



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 04:07 AM UTC

PDB ID : 4CZZ / pdb_00004czz
Title : Histone demethylase LSD1(KDM1A)-CoREST3 Complex
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Deposited on : 2014-04-23
Resolution : 3.00 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

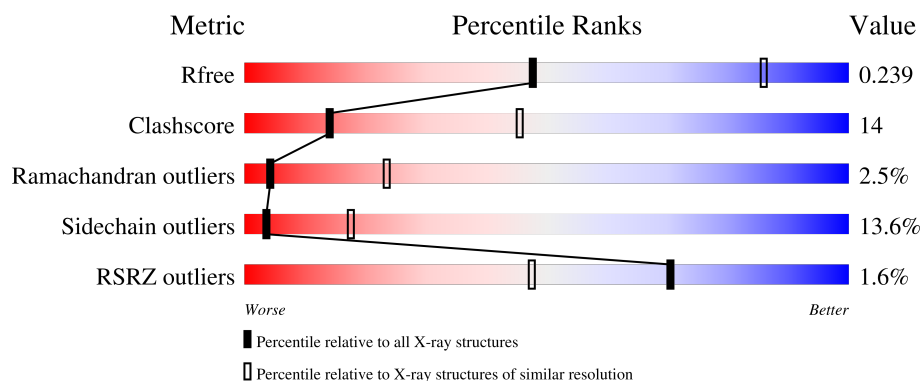
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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	2672 (3.00-3.00)
Clashscore	190562	2977 (3.00-3.00)
Ramachandran outliers	187476	2877 (3.00-3.00)
Sidechain outliers	187428	2880 (3.00-3.00)
RSRZ outliers	180081	2671 (3.00-3.00)

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	872	47% 24% . 24%
2	B	553	13% 10% . 76%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 6339 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 LYSINE-SPECIFIC HISTONE DEMETHYLASE 1A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	666	Total	C	N	O	S	0	0	0
			5217	3324	906	967	20			

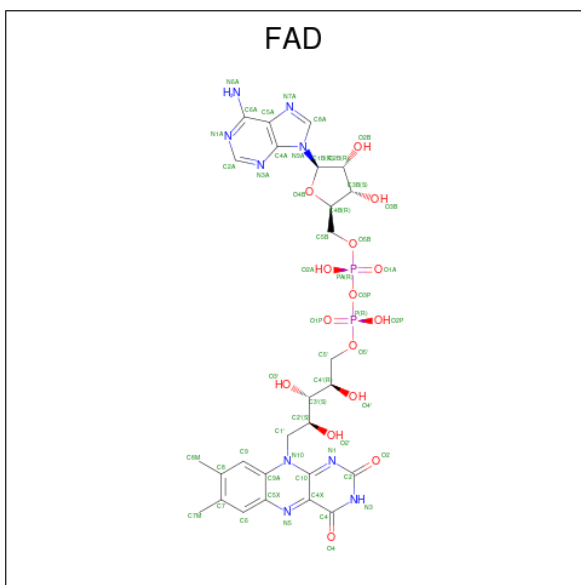
There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	ASP	deletion	UNP O60341
A	?	-	THR	deletion	UNP O60341
A	?	-	VAL	deletion	UNP O60341
A	?	-	LYS	deletion	UNP O60341

- Molecule 2 is a protein called REST COREPRESSOR 3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	133	Total	C	N	O	S	0	0	0
			1069	670	192	202	5			

- Molecule 3 is FLAVIN-ADENINE DINUCLEOTIDE (CCD ID: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$).

