



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 08:20 AM UTC

PDB ID : 1NEC / pdb_00001nec
Title : NITROREDUCTASE FROM ENTEROBACTER CLOACAE
Authors : Hecht, H.J.; Bryant, C.; Erdmann, H.; Pelletier, H.; Sawaya, R.
Deposited on : 1999-03-30
Resolution : 1.95 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

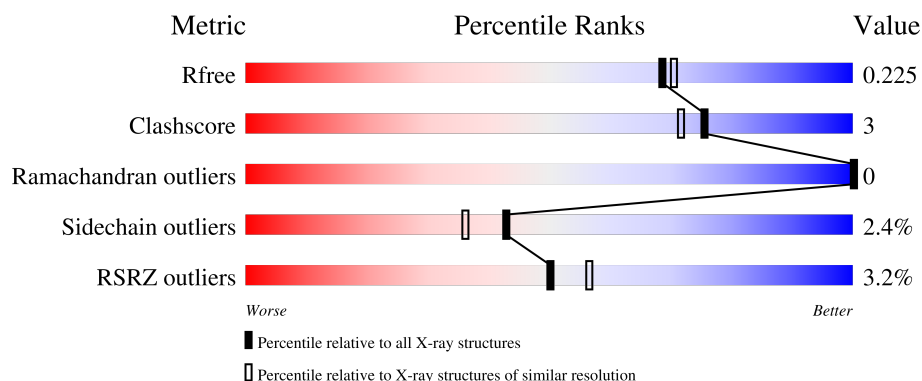
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.95 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	3494 (1.96-1.96)
Clashscore	190562	3612 (1.96-1.96)
Ramachandran outliers	187476	3587 (1.96-1.96)
Sidechain outliers	187428	3587 (1.96-1.96)
RSRZ outliers	180081	3495 (1.96-1.96)

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 $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	216	8% 76% 20% .
1	B	216	% 73% 25% .
1	C	216	3% 75% 21% .
1	D	216	% 77% 22% .

2 Entry composition [i](#)

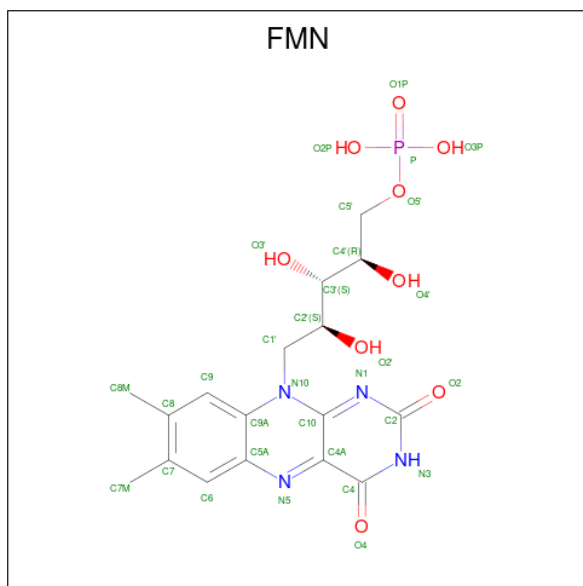
There are 3 unique types of molecules in this entry. The entry contains 7152 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 PROTEIN (NITROREDUCTASE).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	216	Total	C	N	O	S	0	0	0
			1677	1060	286	324	7			
1	B	216	Total	C	N	O	S	0	0	0
			1677	1060	286	324	7			
1	C	216	Total	C	N	O	S	0	0	0
			1677	1060	286	324	7			
1	D	216	Total	C	N	O	S	0	0	0
			1677	1060	286	324	7			

- Molecule 2 is FLAVIN MONONUCLEOTIDE (CCD ID: FMN) (formula: $C_{17}H_{21}N_4O_9P$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
2	B	1	Total	C	N	O	P	0	0
			31	17	4	9	1		

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	C	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
2	D	1	Total	C	N	O	P	0	0
			31	17	4	9	1		

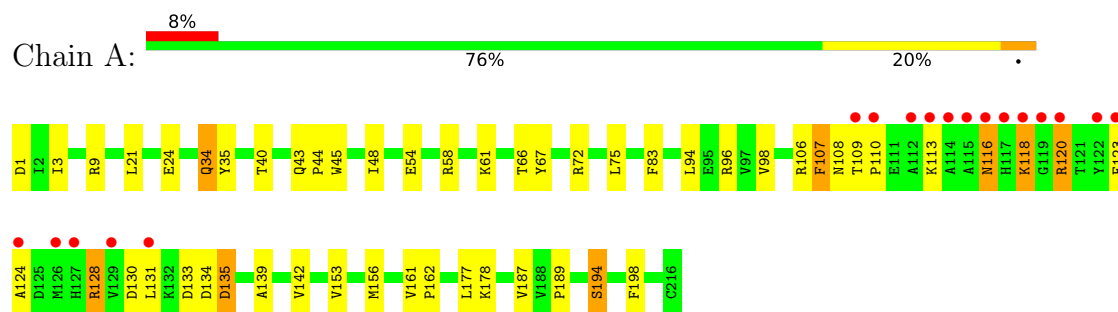
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	72	Total	O	0	0
			72	72		
3	B	79	Total	O	0	0
			79	79		
3	C	85	Total	O	0	0
			85	85		
3	D	84	Total	O	0	0
			84	84		

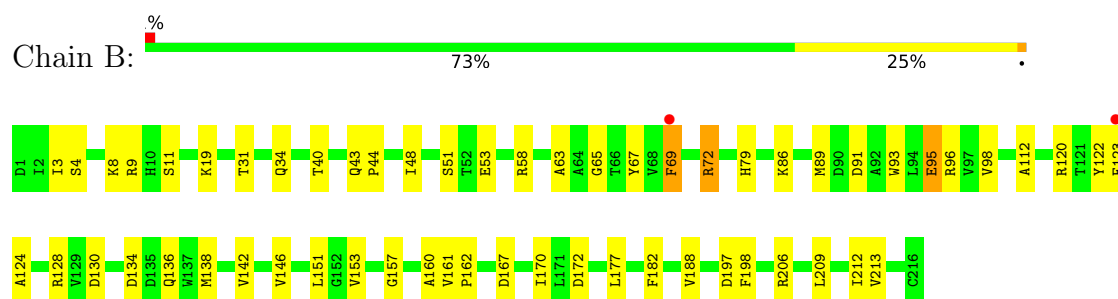
3 Residue-property plots [i](#)

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

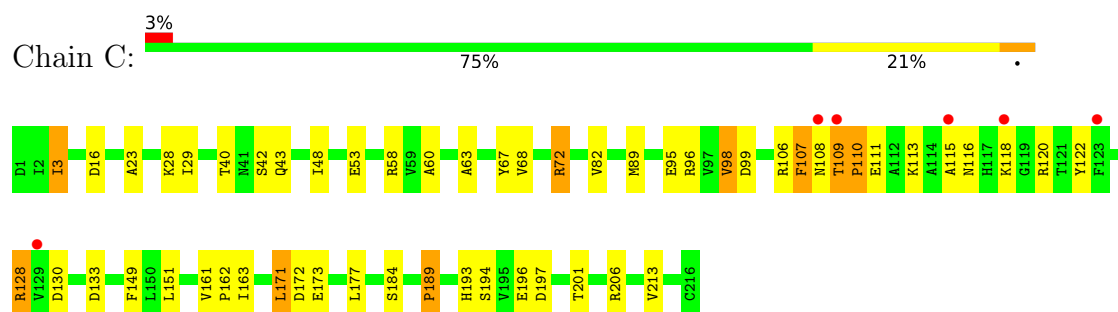
- Molecule 1: PROTEIN (NITROREDUCTASE)



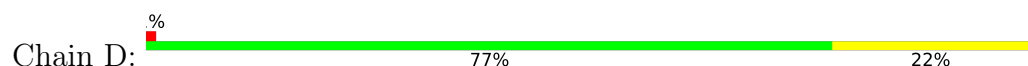
- Molecule 1: PROTEIN (NITROREDUCTASE)

