Full wwPDB X-ray Structure Validation Report ⓘ

Jun 8, 2023 – 01:22 pm BST

PDB ID	:	8CJF
Title	:	AetF, a single-component flavin-dependent tryptophan halogenase, in complex with 5-bromo-L-tryptophan
Authors	:	Gafe, S.; Niemann, H.H.
Deposited on	:	2023-02-13
Resolution	:	1.90 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:

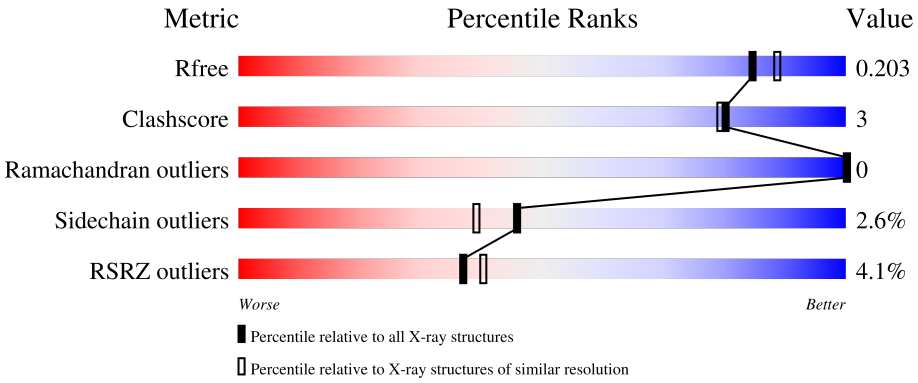
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.33
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)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

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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	6207 (1.90-1.90)
Clashscore	141614	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)
RSRZ outliers	127900	6082 (1.90-1.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5% The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	663	4% 87% 8%
1	B	663	4% 89% 7%

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	CL	A	705[A]	-	-	X	-

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 21878 atoms, of which 10409 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.

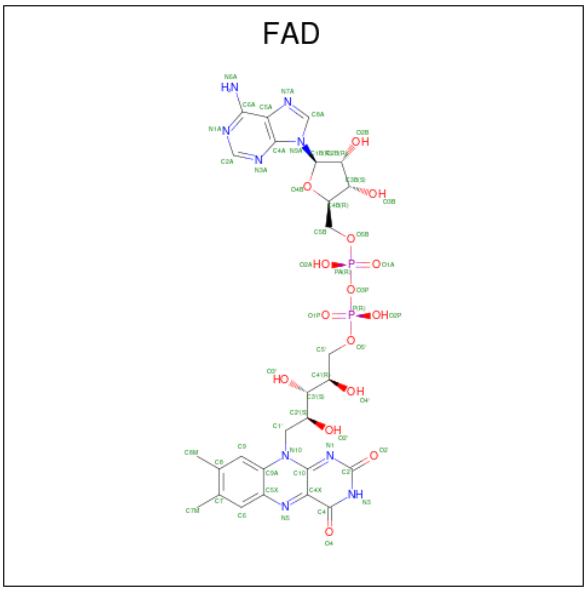
- Molecule 1 is a protein called AetF.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	637	Total	C	H	N	O	S	0	7	0
			10500	3425	5162	907	990	16			
1	B	638	Total	C	H	N	O	S	0	5	0
			10518	3421	5187	906	988	16			

There are 16 discrepancies between the modelled and reference sequences:

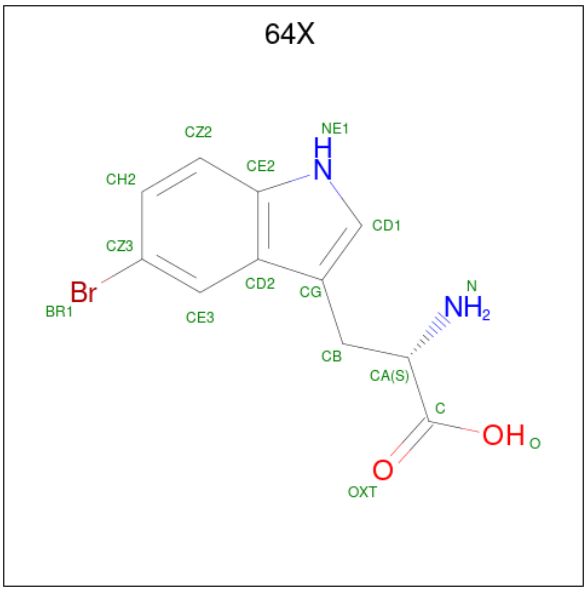
Chain	Residue	Modelled	Actual	Comment	Reference
A	-7	GLY	-	expression tag	UNP A0A861B9Z9
A	-6	ALA	-	expression tag	UNP A0A861B9Z9
A	-5	SER	-	expression tag	UNP A0A861B9Z9
A	-4	GLY	-	expression tag	UNP A0A861B9Z9
A	-3	SER	-	expression tag	UNP A0A861B9Z9
A	-2	GLY	-	expression tag	UNP A0A861B9Z9
A	-1	SER	-	expression tag	UNP A0A861B9Z9
A	0	GLY	-	expression tag	UNP A0A861B9Z9
B	-7	GLY	-	expression tag	UNP A0A861B9Z9
B	-6	ALA	-	expression tag	UNP A0A861B9Z9
B	-5	SER	-	expression tag	UNP A0A861B9Z9
B	-4	GLY	-	expression tag	UNP A0A861B9Z9
B	-3	SER	-	expression tag	UNP A0A861B9Z9
B	-2	GLY	-	expression tag	UNP A0A861B9Z9
B	-1	SER	-	expression tag	UNP A0A861B9Z9
B	0	GLY	-	expression tag	UNP A0A861B9Z9

- Molecule 2 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 3 is 5-bromo-L-tryptophan (three-letter code: 64X) (formula: $C_{11}H_{11}BrN_2O_2$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
3	A	1	Total	Br	C	H	N	O	0	0
			26	1	11	10	2	2		

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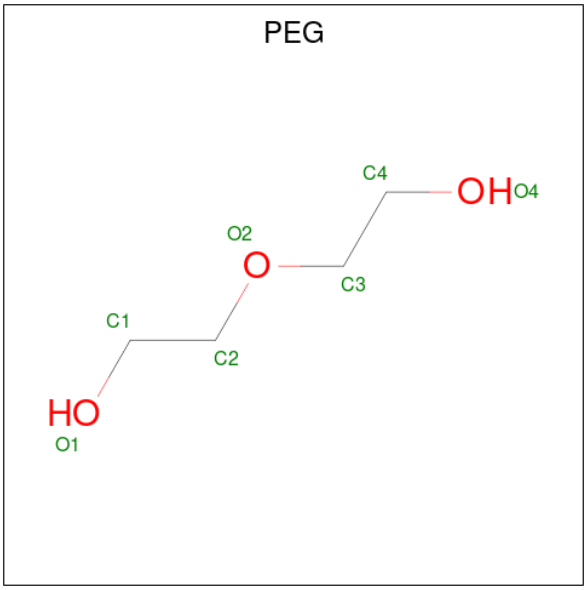
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
3	B	1	Total	Br	C	H	N	O	0	0
			26	1	11	10	2	2		

- Molecule 4 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: $C_4H_{10}O_3$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	H	O	0	0
			17	4	10	3		
4	A	1	Total	C	H	O	0	0
			17	4	10	3		
4	B	1	Total	C	H	O	0	0
			17	4	10	3		
4	B	1	Total	C	H	O	0	0
			17	4	10	3		

- Molecule 5 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total	Cl	0	1
			1	1		
5	B	1	Total	Cl	0	0
			1	1		

- Molecule 6 is water.

