



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 21, 2021 – 01:13 PM BST

PDB ID : 7OBZ  
Title : Structure of RsLOV D109G  
Authors : Moeglich, A.; Krafft, T.G.A.; Weyand, M.  
Deposited on : 2021-04-25  
Resolution : 2.00 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 : 2.20  
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) : 2.20

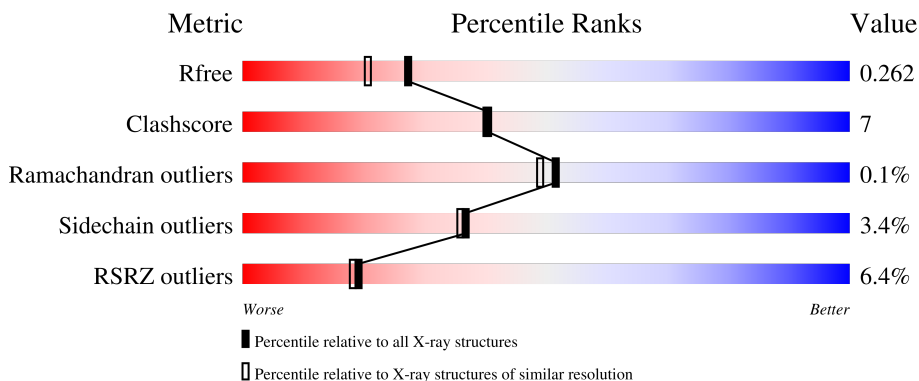
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.00 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.



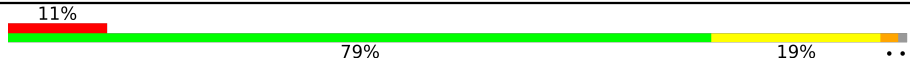
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (2.00-2.00)

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	176	 4% 89% 10% .
1	B	176	 4% 91% 9% .
1	C	176	 3% 85% 15% .
1	D	176	 6% 77% 21% ..
1	E	176	 11% 78% 19% ..

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Mol	Chain	Length	Quality of chain
1	F	176	 <p>11% 79% 19% ..</p>

## 2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 8534 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.

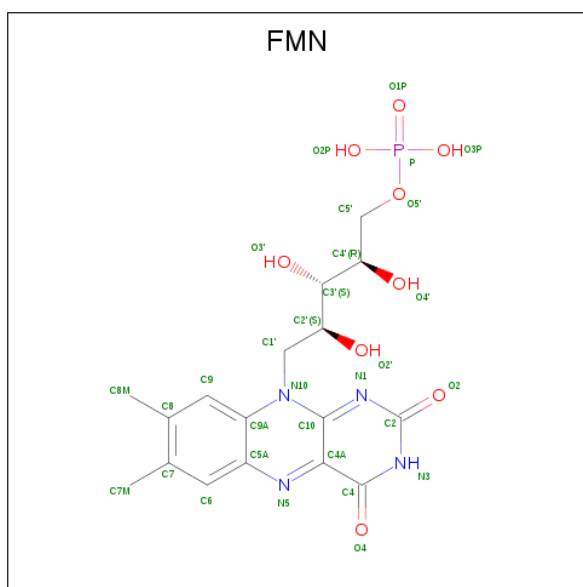
- Molecule 1 is a protein called LOV protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	176	1412	881	270	255	6	0	8	0
1	B	175	1394	874	265	250	5	0	7	0
1	C	175	1380	862	264	249	5	0	4	0
1	D	175	1361	852	253	251	5	0	4	0
1	E	173	1280	805	234	236	5	0	0	0
1	F	175	1301	819	231	246	5	0	0	0

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	32	LEU	VAL	variant	UNP M1E1F8
A	109	GLY	ASP	engineered mutation	UNP M1E1F8
B	32	LEU	VAL	variant	UNP M1E1F8
B	109	GLY	ASP	engineered mutation	UNP M1E1F8
C	32	LEU	VAL	variant	UNP M1E1F8
C	109	GLY	ASP	engineered mutation	UNP M1E1F8
D	32	LEU	VAL	variant	UNP M1E1F8
D	109	GLY	ASP	engineered mutation	UNP M1E1F8
E	32	LEU	VAL	variant	UNP M1E1F8
E	109	GLY	ASP	engineered mutation	UNP M1E1F8
F	32	LEU	VAL	variant	UNP M1E1F8
F	109	GLY	ASP	engineered mutation	UNP M1E1F8

- Molecule 2 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 depositor).

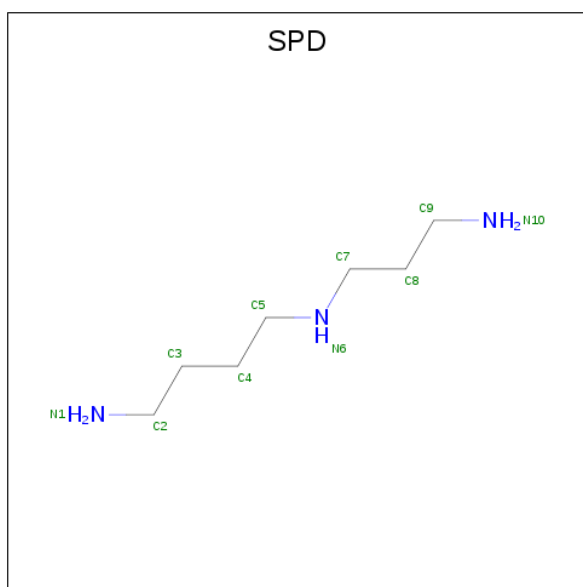


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
2	B	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
2	C	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
2	D	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
2	E	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
2	F	1	Total	C	N	O	P	0	0
			31	17	4	9	1		

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

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	6	Total	Cl	0	0
			6	6		
3	B	1	Total	Cl	0	0
			1	1		
3	C	3	Total	Cl	0	0
			3	3		
3	D	2	Total	Cl	0	0
			2	2		
3	E	1	Total	Cl	0	0
			1	1		

- Molecule 4 is SPERMIDINE (three-letter code: SPD) (formula: C<sub>7</sub>H<sub>19</sub>N<sub>3</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C N 3 2 1	0	0
4	A	1	Total C N 10 7 3	0	0
4	B	1	Total C N 5 4 1	0	0
4	E	1	Total C N 4 3 1	0	0
4	E	1	Total C N 10 7 3	0	0

- Molecule 5 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	1	Total Na 1 1	0	0
5	C	1	Total Na 1 1	0	0
5	D	1	Total Na 1 1	0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	63	Total O 63 63	0	1

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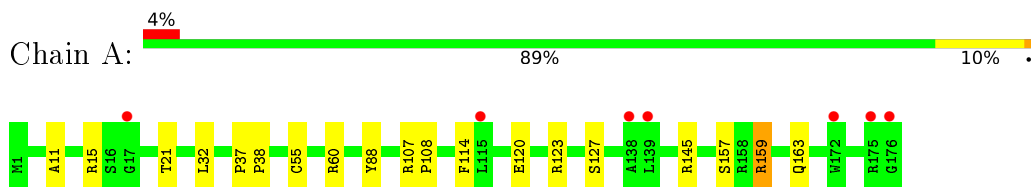
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<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
6	B	53	Total 53	O 53	0	1
6	C	45	Total 45	O 45	0	3
6	D	9	Total 9	O 9	0	0
6	E	2	Total 2	O 2	0	0

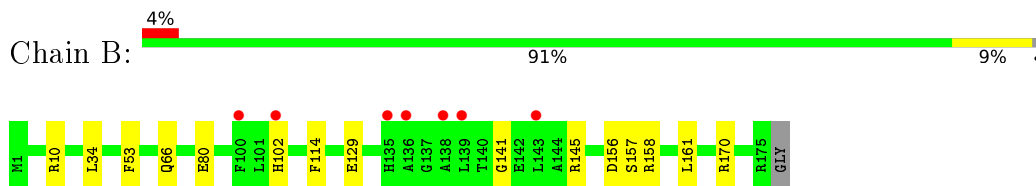
### 3 Residue-property plots [i](#)

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.

