



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 15, 2023 – 02:49 PM EDT

PDB ID : 7V0B
Title : Crystal structure of halogenase CtcP from Kitasatospora aureofaciens in complex with FAD
Authors : Hou, C.; Tsodikov, O.V.
Deposited on : 2022-05-10
Resolution : 2.15 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

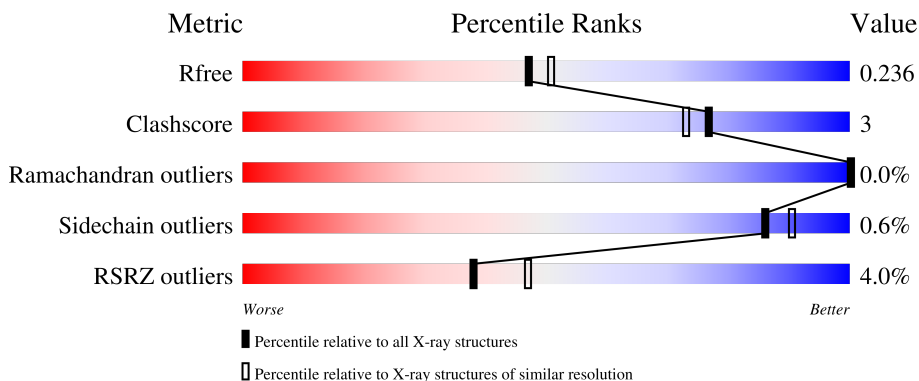
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.15 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	1479 (2.16-2.16)
Clashscore	141614	1585 (2.16-2.16)
Ramachandran outliers	138981	1560 (2.16-2.16)
Sidechain outliers	138945	1559 (2.16-2.16)
RSRZ outliers	127900	1456 (2.16-2.16)

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	558	 4% 90% 6%
1	B	558	 4% 87% 7% 5%
1	C	558	 3% 89% 6%
1	D	558	 4% 87% 7% 6%

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 18178 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 Tetracycline 7-halogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	539	4293	2699	776	798	20	0	0	0
1	B	528	4209	2651	759	780	19	0	0	0
1	C	535	4264	2682	769	794	19	0	0	0
1	D	527	4207	2649	758	781	19	0	0	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	GLY	-	expression tag	UNP A0A1E7MYN1
A	-1	PRO	-	expression tag	UNP A0A1E7MYN1
A	0	HIS	-	expression tag	UNP A0A1E7MYN1
B	-2	GLY	-	expression tag	UNP A0A1E7MYN1
B	-1	PRO	-	expression tag	UNP A0A1E7MYN1
B	0	HIS	-	expression tag	UNP A0A1E7MYN1
C	-2	GLY	-	expression tag	UNP A0A1E7MYN1
C	-1	PRO	-	expression tag	UNP A0A1E7MYN1
C	0	HIS	-	expression tag	UNP A0A1E7MYN1
D	-2	GLY	-	expression tag	UNP A0A1E7MYN1
D	-1	PRO	-	expression tag	UNP A0A1E7MYN1
D	0	HIS	-	expression tag	UNP A0A1E7MYN1

- 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
2	B	1	53	27	9	15	2	0	0
2	C	1	53	27	9	15	2	0	0
2	D	1	53	27	9	15	2	0	0

- Molecule 3 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).

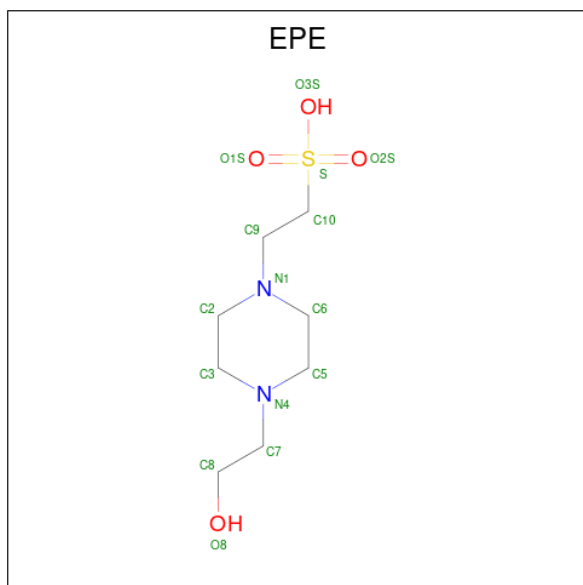


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			6	3	3		
3	B	1	Total	C	O	0	0
			6	3	3		
3	C	1	Total	C	O	0	0
			6	3	3		

- Molecule 4 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Cl	0	0
			1	1		
4	B	1	Total	Cl	0	0
			1	1		
4	C	1	Total	Cl	0	0
			1	1		
4	D	1	Total	Cl	0	0
			1	1		

- Molecule 5 is 4-(2-HYDROXYETHYL)-1-PIPERAZINE ETHANESULFONIC ACID (three-letter code: EPE) (formula: C₈H₁₈N₂O₄S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	B	1	Total	C	N	O	S	0	0
			15	8	2	4	1		
5	C	1	Total	C	N	O	S	0	0
			13	7	2	3	1		

- Molecule 6 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	C	1	Total 1	Na 1	0	0

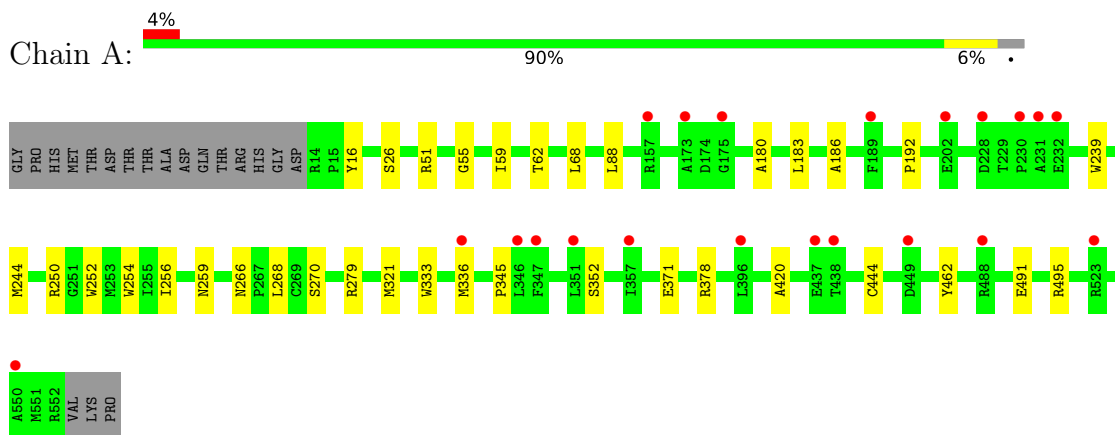
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	339	Total 339	O 339	0	0
7	B	282	Total 282	O 282	0	0
7	C	215	Total 215	O 215	0	0
7	D	106	Total 106	O 106	0	0