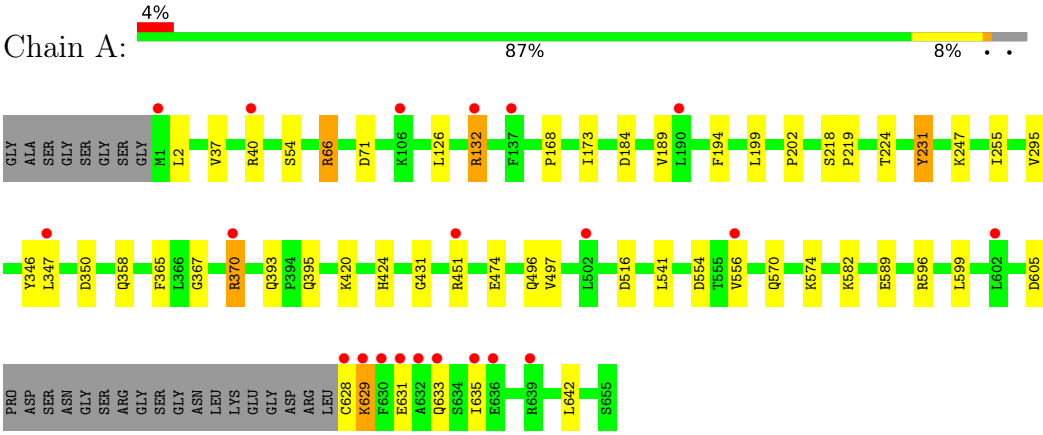
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	329	Total O 329 329	0	6
6	B	302	Total O 303 303	0	5

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.

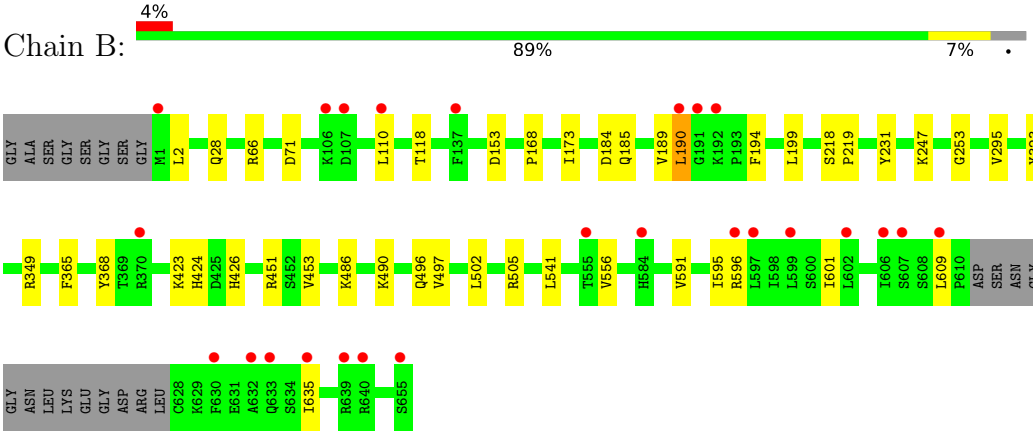
• Molecule 1: AetF

Chain A:



• Molecule 1: AetF

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 43	Depositor
Cell constants a, b, c, α, β, γ	122.70Å 122.70Å 87.42Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.48 – 1.90 46.48 – 1.90	Depositor EDS
% Data completeness (in resolution range)	99.5 (46.48-1.90) 100.0 (46.48-1.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.36 (at 1.90Å)	Xtriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.183 , 0.207 0.178 , 0.203	Depositor DCC
R_{free} test set	5106 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	38.8	Xtriage
Anisotropy	0.106	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.39 , 36.5	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	0.026 for h,-k,-l	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	21878	wwPDB-VP
Average B, all atoms (Å^2)	51.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.89% 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: 64X, PEG, FAD, CL

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\#\|Z\| > 5$	RMSZ	$\#\|Z\| > 5$
1	A	0.26	0/5475	0.51	0/7414
1	B	0.26	0/5469	0.50	0/7407
All	All	0.26	0/10944	0.50	0/14821

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	5338	5162	5195	32	0
1	B	5331	5187	5188	26	0
2	A	53	0	31	0	0
2	B	53	0	31	2	0
3	A	16	10	0	0	0
3	B	16	10	0	0	0
4	A	14	20	20	0	0
4	B	14	20	20	0	0
5	A	1	0	0	2	0
5	B	1	0	0	1	0
6	A	329	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	B	303	0	0	4	0
All	All	11469	10409	10485	58	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 3.

