# Full wwPDB X-ray Structure Validation Report (i)

Nov 1, 2023 – 05:03 PM JST

| | | |
|---|---|---|
| PDB ID | : | 5WSB |
| Title | : | Pyruvate kinase (PYK) from Mycobacterium tuberculosis in complex with Oxalate, allosteric activators AMP and Glucose 6-Phosphate |
| Authors | : | Zhong, W.; Cai, Q.; El Sahili, A.; Lescar, J.; Dedon, P.C. |
| Deposited on | : | 2016-12-06 |
| Resolution | : | 2.25 Å(reported) |

This is a Full wwPDB X-ray Structure Validation 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 (i) symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

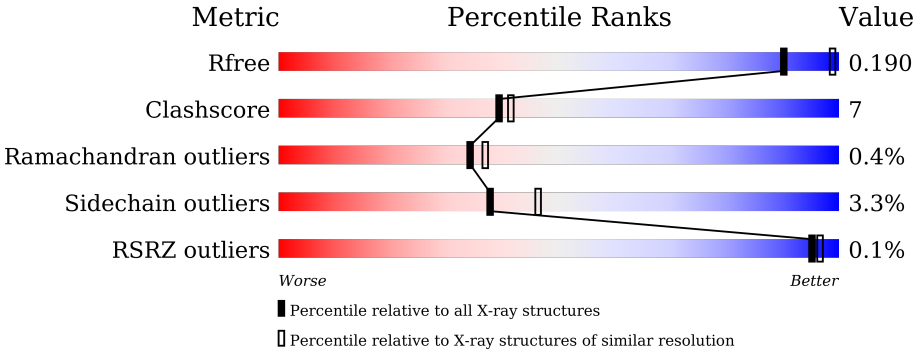
| | | |
|---|---|---|
| MolProbity | : | 4.02b-467 |
| Mogul | : | 1.8.5 (274361), CSD as541be (2020) |
| Xtriage (Phenix) | : | 1.13 |
| EDS | : | 2.36 |
| buster-report | : | 1.1.7 (2018) |
| Percentile statistics | : | 20191225.v01 (using entries in the PDB archive December 25th 2019) |
| Refmac | : | 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) | : | 2.36 |

# 1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.25 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 | 1377 (2.26-2.26) |
| Clashscore | 141614 | 1487 (2.26-2.26) |
| Ramachandran outliers | 138981 | 1449 (2.26-2.26) |
| Sidechain outliers | 138945 | 1450 (2.26-2.26) |
| RSRZ outliers | 127900 | 1356 (2.26-2.26) |

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 of 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 <=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 | 475 | 86% 11% • • |
| 1 | B | 475 | 84% 14% • • |
| 1 | C | 475 | 84% 15% • • |
| 1 | D | 475 | 80% 17% • • |

# 2 Entry composition (i)

There are 8 unique types of molecules in this entry. The entry contains 14777 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.

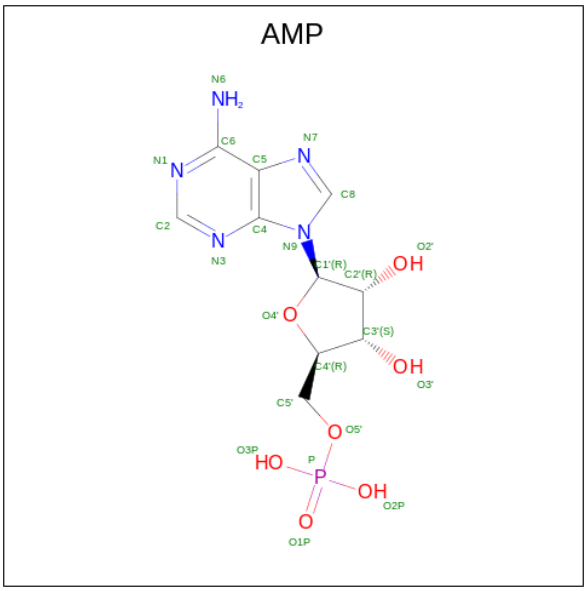
- Molecule 1 is a protein called Pyruvate kinase.

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | C | N | O | S | | | |
| 1 | A | 471 | 3543 | 2206 | 640 | 679 | 18 | 0 | 0 | 0 |
| 1 | B | 471 | 3543 | 2206 | 640 | 679 | 18 | 0 | 0 | 0 |
| 1 | C | 471 | 3543 | 2206 | 640 | 679 | 18 | 0 | 0 | 0 |
| 1 | D | 471 | 3543 | 2206 | 640 | 679 | 18 | 0 | 0 | 0 |

There are 12 discrepancies between the modelled and reference sequences:

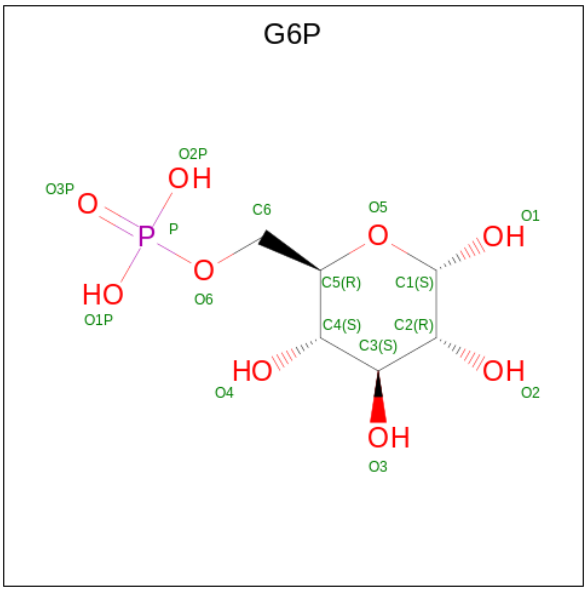
| Chain | Residue | Modelled | Actual | Comment | Reference |
|---|---|---|---|---|---|
| A | -2 | GLY | - | expression tag | UNP P9WKE5 |
| A | -1 | GLY | - | expression tag | UNP P9WKE5 |
| A | 0 | HIS | - | expression tag | UNP P9WKE5 |
| B | -2 | GLY | - | expression tag | UNP P9WKE5 |
| B | -1 | GLY | - | expression tag | UNP P9WKE5 |
| B | 0 | HIS | - | expression tag | UNP P9WKE5 |
| C | -2 | GLY | - | expression tag | UNP P9WKE5 |
| C | -1 | GLY | - | expression tag | UNP P9WKE5 |
| C | 0 | HIS | - | expression tag | UNP P9WKE5 |
| D | -2 | GLY | - | expression tag | UNP P9WKE5 |
| D | -1 | GLY | - | expression tag | UNP P9WKE5 |
| D | 0 | HIS | - | expression tag | UNP P9WKE5 |

- Molecule 2 is ADENOSINE MONOPHOSPHATE (three-letter code: AMP) (formula: $C_{10}H_{14}N_5O_7P$).




| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf |
|---|---|---|---|---|---|---|---|---|---|
| | | | Total | C | N | O | P | | |
| 2 | A | 1 | 23 | 10 | 5 | 7 | 1 | 0 | 0 |
| | | | Total | C | N | O | P | | |
| 2 | B | 1 | 23 | 10 | 5 | 7 | 1 | 0 | 0 |
| | | | Total | C | N | O | P | | |
| 2 | C | 1 | 23 | 10 | 5 | 7 | 1 | 0 | 0 |
| | | | Total | C | N | O | P | | |
| 2 | D | 1 | 23 | 10 | 5 | 7 | 1 | 0 | 0 |

- Molecule 3 is 6-O-phosphono-alpha-D-glucopyranose (three-letter code: G6P) (formula: $C_6H_{13}O_9P$).

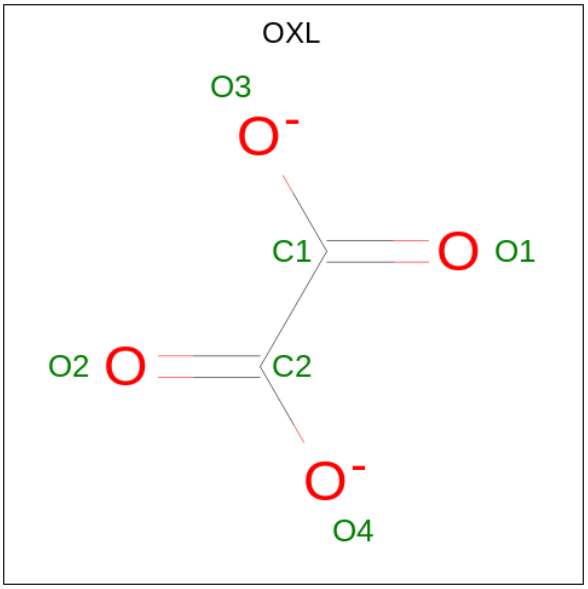


| Mol | Chain | Residues | Atoms | | | | ZeroOcc | AltConf |
|---|---|---|---|---|---|---|---|---|
| | | | Total | C | O | P | | |
| 3 | A | 1 | 16 | 6 | 9 | 1 | 0 | 0 |
| 3 | B | 1 | 16 | 6 | 9 | 1 | 0 | 0 |
| 3 | C | 1 | 16 | 6 | 9 | 1 | 0 | 0 |
| 3 | D | 1 | 16 | 6 | 9 | 1 | 0 | 0 |

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

| Mol | Chain | Residues | Atoms | | ZeroOcc | AltConf |
|---|---|---|---|---|---|---|
| | | | Total | Mg | | |
| 4 | A | 1 | 1 | 1 | 0 | 0 |
| 4 | B | 1 | 1 | 1 | 0 | 0 |
| 4 | C | 1 | 1 | 1 | 0 | 0 |
| 4 | D | 1 | 1 | 1 | 0 | 0 |

- Molecule 5 is OXALATE ION (three-letter code: OXL) (formula: $C_2O_4$).




| Mol | Chain | Residues | Atoms | | | ZeroOcc | AltConf |
|---|---|---|---|---|---|---|---|
| | | | Total | C | O | | |
| 5 | A | 1 | 6 | 2 | 4 | 0 | 0 |
| 5 | B | 1 | 6 | 2 | 4 | 0 | 0 |

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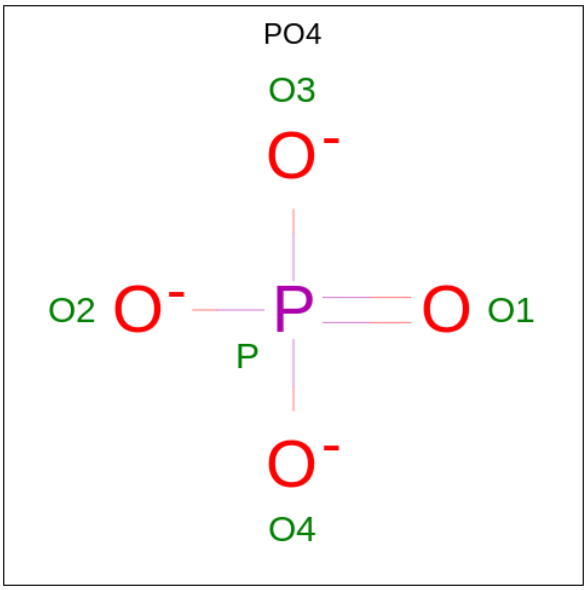
| Mol | Chain | Residues | Atoms | | | ZeroOcc | AltConf |
|---|---|---|---|---|---|---|---|
| | | | Total | C | O | | |
| 5 | C | 1 | 6 | 2 | 4 | 0 | 0 |
| | | | Total | C | O | | |
| 5 | D | 1 | 6 | 2 | 4 | 0 | 0 |

- Molecule 6 is POTASSIUM ION (three-letter code: K) (formula: K).

| Mol | Chain | Residues | Atoms | | ZeroOcc | AltConf |
|---|---|---|---|---|---|---|
| | | | Total | K | | |
| 6 | B | 1 | 1 | 1 | 0 | 0 |

- Molecule 7 is PHOSPHATE ION (three-letter code: PO4) (formula: $O_4P$).




| Mol | Chain | Residues | Atoms | | | ZeroOcc | AltConf |
|---|---|---|---|---|---|---|---|
| | | | Total | O | P | | |
| 7 | C | 1 | 5 | 4 | 1 | 0 | 0 |
| | | | Total | O | P | | |
| 7 | D | 1 | 5 | 4 | 1 | 0 | 0 |

