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

Aug 22, 2023 – 11:18 AM EDT

| | | |
|---|---|---|
| PDB ID | : | 2R9R |
| Title | : | Shaker family voltage dependent potassium channel (kv1.2-kv2.1 paddle chimera channel) in association with beta subunit |
| Authors | : | Long, S.B.; Tao, X.; Campbell, E.B.; Mackinnon, R. |
| Deposited on | : | 2007-09-13 |
| Resolution | : | 2.40 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 (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:

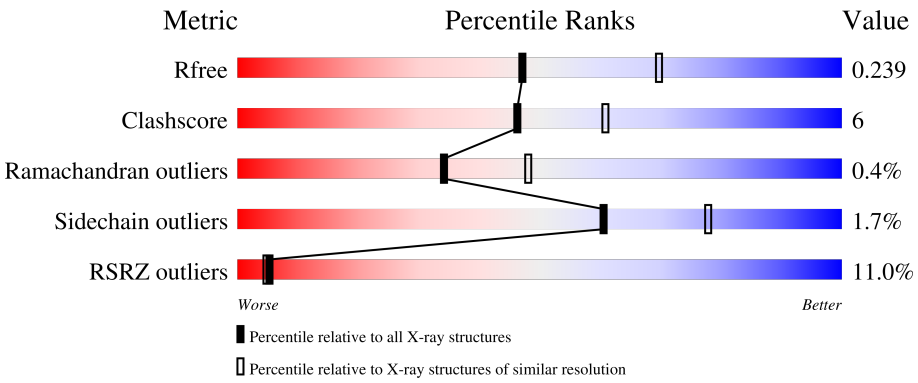
| | | |
|---|---|---|
| MolProbity | : | 4.02b-467 |
| Mogul | : | 1.8.5 (274361), CSD as541be (2020) |
| Xtriage (Phenix) | : | 1.13 |
| EDS | : | 2.35 |
| buster-report | : | 1.1.7 (2018) |
| Percentile statistics | : | 20191225.v01 (using entries in the PDB archive December 25th 2019) |
| Refmac | : | 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) | : | 2.35 |

# 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 2.40 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 | 3907 (2.40-2.40) |
| Clashscore | 141614 | 4398 (2.40-2.40) |
| Ramachandran outliers | 138981 | 4318 (2.40-2.40) |
| Sidechain outliers | 138945 | 4319 (2.40-2.40) |
| RSRZ outliers | 127900 | 3811 (2.40-2.40) |

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 | 333 | .% 88% 9% • • |
| 1 | G | 333 | .% 86% 11% • • |
| 2 | B | 514 | 5% 61% 13% 25% |
| 2 | H | 514 | 24% 55% 15% 29% |

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

| Mol | Type | Chain | Res | Chirality | Geometry | Clashes | Electron density |
|---|---|---|---|---|---|---|---|
| 5 | PGW | B | 511 | - | - | - | X |
| 5 | PGW | B | 515 | - | - | - | X |

# 2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 11814 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 Voltage-gated potassium channel subunit beta-2.

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | C | N | O | S | | | |
| 1 | A | 326 | 2556 | 1627 | 443 | 470 | 16 | 0 | 0 | 0 |
| 1 | G | 326 | 2556 | 1627 | 443 | 470 | 16 | 0 | 0 | 0 |

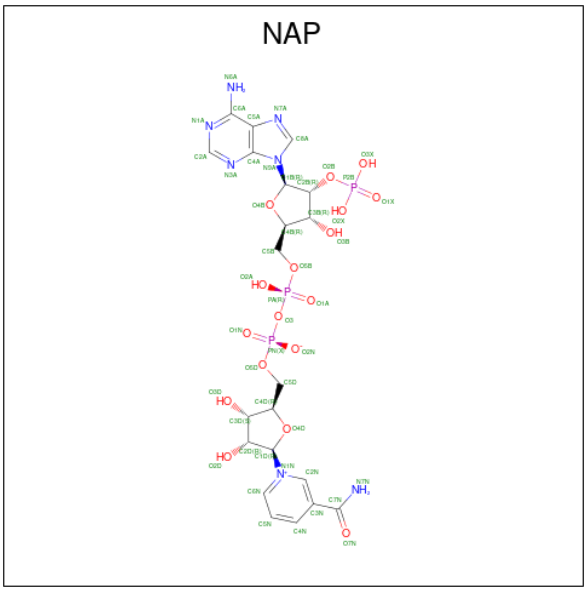
There are 2 discrepancies between the modelled and reference sequences:

| Chain | Residue | Modelled | Actual | Comment | Reference |
|---|---|---|---|---|---|
| A | 35 | MET | - | expression tag | UNP P62483 |
| G | 35 | MET | - | expression tag | UNP P62483 |

- Molecule 2 is a protein called Paddle chimera voltage gated potassium channel Kv1.2-Kv2.1.

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf | Trace |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | C | N | O | S | | | |
| 2 | B | 386 | 3088 | 2022 | 504 | 548 | 14 | 0 | 0 | 0 |
| 2 | H | 363 | 2959 | 1950 | 478 | 518 | 13 | 0 | 0 | 0 |

- Molecule 3 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NAP) (formula: $C_{21}H_{28}N_7O_{17}P_3$).



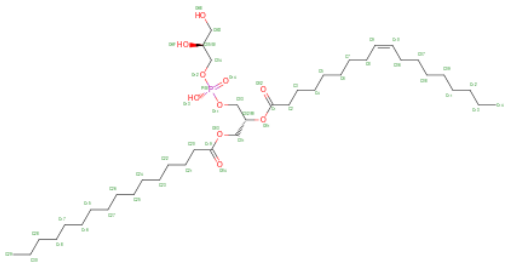

| Mol | Chain | Residues | Atoms | | | | | ZeroOcc | AltConf |
|---|---|---|---|---|---|---|---|---|---|
| | | | Total | C | N | O | P | | |
| 3 | A | 1 | 48 | 21 | 7 | 17 | 3 | 0 | 0 |
| | | | Total | C | N | O | P | | |
| 3 | G | 1 | 48 | 21 | 7 | 17 | 3 | 0 | 0 |

- Molecule 4 is POTASSIUM ION (three-letter code: K) (formula: K).

| Mol | Chain | Residues | Atoms | | ZeroOcc | AltConf |
|---|---|---|---|---|---|---|
| | | | Total | K | | |
| 4 | B | 4 | 4 | 4 | 0 | 0 |
| | | | Total | K | | |
| 4 | H | 4 | 4 | 4 | 0 | 0 |

- Molecule 5 is (1R)-2-{[(S)-{[(2S)-2,3-dihydroxypropyl]oxy}(hydroxy)phosphoryl]oxy}-1-[(hexadecanoyloxy)methyl]ethyl (9Z)-octadec-9-enoate (three-letter code: PGW) (formula: $C_{40}H_{77}O_{10}P$).

PGW



| Mol | Chain | Residues | Atoms | ZeroOcc | AltConf |
|---|---|---|---|---|---|
| 5 | B | 1 | Total C O<br>22 17 5 | 0 | 0 |
| 5 | B | 1 | Total C<br>9 9 | 0 | 0 |
| 5 | B | 1 | Total C<br>9 9 | 0 | 0 |
| 5 | B | 1 | Total C<br>9 9 | 0 | 0 |
| 5 | B | 1 | Total C<br>9 9 | 0 | 0 |
| 5 | B | 1 | Total C<br>9 9 | 0 | 0 |
| 5 | B | 1 | Total C<br>9 9 | 0 | 0 |
| 5 | B | 1 | Total C<br>7 7 | 0 | 0 |
| 5 | B | 1 | Total C<br>9 9 | 0 | 0 |
| 5 | B | 1 | Total C<br>12 12 | 0 | 0 |
| 5 | B | 1 | Total C O P<br>23 14 8 1 | 0 | 0 |
| 5 | B | 1 | Total C<br>12 12 | 0 | 0 |
| 5 | B | 1 | Total C O P<br>37 26 10 1 | 0 | 0 |
| 5 | B | 1 | Total C<br>10 10 | 0 | 0 |

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| Mol | Chain | Residues | Atoms | ZeroOcc | AltConf |
|---|---|---|---|---|---|
| 5 | B | 1 | Total C<br>12 12 | 0 | 0 |
| 5 | B | 1 | Total C<br>12 12 | 0 | 0 |
| 5 | H | 1 | Total C O<br>22 17 5 | 0 | 0 |

- Molecule 6 is water.

