Full wwPDB X-ray Structure Validation Report (i)

Nov 17, 2026 – 12:59 AM JST

PDB ID	:	9XRQ / pdb_00009xrq
Title	:	Structure of the human LSD2 and ASXL2 complex
Authors	:	Liu, J.; Song, A.; Xu, Y.; Cheng, J.; Chen, F.X.
Deposited on	:	2025-11-19
Resolution	:	3.41 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 (i) 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 (i)) were used in the production of this report:

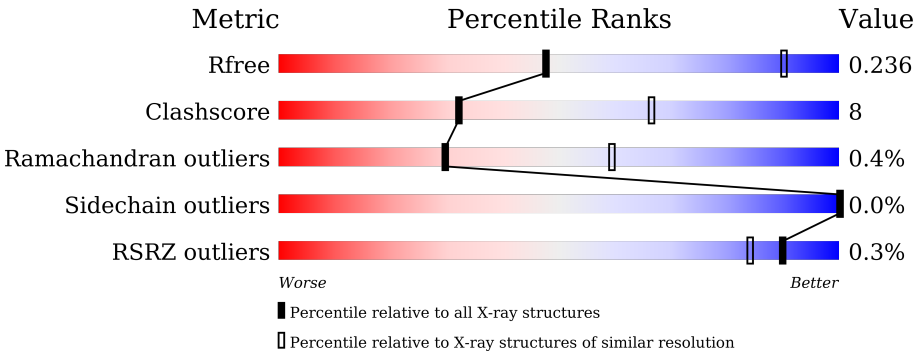
MolProbity	:	4-5-2 with Phenix2.2
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	2.2
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.51

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 3.41 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.



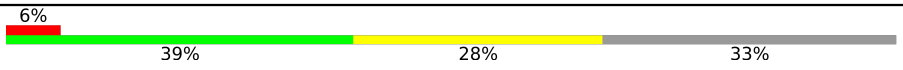
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	1210 (3.48-3.36)
Clashscore	190562	1234 (3.48-3.36)
Ramachandran outliers	187476	1222 (3.48-3.36)
Sidechain outliers	187428	1222 (3.48-3.36)
RSRZ outliers	180081	1210 (3.48-3.36)

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 <=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	776	77% 17% 5%
1	C	776	78% 17% 5%
1	E	776	80% 16% .
1	G	776	% 74% 22% .
2	B	18	56% 22% 22%
2	D	18	56% 11% 33%

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Mol	Chain	Length	Quality of chain
2	F	18	
2	H	18	

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 24143 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 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	737	Total	C	N	O	S	0	0	0
			5842	3731	995	1075	41			
1	C	741	Total	C	N	O	S	0	0	0
			5866	3746	999	1080	41			
1	E	749	Total	C	N	O	S	0	0	0
			5926	3785	1008	1092	41			
1	G	747	Total	C	N	O	S	0	0	0
			5908	3771	1006	1090	41			

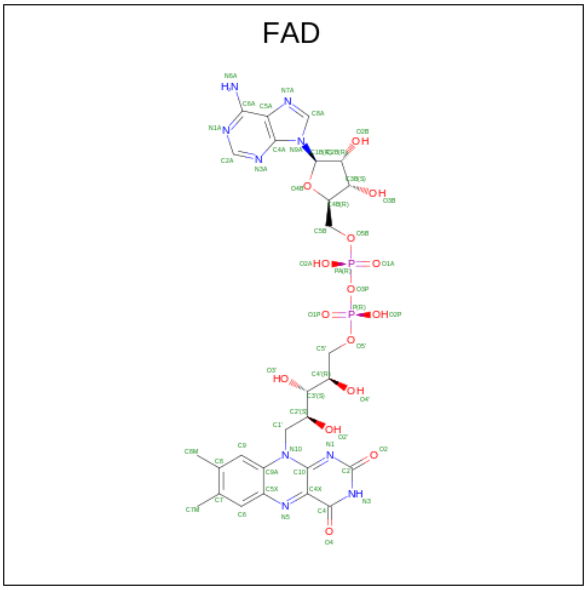
There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	47	PRO	-	expression tag	UNP Q8NB78
A	48	LEU	-	expression tag	UNP Q8NB78
A	49	GLY	-	expression tag	UNP Q8NB78
A	50	SER	-	expression tag	UNP Q8NB78
C	47	PRO	-	expression tag	UNP Q8NB78
C	48	LEU	-	expression tag	UNP Q8NB78
C	49	GLY	-	expression tag	UNP Q8NB78
C	50	SER	-	expression tag	UNP Q8NB78
E	47	PRO	-	expression tag	UNP Q8NB78
E	48	LEU	-	expression tag	UNP Q8NB78
E	49	GLY	-	expression tag	UNP Q8NB78
E	50	SER	-	expression tag	UNP Q8NB78
G	47	PRO	-	expression tag	UNP Q8NB78
G	48	LEU	-	expression tag	UNP Q8NB78
G	49	GLY	-	expression tag	UNP Q8NB78
G	50	SER	-	expression tag	UNP Q8NB78

- Molecule 2 is a protein called Putative Polycomb group protein ASXL2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	14	Total	C	N	O	S	0	0	0
			108	71	17	19	1			
2	D	12	Total	C	N	O	S	0	0	0
			96	63	15	17	1			
2	F	12	Total	C	N	O	S	0	0	0
			96	63	15	17	1			
2	H	10	Total	C	N	O	S	0	0	0
			77	50	13	13	1			

- 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	C	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
3	E	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
3	G	1	Total	C	N	O	P	0	0
			53	27	9	15	2		

- Molecule 4 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	3	Total	Zn	0	0
			3	3		
4	C	3	Total	Zn	0	0
			3	3		

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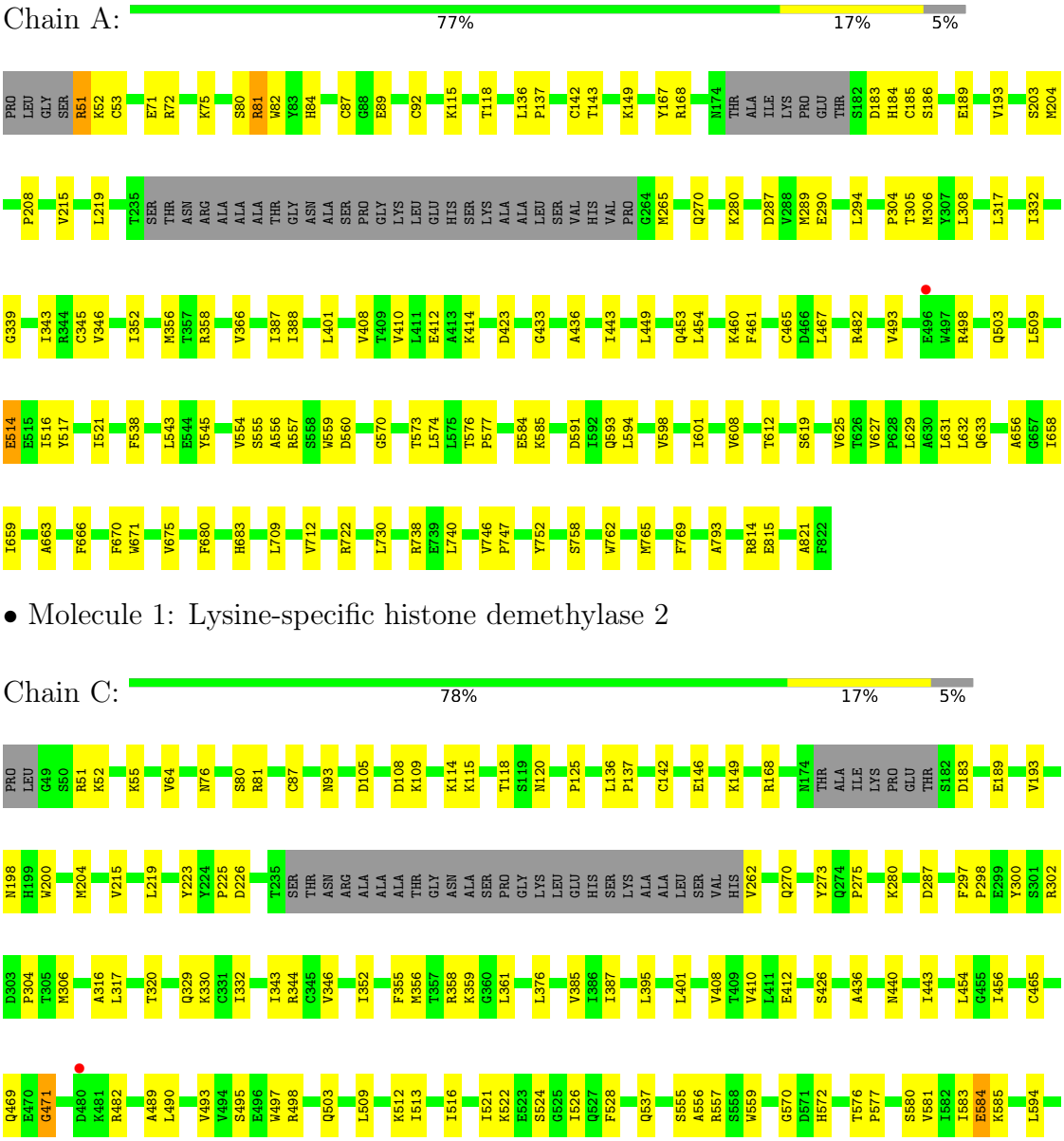
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	E	3	Total Zn 3 3	0	0
4	G	3	Total Zn 3 3	0	0

3 Residue-property plots (i)

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

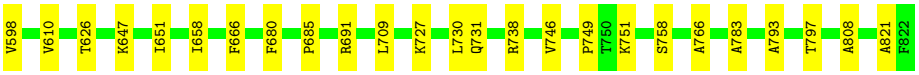
• Molecule 1: Lysine-specific histone demethylase 2

Chain A:

