



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 05:49 PM UTC

PDB ID : 6C80 / pdb_00006c80
Title : Crystal structure of a flax cytokinin oxidase
Authors : Wan, L.; Williams, S.; Kobe, B.
Deposited on : 2018-01-23
Resolution : 1.78 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 : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

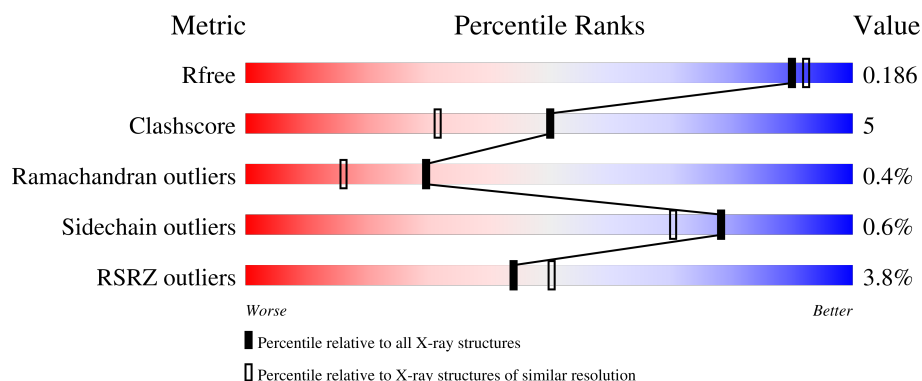
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.78 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}	180053	1365 (1.78-1.78)
Clashscore	190562	1395 (1.78-1.78)
Ramachandran outliers	187476	1382 (1.78-1.78)
Sidechain outliers	187428	1382 (1.78-1.78)
RSRZ outliers	180081	1365 (1.78-1.78)

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	489	4% 89% 9% .
1	B	489	4% 88% 11% ..

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

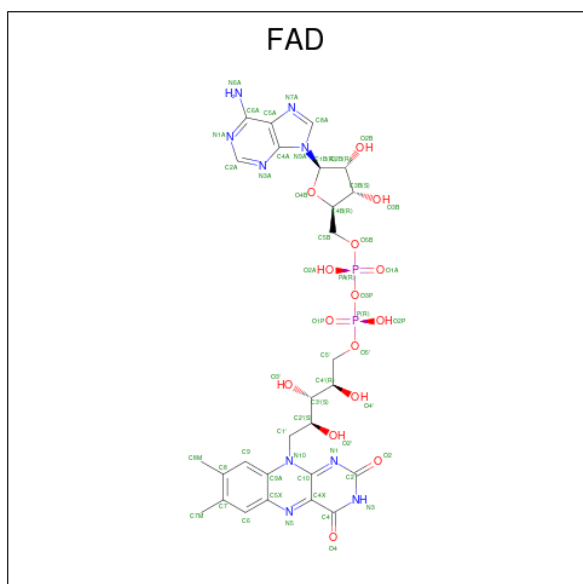
Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	GOL	A	604	-	-	X	-

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 cytokinin oxidase LuCKX1.1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	478	Total 3759	C 2397	N 651	O 695	S 16	3	3	0
1	B	486	Total 3847	C 2451	N 668	O 710	S 18	0	9	0

- Molecule 2 is FLAVIN-ADENINE DINUCLEOTIDE (CCD ID: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$).



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

- Molecule 3 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



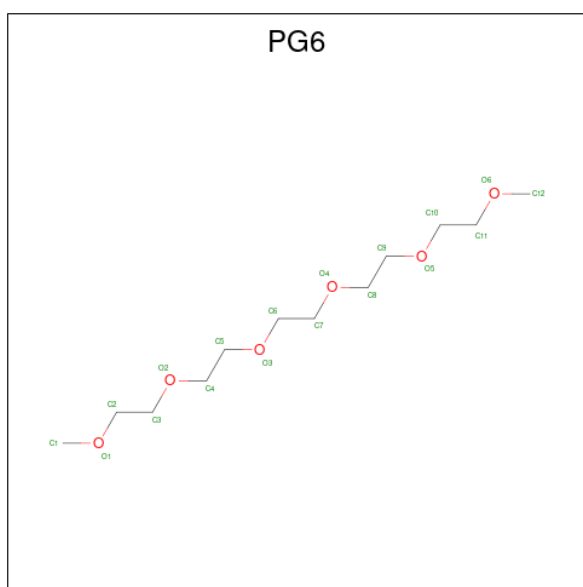
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			7	4	3		
3	B	1	Total	C	O	0	0
			7	4	3		
3	B	1	Total	C	O	0	0
			7	4	3		
3	B	1	Total	C	O	0	0
			7	4	3		

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



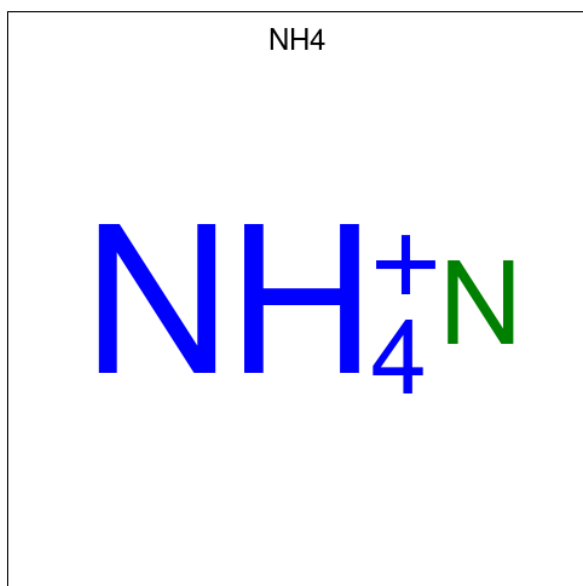
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0
4	B	1	Total C O 6 3 3	0	0
4	B	1	Total C O 6 3 3	0	0
4	B	1	Total C O 6 3 3	0	0
4	B	1	Total C O 6 3 3	0	0
4	B	1	Total C O 6 3 3	0	0
4	B	1	Total C O 6 3 3	0	0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

