



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 10, 2023 – 02:21 PM EDT

PDB ID : 7KAZ
Title : Crystal structure of OhyA(E82A)-18:1/h18:0-FAD complex from Staphylococcus aureus
Authors : Radka, C.D.; Rock, C.O.
Deposited on : 2020-10-01
Resolution : 1.85 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 : 2.35.1
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) : 2.35.1

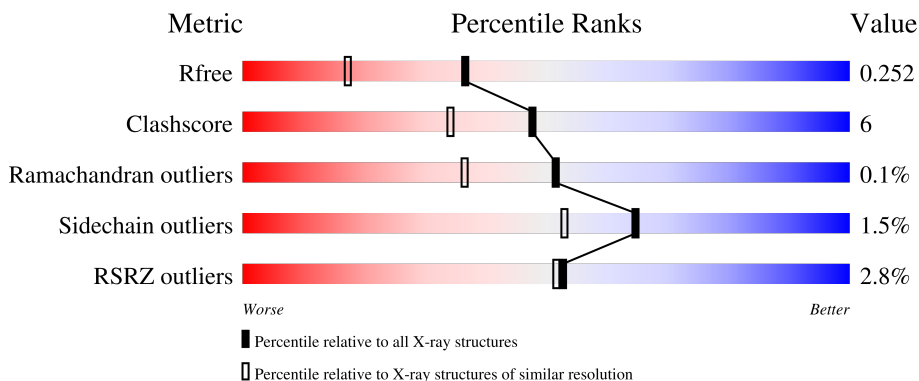
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.85 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	2469 (1.86-1.86)
Clashscore	141614	2625 (1.86-1.86)
Ramachandran outliers	138981	2592 (1.86-1.86)
Sidechain outliers	138945	2592 (1.86-1.86)
RSRZ outliers	127900	2436 (1.86-1.86)

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	611	 2% 85% 10% 5%
1	B	611	 3% 84% 11% 5%
1	C	611	 3% 82% 12% 5%

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 30841 atoms, of which 13849 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 Oleate hydratase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	C	579	9234	2989	4550	772	901	22	0	0	0
1	B	584	9288	3008	4574	778	906	22	0	0	0
1	A	583	9263	3002	4562	776	901	22	0	0	0

There are 63 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	-19	MET	-	initiating methionine	UNP A0A0D6GJV1
C	-18	GLY	-	expression tag	UNP A0A0D6GJV1
C	-17	SER	-	expression tag	UNP A0A0D6GJV1
C	-16	SER	-	expression tag	UNP A0A0D6GJV1
C	-15	HIS	-	expression tag	UNP A0A0D6GJV1
C	-14	HIS	-	expression tag	UNP A0A0D6GJV1
C	-13	HIS	-	expression tag	UNP A0A0D6GJV1
C	-12	HIS	-	expression tag	UNP A0A0D6GJV1
C	-11	HIS	-	expression tag	UNP A0A0D6GJV1
C	-10	HIS	-	expression tag	UNP A0A0D6GJV1
C	-9	SER	-	expression tag	UNP A0A0D6GJV1
C	-8	SER	-	expression tag	UNP A0A0D6GJV1
C	-7	GLY	-	expression tag	UNP A0A0D6GJV1
C	-6	LEU	-	expression tag	UNP A0A0D6GJV1
C	-5	VAL	-	expression tag	UNP A0A0D6GJV1
C	-4	PRO	-	expression tag	UNP A0A0D6GJV1
C	-3	ARG	-	expression tag	UNP A0A0D6GJV1
C	-2	GLY	-	expression tag	UNP A0A0D6GJV1
C	-1	SER	-	expression tag	UNP A0A0D6GJV1
C	0	HIS	-	expression tag	UNP A0A0D6GJV1
C	82	ALA	GLU	engineered mutation	UNP A0A0D6GJV1
B	-19	MET	-	initiating methionine	UNP A0A0D6GJV1
B	-18	GLY	-	expression tag	UNP A0A0D6GJV1

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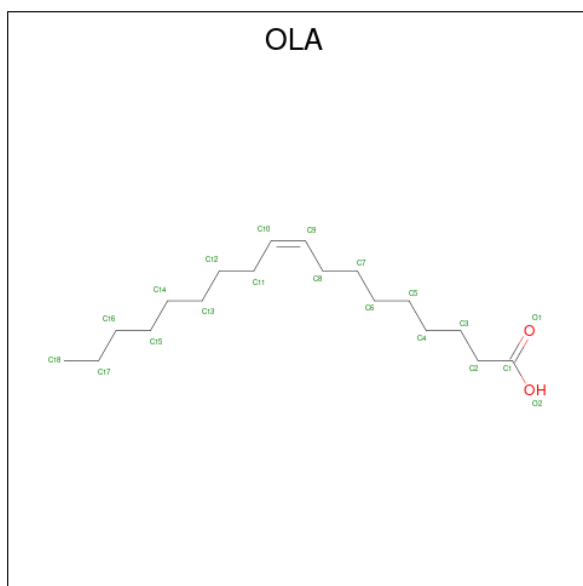
Chain	Residue	Modelled	Actual	Comment	Reference
B	-17	SER	-	expression tag	UNP A0A0D6GJV1
B	-16	SER	-	expression tag	UNP A0A0D6GJV1
B	-15	HIS	-	expression tag	UNP A0A0D6GJV1
B	-14	HIS	-	expression tag	UNP A0A0D6GJV1
B	-13	HIS	-	expression tag	UNP A0A0D6GJV1
B	-12	HIS	-	expression tag	UNP A0A0D6GJV1
B	-11	HIS	-	expression tag	UNP A0A0D6GJV1
B	-10	HIS	-	expression tag	UNP A0A0D6GJV1
B	-9	SER	-	expression tag	UNP A0A0D6GJV1
B	-8	SER	-	expression tag	UNP A0A0D6GJV1
B	-7	GLY	-	expression tag	UNP A0A0D6GJV1
B	-6	LEU	-	expression tag	UNP A0A0D6GJV1
B	-5	VAL	-	expression tag	UNP A0A0D6GJV1
B	-4	PRO	-	expression tag	UNP A0A0D6GJV1
B	-3	ARG	-	expression tag	UNP A0A0D6GJV1
B	-2	GLY	-	expression tag	UNP A0A0D6GJV1
B	-1	SER	-	expression tag	UNP A0A0D6GJV1
B	0	HIS	-	expression tag	UNP A0A0D6GJV1
B	82	ALA	GLU	engineered mutation	UNP A0A0D6GJV1
A	-19	MET	-	initiating methionine	UNP A0A0D6GJV1
A	-18	GLY	-	expression tag	UNP A0A0D6GJV1
A	-17	SER	-	expression tag	UNP A0A0D6GJV1
A	-16	SER	-	expression tag	UNP A0A0D6GJV1
A	-15	HIS	-	expression tag	UNP A0A0D6GJV1
A	-14	HIS	-	expression tag	UNP A0A0D6GJV1
A	-13	HIS	-	expression tag	UNP A0A0D6GJV1
A	-12	HIS	-	expression tag	UNP A0A0D6GJV1
A	-11	HIS	-	expression tag	UNP A0A0D6GJV1
A	-10	HIS	-	expression tag	UNP A0A0D6GJV1
A	-9	SER	-	expression tag	UNP A0A0D6GJV1
A	-8	SER	-	expression tag	UNP A0A0D6GJV1
A	-7	GLY	-	expression tag	UNP A0A0D6GJV1
A	-6	LEU	-	expression tag	UNP A0A0D6GJV1
A	-5	VAL	-	expression tag	UNP A0A0D6GJV1
A	-4	PRO	-	expression tag	UNP A0A0D6GJV1
A	-3	ARG	-	expression tag	UNP A0A0D6GJV1
A	-2	GLY	-	expression tag	UNP A0A0D6GJV1
A	-1	SER	-	expression tag	UNP A0A0D6GJV1
A	0	HIS	-	expression tag	UNP A0A0D6GJV1
A	82	ALA	GLU	engineered mutation	UNP A0A0D6GJV1

- Molecule 2 is (10R)-10-hydroxyoctadecanoic acid (three-letter code: WAD) (formula: C₁₈H₃₆O₃) (labeled as "Ligand of Interest" by depositor).

