PDB ID : 6PB4
EMDB ID : EMD-20286
Title : The E. coli class-II CAP-dependent transcription activation complex with de
 novo RNA transcript at the state 2
Authors : Liu, B.; Shi, W.
Deposited on : 2019-06-13
Resolution : 4.35 Å(reported)

This is a Full wwPDB EM Model Validation Report for a publicly released PDB/EMDB 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 : 4.02b-467
- Mogul : 1.8.0 (224370), CSD as540be (2019)
- buster-report : 1.1.7 (2018)
- Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)
- Ideal geometry (proteins) : Engh & Huber (2001)
- Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
- Validation Pipeline (wwPDB-VP) : 2.8
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

**ELECTRON MICROSCOPY**

The reported resolution of this entry is 4.35 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>Percentile Ranks</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clashscore</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Ramachandran outliers</td>
<td></td>
<td>0.4%</td>
</tr>
<tr>
<td>Sidechain outliers</td>
<td></td>
<td>1.0%</td>
</tr>
<tr>
<td>RNA backbone</td>
<td></td>
<td>0.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Metric</th>
<th>Whole archive (#Entries)</th>
<th>EM structures (#Entries)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clashscore</td>
<td>136327</td>
<td>1886</td>
</tr>
<tr>
<td>Ramachandran outliers</td>
<td>132723</td>
<td>1663</td>
</tr>
<tr>
<td>Sidechain outliers</td>
<td>132532</td>
<td>1531</td>
</tr>
<tr>
<td>RNA backbone</td>
<td>3747</td>
<td>458</td>
</tr>
</tbody>
</table>

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 on the bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5%

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Length</th>
<th>Quality of chain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>329</td>
<td><img src="#" alt="Bar chart" /></td>
</tr>
<tr>
<td>1</td>
<td>B</td>
<td>329</td>
<td><img src="#" alt="Bar chart" /></td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>1342</td>
<td><img src="#" alt="Bar chart" /></td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>1407</td>
<td><img src="#" alt="Bar chart" /></td>
</tr>
<tr>
<td>4</td>
<td>E</td>
<td>91</td>
<td><img src="#" alt="Bar chart" /></td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>628</td>
<td><img src="#" alt="Bar chart" /></td>
</tr>
<tr>
<td>6</td>
<td>G</td>
<td>210</td>
<td><img src="#" alt="Bar chart" /></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Length</th>
<th>Quality of chain</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>H</td>
<td>210</td>
<td>71% 21% 6%</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>78</td>
<td>76% 23%</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>78</td>
<td>76% 24%</td>
</tr>
<tr>
<td>9</td>
<td>3</td>
<td>3</td>
<td>67% 33%</td>
</tr>
</tbody>
</table>
2 Entry composition

There are 12 unique types of molecules in this entry. The entry contains 69953 atoms, of which 34440 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 DNA-directed RNA polymerase subunit alpha.

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>230</td>
<td>Total C H N O S</td>
<td>3599 1112 1813 317 351 6</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>B</td>
<td>228</td>
<td>Total C H N O S</td>
<td>3556 1100 1789 312 349 6</td>
<td>0</td>
</tr>
</tbody>
</table>

- Molecule 2 is a protein called DNA-directed RNA polymerase subunit beta.

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>C</td>
<td>1340</td>
<td>Total C H N O S</td>
<td>21151 6631 10581 1841 2055 43</td>
<td>0</td>
</tr>
</tbody>
</table>

- Molecule 3 is a protein called DNA-directed RNA polymerase subunit beta’.

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>D</td>
<td>1337</td>
<td>Total C H N O S</td>
<td>21012 6531 10616 1853 1962 50</td>
<td>0</td>
</tr>
</tbody>
</table>

- Molecule 4 is a protein called DNA-directed RNA polymerase subunit omega.

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>E</td>
<td>79</td>
<td>Total C H N O S</td>
<td>1261 382 634 118 126 1</td>
<td>0</td>
</tr>
</tbody>
</table>

- Molecule 5 is a protein called RNA polymerase sigma factor RpoD.

