



# Full wwPDB X-ray Structure Validation Report ⓘ

May 28, 2020 – 09:47 pm BST

PDB ID : 6WT2  
Title : Crystal Structure of Putative NAD(P)H-Flavin Oxidoreductase from *Neisseria meningitidis*  
Authors : Kim, Y.; Maltseva, N.; Endres, M.; Crofts, T.; Joachimiak, A.; Center for Structural Genomics of Infectious Diseases (CSGID)  
Deposited on : 2020-05-01  
Resolution : 1.75 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.

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.11  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.11

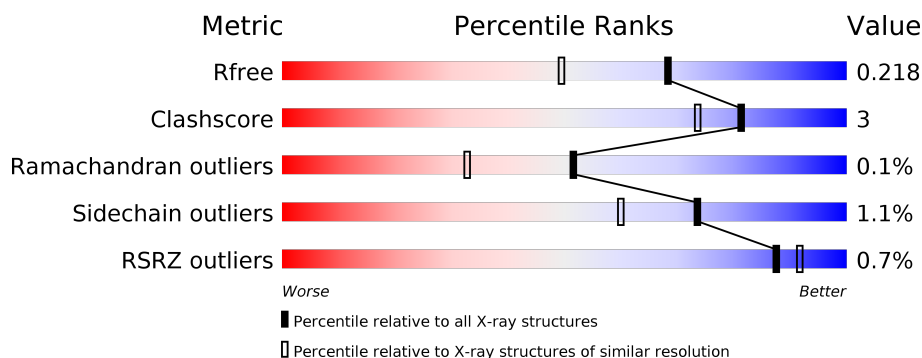
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 1.75 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))
$R_{free}$	130704	2340 (1.76-1.76)
Clashscore	141614	2466 (1.76-1.76)
Ramachandran outliers	138981	2437 (1.76-1.76)
Sidechain outliers	138945	2437 (1.76-1.76)
RSRZ outliers	127900	2298 (1.76-1.76)

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 on 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	224	<div> <div>%</div> <div> <div></div> <div>92%</div> <div>7%</div> </div> </div>
1	B	224	<div> <div></div> <div>89%</div> <div>9%</div> </div>
1	C	224	<div> <div></div> <div>92%</div> <div>6%</div> </div>
1	D	224	<div> <div>%</div> <div> <div></div> <div>92%</div> <div>6%</div> </div> </div>

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit crite-

ria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
6	FMT	D	301	-	-	X	-

## 2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 7730 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.

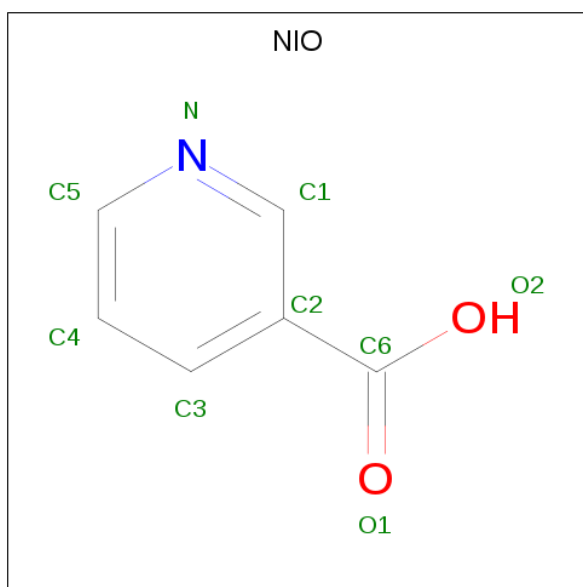
- Molecule 1 is a protein called Putative NAD(P)H-flavin oxidoreductase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	221	Total	C	N	O	S	Se	0	3	0
			1772	1122	310	328	4	8			
1	B	221	Total	C	N	O	S	Se	0	5	0
			1795	1134	314	335	4	8			
1	C	221	Total	C	N	O	S	Se	0	4	0
			1787	1130	311	334	4	8			
1	D	221	Total	C	N	O	S	Se	0	4	0
			1777	1124	311	330	4	8			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	SER	-	expression tag	UNP A0A0U1RIB4
A	-1	ASN	-	expression tag	UNP A0A0U1RIB4
A	0	ALA	-	expression tag	UNP A0A0U1RIB4
B	-2	SER	-	expression tag	UNP A0A0U1RIB4
B	-1	ASN	-	expression tag	UNP A0A0U1RIB4
B	0	ALA	-	expression tag	UNP A0A0U1RIB4
C	-2	SER	-	expression tag	UNP A0A0U1RIB4
C	-1	ASN	-	expression tag	UNP A0A0U1RIB4
C	0	ALA	-	expression tag	UNP A0A0U1RIB4
D	-2	SER	-	expression tag	UNP A0A0U1RIB4
D	-1	ASN	-	expression tag	UNP A0A0U1RIB4
D	0	ALA	-	expression tag	UNP A0A0U1RIB4

- Molecule 2 is NICOTINIC ACID (three-letter code: NIO) (formula: C<sub>6</sub>H<sub>5</sub>NO<sub>2</sub>).

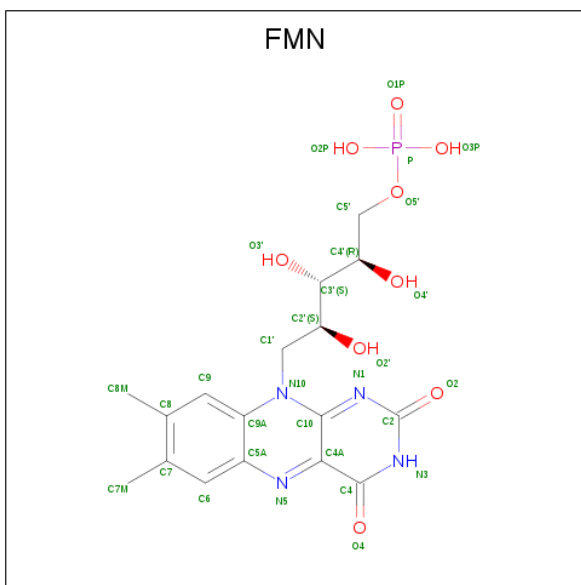


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			9	6	1	2		
2	B	1	Total	C	N	O	0	0
			9	6	1	2		
2	C	1	Total	C	N	O	0	0
			9	6	1	2		
2	D	1	Total	C	N	O	0	0
			9	6	1	2		

