Full wwPDB X-ray Structure Validation Report ⓘ

Nov 2, 2026 – 09:13 am GMT

PDB ID	:	33QG / pdb_000033qg
Title	:	Cytochrome P450 reductase in complex with NADPH from Mycosarcoma maydis
Authors	:	Opperman, D.J.; Ebrecht, A.C.
Deposited on	:	2026-08-19
Resolution	:	2.45 Å(reported)

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

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

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

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

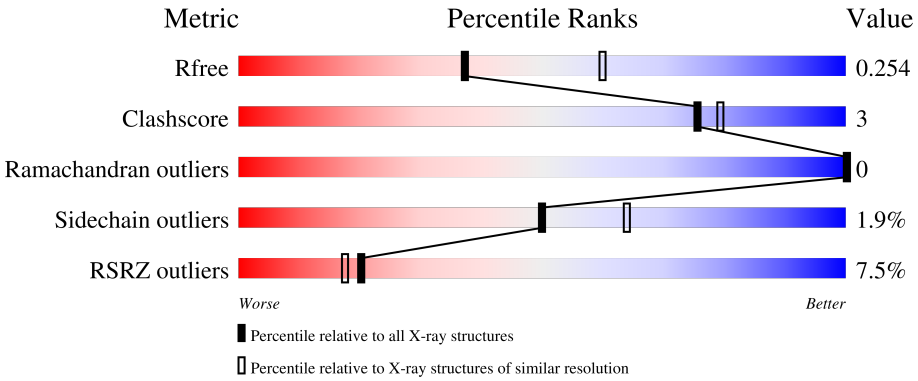
MolProbity	:	4-5-2 with Phenix2.2
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	2.2
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.51

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 2.45 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	1190 (2.46-2.46)
Clashscore	190562	1229 (2.46-2.46)
Ramachandran outliers	187476	1218 (2.46-2.46)
Sidechain outliers	187428	1218 (2.46-2.46)
RSRZ outliers	180081	1190 (2.46-2.46)

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	722	5% 86% 6% 7%
1	B	722	9% 83% 9% · 7%

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 11114 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.

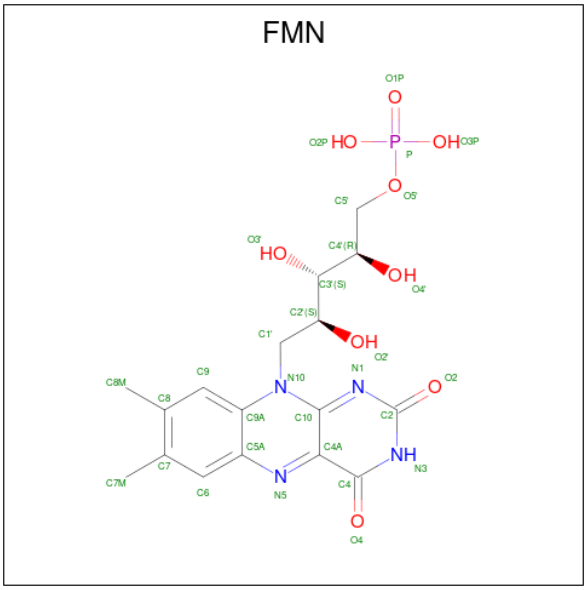
- Molecule 1 is a protein called NADPH–cytochrome P450 reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	671	Total	C	N	O	S	0	2	0
			5315	3371	917	1011	16			
1	B	671	Total	C	N	O	S	0	2	0
			5318	3374	916	1012	16			

There are 6 discrepancies between the modelled and reference sequences:

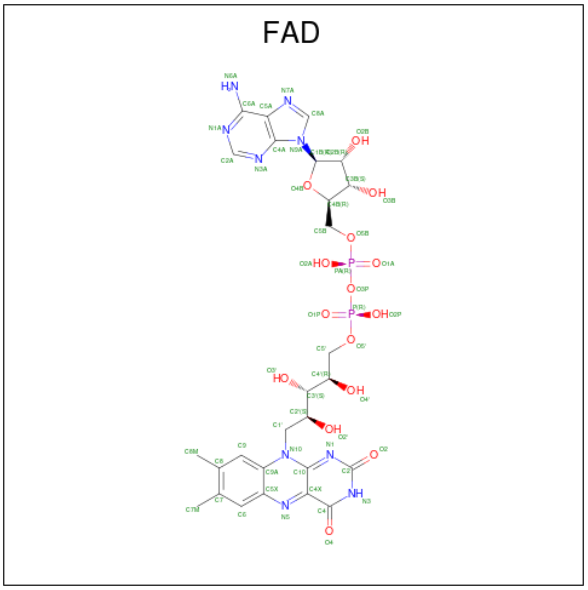
Chain	Residue	Modelled	Actual	Comment	Reference
A	305	GLU	GLN	conflict	UNP A0A1S6R4L8
A	402	LEU	ILE	conflict	UNP A0A1S6R4L8
A	406	GLN	GLU	conflict	UNP A0A1S6R4L8
B	305	GLU	GLN	conflict	UNP A0A1S6R4L8
B	402	LEU	ILE	conflict	UNP A0A1S6R4L8
B	406	GLN	GLU	conflict	UNP A0A1S6R4L8

- Molecule 2 is FLAVIN MONONUCLEOTIDE (CCD ID: FMN) (formula: $C_{17}H_{21}N_4O_9P$) (labeled as "Ligand of Interest" by depositor).



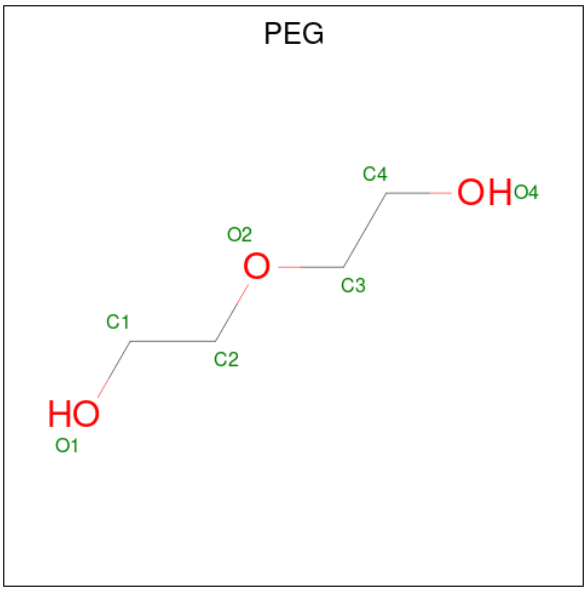
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
2	B	1	Total	C	N	O	P	0	0
			31	17	4	9	1		

- Molecule 3 is FLAVIN-ADENINE DINUCLEOTIDE (CCD ID: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$) (labeled as "Ligand of Interest" by depositor).



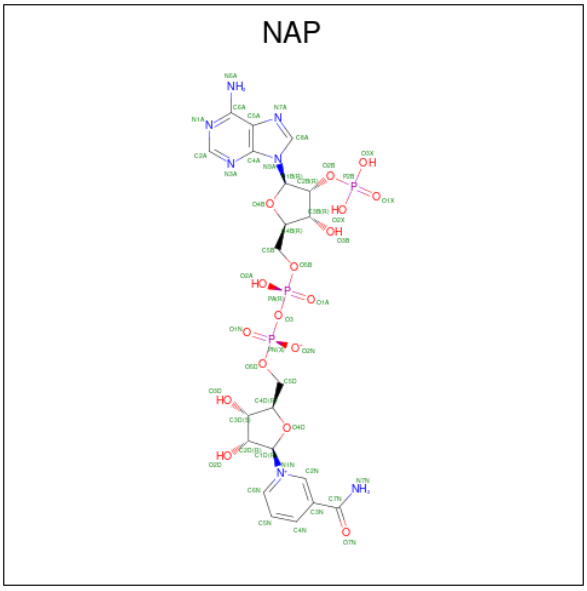
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
3	B	1	Total	C	N	O	P	0	0
			53	27	9	15	2		

- Molecule 4 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 7 4 3	0	0
4	A	1	Total C O 7 4 3	0	0
4	B	1	Total C O 7 4 3	0	0
4	B	1	Total C O 7 4 3	0	0

- Molecule 5 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (CCD ID: NAP) (formula: $C_{21}H_{28}N_7O_{17}P_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
5	B	1	Total	C	N	O	P	0	0
			48	21	7	17	3		

- Molecule 6 is water.

