WORLDWIDE wwPDB PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

Oct 23, 2023 – 01:23 PM EDT

PDB ID	:	3APY
Title	:	Properties and crystal structure of methylenetetrahydrofolate reductase from Thermus thermophilus HB8
Authors	:	Yamada, K.
Deposited on	:	2010-10-21
Resolution	:	2.80 Å(reported)

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

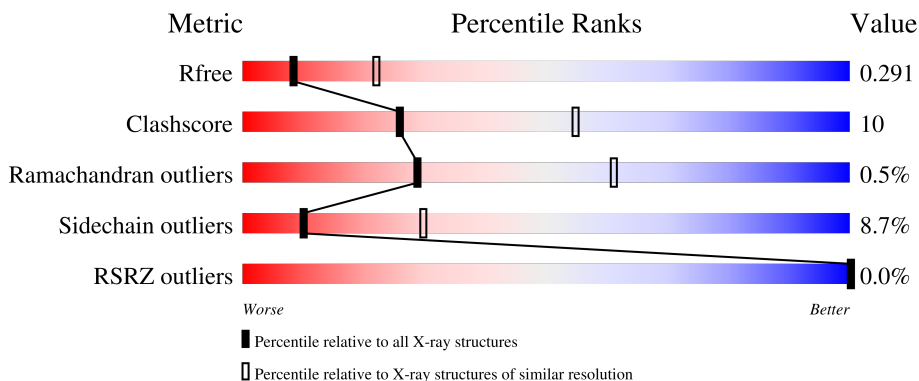|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1   Overall quality at a glance ⓘ

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

The reported resolution of this entry is 2.80 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	Percentile Ranks	Value
Rfree		0.291
Clashscore		10
Ramachandran outliers		0.5%
Sidechain outliers		8.7%
RSRZ outliers		0.0%

Worse   *Better*

■ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	3140 (2.80-2.80)
Clashscore	141614	3569 (2.80-2.80)
Ramachandran outliers	138981	3498 (2.80-2.80)
Sidechain outliers	138945	3500 (2.80-2.80)
RSRZ outliers	127900	3078 (2.80-2.80)

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	310	67% 23% • 6%
1	B	310	74% 17% • 6%
1	C	310	72% 20% • 6%
1	D	310	74% 16% • 6%
1	E	310	70% 21% • 6%

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Mol	Chain	Length	Quality of chain
1	F	310	71% 21% 6%
1	G	310	69% 21% 6%
1	H	310	73% 18% 6%

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 19755 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 Methylenetetrahydrofolate reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	291	Total	C	N	O	S	0	0	0
			2302	1469	422	406	5			
1	B	291	Total	C	N	O	S	0	0	0
			2302	1469	422	406	5			
1	C	291	Total	C	N	O	S	0	0	0
			2302	1469	422	406	5			
1	D	291	Total	C	N	O	S	0	0	0
			2302	1469	422	406	5			
1	E	291	Total	C	N	O	S	0	0	0
			2302	1469	422	406	5			
1	F	291	Total	C	N	O	S	0	0	0
			2302	1469	422	406	5			
1	G	291	Total	C	N	O	S	0	0	0
			2302	1469	422	406	5			
1	H	291	Total	C	N	O	S	0	0	0
			2302	1469	422	406	5			

There are 112 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	297	ALA	-	expression tag	UNP Q5SLG6
A	298	LYS	-	expression tag	UNP Q5SLG6
A	299	LEU	-	expression tag	UNP Q5SLG6
A	300	ALA	-	expression tag	UNP Q5SLG6
A	301	ALA	-	expression tag	UNP Q5SLG6
A	302	ALA	-	expression tag	UNP Q5SLG6
A	303	LEU	-	expression tag	UNP Q5SLG6
A	304	GLU	-	expression tag	UNP Q5SLG6
A	305	HIS	-	expression tag	UNP Q5SLG6
A	306	HIS	-	expression tag	UNP Q5SLG6
A	307	HIS	-	expression tag	UNP Q5SLG6
A	308	HIS	-	expression tag	UNP Q5SLG6
A	309	HIS	-	expression tag	UNP Q5SLG6

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Chain	Residue	Modelled	Actual	Comment	Reference
A	310	HIS	-	expression tag	UNP Q5SLG6
B	297	ALA	-	expression tag	UNP Q5SLG6
B	298	LYS	-	expression tag	UNP Q5SLG6
B	299	LEU	-	expression tag	UNP Q5SLG6
B	300	ALA	-	expression tag	UNP Q5SLG6
B	301	ALA	-	expression tag	UNP Q5SLG6
B	302	ALA	-	expression tag	UNP Q5SLG6
B	303	LEU	-	expression tag	UNP Q5SLG6
B	304	GLU	-	expression tag	UNP Q5SLG6
B	305	HIS	-	expression tag	UNP Q5SLG6
B	306	HIS	-	expression tag	UNP Q5SLG6
B	307	HIS	-	expression tag	UNP Q5SLG6
B	308	HIS	-	expression tag	UNP Q5SLG6
B	309	HIS	-	expression tag	UNP Q5SLG6
B	310	HIS	-	expression tag	UNP Q5SLG6
C	297	ALA	-	expression tag	UNP Q5SLG6
C	298	LYS	-	expression tag	UNP Q5SLG6
C	299	LEU	-	expression tag	UNP Q5SLG6
C	300	ALA	-	expression tag	UNP Q5SLG6
C	301	ALA	-	expression tag	UNP Q5SLG6
C	302	ALA	-	expression tag	UNP Q5SLG6
C	303	LEU	-	expression tag	UNP Q5SLG6
C	304	GLU	-	expression tag	UNP Q5SLG6
C	305	HIS	-	expression tag	UNP Q5SLG6
C	306	HIS	-	expression tag	UNP Q5SLG6
C	307	HIS	-	expression tag	UNP Q5SLG6
C	308	HIS	-	expression tag	UNP Q5SLG6
C	309	HIS	-	expression tag	UNP Q5SLG6
C	310	HIS	-	expression tag	UNP Q5SLG6
D	297	ALA	-	expression tag	UNP Q5SLG6
D	298	LYS	-	expression tag	UNP Q5SLG6
D	299	LEU	-	expression tag	UNP Q5SLG6
D	300	ALA	-	expression tag	UNP Q5SLG6
D	301	ALA	-	expression tag	UNP Q5SLG6
D	302	ALA	-	expression tag	UNP Q5SLG6
D	303	LEU	-	expression tag	UNP Q5SLG6
D	304	GLU	-	expression tag	UNP Q5SLG6
D	305	HIS	-	expression tag	UNP Q5SLG6
D	306	HIS	-	expression tag	UNP Q5SLG6
D	307	HIS	-	expression tag	UNP Q5SLG6
D	308	HIS	-	expression tag	UNP Q5SLG6
D	309	HIS	-	expression tag	UNP Q5SLG6

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Chain	Residue	Modelled	Actual	Comment	Reference
D	310	HIS	-	expression tag	UNP Q5SLG6
E	297	ALA	-	expression tag	UNP Q5SLG6
E	298	LYS	-	expression tag	UNP Q5SLG6
E	299	LEU	-	expression tag	UNP Q5SLG6
E	300	ALA	-	expression tag	UNP Q5SLG6
E	301	ALA	-	expression tag	UNP Q5SLG6
E	302	ALA	-	expression tag	UNP Q5SLG6
E	303	LEU	-	expression tag	UNP Q5SLG6
E	304	GLU	-	expression tag	UNP Q5SLG6
E	305	HIS	-	expression tag	UNP Q5SLG6
E	306	HIS	-	expression tag	UNP Q5SLG6
E	307	HIS	-	expression tag	UNP Q5SLG6
E	308	HIS	-	expression tag	UNP Q5SLG6
E	309	HIS	-	expression tag	UNP Q5SLG6
E	310	HIS	-	expression tag	UNP Q5SLG6
F	297	ALA	-	expression tag	UNP Q5SLG6
F	298	LYS	-	expression tag	UNP Q5SLG6
F	299	LEU	-	expression tag	UNP Q5SLG6
F	300	ALA	-	expression tag	UNP Q5SLG6
F	301	ALA	-	expression tag	UNP Q5SLG6
F	302	ALA	-	expression tag	UNP Q5SLG6
F	303	LEU	-	expression tag	UNP Q5SLG6
F	304	GLU	-	expression tag	UNP Q5SLG6
F	305	HIS	-	expression tag	UNP Q5SLG6
F	306	HIS	-	expression tag	UNP Q5SLG6
F	307	HIS	-	expression tag	UNP Q5SLG6
F	308	HIS	-	expression tag	UNP Q5SLG6
F	309	HIS	-	expression tag	UNP Q5SLG6
F	310	HIS	-	expression tag	UNP Q5SLG6
G	297	ALA	-	expression tag	UNP Q5SLG6
G	298	LYS	-	expression tag	UNP Q5SLG6
G	299	LEU	-	expression tag	UNP Q5SLG6
G	300	ALA	-	expression tag	UNP Q5SLG6
G	301	ALA	-	expression tag	UNP Q5SLG6
G	302	ALA	-	expression tag	UNP Q5SLG6
G	303	LEU	-	expression tag	UNP Q5SLG6
G	304	GLU	-	expression tag	UNP Q5SLG6
G	305	HIS	-	expression tag	UNP Q5SLG6
G	306	HIS	-	expression tag	UNP Q5SLG6
G	307	HIS	-	expression tag	UNP Q5SLG6
G	308	HIS	-	expression tag	UNP Q5SLG6
G	309	HIS	-	expression tag	UNP Q5SLG6

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Chain	Residue	Modelled	Actual	Comment	Reference
G	310	HIS	-	expression tag	UNP Q5SLG6
H	297	ALA	-	expression tag	UNP Q5SLG6
H	298	LYS	-	expression tag	UNP Q5SLG6
H	299	LEU	-	expression tag	UNP Q5SLG6
H	300	ALA	-	expression tag	UNP Q5SLG6
H	301	ALA	-	expression tag	UNP Q5SLG6
H	302	ALA	-	expression tag	UNP Q5SLG6
H	303	LEU	-	expression tag	UNP Q5SLG6
H	304	GLU	-	expression tag	UNP Q5SLG6
H	305	HIS	-	expression tag	UNP Q5SLG6
H	306	HIS	-	expression tag	UNP Q5SLG6
H	307	HIS	-	expression tag	UNP Q5SLG6
H	308	HIS	-	expression tag	UNP Q5SLG6
H	309	HIS	-	expression tag	UNP Q5SLG6
H	310	HIS	-	expression tag	UNP Q5SLG6

- Molecule 2 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$).

