Full wwPDB X-ray Structure Validation Report (i)

Oct 10, 2023 – 04:41 PM EDT

PDB ID	:	7JVK
Title	:	Structure of the M101A variant of the SidA ornithine hydroxylase with the FAD in the "out" conformation
Authors	:	Tanner, J.J.; Campbell, A.C.
Deposited on	:	2020-08-21
Resolution	:	2.20 Å(reported)

The following versions of software and data (see references (i)) were used in the production of this report:

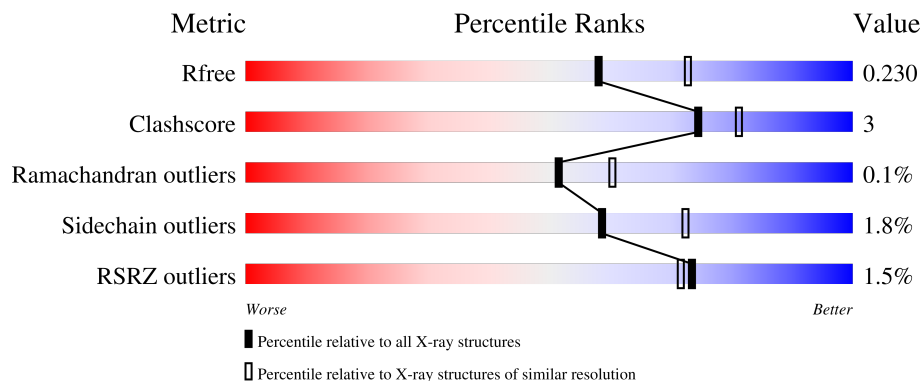|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & 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 2.20 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	Percentile Ranks	Value
Rfree		0.230
Clashscore		3
Ramachandran outliers		0.1%
Sidechain outliers		1.8%
RSRZ outliers		1.5%

Worse   *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

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	501	80% 11% 9%
1	B	501	·% 80% 10% 11%
1	C	501	2% 81% 8% 11%
1	D	501	2% 82% 7% 11%

2 Entry composition ⓘ

There are 6 unique types of molecules in this entry. The entry contains 14556 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 L-ornithine N(5)-monooxygenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	455	Total	C	N	O	S	0	0	0
			3534	2226	633	660	15			
1	B	448	Total	C	N	O	S	0	0	0
			3468	2189	618	646	15			
1	C	446	Total	C	N	O	S	0	0	0
			3481	2192	628	646	15			
1	D	448	Total	C	N	O	S	0	0	0
			3436	2167	607	647	15			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	101	ALA	MET	engineered mutation	UNP E9QYP0
B	101	ALA	MET	engineered mutation	UNP E9QYP0
C	101	ALA	MET	engineered mutation	UNP E9QYP0
D	101	ALA	MET	engineered mutation	UNP E9QYP0

- 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).

FAD

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		
2	C	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
2	D	1	Total	C	N	O	P	0	0
			53	27	9	15	2		

- Molecule 3 is TRIETHYLENE GLYCOL (three-letter code: PGE) (formula: $C_6H_{14}O_4$).

PGE
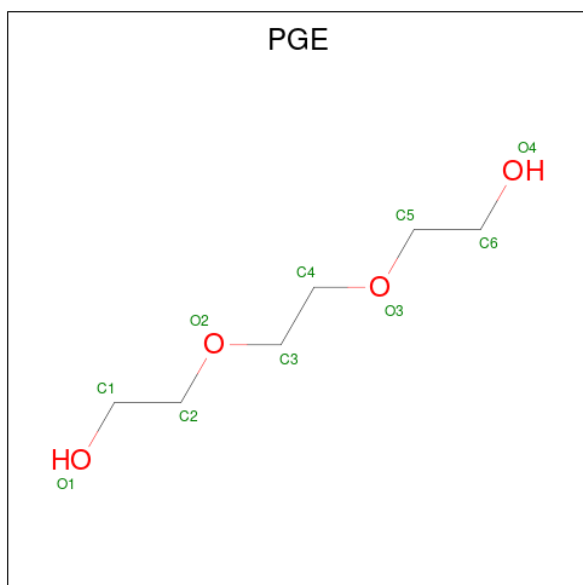
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total　C　O 10　　6　4			0	0
3	B	1	Total　C　O 10　　6　4			0	0

- Molecule 4 is ACETATE ION (three-letter code: ACT) (formula: $C_2H_3O_2$).

ACT
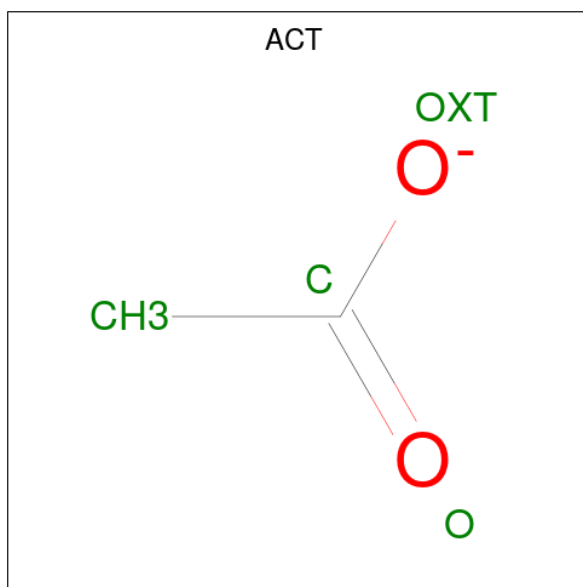
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total　C　O 4　　2　2			0	0
4	B	1	Total　C　O 4　　2　2			0	0
4	C	1	Total　C　O 4　　2　2			0	0
4	D	1	Total　C　O 4　　2　2			0	0

- Molecule 5 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total　Ca 1　　1		0	0
5	C	1	Total　Ca 1　　1		0	0

- Molecule 6 is water.

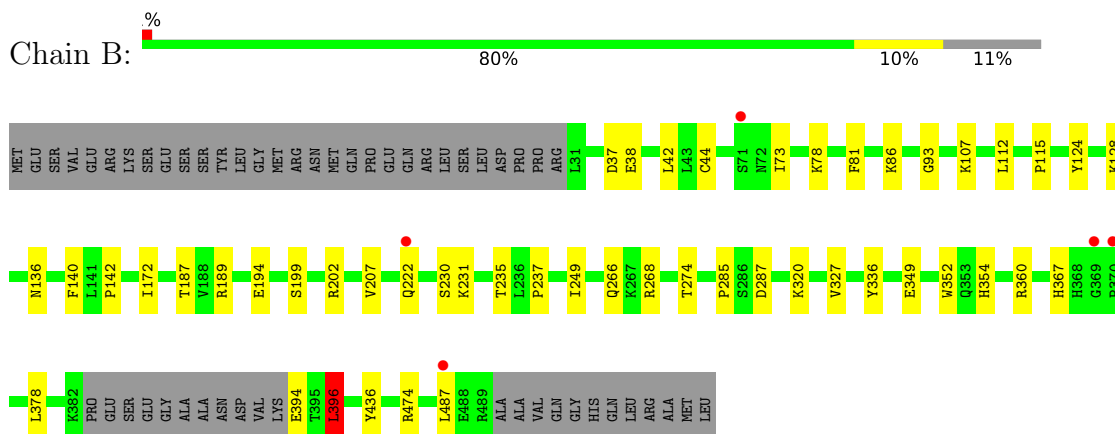| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	95	Total 95	O 95	0	0
6	B	121	Total 121	O 121	0	0
6	C	97	Total 97	O 97	0	0
6	D	74	Total 74	O 74	0	0