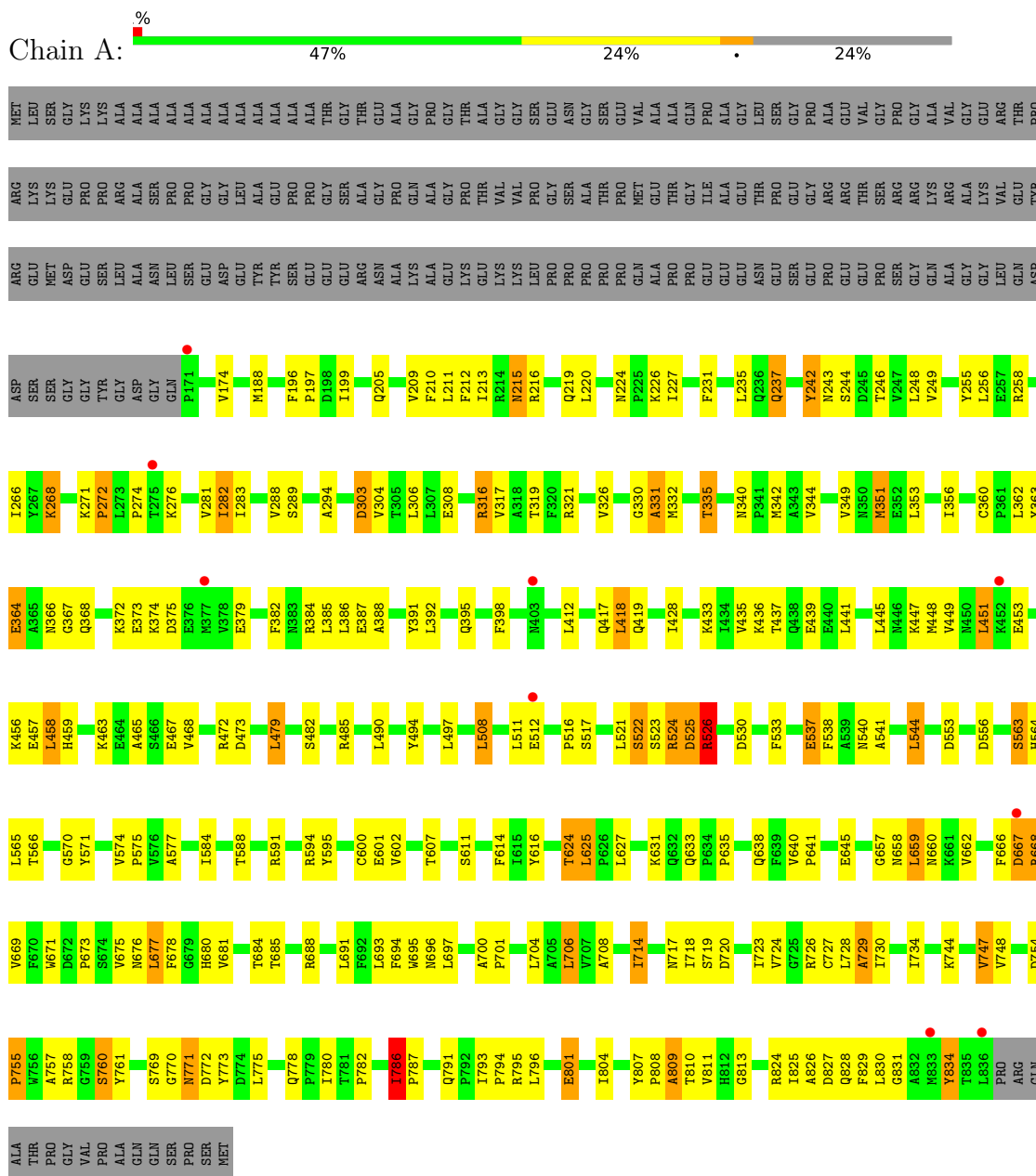


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			53	27	9	15	2		

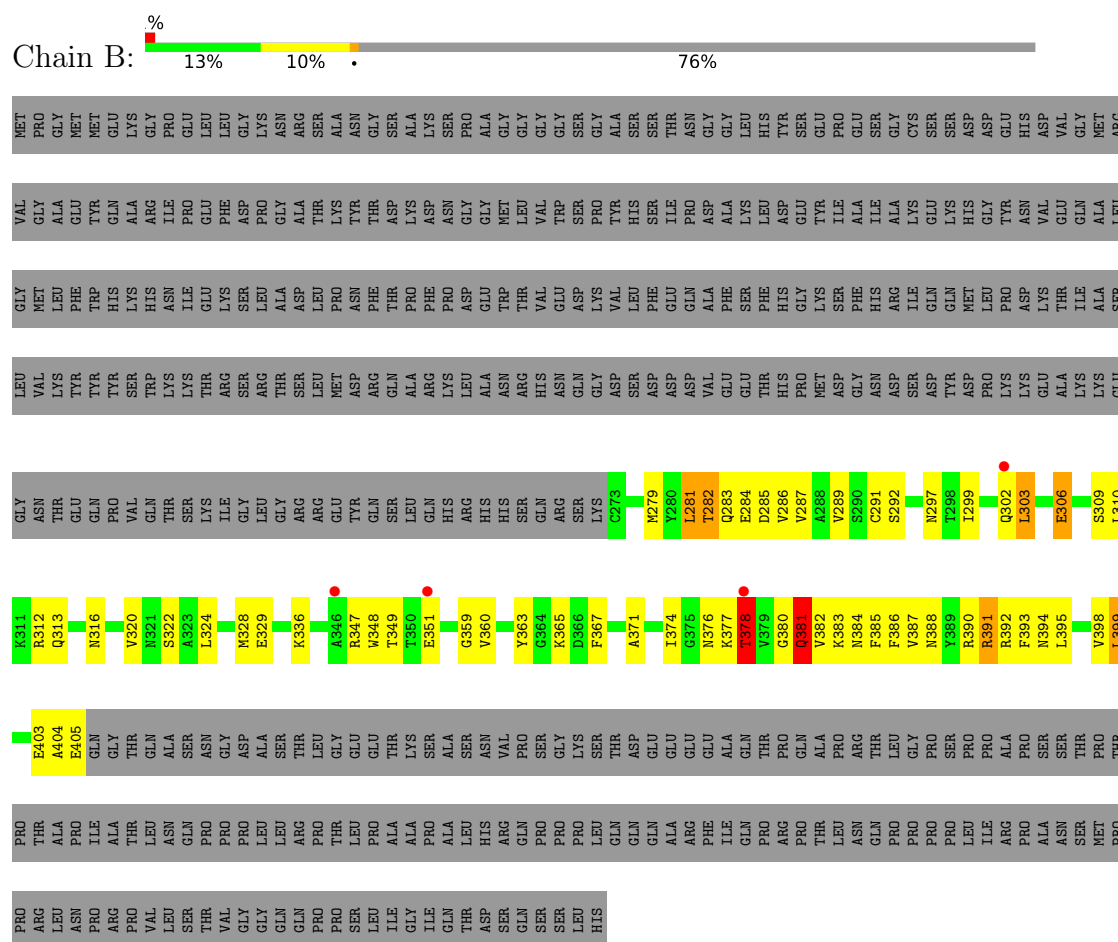
3 Residue-property plots

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: LYSINE-SPECIFIC HISTONE DEMETHYLASE 1A