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

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	D	1	Total 53	C 27	N 9	O 15	P 2	0	0
2	E	1	Total 53	C 27	N 9	O 15	P 2	0	0
2	F	1	Total 53	C 27	N 9	O 15	P 2	0	0
2	G	1	Total 53	C 27	N 9	O 15	P 2	0	0
2	H	1	Total 53	C 27	N 9	O 15	P 2	0	0

- Molecule 3 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total 1	Cl 1	0	0
3	D	1	Total 1	Cl 1	0	0
3	E	1	Total 1	Cl 1	0	0
3	F	1	Total 1	Cl 1	0	0
3	G	1	Total 1	Cl 1	0	0
3	H	1	Total 1	Cl 1	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	112	Total 112	O 112	0	0
4	B	111	Total 111	O 111	0	0
4	C	117	Total 117	O 117	0	0
4	D	97	Total 97	O 97	0	0
4	E	127	Total 127	O 127	0	0
4	F	119	Total 119	O 119	0	0

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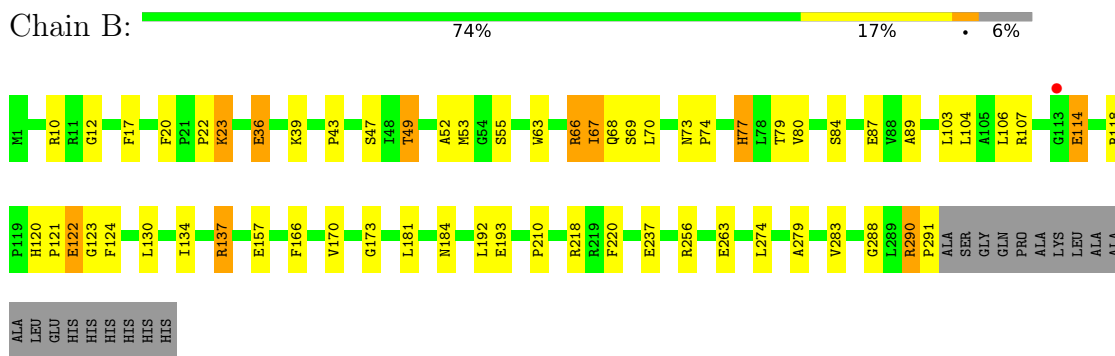| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	G	111	Total 111	O 111	0	0
4	H	115	Total 115	O 115	0	0

3 Residue-property plots ⓘ

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

- Molecule 1: Methylenetetrahydrofolate reductase
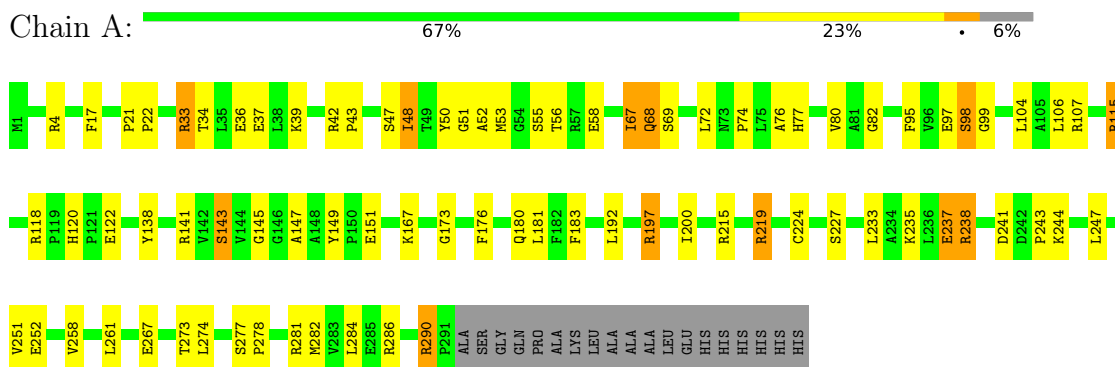
Chain A:

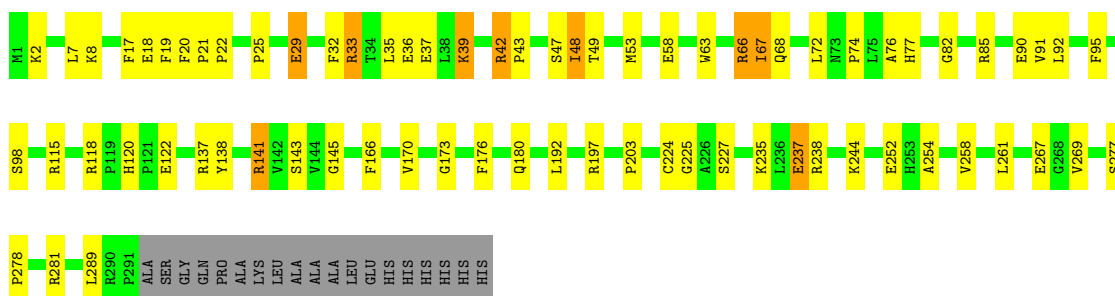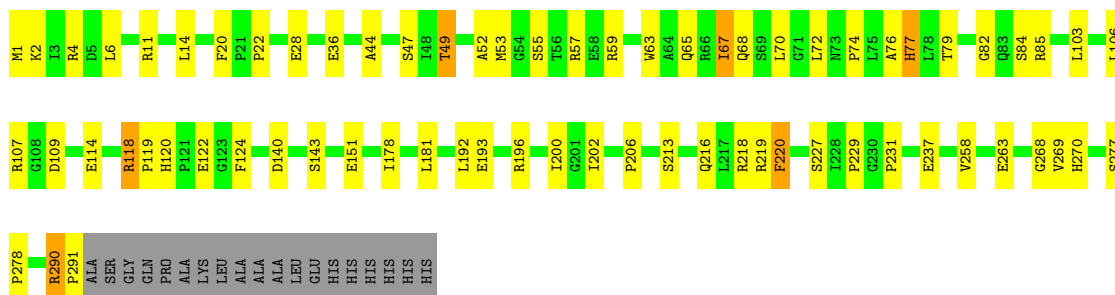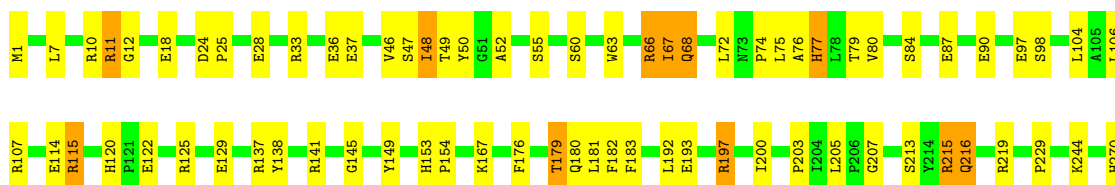
- Molecule 1: Methylenetetrahydrofolate reductase

Chain B:

- Molecule 1: Methylenetetrahydrofolate reductase

Chain C:

• Molecule 1: Methylenetetrahydrofolate reductase

Chain D:
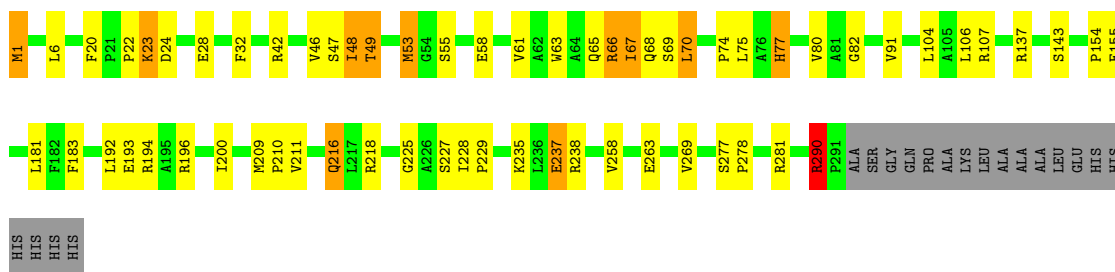
• Molecule 1: Methylenetetrahydrofolate reductase

Chain E:

• Molecule 1: Methylenetetrahydrofolate reductase

Chain F:

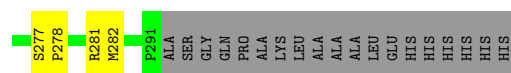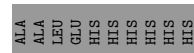• Molecule 1: Methylenetetrahydrofolate reductase

Chain G:

S277 P278 R281 M282 P291 ALA SER GLY GLN PRO ALA LYS LEU ALA ALA ALA LEU GLU HIS HIS HIS HIS HIS HIS

• Molecule 1: Methylenetetrahydrofolate reductase

Chain H:

73%   18%   •   6%

M1 L6 L7 K8 E18 F19 F20 P21 P22 K23 E26 G27 E28 E29 T34 L35 E36 R42 P43 S47 I48 T49 S55 R66 I67 L72 N73 P74 H77 L78 T79 V80 S84 R85 K86 E87 V91 L104 A105 L106 R107 G108 D109 P110 E114 R115

R118 P119 H120 G123 R137 S143 H153 P154 G173 L174 D175 L181 F182 F183 L192 E193 R194 P203 P210 S213 Q216 L217 R218 S227 K235 L236 E237 E263 T273 S277 L289 R290 P291 ALA SER GLY GLN PRO ALA LYS LEU ALA

ALA ALA LEU GLU HIS HIS HIS HIS HIS HIS

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	116.59Å 90.93Å 125.15Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.96 – 2.80 19.96 – 2.80	Depositor EDS
% Data completeness (in resolution range)	93.8 (19.96-2.80) 93.8 (19.96-2.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	5.64 (at 2.79Å)	Xtriage
Refinement program	REFMAC 5.5.0102	Depositor
R, R_{free}	0.204 , 0.306 0.203 , 0.291	Depositor DCC
R_{free} test set	3050 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å^2)	25.7	Xtriage
Anisotropy	0.092	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 2.9	EDS
L-test for twinning[2]	$< |L| > = 0.48, < L^2 > = 0.31$	Xtriage
Estimated twinning fraction	0.459 for h,-k,-l	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	19755	wwPDB-VP
Average B, all atoms (Å^2)	19.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 55.73 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 3.0318e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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[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, CL

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	0.70	0/2357	0.78	1/3185 (0.0%)
1	B	0.67	0/2357	0.73	0/3185
1	C	0.71	0/2357	0.77	1/3185 (0.0%)
1	D	0.68	0/2357	0.75	0/3185
1	E	0.70	0/2357	0.74	1/3185 (0.0%)
1	F	0.69	0/2357	0.73	0/3185
1	G	0.71	0/2357	0.75	0/3185
1	H	0.65	0/2357	0.72	0/3185
All	All	0.69	0/18856	0.75	3/25480 (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	F	0	1

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	51	GLY	N-CA-C	-7.63	94.02	113.10
1	C	52	ALA	N-CA-C	-6.78	92.70	111.00
1	E	33	ARG	NE-CZ-NH1	5.18	122.89	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	F	290	ARG	Peptide

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	2302	0	2319	71	0
1	B	2302	0	2319	46	0
1	C	2302	0	2319	47	0
1	D	2302	0	2319	46	0
1	E	2302	0	2319	55	0
1	F	2302	0	2319	45	0
1	G	2302	0	2319	66	0
1	H	2302	0	2319	39	0
2	A	53	0	31	5	0
2	B	53	0	31	2	0
2	C	53	0	31	1	0
2	D	53	0	31	1	0
2	E	53	0	31	0	0
2	F	53	0	31	2	0
2	G	53	0	31	3	0
2	H	53	0	31	1	0
3	A	1	0	0	0	0
3	D	1	0	0	0	0
3	E	1	0	0	0	0
3	F	1	0	0	0	0
3	G	1	0	0	1	0
3	H	1	0	0	0	0
4	A	112	0	0	6	0
4	B	111	0	0	5	0
4	C	117	0	0	7	0
4	D	97	0	0	4	0
4	E	127	0	0	7	0
4	F	119	0	0	5	0
4	G	111	0	0	3	0
4	H	115	0	0	7	0
All	All	19755	0	18800	395	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 10.

