Full wwPDB X-ray Structure Validation Report (i)

Jan 23, 2023 – 11:24 PM EST

PDB ID	:	3GAG
Title	:	Crystal structure of a nitroreductase-like protein (smu.346) from streptococcus mutans at 1.70 A resolution
Authors	:	Joint Center for Structural Genomics (JCSG)
Deposited on	:	2009-02-17
Resolution	:	1.70 Å(reported)

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

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

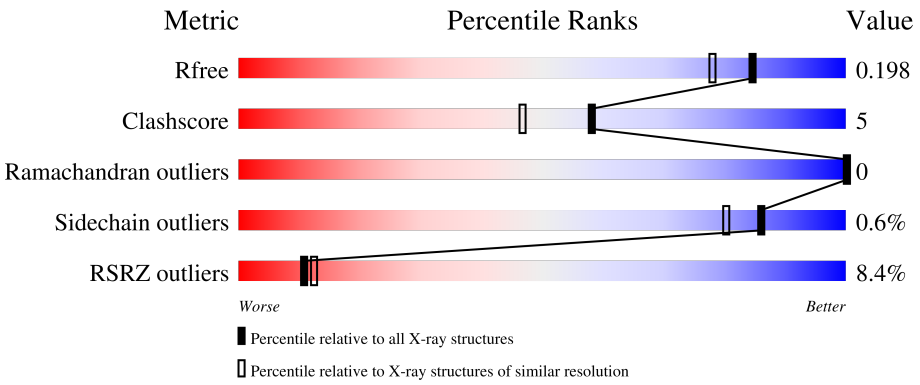
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.31.2
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.31.2

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 1.70 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	4298 (1.70-1.70)
Clashscore	141614	4695 (1.70-1.70)
Ramachandran outliers	138981	4610 (1.70-1.70)
Sidechain outliers	138945	4610 (1.70-1.70)
RSRZ outliers	127900	4222 (1.70-1.70)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=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	206	9% 91% 8%
1	B	206	5% 91% 8%
1	C	206	9% 89% 10% •
1	D	206	9% 88% 11%

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 criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	GOL	D	209	-	-	X	-

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 7575 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.

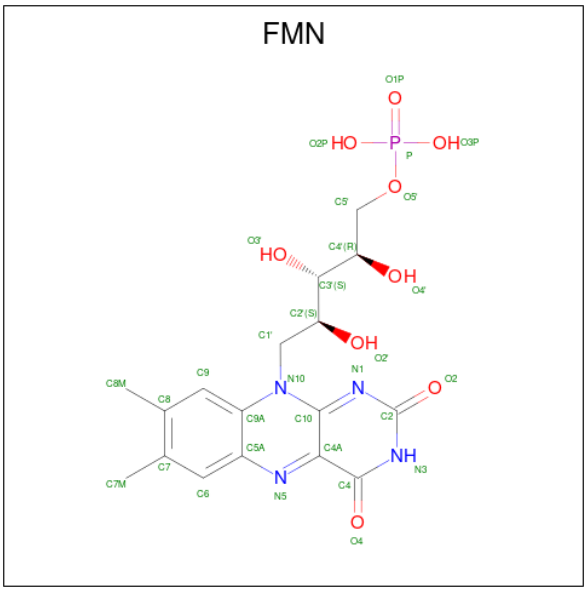
- Molecule 1 is a protein called Putative NADH dehydrogenase, NADPH nitroreductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	Se			
1	A	206	1711	1094	295	313	9	0	11	0
1	B	205	1653	1062	278	305	8	0	4	0
1	C	204	1682	1078	289	306	9	0	10	0
1	D	205	1665	1070	280	306	9	0	5	0

There are 12 discrepancies between the modelled and reference sequences:

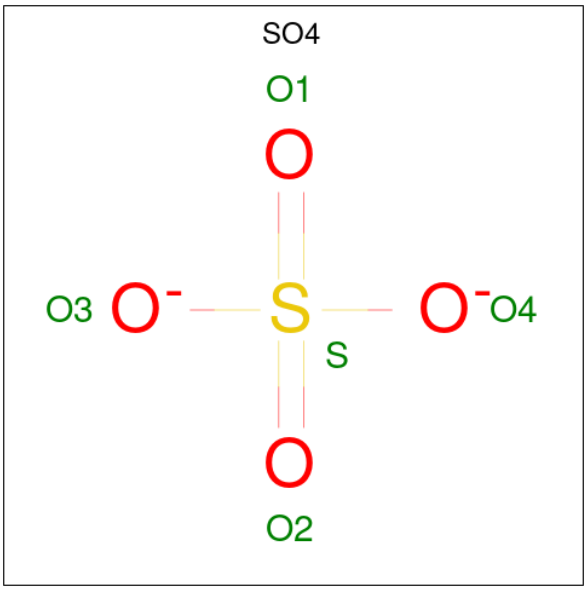
Chain	Residue	Modelled	Actual	Comment	Reference
A	0	GLY	-	expression tag	UNP Q8DVW4
A	17	ARG	GLN	SEE REMARK 999	UNP Q8DVW4
A	173	GLY	GLU	SEE REMARK 999	UNP Q8DVW4
B	0	GLY	-	expression tag	UNP Q8DVW4
B	17	ARG	GLN	SEE REMARK 999	UNP Q8DVW4
B	173	GLY	GLU	SEE REMARK 999	UNP Q8DVW4
C	0	GLY	-	expression tag	UNP Q8DVW4
C	17	ARG	GLN	SEE REMARK 999	UNP Q8DVW4
C	173	GLY	GLU	SEE REMARK 999	UNP Q8DVW4
D	0	GLY	-	expression tag	UNP Q8DVW4
D	17	ARG	GLN	SEE REMARK 999	UNP Q8DVW4
D	173	GLY	GLU	SEE REMARK 999	UNP Q8DVW4

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



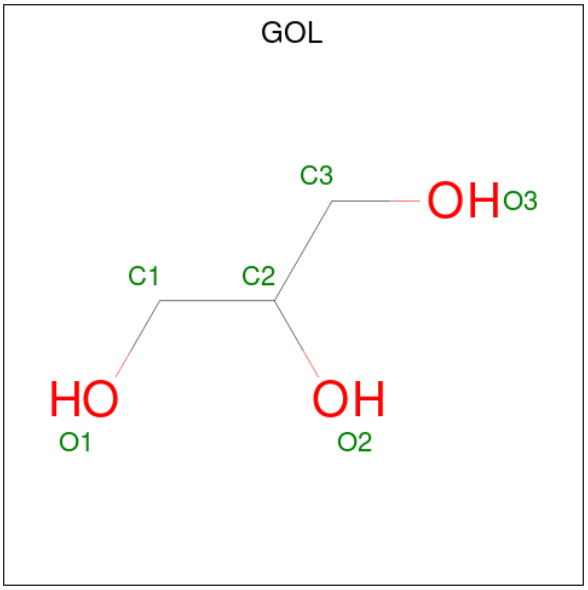
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
2	B	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
2	C	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
2	D	1	Total	C	N	O	P	0	0
			31	17	4	9	1		

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O_4S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	O	S		
3	A	1	5	4	1	0	0
			Total	O	S		
3	D	1	5	4	1	0	0

- Molecule 4 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
4	A	1	6	3	3	0	0
			Total	C	O		
4	A	1	6	3	3	0	0
			Total	C	O		
4	A	1	6	3	3	0	0
			Total	C	O		
4	A	1	6	3	3	0	0
			Total	C	O		
4	B	1	6	3	3	0	0
			Total	C	O		
4	B	1	6	3	3	0	0
			Total	C	O		
4	B	1	6	3	3	0	0
			Total	C	O		
4	B	1	6	3	3	0	0
			Total	C	O		
4	C	1	6	3	3	0	0
			Total	C	O		
4	C	1	6	3	3	0	0

Continued on next page...

