Full wwPDB X-ray Structure Validation Report (i)

May 23, 2023 – 10:23 am BST

PDB ID	:	8B9W
Title	:	Cysteine Synthase from Trypanosoma theileri with PLP bound
Authors	:	Sowerby, K.V.; Pohl, E.
Deposited on	:	2022-10-10
Resolution	:	2.75 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.

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

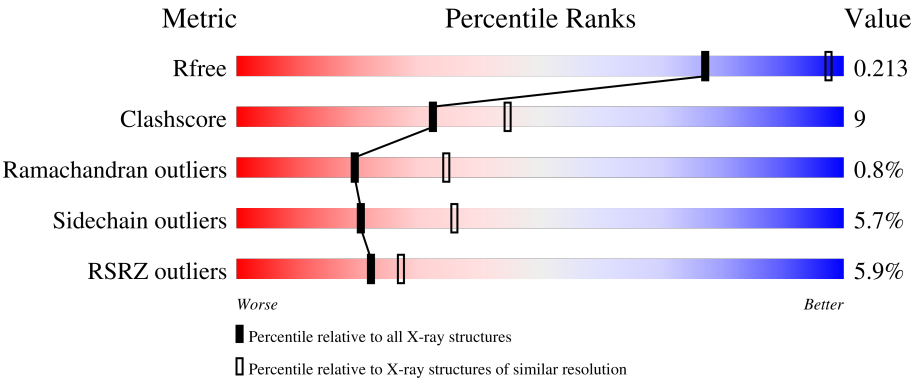
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.33
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.33

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 2.75 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	1235 (2.78-2.74)
Clashscore	141614	1277 (2.78-2.74)
Ramachandran outliers	138981	1257 (2.78-2.74)
Sidechain outliers	138945	1257 (2.78-2.74)
RSRZ outliers	127900	1207 (2.78-2.74)

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	354	2% 75% 16% 7%
1	B	354	9% 64% 23% 8%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 10044 atoms, of which 4985 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 Putative cysteine synthase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	329	Total	C	H	N	O	S	146	4	0
			4981	1551	2520	430	468	12			
1	B	327	Total	C	H	N	O	S	149	2	0
			4805	1507	2409	413	465	11			

There are 38 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MET	-	initiating methionine	UNP A0A1X0P4R1
A	2	GLY	-	expression tag	UNP A0A1X0P4R1
A	3	SER	-	expression tag	UNP A0A1X0P4R1
A	4	SER	-	expression tag	UNP A0A1X0P4R1
A	5	HIS	-	expression tag	UNP A0A1X0P4R1
A	6	HIS	-	expression tag	UNP A0A1X0P4R1
A	7	HIS	-	expression tag	UNP A0A1X0P4R1
A	8	HIS	-	expression tag	UNP A0A1X0P4R1
A	9	HIS	-	expression tag	UNP A0A1X0P4R1
A	10	HIS	-	expression tag	UNP A0A1X0P4R1
A	11	SER	-	expression tag	UNP A0A1X0P4R1
A	12	SER	-	expression tag	UNP A0A1X0P4R1
A	13	GLY	-	expression tag	UNP A0A1X0P4R1
A	14	LEU	-	expression tag	UNP A0A1X0P4R1
A	15	VAL	-	expression tag	UNP A0A1X0P4R1
A	16	PRO	-	expression tag	UNP A0A1X0P4R1
A	17	ARG	-	expression tag	UNP A0A1X0P4R1
A	18	GLY	-	expression tag	UNP A0A1X0P4R1
A	19	SER	-	expression tag	UNP A0A1X0P4R1
B	1	MET	-	initiating methionine	UNP A0A1X0P4R1
B	2	GLY	-	expression tag	UNP A0A1X0P4R1
B	3	SER	-	expression tag	UNP A0A1X0P4R1
B	4	SER	-	expression tag	UNP A0A1X0P4R1
B	5	HIS	-	expression tag	UNP A0A1X0P4R1
B	6	HIS	-	expression tag	UNP A0A1X0P4R1