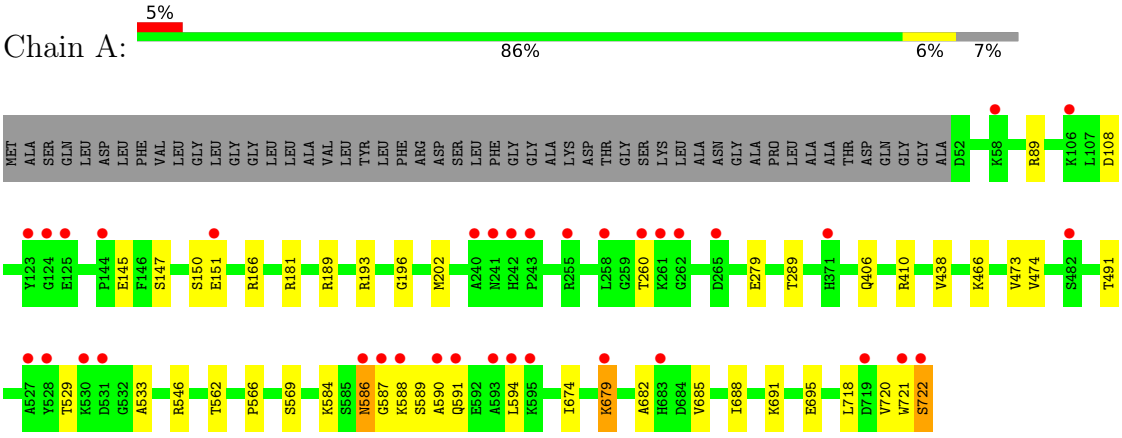
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	91	Total	O	0	0
			91	91		
6	B	98	Total	O	0	0
			98	98		

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.

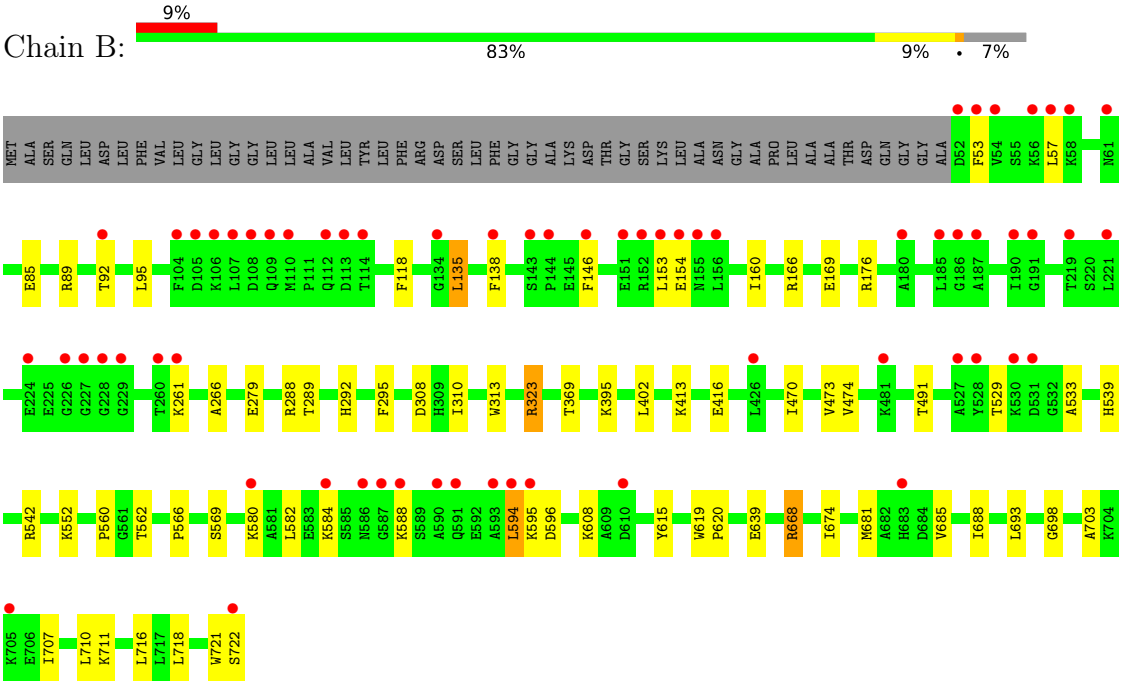
• Molecule 1: NADPH–cytochrome P450 reductase

Chain A:



• Molecule 1: NADPH–cytochrome P450 reductase

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	72.53Å 139.03Å 153.59Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	76.92 – 2.45 76.92 – 2.45	Depositor EDS
% Data completeness (in resolution range)	99.7 (76.92-2.45) 92.3 (76.92-2.45)	Depositor EDS
R_{merge}	0.41	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.62 (at 2.45Å)	Xtriage
Refinement program	REFMAC 5.8.0431 (REFMACAT 0.4.126)	Depositor
R, R_{free}	0.203 , 0.242 0.214 , 0.254	Depositor DCC
R_{free} test set	2840 reflections (4.92%)	wwPDB-VP
Wilson B-factor (Å^2)	33.3	Xtriage
Anisotropy	0.161	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 47.4	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.92	EDS
Total number of atoms	11114	wwPDB-VP
Average B, all atoms (Å^2)	49.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.76% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: FMN, NAP, PEG, FAD

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	0.51	0/5439	0.84	1/7353 (0.0%)
1	B	0.52	0/5443	0.85	1/7360 (0.0%)
All	All	0.51	0/10882	0.85	2/14713 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	4
1	B	0	3
All	All	0	7

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	596	ASP	N-CA-C	-10.91	100.28	112.72
1	A	586	ASN	N-CA-C	-5.54	106.10	112.86

There are no chirality outliers.

All (7) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	181	ARG	Sidechain
1	A	189	ARG	Sidechain
1	A	546	ARG	Sidechain
1	A	89	ARG	Sidechain

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Group
1	B	288	ARG	Sidechain
1	B	323	ARG	Sidechain
1	B	668	ARG	Sidechain

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	5315	0	5227	25	0
1	B	5318	0	5223	39	0
2	A	31	0	19	0	0
2	B	31	0	19	0	0
3	A	53	0	31	0	0
3	B	53	0	31	0	0
4	A	14	0	20	2	0
4	B	14	0	20	0	0
5	A	48	0	25	0	0
5	B	48	0	25	1	0
6	A	91	0	0	0	0
6	B	98	0	0	0	0
All	All	11114	0	10640	64	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 (64) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:679[A]:LYS:O	1:A:679[A]:LYS:NZ	2.17	0.77
1:B:292:HIS:HD2	1:B:615:TYR:OH	1.74	0.71
1:B:308:ASP:OD2	1:B:542:ARG:NH1	2.28	0.67
1:B:703:ALA:O	1:B:707:ILE:HD12	1.96	0.65
1:A:529:THR:HA	1:A:533:ALA:O	1.96	0.65
1:B:529:THR:HA	1:B:533:ALA:O	1.97	0.64
1:A:150:SER:O	1:A:151:GLU:HG2	1.98	0.64
1:A:590:ALA:O	1:A:594:LEU:HD23	1.98	0.63

