Full wwPDB X-ray Structure Validation Report ⓘ

May 22, 2020 – 01:15 am BST

PDB ID	:	6SLT
Title	:	Flavin-dependent tryptophan 6-halogenase Thal in complex with tryptophan and FAD
Authors	:	Moritzer, A.; Niemann, H.H.
Deposited on	:	2019-08-20
Resolution	:	2.70 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 following versions of software and data (see references ⓘ) were used in the production of this report:

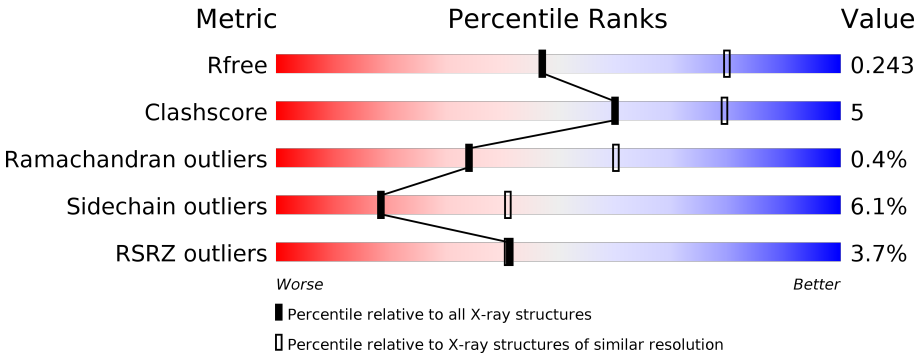
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.11
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

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 2.70 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	2808 (2.70-2.70)
Clashscore	141614	3122 (2.70-2.70)
Ramachandran outliers	138981	3069 (2.70-2.70)
Sidechain outliers	138945	3069 (2.70-2.70)
RSRZ outliers	127900	2737 (2.70-2.70)

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 on 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	534	% 85% 13%
1	B	534	7% 82% 15%

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
3	PO4	A	607	-	-	-	X

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 8674 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.

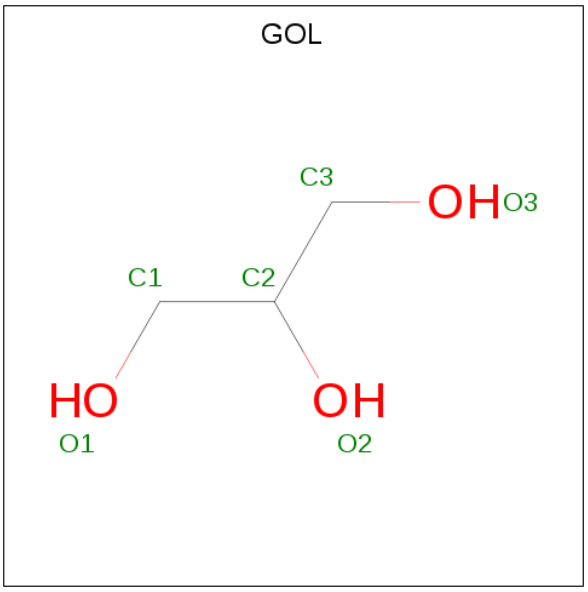
- Molecule 1 is a protein called Tryptophan 6-halogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	528	Total	C	N	O	S	0	1	0
			4221	2696	724	781	20			
1	B	525	Total	C	N	O	S	0	6	0
			4236	2706	727	783	20			

There are 8 discrepancies between the modelled and reference sequences:

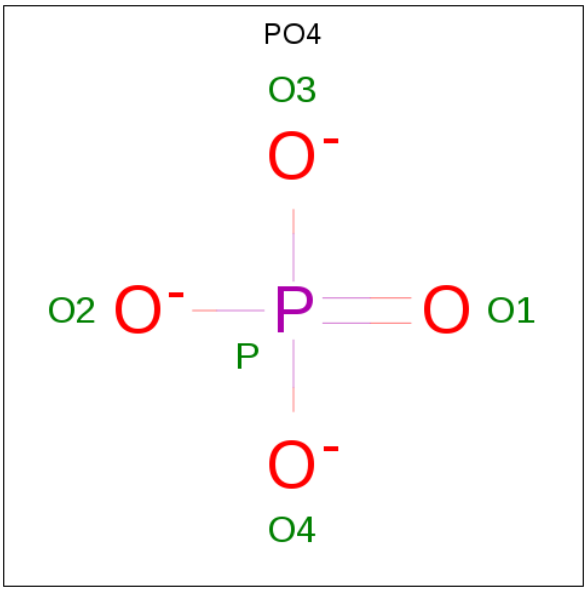
Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	GLY	-	expression tag	UNP A1E280
A	-1	ALA	-	expression tag	UNP A1E280
A	0	MET	-	expression tag	UNP A1E280
A	1	GLY	-	expression tag	UNP A1E280
B	-2	GLY	-	expression tag	UNP A1E280
B	-1	ALA	-	expression tag	UNP A1E280
B	0	MET	-	expression tag	UNP A1E280
B	1	GLY	-	expression tag	UNP A1E280

