Full wwPDB/EMDataBank EM Map/Model Validation Report

Feb 10, 2019 – 11:37 AM EST

PDB ID : 6C6S
EMDB ID: : EMD-7349
Title : CryoEM structure of E.coli RNA polymerase elongation complex bound with RfaH
Authors : Kang, J.Y.; Artsimovitch, I.; Landick, R.; Darst, S.A.
Deposited on : 2018-01-19
Resolution : 3.70 Å (reported)

This is a Full wwPDB/EMDataBank EM Map/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 https://www.wwpdb.org/validation/2017/EMValidationReportHelp
with specific help available everywhere you see the symbol.

MolProbity : 4.02b-467
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) : rb-20031633
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

**ELECTRON MICROSCOPY**

The reported resolution of this entry is 3.70 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>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. 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. 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>29</td>
<td>69%</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>29</td>
<td>79%</td>
</tr>
<tr>
<td>3</td>
<td>R</td>
<td>20</td>
<td>5%</td>
</tr>
<tr>
<td>4</td>
<td>G</td>
<td>239</td>
<td>77%</td>
</tr>
<tr>
<td>4</td>
<td>H</td>
<td>239</td>
<td>70%</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>1342</td>
<td>84%</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>1407</td>
<td>77%</td>
</tr>
<tr>
<td>7</td>
<td>K</td>
<td>91</td>
<td>78%</td>
</tr>
</tbody>
</table>

*Continued on next page...*
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<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Length</th>
<th>Quality of chain</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>D</td>
<td>162</td>
<td>34%</td>
</tr>
</tbody>
</table>

25%
2 Entry composition

There are 10 unique types of molecules in this entry. The entry contains 27691 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 DNA chain called DNA (29-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>1</td>
<td>A</td>
<td>29</td>
<td>Total C N O P</td>
<td>598 282 117 171 28</td>
<td>0</td>
</tr>
</tbody>
</table>

- Molecule 2 is a DNA chain called DNA (29-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>2</td>
<td>B</td>
<td>29</td>
<td>Total C N O P</td>
<td>585 279 102 176 28</td>
<td>0</td>
</tr>
</tbody>
</table>

- Molecule 3 is a RNA chain called RNA (5'-R(*GP*CP*AP*UP*UP*CP*AP*AP*AP*GP* CP*CP*GP*AP*GP*AP*GP*GP*UP*A)-3').

<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>R</td>
<td>10</td>
<td>Total C N O P</td>
<td>218 97 43 68 10</td>
<td>0</td>
</tr>
</tbody>
</table>

- Molecule 4 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>4</td>
<td>G</td>
<td>221</td>
<td>Total C N O S</td>
<td>1694 1061 296 331 6</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>H</td>
<td>219</td>
<td>Total C N O S</td>
<td>1687 1053 298 330 6</td>
<td>0</td>
</tr>
</tbody>
</table>

There are 10 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>G</td>
<td>235</td>
<td>GLU</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P0A7Z4</td>
</tr>
<tr>
<td>G</td>
<td>236</td>
<td>VAL</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P0A7Z4</td>
</tr>
<tr>
<td>G</td>
<td>237</td>
<td>LEU</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P0A7Z4</td>
</tr>
<tr>
<td>G</td>
<td>238</td>
<td>PHE</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P0A7Z4</td>
</tr>
<tr>
<td>G</td>
<td>239</td>
<td>GLN</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P0A7Z4</td>
</tr>
<tr>
<td>H</td>
<td>235</td>
<td>GLU</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P0A7Z4</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Chain</th>
<th>Residue</th>
<th>Modeled</th>
<th>Actual</th>
<th>Comment</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>236</td>
<td>VAL</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P0A7Z4</td>
</tr>
<tr>
<td>H</td>
<td>237</td>
<td>LEU</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P0A7Z4</td>
</tr>
<tr>
<td>H</td>
<td>238</td>
<td>PHE</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P0A7Z4</td>
</tr>
<tr>
<td>H</td>
<td>239</td>
<td>GLN</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P0A7Z4</td>
</tr>
</tbody>
</table>

