Full wwPDB X-ray Structure Validation Report ⓘ

Sep 11, 2023 – 03:50 AM EDT

PDB ID	:	4J56
Title	:	Structure of Plasmodium falciparum thioredoxin reductase-thioredoxin complex
Authors	:	Fritz-Wolf, K.; Jortzik, E.; Stumpf, M.; Preuss, J.; Iozef, R.; Rahlfs, S.; Becker, K.
Deposited on	:	2013-02-08
Resolution	:	2.37 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:

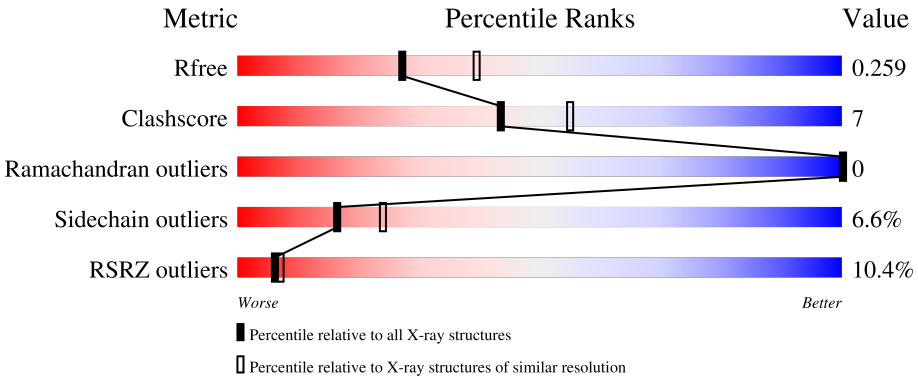
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35.1

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 2.37 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	5509 (2.40-2.36)
Clashscore	141614	6082 (2.40-2.36)
Ramachandran outliers	138981	5973 (2.40-2.36)
Sidechain outliers	138945	5975 (2.40-2.36)
RSRZ outliers	127900	5397 (2.40-2.36)

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	541	2% 76% 16% • 7%
1	B	541	% 74% 17% • 7%
1	C	541	2% 77% 15% • 7%
1	D	541	2% 75% 16% • 7%

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Mol	Chain	Length	Quality of chain
2	E	114	41% 63% 25% 8%
2	F	114	53% 66% 24% 8%
2	G	114	68% 67% 23% 8%
2	H	114	25% 67% 23% 8%

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 19267 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 Thioredoxin reductase 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	504	Total	C	N	O	S	0	0	0
			3887	2473	650	742	22			
1	B	504	Total	C	N	O	S	0	0	0
			3887	2473	650	742	22			
1	C	504	Total	C	N	O	S	0	0	0
			3887	2473	650	742	22			
1	D	504	Total	C	N	O	S	0	0	0
			3887	2473	650	742	22			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	535	SER	CYS	engineered mutation	UNP P61076
B	535	SER	CYS	engineered mutation	UNP P61076
C	535	SER	CYS	engineered mutation	UNP P61076
D	535	SER	CYS	engineered mutation	UNP P61076

- Molecule 2 is a protein called Thioredoxin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	E	105	Total	C	N	O	S	0	0	0
			823	526	126	167	4			
2	F	105	Total	C	N	O	S	0	0	0
			823	526	126	167	4			
2	G	105	Total	C	N	O	S	0	0	0
			823	526	126	167	4			
2	H	105	Total	C	N	O	S	0	0	0
			823	526	126	167	4			

There are 48 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	-9	ARG	-	expression tag	UNP Q7KQL8
E	-8	GLY	-	expression tag	UNP Q7KQL8
E	-7	SER	-	expression tag	UNP Q7KQL8
E	-6	HIS	-	expression tag	UNP Q7KQL8
E	-5	HIS	-	expression tag	UNP Q7KQL8
E	-4	HIS	-	expression tag	UNP Q7KQL8
E	-3	HIS	-	expression tag	UNP Q7KQL8
E	-2	HIS	-	expression tag	UNP Q7KQL8
E	-1	HIS	-	expression tag	UNP Q7KQL8
E	0	GLY	-	expression tag	UNP Q7KQL8
E	1	SER	-	expression tag	UNP Q7KQL8
E	33	SER	CYS	engineered mutation	UNP Q7KQL8
F	-9	ARG	-	expression tag	UNP Q7KQL8
F	-8	GLY	-	expression tag	UNP Q7KQL8
F	-7	SER	-	expression tag	UNP Q7KQL8
F	-6	HIS	-	expression tag	UNP Q7KQL8
F	-5	HIS	-	expression tag	UNP Q7KQL8
F	-4	HIS	-	expression tag	UNP Q7KQL8
F	-3	HIS	-	expression tag	UNP Q7KQL8
F	-2	HIS	-	expression tag	UNP Q7KQL8
F	-1	HIS	-	expression tag	UNP Q7KQL8
F	0	GLY	-	expression tag	UNP Q7KQL8
F	1	SER	-	expression tag	UNP Q7KQL8
F	33	SER	CYS	engineered mutation	UNP Q7KQL8
G	-9	ARG	-	expression tag	UNP Q7KQL8
G	-8	GLY	-	expression tag	UNP Q7KQL8
G	-7	SER	-	expression tag	UNP Q7KQL8
G	-6	HIS	-	expression tag	UNP Q7KQL8
G	-5	HIS	-	expression tag	UNP Q7KQL8
G	-4	HIS	-	expression tag	UNP Q7KQL8
G	-3	HIS	-	expression tag	UNP Q7KQL8
G	-2	HIS	-	expression tag	UNP Q7KQL8
G	-1	HIS	-	expression tag	UNP Q7KQL8
G	0	GLY	-	expression tag	UNP Q7KQL8
G	1	SER	-	expression tag	UNP Q7KQL8
G	33	SER	CYS	engineered mutation	UNP Q7KQL8
H	-9	ARG	-	expression tag	UNP Q7KQL8
H	-8	GLY	-	expression tag	UNP Q7KQL8
H	-7	SER	-	expression tag	UNP Q7KQL8
H	-6	HIS	-	expression tag	UNP Q7KQL8
H	-5	HIS	-	expression tag	UNP Q7KQL8
H	-4	HIS	-	expression tag	UNP Q7KQL8
H	-3	HIS	-	expression tag	UNP Q7KQL8

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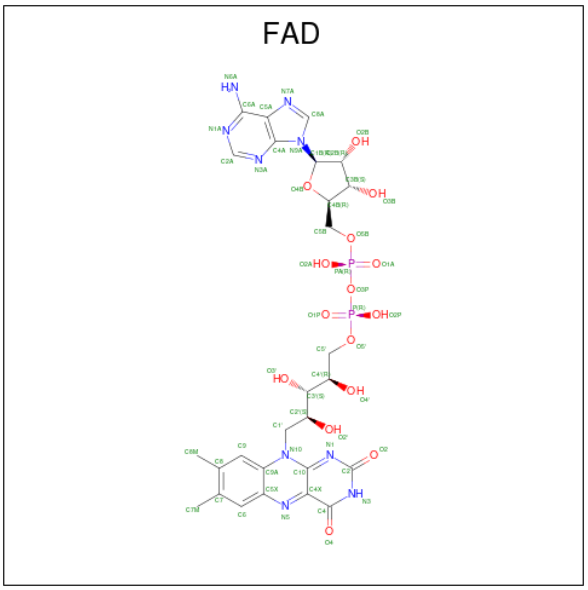
Chain	Residue	Modelled	Actual	Comment	Reference
H	-2	HIS	-	expression tag	UNP Q7KQL8
H	-1	HIS	-	expression tag	UNP Q7KQL8
H	0	GLY	-	expression tag	UNP Q7KQL8
H	1	SER	-	expression tag	UNP Q7KQL8
H	33	SER	CYS	engineered mutation	UNP Q7KQL8

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

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	47	Total	O	0	0
			47	47		
4	B	53	Total	O	0	0
			53	53		

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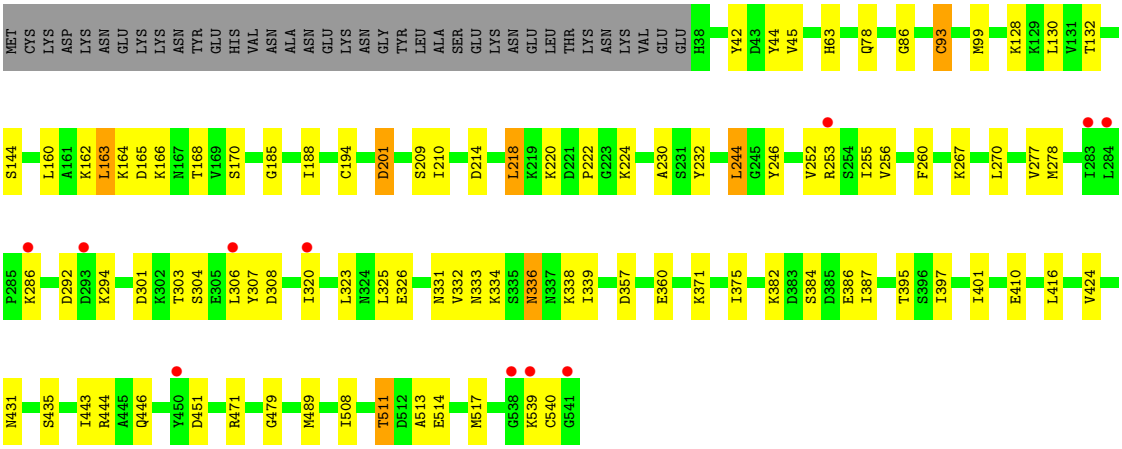
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	C	62	Total O 62 62	0	0
4	D	45	Total O 45 45	0	0
4	E	2	Total O 2 2	0	0
4	F	1	Total O 1 1	0	0
4	G	2	Total O 2 2	0	0
4	H	3	Total O 3 3	0	0

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.

