



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 11, 2024 – 09:03 PM EDT

PDB ID : 1DJL
Title : THE CRYSTAL STRUCTURE OF HUMAN TRANSHYDROGENASE DOMAIN III WITH BOUND NADP
Authors : White, S.A.; Peak, S.J.; Cotton, N.P.; Jackson, J.B.
Deposited on : 1999-12-03
Resolution : 2.00 Å(reported)

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

We welcome your comments at validation@mail.wwpdb.org

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 : 4.02b-467
Mogul : 2022.3.0, CSD as543be (2022)
Xtrriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36.2

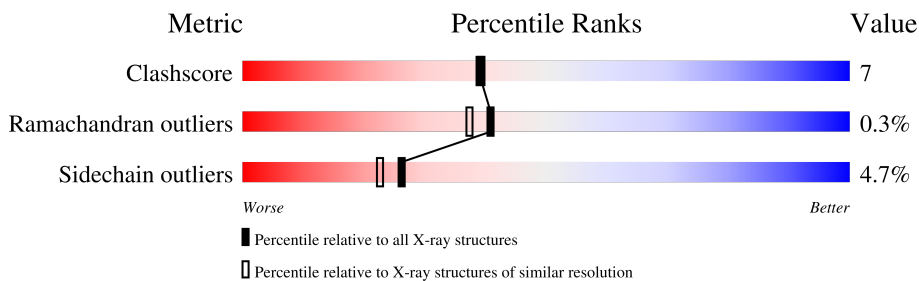
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	207	
1	B	207	

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 3002 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 TRANSHYDROGENASE DIII.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	182	Total 1421	C 897	N 239	O 274	S 11	0	5	0
1	B	182	Total 1383	C 875	N 232	O 266	S 10	0	1	0

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



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

- Molecule 3 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NAP) (formula: C₂₁H₂₈N₇O₁₇P₃).



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

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



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

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	41	Total 41	O 41	0	0
5	B	39	Total 39	O 39	0	0

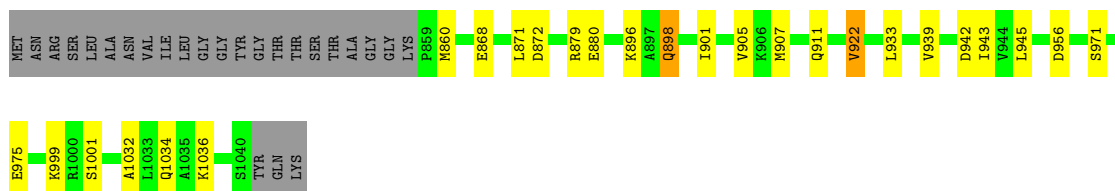
3 Residue-property plots [i](#)

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. 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. 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.

Note EDS was not executed.

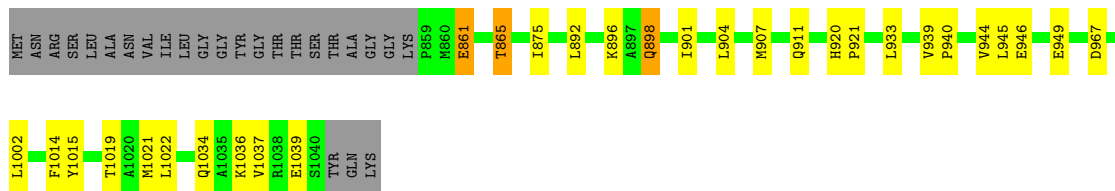
- Molecule 1: TRANSHYDROGENASE DIII

Chain A:  75% 12% 12%



- Molecule 1: TRANSHYDROGENASE DIII

Chain B:  73% 13% 12%



4 Data and refinement statistics

Xtrriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 41 2 2	Depositor
Cell constants a, b, c, α , β , γ	58.10Å 58.10Å 250.77Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	(Not available) – 2.00	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-2.00)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS	Depositor
R, R_{free}	0.237 , 0.258	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	3002	wwPDB-VP
Average B, all atoms (Å ²)	35.0	wwPDB-VP