Continued from previous page...

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

- Molecule 5 is water.

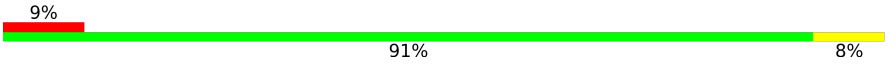
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
5	A	148	149	149	0	1
			Total	O		
5	B	170	170	170	0	0
			Total	O		
5	C	157	158	158	0	1
			Total	O		
5	D	169	169	169	0	0

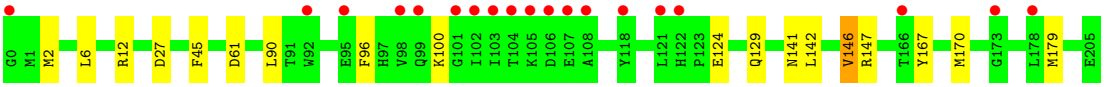
3 Residue-property plots (i)

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: Putative NADH dehydrogenase, NADPH nitroreductase

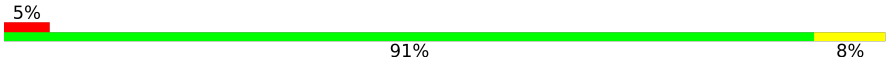
Chain A:





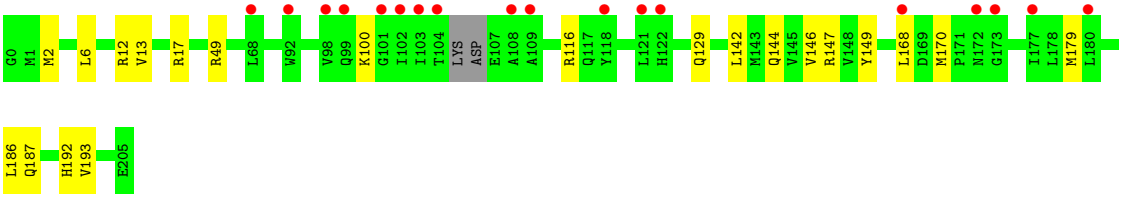
• Molecule 1: Putative NADH dehydrogenase, NADPH nitroreductase

Chain B:



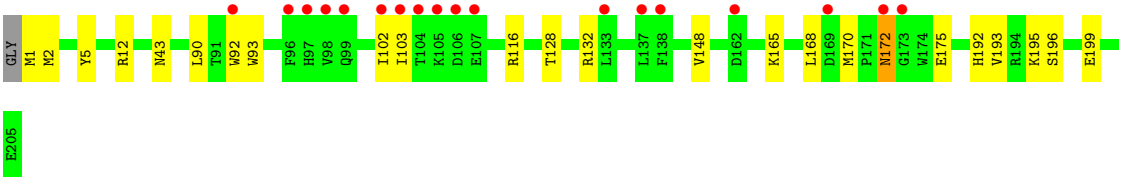
• Molecule 1: Putative NADH dehydrogenase, NADPH nitroreductase

Chain C:



• Molecule 1: Putative NADH dehydrogenase, NADPH nitroreductase

Chain D:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α, β, γ	49.11Å 52.48Å 93.11Å 88.13° 80.35° 62.14°	Depositor
Resolution (Å)	29.59 – 1.70 29.59 – 1.70	Depositor EDS
% Data completeness (in resolution range)	91.3 (29.59-1.70) 91.3 (29.59-1.70)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	0.11	Depositor
$< I/\sigma(I) >$ [1]	1.97 (at 1.70Å)	Xtriage
Refinement program	REFMAC 5.2.0019, PHENIX	Depositor
R, R_{free}	0.152 , 0.188 0.164 , 0.198	Depositor DCC
R_{free} test set	4057 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å^2)	16.7	Xtriage
Anisotropy	0.447	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 54.5	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.96	EDS
Total number of atoms	7575	wwPDB-VP
Average B, all atoms (Å^2)	24.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.04% of the height of the origin peak. No significant pseudotranslation is detected.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ 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, SO4, GOL

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	0.78	2/1741 (0.1%)	0.76	0/2346
1	B	0.74	0/1685	0.82	3/2275 (0.1%)
1	C	0.79	1/1712 (0.1%)	0.78	1/2308 (0.0%)
1	D	0.78	0/1696	0.81	2/2289 (0.1%)
All	All	0.77	3/6834 (0.0%)	0.79	6/9218 (0.1%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	146	VAL	CB-CG2	-6.37	1.39	1.52
1	C	179	MSE	SE-CE	-6.18	1.59	1.95
1	A	179	MSE	SE-CE	-5.35	1.63	1.95

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	D	12	ARG	NE-CZ-NH1	6.49	123.55	120.30
1	B	134	ASP	CB-CG-OD1	6.00	123.70	118.30
1	C	49	ARG	NE-CZ-NH1	5.61	123.10	120.30
1	B	89	ASP	CB-CG-OD1	5.37	123.13	118.30
1	D	12	ARG	NE-CZ-NH2	-5.24	117.68	120.30
1	B	12	ARG	NE-CZ-NH1	5.11	122.85	120.30

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	1711	0	1654	12	0
1	B	1653	0	1607	13	0
1	C	1682	0	1622	15	0
1	D	1665	0	1621	26	0
2	A	31	0	19	2	0
2	B	31	0	19	1	0
2	C	31	0	19	2	0
2	D	31	0	19	1	0
3	A	5	0	0	0	0
3	D	5	0	0	0	0
4	A	24	0	32	4	0
4	B	24	0	32	2	0
4	C	18	0	24	1	0
4	D	18	0	24	4	0
5	A	149	0	0	4	0
5	B	170	0	0	4	0
5	C	158	0	0	3	0
5	D	169	0	0	3	0
All	All	7575	0	6692	65	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 5.

