



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 10:44 AM UTC

PDB ID : 9DIK / pdb_00009dik
Title : Crystal structure of Plasmodium falciparum dihydroorotate dehydrogenase bound with Inhibitor DSM681 (N-cyclopropyl-1,4-dimethyl-5-((6-(trifluoromethyl)pyridin-3-yl)methyl)-1H-pyrazole-3-carboxamide)
Authors : Deng, X.; Tomchick, D.; Phillips, M.
Deposited on : 2024-09-05
Resolution : 2.10 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

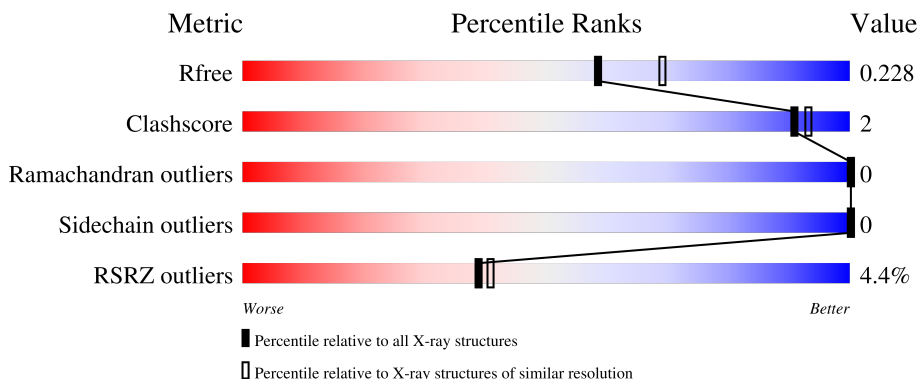
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

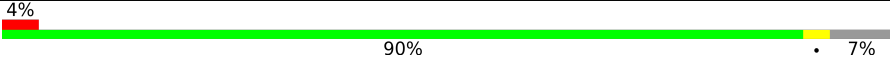
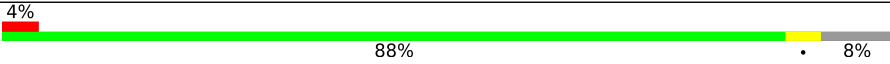
The reported resolution of this entry is 2.10 Å.

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	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (2.10-2.10)

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	401	
1	B	401	

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 12372 atoms, of which 6082 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 Dihydroorotate dehydrogenase (quinone), mitochondrial.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	372	Total	C	H	N	O	S	0	2	0
			5960	1889	3003	497	557	14			
1	B	370	Total	C	H	N	O	S	0	2	0
			5945	1887	3001	493	549	15			

There are 98 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	139	MET	-	initiating methionine	UNP Q08210
A	140	GLY	-	expression tag	UNP Q08210
A	141	HIS	-	expression tag	UNP Q08210
A	142	HIS	-	expression tag	UNP Q08210
A	143	HIS	-	expression tag	UNP Q08210
A	144	HIS	-	expression tag	UNP Q08210
A	145	HIS	-	expression tag	UNP Q08210
A	146	HIS	-	expression tag	UNP Q08210
A	147	ALA	-	expression tag	UNP Q08210
A	148	GLU	-	expression tag	UNP Q08210
A	149	ASN	-	expression tag	UNP Q08210
A	150	LEU	-	expression tag	UNP Q08210
A	151	TYR	-	expression tag	UNP Q08210
A	152	PHE	-	expression tag	UNP Q08210
A	153	GLN	-	expression tag	UNP Q08210
A	154	GLY	-	expression tag	UNP Q08210
A	155	ALA	-	expression tag	UNP Q08210
A	156	ASP	-	expression tag	UNP Q08210
A	157	PRO	-	expression tag	UNP Q08210
A	?	-	SER	deletion	UNP Q08210
A	?	-	THR	deletion	UNP Q08210
A	?	-	TYR	deletion	UNP Q08210
A	?	-	ASN	deletion	UNP Q08210
A	?	-	GLU	deletion	UNP Q08210
A	?	-	ASP	deletion	UNP Q08210

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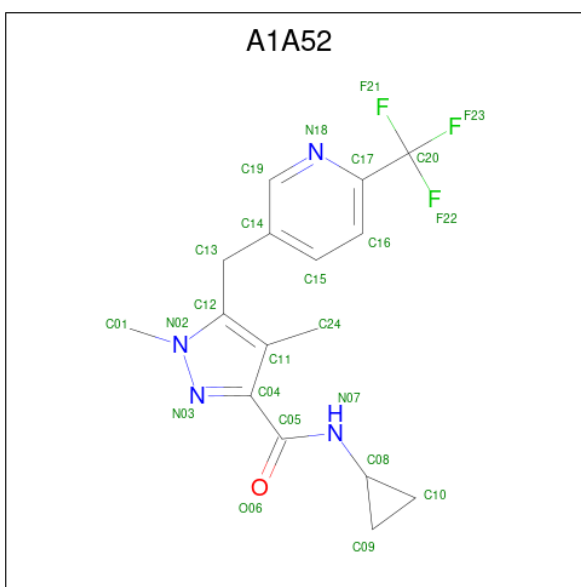
Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	ASN	deletion	UNP Q08210
A	?	-	LYS	deletion	UNP Q08210
A	?	-	ILE	deletion	UNP Q08210
A	?	-	VAL	deletion	UNP Q08210
A	?	-	GLU	deletion	UNP Q08210
A	?	-	LYS	deletion	UNP Q08210
A	?	-	LYS	deletion	UNP Q08210
A	?	-	ASN	deletion	UNP Q08210
A	?	-	ASN	deletion	UNP Q08210
A	?	-	PHE	deletion	UNP Q08210
A	?	-	ASN	deletion	UNP Q08210
A	?	-	LYS	deletion	UNP Q08210
A	?	-	ASN	deletion	UNP Q08210
A	?	-	ASN	deletion	UNP Q08210
A	?	-	SER	deletion	UNP Q08210
A	?	-	HIS	deletion	UNP Q08210
A	?	-	MET	deletion	UNP Q08210
A	?	-	MET	deletion	UNP Q08210
A	?	-	LYS	deletion	UNP Q08210
A	?	-	ASP	deletion	UNP Q08210
A	?	-	ALA	deletion	UNP Q08210
A	?	-	LYS	deletion	UNP Q08210
A	?	-	ASP	deletion	UNP Q08210
A	?	-	ASN	deletion	UNP Q08210
B	139	MET	-	initiating methionine	UNP Q08210
B	140	GLY	-	expression tag	UNP Q08210
B	141	HIS	-	expression tag	UNP Q08210
B	142	HIS	-	expression tag	UNP Q08210
B	143	HIS	-	expression tag	UNP Q08210
B	144	HIS	-	expression tag	UNP Q08210
B	145	HIS	-	expression tag	UNP Q08210
B	146	HIS	-	expression tag	UNP Q08210
B	147	ALA	-	expression tag	UNP Q08210
B	148	GLU	-	expression tag	UNP Q08210
B	149	ASN	-	expression tag	UNP Q08210
B	150	LEU	-	expression tag	UNP Q08210
B	151	TYR	-	expression tag	UNP Q08210
B	152	PHE	-	expression tag	UNP Q08210
B	153	GLN	-	expression tag	UNP Q08210
B	154	GLY	-	expression tag	UNP Q08210
B	155	ALA	-	expression tag	UNP Q08210
B	156	ASP	-	expression tag	UNP Q08210

