



Full wwPDB X-ray Structure Validation Report ⓘ

Nov 19, 2024 – 04:37 PM EST

PDB ID : 9DL4
Title : Structure of proline utilization A complexed with 2-pyridinethiol
Authors : Tanner, J.J.; Meeks, K.R.
Deposited on : 2024-09-10
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 : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 1.21
EDS : 3.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.003 (Gargrove)
Density-Fitness : 1.0.11
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.39

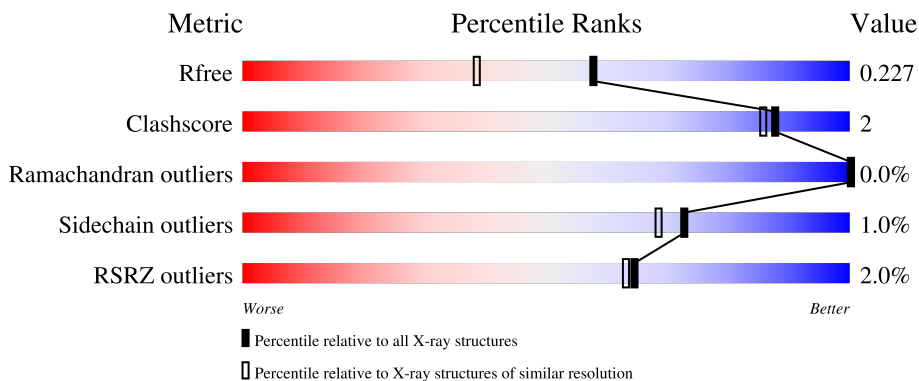
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

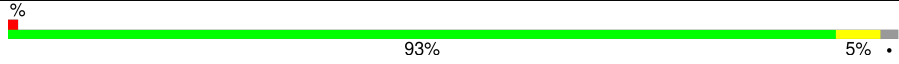
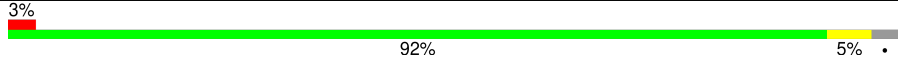
The reported resolution of this entry is 1.80 Å.

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}	164625	7108 (1.80-1.80)
Clashscore	180529	8162 (1.80-1.80)
Ramachandran outliers	177936	8077 (1.80-1.80)
Sidechain outliers	177891	8076 (1.80-1.80)
RSRZ outliers	164620	7108 (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	1235	 93% 5%
1	B	1235	 92% 5%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
5	FMT	B	1307	-	-	X	-

2 Entry composition i

There are 8 unique types of molecules in this entry. The entry contains 19251 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.

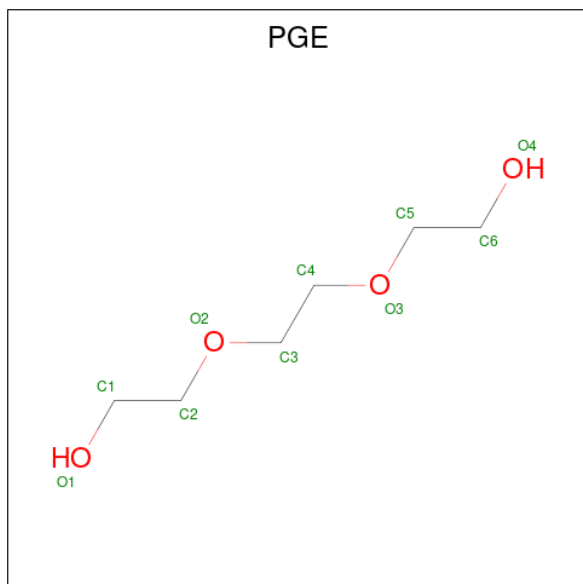
- Molecule 1 is a protein called Bifunctional protein PutA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	1205	Total 8938	C 5631	N 1605	O 1669	S 33	0	12	0
1	B	1199	Total 8685	C 5467	N 1563	O 1622	S 33	0	4	0

There are 4 discrepancies between the modelled and reference sequences:

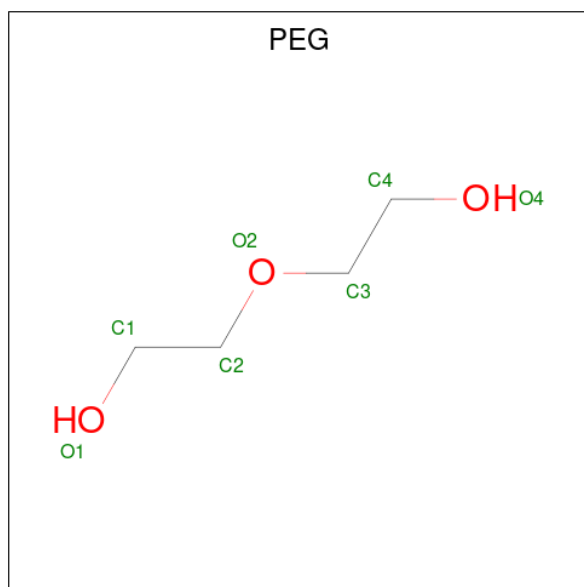
Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	SER	-	expression tag	UNP F7X6I3
A	0	MET	-	expression tag	UNP F7X6I3
B	-1	SER	-	expression tag	UNP F7X6I3
B	0	MET	-	expression tag	UNP F7X6I3

- Molecule 2 is TRIETHYLENE GLYCOL (three-letter code: PGE) (formula: C₆H₁₄O₄).



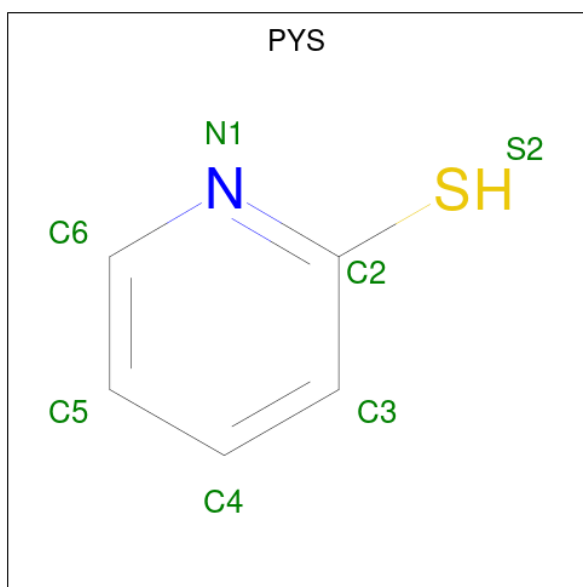
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			10	6	4		
2	B	1	Total	C	O	0	0
			10	6	4		

- Molecule 3 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: C₄H₁₀O₃).



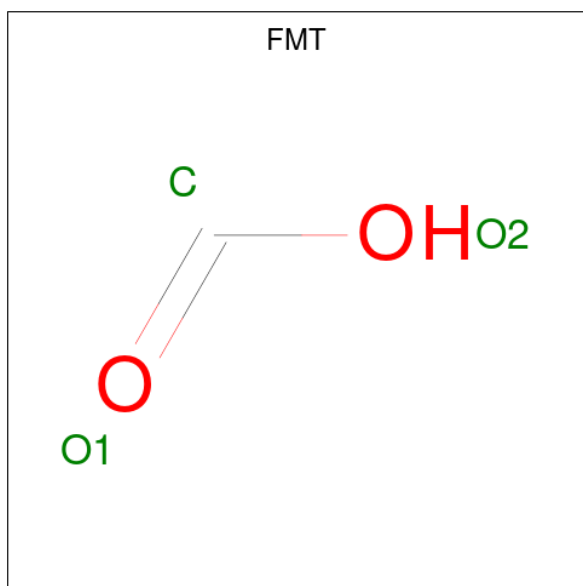
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			7	4	3		
3	A	1	Total	C	O	0	0
			7	4	3		
3	A	1	Total	C	O	0	0
			7	4	3		
3	A	1	Total	C	O	0	0
			7	4	3		
3	A	1	Total	C	O	0	0
			7	4	3		
3	B	1	Total	C	O	0	0
			7	4	3		
3	B	1	Total	C	O	0	0
			7	4	3		
3	B	1	Total	C	O	0	0
			7	4	3		

- Molecule 4 is 2-PYRIDINETHIOL (three-letter code: PYS) (formula: C₅H₅NS) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	S	0	0
			7	5	1	1		
4	B	1	Total	C	N	S	0	0
			7	5	1	1		

- Molecule 5 is FORMIC ACID (three-letter code: FMT) (formula: CH₂O₂).