All (395) 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:D:67:ILE:HD11	1:D:74:PRO:HB3	1.36	1.04
1:A:290:ARG:HG2	1:A:290:ARG:HH11	1.24	0.99
1:H:290:ARG:O	1:H:290:ARG:HD3	1.61	0.99
1:A:52:ALA:HB2	1:A:56:THR:HG23	1.46	0.98
1:A:237:GLU:HG3	1:B:218:ARG:HH12	1.27	0.98
1:B:291:PRO:HG3	4:B:520:HOH:O	1.64	0.96
1:D:32:PHE:HZ	1:D:66:ARG:HD3	1.32	0.95
1:F:65:GLN:HA	1:F:68:GLN:HE21	1.32	0.92
1:A:238:ARG:HH11	1:A:238:ARG:HG2	1.36	0.91
1:E:53:MET:HE3	1:E:82:GLY:HA3	1.53	0.91
1:D:32:PHE:CZ	1:D:66:ARG:HD3	2.07	0.89
1:A:53:MET:HG2	1:A:82:GLY:HA3	1.56	0.88
1:E:237:GLU:HG3	1:F:218:ARG:HH12	1.38	0.88
1:G:120:HIS:HD2	1:G:122:GLU:H	1.22	0.87
1:A:50:TYR:O	2:A:311:FAD:N3	2.08	0.86
1:G:213:SER:HB3	1:G:216:GLN:HB3	1.58	0.86
1:H:67:ILE:HD11	1:H:74:PRO:HB3	1.56	0.86
1:E:120:HIS:HD2	1:E:122:GLU:H	1.19	0.85
1:D:67:ILE:HD11	1:D:74:PRO:CB	2.07	0.84
1:E:267:GLU:HG2	4:E:442:HOH:O	1.75	0.84
1:E:141:ARG:HH11	1:E:141:ARG:HB3	1.42	0.83
1:A:237:GLU:HG3	1:B:218:ARG:NH1	1.93	0.83
1:A:33:ARG:HG2	1:A:33:ARG:HH11	1.44	0.83
1:A:120:HIS:HD2	1:A:122:GLU:H	1.23	0.82
1:D:67:ILE:CD1	1:D:74:PRO:HB3	2.08	0.82
1:G:67:ILE:HD12	1:G:74:PRO:HB3	1.61	0.82
1:F:1:MET:HG2	1:F:6:LEU:HG	1.61	0.82
1:E:238:ARG:NH1	4:E:333:HOH:O	2.12	0.81
1:A:47:SER:HB2	1:A:77:HIS:HE1	1.44	0.81
1:B:89:ALA:HB1	1:B:137:ARG:HH22	1.45	0.81
1:A:290:ARG:HH11	1:A:290:ARG:CG	1.94	0.80
1:E:49:THR:HG22	4:E:893:HOH:O	1.82	0.79
1:A:52:ALA:HB3	1:A:55:SER:HB2	1.63	0.78
1:G:215:ARG:O	1:G:219:ARG:HG3	1.82	0.78
1:G:33:ARG:NH1	3:G:312:CL:CL	2.54	0.77
1:C:120:HIS:HD2	1:C:122:GLU:H	1.32	0.77
1:E:42:ARG:HA	4:E:965:HOH:O	1.84	0.77
1:A:68:GLN:HG2	1:A:74:PRO:HG3	1.65	0.76

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Full wwPDB X-ray Structure Validation Report