• Molecule 2: REST COREPRESSOR 3



4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	118.04Å 177.44Å 235.79Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	141.78 – 3.00 141.78 – 3.00	Depositor EDS
% Data completeness (in resolution range)	99.3 (141.78-3.00) 99.4 (141.78-3.00)	Depositor EDS
R_{merge}	0.19	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.58 (at 3.01Å)	Xtriage
Refinement program	REFMAC 5.8.0069	Depositor
R, R_{free}	0.197 , 0.236 0.207 , 0.239	Depositor DCC
R_{free} test set	971 reflections (1.96%)	wwPDB-VP
Wilson B-factor (Å ²)	75.2	Xtriage
Anisotropy	0.091	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 74.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	6339	wwPDB-VP
Average B, all atoms (Å ²)	80.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.98% 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 ⓘ

5.1 Standard geometry ⓘ

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	1.02	2/5331 (0.0%)	1.16	18/7232 (0.2%)
2	B	0.79	0/1085	1.01	0/1461
All	All	0.99	2/6416 (0.0%)	1.14	18/8693 (0.2%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	451	LEU	C-N	6.80	1.42	1.33
1	A	635	PRO	C-O	-6.02	1.16	1.23

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	625	LEU	CA-C-N	10.64	130.75	119.89
1	A	625	LEU	C-N-CA	10.64	130.75	119.89
1	A	351	MET	N-CA-C	-6.24	99.52	109.76
1	A	791	GLN	CA-C-N	-6.12	114.43	120.98
1	A	791	GLN	C-N-CA	-6.12	114.43	120.98
1	A	770	GLY	N-CA-C	-6.09	106.79	114.16
1	A	473	ASP	N-CA-C	-5.95	102.86	110.53
1	A	344	VAL	CB-CA-C	-5.67	104.62	111.88
1	A	717	ASN	N-CA-C	5.57	118.87	112.97
1	A	714	ILE	CB-CA-C	-5.47	105.04	111.94
1	A	451	LEU	O-C-N	5.45	127.98	122.09
1	A	281	VAL	CB-CA-C	-5.41	102.43	110.33
1	A	771	ASN	N-CA-C	5.34	117.79	111.33
1	A	834	TYR	N-CA-C	5.30	122.09	110.80
1	A	786	ILE	CA-C-N	-5.25	114.83	120.03
1	A	786	ILE	C-N-CA	-5.25	114.83	120.03
1	A	747	VAL	CB-CA-C	-5.24	102.76	110.82

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	242	TYR	N-CA-C	5.07	116.89	111.36

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	5217	0	5252	148	0
2	B	1069	0	1075	38	0
3	A	53	0	31	5	0
All	All	6339	0	6358	182	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 14.

All (182) 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:526:ARG:NH2	1:A:530:ASP:OD1	1.86	1.08
2:B:306:GLU:O	2:B:310:LEU:HD12	1.68	0.93
1:A:726:ARG:O	1:A:730:ILE:HG12	1.84	0.77
1:A:659:LEU:C	1:A:659:LEU:HD12	2.11	0.76
2:B:378:THR:O	2:B:381:GLN:NE2	2.18	0.75
1:A:671:TRP:O	1:A:673:PRO:HD3	1.88	0.74
1:A:340:ASN:OD1	1:A:342:MET:N	2.22	0.73
1:A:522:SER:OG	1:A:525:ASP:OD1	2.06	0.72
1:A:564:HIS:C	1:A:565:LEU:HD12	2.14	0.72
1:A:353:LEU:HB3	1:A:565:LEU:HD23	1.73	0.70
1:A:331:ALA:HA	3:A:900:FAD:N5	2.07	0.69
1:A:385:LEU:O	1:A:388:ALA:HB3	1.93	0.69
1:A:468:VAL:O	1:A:472:ARG:NH1	2.27	0.68
1:A:755:PRO:HA	1:A:758:ARG:NH1	2.09	0.68
1:A:801:GLU:HG3	1:A:809:ALA:HA	1.78	0.65
1:A:658:ASN:HA	1:A:760:SER:HB3	1.78	0.65

