



wwPDB X-ray Structure Validation Summary Report ⓘ

May 17, 2020 – 11:10 am BST

PDB ID : 3S1R
Title : RNA Polymerase II Initiation Complex with a 5-nt 3'-deoxy RNA soaked with GTP
Authors : Liu, X.; Bushnell, D.A.; Silva, D.A.; Huang, X.; Kornberg, R.D.
Deposited on : 2011-05-16
Resolution : 3.20 Å(reported)

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

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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

| | | |
|--------------------------------|---|--|
| MolProbity | : | 4.02b-467 |
| Mogul | : | 1.8.5 (274361), CSD as541be (2020) |
| Xtriage (Phenix) | : | 1.13 |
| EDS | : | 2.11 |
| buster-report | : | 1.1.7 (2018) |
| Percentile statistics | : | 20191225.v01 (using entries in the PDB archive December 25th 2019) |
| Refmac | : | 5.8.0158 |
| CCP4 | : | 7.0.044 (Gargrove) |
| Ideal geometry (proteins) | : | Engh & Huber (2001) |
| Ideal geometry (DNA, RNA) | : | Parkinson et al. (1996) |
| Validation Pipeline (wwPDB-VP) | : | 2.11 |

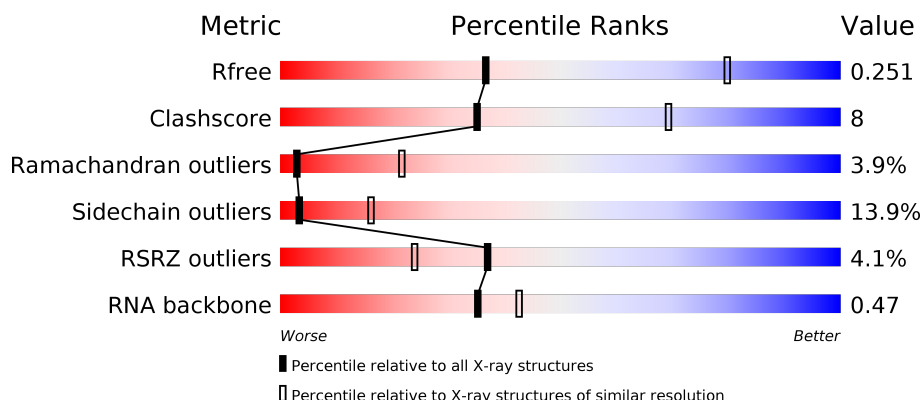
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.20 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.



| Metric | Whole archive (#Entries) | Similar resolution (#Entries, resolution range(Å)) |
|-----------------------|-----------------------------|---|
| R_{free} | 130704 | 1133 (3.20-3.20) |
| Clashscore | 141614 | 1253 (3.20-3.20) |
| Ramachandran outliers | 138981 | 1234 (3.20-3.20) |
| Sidechain outliers | 138945 | 1233 (3.20-3.20) |
| RSRZ outliers | 127900 | 1095 (3.20-3.20) |
| RNA backbone | 3102 | 1010 (3.50-2.90) |

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

| Mol | Chain | Length | Quality of chain |
|-----|-------|--------|---|
| 1 | A | 1733 | <div> <div>5%</div> <div> <div></div> <div>56%</div> <div>21%</div> <div>• •</div> <div>19%</div> </div> </div> |
| 2 | B | 1224 | <div> <div>3%</div> <div> <div></div> <div>62%</div> <div>25%</div> <div>•</div> <div>9%</div> </div> </div> |
| 3 | C | 318 | <div> <div></div> <div> <div></div> <div>56%</div> <div>24%</div> <div>•</div> <div>16%</div> </div> </div> |
| 4 | E | 215 | <div> <div>2%</div> <div> <div></div> <div>70%</div> <div>26%</div> <div>•</div> </div> </div> |

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| Mol | Chain | Length | Quality of chain |
|-----|-------|--------|---|
| 5 | F | 155 | <div><div></div><div>42%12%45%</div></div> |
| 6 | H | 146 | <div><div>7%</div><div>58%29%9%</div></div> |
| 7 | I | 122 | <div><div></div><div>75%17%5%</div></div> |
| 8 | J | 70 | <div><div></div><div>61%23%9%7%</div></div> |
| 9 | K | 120 | <div><div>%</div><div>67%24%5%</div></div> |
| 10 | L | 70 | <div><div>3%</div><div>34%17%10%34%</div></div> |
| 11 | R | 5 | <div><div>60%</div><div>80%20%</div></div> |
| 12 | T | 29 | <div><div>7%</div><div>10%10%7%72%</div></div> |

2 Entry composition

There are 15 unique types of molecules in this entry. The entry contains 28601 atoms, of which 0 are hydrogens and 0 are deuteriums.

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

- Molecule 1 is a protein called DNA-directed RNA polymerase II subunit RPB1.

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|------|------|------|----|---------|---------|-------|
| 1 | A | 1405 | Total | C | N | O | S | 0 | 0 | 0 |
| | | | 11043 | 6965 | 1936 | 2081 | 61 | | | |

- Molecule 2 is a protein called DNA-directed RNA polymerase II subunit RPB2.

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|------|------|------|----|---------|---------|-------|
| 2 | B | 1114 | Total | C | N | O | S | 0 | 0 | 0 |
| | | | 8861 | 5610 | 1549 | 1647 | 55 | | | |

- Molecule 3 is a protein called DNA-directed RNA polymerase II subunit RPB3.

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|---------|-------|
| 3 | C | 266 | Total | C | N | O | S | 0 | 0 | 0 |
| | | | 2095 | 1317 | 348 | 417 | 13 | | | |

- Molecule 4 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC1.

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|------|-----|-----|----|---------|---------|-------|
| 4 | E | 214 | Total | C | N | O | S | 0 | 0 | 0 |
| | | | 1752 | 1111 | 309 | 321 | 11 | | | |

- Molecule 5 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC2.

