



# Full wwPDB X-ray Structure Validation Report ⓘ

Jan 27, 2024 – 08:17 PM EST

PDB ID : 1DFG  
Title : X-RAY STRUCTURE OF ESCHERICHIA COLI ENOYL REDUCTASE WITH BOUND NAD AND BENZO-DIAZABORINE  
Authors : Baldock, C.; Rafferty, J.B.; Rice, D.W.  
Deposited on : 1997-01-16  
Resolution : 2.50 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](mailto: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>.

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
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

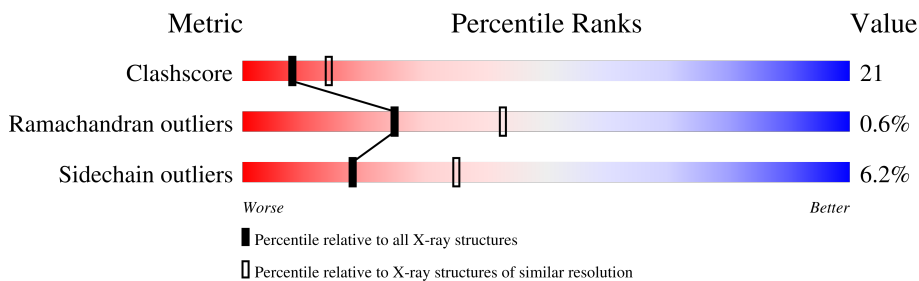
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.50 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	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)

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  $\geq 3$ , 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	261	
1	B	261	

## 2 Entry composition i

There are 3 unique types of molecules in this entry. The entry contains 3930 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 ENOYL ACYL CARRIER PROTEIN REDUCTASE.

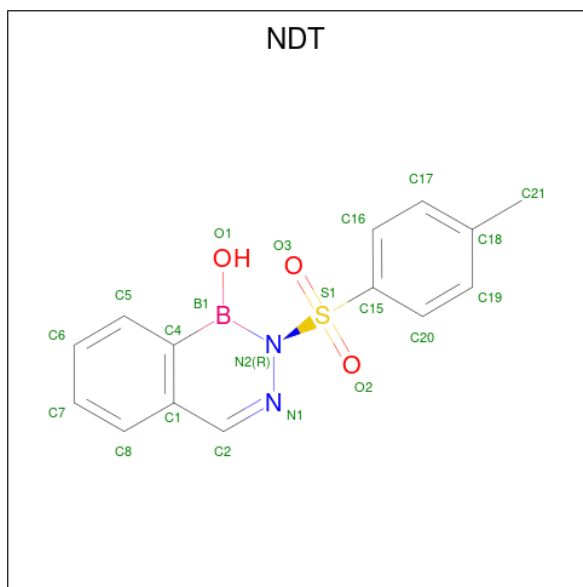
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	257	Total 1900	C 1197	N 326	O 364	S 13	0	0	0
1	B	257	Total 1900	C 1197	N 326	O 364	S 13	0	0	0

- Molecule 2 is NICOTINAMIDE-ADENINE-DINUCLEOTIDE (three-letter code: NAD) (formula:  $C_{21}H_{27}N_7O_{14}P_2$ ).



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

- Molecule 3 is 2-(TOLUENE-4-SULFONYL)-2H-BENZO[D][1,2,3]DIAZABORININ-1-OL (three-letter code: NDT) (formula:  $C_{14}H_{13}BN_2O_3S$ ).



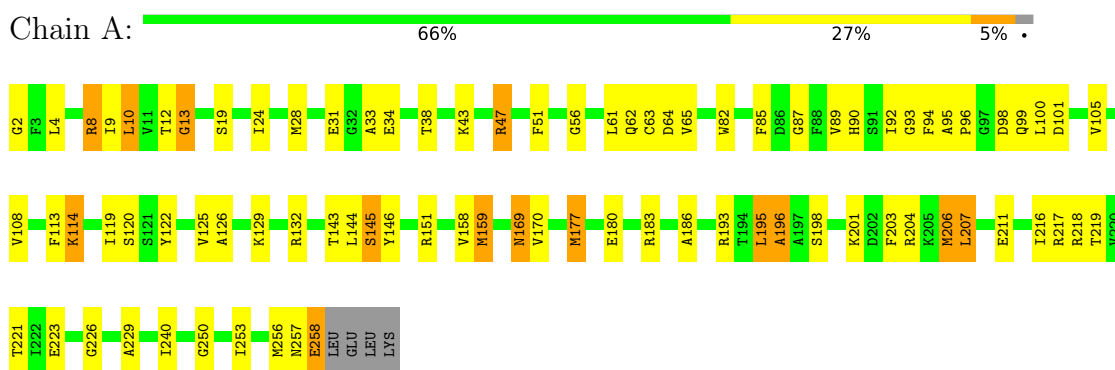
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	B	C	N	O			S
3	A	1	21	1	14	2	3	1	0	0
3	B	1	21	1	14	2	3	1	0	0

### 3 Residue-property plots

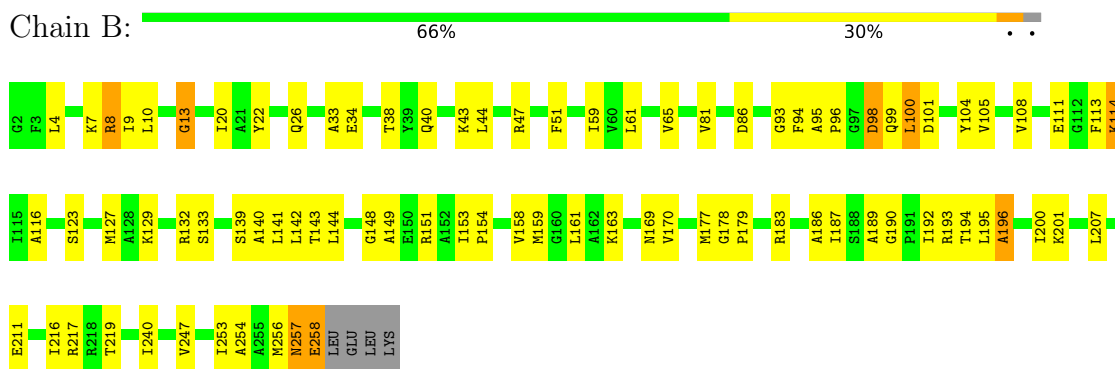
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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: ENOYL ACYL CARRIER PROTEIN REDUCTASE