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:437:THR:HG22	1:A:508:LEU:HD23	1.78	0.64
1:A:448:MET:HE3	2:B:328:MET:SD	2.40	0.62
1:A:384:ARG:HB3	2:B:279:MET:HE1	1.81	0.62
2:B:371:ALA:HB1	2:B:377:LYS:O	2.00	0.62
1:A:537:GLU:HG2	1:A:544:LEU:HD21	1.82	0.62
2:B:403:GLU:O	2:B:405:GLU:N	2.29	0.61
1:A:801:GLU:CG	1:A:809:ALA:HA	2.31	0.61
2:B:360:VAL:HG12	2:B:398:VAL:HG12	1.82	0.60
1:A:209:VAL:O	1:A:213:ILE:HG13	2.01	0.60
1:A:465:ALA:CB	1:A:479:LEU:HD23	2.32	0.59
1:A:563:SER:O	1:A:565:LEU:CD1	2.50	0.59
1:A:231:PHE:HE1	1:A:249:VAL:HG12	1.67	0.59
1:A:659:LEU:HD12	1:A:660:ASN:N	2.17	0.58
1:A:754:ASP:OD1	1:A:755:PRO:HD2	2.03	0.58
2:B:381:GLN:N	2:B:381:GLN:CD	2.61	0.58
1:A:563:SER:O	1:A:565:LEU:HD12	2.04	0.58
1:A:666:PHE:O	1:A:701:PRO:HG2	2.04	0.57
1:A:695:TRP:HE1	1:A:706:LEU:HD21	1.69	0.57
1:A:330:GLY:O	1:A:331:ALA:C	2.48	0.57
1:A:465:ALA:HB2	1:A:479:LEU:HD23	1.85	0.57
1:A:216:ARG:O	1:A:220:LEU:HD12	2.05	0.56
1:A:807:TYR:N	1:A:808:PRO:CD	2.68	0.56
2:B:384:ASN:C	2:B:388:ASN:HD22	2.13	0.56
1:A:691:LEU:HD22	1:A:727:CYS:SG	2.46	0.56
1:A:662:VAL:HG13	1:A:748:VAL:HG22	1.88	0.55
1:A:363:TYR:CD2	1:A:734:ILE:HG23	2.42	0.55
2:B:351:GLU:OE1	2:B:351:GLU:N	2.40	0.55
1:A:211:LEU:O	1:A:215:ASN:OD1	2.25	0.54
1:A:437:THR:CG2	1:A:508:LEU:HD23	2.37	0.54
1:A:676:ASN:HB2	1:A:677:LEU:HD23	1.90	0.54
1:A:366:ASN:OD1	1:A:368:GLN:N	2.40	0.54
1:A:685:THR:O	1:A:688:ARG:HG2	2.06	0.54
2:B:312:ARG:HG3	2:B:313:GLN:N	2.23	0.54
1:A:538:PHE:CE1	1:A:706:LEU:HD23	2.43	0.54
1:A:331:ALA:HA	3:A:900:FAD:C4X	2.38	0.53
1:A:553:ASP:O	1:A:556:ASP:HB2	2.07	0.53
1:A:364:GLU:HA	1:A:681:VAL:HB	1.90	0.53
1:A:807:TYR:O	1:A:813:GLY:HA3	2.08	0.53
1:A:456:LYS:O	1:A:459:HIS:HB3	2.09	0.53
1:A:366:ASN:OD1	1:A:367:GLY:N	2.42	0.53
1:A:808:PRO:O	1:A:810:THR:HG23	2.09	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:381:GLN:HA	2:B:384:ASN:HB2	1.91	0.52
1:A:196:PHE:N	1:A:197:PRO:CD	2.73	0.52
1:A:209:VAL:HG13	1:A:242:TYR:HD1	1.75	0.52
1:A:379:GLU:O	1:A:382:PHE:HB3	2.09	0.52
1:A:594:ARG:HA	1:A:640:VAL:O	2.09	0.52
2:B:380:GLY:O	2:B:383:LYS:N	2.42	0.52
1:A:330:GLY:O	1:A:331:ALA:O	2.28	0.52
1:A:667:ASP:OD1	1:A:667:ASP:N	2.42	0.51
1:A:205:GLN:O	1:A:209:VAL:HG23	2.11	0.51
1:A:303:ASP:OD1	1:A:303:ASP:C	2.53	0.51
2:B:283:GLN:O	2:B:287:VAL:HG23	2.11	0.51
2:B:376:ASN:O	2:B:376:ASN:OD1	2.29	0.50
1:A:306:LEU:HD13	1:A:584:ILE:HG12	1.93	0.50
2:B:349:THR:OG1	2:B:351:GLU:OE1	2.28	0.50
1:A:255:TYR:CD1	1:A:256:LEU:HD23	2.47	0.50
1:A:826:ALA:O	1:A:827:ASP:C	2.55	0.50
1:A:319:THR:HG21	1:A:570:GLY:HA3	1.94	0.50
1:A:209:VAL:HG12	1:A:213:ILE:HD11	1.93	0.49
1:A:374:LYS:O	1:A:375:ASP:C	2.54	0.49
1:A:384:ARG:HB3	2:B:279:MET:CE	2.42	0.49
1:A:392:LEU:HD11	2:B:281:LEU:HD22	1.93	0.49
1:A:706:LEU:CD1	1:A:706:LEU:N	2.76	0.49
2:B:299:ILE:O	2:B:303:LEU:HD22	2.12	0.49
1:A:353:LEU:HD13	1:A:565:LEU:HD22	1.95	0.49
1:A:718:ILE:HG22	1:A:723:ILE:HG13	1.95	0.48
1:A:364:GLU:OE2	1:A:524:ARG:HG2	2.14	0.48
1:A:271:LYS:O	1:A:272:PRO:C	2.56	0.48
1:A:595:TYR:CZ	1:A:641:PRO:HD2	2.48	0.48
1:A:174:VAL:HG12	1:A:219:GLN:OE1	2.14	0.48
1:A:693:LEU:HD12	1:A:694:PHE:H	1.78	0.48
1:A:282:ILE:HG21	1:A:602:VAL:HG21	1.96	0.48
1:A:392:LEU:HD23	1:A:398:PHE:CD2	2.49	0.47
1:A:793:ILE:HD12	1:A:793:ILE:H	1.79	0.47
1:A:363:TYR:CD2	1:A:734:ILE:HD12	2.49	0.47
1:A:258:ARG:HD3	1:A:258:ARG:HA	1.64	0.47
1:A:521:LEU:O	1:A:522:SER:O	2.32	0.47
1:A:215:ASN:OD1	1:A:215:ASN:N	2.48	0.47
1:A:760:SER:HB2	3:A:900:FAD:HM83	1.97	0.47
1:A:231:PHE:CE1	1:A:249:VAL:HG12	2.49	0.46
1:A:199:ILE:HD11	1:A:248:LEU:HD11	1.97	0.46
1:A:441:LEU:O	1:A:445:LEU:HG	2.15	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:773:TYR:CE2	1:A:808:PRO:HB3	2.51	0.46
2:B:348:TRP:CZ2	2:B:385:PHE:HB2	2.51	0.46
1:A:447:LYS:HE3	1:A:497:LEU:HD21	1.98	0.46
