



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 01:07 PM UTC

PDB ID : 8B2D / pdb_00008b2d
Title : CRYSTAL STRUCTURE OF BACTERIAL FLAVIN CONTAINING MONOOXYGENASE THERMORESISTANT MUTANT, IN COMPLEX WITH NADP+
Authors : Cea-Rama, I.; Sanz-Aparicio, J.; Ferrer Martinez, M.; Goris, M.; Bjerga, G.
Deposited on : 2022-09-13
Resolution : 1.62 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 Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

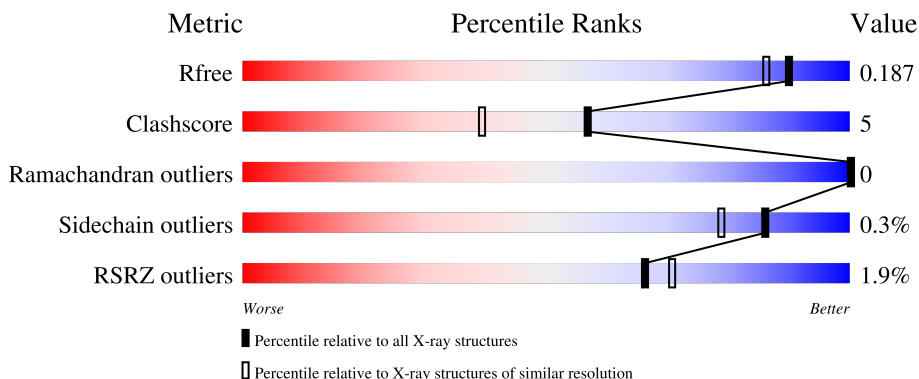
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.62 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	6728 (1.64-1.60)
Clashscore	190562	7023 (1.64-1.60)
Ramachandran outliers	187476	6898 (1.64-1.60)
Sidechain outliers	187428	6896 (1.64-1.60)
RSRZ outliers	180081	6727 (1.64-1.60)

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 $\leq 5\%$. 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	464	 2% 88% 9%
1	B	464	 2% 89% 6%

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
3	GOL	A	506	-	-	X	-
3	GOL	B	506	-	-	X	-

2 Entry composition i

There are 8 unique types of molecules in this entry. The entry contains 8111 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 Flavin-containing monooxygenase, Fmo.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	448	3699	2366	615	698	20	0	2	0
1	B	444	3653	2339	606	689	19	0	0	0

There are 56 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	95	PRO	ALA	engineered mutation	UNP F5SYD3
A	135	THR	SER	engineered mutation	UNP F5SYD3
A	197	GLY	ASP	engineered mutation	UNP F5SYD3
A	224	VAL	LEU	engineered mutation	UNP F5SYD3
A	236	ASP	LYS	engineered mutation	UNP F5SYD3
A	252	GLY	THR	engineered mutation	UNP F5SYD3
A	290	ASP	ASN	engineered mutation	UNP F5SYD3
A	296	PRO	LEU	engineered mutation	UNP F5SYD3
A	340	ILE	LEU	engineered mutation	UNP F5SYD3
A	353	GLN	MET	engineered mutation	UNP F5SYD3
A	358	ARG	LYS	engineered mutation	UNP F5SYD3
A	360	GLU	LEU	engineered mutation	UNP F5SYD3
A	363	LYS	VAL	engineered mutation	UNP F5SYD3
A	365	ASP	ALA	engineered mutation	UNP F5SYD3
A	370	ASP	THR	engineered mutation	UNP F5SYD3
A	371	PHE	TYR	engineered mutation	UNP F5SYD3
A	378	ASP	ASN	engineered mutation	UNP F5SYD3
A	393	VAL	THR	engineered mutation	UNP F5SYD3
A	398	LYS	LEU	engineered mutation	UNP F5SYD3
A	443	PHE	TYR	engineered mutation	UNP F5SYD3
A	457	LEU	-	expression tag	UNP F5SYD3
A	458	GLU	-	expression tag	UNP F5SYD3
A	459	HIS	-	expression tag	UNP F5SYD3
A	460	HIS	-	expression tag	UNP F5SYD3
A	461	HIS	-	expression tag	UNP F5SYD3

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
A	462	HIS	-	expression tag	UNP F5SYD3
A	463	HIS	-	expression tag	UNP F5SYD3
A	464	HIS	-	expression tag	UNP F5SYD3
B	95	PRO	ALA	engineered mutation	UNP F5SYD3
B	135	THR	SER	engineered mutation	UNP F5SYD3
B	197	GLY	ASP	engineered mutation	UNP F5SYD3
B	224	VAL	LEU	engineered mutation	UNP F5SYD3
B	236	ASP	LYS	engineered mutation	UNP F5SYD3
B	252	GLY	THR	engineered mutation	UNP F5SYD3
B	290	ASP	ASN	engineered mutation	UNP F5SYD3
B	296	PRO	LEU	engineered mutation	UNP F5SYD3
B	340	ILE	LEU	engineered mutation	UNP F5SYD3
B	353	GLN	MET	engineered mutation	UNP F5SYD3
B	358	ARG	LYS	engineered mutation	UNP F5SYD3
B	360	GLU	LEU	engineered mutation	UNP F5SYD3
B	363	LYS	VAL	engineered mutation	UNP F5SYD3
B	365	ASP	ALA	engineered mutation	UNP F5SYD3
B	370	ASP	THR	engineered mutation	UNP F5SYD3
B	371	PHE	TYR	engineered mutation	UNP F5SYD3
B	378	ASP	ASN	engineered mutation	UNP F5SYD3
B	393	VAL	THR	engineered mutation	UNP F5SYD3
B	398	LYS	LEU	engineered mutation	UNP F5SYD3
B	443	PHE	TYR	engineered mutation	UNP F5SYD3
B	457	LEU	-	expression tag	UNP F5SYD3
B	458	GLU	-	expression tag	UNP F5SYD3
B	459	HIS	-	expression tag	UNP F5SYD3
B	460	HIS	-	expression tag	UNP F5SYD3
B	461	HIS	-	expression tag	UNP F5SYD3
B	462	HIS	-	expression tag	UNP F5SYD3
B	463	HIS	-	expression tag	UNP F5SYD3
B	464	HIS	-	expression tag	UNP F5SYD3

- Molecule 2 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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

- Molecule 3 is GLYCEROL (CCD ID: GOL) (formula: C₃H₈O₃).