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

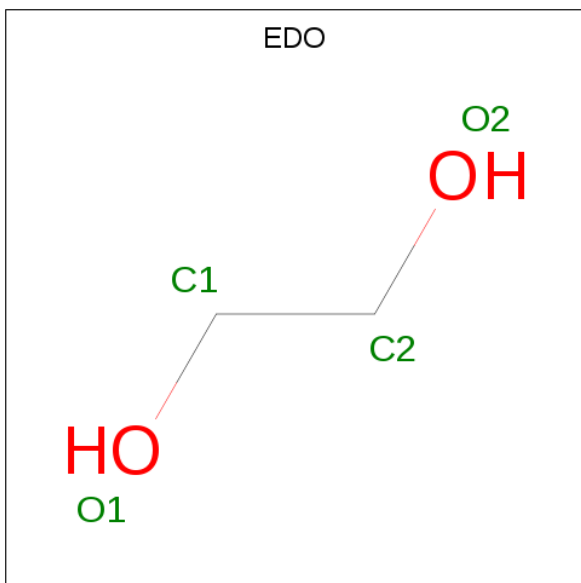
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	1	Total	Cl	0	0
			1	1		
3	A	1	Total	Cl	0	0
			1	1		
3	D	1	Total	Cl	0	0
			1	1		
3	C	1	Total	Cl	0	0
			1	1		

- Molecule 4 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: C<sub>17</sub>H<sub>21</sub>N<sub>4</sub>O<sub>9</sub>P) (labeled as "Ligand of Interest" by author).



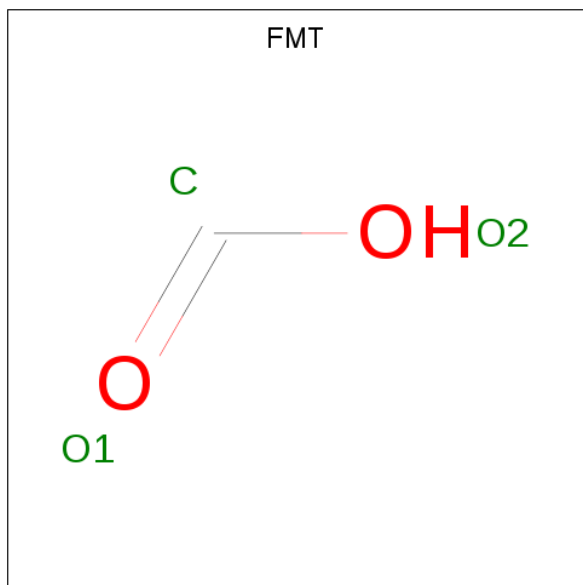
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total 31	C 17	N 4	O 9	P 1	0	0
4	B	1	Total 31	C 17	N 4	O 9	P 1	0	0
4	C	1	Total 31	C 17	N 4	O 9	P 1	0	0
4	D	1	Total 31	C 17	N 4	O 9	P 1	0	0

- Molecule 5 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula:  $\text{C}_2\text{H}_6\text{O}_2$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	B	1	Total	C	O	0	0
			4	2	2		
5	C	1	Total	C	O	0	0
			4	2	2		

- Molecule 6 is FORMIC ACID (three-letter code: FMT) (formula: CH<sub>2</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	D	1	Total	C	O	0	0
			3	1	2		

- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	98	Total	O	0	0
			98	98		
7	B	106	Total	O	0	0
			106	106		
7	C	110	Total	O	0	0
			110	110		
7	D	110	Total	O	0	0
			110	110		

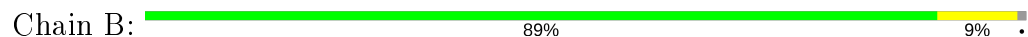
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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: Putative NAD(P)H-flavin oxidoreductase



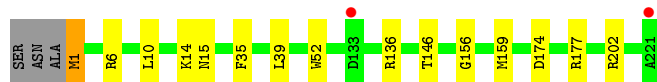
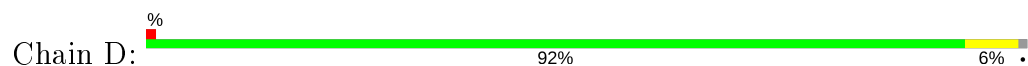
- Molecule 1: Putative NAD(P)H-flavin oxidoreductase



- Molecule 1: Putative NAD(P)H-flavin oxidoreductase



- Molecule 1: Putative NAD(P)H-flavin oxidoreductase





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	81.56Å 70.17Å 85.62Å 90.00° 89.96° 90.00°	Depositor
Resolution (Å)	45.17 – 1.75 45.17 – 1.75	Depositor EDS
% Data completeness (in resolution range)	98.6 (45.17-1.75) 98.7 (45.17-1.75)	Depositor EDS
$R_{merge}$	0.19	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.74 (at 1.75Å)	Xtriage
Refinement program	PHENIX 1.13_2998	Depositor
R, $R_{free}$	0.193 , 0.218 0.193 , 0.218	Depositor DCC
$R_{free}$ test set	4827 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	22.0	Xtriage
Anisotropy	0.560	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 21.6	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.000 for -l,k,h 0.459 for h,-k,-l 0.000 for -l,-k,-h	Xtriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	7730	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	28.0	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 49.41 % 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 7.4883e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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: FMN, FMT, EDO, NIO, CL

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 5$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z  > 5$	RMSZ	$\# Z  > 5$
1	A	0.37	0/1803	0.52	0/2422
1	B	0.37	0/1826	0.51	0/2454
1	C	0.37	0/1818	0.50	0/2443
1	D	0.35	0/1808	0.51	0/2429
All	All	0.36	0/7255	0.51	0/9748