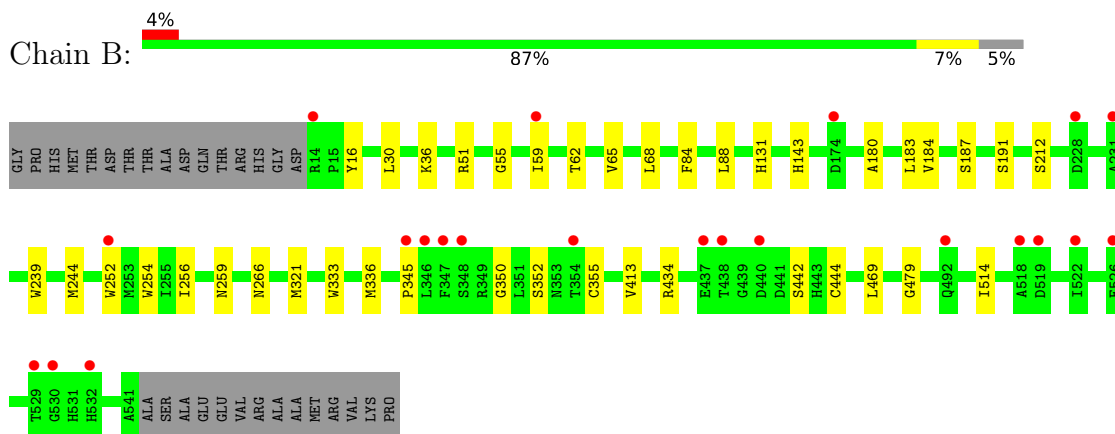
3 Residue-property plots [i](#)

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.

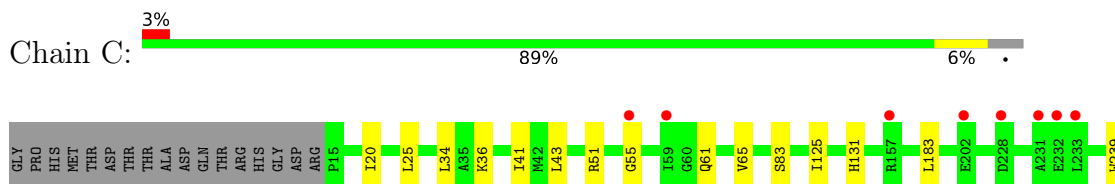
- Molecule 1: Tetracycline 7-halogenase

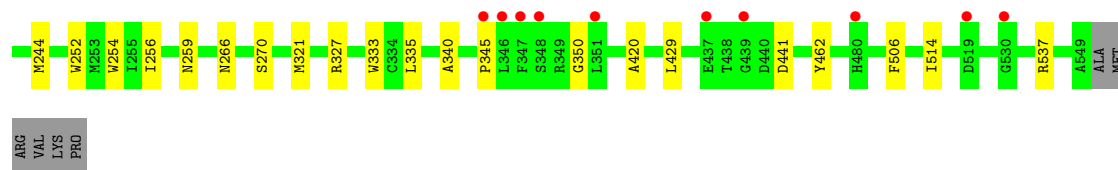


- Molecule 1: Tetracycline 7-halogenase



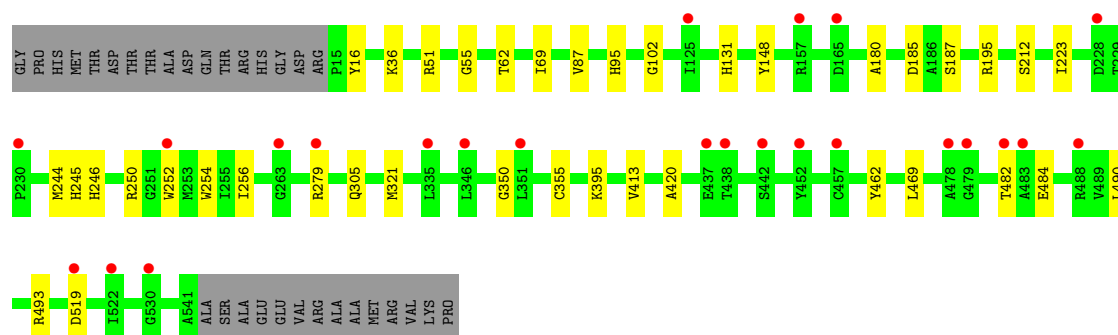
- Molecule 1: Tetracycline 7-halogenase





● Molecule 1: Tetracycline 7-halogenase

Chain D: 4% 87% 7% 6%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	62.76Å 103.58Å 179.22Å 90.00° 95.40° 90.00°	Depositor
Resolution (Å)	35.00 – 2.15 35.61 – 2.14	Depositor EDS
% Data completeness (in resolution range)	96.9 (35.00-2.15) 95.9 (35.61-2.14)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.78 (at 2.14Å)	Xtrriage
Refinement program	REFMAC 5.8.0267	Depositor
R, R_{free}	0.188 , 0.233 0.194 , 0.236	Depositor DCC
R_{free} test set	6222 reflections (5.13%)	wwPDB-VP
Wilson B-factor (Å ²)	25.6	Xtrriage
Anisotropy	0.676	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 45.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	18178	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.86% 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: EPE, NA, GOL, CL, 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	0.63	0/4409	0.72	0/5990
1	B	0.63	0/4325	0.73	0/5878
1	C	0.64	0/4380	0.72	0/5951
1	D	0.64	0/4323	0.71	0/5874
All	All	0.63	0/17437	0.72	0/23693

