



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 11, 2024 – 06:09 PM JST

PDB ID : 8JZ4
Title : Crystal structure of AetF in complex with FAD and 5-bromo-L-tryptophan
Authors : Li, H.; Dai, L.; Chen, C.-C.; Guo, R.-T.
Deposited on : 2023-07-04
Resolution : 2.08 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 : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
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) : 2.36

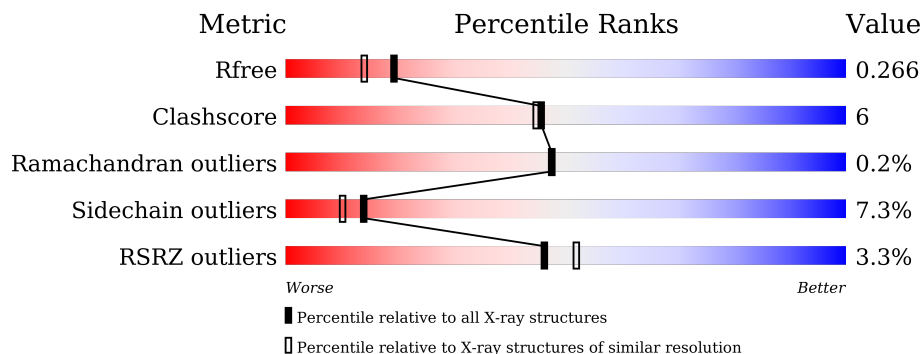
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

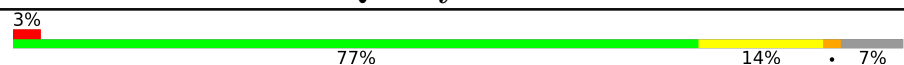
The reported resolution of this entry is 2.08 Å.

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	6189 (2.10-2.06)
Clashscore	141614	6738 (2.10-2.06)
Ramachandran outliers	138981	6663 (2.10-2.06)
Sidechain outliers	138945	6664 (2.10-2.06)
RSRZ outliers	127900	6057 (2.10-2.06)

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	679	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 5671 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.

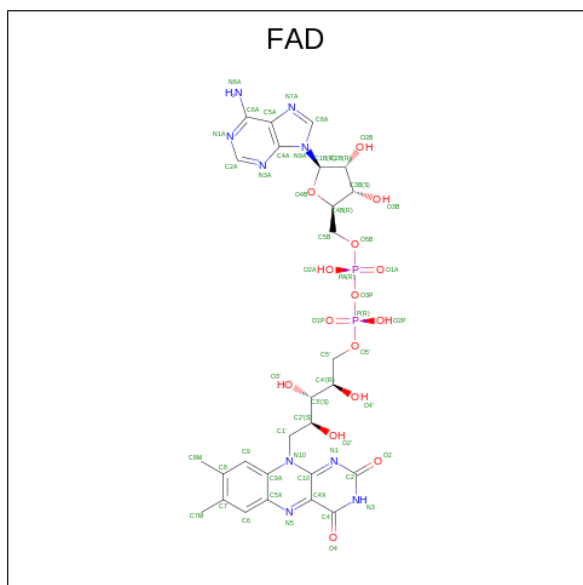
- Molecule 1 is a protein called AetF.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	630	5217	3353	881	968	15	0	0	0

There are 11 discrepancies between the modelled and reference sequences:

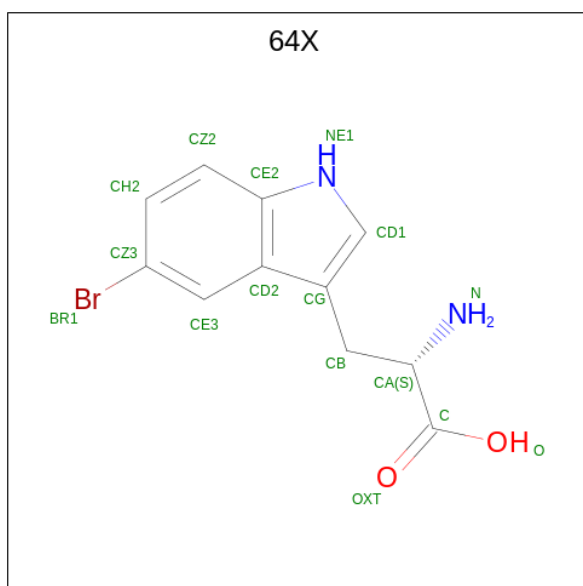
Chain	Residue	Modelled	Actual	Comment	Reference
A	-10	GLY	-	expression tag	UNP A0A861B9Z9
A	-9	ALA	-	expression tag	UNP A0A861B9Z9
A	-8	GLY	-	expression tag	UNP A0A861B9Z9
A	-7	ALA	-	expression tag	UNP A0A861B9Z9
A	-6	GLY	-	expression tag	UNP A0A861B9Z9
A	-5	ALA	-	expression tag	UNP A0A861B9Z9
A	-4	GLY	-	expression tag	UNP A0A861B9Z9
A	-3	ALA	-	expression tag	UNP A0A861B9Z9
A	-2	GLY	-	expression tag	UNP A0A861B9Z9
A	-1	ALA	-	expression tag	UNP A0A861B9Z9
A	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
			Total	C	N	O	P		
2	A	1	53	27	9	15	2	0	0