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:53:PHE:O	1:B:57:LEU:HD13	1.98	0.62
1:A:674:ILE:HB	1:A:718:LEU:HD13	1.84	0.59
1:A:594:LEU:HD23	1:A:594:LEU:H	1.68	0.58
1:B:674:ILE:HB	1:B:718:LEU:HD13	1.86	0.58
1:B:57:LEU:HD12	1:B:95:LEU:HD12	1.86	0.57
1:B:118:PHE:HB2	1:B:160:ILE:HD13	1.85	0.57
1:A:721:TRP:O	1:A:722:SER:C	2.47	0.57
1:B:721:TRP:O	1:B:722:SER:C	2.48	0.57
5:B:805:NAP:H2N	5:B:805:NAP:H51N	1.87	0.57
1:B:685:VAL:O	1:B:688:ILE:HG22	2.05	0.56
1:B:279:GLU:OE1	1:B:289:THR:HG23	2.06	0.56
1:A:279:GLU:OE1	1:A:289:THR:HG23	2.06	0.56
1:A:685:VAL:O	1:A:688:ILE:HG22	2.06	0.54
1:B:580:LYS:O	1:B:584:LYS:HD3	2.08	0.53
1:A:108:ASP:OD2	1:A:147:SER:O	2.28	0.51
1:B:85:GLU:OE2	1:B:89:ARG:NH1	2.42	0.51
1:A:590:ALA:O	1:A:594:LEU:CD2	2.58	0.51
1:B:135:LEU:C	1:B:135:LEU:CD2	2.84	0.50
1:A:406:GLN:O	1:A:410:ARG:HD3	2.12	0.50
1:B:608:LYS:HG2	1:B:639:GLU:HG3	1.94	0.50
1:B:552:LYS:O	1:B:668:ARG:NH2	2.45	0.49
1:A:586:ASN:O	1:A:587:GLY:C	2.55	0.49
1:A:193:ARG:HH22	4:A:804:PEG:H22	1.77	0.49
1:B:313:TRP:HE1	1:B:539:HIS:HD2	1.62	0.48
1:B:295:PHE:HE2	1:B:470:ILE:HD12	1.79	0.48
1:A:473:VAL:HG23	1:A:562:THR:CG2	2.43	0.48
1:B:693:LEU:HD12	1:B:707:ILE:HD11	1.96	0.48
1:A:682:ALA:HB2	1:A:720:VAL:HG21	1.96	0.48
1:B:369:THR:HA	1:B:413:LYS:HD3	1.96	0.47
1:B:474:VAL:HA	1:B:491:THR:HB	1.98	0.46
1:B:560:PRO:HG3	1:B:681:MET:HG3	1.98	0.46
1:B:292:HIS:CD2	1:B:615:TYR:OH	2.62	0.46
1:B:703:ALA:O	1:B:707:ILE:CD1	2.64	0.46
1:A:474:VAL:HA	1:A:491:THR:HB	1.97	0.46
1:B:711:LYS:HE2	1:B:716:LEU:HD23	1.98	0.46
1:B:582:LEU:CD1	1:B:594:LEU:HD21	2.46	0.45
1:A:566:PRO:O	1:A:569:SER:HB3	2.17	0.45
1:B:473:VAL:HG23	1:B:562:THR:CG2	2.46	0.45
1:A:145:GLU:HG2	1:A:145:GLU:O	2.18	0.44
1:B:57:LEU:CD1	1:B:95:LEU:HD12	2.47	0.44
1:B:473:VAL:HG23	1:B:562:THR:HG21	1.98	0.44

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:566:PRO:O	1:B:569:SER:HB3	2.17	0.43
1:A:591:GLN:HA	1:A:594:LEU:HD21	1.99	0.43
1:A:594:LEU:HD23	1:A:594:LEU:N	2.32	0.43
1:B:582:LEU:HD12	1:B:594:LEU:HD21	2.01	0.43
1:A:584:LYS:C	1:A:586:ASN:H	2.27	0.42
1:A:196:GLY:HA3	1:A:202:MET:SD	2.59	0.42
1:B:138:PHE:C	1:B:138:PHE:CD1	2.97	0.42
1:B:395:LYS:O	1:B:402:LEU:HD23	2.20	0.42
1:B:146:PHE:CZ	1:B:153:LEU:HD21	2.54	0.41
1:B:266:ALA:HA	1:B:539:HIS:CD2	2.56	0.41
4:A:804:PEG:H12	1:B:698:GLY:HA2	2.03	0.41
1:A:695:GLU:OE1	1:B:176:ARG:NH2	2.53	0.41
1:B:619:TRP:N	1:B:620:PRO:CD	2.84	0.41
1:A:679[A]:LYS:H	1:A:679[A]:LYS:HG3	1.50	0.40
1:B:310:ILE:HG21	1:B:470:ILE:HD11	2.03	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	671/722 (93%)	652 (97%)	19 (3%)	0	100	100
1	B	671/722 (93%)	652 (97%)	19 (3%)	0	100	100
All	All	1342/1444 (93%)	1304 (97%)	38 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains (i)

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

resolution.

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	564/596 (95%)	554 (98%)	10 (2%)	51	65
1	B	564/596 (95%)	552 (98%)	12 (2%)	47	62
All	All	1128/1192 (95%)	1106 (98%)	22 (2%)	50	63

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	166	ARG
1	A	260	THR
1	A	438	VAL
1	A	466	LYS
1	A	588	LYS
1	A	589	SER
1	A	679[A]	LYS
1	A	679[B]	LYS
1	A	691	LYS
1	A	722	SER
1	B	92	THR
1	B	135	LEU
1	B	154	GLU
1	B	166	ARG
1	B	169	GLU
1	B	261	LYS
1	B	323	ARG
1	B	416	GLU
1	B	588	LYS
1	B	594	LEU
1	B	595	LYS
1	B	710	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	141	ASN
1	A	157	ASN
1	A	264	HIS
1	A	283	GLN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	364	HIS
1	A	378	ASN
1	B	141	ASN
1	B	264	HIS
1	B	283	GLN
1	B	292	HIS
1	B	539	HIS
1	B	683	HIS

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

5.6 Ligand geometry (i)

10 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	A	801	-	33,33,33	0.55	0	48,50,50	0.67	0
4	PEG	A	803	-	6,6,6	0.13	0	5,5,5	0.09	0
3	FAD	A	802	-	56,58,58	0.47	0	81,89,89	0.56	1 (1%)
3	FAD	B	802	-	56,58,58	0.48	0	81,89,89	0.57	1 (1%)
4	PEG	A	804	-	6,6,6	0.25	0	5,5,5	0.20	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
4	PEG	B	804	-	6,6,6	0.12	0	5,5,5	0.09	0
5	NAP	B	805	-	49,52,52	0.65	1 (2%)	69,80,80	0.75	2 (2%)
5	NAP	A	805	-	49,52,52	0.64	1 (2%)	69,80,80	0.67	1 (1%)
4	PEG	B	803	-	6,6,6	0.21	0	5,5,5	0.11	0
2	FMN	B	801	-	33,33,33	0.56	0	48,50,50	0.67	1 (2%)

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	A	801	-	-	0/18/18/18	0/3/3/3
4	PEG	A	803	-	-	2/4/4/4	-
3	FAD	A	802	-	-	0/34/50/50	0/6/6/6
3	FAD	B	802	-	-	0/34/50/50	0/6/6/6
4	PEG	A	804	-	-	3/4/4/4	-
4	PEG	B	804	-	-	2/4/4/4	-
5	NAP	B	805	-	-	6/35/67/67	0/5/5/5
5	NAP	A	805	-	-	8/35/67/67	0/5/5/5
4	PEG	B	803	-	-	2/4/4/4	-
2	FMN	B	801	-	-	0/18/18/18	0/3/3/3

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	805	NAP	C2N-N1N	2.65	1.38	1.35
5	B	805	NAP	C2N-N1N	2.57	1.38	1.35

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	B	805	NAP	PN-O3-PA	-3.38	121.24	132.83
5	A	805	NAP	C6N-N1N-C2N	-2.57	119.63	121.97
5	B	805	NAP	C6N-N1N-C2N	-2.45	119.74	121.97
3	B	802	FAD	C1'-C2'-C3'	2.29	116.19	109.79
2	B	801	FMN	C4-N3-C2	-2.12	121.73	125.64
3	A	802	FAD	C1'-C2'-C3'	2.00	115.39	109.79

There are no chirality outliers.

All (23) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	805	NAP	C2D-C1D-N1N-C2N
5	A	805	NAP	C2D-C1D-N1N-C6N
4	B	804	PEG	O2-C3-C4-O4
5	A	805	NAP	O4D-C4D-C5D-O5D
5	A	805	NAP	C3D-C4D-C5D-O5D
4	A	804	PEG	O2-C3-C4-O4
4	B	804	PEG	O1-C1-C2-O2
4	A	804	PEG	O1-C1-C2-O2
4	B	803	PEG	O1-C1-C2-O2
5	B	805	NAP	O4D-C4D-C5D-O5D
5	A	805	NAP	C2B-C1B-N9A-C8A
5	B	805	NAP	C2B-C1B-N9A-C8A
5	B	805	NAP	PA-O3-PN-O5D
5	A	805	NAP	C2B-O2B-P2B-O1X
5	B	805	NAP	C2B-O2B-P2B-O1X
4	B	803	PEG	C1-C2-O2-C3
4	A	803	PEG	C1-C2-O2-C3
4	A	804	PEG	C1-C2-O2-C3
5	A	805	NAP	C2B-C1B-N9A-C4A
5	B	805	NAP	C2B-C1B-N9A-C4A
5	A	805	NAP	O4B-C1B-N9A-C8A
4	A	803	PEG	O2-C3-C4-O4
5	B	805	NAP	O4B-C1B-N9A-C8A

There are no ring outliers.