- Molecule 5 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>5</td>
<td>I</td>
<td>1341</td>
<td>Total C N O S</td>
<td>10577 6636 1842 2056 43</td>
<td>0 0</td>
</tr>
</tbody>
</table>

- Molecule 6 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>6</td>
<td>J</td>
<td>1335</td>
<td>Total C N O S</td>
<td>10388 6526 1854 1958 50</td>
<td>0 0</td>
</tr>
</tbody>
</table>

- Molecule 7 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>7</td>
<td>K</td>
<td>83</td>
<td>Total C N O S</td>
<td>655 399 123 132 1</td>
<td>0 0</td>
</tr>
</tbody>
</table>

- Molecule 8 is a protein called Transcription antitermination protein RfaH.

<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>D</td>
<td>161</td>
<td>Total C N O S</td>
<td>1286 828 222 232 4</td>
<td>0 0</td>
</tr>
</tbody>
</table>

- Molecule 9 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>R</td>
<td>1</td>
<td>Total Mg</td>
<td>1 1</td>
</tr>
</tbody>
</table>

- Molecule 10 is ZINC ION (three-letter code: ZN) (formula: Zn).

<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>J</td>
<td>2</td>
<td>Total Zn</td>
<td>2 2</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 (29-MER)

Chain A:

• Molecule 2: DNA (29-MER)

Chain B:

• Molecule 3: RNA (5'-R(*GP*CP*AP*UP*UP*CP*AP*AP*AP*GP*CP*GP*AP*GP*AP*GP*GP*UP*A)-3')

Chain R:

• Molecule 4: DNA-directed RNA polymerase subunit alpha

Chain G:

• Molecule 4: DNA-directed RNA polymerase subunit alpha

Chain H:
• Molecule 5: DNA-directed RNA polymerase subunit beta

Chain I:

• Molecule 6: DNA-directed RNA polymerase subunit beta’

Chain J:
• Molecule 7: DNA-directed RNA polymerase subunit omega

Chain K:

• Molecule 8: Transcription antitermination protein RfaH

Chain D:
## 4 Experimental information

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reconstruction method</td>
<td>SINGLE PARTICLE</td>
<td>Depositor</td>
</tr>
<tr>
<td>Imposed symmetry</td>
<td>POINT, C1</td>
<td>Depositor</td>
</tr>
<tr>
<td>Number of particles used</td>
<td>107500</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>PHASE FLIPPING AND AMPLITUDE CORRECTION</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>71.0</td>
<td>Depositor</td>
</tr>
<tr>
<td>Minimum defocus (nm)</td>
<td>500</td>
<td>Depositor</td>
</tr>
<tr>
<td>Maximum defocus (nm)</td>
<td>3000</td>
<td>Depositor</td>
</tr>
<tr>
<td>Magnification</td>
<td>38462</td>
<td>Depositor</td>
</tr>
<tr>
<td>Image detector</td>
<td>GATAN K2 SUMMIT (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: ZN, MG

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>0.96</td>
<td>0/672</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>1.08</td>
<td>0/653</td>
</tr>
<tr>
<td>3</td>
<td>R</td>
<td>0.94</td>
<td>0/244</td>
</tr>
<tr>
<td>4</td>
<td>G</td>
<td>0.41</td>
<td>0/1714</td>
</tr>
<tr>
<td>4</td>
<td>H</td>
<td>0.37</td>
<td>0/1706</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>0.46</td>
<td>1/10746 (0.0%)</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>0.44</td>
<td>0/10545</td>
</tr>
<tr>
<td>7</td>
<td>K</td>
<td>0.37</td>
<td>0/657</td>
</tr>
<tr>
<td>8</td>
<td>D</td>
<td>0.39</td>
<td>0/1317</td>
</tr>
<tr>
<td>All</td>
<td>All</td>
<td>0.49</td>
<td>1/28254 (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>5</td>
<td>I</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>K</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>All</td>
<td>All</td>
<td>0</td>
<td>9</td>
</tr>
</tbody>
</table>

All (1) 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>5</td>
<td>I</td>
<td>550</td>
<td>VAL</td>
<td>C-N</td>
<td>-5.64</td>
<td>1.21</td>
<td>1.34</td>
</tr>
</tbody>
</table>

All (8) bond angle outliers are listed below:
There are no chirality outliers.