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	1772	0	1739	13	0
1	B	1795	0	1752	12	0
1	C	1787	0	1745	13	0
1	D	1777	0	1741	12	0
2	A	9	0	4	0	0
2	B	9	0	4	0	0
2	C	9	0	4	0	0
2	D	9	0	4	0	0
3	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	A	31	0	19	0	0
4	B	31	0	19	0	0
4	C	31	0	19	0	0
4	D	31	0	19	0	0
5	B	4	0	6	0	0
5	C	4	0	6	0	0
6	D	3	0	1	2	0
7	A	98	0	0	0	0
7	B	106	0	0	0	0
7	C	110	0	0	1	0
7	D	110	0	0	1	0
All	All	7730	0	7082	38	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 (38) 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:C:4:LEU:HD22	1:C:8:GLN:HE22	1.64	0.61
1:A:6:ARG:NH1	1:B:32:ASP:OD1	2.35	0.60
1:D:10:LEU:HG	1:D:14:LYS:HE3	1.87	0.57
1:C:90:LYS:NZ	7:C:402:HOH:O	2.35	0.57
1:B:47:VAL:HG21	1:B:99:MSE:HE1	1.88	0.55
1:A:64[B]:GLN:HG3	6:D:301:FMT:H	1.90	0.54
1:C:1:MSE:SE	1:D:202:ARG:HH12	2.42	0.52
1:A:202:ARG:HH12	1:B:1:MSE:SE	2.42	0.52
1:A:12:ALA:HB3	1:A:159:MSE:HE3	1.93	0.51
1:A:60:PRO:HB2	6:D:301:FMT:C	2.41	0.51
1:A:116:LYS:NZ	1:A:120:ARG:HH12	2.09	0.51
1:C:32:ASP:OD1	1:D:6:ARG:NH1	2.44	0.50
1:C:52:TRP:HB3	1:C:146:THR:HG22	1.94	0.50
1:A:4:LEU:HD12	1:B:159:MSE:HE2	1.94	0.49
1:A:1:MSE:SE	1:B:202:ARG:HH12	2.44	0.49
1:A:159:MSE:HE2	1:B:4:LEU:HD12	1.95	0.48
1:C:4:LEU:HB3	1:C:8:GLN:NE2	2.28	0.48
1:A:39:LEU:HD13	1:A:156:GLY:HA3	1.96	0.47
1:D:136[A]:ARG:NH2	7:D:404:HOH:O	2.47	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:1:MSE:HE2	1:D:15:ASN:HB3	1.96	0.47
1:C:15:ASN:HB3	1:D:1:MSE:HE2	1.97	0.47
1:D:52:TRP:HB3	1:D:146:THR:HG22	1.97	0.47
1:B:10:LEU:HG	1:B:14:LYS:HE2	1.97	0.46
1:B:52:TRP:HB3	1:B:146:THR:HG22	1.97	0.46
1:A:47:VAL:HG21	1:A:99:MSE:HE1	1.98	0.46
1:C:202:ARG:HH12	1:D:1:MSE:SE	2.48	0.46
1:B:91[B]:ASN:HA	1:B:138:LEU:HD23	1.97	0.45
1:B:150:LEU:HG	1:B:154:MSE:HE2	1.99	0.44
1:B:12:ALA:HB3	1:B:159:MSE:HE3	2.00	0.44
1:C:60:PRO:O	1:C:64[A]:GLN:HG2	2.18	0.43
1:C:91:ASN:HA	1:C:138:LEU:HD23	2.00	0.43
1:C:4:LEU:HD12	1:D:159:MSE:HE2	2.01	0.42
1:D:39:LEU:HD13	1:D:156:GLY:HA3	2.00	0.42
1:C:1:MSE:CE	1:D:15:ASN:HB3	2.51	0.41
1:A:10:LEU:HG	1:A:14:LYS:HE3	2.01	0.41
1:A:47:VAL:CG2	1:A:99:MSE:HE1	2.49	0.41
1:B:116:LYS:HB3	1:B:116:LYS:HE2	1.83	0.41
1:D:174:ASP:OD1	1:D:177:ARG:NH1	2.52	0.40

There are no symmetry-related clashes.

## 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	222/224 (99%)	215 (97%)	7 (3%)	0	100	100
1	B	225/224 (100%)	216 (96%)	9 (4%)	0	100	100
1	C	224/224 (100%)	217 (97%)	6 (3%)	1 (0%)	34	17
1	D	223/224 (100%)	217 (97%)	6 (3%)	0	100	100
All	All	894/896 (100%)	865 (97%)	28 (3%)	1 (0%)	51	33

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	47	VAL

### 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	184/175 (105%)	183 (100%)	1 (0%)	88	83
1	B	187/175 (107%)	182 (97%)	5 (3%)	44	22
1	C	186/175 (106%)	185 (100%)	1 (0%)	88	83
1	D	185/175 (106%)	183 (99%)	2 (1%)	73	60
All	All	742/700 (106%)	733 (99%)	9 (1%)	73	56

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	MSE
1	B	35	PHE
1	B	122[A]	GLN
1	B	122[B]	GLN
1	B	133	ASP
1	B	205	GLU
1	C	1	MSE
1	D	1	MSE
1	D	35	PHE

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	C	8	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

Of 15 ligands modelled in this entry, 4 are monoatomic - leaving 11 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	FMN	D	304	-	31,33,33	2.18	5 (16%)	40,50,50	2.20	8 (20%)
4	FMN	C	304	-	31,33,33	2.10	4 (12%)	40,50,50	2.37	7 (17%)
4	FMN	B	304	-	31,33,33	2.16	5 (16%)	40,50,50	2.16	9 (22%)
4	FMN	A	303	-	31,33,33	2.27	5 (16%)	40,50,50	2.12	8 (20%)
2	NIO	D	302	-	7,9,9	1.05	1 (14%)	8,11,11	1.30	1 (12%)
2	NIO	A	301	-	7,9,9	1.36	1 (14%)	8,11,11	1.22	1 (12%)
2	NIO	B	301	-	7,9,9	0.88	1 (14%)	8,11,11	1.37	1 (12%)
6	FMT	D	301	-	0,2,2	0.00	-	0,1,1	0.00	-
5	EDO	C	302	-	3,3,3	0.53	0	2,2,2	0.25	0
2	NIO	C	301	-	7,9,9	1.04	1 (14%)	8,11,11	1.34	1 (12%)
5	EDO	B	302	-	3,3,3	0.50	0	2,2,2	0.32	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	FMN	D	304	-	-	0/18/18/18	0/3/3/3
4	FMN	C	304	-	-	0/18/18/18	0/3/3/3
4	FMN	B	304	-	-	0/18/18/18	0/3/3/3
4	FMN	A	303	-	-	0/18/18/18	0/3/3/3
2	NIO	D	302	-	-	0/0/4/4	0/1/1/1
2	NIO	A	301	-	-	0/0/4/4	0/1/1/1
2	NIO	B	301	-	-	0/0/4/4	0/1/1/1
5	EDO	C	302	-	-	0/1/1/1	-
2	NIO	C	301	-	-	0/0/4/4	0/1/1/1
5	EDO	B	302	-	-	0/1/1/1	-