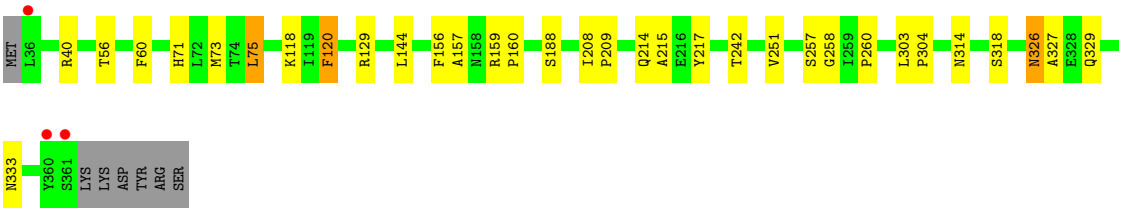
| Mol | Chain | Residues | Atoms | ZeroOcc | AltConf |
|---|---|---|---|---|---|
| 6 | A | 141 | Total O<br>141 141 | 0 | 0 |
| 6 | B | 52 | Total O<br>52 52 | 0 | 0 |
| 6 | G | 102 | Total O<br>102 102 | 0 | 0 |
| 6 | H | 24 | Total O<br>24 24 | 0 | 0 |

# 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.

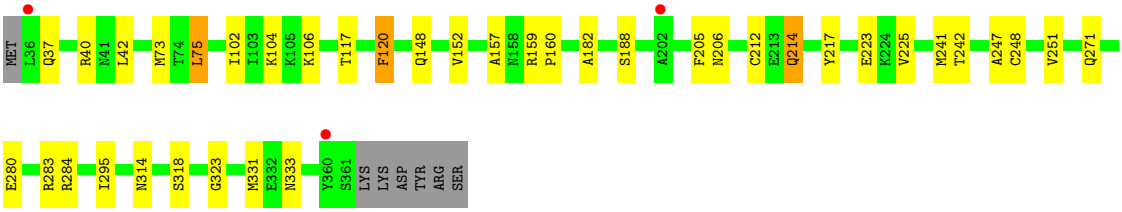
• Molecule 1: Voltage-gated potassium channel subunit beta-2

Chain A:



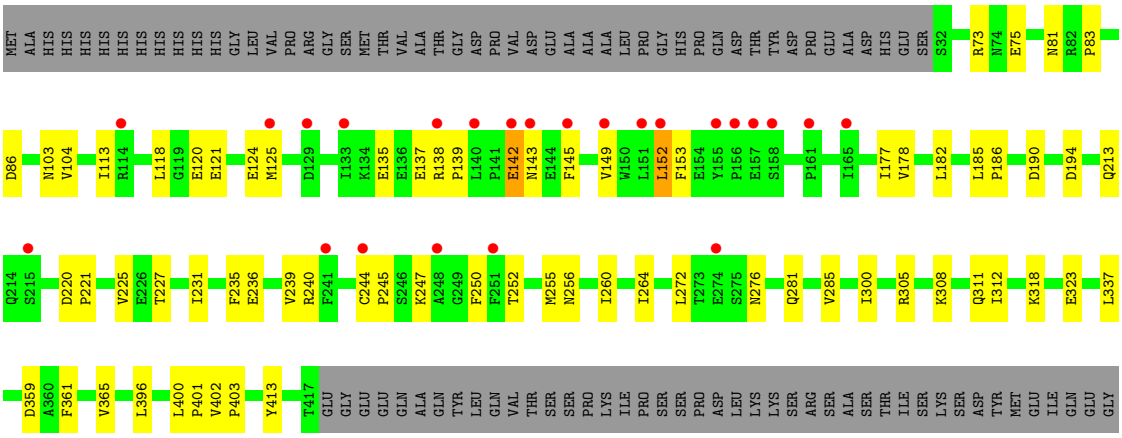

• Molecule 1: Voltage-gated potassium channel subunit beta-2

Chain G:




• Molecule 2: Paddle chimera voltage gated potassium channel Kv1.2-Kv2.1

Chain B:



VAL ASN ASN SER ASN GLU ASP PHE ARG GLU GLU ASN LEU LYS THR ALA ASN SER THR LEU ALA ASN THR ASN TYR VAL ASN ILE THR LYS MET LEU THR ASP VAL

- Molecule 2: Paddle chimera voltage gated potassium channel Kv1.2-Kv2.1

Chain H: 24% 55% 15% 29%

MET ALA HIS HIS HIS HIS HIS HIS HIS HIS GLY LEU VAL PRO ARG GLY SER MET THR VAL ALA THR GLY ASP PRO VAL ASP GLU ALA ALA ALA LEU PRO GLY HIS PRO GLN ASP THR TYR ASP PRO GLU ALA ASP HIS GLU SER S32 L58 R82 D86 A87 I88

Y91 P101 V102 N103 V104 D107 E111 R114 E120 M123 R127 G131 TYR ILE LYS GLU GLU GLU ARG PRO LEU PRO GLU ASN GLU F145 Q146 R147 Q148 V149 W150 L151 L152 F153 E154 Y155 P156 E157 S158 S159 G160 P161 A162 R163 I164 I165 V168 S169 V172 I173

L174 I175 S176 I177 V178 L182 P186 I187 F188 R189 D190 E191 ASN GLU ASP MET HIS GLY GLY GLY VAL THR F202 H203 T204 Y205 S206 Q207 S208 T209 I210 G211 Y212 Q213 Q214 S215 T216 S217 F218 T219 D220 P221 F222 F223 I224 V225 E226 T227 L228 C229 I230 I231 W232 F233 S234 F235 E236 F237

L238 V239 R240 F241 F242 A243 C244 P245 S246 K247 A248 G249 F250 F251 T252 N253 I254 M255 N256 I257 I258 D259 I260 V261 I264 P265 Y266 Y267 V268 T269 I270 F271 L272 T273 E274 S275 N276 K277 S278 V279 L280 Q281 F282 Q283 N284 V285 R286 R287 V288 V289 Q290 I291 F292 R293 I294 M295 R296 I297 L298

R299 I300 F301 R305 I312 M321 R322 E323 R350 D351 I357 P358 D359 A360 F361 V365 L396 T397 I398 A399 L400 P401 V402 P403 Y411 F412 Y413 H414 R415 E416 T417 GLU GLY GLU GLU GLN ALA GLN TYR LEU GLN VAL THR SER SER PRO LYS ILE PRO SER SER PRO

ASP LEU LYS LYS SER ARG SER ALA SER THR ILE SER LYS SER ASP TYR MET GLU ILE GLN GLU GLY VAL ASN ASN SER ASN GLU ASP PHE ARG GLU GLU ASN LEU LYS THR ALA ASN SER THR LEU ALA ASN THR ASN TYR VAL ASN ILE THR LYS MET LEU THR ASP VAL

# 4 Data and refinement statistics (i)

| Property | Value | Source |
|---|---|---|
| Space group | P 4 21 2 | Depositor |
| Cell constants<br>a, b, c, $\alpha$, $\beta$, $\gamma$ | 144.05Å 144.05Å 284.40Å<br>90.00° 90.00° 90.00° | Depositor |
| Resolution (Å) | 49.66 – 2.40<br>49.66 – 2.30 | Depositor<br>EDS |
| % Data completeness<br>(in resolution range) | 89.4 (49.66-2.40)<br>85.3 (49.66-2.30) | Depositor<br>EDS |
| $R_{merge}$ | (Not available) | Depositor |
| $R_{sym}$ | 0.06 | Depositor |
| $< I/\sigma(I) >$ [1] | 1.39 (at 2.29Å) | Xtriage |
| Refinement program | CNS 1.1 | Depositor |
| R, $R_{free}$ | 0.212 , 0.244<br>0.207 , 0.239 | Depositor<br>DCC |
| $R_{free}$ test set | 5746 reflections (5.07%) | wwPDB-VP |
| Wilson B-factor (Å$^2$) | 34.4 | Xtriage |
| Anisotropy | 0.308 | Xtriage |
| Bulk solvent $k_{sol}$(e/Å$^3$), $B_{sol}$(Å$^2$) | 0.34 , 54.5 | EDS |
| L-test for twinning[2] | $< \|L\| > = 0.49$, $< L^2 > = 0.32$ | Xtriage |
| Estimated twinning fraction | No twinning to report. | Xtriage |
| $F_o$,$F_c$ correlation | 0.93 | EDS |
| Total number of atoms | 11814 | wwPDB-VP |
| Average B, all atoms (Å$^2$) | 58.0 | wwPDB-VP |

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.03% 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: K, PGW, NAP

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 | 0.69 | 0/2608 | 0.73 | 1/3524 (0.0%) |
| 1 | G | 0.68 | 0/2608 | 0.70 | 1/3524 (0.0%) |
| 2 | B | 0.57 | 0/3169 | 0.66 | 0/4292 |
| 2 | H | 0.49 | 0/3036 | 0.60 | 2/4114 (0.0%) |
| All | All | 0.61 | 0/11421 | 0.67 | 4/15454 (0.0%) |

There are no bond length outliers.

