



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 16, 2024 – 01:47 PM EDT

PDB ID : 5COQ
Title : The effect of valine to alanine mutation on InhA enzyme crystallization pattern and substrate binding loop conformation and flexibility
Authors : Li, H.-J.; Lai, C.-T.; Liu, N.; Yu, W.; Shah, S.; Bommineni, G.R.; Perrone, V.; Garcia-Diaz, M.; Tonge, P.J.; Simmerling, C.
Deposited on : 2015-07-20
Resolution : 2.30 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	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.37.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

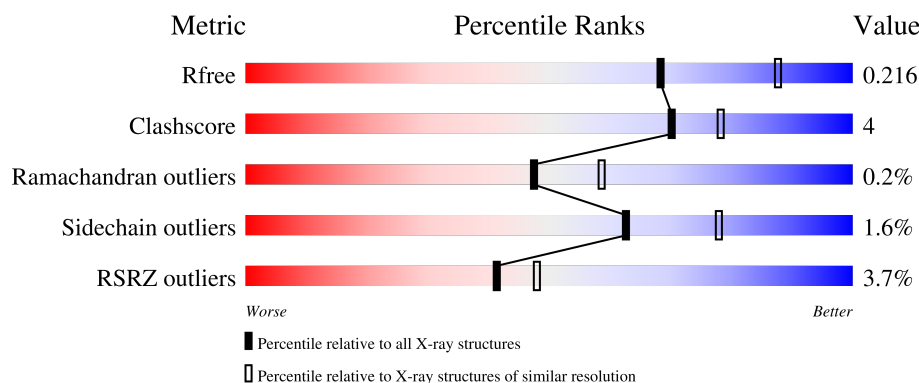
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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}	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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	289	 3% 86% 6% 9%
1	B	289	 3% 84% 8% 7%
1	C	289	 2% 80% 9% 11%
1	D	289	 4% 82% 9% 9%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 8396 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	264	Total	C	N	O	S	0	0	0
			1946	1235	338	363	10			
1	B	268	Total	C	N	O	S	0	0	0
			1989	1260	348	371	10			
1	C	258	Total	C	N	O	S	0	0	0
			1920	1217	336	357	10			
1	D	262	Total	C	N	O	S	0	0	0
			1952	1237	342	363	10			

There are 84 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-19	MET	-	initiating methionine	UNP M9TGV3
A	-18	GLY	-	expression tag	UNP M9TGV3
A	-17	SER	-	expression tag	UNP M9TGV3
A	-16	SER	-	expression tag	UNP M9TGV3
A	-15	HIS	-	expression tag	UNP M9TGV3
A	-14	HIS	-	expression tag	UNP M9TGV3
A	-13	HIS	-	expression tag	UNP M9TGV3
A	-12	HIS	-	expression tag	UNP M9TGV3
A	-11	HIS	-	expression tag	UNP M9TGV3
A	-10	HIS	-	expression tag	UNP M9TGV3
A	-9	SER	-	expression tag	UNP M9TGV3
A	-8	SER	-	expression tag	UNP M9TGV3
A	-7	GLY	-	expression tag	UNP M9TGV3
A	-6	LEU	-	expression tag	UNP M9TGV3
A	-5	VAL	-	expression tag	UNP M9TGV3
A	-4	PRO	-	expression tag	UNP M9TGV3
A	-3	ARG	-	expression tag	UNP M9TGV3
A	-2	GLY	-	expression tag	UNP M9TGV3
A	-1	SER	-	expression tag	UNP M9TGV3
A	0	HIS	-	expression tag	UNP M9TGV3
A	203	ALA	VAL	engineered mutation	UNP M9TGV3

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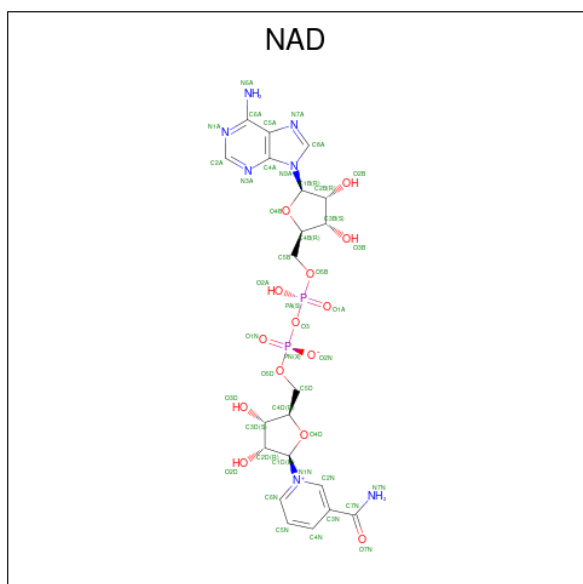
Chain	Residue	Modelled	Actual	Comment	Reference
B	-19	MET	-	initiating methionine	UNP M9TGV3
B	-18	GLY	-	expression tag	UNP M9TGV3
B	-17	SER	-	expression tag	UNP M9TGV3
B	-16	SER	-	expression tag	UNP M9TGV3
B	-15	HIS	-	expression tag	UNP M9TGV3
B	-14	HIS	-	expression tag	UNP M9TGV3
B	-13	HIS	-	expression tag	UNP M9TGV3
B	-12	HIS	-	expression tag	UNP M9TGV3
B	-11	HIS	-	expression tag	UNP M9TGV3
B	-10	HIS	-	expression tag	UNP M9TGV3
B	-9	SER	-	expression tag	UNP M9TGV3
B	-8	SER	-	expression tag	UNP M9TGV3
B	-7	GLY	-	expression tag	UNP M9TGV3
B	-6	LEU	-	expression tag	UNP M9TGV3
B	-5	VAL	-	expression tag	UNP M9TGV3
B	-4	PRO	-	expression tag	UNP M9TGV3
B	-3	ARG	-	expression tag	UNP M9TGV3
B	-2	GLY	-	expression tag	UNP M9TGV3
B	-1	SER	-	expression tag	UNP M9TGV3
B	0	HIS	-	expression tag	UNP M9TGV3
B	203	ALA	VAL	engineered mutation	UNP M9TGV3
C	-19	MET	-	initiating methionine	UNP M9TGV3
C	-18	GLY	-	expression tag	UNP M9TGV3
C	-17	SER	-	expression tag	UNP M9TGV3
C	-16	SER	-	expression tag	UNP M9TGV3
C	-15	HIS	-	expression tag	UNP M9TGV3
C	-14	HIS	-	expression tag	UNP M9TGV3
C	-13	HIS	-	expression tag	UNP M9TGV3
C	-12	HIS	-	expression tag	UNP M9TGV3
C	-11	HIS	-	expression tag	UNP M9TGV3
C	-10	HIS	-	expression tag	UNP M9TGV3
C	-9	SER	-	expression tag	UNP M9TGV3
C	-8	SER	-	expression tag	UNP M9TGV3
C	-7	GLY	-	expression tag	UNP M9TGV3
C	-6	LEU	-	expression tag	UNP M9TGV3
C	-5	VAL	-	expression tag	UNP M9TGV3
C	-4	PRO	-	expression tag	UNP M9TGV3
C	-3	ARG	-	expression tag	UNP M9TGV3
C	-2	GLY	-	expression tag	UNP M9TGV3
C	-1	SER	-	expression tag	UNP M9TGV3
C	0	HIS	-	expression tag	UNP M9TGV3
C	203	ALA	VAL	engineered mutation	UNP M9TGV3

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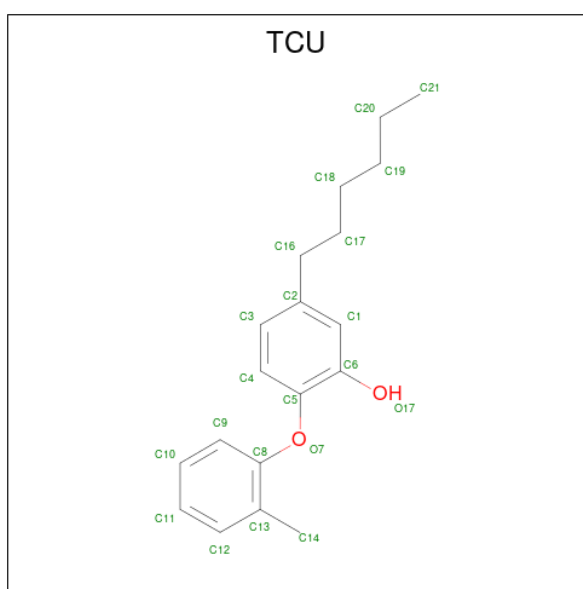
Chain	Residue	Modelled	Actual	Comment	Reference
D	-19	MET	-	initiating methionine	UNP M9TGV3
D	-18	GLY	-	expression tag	UNP M9TGV3
D	-17	SER	-	expression tag	UNP M9TGV3
D	-16	SER	-	expression tag	UNP M9TGV3
D	-15	HIS	-	expression tag	UNP M9TGV3
D	-14	HIS	-	expression tag	UNP M9TGV3
D	-13	HIS	-	expression tag	UNP M9TGV3
D	-12	HIS	-	expression tag	UNP M9TGV3
D	-11	HIS	-	expression tag	UNP M9TGV3
D	-10	HIS	-	expression tag	UNP M9TGV3
D	-9	SER	-	expression tag	UNP M9TGV3
D	-8	SER	-	expression tag	UNP M9TGV3
D	-7	GLY	-	expression tag	UNP M9TGV3
D	-6	LEU	-	expression tag	UNP M9TGV3
D	-5	VAL	-	expression tag	UNP M9TGV3
D	-4	PRO	-	expression tag	UNP M9TGV3
D	-3	ARG	-	expression tag	UNP M9TGV3
D	-2	GLY	-	expression tag	UNP M9TGV3
D	-1	SER	-	expression tag	UNP M9TGV3
D	0	HIS	-	expression tag	UNP M9TGV3
D	203	ALA	VAL	engineered mutation	UNP M9TGV3

