WORLDWIDE PDB

PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report (i)

Dec 12, 2024 – 09:32 pm GMT

PDB ID	:	9H8Q
Title	:	Eugenol Oxidase (EUGO)from Rhodococcus jostii RHA1, mutant DTT-T425G
Authors	:	Rozeboom, H.J.; Fraaije, M.W.
Deposited on	:	2024-10-29
Resolution	:	1.60 Å(reported)

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

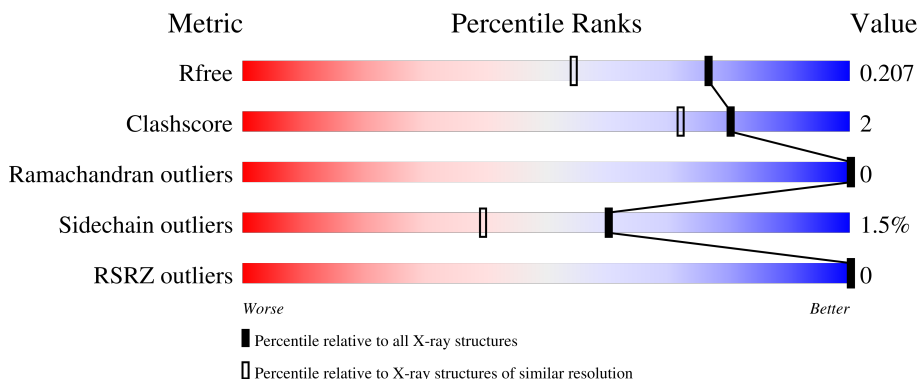|		
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.40

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 1.60 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.
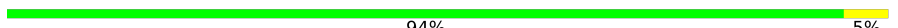
Metric	Percentile Ranks	Value
Rfree		0.207
Clashscore		2
Ramachandran outliers		0
Sidechain outliers		1.5%
RSRZ outliers		0

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$_{free}$	164625	4274 (1.60-1.60)
Clashscore	180529	4682 (1.60-1.60)
Ramachandran outliers	177936	4583 (1.60-1.60)
Sidechain outliers	177891	4582 (1.60-1.60)
RSRZ outliers	164620	4272 (1.60-1.60)

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	526	92% ... 7%
1	B	526	94% ... 6%
1	C	526	94% ... 5% •
1	D	526	94% ... 5% •
1	E	526	92% ... 7%

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Mol	Chain	Length	Quality of chain
1	F	526	94% · 5% ·
1	G	526	93% · 6% ·
1	H	526	94% · 5%

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 36661 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 Probable vanillyl-alcohol oxidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	525	Total	C	N	O	S	0	2	0
			4146	2642	702	776	26			
1	B	525	Total	C	N	O	S	0	1	0
			4138	2637	701	775	25			
1	C	525	Total	C	N	O	S	0	3	0
			4154	2646	703	779	26			
1	D	525	Total	C	N	O	S	0	0	0
			4130	2632	700	774	24			
1	E	525	Total	C	N	O	S	0	2	0
			4146	2642	702	776	26			
1	F	525	Total	C	N	O	S	0	0	0
			4130	2632	700	774	24			
1	G	525	Total	C	N	O	S	0	1	0
			4138	2638	701	775	24			
1	H	525	Total	C	N	O	S	0	0	0
			4130	2632	700	774	24			

There are 64 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	81	HIS	SER	engineered mutation	UNP Q0SBK1
A	394	VAL	SER	engineered mutation	UNP Q0SBK1
A	423	MET	ALA	engineered mutation	UNP Q0SBK1
A	425	GLY	GLN	engineered mutation	UNP Q0SBK1
A	427	THR	ILE	engineered mutation	UNP Q0SBK1
A	434	TYR	HIS	engineered mutation	UNP Q0SBK1
A	445	ASP	ILE	engineered mutation	UNP Q0SBK1
A	518	PRO	SER	engineered mutation	UNP Q0SBK1
B	81	HIS	SER	engineered mutation	UNP Q0SBK1
B	394	VAL	SER	engineered mutation	UNP Q0SBK1
B	423	MET	ALA	engineered mutation	UNP Q0SBK1
B	425	GLY	GLN	engineered mutation	UNP Q0SBK1
B	427	THR	ILE	engineered mutation	UNP Q0SBK1

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Chain	Residue	Modelled	Actual	Comment	Reference
B	434	TYR	HIS	engineered mutation	UNP Q0SBK1
B	445	ASP	ILE	engineered mutation	UNP Q0SBK1
B	518	PRO	SER	engineered mutation	UNP Q0SBK1
C	81	HIS	SER	engineered mutation	UNP Q0SBK1
C	394	VAL	SER	engineered mutation	UNP Q0SBK1
C	423	MET	ALA	engineered mutation	UNP Q0SBK1
C	425	GLY	GLN	engineered mutation	UNP Q0SBK1
C	427	THR	ILE	engineered mutation	UNP Q0SBK1
C	434	TYR	HIS	engineered mutation	UNP Q0SBK1
C	445	ASP	ILE	engineered mutation	UNP Q0SBK1
C	518	PRO	SER	engineered mutation	UNP Q0SBK1
D	81	HIS	SER	engineered mutation	UNP Q0SBK1
D	394	VAL	SER	engineered mutation	UNP Q0SBK1
D	423	MET	ALA	engineered mutation	UNP Q0SBK1
D	425	GLY	GLN	engineered mutation	UNP Q0SBK1
D	427	THR	ILE	engineered mutation	UNP Q0SBK1
D	434	TYR	HIS	engineered mutation	UNP Q0SBK1
D	445	ASP	ILE	engineered mutation	UNP Q0SBK1
D	518	PRO	SER	engineered mutation	UNP Q0SBK1
E	81	HIS	SER	engineered mutation	UNP Q0SBK1
E	394	VAL	SER	engineered mutation	UNP Q0SBK1
E	423	MET	ALA	engineered mutation	UNP Q0SBK1
E	425	GLY	GLN	engineered mutation	UNP Q0SBK1
E	427	THR	ILE	engineered mutation	UNP Q0SBK1
E	434	TYR	HIS	engineered mutation	UNP Q0SBK1
E	445	ASP	ILE	engineered mutation	UNP Q0SBK1
E	518	PRO	SER	engineered mutation	UNP Q0SBK1
F	81	HIS	SER	engineered mutation	UNP Q0SBK1
F	394	VAL	SER	engineered mutation	UNP Q0SBK1
F	423	MET	ALA	engineered mutation	UNP Q0SBK1
F	425	GLY	GLN	engineered mutation	UNP Q0SBK1
F	427	THR	ILE	engineered mutation	UNP Q0SBK1
F	434	TYR	HIS	engineered mutation	UNP Q0SBK1
F	445	ASP	ILE	engineered mutation	UNP Q0SBK1
F	518	PRO	SER	engineered mutation	UNP Q0SBK1
G	81	HIS	SER	engineered mutation	UNP Q0SBK1
G	394	VAL	SER	engineered mutation	UNP Q0SBK1
G	423	MET	ALA	engineered mutation	UNP Q0SBK1
G	425	GLY	GLN	engineered mutation	UNP Q0SBK1
G	427	THR	ILE	engineered mutation	UNP Q0SBK1
G	434	TYR	HIS	engineered mutation	UNP Q0SBK1
G	445	ASP	ILE	engineered mutation	UNP Q0SBK1

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Chain	Residue	Modelled	Actual	Comment	Reference
G	518	PRO	SER	engineered mutation	UNP Q0SBK1
H	81	HIS	SER	engineered mutation	UNP Q0SBK1
H	394	VAL	SER	engineered mutation	UNP Q0SBK1
H	423	MET	ALA	engineered mutation	UNP Q0SBK1
H	425	GLY	GLN	engineered mutation	UNP Q0SBK1
H	427	THR	ILE	engineered mutation	UNP Q0SBK1
H	434	TYR	HIS	engineered mutation	UNP Q0SBK1
H	445	ASP	ILE	engineered mutation	UNP Q0SBK1
H	518	PRO	SER	engineered mutation	UNP Q0SBK1

- Molecule 2 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$).
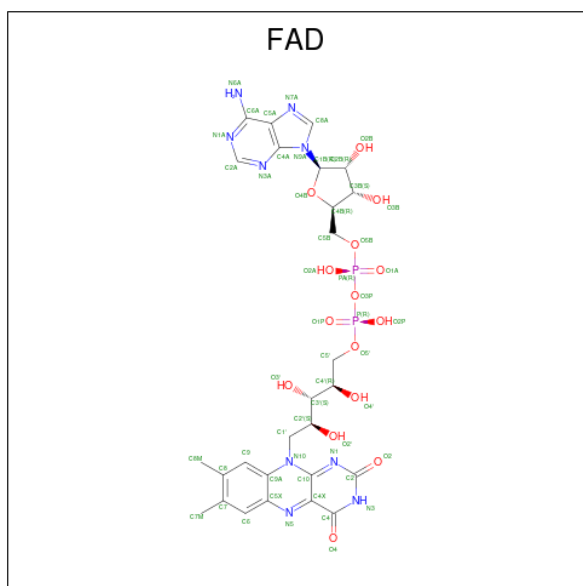
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
2	B	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
2	C	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
2	D	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
2	E	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
2	F	1	Total	C	N	O	P	0	0
			53	27	9	15	2		

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

- Molecule 3 is 2-[3-(2-HYDROXY-1,1-DIHYDROXYMETHYL-ETHYLAMINO)-PROPYL AMINO]-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (three-letter code: B3P) (formula: $C_{11}H_{26}N_2O_6$).
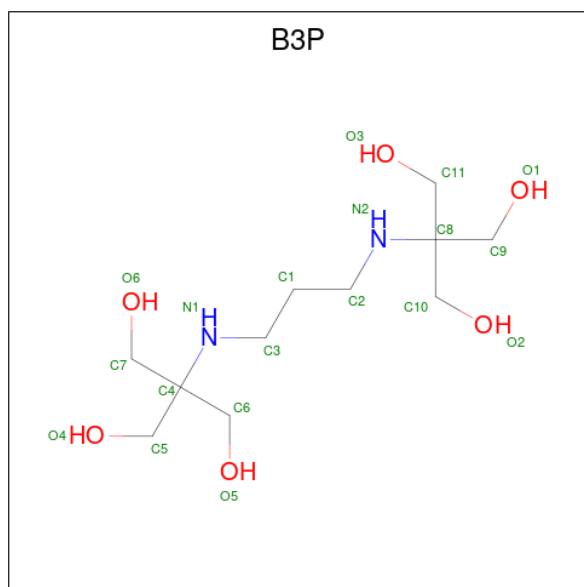
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			19	11	2	6		
3	A	1	Total	C	N	O	0	0
			19	11	2	6		
3	F	1	Total	C	N	O	0	0
			19	11	2	6		
3	F	1	Total	C	N	O	0	0
			19	11	2	6		

- Molecule 4 is (4S)-2-METHYL-2,4-PENTANEDIOL (three-letter code: MPD) (formula: $C_6H_{14}O_2$).