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:120:HIS:CD2	1:E:122:GLU:H	2.04	0.75
1:G:47:SER:HB3	1:G:77:HIS:CE1	2.22	0.74
1:H:291:PRO:HG3	4:H:340:HOH:O	1.86	0.74
1:B:89:ALA:HB1	1:B:137:ARG:NH2	2.03	0.74
1:A:120:HIS:CD2	1:A:122:GLU:H	2.05	0.73
1:A:115:ARG:HG2	4:B:984:HOH:O	1.87	0.73
1:A:47:SER:HB2	1:A:77:HIS:CE1	2.23	0.73
1:B:36:GLU:OE1	1:B:39:LYS:NZ	2.20	0.73
1:C:37:GLU:OE2	1:C:281:ARG:HD3	1.87	0.73
1:C:120:HIS:CD2	1:C:122:GLU:H	2.07	0.72
1:G:66:ARG:HG2	1:G:66:ARG:HH11	1.53	0.72
1:G:229:PRO:HA	1:H:227:SER:HB3	1.72	0.72
1:F:65:GLN:HA	1:F:68:GLN:NE2	2.05	0.71
1:B:23:LYS:HD3	4:B:323:HOH:O	1.91	0.71
1:F:52:ALA:C	1:F:53:MET:HG2	2.11	0.71
1:B:73:ASN:OD1	4:B:349:HOH:O	2.08	0.71
4:A:617:HOH:O	1:B:263:GLU:HG2	1.90	0.70
1:B:63:TRP:O	1:B:67:ILE:HG23	1.91	0.70
1:F:216:GLN:O	1:F:220:PHE:HB2	1.91	0.70
1:G:104:LEU:HD23	1:G:106:LEU:HD11	1.75	0.68
1:G:149:TYR:HH	2:G:311:FAD:HO3'	1.40	0.68
1:F:63:TRP:O	1:F:67:ILE:HG23	1.94	0.68
1:H:84:SER:OG	1:H:87:GLU:HG3	1.94	0.68
1:A:238:ARG:HH11	1:A:238:ARG:CG	2.06	0.68
1:D:1:MET:HG2	1:D:6:LEU:HG	1.76	0.67
1:A:241:ASP:O	1:A:243:PRO:HD3	1.95	0.67
1:A:33:ARG:HH11	1:A:33:ARG:CG	2.08	0.66
1:E:32:PHE:HZ	1:E:66:ARG:HH11	1.43	0.65
1:C:48:ILE:HD12	1:C:76:ALA:HA	1.79	0.65
1:A:52:ALA:CB	1:A:55:SER:HB2	2.27	0.65
1:F:291:PRO:HG3	4:F:793:HOH:O	1.96	0.65
1:G:68:GLN:HG2	1:G:74:PRO:HG3	1.79	0.65
1:C:49:THR:HG22	4:C:378:HOH:O	1.96	0.65
1:B:120:HIS:HD2	1:B:122:GLU:H	1.42	0.64
1:E:68:GLN:HG2	1:E:74:PRO:HG3	1.78	0.64
1:A:290:ARG:HG2	1:A:290:ARG:NH1	2.00	0.64
1:A:47:SER:CB	1:A:77:HIS:HE1	2.11	0.63
1:A:147:ALA:HB1	2:A:311:FAD:HM83	1.81	0.63
1:C:256:ARG:NE	4:C:954:HOH:O	2.30	0.63
1:E:47:SER:HB3	1:E:77:HIS:CE1	2.33	0.63
1:A:238:ARG:HG2	1:A:238:ARG:NH1	2.10	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:235:LYS:HE3	4:C:866:HOH:O	1.98	0.62
1:A:17:PHE:CE1	1:A:43:PRO:HG3	2.33	0.62
1:A:107:ARG:HB2	2:A:311:FAD:O1A	1.98	0.62
1:H:1:MET:HG3	1:H:6:LEU:HG	1.81	0.62
1:E:33:ARG:NH1	1:G:281:ARG:HD2	2.15	0.62
1:G:63:TRP:O	1:G:67:ILE:HG22	2.00	0.62
1:A:151:GLU:HB3	1:B:184:ASN:ND2	2.15	0.61
1:D:63:TRP:O	1:D:67:ILE:HG23	2.01	0.61
1:G:66:ARG:HH11	1:G:66:ARG:CG	2.14	0.61
1:H:290:ARG:HD3	1:H:290:ARG:C	2.16	0.61
1:F:2:LYS:HD3	1:F:4:ARG:NH2	2.16	0.61
1:E:141:ARG:HB3	1:E:141:ARG:NH1	2.12	0.61
1:A:34:THR:HG23	1:A:277:SER:HB3	1.82	0.61
1:D:67:ILE:HD11	1:D:74:PRO:CA	2.31	0.61
1:G:167:LYS:HB2	1:G:200:ILE:HD11	1.83	0.61
1:A:52:ALA:CB	1:A:56:THR:HG23	2.27	0.60
1:A:17:PHE:HE1	1:A:43:PRO:HG3	1.66	0.60
1:A:67:ILE:HG12	1:A:72:LEU:HB2	1.82	0.60
1:C:215:ARG:O	1:C:219:ARG:HG3	2.02	0.60
1:E:18:GLU:HA	1:E:47:SER:HB2	1.84	0.60
1:G:278:PRO:O	1:G:282:MET:HG3	2.01	0.60
1:A:167:LYS:HB2	1:A:200:ILE:HD11	1.84	0.60
1:G:179:THR:HG23	1:G:180:GLN:O	2.02	0.59
1:D:290:ARG:CD	4:D:914:HOH:O	2.51	0.59
1:E:237:GLU:HG3	1:F:218:ARG:NH1	2.14	0.59
1:C:47:SER:HB2	1:C:77:HIS:CE1	2.38	0.58
1:F:85:ARG:NE	4:F:592:HOH:O	2.36	0.58
1:G:67:ILE:CD1	1:G:74:PRO:HB3	2.32	0.58
1:A:149:TYR:OH	2:A:311:FAD:H5'2	2.04	0.58
1:G:145:GLY:HA2	1:G:176:PHE:O	2.03	0.58
1:E:37:GLU:OE1	1:E:281:ARG:HD3	2.04	0.57
1:G:120:HIS:CD2	1:G:122:GLU:H	2.13	0.57
1:H:290:ARG:O	1:H:290:ARG:CD	2.46	0.57
1:D:47:SER:OG	1:D:77:HIS:HE1	1.87	0.57
1:G:66:ARG:HG2	1:G:66:ARG:NH1	2.18	0.57
1:H:175:ASP:O	1:H:203:PRO:HD2	2.05	0.57
1:D:24:ASP:O	1:D:28:GLU:HG3	2.04	0.57
1:E:48:ILE:HD12	1:E:76:ALA:HA	1.86	0.57
1:G:37:GLU:OE2	1:G:281:ARG:HD3	2.04	0.57
1:E:29:GLU:HG3	4:E:580:HOH:O	2.04	0.57
1:A:282:MET:O	1:A:286:ARG:HG3	2.05	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:278:PRO:O	1:A:282:MET:HG3	2.06	0.56
1:A:48:ILE:HD12	1:A:76:ALA:HA	1.86	0.56
1:E:25:PRO:O	1:E:29:GLU:HG2	2.05	0.56
1:D:22:PRO:HG2	1:D:28:GLU:HA	1.88	0.56
1:G:115:ARG:H	1:G:115:ARG:CZ	2.19	0.56
1:E:138:TYR:O	1:E:141:ARG:HG3	2.06	0.56
1:B:130:LEU:O	1:B:134:ILE:HG13	2.06	0.56
1:H:47:SER:HB3	1:H:77:HIS:CE1	2.42	0.55
1:A:233:LEU:O	1:A:237:GLU:HB2	2.07	0.55
1:E:166:PHE:O	1:E:170:VAL:HG23	2.06	0.55
1:D:65:GLN:HA	1:D:68:GLN:HE21	1.71	0.55
1:H:22:PRO:HG2	1:H:28:GLU:HA	1.89	0.55
1:B:120:HIS:CD2	1:B:122:GLU:H	2.22	0.55
1:A:258:VAL:HA	1:A:261:LEU:HD12	1.89	0.55
1:C:229:PRO:HA	1:D:227:SER:HB3	1.89	0.54
1:E:47:SER:HB3	1:E:77:HIS:HE1	1.72	0.54
1:A:37:GLU:OE1	1:A:281:ARG:HD3	2.07	0.54
1:C:63:TRP:O	1:C:67:ILE:HG22	2.08	0.54
1:G:179:THR:HG22	1:G:207:GLY:H	1.70	0.54
1:B:10:ARG:HB2	1:B:12:GLY:O	2.07	0.54
1:E:120:HIS:HD2	1:E:122:GLU:N	1.99	0.54
1:F:106:LEU:HD13	2:F:311:FAD:C4X	2.37	0.54
1:A:95:PHE:O	1:A:98:SER:HB2	2.07	0.54
1:H:216:GLN:HG3	4:H:400:HOH:O	2.07	0.54
1:D:196:ARG:HD3	1:D:200:ILE:O	2.08	0.54
1:E:197:ARG:CZ	1:F:193:GLU:OE1	2.56	0.54
1:B:103:LEU:HD13	1:B:134:ILE:HD13	1.90	0.53
1:C:214:TYR:HE1	1:C:233:LEU:HD12	1.72	0.53
1:F:107:ARG:HB3	2:F:311:FAD:H5'2	1.90	0.53
1:D:106:LEU:HD13	2:D:311:FAD:C4X	2.37	0.53
1:A:273:THR:O	1:A:274:LEU:HB2	2.07	0.53
1:C:284:LEU:HB3	1:C:289:LEU:HD22	1.89	0.53
1:E:29:GLU:HB2	1:E:33:ARG:NH2	2.23	0.53
1:H:23:LYS:HG3	4:H:316:HOH:O	2.08	0.53
1:D:216:GLN:HG3	4:D:603:HOH:O	2.09	0.53
1:E:197:ARG:HH12	1:F:193:GLU:HB3	1.74	0.53
1:G:80:VAL:HG22	1:G:107:ARG:HA	1.91	0.53
1:A:197:ARG:NE	1:B:193:GLU:OE1	2.41	0.52
1:A:80:VAL:HG22	1:A:107:ARG:HA	1.92	0.52
1:B:120:HIS:HB3	1:B:123:GLY:HA3	1.91	0.52
1:F:20:PHE:HA	1:F:49:THR:HB	1.91	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:76:ALA:HB3	1:F:103:LEU:HD23	1.92	0.52
1:B:69:SER:O	4:B:930:HOH:O	2.18	0.52
1:B:106:LEU:HD13	2:B:311:FAD:C4X	2.40	0.52
1:H:106:LEU:HD13	2:H:311:FAD:C4X	2.39	0.52
1:H:210:PRO:HD2	4:H:505:HOH:O	2.09	0.52
1:F:178:ILE:HG21	1:F:270:HIS:CD2	2.45	0.52
1:G:181:LEU:HD13	1:G:183:PHE:CE2	2.45	0.51
1:E:2:LYS:HE2	1:E:141:ARG:O	2.11	0.51
1:B:67:ILE:C	1:B:67:ILE:HD12	2.30	0.51
1:G:67:ILE:HD13	1:G:67:ILE:C	2.31	0.51
1:D:32:PHE:HE2	1:D:66:ARG:HH11	1.57	0.51
1:E:48:ILE:CD1	1:E:76:ALA:HA	2.40	0.51
1:F:85:ARG:HD3	1:F:124:PHE:CE2	2.46	0.51
1:H:109:ASP:HB3	1:H:110:PRO:HD2	1.93	0.51
1:A:267:GLU:HG2	4:A:320:HOH:O	2.11	0.51
1:D:80:VAL:HG22	1:D:107:ARG:HA	1.93	0.51
1:D:48:ILE:HD12	1:D:48:ILE:H	1.76	0.51
1:C:20:PHE:HA	1:C:49:THR:HB	1.92	0.51
1:D:277:SER:N	1:D:278:PRO:CD	2.74	0.51
1:B:80:VAL:HG22	1:B:107:ARG:HA	1.92	0.50
1:F:151:GLU:OE1	1:F:227:SER:OG	2.29	0.50
1:G:138:TYR:O	1:G:141:ARG:HG2	2.11	0.50
1:C:67:ILE:HG12	1:C:72:LEU:HB2	1.93	0.50
1:D:46:VAL:HG12	1:D:67:ILE:HD12	1.93	0.50
1:E:66:ARG:NE	4:E:326:HOH:O	2.44	0.50
1:D:65:GLN:HA	1:D:68:GLN:NE2	2.27	0.50
1:D:181:LEU:HD12	1:D:181:LEU:O	2.11	0.50
1:D:68:GLN:HG3	1:D:74:PRO:HG3	1.94	0.50
1:H:55:SER:HB2	4:H:334:HOH:O	2.11	0.50
1:H:218:ARG:HB3	1:H:218:ARG:HH11	1.76	0.50
1:A:181:LEU:CD1	1:A:183:PHE:CE2	2.95	0.49
1:B:89:ALA:CB	1:B:137:ARG:NH2	2.72	0.49
1:C:227:SER:HB3	1:D:229:PRO:HA	1.93	0.49
1:G:79:THR:HA	1:G:106:LEU:O	2.12	0.49
1:C:37:GLU:OE1	1:C:277:SER:OG	2.23	0.49
1:C:213:SER:HB3	1:C:216:GLN:HB3	1.95	0.49
1:G:18:GLU:HB2	1:G:270:HIS:NE2	2.27	0.49
1:H:104:LEU:HD23	1:H:106:LEU:HD11	1.94	0.49
1:A:180:GLN:NE2	1:A:224:CYS:HB2	2.28	0.49
1:F:79:THR:HA	1:F:106:LEU:O	2.12	0.49
1:A:151:GLU:OE1	1:A:227:SER:OG	2.16	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:104:LEU:HD23	1:D:106:LEU:HD11	1.95	0.49
1:E:19:PHE:CE2	1:E:35:LEU:HD21	2.48	0.49
1:G:181:LEU:HA	1:G:207:GLY:O	2.12	0.49
1:H:18:GLU:O	1:H:273:THR:OG1	2.26	0.49
1:G:46:VAL:HG21	1:G:72:LEU:HD13	1.93	0.49
1:G:213:SER:CB	1:G:216:GLN:HB3	2.37	0.49
1:G:24:ASP:HB2	1:G:25:PRO:HD2	1.94	0.48
1:E:227:SER:HB2	1:F:227:SER:HB2	1.95	0.48
1:C:181:LEU:HA	1:C:207:GLY:O	2.12	0.48
1:C:193:GLU:HB3	4:C:318:HOH:O	2.12	0.48
1:G:179:THR:HG21	1:G:182:PHE:HE1	1.79	0.48
1:A:68:GLN:HG2	1:A:74:PRO:CG	2.38	0.48
1:A:120:HIS:HD2	1:A:122:GLU:N	2.03	0.48
1:C:67:ILE:CD1	1:C:74:PRO:HB3	2.44	0.48
1:E:254:ALA:O	1:E:258:VAL:HG23	2.13	0.48
1:C:104:LEU:HD23	1:C:106:LEU:HD11	1.95	0.48
1:H:48:ILE:HD12	1:H:48:ILE:H	1.79	0.48
1:G:18:GLU:HA	1:G:47:SER:HB2	1.95	0.48
1:G:67:ILE:HG12	1:G:72:LEU:HB2	1.95	0.48
1:A:215:ARG:O	1:A:219:ARG:HG2	2.14	0.48
1:B:79:THR:HA	1:B:106:LEU:O	2.14	0.47
1:C:246:VAL:HG21	4:C:329:HOH:O	2.14	0.47
1:D:67:ILE:HD11	1:D:74:PRO:HA	1.95	0.47
1:F:258:VAL:HG13	1:F:269:VAL:HG21	1.96	0.47
1:B:80:VAL:HB	1:B:124:PHE:HB2	1.95	0.47
1:H:34:THR:HG23	1:H:277:SER:HB3	1.97	0.47
1:A:138:TYR:O	1:A:141:ARG:HG3	2.13	0.47
1:B:22:PRO:HD2	1:B:63:TRP:NE1	2.29	0.47
1:G:60:SER:HB3	4:G:467:HOH:O	2.13	0.47
1:B:84:SER:OG	1:B:87:GLU:HG3	2.15	0.47
1:A:97:GLU:HB3	4:A:704:HOH:O	2.15	0.47
1:D:53:MET:HG3	1:D:82:GLY:HA3	1.95	0.47
1:H:216:GLN:CG	4:H:400:HOH:O	2.63	0.47
1:C:17:PHE:CE2	1:C:280:THR:HG21	2.50	0.47
1:C:68:GLN:HG2	1:C:74:PRO:HG3	1.97	0.46
1:C:85:ARG:HD3	1:C:124:PHE:CE2	2.50	0.46
1:A:21:PRO:HA	1:A:22:PRO:HD3	1.75	0.46
1:B:52:ALA:C	1:B:53:MET:HG2	2.36	0.46
1:B:220:PHE:CZ	1:B:274:LEU:HD11	2.50	0.46
1:A:4:ARG:HB2	1:A:143:SER:OG	2.16	0.46
1:H:67:ILE:HD11	1:H:74:PRO:CB	2.36	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:247:LEU:O	1:A:251:VAL:HG23	2.15	0.46
1:G:52:ALA:O	1:G:55:SER:HB2	2.15	0.46
1:F:85:ARG:NH1	4:F:682:HOH:O	2.48	0.46
1:E:95:PHE:O	1:E:98:SER:HB2	2.16	0.46
1:F:22:PRO:HD2	1:F:63:TRP:NE1	2.30	0.46
1:B:166:PHE:O	1:B:170:VAL:HG23	2.16	0.46
1:F:47:SER:HB3	1:F:77:HIS:CE1	2.51	0.46
1:C:120:HIS:HD2	1:C:122:GLU:N	2.07	0.46
1:B:20:PHE:HA	1:B:49:THR:HB	1.97	0.46
1:D:211:VAL:HG23	4:D:336:HOH:O	2.16	0.46
1:B:220:PHE:HZ	1:B:274:LEU:HD11	1.80	0.45
1:C:77:HIS:HD2	2:C:311:FAD:N5	2.14	0.45
1:D:181:LEU:HD12	1:D:181:LEU:C	2.36	0.45
1:F:22:PRO:O	1:F:59:ARG:HD3	2.15	0.45
1:F:67:ILE:HG12	1:F:74:PRO:HB3	1.98	0.45
1:A:197:ARG:HH11	1:A:197:ARG:CG	2.28	0.45
1:B:279:ALA:O	1:B:283:VAL:HG23	2.16	0.45
1:C:166:PHE:O	1:C:170:VAL:HG23	2.16	0.45
1:D:237:GLU:HG3	1:D:238:ARG:N	2.30	0.45
1:G:193:GLU:HG3	1:H:194:ARG:HG2	1.98	0.45
1:F:52:ALA:O	1:F:53:MET:HG2	2.16	0.45
1:G:277:SER:N	1:G:278:PRO:CD	2.78	0.45
1:A:145:GLY:HA2	1:A:176:PHE:O	2.15	0.45
1:E:237:GLU:CG	1:F:218:ARG:HH12	2.21	0.45
1:G:28:GLU:HG2	1:G:63:TRP:HZ2	1.81	0.45
1:E:85:ARG:HG3	1:E:122:GLU:O	2.17	0.45
1:G:179:THR:CG2	1:G:180:GLN:O	2.65	0.45
1:G:50:TYR:O	2:G:311:FAD:N3	2.43	0.45
1:H:74:PRO:HD2	4:H:601:HOH:O	2.17	0.45
1:D:290:ARG:HD3	4:D:914:HOH:O	2.17	0.45
1:B:17:PHE:CE1	1:B:43:PRO:HG3	2.52	0.45
1:B:106:LEU:HD13	2:B:311:FAD:N5	2.32	0.45
1:C:47:SER:HB3	1:C:75:LEU:HB3	1.98	0.45
1:C:86:LYS:HB2	4:C:873:HOH:O	2.17	0.45
1:D:20:PHE:HA	1:D:49:THR:HB	1.99	0.45
1:F:196:ARG:HD3	1:F:200:ILE:O	2.17	0.44
1:E:227:SER:HB3	1:F:229:PRO:HA	1.99	0.44
1:F:14:LEU:HD22	1:F:44:ALA:CB	2.48	0.44
1:G:181:LEU:CD1	1:G:183:PHE:CE2	3.01	0.44
1:A:52:ALA:HB3	1:A:55:SER:CB	2.41	0.44
1:B:290:ARG:HA	1:B:291:PRO:HD2	1.64	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:281:ARG:HG2	1:D:281:ARG:HH11	1.82	0.44
1:F:67:ILE:HD12	1:F:72:LEU:HB2	1.99	0.44
1:C:47:SER:HB2	1:C:77:HIS:HE1	1.82	0.44
1:C:67:ILE:HD13	1:C:67:ILE:C	2.38	0.44
1:C:244:LYS:O	1:C:244:LYS:HG2	2.16	0.44
1:F:120:HIS:HD2	1:F:122:GLU:H	1.65	0.44
1:A:68:GLN:HE22	1:A:99:GLY:HA3	1.83	0.44
1:C:193:GLU:HG3	1:D:194:ARG:HG2	1.98	0.44
1:C:209:MET:HG3	1:C:272:TYR:HB2	2.00	0.44
1:D:183:PHE:HB2	1:D:229:PRO:HD3	2.00	0.44
1:G:149:TYR:OH	2:G:311:FAD:O3'	2.12	0.44
1:C:124:PHE:CD2	1:C:129:GLU:HB3	2.53	0.44
1:E:47:SER:CB	1:E:77:HIS:HE1	2.31	0.44
1:E:72:LEU:HD23	1:E:72:LEU:HA	1.79	0.44
1:F:120:HIS:CD2	1:F:122:GLU:H	2.36	0.44
1:E:258:VAL:HA	1:E:261:LEU:HD12	2.00	0.44
1:G:197:ARG:HG3	1:H:193:GLU:OE1	2.18	0.44
1:B:47:SER:OG	1:B:77:HIS:HE1	2.01	0.44
1:F:277:SER:N	1:F:278:PRO:CD	2.81	0.44
1:H:289:LEU:O	1:H:290:ARG:HD3	2.18	0.44
1:C:7:LEU:HD13	1:C:203:PRO:HG2	2.00	0.43
1:G:47:SER:HB3	1:G:77:HIS:HE1	1.76	0.43
1:H:43:PRO:HG2	1:H:72:LEU:HD22	1.99	0.43
1:H:120:HIS:HB3	1:H:123:GLY:HA3	1.99	0.43
1:D:23:LYS:HG3	1:D:24:ASP:H	1.83	0.43
1:D:258:VAL:HG13	1:D:269:VAL:HG21	2.01	0.43
1:E:21:PRO:HA	1:E:22:PRO:HD3	1.76	0.43
1:G:7:LEU:HD13	1:G:203:PRO:HG2	1.99	0.43
1:H:290:ARG:C	1:H:290:ARG:CD	2.84	0.43
1:F:2:LYS:HD3	1:F:4:ARG:HH21	1.82	0.43
1:F:109:ASP:HB3	4:F:406:HOH:O	2.17	0.43
1:B:23:LYS:HD3	1:B:23:LYS:H	1.84	0.43
1:B:67:ILE:HD11	1:B:74:PRO:N	2.32	0.43
1:B:68:GLN:HG3	1:B:74:PRO:HG3	2.00	0.43
1:E:66:ARG:CD	4:E:326:HOH:O	2.66	0.43
1:C:197:ARG:HG3	1:D:193:GLU:OE1	2.19	0.43
1:G:114:GLU:HA	1:G:115:ARG:NH1	2.34	0.43
1:B:52:ALA:O	1:B:53:MET:HG2	2.18	0.43
1:E:37:GLU:OE2	1:E:277:SER:OG	2.21	0.43
1:G:125:ARG:N	1:G:129:GLU:OE1	2.49	0.43
1:G:179:THR:HG21	1:G:182:PHE:CE1	2.54	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:277:SER:N	1:E:278:PRO:CD	2.82	0.43
1:H:26:GLU:H	1:H:26:GLU:CD	2.22	0.43
1:D:209:MET:HA	1:D:210:PRO:HD3	1.84	0.43
1:E:145:GLY:HA2	1:E:176:PHE:O	2.19	0.43
1:G:63:TRP:O	1:G:67:ILE:CG2	2.67	0.42
1:C:213:SER:CB	1:C:216:GLN:HB3	2.49	0.42
1:G:84:SER:OG	1:G:87:GLU:HG3	2.18	0.42
1:C:138:TYR:O	1:C:141:ARG:HB3	2.19	0.42
1:E:17:PHE:CE1	1:E:43:PRO:HG3	2.54	0.42
1:G:48:ILE:HD12	1:G:76:ALA:HA	2.01	0.42
1:A:104:LEU:HD12	1:A:145:GLY:C	2.39	0.42
1:A:277:SER:N	1:A:278:PRO:CD	2.82	0.42
1:F:118:ARG:HA	1:F:119:PRO:HD2	1.84	0.42
1:E:180:GLN:NE2	1:E:224:CYS:HB2	2.34	0.42
1:E:35:LEU:O	1:E:39:LYS:HG2	2.20	0.42
1:G:244:LYS:HE3	4:G:551:HOH:O	2.20	0.42
1:A:181:LEU:HD13	1:A:183:PHE:CZ	2.55	0.42
1:D:154:PRO:HG3	1:D:225:GLY:HA3	2.01	0.42
1:E:35:LEU:HD23	1:E:35:LEU:HA	1.86	0.42
1:H:20:PHE:HA	1:H:49:THR:HB	2.01	0.42
1:H:109:ASP:HB3	1:H:110:PRO:CD	2.49	0.42
1:B:66:ARG:HA	1:B:66:ARG:HD2	1.68	0.41
1:C:21:PRO:HA	1:C:22:PRO:HD3	1.86	0.41
1:E:20:PHE:HA	1:E:49:THR:HB	2.01	0.41
1:A:53:MET:H	1:A:55:SER:H	1.68	0.41
1:G:179:THR:HB	1:G:205:LEU:O	2.20	0.41
1:A:106:LEU:HD13	2:A:311:FAD:C4X	2.50	0.41
1:A:197:ARG:CG	1:A:197:ARG:NH1	2.83	0.41
1:H:47:SER:OG	1:H:77:HIS:HE1	2.03	0.41
1:H:181:LEU:HD13	1:H:183:PHE:CE2	2.54	0.41
1:A:215:ARG:NH2	4:A:546:HOH:O	2.52	0.41
1:B:210:PRO:HB2	1:B:279:ALA:HB1	2.02	0.41
1:H:80:VAL:HG22	1:H:107:ARG:HA	2.01	0.41
1:A:115:ARG:HG3	4:A:981:HOH:O	2.20	0.41
1:C:277:SER:N	1:C:278:PRO:CD	2.83	0.41
1:E:141:ARG:NH1	1:E:141:ARG:CB	2.83	0.41
1:F:14:LEU:HD22	1:F:44:ALA:HB2	2.01	0.41
1:D:70:LEU:HD12	1:D:70:LEU:HA	1.94	0.41
1:E:7:LEU:HD13	1:E:203:PRO:HG2	2.03	0.41
1:F:82:GLY:HA2	4:F:753:HOH:O	2.21	0.41
1:C:215:ARG:HE	1:C:219:ARG:HD3	1.86	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:48:ILE:HD12	1:D:75:LEU:O	2.21	0.41
1:G:47:SER:CB	1:G:77:HIS:HE1	2.33	0.41
1:A:33:ARG:CG	1:A:33:ARG:NH1	2.76	0.41
1:C:63:TRP:O	1:C:67:ILE:CG2	2.69	0.41
1:E:258:VAL:HG13	1:E:269:VAL:HG21	2.03	0.41
1:A:39:LYS:NZ	4:A:595:HOH:O	2.53	0.41
1:A:52:ALA:HB2	1:A:56:THR:CG2	2.33	0.41
1:B:104:LEU:HD23	1:B:106:LEU:HD11	2.03	0.41
1:C:80:VAL:CG1	1:C:130:LEU:HB2	2.51	0.41
1:G:1:MET:N	4:G:544:HOH:O	2.53	0.41
1:G:10:ARG:HB2	1:G:12:GLY:O	2.21	0.41
1:G:11:ARG:HG2	1:G:11:ARG:HH11	1.86	0.41
1:G:47:SER:HA	1:G:75:LEU:O	2.21	0.41
1:H:289:LEU:O	1:H:290:ARG:O	2.39	0.41
1:B:120:HIS:CG	1:B:121:PRO:HD2	2.56	0.41
1:F:206:PRO:HD2	1:F:268:GLY:O	2.21	0.41
1:G:114:GLU:HG2	1:G:115:ARG:HH12	1.85	0.41
1:H:153:HIS:HA	1:H:154:PRO:HD3	1.93	0.41
1:A:284:LEU:HD23	1:A:284:LEU:HA	1.88	0.40
1:B:288:GLY:C	1:B:290:ARG:H	2.24	0.40
1:C:118:ARG:NH1	4:C:862:HOH:O	2.54	0.40
1:D:277:SER:H	1:D:278:PRO:CD	2.34	0.40
1:F:22:PRO:HB2	1:F:28:GLU:HG2	2.03	0.40
1:G:153:HIS:HA	1:G:154:PRO:HD2	1.87	0.40
1:E:63:TRP:O	1:E:67:ILE:HG23	2.21	0.40
1:E:225:GLY:HA2	1:F:231:PRO:HD3	2.03	0.40
1:D:277:SER:N	1:D:278:PRO:HD2	2.36	0.40
1:G:24:ASP:HB2	1:G:25:PRO:CD	2.51	0.40
1:G:215:ARG:HE	1:G:219:ARG:HD3	1.86	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	289/310 (93%)	280 (97%)	8 (3%)	1 (0%)	41	72
1	B	289/310 (93%)	278 (96%)	8 (3%)	3 (1%)	15	44
1	C	289/310 (93%)	275 (95%)	13 (4%)	1 (0%)	41	72
1	D	289/310 (93%)	274 (95%)	13 (4%)	2 (1%)	22	53
1	E	289/310 (93%)	277 (96%)	11 (4%)	1 (0%)	41	72
1	F	289/310 (93%)	275 (95%)	12 (4%)	2 (1%)	22	53
1	G	289/310 (93%)	272 (94%)	17 (6%)	0	100	100
1	H	289/310 (93%)	279 (96%)	8 (3%)	2 (1%)	22	53
All	All	2312/2480 (93%)	2210 (96%)	90 (4%)	12 (0%)	29	61