- Molecule 4 is POTASSIUM ION (three-letter code: K) (formula: K).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	C	1	Total K 1 1	0	0

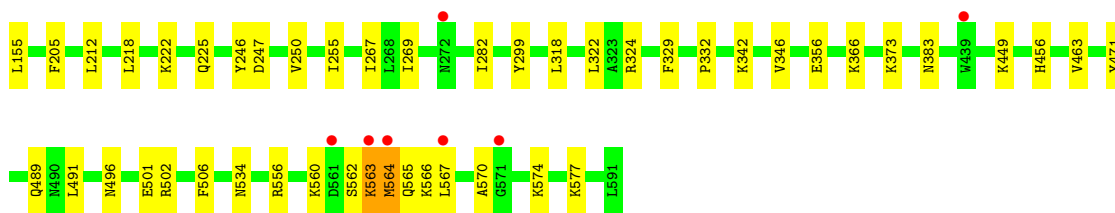
- Molecule 5 is OLEIC ACID (three-letter code: OLA) (formula: C₁₈H₃₄O₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	1	Total C H O 53 18 33 2	0	0
5	A	1	Total C H O 53 18 33 2	0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	C	917	Total O 917 917	0	0
6	B	908	Total O 908 908	0	0
6	A	900	Total O 900 900	0	0



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	188.02Å 113.08Å 118.39Å 90.00° 116.91° 90.00°	Depositor
Resolution (Å)	22.42 – 1.85 22.42 – 1.85	Depositor EDS
% Data completeness (in resolution range)	98.5 (22.42-1.85) 98.5 (22.42-1.85)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.74 (at 1.85Å)	Xtrriage
Refinement program	PHENIX 1.16_3549	Depositor
R, R_{free}	0.194 , 0.249 0.199 , 0.252	Depositor DCC
R_{free} test set	2005 reflections (1.09%)	wwPDB-VP
Wilson B-factor (Å ²)	19.4	Xtrriage
Anisotropy	0.182	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.41 , 50.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.35$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	30841	wwPDB-VP
Average B, all atoms (Å ²)	29.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.24% 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: OLA, WAD, FAD, K

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	0.64	0/4810	0.70	0/6519
1	B	0.64	0/4823	0.71	0/6535
1	C	0.61	0/4792	0.66	0/6494
All	All	0.63	0/14425	0.69	0/19548