- Molecule 2 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



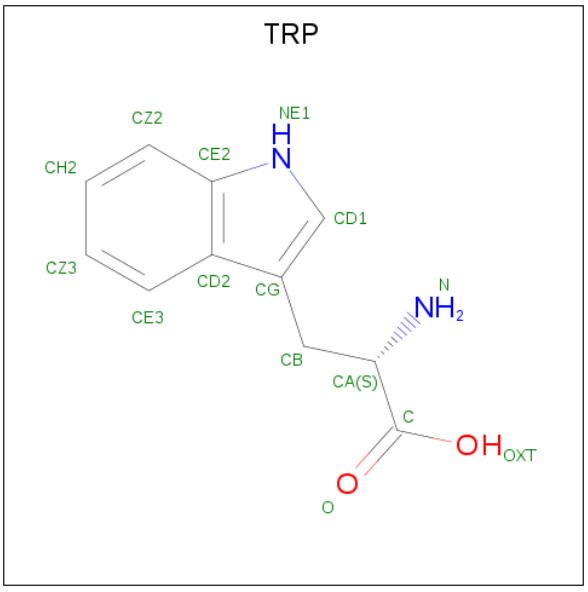
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total C O 6 3 3	0	0
2	A	1	Total C O 6 3 3	0	0
2	A	1	Total C O 6 3 3	0	0
2	A	1	Total C O 6 3 3	0	0
2	A	1	Total C O 6 3 3	0	0
2	B	1	Total C O 6 3 3	0	0

- Molecule 3 is PHOSPHATE ION (three-letter code: PO4) (formula: O_4P).



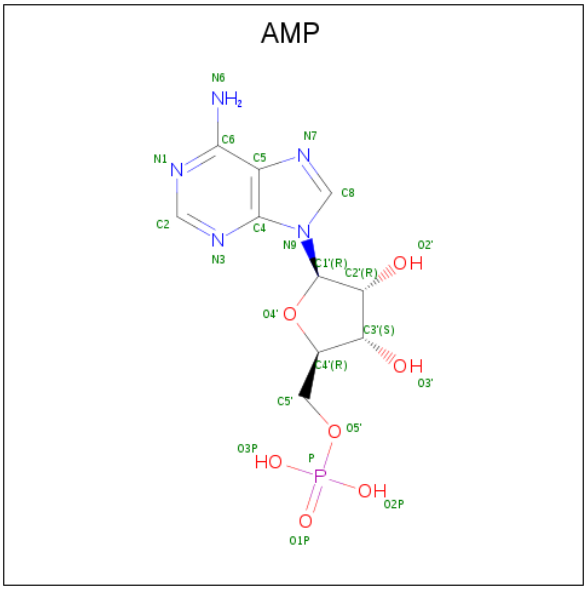
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total O P 5 4 1	0	0
3	A	1	Total O P 5 4 1	0	0
3	B	1	Total O P 5 4 1	0	0

- Molecule 4 is TRYPTOPHAN (three-letter code: TRP) (formula: $C_{11}H_{12}N_2O_2$).



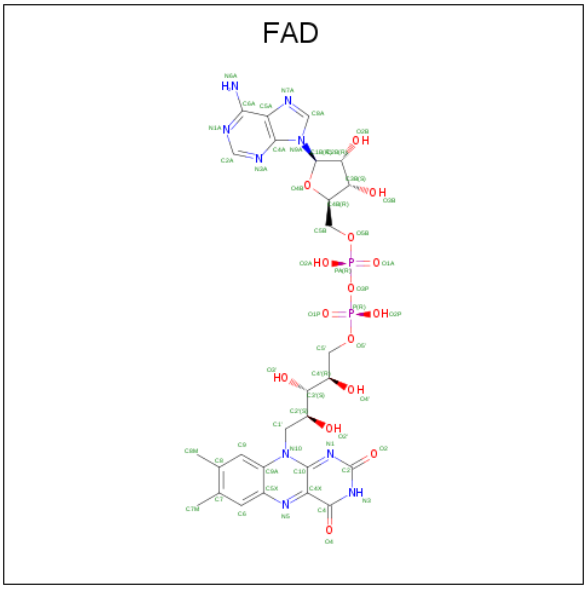
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C N O 15 11 2 2	0	0

- Molecule 5 is ADENOSINE MONOPHOSPHATE (three-letter code: AMP) (formula: $C_{10}H_{14}N_5O_7P$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	P	0	0
			23	10	5	7	1		

- Molecule 6 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$) (labeled as "Ligand of Interest" by author).



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

- Molecule 7 is water.

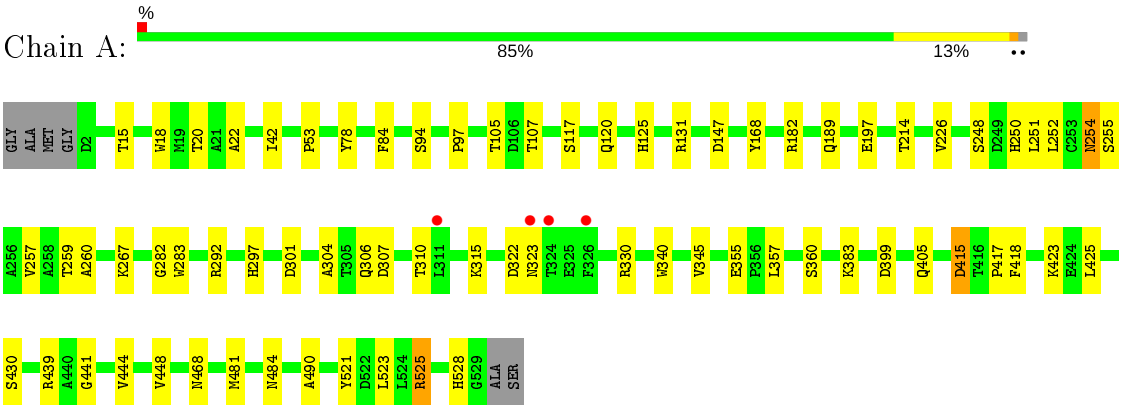
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	51	Total O 51 51	0	0
7	B	24	Total O 24 24	0	0

3 Residue-property plots (i)

These plots are drawn for all protein, RNA and DNA 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.