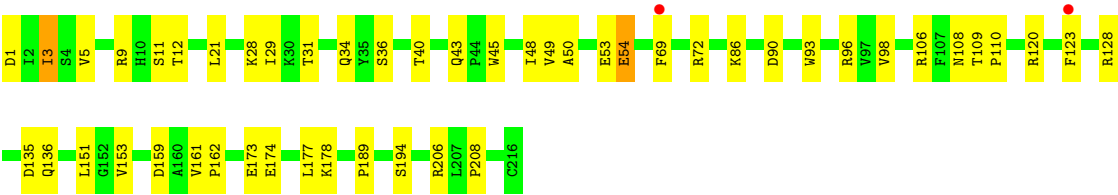


- Molecule 1: PROTEIN (NITROREDUCTASE)



- Molecule 1: PROTEIN (NITROREDUCTASE)





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	44.00Å 92.50Å 102.50Å 90.00° 93.00° 90.00°	Depositor
Resolution (Å)	20.00 – 1.95 20.00 – 1.95	Depositor EDS
% Data completeness (in resolution range)	95.0 (20.00-1.95) 78.9 (20.00-1.95)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	0.06	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.00 (at 1.95Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.180 , 0.240 0.172 , 0.225	Depositor DCC
R_{free} test set	2644 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	19.0	Xtriage
Anisotropy	0.350	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 42.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.54$, $\langle L^2 \rangle = 0.37$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	7152	wwPDB-VP
Average B, all atoms (Å ²)	26.0	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 47.64 % 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 9.6460e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: FMN

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	0.79	0/1711	2.12	57/2314 (2.5%)
1	B	0.82	1/1711 (0.1%)	2.04	51/2314 (2.2%)
1	C	0.83	0/1711	2.05	54/2314 (2.3%)
1	D	0.86	0/1711	1.97	42/2314 (1.8%)
All	All	0.83	1/6844 (0.0%)	2.04	204/9256 (2.2%)

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	1
1	B	0	1
1	C	0	1
All	All	0	3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	43	GLN	C-O	7.74	1.27	1.23

All (204) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	108	ASN	CA-C-N	12.39	141.25	122.42
1	A	108	ASN	C-N-CA	12.39	141.25	122.42
1	A	130	ASP	CA-CB-CG	12.37	124.97	112.60
1	B	43	GLN	O-C-N	-11.94	116.04	121.53
1	A	43	GLN	O-C-N	-11.43	116.27	121.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	54	GLU	CB-CG-CD	10.83	131.00	112.60
1	A	134	ASP	CA-CB-CG	10.44	123.04	112.60
1	B	96	ARG	CD-NE-CZ	10.35	138.89	124.40
1	C	72	ARG	CD-NE-CZ	8.85	136.79	124.40
1	C	110	PRO	CA-C-N	8.72	137.01	121.66
1	C	110	PRO	C-N-CA	8.72	137.01	121.66
1	A	1	ASP	CA-CB-CG	8.67	121.27	112.60
1	A	58	ARG	CD-NE-CZ	8.66	136.52	124.40
1	C	120	ARG	CD-NE-CZ	8.55	136.37	124.40
1	D	151	LEU	CA-C-N	8.46	129.33	119.94
1	D	151	LEU	C-N-CA	8.46	129.33	119.94
1	D	3	ILE	CB-CG1-CD1	8.43	131.50	113.80
1	C	130	ASP	CA-CB-CG	8.40	121.00	112.60
1	B	53	GLU	CB-CG-CD	8.28	126.68	112.60
1	C	42	SER	CA-C-N	8.03	131.50	122.83
1	C	42	SER	C-N-CA	8.03	131.50	122.83
1	B	96	ARG	NE-CZ-NH1	7.94	129.44	121.50
1	D	136	GLN	OE1-CD-NE2	-7.71	114.89	122.60
1	A	106	ARG	CD-NE-CZ	7.62	135.07	124.40
1	D	34	GLN	CA-C-O	-7.62	112.34	120.42
1	B	3	ILE	CB-CG1-CD1	7.61	129.78	113.80
1	C	206	ARG	CD-NE-CZ	7.56	134.99	124.40
1	A	135	ASP	CA-CB-CG	7.55	120.15	112.60
1	D	69	PHE	CA-CB-CG	7.55	121.35	113.80
1	B	58	ARG	CD-NE-CZ	7.52	134.93	124.40
1	A	107	PHE	CA-CB-CG	7.48	121.28	113.80
1	C	3	ILE	CB-CG1-CD1	7.48	129.50	113.80
1	C	106	ARG	CD-NE-CZ	7.45	134.84	124.40
1	D	106	ARG	CD-NE-CZ	7.37	134.72	124.40
1	D	72	ARG	CD-NE-CZ	7.29	134.60	124.40
1	B	40	THR	O-C-N	-7.26	112.92	122.00
1	C	193	HIS	CA-CB-CG	7.26	121.06	113.80
1	A	43	GLN	CA-C-O	7.24	126.05	120.26
1	A	72	ARG	CD-NE-CZ	7.22	134.51	124.40
1	B	136	GLN	OE1-CD-NE2	-7.17	115.43	122.60
1	C	197	ASP	CA-CB-CG	7.17	119.77	112.60
1	C	53	GLU	CB-CG-CD	7.17	124.78	112.60
1	B	69	PHE	O-C-N	-7.11	111.04	122.41
1	B	72	ARG	CD-NE-CZ	7.07	134.30	124.40
1	A	128	ARG	CD-NE-CZ	7.06	134.28	124.40
1	C	96	ARG	CD-NE-CZ	7.04	134.26	124.40
1	A	120	ARG	CD-NE-CZ	7.03	134.24	124.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	23	ALA	CA-C-N	7.01	129.56	120.44
1	C	23	ALA	C-N-CA	7.01	129.56	120.44
1	A	123	PHE	CA-CB-CG	7.01	120.81	113.80
1	C	116	ASN	CA-CB-CG	6.97	119.57	112.60
1	C	107	PHE	CA-CB-CG	6.87	120.67	113.80
1	A	156	MET	CA-CB-CG	6.86	127.83	114.10
1	D	98	VAL	CA-C-O	-6.84	113.84	120.95
1	D	1	ASP	CA-CB-CG	6.79	119.39	112.60
1	B	91	ASP	CA-CB-CG	6.77	119.37	112.60
1	A	110	PRO	CA-C-N	6.73	132.12	120.68
1	A	110	PRO	C-N-CA	6.73	132.12	120.68
1	C	173	GLU	CA-CB-CG	6.73	127.56	114.10
1	D	136	GLN	CB-CG-CD	6.72	124.03	112.60
1	B	182	PHE	CA-CB-CG	6.63	120.43	113.80
1	C	58	ARG	CD-NE-CZ	6.63	133.68	124.40
1	C	72	ARG	CA-CB-CG	6.63	127.35	114.10
1	B	43	GLN	CA-C-O	6.62	125.56	120.26
1	D	34	GLN	O-C-N	6.62	129.69	122.15
1	C	133	ASP	CA-CB-CG	6.59	119.19	112.60
1	C	16	ASP	CA-CB-CG	6.55	119.15	112.60
1	C	99	ASP	CA-CB-CG	6.50	119.10	112.60
1	D	54	GLU	CA-CB-CG	6.44	126.98	114.10
1	B	146	VAL	CA-C-N	6.43	127.07	119.94
1	B	146	VAL	C-N-CA	6.43	127.07	119.94
1	A	40	THR	CA-C-O	6.38	127.85	120.32
1	A	35	TYR	N-CA-C	6.37	120.91	113.20
1	A	187	VAL	O-C-N	-6.36	116.50	123.18
1	C	163	ILE	CA-C-O	6.35	126.68	120.27
1	C	95	GLU	CB-CG-CD	6.33	123.37	112.60
1	B	206	ARG	CD-NE-CZ	6.30	133.22	124.40
1	A	75	LEU	N-CA-C	6.29	118.22	111.36
1	A	194	SER	O-C-N	-6.25	115.02	122.65
1	C	72	ARG	CA-C-N	6.22	128.61	120.28
1	C	72	ARG	C-N-CA	6.22	128.61	120.28
1	C	128	ARG	CG-CD-NE	6.19	125.62	112.00
1	B	9	ARG	CD-NE-CZ	6.18	133.06	124.40
1	B	63	ALA	CA-C-N	6.18	133.99	122.74
1	B	63	ALA	C-N-CA	6.18	133.99	122.74
1	C	72	ARG	NE-CZ-NH1	6.17	127.67	121.50
1	B	19	LYS	CA-C-O	6.17	126.96	120.36
1	A	133	ASP	CA-CB-CG	6.16	118.76	112.60
1	A	156	MET	O-C-N	-6.14	113.30	122.39