- 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
2	A	1	Total	C	N	O	P	0	0
			44	21	7	14	2		
2	B	1	Total	C	N	O	P	0	0
			44	21	7	14	2		
2	C	1	Total	C	N	O	P	0	0
			44	21	7	14	2		
2	D	1	Total	C	N	O	P	0	0
			44	21	7	14	2		

- Molecule 3 is 5-HEXYL-2-(2-METHYLPHENOXY)PHENOL (three-letter code: TCU) (formula: C₁₉H₂₄O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			21	19	2		
3	B	1	Total	C	O	0	0
			21	19	2		
3	C	1	Total	C	O	0	0
			21	19	2		
3	D	1	Total	C	O	0	0
			21	19	2		

- Molecule 4 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	C	1	Total	Na	0	0
			1	1		

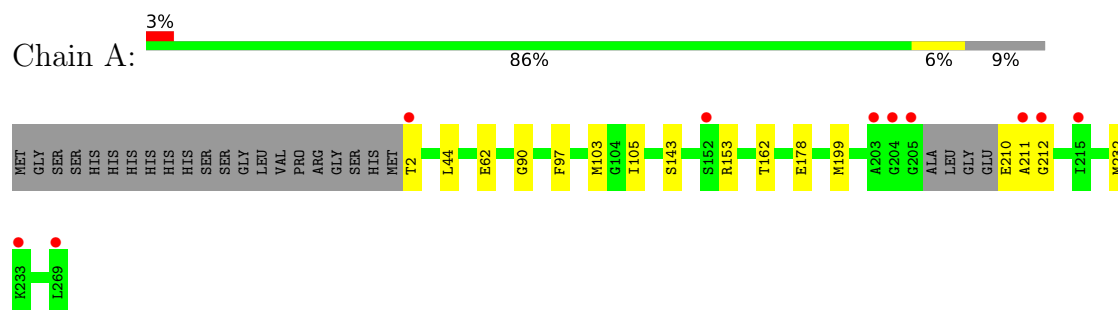
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	94	Total 94	O 94	0	0
5	B	87	Total 87	O 87	0	0
5	C	82	Total 82	O 82	0	0
5	D	65	Total 65	O 65	0	0

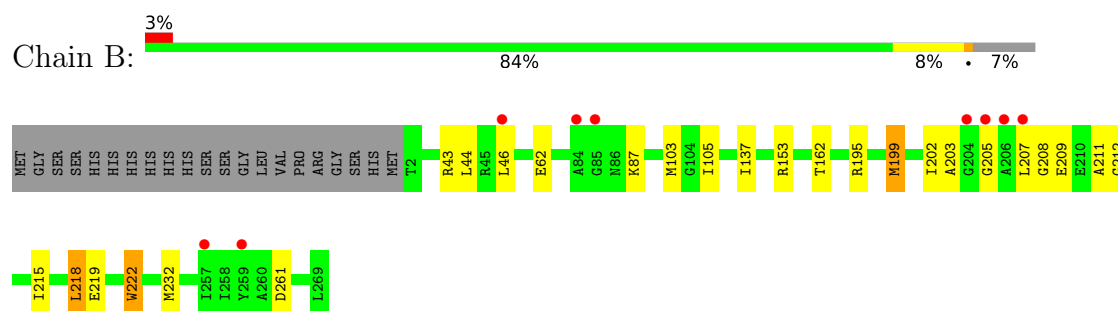
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

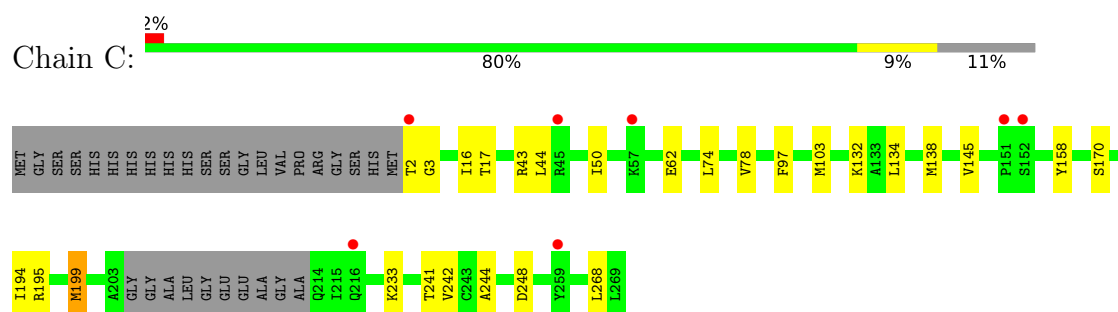
- Molecule 1: Enoyl-[acyl-carrier-protein] reductase [NADH]



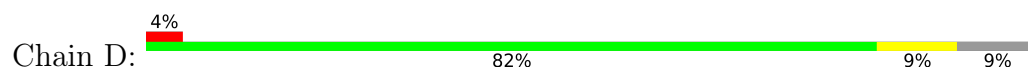
- Molecule 1: Enoyl-[acyl-carrier-protein] reductase [NADH]

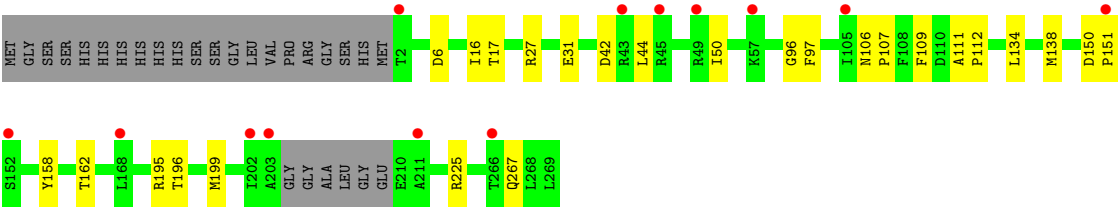


- Molecule 1: Enoyl-[acyl-carrier-protein] reductase [NADH]



- Molecule 1: Enoyl-[acyl-carrier-protein] reductase [NADH]





4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	126.09Å 91.90Å 102.85Å 90.00° 106.45° 90.00°	Depositor
Resolution (Å)	46.07 – 2.30 46.07 – 2.30	Depositor EDS
% Data completeness (in resolution range)	97.9 (46.07-2.30) 97.8 (46.07-2.30)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.27 (at 2.29Å)	Xtriage
Refinement program	PHENIX 1.8.4_1496	Depositor
R, R_{free}	0.161 , 0.212 0.167 , 0.216	Depositor DCC
R_{free} test set	2478 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å ²)	39.7	Xtriage
Anisotropy	0.227	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 35.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	8396	wwPDB-VP
Average B, all atoms (Å ²)	43.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.20% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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

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	0.40	0/1983	0.52	0/2695
1	B	0.40	0/2027	0.56	1/2753 (0.0%)
1	C	0.37	0/1957	0.52	0/2657
1	D	0.37	0/1989	0.53	0/2699
All	All	0.39	0/7956	0.53	1/10804 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	208	GLY	N-CA-C	-6.14	97.74	113.10

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1946	0	1947	10	0
1	B	1989	0	2005	17	0
1	C	1920	0	1926	19	0
1	D	1952	0	1964	15	0
2	A	44	0	24	0	0
2	B	44	0	24	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	44	0	25	0	0
2	D	44	0	25	0	0
3	A	21	0	24	2	0
3	B	21	0	24	4	0
3	C	21	0	24	4	0
3	D	21	0	24	3	0
4	C	1	0	0	0	0
5	A	94	0	0	3	0
5	B	87	0	0	0	0
5	C	82	0	0	1	0
5	D	65	0	0	0	0
All	All	8396	0	8036	58	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 4.