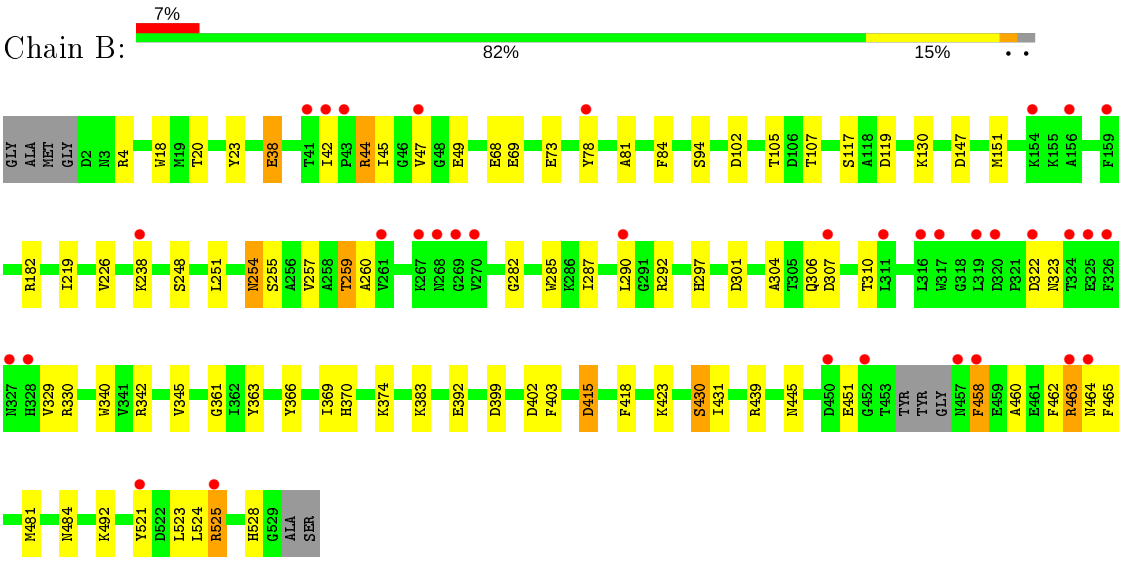
- Molecule 1: Tryptophan 6-halogenase

Chain A:



- Molecule 1: Tryptophan 6-halogenase

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 64	Depositor
Cell constants a, b, c, α, β, γ	138.25Å 138.25Å 142.01Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	49.58 – 2.70 49.53 – 2.70	Depositor EDS
% Data completeness (in resolution range)	100.0 (49.58-2.70) 100.0 (49.53-2.70)	Depositor EDS
R_{merge}	0.17	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.94 (at 2.69Å)	Xtriage
Refinement program	REFMAC 5.8.0238	Depositor
R, R_{free}	0.186 , 0.244 0.188 , 0.243	Depositor DCC
R_{free} test set	2195 reflections (5.19%)	wwPDB-VP
Wilson B-factor (Å^2)	64.5	Xtriage
Anisotropy	0.167	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 42.2	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	0.035 for h,-h-k,-l	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	8674	wwPDB-VP
Average B, all atoms (Å^2)	75.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.59% 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: GOL, PO4, FAD, AMP

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	0.70	0/4339	0.87	1/5891 (0.0%)
1	B	0.71	0/4359	0.87	0/5915
All	All	0.71	0/8698	0.87	1/11806 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	131	ARG	NE-CZ-NH2	-5.12	117.74	120.30

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	4221	0	4077	33	0
1	B	4236	0	4093	49	0
2	A	30	0	40	3	0
2	B	6	0	8	0	0
3	A	10	0	0	0	0
3	B	5	0	0	0	0
4	A	15	0	9	0	0
5	A	23	0	12	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	B	53	0	31	3	0
7	A	51	0	0	2	0
7	B	24	0	0	1	0
All	All	8674	0	8270	77	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 5.