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	4293	0	4093	28	0
1	B	4209	0	4010	27	0
1	C	4264	0	4065	23	0
1	D	4207	0	4011	25	0
2	A	53	0	31	6	0
2	B	53	0	31	5	0
2	C	53	0	31	5	0
2	D	53	0	31	5	0
3	A	6	0	8	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	6	0	8	0	0
3	C	6	0	8	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	C	1	0	0	0	0
4	D	1	0	0	0	0
5	B	15	0	18	0	0
5	C	13	0	13	1	0
6	C	1	0	0	0	0
7	A	339	0	0	2	0
7	B	282	0	0	1	0
7	C	215	0	0	1	0
7	D	106	0	0	2	0
All	All	18178	0	16358	101	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 (101) 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:C:55:GLY:HA2	2:C:601:FAD:C4X	2.13	0.77
1:A:55:GLY:HA2	2:A:601:FAD:C4X	2.16	0.75
1:A:62:THR:HG21	7:A:835:HOH:O	1.87	0.74
1:B:55:GLY:HA2	2:B:601:FAD:C4X	2.17	0.74
1:D:321:MET:HE2	2:D:601:FAD:HM83	1.74	0.69
1:D:62:THR:HG21	7:D:712:HOH:O	1.94	0.68
1:C:345:PRO:HG3	2:C:601:FAD:C6	2.26	0.65
1:A:336:MET:HG3	7:A:939:HOH:O	1.98	0.63
1:D:55:GLY:HA2	2:D:601:FAD:C4X	2.29	0.62
1:A:491:GLU:OE2	1:A:495:ARG:NH1	2.33	0.61
1:B:30:LEU:HD22	1:B:336:MET:HE1	1.83	0.59
1:B:350:GLY:HA3	2:B:601:FAD:H1'2	1.85	0.58
1:A:62:THR:HG22	1:A:352:SER:CA	2.34	0.57
1:B:62:THR:HG22	1:B:352:SER:CA	2.34	0.57
1:A:345:PRO:HG3	2:A:601:FAD:C6	2.36	0.55
1:A:420:ALA:HB2	1:A:462:TYR:CE1	2.42	0.55
1:C:420:ALA:HB2	1:C:462:TYR:CE1	2.41	0.55
1:A:259:ASN:HB3	1:A:266:ASN:O	2.07	0.54
1:A:321:MET:HE2	2:A:601:FAD:HM83	1.89	0.54
1:D:55:GLY:HA2	2:D:601:FAD:C10	2.37	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:321:MET:CE	2:C:601:FAD:HM83	2.38	0.53
1:B:345:PRO:HG3	2:B:601:FAD:C6	2.39	0.53
1:B:321:MET:HE1	2:B:601:FAD:HM83	1.91	0.52
1:B:413:VAL:HG22	1:B:469:LEU:HD11	1.92	0.52
1:B:62:THR:HG21	7:B:734:HOH:O	2.09	0.52
1:A:252:TRP:CZ3	1:A:254:TRP:HB3	2.45	0.51
1:A:239:TRP:HB3	1:A:244:MET:HE3	1.93	0.49
1:D:16:TYR:O	1:D:180:ALA:HA	2.12	0.49
1:B:68:LEU:HD11	1:B:444:CYS:SG	2.52	0.49
1:A:62:THR:HG22	1:A:352:SER:HA	1.94	0.48
1:A:68:LEU:HD11	1:A:444:CYS:SG	2.53	0.48
1:A:183:LEU:O	1:A:333:TRP:HA	2.13	0.48
1:D:185:ASP:OD1	1:D:187:SER:OG	2.28	0.47
1:A:250:ARG:HG3	1:A:279:ARG:CD	2.44	0.47
1:B:62:THR:HG22	1:B:352:SER:HA	1.96	0.47
1:C:183:LEU:O	1:C:333:TRP:HA	2.15	0.47
1:A:239:TRP:CE3	1:A:244:MET:HE1	2.50	0.47
1:D:69:ILE:HD11	1:D:355:CYS:O	2.15	0.47
1:D:420:ALA:HB2	1:D:462:TYR:CZ	2.50	0.47
1:A:26:SER:OG	1:A:186:ALA:HB1	2.15	0.46
1:B:59:ILE:HG12	1:B:62:THR:HG23	1.97	0.46
1:B:321:MET:CE	2:B:601:FAD:HM83	2.46	0.46
1:D:252:TRP:CZ3	1:D:254:TRP:HB3	2.50	0.46
1:B:187:SER:OG	1:B:191:SER:HA	2.15	0.46
1:B:259:ASN:HB3	1:B:266:ASN:O	2.16	0.45
1:C:239:TRP:HB3	1:C:244:MET:HE3	1.98	0.45
1:D:490:LEU:O	1:D:493:ARG:HB3	2.16	0.45
1:A:250:ARG:HG3	1:A:279:ARG:HD2	1.99	0.45
1:C:239:TRP:CE3	1:C:244:MET:HE1	2.51	0.45
1:C:506:PHE:CZ	1:C:514:ILE:HG21	2.51	0.45
1:B:212:SER:HB2	1:B:321:MET:SD	2.56	0.45
1:B:479:GLY:O	1:C:537:ARG:NH2	2.49	0.45
1:B:252:TRP:CZ3	1:B:254:TRP:HB3	2.52	0.45
1:C:20:ILE:HB	1:C:43:LEU:HD23	1.99	0.45
1:C:252:TRP:CZ3	1:C:254:TRP:HB3	2.52	0.45
1:A:16:TYR:O	1:A:180:ALA:HA	2.18	0.44
1:A:371:GLU:OE2	1:A:378:ARG:NH2	2.46	0.44
1:B:239:TRP:CE3	1:B:244:MET:HE1	2.53	0.44
1:C:55:GLY:HA2	2:C:601:FAD:C10	2.48	0.44
1:B:84:PHE:CZ	1:B:88:LEU:HD11	2.53	0.43
1:C:335:LEU:HD23	1:C:340:ALA:HA	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:131:HIS:CG	1:C:256:ILE:HG23	2.53	0.43
1:D:223:ILE:HG21	1:D:244:MET:HE3	2.00	0.43
1:D:246:HIS:HE1	1:D:305:GLN:OE1	2.01	0.43
1:A:192:PRO:HG3	2:A:601:FAD:N6A	2.34	0.43
1:A:321:MET:CE	2:A:601:FAD:HM83	2.48	0.43
1:A:420:ALA:HB2	1:A:462:TYR:CZ	2.53	0.43
1:B:131:HIS:CG	1:B:256:ILE:HG23	2.53	0.43
1:A:256:ILE:HB	1:A:270:SER:HB3	2.01	0.43
1:D:250:ARG:HG3	1:D:279:ARG:HD2	2.00	0.43
1:C:125:ILE:HG13	1:C:429:LEU:HD13	1.99	0.43
1:D:102:GLY:O	1:D:245:HIS:HD2	2.01	0.43
1:D:195:ARG:NH2	7:D:701:HOH:O	2.42	0.43
1:B:16:TYR:O	1:B:180:ALA:HA	2.18	0.42
1:C:327:ARG:HD2	7:C:762:HOH:O	2.18	0.42
1:A:62:THR:HG22	1:A:352:SER:N	2.34	0.42
1:C:256:ILE:HB	1:C:270:SER:HB3	2.01	0.42
1:D:131:HIS:CG	1:D:256:ILE:HG23	2.55	0.42
1:B:184:VAL:HG11	1:B:336:MET:CE	2.49	0.42
1:D:420:ALA:HB2	1:D:462:TYR:CE1	2.55	0.42
1:B:65:VAL:HG12	1:B:355:CYS:HB3	2.01	0.42
1:A:268:LEU:HD11	1:B:143:HIS:CE1	2.55	0.42
1:D:87:VAL:CG1	1:D:95:HIS:CD2	3.03	0.42
1:D:482:THR:HG22	1:D:484:GLU:OE1	2.20	0.42
1:B:131:HIS:CD2	1:B:256:ILE:HG23	2.56	0.41
1:C:34:LEU:HB3	1:C:41:ILE:HD11	2.01	0.41
1:D:350:GLY:HA3	2:D:601:FAD:H1'2	2.01	0.41
1:A:59:ILE:HG12	1:A:62:THR:HG23	2.03	0.41
1:C:350:GLY:HA3	2:C:601:FAD:H1'2	2.03	0.41
1:D:87:VAL:HG12	1:D:95:HIS:CD2	2.56	0.41
1:D:36:LYS:HG3	1:D:148:TYR:CE1	2.55	0.41
1:A:55:GLY:HA2	2:A:601:FAD:C10	2.48	0.41
1:B:183:LEU:O	1:B:333:TRP:HA	2.20	0.41
1:C:259:ASN:HB3	1:C:266:ASN:O	2.21	0.41
1:D:321:MET:CE	2:D:601:FAD:HM83	2.45	0.41
1:D:212:SER:HB2	1:D:321:MET:SD	2.61	0.41
1:B:514:ILE:N	1:B:514:ILE:HD12	2.36	0.40
1:C:441:ASP:OD2	5:C:603:EPE:H32	2.21	0.40
1:C:61:GLN:O	1:C:65:VAL:HG23	2.20	0.40
1:C:25:LEU:HD23	1:C:25:LEU:HA	1.95	0.40
1:D:413:VAL:HG22	1:D:469:LEU:HD11	2.03	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	537/558 (96%)	524 (98%)	13 (2%)	0	100	100
1	B	526/558 (94%)	511 (97%)	14 (3%)	1 (0%)	47	46
1	C	533/558 (96%)	520 (98%)	13 (2%)	0	100	100
1	D	525/558 (94%)	511 (97%)	14 (3%)	0	100	100
All	All	2121/2232 (95%)	2066 (97%)	54 (2%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	442	SER

