



# Full wwPDB X-ray Structure Validation Report ⓘ

Dec 17, 2023 – 07:01 am GMT

PDB ID : 4CZZ  
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](mailto: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>.

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

MolProbity : 4.02b-467  
Mogul : 1.8.4, CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

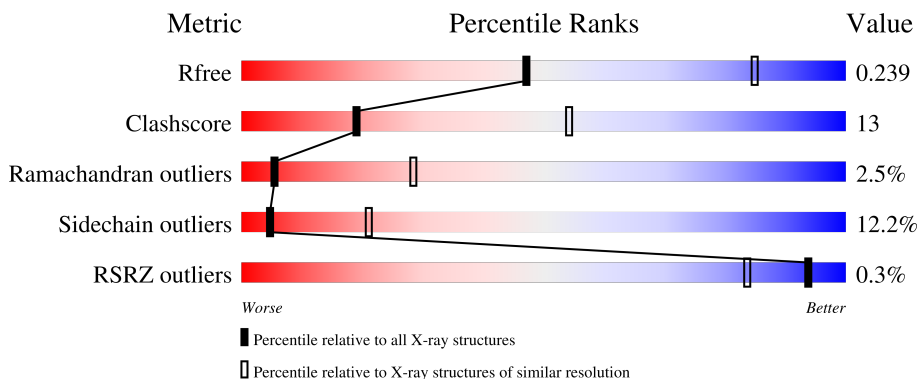
# 1 Overall quality at a glance

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))
$R_{free}$	130704	2092 (3.00-3.00)
Clashscore	141614	2416 (3.00-3.00)
Ramachandran outliers	138981	2333 (3.00-3.00)
Sidechain outliers	138945	2336 (3.00-3.00)
RSRZ outliers	127900	1990 (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  $\geq 3$ , 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	
2	B	553	

## 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
			Total	C	N	O	S			
1	A	666	5217	3324	906	967	20	0	0	0

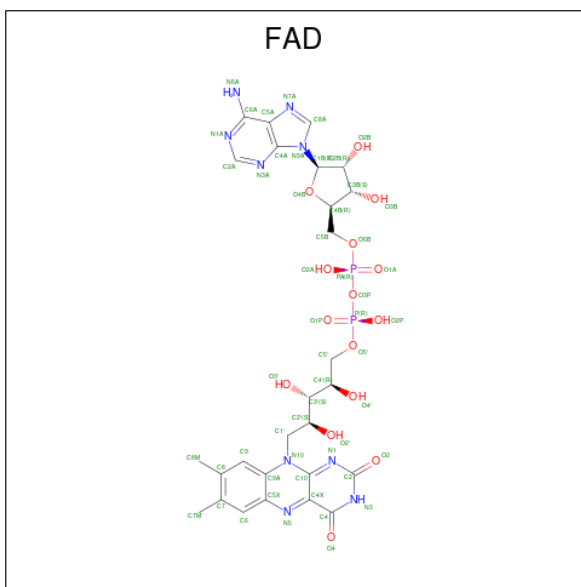
There are 4 discrepancies between the modelled and reference sequences:

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
			Total	C	N	O	S			
2	B	133	1069	670	192	202	5	0	0	0

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



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





## 4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	118.04Å 177.44Å 235.79Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	141.78 – 3.00 70.89 – 3.00	Depositor EDS
% Data completeness (in resolution range)	99.3 (141.78-3.00) 99.4 (70.89-3.00)	Depositor EDS
$R_{merge}$	0.19	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.58 (at 3.01Å)	Xtrriage
Refinement program	REFMAC 5.8.0069	Depositor
R, $R_{free}$	0.197 , 0.236 0.206 , 0.239	Depositor DCC
$R_{free}$ test set	971 reflections (1.96%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	75.2	Xtrriage
Anisotropy	0.091	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 66.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	6339	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	80.0	wwPDB-VP

Xtrriage'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.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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	0.73	0/5331	0.89	6/7232 (0.1%)
2	B	0.57	0/1085	0.80	1/1461 (0.1%)
All	All	0.71	0/6416	0.87	7/8693 (0.1%)

There are no bond length outliers.