All (77) 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:22:ALA:HA	1:A:189:GLN:HE22	1.55	0.72
1:A:254:ASN:HD22	1:A:254:ASN:C	1.99	0.67
1:A:521:TYR:CZ	1:A:525:ARG:HD3	2.32	0.64
1:B:254:ASN:HD22	1:B:254:ASN:C	2.00	0.63
1:B:361:GLY:HA3	6:B:603:FAD:H1'2	1.80	0.62
1:A:168:TYR:O	2:A:601:GOL:H31	2.00	0.61
1:B:415:ASP:N	1:B:415:ASP:OD1	2.34	0.60
1:A:22:ALA:HA	1:A:189:GLN:NE2	2.17	0.58
1:A:248:SER:HA	1:A:251:LEU:O	2.03	0.58
1:B:290:LEU:HD22	1:B:524:LEU:HB3	1.86	0.58
1:B:49:GLU:HB2	1:B:287:ILE:HD13	1.85	0.57
1:A:20:THR:HG21	1:A:226:VAL:HG11	1.87	0.56
1:B:521:TYR:CZ	1:B:525:ARG:HD3	2.40	0.56
1:B:402[B]:ASP:OD1	1:B:403:PHE:N	2.40	0.55
1:B:282:GLY:HA2	1:B:418:PHE:CE2	2.42	0.55
1:B:23:TYR:CD2	1:B:369:ILE:HG22	2.41	0.54
1:A:78:TYR:CE2	1:A:523:LEU:HD23	2.42	0.54
1:B:248:SER:HA	1:B:251:LEU:O	2.08	0.53
1:B:20:THR:HG21	1:B:226:VAL:HG11	1.89	0.53
1:B:402[B]:ASP:OD2	1:B:430:SER:OG	2.27	0.53
1:B:445:ASN:HB3	1:B:464[A]:ASN:OD1	2.08	0.53
1:B:363:TYR:HA	1:B:366:TYR:CE2	2.43	0.53
1:A:53:PRO:HD2	7:A:706:HOH:O	2.08	0.53
1:A:282:GLY:HA2	1:A:418:PHE:CE2	2.45	0.51
1:B:47:VAL:HG21	6:B:603:FAD:C7	2.41	0.50
1:B:18:TRP:CE3	1:B:182:ARG:HA	2.46	0.50
1:A:120:GLN:OE1	1:B:370:HIS:NE2	2.43	0.49
1:A:323:ASN:ND2	1:A:323:ASN:O	2.44	0.49
1:A:306:GLN:O	1:A:310:THR:OG1	2.27	0.49
1:A:448:VAL:HG21	1:B:463[A]:ARG:HD2	1.94	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:402[A]:ASP:HB3	1:B:431:ILE:HB	1.95	0.48
1:A:18:TRP:CE3	1:A:182:ARG:HA	2.49	0.48
1:B:45:ILE:HD11	1:B:329:VAL:HG13	1.93	0.48
1:A:439:ARG:NH1	1:A:481:MET:O	2.43	0.47
1:A:490:ALA:HB1	1:B:4:ARG:HD3	1.95	0.47
1:B:323:ASN:O	1:B:323:ASN:ND2	2.48	0.47
1:B:285:TRP:CD1	1:B:287:ILE:HD12	2.50	0.47
1:B:47:VAL:HG21	6:B:603:FAD:C8	2.45	0.47
1:B:463[A]:ARG:HG3	1:B:463[A]:ARG:O	2.14	0.47
1:B:301:ASP:HA	1:B:304:ALA:O	2.15	0.46
1:B:306:GLN:O	1:B:310:THR:OG1	2.24	0.46
1:A:252:LEU:HD21	1:A:425:LEU:HD21	1.98	0.46
1:A:448:VAL:HB	1:B:460:ALA:HA	1.97	0.45
1:A:301:ASP:HA	1:A:304:ALA:O	2.16	0.45
1:B:285:TRP:CD1	1:B:287:ILE:CD1	3.00	0.45
2:A:605:GOL:H12	1:B:492:LYS:HE3	1.99	0.44
1:A:417:PRO:HD2	7:A:731:HOH:O	2.18	0.44
1:B:439:ARG:NH1	1:B:481:MET:O	2.49	0.44
1:B:68:GLU:H	1:B:68:GLU:CD	2.20	0.44
1:B:259:THR:OG1	1:B:260:ALA:N	2.51	0.44
1:B:81:ALA:HB3	1:B:151:MET:SD	2.57	0.44
1:A:120:GLN:NE2	1:B:458[A]:PHE:CE2	2.86	0.43
1:B:78:TYR:CE1	1:B:523:LEU:HD23	2.52	0.43
1:B:130:LYS:NZ	7:B:703:HOH:O	2.51	0.43
1:B:23:TYR:CD2	1:B:369:ILE:CG2	3.02	0.43
1:A:259:THR:OG1	1:A:260:ALA:N	2.51	0.43
1:A:283:TRP:CE2	1:A:357:LEU:HD13	2.54	0.43
1:A:415:ASP:OD1	1:A:415:ASP:N	2.32	0.42
1:B:363:TYR:HA	1:B:366:TYR:CZ	2.53	0.42
1:A:125:HIS:CD2	1:A:441:GLY:O	2.71	0.42
1:A:97:PRO:HB2	1:A:105:THR:HG22	2.02	0.42
1:B:44:ARG:HB3	1:B:44:ARG:CZ	2.50	0.42
2:A:605:GOL:O2	1:B:119:ASP:O	2.38	0.42
1:B:23:TYR:HB3	1:B:369:ILE:HG21	2.02	0.42
1:B:340:TRP:CG	1:B:345:VAL:HG22	2.55	0.42
1:B:84:PHE:O	1:B:107:THR:HA	2.20	0.41
1:B:254:ASN:C	1:B:254:ASN:ND2	2.72	0.41
1:A:105:THR:HG22	1:A:107:THR:HG23	2.02	0.41
1:A:340:TRP:CG	1:A:345:VAL:HG22	2.55	0.41
1:B:69:GLU:O	1:B:73:GLU:HG2	2.21	0.41
1:A:197:GLU:O	1:A:214:THR:HA	2.21	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:444:VAL:O	1:A:468:ASN:HA	2.20	0.41
1:B:392:GLU:OE1	1:B:462[A]:PHE:HE1	2.03	0.41
1:A:84:PHE:O	1:A:107:THR:HA	2.21	0.40
1:A:250:HIS:O	1:A:405:GLN:HG3	2.22	0.40
1:B:38:GLU:O	1:B:38:GLU:HG3	2.21	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	527/534 (99%)	496 (94%)	30 (6%)	1 (0%)	47	73
1	B	527/534 (99%)	490 (93%)	34 (6%)	3 (1%)	25	50
All	All	1054/1068 (99%)	986 (94%)	64 (6%)	4 (0%)	34	60