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	453/470 (96%)	451 (100%)	2 (0%)	91	93
1	B	445/470 (95%)	442 (99%)	3 (1%)	84	89
1	C	451/470 (96%)	448 (99%)	3 (1%)	84	89
1	D	446/470 (95%)	443 (99%)	3 (1%)	84	89
All	All	1795/1880 (96%)	1784 (99%)	11 (1%)	86	90

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	51	ARG
1	A	88	LEU
1	B	36	LYS
1	B	51	ARG
1	B	434	ARG
1	C	36	LYS
1	C	51	ARG
1	C	83	SER
1	D	51	ARG
1	D	395	LYS
1	D	519	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	D	245	HIS
1	D	246	HIS
1	D	492	GLN

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 14 ligands modelled in this entry, 5 are monoatomic - leaving 9 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	GOL	A	602	-	5,5,5	0.12	0	5,5,5	0.30	0
2	FAD	C	601	-	53,58,58	0.60	0	68,89,89	0.78	3 (4%)
5	EPE	B	603	-	15,15,15	0.59	1 (6%)	18,20,20	0.79	1 (5%)
2	FAD	B	601	-	53,58,58	0.59	0	68,89,89	0.75	1 (1%)
2	FAD	D	601	-	53,58,58	0.58	0	68,89,89	0.73	1 (1%)
5	EPE	C	603	-	13,13,15	0.66	1 (7%)	16,18,20	0.75	0
3	GOL	B	602	-	5,5,5	0.08	0	5,5,5	0.24	0
2	FAD	A	601	-	53,58,58	0.62	0	68,89,89	0.82	3 (4%)
3	GOL	C	602	-	5,5,5	0.12	0	5,5,5	0.30	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	GOL	A	602	-	-	0/4/4/4	-
2	FAD	C	601	-	-	11/30/50/50	0/6/6/6
5	EPE	B	603	-	-	1/9/19/19	0/1/1/1
2	FAD	B	601	-	-	2/30/50/50	0/6/6/6
2	FAD	D	601	-	-	1/30/50/50	0/6/6/6
5	EPE	C	603	-	-	2/6/16/19	0/1/1/1
3	GOL	B	602	-	-	0/4/4/4	-
2	FAD	A	601	-	-	12/30/50/50	0/6/6/6
3	GOL	C	602	-	-	0/4/4/4	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	603	EPE	O3S-S	2.14	1.55	1.47
5	C	603	EPE	O3S-S	2.10	1.55	1.47

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	603	EPE	O3S-S-C10	-2.84	101.17	105.77
2	A	601	FAD	C5A-C6A-N6A	2.53	124.20	120.35

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	601	FAD	C5A-C6A-N6A	2.45	124.08	120.35
2	A	601	FAD	O4B-C1B-C2B	-2.36	103.48	106.93
2	D	601	FAD	C5A-C6A-N6A	2.28	123.82	120.35
2	A	601	FAD	C1'-C2'-C3'	2.09	115.63	109.79
2	C	601	FAD	C4-N3-C2	-2.04	121.88	125.64
2	C	601	FAD	C1'-C2'-C3'	2.03	115.46	109.79
2	B	601	FAD	C1'-C2'-C3'	2.01	115.39	109.79

There are no chirality outliers.

All (29) torsion outliers are listed below:

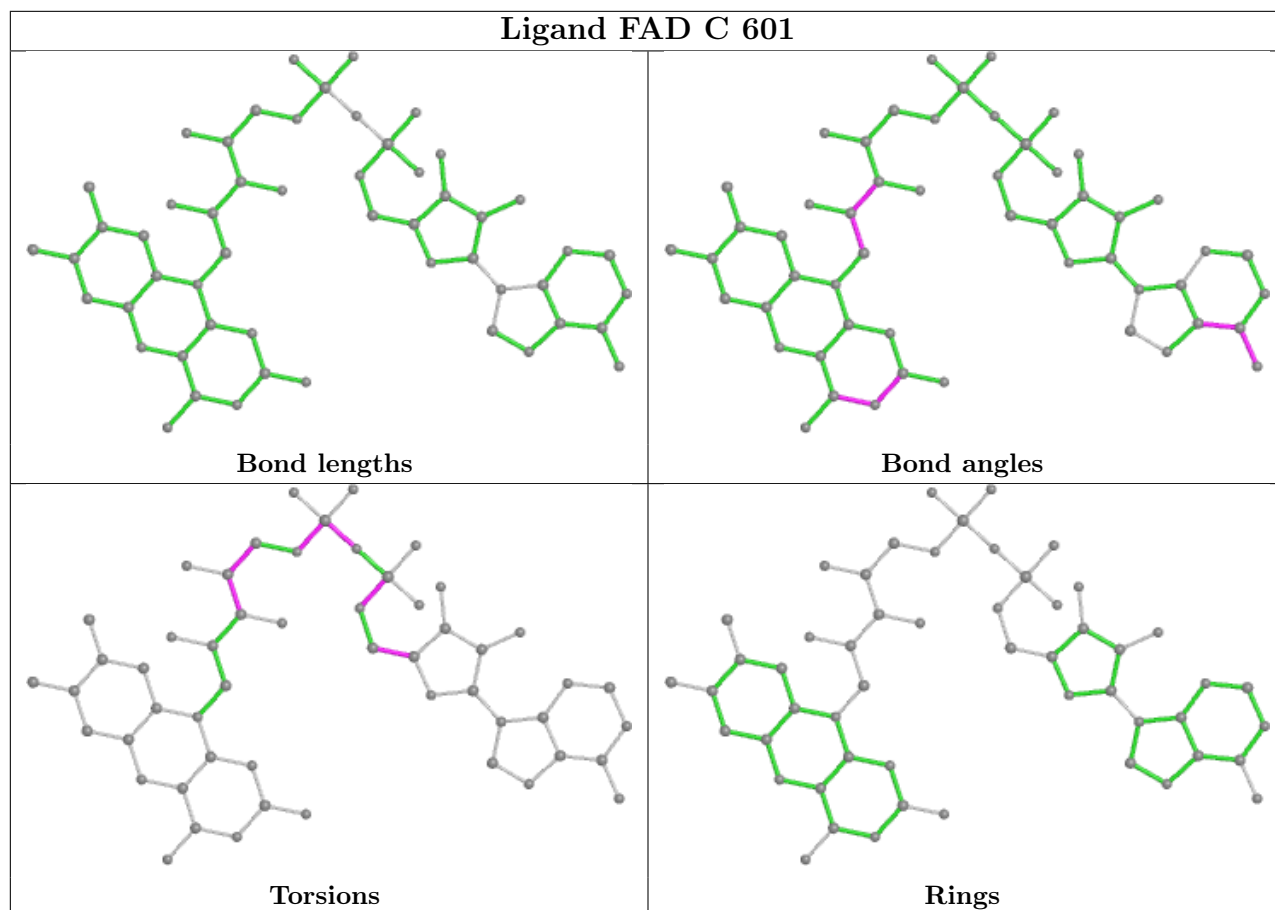
Mol	Chain	Res	Type	Atoms
2	A	601	FAD	C5B-O5B-PA-O2A
2	A	601	FAD	O4B-C4B-C5B-O5B
2	A	601	FAD	C3'-C4'-C5'-O5'
2	A	601	FAD	O4'-C4'-C5'-O5'
2	A	601	FAD	C5'-O5'-P-O1P
2	A	601	FAD	C5'-O5'-P-O2P
2	A	601	FAD	PA-O3P-P-O5'
2	B	601	FAD	O4'-C4'-C5'-O5'
2	C	601	FAD	C5B-O5B-PA-O1A
2	C	601	FAD	C5B-O5B-PA-O2A
2	C	601	FAD	C3'-C4'-C5'-O5'
2	C	601	FAD	O4'-C4'-C5'-O5'
2	C	601	FAD	PA-O3P-P-O5'
5	C	603	EPE	C10-C9-N1-C6
2	C	601	FAD	O4B-C4B-C5B-O5B
2	C	601	FAD	C3B-C4B-C5B-O5B
2	A	601	FAD	C3B-C4B-C5B-O5B
5	B	603	EPE	N4-C7-C8-O8
5	C	603	EPE	C10-C9-N1-C2
2	A	601	FAD	C5B-O5B-PA-O3P
2	A	601	FAD	C5'-O5'-P-O3P
2	C	601	FAD	C5B-O5B-PA-O3P
2	C	601	FAD	C5'-O5'-P-O3P
2	A	601	FAD	C5B-O5B-PA-O1A
2	C	601	FAD	C5'-O5'-P-O2P
2	B	601	FAD	O4B-C4B-C5B-O5B
2	C	601	FAD	C2'-C3'-C4'-O4'
2	D	601	FAD	O4B-C4B-C5B-O5B
2	A	601	FAD	C1'-C2'-C3'-O3'

