



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 05:10 AM UTC

PDB ID : 1I2Z / pdb_00001i2z
Title : E. COLI ENOYL REDUCTASE IN COMPLEX WITH NAD AND BRL-12654
Authors : Heerding, D.A.; Miller, W.H.; Payne, D.J.; Janson, C.A.; Qiu, X.
Deposited on : 2001-02-12
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) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

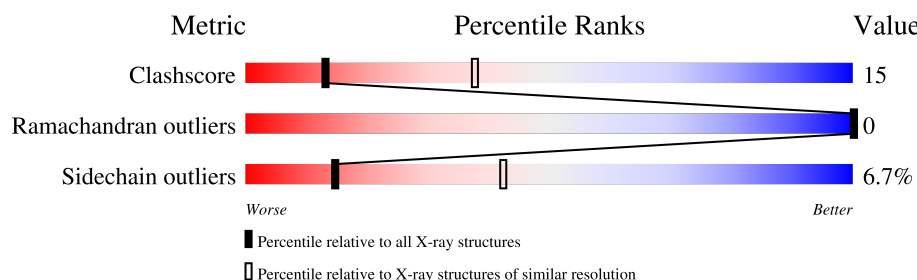
1 Overall quality at a glance

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))
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (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 $\leq 5\%$

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	262	
1	B	262	

2 Entry composition [i](#)

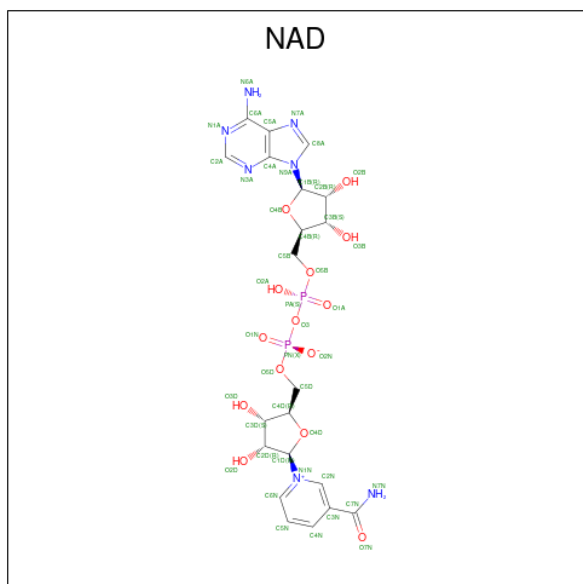
There are 4 unique types of molecules in this entry. The entry contains 4041 atoms, of which 0 are hydrogens and 0 are deuteriums.

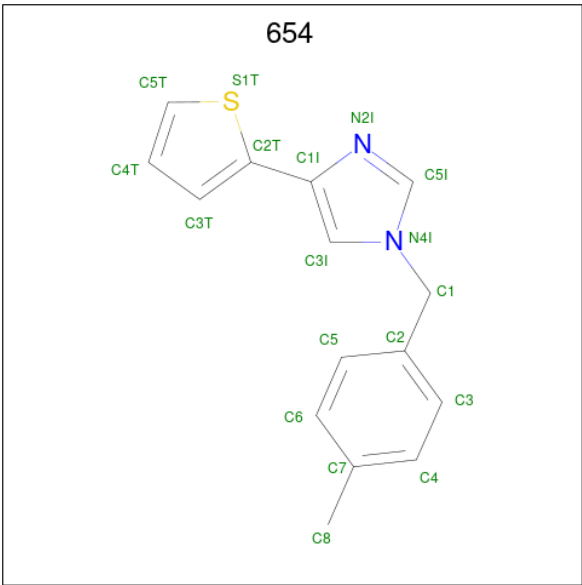
In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE [NADH].

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	257	Total	C	N	O	S	0	0	0
			1900	1197	326	364	13			
1	B	257	Total	C	N	O	S	0	0	0
			1904	1200	327	364	13			

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





Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	S	12	0
			18	15	2	1		
3	B	1	Total	C	N	S	12	0
			18	15	2	1		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	69	Total	O	0	0
			69	69		
4	B	44	Total	O	0	0
			44	44		

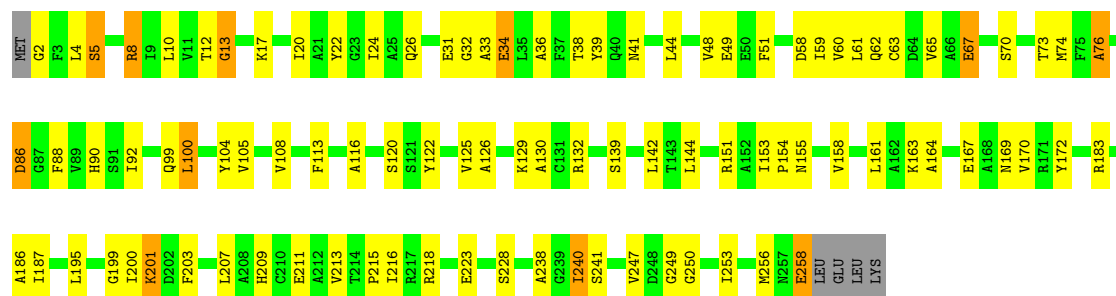
3 Residue-property plots

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.