MPD

O4
OH

C1

C5

C4(S)

C2 CM

C3

OH
O2
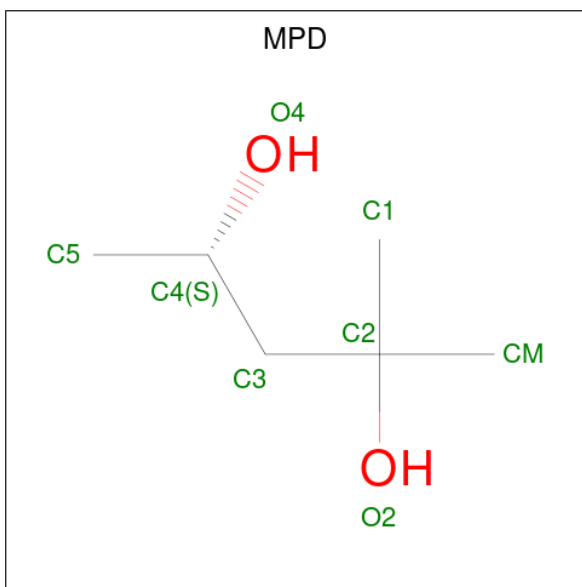
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total 8	C 6	O 2	0	0
4	B	1	Total 8	C 6	O 2	0	0
4	C	1	Total 8	C 6	O 2	0	0
4	D	1	Total 8	C 6	O 2	0	0
4	F	1	Total 8	C 6	O 2	0	0
4	H	1	Total 8	C 6	O 2	0	0

- Molecule 5 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	B	1	Total 1	Cl 1	0	0
5	F	1	Total 1	Cl 1	0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	392	Total 392	O 392	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	B	371	Total 371	O 371	0	0
6	C	374	Total 374	O 374	0	0
6	D	389	Total 389	O 389	0	0
6	E	420	Total 420	O 420	0	0
6	F	385	Total 385	O 385	0	0
6	G	329	Total 329	O 329	0	0
6	H	339	Total 339	O 339	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.

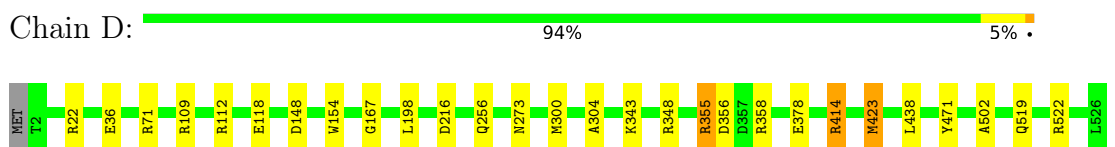- Molecule 1: Probable vanillyl-alcohol oxidase

Chain A:

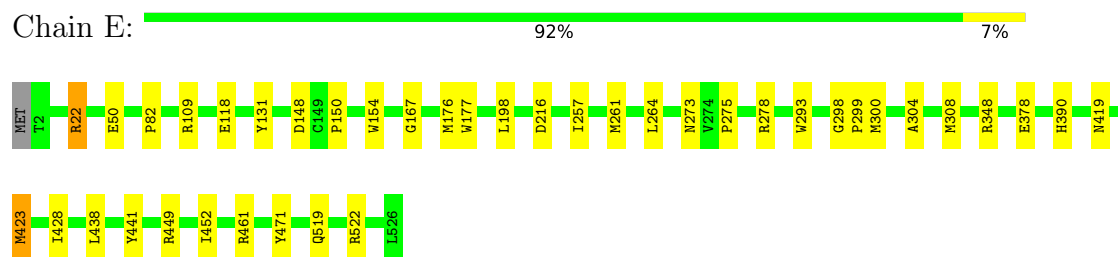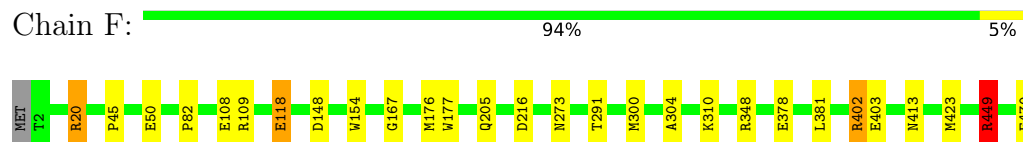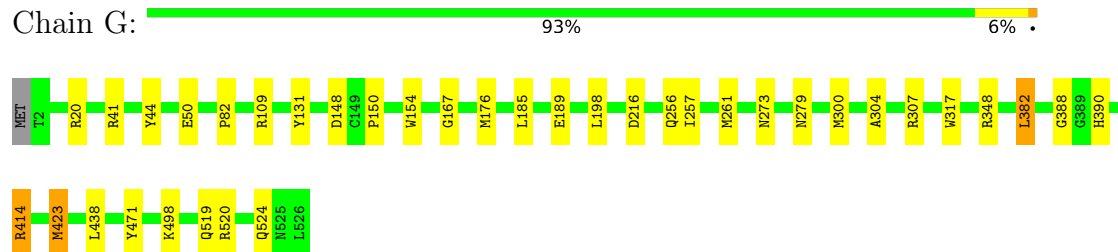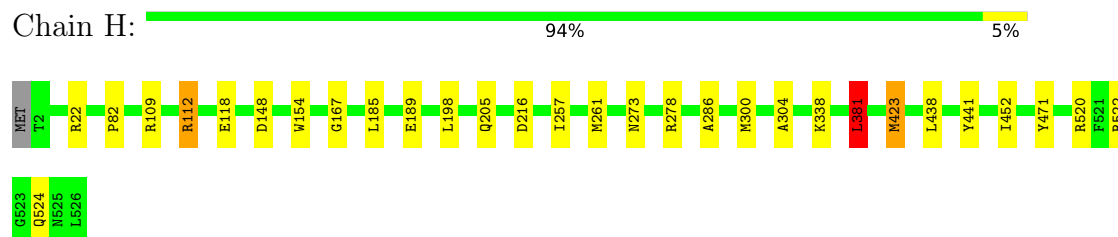- Molecule 1: Probable vanillyl-alcohol oxidase

Chain B:

- Molecule 1: Probable vanillyl-alcohol oxidase

Chain C:

- Molecule 1: Probable vanillyl-alcohol oxidase

Chain D:

- Molecule 1: Probable vanillyl-alcohol oxidase

Chain E: 92% 7%

MET T2 R22 E50 P82 R109 E118 Y131 D148 C149 P150 W154 G167 M176 W177 L198 D216 I257 M261 L264 N273 V274 P275 R278 W293 G298 P299 M300 A304 M308 R348 E378 H390 N419

M423 I428 L438 Y441 R449 I452 R461 Y471 Q519 R522 L526

• Molecule 1: Probable vanillyl-alcohol oxidase

Chain F: 94% 5% •

MET T2 R20 P45 E50 P82 E108 R109 E118 D148 W154 G167 M176 W177 Q205 D216 N273 T291 M300 A304 K310 R348 E378 L381 R402 E403 N413 M423 R449 E470 Y471 L526

• Molecule 1: Probable vanillyl-alcohol oxidase

Chain G: 93% 6% •

MET T2 R20 R41 Y44 E50 P82 R109 Y131 D148 C149 P150 W154 G167 M176 L185 E189 L198 D216 Q256 I257 M261 N273 N279 M300 A304 R307 W317 R348 L382 G388 G389 H390

R414 M423 L438 Y471 K498 Q519 R520 Q524 N525 L526

• Molecule 1: Probable vanillyl-alcohol oxidase

Chain H: 94% 5%

MET T2 R22 P82 R109 R112 E118 D148 W154 G167 L185 E189 L198 Q205 D216 I257 M261 N273 R278 A286 M300 A304 K338 L381 M423 L438 Y441 I452 Y471 R520 F521 R522

G523 Q524 N525 L526

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	90.44Å 110.20Å 117.54Å 89.87° 89.34° 68.51°	Depositor
Resolution (Å)	102.75 – 1.60 102.75 – 1.60	Depositor EDS
% Data completeness (in resolution range)	93.2 (102.75-1.60) 93.2 (102.75-1.60)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.58 (at 1.60Å)	Xtriage
Refinement program	REFMAC 5.8.0430	Depositor
R, R_{free}	0.177 , 0.198 0.188 , 0.207	Depositor DCC
R_{free} test set	25315 reflections (4.88%)	wwPDB-VP
Wilson B-factor (Å^2)	17.0	Xtriage
Anisotropy	0.238	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 24.3	EDS
L-test for twinning[2]	$< |L| > = 0.48, < L^2 > = 0.31$	Xtriage
Estimated twinning fraction	0.020 for h,h-k,-l 0.137 for -h,-k,l 0.019 for -h,-h+k,-l	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	36661	wwPDB-VP
Average B, all atoms (Å^2)	20.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.44% of the height of the origin peak. No significant pseudotranslation is detected.*

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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:
MPD, FAD, CL, B3P

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	0.48	0/4255	0.85	12/5772 (0.2%)
1	B	0.47	0/4247	0.80	5/5762 (0.1%)
1	C	0.46	0/4263	0.82	8/5783 (0.1%)
1	D	0.51	0/4239	0.85	12/5752 (0.2%)
1	E	0.51	0/4255	0.86	13/5772 (0.2%)
1	F	0.48	0/4239	0.84	9/5752 (0.2%)
1	G	0.43	0/4247	0.79	6/5763 (0.1%)
1	H	0.46	0/4239	0.81	10/5752 (0.2%)
All	All	0.48	0/33984	0.83	75/46108 (0.2%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	2
1	B	0	2
1	C	0	2
1	D	0	2
1	E	0	2
1	F	0	2
1	G	0	3
1	H	0	1
All	All	0	16

There are no bond length outliers.

