



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 04:42 AM UTC

PDB ID : 4D7E / pdb_00004d7e
Title : An unprecedented NADPH domain conformation in Lysine Monooxygenase NbtG from Nocardia farcinica
Authors : Binda, C.; Robinson, R.; Keul, N.; Rodriguez, P.; Robinson, H.H.; Mattevi, A.; Sobrado, P.
Deposited on : 2014-11-24
Resolution : 2.40 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

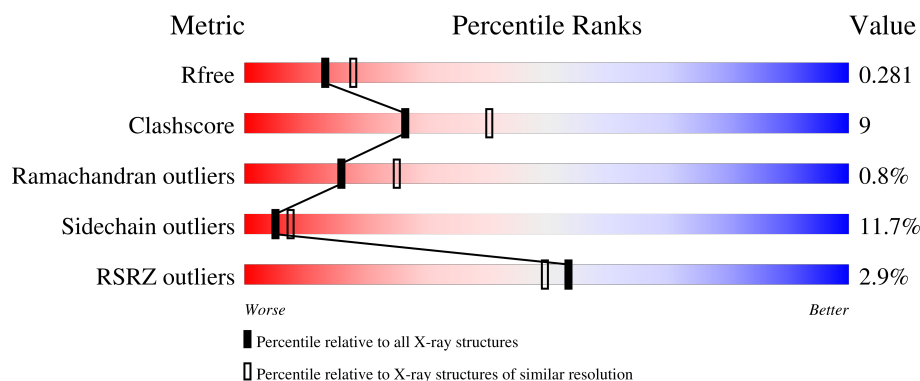
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

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	429	0.2% 66% 22% • 8%
1	B	429	2% 71% 18% • 9%
1	C	429	2% 65% 20% • 12%
1	D	429	5% 51% 16% • 30%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 11714 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-LYS MONOOXYGENASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	396	Total	C	N	O	S	0	0	0
			3045	1921	555	560	9			
1	B	392	Total	C	N	O	S	0	0	0
			3005	1899	544	556	6			
1	C	377	Total	C	N	O	S	0	0	0
			2885	1824	521	534	6			
1	D	300	Total	C	N	O	S	0	0	0
			2329	1482	412	430	5			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	184	ALA	LYS	engineered mutation	UNP Q5Z1T5
B	184	ALA	LYS	engineered mutation	UNP Q5Z1T5
C	184	ALA	LYS	engineered mutation	UNP Q5Z1T5
D	184	ALA	LYS	engineered mutation	UNP Q5Z1T5

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

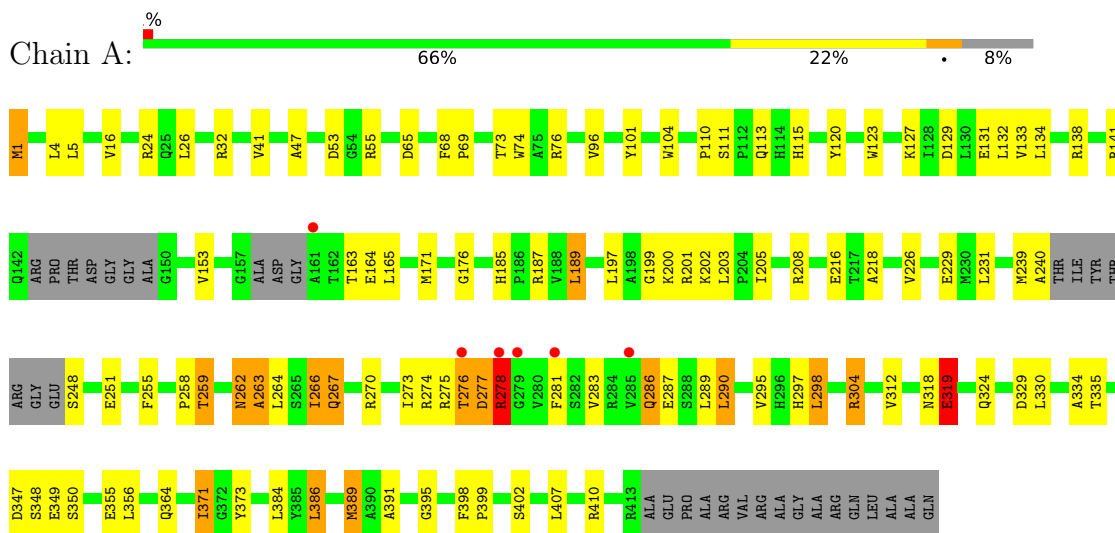
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	68	Total O 68 68	0	0
3	B	69	Total O 69 69	0	0
3	C	52	Total O 52 52	0	0
3	D	49	Total O 49 49	0	0