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	4701	4562	4595	52	0
1	B	4714	4574	4608	66	0
1	C	4684	4550	4577	54	0
2	C	21	35	0	0	0
3	B	53	31	31	5	0
3	C	53	31	31	6	0
4	C	1	0	0	0	0
5	A	20	33	33	2	0
5	B	20	33	33	0	0
6	A	900	0	0	23	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	B	908	0	0	23	0
6	C	917	0	0	12	0
All	All	16992	13849	13908	172	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 (172) 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:B:81:ARG:HH22	1:B:378:GLY:HA2	1.22	1.01
1:B:389:MET:SD	6:B:1264:HOH:O	2.21	0.98
1:B:81:ARG:NH2	1:B:378:GLY:HA2	1.85	0.90
1:C:135:VAL:HG23	6:C:775:HOH:O	1.75	0.87
1:A:563:LYS:O	1:A:567:LEU:HD13	1.83	0.78
1:B:473:MET:HE1	6:B:831:HOH:O	1.85	0.76
1:B:225:GLN:NE2	6:B:706:HOH:O	2.25	0.69
1:B:256:ASP:CG	6:B:702:HOH:O	2.30	0.69
1:B:473:MET:CE	6:B:831:HOH:O	2.39	0.68
1:A:132:GLN:NE2	6:A:705:HOH:O	2.27	0.68
1:B:78:ARG:NH2	6:B:710:HOH:O	2.29	0.66
1:B:81:ARG:HH22	1:B:378:GLY:CA	2.03	0.64
1:B:468:ILE:CD1	3:B:601:FAD:HM83	2.28	0.63
1:C:81:ARG:HH21	1:C:225:GLN:H	1.46	0.63
1:B:81:ARG:HB2	1:B:220:PHE:HE2	1.63	0.63
1:A:456:HIS:HB3	6:A:1060:HOH:O	2.00	0.61
1:B:308:PRO:HA	1:B:464:TYR:CE1	2.35	0.61
1:C:282:ILE:H	1:C:282:ILE:HD12	1.65	0.61
1:B:243:GLN:NE2	6:B:715:HOH:O	2.32	0.61
1:B:80:GLY:HA2	3:B:601:FAD:N5	2.16	0.61
1:A:59:PRO:CA	6:A:701:HOH:O	2.48	0.61
1:B:81:ARG:HB2	1:B:220:PHE:CE2	2.36	0.60
1:B:468:ILE:HD11	3:B:601:FAD:HM83	1.84	0.60
1:C:210:SER:HB3	6:C:872:HOH:O	2.02	0.59
1:B:575:LYS:NZ	6:B:709:HOH:O	2.27	0.59
1:B:565:GLN:NE2	6:B:722:HOH:O	2.36	0.59
1:C:312:LEU:HD23	1:C:467:TYR:OH	2.02	0.59
1:A:566:LYS:NZ	6:A:716:HOH:O	2.33	0.59
1:A:59:PRO:CB	6:A:701:HOH:O	2.51	0.57
1:A:501:GLU:CG	6:A:733:HOH:O	2.52	0.57
1:B:217:ALA:HB3	6:B:718:HOH:O	2.04	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:119:PRO:HB3	6:C:1142:HOH:O	2.05	0.57
1:B:389:MET:HB3	6:B:1264:HOH:O	2.03	0.57
1:B:79:GLY:O	1:B:81:ARG:HG2	2.05	0.56
1:B:79:GLY:HA3	3:B:601:FAD:HM72	1.87	0.56
1:B:502:ARG:HD2	6:B:1199:HOH:O	2.05	0.56
1:A:560:LYS:NZ	6:A:729:HOH:O	2.39	0.56
1:B:575:LYS:HE3	6:B:1239:HOH:O	2.04	0.55
1:C:263:ILE:HD12	6:C:928:HOH:O	2.07	0.55
1:A:28:ILE:HD12	1:A:250:VAL:HG21	1.88	0.55
1:B:30:SER:OG	1:B:61:ALA:HA	2.06	0.55
1:A:299:TYR:CD2	1:A:463:VAL:HG22	2.42	0.55
1:B:309:THR:H	1:B:464:TYR:HE1	1.55	0.55
1:A:78:ARG:HB2	6:A:860:HOH:O	2.08	0.54
1:B:342:LYS:NZ	1:B:417:ASP:OD1	2.40	0.54
1:A:332:PRO:HD2	6:A:744:HOH:O	2.07	0.54
1:A:534:ASN:ND2	6:A:732:HOH:O	2.41	0.54
1:B:84:GLU:OE1	1:B:208:HIS:CD2	2.60	0.54
1:B:183:TRP:CH2	1:B:202:LEU:HD23	2.43	0.54
1:C:293:ILE:HD11	3:C:602:FAD:HM81	1.90	0.53
1:C:447:THR:HA	1:C:450:ILE:HD12	1.91	0.53
1:B:84:GLU:OE1	1:B:208:HIS:NE2	2.42	0.53
1:A:58:LEU:O	1:A:246:TYR:HB3	2.09	0.53
1:C:254:LYS:HE3	1:C:268:LEU:HD21	1.90	0.53
1:B:222:LYS:CD	6:B:913:HOH:O	2.56	0.52
1:A:59:PRO:CG	6:A:701:HOH:O	2.56	0.52
1:B:222:LYS:HD3	6:B:913:HOH:O	2.08	0.52
1:B:80:GLY:HA2	3:B:601:FAD:C5X	2.40	0.52
1:A:59:PRO:N	6:A:701:HOH:O	2.41	0.52
1:B:308:PRO:HA	1:B:464:TYR:CD1	2.45	0.51
1:A:373:LYS:HE2	6:A:1218:HOH:O	2.11	0.51
1:A:356:GLU:OE2	1:A:449:LYS:NZ	2.30	0.50
1:C:543:MET:SD	1:C:585:LEU:HD23	2.51	0.50
1:B:225:GLN:HG3	1:B:229:LEU:HD12	1.93	0.50
1:C:91:TRP:CE3	1:C:108:LEU:HD13	2.47	0.49
1:A:222:LYS:NZ	6:A:739:HOH:O	2.45	0.49
1:B:543:MET:HG2	1:B:590:LEU:HD12	1.95	0.49
1:B:262:LYS:HB2	1:B:488:SER:HA	1.93	0.49
1:C:78:ARG:HB3	3:C:602:FAD:HM72	1.95	0.49
1:B:471:TYR:CE1	1:B:496:ASN:HB2	2.48	0.48
1:C:78:ARG:NE	1:C:81:ARG:HG2	2.27	0.48
1:C:209:ILE:HD11	1:C:549:LEU:HG	1.96	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:77:VAL:HG12	1:B:79:GLY:H	1.79	0.48
1:C:178:ASN:HA	1:C:181:ILE:HD12	1.94	0.48
1:B:227:GLU:OE2	1:B:400:LYS:HG3	2.14	0.48
1:B:577:LYS:HE2	6:B:1258:HOH:O	2.13	0.48
1:C:80:GLY:O	1:C:81:ARG:NE	2.47	0.47
1:A:247:ASP:OD1	6:A:701:HOH:O	2.20	0.47
1:B:90:LEU:HA	1:B:512:VAL:HG11	1.96	0.47
1:A:471:TYR:CE1	1:A:496:ASN:HB2	2.50	0.47
1:A:82:ALA:CB	1:A:218:LEU:HD22	2.44	0.47
1:A:255:ILE:HD13	1:A:491:LEU:HD22	1.94	0.47
1:C:23:LYS:HE2	1:C:283:ASN:OD1	2.15	0.47
1:B:256:ASP:CB	6:B:702:HOH:O	2.62	0.47
1:A:318:LEU:O	1:A:322:LEU:HG	2.14	0.47
1:B:71:PRO:HB3	1:B:73:LYS:HZ1	1.79	0.47
1:C:125:ARG:O	1:C:125:ARG:HG3	2.13	0.47
1:B:158:GLU:HG3	1:B:196:MET:HG3	1.97	0.47
1:A:13:ARG:HD2	6:A:959:HOH:O	2.15	0.46
1:B:13:ARG:HD3	6:B:1021:HOH:O	2.14	0.46
1:C:80:GLY:HA2	3:C:602:FAD:N5	2.31	0.46
1:B:159:GLU:H	1:B:159:GLU:CD	2.19	0.46
1:A:77:VAL:O	1:A:78:ARG:HB2	2.16	0.46
1:C:387:TRP:HB3	1:C:413:ALA:HB1	1.98	0.45
1:A:151:LEU:O	1:A:155:LEU:HG	2.16	0.45
1:C:293:ILE:CD1	3:C:602:FAD:HM81	2.46	0.45
1:B:556:ARG:HH22	1:B:566:LYS:HG2	1.80	0.45
1:C:186:MET:SD	1:C:212:LEU:CD1	3.05	0.45
1:A:205:PHE:HB3	5:A:600:OLA:H81	1.99	0.45
1:B:4:SER:O	1:B:530:PRO:HA	2.17	0.45
1:C:85:ASN:OD1	1:C:85:ASN:N	2.50	0.45
1:A:32:LEU:HD12	1:A:32:LEU:O	2.17	0.45
1:A:59:PRO:HG3	6:A:701:HOH:O	2.17	0.44
1:C:56:GLU:OE2	1:C:56:GLU:HA	2.18	0.44
1:C:82:ALA:HB1	1:C:218:LEU:HD22	1.99	0.44
1:C:77:VAL:O	1:C:78:ARG:HB2	2.18	0.44
1:B:468:ILE:O	1:B:468:ILE:HG13	2.17	0.44
1:C:451:GLU:OE2	1:C:455:LYS:NZ	2.51	0.44
1:A:562:SER:HB3	1:A:565:GLN:HB2	2.00	0.43
1:B:28:ILE:N	1:B:28:ILE:HD13	2.33	0.43
1:A:501:GLU:CB	6:A:733:HOH:O	2.67	0.43
1:C:225:GLN:HG2	1:C:225:GLN:O	2.17	0.43
1:C:293:ILE:HD13	1:C:471:TYR:CE2	2.53	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:334:LYS:NZ	6:B:747:HOH:O	2.46	0.43
1:B:533:ILE:HD12	6:B:1056:HOH:O	2.18	0.43
1:C:18:GLU:OE2	1:C:18:GLU:HA	2.18	0.43
1:C:544:ASP:OD1	1:C:588:HIS:HD2	2.01	0.43
1:B:91:TRP:CE3	1:B:108:LEU:HD13	2.53	0.43
1:A:250:VAL:HG22	1:A:269:ILE:HG22	1.99	0.43
1:C:507:THR:HA	3:C:602:FAD:O2	2.18	0.43
1:B:271:ARG:NE	1:B:276:GLU:OE1	2.44	0.43
1:A:151:LEU:HD11	1:A:155:LEU:HD11	2.00	0.43
1:C:75:TYR:N	6:C:752:HOH:O	2.51	0.43
1:A:267:ILE:HG22	1:A:269:ILE:CG2	2.49	0.43
1:B:577:LYS:HD2	1:B:582:GLU:OE1	2.19	0.43
1:C:84:GLU:OE2	1:C:204:ARG:NH1	2.52	0.42
1:C:253:ILE:HD13	1:C:286:VAL:HG11	2.01	0.42
1:C:256:ASP:O	1:C:262:LYS:HA	2.19	0.42
1:C:77:VAL:HG13	1:C:399:PHE:CZ	2.54	0.42
1:C:209:ILE:CD1	1:C:549:LEU:HG	2.49	0.42
1:A:126:VAL:CG1	1:A:383:ASN:HB2	2.50	0.42
1:A:324:ARG:HD3	6:A:1219:HOH:O	2.19	0.42
1:A:346:VAL:HA	1:A:463:VAL:O	2.19	0.42
1:C:81:ARG:H	3:C:602:FAD:C4	2.32	0.42
1:C:471:TYR:CZ	1:C:496:ASN:HB2	2.55	0.42
1:B:91:TRP:CE3	1:B:91:TRP:HA	2.55	0.42
1:B:104:ASN:ND2	6:B:750:HOH:O	2.47	0.42
1:A:85:ASN:N	1:A:85:ASN:OD1	2.53	0.42
1:A:501:GLU:HG2	6:A:733:HOH:O	2.17	0.42
1:C:346:VAL:HA	1:C:463:VAL:O	2.20	0.42
1:B:544:ASP:OD1	1:B:588:HIS:ND1	2.47	0.42
1:B:566:LYS:HG3	6:B:876:HOH:O	2.20	0.42
1:C:273:GLY:HA2	6:C:725:HOH:O	2.19	0.42
1:A:79:GLY:O	1:A:225:GLN:NE2	2.53	0.42
1:A:574:LYS:N	1:A:574:LYS:HD3	2.35	0.42
1:C:247:ASP:HA	6:C:816:HOH:O	2.19	0.41
1:C:409:THR:HG21	1:C:439:TRP:CZ2	2.54	0.41
1:B:217:ALA:N	6:B:718:HOH:O	2.37	0.41
1:A:59:PRO:HB3	1:A:247:ASP:OD1	2.21	0.41
1:C:222:LYS:HD2	6:C:712:HOH:O	2.21	0.41
1:C:373:LYS:HE3	6:C:1190:HOH:O	2.20	0.41
1:A:567:LEU:O	1:A:570:ALA:HB3	2.19	0.41
1:B:556:ARG:HD2	1:B:569:LEU:CD2	2.51	0.41
1:A:212:LEU:HD12	5:A:600:OLA:C9	2.50	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:556:ARG:O	1:A:560:LYS:HG2	2.21	0.41
1:C:133:ARG:NH1	6:C:740:HOH:O	2.47	0.41
1:C:222:LYS:HB2	1:C:222:LYS:HE2	1.92	0.41
1:C:246:TYR:HB2	6:C:771:HOH:O	2.20	0.41
1:A:255:ILE:HD12	1:A:329:PHE:CE2	2.55	0.41
1:A:366:LYS:CE	6:A:864:HOH:O	2.69	0.41
1:C:169:VAL:HG23	1:C:170:PHE:CD2	2.56	0.40
1:B:535:SER:N	1:B:536:PRO:HD2	2.35	0.40
1:C:183:TRP:CZ2	1:C:201:TYR:HB3	2.56	0.40
1:A:282:ILE:HD11	1:A:489:GLN:HB3	2.04	0.40
1:A:366:LYS:HE2	6:A:864:HOH:O	2.22	0.40
1:C:395:ARG:HG3	6:C:908:HOH:O	2.21	0.40
1:C:496:ASN:OD1	1:C:506:PHE:N	2.55	0.40
1:B:346:VAL:HA	1:B:463:VAL:O	2.21	0.40
1:B:447:THR:HA	1:B:450:ILE:HD12	2.04	0.40
1:B:556:ARG:HD2	1:B:569:LEU:HD23	2.03	0.40
1:A:502:ARG:HD2	6:A:975:HOH:O	2.22	0.40
1:A:564:MET:CE	1:A:567:LEU:HD23	2.51	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	579/611 (95%)	557 (96%)	22 (4%)	0	100	100
1	B	580/611 (95%)	558 (96%)	21 (4%)	1 (0%)	47	33
1	C	575/611 (94%)	552 (96%)	22 (4%)	1 (0%)	47	33
All	All	1734/1833 (95%)	1667 (96%)	65 (4%)	2 (0%)	51	36

