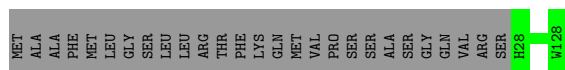
- Molecule 12: 28S ribosomal protein S12, mitochondrial

Chain AJ:  78% 22%



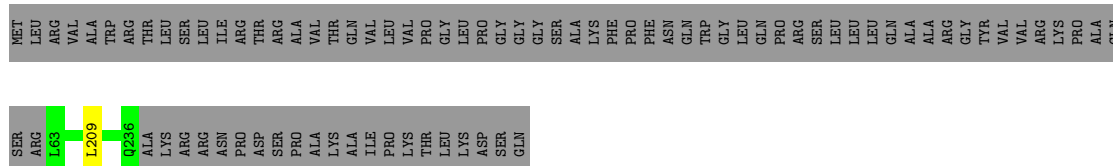
- Molecule 13: 28S ribosomal protein S14, mitochondrial

Chain AK:  79% 21%



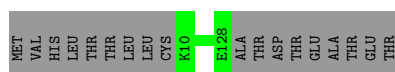
- Molecule 14: 28S ribosomal protein S15, mitochondrial

Chain AL:  67% 32%




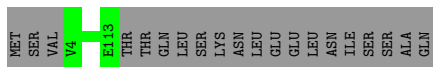
- Molecule 15: 28S ribosomal protein S16, mitochondrial

Chain AM:  87% 13%

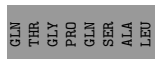
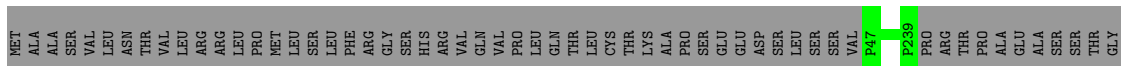
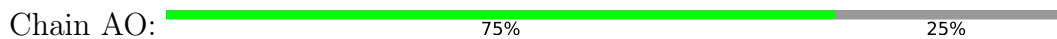


- Molecule 16: 28S ribosomal protein S17, mitochondrial

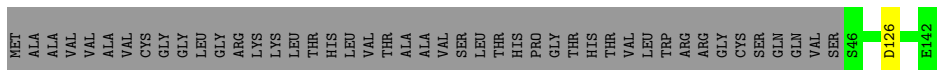
Chain AN:  85% 15%



- Molecule 17: 28S ribosomal protein S18b, mitochondrial



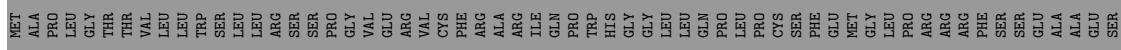
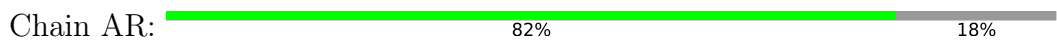
- Molecule 18: 28S ribosomal protein S18c, mitochondrial



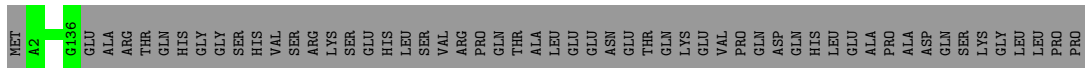
- Molecule 19: 28S ribosomal protein S21, mitochondrial



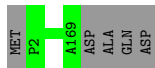
- Molecule 20: 28S ribosomal protein S22, mitochondrial



- Molecule 21: 28S ribosomal protein S23, mitochondrial



- Molecule 22: 28S ribosomal protein S25, mitochondrial




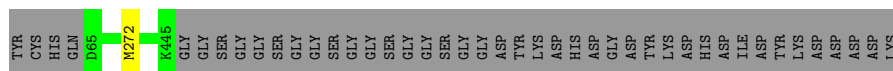


Chain AZ:  94% 6%




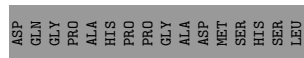
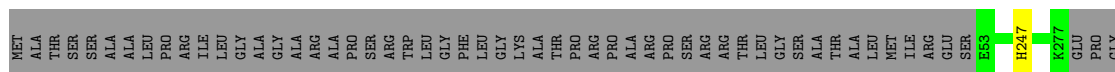
- Molecule 29: Peptide chain release factor 1, mitochondrial,mtRF1(AAQ)

Chain Aa:  79% 21%



- Molecule 30: 28S ribosomal protein S2, mitochondrial

Chain Ab:  76% 24%




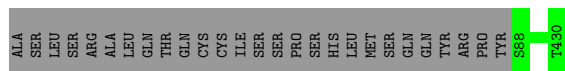
- Molecule 31: Coiled-coil-helix-coiled-coil-helix domain-containing protein 1

Chain Ac:  99% .




