Full wwPDB X-ray Structure Validation Report

Aug 9, 2020 – 11:38 PM BST

PDB ID : 1PPJ
Title : Bovine cytochrome bcl complex with stigmatellin and antimycin
Authors : Huang, L.S.; Cobessi, D.; Tung, E.Y.; Berry, E.A.
Deposited on : 2003-06-16
Resolution : 2.10 Å (reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org
A user guide is available at
with specific help available everywhere you see the symbol.

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

- MolProbity : 4.020-467
- Mogul : 1.8.5 (274361), CSD as541be (2020)
- Xtriage (Phenix) : 1.13
- EDS : 2.13.1
- buster-report : 1.1.7 (2018)
- Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
- Refmac : 5.8.0158
- CCP4 : 7.0.044 (Gargrove)
- Ideal geometry (proteins) : Engh & Huber (2001)
- Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
- Validation Pipeline (wwPDB-VP) : 2.13.1
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.10 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.

<table>
<thead>
<tr>
<th>Metric</th>
<th>Whole archive (#Entries)</th>
<th>Similar resolution (#Entries, resolution range(Å))</th>
</tr>
</thead>
<tbody>
<tr>
<td>R_free</td>
<td>130704</td>
<td>5197 (2.10-2.10)</td>
</tr>
<tr>
<td>Clashscore</td>
<td>141614</td>
<td>5710 (2.10-2.10)</td>
</tr>
<tr>
<td>Ramachandran outliers</td>
<td>138981</td>
<td>5647 (2.10-2.10)</td>
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<tr>
<td>Sidechain outliers</td>
<td>138945</td>
<td>5648 (2.10-2.10)</td>
</tr>
<tr>
<td>RSRZ outliers</td>
<td>127900</td>
<td>5083 (2.10-2.10)</td>
</tr>
</tbody>
</table>

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5%. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.
The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

<table>
<thead>
<tr>
<th>Mol</th>
<th>Type</th>
<th>Chain</th>
<th>Res</th>
<th>Chirality</th>
<th>Geometry</th>
<th>Clashes</th>
<th>Electron density</th>
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</thead>
<tbody>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
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<td>-</td>
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<td>X</td>
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<td>X</td>
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<tr>
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<td>A</td>
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<td>-</td>
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<td>X</td>
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<tr>
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<td>X</td>
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<tr>
<td>14</td>
<td>GOL</td>
<td>B</td>
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<td>P</td>
<td>3002</td>
<td>X</td>
<td>-</td>
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</tbody>
</table>
2 Entry composition

There are 22 unique types of molecules in this entry. The entry contains 33549 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, 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 Ubiquinol-cytochrome C reductase complex core protein I, mitochondrial.

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>ZeroOcc</th>
<th>AltConf</th>
<th>Trace</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>442</td>
<td>Total C N O S</td>
<td>3396 2117 601 658 20</td>
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</tr>
<tr>
<td>1</td>
<td>N</td>
<td>442</td>
<td>Total C N O S</td>
<td>3396 2117 601 658 20</td>
<td>10</td>
<td>0</td>
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</tbody>
</table>

- Molecule 2 is a protein called Ubiquinol-cytochrome C reductase complex core protein 2, mitochondrial.

<table>
<thead>
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<th>Mol</th>
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<th>Residues</th>
<th>Atoms</th>
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<th>AltConf</th>
<th>Trace</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>B</td>
<td>424</td>
<td>Total C N O S</td>
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<td>2</td>
<td>O</td>
<td>424</td>
<td>Total C N O S</td>
<td>3156 1984 558 607 7</td>
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<td>0</td>
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</table>

- Molecule 3 is a protein called Cytochrome b.

<table>
<thead>
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<th>Mol</th>
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<th>Atoms</th>
<th>ZeroOcc</th>
<th>AltConf</th>
<th>Trace</th>
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</thead>
<tbody>
<tr>
<td>3</td>
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<td>365</td>
<td>Total C N O S</td>
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<td>0</td>
</tr>
<tr>
<td>3</td>
<td>P</td>
<td>365</td>
<td>Total C N O S</td>
<td>2891 1940 449 485 17</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- Molecule 4 is a protein called Cytochrome c1, heme protein, mitochondrial.

<table>
<thead>
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<th>Atoms</th>
<th>ZeroOcc</th>
<th>AltConf</th>
<th>Trace</th>
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</thead>
<tbody>
<tr>
<td>4</td>
<td>D</td>
<td>241</td>
<td>Total C N O S</td>
<td>1919 1225 330 349 15</td>
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</tr>
<tr>
<td>4</td>
<td>Q</td>
<td>241</td>
<td>Total C N O S</td>
<td>1919 1225 330 349 15</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

- Molecule 5 is a protein called Ubiquinol-cytochrome C reductase iron-sulfur subunit, mitochondrial.
- Molecule 6 is a protein called Ubiquinol-cytochrome C reductase complex 14 kDa protein.

