



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 09:38 PM UTC

PDB ID : 5MGB / pdb_00005mgb
Title : Crystal Structure of Rat Peroxisomal Multifunctional enzyme Type-1 (RPMFE1) Complexed with Acetoacetyl-CoA and NAD
Authors : Kasaragod, P.; Kiema, T.-R.; Schmitz, W.; Hiltunen, J.K.; Wierenga, R.K.
Deposited on : 2016-11-21
Resolution : 2.80 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

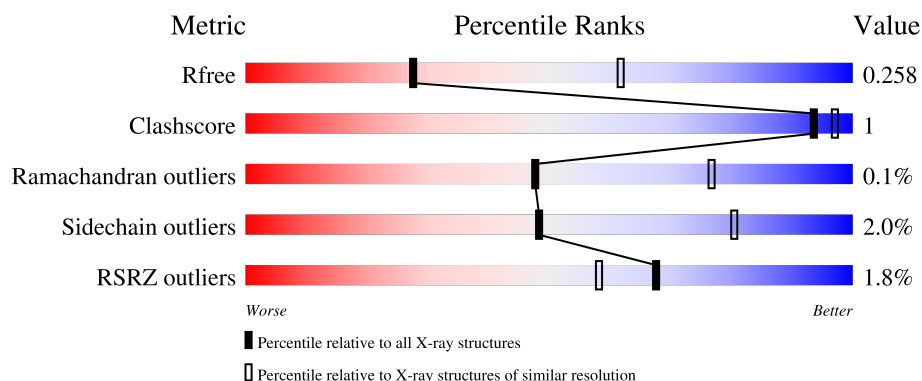
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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	3866 (2.80-2.80)
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (2.80-2.80)
RSRZ outliers	180081	3869 (2.80-2.80)

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	742	93% 5%
1	B	742	2% 92% 5%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 11416 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 Peroxisomal bifunctional enzyme.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	725	Total	C	N	O	S	0	0	0
			5562	3553	976	1010	23			
1	B	720	Total	C	N	O	S	0	0	0
			5530	3535	968	1004	23			

There are 40 discrepancies between the modelled and reference sequences:

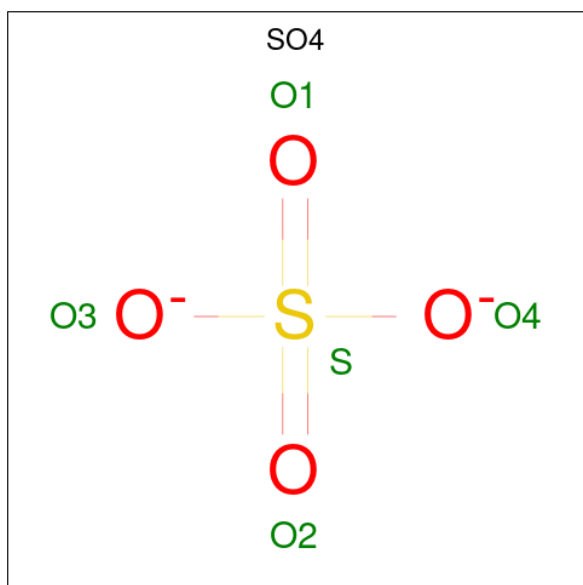
Chain	Residue	Modelled	Actual	Comment	Reference
A	-19	MET	-	initiating methionine	UNP P07896
A	-18	GLY	-	expression tag	UNP P07896
A	-17	SER	-	expression tag	UNP P07896
A	-16	SER	-	expression tag	UNP P07896
A	-15	HIS	-	expression tag	UNP P07896
A	-14	HIS	-	expression tag	UNP P07896
A	-13	HIS	-	expression tag	UNP P07896
A	-12	HIS	-	expression tag	UNP P07896
A	-11	HIS	-	expression tag	UNP P07896
A	-10	HIS	-	expression tag	UNP P07896
A	-9	SER	-	expression tag	UNP P07896
A	-8	SER	-	expression tag	UNP P07896
A	-7	GLY	-	expression tag	UNP P07896
A	-6	LEU	-	expression tag	UNP P07896
A	-5	VAL	-	expression tag	UNP P07896
A	-4	PRO	-	expression tag	UNP P07896
A	-3	ARG	-	expression tag	UNP P07896
A	-2	GLY	-	expression tag	UNP P07896
A	-1	SER	-	expression tag	UNP P07896
A	0	HIS	-	expression tag	UNP P07896
B	-19	MET	-	initiating methionine	UNP P07896
B	-18	GLY	-	expression tag	UNP P07896
B	-17	SER	-	expression tag	UNP P07896
B	-16	SER	-	expression tag	UNP P07896
B	-15	HIS	-	expression tag	UNP P07896

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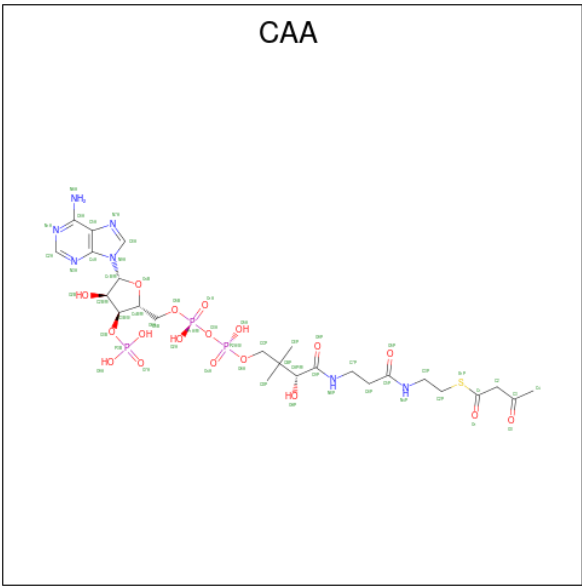
Chain	Residue	Modelled	Actual	Comment	Reference
B	-14	HIS	-	expression tag	UNP P07896
B	-13	HIS	-	expression tag	UNP P07896
B	-12	HIS	-	expression tag	UNP P07896
B	-11	HIS	-	expression tag	UNP P07896
B	-10	HIS	-	expression tag	UNP P07896
B	-9	SER	-	expression tag	UNP P07896
B	-8	SER	-	expression tag	UNP P07896
B	-7	GLY	-	expression tag	UNP P07896
B	-6	LEU	-	expression tag	UNP P07896
B	-5	VAL	-	expression tag	UNP P07896
B	-4	PRO	-	expression tag	UNP P07896
B	-3	ARG	-	expression tag	UNP P07896
B	-2	GLY	-	expression tag	UNP P07896
B	-1	SER	-	expression tag	UNP P07896
B	0	HIS	-	expression tag	UNP P07896

