Aug 16, 2018 – 04:40 PM EDT

PDB ID : 6GMH
EMDB ID: : EMD-0031
Title : Structure of activated transcription complex Pol II-DSIF-PAF-SPT6
Authors : Vos, S.M.; Farnung, L.; Boehing, M.; Linden, A.; Wigge, C.; Urlaub, H.; Cramer, P.
Deposited on : 2018-05-26
Resolution : 3.10 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 i symbol.

MolProbity : 4.02b-467
Mogul : 1.7.3 (157068), CSD as539be (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) : rb-20031172
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 3.10 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>EM structures (#Entries)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clashescore</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 $\geq 3$, 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 $\leq 5\%$.

<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>1970</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>1174</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>275</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>D</td>
<td>142</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>E</td>
<td>210</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>127</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>G</td>
<td>172</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>H</td>
<td>150</td>
<td></td>
</tr>
</tbody>
</table>

Continued on next page...
## Quality of chain

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Length</th>
<th>Quality of chain</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>I</td>
<td>125</td>
<td>85% 9% 6%</td>
</tr>
<tr>
<td>10</td>
<td>J</td>
<td>67</td>
<td>84% 16%</td>
</tr>
<tr>
<td>11</td>
<td>K</td>
<td>117</td>
<td>83% 15%</td>
</tr>
<tr>
<td>12</td>
<td>L</td>
<td>58</td>
<td>71% 9% 21%</td>
</tr>
<tr>
<td>13</td>
<td>M</td>
<td>1726</td>
<td>56% 42%</td>
</tr>
<tr>
<td>14</td>
<td>N</td>
<td>48</td>
<td>71% 6% 23%</td>
</tr>
<tr>
<td>15</td>
<td>P</td>
<td>46</td>
<td>17% 22% 7% 54%</td>
</tr>
<tr>
<td>16</td>
<td>Q</td>
<td>1178</td>
<td>72% 25%</td>
</tr>
<tr>
<td>17</td>
<td>T</td>
<td>48</td>
<td>75% 23%</td>
</tr>
<tr>
<td>18</td>
<td>U</td>
<td>776</td>
<td>14% 86%</td>
</tr>
<tr>
<td>19</td>
<td>V</td>
<td>613</td>
<td>13% 87%</td>
</tr>
<tr>
<td>20</td>
<td>W</td>
<td>305</td>
<td>88% 10%</td>
</tr>
<tr>
<td>21</td>
<td>X</td>
<td>16</td>
<td>100%</td>
</tr>
<tr>
<td>22</td>
<td>Y</td>
<td>121</td>
<td>87% 9%</td>
</tr>
<tr>
<td>23</td>
<td>Z</td>
<td>1087</td>
<td>39% 6% 55%</td>
</tr>
</tbody>
</table>
2 Entry composition

There are 25 unique types of molecules in this entry. The entry contains 50239 atoms, of which 0 are hydrogens and 0 are deuteriums.

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

- Molecule 1 is a protein called RPB1.

<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>1441</td>
<td>Total</td>
<td>C</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>11371</td>
<td>7151</td>
<td>2033</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>B</td>
<td>1132</td>
<td>Total</td>
<td>C</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9052</td>
<td>5725</td>
<td>1592</td>
</tr>
</tbody>
</table>

- Molecule 3 is a protein called RNA polymerase II subunit C.

<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>C</td>
<td>263</td>
<td>Total</td>
<td>C</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2115</td>
<td>1324</td>
<td>365</td>
</tr>
</tbody>
</table>

- Molecule 4 is a protein called RNA polymerase II subunit D.

<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>D</td>
<td>126</td>
<td>Total</td>
<td>C</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1004</td>
<td>630</td>
<td>170</td>
</tr>
</tbody>
</table>

- Molecule 5 is a protein called RNA polymerase II subunit E.

<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>E</td>
<td>209</td>
<td>Total</td>
<td>C</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1720</td>
<td>1089</td>
<td>300</td>
</tr>
</tbody>
</table>

- Molecule 6 is a protein called RNA polymerase II subunit F.

<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>F</td>
<td>82</td>
<td>Total</td>
<td>C</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>657</td>
<td>418</td>
<td>113</td>
</tr>
</tbody>
</table>
• Molecule 7 is a protein called RNA polymerase II subunit G.

<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>G</td>
<td>171</td>
<td>Total C N O S</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1333 866 214 245 8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• Molecule 8 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC3.

<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>H</td>
<td>148</td>
<td>Total C N O S</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1186 750 194 237 5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• Molecule 9 is a protein called DNA-directed RNA polymerase II subunit RPB9.

<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>I</td>
<td>117</td>
<td>Total C N O S</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>949 587 169 182 11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• Molecule 10 is a protein called RPB10.

<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>10</td>
<td>J</td>
<td>67</td>
<td>Total C N O S</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>533 345 90 92 6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• Molecule 11 is a protein called RPB11.