- Molecule 5 is 1-(2-METHOXY-ETHOXY)-2-{2-[2-(2-METHOXY-ETHOXY)-ETHOXY]-ETHANE (CCD ID: PG6) (formula: C₁₂H₂₆O₆).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			18	12	6		

- Molecule 6 is AMMONIUM ION (CCD ID: NH4) (formula: H₄N).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	H	N	0	0
			5	4	1		
6	B	1	Total	H	N	0	0
			5	4	1		

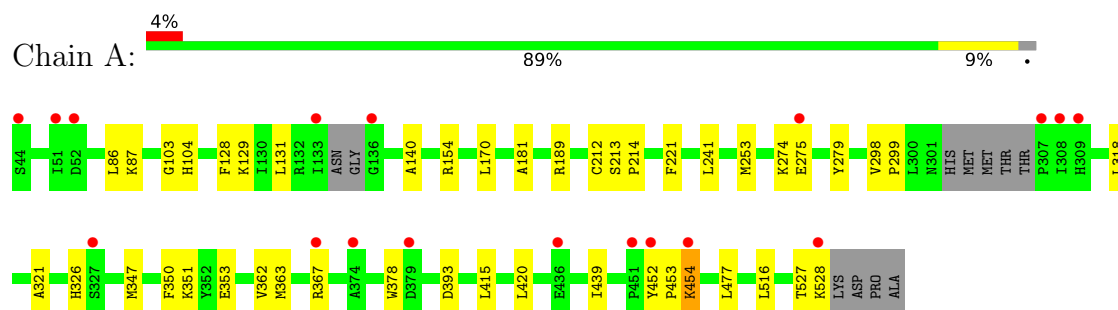
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	293	Total	O	0	0
			293	293		
7	B	286	Total	O	0	0
			286	286		

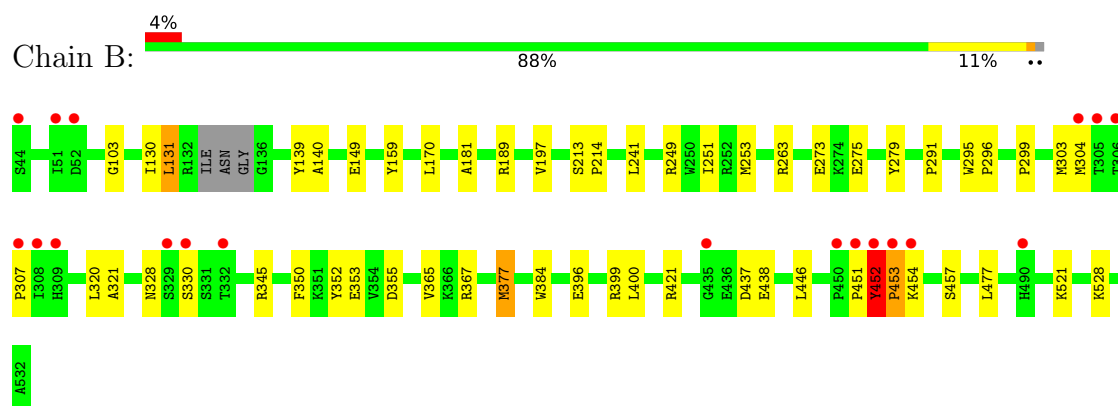
3 Residue-property plots

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: cytokinin oxidase LuCKX1.1



- Molecule 1: cytokinin oxidase LuCKX1.1



4 Data and refinement statistics

Property	Value	Source
Space group	I 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	91.23Å 58.93Å 188.87Å 90.00° 95.62° 90.00°	Depositor
Resolution (Å)	49.35 – 1.78 49.35 – 1.78	Depositor EDS
% Data completeness (in resolution range)	99.7 (49.35-1.78) 99.8 (49.35-1.78)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.14 (at 1.78Å)	Xtriage
Refinement program	PHENIX 1.8.4_1496	Depositor
R, R_{free}	0.151 , 0.184 0.155 , 0.186	Depositor DCC
R_{free} test set	4796 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	17.6	Xtriage
Anisotropy	0.051	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 47.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	8413	wwPDB-VP
Average B, all atoms (Å ²)	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.98% 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: NH4, PG6, FAD, GOL, PEG

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	0.43	0/3868	0.72	0/5242
1	B	0.43	0/3974	0.73	1/5387 (0.0%)
All	All	0.43	0/7842	0.72	1/10629 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	B	0	1

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	B	528	LYS	CB-CA-C	-5.53	110.18	116.54

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	452	TYR	Peptide

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	3759	0	3677	35	0
1	B	3847	0	3773	41	0
2	A	53	0	29	1	0
2	B	53	0	29	0	0
3	A	7	0	10	0	0
3	B	21	0	30	2	0
4	A	24	0	32	8	0
4	B	42	0	56	3	0
5	A	18	0	26	4	0
6	A	1	4	0	0	0
6	B	1	4	0	0	0
7	A	293	0	0	10	0
7	B	286	0	0	6	0
All	All	8405	8	7662	82	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 5.