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



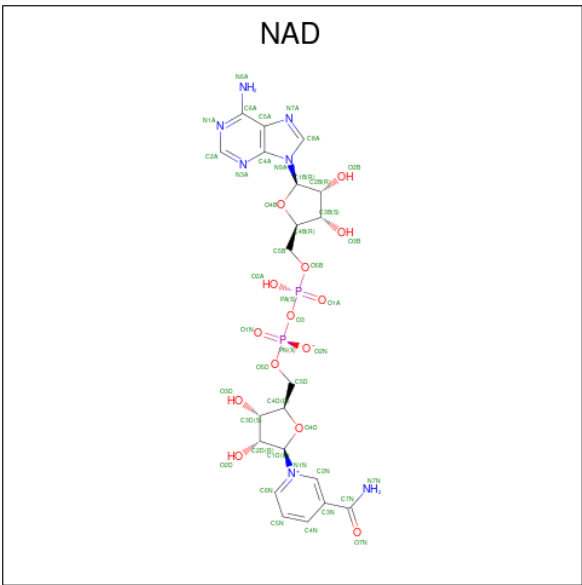
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		

- Molecule 3 is ACETOACETYL-COENZYME A (CCD ID: CAA) (formula: C₂₅H₄₀N₇O₁₈P₃S).



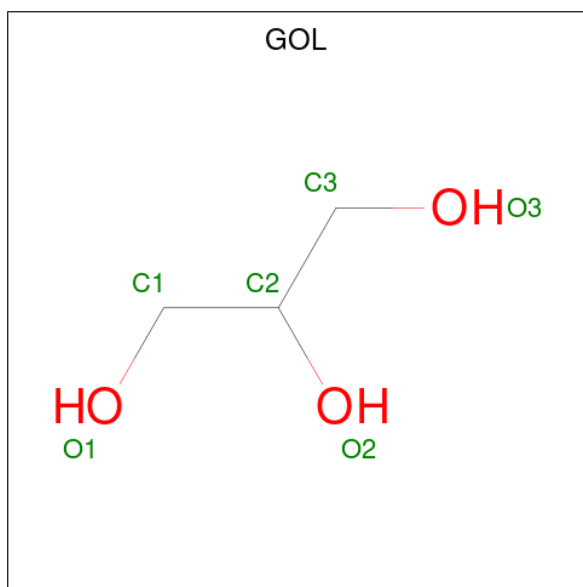
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
			Total	C	N	O	P	S		
3	A	1	54	25	7	18	3	1	0	0
3	B	1	54	25	7	18	3	1	0	0

- Molecule 4 is NICOTINAMIDE-ADENINE-DINUCLEOTIDE (CCD ID: NAD) (formula: C₂₁H₂₇N₇O₁₄P₂).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			44	21	7	14	2		
4	B	1	Total	C	N	O	P	0	0
			44	21	7	14	2		

- Molecule 5 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



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

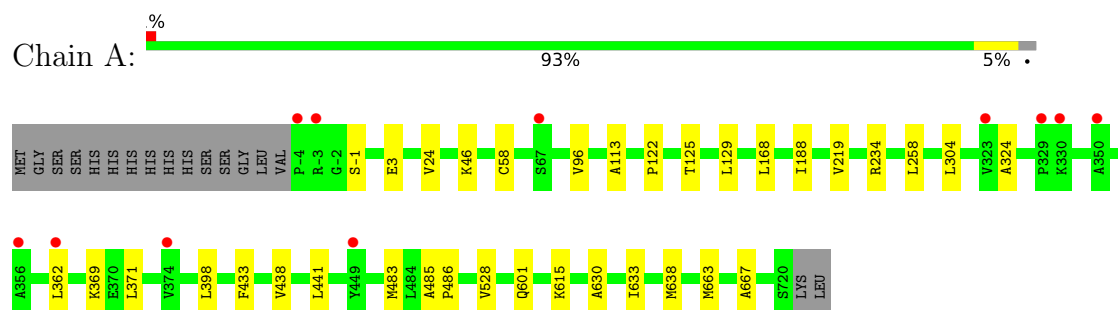
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	56	Total	O	0	0
			56	56		
6	B	40	Total	O	0	0
			40	40		