All (75) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	433	MET	CG-SD-CE	-12.34	80.46	100.20
1	G	176	MET	CG-SD-CE	10.52	117.03	100.20
1	A	423	MET	CG-SD-CE	-10.51	83.39	100.20
1	H	109	ARG	NE-CZ-NH2	-9.70	115.45	120.30
1	G	109	ARG	NE-CZ-NH2	-9.39	115.61	120.30
1	A	264	LEU	CB-CG-CD1	9.35	126.89	111.00
1	C	423[A]	MET	CG-SD-CE	-9.31	85.30	100.20
1	C	423[B]	MET	CG-SD-CE	-9.31	85.30	100.20
1	A	109	ARG	NE-CZ-NH2	-9.30	115.65	120.30
1	G	423	MET	CG-SD-CE	-9.26	85.38	100.20
1	D	355	ARG	NE-CZ-NH1	-9.24	115.68	120.30
1	F	118	GLU	CG-CD-OE2	-9.21	99.88	118.30
1	D	109	ARG	NE-CZ-NH2	-9.18	115.71	120.30
1	B	109	ARG	NE-CZ-NH2	-9.13	115.73	120.30
1	E	264	LEU	CB-CG-CD1	8.66	125.73	111.00
1	F	403	GLU	CG-CD-OE1	8.61	135.52	118.30
1	A	176[A]	MET	CG-SD-CE	-8.59	86.46	100.20
1	A	176[B]	MET	CG-SD-CE	-8.59	86.46	100.20
1	D	109	ARG	NE-CZ-NH1	8.17	124.39	120.30
1	F	118	GLU	CG-CD-OE1	8.15	134.60	118.30
1	D	414	ARG	NE-CZ-NH2	-8.15	116.22	120.30
1	E	118	GLU	CG-CD-OE2	-7.97	102.36	118.30
1	E	109	ARG	NE-CZ-NH2	-7.94	116.33	120.30
1	C	109	ARG	NE-CZ-NH2	-7.72	116.44	120.30
1	F	109	ARG	NE-CZ-NH2	-7.68	116.46	120.30
1	E	423[A]	MET	CB-CG-SD	-7.52	89.85	112.40
1	E	423[B]	MET	CB-CG-SD	-7.52	89.85	112.40
1	F	423	MET	CG-SD-CE	-7.50	88.20	100.20
1	D	358	ARG	NE-CZ-NH2	-7.50	116.55	120.30
1	E	423[A]	MET	CG-SD-CE	-7.24	88.62	100.20
1	E	423[B]	MET	CG-SD-CE	-7.24	88.62	100.20
1	A	118	GLU	CG-CD-OE2	-7.19	103.92	118.30
1	E	109	ARG	NE-CZ-NH1	7.13	123.86	120.30
1	A	22	ARG	NE-CZ-NH1	7.07	123.84	120.30
1	C	109	ARG	NE-CZ-NH1	6.96	123.78	120.30
1	H	118	GLU	CG-CD-OE2	-6.95	104.39	118.30
1	D	522	ARG	NE-CZ-NH2	-6.92	116.84	120.30
1	D	71	ARG	NE-CZ-NH2	-6.60	117.00	120.30
1	D	118	GLU	CG-CD-OE2	-6.46	105.39	118.30
1	H	381	LEU	CB-CG-CD2	6.45	121.97	111.00
1	E	118	GLU	CG-CD-OE1	6.39	131.09	118.30
1	G	414	ARG	NE-CZ-NH2	-6.24	117.18	120.30
1	H	423	MET	CG-SD-CE	-6.15	90.36	100.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	G	109	ARG	NE-CZ-NH1	6.05	123.33	120.30
1	H	118	GLU	CG-CD-OE1	6.03	130.37	118.30
1	H	109	ARG	NE-CZ-NH1	6.01	123.31	120.30
1	F	403	GLU	CG-CD-OE2	-5.98	106.33	118.30
1	B	109	ARG	NE-CZ-NH1	5.98	123.29	120.30
1	D	358	ARG	CB-CG-CD	-5.87	96.33	111.60
1	C	522	ARG	NE-CZ-NH2	-5.84	117.38	120.30
1	C	414	ARG	NE-CZ-NH2	-5.83	117.39	120.30
1	A	118	GLU	CG-CD-OE1	5.79	129.87	118.30
1	B	355	ARG	CG-CD-NE	-5.73	99.77	111.80
1	A	449	ARG	CG-CD-NE	5.66	123.68	111.80
1	H	22	ARG	NE-CZ-NH2	-5.62	117.49	120.30
1	E	461	ARG	NE-CZ-NH1	5.62	123.11	120.30
1	A	461	ARG	NE-CZ-NH2	-5.52	117.54	120.30
1	E	522	ARG	NE-CZ-NH1	5.46	123.03	120.30
1	D	358	ARG	NE-CZ-NH1	5.45	123.03	120.30
1	D	118	GLU	CG-CD-OE1	5.41	129.12	118.30
1	B	522	ARG	NE-CZ-NH1	5.41	123.00	120.30
1	E	22	ARG	NE-CZ-NH2	-5.33	117.63	120.30
1	D	423	MET	CG-SD-CE	-5.22	91.84	100.20
1	F	402	ARG	CG-CD-NE	5.18	122.67	111.80
1	H	522	ARG	NE-CZ-NH2	-5.16	117.72	120.30
1	C	378	GLU	CB-CG-CD	5.15	128.11	114.20
1	E	278	ARG	NE-CZ-NH2	-5.15	117.73	120.30
1	G	20	ARG	NE-CZ-NH1	5.15	122.87	120.30
1	F	449	ARG	CG-CD-NE	5.14	122.59	111.80
1	F	109	ARG	NE-CZ-NH1	5.13	122.87	120.30
1	H	338	LYS	CD-CE-NZ	5.13	123.49	111.70
1	A	278	ARG	NE-CZ-NH2	-5.08	117.76	120.30
1	B	278	ARG	CD-NE-CZ	5.04	130.66	123.60
1	A	109	ARG	NE-CZ-NH1	5.04	122.82	120.30
1	H	278	ARG	CD-NE-CZ	5.02	130.62	123.60

There are no chirality outliers.

All (16) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	112	ARG	Sidechain
1	A	348	ARG	Sidechain
1	B	20	ARG	Sidechain
1	B	348	ARG	Sidechain
1	C	13	ARG	Sidechain

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Mol	Chain	Res	Type	Group
1	C	348	ARG	Sidechain
1	D	22	ARG	Sidechain
1	D	348	ARG	Sidechain
1	E	22	ARG	Sidechain
1	E	348	ARG	Sidechain
1	F	20	ARG	Sidechain
1	F	348	ARG	Sidechain
1	G	307	ARG	Sidechain
1	G	348	ARG	Sidechain
1	G	41	ARG	Sidechain
1	H	112	ARG	Sidechain

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	4146	0	4012	22	0
1	B	4138	0	4004	20	0
1	C	4154	0	4015	22	0
1	D	4130	0	3996	12	0
1	E	4146	0	4012	24	0
1	F	4130	0	3996	16	0
1	G	4138	0	4006	28	0
1	H	4130	0	3996	13	0
2	A	53	0	30	1	0
2	B	53	0	30	6	0
2	C	53	0	31	7	0
2	D	53	0	30	1	0
2	E	53	0	30	6	0
2	F	53	0	30	1	0
2	G	53	0	31	7	0
2	H	53	0	30	1	0
3	A	38	0	52	0	0
3	F	38	0	52	1	0
4	A	8	0	14	1	0
4	B	8	0	14	2	0
4	C	8	0	14	0	0
4	D	8	0	14	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	F	8	0	14	0	0
4	H	8	0	14	0	0
5	B	1	0	0	0	0
5	F	1	0	0	0	0
6	A	392	0	0	5	0
6	B	371	0	0	6	0
6	C	374	0	0	2	0
6	D	389	0	0	6	0
6	E	420	0	0	6	0
6	F	385	0	0	9	0
6	G	329	0	0	4	0
6	H	339	0	0	4	0
All	All	36661	0	32467	164	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 2.