All (9) planarity outliers are listed below:

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Res</th>
<th>Type</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>I</td>
<td>1157</td>
<td>GLN</td>
<td>Peptide</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>1158</td>
<td>LYS</td>
<td>Peptide</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>594</td>
<td>VAL</td>
<td>Peptide</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>595</td>
<td>THR</td>
<td>Peptide</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>1184</td>
<td>ASP</td>
<td>Peptide</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>1326</td>
<td>GLN</td>
<td>Peptide</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>313</td>
<td>GLY</td>
<td>Peptide</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>416</td>
<td>ILE</td>
<td>Peptide</td>
</tr>
<tr>
<td>7</td>
<td>K</td>
<td>32</td>
<td>VAL</td>
<td>Peptide</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Non-H</th>
<th>H(model)</th>
<th>H(added)</th>
<th>Clashes</th>
<th>Symm-Clashes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>598</td>
<td>0</td>
<td>325</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>585</td>
<td>0</td>
<td>328</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>R</td>
<td>218</td>
<td>0</td>
<td>109</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>G</td>
<td>1694</td>
<td>0</td>
<td>1722</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>H</td>
<td>1687</td>
<td>0</td>
<td>1722</td>
<td>36</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>10577</td>
<td>0</td>
<td>10590</td>
<td>124</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>10388</td>
<td>0</td>
<td>10611</td>
<td>147</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>K</td>
<td>655</td>
<td>0</td>
<td>663</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>D</td>
<td>1286</td>
<td>0</td>
<td>1303</td>
<td>28</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>R</td>
<td>1</td>
<td>0</td>
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<td>0</td>
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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 6.