All (65) 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:13[B]:VAL:HG23	5:C:324:HOH:O	1.60	0.99
2:C:500:FMN:C4A	4:D:209:GOL:H2	2.07	0.85
1:B:97:HIS:HD2	1:B:102:ILE:HD12	1.44	0.81
1:D:90[A]:LEU:HD22	1:D:116:ARG:HG3	1.64	0.80
1:D:170:MSE:HA	1:D:170:MSE:HE2	1.75	0.69
4:A:208:GOL:H31	1:C:186:LEU:O	1.93	0.68
1:C:6:LEU:HG	1:D:148:VAL:HG11	1.77	0.66
1:C:149:TYR:HA	1:D:2[A]:MSE:HE2	1.77	0.65
1:D:90[A]:LEU:CD2	1:D:116:ARG:HG3	2.29	0.62

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:C:414:HOH:O	1:D:2[B]:MSE:HG2	2.01	0.61
1:A:6:LEU:HG	1:B:148:VAL:HG11	1.83	0.60
4:A:208:GOL:H2	5:A:448:HOH:O	2.00	0.60
2:A:500:FMN:C10	4:B:208:GOL:H2	2.32	0.59
1:D:128:THR:OG1	1:D:175:GLU:OE1	2.16	0.58
2:A:500:FMN:C4A	4:B:208:GOL:H2	2.33	0.58
1:C:170:MSE:HA	1:C:170:MSE:HE2	1.84	0.58
1:B:97:HIS:CD2	1:B:102:ILE:HD12	2.32	0.57
1:D:102:ILE:HG22	1:D:103:ILE:HG23	1.86	0.57
1:A:12:ARG:HA	1:A:147[B]:ARG:HD2	1.87	0.57
1:B:196:SER:OG	1:B:199:GLU:HG3	2.05	0.57
1:C:168:LEU:O	1:C:170:MSE:HE3	2.05	0.56
1:A:100:LYS:HE3	1:B:193:VAL:HG13	1.87	0.56
1:D:90[A]:LEU:HD22	1:D:116:ARG:CG	2.35	0.55
1:A:142:LEU:O	1:A:146:VAL:HG13	2.07	0.54
1:B:13:VAL:HG12	1:B:192:HIS:CE1	2.43	0.54
1:B:126:LYS:NZ	5:B:254:HOH:O	2.35	0.54
2:C:500:FMN:C10	4:D:209:GOL:H2	2.38	0.54
1:C:193:VAL:HG21	1:D:102:ILE:HD11	1.90	0.53
1:B:170:MSE:HE2	1:B:170:MSE:HA	1.90	0.53
1:C:13[A]:VAL:HG22	5:C:324:HOH:O	2.07	0.53
1:D:168:LEU:O	1:D:170:MSE:HE3	2.10	0.52
4:A:210:GOL:H2	2:B:500:FMN:C10	2.39	0.52
1:A:170:MSE:HA	1:A:170:MSE:HE2	1.91	0.52
1:A:27:ASP:CB	5:A:499:HOH:O	2.57	0.51
1:A:124:GLU:HG3	1:A:129[B]:GLN:OE1	2.10	0.51
1:C:13[A]:VAL:HG12	1:C:192:HIS:CE1	2.46	0.50
1:D:43:ASN:CG	4:D:209:GOL:H32	2.34	0.48
1:D:1:MSE:HE3	1:D:5:TYR:OH	2.14	0.48
1:B:57[B]:ASN:ND2	5:B:574:HOH:O	2.47	0.48
1:C:100:LYS:HE3	1:D:193:VAL:HG13	1.96	0.48
1:A:2[B]:MSE:HG2	1:B:148:VAL:HG12	1.96	0.47
1:D:43:ASN:ND2	4:D:209:GOL:H32	2.29	0.47
1:D:195:LYS:NZ	5:D:428:HOH:O	2.48	0.47
1:D:175:GLU:HB3	5:D:350:HOH:O	2.15	0.47
1:D:90[B]:LEU:HD13	1:D:116:ARG:HG3	1.96	0.46
1:D:196:SER:OG	1:D:199:GLU:HG3	2.15	0.46
1:D:165:LYS:HZ3	1:D:172:ASN:HA	1.80	0.46
1:B:169:ASP:CB	5:B:607:HOH:O	2.63	0.46
1:A:90:LEU:HD23	1:A:90:LEU:HA	1.80	0.45
1:C:17:ARG:NE	1:C:187:GLN:OE1	2.50	0.45

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:192:HIS:ND1	5:D:278:HOH:O	2.26	0.45
4:A:208:GOL:C2	5:A:448:HOH:O	2.61	0.44
1:B:113:GLU:OE2	5:B:585:HOH:O	2.21	0.44
1:C:144[A]:GLN:O	1:C:147[A]:ARG:HB2	2.17	0.43
1:D:92:TRP:CE3	1:D:93:TRP:HA	2.53	0.43
1:C:142:LEU:O	1:C:146:VAL:HG13	2.19	0.43
1:A:61:ASP:OD2	1:A:167:TYR:OH	2.27	0.43
1:B:90:LEU:HD13	1:B:90:LEU:HA	1.92	0.42
1:C:129[B]:GLN:OE1	1:D:128:THR:HG21	2.19	0.42
4:C:207:GOL:H12	2:D:500:FMN:C4A	2.50	0.41
1:A:45:PHE:HB2	5:A:241:HOH:O	2.20	0.41
1:C:2:MSE:HG3	1:D:148:VAL:HG12	2.01	0.41
1:A:96:PHE:O	1:A:100:LYS:HG2	2.21	0.41
1:D:132:ARG:HH11	1:D:132:ARG:HD2	1.72	0.41
1:D:165:LYS:NZ	1:D:172:ASN:HA	2.36	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	215/206 (104%)	213 (99%)	2 (1%)	0	100	100
1	B	207/206 (100%)	204 (99%)	3 (1%)	0	100	100
1	C	210/206 (102%)	203 (97%)	7 (3%)	0	100	100
1	D	208/206 (101%)	205 (99%)	3 (1%)	0	100	100
All	All	840/824 (102%)	825 (98%)	15 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains (i)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	175/167 (105%)	174 (99%)	1 (1%)	86	80
1	B	171/167 (102%)	171 (100%)	0	100	100
1	C	172/167 (103%)	170 (99%)	2 (1%)	71	59
1	D	173/167 (104%)	172 (99%)	1 (1%)	86	80
All	All	691/668 (103%)	687 (99%)	4 (1%)	86	80

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	141	ASN
1	C	12	ARG
1	C	116	ARG
1	D	172	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	141	ASN
1	D	190	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 monosaccharides in this entry.

5.6 Ligand geometry (i)

20 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	FMN	D	500	-	33,33,33	1.21	2 (6%)	48,50,50	1.43	8 (16%)
4	GOL	A	210	-	5,5,5	0.28	0	5,5,5	0.99	0
4	GOL	B	207	-	5,5,5	0.44	0	5,5,5	0.90	0
2	FMN	A	500	-	33,33,33	1.41	2 (6%)	48,50,50	1.03	4 (8%)
4	GOL	A	208	-	5,5,5	0.60	0	5,5,5	0.92	0
3	SO4	A	206	-	4,4,4	0.40	0	6,6,6	1.02	0
2	FMN	C	500	-	33,33,33	1.34	2 (6%)	48,50,50	1.09	3 (6%)
4	GOL	C	206	-	5,5,5	0.29	0	5,5,5	0.44	0
4	GOL	B	208	-	5,5,5	0.29	0	5,5,5	0.87	0
4	GOL	D	209	-	5,5,5	0.73	0	5,5,5	0.69	0
4	GOL	A	207	-	5,5,5	0.39	0	5,5,5	0.30	0
4	GOL	D	208	-	5,5,5	0.39	0	5,5,5	0.38	0
4	GOL	A	209	-	5,5,5	0.70	0	5,5,5	0.56	0
4	GOL	D	207	-	5,5,5	0.49	0	5,5,5	0.38	0
4	GOL	B	206	-	5,5,5	0.41	0	5,5,5	0.19	0
3	SO4	D	206	-	4,4,4	0.31	0	6,6,6	1.07	1 (16%)
4	GOL	C	207	-	5,5,5	0.32	0	5,5,5	0.19	0
4	GOL	B	209	-	5,5,5	0.31	0	5,5,5	0.75	0
2	FMN	B	500	-	33,33,33	1.25	3 (9%)	48,50,50	1.32	7 (14%)
4	GOL	C	208	-	5,5,5	0.60	0	5,5,5	0.38	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	GOL	D	209	-	-	3/4/4/4	-
4	GOL	A	207	-	-	0/4/4/4	-
2	FMN	D	500	-	-	0/18/18/18	0/3/3/3
4	GOL	D	207	-	-	1/4/4/4	-
4	GOL	A	210	-	-	3/4/4/4	-
4	GOL	B	206	-	-	2/4/4/4	-
4	GOL	A	208	-	-	4/4/4/4	-
4	GOL	C	207	-	-	4/4/4/4	-
4	GOL	D	208	-	-	0/4/4/4	-
2	FMN	C	500	-	-	1/18/18/18	0/3/3/3
4	GOL	B	209	-	-	2/4/4/4	-
4	GOL	A	209	-	-	2/4/4/4	-
2	FMN	B	500	-	-	1/18/18/18	0/3/3/3
4	GOL	C	206	-	-	2/4/4/4	-
4	GOL	B	208	-	-	1/4/4/4	-
4	GOL	C	208	-	-	4/4/4/4	-
4	GOL	B	207	-	-	2/4/4/4	-
2	FMN	A	500	-	-	0/18/18/18	0/3/3/3