1:A:680:HIS:CD2	1:A:730:ILE:HG23	2.51	0.46
1:A:574:VAL:HB	1:A:575:PRO:HD3	1.97	0.46
2:B:394:ASN:OD1	2:B:394:ASN:N	2.49	0.46
1:A:321:ARG:HG2	1:A:326:VAL:HG22	1.97	0.45
2:B:365:LYS:HG3	2:B:399:LEU:HD11	1.97	0.45
2:B:393:PHE:CB	2:B:395:LEU:HD21	2.45	0.45
1:A:695:TRP:CE3	1:A:697:LEU:HD11	2.51	0.45
1:A:266:ILE:HD13	1:A:577:ALA:HB1	1.97	0.45
1:A:782:PRO:HG3	1:A:795:ARG:HG3	1.99	0.45
2:B:282:THR:O	2:B:286:VAL:HG23	2.17	0.45
1:A:720:ASP:O	1:A:724:VAL:HG23	2.16	0.45
1:A:360:CYS:SG	1:A:678:PHE:HA	2.57	0.45
2:B:284:GLU:HG3	2:B:285:ASP:N	2.31	0.45
2:B:391:ARG:HG2	2:B:392:ARG:N	2.32	0.45
1:A:362:LEU:C	1:A:363:TYR:CD1	2.94	0.45
1:A:538:PHE:CD1	1:A:706:LEU:HD23	2.51	0.45
2:B:380:GLY:C	2:B:382:VAL:N	2.75	0.45
1:A:828:GLN:HG2	1:A:829:PHE:CE2	2.52	0.44
1:A:255:TYR:CE1	1:A:256:LEU:HD23	2.53	0.44
1:A:700:ALA:HB1	1:A:701:PRO:HD2	2.00	0.44
1:A:237:GLN:HE21	1:A:237:GLN:HB2	1.41	0.44
2:B:381:GLN:CD	2:B:381:GLN:H	2.26	0.44
1:A:316:ARG:NH1	1:A:801:GLU:OE1	2.50	0.44
1:A:523:SER:O	1:A:524:ARG:C	2.60	0.44
1:A:188:MET:HG2	1:A:210:PHE:CE2	2.52	0.44
1:A:308:GLU:OE1	3:A:900:FAD:O3B	2.33	0.44
1:A:258:ARG:NH1	1:A:827:ASP:OD1	2.51	0.43
1:A:793:ILE:HG23	1:A:828:GLN:CD	2.43	0.43
1:A:282:ILE:HD13	1:A:282:ILE:HA	1.89	0.43
1:A:451:LEU:HD23	1:A:494:TYR:HB2	1.99	0.43
1:A:829:PHE:C	1:A:830:LEU:HD23	2.43	0.43
1:A:235:LEU:HD11	1:A:243:ASN:HB2	2.00	0.43
1:A:667:ASP:OD2	1:A:668:ARG:NH1	2.52	0.43
1:A:804:ILE:HG21	1:A:813:GLY:O	2.19	0.43
1:A:283:ILE:HD12	1:A:294:ALA:HB2	2.00	0.43
1:A:435:VAL:HG23	1:A:436:LYS:N	2.32	0.43
1:A:457:GLU:HG2	1:A:458:LEU:N	2.33	0.43
1:A:728:LEU:O	1:A:729:ALA:C	2.61	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:359:GLY:O	2:B:363:TYR:N	2.47	0.43
1:A:356:ILE:HD11	1:A:566:THR:CG2	2.49	0.43
1:A:540:ASN:HD22	1:A:540:ASN:N	2.17	0.43
1:A:669:VAL:HG11	1:A:673:PRO:HG3	2.00	0.43
1:A:340:ASN:OD1	1:A:340:ASN:C	2.62	0.43
1:A:627:LEU:O	1:A:631:LYS:HG3	2.19	0.43
1:A:780:ILE:HB	1:A:796:LEU:HB3	2.00	0.43
2:B:386:PHE:C	2:B:386:PHE:CD1	2.97	0.43
1:A:386:LEU:O	1:A:387:GLU:C	2.62	0.42
1:A:538:PHE:HB2	1:A:708:ALA:HB2	2.01	0.42
1:A:761:TYR:CD1	1:A:809:ALA:HB1	2.54	0.42
1:A:463:LYS:HD2	1:A:463:LYS:HA	1.85	0.42
1:A:640:VAL:HA	1:A:641:PRO:HA	1.89	0.42
2:B:299:ILE:O	2:B:303:LEU:CD2	2.67	0.42
2:B:365:LYS:O	2:B:367:PHE:N	2.52	0.42
1:A:317:VAL:HG13	1:A:571:TYR:HB3	2.01	0.42
1:A:412:LEU:HD13	1:A:533:PHE:CE1	2.54	0.42
1:A:525:ASP:OD1	1:A:525:ASP:N	2.40	0.42
1:A:624:THR:O	1:A:625:LEU:C	2.61	0.42
2:B:367:PHE:HE1	2:B:386:PHE:HD2	1.68	0.42
2:B:384:ASN:O	2:B:388:ASN:ND2	2.51	0.42
2:B:376:ASN:O	2:B:377:LYS:HG2	2.19	0.42
1:A:224:ASN:ND2	1:A:227:ILE:HD11	2.35	0.42
1:A:271:LYS:O	1:A:272:PRO:O	2.38	0.42
1:A:566:THR:HG21	1:A:697:LEU:HD13	2.02	0.42
2:B:376:ASN:OD1	2:B:376:ASN:C	2.63	0.42
1:A:268:LYS:HE3	1:A:268:LYS:HA	2.00	0.41
1:A:391:TYR:CD2	1:A:395:GLN:HG3	2.56	0.41
3:A:900:FAD:HM83	3:A:900:FAD:HM71	1.84	0.41
1:A:362:LEU:C	1:A:363:TYR:HD1	2.28	0.41
1:A:786:ILE:HG22	1:A:787:PRO:HD2	2.02	0.41
1:A:196:PHE:N	1:A:197:PRO:HD3	2.36	0.41
1:A:418:LEU:CD1	2:B:289:VAL:HG21	2.51	0.41
1:A:772:ASP:HA	1:A:775:LEU:HD12	2.02	0.41
1:A:538:PHE:CE1	1:A:706:LEU:CD2	3.04	0.41
1:A:288:VAL:O	1:A:289:SER:C	2.64	0.41
1:A:601:GLU:HA	1:A:616:TYR:O	2.21	0.40
1:A:807:TYR:N	1:A:808:PRO:HD3	2.36	0.40
1:A:366:ASN:OD1	1:A:366:ASN:C	2.64	0.40
2:B:393:PHE:HB3	2:B:395:LEU:HD21	2.03	0.40
1:A:541:ALA:O	1:A:657:GLY:HA3	2.22	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:211:LEU:O	1:A:212:PHE:C	2.63	0.40
1:A:614:PHE:CD1	1:A:614:PHE:N	2.90	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	664/872 (76%)	586 (88%)	63 (10%)	15 (2%)	5	25
2	B	131/553 (24%)	113 (86%)	13 (10%)	5 (4%)	2	15
All	All	795/1425 (56%)	699 (88%)	76 (10%)	20 (2%)	4	23