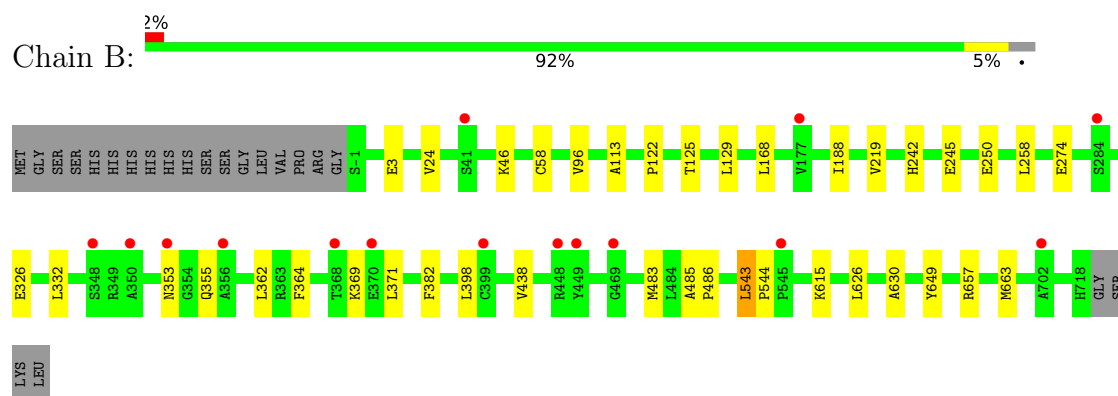
3 Residue-property plots [i](#)

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: Peroxisomal bifunctional enzyme



- Molecule 1: Peroxisomal bifunctional enzyme



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	65.23Å 125.82Å 223.90Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	33.56 – 2.80 33.56 – 2.80	Depositor EDS
% Data completeness (in resolution range)	82.5 (33.56-2.80) 82.5 (33.56-2.80)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.12 (at 2.81Å)	Xtriage
Refinement program	REFMAC 5.8.0155	Depositor
R, R_{free}	0.209 , 0.261 0.213 , 0.258	Depositor DCC
R_{free} test set	1980 reflections (4.27%)	wwPDB-VP
Wilson B-factor (Å ²)	49.5	Xtriage
Anisotropy	0.047	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 41.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.28$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	11416	wwPDB-VP
Average B, all atoms (Å ²)	54.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.21% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: NAD, CAA, 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	0.64	0/5691	0.88	0/7709
1	B	0.62	0/5658	0.86	0/7666
All	All	0.63	0/11349	0.87	0/15375

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	5562	0	5667	17	0
1	B	5530	0	5636	16	0
2	A	15	0	0	0	0
2	B	5	0	0	0	0
3	A	54	0	36	0	0
3	B	54	0	36	0	0
4	A	44	0	26	0	0
4	B	44	0	26	1	0
5	A	12	0	16	1	0
6	A	56	0	0	0	0
6	B	40	0	0	1	0
All	All	11416	0	11443	32	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 1.

All (32) 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:369:LYS:HD3	1:A:398:LEU:HD13	1.77	0.65
1:A:369:LYS:CD	1:A:398:LEU:HD13	2.29	0.63
1:A:433:PHE:CE1	1:A:441:LEU:HD23	2.34	0.62
1:A:667:ALA:HB3	5:A:806:GOL:H31	1.88	0.56
1:B:485:ALA:HB3	1:B:486:PRO:HD3	1.94	0.49
1:B:663:MET:HA	1:B:663:MET:HE2	1.95	0.48
1:A:485:ALA:HB3	1:A:486:PRO:HD3	1.94	0.48
1:A:601:GLN:HB3	1:B:382:PHE:CE2	2.49	0.48
1:A:46:LYS:HB2	1:A:188:ILE:HD11	1.95	0.48
1:A:663:MET:HA	1:A:663:MET:HE2	1.94	0.48
1:B:129:LEU:HD12	1:B:129:LEU:C	2.39	0.47
1:B:369:LYS:HA	1:B:398:LEU:HD21	1.96	0.47
1:A:369:LYS:HA	1:A:398:LEU:HD21	1.97	0.47
1:B:46:LYS:HB2	1:B:188:ILE:HD11	1.96	0.47
1:A:24:VAL:HG23	1:A:58:CYS:SG	2.55	0.46
1:B:332:LEU:HD11	1:B:364:PHE:HB3	1.98	0.46
1:A:129:LEU:C	1:A:129:LEU:HD12	2.41	0.45
1:B:274:GLU:OE2	1:B:657:ARG:NH2	2.49	0.45
1:B:657:ARG:NH1	6:B:903:HOH:O	2.49	0.45
1:A:113:ALA:HB3	1:A:168:LEU:HD13	1.99	0.45
1:B:122:PRO:O	1:B:125:THR:HB	2.17	0.45
1:A:122:PRO:O	1:A:125:THR:HB	2.17	0.44
1:B:24:VAL:HG23	1:B:58:CYS:SG	2.58	0.44
1:B:326:GLU:OE1	4:B:803:NAD:O2B	2.31	0.44
1:B:113:ALA:HB3	1:B:168:LEU:HD13	2.00	0.42
1:A:483:MET:HE3	1:A:630:ALA:HB2	2.00	0.42
1:B:483:MET:HE3	1:B:630:ALA:HB2	2.02	0.42
1:B:543:LEU:HD22	1:B:544:PRO:HD2	2.02	0.41
1:A:369:LYS:HD2	1:A:398:LEU:HD13	2.00	0.41
1:B:626:LEU:HD11	1:B:649:TYR:CE2	2.55	0.41
1:A:633:ILE:HG23	1:A:638:MET:HB2	2.04	0.40
1:A:304:LEU:HD11	1:A:324:ALA:HB1	2.04	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	723/742 (97%)	692 (96%)	30 (4%)	1 (0%)	48	77
1	B	718/742 (97%)	686 (96%)	32 (4%)	0	100	100
All	All	1441/1484 (97%)	1378 (96%)	62 (4%)	1 (0%)	48	77

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	-1	SER

5.3.2 Protein sidechains

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	594/609 (98%)	584 (98%)	10 (2%)	53	83
1	B	591/609 (97%)	577 (98%)	14 (2%)	43	77
All	All	1185/1218 (97%)	1161 (98%)	24 (2%)	48	80

All (24) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3	GLU
1	A	96	VAL
1	A	219	VAL
1	A	234	ARG
1	A	258	LEU