All (58) 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:C:199:MET:HG2	3:C:302:TCU:H3	1.54	0.87
1:A:103:MET:SD	5:A:478:HOH:O	2.36	0.83
1:B:43:ARG:HD3	1:B:46:LEU:HD12	1.69	0.74
1:D:196:THR:H	1:D:199:MET:HB3	1.55	0.72
1:A:2:THR:HA	1:C:2:THR:HA	1.72	0.71
1:D:17:THR:HA	1:D:50:ILE:HD13	1.78	0.66
1:D:16:ILE:HG23	1:D:17:THR:HG23	1.80	0.63
1:C:16:ILE:HD11	1:C:43:ARG:HD2	1.80	0.63
1:D:158:TYR:HB2	3:D:301:TCU:H213	1.82	0.61
1:B:203:ALA:O	1:B:207:LEU:HB2	2.01	0.60
1:C:248:ASP:OD1	5:C:401:HOH:O	2.16	0.59
1:B:199:MET:CG	3:B:301:TCU:H3	2.34	0.57
1:B:199:MET:HG2	3:B:301:TCU:H3	1.87	0.55
1:A:178:GLU:OE1	5:A:401:HOH:O	2.18	0.55
1:C:195:ARG:HA	1:C:199:MET:HE2	1.89	0.54
1:C:17:THR:HA	1:C:50:ILE:HD13	1.88	0.54
1:A:103:MET:CE	3:A:301:TCU:H10	2.38	0.54
1:B:195:ARG:HA	1:B:199:MET:HE2	1.91	0.53
1:C:195:ARG:HH11	1:C:233:LYS:HE3	1.75	0.50
1:A:44:LEU:HD21	1:A:62:GLU:HG3	1.94	0.50
1:D:195:ARG:HA	1:D:199:MET:HG2	1.93	0.50
1:B:222:TRP:HE1	1:B:261:ASP:HB2	1.78	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:153:ARG:NH2	5:A:406:HOH:O	2.43	0.49
1:A:105:ILE:HG23	1:A:211:ALA:HB2	1.94	0.48
1:C:158:TYR:HB2	3:C:302:TCU:H212	1.93	0.48
1:B:207:LEU:HD23	1:B:212:GLY:HA2	1.95	0.48
1:A:210:GLU:HG3	1:A:212:GLY:H	1.79	0.47
1:B:207:LEU:HB3	1:B:212:GLY:HA2	1.97	0.47
1:D:134:LEU:O	1:D:138:MET:HG3	2.14	0.47
1:B:199:MET:HE2	1:B:199:MET:HB3	1.57	0.47
1:C:44:LEU:HD21	1:C:62:GLU:HG3	1.97	0.46
1:D:27:ARG:O	1:D:31:GLU:HG3	2.15	0.46
1:B:103:MET:SD	3:B:301:TCU:H10	2.56	0.45
1:C:145:VAL:HG11	1:C:242:VAL:HG13	1.97	0.45
1:A:97:PHE:HA	3:A:301:TCU:H12	1.99	0.44
1:C:132:LYS:HD2	1:D:109:PHE:HB3	1.99	0.44
1:C:194:ILE:O	1:C:199:MET:HG3	2.18	0.44
1:C:134:LEU:O	1:C:138:MET:HG3	2.18	0.43
1:D:97:PHE:HA	3:D:301:TCU:H12	1.99	0.43
1:B:44:LEU:HD21	1:B:62:GLU:HG3	2.01	0.42
1:C:241:THR:O	1:C:244:ALA:HB3	2.18	0.42
1:D:225:ARG:HD2	1:D:267:GLN:O	2.19	0.42
1:D:106:ASN:HA	1:D:107:PRO:HD3	1.91	0.42
1:B:87:LYS:HE2	1:B:137:ILE:HA	2.02	0.42
1:B:105:ILE:HG22	1:B:211:ALA:HB3	2.01	0.42
1:B:219:GLU:HB3	1:B:232:MET:SD	2.59	0.42
1:C:74:LEU:O	1:C:78:VAL:HG23	2.20	0.42
1:A:90:GLY:HA2	1:A:143:SER:O	2.20	0.41
1:C:97:PHE:HA	3:C:302:TCU:H12	2.02	0.41
1:D:44:LEU:HD13	1:D:44:LEU:HA	1.90	0.41
1:C:2:THR:HG23	1:C:3:GLY:H	1.84	0.41
1:D:96:GLY:O	3:D:301:TCU:H141	2.21	0.41
1:D:150:ASP:HA	1:D:151:PRO:HD3	1.89	0.41
1:B:218:LEU:CD1	3:B:301:TCU:H201	2.52	0.41
1:C:103:MET:SD	3:C:302:TCU:H10	2.61	0.41
1:B:202:ILE:O	1:B:207:LEU:HD13	2.21	0.40
1:D:111:ALA:HA	1:D:112:PRO:HD3	1.92	0.40
1:B:153:ARG:NH1	1:C:268:LEU:HD13	2.37	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	260/289 (90%)	246 (95%)	14 (5%)	0	100	100
1	B	266/289 (92%)	253 (95%)	12 (4%)	1 (0%)	34	42
1	C	254/289 (88%)	243 (96%)	11 (4%)	0	100	100
1	D	258/289 (89%)	248 (96%)	9 (4%)	1 (0%)	34	42
All	All	1038/1156 (90%)	990 (95%)	46 (4%)	2 (0%)	47	58

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	205	GLY
1	D	42	ASP

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	196/221 (89%)	193 (98%)	3 (2%)	65	79
1	B	202/221 (91%)	196 (97%)	6 (3%)	41	57
1	C	196/221 (89%)	194 (99%)	2 (1%)	76	87
1	D	200/221 (90%)	198 (99%)	2 (1%)	76	87
All	All	794/884 (90%)	781 (98%)	13 (2%)	62	78

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	162	THR
1	A	199	MET
1	A	232	MET
1	B	162	THR
1	B	199	MET
1	B	209	GLU
1	B	215	ILE
1	B	218	LEU
1	B	222	TRP
1	C	170	SER
1	C	199	MET
1	D	6	ASP
1	D	162	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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](#)

Of 9 ligands modelled in this entry, 1 is monoatomic - leaving 8 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	NAD	C	301	-	42,48,48	4.34	19 (45%)	50,73,73	2.30	8 (16%)
3	TCU	D	301	-	22,22,22	0.76	0	28,28,28	0.89	2 (7%)
3	TCU	B	301	-	22,22,22	0.72	1 (4%)	28,28,28	0.81	0
2	NAD	B	300	-	42,48,48	4.20	19 (45%)	50,73,73	2.33	8 (16%)
3	TCU	C	302	-	22,22,22	0.67	0	28,28,28	0.80	1 (3%)
2	NAD	A	300	-	42,48,48	4.23	18 (42%)	50,73,73	2.31	10 (20%)
2	NAD	D	300	-	42,48,48	4.37	19 (45%)	50,73,73	2.25	8 (16%)
3	TCU	A	301	-	22,22,22	0.81	1 (4%)	28,28,28	0.94	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
2	NAD	C	301	-	-	7/26/62/62	0/5/5/5
3	TCU	D	301	-	-	5/10/10/10	0/2/2/2
3	TCU	B	301	-	-	2/10/10/10	0/2/2/2
2	NAD	B	300	-	-	10/26/62/62	0/5/5/5
3	TCU	C	302	-	-	2/10/10/10	0/2/2/2
2	NAD	A	300	-	-	10/26/62/62	0/5/5/5
2	NAD	D	300	-	-	6/26/62/62	0/5/5/5
3	TCU	A	301	-	-	3/10/10/10	0/2/2/2

All (77) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	301	NAD	C2D-C1D	-15.82	1.29	1.53
2	D	300	NAD	C2D-C1D	-15.82	1.29	1.53
2	A	300	NAD	C2D-C1D	-15.08	1.30	1.53
2	B	300	NAD	C2D-C1D	-14.93	1.31	1.53
2	D	300	NAD	O4D-C1D	13.92	1.60	1.41
2	C	301	NAD	O4D-C1D	13.50	1.59	1.41
2	A	300	NAD	O4D-C1D	12.98	1.59	1.41
2	B	300	NAD	O4D-C1D	12.79	1.58	1.41
2	B	300	NAD	C2B-C3B	-9.80	1.26	1.53
2	D	300	NAD	C2B-C3B	-9.79	1.26	1.53
2	A	300	NAD	C2B-C3B	-9.58	1.27	1.53
2	C	301	NAD	C2B-C3B	-9.55	1.27	1.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	301	NAD	C2B-C1B	7.79	1.65	1.53
2	D	300	NAD	C2B-C1B	7.61	1.65	1.53
2	B	300	NAD	O4B-C1B	-7.57	1.30	1.41
2	A	300	NAD	C2B-C1B	7.52	1.65	1.53
2	B	300	NAD	C2B-C1B	7.15	1.64	1.53
2	D	300	NAD	O4B-C1B	-7.13	1.31	1.41
2	C	301	NAD	O4B-C1B	-7.05	1.31	1.41
2	A	300	NAD	O4B-C1B	-6.92	1.31	1.41
2	A	300	NAD	O4D-C4D	-5.68	1.32	1.45
2	C	301	NAD	O4D-C4D	-5.52	1.32	1.45
2	D	300	NAD	O4D-C4D	-5.17	1.33	1.45
2	B	300	NAD	O4D-C4D	-5.07	1.33	1.45
2	D	300	NAD	C7N-N7N	3.81	1.40	1.33
2	C	301	NAD	C5B-C4B	-3.58	1.40	1.51
2	A	300	NAD	C7N-N7N	3.57	1.39	1.33
2	A	300	NAD	C5B-C4B	-3.57	1.40	1.51
2	D	300	NAD	C5B-C4B	-3.55	1.40	1.51
2	C	301	NAD	O7N-C7N	-3.52	1.17	1.24
2	B	300	NAD	C5B-C4B	-3.48	1.40	1.51
2	D	300	NAD	O4B-C4B	3.46	1.52	1.45
2	B	300	NAD	C7N-N7N	3.42	1.39	1.33
2	A	300	NAD	C3B-C4B	3.37	1.61	1.53
2	D	300	NAD	O7N-C7N	-3.37	1.17	1.24
2	C	301	NAD	O4B-C4B	3.36	1.52	1.45
2	C	301	NAD	C7N-N7N	3.36	1.39	1.33
2	B	300	NAD	O4B-C4B	3.28	1.52	1.45
2	A	300	NAD	O4B-C4B	3.25	1.52	1.45
2	C	301	NAD	C3B-C4B	3.24	1.61	1.53
2	A	300	NAD	O7N-C7N	-3.18	1.18	1.24
2	B	300	NAD	C2A-N3A	3.14	1.37	1.32
2	C	301	NAD	O3D-C3D	-3.11	1.35	1.43
2	D	300	NAD	C3B-C4B	3.10	1.60	1.53
2	B	300	NAD	O3D-C3D	-3.04	1.35	1.43
2	A	300	NAD	O3D-C3D	-3.04	1.35	1.43
2	C	301	NAD	C2A-N3A	2.99	1.36	1.32
2	B	300	NAD	O7N-C7N	-2.99	1.18	1.24
2	D	300	NAD	C2A-N3A	2.98	1.36	1.32
2	B	300	NAD	C3B-C4B	2.93	1.60	1.53
2	D	300	NAD	O3D-C3D	-2.91	1.36	1.43
2	A	300	NAD	O3B-C3B	2.82	1.49	1.43
2	A	300	NAD	C2A-N3A	2.80	1.36	1.32
2	C	301	NAD	C2N-C3N	2.72	1.43	1.39