- Molecule 8 is water.

| Mol | Chain | Residues | Atoms | | ZeroOcc | AltConf |
|---|---|---|---|---|---|---|
| | | | Total | O | | |
| 8 | A | 116 | 116 | 116 | 0 | 0 |
| | | | Total | O | | |
| 8 | B | 117 | 117 | 117 | 0 | 0 |

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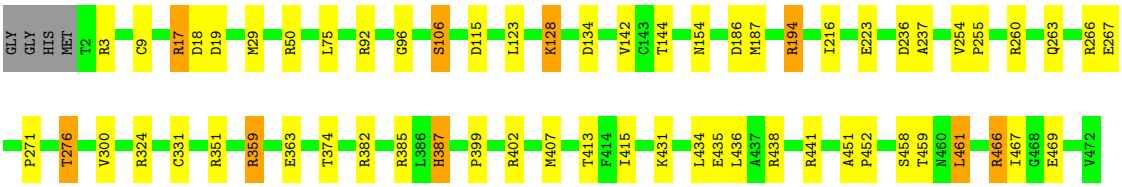
| Mol | Chain | Residues | Atoms | | ZeroOcc | AltConf |
|---|---|---|---|---|---|---|
| | | | Total | O | | |
| 8 | C | 74 | 74 | 74 | 0 | 0 |
| | | | Total | O | | |
| 8 | D | 103 | 103 | 103 | 0 | 0 |

# 3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide 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.

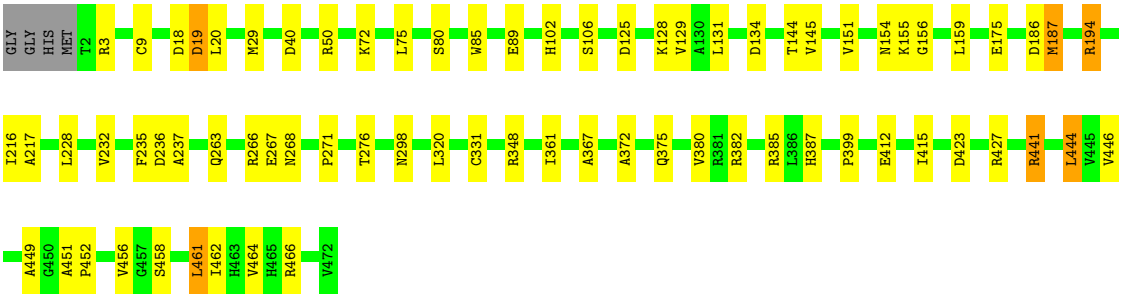
• Molecule 1: Pyruvate kinase

Chain A:



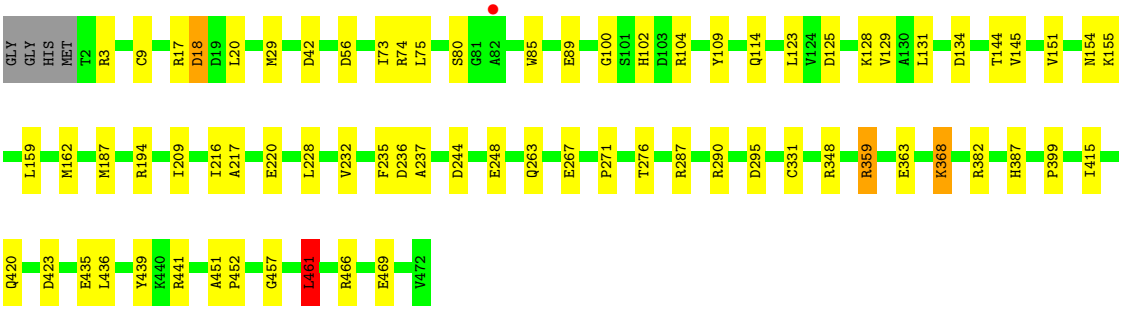

• Molecule 1: Pyruvate kinase

Chain B:




• Molecule 1: Pyruvate kinase

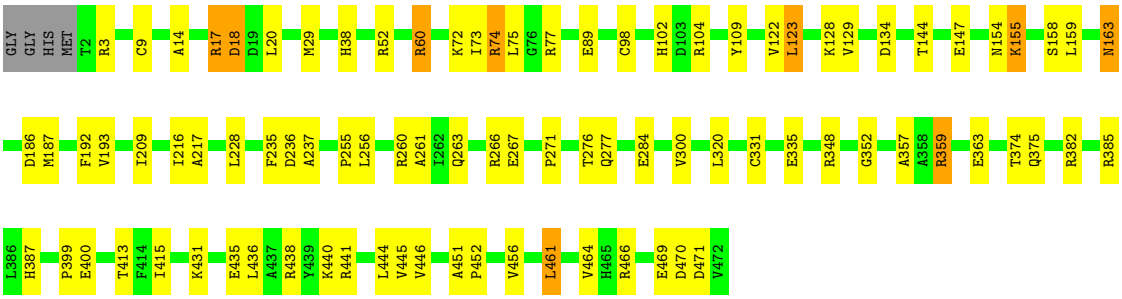
Chain C:




• Molecule 1: Pyruvate kinase

Chain D:

80%
17%


GLY
GLY
HIS
MET
T2
R3
C9
A14
R17
D18
D19
L20
M29
H38
R52
R60
K72
I73
R74
L75
G76
R77
E89
C98
H102
D103
R104
Y109
V122
L123
K128
V129
D134
T144
E147
N154
K155
S158
L159
N163
D186
M187
F192
V193
I209
I216
A217
L228
F235
D236
A237
P255
L256
R260
A261
I262
Q263
R266
E267
P271
T276
Q277
E284
V300
L320
C331
E335
R348
G352
A357
A358
R359
E363
T374
Q375
R382
R385
L386
H387
P399
E400
T413
F414
I415
K431
E435
L436
A437
R438
Y439
K440
R441
L444
V445
V446
A451
P452
V456
L461
V464
H465
R466
E469
D470
D471
V472

# 4 Data and refinement statistics (i)

| Property | Value | Source |
|---|---|---|
| Space group | P 31 | Depositor |
| Cell constants<br>a, b, c, $\alpha$, $\beta$, $\gamma$ | 125.63Å 125.63Å 144.51Å<br>90.00° 90.00° 120.00° | Depositor |
| Resolution (Å) | 62.82 – 2.25<br>48.17 – 2.25 | Depositor<br>EDS |
| % Data completeness<br>(in resolution range) | 99.3 (62.82-2.25)<br>99.3 (48.17-2.25) | Depositor<br>EDS |
| $R_{merge}$ | (Not available) | Depositor |
| $R_{sym}$ | (Not available) | Depositor |
| $< I/\sigma(I) >$ [1] | 2.08 (at 2.24Å) | Xtriage |
| Refinement program | REFMAC 5.8.0158 | Depositor |
| R, $R_{free}$ | 0.187 , 0.228<br>0.149 , 0.190 | Depositor<br>DCC |
| $R_{free}$ test set | 5943 reflections (4.94%) | wwPDB-VP |
| Wilson B-factor (Å$^2$) | 31.9 | Xtriage |
| Anisotropy | 0.741 | Xtriage |
| Bulk solvent $k_{sol}$(e/Å$^3$), $B_{sol}$(Å$^2$) | 0.35 , 11.8 | EDS |
| L-test for twinning[2] | $< \|L\| > = 0.43$, $< L^2 > = 0.25$ | Xtriage |
| Estimated twinning fraction | 0.477 for -h,-k,l<br>0.478 for h,-h-k,-l<br>0.477 for -k,-h,-l | Xtriage |
| Reported twinning fraction | 0.264 for H, K, L<br>0.255 for -K, -H, -L<br>0.240 for -h,-k,l<br>0.242 for K, H, -L | Depositor |
| Outliers | 0 of 120239 reflections | Xtriage |
| $F_o$,$F_c$ correlation | 0.97 | EDS |
| Total number of atoms | 14777 | wwPDB-VP |
| Average B, all atoms (Å$^2$) | 37.0 | wwPDB-VP |

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.22% of the height of the origin peak. No significant pseudotranslation is detected.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

# 5 Model quality (i)

## 5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: OXL, G6P, AMP, MG, K, PO4

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 | 0.61 | 0/3593 | 0.69 | 0/4881 |
| 1 | B | 0.61 | 0/3593 | 0.70 | 0/4881 |
| 1 | C | 0.61 | 0/3593 | 0.67 | 1/4881 (0.0%) |
| 1 | D | 0.60 | 0/3593 | 0.67 | 1/4881 (0.0%) |
| All | All | 0.61 | 0/14372 | 0.68 | 2/19524 (0.0%) |

There are no bond length outliers.

All (2) bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed($^o$) | Ideal($^o$) |
|---|---|---|---|---|---|---|---|
| 1 | C | 461 | LEU | CA-CB-CG | 5.62 | 128.22 | 115.30 |
| 1 | D | 60 | ARG | NE-CZ-NH2 | -5.29 | 117.65 | 120.30 |

There are no chirality outliers.

There are no planarity outliers.

## 5.2 Too-close contacts (i)

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 | 3543 | 0 | 3608 | 53 | 1 |
| 1 | B | 3543 | 0 | 3608 | 46 | 0 |
| 1 | C | 3543 | 0 | 3608 | 47 | 1 |
| 1 | D | 3543 | 0 | 3608 | 70 | 0 |
| 2 | A | 23 | 0 | 12 | 2 | 0 |

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| Mol | Chain | Non-H | H(model) | H(added) | Clashes | Symm-Clashes |
|---|---|---|---|---|---|---|
| 2 | B | 23 | 0 | 12 | 1 | 0 |
| 2 | C | 23 | 0 | 12 | 1 | 0 |
| 2 | D | 23 | 0 | 12 | 1 | 0 |
| 3 | A | 16 | 0 | 11 | 2 | 0 |
| 3 | B | 16 | 0 | 11 | 3 | 0 |
| 3 | C | 16 | 0 | 11 | 4 | 0 |
| 3 | D | 16 | 0 | 11 | 2 | 0 |
| 4 | A | 1 | 0 | 0 | 0 | 0 |
| 4 | B | 1 | 0 | 0 | 0 | 0 |
| 4 | C | 1 | 0 | 0 | 0 | 0 |
| 4 | D | 1 | 0 | 0 | 0 | 0 |
| 5 | A | 6 | 0 | 0 | 0 | 0 |
| 5 | B | 6 | 0 | 0 | 0 | 0 |
| 5 | C | 6 | 0 | 0 | 0 | 0 |
| 5 | D | 6 | 0 | 0 | 0 | 0 |
| 6 | B | 1 | 0 | 0 | 0 | 0 |
| 7 | C | 5 | 0 | 0 | 0 | 0 |
| 7 | D | 5 | 0 | 0 | 1 | 0 |
| 8 | A | 116 | 0 | 0 | 13 | 0 |
| 8 | B | 117 | 0 | 0 | 8 | 0 |
| 8 | C | 74 | 0 | 0 | 8 | 0 |
| 8 | D | 103 | 0 | 0 | 12 | 0 |
| All | All | 14777 | 0 | 14524 | 213 | 1 |

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 7.