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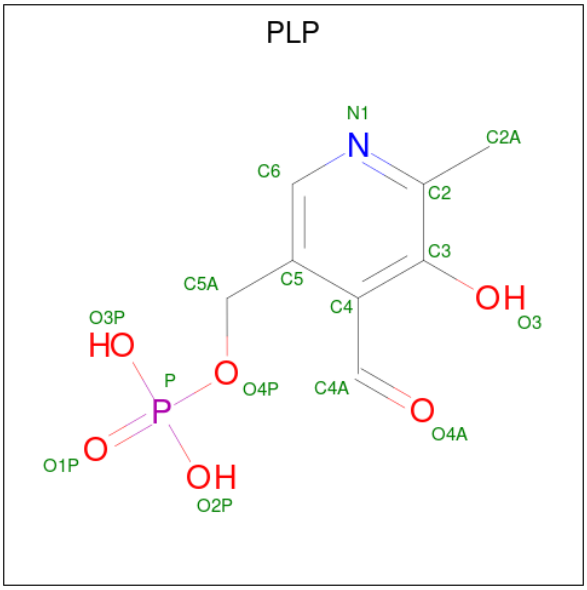
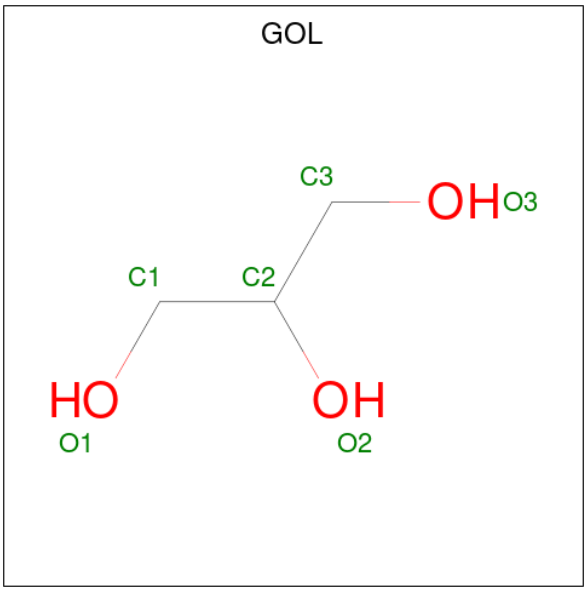
Chain	Residue	Modelled	Actual	Comment	Reference
B	7	HIS	-	expression tag	UNP A0A1X0P4R1
B	8	HIS	-	expression tag	UNP A0A1X0P4R1
B	9	HIS	-	expression tag	UNP A0A1X0P4R1
B	10	HIS	-	expression tag	UNP A0A1X0P4R1
B	11	SER	-	expression tag	UNP A0A1X0P4R1
B	12	SER	-	expression tag	UNP A0A1X0P4R1
B	13	GLY	-	expression tag	UNP A0A1X0P4R1
B	14	LEU	-	expression tag	UNP A0A1X0P4R1
B	15	VAL	-	expression tag	UNP A0A1X0P4R1
B	16	PRO	-	expression tag	UNP A0A1X0P4R1
B	17	ARG	-	expression tag	UNP A0A1X0P4R1
B	18	GLY	-	expression tag	UNP A0A1X0P4R1
B	19	SER	-	expression tag	UNP A0A1X0P4R1

- Molecule 2 is PYRIDOXAL-5'-PHOSPHATE (three-letter code: PLP) (formula: $C_8H_{10}NO_6P$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total	C	H	N	O	P	1	0
			23	8	8	1	5	1		
2	B	1	Total	C	H	N	O	P	1	0
			23	8	8	1	5	1		

- Molecule 3 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C H O 14 3 8 3	2	0
3	A	1	Total C H O 14 3 8 3	2	0
3	A	1	Total C H O 14 3 8 3	2	0
3	A	1	Total C H O 14 3 8 3	2	0
3	B	1	Total C H O 14 3 8 3	2	0

- Molecule 4 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total Cl 1 1	0	0

- Molecule 5 is water.

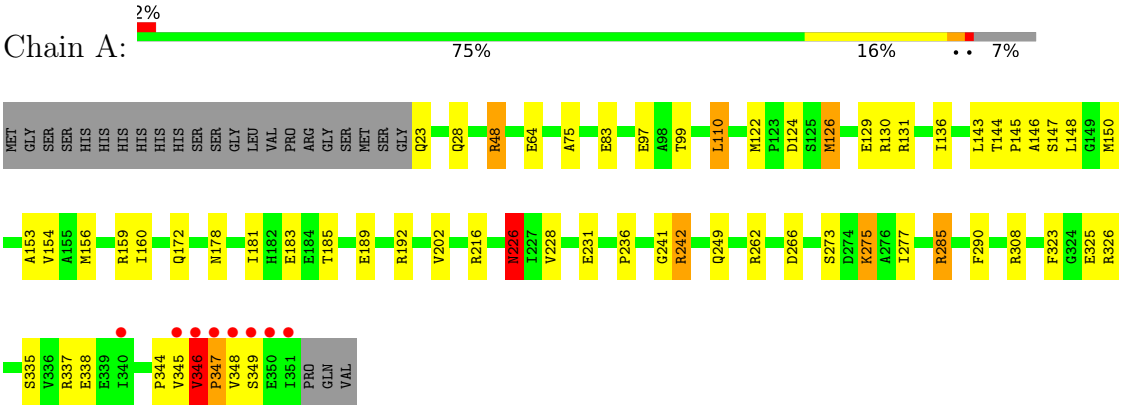
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	81	Total O 81 81	0	0
5	B	60	Total O 60 60	0	0

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.

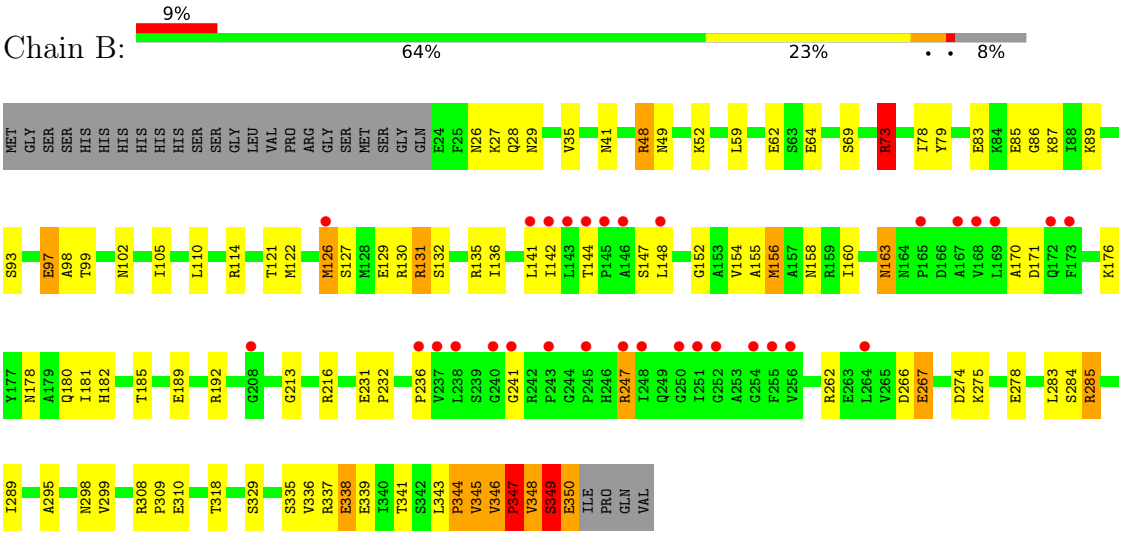
• Molecule 1: Putative cysteine synthase