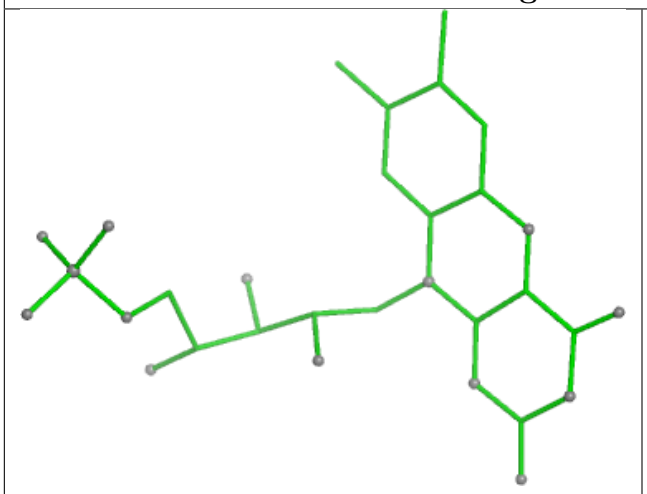
2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	804	PEG	2	0
5	B	805	NAP	1	0

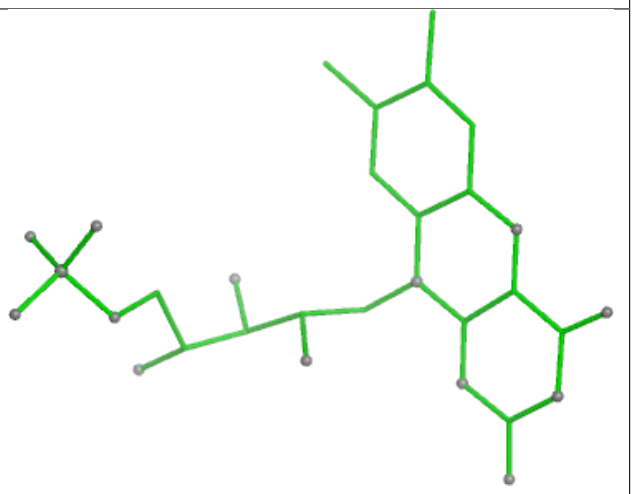
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