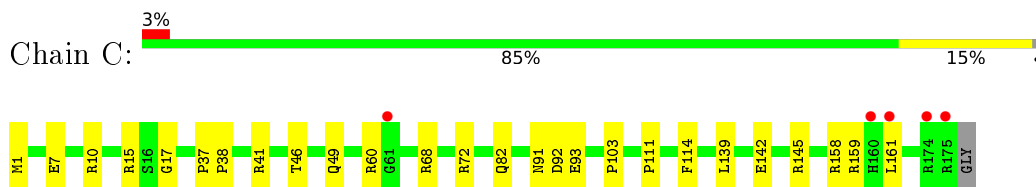
- Molecule 1: LOV protein



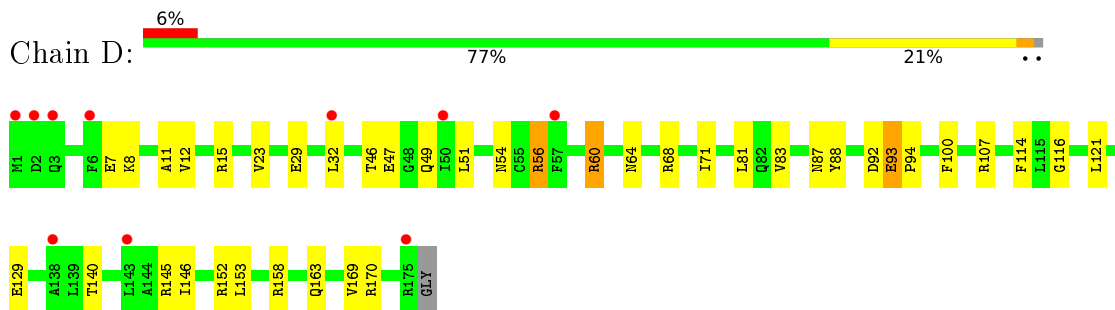
- Molecule 1: LOV protein



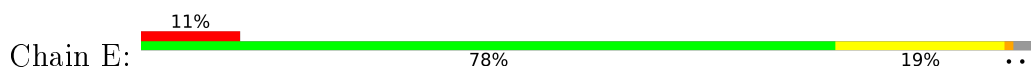
- Molecule 1: LOV protein



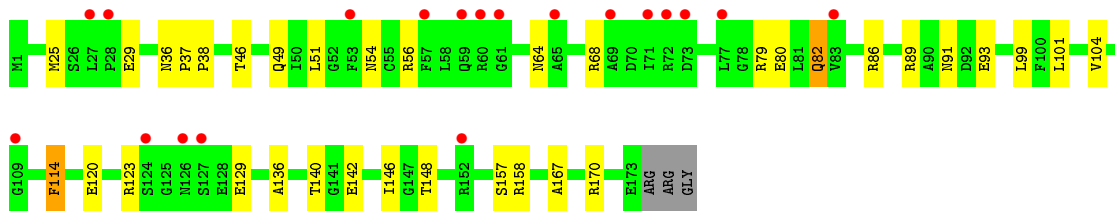
- Molecule 1: LOV protein



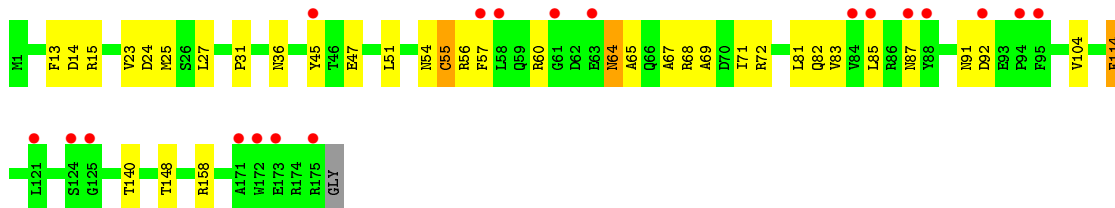
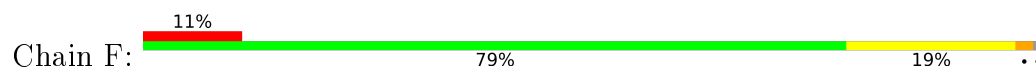
- Molecule 1: LOV protein







- Molecule 1: LOV protein



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	90.96Å 65.80Å 122.72Å 90.00° 94.00° 90.00°	Depositor
Resolution (Å)	45.37 – 2.00 48.13 – 2.00	Depositor EDS
% Data completeness (in resolution range)	99.4 (45.37-2.00) 99.5 (48.13-2.00)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.01 (at 2.00Å)	Xtrriage
Refinement program	PHENIX 1.19_4092	Depositor
R, $R_{free}$	0.217 , 0.263 0.218 , 0.262	Depositor DCC
$R_{free}$ test set	2921 reflections (2.99%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	51.1	Xtrriage
Anisotropy	0.353	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 56.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	8534	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	75.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.80% 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: SPD, NA, FMN, 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	0.48	0/1461	0.67	0/1968
1	B	0.47	0/1438	0.68	0/1941
1	C	0.43	0/1418	0.66	0/1915
1	D	0.36	0/1398	0.63	0/1891
1	E	0.36	0/1304	0.59	0/1770
1	F	0.33	0/1325	0.59	0/1797
All	All	0.41	0/8344	0.64	0/11282

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	1412	0	1414	16	0
1	B	1394	0	1382	17	0
1	C	1380	0	1367	23	0
1	D	1361	0	1331	27	0
1	E	1280	0	1218	22	0
1	F	1301	0	1237	25	0
2	A	31	0	19	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	31	0	19	0	0
2	C	31	0	19	0	0
2	D	31	0	19	3	0
2	E	31	0	19	1	0
2	F	31	0	19	4	0
3	A	6	0	0	0	0
3	B	1	0	0	0	0
3	C	3	0	0	1	0
3	D	2	0	0	1	0
3	E	1	0	0	0	0
4	A	13	0	23	2	0
4	B	5	0	5	0	0
4	E	14	0	23	1	0
5	B	1	0	0	0	0
5	C	1	0	0	0	0
5	D	1	0	0	0	0
6	A	63	0	0	1	0
6	B	53	0	0	1	0
6	C	45	0	0	4	0
6	D	9	0	0	0	0
6	E	2	0	0	0	0
All	All	8534	0	8114	119	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 7.