3 Residue-property plots ⓘ

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.
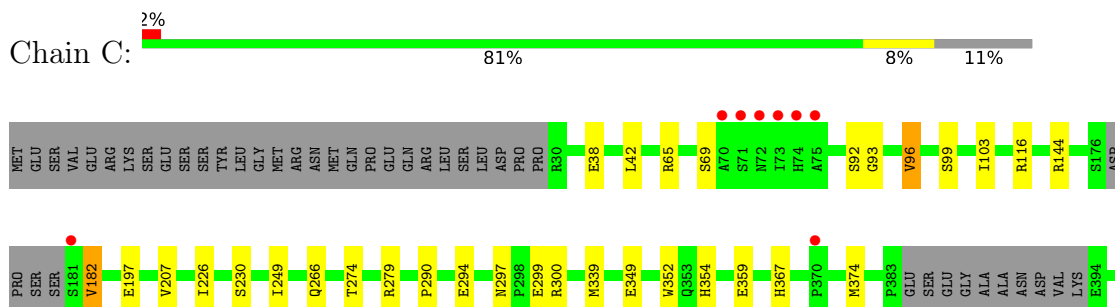
• Molecule 1: L-ornithine N(5)-monooxygenase
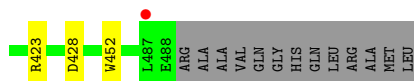
Chain A:

• Molecule 1: L-ornithine N(5)-monooxygenase

Chain B:

• Molecule 1: L-ornithine N(5)-monooxygenase

Chain C:

N410 A411 H412 Y436 K444 W452 H461 L468 R474 R489 ALA ALA VAL GLN GLY HIS GLN LEU ARG ALA MET LEU

• Molecule 1: L-ornithine N(5)-monooxygenase

Chain D:

MET GLU SER VAL GLU ARG LYS SER GLU SER SER TYR LEU GLY MET ARG ASN MET GLN PRO GLU GLN ARG LEU SER LEU ASP PRO PRO R30 S33 T34 D37 L42 L43 C44 S69 A70 S71 N72 I73 H74 A75 K78 F81 L82 E83 S92 L95 F121

L125 D160 S179 I198 R204 V207 S244 Q266 R279 M283 E311 R314 A318 D319 K320 V327 I335 M339 H354 E359 H368 G369 P370 Q371 L378 K382 PRO GLU SER GLU GLY ALA ALA ASN ASP VAL LYS E394 Q420

R423 D428 W452 L487 E488 ARG ALA ALA VAL GLN GLY HIS GLN LEU ARG ALA MET LEU

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	76.44Å　　155.28Å　　88.27Å 90.00°　　110.33°　　90.00°	Depositor
Resolution (Å)	56.63　–　2.20 56.63　–　2.20	Depositor EDS
% Data completeness (in resolution range)	98.6 (56.63-2.20) 98.6 (56.63-2.20)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.48 (at 2.20Å)	Xtriage
Refinement program	PHENIX 1.18	Depositor
R, R_{free}	0.195　,　0.230 0.195　,　0.230	Depositor DCC
R_{free} test set	1928 reflections (2.00%)	wwPDB-VP
Wilson B-factor (Å^2)	29.0	Xtriage
Anisotropy	0.135	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 36.8	EDS
L-test for twinning[2]	$< |L| > = 0.52, < L^2 > = 0.35$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	14556	wwPDB-VP
Average B, all atoms (Å^2)	34.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.72% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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 (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: ACT, CA, PGE, 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	0.42	1/3611 (0.0%)	0.58	0/4900
1	B	0.40	0/3544	0.57	1/4811 (0.0%)
1	C	0.42	0/3556	0.57	0/4822
1	D	0.38	0/3512	0.55	0/4777
All	All	0.40	1/14223 (0.0%)	0.57	1/19310 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	80	CYS	CB-SG	-5.45	1.73	1.81

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	396	LEU	CA-CB-CG	5.44	127.82	115.30