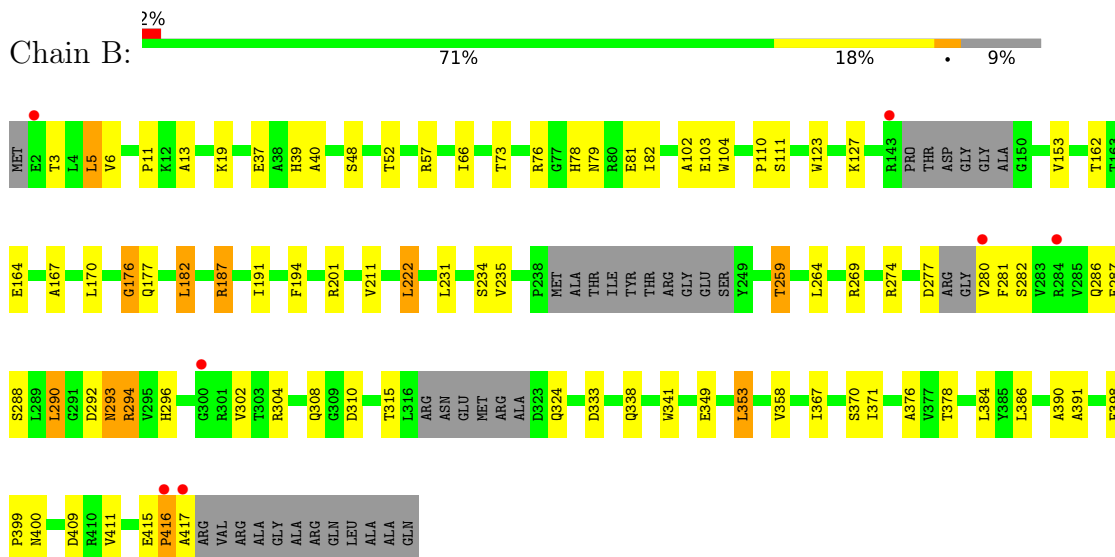
3 Residue-property plots

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-LYS MONOOXYGENASE

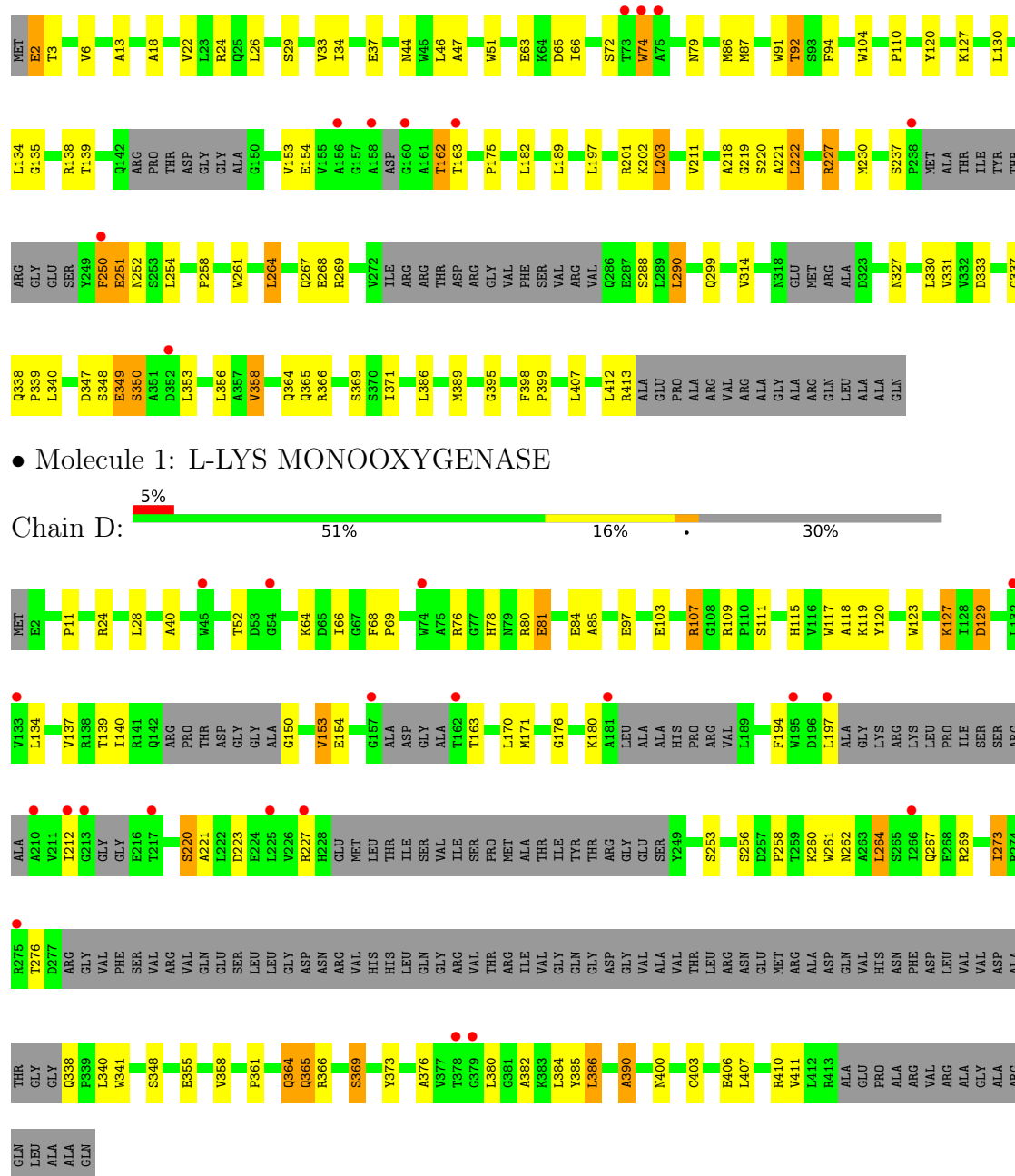


• Molecule 1: L-LYS MONOOXYGENASE



• Molecule 1: L-LYS MONOOXYGENASE





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	80.64Å 121.92Å 91.86Å 90.00° 97.72° 90.00°	Depositor
Resolution (Å)	91.19 – 2.40 91.03 – 2.40	Depositor EDS
% Data completeness (in resolution range)	99.2 (91.19-2.40) 99.1 (91.03-2.40)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.43 (at 2.39Å)	Xtriage
Refinement program	REFMAC 5.8.0073	Depositor
R, R_{free}	0.208 , 0.281 0.210 , 0.281	Depositor DCC
R_{free} test set	2819 reflections (4.13%)	wwPDB-VP
Wilson B-factor (Å ²)	54.7	Xtriage
Anisotropy	0.291	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 52.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	11714	wwPDB-VP
Average B, all atoms (Å ²)	71.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.37% 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: 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	1.00	2/3109 (0.1%)	1.04	4/4217 (0.1%)
1	B	0.95	2/3069 (0.1%)	1.01	1/4167 (0.0%)
1	C	0.87	0/2946	0.98	2/3998 (0.1%)
1	D	0.81	1/2380 (0.0%)	1.00	4/3227 (0.1%)
All	All	0.92	5/11504 (0.0%)	1.01	11/15609 (0.1%)

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	A	0	1
1	C	0	1
1	D	0	1
All	All	0	3

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	176	GLY	C-O	-9.89	1.17	1.24
1	D	390	ALA	C-O	8.53	1.35	1.24
1	B	40	ALA	CA-C	-6.21	1.45	1.52
1	B	176	GLY	C-O	-5.23	1.16	1.23
1	A	258	PRO	CA-C	5.03	1.59	1.52

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	365	GLN	N-CA-C	-7.46	102.31	111.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	162	THR	N-CA-C	6.83	119.55	108.76
1	A	41	VAL	N-CA-C	-6.75	100.86	109.30
1	A	185	HIS	CA-C-N	5.65	126.03	119.47
1	A	185	HIS	C-N-CA	5.65	126.03	119.47
1	D	212	ILE	N-CA-C	5.62	115.97	108.11
1	A	304	ARG	N-CA-C	5.33	116.38	108.60
1	B	79	ASN	N-CA-C	5.29	116.73	111.07
1	C	337	GLY	N-CA-C	5.14	118.55	112.33
1	D	109	ARG	CA-C-N	-5.00	114.61	119.76
1	D	109	ARG	C-N-CA	-5.00	114.61	119.76

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	277	ASP	Peptide
1	C	2	GLU	Peptide
1	D	390	ALA	Mainchain

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	3045	0	3031	59	0
1	B	3005	0	2979	46	1
1	C	2885	0	2855	49	1
1	D	2329	0	2287	54	0
2	A	53	0	31	2	0
2	B	53	0	31	6	0
2	C	53	0	31	2	0
2	D	53	0	31	6	0
3	A	68	0	0	5	0
3	B	69	0	0	6	1
3	C	52	0	0	0	1
3	D	49	0	0	10	0
All	All	11714	0	11276	211	2

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 9.