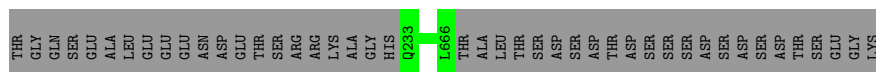
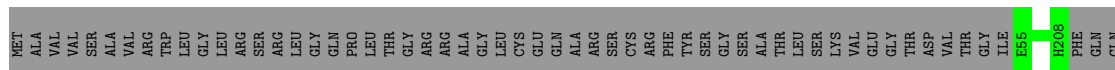
- Molecule 32: 28S ribosomal protein S5, mitochondrial

Chain Ad:  80% 20%




- Molecule 33: Pentatricopeptide repeat domain-containing protein 3, mitochondrial

Chain Ae:  85% 15%



- Molecule 34: 28S ribosomal protein S9, mitochondrial

Chain Ag:  82% 17%

MET ALA ALA PRO CYS VAL SER TYR GLY GLY ALA ALA VAL SER TYR ARG ARG LEU LEU TRP GLY ARG GLY SER SER LEU ALA ARG LYS LYS THR ALA ALA PRO GLU LEU LEU GLN THR VAL ASN VAL ARG SER GLN ILE LEU ARG LEU ARG HIS HIS THR A63 G176 SER HIS LEU GLN ALA

LYS SER LEU LEU PRO CYS LYS THR VAL THR ARG ASP V194 F315 F396

- Molecule 35: 28S ribosomal protein S11, mitochondrial

Chain Ai:  70% 29%

MET GLN ALA VAL ARG ASN ALA GLY SER ARG PHE ARG LEU ARG SER TRP TRP PRO PRO GLN THR ALA GLY ARG VAL VAL ALA ARG THR PRO GLY THR LLE CYS THR GLY ALA ARG GLN LEU GLN ASP ALA ALA LYS GLN LYS VAL GLU GLN ASN ALA ALA PRO SER HIS T58 5F0184

L194

- Molecule 36: 28S ribosomal protein S34, mitochondrial

Chain Aj:  99%

MET ALA ARG R4 V218

## 4 Experimental information

| Property                             | Value                                   | Source    |
|--------------------------------------|---|-----------|
| EM reconstruction method             | SINGLE PARTICLE                         | Depositor |
| Imposed symmetry                     | POINT, Not provided                     |           |
| Number of particles used             | 41288                                   | Depositor |
| Resolution determination method      | FSC 0.143 CUT-OFF                       | Depositor |
| CTF correction method                | PHASE FLIPPING AND AMPLITUDE CORRECTION | Depositor |
| Microscope                           | FEI TITAN KRIOS                         | Depositor |
| Voltage (kV)                         | 300                                     | Depositor |
| Electron dose ( $e^-/\text{\AA}^2$ ) | 60                                      | Depositor |
| Minimum defocus (nm)                 | 600                                     | Depositor |
| Maximum defocus (nm)                 | 3000                                    | Depositor |
| Magnification                        | 81000                                   | Depositor |
| Image detector                       | GATAN K3 (6k x 4k)                      | Depositor |

## 5 Model quality i

### 5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: MA6, 5F0, 5MU, ZN, ATP, FS2, GDP, AYA, B8T, MG, Y5P, 5MC, RSQ, PSU, K