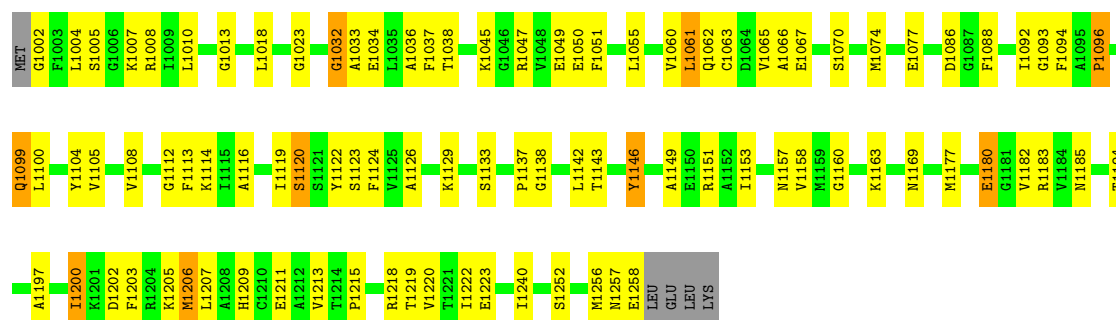
• Molecule 1: ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE [NADH]

Chain A: 



• Molecule 1: ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE [NADH]

Chain B: 



4 Data and refinement statistics

Xtriage (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, α , β , γ	79.58Å 79.58Å 323.39Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	7.00 – 2.80	Depositor
% Data completeness (in resolution range)	(Not available) (7.00-2.80)	Depositor
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, R_{free}	0.191 , 0.273	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4041	wwPDB-VP
Average B, all atoms (Å ²)	24.0	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, 654

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	0.74	0/1932	1.16	13/2612 (0.5%)
1	B	0.78	0/1936	1.16	12/2616 (0.5%)
All	All	0.76	0/3868	1.16	25/5228 (0.5%)

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.

All (25) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	100	LEU	N-CA-C	9.61	124.83	113.20
1	B	1099	GLN	N-CA-C	7.94	120.64	111.11
1	A	13	GLY	N-CA-C	7.61	126.62	114.90
1	A	86	ASP	N-CA-C	7.42	122.45	112.88
1	A	240	ILE	N-CA-C	6.23	116.83	107.80
1	A	130	ALA	N-CA-C	6.23	120.14	112.54
1	B	1223	GLU	N-CA-C	-5.94	104.50	110.97
1	B	1200	ILE	N-CA-C	5.79	116.64	108.36
1	B	1013	GLY	N-CA-C	5.72	123.25	115.30
1	B	1032	GLY	N-CA-C	5.71	123.77	115.32
1	B	1138	GLY	N-CA-C	-5.54	107.02	115.00
1	B	1120	SER	N-CA-C	5.53	119.20	112.23
1	A	199	GLY	N-CA-C	5.51	122.14	115.31
1	B	1036	ALA	N-CA-C	-5.43	100.91	109.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	1252	SER	N-CA-C	5.41	118.09	111.82
1	B	1112	GLY	N-CA-C	-5.29	106.00	112.77
1	B	1086	ASP	N-CA-C	5.27	119.22	112.26
1	A	223	GLU	N-CA-C	-5.21	105.51	111.14
1	A	100	LEU	CA-C-N	-5.20	115.66	122.99
1	A	100	LEU	C-N-CA	-5.20	115.66	122.99
1	A	164	ALA	N-CA-C	-5.18	105.52	111.07
1	A	169	ASN	N-CA-C	-5.17	105.64	111.28
1	A	76	ALA	N-CA-C	-5.10	105.37	111.03
1	A	228	SER	N-CA-C	-5.08	105.83	111.36
1	B	1070	SER	N-CA-C	-5.03	105.70	111.14

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	1146	TYR	Sidechain

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	1900	0	1876	63	0
1	B	1904	0	1887	59	0
2	A	44	0	26	1	0
2	B	44	0	26	0	0
3	A	18	0	14	0	0
3	B	18	0	14	0	0
4	A	69	0	0	1	0
4	B	44	0	0	3	0
All	All	4041	0	3843	115	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 15.