All (58) 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:629:LYS:HA	1:A:629:LYS:HE3	1.46	0.97
1:B:332:ARG:NH2	2:B:701:FAD:H2B	2.05	0.71
1:B:332:ARG:HH21	2:B:701:FAD:H2B	1.56	0.69
1:A:367:GLY:O	1:A:370[A]:ARG:NH2	2.26	0.68
1:B:168:PRO:HA	1:B:541:LEU:HD22	1.76	0.68
1:A:168:PRO:HA	1:A:541:LEU:HD22	1.77	0.66
1:A:496[B]:GLN:OE1	1:A:497:VAL:HG23	1.97	0.65
1:B:173:ILE:HB	1:B:295:VAL:HG22	1.81	0.63
1:A:582:LYS:NZ	6:A:805:HOH:O	2.34	0.60
1:B:66:ARG:NE	6:B:804:HOH:O	2.33	0.60
1:A:173:ILE:HB	1:A:295:VAL:HG22	1.83	0.59
1:B:496[B]:GLN:OE1	1:B:497:VAL:HG23	2.04	0.58
1:B:66:ARG:NH2	6:B:806:HOH:O	2.36	0.58
1:B:349:ARG:NH1	6:B:807:HOH:O	2.36	0.57
1:B:110:LEU:HD11	1:B:118:THR:HG21	1.88	0.56
1:A:628:CYS:N	1:A:631:GLU:OE1	2.39	0.55
1:B:194:PHE:CD2	1:B:199:LEU:HD21	2.41	0.55
1:A:132:ARG:NH1	1:A:329:GLU:OE1	2.40	0.54
1:A:189:VAL:HG23	1:A:189:VAL:O	2.07	0.54
1:A:629:LYS:HA	1:A:629:LYS:CE	2.28	0.54
1:A:350:ASP:OD1	1:A:358:GLN:NE2	2.37	0.53
1:B:502:LEU:O	1:B:505:ARG:NH1	2.42	0.53
1:A:606:ILE:HG21	1:A:642:LEU:HD21	1.92	0.51
1:A:71:ASP:HA	5:A:705[A]:CL:CL	2.49	0.50
1:A:570:GLN:O	1:A:574:LYS:HG2	2.12	0.49
1:B:609:LEU:HD13	1:B:635:ILE:HD12	1.94	0.49
1:A:126:LEU:HD12	1:A:365:PHE:HE1	1.78	0.49
1:A:66:ARG:NH1	6:A:808:HOH:O	2.39	0.49
1:B:185:GLN:OE1	6:B:801:HOH:O	2.20	0.49
1:A:605:ASP:O	1:A:609:LEU:HD13	2.13	0.49
1:A:346:TYR:C	1:A:347[A]:LEU:HD12	2.33	0.48
1:A:393:GLN:NE2	1:A:474:GLU:OE2	2.45	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:2:LEU:HD21	1:B:28:GLN:HB3	1.96	0.47
1:B:591:VAL:O	1:B:595:ILE:HD12	2.15	0.47
1:B:189:VAL:HG23	1:B:190:LEU:HD12	1.98	0.46
1:A:37:VAL:HG23	1:A:40:ARG:NH2	2.31	0.46
1:A:54:SER:HB2	5:A:705[A]:CL:CL	2.54	0.45
1:B:189:VAL:O	1:B:189:VAL:CG2	2.65	0.45
1:B:110:LEU:HD11	1:B:118:THR:CG2	2.46	0.45
1:B:453:VAL:HG21	1:B:601:ILE:HG13	2.00	0.44
1:A:194:PHE:CD2	1:A:199:LEU:HD21	2.53	0.44
1:A:189:VAL:O	1:A:189:VAL:CG2	2.65	0.44
1:B:153:ASP:OD2	1:B:323:TYR:OH	2.26	0.43
1:B:365:PHE:HB3	1:B:368:TYR:CD2	2.53	0.43
1:B:71:ASP:HA	5:B:705:CL:CL	2.56	0.42
1:A:255:ILE:HD13	1:A:424:HIS:CE1	2.54	0.42
1:B:189:VAL:HG23	1:B:189:VAL:O	2.20	0.42
1:A:606:ILE:HD13	1:A:642:LEU:HD21	2.02	0.42
1:A:218:SER:N	1:A:219:PRO:CD	2.83	0.42
1:B:218:SER:N	1:B:219:PRO:CD	2.83	0.41
1:A:224:THR:HG22	1:A:231:TYR:OH	2.20	0.41
1:A:556:VAL:O	1:A:556:VAL:HG13	2.21	0.41
1:B:486:LYS:HG2	1:B:490:LYS:HE2	2.03	0.41
1:A:609:LEU:HD13	1:A:609:LEU:N	2.35	0.41
1:A:609:LEU:HD13	1:A:609:LEU:H	1.86	0.41
1:B:253:GLY:HA2	1:B:424:HIS:O	2.22	0.40
1:A:202:PRO:HG2	1:A:431:GLY:HA3	2.04	0.40
1:A:629:LYS:HE3	1:A:629:LYS:CA	2.34	0.40

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	640/663 (96%)	630 (98%)	10 (2%)	0	100	100
1	B	639/663 (96%)	628 (98%)	11 (2%)	0	100	100
All	All	1279/1326 (96%)	1258 (98%)	21 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	586/596 (98%)	565 (96%)	21 (4%)	35	26
1	B	585/596 (98%)	575 (98%)	10 (2%)	60	57
All	All	1171/1192 (98%)	1140 (97%)	31 (3%)	46	39

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2	LEU
1	A	66	ARG
1	A	132	ARG
1	A	184	ASP
1	A	231	TYR
1	A	247	LYS
1	A	327	ASP
1	A	370[A]	ARG
1	A	370[B]	ARG
1	A	395	GLN
1	A	420	LYS
1	A	451	ARG
1	A	516	ASP
1	A	554	ASP
1	A	589	GLU
1	A	596	ARG
1	A	599	LEU
1	A	609	LEU

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Mol	Chain	Res	Type
1	A	629	LYS
1	A	633	GLN
1	A	635	ILE
1	B	184	ASP
1	B	190	LEU
1	B	231	TYR
1	B	247	LYS
1	B	327	ASP
1	B	423	LYS
1	B	426	HIS
1	B	451	ARG
1	B	556	VAL
1	B	596	ARG

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

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 10 ligands modelled in this entry, 2 are monoatomic - leaving 8 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
3	64X	A	702	-	15,17,17	1.55	5 (33%)	17,24,24	1.32	3 (17%)
3	64X	B	702	-	15,17,17	1.72	4 (26%)	17,24,24	1.19	1 (5%)
2	FAD	A	701	-	53,58,58	0.47	0	68,89,89	0.50	1 (1%)
4	PEG	B	704	-	6,6,6	0.13	0	5,5,5	0.07	0
2	FAD	B	701	-	53,58,58	0.45	0	68,89,89	0.49	1 (1%)
4	PEG	B	703	-	6,6,6	0.16	0	5,5,5	0.06	0
4	PEG	A	704	-	6,6,6	0.08	0	5,5,5	0.16	0
4	PEG	A	703	-	6,6,6	0.10	0	5,5,5	0.10	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
3	64X	A	702	-	-	3/7/8/8	0/2/2/2
3	64X	B	702	-	-	3/7/8/8	0/2/2/2
2	FAD	A	701	-	-	5/30/50/50	0/6/6/6
4	PEG	B	704	-	-	1/4/4/4	-
2	FAD	B	701	-	-	4/30/50/50	0/6/6/6
4	PEG	B	703	-	-	3/4/4/4	-
4	PEG	A	704	-	-	1/4/4/4	-
4	PEG	A	703	-	-	2/4/4/4	-

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	702	64X	BR1-CZ3	3.14	1.96	1.90
3	B	702	64X	CE3-CZ3	2.95	1.41	1.36
3	B	702	64X	OXT-C	2.73	1.30	1.22
3	A	702	64X	CE3-CZ3	2.68	1.40	1.36
3	A	702	64X	BR1-CZ3	2.41	1.95	1.90
3	A	702	64X	CZ2-CH2	2.41	1.41	1.36
3	B	702	64X	CZ2-CH2	2.38	1.41	1.36
3	A	702	64X	OXT-C	2.23	1.28	1.22
3	A	702	64X	CD1-CG	2.01	1.42	1.37

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	701	FAD	C5A-C6A-N6A	2.37	123.95	120.35
2	B	701	FAD	C5A-C6A-N6A	2.32	123.87	120.35
3	A	702	64X	BR1-CZ3-CE3	-2.30	116.33	119.72
3	A	702	64X	O-C-CA	2.17	120.78	113.38
3	A	702	64X	O-C-OXT	-2.08	119.36	124.09
3	B	702	64X	O-C-OXT	-2.01	119.53	124.09

There are no chirality outliers.