All (20) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	331	ALA
1	A	364	GLU
1	A	516	PRO
1	A	522	SER
1	A	834	TYR
2	B	291	CYS
2	B	378	THR
2	B	381	GLN
2	B	404	ALA
1	A	809	ALA
1	A	272	PRO
1	A	335	THR
1	A	526	ARG
1	A	757	ALA
1	A	831	GLY
1	A	316	ARG

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Mol	Chain	Res	Type
1	A	729	ALA
2	B	316	ASN
1	A	428	ILE
1	A	274	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	566/711 (80%)	494 (87%)	72 (13%)	4	20
2	B	116/473 (24%)	95 (82%)	21 (18%)	2	9
All	All	682/1184 (58%)	589 (86%)	93 (14%)	3	17

All (93) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	215	ASN
1	A	226	LYS
1	A	237	GLN
1	A	244	SER
1	A	246	THR
1	A	268	LYS
1	A	276	LYS
1	A	282	ILE
1	A	303	ASP
1	A	304	VAL
1	A	332	MET
1	A	335	THR
1	A	349	VAL
1	A	351	MET
1	A	372	LYS
1	A	373	GLU
1	A	417	GLN
1	A	418	LEU
1	A	419	GLN

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Mol	Chain	Res	Type
1	A	433	LYS
1	A	439	GLU
1	A	449	VAL
1	A	453	GLU
1	A	458	LEU
1	A	467	GLU
1	A	479	LEU
1	A	482	SER
1	A	485	ARG
1	A	490	LEU
1	A	508	LEU
1	A	511	LEU
1	A	512	GLU
1	A	517	SER
1	A	524	ARG
1	A	525	ASP
1	A	526	ARG
1	A	537	GLU
1	A	544	LEU
1	A	563	SER
1	A	588	THR
1	A	591	ARG
1	A	600	CYS
1	A	607	THR
1	A	611	SER
1	A	624	THR
1	A	633	GLN
1	A	638	GLN
1	A	645	GLU
1	A	659	LEU
1	A	667	ASP
1	A	668	ARG
1	A	675	VAL
1	A	677	LEU
1	A	684	THR
1	A	696	ASN
1	A	704	LEU
1	A	706	LEU
1	A	714	ILE
1	A	719	SER
1	A	744	LYS
1	A	747	VAL

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Mol	Chain	Res	Type
1	A	755	PRO
1	A	760	SER
1	A	769	SER
1	A	771	ASN
1	A	778	GLN
1	A	786	ILE
1	A	794	PRO
1	A	801	GLU
1	A	811	VAL
1	A	824	ARG
1	A	825	ILE
2	B	281	LEU
2	B	282	THR
2	B	292	SER
2	B	297	ASN
2	B	302	GLN
2	B	303	LEU
2	B	306	GLU
2	B	309	SER
2	B	320	VAL
2	B	322	SER
2	B	324	LEU
2	B	329	GLU
2	B	336	LYS
2	B	347	ARG
2	B	374	ILE
2	B	378	THR
2	B	381	GLN
2	B	387	VAL
2	B	390	ARG
2	B	391	ARG
2	B	399	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (21) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	237	GLN
1	A	296	GLN
1	A	298	GLN
1	A	395	GLN
1	A	402	ASN
1	A	422	HIS

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Mol	Chain	Res	Type
1	A	430	HIS
1	A	438	GLN
1	A	459	HIS
1	A	540	ASN
1	A	551	HIS
1	A	564	HIS
1	A	633	GLN
2	B	283	GLN
2	B	297	ASN
2	B	302	GLN
2	B	313	GLN
2	B	316	ASN
2	B	341	ASN
2	B	353	GLN
2	B	388	ASN

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 ⓘ

1 ligand is 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
3	FAD	A	900	-	58,58,58	1.48	10 (17%)	85,89,89	1.90	22 (25%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	FAD	A	900	-	-	2/34/50/50	0/6/6/6

