



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 30, 2025 – 08:10 AM JST

PDB ID : 9VP7 / pdb\_00009vp7  
Title : Glucose-6-phosphate dehydrogenase from Leishmania donovani in complex with pseudo substrate  
Authors : Jakkula, P.; Qureshi, I.A.  
Deposited on : 2025-07-02  
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](mailto:validation@mail.wwpdb.org)

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

---

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

MolProbity : 4-5-2 with Phenix2.0  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 2.0  
EDS : 3.0  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.010 (Gargrove)  
Density-Fitness : 1.0.12  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.46

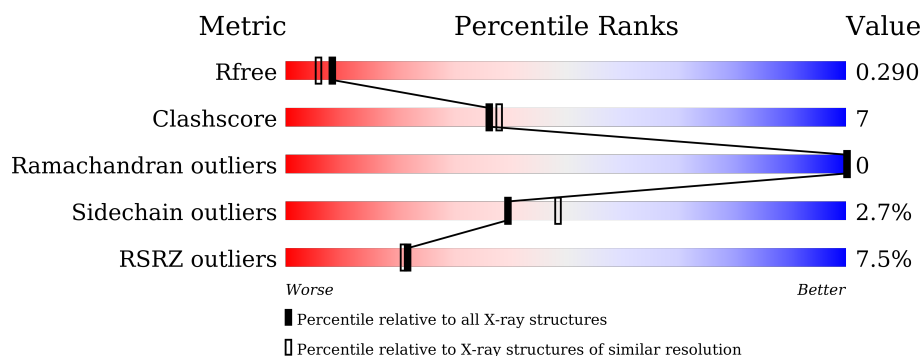
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 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))
$R_{free}$	164625	1763 (2.26-2.26)
Clashscore	180529	1919 (2.26-2.26)
Ramachandran outliers	177936	1884 (2.26-2.26)
Sidechain outliers	177891	1885 (2.26-2.26)
RSRZ outliers	164620	1763 (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  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	596	<div> <div>8%</div> <div> <div></div> <div>77%</div> <div>11%</div> <div>•</div> <div>12%</div> </div> </div>
1	B	596	<div> <div>5%</div> <div> <div></div> <div>75%</div> <div>12%</div> <div>•</div> <div>12%</div> </div> </div>

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
2	PEG	A	601	-	-	X	-
2	PEG	B	601	-	-	X	-
2	PEG	B	604	-	-	X	-
4	GLP	A	604	-	-	X	-
5	GOL	B	602	-	-	X	-
5	GOL	B	603	-	-	X	-

## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 8840 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 Glucose-6-phosphate 1-dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	525	Total	C	N	O	S	0	0	0
			4003	2546	680	760	17			
1	B	524	Total	C	N	O	S	0	0	0
			4037	2579	685	756	17			

There are 68 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-33	MET	-	initiating methionine	UNP A2CIK6
A	-32	GLY	-	expression tag	UNP A2CIK6
A	-31	SER	-	expression tag	UNP A2CIK6
A	-30	SER	-	expression tag	UNP A2CIK6
A	-29	HIS	-	expression tag	UNP A2CIK6
A	-28	HIS	-	expression tag	UNP A2CIK6
A	-27	HIS	-	expression tag	UNP A2CIK6
A	-26	HIS	-	expression tag	UNP A2CIK6
A	-25	HIS	-	expression tag	UNP A2CIK6
A	-24	HIS	-	expression tag	UNP A2CIK6
A	-23	SER	-	expression tag	UNP A2CIK6
A	-22	SER	-	expression tag	UNP A2CIK6
A	-21	GLY	-	expression tag	UNP A2CIK6
A	-20	LEU	-	expression tag	UNP A2CIK6
A	-19	VAL	-	expression tag	UNP A2CIK6
A	-18	PRO	-	expression tag	UNP A2CIK6
A	-17	ARG	-	expression tag	UNP A2CIK6
A	-16	GLY	-	expression tag	UNP A2CIK6
A	-15	SER	-	expression tag	UNP A2CIK6
A	-14	HIS	-	expression tag	UNP A2CIK6
A	-13	MET	-	expression tag	UNP A2CIK6
A	-12	ALA	-	expression tag	UNP A2CIK6
A	-11	SER	-	expression tag	UNP A2CIK6
A	-10	MET	-	expression tag	UNP A2CIK6
A	-9	THR	-	expression tag	UNP A2CIK6