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|---------|-------|
| 5 | F | 85 | Total | C | N | O | S | 0 | 0 | 0 |
| | | | 688 | 439 | 116 | 130 | 3 | | | |

- Molecule 6 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC3.

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|---------|-------|
| 6 | H | 133 | Total | C | N | O | S | 0 | 0 | 0 |
| | | | 1068 | 673 | 180 | 211 | 4 | | | |

- Molecule 7 is a protein called DNA-directed RNA polymerase II subunit RPB9.

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|----|---------|---------|-------|
| 7 | I | 119 | Total | C | N | O | S | 0 | 0 | 0 |
| | | | 971 | 596 | 179 | 186 | 10 | | | |

- Molecule 8 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC5.

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|-----|----|----|---|---------|---------|-------|
| 8 | J | 65 | Total | C | N | O | S | 0 | 0 | 0 |
| | | | 532 | 339 | 93 | 94 | 6 | | | |

- Molecule 9 is a protein called DNA-directed RNA polymerase II subunit RPB11.

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|-----|-----|-----|---|---------|---------|-------|
| 9 | K | 114 | Total | C | N | O | S | 0 | 0 | 0 |
| | | | 919 | 590 | 156 | 171 | 2 | | | |

- Molecule 10 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC4.

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|-----|----|----|---|---------|---------|-------|
| 10 | L | 46 | Total | C | N | O | S | 0 | 0 | 0 |
| | | | 363 | 224 | 72 | 63 | 4 | | | |

- Molecule 11 is a RNA chain called RNA (5'-R(*AP*GP*AP*GP*G*)-3').

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|----|----|----|---|---------|---------|-------|
| 11 | R | 5 | Total | C | N | O | P | 0 | 0 | 0 |
| | | | 109 | 50 | 25 | 30 | 4 | | | |

- Molecule 12 is a DNA chain called DNA (5'-D(*CP*TP*AP*CP*CP*GP*AP*TP*AP*AP*GP*CP*AP*GP*AP*CP*GP*AP*TP*CP*CP*TP*CP*TP*CP*GP*AP*TP*G)-3').

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|-----|-------|----------|-------|----|----|----|---|---------|---------|-------|
| 12 | T | 8 | Total | C | N | O | P | 0 | 0 | 0 |
| | | | 159 | 76 | 26 | 49 | 8 | | | |

- Molecule 13 is ZINC ION (three-letter code: ZN) (formula: Zn).

| Mol | Chain | Residues | Atoms | | ZeroOcc | AltConf |
|-----|-------|----------|-------|----|---------|---------|
| 13 | J | 1 | Total | Zn | 0 | 0 |
| | | | 1 | 1 | | |

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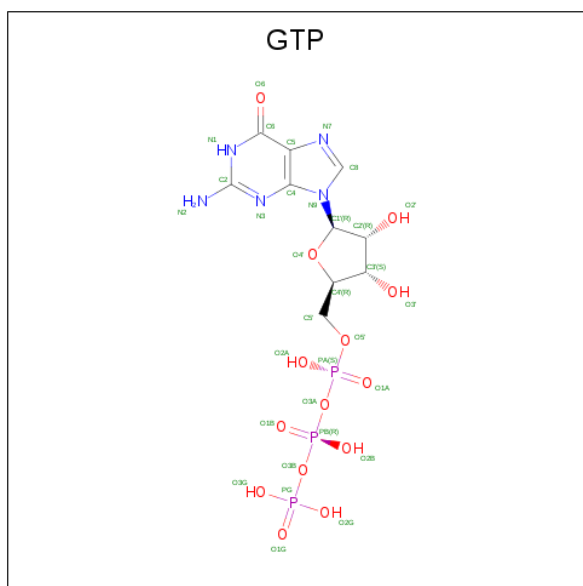
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| Mol | Chain | Residues | Atoms | | ZeroOcc | AltConf |
|-----|-------|----------|-------|----|---------|---------|
| 13 | B | 1 | Total | Zn | 0 | 0 |
| | | | 1 | 1 | | |
| 13 | I | 2 | Total | Zn | 0 | 0 |
| | | | 2 | 2 | | |
| 13 | C | 1 | Total | Zn | 0 | 0 |
| | | | 1 | 1 | | |
| 13 | A | 2 | Total | Zn | 0 | 0 |
| | | | 2 | 2 | | |
| 13 | L | 1 | Total | Zn | 0 | 0 |
| | | | 1 | 1 | | |

- Molecule 14 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

| Mol | Chain | Residues | Atoms | | ZeroOcc | AltConf |
|-----|-------|----------|-------|----|---------|---------|
| 14 | A | 1 | Total | Mg | 0 | 0 |
| | | | 1 | 1 | | |

- Molecule 15 is GUANOSINE-5'-TRIPHOSPHATE (three-letter code: GTP) (formula: C₁₀H₁₆N₅O₁₄P₃).

