



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 08:34 PM UTC

PDB ID : 6F7L / pdb_00006f7l
Title : Crystal structure of LkcE R326Q mutant in complex with its substrate
Authors : Dorival, J.; Risser, F.; Jacob, C.; Collin, S.; Drager, G.; Kirschning, A.; Paris, C.; Chagot, B.; Gruez, A.; Weissman, K.J.
Deposited on : 2017-12-11
Resolution : 2.50 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

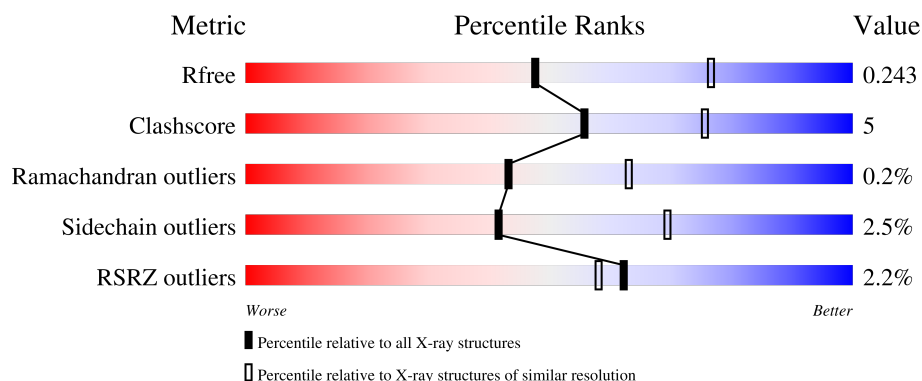
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.50 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	5829 (2.50-2.50)
Clashscore	190562	6492 (2.50-2.50)
Ramachandran outliers	187476	6378 (2.50-2.50)
Sidechain outliers	187428	6380 (2.50-2.50)
RSRZ outliers	180081	5833 (2.50-2.50)

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	442	
1	B	442	

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
3	CA	A	502	-	-	-	X

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 7247 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.

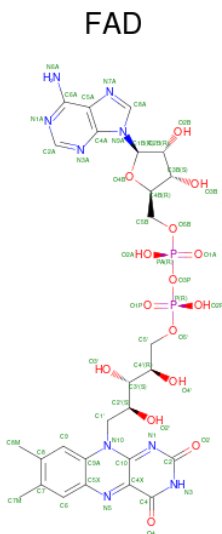
- Molecule 1 is a protein called Amine oxidase LkcE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	431	Total	C	N	O	S	0	0	0
			3402	2156	595	637	14			
1	B	428	Total	C	N	O	S	0	0	0
			3380	2142	591	633	14			

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-3	GLY	-	expression tag	UNP Q83X90
A	-2	PRO	-	expression tag	UNP Q83X90
A	-1	GLY	-	expression tag	UNP Q83X90
A	0	SER	-	expression tag	UNP Q83X90
A	54	GLN	ARG	conflict	UNP Q83X90
A	326	GLN	ARG	engineered mutation	UNP Q83X90
A	424	PRO	LEU	conflict	UNP Q83X90
B	-3	GLY	-	expression tag	UNP Q83X90
B	-2	PRO	-	expression tag	UNP Q83X90
B	-1	GLY	-	expression tag	UNP Q83X90
B	0	SER	-	expression tag	UNP Q83X90
B	54	GLN	ARG	conflict	UNP Q83X90
B	326	GLN	ARG	engineered mutation	UNP Q83X90
B	424	PRO	LEU	conflict	UNP Q83X90

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

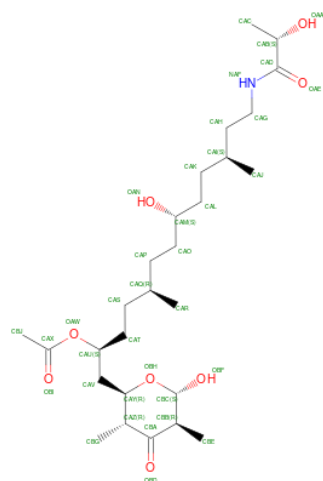


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total 53	C 27	N 9	O 15	P 2	0	0
2	B	1	Total 53	C 27	N 9	O 15	P 2	0	0

- Molecule 3 is CALCIUM ION (CCD ID: CA) (formula: Ca).

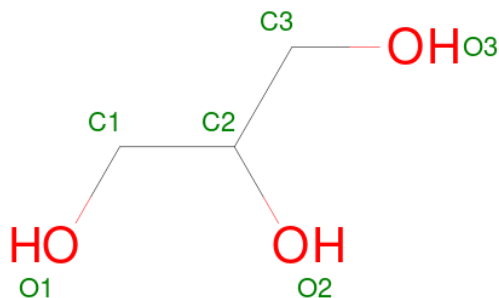
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	2	Total Ca 2 2	0	0
3	B	1	Total Ca 1 1	0	0

- Molecule 4 is [(2 {S},5 {R},8 {S},11 {S})-1-[(2 {R},3 {R},5 {R},6 {S})-3,5-dimethyl-6-oxido-4-oxido-2-yl]-5,11-dimethyl-8-oxido-13-[[[(2 {S})-2-oxido-1-propanoyl]amino]tridecan-2-yl] ethanoate (CCD ID: CWH) (formula: C₂₇H₄₉NO₈) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total 36	C 27	N 1	O 8	0	0
4	B	1	Total 36	C 27	N 1	O 8	0	0

- Molecule 5 is GLYCEROL (CCD ID: GOL) (formula: $\text{C}_3\text{H}_8\text{O}_3$).



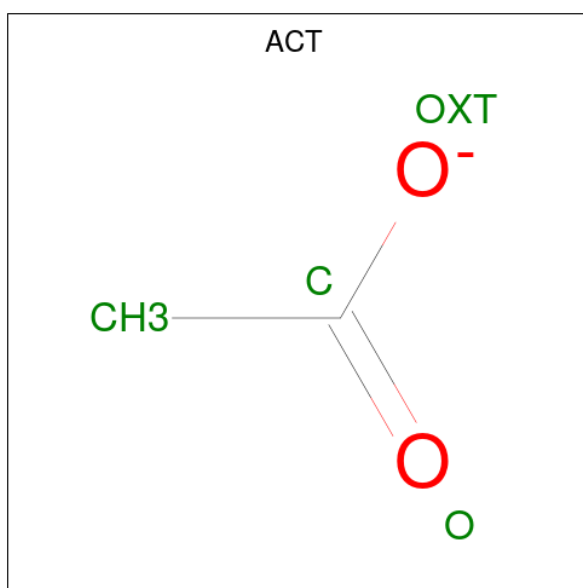
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total 6	C 3	O 3	0	0
5	A	1	Total 6	C 3	O 3	0	0