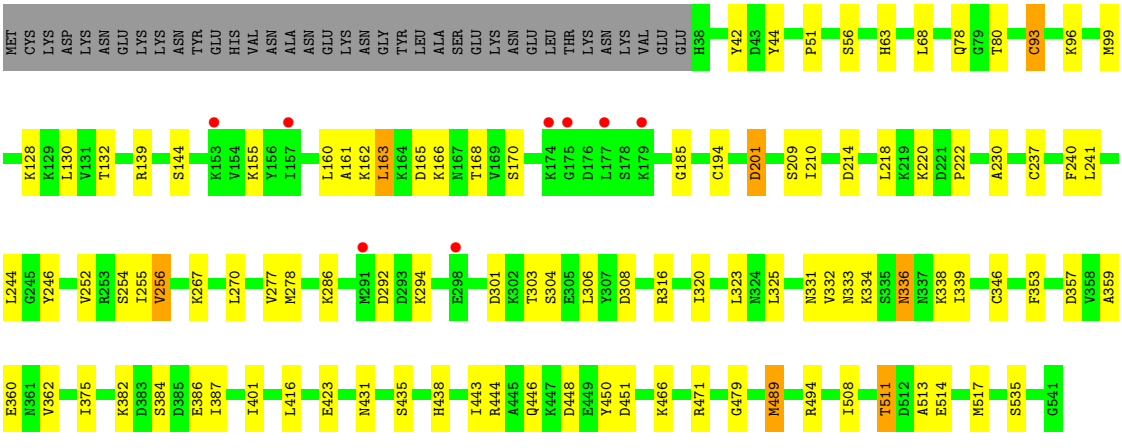
• Molecule 1: Thioredoxin reductase 2

Chain A:



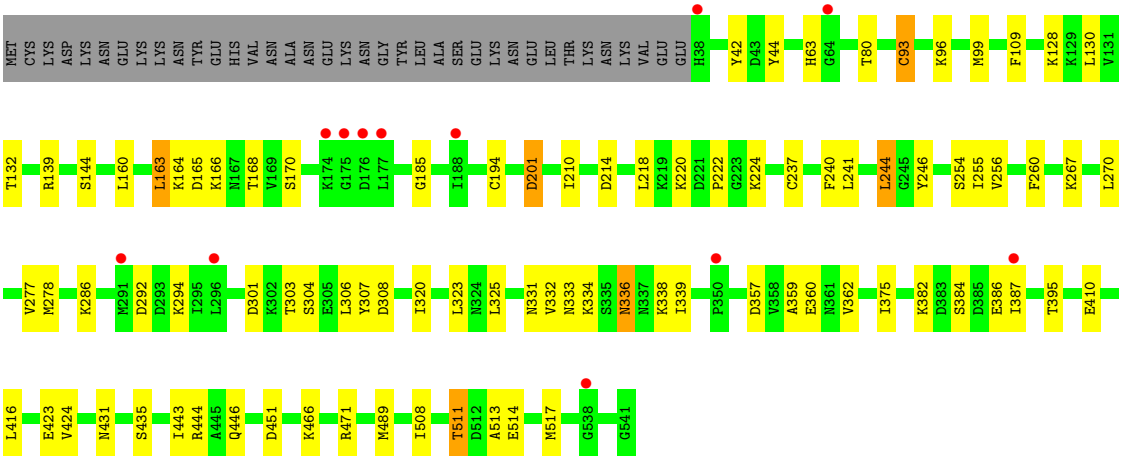
• Molecule 1: Thioredoxin reductase 2

Chain B:



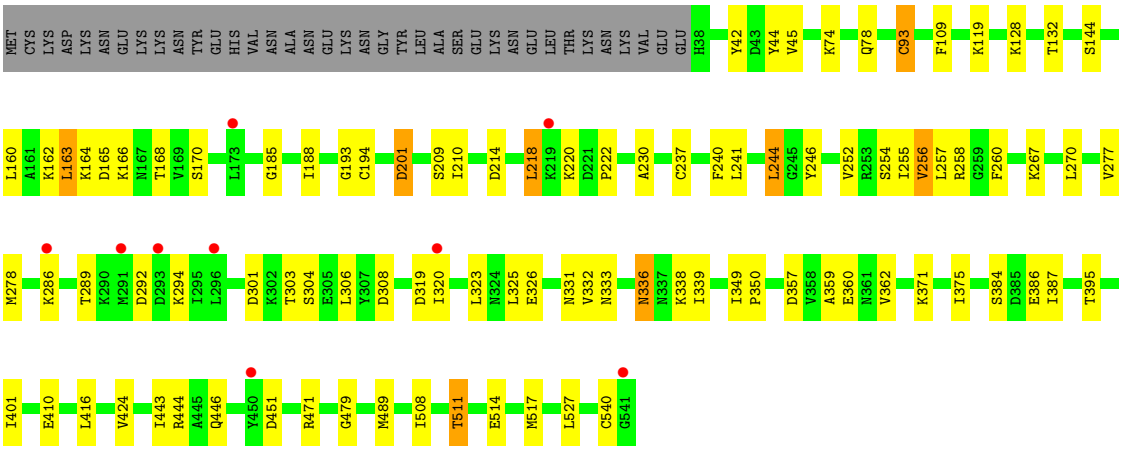
• Molecule 1: Thioredoxin reductase 2

Chain C:



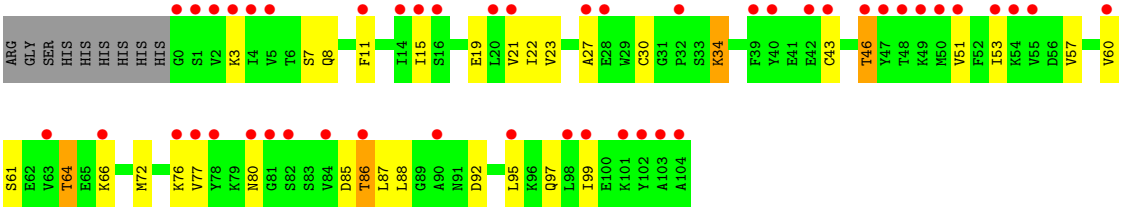
• Molecule 1: Thioredoxin reductase 2

Chain D:



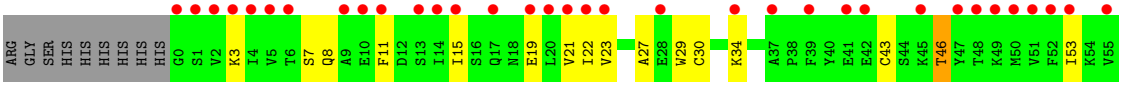
• Molecule 2: Thioredoxin

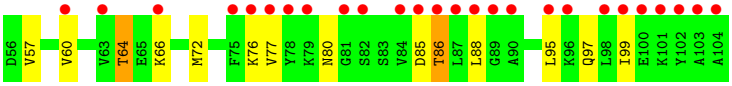
Chain E:



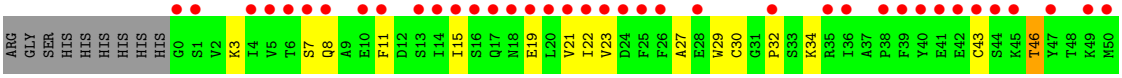
• Molecule 2: Thioredoxin

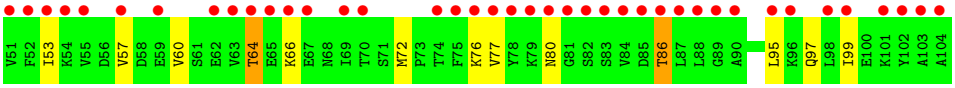
Chain F:



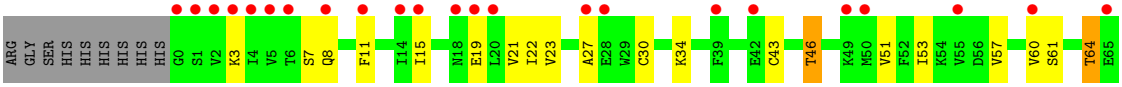


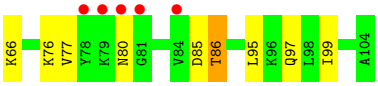
• Molecule 2: Thioredoxin





• Molecule 2: Thioredoxin





4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	101.88Å 89.18Å 151.33Å 90.00° 91.62° 90.00°	Depositor
Resolution (Å)	19.97 – 2.37 19.97 – 2.37	Depositor EDS
% Data completeness (in resolution range)	98.0 (19.97-2.37) 90.5 (19.97-2.37)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.11	Depositor
$< I/\sigma(I) >$ [1]	1.49 (at 2.38Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.7.2_869)	Depositor
R, R_{free}	0.236 , 0.259 0.237 , 0.259	Depositor DCC
R_{free} test set	7649 reflections (7.09%)	wwPDB-VP
Wilson B-factor (Å^2)	44.2	Xtriage
Anisotropy	0.358	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 17.6	EDS
L-test for twinning[2]	$< \|L\| > = 0.44$, $< L^2 > = 0.26$	Xtriage
Estimated twinning fraction	0.216 for h,-k,-l	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	19267	wwPDB-VP
Average B, all atoms (Å^2)	43.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 15.53% 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

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	0.45	0/3961	0.60	0/5341
1	B	0.45	0/3961	0.59	0/5341
1	C	0.44	0/3961	0.60	0/5341
1	D	0.45	0/3961	0.60	0/5341
2	E	0.40	0/837	0.51	0/1130
2	F	0.35	0/837	0.51	0/1130
2	G	0.36	0/837	0.50	0/1130
2	H	0.37	0/837	0.52	0/1130
All	All	0.43	0/19192	0.58	0/25884

There are no bond length outliers.

There are no bond angle outliers.

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	3887	0	3898	47	0
1	B	3887	0	3898	55	0
1	C	3887	0	3898	47	0
1	D	3887	0	3898	50	0
2	E	823	0	818	18	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	F	823	0	818	15	0
2	G	823	0	818	14	0
2	H	823	0	818	15	0
3	A	53	0	31	2	0
3	B	53	0	31	5	0
3	C	53	0	31	3	0
3	D	53	0	31	1	0
4	A	47	0	0	0	0
4	B	53	0	0	1	0
4	C	62	0	0	0	0
4	D	45	0	0	1	0
4	E	2	0	0	0	0
4	F	1	0	0	0	0
4	G	2	0	0	0	0
4	H	3	0	0	0	0
All	All	19267	0	18988	253	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 7.

All (253) 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:B:165:ASP:HB3	1:B:168:THR:HB	1.69	0.74
1:B:346:CYS:HG	1:B:353:PHE:HE1	1.33	0.73
1:C:165:ASP:HB3	1:C:168:THR:HB	1.70	0.73
1:A:165:ASP:HB3	1:A:168:THR:HB	1.72	0.72
1:D:384:SER:OG	1:D:386:GLU:HG2	1.92	0.70
1:D:165:ASP:HB3	1:D:168:THR:HB	1.74	0.70
1:A:93:CYS:HB3	3:A:600:FAD:C4	2.22	0.69
1:A:384:SER:OG	1:A:386:GLU:HG2	1.93	0.69
1:C:278:MET:SD	1:C:444:ARG:NH1	2.66	0.68
1:D:255:ILE:HD11	1:D:258:ARG:HG3	1.76	0.68
1:B:384:SER:OG	1:B:386:GLU:HG2	1.95	0.66
1:C:384:SER:OG	1:C:386:GLU:HG2	1.96	0.66
1:B:96:LYS:HZ3	3:B:600:FAD:H6	1.59	0.65
2:H:8:GLN:OE1	2:H:66:LYS:NZ	2.21	0.65
1:B:278:MET:SD	1:B:444:ARG:NH1	2.69	0.65
1:A:163:LEU:HD11	1:A:325:LEU:HD23	1.77	0.65
1:D:278:MET:SD	1:D:444:ARG:NH1	2.69	0.65
1:A:320:ILE:HD11	1:A:339:ILE:HD11	1.79	0.65