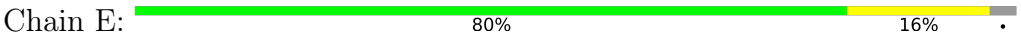


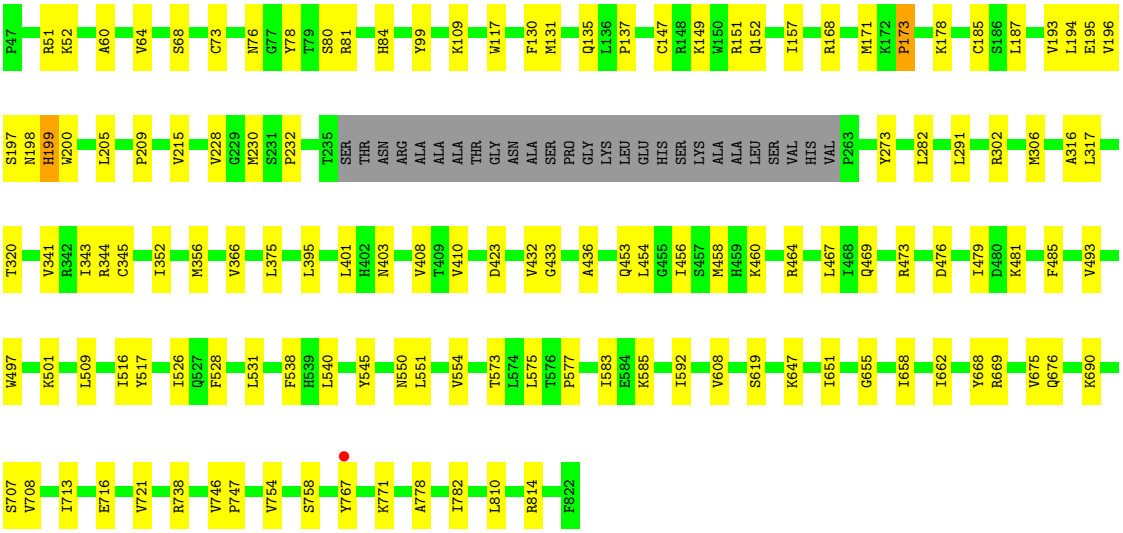
• Molecule 1: Lysine-specific histone demethylase 2

Chain C:

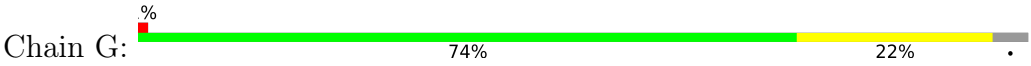


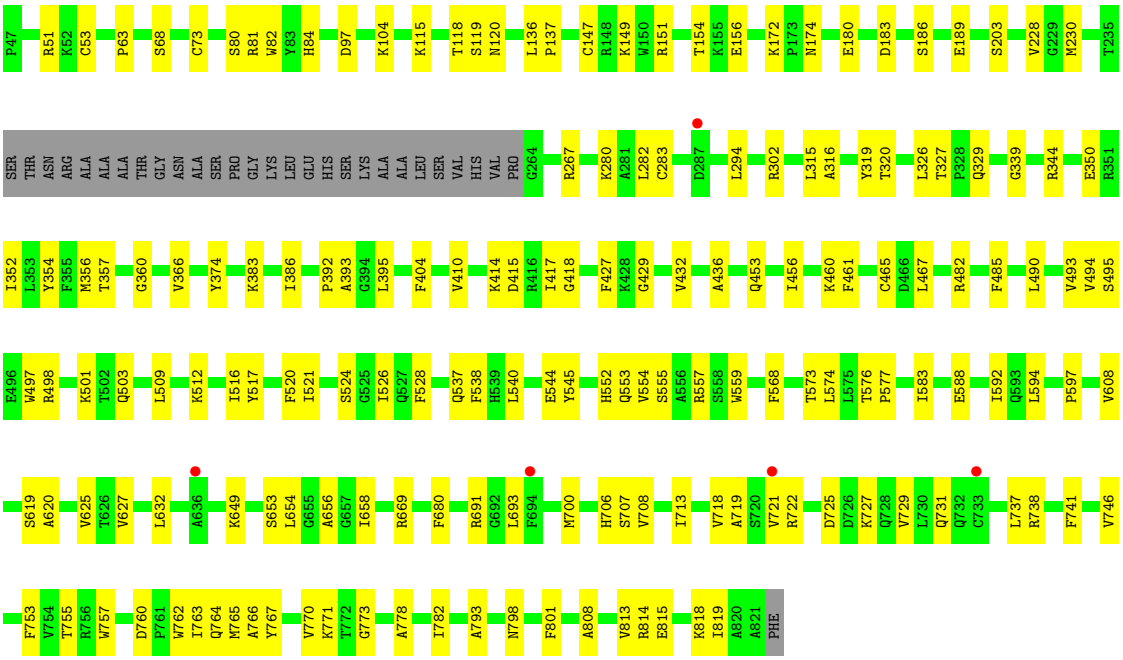
• Molecule 1: Lysine-specific histone demethylase 2





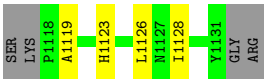
• Molecule 1: Lysine-specific histone demethylase 2





• Molecule 2: Putative Polycomb group protein ASXL2

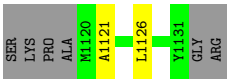




• Molecule 2: Putative Polycomb group protein ASXL2

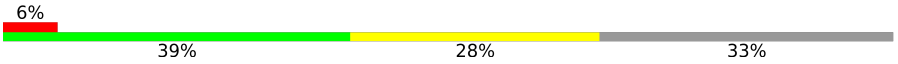
Chain D:

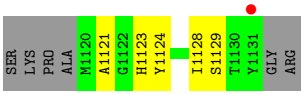




• Molecule 2: Putative Polycomb group protein ASXL2

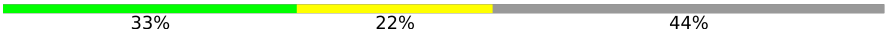
Chain F:





• Molecule 2: Putative Polycomb group protein ASXL2

Chain H:





4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	101.45Å 108.69Å 122.42Å 63.27° 88.31° 62.21°	Depositor
Resolution (Å)	48.06 – 3.41 48.06 – 3.41	Depositor EDS
% Data completeness (in resolution range)	98.6 (48.06-3.41) 94.4 (48.06-3.41)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.84 (at 3.40Å)	Xtriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, R_{free}	0.181 , 0.236 0.181 , 0.236	Depositor DCC
R_{free} test set	2011 reflections (3.72%)	wwPDB-VP
Wilson B-factor (Å^2)	79.6	Xtriage
Anisotropy	0.490	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.30 , 46.1	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.31$	Xtriage
Estimated twinning fraction	0.098 for h,h-k,-l	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	24143	wwPDB-VP
Average B, all atoms (Å^2)	89.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.57% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: ZN, 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	0.54	1/5987 (0.0%)	0.78	4/8110 (0.0%)
1	C	0.48	0/6012	0.73	2/8145 (0.0%)
1	E	0.48	1/6075 (0.0%)	0.74	5/8232 (0.1%)
1	G	0.48	0/6055	0.73	0/8205
2	B	0.63	0/111	0.86	0/150
2	D	0.60	0/98	0.70	0/132
2	F	0.51	0/98	0.75	0/132
2	H	0.61	0/78	0.88	0/104
All	All	0.50	2/24514 (0.0%)	0.74	11/33210 (0.0%)

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

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

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	E	81	ARG	CG-CD	-7.19	1.30	1.52
1	A	51	ARG	CB-CG	-5.87	1.34	1.52

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	E	81	ARG	CB-CG-CD	-8.80	91.05	111.30
1	E	81	ARG	CA-CB-CG	-6.00	102.11	114.10
1	C	81	ARG	N-CA-CB	5.84	121.70	111.13

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	584	GLU	CA-CB-CG	5.76	125.62	114.10
1	A	92	CYS	CB-CA-C	-5.72	97.72	110.19
1	A	584	GLU	CA-CB-CG	-5.71	102.67	114.10
1	E	84	HIS	CB-CA-C	-5.64	100.22	109.53
1	E	81	ARG	CG-CD-NE	5.58	124.29	112.00
1	A	51	ARG	CG-CD-NE	-5.54	99.81	112.00
1	E	81	ARG	CD-NE-CZ	-5.45	116.77	124.40
1	A	514	GLU	CA-CB-CG	5.24	124.58	114.10

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	81	ARG	Sidechain

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	5842	0	5756	89	3
1	C	5866	0	5780	98	0
1	E	5926	0	5848	86	2
1	G	5908	0	5831	117	1
2	B	108	0	105	2	0
2	D	96	0	92	2	0
2	F	96	0	92	4	0
2	H	77	0	76	3	0
3	A	53	0	31	2	0
3	C	53	0	31	7	0
3	E	53	0	31	3	0
3	G	53	0	31	2	0
4	A	3	0	0	0	0
4	C	3	0	0	0	0
4	E	3	0	0	0	0
4	G	3	0	0	0	0
All	All	24143	0	23704	381	3

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 8.