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

- Molecule 6 is ACETATE ION (CCD ID: ACT) (formula: $C_2H_3O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	B	1	Total	C	O	0	0
			4	2	2		
6	B	1	Total	C	O	0	0
			4	2	2		
6	B	1	Total	C	O	0	0
			4	2	2		

- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	109	Total	O	0	0
			109	109		

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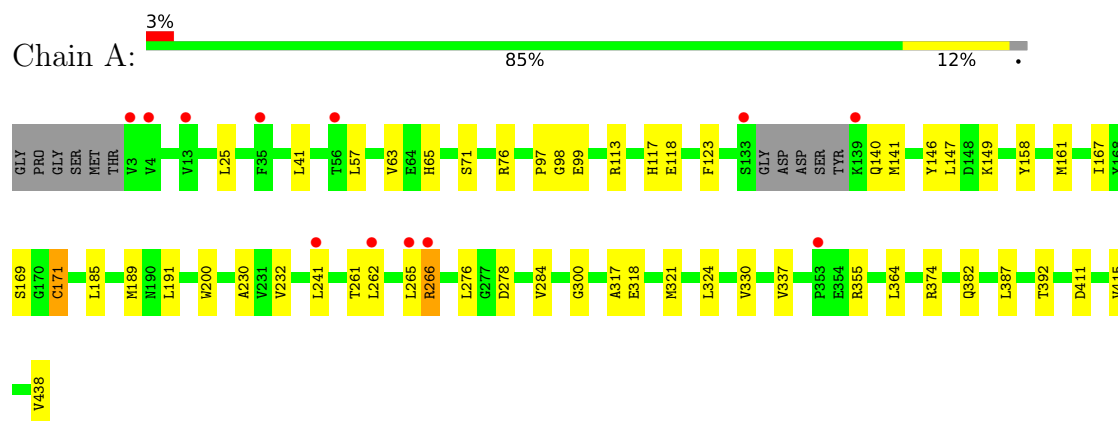
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	B	121	Total 121	O 121	0	0

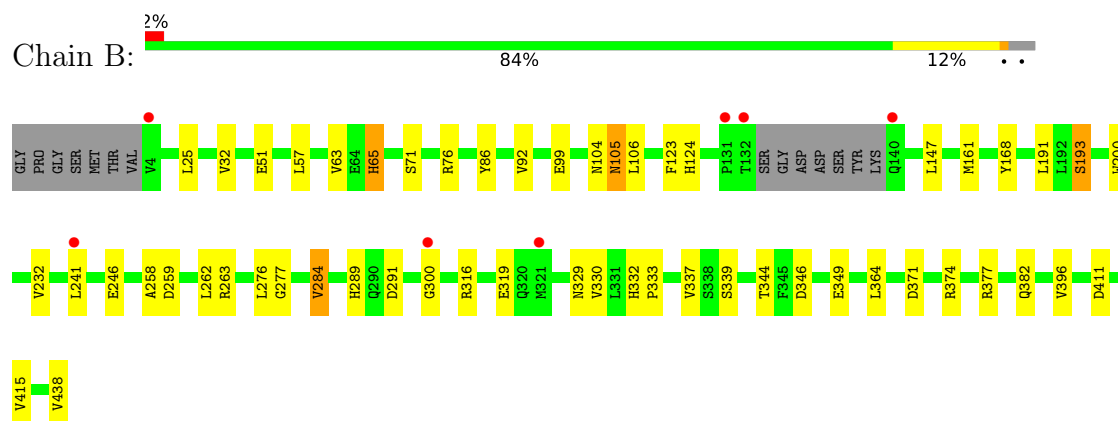
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: Amine oxidase LkcE



• Molecule 1: Amine oxidase LkcE



4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	125.55Å 125.55Å 156.66Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.99 – 2.50 48.99 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.4 (48.99-2.50) 99.6 (48.99-2.50)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.86 (at 2.51Å)	Xtriage
Refinement program	REFMAC 5.8.0103	Depositor
R, R_{free}	0.206 , 0.244 0.205 , 0.243	Depositor DCC
R_{free} test set	2191 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	60.8	Xtriage
Anisotropy	0.121	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 44.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	7247	wwPDB-VP
Average B, all atoms (Å ²)	61.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.59% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CA, GOL, ACT, CWH, 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	1.04	1/3490 (0.0%)	1.10	3/4732 (0.1%)
1	B	1.07	3/3468 (0.1%)	1.12	11/4703 (0.2%)
All	All	1.06	4/6958 (0.1%)	1.11	14/9435 (0.1%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	346	ASP	C-O	-8.11	1.20	1.23
1	B	124	HIS	N-CA	5.99	1.53	1.46
1	B	193	SER	C-O	-5.27	1.17	1.23
1	A	98	GLY	N-CA	5.10	1.52	1.45

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	97	PRO	N-CA-C	7.07	123.03	113.84
1	A	169	SER	N-CA-C	6.01	120.34	112.89
1	B	105	ASN	N-CA-C	5.81	118.56	111.82
1	A	171	CYS	N-CA-C	5.76	119.93	113.01
1	B	65	HIS	N-CA-C	5.55	118.53	109.59
1	B	104	ASN	CA-C-N	5.43	128.57	120.31
1	B	104	ASN	C-N-CA	5.43	128.57	120.31
1	B	259	ASP	N-CA-CB	-5.29	102.05	109.94
1	B	277	GLY	N-CA-C	-5.16	104.62	112.51
1	B	258	ALA	CA-C-N	5.07	127.38	120.54
1	B	258	ALA	C-N-CA	5.07	127.38	120.54
1	B	106	LEU	N-CA-C	5.04	119.50	112.90
1	B	329	ASN	CA-C-N	5.02	128.88	120.64
1	B	329	ASN	C-N-CA	5.02	128.88	120.64