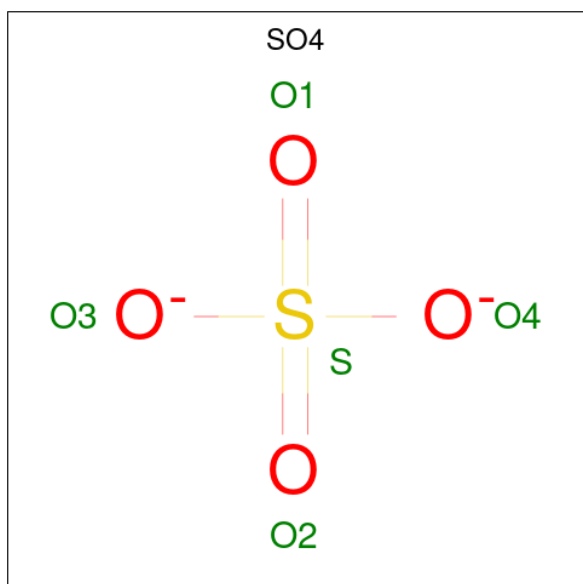
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			3	1	2		
5	B	1	Total	C	O	0	0
			3	1	2		

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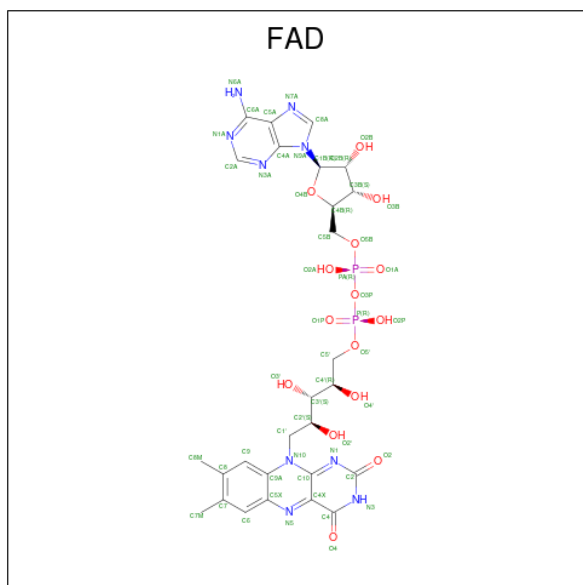
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
5	B	1	3	1	2	0	0

- Molecule 6 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	O	S		
6	A	1	5	4	1	0	0
6	A	1	5	4	1	0	0
6	A	1	5	4	1	0	0
6	A	1	5	4	1	0	0
6	B	1	5	4	1	0	0
6	B	1	5	4	1	0	0

- Molecule 7 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula: C₂₇H₃₃N₉O₁₅P₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	N	O			P
7	A	1	53	27	9	15	2	0	0
7	B	1	53	27	9	15	2	0	0

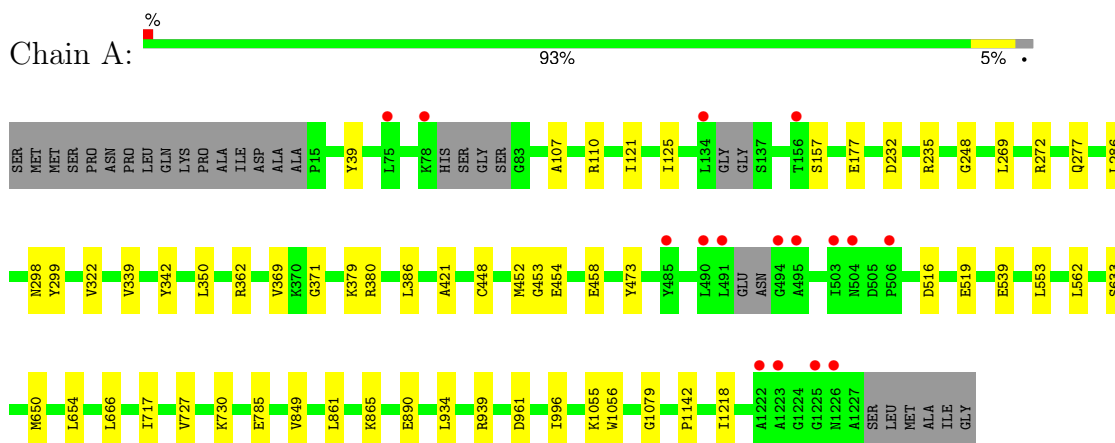
- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
8	A	748	748	748	0	0
8	B	645	645	645	0	0

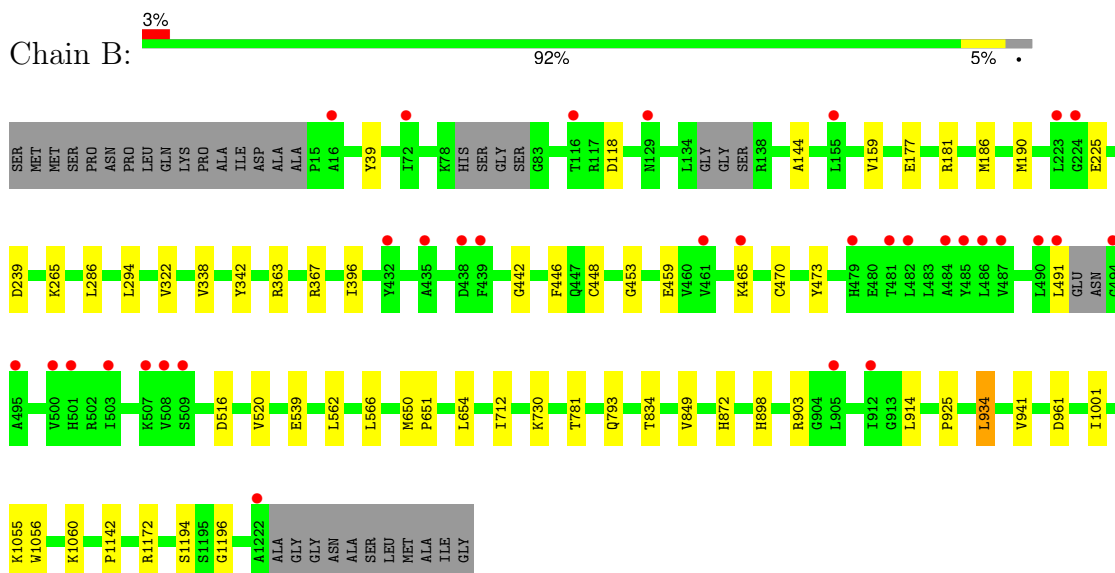
3 Residue-property plots [i](#)