All (381) 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:E:545:TYR:O	1:E:767:TYR:OH	1.80	1.00
1:A:136:LEU:HD22	1:A:339:GLY:HA2	1.43	0.98
1:G:51:ARG:NH2	1:G:80:SER:O	2.00	0.94
1:C:51:ARG:NH2	1:C:80:SER:O	2.01	0.92
1:G:136:LEU:HD22	1:G:339:GLY:HA2	1.53	0.90
1:C:298:PRO:O	1:G:520:PHE:HE1	1.59	0.84
1:A:203:SER:HB3	1:E:526:ILE:HD11	1.59	0.83
1:A:289:MET:HE2	1:A:294:LEU:HD22	1.62	0.81
1:C:526:ILE:HD11	1:G:203:SER:HB3	1.61	0.81
1:G:713:ILE:HD13	1:G:721:VAL:HG21	1.65	0.78
1:G:718:VAL:HG12	1:G:722:ARG:HH21	1.49	0.76
1:G:456:ILE:HB	1:G:577:PRO:HG2	1.66	0.75
1:A:814:ARG:HG3	2:B:1128:ILE:HD13	1.69	0.74
1:E:52:LYS:NZ	1:E:60:ALA:O	2.20	0.71
1:C:149:LYS:HD2	1:C:189:GLU:HB2	1.73	0.71
1:C:87:CYS:SG	1:C:204:MET:HG3	2.31	0.70
1:A:493:VAL:HG23	1:A:516:ILE:HD13	1.73	0.70
1:E:460:LYS:HA	1:E:573:THR:HG22	1.76	0.68
1:G:410:VAL:HG13	1:G:592:ILE:HA	1.75	0.68
1:A:401:LEU:HB2	1:A:408:VAL:HG21	1.75	0.68
1:E:195:GLU:O	1:E:197:SER:N	2.27	0.68
1:E:493:VAL:HG13	1:E:516:ILE:HD13	1.75	0.67
1:G:738:ARG:HG2	1:G:746:VAL:HB	1.75	0.66
1:C:412:GLU:OE2	3:C:901:FAD:O3B	2.13	0.66
1:A:658:ILE:HG12	1:A:758:SER:HB3	1.77	0.66
1:G:316:ALA:O	1:G:320:THR:HG23	1.96	0.66
1:G:555:SER:O	1:G:559:TRP:HB3	1.97	0.65
1:G:136:LEU:CD2	1:G:339:GLY:HA2	2.24	0.65
1:C:64:VAL:HG12	1:C:76:ASN:HB3	1.77	0.65
1:G:136:LEU:HD22	1:G:339:GLY:CA	2.26	0.65
1:A:51:ARG:HG3	1:A:52:LYS:N	2.12	0.64
1:C:454:LEU:HD21	1:C:585:LYS:HG3	1.79	0.64
2:H:1123:HIS:HB3	2:H:1126:LEU:HB2	1.78	0.64
1:G:149:LYS:HE2	1:G:151:ARG:NH2	2.12	0.64
1:A:493:VAL:CG2	1:A:516:ILE:HD13	2.28	0.63
1:C:401:LEU:HB2	1:C:408:VAL:HG21	1.80	0.63
1:A:71:GLU:HG2	1:C:105:ASP:OD1	1.98	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:412:GLU:OE2	3:A:901:FAD:O3B	2.17	0.62
1:C:51:ARG:HG3	1:C:52:LYS:H	1.65	0.62
1:C:456:ILE:HB	1:C:577:PRO:HG2	1.82	0.62
1:A:493:VAL:HG21	1:A:516:ILE:HG21	1.81	0.61
1:A:436:ALA:HA	3:A:901:FAD:N5	2.16	0.61
1:A:631:LEU:HD11	1:A:762:TRP:HA	1.81	0.61
1:C:270:GLN:OE1	1:C:280:LYS:NZ	2.34	0.61
1:C:436:ALA:HA	3:C:901:FAD:N5	2.16	0.61
1:A:270:GLN:OE1	1:A:280:LYS:NZ	2.33	0.60
1:A:793:ALA:HB2	1:A:815:GLU:HG3	1.82	0.60
1:A:423:ASP:HA	1:A:433:GLY:HA2	1.83	0.60
1:G:149:LYS:HD2	1:G:189:GLU:HB2	1.84	0.60
1:C:521:ILE:HD11	1:C:528:PHE:CD2	2.37	0.60
1:E:454:LEU:HD21	1:E:585:LYS:HG3	1.83	0.60
1:G:521:ILE:HD13	1:G:526:ILE:HG23	1.82	0.60
1:G:537:GLN:OE1	1:G:540:LEU:HD22	2.01	0.60
1:A:366:VAL:HG22	1:A:453:GLN:OE1	2.03	0.59
1:C:306:MET:HE1	1:C:344:ARG:HG3	1.84	0.59
1:E:493:VAL:HG11	1:E:516:ILE:HG21	1.84	0.59
1:C:395:LEU:HD12	1:C:583:ILE:HG23	1.85	0.59
1:C:298:PRO:O	1:G:520:PHE:CE1	2.49	0.58
1:G:521:ILE:HG23	1:G:526:ILE:O	2.04	0.58
1:G:545:TYR:O	1:G:767:TYR:OH	2.19	0.58
1:C:352:ILE:O	1:C:356:MET:HG3	2.04	0.58
1:G:576:THR:HB	1:G:577:PRO:HD3	1.85	0.58
1:G:136:LEU:HD23	1:G:137:PRO:HD2	1.85	0.58
1:E:64:VAL:HG12	1:E:76:ASN:HB3	1.85	0.58
1:E:410:VAL:HG13	1:E:592:ILE:HA	1.85	0.57
1:A:576:THR:HB	1:A:577:PRO:HD3	1.87	0.57
1:C:493:VAL:HG11	1:C:516:ILE:HG21	1.86	0.57
1:C:316:ALA:O	1:C:320:THR:HG23	2.05	0.56
1:A:81:ARG:HG3	1:A:82:TRP:N	2.21	0.56
1:A:136:LEU:HD23	1:A:137:PRO:HD2	1.87	0.56
1:A:51:ARG:HG3	1:A:52:LYS:H	1.69	0.56
1:C:509:LEU:HA	1:C:556:ALA:HB2	1.88	0.56
1:E:458:MET:HG2	1:E:575:LEU:HD12	1.87	0.56
1:E:658:ILE:HG12	1:E:758:SER:HB3	1.86	0.56
1:C:273:TYR:OH	2:D:1121:ALA:HB1	2.06	0.56
1:A:517:TYR:O	1:A:521:ILE:HG12	2.05	0.55
1:G:350:GLU:HG2	1:G:354:TYR:CE2	2.41	0.55
1:G:814:ARG:HG2	1:G:818:LYS:HE3	1.88	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:503:GLN:HG2	1:C:557:ARG:NH1	2.21	0.55
1:E:423:ASP:HA	1:E:433:GLY:HA2	1.89	0.55
1:G:436:ALA:HA	3:G:901:FAD:N5	2.21	0.55
2:B:1123:HIS:HB3	2:B:1126:LEU:HB2	1.89	0.54
1:G:436:ALA:HA	3:G:901:FAD:C4X	2.38	0.54
1:C:443:ILE:HG13	1:C:570:GLY:HA3	1.89	0.54
1:C:727:LYS:HE2	1:C:731:GLN:NE2	2.23	0.54
1:C:576:THR:OG1	1:C:577:PRO:HD3	2.07	0.54
1:G:493:VAL:HG13	1:G:516:ILE:HD13	1.90	0.54
1:E:662:ILE:HG13	1:E:754:VAL:HG22	1.89	0.53
1:A:591:ASP:OD1	1:A:593:GLN:NE2	2.33	0.53
1:G:51:ARG:HH21	1:G:81:ARG:HA	1.74	0.53
1:G:517:TYR:HE1	1:G:528:PHE:CD2	2.27	0.53
1:C:580:SER:O	1:C:584:GLU:OE1	2.27	0.53
1:G:503:GLN:NE2	1:G:773:GLY:O	2.40	0.53
1:C:666:PHE:HE2	1:C:709:LEU:HD12	1.73	0.53
1:E:306:MET:HE1	1:E:344:ARG:HG3	1.90	0.53
1:G:119:SER:OG	1:G:120:ASN:OD1	2.24	0.53
1:G:467:LEU:HD11	1:G:538:PHE:CE2	2.43	0.53
1:C:454:LEU:HD13	1:C:581:VAL:HG12	1.91	0.53
1:E:436:ALA:HA	3:E:901:FAD:C4X	2.39	0.52
1:E:456:ILE:HB	1:E:577:PRO:HG2	1.91	0.52
1:A:289:MET:HB3	1:A:294:LEU:HD22	1.89	0.52
1:A:304:PRO:HB2	1:A:308:LEU:HD13	1.92	0.52
1:A:219:LEU:HD21	1:A:265:MET:HE1	1.91	0.52
1:C:355:PHE:O	1:C:359:LYS:HG2	2.10	0.52
2:H:1127:ASN:O	2:H:1128:ILE:HD13	2.09	0.52
1:A:554:VAL:HG12	1:A:769:PHE:CD1	2.44	0.52
1:C:495:SER:HA	1:C:498:ARG:HG2	1.92	0.51
1:G:327:THR:OG1	1:G:329:GLN:HG2	2.11	0.51
1:G:493:VAL:HG11	1:G:516:ILE:HG21	1.92	0.51
1:G:509:LEU:HB3	1:G:554:VAL:HG23	1.92	0.51
1:E:476:ASP:HB3	1:E:479:ILE:HD12	1.92	0.51
1:A:730:LEU:HD12	1:A:752:TYR:CG	2.46	0.51
1:E:198:ASN:HB3	1:E:200:TRP:NE1	2.26	0.51
1:A:467:LEU:HD11	1:A:538:PHE:CE2	2.45	0.51
1:E:401:LEU:HB2	1:E:408:VAL:HG21	1.92	0.51
1:A:461:PHE:CZ	1:A:574:LEU:HB2	2.45	0.51
1:C:482:ARG:HG3	1:G:302:ARG:O	2.11	0.51
1:E:352:ILE:O	1:E:356:MET:HG3	2.11	0.51
1:A:304:PRO:HG3	1:E:485:PHE:CZ	2.46	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:550:ASN:HB2	1:E:716:GLU:HG3	1.93	0.51
1:G:53:CYS:SG	1:G:84:HIS:HB2	2.51	0.51
1:E:99:TYR:CD2	1:E:131:MET:HE1	2.46	0.51
1:E:273:TYR:OH	2:F:1121:ALA:HB1	2.11	0.51
1:G:553:GLN:O	1:G:771:LYS:HG3	2.11	0.51
1:G:737:LEU:HD22	1:G:741:PHE:HE1	1.76	0.51
1:E:713:ILE:HD13	1:E:721:VAL:HG21	1.94	0.50