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	3402	0	3276	36	0
1	B	3380	0	3249	28	0
2	A	53	0	31	4	0
2	B	53	0	31	2	0
3	A	2	0	0	0	0
3	B	1	0	0	0	0
4	A	36	0	0	0	0
4	B	36	0	0	1	0
5	A	12	0	16	1	0
5	B	30	0	40	2	0
6	B	12	0	9	1	0
7	A	109	0	0	4	0
7	B	121	0	0	4	0
All	All	7247	0	6652	64	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 (64) 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:392:THR:HG22	7:A:613:HOH:O	1.73	0.87
1:B:51:GLU:H	6:B:503:ACT:H3	1.55	0.70
1:A:382:GLN:HG2	1:A:438:VAL:HG22	1.74	0.69
1:B:382:GLN:HG2	1:B:438:VAL:HG22	1.77	0.66
1:A:113:ARG:HD2	1:A:117:HIS:ND1	2.12	0.64
1:A:141:MET:HE2	1:A:146:TYR:HA	1.81	0.63
1:A:278:ASP:HB3	1:A:374:ARG:NH1	2.14	0.63
1:B:241:LEU:CD2	1:B:246:GLU:HG3	2.31	0.61
1:B:289:HIS:HD2	1:B:291:ASP:H	1.51	0.57
1:A:57:LEU:HD11	1:A:337:VAL:HG21	1.86	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:332:HIS:HB3	1:B:333:PRO:HD3	1.87	0.57
1:B:57:LEU:HD11	1:B:337:VAL:HG21	1.88	0.55
1:A:76:ARG:HA	1:A:76:ARG:HE	1.73	0.53
1:A:392:THR:HG23	2:A:501:FAD:H5'2	1.92	0.51
1:A:63:VAL:HA	2:A:501:FAD:C4X	2.40	0.51
1:B:65:HIS:HB3	1:B:200:TRP:CE3	2.45	0.51
1:A:185:LEU:HD22	1:A:189:MET:HE3	1.93	0.51
1:B:263:ARG:HD2	7:B:627:HOH:O	2.11	0.51
1:A:65:HIS:HB3	1:A:200:TRP:CE3	2.45	0.50
1:B:76:ARG:CD	7:B:684:HOH:O	2.59	0.50
1:B:105:ASN:OD1	1:B:193:SER:O	2.30	0.50
1:A:118:GLU:HG3	5:B:511:GOL:H12	1.92	0.50
1:B:411:ASP:HA	1:B:415:VAL:O	2.12	0.50
1:B:289:HIS:HE1	1:B:344:THR:OG1	1.95	0.49
1:B:364:LEU:HD21	2:B:501:FAD:C9	2.43	0.49
1:B:371:ASP:OD1	1:B:374:ARG:NH1	2.46	0.49
1:A:171:CYS:HA	5:A:505:GOL:H2	1.94	0.48
1:A:265:LEU:HD11	1:A:387:LEU:HD13	1.96	0.48
1:B:76:ARG:HD3	7:B:684:HOH:O	2.14	0.48
1:A:266:ARG:CZ	1:A:266:ARG:HA	2.44	0.47
1:B:86:TYR:HB3	5:B:511:GOL:H2	1.97	0.47
1:A:230:ALA:HB3	1:A:241:LEU:HD13	1.97	0.46
1:A:411:ASP:HA	1:A:415:VAL:O	2.16	0.46
1:B:92:VAL:H	1:B:105:ASN:HB2	1.80	0.46
1:A:141:MET:HE1	1:A:149:LYS:HD2	1.98	0.46
1:B:316:ARG:O	1:B:319:GLU:HG2	2.16	0.46
1:A:262:LEU:HD13	1:A:276:LEU:HB2	1.98	0.45
1:A:355:ARG:NH1	7:A:603:HOH:O	2.37	0.45
1:B:147:LEU:HD11	1:B:161:MET:HG2	1.99	0.45
1:B:191:LEU:HB3	1:B:200:TRP:CZ2	2.52	0.45
1:A:265:LEU:HD11	1:A:387:LEU:CD1	2.46	0.45
1:B:63:VAL:HA	2:B:501:FAD:C4X	2.47	0.45
1:A:140:GLN:OE1	1:A:140:GLN:HA	2.12	0.45
1:A:185:LEU:CD2	1:A:189:MET:HE3	2.47	0.45
1:B:168:TYR:HA	4:B:506:CWH:CAH	2.48	0.44
1:A:191:LEU:HB3	1:A:200:TRP:CZ2	2.51	0.44
1:B:262:LEU:HD13	1:B:276:LEU:HB2	1.98	0.44
1:A:167:ILE:CD1	1:A:324:LEU:HD11	2.47	0.43
1:B:289:HIS:HD2	1:B:291:ASP:N	2.16	0.43
1:A:321:MET:HE1	7:A:704:HOH:O	2.18	0.43
1:B:25:LEU:O	1:B:415:VAL:HG21	2.18	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:76:ARG:HD2	7:B:684:HOH:O	2.17	0.43
1:A:25:LEU:O	1:A:415:VAL:HG21	2.19	0.43
1:A:123:PHE:CE2	1:A:161:MET:HE1	2.53	0.43
1:A:141:MET:HE2	1:A:146:TYR:CA	2.47	0.43
1:A:147:LEU:HD11	1:A:161:MET:HG2	2.00	0.43
1:A:118:GLU:HB2	7:A:663:HOH:O	2.18	0.43
1:A:261:THR:O	1:A:265:LEU:HB2	2.19	0.43
1:A:76:ARG:HA	1:A:76:ARG:NE	2.33	0.43
1:A:364:LEU:HD21	2:A:501:FAD:C9	2.49	0.42
1:B:123:PHE:CE2	1:B:161:MET:HE1	2.55	0.42
1:A:63:VAL:HA	2:A:501:FAD:N5	2.36	0.41
1:A:158:TYR:CD1	1:A:317:ALA:HB1	2.55	0.41
1:B:284:VAL:HG21	1:B:364:LEU:HD12	2.03	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	427/442 (97%)	416 (97%)	10 (2%)	1 (0%)	43	63
1	B	424/442 (96%)	413 (97%)	10 (2%)	1 (0%)	43	63
All	All	851/884 (96%)	829 (97%)	20 (2%)	2 (0%)	43	63

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	300	GLY
1	A	300	GLY

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	364/372 (98%)	356 (98%)	8 (2%)	45	73
1	B	361/372 (97%)	351 (97%)	10 (3%)	38	66
All	All	725/744 (97%)	707 (98%)	18 (2%)	42	69

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	41	LEU
1	A	71	SER
1	A	99	GLU
1	A	232	VAL
1	A	266	ARG
1	A	284	VAL
1	A	318	GLU
1	A	330	VAL
1	B	32	VAL
1	B	71	SER
1	B	99	GLU
1	B	232	VAL
1	B	284	VAL
1	B	330	VAL
1	B	339	SER
1	B	349	GLU
1	B	377	ARG
1	B	396	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (19) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	125	GLN
1	A	129	GLN
1	A	162	ASN
1	A	190	ASN