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	3534	0	3429	27	0
1	B	3468	0	3351	25	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	3481	0	3389	21	0
1	D	3436	0	3275	17	0
2	A	53	0	30	0	0
2	B	53	0	30	0	0
2	C	53	0	31	0	0
2	D	53	0	31	1	0
3	A	10	0	14	1	0
3	B	10	0	14	0	0
4	A	4	0	3	0	0
4	B	4	0	3	0	0
4	C	4	0	3	0	0
4	D	4	0	3	0	0
5	A	1	0	0	0	0
5	C	1	0	0	0	0
6	A	95	0	0	1	0
6	B	121	0	0	1	0
6	C	97	0	0	0	0
6	D	74	0	0	0	0
All	All	14556	0	13606	88	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 (88) 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:D:311:GLU:OE2	1:D:314:ARG:NH2	2.20	0.75
1:A:225:ARG:HG2	1:A:239:LEU:HD21	1.78	0.65
1:A:231:LYS:HD3	3:A:602:PGE:H5	1.78	0.65
1:B:287:ASP:HB3	1:B:320:LYS:HE2	1.82	0.62
1:C:42:LEU:HD11	1:C:207:VAL:HG23	1.82	0.62
1:B:360:ARG:HH21	1:B:394:GLU:CD	2.05	0.60
1:D:318:ALA:O	1:D:320:LYS:N	2.39	0.55
1:C:103:ILE:HD13	1:C:468:LEU:HB2	1.89	0.55
1:C:226:ILE:HD11	1:C:374:MET:HE1	1.90	0.54
1:D:34:THR:HG21	1:D:78:LYS:HA	1.89	0.54
1:A:294:GLU:O	1:A:300:ARG:HG3	2.08	0.53
1:A:42:LEU:HD11	1:A:207:VAL:HG23	1.91	0.53
1:D:33:SER:HB2	1:D:160:ASP:O	2.10	0.52
1:B:37:ASP:O	1:B:202:ARG:NH2	2.43	0.52
1:A:96:VAL:HG22	1:A:99:SER:HB3	1.93	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:65:ARG:NH2	1:C:116:ARG:O	2.38	0.51
1:D:92:SER:HA	1:D:95:LEU:HG	1.93	0.51
1:A:283:MET:HE2	1:A:332:ILE:HG23	1.93	0.50
1:A:393:LYS:O	1:A:394:GLU:HG2	2.12	0.50
1:B:86:LYS:NZ	1:B:194:GLU:OE2	2.30	0.50
1:B:93:GLY:HA3	1:B:230:SER:O	2.11	0.50
1:A:177:ASP:HB3	1:A:180:SER:HB3	1.93	0.50
1:C:266:GLN:HG2	1:C:354:HIS:CE1	2.48	0.49
1:A:319:ASP:O	1:A:322:THR:OG1	2.31	0.48
1:D:207:VAL:HG22	1:D:452:TRP:HB2	1.95	0.48
1:B:249:ILE:O	1:B:274:THR:HA	2.12	0.48
1:D:279:ARG:O	1:D:359:GLU:HA	2.12	0.48
1:C:294:GLU:O	1:C:300:ARG:HG3	2.14	0.48
1:B:124:TYR:O	1:B:128:LYS:HG2	2.14	0.48
1:B:172:ILE:HG12	1:B:187:THR:HB	1.95	0.48
1:C:249:ILE:O	1:C:274:THR:HA	2.14	0.48
1:A:410:ASN:HA	1:A:412:HIS:CE1	2.48	0.48
1:A:297:ASN:HB3	1:A:299:GLU:OE1	2.13	0.47
1:C:367:HIS:HB3	1:C:374:MET:HE2	1.96	0.47
1:A:281:SER:HA	1:A:359:GLU:HG3	1.95	0.47
1:B:44:CYS:HB2	1:B:81:PHE:CD2	2.49	0.47
1:A:130:ARG:HA	1:A:133:HIS:HD2	1.79	0.47
1:D:121:PHE:CE2	1:D:125:LEU:HD11	2.49	0.47
1:D:335:ILE:O	1:D:339:MET:HG2	2.15	0.47
1:C:339:MET:HG3	1:C:352:TRP:CZ3	2.50	0.47
1:B:436:TYR:CZ	1:B:474:ARG:HD2	2.50	0.46
1:D:283:MET:HG2	1:D:327:VAL:HG21	1.96	0.46
1:D:266:GLN:HG2	1:D:354:HIS:CE1	2.49	0.46
1:B:189:ARG:HA	1:B:199:SER:O	2.15	0.46
1:B:231:LYS:O	1:B:235:THR:HB	2.16	0.46
1:B:285:PRO:HA	1:B:327:VAL:O	2.15	0.46
1:C:93:GLY:HA3	1:C:230:SER:O	2.16	0.46
1:A:254:SER:HB3	1:A:278:MET:HB2	1.97	0.45
1:C:182:VAL:HG22	1:C:444:LYS:C	2.37	0.45
1:A:45:VAL:HG22	1:A:168:VAL:HG21	1.99	0.45
1:A:170:GLU:OE1	1:A:189:ARG:HD2	2.17	0.44
1:A:322:THR:HG22	6:A:738:HOH:O	2.16	0.44
1:B:38:GLU:OE1	1:B:78:LYS:NZ	2.36	0.44
1:D:37:ASP:OD2	1:D:37:ASP:N	2.49	0.44
1:A:266:GLN:HG2	1:A:354:HIS:CE1	2.53	0.44
1:B:378:LEU:HD11	1:B:396:LEU:HD11	1.99	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:378:LEU:O	1:A:393:LYS:HB3	2.19	0.43
1:B:73:ILE:HD13	1:B:487:LEU:HD22	2.00	0.43
1:D:83:GLU:OE2	2:D:601:FAD:O2B	2.29	0.43
1:A:323:ASN:HB2	1:A:324:TYR:H	1.69	0.42
1:B:140:PHE:O	1:B:142:PRO:HD3	2.19	0.42
1:A:44:CYS:HB2	1:A:81:PHE:CD2	2.54	0.42
1:A:207:VAL:HG22	1:A:452:TRP:HB2	2.00	0.42
1:B:42:LEU:HD11	1:B:207:VAL:HG23	2.00	0.42
1:B:136:ASN:ND2	6:B:707:HOH:O	2.47	0.42
1:C:207:VAL:HG22	1:C:452:TRP:HB2	2.01	0.42
1:A:93:GLY:HA3	1:A:230:SER:O	2.19	0.42
1:B:266:GLN:HG2	1:B:354:HIS:CE1	2.55	0.42
1:D:44:CYS:HB2	1:D:81:PHE:CD2	2.55	0.42
1:D:420:GLN:HB2	1:D:423:ARG:NH2	2.35	0.42
1:A:123:ASN:HA	1:B:115:PRO:HG2	2.02	0.42
1:A:316:LEU:HD23	1:A:316:LEU:HA	1.86	0.41
1:C:436:TYR:CZ	1:C:474:ARG:HD2	2.54	0.41
1:A:92:SER:HA	1:A:95:LEU:HG	2.03	0.41
1:B:237:PRO:HG3	1:B:268:ARG:HH11	1.85	0.41
1:C:279:ARG:O	1:C:359:GLU:HA	2.20	0.41
1:B:107:LYS:HG2	1:B:112:LEU:HD11	2.02	0.41
1:D:378:LEU:HD23	1:D:378:LEU:HA	1.84	0.41
1:A:335:ILE:O	1:A:339:MET:HG2	2.20	0.41
1:B:349:GLU:HA	1:B:352:TRP:CE2	2.56	0.41
1:C:99:SER:HB2	1:C:144:ARG:CZ	2.50	0.41
1:C:410:ASN:HA	1:C:412:HIS:CE1	2.56	0.41
1:B:336:TYR:CD1	1:C:290:PRO:HB2	2.55	0.41
1:C:96:VAL:HG22	1:C:99:SER:HB3	2.02	0.41
1:C:297:ASN:HB3	1:C:299:GLU:OE2	2.21	0.40
1:C:349:GLU:HA	1:C:352:TRP:CE2	2.56	0.40
1:D:42:LEU:HD11	1:D:207:VAL:HG23	2.02	0.40
1:C:436:TYR:CE1	1:C:461:HIS:CD2	3.10	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	451/501 (90%)	435 (96%)	16 (4%)	0	100	100
1	B	444/501 (89%)	432 (97%)	12 (3%)	0	100	100
1	C	440/501 (88%)	425 (97%)	15 (3%)	0	100	100
1	D	444/501 (89%)	430 (97%)	12 (3%)	2 (0%)	29	31
All	All	1779/2004 (89%)	1722 (97%)	55 (3%)	2 (0%)	51	60

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	319	ASP
1	D	318	ALA

5.3.2 Protein sidechains ⓘ

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	376/441 (85%)	367 (98%)	9 (2%)	49	62
1	B	365/441 (83%)	362 (99%)	3 (1%)	81	90
1	C	371/441 (84%)	365 (98%)	6 (2%)	62	76
1	D	359/441 (81%)	351 (98%)	8 (2%)	52	65
All	All	1471/1764 (83%)	1445 (98%)	26 (2%)	59	72

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	30	ARG
1	A	69	SER
1	A	71	SER
1	A	199	SER