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, NAP, 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	0.43	0/1444	0.64	0/1960
1	B	0.42	0/1406	0.66	0/1909
All	All	0.43	0/2850	0.65	0/3869

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	B	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	1015	TYR	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	1421	0	1438	17	0
1	B	1383	0	1404	26	0
2	A	5	0	0	0	0
2	B	5	0	0	0	0
3	A	48	0	25	1	0
3	B	48	0	25	0	0
4	A	6	0	8	0	0
4	B	6	0	8	1	0
5	A	41	0	0	1	0
5	B	39	0	0	1	0
All	All	3002	0	2908	43	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 7.

All (43) 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:871:LEU:HD21	1:A:1032:ALA:HB1	1.61	0.83
1:B:1014:PHE:HA	1:B:1021:MET:HE1	1.58	0.83
1:B:1019:THR:HG22	1:B:1021:MET:HE2	1.68	0.75
1:A:898:GLN:HG2	1:A:933:LEU:HB3	1.73	0.70
1:B:1014:PHE:HA	1:B:1021:MET:CE	2.20	0.70
1:B:898:GLN:HG2	1:B:933:LEU:HB3	1.80	0.64
1:B:861:GLU:O	1:B:861:GLU:HG3	1.98	0.63
1:B:1019:THR:HG21	1:B:1021:MET:HE1	1.79	0.62
1:B:946:GLU:HG2	1:B:949:GLU:CD	2.22	0.61
1:B:898:GLN:O	1:B:901:ILE:HG22	2.01	0.60
1:A:922:VAL:HG13	3:A:1136:NAP:H2D	1.87	0.57
1:A:922:VAL:HG13	1:A:922:VAL:O	2.04	0.56
1:B:904:LEU:HD11	1:B:1037:VAL:HG21	1.87	0.54
1:B:1019:THR:HG22	1:B:1021:MET:CE	2.38	0.54
1:B:1019:THR:CG2	1:B:1021:MET:CE	2.85	0.53
1:A:907:MET:O	1:A:911:GLN:HG2	2.08	0.53
1:A:871:LEU:HD21	1:A:1032:ALA:CB	2.37	0.52
1:A:898:GLN:CG	1:A:933:LEU:HB3	2.39	0.52
1:B:875:ILE:HD11	1:B:1036:LYS:HD2	1.92	0.51
1:A:939:VAL:HG13	1:A:943:ILE:HD11	1.93	0.50
1:A:999:LYS:HG3	1:A:1001:SER:O	2.12	0.50
1:A:898:GLN:O	1:A:901:ILE:HG22	2.12	0.49
1:A:971:SER:O	1:A:975:GLU:HG3	2.13	0.48
1:A:879[B]:ARG:NH2	1:A:911:GLN:HG3	2.29	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:945:LEU:HD12	1:B:945:LEU:N	2.29	0.48
1:B:920:HIS:ND1	1:B:921:PRO:HD2	2.29	0.47
1:B:896:LYS:HA	1:B:898:GLN:OE1	2.15	0.47
1:A:872:ASP:OD1	1:A:1036:LYS:NZ	2.46	0.46
1:A:879[A]:ARG:HH12	1:A:911:GLN:HG3	1.80	0.46
1:B:967:ASP:HB3	4:B:2137:GOL:H2	1.97	0.46
1:B:1019:THR:CG2	1:B:1021:MET:HE1	2.44	0.45
1:B:907:MET:O	1:B:911:GLN:HG3	2.17	0.45
1:B:865:THR:HG22	5:B:5:HOH:O	2.17	0.44
1:B:892:LEU:C	1:B:892:LEU:HD23	2.38	0.43
1:B:892:LEU:HD21	1:B:898:GLN:HG3	2.00	0.43
1:B:946:GLU:O	1:B:949:GLU:HG2	2.18	0.43
1:A:901:ILE:O	1:A:905:VAL:HG23	2.19	0.43
1:A:945:LEU:HD12	1:A:945:LEU:N	2.35	0.42
1:B:875:ILE:CD1	1:B:1036:LYS:HD2	2.50	0.42
1:A:868[B]:GLU:HG3	5:A:24:HOH:O	2.21	0.41
1:B:944:VAL:C	1:B:945:LEU:HD12	2.41	0.41
1:B:939:VAL:HA	1:B:940:PRO:HD3	1.94	0.41
1:B:1014:PHE:O	1:B:1021:MET:HE3	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	185/207 (89%)	180 (97%)	5 (3%)	0	100	100
1	B	181/207 (87%)	176 (97%)	4 (2%)	1 (1%)	25	19
All	All	366/414 (88%)	356 (97%)	9 (2%)	1 (0%)	41	37