All (4) bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed($^o$) | Ideal($^o$) |
|---|---|---|---|---|---|---|---|
| 2 | H | 82 | ARG | NE-CZ-NH2 | -7.47 | 116.56 | 120.30 |
| 2 | H | 82 | ARG | NE-CZ-NH1 | 5.96 | 123.28 | 120.30 |
| 1 | G | 157 | ALA | N-CA-C | -5.08 | 97.28 | 111.00 |
| 1 | A | 157 | ALA | N-CA-C | -5.07 | 97.31 | 111.00 |

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 | 2556 | 0 | 2582 | 21 | 0 |
| 1 | G | 2556 | 0 | 2582 | 23 | 0 |
| 2 | B | 3088 | 0 | 3033 | 44 | 1 |

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| Mol | Chain | Non-H | H(model) | H(added) | Clashes | Symm-Clashes |
|---|---|---|---|---|---|---|
| 2 | H | 2959 | 0 | 2955 | 53 | 0 |
| 3 | A | 48 | 0 | 25 | 1 | 0 |
| 3 | G | 48 | 0 | 25 | 3 | 0 |
| 4 | B | 4 | 0 | 0 | 0 | 0 |
| 4 | H | 4 | 0 | 0 | 0 | 0 |
| 5 | B | 210 | 0 | 291 | 9 | 0 |
| 5 | H | 22 | 0 | 25 | 6 | 0 |
| 6 | A | 141 | 0 | 0 | 1 | 0 |
| 6 | B | 52 | 0 | 0 | 0 | 0 |
| 6 | G | 102 | 0 | 0 | 0 | 0 |
| 6 | H | 24 | 0 | 0 | 1 | 0 |
| All | All | 11814 | 0 | 11518 | 144 | 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 6.

The worst 5 of 144 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) |
|---|---|---|---|
| 2:H:103:ASN:HD22 | 2:H:103:ASN:H | 1.16 | 0.93 |
| 1:G:333:ASN:HD21 | 3:G:1001:NAP:H61A | 1.29 | 0.79 |
| 1:A:118:LYS:HG3 | 1:A:156:PHE:HB2 | 1.72 | 0.71 |
| 2:B:177:ILE:HD13 | 2:B:300:ILE:HD12 | 1.73 | 0.70 |
| 2:H:400:LEU:HB2 | 2:H:401:PRO:HD3 | 1.72 | 0.70 |

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) |
|---|---|---|---|
| 2:B:142:GLU:O | 2:B:142:GLU:O[8_556] | 1.43 | 0.77 |

## 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 | 324/333 (97%) | 316 (98%) | 7 (2%) | 1 (0%) | 41 | 55 |
| 1 | G | 324/333 (97%) | 317 (98%) | 6 (2%) | 1 (0%) | 41 | 55 |
| 2 | B | 384/514 (75%) | 365 (95%) | 16 (4%) | 3 (1%) | 19 | 29 |
| 2 | H | 357/514 (70%) | 345 (97%) | 11 (3%) | 1 (0%) | 41 | 55 |
| All | All | 1389/1694 (82%) | 1343 (97%) | 40 (3%) | 6 (0%) | 34 | 48 |

5 of 6 Ramachandran outliers are listed below:

| Mol | Chain | Res | Type |
|---|---|---|---|
| 1 | A | 120 | PHE |
| 2 | B | 137 | GLU |
| 1 | G | 120 | PHE |
| 2 | B | 135 | GLU |
| 2 | B | 142 | GLU |

### 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 | 273/280 (98%) | 268 (98%) | 5 (2%) | 59 | 76 |
| 1 | G | 273/280 (98%) | 265 (97%) | 8 (3%) | 42 | 62 |
| 2 | B | 332/459 (72%) | 327 (98%) | 5 (2%) | 65 | 80 |
| 2 | H | 324/459 (71%) | 321 (99%) | 3 (1%) | 78 | 90 |
| All | All | 1202/1478 (81%) | 1181 (98%) | 21 (2%) | 60 | 78 |

5 of 21 residues with a non-rotameric sidechain are listed below:

| Mol | Chain | Res | Type |
|---|---|---|---|
| 1 | G | 223 | GLU |
| 1 | G | 314 | ASN |
| 2 | H | 152 | LEU |
| 2 | H | 82 | ARG |

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| Mol | Chain | Res | Type |
|---|---|---|---|
| 1 | G | 283 | ARG |

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 17 such sidechains are listed below:

| Mol | Chain | Res | Type |
|---|---|---|---|
| 1 | G | 333 | ASN |
| 2 | H | 103 | ASN |
| 2 | B | 53 | GLN |
| 2 | B | 103 | ASN |
| 2 | B | 192 | ASN |

### 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 27 ligands modelled in this entry, 8 are monoatomic - leaving 19 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 | NAP | A | 1001 | - | 45,52,52 | 1.41 | 8 (17%) | 56,80,80 | 1.18 | 5 (8%) |
| 5 | PGW | B | 503 | - | 8,8,50 | 0.35 | 0 | 7,7,56 | 0.50 | 0 |

| Mol | Type | Chain | Res | Link | Bond lengths | | | Bond angles | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Counts | RMSZ | $\#\|Z\| > 2$ | Counts | RMSZ | $\#\|Z\| > 2$ |
| 3 | NAP | G | 1001 | - | 45,52,52 | 1.40 | 6 (13%) | 56,80,80 | 1.18 | 3 (5%) |
| 5 | PGW | B | 508 | - | 8,8,50 | 0.35 | 0 | 7,7,56 | 0.51 | 0 |
| 5 | PGW | B | 515 | - | 11,11,50 | 0.35 | 0 | 10,10,56 | 0.57 | 0 |
| 5 | PGW | B | 511 | - | 11,11,50 | 0.34 | 0 | 10,10,56 | 0.60 | 0 |
| 5 | PGW | B | 506 | - | 8,8,50 | 0.34 | 0 | 7,7,56 | 0.57 | 0 |
| 5 | PGW | B | 514 | - | 11,11,50 | 0.35 | 0 | 10,10,56 | 0.53 | 0 |
| 5 | PGW | B | 509 | - | 11,11,50 | 0.35 | 0 | 10,10,56 | 0.58 | 0 |
| 5 | PGW | H | 500 | - | 21,21,50 | 0.60 | 0 | 23,23,56 | 1.08 | 1 (4%) |
| 5 | PGW | B | 507 | - | 6,6,50 | 0.36 | 0 | 5,5,56 | 0.47 | 0 |
| 5 | PGW | B | 502 | - | 8,8,50 | 0.35 | 0 | 7,7,56 | 0.49 | 0 |
| 5 | PGW | B | 512 | - | 36,36,50 | 0.64 | 0 | 39,42,56 | 0.97 | 3 (7%) |
| 5 | PGW | B | 513 | - | 9,9,50 | 0.35 | 0 | 8,8,56 | 0.58 | 0 |
| 5 | PGW | B | 501 | - | 8,8,50 | 0.35 | 0 | 7,7,56 | 0.50 | 0 |
| 5 | PGW | B | 505 | - | 8,8,50 | 0.35 | 0 | 7,7,56 | 0.54 | 0 |
| 5 | PGW | B | 510 | - | 22,22,50 | 0.78 | 0 | 26,27,56 | 1.25 | 4 (15%) |
| 5 | PGW | B | 504 | - | 8,8,50 | 0.36 | 0 | 7,7,56 | 0.49 | 0 |
| 5 | PGW | B | 500 | - | 21,21,50 | 0.59 | 0 | 23,23,56 | 1.12 | 1 (4%) |

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 | NAP | A | 1001 | - | - | 4/31/67/67 | 0/5/5/5 |
| 5 | PGW | B | 503 | - | - | 0/6/6/55 | - |
| 3 | NAP | G | 1001 | - | - | 2/31/67/67 | 0/5/5/5 |
| 5 | PGW | B | 508 | - | - | 0/6/6/55 | - |
| 5 | PGW | B | 515 | - | - | 0/9/9/55 | - |
| 5 | PGW | B | 511 | - | - | 0/9/9/55 | - |
| 5 | PGW | B | 506 | - | - | 0/6/6/55 | - |
| 5 | PGW | B | 514 | - | - | 0/9/9/55 | - |
| 5 | PGW | B | 509 | - | - | 0/9/9/55 | - |
| 5 | PGW | H | 500 | - | - | 3/23/23/55 | - |
| 5 | PGW | B | 507 | - | - | 0/4/4/55 | - |
| 5 | PGW | B | 502 | - | - | 0/6/6/55 | - |
| 5 | PGW | B | 512 | - | - | 10/41/41/55 | - |
| 5 | PGW | B | 513 | - | - | 0/7/7/55 | - |
| 5 | PGW | B | 501 | - | - | 0/6/6/55 | - |
| 5 | PGW | B | 505 | - | - | 0/6/6/55 | - |

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| Mol | Type | Chain | Res | Link | Chirals | Torsions | Rings |
|---|---|---|---|---|---|---|---|
| 5 | PGW | B | 510 | - | - | 10/24/24/55 | - |
| 5 | PGW | B | 504 | - | - | 0/6/6/55 | - |
| 5 | PGW | B | 500 | - | - | 3/23/23/55 | - |

The worst 5 of 14 bond length outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed(Å) | Ideal(Å) |
|---|---|---|---|---|---|---|---|
| 3 | A | 1001 | NAP | C6N-N1N | 4.23 | 1.45 | 1.35 |
| 3 | G | 1001 | NAP | C2A-N3A | 3.99 | 1.38 | 1.32 |
| 3 | G | 1001 | NAP | C6N-N1N | 3.75 | 1.44 | 1.35 |
| 3 | A | 1001 | NAP | C4N-C3N | 3.40 | 1.45 | 1.39 |
| 3 | G | 1001 | NAP | C4A-N3A | 3.08 | 1.39 | 1.35 |

The worst 5 of 17 bond angle outliers are listed below:

| Mol | Chain | Res | Type | Atoms | Z | Observed($^o$) | Ideal($^o$) |
|---|---|---|---|---|---|---|---|
| 5 | B | 500 | PGW | O01-C1-C2 | 3.26 | 118.53 | 111.50 |
| 3 | G | 1001 | NAP | C6N-N1N-C2N | -3.25 | 119.01 | 121.97 |
| 5 | B | 510 | PGW | C03-C02-C01 | -3.04 | 104.59 | 111.79 |
| 5 | H | 500 | PGW | O01-C1-C2 | 2.95 | 117.86 | 111.50 |
| 3 | A | 1001 | NAP | C2A-N1A-C6A | 2.79 | 123.53 | 118.75 |

There are no chirality outliers.

