



## Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 11:56 AM UTC

PDB ID : 9N6O / pdb\_00009n6o  
Title : Crystal structure of dihydroorotate dehydrogenase from *Leishmania braziliensis* in complex with 5-(4-hydroxy-3-methoxybenzyl)pyrimidine-2,4,6(1H,3H,5H)-trione  
Authors : Froes, T.Q.; Vaidergorn, M.M.; Leite, P.I.P.L.; Godoi, B.F.; dos Santos, T.; Emery, F.S.; Nonato, M.C.  
Deposited on : 2025-02-05  
Resolution : 1.90 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](mailto: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>.

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The following versions of software and data (see [references](#) ①) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtrriage (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

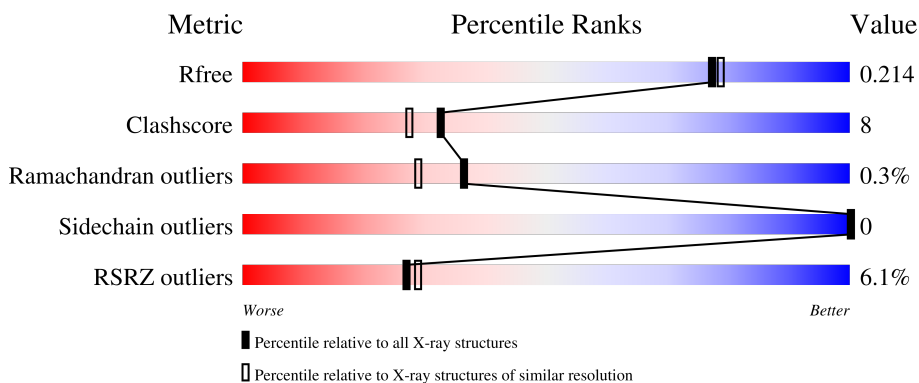
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.90 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	7789 (1.90-1.90)
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (1.90-1.90)

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  $\geq 3$ , 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	347	 7% 73% 15% • 11%
1	B	347	 3% 78% 11% • 10%

## 2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 4886 atoms, of which 51 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.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	309	2276	1466	4	377	411	18	0	2	0
1	B	313	2327	1497	4	393	415	18	0	0	0

There are 68 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-33	MET	-	initiating methionine	UNP E9AI53
A	-32	GLY	-	expression tag	UNP E9AI53
A	-31	SER	-	expression tag	UNP E9AI53
A	-30	SER	-	expression tag	UNP E9AI53
A	-29	HIS	-	expression tag	UNP E9AI53
A	-28	HIS	-	expression tag	UNP E9AI53
A	-27	HIS	-	expression tag	UNP E9AI53
A	-26	HIS	-	expression tag	UNP E9AI53
A	-25	HIS	-	expression tag	UNP E9AI53
A	-24	HIS	-	expression tag	UNP E9AI53
A	-23	SER	-	expression tag	UNP E9AI53
A	-22	SER	-	expression tag	UNP E9AI53
A	-21	GLY	-	expression tag	UNP E9AI53
A	-20	LEU	-	expression tag	UNP E9AI53
A	-19	VAL	-	expression tag	UNP E9AI53
A	-18	PRO	-	expression tag	UNP E9AI53
A	-17	ARG	-	expression tag	UNP E9AI53
A	-16	GLY	-	expression tag	UNP E9AI53
A	-15	SER	-	expression tag	UNP E9AI53
A	-14	HIS	-	expression tag	UNP E9AI53
A	-13	MET	-	expression tag	UNP E9AI53
A	-12	ALA	-	expression tag	UNP E9AI53
A	-11	SER	-	expression tag	UNP E9AI53
A	-10	MET	-	expression tag	UNP E9AI53
A	-9	THR	-	expression tag	UNP E9AI53

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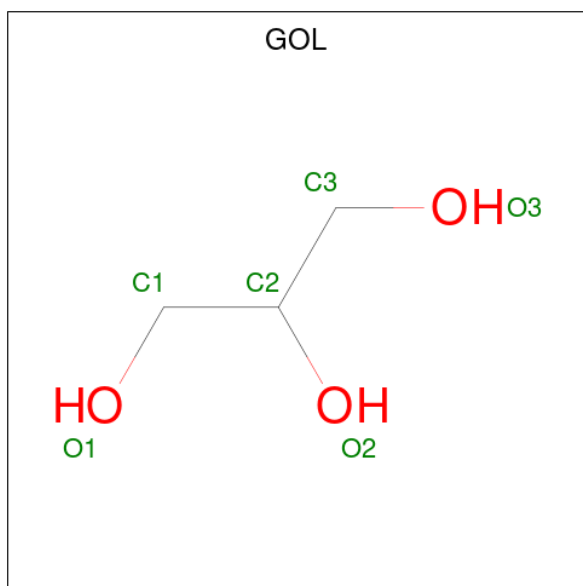
Chain	Residue	Modelled	Actual	Comment	Reference
A	-8	GLY	-	expression tag	UNP E9AI53
A	-7	GLY	-	expression tag	UNP E9AI53
A	-6	GLY	-	expression tag	UNP E9AI53
A	-5	GLN	-	expression tag	UNP E9AI53
A	-4	MET	-	expression tag	UNP E9AI53
A	-3	GLY	-	expression tag	UNP E9AI53
A	-2	ARG	-	expression tag	UNP E9AI53
A	-1	GLY	-	expression tag	UNP E9AI53
A	0	SER	-	expression tag	UNP E9AI53
B	-33	MET	-	initiating methionine	UNP E9AI53
B	-32	GLY	-	expression tag	UNP E9AI53
B	-31	SER	-	expression tag	UNP E9AI53
B	-30	SER	-	expression tag	UNP E9AI53
B	-29	HIS	-	expression tag	UNP E9AI53
B	-28	HIS	-	expression tag	UNP E9AI53
B	-27	HIS	-	expression tag	UNP E9AI53
B	-26	HIS	-	expression tag	UNP E9AI53
B	-25	HIS	-	expression tag	UNP E9AI53
B	-24	HIS	-	expression tag	UNP E9AI53
B	-23	SER	-	expression tag	UNP E9AI53
B	-22	SER	-	expression tag	UNP E9AI53
B	-21	GLY	-	expression tag	UNP E9AI53
B	-20	LEU	-	expression tag	UNP E9AI53
B	-19	VAL	-	expression tag	UNP E9AI53
B	-18	PRO	-	expression tag	UNP E9AI53
B	-17	ARG	-	expression tag	UNP E9AI53
B	-16	GLY	-	expression tag	UNP E9AI53
B	-15	SER	-	expression tag	UNP E9AI53
B	-14	HIS	-	expression tag	UNP E9AI53
B	-13	MET	-	expression tag	UNP E9AI53
B	-12	ALA	-	expression tag	UNP E9AI53
B	-11	SER	-	expression tag	UNP E9AI53
B	-10	MET	-	expression tag	UNP E9AI53
B	-9	THR	-	expression tag	UNP E9AI53
B	-8	GLY	-	expression tag	UNP E9AI53
B	-7	GLY	-	expression tag	UNP E9AI53
B	-6	GLY	-	expression tag	UNP E9AI53
B	-5	GLN	-	expression tag	UNP E9AI53
B	-4	MET	-	expression tag	UNP E9AI53
B	-3	GLY	-	expression tag	UNP E9AI53
B	-2	ARG	-	expression tag	UNP E9AI53
B	-1	GLY	-	expression tag	UNP E9AI53