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Mol	Chain	Res	Type
1	A	362	LEU
1	A	371	LEU
1	A	438	VAL
1	A	528	VAL
1	A	615	LYS
1	B	3	GLU
1	B	96	VAL
1	B	219	VAL
1	B	242	HIS
1	B	245	GLU
1	B	250	GLU
1	B	258	LEU
1	B	353	ASN
1	B	355	GLN
1	B	362	LEU
1	B	371	LEU
1	B	438	VAL
1	B	543	LEU
1	B	615	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	94	GLN
1	A	601	GLN
1	B	83	GLN
1	B	94	GLN
1	B	572	GLN
1	B	718	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [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
3	CAA	B	802	-	53,56,56	1.27	6 (11%)	77,83,83	1.63	12 (15%)
2	SO4	A	801	-	4,4,4	0.48	0	6,6,6	0.21	0
2	SO4	A	802	-	4,4,4	0.50	0	6,6,6	0.32	0
2	SO4	B	801	-	4,4,4	0.45	0	6,6,6	0.35	0
4	NAD	B	803	-	46,48,48	1.32	5 (10%)	64,73,73	1.66	12 (18%)
5	GOL	A	807	-	5,5,5	0.49	0	5,5,5	0.52	0
5	GOL	A	806	-	5,5,5	0.54	0	5,5,5	0.60	0
4	NAD	A	805	-	46,48,48	1.36	7 (15%)	64,73,73	1.68	12 (18%)
3	CAA	A	804	-	53,56,56	1.30	8 (15%)	77,83,83	1.61	13 (16%)
2	SO4	A	803	-	4,4,4	0.47	0	6,6,6	0.31	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
3	CAA	B	802	-	-	9/55/71/71	0/3/3/3
4	NAD	B	803	-	-	10/30/62/62	0/5/5/5
5	GOL	A	807	-	-	1/4/4/4	-
5	GOL	A	806	-	-	2/4/4/4	-
4	NAD	A	805	-	-	12/30/62/62	0/5/5/5
3	CAA	A	804	-	-	10/55/71/71	0/3/3/3

All (26) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	803	NAD	C5A-C4A	5.08	1.48	1.39
4	A	805	NAD	C5A-C4A	4.89	1.47	1.39
3	B	802	CAA	C5A-C4A	4.59	1.47	1.39
3	A	804	CAA	C5A-C4A	4.57	1.47	1.39
3	B	802	CAA	C1-S1P	-3.24	1.68	1.76
3	A	804	CAA	C1-S1P	-3.12	1.68	1.76
3	B	802	CAA	C5A-C6A	3.03	1.49	1.41
4	B	803	NAD	C5A-C6A	3.03	1.49	1.41
4	A	805	NAD	PA-O3	2.98	1.62	1.59
4	A	805	NAD	C5A-C6A	2.88	1.49	1.41
4	A	805	NAD	PN-O3	2.85	1.62	1.59
3	A	804	CAA	C5A-C6A	2.80	1.48	1.41
3	A	804	CAA	P2A-O3A	2.76	1.62	1.59
4	B	803	NAD	C8A-N7A	2.63	1.36	1.31
3	B	802	CAA	C8A-N7A	2.56	1.36	1.31
3	A	804	CAA	C5A-N7A	-2.48	1.34	1.39
3	A	804	CAA	P1A-O3A	2.47	1.62	1.59
3	A	804	CAA	C4A-N9A	-2.43	1.32	1.37
4	B	803	NAD	O4D-C1D	2.42	1.44	1.40
3	B	802	CAA	P2A-O3A	2.32	1.62	1.59
4	A	805	NAD	C8A-N7A	2.32	1.36	1.31
3	A	804	CAA	C8A-N7A	2.32	1.36	1.31
4	B	803	NAD	PN-O3	2.31	1.62	1.59
4	A	805	NAD	O4D-C1D	2.27	1.43	1.40
4	A	805	NAD	C5A-N7A	-2.26	1.35	1.39
3	B	802	CAA	C4A-N9A	-2.26	1.33	1.37

All (49) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	805	NAD	C5A-C4A-N3A	-5.73	118.83	126.72
4	B	803	NAD	C5A-C4A-N3A	-5.61	118.99	126.72
3	A	804	CAA	C2-C1-S1P	5.49	120.60	113.63
3	B	802	CAA	C5A-C4A-N3A	-5.46	119.20	126.72
3	B	802	CAA	C2-C1-S1P	5.07	120.07	113.63
3	A	804	CAA	C5A-C4A-N3A	-4.95	119.90	126.72
4	A	805	NAD	N3A-C4A-N9A	4.85	135.42	127.17
4	B	803	NAD	N3A-C4A-N9A	4.53	134.87	127.17
3	B	802	CAA	C4A-C5A-N7A	-4.18	105.80	110.58
4	A	805	NAD	N3A-C2A-N1A	-4.05	122.46	128.58
3	B	802	CAA	N3A-C4A-N9A	4.01	133.98	127.17
4	A	805	NAD	C2A-N3A-C4A	3.97	121.54	111.83
4	B	803	NAD	C2A-N3A-C4A	3.90	121.35	111.83