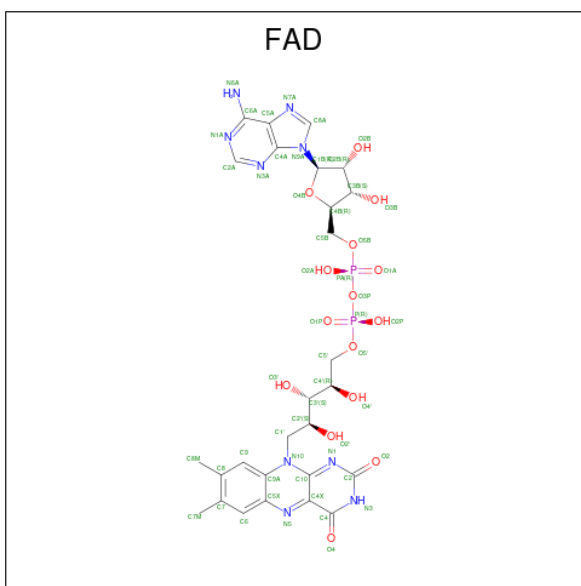
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			6	3	3		
3	A	1	Total	C	O	0	0
			6	3	3		

Continued on next page...

Continued from previous page...

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

- Molecule 4 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	
4	A	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
4	B	1	Total	C	N	O	P	0	0
			53	27	9	15	2		

- 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).

- Molecule 7 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	B	2	Total Cl 2 2	0	0

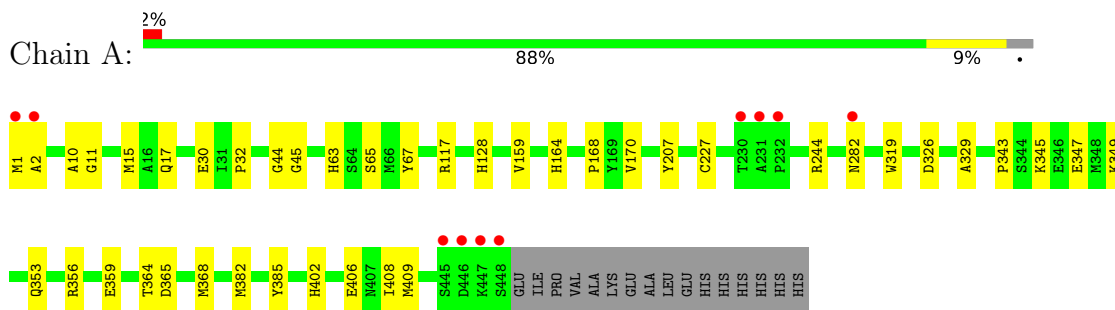
- Molecule 8 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	249	Total O 249 249	0	0
8	B	246	Total O 246 246	0	0

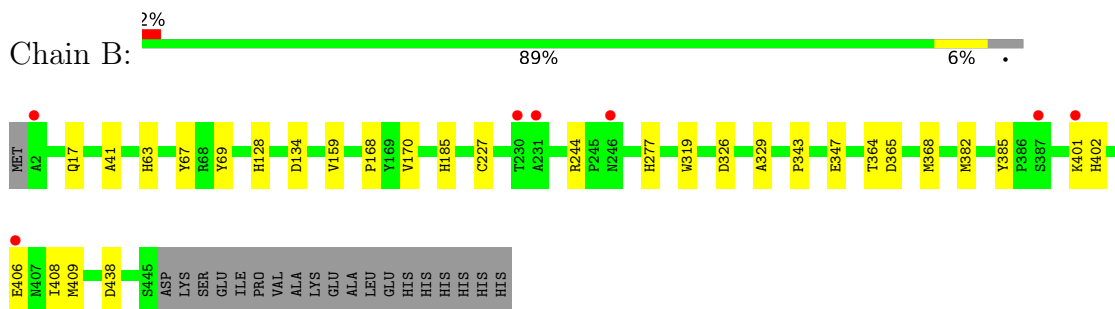
3 Residue-property plots [i](#)

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: Flavin-containing monooxygenase, Fmo



- Molecule 1: Flavin-containing monooxygenase, Fmo



4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	125.61Å 130.36Å 115.65Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	45.27 – 1.62 45.27 – 1.62	Depositor EDS
% Data completeness (in resolution range)	99.9 (45.27-1.62) 99.9 (45.27-1.62)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.97 (at 1.62Å)	Xtrriage
Refinement program	REFMAC 5.8.0267	Depositor
R, R_{free}	0.162 , 0.180 0.173 , 0.187	Depositor DCC
R_{free} test set	6049 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	20.1	Xtrriage
Anisotropy	0.236	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 28.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.017 for -k,-h,-l	Xtrriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	8111	wwPDB-VP
Average B, all atoms (Å ²)	23.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.82% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: SO4, CL, BTB, NAP, GOL, 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	0.89	0/3819	1.08	1/5182 (0.0%)
1	B	0.89	0/3769	1.09	2/5116 (0.0%)
All	All	0.89	0/7588	1.09	3/10298 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	63	HIS	CA-CB-CG	-5.89	107.91	113.80
1	A	63	HIS	CA-CB-CG	-5.68	108.11	113.80
1	B	134	ASP	CA-CB-CG	5.06	117.66	112.60