All (211) 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:273:ILE:O	1:A:276:THR:HG22	1.32	1.24
1:D:403:CYS:O	3:D:2031:HOH:O	1.79	0.98
1:D:364:GLN:OE1	3:D:2027:HOH:O	1.93	0.86
1:A:240:ALA:HA	1:A:297:HIS:CE1	2.14	0.81
1:D:180:LYS:O	1:D:338:GLN:NE2	2.15	0.79
1:B:73:THR:OG1	1:B:259:THR:HG21	1.85	0.77
1:B:296:HIS:HB2	3:B:2051:HOH:O	1.85	0.77
1:D:364:GLN:NE2	3:D:2027:HOH:O	2.18	0.74
1:D:384:LEU:CD2	1:D:386:LEU:HD21	2.17	0.74
1:D:364:GLN:CD	3:D:2027:HOH:O	2.31	0.73
1:D:220:SER:O	1:D:223:ASP:HB3	1.87	0.73
1:C:407:LEU:C	1:C:407:LEU:HD23	2.14	0.72
1:D:403:CYS:HB2	3:D:2031:HOH:O	1.88	0.71
1:A:273:ILE:O	1:A:276:THR:CG2	2.26	0.71
1:D:406:GLU:CB	3:D:2031:HOH:O	2.39	0.70
3:A:2024:HOH:O	1:C:92:THR:HG23	1.91	0.70
1:A:199:GLY:HA3	3:A:2040:HOH:O	1.94	0.68
1:B:177:GLN:OE1	1:B:338:GLN:NE2	2.27	0.67
1:A:226:VAL:HG11	1:A:289:LEU:HD21	1.77	0.66
1:A:239:MET:HE1	1:A:274:ARG:HB3	1.77	0.66
1:C:290:LEU:HD22	1:D:107:ARG:HA	1.78	0.65
1:D:365:GLN:O	1:D:369:SER:OG	2.15	0.63
1:D:103:GLU:O	1:D:107:ARG:HG3	1.99	0.62
1:D:171:MET:HE1	1:D:407:LEU:HD21	1.81	0.62
1:D:406:GLU:O	1:D:410:ARG:HG2	1.98	0.62
1:B:280:VAL:HG13	1:B:281:PHE:H	1.65	0.62
1:D:24:ARG:HA	1:D:28:LEU:O	2.00	0.61
1:A:267:GLN:HB2	3:A:2049:HOH:O	1.99	0.61
1:B:293:ASN:H	1:B:293:ASN:HD22	1.46	0.60
1:C:250:PHE:O	1:C:254:LEU:HG	2.00	0.60
1:D:220:SER:O	1:D:223:ASP:CB	2.50	0.59
1:B:123:TRP:CZ2	1:B:127:LYS:HD2	2.37	0.59
1:A:189:LEU:HD22	1:A:330:LEU:HD11	1.83	0.59
1:C:6:VAL:HG11	1:C:13:ALA:HB2	1.85	0.59
1:D:40:ALA:HB1	3:D:2004:HOH:O	2.03	0.58
1:A:123:TRP:CZ2	1:A:127:LYS:HD2	2.39	0.58
1:D:140:ILE:HG12	1:D:153:VAL:HG23	1.85	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:407:LEU:C	1:D:407:LEU:HD23	2.29	0.57
1:B:187:ARG:NE	1:B:310:ASP:O	2.38	0.57
1:C:211:VAL:HG21	1:C:222:LEU:HD13	1.86	0.57
2:B:500:FAD:O2'	2:B:500:FAD:O4'	2.11	0.56
1:A:240:ALA:CA	1:A:297:HIS:CE1	2.86	0.56
1:C:237:SER:O	1:C:299:GLN:HA	2.05	0.56
1:A:200:LYS:O	1:A:201:ARG:C	2.48	0.56
1:B:292:ASP:OD1	1:B:294:ARG:HD3	2.06	0.56
1:D:376:ALA:HB2	1:D:385:TYR:CE1	2.41	0.56
1:A:371:ILE:HD13	1:A:389:MET:HB2	1.87	0.56
1:B:37:GLU:OE2	2:B:500:FAD:O2B	2.22	0.56
1:B:282:SER:O	1:B:286:GLN:HB2	2.06	0.55
1:C:91:TRP:O	1:C:94:PHE:HB3	2.06	0.55
1:A:283:VAL:O	1:A:287:GLU:HB2	2.05	0.55
1:A:273:ILE:C	1:A:276:THR:HG22	2.22	0.55
1:A:262:ASN:OD1	1:A:262:ASN:N	2.39	0.55
1:D:373:TYR:CZ	1:D:410:ARG:NH1	2.75	0.55
1:A:391:ALA:HA	1:A:395:GLY:O	2.07	0.55
1:B:191:ILE:O	1:B:194:PHE:HB3	2.08	0.54
1:C:330:LEU:C	1:C:330:LEU:HD23	2.33	0.54
1:A:389:MET:HE2	1:A:389:MET:HA	1.88	0.54
1:D:220:SER:O	1:D:223:ASP:N	2.41	0.54
1:B:176:GLY:HA2	1:B:341:TRP:CG	2.43	0.54
1:C:412:LEU:O	1:C:413:ARG:HB3	2.08	0.54
1:A:226:VAL:HG11	1:A:289:LEU:CD2	2.37	0.54
1:D:117:TRP:O	1:D:120:TYR:HB3	2.08	0.53
1:D:273:ILE:O	1:D:276:THR:HG22	2.09	0.53
1:D:261:TRP:CE2	1:D:269:ARG:HD2	2.43	0.53
1:B:211:VAL:HG21	1:B:222:LEU:HD13	1.90	0.53
1:D:150:GLY:N	1:D:382:ALA:HB2	2.24	0.52
1:D:256:SER:HA	1:D:403:CYS:HB3	1.90	0.52
1:A:74:TRP:O	1:A:76:ARG:N	2.42	0.52
1:D:358:VAL:CG1	1:D:366:ARG:HG2	2.40	0.52
1:A:407:LEU:C	1:A:407:LEU:HD23	2.35	0.52
1:B:73:THR:OG1	1:B:259:THR:CG2	2.56	0.52
1:C:339:PRO:CB	1:C:389:MET:HE1	2.40	0.52
1:B:123:TRP:CZ2	1:B:127:LYS:CD	2.93	0.51
1:B:5:LEU:HD12	1:B:167:ALA:HB2	1.92	0.51
2:A:500:FAD:N1	2:A:500:FAD:O3'	2.44	0.51
1:D:361:PRO:O	1:D:366:ARG:HD2	2.10	0.51
1:B:400:ASN:HA	2:B:500:FAD:O3'	2.10	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:216:GLU:HG2	1:A:278:ARG:CB	2.41	0.51
1:C:104:TRP:CD1	1:C:110:PRO:HD2	2.46	0.50
1:A:216:GLU:HG2	1:A:278:ARG:HB2	1.93	0.50
1:B:367:ILE:O	1:B:371:ILE:CD1	2.60	0.50
1:B:416:PRO:O	1:B:417:ALA:HB2	2.12	0.50
1:C:251:GLU:HG3	1:C:252:ASN:H	1.76	0.50
1:C:333:ASP:C	1:C:333:ASP:OD1	2.55	0.49
1:D:384:LEU:HD23	1:D:386:LEU:HD21	1.94	0.49
1:B:293:ASN:H	1:B:293:ASN:ND2	2.11	0.49
1:A:197:LEU:CD1	1:A:203:LEU:HD23	2.43	0.49
1:A:262:ASN:C	1:A:264:LEU:H	2.20	0.49
1:D:68:PHE:HB3	3:D:2008:HOH:O	2.13	0.49
1:C:46:LEU:O	1:C:47:ALA:C	2.55	0.49
1:D:68:PHE:CD1	1:D:69:PRO:HA	2.48	0.49
1:D:384:LEU:HD21	1:D:386:LEU:HD21	1.91	0.49
1:A:251:GLU:OE2	1:A:275:ARG:NH1	2.44	0.48
1:A:371:ILE:CD1	1:A:389:MET:HB2	2.43	0.48
1:A:398:PHE:N	1:A:399:PRO:CD	2.76	0.48
1:C:261:TRP:CE2	1:C:269:ARG:HG2	2.49	0.48
2:D:500:FAD:O2'	2:D:500:FAD:H9	2.14	0.48
1:A:218:ALA:HA	1:A:334:ALA:HB1	1.96	0.48
1:C:371:ILE:HD13	1:C:389:MET:O	2.14	0.48
1:D:78:HIS:HB3	1:D:81:GLU:HG2	1.96	0.48
2:B:500:FAD:H5'1	3:B:2003:HOH:O	2.12	0.48
1:B:6:VAL:HG11	1:B:13:ALA:HB2	1.96	0.48
1:B:19:LYS:NZ	3:B:2005:HOH:O	2.47	0.48
1:A:201:ARG:NH1	1:B:201:ARG:HB2	2.29	0.48
1:B:39:HIS:NE2	1:B:48:SER:OG	2.42	0.48
2:D:500:FAD:C9	2:D:500:FAD:C2'	2.91	0.48
1:D:64:LYS:HG2	1:D:68:PHE:CE2	2.48	0.47
1:A:1:MET:HE2	1:A:1:MET:HB3	1.63	0.47
1:A:47:ALA:HB2	1:A:53:ASP:O	2.14	0.47
1:A:263:ALA:C	1:A:264:LEU:HD12	2.38	0.47
1:A:255:PHE:HB3	1:A:402:SER:HB3	1.95	0.47
1:A:65:ASP:HB2	1:A:120:TYR:OH	2.15	0.47
1:B:104:TRP:CD1	1:B:110:PRO:HD2	2.50	0.47
1:C:3:THR:HG23	1:C:34:ILE:HD12	1.96	0.47
1:C:347:ASP:OD1	1:C:350:SER:OG	2.33	0.47
1:A:104:TRP:CD1	1:A:110:PRO:HD2	2.50	0.47
1:A:133:VAL:HG21	1:A:165:LEU:HD11	1.95	0.47
1:D:170:LEU:HD23	1:D:384:LEU:HD12	1.97	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:267:GLN:O	1:C:268:GLU:C	2.55	0.47
1:D:273:ILE:O	1:D:276:THR:CG2	2.63	0.47
1:A:289:LEU:HD22	1:A:295:VAL:HG21	1.96	0.47
1:D:264:LEU:CD1	1:D:269:ARG:HG2	2.43	0.47
1:C:339:PRO:HB3	1:C:389:MET:HE1	1.96	0.46
1:C:227:ARG:NE	1:D:227:ARG:NH2	2.63	0.46
1:A:276:THR:O	1:A:277:ASP:C	2.58	0.46
1:C:203:LEU:HD12	1:C:230:MET:HE1	1.96	0.46
1:A:290:LEU:O	1:B:57:ARG:NH2	2.40	0.46
1:C:358:VAL:HG13	1:C:366:ARG:HG2	1.97	0.46
1:A:216:GLU:OE2	1:A:278:ARG:HB3	2.16	0.46
1:C:197:LEU:HD21	1:C:202:LYS:O	2.16	0.46
1:A:297:HIS:CE1	1:A:298:LEU:O	2.69	0.46
1:C:44:ASN:ND2	2:C:500:FAD:O1A	2.48	0.46
1:C:197:LEU:HD22	1:C:203:LEU:HD22	1.97	0.46
1:D:11:PRO:HD2	2:D:500:FAD:O2A	2.16	0.46
3:A:2024:HOH:O	1:C:92:THR:CG2	2.58	0.45
1:C:37:GLU:O	1:C:135:GLY:N	2.48	0.45
2:C:500:FAD:O3'	2:C:500:FAD:N1	2.49	0.45
1:A:199:GLY:O	1:B:201:ARG:CZ	2.65	0.45
1:A:373:TYR:O	1:A:410:ARG:HD2	2.16	0.45
1:C:203:LEU:HD12	1:C:230:MET:CE	2.46	0.45
1:A:96:VAL:HG21	1:C:87:MET:SD	2.56	0.45
1:D:400:ASN:HB2	2:D:500:FAD:N1	2.31	0.45
1:A:281:PHE:HB3	1:A:286:GLN:HG3	1.99	0.45
1:D:194:PHE:CE1	1:D:221:ALA:HB1	2.52	0.45
1:B:349:GLU:O	1:B:353:LEU:HB2	2.16	0.45
1:D:406:GLU:HB2	3:D:2031:HOH:O	2.09	0.45
2:D:500:FAD:H9	2:D:500:FAD:C2'	2.47	0.45
1:A:73:THR:HG21	1:A:259:THR:HG21	1.99	0.45
1:A:113:GLN:OE1	1:A:115:HIS:NE2	2.50	0.44
1:A:384:LEU:HG	1:A:386:LEU:HD13	1.99	0.44
1:D:406:GLU:HB3	3:D:2031:HOH:O	2.09	0.44
1:C:74:TRP:HB2	1:C:79:ASN:OD1	2.18	0.44
2:A:500:FAD:H5'1	3:A:2003:HOH:O	2.18	0.44
1:D:123:TRP:CZ2	1:D:127:LYS:HD2	2.52	0.44
1:A:141:ARG:HD2	1:A:347:ASP:OD2	2.17	0.44
1:B:222:LEU:HD21	1:B:235:VAL:HG13	2.00	0.44
1:D:176:GLY:HA2	1:D:341:TRP:CD2	2.53	0.44
1:A:141:ARG:HA	1:A:350:SER:OG	2.18	0.44
1:D:129:ASP:CG	1:D:129:ASP:O	2.61	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:264:LEU:HD13	1:D:269:ARG:HG2	1.99	0.44
1:B:182:LEU:C	1:B:182:LEU:CD1	2.91	0.43
1:A:68:PHE:CG	1:A:69:PRO:HA	2.52	0.43
1:B:177:GLN:HG3	3:B:2042:HOH:O	2.17	0.43
1:B:338:GLN:O	1:B:338:GLN:HG2	2.18	0.43
1:C:18:ALA:C	1:C:86:MET:HE1	2.42	0.43
1:C:348:SER:O	1:C:349:GLU:C	2.62	0.43
1:A:187:ARG:HD2	1:A:329:ASP:O	2.18	0.43
1:C:218:ALA:O	1:C:219:GLY:C	2.61	0.43
1:C:407:LEU:C	1:C:407:LEU:CD2	2.87	0.43
2:B:500:FAD:O3'	2:B:500:FAD:N1	2.52	0.43
1:B:11:PRO:HD2	2:B:500:FAD:O2A	2.20	0.42
1:B:333:ASP:OD1	1:B:333:ASP:C	2.60	0.42
1:C:22:VAL:CG2	1:C:86:MET:HE3	2.49	0.42
1:C:330:LEU:HD23	1:C:331:VAL:N	2.35	0.42
1:C:339:PRO:HB3	1:C:389:MET:CE	2.49	0.42
1:C:398:PHE:N	1:C:399:PRO:CD	2.82	0.42
1:D:84:GLU:O	1:D:85:ALA:C	2.61	0.42
1:D:115:HIS:O	1:D:118:ALA:HB3	2.20	0.42
1:A:318:ASN:O	1:A:319:GLU:C	2.62	0.42
1:D:340:LEU:O	1:D:341:TRP:C	2.62	0.42
1:D:358:VAL:HG12	1:D:366:ARG:HG2	2.01	0.42
1:A:101:TYR:OH	1:C:63:GLU:HB3	2.20	0.42
1:A:123:TRP:CZ2	1:A:127:LYS:CD	3.03	0.42
1:B:5:LEU:O	1:B:170:LEU:HA	2.20	0.42
1:B:19:LYS:CE	1:B:409:ASP:OD1	2.68	0.42
1:B:78:HIS:ND1	1:B:81:GLU:OE1	2.52	0.42
1:C:51:TRP:CZ2	1:C:175:PRO:HG2	2.55	0.41
1:B:102:ALA:HB3	3:B:2029:HOH:O	2.20	0.41
1:B:290:LEU:HD23	1:B:290:LEU:HA	1.93	0.41
1:C:340:LEU:HD21	1:C:364:GLN:HG3	2.02	0.41
1:B:264:LEU:O	1:B:269:ARG:HD2	2.20	0.41
1:C:65:ASP:HB2	1:C:120:TYR:OH	2.19	0.41
1:C:261:TRP:CD1	1:C:395:GLY:HA2	2.56	0.41
1:D:364:GLN:C	1:D:366:ARG:N	2.74	0.41
1:A:266:ILE:O	1:A:270:ARG:HB2	2.21	0.41
1:C:264:LEU:O	1:C:269:ARG:HD2	2.20	0.41
1:C:364:GLN:O	1:C:365:GLN:C	2.64	0.41
1:B:6:VAL:HG11	1:B:13:ALA:CB	2.50	0.41
1:B:390:ALA:O	1:B:391:ALA:C	2.61	0.41
2:D:500:FAD:O2'	2:D:500:FAD:O4'	2.25	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:103:GLU:N	3:B:2029:HOH:O	2.43	0.41
1:A:32:ARG:NH2	1:A:131:GLU:OE2	2.54	0.41
1:C:220:SER:O	1:C:221:ALA:C	2.63	0.40
1:A:197:LEU:HB2	1:A:202:LYS:HB2	2.02	0.40
1:B:304:ARG:HB3	1:B:315:THR:HB	2.03	0.40
1:B:398:PHE:N	1:B:399:PRO:CD	2.83	0.40
1:B:376:ALA:HA	1:B:384:LEU:O	2.21	0.40
1:D:137:VAL:HG13	1:D:153:VAL:CG2	2.50	0.40
1:A:16:VAL:HG21	1:A:171:MET:HE1	2.02	0.40
1:C:258:PRO:O	1:C:261:TRP:HB3	2.22	0.40