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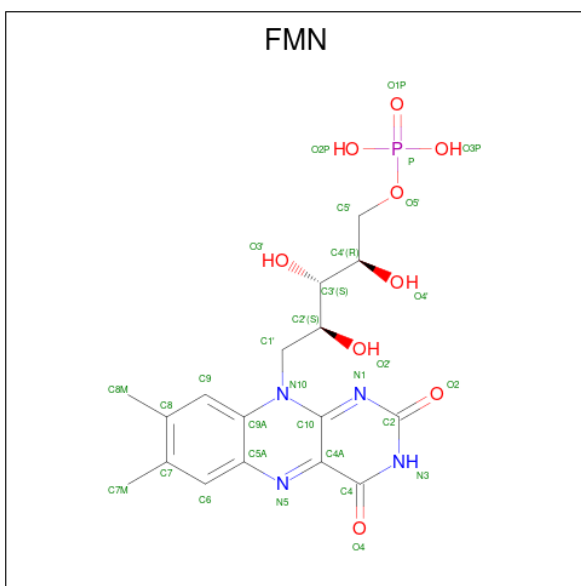
Chain	Residue	Modelled	Actual	Comment	Reference
B	157	PRO	-	expression tag	UNP Q08210
B	?	-	SER	deletion	UNP Q08210
B	?	-	THR	deletion	UNP Q08210
B	?	-	TYR	deletion	UNP Q08210
B	?	-	ASN	deletion	UNP Q08210
B	?	-	GLU	deletion	UNP Q08210
B	?	-	ASP	deletion	UNP Q08210
B	?	-	ASN	deletion	UNP Q08210
B	?	-	LYS	deletion	UNP Q08210
B	?	-	ILE	deletion	UNP Q08210
B	?	-	VAL	deletion	UNP Q08210
B	?	-	GLU	deletion	UNP Q08210
B	?	-	LYS	deletion	UNP Q08210
B	?	-	LYS	deletion	UNP Q08210
B	?	-	ASN	deletion	UNP Q08210
B	?	-	ASN	deletion	UNP Q08210
B	?	-	PHE	deletion	UNP Q08210
B	?	-	ASN	deletion	UNP Q08210
B	?	-	LYS	deletion	UNP Q08210
B	?	-	ASN	deletion	UNP Q08210
B	?	-	ASN	deletion	UNP Q08210
B	?	-	SER	deletion	UNP Q08210
B	?	-	HIS	deletion	UNP Q08210
B	?	-	MET	deletion	UNP Q08210
B	?	-	MET	deletion	UNP Q08210
B	?	-	LYS	deletion	UNP Q08210
B	?	-	ASP	deletion	UNP Q08210
B	?	-	ALA	deletion	UNP Q08210
B	?	-	LYS	deletion	UNP Q08210
B	?	-	ASP	deletion	UNP Q08210
B	?	-	ASN	deletion	UNP Q08210

- Molecule 2 is N-cyclopropyl-1,4-dimethyl-5-{{6-(trifluoromethyl)pyridin-3-yl}methyl}-1H-pyrazole-3-carboxamide (CCD ID: A1A52) (formula: C₁₆H₁₇F₃N₄O) (labeled as "Ligand of Interest" by depositor).



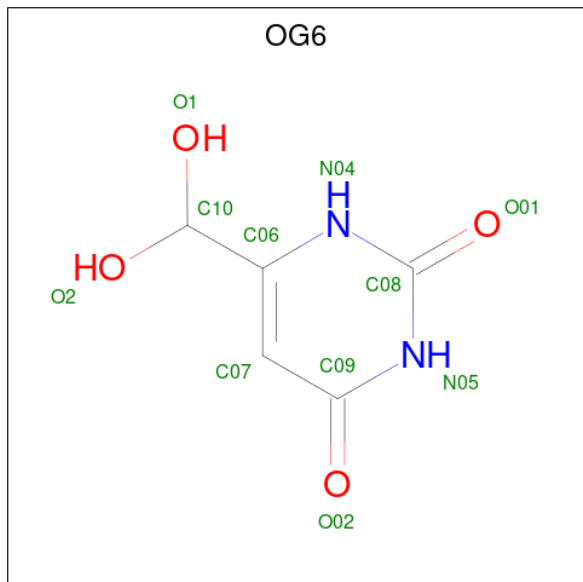
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total 41	C 16	F 3	H 17	N 4	O 1	0	0
2	B	1	Total 41	C 16	F 3	H 17	N 4	O 1	0	0