All (115) 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:12:THR:HG21	1:A:92:ILE:HD11	1.47	0.96
1:A:108:VAL:O	1:B:1129:LYS:HE3	1.69	0.91
1:A:99:GLN:HE22	1:A:108:VAL:HA	1.51	0.75
1:A:203:PHE:HE1	1:A:207:LEU:HD22	1.52	0.73
1:A:258:GLU:OE1	1:A:258:GLU:HA	1.87	0.72
1:A:90:HIS:CD2	1:A:92:ILE:HD12	2.23	0.72
1:B:1047:ARG:HD2	1:B:1051:PHE:CE2	2.28	0.68
1:B:1023:GLY:CA	1:B:1222:ILE:HD12	2.25	0.67
1:A:38:THR:HA	1:A:61:LEU:O	1.95	0.67
1:A:62:GLN:HG3	1:A:63:CYS:N	2.11	0.66
1:B:1038:THR:HA	1:B:1061:LEU:O	1.97	0.65
1:B:1116:ALA:O	1:B:1120:SER:HB2	1.96	0.65
1:A:183:ARG:HD2	1:A:240:ILE:O	1.96	0.65
1:A:4:LEU:HB3	1:A:33:ALA:HB2	1.79	0.65
1:A:86:ASP:HA	1:A:139:SER:OG	1.97	0.64
1:A:20:ILE:HG21	1:A:144:LEU:HD22	1.79	0.64
1:B:1211:GLU:HG3	1:B:1219:THR:HG23	1.79	0.64
1:A:211:GLU:HG2	1:A:218:ARG:HA	1.79	0.64
1:B:1180:GLU:HG3	4:B:2096:HOH:O	1.98	0.63
1:B:1099:GLN:HE22	1:B:1108:VAL:HA	1.64	0.62
1:B:1008:ARG:HG2	1:B:1008:ARG:HH11	1.65	0.61
1:A:247:VAL:HG12	1:A:247:VAL:O	1.99	0.61
1:A:203:PHE:CE1	1:A:207:LEU:HD22	2.34	0.61
1:A:209:HIS:O	1:A:213:VAL:HG22	2.02	0.60
1:B:1004:LEU:HB3	1:B:1033:ALA:HB2	1.84	0.60
1:A:22:TYR:CE2	1:A:26:GLN:NE2	2.70	0.59
1:B:1023:GLY:HA3	1:B:1222:ILE:HD12	1.85	0.58
1:B:1202:ASP:HA	4:B:2108:HOH:O	2.02	0.58
1:B:1256:MET:C	1:B:1258:GLU:H	2.10	0.57
1:A:65:VAL:HG22	2:A:501:NAD:N1A	2.19	0.57
1:A:99:GLN:NE2	1:A:108:VAL:HA	2.19	0.56
1:B:1137:PRO:HG2	4:B:2106:HOH:O	2.04	0.56
1:A:256:MET:C	1:A:258:GLU:H	2.13	0.55
1:A:163:LYS:O	1:A:167:GLU:HG3	2.06	0.55
1:B:1037:PHE:HZ	1:B:1055:LEU:HD12	1.70	0.55
1:B:1183:ARG:HD2	1:B:1240:ILE:O	2.07	0.55
1:A:172:TYR:CE2	1:B:1160:GLY:HA3	2.43	0.54
1:A:17:LYS:HG2	1:A:22:TYR:CE2	2.43	0.53
1:B:1114:LYS:HD2	1:B:1114:LYS:C	2.33	0.53
1:B:1177:MET:HB3	1:B:1182:VAL:HB	1.90	0.53
1:B:1049:GLU:HG2	1:B:1060:VAL:HG11	1.90	0.53
1:A:12:THR:HG22	1:A:13:GLY:N	2.25	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:1002:GLY:N	1:B:1005:SER:HG	2.08	0.52
1:B:1218:ARG:HH11	1:B:1218:ARG:HG3	1.74	0.51
1:A:49:GLU:HA	1:A:60:VAL:HG21	1.91	0.51
1:A:38:THR:HG21	1:A:74:MET:HE2	1.93	0.51
1:B:1005:SER:HA	1:B:1032:GLY:O	2.11	0.51
1:A:12:THR:HG21	1:A:92:ILE:CD1	2.32	0.50
1:A:122:TYR:CE2	1:A:126:ALA:HB2	2.46	0.50
1:B:1122:TYR:CE2	1:B:1126:ALA:HB2	2.46	0.50
1:A:155:ASN:ND2	1:A:201:LYS:HB3	2.27	0.49
1:A:122:TYR:O	1:A:125:VAL:HG12	2.12	0.49
1:B:1209:HIS:O	1:B:1213:VAL:HG22	2.13	0.49
1:A:90:HIS:HD2	1:A:92:ILE:HD12	1.72	0.49
1:A:5:SER:HA	1:A:32:GLY:O	2.14	0.48
1:A:105:VAL:O	1:B:1129:LYS:HE2	2.13	0.48
1:A:216:ILE:HD13	1:A:249:GLY:HA2	1.95	0.48
1:B:1206:MET:HG2	1:B:1207:LEU:N	2.28	0.48
1:B:1018:LEU:O	1:B:1194:THR:HG22	2.12	0.48
