PDB ID : 5GM6
EMDB ID: EMD-9524
Title : Cryo-EM structure of the activated spliceosome (Bact complex) at 3.5 angstrom resolution
Authors : Yan, C.; Wan, R.; Bai, R.; Huang, G.; Shi, Y.
Deposited on : 2016-07-12
Resolution : 3.50 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
with specific help available everywhere you see the ı 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) : trunk30686
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 3.50 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>
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<td>1886</td>
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<tr>
<td>Ramachandran outliers</td>
<td>132675</td>
<td>1663</td>
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<tr>
<td>Sidechain outliers</td>
<td>132484</td>
<td>1531</td>
</tr>
<tr>
<td>RNA backbone</td>
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<td>458</td>
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</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 \(< 5\%\)

<table>
<thead>
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Continued on next page...
### Quality of Chain Validation

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<td>876</td>
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<tr>
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<td>p</td>
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<td>24%</td>
</tr>
<tr>
<td>34</td>
<td>q</td>
<td>503</td>
<td>71%</td>
</tr>
<tr>
<td>34</td>
<td>r</td>
<td>503</td>
<td>23%</td>
</tr>
<tr>
<td>35</td>
<td>t</td>
<td>175</td>
<td>81%</td>
</tr>
<tr>
<td>36</td>
<td>n</td>
<td>455</td>
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</tr>
<tr>
<td>37</td>
<td>k</td>
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<tr>
<td>38</td>
<td>i</td>
<td>94</td>
<td>74%</td>
</tr>
<tr>
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<td>h</td>
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<td>78%</td>
</tr>
<tr>
<td>40</td>
<td>j</td>
<td>77</td>
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</tr>
<tr>
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<td>l</td>
<td>101</td>
<td>77%</td>
</tr>
<tr>
<td>42</td>
<td>m</td>
<td>146</td>
<td>52%</td>
</tr>
<tr>
<td>43</td>
<td>g</td>
<td>94</td>
<td>93%</td>
</tr>
</tbody>
</table>
2 Entry composition

There are 47 unique types of molecules in this entry. The entry contains 112064 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 Pre-mRNA-splicing factor 8.

<table>
<thead>
<tr>
<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
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</thead>
<tbody>
<tr>
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<td>A</td>
<td>2200</td>
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<td>0</td>
<td>0</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>18101 11636 3086 3315 64</td>
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</tbody>
</table>

There is a discrepancy 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>A</td>
<td>127</td>
<td>ALA</td>
<td>-</td>
<td>expression tag</td>
<td>UNP P33334</td>
</tr>
</tbody>
</table>

• Molecule 2 is a protein called Pre-mRNA-splicing helicase BRR2.

<table>
<thead>
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<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
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</thead>
<tbody>
<tr>
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<td>0</td>
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<tr>
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<td></td>
<td></td>
<td>14504 9283 2414 2750 57</td>
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</tbody>
</table>

• Molecule 3 is a protein called Pre-mRNA-splicing factor SNU114.

<table>
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<th>Mol</th>
<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
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<th>Trace</th>
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</thead>
<tbody>
<tr>
<td>3</td>
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<td>Total C N O S</td>
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<td>0</td>
</tr>
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<td></td>
<td>7014 4526 1166 1293 29</td>
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</tbody>
</table>

• Molecule 4 is a RNA chain called Saccharomyces cerevisiae strain CDRDR_sf_H chromosome VII sequence.

<table>
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<th>Chain</th>
<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
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<tbody>
<tr>
<td>4</td>
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<td>117</td>
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<td>0</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>2465 1104 414 830 117</td>
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</tr>
</tbody>
</table>

• Molecule 5 is a RNA chain called Saccharomyces cerevisiae strain T.52_2H chromosome XII sequence.

<table>
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<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>103</td>
<td>Total C N O P</td>
<td>0</td>
<td>0</td>
</tr>
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<td></td>
<td></td>
<td>2192 982 391 716 103</td>
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</table>
• Molecule 6 is a protein called Pre-mRNA-splicing factor RSE1.

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<th>Atoms</th>
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<tbody>
<tr>
<td>6</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>9380   5996 1580 1753 51</td>
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• Molecule 7 is a protein called Cold sensitive U2 snRNA suppressor 1.