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	500	FMN	C4A-N5	5.21	1.40	1.30
2	C	500	FMN	C4A-N5	5.01	1.40	1.30
2	D	500	FMN	C4A-N5	4.41	1.39	1.30
2	B	500	FMN	C4A-N5	3.45	1.37	1.30
2	A	500	FMN	C10-N1	2.66	1.38	1.33
2	B	500	FMN	C10-N1	2.52	1.38	1.33
2	C	500	FMN	C10-N1	2.44	1.38	1.33
2	D	500	FMN	C10-N1	2.19	1.37	1.33
2	B	500	FMN	C5'-C4'	2.07	1.54	1.51

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	500	FMN	C4-N3-C2	-3.43	119.31	125.64
2	C	500	FMN	C5A-C9A-N10	3.22	121.28	117.95
2	D	500	FMN	C9A-C5A-N5	-2.93	119.25	122.43
2	D	500	FMN	C5A-C9A-N10	2.83	120.88	117.95
2	B	500	FMN	C4A-C4-N3	2.73	120.13	113.19
2	D	500	FMN	C4-N3-C2	-2.73	120.60	125.64

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	500	FMN	C4A-C10-N10	2.66	120.38	116.48
2	A	500	FMN	C5A-C9A-N10	2.51	120.54	117.95
2	D	500	FMN	O5'-P-O1P	-2.50	99.46	106.47
2	B	500	FMN	O4-C4-C4A	-2.50	119.98	126.60
2	D	500	FMN	C10-C4A-N5	-2.46	119.63	124.86
2	D	500	FMN	C4A-C4-N3	2.40	119.28	113.19
2	A	500	FMN	C4A-C10-N10	2.36	119.93	116.48
2	D	500	FMN	C4A-C10-N10	2.29	119.83	116.48
2	C	500	FMN	C9A-N10-C10	-2.18	117.38	120.77
2	B	500	FMN	C4A-C10-N1	-2.16	119.71	124.73
3	D	206	SO4	O4-S-O3	2.15	118.24	109.06
2	B	500	FMN	C10-C4A-N5	-2.13	120.34	124.86
2	A	500	FMN	C9A-N10-C10	-2.11	117.48	120.77
2	B	500	FMN	O3P-P-O5'	2.10	112.31	106.73
2	D	500	FMN	C4A-C10-N1	-2.10	119.87	124.73
2	C	500	FMN	C4A-C10-N10	2.09	119.53	116.48
2	A	500	FMN	C9-C9A-N10	-2.01	119.12	121.84

There are no chirality outliers.

All (32) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	208	GOL	O1-C1-C2-C3
4	A	208	GOL	C1-C2-C3-O3
4	B	206	GOL	C1-C2-C3-O3
4	B	206	GOL	O2-C2-C3-O3
4	C	208	GOL	O1-C1-C2-C3
4	D	209	GOL	C1-C2-C3-O3
4	C	207	GOL	O2-C2-C3-O3
4	C	208	GOL	O2-C2-C3-O3
4	A	209	GOL	O1-C1-C2-C3
4	B	207	GOL	C1-C2-C3-O3
4	C	206	GOL	O1-C1-C2-C3
4	C	207	GOL	O1-C1-C2-C3
4	C	207	GOL	C1-C2-C3-O3
4	C	208	GOL	C1-C2-C3-O3
4	A	208	GOL	O1-C1-C2-O2
4	A	209	GOL	O1-C1-C2-O2
4	A	210	GOL	O2-C2-C3-O3
4	B	207	GOL	O2-C2-C3-O3
4	C	207	GOL	O1-C1-C2-O2
4	C	208	GOL	O1-C1-C2-O2

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms
4	D	209	GOL	O2-C2-C3-O3
4	B	208	GOL	O1-C1-C2-O2
4	B	209	GOL	O1-C1-C2-O2
4	D	209	GOL	O1-C1-C2-O2
4	A	210	GOL	C1-C2-C3-O3
4	A	208	GOL	O2-C2-C3-O3
4	C	206	GOL	O1-C1-C2-O2
4	D	207	GOL	O1-C1-C2-C3
4	A	210	GOL	O1-C1-C2-C3
4	B	209	GOL	O1-C1-C2-C3
2	B	500	FMN	C2'-C1'-N10-C10
2	C	500	FMN	C2'-C1'-N10-C10

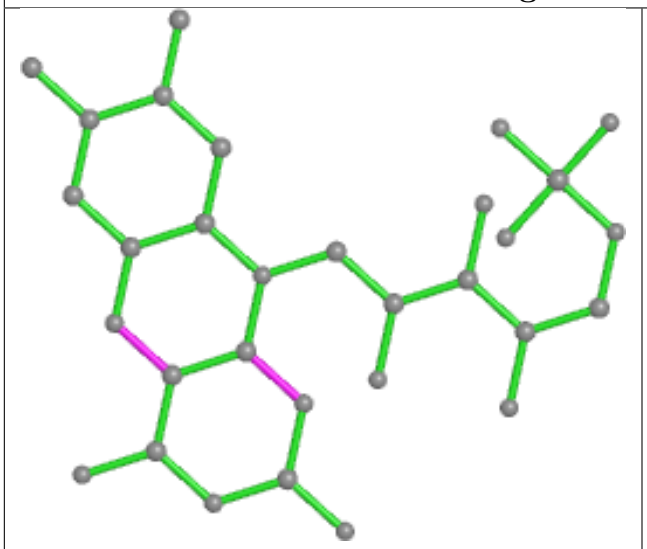
There are no ring outliers.