- 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
			Total	Br	C	N	O		
3	A	1	16	1	11	2	2	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	385	Total 385	O 385	0	0

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	58.61Å 75.94Å 144.24Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	24.51 – 2.08 24.50 – 2.07	Depositor EDS
% Data completeness (in resolution range)	88.3 (24.51-2.08) 88.4 (24.50-2.07)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.90 (at 2.06Å)	Xtrriage
Refinement program	REFMAC 5.8.0238	Depositor
R, R_{free}	0.190 , 0.261 0.198 , 0.266	Depositor DCC
R_{free} test set	1769 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å ²)	24.8	Xtrriage
Anisotropy	0.195	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 43.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	5671	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 4.00% 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: 64X, FAD

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	0.69	0/5352	0.82	0/7250

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 [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	5217	0	5076	66	0
2	A	53	0	31	0	0
3	A	16	0	0	0	0
4	A	385	0	0	13	0
All	All	5671	0	5107	66	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 6.

All (66) 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:316:ILE:HB	4:A:818:HOH:O	1.67	0.94
1:A:237:ILE:HG23	1:A:297:LEU:HD11	1.59	0.83
1:A:574:LYS:O	1:A:577:PRO:HD2	1.81	0.80
1:A:485:GLN:HG3	4:A:1145:HOH:O	1.82	0.79
1:A:509:SER:HB3	4:A:865:HOH:O	1.83	0.78
1:A:231:TYR:HA	1:A:237:ILE:HD11	1.72	0.71
1:A:314:ALA:HB3	4:A:818:HOH:O	1.91	0.70
1:A:237:ILE:HG23	1:A:297:LEU:CD1	2.21	0.69
1:A:349:ARG:HD2	1:A:425:ASP:OD2	1.93	0.68
1:A:73:TYR:OH	1:A:186:GLU:HG3	1.95	0.65
1:A:231:TYR:CA	1:A:237:ILE:HD11	2.27	0.65
1:A:231:TYR:HB3	1:A:237:ILE:HD11	1.79	0.64
1:A:633:GLN:HE21	1:A:633:GLN:N	1.96	0.63
1:A:231:TYR:CB	1:A:237:ILE:HD11	2.29	0.62
1:A:236:LEU:HD23	4:A:1113:HOH:O	2.00	0.62
1:A:365:PHE:HB3	1:A:368:TYR:HD2	1.65	0.61
1:A:310:THR:HA	1:A:318:ARG:O	2.02	0.59
1:A:153:ASP:HB3	1:A:325:LYS:O	2.02	0.59
1:A:122:LYS:HG2	1:A:123:HIS:CD2	2.38	0.58
1:A:215:LEU:HB2	1:A:504:ILE:HD11	1.84	0.58
1:A:173:ILE:HB	1:A:295:VAL:HG22	1.84	0.58
1:A:490:LYS:HE2	4:A:1157:HOH:O	2.03	0.57
1:A:365:PHE:HB3	1:A:368:TYR:CD2	2.39	0.57
1:A:560:GLU:HB2	4:A:805:HOH:O	2.03	0.57
1:A:370:ARG:CZ	4:A:933:HOH:O	2.52	0.57
1:A:596:ARG:HG3	1:A:597:LEU:N	2.20	0.56
1:A:485:GLN:HE21	1:A:485:GLN:HA	1.70	0.55
1:A:597:LEU:C	1:A:597:LEU:HD13	2.28	0.54
1:A:653:ARG:O	1:A:653:ARG:HG3	2.08	0.53
1:A:73:TYR:OH	1:A:195:THR:HG22	2.08	0.53