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: Bifunctional protein PutA



- Molecule 1: Bifunctional protein PutA



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	101.16Å 102.37Å 127.50Å 90.00° 106.29° 90.00°	Depositor
Resolution (Å)	40.77 – 1.80 40.77 – 1.80	Depositor EDS
% Data completeness (in resolution range)	93.8 (40.77-1.80) 95.6 (40.77-1.80)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.72 (at 1.79Å)	Xtrriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.194 , 0.224 0.196 , 0.227	Depositor DCC
R_{free} test set	11317 reflections (4.91%)	wwPDB-VP
Wilson B-factor (Å ²)	26.3	Xtrriage
Anisotropy	0.243	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 39.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	19251	wwPDB-VP
Average B, all atoms (Å ²)	33.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.95% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: FMT, FAD, SO4, PYS, PEG, PGE

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	0.35	0/9132	0.59	0/12433
1	B	0.35	0/8849	0.59	0/12070
All	All	0.35	0/17981	0.59	0/24503

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

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	8938	0	8921	34	0
1	B	8685	0	8525	34	0
2	A	10	0	14	1	0
2	B	10	0	14	0	0
3	A	35	0	50	3	0
3	B	21	0	30	2	0
4	A	7	0	5	0	0
4	B	7	0	5	1	0
5	A	3	0	1	1	0
5	B	6	0	2	3	0
6	A	20	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	B	10	0	0	0	0
7	A	53	0	31	3	0
7	B	53	0	31	4	0
8	A	748	0	0	2	1
8	B	645	0	0	2	1
All	All	19251	0	17629	69	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 2.

All (69) 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:539:GLU:OE1	8:A:1401:HOH:O	2.05	0.75
1:A:961:ASP:OD2	1:B:1055:LYS:NZ	2.21	0.73
1:A:473:TYR:HB2	7:A:1313:FAD:HM72	1.73	0.70
3:A:1304:PEG:H32	3:A:1305:PEG:H41	1.75	0.68
1:B:539:GLU:OE1	8:B:1401:HOH:O	2.12	0.66
1:B:118:ASP:OD1	1:B:181:ARG:NH2	2.34	0.61
1:A:286:LEU:HD21	1:A:322:VAL:HG11	1.82	0.61
1:B:914:LEU:HD11	1:B:925:PRO:HD3	1.82	0.60
1:B:650:MET:O	1:B:654:LEU:HG	2.03	0.59
1:B:1172:ARG:HH12	5:B:1307:FMT:H	1.68	0.58
1:B:849:VAL:HG21	1:B:934:LEU:HD11	1.85	0.57
1:B:286:LEU:HD21	1:B:322:VAL:HG11	1.86	0.57
1:B:1196:GLY:HA3	3:B:1305:PEG:H22	1.85	0.57
1:A:996[A]:ILE:HD12	1:A:1218:ILE:HG12	1.86	0.56
1:A:650:MET:O	1:A:654:LEU:HG	2.07	0.54
1:A:861[A]:LEU:HG	1:A:865:LYS:HE3	1.89	0.54
1:B:473:TYR:HB2	7:B:1310:FAD:HM72	1.88	0.54
1:A:1056:TRP:CD1	1:A:1142:PRO:HD3	2.43	0.53
1:A:849:VAL:HG11	1:A:934:LEU:HD13	1.90	0.53
1:A:562:LEU:HD11	1:A:654:LEU:HD12	1.91	0.53
1:A:1079:GLY:HA2	2:A:1301:PGE:H32	1.92	0.52
1:B:898:HIS:CD2	1:B:941:VAL:HG21	2.45	0.52
1:B:712:ILE:HD13	1:B:781:THR:HG21	1.92	0.51
1:A:371:GLY:N	7:A:1313:FAD:O2'	2.43	0.51
1:A:339:VAL:HG21	1:A:350:LEU:HD21	1.93	0.51
1:B:834:THR:HG22	1:B:1001:ILE:HD11	1.92	0.51
1:A:473:TYR:CB	7:A:1313:FAD:HM72	2.41	0.50
1:A:386:LEU:HD22	5:A:1307:FMT:H	1.93	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:448:CYS:HB2	1:B:453:GLY:HA3	1.94	0.50
1:B:473:TYR:CB	7:B:1310:FAD:HM72	2.41	0.50
1:A:232:ASP:OD1	1:A:235:ARG:NH2	2.46	0.49
1:B:1172:ARG:NH1	5:B:1307:FMT:H	2.27	0.48
1:B:651:PRO:HG3	5:B:1306:FMT:H	1.95	0.48
1:B:1194:SER:OG	3:B:1305:PEG:H32	2.13	0.47
1:B:225:GLU:HB3	1:B:265:LYS:HD2	1.96	0.47
1:B:459:GLU:HA	1:B:465:LYS:HD2	1.96	0.46
1:B:239:ASP:OD2	8:B:1402:HOH:O	2.21	0.46
1:A:107:ALA:HA	1:A:110:ARG:HD3	1.98	0.46
1:B:338:VAL:HG22	1:B:367:ARG:HB3	1.97	0.46
1:B:396:ILE:HD11	1:B:520:VAL:HB	1.98	0.45
1:B:1056:TRP:CD1	1:B:1142:PRO:HD3	2.50	0.45
1:A:785:GLU:H	1:A:785:GLU:HG3	1.59	0.44
7:B:1310:FAD:H9	7:B:1310:FAD:H1'1	1.79	0.44
1:A:448:CYS:HB2	1:A:453:GLY:HA3	1.99	0.43
1:B:1056:TRP:CZ2	1:B:1060:LYS:HD2	2.53	0.43
1:B:363:ARG:NH1	1:B:442:GLY:O	2.48	0.43
1:A:666:LEU:HD12	1:A:666:LEU:HA	1.85	0.43
1:A:379:LYS:HE2	3:A:1304:PEG:H21	2.01	0.43
1:B:793:GLN:HE22	4:B:1303:PYS:H4	1.84	0.43
1:A:454:GLU:O	1:A:458:GLU:HG3	2.18	0.42
1:A:269:LEU:HD23	1:A:269:LEU:HA	1.86	0.42
1:A:121:ILE:HA	1:A:125:ILE:HB	2.01	0.42
1:A:717:ILE:HG12	1:A:727:VAL:HG11	2.01	0.42
1:A:1055:LYS:NZ	1:B:961:ASP:OD2	2.39	0.42
1:A:379:LYS:HE2	3:A:1304:PEG:H31	2.02	0.42
1:A:298:ASN:ND2	8:A:1406:HOH:O	2.37	0.41
1:B:491:LEU:HD23	1:B:491:LEU:HA	1.86	0.41
1:A:553:LEU:HD12	1:A:666:LEU:HD13	2.01	0.41
1:B:446:PHE:O	1:B:470:CYS:HA	2.21	0.41
1:B:186:MET:O	1:B:190:MET:HG3	2.20	0.41
7:B:1310:FAD:H1'1	7:B:1310:FAD:H4'	1.84	0.41
1:A:272:ARG:HB3	1:A:277:GLN:HG3	2.02	0.41
1:B:562:LEU:O	1:B:566:LEU:HG	2.21	0.41
1:A:248:GLY:HA3	1:A:299:TYR:CG	2.55	0.41
1:A:369:VAL:HG12	1:A:421:ALA:HB3	2.03	0.40
1:B:516:ASP:O	1:B:520:VAL:HG23	2.21	0.40
1:A:516:ASP:OD2	1:A:519:GLU:HG2	2.21	0.40
1:A:890:GLU:OE1	1:A:890:GLU:N	2.52	0.40
1:B:144:ALA:HB3	1:B:159:VAL:CG2	2.52	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)
8:A:1611:HOH:O	8:B:1984:HOH:O[1_565]	2.19	0.01

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	1210/1235 (98%)	1189 (98%)	20 (2%)	1 (0%)	48	34
1	B	1195/1235 (97%)	1170 (98%)	25 (2%)	0	100	100
All	All	2405/2470 (97%)	2359 (98%)	45 (2%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	452	MET

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	890/951 (94%)	881 (99%)	9 (1%)	73	68
1	B	835/951 (88%)	827 (99%)	8 (1%)	73	68
All	All	1725/1902 (91%)	1708 (99%)	17 (1%)	73	68

