



Full wwPDB X-ray Structure Validation Report ⓘ

May 23, 2023 – 10:25 am BST

PDB ID : 8B9Y
Title : Cysteine Synthase from Trypanosoma cruzi with PLP and OAS
Authors : Sowerby, K.V.; Pohl, E.
Deposited on : 2022-10-10
Resolution : 1.80 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 ⓘ 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 : 4.02b-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

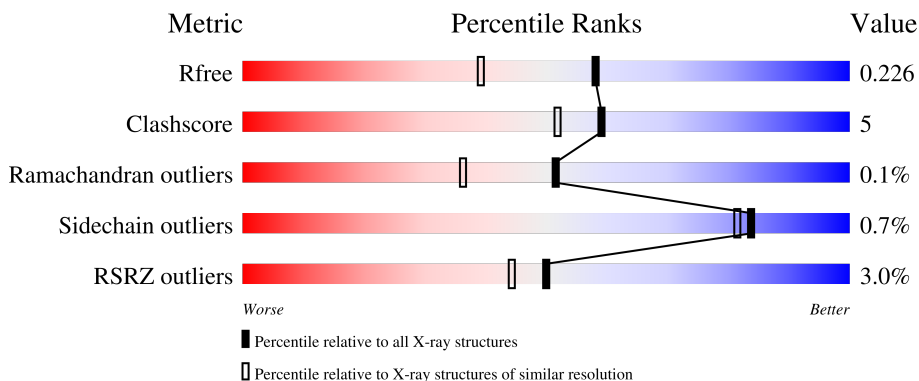
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION


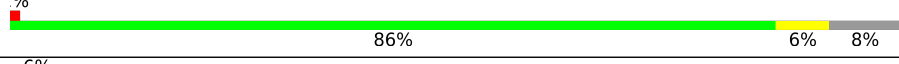
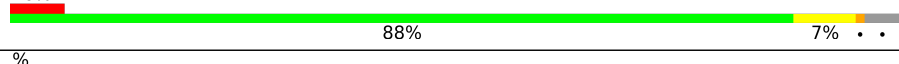

The reported resolution of this entry is 1.80 Å.

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	5950 (1.80-1.80)
Clashscore	141614	6793 (1.80-1.80)
Ramachandran outliers	138981	6697 (1.80-1.80)
Sidechain outliers	138945	6696 (1.80-1.80)
RSRZ outliers	127900	5850 (1.80-1.80)

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 $\leq 5\%$. 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	344	 3% 84% 7% 9%
1	B	344	 0% 86% 6% 8%
1	C	344	 6% 88% 7% . .
1	D	344	 0% 87% 6% 7%

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 19553 atoms, of which 9519 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 Cysteine synthase, putative.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	H	N	O				S
1	A	313	4575	1450	2293	384	435	13	134	2	0
1	B	316	4710	1483	2368	397	448	14	128	4	0
1	C	330	4814	1524	2407	405	463	15	136	3	0
1	D	321	4747	1494	2384	402	451	16	139	5	0

There are 52 discrepancies between the modelled and reference sequences:

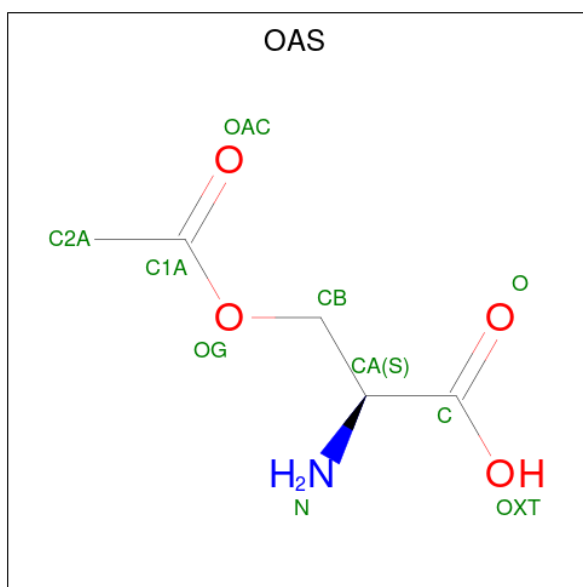
Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MET	-	initiating methionine	UNP Q4CST7
A	2	THR	-	expression tag	UNP Q4CST7
A	3	MET	-	expression tag	UNP Q4CST7
A	4	ILE	-	expression tag	UNP Q4CST7
A	5	THR	-	expression tag	UNP Q4CST7
A	6	HIS	-	expression tag	UNP Q4CST7
A	7	HIS	-	expression tag	UNP Q4CST7
A	8	HIS	-	expression tag	UNP Q4CST7
A	9	HIS	-	expression tag	UNP Q4CST7
A	10	HIS	-	expression tag	UNP Q4CST7
A	11	HIS	-	expression tag	UNP Q4CST7
A	12	GLY	-	expression tag	UNP Q4CST7
A	13	SER	-	expression tag	UNP Q4CST7
B	1	MET	-	initiating methionine	UNP Q4CST7
B	2	THR	-	expression tag	UNP Q4CST7
B	3	MET	-	expression tag	UNP Q4CST7
B	4	ILE	-	expression tag	UNP Q4CST7
B	5	THR	-	expression tag	UNP Q4CST7
B	6	HIS	-	expression tag	UNP Q4CST7
B	7	HIS	-	expression tag	UNP Q4CST7
B	8	HIS	-	expression tag	UNP Q4CST7

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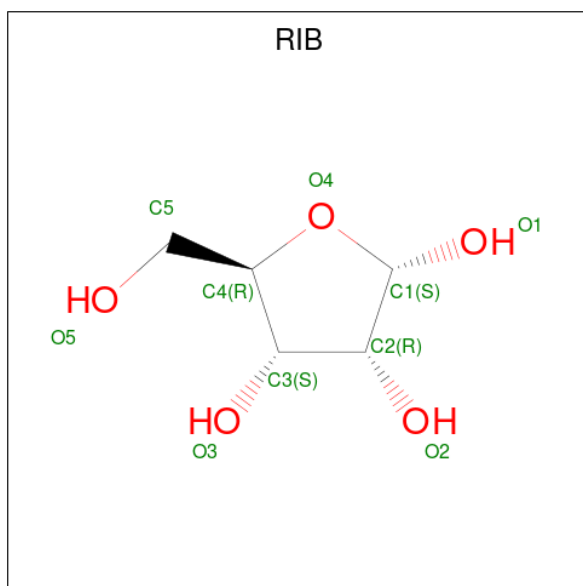
Chain	Residue	Modelled	Actual	Comment	Reference
B	9	HIS	-	expression tag	UNP Q4CST7
B	10	HIS	-	expression tag	UNP Q4CST7
B	11	HIS	-	expression tag	UNP Q4CST7
B	12	GLY	-	expression tag	UNP Q4CST7
B	13	SER	-	expression tag	UNP Q4CST7
C	1	MET	-	initiating methionine	UNP Q4CST7
C	2	THR	-	expression tag	UNP Q4CST7
C	3	MET	-	expression tag	UNP Q4CST7
C	4	ILE	-	expression tag	UNP Q4CST7
C	5	THR	-	expression tag	UNP Q4CST7
C	6	HIS	-	expression tag	UNP Q4CST7
C	7	HIS	-	expression tag	UNP Q4CST7
C	8	HIS	-	expression tag	UNP Q4CST7
C	9	HIS	-	expression tag	UNP Q4CST7
C	10	HIS	-	expression tag	UNP Q4CST7
C	11	HIS	-	expression tag	UNP Q4CST7
C	12	GLY	-	expression tag	UNP Q4CST7
C	13	SER	-	expression tag	UNP Q4CST7
D	1	MET	-	initiating methionine	UNP Q4CST7
D	2	THR	-	expression tag	UNP Q4CST7
D	3	MET	-	expression tag	UNP Q4CST7
D	4	ILE	-	expression tag	UNP Q4CST7
D	5	THR	-	expression tag	UNP Q4CST7
D	6	HIS	-	expression tag	UNP Q4CST7
D	7	HIS	-	expression tag	UNP Q4CST7
D	8	HIS	-	expression tag	UNP Q4CST7
D	9	HIS	-	expression tag	UNP Q4CST7
D	10	HIS	-	expression tag	UNP Q4CST7
D	11	HIS	-	expression tag	UNP Q4CST7
D	12	GLY	-	expression tag	UNP Q4CST7
D	13	SER	-	expression tag	UNP Q4CST7