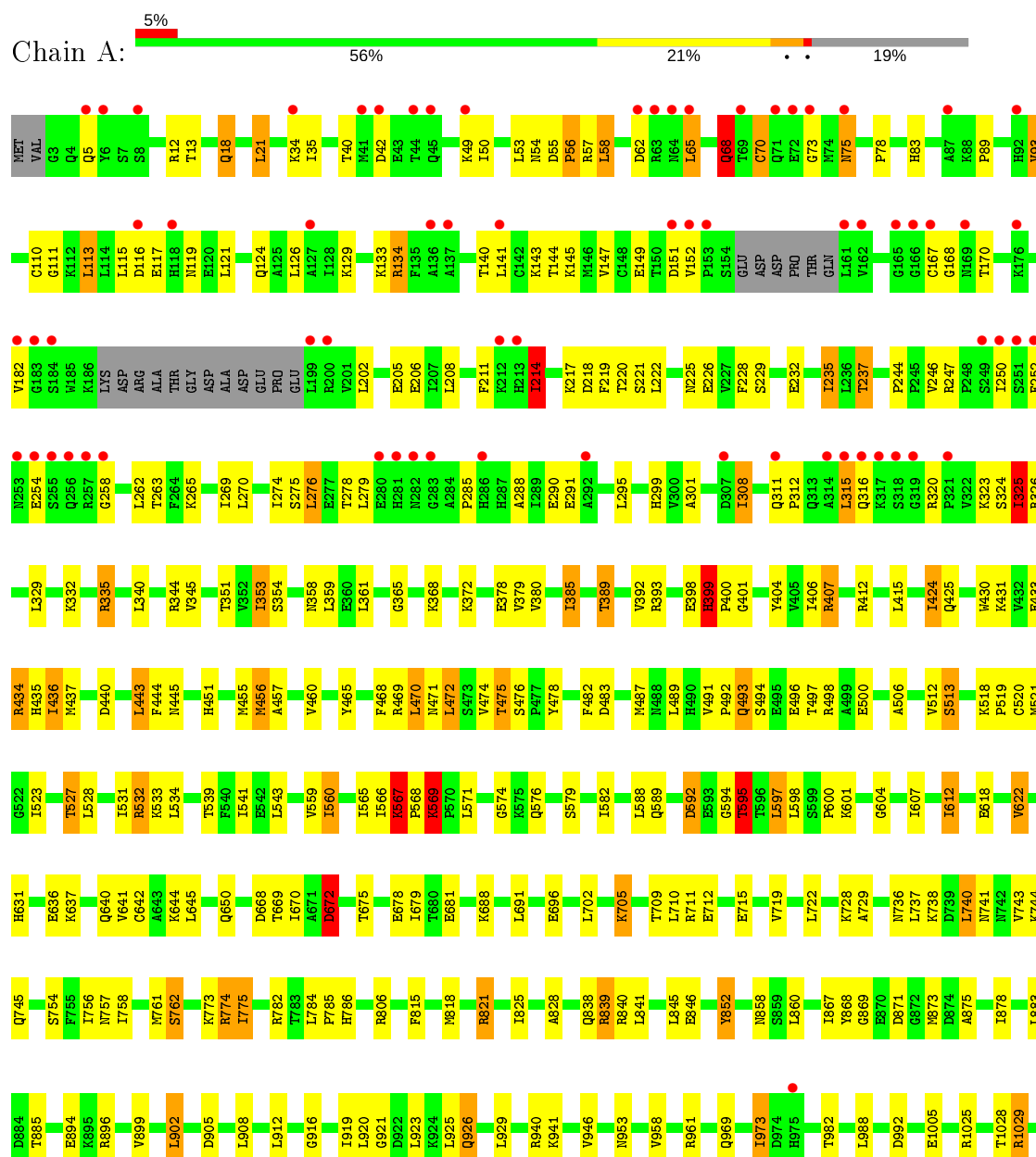


| Mol | Chain | Residues | Atoms | | | | ZeroOcc | AltConf |
|-----|-------|----------|-------|----|---|----|---------|---------|
| 15 | R | 1 | Total | C | N | O | P | |
| | | | 32 | 10 | 5 | 14 | 3 | 0 |

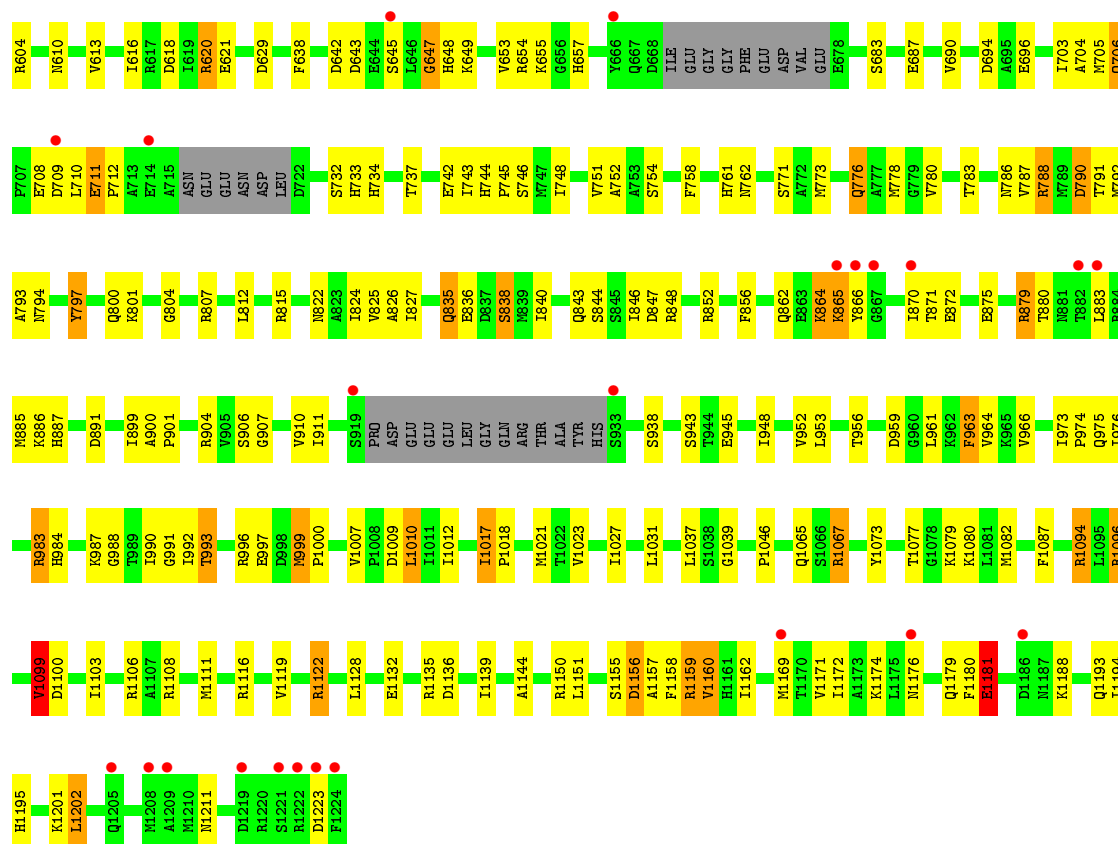
3 Residue-property plots [i](#)