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:B:2067:HOH:O	3:C:2025:HOH:O[2_646]	2.00	0.20
1:B:76:ARG:NH1	1:C:138:ARG:O[2_646]	2.05	0.15

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	388/429 (90%)	364 (94%)	21 (5%)	3 (1%)	16	25
1	B	382/429 (89%)	355 (93%)	23 (6%)	4 (1%)	12	20
1	C	365/429 (85%)	338 (93%)	24 (7%)	3 (1%)	16	25
1	D	284/429 (66%)	261 (92%)	21 (7%)	2 (1%)	18	28
All	All	1419/1716 (83%)	1318 (93%)	89 (6%)	12 (1%)	16	25

All (12) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	278	ARG
1	A	319	GLU
1	C	201	ARG
1	D	220	SER
1	A	263	ALA
1	B	259	THR
1	B	302	VAL
1	C	74	TRP
1	C	251	GLU
1	B	415	GLU
1	D	258	PRO
1	B	416	PRO

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	316/336 (94%)	274 (87%)	42 (13%)	4	5
1	B	311/336 (93%)	282 (91%)	29 (9%)	8	14
1	C	298/336 (89%)	263 (88%)	35 (12%)	5	7
1	D	240/336 (71%)	210 (88%)	30 (12%)	4	6
All	All	1165/1344 (87%)	1029 (88%)	136 (12%)	5	7

All (136) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	MET
1	A	4	LEU
1	A	5	LEU
1	A	24	ARG
1	A	26	LEU
1	A	55	ARG
1	A	111	SER
1	A	129	ASP
1	A	132	LEU
1	A	134	LEU

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Mol	Chain	Res	Type
1	A	138	ARG
1	A	153	VAL
1	A	163	THR
1	A	164	GLU
1	A	189	LEU
1	A	205	ILE
1	A	208	ARG
1	A	229	GLU
1	A	231	LEU
1	A	248	SER
1	A	259	THR
1	A	262	ASN
1	A	266	ILE
1	A	267	GLN
1	A	276	THR
1	A	278	ARG
1	A	286	GLN
1	A	290	LEU
1	A	298	LEU
1	A	304	ARG
1	A	312	VAL
1	A	319	GLU
1	A	324	GLN
1	A	335	THR
1	A	348	SER
1	A	349	GLU
1	A	355	GLU
1	A	356	LEU
1	A	364	GLN
1	A	371	ILE
1	A	386	LEU
1	A	389	MET
1	B	3	THR
1	B	5	LEU
1	B	52	THR
1	B	66	ILE
1	B	82	ILE
1	B	111	SER
1	B	153	VAL
1	B	162	THR
1	B	164	GLU
1	B	182	LEU

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Mol	Chain	Res	Type
1	B	187	ARG
1	B	222	LEU
1	B	231	LEU
1	B	234	SER
1	B	274	ARG
1	B	277	ASP
1	B	287	GLU
1	B	288	SER
1	B	290	LEU
1	B	293	ASN
1	B	294	ARG
1	B	308	GLN
1	B	324	GLN
1	B	353	LEU
1	B	358	VAL
1	B	370	SER
1	B	378	THR
1	B	386	LEU
1	B	411	VAL
1	C	2	GLU
1	C	24	ARG
1	C	26	LEU
1	C	29	SER
1	C	33	VAL
1	C	66	ILE
1	C	72	SER
1	C	92	THR
1	C	127	LYS
1	C	130	LEU
1	C	134	LEU
1	C	139	THR
1	C	153	VAL
1	C	154	GLU
1	C	162	THR
1	C	163	THR
1	C	182	LEU
1	C	189	LEU
1	C	203	LEU
1	C	222	LEU
1	C	227	ARG
1	C	250	PHE
1	C	264	LEU

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Mol	Chain	Res	Type
1	C	288	SER
1	C	290	LEU
1	C	314	VAL
1	C	327	ASN
1	C	338	GLN
1	C	349	GLU
1	C	350	SER
1	C	353	LEU
1	C	356	LEU
1	C	358	VAL
1	C	369	SER
1	C	386	LEU
1	D	52	THR
1	D	66	ILE
1	D	76	ARG
1	D	80	ARG
1	D	81	GLU
1	D	97	GLU
1	D	107	ARG
1	D	111	SER
1	D	119	LYS
1	D	127	LYS
1	D	129	ASP
1	D	134	LEU
1	D	139	THR
1	D	153	VAL
1	D	154	GLU
1	D	163	THR
1	D	197	LEU
1	D	253	SER
1	D	260	LYS
1	D	262	ASN
1	D	264	LEU
1	D	267	GLN
1	D	273	ILE
1	D	348	SER
1	D	355	GLU
1	D	364	GLN
1	D	369	SER
1	D	380	LEU
1	D	386	LEU
1	D	411	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	78	HIS
1	A	79	ASN
1	A	318	ASN
1	A	324	GLN
1	A	326	HIS
1	A	364	GLN
1	B	25	GLN
1	B	293	ASN
1	B	297	HIS
1	B	308	GLN
1	C	297	HIS
1	C	327	ASN
1	C	365	GLN
1	D	78	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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

4 ligands are modelled in this entry.

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	C	500	-	58,58,58	1.48	7 (12%)	85,89,89	2.12	32 (37%)
2	FAD	D	500	-	58,58,58	1.40	9 (15%)	85,89,89	1.99	21 (24%)
2	FAD	A	500	-	58,58,58	1.57	12 (20%)	85,89,89	2.67	29 (34%)
2	FAD	B	500	-	58,58,58	1.47	9 (15%)	85,89,89	2.33	30 (35%)

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	C	500	-	-	16/34/50/50	0/6/6/6
2	FAD	D	500	-	-	9/34/50/50	0/6/6/6
2	FAD	A	500	-	-	13/34/50/50	0/6/6/6
2	FAD	B	500	-	-	11/34/50/50	0/6/6/6

All (37) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	500	FAD	C5A-C4A	5.03	1.48	1.39
2	B	500	FAD	C5A-C4A	4.97	1.48	1.39
2	D	500	FAD	C5A-C4A	4.94	1.47	1.39
2	A	500	FAD	PA-O3P	4.67	1.64	1.59
2	C	500	FAD	C9A-C5X	4.09	1.47	1.41
2	A	500	FAD	C5A-C4A	3.89	1.46	1.39
2	B	500	FAD	C5X-N5	-3.84	1.32	1.39
2	C	500	FAD	PA-O3P	3.72	1.63	1.59
2	D	500	FAD	C9A-C5X	3.63	1.47	1.41
2	A	500	FAD	C9A-C5X	3.54	1.46	1.41
2	C	500	FAD	C8A-N7A	3.01	1.37	1.31
2	B	500	FAD	C2'-C3'	-2.97	1.48	1.53
2	B	500	FAD	C10-N10	2.93	1.43	1.37
2	A	500	FAD	C4A-N9A	-2.92	1.31	1.37
2	A	500	FAD	P-O3P	2.73	1.62	1.59
2	B	500	FAD	C4A-N9A	-2.73	1.32	1.37
2	D	500	FAD	C8A-N7A	2.67	1.36	1.31
2	A	500	FAD	C5A-N7A	-2.61	1.34	1.39
2	D	500	FAD	PA-O3P	2.57	1.62	1.59
2	C	500	FAD	C5X-N5	-2.56	1.34	1.39
2	D	500	FAD	C10-N10	2.54	1.42	1.37