- Molecule 1: ENOYL ACYL CARRIER PROTEIN REDUCTASE



## 4 Data and refinement statistics

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

Property	Value	Source
Space group	P 61 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	80.60Å 80.60Å 325.30Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	10.00 – 2.50	Depositor
% Data completeness (in resolution range)	90.0 (10.00-2.50)	Depositor
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	TNT	Depositor
R, $R_{free}$	0.173 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	3930	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	25.0	wwPDB-VP

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: NAD, NDT

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	0.80	1/1932 (0.1%)	0.91	7/2612 (0.3%)
1	B	0.78	0/1932	0.84	2/2612 (0.1%)
All	All	0.79	1/3864 (0.0%)	0.88	9/5224 (0.2%)

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	2
1	B	0	2
All	All	0	4

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	10	LEU	C-N	10.66	1.58	1.34

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	13	GLY	O-C-N	-12.98	101.93	122.70
1	B	13	GLY	O-C-N	-9.99	106.72	122.70
1	A	95	ALA	O-C-N	-8.60	104.76	121.10
1	B	8	ARG	NE-CZ-NH2	6.67	123.63	120.30
1	A	95	ALA	CA-C-N	6.17	134.39	117.10
1	A	159	MET	CG-SD-CE	5.55	109.08	100.20
1	A	85	PHE	C-N-CA	-5.27	108.53	121.70
1	A	177	MET	CG-SD-CE	5.26	108.61	100.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	10	LEU	C-N-CA	-5.07	109.04	121.70

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	13	GLY	Mainchain
1	A	56	GLY	Mainchain
1	B	13	GLY	Mainchain
1	B	9	ILE	Mainchain

## 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	1900	0	1876	93	0
1	B	1900	0	1876	75	0
2	A	44	0	23	5	0
2	B	44	0	23	5	0
3	A	21	0	13	5	0
3	B	21	0	13	5	0
All	All	3930	0	3824	164	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 21.

All (164) 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:101:ASP:HB2	1:A:201:LYS:CE	1.34	1.54
1:A:101:ASP:CB	1:A:201:LYS:CE	1.95	1.41
1:A:101:ASP:HB2	1:A:201:LYS:NZ	0.98	1.31
1:A:101:ASP:CB	1:A:201:LYS:NZ	1.91	1.28
1:A:101:ASP:CB	1:A:201:LYS:HE3	1.57	1.26
1:A:12:THR:CG2	1:A:92:ILE:CD1	2.33	1.05