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Mol	Chain	Res	Type
1	A	204	GLN
1	A	247	HIS
1	A	270	GLN
1	A	379	HIS
1	B	101	GLN
1	B	105	ASN
1	B	125	GLN
1	B	129	GLN
1	B	190	ASN
1	B	208	HIS
1	B	247	HIS
1	B	270	GLN
1	B	289	HIS
1	B	348	GLN
1	B	379	HIS

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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 17 ligands modelled in this entry, 3 are monoatomic - leaving 14 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
5	GOL	B	507	-	5,5,5	1.09	0	5,5,5	0.69	0
5	GOL	B	509	-	5,5,5	0.48	0	5,5,5	0.55	0
5	GOL	B	511	-	5,5,5	0.75	0	5,5,5	0.65	0
6	ACT	B	505	-	3,3,3	2.17	1 (33%)	3,3,3	1.04	0
2	FAD	B	501	-	58,58,58	1.62	11 (18%)	85,89,89	1.51	12 (14%)
5	GOL	A	505	-	5,5,5	0.87	0	5,5,5	1.09	0
5	GOL	A	506	-	5,5,5	1.03	0	5,5,5	0.96	0
6	ACT	B	504	-	3,3,3	0.97	0	3,3,3	0.04	0
6	ACT	B	503	-	3,3,3	0.57	0	3,3,3	1.39	0
2	FAD	A	501	-	58,58,58	1.42	9 (15%)	85,89,89	1.48	11 (12%)
4	CWH	A	504	-	36,36,36	2.21	8 (22%)	44,48,48	1.81	12 (27%)
4	CWH	B	506	-	36,36,36	1.96	9 (25%)	44,48,48	1.83	13 (29%)
5	GOL	B	508	-	5,5,5	0.31	0	5,5,5	0.27	0
5	GOL	B	510	-	5,5,5	0.69	0	5,5,5	0.51	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
5	GOL	B	507	-	-	2/4/4/4	-
5	GOL	B	509	-	-	0/4/4/4	-
5	GOL	B	511	-	-	2/4/4/4	-
2	FAD	B	501	-	-	9/34/50/50	0/6/6/6
5	GOL	A	505	-	-	2/4/4/4	-
5	GOL	A	506	-	-	2/4/4/4	-
2	FAD	A	501	-	-	3/34/50/50	0/6/6/6
4	CWH	A	504	-	-	9/33/53/53	0/1/1/1
4	CWH	B	506	-	-	17/33/53/53	0/1/1/1
5	GOL	B	508	-	-	0/4/4/4	-
5	GOL	B	510	-	-	0/4/4/4	-

All (38) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	506	CWH	CBB-CBA	-6.42	1.41	1.51
4	A	504	CWH	CAZ-CBA	-5.92	1.42	1.51
4	A	504	CWH	CBB-CBC	5.71	1.59	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	501	FAD	C9A-C5X	5.13	1.49	1.41
4	A	504	CWH	CBB-CBA	-5.08	1.43	1.51
4	B	506	CWH	CAZ-CBA	-4.72	1.44	1.51
2	A	501	FAD	C5A-C4A	4.58	1.47	1.39
4	A	504	CWH	CAB-CAD	4.49	1.61	1.53
2	B	501	FAD	C1'-C2'	-4.00	1.47	1.52
2	B	501	FAD	C5A-C4A	3.94	1.46	1.39
4	A	504	CWH	CAV-CAU	3.68	1.60	1.52
4	B	506	CWH	OAW-CAX	3.52	1.43	1.35
6	B	505	ACT	O-C	3.43	1.37	1.22
4	A	504	CWH	OAW-CAX	3.36	1.42	1.35
2	A	501	FAD	C9A-C5X	3.30	1.46	1.41
2	B	501	FAD	C8-C7	3.25	1.48	1.40
2	B	501	FAD	C4-N3	-3.04	1.33	1.38
2	A	501	FAD	C4-N3	-3.01	1.33	1.38
2	A	501	FAD	O4-C4	2.99	1.29	1.23
4	B	506	CWH	OBH-CAY	2.96	1.51	1.44
2	B	501	FAD	C5A-N7A	-2.88	1.33	1.39
2	A	501	FAD	C4A-N9A	-2.81	1.31	1.37
2	B	501	FAD	C4A-N9A	-2.79	1.31	1.37
2	A	501	FAD	C8-C7	2.69	1.47	1.40
4	B	506	CWH	CAV-CAU	2.67	1.58	1.52
2	A	501	FAD	C5A-C6A	2.65	1.48	1.41
2	B	501	FAD	C5X-N5	-2.62	1.34	1.39
4	B	506	CWH	CAB-CAD	2.50	1.57	1.53
4	B	506	CWH	CAO-CAM	2.38	1.59	1.52
2	A	501	FAD	C6-C7	-2.35	1.36	1.39
4	B	506	CWH	OAW-CAU	2.29	1.52	1.46
2	B	501	FAD	C5A-C6A	2.24	1.47	1.41
2	A	501	FAD	C5X-N5	-2.24	1.35	1.39
2	B	501	FAD	O4-C4	2.23	1.27	1.23
4	B	506	CWH	CAH-CAG	2.12	1.59	1.52
2	B	501	FAD	C2'-C3'	-2.09	1.49	1.53
4	A	504	CWH	CAD-NAF	2.05	1.38	1.33
4	A	504	CWH	CBG-CAZ	2.04	1.57	1.53

All (48) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	506	CWH	CAU-OAW-CAX	6.15	128.71	117.85
2	B	501	FAD	N3A-C4A-N9A	4.99	135.66	127.17
2	B	501	FAD	C4A-N9A-C8A	4.94	110.92	105.74