All (119) 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:D:15[A]:ARG:HD3	1:D:145[A]:ARG:HH12	1.44	0.82
1:D:47:GLU:HG2	1:D:51:LEU:HD11	1.62	0.81
1:A:108:PRO:HG3	1:B:53:PHE:CD2	2.22	0.74
1:F:25:MET:HE1	1:F:114:PHE:HB2	1.69	0.74
1:A:159:ARG:NH1	1:A:163:GLN:OE1	2.21	0.74
1:E:140:THR:HG21	1:E:158:ARG:HA	1.72	0.71
1:F:23:VAL:HG21	2:F:201:FMN:HM82	1.75	0.69
1:F:60:ARG:NH1	1:F:92:ASP:OD1	2.26	0.68
1:F:140:THR:HG21	1:F:158:ARG:HB2	1.75	0.67
1:A:120:GLU:HB3	1:A:123:ARG:NH1	2.10	0.67
1:D:23:VAL:HG12	1:D:32:LEU:HD23	1.77	0.66
1:D:23:VAL:HG21	2:D:201:FMN:HM82	1.80	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:8:LYS:NZ	1:D:146:ILE:O	2.31	0.62
1:B:129:GLU:OE2	1:B:170[A]:ARG:NH1	2.30	0.61
1:E:167:ALA:HA	1:E:170:ARG:HH11	1.64	0.61
1:D:29:GLU:OE2	1:D:29:GLU:N	2.26	0.59
1:A:107:ARG:HH11	1:A:107:ARG:HG2	1.66	0.59
1:D:121:LEU:HD21	1:D:169:VAL:HG22	1.83	0.59
1:C:7:GLU:OE2	1:C:10[A]:ARG:NH1	2.35	0.59
1:B:145[B]:ARG:HE	1:C:145[B]:ARG:NH1	2.01	0.58
1:E:142:GLU:O	1:E:146:ILE:HG13	2.04	0.57
1:B:141:GLY:O	1:B:145[A]:ARG:HG2	2.04	0.57
1:D:152:ARG:HG2	3:D:203:CL:CL	2.41	0.57
1:B:145[A]:ARG:HH21	1:C:145[A]:ARG:NH1	2.01	0.57
1:F:55:CYS:HA	1:F:57:PHE:CE1	2.40	0.57
1:D:71:ILE:HG21	2:D:201:FMN:H4'	1.89	0.55
1:B:145[A]:ARG:NH2	1:C:142:GLU:OE2	2.38	0.55
1:C:91:ASN:OD1	1:C:93:GLU:HG2	2.07	0.55
1:C:103:PRO:HB3	1:C:111:PRO:HG3	1.90	0.54
1:A:11:ALA:O	1:A:15[A]:ARG:HG2	2.08	0.53
4:A:209:SPD:H41	1:B:53:PHE:CE1	2.44	0.53
6:B:322:HOH:O	1:C:158:ARG:HD2	2.09	0.52
1:D:152:ARG:HG3	1:D:153:LEU:HG	1.90	0.52
1:E:80:GLU:HG3	4:E:203:SPD:H72	1.91	0.51
1:A:127:SER:OG	1:D:163:GLN:NE2	2.44	0.51
1:E:129:GLU:OE2	1:E:170:ARG:NH2	2.44	0.51
1:E:46:THR:OG1	1:E:49:GLN:HG2	2.11	0.50
1:F:71:ILE:HG21	2:F:201:FMN:H4'	1.93	0.50
1:F:65:ALA:HA	1:F:68:ARG:HH11	1.76	0.50
1:E:89:ARG:NH2	1:E:120:GLU:OE1	2.44	0.50
1:F:69:ALA:HA	1:F:72:ARG:HH12	1.77	0.50
1:D:100:PHE:O	1:D:116:GLY:HA2	2.12	0.50
1:B:145[A]:ARG:NH1	1:C:15:ARG:HG2	2.27	0.49
1:A:145[B]:ARG:NH1	1:D:145[B]:ARG:HE	2.09	0.49
1:C:41:ARG:NH2	6:C:306:HOH:O	2.45	0.49
1:F:23:VAL:CG2	2:F:201:FMN:HM82	2.42	0.48
1:E:136:ALA:O	1:E:140:THR:HG23	2.13	0.48
1:C:139:LEU:HD23	1:C:161:LEU:HD21	1.96	0.48
1:B:145[A]:ARG:HH11	1:C:15:ARG:HG2	1.78	0.47
1:A:37:PRO:HB2	1:A:38:PRO:HD3	1.95	0.47
1:A:60[A]:ARG:HG3	1:A:88:TYR:CE1	2.50	0.47
1:D:81:LEU:HD11	1:D:83:VAL:HB	1.95	0.47
1:F:81:LEU:HD12	1:F:82:GLN:H	1.79	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:65:ALA:HA	1:F:68:ARG:HD3	1.97	0.47
1:B:80:GLU:OE2	1:B:102[B]:HIS:NE2	2.48	0.46
1:C:1:MET:HB2	3:C:203:CL:CL	2.52	0.46
1:D:93:GLU:HG3	1:D:94:PRO:HD2	1.96	0.46
1:E:101:LEU:HB3	1:E:114:PHE:CE1	2.49	0.46
1:B:10[B]:ARG:HD2	1:B:34:LEU:HD21	1.96	0.46
1:D:11:ALA:O	1:D:15[B]:ARG:HG2	2.15	0.46
1:E:25:MET:CE	1:E:114:PHE:HB2	2.45	0.46
1:F:45:TYR:HE2	1:F:57:PHE:CD2	2.33	0.46
1:D:23:VAL:CG2	2:D:201:FMN:HM82	2.42	0.46
1:E:167:ALA:HA	1:E:170:ARG:NH1	2.30	0.46
1:C:37:PRO:HB2	1:C:38:PRO:HD3	1.97	0.46
1:F:54:ASN:ND2	1:F:56:ARG:HD2	2.30	0.46
1:C:15:ARG:HH11	1:C:15:ARG:HG3	1.80	0.46
1:D:54:ASN:OD1	1:D:56:ARG:HG2	2.15	0.45
1:C:82:GLN:NE2	6:C:308:HOH:O	2.50	0.45
1:E:29:GLU:O	1:E:54:ASN:ND2	2.45	0.45
1:A:107:ARG:HG2	1:A:107:ARG:NH1	2.32	0.44
1:C:60:ARG:NH1	1:C:92:ASP:OD1	2.49	0.44
4:A:209:SPD:H41	1:B:53:PHE:CD1	2.53	0.44
1:B:145[B]:ARG:HH21	1:C:145[B]:ARG:HH11	1.66	0.44
1:F:67:ALA:HB1	1:F:83:VAL:CG2	2.48	0.44
1:C:15:ARG:HG3	1:C:15:ARG:NH1	2.33	0.44
1:C:60:ARG:NH2	6:C:309:HOH:O	2.51	0.44
1:D:46:THR:HG22	1:D:49:GLN:OE1	2.17	0.44
1:D:60:ARG:NH2	1:D:92:ASP:OD2	2.50	0.44
1:D:12:VAL:HG22	1:D:15[B]:ARG:NH2	2.33	0.43
1:A:60[B]:ARG:HG2	1:A:88:TYR:CD1	2.53	0.43
1:E:64:ASN:O	1:E:68:ARG:HG3	2.17	0.43
1:C:46:THR:OG1	1:C:49:GLN:HG3	2.19	0.43
1:A:21:THR:HB	1:A:32:LEU:HD21	2.00	0.43
1:C:158:ARG:NH1	6:C:310:HOH:O	2.52	0.43
1:F:104:VAL:HG13	1:F:148:THR:HG21	2.00	0.43
1:F:27:LEU:HD22	1:F:31:PRO:HG3	2.00	0.43
1:F:85:LEU:HD11	2:F:201:FMN:O2	2.19	0.43
1:B:158:ARG:NH2	1:C:17:GLY:O	2.52	0.43
1:F:24:ASP:HB3	1:F:31:PRO:HD2	2.01	0.43
1:F:69:ALA:HA	1:F:72:ARG:NH1	2.33	0.42
1:D:129:GLU:OE2	1:D:170:ARG:NH1	2.51	0.42
1:E:123:ARG:HG2	1:E:123:ARG:O	2.19	0.42
1:A:108:PRO:HG3	1:B:53:PHE:HD2	1.74	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:64:ASN:O	1:F:64:ASN:ND2	2.52	0.42
1:C:68:ARG:O	1:C:72:ARG:HG3	2.20	0.42
1:A:32:LEU:HG	1:A:55[A]:CYS:SG	2.60	0.42
1:F:91:ASN:O	1:F:92:ASP:HB2	2.20	0.42
1:A:145[B]:ARG:NH1	6:A:304:HOH:O	2.52	0.42
1:E:56:ARG:HD3	2:E:201:FMN:O2P	2.19	0.41
1:D:60:ARG:HG2	1:D:88:TYR:CD1	2.55	0.41
1:D:140:THR:HG21	1:D:158:ARG:HB2	2.02	0.41
1:E:91:ASN:OD1	1:E:93:GLU:HG3	2.20	0.41
1:E:101:LEU:HB3	1:E:114:PHE:HE1	1.86	0.41
1:F:13:PHE:O	1:F:36:ASN:HB2	2.20	0.41
1:D:32:LEU:HD23	1:D:32:LEU:HA	1.84	0.41
1:E:82:GLN:HA	1:E:99:LEU:O	2.21	0.41
1:A:120:GLU:HB3	1:A:123:ARG:HH12	1.86	0.41
1:B:161:LEU:HD12	1:B:161:LEU:HA	1.94	0.41
1:D:64:ASN:O	1:D:68:ARG:HG3	2.21	0.41
1:E:51:LEU:HD23	1:E:51:LEU:HA	1.86	0.41
1:F:51:LEU:HD23	1:F:51:LEU:HA	1.85	0.41
1:F:81:LEU:HD12	1:F:82:GLN:N	2.36	0.41
1:E:36:ASN:CG	1:E:38:PRO:HD2	2.42	0.41
1:D:47:GLU:O	1:D:51:LEU:HG	2.21	0.40
1:E:104:VAL:HG22	1:E:148:THR:HG21	2.03	0.40
1:B:10[B]:ARG:HD2	1:B:34:LEU:CD2	2.52	0.40
1:E:36:ASN:HB2	1:E:37:PRO:HD2	2.03	0.40
1:F:87:ASN:HD22	1:F:87:ASN:HA	1.61	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	182/176 (103%)	182 (100%)	0	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	180/176 (102%)	175 (97%)	5 (3%)	0	100	100
1	C	177/176 (101%)	173 (98%)	4 (2%)	0	100	100
1	D	177/176 (101%)	170 (96%)	7 (4%)	0	100	100
1	E	171/176 (97%)	164 (96%)	7 (4%)	0	100	100
1	F	173/176 (98%)	165 (95%)	7 (4%)	1 (1%)	25	19
All	All	1060/1056 (100%)	1029 (97%)	30 (3%)	1 (0%)	51	49

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	F	55	CYS

### 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	142/135 (105%)	139 (98%)	3 (2%)	53	57
1	B	137/135 (102%)	133 (97%)	4 (3%)	42	43
1	C	137/135 (102%)	135 (98%)	2 (2%)	65	69
1	D	133/135 (98%)	126 (95%)	7 (5%)	22	18
1	E	118/135 (87%)	113 (96%)	5 (4%)	30	27
1	F	122/135 (90%)	117 (96%)	5 (4%)	30	28
All	All	789/810 (97%)	763 (97%)	26 (3%)	37	37

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	114	PHE
1	A	157	SER
1	A	159	ARG
1	B	66	GLN
1	B	114	PHE

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Mol	Chain	Res	Type
1	B	156	ASP
1	B	157	SER
1	C	114	PHE
1	C	159	ARG
1	D	7	GLU
1	D	56	ARG
1	D	60	ARG
1	D	87	ASN
1	D	93	GLU
1	D	107	ARG
1	D	114	PHE
1	E	79	ARG
1	E	82	GLN
1	E	86	ARG
1	E	114	PHE
1	E	157	SER
1	F	14	ASP
1	F	15	ARG
1	F	47	GLU
1	F	64	ASN
1	F	114	PHE

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

Mol	Chain	Res	Type
1	D	163	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 monosaccharides in this entry.

## 5.6 Ligand geometry

Of 27 ligands modelled in this entry, 16 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
2	FMN	E	201	-	31,33,33	1.34	4 (12%)	40,50,50	1.48	6 (15%)
4	SPD	B	204	-	4,4,9	0.41	0	3,3,8	0.56	0
4	SPD	E	204	-	9,9,9	0.33	0	8,8,8	0.66	0
2	FMN	A	201	-	31,33,33	1.54	5 (16%)	40,50,50	1.61	7 (17%)
4	SPD	A	209	-	9,9,9	0.39	0	8,8,8	0.70	0
4	SPD	A	208	-	2,2,9	0.59	0	0,1,8	0.00	-
2	FMN	B	201	-	31,33,33	1.33	5 (16%)	40,50,50	2.20	9 (22%)
2	FMN	C	201	-	31,33,33	1.47	5 (16%)	40,50,50	1.70	7 (17%)
2	FMN	D	201	-	31,33,33	1.42	3 (9%)	40,50,50	1.82	10 (25%)
4	SPD	E	203	-	3,3,9	0.57	0	2,2,8	0.05	0
2	FMN	F	201	-	31,33,33	1.36	4 (12%)	40,50,50	1.59	6 (15%)

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	E	201	-	-	4/18/18/18	0/3/3/3
4	SPD	B	204	-	-	1/2/2/7	-
4	SPD	E	204	-	-	3/7/7/7	-
2	FMN	A	201	-	-	1/18/18/18	0/3/3/3
4	SPD	A	209	-	-	1/7/7/7	-
2	FMN	B	201	-	-	3/18/18/18	0/3/3/3
2	FMN	C	201	-	-	1/18/18/18	0/3/3/3
2	FMN	D	201	-	-	3/18/18/18	0/3/3/3
4	SPD	E	203	-	-	0/1/1/7	-
2	FMN	F	201	-	-	6/18/18/18	0/3/3/3