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:101:ASP:HB3	1:A:201:LYS:CE	1.88	1.04
1:A:12:THR:HG21	1:A:92:ILE:HD12	1.37	1.02
1:A:101:ASP:CB	1:A:201:LYS:HZ1	1.59	1.01
1:A:12:THR:HG23	1:A:92:ILE:HD11	1.41	0.99
1:A:12:THR:CG2	1:A:92:ILE:HD11	1.92	0.97
1:B:47:ARG:HD2	1:B:51:PHE:CZ	2.02	0.95
1:A:12:THR:HG21	1:A:92:ILE:CD1	1.95	0.94
1:A:257:ASN:O	1:A:258:GLU:HB2	1.69	0.92
1:B:258:GLU:HA	1:B:258:GLU:OE1	1.68	0.92
1:A:101:ASP:HB3	1:A:201:LYS:HE3	1.47	0.89
1:A:101:ASP:CA	1:A:201:LYS:HE3	2.04	0.86
1:A:8:ARG:HG2	1:A:82:TRP:CE2	2.11	0.85
1:A:47:ARG:HD2	1:A:51:PHE:CZ	2.15	0.81
1:A:101:ASP:HB2	1:A:201:LYS:HZ3	1.43	0.78
1:B:8:ARG:NH1	1:B:34:GLU:OE1	2.18	0.76
1:A:108:VAL:O	1:B:129:LYS:HE3	1.86	0.75
1:B:200:ILE:H	1:B:200:ILE:HD12	1.51	0.75
1:B:257:ASN:O	1:B:258:GLU:HB2	1.86	0.75
1:A:129:LYS:HE2	1:B:108:VAL:O	1.87	0.73
1:B:148:GLY:HA2	1:B:153:ILE:HD12	1.71	0.73
1:A:38:THR:HA	1:A:61:LEU:O	1.90	0.71
1:A:211:GLU:HG3	1:A:219:THR:HG23	1.70	0.71
1:A:101:ASP:HB2	1:A:201:LYS:HZ1	0.89	0.70
1:B:256:MET:C	1:B:258:GLU:H	1.93	0.70
1:B:99:GLN:HE22	1:B:108:VAL:HA	1.55	0.70
1:B:101:ASP:OD1	1:B:201:LYS:HD2	1.92	0.69
2:B:501:NAD:H2D	3:B:0:NDT:N2	2.07	0.69
1:B:253:ILE:HD12	1:B:253:ILE:C	2.13	0.68
1:A:96:PRO:HB2	1:A:98:ASP:OD1	1.93	0.68
1:A:101:ASP:HA	1:A:201:LYS:HE3	1.76	0.68
1:B:20:ILE:HG21	1:B:144:LEU:HD22	1.76	0.68
1:A:4:LEU:CD1	1:A:28:MET:HG2	2.24	0.68
1:A:193:ARG:HA	1:A:207:LEU:HD11	1.75	0.68
1:A:12:THR:CG2	1:A:92:ILE:HD12	2.06	0.67
1:B:211:GLU:CG	1:B:219:THR:HG23	2.25	0.66
1:A:101:ASP:HB3	1:A:201:LYS:HE2	1.78	0.65
1:A:250:GLY:O	1:A:253:ILE:HG13	1.96	0.65
1:B:256:MET:C	1:B:258:GLU:N	2.47	0.65
1:B:38:THR:HA	1:B:61:LEU:O	1.97	0.64
1:A:256:MET:C	1:A:258:GLU:H	2.01	0.64
1:A:62:GLN:HG2	1:A:63:CYS:N	2.13	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:101:ASP:CB	1:A:201:LYS:HE2	2.22	0.62
1:B:100:LEU:HD23	3:B:0:NDT:H211	1.82	0.61
1:A:129:LYS:NZ	1:B:105:VAL:O	2.31	0.61
1:A:8:ARG:NH1	1:A:34:GLU:OE1	2.34	0.61
1:A:12:THR:HB	1:A:89:VAL:O	2.01	0.60
1:B:132:ARG:HG3	1:B:177:MET:CE	2.31	0.60
1:B:114:LYS:HD2	1:B:114:LYS:C	2.23	0.59
1:A:100:LEU:HD12	3:A:0:NDT:H211	1.85	0.59
1:B:211:GLU:HG3	1:B:219:THR:HG23	1.83	0.59
1:B:256:MET:O	1:B:258:GLU:N	2.36	0.59
1:B:8:ARG:HH11	1:B:8:ARG:HG2	1.68	0.59
1:A:108:VAL:O	1:B:129:LYS:CE	2.51	0.58
1:A:195:LEU:O	1:A:196:ALA:O	2.21	0.58
1:A:256:MET:C	1:A:258:GLU:N	2.57	0.57
1:B:195:LEU:O	1:B:196:ALA:O	2.22	0.57
1:A:193:ARG:CA	1:A:207:LEU:HD11	2.33	0.57
1:A:226:GLY:O	1:A:229:ALA:HB3	2.04	0.57
1:B:95:ALA:O	3:B:0:NDT:H212	2.03	0.57
1:A:193:ARG:HA	1:A:207:LEU:CD1	2.34	0.56
1:B:187:ILE:HG23	1:B:247:VAL:HG23	1.86	0.56
1:B:193:ARG:HG3	1:B:207:LEU:HD13	1.88	0.56
1:B:96:PRO:O	1:B:99:GLN:HB2	2.06	0.55
1:B:40:GLN:NE2	2:B:501:NAD:O2B	2.40	0.54
1:B:140:ALA:C	1:B:141:LEU:HD23	2.27	0.54
2:A:501:NAD:H2D	3:A:0:NDT:N2	2.22	0.54
1:A:193:ARG:HB2	1:A:207:LEU:HD12	1.90	0.53
1:B:187:ILE:HG23	1:B:247:VAL:CG2	2.39	0.53
1:B:159:MET:O	1:B:163:LYS:HG2	2.09	0.53
1:B:4:LEU:O	1:B:7:LYS:HB2	2.08	0.53
1:A:183:ARG:HD2	1:A:240:ILE:O	2.10	0.52
1:B:100:LEU:CD2	3:B:0:NDT:H211	2.38	0.52
1:A:2:GLY:HA3	1:A:31:GLU:O	2.09	0.52
1:A:43:LYS:CG	1:A:43:LYS:O	2.58	0.52
1:A:101:ASP:CG	1:A:201:LYS:NZ	2.60	0.52
1:B:47:ARG:HD2	1:B:51:PHE:CE2	2.44	0.52
1:B:258:GLU:OE1	1:B:258:GLU:CA	2.47	0.51
1:B:141:LEU:HD23	1:B:141:LEU:N	2.23	0.51
1:B:253:ILE:C	1:B:253:ILE:CD1	2.79	0.51
1:A:8:ARG:HG2	1:A:82:TRP:CZ2	2.47	0.50
1:A:203:PHE:O	1:A:206:MET:HB3	2.11	0.50