All (22) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	701	FAD	N10-C1'-C2'-O2'
2	A	701	FAD	N10-C1'-C2'-C3'
2	B	701	FAD	N10-C1'-C2'-O2'
2	B	701	FAD	N10-C1'-C2'-C3'
3	B	702	64X	OXT-C-CA-N
3	B	702	64X	O-C-CA-N
3	A	702	64X	O-C-CA-N
4	B	703	PEG	O2-C3-C4-O4
4	A	704	PEG	O2-C3-C4-O4
2	B	701	FAD	O4B-C4B-C5B-O5B
4	A	703	PEG	O1-C1-C2-O2
4	B	703	PEG	O1-C1-C2-O2
4	B	704	PEG	O2-C3-C4-O4
3	A	702	64X	OXT-C-CA-N
2	A	701	FAD	O4B-C4B-C5B-O5B
4	A	703	PEG	O2-C3-C4-O4
2	A	701	FAD	C2'-C3'-C4'-O4'
3	A	702	64X	CA-CB-CG-CD1
3	B	702	64X	CA-CB-CG-CD1
4	B	703	PEG	C4-C3-O2-C2
2	A	701	FAD	O3'-C3'-C4'-O4'
2	B	701	FAD	C3B-C4B-C5B-O5B

There are no ring outliers.

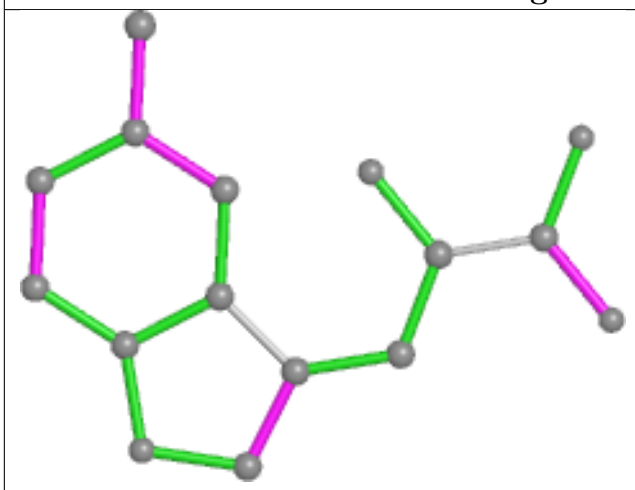
1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	701	FAD	2	0

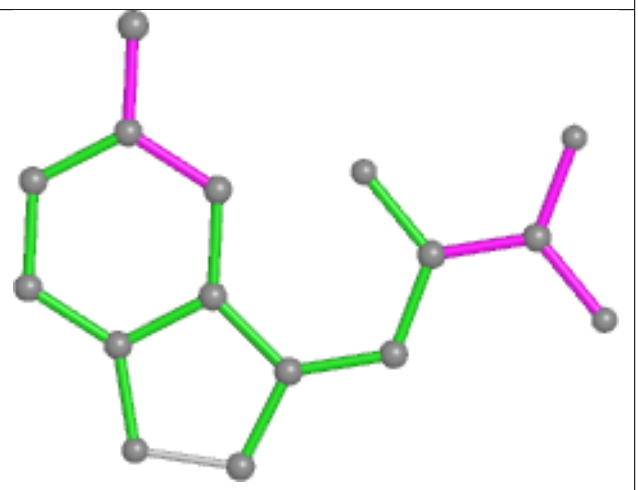
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In

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.