All (26) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	201	FMN	C10-N1	4.37	1.38	1.33
2	A	201	FMN	C10-N1	4.31	1.38	1.33
2	C	201	FMN	C10-N1	4.16	1.38	1.33
2	F	201	FMN	C4A-N5	3.84	1.38	1.33
2	E	201	FMN	C10-N1	3.83	1.38	1.33
2	F	201	FMN	C10-N1	3.76	1.38	1.33
2	C	201	FMN	C4A-N5	3.75	1.38	1.33
2	D	201	FMN	C4A-N5	3.64	1.38	1.33
2	A	201	FMN	C4A-N5	3.35	1.38	1.33
2	B	201	FMN	C4A-N5	3.33	1.38	1.33
2	B	201	FMN	C10-N1	3.30	1.37	1.33
2	D	201	FMN	C4-N3	3.22	1.38	1.33
2	F	201	FMN	C4-N3	3.18	1.38	1.33
2	A	201	FMN	C4-N3	3.16	1.38	1.33
2	E	201	FMN	C4A-N5	3.14	1.37	1.33
2	C	201	FMN	C4-N3	2.94	1.38	1.33
2	E	201	FMN	C4-N3	2.86	1.38	1.33
2	B	201	FMN	C4-N3	2.82	1.37	1.33
2	B	201	FMN	C1'-N10	2.53	1.50	1.48
2	E	201	FMN	C1'-N10	2.49	1.50	1.48
2	A	201	FMN	C1'-N10	2.40	1.50	1.48
2	A	201	FMN	C6-C5A	-2.34	1.38	1.41
2	C	201	FMN	C1'-N10	2.18	1.50	1.48
2	C	201	FMN	C5A-N5	2.12	1.38	1.35
2	B	201	FMN	C6-C5A	-2.06	1.38	1.41
2	F	201	FMN	C5A-N5	2.04	1.38	1.35

All (45) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	201	FMN	C5'-C4'-C3'	-6.96	98.76	112.20
2	A	201	FMN	C4-N3-C2	6.53	120.66	115.14
2	D	201	FMN	C4-N3-C2	6.17	120.35	115.14
2	B	201	FMN	C1'-N10-C9A	6.09	123.09	118.29
2	B	201	FMN	C4-N3-C2	6.03	120.23	115.14
2	F	201	FMN	C4-N3-C2	5.78	120.02	115.14
2	C	201	FMN	C4-N3-C2	5.56	119.84	115.14
2	C	201	FMN	C1'-N10-C9A	5.16	122.36	118.29
2	E	201	FMN	C4-N3-C2	4.73	119.13	115.14
2	D	201	FMN	C4A-N5-C5A	4.39	121.16	116.77
2	F	201	FMN	C4A-N5-C5A	3.78	120.55	116.77
2	D	201	FMN	C1'-N10-C9A	3.60	121.12	118.29

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	201	FMN	C1'-N10-C9A	3.49	121.04	118.29
2	E	201	FMN	C1'-N10-C9A	3.24	120.84	118.29
2	F	201	FMN	C5A-C9A-N10	3.09	119.96	117.72
2	F	201	FMN	C4A-C4-N3	-3.09	119.21	123.43
2	B	201	FMN	C4A-N5-C5A	3.09	119.86	116.77
2	B	201	FMN	C10-C4A-N5	-3.02	119.17	121.26
2	C	201	FMN	C10-C4A-N5	-2.94	119.22	121.26
2	C	201	FMN	C4A-N5-C5A	2.93	119.70	116.77
2	D	201	FMN	C10-C4A-N5	-2.87	119.27	121.26
2	D	201	FMN	P-O5'-C5'	2.79	125.97	118.30
2	E	201	FMN	C4A-C4-N3	-2.74	119.68	123.43
2	A	201	FMN	C4-C4A-N5	2.70	121.68	118.60
2	D	201	FMN	C4A-C4-N3	-2.67	119.78	123.43
2	F	201	FMN	C1'-N10-C9A	2.64	120.37	118.29
2	E	201	FMN	C4A-N5-C5A	2.63	119.40	116.77
2	E	201	FMN	C5A-C9A-N10	2.60	119.60	117.72
2	C	201	FMN	C4A-C4-N3	-2.59	119.89	123.43
2	A	201	FMN	C10-C4A-N5	-2.55	119.49	121.26
2	B	201	FMN	C4A-C4-N3	-2.54	119.96	123.43
2	F	201	FMN	C10-C4A-N5	-2.48	119.54	121.26
2	B	201	FMN	C4-C4A-N5	2.44	121.39	118.60
2	D	201	FMN	C5A-C9A-N10	2.42	119.47	117.72
2	A	201	FMN	C4A-C4-N3	-2.38	120.18	123.43
2	B	201	FMN	O4'-C4'-C5'	2.36	115.22	109.92
2	D	201	FMN	O3P-P-O5'	2.36	113.01	106.73
2	E	201	FMN	C9A-N10-C10	-2.34	118.85	121.91
2	C	201	FMN	O3P-P-O5'	2.31	112.87	106.73
2	B	201	FMN	O3'-C3'-C4'	-2.14	103.63	108.81
2	D	201	FMN	O5'-C5'-C4'	-2.13	103.68	109.36
2	A	201	FMN	C4A-N5-C5A	2.08	118.85	116.77
2	A	201	FMN	O3P-P-O5'	2.07	112.23	106.73
2	D	201	FMN	C4-C4A-N5	2.04	120.93	118.60
2	C	201	FMN	C4-C4A-N5	2.02	120.91	118.60

There are no chirality outliers.

All (23) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	201	FMN	N10-C1'-C2'-O2'
2	D	201	FMN	C5'-O5'-P-O1P
2	D	201	FMN	C5'-O5'-P-O2P
2	D	201	FMN	C5'-O5'-P-O3P

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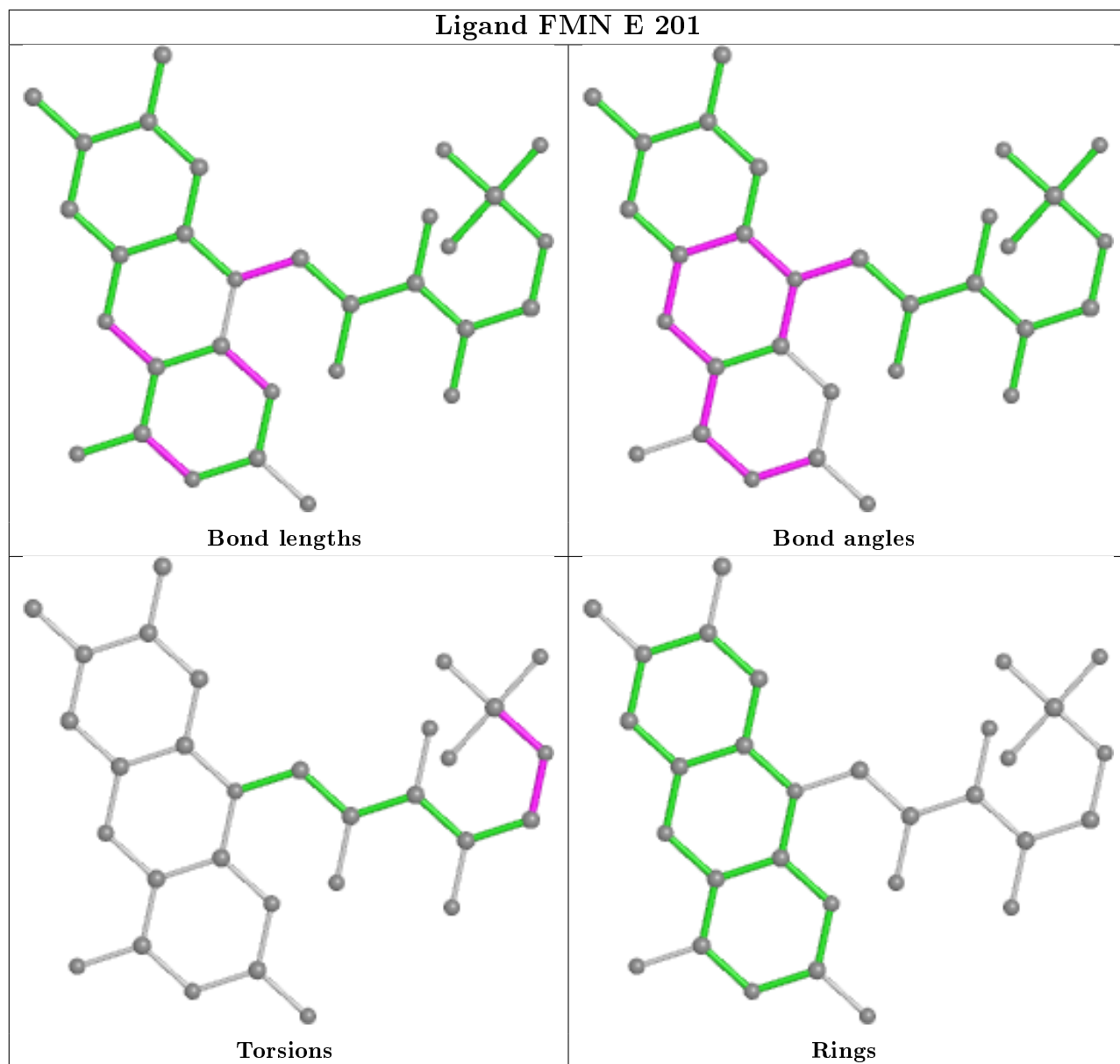
Mol	Chain	Res	Type	Atoms
2	E	201	FMN	C5'-O5'-P-O1P
2	E	201	FMN	C5'-O5'-P-O2P
2	E	201	FMN	C5'-O5'-P-O3P
2	F	201	FMN	C3'-C4'-C5'-O5'
2	F	201	FMN	O4'-C4'-C5'-O5'
2	F	201	FMN	C5'-O5'-P-O2P
2	F	201	FMN	C5'-O5'-P-O3P
4	B	204	SPD	N6-C7-C8-C9
4	E	204	SPD	C3-C4-C5-N6
4	E	204	SPD	C7-C8-C9-N10
4	A	209	SPD	C2-C3-C4-C5
2	F	201	FMN	C5'-O5'-P-O1P
2	B	201	FMN	C4'-C5'-O5'-P
2	C	201	FMN	C4'-C5'-O5'-P
2	A	201	FMN	C4'-C5'-O5'-P
2	E	201	FMN	C4'-C5'-O5'-P
4	E	204	SPD	C8-C7-N6-C5
2	B	201	FMN	O4'-C4'-C5'-O5'
2	F	201	FMN	C4'-C5'-O5'-P