All (82) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:527:THR:HG22	1:A:528:LYS:HG3	1.43	0.98
1:B:189:ARG:NH1	7:B:701:HOH:O	1.99	0.94
1:A:104:HIS:NE2	4:A:604:GOL:H11	1.99	0.77
1:B:377:MET:HE1	1:B:451:PRO:HD3	1.65	0.77
1:B:189:ARG:NH1	1:B:273:GLU:HG2	2.00	0.75
1:A:393:ASP:HB3	1:A:477:LEU:HD22	1.70	0.74
1:B:131:LEU:HD11	1:B:139:TYR:HB2	1.72	0.71
1:B:189:ARG:CZ	1:B:273:GLU:HG2	2.20	0.71
7:A:945:HOH:O	1:B:304:MET:SD	2.50	0.70
1:A:415:LEU:HD21	5:A:607:PG6:H62	1.74	0.68
1:A:170:LEU:HD11	1:A:362:VAL:HG12	1.75	0.68
1:B:279:TYR:HB3	1:B:321:ALA:HB3	1.74	0.67
1:B:453:PRO:HD2	1:B:454:LYS:H	1.60	0.67
1:A:326:HIS:NE2	1:B:303:MET:O	2.21	0.66
5:A:607:PG6:H42	7:A:962:HOH:O	1.97	0.64
4:B:608:GOL:H11	7:B:961:HOH:O	1.99	0.63
2:A:601:FAD:C4	4:A:605:GOL:H2	2.29	0.63
4:A:604:GOL:H32	7:A:832:HOH:O	1.98	0.62
1:B:131:LEU:CD1	1:B:139:TYR:HB2	2.32	0.60

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:253:MET:CE	1:A:318:LEU:HD23	2.30	0.60
1:A:527:THR:HG22	1:A:528:LYS:CG	2.24	0.59
1:A:189:ARG:NH1	7:A:703:HOH:O	2.35	0.59
1:A:378:TRP:HE1	4:A:604:GOL:H12	1.69	0.57
1:B:396[B]:GLU:OE2	1:B:399[B]:ARG:NE	2.34	0.56
1:B:103:GLY:HA2	7:B:934:HOH:O	2.05	0.55
1:B:303:MET:C	1:B:304:MET:HG2	2.32	0.55
1:A:378:TRP:NE1	4:A:604:GOL:H12	2.22	0.53
1:B:377:MET:HA	1:B:377:MET:HE2	1.90	0.53
1:A:452:TYR:CG	1:A:453:PRO:HA	2.44	0.53
1:A:129:LYS:NZ	7:A:709:HOH:O	2.41	0.53
1:B:421:ARG:HD2	1:B:437:ASP:O	2.09	0.52
1:A:279:TYR:HB3	1:A:321:ALA:HB3	1.90	0.52
1:B:307:PRO:HA	1:B:350:PHE:CZ	2.45	0.52
1:A:140:ALA:HB2	1:A:241:LEU:HD11	1.92	0.52
1:B:396[A]:GLU:HG2	1:B:400:LEU:HD12	1.92	0.52
1:B:377:MET:CE	1:B:451:PRO:HD3	2.37	0.52
1:B:453:PRO:CD	1:B:454:LYS:H	2.22	0.52
1:A:104:HIS:NE2	4:A:604:GOL:C1	2.73	0.51
1:B:421:ARG:HG3	1:B:438:GLU:O	2.10	0.51
1:B:367:ARG:NH2	7:B:703:HOH:O	2.29	0.51
1:B:452:TYR:HB2	1:B:457:SER:HA	1.93	0.51
1:B:140:ALA:HB2	1:B:241:LEU:HD11	1.93	0.50
1:A:298:VAL:HB	1:A:299:PRO:HD3	1.93	0.50
1:B:384:TRP:CE3	1:B:446:LEU:HD22	2.47	0.50
1:B:328:ASN:HA	7:B:802:HOH:O	2.12	0.49
1:A:87:LYS:HE2	7:A:774:HOH:O	2.12	0.49
1:A:420:LEU:HD23	1:A:439:ILE:HD13	1.92	0.49
1:A:103:GLY:HA2	7:A:951:HOH:O	2.12	0.49
1:B:253:MET:HE1	1:B:320:LEU:HD11	1.95	0.48
1:B:521:LYS:HE3	4:B:608:GOL:H31	1.95	0.47
1:A:274:LYS:HG3	1:A:275:GLU:HG3	1.95	0.47
1:B:263:ARG:HH22	1:B:345:ARG:HD2	1.80	0.47
1:A:452:TYR:CD2	1:A:453:PRO:HA	2.50	0.47
1:A:104:HIS:CD2	4:A:604:GOL:H11	2.50	0.46
1:A:351:LYS:NZ	1:A:353:GLU:OE2	2.43	0.45
1:A:347:MET:HE2	1:A:350:PHE:CD1	2.51	0.45
1:A:454:LYS:HD2	1:A:454:LYS:HA	1.71	0.45
1:B:197:VAL:O	4:B:611:GOL:H12	2.17	0.45
1:A:213:SER:HB2	1:A:214:PRO:CD	2.47	0.44
1:A:213:SER:HB2	1:A:214:PRO:HD2	2.00	0.44