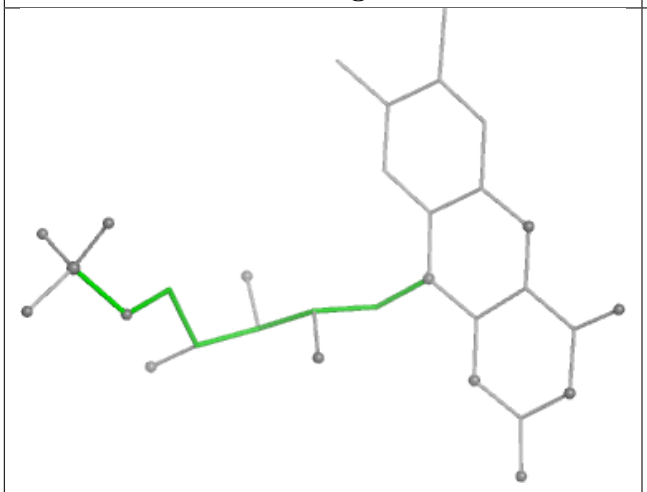
Ligand FMN A 801



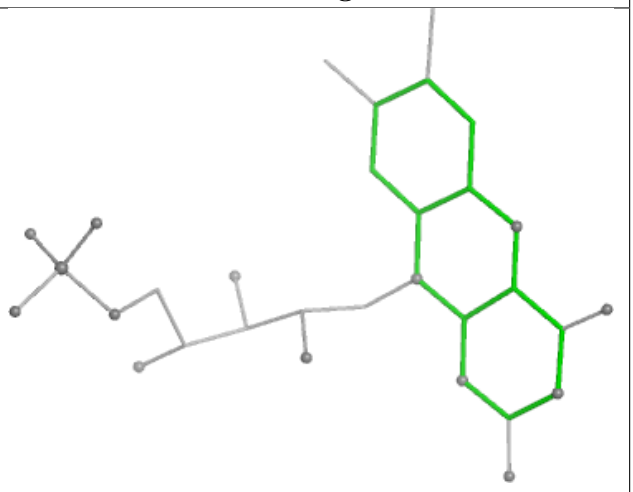
Bond lengths



Bond angles

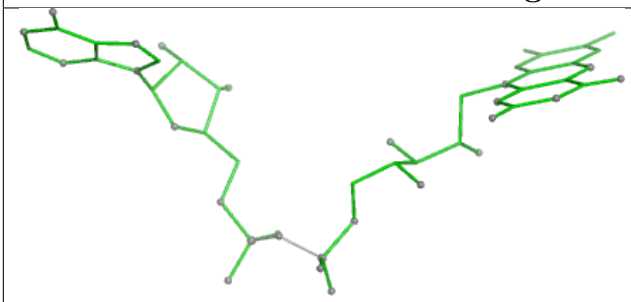


Torsions

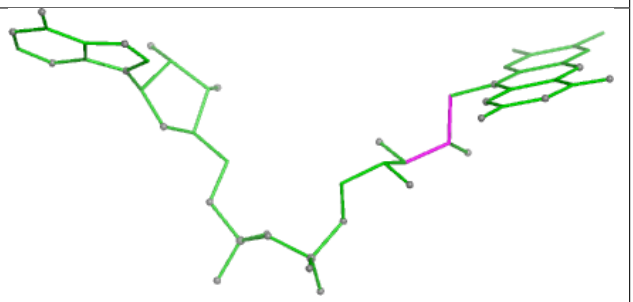


Rings

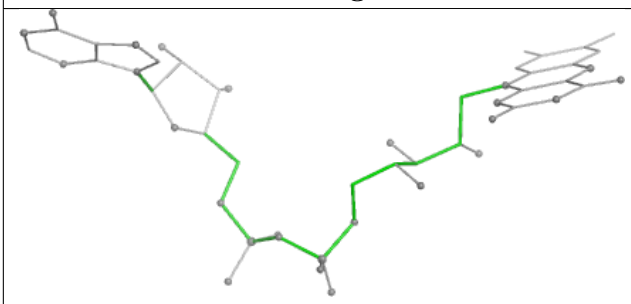
Ligand FAD A 802



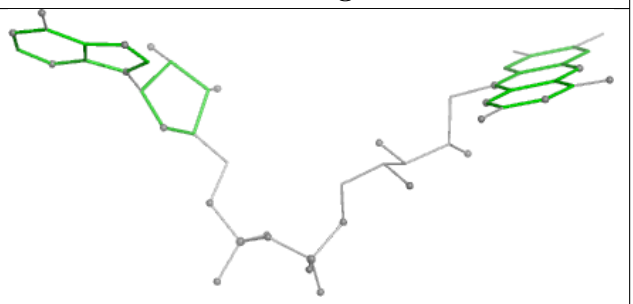
Bond lengths



Bond angles

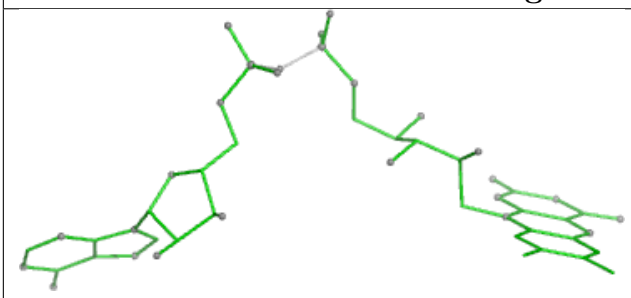


Torsions

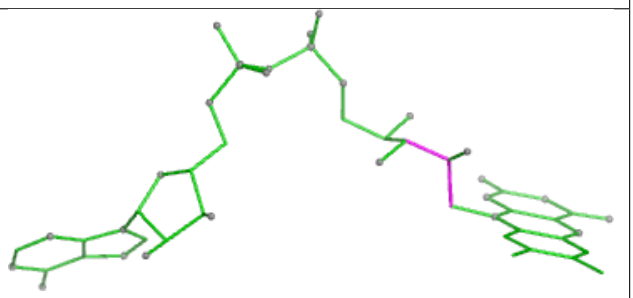


Rings

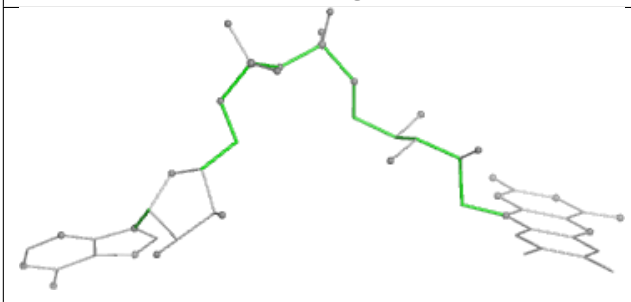
Ligand FAD B 802



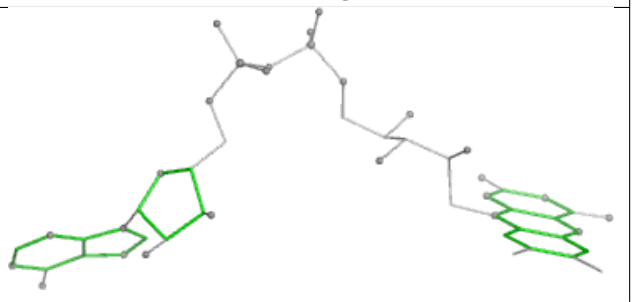
Bond lengths



Bond angles

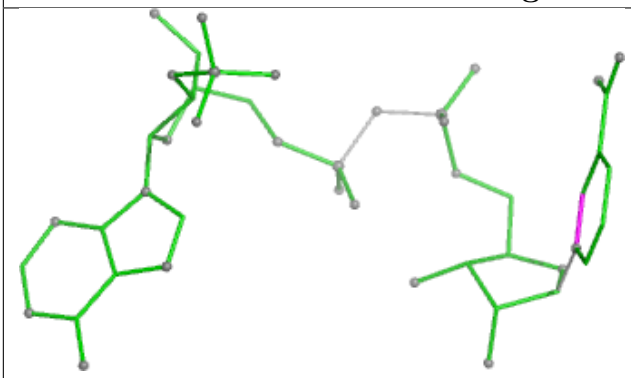


Torsions

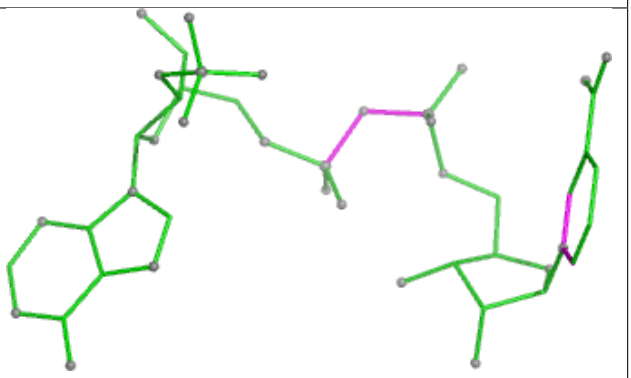


Rings

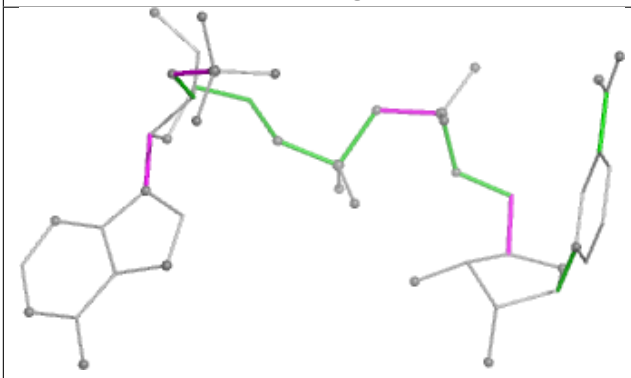
Ligand NAP B 805



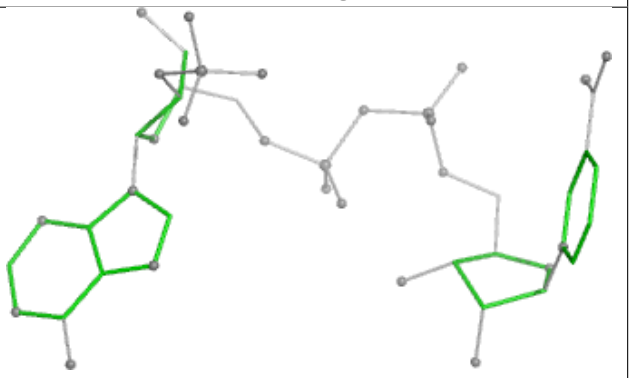
Bond lengths



Bond angles

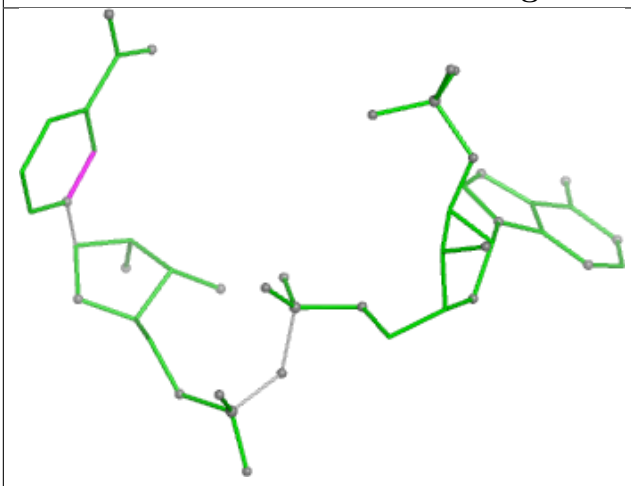


Torsions

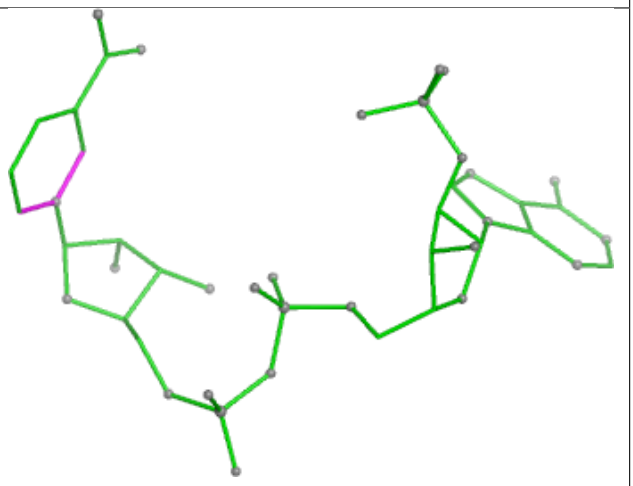


Rings

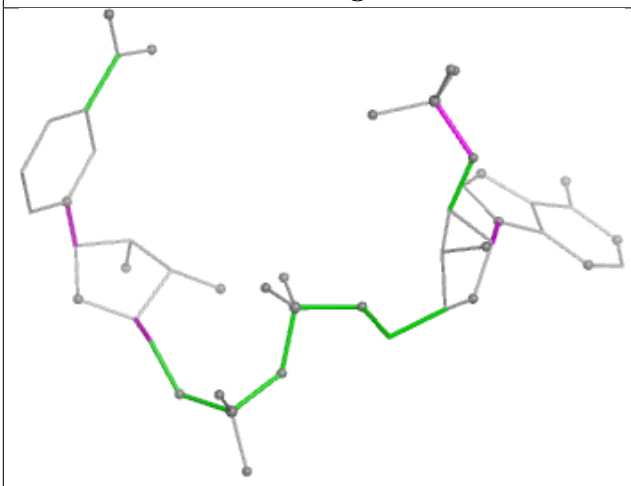
Ligand NAP A 805



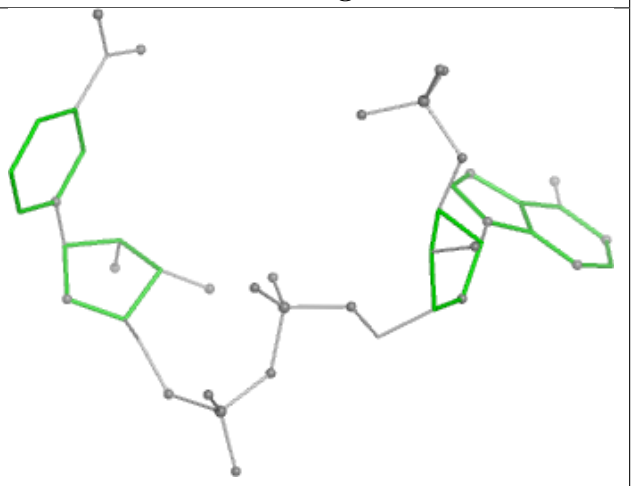
Bond lengths



Bond angles

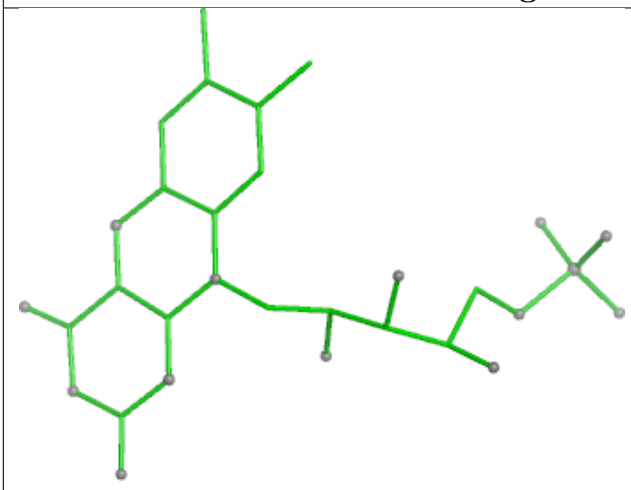


Torsions

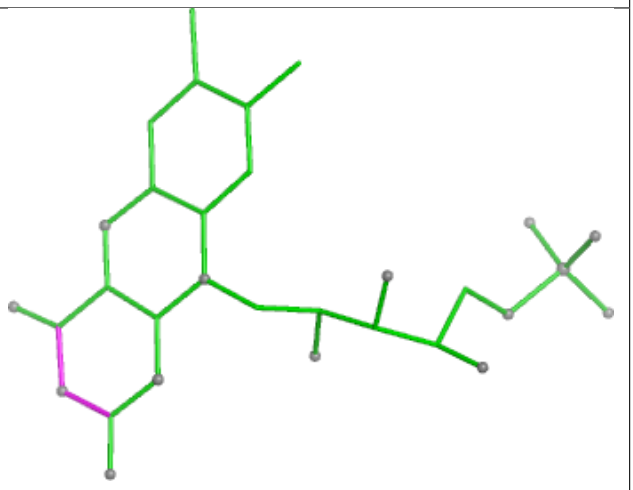


Rings

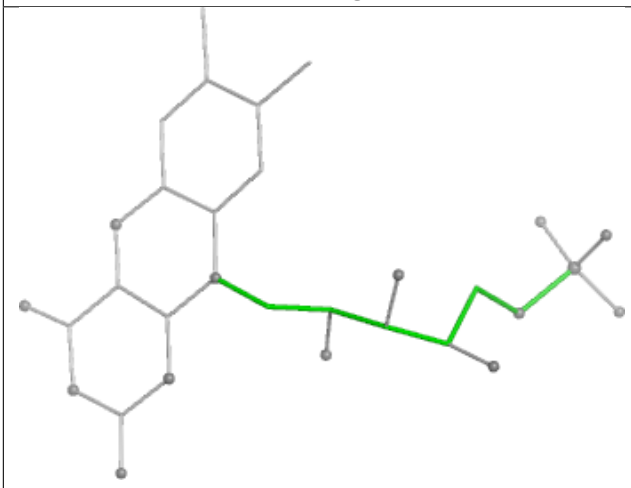
Ligand FMN B 801



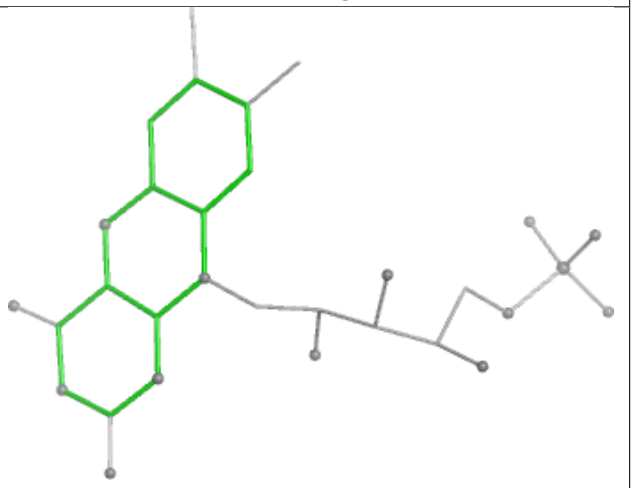
Bond lengths



Bond angles



Torsions



Rings

5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95^{th} 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	671/722 (92%)	0.45	36 (5%)	31	29	19, 43, 78, 133	2 (0%)
1	B	671/722 (92%)	0.67	64 (9%)	14	11	18, 44, 101, 132	2 (0%)
All	All	1342/1444 (92%)	0.56	100 (7%)	20	17	18, 44, 90, 133	4 (0%)

All (100) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	114	THR	4.1
1	A	594	LEU	4.1
1	B	190	ILE	3.9
1	B	107	LEU	3.9
1	A	260	THR	3.9
1	B	54	VAL	3.9