1:A:683:HIS:ND1	1:A:740:LEU:HD11	2.27	0.50
1:G:757:TRP:CE3	1:G:763:ILE:HG21	2.47	0.50
1:E:479:ILE:HD13	1:E:531:LEU:HD21	1.93	0.50
1:E:540:LEU:HD11	1:E:551:LEU:HD12	1.94	0.50
1:G:460:LYS:HA	1:G:573:THR:HG22	1.94	0.50
1:C:304:PRO:HG3	1:G:485:PHE:CE2	2.47	0.50
1:G:427:PHE:O	1:G:429:GLY:N	2.45	0.50
1:E:655:GLY:HA3	1:E:771:LYS:HD3	1.93	0.50
1:E:228:VAL:CG2	1:E:230:MET:HE2	2.41	0.49
1:G:228:VAL:HG23	1:G:230:MET:HE2	1.94	0.49
1:G:654:LEU:CD2	1:G:770:VAL:HG22	2.42	0.49
1:G:461:PHE:CZ	1:G:574:LEU:HB2	2.47	0.49
1:C:526:ILE:HD11	1:G:203:SER:CB	2.38	0.49
1:A:738:ARG:HG2	1:A:746:VAL:HB	1.93	0.49
1:G:393:ALA:HB2	1:G:808:ALA:HB1	1.95	0.49
1:G:432:VAL:HG21	1:G:708:VAL:HG11	1.93	0.49
1:A:449:LEU:C	1:A:449:LEU:HD23	2.38	0.49
1:A:115:LYS:O	1:A:118:THR:HG22	2.13	0.49
1:C:493:VAL:HG13	1:C:516:ILE:HD13	1.95	0.49
1:E:366:VAL:HG22	1:E:453:GLN:OE1	2.12	0.49
1:E:432:VAL:HG21	1:E:708:VAL:HG11	1.95	0.49
1:A:142:CYS:SG	1:A:168:ARG:HA	2.53	0.48
1:C:51:ARG:HG3	1:C:52:LYS:N	2.27	0.48
1:C:302:ARG:HE	1:G:526:ILE:HD11	1.78	0.48
1:C:727:LYS:HE2	1:C:731:GLN:HE21	1.76	0.48
1:C:142:CYS:SG	1:C:168:ARG:HA	2.53	0.48
1:G:282:LEU:HD13	1:G:568:PHE:CZ	2.48	0.48
1:E:669:ARG:HG2	1:E:707:SER:HB3	1.95	0.48
1:C:658:ILE:HG12	1:C:758:SER:HB3	1.95	0.48
1:E:117:TRP:CZ3	1:E:232:PRO:HD2	2.47	0.48
1:C:524:SER:C	1:C:526:ILE:H	2.22	0.48
1:G:669:ARG:HG2	1:G:707:SER:HB3	1.94	0.48
1:G:267:ARG:H	1:G:267:ARG:HD3	1.79	0.48
1:A:388:ILE:CD1	1:A:601:ILE:HD11	2.44	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:414:LYS:HG2	1:G:415:ASP:H	1.79	0.47
1:A:215:VAL:HG21	1:A:317:LEU:HD21	1.96	0.47
1:E:215:VAL:HG21	1:E:317:LEU:HD21	1.96	0.47
1:G:727:LYS:HE2	1:G:731:GLN:NE2	2.29	0.47
1:G:778:ALA:O	1:G:782:ILE:HG13	2.14	0.47
1:E:149:LYS:HD3	1:E:151:ARG:NH1	2.29	0.47
1:C:555:SER:O	1:C:559:TRP:HB3	2.14	0.47
1:A:545:TYR:CE1	1:A:712:VAL:HG11	2.49	0.47
1:C:395:LEU:CD1	1:C:583:ILE:HG23	2.44	0.47
1:C:521:ILE:HD11	1:C:528:PHE:CE2	2.49	0.47
1:E:509:LEU:HB3	1:E:554:VAL:HG23	1.96	0.47
1:A:503:GLN:HG2	1:A:557:ARG:NH1	2.30	0.47
1:C:401:LEU:CB	1:C:408:VAL:HG21	2.44	0.47
1:E:469:GLN:OE1	1:E:531:LEU:HD12	2.15	0.47
1:G:544:GLU:OE2	1:G:691:ARG:NH2	2.39	0.47
1:G:658:ILE:HD12	1:G:766:ALA:HB2	1.97	0.47
1:A:352:ILE:O	1:A:356:MET:HG3	2.13	0.47
1:C:226:ASP:N	1:C:226:ASP:OD1	2.47	0.47
1:E:147:CYS:SG	1:E:185:CYS:HB3	2.54	0.47
1:E:655:GLY:CA	1:E:771:LYS:HD3	2.44	0.47
1:E:810:LEU:HA	1:E:810:LEU:HD23	1.76	0.47
1:G:352:ILE:O	1:G:356:MET:HG3	2.15	0.47
1:G:357:THR:HG22	1:G:404:PHE:HE1	1.79	0.47
1:G:383:LYS:HE2	1:G:383:LYS:HB3	1.67	0.47
1:G:395:LEU:CD1	1:G:583:ILE:HG23	2.45	0.47
1:G:524:SER:OG	1:G:526:ILE:HG22	2.15	0.47
1:G:649:LYS:O	1:G:653:SER:HB3	2.15	0.47
1:G:360:GLY:HA3	1:G:813:VAL:CG1	2.45	0.47
1:G:97:ASP:O	1:G:104:LYS:HG3	2.15	0.47
1:G:755:THR:HB	1:G:757:TRP:CD1	2.49	0.47
1:C:302:ARG:HB2	1:G:526:ILE:CD1	2.45	0.46
1:G:392:PRO:HD3	1:G:418:GLY:O	2.15	0.46
1:C:223:TYR:OH	1:C:273:TYR:O	2.32	0.46
1:C:436:ALA:HA	3:C:901:FAD:C4X	2.45	0.46
1:C:766:ALA:HA	3:C:901:FAD:HM82	1.97	0.46
1:A:467:LEU:HD11	1:A:538:PHE:CD2	2.50	0.46
1:A:555:SER:O	1:A:559:TRP:HB3	2.16	0.46
1:A:663:ALA:O	1:A:752:TYR:HA	2.15	0.46
1:E:282:LEU:HD22	2:F:1123:HIS:CE1	2.51	0.46
1:A:143:THR:N	1:A:167:TYR:O	2.45	0.46
1:A:656:ALA:HB1	1:A:765:MET:HB3	1.96	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:302:ARG:O	1:G:482:ARG:HG3	2.16	0.46
1:G:793:ALA:HB2	1:G:815:GLU:HG3	1.97	0.46
1:C:440:ASN:HB3	1:C:572:HIS:CE1	2.50	0.46
1:E:194:LEU:HD23	1:E:194:LEU:O	2.15	0.46
1:G:765:MET:HE3	1:G:765:MET:HB2	1.68	0.46
1:E:99:TYR:CE2	1:E:131:MET:HE1	2.50	0.46
1:G:495:SER:HA	1:G:498:ARG:HG2	1.96	0.46
1:A:498:ARG:NH2	1:A:560:ASP:OD1	2.49	0.45
1:A:290:GLU:O	1:A:294:LEU:HD23	2.15	0.45
1:G:315:LEU:HD22	1:G:319:TYR:HE2	1.80	0.45
1:G:815:GLU:O	1:G:819:ILE:HG13	2.16	0.45
1:A:71:GLU:HG3	1:A:72:ARG:HD3	1.98	0.45
1:C:297:PHE:HB3	1:C:300:TYR:HD2	1.82	0.45
1:E:497:TRP:NE1	1:E:501:LYS:HE3	2.30	0.45
1:G:725:ASP:O	1:G:729:VAL:HG23	2.17	0.45
1:A:193:VAL:HG13	1:A:343:ILE:HD13	1.97	0.45
1:E:647:LYS:O	1:E:651:ILE:HG13	2.16	0.45
1:G:315:LEU:HG	1:G:356:MET:HE1	1.98	0.45
1:G:632:LEU:HD23	1:G:632:LEU:HA	1.83	0.45
1:A:184:HIS:C	1:A:186:SER:H	2.25	0.45
1:A:87:CYS:SG	1:A:204:MET:HG3	2.57	0.45
1:A:814:ARG:HE	1:A:815:GLU:HG2	1.81	0.45
1:C:738:ARG:HG2	1:C:746:VAL:HB	1.98	0.45
1:G:497:TRP:NE1	1:G:501:LYS:HE3	2.31	0.45
1:A:287:ASP:OD1	1:A:287:ASP:N	2.47	0.45
1:A:289:MET:HB3	1:A:294:LEU:CD2	2.46	0.45
1:E:193:VAL:HG13	1:E:343:ILE:HD13	1.98	0.45
1:E:198:ASN:O	1:E:200:TRP:N	2.50	0.45
1:C:537:GLN:HG3	1:C:691:ARG:HD3	1.98	0.45
1:E:157:ILE:HD11	1:E:173:PRO:HD3	1.99	0.45
1:A:608:VAL:O	1:A:619:SER:HA	2.17	0.45
1:E:517:TYR:HE1	1:E:528:PHE:CE2	2.35	0.45
1:G:415:ASP:O	1:G:594:LEU:HD13	2.16	0.45
1:E:109:LYS:HE2	1:E:130:PHE:HZ	1.81	0.45
1:C:193:VAL:HG13	1:C:343:ILE:HD13	1.99	0.44
1:G:465:CYS:HB2	1:G:680:PHE:HE1	1.82	0.44
1:A:625:VAL:HG12	1:A:627:VAL:HG22	1.98	0.44
1:A:666:PHE:HE2	1:A:709:LEU:HD12	1.80	0.44
1:C:330:LYS:HD3	1:C:330:LYS:O	2.17	0.44
1:E:738:ARG:NH2	1:E:746:VAL:O	2.45	0.44
1:A:670:PHE:CD1	1:A:747:PRO:HD2	2.51	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:81:ARG:HG3	1:A:82:TRP:H	1.82	0.44
1:G:154:THR:HB	1:G:156:GLU:OE1	2.17	0.44
1:G:386:ILE:HG13	1:G:620:ALA:HB2	2.00	0.44
1:E:51:ARG:NH2	1:E:78:TYR:OH	2.51	0.44
1:E:198:ASN:O	1:E:199:HIS:C	2.60	0.44
1:G:63:PRO:HB2	1:G:82:TRP:CE2	2.53	0.44
1:A:265:MET:HE3	1:A:265:MET:HB2	1.82	0.44
1:A:666:PHE:CE2	1:A:709:LEU:HD12	2.53	0.44
1:C:115:LYS:O	1:C:118:THR:HG22	2.18	0.44
1:G:366:VAL:HG22	1:G:453:GLN:OE1	2.17	0.44
1:G:814:ARG:HG3	2:H:1128:ILE:HG13	2.00	0.44