5 of 32 torsion outliers are listed below:

| Mol | Chain | Res | Type | Atoms |
|---|---|---|---|---|
| 3 | A | 1001 | NAP | PN-O3-PA-O5B |
| 3 | A | 1001 | NAP | O4D-C1D-N1N-C6N |
| 5 | B | 510 | PGW | C20-C19-O03-C01 |
| 5 | B | 500 | PGW | C20-C19-O03-C01 |
| 5 | B | 500 | PGW | O04-C19-O03-C01 |

There are no ring outliers.

7 monomers are involved in 19 short contacts:

| Mol | Chain | Res | Type | Clashes | Symm-Clashes |
|---|---|---|---|---|---|
| 3 | A | 1001 | NAP | 1 | 0 |
| 3 | G | 1001 | NAP | 3 | 0 |
| 5 | H | 500 | PGW | 6 | 0 |
| 5 | B | 512 | PGW | 2 | 0 |

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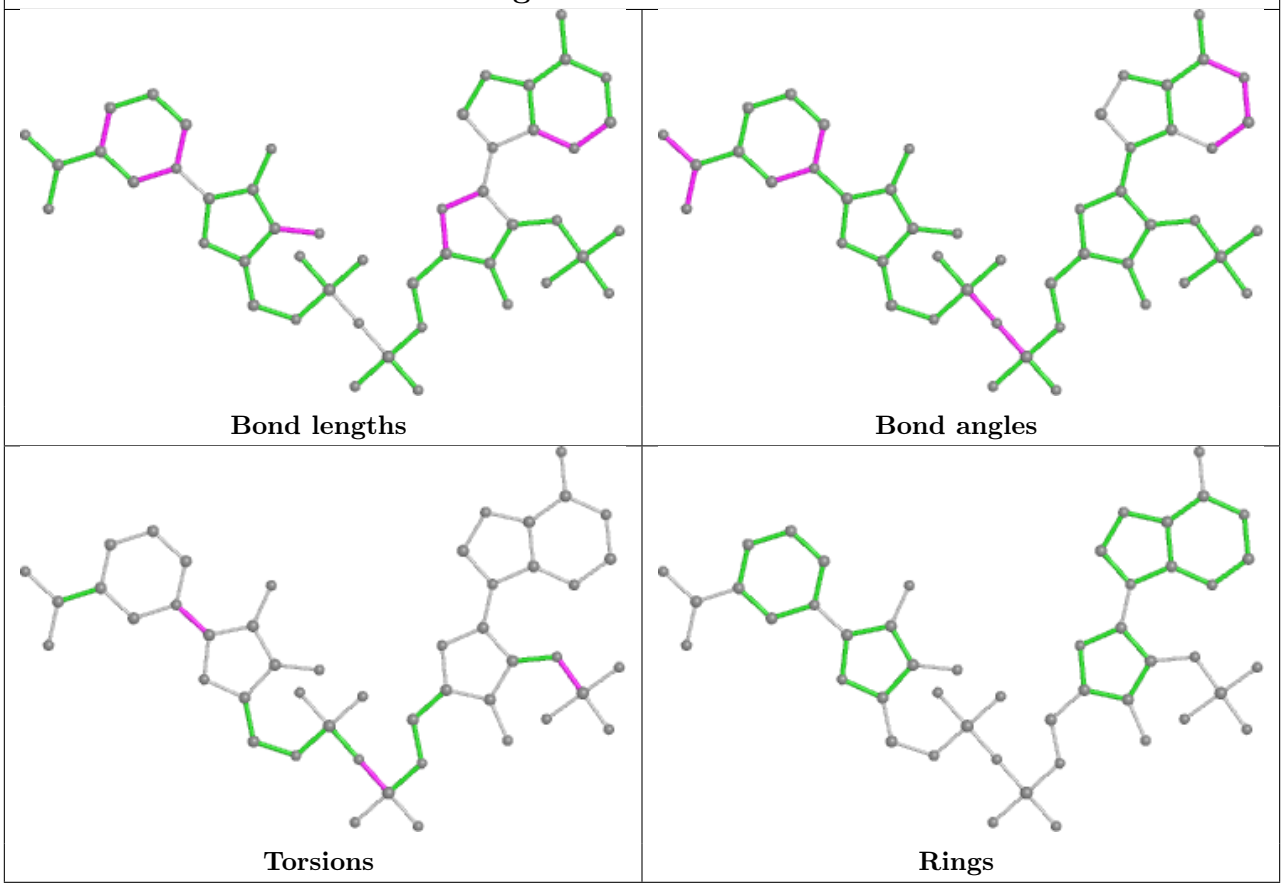
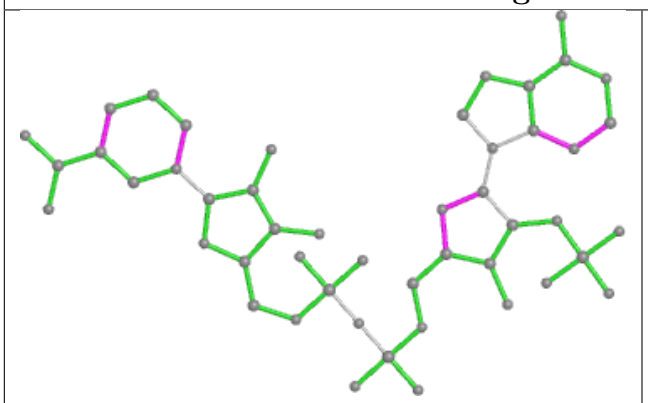
| Mol | Chain | Res | Type | Clashes | Symm-Clashes |
|---|---|---|---|---|---|
| 5 | B | 505 | PGW | 1 | 0 |
| 5 | B | 510 | PGW | 1 | 0 |
| 5 | B | 500 | PGW | 5 | 0 |

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.