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 and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

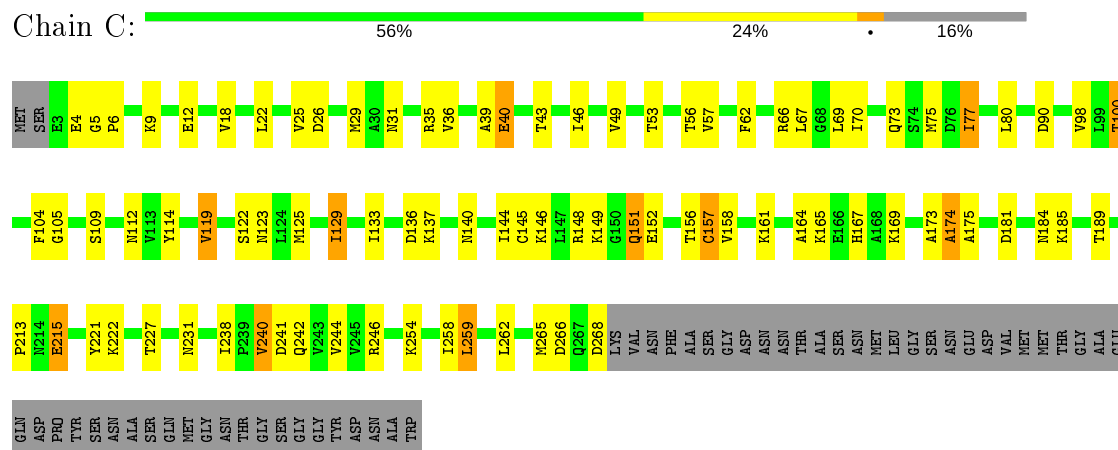
- Molecule 1: DNA-directed RNA polymerase II subunit RPB1



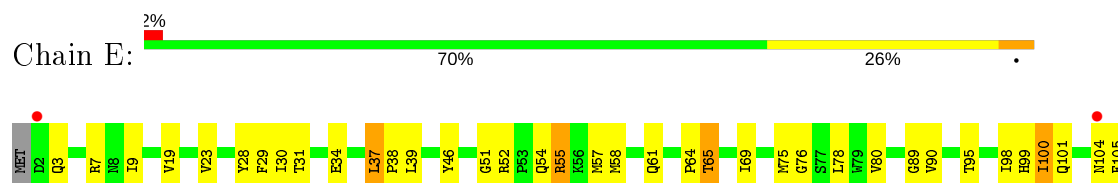




• Molecule 3: DNA-directed RNA polymerase II subunit RPB3



• Molecule 4: DNA-directed RNA polymerases I, II, and III subunit RPABC1





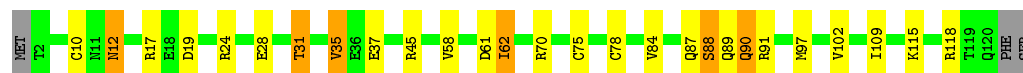
- Molecule 5: DNA-directed RNA polymerases I, II, and III subunit RPABC2



- Molecule 6: DNA-directed RNA polymerases I, II, and III subunit RPABC3



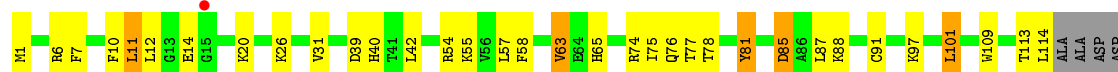
- Molecule 7: DNA-directed RNA polymerase II subunit RPB9



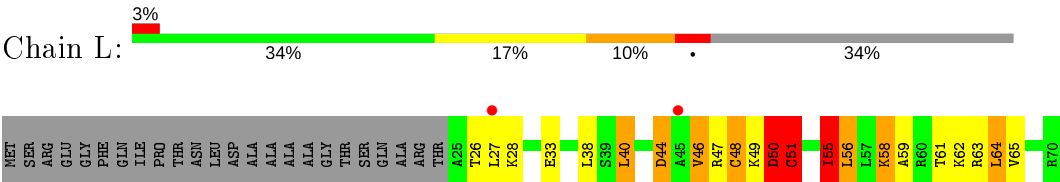
- Molecule 8: DNA-directed RNA polymerases I, II, and III subunit RPABC5



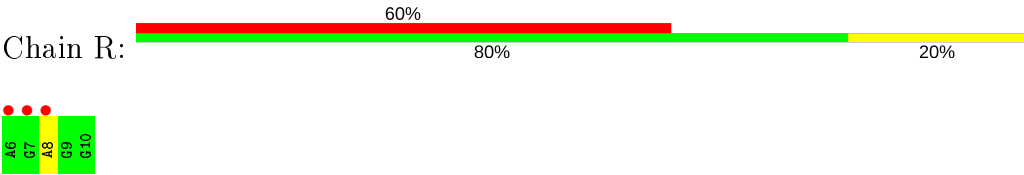
- Molecule 9: DNA-directed RNA polymerase II subunit RPB11



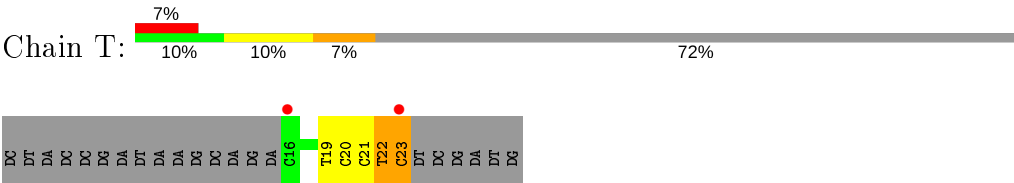
- Molecule 10: DNA-directed RNA polymerases I, II, and III subunit RPABC4



• Molecule 11: RNA (5'-R(*AP*GP*AP*GP*G*)-3')