- Molecule 3 is FLAVIN MONONUCLEOTIDE (CCD ID: FMN) (formula: $C_{17}H_{21}N_4O_9P$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
3	A	1	Total 50	C 17	H 19	N 4	O 9	P 1	0	0
3	B	1	Total 50	C 17	H 19	N 4	O 9	P 1	0	0

- Molecule 4 is 6-[bis(oxidanyl)methyl]-5 {H}-pyrimidine-2,4-dione (CCD ID: OG6) (formula: $C_5H_6N_2O_4$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	H	N	O	0	0
			14	5	3	2	4		
4	B	1	Total	C	H	N	O	0	0
			14	5	3	2	4		

- Molecule 5 is SODIUM ION (CCD ID: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	B	2	Total	Na	0	0
			2	2		

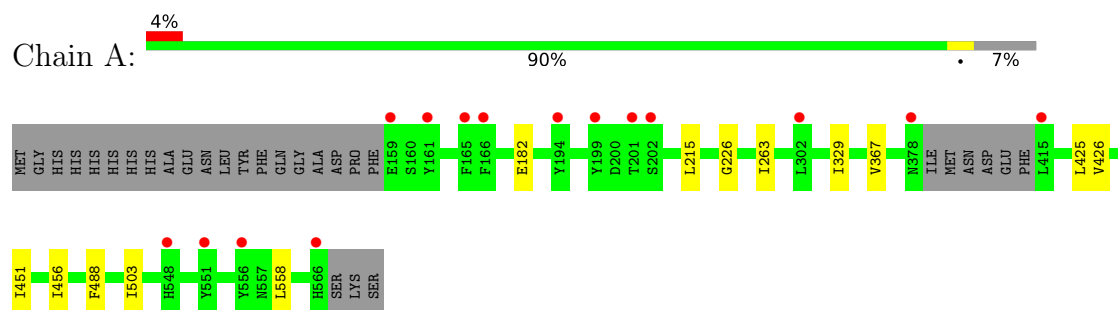
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	130	Total	O	0	0
			130	130		
6	B	125	Total	O	0	0
			125	125		

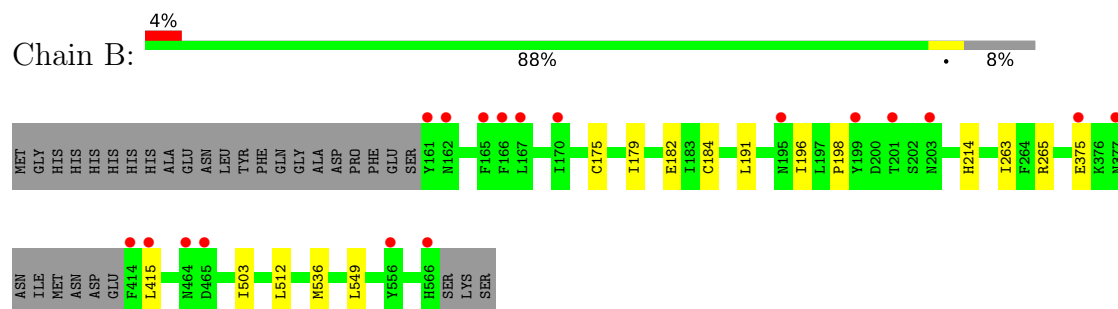
3 Residue-property plots

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: Dihydroorotate dehydrogenase (quinone), mitochondrial



- Molecule 1: Dihydroorotate dehydrogenase (quinone), mitochondrial



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	68.54Å 107.98Å 157.84Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	40.96 – 2.10 40.96 – 2.10	Depositor EDS
% Data completeness (in resolution range)	80.7 (40.96-2.10) 80.6 (40.96-2.10)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.79 (at 2.10Å)	Xtriage
Refinement program	PHENIX 1.21.1_5286	Depositor
R, R_{free}	0.176 , 0.210 (Not available) , 0.228	Depositor DCC
R_{free} test set	1672 reflections (2.42%)	wwPDB-VP
Wilson B-factor (Å ²)	24.7	Xtriage
Anisotropy	0.359	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 39.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	12372	wwPDB-VP
Average B, all atoms (Å ²)	39.0	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 31.68 % 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 1.0636e-03. 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: A1A52, NA, FMN, OG6

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	0.38	0/3012	0.41	0/4055
1	B	0.36	0/3000	0.41	0/4037
All	All	0.37	0/6012	0.41	0/8092