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	3699	0	3459	41	0
1	B	3653	0	3413	23	0
2	A	5	0	0	0	0
2	B	5	0	0	0	0
3	A	18	0	24	6	0
3	B	18	0	24	8	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	A	53	0	31	2	0
4	B	53	0	31	1	0
5	A	48	0	25	2	0
5	B	48	0	25	2	0
6	B	14	0	19	0	0
7	B	2	0	0	0	0
8	A	249	0	0	5	0
8	B	246	0	0	4	0
All	All	8111	0	7051	67	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 (67) 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:B:365:ASP:HB2	3:B:506:GOL:H11	1.35	1.05
1:B:365:ASP:H	3:B:506:GOL:H32	1.22	1.00
1:A:2:ALA:HB3	8:A:820:HOH:O	1.71	0.90
1:A:365:ASP:H	3:A:506:GOL:H11	1.38	0.89
1:A:128[B]:HIS:HE1	1:A:282[B]:ASN:ND2	1.69	0.88
1:A:365:ASP:HB2	3:A:506:GOL:H32	1.53	0.88
1:A:15:MET:HE1	1:A:44:GLY:HA2	1.53	0.88
1:A:382:MET:HE1	8:A:655:HOH:O	1.73	0.87
1:B:365:ASP:N	3:B:506:GOL:H32	1.95	0.82
1:B:382:MET:HE1	8:B:671:HOH:O	1.83	0.79
1:A:353:GLN:HE22	1:A:356:ARG:HH21	1.34	0.74
1:A:67:TYR:OH	5:A:505:NAP:H4N	1.90	0.72
1:A:353:GLN:HE22	1:A:356:ARG:NH2	1.87	0.71
1:A:128[B]:HIS:CE1	1:A:282[B]:ASN:ND2	2.56	0.71
1:A:11:GLY:C	1:A:15:MET:HE3	2.16	0.70
1:B:364:THR:HB	3:B:506:GOL:H31	1.75	0.67
1:B:67:TYR:OH	5:B:505:NAP:H4N	1.94	0.67
3:B:502:GOL:H32	8:B:604:HOH:O	2.01	0.60
1:A:345:LYS:HE2	1:A:349:LYS:HE3	1.83	0.59
1:A:168:PRO:HB2	1:A:170:VAL:CG2	2.32	0.59
1:A:319:TRP:HE1	1:A:368:MET:HE2	1.67	0.58
1:B:319:TRP:HE1	1:B:368:MET:HE2	1.69	0.57
1:A:1:MET:HB2	1:A:32:PRO:HA	1.87	0.56
1:B:408:ILE:HG23	1:B:409:MET:HE2	1.87	0.56
1:A:408:ILE:HG23	1:A:409:MET:HE2	1.88	0.56

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:168:PRO:HB2	1:A:170:VAL:HG23	1.86	0.55
1:A:15:MET:HE1	1:A:44:GLY:CA	2.33	0.55
1:A:353:GLN:NE2	1:A:356:ARG:HH21	2.03	0.55
1:A:164:HIS:HD2	8:A:712:HOH:O	1.89	0.55
1:A:10:ALA:O	1:A:15:MET:HE2	2.09	0.53
1:B:365:ASP:OD2	1:B:401:LYS:HE3	2.09	0.53
1:A:402:HIS:NE2	1:A:406:GLU:OE2	2.42	0.52
1:B:168:PRO:HB2	1:B:170:VAL:CG2	2.39	0.52
1:B:402:HIS:NE2	1:B:406:GLU:OE2	2.44	0.51
3:B:502:GOL:H11	8:B:810:HOH:O	2.11	0.51
1:A:356:ARG:HD2	8:A:829:HOH:O	2.10	0.49
1:A:45:GLY:HA2	4:A:504:FAD:H3B	1.95	0.49
1:A:353:GLN:HE22	1:A:356:ARG:CZ	2.26	0.49
1:A:117:ARG:HE	3:A:502:GOL:H32	1.77	0.48
1:A:227:CYS:HA	1:A:244:ARG:O	2.13	0.48
1:B:227:CYS:HA	1:B:244:ARG:O	2.14	0.47
1:A:15:MET:HE2	1:A:44:GLY:H	1.80	0.46
1:A:343:PRO:HB2	1:A:347:GLU:HB2	1.98	0.46
1:A:15:MET:HE2	1:A:44:GLY:N	2.32	0.45
1:B:364:THR:HB	3:B:506:GOL:C3	2.44	0.44
1:A:15:MET:CE	1:A:44:GLY:HA2	2.36	0.44
1:A:353:GLN:NE2	1:A:356:ARG:HE	2.15	0.44
1:A:365:ASP:N	3:A:506:GOL:H11	2.18	0.44
1:B:17:GLN:HE21	1:B:159:VAL:HG11	1.83	0.44
1:B:41:ALA:H	3:B:502:GOL:C1	2.31	0.43
1:A:365:ASP:HB2	3:A:506:GOL:C3	2.37	0.43
1:A:17:GLN:HA	1:A:329:ALA:HB1	2.01	0.43
1:A:17:GLN:HE21	1:A:159:VAL:HG11	1.83	0.42
1:A:326:ASP:HB3	1:A:385:TYR:CE1	2.54	0.42
1:B:69:TYR:HA	1:B:438:ASP:HB3	2.00	0.42
1:B:326:ASP:HB3	1:B:385:TYR:CE1	2.54	0.42
1:B:343:PRO:HB2	1:B:347:GLU:HB2	2.02	0.42
1:A:207:TYR:HB2	5:A:505:NAP:H2D	2.01	0.41
1:B:168:PRO:HB3	1:B:185:HIS:CE1	2.55	0.41
4:B:504:FAD:C6	5:B:505:NAP:C2N	2.98	0.41
1:B:17:GLN:HA	1:B:329:ALA:HB1	2.02	0.41
1:B:168:PRO:HB2	1:B:170:VAL:HG23	2.02	0.41
8:A:833:HOH:O	1:B:277:HIS:HE1	2.04	0.40
1:B:277:HIS:HD2	8:B:813:HOH:O	2.04	0.40
1:A:65:SER:HB2	4:A:504:FAD:HM81	2.03	0.40
1:A:364:THR:HB	3:A:506:GOL:H12	2.04	0.40