1	A	125	GLU	3.8
1	A	527	ALA	3.7
1	B	228	GLY	3.7
1	A	587	GLY	3.6
1	B	587	GLY	3.6
1	B	594	LEU	3.6
1	A	588	LYS	3.4
1	B	180	ALA	3.4
1	A	243	PRO	3.4
1	B	593	ALA	3.4
1	A	722	SER	3.4
1	B	151	GLU	3.3
1	B	586	ASN	3.3
1	A	124	GLY	3.3
1	B	722	SER	3.2
1	B	229	GLY	3.2
1	B	186	GLY	3.2
1	A	593	ALA	3.2

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	588	LYS	3.2
1	B	52	ASP	3.1
1	B	226	GLY	3.1
1	B	104	PHE	3.0
1	B	138	PHE	2.9
1	B	185	LEU	2.8
1	A	591	GLN	2.8
1	A	719	ASP	2.8
1	B	527	ALA	2.8
1	A	679[A]	LYS	2.8
1	B	155	ASN	2.8
1	B	110	MET	2.8
1	A	151	GLU	2.8
1	B	58	LYS	2.8
1	B	191	GLY	2.7
1	B	530	LYS	2.7
1	B	595	LYS	2.7
1	B	108	ASP	2.7
1	B	152	ARG	2.7
1	B	154	GLU	2.6
1	B	112	GLN	2.6
1	A	241	ASN	2.6
1	A	265	ASP	2.6
1	A	590	ALA	2.6
1	B	187	ALA	2.6
1	B	53	PHE	2.5
1	A	586	ASN	2.5
1	B	61	ASN	2.5
1	B	143	SER	2.5
1	B	113	ASP	2.4
1	B	531	ASP	2.4
1	B	580	LYS	2.4
1	A	528	TYR	2.4
1	A	240	ALA	2.4
1	A	482	SER	2.4
1	B	106	LYS	2.4
1	B	227	GLY	2.4
1	B	153	LEU	2.4
1	B	528	TYR	2.4
1	A	595	LYS	2.4
1	A	261	LYS	2.3
1	B	92	THR	2.3

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	109	GLN	2.3
1	B	224	GLU	2.3
1	A	531	ASP	2.3
1	B	134	GLY	2.2
1	B	221	LEU	2.2
1	B	683	HIS	2.2
1	B	584	LYS	2.2
1	A	144	PRO	2.2
1	A	106	LYS	2.2
1	B	156	LEU	2.2
1	B	610	ASP	2.2
1	A	530	LYS	2.2
1	A	683[A]	HIS	2.2
1	B	426	LEU	2.2
1	B	144	PRO	2.2
1	A	371	HIS	2.1
1	B	261	LYS	2.1
1	B	705	LYS	2.1
1	B	219	THR	2.1
1	B	591	GLN	2.1
1	A	721	TRP	2.1
1	B	590	ALA	2.1
1	B	57	LEU	2.1
1	A	58	LYS	2.1
1	B	146	PHE	2.1
1	A	262	GLY	2.1
1	B	56	LYS	2.1
1	B	481	LYS	2.1
1	A	242	HIS	2.1
1	A	255	ARG	2.0
1	A	258	LEU	2.0
1	B	260	THR	2.0
1	B	105	ASP	2.0
1	A	123	TYR	2.0

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

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

6.3 Carbohydrates (i)

There are no oligosaccharides in this entry.