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	500	FAD	C4A-N9A	-2.52	1.32	1.37
2	D	500	FAD	C4X-N5	2.43	1.36	1.30
2	A	500	FAD	C8A-N7A	2.37	1.36	1.31
2	A	500	FAD	C5X-N5	-2.31	1.35	1.39
2	B	500	FAD	C9A-C5X	2.30	1.44	1.41
2	B	500	FAD	C9A-N10	2.27	1.45	1.41
2	C	500	FAD	C5A-N7A	-2.25	1.35	1.39
2	A	500	FAD	C2-N3	-2.24	1.34	1.39
2	B	500	FAD	C8A-N7A	2.20	1.35	1.31
2	B	500	FAD	C4-N3	-2.17	1.34	1.38
2	A	500	FAD	C1'-C2'	-2.15	1.49	1.52
2	D	500	FAD	C5X-N5	-2.13	1.35	1.39
2	C	500	FAD	C10-N10	2.09	1.41	1.37
2	A	500	FAD	C8A-N9A	-2.04	1.34	1.37
2	D	500	FAD	C5A-N7A	-2.04	1.35	1.39
2	A	500	FAD	O4B-C4B	-2.04	1.40	1.45

All (112) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	500	FAD	O4'-C4'-C5'	-9.91	88.13	109.99
2	B	500	FAD	O4'-C4'-C5'	-8.36	91.55	109.99
2	A	500	FAD	C5'-C4'-C3'	8.03	127.36	112.22
2	C	500	FAD	C4'-C3'-C2'	-6.92	102.06	113.57
2	B	500	FAD	C5'-C4'-C3'	6.50	124.48	112.22
2	A	500	FAD	O4'-C4'-C3'	-6.46	94.13	109.25
2	D	500	FAD	C4'-C3'-C2'	-6.14	103.35	113.57
2	A	500	FAD	C4'-C3'-C2'	-6.00	103.59	113.57
2	B	500	FAD	O4'-C4'-C3'	-5.53	96.30	109.25
2	B	500	FAD	C4'-C3'-C2'	-5.31	104.74	113.57
2	D	500	FAD	N3A-C2A-N1A	-5.16	120.77	128.58
2	C	500	FAD	C5A-C4A-N3A	-5.11	119.68	126.72
2	A	500	FAD	C5A-C4A-N3A	-5.08	119.72	126.72
2	C	500	FAD	O4'-C4'-C5'	-4.94	99.10	109.99
2	D	500	FAD	C4A-C5A-N7A	-4.74	105.17	110.58
2	C	500	FAD	N3A-C2A-N1A	-4.69	121.47	128.58
2	A	500	FAD	C4-N3-C2	-4.66	117.37	125.64
2	C	500	FAD	O3'-C3'-C4'	4.65	119.50	108.93
2	A	500	FAD	C4A-C5A-N7A	-4.42	105.53	110.58
2	A	500	FAD	N3A-C2A-N1A	-4.39	121.94	128.58
2	D	500	FAD	C4A-N9A-C8A	4.28	110.23	105.74
2	B	500	FAD	N3A-C2A-N1A	-4.19	122.23	128.58

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	500	FAD	C5A-C4A-N3A	-4.19	120.95	126.72
2	A	500	FAD	O3'-C3'-C4'	4.11	118.27	108.93
2	D	500	FAD	C4-N3-C2	-3.91	118.69	125.64
2	A	500	FAD	C4A-N9A-C8A	3.91	109.84	105.74
2	A	500	FAD	O4B-C1B-N9A	-3.90	100.61	108.09
2	B	500	FAD	C2A-N1A-C6A	3.87	125.08	118.73
2	B	500	FAD	O3'-C3'-C4'	3.82	117.60	108.93
2	C	500	FAD	C4-N3-C2	-3.79	118.92	125.64
2	C	500	FAD	C4A-C5A-N7A	-3.78	106.26	110.58
2	A	500	FAD	C4X-C10-N1	-3.77	115.35	124.59
2	D	500	FAD	C2A-N1A-C6A	3.76	124.91	118.73
2	A	500	FAD	O5'-C5'-C4'	3.76	119.41	109.36
2	B	500	FAD	C4X-C10-N1	-3.73	115.44	124.59
2	D	500	FAD	C4X-C10-N1	-3.71	115.49	124.59
2	A	500	FAD	N3A-C4A-N9A	3.71	133.48	127.17
2	D	500	FAD	C9A-C5X-N5	-3.66	118.57	122.45
2	A	500	FAD	C4X-C4-N3	3.63	122.49	113.25
2	A	500	FAD	O3'-C3'-C2'	-3.59	100.77	108.93
2	C	500	FAD	N3A-C4A-N9A	3.57	133.25	127.17
2	D	500	FAD	C5A-N7A-C8A	3.56	109.05	103.45
2	B	500	FAD	C2B-C1B-N9A	3.49	121.97	113.30
2	D	500	FAD	N9A-C8A-N7A	-3.47	109.01	113.94
2	A	500	FAD	N9A-C8A-N7A	-3.44	109.06	113.94
2	B	500	FAD	C9A-C5X-N5	-3.38	118.87	122.45
2	A	500	FAD	C2B-C1B-N9A	3.34	121.61	113.30
2	A	500	FAD	C5A-N7A-C8A	3.30	108.64	103.45
2	D	500	FAD	O4-C4-C4X	-3.27	117.89	126.53
2	C	500	FAD	C9A-C5X-N5	-3.27	118.98	122.45
2	B	500	FAD	C4A-N9A-C1B	-3.25	119.02	126.63
2	C	500	FAD	C2A-N3A-C4A	3.24	119.73	111.83
2	B	500	FAD	O4B-C1B-N9A	-3.19	101.97	108.09
2	B	500	FAD	C4A-C5A-N7A	-3.18	106.94	110.58
2	D	500	FAD	N3A-C4A-N9A	3.16	132.53	127.17
2	D	500	FAD	C2A-N3A-C4A	3.14	119.50	111.83
2	A	500	FAD	C10-N1-C2	3.11	123.59	116.85
2	A	500	FAD	C2A-N3A-C4A	3.05	119.29	111.83
2	A	500	FAD	C9A-N10-C10	-3.02	116.15	120.75
2	B	500	FAD	C4-N3-C2	-3.01	120.30	125.64
2	B	500	FAD	C5X-N5-C4X	3.00	122.95	118.09
2	C	500	FAD	C4X-C10-N1	-2.97	117.30	124.59
2	A	500	FAD	C4X-C10-N10	2.94	120.69	116.48
2	A	500	FAD	O4-C4-C4X	-2.90	118.88	126.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	500	FAD	C5A-C4A-N3A	-2.89	122.74	126.72
2	D	500	FAD	C4X-C4-N3	2.84	120.48	113.25
2	B	500	FAD	O4-C4-C4X	-2.82	119.09	126.53
2	C	500	FAD	O3P-P-O1P	2.81	119.15	110.70
2	C	500	FAD	C5'-C4'-C3'	2.79	117.47	112.22
2	B	500	FAD	O3'-C3'-C2'	-2.73	102.73	108.93
2	B	500	FAD	C10-N1-C2	2.73	122.75	116.85
2	C	500	FAD	C5A-N7A-C8A	2.72	107.73	103.45
2	C	500	FAD	C2B-C1B-N9A	2.72	120.06	113.30
2	C	500	FAD	O3'-C3'-C2'	-2.69	102.82	108.93
2	A	500	FAD	C2A-N1A-C6A	2.68	123.13	118.73
2	C	500	FAD	C2B-C3B-C4B	2.67	107.77	102.61
2	C	500	FAD	C4X-C10-N10	2.64	120.25	116.48
2	C	500	FAD	C6-C5X-N5	2.61	122.77	118.44
2	D	500	FAD	C6A-C5A-N7A	2.59	137.08	132.09
2	B	500	FAD	C4A-N9A-C8A	2.49	108.35	105.74
2	C	500	FAD	C2A-N1A-C6A	2.48	122.81	118.73
2	C	500	FAD	C5X-N5-C4X	2.46	122.06	118.09
2	D	500	FAD	C5X-N5-C4X	2.42	122.00	118.09
2	D	500	FAD	C10-N1-C2	2.40	122.05	116.85
2	B	500	FAD	C9-C9A-N10	2.40	125.08	121.85
2	D	500	FAD	C4A-N9A-C1B	-2.38	121.06	126.63
2	C	500	FAD	C4X-C4-N3	2.38	119.32	113.25
2	B	500	FAD	C6A-C5A-N7A	2.37	136.67	132.09
2	A	500	FAD	C6A-C5A-N7A	2.36	136.63	132.09
2	B	500	FAD	C1B-N9A-C8A	2.32	132.24	127.09
2	D	500	FAD	C2B-C3B-C4B	2.31	107.08	102.61
2	C	500	FAD	O2-C2-N1	-2.31	117.96	121.80
2	C	500	FAD	C4A-N9A-C8A	2.27	108.12	105.74
2	C	500	FAD	C4A-N9A-C1B	-2.26	121.34	126.63
2	C	500	FAD	O2A-PA-O3P	2.26	113.37	107.27
2	B	500	FAD	C4X-C4-N3	2.25	118.98	113.25
2	A	500	FAD	O4B-C1B-C2B	-2.23	101.85	106.62
2	B	500	FAD	O5'-P-O1P	2.22	117.75	108.94
2	B	500	FAD	O5B-PA-O1A	-2.22	100.12	108.94
2	A	500	FAD	C9A-C5X-N5	-2.22	120.10	122.45
2	C	500	FAD	N9A-C8A-N7A	-2.21	110.81	113.94
2	A	500	FAD	C4A-N9A-C1B	-2.17	121.55	126.63
2	C	500	FAD	O4B-C1B-N9A	-2.16	103.94	108.09
2	C	500	FAD	C9A-N10-C10	-2.15	117.48	120.75
2	B	500	FAD	C9-C9A-C5X	-2.15	116.24	120.03
2	C	500	FAD	O2'-C2'-C1'	2.14	119.01	110.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	500	FAD	C6A-C5A-N7A	2.13	136.20	132.09
2	C	500	FAD	C10-C4X-N5	-2.08	120.56	124.81
2	B	500	FAD	O2-C2-N1	-2.07	118.37	121.80
2	B	500	FAD	C10-C4X-N5	-2.07	120.59	124.81
2	B	500	FAD	C9A-N10-C10	-2.06	117.61	120.75
2	D	500	FAD	O3B-C3B-C2B	-2.03	105.31	111.82

There are no chirality outliers.