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	465	PHE
1	B	342	ARG
1	A	42	ILE
1	B	42	ILE

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	444/445 (100%)	420 (95%)	24 (5%)	22 47
1	B	447/445 (100%)	415 (93%)	32 (7%)	14 34
All	All	891/890 (100%)	835 (94%)	56 (6%)	18 40

All (56) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	15	THR
1	A	94	SER
1	A	117	SER
1	A	147	ASP
1	A	254	ASN
1	A	255	SER
1	A	257	VAL
1	A	267	LYS
1	A	292	ARG
1	A	297	HIS
1	A	307	ASP
1	A	315	LYS
1	A	322	ASP
1	A	330	ARG
1	A	355	GLU
1	A	360	SER
1	A	383	LYS
1	A	399	ASP
1	A	415	ASP
1	A	423	LYS
1	A	430	SER
1	A	484	ASN
1	A	525	ARG
1	A	528	HIS
1	B	38	GLU
1	B	44	ARG
1	B	94	SER
1	B	102	ASP
1	B	105	THR
1	B	117	SER
1	B	147	ASP
1	B	219	ILE
1	B	238	LYS
1	B	254	ASN
1	B	255	SER

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Mol	Chain	Res	Type
1	B	257	VAL
1	B	259	THR
1	B	292	ARG
1	B	297	HIS
1	B	307	ASP
1	B	322	ASP
1	B	330	ARG
1	B	374	LYS
1	B	383	LYS
1	B	399	ASP
1	B	415	ASP
1	B	423	LYS
1	B	430	SER
1	B	451	GLU
1	B	458[A]	PHE
1	B	458[B]	PHE
1	B	463[A]	ARG
1	B	463[B]	ARG
1	B	484	ASN
1	B	525	ARG
1	B	528	HIS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	133	GLN
1	A	152	ASN
1	A	189	GLN
1	A	254	ASN
1	B	75	ASN
1	B	133	GLN
1	B	152	ASN
1	B	189	GLN
1	B	254	ASN

5.3.3 RNA

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 carbohydrates in this entry.

5.6 Ligand geometry (i)

12 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	GOL	A	601	-	5,5,5	0.15	0	5,5,5	0.62	0
2	GOL	B	601	-	5,5,5	0.10	0	5,5,5	0.28	0
2	GOL	A	604	-	5,5,5	0.15	0	5,5,5	0.38	0
3	PO4	A	606	-	4,4,4	1.56	1 (25%)	6,6,6	0.58	0
3	PO4	A	607	-	4,4,4	0.34	0	6,6,6	0.59	0
5	AMP	A	609	-	22,25,25	0.71	0	25,38,38	0.90	1 (4%)
2	GOL	A	603	-	5,5,5	0.17	0	5,5,5	0.48	0
6	FAD	B	603	-	51,58,58	1.17	2 (3%)	60,89,89	1.95	11 (18%)
3	PO4	B	602	-	4,4,4	0.80	0	6,6,6	0.47	0
2	GOL	A	605	-	5,5,5	0.16	0	5,5,5	0.33	0
2	GOL	A	602	-	5,5,5	0.16	0	5,5,5	0.46	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	GOL	A	601	-	-	4/4/4/4	-
2	GOL	B	601	-	-	4/4/4/4	-
2	GOL	A	604	-	-	2/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	AMP	A	609	-	-	0/6/26/26	0/3/3/3
2	GOL	A	603	-	-	3/4/4/4	-
6	FAD	B	603	-	-	12/30/50/50	0/6/6/6
2	GOL	A	605	-	-	2/4/4/4	-
2	GOL	A	602	-	-	2/4/4/4	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	B	603	FAD	C4X-C10	6.09	1.44	1.38
6	B	603	FAD	C4-N3	2.96	1.38	1.33
3	A	606	PO4	P-O1	2.35	1.56	1.50

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
6	B	603	FAD	C4-N3-C2	8.48	122.30	115.14
6	B	603	FAD	C4-C4X-C10	-5.15	116.54	119.95
6	B	603	FAD	C10-C4X-N5	5.04	124.74	121.26
6	B	603	FAD	C4X-C4-N3	-4.28	117.58	123.43
6	B	603	FAD	C4X-C10-N10	-3.79	116.41	120.30
5	A	609	AMP	C5-C6-N6	2.72	124.48	120.35
6	B	603	FAD	C1'-C2'-C3'	2.68	117.26	109.79
6	B	603	FAD	C1'-N10-C9A	2.61	120.35	118.29
6	B	603	FAD	O2P-P-O1P	2.59	125.06	112.24
6	B	603	FAD	C5A-C6A-N6A	2.12	123.58	120.35
6	B	603	FAD	O4B-C1B-C2B	-2.11	103.84	106.93
6	B	603	FAD	O2A-PA-O1A	2.10	122.64	112.24

There are no chirality outliers.