<table>
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<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
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</thead>
<tbody>
<tr>
<td>7</td>
<td>H</td>
<td>151</td>
<td>Total C N O S</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1248 804 217 221 6</td>
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• Molecule 8 is a protein called Pre-mRNA-splicing factor PRP11.

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<th>Residues</th>
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<th>AltConf</th>
<th>Trace</th>
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</thead>
<tbody>
<tr>
<td>8</td>
<td>I</td>
<td>102</td>
<td>Total C N O S</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>800   495 150 150 5</td>
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<td>0</td>
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• Molecule 9 is a protein called Pre-mRNA-splicing factor RDS3.

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<th>Trace</th>
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<tr>
<td>9</td>
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<td>103</td>
<td>Total C N O S</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>814   503 154 143 14</td>
<td>0</td>
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• Molecule 10 is a protein called RDS3 complex subunit 10.

<table>
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<th>Atoms</th>
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<tr>
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<td></td>
<td></td>
<td>693   429 130 132 2</td>
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• Molecule 11 is a RNA chain called U2 snRNA.

<table>
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<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>L</td>
<td>66</td>
<td>Total C N O P</td>
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<td></td>
</tr>
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<td></td>
<td>1388 622 228 472 66</td>
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</tbody>
</table>

• Molecule 12 is a RNA chain called Pre-mRNA.

<table>
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<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>N</td>
<td>25</td>
<td>Total C N O P</td>
<td></td>
<td></td>
</tr>
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<td></td>
<td>521   234 77 185 25</td>
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• Molecule 13 is a RNA chain called Pre-mRNA.
<table>
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<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
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</thead>
<tbody>
<tr>
<td>13</td>
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<td></td>
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<td>1057 479 191 338 49</td>
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- Molecule 14 is a protein called Pre-mRNA-splicing factor PRP46.

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<th>Trace</th>
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<tbody>
<tr>
<td>14</td>
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<td></td>
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<tr>
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<td></td>
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<td>2646 1669 466 501 10</td>
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- Molecule 15 is a protein called Pre-mRNA-processing protein 45.

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<th>Atoms</th>
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<td></td>
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<td></td>
<td></td>
<td>1978 1233 359 380 6</td>
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- Molecule 16 is a protein called Pre-mRNA-splicing factor SLT11.

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<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Q</td>
<td>185</td>
<td>Total C N O S</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1472 930 256 271 15</td>
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<td>0</td>
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- Molecule 17 is a protein called Pre-mRNA-splicing factor CWC2.

<table>
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<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
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</thead>
<tbody>
<tr>
<td>17</td>
<td>R</td>
<td>261</td>
<td>Total C N O S</td>
<td></td>
<td></td>
</tr>
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<td></td>
<td></td>
<td>2089 1320 369 388 12</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

- Molecule 18 is a protein called Pre-mRNA-splicing factor CWC15.

<table>
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<th>Atoms</th>
<th>AltConf</th>
<th>Trace</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>S</td>
<td>71</td>
<td>Total C N O S</td>
<td></td>
<td></td>
</tr>
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<td></td>
<td>578 361 117 99 1</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

- Molecule 19 is a protein called Pre-mRNA-splicing factor BUD31.

<table>
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<th>Residues</th>
<th>Atoms</th>
<th>AltConf</th>
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<tbody>
<tr>
<td>19</td>
<td>T</td>
<td>157</td>
<td>Total C N O S</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td>1291 808 240 232 11</td>
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- Molecule 20 is a protein called Pre-mRNA leakage protein 1.
There are 3 discrepancies between the modelled and reference sequences:

<table>
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<tr>
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<th>Actual</th>
<th>Comment</th>
<th>Reference</th>
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<td>-</td>
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<td>UNP Q07930</td>
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<td>HIS</td>
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- Molecule 21 is a protein called U2 snRNP component IST3.

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<tr>
<td>21</td>
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- Molecule 22 is a protein called Pre-mRNA-splicing factor CWC26.

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<tr>
<td>22</td>
<td>W</td>
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- Molecule 23 is a protein called Pre-mRNA-splicing factor ATP-dependent RNA helicase-like protein PRP2.

<table>
<thead>
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<th>Chain</th>
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<th>Atoms</th>
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<th>Trace</th>
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<tbody>
<tr>
<td>23</td>
<td>Y</td>
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<td>Total C N O S</td>
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- Molecule 24 is a protein called Pre-mRNA-splicing factor CWC22.