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>F</td>
<td>483</td>
<td>Total C H N O S</td>
<td>7918 2455 3990 704 746 23</td>
<td>0</td>
</tr>
</tbody>
</table>

There are 15 discrepancies between the modelled and reference sequences:

<table>
<thead>
<tr>
<th>Chain</th>
<th>Residue</th>
<th>Modelled</th>
<th>Actual</th>
<th>Comment</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>-14</td>
<td>MET</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P00579</td>
</tr>
</tbody>
</table>
Continued from previous page...

<table>
<thead>
<tr>
<th>Chain</th>
<th>Residue</th>
<th>Modelled</th>
<th>Actual</th>
<th>Comment</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>-13</td>
<td>ARG</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P00579</td>
</tr>
<tr>
<td>F</td>
<td>-12</td>
<td>GLY</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P00579</td>
</tr>
<tr>
<td>F</td>
<td>-11</td>
<td>SER</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P00579</td>
</tr>
<tr>
<td>F</td>
<td>-10</td>
<td>HIS</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P00579</td>
</tr>
<tr>
<td>F</td>
<td>-9</td>
<td>HIS</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P00579</td>
</tr>
<tr>
<td>F</td>
<td>-8</td>
<td>HIS</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P00579</td>
</tr>
<tr>
<td>F</td>
<td>-7</td>
<td>HIS</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P00579</td>
</tr>
<tr>
<td>F</td>
<td>-6</td>
<td>HIS</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P00579</td>
</tr>
<tr>
<td>F</td>
<td>-5</td>
<td>HIS</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P00579</td>
</tr>
<tr>
<td>F</td>
<td>-4</td>
<td>THR</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P00579</td>
</tr>
<tr>
<td>F</td>
<td>-3</td>
<td>ASP</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P00579</td>
</tr>
<tr>
<td>F</td>
<td>-2</td>
<td>GLN</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P00579</td>
</tr>
<tr>
<td>F</td>
<td>-1</td>
<td>PHE</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P00579</td>
</tr>
<tr>
<td>F</td>
<td>0</td>
<td>THR</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P00579</td>
</tr>
</tbody>
</table>

- Molecule 6 is a protein called cAMP-activated global transcriptional regulator CRP.

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>G</td>
<td>197</td>
<td>Total C H N O S</td>
<td>3156 986 1600 273 288 9</td>
<td>0 0</td>
</tr>
<tr>
<td>6</td>
<td>H</td>
<td>197</td>
<td>Total C H N O S</td>
<td>3156 986 1600 273 288 9</td>
<td>0 0</td>
</tr>
</tbody>
</table>

- Molecule 7 is a DNA chain called SYNTHETIC NONTEMPLATE STRAND DNA (78-MER).

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>1</td>
<td>78</td>
<td>Total C H N O P</td>
<td>2481 765 890 264 484 78</td>
<td>0 0</td>
</tr>
</tbody>
</table>

- Molecule 8 is a DNA chain called SYNTHETIC TEMPLATE STRAND DNA (78-MER).

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>2</td>
<td>78</td>
<td>Total C H N O P</td>
<td>2485 767 873 313 454 78</td>
<td>0 0</td>
</tr>
</tbody>
</table>

- Molecule 9 is a RNA chain called Nascent RNA.

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>3</td>
<td>3</td>
<td>Total C H N O P</td>
<td>109 30 32 15 27 5</td>
<td>0 0</td>
</tr>
</tbody>
</table>
• Molecule 10 is ZINC ION (three-letter code: ZN) (formula: Zn) (labeled as "Ligand of Interest" by author).

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>D</td>
<td>2</td>
<td>Total 2 Zn 2 0</td>
<td></td>
</tr>
</tbody>
</table>

• Molecule 11 is MAGNESIUM ION (three-letter code: MG) (formula: Mg) (labeled as "Ligand of Interest" by author).

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>D</td>
<td>1</td>
<td>Total 1 Mg 1 0</td>
<td></td>
</tr>
</tbody>
</table>

• Molecule 12 is ADENOSINE-3',5'-CYCLIC-MONOPHOSPHATE (three-letter code: CMP) (formula: C_{10}H_{12}N_{5}O_{6}P) (labeled as "Ligand of Interest" by author).