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	820	ARG	NE-CZ-NH2	-6.95	116.83	120.30
1	A	820	ARG	NE-CZ-NH1	6.63	123.61	120.30
1	A	815	LEU	CA-CB-CG	6.42	130.08	115.30
1	A	795	ARG	NE-CZ-NH2	-5.43	117.58	120.30
1	A	795	ARG	NE-CZ-NH1	5.15	122.87	120.30
1	A	805	ARG	NE-CZ-NH1	5.13	122.87	120.30
2	B	354	LEU	CA-CB-CG	-5.02	103.76	115.30

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	5217	0	5252	135	0
2	B	1069	0	1075	34	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	53	0	31	4	0
All	All	6339	0	6358	165	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 13.

All (165) 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:760:SER:HB2	3:A:900:FAD:HM83	1.69	0.75
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:659:LEU:C	1:A:659:LEU:HD12	2.11	0.71
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:564:HIS:C	1:A:565:LEU:HD12	2.14	0.67
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
1:A:437:THR:HG22	1:A:508:LEU:HD23	1.78	0.64
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
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

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
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
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
2:B:381:GLN:N	2:B:381:GLN:CD	2.61	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
2:B:381:GLN:HA	2:B:384:ASN:HB2	1.91	0.52
1:A:330:GLY:O	1:A:331:ALA:C	2.48	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
2:B:384:ASN:C	2:B:388:ASN:HD22	2.13	0.51
1:A:205:GLN:O	1:A:209:VAL:HG23	2.11	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:525:ASP:OD1	1:A:525:ASP:N	2.40	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

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
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: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:303:ASP:OD1	1:A:303:ASP:C	2.53	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
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:308:GLU:OE1	3:A:900:FAD:O3B	2.33	0.45
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
1:A:826:ALA:O	1:A:827:ASP:C	2.55	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
1:A:374:LYS:O	1:A:375:ASP:C	2.54	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

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:538:PHE:CD1	1:A:706:LEU:HD23	2.51	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
1:A:316:ARG:NH1	1:A:801:GLU:OE1	2.50	0.44
1:A:188:MET:HG2	1:A:210:PHE:CE2	2.52	0.44
1:A:258:ARG:NH1	1:A:827:ASP:OD1	2.51	0.43
1:A:271:LYS:O	1:A:272:PRO:C	2.56	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: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
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: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
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
1:A:384:ARG:HB3	2:B:279:MET:HE1	1.99	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
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
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
1:A:786:ILE:HG22	1:A:787:PRO:HD2	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
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: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
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
1:A:614:PHE:CD1	1:A:614:PHE:N	2.90	0.40
2:B:380:GLY:C	2:B:382:VAL:N	2.75	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%)	6	30
2	B	131/553 (24%)	113 (86%)	13 (10%)	5 (4%)	3	18
All	All	795/1425 (56%)	699 (88%)	76 (10%)	20 (2%)	5	28

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

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Mol	Chain	Res	Type
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
1	A	729	ALA
2	B	316	ASN
1	A	428	ILE
1	A	274	PRO

### 5.3.2 Protein sidechains [i](#)

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%)	500 (88%)	66 (12%)	5	22
2	B	116/473 (24%)	99 (85%)	17 (15%)	3	15
All	All	682/1184 (58%)	599 (88%)	83 (12%)	5	21

All (83) 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	255	TYR
1	A	258	ARG
1	A	268	LYS
1	A	276	LYS
1	A	299	SER
1	A	303	ASP