• Molecule 12: DNA (5'-D(*CP*TP*AP*CP*CP*GP*AP*TP*AP*AP*GP*CP*AP*GP*AP*C
P*GP*AP*TP*CP*CP*TP*CP*TP*CP*GP*AP*TP*G)-3')



4 Data and refinement statistics

| Property | Value | Source |
|---|---|------------------|
| Space group | C 1 2 1 | Depositor |
| Cell constants a, b, c, α , β , γ | 160.67Å 221.32Å 193.21Å 90.00° 98.31° 90.00° | Depositor |
| Resolution (Å) | 29.97 – 3.20 29.97 – 3.20 | Depositor EDS |
| % Data completeness (in resolution range) | (Not available) (29.97-3.20) 99.4 (29.97-3.20) | Depositor EDS |
| R_{merge} | 0.16 | Depositor |
| R_{sym} | (Not available) | Depositor |
| $\langle I/\sigma(I) \rangle$ ¹ | 1.30 (at 3.18Å) | Xtriage |
| Refinement program | BUSTER-TNT BUSTER 2.8.0, BUSTER 2.8.0 | Depositor |
| R, R_{free} | 0.177 , 0.226 0.201 , 0.251 | Depositor DCC |
| R_{free} test set | 5435 reflections (5.00%) | wwPDB-VP |
| Wilson B-factor (Å ²) | 74.7 | Xtriage |
| Anisotropy | 0.630 | Xtriage |
| Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²) | 0.30 , 97.1 | EDS |
| L-test for twinning ² | $\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$ | Xtriage |
| Estimated twinning fraction | No twinning to report. | Xtriage |
| F_o, F_c correlation | 0.94 | EDS |
| Total number of atoms | 28601 | wwPDB-VP |
| Average B, all atoms (Å ²) | 104.0 | wwPDB-VP |

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.65% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: GTP, 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).

| Mol | Chain | Bond lengths | | Bond angles | |
|-----|-------|--------------|-------------|-------------|-----------------|
| | | RMSZ | $\# Z > 5$ | RMSZ | $\# Z > 5$ |
| 1 | A | 0.50 | 0/11241 | 0.77 | 3/15199 (0.0%) |
| 2 | B | 0.52 | 0/9033 | 0.80 | 2/12181 (0.0%) |
| 3 | C | 0.49 | 0/2133 | 0.81 | 0/2891 |
| 4 | E | 0.45 | 0/1788 | 0.73 | 0/2406 |
| 5 | F | 0.51 | 0/700 | 0.76 | 0/945 |
| 6 | H | 0.50 | 0/1086 | 0.83 | 1/1470 (0.1%) |
| 7 | I | 0.51 | 0/989 | 0.82 | 0/1331 |
| 8 | J | 0.55 | 0/541 | 0.88 | 0/727 |
| 9 | K | 0.45 | 0/937 | 0.71 | 0/1265 |
| 10 | L | 0.57 | 0/365 | 1.13 | 2/485 (0.4%) |
| 11 | R | 0.93 | 0/123 | 1.64 | 0/191 |
| 12 | T | 1.29 | 0/176 | 1.87 | 5/268 (1.9%) |
| All | All | 0.51 | 0/29112 | 0.81 | 13/39359 (0.0%) |

There are no bond length outliers.

The worst 5 of 13 bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(°) | Ideal(°) |
|-----|-------|------|------|------------|------|-------------|----------|
| 12 | T | 22 | DT | O4'-C1'-N1 | 8.14 | 113.70 | 108.00 |
| 2 | B | 647 | GLY | C-N-CA | 7.65 | 140.83 | 121.70 |
| 10 | L | 50 | ASP | C-N-CA | 7.62 | 140.74 | 121.70 |
| 12 | T | 23 | DC | O4'-C1'-N1 | 6.07 | 112.25 | 108.00 |
| 1 | A | 1123 | GLY | C-N-CA | 6.02 | 136.75 | 121.70 |

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

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

| Mol | Chain | Non-H | H(model) | H(added) | Clashes | Symm-Clashes |
|-----|-------|-------|----------|----------|---------|--------------|
| 1 | A | 11043 | 0 | 11133 | 208 | 0 |
| 2 | B | 8861 | 0 | 8884 | 169 | 0 |
| 3 | C | 2095 | 0 | 2051 | 46 | 0 |
| 4 | E | 1752 | 0 | 1776 | 32 | 0 |
| 5 | F | 688 | 0 | 707 | 6 | 0 |
| 6 | H | 1068 | 0 | 1040 | 18 | 0 |
| 7 | I | 971 | 0 | 927 | 14 | 0 |
| 8 | J | 532 | 0 | 542 | 23 | 0 |
| 9 | K | 919 | 0 | 929 | 19 | 0 |
| 10 | L | 363 | 0 | 386 | 11 | 0 |
| 11 | R | 109 | 0 | 55 | 0 | 0 |
| 12 | T | 159 | 0 | 91 | 2 | 0 |
| 13 | A | 2 | 0 | 0 | 0 | 0 |
| 13 | B | 1 | 0 | 0 | 0 | 0 |
| 13 | C | 1 | 0 | 0 | 0 | 0 |
| 13 | I | 2 | 0 | 0 | 0 | 0 |
| 13 | J | 1 | 0 | 0 | 0 | 0 |
| 13 | L | 1 | 0 | 0 | 0 | 0 |
| 14 | A | 1 | 0 | 0 | 0 | 0 |
| 15 | R | 32 | 0 | 12 | 0 | 0 |
| All | All | 28601 | 0 | 28533 | 468 | 0 |

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 8.