1:A:170:VAL:HG21	1:A:186:ALA:HB2	1.94	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:221:THR:OG1	1:A:223:GLU:HB2	2.12	0.50
1:B:257:ASN:O	1:B:258:GLU:CB	2.58	0.49
1:B:148:GLY:CA	1:B:153:ILE:HD12	2.42	0.49
1:B:178:GLY:N	1:B:179:PRO:CD	2.76	0.49
1:B:253:ILE:HD12	1:B:254:ALA:N	2.27	0.49
1:A:64:ASP:OD1	1:A:64:ASP:C	2.49	0.48
1:A:204:ARG:O	1:A:207:LEU:HB2	2.13	0.48
1:B:153:ILE:HG23	1:B:154:PRO:HD2	1.96	0.48
1:A:120:SER:CB	1:A:159:MET:CE	2.92	0.48
1:A:122:TYR:O	1:A:125:VAL:HG12	2.14	0.47
1:A:145:SER:O	2:A:501:NAD:H6N	2.15	0.47
1:B:159:MET:CE	1:B:163:LYS:HE2	2.44	0.47
1:B:170:VAL:HG21	1:B:186:ALA:HB2	1.97	0.47
1:A:65:VAL:HG22	2:A:501:NAD:N1A	2.30	0.47
1:A:105:VAL:O	1:B:129:LYS:HE2	2.14	0.47
1:B:10:LEU:HD11	1:B:38:THR:HG23	1.95	0.46
1:B:4:LEU:HB3	1:B:33:ALA:HB2	1.97	0.46
1:B:59:ILE:HD13	1:B:81:VAL:HG11	1.97	0.46
1:A:216:ILE:O	1:A:217:ARG:HB2	2.16	0.46
1:A:99:GLN:C	1:A:100:LEU:HD23	2.36	0.46
1:A:129:LYS:CE	1:B:108:VAL:O	2.60	0.46
1:A:24:ILE:HG12	1:A:229:ALA:CB	2.47	0.45
1:A:169:ASN:ND2	1:B:104:TYR:OH	2.48	0.45
1:B:86:ASP:HA	1:B:139:SER:OG	2.17	0.45
1:B:98:ASP:OD1	1:B:98:ASP:N	2.48	0.45
1:B:20:ILE:HG21	1:B:144:LEU:CD2	2.45	0.45
1:B:183:ARG:HD2	1:B:240:ILE:O	2.16	0.45
1:A:195:LEU:C	1:A:196:ALA:O	2.55	0.45
1:A:47:ARG:HA	1:A:47:ARG:HD3	1.60	0.45
1:A:8:ARG:NH1	1:A:34:GLU:CD	2.71	0.45
1:A:10:LEU:HD11	1:A:38:THR:HG23	1.99	0.45
1:B:113:PHE:HA	1:B:158:VAL:HG21	1.99	0.44
1:A:99:GLN:HE22	1:A:108:VAL:HA	1.83	0.44
1:B:200:ILE:HD12	1:B:200:ILE:N	2.27	0.44
2:B:501:NAD:H2D	3:B:0:NDT:C4	2.47	0.44
1:B:132:ARG:HG3	1:B:177:MET:HE3	1.98	0.43
1:B:161:LEU:HD12	1:B:161:LEU:N	2.33	0.43
1:A:43:LYS:O	1:A:43:LYS:HG3	2.18	0.43
1:A:100:LEU:CD1	3:A:0:NDT:H19	2.48	0.43
1:A:122:TYR:CE2	1:A:126:ALA:HB2	2.53	0.43
1:B:192:ILE:N	2:B:501:NAD:O7N	2.44	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:193:ARG:N	1:A:207:LEU:HD11	2.33	0.43
1:B:123:SER:O	1:B:127:MET:HG3	2.19	0.43
1:A:257:ASN:O	1:A:258:GLU:CB	2.52	0.43
1:B:94:PHE:O	1:B:116:ALA:HA	2.18	0.43
1:B:190:GLY:O	2:B:501:NAD:H4N	2.19	0.43
1:A:38:THR:CA	1:A:61:LEU:O	2.64	0.43
1:B:93:GLY:O	1:B:94:PHE:HB2	2.19	0.43
1:A:218:ARG:NH1	1:A:219:THR:O	2.47	0.43
1:B:153:ILE:HA	1:B:154:PRO:HD3	1.87	0.43
1:A:92:ILE:CG2	1:A:93:GLY:N	2.82	0.42
1:A:101:ASP:CB	1:A:201:LYS:HZ3	2.12	0.42
1:A:114:LYS:HE3	1:A:114:LYS:HB3	1.48	0.42
1:A:193:ARG:CA	1:A:207:LEU:CD1	2.95	0.42
1:A:90:HIS:O	1:A:143:THR:HA	2.18	0.42
1:B:149:ALA:HB2	1:B:163:LYS:CB	2.49	0.42
1:A:132:ARG:NH1	1:B:105:VAL:HB	2.35	0.42
1:B:22:TYR:CE2	1:B:26:GLN:NE2	2.87	0.42
1:A:65:VAL:HG22	2:A:501:NAD:C6A	2.49	0.42
1:A:113:PHE:HA	1:A:158:VAL:HG21	2.01	0.42
2:A:501:NAD:H2D	3:A:0:NDT:C4	2.48	0.41
1:B:65:VAL:HB	1:B:123:SER:HB2	2.02	0.41
1:A:8:ARG:NH1	1:A:34:GLU:OE2	2.54	0.41
1:A:4:LEU:HD13	1:A:28:MET:HG2	1.99	0.41
1:B:142:LEU:HG	1:B:143:THR:N	2.34	0.41
1:A:177:MET:O	1:A:180:GLU:HG2	2.20	0.41
1:B:195:LEU:C	1:B:196:ALA:O	2.59	0.41
1:B:94:PHE:CG	1:B:95:ALA:N	2.89	0.40
1:A:98:ASP:OD1	1:A:98:ASP:N	2.54	0.40
1:A:146:TYR:CG	3:A:0:NDT:H6	2.55	0.40
1:B:189:ALA:HA	1:B:247:VAL:O	2.21	0.40
1:B:216:ILE:O	1:B:217:ARG:HB2	2.20	0.40
1:A:4:LEU:HB3	1:A:33:ALA:HB2	2.04	0.40
1:A:9:ILE:HA	1:A:87:GLY:O	2.21	0.40
1:A:94:PHE:HB3	1:A:119:ILE:HG21	2.04	0.40
1:A:120:SER:CB	1:A:159:MET:HE3	2.52	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	255/261 (98%)	242 (95%)	12 (5%)	1 (0%)	34	54
1	B	255/261 (98%)	237 (93%)	16 (6%)	2 (1%)	19	35
All	All	510/522 (98%)	479 (94%)	28 (6%)	3 (1%)	25	43