1:A:208:PRO:HB2	1:A:305:THR:HG21	2.00	0.44
1:C:215:VAL:HG21	1:C:317:LEU:HD21	2.00	0.44
1:C:730:LEU:HD21	1:C:749:PRO:HG3	1.99	0.44
1:A:454:LEU:HD21	1:A:585:LYS:HG3	2.00	0.44
1:E:109:LYS:NZ	1:E:135:GLN:OE1	2.50	0.44
1:C:454:LEU:CD2	1:C:585:LYS:HG3	2.48	0.43
1:E:668:TYR:OH	1:E:747:PRO:HD3	2.18	0.43
1:A:443:ILE:HG13	1:A:570:GLY:HA3	2.00	0.43
1:C:332:ILE:HG12	1:C:346:VAL:HG13	1.98	0.43
1:C:385:VAL:HB	1:C:408:VAL:HG22	1.99	0.43
1:E:436:ALA:HA	3:E:901:FAD:N5	2.33	0.43
1:G:357:THR:HG22	1:G:404:PHE:CE1	2.52	0.43
1:C:361:LEU:HD21	2:D:1126:LEU:HG	2.00	0.43
1:C:146:GLU:OE2	1:C:146:GLU:N	2.52	0.43
1:C:412:GLU:OE1	3:C:901:FAD:H1B	2.17	0.43
1:A:306:MET:HE3	1:A:345:CYS:HA	1.99	0.43
1:C:522:LYS:HB3	1:C:522:LYS:HE2	1.82	0.43
1:E:149:LYS:HD3	1:E:151:ARG:HH12	1.84	0.43
1:E:814:ARG:NH1	2:F:1124:TYR:OH	2.52	0.43
1:E:467:LEU:HD21	1:E:538:PHE:CD2	2.53	0.43
1:G:68:SER:HA	1:G:73:CYS:SG	2.59	0.43
1:A:722:ARG:HE	1:A:722:ARG:HB3	1.64	0.43
1:G:326:LEU:HD12	1:G:326:LEU:HA	1.82	0.43
1:C:387:ILE:O	1:C:410:VAL:HA	2.19	0.43
1:C:808:ALA:HB2	3:C:901:FAD:H5'2	2.01	0.43
1:E:375:LEU:HD12	1:E:403:ASN:HB3	1.99	0.43
1:E:395:LEU:HD12	1:E:583:ILE:HG23	2.00	0.43
1:A:598:VAL:HA	1:A:612:THR:HA	2.00	0.43
1:C:358:ARG:NH1	1:C:821:ALA:HB2	2.34	0.43
1:C:537:GLN:HB3	1:C:685:PRO:HG2	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:109:LYS:HE2	1:E:109:LYS:HB3	1.84	0.43
1:E:205:LEU:HA	1:E:205:LEU:HD23	1.76	0.43
1:E:344:ARG:HD2	1:E:344:ARG:HA	1.79	0.43
1:A:671:TRP:HB2	1:A:675:VAL:CG2	2.49	0.43
1:A:627:VAL:HG23	1:A:632:LEU:HG	2.00	0.42
3:E:901:FAD:H9	3:E:901:FAD:H1'1	1.86	0.42
1:G:490:LEU:O	1:G:494:VAL:HG23	2.18	0.42
1:G:693:LEU:HD23	1:G:693:LEU:HA	1.90	0.42
1:C:55:LYS:NZ	1:C:204:MET:SD	2.82	0.42
1:C:469:GLN:O	1:C:471:GLY:N	2.52	0.42
1:E:464:ARG:HH22	1:E:676:GLN:HB2	1.84	0.42
1:G:344:ARG:HD2	1:G:344:ARG:HA	1.81	0.42
1:G:494:VAL:HG22	1:G:512:LYS:HG3	2.00	0.42
1:A:358:ARG:NH1	1:A:821:ALA:HB2	2.35	0.42
1:C:626:THR:HG22	1:C:793:ALA:HB3	2.02	0.42
1:E:517:TYR:HE1	1:E:528:PHE:HE2	1.67	0.42
1:G:760:ASP:O	1:G:764:GLN:HG3	2.19	0.42
1:G:520:PHE:CZ	1:G:526:ILE:HG21	2.54	0.42
1:A:543:LEU:HD12	1:A:543:LEU:HA	1.65	0.42
1:E:187:LEU:HD23	1:E:187:LEU:HA	1.80	0.42
1:G:719:ALA:O	1:G:722:ARG:HG2	2.20	0.42
1:C:219:LEU:HD23	1:C:262:VAL:HG21	2.01	0.42
1:C:465:CYS:HB2	1:C:680:PHE:CE1	2.55	0.42
1:C:783:ALA:HB2	1:C:797:THR:HB	2.00	0.42
1:E:608:VAL:O	1:E:619:SER:HA	2.20	0.42
1:A:545:TYR:HE1	1:A:659:ILE:HD13	1.84	0.42
1:C:114:LYS:HG3	1:C:125:PRO:HB2	2.02	0.42
1:E:68:SER:HA	1:E:73:CYS:SG	2.60	0.42
1:E:137:PRO:HG2	1:E:152:GLN:NE2	2.34	0.42
2:F:1128:ILE:HG13	2:F:1129:SER:N	2.34	0.42
1:G:417:ILE:HG23	1:G:594:LEU:HD21	2.01	0.42
1:C:108:ASP:O	1:C:109:LYS:C	2.62	0.42
1:C:136:LEU:HD23	1:C:137:PRO:HD2	2.00	0.42
1:C:198:ASN:HB3	1:C:200:TRP:NE1	2.35	0.42
1:E:168:ARG:O	1:E:171:MET:HB2	2.19	0.42
1:E:481:LYS:HA	1:E:481:LYS:HD3	1.92	0.42
1:A:149:LYS:HD2	1:A:189:GLU:HB2	2.02	0.42
1:E:291:LEU:HD13	1:E:291:LEU:HA	1.75	0.42
1:A:53:CYS:SG	1:A:84:HIS:HB2	2.60	0.42
1:C:412:GLU:HB3	1:C:594:LEU:HD23	2.02	0.42
1:G:115:LYS:O	1:G:118:THR:HG22	2.20	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:901:FAD:H9	3:C:901:FAD:H1'1	1.87	0.41
1:G:737:LEU:HD22	1:G:741:PHE:CE1	2.55	0.41
1:A:89:GLU:OE2	1:A:136:LEU:HD21	2.20	0.41
1:A:460:LYS:HA	1:A:573:THR:HG22	2.01	0.41
1:A:482:ARG:HG3	1:E:302:ARG:O	2.20	0.41
1:C:513:ILE:HD13	1:C:513:ILE:HG21	1.83	0.41
1:E:117:TRP:CH2	1:E:232:PRO:HD2	2.55	0.41
1:E:209:PRO:HB3	1:E:341:VAL:HG21	2.00	0.41
1:G:526:ILE:HG23	1:G:526:ILE:O	2.19	0.41
1:G:700:MET:HE3	1:G:700:MET:HB3	1.77	0.41
1:A:509:LEU:HA	1:A:556:ALA:HB2	2.03	0.41
1:C:376:LEU:HA	1:C:376:LEU:HD23	1.70	0.41
1:E:178:LYS:HE3	1:E:178:LYS:HB3	1.75	0.41
1:G:280:LYS:HG3	1:G:283:CYS:SG	2.61	0.41
1:G:503:GLN:HG2	1:G:557:ARG:NH1	2.35	0.41
1:A:136:LEU:HD23	1:A:137:PRO:CD	2.50	0.41
1:A:332:ILE:HG12	1:A:346:VAL:HG13	2.03	0.41
1:C:223:TYR:CE1	1:C:275:PRO:HD3	2.56	0.41
1:C:465:CYS:HB2	1:C:680:PHE:HE1	1.86	0.41
1:C:489:ALA:HB1	1:G:294:LEU:HD21	2.02	0.41
1:E:464:ARG:NH2	1:E:675:VAL:O	2.54	0.41
1:G:183:ASP:OD2	1:G:186:SER:HB3	2.20	0.41
1:C:329:GLN:O	1:C:329:GLN:HG2	2.20	0.41
1:C:497:TRP:CE2	1:C:512:LYS:HE3	2.56	0.41
1:G:360:GLY:HA3	1:G:813:VAL:HG11	2.01	0.41
1:A:629:LEU:O	1:A:633:GLN:HG3	2.20	0.41
1:E:282:LEU:HD11	1:E:810:LEU:HD11	2.01	0.41
1:G:172:LYS:HD3	1:G:174:ASN:ND2	2.35	0.41
1:G:597:PRO:HB3	1:G:762:TRP:CH2	2.55	0.41
1:A:412:GLU:HB3	1:A:594:LEU:HD23	2.02	0.41
1:C:426:SER:HB2	1:C:751:LYS:HE3	2.01	0.41
1:E:306:MET:HE3	1:E:345:CYS:HA	2.03	0.41
1:E:690:LYS:HA	1:E:690:LYS:HD3	1.75	0.41
1:G:763:ILE:O	1:G:764:GLN:HB2	2.20	0.41
1:G:798:ASN:HB3	1:G:801:PHE:O	2.21	0.41
1:A:75:LYS:HA	1:A:75:LYS:HD3	1.92	0.41
1:A:412:GLU:HG3	1:A:414:LYS:H	1.86	0.41
1:C:287:ASP:OD1	1:C:287:ASP:N	2.52	0.41
1:E:668:TYR:CE1	1:E:747:PRO:HG3	2.56	0.41
1:G:63:PRO:HG2	1:G:82:TRP:CD1	2.55	0.41
1:C:647:LYS:O	1:C:651:ILE:HG13	2.21	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:473:ARG:HD3	1:E:473:ARG:HA	1.79	0.40
1:A:387:ILE:O	1:A:410:VAL:HA	2.21	0.40
1:G:656:ALA:HB1	1:G:765:MET:CB	2.51	0.40
1:A:81:ARG:CG	1:A:82:TRP:N	2.83	0.40
1:C:93:ASN:OD1	1:C:93:ASN:O	2.39	0.40
1:C:120:ASN:O	1:C:225:PRO:HD2	2.21	0.40
1:C:490:LEU:HA	1:C:493:VAL:HG12	2.04	0.40
1:G:753:PHE:CD1	1:G:753:PHE:C	2.98	0.40
1:C:302:ARG:HE	1:G:526:ILE:CD1	2.35	0.40
1:G:608:VAL:O	1:G:619:SER:HA	2.22	0.40
1:G:625:VAL:HG12	1:G:627:VAL:HG22	2.03	0.40
1:A:465:CYS:HB2	1:A:680:PHE:HE1	1.86	0.40
1:C:598:VAL:CG1	1:C:610:VAL:HG13	2.52	0.40
1:E:316:ALA:O	1:E:320:THR:HG23	2.21	0.40
1:E:778:ALA:O	1:E:782:ILE:HG13	2.22	0.40
1:G:669:ARG:NH1	1:G:706:HIS:O	2.51	0.40