![CMP molecule](image)

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>G</td>
<td>1</td>
<td>Total 33 C 10 H 11 N 5 O 6 P 0</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>H</td>
<td>1</td>
<td>Total 33 C 10 H 11 N 5 O 6 P 0</td>
<td></td>
</tr>
</tbody>
</table>
3  Residue-property plots

These plots are drawn for all protein, RNA and DNA 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. 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. 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: DNA-directed RNA polymerase subunit alpha

Chain A:

- Molecule 1: DNA-directed RNA polymerase subunit alpha

Chain B:

- Molecule 2: DNA-directed RNA polymerase subunit beta

Chain C:
- Molecule 3: DNA-directed RNA polymerase subunit beta'

Chain D:
Molecule 4: DNA-directed RNA polymerase subunit omega

Chain E:

Molecule 5: RNA polymerase sigma factor RpoD

Chain F:
- Molecule 6: cAMP-activated global transcriptional regulator CRP

Chain G:

- Molecule 6: cAMP-activated global transcriptional regulator CRP

Chain H:

- Molecule 7: SYNTHETIC NONTEMPLATE STRAND DNA (78-MER)

Chain 1:

- Molecule 8: SYNTHETIC TEMPLATE STRAND DNA (78-MER)

Chain 2:

- Molecule 9: Nascent RNA

Chain 3:
## 4 Experimental information

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM reconstruction method</td>
<td>SINGLE PARTICLE</td>
<td>Depositor</td>
</tr>
<tr>
<td>Imposed symmetry</td>
<td>POINT, Not provided</td>
<td>Depositor</td>
</tr>
<tr>
<td>Number of particles used</td>
<td>33455</td>
<td>Depositor</td>
</tr>
<tr>
<td>Resolution determination method</td>
<td>FSC 0.143 CUT-OFF</td>
<td>Depositor</td>
</tr>
<tr>
<td>CTF correction method</td>
<td>NONE</td>
<td>Depositor</td>
</tr>
<tr>
<td>Microscope</td>
<td>FEI TITAN KRIOS</td>
<td>Depositor</td>
</tr>
<tr>
<td>Voltage (kV)</td>
<td>300</td>
<td>Depositor</td>
</tr>
<tr>
<td>Electron dose ( e^-/\AA^2 )</td>
<td>36</td>
<td>Depositor</td>
</tr>
<tr>
<td>Minimum defocus (nm)</td>
<td>800</td>
<td>Depositor</td>
</tr>
<tr>
<td>Maximum defocus (nm)</td>
<td>2600</td>
<td>Depositor</td>
</tr>
<tr>
<td>Magnification</td>
<td>96000</td>
<td>Depositor</td>
</tr>
<tr>
<td>Image detector</td>
<td>FEI FALCON III (4k x 4k)</td>
<td>Depositor</td>
</tr>
</tbody>
</table>
5 Model quality

5.1 Standard geometry

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

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).

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Bond lengths</th>
<th>Bond angles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>RMSZ</td>
<td>#</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>0.45</td>
<td>0/1808</td>
</tr>
<tr>
<td>1</td>
<td>B</td>
<td>0.42</td>
<td>0/1789</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>0.52</td>
<td>0/10739</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>0.49</td>
<td>0/10553</td>
</tr>
<tr>
<td>4</td>
<td>E</td>
<td>0.33</td>
<td>0/629</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>0.44</td>
<td>0/3982</td>
</tr>
<tr>
<td>6</td>
<td>G</td>
<td>0.40</td>
<td>0/1580</td>
</tr>
<tr>
<td>6</td>
<td>H</td>
<td>0.38</td>
<td>0/1580</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>1.04</td>
<td>1/1777 (0.1%)</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>1.02</td>
<td>2/1815 (0.1%)</td>
</tr>
<tr>
<td>9</td>
<td>3</td>
<td>0.83</td>
<td>0/50</td>
</tr>
<tr>
<td>All</td>
<td>All</td>
<td>0.56</td>
<td>3/36302 (0.0%)</td>
</tr>
</tbody>
</table>

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>#Chirality outliers</th>
<th>#Planarity outliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>B</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>G</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>H</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>All</td>
<td>All</td>
<td>0</td>
<td>45</td>
</tr>
</tbody>
</table>

All (3) bond length outliers are listed below:
## Bond Angle Outliers

All (17) bond angle outliers are listed below:

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Res</th>
<th>Type</th>
<th>Atoms</th>
<th>Z</th>
<th>Observed(Å)</th>
<th>Ideal(Å)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>1</td>
<td>47</td>
<td>DT</td>
<td>C3'-O3'</td>
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## Planarity Outliers

There are no chirality outliers.