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	300	NAD	C2N-C3N	2.66	1.43	1.39
2	C	301	NAD	O3B-C3B	2.65	1.49	1.43
2	B	300	NAD	PN-O2N	-2.64	1.42	1.55
2	B	300	NAD	C2N-C3N	2.59	1.43	1.39
2	A	300	NAD	PN-O2N	-2.59	1.43	1.55
2	C	301	NAD	PN-O2N	-2.58	1.43	1.55
2	B	300	NAD	O2D-C2D	2.57	1.49	1.43
2	D	300	NAD	PN-O2N	-2.54	1.43	1.55
2	D	300	NAD	C5A-C4A	-2.53	1.34	1.40
2	D	300	NAD	O3B-C3B	2.48	1.48	1.43
2	A	300	NAD	C5A-C4A	-2.46	1.34	1.40
2	B	300	NAD	C5A-C4A	-2.37	1.34	1.40
2	C	301	NAD	C5A-C4A	-2.34	1.34	1.40
2	B	300	NAD	O3B-C3B	2.27	1.48	1.43
2	A	300	NAD	C6A-N6A	2.27	1.42	1.34
2	D	300	NAD	C2N-C3N	2.26	1.42	1.39
3	A	301	TCU	O17-C6	2.23	1.40	1.36
2	C	301	NAD	C6A-N6A	2.16	1.41	1.34
2	C	301	NAD	O2D-C2D	2.11	1.48	1.43
2	D	300	NAD	C6A-N6A	2.10	1.41	1.34
2	B	300	NAD	C6A-N6A	2.10	1.41	1.34
3	B	301	TCU	O17-C6	2.04	1.40	1.36
2	D	300	NAD	O2D-C2D	2.02	1.47	1.43

All (37) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	300	NAD	C1B-N9A-C4A	-10.50	108.19	126.64
2	A	300	NAD	C1B-N9A-C4A	-9.90	109.25	126.64
2	B	300	NAD	C1B-N9A-C4A	-9.83	109.37	126.64
2	C	301	NAD	C1B-N9A-C4A	-9.25	110.38	126.64
2	C	301	NAD	C5A-C6A-N6A	7.20	131.30	120.35
2	B	300	NAD	C5A-C6A-N6A	7.13	131.19	120.35
2	A	300	NAD	C5A-C6A-N6A	6.97	130.94	120.35
2	D	300	NAD	C5A-C6A-N6A	6.14	129.68	120.35
2	A	300	NAD	N3A-C2A-N1A	-5.72	119.73	128.68
2	D	300	NAD	N3A-C2A-N1A	-5.47	120.12	128.68
2	B	300	NAD	N3A-C2A-N1A	-5.26	120.45	128.68
2	B	300	NAD	N6A-C6A-N1A	-4.82	108.56	118.57
2	A	300	NAD	N6A-C6A-N1A	-4.78	108.64	118.57
2	C	301	NAD	N3A-C2A-N1A	-4.68	121.36	128.68
2	C	301	NAD	N6A-C6A-N1A	-4.64	108.93	118.57

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	300	NAD	C3B-C2B-C1B	4.60	107.90	100.98
2	C	301	NAD	O4B-C1B-C2B	-4.58	100.23	106.93
2	D	300	NAD	N6A-C6A-N1A	-4.18	109.90	118.57
2	C	301	NAD	C3B-C2B-C1B	3.96	106.94	100.98
2	A	300	NAD	C3B-C2B-C1B	3.89	106.84	100.98
2	C	301	NAD	C3N-C7N-N7N	3.82	122.33	117.75
2	D	300	NAD	C3B-C2B-C1B	3.64	106.46	100.98
2	D	300	NAD	C3N-C7N-N7N	3.24	121.63	117.75
2	C	301	NAD	O7N-C7N-N7N	-2.99	118.32	122.58
2	A	300	NAD	C3N-C7N-N7N	2.51	120.77	117.75
2	A	300	NAD	O4B-C1B-C2B	-2.49	103.28	106.93
2	B	300	NAD	C6N-N1N-C2N	-2.45	119.74	121.97
2	B	300	NAD	O4B-C1B-C2B	-2.44	103.36	106.93
2	D	300	NAD	C6N-N1N-C2N	-2.39	119.80	121.97
2	D	300	NAD	O4B-C1B-C2B	-2.29	103.58	106.93
3	D	301	TCU	O7-C5-C6	2.28	120.48	116.22
2	B	300	NAD	O4D-C1D-C2D	-2.25	103.63	106.93
2	A	300	NAD	C6N-N1N-C2N	-2.20	119.97	121.97
2	A	300	NAD	O4D-C1D-C2D	-2.18	103.74	106.93
3	C	302	TCU	O7-C5-C6	2.09	120.12	116.22
2	A	300	NAD	PN-O3-PA	-2.08	125.68	132.83
3	D	301	TCU	C8-O7-C5	-2.05	113.16	118.04

There are no chirality outliers.

All (45) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	300	NAD	C5B-O5B-PA-O2A
2	A	300	NAD	C5D-O5D-PN-O1N
2	A	300	NAD	C5D-O5D-PN-O2N
2	A	300	NAD	O4D-C1D-N1N-C2N
2	B	300	NAD	C5B-O5B-PA-O2A
2	B	300	NAD	C5D-O5D-PN-O1N
2	B	300	NAD	C5D-O5D-PN-O2N
2	B	300	NAD	O4D-C1D-N1N-C2N
2	C	301	NAD	C5D-O5D-PN-O1N
2	C	301	NAD	C5D-O5D-PN-O2N
2	C	301	NAD	O4D-C1D-N1N-C2N
2	D	300	NAD	PN-O3-PA-O5B
2	D	300	NAD	C5D-O5D-PN-O1N
2	D	300	NAD	C5D-O5D-PN-O2N
2	D	300	NAD	O4D-C1D-N1N-C2N

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Mol	Chain	Res	Type	Atoms
2	A	300	NAD	O4B-C4B-C5B-O5B
2	B	300	NAD	O4B-C4B-C5B-O5B
3	D	301	TCU	C2-C16-C17-C18
2	B	300	NAD	C3B-C4B-C5B-O5B
3	D	301	TCU	C17-C18-C19-C20
2	A	300	NAD	C3B-C4B-C5B-O5B
3	C	302	TCU	C17-C18-C19-C20
3	D	301	TCU	C18-C19-C20-C21
3	A	301	TCU	C2-C16-C17-C18
2	A	300	NAD	PN-O3-PA-O5B
2	B	300	NAD	PN-O3-PA-O5B
2	C	301	NAD	PN-O3-PA-O5B
3	A	301	TCU	C16-C17-C18-C19
3	C	302	TCU	C18-C19-C20-C21
3	B	301	TCU	C2-C16-C17-C18
2	A	300	NAD	C5B-O5B-PA-O3
2	B	300	NAD	C5B-O5B-PA-O3
2	A	300	NAD	C5B-O5B-PA-O1A
2	B	300	NAD	C5B-O5B-PA-O1A
3	A	301	TCU	C18-C19-C20-C21
3	B	301	TCU	C18-C19-C20-C21
2	C	301	NAD	PA-O3-PN-O1N
3	D	301	TCU	C17-C16-C2-C1
3	D	301	TCU	C17-C16-C2-C3
2	A	300	NAD	C5D-O5D-PN-O3
2	B	300	NAD	C5D-O5D-PN-O3
2	C	301	NAD	C5D-O5D-PN-O3
2	D	300	NAD	C5D-O5D-PN-O3
2	C	301	NAD	O4B-C4B-C5B-O5B
2	D	300	NAD	O4B-C4B-C5B-O5B

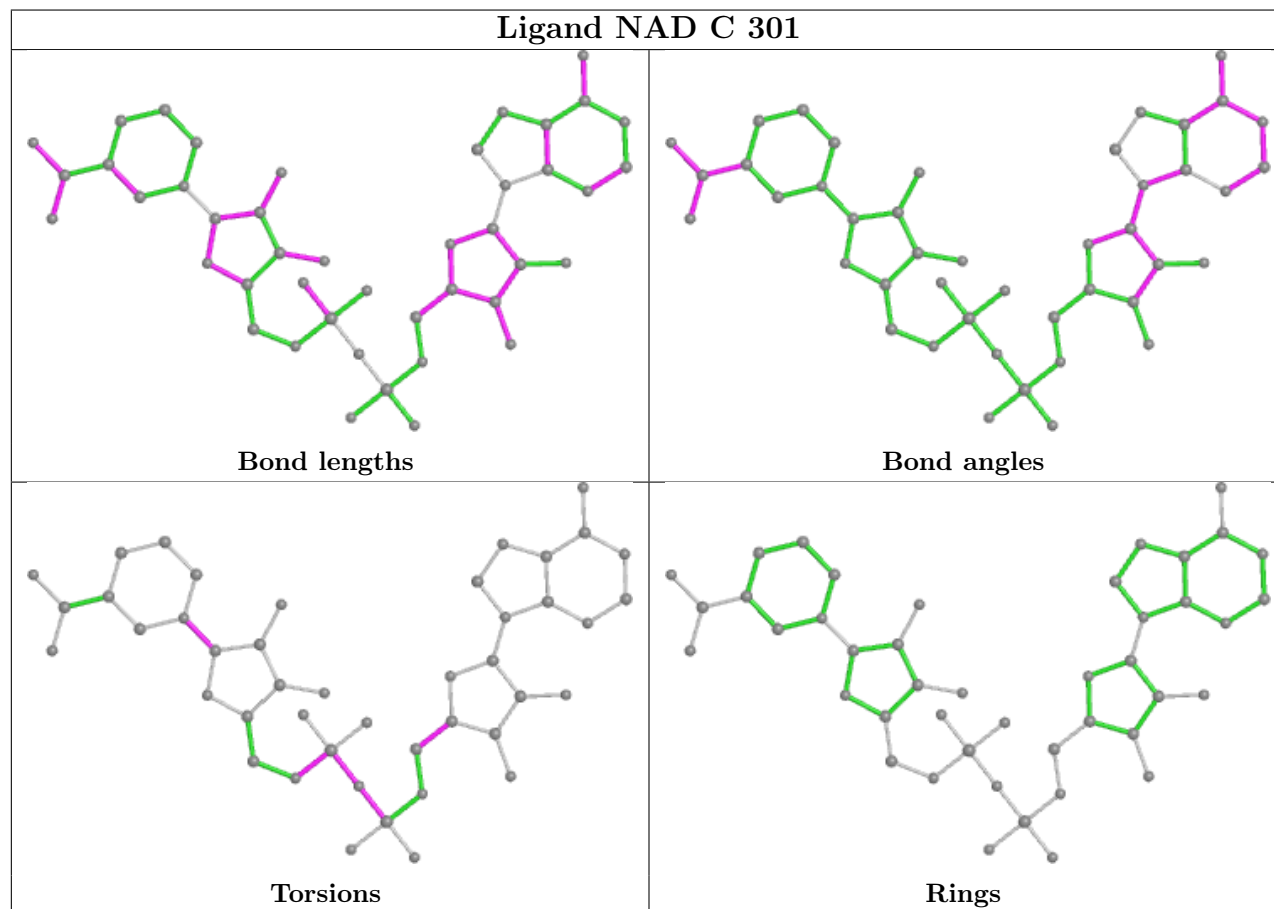
There are no ring outliers.