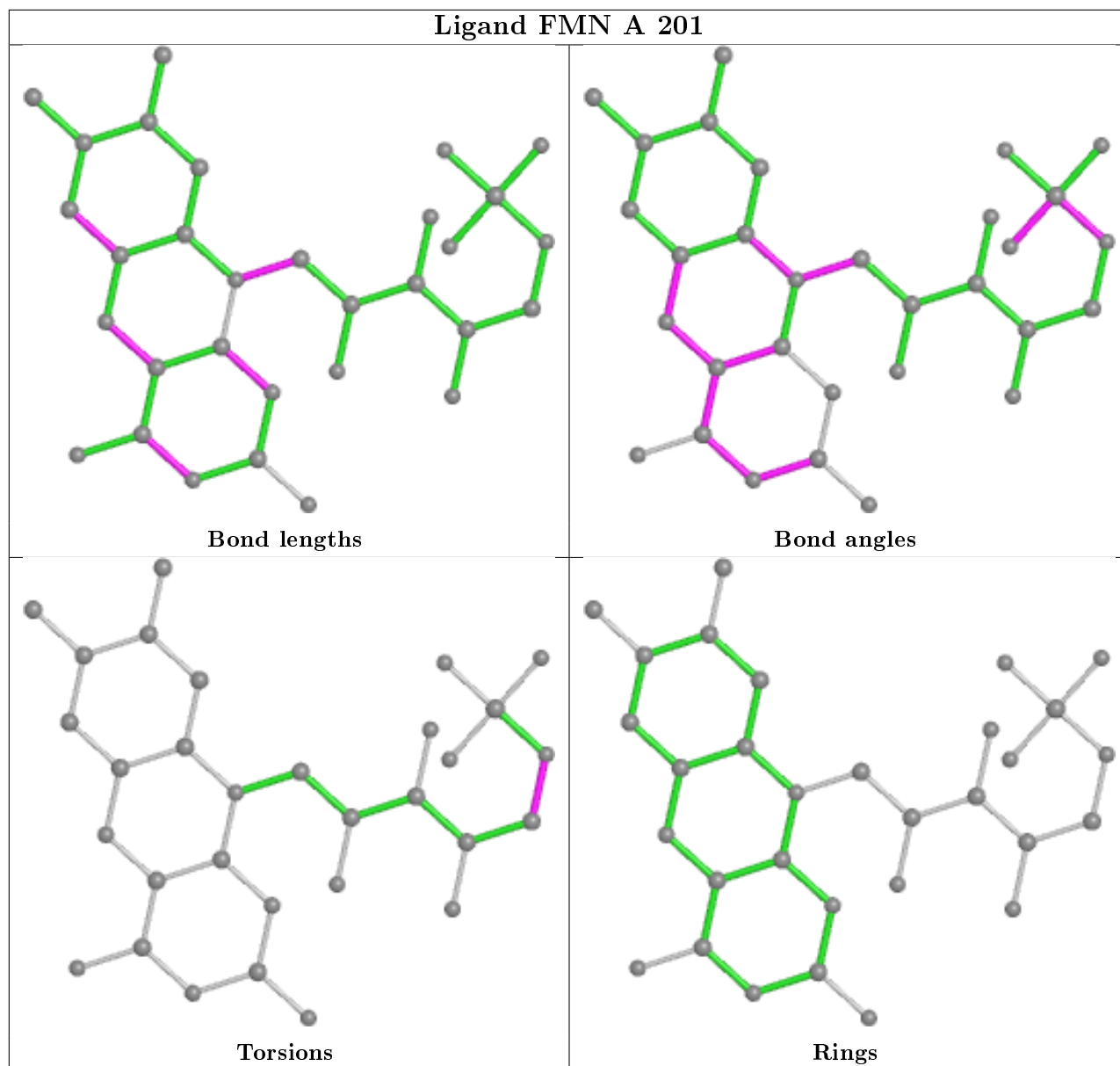
There are no ring outliers.

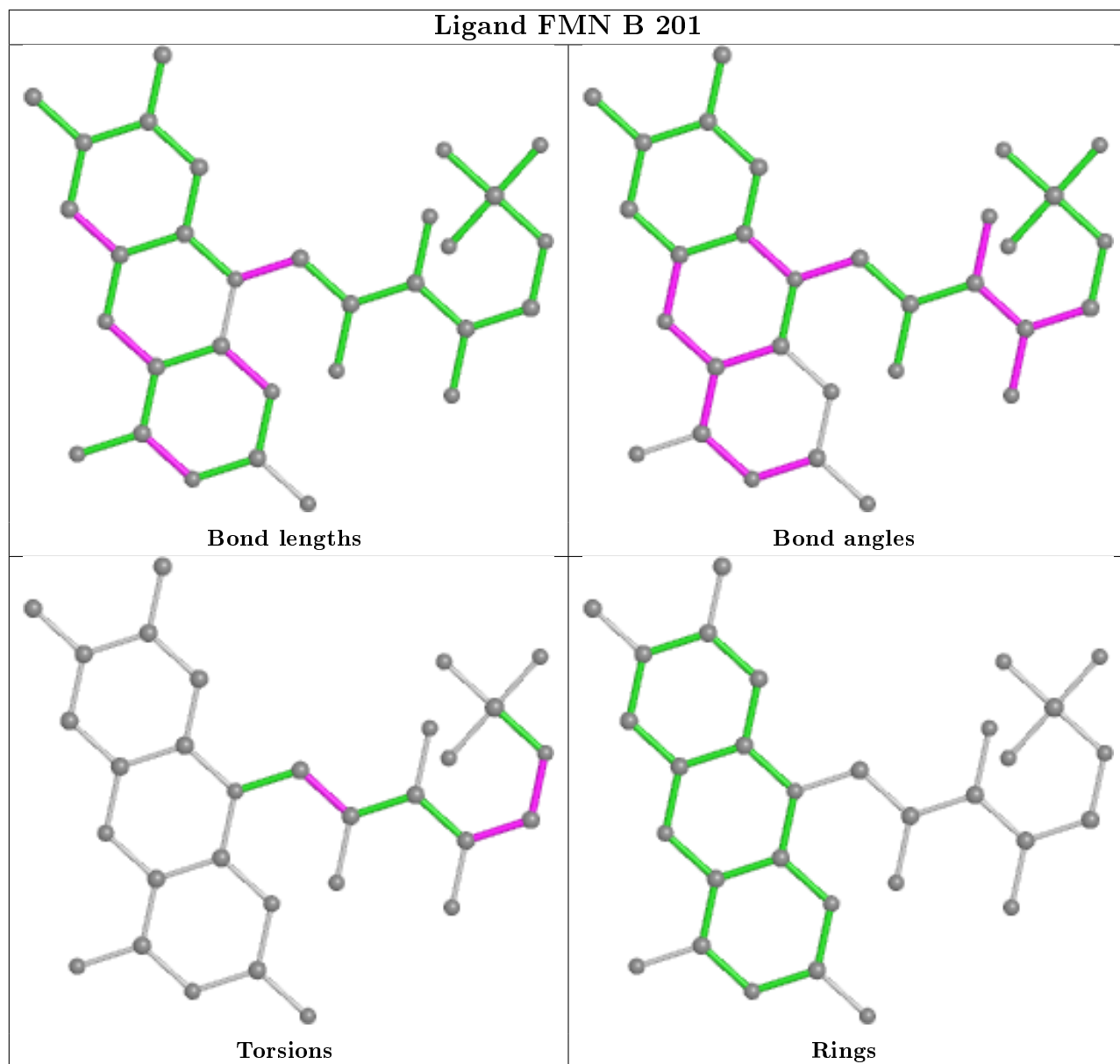
5 monomers are involved in 11 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	E	201	FMN	1	0
4	A	209	SPD	2	0
2	D	201	FMN	3	0
4	E	203	SPD	1	0
2	F	201	FMN	4	0

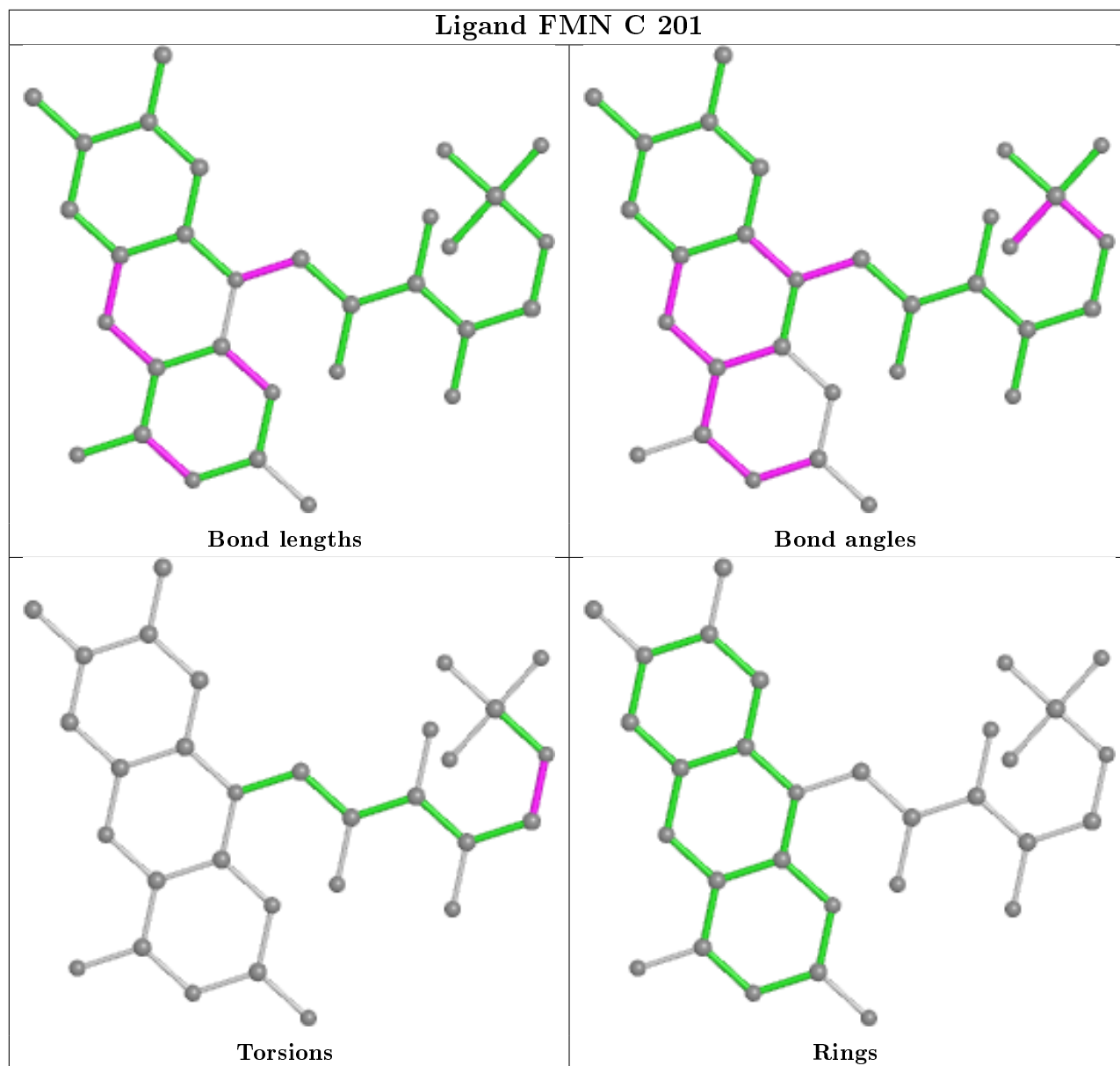
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