All (213) 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) |
|---|---|---|---|
| 1:A:434:LEU:HD21 | 1:A:467:ILE:CG2 | 1.96 | 0.95 |
| 1:A:466:ARG:HB3 | 1:A:469:GLU:HG3 | 1.49 | 0.93 |
| 1:A:434:LEU:HD21 | 1:A:467:ILE:HG21 | 1.56 | 0.87 |
| 1:D:331:CYS:O | 1:D:335:GLU:HG3 | 1.74 | 0.86 |
| 1:A:434:LEU:CD2 | 1:A:467:ILE:HG21 | 2.07 | 0.85 |
| 1:A:260:ARG:HG3 | 8:A:611:HOH:O | 1.77 | 0.83 |
| 1:D:38:HIS:NE2 | 7:D:505:PO4:O1 | 2.16 | 0.79 |
| 1:D:470:ASP:OD2 | 8:D:601:HOH:O | 2.01 | 0.78 |
| 1:A:260:ARG:CG | 8:A:611:HOH:O | 2.32 | 0.77 |
| 1:C:74:ARG:NE | 1:C:154:ASN:O | 2.19 | 0.76 |
| 1:A:434:LEU:CD2 | 1:A:467:ILE:CG2 | 2.62 | 0.76 |

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| Atom-1 | Atom-2 | Interatomic distance (Å) | Clash overlap (Å) |
|---|---|---|---|
| 3:A:502:G6P:O2P | 8:A:601:HOH:O | 2.03 | 0.76 |
| 1:C:382:ARG:HH12 | 3:C:502:G6P:H62 | 1.49 | 0.75 |
| 1:C:17:ARG:HG3 | 1:C:18:ASP:N | 2.02 | 0.73 |
| 1:D:374:THR:HA | 2:D:501:AMP:H5'2 | 1.70 | 0.72 |
| 1:D:72:LYS:HG3 | 1:D:74:ARG:CD | 2.20 | 0.72 |
| 1:D:72:LYS:HG3 | 1:D:74:ARG:HD2 | 1.72 | 0.70 |
| 1:D:413:THR:O | 8:D:603:HOH:O | 2.09 | 0.70 |
| 1:D:400:GLU:OE2 | 8:D:602:HOH:O | 2.09 | 0.70 |
| 1:B:298:ASN:HB3 | 8:B:672:HOH:O | 1.91 | 0.70 |
| 1:C:469:GLU:OE1 | 8:C:601:HOH:O | 2.10 | 0.70 |
| 1:D:436:LEU:O | 8:D:605:HOH:O | 2.10 | 0.70 |
| 1:B:441:ARG:H | 1:B:441:ARG:CD | 2.04 | 0.69 |
| 1:C:287:ARG:NH2 | 1:D:147:GLU:OE1 | 2.23 | 0.68 |
| 1:D:284:GLU:OE1 | 8:D:604:HOH:O | 2.10 | 0.68 |
| 1:D:382:ARG:HH22 | 3:D:502:G6P:H1 | 1.59 | 0.66 |
| 1:C:382:ARG:NH1 | 3:C:502:G6P:H62 | 2.11 | 0.66 |
| 1:A:399:PRO:HA | 1:A:415:ILE:HD12 | 1.78 | 0.66 |
| 1:D:399:PRO:HA | 1:D:415:ILE:HD12 | 1.77 | 0.65 |
| 1:D:461:LEU:HD12 | 1:D:461:LEU:C | 2.16 | 0.65 |
| 1:A:374:THR:HA | 2:A:501:AMP:H5'2 | 1.79 | 0.65 |
| 1:A:50:ARG:HG2 | 1:A:50:ARG:HH11 | 1.63 | 0.64 |
| 1:D:128:LYS:O | 1:D:129:VAL:HG23 | 1.98 | 0.64 |
| 1:B:399:PRO:HA | 1:B:415:ILE:HD12 | 1.79 | 0.63 |
| 1:C:382:ARG:HH22 | 3:C:502:G6P:H1 | 1.63 | 0.63 |
| 1:C:73:ILE:HG23 | 1:C:109:TYR:HB2 | 1.81 | 0.63 |
| 1:C:399:PRO:HA | 1:C:415:ILE:HD12 | 1.81 | 0.62 |
| 1:D:60:ARG:HD2 | 8:D:635:HOH:O | 1.99 | 0.62 |
| 1:B:75:LEU:O | 1:B:154:ASN:HA | 1.99 | 0.62 |
| 1:D:134:ASP:OD2 | 1:D:144:THR:OG1 | 2.16 | 0.62 |
| 1:A:187:MET:SD | 1:A:407:MET:CE | 2.87 | 0.62 |
| 1:B:441:ARG:H | 1:B:441:ARG:NE | 1.98 | 0.62 |
| 1:B:128:LYS:O | 1:B:129:VAL:HG23 | 2.01 | 0.61 |
| 1:C:75:LEU:O | 1:C:154:ASN:HA | 1.99 | 0.61 |
| 1:D:155:LYS:HA | 1:D:155:LYS:CE | 2.30 | 0.61 |
| 1:A:75:LEU:O | 1:A:154:ASN:HA | 2.01 | 0.61 |
| 1:C:423:ASP:O | 8:C:604:HOH:O | 2.16 | 0.61 |
| 1:D:17:ARG:HD2 | 1:D:18:ASP:H | 1.66 | 0.60 |
| 1:D:75:LEU:O | 1:D:154:ASN:HA | 2.00 | 0.60 |
| 1:B:19:ASP:HA | 8:B:694:HOH:O | 2.02 | 0.60 |
| 1:A:387:HIS:O | 8:A:604:HOH:O | 2.17 | 0.60 |
| 1:D:98:CYS:HB3 | 1:D:104:ARG:NH2 | 2.16 | 0.60 |

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| Atom-1 | Atom-2 | Interatomic distance (Å) | Clash overlap (Å) |
|---|---|---|---|
| 1:C:17:ARG:O | 8:C:603:HOH:O | 2.16 | 0.59 |
| 1:A:128:LYS:N | 1:A:128:LYS:HE3 | 2.17 | 0.59 |
| 1:A:466:ARG:HB3 | 1:A:469:GLU:CG | 2.30 | 0.58 |
| 1:B:449:ALA:HB3 | 1:B:461:LEU:HD12 | 1.86 | 0.58 |
| 1:A:17:ARG:HB3 | 1:A:17:ARG:NH2 | 2.18 | 0.58 |
| 1:C:399:PRO:HA | 1:C:415:ILE:CD1 | 2.33 | 0.58 |
| 1:D:440:LYS:HD3 | 1:D:441:ARG:O | 2.04 | 0.58 |
| 1:C:159:LEU:HD13 | 1:C:162:MET:CE | 2.34 | 0.57 |
| 1:D:399:PRO:HA | 1:D:415:ILE:CD1 | 2.33 | 0.57 |
| 1:A:399:PRO:HA | 1:A:415:ILE:CD1 | 2.34 | 0.57 |
| 1:B:367:ALA:HA | 1:B:444:LEU:HG | 1.87 | 0.57 |
| 1:C:368:LYS:HE3 | 1:C:368:LYS:HA | 1.86 | 0.57 |
| 1:B:399:PRO:HA | 1:B:415:ILE:CD1 | 2.35 | 0.57 |
| 1:C:134:ASP:OD2 | 1:C:144:THR:OG1 | 2.18 | 0.56 |
| 1:D:444:LEU:HD11 | 1:D:464:VAL:CG1 | 2.34 | 0.56 |
| 1:C:3:ARG:HB2 | 1:C:331:CYS:SG | 2.46 | 0.55 |
| 1:A:451:ALA:HA | 1:A:452:PRO:C | 2.26 | 0.55 |
| 1:D:451:ALA:HA | 1:D:452:PRO:C | 2.26 | 0.55 |
| 1:B:451:ALA:HA | 1:B:452:PRO:C | 2.26 | 0.54 |
| 1:C:451:ALA:HA | 1:C:452:PRO:C | 2.27 | 0.54 |
| 1:C:295:ASP:O | 8:C:605:HOH:O | 2.18 | 0.54 |
| 1:A:216:ILE:HG12 | 1:A:237:ALA:HB3 | 1.90 | 0.54 |
| 1:A:19:ASP:HB3 | 8:A:654:HOH:O | 2.07 | 0.54 |
| 1:C:125:ASP:OD2 | 1:C:155:LYS:HE3 | 2.07 | 0.54 |
| 1:D:155:LYS:HA | 1:D:155:LYS:HE3 | 1.90 | 0.54 |
| 1:C:461:LEU:C | 1:C:461:LEU:CD1 | 2.76 | 0.54 |
| 1:D:461:LEU:HD12 | 1:D:461:LEU:O | 2.08 | 0.53 |
| 1:A:324:ARG:NE | 8:A:603:HOH:O | 2.15 | 0.53 |
| 1:D:17:ARG:HD2 | 1:D:18:ASP:N | 2.24 | 0.52 |
| 1:A:434:LEU:HD21 | 1:A:467:ILE:HG22 | 1.86 | 0.52 |
| 1:C:216:ILE:HG12 | 1:C:237:ALA:HB3 | 1.91 | 0.52 |
| 1:D:193:VAL:O | 8:D:606:HOH:O | 2.19 | 0.52 |
| 1:B:3:ARG:HB2 | 1:B:331:CYS:SG | 2.50 | 0.52 |
| 1:A:187:MET:SD | 1:A:407:MET:HE2 | 2.51 | 0.51 |
| 1:B:446:VAL:HG22 | 1:B:464:VAL:HG22 | 1.93 | 0.51 |
| 1:D:300:VAL:HG13 | 8:D:628:HOH:O | 2.11 | 0.51 |
| 1:A:9:CYS:HB2 | 1:A:29:MET:SD | 2.51 | 0.51 |
| 1:B:216:ILE:HG12 | 1:B:237:ALA:HB3 | 1.93 | 0.50 |
| 1:A:382:ARG:HH22 | 3:A:502:G6P:H1 | 1.76 | 0.50 |
| 1:C:9:CYS:HB2 | 1:C:29:MET:SD | 2.51 | 0.50 |
| 1:D:469:GLU:OE2 | 8:D:607:HOH:O | 2.19 | 0.50 |

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| Atom-1 | Atom-2 | Interatomic distance (Å) | Clash overlap (Å) |
|---|---|---|---|
| 1:C:244:ASP:O | 1:C:248:GLU:HG2 | 2.11 | 0.50 |
| 1:D:14:ALA:O | 1:D:20:LEU:CD1 | 2.60 | 0.50 |
| 1:B:361:ILE:HD11 | 1:D:357:ALA:CB | 2.42 | 0.50 |
| 1:D:14:ALA:O | 8:D:608:HOH:O | 2.20 | 0.50 |
| 1:B:375:GLN:HB3 | 1:B:456:VAL:HG12 | 1.94 | 0.49 |
| 1:C:461:LEU:C | 1:C:461:LEU:HD13 | 2.31 | 0.49 |
| 1:D:216:ILE:HG12 | 1:D:237:ALA:HB3 | 1.94 | 0.49 |
| 1:D:263:GLN:O | 1:D:267:GLU:HG2 | 2.12 | 0.49 |
| 1:B:268:ASN:O | 3:B:502:G6P:O1 | 2.30 | 0.49 |
| 1:C:263:GLN:O | 1:C:267:GLU:HG2 | 2.12 | 0.49 |
| 1:A:402:ARG:HD3 | 8:A:626:HOH:O | 2.11 | 0.49 |
| 1:D:3:ARG:HB2 | 1:D:331:CYS:SG | 2.52 | 0.49 |
| 1:A:324:ARG:NH1 | 8:A:616:HOH:O | 2.46 | 0.49 |
| 1:B:263:GLN:O | 1:B:267:GLU:HG2 | 2.12 | 0.49 |
| 1:C:436:LEU:CD1 | 1:C:436:LEU:N | 2.75 | 0.49 |
| 1:A:461:LEU:HD12 | 1:A:461:LEU:C | 2.33 | 0.49 |
| 1:A:3:ARG:HB2 | 1:A:331:CYS:SG | 2.52 | 0.49 |
| 1:B:72:LYS:HE3 | 1:B:156:GLY:HA3 | 1.94 | 0.49 |
| 1:B:412:GLU:OE1 | 8:B:602:HOH:O | 2.20 | 0.49 |
| 1:D:20:LEU:HA | 1:D:20:LEU:HD23 | 1.70 | 0.49 |
| 1:A:187:MET:SD | 1:A:407:MET:HE1 | 2.52 | 0.49 |
| 1:A:260:ARG:NE | 8:A:611:HOH:O | 2.37 | 0.49 |
| 1:D:73:ILE:HG23 | 1:D:109:TYR:HB2 | 1.95 | 0.48 |
| 1:C:209:ILE:HG22 | 1:C:209:ILE:O | 2.12 | 0.48 |
| 1:A:263:GLN:O | 1:A:267:GLU:HG2 | 2.12 | 0.48 |
| 1:B:134:ASP:OD2 | 1:B:144:THR:OG1 | 2.21 | 0.48 |
| 1:B:159:LEU:N | 1:B:159:LEU:HD22 | 2.28 | 0.48 |
| 1:C:457:GLY:N | 2:C:501:AMP:O2P | 2.43 | 0.48 |
| 1:A:359:ARG:HD3 | 1:A:363:GLU:OE2 | 2.14 | 0.48 |
| 1:C:348:ARG:HD3 | 1:C:348:ARG:HA | 1.55 | 0.48 |
| 1:A:300:VAL:HG13 | 8:A:632:HOH:O | 2.14 | 0.48 |
| 1:A:50:ARG:HH11 | 1:A:50:ARG:CG | 2.26 | 0.48 |
| 1:D:98:CYS:HB3 | 1:D:104:ARG:HH22 | 1.79 | 0.47 |
| 1:D:186:ASP:O | 1:D:187:MET:HG3 | 2.14 | 0.47 |
| 1:B:348:ARG:HH11 | 1:B:348:ARG:HA | 1.79 | 0.47 |
| 1:D:228:LEU:HD21 | 1:D:261:ALA:HA | 1.95 | 0.47 |
| 1:D:256:LEU:O | 1:D:260:ARG:HG3 | 2.15 | 0.47 |
| 1:D:72:LYS:HB2 | 1:D:192:PHE:HE2 | 1.80 | 0.47 |
| 1:A:359:ARG:NE | 8:A:604:HOH:O | 2.45 | 0.47 |
| 1:D:266:ARG:O | 1:D:385:ARG:HD2 | 2.14 | 0.47 |
| 1:B:186:ASP:C | 1:B:187:MET:HG3 | 2.35 | 0.46 |