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	39	TYR
1	A	157	SER
1	A	177	GLU
1	A	342	TYR
1	A	362	ARG
1	A	380	ARG
1	A	633	SER
1	A	730	LYS
1	A	939	ARG
1	B	39	TYR
1	B	177	GLU
1	B	294	LEU
1	B	342	TYR
1	B	730	LYS
1	B	872	HIS
1	B	903	ARG
1	B	934	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	479	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

23 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
3	PEG	A	1304	-	6,6,6	0.19	0	5,5,5	0.07	0
6	SO4	A	1312	-	4,4,4	0.22	0	6,6,6	0.19	0
3	PEG	A	1308	-	6,6,6	0.10	0	5,5,5	0.13	0
3	PEG	B	1304	-	6,6,6	0.14	0	5,5,5	0.14	0
3	PEG	A	1306	-	6,6,6	0.14	0	5,5,5	0.06	0
3	PEG	A	1305	-	6,6,6	0.20	0	5,5,5	0.13	0
6	SO4	A	1311	-	4,4,4	0.23	0	6,6,6	0.25	0
4	PYS	A	1303	-	6,7,7	0.48	0	6,8,8	0.54	0
2	PGE	A	1301	-	9,9,9	0.35	0	8,8,8	0.33	0
5	FMT	A	1307	-	2,2,2	0.72	0	1,1,1	0.23	0
2	PGE	B	1301	-	9,9,9	0.36	0	8,8,8	0.35	0
7	FAD	B	1310	-	54,58,58	2.23	17 (31%)	71,89,89	1.68	14 (19%)
6	SO4	B	1308	-	4,4,4	0.33	0	6,6,6	0.20	0
5	FMT	B	1307	-	2,2,2	0.72	0	1,1,1	0.30	0
3	PEG	A	1302	-	6,6,6	0.13	0	5,5,5	0.16	0
6	SO4	A	1309	-	4,4,4	0.18	0	6,6,6	0.49	0
7	FAD	A	1313	-	54,58,58	2.36	15 (27%)	71,89,89	1.70	16 (22%)
3	PEG	B	1302	-	6,6,6	0.21	0	5,5,5	0.11	0
6	SO4	B	1309	-	4,4,4	0.19	0	6,6,6	0.16	0
3	PEG	B	1305	-	6,6,6	0.13	0	5,5,5	0.10	0
5	FMT	B	1306	-	2,2,2	0.69	0	1,1,1	0.18	0
6	SO4	A	1310	-	4,4,4	0.20	0	6,6,6	0.27	0
4	PYS	B	1303	-	6,7,7	0.43	0	6,8,8	0.67	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
2	PGE	A	1301	-	-	4/7/7/7	-
3	PEG	A	1304	-	-	4/4/4/4	-
2	PGE	B	1301	-	-	1/7/7/7	-
3	PEG	A	1308	-	-	3/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	PEG	B	1305	-	-	1/4/4/4	-
3	PEG	A	1302	-	-	3/4/4/4	-
3	PEG	B	1304	-	-	2/4/4/4	-
7	FAD	B	1310	-	-	7/30/50/50	0/6/6/6
3	PEG	A	1306	-	-	1/4/4/4	-
3	PEG	A	1305	-	-	1/4/4/4	-
4	PYS	B	1303	-	-	-	0/1/1/1
7	FAD	A	1313	-	-	9/30/50/50	0/6/6/6
4	PYS	A	1303	-	-	-	0/1/1/1
3	PEG	B	1302	-	-	4/4/4/4	-

All (32) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	A	1313	FAD	PA-O3P	-8.79	1.50	1.59
7	B	1310	FAD	PA-O3P	-8.09	1.50	1.59
7	A	1313	FAD	O4-C4	7.35	1.37	1.23
7	B	1310	FAD	O4-C4	6.77	1.36	1.23
7	B	1310	FAD	O2-C2	5.74	1.35	1.24
7	A	1313	FAD	O2-C2	5.06	1.34	1.24
7	B	1310	FAD	C4X-N5	4.36	1.40	1.30
7	A	1313	FAD	C4X-N5	4.26	1.39	1.30
7	A	1313	FAD	C2-N1	3.47	1.44	1.36
7	A	1313	FAD	P-O3P	3.11	1.62	1.59
7	A	1313	FAD	C6A-N6A	3.08	1.45	1.34
7	A	1313	FAD	C2A-N3A	3.07	1.36	1.32
7	A	1313	FAD	O2'-C2'	-3.05	1.36	1.43
7	B	1310	FAD	C2-N1	2.85	1.43	1.36
7	A	1313	FAD	C10-N1	2.77	1.38	1.33
7	B	1310	FAD	C2A-N3A	2.70	1.36	1.32
7	A	1313	FAD	PA-O5B	-2.70	1.48	1.59
7	B	1310	FAD	C10-N1	2.69	1.38	1.33
7	B	1310	FAD	C6A-N6A	2.65	1.43	1.34
7	A	1313	FAD	O4'-C4'	-2.53	1.38	1.43
7	B	1310	FAD	O2'-C2'	-2.46	1.38	1.43
7	B	1310	FAD	C1B-N9A	-2.42	1.43	1.49
7	B	1310	FAD	PA-O5B	-2.33	1.50	1.59
7	B	1310	FAD	O4B-C4B	-2.21	1.40	1.45
7	B	1310	FAD	P-O1P	2.21	1.58	1.50
7	A	1313	FAD	PA-O2A	-2.21	1.45	1.55
7	A	1313	FAD	C1B-N9A	-2.18	1.44	1.49

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	B	1310	FAD	P-O3P	2.16	1.61	1.59
7	B	1310	FAD	O2B-C2B	-2.14	1.37	1.43
7	B	1310	FAD	PA-O2A	-2.13	1.45	1.55
7	B	1310	FAD	O4'-C4'	-2.08	1.39	1.43
7	A	1313	FAD	P-O1P	2.07	1.58	1.50

All (30) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	B	1310	FAD	N3A-C2A-N1A	-6.65	119.65	128.67
7	A	1313	FAD	N3A-C2A-N1A	-6.51	119.83	128.67
7	B	1310	FAD	O2P-P-O3P	-4.18	95.98	107.27
7	A	1313	FAD	O2P-P-O3P	-4.00	96.47	107.27
7	A	1313	FAD	C4-C4X-N5	3.34	122.82	118.21
7	B	1310	FAD	C4X-C4-N3	3.13	121.21	113.25
7	A	1313	FAD	O3P-P-O1P	3.08	119.98	110.70
7	A	1313	FAD	O2A-PA-O3P	-3.08	98.96	107.27
7	B	1310	FAD	O3P-P-O1P	3.05	119.86	110.70
7	B	1310	FAD	C4-N3-C2	-3.02	120.27	125.64
7	B	1310	FAD	C5X-C9A-N10	2.97	120.66	117.97
7	A	1313	FAD	C4'-C3'-C2'	2.96	118.49	113.57
7	A	1313	FAD	C4-N3-C2	-2.95	120.41	125.64
7	B	1310	FAD	O2A-PA-O3P	-2.91	99.40	107.27
7	B	1310	FAD	O4-C4-C4X	-2.86	118.99	126.53
7	B	1310	FAD	C4-C4X-N5	2.83	122.11	118.21
7	A	1313	FAD	C4X-C4-N3	2.76	120.29	113.25
7	A	1313	FAD	O5'-P-O1P	2.47	118.72	108.94
7	A	1313	FAD	C5X-C9A-N10	2.40	120.14	117.97
7	B	1310	FAD	C9-C9A-N10	-2.36	118.67	121.85
7	A	1313	FAD	C10-C4X-N5	-2.24	120.24	124.81
7	A	1313	FAD	C4B-O4B-C1B	-2.20	107.91	109.92
7	B	1310	FAD	C4B-O4B-C1B	-2.20	107.91	109.92
7	B	1310	FAD	O2-C2-N1	-2.15	118.24	121.80
7	A	1313	FAD	C1'-C2'-C3'	2.14	115.45	109.66
7	A	1313	FAD	C4A-C5A-N7A	-2.06	107.16	109.34
7	A	1313	FAD	O2P-P-O5'	-2.04	98.34	107.57
7	B	1310	FAD	O5'-P-O1P	2.03	116.99	108.94
7	B	1310	FAD	C4A-C5A-N7A	-2.03	107.20	109.34
7	A	1313	FAD	C4X-C10-N10	2.02	119.38	116.48

There are no chirality outliers.