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	A	304	VAL
1	A	332	MET
1	A	335	THR
1	A	351	MET
1	A	372	LYS
1	A	373	GLU
1	A	418	LEU
1	A	419	GLN
1	A	439	GLU
1	A	449	VAL
1	A	453	GLU
1	A	458	LEU
1	A	472	ARG
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	538	PHE
1	A	563	SER
1	A	571	TYR
1	A	588	THR
1	A	591	ARG
1	A	594	ARG
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	680	HIS

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	A	684	THR
1	A	688	ARG
1	A	704	LEU
1	A	719	SER
1	A	744	LYS
1	A	755	PRO
1	A	760	SER
1	A	769	SER
1	A	771	ASN
1	A	786	ILE
1	A	794	PRO
1	A	801	GLU
1	A	824	ARG
2	B	281	LEU
2	B	282	THR
2	B	292	SER
2	B	297	ASN
2	B	302	GLN
2	B	306	GLU
2	B	309	SER
2	B	316	ASN
2	B	322	SER
2	B	324	LEU
2	B	329	GLU
2	B	347	ARG
2	B	374	ILE
2	B	378	THR
2	B	381	GLN
2	B	390	ARG
2	B	391	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	A	237	GLN
1	A	395	GLN
1	A	402	ASN
1	A	410	GLN
1	A	535	ASN
1	A	540	ASN
1	A	633	GLN
2	B	283	GLN

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Mol	Chain	Res	Type
2	B	302	GLN
2	B	313	GLN
2	B	316	ASN
2	B	388	ASN

### 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 monosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

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	-	53,58,58	1.34	5 (9%)	68,89,89	1.72	16 (23%)

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	-	-	3/30/50/50	0/6/6/6

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	900	FAD	C9A-C5X	4.48	1.48	1.41
3	A	900	FAD	C5X-N5	-3.56	1.32	1.39
3	A	900	FAD	C4-N3	-3.01	1.33	1.38
3	A	900	FAD	C8-C7	2.86	1.48	1.40
3	A	900	FAD	C2B-C1B	-2.02	1.50	1.53

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	900	FAD	N3A-C2A-N1A	-4.55	121.57	128.68
3	A	900	FAD	P-O3P-PA	-3.57	120.58	132.83
3	A	900	FAD	C4X-C10-N1	-3.28	117.12	124.73
3	A	900	FAD	O4-C4-C4X	-3.27	117.92	126.60
3	A	900	FAD	C6-C5X-C9A	3.27	123.56	118.94
3	A	900	FAD	C5'-C4'-C3'	-3.01	106.39	112.20
3	A	900	FAD	O4B-C1B-C2B	-2.76	102.90	106.93
3	A	900	FAD	C9A-C5X-N5	-2.48	119.74	122.43
3	A	900	FAD	C4-N3-C2	-2.34	121.32	125.64
3	A	900	FAD	N10-C10-N1	2.29	124.95	118.35
3	A	900	FAD	C4X-C4-N3	2.19	118.76	113.19
3	A	900	FAD	C1B-N9A-C4A	-2.18	122.82	126.64
3	A	900	FAD	O2A-PA-O1A	2.13	122.78	112.24
3	A	900	FAD	N6A-C6A-N1A	2.08	122.88	118.57
3	A	900	FAD	C9-C9A-C5X	-2.06	116.21	120.11
3	A	900	FAD	C10-N1-C2	2.02	120.94	116.90

There are no chirality outliers.

All (3) torsion outliers are listed below:

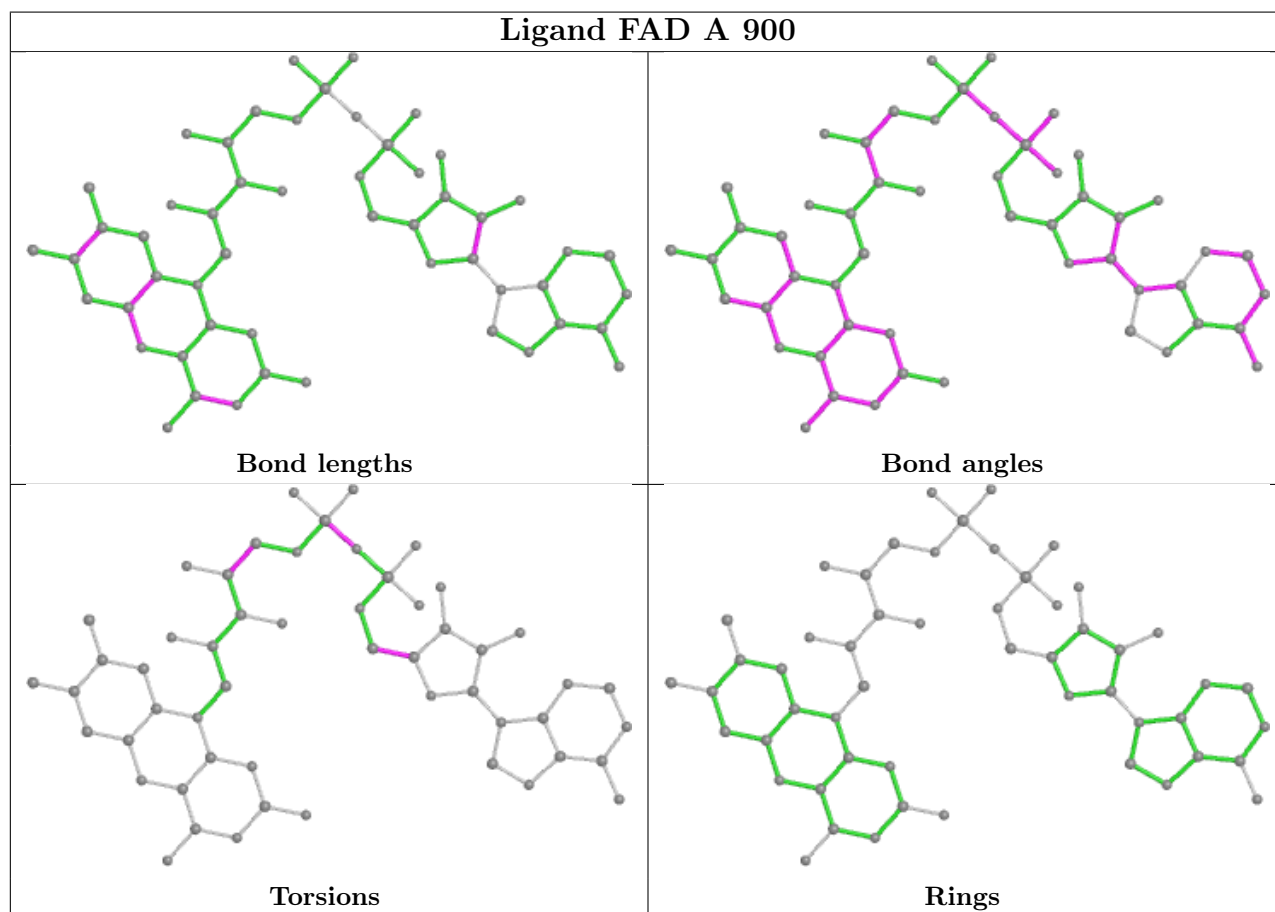
Mol	Chain	Res	Type	Atoms
3	A	900	FAD	O4'-C4'-C5'-O5'
3	A	900	FAD	PA-O3P-P-O5'
3	A	900	FAD	O4B-C4B-C5B-O5B

There are no ring outliers.