- Molecule 2 is O-ACETYLSERINE (three-letter code: OAS) (formula: C₅H₉NO₄) (labeled as "Ligand of Interest" by depositor).



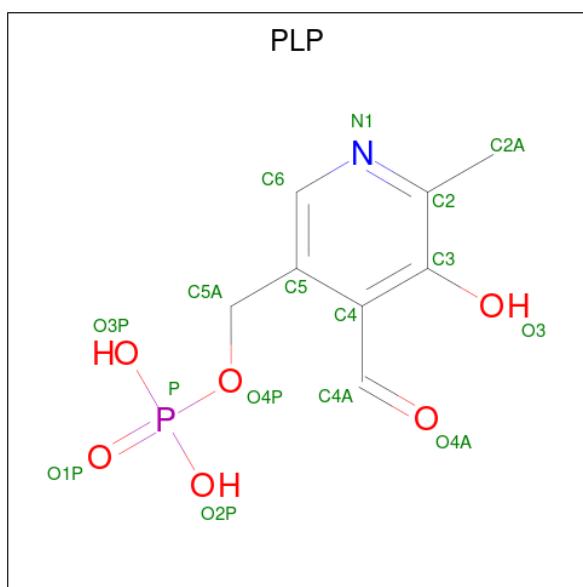
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	H	N	O		
2	A	1	19	5	9	1	4	0	0

- Molecule 3 is alpha-D-ribofuranose (three-letter code: RIB) (formula: C₅H₁₀O₅).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	H	O		
3	A	1	20	5	10	5	3	0

- Molecule 4 is PYRIDOXAL-5'-PHOSPHATE (three-letter code: PLP) (formula: C₈H₁₀NO₆P) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



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

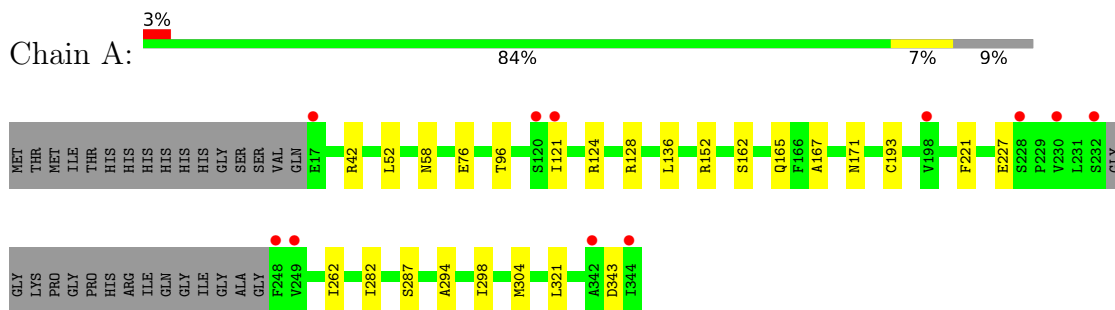
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	123	Total	O	0	0
			123	123		
6	B	143	Total	O	0	0
			143	143		
6	C	141	Total	O	0	0
			141	141		
6	D	141	Total	O	0	0
			141	141		

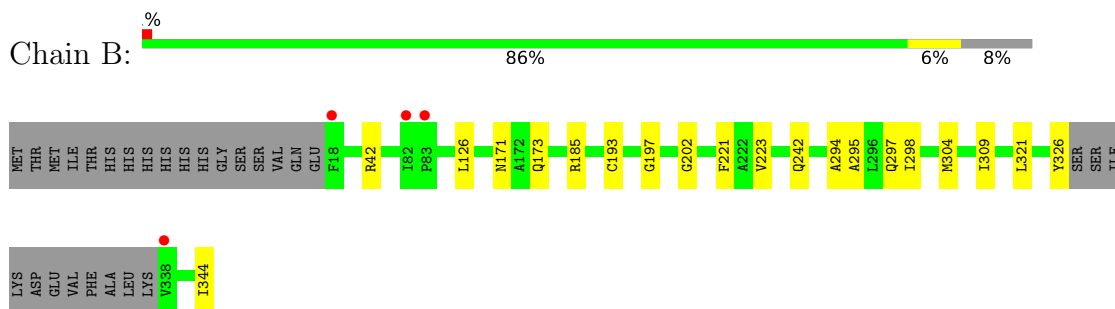
3 Residue-property plots [i](#)

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.

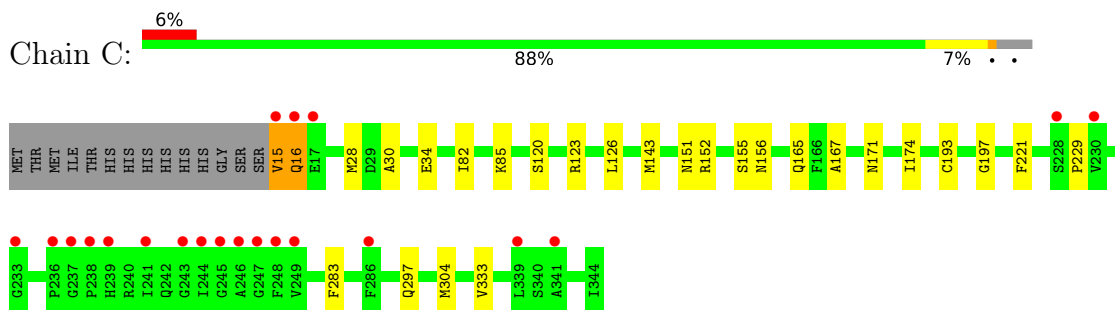
- Molecule 1: Cysteine synthase, putative