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	502	ARG
1	C	78	ARG

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	519/543 (96%)	511 (98%)	8 (2%)	65	53
1	B	521/543 (96%)	515 (99%)	6 (1%)	71	62
1	C	519/543 (96%)	510 (98%)	9 (2%)	60	47
All	All	1559/1629 (96%)	1536 (98%)	23 (2%)	65	53

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	32	LEU
1	C	57	GLU
1	C	95	ARG
1	C	279	LYS
1	C	412	TYR
1	C	506	PHE
1	C	564	MET
1	C	566	LYS
1	C	574	LYS
1	B	81	ARG
1	B	95	ARG
1	B	277	SER
1	B	342	LYS
1	B	412	TYR
1	B	506	PHE
1	A	48	GLU
1	A	84	GLU
1	A	95	ARG
1	A	342	LYS
1	A	506	PHE
1	A	563	LYS

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Mol	Chain	Res	Type
1	A	564	MET
1	A	577	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	C	338	ASN
1	C	486	HIS
1	C	565	GLN
1	B	0	HIS
1	B	104	ASN
1	B	132	GLN
1	B	261	GLN
1	B	553	GLN
1	A	419	ASN
1	A	524	ASN

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 6 ligands modelled in this entry, 1 is monoatomic - leaving 5 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	FAD	B	601	-	53,58,58	1.67	14 (26%)	68,89,89	1.60	10 (14%)
5	OLA	A	600	-	19,19,19	0.53	0	19,19,19	1.18	2 (10%)
5	OLA	B	600	-	19,19,19	0.82	1 (5%)	19,19,19	0.99	1 (5%)
3	FAD	C	602	-	53,58,58	1.28	5 (9%)	68,89,89	1.38	11 (16%)
2	WAD	C	601	-	20,20,20	0.58	0	21,21,21	0.90	1 (4%)

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	FAD	B	601	-	-	7/30/50/50	0/6/6/6
5	OLA	A	600	-	-	10/17/17/17	-
5	OLA	B	600	-	-	9/17/17/17	-
3	FAD	C	602	-	-	8/30/50/50	0/6/6/6
2	WAD	C	601	-	-	9/19/19/19	-

All (20) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	602	FAD	C9A-C5X	5.00	1.49	1.41
3	B	601	FAD	C9A-C5X	4.14	1.48	1.41
3	C	602	FAD	C8-C7	3.33	1.49	1.40
3	B	601	FAD	C4-N3	-3.22	1.32	1.38
3	B	601	FAD	C6-C7	-3.10	1.35	1.39
3	B	601	FAD	C7M-C7	-3.08	1.44	1.51
3	B	601	FAD	C5X-N5	-2.92	1.33	1.39
3	B	601	FAD	C6-C5X	-2.84	1.35	1.40
5	B	600	OLA	C10-C9	2.74	1.47	1.31
3	B	601	FAD	P-O2P	-2.74	1.42	1.55
3	B	601	FAD	P-O1P	-2.65	1.41	1.50
3	B	601	FAD	C5A-N7A	-2.61	1.30	1.39
3	B	601	FAD	C1'-N10	-2.61	1.41	1.48
3	B	601	FAD	C9-C8	-2.55	1.35	1.39
3	B	601	FAD	C2-N3	-2.52	1.33	1.39
3	C	602	FAD	C4X-N5	2.50	1.35	1.30
3	B	601	FAD	C4A-N3A	-2.50	1.32	1.35
3	C	602	FAD	C4-N3	-2.43	1.34	1.38
3	C	602	FAD	C5A-C4A	2.42	1.47	1.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	601	FAD	C5A-C4A	2.02	1.46	1.40

All (25) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	601	FAD	C1B-N9A-C4A	4.50	134.55	126.64
3	B	601	FAD	C6-C7-C8	4.29	125.82	119.67
3	B	601	FAD	C8M-C8-C9	3.84	126.60	119.49
3	C	602	FAD	N3A-C2A-N1A	-3.66	122.95	128.68
3	C	602	FAD	P-O3P-PA	-3.61	120.43	132.83
3	C	602	FAD	C3B-C2B-C1B	3.34	106.01	100.98
3	B	601	FAD	C7M-C7-C8	-3.00	114.58	120.74
3	B	601	FAD	C4X-C4-N3	2.98	120.75	113.19
3	B	601	FAD	N3A-C2A-N1A	-2.81	124.28	128.68
3	B	601	FAD	C4A-C5A-N7A	-2.79	106.49	109.40
3	C	602	FAD	C4-C4X-N5	2.76	122.16	118.23
5	A	600	OLA	C12-C11-C10	-2.66	97.18	112.43
3	C	602	FAD	C4A-C5A-N7A	-2.66	106.63	109.40
3	C	602	FAD	C4X-C10-N1	-2.64	118.61	124.73
3	B	601	FAD	O4-C4-C4X	-2.53	119.89	126.60
5	A	600	OLA	O2-C1-C2	2.50	122.07	114.03
3	B	601	FAD	C8M-C8-C7	-2.39	115.83	120.74
2	C	601	WAD	CB-CA-C	-2.25	108.79	114.47
3	C	602	FAD	O4-C4-C4X	-2.25	120.64	126.60
3	C	602	FAD	C10-N1-C2	2.23	121.35	116.90
3	B	601	FAD	O5'-P-O1P	2.21	117.72	109.07
3	C	602	FAD	C4X-C4-N3	2.19	118.75	113.19
5	B	600	OLA	C3-C2-C1	-2.11	109.15	114.47
3	C	602	FAD	C4X-C10-N10	2.05	119.47	116.48
3	C	602	FAD	C4-N3-C2	-2.04	121.88	125.64

There are no chirality outliers.