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:375:ILE:HG23	1:C:386:GLU:HG3	1.79	0.65
2:G:8:GLN:OE1	2:G:66:LYS:NZ	2.23	0.63
1:D:163:LEU:HD11	1:D:325:LEU:HD23	1.80	0.63
1:D:333:ASN:ND2	1:D:360:GLU:OE2	2.31	0.63
1:A:278:MET:SD	1:A:444:ARG:NH1	2.72	0.62
1:B:163:LEU:HD11	1:B:325:LEU:HD23	1.80	0.62
2:F:8:GLN:OE1	2:F:66:LYS:NZ	2.23	0.62
1:C:254:SER:OG	1:C:255:ILE:N	2.33	0.61
1:C:163:LEU:HD11	1:C:325:LEU:HD23	1.82	0.61
1:B:333:ASN:ND2	1:B:360:GLU:OE2	2.34	0.61
1:A:375:ILE:HG23	1:A:386:GLU:HG3	1.81	0.61
1:D:320:ILE:HD11	1:D:339:ILE:HD11	1.83	0.60
1:D:119:LYS:NZ	4:D:703:HOH:O	2.33	0.60
1:A:333:ASN:ND2	1:A:360:GLU:OE2	2.35	0.60
1:B:320:ILE:HD11	1:B:339:ILE:HD11	1.84	0.59
1:B:511:THR:HG22	1:B:514:GLU:H	1.67	0.59
1:A:99:MET:HG2	1:A:130:LEU:HD21	1.85	0.59
1:C:320:ILE:HD11	1:C:339:ILE:HD11	1.84	0.59
1:A:230:ALA:HB2	1:A:252:VAL:HG22	1.85	0.59
1:B:194:CYS:SG	1:B:357:ASP:HB3	2.43	0.58
1:C:333:ASN:ND2	1:C:360:GLU:OE2	2.37	0.58
1:C:511:THR:HG22	1:C:514:GLU:H	1.69	0.58
1:A:194:CYS:SG	1:A:357:ASP:HB3	2.44	0.58
1:C:508:ILE:O	1:C:511:THR:HB	2.04	0.57
1:D:446:GLN:HG2	1:D:451:ASP:O	2.04	0.57
1:D:508:ILE:O	1:D:511:THR:HB	2.05	0.57
1:B:93:CYS:HB3	3:B:600:FAD:C4	2.35	0.56
1:A:511:THR:HG22	1:A:514:GLU:H	1.71	0.56
1:D:93:CYS:HB3	3:D:600:FAD:C4	2.34	0.56
1:C:96:LYS:HZ3	3:C:600:FAD:H6	1.70	0.56
1:A:334:LYS:HB3	1:D:527:LEU:HD23	1.87	0.55
1:D:230:ALA:HB1	1:D:256:VAL:HA	1.88	0.55
1:D:410:GLU:HG3	1:D:424:VAL:HG21	1.88	0.55
1:A:301:ASP:OD1	1:A:303:THR:HG22	2.05	0.55
1:B:230:ALA:HB1	1:B:256:VAL:HG22	1.89	0.55
1:B:375:ILE:HG23	1:B:386:GLU:HG3	1.89	0.55
1:B:254:SER:OG	1:B:255:ILE:N	2.40	0.54
1:D:375:ILE:HG23	1:D:386:GLU:HG3	1.89	0.54
1:C:99:MET:HG2	1:C:130:LEU:HD21	1.89	0.54
1:C:194:CYS:SG	1:C:357:ASP:HB3	2.48	0.54
2:E:43:CYS:HA	2:E:46:THR:HG23	1.88	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:446:GLN:HG2	1:B:451:ASP:O	2.08	0.53
2:G:43:CYS:HA	2:G:46:THR:HG23	1.90	0.53
2:H:43:CYS:HA	2:H:46:THR:HG23	1.89	0.53
1:D:194:CYS:SG	1:D:357:ASP:HB3	2.48	0.53
1:A:401:ILE:HD11	1:A:479:GLY:HA2	1.91	0.53
1:C:201:ASP:OD1	1:C:201:ASP:N	2.41	0.53
1:A:446:GLN:HG2	1:A:451:ASP:O	2.09	0.53
1:D:540:CYS:SG	2:G:32:PRO:HD2	2.49	0.53
1:B:508:ILE:O	1:B:511:THR:HB	2.09	0.53
1:B:320:ILE:HD12	1:B:323:LEU:HD12	1.91	0.53
2:F:43:CYS:HA	2:F:46:THR:HG23	1.91	0.53
1:D:301:ASP:OD1	1:D:303:THR:HG22	2.08	0.52
1:B:128:LYS:O	1:B:132:THR:HG23	2.09	0.52
1:B:96:LYS:NZ	3:B:600:FAD:H6	2.24	0.52
1:A:165:ASP:HB3	1:A:168:THR:CB	2.39	0.52
1:C:336:ASN:HB3	1:C:338:LYS:HG3	1.92	0.52
1:D:78:GLN:NE2	1:D:209:SER:O	2.43	0.52
1:D:511:THR:HG22	1:D:514:GLU:H	1.75	0.52
1:B:165:ASP:HB3	1:B:168:THR:CB	2.38	0.52
1:D:220:LYS:NZ	1:D:308:ASP:O	2.43	0.52
1:D:256:VAL:HG13	1:D:257:LEU:HG	1.92	0.52
2:E:27:ALA:HB3	2:E:30:CYS:HB2	1.92	0.52
1:A:294:LYS:HD2	1:A:306:LEU:HD21	1.93	0.51
1:B:336:ASN:HB3	1:B:338:LYS:HG3	1.92	0.51
1:A:128:LYS:O	1:A:132:THR:HG23	2.11	0.51
2:F:22:ILE:HG13	2:F:77:VAL:HG12	1.93	0.51
1:C:165:ASP:HB3	1:C:168:THR:CB	2.39	0.51
2:H:76:LYS:HG2	2:H:86:THR:HB	1.94	0.50
1:C:301:ASP:OD1	1:C:303:THR:HG22	2.11	0.50
1:C:446:GLN:HG2	1:C:451:ASP:O	2.11	0.50
2:H:27:ALA:HB3	2:H:30:CYS:HB2	1.93	0.50
1:C:128:LYS:O	1:C:132:THR:HG23	2.11	0.50
2:G:76:LYS:HG2	2:G:86:THR:HB	1.94	0.50
1:B:201:ASP:OD1	1:B:201:ASP:N	2.43	0.50
1:D:165:ASP:HB3	1:D:168:THR:CB	2.42	0.49
1:D:336:ASN:HB3	1:D:338:LYS:HG3	1.93	0.49
1:D:128:LYS:O	1:D:132:THR:HG23	2.13	0.49
2:E:76:LYS:HG2	2:E:86:THR:HB	1.95	0.49
2:H:3:LYS:HG2	2:H:53:ILE:HG22	1.93	0.49
1:B:301:ASP:OD1	1:B:303:THR:HG22	2.12	0.49
1:C:320:ILE:HD12	1:C:323:LEU:HD12	1.95	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:511:THR:HG23	1:C:513:ALA:H	1.78	0.48
2:E:11:PHE:HE1	2:E:23:VAL:HG21	1.79	0.48
1:A:539:LYS:HD2	2:F:88:LEU:HB3	1.95	0.48
1:A:86:GLY:HA2	3:A:600:FAD:O3B	2.13	0.48
2:F:95:LEU:O	2:F:99:ILE:HG13	2.13	0.48
2:G:22:ILE:HG13	2:G:77:VAL:HG12	1.95	0.48
1:A:201:ASP:OD1	1:A:201:ASP:N	2.44	0.48
1:A:220:LYS:NZ	1:A:308:ASP:O	2.47	0.48
2:E:22:ILE:HG13	2:E:77:VAL:HG12	1.95	0.48
1:B:222:PRO:HD2	1:B:246:TYR:CZ	2.49	0.48
1:C:237:CYS:HA	1:C:240:PHE:CE2	2.49	0.47
1:C:93:CYS:HB3	3:C:600:FAD:C4	2.45	0.47
1:D:201:ASP:OD1	1:D:201:ASP:N	2.44	0.47
2:E:8:GLN:OE1	2:E:66:LYS:NZ	2.29	0.47
2:G:11:PHE:HE1	2:G:23:VAL:HG21	1.80	0.47
1:C:222:PRO:HD2	1:C:246:TYR:CZ	2.49	0.47
1:A:508:ILE:O	1:A:511:THR:HB	2.13	0.47
1:B:139:ARG:HB3	2:F:29:TRP:CD1	2.49	0.47
2:E:3:LYS:HG2	2:E:53:ILE:HG22	1.95	0.47
1:A:253:ARG:NH1	1:C:382:LYS:HA	2.29	0.47
2:H:22:ILE:HG13	2:H:77:VAL:HG12	1.96	0.47
1:B:230:ALA:HB2	1:B:252:VAL:HG13	1.97	0.47
1:A:410:GLU:HG3	1:A:424:VAL:HG21	1.97	0.47
1:D:165:ASP:OD1	1:D:166:LYS:N	2.48	0.46
2:F:3:LYS:HG2	2:F:53:ILE:HG22	1.96	0.46
1:B:161:ALA:H	3:B:600:FAD:H62A	1.64	0.46
1:B:431:ASN:O	1:B:435:SER:HB2	2.15	0.46
2:G:95:LEU:O	2:G:99:ILE:HG13	2.15	0.46
1:B:316:ARG:NH2	4:B:704:HOH:O	2.46	0.46
1:D:401:ILE:HD11	1:D:479:GLY:HA2	1.98	0.46
1:C:220:LYS:NZ	1:C:308:ASP:O	2.49	0.46
2:H:11:PHE:HE1	2:H:23:VAL:HG21	1.81	0.46
1:A:320:ILE:HD12	1:A:323:LEU:HD12	1.98	0.46
2:F:76:LYS:HG2	2:F:86:THR:HB	1.97	0.46
1:D:359:ALA:O	1:D:362:VAL:HG22	2.16	0.45
2:G:3:LYS:HG2	2:G:53:ILE:HG22	1.97	0.45
1:C:42:TYR:O	1:C:185:GLY:HA2	2.16	0.45
1:C:80:THR:OG1	1:C:214:ASP:OD1	2.20	0.45
1:B:78:GLN:NE2	1:B:209:SER:O	2.49	0.45
1:C:210:ILE:HB	1:C:214:ASP:HB2	1.97	0.45
2:E:95:LEU:O	2:E:99:ILE:HG13	2.16	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:63:HIS:CE1	1:C:382:LYS:HD2	2.52	0.44
1:C:96:LYS:NZ	3:C:600:FAD:H6	2.33	0.44
1:C:109:PHE:CE1	1:D:109:PHE:CE1	3.05	0.44
2:E:19:GLU:HA	2:E:80:ASN:HA	1.99	0.44
2:G:19:GLU:HA	2:G:80:ASN:HA	2.00	0.44
1:A:45:VAL:CG1	1:A:188:ILE:HG12	2.48	0.44
1:B:237:CYS:HA	1:B:240:PHE:CE2	2.52	0.44
1:D:237:CYS:HA	1:D:240:PHE:CE2	2.53	0.44
2:G:27:ALA:HB3	2:G:30:CYS:HB2	1.98	0.44
1:B:359:ALA:O	1:B:362:VAL:HG22	2.17	0.44
1:A:244:LEU:HD12	1:A:244:LEU:HA	1.82	0.44
1:C:410:GLU:HG3	1:C:424:VAL:HG21	1.99	0.44
1:B:438:HIS:ND1	1:B:535:SER:OG	2.34	0.43
1:D:218:LEU:HD23	1:D:218:LEU:HA	1.82	0.43
2:H:19:GLU:HA	2:H:80:ASN:HA	2.00	0.43
1:C:511:THR:HG23	1:C:513:ALA:N	2.33	0.43
1:D:222:PRO:HD2	1:D:246:TYR:CZ	2.52	0.43
2:H:95:LEU:O	2:H:99:ILE:HG13	2.17	0.43
1:B:80:THR:OG1	1:B:214:ASP:OD1	2.21	0.43
1:B:241:LEU:HD23	1:B:241:LEU:HA	1.91	0.43
1:C:431:ASN:O	1:C:435:SER:HB2	2.19	0.43
1:A:260:PHE:HE1	1:A:395:THR:HG21	1.83	0.43
1:B:220:LYS:NZ	1:B:308:ASP:O	2.51	0.43
1:A:224:LYS:HG2	1:A:307:TYR:HD2	1.83	0.43
1:B:210:ILE:HB	1:B:214:ASP:HB2	1.99	0.43
1:B:489:MET:HA	1:B:489:MET:HE3	2.00	0.43
1:C:294:LYS:HD2	1:C:306:LEU:HD21	2.00	0.43
2:F:19:GLU:HA	2:F:80:ASN:HA	2.01	0.43
1:B:165:ASP:OD1	1:B:166:LYS:N	2.51	0.43
1:C:164:LYS:HB2	1:C:170:SER:OG	2.17	0.43
1:C:320:ILE:HD12	1:C:320:ILE:HA	1.87	0.43
1:B:401:ILE:HD11	1:B:479:GLY:HA2	2.01	0.43
1:B:63:HIS:CE1	1:B:382:LYS:HD2	2.54	0.43
2:E:34:LYS:HA	2:E:34:LYS:HD2	1.84	0.43
1:A:210:ILE:HB	1:A:214:ASP:HB2	2.00	0.43
1:B:51:PRO:HD2	3:B:600:FAD:O2A	2.19	0.43
1:B:294:LYS:HD2	1:B:306:LEU:HD21	2.01	0.43
2:G:15:ILE:HG12	2:G:21:VAL:HG11	2.01	0.43
1:A:371:LYS:O	1:A:375:ILE:HG13	2.19	0.42
1:D:162:LYS:HE3	1:D:170:SER:HB2	2.01	0.42
2:H:21:VAL:HG22	2:H:51:VAL:HB	2.01	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:431:ASN:O	1:A:435:SER:HB2	2.19	0.42
1:B:423:GLU:HG2	1:B:466:LYS:HG3	2.01	0.42
1:D:42:TYR:O	1:D:185:GLY:HA2	2.19	0.42
1:D:45:VAL:CG1	1:D:188:ILE:HG12	2.49	0.42
1:D:326:GLU:CD	1:D:326:GLU:H	2.22	0.42
1:D:349:ILE:HA	1:D:350:PRO:HD3	1.87	0.42
2:E:21:VAL:HG22	2:E:51:VAL:HB	2.01	0.42
1:B:438:HIS:CE1	1:B:535:SER:HG	2.29	0.42
1:D:244:LEU:HD12	1:D:244:LEU:HA	1.85	0.42
1:B:162:LYS:HE3	1:B:170:SER:HB2	2.00	0.42
1:D:210:ILE:HB	1:D:214:ASP:HB2	2.00	0.42
1:D:294:LYS:HD2	1:D:306:LEU:HD21	2.02	0.42
2:F:11:PHE:HE1	2:F:23:VAL:HG21	1.85	0.42
1:C:165:ASP:OD1	1:C:166:LYS:N	2.52	0.42
1:A:78:GLN:NE2	1:A:209:SER:O	2.53	0.42
1:D:241:LEU:HD23	1:D:241:LEU:HA	1.88	0.42
1:D:252:VAL:HG12	1:D:254:SER:O	2.19	0.42
2:E:15:ILE:HG12	2:E:21:VAL:HG11	2.01	0.42
2:H:15:ILE:HG12	2:H:21:VAL:HG11	2.01	0.42
1:A:336:ASN:HB3	1:A:338:LYS:HG3	2.01	0.42
1:B:99:MET:HG2	1:B:130:LEU:HD21	2.01	0.42
1:A:42:TYR:O	1:A:185:GLY:HA2	2.19	0.42
1:C:423:GLU:HG2	1:C:466:LYS:HG3	2.01	0.42
1:C:260:PHE:HE1	1:C:395:THR:HG21	1.85	0.42
1:D:320:ILE:HD12	1:D:323:LEU:HD12	2.02	0.42
2:E:61:SER:O	2:E:64:THR:HG23	2.20	0.42
1:B:42:TYR:O	1:B:185:GLY:HA2	2.20	0.41
2:E:64:THR:C	2:E:66:LYS:H	2.23	0.41
1:A:164:LYS:HB2	1:A:170:SER:OG	2.20	0.41
1:C:224:LYS:HG2	1:C:307:TYR:HD2	1.85	0.41
2:F:27:ALA:HB3	2:F:30:CYS:HB2	2.01	0.41
1:A:165:ASP:OD1	1:A:166:LYS:N	2.54	0.41
1:A:326:GLU:CD	1:A:326:GLU:H	2.23	0.41
2:G:57:VAL:O	2:G:64:THR:HG21	2.19	0.41
1:A:218:LEU:HD23	1:A:218:LEU:HA	1.82	0.41
1:D:74:LYS:NZ	1:D:319:ASP:OD1	2.51	0.41
2:E:77:VAL:HG22	2:E:85:ASP:HB3	2.02	0.41
2:F:15:ILE:HG12	2:F:21:VAL:HG11	2.02	0.41
1:C:241:LEU:HD23	1:C:241:LEU:HA	1.94	0.41
2:H:77:VAL:HG22	2:H:85:ASP:HB3	2.02	0.41
1:A:511:THR:HG23	1:A:513:ALA:H	1.86	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:260:PHE:HE1	1:D:395:THR:HG21	1.85	0.41
2:F:57:VAL:O	2:F:64:THR:HG21	2.20	0.41
2:F:64:THR:C	2:F:66:LYS:H	2.24	0.41
1:C:139:ARG:HB3	2:G:29:TRP:CD1	2.56	0.41
1:C:334:LYS:HA	1:C:334:LYS:HD2	1.91	0.41
1:B:320:ILE:HD12	1:B:320:ILE:HA	1.85	0.41
1:B:334:LYS:HD2	1:B:334:LYS:HA	1.93	0.41
1:B:450:TYR:OH	2:E:92:ASP:HB2	2.21	0.41
1:B:494:ARG:HE	1:B:494:ARG:HB2	1.78	0.41
1:D:371:LYS:O	1:D:375:ILE:HG13	2.21	0.41
2:E:57:VAL:O	2:E:64:THR:HG21	2.20	0.41
2:H:3:LYS:HE3	2:H:3:LYS:HB2	1.95	0.41
1:B:68:LEU:HD12	1:B:155:LYS:O	2.20	0.41
1:C:359:ALA:O	1:C:362:VAL:HG22	2.20	0.41
2:H:57:VAL:O	2:H:64:THR:HG21	2.20	0.40
1:A:222:PRO:HD2	1:A:246:TYR:CZ	2.56	0.40
1:D:193:GLY:HA2	1:D:357:ASP:HB2	2.03	0.40
2:E:87:LEU:C	2:E:88:LEU:HD12	2.41	0.40
1:A:232:TYR:HB2	1:A:397:ILE:HG23	2.03	0.40
1:B:511:THR:HG23	1:B:513:ALA:N	2.36	0.40
1:C:244:LEU:HD12	1:C:244:LEU:HA	1.84	0.40
1:D:164:LYS:HB2	1:D:170:SER:OG	2.21	0.40
1:D:320:ILE:HD12	1:D:320:ILE:HA	1.84	0.40
2:G:64:THR:C	2:G:66:LYS:H	2.25	0.40
1:A:63:HIS:CE1	1:A:382:LYS:HD2	2.57	0.40
1:A:162:LYS:HE3	1:A:170:SER:HB2	2.03	0.40
1:A:320:ILE:HD12	1:A:320:ILE:HA	1.86	0.40
1:B:511:THR:HG23	1:B:513:ALA:H	1.86	0.40
2:F:77:VAL:HG22	2:F:85:ASP:HB3	2.02	0.40
2:H:61:SER:O	2:H:64:THR:HG23	2.21	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	502/541 (93%)	471 (94%)	31 (6%)	0	100	100
1	B	502/541 (93%)	473 (94%)	29 (6%)	0	100	100
1	C	502/541 (93%)	472 (94%)	30 (6%)	0	100	100
1	D	502/541 (93%)	472 (94%)	30 (6%)	0	100	100
2	E	103/114 (90%)	93 (90%)	10 (10%)	0	100	100
2	F	103/114 (90%)	94 (91%)	9 (9%)	0	100	100
2	G	103/114 (90%)	94 (91%)	9 (9%)	0	100	100
2	H	103/114 (90%)	93 (90%)	10 (10%)	0	100	100
All	All	2420/2620 (92%)	2262 (94%)	158 (6%)	0	100	100