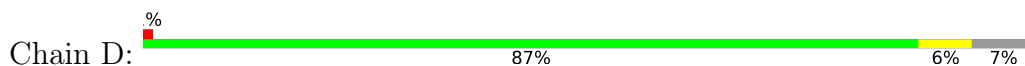
- Molecule 1: Cysteine synthase, putative

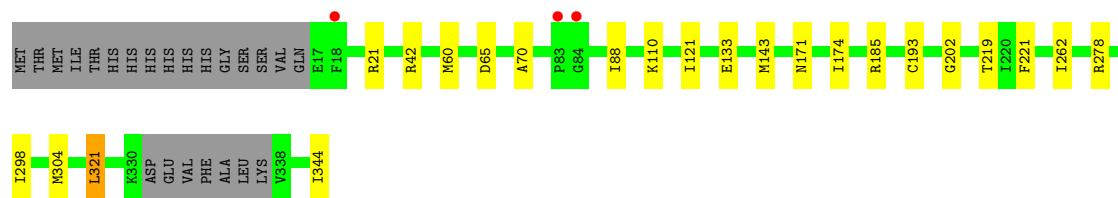


- Molecule 1: Cysteine synthase, putative



- Molecule 1: Cysteine synthase, putative





4 Data and refinement statistics i

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	55.01Å 66.67Å 167.52Å 90.00° 90.47° 90.00°	Depositor
Resolution (Å)	54.94 – 1.80 55.84 – 1.80	Depositor EDS
% Data completeness (in resolution range)	97.9 (54.94-1.80) 95.5 (55.84-1.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.70 (at 1.80Å)	Xtrriage
Refinement program	REFMAC 5.8.0352	Depositor
R, R_{free}	0.191 , 0.217 0.200 , 0.226	Depositor DCC
R_{free} test set	5483 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å ²)	22.4	Xtrriage
Anisotropy	0.146	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.43 , 34.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	0.167 for h,-k,-l	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	19553	wwPDB-VP
Average B, all atoms (Å ²)	27.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.04% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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

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	0.42	0/2326	0.66	0/3170
1	B	0.48	0/2391	0.68	0/3249
1	C	0.44	0/2458	0.66	0/3347
1	D	0.46	0/2415	0.70	0/3282
All	All	0.45	0/9590	0.67	0/13048

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	2
1	B	0	1
1	C	0	1
1	D	0	3
All	All	0	7

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (7) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	128	ARG	Sidechain
1	A	152	ARG	Sidechain
1	B	185	ARG	Sidechain
1	C	152	ARG	Sidechain
1	D	185	ARG	Sidechain

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Mol	Chain	Res	Type	Group
1	D	278	ARG	Sidechain
1	D	42	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	2282	2293	2253	19	0
1	B	2342	2368	2355	24	0
1	C	2407	2407	2376	26	0
1	D	2363	2384	2361	23	0
2	A	10	9	8	2	0
3	A	10	10	0	1	0
4	A	15	8	7	0	0
4	B	15	8	7	0	0
4	C	15	8	7	0	0
4	D	15	8	6	0	0
5	C	6	8	8	0	0
5	D	6	8	8	1	0
6	A	123	0	0	4	0
6	B	143	0	0	6	0
6	C	141	0	0	10	0
6	D	141	0	0	3	1
All	All	10034	9519	9396	88	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 5.

All (88) 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:D:143[B]:MET:HA	1:D:143[B]:MET:HE3	1.46	0.98
1:C:156:ASN:ND2	6:C:501:HOH:O	2.08	0.85
1:D:143[B]:MET:HA	1:D:143[B]:MET:CE	2.06	0.85
1:A:76:GLU:OE1	6:A:801:HOH:O	1.98	0.80
1:C:151:ASN:HB3	6:C:612:HOH:O	1.83	0.78