All (29) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	601	GOL	C1-C2-C3-O3
2	B	601	GOL	O1-C1-C2-C3
2	A	603	GOL	O1-C1-C2-O2
2	A	603	GOL	O1-C1-C2-C3
6	B	603	FAD	C5B-O5B-PA-O2A
6	B	603	FAD	C2'-C3'-C4'-O4'
6	B	603	FAD	C2'-C3'-C4'-C5'

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Mol	Chain	Res	Type	Atoms
6	B	603	FAD	O3'-C3'-C4'-O4'
6	B	603	FAD	O3'-C3'-C4'-C5'
6	B	603	FAD	C5'-O5'-P-O1P
2	A	605	GOL	C1-C2-C3-O3
2	A	602	GOL	O1-C1-C2-O2
2	A	602	GOL	O1-C1-C2-C3
6	B	603	FAD	O4B-C4B-C5B-O5B
2	B	601	GOL	C1-C2-C3-O3
2	A	604	GOL	C1-C2-C3-O3
2	A	603	GOL	C1-C2-C3-O3
2	A	601	GOL	O2-C2-C3-O3
2	B	601	GOL	O1-C1-C2-O2
2	B	601	GOL	O2-C2-C3-O3
2	A	604	GOL	O2-C2-C3-O3
2	A	601	GOL	O1-C1-C2-O2
6	B	603	FAD	C5B-O5B-PA-O3P
6	B	603	FAD	C5B-O5B-PA-O1A
6	B	603	FAD	C3'-C4'-C5'-O5'
6	B	603	FAD	C3B-C4B-C5B-O5B
2	A	601	GOL	O1-C1-C2-C3
2	A	605	GOL	O2-C2-C3-O3
6	B	603	FAD	C5'-O5'-P-O3P

There are no ring outliers.

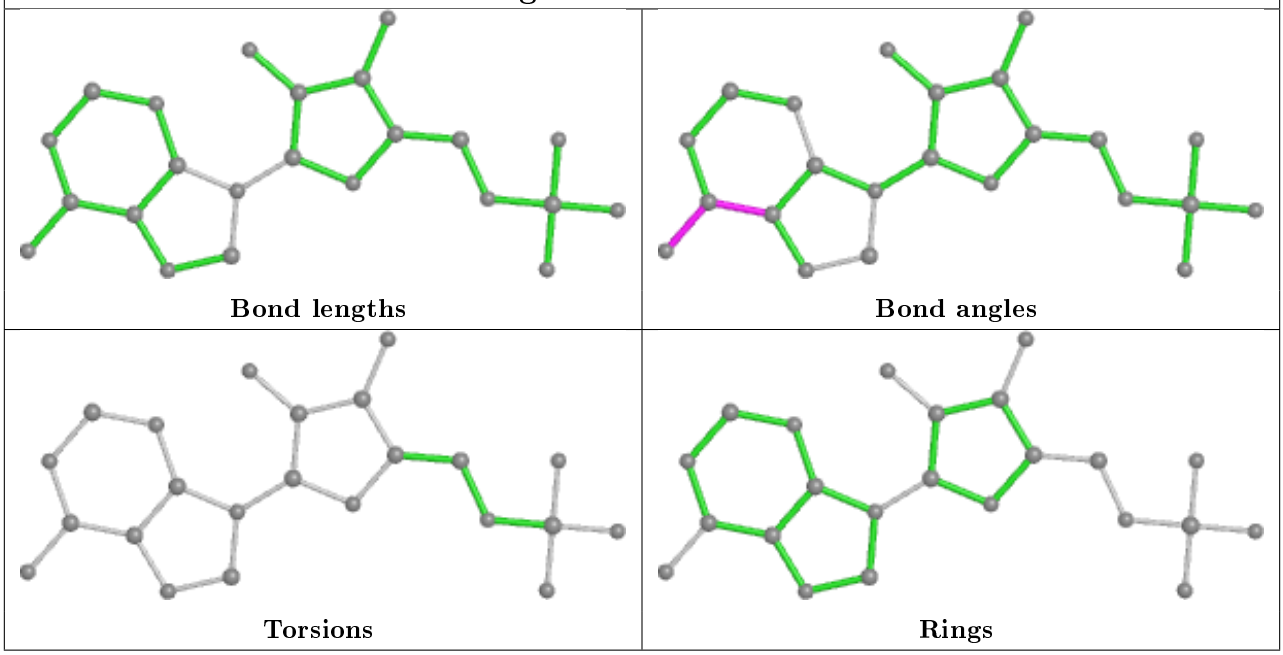
3 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	601	GOL	1	0
6	B	603	FAD	3	0
2	A	605	GOL	2	0