All (345) 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>
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<td>2.18</td>
<td>0.43</td>
</tr>
<tr>
<td>4:H:89:ALA:HB1</td>
<td>4:H:210:THR:HG23</td>
<td>2.00</td>
<td>0.43</td>
</tr>
<tr>
<td>6:J:975:ILE:HD12</td>
<td>6:J:997:VAL:HG11</td>
<td>2.00</td>
<td>0.43</td>
</tr>
<tr>
<td>5:I:1184:THR:HG23</td>
<td>5:I:1190:ALA:H</td>
<td>1.83</td>
<td>0.42</td>
</tr>
<tr>
<td>5:I:360:LEU:HD13</td>
<td>5:I:378:ARG:HH11</td>
<td>1.84</td>
<td>0.42</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Atom-1</th>
<th>Atom-2</th>
<th>Interatomic distance (Å)</th>
<th>Clash overlap (Å)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5:I:626:GLU:HB3</td>
<td>5:I:628:HIS:HD2</td>
<td>1.84</td>
<td>0.42</td>
</tr>
<tr>
<td>5:I:800:MET:HE3</td>
<td>5:I:800:MET:HB2</td>
<td>1.88</td>
<td>0.42</td>
</tr>
<tr>
<td>8:D:111:TYR:HB2</td>
<td>8:D:114:ASP:OD2</td>
<td>2.20</td>
<td>0.42</td>
</tr>
<tr>
<td>4:G:7:GLU:O</td>
<td>4:H:150:ARG:NH2</td>
<td>2.52</td>
<td>0.42</td>
</tr>
<tr>
<td>6:J:244:VAL:HG23</td>
<td>6:J:244:VAL:O</td>
<td>2.18</td>
<td>0.42</td>
</tr>
<tr>
<td>5:I:255:ILE:HB</td>
<td>5:I:263:VAL:O</td>
<td>2.20</td>
<td>0.42</td>
</tr>
<tr>
<td>5:I:75:LEU:HD21</td>
<td>5:I:127:ILE:HD11</td>
<td>2.00</td>
<td>0.42</td>
</tr>
<tr>
<td>5:I:373:GLY:HA2</td>
<td>8:D:83:ALA:HB1</td>
<td>2.01</td>
<td>0.42</td>
</tr>
<tr>
<td>5:I:618:GLN:HG3</td>
<td>6:J:770:LEU:HD13</td>
<td>2.01</td>
<td>0.42</td>
</tr>
<tr>
<td>5:I:689:ALA:HB3</td>
<td>5:I:796:LEU:HD23</td>
<td>2.02</td>
<td>0.42</td>
</tr>
<tr>
<td>6:J:553:THR:HG23</td>
<td>6:J:567:THR:HB</td>
<td>2.02</td>
<td>0.42</td>
</tr>
<tr>
<td>8:D:116:VAL:HG12</td>
<td>8:D:161:LYS:HA</td>
<td>2.01</td>
<td>0.42</td>
</tr>
<tr>
<td>4:R:14:A:H2'</td>
<td>2:B:16:DA:C8</td>
<td>2.55</td>
<td>0.41</td>
</tr>
<tr>
<td>6:J:1346:GLY:O</td>
<td>6:J:1350:ASN:ND2</td>
<td>2.53</td>
<td>0.41</td>
</tr>
<tr>
<td>3:R:12:C:H2'</td>
<td>3:R:13:G:C8</td>
<td>2.55</td>
<td>0.41</td>
</tr>
<tr>
<td>5:I:690:VAL:HG21</td>
<td>5:I:832:HIS:HE2</td>
<td>1.85</td>
<td>0.41</td>
</tr>
<tr>
<td>6:J:365:GLN:HA</td>
<td>6:J:438:GLU:H</td>
<td>1.84</td>
<td>0.41</td>
</tr>
<tr>
<td>5:I:559:CYS:HA</td>
<td>5:I:560:PRO:HD3</td>
<td>1.85</td>
<td>0.41</td>
</tr>
<tr>
<td>6:J:1274:PHE:HE1</td>
<td>6:J:1280:VAL:HG21</td>
<td>1.86</td>
<td>0.41</td>
</tr>
<tr>
<td>6:J:139:LEU:HA</td>
<td>6:J:181:GLY:HA2</td>
<td>2.02</td>
<td>0.41</td>
</tr>
<tr>
<td>6:J:516:ASP:HB3</td>
<td>6:J:573:THR:HG21</td>
<td>2.01</td>
<td>0.41</td>
</tr>
<tr>
<td>4:G:32:GLU:OE1</td>
<td>4:H:150:ARG:NH1</td>
<td>2.53</td>
<td>0.41</td>
</tr>
<tr>
<td>4:H:178:SER:HA</td>
<td>4:H:179:PRO:HD3</td>
<td>1.95</td>
<td>0.41</td>
</tr>
<tr>
<td>6:J:968:ASN:HB3</td>
<td>6:J:1118:GLY:HA3</td>
<td>2.02</td>
<td>0.41</td>
</tr>
<tr>
<td>6:J:1357:ILE:HG22</td>
<td>6:J:1359:ALA:H</td>
<td>1.86</td>
<td>0.41</td>
</tr>
<tr>
<td>3:R:14:A:H2'</td>
<td>3:R:15:G:C8</td>
<td>2.56</td>
<td>0.41</td>
</tr>
<tr>
<td>8:D:38:ILE:HD13</td>
<td>8:D:156:ASN:HB3</td>
<td>2.03</td>
<td>0.41</td>
</tr>
<tr>
<td>5:I:1247:SER:OG</td>
<td>5:I:1248:THR:N</td>
<td>2.54</td>
<td>0.41</td>
</tr>
</tbody>
</table>