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:126:LEU:HD21	1:D:321:LEU:HD21	1.68	0.75
1:B:193[A]:CYS:SG	1:B:298:ILE:CD1	2.77	0.73
1:B:295:ALA:O	1:B:298:ILE:CG2	2.41	0.69
1:B:193[A]:CYS:SG	1:B:298:ILE:HD11	2.32	0.69
1:A:58:ASN:O	3:A:702:RIB:O2	2.09	0.68
1:B:295:ALA:O	1:B:298:ILE:HG23	1.94	0.67
1:C:151:ASN:HB3	6:C:606:HOH:O	1.95	0.66
1:A:287:SER:OG	6:A:802:HOH:O	2.14	0.66
1:D:193[B]:CYS:SG	1:D:304:MET:CE	2.86	0.65
1:C:82:ILE:HD12	1:C:85:LYS:HE2	1.80	0.64
1:C:193[B]:CYS:SG	1:C:221:PHE:CE1	2.91	0.63
1:D:344:ILE:OXT	6:D:502:HOH:O	2.16	0.61
1:D:110:LYS:HE3	1:D:133:GLU:HG2	1.82	0.60
1:C:28:MET:HE2	6:D:517:HOH:O	2.02	0.60
1:C:15:VAL:O	1:C:16:GLN:CB	2.50	0.58
1:B:344:ILE:HG13	6:B:681:HOH:O	2.04	0.57
1:D:262:ILE:HD11	1:D:298:ILE:HD11	1.86	0.57
1:A:52:LEU:HD12	1:A:282:ILE:HD13	1.86	0.57
1:D:143[B]:MET:HE3	1:D:143[B]:MET:CA	2.30	0.57
1:D:219[A]:THR:HG23	1:D:221:PHE:HE1	1.70	0.57
1:C:297:GLN:HG2	6:C:515:HOH:O	2.03	0.56
1:B:193[B]:CYS:SG	1:B:304:MET:CE	2.93	0.56
1:B:193[A]:CYS:SG	1:B:298:ILE:HD13	2.46	0.55
1:B:193[B]:CYS:SG	1:B:304:MET:SD	3.04	0.55
1:D:143[B]:MET:CE	1:D:143[B]:MET:CA	2.79	0.55
1:A:227:GLU:CB	6:A:856:HOH:O	2.53	0.55
1:C:193[B]:CYS:HG	1:C:221:PHE:HE1	1.50	0.55
1:A:52:LEU:CD1	1:A:282:ILE:HD13	2.36	0.55
1:A:193[B]:CYS:SG	1:A:221:PHE:CE1	3.00	0.55
1:B:344:ILE:CG1	6:B:681:HOH:O	2.56	0.54
1:C:167:ALA:O	1:C:171:ASN:HB2	2.08	0.54
1:B:242:GLN:NE2	6:B:602:HOH:O	2.31	0.54
1:B:221:PHE:CE1	1:B:298:ILE:CD1	2.91	0.53
1:B:221:PHE:CE1	1:B:298:ILE:HD12	2.44	0.53
1:C:15:VAL:HB	1:C:30:ALA:O	2.09	0.52
1:A:167:ALA:O	1:A:171:ASN:HB2	2.08	0.52
1:B:297:GLN:NE2	6:B:605:HOH:O	2.43	0.52
1:B:173:GLN:HG3	6:B:707:HOH:O	2.10	0.52
1:C:193[B]:CYS:SG	1:C:221:PHE:CD1	3.03	0.52
1:C:333:VAL:HG23	1:D:121:ILE:HD11	1.90	0.52
1:C:193[A]:CYS:SG	1:C:304:MET:CE	2.99	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:52:LEU:HD12	1:A:282:ILE:CD1	2.41	0.50
1:C:82:ILE:HD12	1:C:85:LYS:CE	2.42	0.50
1:B:326:TYR:OH	6:B:601:HOH:O	2.05	0.50
1:B:295:ALA:O	1:B:298:ILE:HG22	2.11	0.49
1:A:193[A]:CYS:SG	1:A:304:MET:CE	3.01	0.49
1:B:304:MET:HE2	1:B:309:ILE:HG12	1.96	0.47
1:A:124:ARG:HD3	1:A:136:LEU:HD11	1.96	0.47
1:B:295:ALA:HA	1:B:298:ILE:CG2	2.45	0.47
1:A:193[B]:CYS:SG	1:A:221:PHE:CD1	3.08	0.47
1:C:165:GLN:CB	6:C:618:HOH:O	2.63	0.47
1:C:197:GLY:HA3	6:C:533:HOH:O	2.15	0.46
1:B:294:ALA:O	1:B:298:ILE:HG22	2.17	0.45
1:D:193[A]:CYS:SG	1:D:221:PHE:CE1	3.10	0.45
5:D:402:GOL:H32	6:D:525:HOH:O	2.16	0.45
1:C:229:PRO:HG3	6:C:562:HOH:O	2.15	0.45
1:D:193[B]:CYS:SG	1:D:304:MET:SD	3.15	0.45
1:D:171:ASN:OD1	1:D:202:GLY:HA3	2.17	0.44
1:A:96:THR:CB	2:A:701:OAS:H	2.30	0.44
1:C:120:SER:OG	1:C:123:ARG:HG3	2.17	0.44
1:D:88:ILE:HD12	1:D:88:ILE:N	2.32	0.44
1:D:60[A]:MET:HB2	1:D:65:ASP:OD1	2.18	0.44
1:D:219[A]:THR:CG2	1:D:221:PHE:HE1	2.31	0.43
1:A:96:THR:HB	2:A:701:OAS:H	1.83	0.43
1:D:193[A]:CYS:SG	1:D:221:PHE:CD1	3.11	0.43
1:C:155:SER:HB2	6:C:501:HOH:O	2.18	0.43
1:B:193[A]:CYS:SG	1:B:221:PHE:CE1	3.12	0.43
1:A:42:ARG:NH2	6:A:804:HOH:O	2.52	0.42
1:C:229:PRO:CG	6:C:562:HOH:O	2.68	0.42
1:B:221:PHE:CE1	1:B:298:ILE:HD11	2.54	0.42
1:C:151:ASN:CB	6:C:612:HOH:O	2.55	0.42
1:D:70:ALA:HB2	1:D:174:ILE:HB	2.02	0.41
1:A:162:SER:O	1:A:165:GLN:HG2	2.21	0.41
1:C:34:GLU:OE1	1:D:21:ARG:HB3	2.20	0.41
1:C:283:PHE:CD2	1:D:60[B]:MET:HE1	2.55	0.41
1:A:321[B]:LEU:HD11	1:B:126:LEU:HD21	2.03	0.41
1:D:193[B]:CYS:SG	1:D:304:MET:HE2	2.60	0.41
1:A:262:ILE:HD12	1:A:294:ALA:HB1	2.03	0.41
1:D:174:ILE:HD12	1:D:174:ILE:HA	1.99	0.40
1:A:262:ILE:HD11	1:A:298:ILE:HD11	2.03	0.40
1:C:174:ILE:HD12	1:C:174:ILE:HA	2.00	0.40
1:B:171:ASN:OD1	1:B:202:GLY:HA3	2.22	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:197:GLY:HA2	1:B:223:VAL:HB	2.04	0.40

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

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
6:D:502:HOH:O	6:D:606:HOH:O[2_546]	1.70	0.50

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	311/344 (90%)	305 (98%)	6 (2%)	0	100	100
1	B	316/344 (92%)	309 (98%)	7 (2%)	0	100	100
1	C	331/344 (96%)	324 (98%)	6 (2%)	1 (0%)	41	27
1	D	322/344 (94%)	315 (98%)	7 (2%)	0	100	100
All	All	1280/1376 (93%)	1253 (98%)	26 (2%)	1 (0%)	51	36

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	16	GLN

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	231/271 (85%)	229 (99%)	2 (1%)	78	75
1	B	244/271 (90%)	242 (99%)	2 (1%)	81	78
1	C	245/271 (90%)	243 (99%)	2 (1%)	81	78
1	D	244/271 (90%)	243 (100%)	1 (0%)	91	89
All	All	964/1084 (89%)	957 (99%)	7 (1%)	84	81

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	121	ILE
1	A	343	ASP
1	B	42	ARG
1	B	321	LEU
1	C	15	VAL
1	C	143	MET
1	D	321	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	173	GLN
1	C	239	HIS

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

8 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
5	GOL	D	402	-	5,5,5	0.15	0	5,5,5	0.49	0
4	PLP	B	500	1	15,15,16	1.20	2 (13%)	20,22,23	0.99	0
4	PLP	D	401	1	15,15,16	0.91	1 (6%)	20,22,23	1.03	0
5	GOL	C	402	-	5,5,5	0.11	0	5,5,5	0.26	0
4	PLP	A	703	1	15,15,16	0.74	0	20,22,23	1.13	1 (5%)
3	RIB	A	702	-	10,10,10	0.99	1 (10%)	13,14,14	1.23	1 (7%)
2	OAS	A	701	-	8,9,9	0.66	0	9,11,11	0.78	0
4	PLP	C	401	1	15,15,16	0.71	0	20,22,23	0.91	1 (5%)

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
5	GOL	D	402	-	-	2/4/4/4	-
4	PLP	B	500	1	-	0/6/6/8	0/1/1/1
4	PLP	D	401	1	-	0/6/6/8	0/1/1/1
5	GOL	C	402	-	-	2/4/4/4	-
4	PLP	A	703	1	-	1/6/6/8	0/1/1/1
3	RIB	A	702	-	-	2/2/18/18	0/1/1/1
2	OAS	A	701	-	-	8/9/9/9	-
4	PLP	C	401	1	-	0/6/6/8	0/1/1/1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	500	PLP	C4A-C4	-3.13	1.45	1.51
4	D	401	PLP	C4A-C4	-2.91	1.45	1.51

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	702	RIB	O4-C1	2.59	1.46	1.43
4	B	500	PLP	C5-C4	2.42	1.43	1.40

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	703	PLP	O4P-C5A-C5	3.03	115.13	109.35
3	A	702	RIB	C1-C2-C3	2.82	105.83	102.30
4	C	401	PLP	O4P-C5A-C5	2.24	113.61	109.35

There are no chirality outliers.