<table>
<thead>
<tr>
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<th>Atoms</th>
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<th>AltConf</th>
<th>Trace</th>
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</thead>
<tbody>
<tr>
<td>5</td>
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<td>Total C N O S 1510 954 263 285 8</td>
<td>0</td>
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<table>
<thead>
<tr>
<th>mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>ZeroOcc</th>
<th>AltConf</th>
<th>Trace</th>
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</thead>
<tbody>
<tr>
<td>5</td>
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<td>196</td>
<td>Total C N O S 1517 956 263 290 8</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

- Molecule 7 is a protein called Ubiquinol-cytochrome C reductase complex ubiquinone-binding protein QP-C.

<table>
<thead>
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<th>Residues</th>
<th>Atoms</th>
<th>ZeroOcc</th>
<th>AltConf</th>
<th>Trace</th>
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</thead>
<tbody>
<tr>
<td>6</td>
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<td>Total C N O S 861 545 155 159 2</td>
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<td>0</td>
<td>0</td>
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</table>

<table>
<thead>
<tr>
<th>mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>ZeroOcc</th>
<th>AltConf</th>
<th>Trace</th>
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</thead>
<tbody>
<tr>
<td>6</td>
<td>S</td>
<td>99</td>
<td>Total C N O S 861 545 155 159 2</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

- Molecule 8 is a protein called Ubiquinol-cytochrome C reductase complex 11 kDa protein.

<table>
<thead>
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<th>Residues</th>
<th>Atoms</th>
<th>ZeroOcc</th>
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</thead>
<tbody>
<tr>
<td>7</td>
<td>G</td>
<td>75</td>
<td>Total C N O S 621 406 117 97 1</td>
<td>0</td>
<td>0</td>
<td>2</td>
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<table>
<thead>
<tr>
<th>mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>ZeroOcc</th>
<th>AltConf</th>
<th>Trace</th>
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</thead>
<tbody>
<tr>
<td>7</td>
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<td>Total C N O S 626 409 118 98 1</td>
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<td>0</td>
<td>2</td>
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</table>

- Molecule 9 is a protein called Ubiquinol-cytochrome C reductase iron-sulfur subunit, mitochondrial.

<table>
<thead>
<tr>
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<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>ZeroOcc</th>
<th>AltConf</th>
<th>Trace</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>H</td>
<td>66</td>
<td>Total C N O S 539 327 98 109 5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>ZeroOcc</th>
<th>AltConf</th>
<th>Trace</th>
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</thead>
<tbody>
<tr>
<td>8</td>
<td>U</td>
<td>66</td>
<td>Total C N O S 539 327 98 109 5</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- Molecule 10 is a protein called Ubiquinol-cytochrome C reductase complex 7.2 kDa protein.
- Molecule 11 is hexyl beta-D-glucopyranoside (three-letter code: JZR) (formula: C_{12}H_{24}O_{6}).

- Molecule 12 is PHOSPHATE ION (three-letter code: PO4) (formula: O_{4}P).
Molecule 13 is AZIDE ION (three-letter code: AZI) (formula: N₃).
<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>ZeroOcc</th>
<th>AltConf</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>A</td>
<td>1</td>
<td>Total N</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>C</td>
<td>1</td>
<td>Total N</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>G</td>
<td>1</td>
<td>Total N</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>O</td>
<td>1</td>
<td>Total N</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>P</td>
<td>1</td>
<td>Total N</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- Molecule 14 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).

![GOL](image)

- Molecule 15 is PROTOPORPHYRIN IX CONTAINING FE (three-letter code: HEM) (for-
Molecule 16 is STIGMATELLIN A (three-letter code: SMA) (formula: $C_{30}H_{42}O_7$).
Molecule 17 is 1,2-Dioleoyl-sn-glycero-3-phosphoethanolamine (three-letter code: PEE) (formula: C₄₁H₈₃NO₈P).

- Molecule 19 is HEME C (three-letter code: HEC) (formula: C\textsubscript{34}H\textsubscript{34}FeN\textsubscript{4}O\textsubscript{4}).