1:A:69:GLU:O	1:A:490:LYS:NZ	2.36	0.52
1:A:610:PRO:O	1:A:635:ILE:HG21	2.10	0.51
1:A:349:ARG:NH2	1:A:419:ALA:O	2.45	0.50
1:A:496:GLN:HE21	1:A:497:VAL:N	2.09	0.50
1:A:566:LYS:HE2	1:A:566:LYS:N	2.26	0.50
1:A:110:LEU:HD11	1:A:118:THR:HG23	1.94	0.50
1:A:585:TYR:CD1	4:A:1181:HOH:O	2.55	0.50
1:A:446:GLN:HE21	1:A:448:ASN:HD21	1.60	0.49
1:A:44:SER:OG	1:A:46:ARG:HG3	2.13	0.49
1:A:49:PHE:HB2	4:A:1086:HOH:O	2.12	0.49
1:A:633:GLN:HE21	1:A:633:GLN:CA	2.25	0.49
1:A:167:ILE:N	1:A:168:PRO:CD	2.77	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:296:ILE:HD12	1:A:298:VAL:HG13	1.97	0.47
1:A:222:PRO:HA	1:A:231:TYR:CZ	2.50	0.47
1:A:222:PRO:HA	1:A:231:TYR:CE1	2.51	0.46
1:A:493:HIS:ND1	4:A:811:HOH:O	2.36	0.45
1:A:224:THR:HG22	1:A:231:TYR:OH	2.17	0.45
1:A:452:SER:O	1:A:606:ILE:HD11	2.17	0.45
1:A:39:ASP:OD1	4:A:801:HOH:O	2.21	0.44
1:A:446:GLN:NE2	1:A:448:ASN:HD21	2.16	0.44
1:A:653:ARG:C	4:A:971:HOH:O	2.56	0.44
1:A:180:PHE:CE2	1:A:237:ILE:HG22	2.53	0.44
1:A:254:LEU:HD23	1:A:372:PHE:CZ	2.54	0.43
1:A:237:ILE:CG2	1:A:297:LEU:HD11	2.41	0.43
1:A:495:ALA:O	1:A:499:VAL:HG23	2.18	0.42
1:A:218:SER:N	1:A:219:PRO:CD	2.82	0.42
1:A:314:ALA:O	1:A:316:ILE:HD13	2.20	0.42
1:A:576:ALA:N	1:A:577:PRO:CD	2.83	0.42
1:A:558:ASP:O	1:A:561:TRP:N	2.52	0.42
1:A:596:ARG:HG3	1:A:597:LEU:H	1.85	0.42
1:A:597:LEU:O	1:A:600:SER:OG	2.27	0.41
1:A:370:ARG:O	1:A:427:THR:HA	2.20	0.41
1:A:46:ARG:NH1	1:A:140:ASN:O	2.54	0.40
1:A:183:LEU:O	1:A:258:LYS:HA	2.22	0.40
1:A:296:ILE:HD12	1:A:298:VAL:CG1	2.51	0.40
1:A:229:VAL:HG12	1:A:232:ASN:ND2	2.37	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	624/679 (92%)	596 (96%)	27 (4%)	1 (0%)	47 47

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	327	ASP

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	572/603 (95%)	530 (93%)	42 (7%)	14 10

All (42) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	37	VAL
1	A	117	LYS
1	A	118	THR
1	A	143	ASN
1	A	145	VAL
1	A	178	ASN
1	A	184	ASP
1	A	192	LYS
1	A	208	SER
1	A	231	TYR
1	A	257	ILE
1	A	271	ASP
1	A	273	LEU
1	A	304	ILE
1	A	305	ASN
1	A	308	LYS
1	A	321	HIS
1	A	330	GLN
1	A	341	GLU
1	A	342	THR
1	A	345	GLU
1	A	359	ARG
1	A	370	ARG
1	A	426	HIS

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Mol	Chain	Res	Type
1	A	456	LEU
1	A	457	LEU
1	A	483	LEU
1	A	485	GLN
1	A	492	ASP
1	A	496	GLN
1	A	504	ILE
1	A	520	ARG
1	A	548	GLU
1	A	551	SER
1	A	560	GLU
1	A	566	LYS
1	A	589	GLU
1	A	596	ARG
1	A	607	SER
1	A	631	GLU
1	A	633	GLN
1	A	653	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	28	GLN
1	A	83	HIS
1	A	169	ASN
1	A	264	GLN
1	A	305	ASN
1	A	330	GLN
1	A	426	HIS
1	A	446	GLN
1	A	485	GLN
1	A	496	GLN
1	A	500	GLN
1	A	592	ASN
1	A	633	GLN