All (15) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	701	OAS	N-CA-CB-OG
2	A	701	OAS	C-CA-CB-OG
2	A	701	OAS	O-C-CA-CB
2	A	701	OAS	OXT-C-CA-CB
4	A	703	PLP	C6-C5-C5A-O4P
5	C	402	GOL	C1-C2-C3-O3
3	A	702	RIB	O4-C4-C5-O5
2	A	701	OAS	OAC-C1A-OG-CB
2	A	701	OAS	C2A-C1A-OG-CB
5	D	402	GOL	O1-C1-C2-C3
5	D	402	GOL	O1-C1-C2-O2
5	C	402	GOL	O2-C2-C3-O3
3	A	702	RIB	C3-C4-C5-O5
2	A	701	OAS	O-C-CA-N
2	A	701	OAS	OXT-C-CA-N

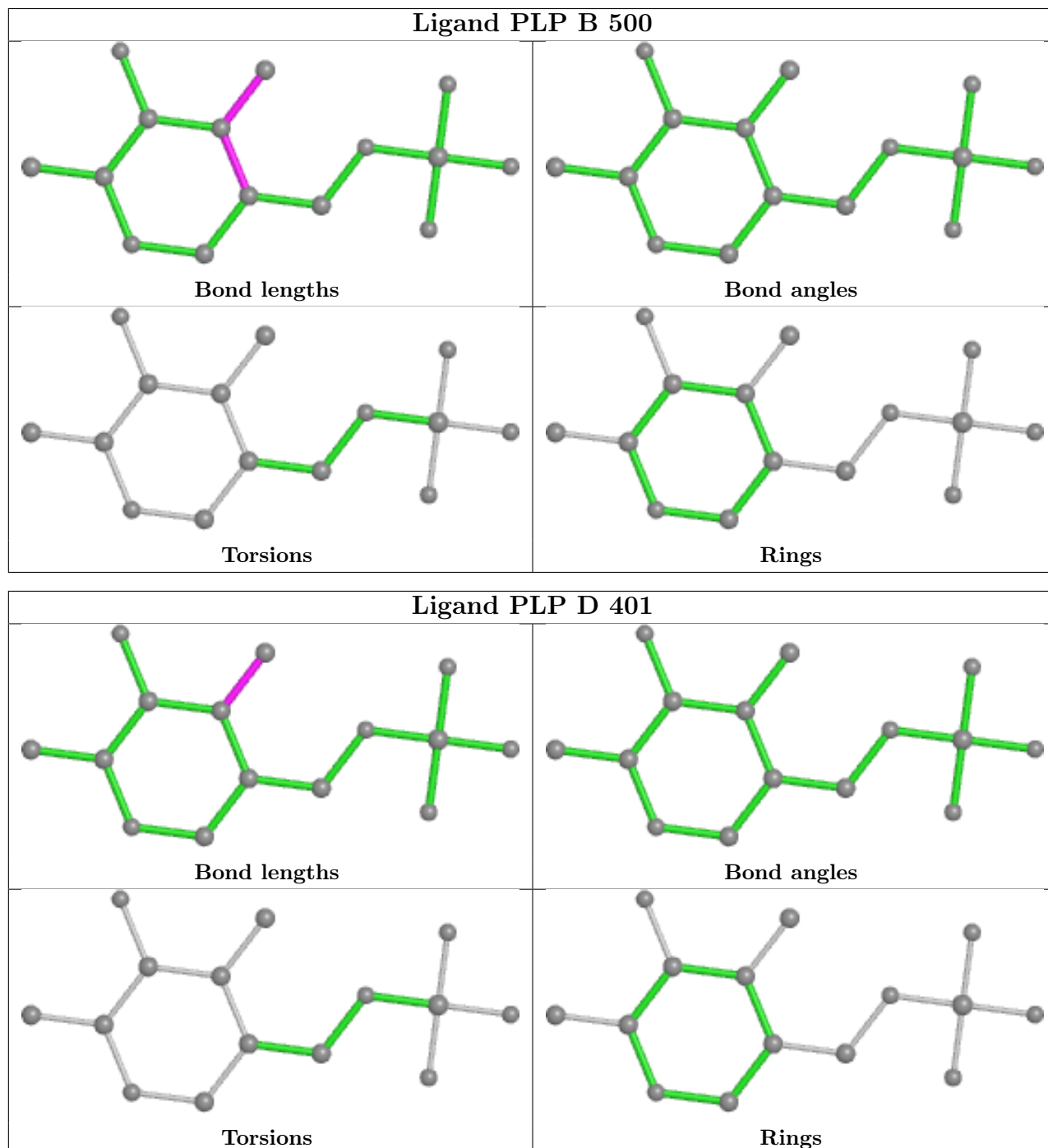
There are no ring outliers.