All (12) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	290	ARG
1	C	52	ALA
1	D	290	ARG
1	H	290	ARG
1	B	114	GLU
1	F	290	ARG
1	A	173	GLY
1	F	57	ARG
1	D	61	VAL
1	B	173	GLY
1	E	173	GLY
1	H	173	GLY

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	236/249 (95%)	215 (91%)	21 (9%)	9	28
1	B	236/249 (95%)	219 (93%)	17 (7%)	14	38
1	C	236/249 (95%)	220 (93%)	16 (7%)	16	42

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles		
1	D	236/249 (95%)	211 (89%)	25 (11%)		6	20
1	E	236/249 (95%)	213 (90%)	23 (10%)		8	24
1	F	236/249 (95%)	216 (92%)	20 (8%)		10	31
1	G	236/249 (95%)	218 (92%)	18 (8%)		13	36
1	H	236/249 (95%)	211 (89%)	25 (11%)		6	20
All	All	1888/1992 (95%)	1723 (91%)	165 (9%)		10	30

All (165) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	33	ARG
1	A	36	GLU
1	A	42	ARG
1	A	48	ILE
1	A	58	GLU
1	A	67	ILE
1	A	68	GLN
1	A	69	SER
1	A	98	SER
1	A	115	ARG
1	A	118	ARG
1	A	143	SER
1	A	192	LEU
1	A	197	ARG
1	A	219	ARG
1	A	235	LYS
1	A	237	GLU
1	A	238	ARG
1	A	244	LYS
1	A	252	GLU
1	A	290	ARG
1	B	23	LYS
1	B	36	GLU
1	B	49	THR
1	B	55	SER
1	B	66	ARG
1	B	67	ILE
1	B	70	LEU
1	B	77	HIS
1	B	114	GLU

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Mol	Chain	Res	Type
1	B	118	ARG
1	B	122	GLU
1	B	137	ARG
1	B	157	GLU
1	B	181	LEU
1	B	192	LEU
1	B	237	GLU
1	B	256	ARG
1	C	11	ARG
1	C	29	GLU
1	C	36	GLU
1	C	48	ILE
1	C	49	THR
1	C	58	GLU
1	C	66	ARG
1	C	67	ILE
1	C	90	GLU
1	C	97	GLU
1	C	115	ARG
1	C	157	GLU
1	C	192	LEU
1	C	197	ARG
1	C	216	GLN
1	C	276	LYS
1	D	1	MET
1	D	23	LYS
1	D	42	ARG
1	D	48	ILE
1	D	49	THR
1	D	53	MET
1	D	55	SER
1	D	58	GLU
1	D	66	ARG
1	D	67	ILE
1	D	69	SER
1	D	70	LEU
1	D	77	HIS
1	D	91	VAL
1	D	137	ARG
1	D	143	SER
1	D	155	GLU
1	D	192	LEU

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Mol	Chain	Res	Type
1	D	216	GLN
1	D	218	ARG
1	D	228	ILE
1	D	235	LYS
1	D	237	GLU
1	D	263	GLU
1	D	290	ARG
1	E	8	LYS
1	E	29	GLU
1	E	36	GLU
1	E	39	LYS
1	E	42	ARG
1	E	48	ILE
1	E	58	GLU
1	E	66	ARG
1	E	67	ILE
1	E	90	GLU
1	E	91	VAL
1	E	92	LEU
1	E	115	ARG
1	E	118	ARG
1	E	137	ARG
1	E	141	ARG
1	E	143	SER
1	E	192	LEU
1	E	235	LYS
1	E	237	GLU
1	E	244	LYS
1	E	252	GLU
1	E	289	LEU
1	F	11	ARG
1	F	36	GLU
1	F	49	THR
1	F	55	SER
1	F	67	ILE
1	F	70	LEU
1	F	77	HIS
1	F	84	SER
1	F	114	GLU
1	F	118	ARG
1	F	140	ASP
1	F	143	SER