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2957	3003	3003	9	0
1	B	2944	3001	3001	11	0
2	A	24	17	0	0	0
2	B	24	17	0	0	0
3	A	31	19	19	1	0
3	B	31	19	19	0	0
4	A	11	3	0	0	0
4	B	11	3	0	0	0
5	B	2	0	0	0	0
6	A	130	0	0	0	0
6	B	125	0	0	1	0
All	All	6290	6082	6042	20	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 (20) 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:A:182:GLU:HG2	1:A:263:ILE:HD12	1.67	0.75
1:B:182:GLU:CG	1:B:263:ILE:HD12	2.25	0.67
1:B:182:GLU:HG3	1:B:263:ILE:HD12	1.79	0.62
1:B:512:LEU:HD23	1:B:549:LEU:HD21	1.83	0.59
1:A:182:GLU:CG	1:A:263:ILE:HD12	2.32	0.59
1:B:191:LEU:HD22	1:B:196:ILE:HD11	1.88	0.56
1:A:426:VAL:HG12	1:A:451:ILE:HD11	1.91	0.52
1:B:182:GLU:HG2	1:B:263:ILE:HD12	1.94	0.48
1:B:503:ILE:HD12	1:B:503:ILE:N	2.29	0.47
1:A:329:ILE:HD11	1:A:367:VAL:HG13	1.98	0.45
1:A:456:ILE:HG23	1:A:488:PHE:CD2	2.52	0.45
1:B:179:ILE:O	1:B:265:ARG:NH2	2.49	0.44
1:B:198:PRO:HD2	1:B:536:MET:HE2	1.99	0.43
1:A:558:LEU:HD23	1:A:558:LEU:C	2.44	0.43
1:A:503:ILE:HD12	1:A:503:ILE:N	2.34	0.43
1:A:226:GLY:HA3	3:A:1002:FMN:N5	2.34	0.42
1:B:375:GLU:HA	1:B:415:LEU:HD22	2.01	0.41
1:A:215:LEU:CD1	1:A:425:LEU:HD12	2.50	0.41
1:B:214:HIS:HE1	6:B:1114:HOH:O	2.04	0.41
1:B:175:CYS:HB3	1:B:184:CYS:SG	2.61	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	298/401 (74%)	289 (97%)	9 (3%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	368/401 (92%)	355 (96%)	13 (4%)	0	100	100
All	All	666/802 (83%)	644 (97%)	22 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	331/354 (94%)	331 (100%)	0	100	100
1	B	329/354 (93%)	329 (100%)	0	100	100
All	All	660/708 (93%)	660 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	354	ASN
1	A	464	ASN
1	B	541	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 8 ligands modelled in this entry, 2 are monoatomic - leaving 6 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
4	OG6	A	1003	-	10,11,11	4.88	2 (20%)	10,15,15	2.02	1 (10%)
2	A1A52	B	1001	-	26,26,26	1.92	6 (23%)	33,39,39	1.82	8 (24%)
3	FMN	A	1002	-	33,33,33	1.13	2 (6%)	48,50,50	1.12	5 (10%)
4	OG6	B	1003	-	10,11,11	4.91	2 (20%)	10,15,15	2.24	2 (20%)
2	A1A52	A	1001	-	26,26,26	1.87	5 (19%)	33,39,39	1.81	8 (24%)
3	FMN	B	1002	-	33,33,33	1.12	2 (6%)	48,50,50	1.33	7 (14%)

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
4	OG6	A	1003	-	-	0/0/4/4	0/1/1/1
2	A1A52	B	1001	-	-	2/18/20/20	0/3/3/3
3	FMN	A	1002	-	-	3/18/18/18	0/3/3/3
4	OG6	B	1003	-	-	0/0/4/4	0/1/1/1
2	A1A52	A	1001	-	-	2/18/20/20	0/3/3/3
3	FMN	B	1002	-	-	1/18/18/18	0/3/3/3

All (19) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	1003	OG6	O1-C10	-11.49	1.23	1.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	1003	OG6	O1-C10	-11.19	1.24	1.40
4	A	1003	OG6	O2-C10	-10.33	1.25	1.40
4	B	1003	OG6	O2-C10	-10.11	1.25	1.40
2	B	1001	A1A52	C05-N07	6.14	1.47	1.34
2	A	1001	A1A52	C05-N07	5.82	1.46	1.34
2	A	1001	A1A52	C13-C12	4.12	1.55	1.50
3	A	1002	FMN	C4A-N5	4.02	1.39	1.30
2	B	1001	A1A52	C13-C12	3.77	1.55	1.50
3	B	1002	FMN	C4A-N5	3.21	1.37	1.30
2	B	1001	A1A52	C04-C05	2.60	1.53	1.48
3	A	1002	FMN	C10-N1	2.45	1.38	1.33
3	B	1002	FMN	C10-N1	2.35	1.38	1.33
2	B	1001	A1A52	C10-C08	2.34	1.54	1.48
2	A	1001	A1A52	C10-C08	2.33	1.54	1.48
2	A	1001	A1A52	O06-C05	-2.23	1.19	1.23
2	A	1001	A1A52	C09-C08	2.17	1.53	1.48
2	B	1001	A1A52	C04-C11	-2.02	1.39	1.45
2	B	1001	A1A52	C24-C11	2.01	1.54	1.50

All (31) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	1003	OG6	O1-C10-O2	5.90	130.67	111.97
4	A	1003	OG6	O1-C10-O2	5.62	129.78	111.97
2	B	1001	A1A52	C11-C04-N03	-4.68	108.40	112.02
2	A	1001	A1A52	C10-C08-N07	-4.63	112.45	118.52
2	A	1001	A1A52	C11-C04-N03	-3.94	108.97	112.02
2	B	1001	A1A52	C10-C08-N07	-3.62	113.77	118.52
3	B	1002	FMN	C4-N3-C2	-3.53	119.37	125.64
2	A	1001	A1A52	C01-N02-N03	3.19	124.07	119.29
2	B	1001	A1A52	C01-N02-N03	3.05	123.85	119.29
3	A	1002	FMN	C5A-C9A-N10	3.03	120.70	117.97
3	B	1002	FMN	C4A-C10-N10	2.98	120.75	116.48
2	B	1001	A1A52	C16-C15-C14	-2.90	117.19	121.00
3	B	1002	FMN	C4A-C4-N3	2.80	120.38	113.25
2	A	1001	A1A52	C16-C15-C14	-2.79	117.33	121.00
3	B	1002	FMN	C10-C4A-N5	-2.76	119.18	124.81
2	B	1001	A1A52	F22-C20-C17	-2.70	107.67	112.43
3	A	1002	FMN	C4-N3-C2	-2.63	120.97	125.64
3	A	1002	FMN	C4A-C4-N3	2.61	119.89	113.25
2	A	1001	A1A52	C19-N18-C17	2.57	120.35	117.60
2	B	1001	A1A52	C09-C08-N07	-2.46	115.29	118.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	1002	FMN	O4-C4-C4A	-2.46	120.05	126.53
3	B	1002	FMN	C9A-C5A-N5	-2.45	119.85	122.45
3	B	1002	FMN	C5A-C9A-N10	2.41	120.15	117.97
2	B	1001	A1A52	C19-N18-C17	2.35	120.12	117.60
2	B	1001	A1A52	F23-C20-C17	-2.30	108.38	112.43
2	A	1001	A1A52	F23-C20-C17	-2.23	108.50	112.43
3	A	1002	FMN	C4A-C10-N10	2.20	119.64	116.48
4	B	1003	OG6	C09-C07-C06	-2.13	118.88	120.66
2	A	1001	A1A52	C13-C14-C19	-2.11	117.95	120.98
3	B	1002	FMN	C4A-C10-N1	-2.09	119.46	124.59
2	A	1001	A1A52	C08-N07-C05	-2.00	119.75	123.09