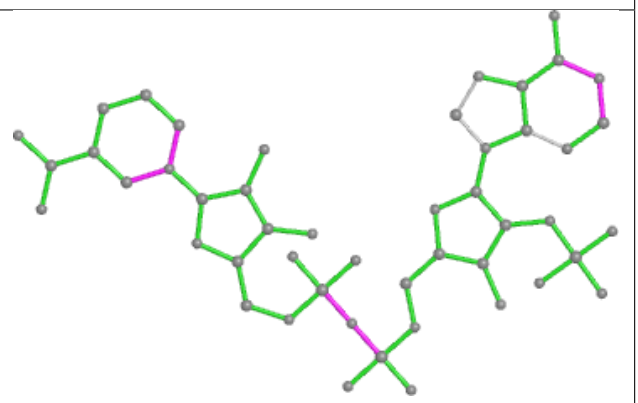
**Ligand NAP A 1001**



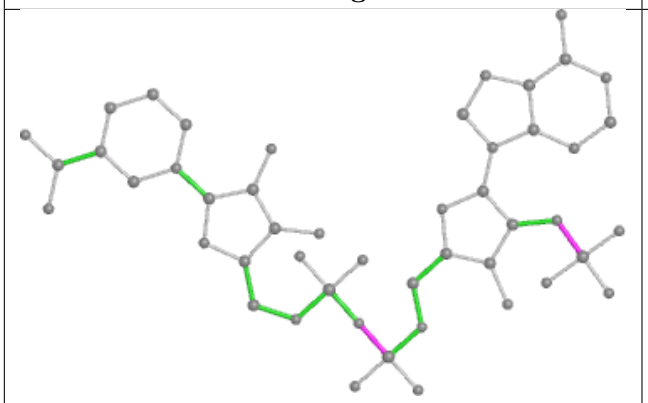
## Ligand NAP G 1001



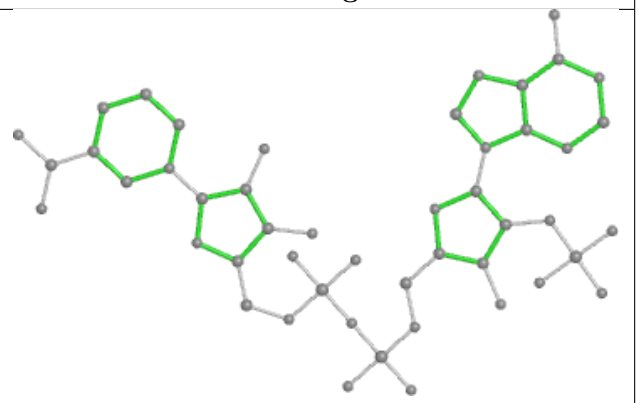
Bond lengths



Bond angles



Torsions



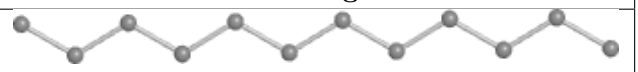
Rings

## Ligand PGW B 515

Bond lengths

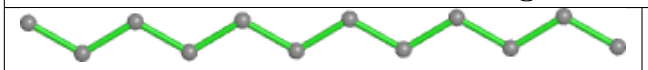
Bond angles

Torsions



Rings

## Ligand PGW B 511



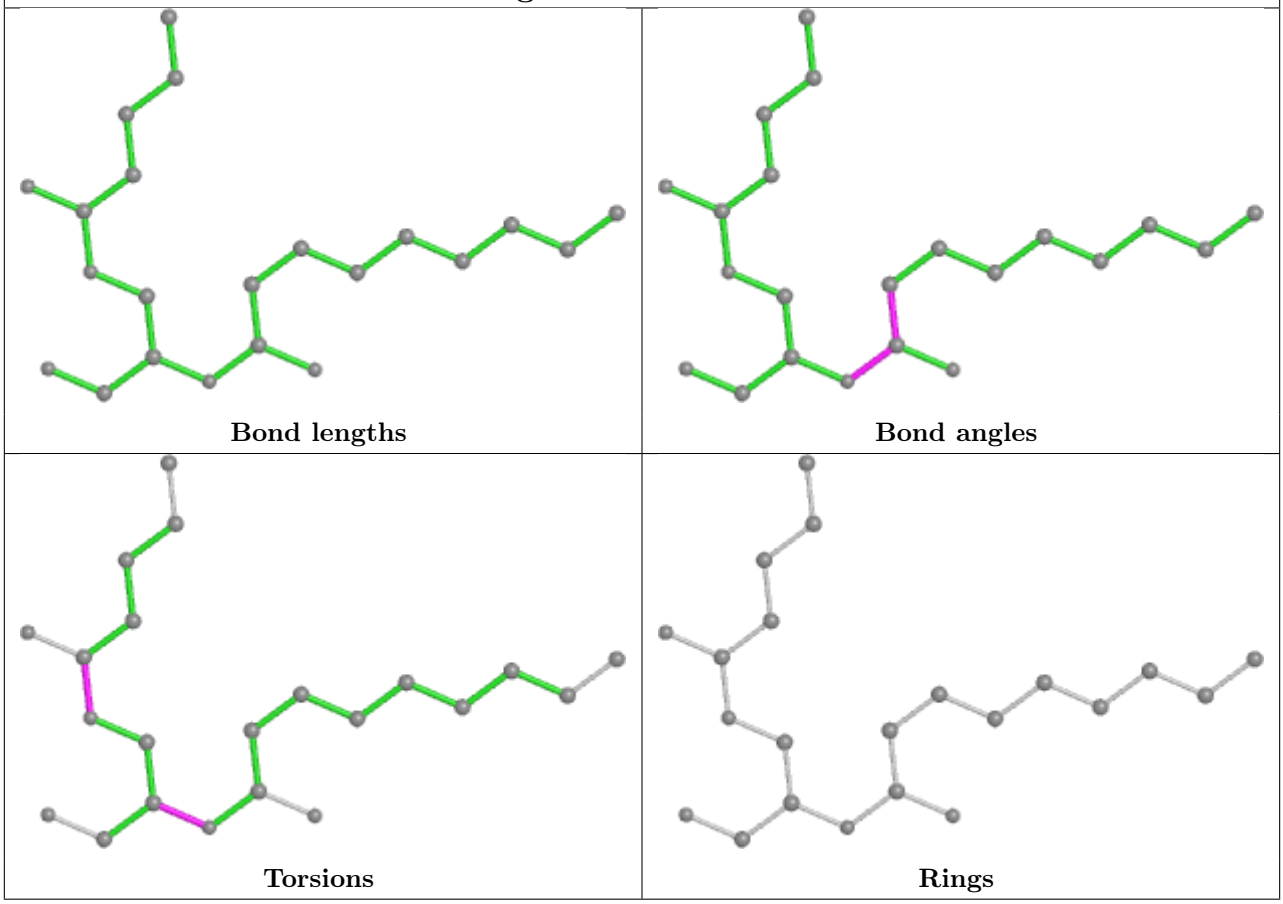
Bond lengths

Bond angles

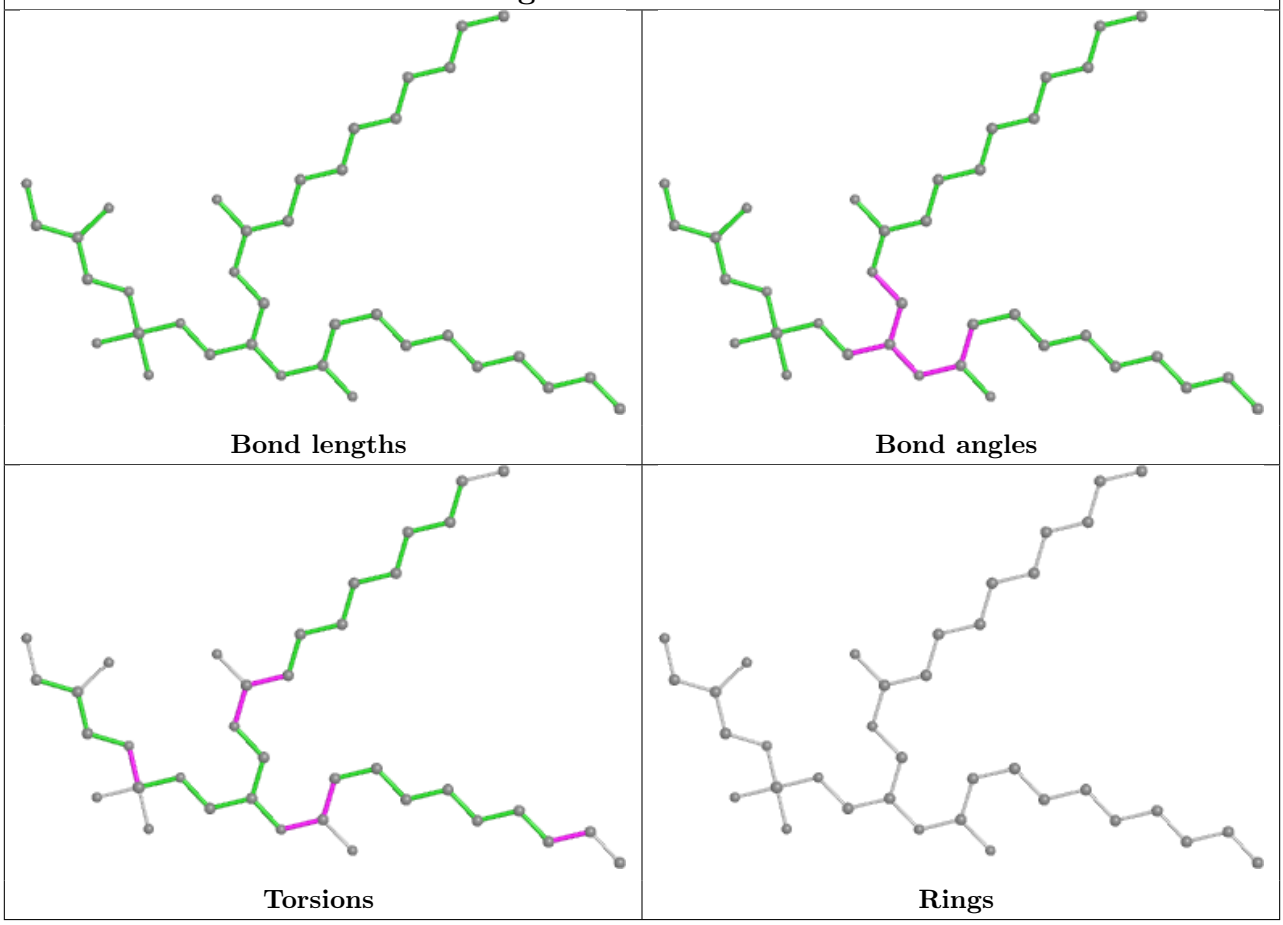
Torsions

Rings

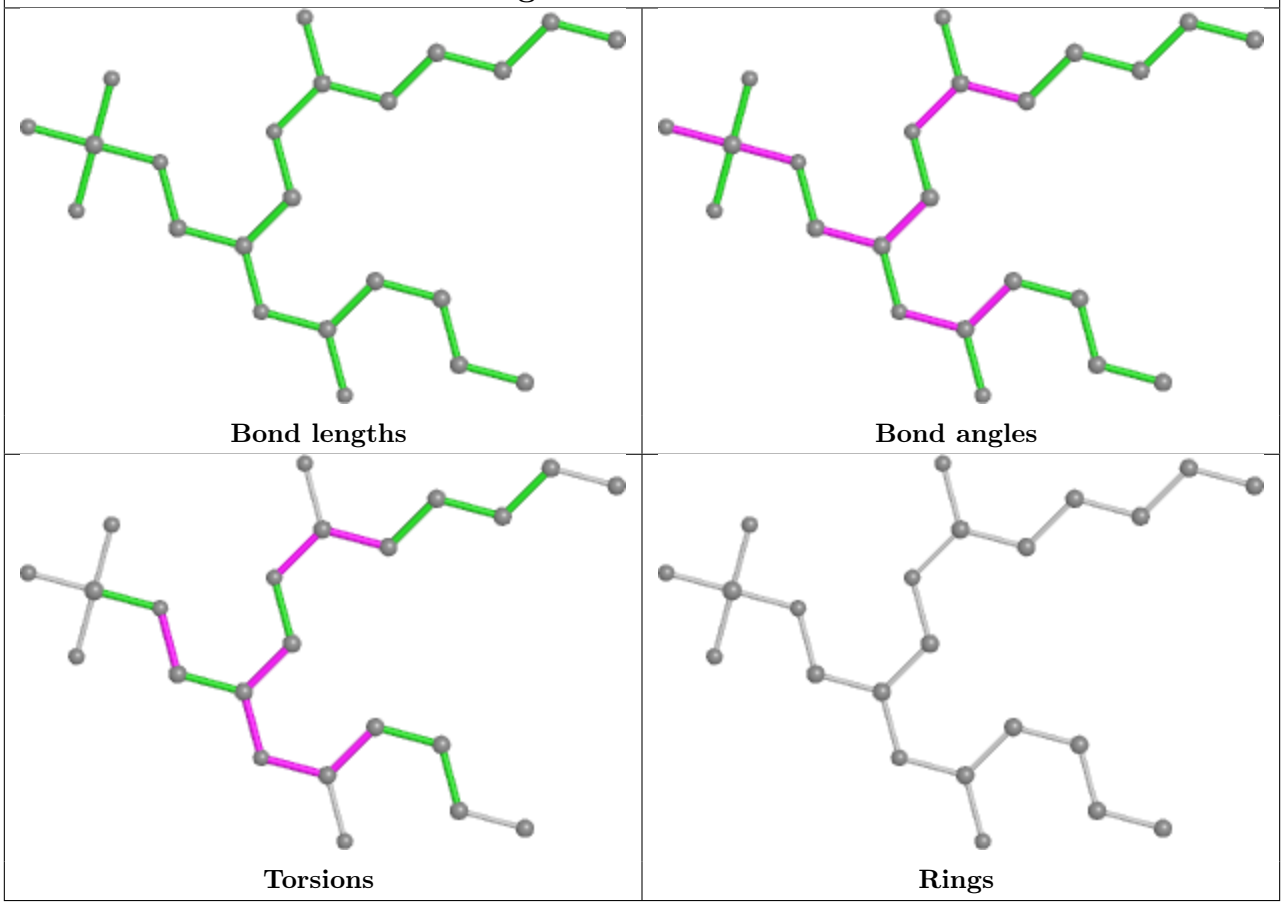
**Ligand PGW H 500**



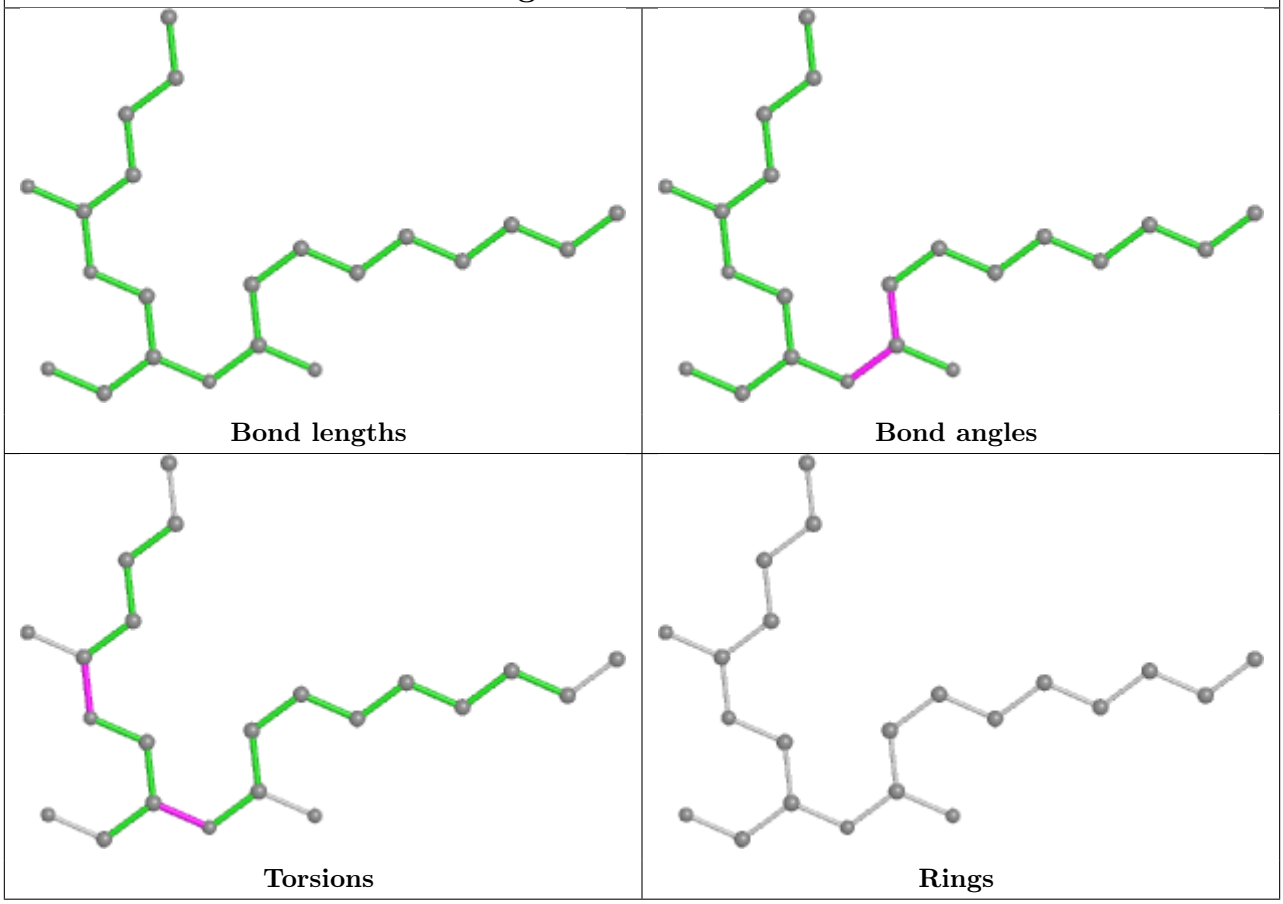
**Ligand PGW B 512**



**Ligand PGW B 510**



**Ligand PGW B 500**




## 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 | 326/333 (97%) | -0.33 | 3 (0%) | 84 | 82 | 18, 32, 54, 74 | 0 |
| 1 | G | 326/333 (97%) | -0.26 | 3 (0%) | 84 | 82 | 19, 34, 63, 82 | 0 |
| 2 | B | 386/514 (75%) | 0.20 | 24 (6%) | 20 | 19 | 25, 53, 98, 113 | 0 |
| 2 | H | 363/514 (70%) | 2.27 | 124 (34%) | 0 | 0 | 30, 85, 176, 185 | 0 |
| All | All | 1401/1694 (82%) | 0.50 | 154 (10%) | 5 | 5 | 18, 46, 153, 185 | 0 |

The worst 5 of 154 RSRZ outliers are listed below:

| Mol | Chain | Res | Type | RSRZ |
|---|---|---|---|---|
| 2 | H | 205 | TYR | 22.3 |
| 2 | H | 149 | VAL | 16.5 |
| 2 | H | 214 | GLN | 16.1 |
| 2 | H | 244 | CYS | 15.4 |
| 2 | H | 269 | THR | 13.8 |