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Mol	Chain	Res	Type
1	F	181	LEU
1	F	192	LEU
1	F	202	ILE
1	F	213	SER
1	F	219	ARG
1	F	220	PHE
1	F	237	GLU
1	F	263	GLU
1	G	11	ARG
1	G	36	GLU
1	G	48	ILE
1	G	49	THR
1	G	66	ARG
1	G	67	ILE
1	G	68	GLN
1	G	77	HIS
1	G	90	GLU
1	G	97	GLU
1	G	98	SER
1	G	115	ARG
1	G	137	ARG
1	G	179	THR
1	G	192	LEU
1	G	197	ARG
1	G	215	ARG
1	G	216	GLN
1	H	8	LYS
1	H	23	LYS
1	H	29	GLU
1	H	36	GLU
1	H	42	ARG
1	H	48	ILE
1	H	66	ARG
1	H	67	ILE
1	H	77	HIS
1	H	78	LEU
1	H	86	LYS
1	H	91	VAL
1	H	114	GLU
1	H	115	ARG
1	H	118	ARG
1	H	137	ARG

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Mol	Chain	Res	Type
1	H	143	SER
1	H	192	LEU
1	H	213	SER
1	H	216	GLN
1	H	218	ARG
1	H	235	LYS
1	H	237	GLU
1	H	263	GLU
1	H	290	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (35) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	65	GLN
1	A	68	GLN
1	A	77	HIS
1	A	120	HIS
1	A	216	GLN
1	B	65	GLN
1	B	68	GLN
1	B	77	HIS
1	B	120	HIS
1	B	239	HIS
1	C	65	GLN
1	C	77	HIS
1	C	120	HIS
1	C	239	HIS
1	D	65	GLN
1	D	68	GLN
1	D	77	HIS
1	D	83	GLN
1	E	65	GLN
1	E	68	GLN
1	E	77	HIS
1	E	120	HIS
1	F	65	GLN
1	F	68	GLN
1	F	77	HIS
1	F	120	HIS
1	F	240	GLN
1	G	65	GLN
1	G	68	GLN

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Mol	Chain	Res	Type
1	G	77	HIS
1	G	120	HIS
1	H	65	GLN
1	H	68	GLN
1	H	77	HIS
1	H	120	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 ⓘ

Of 14 ligands modelled in this entry, 6 are monoatomic - leaving 8 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	#$|Z| > 2$
2	FAD	F	311	-	53,58,58	1.29	4 (7%)	68,89,89	1.60	13 (19%)
2	FAD	B	311	-	53,58,58	1.23	3 (5%)	68,89,89	1.53	11 (16%)
2	FAD	A	311	-	53,58,58	1.27	3 (5%)	68,89,89	1.35	11 (16%)
2	FAD	H	311	-	53,58,58	1.17	4 (7%)	68,89,89	1.40	9 (13%)
2	FAD	D	311	-	53,58,58	1.14	4 (7%)	68,89,89	1.46	12 (17%)
2	FAD	E	311	-	53,58,58	1.21	5 (9%)	68,89,89	1.45	11 (16%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#|Z| > 2	Counts	RMSZ	#|Z| > 2
2	FAD	G	311	-	53,58,58	1.23	5 (9%)	68,89,89	1.61	12 (17%)
2	FAD	C	311	-	53,58,58	1.14	3 (5%)	68,89,89	1.38	9 (13%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	FAD	F	311	-	-	10/30/50/50	0/6/6/6
2	FAD	B	311	-	-	4/30/50/50	0/6/6/6
2	FAD	A	311	-	-	9/30/50/50	0/6/6/6
2	FAD	H	311	-	-	5/30/50/50	0/6/6/6
2	FAD	D	311	-	-	5/30/50/50	0/6/6/6
2	FAD	E	311	-	-	1/30/50/50	0/6/6/6
2	FAD	G	311	-	-	8/30/50/50	0/6/6/6
2	FAD	C	311	-	-	5/30/50/50	0/6/6/6

All (31) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	G	311	FAD	C4X-N5	4.58	1.39	1.30
2	A	311	FAD	C2A-N3A	4.52	1.39	1.32
2	F	311	FAD	C2A-N3A	4.51	1.39	1.32
2	A	311	FAD	C4X-N5	4.35	1.39	1.30
2	B	311	FAD	C4X-N5	4.34	1.39	1.30
2	C	311	FAD	C4X-N5	4.04	1.38	1.30
2	E	311	FAD	C2A-N3A	4.00	1.38	1.32
2	D	311	FAD	C4X-N5	3.94	1.38	1.30
2	D	311	FAD	C2A-N3A	3.85	1.38	1.32
2	B	311	FAD	C2A-N3A	3.81	1.38	1.32
2	H	311	FAD	C2A-N3A	3.71	1.38	1.32
2	F	311	FAD	C4X-N5	3.64	1.37	1.30
2	H	311	FAD	C4X-N5	3.54	1.37	1.30
2	G	311	FAD	C2A-N3A	3.54	1.37	1.32
2	E	311	FAD	C4X-N5	3.44	1.37	1.30
2	F	311	FAD	C2A-N1A	3.28	1.40	1.33
2	A	311	FAD	C2A-N1A	3.25	1.39	1.33
2	C	311	FAD	C2A-N3A	3.22	1.37	1.32
2	F	311	FAD	C5'-C4'	3.21	1.56	1.51

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W O R L D W I D E
wwPDB
PROTEIN DATA BANK

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	311	FAD	C2A-N1A	3.14	1.39	1.33
2	C	311	FAD	C10-N1	3.05	1.39	1.33
2	E	311	FAD	C10-N1	2.62	1.38	1.33
2	E	311	FAD	C2A-N1A	2.53	1.38	1.33
2	D	311	FAD	C2A-N1A	2.53	1.38	1.33
2	H	311	FAD	C2A-N1A	2.51	1.38	1.33
2	D	311	FAD	C10-N1	2.48	1.38	1.33
2	G	311	FAD	C2A-N1A	2.33	1.38	1.33
2	E	311	FAD	C4X-C10	-2.20	1.37	1.44
2	H	311	FAD	C10-N1	2.10	1.37	1.33
2	G	311	FAD	O2'-C2'	-2.02	1.39	1.43
2	G	311	FAD	C4X-C10	-2.01	1.38	1.44

All (88) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	311	FAD	N3A-C2A-N1A	-6.67	118.25	128.68
2	H	311	FAD	N3A-C2A-N1A	-6.20	118.99	128.68
2	G	311	FAD	N3A-C2A-N1A	-5.87	119.50	128.68
2	C	311	FAD	N3A-C2A-N1A	-5.67	119.82	128.68
2	D	311	FAD	N3A-C2A-N1A	-5.30	120.39	128.68
2	E	311	FAD	N3A-C2A-N1A	-5.11	120.69	128.68
2	F	311	FAD	N3A-C2A-N1A	-5.02	120.84	128.68
2	A	311	FAD	N3A-C2A-N1A	-4.58	121.52	128.68
2	F	311	FAD	O4'-C4'-C5'	3.88	118.65	109.92
2	G	311	FAD	C4X-C10-N10	3.80	122.04	116.48
2	D	311	FAD	C4-N3-C2	-3.74	118.74	125.64
2	A	311	FAD	C4X-C10-N10	3.66	121.83	116.48
2	G	311	FAD	O4B-C1B-C2B	-3.38	101.98	106.93
2	F	311	FAD	C4-N3-C2	-3.38	119.39	125.64
2	E	311	FAD	C9A-C5X-N5	-3.27	118.87	122.43
2	F	311	FAD	O2-C2-N1	-3.24	116.46	121.83
2	H	311	FAD	C4-N3-C2	-3.24	119.66	125.64
2	G	311	FAD	C4-N3-C2	-3.16	119.80	125.64
2	G	311	FAD	C4X-C4-N3	3.10	121.05	113.19
2	B	311	FAD	C4X-C10-N10	3.03	120.91	116.48
2	B	311	FAD	O2-C2-N1	-3.01	116.84	121.83
2	E	311	FAD	C4-N3-C2	-3.00	120.09	125.64
2	F	311	FAD	C4X-C10-N10	2.94	120.78	116.48
2	G	311	FAD	C9A-C5X-N5	-2.93	119.24	122.43
2	D	311	FAD	C4X-C10-N10	2.93	120.77	116.48
2	D	311	FAD	C10-C4X-N5	-2.91	118.67	124.86

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	311	FAD	C4X-C4-N3	2.89	120.53	113.19
2	B	311	FAD	C4-N3-C2	-2.88	120.32	125.64
2	H	311	FAD	C4X-C10-N10	2.88	120.69	116.48
2	F	311	FAD	C10-C4X-N5	-2.86	118.79	124.86
2	G	311	FAD	C10-N1-C2	2.86	122.62	116.90
2	A	311	FAD	C4X-C4-N3	2.84	120.41	113.19
2	B	311	FAD	C1B-N9A-C4A	-2.82	121.69	126.64
2	F	311	FAD	O5'-C5'-C4'	2.81	116.86	109.36
2	C	311	FAD	C9A-C5X-N5	-2.80	119.39	122.43
2	D	311	FAD	C4X-C4-N3	2.78	120.24	113.19
2	G	311	FAD	C10-C4X-N5	-2.77	118.97	124.86
2	B	311	FAD	O4-C4-C4X	-2.77	119.24	126.60
2	H	311	FAD	O4-C4-C4X	-2.76	119.27	126.60
2	G	311	FAD	C4-C4X-N5	2.75	122.14	118.23
2	A	311	FAD	C4-N3-C2	-2.75	120.56	125.64
2	G	311	FAD	C4X-C10-N1	-2.70	118.45	124.73
2	C	311	FAD	C4X-C4-N3	2.70	120.04	113.19
2	E	311	FAD	O4-C4-C4X	-2.69	119.47	126.60
2	B	311	FAD	C10-C4X-N5	-2.63	119.28	124.86
2	E	311	FAD	C4X-C10-N10	2.61	120.30	116.48
2	E	311	FAD	C10-C4X-N5	-2.59	119.36	124.86
2	D	311	FAD	P-O3P-PA	-2.59	123.94	132.83
2	C	311	FAD	C4X-C10-N10	2.59	120.27	116.48
2	C	311	FAD	C10-C4X-N5	-2.57	119.41	124.86
2	H	311	FAD	C4X-C4-N3	2.56	119.68	113.19
2	B	311	FAD	O2-C2-N3	2.49	123.49	118.65
2	F	311	FAD	O3'-C3'-C2'	2.49	114.83	108.81
2	C	311	FAD	P-O3P-PA	-2.48	124.31	132.83
2	D	311	FAD	C4X-C10-N1	-2.48	118.98	124.73
2	C	311	FAD	C4-N3-C2	-2.44	121.13	125.64
2	F	311	FAD	C4-C4X-C10	2.44	120.89	116.79
2	C	311	FAD	C4X-C10-N1	-2.44	119.08	124.73
2	A	311	FAD	C10-C4X-N5	-2.42	119.72	124.86
2	F	311	FAD	O4B-C1B-C2B	-2.42	103.39	106.93
2	H	311	FAD	C10-C4X-N5	-2.38	119.81	124.86
2	F	311	FAD	O4-C4-C4X	-2.37	120.31	126.60
2	D	311	FAD	O4'-C4'-C3'	-2.37	103.35	109.10
2	A	311	FAD	C4-C4X-N5	2.36	121.59	118.23
2	E	311	FAD	C10-N1-C2	2.36	121.62	116.90
2	G	311	FAD	C5X-C9A-N10	2.35	120.38	117.95
2	B	311	FAD	C4X-C4-N3	2.35	119.16	113.19
2	F	311	FAD	C4A-C5A-N7A	-2.30	107.00	109.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	311	FAD	C10-N1-C2	2.28	121.47	116.90
2	B	311	FAD	C2A-N1A-C6A	2.25	122.61	118.75
2	H	311	FAD	O2-C2-N1	-2.25	118.10	121.83
2	A	311	FAD	O4B-C1B-C2B	-2.23	103.67	106.93
2	E	311	FAD	C5X-N5-C4X	2.21	121.75	118.07
2	E	311	FAD	C4X-C10-N1	-2.20	119.64	124.73
2	D	311	FAD	O2-C2-N1	-2.18	118.22	121.83
2	C	311	FAD	C10-N1-C2	2.17	121.24	116.90
2	H	311	FAD	P-O3P-PA	-2.14	125.48	132.83
2	D	311	FAD	C4-C4X-C10	2.14	120.38	116.79
2	F	311	FAD	C4X-C4-N3	2.13	118.61	113.19
2	G	311	FAD	O4-C4-N3	-2.13	116.04	120.12
2	D	311	FAD	O4-C4-C4X	-2.12	120.97	126.60
2	E	311	FAD	C1B-N9A-C4A	-2.09	122.96	126.64
2	A	311	FAD	C4X-C10-N1	-2.09	119.88	124.73
2	B	311	FAD	C4-C4X-N5	2.08	121.19	118.23
2	A	311	FAD	C9A-C5X-N5	-2.07	120.19	122.43
2	A	311	FAD	O5B-PA-O1A	2.06	117.12	109.07
2	D	311	FAD	C4A-C5A-N7A	-2.05	107.27	109.40
2	H	311	FAD	C9A-C5X-N5	-2.01	120.25	122.43

There are no chirality outliers.