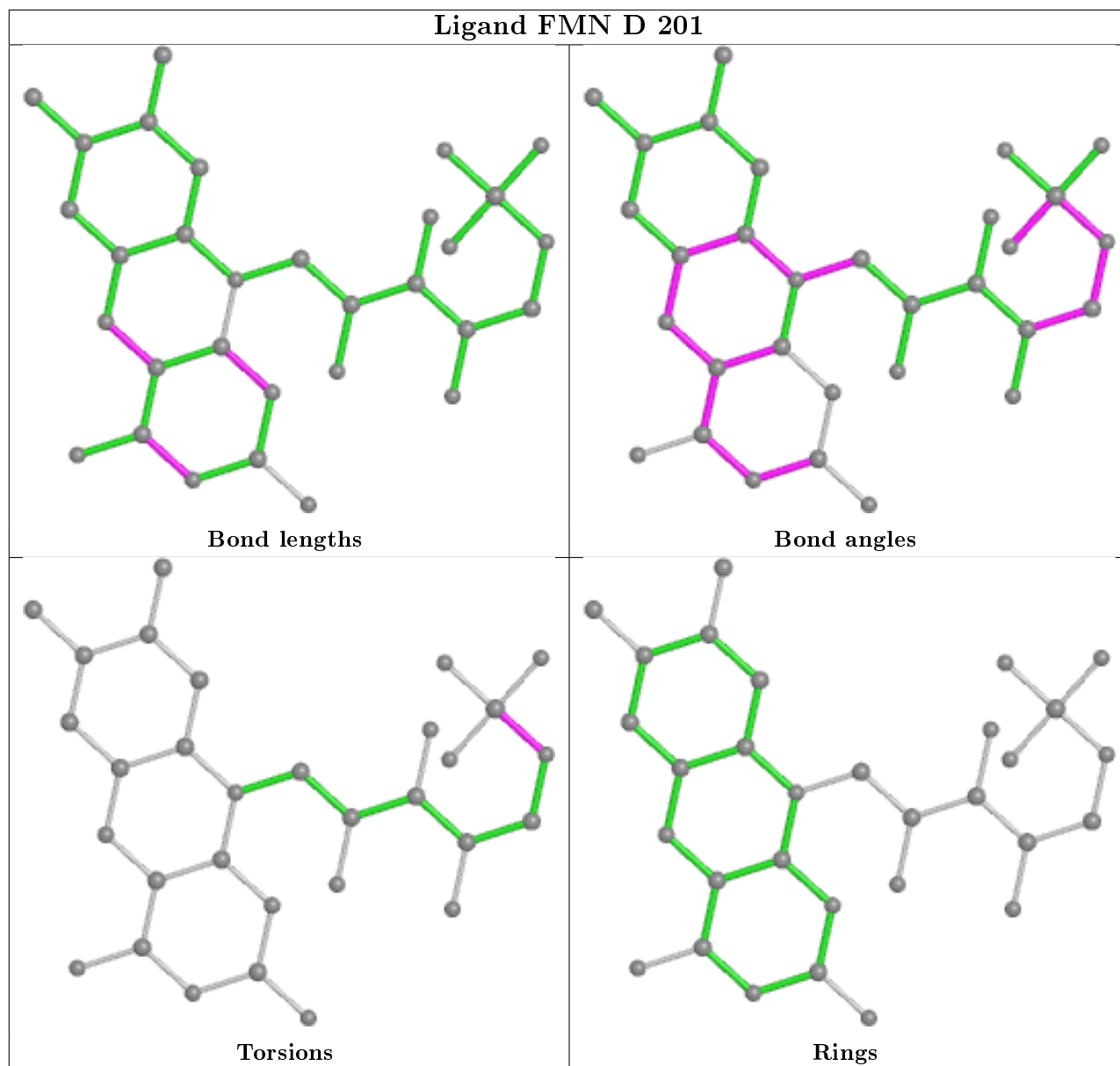


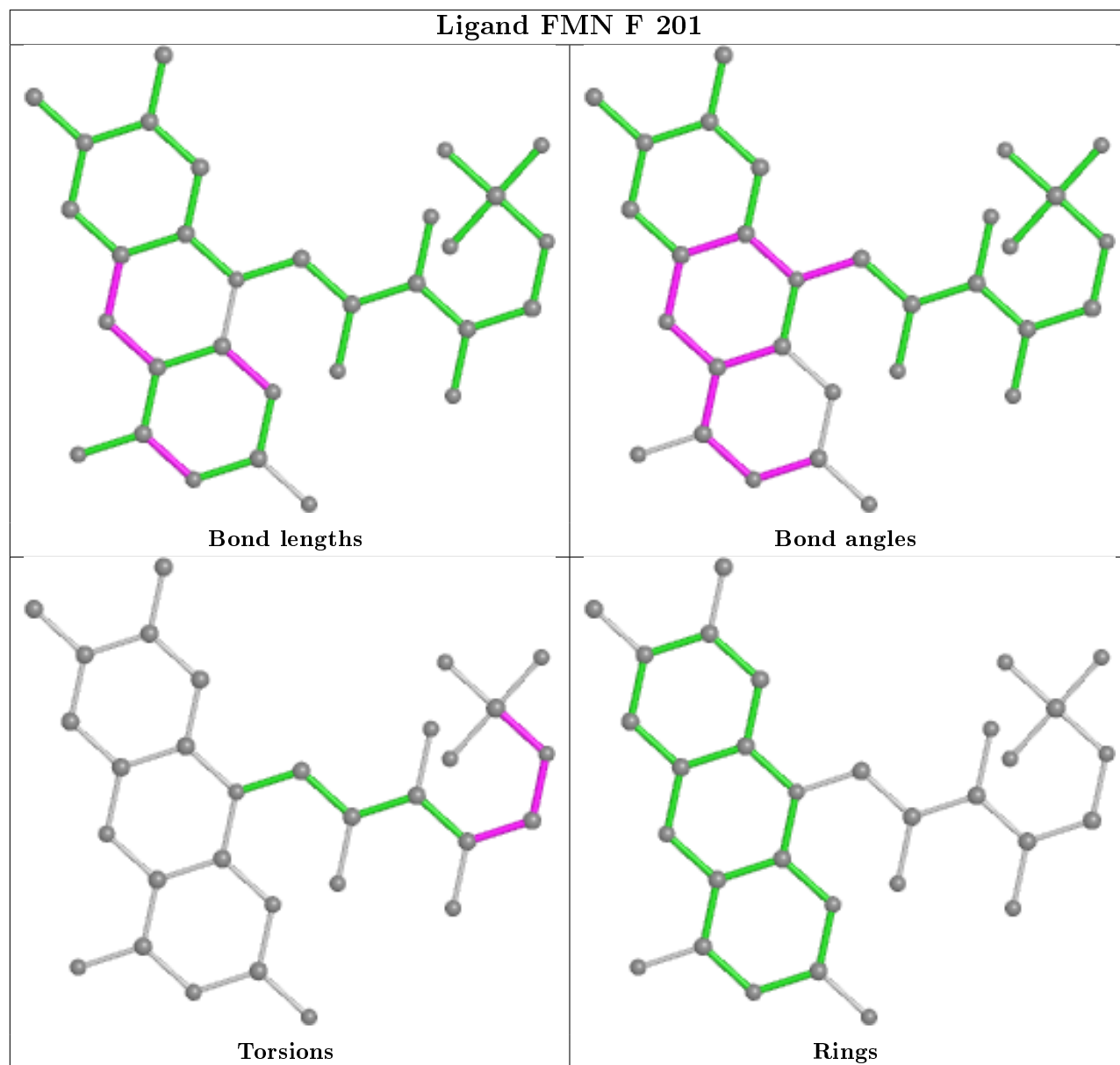












## 5.7 Other polymers [i](#)

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	176/176 (100%)	0.50	7 (3%) 38 37	39, 54, 81, 120	0
1	B	175/176 (99%)	0.46	7 (4%) 38 37	39, 55, 87, 108	0
1	C	175/176 (99%)	0.36	5 (2%) 51 50	39, 60, 90, 137	0
1	D	175/176 (99%)	0.55	10 (5%) 23 23	51, 84, 116, 146	0
1	E	173/176 (98%)	0.73	19 (10%) 5 5	67, 91, 123, 144	0
1	F	175/176 (99%)	0.82	19 (10%) 5 5	67, 98, 127, 158	0
All	All	1049/1056 (99%)	0.57	67 (6%) 19 18	39, 73, 117, 158	0