All (23) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	303	FMN	C4A-C10	10.00	1.48	1.38
4	B	304	FMN	C4A-C10	9.43	1.48	1.38
4	D	304	FMN	C4A-C10	9.17	1.48	1.38
4	C	304	FMN	C4A-C10	9.00	1.47	1.38
4	D	304	FMN	C4-C4A	4.62	1.49	1.41
4	C	304	FMN	C4-C4A	4.40	1.48	1.41
4	A	303	FMN	C4-C4A	3.71	1.47	1.41
4	B	304	FMN	C4-C4A	3.60	1.47	1.41
2	A	301	NIO	C2-C6	3.53	1.50	1.47
4	C	304	FMN	C9A-C5A	3.49	1.49	1.42
4	B	304	FMN	C9A-C5A	3.44	1.49	1.42
4	A	303	FMN	C9A-C5A	3.38	1.49	1.42
4	D	304	FMN	C9A-C5A	3.31	1.49	1.42
4	D	304	FMN	C8-C7	3.31	1.49	1.40
4	B	304	FMN	C8-C7	3.22	1.48	1.40
4	A	303	FMN	C8-C7	3.20	1.48	1.40
4	C	304	FMN	C8-C7	2.90	1.48	1.40
2	D	302	NIO	C2-C6	2.72	1.50	1.47
2	C	301	NIO	C2-C6	2.69	1.50	1.47
4	A	303	FMN	C9A-N10	2.47	1.41	1.38
2	B	301	NIO	C2-C6	2.28	1.49	1.47
4	D	304	FMN	C9A-N10	2.19	1.41	1.38
4	B	304	FMN	C9A-N10	2.10	1.41	1.38

All (36) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	304	FMN	C4-N3-C2	8.86	122.62	115.14
4	A	303	FMN	C4-N3-C2	8.67	122.46	115.14

*Continued on next page...*

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	304	FMN	C4-N3-C2	8.31	122.16	115.14
4	B	304	FMN	C4-N3-C2	8.10	121.98	115.14
4	C	304	FMN	C1'-N10-C9A	6.08	123.08	118.29
4	B	304	FMN	C4-C4A-C10	-4.73	116.82	119.95
4	C	304	FMN	C4A-C4-N3	-4.34	117.50	123.43
4	A	303	FMN	C4-C4A-C10	-4.25	117.14	119.95
4	D	304	FMN	C4-C4A-C10	-4.17	117.19	119.95
4	C	304	FMN	C5A-C9A-N10	4.13	120.71	117.72
4	D	304	FMN	C5A-C9A-N10	4.12	120.70	117.72
4	A	303	FMN	C4A-C4-N3	-4.11	117.80	123.43
4	D	304	FMN	C4A-N5-C5A	4.01	120.78	116.77
4	B	304	FMN	C4A-C4-N3	-3.96	118.01	123.43
4	D	304	FMN	C4A-C4-N3	-3.93	118.05	123.43
4	D	304	FMN	C1'-N10-C9A	3.93	121.39	118.29
4	B	304	FMN	C1'-N10-C9A	3.90	121.36	118.29
4	C	304	FMN	C4-C4A-C10	-3.85	117.40	119.95
4	C	304	FMN	C9A-N10-C10	-3.83	116.89	121.91
4	B	304	FMN	C9A-N10-C10	-3.71	117.05	121.91
4	D	304	FMN	C9A-N10-C10	-3.58	117.21	121.91
4	C	304	FMN	C4A-N5-C5A	3.51	120.28	116.77
4	B	304	FMN	C5A-C9A-N10	3.43	120.20	117.72
4	A	303	FMN	C1'-N10-C9A	3.32	120.90	118.29
4	B	304	FMN	C1'-N10-C10	3.14	121.22	118.41
4	A	303	FMN	C4A-N5-C5A	2.97	119.74	116.77
4	A	303	FMN	C5A-C9A-N10	2.97	119.86	117.72
4	A	303	FMN	C9A-N10-C10	-2.91	118.09	121.91
4	A	303	FMN	C1'-N10-C10	2.84	120.95	118.41
4	D	304	FMN	C1'-N10-C10	2.74	120.86	118.41
4	B	304	FMN	C4A-N5-C5A	2.70	119.47	116.77
2	C	301	NIO	C5-N-C1	2.47	121.11	116.85
2	B	301	NIO	C5-N-C1	2.33	120.89	116.85
2	D	302	NIO	C5-N-C1	2.26	120.76	116.85
2	A	301	NIO	C5-N-C1	2.23	120.70	116.85
4	B	304	FMN	C7-C6-C5A	-2.00	118.39	121.22

There are no chirality outliers.

There are no torsion outliers.