All (164) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:390:HIS:NE2	2:E:600:FAD:C8M	1.68	1.56
1:B:390:HIS:NE2	2:B:601:FAD:C8M	1.69	1.56
1:C:390:HIS:NE2	2:C:600:FAD:C8M	1.74	1.47
1:G:390:HIS:NE2	2:G:600:FAD:C8M	1.79	1.41
1:G:390:HIS:NE2	2:G:600:FAD:HM82	1.02	1.34
1:C:390:HIS:NE2	2:C:600:FAD:HM82	0.90	1.22
1:G:390:HIS:CD2	2:G:600:FAD:HM82	1.81	1.16
1:C:390:HIS:CD2	2:C:600:FAD:HM82	1.83	1.13
1:G:44:TYR:CZ	1:G:382[A]:LEU:HD11	2.01	0.94
1:H:286:ALA:HA	1:H:381:LEU:HD22	1.52	0.91
1:B:390:HIS:NE2	2:B:601:FAD:HM81	1.90	0.78
1:A:282[B]:MET:HE1	4:A:603:MPD:H53	1.69	0.75
1:G:44:TYR:CZ	1:G:382[A]:LEU:CD1	2.69	0.74
1:F:108:GLU:HG2	6:F:782:HOH:O	1.87	0.73
1:E:390:HIS:CD2	2:E:600:FAD:C8M	2.69	0.72
1:B:390:HIS:CD2	2:B:601:FAD:C8M	2.70	0.71
1:F:413:ASN:HB2	3:F:604:B3P:O2	1.91	0.71
1:H:286:ALA:CA	1:H:381:LEU:HD22	2.20	0.71
1:E:390:HIS:NE2	2:E:600:FAD:HM81	1.97	0.71
1:G:390:HIS:NE2	2:G:600:FAD:HM81	2.01	0.70
1:B:82:PRO:HD2	6:B:771:HOH:O	1.93	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:82:PRO:HD2	6:E:801:HOH:O	1.94	0.68
1:A:112:ARG:NH2	6:A:702:HOH:O	2.27	0.68
1:E:390:HIS:NE2	2:E:600:FAD:C8	2.56	0.66
1:G:498:LYS:HG3	6:G:705:HOH:O	1.95	0.66
1:G:44:TYR:OH	1:G:382[A]:LEU:CD1	2.44	0.65
1:B:390:HIS:NE2	2:B:601:FAD:C8	2.58	0.64
1:C:390:HIS:NE2	2:C:600:FAD:HM81	2.01	0.64
1:G:44:TYR:OH	1:G:382[A]:LEU:HD11	1.98	0.62
1:B:390:HIS:CE1	2:B:601:FAD:C8M	2.72	0.62
1:G:82:PRO:HD2	6:G:781:HOH:O	2.00	0.62
1:H:82:PRO:HD2	6:H:722:HOH:O	2.00	0.60
1:C:295[B]:ASP:CG	1:C:295[B]:ASP:O	2.40	0.60
1:E:390:HIS:CE1	2:E:600:FAD:C8M	2.74	0.59
1:G:423:MET:HG3	6:G:943:HOH:O	2.01	0.59
1:G:390:HIS:NE2	2:G:600:FAD:C8	2.61	0.59
1:D:378:GLU:HG2	6:D:748:HOH:O	2.04	0.58
1:B:311:ASP:HB2	6:B:1019:HOH:O	2.05	0.57
1:A:298:GLY:HA2	1:A:419:ASN:ND2	2.20	0.57
1:C:390:HIS:CE1	2:C:600:FAD:C8M	2.74	0.57
1:C:390:HIS:NE2	2:C:600:FAD:C8	2.64	0.56
1:A:422:TYR:OH	1:A:435:HIS:HE1	1.87	0.56
1:A:275:PRO:HG2	1:A:428:ILE:HG12	1.88	0.56
1:D:112:ARG:NH2	6:D:705:HOH:O	2.32	0.55
2:G:600:FAD:H8A	2:G:600:FAD:O5B	2.07	0.55
2:C:600:FAD:H8A	2:C:600:FAD:O5B	2.07	0.54
1:B:343:LYS:HD2	6:B:799:HOH:O	2.07	0.54
1:C:82:PRO:HD2	6:C:778:HOH:O	2.08	0.54
1:A:378:GLU:HG3	6:A:756:HOH:O	2.07	0.54
2:B:601:FAD:O5B	2:B:601:FAD:H8A	2.09	0.53
1:B:422:TYR:OH	1:B:435:HIS:HE1	1.90	0.53
1:A:435:HIS:HD2	6:A:811:HOH:O	1.92	0.52
1:H:423:MET:HG3	6:H:928:HOH:O	2.10	0.52
1:A:82:PRO:HD2	6:A:802:HOH:O	2.10	0.52
1:A:343:LYS:CE	6:A:958:HOH:O	2.57	0.52
1:A:45:PRO:HG2	1:A:449:ARG:HD2	1.93	0.51
1:G:44:TYR:CE1	1:G:382[A]:LEU:CD1	2.94	0.51
2:A:600:FAD:H8A	2:A:600:FAD:O5B	2.11	0.51
1:D:148:ASP:OD1	1:D:167:GLY:HA3	2.11	0.51
2:E:600:FAD:H8A	2:E:600:FAD:O5B	2.11	0.51
1:A:275:PRO:HG2	1:A:428:ILE:CG1	2.41	0.51
1:F:82:PRO:HD2	6:F:801:HOH:O	2.10	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:305:ILE:HA	1:A:308:MET:HE2	1.94	0.50
1:E:378:GLU:HG2	6:E:725:HOH:O	2.11	0.50
1:C:428:ILE:CG1	1:C:433:MET:HE3	2.42	0.50
1:G:44:TYR:OH	1:G:382[A]:LEU:HD12	2.10	0.50
1:E:275:PRO:HG2	1:E:428:ILE:HG12	1.93	0.50
1:F:291:THR:HG23	6:F:1064:HOH:O	2.10	0.50
1:A:148:ASP:OD1	1:A:167:GLY:HA3	2.12	0.49
1:D:300:MET:HG2	1:D:304:ALA:HB3	1.94	0.49
1:E:298:GLY:HA2	1:E:419:ASN:ND2	2.27	0.49
1:F:118:GLU:HG2	6:F:747:HOH:O	2.12	0.49
1:E:148:ASP:OD1	1:E:167:GLY:HA3	2.13	0.49
1:C:148:ASP:OD1	1:C:167:GLY:HA3	2.13	0.49
1:C:257:ILE:O	1:C:261:MET:HG3	2.13	0.49
1:F:45:PRO:HG2	1:F:449:ARG:HD2	1.95	0.49
1:F:148:ASP:OD1	1:F:167:GLY:HA3	2.13	0.49
1:H:148:ASP:OD1	1:H:167:GLY:HA3	2.12	0.49
1:F:50:GLU:HA	1:F:50:GLU:OE1	2.13	0.49
1:E:50:GLU:HA	1:E:50:GLU:OE1	2.13	0.48
1:F:470:GLU:HG2	6:F:875:HOH:O	2.12	0.48
2:H:602:FAD:O5B	2:H:602:FAD:H8A	2.12	0.48
1:B:148:ASP:OD1	1:B:167:GLY:HA3	2.13	0.48
1:B:435:HIS:HD2	6:B:969:HOH:O	1.97	0.48
1:C:142:ASP:HB3	6:C:1010:HOH:O	2.14	0.48
1:D:356:ASP:HB3	1:G:519:GLN:NE2	2.29	0.48
1:A:50:GLU:HA	1:A:50:GLU:OE1	2.13	0.48
1:B:300:MET:HG2	1:B:304:ALA:HB3	1.96	0.47
1:G:148:ASP:OD1	1:G:167:GLY:HA3	2.13	0.47
1:B:257:ILE:O	1:B:261:MET:HG3	2.15	0.47
1:C:300:MET:HG2	1:C:304:ALA:HB3	1.97	0.47
1:E:257:ILE:O	1:E:261:MET:HG3	2.15	0.47
1:E:275:PRO:HG2	1:E:428:ILE:CG1	2.44	0.47
1:A:257:ILE:O	1:A:261:MET:HG3	2.15	0.46
2:D:600:FAD:H8A	2:D:600:FAD:O5B	2.16	0.46
1:H:257:ILE:O	1:H:261:MET:HG3	2.15	0.46
1:G:257:ILE:O	1:G:261:MET:HG3	2.15	0.46
1:E:449:ARG:CZ	6:E:726:HOH:O	2.63	0.46
1:C:50:GLU:HA	1:C:50:GLU:OE1	2.15	0.46
1:A:422:TYR:OH	1:A:435:HIS:CE1	2.68	0.46
1:G:50:GLU:HA	1:G:50:GLU:OE1	2.16	0.46
1:B:13:ARG:NE	1:B:13:ARG:HA	2.31	0.46
1:B:307:ARG:HD2	6:B:1014:HOH:O	2.15	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:423[A]:MET:HG3	6:E:967:HOH:O	2.15	0.46
1:E:299:PRO:HD3	1:E:419:ASN:HD22	1.80	0.46
2:F:601:FAD:O5B	2:F:601:FAD:H8A	2.16	0.46
1:C:185:LEU:HB2	1:C:189:GLU:HG2	1.98	0.45
1:F:378:GLU:HG2	6:F:778:HOH:O	2.15	0.45
1:H:300:MET:HG2	1:H:304:ALA:HB3	1.97	0.45
1:E:378:GLU:CG	6:E:725:HOH:O	2.64	0.45
1:D:414:ARG:HA	1:D:414:ARG:HD3	1.84	0.44
1:F:20:ARG:HD2	6:F:1032:HOH:O	2.17	0.44
1:G:300:MET:HG2	1:G:304:ALA:HB3	2.00	0.44
1:A:378:GLU:HG2	1:A:381:LEU:HD12	1.99	0.44
1:D:378:GLU:CG	6:D:748:HOH:O	2.64	0.44
1:C:428:ILE:HG12	1:C:433:MET:HE3	1.99	0.44
1:B:436:VAL:HG11	4:B:602:MPD:H31	1.98	0.44
1:F:176:MET:HE2	1:F:177:TRP:CZ2	2.54	0.43
1:D:256:GLN:NE2	6:D:722:HOH:O	2.51	0.43
1:H:205:GLN:NE2	6:H:719:HOH:O	2.51	0.43
1:E:423[A]:MET:HB2	1:E:438:LEU:O	2.19	0.43
1:F:205:GLN:NE2	6:F:716:HOH:O	2.51	0.43
1:A:298:GLY:HA2	1:A:419:ASN:HD22	1.84	0.43
1:A:378:GLU:HG2	1:A:381:LEU:CD1	2.49	0.43
1:E:441:TYR:CG	1:E:452:ILE:HG13	2.54	0.43
1:F:378:GLU:O	1:F:381:LEU:HD13	2.18	0.43
1:E:300:MET:HG2	1:E:304:ALA:HB3	2.00	0.42
1:G:256:GLN:OE1	6:G:701:HOH:O	2.22	0.42
1:H:185:LEU:HB2	1:H:189:GLU:HG2	2.01	0.42
1:G:185:LEU:HB2	1:G:189:GLU:HG2	2.00	0.42
1:D:423:MET:HB2	1:D:438:LEU:O	2.20	0.42
1:G:390:HIS:CE1	2:G:600:FAD:C8M	2.83	0.42
1:A:185:LEU:HB2	1:A:189:GLU:HG2	2.00	0.42
1:B:422:TYR:OH	1:B:435:HIS:CE1	2.71	0.42
1:E:519:GLN:HG2	6:E:984:HOH:O	2.20	0.42
1:C:428:ILE:CG1	1:C:433:MET:CE	2.97	0.42
1:E:176:MET:HE2	1:E:177:TRP:CZ2	2.55	0.42
1:H:441:TYR:CG	1:H:452:ILE:HG13	2.55	0.42
1:A:423:MET:HB2	1:A:438:LEU:O	2.20	0.41
1:C:428:ILE:HG13	1:C:433:MET:CE	2.50	0.41
1:F:108:GLU:CG	6:F:782:HOH:O	2.58	0.41
1:G:414:ARG:HA	1:G:414:ARG:HD3	1.88	0.41
1:C:414:ARG:HA	1:C:414:ARG:HD3	1.88	0.41
1:C:520:ARG:O	1:C:524:GLN:NE2	2.54	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:36:GLU:OE1	6:D:701:HOH:O	2.21	0.41
1:F:300:MET:HG2	1:F:304:ALA:HB3	2.01	0.41
1:G:423:MET:HB2	1:G:438:LEU:O	2.21	0.41
1:E:131:TYR:CZ	1:E:150:PRO:HD3	2.56	0.41
1:B:378:GLU:HG2	6:B:728:HOH:O	2.20	0.41
4:B:602:MPD:O4	4:B:602:MPD:O2	2.35	0.41
1:D:343:LYS:NZ	6:D:729:HOH:O	2.53	0.41
1:E:293:TRP:CD2	1:E:308:MET:HG2	2.56	0.41
1:G:382[A]:LEU:HD13	1:G:388:GLY:O	2.21	0.41
1:C:502:ALA:HB2	1:D:502:ALA:HB2	2.03	0.40
1:H:112:ARG:NH2	6:H:720:HOH:O	2.53	0.40
1:A:279:ASN:HB3	1:A:317:TRP:CZ3	2.56	0.40
1:B:520:ARG:O	1:B:524:GLN:NE2	2.54	0.40
1:G:131:TYR:CZ	1:G:150:PRO:HD3	2.57	0.40
1:G:520:ARG:O	1:G:524:GLN:NE2	2.54	0.40
1:B:279:ASN:HB3	1:B:317:TRP:CZ3	2.57	0.40
1:C:279:ASN:HB3	1:C:317:TRP:CZ3	2.57	0.40
1:G:279:ASN:HB3	1:G:317:TRP:CZ3	2.56	0.40
1:H:423:MET:HB2	1:H:438:LEU:O	2.22	0.40
1:H:520:ARG:O	1:H:524:GLN:NE2	2.54	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	525/526 (100%)	515 (98%)	10 (2%)	0	100	100
1	B	524/526 (100%)	512 (98%)	12 (2%)	0	100	100
1	C	526/526 (100%)	514 (98%)	12 (2%)	0	100	100
1	D	523/526 (99%)	512 (98%)	11 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	E	525/526 (100%)	514 (98%)	11 (2%)	0	100	100
1	F	523/526 (99%)	511 (98%)	12 (2%)	0	100	100
1	G	524/526 (100%)	512 (98%)	12 (2%)	0	100	100
1	H	523/526 (99%)	513 (98%)	10 (2%)	0	100	100
All	All	4193/4208 (100%)	4103 (98%)	90 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	435/434 (100%)	429 (99%)	6 (1%)	62	43
1	B	434/434 (100%)	427 (98%)	7 (2%)	58	37
1	C	436/434 (100%)	428 (98%)	8 (2%)	54	31
1	D	433/434 (100%)	426 (98%)	7 (2%)	58	37
1	E	435/434 (100%)	430 (99%)	5 (1%)	70	53
1	F	433/434 (100%)	426 (98%)	7 (2%)	58	37
1	G	434/434 (100%)	427 (98%)	7 (2%)	58	37
1	H	433/434 (100%)	427 (99%)	6 (1%)	62	43
All	All	3473/3472 (100%)	3420 (98%)	53 (2%)	60	39