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	67	TYR	CA-C-O	6.13	126.73	119.56
1	A	108	ASN	CA-C-O	6.11	126.92	119.11
1	C	40	THR	O-C-N	-6.09	113.51	122.04
1	A	96	ARG	CD-NE-CZ	6.02	132.82	124.40
1	A	153	VAL	N-CA-CB	6.02	119.60	110.58
1	C	184	SER	O-C-N	-6.00	115.93	123.01
1	C	189	PRO	O-C-N	-5.98	116.41	123.10
1	B	209	LEU	CA-C-N	5.96	128.87	120.28
1	B	209	LEU	C-N-CA	5.96	128.87	120.28
1	D	153	VAL	CA-C-N	5.93	126.70	119.99
1	D	153	VAL	C-N-CA	5.93	126.70	119.99
1	A	116	ASN	CA-CB-CG	5.93	118.53	112.60
1	D	45	TRP	CA-CB-CG	5.92	124.85	113.60
1	B	69	PHE	CA-C-N	5.91	131.51	122.29
1	B	69	PHE	C-N-CA	5.91	131.51	122.29
1	C	72	ARG	NE-CZ-NH2	-5.87	113.92	119.20
1	A	107	PHE	CA-C-O	5.86	126.55	120.40
1	B	95	GLU	CB-CG-CD	-5.84	102.67	112.60
1	A	120	ARG	NE-CZ-NH1	5.82	127.32	121.50
1	B	120	ARG	CD-NE-CZ	5.82	132.55	124.40
1	C	60	ALA	CA-C-N	5.82	128.66	120.28
1	C	60	ALA	C-N-CA	5.82	128.66	120.28
1	D	174	GLU	N-CA-C	5.82	118.09	111.11
1	A	83	PHE	CA-CB-CG	5.81	119.61	113.80
1	D	96	ARG	CD-NE-CZ	5.81	132.53	124.40
1	B	198	PHE	CA-CB-CG	5.77	119.57	113.80
1	D	208	PRO	CA-C-N	5.75	128.56	120.28
1	D	208	PRO	C-N-CA	5.75	128.56	120.28
1	B	53	GLU	CB-CA-C	5.73	121.68	110.67
1	D	90	ASP	CA-CB-CG	5.71	118.31	112.60
1	A	45	TRP	N-CA-C	5.70	117.73	109.07
1	A	9	ARG	CD-NE-CZ	5.68	132.35	124.40
1	D	135	ASP	CA-CB-CG	5.68	118.28	112.60
1	B	112	ALA	CA-C-O	-5.67	114.41	120.42
1	A	45	TRP	CA-CB-CG	5.67	124.37	113.60
1	A	40	THR	O-C-N	-5.62	111.80	122.09
1	D	53	GLU	CB-CG-CD	5.62	122.14	112.60
1	C	149	PHE	N-CA-C	5.61	117.40	111.28
1	A	94	LEU	CA-C-N	5.61	128.25	120.29
1	A	94	LEU	C-N-CA	5.61	128.25	120.29
1	C	60	ALA	O-C-N	-5.60	114.98	122.43
1	A	109	THR	CA-C-N	5.59	125.26	119.56

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	109	THR	C-N-CA	5.59	125.26	119.56
1	C	108	ASN	CA-C-O	5.57	126.12	119.60
1	B	188	VAL	CA-CB-CG2	5.54	119.82	110.40
1	B	136	GLN	CB-CG-CD	5.53	122.00	112.60
1	A	108	ASN	CA-CB-CG	5.51	118.11	112.60
1	D	128	ARG	CA-C-O	-5.51	113.29	119.79
1	B	153	VAL	CA-CB-CG2	5.50	119.74	110.40
1	B	213	VAL	O-C-N	-5.49	117.26	123.03
1	D	36	SER	N-CA-CB	-5.49	101.68	109.75
1	B	130	ASP	N-CA-C	5.48	117.11	111.03
1	C	171	LEU	CA-CB-CG	5.46	135.40	116.30
1	A	142	VAL	CA-C-O	-5.45	115.07	120.85
1	A	139	ALA	CA-C-N	5.45	127.52	120.44
1	A	139	ALA	C-N-CA	5.45	127.52	120.44
1	B	151	LEU	CA-C-O	-5.43	114.67	120.42
1	D	206	ARG	CD-NE-CZ	5.42	131.98	124.40
1	B	160	ALA	O-C-N	-5.41	117.58	123.26
1	D	31	THR	CA-CB-OG1	-5.38	101.53	109.60
1	B	151	LEU	CA-C-N	5.37	125.94	119.98
1	B	151	LEU	C-N-CA	5.37	125.94	119.98
1	C	201	THR	CA-C-O	5.36	126.44	119.95
1	A	61	LYS	O-C-N	-5.34	115.98	122.22
1	A	34	GLN	CA-C-O	-5.32	114.91	120.55
1	C	68	VAL	CA-C-N	5.31	129.10	120.60
1	C	68	VAL	C-N-CA	5.31	129.10	120.60
1	A	131	LEU	CA-C-N	5.31	131.59	123.47
1	A	131	LEU	C-N-CA	5.31	131.59	123.47
1	D	29	ILE	O-C-N	-5.29	116.53	121.87
1	D	123	PHE	CA-CB-CG	5.29	119.09	113.80
1	D	189	PRO	O-C-N	-5.29	116.75	123.10
1	B	142	VAL	CA-C-O	-5.26	115.28	120.85
1	C	67	TYR	CA-CB-CG	5.25	123.35	113.90
1	C	111	GLU	CB-CG-CD	5.23	121.50	112.60
1	B	172	ASP	CA-C-O	-5.22	114.89	120.42
1	D	50	ALA	CA-C-O	5.20	125.92	120.36
1	D	178	LYS	O-C-N	-5.20	116.14	122.22
1	C	151	LEU	CA-C-O	-5.19	114.92	120.42
1	C	122	TYR	CA-C-O	-5.18	115.36	120.70
1	B	157	GLY	N-CA-C	-5.18	107.65	115.32
1	D	108	ASN	OD1-CG-ND2	5.18	127.78	122.60
1	A	198	PHE	CA-CB-CG	5.15	118.95	113.80
1	B	134	ASP	CA-CB-CG	5.14	117.74	112.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	172	ASP	CA-CB-CG	5.14	117.74	112.60
1	D	9	ARG	CD-NE-CZ	5.14	131.60	124.40
1	B	34	GLN	CA-C-O	-5.14	114.97	120.42
1	D	43	GLN	CA-CB-CG	5.14	124.37	114.10
1	A	109	THR	CA-C-O	5.12	124.43	119.62
1	D	40	THR	O-C-N	-5.11	115.61	122.00
1	B	197	ASP	CA-C-O	5.10	126.49	120.98
1	B	31	THR	CA-CB-OG1	-5.09	101.97	109.60
1	D	5	VAL	CA-C-O	5.08	126.56	121.17
1	C	72	ARG	CB-CG-CD	5.08	122.99	111.30
1	A	21	LEU	N-CA-CB	5.08	118.01	110.29
1	A	24	GLU	CB-CG-CD	5.07	121.22	112.60
1	C	82	VAL	N-CA-CB	5.06	118.05	111.67
1	B	63	ALA	CA-C-O	5.06	129.91	122.38
1	A	142	VAL	N-CA-CB	5.06	118.16	110.58
1	B	65	GLY	CA-C-O	5.05	129.36	120.57
1	D	128	ARG	CD-NE-CZ	5.03	131.44	124.40
1	B	72	ARG	NE-CZ-NH1	5.02	126.52	121.50
1	C	196	GLU	CA-C-O	5.02	125.77	119.59
1	B	67	TYR	CA-C-N	5.02	128.40	120.47
1	B	67	TYR	C-N-CA	5.02	128.40	120.47
1	A	3	ILE	CA-C-O	-5.01	115.06	120.47
1	D	194	SER	CA-C-N	5.01	129.23	120.86
1	D	194	SER	C-N-CA	5.01	129.23	120.86
1	D	29	ILE	CA-C-N	5.01	126.99	120.28
1	D	29	ILE	C-N-CA	5.01	126.99	120.28
1	C	63	ALA	CA-C-N	5.01	131.85	122.74
1	C	63	ALA	C-N-CA	5.01	131.85	122.74
1	A	40	THR	CA-C-N	5.00	129.24	122.19
1	A	40	THR	C-N-CA	5.00	129.24	122.19
1	C	43	GLN	N-CA-CB	-5.00	104.35	111.51

