



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 05:57 PM UTC

PDB ID : 1BTO / pdb_00001bto
Title : HORSE LIVER ALCOHOL DEHYDROGENASE COMPLEXED TO NADH
AND (1S,3R)3-BUTYLTHIOLANE 1-OXIDE
Authors : Ramaswamy, S.; Plapp, B.V.
Deposited on : 1996-11-08
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 : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

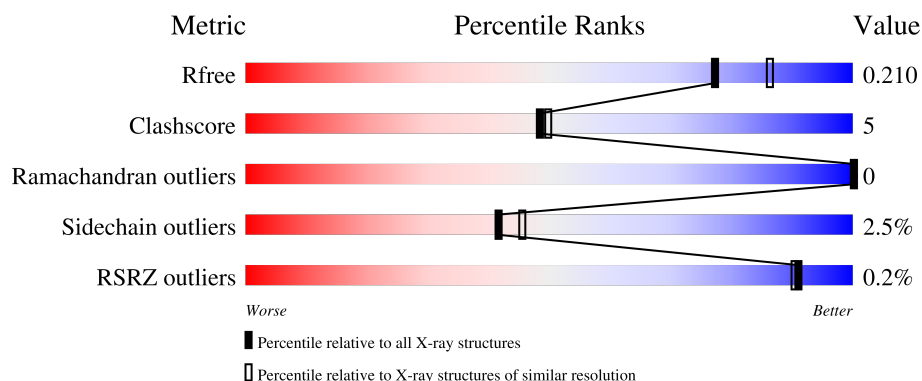
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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))
R_{free}	180053	10052 (2.00-2.00)
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (2.00-2.00)
RSRZ outliers	180081	10067 (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 $\leq 5\%$. 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	374	 84% 15% .
1	B	374	 84% 13% ..
1	C	374	 83% 14% .
1	D	374	 85% 13% .

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	SSB	A	378	X	-	-	-
4	SSB	B	378	X	-	-	-
4	SSB	C	378	X	-	-	-
4	SSB	D	378	X	-	-	-

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 12882 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.

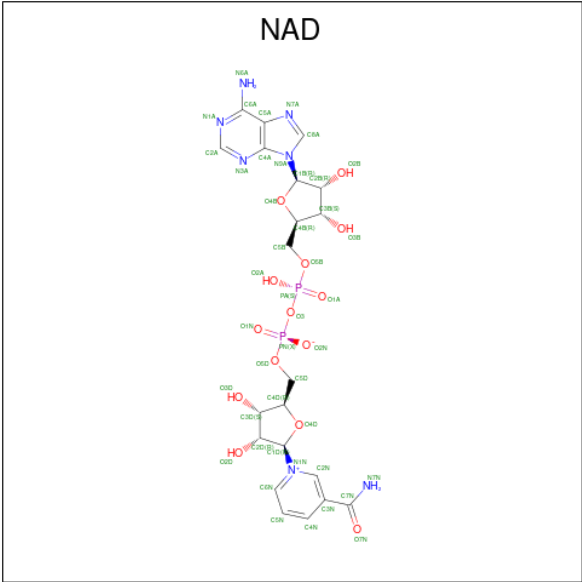
- Molecule 1 is a protein called LIVER ALCOHOL DEHYDROGENASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	374	Total	C	N	O	S	0	0	0
			2785	1769	472	521	23			
1	B	374	Total	C	N	O	S	0	0	0
			2785	1769	472	521	23			
1	C	374	Total	C	N	O	S	0	0	0
			2785	1769	472	521	23			
1	D	374	Total	C	N	O	S	0	0	0
			2785	1769	472	521	23			

- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn).