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	504	CWH	CAU-OAW-CAX	4.53	125.85	117.85
2	A	501	FAD	N3A-C4A-N9A	4.36	134.59	127.17
2	A	501	FAD	C5A-C4A-N3A	-4.21	120.92	126.72
2	B	501	FAD	C5A-C4A-N3A	-3.93	121.31	126.72
4	A	504	CWH	CAG-CAH-CAI	3.84	123.78	114.42
2	A	501	FAD	N3A-C2A-N1A	-3.69	123.00	128.58
4	A	504	CWH	CAH-CAG-NAF	3.67	121.93	111.88
2	A	501	FAD	O2-C2-N1	-3.27	116.37	121.80
2	B	501	FAD	N3A-C2A-N1A	-3.23	123.69	128.58
4	B	506	CWH	CAK-CAL-CAM	-3.22	106.36	113.02
2	A	501	FAD	C4A-N9A-C8A	3.15	109.04	105.74
2	A	501	FAD	C2A-N3A-C4A	3.12	119.46	111.83
4	A	504	CWH	OAW-CAX-CBJ	3.03	116.49	111.09
2	B	501	FAD	C2A-N3A-C4A	3.01	119.19	111.83
2	A	501	FAD	C2'-C1'-N10	2.84	123.61	110.20
4	A	504	CWH	CAJ-CAI-CAH	2.82	121.31	111.27
4	B	506	CWH	CAB-CAD-NAF	-2.79	111.33	116.54
4	A	504	CWH	CAT-CAS-CAQ	-2.79	105.38	114.97
4	B	506	CWH	OAW-CAX-OB1	2.75	128.29	122.99
4	B	506	CWH	CBB-CBA-CAZ	2.73	119.93	116.42
2	B	501	FAD	N9A-C8A-N7A	-2.72	110.07	113.94
4	B	506	CWH	CBC-CBB-CBA	-2.70	103.24	109.20
4	A	504	CWH	CAG-NAF-CAD	-2.69	117.71	122.55
4	B	506	CWH	CAP-CAO-CAM	2.69	118.58	113.02
2	B	501	FAD	C9A-C5X-N5	-2.68	119.61	122.45
4	B	506	CWH	CAT-CAS-CAQ	-2.67	105.78	114.97
4	B	506	CWH	CAG-NAF-CAD	2.63	127.26	122.55
2	B	501	FAD	C5A-C4A-N9A	-2.55	103.03	105.81
2	B	501	FAD	N6A-C6A-N1A	2.47	123.87	118.38
2	A	501	FAD	C2A-N1A-C6A	2.45	122.75	118.73
4	A	504	CWH	CBE-CBB-CBA	2.44	116.66	111.63
4	B	506	CWH	CBE-CBB-CBA	2.43	116.65	111.63
4	A	504	CWH	CBB-CBA-CAZ	2.43	119.54	116.42
2	B	501	FAD	O4-C4-C4X	-2.40	120.19	126.53
4	A	504	CWH	CAP-CAO-CAM	2.35	117.88	113.02
4	A	504	CWH	CAK-CAL-CAM	-2.34	108.18	113.02
4	B	506	CWH	OAN-CAM-CAO	2.33	115.56	109.35
2	B	501	FAD	O4B-C1B-N9A	2.31	112.53	108.09
4	A	504	CWH	OAN-CAM-CAO	2.28	115.43	109.35
2	B	501	FAD	C5A-C6A-N6A	-2.27	117.67	123.29
4	B	506	CWH	CBG-CAZ-CAY	-2.24	108.46	112.77
2	A	501	FAD	C4-C4X-N5	2.23	121.28	118.21

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	506	CWH	CBC-OBH-CAY	2.22	117.95	113.65
2	A	501	FAD	C4X-C10-N10	2.13	119.53	116.48
2	A	501	FAD	C6A-C5A-N7A	2.00	135.95	132.09

There are no chirality outliers.

All (46) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	501	FAD	N10-C1'-C2'-O2'
2	A	501	FAD	N10-C1'-C2'-C3'
2	B	501	FAD	C5B-O5B-PA-O1A
2	B	501	FAD	N10-C1'-C2'-O2'
2	B	501	FAD	N10-C1'-C2'-C3'
2	B	501	FAD	C5'-O5'-P-O2P
2	B	501	FAD	C5'-O5'-P-O3P
4	A	504	CWH	CAT-CAU-CAV-CAY
4	A	504	CWH	OBI-CAX-OAW-CAU
4	A	504	CWH	CBJ-CAX-OAW-CAU
4	A	504	CWH	CAG-CAH-CAI-CAJ
4	A	504	CWH	NAF-CAG-CAH-CAI
4	B	506	CWH	OAW-CAU-CAV-CAY
4	B	506	CWH	CAT-CAU-CAV-CAY
4	B	506	CWH	CAT-CAU-OAW-CAX
4	B	506	CWH	CAS-CAT-CAU-CAV
4	B	506	CWH	CAS-CAT-CAU-OAW
4	B	506	CWH	CBJ-CAX-OAW-CAU
4	B	506	CWH	CAL-CAM-CAO-CAP
4	B	506	CWH	CAK-CAL-CAM-CAO
5	B	507	GOL	O1-C1-C2-C3
5	B	511	GOL	C1-C2-C3-O3
4	B	506	CWH	OBI-CAX-OAW-CAU
4	B	506	CWH	CAJ-CAI-CAK-CAL
4	B	506	CWH	CAK-CAL-CAM-OAN
4	A	504	CWH	CAQ-CAS-CAT-CAU
4	A	504	CWH	CAM-CAO-CAP-CAQ
5	A	506	GOL	C1-C2-C3-O3
4	B	506	CWH	OAN-CAM-CAO-CAP
5	B	507	GOL	O1-C1-C2-O2
4	A	504	CWH	CAL-CAM-CAO-CAP
4	A	504	CWH	OAN-CAM-CAO-CAP
5	A	506	GOL	O2-C2-C3-O3
5	B	511	GOL	O2-C2-C3-O3