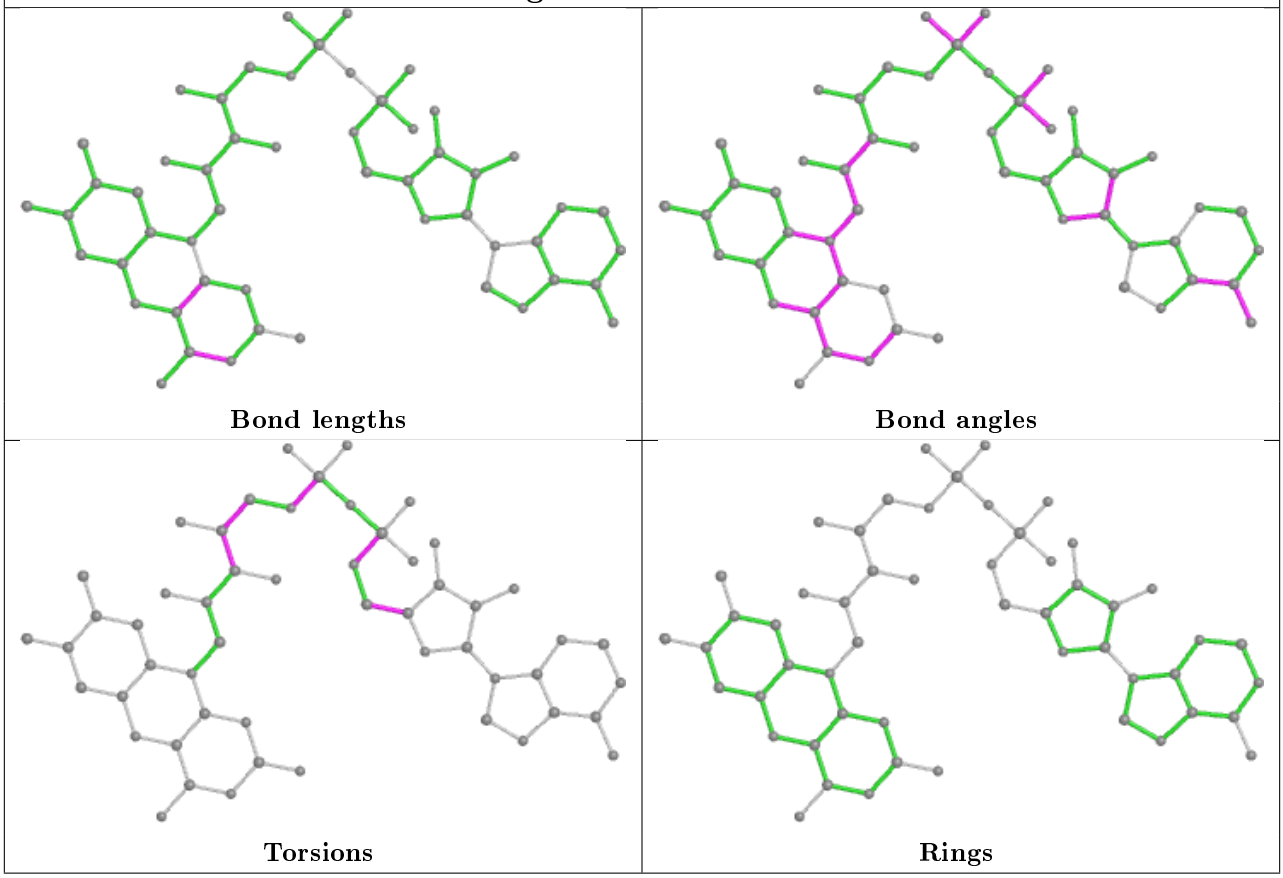
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less 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 AMP A 609



Ligand FAD B 603



5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

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	528/534 (98%)	-0.23	4 (0%)	86	87	46, 61, 93, 135	0
1	B	525/534 (98%)	0.20	35 (6%)	17	16	47, 82, 118, 167	0
All	All	1053/1068 (98%)	-0.01	39 (3%)	41	41	46, 71, 111, 167	0

All (39) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	326	PHE	6.0
1	B	41	THR	5.2
1	B	325	GLU	4.5
1	B	269	GLY	4.0
1	B	319	LEU	3.8
1	B	521	TYR	3.6
1	B	463[A]	ARG	3.3
1	B	324	THR	3.2
1	B	78	TYR	3.2
1	B	525	ARG	3.1
1	B	261	VAL	3.1
1	B	322	ASP	3.1
1	B	270	VAL	3.0
1	B	42	ILE	3.0
1	B	268	ASN	2.9
1	B	290	LEU	2.8
1	B	47	VAL	2.7
1	A	326	PHE	2.7
1	B	452	GLY	2.7
1	B	267	LYS	2.7
1	B	317	TRP	2.6
1	A	311	LEU	2.5
1	B	327	ASN	2.5
1	B	457	ASN	2.4

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Mol	Chain	Res	Type	RSRZ
1	B	311	LEU	2.4
1	B	464[A]	ASN	2.3
1	B	238	LYS	2.3
1	A	323	ASN	2.3
1	B	156	ALA	2.3
1	B	450[A]	ASP	2.3
1	A	324	THR	2.2
1	B	316	LEU	2.1
1	B	307	ASP	2.1
1	B	43	PRO	2.1
1	B	159	PHE	2.1
1	B	320	ASP	2.0
1	B	154	LYS	2.0
1	B	458[A]	PHE	2.0
1	B	328	HIS	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 carbohydrates 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	PO4	A	607	5/5	0.76	0.45	64,70,74,77	5
3	PO4	B	602	5/5	0.83	0.32	82,89,101,105	5
5	AMP	A	609	23/23	0.87	0.21	82,107,137,148	0
2	GOL	A	602	6/6	0.87	0.29	63,66,73,74	6
2	GOL	A	604	6/6	0.88	0.20	74,92,101,106	0
2	GOL	A	605	6/6	0.89	0.36	83,98,114,119	0
2	GOL	A	603	6/6	0.89	0.30	97,108,117,123	0
2	GOL	B	601	6/6	0.90	0.18	94,102,109,116	0