All (43) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	C	602	FAD	C5B-O5B-PA-O3P
3	C	602	FAD	O4B-C4B-C5B-O5B
3	C	602	FAD	C3B-C4B-C5B-O5B
3	B	601	FAD	C5B-O5B-PA-O1A
3	B	601	FAD	C3B-C4B-C5B-O5B
3	B	601	FAD	N10-C1'-C2'-O2'
3	B	601	FAD	O4B-C4B-C5B-O5B

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Mol	Chain	Res	Type	Atoms
5	A	600	OLA	C13-C14-C15-C16
2	C	601	WAD	C14-C15-CB-CA
3	C	602	FAD	C4B-C5B-O5B-PA
5	B	600	OLA	C1-C2-C3-C4
2	C	601	WAD	C3-C4-C5-C6
2	C	601	WAD	C1-C2-C3-C4
5	B	600	OLA	C11-C10-C9-C8
5	A	600	OLA	C11-C10-C9-C8
2	C	601	WAD	C12-C13-C14-C15
2	C	601	WAD	C5-C6-CD1-CE1
5	A	600	OLA	C3-C4-C5-C6
5	A	600	OLA	C14-C15-C16-C17
2	C	601	WAD	C4-C5-C6-CD1
5	B	600	OLA	C11-C12-C13-C14
3	C	602	FAD	C5'-O5'-P-O3P
3	B	601	FAD	C5B-O5B-PA-O3P
3	C	602	FAD	C5B-O5B-PA-O2A
5	B	600	OLA	C3-C4-C5-C6
5	A	600	OLA	C12-C13-C14-C15
5	A	600	OLA	C9-C10-C11-C12
5	A	600	OLA	C15-C16-C17-C18
3	B	601	FAD	C4B-C5B-O5B-PA
2	C	601	WAD	C12-CD2-CE2-CZ
5	A	600	OLA	O1-C1-C2-C3
5	B	600	OLA	C12-C13-C14-C15
2	C	601	WAD	C-CA-CB-C15
5	B	600	OLA	C4-C5-C6-C7
5	A	600	OLA	O2-C1-C2-C3
3	C	602	FAD	C2'-C3'-C4'-O4'
3	B	601	FAD	O4'-C4'-C5'-O5'
5	B	600	OLA	O2-C1-C2-C3
5	B	600	OLA	C9-C10-C11-C12
5	B	600	OLA	O1-C1-C2-C3
5	A	600	OLA	C7-C8-C9-C10
3	C	602	FAD	C5'-O5'-P-O1P
2	C	601	WAD	O-C-CA-CB

There are no ring outliers.

3 monomers are involved in 13 short contacts:

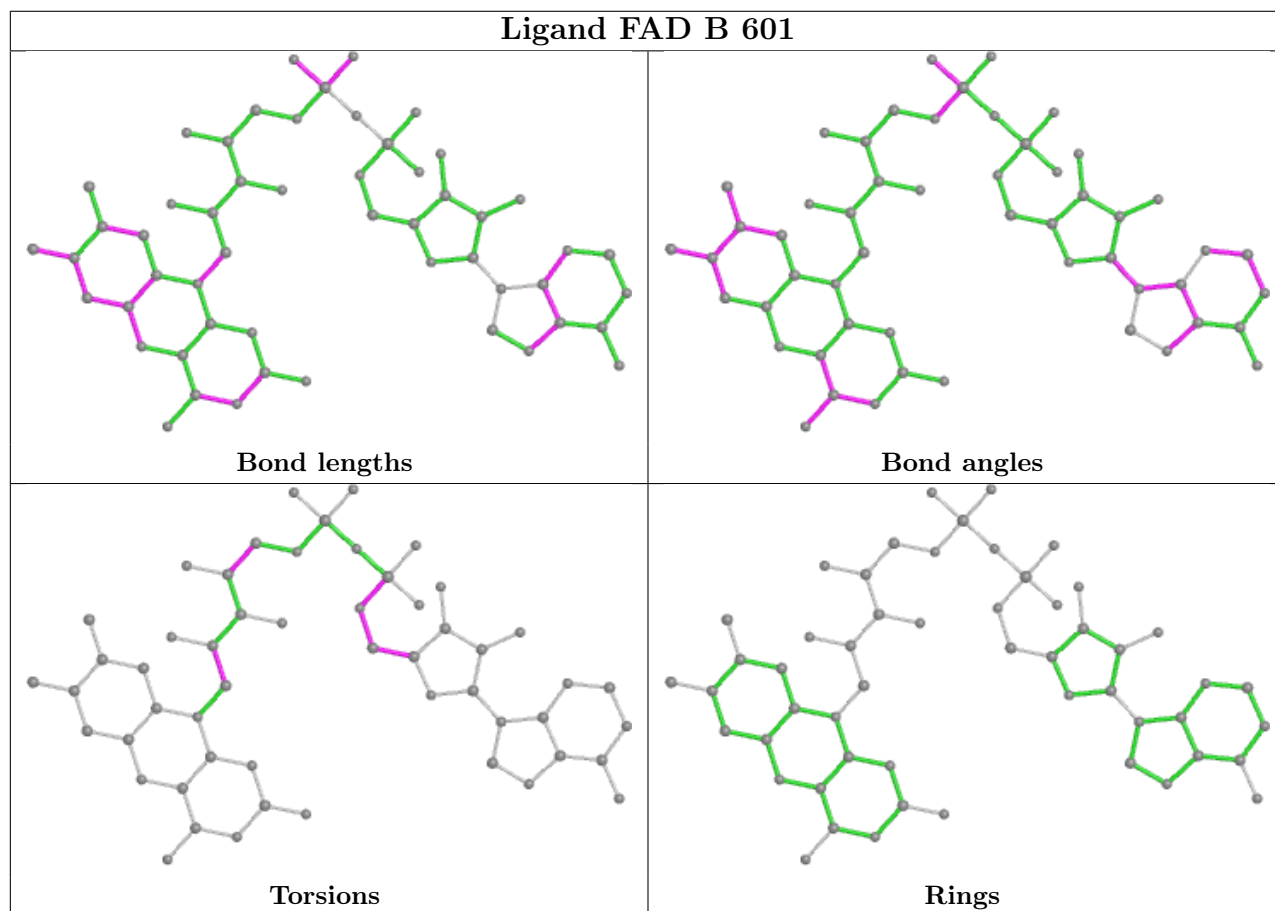
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	601	FAD	5	0