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	804	CAA	N3A-C4A-N9A	3.88	133.77	127.17
3	A	804	CAA	N3A-C2A-N1A	-3.84	122.77	128.58
3	B	802	CAA	C2A-N3A-C4A	3.82	121.17	111.83
4	B	803	NAD	N3A-C2A-N1A	-3.75	122.90	128.58
3	A	804	CAA	C2A-N3A-C4A	3.69	120.83	111.83
3	B	802	CAA	N3A-C2A-N1A	-3.58	123.16	128.58
3	A	804	CAA	C4A-C5A-N7A	-3.56	106.51	110.58
4	B	803	NAD	C4A-C5A-N7A	-3.53	106.55	110.58
3	A	804	CAA	O1-C1-S1P	-3.36	118.41	122.68
3	B	802	CAA	C4A-N9A-C8A	3.18	109.08	105.74
4	A	805	NAD	C4A-C5A-N7A	-3.17	106.96	110.58
4	B	803	NAD	C4A-N9A-C8A	3.15	109.05	105.74
3	A	804	CAA	C4A-N9A-C8A	3.05	108.94	105.74
4	B	803	NAD	C6N-N1N-C2N	-3.04	119.29	121.88
4	A	805	NAD	C4A-N9A-C8A	2.96	108.84	105.74
3	B	802	CAA	C5A-N7A-C8A	2.87	107.96	103.45
3	B	802	CAA	C6A-C5A-N7A	2.82	137.52	132.09
4	B	803	NAD	C5A-N7A-C8A	2.74	107.76	103.45
4	A	805	NAD	C5A-N7A-C8A	2.65	107.61	103.45
3	A	804	CAA	C6A-C5A-N7A	2.61	137.13	132.09
3	B	802	CAA	N9A-C8A-N7A	-2.53	110.35	113.94
3	A	804	CAA	C5A-N7A-C8A	2.50	107.38	103.45
4	B	803	NAD	N9A-C8A-N7A	-2.43	110.49	113.94
3	B	802	CAA	O1-C1-C2	-2.39	119.43	123.40
4	B	803	NAD	C6A-C5A-N7A	2.34	136.59	132.09
3	A	804	CAA	O6A-CCP-CBP	2.33	114.30	110.55
3	A	804	CAA	C2A-N1A-C6A	2.29	122.50	118.73
4	B	803	NAD	C4D-O4D-C1D	2.22	111.96	109.92
4	A	805	NAD	N9A-C8A-N7A	-2.19	110.83	113.94
3	A	804	CAA	N9A-C8A-N7A	-2.18	110.84	113.94
3	B	802	CAA	CEP-CBP-CAP	2.18	112.48	108.77
4	A	805	NAD	C6A-C5A-N7A	2.14	136.21	132.09
4	A	805	NAD	C2D-C3D-C4D	2.13	106.72	102.61
4	A	805	NAD	C6N-N1N-C2N	-2.04	120.14	121.88
4	B	803	NAD	C2B-C1B-N9A	2.03	118.35	113.30
4	A	805	NAD	C2A-N1A-C6A	2.02	122.06	118.73

There are no chirality outliers.

All (44) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	804	CAA	CDP-CBP-CCP-O6A

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Mol	Chain	Res	Type	Atoms
3	A	804	CAA	CEP-CBP-CCP-O6A
3	A	804	CAA	CAP-CBP-CCP-O6A
3	A	804	CAA	C1-C2-C3-O3
3	A	804	CAA	C1-C2-C3-C4
3	B	802	CAA	P1A-O3A-P2A-O6A
3	B	802	CAA	CCP-O6A-P2A-O3A
3	B	802	CAA	CCP-O6A-P2A-O4A
4	A	805	NAD	O4D-C1D-N1N-C2N
4	A	805	NAD	O4D-C1D-N1N-C6N
4	A	805	NAD	C2D-C1D-N1N-C6N
4	B	803	NAD	O4D-C1D-N1N-C2N
4	B	803	NAD	O4D-C1D-N1N-C6N
4	B	803	NAD	C2D-C1D-N1N-C2N
4	B	803	NAD	C2D-C1D-N1N-C6N
5	A	806	GOL	C1-C2-C3-O3
5	A	806	GOL	O2-C2-C3-O3
4	B	803	NAD	C2N-C3N-C7N-O7N
3	B	802	CAA	C1-C2-C3-C4
4	B	803	NAD	C4N-C3N-C7N-O7N
4	A	805	NAD	C2N-C3N-C7N-O7N
4	B	803	NAD	C4N-C3N-C7N-N7N
4	A	805	NAD	C4N-C3N-C7N-N7N
3	A	804	CAA	P1A-O3A-P2A-O6A
4	A	805	NAD	C4N-C3N-C7N-O7N
5	A	807	GOL	O1-C1-C2-O2
4	A	805	NAD	C2N-C3N-C7N-N7N
3	B	802	CAA	C3P-C2P-S1P-C1
4	B	803	NAD	C2N-C3N-C7N-N7N
3	A	804	CAA	C5B-O5B-P1A-O1A
3	A	804	CAA	CCP-O6A-P2A-O4A
4	A	805	NAD	C5B-O5B-PA-O1A
4	B	803	NAD	C5D-O5D-PN-O2N
3	B	802	CAA	C1-C2-C3-O3
3	A	804	CAA	P1A-O3A-P2A-O4A
4	A	805	NAD	C2D-C1D-N1N-C2N
4	B	803	NAD	O4B-C4B-C5B-O5B
3	B	802	CAA	P1A-O3A-P2A-O4A
4	A	805	NAD	PN-O3-PA-O1A
3	A	804	CAA	C2P-C3P-N4P-C5P
3	B	802	CAA	O1-C1-C2-C3
4	A	805	NAD	O4B-C4B-C5B-O5B
4	A	805	NAD	PN-O3-PA-O2A