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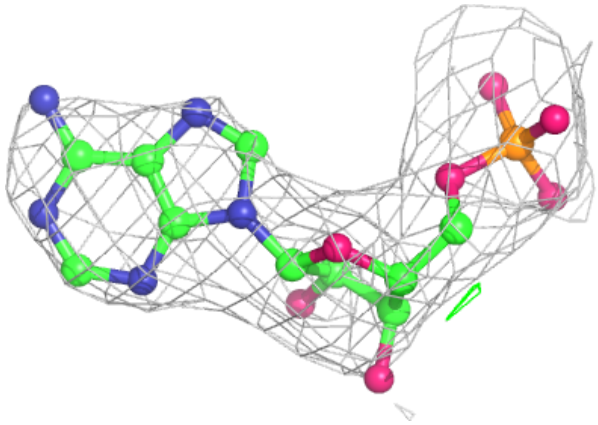
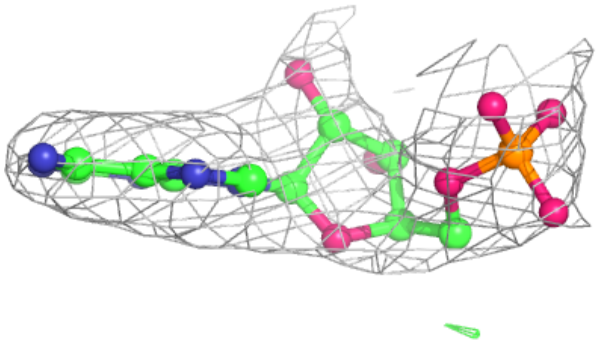
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
6	FAD	B	603	53/53	0.93	0.17	63,93,108,110	0
3	PO4	A	606	5/5	0.96	0.11	47,47,53,59	5
2	GOL	A	601	6/6	0.96	0.22	53,60,61,65	0
4	TRP	A	608	15/15	0.97	0.15	48,53,60,67	0

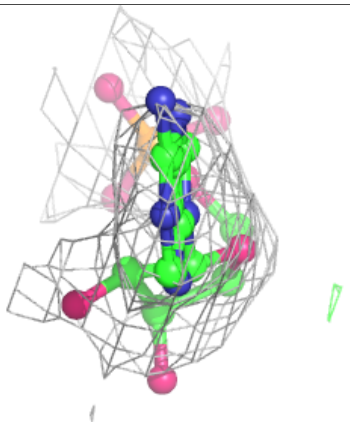
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around AMP A 609:

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

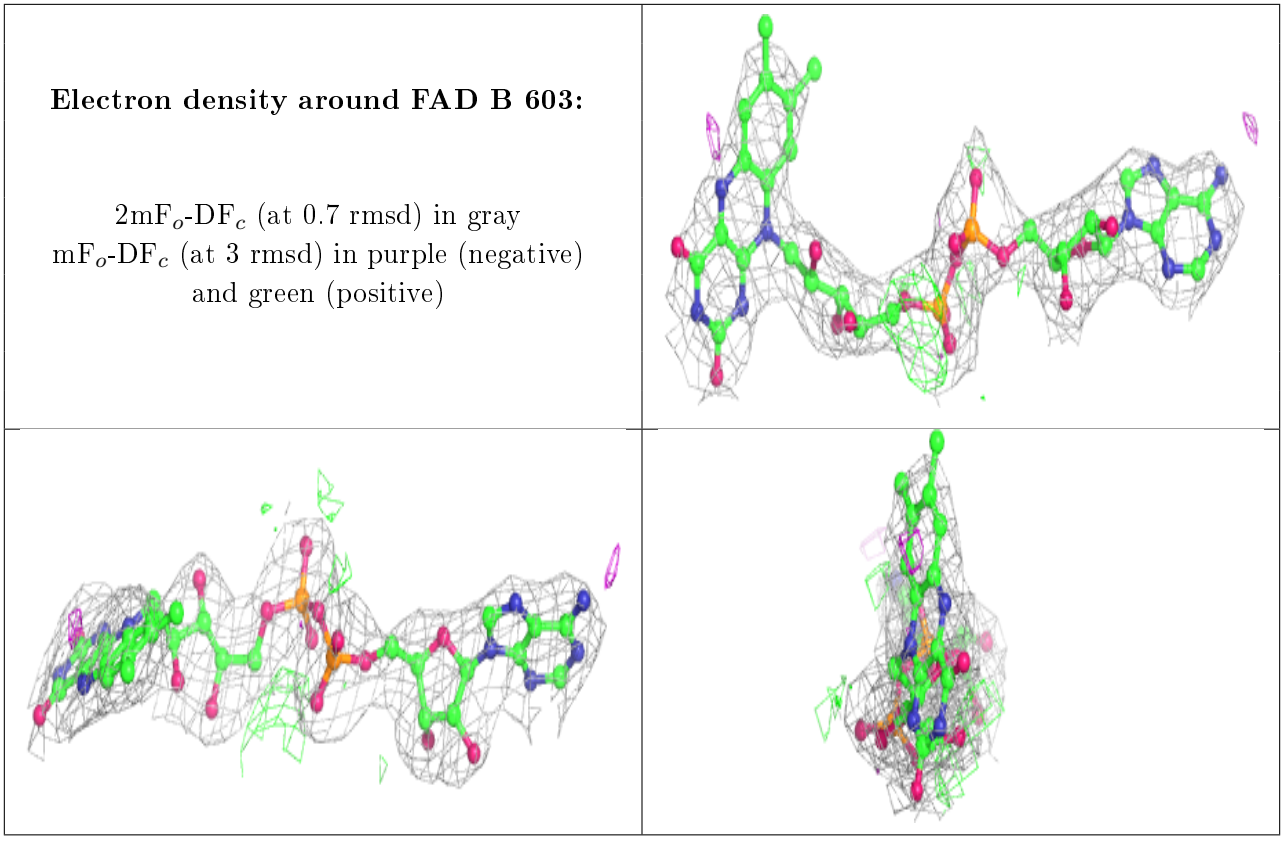






Electron density around FAD B 603:

$2mF_o$-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

There are no such residues in this entry.