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:367:ARG:HH22	5:A:607:PG6:H122	1.82	0.44
1:B:295:TRP:O	1:B:299:PRO:HD3	2.17	0.44
3:B:604:PEG:H32	7:B:852:HOH:O	2.18	0.44
1:B:130:ILE:HG13	1:B:159:TYR:CE2	2.53	0.43
1:B:303:MET:HE2	1:B:352:TYR:CD2	2.54	0.43
1:B:275:GLU:O	1:B:275:GLU:HG3	2.18	0.43
7:A:929:HOH:O	1:B:330:SER:HB2	2.18	0.43
1:A:274:LYS:NZ	7:A:720:HOH:O	2.51	0.42
1:B:251:ILE:HG12	1:B:353:GLU:HG2	2.01	0.42
1:B:521:LYS:HA	1:B:521:LYS:HD2	1.89	0.42
1:B:149:GLU:HA	1:B:170:LEU:HD23	2.00	0.42
1:A:86:LEU:HD21	1:A:516:LEU:HD13	2.01	0.42
1:A:128:PHE:CZ	1:A:154:ARG:HG2	2.55	0.42
1:A:212[B]:CYS:HB2	1:A:221:PHE:HB2	2.03	0.41
5:A:607:PG6:H71	7:A:899:HOH:O	2.20	0.41
1:B:213:SER:HB2	1:B:214:PRO:HD2	2.03	0.41
1:B:249:ARG:NE	1:B:355:ASP:OD1	2.51	0.41
3:B:604:PEG:H21	3:B:604:PEG:H42	1.86	0.41
1:A:170:LEU:HD12	1:A:363:MET:SD	2.62	0.40
1:A:378:TRP:HE1	4:A:604:GOL:C1	2.31	0.40
1:B:291:PRO:HA	1:B:296:PRO:HB2	2.03	0.40
1:B:365:VAL:O	1:B:365:VAL:HG12	2.21	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	476/489 (97%)	459 (96%)	16 (3%)	1 (0%)	43	29
1	B	491/489 (100%)	474 (96%)	14 (3%)	3 (1%)	21	9
All	All	967/978 (99%)	933 (96%)	30 (3%)	4 (0%)	30	16

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	453	PRO
1	A	181	ALA
1	B	181	ALA
1	B	452	TYR

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	406/411 (99%)	404 (100%)	2 (0%)	81	73
1	B	417/411 (102%)	414 (99%)	3 (1%)	76	66
All	All	823/822 (100%)	818 (99%)	5 (1%)	78	70

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	131	LEU
1	A	454	LYS
1	B	131	LEU
1	B	377	MET
1	B	477	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	138	HIS
1	A	323	HIS
1	A	490	HIS
1	B	464	GLN
1	B	470	GLN
1	B	474	GLN
1	B	489	GLN
1	B	499	GLN

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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 20 ligands modelled in this entry, 2 are modelled with single atom - leaving 18 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	PEG	B	603	-	6,6,6	0.58	0	5,5,5	0.23	0
4	GOL	A	606	-	5,5,5	0.30	0	5,5,5	0.33	0
4	GOL	B	605	-	5,5,5	0.38	0	5,5,5	0.42	0
4	GOL	B	609	-	5,5,5	0.38	0	5,5,5	0.35	0
3	PEG	B	604	-	6,6,6	0.58	0	5,5,5	0.25	0
4	GOL	A	603	-	5,5,5	0.36	0	5,5,5	0.45	0
4	GOL	A	605	-	5,5,5	0.39	0	5,5,5	0.62	0
4	GOL	B	606	-	5,5,5	0.32	0	5,5,5	0.39	0
4	GOL	B	607	-	5,5,5	0.41	0	5,5,5	0.52	0
2	FAD	B	601	1	58,58,58	1.80	14 (24%)	85,89,89	1.63	13 (15%)
4	GOL	B	610	-	5,5,5	0.35	0	5,5,5	0.65	0
4	GOL	A	604	-	5,5,5	0.38	0	5,5,5	0.70	0
2	FAD	A	601	1	58,58,58	1.85	16 (27%)	85,89,89	1.56	12 (14%)
3	PEG	A	602	-	6,6,6	0.61	0	5,5,5	0.17	0
4	GOL	B	611	-	5,5,5	0.36	0	5,5,5	0.38	0
5	PG6	A	607	-	17,17,17	0.75	0	16,16,16	0.47	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	PEG	B	602	-	6,6,6	0.59	0	5,5,5	0.24	0
4	GOL	B	608	-	5,5,5	0.40	0	5,5,5	0.40	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	PEG	B	603	-	-	2/4/4/4	-
4	GOL	A	606	-	-	0/4/4/4	-
4	GOL	B	605	-	-	2/4/4/4	-
4	GOL	B	609	-	-	2/4/4/4	-
3	PEG	B	604	-	-	2/4/4/4	-
4	GOL	A	603	-	-	0/4/4/4	-
4	GOL	A	605	-	-	2/4/4/4	-
4	GOL	B	606	-	-	2/4/4/4	-
4	GOL	B	607	-	-	2/4/4/4	-
2	FAD	B	601	1	-	2/34/50/50	0/6/6/6
4	GOL	B	610	-	-	0/4/4/4	-
4	GOL	A	604	-	-	2/4/4/4	-
2	FAD	A	601	1	-	1/34/50/50	0/6/6/6
3	PEG	A	602	-	-	0/4/4/4	-
4	GOL	B	611	-	-	2/4/4/4	-
5	PG6	A	607	-	-	6/15/15/15	-
3	PEG	B	602	-	-	2/4/4/4	-
4	GOL	B	608	-	-	2/4/4/4	-

All (30) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	601	FAD	C5X-N5	5.17	1.48	1.39
2	B	601	FAD	C5X-N5	5.00	1.48	1.39
2	B	601	FAD	C2-N1	4.66	1.47	1.36
2	A	601	FAD	C1'-C2'	-4.28	1.46	1.52
2	A	601	FAD	C2-N1	4.24	1.46	1.36
2	B	601	FAD	C1'-C2'	-4.02	1.47	1.52
2	B	601	FAD	C3B-C4B	-3.39	1.44	1.53
2	B	601	FAD	O2'-C2'	-3.38	1.36	1.43