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	900	FAD	C9A-C5X	4.67	1.48	1.41
3	A	900	FAD	C5X-N5	-3.72	1.32	1.39
3	A	900	FAD	C4A-N9A	-2.99	1.31	1.37
3	A	900	FAD	C4-N3	-2.99	1.33	1.38
3	A	900	FAD	C8-C7	2.94	1.48	1.40
3	A	900	FAD	C5A-N7A	-2.85	1.33	1.39
3	A	900	FAD	C8A-N9A	-2.37	1.33	1.37
3	A	900	FAD	C8A-N7A	2.32	1.36	1.31
3	A	900	FAD	C5A-C4A	2.16	1.42	1.39
3	A	900	FAD	P-O3P	2.04	1.61	1.59

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	900	FAD	C5A-C4A-N3A	-5.35	119.35	126.72
3	A	900	FAD	N3A-C2A-N1A	-4.63	121.57	128.58
3	A	900	FAD	N3A-C4A-N9A	4.47	134.76	127.17
3	A	900	FAD	C4A-N9A-C8A	4.29	110.25	105.74
3	A	900	FAD	C2A-N3A-C4A	4.23	122.17	111.83
3	A	900	FAD	N9A-C8A-N7A	-3.41	109.10	113.94
3	A	900	FAD	C6-C5X-C9A	3.29	123.56	119.05
3	A	900	FAD	O4-C4-C4X	-3.26	117.92	126.53
3	A	900	FAD	C5'-C4'-C3'	-3.09	106.39	112.22
3	A	900	FAD	C4X-C10-N1	-3.05	117.12	124.59
3	A	900	FAD	C4B-O4B-C1B	-2.63	103.67	109.47
3	A	900	FAD	C9A-C5X-N5	-2.56	119.74	122.45
3	A	900	FAD	C4A-C5A-N7A	-2.52	107.70	110.58
3	A	900	FAD	C4-N3-C2	-2.43	121.32	125.64
3	A	900	FAD	O3P-P-O1P	-2.34	103.67	110.70

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	900	FAD	C5A-N7A-C8A	2.29	107.06	103.45
3	A	900	FAD	O2A-PA-O1A	2.22	122.78	112.44
3	A	900	FAD	N10-C10-N1	2.19	124.95	118.51
3	A	900	FAD	C4X-C4-N3	2.16	118.76	113.25
3	A	900	FAD	C9-C9A-C5X	-2.16	116.21	120.03
3	A	900	FAD	C4'-C3'-C2'	-2.03	110.19	113.57
3	A	900	FAD	N6A-C6A-N1A	2.02	122.88	118.38

There are no chirality outliers.

All (2) torsion outliers are listed below:

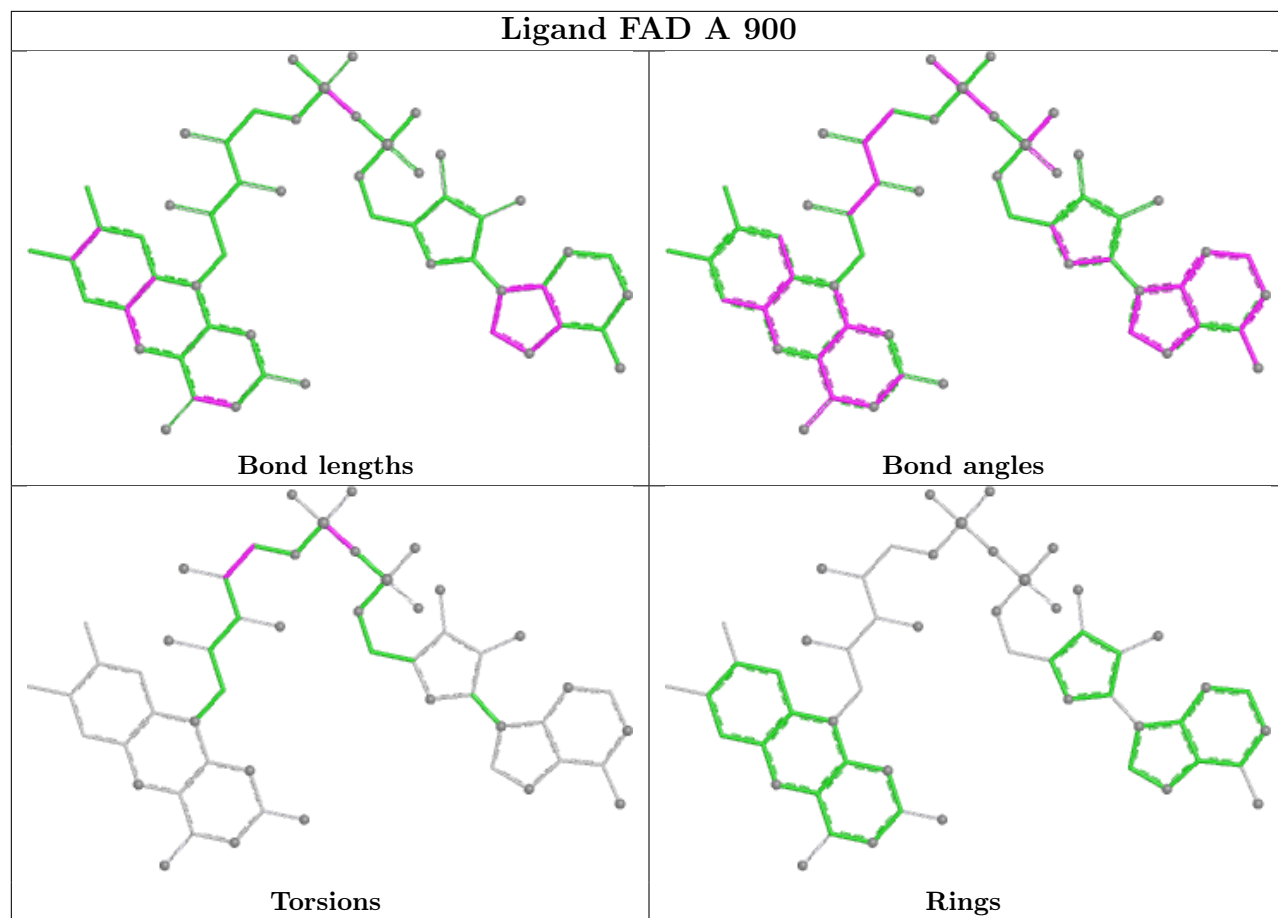
Mol	Chain	Res	Type	Atoms
3	A	900	FAD	O4'-C4'-C5'-O5'
3	A	900	FAD	PA-O3P-P-O5'