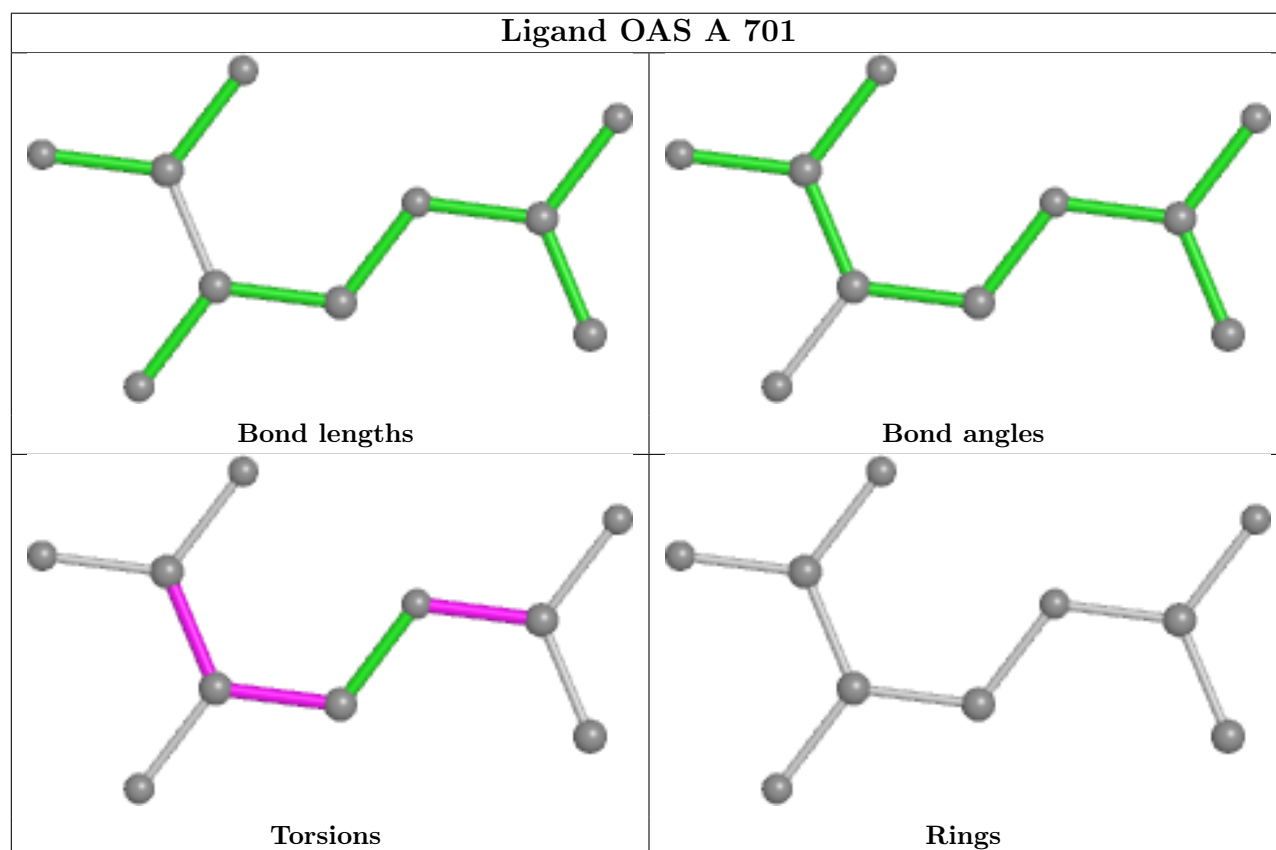
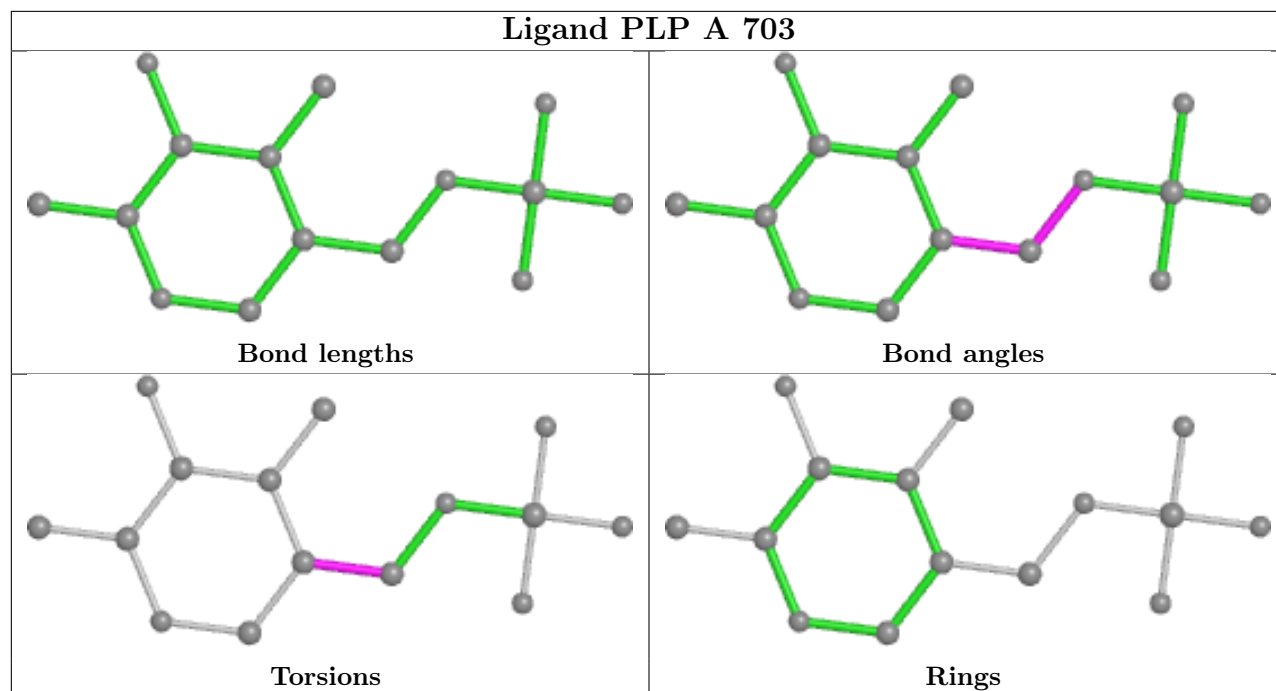
3 monomers are involved in 4 short contacts:

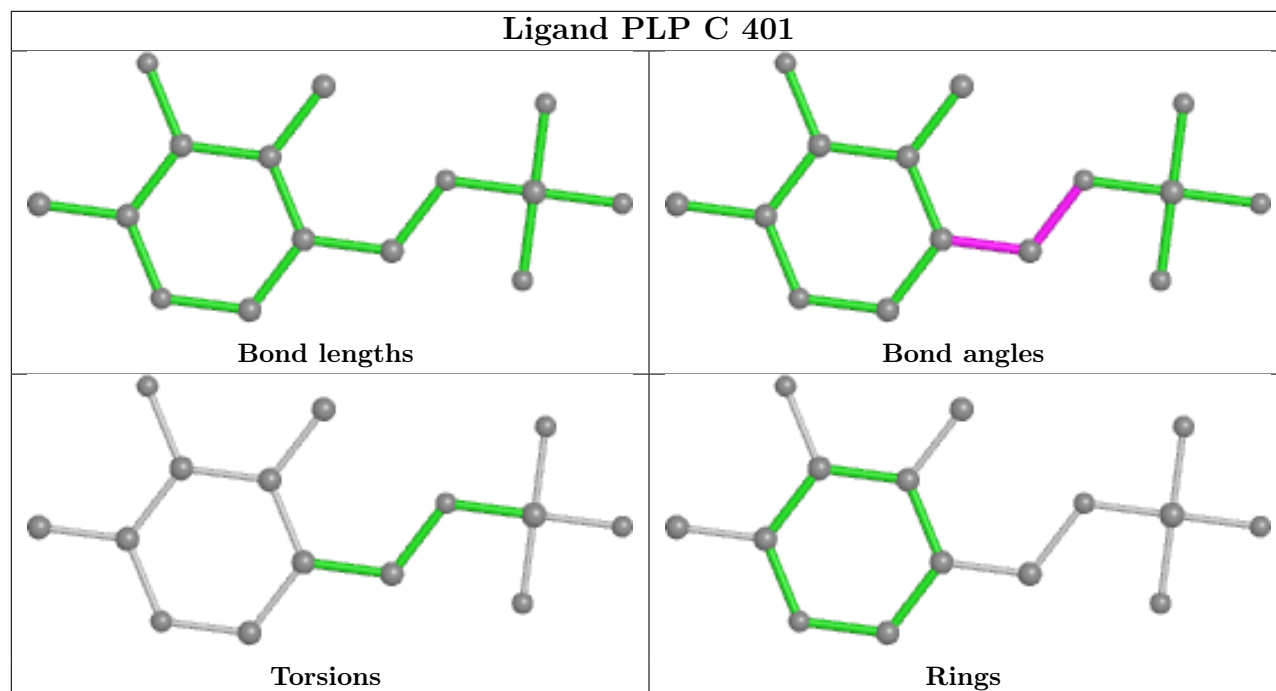
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	D	402	GOL	1	0
3	A	702	RIB	1	0
2	A	701	OAS	2	0