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	601	FAD	C3B-C4B	-3.29	1.44	1.53
2	A	601	FAD	O2'-C2'	-3.21	1.36	1.43
2	A	601	FAD	P-O3P	-3.17	1.56	1.59
2	B	601	FAD	C2B-C3B	-3.11	1.44	1.53
2	B	601	FAD	O4'-C4'	-3.04	1.37	1.43
2	A	601	FAD	C6A-N6A	2.97	1.41	1.34
2	A	601	FAD	PA-O3P	-2.86	1.56	1.59
2	A	601	FAD	C2B-C3B	-2.83	1.45	1.53
2	B	601	FAD	C6A-N6A	2.81	1.41	1.34
2	B	601	FAD	C5'-C4'	2.70	1.55	1.51
2	A	601	FAD	O4'-C4'	-2.69	1.37	1.43
2	B	601	FAD	C7M-C7	2.68	1.56	1.51
2	B	601	FAD	PA-O3P	-2.56	1.56	1.59
2	A	601	FAD	C2B-C1B	-2.51	1.45	1.53
2	B	601	FAD	C2B-C1B	-2.42	1.45	1.53
2	A	601	FAD	C4'-C3'	-2.33	1.49	1.53
2	B	601	FAD	C4'-C3'	-2.32	1.49	1.53
2	B	601	FAD	C4X-C10	2.21	1.50	1.44
2	A	601	FAD	C5'-C4'	2.19	1.54	1.51
2	A	601	FAD	C4X-C10	2.19	1.50	1.44
2	A	601	FAD	C7M-C7	2.15	1.55	1.51
2	A	601	FAD	C10-N10	2.06	1.41	1.37

All (25) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	601	FAD	N3A-C2A-N1A	-5.97	119.54	128.58
2	B	601	FAD	N3A-C2A-N1A	-5.97	119.54	128.58
2	B	601	FAD	C5A-C4A-N3A	-4.92	119.94	126.72
2	A	601	FAD	C5A-C4A-N3A	-4.22	120.91	126.72
2	B	601	FAD	C2A-N3A-C4A	4.00	121.61	111.83
2	B	601	FAD	N3A-C4A-N9A	3.85	133.71	127.17
2	B	601	FAD	C5A-N7A-C8A	3.75	109.34	103.45
2	A	601	FAD	N3A-C4A-N9A	3.59	133.28	127.17
2	A	601	FAD	C5A-N7A-C8A	3.48	108.92	103.45
2	A	601	FAD	C2A-N3A-C4A	3.34	119.98	111.83
2	B	601	FAD	N9A-C8A-N7A	-3.05	109.60	113.94
2	B	601	FAD	C4A-C5A-N7A	-3.01	107.14	110.58
2	B	601	FAD	O4-C4-C4X	-2.98	118.67	126.53
2	A	601	FAD	N9A-C8A-N7A	-2.94	109.77	113.94
2	A	601	FAD	O4-C4-C4X	-2.65	119.52	126.53
2	A	601	FAD	C4A-C5A-N7A	-2.52	107.70	110.58

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	601	FAD	O2-C2-N3	2.49	123.36	118.58
2	B	601	FAD	O2-C2-N3	2.41	123.21	118.58
2	A	601	FAD	C2A-N1A-C6A	2.38	122.63	118.73
2	B	601	FAD	C2'-C1'-N10	2.34	121.24	110.20
2	A	601	FAD	C2'-C1'-N10	2.29	121.04	110.20
2	B	601	FAD	C8M-C8-C9	-2.20	115.69	119.57
2	A	601	FAD	C1'-C2'-C3'	-2.16	103.79	109.66
2	B	601	FAD	O4-C4-N3	2.10	124.07	120.11
2	B	601	FAD	C6A-C5A-N7A	2.00	135.95	132.09

There are no chirality outliers.

All (31) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	604	GOL	C1-C2-C3-O3
4	A	605	GOL	O1-C1-C2-C3
4	B	605	GOL	O1-C1-C2-C3
4	B	607	GOL	O1-C1-C2-C3
4	B	608	GOL	O1-C1-C2-C3
4	B	609	GOL	O1-C1-C2-C3
5	A	607	PG6	O2-C4-C5-O3
5	A	607	PG6	O4-C8-C9-O5
4	A	605	GOL	O1-C1-C2-O2
5	A	607	PG6	O3-C6-C7-O4
4	B	606	GOL	O1-C1-C2-C3
4	B	611	GOL	O1-C1-C2-C3
3	B	603	PEG	O1-C1-C2-O2
4	A	604	GOL	O2-C2-C3-O3
3	B	604	PEG	O1-C1-C2-O2
4	B	605	GOL	O1-C1-C2-O2
4	B	607	GOL	O1-C1-C2-O2
4	B	608	GOL	O1-C1-C2-O2
4	B	609	GOL	O1-C1-C2-O2
4	B	606	GOL	O1-C1-C2-O2
3	B	604	PEG	C4-C3-O2-C2
3	B	603	PEG	C1-C2-O2-C3
2	A	601	FAD	C2'-C3'-C4'-C5'
2	B	601	FAD	C2'-C3'-C4'-C5'
3	B	602	PEG	O2-C3-C4-O4
5	A	607	PG6	C6-C7-O4-C8
5	A	607	PG6	C4-C5-O3-C6
4	B	611	GOL	O1-C1-C2-O2

Continued on next page...

Continued from previous page...