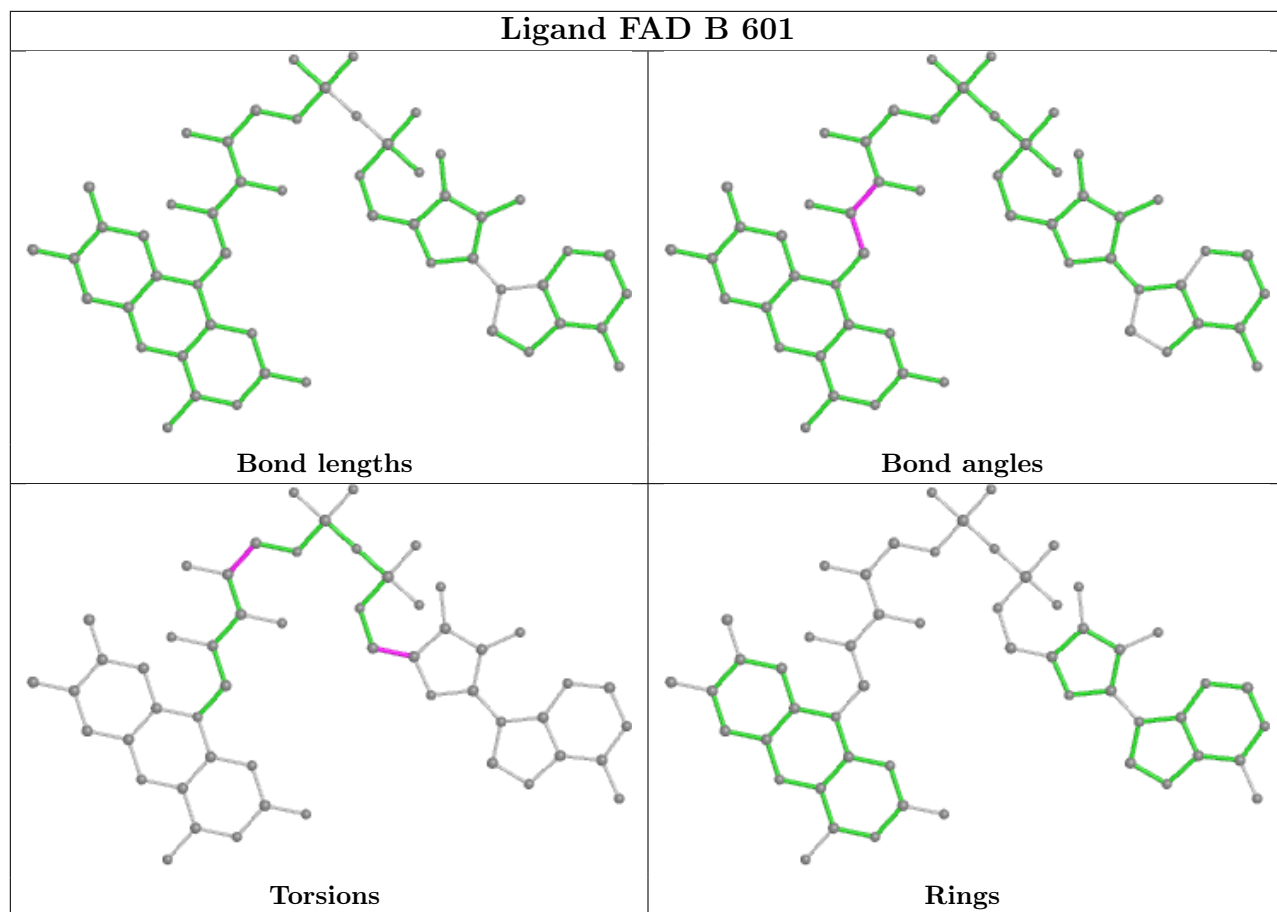
There are no ring outliers.