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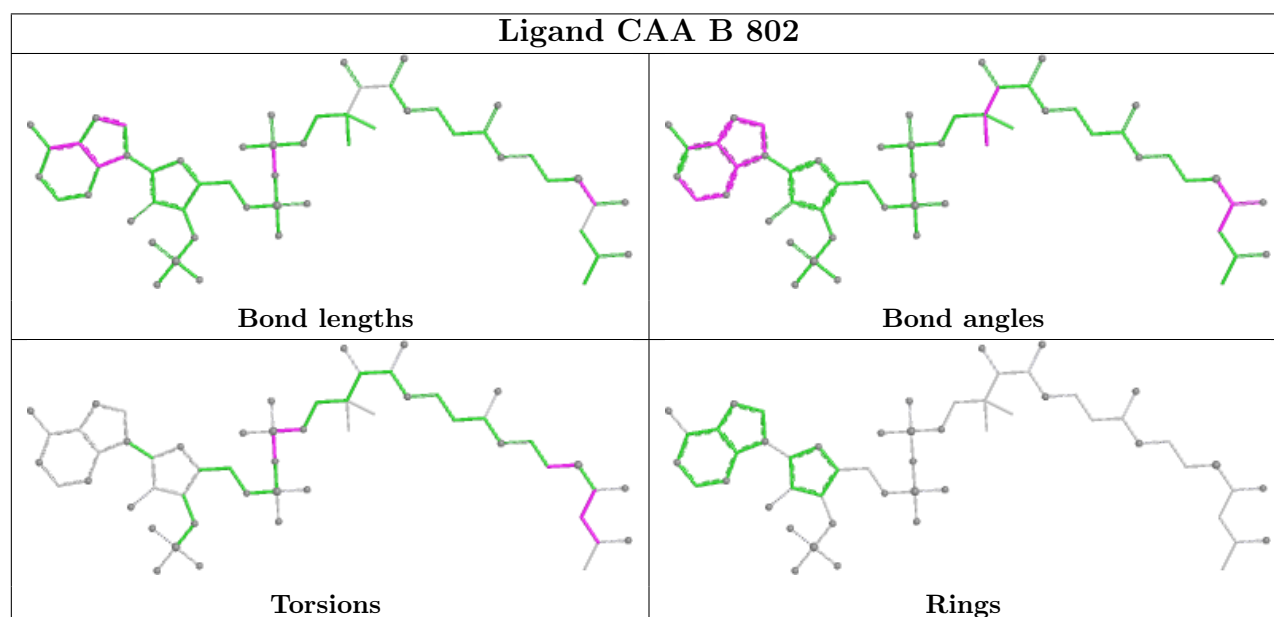
Mol	Chain	Res	Type	Atoms
3	B	802	CAA	P1A-O3A-P2A-O5A

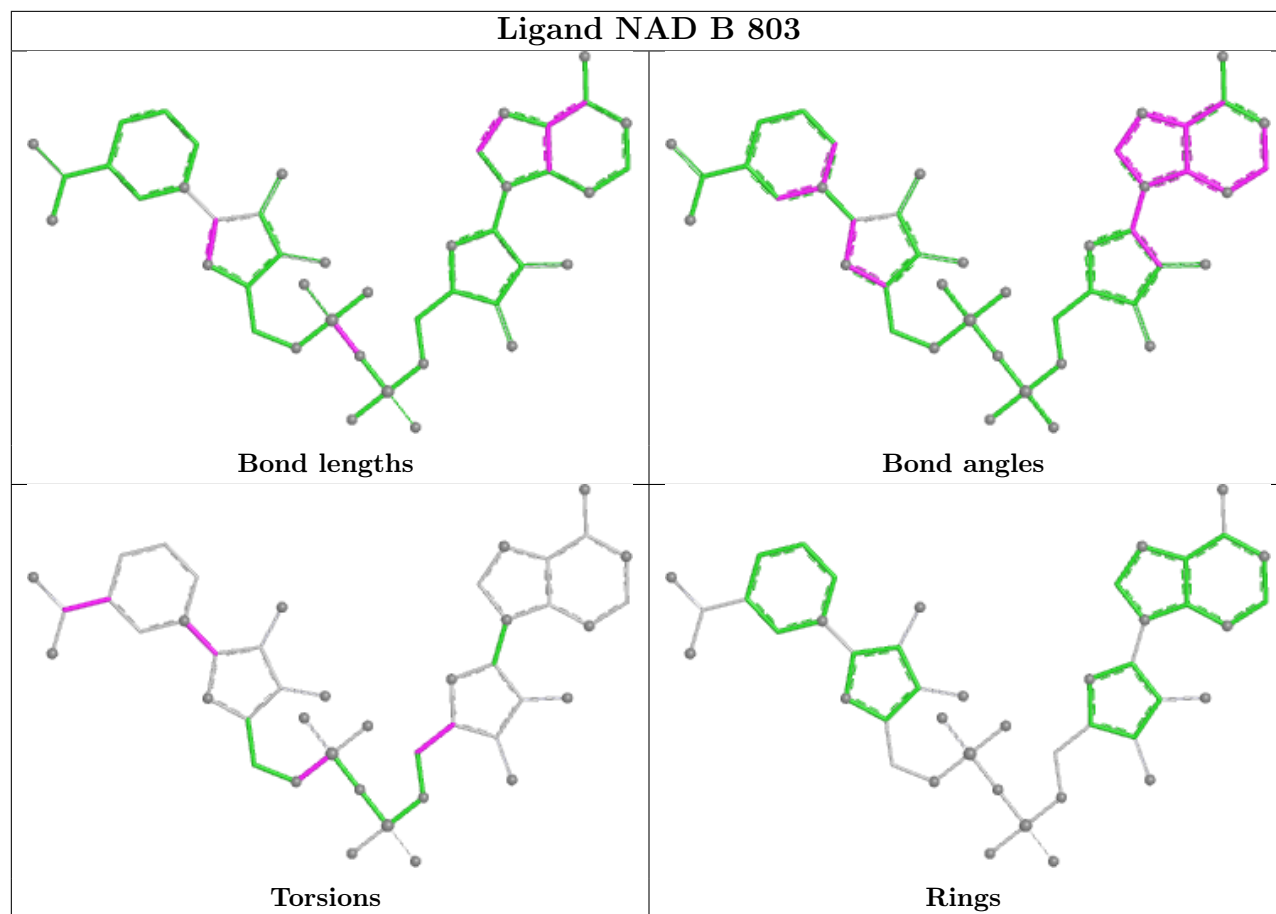
There are no ring outliers.