9 monomers are involved in 11 short contacts:

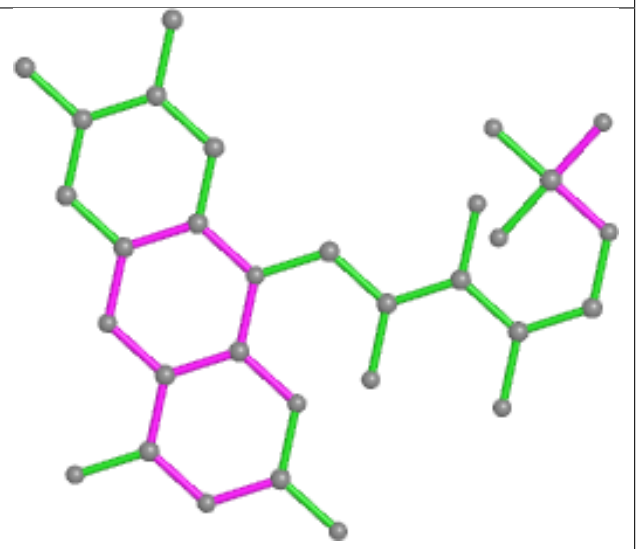
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	500	FMN	1	0
4	A	210	GOL	1	0
2	A	500	FMN	2	0
4	A	208	GOL	3	0
2	C	500	FMN	2	0
4	B	208	GOL	2	0
4	D	209	GOL	4	0
4	C	207	GOL	1	0
2	B	500	FMN	1	0