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	1039	GLU

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	155/168 (92%)	146 (94%)	9 (6%)	20	15
1	B	151/168 (90%)	145 (96%)	6 (4%)	31	29
All	All	306/336 (91%)	291 (95%)	15 (5%)	26	21

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	860	MET
1	A	880[A]	GLU
1	A	880[B]	GLU
1	A	896	LYS
1	A	898	GLN
1	A	922	VAL
1	A	942	ASP
1	A	956	ASP
1	A	1034	GLN
1	B	861	GLU
1	B	865	THR
1	B	898	GLN
1	B	1002	LEU
1	B	1022	LEU
1	B	1034	GLN

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

Mol	Chain	Res	Type
1	A	911	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

6 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	NAP	B	2136	-	46,52,52	2.50	12 (26%)	61,80,80	2.32	14 (22%)
4	GOL	B	2137	-	5,5,5	0.30	0	5,5,5	0.32	0
2	SO4	A	1138	-	4,4,4	0.74	0	6,6,6	0.29	0
2	SO4	B	2138	-	4,4,4	0.77	0	6,6,6	0.16	0
3	NAP	A	1136	-	46,52,52	2.63	13 (28%)	61,80,80	2.33	14 (22%)
4	GOL	A	1137	-	5,5,5	0.35	0	5,5,5	0.36	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	NAP	A	1136	-	-	9/31/67/67	0/5/5/5
4	GOL	A	1137	-	-	0/4/4/4	-
4	GOL	B	2137	-	-	0/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAP	B	2136	-	-	9/31/67/67	0/5/5/5

All (25) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1136	NAP	PN-O3	9.57	1.69	1.59
3	B	2136	NAP	PN-O3	9.41	1.69	1.59
3	A	1136	NAP	C2N-N1N	9.01	1.44	1.35
3	B	2136	NAP	C2N-N1N	8.14	1.43	1.35
3	B	2136	NAP	C5N-C4N	4.40	1.46	1.38
3	B	2136	NAP	C6N-N1N	4.29	1.45	1.35
3	A	1136	NAP	C6N-N1N	4.03	1.44	1.35
3	B	2136	NAP	C4N-C3N	3.94	1.45	1.39
3	A	1136	NAP	C5N-C4N	3.79	1.45	1.38
3	A	1136	NAP	C2A-N3A	3.74	1.37	1.32
3	B	2136	NAP	PA-O1A	-3.46	1.38	1.50
3	A	1136	NAP	C4N-C3N	3.31	1.44	1.39
3	A	1136	NAP	O4D-C1D	3.16	1.45	1.40
3	A	1136	NAP	PA-O1A	-3.14	1.39	1.50
3	A	1136	NAP	C4A-N3A	2.90	1.39	1.35
3	A	1136	NAP	PA-O2A	-2.82	1.42	1.55
3	B	2136	NAP	PA-O2A	-2.72	1.42	1.55
3	B	2136	NAP	C2A-N3A	2.67	1.36	1.32
3	A	1136	NAP	P2B-O2B	2.40	1.63	1.59
3	B	2136	NAP	C4A-N3A	2.25	1.38	1.35
3	A	1136	NAP	PN-O2N	-2.25	1.44	1.55
3	A	1136	NAP	C3N-C7N	2.18	1.53	1.50
3	B	2136	NAP	C6N-C5N	2.17	1.43	1.38
3	B	2136	NAP	C5A-N7A	-2.11	1.32	1.39
3	B	2136	NAP	P2B-O2X	-2.03	1.47	1.54