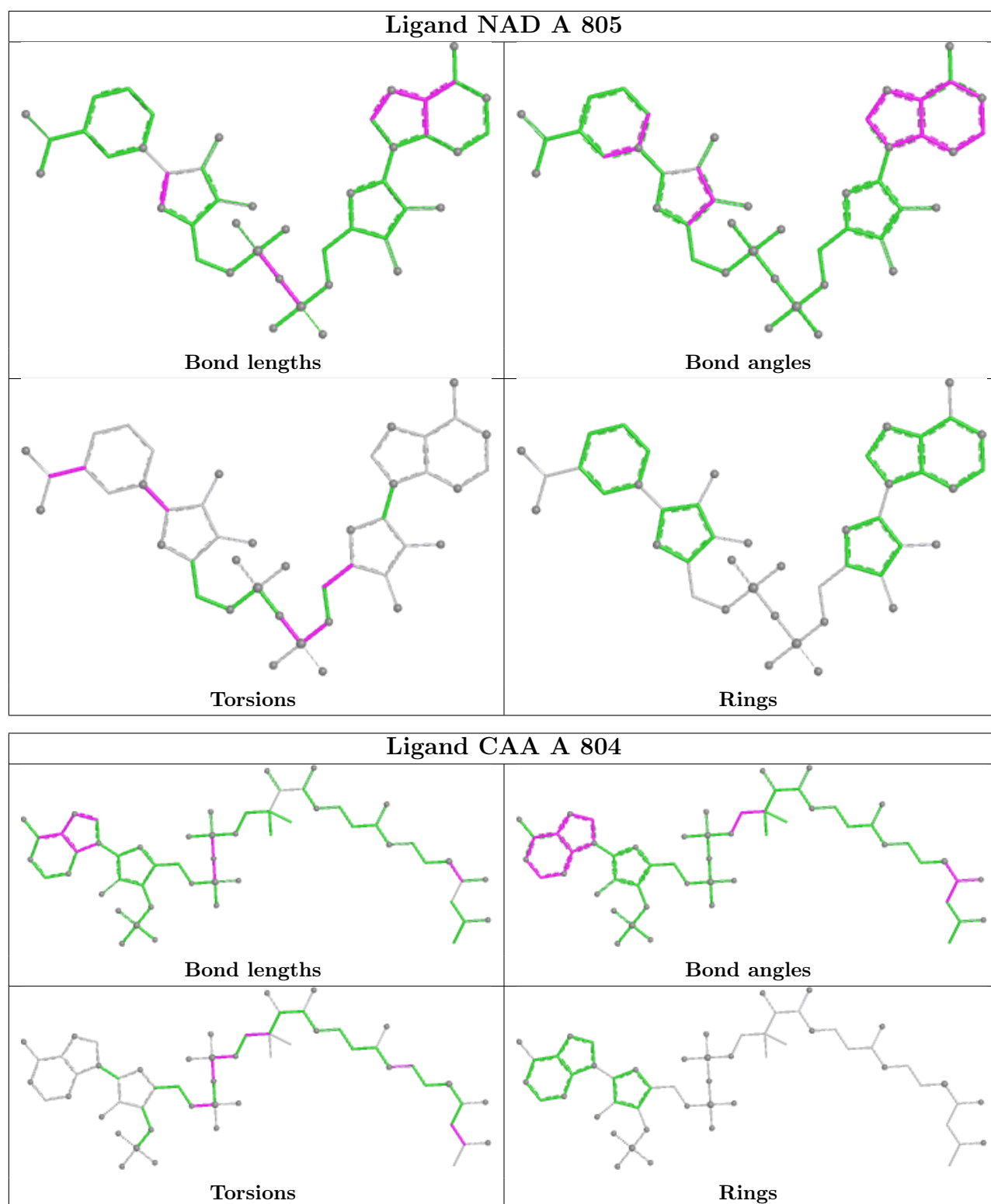
2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	803	NAD	1	0
5	A	806	GOL	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 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 ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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, 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	725/742 (97%)	-0.08	11 (1%) 72 63	19, 42, 95, 157	0
1	B	720/742 (97%)	0.11	15 (2%) 63 54	27, 57, 90, 151	0
All	All	1445/1484 (97%)	0.01	26 (1%) 67 58	19, 50, 93, 157	0

All (26) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	330	LYS	3.5
1	B	449	TYR	3.4
1	B	348	SER	3.2
1	A	356	ALA	3.0
1	B	469	GLY	2.9
1	A	67	SER	2.8
1	A	329	PRO	2.8
1	A	362	LEU	2.7
1	B	702	ALA	2.4
1	B	41	SER	2.3
1	B	368	THR	2.3
1	B	370	GLU	2.2
1	B	399	CYS	2.2
1	A	-3	ARG	2.2
1	B	545	PRO	2.1
1	B	448	ARG	2.1
1	A	449	TYR	2.1
1	B	177	VAL	2.1
1	B	284	SER	2.1
1	A	374	VAL	2.1
1	B	350	ALA	2.1
1	A	350	ALA	2.0
1	A	-4	PRO	2.0
1	B	353	ASN	2.0

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Mol	Chain	Res	Type	RSRZ
1	B	356	ALA	2.0
1	A	323	VAL	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](#)