All (53) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	154	TRP
1	A	198	LEU
1	A	216	ASP
1	A	273	ASN
1	A	449	ARG
1	A	471	TYR

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Mol	Chain	Res	Type
1	B	154	TRP
1	B	216	ASP
1	B	273	ASN
1	B	297	ASP
1	B	355	ARG
1	B	471	TYR
1	B	519	GLN
1	C	11	ASP
1	C	154	TRP
1	C	216	ASP
1	C	273	ASN
1	C	378	GLU
1	C	423[A]	MET
1	C	423[B]	MET
1	C	471	TYR
1	D	154	TRP
1	D	198	LEU
1	D	216	ASP
1	D	273	ASN
1	D	355	ARG
1	D	471	TYR
1	D	519	GLN
1	E	154	TRP
1	E	198	LEU
1	E	216	ASP
1	E	273	ASN
1	E	471	TYR
1	F	154	TRP
1	F	216	ASP
1	F	273	ASN
1	F	310	LYS
1	F	402	ARG
1	F	449	ARG
1	F	471	TYR
1	G	154	TRP
1	G	198	LEU
1	G	216	ASP
1	G	273	ASN
1	G	382[A]	LEU
1	G	382[B]	LEU
1	G	471	TYR
1	H	154	TRP

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Mol	Chain	Res	Type
1	H	198	LEU
1	H	216	ASP
1	H	273	ASN
1	H	381	LEU
1	H	471	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (31) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	419	ASN
1	A	435	HIS
1	A	496	HIS
1	B	435	HIS
1	B	496	HIS
1	C	256	GLN
1	C	267	ASN
1	C	506	ASN
1	D	205	GLN
1	D	256	GLN
1	D	267	ASN
1	D	506	ASN
1	E	139	GLN
1	E	205	GLN
1	E	256	GLN
1	E	267	ASN
1	E	419	ASN
1	F	67	GLN
1	F	205	GLN
1	F	267	ASN
1	F	506	ASN
1	G	205	GLN
1	G	267	ASN
1	G	352	HIS
1	G	419	ASN
1	G	475	ASN
1	G	506	ASN
1	H	205	GLN
1	H	267	ASN
1	H	419	ASN
1	H	506	ASN

5.3.3   RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5   Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6   Ligand geometry ⓘ

Of 20 ligands modelled in this entry, 2 are monoatomic - leaving 18 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	601	-	53,58,58	0.83	1 (1%)	68,89,89	0.98	2 (2%)
3	B3P	A	601	-	18,18,18	0.36	0	21,23,23	0.80	1 (4%)
2	FAD	D	600	-	53,58,58	0.77	1 (1%)	68,89,89	1.07	4 (5%)
2	FAD	C	600	-	53,58,58	0.74	1 (1%)	68,89,89	0.75	0
4	MPD	C	601	-	7,7,7	0.21	0	9,10,10	0.56	0
2	FAD	H	602	-	53,58,58	0.69	0	68,89,89	0.95	4 (5%)
3	B3P	A	602	-	18,18,18	0.21	0	21,23,23	0.82	1 (4%)
3	B3P	F	604	-	18,18,18	0.23	0	21,23,23	1.04	1 (4%)
2	FAD	G	600	-	53,58,58	0.67	0	68,89,89	0.82	1 (1%)
3	B3P	F	602	-	18,18,18	0.20	0	21,23,23	0.80	0
4	MPD	D	601	-	7,7,7	0.20	0	9,10,10	0.40	0
2	FAD	A	600	-	53,58,58	0.81	1 (1%)	68,89,89	0.85	3 (4%)
4	MPD	H	601	-	7,7,7	0.25	0	9,10,10	0.34	0
4	MPD	A	603	-	7,7,7	0.30	0	9,10,10	0.42	0
2	FAD	E	600	-	53,58,58	0.65	0	68,89,89	0.83	2 (2%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#|Z| > 2	Counts	RMSZ	#|Z| > 2
4	MPD	F	603	-	7,7,7	0.21	0	9,10,10	0.62	0
2	FAD	B	601	-	53,58,58	0.70	0	68,89,89	1.00	5 (7%)
4	MPD	B	602	-	7,7,7	0.35	0	9,10,10	0.44	0

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	601	-	-	4/30/50/50	0/6/6/6
3	B3P	A	601	-	-	3/28/28/28	-
2	FAD	D	600	-	-	3/30/50/50	0/6/6/6
2	FAD	C	600	-	-	6/30/50/50	0/6/6/6
4	MPD	C	601	-	-	1/5/5/5	-
2	FAD	H	602	-	-	7/30/50/50	0/6/6/6
3	B3P	A	602	-	-	0/28/28/28	-
3	B3P	F	604	-	-	9/28/28/28	-
2	FAD	G	600	-	-	5/30/50/50	0/6/6/6
3	B3P	F	602	-	-	3/28/28/28	-
4	MPD	D	601	-	-	0/5/5/5	-
2	FAD	A	600	-	-	4/30/50/50	0/6/6/6
4	MPD	H	601	-	-	0/5/5/5	-
4	MPD	A	603	-	-	0/5/5/5	-
2	FAD	E	600	-	-	5/30/50/50	0/6/6/6
4	MPD	F	603	-	-	0/5/5/5	-
2	FAD	B	601	-	-	5/30/50/50	0/6/6/6
4	MPD	B	602	-	-	1/5/5/5	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	600	FAD	C1'-C2'	2.49	1.56	1.52
2	C	600	FAD	C8A-N7A	-2.30	1.30	1.34
2	A	600	FAD	C8A-N7A	-2.22	1.30	1.34
2	F	601	FAD	O4B-C1B	2.13	1.44	1.41