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, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	313/344 (90%)	0.20	11 (3%) 44 38	16, 26, 51, 72	0
1	B	316/344 (91%)	0.01	4 (1%) 77 74	14, 23, 39, 58	0
1	C	330/344 (95%)	0.32	21 (6%) 19 15	15, 26, 59, 80	0
1	D	321/344 (93%)	0.03	3 (0%) 84 82	14, 22, 39, 72	0
All	All	1280/1376 (93%)	0.14	39 (3%) 50 44	14, 24, 47, 80	0

All (39) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	238	PRO	7.0
1	D	84	GLY	7.0
1	C	246	ALA	5.3
1	A	248	PHE	5.1
1	C	237	GLY	5.1
1	C	247	GLY	5.1
1	C	241	ILE	5.0
1	C	15	VAL	4.5
1	A	121	ILE	4.4
1	A	249	VAL	4.4
1	A	120	SER	4.1
1	C	245	GLY	4.0
1	A	344	ILE	4.0
1	C	228	SER	4.0
1	C	233	GLY	3.8
1	B	18	PHE	3.4
1	A	228	SER	3.3
1	C	239	HIS	3.2
1	C	230	VAL	3.1
1	C	248	PHE	3.1
1	A	198	VAL	3.0

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Mol	Chain	Res	Type	RSRZ
1	C	243	GLY	2.7
1	B	338	VAL	2.6
1	A	17	GLU	2.6
1	D	83	PRO	2.6
1	C	236	PRO	2.6
1	C	341	ALA	2.5
1	C	16	GLN	2.3
1	C	249	VAL	2.3
1	A	342	ALA	2.3
1	B	83	PRO	2.3
1	A	232	SER	2.3
1	C	17	GLU	2.2
1	C	244	ILE	2.1
1	C	339	LEU	2.1
1	C	286	PHE	2.1
1	B	82	ILE	2.1
1	A	230	VAL	2.1
1	D	18	PHE	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, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

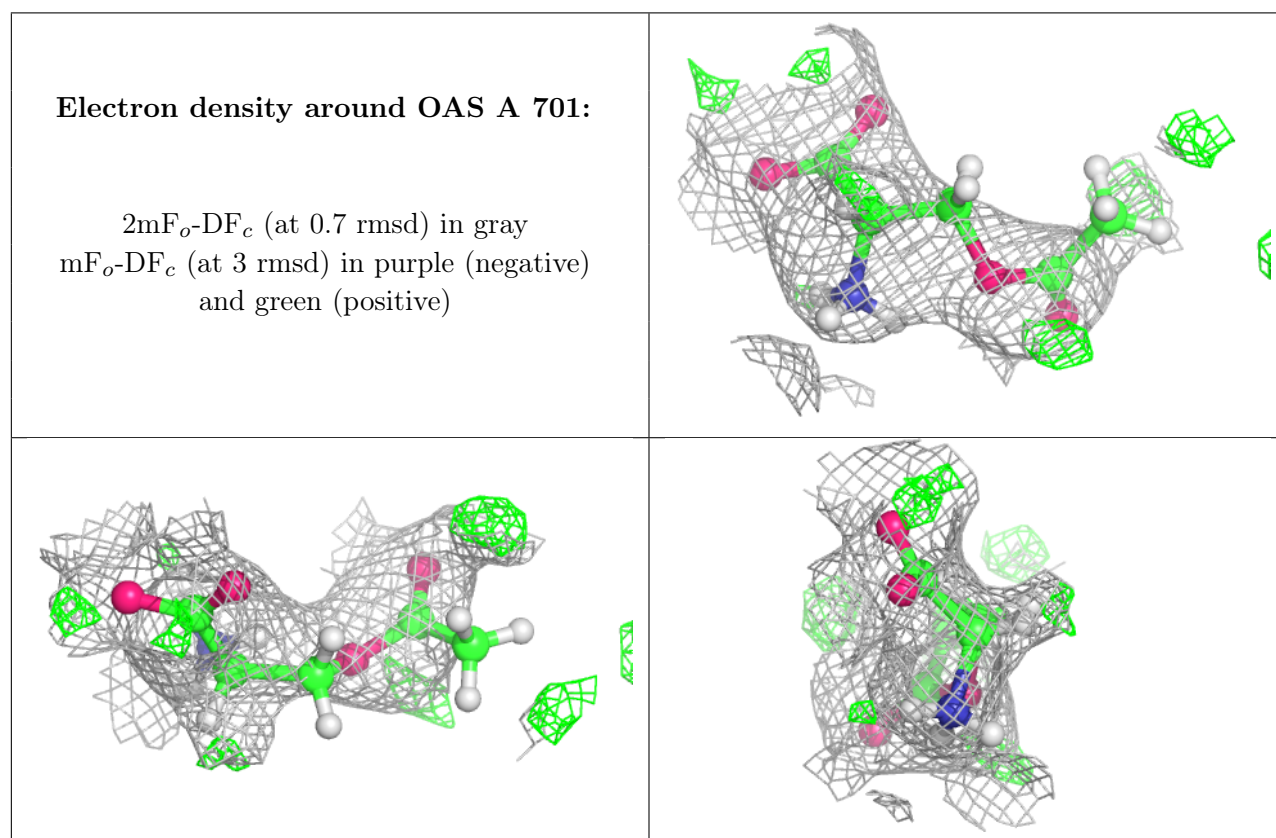
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
5	GOL	C	402	6/6	0.75	0.20	45,51,55,55	2
3	RIB	A	702	10/10	0.76	0.26	36,43,62,62	3
2	OAS	A	701	10/10	0.77	0.21	47,52,57,57	0
4	PLP	C	401	15/16	0.91	0.22	30,36,38,40	1
4	PLP	A	703	15/16	0.93	0.15	32,41,43,44	1