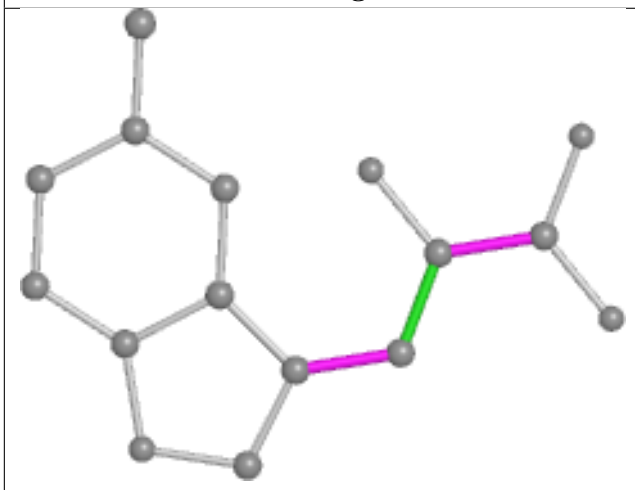
Ligand 64X A 702



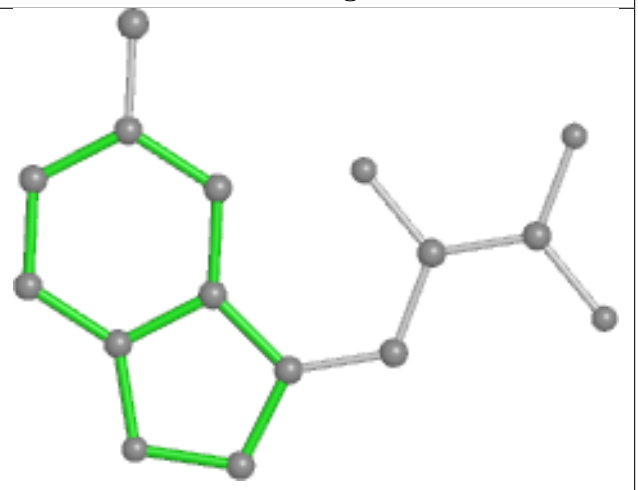
Bond lengths



Bond angles

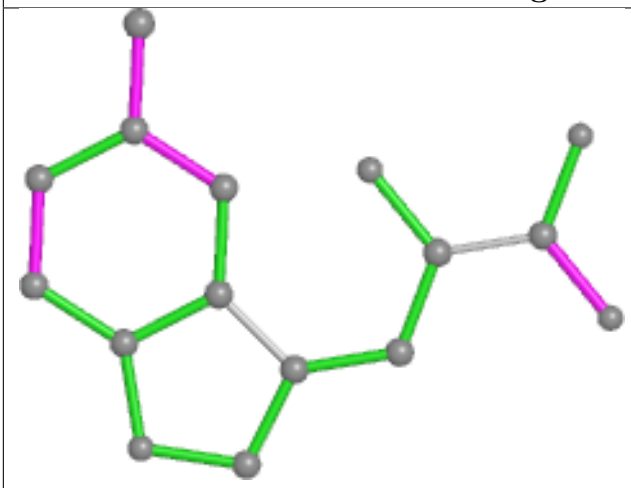


Torsions

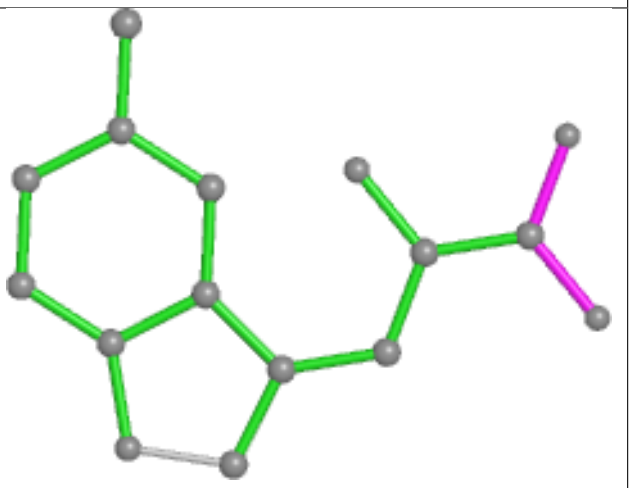


Rings

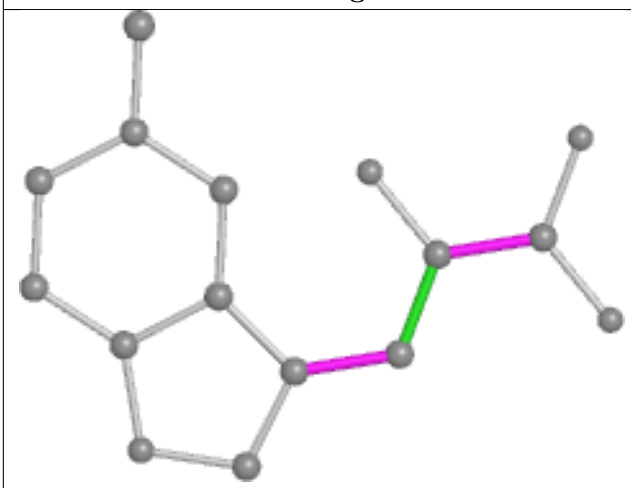
Ligand 64X B 702



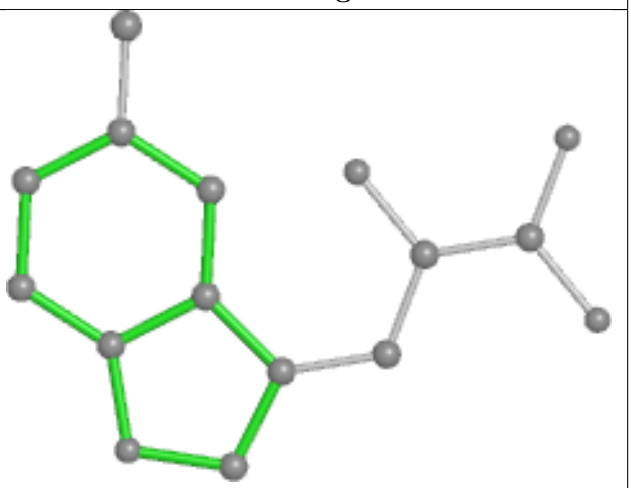
Bond lengths



Bond angles

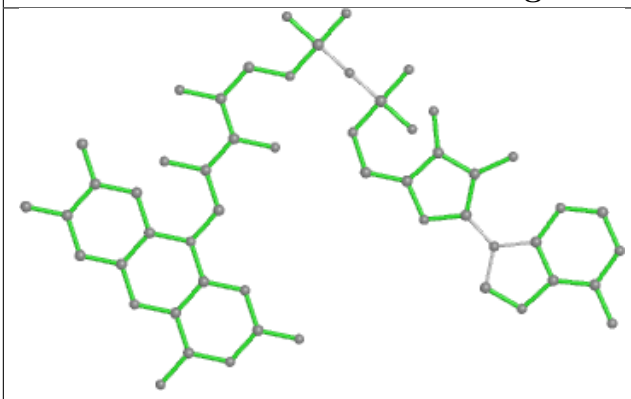


Torsions

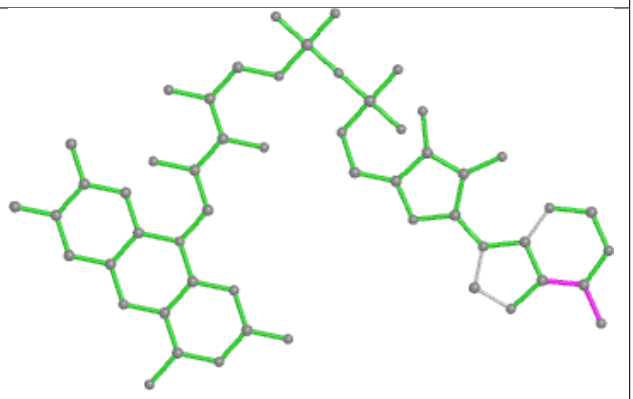


Rings

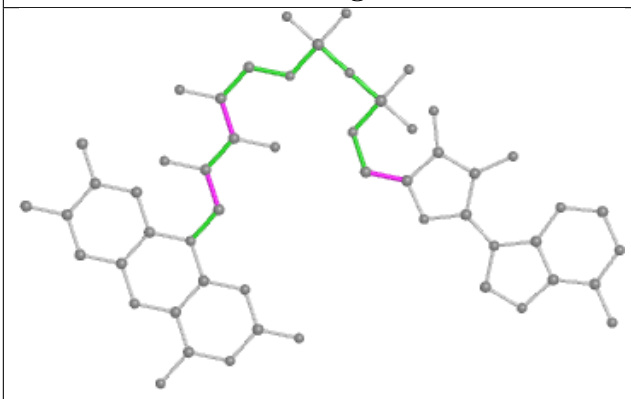
Ligand FAD A 701



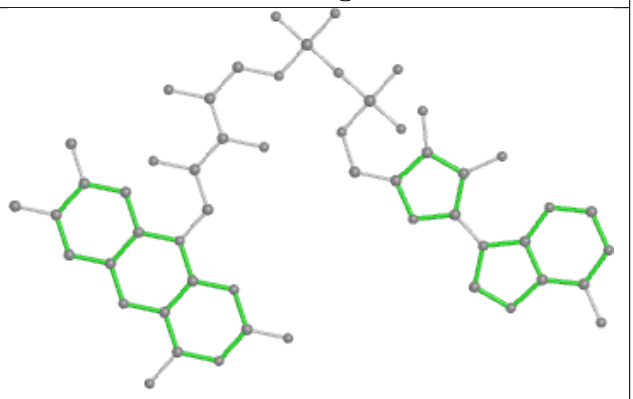
Bond lengths



Bond angles

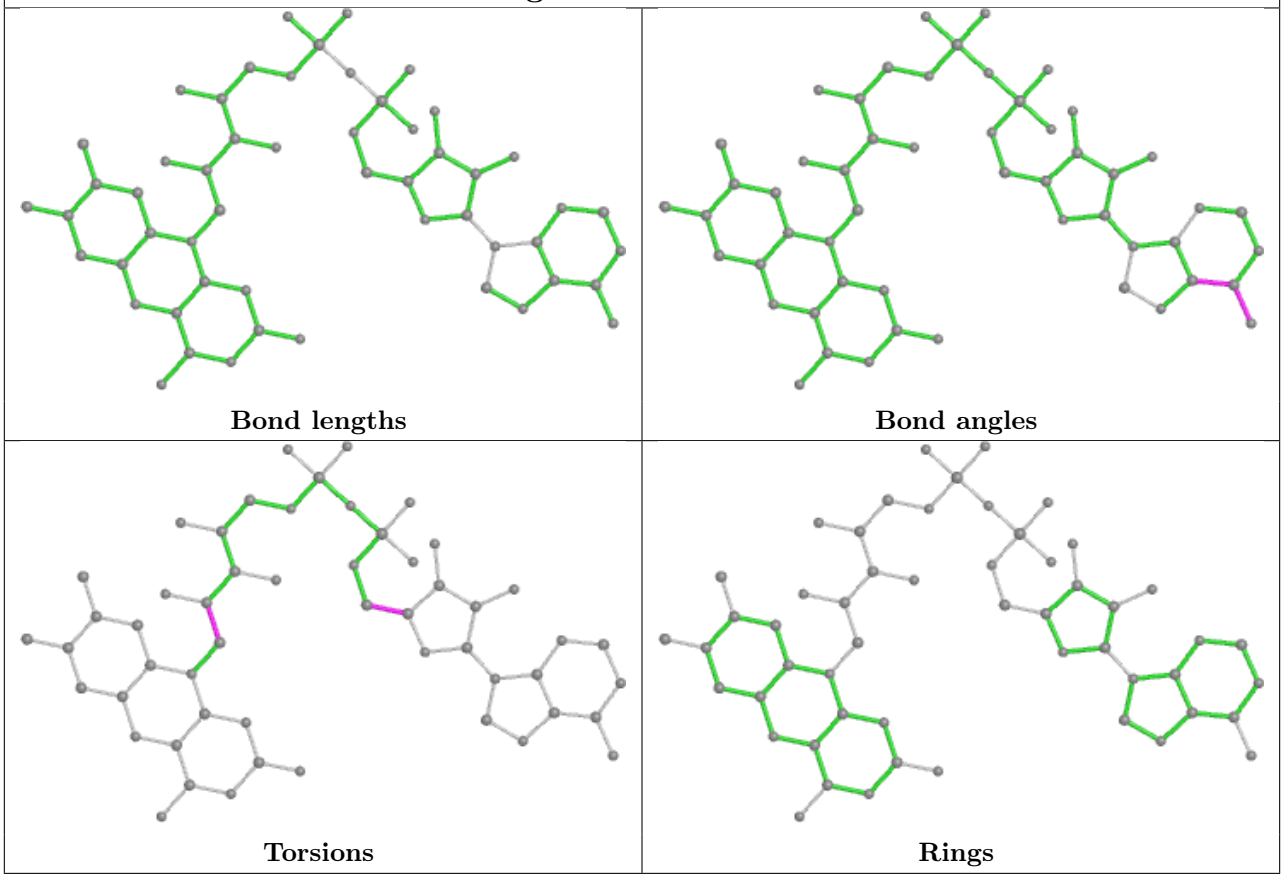


Torsions



Rings

Ligand FAD B 701



5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95^{th} percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	A	637/663 (96%)	0.15	26 (4%)	37	40	31, 43, 71, 105	0
1	B	638/663 (96%)	0.17	26 (4%)	37	40	30, 43, 74, 107	0
All	All	1275/1326 (96%)	0.16	52 (4%)	37	40	30, 43, 73, 107	0

All (52) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	190	LEU	6.7