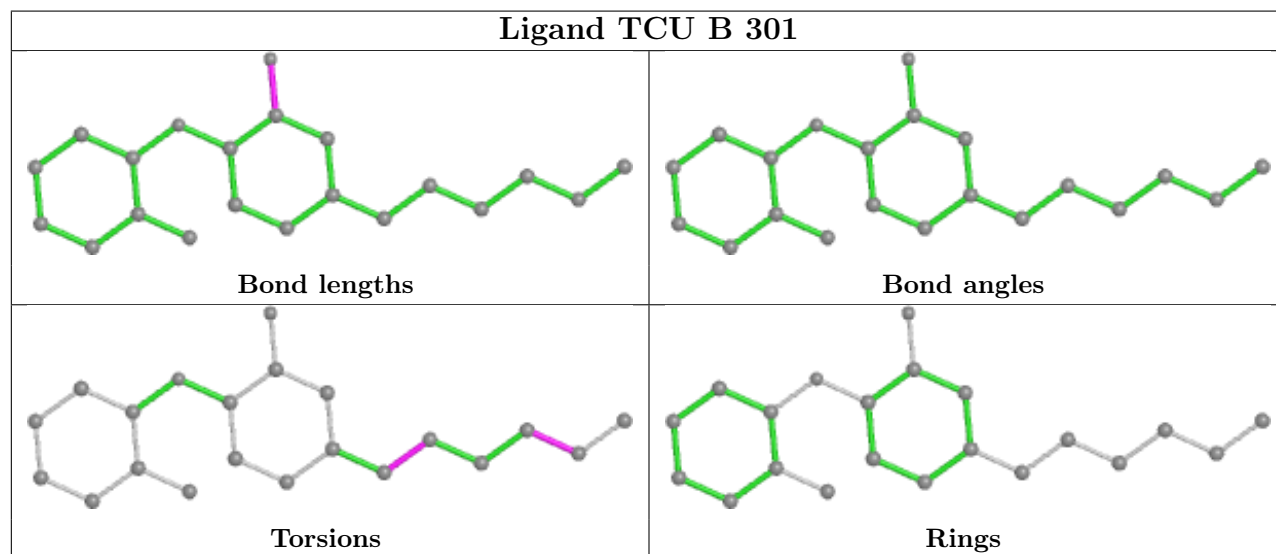
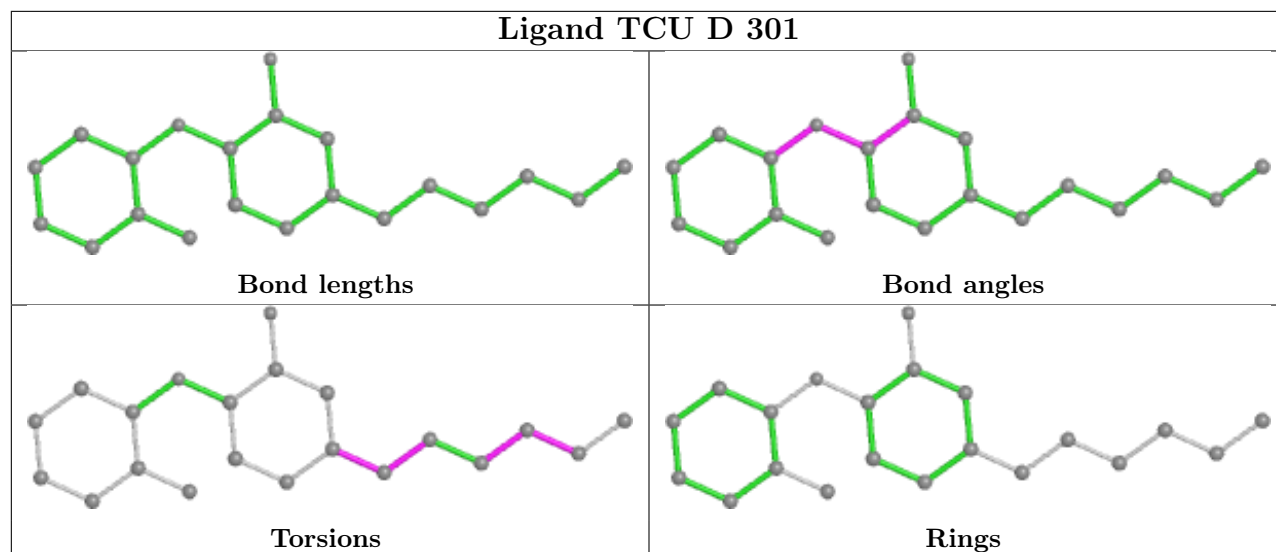
4 monomers are involved in 13 short contacts:

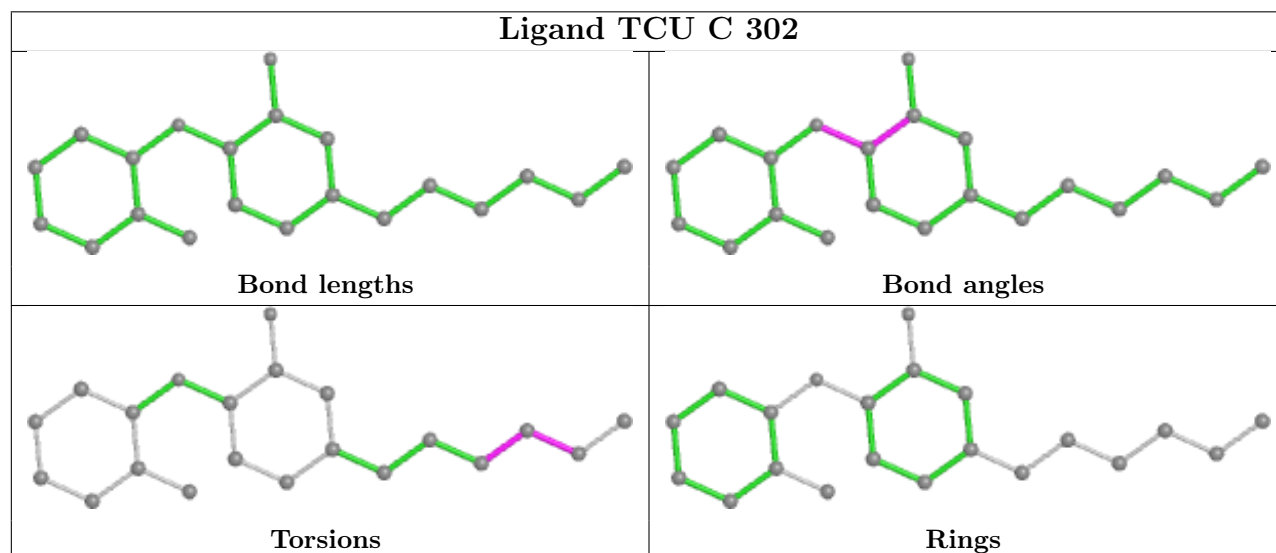
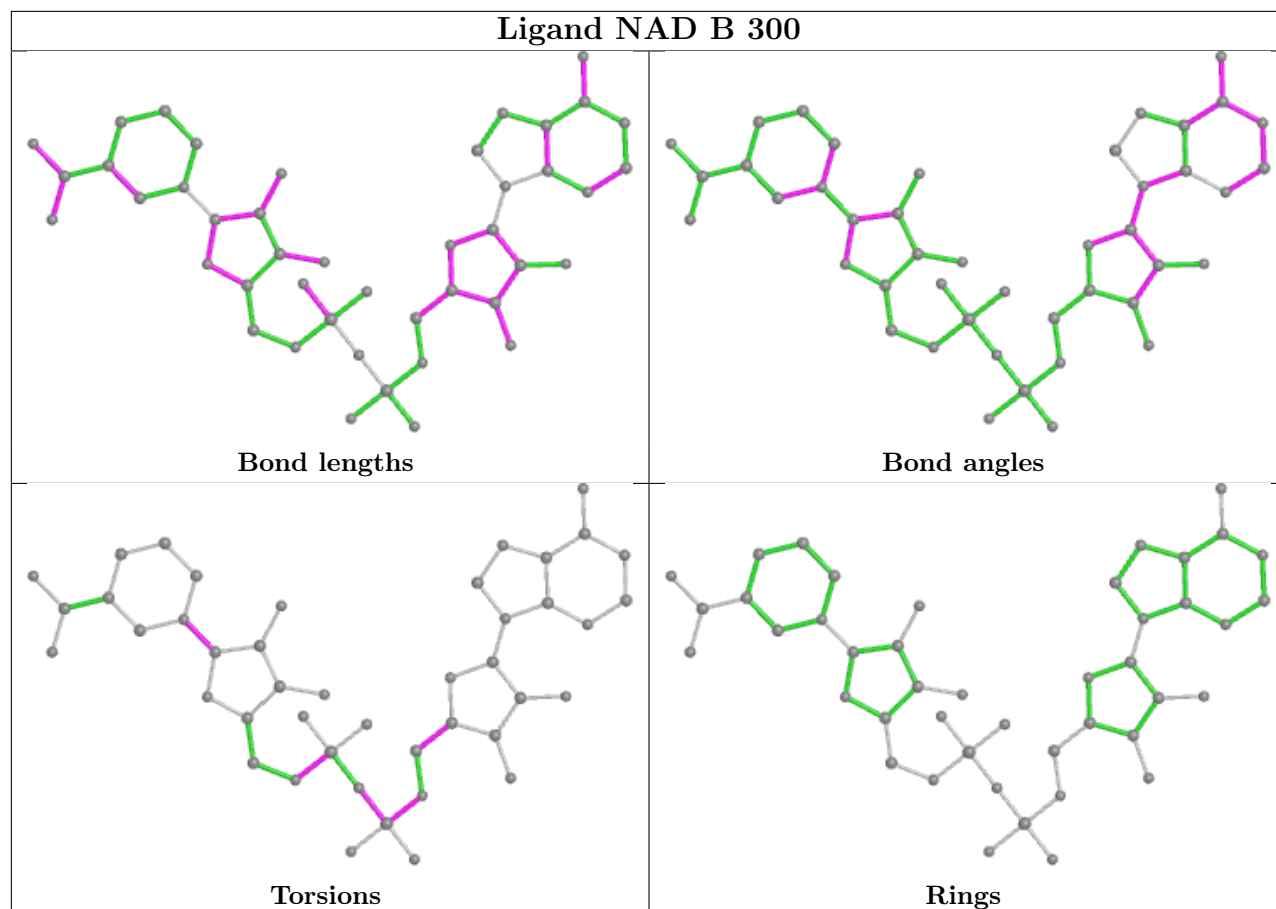
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	301	TCU	3	0
3	B	301	TCU	4	0
3	C	302	TCU	4	0
3	A	301	TCU	2	0