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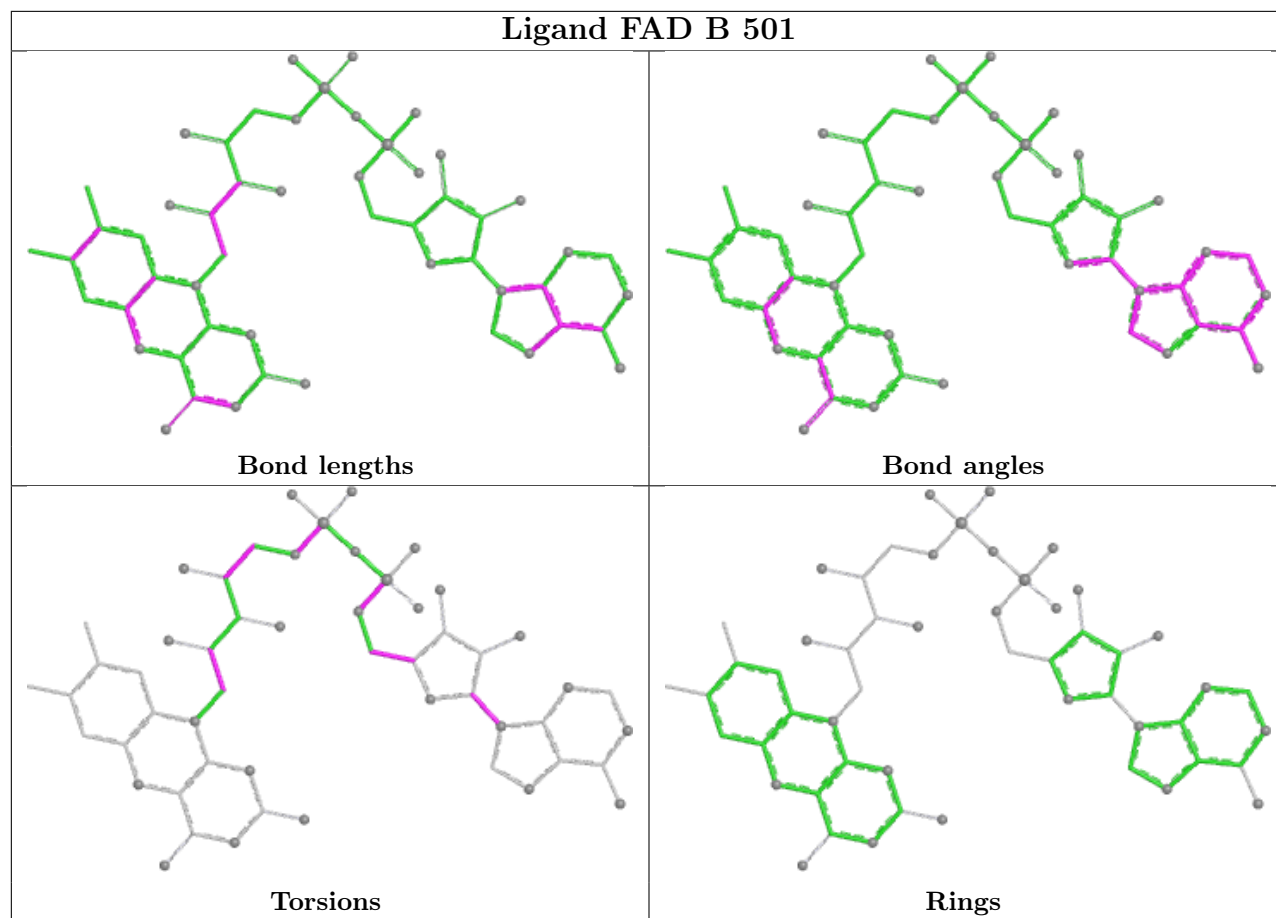
Mol	Chain	Res	Type	Atoms
4	B	506	CWH	CAH-CAI-CAK-CAL
4	B	506	CWH	CAM-CAO-CAP-CAQ
5	A	505	GOL	O1-C1-C2-C3
5	A	505	GOL	O1-C1-C2-O2
4	B	506	CWH	CAU-CAV-CAY-CAZ
2	B	501	FAD	C5B-O5B-PA-O3P
4	B	506	CWH	NAF-CAG-CAH-CAI
2	B	501	FAD	O4B-C4B-C5B-O5B
2	B	501	FAD	C3'-C4'-C5'-O5'
2	B	501	FAD	C2B-C1B-N9A-C8A
4	B	506	CWH	CAU-CAV-CAY-OBH
2	A	501	FAD	O4B-C4B-C5B-O5B

There are no ring outliers.

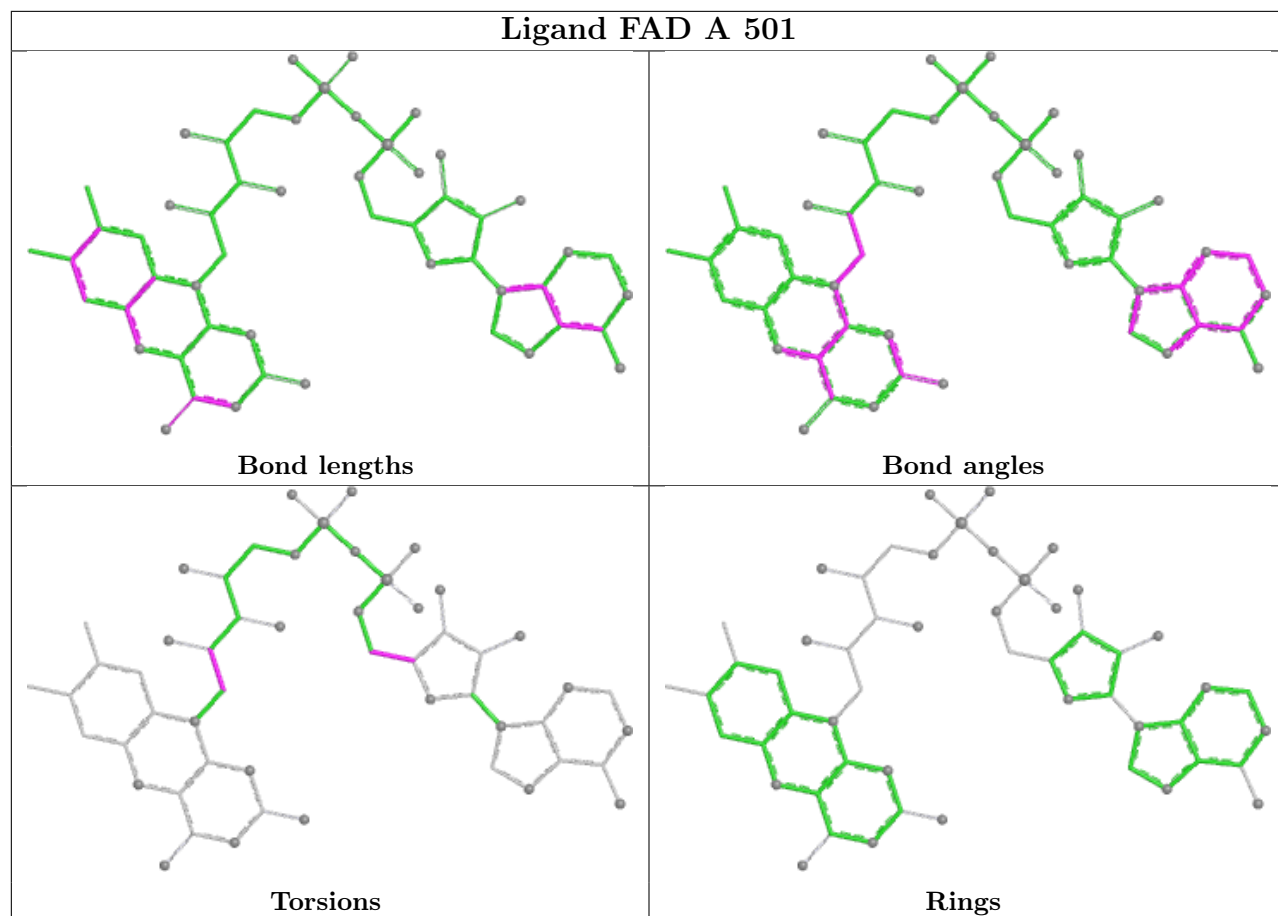
6 monomers are involved in 11 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	511	GOL	2	0
2	B	501	FAD	2	0
5	A	505	GOL	1	0
6	B	503	ACT	1	0
2	A	501	FAD	4	0
4	B	506	CWH	1	0