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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

2 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	64X	A	702	-	15,17,17	2.23	6 (40%)	17,24,24	1.10	1 (5%)
2	FAD	A	701	-	53,58,58	0.66	0	68,89,89	0.87	1 (1%)

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
2	FAD	A	701	-	-	3/30/50/50	0/6/6/6

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	702	64X	BR1-CZ3	4.12	1.98	1.90
3	A	702	64X	CE3-CD2	-3.75	1.34	1.42
3	A	702	64X	CZ2-CE2	-3.22	1.36	1.41
3	A	702	64X	CD2-CE2	-2.55	1.35	1.42
3	A	702	64X	CE3-CZ3	2.34	1.40	1.36
3	A	702	64X	CD1-NE1	-2.31	1.31	1.36

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	701	FAD	C5A-C6A-N6A	2.48	124.12	120.35
3	A	702	64X	CH2-CZ3-CE3	-2.12	119.04	121.99

There are no chirality outliers.

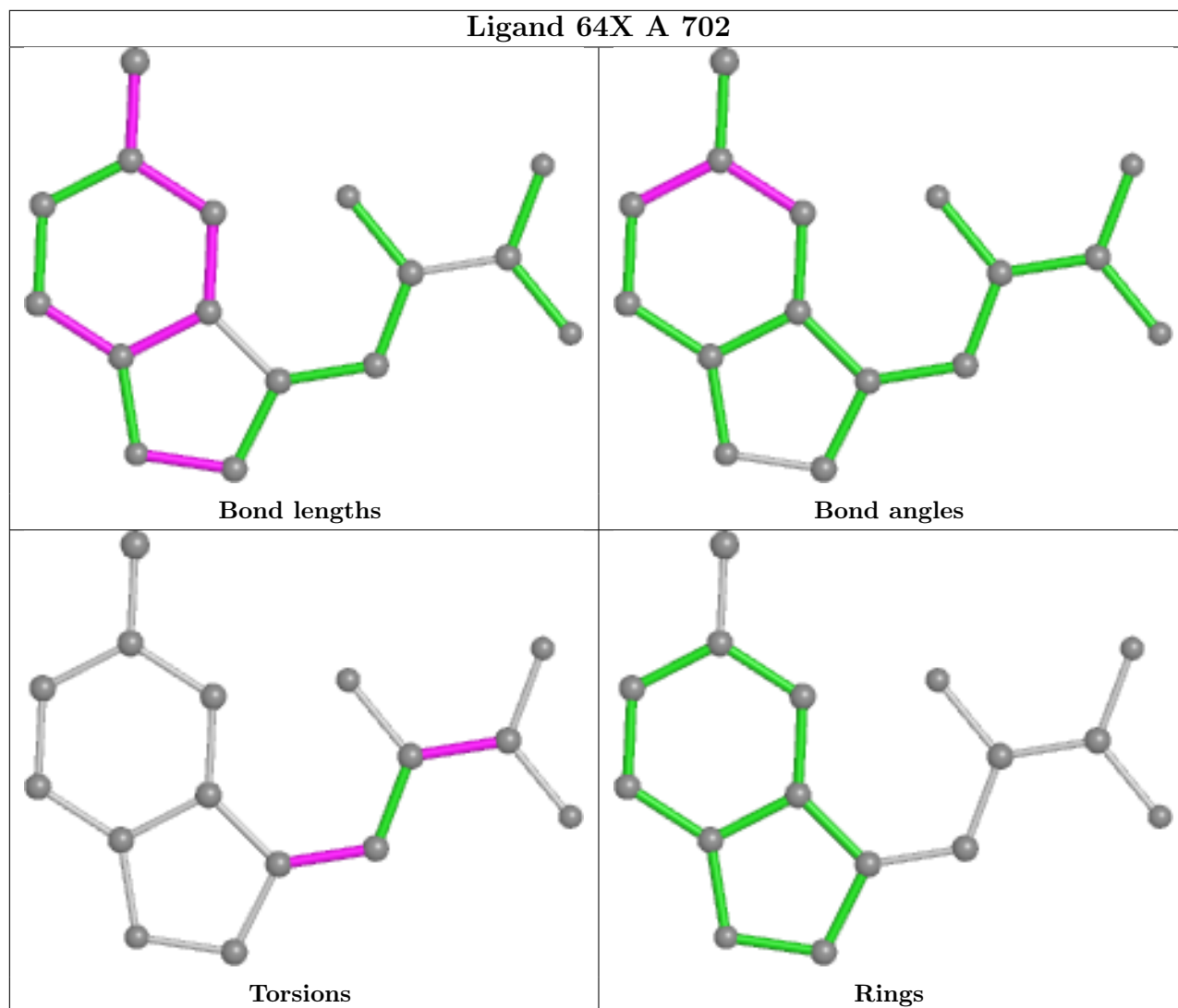
All (6) torsion outliers are listed below:

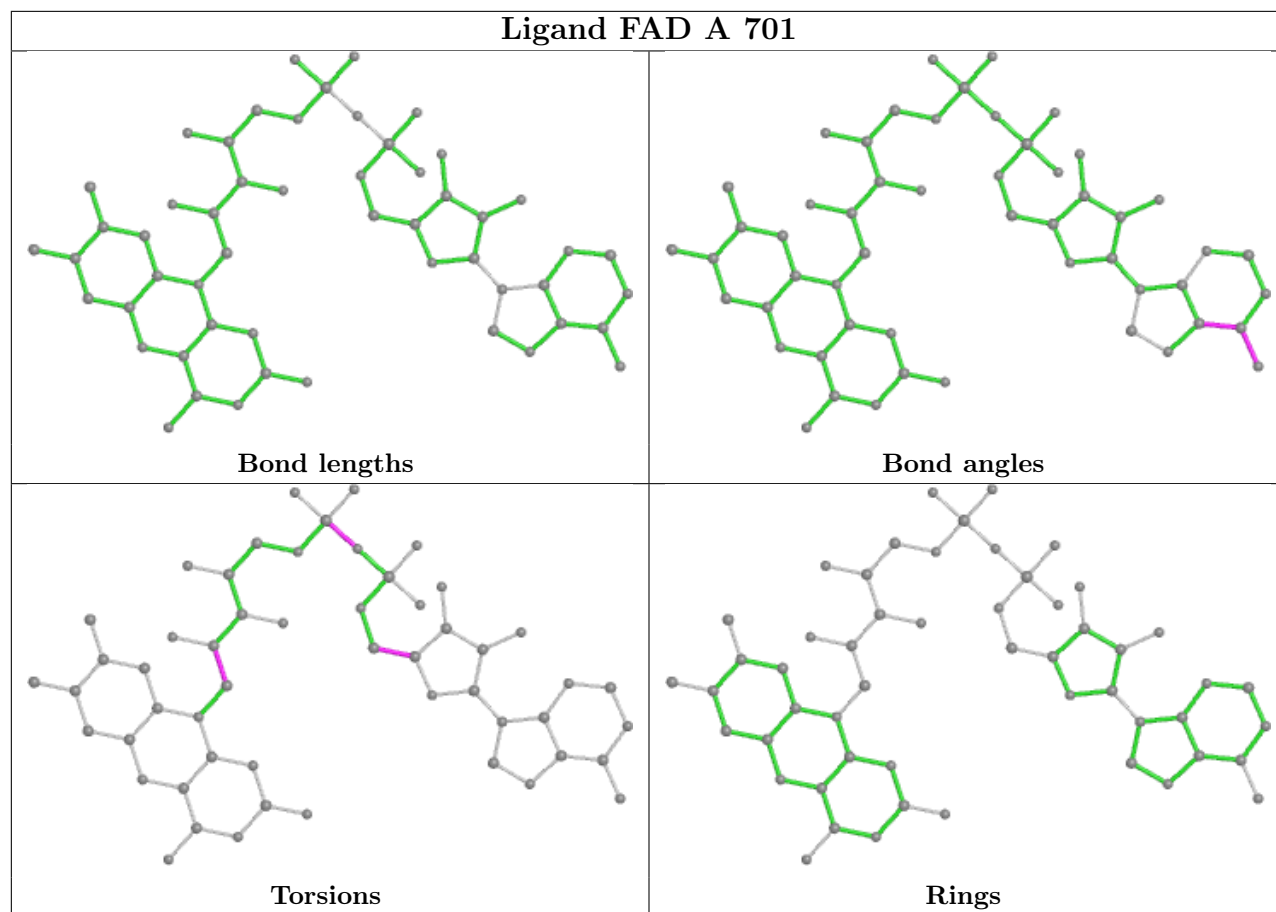
Mol	Chain	Res	Type	Atoms
2	A	701	FAD	N10-C1'-C2'-C3'
3	A	702	64X	OXT-C-CA-N
3	A	702	64X	O-C-CA-N
2	A	701	FAD	PA-O3P-P-O5'
3	A	702	64X	CA-CB-CG-CD1
2	A	701	FAD	O4B-C4B-C5B-O5B