All (67) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	F	124	SER	9.2
1	F	172	TRP	7.4
1	F	95	PHE	5.9
1	A	176	GLY	5.2
1	F	57	PHE	4.9
1	E	28	PRO	4.3
1	E	27	LEU	4.1
1	F	61	GLY	4.0
1	E	83	VAL	3.8
1	E	53	PHE	3.8
1	D	175	ARG	3.7
1	F	125	GLY	3.5
1	E	77	LEU	3.3
1	F	85	LEU	3.2
1	A	175	ARG	3.1
1	C	61	GLY	3.0
1	F	94	PRO	3.0
1	D	3	GLN	3.0
1	F	92	ASP	2.9

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	F	63	GLU	2.9
1	F	175	ARG	2.9
1	F	171	ALA	2.9
1	E	109	GLY	2.9
1	D	1	MET	2.9
1	F	87	ASN	2.8
1	E	60	ARG	2.8
1	D	32	LEU	2.8
1	A	17	GLY	2.7
1	E	59	GLN	2.7
1	B	139	LEU	2.7
1	E	57	PHE	2.7
1	B	102[A]	HIS	2.6
1	F	121	LEU	2.6
1	A	172	TRP	2.6
1	E	124	SER	2.6
1	E	61	GLY	2.6
1	E	73	ASP	2.6
1	E	65	ALA	2.6
1	D	57	PHE	2.6
1	F	84	VAL	2.5
1	A	139	LEU	2.5
1	B	135	HIS	2.5
1	E	71	ILE	2.5
1	D	2	ASP	2.5
1	F	173	GLU	2.5
1	A	138	ALA	2.4
1	F	45	TYR	2.4
1	C	175	ARG	2.4
1	C	160[A]	HIS	2.4
1	D	138	ALA	2.4
1	E	69	ALA	2.3
1	D	6	PHE	2.3
1	E	126	ASN	2.3
1	E	72	ARG	2.3
1	F	88	TYR	2.3
1	B	143	LEU	2.2
1	B	100	PHE	2.2
1	E	152	ARG	2.2
1	D	143	LEU	2.2
1	D	50	ILE	2.1
1	C	161	LEU	2.1

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Mol	Chain	Res	Type	RSRZ
1	C	174	ARG	2.1
1	B	136	ALA	2.1
1	F	58	LEU	2.1
1	B	138	ALA	2.1
1	A	115	LEU	2.0
1	E	127	SER	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 monosaccharides 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.

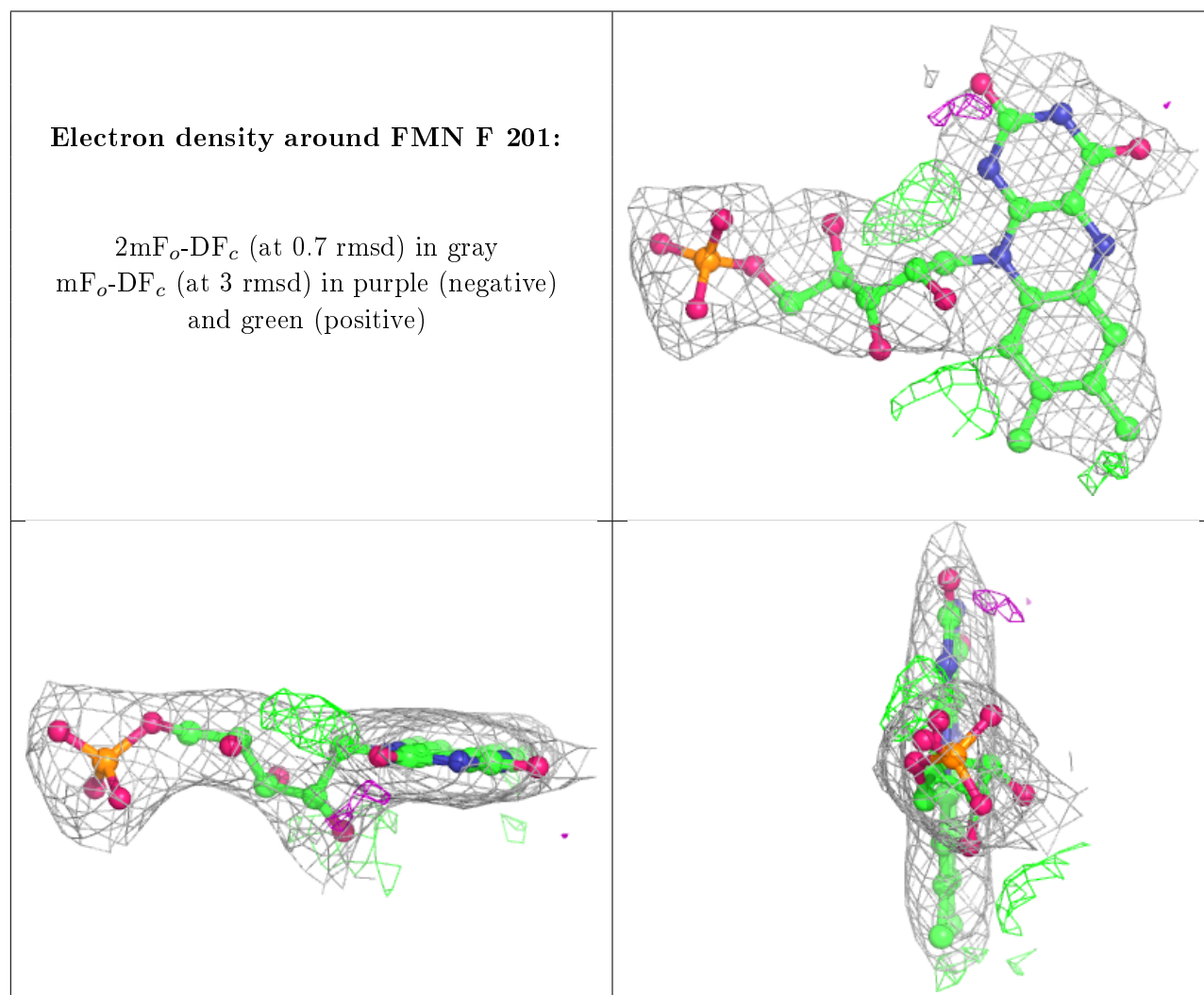
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
4	SPD	E	204	10/10	0.70	0.21	83,102,109,111	0
3	CL	A	205	1/1	0.76	0.09	88,88,88,88	0
4	SPD	B	204	5/10	0.82	0.29	43,59,71,86	0
4	SPD	A	209	10/10	0.86	0.15	64,76,82,83	0
3	CL	A	207	1/1	0.86	0.13	81,81,81,81	0
4	SPD	E	203	4/10	0.86	0.13	65,70,70,84	0
3	CL	D	202	1/1	0.86	0.21	84,84,84,84	0
3	CL	C	204	1/1	0.87	0.43	86,86,86,86	0
3	CL	D	203	1/1	0.87	0.11	98,98,98,98	0
5	NA	D	204	1/1	0.87	0.15	75,75,75,75	0
3	CL	B	202	1/1	0.88	0.11	63,63,63,63	0
2	FMN	F	201	31/31	0.90	0.12	65,84,113,125	0
3	CL	C	203	1/1	0.90	0.10	78,78,78,78	0
4	SPD	A	208	3/10	0.91	0.15	55,55,57,73	0
2	FMN	E	201	31/31	0.91	0.21	73,81,91,98	0
3	CL	A	202	1/1	0.93	0.14	56,56,56,56	0
2	FMN	D	201	31/31	0.93	0.12	69,83,93,112	0

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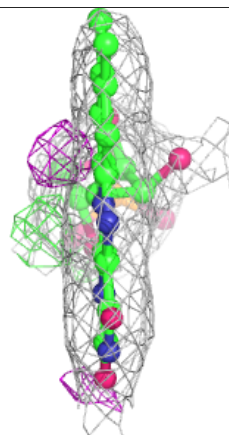
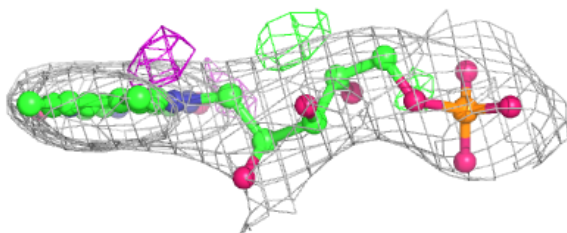
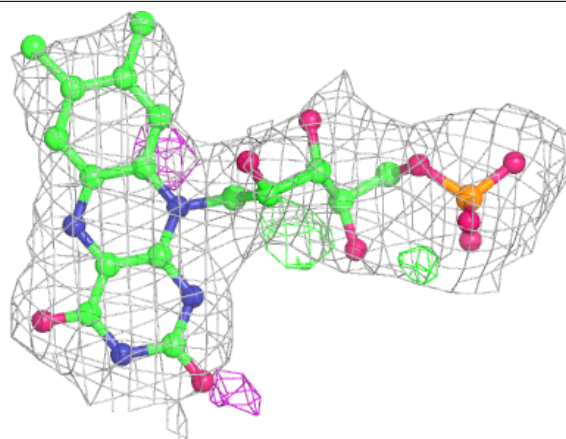
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
3	CL	A	204	1/1	0.94	0.09	78,78,78,78	0
3	CL	A	203	1/1	0.94	0.05	61,61,61,61	0
3	CL	E	202	1/1	0.94	0.23	99,99,99,99	0
3	CL	C	202	1/1	0.95	0.20	85,85,85,85	0
2	FMN	C	201	31/31	0.95	0.11	43,54,66,70	0
2	FMN	B	201	31/31	0.95	0.14	36,47,57,59	0
5	NA	B	203	1/1	0.96	0.39	67,67,67,67	0
5	NA	C	205	1/1	0.96	0.06	73,73,73,73	0
2	FMN	A	201	31/31	0.96	0.11	34,45,53,57	0
3	CL	A	206	1/1	0.98	0.11	65,65,65,65	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 E 201:**