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   | BX    | 0.23         | 0/118          | 0.47        | 0/162          |
| 2   | Bd    | 0.22         | 0/246          | 0.52        | 0/329          |
| 3   | AA    | 0.21         | 1/22563 (0.0%) | 0.67        | 1/35124 (0.0%) |
| 4   | AB    | 0.24         | 0/2313         | 0.43        | 0/3129         |
| 5   | AC    | 0.24         | 0/1113         | 0.46        | 0/1505         |
| 6   | AD    | 0.23         | 0/636          | 0.52        | 0/839          |
| 7   | AE    | 0.25         | 0/989          | 0.49        | 0/1335         |
| 8   | AF    | 0.24         | 0/1767         | 0.44        | 0/2373         |
| 9   | AG    | 0.30         | 1/1588 (0.1%)  | 0.69        | 0/2466         |
| 10  | AH    | 0.24         | 0/1178         | 0.45        | 0/1598         |
| 11  | AI    | 0.16         | 0/149          | 0.65        | 0/231          |
| 12  | AJ    | 0.25         | 0/855          | 0.53        | 0/1148         |
| 13  | AK    | 0.23         | 0/880          | 0.53        | 0/1182         |
| 14  | AL    | 0.23         | 0/1477         | 0.45        | 0/1974         |
| 15  | AM    | 0.24         | 0/963          | 0.50        | 0/1295         |
| 16  | AN    | 0.25         | 0/886          | 0.47        | 0/1199         |
| 17  | AO    | 0.24         | 0/1648         | 0.46        | 0/2243         |
| 18  | AP    | 0.24         | 0/798          | 0.43        | 0/1070         |
| 19  | AQ    | 0.25         | 0/748          | 0.53        | 0/994          |
| 20  | AR    | 0.24         | 0/2456         | 0.43        | 0/3317         |
| 21  | AS    | 0.25         | 0/1138         | 0.47        | 0/1533         |
| 22  | AT    | 0.25         | 0/1402         | 0.44        | 0/1883         |
| 23  | AU    | 0.23         | 0/1510         | 0.50        | 0/2025         |
| 24  | AV    | 0.23         | 0/3030         | 0.38        | 0/4093         |
| 25  | AW    | 0.25         | 0/801          | 0.50        | 0/1079         |
| 26  | AX    | 0.24         | 0/2921         | 0.42        | 0/3954         |
| 27  | AY    | 0.24         | 0/1280         | 0.38        | 0/1725         |
| 28  | AZ    | 0.24         | 0/857          | 0.45        | 0/1141         |
| 29  | Aa    | 0.23         | 0/3162         | 0.46        | 0/4253         |
| 30  | Ab    | 0.25         | 0/1871         | 0.46        | 0/2531         |
| 31  | Ac    | 0.23         | 0/941          | 0.49        | 0/1257         |
| 32  | Ad    | 0.24         | 0/2783         | 0.49        | 0/3724         |

| Mol | Chain | Bond lengths |                | Bond angles |                 |
|-----|-------|--------------|----------------|-------------|-----------------|
|     |       | RMSZ         | # Z  >5        | RMSZ        | # Z  >5         |
| 33  | Ae    | 0.23         | 0/4877         | 0.40        | 0/6598          |
| 34  | Ag    | 0.24         | 0/2746         | 0.46        | 0/3681          |
| 35  | Ai    | 0.25         | 0/1030         | 0.48        | 0/1386          |
| 36  | Aj    | 0.23         | 0/1834         | 0.51        | 0/2484          |
| All | All   | 0.23         | 2/75554 (0.0%) | 0.54        | 1/106860 (0.0%) |

All (2) bond length outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z      | Observed(Å) | Ideal(Å) |
|-----|-------|-----|------|-------|--------|-------------|----------|
| 3   | AA    | 1   | A    | OP3-P | -10.59 | 1.48        | 1.61     |
| 9   | AG    | 1   | A    | OP3-P | -10.53 | 1.48        | 1.61     |

All (1) bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms     | Z    | Observed(°) | Ideal(°) |
|-----|-------|-----|------|-----------|------|-------------|----------|
| 3   | AA    | 118 | C    | C2-N1-C1' | 5.73 | 125.11      | 118.80   |

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   | BX    | 12/292 (4%)   | 12 (100%) | 0       | 0        | 100         | 100 |
| 2   | Bd    | 24/128 (19%)  | 23 (96%)  | 1 (4%)  | 0        | 100         | 100 |
| 4   | AB    | 277/323 (86%) | 275 (99%) | 2 (1%)  | 0        | 100         | 100 |