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| Atom-1 | Atom-2 | Interatomic distance (Å) | Clash overlap (Å) |
|---|---|---|---|
| 1:B:385:ARG:NH2 | 3:B:502:G6P:O2P | 2.42 | 0.46 |
| 1:C:220:GLU:OE2 | 8:C:606:HOH:O | 2.20 | 0.46 |
| 1:D:155:LYS:HE3 | 1:D:155:LYS:CA | 2.46 | 0.46 |
| 1:A:92:ARG:NH1 | 1:A:142:VAL:HG22 | 2.31 | 0.46 |
| 1:D:98:CYS:CB | 1:D:104:ARG:NH2 | 2.79 | 0.46 |
| 1:B:9:CYS:HB2 | 1:B:29:MET:SD | 2.56 | 0.45 |
| 1:B:20:LEU:HD23 | 1:B:20:LEU:HA | 1.75 | 0.45 |
| 1:B:461:LEU:HD22 | 1:B:462:ILE:N | 2.30 | 0.45 |
| 1:C:359:ARG:HB3 | 1:C:359:ARG:HH11 | 1.81 | 0.45 |
| 1:D:122:VAL:HG22 | 1:D:159:LEU:HD11 | 1.98 | 0.45 |
| 1:D:461:LEU:C | 1:D:461:LEU:CD1 | 2.84 | 0.45 |
| 1:B:451:ALA:HB3 | 1:D:471:ASP:O | 2.17 | 0.45 |
| 1:C:382:ARG:HH12 | 3:C:502:G6P:C6 | 2.24 | 0.45 |
| 1:B:427:ARG:NH1 | 8:B:614:HOH:O | 2.38 | 0.45 |
| 1:A:134:ASP:OD2 | 1:A:144:THR:OG1 | 2.23 | 0.45 |
| 1:B:125:ASP:OD1 | 1:B:125:ASP:O | 2.34 | 0.45 |
| 1:A:431:LYS:O | 1:A:435:GLU:HG3 | 2.16 | 0.45 |
| 1:D:359:ARG:HD3 | 1:D:363:GLU:OE2 | 2.17 | 0.45 |
| 1:C:128:LYS:O | 1:C:129:VAL:HG23 | 2.17 | 0.45 |
| 1:C:441:ARG:NE | 8:C:616:HOH:O | 2.46 | 0.44 |
| 1:A:266:ARG:O | 1:A:385:ARG:HD2 | 2.16 | 0.44 |
| 1:C:159:LEU:HD13 | 1:C:162:MET:HE1 | 1.98 | 0.44 |
| 1:C:131:LEU:HD22 | 1:C:145:VAL:HG22 | 2.00 | 0.44 |
| 1:B:125:ASP:HB2 | 1:B:155:LYS:HG2 | 1.99 | 0.44 |
| 1:D:375:GLN:HG2 | 1:D:456:VAL:HG12 | 2.00 | 0.44 |
| 1:D:431:LYS:O | 1:D:435:GLU:HG3 | 2.18 | 0.44 |
| 8:C:655:HOH:O | 1:D:123:LEU:HD11 | 2.18 | 0.44 |
| 1:D:158:SER:C | 1:D:159:LEU:HD22 | 2.38 | 0.43 |
| 1:B:458:SER:HG | 2:B:501:AMP:HO3' | 1.66 | 0.43 |
| 1:A:402:ARG:HG3 | 1:A:413:THR:HB | 2.00 | 0.43 |
| 1:B:266:ARG:O | 1:B:385:ARG:HD2 | 2.18 | 0.43 |
| 1:D:9:CYS:HB2 | 1:D:29:MET:SD | 2.57 | 0.43 |
| 1:A:96:GLY:O | 1:A:106:SER:OG | 2.37 | 0.43 |
| 1:C:85:TRP:CE3 | 1:C:151:VAL:HG11 | 2.53 | 0.43 |
| 1:A:186:ASP:C | 1:A:187:MET:HG3 | 2.39 | 0.43 |
| 1:D:352:GLY:HA3 | 3:D:502:G6P:O3P | 2.19 | 0.43 |
| 1:D:255:PRO:HA | 8:D:686:HOH:O | 2.18 | 0.43 |
| 1:A:351:ARG:HD3 | 2:A:501:AMP:O2P | 2.18 | 0.42 |
| 1:C:359:ARG:HD3 | 1:C:363:GLU:OE2 | 2.18 | 0.42 |
| 1:B:423:ASP:OD1 | 8:B:603:HOH:O | 2.22 | 0.42 |
| 1:B:89:GLU:OE1 | 1:B:102:HIS:NE2 | 2.51 | 0.42 |

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| Atom-1 | Atom-2 | Interatomic distance (Å) | Clash overlap (Å) |
|---|---|---|---|
| 1:B:85:TRP:CE3 | 1:B:151:VAL:HG11 | 2.54 | 0.42 |
| 1:B:236:ASP:O | 1:B:271:PRO:HD2 | 2.20 | 0.42 |
| 1:D:236:ASP:O | 1:D:271:PRO:HD2 | 2.18 | 0.42 |
| 1:C:100:GLY:HA2 | 1:C:104:ARG:O | 2.19 | 0.42 |
| 1:A:194:ARG:HB3 | 1:A:223:GLU:HB2 | 2.00 | 0.42 |
| 1:D:209:ILE:O | 1:D:209:ILE:HG22 | 2.19 | 0.42 |
| 1:C:17:ARG:HB3 | 1:C:20:LEU:HD12 | 2.02 | 0.42 |
| 1:B:194:ARG:NH2 | 8:B:635:HOH:O | 2.52 | 0.42 |
| 1:B:217:ALA:HB2 | 1:B:235:PHE:CD2 | 2.55 | 0.41 |
| 1:C:89:GLU:OE1 | 1:C:102:HIS:NE2 | 2.54 | 0.41 |
| 1:D:72:LYS:HG3 | 1:D:74:ARG:HD3 | 1.99 | 0.41 |
| 1:D:217:ALA:HB2 | 1:D:235:PHE:CD2 | 2.55 | 0.41 |
| 1:A:458:SER:O | 1:A:459:THR:C | 2.59 | 0.41 |
| 1:D:14:ALA:O | 1:D:20:LEU:HD13 | 2.21 | 0.41 |
| 1:B:50:ARG:HD3 | 8:B:644:HOH:O | 2.19 | 0.41 |
| 1:D:52:ARG:HD3 | 1:D:52:ARG:HA | 1.78 | 0.41 |
| 1:D:217:ALA:HB2 | 1:D:235:PHE:CG | 2.56 | 0.41 |
| 1:B:131:LEU:HD22 | 1:B:145:VAL:HG22 | 2.03 | 0.41 |
| 1:C:217:ALA:HB2 | 1:C:235:PHE:CD2 | 2.56 | 0.41 |
| 1:C:236:ASP:O | 1:C:271:PRO:HD2 | 2.20 | 0.41 |
| 1:A:236:ASP:O | 1:A:271:PRO:HD2 | 2.21 | 0.41 |
| 1:D:163:ASN:HB3 | 8:D:681:HOH:O | 2.19 | 0.41 |
| 1:A:17:ARG:HB3 | 1:A:17:ARG:CZ | 2.50 | 0.41 |
| 1:A:276:THR:N | 8:A:622:HOH:O | 2.51 | 0.41 |
| 1:B:175:GLU:HB2 | 8:B:604:HOH:O | 2.21 | 0.41 |
| 1:B:228:LEU:O | 1:B:232:VAL:HG23 | 2.21 | 0.41 |
| 1:C:228:LEU:O | 1:C:232:VAL:HG23 | 2.21 | 0.41 |
| 1:C:290:ARG:HG2 | 1:D:277:GLN:OE1 | 2.21 | 0.41 |
| 1:D:89:GLU:OE1 | 1:D:102:HIS:NE2 | 2.54 | 0.41 |
| 1:D:445:VAL:HG12 | 1:D:446:VAL:N | 2.36 | 0.41 |
| 1:B:372:ALA:HB3 | 1:B:380:VAL:HG22 | 2.03 | 0.40 |
| 1:A:92:ARG:HH12 | 1:A:142:VAL:HG22 | 1.86 | 0.40 |
| 1:A:438:ARG:NH1 | 8:A:602:HOH:O | 2.14 | 0.40 |
| 1:B:382:ARG:HH22 | 3:B:502:G6P:H1 | 1.85 | 0.40 |
| 1:D:74:ARG:HH11 | 1:D:74:ARG:HB3 | 1.86 | 0.40 |
| 1:A:359:ARG:HH11 | 1:A:359:ARG:HB3 | 1.86 | 0.40 |
| 1:C:439:TYR:OH | 8:C:602:HOH:O | 2.11 | 0.40 |
| 1:A:254:VAL:N | 1:A:255:PRO:CD | 2.84 | 0.40 |

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

| Atom-1 | Atom-2 | Interatomic distance (Å) | Clash overlap (Å) |
|---|---|---|---|
| 1:A:134:ASP:OD1 | 1:C:56:ASP:OD2[3_444] | 2.18 | 0.02 |

## 5.3 Torsion angles (i)

### 5.3.1 Protein backbone (i)

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 | 469/475 (99%) | 459 (98%) | 8 (2%) | 2 (0%) | 34 | 37 |
| 1 | B | 469/475 (99%) | 455 (97%) | 12 (3%) | 2 (0%) | 34 | 37 |
| 1 | C | 469/475 (99%) | 455 (97%) | 12 (3%) | 2 (0%) | 34 | 37 |
| 1 | D | 469/475 (99%) | 456 (97%) | 11 (2%) | 2 (0%) | 34 | 37 |
| All | All | 1876/1900 (99%) | 1825 (97%) | 43 (2%) | 8 (0%) | 34 | 37 |

All (8) Ramachandran outliers are listed below:

| Mol | Chain | Res | Type |
|---|---|---|---|
| 1 | A | 387 | HIS |
| 1 | B | 387 | HIS |
| 1 | C | 387 | HIS |
| 1 | A | 276 | THR |
| 1 | B | 276 | THR |
| 1 | C | 276 | THR |
| 1 | D | 276 | THR |
| 1 | D | 387 | HIS |

### 5.3.2 Protein sidechains (i)

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 | 379/381 (100%) | 367 (97%) | 12 (3%) | 39 | 47 |
| 1 | B | 379/381 (100%) | 367 (97%) | 12 (3%) | 39 | 47 |
| 1 | C | 379/381 (100%) | 366 (97%) | 13 (3%) | 37 | 45 |
| 1 | D | 379/381 (100%) | 366 (97%) | 13 (3%) | 37 | 45 |
| All | All | 1516/1524 (100%) | 1466 (97%) | 50 (3%) | 38 | 46 |

All (50) residues with a non-rotameric sidechain are listed below:

| Mol | Chain | Res | Type |
|---|---|---|---|
| 1 | A | 17 | ARG |
| 1 | A | 18 | ASP |
| 1 | A | 106 | SER |
| 1 | A | 115 | ASP |
| 1 | A | 123 | LEU |
| 1 | A | 128 | LYS |
| 1 | A | 194 | ARG |
| 1 | A | 359 | ARG |
| 1 | A | 436 | LEU |
| 1 | A | 441 | ARG |
| 1 | A | 461 | LEU |
| 1 | A | 466 | ARG |
| 1 | B | 18 | ASP |
| 1 | B | 19 | ASP |
| 1 | B | 40 | ASP |
| 1 | B | 80 | SER |
| 1 | B | 106 | SER |
| 1 | B | 187 | MET |
| 1 | B | 194 | ARG |
| 1 | B | 320 | LEU |
| 1 | B | 441 | ARG |
| 1 | B | 444 | LEU |
| 1 | B | 461 | LEU |
| 1 | B | 466 | ARG |
| 1 | C | 18 | ASP |
| 1 | C | 42 | ASP |
| 1 | C | 80 | SER |
| 1 | C | 114 | GLN |
| 1 | C | 123 | LEU |
| 1 | C | 187 | MET |
| 1 | C | 194 | ARG |
| 1 | C | 359 | ARG |
| 1 | C | 368 | LYS |

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| Mol | Chain | Res | Type |
|---|---|---|---|
| 1 | C | 420 | GLN |
| 1 | C | 435 | GLU |
| 1 | C | 461 | LEU |
| 1 | C | 466 | ARG |
| 1 | D | 17 | ARG |
| 1 | D | 18 | ASP |
| 1 | D | 74 | ARG |
| 1 | D | 77 | ARG |
| 1 | D | 123 | LEU |
| 1 | D | 155 | LYS |
| 1 | D | 163 | ASN |
| 1 | D | 320 | LEU |
| 1 | D | 348 | ARG |
| 1 | D | 359 | ARG |
| 1 | D | 438 | ARG |
| 1 | D | 461 | LEU |
| 1 | D | 466 | ARG |

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

| Mol | Chain | Res | Type |
|---|---|---|---|
| 1 | A | 404 | GLN |
| 1 | B | 154 | ASN |
| 1 | B | 404 | GLN |
| 1 | C | 387 | HIS |
| 1 | C | 404 | GLN |
| 1 | D | 404 | GLN |

### 5.3.3 RNA (i)

There are no RNA molecules in this entry.