All (45) planarity outliers are listed below:

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<tr>
<th>Mol</th>
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<th>Res</th>
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<td>ALA</td>
<td>Peptide</td>
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<td>ARG</td>
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Continued on next page...
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.
The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 11.

All (739) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

<table>
<thead>
<tr>
<th>Atom-1</th>
<th>Atom-2</th>
<th>Interatomic distance (Å)</th>
<th>Clash overlap (Å)</th>
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### Interatomic distances and clash overlap

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<td>5:F:586:ARG:NH2</td>
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<tr>
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<td>3:D:604:MET:HB2</td>
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</tr>
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</tr>
<tr>
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<td>5:F:319:ALA:HB2</td>
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<tr>
<td>2:C:520:PRO:O</td>
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<td>3:D:1028:ILE:CG2</td>
<td>3:D:1120:THR:HG23</td>
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</tbody>
</table>

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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

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

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Analysed</th>
<th>Favoured</th>
<th>Allowed</th>
<th>Outliers</th>
<th>Percentiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>228/329 (69%)</td>
<td>201 (88%)</td>
<td>27 (12%)</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>B</td>
<td>226/329 (69%)</td>
<td>203 (90%)</td>
<td>23 (10%)</td>
<td>0</td>
<td>100</td>
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</tbody>
</table>
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<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Analysed</th>
<th>Favoured</th>
<th>Allowed</th>
<th>Outliers</th>
<th>Percentiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>C</td>
<td>1338/1342 (100%)</td>
<td>1180 (88%)</td>
<td>154 (12%)</td>
<td>4 (0%)</td>
<td>43 80</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>1331/1407 (95%)</td>
<td>1160 (87%)</td>
<td>169 (13%)</td>
<td>2 (0%)</td>
<td>49 84</td>
</tr>
<tr>
<td>4</td>
<td>E</td>
<td>77/91 (85%)</td>
<td>69 (90%)</td>
<td>8 (10%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>479/628 (76%)</td>
<td>414 (86%)</td>
<td>57 (12%)</td>
<td>8 (2%)</td>
<td>10 48</td>
</tr>
<tr>
<td>6</td>
<td>G</td>
<td>195/210 (93%)</td>
<td>178 (91%)</td>
<td>15 (8%)</td>
<td>2 (1%)</td>
<td>17 58</td>
</tr>
<tr>
<td>6</td>
<td>H</td>
<td>195/210 (93%)</td>
<td>181 (93%)</td>
<td>13 (7%)</td>
<td>1 (0%)</td>
<td>31 73</td>
</tr>
<tr>
<td>All</td>
<td>All</td>
<td>4069/4546 (90%)</td>
<td>3586 (88%)</td>
<td>466 (12%)</td>
<td>17 (0%)</td>
<td>40 76</td>
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</table>

All (17) Ramachandran outliers are listed below:

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<td>F</td>
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<td>THR</td>
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<td>PHE</td>
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<td>C</td>
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<td>263</td>
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</tr>
<tr>
<td>5</td>
<td>F</td>
<td>166</td>
<td>VAL</td>
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</table>

5.3.2 Protein sidechains

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

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

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>
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<tbody>
<tr>
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<td>198/286 (69%)</td>
<td>197 (100%)</td>
<td>1 (0%)</td>
<td>90 95</td>
</tr>
<tr>
<td>1</td>
<td>B</td>
<td>196/286 (68%)</td>
<td>196 (100%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>1155/1157 (100%)</td>
<td>1147 (99%)</td>
<td>8 (1%)</td>
<td>85 92</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>1120/1168 (96%)</td>
<td>1107 (99%)</td>
<td>13 (1%)</td>
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<tr>
<td>4</td>
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<td>67/75 (89%)</td>
<td>67 (100%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>5</td>
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<td>429/554 (77%)</td>
<td>419 (98%)</td>
<td>10 (2%)</td>
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</tr>
<tr>
<td>6</td>
<td>G</td>
<td>170/181 (94%)</td>
<td>170 (100%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>6</td>
<td>H</td>
<td>170/181 (94%)</td>
<td>166 (98%)</td>
<td>4 (2%)</td>
<td>52 75</td>
</tr>
<tr>
<td>All</td>
<td>All</td>
<td>3505/3888 (90%)</td>
<td>3469 (99%)</td>
<td>36 (1%)</td>
<td>80 89</td>
</tr>
</tbody>
</table>