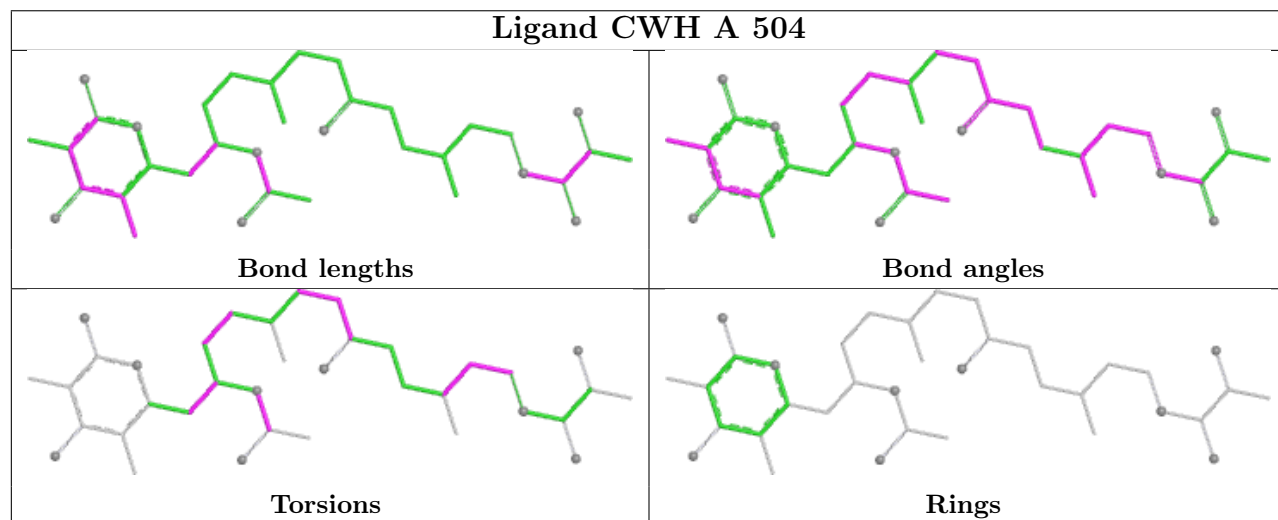
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less 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.

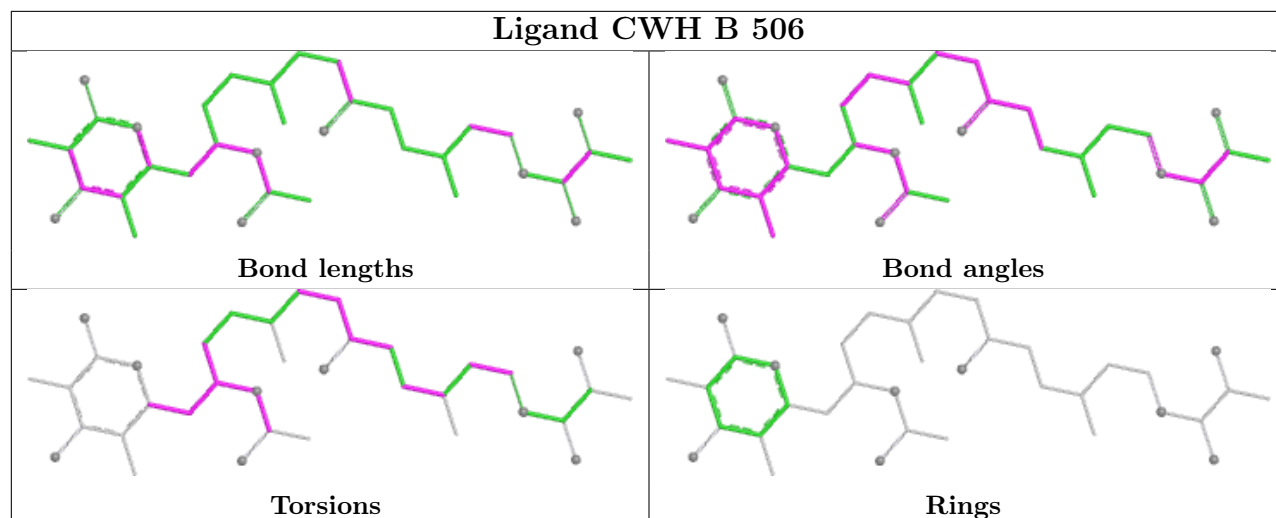


Ligand FAD A 501



Ligand CWH A 504





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

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

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	431/442 (97%)	0.33	12 (2%) 55 50	36, 62, 96, 129	0
1	B	428/442 (96%)	0.03	7 (1%) 70 67	35, 55, 85, 107	0
All	All	859/884 (97%)	0.18	19 (2%) 62 58	35, 58, 92, 129	0

All (19) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	132	THR	4.4
1	A	139	LYS	3.6
1	B	300	GLY	3.2
1	B	140	GLN	3.0
1	A	4	VAL	2.8
1	B	131	PRO	2.7
1	B	4	VAL	2.5
1	A	35	PHE	2.4
1	B	241	LEU	2.4
1	A	133	SER	2.4
1	A	13	VAL	2.4
1	A	265	LEU	2.4
1	A	3	VAL	2.3
1	B	321	MET	2.3
1	A	262	LEU	2.2
1	A	241	LEU	2.2
1	A	266	ARG	2.1
1	A	56	THR	2.1
1	A	353	PRO	2.1

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 ⓘ

There are no oligosaccharides in this entry.