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| Mol | Chain | Analysed        | Favoured   | Allowed | Outliers | Percentiles |     |
|-----|-------|-----------------|------------|---------|----------|-------------|-----|
| 5   | AC    | 130/167 (78%)   | 128 (98%)  | 2 (2%)  | 0        | 100         | 100 |
| 6   | AD    | 68/199 (34%)    | 67 (98%)   | 1 (2%)  | 0        | 100         | 100 |
| 7   | AE    | 120/125 (96%)   | 118 (98%)  | 2 (2%)  | 0        | 100         | 100 |
| 8   | AF    | 206/242 (85%)   | 206 (100%) | 0       | 0        | 100         | 100 |
| 10  | AH    | 138/201 (69%)   | 133 (96%)  | 4 (3%)  | 1 (1%)   | 22          | 60  |
| 12  | AJ    | 106/138 (77%)   | 105 (99%)  | 1 (1%)  | 0        | 100         | 100 |
| 13  | AK    | 99/128 (77%)    | 98 (99%)   | 1 (1%)  | 0        | 100         | 100 |
| 14  | AL    | 172/257 (67%)   | 172 (100%) | 0       | 0        | 100         | 100 |
| 15  | AM    | 117/137 (85%)   | 117 (100%) | 0       | 0        | 100         | 100 |
| 16  | AN    | 108/130 (83%)   | 106 (98%)  | 2 (2%)  | 0        | 100         | 100 |
| 17  | AO    | 191/258 (74%)   | 189 (99%)  | 2 (1%)  | 0        | 100         | 100 |
| 18  | AP    | 95/142 (67%)    | 95 (100%)  | 0       | 0        | 100         | 100 |
| 19  | AQ    | 84/87 (97%)     | 82 (98%)   | 2 (2%)  | 0        | 100         | 100 |
| 20  | AR    | 293/360 (81%)   | 288 (98%)  | 5 (2%)  | 0        | 100         | 100 |
| 21  | AS    | 133/190 (70%)   | 132 (99%)  | 1 (1%)  | 0        | 100         | 100 |
| 22  | AT    | 166/173 (96%)   | 164 (99%)  | 2 (1%)  | 0        | 100         | 100 |
| 23  | AU    | 174/205 (85%)   | 174 (100%) | 0       | 0        | 100         | 100 |
| 24  | AV    | 358/414 (86%)   | 354 (99%)  | 4 (1%)  | 0        | 100         | 100 |
| 25  | AW    | 98/187 (52%)    | 95 (97%)   | 3 (3%)  | 0        | 100         | 100 |
| 26  | AX    | 350/398 (88%)   | 345 (99%)  | 5 (1%)  | 0        | 100         | 100 |
| 27  | AY    | 147/395 (37%)   | 146 (99%)  | 1 (1%)  | 0        | 100         | 100 |
| 28  | AZ    | 98/106 (92%)    | 97 (99%)   | 1 (1%)  | 0        | 100         | 100 |
| 29  | Aa    | 379/484 (78%)   | 376 (99%)  | 3 (1%)  | 0        | 100         | 100 |
| 30  | Ab    | 223/296 (75%)   | 222 (100%) | 1 (0%)  | 0        | 100         | 100 |
| 31  | Ac    | 115/118 (98%)   | 113 (98%)  | 2 (2%)  | 0        | 100         | 100 |
| 32  | Ad    | 341/430 (79%)   | 333 (98%)  | 8 (2%)  | 0        | 100         | 100 |
| 33  | Ae    | 584/689 (85%)   | 580 (99%)  | 4 (1%)  | 0        | 100         | 100 |
| 34  | Ag    | 323/396 (82%)   | 318 (98%)  | 5 (2%)  | 0        | 100         | 100 |
| 35  | Ai    | 134/194 (69%)   | 132 (98%)  | 2 (2%)  | 0        | 100         | 100 |
| 36  | Aj    | 213/218 (98%)   | 211 (99%)  | 2 (1%)  | 0        | 100         | 100 |
| All | All   | 6076/8207 (74%) | 6006 (99%) | 69 (1%) | 1 (0%)   | 100         | 100 |

All (1) Ramachandran outliers are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 10  | AH    | 126 | ILE  |

### 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   | BX    | 14/256 (6%)   | 14 (100%)  | 0        | 100         | 100 |
| 2   | Bd    | 26/113 (23%)  | 26 (100%)  | 0        | 100         | 100 |
| 4   | AB    | 257/291 (88%) | 257 (100%) | 0        | 100         | 100 |
| 5   | AC    | 115/143 (80%) | 115 (100%) | 0        | 100         | 100 |
| 6   | AD    | 65/166 (39%)  | 64 (98%)   | 1 (2%)   | 65          | 87  |
| 7   | AE    | 104/107 (97%) | 103 (99%)  | 1 (1%)   | 76          | 91  |
| 8   | AF    | 185/209 (88%) | 185 (100%) | 0        | 100         | 100 |
| 10  | AH    | 130/180 (72%) | 130 (100%) | 0        | 100         | 100 |
| 12  | AJ    | 93/118 (79%)  | 93 (100%)  | 0        | 100         | 100 |
| 13  | AK    | 91/113 (80%)  | 91 (100%)  | 0        | 100         | 100 |
| 14  | AL    | 158/226 (70%) | 157 (99%)  | 1 (1%)   | 86          | 95  |
| 15  | AM    | 97/113 (86%)  | 97 (100%)  | 0        | 100         | 100 |
| 16  | AN    | 96/115 (84%)  | 96 (100%)  | 0        | 100         | 100 |
| 17  | AO    | 174/230 (76%) | 174 (100%) | 0        | 100         | 100 |
| 18  | AP    | 88/123 (72%)  | 87 (99%)   | 1 (1%)   | 73          | 90  |
| 19  | AQ    | 78/79 (99%)   | 78 (100%)  | 0        | 100         | 100 |
| 20  | AR    | 264/318 (83%) | 264 (100%) | 0        | 100         | 100 |
| 21  | AS    | 116/164 (71%) | 116 (100%) | 0        | 100         | 100 |
| 22  | AT    | 153/157 (98%) | 153 (100%) | 0        | 100         | 100 |
| 23  | AU    | 152/174 (87%) | 152 (100%) | 0        | 100         | 100 |
| 24  | AV    | 325/364 (89%) | 325 (100%) | 0        | 100         | 100 |
| 25  | AW    | 87/158 (55%)  | 87 (100%)  | 0        | 100         | 100 |