All (3) 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)
1:A:81:ARG:NH2	1:E:80:SER:O[1_655]	2.02	0.18
1:A:80:SER:OG	1:E:80:SER:OG[1_655]	2.04	0.16
1:A:514:GLU:OE1	1:G:552:HIS:NE2[1_464]	2.04	0.16

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	731/776 (94%)	706 (97%)	23 (3%)	2 (0%)	36 65
1	C	735/776 (95%)	709 (96%)	24 (3%)	2 (0%)	36 65

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
1	E	745/776 (96%)	722 (97%)	20 (3%)	3 (0%)	30 59
1	G	743/776 (96%)	714 (96%)	26 (4%)	3 (0%)	30 59
2	B	12/18 (67%)	9 (75%)	2 (17%)	1 (8%)	0 4
2	D	10/18 (56%)	10 (100%)	0	0	100 100
2	F	10/18 (56%)	9 (90%)	1 (10%)	0	100 100
2	H	8/18 (44%)	5 (62%)	3 (38%)	0	100 100
All	All	2994/3176 (94%)	2884 (96%)	99 (3%)	11 (0%)	30 59

All (11) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	E	173	PRO
1	E	196	VAL
1	G	374	TYR
1	A	183	ASP
1	E	199	HIS
1	G	588	GLU
1	A	185	CYS
2	B	1119	ALA
1	C	183	ASP
1	G	180	GLU
1	C	471	GLY

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	633/662 (96%)	633 (100%)	0	100 100
1	C	636/662 (96%)	636 (100%)	0	100 100
1	E	643/662 (97%)	643 (100%)	0	100 100
1	G	641/662 (97%)	640 (100%)	1 (0%)	87 85
2	B	11/14 (79%)	11 (100%)	0	100 100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	D	10/14 (71%)	10 (100%)	0	100	100
2	F	10/14 (71%)	10 (100%)	0	100	100
2	H	8/14 (57%)	8 (100%)	0	100	100
All	All	2592/2704 (96%)	2591 (100%)	1 (0%)	100	100

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	G	147	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (27) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	103	HIS
1	A	152	GLN
1	A	198	ASN
1	A	274	GLN
1	A	728	GLN
1	A	731	GLN
1	A	800	HIS
1	C	103	HIS
1	C	120	ASN
1	C	537	GLN
1	C	539	HIS
1	C	640	ASN
1	C	683	HIS
2	D	1123	HIS
1	E	98	HIS
1	E	103	HIS
1	E	120	ASN
1	E	152	GLN
1	E	329	GLN
1	E	505	GLN
1	E	561	HIS
1	E	609	GLN
1	G	93	ASN
1	G	274	GLN
1	G	539	HIS
1	G	542	ASN
2	H	1127	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 oligosaccharides in this entry.

5.6 Ligand geometry (i)

Of 16 ligands modelled in this entry, 12 are monoatomic - leaving 4 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
3	FAD	C	901	-	56,58,58	0.35	0	81,89,89	0.60	1 (1%)
3	FAD	G	901	-	56,58,58	0.39	0	81,89,89	0.58	0
3	FAD	E	901	-	56,58,58	0.41	0	81,89,89	0.53	0
3	FAD	A	901	-	56,58,58	0.54	1 (1%)	81,89,89	0.75	2 (2%)

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	C	901	-	-	6/34/50/50	0/6/6/6
3	FAD	G	901	-	-	7/34/50/50	0/6/6/6
3	FAD	E	901	-	-	6/34/50/50	0/6/6/6
3	FAD	A	901	-	-	6/34/50/50	0/6/6/6

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	901	FAD	C4X-N5	-2.37	1.26	1.30

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	901	FAD	O2P-P-O5'	3.19	122.57	107.75
3	C	901	FAD	O2P-P-O5'	2.82	120.86	107.75
3	A	901	FAD	O5'-P-O1P	-2.19	100.53	109.07

There are no chirality outliers.

All (25) torsion outliers are listed below:

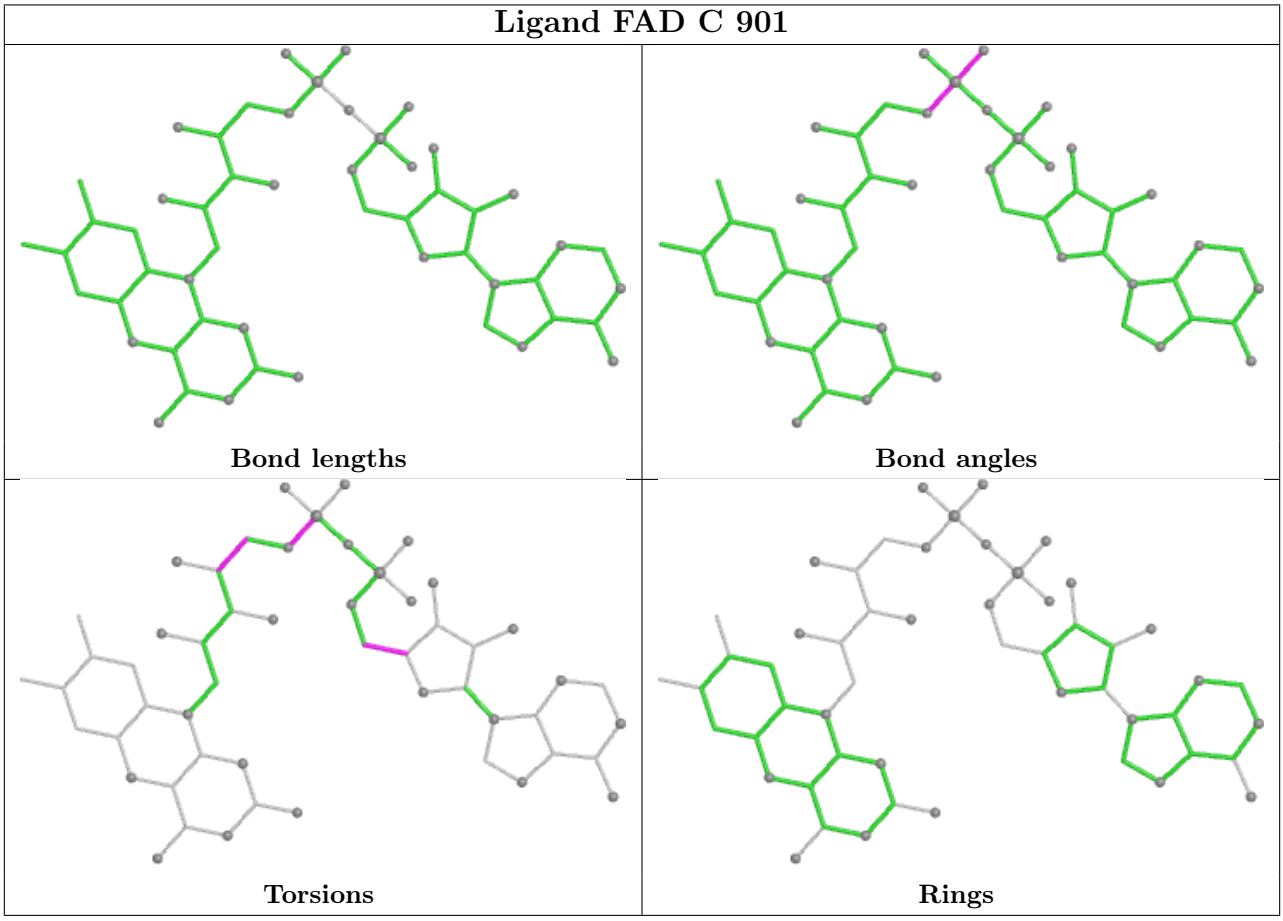
Mol	Chain	Res	Type	Atoms
3	A	901	FAD	C3'-C4'-C5'-O5'
3	A	901	FAD	O4'-C4'-C5'-O5'
3	A	901	FAD	C5'-O5'-P-O2P
3	C	901	FAD	C3'-C4'-C5'-O5'
3	C	901	FAD	O4'-C4'-C5'-O5'
3	C	901	FAD	C5'-O5'-P-O1P
3	C	901	FAD	C5'-O5'-P-O2P
3	E	901	FAD	C3'-C4'-C5'-O5'
3	E	901	FAD	O4'-C4'-C5'-O5'
3	E	901	FAD	C5'-O5'-P-O1P
3	G	901	FAD	C3'-C4'-C5'-O5'
3	G	901	FAD	O4'-C4'-C5'-O5'
3	G	901	FAD	C5'-O5'-P-O3P
3	A	901	FAD	C5'-O5'-P-O3P
3	E	901	FAD	O4B-C4B-C5B-O5B
3	G	901	FAD	C2B-C1B-N9A-C8A
3	A	901	FAD	C5'-O5'-P-O1P
3	G	901	FAD	C5'-O5'-P-O1P
3	A	901	FAD	O4B-C4B-C5B-O5B
3	G	901	FAD	O4B-C1B-N9A-C8A
3	C	901	FAD	C5'-O5'-P-O3P
3	E	901	FAD	C5'-O5'-P-O3P
3	E	901	FAD	P-O3P-PA-O2A
3	C	901	FAD	O4B-C4B-C5B-O5B
3	G	901	FAD	O4B-C4B-C5B-O5B

There are no ring outliers.