All (24) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	601	FAD	O2'-C2'-C3'	-4.04	99.27	109.10
2	D	600	FAD	P-O3P-PA	-3.45	120.99	132.83
2	D	600	FAD	O2'-C2'-C3'	-3.42	100.79	109.10
2	F	601	FAD	P-O3P-PA	-3.15	122.02	132.83
2	E	600	FAD	P-O3P-PA	-3.00	122.52	132.83
2	H	602	FAD	O3'-C3'-C2'	2.88	115.78	108.81
2	H	602	FAD	P-O3P-PA	-2.83	123.12	132.83
2	F	601	FAD	O2'-C2'-C3'	-2.77	102.36	109.10
2	B	601	FAD	P-O3P-PA	-2.62	123.82	132.83
2	B	601	FAD	C4A-C5A-N7A	2.60	112.10	109.40
2	D	600	FAD	C4A-C5A-N7A	2.53	112.04	109.40
2	A	600	FAD	O2'-C2'-C3'	-2.51	102.99	109.10
2	D	600	FAD	C1'-C2'-C3'	2.43	116.58	109.79
3	A	602	B3P	C3-N1-C4	2.38	119.45	116.08
2	A	600	FAD	C1'-C2'-C3'	2.37	116.42	109.79
2	A	600	FAD	P-O3P-PA	-2.29	124.96	132.83
3	A	601	B3P	C7-C4-C5	-2.19	105.41	110.04
2	E	600	FAD	C5A-C6A-N6A	2.15	123.61	120.35
3	F	604	B3P	C7-C4-C6	-2.14	105.53	110.04
2	B	601	FAD	O2P-P-O1P	2.13	122.77	112.24
2	H	602	FAD	C4A-C5A-N7A	2.12	111.61	109.40
2	H	602	FAD	O2P-P-O1P	2.09	122.59	112.24
2	B	601	FAD	O2'-C2'-C1'	2.07	114.81	109.80
2	G	600	FAD	O2'-C2'-C1'	2.02	114.69	109.80

There are no chirality outliers.

All (56) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	F	602	B3P	N1-C4-C7-O6
3	F	602	B3P	C5-C4-C7-O6
3	F	602	B3P	C6-C4-C7-O6
3	F	604	B3P	C6-C4-C5-O4
3	F	604	B3P	N1-C4-C7-O6
3	F	604	B3P	C5-C4-C7-O6
3	F	604	B3P	C6-C4-C7-O6
3	A	601	B3P	C6-C4-C7-O6
2	H	602	FAD	C2'-C3'-C4'-O4'
2	H	602	FAD	C2'-C3'-C4'-C5'
2	C	600	FAD	C2'-C3'-C4'-O4'
2	E	600	FAD	C2'-C3'-C4'-O4'
2	F	601	FAD	C2'-C3'-C4'-O4'
2	A	600	FAD	C3'-C4'-C5'-O5'

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Mol	Chain	Res	Type	Atoms
2	B	601	FAD	C3'-C4'-C5'-O5'
2	G	600	FAD	C3'-C4'-C5'-O5'
2	H	602	FAD	C3'-C4'-C5'-O5'
3	F	604	B3P	C6-C4-N1-C3
2	A	600	FAD	C2'-C3'-C4'-O4'
2	B	601	FAD	C2'-C3'-C4'-O4'
2	C	600	FAD	C2'-C3'-C4'-C5'
2	D	600	FAD	C2'-C3'-C4'-C5'
2	F	601	FAD	C2'-C3'-C4'-C5'
2	D	600	FAD	C4'-C5'-O5'-P
2	E	600	FAD	C4'-C5'-O5'-P
2	F	601	FAD	C4'-C5'-O5'-P
2	E	600	FAD	O3'-C3'-C4'-O4'
2	G	600	FAD	C2'-C3'-C4'-O4'
2	H	602	FAD	C4'-C5'-O5'-P
2	E	600	FAD	C2'-C3'-C4'-C5'
2	A	600	FAD	C4'-C5'-O5'-P
2	B	601	FAD	C4'-C5'-O5'-P
2	C	600	FAD	C4'-C5'-O5'-P
2	G	600	FAD	C4'-C5'-O5'-P
2	C	600	FAD	C3'-C4'-C5'-O5'
2	E	600	FAD	C3'-C4'-C5'-O5'
3	F	604	B3P	C9-C8-N2-C2
2	F	601	FAD	N10-C1'-C2'-O2'
2	B	601	FAD	O4'-C4'-C5'-O5'
2	B	601	FAD	C2'-C3'-C4'-C5'
3	A	601	B3P	N1-C4-C7-O6
3	F	604	B3P	N1-C4-C5-O4
2	H	602	FAD	O3'-C3'-C4'-O4'
2	C	600	FAD	O3'-C3'-C4'-O4'
3	F	604	B3P	C7-C4-N1-C3
2	G	600	FAD	C2'-C3'-C4'-C5'
2	D	600	FAD	C2'-C3'-C4'-O4'
2	A	600	FAD	O4'-C4'-C5'-O5'
2	G	600	FAD	O4'-C4'-C5'-O5'
2	H	602	FAD	O4'-C4'-C5'-O5'
3	A	601	B3P	C5-C4-C7-O6
3	F	604	B3P	C7-C4-C5-O4
2	H	602	FAD	C1'-C2'-C3'-O3'
4	B	602	MPD	C2-C3-C4-O4
4	C	601	MPD	C2-C3-C4-O4
2	C	600	FAD	O4'-C4'-C5'-O5'

There are no ring outliers.

11 monomers are involved in 34 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	F	601	FAD	1	0
2	D	600	FAD	1	0
2	C	600	FAD	7	0
2	H	602	FAD	1	0
3	F	604	B3P	1	0
2	G	600	FAD	7	0
2	A	600	FAD	1	0
4	A	603	MPD	1	0
2	E	600	FAD	6	0
2	B	601	FAD	6	0
4	B	602	MPD	2	0

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

Ligand FAD F 601

Bond lengths

Bond angles

Torsions

Rings

Ligand B3P A 601

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD D 600

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD C 600

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD H 602

Bond lengths

Bond angles

Torsions

Rings

Ligand B3P A 602

Bond lengths

Bond angles

Torsions

Rings

Ligand B3P F 604

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD G 600

Bond lengths

Bond angles

Torsions

Rings

Ligand B3P F 602

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD A 600

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD E 600

Bond lengths

Bond angles

Torsions

Rings

Ligand FAD B 601

Bond lengths

Bond angles

Torsions

Rings

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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(Å²)	Q<0.9
1	A	525/526 (99%)	-1.30	0	100	100	10, 18, 31, 56	2 (0%)
1	B	525/526 (99%)	-1.28	0	100	100	11, 18, 33, 63	1 (0%)
1	C	525/526 (99%)	-1.25	0	100	100	10, 19, 34, 59	3 (0%)
1	D	525/526 (99%)	-1.31	0	100	100	10, 16, 32, 60	0
1	E	525/526 (99%)	-1.32	0	100	100	10, 17, 29, 66	2 (0%)
1	F	525/526 (99%)	-1.28	0	100	100	10, 17, 31, 71	0
1	G	525/526 (99%)	-1.20	0	100	100	11, 22, 40, 61	1 (0%)
1	H	525/526 (99%)	-1.26	0	100	100	12, 18, 34, 73	0
All	All	4200/4208 (99%)	-1.27	0	100	100	10, 18, 34, 73	9 (0%)

There are no RSRZ outliers to report.