There are no ring outliers.

No monomer is involved in short contacts.

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	630/679 (92%)	0.01	21 (3%) 46 52	13, 30, 62, 85	0

All (21) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	577	PRO	3.8
1	A	632	ALA	3.8
1	A	330	GLN	3.6
1	A	315	GLY	3.3
1	A	317	GLU	2.9
1	A	585	TYR	2.8
1	A	578	ASN	2.8
1	A	141	PHE	2.7
1	A	271	ASP	2.7
1	A	553	ASP	2.6
1	A	574	LYS	2.5
1	A	339	ASN	2.5
1	A	144	HIS	2.4
1	A	596	ARG	2.4
1	A	341	GLU	2.3
1	A	554	ASP	2.3
1	A	327	ASP	2.2
1	A	555	THR	2.2
1	A	552	VAL	2.2
1	A	653	ARG	2.0
1	A	316	ILE	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](#)

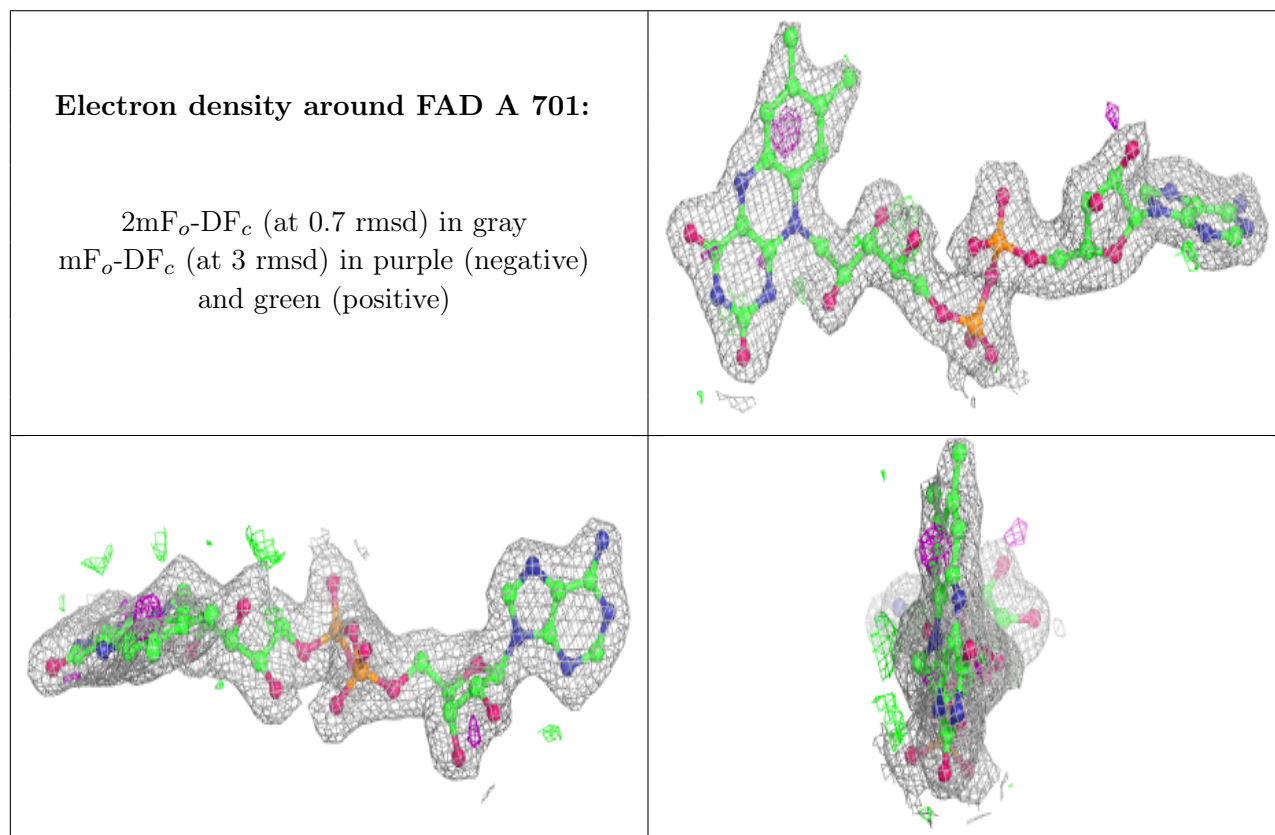
There are no monosaccharides in this entry.