## 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 monosaccharides in this entry.

## 5.6 Ligand geometry (i)

Of 19 ligands modelled in this entry, 5 are monoatomic - leaving 14 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 | $\#\|Z\| > 2$ |
| 3 | G6P | D | 502 | - | 16,16,16 | 0.66 | 0 | 24,24,24 | 1.55 | 2 (8%) |
| 5 | OXL | B | 504 | 4 | 5,5,5 | 1.89 | 1 (20%) | 6,6,6 | 1.05 | 0 |
| 5 | OXL | A | 504 | 4 | 5,5,5 | 1.98 | 1 (20%) | 6,6,6 | 1.02 | 0 |
| 3 | G6P | C | 502 | - | 16,16,16 | 0.68 | 0 | 24,24,24 | 0.77 | 0 |
| 3 | G6P | B | 502 | - | 16,16,16 | 0.67 | 0 | 24,24,24 | 1.44 | 3 (12%) |
| 3 | G6P | A | 502 | - | 16,16,16 | 0.62 | 0 | 24,24,24 | 1.53 | 3 (12%) |
| 7 | PO4 | D | 505 | - | 4,4,4 | 0.65 | 0 | 6,6,6 | 0.66 | 0 |
| 5 | OXL | C | 504 | 4 | 5,5,5 | 1.90 | 1 (20%) | 6,6,6 | 0.91 | 0 |
| 5 | OXL | D | 504 | 4 | 5,5,5 | 1.86 | 2 (40%) | 6,6,6 | 1.21 | 1 (16%) |
| 2 | AMP | B | 501 | - | 22,25,25 | 0.91 | 0 | 25,38,38 | 1.25 | 3 (12%) |
| 2 | AMP | A | 501 | - | 22,25,25 | 1.00 | 1 (4%) | 25,38,38 | 1.15 | 2 (8%) |
| 2 | AMP | D | 501 | - | 22,25,25 | 0.85 | 0 | 25,38,38 | 1.38 | 4 (16%) |
| 7 | PO4 | C | 505 | - | 4,4,4 | 0.64 | 0 | 6,6,6 | 0.71 | 0 |
| 2 | AMP | C | 501 | - | 22,25,25 | 0.92 | 2 (9%) | 25,38,38 | 1.31 | 4 (16%) |

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 |
|---|---|---|---|---|---|---|---|
| 3 | G6P | D | 502 | - | - | 0/6/26/26 | 0/1/1/1 |
| 5 | OXL | B | 504 | 4 | - | 0/4/4/4 | - |
| 5 | OXL | A | 504 | 4 | - | 0/4/4/4 | - |
| 3 | G6P | C | 502 | - | - | 0/6/26/26 | 0/1/1/1 |
| 3 | G6P | B | 502 | - | - | 0/6/26/26 | 0/1/1/1 |
| 3 | G6P | A | 502 | - | - | 0/6/26/26 | 0/1/1/1 |
| 5 | OXL | C | 504 | 4 | - | 1/4/4/4 | - |
| 5 | OXL | D | 504 | 4 | - | 0/4/4/4 | - |

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| Mol | Type | Chain | Res | Link | Chirals | Torsions | Rings |
|---|---|---|---|---|---|---|---|
| 2 | AMP | B | 501 | - | - | 0/6/26/26 | 0/3/3/3 |
| 2 | AMP | A | 501 | - | - | 0/6/26/26 | 0/3/3/3 |
| 2 | AMP | D | 501 | - | - | 0/6/26/26 | 0/3/3/3 |
| 2 | AMP | C | 501 | - | - | 1/6/26/26 | 0/3/3/3 |

All (8) bond length outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|---|---|---|---|---|---|---|---|
| 5 | A | 504 | OXL | C2-C1 | -3.42 | 1.44 | 1.54 |
| 5 | B | 504 | OXL | C2-C1 | -3.08 | 1.45 | 1.54 |
| 5 | C | 504 | OXL | C2-C1 | -2.98 | 1.46 | 1.54 |
| 5 | D | 504 | OXL | C2-C1 | -2.92 | 1.46 | 1.54 |
| 2 | A | 501 | AMP | O4'-C1' | 2.31 | 1.44 | 1.41 |
| 2 | C | 501 | AMP | O4'-C1' | 2.27 | 1.44 | 1.41 |
| 5 | D | 504 | OXL | O4-C2 | -2.08 | 1.24 | 1.30 |
| 2 | C | 501 | AMP | C5-N7 | -2.03 | 1.32 | 1.39 |

All (22) bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed($^o$) | Ideal($^o$) |
|---|---|---|---|---|---|---|---|
| 3 | D | 502 | G6P | O5-C1-C2 | 4.57 | 118.44 | 110.28 |
| 3 | A | 502 | G6P | C1-O5-C5 | 4.51 | 122.17 | 113.66 |
| 3 | B | 502 | G6P | O5-C1-C2 | 4.46 | 118.23 | 110.28 |
| 3 | A | 502 | G6P | O5-C1-C2 | 4.03 | 117.48 | 110.28 |
| 2 | D | 501 | AMP | N3-C2-N1 | -4.02 | 122.40 | 128.68 |
| 2 | B | 501 | AMP | N3-C2-N1 | -3.84 | 122.67 | 128.68 |
| 2 | C | 501 | AMP | N3-C2-N1 | -3.77 | 122.78 | 128.68 |
| 3 | D | 502 | G6P | C1-O5-C5 | 3.70 | 120.64 | 113.66 |
| 3 | B | 502 | G6P | C1-O5-C5 | 3.21 | 119.72 | 113.66 |
| 2 | A | 501 | AMP | N3-C2-N1 | -3.16 | 123.74 | 128.68 |
| 3 | A | 502 | G6P | O5-C5-C4 | 2.70 | 114.60 | 109.69 |
| 2 | D | 501 | AMP | C3'-C2'-C1' | 2.64 | 104.95 | 100.98 |
| 2 | C | 501 | AMP | C1'-N9-C4 | -2.45 | 122.34 | 126.64 |
| 2 | A | 501 | AMP | C3'-C2'-C1' | 2.33 | 104.49 | 100.98 |
| 3 | B | 502 | G6P | C1-C2-C3 | 2.29 | 115.06 | 110.31 |
| 2 | B | 501 | AMP | C2-N1-C6 | 2.26 | 122.62 | 118.75 |
| 2 | C | 501 | AMP | C2-N1-C6 | 2.24 | 122.58 | 118.75 |
| 2 | C | 501 | AMP | C3'-C2'-C1' | 2.24 | 104.34 | 100.98 |
| 2 | D | 501 | AMP | N6-C6-N1 | 2.14 | 123.02 | 118.57 |
| 2 | D | 501 | AMP | C2-N1-C6 | 2.12 | 122.39 | 118.75 |
| 5 | D | 504 | OXL | O3-C1-C2 | 2.12 | 119.47 | 113.16 |
| 2 | B | 501 | AMP | N6-C6-N1 | 2.01 | 122.75 | 118.57 |

There are no chirality outliers.

All (2) torsion outliers are listed below:

| Mol | Chain | Res | Type | Atoms |
|---|---|---|---|---|
| 2 | C | 501 | AMP | C3'-C4'-C5'-O5' |
| 5 | C | 504 | OXL | O3-C1-C2-O4 |

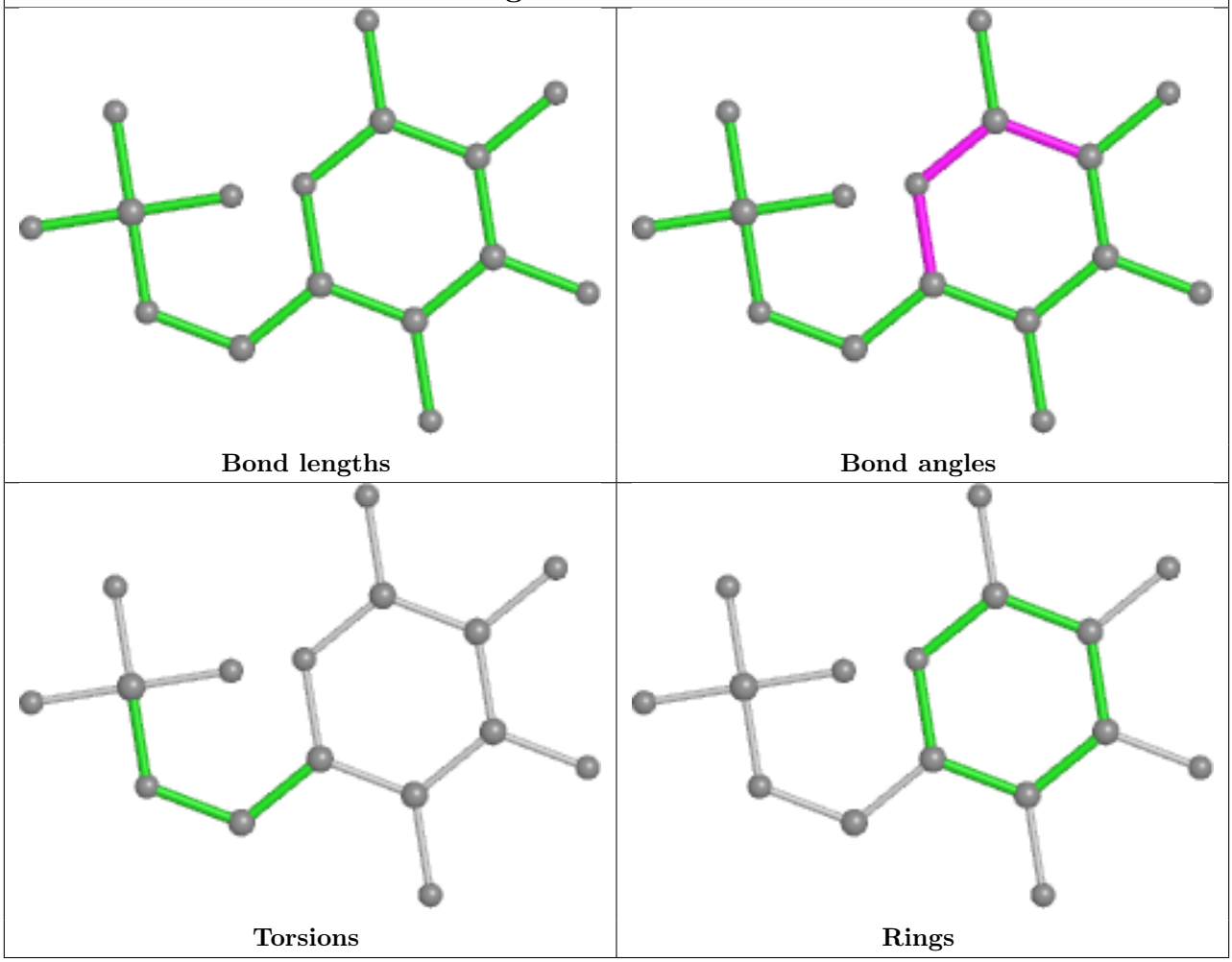
There are no ring outliers.