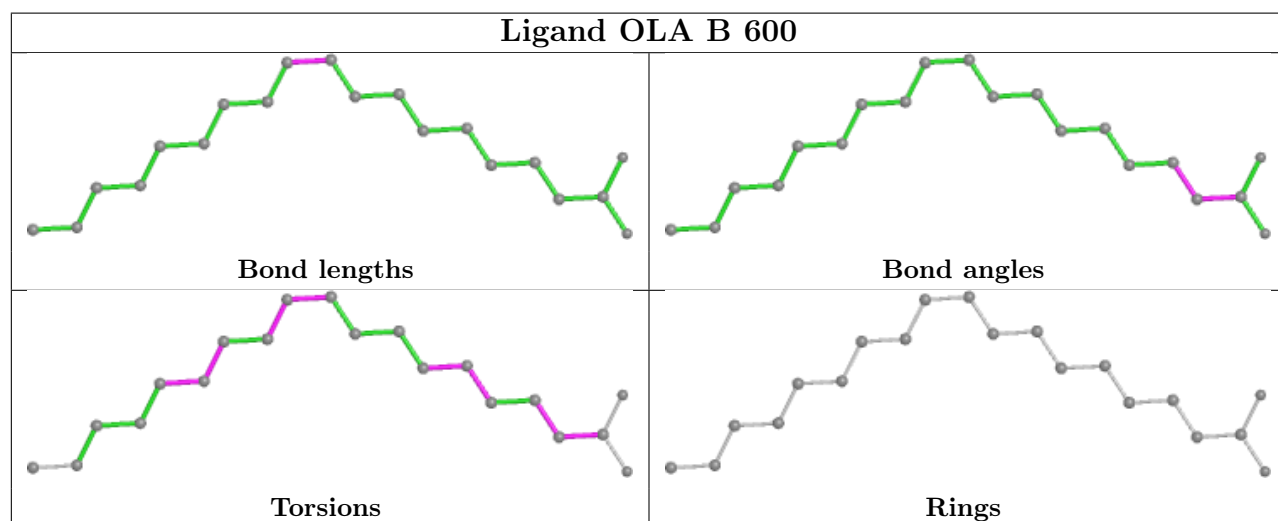
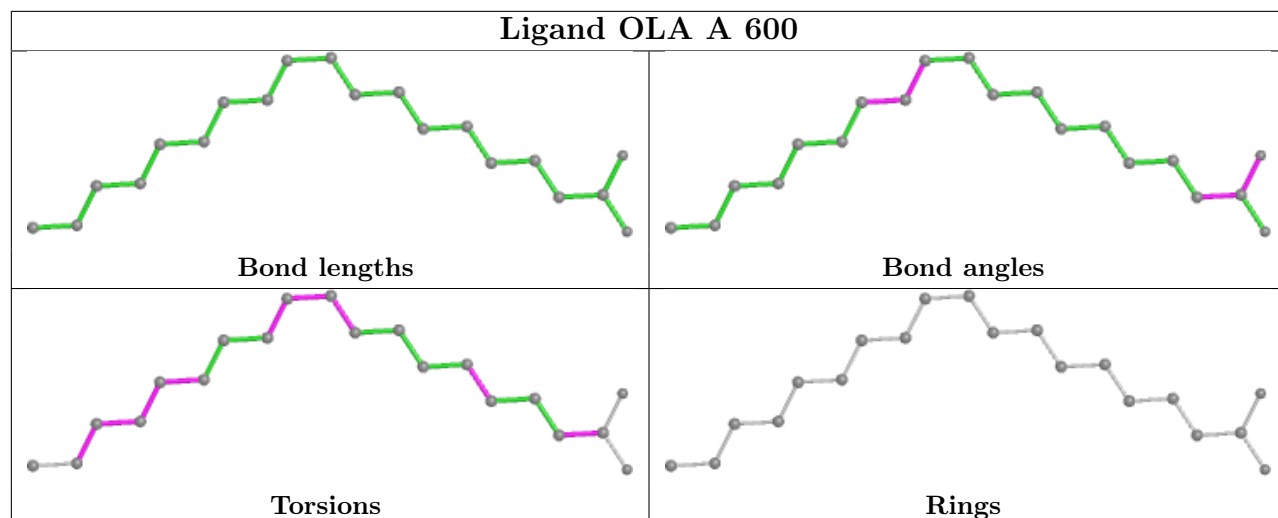
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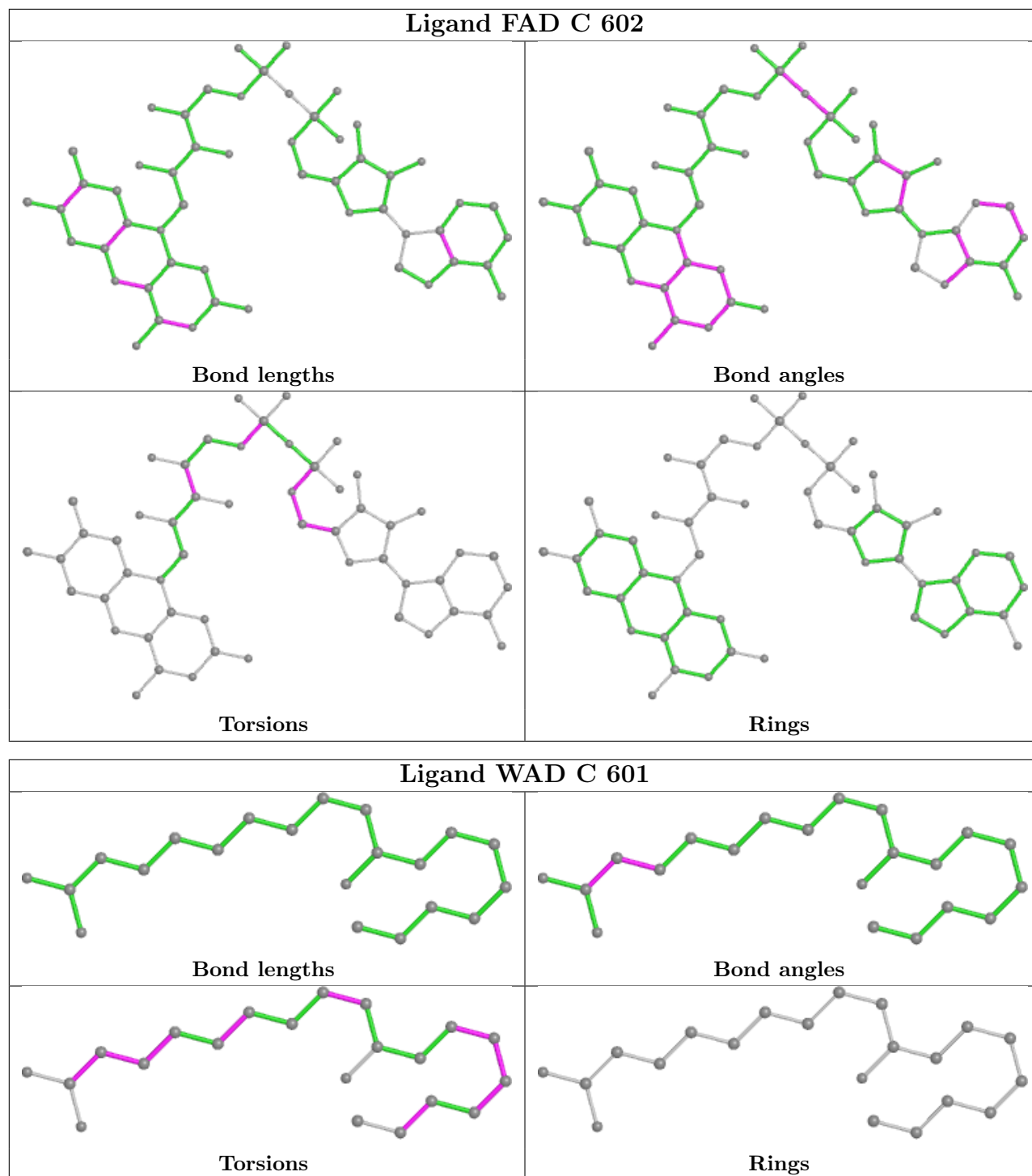
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Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	600	OLA	2	0
3	C	602	FAD	6	0