All (36) residues with a non-rotameric sidechain 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>12</td>
<td>ARG</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>768</td>
<td>MET</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>903</td>
<td>ARG</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>976</td>
<td>ARG</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>1022</td>
<td>LYS</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>1147</td>
<td>ARG</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>1230</td>
<td>MET</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>1234</td>
<td>LYS</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>1246</td>
<td>ARG</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>50</td>
<td>LYS</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>76</td>
<td>LYS</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>133</td>
<td>ARG</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>214</td>
<td>ARG</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>276</td>
<td>ASN</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>280</td>
<td>LYS</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>424</td>
<td>ASN</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>610</td>
<td>ARG</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>644</td>
<td>MET</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>720</td>
<td>ASN</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>954</td>
<td>ASN</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>1151</td>
<td>LYS</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>1197</td>
<td>ASN</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>93</td>
<td>ARG</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>105</td>
<td>MET</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Res</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>F</td>
<td>309</td>
<td>ASN</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>329</td>
<td>LYS</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>374</td>
<td>ARG</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>451</td>
<td>ARG</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>499</td>
<td>LYS</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>554</td>
<td>ARG</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>557</td>
<td>LYS</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>586</td>
<td>ARG</td>
</tr>
<tr>
<td>6</td>
<td>H</td>
<td>52</td>
<td>LYS</td>
</tr>
<tr>
<td>6</td>
<td>H</td>
<td>87</td>
<td>ARG</td>
</tr>
<tr>
<td>6</td>
<td>H</td>
<td>147</td>
<td>LEU</td>
</tr>
<tr>
<td>6</td>
<td>H</td>
<td>194</td>
<td>ASN</td>
</tr>
</tbody>
</table>

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) 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>2</td>
<td>C</td>
<td>165</td>
<td>HIS</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>799</td>
<td>ASN</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>424</td>
<td>ASN</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>450</td>
<td>HIS</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>954</td>
<td>ASN</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>1279</td>
<td>GLN</td>
</tr>
<tr>
<td>6</td>
<td>G</td>
<td>159</td>
<td>HIS</td>
</tr>
<tr>
<td>6</td>
<td>H</td>
<td>19</td>
<td>HIS</td>
</tr>
</tbody>
</table>

5.3.3 RNA

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Analysed</th>
<th>Backbone Outliers</th>
<th>Pucker Outliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>3</td>
<td>1/3 (33%)</td>
<td>1 (100%)</td>
<td>0</td>
</tr>
</tbody>
</table>

All (1) RNA backbone outliers are listed below:

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Res</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>3</td>
<td>3</td>
<td>G</td>
</tr>
</tbody>
</table>

There are no RNA pucker outliers to report.
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 carbohydrates in this entry.

5.6 Ligand geometry

Of 5 ligands modelled in this entry, 3 are monoatomic - leaving 2 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).

<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>
<td></td>
<td></td>
<td>Counts</td>
<td>RMSZ</td>
</tr>
<tr>
<td>12</td>
<td>CMP</td>
<td>G</td>
<td>301</td>
<td>-</td>
<td>20,25,25</td>
<td>1.43</td>
</tr>
<tr>
<td>12</td>
<td>CMP</td>
<td>H</td>
<td>301</td>
<td>-</td>
<td>20,25,25</td>
<td>1.41</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Mol</th>
<th>Type</th>
<th>Chain</th>
<th>Res</th>
<th>Link</th>
<th>Chirals</th>
<th>Torsions</th>
<th>Rings</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>CMP</td>
<td>G</td>
<td>301</td>
<td>-</td>
<td>0/0/31</td>
<td>0/4/4/4</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>CMP</td>
<td>H</td>
<td>301</td>
<td>-</td>
<td>0/0/31</td>
<td>0/4/4/4</td>
<td></td>
</tr>
</tbody>
</table>