*Continued on next page...*

*Continued from previous page...*

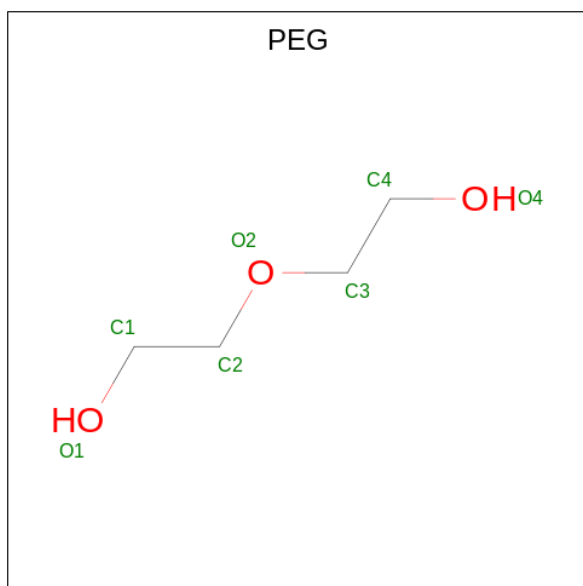
Chain	Residue	Modelled	Actual	Comment	Reference
A	-8	GLY	-	expression tag	UNP A2CIK6
A	-7	GLY	-	expression tag	UNP A2CIK6
A	-6	GLN	-	expression tag	UNP A2CIK6
A	-5	GLN	-	expression tag	UNP A2CIK6
A	-4	MET	-	expression tag	UNP A2CIK6
A	-3	GLY	-	expression tag	UNP A2CIK6
A	-2	ARG	-	expression tag	UNP A2CIK6
A	-1	GLY	-	expression tag	UNP A2CIK6
A	0	SER	-	expression tag	UNP A2CIK6
B	-33	MET	-	initiating methionine	UNP A2CIK6
B	-32	GLY	-	expression tag	UNP A2CIK6
B	-31	SER	-	expression tag	UNP A2CIK6
B	-30	SER	-	expression tag	UNP A2CIK6
B	-29	HIS	-	expression tag	UNP A2CIK6
B	-28	HIS	-	expression tag	UNP A2CIK6
B	-27	HIS	-	expression tag	UNP A2CIK6
B	-26	HIS	-	expression tag	UNP A2CIK6
B	-25	HIS	-	expression tag	UNP A2CIK6
B	-24	HIS	-	expression tag	UNP A2CIK6
B	-23	SER	-	expression tag	UNP A2CIK6
B	-22	SER	-	expression tag	UNP A2CIK6
B	-21	GLY	-	expression tag	UNP A2CIK6
B	-20	LEU	-	expression tag	UNP A2CIK6
B	-19	VAL	-	expression tag	UNP A2CIK6
B	-18	PRO	-	expression tag	UNP A2CIK6
B	-17	ARG	-	expression tag	UNP A2CIK6
B	-16	GLY	-	expression tag	UNP A2CIK6
B	-15	SER	-	expression tag	UNP A2CIK6
B	-14	HIS	-	expression tag	UNP A2CIK6
B	-13	MET	-	expression tag	UNP A2CIK6
B	-12	ALA	-	expression tag	UNP A2CIK6
B	-11	SER	-	expression tag	UNP A2CIK6
B	-10	MET	-	expression tag	UNP A2CIK6
B	-9	THR	-	expression tag	UNP A2CIK6
B	-8	GLY	-	expression tag	UNP A2CIK6
B	-7	GLY	-	expression tag	UNP A2CIK6
B	-6	GLN	-	expression tag	UNP A2CIK6
B	-5	GLN	-	expression tag	UNP A2CIK6
B	-4	MET	-	expression tag	UNP A2CIK6
B	-3	GLY	-	expression tag	UNP A2CIK6
B	-2	ARG	-	expression tag	UNP A2CIK6
B	-1	GLY	-	expression tag	UNP A2CIK6

*Continued on next page...*

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
B	0	SER	-	expression tag	UNP A2CIK6

- Molecule 2 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula:  $C_4H_{10}O_3$ ).



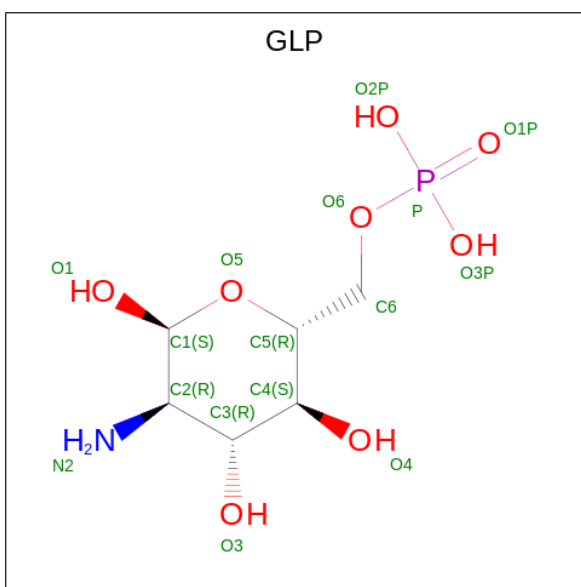
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			7	4	3		
2	A	1	Total	C	O	0	0
			7	4	3		
2	B	1	Total	C	O	0	0
			7	4	3		
2	B	1	Total	C	O	0	0
			7	4	3		

- Molecule 3 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula:  $C_2H_6O_2$ ).