1	A	609	LEU	5.5
1	A	628	CYS	4.5
1	A	630	PHE	4.4
1	A	606	ILE	4.2
1	A	608	SER	3.6
1	A	632	ALA	3.5
1	A	629	LYS	3.5
1	A	639	ARG	3.5
1	B	327	ASP	3.4
1	B	606	ILE	3.3
1	A	1	MET	3.3
1	B	609	LEU	3.3
1	B	632	ALA	3.1
1	A	636	GLU	2.9
1	A	137	PHE	2.9
1	A	631	GLU	2.8
1	B	633	GLN	2.8
1	A	635	ILE	2.7
1	B	607	SER	2.7
1	B	602	LEU	2.7
1	B	192	LYS	2.7
1	B	370[A]	ARG	2.7
1	B	640	ARG	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	190	LEU	2.6
1	B	655	SER	2.6
1	A	607	SER	2.6
1	A	370[A]	ARG	2.5
1	A	502	LEU	2.5
1	B	191	GLY	2.4
1	A	602	LEU	2.4
1	B	635	ILE	2.4
1	A	40	ARG	2.4
1	B	630	PHE	2.4
1	A	106	LYS	2.4
1	B	639	ARG	2.3
1	B	107	ASP	2.3
1	B	1	MET	2.3
1	A	633	GLN	2.3
1	A	347[A]	LEU	2.3
1	B	596	ARG	2.3
1	B	106	LYS	2.2
1	B	584	HIS	2.2
1	B	597	LEU	2.2
1	A	451	ARG	2.2
1	B	599	LEU	2.2
1	B	110	LEU	2.2
1	A	132	ARG	2.1
1	A	556	VAL	2.1
1	A	328	ALA	2.1
1	B	137	PHE	2.0
1	B	555	THR	2.0

6.2 Non-standard residues in protein, DNA, RNA chains (i)

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

6.3 Carbohydrates (i)

There are no monosaccharides in this entry.