All (6) bond length outliers are listed below:

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Res</th>
<th>Type</th>
<th>Atoms</th>
<th>$Z$</th>
<th>Observed(Å)</th>
<th>Ideal(Å)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>G</td>
<td>301</td>
<td>CMP</td>
<td>P-O3'</td>
<td>3.72</td>
<td>1.64</td>
<td>1.58</td>
</tr>
<tr>
<td>12</td>
<td>H</td>
<td>301</td>
<td>CMP</td>
<td>P-O3'</td>
<td>3.01</td>
<td>1.63</td>
<td>1.58</td>
</tr>
<tr>
<td>12</td>
<td>H</td>
<td>301</td>
<td>CMP</td>
<td>C5-C4</td>
<td>3.01</td>
<td>1.47</td>
<td>1.40</td>
</tr>
<tr>
<td>12</td>
<td>G</td>
<td>301</td>
<td>CMP</td>
<td>C5-C4</td>
<td>3.00</td>
<td>1.47</td>
<td>1.40</td>
</tr>
<tr>
<td>12</td>
<td>H</td>
<td>301</td>
<td>CMP</td>
<td>O5'-C5'</td>
<td>-2.24</td>
<td>1.42</td>
<td>1.46</td>
</tr>
<tr>
<td>12</td>
<td>H</td>
<td>301</td>
<td>CMP</td>
<td>O3'-C3'</td>
<td>-2.01</td>
<td>1.41</td>
<td>1.44</td>
</tr>
</tbody>
</table>
All (11) bond angle outliers are listed below:

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Res</th>
<th>Type</th>
<th>Atoms</th>
<th>Z</th>
<th>Observed(°)</th>
<th>Ideal(°)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>H</td>
<td>301</td>
<td>CMP</td>
<td>N3-C2-N1</td>
<td>-3.63</td>
<td>122.83</td>
<td>128.68</td>
</tr>
<tr>
<td>12</td>
<td>H</td>
<td>301</td>
<td>CMP</td>
<td>C4-C5-N7</td>
<td>-3.13</td>
<td>106.13</td>
<td>109.40</td>
</tr>
<tr>
<td>12</td>
<td>G</td>
<td>301</td>
<td>CMP</td>
<td>N3-C2-N1</td>
<td>-2.90</td>
<td>124.01</td>
<td>128.68</td>
</tr>
<tr>
<td>12</td>
<td>H</td>
<td>301</td>
<td>CMP</td>
<td>O2P-P-O1P</td>
<td>2.89</td>
<td>117.75</td>
<td>108.62</td>
</tr>
<tr>
<td>12</td>
<td>G</td>
<td>301</td>
<td>CMP</td>
<td>O2P-P-O1P</td>
<td>2.81</td>
<td>117.49</td>
<td>108.62</td>
</tr>
<tr>
<td>12</td>
<td>H</td>
<td>301</td>
<td>CMP</td>
<td>O3'-C3'-C2'</td>
<td>2.30</td>
<td>117.86</td>
<td>115.61</td>
</tr>
<tr>
<td>12</td>
<td>G</td>
<td>301</td>
<td>CMP</td>
<td>O5'-P-O3'</td>
<td>2.22</td>
<td>108.86</td>
<td>105.72</td>
</tr>
<tr>
<td>12</td>
<td>H</td>
<td>301</td>
<td>CMP</td>
<td>O5'-P-O3'</td>
<td>2.15</td>
<td>108.77</td>
<td>105.72</td>
</tr>
<tr>
<td>12</td>
<td>H</td>
<td>301</td>
<td>CMP</td>
<td>O5'-C5'-C4'</td>
<td>2.05</td>
<td>110.50</td>
<td>105.71</td>
</tr>
</tbody>
</table>

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 5 short contacts:

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Res</th>
<th>Type</th>
<th>Clashes</th>
<th>Symm-Clashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>G</td>
<td>301</td>
<td>CMP</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>H</td>
<td>301</td>
<td>CMP</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

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.
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.