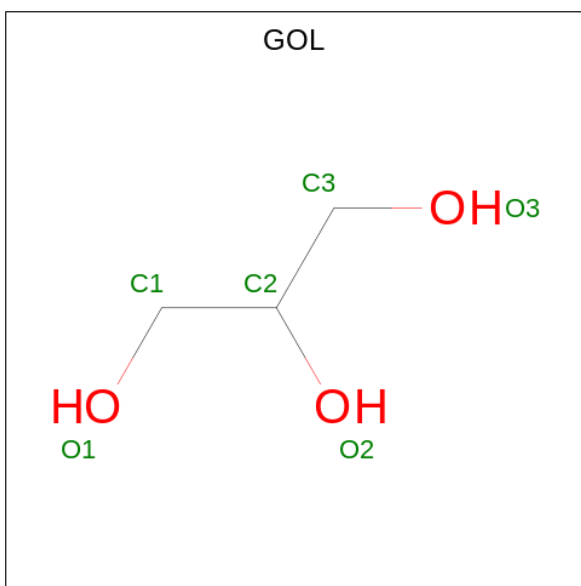
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	0
			4	2	2		

- Molecule 4 is 2-amino-2-deoxy-6-O-phosphono-alpha-D-glucopyranose (CCD ID: GLP) (formula: C<sub>6</sub>H<sub>14</sub>NO<sub>8</sub>P) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			16	6	1	8	1		

- Molecule 5 is GLYCEROL (CCD ID: GOL) (formula:  $C_3H_8O_3$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	B	1	Total	C	O	0	0
			6	3	3		
5	B	1	Total	C	O	0	0
			6	3	3		

- Molecule 6 is water.

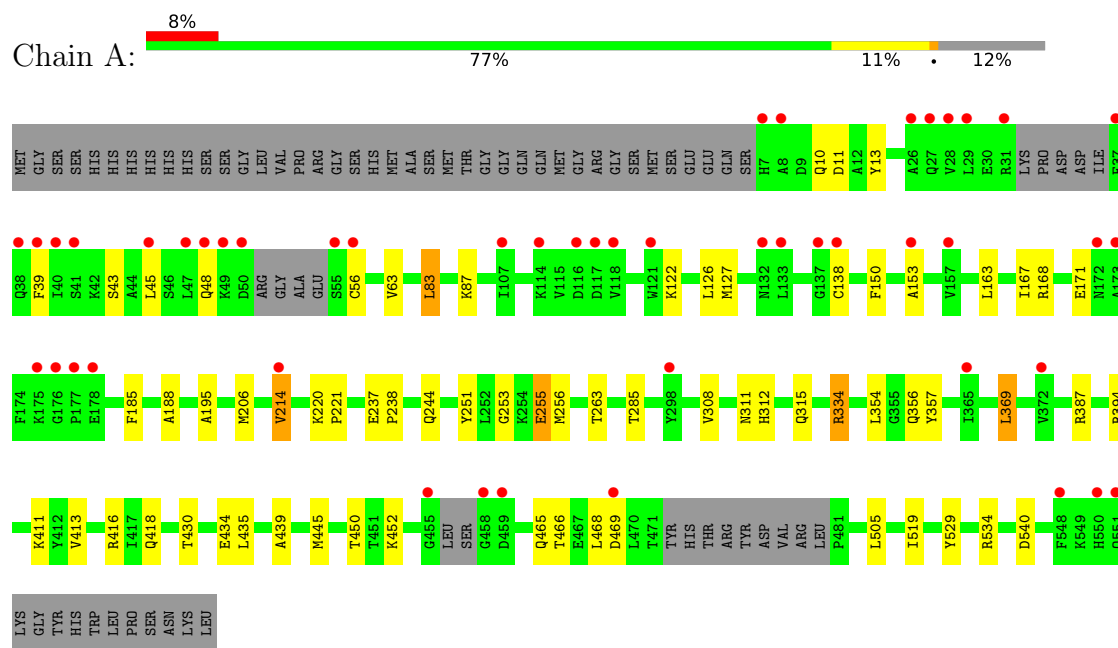


Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	311	Total 311	O 311	0	0
6	B	413	Total 413	O 413	0	0

### 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: Glucose-6-phosphate 1-dehydrogenase



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	191.84Å 97.69Å 70.45Å 90.00° 94.00° 90.00°	Depositor
Resolution (Å)	30.20 – 2.25 30.20 – 2.25	Depositor EDS
% Data completeness (in resolution range)	99.7 (30.20-2.25) 99.7 (30.20-2.25)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.04 (at 2.24Å)	Xtriage
Refinement program	REFMAC 5.8.0415	Depositor
R, $R_{free}$	0.220 , 0.286 0.223 , 0.290	Depositor DCC
$R_{free}$ test set	3092 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	19.0	Xtriage
Anisotropy	0.470	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 36.3	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.53$ , $\langle L^2 \rangle = 0.37$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	8840	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.34% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

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

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: GOL, PEG, GLP, EDO

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	0.54	0/4081	0.97	1/5536 (0.0%)
1	B	0.55	0/4118	1.00	2/5579 (0.0%)
All	All	0.54	0/8199	0.98	3/11115 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	3
1	B	0	4
All	All	0	7

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	469	ASP	CA-CB-CG	5.77	118.37	112.60
1	B	177	PRO	CB-CA-C	-5.57	104.19	112.55
1	B	177	PRO	N-CA-C	5.34	120.55	113.40

There are no chirality outliers.

All (7) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	334	ARG	Sidechain
1	A	387	ARG	Sidechain
1	A	394	ARG	Sidechain

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Group
1	B	112	ARG	Sidechain
1	B	334	ARG	Sidechain
1	B	394	ARG	Sidechain
1	B	534	ARG	Sidechain

## 5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4003	0	3820	50	0
1	B	4037	0	3914	60	0
2	A	14	0	20	4	0
2	B	14	0	20	13	0
3	A	4	0	6	1	0
3	B	16	0	24	1	0
4	A	16	0	12	9	0
5	B	12	0	16	12	0
6	A	311	0	0	6	0
6	B	413	0	0	6	0
All	All	8840	0	7832	113	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 7.