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

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	583/611 (95%)	-0.12	13 (2%) 62 61	11, 22, 46, 74	4 (0%)
1	B	584/611 (95%)	-0.10	18 (3%) 49 47	12, 22, 50, 82	3 (0%)
1	C	579/611 (94%)	-0.06	18 (3%) 49 47	12, 25, 47, 74	4 (0%)
All	All	1746/1833 (95%)	-0.09	49 (2%) 53 52	11, 23, 47, 82	11 (0%)

All (49) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	80	GLY	11.9
1	B	71	PRO	7.4
1	C	79	GLY	5.9
1	A	58	LEU	4.7
1	C	59	PRO	4.5
1	A	59	PRO	4.3
1	A	71	PRO	4.1
1	B	72	LEU	4.1
1	A	79	GLY	4.1
1	C	81	ARG	4.0
1	B	564	MET	3.9
1	C	-1	SER	3.8
1	C	272	ASN	3.8
1	A	272	ASN	3.8
1	A	563	LYS	3.7
1	A	-1	SER	3.7
1	C	564	MET	3.6
1	A	567	LEU	3.6
1	A	571	GLY	3.6
1	C	273	GLY	3.5
1	C	401	ASP	3.2
1	B	561	ASP	3.1
1	C	400	LYS	3.1

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Mol	Chain	Res	Type	RSRZ
1	A	564	MET	3.1
1	B	81	ARG	2.9
1	B	-1	SER	2.8
1	A	561	ASP	2.8
1	B	560	LYS	2.7
1	B	562	SER	2.7
1	B	439	TRP	2.6
1	B	78	ARG	2.6
1	A	439	TRP	2.6
1	C	58	LEU	2.5
1	B	73	LYS	2.5
1	B	135	VAL	2.5
1	B	404	GLU	2.3
1	B	59	PRO	2.3
1	C	287	PHE	2.3
1	C	404	GLU	2.3
1	B	80	GLY	2.3
1	A	151	LEU	2.3
1	C	60	LYS	2.1
1	C	561	ASP	2.1
1	B	574	LYS	2.1
1	B	570	ALA	2.1
1	C	370	LEU	2.1
1	C	567	LEU	2.1
1	B	464	TYR	2.0
1	C	274	ASN	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [\(i\)](#)

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

6.3 Carbohydrates [\(i\)](#)

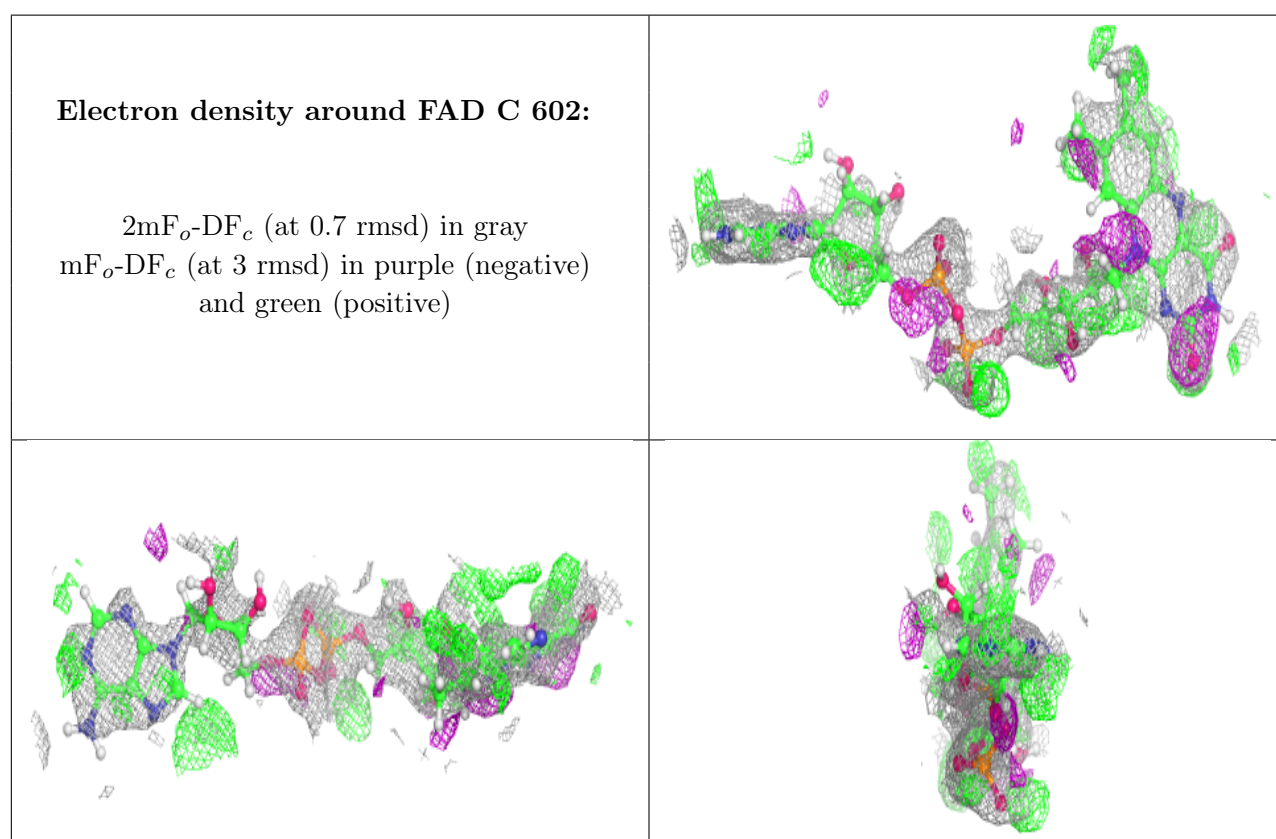
There are no monosaccharides in this entry.

6.4 Ligands [\(i\)](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

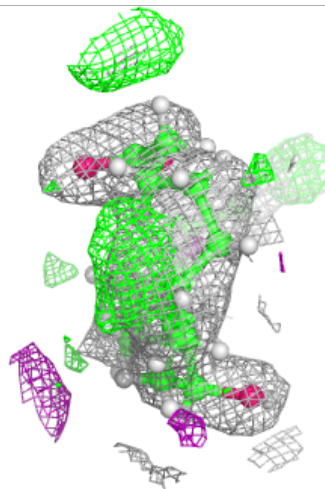
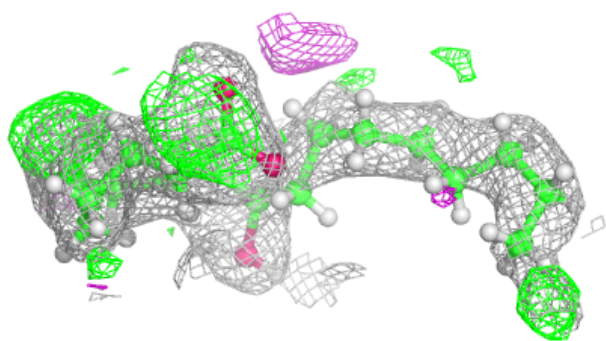
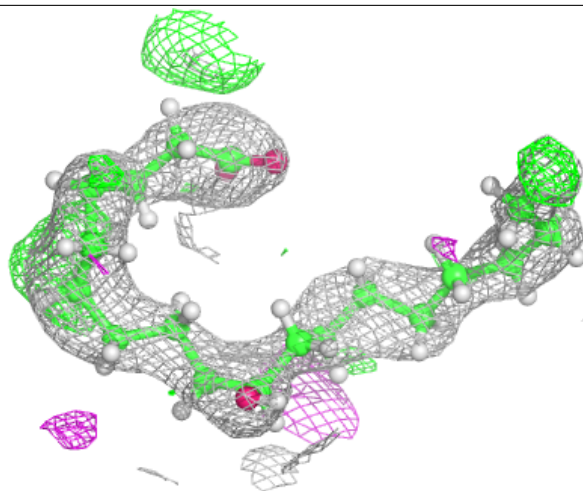
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
3	FAD	C	602	53/53	0.70	0.29	19,40,53,66	84
2	WAD	C	601	21/21	0.80	0.17	21,33,42,47	56
5	OLA	A	600	20/20	0.81	0.18	24,33,43,49	0
5	OLA	B	600	20/20	0.89	0.13	19,30,41,47	53
3	FAD	B	601	53/53	0.89	0.15	19,34,43,47	84
4	K	C	603	1/1	0.95	0.12	18,18,18,18	1

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.