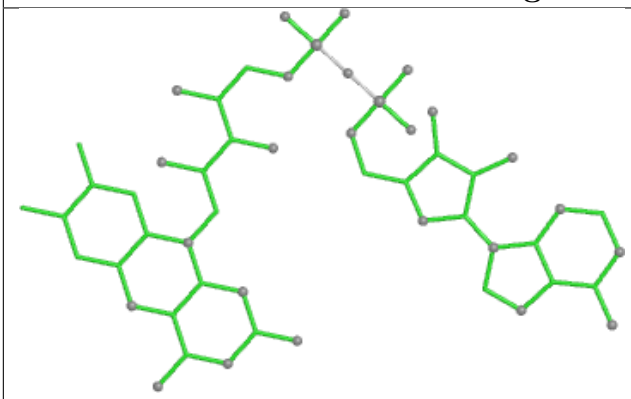
4 monomers are involved in 14 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	901	FAD	7	0
3	G	901	FAD	2	0
3	E	901	FAD	3	0
3	A	901	FAD	2	0

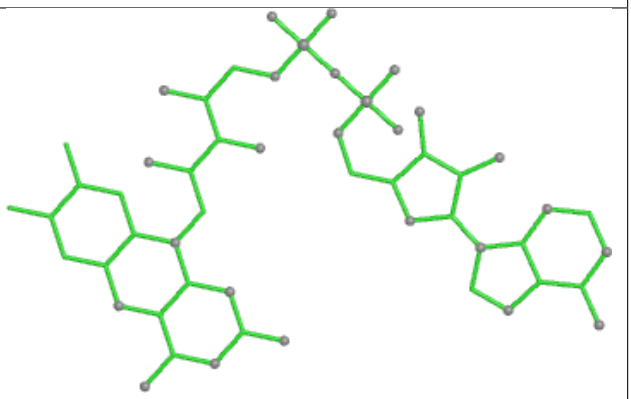
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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