All (113) 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:251:TYR:O	4:A:604:GLP:H1	1.70	0.90
1:B:323:GLU:HG2	5:B:602:GOL:H32	1.55	0.88
1:B:56:CYS:N	1:B:138:CYS:HG	1.72	0.86
1:A:153:ALA:HB3	6:A:805:HOH:O	1.80	0.79
1:A:416:ARG:NH1	1:A:434:GLU:OE1	2.21	0.72
1:B:249:ASP:HA	5:B:603:GOL:H11	1.72	0.70
1:A:311:ASN:HA	2:A:601:PEG:H41	1.74	0.69
1:B:256:MET:SD	2:B:601:PEG:H22	2.32	0.68
1:B:220:LYS:HD3	5:B:603:GOL:H31	1.77	0.67

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:185:PHE:HE1	1:B:214:VAL:HG23	1.61	0.65
1:A:439:ALA:HB1	4:A:604:GLP:H3	1.80	0.64
1:A:450:THR:HG22	1:A:465:GLN:OE1	1.99	0.62
1:B:430:THR:OG1	1:B:450:THR:HG21	2.00	0.62
1:B:323:GLU:HG2	5:B:602:GOL:C3	2.30	0.60
1:B:63:VAL:HG13	1:B:67:GLN:HB2	1.85	0.59
1:A:56:CYS:CB	1:A:138:CYS:SG	2.92	0.57
1:B:137:GLY:HA3	6:B:785:HOH:O	2.04	0.56
1:A:356:GLN:OE1	1:A:369:LEU:HD12	2.06	0.56
1:A:251:TYR:HB3	4:A:604:GLP:H62	1.87	0.55
1:B:206:MET:HE1	1:B:214:VAL:HG11	1.88	0.54
1:B:323:GLU:CG	5:B:602:GOL:H32	2.34	0.54
1:A:251:TYR:O	4:A:604:GLP:C1	2.51	0.53
1:A:411:LYS:NZ	6:A:714:HOH:O	2.40	0.53
1:A:251:TYR:O	4:A:604:GLP:H4	2.09	0.53
1:B:111:ALA:CB	2:B:604:PEG:H11	2.39	0.53
1:A:237:GLU:N	1:A:238:PRO:CD	2.72	0.52
1:A:534:ARG:NH1	1:A:540:ASP:OD1	2.43	0.52
1:B:199:GLU:HG3	1:B:239:PHE:CZ	2.45	0.52
1:A:253:GLY:H	4:A:604:GLP:H2	1.75	0.52
1:B:469:ASP:OD1	1:B:471:THR:N	2.38	0.52
1:B:36:ILE:O	1:B:40:ILE:HG12	2.11	0.51
1:A:195:ALA:HB2	3:A:602:EDO:H21	1.92	0.51
1:B:344:ILE:HG12	1:B:390:ILE:HG12	1.93	0.51
1:B:437:ILE:HD11	1:B:445:MET:HE3	1.93	0.51
1:B:534:ARG:NH2	3:B:606:EDO:O2	2.43	0.51
1:A:220:LYS:HB2	1:A:221:PRO:HA	1.92	0.50
1:A:311:ASN:HA	2:A:601:PEG:C4	2.40	0.50
1:A:206:MET:HE1	1:A:214:VAL:HG11	1.94	0.50
1:B:63:VAL:HG13	1:B:67:GLN:CB	2.41	0.50
1:A:505:LEU:CD1	2:A:601:PEG:H42	2.42	0.49
1:A:214:VAL:HG13	1:A:244:GLN:HE21	1.76	0.49
1:A:10:GLN:HB3	6:A:894:HOH:O	2.12	0.49
1:A:45:LEU:O	1:A:48:GLN:HB3	2.11	0.49
1:A:39:PHE:O	1:A:43:SER:OG	2.23	0.48
1:B:251:TYR:O	2:B:601:PEG:H12	2.13	0.48
1:A:237:GLU:O	6:A:701:HOH:O	2.20	0.48
1:A:418:GLN:NE2	1:A:434:GLU:OE2	2.46	0.48
1:B:323:GLU:N	5:B:602:GOL:H32	2.29	0.48
1:B:447:VAL:HG22	1:B:468:LEU:HB2	1.96	0.48
1:B:470:LEU:O	1:B:471:THR:CB	2.61	0.48