9 monomers are involved in 17 short contacts:

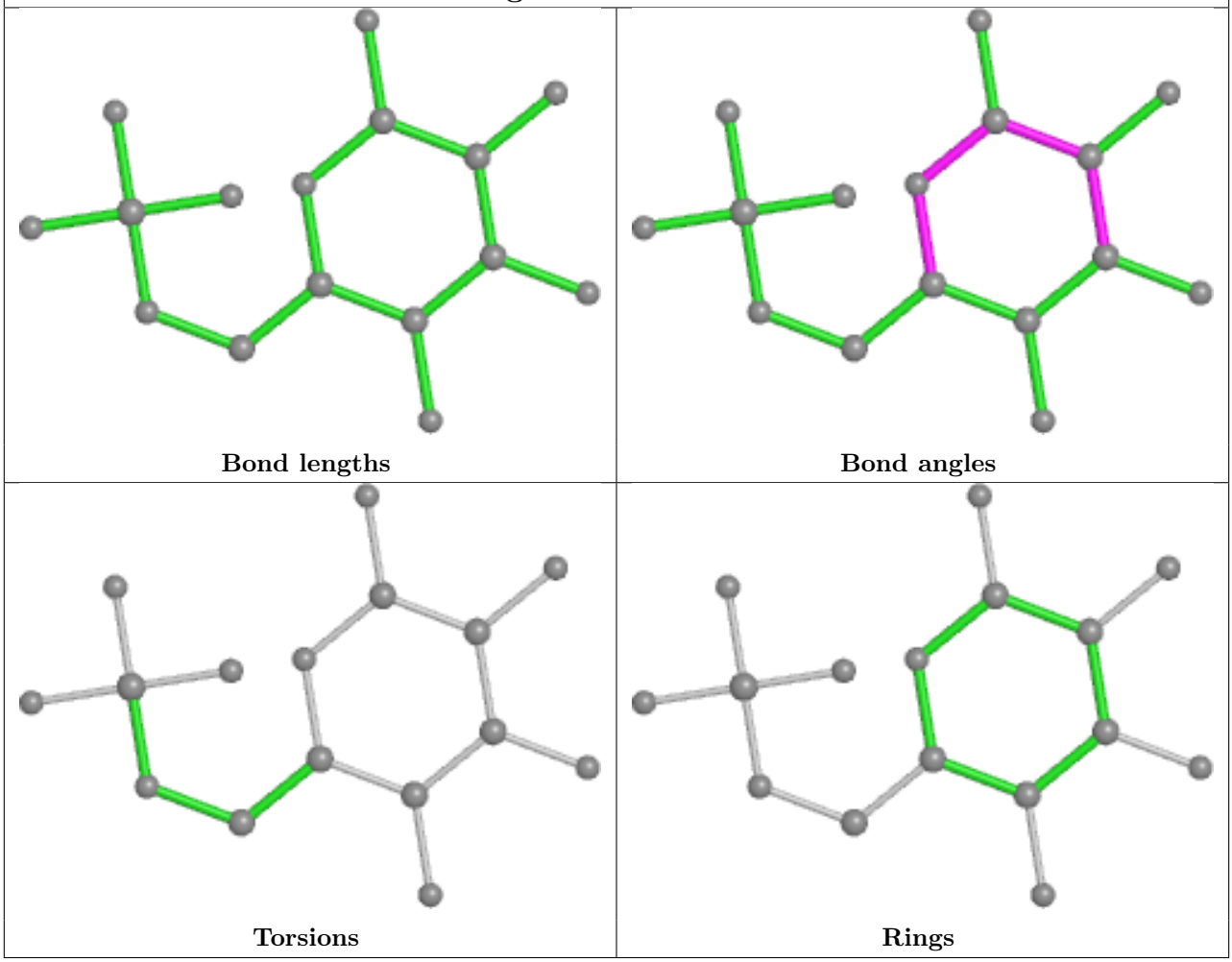
| Mol | Chain | Res | Type | Clashes | Symm-Clashes |
|---|---|---|---|---|---|
| 3 | D | 502 | G6P | 2 | 0 |
| 3 | C | 502 | G6P | 4 | 0 |
| 3 | B | 502 | G6P | 3 | 0 |
| 3 | A | 502 | G6P | 2 | 0 |
| 7 | D | 505 | PO4 | 1 | 0 |
| 2 | B | 501 | AMP | 1 | 0 |
| 2 | A | 501 | AMP | 2 | 0 |
| 2 | D | 501 | AMP | 1 | 0 |
| 2 | C | 501 | AMP | 1 | 0 |