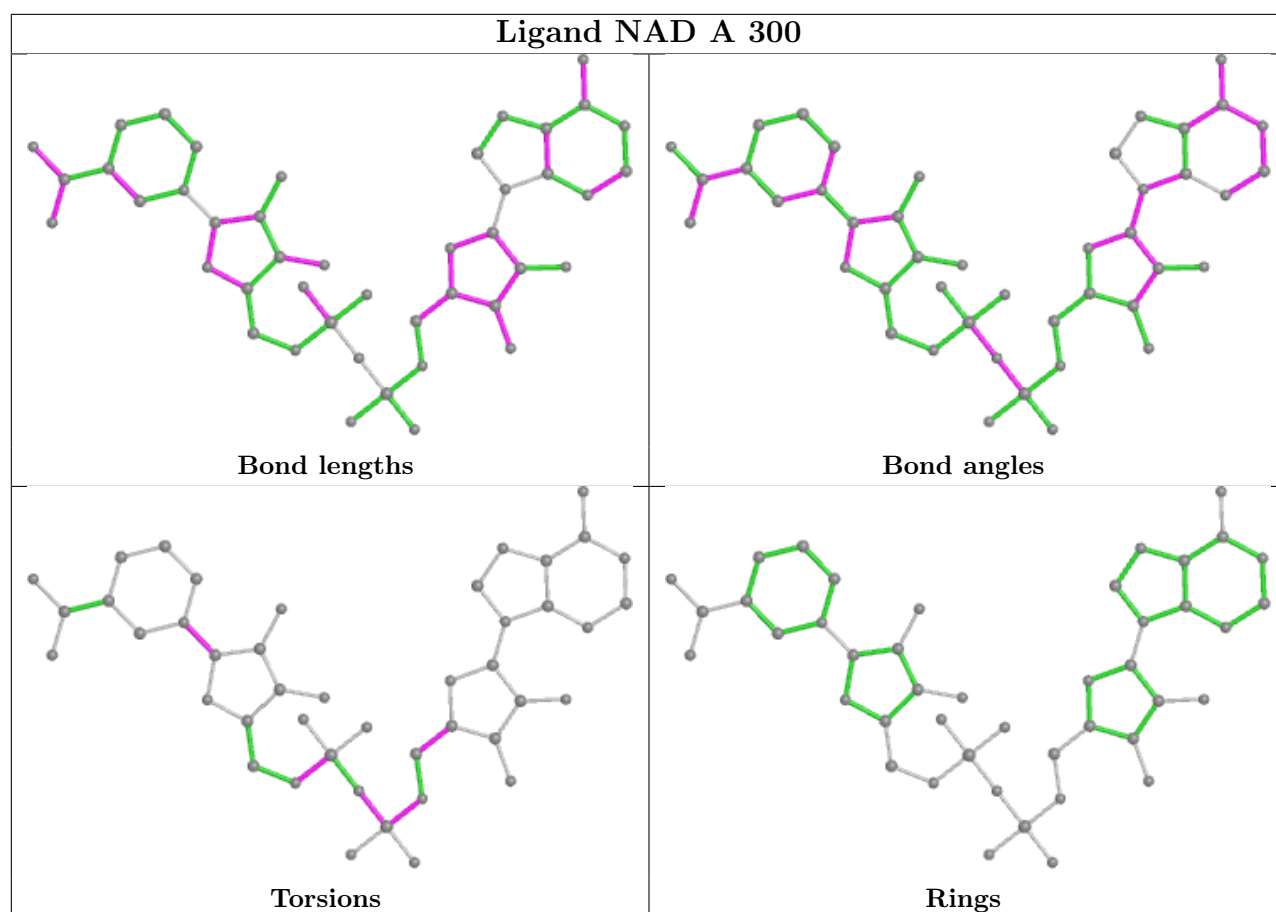
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In

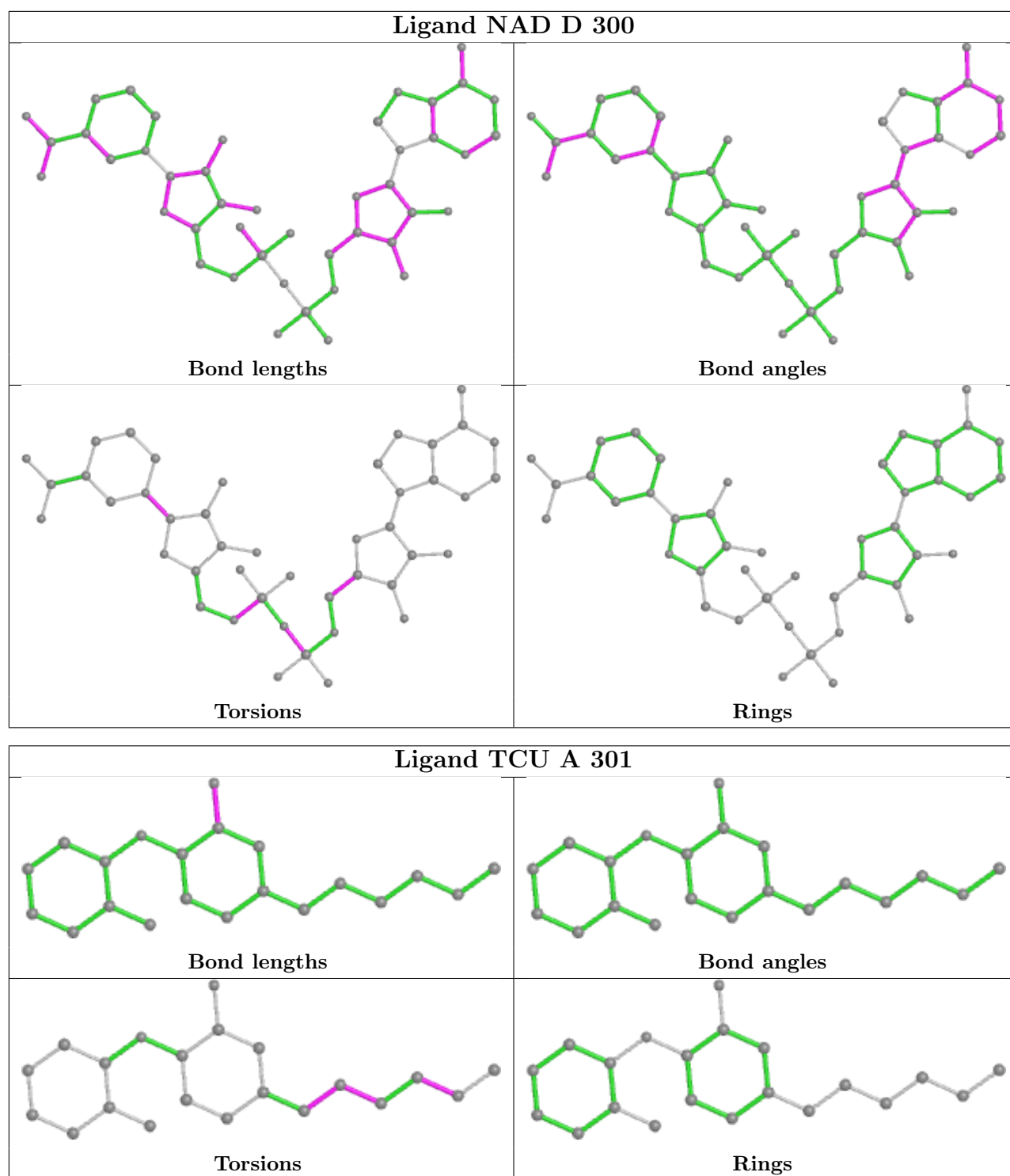
addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier.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