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| Mol | Chain | Analysed        | Rotameric   | Outliers | Percentiles |     |
|-----|-------|-----------------|-------------|----------|-------------|-----|
| 26  | AX    | 311/351 (89%)   | 311 (100%)  | 0        | 100         | 100 |
| 27  | AY    | 137/357 (38%)   | 137 (100%)  | 0        | 100         | 100 |
| 28  | AZ    | 90/95 (95%)     | 90 (100%)   | 0        | 100         | 100 |
| 29  | Aa    | 338/427 (79%)   | 337 (100%)  | 1 (0%)   | 92          | 97  |
| 30  | Ab    | 198/249 (80%)   | 197 (100%)  | 1 (0%)   | 88          | 96  |
| 31  | Ac    | 100/101 (99%)   | 100 (100%)  | 0        | 100         | 100 |
| 32  | Ad    | 286/357 (80%)   | 286 (100%)  | 0        | 100         | 100 |
| 33  | Ae    | 526/609 (86%)   | 526 (100%)  | 0        | 100         | 100 |
| 34  | Ag    | 285/342 (83%)   | 284 (100%)  | 1 (0%)   | 91          | 97  |
| 35  | Ai    | 104/146 (71%)   | 104 (100%)  | 0        | 100         | 100 |
| 36  | Aj    | 188/190 (99%)   | 188 (100%)  | 0        | 100         | 100 |
| All | All   | 5431/7141 (76%) | 5424 (100%) | 7 (0%)   | 93          | 98  |

5 of 7 residues with a non-rotameric sidechain are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 18  | AP    | 126 | ASP  |
| 29  | Aa    | 272 | MET  |
| 34  | Ag    | 315 | PHE  |
| 30  | Ab    | 247 | HIS  |
| 14  | AL    | 209 | LEU  |

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 39 such sidechains are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 30  | Ab    | 276 | GLN  |
| 33  | Ae    | 562 | GLN  |
| 32  | Ad    | 155 | GLN  |
| 33  | Ae    | 306 | ASN  |
| 34  | Ag    | 176 | GLN  |

### 5.3.3 RNA [i](#)

| Mol | Chain | Analysed      | Backbone Outliers | Pucker Outliers |
|-----|-------|---------------|-------------------|-----------------|
| 11  | AI    | 5/33 (15%)    | 1 (20%)           | 0               |
| 3   | AA    | 951/955 (99%) | 120 (12%)         | 0               |

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| Mol | Chain | Analysed        | Backbone Outliers | Pucker Outliers |
|-----|-------|-----------------|-------------------|-----------------|
| 9   | AG    | 69/71 (97%)     | 10 (14%)          | 0               |
| All | All   | 1025/1059 (96%) | 131 (12%)         | 0               |

5 of 131 RNA backbone outliers are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 3   | AA    | 2   | A    |
| 3   | AA    | 4   | A    |
| 3   | AA    | 33  | U    |
| 3   | AA    | 41  | A    |
| 3   | AA    | 57  | U    |

There are no RNA pucker outliers to report.