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1:MET:HE2	1:A:30:GLU:O	2.21	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	448/464 (97%)	431 (96%)	17 (4%)	0	100	100
1	B	442/464 (95%)	425 (96%)	17 (4%)	0	100	100
All	All	890/928 (96%)	856 (96%)	34 (4%)	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	393/405 (97%)	392 (100%)	1 (0%)	86	79
1	B	387/405 (96%)	386 (100%)	1 (0%)	86	79
All	All	780/810 (96%)	778 (100%)	2 (0%)	86	79

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	359	GLU
1	B	128	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	17	GLN
1	A	40	GLN
1	A	48	ASN
1	A	132	ASN
1	A	164	HIS
1	A	254	ASN
1	A	353	GLN
1	A	414	HIS
1	B	17	GLN
1	B	40	GLN
1	B	48	ASN
1	B	128	HIS
1	B	132	ASN
1	B	277	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](#)

Of 15 ligands modelled in this entry, 2 are monoatomic - leaving 13 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
3	GOL	B	502	-	5,5,5	0.16	0	5,5,5	0.44	0
3	GOL	B	506	-	5,5,5	0.18	0	5,5,5	0.62	0
4	FAD	B	504	-	58,58,58	0.67	0	85,89,89	0.70	0
5	NAP	B	505	-	50,52,52	0.81	2 (4%)	71,80,80	0.81	2 (2%)
6	BTB	B	501	-	13,13,13	1.02	1 (7%)	7,16,16	0.67	0
3	GOL	A	503	-	5,5,5	0.08	0	5,5,5	0.24	0
3	GOL	A	506	-	5,5,5	0.15	0	5,5,5	0.44	0
3	GOL	A	502	-	5,5,5	0.11	0	5,5,5	0.37	0
2	SO4	B	503	-	4,4,4	0.32	0	6,6,6	0.17	0
4	FAD	A	504	-	58,58,58	0.65	0	85,89,89	0.73	1 (1%)
2	SO4	A	501	-	4,4,4	0.28	0	6,6,6	0.11	0
3	GOL	B	507	-	5,5,5	0.16	0	5,5,5	0.18	0
5	NAP	A	505	-	50,52,52	0.80	1 (2%)	71,80,80	0.83	1 (1%)

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
3	GOL	B	502	-	-	0/4/4/4	-
3	GOL	B	506	-	-	0/4/4/4	-
4	FAD	B	504	-	-	3/34/50/50	0/6/6/6
5	NAP	B	505	-	-	6/35/67/67	0/5/5/5
6	BTB	B	501	-	-	0/21/21/21	-
3	GOL	A	503	-	-	0/4/4/4	-
3	GOL	A	506	-	-	0/4/4/4	-
3	GOL	A	502	-	-	0/4/4/4	-
4	FAD	A	504	-	-	3/34/50/50	0/6/6/6
3	GOL	B	507	-	-	0/4/4/4	-
5	NAP	A	505	-	-	1/35/67/67	0/5/5/5

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	505	NAP	C2N-N1N	3.99	1.39	1.35

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	505	NAP	C2N-N1N	3.53	1.38	1.35
5	B	505	NAP	PA-O3	2.42	1.62	1.59
6	B	501	BTB	C7-N	2.21	1.51	1.48

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	505	NAP	P2B-O2B-C2B	-3.08	115.22	123.43
5	A	505	NAP	P2B-O2B-C2B	-2.50	116.75	123.43
4	A	504	FAD	C4-N3-C2	-2.28	121.59	125.64
5	B	505	NAP	C3B-C2B-C1B	-2.01	98.96	102.81

There are no chirality outliers.

All (13) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	504	FAD	N10-C1'-C2'-O2'
4	A	504	FAD	N10-C1'-C2'-C3'
4	B	504	FAD	N10-C1'-C2'-O2'
4	B	504	FAD	N10-C1'-C2'-C3'
5	B	505	NAP	C5B-O5B-PA-O2A
5	B	505	NAP	O4B-C4B-C5B-O5B
5	B	505	NAP	C3B-C4B-C5B-O5B
4	A	504	FAD	PA-O3P-P-O5'
5	B	505	NAP	C5B-O5B-PA-O3
5	A	505	NAP	O4B-C4B-C5B-O5B
4	B	504	FAD	O4B-C4B-C5B-O5B
5	B	505	NAP	C2B-O2B-P2B-O2X
5	B	505	NAP	C2B-O2B-P2B-O1X

There are no ring outliers.

8 monomers are involved in 20 short contacts:

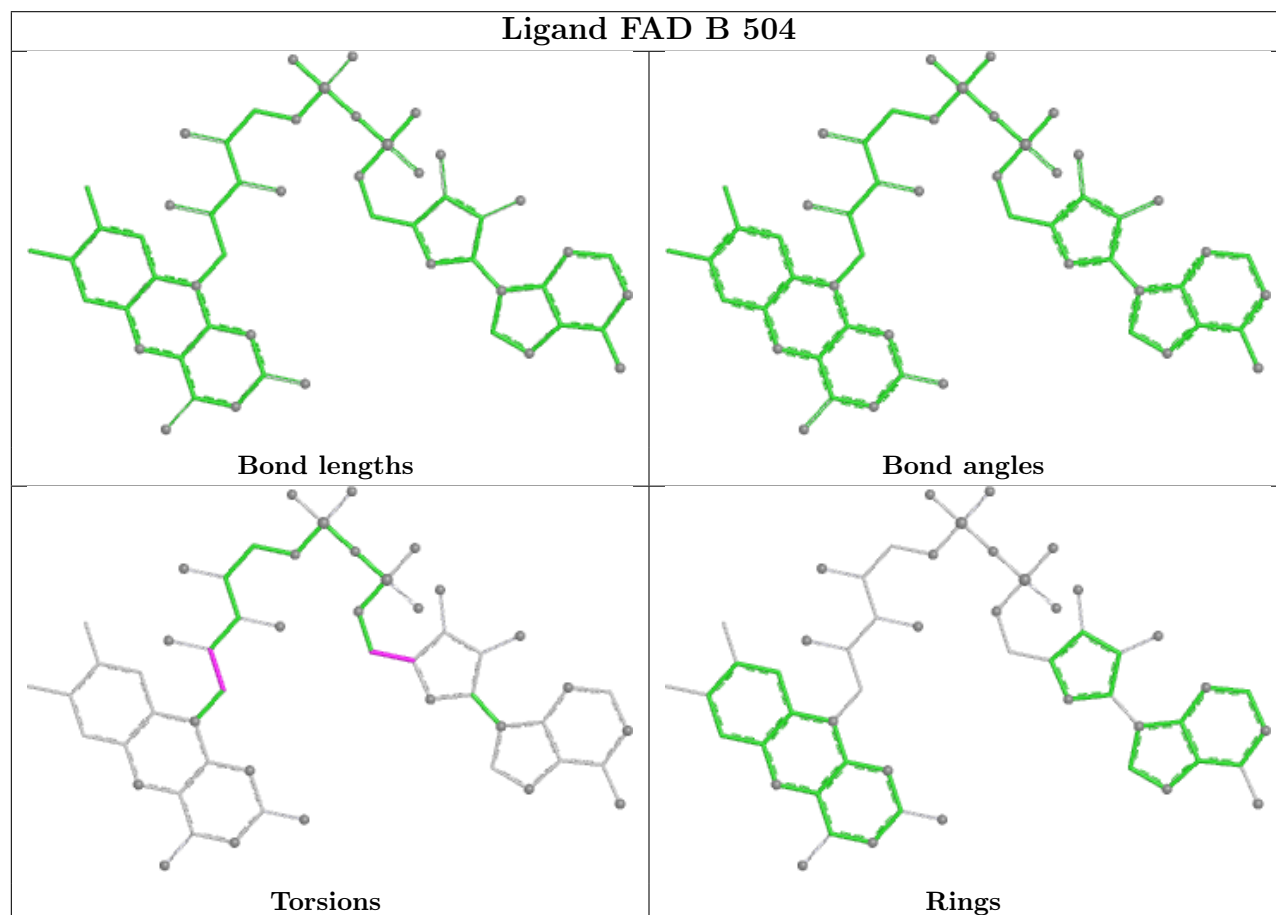
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	502	GOL	3	0
3	B	506	GOL	5	0
4	B	504	FAD	1	0
5	B	505	NAP	2	0
3	A	506	GOL	5	0
3	A	502	GOL	1	0
4	A	504	FAD	2	0

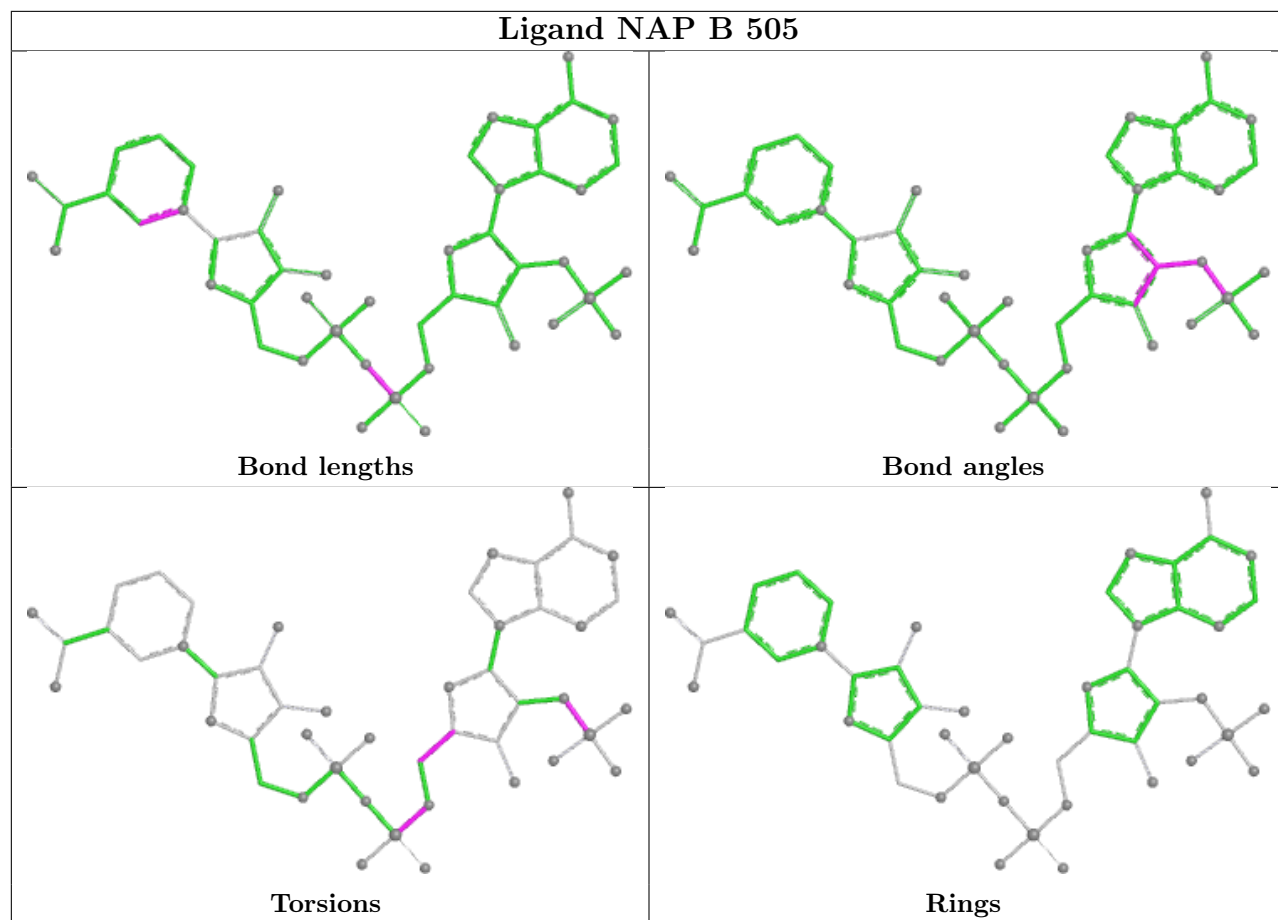
Continued on next page...