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Mol	Chain	Res	Type
1	A	317	LEU
1	A	322	THR
1	A	341	LEU
1	A	415	LEU
1	A	488	GLU
1	B	222	GLN
1	B	367	HIS
1	B	396	LEU
1	C	38	GLU
1	C	69	SER
1	C	92	SER
1	C	96	VAL
1	C	182	VAL
1	C	197	GLU
1	D	30	ARG
1	D	179	SER
1	D	198	ILE
1	D	204	ARG
1	D	244	SER
1	D	339	MET
1	D	371	GLN
1	D	428	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	367	HIS
1	D	367	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 12 ligands modelled in this entry, 2 are monoatomic - leaving 10 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	#$|Z| > 2$
2	FAD	A	601	-	53,58,58	2.09	15 (28%)	68,89,89	1.38	9 (13%)
4	ACT	B	603	-	3,3,3	1.11	0	3,3,3	1.38	0
2	FAD	B	601	-	53,58,58	2.08	15 (28%)	68,89,89	1.42	12 (17%)
2	FAD	C	601	-	53,58,58	1.99	14 (26%)	68,89,89	1.39	8 (11%)
2	FAD	D	601	-	53,58,58	2.03	15 (28%)	68,89,89	1.35	7 (10%)
3	PGE	A	602	-	9,9,9	0.32	0	8,8,8	0.26	0
4	ACT	D	602	-	3,3,3	1.37	0	3,3,3	1.20	0
3	PGE	B	602	-	9,9,9	0.40	0	8,8,8	0.36	0
4	ACT	A	603	-	3,3,3	0.90	0	3,3,3	1.50	0
4	ACT	C	602	-	3,3,3	1.53	1 (33%)	3,3,3	1.44	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	FAD	A	601	-	-	1/30/50/50	0/6/6/6
2	FAD	B	601	-	-	2/30/50/50	0/6/6/6
2	FAD	C	601	-	-	1/30/50/50	0/6/6/6
2	FAD	D	601	-	-	1/30/50/50	0/6/6/6
3	PGE	A	602	-	-	1/7/7/7	-
3	PGE	B	602	-	-	1/7/7/7	-

All (60) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	601	FAD	O4-C4	7.34	1.37	1.23
2	D	601	FAD	O4-C4	7.34	1.37	1.23
2	A	601	FAD	O2-C2	7.23	1.37	1.24

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	601	FAD	O4-C4	7.10	1.37	1.23
2	A	601	FAD	O4-C4	6.94	1.36	1.23
2	B	601	FAD	O2-C2	6.75	1.36	1.24
2	D	601	FAD	O2-C2	6.35	1.36	1.24
2	C	601	FAD	O2-C2	6.22	1.35	1.24
2	B	601	FAD	C4X-N5	4.68	1.39	1.30
2	D	601	FAD	C4X-N5	4.28	1.39	1.30
2	A	601	FAD	C4X-N5	4.14	1.38	1.30
2	C	601	FAD	C4X-N5	3.67	1.37	1.30
2	C	601	FAD	C2B-C1B	-3.55	1.48	1.53
2	A	601	FAD	C2-N1	3.47	1.45	1.36
2	B	601	FAD	C2-N1	3.47	1.45	1.36
2	C	601	FAD	C2-N1	3.39	1.44	1.36
2	A	601	FAD	C10-N1	3.39	1.40	1.33
2	B	601	FAD	C2B-C1B	-3.32	1.48	1.53
2	B	601	FAD	C6A-N6A	3.07	1.45	1.34
2	D	601	FAD	C2-N1	2.98	1.43	1.36
2	A	601	FAD	C6A-N6A	2.97	1.44	1.34
2	D	601	FAD	C10-N1	2.93	1.39	1.33
2	D	601	FAD	C6A-N6A	2.90	1.44	1.34
2	D	601	FAD	C2A-N3A	2.87	1.36	1.32
2	A	601	FAD	C2B-C1B	-2.83	1.49	1.53
2	A	601	FAD	O2B-C2B	-2.74	1.36	1.43
2	B	601	FAD	O2B-C2B	-2.68	1.36	1.43
2	C	601	FAD	C10-N1	2.67	1.38	1.33
2	C	601	FAD	O2'-C2'	-2.65	1.37	1.43
2	A	601	FAD	PA-O5B	-2.61	1.48	1.59
2	A	601	FAD	O4'-C4'	-2.56	1.37	1.43
2	A	601	FAD	C2A-N3A	2.55	1.36	1.32
2	C	601	FAD	C6A-N6A	2.53	1.43	1.34
2	C	601	FAD	O3'-C3'	-2.50	1.37	1.43
2	C	601	FAD	O4'-C4'	-2.49	1.38	1.43
2	D	601	FAD	PA-O5B	-2.49	1.49	1.59
2	D	601	FAD	C2B-C1B	-2.49	1.50	1.53
2	D	601	FAD	O4'-C4'	-2.45	1.38	1.43
2	A	601	FAD	PA-O2A	-2.42	1.44	1.55
2	B	601	FAD	C10-N1	2.41	1.38	1.33
2	D	601	FAD	O2'-C2'	-2.41	1.38	1.43
2	D	601	FAD	O3'-C3'	-2.36	1.37	1.43
2	B	601	FAD	C2A-N3A	2.33	1.35	1.32
2	B	601	FAD	O2'-C2'	-2.32	1.38	1.43
2	D	601	FAD	PA-O2A	-2.27	1.44	1.55

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	C	602	ACT	CH3-C	2.24	1.58	1.49
2	C	601	FAD	PA-O5B	-2.24	1.50	1.59
2	C	601	FAD	O2B-C2B	-2.19	1.37	1.43
2	A	601	FAD	O3'-C3'	-2.19	1.37	1.43
2	B	601	FAD	PA-O2A	-2.18	1.45	1.55
2	C	601	FAD	C2A-N3A	2.18	1.35	1.32
2	B	601	FAD	O4B-C4B	-2.17	1.40	1.45
2	D	601	FAD	O4B-C4B	-2.16	1.40	1.45
2	D	601	FAD	P-O1P	2.14	1.58	1.50
2	B	601	FAD	O4'-C4'	-2.12	1.38	1.43
2	C	601	FAD	PA-O2A	-2.11	1.45	1.55
2	B	601	FAD	PA-O5B	-2.03	1.51	1.59
2	A	601	FAD	O4B-C4B	-2.03	1.40	1.45
2	A	601	FAD	P-O1P	2.02	1.58	1.50
2	B	601	FAD	O3'-C3'	-2.01	1.38	1.43