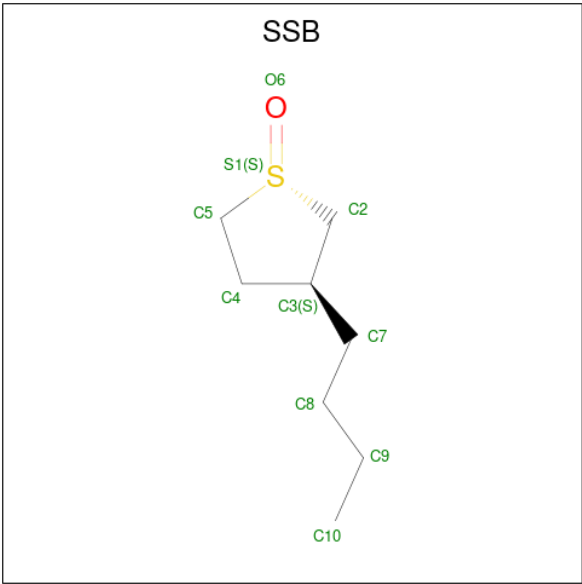
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	2	Total	Zn	0	0
			2	2		
2	B	2	Total	Zn	0	0
			2	2		
2	C	2	Total	Zn	0	0
			2	2		
2	D	2	Total	Zn	0	0
			2	2		

- Molecule 3 is NICOTINAMIDE-ADENINE-DINUCLEOTIDE (CCD ID: NAD) (formula: C₂₁H₂₇N₇O₁₄P₂).



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

- Molecule 4 is 3-BUTYLTHIOLANE 1-OXIDE (CCD ID: SSB) (formula: C₈H₁₆OS).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	O	S	0	0
			10	8	1	1		
4	B	1	Total	C	O	S	0	0
			10	8	1	1		
4	C	1	Total	C	O	S	0	0
			10	8	1	1		
4	D	1	Total	C	O	S	0	0
			10	8	1	1		

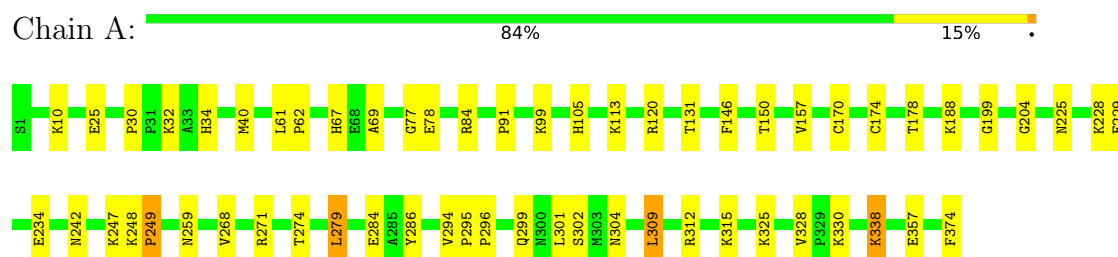
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	372	Total	O	0	0
			372	372		
5	B	396	Total	O	0	0
			396	396		
5	C	374	Total	O	0	0
			374	374		
5	D	376	Total	O	0	0
			376	376		

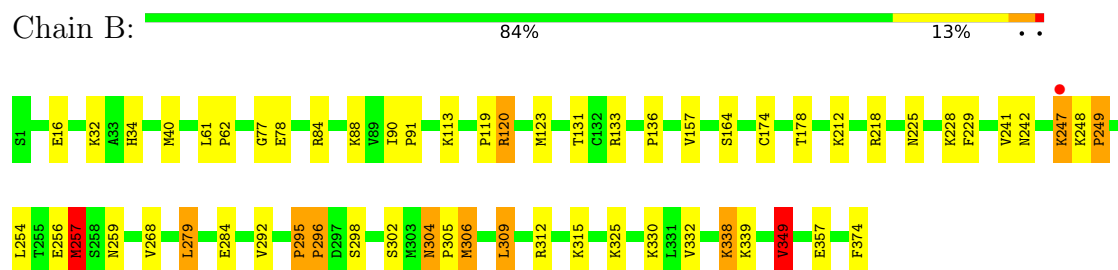
3 Residue-property plots [i](#)

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.

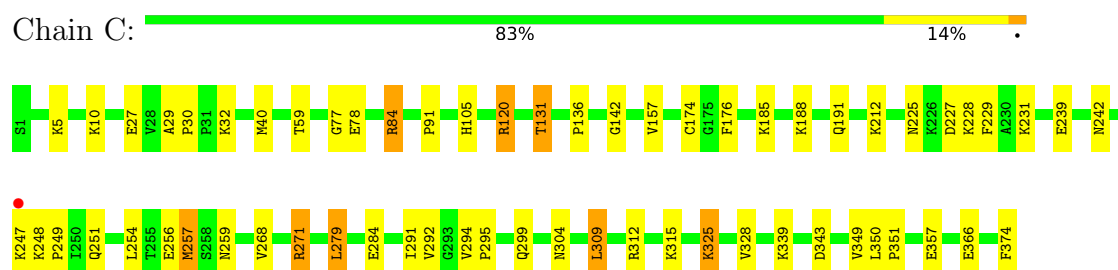
• Molecule 1: LIVER ALCOHOL DEHYDROGENASE