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	196	ALA
1	B	196	ALA
1	B	257	ASN

### 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	194/200 (97%)	181 (93%)	13 (7%)	16	31
1	B	194/200 (97%)	183 (94%)	11 (6%)	20	39
All	All	388/400 (97%)	364 (94%)	24 (6%)	18	35

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

Mol	Chain	Res	Type
1	A	8	ARG
1	A	19	SER
1	A	47	ARG

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Mol	Chain	Res	Type
1	A	114	LYS
1	A	144	LEU
1	A	145	SER
1	A	151	ARG
1	A	169	ASN
1	A	195	LEU
1	A	198	SER
1	A	206	MET
1	A	207	LEU
1	A	258	GLU
1	B	43	LYS
1	B	44	LEU
1	B	98	ASP
1	B	100	LEU
1	B	111	GLU
1	B	114	LYS
1	B	133	SER
1	B	151	ARG
1	B	169	ASN
1	B	194	THR
1	B	258	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	26	GLN
1	A	40	GLN
1	A	99	GLN
1	A	169	ASN
1	A	257	ASN
1	B	26	GLN
1	B	40	GLN
1	B	54	GLN
1	B	99	GLN
1	B	169	ASN
1	B	257	ASN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

4 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	NAD	A	501	3	42,48,48	2.11	13 (30%)	50,73,73	2.80	19 (38%)
2	NAD	B	501	3	42,48,48	1.98	13 (30%)	50,73,73	2.86	17 (34%)
3	NDT	A	0	2	22,23,23	3.96	6 (27%)	25,34,34	4.14	8 (32%)
3	NDT	B	0	2	22,23,23	4.33	4 (18%)	25,34,34	2.67	7 (28%)

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	NAD	A	501	3	-	8/26/62/62	0/5/5/5
2	NAD	B	501	3	-	4/26/62/62	0/5/5/5
3	NDT	A	0	2	-	5/9/25/25	0/3/3/3
3	NDT	B	0	2	-	3/9/25/25	0/3/3/3

All (36) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	0	NDT	B1-O1	16.59	1.59	1.36

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	0	NDT	B1-O1	15.44	1.57	1.36
3	B	0	NDT	N2-N1	-7.75	1.31	1.39
3	A	0	NDT	C15-S1	-7.34	1.66	1.76
3	B	0	NDT	C15-S1	-6.65	1.67	1.76
2	A	501	NAD	C2A-N3A	5.90	1.41	1.32
2	B	501	NAD	C2A-N3A	4.95	1.40	1.32
2	B	501	NAD	O3D-C3D	-4.43	1.32	1.43
2	A	501	NAD	C2B-C1B	4.07	1.59	1.53
2	A	501	NAD	O3D-C3D	-3.93	1.33	1.43
2	B	501	NAD	O4D-C4D	3.70	1.53	1.45
3	A	0	NDT	C2-N1	3.67	1.33	1.29
2	A	501	NAD	O3B-C3B	3.62	1.51	1.43
3	A	0	NDT	N2-N1	-3.41	1.36	1.39
3	B	0	NDT	C1-C4	-3.40	1.38	1.42
2	B	501	NAD	O2B-C2B	-3.39	1.35	1.43
2	A	501	NAD	C3N-C7N	3.36	1.55	1.50
2	A	501	NAD	O4B-C4B	3.12	1.52	1.45
2	B	501	NAD	C3N-C7N	2.98	1.55	1.50
2	B	501	NAD	O4D-C1D	2.96	1.45	1.41
2	B	501	NAD	O2D-C2D	-2.94	1.36	1.43
2	B	501	NAD	C3D-C4D	2.87	1.60	1.53
2	A	501	NAD	C5B-C4B	-2.86	1.42	1.51
3	A	0	NDT	S1-N2	2.83	1.73	1.67
2	A	501	NAD	O2B-C2B	-2.79	1.36	1.43
2	B	501	NAD	C2N-N1N	2.60	1.38	1.35
2	A	501	NAD	O4B-C1B	-2.60	1.37	1.41
3	A	0	NDT	O2-S1	2.58	1.46	1.43
2	A	501	NAD	C7N-N7N	2.55	1.37	1.33
2	A	501	NAD	O4D-C4D	2.48	1.50	1.45
2	B	501	NAD	C2N-C3N	-2.41	1.35	1.39
2	B	501	NAD	O3B-C3B	2.38	1.48	1.43
2	A	501	NAD	C3D-C4D	2.35	1.59	1.53
2	B	501	NAD	C5D-C4D	-2.33	1.44	1.51
2	A	501	NAD	C5D-C4D	-2.29	1.44	1.51
2	B	501	NAD	C5B-C4B	-2.04	1.45	1.51

All (51) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	0	NDT	O3-S1-C15	-12.12	92.71	108.05
3	A	0	NDT	O2-S1-C15	10.38	121.17	108.05
2	B	501	NAD	C3N-C2N-N1N	-10.28	110.38	120.43

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	501	NAD	C3N-C2N-N1N	-9.68	110.96	120.43
2	B	501	NAD	C2N-C3N-C4N	9.58	129.12	118.26
2	A	501	NAD	C2N-C3N-C4N	8.96	128.42	118.26
3	A	0	NDT	O3-S1-O2	-8.70	105.42	119.52
3	B	0	NDT	O3-S1-O2	-7.88	106.75	119.52
3	B	0	NDT	O1-B1-C4	-7.22	101.72	122.94
2	A	501	NAD	C5N-C4N-C3N	-6.30	112.89	120.34
2	B	501	NAD	C5N-C4N-C3N	-6.17	113.05	120.34
3	A	0	NDT	C20-C15-S1	-5.24	114.25	119.76
2	A	501	NAD	C6N-N1N-C2N	5.06	126.59	121.97
3	A	0	NDT	O1-B1-C4	-4.50	109.71	122.94
2	B	501	NAD	C5A-C6A-N6A	4.43	127.09	120.35
2	B	501	NAD	C2A-N1A-C6A	4.29	126.09	118.75
3	A	0	NDT	C16-C15-S1	4.15	124.12	119.76
2	B	501	NAD	C6N-N1N-C2N	4.11	125.72	121.97
2	A	501	NAD	C5A-C6A-N6A	3.94	126.33	120.35
2	A	501	NAD	O7N-C7N-C3N	-3.92	114.94	119.63
2	B	501	NAD	C5A-C6A-N1A	-3.79	111.76	120.35
2	A	501	NAD	C2A-N1A-C6A	3.77	125.20	118.75
3	B	0	NDT	C17-C16-C15	3.44	123.01	119.45
3	B	0	NDT	C20-C15-C16	-3.38	115.73	120.44
2	B	501	NAD	O7N-C7N-C3N	-3.20	115.80	119.63
3	A	0	NDT	C1-C2-N1	-3.19	121.64	125.88
2	A	501	NAD	C3D-C2D-C1D	-3.18	96.18	100.98
2	A	501	NAD	C5A-C6A-N1A	-3.11	113.30	120.35
3	B	0	NDT	C8-C1-C4	3.05	122.37	119.81
2	A	501	NAD	C2D-C3D-C4D	2.95	108.37	102.64
2	A	501	NAD	O4D-C4D-C3D	-2.93	99.32	105.11
2	B	501	NAD	O7N-C7N-N7N	2.91	126.72	122.58
2	A	501	NAD	O3D-C3D-C4D	-2.89	102.69	111.05
2	A	501	NAD	N3A-C2A-N1A	-2.84	124.24	128.68
2	B	501	NAD	C2D-C3D-C4D	2.79	108.06	102.64
2	B	501	NAD	O2B-C2B-C3B	2.65	120.40	111.82
2	B	501	NAD	N3A-C2A-N1A	-2.64	124.55	128.68
2	B	501	NAD	O4D-C1D-C2D	2.58	110.69	106.93
3	B	0	NDT	O3-S1-C15	-2.50	104.89	108.05
2	A	501	NAD	O2N-PN-O1N	2.45	124.33	112.24
2	B	501	NAD	O2N-PN-O1N	2.41	124.17	112.24
2	A	501	NAD	C2N-C3N-C7N	-2.41	112.47	119.46
2	B	501	NAD	O3D-C3D-C4D	-2.35	104.25	111.05
3	B	0	NDT	C19-C20-C15	2.31	121.84	119.45
2	B	501	NAD	C2N-C3N-C7N	-2.27	112.86	119.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	501	NAD	C2B-C3B-C4B	2.15	106.81	102.64
2	A	501	NAD	C3B-C2B-C1B	-2.14	97.75	100.98
2	B	501	NAD	C3B-C2B-C1B	-2.13	97.76	100.98
3	A	0	NDT	C16-C17-C18	-2.08	118.60	121.38
2	A	501	NAD	O3B-C3B-C4B	-2.06	105.10	111.05
2	A	501	NAD	O7N-C7N-N7N	2.02	125.44	122.58