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	1001	A1A52	C09-C08-N07-C05
2	B	1001	A1A52	C09-C08-N07-C05
3	A	1002	FMN	C5'-O5'-P-O1P
3	A	1002	FMN	C4'-C5'-O5'-P
3	B	1002	FMN	C4'-C5'-O5'-P
2	A	1001	A1A52	C12-C13-C14-C19
2	B	1001	A1A52	C12-C13-C14-C19
3	A	1002	FMN	C5'-O5'-P-O2P

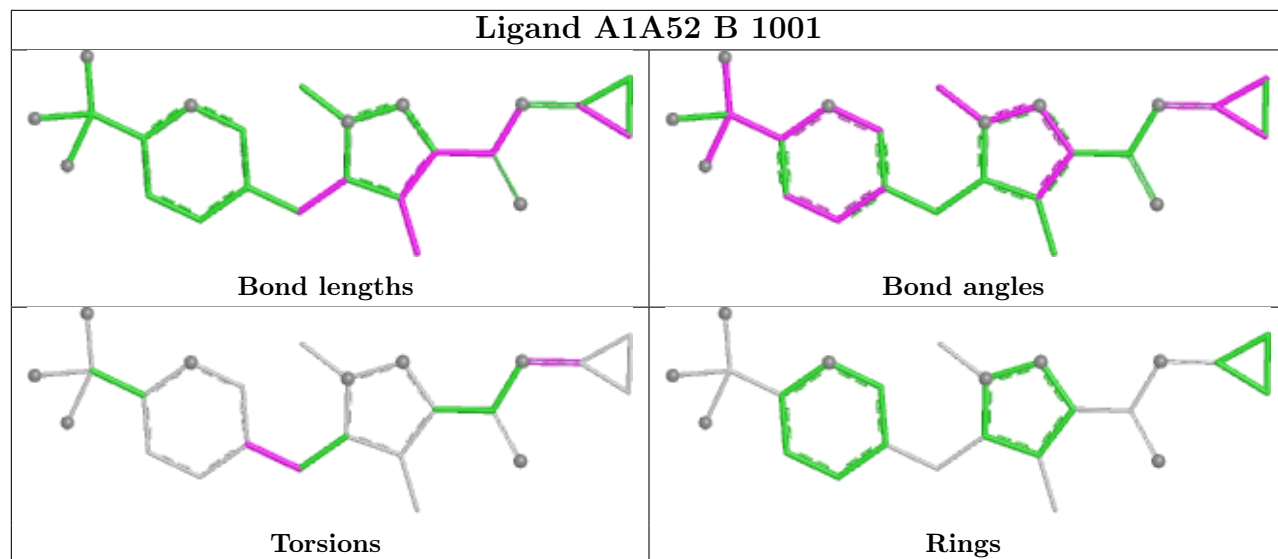
There are no ring outliers.

1 monomer is involved in 1 short contact:

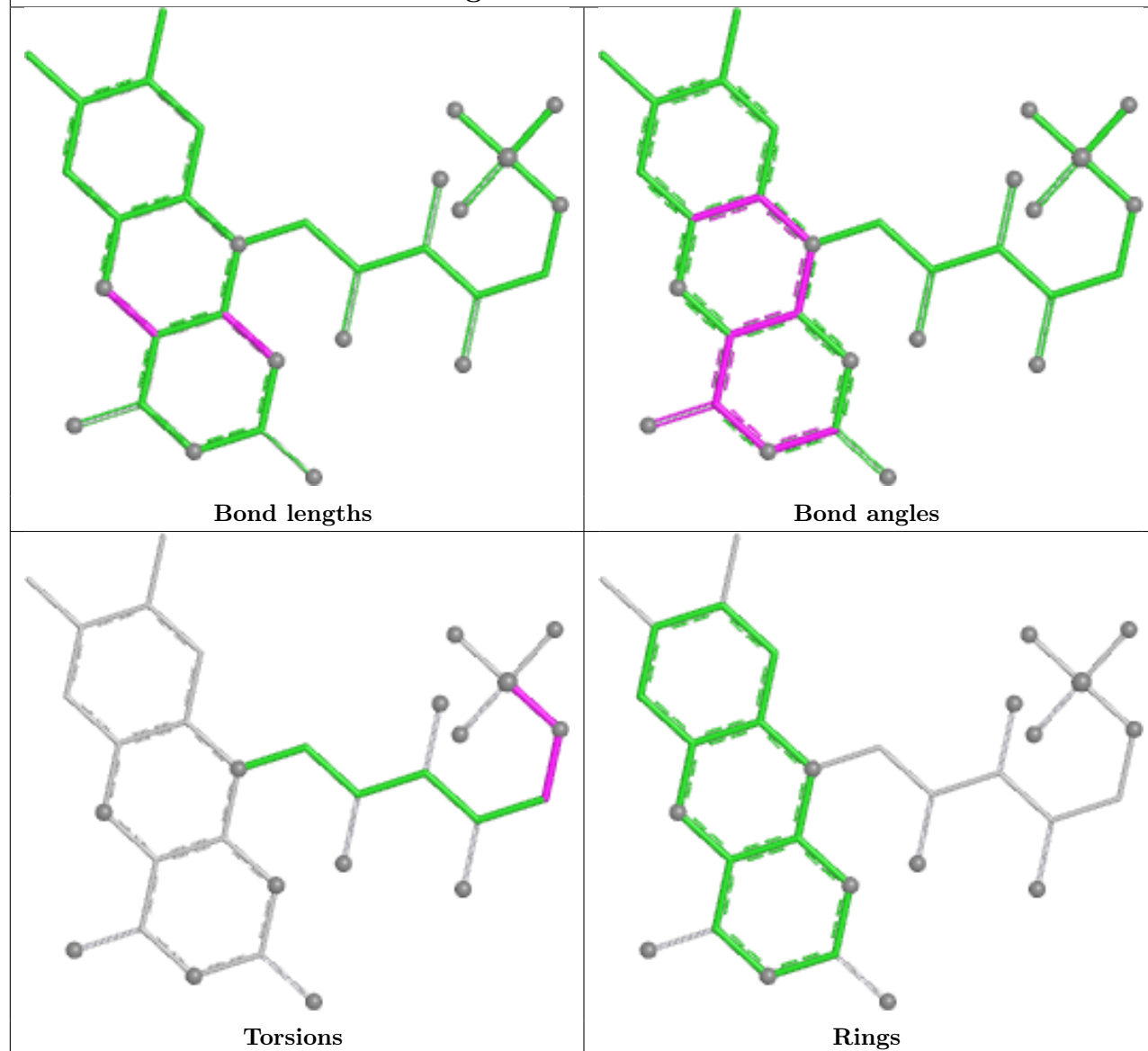
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1002	FMN	1	0