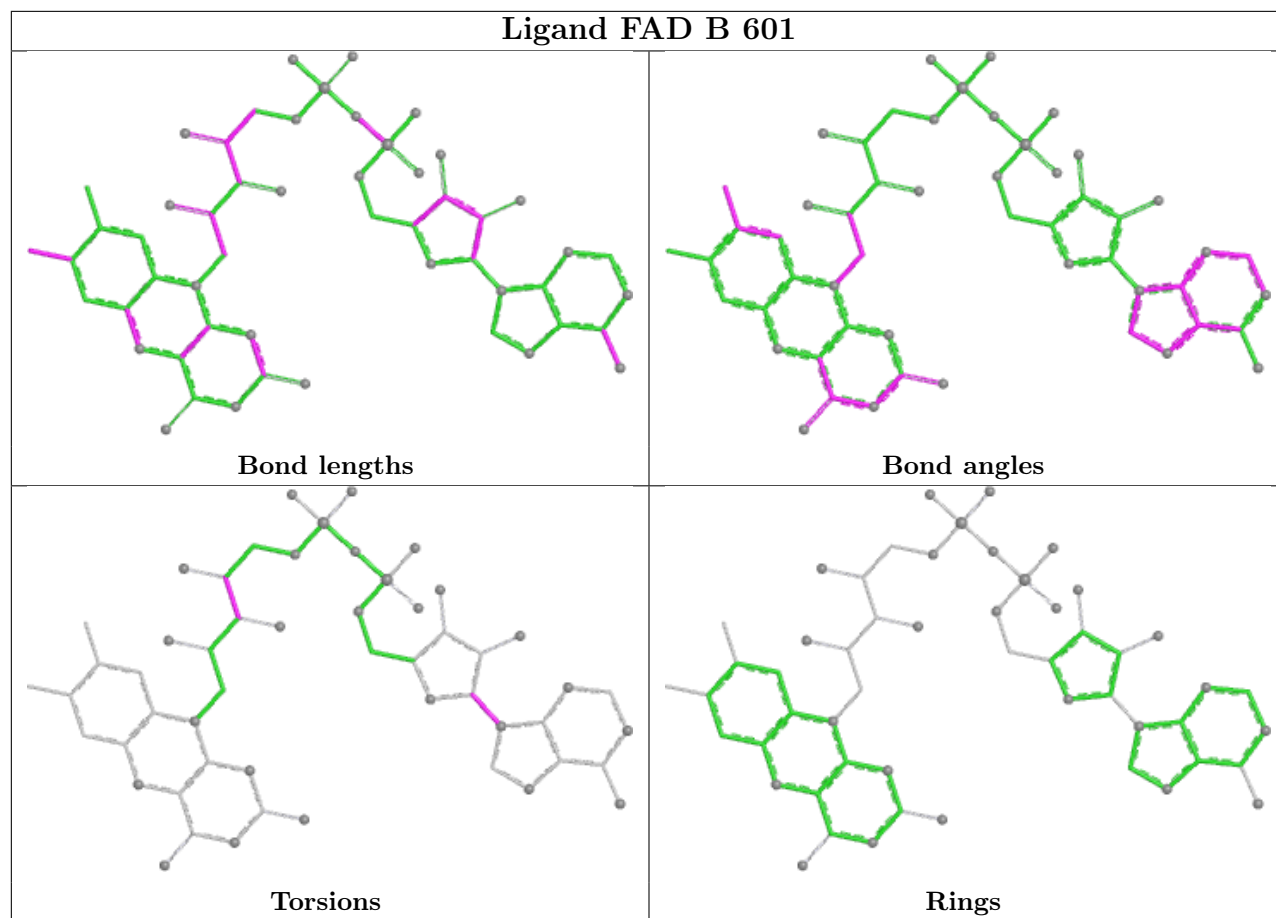
Mol	Chain	Res	Type	Atoms
3	B	602	PEG	C4-C3-O2-C2
5	A	607	PG6	O1-C2-C3-O2
2	B	601	FAD	C2B-C1B-N9A-C8A

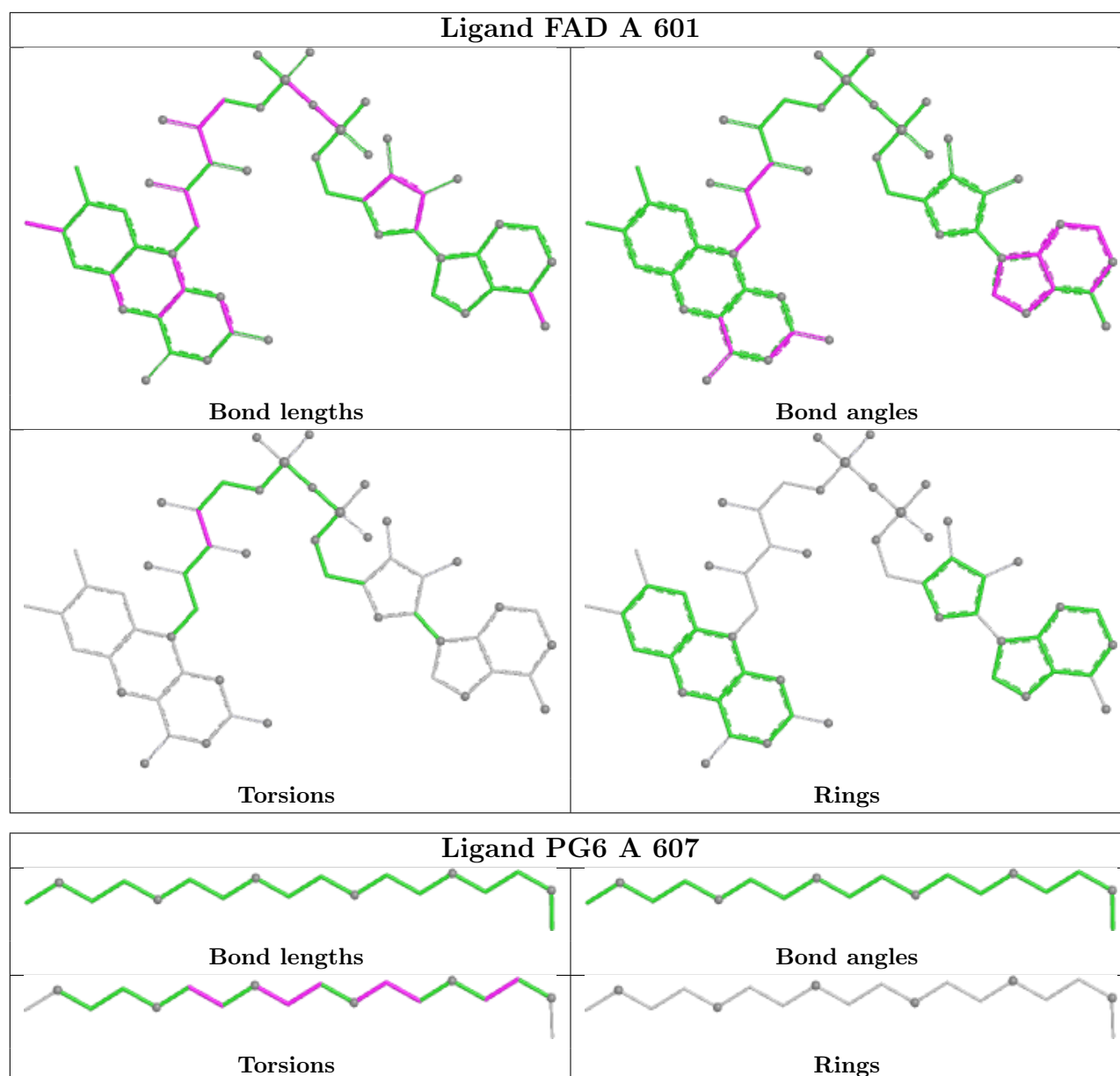
There are no ring outliers.