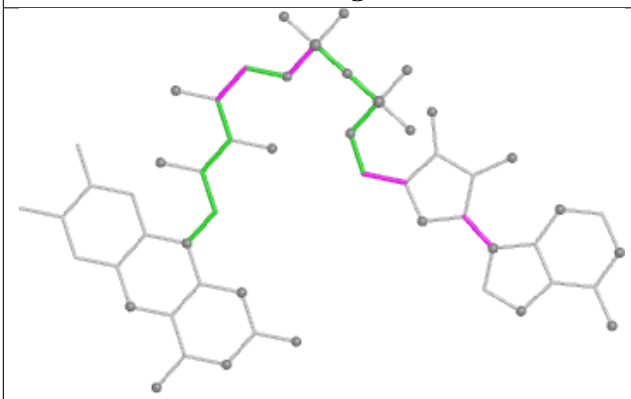
Ligand FAD G 901



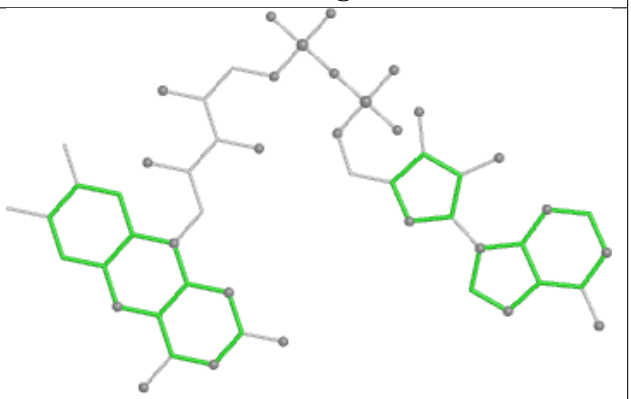
Bond lengths



Bond angles

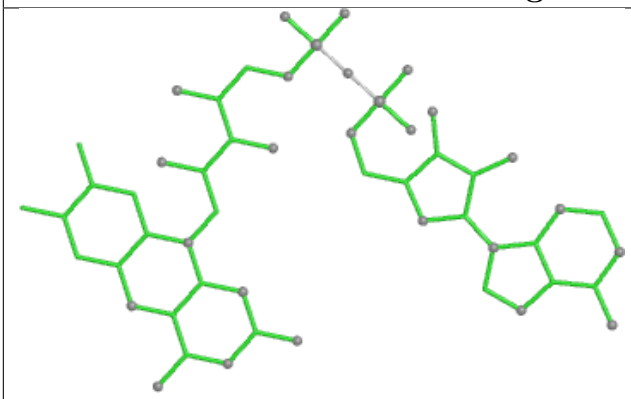


Torsions

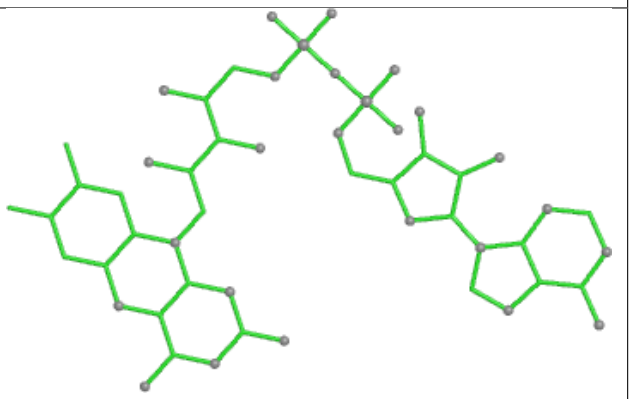


Rings

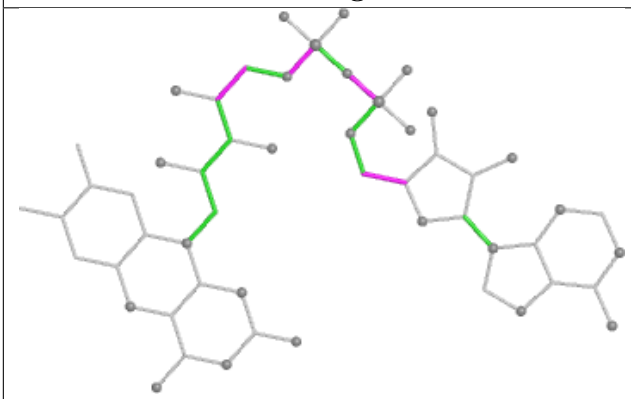
Ligand FAD E 901



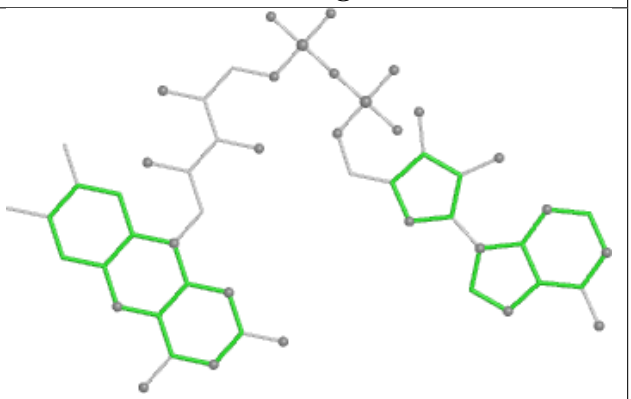
Bond lengths



Bond angles

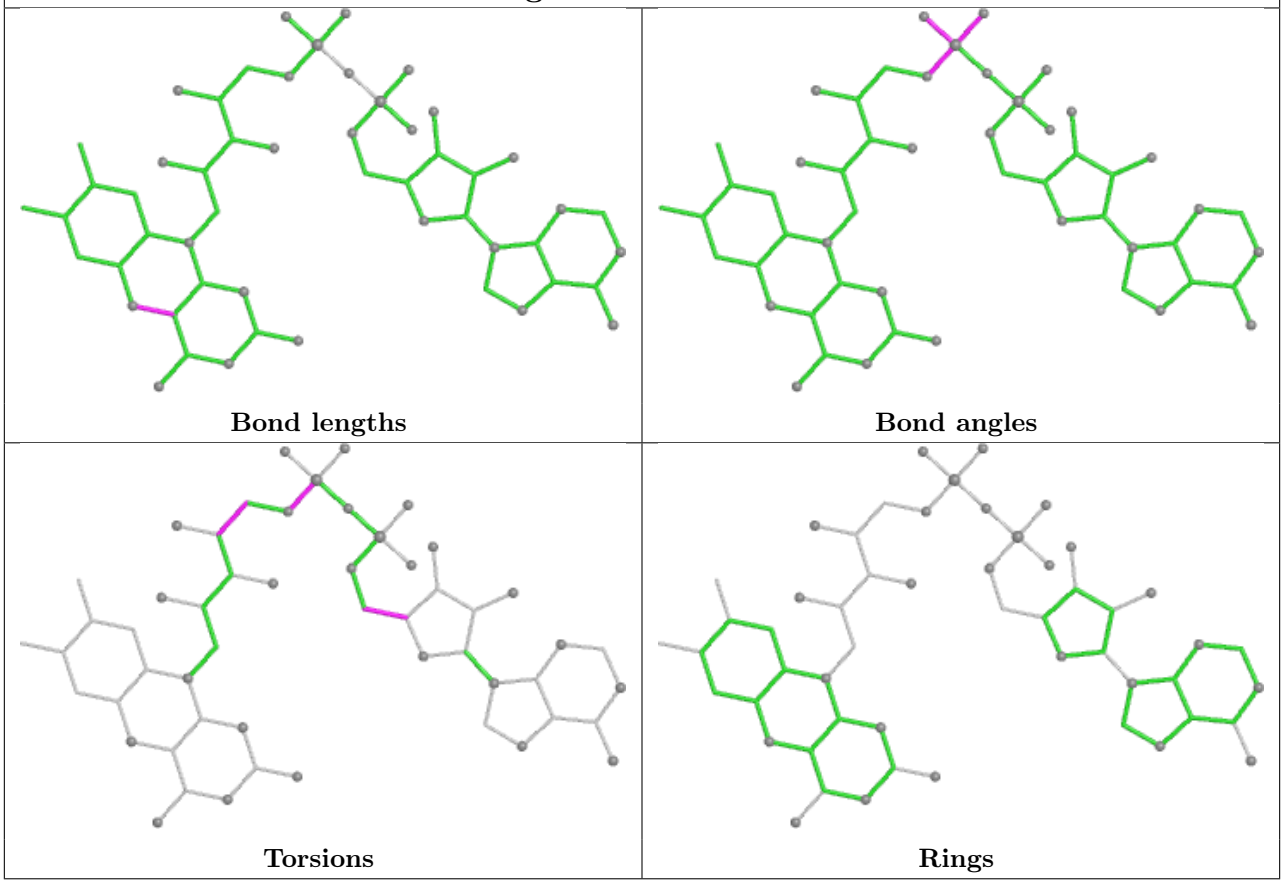


Torsions



Rings

Ligand FAD A 901



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, 95^{th} 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	737/776 (94%)	-0.57	1 (0%) 92 92	45, 74, 119, 177	0
1	C	741/776 (95%)	-0.51	1 (0%) 92 92	48, 81, 124, 183	0
1	E	749/776 (96%)	-0.45	1 (0%) 92 92	55, 91, 133, 186	0
1	G	747/776 (96%)	-0.27	5 (0%) 84 73	55, 100, 140, 192	0
2	B	14/18 (77%)	-0.20	0 100 100	53, 76, 144, 144	0
2	D	12/18 (66%)	-0.28	0 100 100	59, 84, 134, 140	0
2	F	12/18 (66%)	-0.09	1 (8%) 17 15	60, 90, 122, 125	0
2	H	10/18 (55%)	-0.05	0 100 100	74, 87, 96, 102	0
All	All	3022/3176 (95%)	-0.44	9 (0%) 90 84	45, 85, 133, 192	0

All (9) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	G	733	CYS	3.1
1	G	287	ASP	2.7
1	G	721	VAL	2.7
1	C	480	ASP	2.5
1	G	636	ALA	2.3
2	F	1131	TYR	2.2
1	G	694	PHE	2.1
1	A	496	GLU	2.0
1	E	767	TYR	2.0

6.2 Non-standard residues in protein, DNA, RNA chains

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)

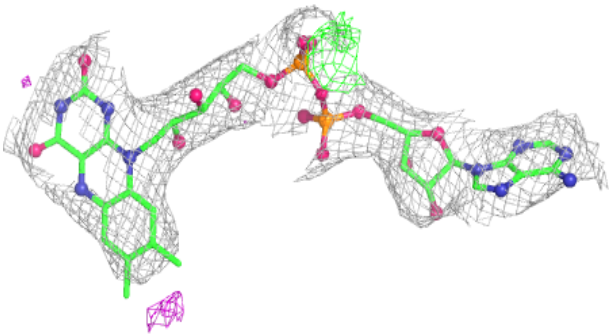
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

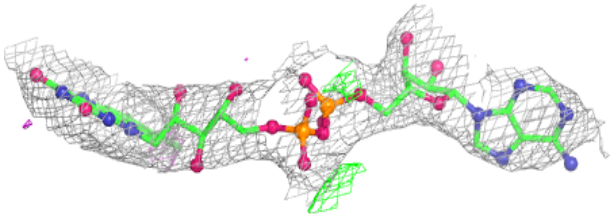
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	FAD	E	901	53/53	0.94	0.08	59,75,95,96	0
3	FAD	G	901	53/53	0.94	0.09	70,84,114,121	0
3	FAD	A	901	53/53	0.96	0.09	49,61,78,86	0
3	FAD	C	901	53/53	0.96	0.07	53,63,70,72	0
4	ZN	C	904	1/1	0.97	0.04	130,130,130,130	0
4	ZN	A	903	1/1	0.99	0.02	72,72,72,72	0
4	ZN	A	904	1/1	0.99	0.03	118,118,118,118	0
4	ZN	C	902	1/1	0.99	0.02	85,85,85,85	0
4	ZN	A	902	1/1	0.99	0.03	72,72,72,72	0
4	ZN	E	902	1/1	0.99	0.03	74,74,74,74	0
4	ZN	G	904	1/1	0.99	0.03	82,82,82,82	0
4	ZN	E	903	1/1	1.00	0.01	78,78,78,78	0
4	ZN	E	904	1/1	1.00	0.02	78,78,78,78	0
4	ZN	G	902	1/1	1.00	0.01	77,77,77,77	0
4	ZN	G	903	1/1	1.00	0.01	79,79,79,79	0
4	ZN	C	903	1/1	1.00	0.02	78,78,78,78	0

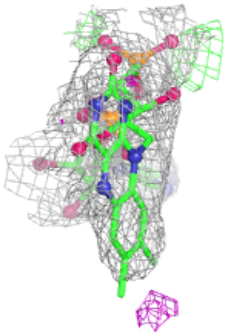
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around FAD E 901:

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

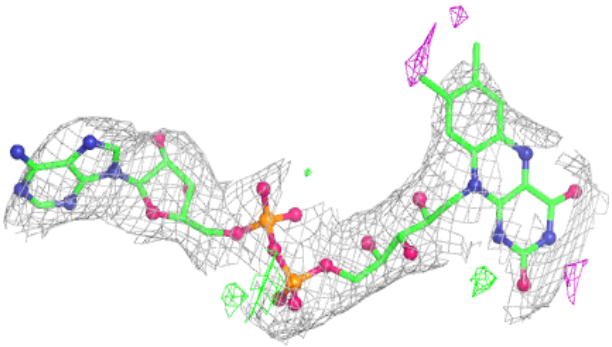


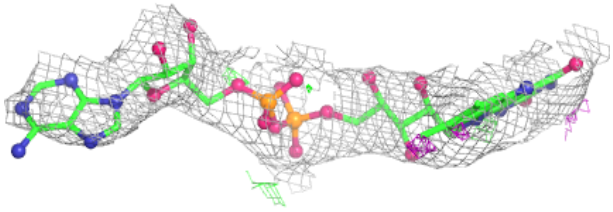


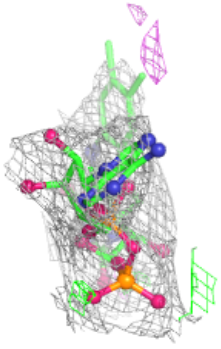


Electron density around FAD G 901:

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

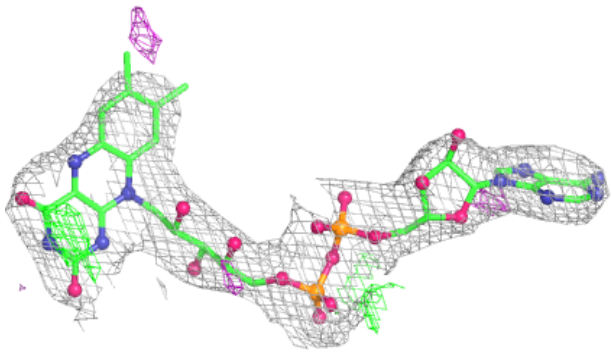


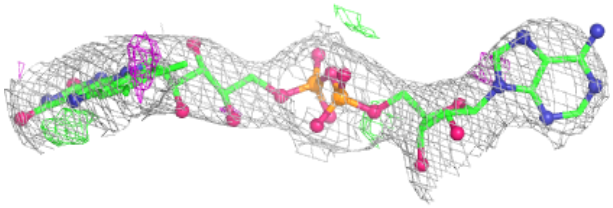


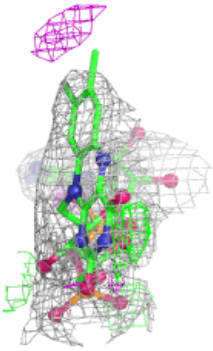


Electron density around FAD A 901:

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

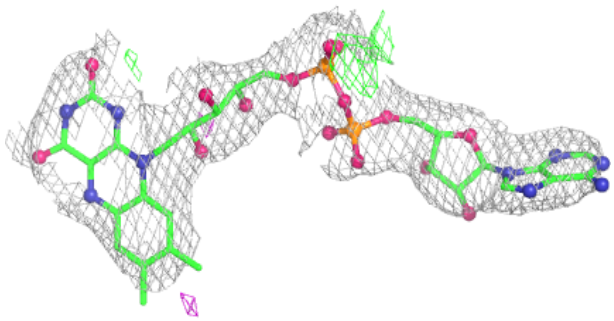


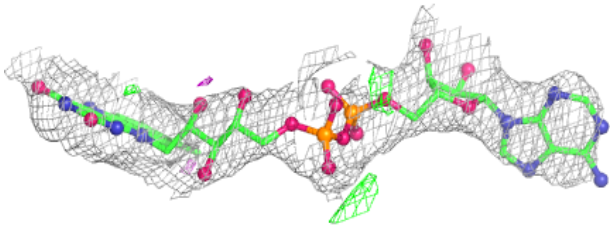


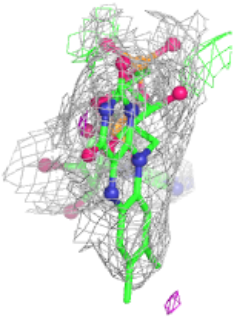


Electron density around FAD C 901:

$2mF_o$-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.