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

13 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 |
| 9   | PSU  | AG    | 46  | 9    | 18,21,22     | 1.32 | 2 (11%)  | 22,30,33    | 1.86 | 3 (13%)  |
| 3   | B8T  | AA    | 839 | 37,3 | 19,22,23     | 0.43 | 0        | 26,31,34    | 0.37 | 0        |
| 9   | RSQ  | AG    | 31  | 9,11 | 20,23,24     | 0.48 | 0        | 26,33,36    | 0.56 | 0        |
| 19  | AYA  | AQ    | 2   | 19   | 6,7,8        | 0.76 | 0        | 5,8,10      | 0.22 | 0        |
| 3   | MA6  | AA    | 937 | 3    | 18,26,27     | 1.10 | 2 (11%)  | 19,38,41    | 1.97 | 3 (15%)  |
| 3   | 5MU  | AA    | 429 | 3    | 19,22,23     | 1.39 | 6 (31%)  | 28,32,35    | 2.06 | 6 (21%)  |
| 31  | AYA  | Ac    | 2   | 31   | 6,7,8        | 0.79 | 0        | 5,8,10      | 0.38 | 0        |
| 9   | PSU  | AG    | 24  | 9    | 18,21,22     | 1.33 | 2 (11%)  | 22,30,33    | 1.85 | 3 (13%)  |
| 3   | 5MC  | AA    | 841 | 3    | 18,22,23     | 0.93 | 2 (11%)  | 26,32,35    | 1.08 | 2 (7%)   |
| 3   | MA6  | AA    | 936 | 3    | 18,26,27     | 1.10 | 2 (11%)  | 19,38,41    | 1.97 | 3 (15%)  |
| 9   | PSU  | AG    | 51  | 9    | 18,21,22     | 1.35 | 2 (11%)  | 22,30,33    | 1.80 | 3 (13%)  |
| 35  | 5F0  | Ai    | 184 | 35   | 8,8,9        | 1.46 | 2 (25%)  | 7,9,11      | 1.66 | 1 (14%)  |
| 11  | Y5P  | AI    | 4   | 11   | 14,19,20     | 0.49 | 0        | 18,26,29    | 0.54 | 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   |
|-----|------|-------|-----|------|---------|-----------|---------|
| 9   | PSU  | AG    | 46  | 9    | -       | 0/7/25/26 | 0/2/2/2 |
| 3   | B8T  | AA    | 839 | 37,3 | -       | 0/7/27/28 | 0/2/2/2 |
| 9   | RSQ  | AG    | 31  | 9,11 | -       | 1/9/27/28 | 0/2/2/2 |
| 19  | AYA  | AQ    | 2   | 19   | -       | 0/4/6/8   | -       |
| 3   | MA6  | AA    | 937 | 3    | -       | 2/7/29/30 | 0/3/3/3 |
| 3   | 5MU  | AA    | 429 | 3    | -       | 0/7/25/26 | 0/2/2/2 |
| 31  | AYA  | Ac    | 2   | 31   | -       | 2/4/6/8   | -       |
| 9   | PSU  | AG    | 24  | 9    | -       | 0/7/25/26 | 0/2/2/2 |
| 3   | 5MC  | AA    | 841 | 3    | -       | 0/7/25/26 | 0/2/2/2 |
| 3   | MA6  | AA    | 936 | 3    | -       | 0/7/29/30 | 0/3/3/3 |
| 9   | PSU  | AG    | 51  | 9    | -       | 2/7/25/26 | 0/2/2/2 |
| 35  | 5F0  | Ai    | 184 | 35   | -       | 4/9/9/10  | -       |
| 11  | Y5P  | AI    | 4   | 11   | -       | 5/7/33/34 | 0/2/2/2 |

The worst 5 of 20 bond length outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z    | Observed(Å) | Ideal(Å) |
|-----|-------|-----|------|-------|------|-------------|----------|
| 3   | AA    | 937 | MA6  | C5-N7 | 3.35 | 1.51        | 1.39     |
| 3   | AA    | 936 | MA6  | C5-N7 | 3.33 | 1.51        | 1.39     |
| 9   | AG    | 51  | PSU  | C6-C5 | 3.23 | 1.39        | 1.35     |
| 9   | AG    | 46  | PSU  | C6-C5 | 3.21 | 1.39        | 1.35     |
| 9   | AG    | 24  | PSU  | C6-C5 | 3.13 | 1.39        | 1.35     |

The worst 5 of 24 bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms    | Z     | Observed(°) | Ideal(°) |
|-----|-------|-----|------|----------|-------|-------------|----------|
| 9   | AG    | 46  | PSU  | N1-C2-N3 | 5.88  | 121.79      | 115.13   |
| 9   | AG    | 24  | PSU  | N1-C2-N3 | 5.87  | 121.78      | 115.13   |
| 3   | AA    | 937 | MA6  | C4-C5-N7 | -5.74 | 103.42      | 109.40   |
| 9   | AG    | 51  | PSU  | N1-C2-N3 | 5.70  | 121.58      | 115.13   |
| 3   | AA    | 936 | MA6  | C4-C5-N7 | -5.67 | 103.49      | 109.40   |

There are no chirality outliers.