1:A:161:LEU:HD21	1:B:1169:ASN:CG	2.39	0.48
1:A:170:VAL:HG21	1:A:186:ALA:HB2	1.95	0.48
1:A:2:GLY:HA3	1:A:31:GLU:O	2.14	0.47
1:A:250:GLY:O	1:A:253:ILE:HG13	2.13	0.47
1:B:1218:ARG:HH12	1:B:1220:VAL:HA	1.78	0.47
1:B:1066:ALA:HB2	1:B:1119:ILE:HD11	1.96	0.47
1:B:1114:LYS:HD2	1:B:1114:LYS:O	2.15	0.47
1:A:48:VAL:HA	1:A:51:PHE:CD2	2.51	0.46
1:A:67:GLU:HB3	1:A:70:SER:H	1.81	0.46
1:A:201:LYS:HB2	1:A:201:LYS:HE2	1.48	0.45
1:A:39:TYR:HD2	1:A:41:ASN:O	1.99	0.45
1:A:113:PHE:HA	1:A:158:VAL:HG21	1.98	0.45
1:A:58:ASP:HA	4:A:2007:HOH:O	2.16	0.45
1:B:1061:LEU:HD22	1:B:1077:GLU:HB2	1.98	0.45
1:B:1004:LEU:HD23	1:B:1007:LYS:HG3	1.98	0.45
1:A:20:ILE:O	1:A:24:ILE:HG13	2.17	0.44
1:A:183:ARG:HD3	1:A:238:ALA:O	2.17	0.44
1:B:1010:LEU:HB3	1:B:1088:PHE:HB3	1.98	0.44
1:B:1063:CYS:HB2	1:B:1074:MET:HG3	1.99	0.44
1:B:1257:ASN:C	1:B:1258:GLU:O	2.52	0.44
1:B:1008:ARG:NH1	1:B:1034:GLU:OE1	2.51	0.43
1:A:142:LEU:HD11	1:A:187:ILE:HG13	2.00	0.43
1:A:158:VAL:HG22	1:A:158:VAL:O	2.18	0.43
1:B:1177:MET:O	1:B:1180:GLU:HG2	2.17	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:8:ARG:NH1	1:A:34:GLU:OE1	2.52	0.43
1:A:67:GLU:HB3	1:A:70:SER:HB2	2.00	0.43
1:A:73:THR:O	1:A:76:ALA:HB3	2.18	0.43
1:B:1124:PHE:CZ	1:B:1143:THR:HB	2.53	0.43
1:B:1008:ARG:HH11	1:B:1008:ARG:CG	2.30	0.42
1:B:1092:ILE:CG2	1:B:1093:GLY:N	2.83	0.42
1:B:1094:PHE:O	1:B:1116:ALA:HA	2.19	0.42
1:A:10:LEU:HB3	1:A:88:PHE:HB3	2.02	0.42
1:A:132:ARG:NH1	1:B:1105:VAL:HB	2.34	0.42
1:A:153:ILE:HA	1:A:154:PRO:HD3	1.91	0.42
1:A:104:TYR:OH	1:B:1169:ASN:ND2	2.52	0.42
1:B:1113:PHE:HA	1:B:1158:VAL:HG21	2.02	0.42
1:B:1197:ALA:HB1	1:B:1203:PHE:CD1	2.55	0.41
1:A:183:ARG:HG2	1:A:241:SER:HB2	2.02	0.41
1:B:1045:LYS:O	1:B:1049:GLU:HG3	2.20	0.41
1:B:1256:MET:C	1:B:1258:GLU:N	2.77	0.41
1:A:36:ALA:HA	1:A:59:ILE:HB	2.02	0.41
1:B:1258:GLU:O	1:B:1258:GLU:HG2	2.19	0.41
1:A:65:VAL:HG11	1:A:92:ILE:HD13	2.02	0.41
1:A:12:THR:CG2	1:A:92:ILE:HD11	2.33	0.41
1:B:1104:TYR:HD1	1:B:1157:ASN:HB3	1.85	0.41
1:A:39:TYR:CZ	1:A:62:GLN:HB2	2.55	0.41
1:A:116:ALA:O	1:A:120:SER:HB2	2.20	0.41
1:A:172:TYR:HE2	1:B:1160:GLY:HA3	1.84	0.41
1:B:1065:VAL:HB	1:B:1123:SER:HB2	2.03	0.41
1:B:1146:TYR:CE2	1:B:1153:ILE:HD12	2.56	0.41
1:B:1149:ALA:HB2	1:B:1163:LYS:HB3	2.03	0.41
1:B:1206:MET:CG	1:B:1207:LEU:N	2.82	0.40
1:B:1142:LEU:HD12	1:B:1143:THR:H	1.87	0.40
1:A:20:ILE:HG21	1:A:144:LEU:CD2	2.48	0.40
1:B:1143:THR:HG22	1:B:1185:ASN:O	2.21	0.40
1:B:1096:PRO:O	1:B:1099:GLN:HB2	2.22	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	255/262 (97%)	240 (94%)	15 (6%)	0	100	100
1	B	255/262 (97%)	240 (94%)	15 (6%)	0	100	100
All	All	510/524 (97%)	480 (94%)	30 (6%)	0	100	100