All (36) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	601	FAD	N3A-C2A-N1A	-6.18	119.02	128.68
2	C	601	FAD	N3A-C2A-N1A	-6.02	119.27	128.68
2	D	601	FAD	N3A-C2A-N1A	-5.47	120.13	128.68
2	B	601	FAD	N3A-C2A-N1A	-5.09	120.72	128.68
2	B	601	FAD	C4X-C4-N3	2.96	120.72	113.19
2	B	601	FAD	C4-N3-C2	-2.88	120.33	125.64
2	A	601	FAD	C4X-C4-N3	2.84	120.41	113.19
2	D	601	FAD	C4-N3-C2	-2.78	120.50	125.64
2	C	601	FAD	O4-C4-C4X	-2.75	119.30	126.60
2	D	601	FAD	O4-C4-C4X	-2.71	119.41	126.60
2	C	601	FAD	C4-N3-C2	-2.71	120.64	125.64
2	B	601	FAD	C4X-C10-N1	-2.64	118.60	124.73
2	B	601	FAD	C4-C4X-N5	2.62	121.97	118.23
2	D	601	FAD	C4X-C4-N3	2.62	119.84	113.19
2	B	601	FAD	O2P-P-O5'	-2.49	96.20	107.75
2	A	601	FAD	C2A-N1A-C6A	2.45	122.94	118.75
2	A	601	FAD	O4-C4-C4X	-2.40	120.24	126.60
2	C	601	FAD	C5X-C9A-N10	2.39	120.43	117.95
2	A	601	FAD	C4-N3-C2	-2.35	121.31	125.64
2	C	601	FAD	C4X-C4-N3	2.35	119.15	113.19
2	A	601	FAD	C4X-C10-N1	-2.32	119.34	124.73
2	C	601	FAD	O5B-PA-O1A	2.28	117.98	109.07
2	B	601	FAD	O5'-P-O1P	2.27	117.93	109.07

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	601	FAD	C4X-C10-N1	-2.22	119.58	124.73
2	D	601	FAD	O2P-P-O5'	-2.22	97.44	107.75
2	B	601	FAD	C10-N1-C2	2.21	121.33	116.90
2	A	601	FAD	C5X-C9A-N10	2.21	120.23	117.95
2	C	601	FAD	O2P-P-O5'	-2.20	97.52	107.75
2	B	601	FAD	C10-C4X-N5	-2.20	120.20	124.86
2	B	601	FAD	C4A-C5A-N7A	-2.15	107.16	109.40
2	B	601	FAD	C5X-C9A-N10	2.12	120.14	117.95
2	D	601	FAD	C4-C4X-N5	2.10	121.22	118.23
2	C	601	FAD	C4X-C10-N1	-2.06	119.95	124.73
2	B	601	FAD	C2A-N1A-C6A	2.04	122.25	118.75
2	A	601	FAD	C9A-C5X-N5	-2.02	120.23	122.43
2	A	601	FAD	O2P-P-O5'	-2.00	98.44	107.75

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	602	PGE	O1-C1-C2-O2
2	B	601	FAD	PA-O3P-P-O5'
3	A	602	PGE	C4-C3-O2-C2
2	B	601	FAD	O4B-C4B-C5B-O5B
2	C	601	FAD	O4B-C4B-C5B-O5B
2	D	601	FAD	O4B-C4B-C5B-O5B
2	A	601	FAD	O4B-C4B-C5B-O5B

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	601	FAD	1	0
3	A	602	PGE	1	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 FAD A 601