All (40) torsion outliers are listed below:

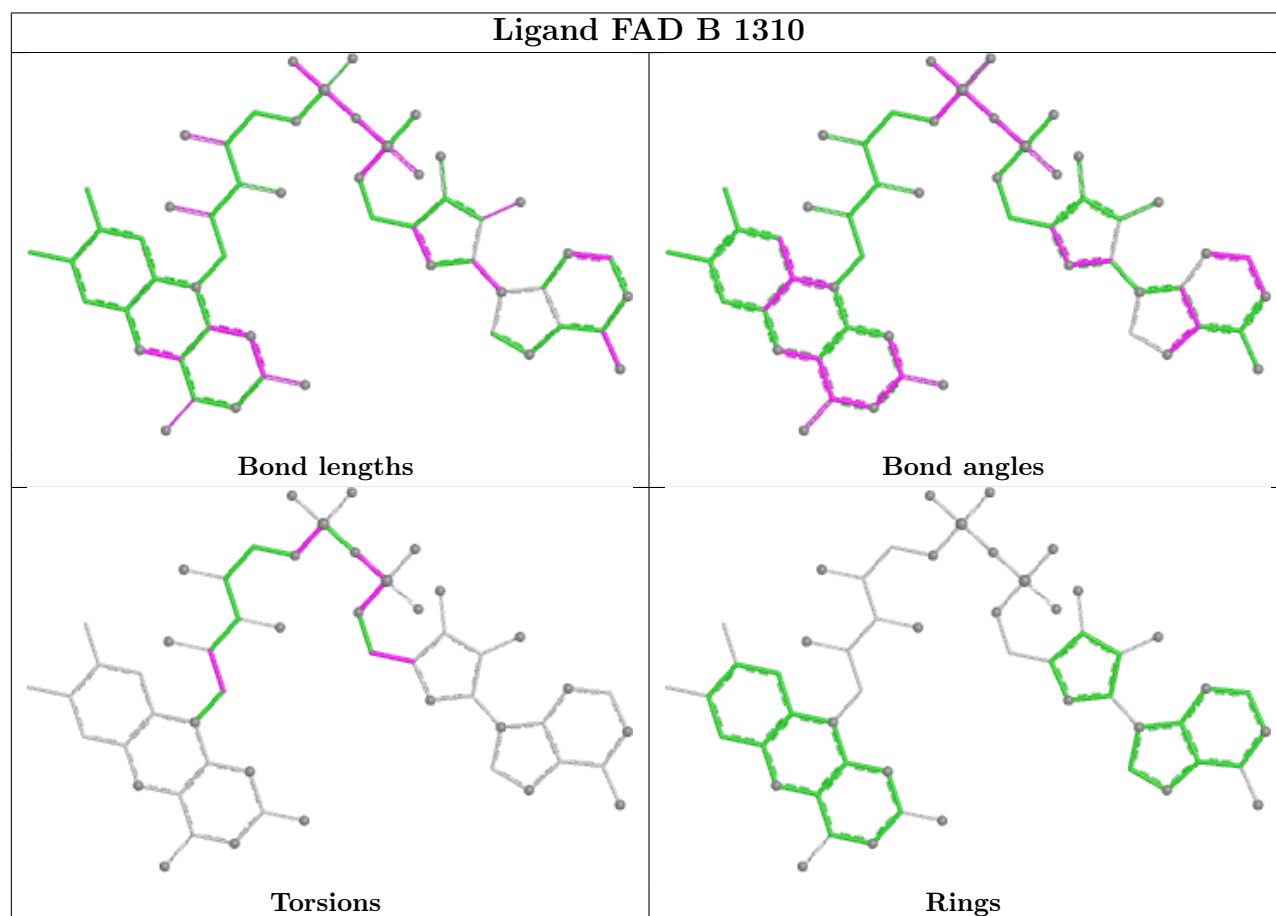
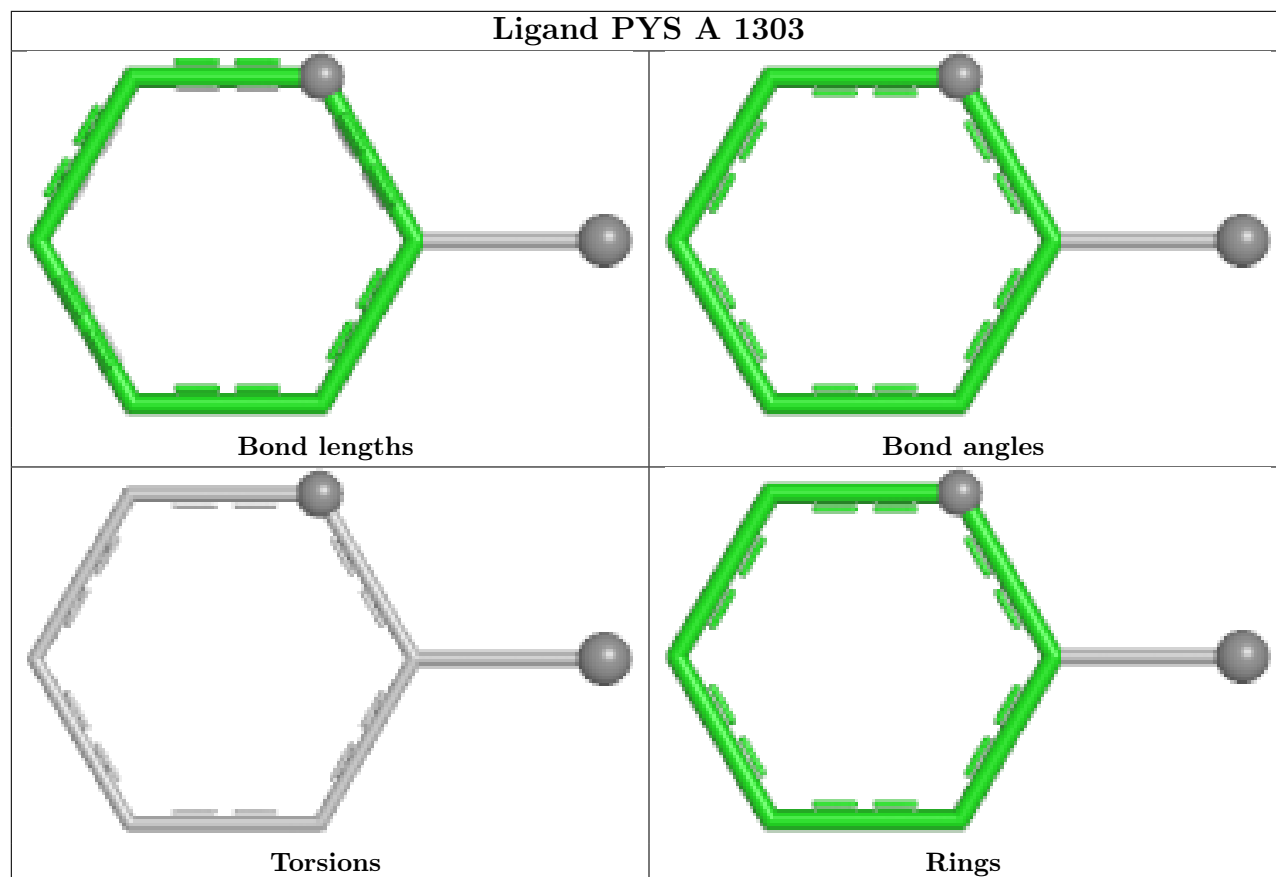
Mol	Chain	Res	Type	Atoms
7	B	1310	FAD	N10-C1'-C2'-O2'
7	B	1310	FAD	N10-C1'-C2'-C3'
7	B	1310	FAD	C5'-O5'-P-O2P
7	A	1313	FAD	C2'-C3'-C4'-O4'
7	A	1313	FAD	O3'-C3'-C4'-O4'
3	B	1302	PEG	O1-C1-C2-O2
7	A	1313	FAD	O3'-C3'-C4'-C5'
7	A	1313	FAD	C2'-C3'-C4'-C5'
3	A	1304	PEG	O1-C1-C2-O2
3	A	1308	PEG	O2-C3-C4-O4
3	B	1302	PEG	O2-C3-C4-O4
7	A	1313	FAD	C3B-C4B-C5B-O5B
2	B	1301	PGE	O1-C1-C2-O2
2	A	1301	PGE	O1-C1-C2-O2
3	A	1304	PEG	O2-C3-C4-O4
3	A	1308	PEG	O1-C1-C2-O2
3	A	1306	PEG	O1-C1-C2-O2
3	A	1308	PEG	C1-C2-O2-C3
7	A	1313	FAD	P-O3P-PA-O5B
7	B	1310	FAD	P-O3P-PA-O5B
3	A	1304	PEG	C1-C2-O2-C3
3	B	1302	PEG	C1-C2-O2-C3
3	B	1304	PEG	C1-C2-O2-C3
2	A	1301	PGE	C1-C2-O2-C3
3	A	1304	PEG	C4-C3-O2-C2
3	A	1302	PEG	C4-C3-O2-C2
3	B	1304	PEG	C4-C3-O2-C2
2	A	1301	PGE	O3-C5-C6-O4
2	A	1301	PGE	C4-C3-O2-C2
3	B	1302	PEG	C4-C3-O2-C2
7	A	1313	FAD	C5B-O5B-PA-O3P
7	B	1310	FAD	C5B-O5B-PA-O3P
7	B	1310	FAD	C5'-O5'-P-O1P
3	A	1302	PEG	O2-C3-C4-O4
3	A	1305	PEG	O2-C3-C4-O4
7	B	1310	FAD	C3B-C4B-C5B-O5B
3	B	1305	PEG	C1-C2-O2-C3
3	A	1302	PEG	C1-C2-O2-C3
7	A	1313	FAD	O4'-C4'-C5'-O5'
7	A	1313	FAD	O4B-C4B-C5B-O5B