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<tr>
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- Molecule 25 is a protein called Pre-mRNA-splicing factor CWC24.

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<tr>
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- Molecule 26 is a protein called Peptidyl-prolyl isomerase CWC27.
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<tbody>
<tr>
<td>26</td>
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<td></td>
<td></td>
<td>1224 789 206 223 6</td>
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- Molecule 27 is a protein called Pre-mRNA-splicing factor CEF1.

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<td>2803 1741 518 537 7</td>
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- Molecule 28 is a protein called U2 snRNP component HSH155.

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<td>6970 4467 1196 1265 42</td>
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- Molecule 29 is a protein called Pre-mRNA-splicing factor CLF1.

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<td>3558 2212 671 667 8</td>
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- Molecule 30 is a protein called Pre-mRNA-splicing factor CWC21.

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<td>190 112 38 40</td>
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- Molecule 31 is a protein called Pre-mRNA-splicing factor SYF1.

<table>
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<td>3047 1871 576 599 1</td>
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- Molecule 32 is a protein called Protein HSH49.

<table>
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<td>947 617 154 174 2</td>
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- Molecule 33 is a protein called Pre-mRNA-splicing factor SYF2.
• Molecule 34 is a protein called Pre-mRNA-processing factor 19.

<table>
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<tr>
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<td>822 504 152 165 1</td>
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<table>
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<td></td>
<td></td>
<td>819 518 132 167 2</td>
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<table>
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<tbody>
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<td>0</td>
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<td></td>
<td></td>
<td></td>
<td>843 533 136 172 2</td>
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<td>2315 1456 396 455 8</td>
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<td>0</td>
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<td></td>
<td></td>
<td>823 521 133 167 2</td>
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• Molecule 35 is a protein called Pre-mRNA-splicing factor SNT309.

<table>
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<td>921 582 159 179 1</td>
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• Molecule 36 is a protein called Pre-mRNA-processing factor 17.

<table>
<thead>
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<th>Chain</th>
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<tbody>
<tr>
<td>36</td>
<td>n</td>
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<td></td>
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<td>195 122 41 32</td>
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• Molecule 37 is a protein called Small nuclear ribonucleoprotein-associated protein B.

<table>
<thead>
<tr>
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<tbody>
<tr>
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<tr>
<td></td>
<td></td>
<td></td>
<td>631 403 114 111 3</td>
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</tr>
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</table>

• Molecule 38 is a protein called Small nuclear ribonucleoprotein E.

<table>
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<tr>
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<tr>
<td>38</td>
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<td></td>
<td></td>
<td>575 379 92 101 3</td>
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• Molecule 39 is a protein called Small nuclear ribonucleoprotein F.
• Molecule 40 is a protein called Small nuclear ribonucleoprotein G.

<table>
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<tr>
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<td>554 355 98 100 1</td>
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• Molecule 41 is a protein called Small nuclear ribonucleoprotein Sm D3.

<table>
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<td></td>
<td></td>
<td>625 399 109 115 2</td>
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• Molecule 42 is a protein called Small nuclear ribonucleoprotein Sm D1.

<table>
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</tr>
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<td></td>
<td></td>
<td>644 409 110 123 2</td>
<td></td>
<td></td>
</tr>
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</table>

• Molecule 43 is a protein called Small nuclear ribonucleoprotein Sm D2.

<table>
<thead>
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<tbody>
<tr>
<td>43</td>
<td>g</td>
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<td></td>
<td></td>
<td>741 477 141 119 4</td>
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</table>

• Molecule 44 is GUANOSINE-5'-TRIPHOSPHATE (three-letter code: GTP) (formula: C_{10}H_{16}N_{5}O_{14}P_{3}).
Molecule 45 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Molecule 46 is ZINC ION (three-letter code: ZN) (formula: Zn).
- Molecule 47 is ADENOSINE-5’-DIPHOSPHATE (three-letter code: ADP) (formula: C_{10}H_{15}N_{5}O_{10}P_{2}).
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: Pre-mRNA-splicing factor 8

Chain A:
• Molecule 2: Pre-mRNA-splicing helicase BRR2

Chain B:
• Molecule 3: Pre-mRNA-splicing factor SNU114

Chain C:

• Molecule 4: Saccharomyces cerevisiae strain CDRDR_sf_H chromosome VII sequence

Chain D:
• Molecule 5: Saccharomyces cerevisiae strain T.52_2H chromosome XII sequence

Chain E:

• Molecule 6: Pre-mRNA-splicing factor RSE1

Chain F:
- Molecule 7: Cold sensitive U2 snRNA suppressor 1

Chain H:

- Molecule 8: Pre-mRNA-splicing factor PRP11

Chain I:
• Molecule 9: Pre-mRNA-splicing factor RDS3

Chain J:

• Molecule 10: RDS3 complex subunit 10

Chain K:

• Molecule 11: U2 snRNA

Chain L:
• Molecule 12: Pre-mRNA

Chain N:

• Molecule 13: Pre-mRNA

Chain M:

• Molecule 14: Pre-mRNA-splicing factor PRP46

Chain O:
• Molecule 15: Pre-mRNA-processing protein 45

Chain P:

Chain Q:

• Molecule 16: Pre-mRNA-splicing factor SLT11

Chain R:

• Molecule 17: Pre-mRNA-splicing factor CWC2
### Chain S:

- **Molecule 18:** Pre-mRNA-splicing factor CWC15

### Chain T:

- **Molecule 19:** Pre-mRNA-splicing factor BUD31

### Chain U:

- **Molecule 20:** Pre-mRNA leakage protein 1

### Chain V:

- **Molecule 21:** U2 snRNP component IST3
• Molecule 22: Pre-mRNA-splicing factor CWC26

Chain W:

• Molecule 23: Pre-mRNA-splicing factor ATP-dependent RNA helicase-like protein PRP2

Chain Y:
• Molecule 24: Pre-mRNA-splicing factor CWC22

Chain Z:

• Molecule 25: Pre-mRNA-splicing factor CWC24

Chain a:

• Molecule 26: Peptidyl-prolyl isomerase CWC27

Chain b:

• Molecule 27: Pre-mRNA-splicing factor CEF1
Chain c:

- Molecule 28: U2 snRNP component HSH155

Chain G:

- Molecule 29: Pre-mRNA-splicing factor CLF1

Chain d:
• Molecule 30: Pre-mRNA-splicing factor CWC21

Chain X:

• Molecule 31: Pre-mRNA-splicing factor SYF1

Chain v:

• Molecule 32: Protein HSH49

Chain e:
• Molecule 33: Pre-mRNA-splicing factor SYF2

Chain f:

47% 53%

• Molecule 34: Pre-mRNA-processing factor 19

Chain o:

23% 75%

• Molecule 34: Pre-mRNA-processing factor 19

Chain p:

24% 75%
• Molecule 34: Pre-mRNA-processing factor 19

Chain q:

• Molecule 34: Pre-mRNA-processing factor 19

Chain r:
• Molecule 35: Pre-mRNA-splicing factor SNT309

Chain t:

• Molecule 36: Pre-mRNA-processing factor 17

Chain n:

• Molecule 37: Small nuclear ribonucleoprotein-associated protein B

Chain k:

• Molecule 38: Small nuclear ribonucleoprotein E
Chain i:

- Molecule 39: Small nuclear ribonucleoprotein F

Chain h:

- Molecule 40: Small nuclear ribonucleoprotein G

Chain j:

- Molecule 41: Small nuclear ribonucleoprotein Sm D3

Chain l:

- Molecule 42: Small nuclear ribonucleoprotein Sm D1

Chain m:

- Molecule 43: Small nuclear ribonucleoprotein Sm D2
### Experimental information

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<th>Value</th>
<th>Source</th>
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<td>Depositor</td>
</tr>
<tr>
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<td>POINT, Not provided</td>
<td>Depositor</td>
</tr>
<tr>
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<td>Resolution determination method</td>
<td>FSC 0.143 CUT-OFF</td>
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<td>CTF correction method</td>
<td>PHASE FLIPPING AND AMPLITUDE CORRECTION</td>
<td>Depositor</td>
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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, ADP

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

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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.

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</tr>
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<th>Ideal(Å)</th>
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5.2 Too-close contacts

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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 18.