There are no Ramachandran outliers to report.

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	194/201 (96%)	181 (93%)	13 (7%)	15	42
1	B	195/201 (97%)	182 (93%)	13 (7%)	15	42
All	All	389/402 (97%)	363 (93%)	26 (7%)	15	42

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	5	SER
1	A	8	ARG
1	A	34	GLU
1	A	44	LEU
1	A	67	GLU
1	A	100	LEU
1	A	129	LYS
1	A	151	ARG
1	A	195	LEU
1	A	200	ILE
1	A	201	LYS
1	A	215	PRO
1	A	258	GLU
1	B	1050	GLU

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Mol	Chain	Res	Type
1	B	1061	LEU
1	B	1062	GLN
1	B	1067	GLU
1	B	1096	PRO
1	B	1100	LEU
1	B	1133	SER
1	B	1151	ARG
1	B	1180	GLU
1	B	1200	ILE
1	B	1205	LYS
1	B	1206	MET
1	B	1215	PRO

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	40	GLN
1	A	99	GLN
1	A	169	ASN
1	A	175	ASN
1	A	257	ASN
1	B	1054	GLN
1	B	1099	GLN
1	B	1157	ASN
1	B	1169	ASN
1	B	1175	ASN

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 ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry

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	-	46,48,48	1.30	3 (6%)	64,73,73	2.15	21 (32%)
2	NAD	B	1501	-	46,48,48	1.49	4 (8%)	64,73,73	2.19	19 (29%)
3	654	B	1502	-	20,20,20	1.25	2 (10%)	25,27,27	2.54	6 (24%)
3	654	A	502	-	20,20,20	1.25	2 (10%)	25,27,27	2.53	6 (24%)

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	-	-	10/30/62/62	0/5/5/5
2	NAD	B	1501	-	-	8/30/62/62	0/5/5/5
3	654	B	1502	-	-	1/8/8/8	0/3/3/3
3	654	A	502	-	-	0/8/8/8	0/3/3/3

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	1501	NAD	C2N-N1N	5.69	1.41	1.35
2	A	501	NAD	C2N-N1N	5.68	1.41	1.35
3	B	1502	654	C3I-N4I	-4.01	1.31	1.37
3	A	502	654	C3I-N4I	-4.01	1.31	1.37
2	B	1501	NAD	C5A-N7A	-3.59	1.32	1.39
2	A	501	NAD	C5A-N7A	-2.64	1.34	1.39
2	B	1501	NAD	O4D-C1D	2.60	1.44	1.40
2	A	501	NAD	C6N-N1N	2.44	1.40	1.35
2	B	1501	NAD	C8A-N7A	2.27	1.36	1.31
3	B	1502	654	C1I-C2T	-2.14	1.42	1.45
3	A	502	654	C1I-C2T	-2.08	1.43	1.45

All (52) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	1502	654	C3I-N4I-C5I	9.55	111.41	106.71
3	A	502	654	C3I-N4I-C5I	9.47	111.37	106.71
2	A	501	NAD	C5A-C4A-N3A	-6.31	118.03	126.72
2	B	1501	NAD	C5A-C4A-N3A	-6.04	118.41	126.72
2	B	1501	NAD	N3A-C4A-N9A	5.83	137.08	127.17
2	B	1501	NAD	O4B-C1B-N9A	5.22	118.11	108.09
2	B	1501	NAD	N3A-C2A-N1A	-5.07	120.90	128.58
2	A	501	NAD	N3A-C4A-N9A	4.90	135.50	127.17
2	B	1501	NAD	C6N-N1N-C2N	-4.85	117.75	121.88
3	B	1502	654	N4I-C5I-N2I	-4.60	108.68	112.35
3	A	502	654	N4I-C5I-N2I	-4.57	108.71	112.35
2	A	501	NAD	O3-PN-O1N	-4.46	97.28	110.70
2	A	501	NAD	N3A-C2A-N1A	-4.33	122.03	128.58
2	A	501	NAD	C6A-C5A-C4A	3.90	122.50	117.18
2	B	1501	NAD	C6A-C5A-N7A	-3.88	124.61	132.09
2	B	1501	NAD	C6A-C5A-C4A	3.84	122.42	117.18
2	A	501	NAD	C4A-N9A-C8A	3.56	109.48	105.74
2	A	501	NAD	C3N-C7N-N7N	3.56	122.12	117.74
2	A	501	NAD	C6A-C5A-N7A	-3.54	125.27	132.09
2	B	1501	NAD	C2A-N3A-C4A	3.38	120.09	111.83
2	A	501	NAD	C2A-N3A-C4A	3.20	119.64	111.83
2	A	501	NAD	C5B-C4B-C3B	-3.18	103.75	115.21
2	A	501	NAD	N9A-C8A-N7A	-3.13	109.49	113.94
2	A	501	NAD	O7N-C7N-C3N	-3.09	115.82	119.60
3	A	502	654	C3I-C1I-C2T	-2.94	122.82	130.62
3	B	1502	654	C3I-C1I-C2T	-2.94	122.82	130.62
2	A	501	NAD	O2B-C2B-C3B	-2.78	102.92	111.82
2	A	501	NAD	C4B-O4B-C1B	-2.74	103.41	109.47
2	B	1501	NAD	O3-PA-O1A	-2.74	102.47	110.70
2	B	1501	NAD	C5B-C4B-C3B	-2.72	105.41	115.21
3	A	502	654	C5-C2-C3	2.69	122.24	118.23
3	B	1502	654	C5-C2-C3	2.66	122.18	118.23
2	B	1501	NAD	C4B-O4B-C1B	-2.65	103.62	109.47
2	A	501	NAD	O2N-PN-O3	2.54	114.14	107.27
2	A	501	NAD	O4B-C1B-N9A	2.51	112.91	108.09
2	A	501	NAD	O4B-C4B-C5B	2.46	117.22	109.33
2	A	501	NAD	C4D-O4D-C1D	-2.45	107.68	109.92
2	B	1501	NAD	N9A-C8A-N7A	-2.43	110.50	113.94
2	B	1501	NAD	C4A-N9A-C8A	2.35	108.21	105.74
2	B	1501	NAD	C5D-C4D-C3D	2.35	123.67	115.21
2	B	1501	NAD	O2N-PN-O3	2.33	113.57	107.27
2	A	501	NAD	O5B-PA-O1A	2.25	117.83	108.94

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	1502	654	C5-C6-C7	-2.23	118.80	121.37
3	A	502	654	C1-N4I-C3I	-2.22	122.76	125.47
3	B	1502	654	C1-N4I-C3I	-2.22	122.76	125.47
3	A	502	654	C5-C6-C7	-2.20	118.84	121.37
2	A	501	NAD	C2A-N1A-C6A	2.14	122.25	118.73
2	B	1501	NAD	C4A-N9A-C1B	-2.11	121.70	126.63
2	B	1501	NAD	C2B-C3B-C4B	2.10	106.67	102.61
2	B	1501	NAD	C4A-C5A-N7A	2.09	112.97	110.58
2	A	501	NAD	O2A-PA-O1A	2.08	122.12	112.44
2	B	1501	NAD	C2A-N1A-C6A	2.04	122.08	118.73

There are no chirality outliers.