There are no chirality outliers.

All (20) torsion outliers are listed below:

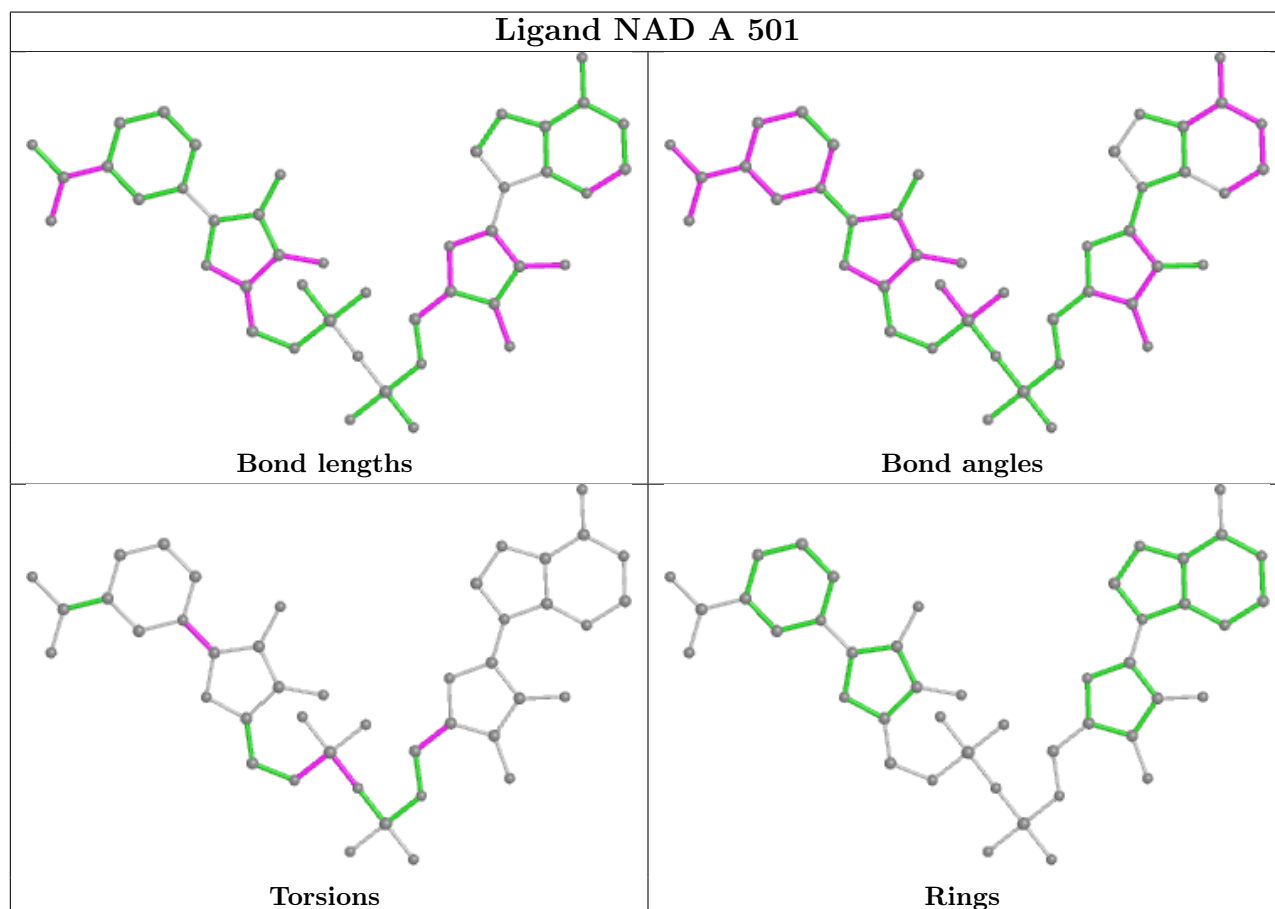
Mol	Chain	Res	Type	Atoms
2	A	501	NAD	C5D-O5D-PN-O1N
2	A	501	NAD	C5D-O5D-PN-O2N
2	A	501	NAD	O4D-C1D-N1N-C2N
2	A	501	NAD	O4D-C1D-N1N-C6N
2	B	501	NAD	O4D-C1D-N1N-C2N
3	A	0	NDT	N1-N2-S1-O2
3	A	0	NDT	C20-C15-S1-N2
3	A	0	NDT	C20-C15-S1-O3
3	B	0	NDT	C20-C15-S1-O3
3	A	0	NDT	C16-C15-S1-O3
2	B	501	NAD	PN-O3-PA-O2A
3	B	0	NDT	C16-C15-S1-O3
3	B	0	NDT	C20-C15-S1-N2
2	A	501	NAD	PA-O3-PN-O2N
2	B	501	NAD	PN-O3-PA-O1A
3	A	0	NDT	C16-C15-S1-N2
2	B	501	NAD	O4B-C4B-C5B-O5B
2	A	501	NAD	C5D-O5D-PN-O3
2	A	501	NAD	O4B-C4B-C5B-O5B
2	A	501	NAD	PA-O3-PN-O1N