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

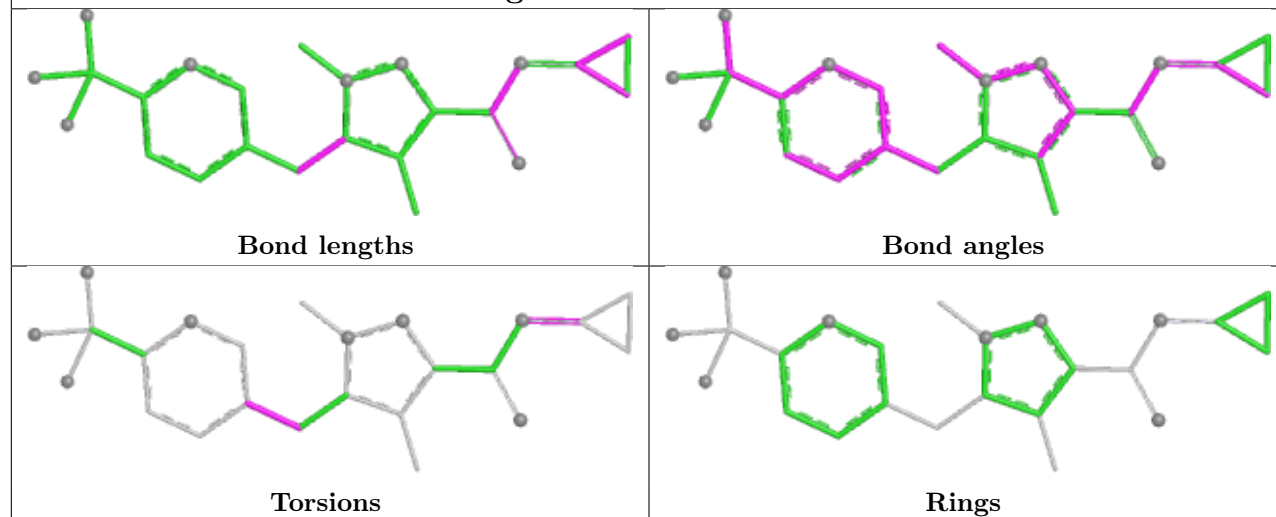
equivalents in the CSD to analyse the geometry.