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
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<td>37 26 2 9</td>
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<tr>
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<td>Total C N O</td>
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<td>37 26 2 9</td>
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<tr>
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<td>43 34 1 4 4</td>
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<tr>
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<td>Q</td>
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<td>Total C Fe N O</td>
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<td></td>
<td></td>
<td></td>
<td>43 34 1 4 4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• Molecule 20 is CARDIOLIPIN (three-letter code: CDL) (formula: \(\text{C}_{81}\text{H}_{156}\text{O}_{17}\text{P}_{2}\)).

```
<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>ZeroOcc</th>
<th>AltConf</th>
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<td>Total</td>
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<td>17</td>
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<td>20</td>
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<td>30</td>
<td>17</td>
</tr>
</tbody>
</table>
```

• Molecule 21 is FE2/S2 (INORGANIC) CLUSTER (three-letter code: FES) (formula: \(\text{Fe}_{2}\text{S}_{2}\)).
<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>ZeroOcc</th>
<th>AltConf</th>
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</thead>
<tbody>
<tr>
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<td>0</td>
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<tr>
<td>21</td>
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<td>1</td>
<td>Total 4 Fe S 2</td>
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</tbody>
</table>

- Molecule 22 is water.

<table>
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<th>Residues</th>
<th>Atoms</th>
<th>ZeroOcc</th>
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<tbody>
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<td>219</td>
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<tr>
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<td>Total 167 O 167</td>
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<td>0</td>
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<tr>
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<td>Total 50 O 50</td>
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<tr>
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<td>0</td>
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<tr>
<td>22</td>
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<td>0</td>
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<tr>
<td>22</td>
<td>H</td>
<td>17</td>
<td>Total 17 O 17</td>
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</tr>
<tr>
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<td>I</td>
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<td>0</td>
</tr>
<tr>
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<td>4</td>
<td>Total 4 O 4</td>
<td>0</td>
<td>0</td>
</tr>
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<td>Total 98 O 98</td>
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<td>0</td>
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<tr>
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<td>Total 63 O 63</td>
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</tr>
<tr>
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<td>6</td>
<td>Total 6 O 6</td>
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*Continued on next page...*
Continued from previous page...

<table>
<thead>
<tr>
<th>Mol</th>
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<th>Residues</th>
<th>Atoms</th>
<th>ZeroOcc</th>
<th>AltConf</th>
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</thead>
<tbody>
<tr>
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<td>V</td>
<td>8</td>
<td>Total 8  O 8</td>
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<td>0</td>
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<tr>
<td>22</td>
<td>W</td>
<td>9</td>
<td>Total 9  O 9</td>
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<td>0</td>
</tr>
</tbody>
</table>
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron 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 dot above a residue indicates a poor fit to the electron density (RSRZ > 2). 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: Ubiquinol-cytochrome C reductase complex core protein I, mitochondrial

Chain A:

- Molecule 1: Ubiquinol-cytochrome C reductase complex core protein I, mitochondrial

Chain N:

- Molecule 2: Ubiquinol-cytochrome C reductase complex core protein 2, mitochondrial

Chain B:
- Molecule 2: Ubiquinol-cytochrome C reductase complex core protein 2, mitochondrial

Chain O:

- Molecule 3: Cytochrome b

Chain C:

- Molecule 3: Cytochrome b

Chain P:

- Molecule 4: Cytochrome c1, heme protein, mitochondrial

Chain D:
• Molecule 4: Cytochrome c1, heme protein, mitochondrial

Chain Q:

• Molecule 5: Ubiquinol-cytochrome C reductase iron-sulfur subunit, mitochondrial

Chain E:

• Molecule 5: Ubiquinol-cytochrome C reductase iron-sulfur subunit, mitochondrial

Chain R:

• Molecule 6: Ubiquinol-cytochrome C reductase complex 14 kDa protein

Chain F:

• Molecule 6: Ubiquinol-cytochrome C reductase complex 14 kDa protein

Chain S:

• Molecule 7: Ubiquinol-cytochrome C reductase complex ubiquinone-binding protein QP-C

Chain G:
- **Molecule 7**: Ubiquinol-cytochrome C reductase complex ubiquinone-binding protein QP-C

Chain T:

- **Molecule 8**: Ubiquinol-cytochrome C reductase complex 11 kDa protein

Chain H:

- **Molecule 8**: Ubiquinol-cytochrome C reductase complex 11 kDa protein

Chain U:

- **Molecule 9**: Ubiquinol-cytochrome C reductase iron-sulfur subunit, mitochondrial

Chain I:

- **Molecule 9**: Ubiquinol-cytochrome C reductase iron-sulfur subunit, mitochondrial

Chain V:

- **Molecule 10**: Ubiquinol-cytochrome C reductase complex 7.2 kDa protein
Chain J:

| Val | Ala | Pro | Thr | Leu | Thr | Ala | Arg | Leu | Tyr | Ser | Leu | Leu | Phe | Arg | Arg | Thr | Ser | Thr | Phe | Ala | Leu | Thr | Ile | Val | Val | Gly | Ala | Leu |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 8%  | 40% | 11% | 47% |