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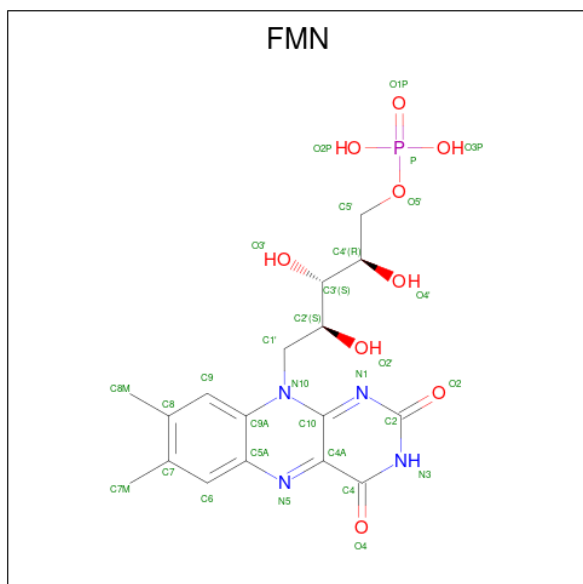
Chain	Residue	Modelled	Actual	Comment	Reference
B	0	SER	-	expression tag	UNP E9AI53

- Molecule 2 is GLYCEROL (CCD ID: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).



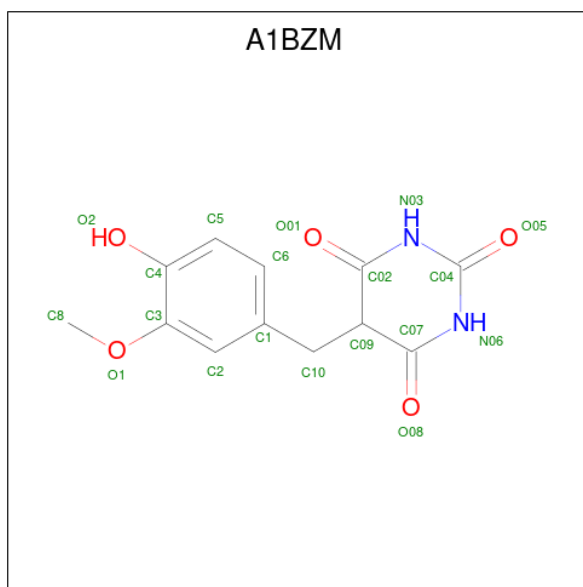
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	H	O		
2	A	1	14	3	8	3	0	0
2	B	1	14	3	8	3	0	0

- Molecule 3 is FLAVIN MONONUCLEOTIDE (CCD ID: FMN) (formula: C<sub>17</sub>H<sub>21</sub>N<sub>4</sub>O<sub>9</sub>P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
3	A	1	Total	C	H	N	O	P	0	0
			50	17	19	4	9	1		
3	B	1	Total	C	N	O	P		0	0
			31	17	4	9	1			

- Molecule 4 is 5-[(4-hydroxy-3-methoxyphenyl)methyl]-1,3-diazinane-2,4,6-trione (CCD ID: A1BZM) (formula: C<sub>12</sub>H<sub>12</sub>N<sub>2</sub>O<sub>5</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	H	N	O	1	0
			15	6	4	2	3		
4	B	1	Total	C	H	N	O	0	0
			14	5	4	2	3		

- Molecule 5 is SULFATE ION (CCD ID: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	B	1	Total	O	S	0	0
			5	4	1		
5	B	1	Total	O	S	0	0
			5	4	1		
5	B	1	Total	O	S	0	0
			5	4	1		

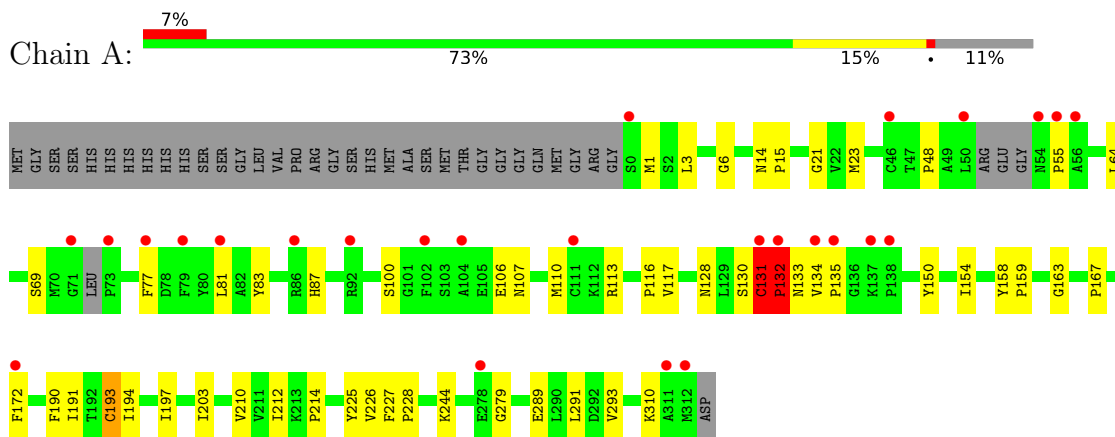
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	47	Total	O	0	0
			47	47		
6	B	83	Total	O	0	0
			83	83		

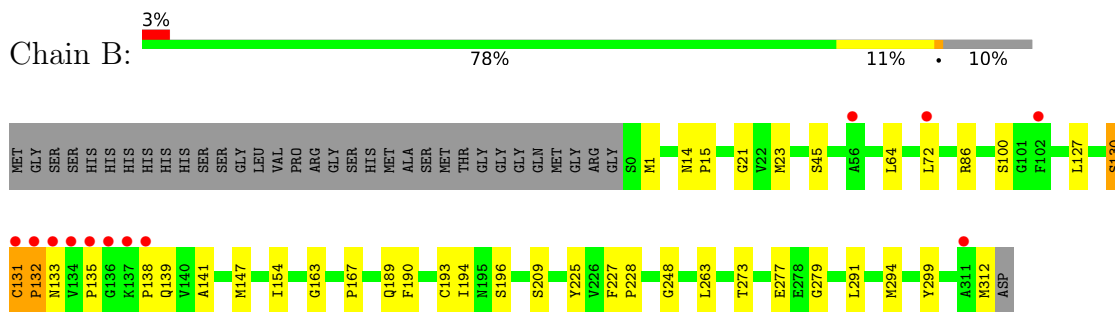
### 3 Residue-property plots

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



- Molecule 1: Dihydroorotate dehydrogenase



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	62.04Å 104.29Å 107.21Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.68 – 1.90 47.68 – 1.90	Depositor EDS
% Data completeness (in resolution range)	100.0 (47.68-1.90) 100.0 (47.68-1.90)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.32 (at 1.90Å)	Xtrriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, $R_{free}$	0.182 , 0.216 0.181 , 0.214	Depositor DCC
$R_{free}$ test set	2780 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	35.8	Xtrriage
Anisotropy	0.249	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 39.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.006 for -h,l,k	Xtrriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	4886	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	42.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.13% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: SO4, GOL, A1BZM, 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	0.31	0/2330	0.63	5/3163 (0.2%)
1	B	0.39	0/2380	0.70	5/3228 (0.2%)
All	All	0.35	0/4710	0.66	10/6391 (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	1
1	B	0	1
All	All	0	2

There are no bond length outliers.