5 of 16 torsion outliers are listed below:

| Mol | Chain | Res | Type | Atoms         |
|-----|-------|-----|------|---------------|
| 9   | AG    | 51  | PSU  | O4'-C1'-C5-C4 |

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| Mol | Chain | Res | Type | Atoms         |
|-----|-------|-----|------|---------------|
| 9   | AG    | 51  | PSU  | O4'-C1'-C5-C6 |
| 35  | Ai    | 184 | 5F0  | OD1-C1-CA-CB  |
| 35  | Ai    | 184 | 5F0  | CA-C1-OD1-CXT |
| 35  | Ai    | 184 | 5F0  | O1-C1-OD1-CXT |

There are no ring outliers.

No monomer is involved in short contacts.

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 149 ligands modelled in this entry, 144 are monoatomic - leaving 5 for Mogul analysis.

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

| Mol | Type | Chain | Res | Link  | Bond lengths |      |             | Bond angles |      |             |
|-----|------|-------|-----|-------|--------------|------|-------------|-------------|------|-------------|
|     |      |       |     |       | Counts       | RMSZ | $\# Z  > 2$ | Counts      | RMSZ | $\# Z  > 2$ |
| 41  | FS2  | AT    | 201 | 22,15 | 0,5,14       | -    | -           | -           |      |             |
| 42  | ATP  | AX    | 501 | 38    | 26,33,33     | 0.62 | 0           | 31,52,52    | 0.73 | 2 (6%)      |
| 43  | GDP  | AX    | 503 | -     | 24,30,30     | 0.95 | 1 (4%)      | 30,47,47    | 1.30 | 4 (13%)     |
| 39  | MET  | AG    | 101 | 9     | 6,7,8        | 0.48 | 0           | 2,7,9       | 0.14 | 0           |
| 41  | FS2  | AP    | 201 | 7,18  | 0,5,14       | -    | -           | -           |      |             |

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   |
|-----|------|-------|-----|-------|---------|------------|---------|
| 41  | FS2  | AT    | 201 | 22,15 | -       | -          | 0/2/2/6 |
| 42  | ATP  | AX    | 501 | 38    | -       | 0/18/38/38 | 0/3/3/3 |

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| Mol | Type | Chain | Res | Link | Chirals | Torsions   | Rings   |
|-----|------|-------|-----|------|---------|------------|---------|
| 43  | GDP  | AX    | 503 | -    | -       | 4/12/32/32 | 0/3/3/3 |
| 39  | MET  | AG    | 101 | 9    | -       | 1/5/6/8    | -       |
| 41  | FS2  | AP    | 201 | 7,18 | -       | -          | 0/2/2/6 |

All (1) bond length outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z     | Observed(Å) | Ideal(Å) |
|-----|-------|-----|------|-------|-------|-------------|----------|
| 43  | AX    | 503 | GDP  | C6-N1 | -2.39 | 1.34        | 1.37     |

The worst 5 of 6 bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms       | Z     | Observed(°) | Ideal(°) |
|-----|-------|-----|------|-------------|-------|-------------|----------|
| 43  | AX    | 503 | GDP  | PA-O3A-PB   | -3.46 | 120.94      | 132.83   |
| 43  | AX    | 503 | GDP  | C3'-C2'-C1' | 3.11  | 105.65      | 100.98   |
| 43  | AX    | 503 | GDP  | C8-N7-C5    | 2.34  | 107.45      | 102.99   |
| 42  | AX    | 501 | ATP  | C5-C6-N6    | 2.30  | 123.85      | 120.35   |
| 43  | AX    | 503 | GDP  | C5-C6-N1    | 2.21  | 117.85      | 113.95   |

There are no chirality outliers.