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:286:PHE:O	1:B:404:ALA:HA	2.14	0.48
1:A:450:THR:HG23	6:A:771:HOH:O	2.14	0.47
2:B:604:PEG:H32	6:B:964:HOH:O	2.14	0.47
1:B:437:ILE:CD1	1:B:445:MET:HE3	2.45	0.47
1:A:150:PHE:CE2	1:A:163:LEU:HA	2.49	0.47
1:A:256:MET:HB3	4:A:604:GLP:N2	2.29	0.47
1:B:17:VAL:O	1:B:20:ILE:HG13	2.15	0.47
1:B:220:LYS:CD	5:B:603:GOL:H31	2.45	0.46
1:A:10:GLN:HG2	1:A:11:ASP:N	2.30	0.46
1:B:220:LYS:HB2	1:B:221:PRO:HA	1.97	0.46
2:B:601:PEG:C4	2:B:601:PEG:C1	2.94	0.46
1:B:83:LEU:HD12	1:B:87:LYS:HB2	1.98	0.46
1:B:447:VAL:CG2	1:B:468:LEU:HD12	2.46	0.46
1:A:167:ILE:O	1:A:171:GLU:HG3	2.15	0.46
1:A:435:LEU:HD11	1:A:445:MET:HE3	1.97	0.46
1:A:122:LYS:O	1:A:126:LEU:HB2	2.16	0.46
1:B:14:VAL:O	1:B:15:ALA:C	2.59	0.45
1:B:439:ALA:CB	2:B:601:PEG:H32	2.46	0.45
1:B:111:ALA:HB1	2:B:604:PEG:H11	1.99	0.45
1:B:340:VAL:HB	5:B:602:GOL:H2	1.98	0.45
1:A:83:LEU:HD23	1:A:188:ALA:HB1	1.97	0.45
1:B:237:GLU:N	1:B:238:PRO:CD	2.80	0.45
1:B:413:VAL:HG11	2:B:601:PEG:O1	2.15	0.45
1:B:340:VAL:HA	5:B:602:GOL:H2	1.99	0.45
1:B:450:THR:HG22	1:B:465:GLN:HE22	1.82	0.45
1:A:263:THR:HG21	1:A:445:MET:CE	2.47	0.44
1:B:453:VAL:HG22	1:B:464:HIS:HB2	1.99	0.44
1:B:103:PRO:HD2	6:B:977:HOH:O	2.17	0.44
1:B:220:LYS:CE	5:B:603:GOL:H31	2.48	0.44
1:A:13:TYR:CE1	1:B:36:ILE:HD11	2.53	0.44
1:A:357:TYR:HA	1:A:529:TYR:O	2.17	0.44
1:B:340:VAL:CB	5:B:602:GOL:H2	2.49	0.43
2:B:601:PEG:H12	2:B:601:PEG:C4	2.48	0.43
1:B:89:PHE:N	1:B:90:PRO:CD	2.82	0.43
1:A:251:TYR:O	4:A:604:GLP:H2	2.18	0.43
1:B:256:MET:SD	2:B:601:PEG:C2	3.06	0.43
1:A:308:VAL:O	1:A:312:HIS:HB3	2.20	0.42
1:A:185:PHE:HE2	1:A:214:VAL:HG23	1.84	0.42
1:B:357:TYR:HA	1:B:529:TYR:O	2.20	0.42
1:A:263:THR:HG21	1:A:445:MET:HE2	2.00	0.42
1:B:436:VAL:O	1:B:445:MET:HA	2.20	0.42

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:416:ARG:HD2	6:A:948:HOH:O	2.20	0.41
1:A:255:GLU:H	1:A:255:GLU:CD	2.28	0.41
1:A:354:LEU:HD11	1:A:519:ILE:HG12	2.01	0.41
1:B:181:GLY:O	1:B:212:GLY:HA3	2.20	0.41
1:B:251:TYR:O	2:B:601:PEG:H42	2.20	0.41
1:B:322:MET:HB2	1:B:336:GLU:HB3	2.02	0.41
1:A:315:GLN:CA	2:A:601:PEG:H12	2.50	0.41
1:A:430:THR:OG1	1:A:450:THR:HG21	2.20	0.41
1:B:149:TYR:OH	2:B:604:PEG:H12	2.20	0.41
1:B:120:LYS:HD2	6:B:978:HOH:O	2.20	0.41
1:A:83:LEU:O	1:A:87:LYS:HB2	2.19	0.41
1:B:340:VAL:CA	5:B:602:GOL:H2	2.50	0.41
1:A:285:THR:O	1:A:413:VAL:HA	2.21	0.41
1:B:134:SER:O	1:B:135:GLU:CB	2.68	0.41
1:B:214:VAL:O	1:B:214:VAL:HG13	2.20	0.41
1:B:418:GLN:OE1	1:B:432:ARG:NH1	2.50	0.41
1:A:206:MET:CE	1:A:214:VAL:HG11	2.51	0.40
1:A:439:ALA:CB	4:A:604:GLP:H3	2.48	0.40
1:B:83:LEU:HD11	1:B:250:HIS:HE1	1.85	0.40
1:B:56:CYS:N	1:B:138:CYS:SG	2.86	0.40
1:B:145:LYS:HE3	6:B:742:HOH:O	2.20	0.40
2:B:601:PEG:H31	6:B:716:HOH:O	2.20	0.40

There are no symmetry-related clashes.