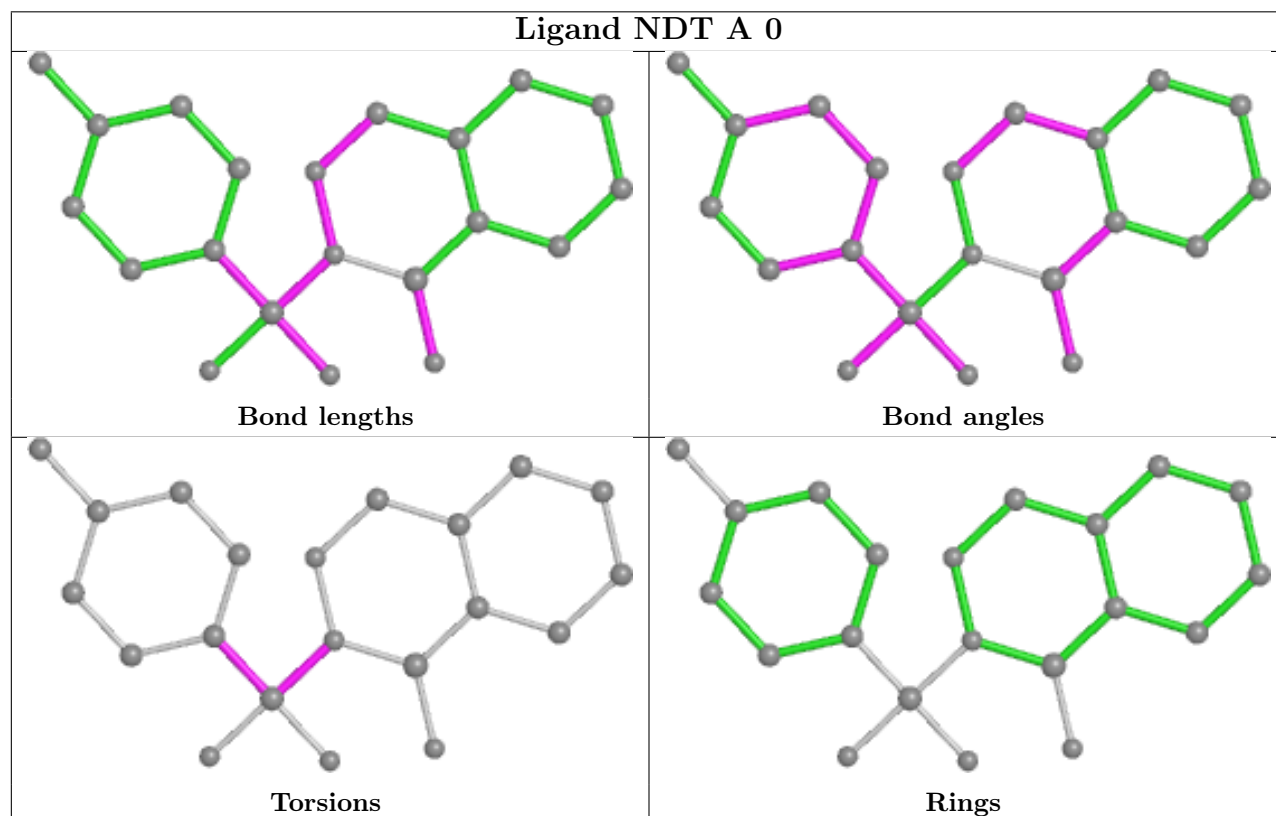
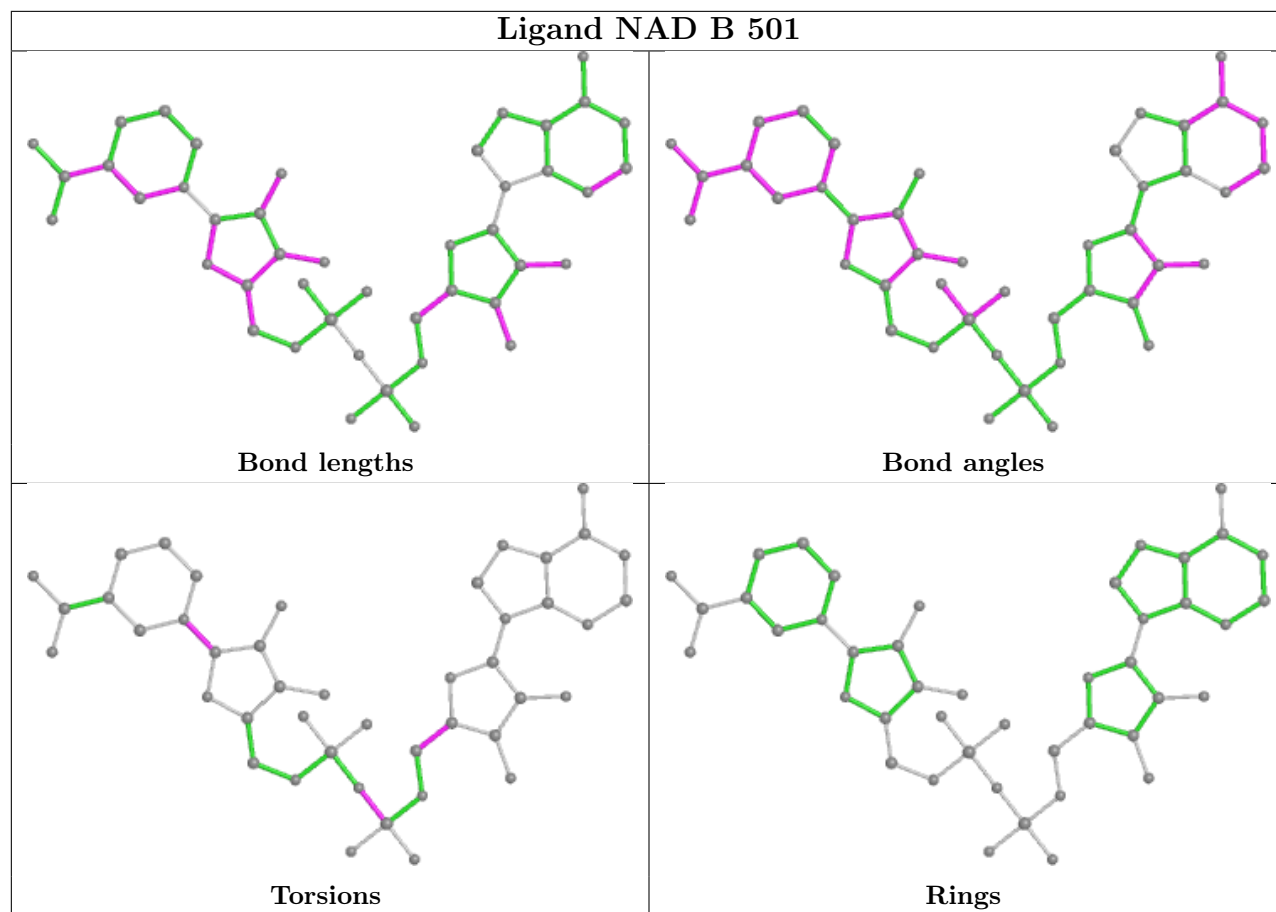
There are no ring outliers.