7 monomers are involved in 17 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	604	PEG	2	0
4	A	605	GOL	1	0
4	A	604	GOL	7	0
2	A	601	FAD	1	0
4	B	611	GOL	1	0
5	A	607	PG6	4	0
4	B	608	GOL	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less 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	478/489 (97%)	-0.26	18 (3%)	44 50	9, 19, 44, 70	3 (0%)
1	B	486/489 (99%)	-0.18	19 (3%)	43 49	10, 19, 47, 98	9 (1%)
All	All	964/978 (98%)	-0.22	37 (3%)	44 50	9, 19, 46, 98	12 (1%)

All (37) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	308	ILE	6.5
1	B	304	MET	5.2
1	B	453	PRO	4.8
1	B	308	ILE	4.4
1	A	133	ILE	4.2
1	B	306	THR	4.2
1	B	305	THR	3.9
1	A	307	PRO	3.8
1	A	52	ASP	3.7
1	A	136	GLY	3.6
1	B	452	TYR	3.6
1	A	451	PRO	3.5
1	B	451	PRO	3.4
1	B	307	PRO	3.3
1	B	44	SER	3.2
1	A	51	ILE	3.1
1	A	367	ARG	3.1
1	B	332	THR	3.0
1	B	52	ASP	2.9
1	A	528	LYS	2.9
1	A	452	TYR	2.8
1	B	330	SER	2.8
1	A	374	ALA	2.7
1	B	435	GLY	2.6

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	51	ILE	2.4
1	B	454	LYS	2.4
1	A	44	SER	2.3
1	B	329	SER	2.3
1	A	436	GLU	2.3
1	A	309	HIS	2.3
1	B	450	PRO	2.2
1	B	490	HIS	2.2
1	A	327	SER	2.2
1	A	454	LYS	2.2
1	A	379	ASP	2.1
1	B	309	HIS	2.1
1	A	275	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 oligosaccharides 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($\text{\AA}^2$)	Q<0.9
4	GOL	A	603	6/6	0.74	0.16	36,39,44,49	0
4	GOL	B	607	6/6	0.76	0.21	42,47,54,56	0
5	PG6	A	607	18/18	0.78	0.17	25,40,49,54	0
4	GOL	B	605	6/6	0.80	0.17	45,51,55,56	0
6	NH4	A	608	1/1	0.80	0.29	55,66,66,66	0
3	PEG	B	604	7/7	0.81	0.30	58,60,70,70	0
4	GOL	B	608	6/6	0.84	0.17	28,53,54,57	0
3	PEG	B	602	7/7	0.84	0.17	48,51,53,54	0
4	GOL	A	604	6/6	0.84	0.17	20,41,42,43	0
6	NH4	B	612	1/1	0.84	0.32	58,70,70,70	0

Continued on next page...

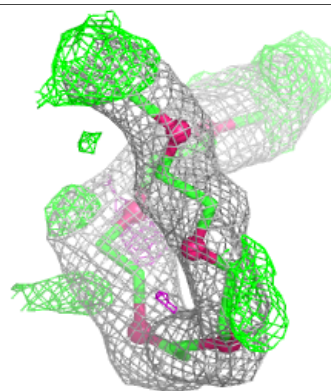
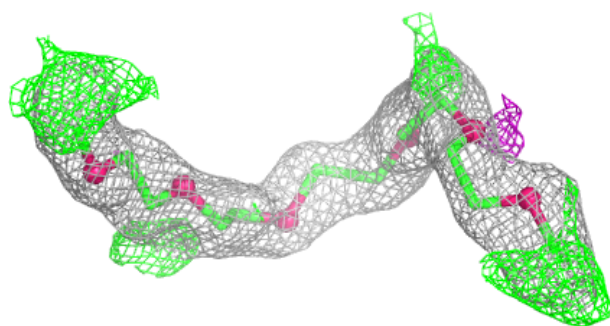
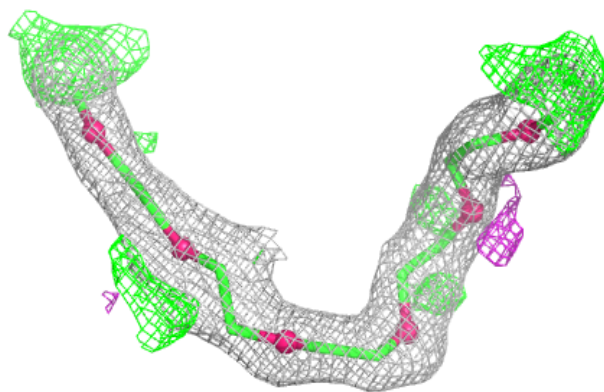
Continued from previous page...