## 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	515/596 (86%)	501 (97%)	14 (3%)	0	100	100
1	B	516/596 (87%)	495 (96%)	21 (4%)	0	100	100
All	All	1031/1192 (86%)	996 (97%)	35 (3%)	0	100	100



There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	405/508 (80%)	394 (97%)	11 (3%)	40	48
1	B	412/508 (81%)	401 (97%)	11 (3%)	40	48
All	All	817/1016 (80%)	795 (97%)	22 (3%)	40	48

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	63	VAL
1	A	83	LEU
1	A	127	MET
1	A	168	ARG
1	A	214	VAL
1	A	255	GLU
1	A	334	ARG
1	A	369	LEU
1	A	452	LYS
1	A	466	THR
1	A	468	LEU
1	B	16	ASP
1	B	43	SER
1	B	63	VAL
1	B	148	SER
1	B	315	GLN
1	B	420	ARG
1	B	450	THR
1	B	452	LYS
1	B	453	VAL
1	B	466	THR
1	B	524	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry ⓘ

12 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z  > 2$	Counts	RMSZ	$\# Z  > 2$
4	GLP	A	604	-	16,16,16	0.51	0	23,24,24	1.73	1 (4%)
2	PEG	B	601	-	6,6,6	0.28	0	5,5,5	0.35	0
5	GOL	B	602	-	5,5,5	0.30	0	5,5,5	0.83	0
2	PEG	B	604	-	6,6,6	0.30	0	5,5,5	0.29	0
2	PEG	A	603	-	6,6,6	0.25	0	5,5,5	0.29	0
3	EDO	B	606	-	3,3,3	0.07	0	2,2,2	0.14	0
3	EDO	A	602	-	3,3,3	0.23	0	2,2,2	0.59	0
5	GOL	B	603	-	5,5,5	0.15	0	5,5,5	0.52	0
3	EDO	B	608	-	3,3,3	0.09	0	2,2,2	0.39	0
3	EDO	B	605	-	3,3,3	0.15	0	2,2,2	0.33	0
2	PEG	A	601	-	6,6,6	0.42	0	5,5,5	0.35	0
3	EDO	B	607	-	3,3,3	0.20	0	2,2,2	0.41	0

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
4	GLP	A	604	-	-	1/6/26/26	0/1/1/1
2	PEG	B	601	-	-	3/4/4/4	-
5	GOL	B	602	-	-	0/4/4/4	-
2	PEG	B	604	-	-	2/4/4/4	-
2	PEG	A	603	-	-	0/4/4/4	-
3	EDO	B	606	-	-	0/1/1/1	-
3	EDO	A	602	-	-	1/1/1/1	-
5	GOL	B	603	-	-	3/4/4/4	-
3	EDO	B	608	-	-	1/1/1/1	-
3	EDO	B	605	-	-	1/1/1/1	-
2	PEG	A	601	-	-	1/4/4/4	-
3	EDO	B	607	-	-	1/1/1/1	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	604	GLP	O5-C1-C2	7.26	117.98	109.51

There are no chirality outliers.

All (14) torsion outliers are listed below:

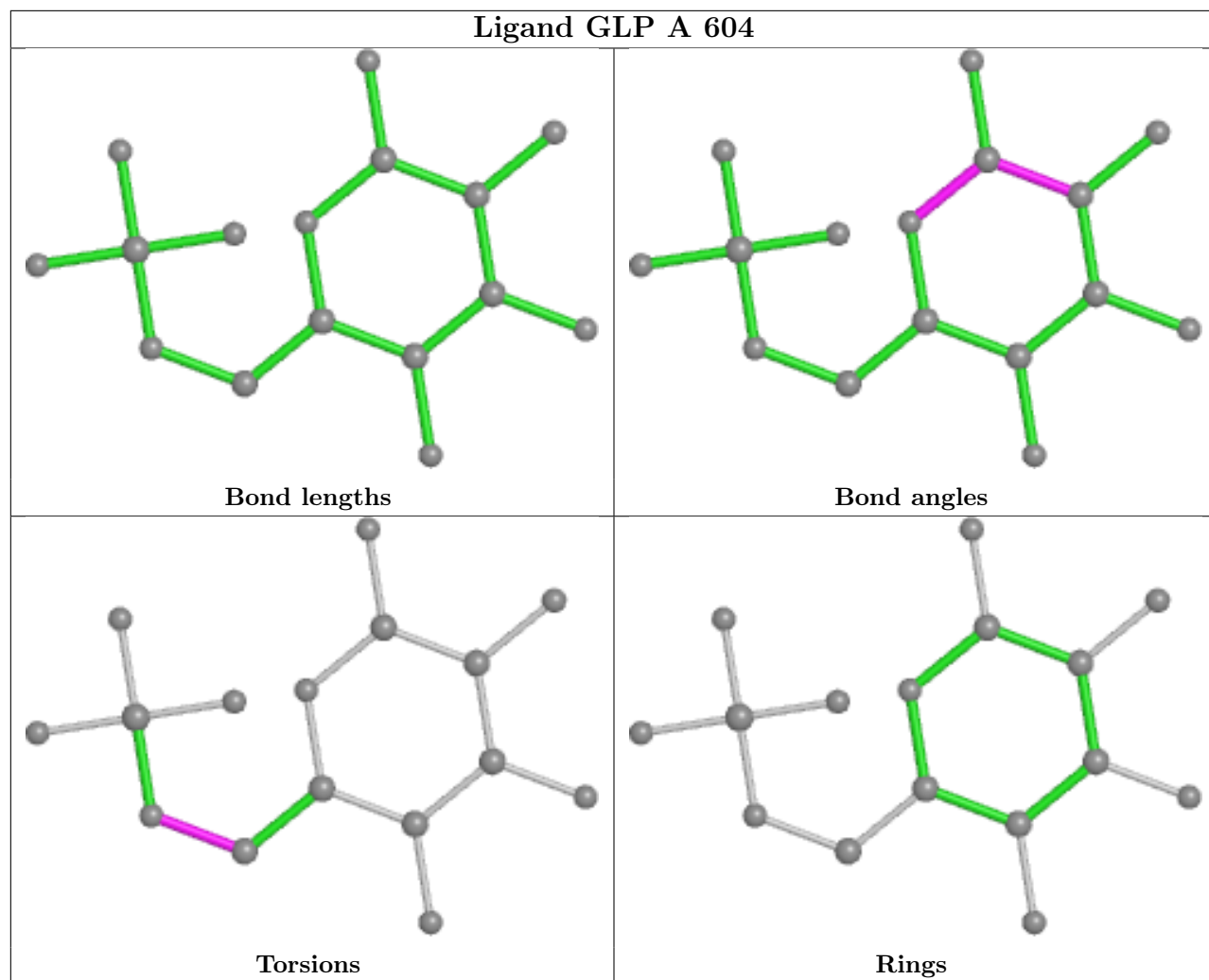
Mol	Chain	Res	Type	Atoms
5	B	603	GOL	O1-C1-C2-C3
3	A	602	EDO	O1-C1-C2-O2
3	B	607	EDO	O1-C1-C2-O2
3	B	608	EDO	O1-C1-C2-O2
2	B	601	PEG	O1-C1-C2-O2
2	B	601	PEG	O2-C3-C4-O4
5	B	603	GOL	O1-C1-C2-O2
2	B	604	PEG	O2-C3-C4-O4
3	B	605	EDO	O1-C1-C2-O2
2	B	601	PEG	C1-C2-O2-C3
2	B	604	PEG	C1-C2-O2-C3
2	A	601	PEG	O2-C3-C4-O4
5	B	603	GOL	O2-C2-C3-O3
4	A	604	GLP	C5-C6-O6-P