All (28) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	2136	NAP	N3A-C2A-N1A	-8.46	117.19	128.67
3	A	1136	NAP	N3A-C2A-N1A	-8.27	117.45	128.67
3	A	1136	NAP	O2A-PA-O3	-8.14	85.27	107.27
3	B	2136	NAP	O2A-PA-O3	-8.12	85.32	107.27
3	A	1136	NAP	O3-PA-O1A	-6.43	91.36	110.70
3	B	2136	NAP	O3-PA-O1A	-6.42	91.39	110.70
3	A	1136	NAP	O2A-PA-O1A	5.37	137.42	112.44
3	B	2136	NAP	O2A-PA-O1A	5.30	137.08	112.44

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	2136	NAP	O3B-C3B-C4B	4.06	122.76	111.08
3	A	1136	NAP	O3B-C3B-C4B	4.06	122.74	111.08
3	A	1136	NAP	C5N-C4N-C3N	4.05	124.34	120.36
3	B	2136	NAP	C5B-C4B-C3B	-3.77	101.65	115.21
3	A	1136	NAP	C5B-C4B-C3B	-3.74	101.75	115.21
3	B	2136	NAP	C5N-C4N-C3N	3.56	123.86	120.36
3	A	1136	NAP	C1B-N9A-C4A	-3.49	120.52	126.64
3	B	2136	NAP	C1B-N9A-C4A	-3.48	120.53	126.64
3	A	1136	NAP	C2B-C1B-N9A	2.74	118.64	112.56
3	A	1136	NAP	C4B-O4B-C1B	2.73	112.42	109.92
3	B	2136	NAP	C4B-O4B-C1B	2.65	112.35	109.92
3	B	2136	NAP	C2B-C1B-N9A	2.37	117.83	112.56
3	B	2136	NAP	O3X-P2B-O2X	2.27	116.30	107.80
3	B	2136	NAP	O4B-C4B-C5B	2.25	116.54	109.33
3	B	2136	NAP	C6N-N1N-C2N	2.21	123.76	121.88
3	A	1136	NAP	C6N-N1N-C2N	2.19	123.74	121.88
3	A	1136	NAP	O5B-C5B-C4B	-2.15	101.68	108.99
3	B	2136	NAP	O5B-C5B-C4B	-2.12	101.78	108.99
3	A	1136	NAP	O3X-P2B-O2X	2.11	115.72	107.80
3	A	1136	NAP	C5N-C6N-N1N	-2.06	117.57	120.38

There are no chirality outliers.

All (18) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1136	NAP	C5B-O5B-PA-O2A
3	A	1136	NAP	C5B-O5B-PA-O3
3	A	1136	NAP	O4D-C1D-N1N-C2N
3	B	2136	NAP	C5B-O5B-PA-O3
3	B	2136	NAP	O4D-C1D-N1N-C2N
3	B	2136	NAP	O4B-C4B-C5B-O5B
3	A	1136	NAP	O4B-C4B-C5B-O5B
3	A	1136	NAP	C3B-C4B-C5B-O5B
3	B	2136	NAP	C3B-C4B-C5B-O5B
3	A	1136	NAP	PA-O3-PN-O1N
3	B	2136	NAP	PA-O3-PN-O1N
3	B	2136	NAP	C5B-O5B-PA-O2A
3	A	1136	NAP	O4D-C1D-N1N-C6N
3	B	2136	NAP	O4D-C1D-N1N-C6N
3	B	2136	NAP	C1B-C2B-O2B-P2B
3	B	2136	NAP	O4D-C4D-C5D-O5D
3	A	1136	NAP	O4D-C4D-C5D-O5D