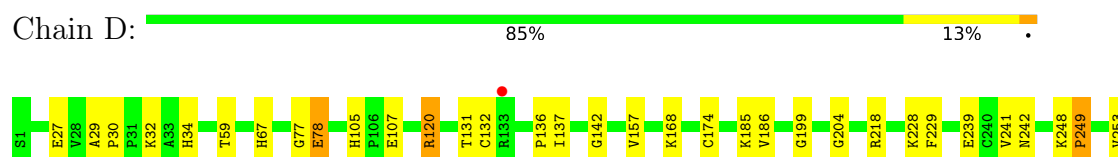
• Molecule 1: LIVER ALCOHOL DEHYDROGENASE

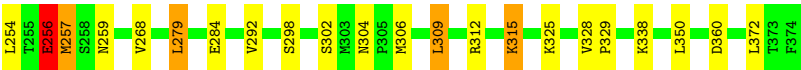


• Molecule 1: LIVER ALCOHOL DEHYDROGENASE



• Molecule 1: LIVER ALCOHOL DEHYDROGENASE





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	49.93Å 180.20Å 86.80Å 90.00° 106.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.00 20.00 – 2.00	Depositor EDS
% Data completeness (in resolution range)	79.0 (20.00-2.00) 79.0 (20.00-2.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.04	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.19 (at 2.01Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.190 , 0.230 0.168 , 0.210	Depositor DCC
R_{free} test set	2335 reflections (2.98%)	wwPDB-VP
Wilson B-factor (Å ²)	14.9	Xtriage
Anisotropy	0.619	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 57.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.000 for h,-k,-h-l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	12882	wwPDB-VP
Average B, all atoms (Å ²)	18.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 66.62 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 5.8724e-06. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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: SSB, NAD, ZN

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	0.86	0/2837	1.61	35/3834 (0.9%)
1	B	0.87	0/2837	1.66	36/3834 (0.9%)
1	C	0.87	0/2837	1.71	40/3834 (1.0%)
1	D	0.92	3/2837 (0.1%)	1.65	36/3834 (0.9%)
All	All	0.88	3/11348 (0.0%)	1.66	147/15336 (1.0%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	34	HIS	CE1-NE2	-10.36	1.22	1.32
1	D	34	HIS	CG-ND1	-7.88	1.29	1.38
1	D	34	HIS	CG-CD2	-6.07	1.29	1.35