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

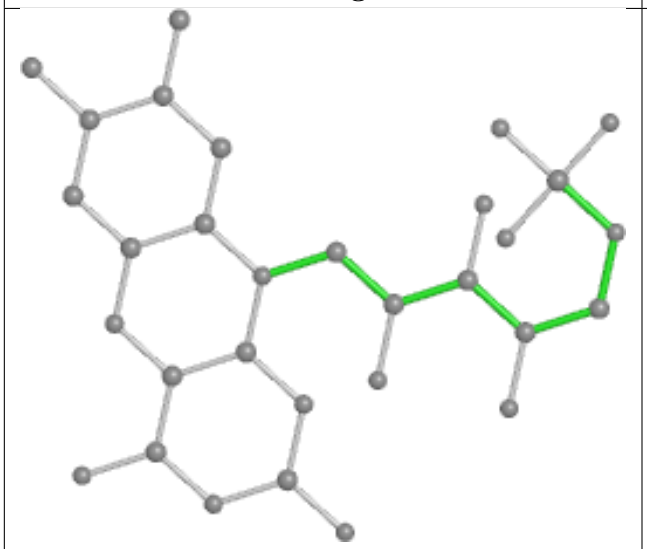
Ligand FMN D 500



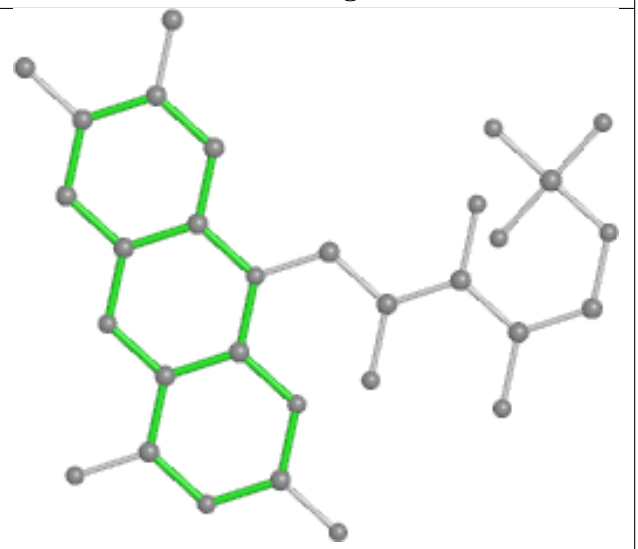
Bond lengths



Bond angles

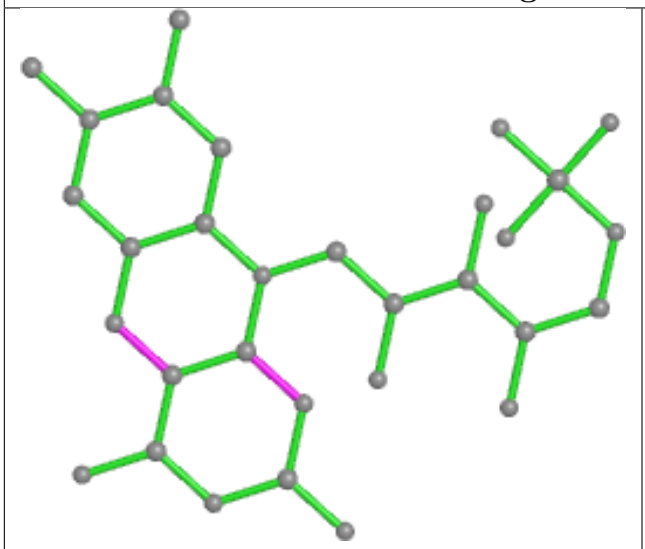


Torsions

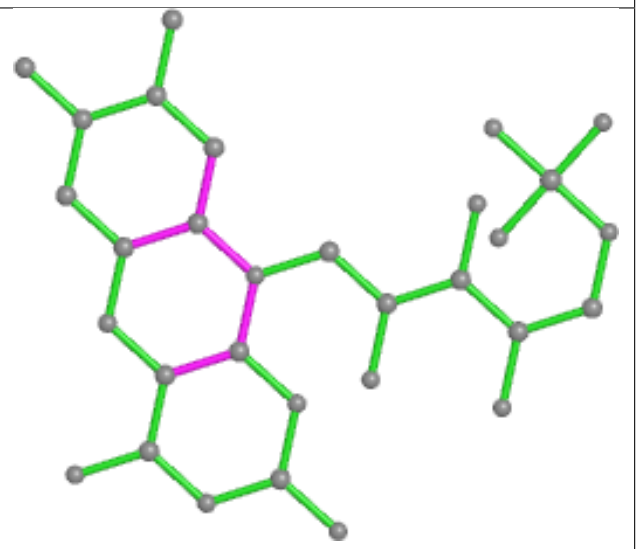


Rings

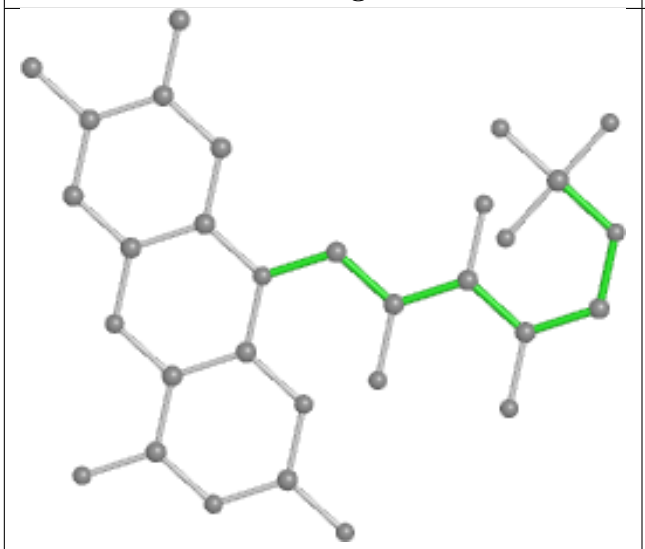
Ligand FMN A 500



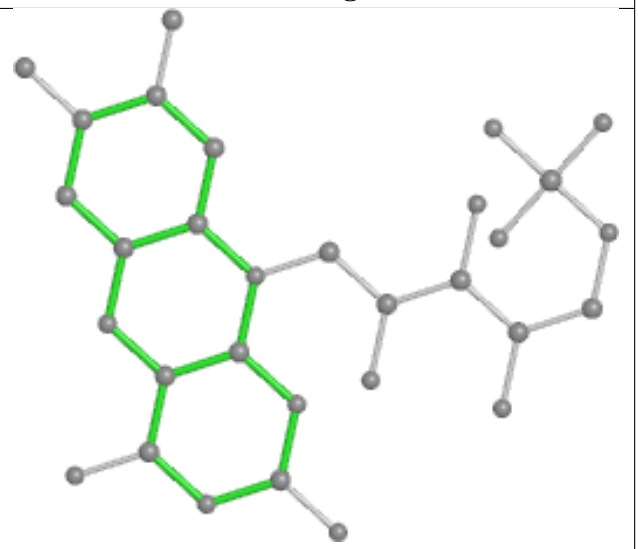
Bond lengths



Bond angles

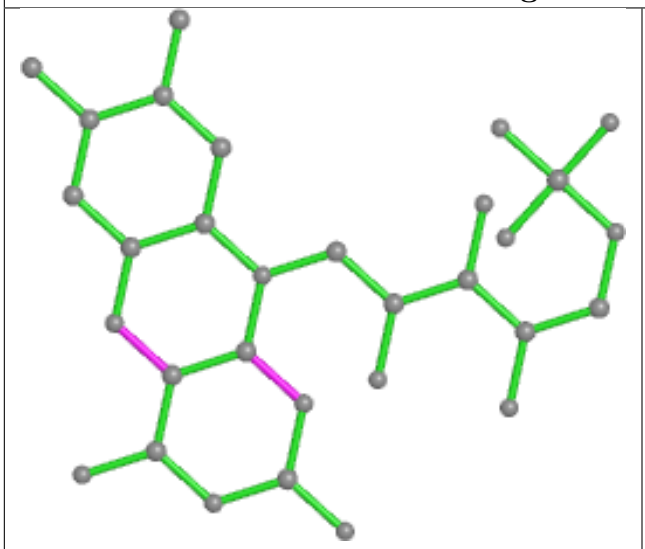


Torsions

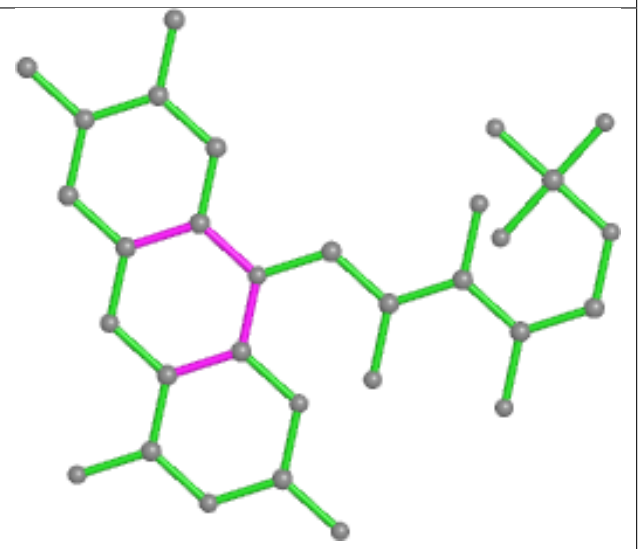


Rings

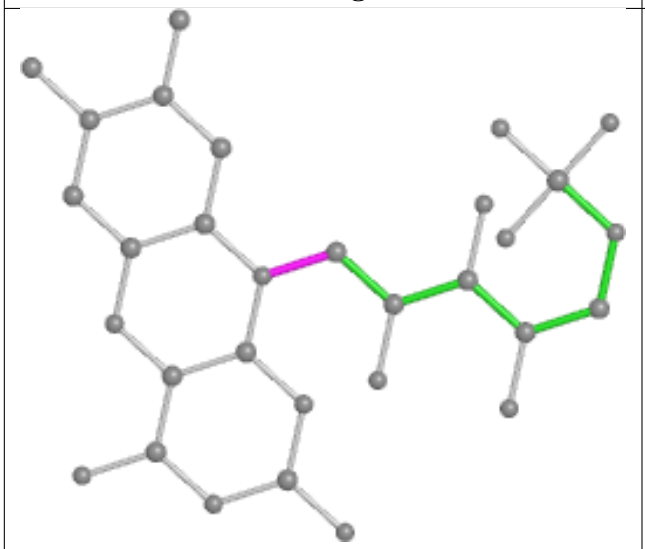
Ligand FMN C 500



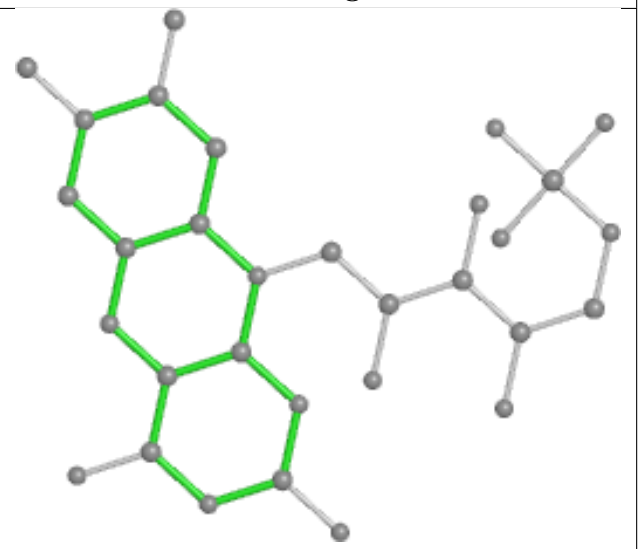
Bond lengths



Bond angles

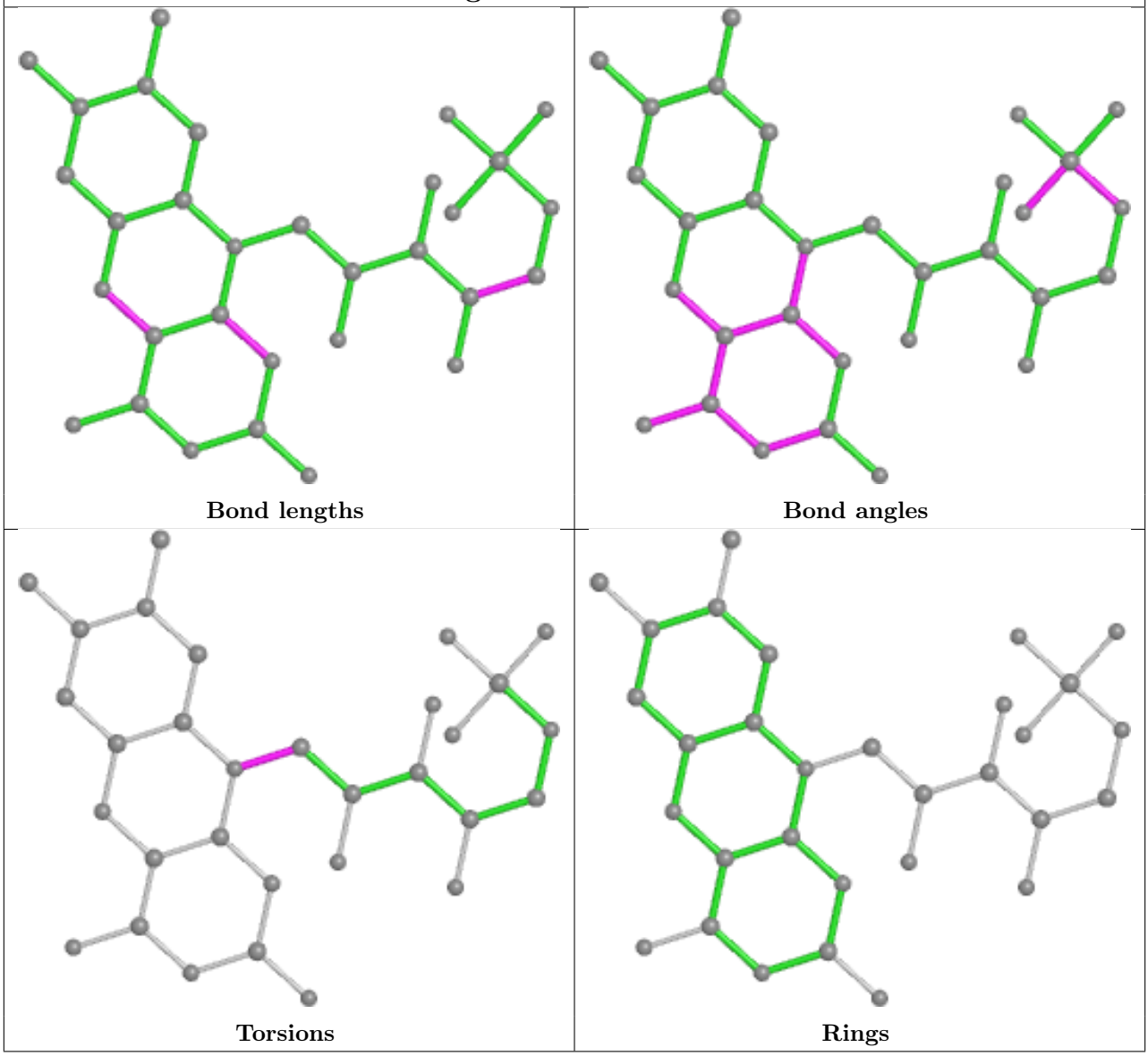


Torsions



Rings

Ligand FMN B 500



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, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	A	198/206 (96%)	0.56	19 (9%)	8	9	15, 21, 40, 46	0
1	B	197/206 (95%)	0.25	11 (5%)	24	27	15, 21, 38, 45	0
1	C	196/206 (95%)	0.41	18 (9%)	9	10	15, 21, 38, 44	0
1	D	197/206 (95%)	0.35	18 (9%)	9	10	15, 20, 41, 46	0
All	All	788/824 (95%)	0.39	66 (8%)	11	12	15, 21, 39, 46	0

All (66) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	103	ILE	6.7
1	A	98	VAL	6.5
1	A	173	GLY	5.7
1	C	98	VAL	5.5
1	A	102	ILE	5.4
1	A	104	THR	5.4
1	D	103	ILE	5.1
1	C	103	ILE	4.8
1	A	101	GLY	4.7
1	C	101	GLY	4.5
1	D	92	TRP	4.3
1	A	108	ALA	4.2
1	A	106	ASP	4.1
1	D	102	ILE	4.0
1	C	121	LEU	3.9
1	C	108	ALA	3.9
1	C	102	ILE	3.9
1	D	172	ASN	3.9
1	B	172	ASN	3.8
1	C	99	GLN	3.4
1	C	168	LEU	3.3

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	103	ILE	3.3
1	D	173	GLY	3.2
1	A	121	LEU	3.2
1	A	99[A]	GLN	3.0
1	D	105	LYS	3.0
1	D	104	THR	2.9
1	B	102	ILE	2.9