1 monomer is involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	900	FAD	4	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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	666/872 (76%)	-0.22	0 <span style="border: 1px solid blue; padding: 2px;">100</span> <span style="border: 1px solid blue; padding: 2px;">100</span>	41, 73, 110, 151	0
2	B	133/553 (24%)	-0.01	2 (1%) <span style="border: 1px solid blue; padding: 2px;">73</span> <span style="border: 1px solid blue; padding: 2px;">46</span>	68, 101, 130, 150	0
All	All	799/1425 (56%)	-0.18	2 (0%) <span style="border: 1px solid blue; padding: 2px;">94</span> <span style="border: 1px solid blue; padding: 2px;">84</span>	41, 78, 118, 151	0

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	277	LYS	2.5
2	B	273	CYS	2.3

### 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 monosaccharides in this entry.

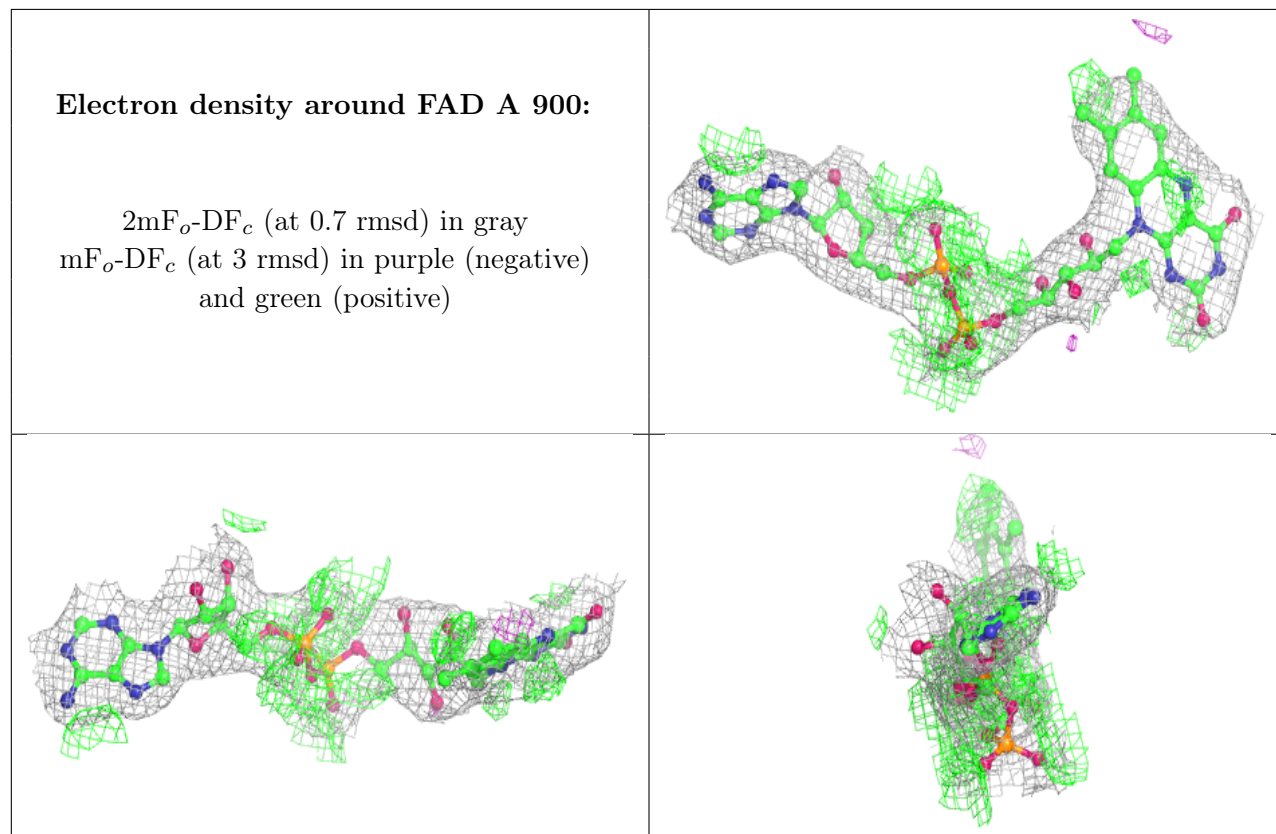
### 6.4 Ligands [i](#)

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
3	FAD	A	900	53/53	0.99	0.21	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.