The worst 5 of 468 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

| Atom-1 | Atom-2 | Interatomic distance (Å) | Clash overlap (Å) |
|------------------|-------------------|--------------------------|-------------------|
| 3:C:57:VAL:HG21 | 8:J:60:PHE:HB3 | 1.27 | 1.11 |
| 2:B:800:GLN:HB2 | 8:J:52:THR:HG22 | 1.19 | 1.08 |
| 2:B:862:GLN:HB3 | 2:B:963:PHE:HB2 | 1.43 | 1.01 |
| 2:B:1094:ARG:HG2 | 2:B:1094:ARG:HH11 | 1.26 | 1.00 |
| 1:A:567:LYS:HB2 | 1:A:568:PRO:HD2 | 1.47 | 0.96 |

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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

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

| Mol | Chain | Analysed | Favoured | Allowed | Outliers | Percentiles | |
|-----|-------|-----------------|------------|-----------|----------|-------------|-----|
| 1 | A | 1395/1733 (80%) | 1205 (86%) | 137 (10%) | 53 (4%) | 3 | 22 |
| 2 | B | 1096/1224 (90%) | 958 (87%) | 90 (8%) | 48 (4%) | 2 | 19 |
| 3 | C | 264/318 (83%) | 238 (90%) | 19 (7%) | 7 (3%) | 5 | 30 |
| 4 | E | 212/215 (99%) | 185 (87%) | 22 (10%) | 5 (2%) | 6 | 34 |
| 5 | F | 83/155 (54%) | 75 (90%) | 6 (7%) | 2 (2%) | 6 | 34 |
| 6 | H | 129/146 (88%) | 102 (79%) | 18 (14%) | 9 (7%) | 1 | 8 |
| 7 | I | 117/122 (96%) | 101 (86%) | 14 (12%) | 2 (2%) | 9 | 42 |
| 8 | J | 63/70 (90%) | 55 (87%) | 7 (11%) | 1 (2%) | 9 | 43 |
| 9 | K | 112/120 (93%) | 107 (96%) | 5 (4%) | 0 | 100 | 100 |
| 10 | L | 44/70 (63%) | 27 (61%) | 7 (16%) | 10 (23%) | 0 | 0 |
| All | All | 3515/4173 (84%) | 3053 (87%) | 325 (9%) | 137 (4%) | 3 | 22 |

5 of 137 Ramachandran outliers are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 1 | A | 55 | ASP |
| 1 | A | 65 | LEU |
| 1 | A | 119 | ASN |
| 1 | A | 399 | HIS |
| 1 | A | 424 | ILE |

5.3.2 Protein sidechains

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

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

| Mol | Chain | Analysed | Rotameric | Outliers | Percentiles | |
|-----|-------|-----------------|------------|-----------|-------------|----|
| 1 | A | 1225/1520 (81%) | 1046 (85%) | 179 (15%) | 3 | 15 |
| 2 | B | 967/1061 (91%) | 840 (87%) | 127 (13%) | 4 | 19 |
| 3 | C | 234/274 (85%) | 208 (89%) | 26 (11%) | 6 | 25 |
| 4 | E | 196/197 (100%) | 174 (89%) | 22 (11%) | 6 | 25 |
| 5 | F | 75/137 (55%) | 64 (85%) | 11 (15%) | 3 | 14 |
| 6 | H | 117/128 (91%) | 99 (85%) | 18 (15%) | 2 | 13 |
| 7 | I | 113/116 (97%) | 101 (89%) | 12 (11%) | 6 | 27 |
| 8 | J | 60/65 (92%) | 49 (82%) | 11 (18%) | 1 | 8 |
| 9 | K | 99/102 (97%) | 83 (84%) | 16 (16%) | 2 | 11 |
| 10 | L | 40/57 (70%) | 27 (68%) | 13 (32%) | 0 | 0 |
| All | All | 3126/3657 (86%) | 2691 (86%) | 435 (14%) | 3 | 16 |

5 of 435 residues with a non-rotameric sidechain are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 2 | B | 194 | GLU |
| 2 | B | 642 | ASP |
| 8 | J | 43 | ARG |
| 2 | B | 261 | ARG |
| 2 | B | 401 | PHE |

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 61 such sidechains are listed below:

| Mol | Chain | Res | Type |
|-----|-------|------|------|
| 1 | A | 1364 | ASN |
| 2 | B | 516 | ASN |
| 6 | H | 11 | GLN |
| 2 | B | 121 | ASN |
| 2 | B | 215 | GLN |

5.3.3 RNA ⓘ

| Mol | Chain | Analysed | Backbone Outliers | Pucker Outliers |
|-----|-------|-----------|-------------------|-----------------|
| 11 | R | 3/5 (60%) | 1 (33%) | 0 |

All (1) RNA backbone outliers are listed below:

| Mol | Chain | Res | Type |
|-----|-------|-----|------|
| 11 | R | 8 | A |

There are no RNA pucker outliers to report.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

5.6 Ligand geometry [i](#)

Of 10 ligands modelled in this entry, 9 are monoatomic - leaving 1 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).

| Mol | Type | Chain | Res | Link | Bond lengths | | | Bond angles | | |
|-----|------|-------|-----|------|--------------|------|-------------|-------------|------|-------------|
| | | | | | Counts | RMSZ | # $ Z > 2$ | Counts | RMSZ | # $ Z > 2$ |
| 15 | GTP | R | 100 | - | 26,34,34 | 1.35 | 3 (11%) | 33,54,54 | 2.01 | 10 (30%) |

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.

| Mol | Type | Chain | Res | Link | Chirals | Torsions | Rings |
|-----|------|-------|-----|------|---------|------------|---------|
| 15 | GTP | R | 100 | - | - | 2/18/38/38 | 0/3/3/3 |

All (3) bond length outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|-----|-------|-----|------|---------|-------|-------------|----------|
| 15 | R | 100 | GTP | O4'-C1' | 3.04 | 1.45 | 1.41 |
| 15 | R | 100 | GTP | C8-N7 | -2.70 | 1.29 | 1.34 |

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| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|-----|-------|-----|------|-------|------|-------------|----------|
| 15 | R | 100 | GTP | C6-N1 | 2.51 | 1.37 | 1.33 |

The worst 5 of 10 bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(°) | Ideal(°) |
|-----|-------|-----|------|-----------|-------|-------------|----------|
| 15 | R | 100 | GTP | C2-N3-C4 | 5.04 | 121.12 | 115.36 |
| 15 | R | 100 | GTP | PB-O3B-PG | -4.33 | 117.97 | 132.83 |
| 15 | R | 100 | GTP | N3-C2-N1 | -4.31 | 121.47 | 127.22 |
| 15 | R | 100 | GTP | C5-C6-N1 | -3.59 | 118.52 | 123.43 |
| 15 | R | 100 | GTP | PA-O3A-PB | -3.59 | 120.51 | 132.83 |

There are no chirality outliers.