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	194	SER	Mainchain
1	B	69	PHE	Mainchain
1	C	194	SER	Mainchain

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	1677	0	1653	10	0
1	B	1677	0	1653	14	0
1	C	1677	0	1653	12	0
1	D	1677	0	1653	11	0
2	A	31	0	19	1	0
2	B	31	0	19	1	0
2	C	31	0	19	1	0
2	D	31	0	19	1	0
3	A	72	0	0	0	0
3	B	79	0	0	0	0
3	C	85	0	0	0	0
3	D	84	0	0	1	0
All	All	7152	0	6688	40	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 3.

All (40) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:11:SER:HB3	1:B:161:VAL:HG23	1.71	0.72
1:A:48:ILE:HD11	1:A:177:LEU:HD21	1.80	0.62
1:C:115:ALA:HA	1:C:118:LYS:HE2	1.84	0.59
1:B:162:PRO:HG2	2:B:218:FMN:C9	2.35	0.55
1:C:162:PRO:HG2	2:C:219:FMN:C9	2.38	0.54
1:D:162:PRO:HG2	2:D:220:FMN:C9	2.39	0.53
1:A:162:PRO:HG2	2:A:217:FMN:C9	2.39	0.53
1:A:98:VAL:HG22	1:A:120:ARG:NH2	2.25	0.52
1:C:48:ILE:HD11	1:C:177:LEU:HD21	1.92	0.51
1:C:28:LYS:HB3	1:D:3:ILE:HD11	1.92	0.50
1:B:167:ASP:HB3	1:B:170:ILE:HD12	1.94	0.50
1:D:86:LYS:HE2	1:D:93:TRP:CG	2.47	0.50
1:D:48:ILE:HD11	1:D:177:LEU:HD21	1.96	0.47
1:C:89:MET:O	1:C:128:ARG:HD2	2.15	0.47
1:C:109:THR:HG22	1:C:110:PRO:HD2	1.97	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:34:GLN:HB2	1:B:212:ILE:HD11	1.96	0.47
1:B:124:ALA:O	1:B:128:ARG:HG3	2.16	0.46
1:C:3:ILE:HD11	1:D:28:LYS:HB3	1.98	0.45
1:C:98:VAL:HG13	1:C:113:LYS:HE3	1.97	0.45
1:A:124:ALA:O	1:A:128:ARG:HG2	2.15	0.45
1:C:115:ALA:HA	1:C:118:LYS:HG2	1.99	0.45
1:D:12:THR:OG1	1:D:159:ASP:HB3	2.17	0.45
1:B:48:ILE:HD11	1:B:177:LEU:HD21	1.98	0.45
1:D:11:SER:HB3	1:D:161:VAL:HG23	1.99	0.45
1:A:161:VAL:O	1:A:189:PRO:HD2	2.16	0.45
1:B:4:SER:O	1:B:8:LYS:HG2	2.17	0.45
1:B:51:SER:HB3	1:B:79:HIS:CD2	2.52	0.44
1:A:118:LYS:O	1:A:118:LYS:HE2	2.17	0.44
1:B:95:GLU:HA	1:B:98:VAL:HG12	1.99	0.43
1:A:66:THR:HG21	1:B:122:TYR:OH	2.18	0.43
1:D:109:THR:HB	1:D:110:PRO:HD2	2.01	0.43
1:A:98:VAL:HG12	1:A:113:LYS:HG2	2.01	0.43
1:B:89:MET:HE2	1:B:138:MET:SD	2.58	0.42
1:A:67:TYR:HE1	1:B:123:PHE:HE1	1.66	0.42
1:C:161:VAL:O	1:C:189:PRO:HD2	2.18	0.42
1:C:28:LYS:HG2	1:D:3:ILE:HG13	2.00	0.42
1:C:213:VAL:HG13	1:D:49:VAL:HG23	2.01	0.41
1:D:120:ARG:HD2	3:D:231:HOH:O	2.19	0.41
1:B:167:ASP:CB	1:B:170:ILE:HD12	2.50	0.41
1:B:86:LYS:HE2	1:B:93:TRP:CG	2.55	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	214/216 (99%)	212 (99%)	2 (1%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	214/216 (99%)	212 (99%)	2 (1%)	0	100	100
1	C	214/216 (99%)	211 (99%)	3 (1%)	0	100	100
1	D	214/216 (99%)	212 (99%)	2 (1%)	0	100	100
All	All	856/864 (99%)	847 (99%)	9 (1%)	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	179/179 (100%)	173 (97%)	6 (3%)	32	23
1	B	179/179 (100%)	177 (99%)	2 (1%)	65	64
1	C	179/179 (100%)	173 (97%)	6 (3%)	32	23
1	D	179/179 (100%)	176 (98%)	3 (2%)	53	49
All	All	716/716 (100%)	699 (98%)	17 (2%)	43	36

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	44	PRO
1	A	107	PHE
1	A	116	ASN
1	A	118	LYS
1	A	135	ASP
1	A	178	LYS
1	B	44	PRO
1	B	72	ARG
1	C	29	ILE
1	C	72	ARG
1	C	98	VAL
1	C	107	PHE
1	C	109	THR

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Mol	Chain	Res	Type
1	C	171	LEU
1	D	21	LEU
1	D	54	GLU
1	D	173	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	34	GLN
1	B	41	ASN
1	B	136	GLN
1	C	34	GLN
1	C	117	HIS
1	D	41	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

4 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	FMN	C	219	-	33,33,33	1.69	6 (18%)	48,50,50	1.50	7 (14%)
2	FMN	B	218	-	33,33,33	1.38	4 (12%)	48,50,50	1.45	7 (14%)
2	FMN	D	220	-	33,33,33	1.40	5 (15%)	48,50,50	1.31	3 (6%)
2	FMN	A	217	-	33,33,33	1.54	8 (24%)	48,50,50	1.49	9 (18%)

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	FMN	C	219	-	-	3/18/18/18	0/3/3/3
2	FMN	B	218	-	-	3/18/18/18	0/3/3/3
2	FMN	D	220	-	-	1/18/18/18	0/3/3/3
2	FMN	A	217	-	-	1/18/18/18	0/3/3/3