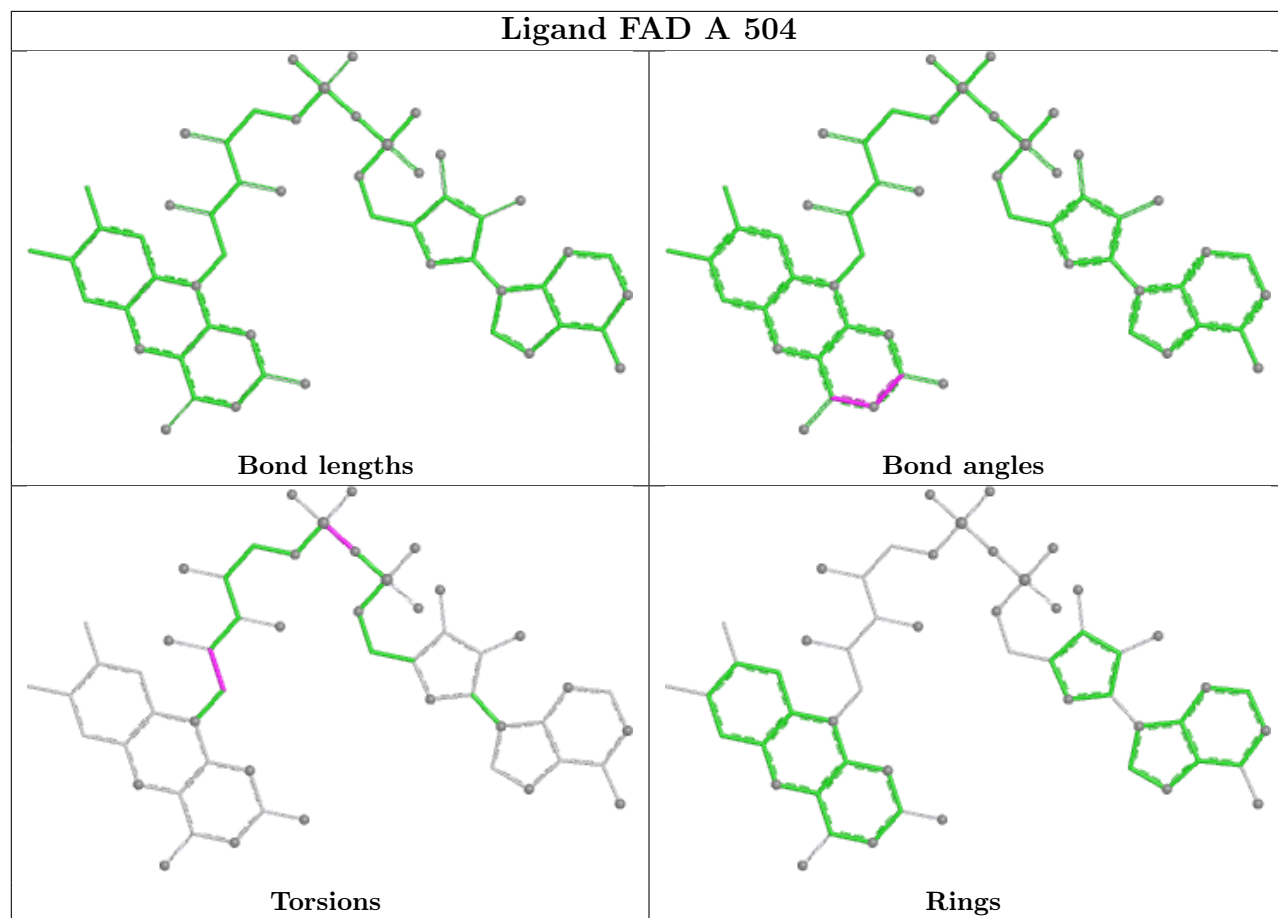
Continued from previous page...