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed( $^{\circ}$ )	Ideal( $^{\circ}$ )
1	B	131	CYS	N-CA-C	15.88	131.31	109.24
1	A	131	CYS	N-CA-C	13.05	128.87	109.04
1	A	131	CYS	CB-CA-C	-9.13	99.44	109.85
1	B	131	CYS	CB-CA-C	-8.13	97.67	109.38
1	B	132	PRO	N-CA-C	-7.48	97.06	112.47
1	A	132	PRO	N-CA-C	-7.11	97.83	112.47
1	B	130	SER	CA-C-N	-5.62	113.80	121.61
1	B	130	SER	C-N-CA	-5.62	113.80	121.61
1	A	193	CYS	CA-C-N	5.29	131.21	121.70
1	A	193	CYS	C-N-CA	5.29	131.21	121.70

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	131	CYS	Peptide
1	B	131	CYS	Peptide

## 5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2272	4	2181	42	1
1	B	2323	4	2279	32	1
2	A	6	8	8	1	0
2	B	6	8	8	2	0
3	A	31	19	19	1	0
3	B	31	0	19	1	0
4	A	11	4	0	1	0
4	B	10	4	0	2	0
5	B	15	0	0	1	0
6	A	47	0	0	1	0
6	B	83	0	0	5	0
All	All	4835	51	4514	73	1

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 8.

All (73) 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:77:PHE:CD2	1:A:110:MET:HG2	2.16	0.81
1:B:127:LEU:HD22	1:B:154:ILE:HD13	1.62	0.80
1:A:81:LEU:HD11	1:A:117:VAL:HG21	1.66	0.78
4:B:403:A1BZM:O01	6:B:501:HOH:O	2.03	0.77
1:B:133:ASN:O	1:B:135:PRO:HD3	1.87	0.74
1:A:172:PHE:H	2:B:401:GOL:H12	1.52	0.73
1:A:23:MET:HE1	1:A:279:GLY:HA2	1.73	0.71
1:B:23:MET:HE1	1:B:279:GLY:HA2	1.72	0.71
1:A:130:SER:HB3	1:A:167:PRO:HD3	1.73	0.71

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:48:PRO:HG2	1:A:106:GLU:HG2	1.71	0.70
1:A:310:LYS:HB2	1:B:209:SER:HB3	1.73	0.69
1:B:193:CYS:C	6:B:502:HOH:O	2.38	0.67
1:A:69:SER:HB2	1:A:212:ILE:HD12	1.78	0.66
1:A:133:ASN:O	1:A:135:PRO:HD3	1.96	0.66
1:A:55:PRO:HD2	1:A:214:PRO:HG3	1.80	0.64
1:A:131:CYS:HB2	4:A:403:A1BZM:O08	1.98	0.63
1:B:227:PHE:HB3	1:B:228:PRO:HD3	1.79	0.62
1:B:127:LEU:HD22	1:B:154:ILE:CD1	2.32	0.60
1:B:141:ALA:HB1	1:B:147:MET:HE2	1.85	0.59
1:B:141:ALA:CB	1:B:147:MET:HE2	2.33	0.59
1:A:130:SER:HB3	1:A:167:PRO:CD	2.33	0.59
1:A:172:PHE:HB2	2:B:401:GOL:H31	1.84	0.58
1:B:21:GLY:HA3	3:B:402:FMN:N5	2.20	0.57
1:A:210:VAL:O	1:B:312:MET:HE3	2.05	0.56
1:A:107:ASN:HB3	1:A:154:ILE:HD11	1.87	0.55
1:B:14:ASN:HB2	1:B:15:PRO:HD2	1.87	0.54
1:A:21:GLY:HA3	3:A:402:FMN:N5	2.23	0.53
1:B:196:SER:HB3	6:B:546:HOH:O	2.09	0.52
1:B:127:LEU:CD2	1:B:154:ILE:HD13	2.39	0.51
1:A:14:ASN:HB2	1:A:15:PRO:HD2	1.92	0.51
1:A:191:ILE:HD11	1:A:244:LYS:HD2	1.93	0.51
1:A:77:PHE:CG	1:A:110:MET:HG2	2.47	0.50
1:A:83:TYR:HA	1:A:87:HIS:HB2	1.95	0.49
1:A:81:LEU:HD11	1:A:117:VAL:CG2	2.41	0.49
1:A:131:CYS:SG	1:A:132:PRO:CD	3.01	0.48
1:B:127:LEU:CD2	1:B:154:ILE:CD1	2.92	0.48
1:B:86:ARG:NH2	5:B:406:SO4:O3	2.47	0.48
1:B:141:ALA:HB3	1:B:167:PRO:CD	2.44	0.48
1:B:248:GLY:HA2	6:B:502:HOH:O	2.13	0.48
1:A:77:PHE:CE2	1:A:110:MET:HG2	2.49	0.47
1:A:132:PRO:CD	1:A:133:ASN:H	2.22	0.47
1:A:163:GLY:HA3	1:A:190:PHE:CZ	2.50	0.47
1:A:131:CYS:O	1:A:134:VAL:HG23	2.15	0.46
1:B:130:SER:HB3	1:B:167:PRO:N	2.31	0.46
1:B:72:LEU:HD21	4:B:403:A1BZM:C10	2.46	0.46
1:A:113:ARG:O	1:A:116:PRO:HD2	2.17	0.45
1:B:130:SER:HB3	1:B:167:PRO:HD3	1.99	0.45
1:A:203:ILE:HG21	1:B:263:LEU:HD23	1.97	0.45
1:B:163:GLY:HA3	1:B:190:PHE:CZ	2.52	0.44
1:B:130:SER:HB3	1:B:167:PRO:CD	2.48	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:45:SER:HB3	1:B:100:SER:HB2	2.00	0.44
1:A:100:SER:HB3	1:A:128:ASN:HB3	2.00	0.43
1:B:138:PRO:O	1:B:139:GLN:C	2.61	0.43
1:A:197:ILE:HD12	1:A:226:VAL:HG12	2.00	0.43
1:B:1:MET:HE3	1:B:291:LEU:HD22	1.99	0.43
1:A:81:LEU:CD1	1:A:117:VAL:HG21	2.42	0.43
1:A:64:LEU:HB2	1:A:225:TYR:CZ	2.54	0.43
1:B:193:CYS:HA	1:B:194:ILE:HA	1.86	0.42
1:B:273:THR:O	1:B:277:GLU:HG3	2.20	0.42
1:B:294:MET:HB3	1:B:299:TYR:HB2	2.02	0.42
1:A:131:CYS:SG	1:A:134:VAL:HG23	2.59	0.42
1:A:289:GLU:O	1:A:293:VAL:HG23	2.20	0.42
1:A:1:MET:HE3	1:A:291:LEU:HD22	2.02	0.41
1:A:158:TYR:HA	1:A:159:PRO:HD3	1.89	0.41
1:A:3:LEU:O	1:A:14:ASN:HA	2.20	0.41
1:A:227:PHE:HB3	1:A:228:PRO:HD3	2.03	0.41
1:A:228:PRO:HD2	6:A:519:HOH:O	2.21	0.41
2:A:401:GOL:H11	6:B:557:HOH:O	2.20	0.41
1:B:64:LEU:HB2	1:B:225:TYR:CZ	2.56	0.41
1:A:150:TYR:O	1:A:154:ILE:HG12	2.21	0.40
1:A:193:CYS:HA	1:A:194:ILE:HA	1.90	0.40
1:A:163:GLY:HA3	1:A:190:PHE:CE2	2.57	0.40
1:B:141:ALA:HA	1:B:147:MET:HE2	2.04	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:6:GLY:O	1:B:189:GLN:NE2[3_544]	1.82	0.38