- Molecule 10: Ubiquinol-cytochrome C reductase complex 7.2 kDa protein

Chain W:

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<th>Thr</th>
<th>Leu</th>
<th>Thr</th>
<th>Ala</th>
<th>Arg</th>
<th>Leu</th>
<th>Tyr</th>
<th>Ser</th>
<th>Leu</th>
<th>Leu</th>
<th>Phe</th>
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<th>Arg</th>
<th>Thr</th>
<th>Ser</th>
<th>Thr</th>
<th>Phe</th>
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<th>Leu</th>
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<th>Ile</th>
<th>Val</th>
<th>Val</th>
<th>Gly</th>
<th>Ala</th>
<th>Leu</th>
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<td>60%</td>
<td>35%</td>
<td>5%</td>
<td></td>
<td></td>
<td></td>
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- Molecule 10: Ubiquinol-cytochrome C reductase complex 7.2 kDa protein
4 Data and refinement statistics

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<tr>
<th>Property</th>
<th>Value</th>
<th>Source</th>
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<tr>
<td>Space group</td>
<td>P 2 1 2 1</td>
<td>Depositor</td>
</tr>
<tr>
<td>Cell constants</td>
<td>128.53Å, 168.75Å, 231.53Å</td>
<td>Depositor</td>
</tr>
<tr>
<td>a, b, c, α, β, γ</td>
<td>90.00°, 90.00°, 90.00°</td>
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<tr>
<td>Resolution (Å)</td>
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<td>EDS</td>
</tr>
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<td>% Data completeness (in resolution range)</td>
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<td>Depositor</td>
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<tr>
<td>R&lt;sub&gt;sym&lt;/sub&gt;</td>
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<td>Depositor</td>
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<tr>
<td>&lt;I/σ(I)&gt;¹</td>
<td>3.03 (at 2.10Å)</td>
<td>Xtriage</td>
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<td>Refinement program</td>
<td>CNS 1.1</td>
<td>Depositor</td>
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<td>R, R&lt;sub&gt;free&lt;/sub&gt;</td>
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<td>Depositor</td>
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<tr>
<td>R&lt;sub&gt;free&lt;/sub&gt; test set</td>
<td>14181 reflections (4.97%)</td>
<td>wwPDB-VP</td>
</tr>
<tr>
<td>Wilson B-factor (Å&lt;sup&gt;2&lt;/sup&gt;)</td>
<td>41.8</td>
<td>Xtriage</td>
</tr>
<tr>
<td>Anisotropy</td>
<td>0.314</td>
<td>Xtriage</td>
</tr>
<tr>
<td>Bulk solvent k&lt;sub&gt;sol&lt;/sub&gt;(e/Å&lt;sup&gt;3&lt;/sup&gt;), B&lt;sub&gt;sol&lt;/sub&gt;(Å&lt;sup&gt;2&lt;/sup&gt;)</td>
<td>0.37, 65.7</td>
<td>EDS</td>
</tr>
<tr>
<td>L-test for twinning&lt;sup&gt;²&lt;/sup&gt;</td>
<td>&lt;L&gt; = 0.51, &lt;L&lt;sup&gt;2&lt;/sup&gt;&gt; = 0.35</td>
<td>Xtriage</td>
</tr>
<tr>
<td>Estimated twinning fraction</td>
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<td>Xtriage</td>
</tr>
<tr>
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<td>Total number of atoms</td>
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</tr>
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<td>Average B, all atoms (Å&lt;sup&gt;2&lt;/sup&gt;)</td>
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<td>wwPDB-VP</td>
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</tbody>
</table>

Xtriage’s analysis on translational NCS is as follows: The largest off-origin peak in the Patterson function is 1.97% of the height of the origin peak. No significant pseudotranslation is detected.

¹Intensities estimated from amplitudes.
²Theoretical values of <L>, <L<sup>2</sup>> for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.
5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: AZI, GOL, CDL, PO4, JZR, FES, HEC, HEM, PEE, ANY, SMA

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).

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<th>Bond lengths</th>
<th>Bond angles</th>
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<td>0.30</td>
<td>0/3465</td>
</tr>
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<td>2</td>
<td>B</td>
<td>0.32</td>
<td>0/3236</td>
</tr>
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<td>O</td>
<td>0.31</td>
<td>0/3213</td>
</tr>
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<td>C</td>
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<td>0/2986</td>
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<td>4</td>
<td>Q</td>
<td>0.29</td>
<td>0/1978</td>
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<td>E</td>
<td>0.29</td>
<td>0/1544</td>
</tr>
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<td>F</td>
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<td>I</td>
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<td>All</td>
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There are no bond length outliers.