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD B 601

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD C 601

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD D 601

Bond lengths

Bond angles

Torsions

Rings
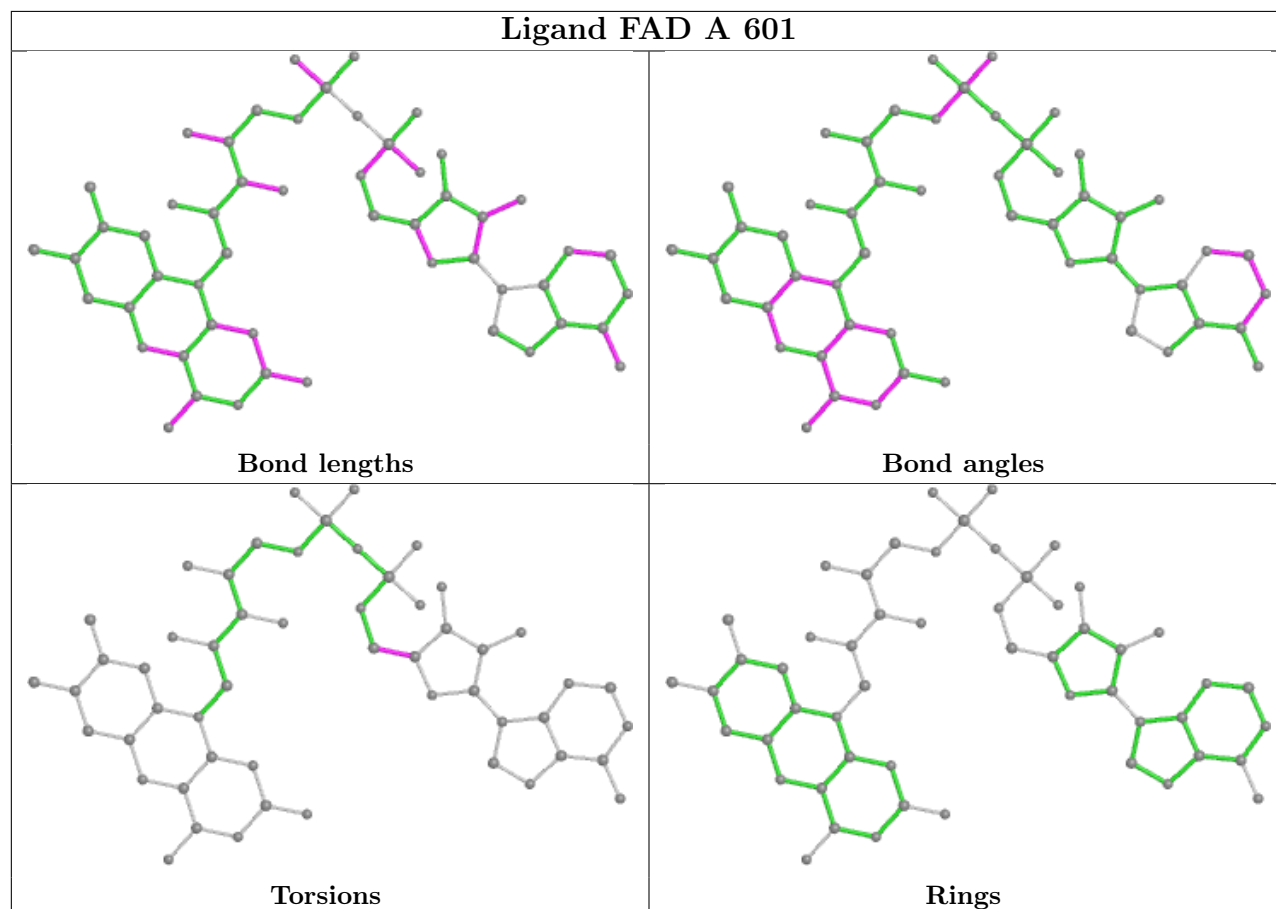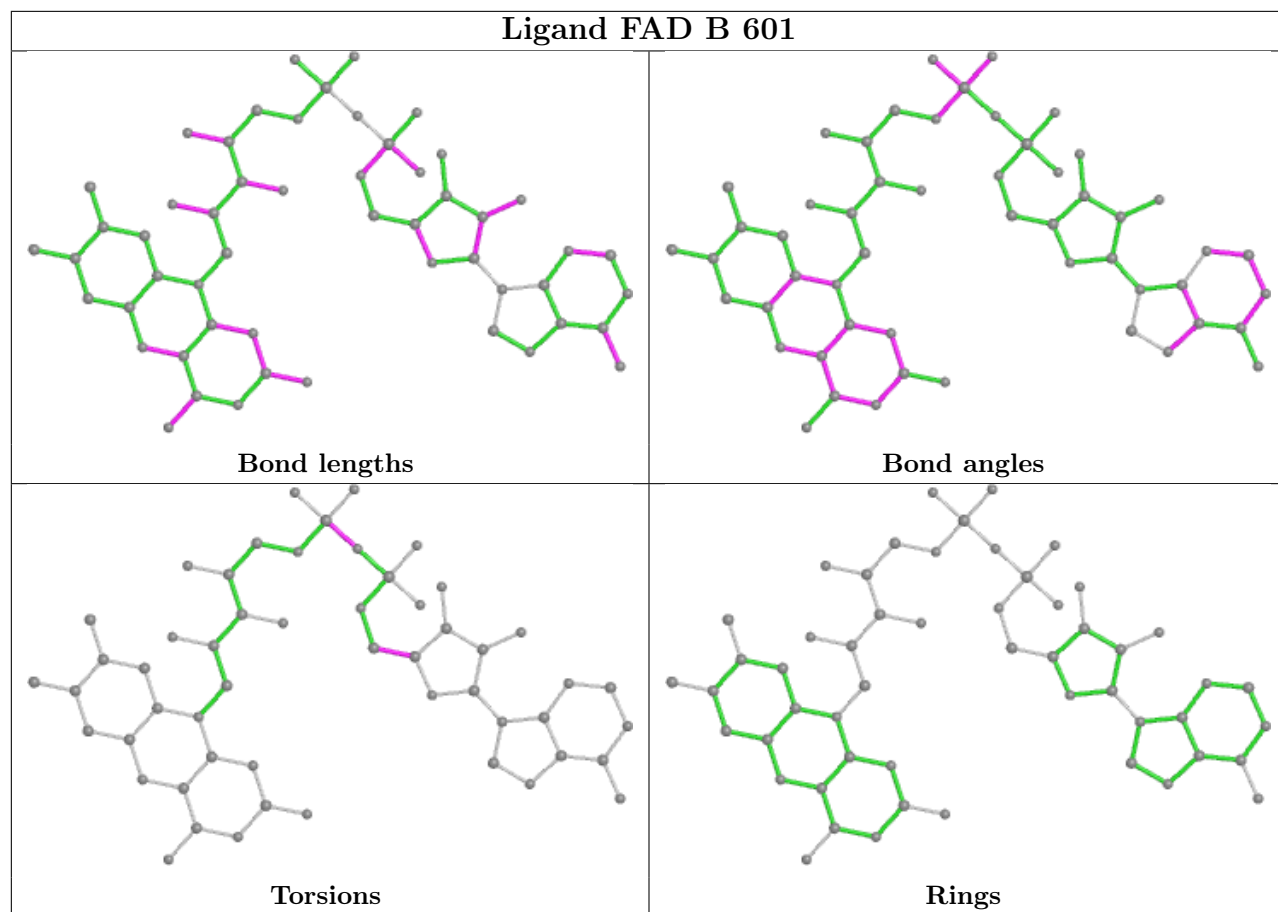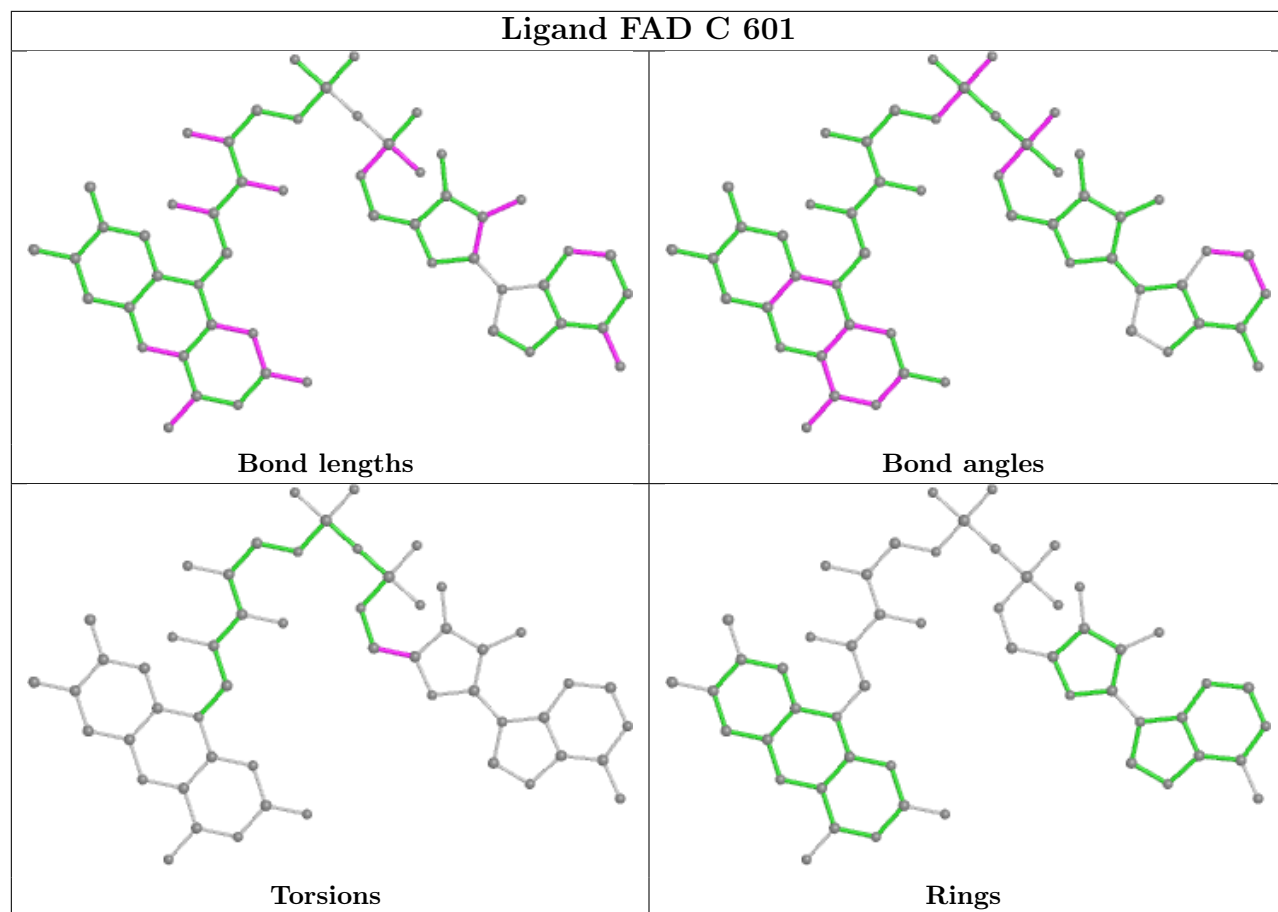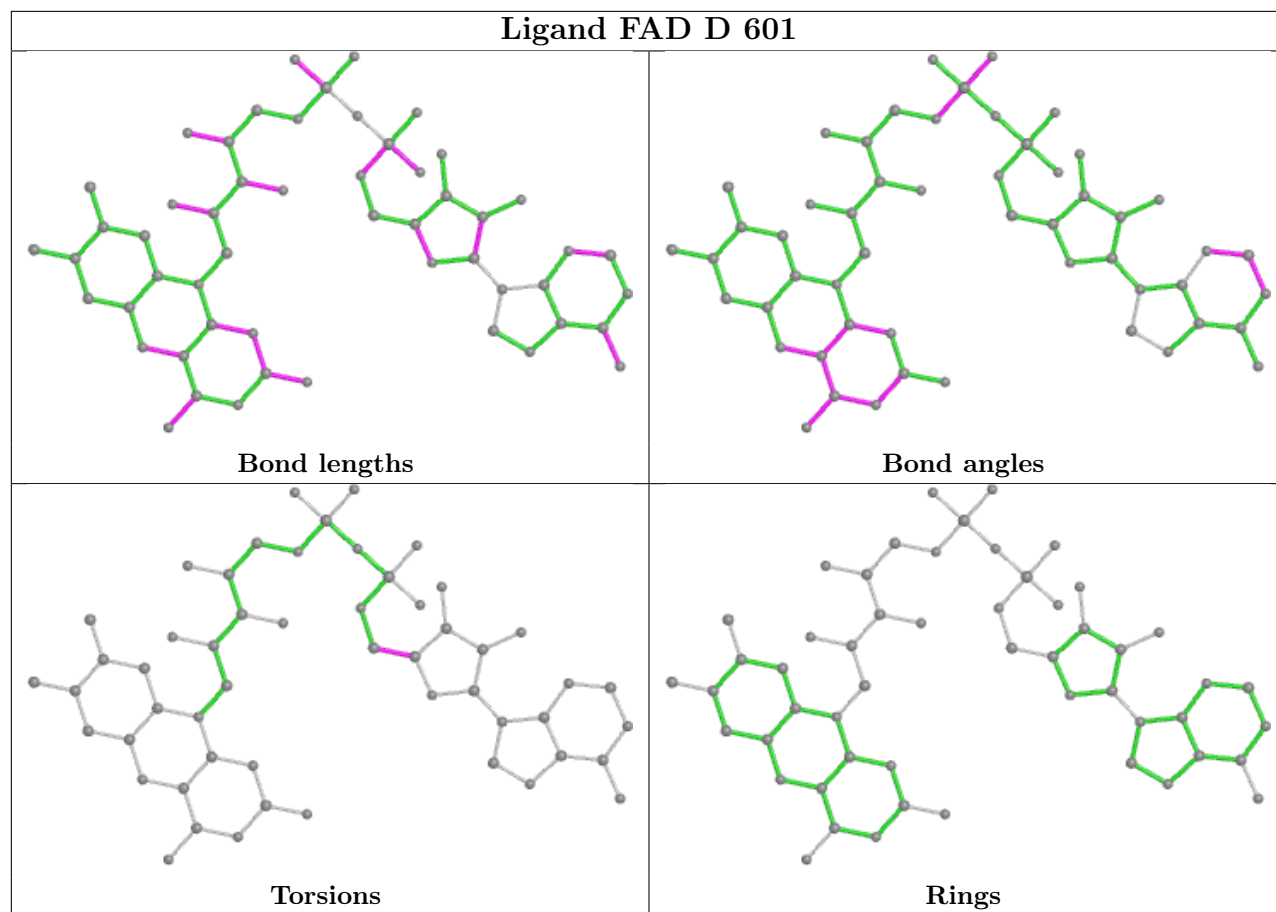
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	455/501 (90%)	-0.33	2 (0%)	92	91	20, 30, 62, 94	0
1	B	448/501 (89%)	-0.33	5 (1%)	80	79	19, 29, 55, 86	0
1	C	446/501 (89%)	-0.21	8 (1%)	68	66	22, 32, 55, 94	0
1	D	448/501 (89%)	-0.13	12 (2%)	54	52	23, 38, 67, 97	0
All	All	1797/2004 (89%)	-0.25	27 (1%)	73	72	19, 32, 59, 97	0