All (147) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	259	ASN	OD1-CG-ND2	-32.80	89.80	122.60
1	C	84	ARG	NE-CZ-NH2	31.54	147.59	119.20
1	C	271	ARG	NE-CZ-NH2	19.59	136.84	119.20
1	D	34	HIS	ND1-CG-CD2	-17.80	88.30	106.10
1	A	234	GLU	OE1-CD-OE2	-17.64	80.57	122.90
1	A	234	GLU	CG-CD-OE2	17.26	158.11	118.40
1	C	84	ARG	NH1-CZ-NH2	-16.64	97.67	119.30
1	D	34	HIS	CG-CD2-NE2	16.16	123.36	107.20
1	D	256	GLU	CG-CD-OE2	-15.19	83.46	118.40
1	D	256	GLU	OE1-CD-OE2	13.12	154.40	122.90
1	C	78	GLU	OE1-CD-OE2	12.51	152.92	122.90
1	C	259	ASN	OD1-CG-ND2	-11.83	110.77	122.60
1	D	259	ASN	OD1-CG-ND2	-11.62	110.98	122.60
1	A	259	ASN	OD1-CG-ND2	-11.45	111.15	122.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	84	ARG	CD-NE-CZ	-11.31	108.57	124.40
1	C	271	ARG	NE-CZ-NH1	-10.29	111.21	121.50
1	B	259	ASN	CB-CG-OD1	10.09	140.99	120.80
1	A	247	LYS	CG-CD-CE	9.88	134.02	111.30
1	D	241	VAL	CG1-CB-CG2	-9.21	90.55	110.80
1	B	247	LYS	CG-CD-CE	9.17	132.39	111.30
1	D	34	HIS	CE1-NE2-CD2	-8.51	100.49	109.00
1	D	256	GLU	CB-CG-CD	-8.46	98.21	112.60
1	B	259	ASN	CB-CG-ND2	8.46	129.09	116.40
1	B	90	ILE	CA-C-O	8.38	124.30	119.94
1	D	34	HIS	CG-ND1-CE1	8.11	123.08	109.30
1	D	34	HIS	CB-CG-CD2	7.88	141.45	131.20
1	D	30	PRO	N-CA-CB	7.85	107.30	103.22
1	D	78	GLU	OE1-CD-OE2	7.59	141.12	122.90
1	C	78	GLU	CB-CG-CD	7.48	125.32	112.60
1	C	247	LYS	CG-CD-CE	7.25	127.97	111.30
1	B	131	THR	OG1-CB-CG2	-7.15	95.01	109.30
1	B	229	PHE	N-CA-C	7.14	119.14	111.36
1	A	294	VAL	CA-C-O	7.13	124.40	119.20
1	C	191	GLN	OE1-CD-NE2	7.10	129.70	122.60
1	B	304	ASN	CA-C-N	7.09	126.77	119.82
1	B	304	ASN	C-N-CA	7.09	126.77	119.82
1	C	78	GLU	CG-CD-OE2	-7.06	102.15	118.40
1	B	257	MET	CG-SD-CE	6.99	116.28	100.90
1	D	59	THR	O-C-N	-6.90	116.46	121.84
1	B	84	ARG	NE-CZ-NH2	-6.85	113.03	119.20
1	C	84	ARG	NE-CZ-NH1	-6.77	114.73	121.50
1	B	78	GLU	OE1-CD-OE2	6.76	139.14	122.90
1	C	292	VAL	CA-C-N	6.71	126.47	120.10
1	C	292	VAL	C-N-CA	6.71	126.47	120.10
1	A	249	PRO	N-CA-CB	6.51	108.98	103.25
1	D	292	VAL	CA-C-N	6.50	126.16	119.92
1	D	292	VAL	C-N-CA	6.50	126.16	119.92
1	B	249	PRO	N-CA-CB	6.50	109.09	103.31
1	A	286	TYR	CA-C-N	6.49	126.26	120.10
1	A	286	TYR	C-N-CA	6.49	126.26	120.10
1	A	78	GLU	OE1-CD-OE2	6.48	138.46	122.90
1	C	304	ASN	CA-C-N	6.42	126.12	119.82
1	C	304	ASN	C-N-CA	6.42	126.12	119.82
1	D	256	GLU	N-CA-CB	-6.40	100.73	110.01
1	A	295	PRO	CA-C-N	6.37	126.70	119.83
1	A	295	PRO	C-N-CA	6.37	126.70	119.83