There are no Ramachandran outliers to report.

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	423/457 (93%)	396 (94%)	27 (6%)	17	25
1	B	423/457 (93%)	396 (94%)	27 (6%)	17	25
1	C	423/457 (93%)	398 (94%)	25 (6%)	19	29
1	D	423/457 (93%)	397 (94%)	26 (6%)	18	27
2	E	94/102 (92%)	86 (92%)	8 (8%)	10	14
2	F	94/102 (92%)	86 (92%)	8 (8%)	10	14
2	G	94/102 (92%)	86 (92%)	8 (8%)	10	14
2	H	94/102 (92%)	87 (93%)	7 (7%)	13	19
All	All	2068/2236 (92%)	1932 (93%)	136 (7%)	16	24

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

Mol	Chain	Res	Type
1	A	44	TYR
1	A	93	CYS
1	A	144	SER
1	A	160	LEU
1	A	163	LEU
1	A	201	ASP
1	A	218	LEU
1	A	244	LEU
1	A	255	ILE
1	A	256	VAL
1	A	267	LYS
1	A	270	LEU
1	A	277	VAL
1	A	286	LYS
1	A	292	ASP
1	A	304	SER
1	A	331	ASN
1	A	332	VAL
1	A	336	ASN
1	A	387	ILE
1	A	416	LEU
1	A	443	ILE
1	A	471	ARG
1	A	489	MET
1	A	511	THR
1	A	517	MET
1	A	540	CYS
1	B	44	TYR
1	B	56	SER
1	B	93	CYS
1	B	144	SER
1	B	160	LEU
1	B	163	LEU
1	B	201	ASP
1	B	218	LEU
1	B	244	LEU
1	B	256	VAL
1	B	267	LYS
1	B	270	LEU
1	B	277	VAL
1	B	286	LYS
1	B	292	ASP
1	B	304	SER

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Mol	Chain	Res	Type
1	B	331	ASN
1	B	332	VAL
1	B	336	ASN
1	B	387	ILE
1	B	416	LEU
1	B	443	ILE
1	B	448	ASP
1	B	471	ARG
1	B	489	MET
1	B	511	THR
1	B	517	MET
1	C	44	TYR
1	C	93	CYS
1	C	144	SER
1	C	160	LEU
1	C	163	LEU
1	C	201	ASP
1	C	218	LEU
1	C	244	LEU
1	C	256	VAL
1	C	267	LYS
1	C	270	LEU
1	C	277	VAL
1	C	286	LYS
1	C	292	ASP
1	C	304	SER
1	C	331	ASN
1	C	332	VAL
1	C	336	ASN
1	C	387	ILE
1	C	416	LEU
1	C	443	ILE
1	C	471	ARG
1	C	489	MET
1	C	511	THR
1	C	517	MET
1	D	44	TYR
1	D	93	CYS
1	D	144	SER
1	D	160	LEU
1	D	163	LEU
1	D	201	ASP

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Mol	Chain	Res	Type
1	D	218	LEU
1	D	244	LEU
1	D	256	VAL
1	D	267	LYS
1	D	270	LEU
1	D	277	VAL
1	D	286	LYS
1	D	289	THR
1	D	292	ASP
1	D	304	SER
1	D	331	ASN
1	D	332	VAL
1	D	336	ASN
1	D	387	ILE
1	D	416	LEU
1	D	443	ILE
1	D	471	ARG
1	D	489	MET
1	D	511	THR
1	D	517	MET
2	E	7	SER
2	E	34	LYS
2	E	46	THR
2	E	60	VAL
2	E	64	THR
2	E	72	MET
2	E	86	THR
2	E	97	GLN
2	F	7	SER
2	F	34	LYS
2	F	46	THR
2	F	60	VAL
2	F	64	THR
2	F	72	MET
2	F	86	THR
2	F	97	GLN
2	G	7	SER
2	G	34	LYS
2	G	46	THR
2	G	60	VAL
2	G	64	THR
2	G	72	MET

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Mol	Chain	Res	Type
2	G	86	THR
2	G	97	GLN
2	H	7	SER
2	H	34	LYS
2	H	46	THR
2	H	60	VAL
2	H	64	THR
2	H	86	THR
2	H	97	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	343	HIS
1	C	197	HIS

5.3.3 RNA

There are no RNA molecules in this entry.