All (47) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	311	FAD	C5B-O5B-PA-O1A
2	A	311	FAD	C5B-O5B-PA-O2A
2	A	311	FAD	C3'-C4'-C5'-O5'
2	A	311	FAD	O4'-C4'-C5'-O5'
2	A	311	FAD	C5'-O5'-P-O1P
2	A	311	FAD	C5'-O5'-P-O2P
2	D	311	FAD	C5B-O5B-PA-O1A
2	D	311	FAD	C5B-O5B-PA-O3P
2	F	311	FAD	O4'-C4'-C5'-O5'
2	F	311	FAD	C5'-O5'-P-O1P
2	H	311	FAD	C5B-O5B-PA-O1A
2	H	311	FAD	C5B-O5B-PA-O3P
2	G	311	FAD	C2'-C3'-C4'-O4'
2	F	311	FAD	C3'-C4'-C5'-O5'
2	G	311	FAD	P-O3P-PA-O1A
2	C	311	FAD	O3'-C3'-C4'-C5'
2	C	311	FAD	C2'-C3'-C4'-C5'

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Mol	Chain	Res	Type	Atoms
2	G	311	FAD	C2'-C3'-C4'-C5'
2	A	311	FAD	PA-O3P-P-O5'
2	F	311	FAD	P-O3P-PA-O5B
2	C	311	FAD	O3'-C3'-C4'-O4'
2	F	311	FAD	C2'-C3'-C4'-C5'
2	C	311	FAD	C2'-C3'-C4'-O4'
2	F	311	FAD	C5'-O5'-P-O3P
2	B	311	FAD	P-O3P-PA-O2A
2	D	311	FAD	P-O3P-PA-O2A
2	F	311	FAD	P-O3P-PA-O1A
2	F	311	FAD	C5'-O5'-P-O2P
2	D	311	FAD	C1'-C2'-C3'-O3'
2	F	311	FAD	C1'-C2'-C3'-O3'
2	G	311	FAD	C1'-C2'-C3'-O3'
2	B	311	FAD	C3B-C4B-C5B-O5B
2	G	311	FAD	O2'-C2'-C3'-C4'
2	B	311	FAD	O4B-C4B-C5B-O5B
2	C	311	FAD	P-O3P-PA-O1A
2	H	311	FAD	P-O3P-PA-O2A
2	G	311	FAD	O3'-C3'-C4'-O4'
2	D	311	FAD	C2'-C3'-C4'-O4'
2	G	311	FAD	O3'-C3'-C4'-C5'
2	A	311	FAD	C5B-O5B-PA-O3P
2	A	311	FAD	C5'-O5'-P-O3P
2	B	311	FAD	P-O3P-PA-O1A
2	G	311	FAD	P-O3P-PA-O2A
2	H	311	FAD	P-O3P-PA-O1A
2	E	311	FAD	C2'-C3'-C4'-O4'
2	H	311	FAD	C5B-O5B-PA-O2A
2	F	311	FAD	O3'-C3'-C4'-C5'

There are no ring outliers.

7 monomers are involved in 15 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	F	311	FAD	2	0
2	B	311	FAD	2	0
2	A	311	FAD	5	0
2	H	311	FAD	1	0
2	D	311	FAD	1	0
2	G	311	FAD	3	0
2	C	311	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 F 311

Bond lengths   Bond angles

Torsions   Rings

Ligand FAD B 311

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD A 311

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD H 311

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD D 311

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD E 311

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD G 311

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD C 311

Bond lengths

Bond angles

Torsions

Rings

5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	A	291/310 (93%)	-0.76	0	100	100	6, 17, 33, 45	1 (0%)
1	B	291/310 (93%)	-0.69	1 (0%)	94	93	5, 18, 34, 46	1 (0%)
1	C	291/310 (93%)	-0.73	0	100	100	5, 18, 34, 56	1 (0%)
1	D	291/310 (93%)	-0.69	0	100	100	5, 18, 33, 46	1 (0%)
1	E	291/310 (93%)	-0.74	0	100	100	7, 18, 36, 52	1 (0%)
1	F	291/310 (93%)	-0.72	0	100	100	7, 18, 35, 47	1 (0%)
1	G	291/310 (93%)	-0.72	0	100	100	6, 17, 33, 50	1 (0%)
1	H	291/310 (93%)	-0.69	0	100	100	5, 18, 35, 47	1 (0%)
All	All	2328/2480 (93%)	-0.72	1 (0%)	100	100	5, 18, 34, 56	8 (0%)

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	113	GLY	3.4

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 ⓘ

There are no monosaccharides in this entry.