There are no ring outliers.

8 monomers are involved in 40 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	604	GLP	9	0
2	B	601	PEG	9	0
5	B	602	GOL	8	0
2	B	604	PEG	4	0
3	B	606	EDO	1	0
3	A	602	EDO	1	0
5	B	603	GOL	4	0
2	A	601	PEG	4	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 than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data

### 6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	525/596 (88%)	0.46	48 (9%) 16 16	9, 25, 60, 87	0
1	B	524/596 (87%)	0.17	31 (5%) 29 29	7, 18, 52, 99	0
All	All	1049/1192 (88%)	0.31	79 (7%) 22 21	7, 21, 58, 99	0

All (79) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	39	PHE	6.6
1	B	14	VAL	6.2
1	B	56	CYS	6.0
1	A	118	VAL	5.6
1	A	55	SER	5.0
1	B	15	ALA	4.9
1	A	551	GLN	4.9
1	A	37	PHE	4.9
1	B	11	ASP	4.9
1	A	26	ALA	4.4
1	A	7	HIS	4.3
1	A	29	LEU	4.2
1	B	13	TYR	3.9
1	B	46	SER	3.9
1	A	27	GLN	3.8
1	B	12	ALA	3.8
1	B	134	SER	3.7
1	A	38	GLN	3.7
1	A	50	ASP	3.7
1	A	8	ALA	3.6
1	B	47	LEU	3.3
1	A	455	GLY	3.3
1	A	133	LEU	3.2
1	B	214	VAL	3.1

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
1	B	479	ARG	3.1
1	A	458	GLY	2.9
1	B	37	PHE	2.9
1	A	28	VAL	2.9
1	A	47	LEU	2.9
1	B	16	ASP	2.9
1	A	114	LYS	2.9
1	A	40	ILE	2.9
1	A	178	GLU	2.8
1	A	45	LEU	2.8
1	A	49	LYS	2.8
1	B	45	LEU	2.8
1	A	175	LYS	2.8
1	B	48	GLN	2.7
1	B	455	GLY	2.7
1	B	44	ALA	2.7
1	B	57	ASP	2.6
1	B	123	HIS	2.6
1	A	298	TYR	2.6
1	A	469	ASP	2.6
1	B	32	LYS	2.5
1	A	177	PRO	2.5
1	A	41	SER	2.4
1	A	172	ASN	2.4
1	B	135	GLU	2.4
1	B	471	THR	2.4
1	A	116	ASP	2.4
1	B	18	ASP	2.4
1	A	137	GLY	2.4
1	B	464	HIS	2.4
1	A	107	ILE	2.4
1	B	36	ILE	2.4
1	A	48	GLN	2.4
1	A	56	CYS	2.4
1	A	372	VAL	2.3
1	A	548	PHE	2.3
1	A	117	ASP	2.3
1	B	17	VAL	2.3
1	A	31	ARG	2.2
1	A	121	TRP	2.2
1	A	138	CYS	2.2
1	B	132	ASN	2.2