All (8) bond angle outliers are listed below:

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<th>Mol</th>
<th>Chain</th>
<th>Res</th>
<th>Type</th>
<th>Atoms</th>
<th>Z</th>
<th>Observed(°)</th>
<th>Ideal(°)</th>
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<tbody>
<tr>
<td>9</td>
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<td>GLY</td>
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<td>5.68</td>
<td>128.36</td>
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Continued on next page...
Continued from previous page...

<table>
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<tr>
<th>Mol</th>
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<th>Res</th>
<th>Type</th>
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<th>Z</th>
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<tbody>
<tr>
<td>5</td>
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</table>

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry related clashes.

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<thead>
<tr>
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<th>Chain</th>
<th>Non-H</th>
<th>H(model)</th>
<th>H(added)</th>
<th>Clashes</th>
<th>Symm-Clashes</th>
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<th>H(model)</th>
<th>H(added)</th>
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<th>Symm-Clashes</th>
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All (551) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

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### Interatomic distance (Å) and Clash overlap (Å)

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### Interatomic distances and clash overlaps

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There are no symmetry-related clashes.
5.3 Torsion angles

5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

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

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<td>1</td>
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<td>11 (2%)</td>
<td>4 (1%)</td>
<td>17 12</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>418/439 (95%)</td>
<td>405 (97%)</td>
<td>10 (2%)</td>
<td>3 (1%)</td>
<td>22 18</td>
</tr>
<tr>
<td>2</td>
<td>O</td>
<td>419/439 (95%)</td>
<td>404 (96%)</td>
<td>13 (3%)</td>
<td>2 (0%)</td>
<td>29 26</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>363/379 (96%)</td>
<td>352 (97%)</td>
<td>9 (2%)</td>
<td>2 (1%)</td>
<td>25 21</td>
</tr>
<tr>
<td>3</td>
<td>P</td>
<td>363/379 (96%)</td>
<td>352 (97%)</td>
<td>10 (3%)</td>
<td>1 (0%)</td>
<td>41 41</td>
</tr>
<tr>
<td>4</td>
<td>D</td>
<td>239/241 (99%)</td>
<td>233 (98%)</td>
<td>6 (2%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>4</td>
<td>Q</td>
<td>239/241 (99%)</td>
<td>232 (97%)</td>
<td>7 (3%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>5</td>
<td>E</td>
<td>194/196 (99%)</td>
<td>181 (93%)</td>
<td>10 (5%)</td>
<td>3 (2%)</td>
<td>10 5</td>
</tr>
<tr>
<td>5</td>
<td>R</td>
<td>194/196 (99%)</td>
<td>183 (94%)</td>
<td>8 (4%)</td>
<td>3 (2%)</td>
<td>10 5</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>97/110 (88%)</td>
<td>96 (99%)</td>
<td>1 (1%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>6</td>
<td>S</td>
<td>97/110 (88%)</td>
<td>94 (97%)</td>
<td>1 (1%)</td>
<td>2 (2%)</td>
<td>7 3</td>
</tr>
<tr>
<td>7</td>
<td>G</td>
<td>73/81 (90%)</td>
<td>70 (96%)</td>
<td>3 (4%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>7</td>
<td>T</td>
<td>74/81 (91%)</td>
<td>69 (93%)</td>
<td>5 (7%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>8</td>
<td>H</td>
<td>64/78 (82%)</td>
<td>63 (98%)</td>
<td>1 (2%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>8</td>
<td>U</td>
<td>64/78 (82%)</td>
<td>64 (100%)</td>
<td>0</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>9</td>
<td>I</td>
<td>39/78 (50%)</td>
<td>37 (95%)</td>
<td>1 (3%)</td>
<td>1 (3%)</td>
<td>5 2</td>
</tr>
<tr>
<td>9</td>
<td>V</td>
<td>39/78 (50%)</td>
<td>36 (92%)</td>
<td>2 (5%)</td>
<td>1 (3%)</td>
<td>5 2</td>
</tr>
<tr>
<td>10</td>
<td>J</td>
<td>30/62 (48%)</td>
<td>28 (93%)</td>
<td>2 (7%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>10</td>
<td>W</td>
<td>59/62 (95%)</td>
<td>54 (92%)</td>
<td>4 (7%)</td>
<td>1 (2%)</td>
<td>9 4</td>
</tr>
<tr>
<td>All</td>
<td>All</td>
<td>3945/4220 (94%)</td>
<td>3803 (96%)</td>
<td>115 (3%)</td>
<td>27 (1%)</td>
<td>22 18</td>
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</table>