All (27) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	71	SER	5.3
1	D	70	ALA	5.1
1	D	71	SER	5.0
1	C	75	ALA	4.7
1	D	73	ILE	4.2
1	D	487	LEU	4.1
1	D	72	ASN	4.0
1	C	70	ALA	3.7
1	D	370	PRO	3.6
1	C	73	ILE	3.3
1	D	319	ASP	3.2
1	C	72	ASN	3.1
1	A	75	ALA	3.1
1	C	370	PRO	3.1
1	D	74	HIS	2.8
1	D	69	SER	2.7
1	A	74	HIS	2.7
1	B	370	PRO	2.7
1	D	369	GLY	2.6
1	D	368	HIS	2.5
1	C	74	HIS	2.5

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Mol	Chain	Res	Type	RSRZ
1	D	75	ALA	2.4
1	B	222	GLN	2.4
1	C	181	SER	2.4
1	B	369	GLY	2.2
1	B	71	SER	2.1
1	B	487	LEU	2.0

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

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

6.3   Carbohydrates ⓘ

There are no monosaccharides in this entry.

6.4   Ligands ⓘ

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
5	CA	A	604	1/1	0.90	0.17	45,45,45,45	0
3	PGE	B	602	10/10	0.91	0.21	35,40,44,47	0
3	PGE	A	602	10/10	0.95	0.14	35,40,43,44	0
2	FAD	D	601	53/53	0.96	0.10	25,33,41,42	0
5	CA	C	603	1/1	0.96	0.08	44,44,44,44	0
4	ACT	B	603	4/4	0.97	0.12	26,27,30,31	0
2	FAD	C	601	53/53	0.97	0.12	23,26,30,33	0
2	FAD	B	601	53/53	0.97	0.11	19,23,28,29	0
4	ACT	C	602	4/4	0.98	0.10	31,32,35,36	0
4	ACT	D	602	4/4	0.98	0.11	28,30,31,33	0
4	ACT	A	603	4/4	0.98	0.09	26,27,28,28	0
2	FAD	A	601	53/53	0.98	0.11	19,24,27,30	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 D 601:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
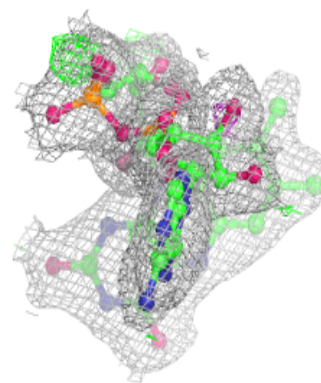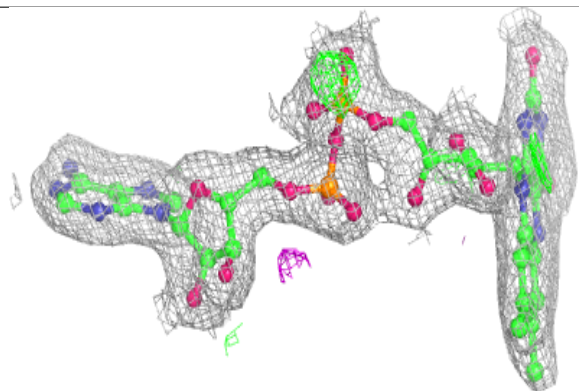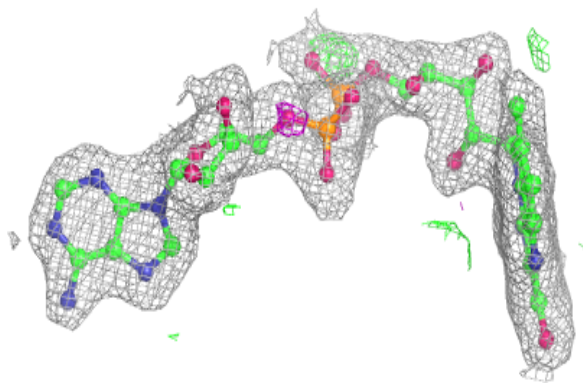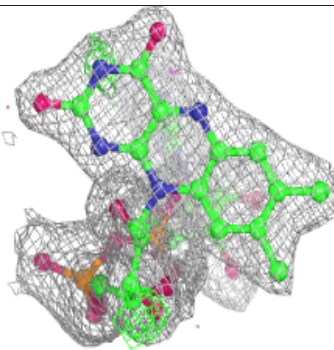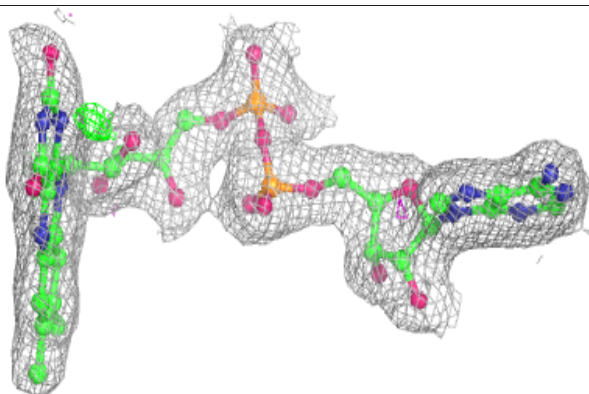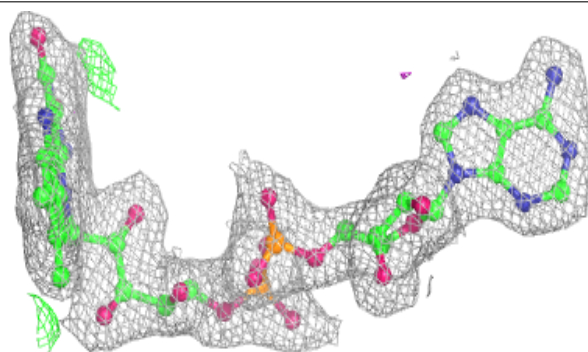and green (positive)
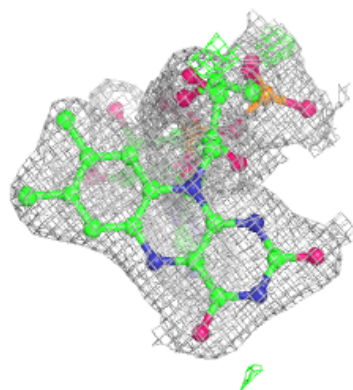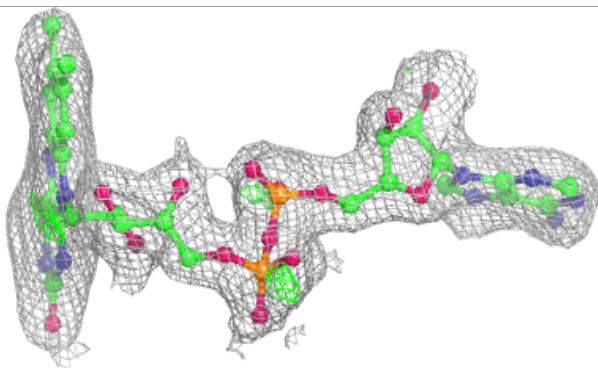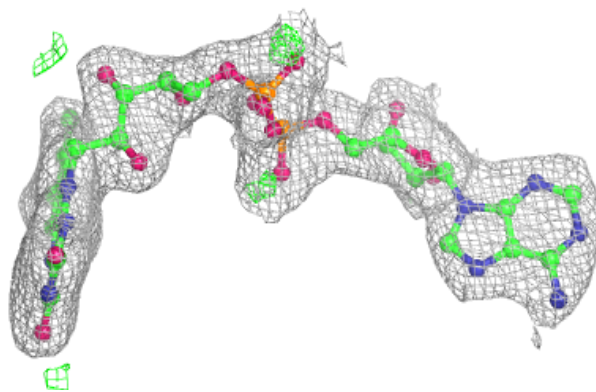
Electron density around FAD C 601:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
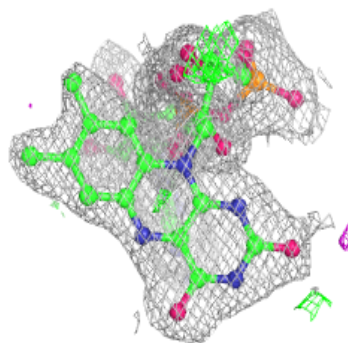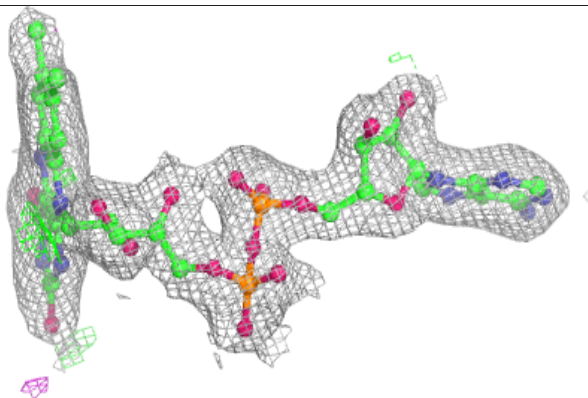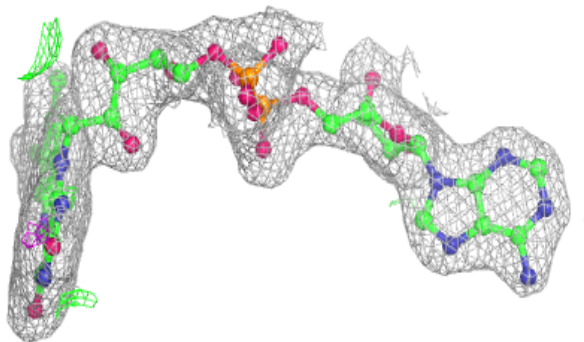
Electron density around FAD B 601:

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 A 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.