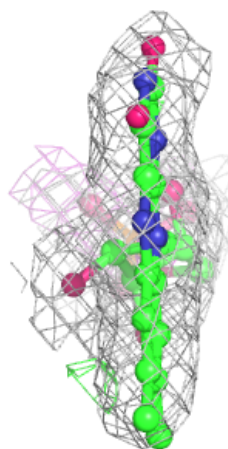
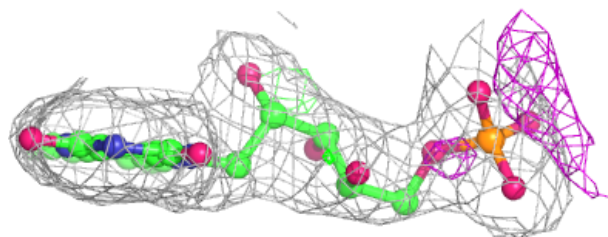
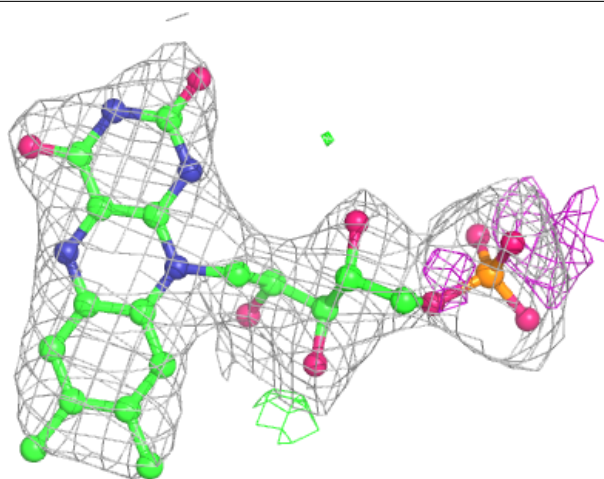
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)





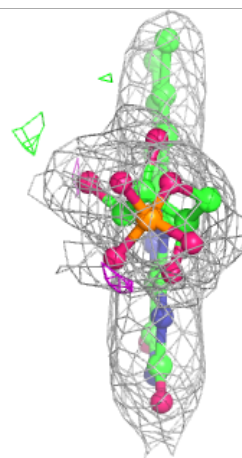
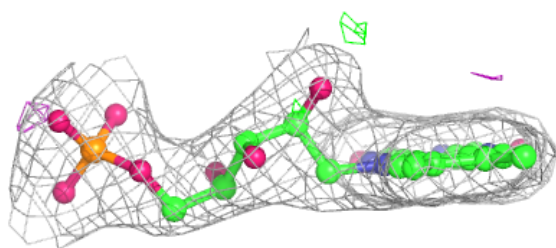
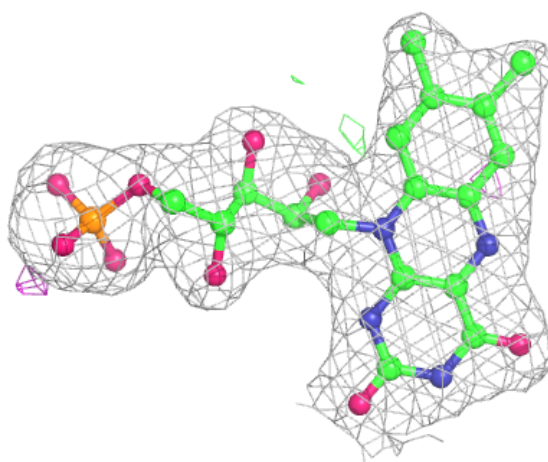
**Electron density around FMN D 201:**

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



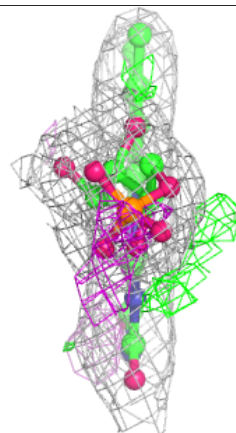
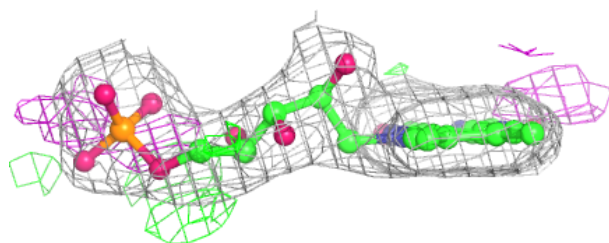
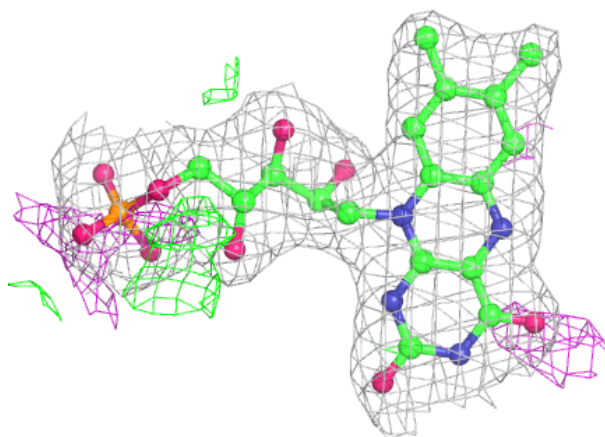
**Electron density around FMN C 201:**

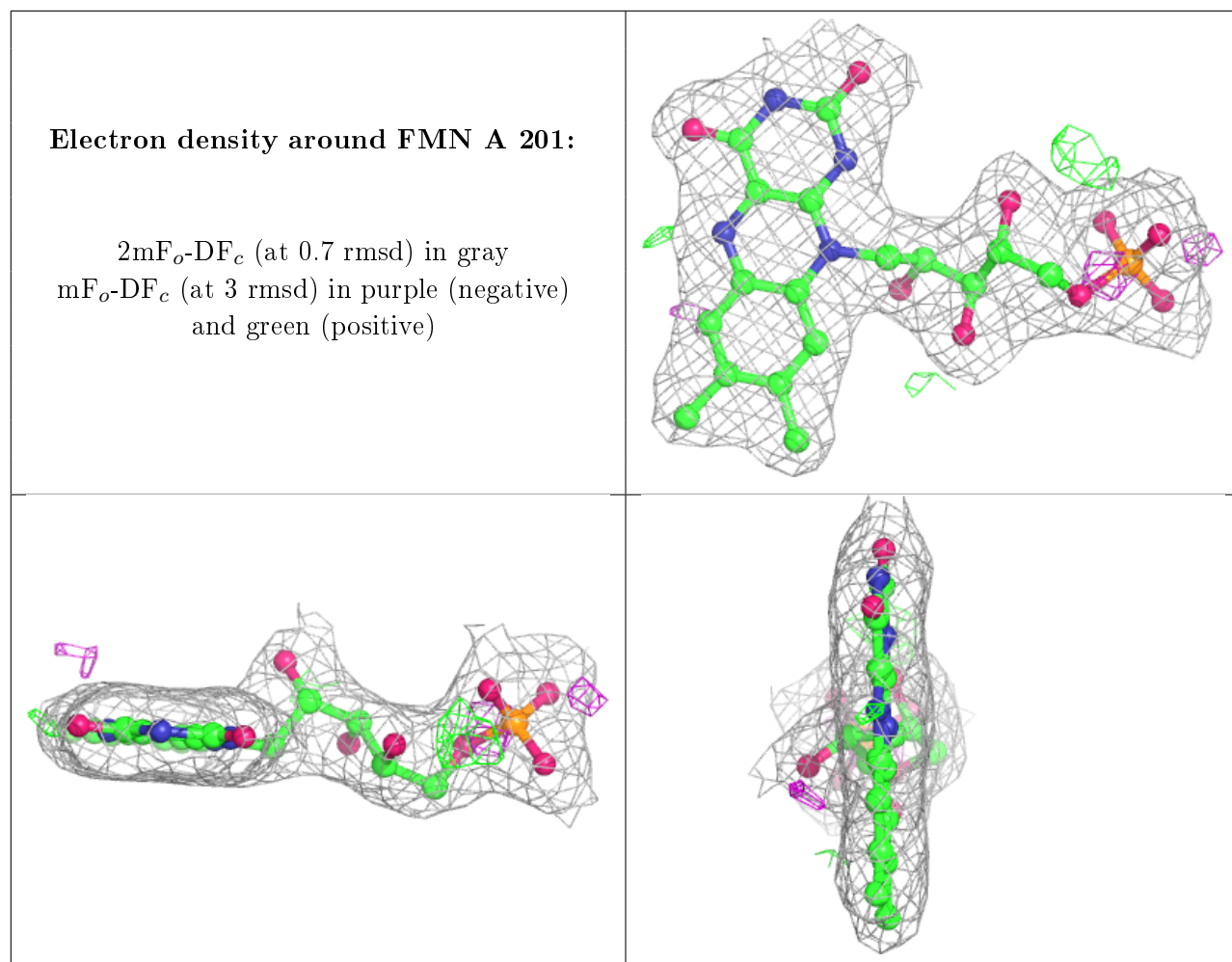
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around FMN B 201:**

$2mF_o-DF_c$  (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.