All (27) Ramachandran outliers are listed below:

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<th>Res</th>
<th>Type</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>224</td>
<td>ASP</td>
</tr>
</tbody>
</table>

Continued on next page...
### 5.3.2 Protein sidechains

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

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

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Analysed</th>
<th>Rotameric</th>
<th>Outliers</th>
<th>Percentiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>363/370 (98%)</td>
<td>355 (98%)</td>
<td>8 (2%)</td>
<td>52</td>
</tr>
<tr>
<td>1</td>
<td>N</td>
<td>363/370 (98%)</td>
<td>357 (98%)</td>
<td>6 (2%)</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>332/343 (97%)</td>
<td>332 (100%)</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>O</td>
<td>328/343 (96%)</td>
<td>328 (100%)</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

Continued on next page...
Continued from previous page...

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Analysed</th>
<th>Rotameric</th>
<th>Outliers</th>
<th>Percentiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>C</td>
<td>312/327 (95%)</td>
<td>304 (97%)</td>
<td>8 (3%)</td>
<td>46 50</td>
</tr>
<tr>
<td>3</td>
<td>P</td>
<td>311/327 (95%)</td>
<td>303 (97%)</td>
<td>8 (3%)</td>
<td>46 50</td>
</tr>
<tr>
<td>4</td>
<td>D</td>
<td>206/206 (100%)</td>
<td>206 (100%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>4</td>
<td>Q</td>
<td>206/206 (100%)</td>
<td>204 (99%)</td>
<td>2 (1%)</td>
<td>76 82</td>
</tr>
<tr>
<td>5</td>
<td>E</td>
<td>165/168 (98%)</td>
<td>164 (99%)</td>
<td>1 (1%)</td>
<td>86 90</td>
</tr>
<tr>
<td>5</td>
<td>R</td>
<td>167/168 (99%)</td>
<td>164 (98%)</td>
<td>3 (2%)</td>
<td>59 65</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>90/98 (92%)</td>
<td>90 (100%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>6</td>
<td>S</td>
<td>90/98 (92%)</td>
<td>87 (97%)</td>
<td>3 (3%)</td>
<td>38 40</td>
</tr>
<tr>
<td>7</td>
<td>G</td>
<td>66/71 (93%)</td>
<td>66 (100%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>7</td>
<td>T</td>
<td>66/71 (93%)</td>
<td>66 (100%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>8</td>
<td>H</td>
<td>63/74 (85%)</td>
<td>63 (100%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>8</td>
<td>U</td>
<td>63/74 (85%)</td>
<td>61 (97%)</td>
<td>2 (3%)</td>
<td>39 41</td>
</tr>
<tr>
<td>9</td>
<td>I</td>
<td>27/60 (45%)</td>
<td>26 (96%)</td>
<td>1 (4%)</td>
<td>34 35</td>
</tr>
<tr>
<td>9</td>
<td>V</td>
<td>27/60 (45%)</td>
<td>26 (96%)</td>
<td>1 (4%)</td>
<td>34 35</td>
</tr>
<tr>
<td>10</td>
<td>J</td>
<td>27/52 (52%)</td>
<td>25 (93%)</td>
<td>2 (7%)</td>
<td>13 10</td>
</tr>
<tr>
<td>10</td>
<td>W</td>
<td>51/52 (98%)</td>
<td>49 (96%)</td>
<td>2 (4%)</td>
<td>32 33</td>
</tr>
<tr>
<td>All</td>
<td>All</td>
<td>3323/3538 (94%)</td>
<td>3276 (99%)</td>
<td>47 (1%)</td>
<td>67 73</td>
</tr>
</tbody>
</table>

All (47) residues with a non-rotameric sidechain are listed below:

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<th>Res</th>
<th>Type</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>58</td>
<td>PHE</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>203</td>
<td>LEU</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>210</td>
<td>ASP</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>245</td>
<td>GLU</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>281</td>
<td>ASP</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>305</td>
<td>GLN</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>316</td>
<td>ASP</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>348</td>
<td>SER</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>16</td>
<td>ASN</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>21</td>
<td>LEU</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>80</td>
<td>ARG</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>90</td>
<td>PHE</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>128</td>
<td>PHE</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>222</td>
<td>PRO</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>346</td>
<td>PRO</td>
</tr>
</tbody>
</table>

Continued on next page...
Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (37) such sidechains are listed below:

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Res</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>15</td>
<td>GLN</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>136</td>
<td>GLN</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>165</td>
<td>GLN</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>213</td>
<td>GLN</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>271</td>
<td>GLN</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>289</td>
<td>HIS</td>
</tr>
</tbody>
</table>

*Continued on next page...*
5.3.3 RNA

There are no RNA molecules in this entry.