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	29	ALA	CA-C-N	6.35	124.23	119.66
1	D	29	ALA	C-N-CA	6.35	124.23	119.66
1	D	218	ARG	NE-CZ-NH2	6.33	124.90	119.20
1	D	304	ASN	CA-C-N	6.31	126.00	119.82
1	D	304	ASN	C-N-CA	6.31	126.00	119.82
1	D	304	ASN	CA-C-O	6.26	123.95	119.32
1	B	338	LYS	CG-CD-CE	6.23	125.64	111.30
1	D	241	VAL	CA-CB-CG2	6.19	120.92	110.40
1	A	34	HIS	ND1-CG-CD2	-6.13	99.97	106.10
1	A	304	ASN	CA-C-N	6.12	125.82	119.82
1	A	304	ASN	C-N-CA	6.12	125.82	119.82
1	B	34	HIS	CG-CD2-NE2	6.04	113.24	107.20
1	D	229	PHE	N-CA-C	6.02	117.92	111.36
1	A	229	PHE	N-CA-C	6.01	117.91	111.36
1	B	133	ARG	NE-CZ-NH2	5.98	124.58	119.20
1	D	249	PRO	N-CA-CB	5.92	108.58	103.31
1	C	136	PRO	N-CA-CB	5.92	108.59	103.27
1	B	120	ARG	CD-NE-CZ	5.88	132.63	124.40
1	C	374	PHE	CA-CB-CG	-5.87	107.93	113.80
1	C	78	GLU	CG-CD-OE1	-5.87	104.89	118.40
1	B	296	PRO	N-CA-CB	5.85	108.53	103.27
1	B	292	VAL	CA-C-N	5.83	125.64	120.10
1	B	292	VAL	C-N-CA	5.83	125.64	120.10
1	C	295	PRO	CA-C-N	5.77	126.06	119.83
1	C	295	PRO	C-N-CA	5.77	126.06	119.83
1	A	131	THR	OG1-CB-CG2	-5.77	97.77	109.30
1	A	374	PHE	CA-CB-CG	-5.76	108.04	113.80
1	A	34	HIS	CG-CD2-NE2	5.76	112.96	107.20
1	C	242	ASN	CA-C-N	5.74	126.13	119.47
1	C	242	ASN	C-N-CA	5.74	126.13	119.47
1	C	105	HIS	CA-C-N	5.69	125.54	119.28
1	C	105	HIS	C-N-CA	5.69	125.54	119.28
1	A	30	PRO	CA-C-N	5.68	125.44	119.76
1	A	30	PRO	C-N-CA	5.68	125.44	119.76
1	B	374	PHE	CA-CB-CG	-5.68	108.12	113.80
1	C	271	ARG	NH1-CZ-NH2	-5.66	111.95	119.30
1	B	34	HIS	ND1-CG-CD2	-5.65	100.45	106.10
1	C	284	GLU	N-CA-C	5.61	118.94	111.75
1	A	259	ASN	CB-CG-ND2	5.59	124.79	116.40
1	C	291	ILE	CA-C-O	-5.50	114.50	120.71
1	B	349	VAL	CG1-CB-CG2	-5.50	98.71	110.80
1	C	357	GLU	CA-C-N	5.46	126.05	119.98

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	357	GLU	C-N-CA	5.46	126.05	119.98
1	B	164	SER	CA-C-N	5.46	126.66	119.84
1	B	164	SER	C-N-CA	5.46	126.66	119.84
1	A	242	ASN	CA-C-N	5.43	125.77	119.47
1	A	242	ASN	C-N-CA	5.43	125.77	119.47
1	C	91	PRO	N-CA-CB	5.42	108.06	103.35
1	A	146	PHE	CA-CB-CG	5.41	119.21	113.80
1	D	241	VAL	N-CA-CB	-5.39	102.59	111.44
1	A	338	LYS	CD-CE-NZ	-5.39	94.66	111.90
1	C	59	THR	O-C-N	-5.39	117.64	121.84
1	B	295	PRO	CA-C-N	5.35	125.60	119.83
1	B	295	PRO	C-N-CA	5.35	125.60	119.83
1	A	284	GLU	N-CA-C	5.32	118.55	111.75
1	C	229	PHE	N-CA-C	5.30	117.14	111.36
1	D	242	ASN	CA-C-N	5.29	125.61	119.47
1	D	242	ASN	C-N-CA	5.29	125.61	119.47
1	C	59	THR	CA-C-N	5.28	125.53	119.83
1	C	59	THR	C-N-CA	5.28	125.53	119.83
1	D	34	HIS	CA-CB-CG	-5.27	108.53	113.80
1	B	284	GLU	N-CA-C	5.26	117.76	111.71
1	B	119	PRO	N-CA-CB	5.26	107.85	103.17
1	B	218	ARG	NE-CZ-NH2	5.23	123.91	119.20
1	B	136	PRO	N-CA-CB	5.19	107.94	103.27
1	C	257	MET	CA-CB-CG	5.18	124.45	114.10
1	A	91	PRO	N-CA-CB	5.17	107.91	103.31
1	D	105	HIS	CA-C-N	5.16	124.96	119.28
1	D	105	HIS	C-N-CA	5.16	124.96	119.28
1	D	67	HIS	CA-CB-CG	-5.14	108.66	113.80
1	B	242	ASN	CA-C-N	5.14	125.44	119.47
1	B	242	ASN	C-N-CA	5.14	125.44	119.47
1	A	67	HIS	CA-CB-CG	-5.12	108.67	113.80
1	B	332	VAL	CA-C-O	-5.12	115.74	121.17
1	D	284	GLU	N-CA-C	5.11	118.29	111.75
1	A	84	ARG	NE-CZ-NH2	-5.11	114.61	119.20
1	C	328	VAL	CA-C-O	5.11	122.11	118.69
1	D	257	MET	CA-CB-CG	5.10	124.30	114.10
1	B	241	VAL	CG1-CB-CG2	-5.09	99.59	110.80
1	B	91	PRO	N-CA-CB	5.09	107.84	103.31
1	A	34	HIS	CA-CB-CG	-5.06	108.74	113.80
1	A	328	VAL	CA-C-N	5.04	124.64	119.05
1	A	328	VAL	C-N-CA	5.04	124.64	119.05
1	D	136	PRO	N-CA-CB	5.03	107.79	103.27