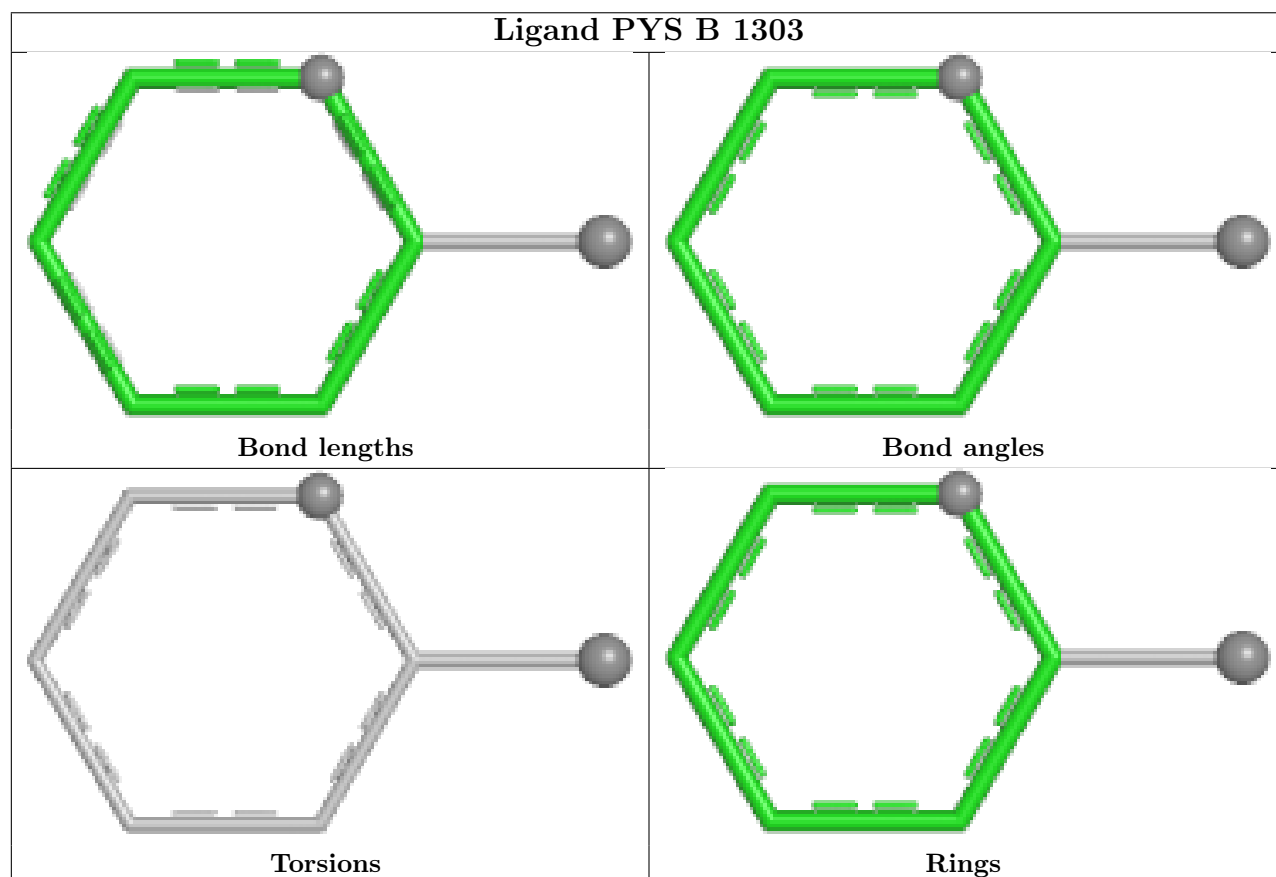
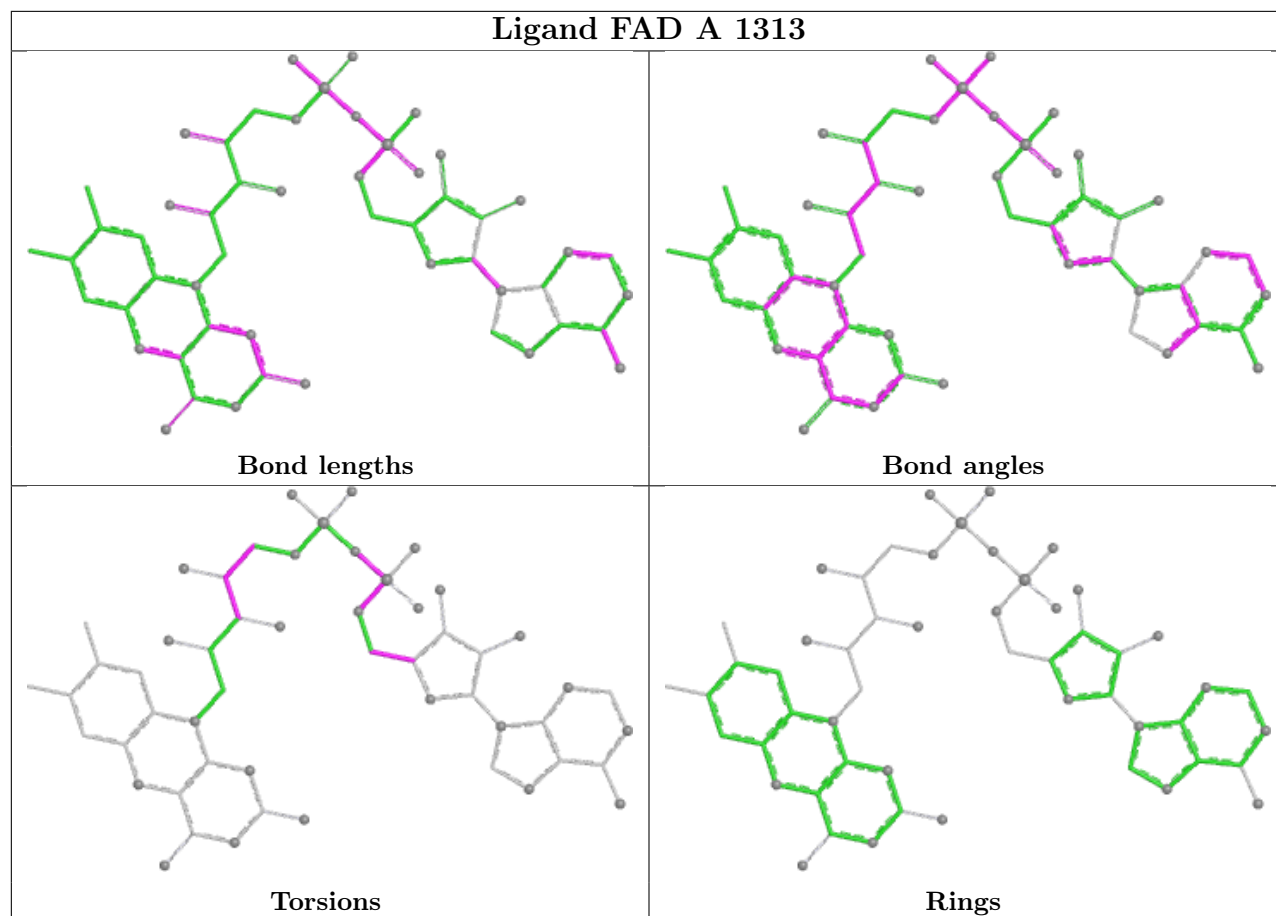
There are no ring outliers.