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
1	A	459	ASP	2.2
1	A	173	ALA	2.1
1	B	551	GLN	2.1
1	A	153	ALA	2.1
1	A	157	VAL	2.1
1	B	19	GLY	2.1
1	A	214	VAL	2.1
1	A	176	GLY	2.0
1	A	550	HIS	2.0
1	B	41	SER	2.0
1	A	365	ILE	2.0
1	B	20	ILE	2.0
1	A	132	ASN	2.0

## 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 oligosaccharides 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<sup>th</sup> 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( $\text{\AA}^2$ )	Q<0.9
4	GLP	A	604	16/16	0.72	0.26	38,47,109,117	0
5	GOL	B	602	6/6	0.76	0.23	24,28,30,36	0
2	PEG	B	601	7/7	0.78	0.19	24,26,29,33	0
3	EDO	A	602	4/4	0.82	0.18	30,31,32,34	0
2	PEG	B	604	7/7	0.84	0.15	26,26,28,28	0
5	GOL	B	603	6/6	0.84	0.19	27,30,31,31	0
2	PEG	A	601	7/7	0.85	0.17	25,26,27,28	0
3	EDO	B	608	4/4	0.87	0.10	37,39,40,42	0
2	PEG	A	603	7/7	0.88	0.16	25,31,33,33	0
3	EDO	B	606	4/4	0.88	0.11	21,23,23,24	0

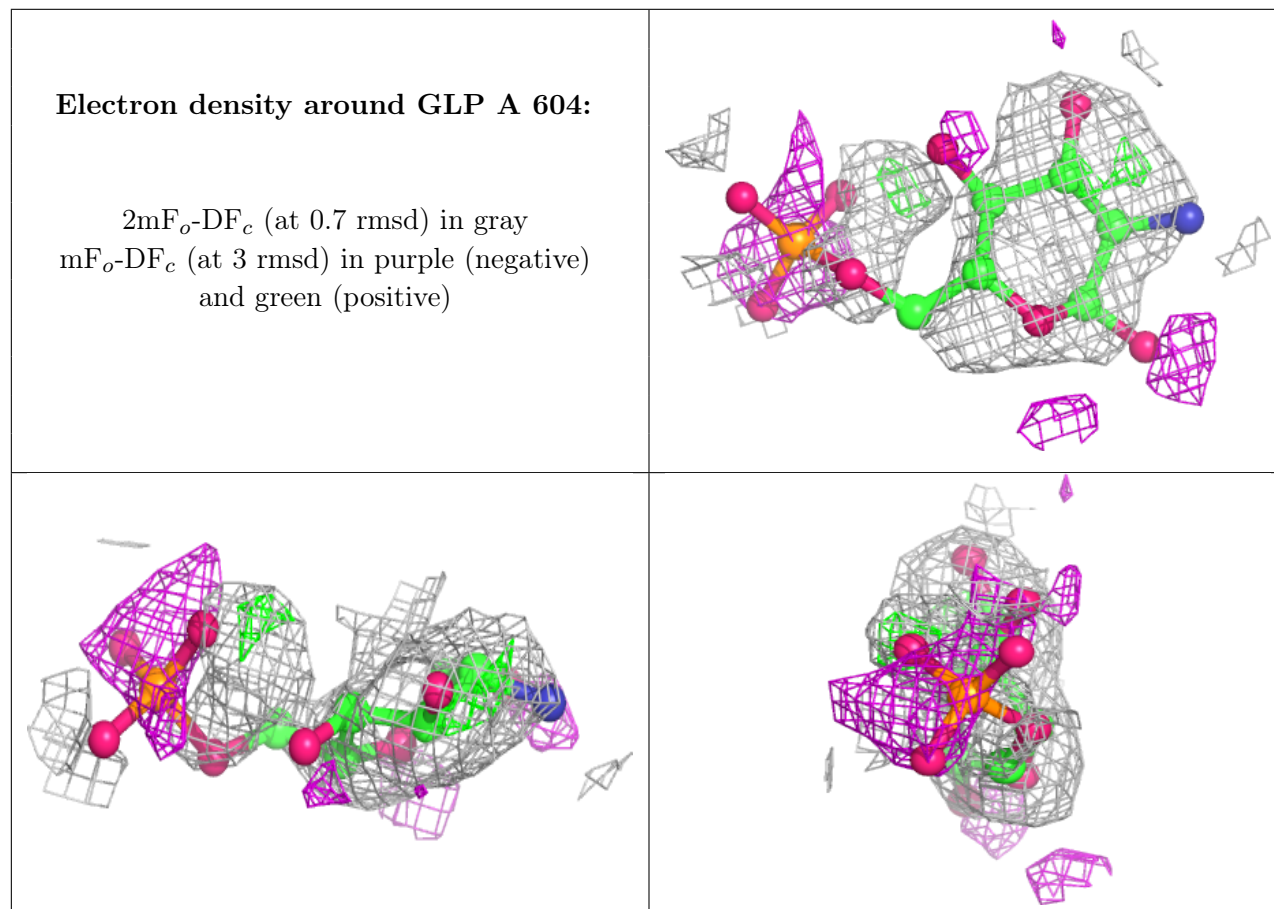
*Continued on next page...*



*Continued from previous page...*

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	EDO	B	605	4/4	0.91	0.11	23,25,27,30	0
3	EDO	B	607	4/4	0.93	0.11	30,32,34,34	0

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



## 6.5 Other polymers [i](#)

There are no such residues in this entry.