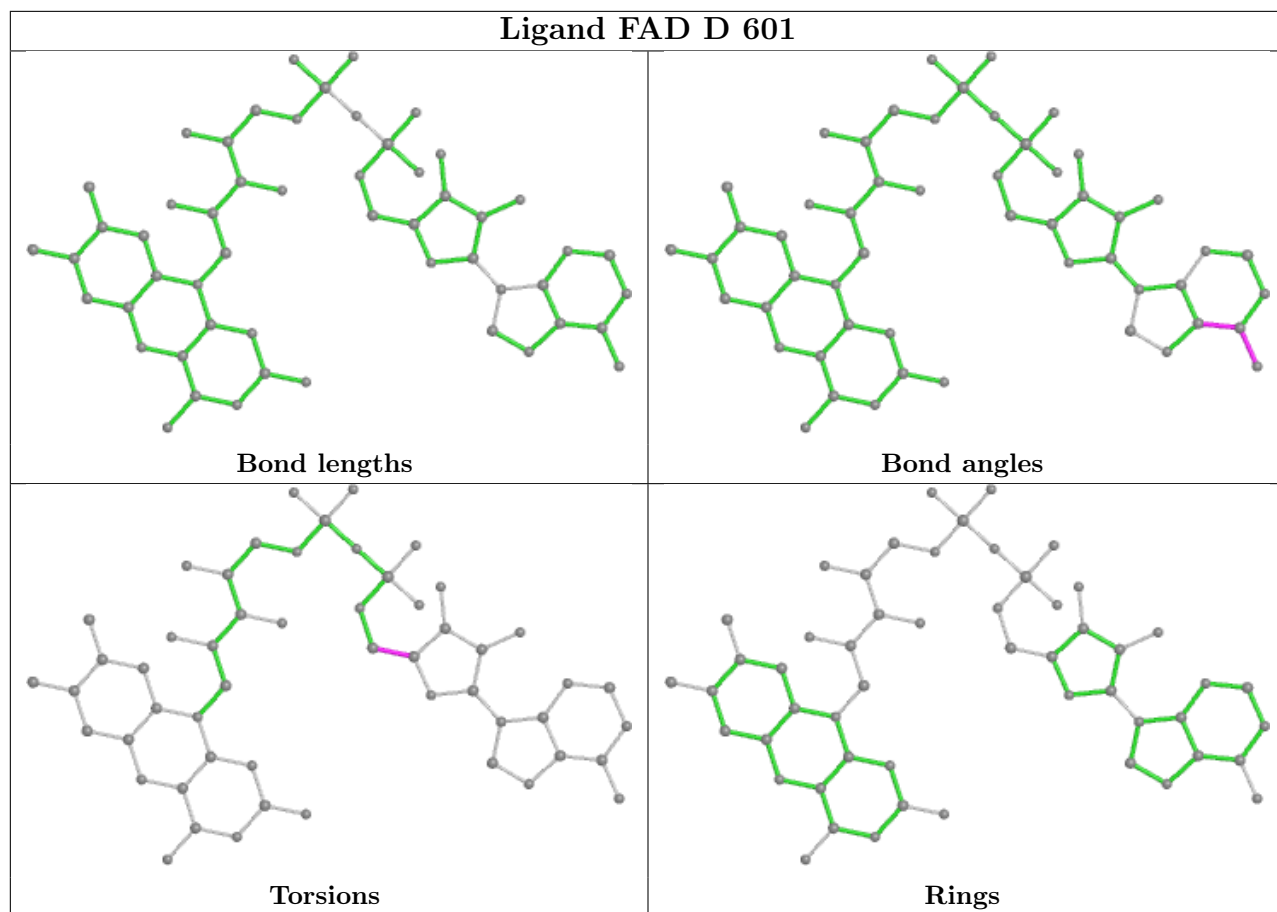
5 monomers are involved in 22 short contacts:

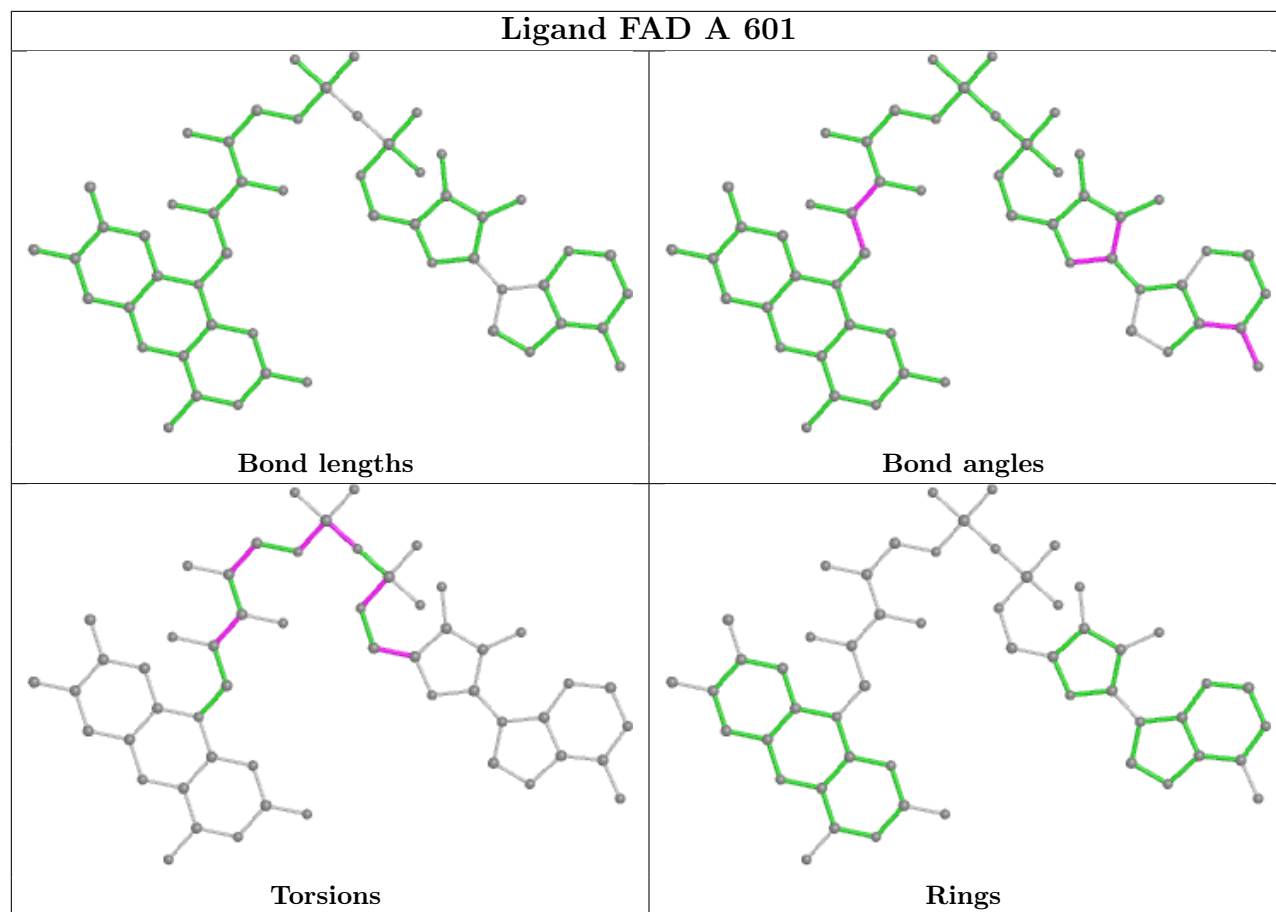
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	601	FAD	5	0
2	B	601	FAD	5	0
2	D	601	FAD	5	0
5	C	603	EPE	1	0
2	A	601	FAD	6	0

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	539/558 (96%)	0.13	21 (3%) 39 48	15, 25, 42, 63	0
1	B	528/558 (94%)	0.22	22 (4%) 36 45	15, 26, 47, 57	0
1	C	535/558 (95%)	0.28	18 (3%) 45 53	21, 31, 49, 62	0
1	D	527/558 (94%)	0.40	24 (4%) 32 42	22, 35, 54, 74	0
All	All	2129/2232 (95%)	0.26	85 (3%) 38 47	15, 30, 50, 74	0