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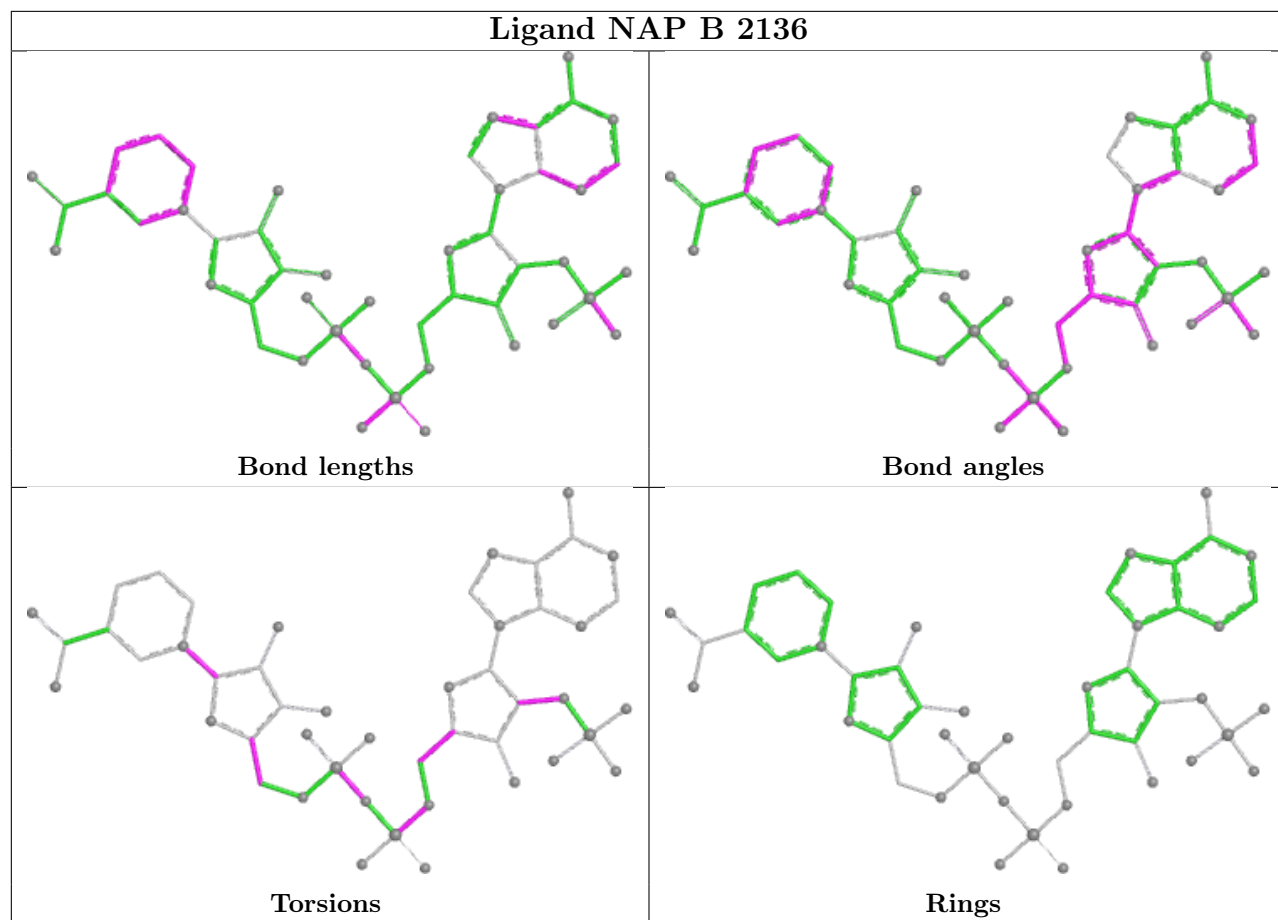
Mol	Chain	Res	Type	Atoms
3	A	1136	NAP	PA-O3-PN-O2N