Chain A:



• Molecule 1: Putative cysteine synthase

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	I 2 3	Depositor
Cell constants a, b, c, α, β, γ	187.30Å 187.30Å 187.30Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	76.47 – 2.75 76.47 – 2.75	Depositor EDS
% Data completeness (in resolution range)	100.0 (76.47-2.75) 100.0 (76.47-2.75)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.12 (at 2.73Å)	Xtriage
Refinement program	REFMAC 5.8.0352	Depositor
R, R_{free}	0.148 , 0.208 0.158 , 0.213	Depositor DCC
R_{free} test set	1448 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å^2)	64.1	Xtriage
Anisotropy	0.000	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.41 , 57.7	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.021 for -l,-k,-h	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	10044	wwPDB-VP
Average B, all atoms (Å^2)	71.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.27% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: PLP, GOL, CL

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	0.80	5/2510 (0.2%)	1.21	13/3404 (0.4%)
1	B	0.77	9/2439 (0.4%)	1.18	15/3317 (0.5%)
All	All	0.79	14/4949 (0.3%)	1.19	28/6721 (0.4%)

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	11
1	B	0	10
All	All	0	21

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	83	GLU	CD-OE1	12.49	1.39	1.25
1	B	64	GLU	CD-OE2	8.13	1.34	1.25
1	A	325	GLU	CD-OE1	7.45	1.33	1.25
1	A	231	GLU	CD-OE1	7.24	1.33	1.25
1	B	267	GLU	CD-OE1	7.23	1.33	1.25
1	B	129	GLU	CD-OE2	7.07	1.33	1.25
1	B	310	GLU	CD-OE2	6.87	1.33	1.25
1	A	64	GLU	CD-OE1	6.53	1.32	1.25
1	B	64	GLU	CD-OE1	6.12	1.32	1.25
1	A	183	GLU	CD-OE2	5.81	1.32	1.25
1	B	83	GLU	CD-OE1	5.78	1.32	1.25
1	B	284	SER	CA-CB	-5.46	1.44	1.52
1	B	69[A]	SER	CA-CB	5.02	1.60	1.52
1	B	69[B]	SER	CA-CB	5.02	1.60	1.52

All (28) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	242[A]	ARG	NE-CZ-NH2	-12.28	114.16	120.30
1	A	242[B]	ARG	NE-CZ-NH2	-12.28	114.16	120.30
1	B	73	ARG	NE-CZ-NH1	9.60	125.10	120.30
1	A	226[A]	ASN	CB-CA-C	9.32	129.05	110.40
1	A	226[B]	ASN	CB-CA-C	9.32	129.05	110.40
1	B	347	PRO	N-CA-CB	-8.78	92.77	103.30
1	A	337	ARG	NE-CZ-NH1	8.63	124.61	120.30
1	B	347	PRO	N-CD-CG	-8.54	90.39	103.20
1	B	285	ARG	NE-CZ-NH2	-8.13	116.23	120.30
1	B	216	ARG	NE-CZ-NH2	-7.89	116.36	120.30
1	A	216	ARG	NE-CZ-NH2	-7.84	116.38	120.30
1	B	275	LYS	CB-CA-C	7.55	125.51	110.40
1	A	326	ARG	NE-CZ-NH2	-7.54	116.53	120.30
1	B	247	ARG	NE-CZ-NH1	7.48	124.04	120.30
1	B	131	ARG	NE-CZ-NH1	-7.12	116.74	120.30
1	B	285	ARG	NE-CZ-NH1	6.88	123.74	120.30
1	B	48	ARG	NE-CZ-NH2	-6.45	117.08	120.30
1	A	275	LYS	CB-CA-C	6.12	122.63	110.40
1	B	73	ARG	NE-CZ-NH2	-6.08	117.26	120.30
1	A	285	ARG	NE-CZ-NH1	6.06	123.33	120.30
1	B	347	PRO	N-CA-C	5.83	127.26	112.10
1	A	266	ASP	CB-CG-OD1	-5.69	113.18	118.30
1	A	242[A]	ARG	NH1-CZ-NH2	5.40	125.34	119.40
1	A	242[B]	ARG	NH1-CZ-NH2	5.40	125.34	119.40
1	B	192	ARG	NE-CZ-NH2	-5.27	117.67	120.30
1	B	266	ASP	CB-CG-OD2	-5.13	113.68	118.30
1	B	48	ARG	NE-CZ-NH1	5.12	122.86	120.30
1	A	308	ARG	NE-CZ-NH2	-5.01	117.79	120.30

There are no chirality outliers.