10 monomers are involved in 18 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1304	PEG	3	0
3	A	1305	PEG	1	0
2	A	1301	PGE	1	0
5	A	1307	FMT	1	0
7	B	1310	FAD	4	0
5	B	1307	FMT	2	0
7	A	1313	FAD	3	0
3	B	1305	PEG	2	0
5	B	1306	FMT	1	0
4	B	1303	PYS	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less 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	1205/1235 (97%)	-0.13	16 (1%) 74 74	11, 30, 50, 63	12 (0%)
1	B	1199/1235 (97%)	-0.00	33 (2%) 55 53	14, 32, 54, 66	4 (0%)
All	All	2404/2470 (97%)	-0.07	49 (2%) 64 63	11, 31, 52, 66	16 (0%)

All (49) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	494	GLY	5.8
1	B	491	LEU	5.3
1	B	487	VAL	4.6
1	B	495	ALA	4.1
1	A	495	ALA	3.8
1	B	1222	ALA	3.6
1	A	1223	ALA	3.4
1	B	486	LEU	3.2
1	B	490	LEU	3.2
1	B	485	TYR	3.1
1	B	439	PHE	3.1
1	A	503	ILE	3.0
1	A	1222	ALA	3.0
1	A	1226	ASN	3.0
1	A	156	THR	2.9
1	B	507	LYS	2.9
1	A	1225	GLY	2.7
1	A	75	LEU	2.6
1	B	438	ASP	2.6
1	A	506	PRO	2.6
1	B	223	LEU	2.6
1	B	16	ALA	2.6
1	B	129	ASN	2.5
1	B	912	ILE	2.5

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Mol	Chain	Res	Type	RSRZ
1	B	482	LEU	2.5
1	B	465	LYS	2.5
1	A	485	TYR	2.4
1	B	116	THR	2.4
1	B	508	VAL	2.4
1	B	224	GLY	2.3
1	A	504	ASN	2.3
1	B	479	HIS	2.3
1	A	494	GLY	2.3
1	B	155	LEU	2.3
1	B	72	ILE	2.2
1	B	500	VAL	2.2
1	A	134	LEU	2.1
1	A	491	LEU	2.1
1	B	435	ALA	2.1
1	B	481	THR	2.1
1	B	509	SER	2.1
1	B	432	TYR	2.1
1	B	501	HIS	2.1
1	B	484	ALA	2.0
1	A	490	LEU	2.0
1	A	78	LYS	2.0
1	B	503	ILE	2.0
1	B	461	VAL	2.0
1	B	905	LEU	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](#)

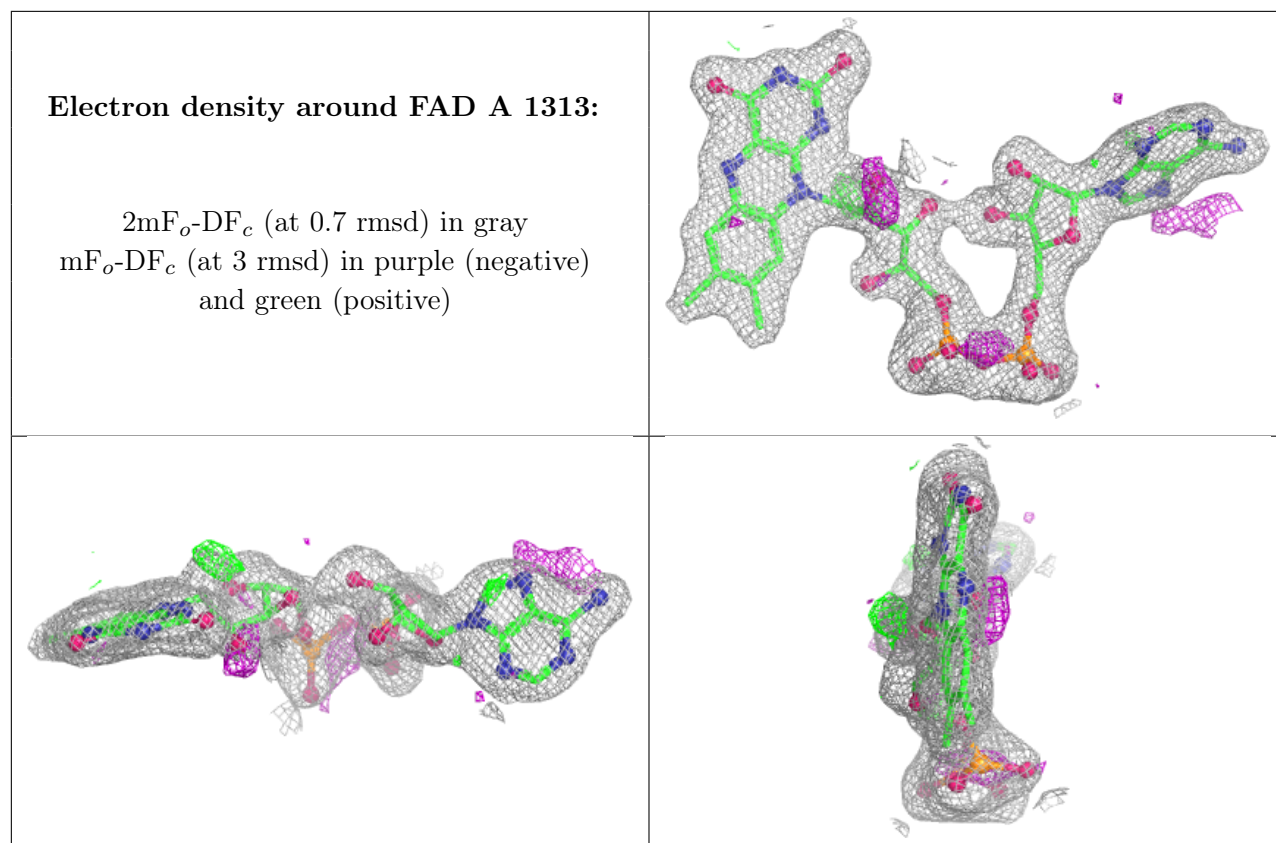
There are no monosaccharides in this entry.