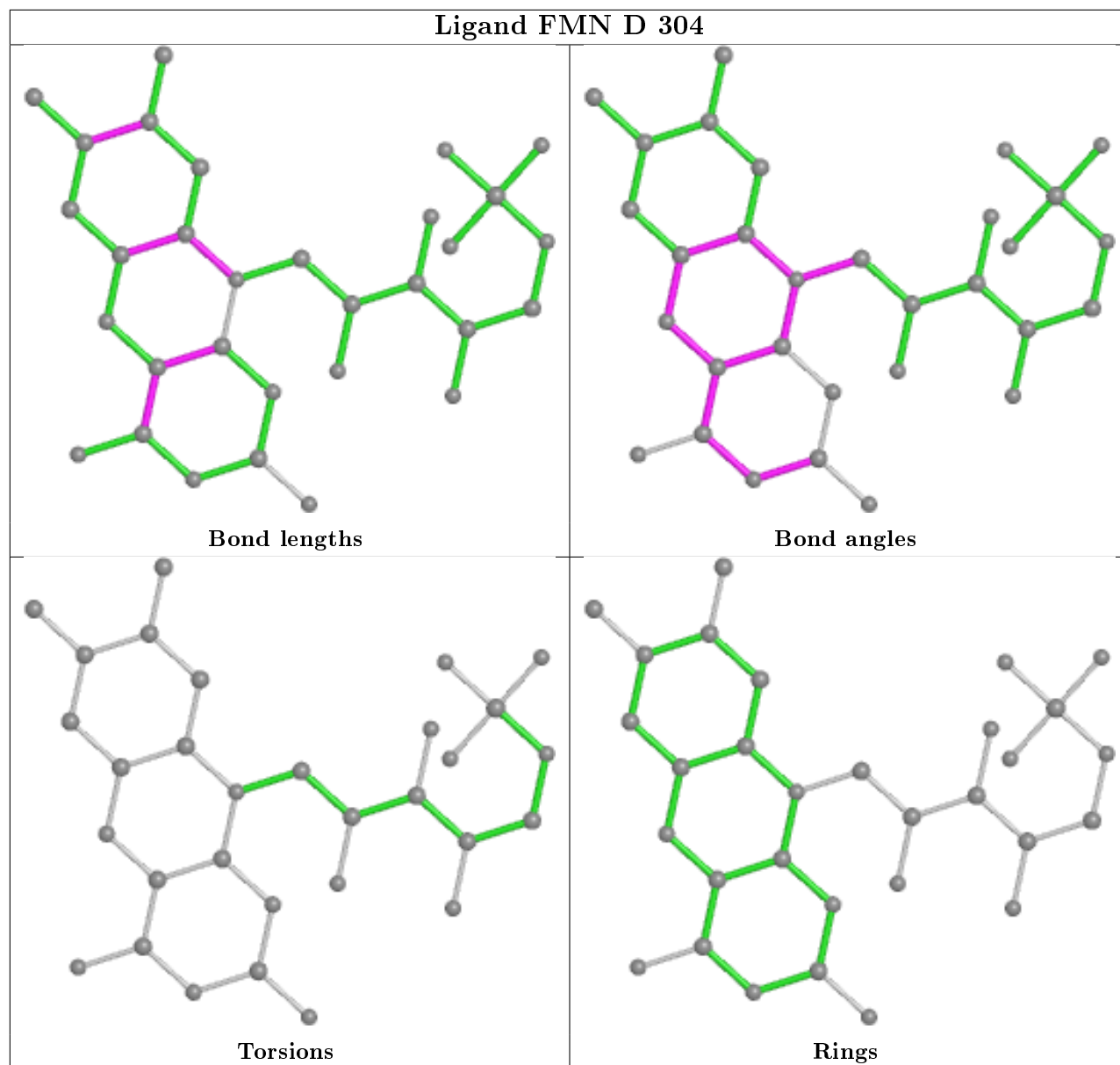
There are no ring outliers.

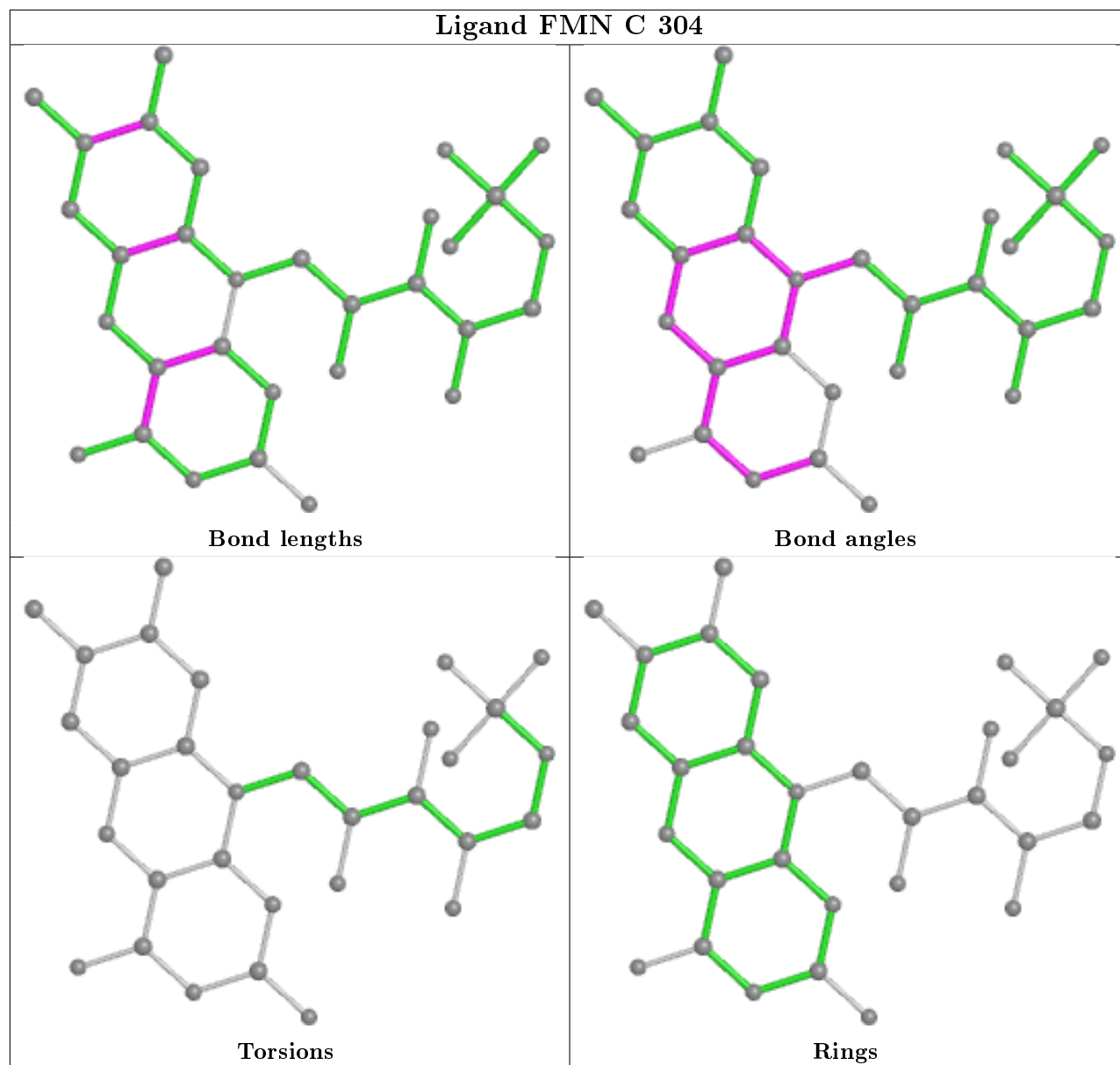
1 monomer is involved in 2 short contacts:

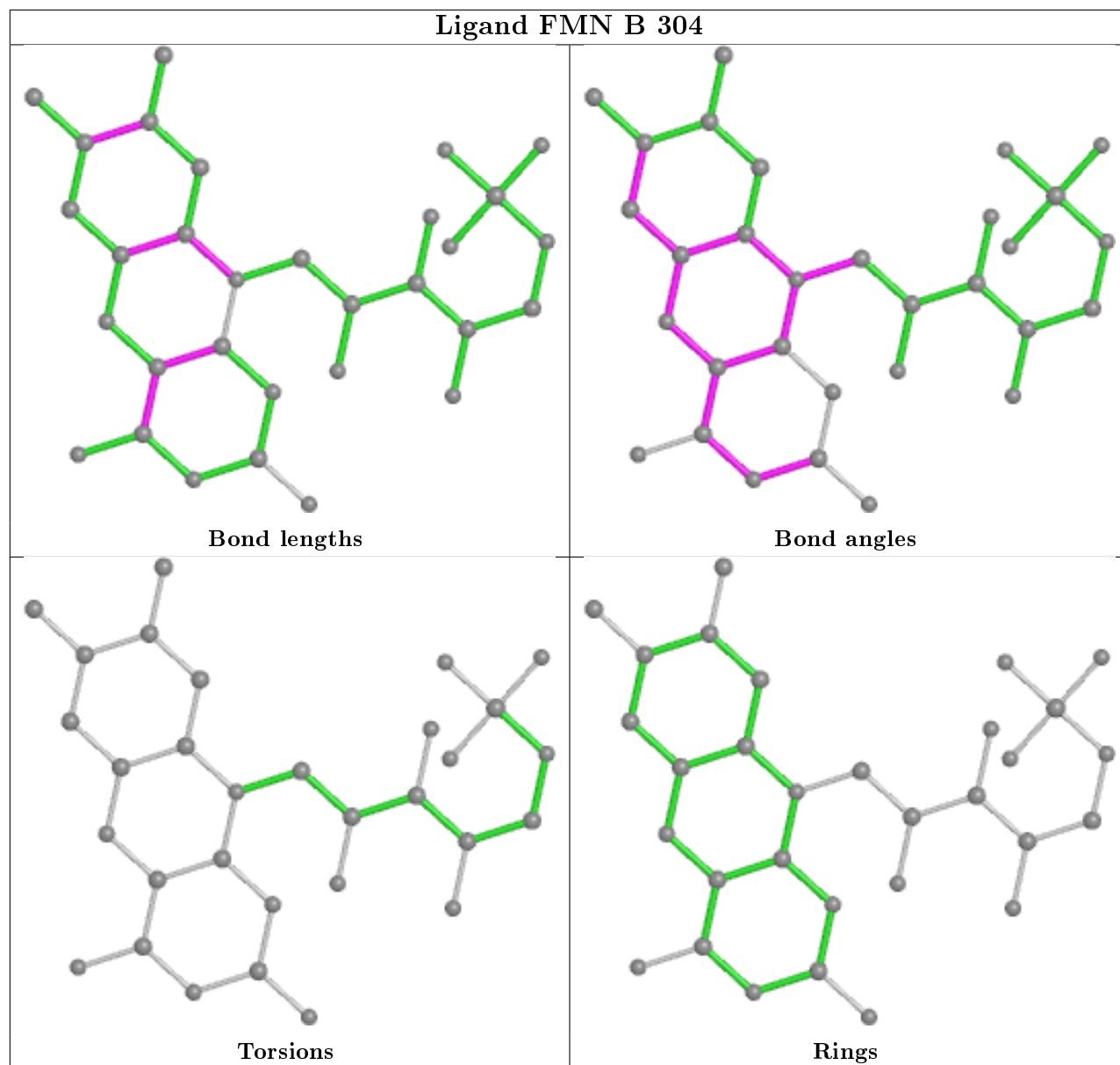


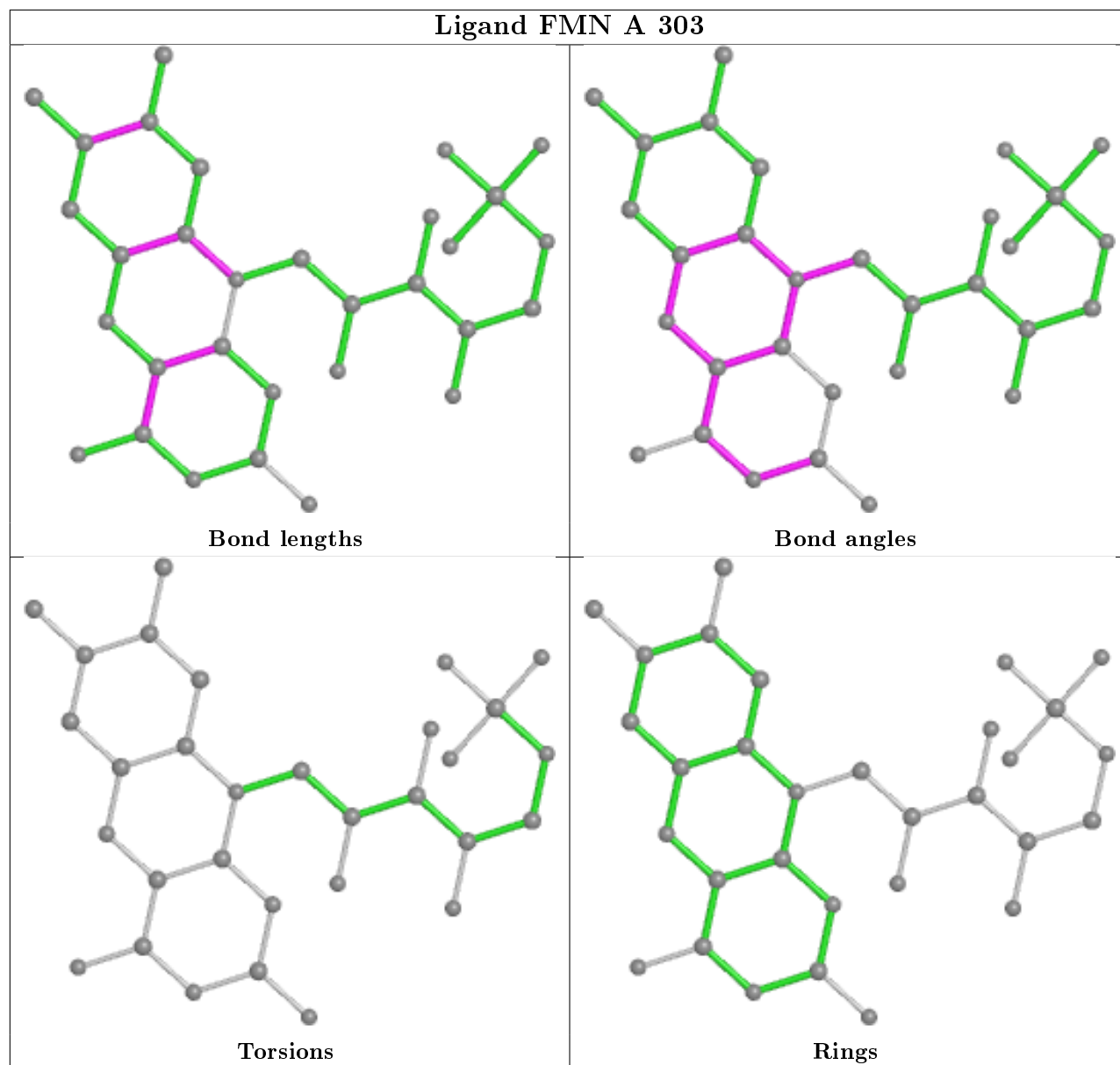
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	D	301	FMT	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less 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 [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