All (85) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	263	GLY	4.0
1	B	231	ALA	4.0
1	C	439	GLY	3.9
1	C	519	ASP	3.8
1	B	228	ASP	3.8
1	B	440	ASP	3.6
1	D	519	ASP	3.3
1	D	228	ASP	3.3
1	B	529	THR	3.3
1	C	228	ASP	3.3
1	D	438	THR	3.3
1	D	125	ILE	3.2
1	D	279	ARG	3.2
1	A	228	ASP	3.2
1	D	479	GLY	3.1
1	A	232	GLU	3.1
1	A	231	ALA	3.0
1	C	437	GLU	2.9
1	D	346	LEU	2.8
1	D	530	GLY	2.8
1	D	488	ARG	2.8

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Mol	Chain	Res	Type	RSRZ
1	A	175	GLY	2.8
1	C	348	SER	2.7
1	D	442	SER	2.7
1	C	231	ALA	2.7
1	A	189	PHE	2.7
1	C	351	LEU	2.7
1	B	518	ALA	2.7
1	B	174	ASP	2.7
1	B	14	ARG	2.7
1	C	480	HIS	2.6
1	C	347	PHE	2.6
1	D	157	ARG	2.6
1	A	202	GLU	2.6
1	A	173	ALA	2.5
1	A	449	ASP	2.5
1	B	438	THR	2.5
1	D	452	TYR	2.5
1	B	519	ASP	2.5
1	A	351	LEU	2.5
1	C	346	LEU	2.5
1	D	335	LEU	2.5
1	B	530	GLY	2.4
1	B	59	ILE	2.4
1	A	438	THR	2.4
1	B	346	LEU	2.4
1	B	348	SER	2.4
1	B	345	PRO	2.4
1	A	550	ALA	2.4
1	B	354	THR	2.3
1	D	165	ASP	2.3
1	C	157	ARG	2.3
1	D	351	LEU	2.3
1	A	157	ARG	2.3
1	C	233	LEU	2.3
1	D	252	TRP	2.3
1	A	357	ILE	2.3
1	A	346	LEU	2.2
1	D	437	GLU	2.2
1	A	488	ARG	2.2
1	C	59	ILE	2.2
1	A	523	ARG	2.2
1	B	526	GLU	2.2

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Mol	Chain	Res	Type	RSRZ
1	D	482	THR	2.2
1	B	492	GLN	2.2
1	C	530	GLY	2.2
1	A	230	PRO	2.2
1	A	437	GLU	2.2
1	C	345	PRO	2.1
1	B	252	TRP	2.1
1	B	532	HIS	2.1
1	A	347	PHE	2.1
1	D	478	ALA	2.1
1	B	522	ILE	2.1
1	C	55	GLY	2.1
1	D	522	ILE	2.1
1	A	396	LEU	2.1
1	A	336	MET	2.1
1	D	483	ALA	2.1
1	D	457	CYS	2.1
1	B	437	GLU	2.0
1	C	202	GLU	2.0
1	D	230	PRO	2.0
1	B	347	PHE	2.0
1	C	232	GLU	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.

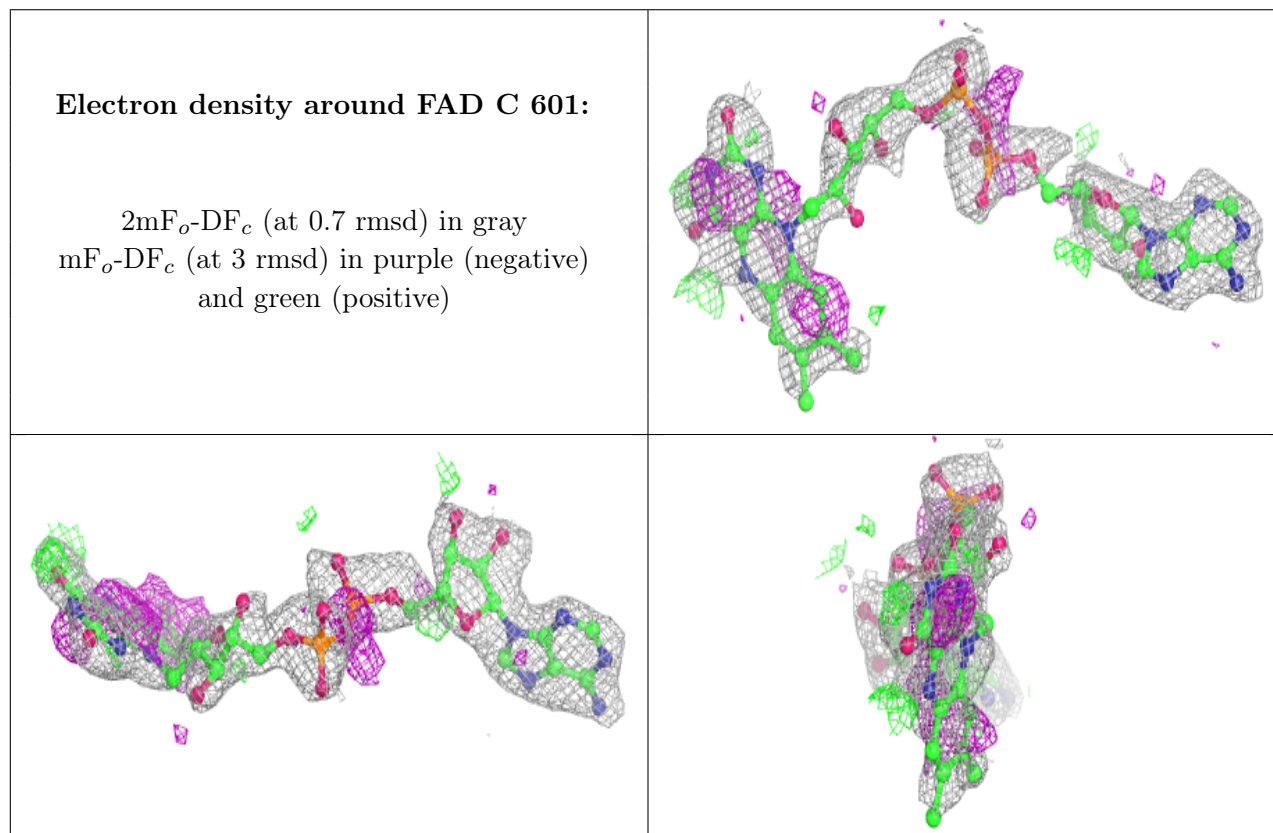
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
6	NA	C	604	1/1	0.81	0.16	51,51,51,51	0