1	B	162	ASP	2.8
1	C	172	ASN	2.8
1	B	137	LEU	2.8
1	D	99	GLN	2.8
1	D	169	ASP	2.8
1	D	162	ASP	2.6
1	C	104	THR	2.6
1	D	106	ASP	2.6
1	C	118	TYR	2.6
1	B	106	ASP	2.6
1	A	0	GLY	2.6
1	D	137	LEU	2.6
1	B	166	THR	2.5
1	D	107	GLU	2.5
1	B	173	GLY	2.5
1	A	122	HIS	2.5
1	B	92	TRP	2.4
1	D	98	VAL	2.4
1	D	96	PHE	2.4
1	B	171	PRO	2.4
1	D	133	LEU	2.3
1	D	138	PHE	2.3
1	A	105	LYS	2.3
1	C	109	ALA	2.3
1	C	122	HIS	2.3
1	A	166	THR	2.2
1	C	180	LEU	2.2
1	A	178[A]	LEU	2.2
1	A	107	GLU	2.2
1	A	118	TYR	2.2
1	A	92	TRP	2.2
1	C	92	TRP	2.1
1	A	95	GLU	2.1
1	C	173	GLY	2.1
1	C	177	ILE	2.1

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	C	68	LEU	2.0
1	B	104	THR	2.0
1	D	97	HIS	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)

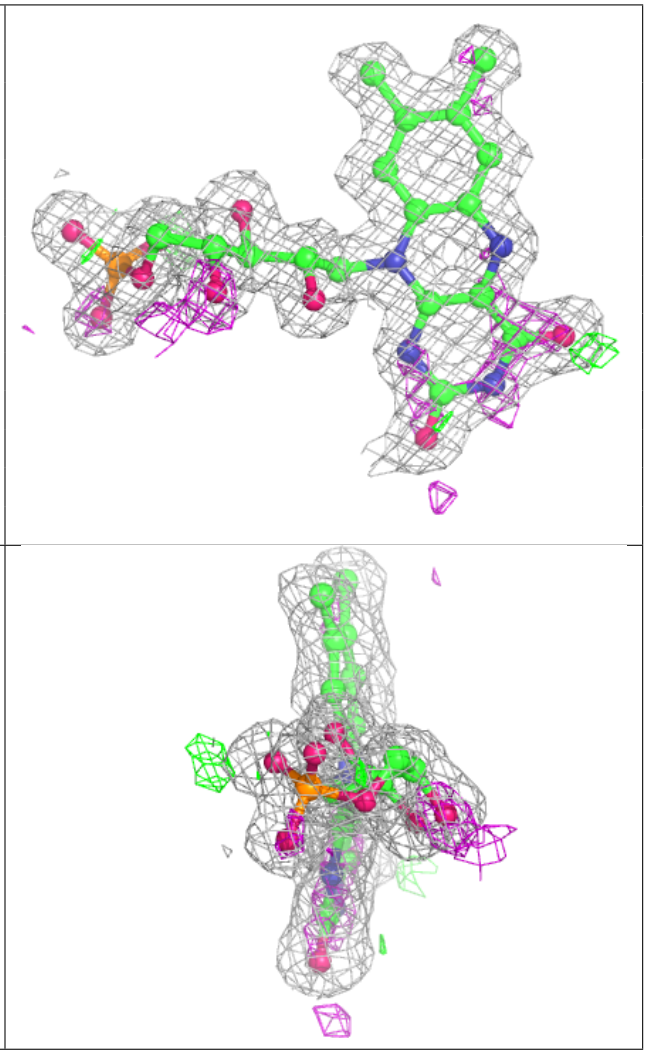
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	GOL	B	206	6/6	0.77	0.28	61,61,62,62	0
4	GOL	B	209	6/6	0.82	0.16	31,38,40,40	0
4	GOL	A	208	6/6	0.86	0.21	33,40,40,47	0
4	GOL	A	210	6/6	0.86	0.18	26,39,41,43	0
4	GOL	B	208	6/6	0.88	0.19	32,42,43,46	0
4	GOL	C	208	6/6	0.88	0.20	28,41,43,47	0
4	GOL	D	208	6/6	0.88	0.18	34,41,44,46	0
4	GOL	C	207	6/6	0.89	0.14	29,42,47,48	0
4	GOL	C	206	6/6	0.90	0.11	47,50,51,51	0
4	GOL	B	207	6/6	0.90	0.22	39,44,46,46	0
4	GOL	D	209	6/6	0.90	0.18	29,39,44,47	0
4	GOL	A	207	6/6	0.92	0.18	35,37,38,39	0
4	GOL	A	209	6/6	0.92	0.18	22,37,43,46	0
4	GOL	D	207	6/6	0.93	0.22	33,40,42,45	0
3	SO4	A	206	5/5	0.95	0.12	33,34,36,38	0
2	FMN	A	500	31/31	0.96	0.08	15,18,21,22	0
2	FMN	B	500	31/31	0.97	0.06	16,19,22,22	0
3	SO4	D	206	5/5	0.97	0.11	31,34,35,35	0
2	FMN	C	500	31/31	0.97	0.07	15,19,21,22	0
2	FMN	D	500	31/31	0.97	0.07	17,20,22,26	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.