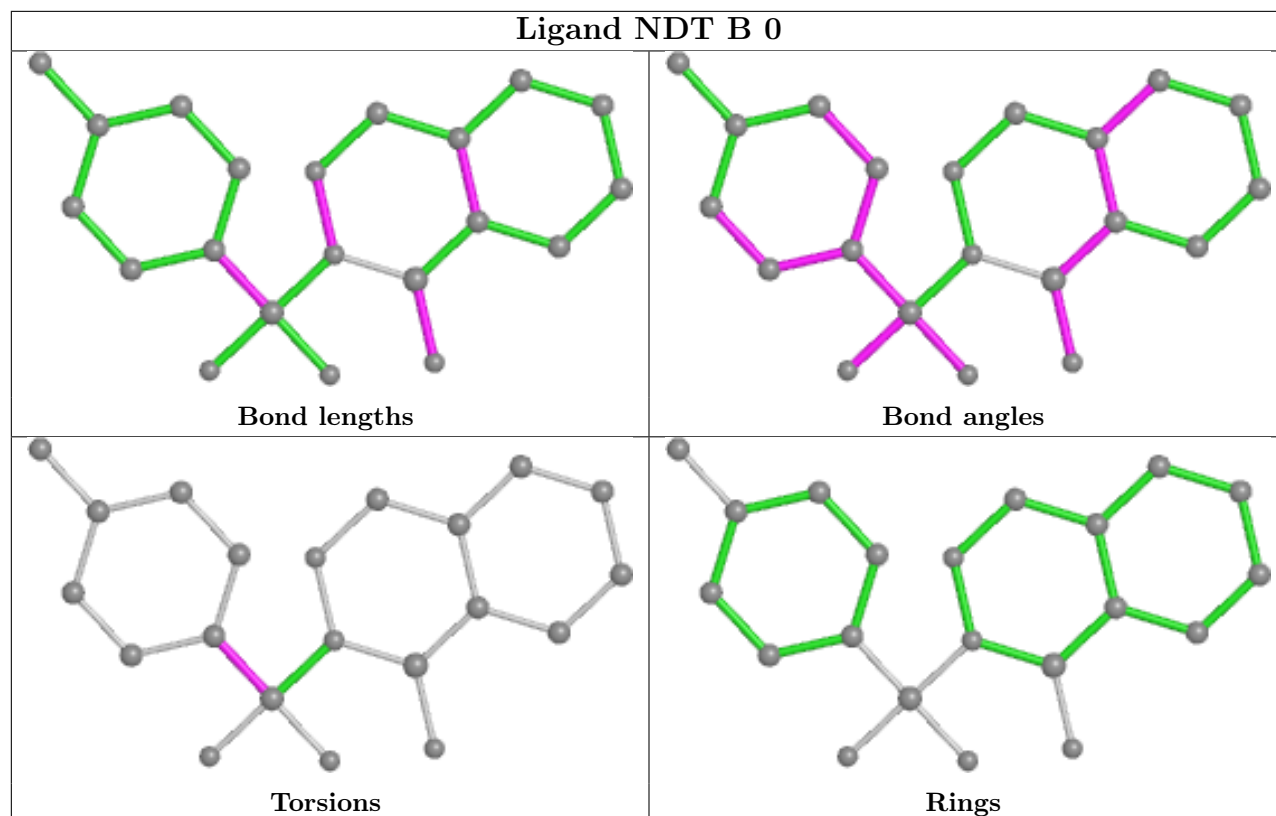
4 monomers are involved in 16 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	501	NAD	5	0
2	B	501	NAD	5	0
3	A	0	NDT	5	0
3	B	0	NDT	5	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](#)

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

### 6.3 Carbohydrates [i](#)

EDS was not executed - this section is therefore empty.

### 6.4 Ligands [i](#)

EDS was not executed - this section is therefore empty.

### 6.5 Other polymers [i](#)

EDS was not executed - this section is therefore empty.