All (23) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	219	FMN	C6-C7	-5.40	1.32	1.39
2	B	218	FMN	C6-C7	-3.70	1.34	1.39
2	D	220	FMN	C6-C7	-3.62	1.34	1.39
2	A	217	FMN	C6-C5A	3.54	1.45	1.40
2	A	217	FMN	C4'-C3'	-3.37	1.47	1.53
2	C	219	FMN	C9-C8	-3.13	1.35	1.39
2	B	218	FMN	C4-N3	-3.08	1.33	1.38
2	A	217	FMN	C6-C7	-3.06	1.35	1.39
2	C	219	FMN	C5A-N5	-2.85	1.34	1.39
2	C	219	FMN	C4'-C3'	-2.80	1.48	1.53
2	A	217	FMN	C9A-N10	-2.80	1.36	1.41
2	C	219	FMN	O3'-C3'	2.67	1.49	1.43
2	D	220	FMN	C4-N3	-2.63	1.33	1.38
2	A	217	FMN	C4-N3	-2.56	1.34	1.38
2	A	217	FMN	C9-C8	-2.46	1.36	1.39
2	B	218	FMN	C9-C8	-2.44	1.36	1.39
2	B	218	FMN	C6-C5A	2.40	1.43	1.40
2	D	220	FMN	C7M-C7	2.29	1.55	1.51
2	D	220	FMN	C5A-N5	-2.28	1.35	1.39
2	D	220	FMN	C2-N3	2.21	1.43	1.39
2	C	219	FMN	C4-N3	-2.16	1.34	1.38
2	A	217	FMN	O3'-C3'	2.11	1.48	1.43

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	217	FMN	C5A-N5	-2.04	1.35	1.39

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	220	FMN	C4'-C3'-C2'	5.70	123.06	113.57
2	B	218	FMN	C4'-C3'-C2'	5.30	122.39	113.57
2	C	219	FMN	C4'-C3'-C2'	4.56	121.16	113.57
2	A	217	FMN	C7M-C7-C8	-3.54	113.54	120.76
2	A	217	FMN	C9A-C5A-N5	3.01	125.65	122.45
2	C	219	FMN	C10-N1-C2	2.93	123.19	116.85
2	C	219	FMN	O3P-P-O5'	-2.74	99.53	106.67
2	D	220	FMN	O2-C2-N3	-2.61	113.58	118.58
2	A	217	FMN	C4'-C3'-C2'	2.61	117.91	113.57
2	C	219	FMN	C9-C9A-N10	2.60	125.35	121.85
2	A	217	FMN	C7M-C7-C6	2.54	124.05	119.57
2	C	219	FMN	C7M-C7-C6	2.47	123.92	119.57
2	B	218	FMN	C7M-C7-C8	-2.46	115.73	120.76
2	A	217	FMN	O4'-C4'-C5'	-2.44	104.60	109.99
2	B	218	FMN	C9A-C9-C8	2.42	124.08	119.22
2	B	218	FMN	O2P-P-O5'	2.41	112.95	106.67
2	B	218	FMN	C5'-C4'-C3'	2.34	116.64	112.22
2	A	217	FMN	C6-C5A-C9A	-2.31	115.87	119.05
2	A	217	FMN	O2P-P-O5'	2.28	112.62	106.67
2	D	220	FMN	C5A-C9A-N10	-2.25	115.94	117.97
2	A	217	FMN	O2'-C2'-C3'	-2.21	104.08	109.25
2	B	218	FMN	C2'-C1'-N10	2.15	120.38	110.20
2	A	217	FMN	O4-C4-C4A	-2.15	120.85	126.53
2	B	218	FMN	C7M-C7-C6	2.12	123.30	119.57
2	C	219	FMN	C7M-C7-C8	-2.06	116.56	120.76
2	C	219	FMN	C9A-C5A-N5	2.05	124.64	122.45

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	217	FMN	N10-C1'-C2'-O2'
2	B	218	FMN	N10-C1'-C2'-O2'
2	B	218	FMN	N10-C1'-C2'-C3'
2	C	219	FMN	N10-C1'-C2'-O2'
2	B	218	FMN	C2'-C1'-N10-C9A
2	D	220	FMN	N10-C1'-C2'-O2'

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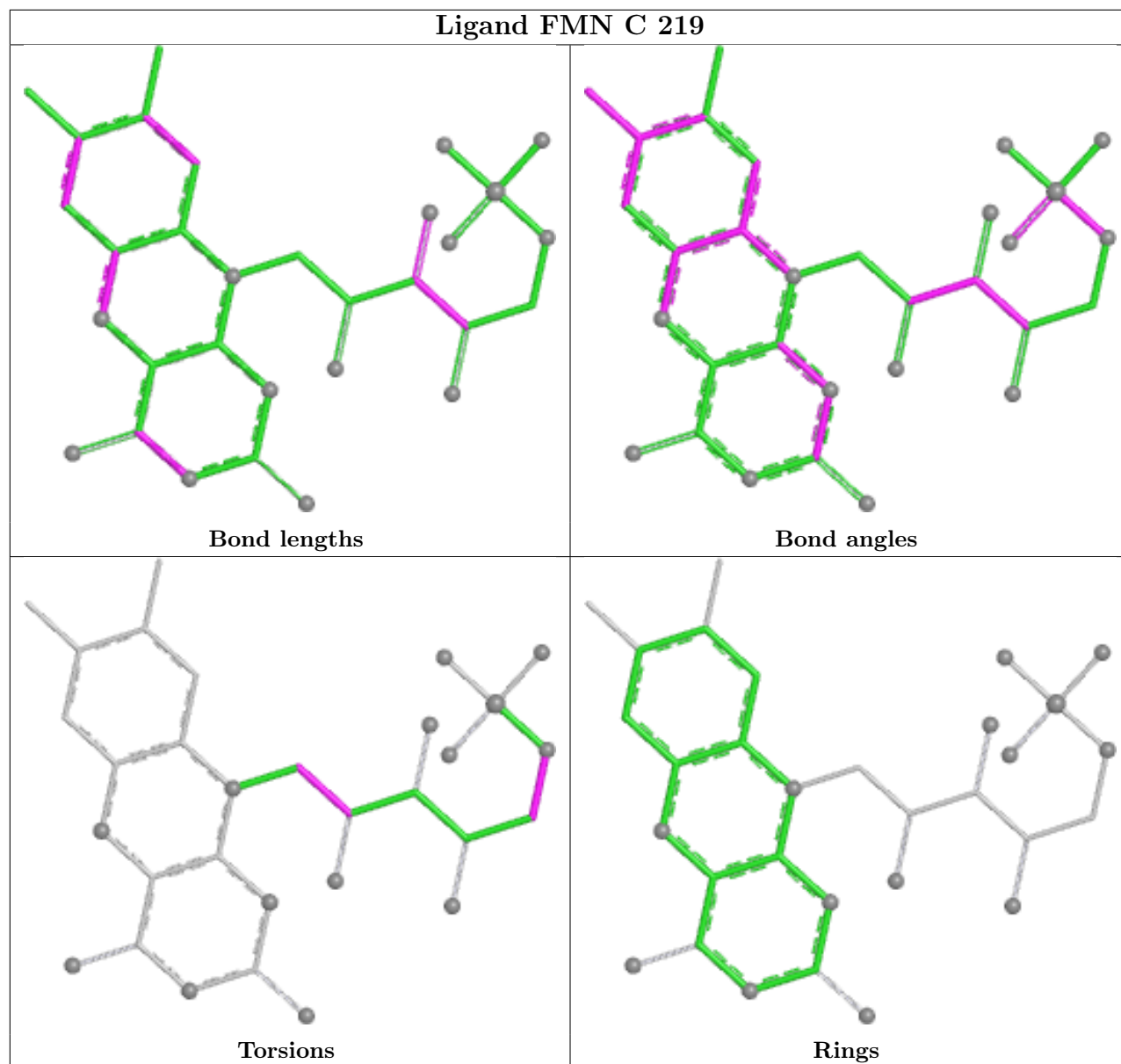
Mol	Chain	Res	Type	Atoms
2	C	219	FMN	C4'-C5'-O5'-P
2	C	219	FMN	N10-C1'-C2'-C3'