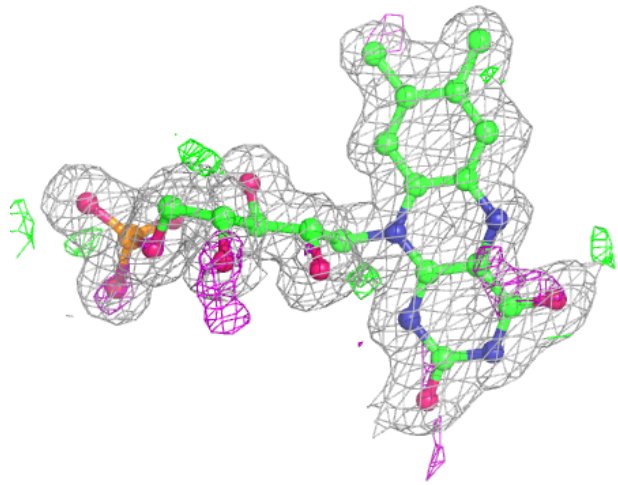
Electron density around FMN A 500:

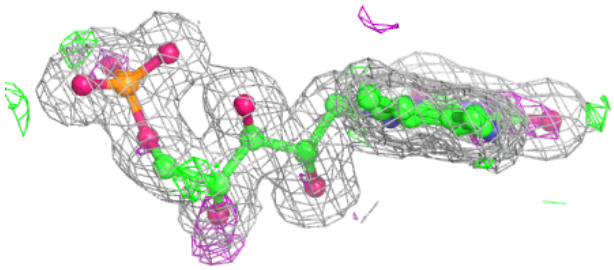
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

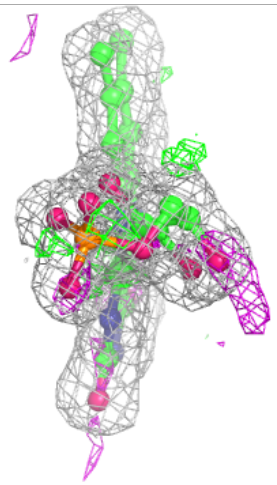


Electron density around FMN B 500:

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

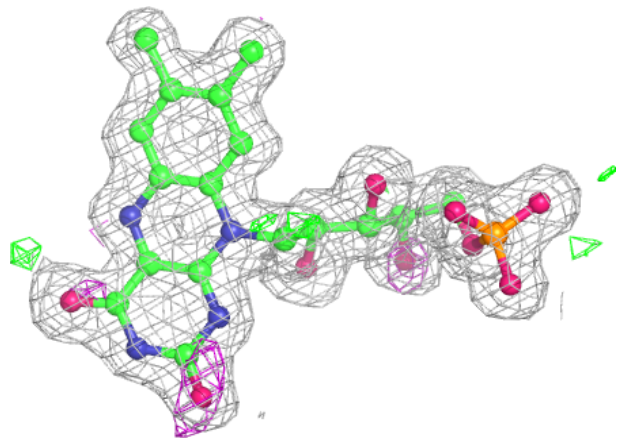


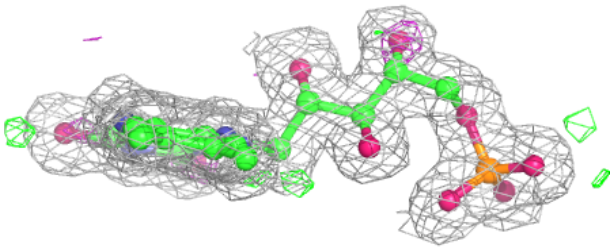


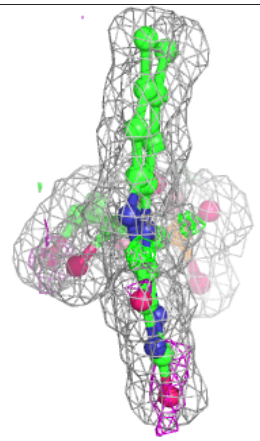


Electron density around FMN C 500:

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

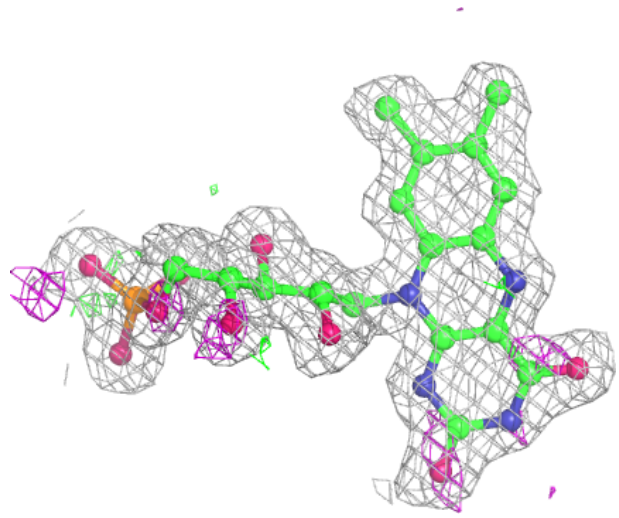


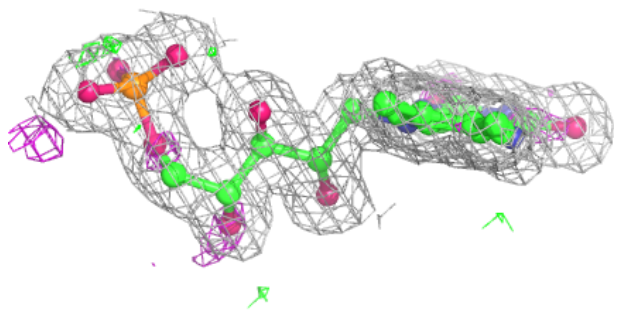




Electron density around FMN D 500:

$2mF_o$-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.