## 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)

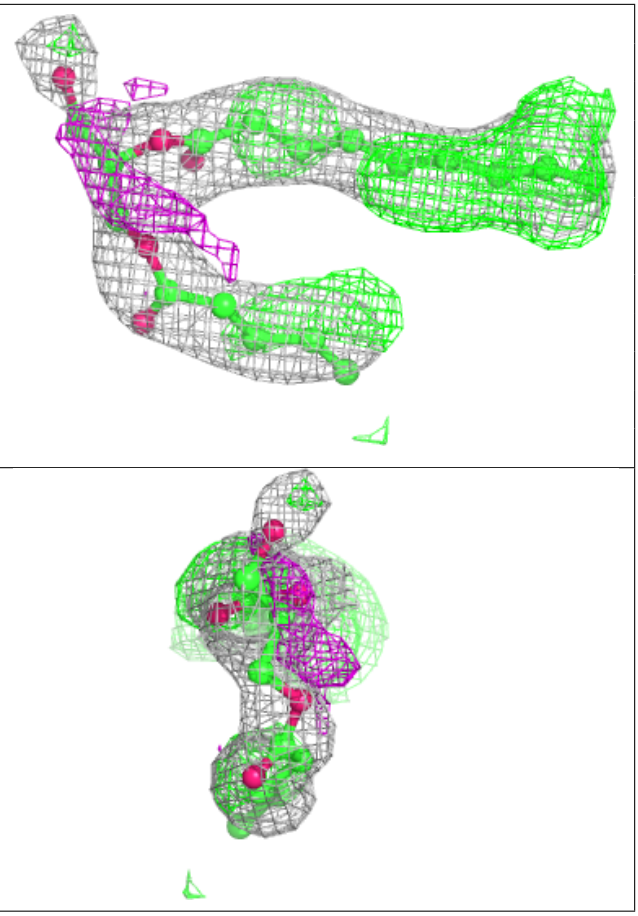
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, $95^{th}$ percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

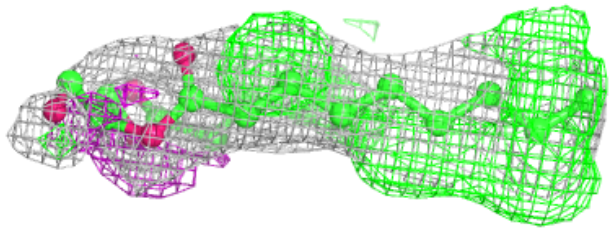
| Mol | Type | Chain | Res | Atoms | RSCC | RSR | B-factors(Å$^2$) | Q<0.9 |
|---|---|---|---|---|---|---|---|---|
| 5 | PGW | B | 514 | 12/51 | 0.45 | 0.34 | 87,88,89,89 | 0 |
| 5 | PGW | B | 500 | 22/51 | 0.50 | 0.34 | 61,65,68,69 | 0 |
| 5 | PGW | B | 512 | 37/51 | 0.51 | 0.28 | 81,99,121,123 | 0 |
| 5 | PGW | B | 511 | 12/51 | 0.51 | 0.45 | 76,79,80,80 | 0 |
| 5 | PGW | B | 503 | 9/51 | 0.53 | 0.34 | 90,91,91,91 | 0 |
| 5 | PGW | B | 504 | 9/51 | 0.58 | 0.27 | 83,84,85,85 | 0 |
| 5 | PGW | B | 510 | 23/51 | 0.59 | 0.29 | 100,103,111,111 | 0 |
| 5 | PGW | H | 500 | 22/51 | 0.63 | 0.26 | 82,90,92,92 | 0 |
| 5 | PGW | B | 515 | 12/51 | 0.64 | 0.51 | 88,89,89,89 | 0 |
| 5 | PGW | B | 501 | 9/51 | 0.72 | 0.22 | 82,84,86,86 | 0 |
| 5 | PGW | B | 502 | 9/51 | 0.74 | 0.23 | 83,84,84,84 | 0 |
| 5 | PGW | B | 513 | 10/51 | 0.76 | 0.22 | 63,64,66,66 | 0 |
| 5 | PGW | B | 506 | 9/51 | 0.77 | 0.39 | 74,76,79,79 | 0 |
| 5 | PGW | B | 509 | 12/51 | 0.78 | 0.22 | 67,67,68,68 | 0 |
| 5 | PGW | B | 507 | 7/51 | 0.79 | 0.21 | 72,73,74,74 | 0 |
| 5 | PGW | B | 505 | 9/51 | 0.80 | 0.27 | 65,66,67,67 | 0 |
| 5 | PGW | B | 508 | 9/51 | 0.80 | 0.28 | 76,77,77,77 | 0 |
| 4 | K | H | 498 | 1/1 | 0.92 | 0.12 | 51,51,51,51 | 1 |
| 4 | K | H | 496 | 1/1 | 0.94 | 0.18 | 49,49,49,49 | 1 |
| 4 | K | B | 496 | 1/1 | 0.97 | 0.14 | 38,38,38,38 | 1 |
| 4 | K | H | 497 | 1/1 | 0.97 | 0.17 | 51,51,51,51 | 1 |
| 3 | NAP | G | 1001 | 48/48 | 0.98 | 0.12 | 27,30,37,37 | 0 |
| 4 | K | B | 497 | 1/1 | 0.98 | 0.20 | 35,35,35,35 | 1 |
| 4 | K | H | 499 | 1/1 | 0.99 | 0.16 | 51,51,51,51 | 1 |
| 4 | K | B | 498 | 1/1 | 0.99 | 0.22 | 29,29,29,29 | 1 |
| 3 | NAP | A | 1001 | 48/48 | 0.99 | 0.13 | 26,30,34,34 | 0 |
| 4 | K | B | 499 | 1/1 | 1.00 | 0.23 | 35,35,35,35 | 1 |