6.4 Ligands (i)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

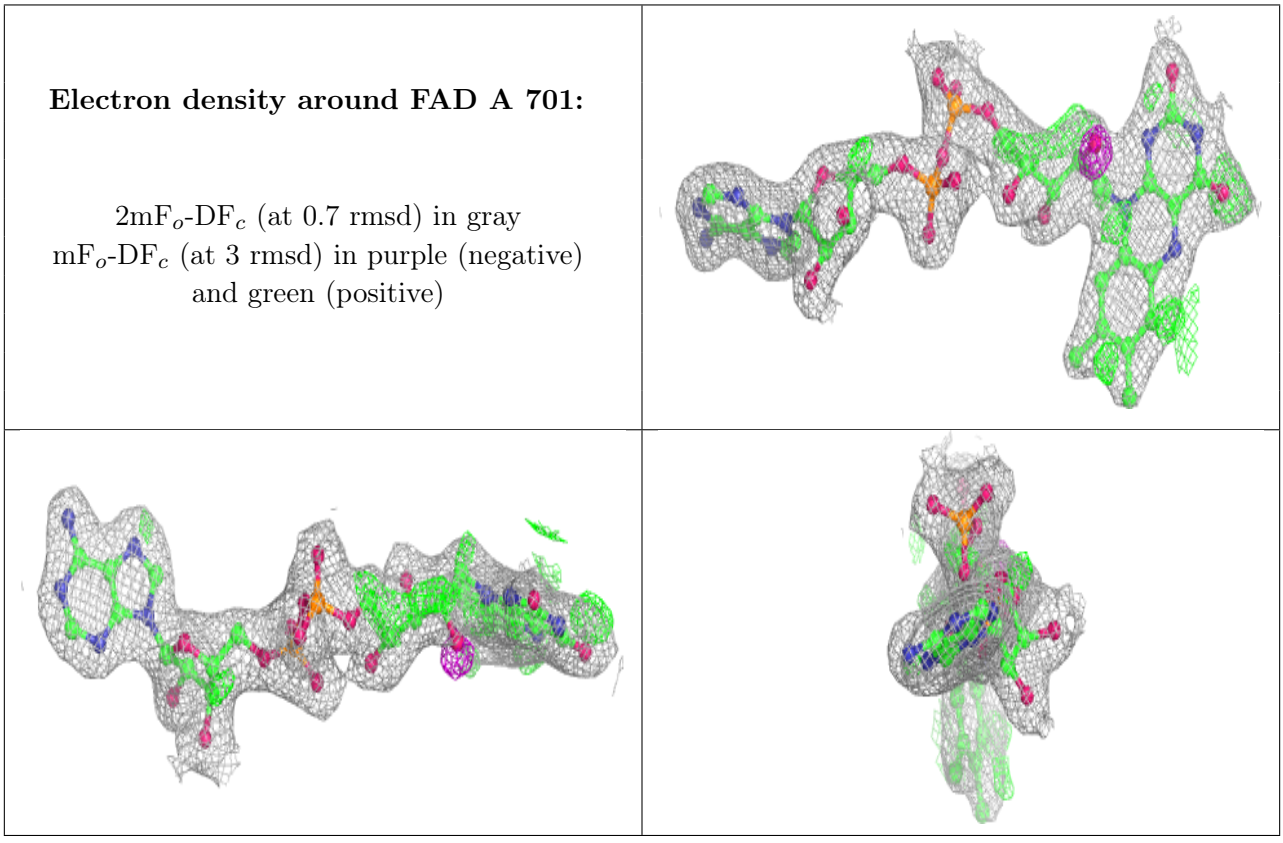
median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	PEG	B	703	7/7	0.74	0.25	45,55,60,60	17
4	PEG	A	704	7/7	0.77	0.19	43,57,66,72	17
4	PEG	A	703	7/7	0.82	0.20	46,55,59,59	17
4	PEG	B	704	7/7	0.83	0.15	44,55,64,64	0
2	FAD	A	701	53/53	0.95	0.15	33,40,46,51	0
2	FAD	B	701	53/53	0.95	0.15	36,42,47,48	0
3	64X	B	702	16/16	0.97	0.09	33,38,46,52	0
3	64X	A	702	16/16	0.98	0.09	33,39,47,52	0
5	CL	A	705[A]	1/1	0.98	0.16	43,43,43,43	1
5	CL	B	705	1/1	0.98	0.05	53,53,53,53	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.

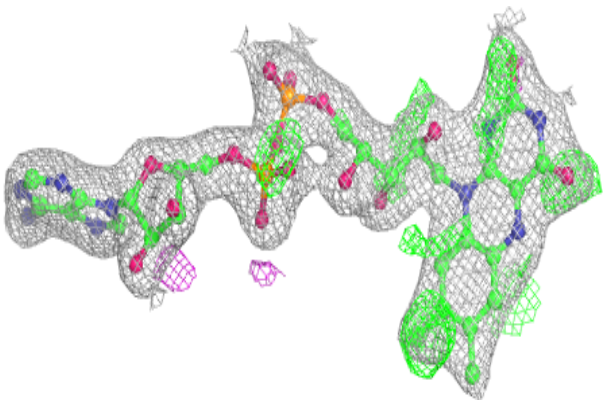
Electron density around FAD A 701:

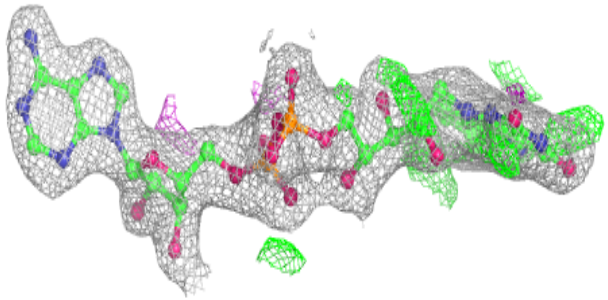
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

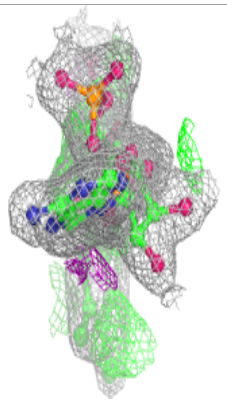


Electron density around FAD B 701:

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

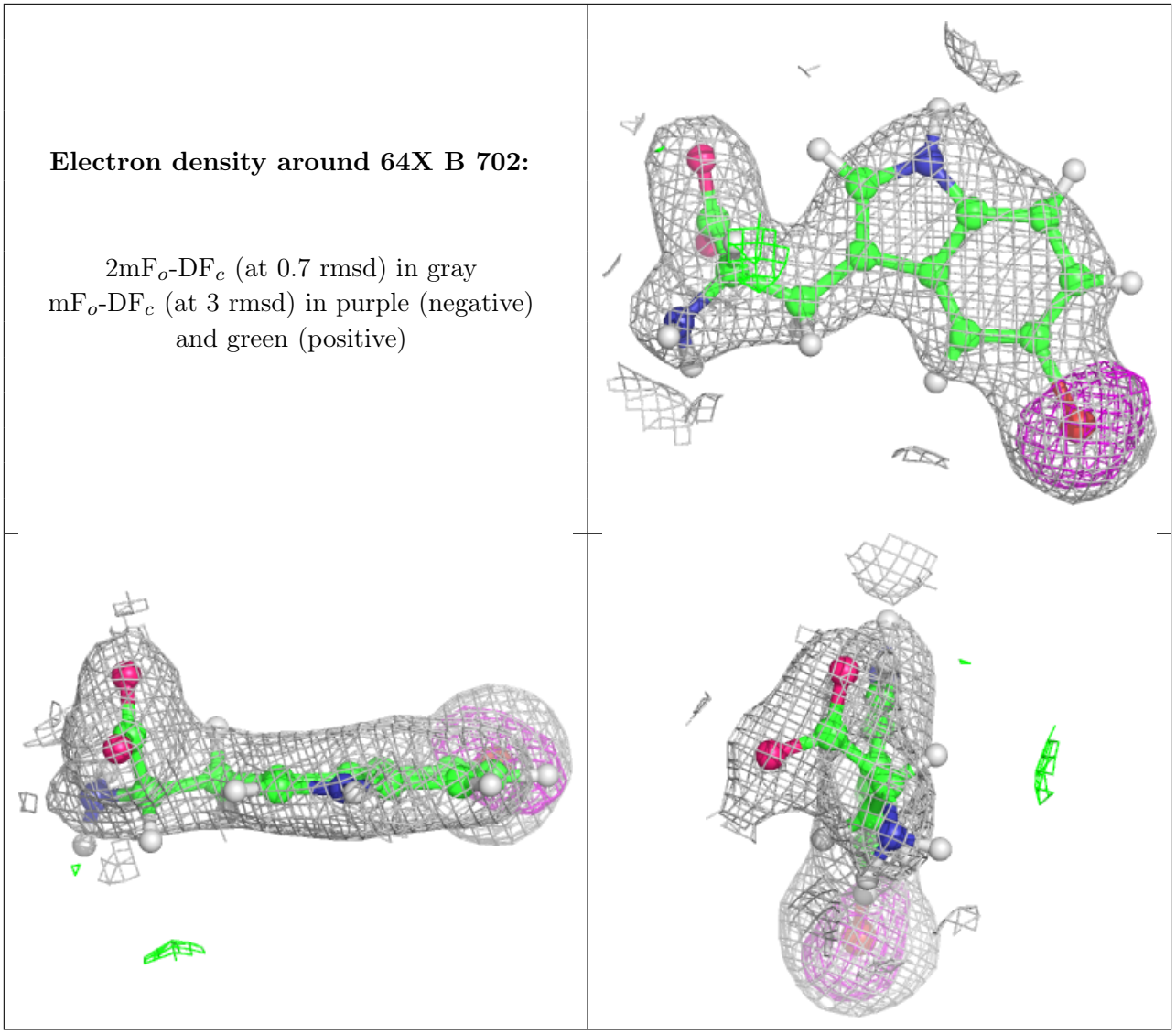






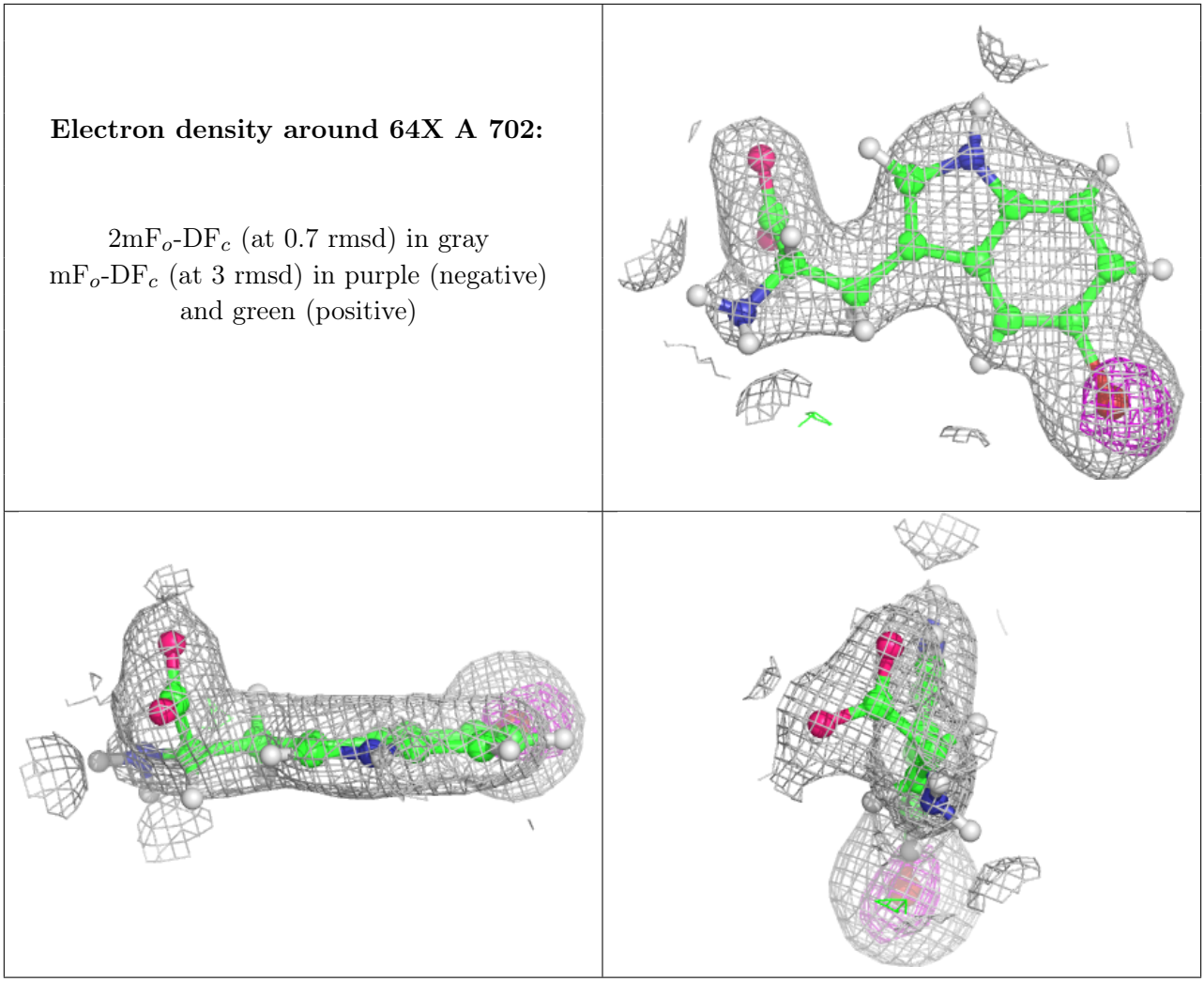
Electron density around 64X B 702:

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



Electron density around 64X A 702:

$2mF_o$-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.