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	305/347 (88%)	294 (96%)	10 (3%)	1 (0%)	36	29
1	B	311/347 (90%)	301 (97%)	9 (3%)	1 (0%)	36	29
All	All	616/694 (89%)	595 (97%)	19 (3%)	2 (0%)	36	29

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	132	PRO
1	B	132	PRO

### 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	223/273 (82%)	223 (100%)	0	100	100
1	B	232/273 (85%)	232 (100%)	0	100	100
All	All	455/546 (83%)	455 (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 (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	133	ASN
1	B	54	ASN
1	B	133	ASN
1	B	189	GLN
1	B	199	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](#)

9 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	GOL	A	401	-	5,5,5	0.90	0	5,5,5	0.99	0
2	GOL	B	401	-	5,5,5	0.59	0	5,5,5	0.76	0
5	SO4	B	404	-	4,4,4	0.23	0	6,6,6	0.21	0
4	A1BZM	B	403	1	10,10,20	3.46	5 (50%)	12,14,28	0.61	0
4	A1BZM	A	403	1	11,11,20	3.69	7 (63%)	14,15,28	2.20	2 (14%)
5	SO4	B	405	-	4,4,4	0.17	0	6,6,6	0.19	0
3	FMN	B	402	-	33,33,33	1.22	2 (6%)	48,50,50	1.25	7 (14%)
5	SO4	B	406	-	4,4,4	0.28	0	6,6,6	0.10	0
3	FMN	A	402	-	33,33,33	1.06	2 (6%)	48,50,50	1.14	5 (10%)

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	GOL	A	401	-	-	0/4/4/4	-
2	GOL	B	401	-	-	2/4/4/4	-
4	A1BZM	B	403	1	-	-	0/1/1/2
4	A1BZM	A	403	1	-	2/2/18/22	0/1/1/2
3	FMN	B	402	-	-	1/18/18/18	0/3/3/3

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	FMN	A	402	-	-	4/18/18/18	0/3/3/3

All (16) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	403	A1BZM	C04-N03	5.58	1.46	1.37
4	A	403	A1BZM	C02-N03	5.41	1.46	1.37
4	A	403	A1BZM	C04-N03	5.40	1.46	1.37
4	A	403	A1BZM	C04-N06	5.34	1.46	1.37
4	B	403	A1BZM	C02-N03	5.25	1.46	1.37
4	B	403	A1BZM	C07-N06	5.13	1.46	1.37
4	B	403	A1BZM	C04-N06	4.78	1.45	1.37
4	A	403	A1BZM	C07-N06	4.77	1.45	1.37
4	A	403	A1BZM	C09-C02	4.52	1.56	1.52
3	B	402	FMN	C4A-N5	3.90	1.39	1.30
3	A	402	FMN	C4A-N5	3.49	1.38	1.30
4	A	403	A1BZM	O08-C07	-3.17	1.17	1.23
3	B	402	FMN	C9A-N10	-2.88	1.36	1.41
3	A	402	FMN	C10-N1	2.58	1.38	1.33
4	B	403	A1BZM	O01-C02	-2.20	1.19	1.23
4	A	403	A1BZM	O01-C02	-2.07	1.19	1.23

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	403	A1BZM	C10-C09-C07	6.94	119.65	109.14
4	A	403	A1BZM	C1-C10-C09	-3.54	104.52	113.01
3	B	402	FMN	C5A-C9A-N10	3.05	120.72	117.97
3	A	402	FMN	C4-N3-C2	-2.99	120.34	125.64
3	B	402	FMN	C4-N3-C2	-2.93	120.43	125.64
3	B	402	FMN	C4A-C10-N10	2.91	120.65	116.48
3	A	402	FMN	C4A-C4-N3	2.46	119.51	113.25
3	B	402	FMN	O4-C4-C4A	-2.43	120.11	126.53
3	A	402	FMN	C4A-C10-N10	2.33	119.82	116.48
3	B	402	FMN	C4A-C4-N3	2.32	119.15	113.25
3	A	402	FMN	C10-C4A-N5	-2.29	120.13	124.81
3	B	402	FMN	C10-C4A-N5	-2.21	120.30	124.81
3	B	402	FMN	C9-C9A-N10	-2.19	118.90	121.85
3	A	402	FMN	O4-C4-C4A	-2.09	121.02	126.53

There are no chirality outliers.

All (9) torsion outliers are listed below:

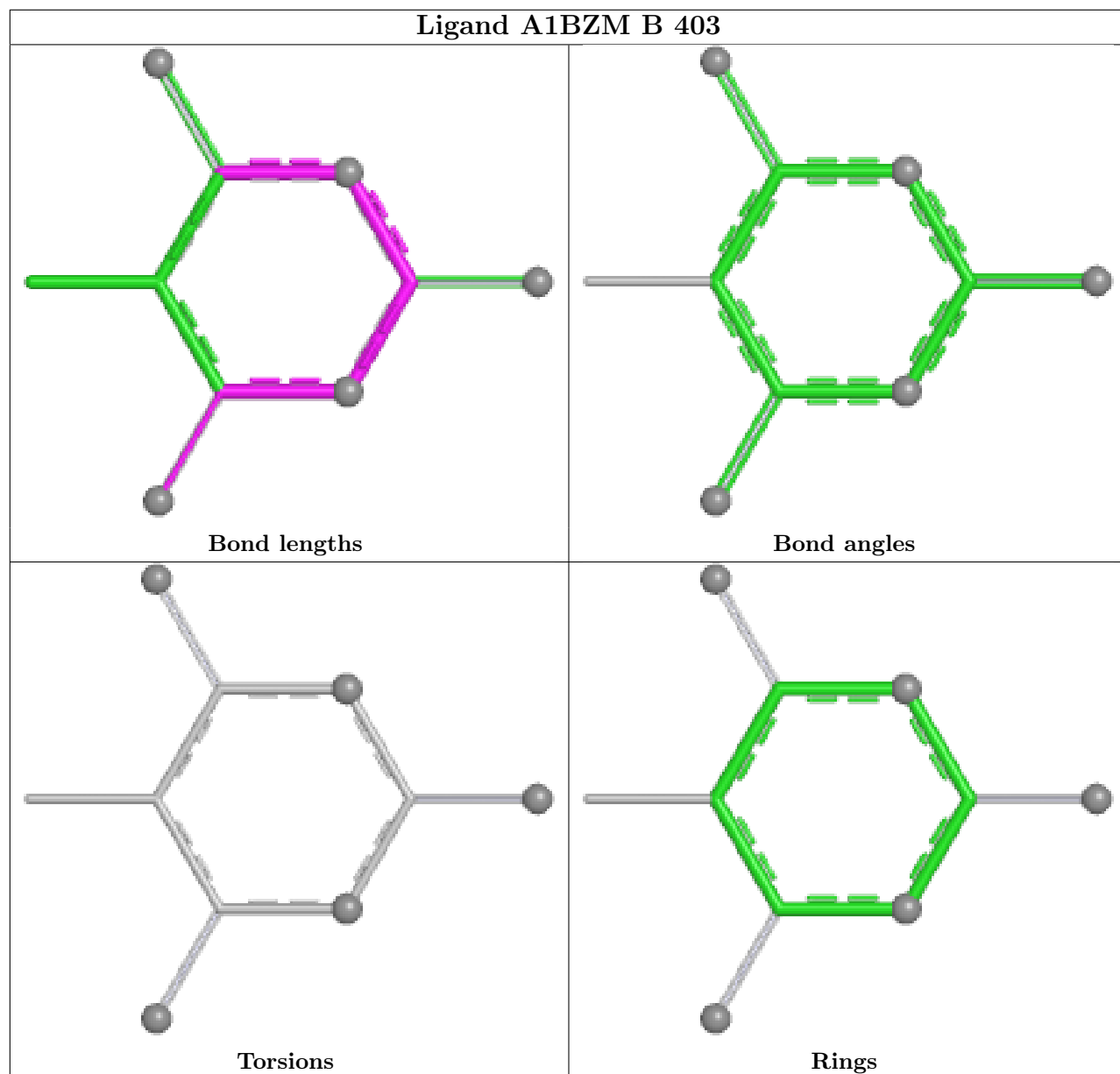
Mol	Chain	Res	Type	Atoms
2	B	401	GOL	O1-C1-C2-C3
4	A	403	A1BZM	C02-C09-C10-C1
2	B	401	GOL	O1-C1-C2-O2
4	A	403	A1BZM	C07-C09-C10-C1
3	A	402	FMN	O3'-C3'-C4'-C5'
3	B	402	FMN	C4'-C5'-O5'-P
3	A	402	FMN	O3'-C3'-C4'-O4'
3	A	402	FMN	C4'-C5'-O5'-P
3	A	402	FMN	C2'-C3'-C4'-O4'

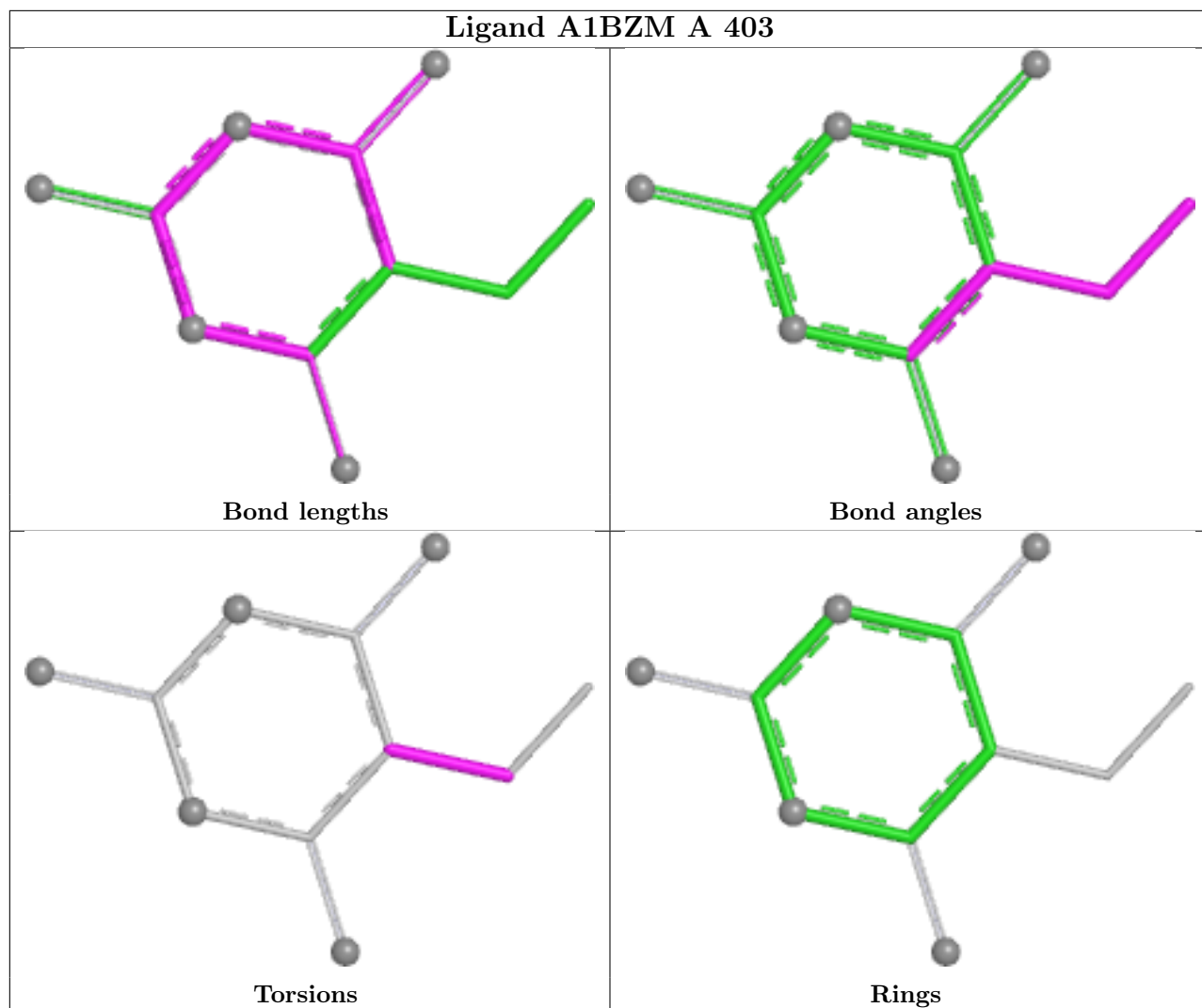
There are no ring outliers.