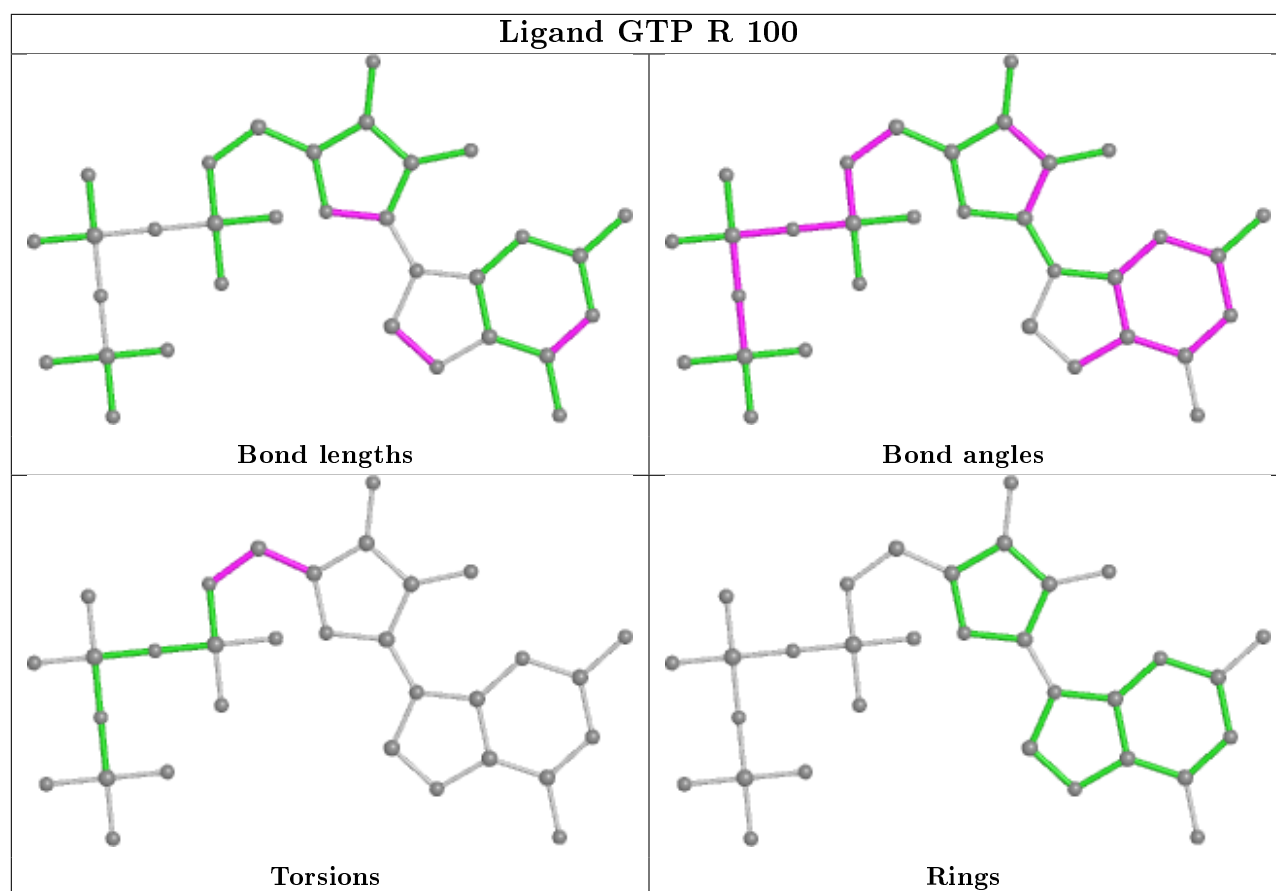
All (2) torsion outliers are listed below:

| Mol | Chain | Res | Type | Atoms |
|-----|-------|-----|------|-----------------|
| 15 | R | 100 | GTP | C4'-C5'-O5'-PA |
| 15 | R | 100 | GTP | O4'-C4'-C5'-O5' |

There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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

| Mol | Chain | Analysed | <RSRZ> | #RSRZ>2 | OWAB(Å ²) | Q<0.9 |
|-----|-------|-----------------|--------|----------------|-----------------------|-------|
| 1 | A | 1405/1733 (81%) | -0.08 | 84 (5%) 21 12 | 49, 97, 192, 214 | 0 |
| 2 | B | 1114/1224 (91%) | -0.25 | 40 (3%) 42 27 | 48, 84, 152, 204 | 0 |
| 3 | C | 266/318 (83%) | -0.43 | 0 100 100 | 58, 81, 117, 175 | 0 |
| 4 | E | 214/215 (99%) | -0.17 | 5 (2%) 60 47 | 69, 124, 172, 182 | 0 |
| 5 | F | 85/155 (54%) | -0.32 | 0 100 100 | 73, 103, 140, 156 | 0 |
| 6 | H | 133/146 (91%) | 0.12 | 10 (7%) 14 8 | 97, 131, 163, 178 | 0 |
| 7 | I | 119/122 (97%) | -0.32 | 0 100 100 | 61, 101, 141, 156 | 0 |
| 8 | J | 65/70 (92%) | -0.43 | 0 100 100 | 55, 73, 107, 123 | 0 |
| 9 | K | 114/120 (95%) | -0.42 | 1 (0%) 84 75 | 59, 91, 118, 133 | 0 |
| 10 | L | 46/70 (65%) | 0.00 | 2 (4%) 35 22 | 70, 116, 147, 156 | 0 |
| 11 | R | 5/5 (100%) | 2.61 | 3 (60%) 0 0 | 202, 206, 209, 212 | 0 |
| 12 | T | 8/29 (27%) | 1.53 | 2 (25%) 0 0 | 169, 178, 191, 196 | 0 |
| All | All | 3574/4207 (84%) | -0.18 | 147 (4%) 37 24 | 48, 94, 180, 214 | 0 |