6.4 Ligands (i)

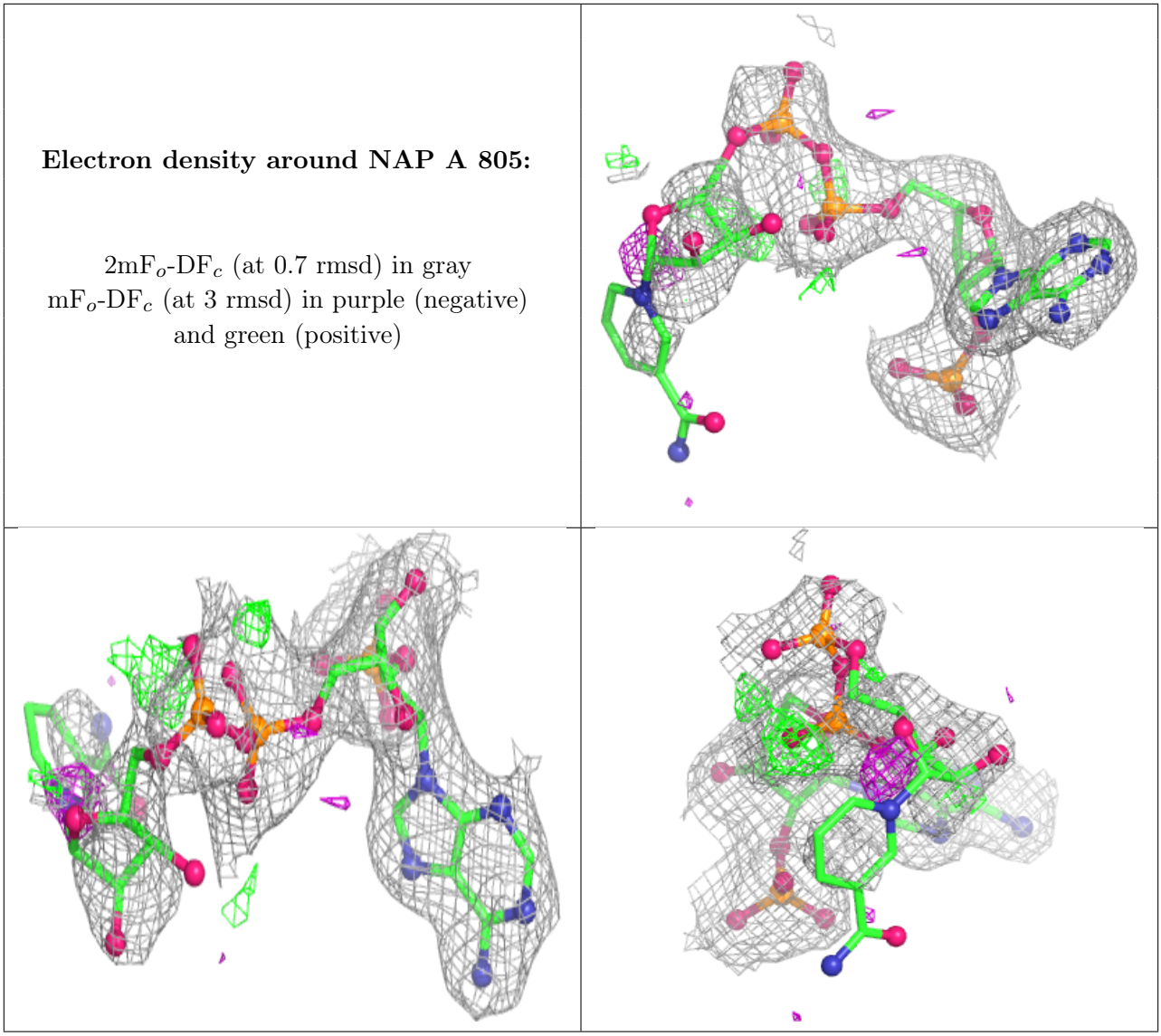
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' 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	PEG	A	804	7/7	0.78	0.19	76,78,85,87	0
4	PEG	B	804	7/7	0.81	0.18	51,65,87,87	0
4	PEG	B	803	7/7	0.85	0.16	41,58,66,66	0
4	PEG	A	803	7/7	0.88	0.16	62,72,80,80	0
5	NAP	A	805	48/48	0.93	0.14	28,58,128,137	0
5	NAP	B	805	48/48	0.93	0.13	25,51,112,122	0
2	FMN	B	801	31/31	0.94	0.08	28,37,43,45	0
3	FAD	A	802	53/53	0.95	0.08	18,24,39,51	0
2	FMN	A	801	31/31	0.96	0.07	28,34,41,44	0
3	FAD	B	802	53/53	0.96	0.07	19,28,43,47	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.

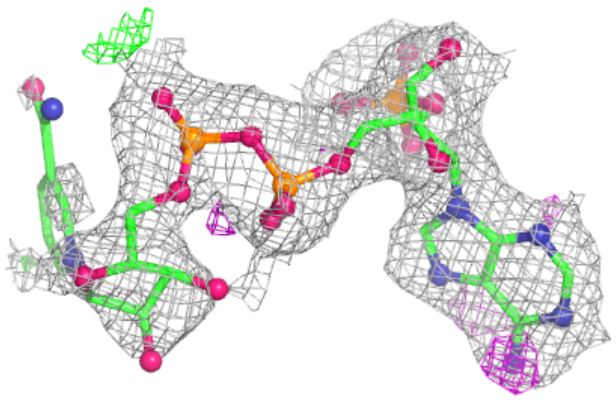
Electron density around NAP A 805:

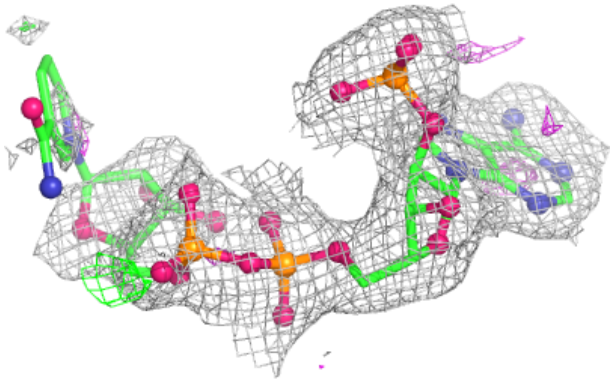
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

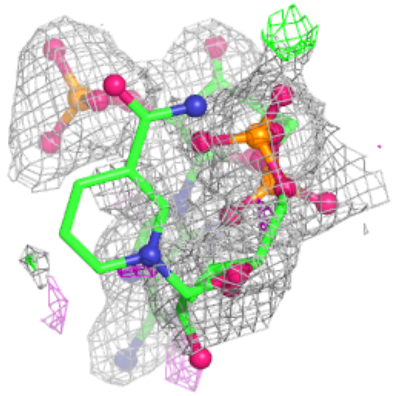


Electron density around NAP B 805:

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

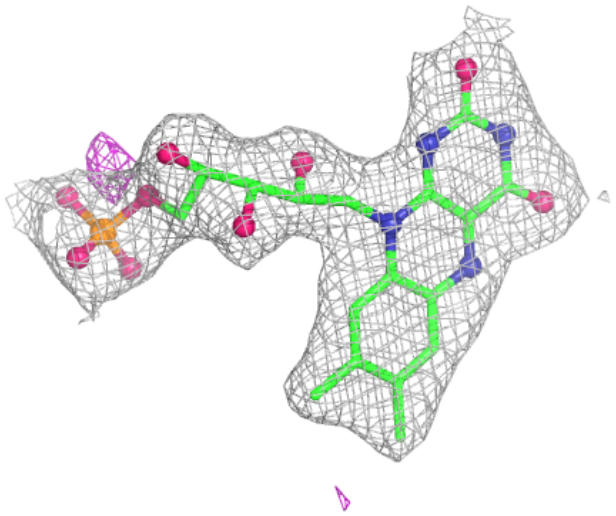


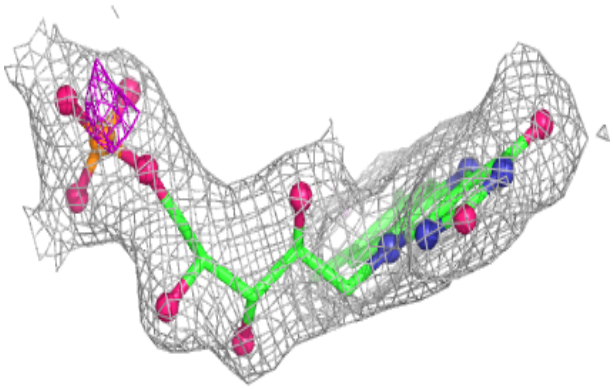




Electron density around FMN B 801:

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

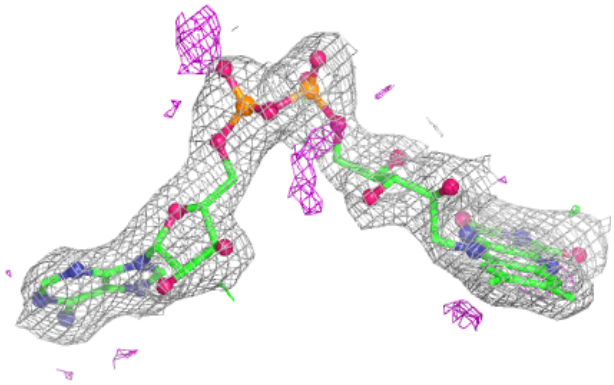


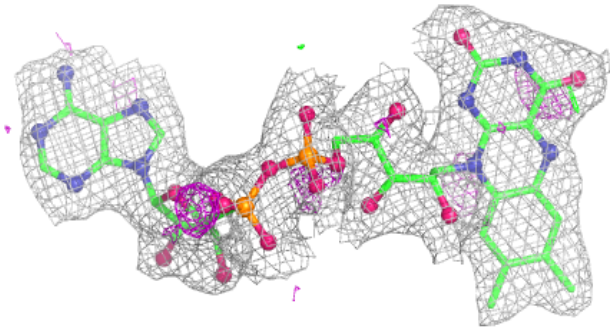


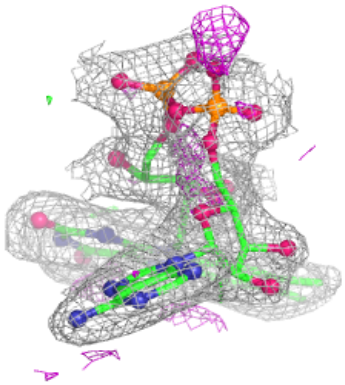


Electron density around FAD A 802:

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

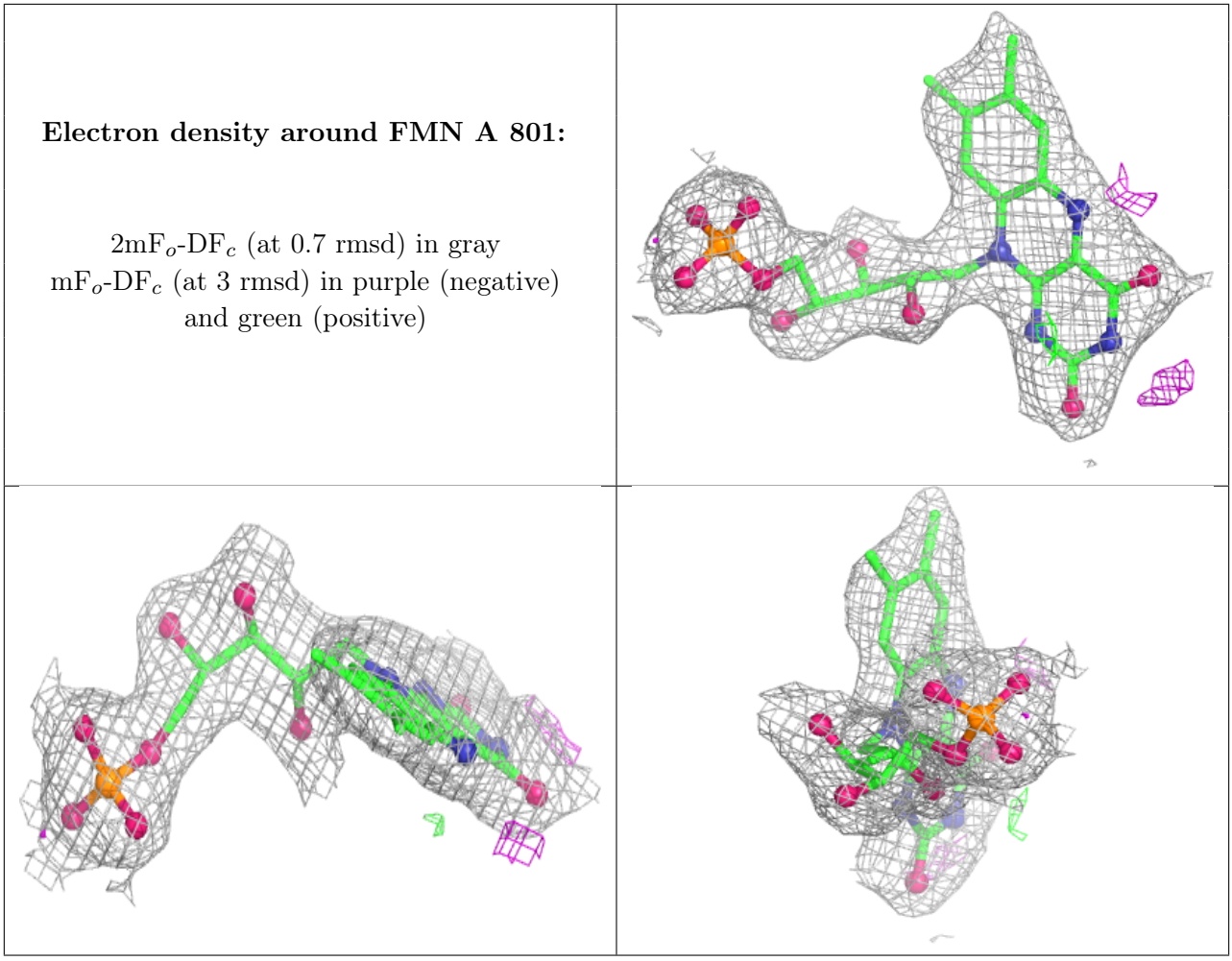






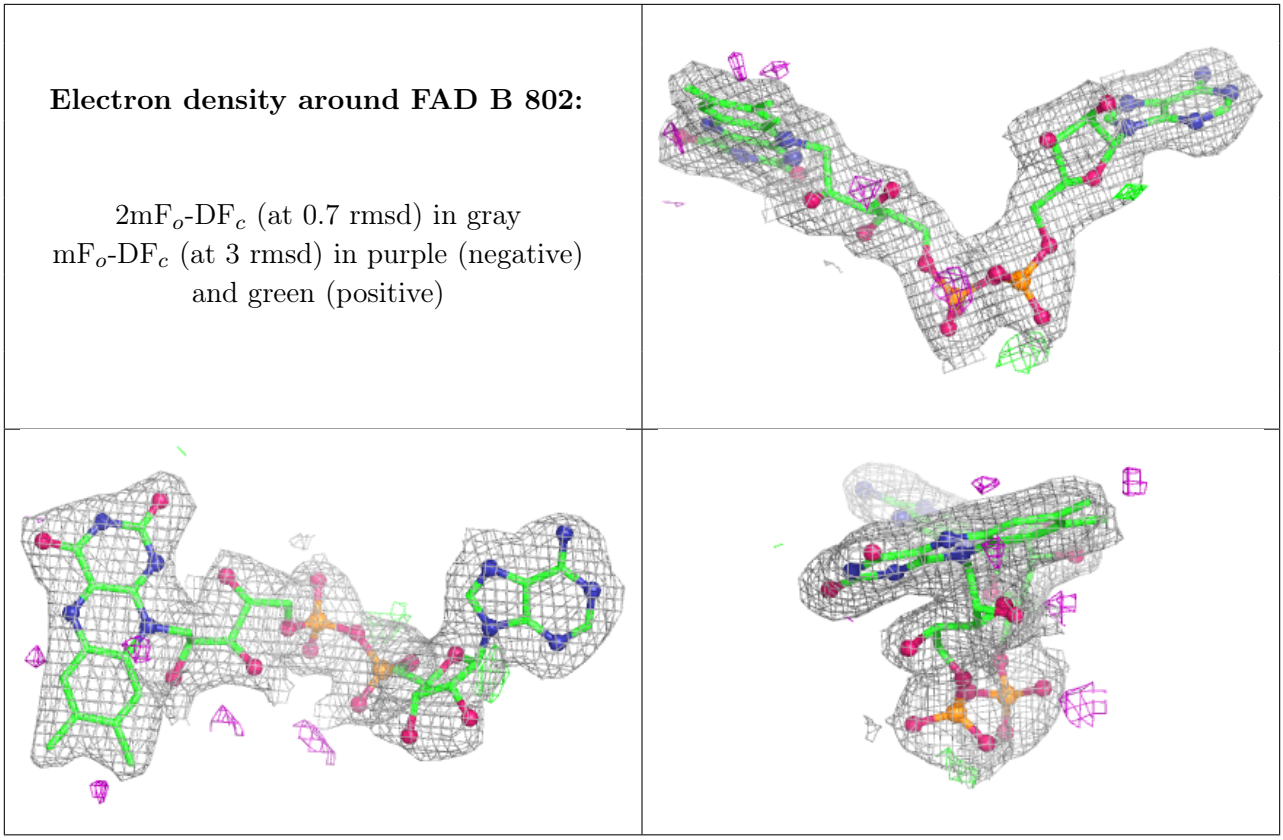
Electron density around FMN A 801:

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



Electron density around FAD B 802:

$2mF_o$-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.