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	213/224 (95%)	-0.34	3 (1%) 75 82	19, 27, 41, 82	0
1	B	213/224 (95%)	-0.29	1 (0%) 91 93	17, 26, 43, 77	0
1	C	213/224 (95%)	-0.31	0 100 100	18, 25, 40, 55	0
1	D	213/224 (95%)	-0.28	2 (0%) 84 89	18, 26, 40, 79	0
All	All	852/896 (95%)	-0.30	6 (0%) 87 92	17, 26, 42, 82	0

All (6) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	133	ASP	4.1
1	A	71	TRP	2.7
1	B	133	ASP	2.5
1	A	221	ALA	2.5
1	A	133	ASP	2.4
1	D	221	ALA	2.1

### 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 carbohydrates 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,

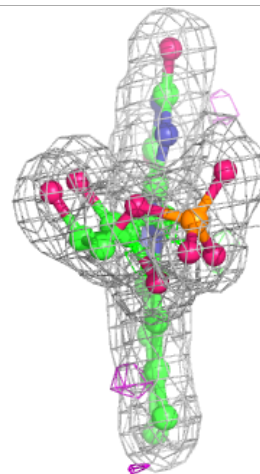
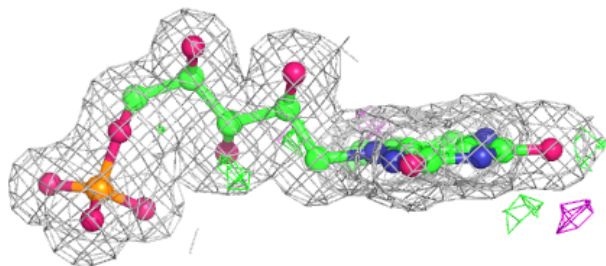
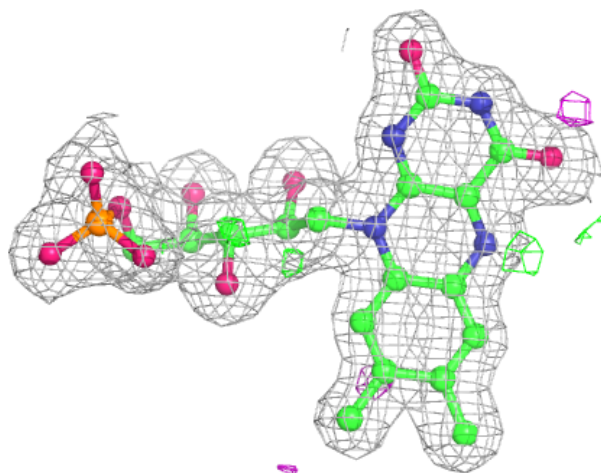
median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
5	EDO	C	302	4/4	0.86	0.13	34,38,40,44	0
5	EDO	B	302	4/4	0.88	0.16	40,46,50,54	0
6	FMT	D	301	3/3	0.89	0.17	51,51,52,54	0
2	NIO	C	301	9/9	0.91	0.14	27,38,40,41	0
2	NIO	A	301	9/9	0.93	0.14	23,36,47,48	0
2	NIO	D	302	9/9	0.94	0.15	23,37,43,46	0
4	FMN	A	303	31/31	0.96	0.08	15,20,23,27	0
4	FMN	D	304	31/31	0.96	0.09	13,18,25,26	0
2	NIO	B	301	9/9	0.96	0.17	25,39,46,46	0
4	FMN	C	304	31/31	0.96	0.08	13,18,23,26	0
4	FMN	B	304	31/31	0.97	0.08	11,18,23,25	0
3	CL	A	302	1/1	0.98	0.04	32,32,32,32	0
3	CL	D	303	1/1	0.98	0.05	32,32,32,32	0
3	CL	B	303	1/1	0.99	0.04	32,32,32,32	0
3	CL	C	303	1/1	1.00	0.03	31,31,31,31	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 A 303:**

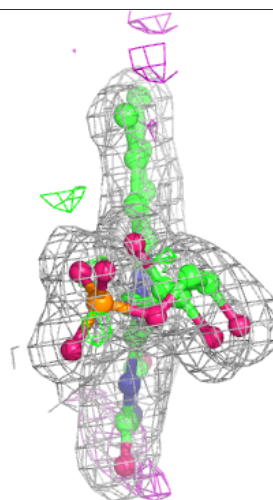
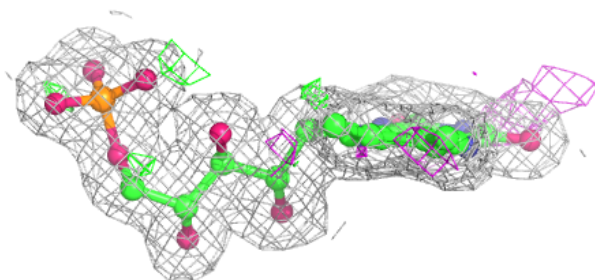
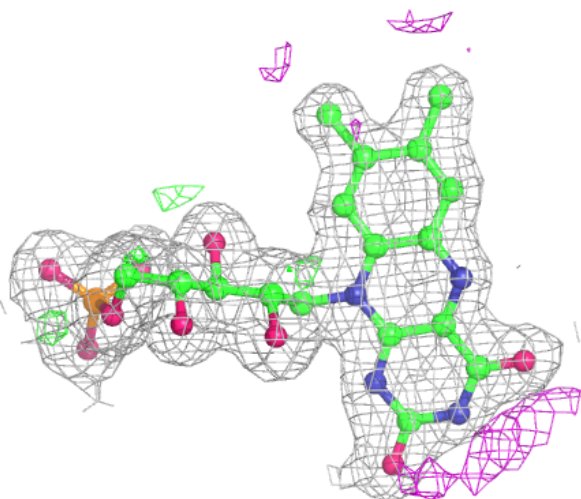
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)