The worst 5 of 147 RSRZ outliers are listed below:

| Mol | Chain | Res | Type | RSRZ |
|-----|-------|------|------|------|
| 1 | A | 1176 | LEU | 6.7 |
| 1 | A | 73 | GLY | 5.8 |
| 2 | B | 883 | LEU | 5.8 |
| 1 | A | 316 | GLN | 5.4 |
| 1 | A | 161 | LEU | 5.4 |

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

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

6.3 Carbohydrates ⓘ

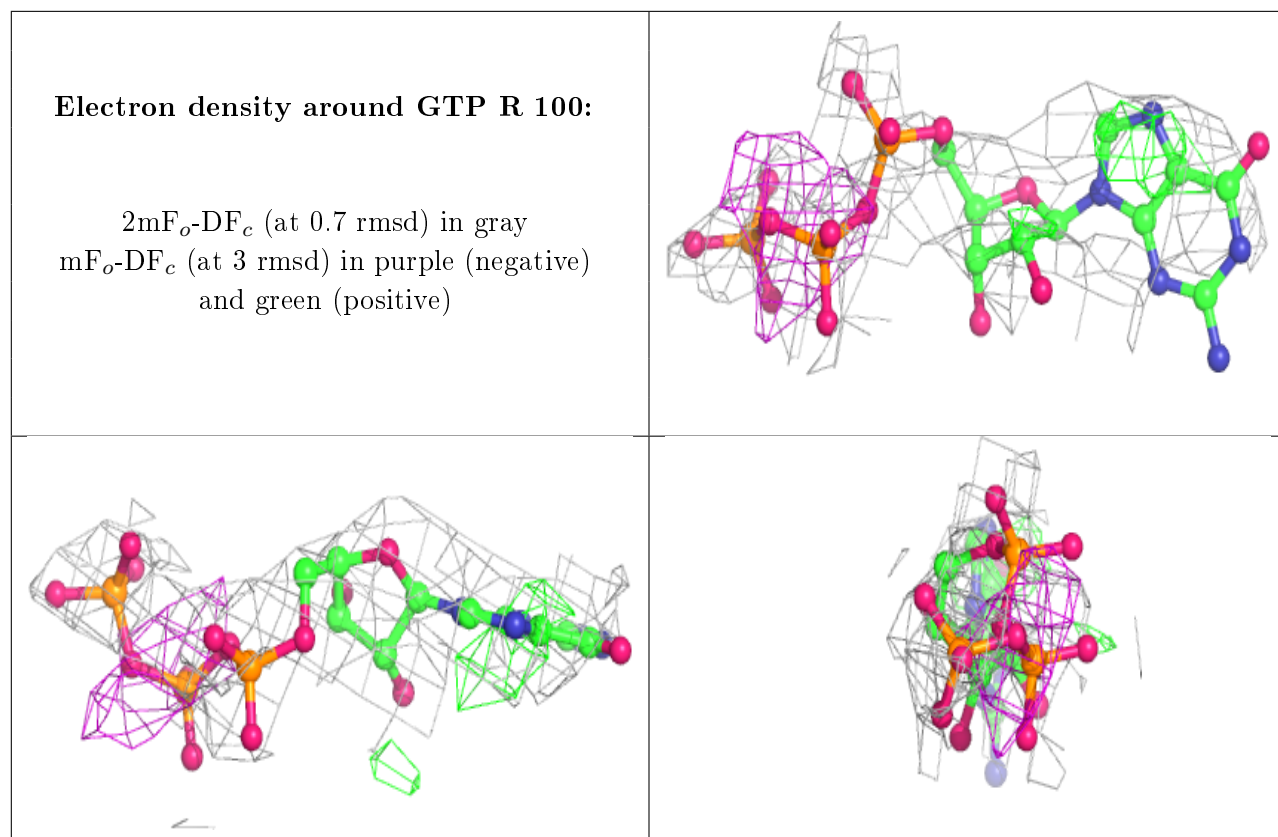
There are no carbohydrates in this entry.

6.4 Ligands ⓘ

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

| Mol | Type | Chain | Res | Atoms | RSCC | RSR | B-factors(\AA^2) | Q<0.9 |
|-----|------|-------|------|-------|------|------|-----------------------------|-------|
| 15 | GTP | R | 100 | 32/32 | 0.61 | 0.35 | 249,251,254,256 | 0 |
| 13 | ZN | B | 1307 | 1/1 | 0.86 | 0.09 | 183,183,183,183 | 0 |
| 13 | ZN | A | 1734 | 1/1 | 0.89 | 0.05 | 289,289,289,289 | 0 |
| 13 | ZN | A | 1735 | 1/1 | 0.92 | 0.16 | 176,176,176,176 | 0 |
| 13 | ZN | I | 203 | 1/1 | 0.98 | 0.06 | 102,102,102,102 | 0 |
| 13 | ZN | I | 204 | 1/1 | 0.98 | 0.08 | 82,82,82,82 | 0 |
| 14 | MG | A | 2001 | 1/1 | 0.98 | 0.07 | 60,60,60,60 | 0 |
| 13 | ZN | C | 319 | 1/1 | 0.99 | 0.10 | 89,89,89,89 | 0 |
| 13 | ZN | J | 101 | 1/1 | 0.99 | 0.17 | 78,78,78,78 | 0 |
| 13 | ZN | L | 105 | 1/1 | 0.99 | 0.04 | 99,99,99,99 | 0 |

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



6.5 Other polymers [i](#)

There are no such residues in this entry.