All (49) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	500	FAD	N10-C1'-C2'-O2'
2	A	500	FAD	N10-C1'-C2'-C3'
2	A	500	FAD	C3'-C4'-C5'-O5'
2	A	500	FAD	O4'-C4'-C5'-O5'
2	B	500	FAD	N10-C1'-C2'-O2'
2	B	500	FAD	N10-C1'-C2'-C3'
2	B	500	FAD	O3'-C3'-C4'-C5'
2	B	500	FAD	C3'-C4'-C5'-O5'
2	B	500	FAD	O4'-C4'-C5'-O5'
2	C	500	FAD	N10-C1'-C2'-O2'
2	C	500	FAD	N10-C1'-C2'-C3'
2	C	500	FAD	C2'-C3'-C4'-C5'
2	C	500	FAD	O3'-C3'-C4'-C5'
2	C	500	FAD	C3'-C4'-C5'-O5'
2	C	500	FAD	O4'-C4'-C5'-O5'
2	C	500	FAD	C5'-O5'-P-O1P
2	C	500	FAD	C5'-O5'-P-O3P
2	D	500	FAD	N10-C1'-C2'-O2'
2	D	500	FAD	N10-C1'-C2'-C3'
2	D	500	FAD	C5'-O5'-P-O2P
2	D	500	FAD	C5'-O5'-P-O3P
2	A	500	FAD	O3'-C3'-C4'-C5'
2	A	500	FAD	C2'-C3'-C4'-C5'
2	A	500	FAD	O3'-C3'-C4'-O4'
2	C	500	FAD	O3'-C3'-C4'-O4'
2	B	500	FAD	C2'-C3'-C4'-C5'
2	C	500	FAD	C2'-C3'-C4'-O4'
2	A	500	FAD	PA-O3P-P-O5'
2	B	500	FAD	PA-O3P-P-O5'
2	C	500	FAD	PA-O3P-P-O5'
2	D	500	FAD	PA-O3P-P-O5'

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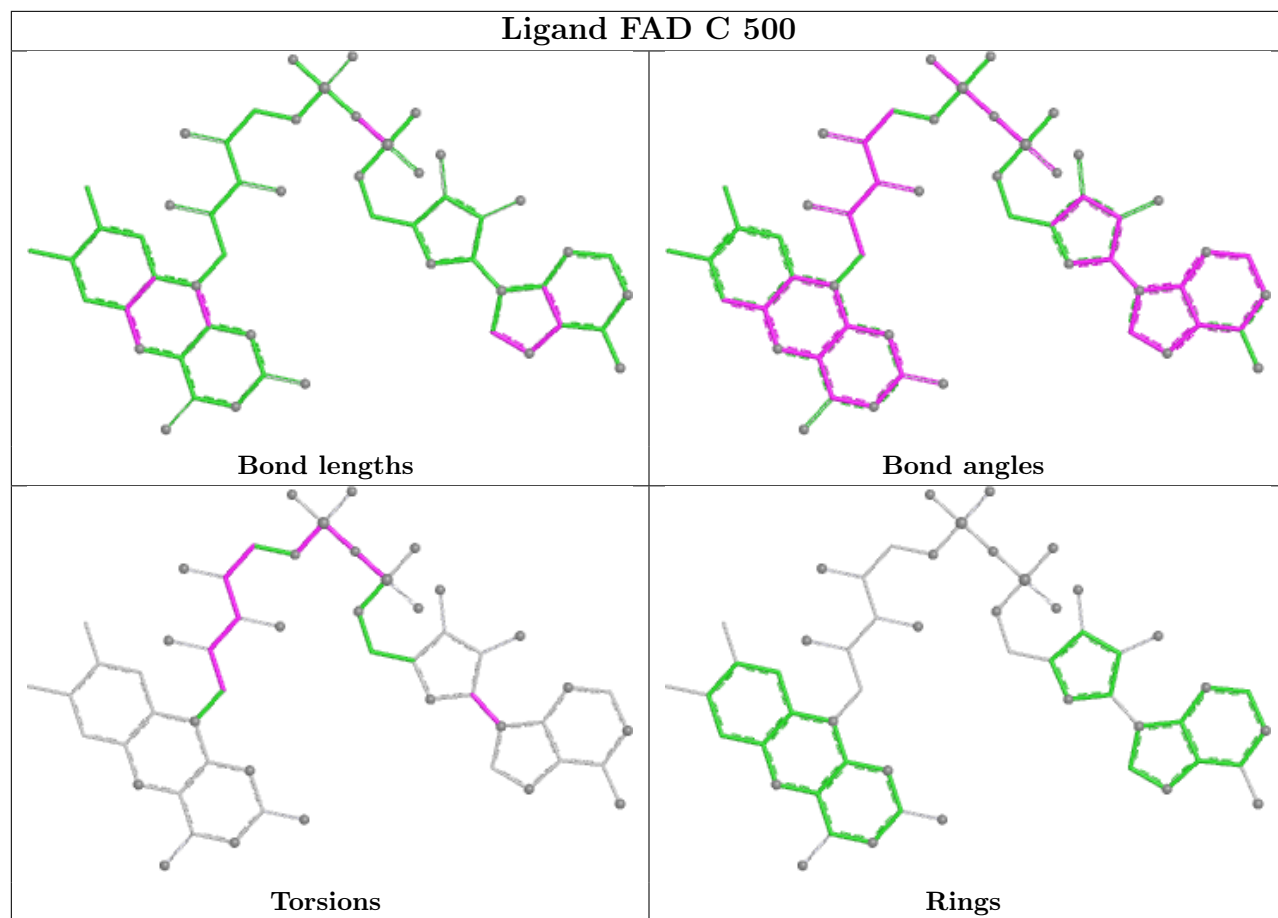
Mol	Chain	Res	Type	Atoms
2	A	500	FAD	C1'-C2'-C3'-O3'
2	C	500	FAD	C2B-C1B-N9A-C8A
2	B	500	FAD	C5'-O5'-P-O1P
2	D	500	FAD	C5'-O5'-P-O1P
2	A	500	FAD	C2'-C3'-C4'-O4'
2	C	500	FAD	P-O3P-PA-O2A
2	D	500	FAD	P-O3P-PA-O2A
2	B	500	FAD	C1'-C2'-C3'-O3'
2	C	500	FAD	C1'-C2'-C3'-O3'
2	A	500	FAD	C1'-C2'-C3'-C4'
2	D	500	FAD	O4B-C4B-C5B-O5B
2	B	500	FAD	P-O3P-PA-O1A
2	C	500	FAD	P-O3P-PA-O1A
2	C	500	FAD	C2B-C1B-N9A-C4A
2	A	500	FAD	PA-O3P-P-O2P
2	B	500	FAD	PA-O3P-P-O2P
2	D	500	FAD	P-O3P-PA-O1A
2	A	500	FAD	O4B-C4B-C5B-O5B

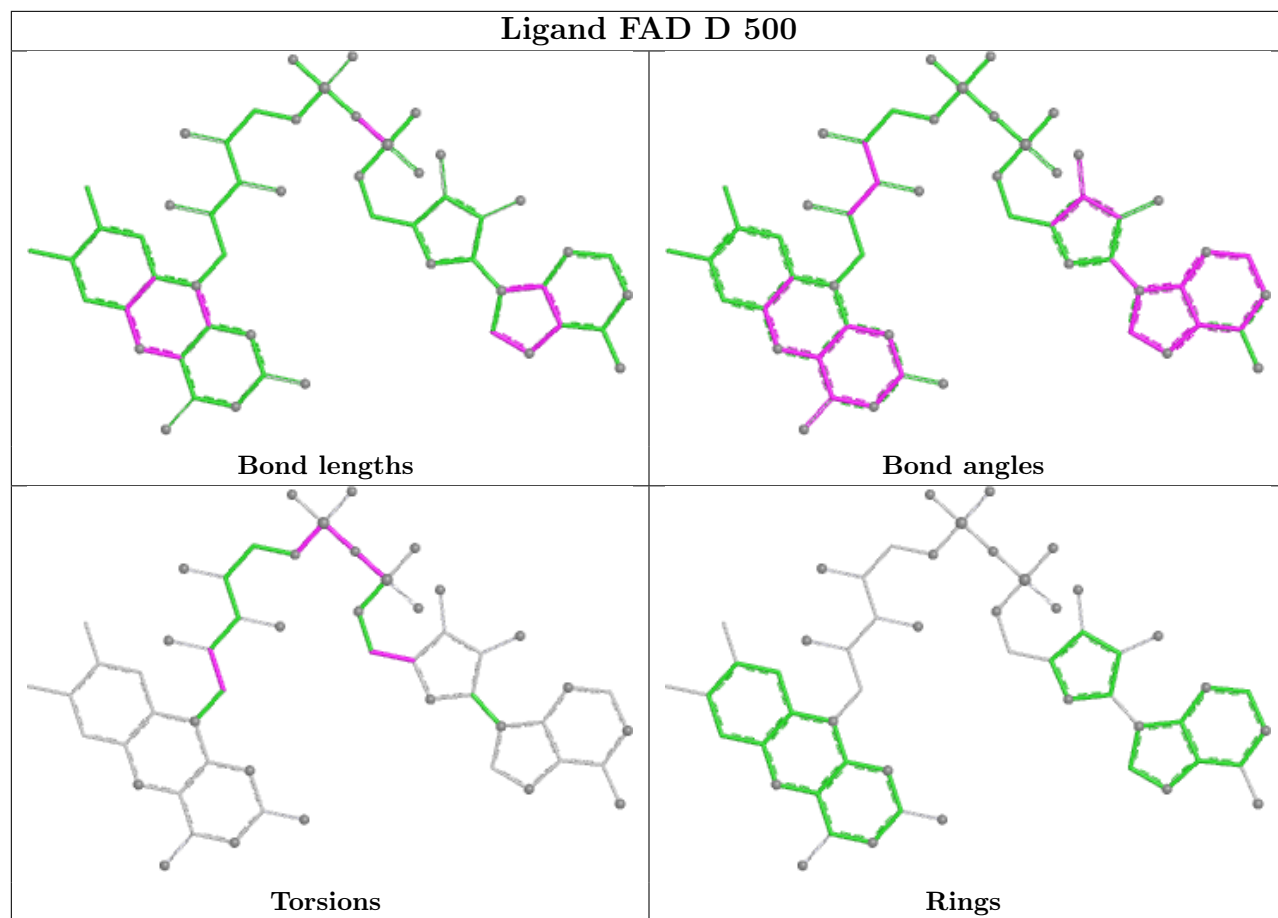
There are no ring outliers.