<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>11</td>
<td>K</td>
<td>115</td>
<td>Total C N O S</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>920 593 152 173 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• Molecule 12 is a protein called RPB12.

<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>12</td>
<td>L</td>
<td>46</td>
<td>Total C N O S</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>388 241 75 66 6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• Molecule 13 is a protein called Transcription elongation factor SPT6, Transcription elongation factor SPT6, Transcription elongation factor SPT6.

<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>13</td>
<td>M</td>
<td>1002</td>
<td>Total C N O S</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4737 2583 1071 1076 7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There are 3 discrepancies between the modelled and reference sequences:
<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>M</td>
<td>-2</td>
<td>SER</td>
<td>-</td>
<td>expression tag</td>
<td>UNP Q7KZ85</td>
</tr>
<tr>
<td>M</td>
<td>-1</td>
<td>ASN</td>
<td>-</td>
<td>expression tag</td>
<td>UNP Q7KZ85</td>
</tr>
<tr>
<td>M</td>
<td>0</td>
<td>ALA</td>
<td>-</td>
<td>expression tag</td>
<td>UNP Q7KZ85</td>
</tr>
</tbody>
</table>

- Molecule 14 is a DNA chain called Non-template DNA.

<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>14</td>
<td>N</td>
<td>37</td>
<td>Total C N O P 773 361 158 217 37</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- Molecule 15 is a RNA chain called 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>15</td>
<td>P</td>
<td>21</td>
<td>Total C N O P 452 202 87 142 21</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- Molecule 16 is a protein called CTR9,RNA polymerase-associated protein CTR9 homolog,RNA polymerase-associated protein CTR9 homolog.

<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>16</td>
<td>Q</td>
<td>884</td>
<td>Total C N O S 4116 2199 953 961 3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

There are 5 discrepancies between the modelled and reference sequences:

<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>Q</td>
<td>1174</td>
<td>GLU</td>
<td>-</td>
<td>expression tag</td>
<td>UNP Q6PD62</td>
</tr>
<tr>
<td>Q</td>
<td>1175</td>
<td>ASN</td>
<td>-</td>
<td>expression tag</td>
<td>UNP Q6PD62</td>
</tr>
<tr>
<td>Q</td>
<td>1176</td>
<td>LEU</td>
<td>-</td>
<td>expression tag</td>
<td>UNP Q6PD62</td>
</tr>
<tr>
<td>Q</td>
<td>1177</td>
<td>TYR</td>
<td>-</td>
<td>expression tag</td>
<td>UNP Q6PD62</td>
</tr>
<tr>
<td>Q</td>
<td>1178</td>
<td>GLN</td>
<td>-</td>
<td>expression tag</td>
<td>UNP Q6PD62</td>
</tr>
</tbody>
</table>

- Molecule 17 is a DNA chain called Template DNA.

<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>17</td>
<td>T</td>
<td>48</td>
<td>Total C N O P 974 462 168 296 48</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- Molecule 18 is a protein called LEO1,LEO1,RNA polymerase-associated protein LEO1.
- Molecule 19 is a protein called PAF1, RNA polymerase II-associated factor 1 homolog, RNA polymerase II-associated factor 1 homolog.

<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>19</td>
<td>V</td>
<td>81</td>
<td>Total C N O</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>AltConf</th>
<th>Trace</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>V</td>
<td>81</td>
<td>Total C N O</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- Molecule 20 is a protein called WD repeat-containing protein 61.

<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>20</td>
<td>W</td>
<td>300</td>
<td>Total C N O S</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- Molecule 21 is a protein called CDC73.

<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>21</td>
<td>X</td>
<td>16</td>
<td>Total C N O</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- Molecule 22 is a protein called Transcription elongation factor SPT4.

<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>22</td>
<td>Y</td>
<td>116</td>
<td>Total C N O S</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

There are 4 discrepancies between the modelled and reference sequences:

<table>
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<th>Chain</th>
<th>Residue</th>
<th>Modelled</th>
<th>Actual</th>
<th>Comment</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>-3</td>
<td>GLY</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P63272</td>
</tr>
<tr>
<td>Y</td>
<td>-2</td>
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<td>-</td>
<td>expression tag</td>
<td>UNP P63272</td>
</tr>
<tr>
<td>Y</td>
<td>-1</td>
<td>GLY</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P63272</td>
</tr>
<tr>
<td>Y</td>
<td>0</td>
<td>SER</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P63272</td>
</tr>
</tbody>
</table>

- Molecule 23 is a protein called Transcription elongation factor SPT5.