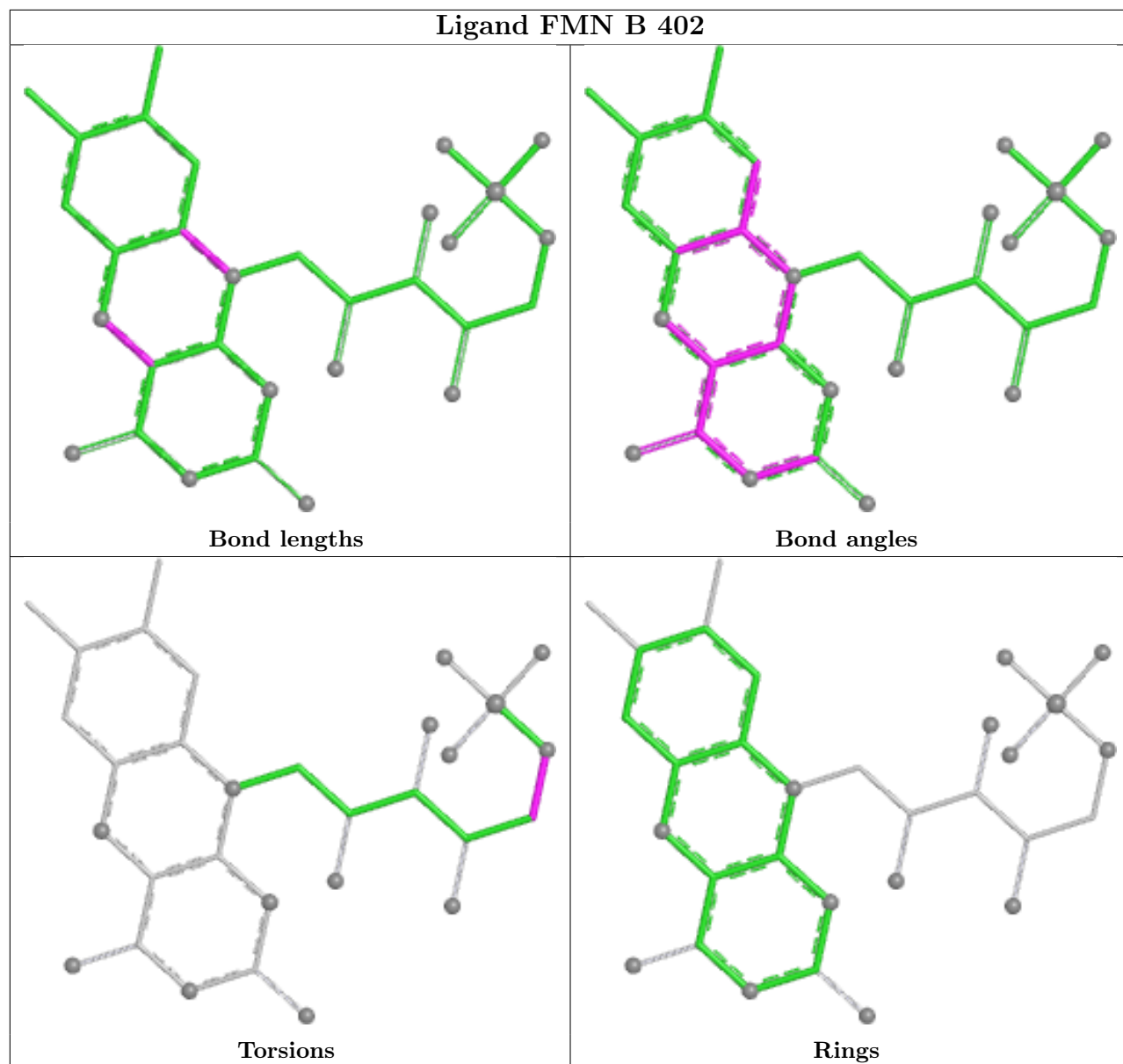
7 monomers are involved in 9 short contacts:

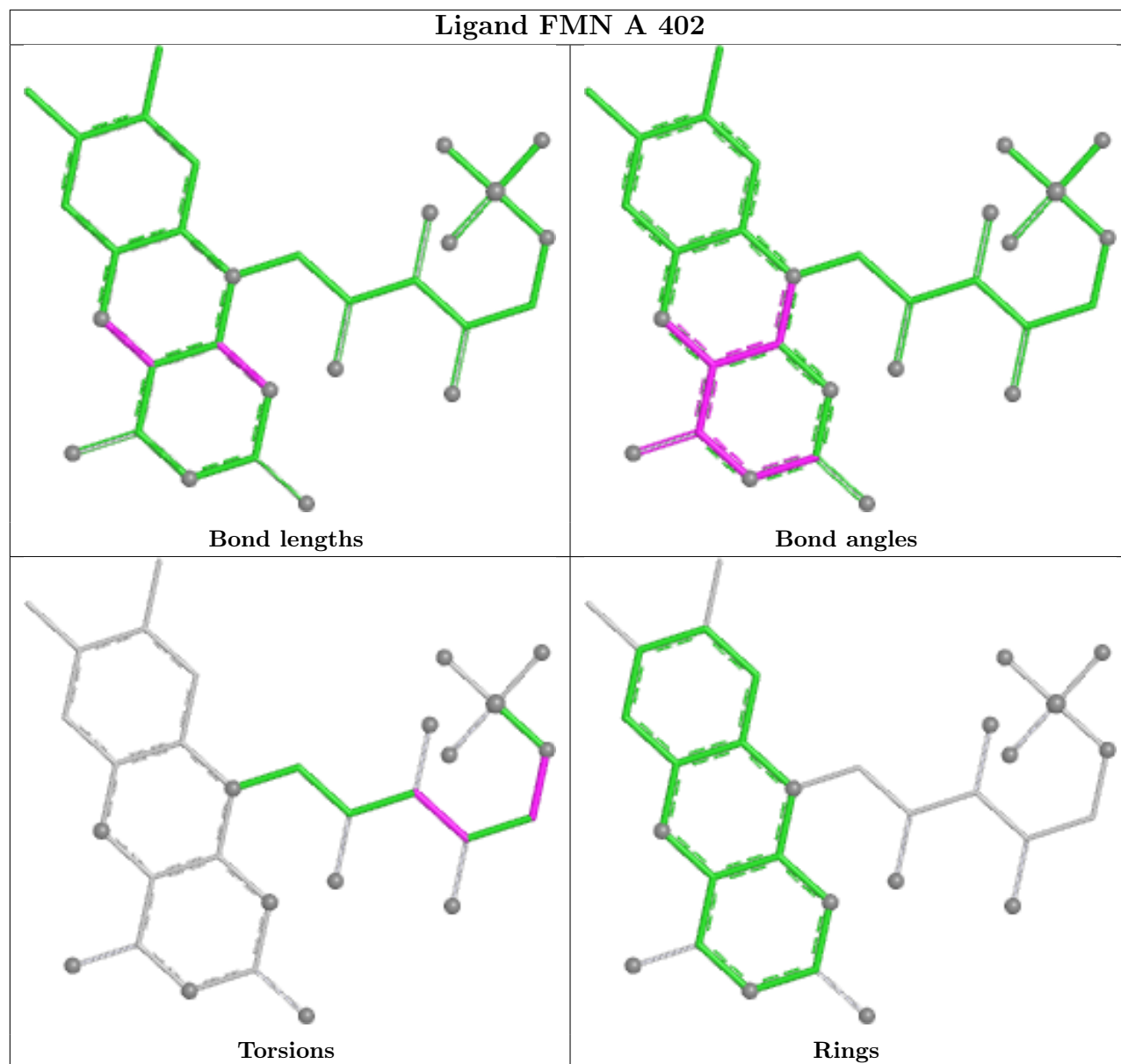
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	401	GOL	1	0
2	B	401	GOL	2	0
4	B	403	A1BZM	2	0
4	A	403	A1BZM	1	0
3	B	402	FMN	1	0
5	B	406	SO4	1	0
3	A	402	FMN	1	0