*Continued on next page...*
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>4</td>
<td>G</td>
<td>217/239 (91%)</td>
<td>201 (93%)</td>
<td>15 (7%)</td>
<td>1 (0%)</td>
<td>31 71</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>Favoured</th>
<th>Allowed</th>
<th>Outliers</th>
<th>Percentiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>H</td>
<td>215/239 (90%)</td>
<td>201 (94%)</td>
<td>14 (6%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>1339/1342 (100%)</td>
<td>1229 (92%)</td>
<td>107 (8%)</td>
<td>3 (0%)</td>
<td>49 83</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>1329/1407 (94%)</td>
<td>1215 (91%)</td>
<td>113 (8%)</td>
<td>1 (0%)</td>
<td>53 87</td>
</tr>
<tr>
<td>7</td>
<td>K</td>
<td>81/91 (89%)</td>
<td>75 (93%)</td>
<td>6 (7%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>8</td>
<td>D</td>
<td>159/162 (98%)</td>
<td>135 (85%)</td>
<td>23 (14%)</td>
<td>1 (1%)</td>
<td>27 68</td>
</tr>
<tr>
<td>All</td>
<td>All</td>
<td>3340/3480 (96%)</td>
<td>3056 (92%)</td>
<td>278 (8%)</td>
<td>6 (0%)</td>
<td>53 83</td>
</tr>
</tbody>
</table>

All (6) Ramachandran outliers are listed below:

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Res</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>I</td>
<td>596</td>
<td>ASP</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>1158</td>
<td>LYS</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>805</td>
<td>GLN</td>
</tr>
<tr>
<td>4</td>
<td>G</td>
<td>119</td>
<td>GLY</td>
</tr>
<tr>
<td>8</td>
<td>D</td>
<td>52</td>
<td>PRO</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>597</td>
<td>GLY</td>
</tr>
</tbody>
</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.

<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>4</td>
<td>G</td>
<td>186/206 (90%)</td>
<td>186 (100%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>4</td>
<td>H</td>
<td>187/206 (91%)</td>
<td>186 (100%)</td>
<td>1 (0%)</td>
<td>90 96</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>1156/1157 (100%)</td>
<td>1154 (100%)</td>
<td>2 (0%)</td>
<td>94 98</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>1120/1168 (96%)</td>
<td>1114 (100%)</td>
<td>6 (0%)</td>
<td>90 96</td>
</tr>
<tr>
<td>7</td>
<td>K</td>
<td>70/75 (93%)</td>
<td>70 (100%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>8</td>
<td>D</td>
<td>141/142 (99%)</td>
<td>141 (100%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>All</td>
<td>All</td>
<td>2860/2954 (97%)</td>
<td>2851 (100%)</td>
<td>9 (0%)</td>
<td>93 97</td>
</tr>
</tbody>
</table>

All (9) residues with a non-rotameric sidechain are listed below:
Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (19) 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>4</td>
<td>H</td>
<td>12</td>
<td>ARG</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>817</td>
<td>LEU</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>1159</td>
<td>VAL</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>53</td>
<td>ARG</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>60</td>
<td>ARG</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>709</td>
<td>ARG</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>836</td>
<td>ARG</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>1268</td>
<td>ASN</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>1373</td>
<td>ARG</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Res</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>H</td>
<td>128</td>
<td>HIS</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>69</td>
<td>GLN</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>580</td>
<td>GLN</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>604</td>
<td>HIS</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>760</td>
<td>ASN</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>1116</td>
<td>HIS</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>1157</td>
<td>GLN</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>1236</td>
<td>ASN</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>1313</td>
<td>HIS</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>365</td>
<td>GLN</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>424</td>
<td>ASN</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>450</td>
<td>HIS</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>489</td>
<td>ASN</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>665</td>
<td>GLN</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>777</td>
<td>HIS</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>805</td>
<td>GLN</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>1268</td>
<td>ASN</td>
</tr>
<tr>
<td>6</td>
<td>J</td>
<td>1326</td>
<td>GLN</td>
</tr>
<tr>
<td>8</td>
<td>D</td>
<td>20</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>3</td>
<td>R</td>
<td>9/20 (45%)</td>
<td>1 (11%)</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>3</td>
<td>R</td>
<td>12</td>
<td>C</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 3 ligands modelled in this entry, 3 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.
There are no bond angle outliers.
There are no chirality outliers.
There are no torsion outliers.
There are no ring outliers.
No monomer is involved in short contacts.

### 5.7 Other polymers

There are no such residues in this entry.

### 5.8 Polymer linkage issues

There are no chain breaks in this entry.