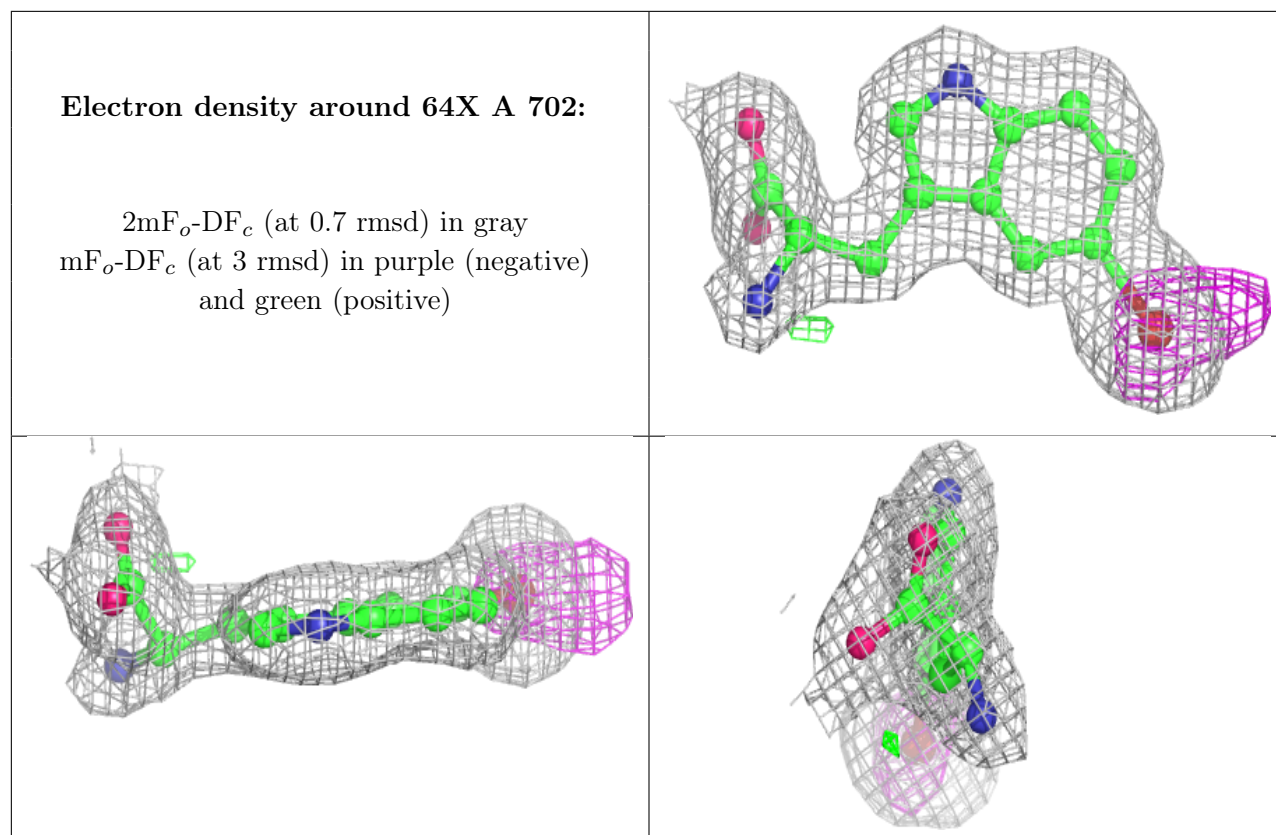
6.4 Ligands [i](#)

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
2	FAD	A	701	53/53	0.95	0.10	17,25,38,41	0
3	64X	A	702	16/16	0.99	0.07	20,22,27,31	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.





6.5 Other polymers [i](#)

There are no such residues in this entry.