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	309/347 (89%)	0.57	26 (8%) 17 18	22, 43, 74, 83	9 (2%)
1	B	313/347 (90%)	0.10	12 (3%) 44 47	25, 35, 54, 81	2 (0%)
All	All	622/694 (89%)	0.34	38 (6%) 27 29	22, 38, 71, 83	11 (1%)

All (38) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	55	PRO	6.5
1	B	311	ALA	6.0
1	B	134	VAL	5.5
1	A	132	PRO	4.9
1	A	135	PRO	4.5
1	A	134	VAL	4.4
1	B	131	CYS	4.1
1	A	71	GLY	4.0
1	A	138	PRO	4.0
1	A	73	PRO	4.0
1	A	50	LEU	3.8
1	B	137	LYS	3.8
1	A	54	ASN	3.7
1	B	135	PRO	3.6
1	B	132	PRO	3.5
1	A	102	PHE	3.5
1	A	311	ALA	3.5
1	B	136	GLY	3.3
1	B	138	PRO	3.3
1	A	137	LYS	2.9
1	A	131	CYS	2.8
1	A	56	ALA	2.8
1	A	92	ARG	2.7
1	A	111	CYS	2.6

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Mol	Chain	Res	Type	RSRZ
1	A	79	PHE	2.6
1	A	81	LEU	2.5
1	A	0	SER	2.5
1	A	77	PHE	2.4
1	A	172	PHE	2.4
1	A	278	GLU	2.3
1	A	46	CYS	2.2
1	B	102	PHE	2.2
1	A	312	MET	2.1
1	A	104	ALA	2.1
1	B	72	LEU	2.1
1	B	56	ALA	2.1
1	B	133	ASN	2.0
1	A	86	ARG	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](#)

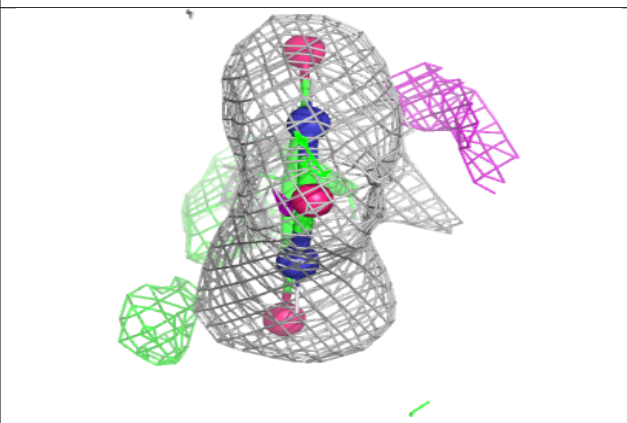
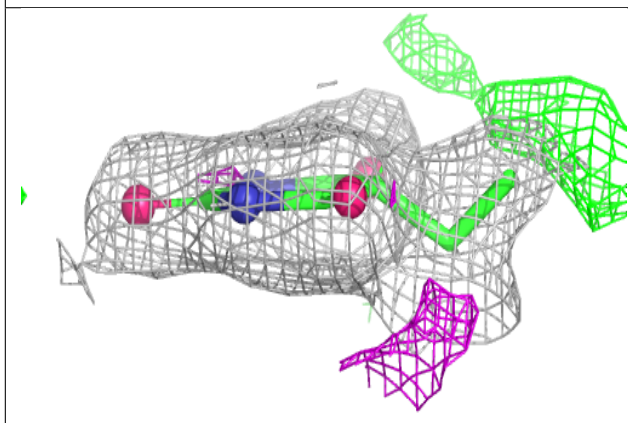
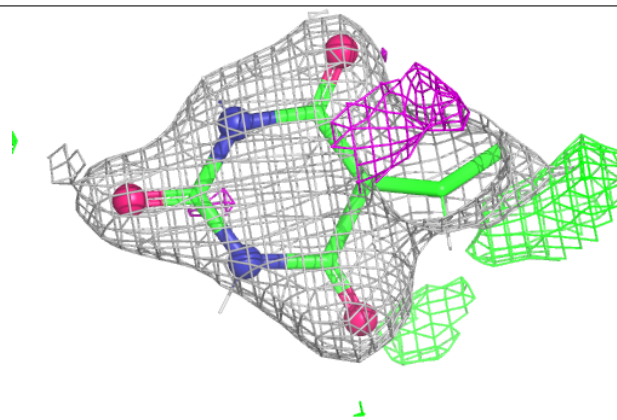
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
5	SO4	B	404	5/5	0.72	0.11	64,78,89,90	0
5	SO4	B	406	5/5	0.73	0.12	71,74,82,108	0
2	GOL	B	401	6/6	0.79	0.13	53,69,83,90	0
4	A1BZM	A	403	11/19	0.79	0.12	43,56,73,78	1
2	GOL	A	401	6/6	0.83	0.14	44,62,70,79	0
5	SO4	B	405	5/5	0.87	0.12	34,48,53,62	5
4	A1BZM	B	403	10/19	0.88	0.09	38,49,62,69	0
3	FMN	B	402	31/31	0.96	0.08	26,28,35,37	0
3	FMN	A	402	31/31	0.96	0.07	30,44,56,58	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.

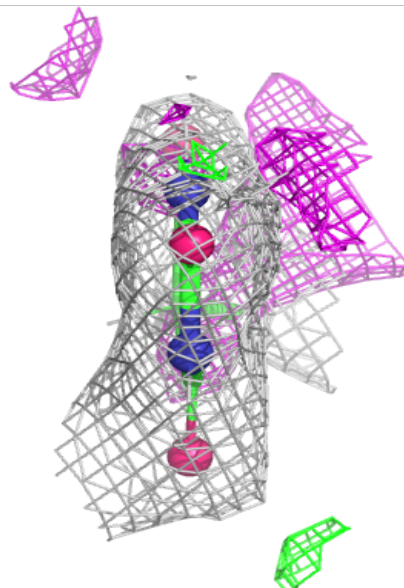
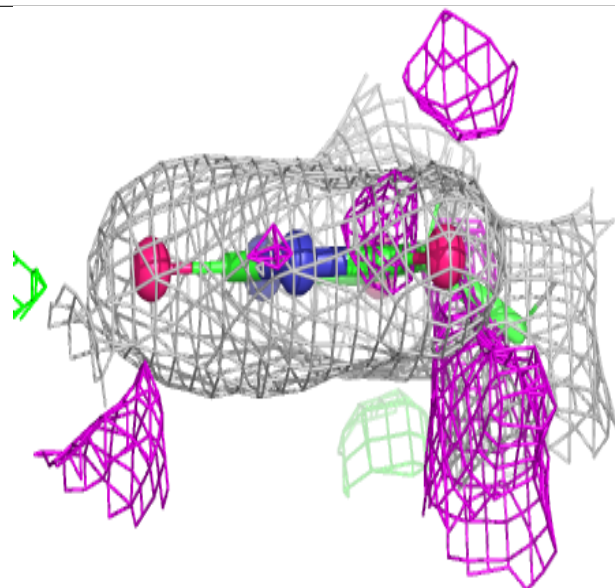
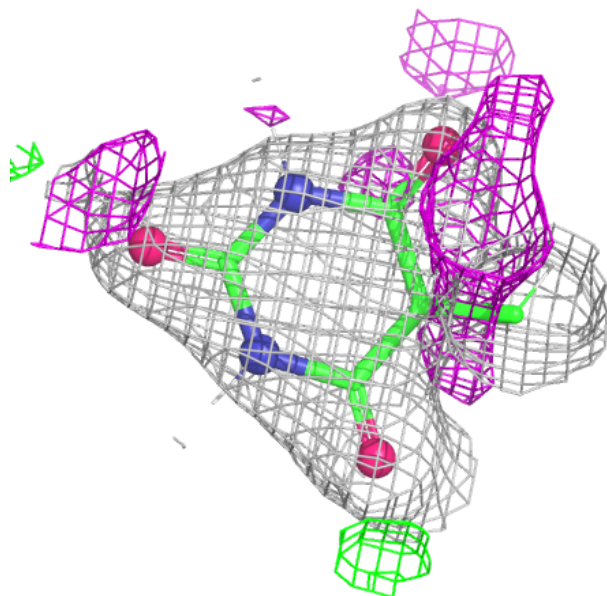
**Electron density around A1BZM A 403:**