<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>23</td>
<td>Z</td>
<td>486</td>
<td>Total C N O S</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
- Molecule 24 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>24</td>
<td>J</td>
<td>1</td>
<td>Total Zn 1 1</td>
<td>0</td>
</tr>
<tr>
<td>24</td>
<td>B</td>
<td>1</td>
<td>Total Zn 1 1</td>
<td>0</td>
</tr>
<tr>
<td>24</td>
<td>I</td>
<td>2</td>
<td>Total Zn 2 2</td>
<td>0</td>
</tr>
<tr>
<td>24</td>
<td>C</td>
<td>1</td>
<td>Total Zn 1 1</td>
<td>0</td>
</tr>
<tr>
<td>24</td>
<td>A</td>
<td>2</td>
<td>Total Zn 2 2</td>
<td>0</td>
</tr>
<tr>
<td>24</td>
<td>Y</td>
<td>1</td>
<td>Total Zn 1 1</td>
<td>0</td>
</tr>
<tr>
<td>24</td>
<td>L</td>
<td>1</td>
<td>Total Zn 1 1</td>
<td>0</td>
</tr>
</tbody>
</table>

- Molecule 25 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>25</td>
<td>A</td>
<td>1</td>
<td>Total Mg 1 1</td>
<td>0</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: RPB1

Chain A:

[Sequence diagram showing residue properties]
- **Molecule 2**: DNA-directed RNA polymerase subunit beta

  **Chain B:**

  ![Chain B Diagram]

  - ![Threading Details]

- **Molecule 3**: RNA polymerase II subunit C

  **Chain C:**

  ![Chain C Diagram]

  - ![Threading Details]

- **Molecule 4**: RNA polymerase II subunit D

  ![Chain D Diagram]
Chain D:

- Molecule 5: RNA polymerase II subunit E

Chain E:

- Molecule 6: RNA polymerase II subunit F

Chain F:

- Molecule 7: RNA polymerase II subunit G

Chain G:

- Molecule 8: DNA-directed RNA polymerases I, II, and III subunit RPABC3

Chain H:

- Molecule 9: DNA-directed RNA polymerase II subunit RPB9

Chain I:

- Molecule 10: RPB10
Chain J:

- Molecule 11: RPB11

Chain K:

- Molecule 12: RPB12

Chain L:

- Molecule 13: Transcription elongation factor SPT6

Chain M:
• Molecule 14: Non-template DNA

Chain N:

• Molecule 15: RNA

Chain P:

• Molecule 16: CTR9, RNA polymerase-associated protein CTR9 homolog, RNA polymerase-associated protein CTR9 homolog

Chain Q:

• Molecule 17: Template DNA
Chain T:

- Molecule 18: LEO1,LEO1,RNA polymerase-associated protein LEO1

Chain U:

- Molecule 19: PAF1,RNA polymerase II-associated factor 1 homolog,RNA polymerase II-associated factor 1 homolog

Chain V:
There are no outlier residues recorded for this chain.

- Molecule 21: CDC73

- Molecule 22: Transcription elongation factor SPT4

- Molecule 23: Transcription elongation factor SPT5
# Experimental information

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>Source</th>
</tr>
</thead>
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<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>374964</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^-/Å^2))</td>
<td>40</td>
<td>Depositor</td>
</tr>
<tr>
<td>Minimum defocus (nm)</td>
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<tr>
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<td>Depositor</td>
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<tr>
<td>Magnification</td>
<td>130000</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: TPO, ZN, MG, SEP.

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>
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<td></td>
<td>RMSZ</td>
<td>#</td>
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<td>0.38</td>
<td>0/11558</td>
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<tr>
<td>10</td>
<td>J</td>
<td>0.42</td>
<td>0/542</td>
</tr>
<tr>
<td>11</td>
<td>K</td>
<td>0.40</td>
<td>0/939</td>
</tr>
<tr>
<td>12</td>
<td>L</td>
<td>0.41</td>
<td>0/394</td>
</tr>
<tr>
<td>13</td>
<td>M</td>
<td>0.26</td>
<td>0/4724</td>
</tr>
<tr>
<td>14</td>
<td>N</td>
<td>0.59</td>
<td>0/870</td>
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<td>15</td>
<td>P</td>
<td>0.44</td>
<td>0/506</td>
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<td>Q</td>
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<td>0/2923</td>
</tr>
<tr>
<td>17</td>
<td>T</td>
<td>0.64</td>
<td>0/1087</td>
</tr>
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<td>2</td>
<td>B</td>
<td>0.41</td>
<td>0/9232</td>
</tr>
<tr>
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<td>8</td>
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<td>All</td>
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<td>0/49176</td>
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</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>2</td>
</tr>
<tr>
<td>13</td>
<td>M</td>
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<td>3</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>#Chirality outliers</th>
<th>#Planarity outliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>C</td>
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</tr>
<tr>
<td>5</td>
<td>E</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>G</td>
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<td>1</td>
</tr>
<tr>
<td>All</td>
<td>All</td>
<td>0</td>
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</table>

There are no bond length outliers.