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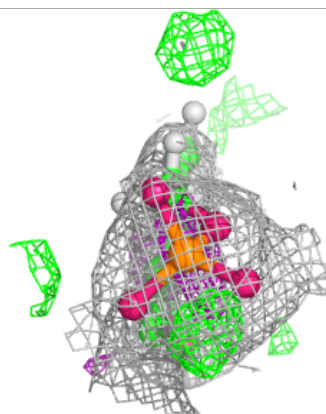
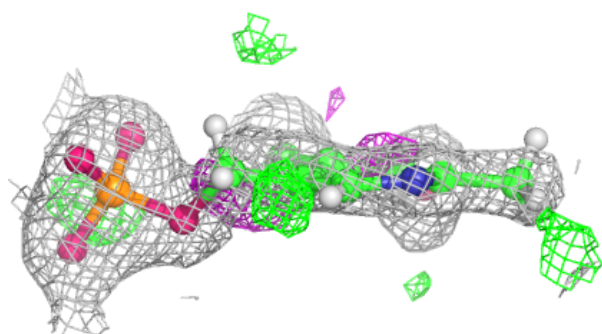
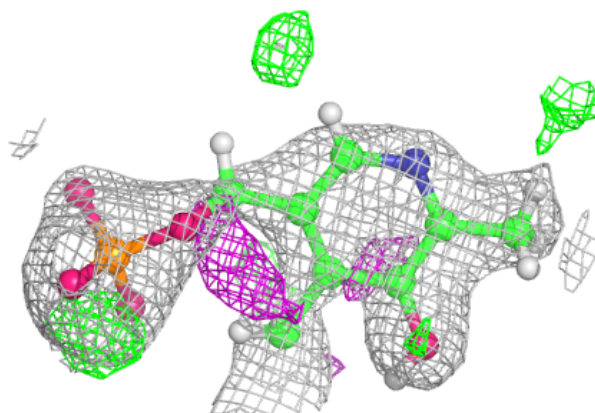
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
5	GOL	D	402	6/6	0.93	0.22	28,31,40,40	2
4	PLP	B	500	15/16	0.98	0.08	14,16,18,18	1
4	PLP	D	401	15/16	0.98	0.09	15,17,18,20	1

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.

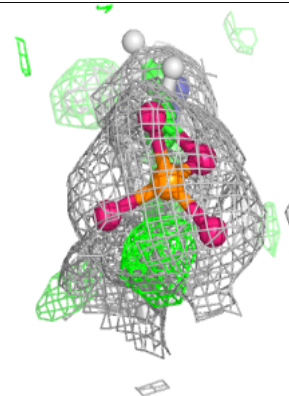
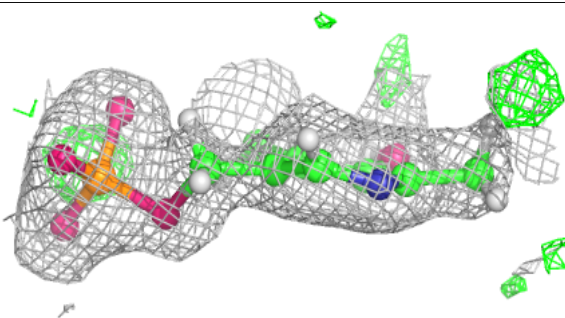
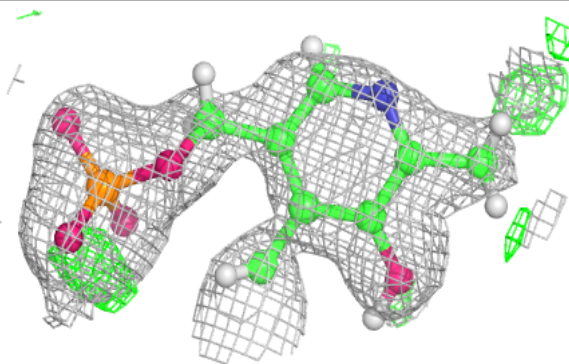


Electron density around PLP C 401:

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

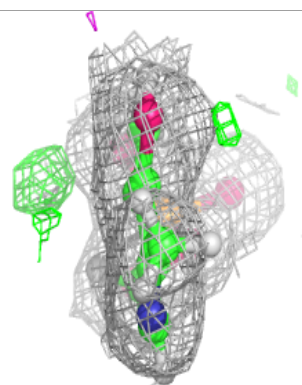
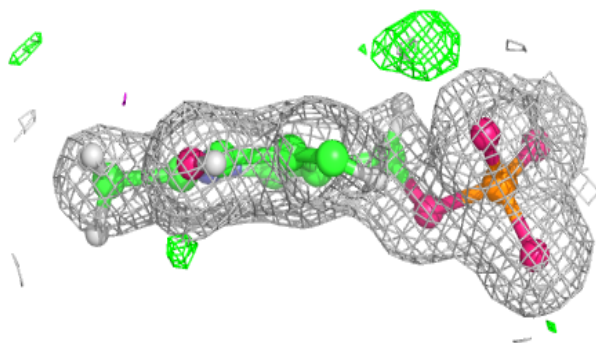
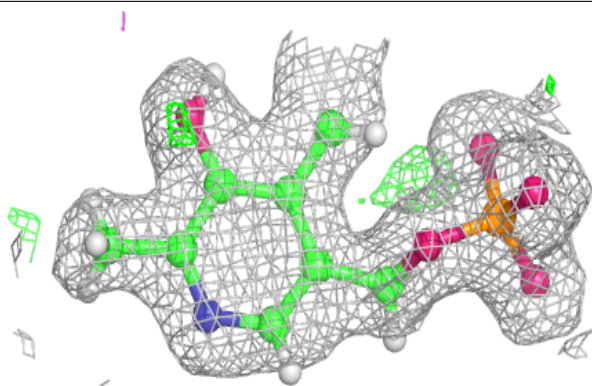
**Electron density around PLP A 703:**

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

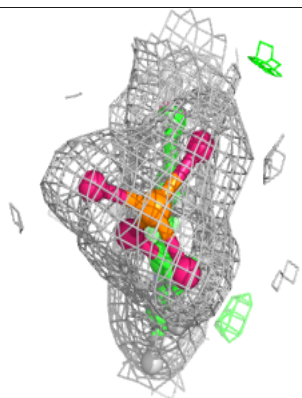
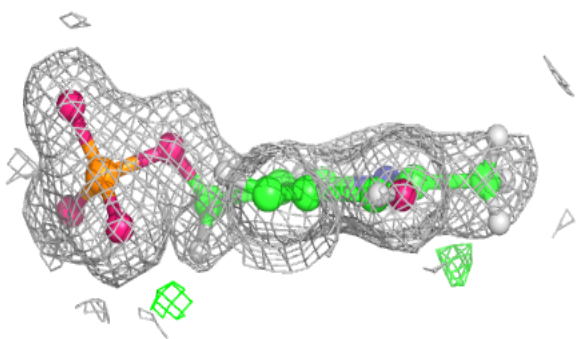
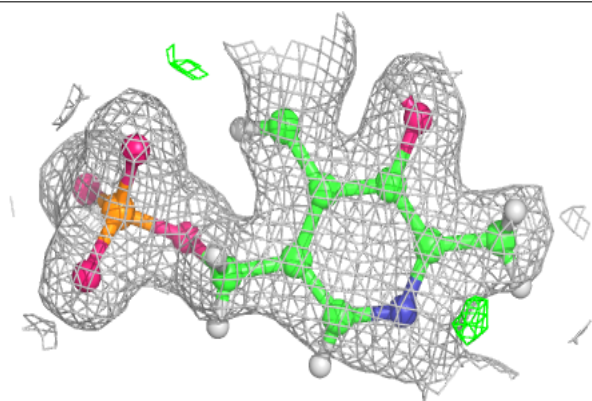


Electron density around PLP B 500:

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

**Electron density around PLP D 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.