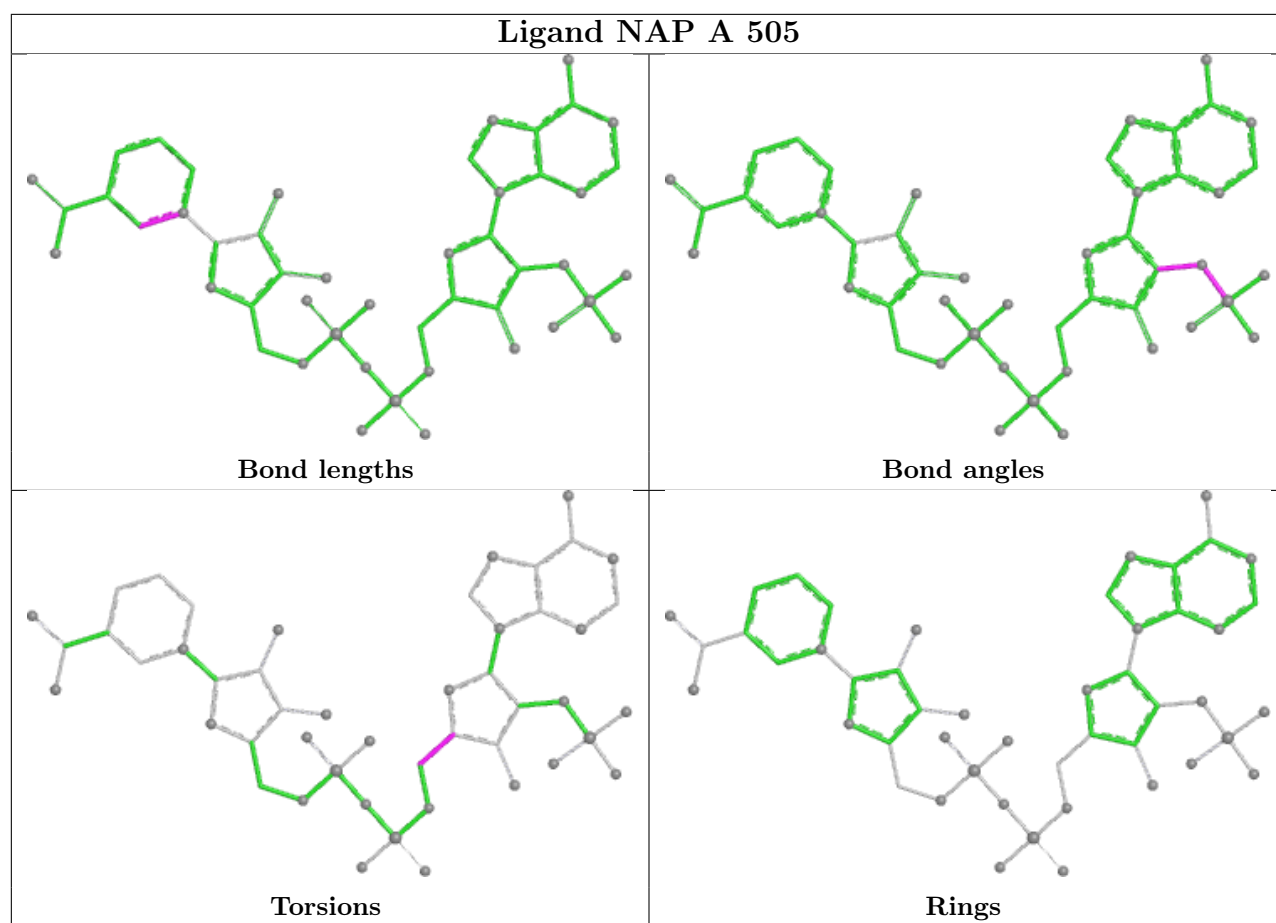
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	505	NAP	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.









5.7 Other polymers [\(i\)](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [\(i\)](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

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

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	448/464 (96%)	0.09	10 (2%) 62 67	11, 21, 38, 54	2 (0%)
1	B	444/464 (95%)	-0.08	7 (1%) 70 75	13, 21, 34, 50	1 (0%)
All	All	892/928 (96%)	0.00	17 (1%) 66 71	11, 21, 35, 54	3 (0%)

All (17) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1	MET	4.9
1	A	230	THR	4.0
1	A	2	ALA	3.8
1	A	231	ALA	3.4
1	B	2	ALA	3.3
1	A	447	LYS	3.2
1	B	230	THR	3.2
1	A	232	PRO	3.1
1	A	448	SER	3.0
1	A	446	ASP	2.6
1	A	282[A]	ASN	2.5
1	A	445	SER	2.5
1	B	231	ALA	2.2
1	B	246	ASN	2.0
1	B	406	GLU	2.0
1	B	387	SER	2.0
1	B	401	LYS	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](#)

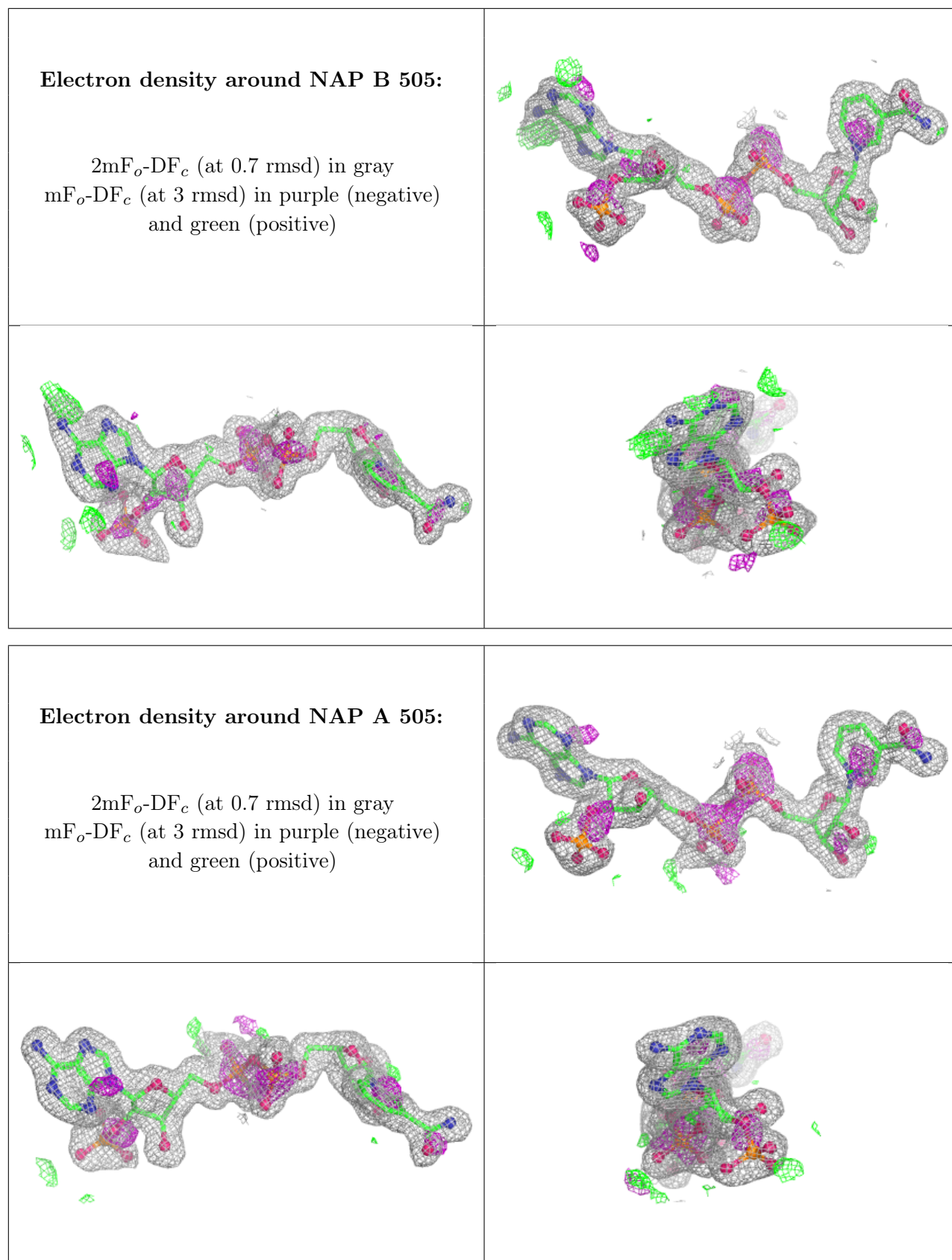
There are no oligosaccharides in this entry.