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

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates

There are no monosaccharides in this entry.

5.6 Ligand geometry

4 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
3	FAD	B	600	-	53,58,58	2.15	9 (16%)	68,89,89	1.74	16 (23%)
3	FAD	A	600	-	53,58,58	2.27	7 (13%)	68,89,89	1.65	17 (25%)
3	FAD	C	600	-	53,58,58	2.21	11 (20%)	68,89,89	1.72	17 (25%)
3	FAD	D	600	-	53,58,58	2.17	8 (15%)	68,89,89	1.71	17 (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	B	600	-	-	9/30/50/50	0/6/6/6
3	FAD	A	600	-	-	7/30/50/50	0/6/6/6
3	FAD	C	600	-	-	10/30/50/50	0/6/6/6
3	FAD	D	600	-	-	8/30/50/50	0/6/6/6

All (35) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	600	FAD	O2-C2	10.12	1.43	1.24
3	C	600	FAD	O2-C2	9.09	1.41	1.24
3	D	600	FAD	O2-C2	9.04	1.41	1.24
3	B	600	FAD	O2-C2	8.84	1.40	1.24
3	A	600	FAD	O4-C4	8.46	1.39	1.23
3	B	600	FAD	O4-C4	8.31	1.39	1.23
3	D	600	FAD	O4-C4	8.27	1.39	1.23
3	C	600	FAD	O4-C4	8.22	1.39	1.23
3	D	600	FAD	C2B-C3B	-5.40	1.38	1.53
3	C	600	FAD	C2B-C3B	-5.39	1.38	1.53
3	A	600	FAD	C2B-C3B	-5.29	1.38	1.53
3	B	600	FAD	C2B-C3B	-5.08	1.39	1.53
3	A	600	FAD	C4X-N5	2.74	1.36	1.30
3	B	600	FAD	C4-N3	-2.67	1.33	1.38
3	D	600	FAD	C2A-N3A	2.55	1.36	1.32
3	D	600	FAD	C6A-N6A	2.53	1.43	1.34
3	C	600	FAD	C6A-N6A	2.52	1.43	1.34
3	A	600	FAD	O3'-C3'	-2.51	1.37	1.43
3	B	600	FAD	C6A-N6A	2.45	1.43	1.34
3	A	600	FAD	C6A-N6A	2.44	1.42	1.34
3	C	600	FAD	C4X-N5	2.39	1.35	1.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	600	FAD	C5X-N5	-2.36	1.34	1.39
3	C	600	FAD	O3'-C3'	-2.35	1.37	1.43
3	D	600	FAD	C4X-N5	2.32	1.35	1.30
3	B	600	FAD	O3'-C3'	-2.26	1.37	1.43
3	B	600	FAD	C4X-N5	2.26	1.35	1.30
3	C	600	FAD	C2A-N3A	2.19	1.35	1.32
3	C	600	FAD	C10-N1	2.19	1.37	1.33
3	D	600	FAD	C3B-C4B	-2.18	1.47	1.53
3	C	600	FAD	C2-N3	-2.17	1.34	1.39
3	B	600	FAD	C2A-N3A	2.17	1.35	1.32
3	D	600	FAD	C9A-N10	-2.13	1.37	1.41
3	C	600	FAD	C3B-C4B	-2.11	1.47	1.53
3	C	600	FAD	C4-N3	-2.08	1.35	1.38
3	A	600	FAD	C3B-C4B	-2.01	1.47	1.53

All (67) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	600	FAD	C1B-N9A-C4A	-4.75	118.30	126.64
3	B	600	FAD	O4B-C1B-C2B	-4.64	100.14	106.93
3	A	600	FAD	N3A-C2A-N1A	-4.28	121.99	128.68
3	B	600	FAD	C1B-N9A-C4A	-4.18	119.29	126.64
3	D	600	FAD	C4X-C10-N10	4.11	122.50	116.48
3	B	600	FAD	O5B-C5B-C4B	4.10	123.09	108.99
3	C	600	FAD	N3A-C2A-N1A	-4.02	122.40	128.68
3	C	600	FAD	C1B-N9A-C4A	-3.87	119.83	126.64
3	D	600	FAD	N3A-C2A-N1A	-3.86	122.64	128.68
3	C	600	FAD	O4B-C1B-C2B	-3.85	101.29	106.93
3	B	600	FAD	O5'-C5'-C4'	3.72	119.30	109.36
3	B	600	FAD	N3A-C2A-N1A	-3.72	122.87	128.68
3	D	600	FAD	C1'-N10-C9A	3.61	126.53	120.51
3	C	600	FAD	C4X-C10-N1	-3.51	116.59	124.73
3	C	600	FAD	C4-N3-C2	-3.35	119.44	125.64
3	B	600	FAD	C4X-C10-N1	-3.31	117.05	124.73
3	D	600	FAD	C4-C4X-N5	3.23	122.83	118.23
3	A	600	FAD	C10-N1-C2	3.20	123.31	116.90
3	D	600	FAD	C4-N3-C2	-3.15	119.82	125.64
3	C	600	FAD	O5B-C5B-C4B	3.14	119.79	108.99
3	B	600	FAD	C4-N3-C2	-3.14	119.85	125.64
3	C	600	FAD	C4X-C4-N3	3.12	121.12	113.19
3	D	600	FAD	O4B-C1B-C2B	-3.10	102.40	106.93
3	D	600	FAD	C3B-C2B-C1B	2.99	105.47	100.98

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	600	FAD	C4-C4X-N5	2.98	122.47	118.23
3	A	600	FAD	C4X-C4-N3	2.97	120.73	113.19
3	D	600	FAD	C4X-C4-N3	2.97	120.73	113.19
3	A	600	FAD	C4X-C10-N10	2.95	120.79	116.48
3	A	600	FAD	C4X-C10-N1	-2.92	117.95	124.73
3	D	600	FAD	C1B-N9A-C4A	-2.90	121.55	126.64
3	A	600	FAD	O5B-C5B-C4B	2.89	118.95	108.99
3	D	600	FAD	O5B-C5B-C4B	2.88	118.89	108.99
3	C	600	FAD	C10-N1-C2	2.87	122.64	116.90
3	C	600	FAD	C1'-N10-C9A	2.86	125.28	120.51
3	C	600	FAD	O5'-C5'-C4'	2.80	116.83	109.36
3	A	600	FAD	O5'-C5'-C4'	2.78	116.79	109.36
3	B	600	FAD	C4X-C4-N3	2.72	120.09	113.19
3	A	600	FAD	C4-N3-C2	-2.69	120.66	125.64
3	D	600	FAD	C10-N1-C2	2.69	122.28	116.90
3	B	600	FAD	C4X-C10-N10	2.66	120.36	116.48
3	B	600	FAD	C1'-N10-C9A	2.64	124.92	120.51
3	C	600	FAD	C4X-C10-N10	2.64	120.33	116.48
3	A	600	FAD	O4B-C1B-C2B	-2.63	103.08	106.93
3	D	600	FAD	C4X-C10-N1	-2.55	118.81	124.73
3	D	600	FAD	C10-C4X-N5	-2.52	119.50	124.86
3	D	600	FAD	O2-C2-N1	-2.48	117.72	121.83
3	A	600	FAD	C10-C4X-N5	-2.48	119.59	124.86
3	C	600	FAD	C4A-C5A-N7A	-2.47	106.82	109.40
3	C	600	FAD	C9-C9A-N10	2.39	125.07	121.84
3	B	600	FAD	C10-N1-C2	2.38	121.66	116.90
3	C	600	FAD	C10-C4X-N5	-2.37	119.83	124.86
3	A	600	FAD	C3B-C2B-C1B	2.30	104.44	100.98
3	C	600	FAD	O4-C4-C4X	-2.27	120.57	126.60
3	B	600	FAD	C10-C4X-N5	-2.26	120.06	124.86
3	A	600	FAD	C4A-C5A-N7A	-2.25	107.05	109.40
3	B	600	FAD	C6-C5X-C9A	2.25	122.13	118.94
3	A	600	FAD	O4-C4-C4X	-2.25	120.64	126.60
3	C	600	FAD	C9-C9A-C5X	-2.23	115.89	120.11
3	D	600	FAD	O5'-C5'-C4'	2.18	115.19	109.36
3	B	600	FAD	C4A-C5A-N7A	-2.18	107.13	109.40
3	D	600	FAD	O4-C4-C4X	-2.17	120.84	126.60
3	B	600	FAD	C9-C9A-C5X	-2.12	116.11	120.11
3	D	600	FAD	C2B-C3B-C4B	2.10	106.72	102.64
3	A	600	FAD	C2B-C3B-C4B	2.08	106.68	102.64
3	B	600	FAD	O4-C4-C4X	-2.06	121.12	126.60
3	C	600	FAD	C4-C4X-N5	2.05	121.15	118.23

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	600	FAD	C1'-N10-C9A	2.01	123.86	120.51

There are no chirality outliers.

All (34) torsion outliers are listed below:

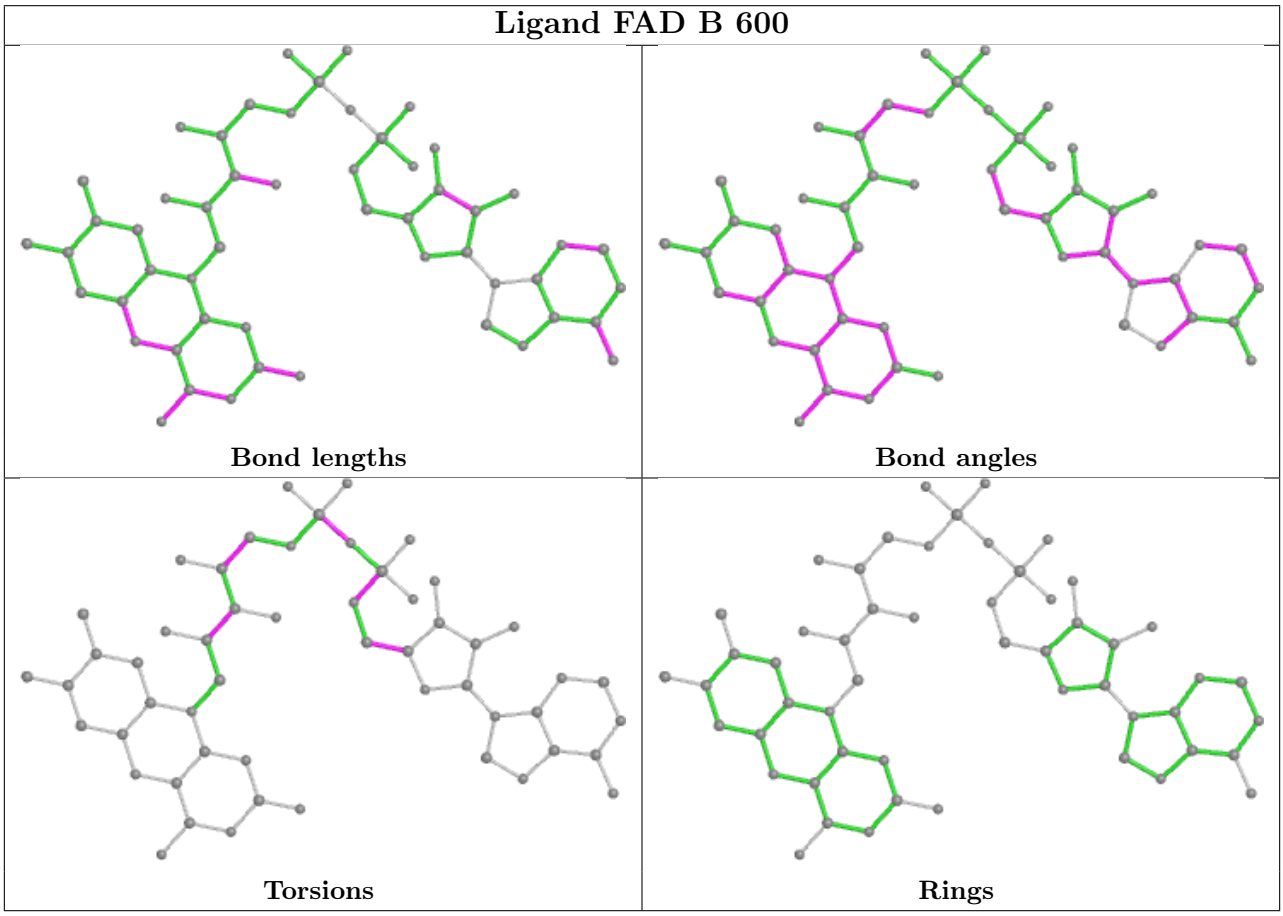
Mol	Chain	Res	Type	Atoms
3	C	600	FAD	C5B-O5B-PA-O1A
3	C	600	FAD	C5B-O5B-PA-O2A
3	C	600	FAD	C3B-C4B-C5B-O5B
3	C	600	FAD	C5'-O5'-P-O2P
3	C	600	FAD	C5'-O5'-P-O3P
3	D	600	FAD	O4'-C4'-C5'-O5'
3	B	600	FAD	O4B-C4B-C5B-O5B
3	B	600	FAD	C3B-C4B-C5B-O5B
3	C	600	FAD	O4B-C4B-C5B-O5B
3	D	600	FAD	O4B-C4B-C5B-O5B
3	C	600	FAD	C3'-C4'-C5'-O5'
3	D	600	FAD	C3B-C4B-C5B-O5B
3	D	600	FAD	P-O3P-PA-O1A
3	B	600	FAD	PA-O3P-P-O5'
3	D	600	FAD	PA-O3P-P-O5'
3	B	600	FAD	C5B-O5B-PA-O3P
3	B	600	FAD	O2'-C2'-C3'-C4'
3	A	600	FAD	C5'-O5'-P-O1P
3	B	600	FAD	C5B-O5B-PA-O2A
3	C	600	FAD	C5'-O5'-P-O1P
3	D	600	FAD	C5'-O5'-P-O1P
3	D	600	FAD	C5'-O5'-P-O2P
3	A	600	FAD	P-O3P-PA-O1A
3	B	600	FAD	O2'-C2'-C3'-O3'
3	A	600	FAD	PA-O3P-P-O5'
3	A	600	FAD	O4B-C4B-C5B-O5B
3	A	600	FAD	O4'-C4'-C5'-O5'
3	C	600	FAD	C5B-O5B-PA-O3P
3	D	600	FAD	C5'-O5'-P-O3P
3	A	600	FAD	P-O3P-PA-O2A
3	A	600	FAD	PA-O3P-P-O2P
3	B	600	FAD	C1'-C2'-C3'-O3'
3	B	600	FAD	O4'-C4'-C5'-O5'
3	C	600	FAD	O4'-C4'-C5'-O5'

There are no ring outliers.

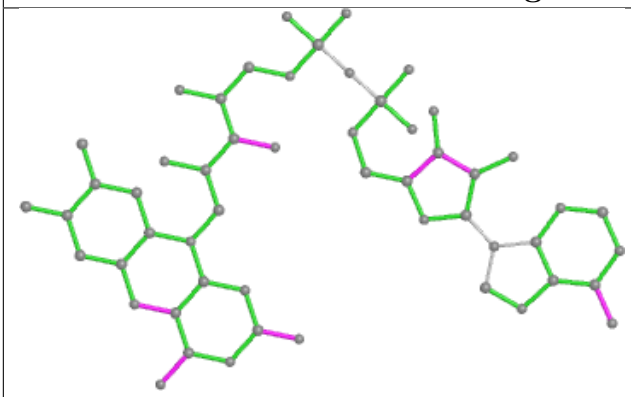
4 monomers are involved in 11 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	600	FAD	5	0
3	A	600	FAD	2	0
3	C	600	FAD	3	0
3	D	600	FAD	1	0

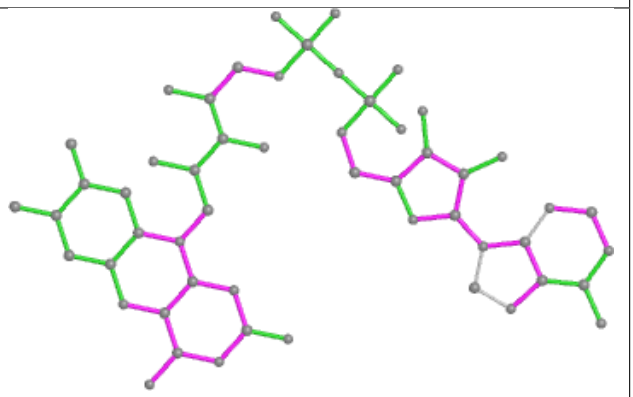
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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