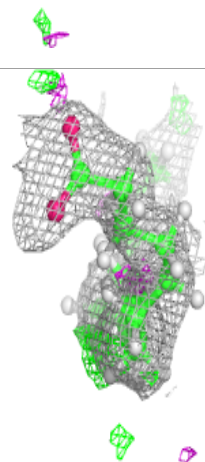
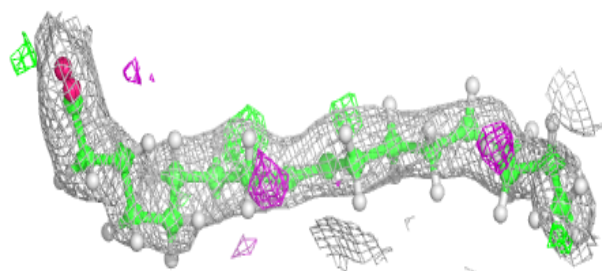
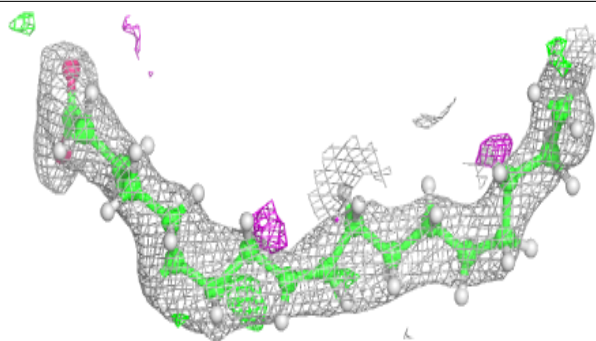
Electron density around WAD C 601:

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

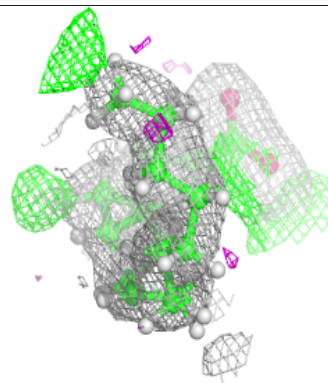
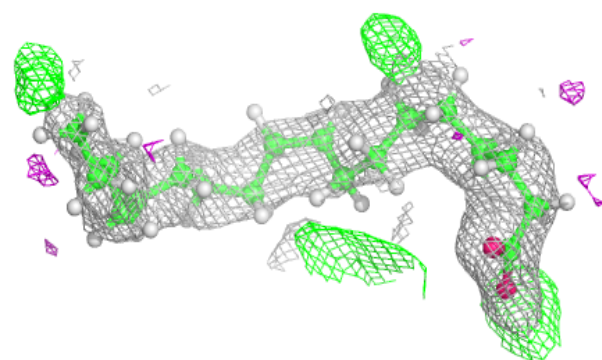
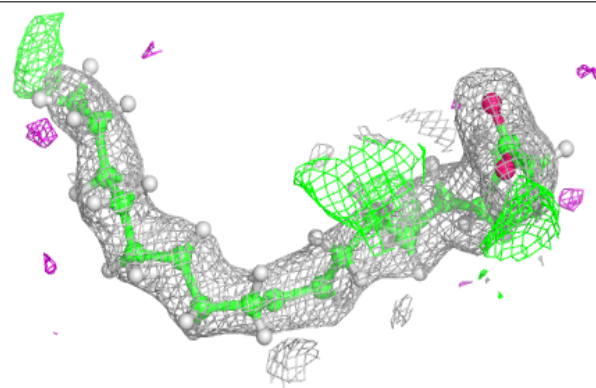


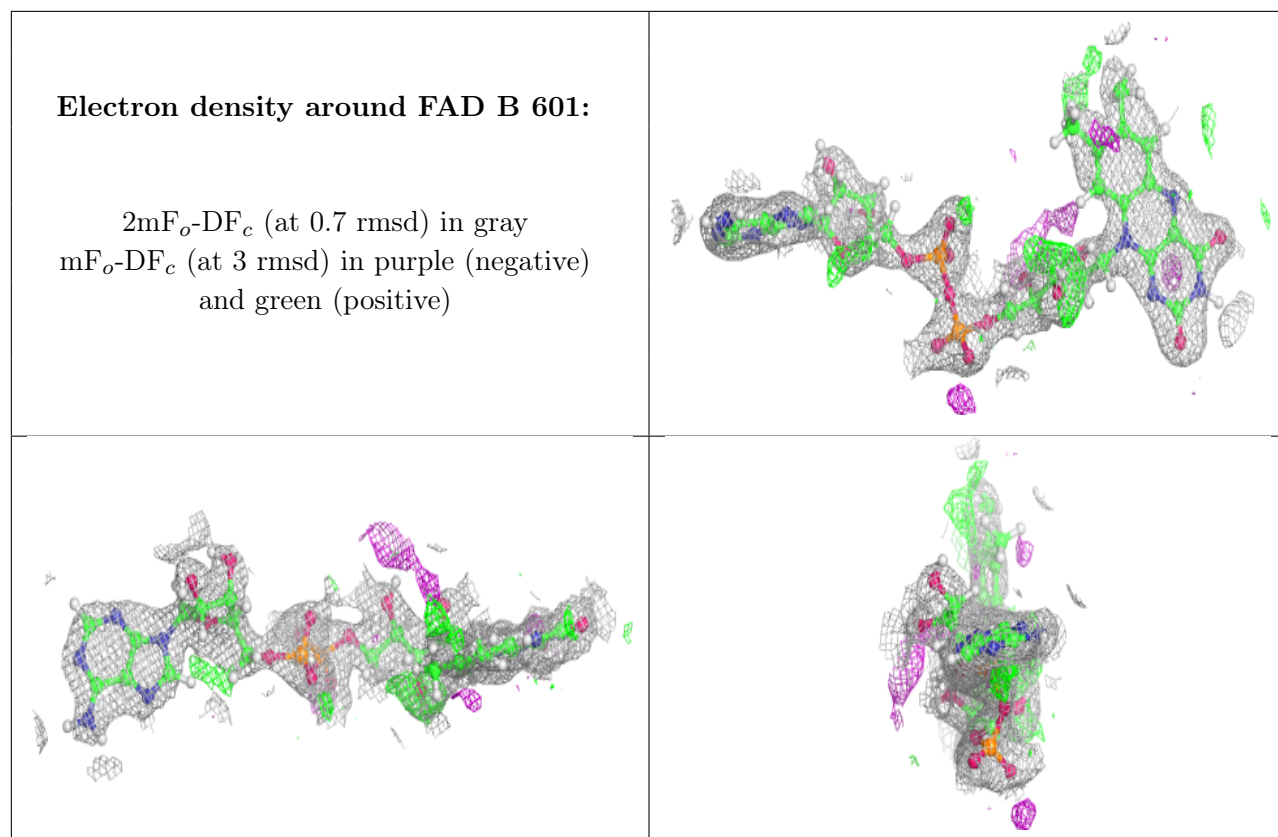
Electron density around OLA A 600:

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

**Electron density around OLA B 600:**

$2mF_o-DF_c$ (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.