All (14) bond angle outliers are listed below:

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<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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<tr>
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<td>E</td>
<td>120</td>
<td>ASP</td>
<td>CB-CG-OD1</td>
<td>8.67</td>
<td>126.11</td>
<td>118.30</td>
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<td>11</td>
<td>K</td>
<td>80</td>
<td>ASP</td>
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<td>124.99</td>
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</tr>
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<td>P</td>
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<td>G</td>
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<td>128.05</td>
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<tr>
<td>15</td>
<td>P</td>
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<td>G</td>
<td>C8-N9-C1'</td>
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<tr>
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<td>LEU</td>
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<td>B</td>
<td>492</td>
<td>ASP</td>
<td>CB-CG-OD1</td>
<td>6.35</td>
<td>124.02</td>
<td>118.30</td>
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<tr>
<td>15</td>
<td>P</td>
<td>32</td>
<td>G</td>
<td>C8-N9-C1'</td>
<td>-5.81</td>
<td>119.44</td>
<td>127.00</td>
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<td>128.56</td>
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<tr>
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<td>B</td>
<td>556</td>
<td>ILE</td>
<td>C-N-CA</td>
<td>5.50</td>
<td>135.52</td>
<td>121.70</td>
</tr>
<tr>
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<td>A</td>
<td>1257</td>
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<td>CA-CB-CG</td>
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<td>127.94</td>
<td>115.30</td>
</tr>
<tr>
<td>17</td>
<td>T</td>
<td>33</td>
<td>DC</td>
<td>OP1-P-O3'</td>
<td>5.29</td>
<td>116.84</td>
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<td>P</td>
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<td>G</td>
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<td>P</td>
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<td>G</td>
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</tbody>
</table>

There are no chirality outliers.

All (12) planarity outliers are listed below:

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<td>A</td>
<td>538</td>
<td>VAL</td>
<td>Peptide</td>
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<tr>
<td>2</td>
<td>B</td>
<td>629</td>
<td>GLU</td>
<td>Peptide</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>71</td>
<td>ALA</td>
<td>Peptide</td>
</tr>
<tr>
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<td>B</td>
<td>98</td>
<td>HIS</td>
<td>Peptide</td>
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<tr>
<td>3</td>
<td>C</td>
<td>91</td>
<td>GLU</td>
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<td>E</td>
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<tr>
<td>5</td>
<td>E</td>
<td>57</td>
<td>ASP</td>
<td>Peptide</td>
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<tr>
<td>7</td>
<td>G</td>
<td>124</td>
<td>ASN</td>
<td>Peptide</td>
</tr>
<tr>
<td>13</td>
<td>M</td>
<td>1145</td>
<td>ASN</td>
<td>Peptide</td>
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<td>M</td>
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<td>M</td>
<td>1252</td>
<td>ARG</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>
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<td>554</td>
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<tr>
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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 5.