All (21) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	130	ARG	Sidechain
1	A	131	ARG	Sidechain
1	A	159	ARG	Sidechain
1	A	23	GLN	Peptide
1	A	242[A]	ARG	Sidechain
1	A	242[B]	ARG	Sidechain
1	A	285	ARG	Sidechain
1	A	344	PRO	Peptide

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Mol	Chain	Res	Type	Group
1	A	346	VAL	Peptide
1	A	348	VAL	Peptide
1	A	48	ARG	Sidechain
1	B	114	ARG	Sidechain
1	B	130	ARG	Sidechain
1	B	131	ARG	Sidechain
1	B	135	ARG	Sidechain
1	B	247	ARG	Sidechain
1	B	285	ARG	Sidechain
1	B	337	ARG	Sidechain
1	B	344	PRO	Peptide
1	B	349	SER	Peptide
1	B	73	ARG	Sidechain

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	2461	2520	2510	34	0
1	B	2396	2409	2380	57	0
2	A	15	8	7	0	0
2	B	15	8	7	1	0
3	A	24	32	32	4	0
3	B	6	8	8	1	0
4	A	1	0	0	0	0
5	A	81	0	0	6	0
5	B	60	0	0	16	0
All	All	5059	4985	4944	87	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 9.

All (87) 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:226[A]:ASN:OD1	5:A:501:HOH:O	1.88	0.92

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:348:VAL:HG23	1:B:348:VAL:O	1.81	0.81
1:B:89:LYS:HA	5:B:539:HOH:O	1.82	0.80
1:B:336:VAL:HA	5:B:512:HOH:O	1.82	0.78
1:B:350:GLU:C	1:B:350:GLU:OE2	2.29	0.71
1:B:163:ASN:CB	5:B:519:HOH:O	2.40	0.70
1:B:97:GLU:HG2	1:B:170:ALA:HB3	1.74	0.69
1:A:262:ARG:HG3	5:A:578:HOH:O	1.90	0.69
1:A:346:VAL:HG13	1:A:347:PRO:HD2	1.73	0.69
1:B:99:THR:OG1	3:B:402:GOL:H31	1.93	0.69
1:B:26:ASN:HD21	1:B:28:GLN:HG2	1.59	0.68
1:B:97:GLU:CG	1:B:170:ALA:HB3	2.23	0.68
1:B:144:THR:HG22	5:B:509:HOH:O	1.95	0.65
1:B:348:VAL:O	1:B:348:VAL:CG2	2.45	0.62
1:B:132:SER:O	1:B:136:ILE:HG23	2.00	0.61
1:B:127:SER:HB2	5:B:542:HOH:O	2.01	0.61
1:A:136:ILE:HG13	1:B:336:VAL:HG11	1.83	0.60
1:B:121:THR:HG22	1:B:142:ILE:HD11	1.83	0.60
1:A:48:ARG:HH22	3:A:403:GOL:H31	1.67	0.59
1:A:346:VAL:HG13	1:A:347:PRO:CD	2.33	0.59
1:A:150:MET:O	1:A:154:VAL:HG23	2.03	0.58
1:B:335:SER:HB3	5:B:516:HOH:O	2.04	0.58
1:B:152:GLY:O	1:B:155:ALA:HB3	2.03	0.58
1:B:295:ALA:O	1:B:299:VAL:HG23	2.03	0.58
1:A:290:PHE:H	3:A:404:GOL:H12	1.71	0.55
1:A:323:PHE:HE1	3:A:404:GOL:H11	1.71	0.55
1:B:274:ASP:O	1:B:278:GLU:HG2	2.06	0.55
1:B:121:THR:CG2	1:B:142:ILE:HD11	2.36	0.55
1:B:283:LEU:HD11	1:B:299:VAL:HG21	1.89	0.55
2:B:401:PLP:H2A3	5:B:518:HOH:O	2.07	0.55
1:B:163:ASN:HB2	5:B:519:HOH:O	2.05	0.54
1:B:148:LEU:HD23	1:B:148:LEU:N	2.23	0.54
1:B:49:ASN:ND2	5:B:503:HOH:O	2.42	0.53
1:B:338:GLU:O	1:B:341:THR:O	2.27	0.53
1:B:85:GLU:O	1:B:87:LYS:N	2.42	0.52
1:A:156:MET:O	1:A:160:ILE:HG13	2.08	0.52
1:B:231:GLU:HB2	1:B:232:PRO:HD2	1.91	0.52
1:B:349:SER:O	5:B:501:HOH:O	2.19	0.52
1:A:185:THR:O	1:A:189:GLU:HG3	2.09	0.52
1:B:347:PRO:HB2	1:B:348:VAL:HG13	1.93	0.50
1:A:28:GLN:HG3	5:B:550:HOH:O	2.11	0.50
1:A:145:PRO:HG3	1:B:346:VAL:O	2.13	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:97:GLU:HG3	1:B:170:ALA:HB3	1.94	0.49
1:B:178:ASN:O	1:B:181:ILE:HG22	2.13	0.49
1:A:178:ASN:O	1:A:181:ILE:HG22	2.13	0.48
1:A:347:PRO:HG2	1:A:349:SER:HB2	1.96	0.48
1:B:59:LEU:HD12	1:B:289:ILE:HD13	1.96	0.47
1:B:185:THR:O	1:B:189:GLU:HG3	2.14	0.47
1:A:347:PRO:HD2	1:A:349:SER:HB3	1.97	0.47
1:A:226[B]:ASN:HB3	5:A:501:HOH:O	2.14	0.47
1:B:236:PRO:HG2	1:B:241:GLY:HA3	1.97	0.47
1:B:154:VAL:O	1:B:158:ASN:ND2	2.48	0.47
1:A:148:LEU:N	1:A:148:LEU:HD23	2.30	0.46
1:A:202[A]:VAL:HG23	1:A:228:VAL:CG1	2.45	0.46
1:A:249:GLN:HB3	5:A:563:HOH:O	2.16	0.46
1:B:27:LYS:HE2	1:B:41:ASN:HB2	1.98	0.46
1:A:236:PRO:HG2	1:A:241:GLY:HA3	1.98	0.45
1:A:136:ILE:CG2	5:A:561:HOH:O	2.64	0.45
1:B:298:ASN:HB3	1:B:318:THR:OG1	2.17	0.45
1:A:122:MET:SD	1:A:126:MET:HE2	2.57	0.45
1:B:343:LEU:HA	1:B:344:PRO:HD2	1.67	0.45
1:B:122:MET:SD	1:B:126:MET:HE2	2.57	0.44
1:B:48:ARG:HD3	1:B:48:ARG:HA	1.70	0.44
1:B:171:ASP:HA	5:B:507:HOH:O	2.18	0.44
1:B:102:ASN:HA	1:B:105:ILE:HD12	2.00	0.43
1:A:273:SER:O	1:A:277:ILE:HG13	2.18	0.43
1:A:75:ALA:HB3	1:A:110:LEU:HD13	2.01	0.43
1:B:163:ASN:CA	5:B:519:HOH:O	2.66	0.43
1:A:136:ILE:HG21	5:A:561:HOH:O	2.18	0.43
1:A:124[B]:ASP:OD1	1:A:146:ALA:HB2	2.18	0.43
1:B:78:ILE:HG22	1:B:79:TYR:N	2.33	0.43
1:B:73:ARG:HH22	1:B:189:GLU:CD	2.22	0.43
1:A:323:PHE:CE1	3:A:404:GOL:H11	2.51	0.42
1:B:308:ARG:HA	1:B:309:PRO:HD3	1.90	0.42
1:A:345:VAL:HG12	1:A:346:VAL:H	1.84	0.42
1:B:93:SER:CB	5:B:505:HOH:O	2.67	0.42
1:A:144:THR:HG21	1:A:153:ALA:HA	2.01	0.41
1:B:93:SER:HB3	5:B:505:HOH:O	2.20	0.41
1:A:97:GLU:OE2	1:A:172:GLN:HG2	2.21	0.41
1:B:98:ALA:HA	1:B:121:THR:O	2.20	0.41
1:B:339:GLU:HB3	5:B:512:HOH:O	2.20	0.41
1:A:346:VAL:HG11	1:B:156:MET:CE	2.52	0.41
1:A:192:ARG:NE	1:B:29:ASN:HD22	2.19	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:124[A]:ASP:HB2	1:B:345:VAL:HG23	2.03	0.40
1:B:62:GLU:CD	1:B:73:ARG:HH11	2.24	0.40
1:B:182:HIS:HB2	1:B:213:GLY:HA3	2.03	0.40
1:B:329:SER:O	1:B:329:SER:OG	2.34	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	331/354 (94%)	316 (96%)	14 (4%)	1 (0%)	41	60
1	B	327/354 (92%)	304 (93%)	19 (6%)	4 (1%)	13	23
All	All	658/708 (93%)	620 (94%)	33 (5%)	5 (1%)	19	34