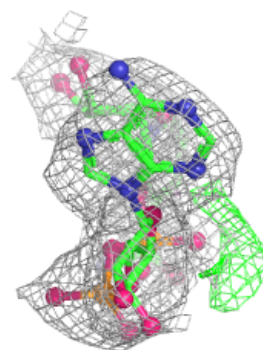
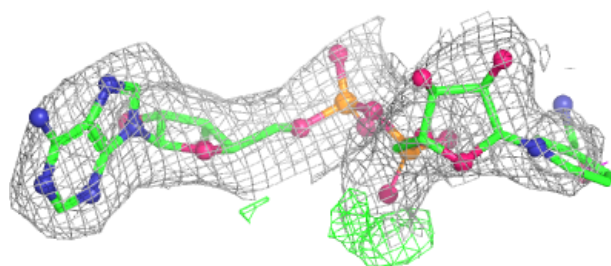
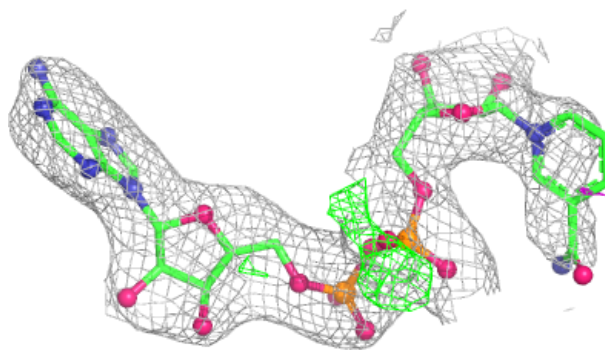
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q<0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	SO4	B	801	5/5	0.80	0.17	84,87,91,92	0
5	GOL	A	807	6/6	0.81	0.15	58,60,62,63	0
4	NAD	A	805	44/44	0.90	0.11	52,59,84,88	0
2	SO4	A	803	5/5	0.90	0.13	78,79,81,84	0
5	GOL	A	806	6/6	0.92	0.10	39,42,43,44	0
3	CAA	A	804	54/54	0.92	0.09	35,67,84,85	0
2	SO4	A	802	5/5	0.93	0.17	53,56,59,62	0
4	NAD	B	803	44/44	0.93	0.10	46,52,98,104	0
3	CAA	B	802	54/54	0.95	0.07	52,56,63,64	0
2	SO4	A	801	5/5	0.98	0.06	43,44,45,46	0

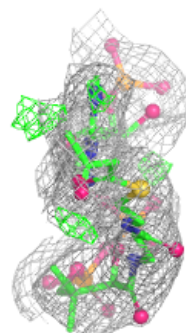
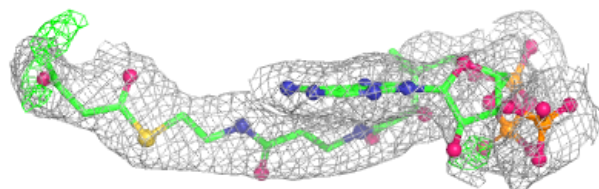
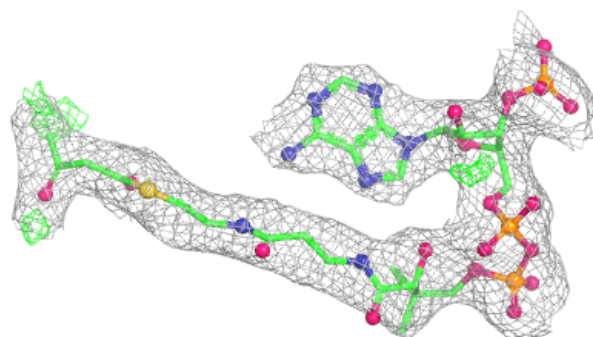
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around NAD 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)

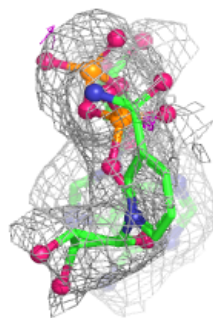
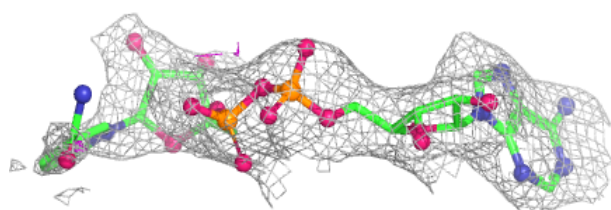
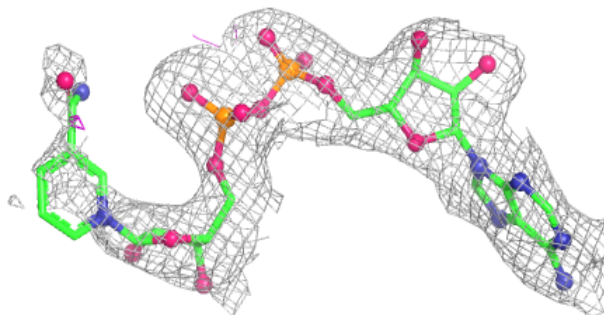
**Electron density around CAA A 804:**

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

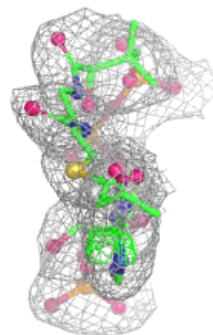
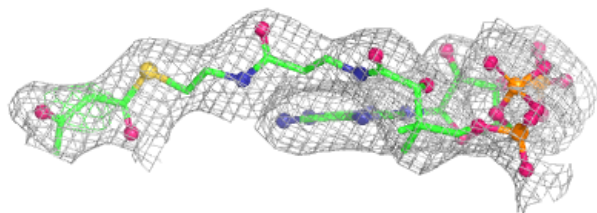
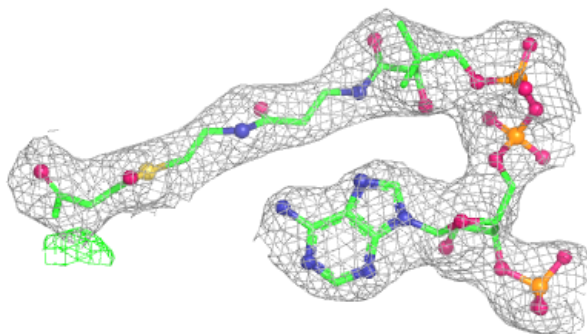


Electron density around NAD B 803:

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

**Electron density around CAA 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.