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.

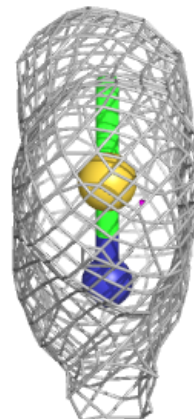
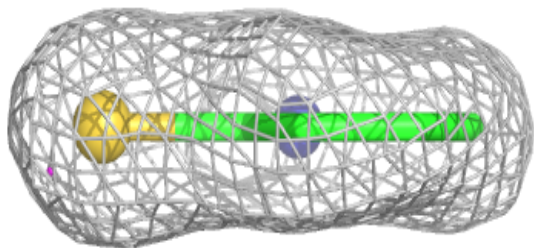
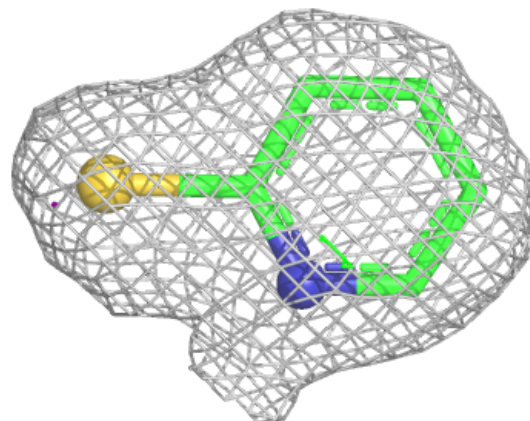
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
3	PEG	A	1305	7/7	0.79	0.13	32,36,43,44	0
3	PEG	B	1305	7/7	0.80	0.12	46,46,48,50	0
5	FMT	B	1306	3/3	0.83	0.13	38,38,38,40	3
3	PEG	A	1308	7/7	0.85	0.11	41,43,49,50	0
5	FMT	B	1307	3/3	0.85	0.12	48,48,49,53	0
2	PGE	A	1301	10/10	0.87	0.10	28,36,46,48	0
3	PEG	A	1304	7/7	0.88	0.11	26,31,36,45	0
3	PEG	B	1302	7/7	0.89	0.11	26,33,36,46	0
6	SO4	A	1312	5/5	0.89	0.07	56,57,60,60	0
6	SO4	B	1309	5/5	0.89	0.11	31,33,36,40	5
3	PEG	B	1304	7/7	0.91	0.08	33,34,42,43	0
3	PEG	A	1306	7/7	0.92	0.09	35,38,43,44	0
6	SO4	A	1311	5/5	0.92	0.08	42,43,44,53	5
5	FMT	A	1307	3/3	0.93	0.08	23,23,33,34	3
3	PEG	A	1302	7/7	0.93	0.09	36,37,42,44	0
7	FAD	A	1313	53/53	0.93	0.08	23,33,39,44	0
4	PYS	A	1303	7/7	0.94	0.09	35,38,41,42	0
2	PGE	B	1301	10/10	0.94	0.07	31,35,39,39	0
7	FAD	B	1310	53/53	0.94	0.08	23,30,35,39	0
6	SO4	A	1310	5/5	0.95	0.08	32,36,42,43	5
4	PYS	B	1303	7/7	0.95	0.08	30,33,34,39	0
6	SO4	A	1309	5/5	0.98	0.04	27,28,29,31	0
6	SO4	B	1308	5/5	0.99	0.05	23,25,26,28	0

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



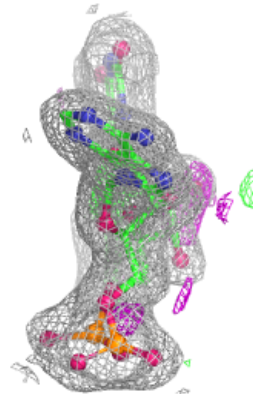
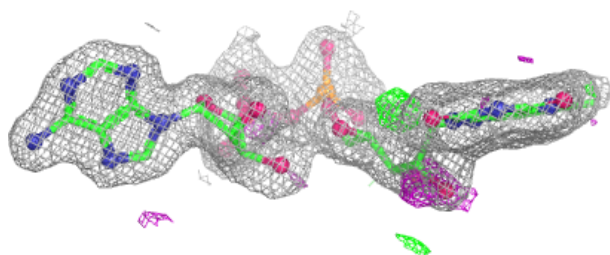
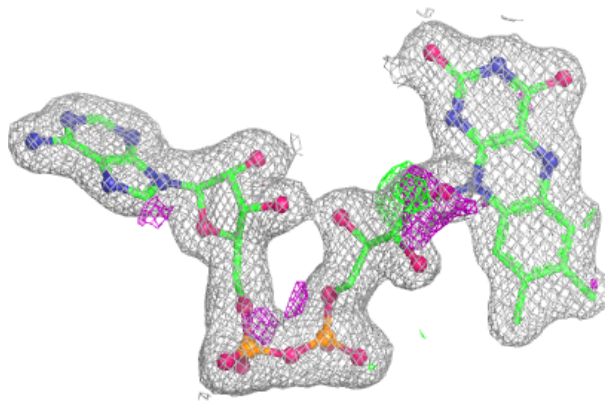
Electron density around PYS A 1303:

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

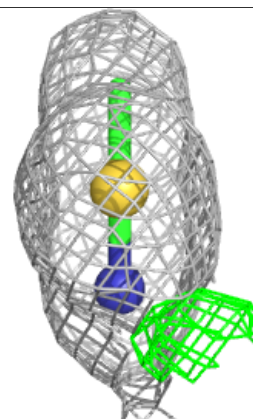
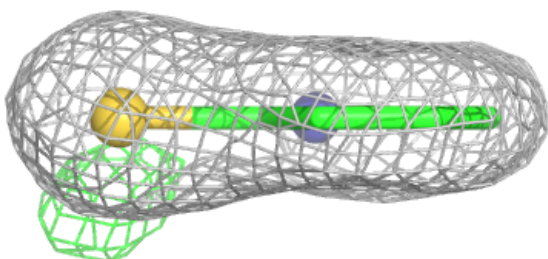
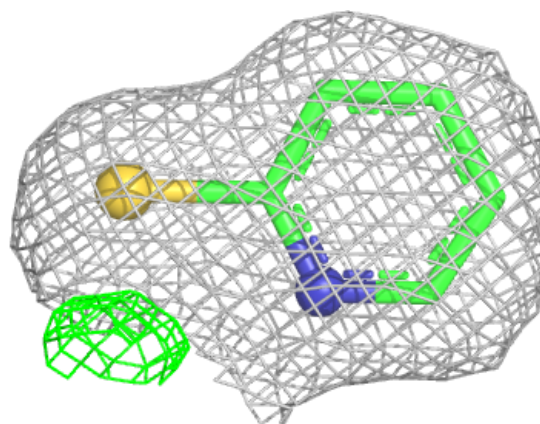


Electron density around FAD B 1310:

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

**Electron density around PYS B 1303:**

$2mF_o-DF_c$ (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.