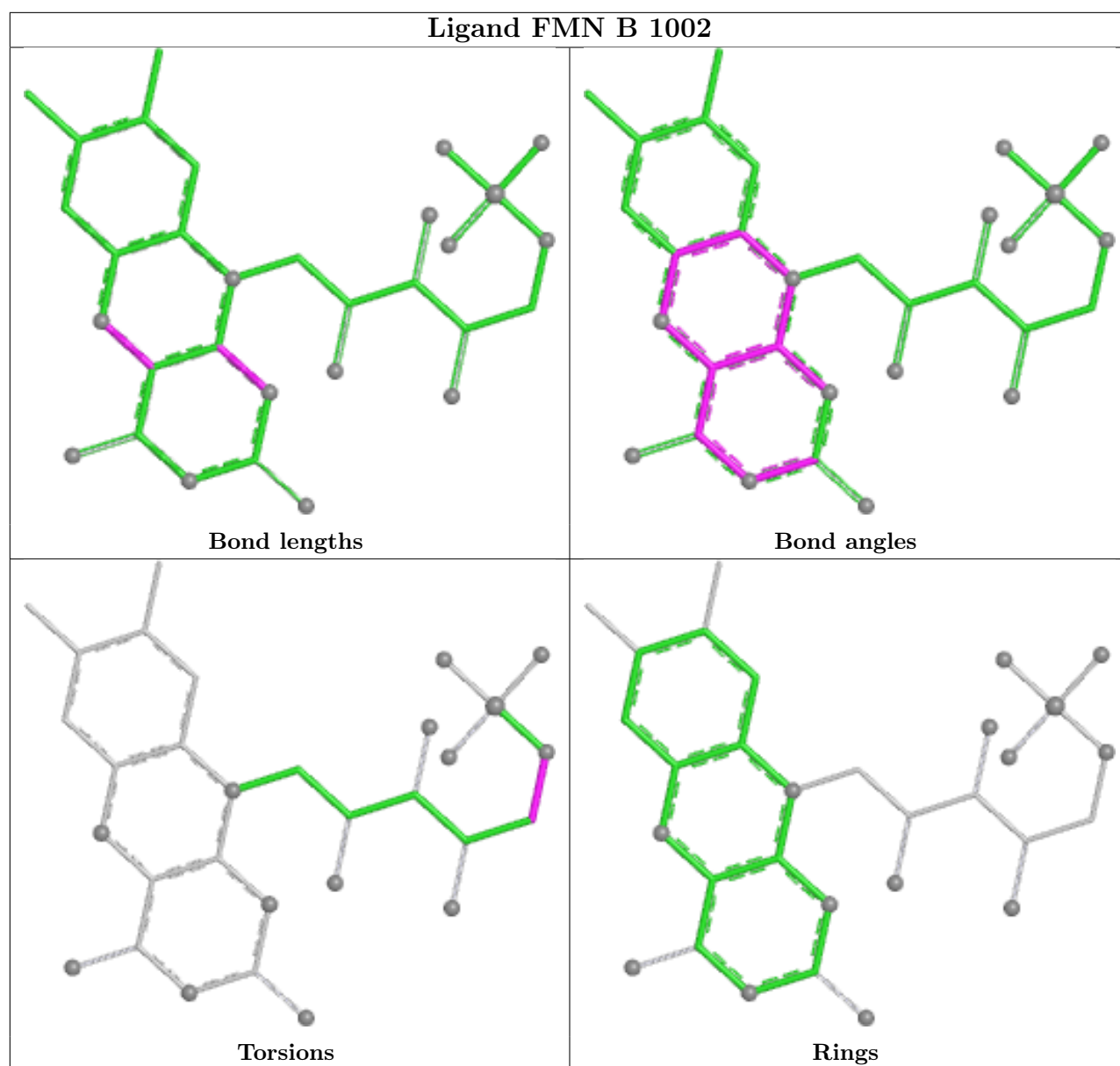


Ligand FMN A 1002



Ligand A1A52 A 1001





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	372/401 (92%)	0.03	15 (4%) 42 44	16, 33, 70, 111	2 (0%)
1	B	370/401 (92%)	0.16	18 (4%) 35 37	17, 36, 73, 95	2 (0%)
All	All	742/802 (92%)	0.09	33 (4%) 39 41	16, 34, 72, 111	4 (0%)

All (33) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	161	TYR	6.5
1	A	566	HIS	6.5
1	B	165	PHE	4.5
1	A	415	LEU	4.2
1	B	201	THR	4.2
1	B	464	ASN	4.1
1	B	414	PHE	4.0
1	B	161	TYR	3.9
1	A	202	SER	3.9
1	B	166	PHE	3.5
1	A	201	THR	3.5
1	A	159	GLU	3.4
1	B	465	ASP	3.4
1	B	377	ASN	3.3
1	B	566	HIS	3.3
1	B	167	LEU	3.1
1	B	556	TYR	3.1
1	B	415	LEU	2.9
1	A	199	TYR	2.7
1	A	378	ASN	2.7
1	B	203	ASN	2.7
1	A	551	TYR	2.5
1	B	199	TYR	2.5
1	A	194	TYR	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	548	HIS	2.4
1	B	170	ILE	2.4
1	A	302	LEU	2.3
1	A	166	PHE	2.2
1	B	162	ASN	2.2
1	A	556	TYR	2.2
1	B	375	GLU	2.1
1	A	165	PHE	2.1
1	B	195	ASN	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

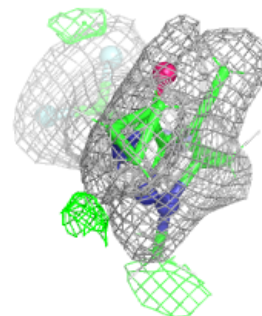
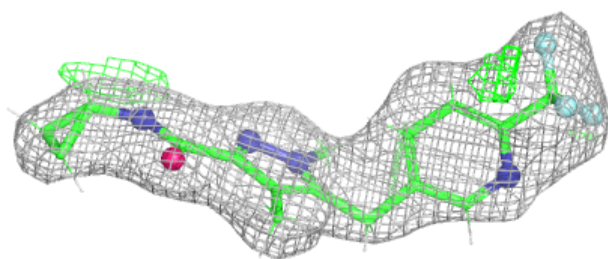
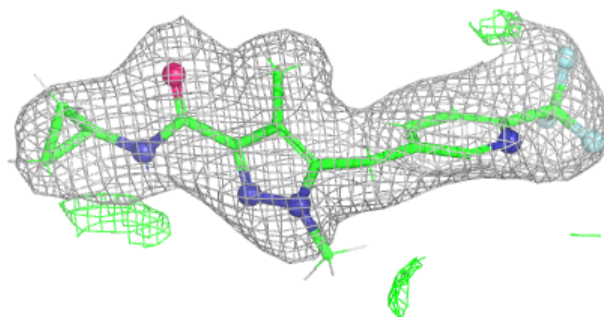
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
5	NA	B	1004	1/1	0.89	0.12	44,44,44,44	0
2	A1A52	B	1001	24/24	0.91	0.11	37,48,58,68	0
5	NA	B	1005	1/1	0.92	0.13	40,40,40,40	0
2	A1A52	A	1001	24/24	0.93	0.09	30,41,50,53	0
4	OG6	B	1003	11/11	0.97	0.06	17,22,27,28	0
3	FMN	A	1002	31/31	0.97	0.05	14,19,24,25	0
4	OG6	A	1003	11/11	0.97	0.05	16,20,24,25	0
3	FMN	B	1002	31/31	0.98	0.05	19,24,30,35	0