All (19) torsion outliers are listed below:

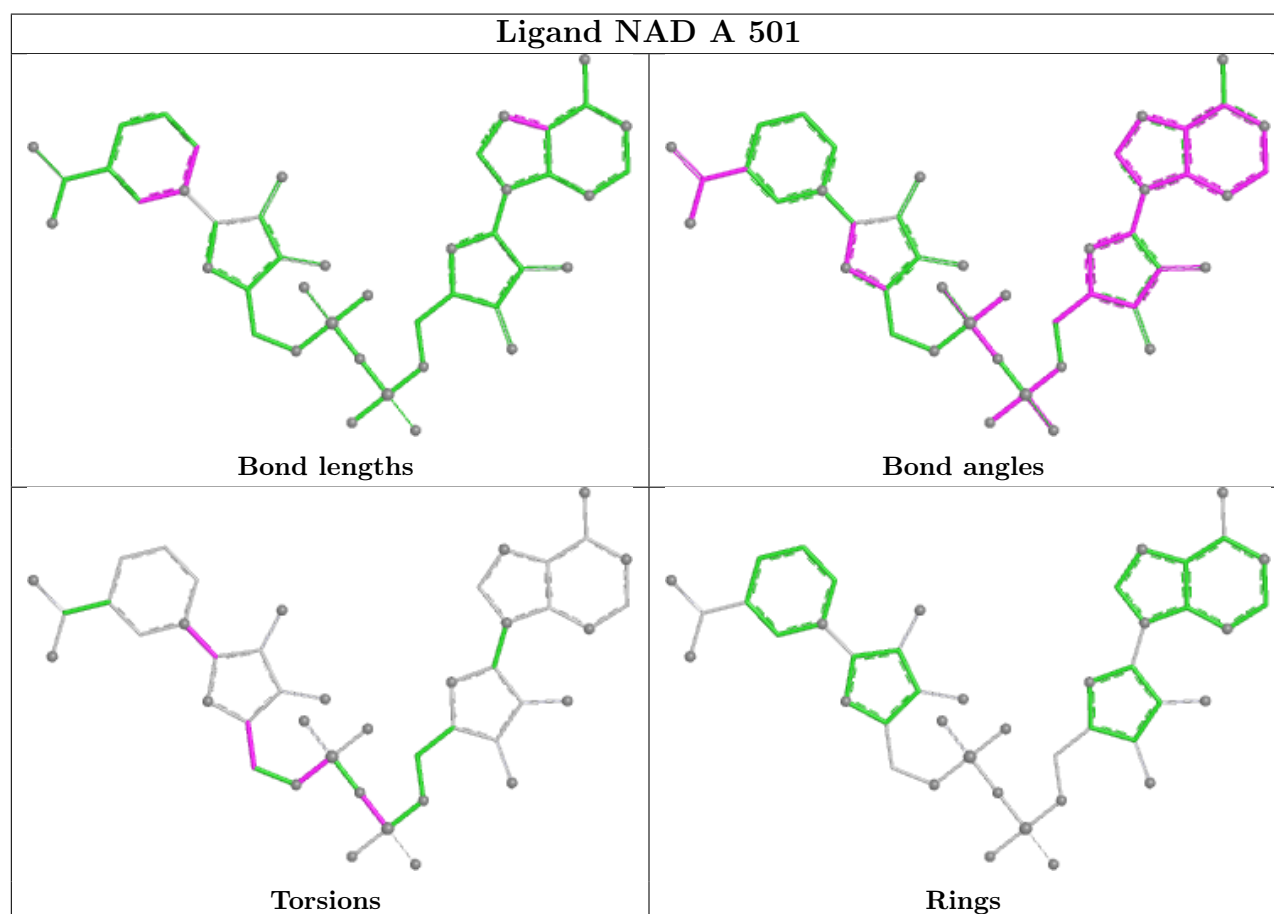
Mol	Chain	Res	Type	Atoms
2	A	501	NAD	PN-O3-PA-O5B
2	A	501	NAD	C5D-O5D-PN-O3
2	A	501	NAD	C5D-O5D-PN-O1N
2	A	501	NAD	C5D-O5D-PN-O2N
2	A	501	NAD	O4D-C1D-N1N-C2N
2	A	501	NAD	O4D-C1D-N1N-C6N
2	A	501	NAD	C2D-C1D-N1N-C2N
2	A	501	NAD	C2D-C1D-N1N-C6N
2	B	1501	NAD	C5D-O5D-PN-O3
2	B	1501	NAD	C5D-O5D-PN-O2N
3	B	1502	654	N2I-C1I-C2T-S1T
2	A	501	NAD	O4D-C4D-C5D-O5D
2	A	501	NAD	C3D-C4D-C5D-O5D
2	B	1501	NAD	C5D-O5D-PN-O1N
2	B	1501	NAD	PN-O3-PA-O1A
2	B	1501	NAD	O4B-C4B-C5B-O5B
2	B	1501	NAD	O4D-C1D-N1N-C6N
2	B	1501	NAD	PN-O3-PA-O2A
2	B	1501	NAD	PA-O3-PN-O1N

There are no ring outliers.