All (495) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.
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<thead>
<tr>
<th>Atom-1</th>
<th>Atom-2</th>
<th>Interatomic distance (Å)</th>
<th>Clash overlap (Å)</th>
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<tbody>
<tr>
<td>1:A:313:HIS:HA</td>
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</tr>
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</tr>
<tr>
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</tr>
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</tr>
<tr>
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<tr>
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</tr>
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<tr>
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<td>8:H:71:ASP:OD1</td>
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</tr>
<tr>
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<td>5:E:183:PHE:O</td>
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<tr>
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</tr>
<tr>
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<td>2:B:891:ASP:HA</td>
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</tr>
<tr>
<td>2:B:801:VAL:HG13</td>
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</tr>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
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</tr>
<tr>
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</tr>
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<td>2:B:525:ASN:HD2</td>
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</tr>
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<td>2:B:754:PRO:HG2</td>
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</tr>
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</tr>
<tr>
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</tr>
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<td>2:B:616:THR:HG23</td>
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</tr>
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<td>2:B:726:SER:HB3</td>
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<td>1:A:570:TRP:O</td>
<td>11:K:26:LYS:NZ</td>
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<td>0.41</td>
</tr>
<tr>
<td>1:A:59:ASP:HB3</td>
<td>1:A:62:GLN:HB2</td>
<td>2.02</td>
<td>0.41</td>
</tr>
<tr>
<td>17:T:27:DT:H2'</td>
<td>17:T:28:DG:H8</td>
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<td>0.41</td>
</tr>
<tr>
<td>1:A:1117:VAL:HG23</td>
<td>1:A:1119:LEU:HG</td>
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</tr>
<tr>
<td>1:A:876:ASP:HB2</td>
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<td>0.41</td>
</tr>
<tr>
<td>13:M:749:LEU:O</td>
<td>13:M:753:LEU:N</td>
<td>2.54</td>
<td>0.41</td>
</tr>
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</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>
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<td>20:W:182:LEU:HD22</td>
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<td>1:A:1548:PRO:HD3</td>
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</tr>
<tr>
<td>2:B:67:LEU:HD11</td>
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</tr>
<tr>
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<td>5:E:137:ILE:HD12</td>
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<td>0.41</td>
</tr>
<tr>
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</tr>
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<td>1:A:1338:THR:HG22</td>
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</tr>
<tr>
<td>1:A:1132:LYS:HE3</td>
<td>1:A:1363:VAL:HG11</td>
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<td>0.41</td>
</tr>
<tr>
<td>1:A:126:ILE:HD11</td>
<td>1:A:147:LEU:HD22</td>
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</tr>
<tr>
<td>1:A:935:GLN:HB2</td>
<td>1:A:938:LEU:HD13</td>
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</tr>
<tr>
<td>2:B:903:ILE:O</td>
<td>2:B:924:ARG:N</td>
<td>2.54</td>
<td>0.41</td>
</tr>
<tr>
<td>7:G:93:ASN:HB3</td>
<td>7:G:96:GLY:H</td>
<td>1.85</td>
<td>0.41</td>
</tr>
<tr>
<td>23:Z:420:PHE:CD1</td>
<td>23:Z:470:LYS:HE3</td>
<td>2.56</td>
<td>0.41</td>
</tr>
<tr>
<td>1:A:610:PRO:HG2</td>
<td>1:A:613:GLU:HB2</td>
<td>2.03</td>
<td>0.41</td>
</tr>
<tr>
<td>2:B:807:ARG:NH1</td>
<td>3:C:66:HIS:CD2</td>
<td>2.89</td>
<td>0.41</td>
</tr>
<tr>
<td>3:C:84:TYR:CZ</td>
<td>3:C:167:LYS:HE3</td>
<td>2.56</td>
<td>0.41</td>
</tr>
<tr>
<td>4:D:111:SER:HB2</td>
<td>4:D:131:LEU:HD21</td>
<td>2.02</td>
<td>0.41</td>
</tr>
<tr>
<td>1:A:983:LEU:HD23</td>
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<td>1.89</td>
<td>0.41</td>
</tr>
<tr>
<td>1:A:1443:ALA:HB2</td>
<td>2:B:1167:ILE:HG23</td>
<td>2.02</td>
<td>0.41</td>
</tr>
<tr>
<td>2:B:956:PHE:HB3</td>
<td>2:B:962:THR:HG22</td>
<td>2.03</td>
<td>0.41</td>
</tr>
<tr>
<td>4:D:104:CYS:SG</td>
<td>4:D:135:GLN:NE2</td>
<td>2.93</td>
<td>0.41</td>
</tr>
<tr>
<td>1:A:141:LEU:HD13</td>
<td>1:A:1445:HIS:HE1</td>
<td>1.86</td>
<td>0.40</td>
</tr>
<tr>
<td>1:A:1546:PHE:HB3</td>
<td>13:M:1515:TYR:CE1</td>
<td>2.56</td>
<td>0.40</td>
</tr>
<tr>
<td>1:A:465:HIS:CD2</td>
<td>1:A:467:MET:HB2</td>
<td>2.57</td>
<td>0.40</td>
</tr>
<tr>
<td>2:B:556:ILE:H</td>
<td>2:B:556:ILE:HG13</td>
<td>1.61</td>
<td>0.40</td>
</tr>
<tr>
<td>2:B:561:ILE:HD11</td>
<td>2:B:573:TRP:HH2</td>
<td>1.86</td>
<td>0.40</td>
</tr>
<tr>
<td>3:C:13:GLU:HB3</td>
<td>3:C:20:LYS:HB3</td>
<td>2.02</td>
<td>0.40</td>
</tr>
<tr>
<td>2:B:86:LEU:HD23</td>
<td>2:B:130:LYS:HB3</td>
<td>2.03</td>
<td>0.40</td>
</tr>
<tr>
<td>3:C:189:ASP:O</td>
<td>3:C:191:ALA:N</td>
<td>2.55</td>
<td>0.40</td>
</tr>
<tr>
<td>1:A:859:TYR:OH</td>
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<td>0.40</td>
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<tr>
<td>12:L:16:ILE:HG12</td>
<td>12:L:27:GLU:HG2</td>
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<td>0.40</td>
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<tr>
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<tr>
<td>2:B:998:ASP:OD2</td>
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<td>2.21</td>
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<td>3:C:175:LYS:H2</td>
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</tr>
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<td>1:A:54:LEU:CB</td>
<td>1:A:61:ARG:HH12</td>
<td>2.31</td>
<td>0.40</td>
</tr>
</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>1425/1970 (72%)</td>
<td>1340 (94%)</td>
<td>82 (6%)</td>
<td>3 (0%)</td>
<td>49 81</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>1122/1174 (96%)</td>
<td>1062 (95%)</td>
<td>59 (5%)</td>
<td>1 (0%)</td>
<td>53 85</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>259/275 (94%)</td>
<td>245 (95%)</td>
<td>14 (5%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>4</td>
<td>D</td>
<td>124/124 (87%)</td>
<td>122 (98%)</td>
<td>2 (2%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>5</td>
<td>E</td>
<td>207/210 (99%)</td>
<td>199 (96%)</td>
<td>7 (3%)</td>
<td>1 (0%)</td>
<td>31 68</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>80/127 (63%)</td>
<td>78 (98%)</td>
<td>2 (2%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>7</td>
<td>G</td>
<td>169/172 (98%)</td>
<td>165 (98%)</td>
<td>4 (2%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>8</td>
<td>H</td>
<td>146/150 (97%)</td>
<td>135 (92%)</td>
<td>11 (8%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>9</td>
<td>I</td>
<td>115/125 (92%)</td>
<td>107 (93%)</td>
<td>8 (7%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>10</td>
<td>J</td>
<td>65/67 (97%)</td>
<td>64 (98%)</td>
<td>1 (2%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>11</td>
<td>K</td>
<td>113/117 (97%)</td>
<td>109 (96%)</td>
<td>4 (4%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>12</td>
<td>L</td>
<td>44/58 (76%)</td>
<td>38 (86%)</td>
<td>6 (14%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>13</td>
<td>M</td>
<td>970/1726 (56%)</td>
<td>918 (95%)</td>
<td>52 (5%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>16</td>
<td>Q</td>
<td>581/1178 (49%)</td>
<td>555 (96%)</td>
<td>25 (4%)</td>
<td>1 (0%)</td>
<td>49 81</td>
</tr>
<tr>
<td>20</td>
<td>W</td>
<td>298/305 (98%)</td>
<td>278 (93%)</td>
<td>20 (7%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>22</td>
<td>Y</td>
<td>114/121 (94%)</td>
<td>114 (100%)</td>
<td>0</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>23</td>
<td>Z</td>
<td>476/1087 (44%)</td>
<td>466 (98%)</td>
<td>9 (2%)</td>
<td>1 (0%)</td>
<td>49 81</td>
</tr>
<tr>
<td>All</td>
<td>All</td>
<td>6308/9004 (70%)</td>
<td>5995 (95%)</td>
<td>306 (5%)</td>
<td>7 (0%)</td>
<td>56 85</td>
</tr>
</tbody>
</table>
All (7) Ramachandran outliers are listed below:

<table>
<thead>
<tr>
<th>Mol</th>
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<th>Res</th>
<th>Type</th>
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<tbody>
<tr>
<td>5</td>
<td>E</td>
<td>57</td>
<td>ASP</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>911</td>
<td>PRO</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>492</td>
<td>ASP</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>540</td>
<td>ASP</td>
</tr>
<tr>
<td>23</td>
<td>Z</td>
<td>506</td>
<td>LEU</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>121</td>
<td>SER</td>
</tr>
<tr>
<td>16</td>
<td>Q</td>
<td>301</td>
<td>VAL</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>1</td>
<td>A</td>
<td>1257/1747 (72%)</td>
<td>1242 (99%)</td>
<td>15 (1%)</td>
<td>74 90</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>992/1027 (97%)</td>
<td>985 (99%)</td>
<td>7 (1%)</td>
<td>85 94</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>240/252 (95%)</td>
<td>239 (100%)</td>
<td>1 (0%)</td>
<td>92 96</td>
</tr>
<tr>
<td>4</td>
<td>D</td>
<td>109/126 (86%)</td>
<td>108 (99%)</td>
<td>1 (1%)</td>
<td>81 92</td>
</tr>
<tr>
<td>5</td>
<td>E</td>
<td>191/192 (100%)</td>
<td>189 (99%)</td>
<td>2 (1%)</td>
<td>78 91</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>71/111 (64%)</td>
<td>69 (97%)</td>
<td>2 (3%)</td>
<td>47 77</td>
</tr>
<tr>
<td>7</td>
<td>G</td>
<td>146/153 (95%)</td>
<td>141 (97%)</td>
<td>5 (3%)</td>
<td>40 73</td>
</tr>
<tr>
<td>8</td>
<td>H</td>
<td>129/131 (98%)</td>
<td>129 (100%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>9</td>
<td>I</td>
<td>105/112 (94%)</td>
<td>105 (100%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>10</td>
<td>J</td>
<td>56/56 (100%)</td>
<td>56 (100%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>11</td>
<td>K</td>
<td>104/106 (98%)</td>
<td>104 (100%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>12</td>
<td>L</td>
<td>43/55 (78%)</td>
<td>43 (100%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>13</td>
<td>M</td>
<td>154/1514 (10%)</td>
<td>153 (99%)</td>
<td>1 (1%)</td>
<td>87 94</td>
</tr>
<tr>
<td>16</td>
<td>Q</td>
<td>121/752 (16%)</td>
<td>120 (99%)</td>
<td>1 (1%)</td>
<td>83 93</td>
</tr>
<tr>
<td>20</td>
<td>W</td>
<td>255/260 (98%)</td>
<td>254 (100%)</td>
<td>1 (0%)</td>
<td>92 96</td>
</tr>
<tr>
<td>22</td>
<td>Y</td>
<td>102/105 (97%)</td>
<td>102 (100%)</td>
<td>0</td>
<td>100 100</td>
</tr>
<tr>
<td>23</td>
<td>Z</td>
<td>427/940 (45%)</td>
<td>426 (100%)</td>
<td>1 (0%)</td>
<td>94 97</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>All</td>
<td>All</td>
<td>4502/7639 (59%)</td>
<td>4465 (99%)</td>
<td>37 (1%)</td>
<td>84, 93</td>
</tr>
</tbody>
</table>