6.4 Ligands ⓘ

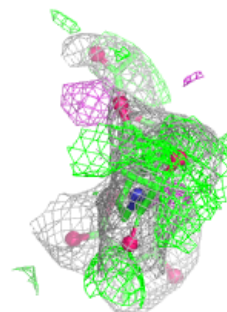
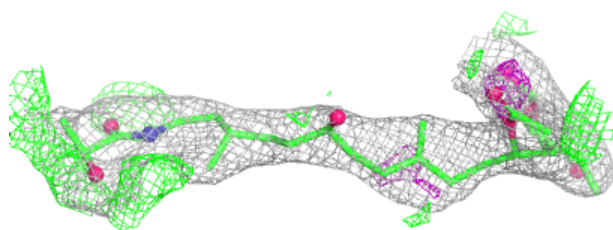
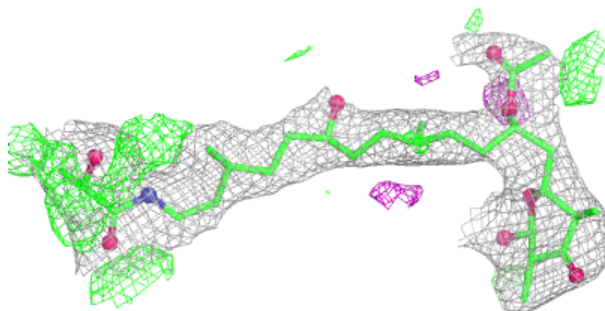
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
6	ACT	B	505	4/4	0.64	0.33	29,29,30,35	0
3	CA	A	502	1/1	0.72	0.43	136,136,136,136	1
5	GOL	B	507	6/6	0.75	0.24	70,74,82,85	0
5	GOL	B	510	6/6	0.80	0.18	81,86,94,97	0
6	ACT	B	504	4/4	0.82	0.16	66,67,74,79	0
5	GOL	B	511	6/6	0.82	0.20	82,85,90,91	0
6	ACT	B	503	4/4	0.83	0.19	58,66,68,74	0
3	CA	A	503	1/1	0.84	0.24	97,97,97,97	0
4	CWH	A	504	36/36	0.84	0.17	45,60,83,90	0
5	GOL	B	509	6/6	0.85	0.20	88,99,100,102	0
5	GOL	A	505	6/6	0.85	0.24	46,62,72,78	0
5	GOL	A	506	6/6	0.86	0.20	53,63,72,73	0
4	CWH	B	506	36/36	0.88	0.17	61,73,88,95	0
5	GOL	B	508	6/6	0.88	0.15	76,78,85,85	0
3	CA	B	502	1/1	0.95	0.17	93,93,93,93	0
2	FAD	A	501	53/53	0.96	0.08	37,54,73,78	0
2	FAD	B	501	53/53	0.98	0.06	30,43,58,62	0

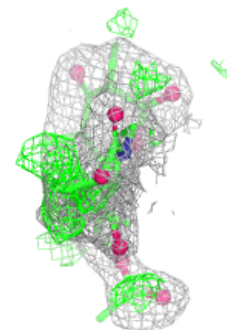
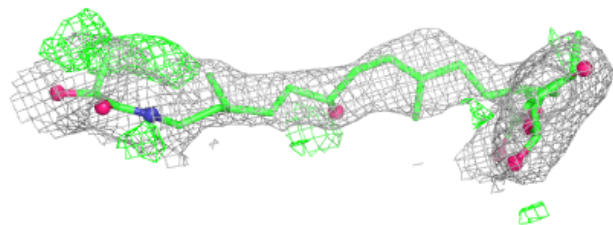
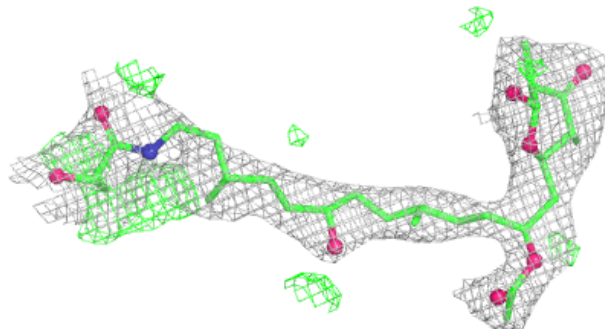
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around CWH A 504:

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

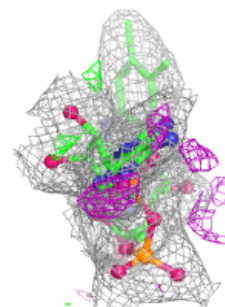
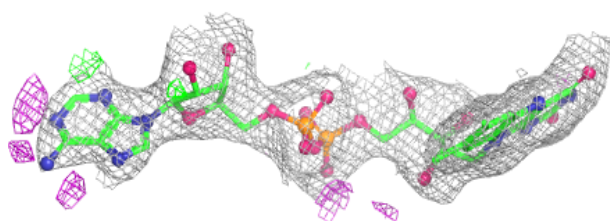
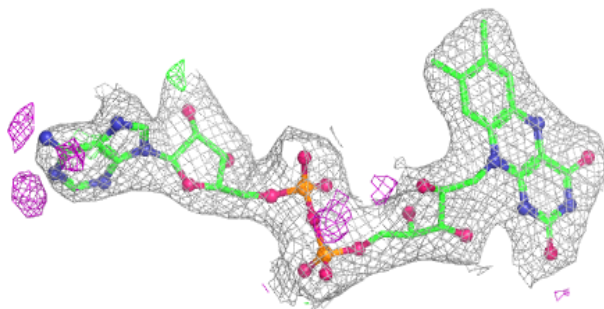
**Electron density around CWH B 506:**

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

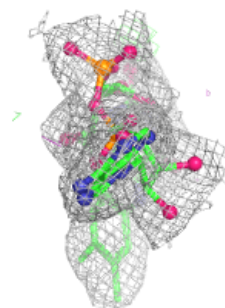
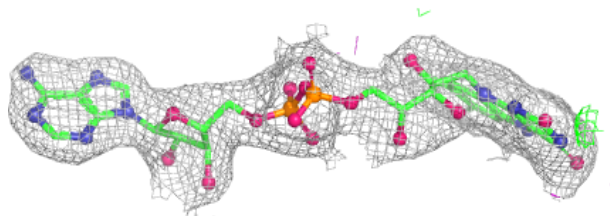
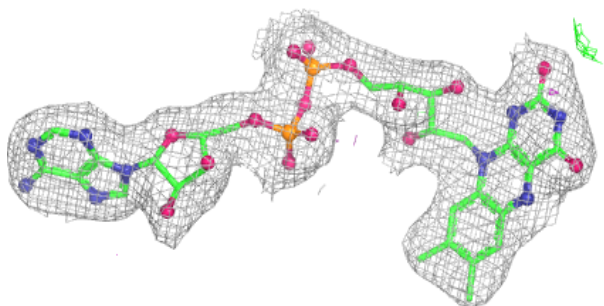


Electron density around FAD A 501:

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

**Electron density around FAD B 501:**

$2mF_o-DF_c$ (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.