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	347	PRO
1	B	347	PRO
1	B	86	GLY
1	B	267	GLU
1	B	348	VAL

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	262/285 (92%)	250 (95%)	12 (5%)	27 46
1	B	249/285 (87%)	231 (93%)	18 (7%)	14 25
All	All	511/570 (90%)	481 (94%)	30 (6%)	20 34

All (30) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	99	THR
1	A	110	LEU
1	A	126	MET
1	A	129	GLU
1	A	143	LEU
1	A	147	SER
1	A	226[A]	ASN
1	A	226[B]	ASN
1	A	275	LYS
1	A	335	SER
1	A	338	GLU
1	A	346	VAL
1	B	35	VAL
1	B	52	LYS
1	B	97	GLU
1	B	110	LEU
1	B	126	MET
1	B	141	LEU
1	B	147	SER
1	B	156	MET
1	B	160	ILE
1	B	163	ASN
1	B	176	LYS
1	B	180	GLN
1	B	262	ARG
1	B	338	GLU
1	B	345	VAL
1	B	346	VAL
1	B	349	SER
1	B	350	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	233	GLN
1	A	270	GLN
1	B	26	ASN
1	B	29	ASN
1	B	158	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 8 ligands modelled in this entry, 1 is monoatomic - leaving 7 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	$\#\|Z\| > 2$
2	PLP	B	401	1	15,15,16	2.14	5 (33%)	20,22,23	2.40	9 (45%)
3	GOL	A	403	-	5,5,5	0.10	0	5,5,5	0.28	0
3	GOL	B	402	-	5,5,5	0.25	0	5,5,5	0.50	0
3	GOL	A	404	-	5,5,5	0.46	0	5,5,5	0.98	0
3	GOL	A	405	-	5,5,5	0.24	0	5,5,5	0.53	0
3	GOL	A	402	-	5,5,5	0.29	0	5,5,5	1.03	1 (20%)
2	PLP	A	401	1	15,15,16	1.48	3 (20%)	20,22,23	1.58	3 (15%)