All (37) 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>58</td>
<td>MET</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>117</td>
<td>LEU</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>134</td>
<td>LYS</td>
</tr>
<tr>
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<td>A</td>
<td>292</td>
<td>ARG</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>309</td>
<td>LEU</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>410</td>
<td>ASN</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>557</td>
<td>ARG</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>744</td>
<td>ILE</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>760</td>
<td>LEU</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>928</td>
<td>ARG</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>1194</td>
<td>ASN</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>1213</td>
<td>ARG</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>1248</td>
<td>ASN</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>1375</td>
<td>ARG</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>1484</td>
<td>MET</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>83</td>
<td>ARG</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>638</td>
<td>ARG</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>770</td>
<td>ARG</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>1080</td>
<td>ARG</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>1091</td>
<td>ARG</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>1104</td>
<td>ARG</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>1120</td>
<td>ASN</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>263</td>
<td>LEU</td>
</tr>
<tr>
<td>4</td>
<td>D</td>
<td>48</td>
<td>ASN</td>
</tr>
<tr>
<td>5</td>
<td>E</td>
<td>52</td>
<td>ARG</td>
</tr>
<tr>
<td>5</td>
<td>E</td>
<td>94</td>
<td>MET</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>62</td>
<td>ARG</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>123</td>
<td>LEU</td>
</tr>
<tr>
<td>7</td>
<td>G</td>
<td>53</td>
<td>ASN</td>
</tr>
<tr>
<td>7</td>
<td>G</td>
<td>78</td>
<td>ARG</td>
</tr>
<tr>
<td>7</td>
<td>G</td>
<td>93</td>
<td>ASN</td>
</tr>
<tr>
<td>7</td>
<td>G</td>
<td>108</td>
<td>ILE</td>
</tr>
<tr>
<td>7</td>
<td>G</td>
<td>110</td>
<td>ARG</td>
</tr>
<tr>
<td>13</td>
<td>M</td>
<td>1515</td>
<td>TYR</td>
</tr>
<tr>
<td>16</td>
<td>Q</td>
<td>775</td>
<td>ASN</td>
</tr>
<tr>
<td>20</td>
<td>W</td>
<td>237</td>
<td>ASN</td>
</tr>
<tr>
<td>23</td>
<td>Z</td>
<td>338</td>
<td>ARG</td>
</tr>
</tbody>
</table>
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>313</td>
<td>HIS</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>678</td>
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<td>GLN</td>
</tr>
<tr>
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<td>A</td>
<td>861</td>
<td>GLN</td>
</tr>
<tr>
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<td>A</td>
<td>884</td>
<td>ASN</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>1005</td>
<td>HIS</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>1082</td>
<td>HIS</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>1108</td>
<td>HIS</td>
</tr>
<tr>
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<td>A</td>
<td>1182</td>
<td>GLN</td>
</tr>
<tr>
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<td>A</td>
<td>1194</td>
<td>ASN</td>
</tr>
<tr>
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<td>A</td>
<td>1220</td>
<td>HIS</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>1248</td>
<td>ASN</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>23</td>
<td>GLN</td>
</tr>
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<td>B</td>
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<td>B</td>
<td>344</td>
<td>GLN</td>
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<td>B</td>
<td>1120</td>
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</tr>
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<td>D</td>
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<td>5</td>
<td>E</td>
<td>95</td>
<td>GLN</td>
</tr>
<tr>
<td>7</td>
<td>G</td>
<td>53</td>
<td>ASN</td>
</tr>
<tr>
<td>7</td>
<td>G</td>
<td>93</td>
<td>ASN</td>
</tr>
<tr>
<td>9</td>
<td>I</td>
<td>22</td>
<td>ASN</td>
</tr>
<tr>
<td>9</td>
<td>I</td>
<td>41</td>
<td>ASN</td>
</tr>
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<td>13</td>
<td>M</td>
<td>1365</td>
<td>ASN</td>
</tr>
<tr>
<td>13</td>
<td>M</td>
<td>1514</td>
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<td>Q</td>
<td>756</td>
<td>ASN</td>
</tr>
<tr>
<td>16</td>
<td>Q</td>
<td>775</td>
<td>ASN</td>
</tr>
<tr>
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<td>W</td>
<td>126</td>
<td>HIS</td>
</tr>
<tr>
<td>20</td>
<td>W</td>
<td>189</td>
<td>HIS</td>
</tr>
<tr>
<td>20</td>
<td>W</td>
<td>221</td>
<td>HIS</td>
</tr>
<tr>
<td>20</td>
<td>W</td>
<td>273</td>
<td>HIS</td>
</tr>
<tr>
<td>22</td>
<td>Y</td>
<td>12</td>
<td>HIS</td>
</tr>
<tr>
<td>23</td>
<td>Z</td>
<td>272</td>
<td>ASN</td>
</tr>
<tr>
<td>23</td>
<td>Z</td>
<td>519</td>
<td>GLN</td>
</tr>
</tbody>
</table>