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	296	PRO	N-CA-CB	5.02	107.78	103.27
1	D	34	HIS	CB-CG-ND1	5.01	130.22	122.70
1	C	176	PHE	CA-CB-CG	-5.01	108.79	113.80
1	C	343	ASP	CA-C-N	5.01	124.67	119.56
1	C	343	ASP	C-N-CA	5.01	124.67	119.56
1	A	105	HIS	CA-C-N	5.00	124.78	119.28
1	A	105	HIS	C-N-CA	5.00	124.78	119.28

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2785	0	2848	26	1
1	B	2785	0	2845	37	0
1	C	2785	0	2848	33	0
1	D	2785	0	2848	28	2
2	A	2	0	0	0	0
2	B	2	0	0	0	0
2	C	2	0	0	0	0
2	D	2	0	0	0	0
3	A	44	0	25	3	0
3	B	44	0	24	2	0
3	C	44	0	25	2	0
3	D	44	0	24	1	0
4	A	10	0	16	2	0
4	B	10	0	16	1	0
4	C	10	0	16	2	0
4	D	10	0	16	1	0
5	A	372	0	0	13	1
5	B	396	0	0	22	1
5	C	374	0	0	16	1
5	D	376	0	0	12	0
All	All	12882	0	11551	125	3

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 5.