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	B3P	A	602	19/19	0.97	0.05	37,47,52,53	0
3	B3P	F	602	19/19	0.97	0.06	30,35,43,51	0
3	B3P	A	601	19/19	0.98	0.04	26,31,37,38	0
3	B3P	F	604	19/19	0.98	0.05	22,27,39,42	0
4	MPD	A	603	8/8	0.98	0.06	31,33,35,40	0
4	MPD	C	601	8/8	0.98	0.05	31,32,34,35	0
4	MPD	H	601	8/8	0.98	0.05	27,29,32,33	0
4	MPD	B	602	8/8	0.99	0.04	29,30,32,33	0
2	FAD	E	600	53/53	0.99	0.02	11,13,16,20	0
4	MPD	D	601	8/8	0.99	0.04	25,28,31,32	0
4	MPD	F	603	8/8	0.99	0.05	27,29,32,33	0
2	FAD	C	600	53/53	0.99	0.02	12,14,17,18	0
2	FAD	G	600	53/53	1.00	0.02	12,16,19,22	0
2	FAD	H	602	53/53	1.00	0.02	9,11,14,18	0
2	FAD	A	600	53/53	1.00	0.02	11,13,16,20	0
2	FAD	D	600	53/53	1.00	0.02	11,13,15,17	0
2	FAD	B	601	53/53	1.00	0.02	12,14,16,21	0
2	FAD	F	601	53/53	1.00	0.02	11,13,15,20	0
5	CL	B	603	1/1	1.00	0.04	25,25,25,25	0
5	CL	F	605	1/1	1.00	0.04	22,22,22,22	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 B3P A 602:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
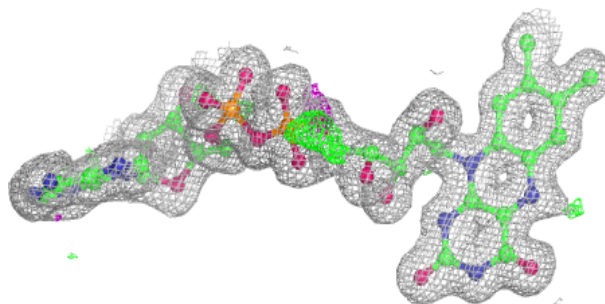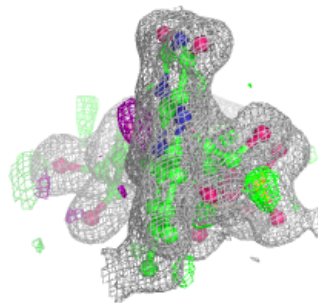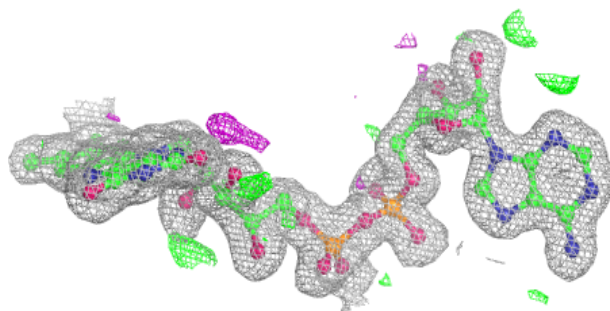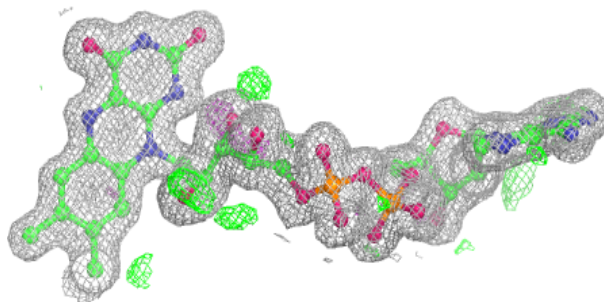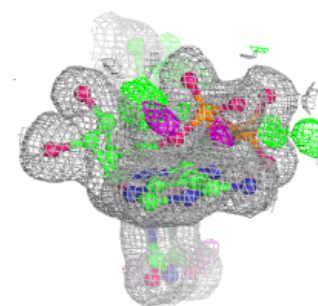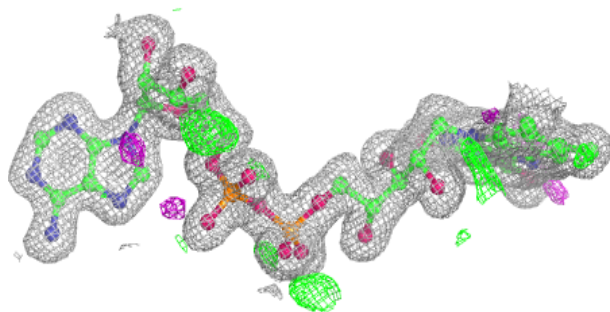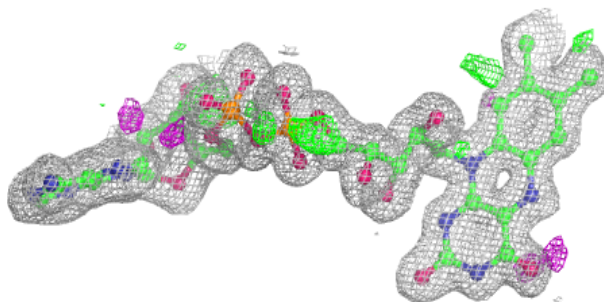mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)
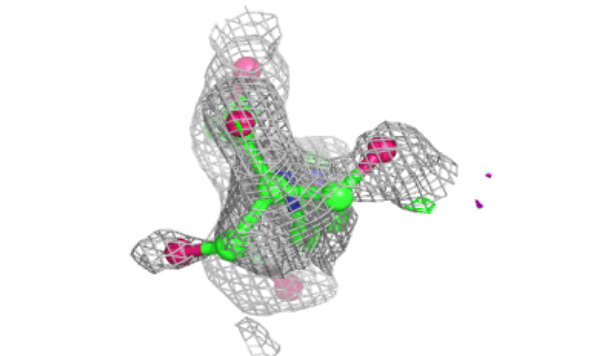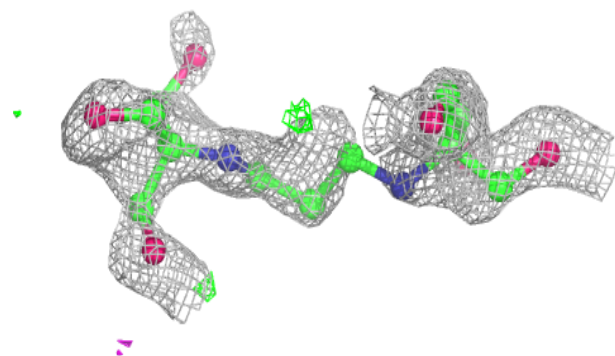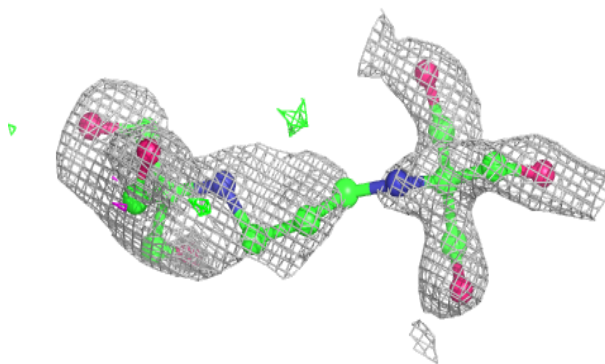
Electron density around B3P F 602:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
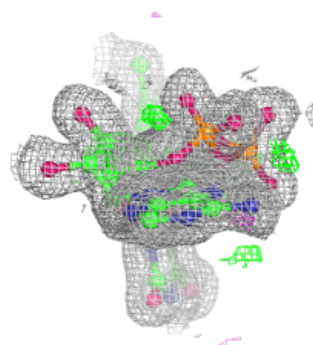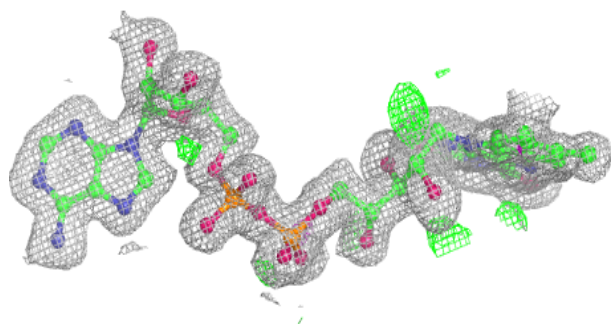and green (positive)
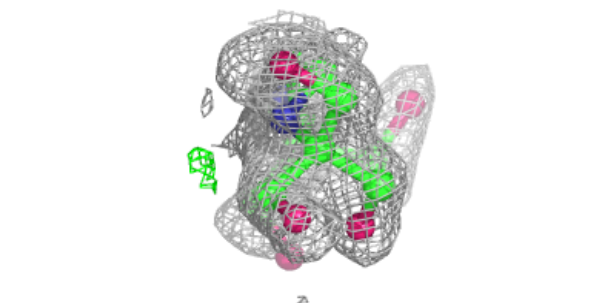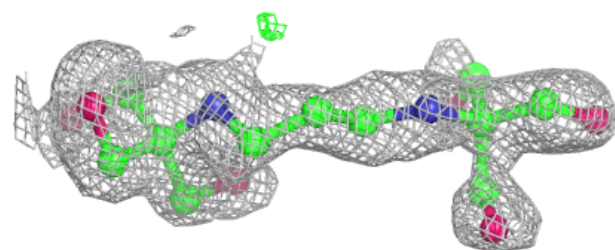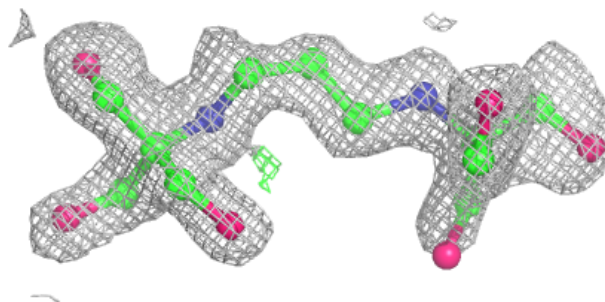
Electron density around B3P A 601:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)
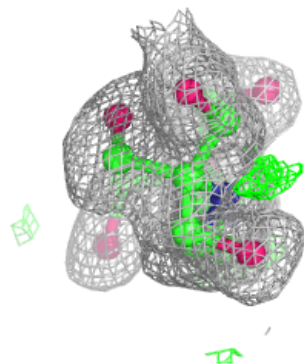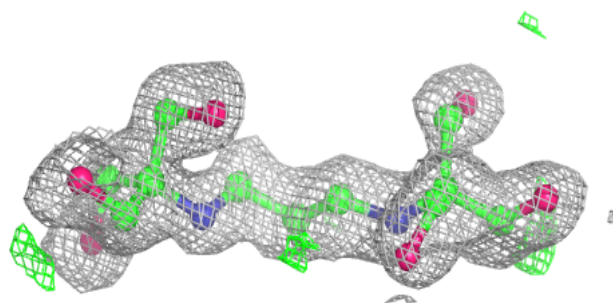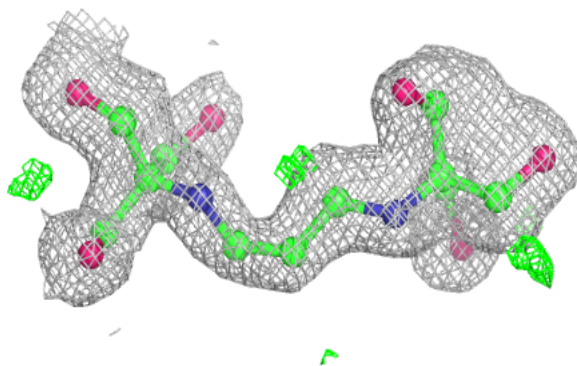
Electron density around B3P F 604:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
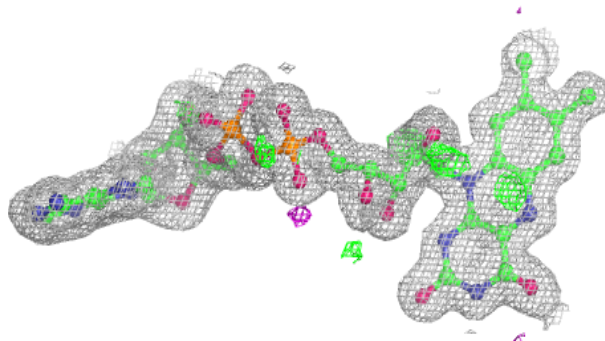and green (positive)
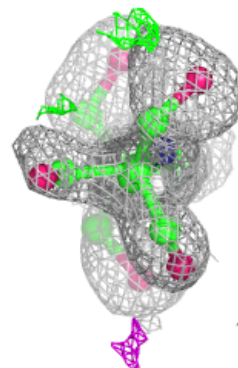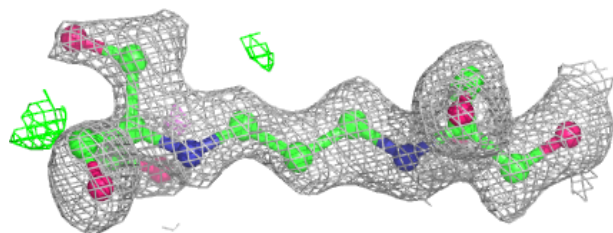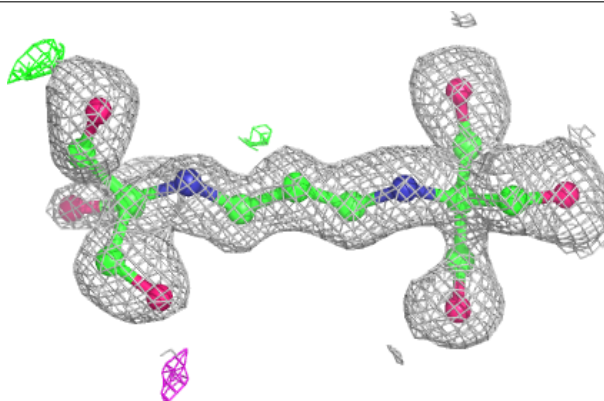
Electron density around FAD E 600:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)
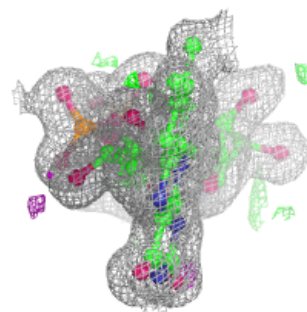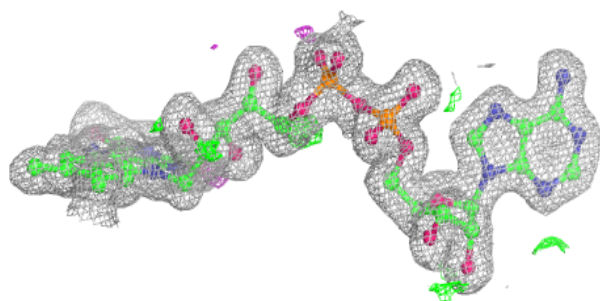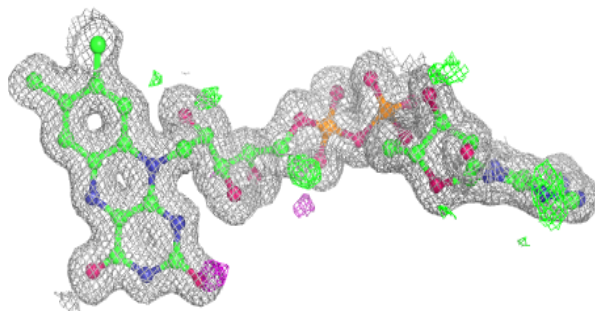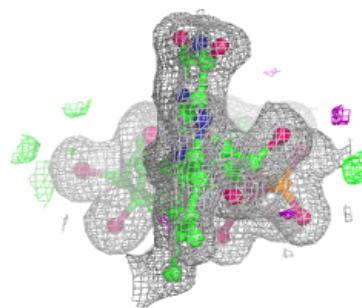