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

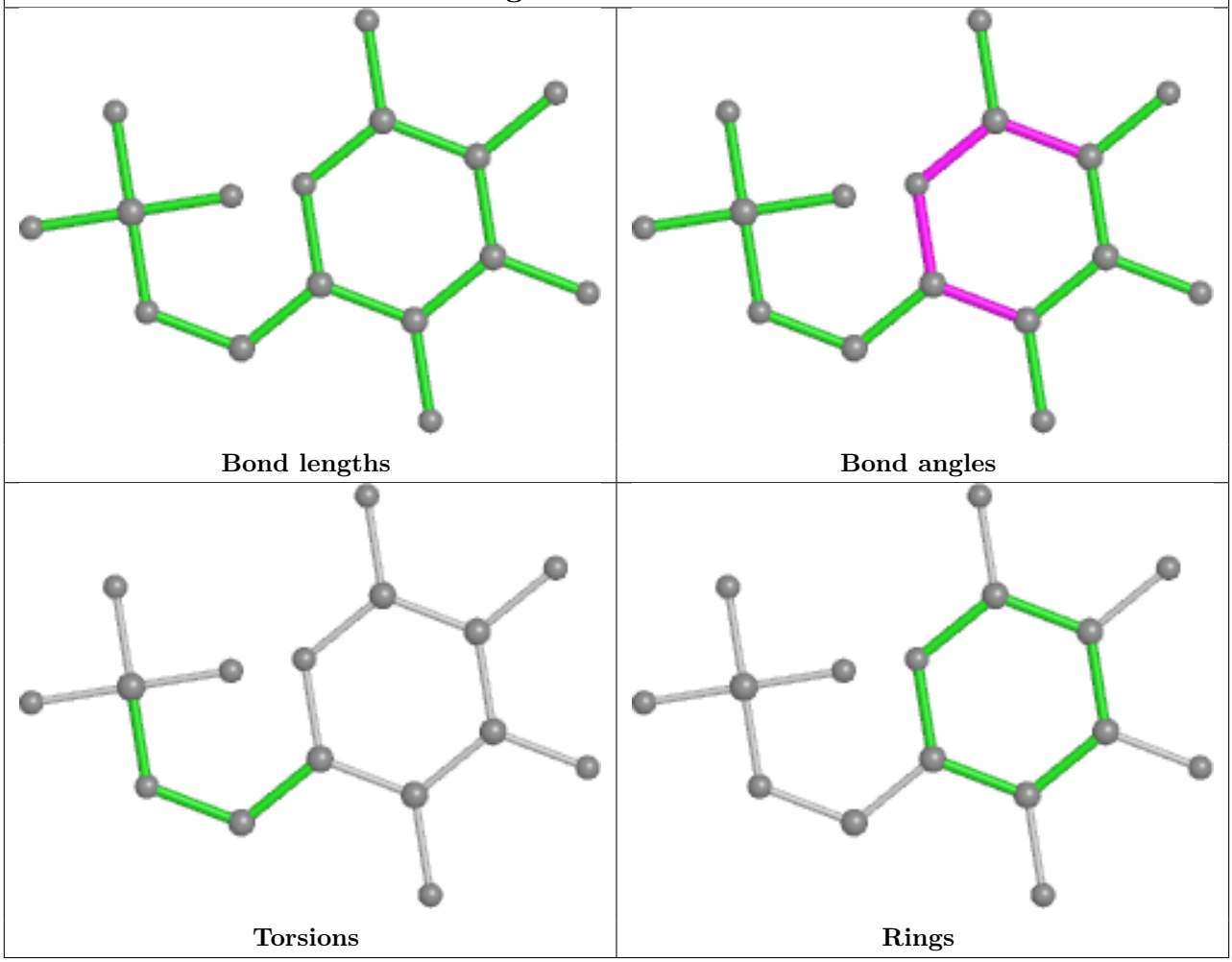
**Ligand G6P D 502**



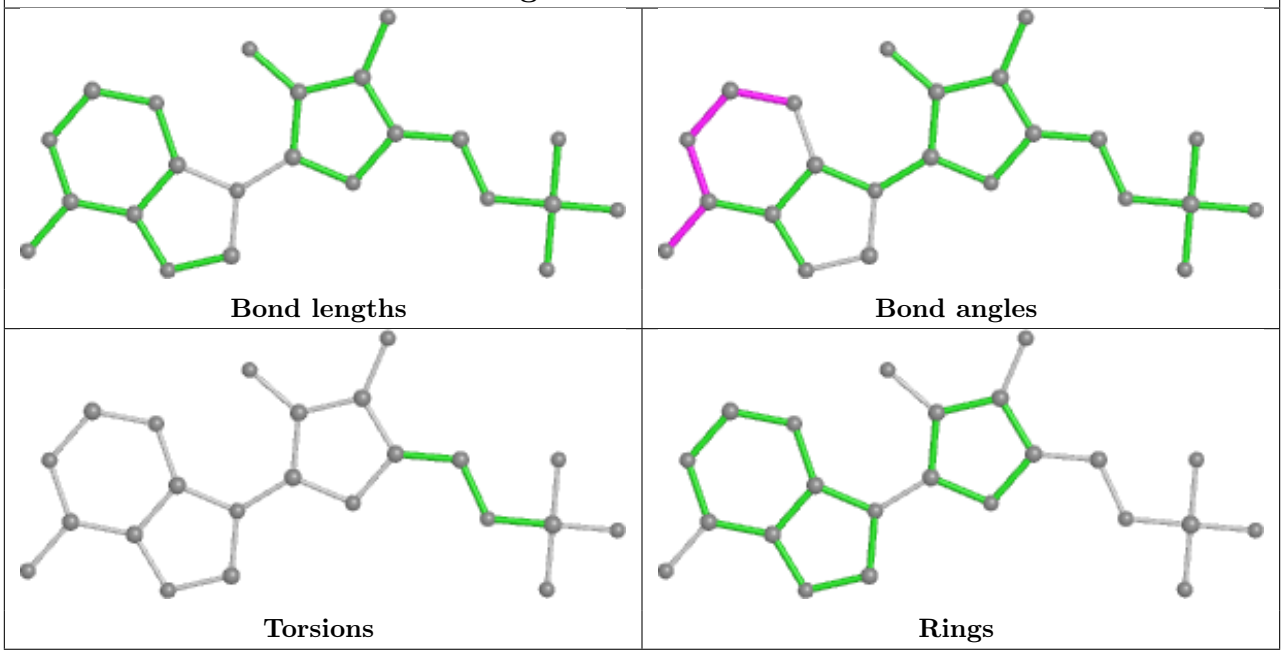
**Ligand G6P B 502**



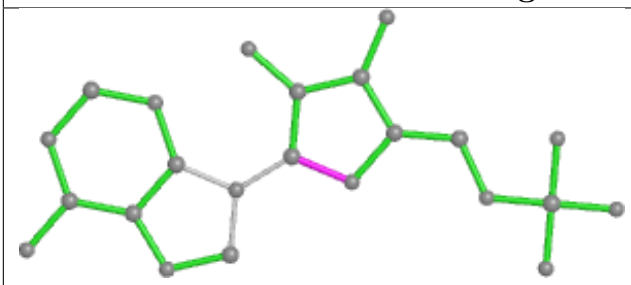
## Ligand G6P A 502



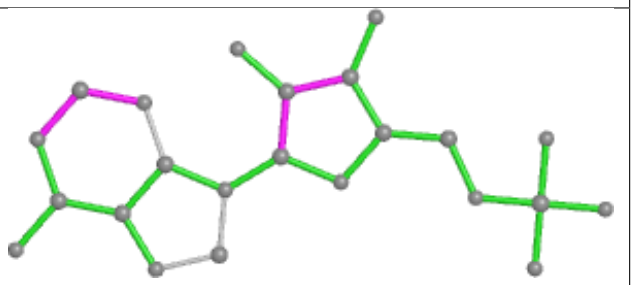

## Ligand AMP B 501



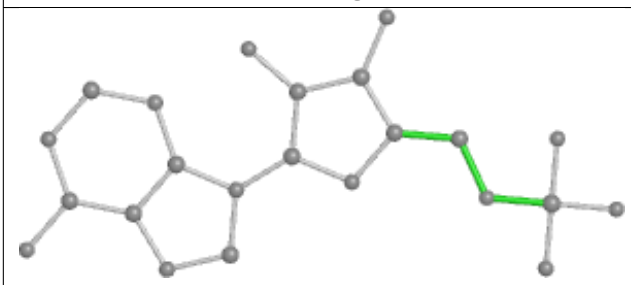
**Ligand AMP A 501**



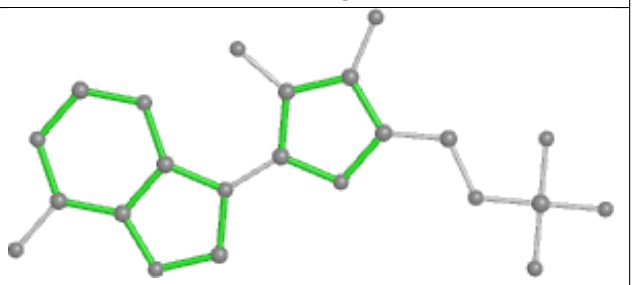
**Bond lengths**



**Bond angles**

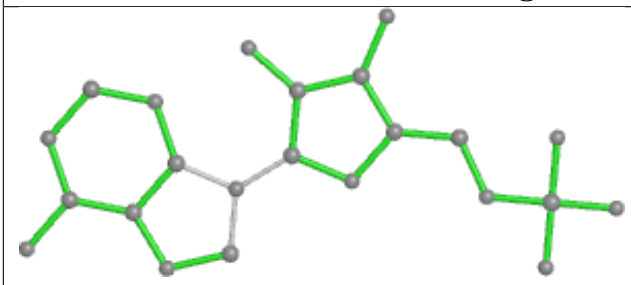


**Torsions**

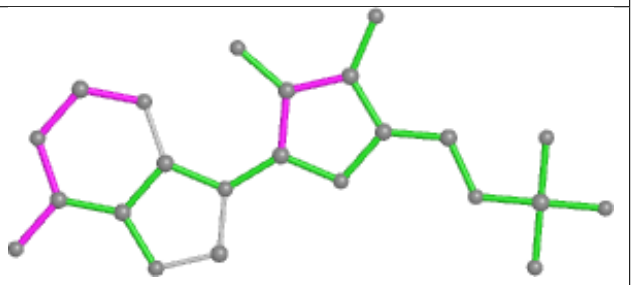


**Rings**

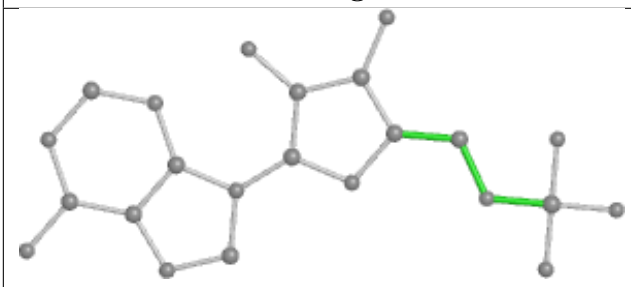
**Ligand AMP D 501**



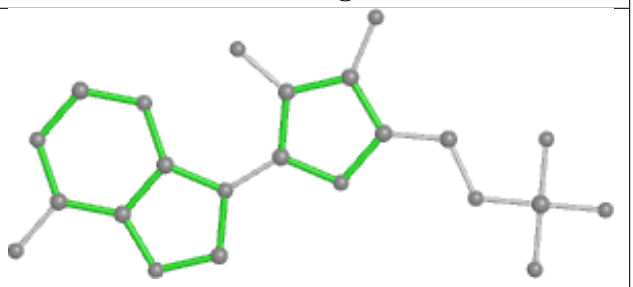
**Bond lengths**



**Bond angles**

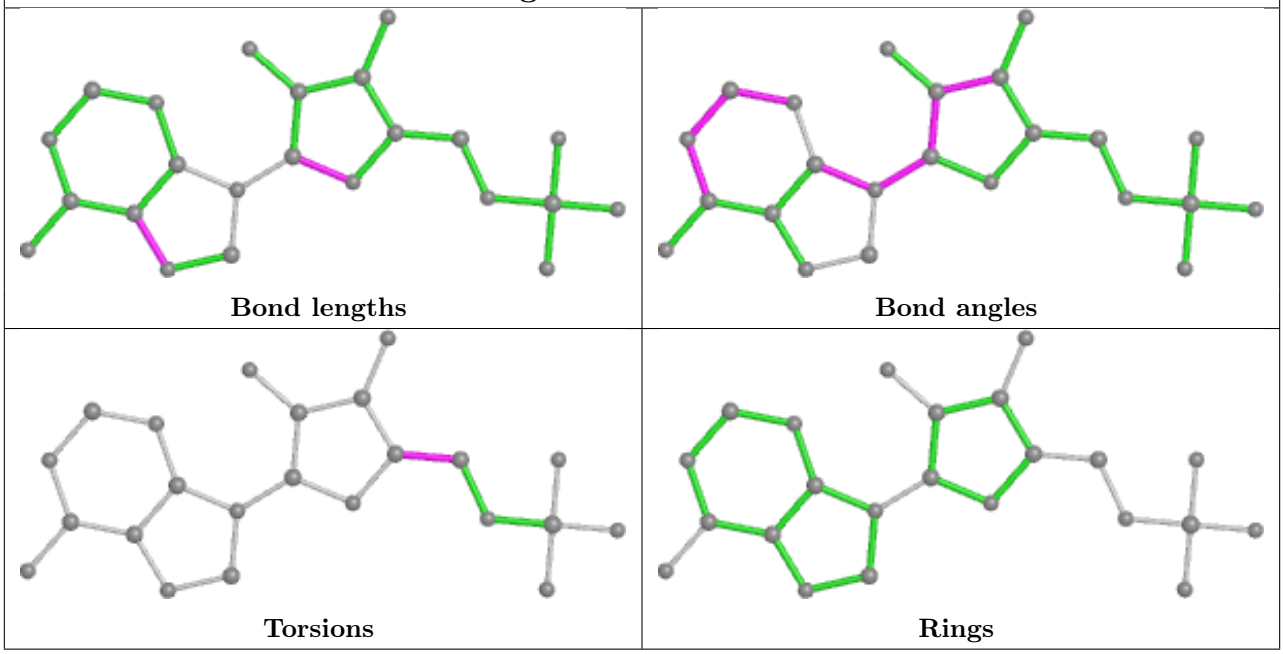


**Torsions**



**Rings**

**Ligand AMP C 501**




## 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 (i)

## 6.1 Protein, DNA and RNA chains (i)

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, $95^{th}$ 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 | 471/475 (99%) | -0.60 | 0 | 100 | 100 | 26, 34, 48, 62 | 0 |
| 1 | B | 471/475 (99%) | -0.61 | 0 | 100 | 100 | 26, 35, 46, 63 | 0 |
| 1 | C | 471/475 (99%) | -0.54 | 1 (0%) | 95 | 96 | 26, 37, 56, 78 | 0 |
| 1 | D | 471/475 (99%) | -0.55 | 0 | 100 | 100 | 25, 36, 54, 71 | 0 |
| All | All | 1884/1900 (99%) | -0.57 | 1 (0%) | 95 | 96 | 25, 36, 52, 78 | 0 |

All (1) RSRZ outliers are listed below:

| Mol | Chain | Res | Type | RSRZ |
|---|---|---|---|---|
| 1 | C | 82 | ALA | 2.2 |

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

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

## 6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

## 6.4 Ligands (i)

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, $95^{th}$ 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(Å$^2$) | Q<0.9 |
|---|---|---|---|---|---|---|---|---|
| 4 | MG | A | 503 | 1/1 | 0.97 | 0.06 | 32,32,32,32 | 0 |

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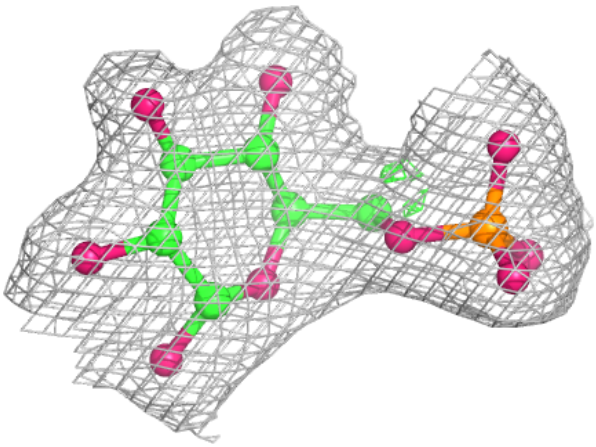
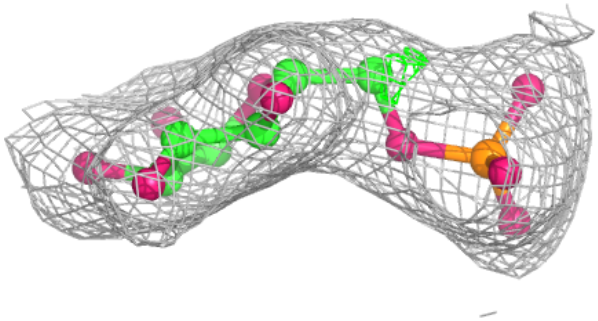
| Mol | Type | Chain | Res | Atoms | RSCC | RSR | B-factors(Å$^2$) | Q<0.9 |
|---|---|---|---|---|---|---|---|---|
| 4 | MG | B | 503 | 1/1 | 0.98 | 0.05 | 35,35,35,35 | 0 |
| 5 | OXL | A | 504 | 6/6 | 0.98 | 0.07 | 23,25,29,31 | 0 |
| 7 | PO4 | C | 505 | 5/5 | 0.98 | 0.07 | 37,37,40,50 | 0 |
| 3 | G6P | A | 502 | 16/16 | 0.99 | 0.12 | 23,29,33,33 | 0 |
| 3 | G6P | B | 502 | 16/16 | 0.99 | 0.11 | 25,29,33,37 | 0 |
| 3 | G6P | C | 502 | 16/16 | 0.99 | 0.10 | 27,30,34,35 | 0 |
| 3 | G6P | D | 502 | 16/16 | 0.99 | 0.11 | 23,28,35,36 | 0 |
| 2 | AMP | A | 501 | 23/23 | 0.99 | 0.12 | 24,31,34,36 | 0 |
| 2 | AMP | B | 501 | 23/23 | 0.99 | 0.10 | 21,30,33,34 | 0 |
| 4 | MG | C | 503 | 1/1 | 0.99 | 0.06 | 32,32,32,32 | 0 |
| 4 | MG | D | 503 | 1/1 | 0.99 | 0.05 | 30,30,30,30 | 0 |
| 2 | AMP | C | 501 | 23/23 | 0.99 | 0.10 | 25,32,36,37 | 0 |
| 5 | OXL | B | 504 | 6/6 | 0.99 | 0.08 | 21,26,30,32 | 0 |
| 5 | OXL | C | 504 | 6/6 | 0.99 | 0.09 | 24,27,29,29 | 0 |
| 5 | OXL | D | 504 | 6/6 | 0.99 | 0.07 | 24,29,29,30 | 0 |
| 2 | AMP | D | 501 | 23/23 | 0.99 | 0.10 | 23,31,36,40 | 0 |
| 7 | PO4 | D | 505 | 5/5 | 0.99 | 0.06 | 33,34,45,48 | 0 |
| 6 | K | B | 505 | 1/1 | 1.00 | 0.06 | 37,37,37,37 | 0 |