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

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

There are no monosaccharides in this entry.

## 5.6 Ligand geometry

45 ligands 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).

<table>
<thead>
<tr>
<th>Mol</th>
<th>Type</th>
<th>Chain</th>
<th>Res</th>
<th>Link</th>
<th>Bond lengths</th>
<th>Bond angles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>Counts</td>
<td>RMSZ</td>
</tr>
<tr>
<td>12</td>
<td>PO4</td>
<td>A</td>
<td>2013</td>
<td>-</td>
<td>4,4,4</td>
<td>1.36</td>
</tr>
<tr>
<td>16</td>
<td>SMA</td>
<td>P</td>
<td>3001</td>
<td>-</td>
<td>35,38,38</td>
<td>1.62</td>
</tr>
<tr>
<td>20</td>
<td>CDL</td>
<td>T</td>
<td>3004</td>
<td>-</td>
<td>48,48,99</td>
<td>1.13</td>
</tr>
<tr>
<td>13</td>
<td>AZI</td>
<td>C</td>
<td>2005</td>
<td>-</td>
<td>0,2,2</td>
<td>0.00</td>
</tr>
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<td>PO4</td>
<td>F</td>
<td>2012</td>
<td>-</td>
<td>4,4,4</td>
<td>1.28</td>
</tr>
<tr>
<td>14</td>
<td>GOL</td>
<td>R</td>
<td>4005</td>
<td>-</td>
<td>5,5,5</td>
<td>1.26</td>
</tr>
<tr>
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<td>JZR</td>
<td>F</td>
<td>3011</td>
<td>-</td>
<td>18,18,18</td>
<td>1.79</td>
</tr>
<tr>
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<td>HEC</td>
<td>Q</td>
<td>501</td>
<td>4</td>
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<td>1.99</td>
</tr>
<tr>
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<td>G</td>
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<td>-</td>
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<tr>
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<td>-</td>
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</tr>
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<td>HEC</td>
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<td>S</td>
<td>3012</td>
<td>-</td>
<td>4,4,4</td>
<td>1.33</td>
</tr>
<tr>
<td>13</td>
<td>AZI</td>
<td>A</td>
<td>4011</td>
<td>-</td>
<td>0,2,2</td>
<td>0.00</td>
</tr>
<tr>
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<td>AZI</td>
<td>P</td>
<td>3005</td>
<td>-</td>
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<td>0.00</td>
</tr>
<tr>
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</tr>
<tr>
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<td>SMA</td>
<td>P</td>
<td>3001</td>
<td>-</td>
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<td>-</td>
<td>28/57/57/110</td>
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<td>P</td>
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<td>-</td>
<td>0/6/54/54</td>
</tr>
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<td>GOL</td>
<td>R</td>
<td>4005</td>
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<td>-</td>
<td>2/4/4/4</td>
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<td>JZR</td>
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<td>3011</td>
<td>-</td>
<td>-</td>
<td>3/9/29/29</td>
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<td>19</td>
<td>HEC</td>
<td>Q</td>
<td>501</td>
<td>4</td>
<td>-</td>
<td>0/6/54/54</td>
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<td>CDL</td>
<td>G</td>
<td>2004</td>
<td>-</td>
<td>-</td>
<td>36/52/52/110</td>
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<td>ANY</td>
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<td>1/1</td>
<td>10/13</td>
<td>3/37/52/56</td>
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<td>4</td>
<td>-</td>
<td>0/6/54/54</td>
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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.
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The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.
Ligand SMA P 3001

Bond lengths

Bond angles

Torsions

Rings

Ligand CDL T 3004

Bond lengths

Bond angles

Torsions

Rings
5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.
6  Fit of model and data

6.1  Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

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6.2 Non-standard residues in protein, DNA, RNA chains

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

6.3 Carbohydrates

There are no monosaccharides in this entry.

6.4 Ligands

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q<0.9’ lists the number of atoms with occupancy less than 0.9.