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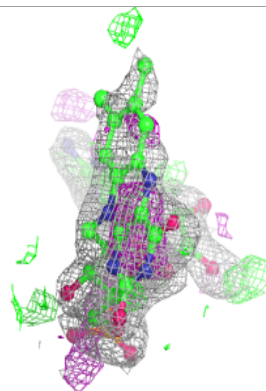
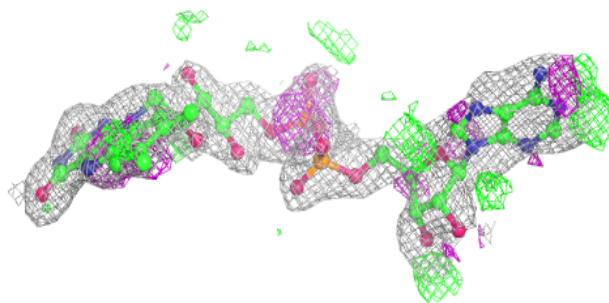
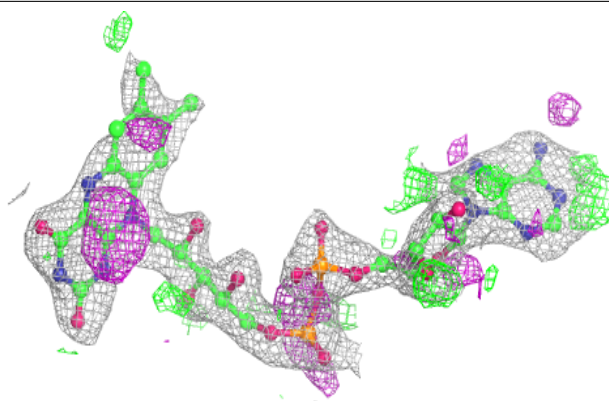
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	FAD	C	601	53/53	0.82	0.23	48,57,72,73	0
2	FAD	B	601	53/53	0.85	0.20	39,47,53,55	0
2	FAD	D	601	53/53	0.86	0.17	45,56,65,71	0
3	GOL	C	602	6/6	0.86	0.15	31,34,34,34	0
2	FAD	A	601	53/53	0.86	0.19	42,51,60,61	0
3	GOL	B	602	6/6	0.90	0.19	38,41,42,45	0
4	CL	B	604	1/1	0.91	0.18	65,65,65,65	0
5	EPE	C	603	13/15	0.93	0.14	43,45,47,50	0
5	EPE	B	603	15/15	0.94	0.12	37,39,43,45	0
4	CL	A	603	1/1	0.95	0.12	49,49,49,49	0
3	GOL	A	602	6/6	0.97	0.08	24,25,26,26	0
4	CL	C	605	1/1	0.97	0.14	60,60,60,60	0
4	CL	D	602	1/1	0.97	0.13	59,59,59,59	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.

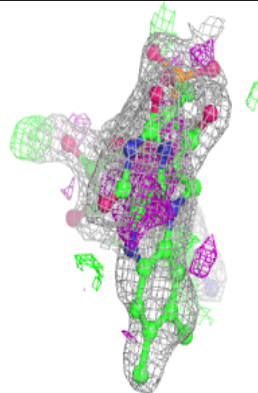
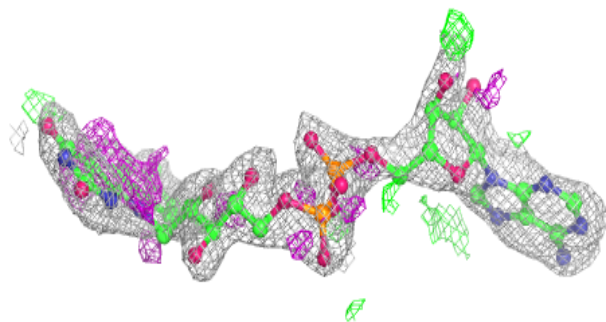
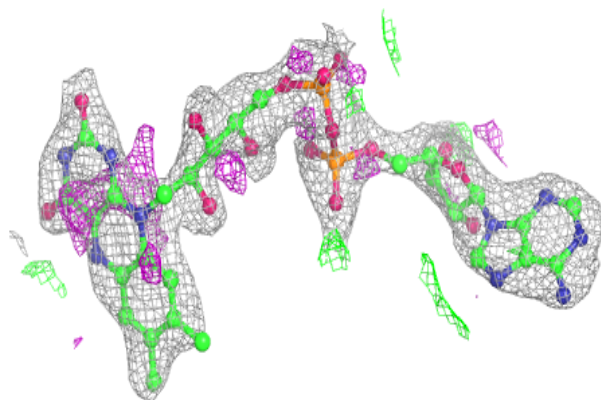


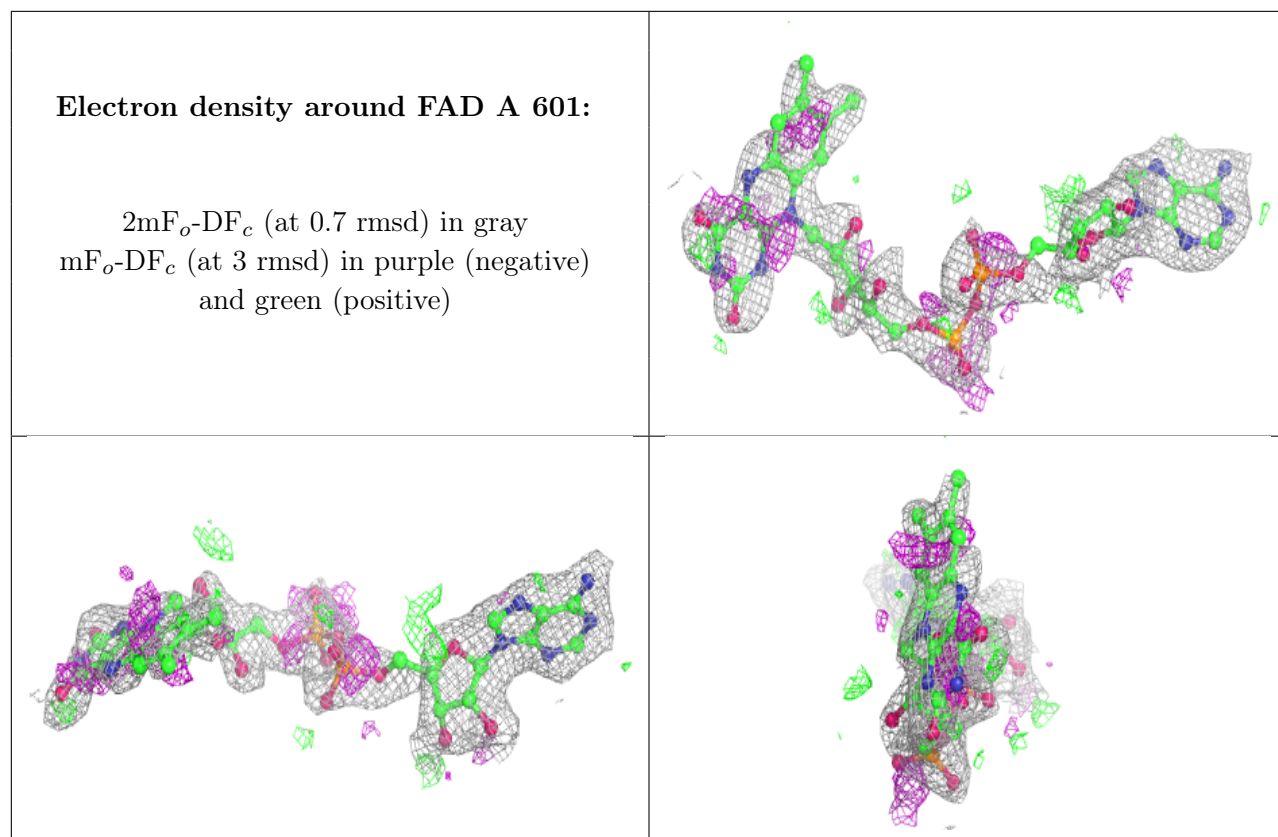
Electron density around FAD B 601:

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

**Electron density around FAD D 601:**

$2mF_o-DF_c$ (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.