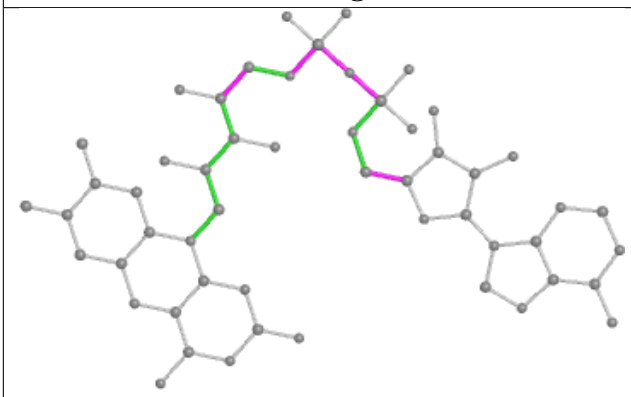
Ligand FAD A 600



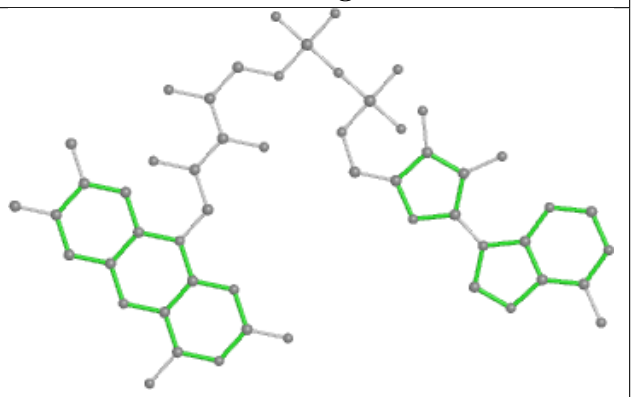
Bond lengths



Bond angles

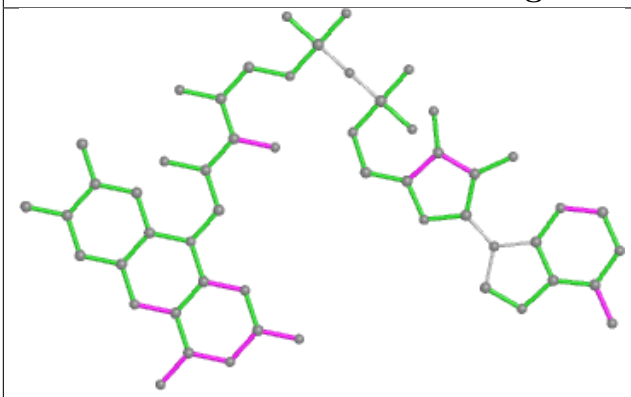


Torsions

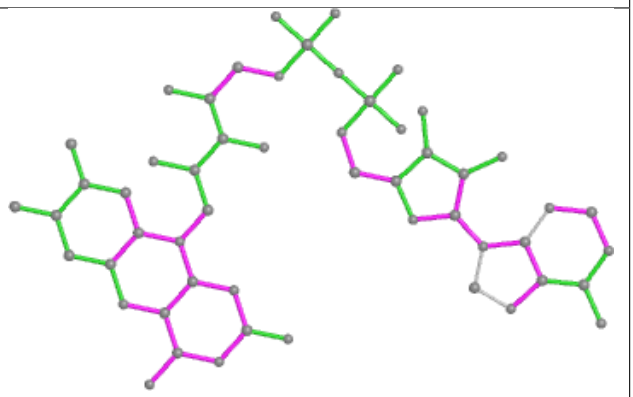


Rings

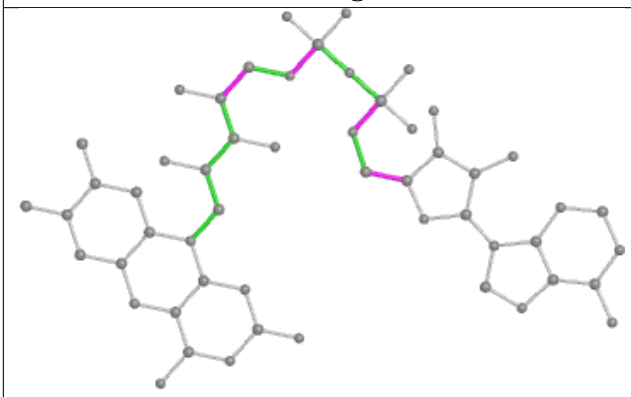
Ligand FAD C 600



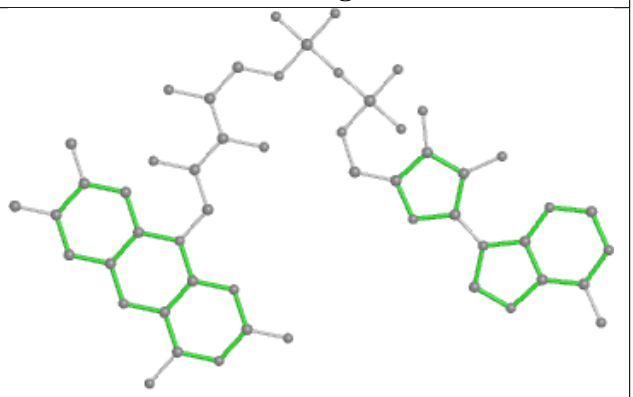
Bond lengths



Bond angles

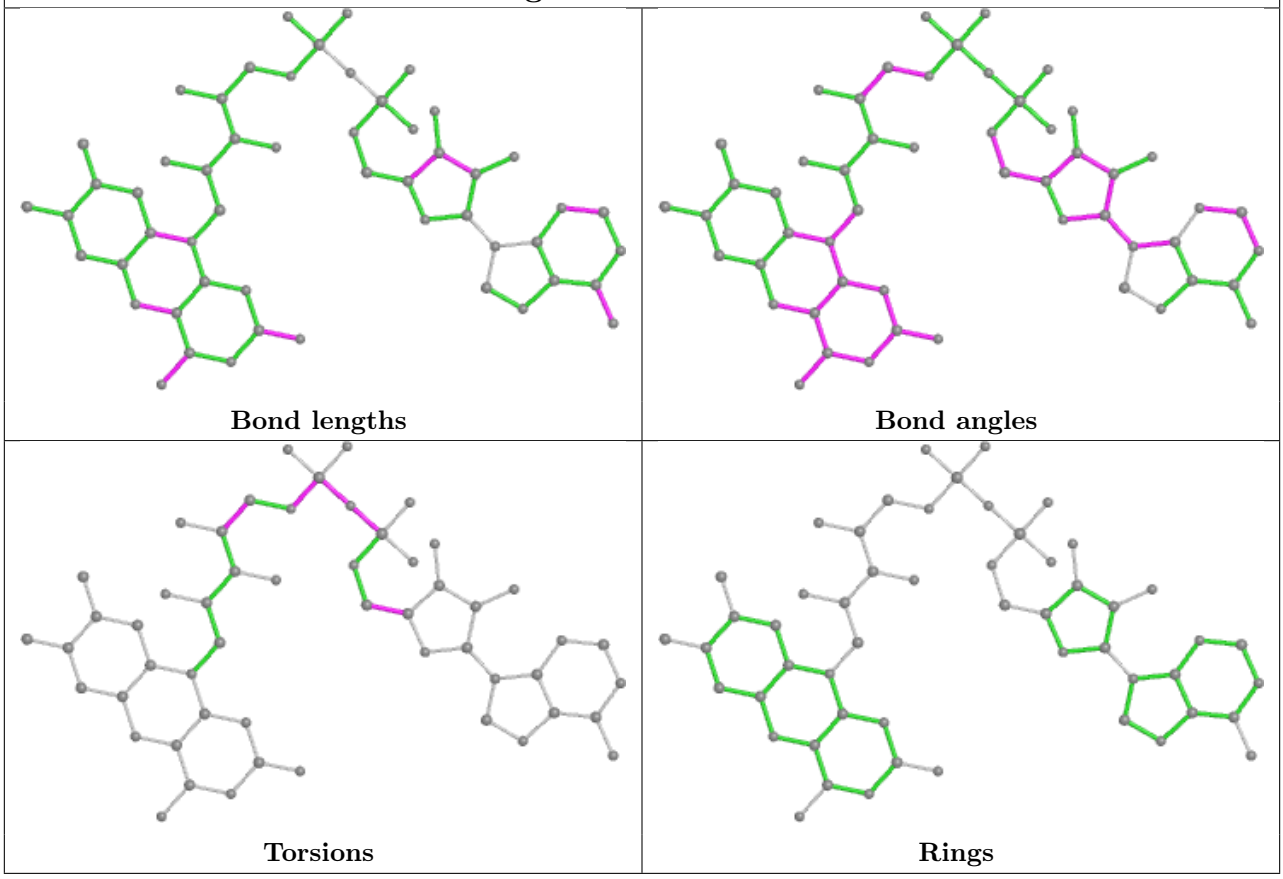


Torsions



Rings

Ligand FAD D 600



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	504/541 (93%)	0.12	11 (2%) 62 63	22, 39, 63, 78	0
1	B	504/541 (93%)	0.06	8 (1%) 72 73	19, 37, 60, 80	0
1	C	504/541 (93%)	0.12	12 (2%) 59 60	17, 40, 59, 79	0
1	D	504/541 (93%)	0.14	9 (1%) 68 70	20, 38, 62, 83	0
2	E	105/114 (92%)	2.44	47 (44%) 0 0	45, 61, 70, 74	105 (100%)
2	F	105/114 (92%)	2.89	60 (57%) 0 0	45, 65, 76, 79	105 (100%)
2	G	105/114 (92%)	3.55	78 (74%) 0 0	45, 65, 75, 82	105 (100%)
2	H	105/114 (92%)	1.51	28 (26%) 0 0	39, 54, 68, 77	105 (100%)
All	All	2436/2620 (92%)	0.54	253 (10%) 6 7	17, 42, 68, 83	420 (17%)

All (253) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	E	0	GLY	18.1
2	G	78	TYR	13.7
2	F	11	PHE	13.2
2	F	77	VAL	11.8
2	F	20	LEU	10.4
2	G	11	PHE	10.2
2	H	0	GLY	10.1
2	G	5	VAL	10.0
2	G	102	TYR	10.0
2	G	0	GLY	9.6
2	G	20	LEU	9.5
2	E	77	VAL	9.5
2	G	79	LYS	9.1
2	G	103	ALA	9.1
2	F	15	ILE	9.0
2	F	0	GLY	8.9

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Mol	Chain	Res	Type	RSRZ
2	E	78	TYR	8.7
2	F	50	MET	8.7
2	F	78	TYR	8.2
2	F	102	TYR	7.9
2	G	104	ALA	7.8
2	E	11	PHE	7.7
2	G	21	VAL	7.7
2	G	50	MET	7.3
2	F	14	ILE	7.3
2	E	15	ILE	6.9
2	G	77	VAL	6.8
2	E	20	LEU	6.7
2	F	21	VAL	6.6
2	E	102	TYR	6.6
2	E	5	VAL	6.5
2	G	15	ILE	6.3
2	E	103	ALA	6.3
2	F	5	VAL	6.2
2	E	50	MET	6.0
2	F	99	ILE	5.9
2	F	79	LYS	5.9
1	C	175	GLY	5.9
2	G	99	ILE	5.8
2	G	76	LYS	5.7
2	H	15	ILE	5.7
2	E	104	ALA	5.6
2	G	25	PHE	5.6
2	H	20	LEU	5.5
1	B	175	GLY	5.5
1	D	450	TYR	5.5
2	G	22	ILE	5.5
1	C	177	LEU	5.4
2	G	95	LEU	5.3
2	F	49	LYS	5.3
2	G	63	VAL	5.1
2	G	44	SER	5.1
2	H	78	TYR	5.1
2	E	27	ALA	5.0
2	G	101	LYS	5.0
2	G	7	SER	4.9
2	F	98	LEU	4.9
2	G	47	TYR	4.9

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Mol	Chain	Res	Type	RSRZ
2	E	53	ILE	4.9
1	A	450	TYR	4.9
2	G	14	ILE	4.9
2	G	98	LEU	4.6
2	G	39	PHE	4.6
2	F	82	SER	4.6
2	E	49	LYS	4.5
2	E	81	GLY	4.5
2	E	4	ILE	4.5
2	E	82	SER	4.5
2	H	11	PHE	4.4
2	F	90	ALA	4.4
2	H	14	ILE	4.4
2	G	16	SER	4.4
2	F	89	GLY	4.3
2	F	39	PHE	4.3
2	F	103	ALA	4.3
2	F	87	LEU	4.3
2	G	55	VAL	4.3
2	E	3	LYS	4.2
2	H	5	VAL	4.2
2	F	60	VAL	4.2
2	G	51	VAL	4.2
2	F	81	GLY	4.1
2	G	19	GLU	4.1
2	G	80	ASN	4.0
2	F	19	GLU	4.0
2	G	66	LYS	3.9
1	D	293	ASP	3.9
2	F	55	VAL	3.9
2	G	75	PHE	3.9
2	G	87	LEU	3.9
2	E	99	ILE	3.8
1	C	291	MET	3.8
1	D	541	GLY	3.8
2	G	82	SER	3.8
2	G	53	ILE	3.8
2	F	1	SER	3.8
2	G	54	LYS	3.8
2	F	95	LEU	3.7
2	E	40	TYR	3.7
2	G	49	LYS	3.7

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Mol	Chain	Res	Type	RSRZ
2	E	1	SER	3.6
2	H	84	VAL	3.6
2	G	4	ILE	3.6
1	A	283	ILE	3.6
2	F	51	VAL	3.6
2	G	45	LYS	3.6
2	G	90	ALA	3.6
2	F	45	LYS	3.6
2	E	28	GLU	3.5
2	G	10	GLU	3.5
2	F	34	LYS	3.5
2	G	84	VAL	3.5
2	E	86	THR	3.5
2	G	6	THR	3.5
2	E	98	LEU	3.4
2	F	22	ILE	3.4
2	F	13	SER	3.4
2	F	47	TYR	3.4
1	A	541	GLY	3.4
2	F	4	ILE	3.4
2	G	81	GLY	3.4
2	F	3	LYS	3.4
2	H	50	MET	3.4
2	H	19	GLU	3.4
2	E	39	PHE	3.3
2	G	52	PHE	3.3
2	E	2	VAL	3.3
2	G	28	GLU	3.3
2	G	74	THR	3.3
2	G	69	ILE	3.2
2	F	104	ALA	3.2
1	D	291	MET	3.2
2	F	2	VAL	3.2
2	F	75	PHE	3.2
2	E	48	THR	3.2
2	F	10	GLU	3.2
1	B	177	LEU	3.2
2	E	95	LEU	3.1
2	F	88	LEU	3.1
2	E	90	ALA	3.1
2	H	27	ALA	3.1
2	G	17	GLN	3.1

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Mol	Chain	Res	Type	RSRZ
2	H	60	VAL	3.1
2	E	16	SER	3.1
2	H	39	PHE	3.1
1	B	174	LYS	3.0
1	A	539	LYS	3.0
2	G	96	LYS	3.0
1	C	38	HIS	2.9
2	H	2	VAL	2.9
2	G	59	GLU	2.9
1	A	253	ARG	2.9
2	F	17	GLN	2.9
2	F	76	LYS	2.9
2	F	101	LYS	2.9
2	G	65	GLU	2.9
2	G	24	ASP	2.9
2	G	64	THR	2.8
2	G	86	THR	2.8
2	E	66	LYS	2.8
2	H	81	GLY	2.8
2	F	63	VAL	2.8
2	F	84	VAL	2.8
2	E	43	CYS	2.8
2	E	51	VAL	2.8
2	G	23	VAL	2.8
2	H	18	ASN	2.8
2	F	6	THR	2.8
2	G	1	SER	2.7
2	H	1	SER	2.7
2	E	46	THR	2.7
2	G	18	ASN	2.7
1	D	173	LEU	2.7
2	E	54	LYS	2.7
1	A	284	LEU	2.7
1	D	296	LEU	2.7
2	H	4	ILE	2.7
2	G	85	ASP	2.7
2	H	28	GLU	2.7
2	G	70	THR	2.7
2	G	13	SER	2.6
2	G	40	TYR	2.6
2	F	85	ASP	2.6
2	G	38	PRO	2.6