5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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	264/289 (91%)	-0.07	10 (3%) 40 47	29, 40, 64, 78	0
1	B	268/289 (92%)	-0.07	9 (3%) 45 52	31, 39, 58, 82	0
1	C	258/289 (89%)	-0.06	7 (2%) 54 62	33, 42, 61, 86	0
1	D	262/289 (90%)	0.15	13 (4%) 28 35	33, 46, 67, 81	1 (0%)
All	All	1052/1156 (91%)	-0.01	39 (3%) 41 48	29, 42, 64, 86	1 (0%)

All (39) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	206	ALA	8.2
1	A	211	ALA	7.5
1	D	2	THR	4.7
1	B	205	GLY	4.5
1	B	207	LEU	4.2
1	A	212	GLY	4.1
1	C	57	LYS	3.6
1	D	105	ILE	3.5
1	A	152	SER	3.4
1	A	205	GLY	3.3
1	B	84	ALA	3.1
1	D	203	ALA	3.1
1	D	152	SER	3.0
1	D	57	LYS	2.9
1	B	85	GLY	2.9
1	A	203	ALA	2.8
1	C	152	SER	2.7
1	A	233	LYS	2.7
1	B	257	ILE	2.6
1	D	45	ARG	2.6
1	B	204	GLY	2.6

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Mol	Chain	Res	Type	RSRZ
1	C	2	THR	2.6
1	C	216	GLN	2.6
1	A	269	LEU	2.5
1	B	46	LEU	2.4
1	A	204	GLY	2.4
1	C	151	PRO	2.3
1	C	45	ARG	2.3
1	D	211	ALA	2.3
1	B	259	TYR	2.2
1	D	151	PRO	2.2
1	C	259	TYR	2.2
1	A	2	THR	2.2
1	D	168	LEU	2.2
1	D	266	THR	2.1
1	D	202	ILE	2.1
1	D	49	ARG	2.0
1	D	43	ARG	2.0
1	A	215	ILE	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 monosaccharides in this entry.

6.4 Ligands [i](#)

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

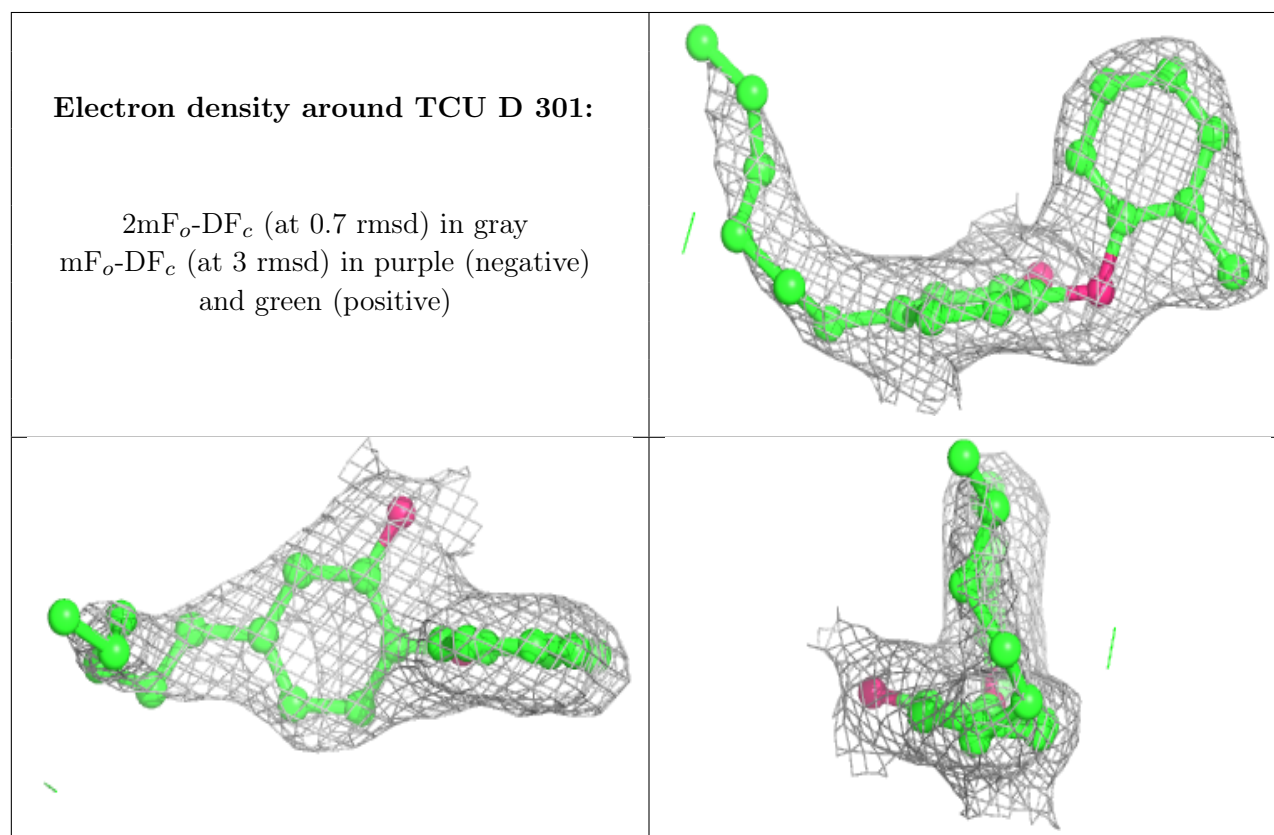
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	TCU	D	301	21/21	0.95	0.17	43,54,89,96	0
3	TCU	A	301	21/21	0.96	0.15	35,39,49,56	0
3	TCU	C	302	21/21	0.97	0.13	32,38,44,50	0
3	TCU	B	301	21/21	0.97	0.13	31,38,45,49	0
2	NAD	A	300	44/44	0.98	0.09	32,38,42,43	0

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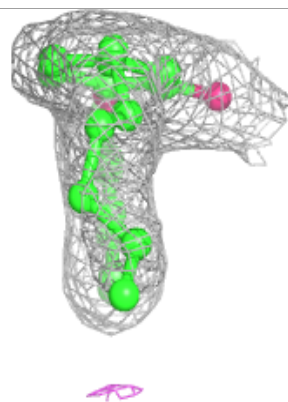
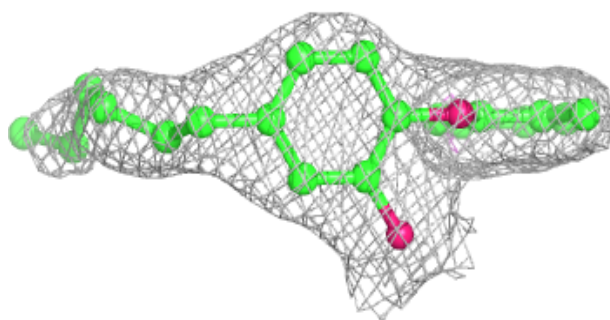
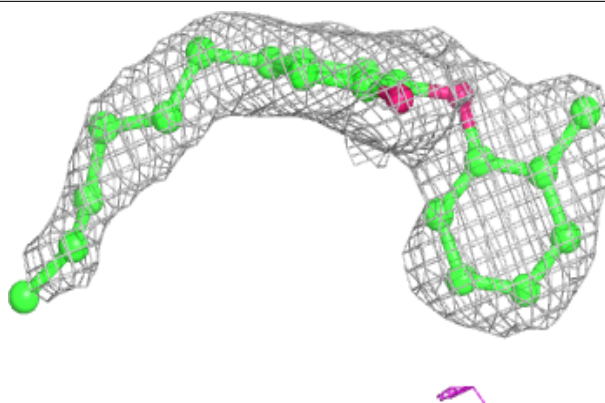
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	NAD	B	300	44/44	0.98	0.10	31,36,40,41	0
2	NAD	C	301	44/44	0.98	0.09	32,37,41,45	0
2	NAD	D	300	44/44	0.98	0.09	43,47,53,55	0
4	NA	C	303	1/1	0.99	0.16	29,29,29,29	0

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.

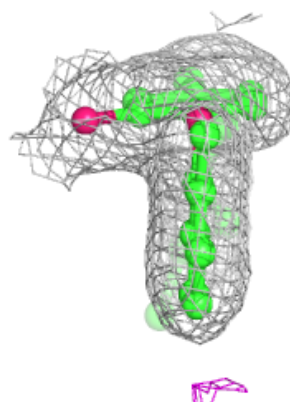
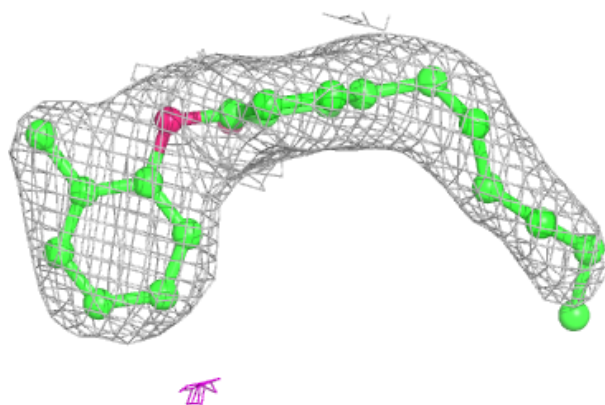


Electron density around TCU A 301:

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

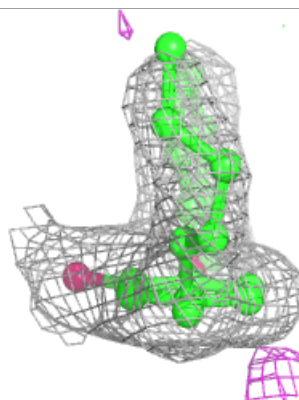
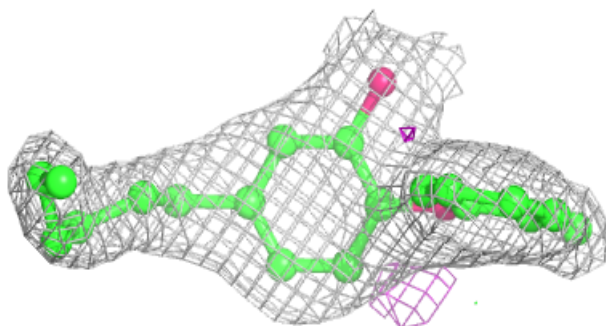
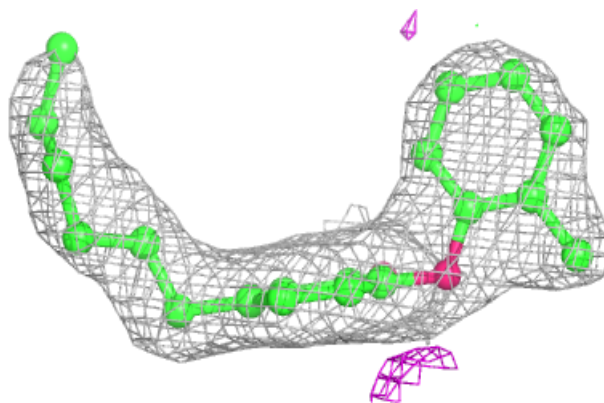
**Electron density around TCU C 302:**

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

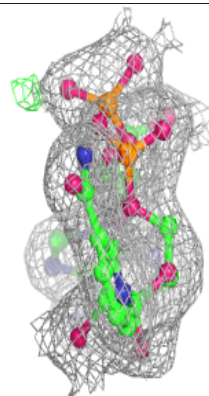
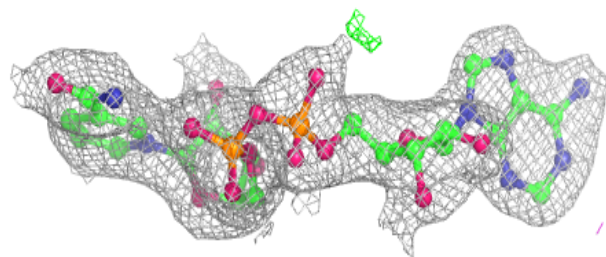
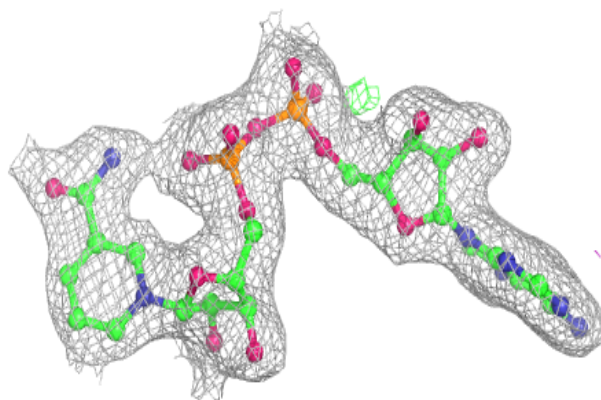


Electron density around TCU B 301:

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

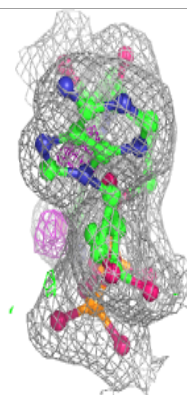
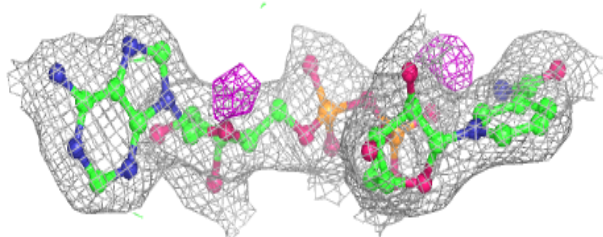
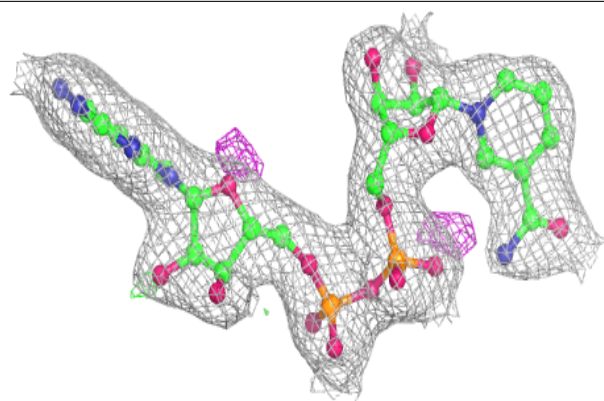
**Electron density around NAD A 300:**

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

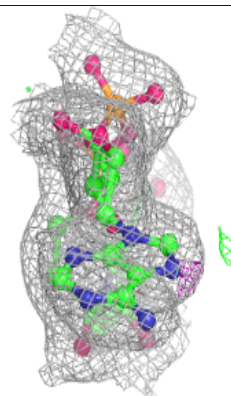
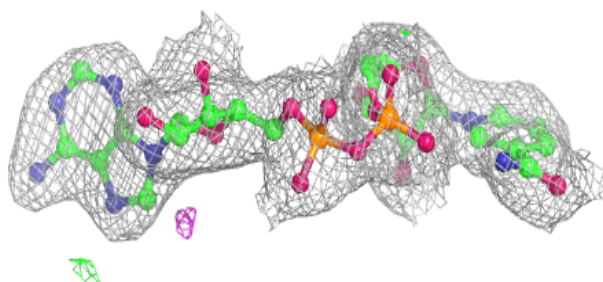
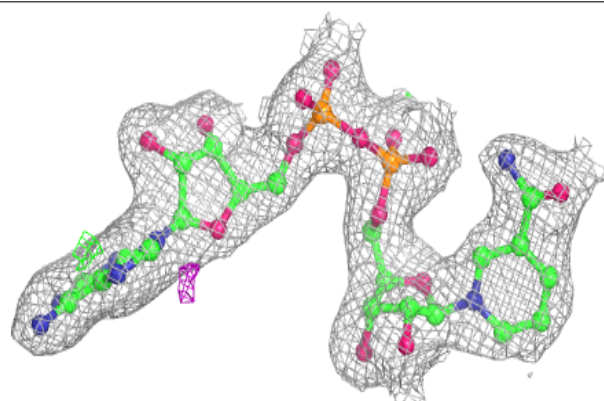


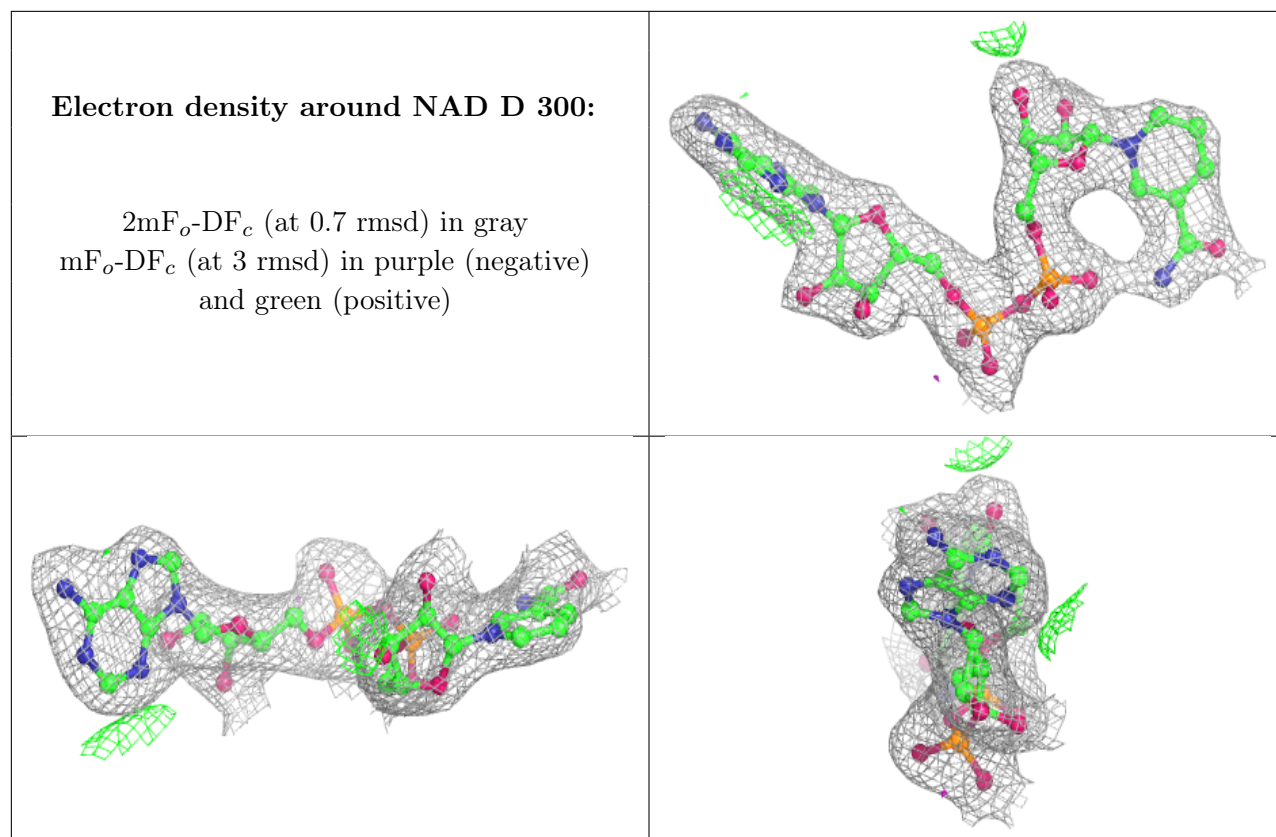
Electron density around NAD B 300:

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

**Electron density around NAD C 301:**

$2mF_o-DF_c$ (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.