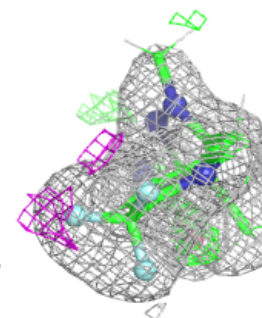
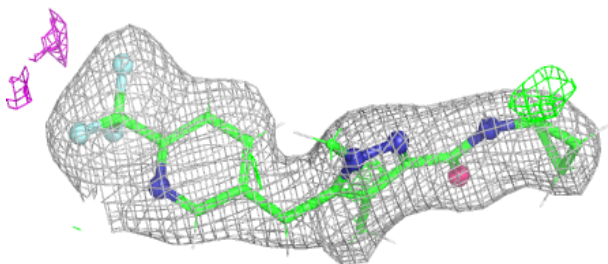
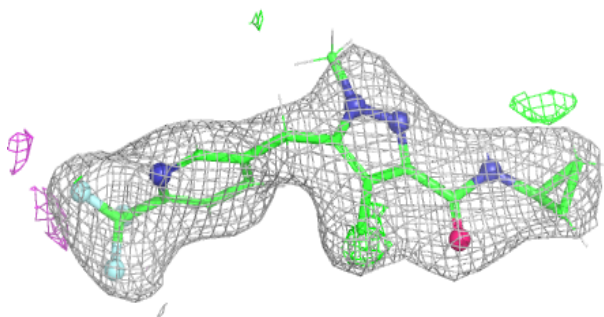
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around A1A52 B 1001:

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

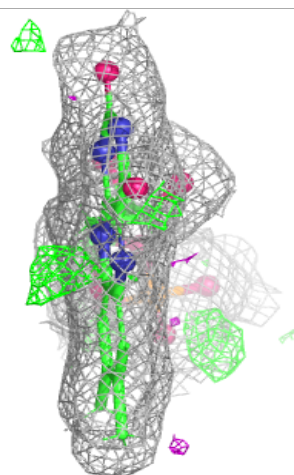
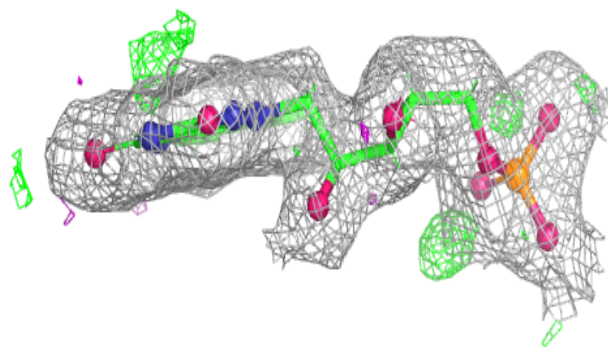
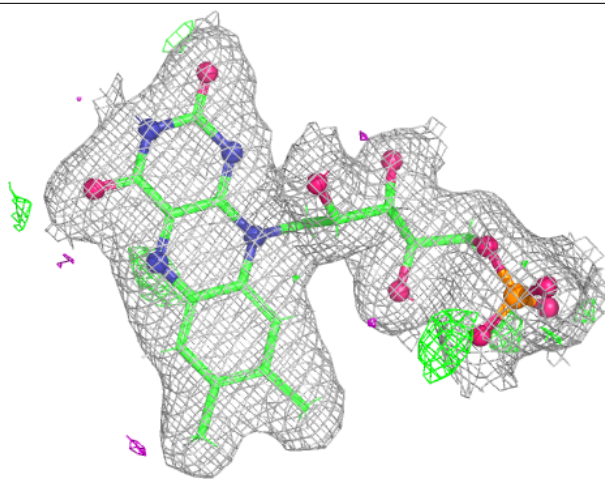
**Electron density around A1A52 A 1001:**

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



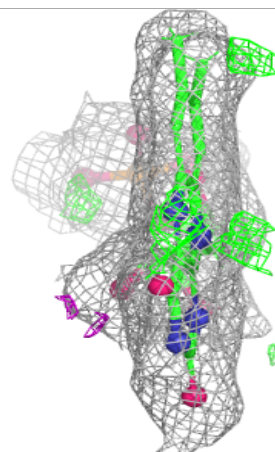
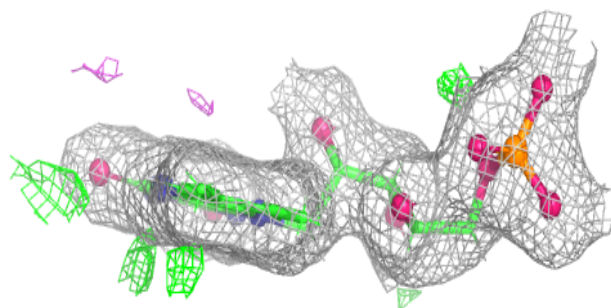
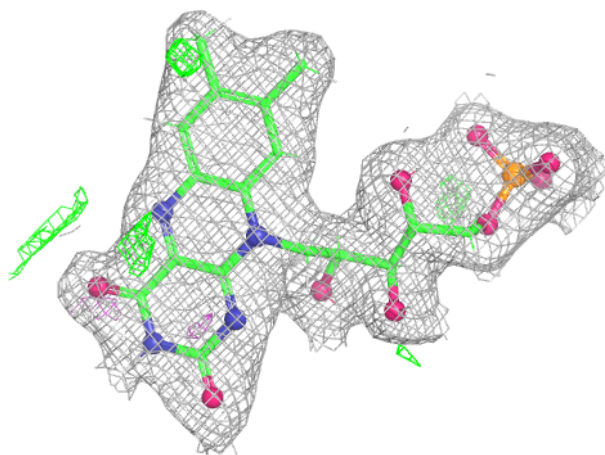
Electron density around FMN A 1002:

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



Electron density around FMN B 1002:

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



6.5 Other polymers [i](#)

There are no such residues in this entry.