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Continued on next page...
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

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</table>
**Electron density around JZR F 4001:**

$2mF_o - DF_c$ (at 0.7 rmsd) in gray

$mF_o - DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

**Electron density around JZR D 4003:**

$2mF_o - DF_c$ (at 0.7 rmsd) in gray

$mF_o - DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
Electron density around JZR S 2011:

$2mF_o - DF_c$ (at 0.7 rmsd) in gray
$mF_o - DF_c$ (at 3 rmsd) in purple (negative) and green (positive)

Electron density around JZR C 4002:

$2mF_o - DF_c$ (at 0.7 rmsd) in gray
$mF_o - DF_c$ (at 3 rmsd) in purple (negative) and green (positive)
Electron density around JZR F 3011:

$2mF_o - DF_c$ (at 0.7 rmsd) in gray
$mF_o - DF_c$ (at 3 rmsd) in purple (negative) and green (positive)

Electron density around JZR P 3010:

$2mF_o - DF_c$ (at 0.7 rmsd) in gray
$mF_o - DF_c$ (at 3 rmsd) in purple (negative) and green (positive)
Electron density around JZR C 2010:

$2mF_o - DF_c$ (at 0.7 rmsd) in gray
$mF_o - DF_c$ (at 3 rmsd) in purple (negative) and green (positive)

Electron density around JZR R 4007:

$2mF_o - DF_c$ (at 0.7 rmsd) in gray
$mF_o - DF_c$ (at 3 rmsd) in purple (negative) and green (positive)
Electron density around PEE D 2006:

\[2mF_o-DF_c\] (at 0.7 rmsd) in gray
\[mF_o-DF_c\] (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around CDL D 2003:

\[2mF_o-DF_c\] (at 0.7 rmsd) in gray
\[mF_o-DF_c\] (at 3 rmsd) in purple (negative)
and green (positive)
Electron density around CDL P 3003:

\[2mF_o - DF_c\] (at 0.7 rmsd) in gray
\[mF_o - DF_c\] (at 3 rmsd) in purple (negative) and green (positive)

Electron density around PEE Q 3006:

\[2mF_o - DF_c\] (at 0.7 rmsd) in gray
\[mF_o - DF_c\] (at 3 rmsd) in purple (negative) and green (positive)
**Electron density around CDL G 2004:**

\[2mF_o - DF_c\] (at 0.7 rmsd) in gray

\[mF_o - DF_c\] (at 3 rmsd) in purple (negative) and green (positive)

---

**Electron density around CDL T 3004:**

\[2mF_o - DF_c\] (at 0.7 rmsd) in gray

\[mF_o - DF_c\] (at 3 rmsd) in purple (negative) and green (positive)
Electron density around PEE P 3007:

$2mF_o - DF_c$ (at 0.7 rmsd) in gray
$mF_o - DF_c$ (at 3 rmsd) in purple (negative) and green (positive)

Electron density around ANY C 2002:

$2mF_o - DF_c$ (at 0.7 rmsd) in gray
$mF_o - DF_c$ (at 3 rmsd) in purple (negative) and green (positive)
Electron density around SMA P 3001:

$2mF_{o} - DF_{c}$ (at 0.7 rmsd) in gray
$mF_{o} - DF_{c}$ (at 3 rmsd) in purple (negative) and green (positive)
**Electron density around ANY P 3002:**

\[ 2mF_o - DF_c \text{ (at 0.7 rmsd) in gray} \]
\[ mF_o - DF_c \text{ (at 3 rmsd) in purple (negative) and green (positive)} \]

**Electron density around PEE C 2007:**

\[ 2mF_o - DF_c \text{ (at 0.7 rmsd) in gray} \]
\[ mF_o - DF_c \text{ (at 3 rmsd) in purple (negative) and green (positive)} \]
Electron density around SMA C 2001:

\[ 2mF_o - DF_c \text{ (at 0.7 rmsd) in gray} \]
\[ mF_o - DF_c \text{ (at 3 rmsd) in purple (negative) and green (positive)} \]

Electron density around JZRA 4004:

\[ 2mF_o - DF_c \text{ (at 0.7 rmsd) in gray} \]
\[ mF_o - DF_c \text{ (at 3 rmsd) in purple (negative) and green (positive)} \]
Electron density around HEM P 502:

$2mF_o - DF_c$ (at 0.7 rmsd) in gray
$mF_o - DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
Electron density around HEM C 501:

$2mF_o - DF_c$ (at 0.7 rmsd) in gray
$mF_o - DF_c$ (at 3 rmsd) in purple (negative) and green (positive)
Electron density around HEC Q 501:

$2mF_o - DF_c$ (at 0.7 rmsd) in gray

$mF_o - DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
Electron density around HEM C 502:

$2mF_o - DF_c$ (at 0.7 rmsd) in gray
$mF_o - DF_c$ (at 3 rmsd) in purple (negative) and green (positive)
Electron density around HEM P 501:

$2mF_o - DF_c$ (at 0.7 rmsd) in gray
$mF_o - DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
Electron density around HEC D 501:

- $2mF_o - DF_c$ (at 0.7 rmsd) in gray
- $mF_o - DF_c$ (at 3 rmsd) in purple (negative) and green (positive)

6.5 Other polymers

There are no such residues in this entry.