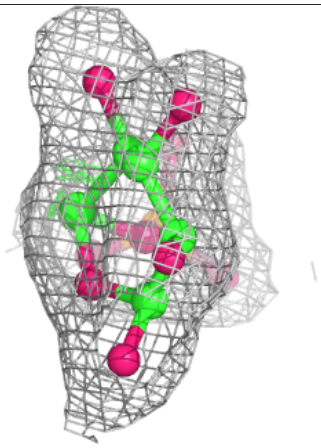
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

**Electron density around G6P A 502:**

$2mF_o$-$DF_c$ (at 0.7 rmsd) in gray
$mF_o$-$DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

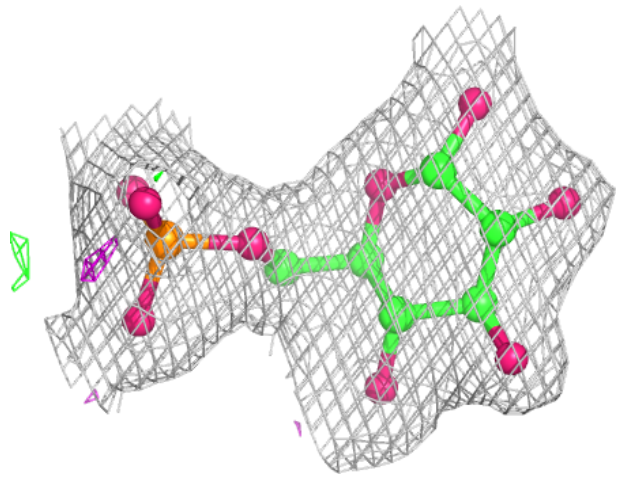


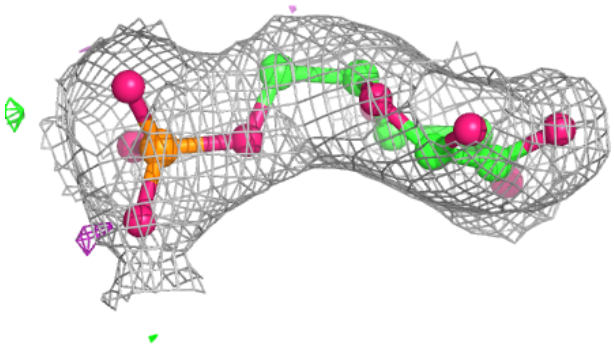


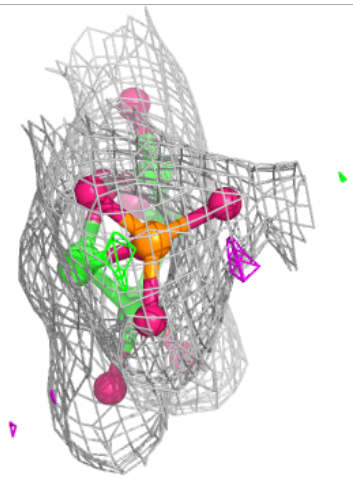


**Electron density around G6P B 502:**

$2mF_o$-$DF_c$ (at 0.7 rmsd) in gray
$mF_o$-$DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

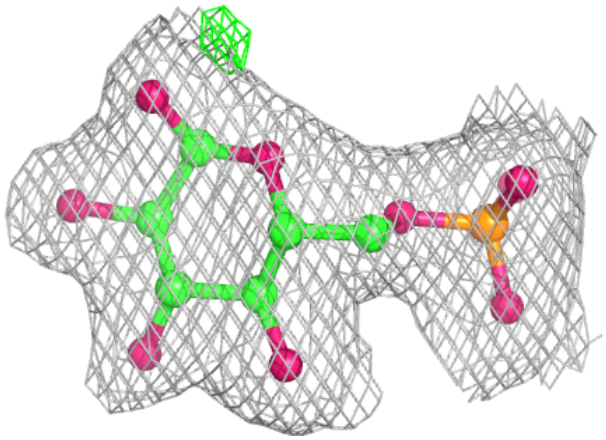


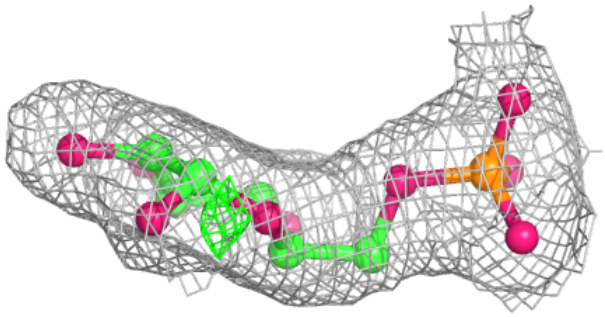


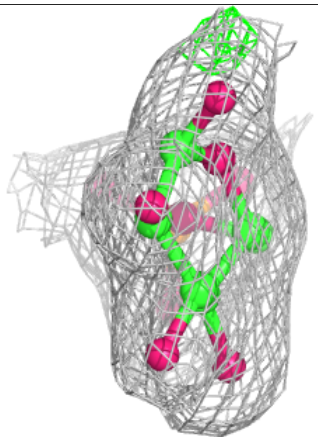


**Electron density around G6P D 502:**

$2mF_o$-$DF_c$ (at 0.7 rmsd) in gray
$mF_o$-$DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

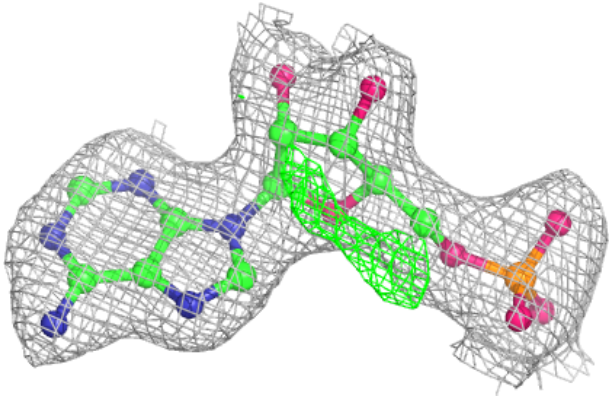


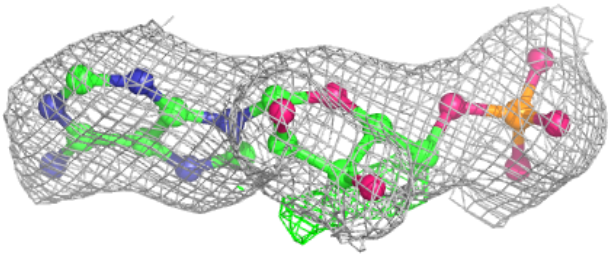


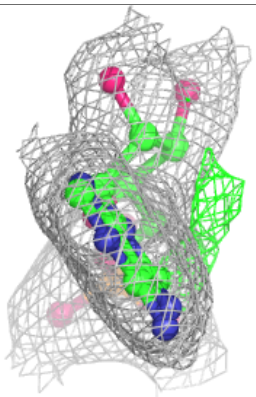


**Electron density around AMP A 501:**

$2mF_o$-$DF_c$ (at 0.7 rmsd) in gray
$mF_o$-$DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

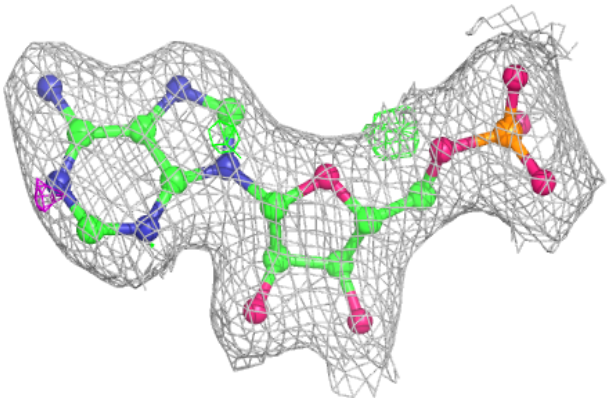


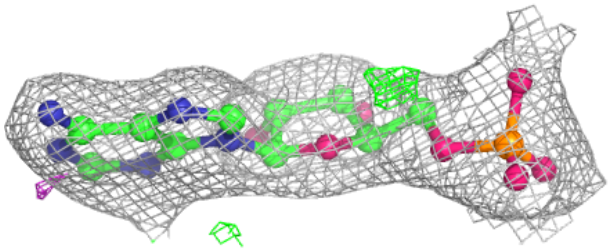


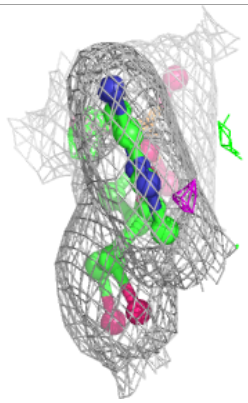


**Electron density around AMP B 501:**

$2mF_o$-$DF_c$ (at 0.7 rmsd) in gray
$mF_o$-$DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

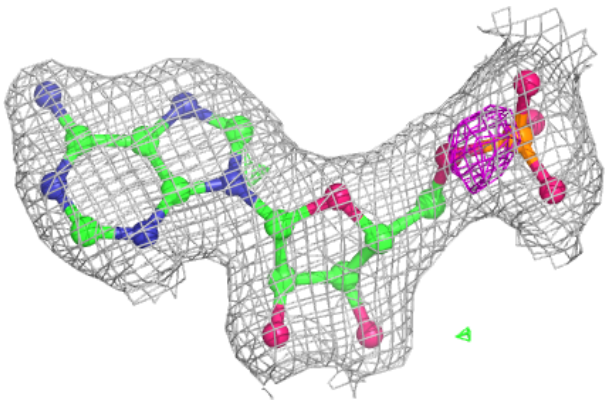


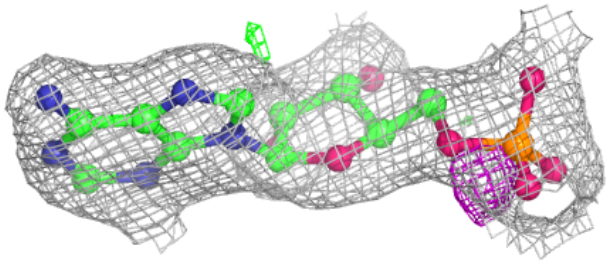


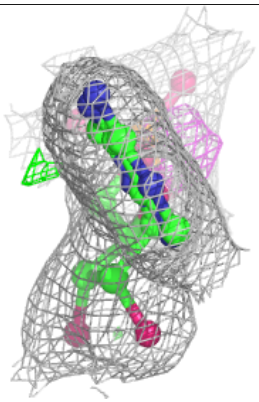


**Electron density around AMP C 501:**

$2mF_o$-$DF_c$ (at 0.7 rmsd) in gray
$mF_o$-$DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

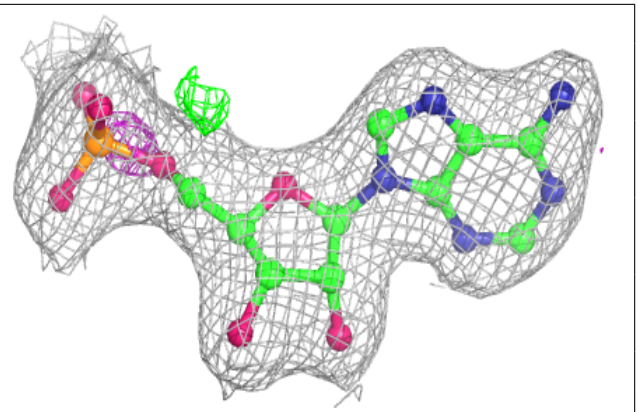


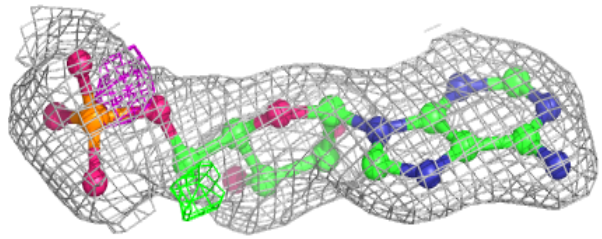


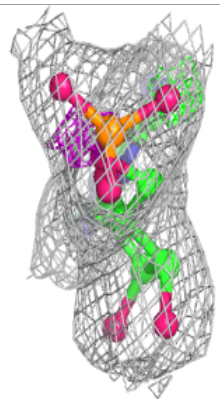


**Electron density around AMP D 501:**

$2mF_o$-$DF_c$ (at 0.7 rmsd) in gray
$mF_o$-$DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)







## 6.5 Other polymers (i)

There are no such residues in this entry.