Electron density around FAD C 600:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)
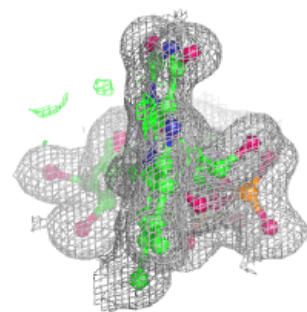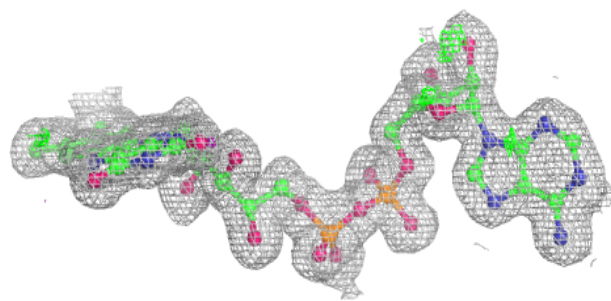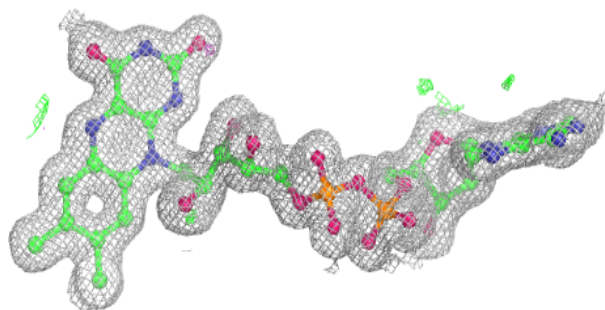
Electron density around FAD G 600:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
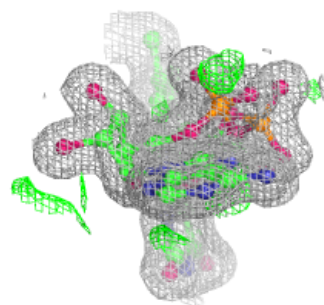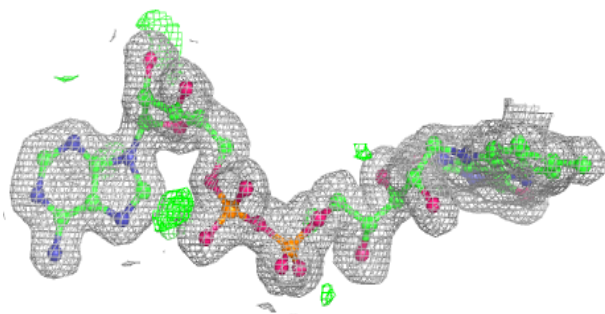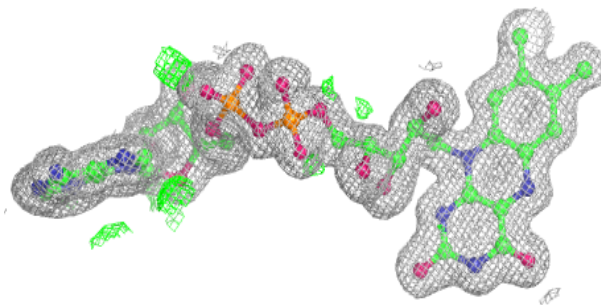
Electron density around FAD H 602:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
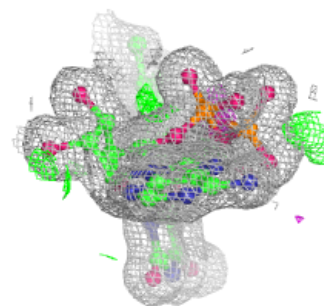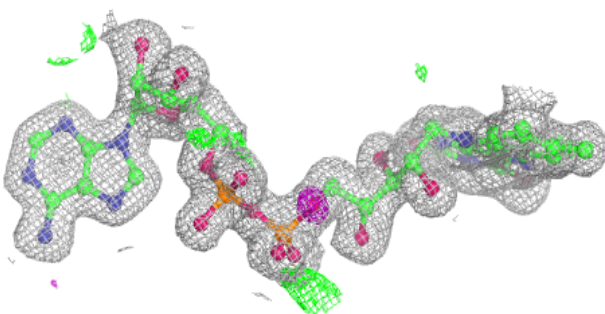
Electron density around FAD A 600:

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

Electron density around FAD D 600:

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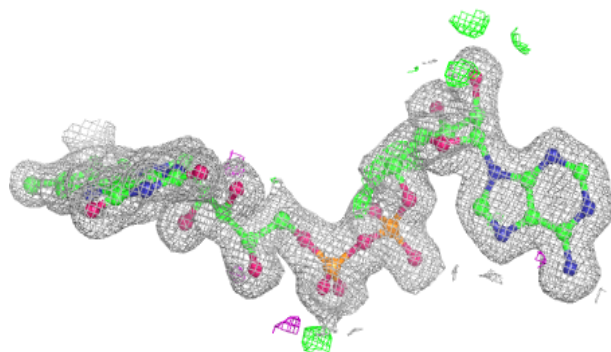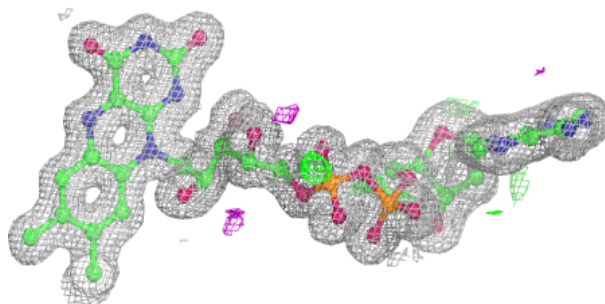$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around FAD B 601:

$2mF_o$-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 F 601:

$2mF_o$-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.