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
2	PLP	B	401	1	-	2/6/6/8	0/1/1/1
3	GOL	A	403	-	-	2/4/4/4	-
3	GOL	B	402	-	-	4/4/4/4	-
3	GOL	A	404	-	-	4/4/4/4	-
3	GOL	A	405	-	-	2/4/4/4	-
3	GOL	A	402	-	-	1/4/4/4	-
2	PLP	A	401	1	-	0/6/6/8	0/1/1/1

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	401	PLP	P-O1P	4.97	1.66	1.50
2	B	401	PLP	O3-C3	3.56	1.45	1.37
2	B	401	PLP	C5-C4	3.06	1.43	1.40
2	A	401	PLP	C5-C4	2.97	1.43	1.40
2	B	401	PLP	P-O4P	2.71	1.69	1.60
2	A	401	PLP	C4A-C4	-2.60	1.46	1.51
2	B	401	PLP	C3-C4	2.49	1.45	1.40
2	A	401	PLP	C3-C2	2.10	1.43	1.40

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	401	PLP	O3-C3-C4	5.01	131.28	118.10
2	B	401	PLP	O3P-P-O4P	-4.79	93.97	106.73
2	B	401	PLP	O4P-C5A-C5	4.14	117.24	109.35
2	A	401	PLP	O3-C3-C4	3.85	128.24	118.10
2	B	401	PLP	O4P-P-O1P	3.26	115.62	106.47
2	B	401	PLP	C4-C3-C2	-2.72	116.05	120.07
2	B	401	PLP	O3-C3-C2	-2.62	111.78	117.49
2	B	401	PLP	C6-C5-C4	-2.44	116.23	118.16
2	A	401	PLP	O4P-C5A-C5	2.37	113.87	109.35
2	A	401	PLP	O3-C3-C2	-2.32	112.44	117.49
3	A	402	GOL	C3-C2-C1	2.08	119.79	111.70
2	B	401	PLP	O3P-P-O1P	2.08	118.82	110.68
2	B	401	PLP	C4A-C4-C5	-2.05	118.82	120.94

There are no chirality outliers.

All (15) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	404	GOL	O1-C1-C2-C3
3	A	405	GOL	C1-C2-C3-O3
3	B	402	GOL	O1-C1-C2-C3
3	B	402	GOL	C1-C2-C3-O3
3	A	403	GOL	O1-C1-C2-C3
3	A	404	GOL	C1-C2-C3-O3
3	A	404	GOL	O1-C1-C2-O2
3	A	404	GOL	O2-C2-C3-O3
3	A	405	GOL	O2-C2-C3-O3
3	B	402	GOL	O2-C2-C3-O3
3	B	402	GOL	O1-C1-C2-O2
3	A	403	GOL	O1-C1-C2-O2
2	B	401	PLP	C5A-O4P-P-O2P
2	B	401	PLP	C5A-O4P-P-O1P
3	A	402	GOL	O1-C1-C2-C3

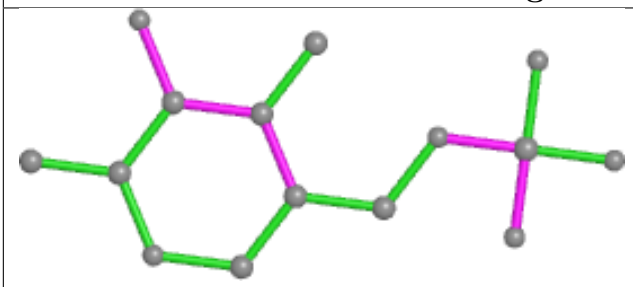
There are no ring outliers.

4 monomers are involved in 6 short contacts:

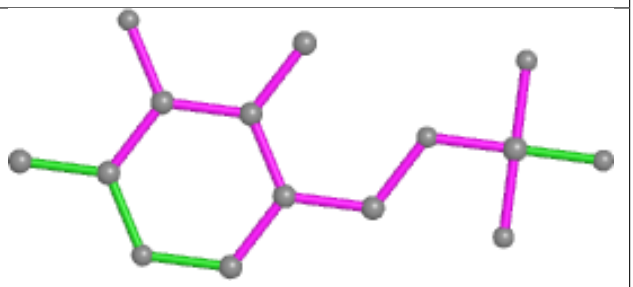
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	401	PLP	1	0
3	A	403	GOL	1	0
3	B	402	GOL	1	0
3	A	404	GOL	3	0

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.