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 PGW B 500:**

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

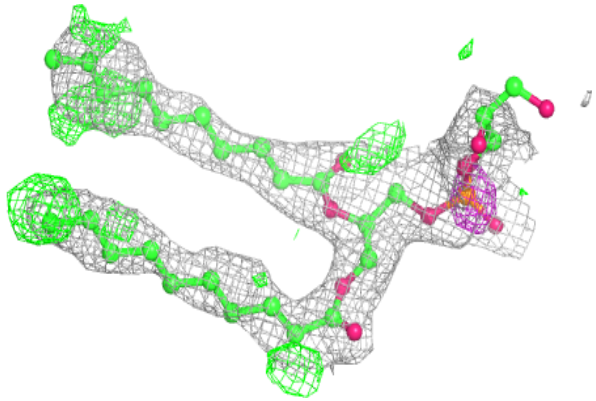


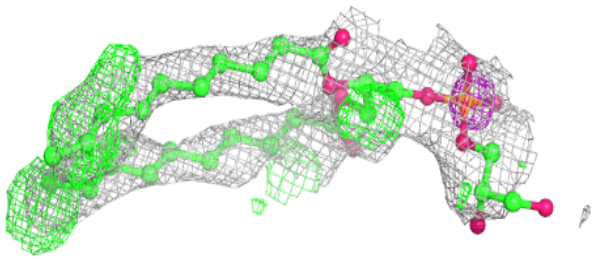


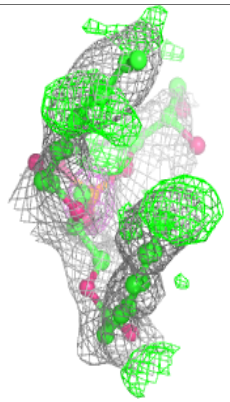


**Electron density around PGW B 512:**

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

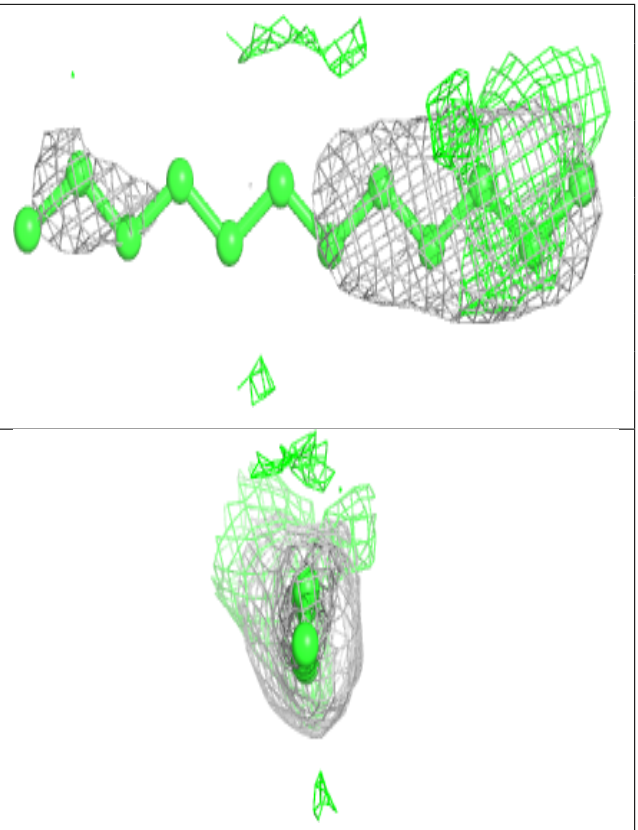






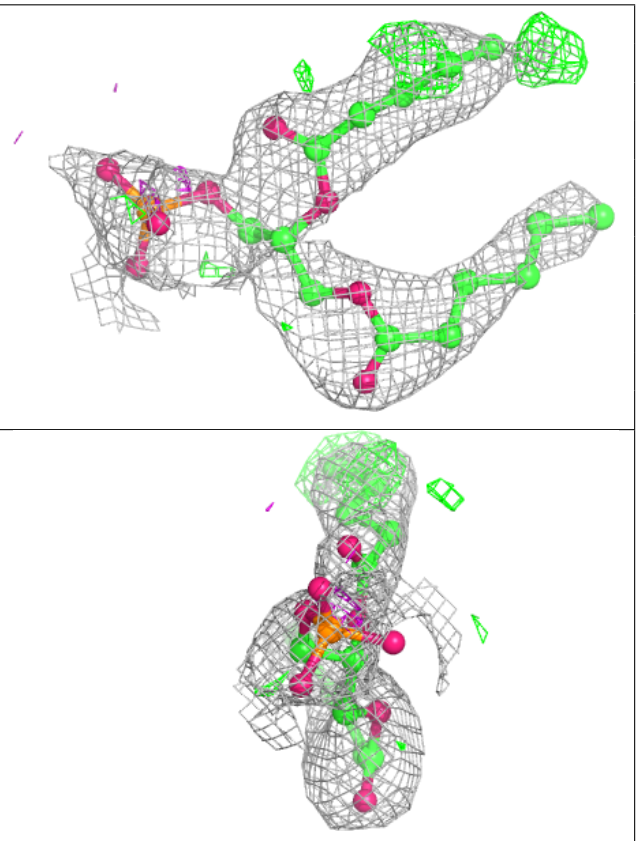
**Electron density around PGW B 511:**

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



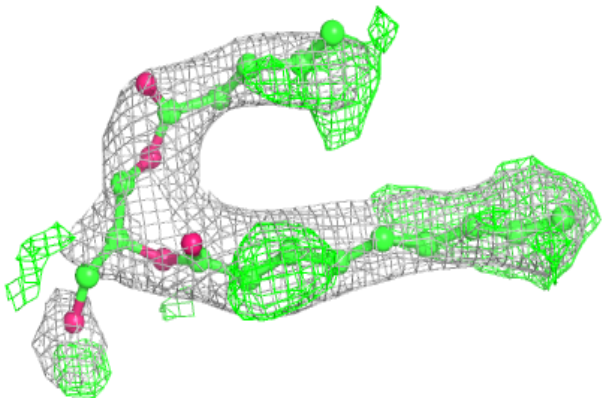
**Electron density around PGW B 510:**

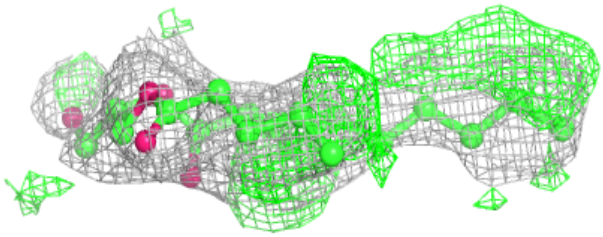
$2mF_o$-$DF_c$ (at 0.7 rmsd) in gray
$mF_o$-$DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

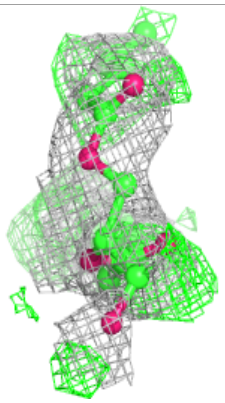


**Electron density around PGW H 500:**

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







**Electron density around PGW B 515:**

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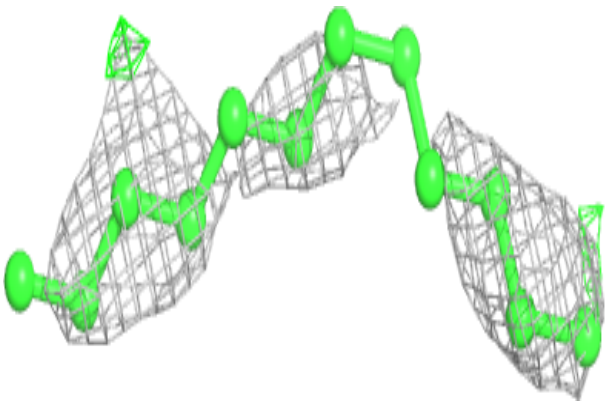
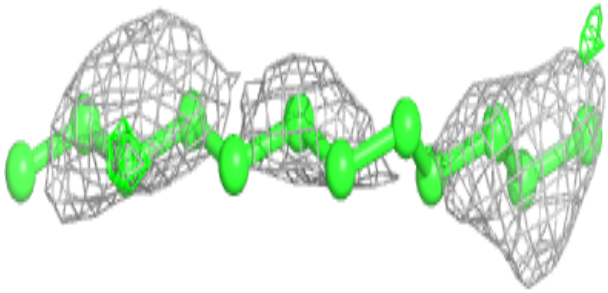
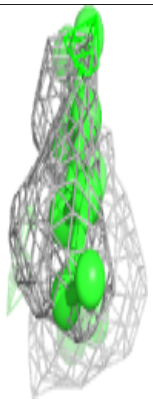
$mF_o$-$DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

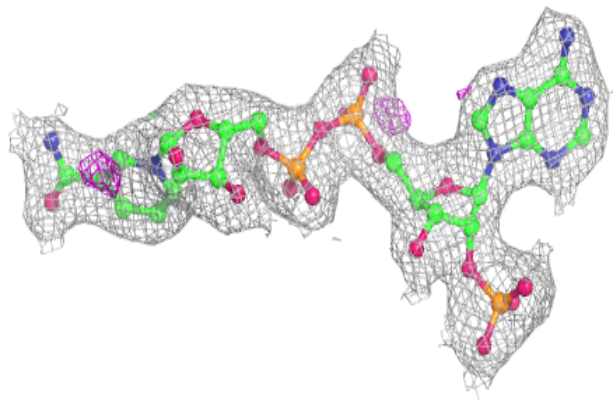


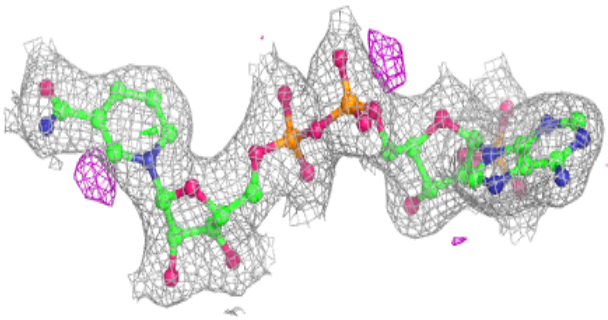


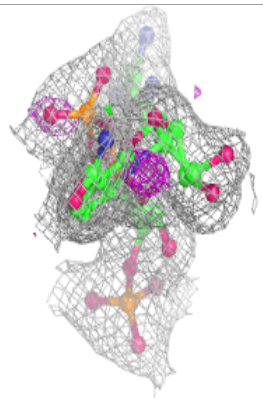


**Electron density around NAP G 1001:**

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

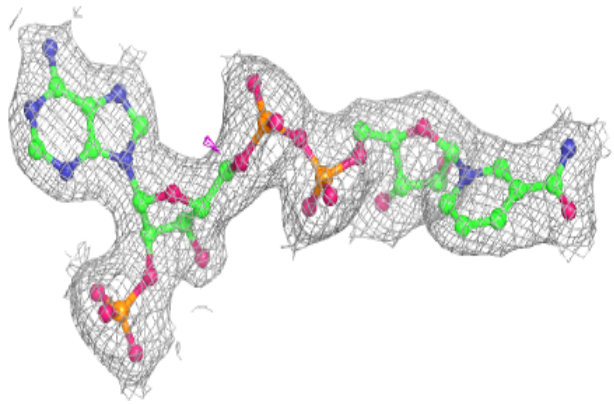


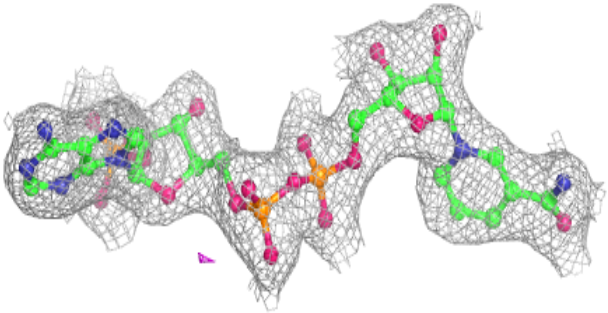


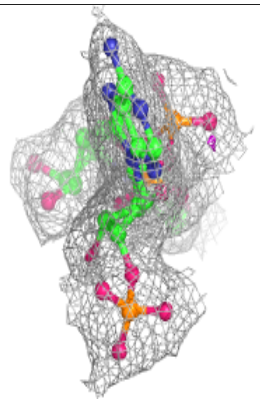


**Electron density around NAP A 1001:**

$2mF_o$-$DF_c$ (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.