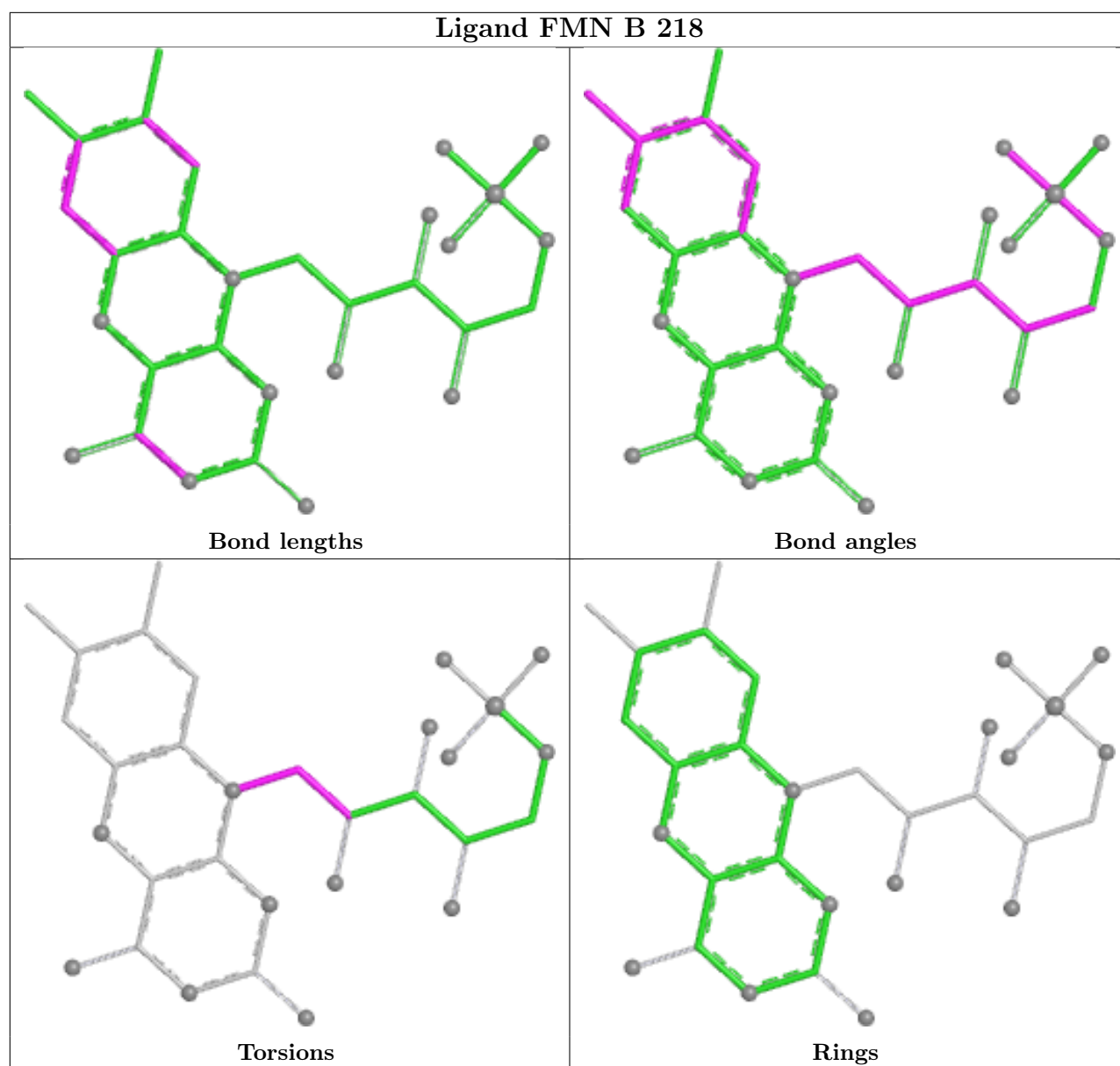
There are no ring outliers.

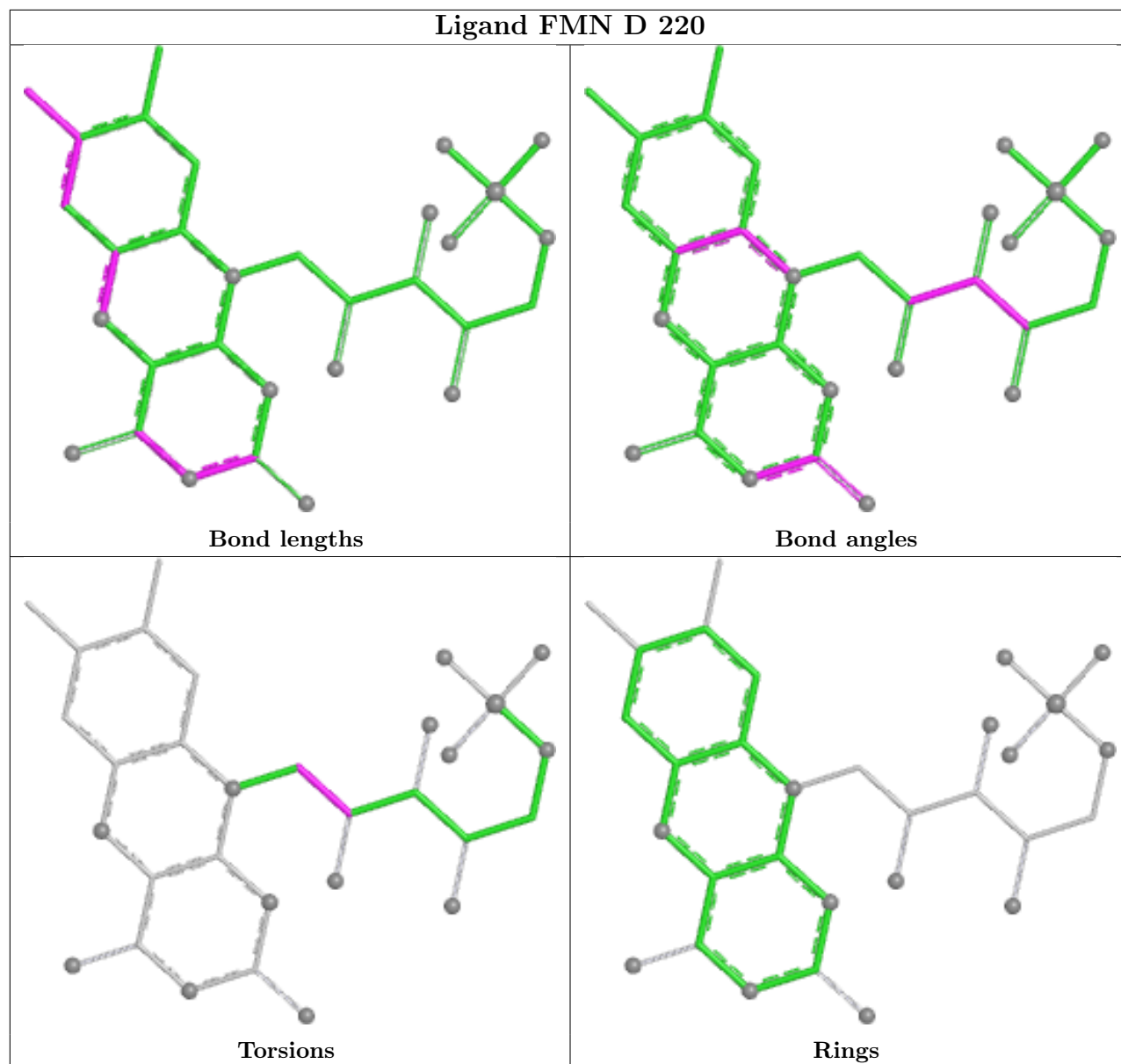
4 monomers are involved in 4 short contacts:

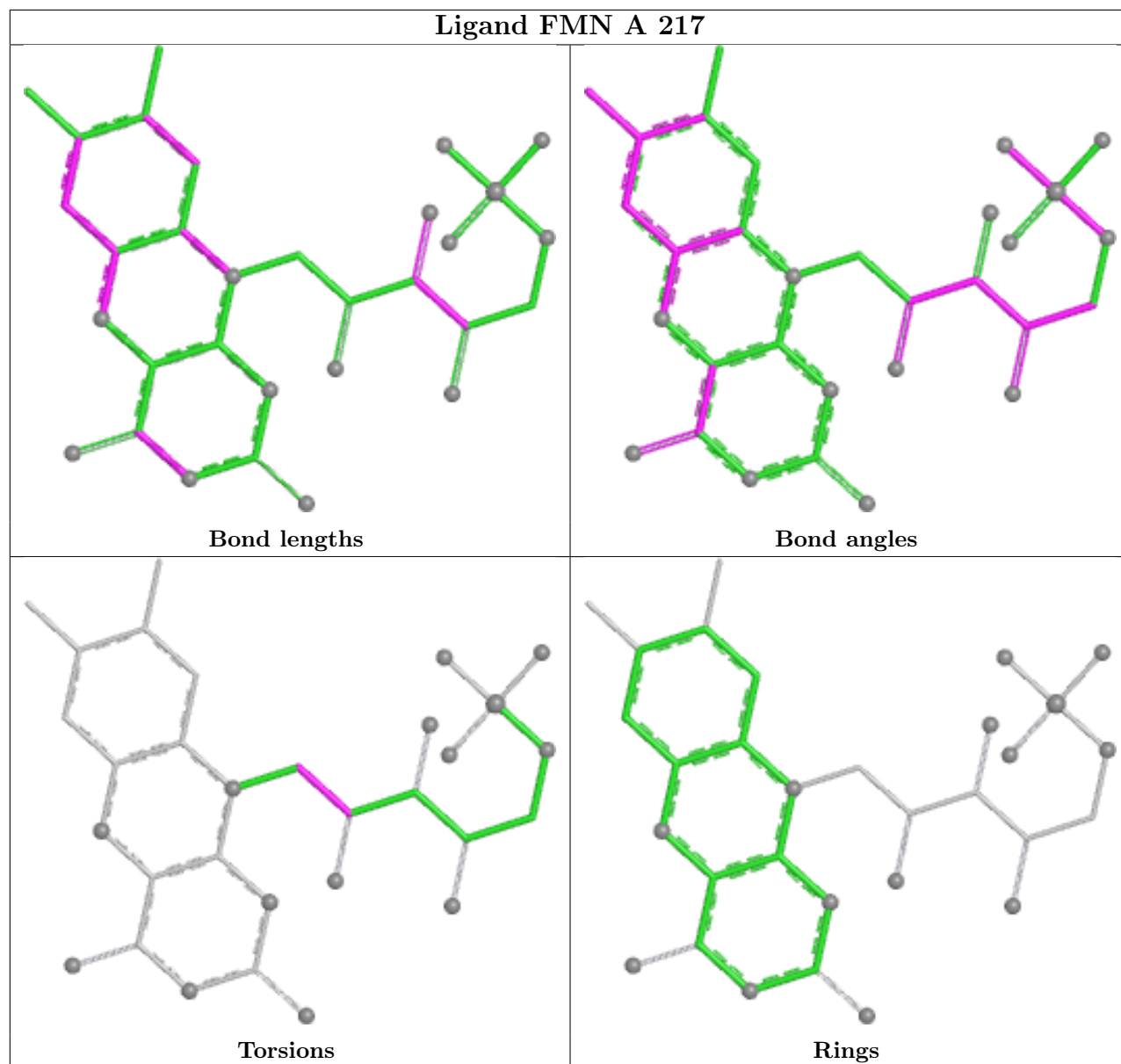
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	219	FMN	1	0
2	B	218	FMN	1	0
2	D	220	FMN	1	0
2	A	217	FMN	1	0

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 than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.









5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

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	216/216 (100%)	-0.05	18 (8%) 17 20	11, 23, 100, 110	0
1	B	216/216 (100%)	-0.39	2 (0%) 81 85	11, 22, 35, 47	0
1	C	216/216 (100%)	-0.30	6 (2%) 55 62	10, 21, 60, 81	0
1	D	216/216 (100%)	-0.41	2 (0%) 81 85	11, 22, 35, 45	0
All	All	864/864 (100%)	-0.29	28 (3%) 50 56	10, 22, 56, 110	0

All (28) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	123	PHE	4.3
1	B	69	PHE	4.0
1	A	129	VAL	4.0
1	A	112	ALA	3.9
1	A	117	HIS	3.8
1	A	131	LEU	3.7
1	A	115	ALA	3.7
1	A	114	ALA	3.5
1	A	116	ASN	3.2
1	A	118	LYS	3.2
1	A	109	THR	3.2
1	A	120	ARG	3.1
1	A	122	TYR	2.9
1	C	123	PHE	2.9
1	A	124	ALA	2.9
1	A	127	HIS	2.8
1	A	113	LYS	2.6
1	D	123	PHE	2.6
1	C	115	ALA	2.6
1	D	69	PHE	2.5
1	A	119	GLY	2.5

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Mol	Chain	Res	Type	RSRZ
1	C	129	VAL	2.5
1	B	123	PHE	2.4
1	A	110	PRO	2.3
1	C	109	THR	2.3
1	A	126	MET	2.2
1	C	108	ASN	2.2
1	C	118	LYS	2.2

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

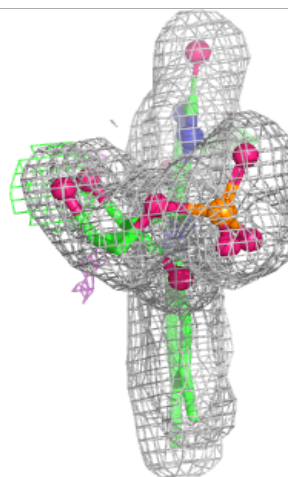
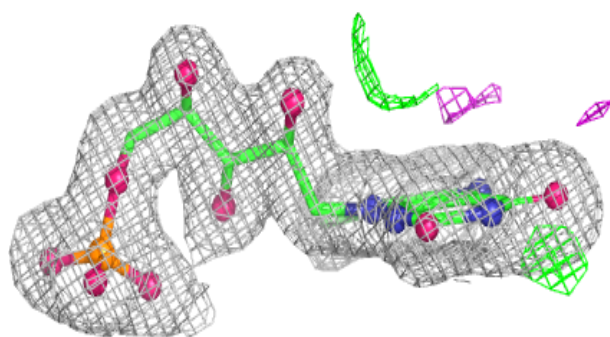
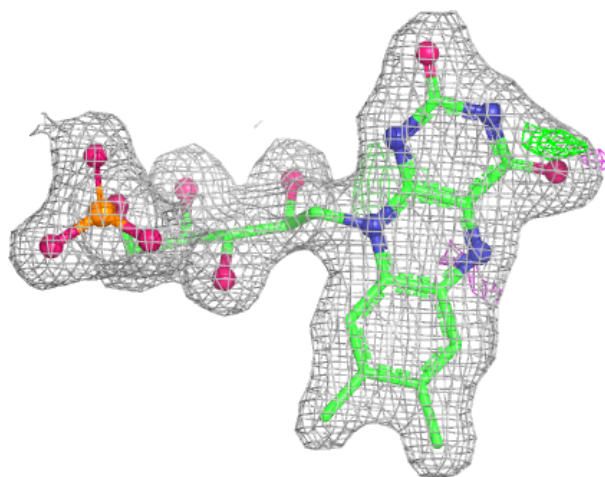
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	FMN	D	220	31/31	0.97	0.05	13,17,21,26	0
2	FMN	B	218	31/31	0.98	0.05	15,19,21,23	0
2	FMN	C	219	31/31	0.98	0.04	10,13,14,17	0
2	FMN	A	217	31/31	0.98	0.03	10,12,15,15	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.