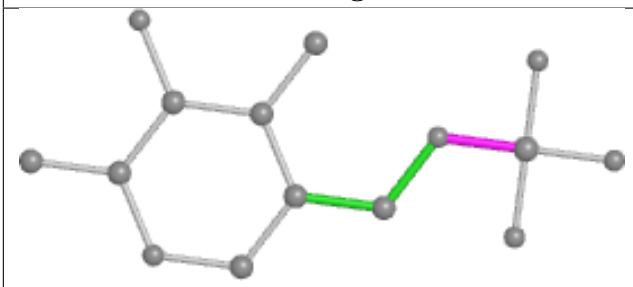
Ligand PLP B 401



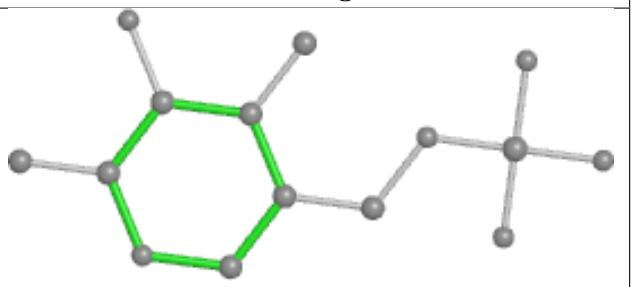
Bond lengths



Bond angles

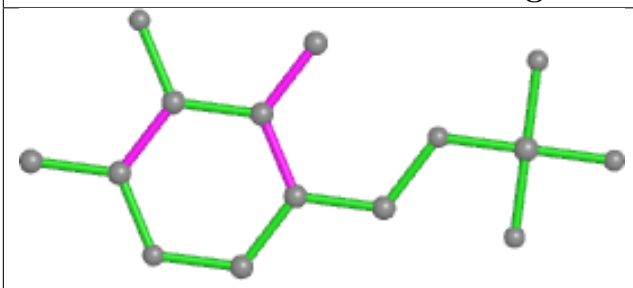


Torsions

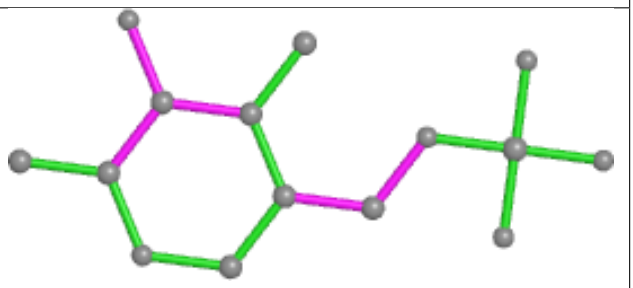


Rings

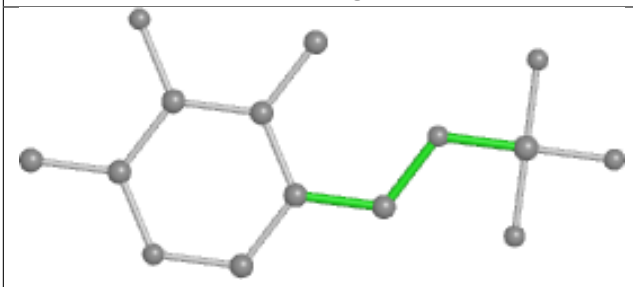
Ligand PLP A 401



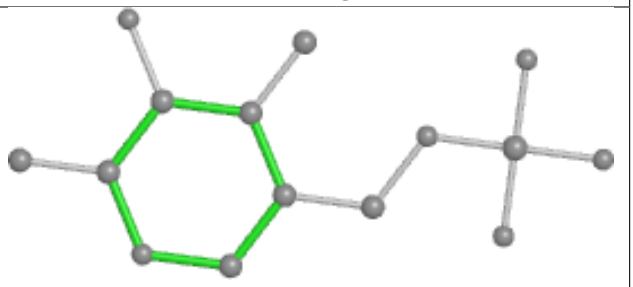
Bond lengths



Bond angles



Torsions



Rings

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^{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	329/354 (92%)	0.58	8 (2%) 59 68	38, 54, 101, 169	0
1	B	327/354 (92%)	0.78	31 (9%) 8 9	42, 76, 131, 169	1 (0%)
All	All	656/708 (92%)	0.68	39 (5%) 22 27	38, 63, 126, 169	1 (0%)

All (39) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	240	GLY	6.2
1	B	248	ILE	5.6
1	A	346	VAL	4.9
1	B	255	PHE	4.3
1	B	252	GLY	4.1
1	B	241	GLY	4.0
1	B	173	PHE	4.0
1	B	167	ALA	3.9
1	A	349	SER	3.9
1	A	348	VAL	3.8
1	B	254	GLY	3.7
1	B	148	LEU	3.6
1	B	245	PRO	3.4
1	A	351	ILE	3.3
1	B	144	THR	3.2
1	B	256	VAL	3.0
1	A	347	PRO	3.0
1	B	247	ARG	3.0
1	B	141	LEU	3.0
1	B	251	ILE	2.9
1	B	169	LEU	2.8
1	B	142	ILE	2.6
1	A	350	GLU	2.6
1	B	165	PRO	2.5

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Mol	Chain	Res	Type	RSRZ
1	B	168	VAL	2.4
1	B	243	PRO	2.4
1	B	238	LEU	2.4
1	B	236	PRO	2.3
1	B	264	LEU	2.3
1	B	143	LEU	2.3
1	B	145	PRO	2.3
1	B	126	MET	2.2
1	A	340	ILE	2.2
1	B	146	ALA	2.2
1	B	208	GLY	2.2
1	A	345	VAL	2.1
1	B	250	GLY	2.1
1	B	237	VAL	2.0
1	B	172	GLN	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 monosaccharides in this entry.