There are no ring outliers.

1 monomer is involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	900	FAD	5	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 [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	666/872 (76%)	-0.19	9 (1%)	73	51	41, 73, 110, 151	0
2	B	133/553 (24%)	0.27	4 (3%)	52	30	68, 101, 130, 150	0
All	All	799/1425 (56%)	-0.11	13 (1%)	70	47	41, 78, 118, 151	0

All (13) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	171	PRO	5.1
1	A	836	LEU	4.6
1	A	833	MET	3.4
1	A	403	ASN	3.3
2	B	346	ALA	3.1
1	A	512	GLU	2.7
2	B	378	THR	2.6
1	A	275	THR	2.6
1	A	377	MET	2.5
2	B	351	GLU	2.4
2	B	302	GLN	2.3
1	A	667	ASP	2.1
1	A	452	LYS	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 [i](#)

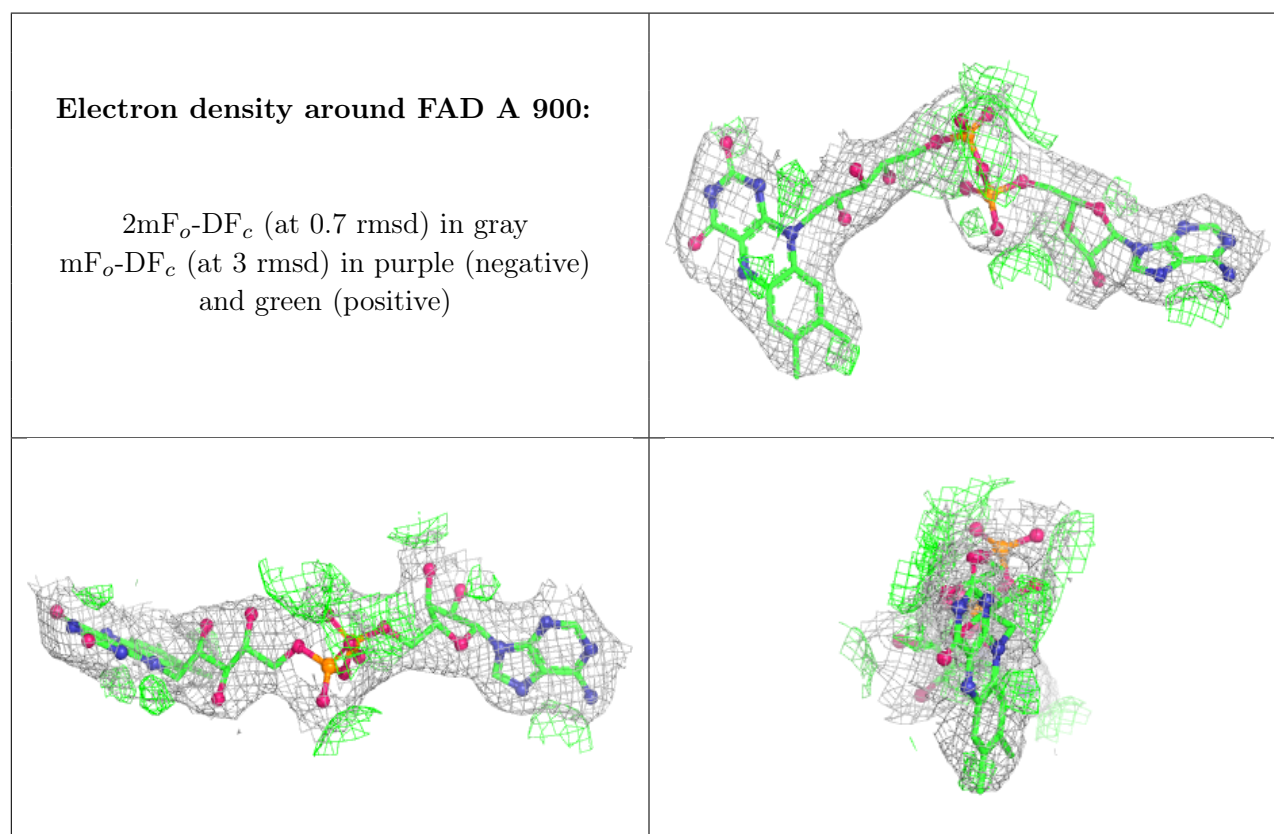
There are no oligosaccharides in this entry.

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
3	FAD	A	900	53/53	0.98	0.07	38,51,72,79	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.



6.5 Other polymers [i](#)

There are no such residues in this entry.