All (125) 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:339:LYS:HE3	5:C:1132:HOH:O	1.47	1.14
1:D:239:GLU:OE1	5:D:748:HOH:O	1.73	1.07
3:A:377:NAD:N7A	5:A:412:HOH:O	1.91	1.01
1:A:188:LYS:HE2	5:A:682:HOH:O	1.67	0.95
1:A:338:LYS:HE3	5:A:574:HOH:O	0.75	0.92
1:C:212:LYS:NZ	5:C:1112:HOH:O	2.01	0.90
1:C:239:GLU:OE1	5:C:934:HOH:O	1.90	0.88
1:B:298:SER:O	5:B:721:HOH:O	2.00	0.79
1:A:32:LYS:HE3	5:A:595:HOH:O	1.83	0.78
1:C:256:GLU:OE1	5:C:1056:HOH:O	2.02	0.78
1:D:185:LYS:HE3	5:D:513:HOH:O	1.84	0.77
1:B:349:VAL:HG11	5:B:642:HOH:O	1.84	0.76
1:B:228:LYS:NZ	5:B:705:HOH:O	2.02	0.76
1:B:349:VAL:CG1	5:B:642:HOH:O	2.33	0.75
1:A:188:LYS:CE	5:A:682:HOH:O	2.28	0.75
1:B:32:LYS:HE3	5:B:594:HOH:O	1.87	0.73
1:B:257:MET:CE	5:B:770:HOH:O	2.37	0.72
1:D:228:LYS:NZ	5:D:696:HOH:O	2.02	0.72
1:C:366:GLU:OE1	5:C:1024:HOH:O	2.09	0.71
1:D:360:ASP:OD1	5:D:703:HOH:O	2.08	0.71
1:A:299:GLN:OE1	5:A:696:HOH:O	2.08	0.70
1:B:338:LYS:HE3	5:B:764:HOH:O	1.91	0.69
1:D:120:ARG:NH2	5:D:718:HOH:O	2.17	0.69
1:D:298:SER:O	5:D:712:HOH:O	2.12	0.68
1:C:299:GLN:OE1	5:C:1091:HOH:O	2.10	0.68
1:B:16:GLU:OE1	5:B:745:HOH:O	2.11	0.68
1:B:257:MET:HE1	5:B:770:HOH:O	1.92	0.67
1:B:338:LYS:CE	5:B:764:HOH:O	2.41	0.67
1:D:256:GLU:OE1	5:D:684:HOH:O	2.15	0.65
1:A:188:LYS:NZ	5:A:682:HOH:O	2.29	0.64
1:C:228:LYS:NZ	5:C:1089:HOH:O	2.16	0.62
1:A:357:GLU:OE2	5:A:652:HOH:O	2.16	0.60
1:B:157:VAL:O	1:B:325:LYS:HE2	2.00	0.60
1:B:113:LYS:HD3	5:B:701:HOH:O	2.02	0.60
1:A:228:LYS:NZ	5:A:694:HOH:O	2.03	0.58
1:C:10:LYS:HE2	5:C:1007:HOH:O	2.04	0.58
1:A:248:LYS:HB2	1:A:249:PRO:HD2	1.87	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:99:LYS:HD2	5:A:647:HOH:O	2.05	0.56
1:D:168:LYS:HD3	5:D:646:HOH:O	2.06	0.56
1:A:157:VAL:O	1:A:325:LYS:HE2	2.07	0.55
1:B:279:LEU:HD22	1:B:312:ARG:HD3	1.88	0.55
1:C:157:VAL:O	1:C:325:LYS:HE2	2.06	0.55
1:A:25:GLU:OE2	5:A:633:HOH:O	2.18	0.55
1:C:142:GLY:HA2	5:C:991:HOH:O	2.07	0.55
1:C:279:LEU:HD22	1:C:312:ARG:HD3	1.89	0.55
1:A:279:LEU:HD22	1:A:312:ARG:HD3	1.89	0.54
1:D:279:LEU:HD22	1:D:312:ARG:HD3	1.89	0.54
1:B:247:LYS:HG2	5:B:746:HOH:O	2.08	0.54
1:C:248:LYS:HB2	1:C:249:PRO:HD2	1.88	0.54
1:C:5:LYS:HE3	5:C:853:HOH:O	2.08	0.53
1:D:174:CYS:SG	3:D:377:NAD:H5N	2.49	0.53
1:B:212:LYS:NZ	5:B:732:HOH:O	2.31	0.53
1:C:10:LYS:CE	5:C:1007:HOH:O	2.56	0.53
1:B:88:LYS:NZ	5:B:644:HOH:O	2.39	0.53
1:B:349:VAL:HG12	5:B:642:HOH:O	2.05	0.52
1:A:330:LYS:HB3	5:A:644:HOH:O	2.10	0.52
1:C:254:LEU:HA	1:C:257:MET:HG2	1.92	0.52
1:C:185:LYS:O	1:C:188:LYS:NZ	2.36	0.51
1:B:248:LYS:HB2	1:B:249:PRO:HD2	1.92	0.51
1:A:309:LEU:HG	4:D:378:SSB:C10	2.40	0.51
1:C:174:CYS:SG	3:C:377:NAD:H5N	2.51	0.50
1:C:350:LEU:HB3	1:C:351:PRO:HD2	1.93	0.50
1:A:225:ASN:C	1:A:225:ASN:HD22	2.19	0.50
4:B:378:SSB:C10	1:C:309:LEU:HG	2.42	0.50