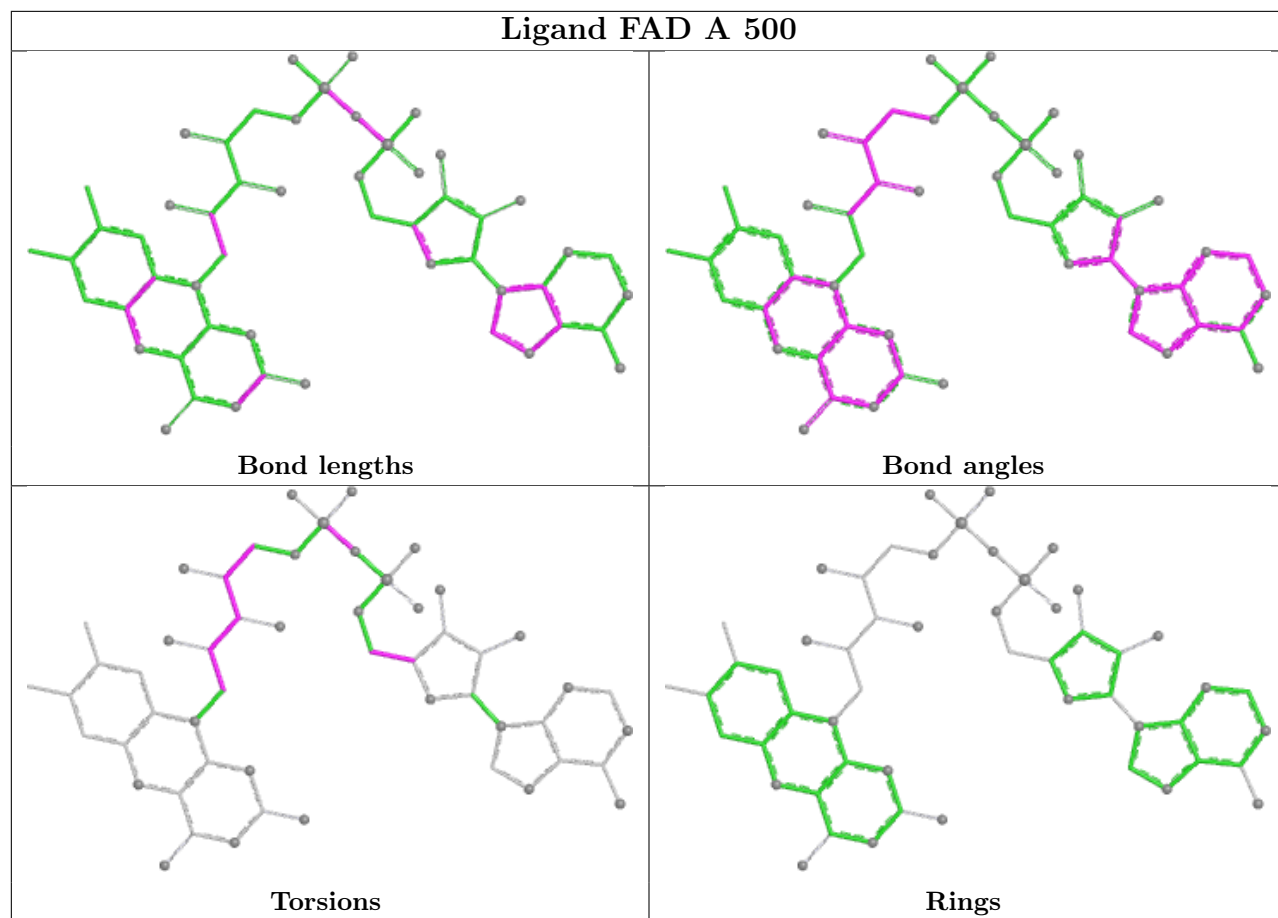
4 monomers are involved in 16 short contacts:

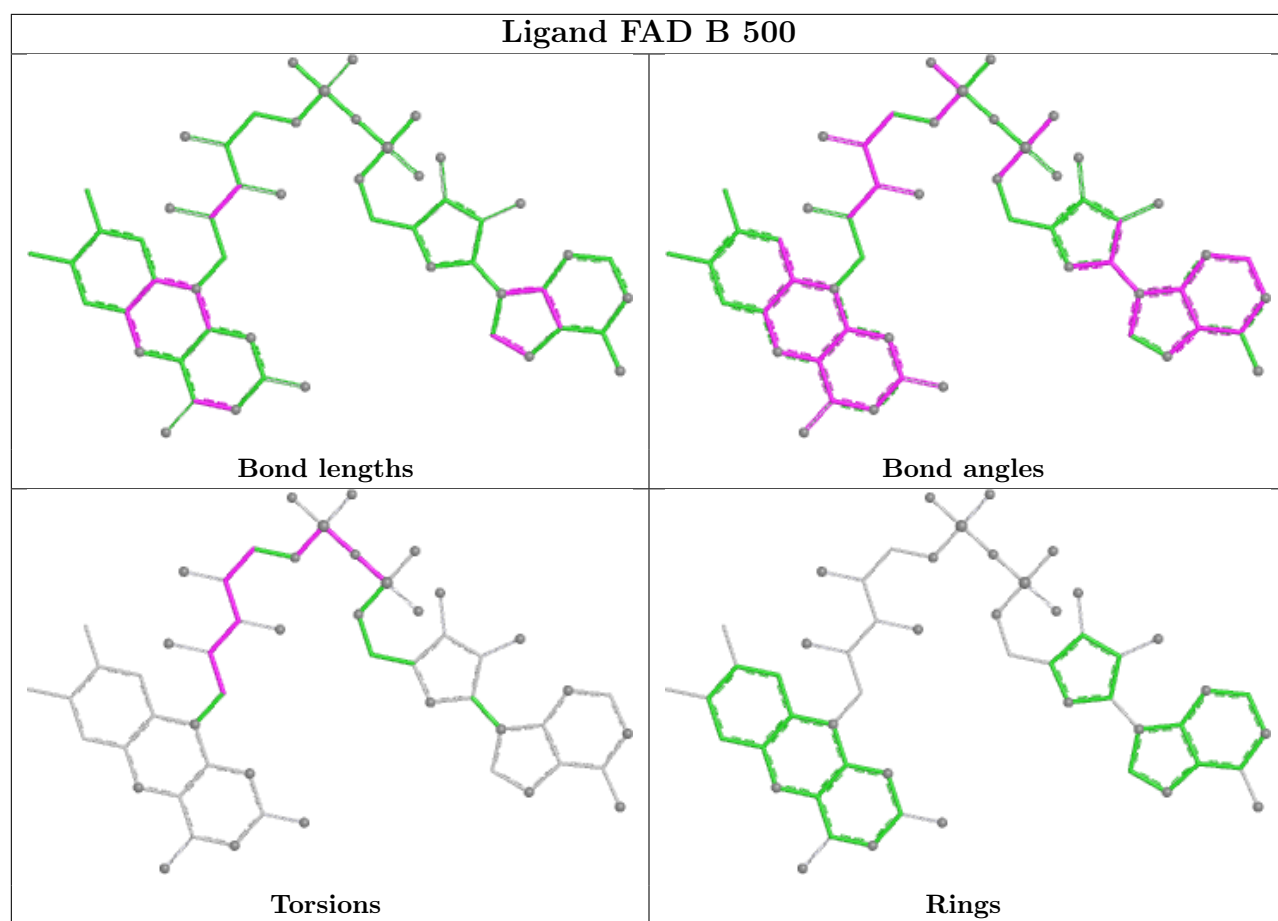
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	500	FAD	2	0
2	D	500	FAD	6	0
2	A	500	FAD	2	0
2	B	500	FAD	6	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.