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	GOL	B	609	6/6	0.86	0.15	46,51,54,60	0
4	GOL	B	611	6/6	0.87	0.13	25,28,40,42	0
3	PEG	A	602	7/7	0.88	0.15	37,53,55,57	0
3	PEG	B	603	7/7	0.89	0.13	46,47,51,54	0
4	GOL	B	610	6/6	0.89	0.16	21,41,48,49	0
4	GOL	A	605	6/6	0.90	0.12	21,37,42,51	0
4	GOL	B	606	6/6	0.92	0.12	20,40,43,45	0
4	GOL	A	606	6/6	0.93	0.10	18,22,36,41	0
2	FAD	A	601	53/53	0.98	0.04	10,12,15,15	0
2	FAD	B	601	53/53	0.98	0.04	8,12,15,15	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.

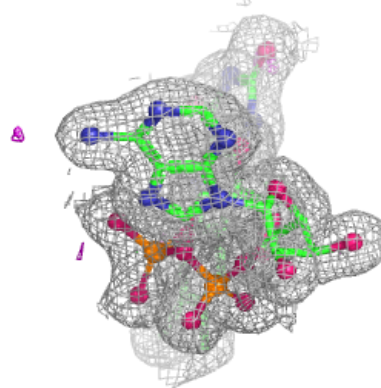
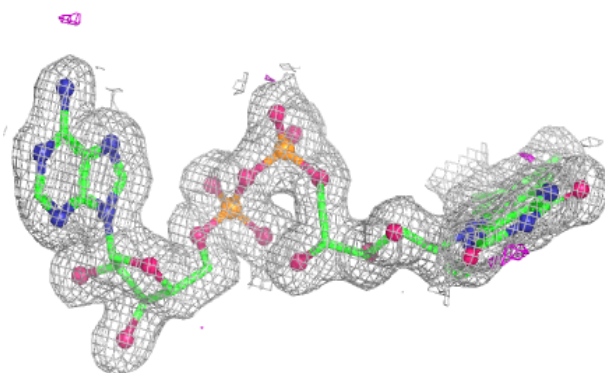
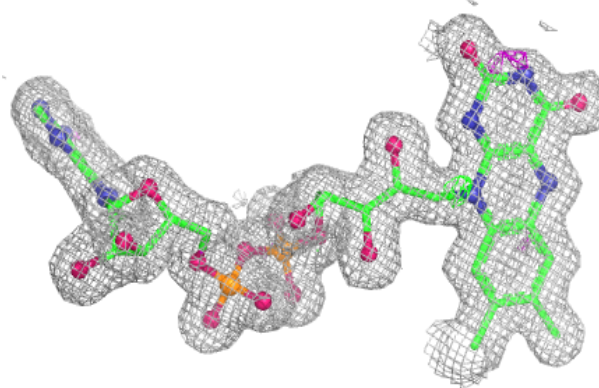
Electron density around PG6 A 607:

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

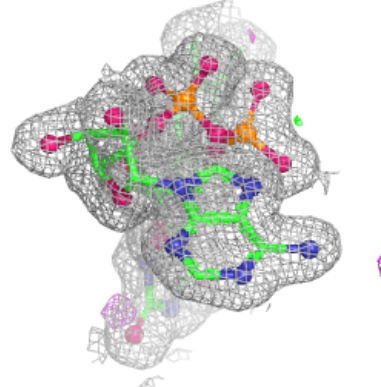
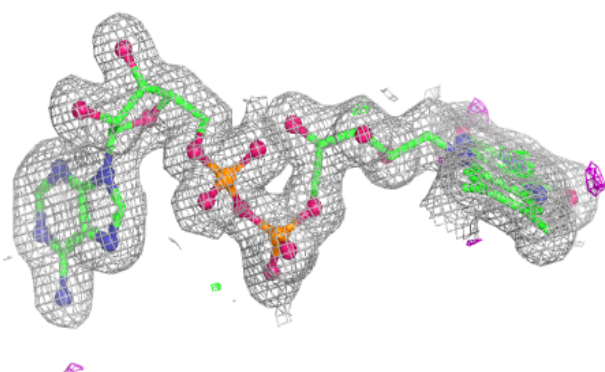
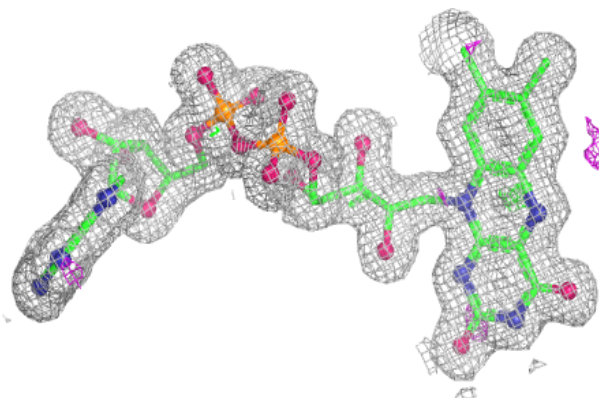


Electron density around FAD A 601:

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

**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)



6.5 Other polymers [i](#)

There are no such residues in this entry.