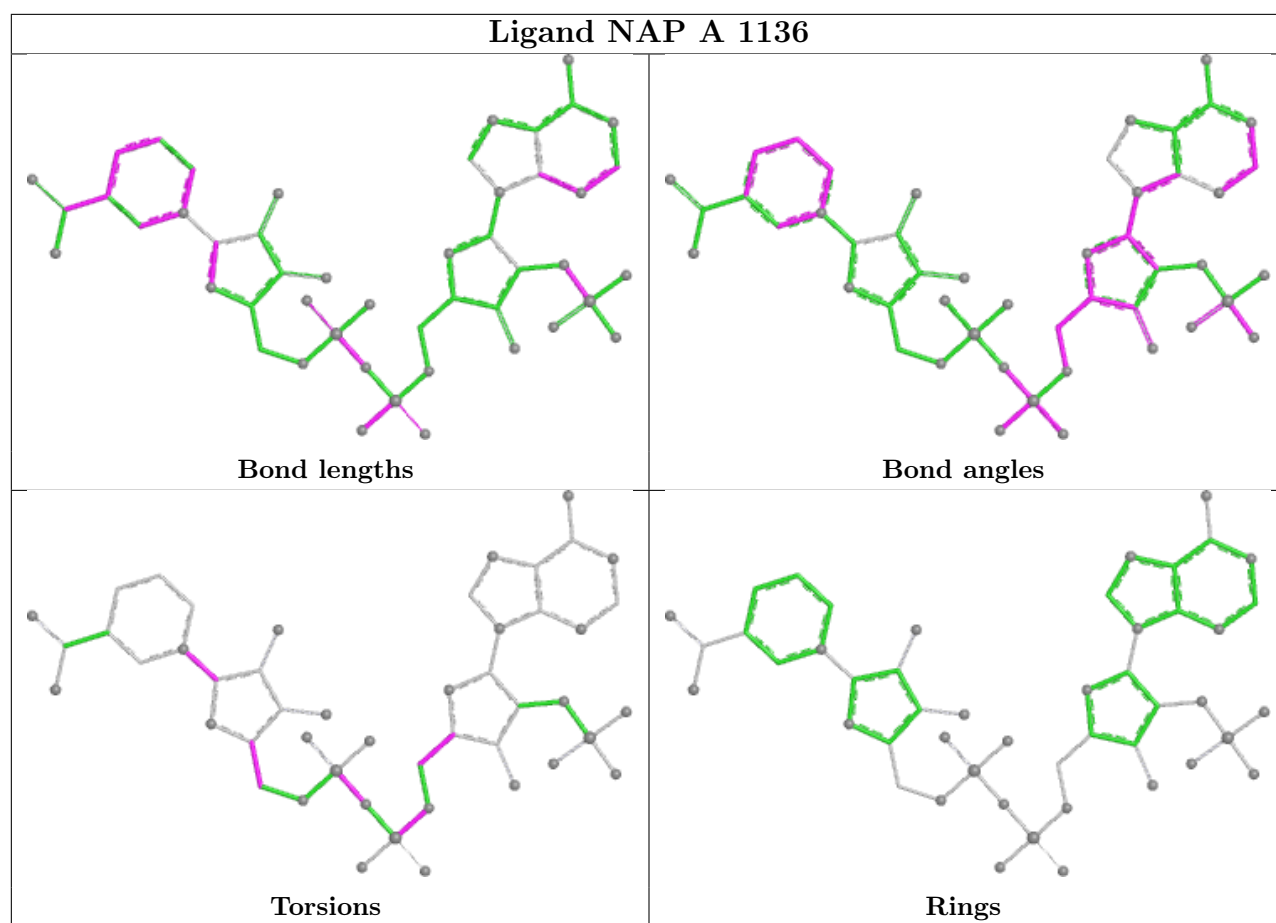
There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	2137	GOL	1	0
3	A	1136	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 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

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.