6.4 Ligands (i)

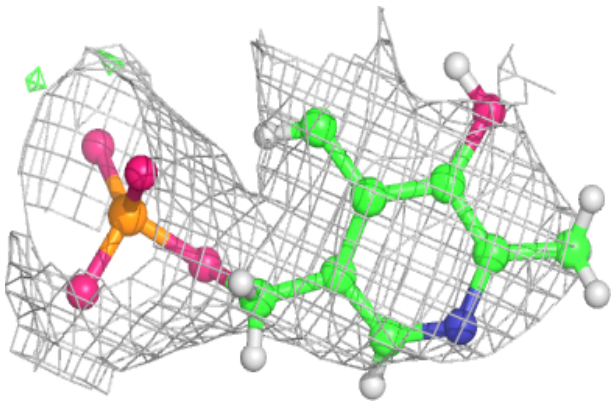
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

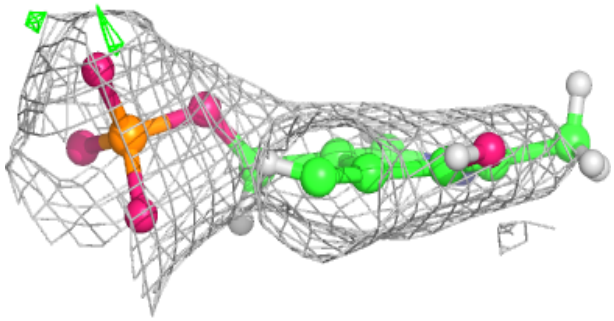
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	GOL	B	402	6/6	0.79	0.31	91,107,129,141	2
3	GOL	A	403	6/6	0.84	0.21	85,92,96,101	2
3	GOL	A	402	6/6	0.85	0.25	61,91,116,129	2
3	GOL	A	405	6/6	0.90	0.48	77,99,103,105	2
4	CL	A	406	1/1	0.94	0.20	76,76,76,76	0
3	GOL	A	404	6/6	0.95	0.56	62,110,117,118	2
2	PLP	B	401	15/16	0.97	0.23	66,85,94,107	1
2	PLP	A	401	15/16	0.99	0.20	36,53,64,72	1

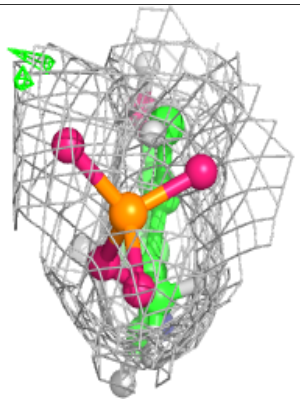
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around PLP B 401:

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

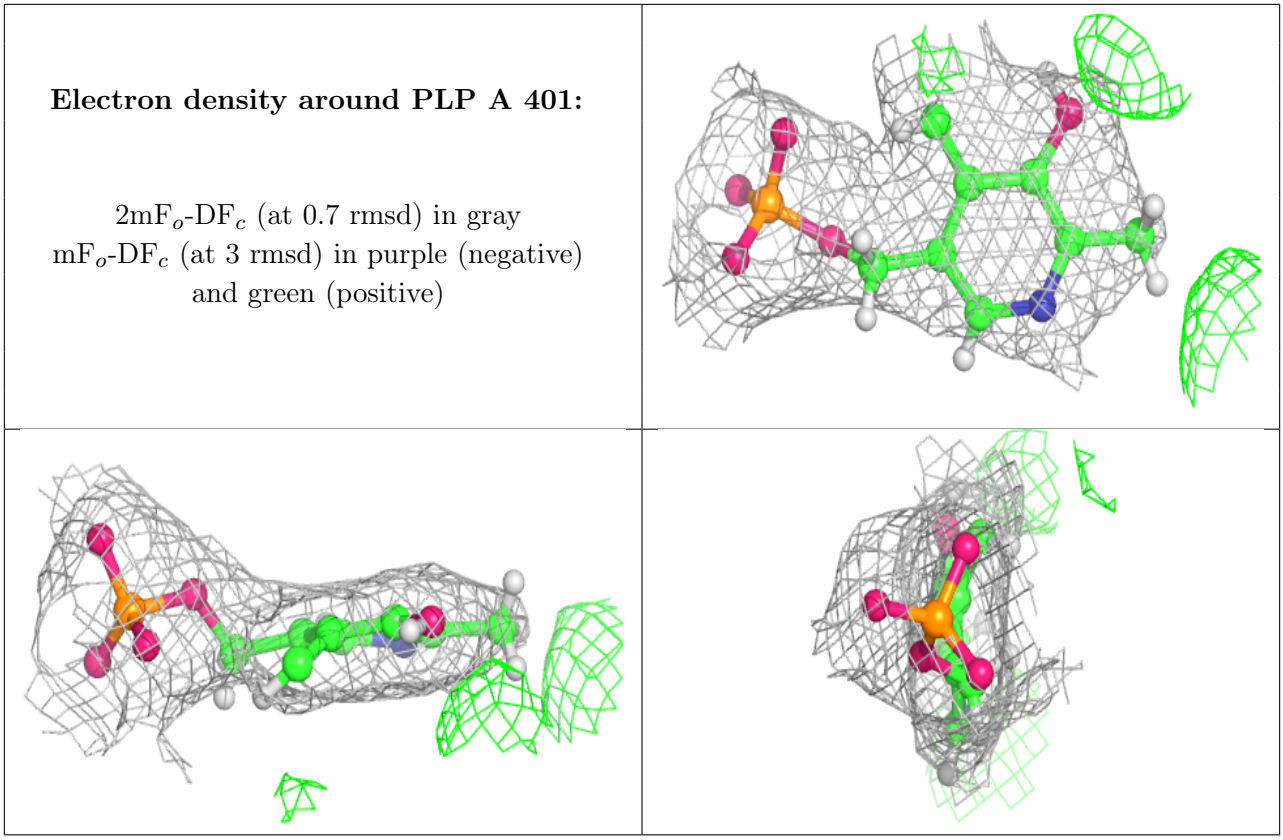






Electron density around PLP A 401:

$2mF_o$-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.