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



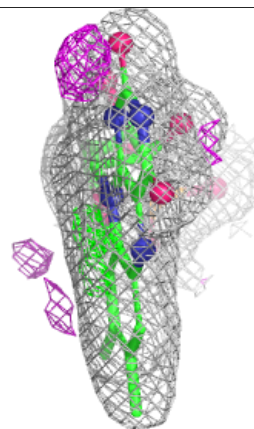
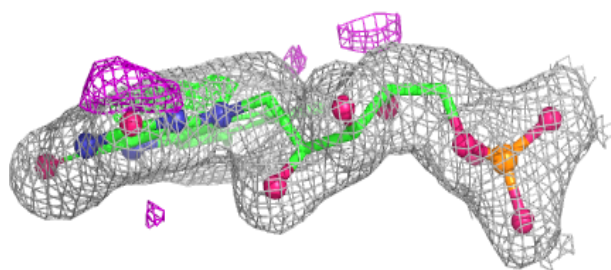
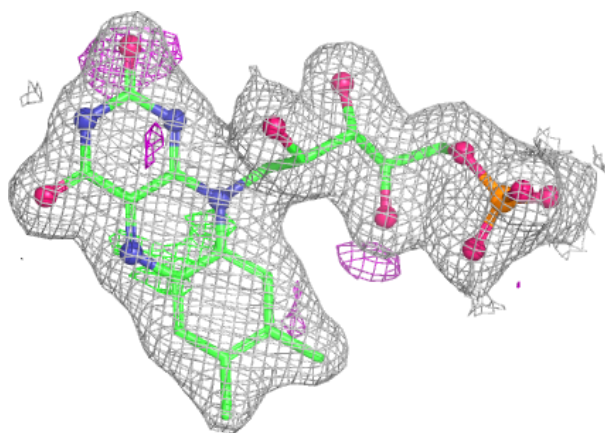
**Electron density around A1BZM B 403:**

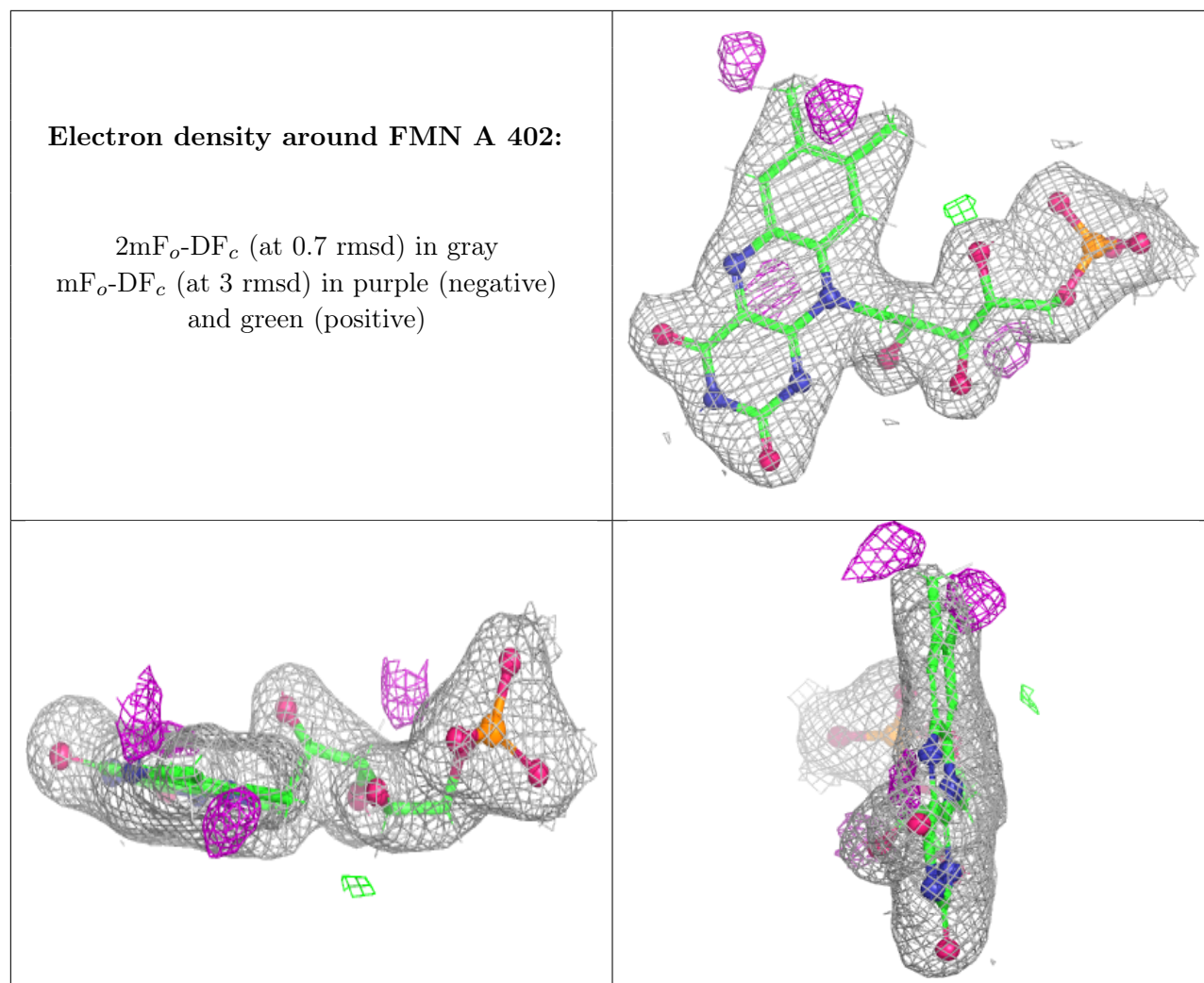
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around FMN B 402:**

$2mF_o-DF_c$  (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.