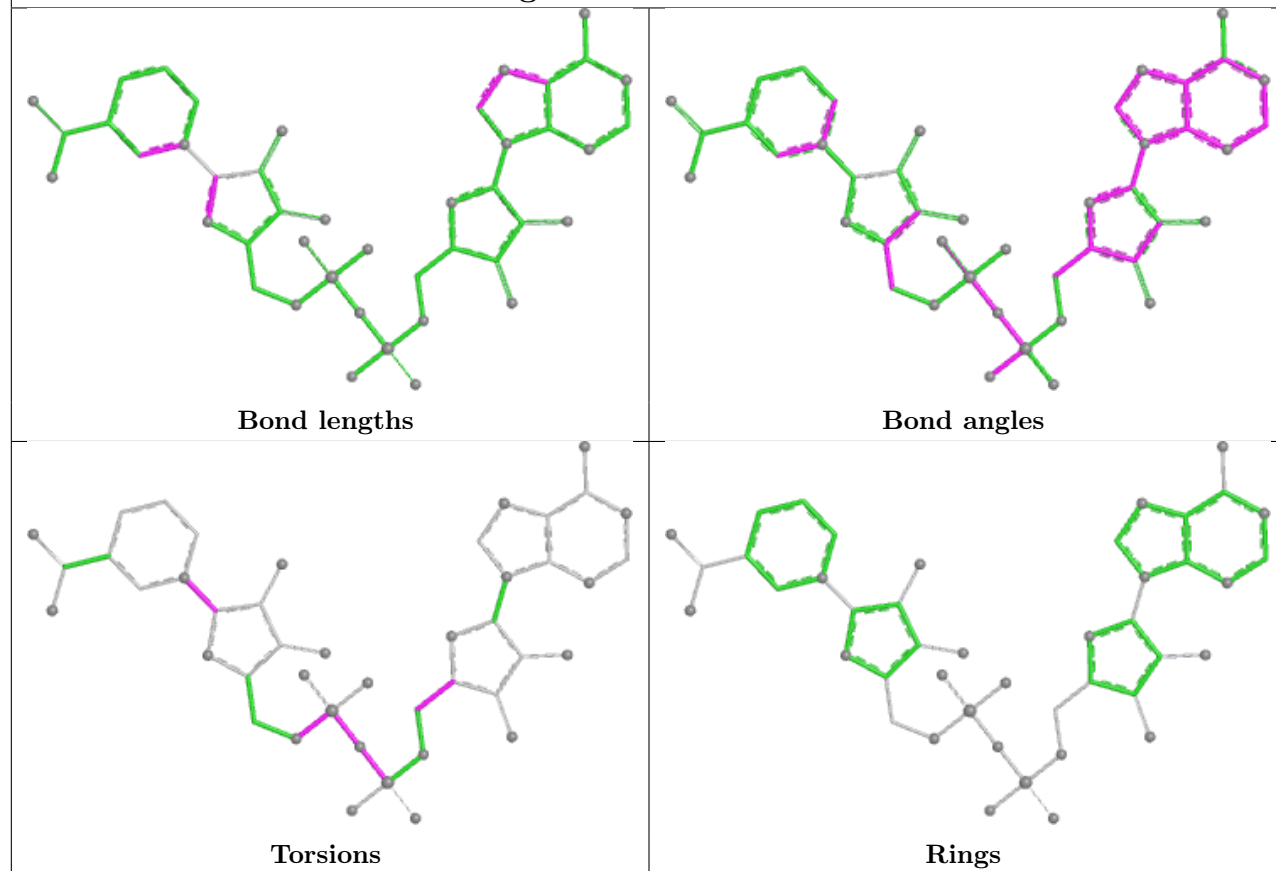
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	501	NAD	1	0