6.4 Ligands ⓘ

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	CL	F	312	1/1	0.90	0.10	41,41,41,41	0
3	CL	G	312	1/1	0.91	0.08	38,38,38,38	0
3	CL	D	312	1/1	0.92	0.15	40,40,40,40	0
3	CL	H	312	1/1	0.96	0.21	31,31,31,31	0
2	FAD	F	311	53/53	0.97	0.12	2,16,19,22	0
3	CL	A	312	1/1	0.97	0.09	31,31,31,31	0
2	FAD	A	311	53/53	0.97	0.12	9,11,14,14	0
3	CL	E	312	1/1	0.97	0.15	37,37,37,37	0
2	FAD	B	311	53/53	0.97	0.12	6,14,18,19	0
2	FAD	D	311	53/53	0.97	0.13	7,12,18,19	0
2	FAD	E	311	53/53	0.97	0.11	6,9,13,14	0
2	FAD	C	311	53/53	0.98	0.12	5,10,15,15	0
2	FAD	G	311	53/53	0.98	0.11	4,9,13,13	0
2	FAD	H	311	53/53	0.98	0.12	11,15,18,19	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 F 311:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)
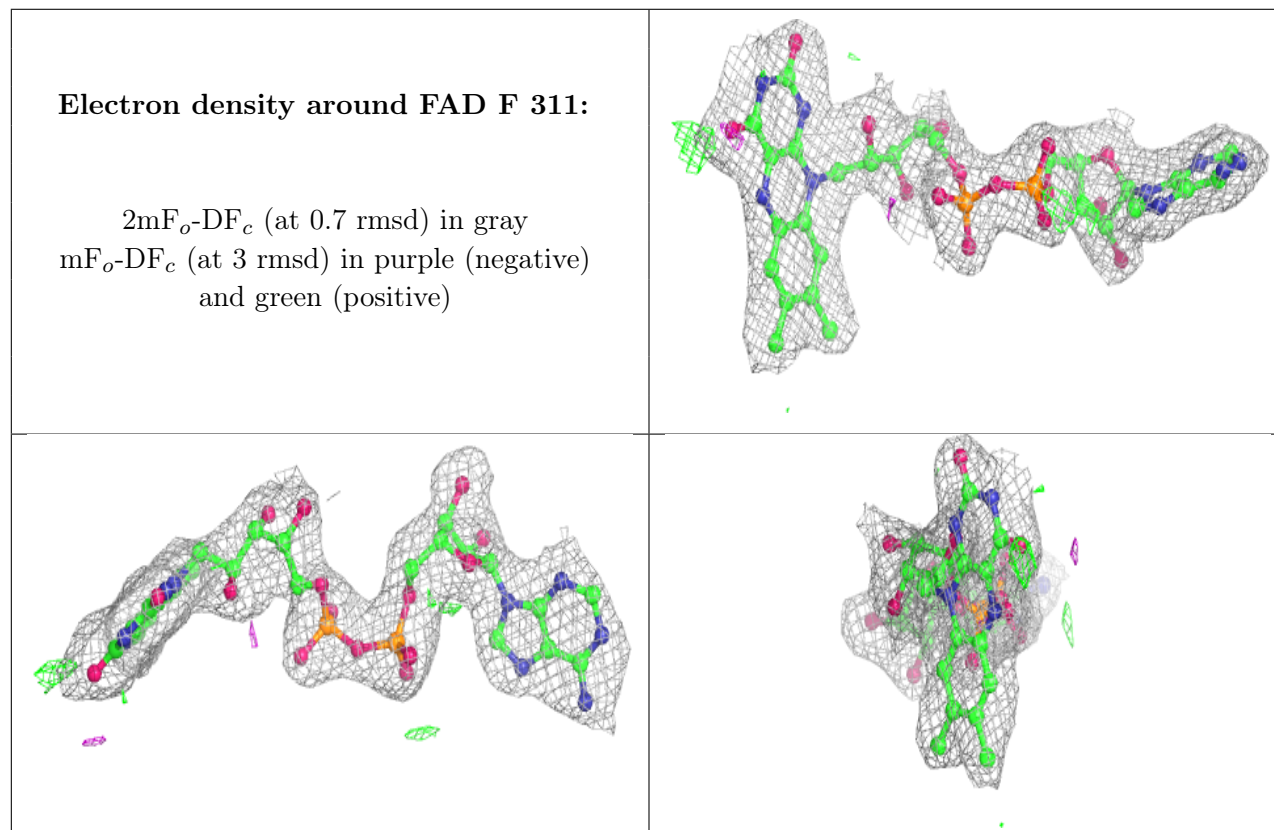
Electron density around FAD A 311:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
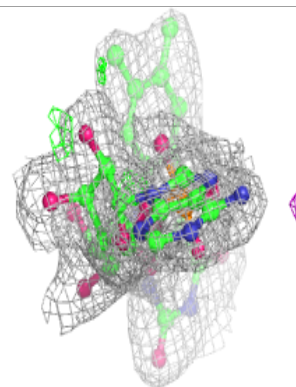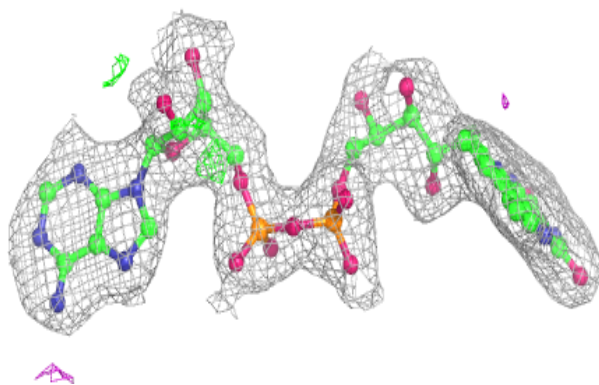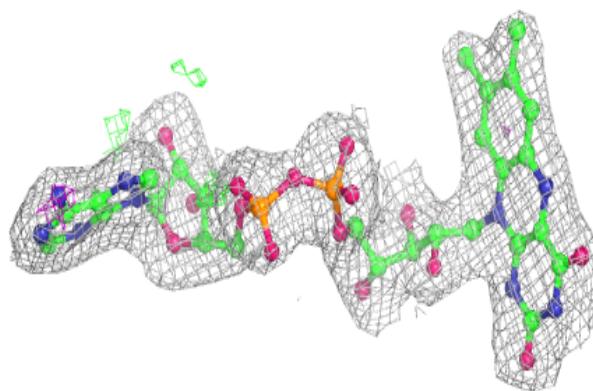
Electron density around FAD B 311:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
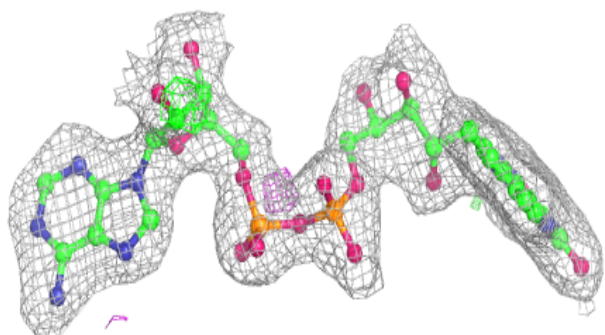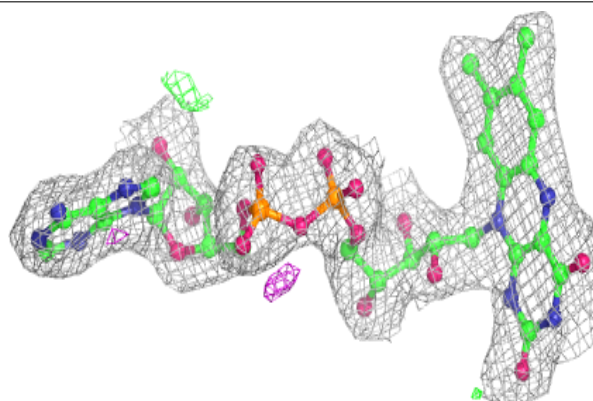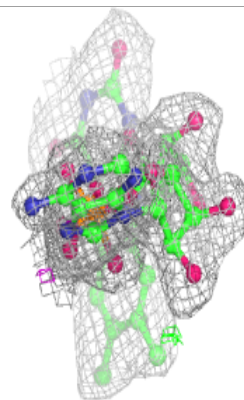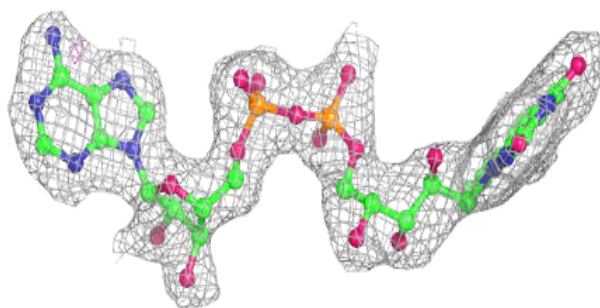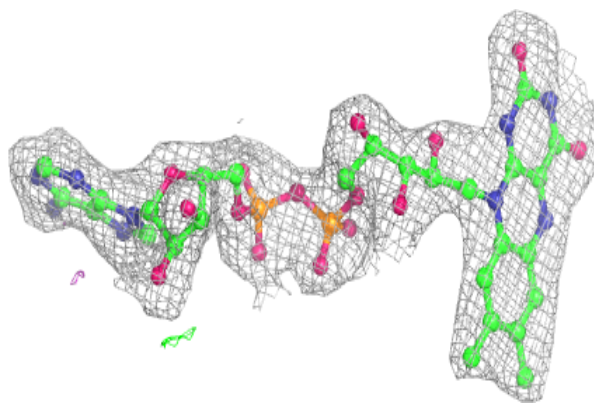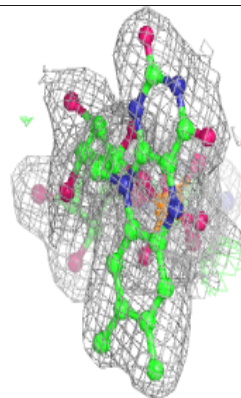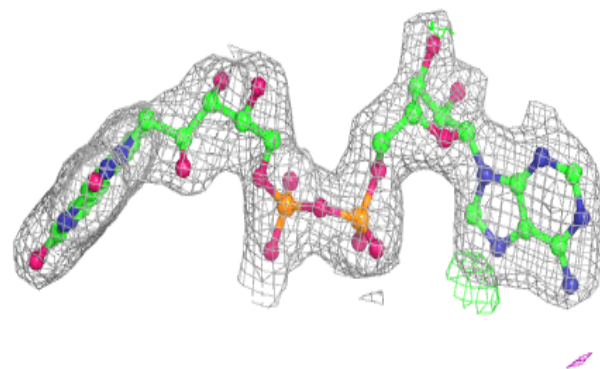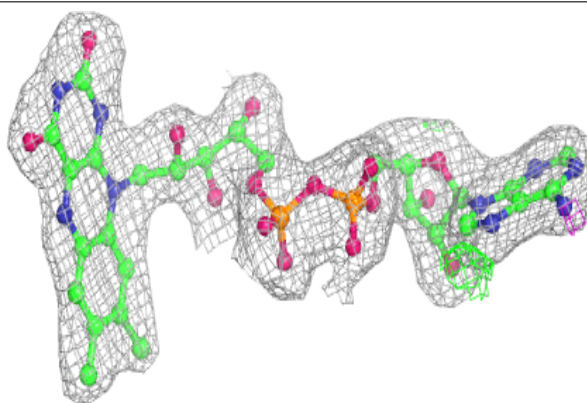mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
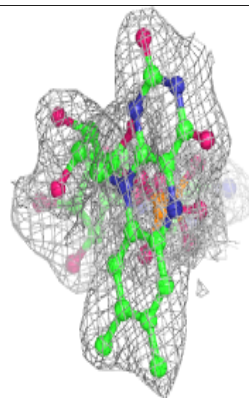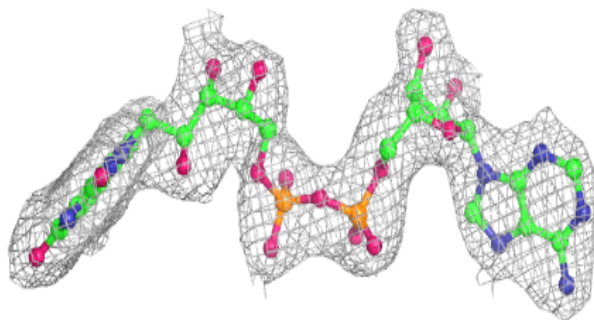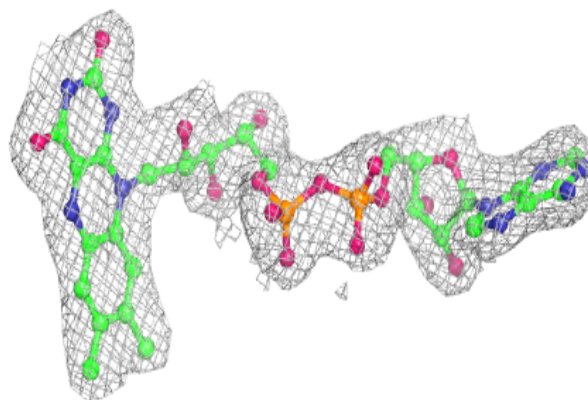
Electron density around FAD D 311:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
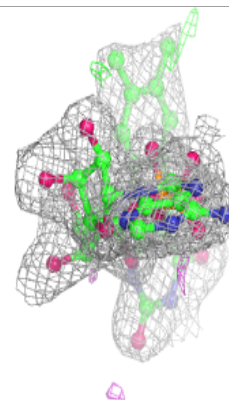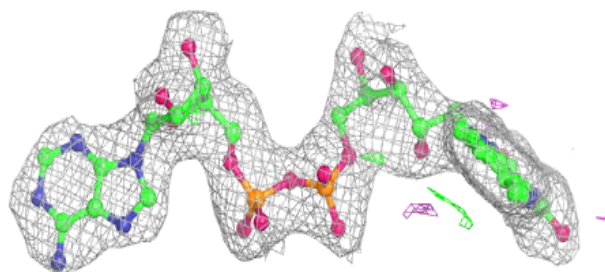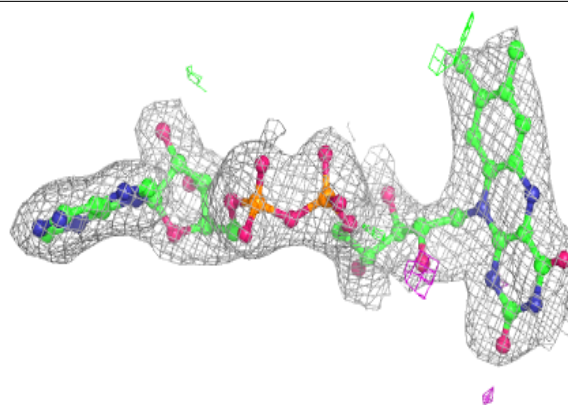
Electron density around FAD E 311:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
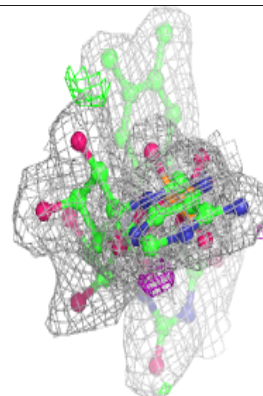
Electron density around FAD C 311:

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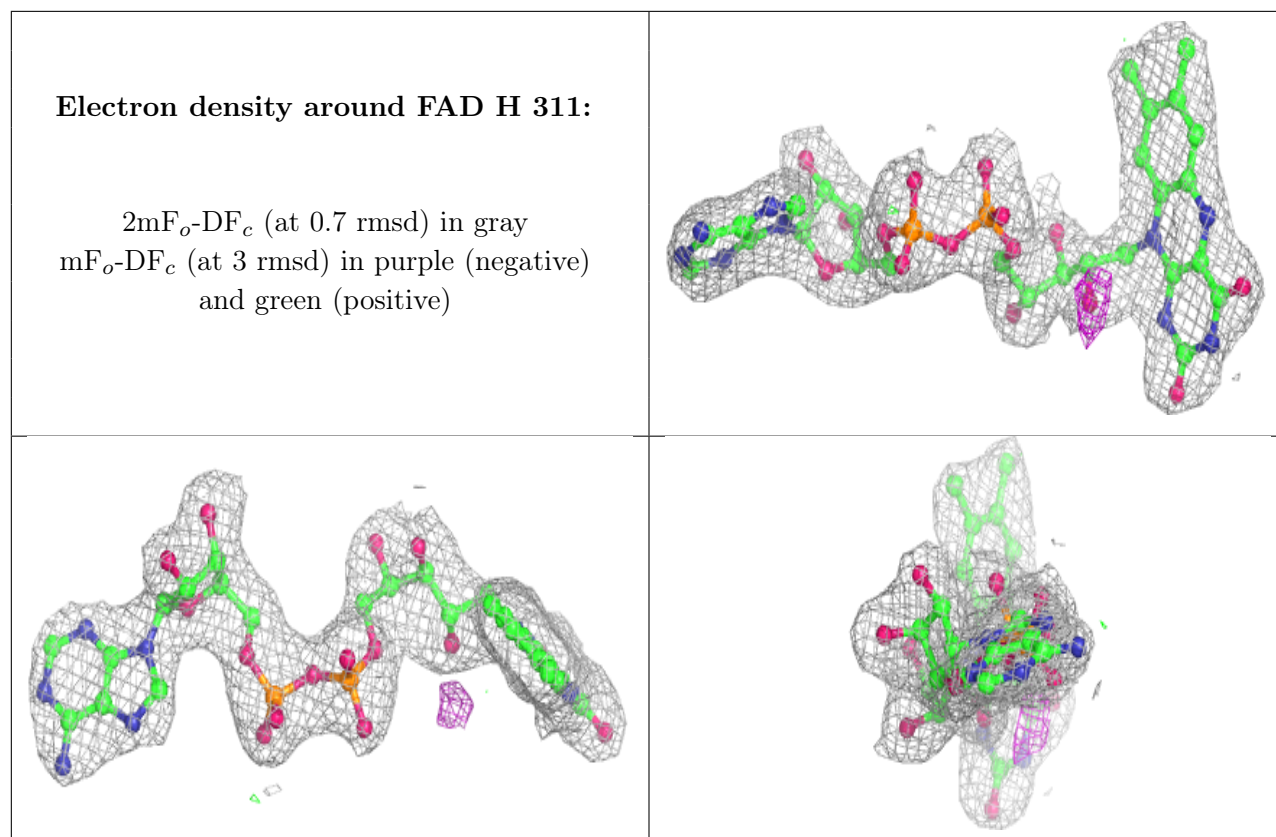mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around FAD G 311:

$2mF_o$-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 H 311:

$2mF_o$-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 ⓘ

There are no such residues in this entry.