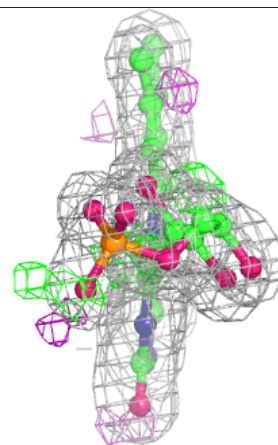
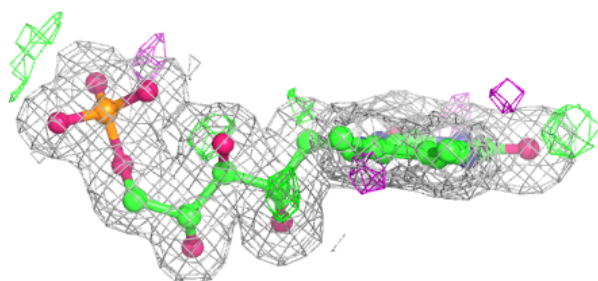
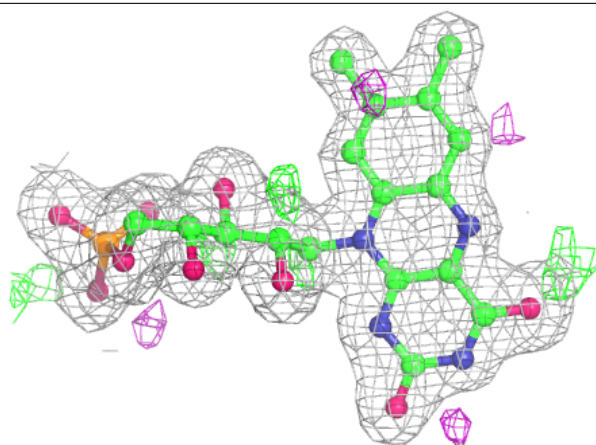
**Electron density around FMN D 304:**

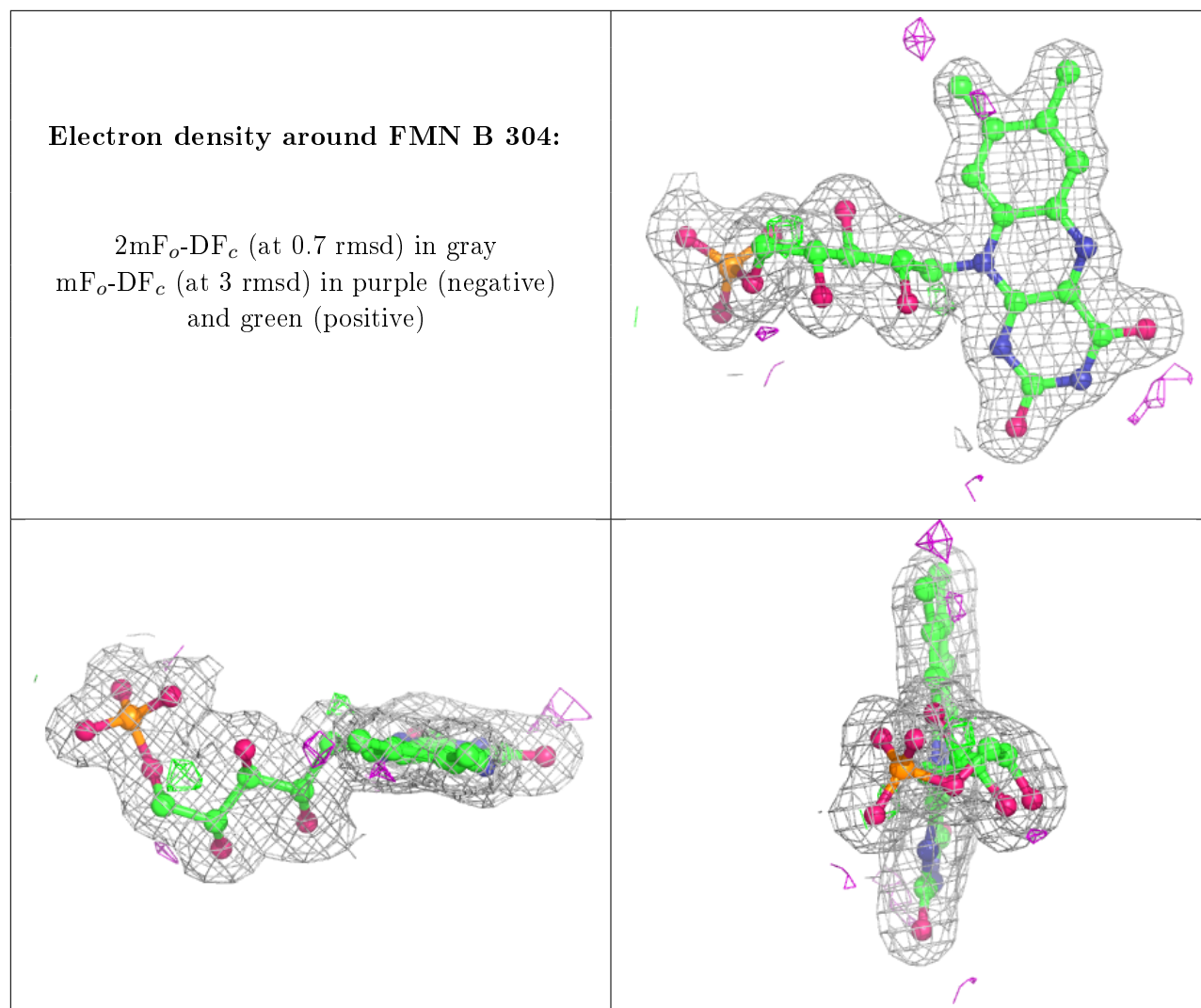
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around FMN C 304:**

$2mF_o - DF_c$  (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.