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, 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.

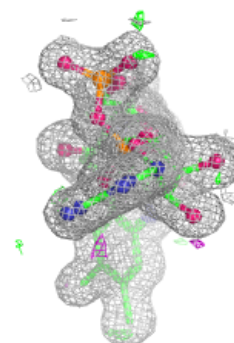
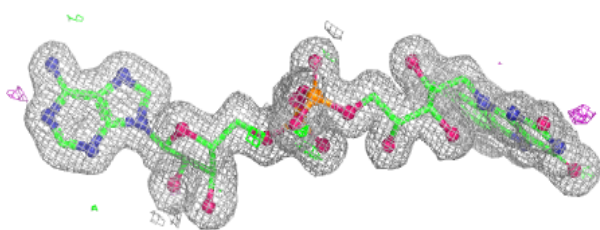
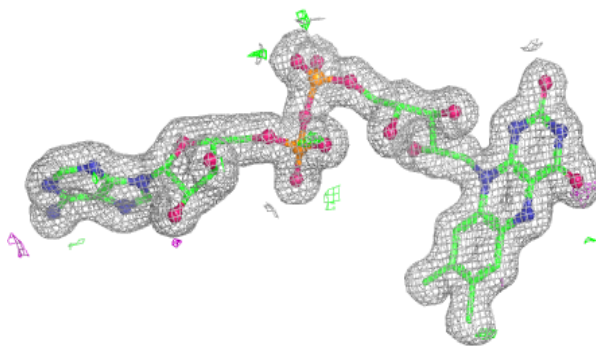
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	GOL	A	506	6/6	0.67	0.16	28,30,32,32	0
3	GOL	B	506	6/6	0.69	0.16	27,29,32,33	0
3	GOL	B	507	6/6	0.74	0.14	25,26,28,29	0
3	GOL	B	502	6/6	0.78	0.15	32,38,40,44	0
3	GOL	A	502	6/6	0.81	0.19	42,48,50,52	0
2	SO4	A	501	5/5	0.88	0.10	38,39,49,50	0
3	GOL	A	503	6/6	0.88	0.12	34,37,39,42	0
7	CL	B	509	1/1	0.88	0.15	54,54,54,54	0
5	NAP	B	505	48/48	0.91	0.10	23,31,38,45	0
7	CL	B	508	1/1	0.93	0.13	48,48,48,48	0
5	NAP	A	505	48/48	0.94	0.08	22,26,34,40	0
6	BTB	B	501	14/14	0.94	0.07	18,20,24,26	0
4	FAD	B	504	53/53	0.98	0.05	12,15,19,21	0
4	FAD	A	504	53/53	0.98	0.05	13,15,20,22	0
2	SO4	B	503	5/5	0.99	0.04	22,23,24,24	5

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.

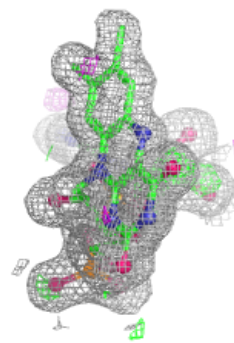
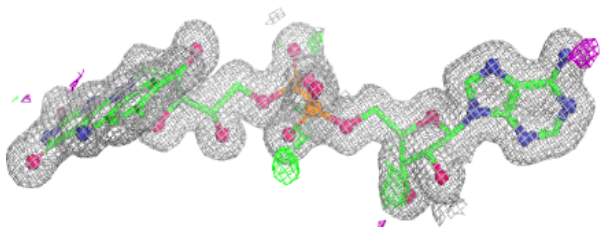
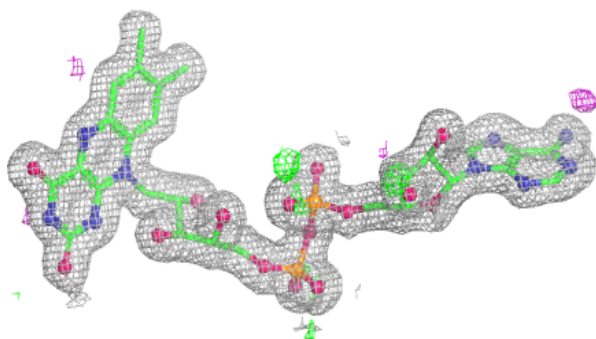


Electron density around FAD B 504:

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

**Electron density around FAD A 504:**

$2mF_o-DF_c$ (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.