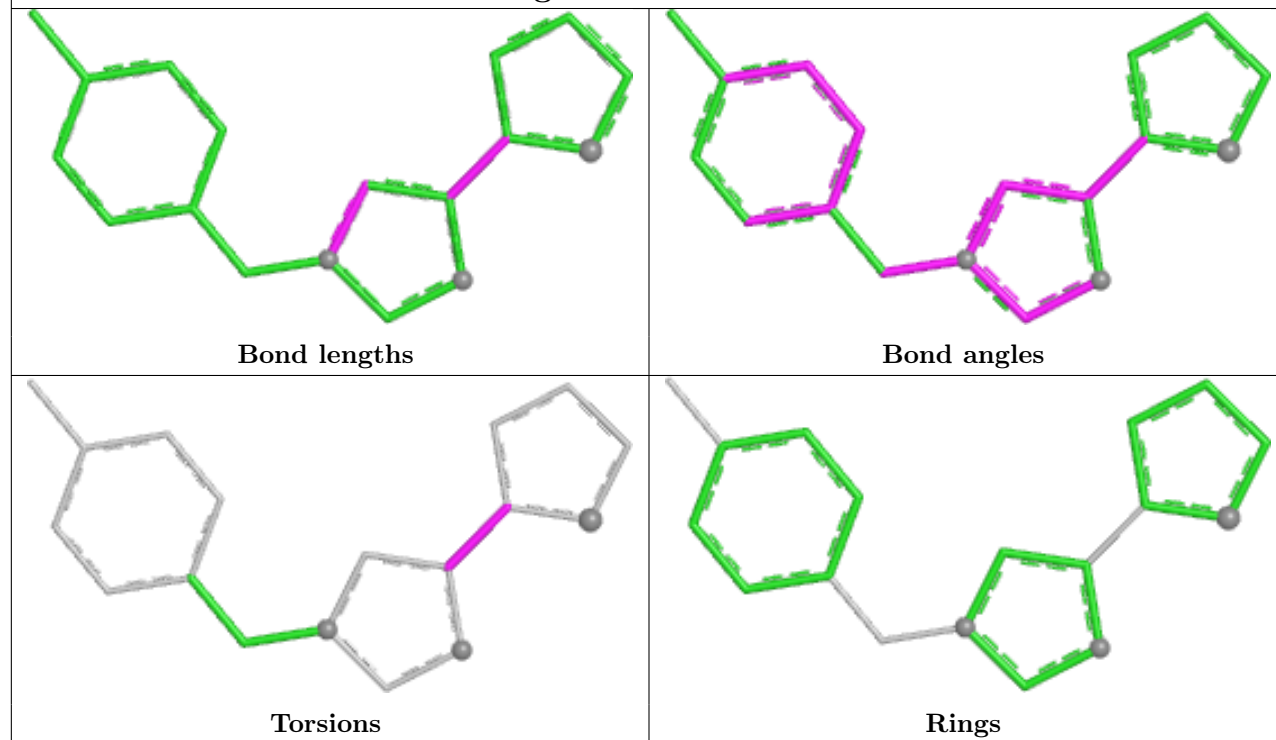
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

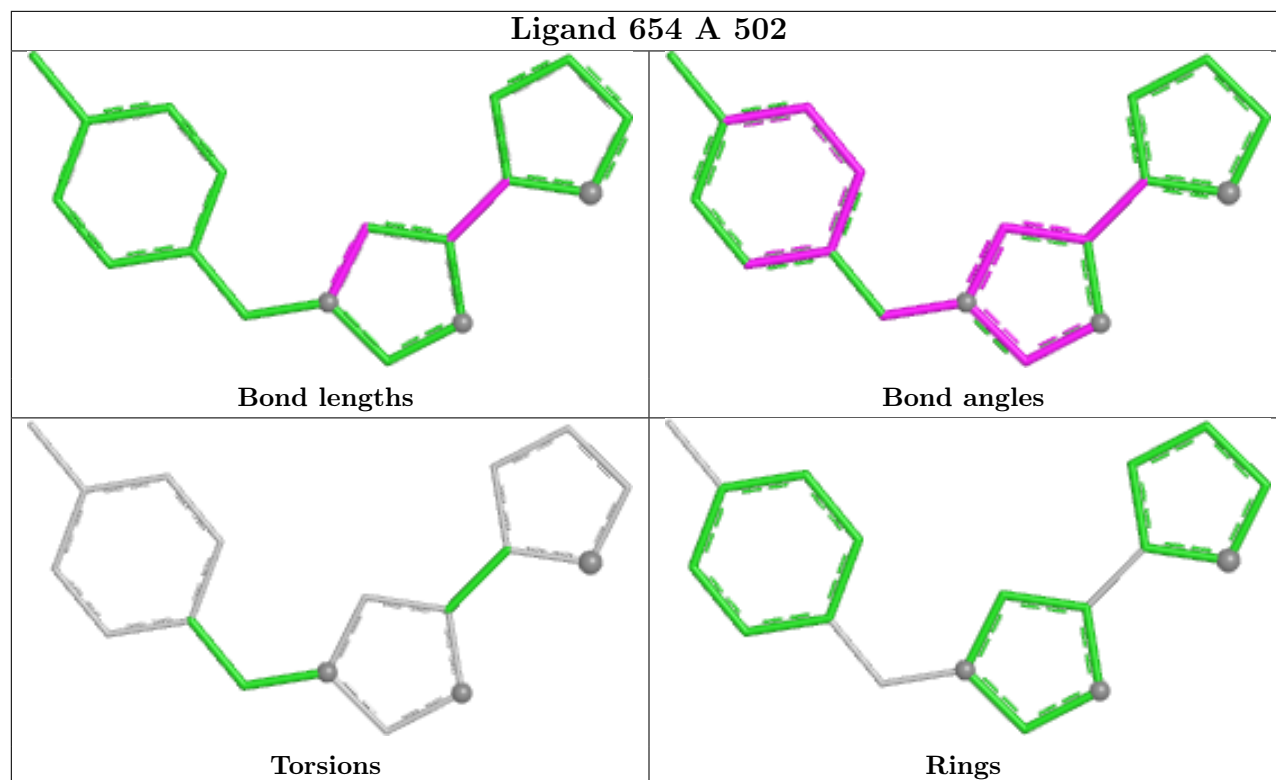


Ligand NAD B 1501



Ligand 654 B 1502





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.