5.3.3 RNA ①
All (8) 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>15</td>
<td>P</td>
<td>27</td>
<td>A</td>
</tr>
<tr>
<td>15</td>
<td>P</td>
<td>29</td>
<td>C</td>
</tr>
<tr>
<td>15</td>
<td>P</td>
<td>30</td>
<td>C</td>
</tr>
<tr>
<td>15</td>
<td>P</td>
<td>31</td>
<td>G</td>
</tr>
<tr>
<td>15</td>
<td>P</td>
<td>33</td>
<td>A</td>
</tr>
<tr>
<td>15</td>
<td>P</td>
<td>36</td>
<td>G</td>
</tr>
<tr>
<td>15</td>
<td>P</td>
<td>37</td>
<td>G</td>
</tr>
<tr>
<td>15</td>
<td>P</td>
<td>39</td>
<td>A</td>
</tr>
</tbody>
</table>

All (3) RNA pucker outliers are listed below:

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Res</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>P</td>
<td>28</td>
<td>A</td>
</tr>
<tr>
<td>15</td>
<td>P</td>
<td>36</td>
<td>G</td>
</tr>
<tr>
<td>15</td>
<td>P</td>
<td>38</td>
<td>G</td>
</tr>
</tbody>
</table>

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

2 non-standard protein/DNA/RNA residues are modelled in this entry.

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

<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>1</td>
<td>TPO</td>
<td>A</td>
<td>1525</td>
<td>1</td>
<td>9,10,11</td>
<td>1.54</td>
</tr>
<tr>
<td>1</td>
<td>SEP</td>
<td>A</td>
<td>1547</td>
<td>1,13</td>
<td>9,9,10</td>
<td>2.19</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.
All (4) 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>1</td>
<td>A</td>
<td>1525</td>
<td>TPO</td>
<td>CA-C</td>
<td>2.07</td>
<td>1.53</td>
<td>1.50</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>1525</td>
<td>TPO</td>
<td>P-O1P</td>
<td>3.08</td>
<td>1.61</td>
<td>1.50</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>1547</td>
<td>SEP</td>
<td>P-O1P</td>
<td>3.40</td>
<td>1.62</td>
<td>1.50</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>1547</td>
<td>SEP</td>
<td>CA-C</td>
<td>4.72</td>
<td>1.56</td>
<td>1.50</td>
</tr>
</tbody>
</table>

All (4) 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>1</td>
<td>A</td>
<td>1525</td>
<td>TPO</td>
<td>P-OG1-CB</td>
<td>-5.99</td>
<td>105.11</td>
<td>123.21</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>1547</td>
<td>SEP</td>
<td>P-OG-CB</td>
<td>-5.94</td>
<td>101.94</td>
<td>118.30</td>
</tr>
<tr>
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<td>A</td>
<td>1525</td>
<td>TPO</td>
<td>O-C-CA</td>
<td>-2.03</td>
<td>120.36</td>
<td>125.09</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>1547</td>
<td>SEP</td>
<td>OG-CB-CA</td>
<td>2.40</td>
<td>110.53</td>
<td>108.17</td>
</tr>
</tbody>
</table>

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 3 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>1</td>
<td>A</td>
<td>1525</td>
<td>TPO</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>A</td>
<td>1547</td>
<td>SEP</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

5.5 Carbohydrates

There are no carbohydrates in this entry.

5.6 Ligand geometry

Of 10 ligands modelled in this entry, 10 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

The following chains have linkage breaks:

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Number of breaks</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>V</td>
<td>3</td>
</tr>
<tr>
<td>18</td>
<td>U</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>M</td>
<td>1</td>
</tr>
</tbody>
</table>

All chain breaks are listed below:

<table>
<thead>
<tr>
<th>Model</th>
<th>Chain</th>
<th>Residue-1</th>
<th>Atom-1</th>
<th>Residue-2</th>
<th>Atom-2</th>
<th>Distance (Å)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>C</td>
<td>498:UNK</td>
<td>N</td>
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</tr>
<tr>
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<td>V</td>
<td>293:UNK</td>
<td>C</td>
<td>307:UNK</td>
<td>N</td>
<td>14.62</td>
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<td>429:UNK</td>
<td>C</td>
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<td>9.56</td>
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<tr>
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<td>C</td>
<td>285:UNK</td>
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</tr>
<tr>
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<td>C</td>
<td>1338:ILE</td>
<td>N</td>
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<td>C</td>
<td>416:UNK</td>
<td>N</td>
<td>3.22</td>
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