5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	396/429 (92%)	0.07	6 (1%) 72 68	36, 60, 99, 140	0
1	B	392/429 (91%)	0.11	7 (1%) 67 63	39, 63, 100, 126	0
1	C	377/429 (87%)	0.24	10 (2%) 56 52	37, 69, 111, 134	0
1	D	300/429 (69%)	0.60	20 (6%) 24 20	52, 85, 119, 145	0
All	All	1465/1716 (85%)	0.23	43 (2%) 53 50	36, 68, 111, 145	0

All (43) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	417	ALA	5.0
1	B	280	VAL	4.6
1	B	416	PRO	4.3
1	D	157	GLY	4.1
1	D	197	LEU	3.8
1	D	54	GLY	3.7
1	C	75	ALA	3.6
1	C	74	TRP	3.4
1	C	158	ALA	3.0
1	C	238	PRO	3.0
1	D	195	TRP	2.9
1	B	300	GLY	2.8
1	C	250	PHE	2.7
1	C	352	ASP	2.7
1	C	73	THR	2.6
1	D	378	THR	2.6
1	D	225	LEU	2.6
1	D	213	GLY	2.5
1	D	212	ILE	2.5
1	D	266	ILE	2.5
1	D	210	ALA	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	278	ARG	2.5
1	A	161	ALA	2.5
1	D	217	THR	2.5
1	B	284	ARG	2.5
1	D	227	ARG	2.5
1	D	162	THR	2.4
1	D	132	LEU	2.4
1	A	281	PHE	2.4
1	C	156	ALA	2.4
1	D	379	GLY	2.3
1	D	133	VAL	2.3
1	B	2	GLU	2.3
1	C	163	THR	2.2
1	C	160	GLY	2.2
1	D	181	ALA	2.2
1	A	285	VAL	2.1
1	A	279	GLY	2.1
1	D	74	TRP	2.1
1	B	143	ARG	2.1
1	A	276	THR	2.1
1	D	275	ARG	2.0
1	D	45	TRP	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(Å ²)	Q<0.9
2	FAD	D	500	53/53	0.93	0.10	63,76,86,86	0

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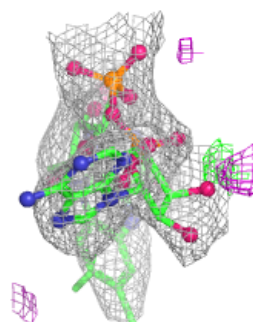
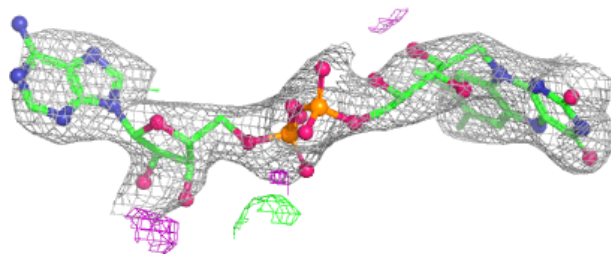
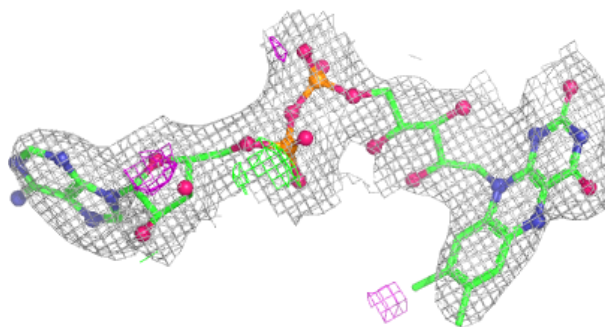
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	FAD	C	500	53/53	0.96	0.07	47,57,69,71	0
2	FAD	A	500	53/53	0.97	0.06	38,44,52,56	0
2	FAD	B	500	53/53	0.97	0.06	37,43,47,49	0

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.

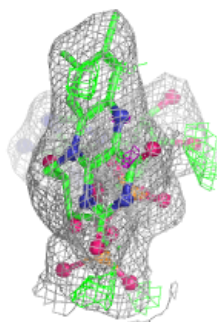
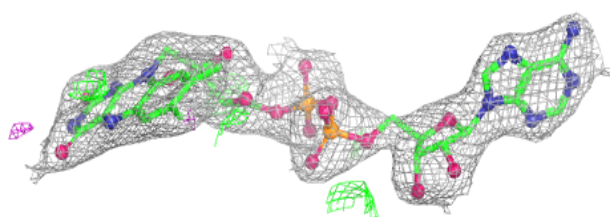
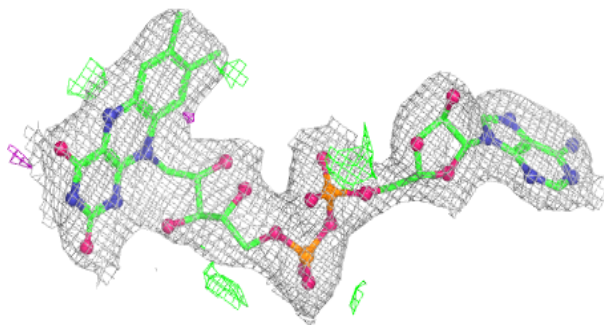
Electron density around FAD D 500:

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

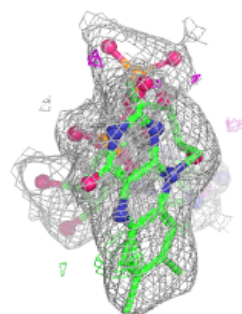
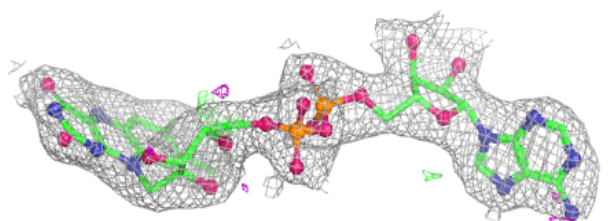
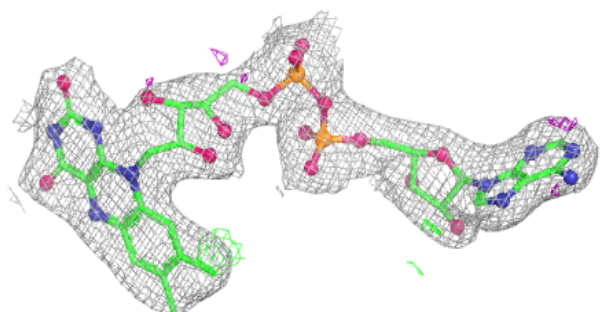


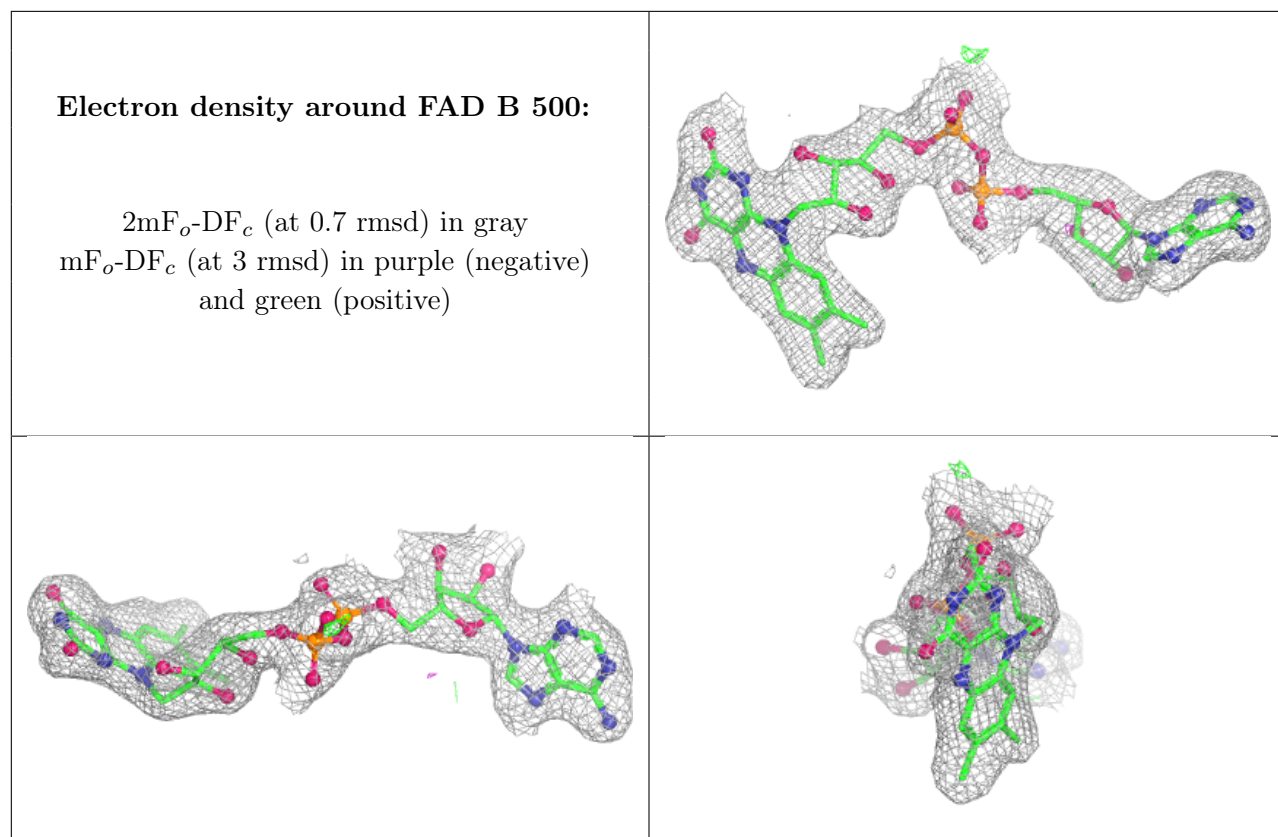
Electron density around FAD C 500:

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

**Electron density around FAD A 500:**

$2mF_o-DF_c$ (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.