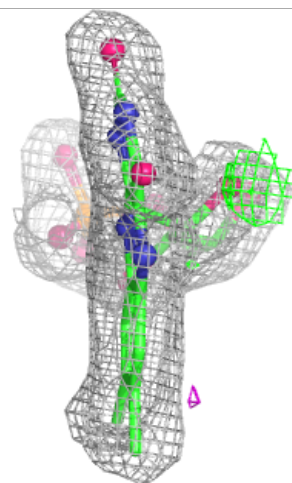
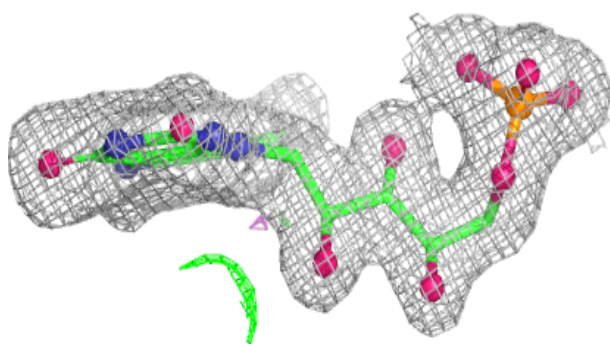
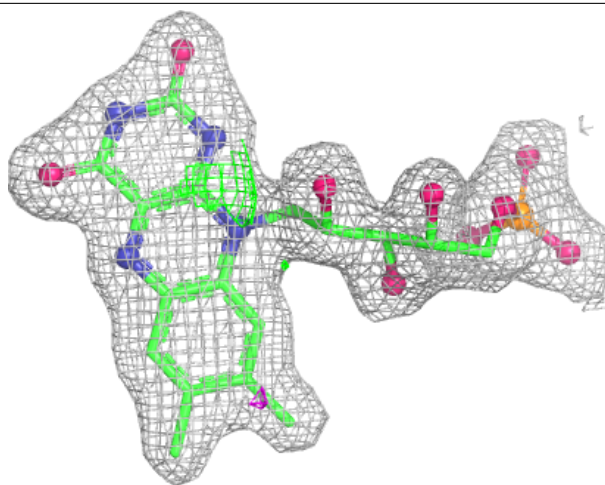
Electron density around FMN D 220:

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



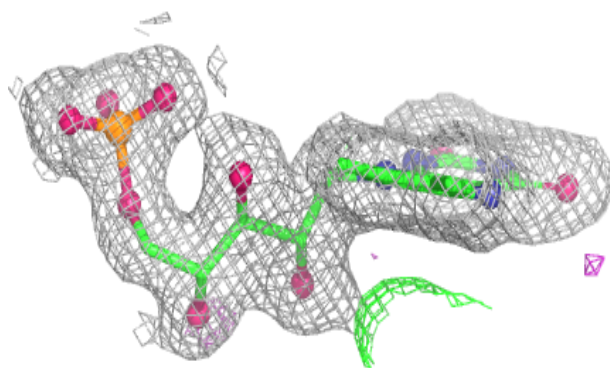
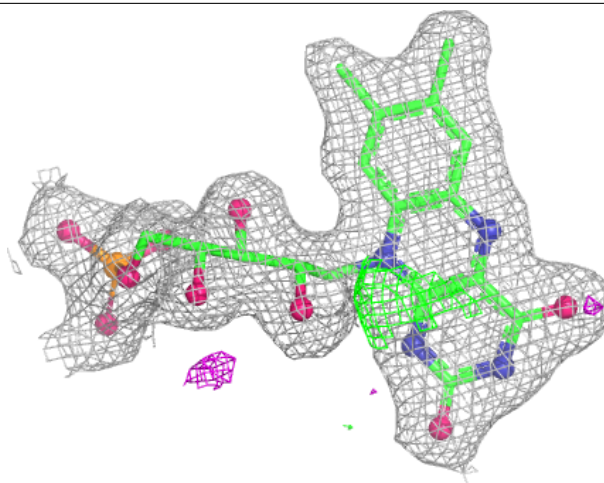
Electron density around FMN B 218:

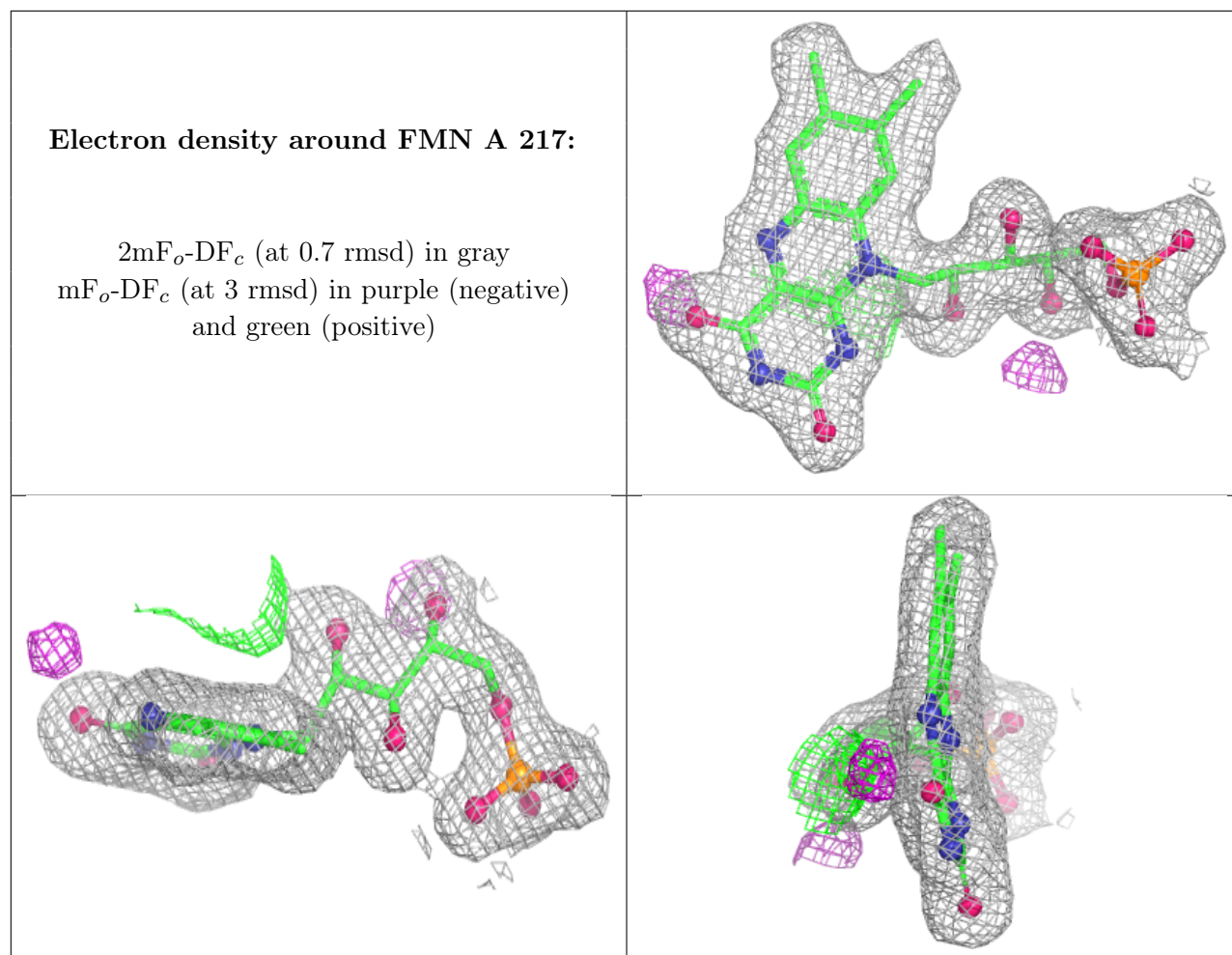
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around FMN C 219:

$2mF_o-DF_c$ (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.