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Mol	Chain	Res	Type	RSRZ
1	A	306	LEU	2.6
2	G	32	PRO	2.6
1	A	538	GLY	2.6
2	H	6	THR	2.6
2	E	63	VAL	2.6
2	E	84	VAL	2.5
2	G	8	GLN	2.5
2	F	9	ALA	2.5
2	G	89	GLY	2.5
2	E	47	TYR	2.5
1	C	176	ASP	2.5
2	H	3	LYS	2.5
2	H	79	LYS	2.5
2	E	42	GLU	2.5
2	F	52	PHE	2.5
1	B	291	MET	2.5
2	G	62	GLU	2.5
2	F	96	LYS	2.5
2	G	43	CYS	2.5
2	G	42	GLU	2.4
2	H	49	LYS	2.4
2	E	55	VAL	2.4
2	G	26	PHE	2.4
1	B	179	LYS	2.4
2	E	60	VAL	2.4
2	F	48	THR	2.4
1	D	320	ILE	2.4
2	H	80	ASN	2.4
1	B	298	GLU	2.4
2	F	86	THR	2.4
2	F	66	LYS	2.4
2	G	35	ARG	2.4
1	D	286	LYS	2.3
2	F	53	ILE	2.3
2	E	80	ASN	2.3
2	E	32	PRO	2.3
2	G	36	ILE	2.3
2	F	37	ALA	2.3
1	C	64	GLY	2.3
2	F	23	VAL	2.3
2	F	42	GLU	2.3
1	A	293	ASP	2.3

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Mol	Chain	Res	Type	RSRZ
2	E	76	LYS	2.3
1	C	350	PRO	2.2
1	D	219	LYS	2.2
1	A	320	ILE	2.2
2	H	55	VAL	2.2
1	C	538	GLY	2.2
2	E	14	ILE	2.2
1	A	286	LYS	2.2
2	G	41	GLU	2.2
2	H	65	GLU	2.2
1	C	188	ILE	2.2
2	G	67	GLU	2.2
2	H	8	GLN	2.2
2	G	57	VAL	2.1
1	C	296	LEU	2.1
2	F	100	GLU	2.1
2	E	21	VAL	2.1
2	F	28	GLU	2.1
1	B	153	LYS	2.1
2	E	101	LYS	2.1
2	G	88	LEU	2.1
2	F	41	GLU	2.0
2	H	42	GLU	2.0
2	G	83	SER	2.0
1	C	174	LYS	2.0
1	C	387	ILE	2.0
1	B	157	ILE	2.0

6.2 Non-standard residues in protein, DNA, RNA chains (i)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates (i)

There are no 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,

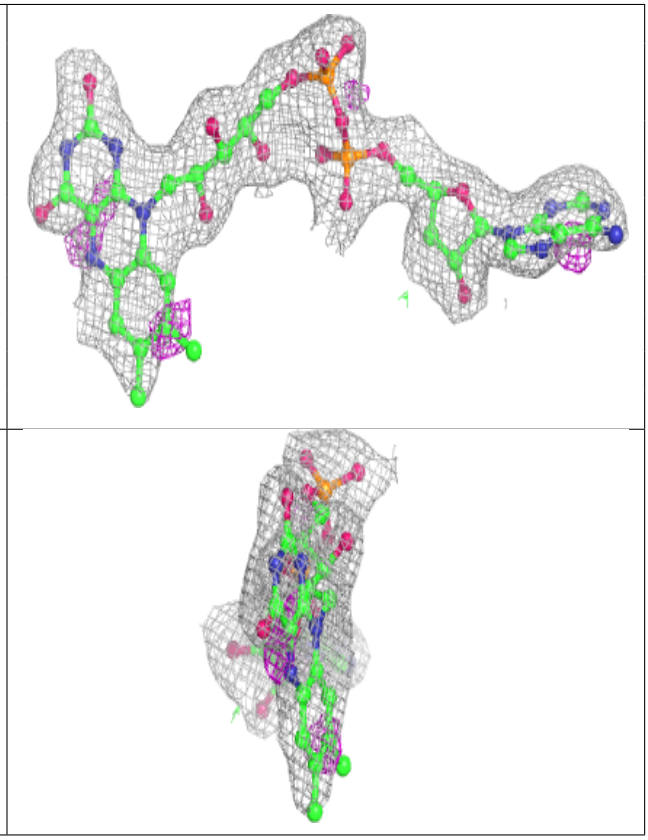
median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

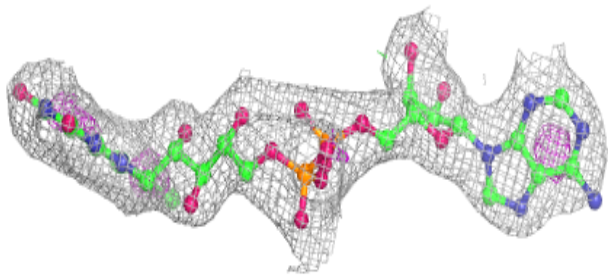
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	FAD	B	600	53/53	0.92	0.14	31,43,49,54	0
3	FAD	C	600	53/53	0.94	0.15	32,44,56,58	0
3	FAD	D	600	53/53	0.94	0.13	28,38,45,45	0
3	FAD	A	600	53/53	0.95	0.12	30,42,47,48	0

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 B 600:

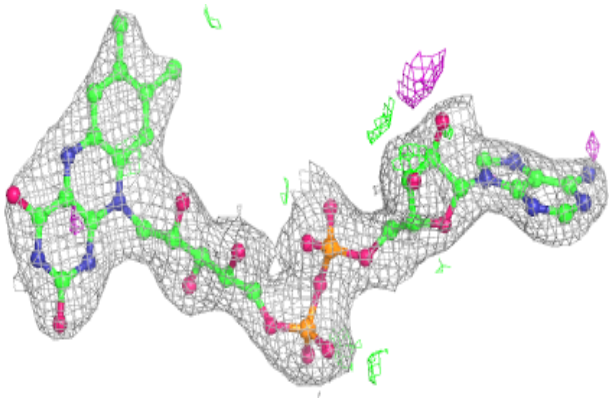
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

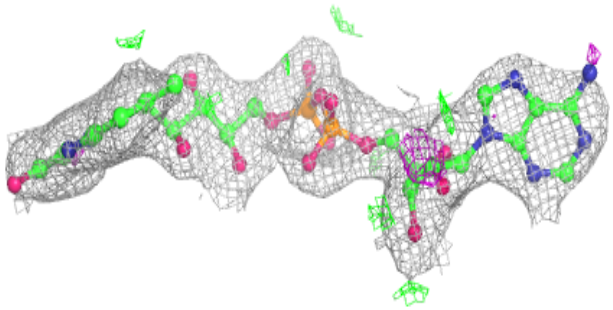


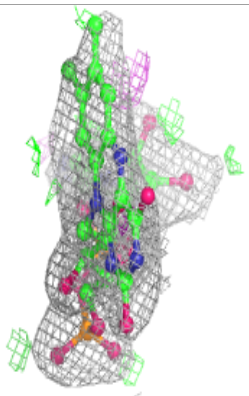


Electron density around FAD C 600:

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

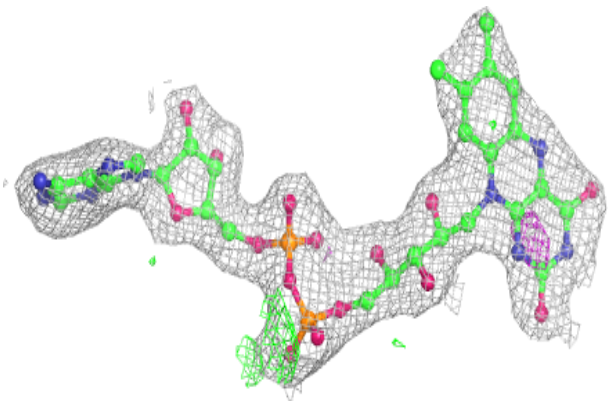


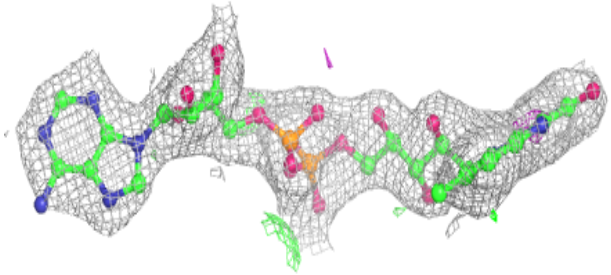


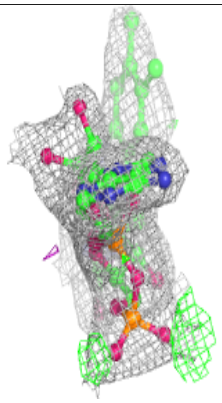


Electron density around FAD D 600:

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

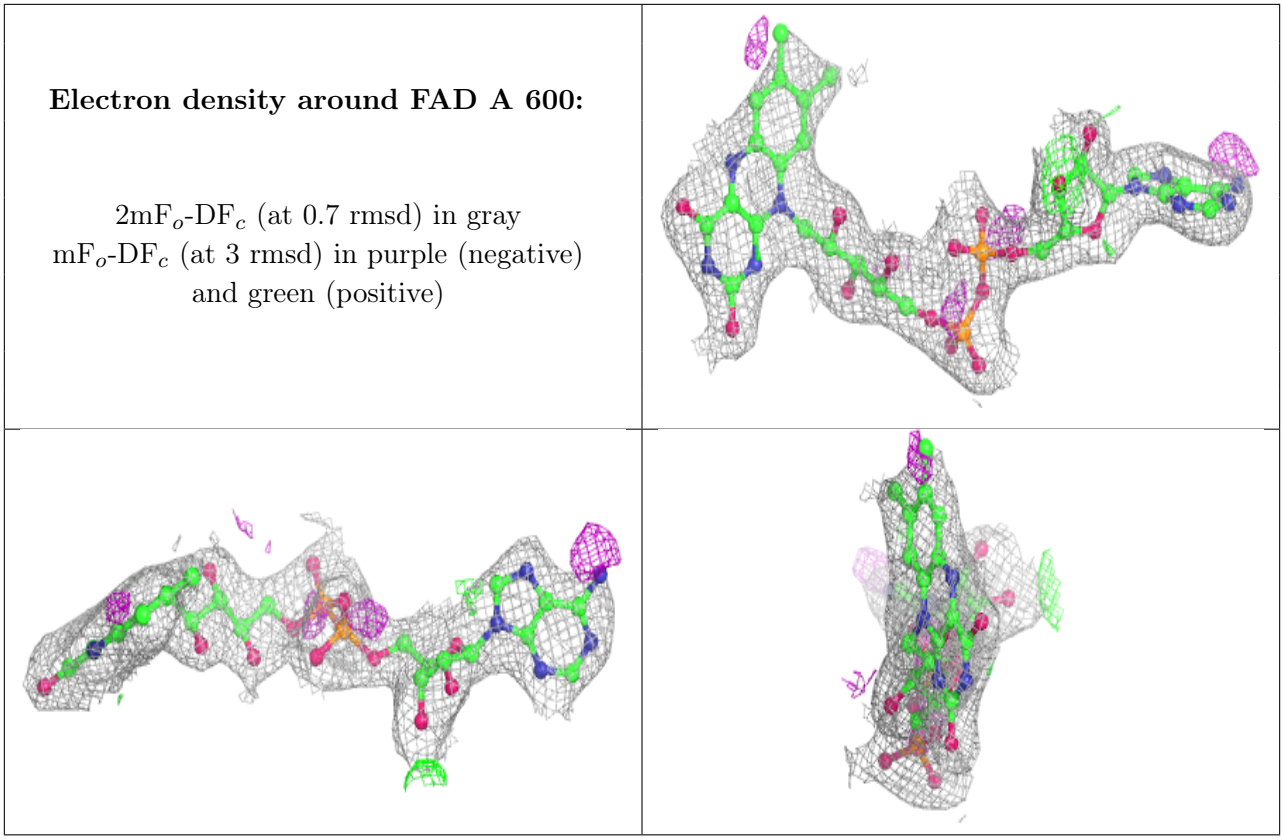






Electron density around FAD A 600:

$2mF_o$-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.