All (5) torsion outliers are listed below:

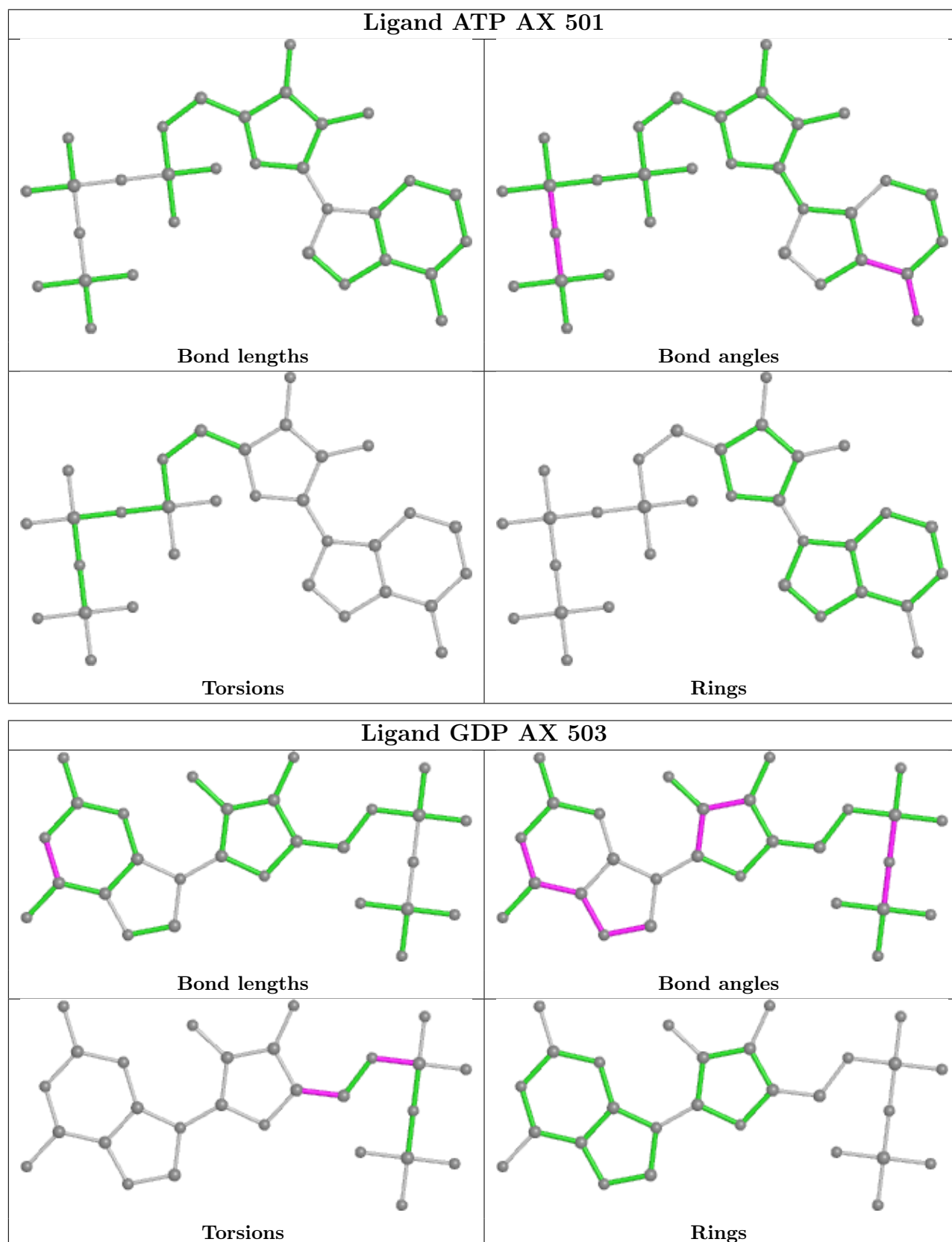
| Mol | Chain | Res | Type | Atoms           |
|-----|-------|-----|------|-----------------|
| 43  | AX    | 503 | GDP  | C5'-O5'-PA-O3A  |
| 43  | AX    | 503 | GDP  | C5'-O5'-PA-O2A  |
| 43  | AX    | 503 | GDP  | C3'-C4'-C5'-O5' |
| 39  | AG    | 101 | MET  | N-CA-CB-CG      |
| 43  | AX    | 503 | GDP  | O4'-C4'-C5'-O5' |

There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier.

The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Map visualisation

This section contains visualisations of the EMDB entry EMD-16898. 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

This section was not generated.

### 6.2 Central slices

This section was not generated.

### 6.3 Largest variance slices

This section was not generated.

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

This section was not generated.

### 6.5 Orthogonal surface views

This section was not generated.

### 6.6 Mask visualisation

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

## 7 Map analysis

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

### 7.1 Map-value distribution

This section was not generated.

### 7.2 Volume estimate versus contour level

This section was not generated.

### 7.3 Rotationally averaged power spectrum

This section was not generated. The rotationally averaged power spectrum had issues being displayed.

## 8 Fourier-Shell correlation

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

## 9 Map-model fit

This section was not generated.