All (3326) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

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1:A:695:LEU:HD12 | 1:A:695:LEU:O | 2.16 | 0.45
3:C:178:LEU:HD12 | 3:C:214:ASP:HB2 | 1.97 | 0.45
3:C:237:ILE:HD13 | 3:C:253:ILE:HG22 | 1.99 | 0.45
6:F:1191:ASN:ND2 | 6:F:1316:LYS:HB2 | 2.31 | 0.45
6:F:509:LYS:HE3 | 6:F:890:GLU:OE2 | 2.16 | 0.45
12:N:113:U:O4' | 17:R:183:PHE:CE2 | 2.69 | 0.45
1:A:1561:LEU:HD11 | 1:A:1608:LEU:CD2 | 2.44 | 0.45
1:A:296:THR:CG2 | 4:D:33:U:OP2 | 2.64 | 0.45
1:A:774:ILE:HD12 | 1:A:775:ARG:H | 1.74 | 0.45
2:B:162:ILE:O | 2:B:166:LYS:N | 2.48 | 0.45
2:B:593:ARG:HD2 | 2:B:596:ARG:HD3 | 1.99 | 0.45
14:O:201:SER:OG | 14:O:202:GLU:N | 2.50 | 0.45
16:Q:209:ASN:CG | 16:Q:288:ILE:O | 2.54 | 0.45
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2:B:717:LYS:HA | 2:B:720:LYS:HB3 | 1.97 | 0.45
3:C:861:ILE:HG21 | 3:C:905:GLN:HB3 | 1.98 | 0.45
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### Atom-1 vs Atom-2

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15:P:52:GLU:OE1 | 15:P:52:GLU:HA | 2.19 | 0.42
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1:A:1286:TRP:HB2 | 1:A:1300:ALA:HB3 | 2.00 | 0.42
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2:B:759:ASN:O | 2:B:762:ALA:N | 2.52 | 0.42
3:C:545:LEU:O | 3:C:545:LEU:HD12 | 2.19 | 0.42
4:D:103:A:O2 | 4:D:104:G:HH5 | 2.19 | 0.42
1:A:744:THR:HG22 | 5:E:75:A:OP1 | 2.18 | 0.42
6:F:1336:PHE:O | 6:F:1339:LYS:HG3 | 2.20 | 0.42
28:G:581:LYS:O | 28:G:585:ALA:N | 2.52 | 0.42
23:Y:277:GLN:HB2 | 23:Y:283:ALA:HB2 | 2.01 | 0.42
24:Z:105:GLN:HG3 | 24:Z:113:SER:HB2 | 2.01 | 0.42
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1:A:589:THR:HG21 | 17:R:38:SER:OG | 2.19 | 0.42
1:A:803:GLY:O | 15:P:166:PRO:HG3 | 2.19 | 0.42
1:A:992:ASP:OD1 | 1:A:1085:LYS:NZ | 2.52 | 0.42
2:B:1214:SER:HB3 | 2:B:1281:GLN:NE2 | 2.33 | 0.42
2:B:1564:LEU:HD21 | 2:B:1597:ALA:HB1 | 2.01 | 0.42
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There are no symmetry-related clashes.
### 5.3 Torsion angles

#### 5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all 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.

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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.

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### 5.3.3 RNA

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All (83) RNA backbone outliers are listed below:

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All (7) RNA pucker outliers are listed below:

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<tr>
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<td>515</td>
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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 20 ligands modelled in this entry, 18 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).

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<th>Bond angles</th>
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</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.

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All (9) bond angle outliers are listed below:

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<td>C4-C5-N7</td>
<td>-3.11</td>
<td>106.40</td>
<td>109.41</td>
</tr>
<tr>
<td>44</td>
<td>C</td>
<td>1500</td>
<td>GTP</td>
<td>C6-N1-C2</td>
<td>3.26</td>
<td>120.75</td>
<td>116.06</td>
</tr>
<tr>
<td>44</td>
<td>C</td>
<td>1500</td>
<td>GTP</td>
<td>C2-N3-C4</td>
<td>5.80</td>
<td>121.93</td>
<td>115.16</td>
</tr>
</tbody>
</table>

There are no chirality outliers.
There are no torsion outliers.
There are no ring outliers.

2 monomers are involved in 6 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>44</td>
<td>C</td>
<td>1500</td>
<td>GTP</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>47</td>
<td>Y</td>
<td>902</td>
<td>ADP</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

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.