1:B:174:CYS:SG	3:B:377:NAD:H5N	2.53	0.49
1:D:338:LYS:HA	5:D:515:HOH:O	2.12	0.49
1:C:225:ASN:C	1:C:225:ASN:HD22	2.21	0.49
1:B:257:MET:HE3	5:B:770:HOH:O	2.05	0.49
1:B:338:LYS:HD2	5:B:764:HOH:O	2.12	0.49
1:C:349:VAL:HG12	5:C:852:HOH:O	2.14	0.48
1:B:309:LEU:HG	4:C:378:SSB:C10	2.42	0.48
1:C:84:ARG:HH11	1:C:84:ARG:HD2	1.27	0.48
1:B:228:LYS:HE2	5:B:622:HOH:O	2.13	0.48
1:D:27:GLU:HB2	1:D:131:THR:OG1	2.14	0.48
1:A:113:LYS:HE2	5:A:668:HOH:O	2.14	0.48
1:A:174:CYS:SG	3:A:377:NAD:H5N	2.54	0.47
1:C:27:GLU:HB2	1:C:131:THR:OG1	2.13	0.47
1:B:254:LEU:HA	1:B:257:MET:HG2	1.96	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:256:GLU:HG3	5:B:656:HOH:O	2.15	0.47
1:D:248:LYS:HB2	1:D:249:PRO:HD2	1.97	0.46
4:A:378:SSB:C10	1:D:309:LEU:HG	2.45	0.46
1:B:61:LEU:HB3	1:B:62:PRO:HA	1.97	0.46
1:B:306:MET:HE1	4:C:378:SSB:C10	2.46	0.46
1:C:231:LYS:NZ	5:C:939:HOH:O	2.02	0.46
1:D:157:VAL:O	1:D:325:LYS:HE2	2.15	0.45
1:B:225:ASN:HD22	1:B:225:ASN:C	2.23	0.45
1:D:254:LEU:HA	1:D:257:MET:HG2	1.99	0.45
1:A:61:LEU:HA	1:A:62:PRO:C	2.42	0.45
1:A:199:GLY:O	1:A:204:GLY:HA3	2.17	0.45
1:D:325:LYS:HE3	5:D:500:HOH:O	2.16	0.45
1:D:142:GLY:HA2	5:D:599:HOH:O	2.15	0.45
1:C:120:ARG:NH2	5:C:1113:HOH:O	2.33	0.44
1:B:357:GLU:OE2	5:B:655:HOH:O	2.21	0.44
1:D:315:LYS:NZ	5:D:675:HOH:O	2.49	0.44
1:B:40:MET:HB2	1:B:40:MET:HE2	1.81	0.43
1:B:178:THR:HG21	3:B:377:NAD:C4N	2.49	0.43
1:D:132:CYS:HB3	1:D:137:ILE:HD11	1.99	0.43
1:C:32:LYS:O	1:C:77:GLY:HA3	2.19	0.43
1:D:253:VAL:HG12	1:D:257:MET:HE3	2.00	0.43
1:D:107:GLU:HA	1:D:107:GLU:OE1	2.18	0.43
1:B:339:LYS:NZ	5:B:637:HOH:O	2.52	0.43
1:C:225:ASN:ND2	1:C:227:ASP:H	2.17	0.42
1:C:40:MET:HE2	1:C:40:MET:HB2	1.85	0.42
1:B:32:LYS:O	1:B:77:GLY:HA3	2.19	0.42
1:B:330:LYS:HB3	5:B:646:HOH:O	2.20	0.42
1:C:349:VAL:CG1	5:C:1028:HOH:O	2.68	0.42
1:D:328:VAL:HB	1:D:329:PRO:HD3	2.02	0.42
1:A:32:LYS:O	1:A:77:GLY:HA3	2.20	0.41
1:A:178:THR:HG21	3:A:377:NAD:C4N	2.50	0.41
1:A:301:LEU:HD12	1:A:301:LEU:C	2.44	0.41
1:B:123:MET:HE3	1:B:123:MET:HB3	1.93	0.41
1:D:32:LYS:O	1:D:77:GLY:HA3	2.20	0.41
1:C:294:VAL:HG23	3:C:377:NAD:H1D	2.02	0.41
1:A:69:ALA:HA	1:A:170:CYS:HB2	2.02	0.41
1:D:199:GLY:O	1:D:204:GLY:HA3	2.20	0.41
1:B:295:PRO:HA	1:B:296:PRO:HD3	1.94	0.41
1:C:29:ALA:HB1	1:C:30:PRO:HD2	2.03	0.41
1:A:40:MET:HE1	1:A:150:THR:HG22	2.03	0.41
4:A:378:SSB:H101	1:D:309:LEU:HG	2.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:304:ASN:HA	1:B:305:PRO:HD2	1.91	0.40
1:D:186:VAL:HG12	1:D:315:LYS:HD3	2.02	0.40
1:A:271:ARG:HB2	1:A:274:THR:OG1	2.21	0.40
1:D:350:LEU:O	1:D:372:LEU:HA	2.22	0.40
1:C:271:ARG:HH11	1:C:271:ARG:HD2	1.64	0.40
1:C:349:VAL:HG11	5:C:1028:HOH:O	2.21	0.40

All (3) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:10:LYS:NZ	1:D:78:GLU:OE1[2_645]	2.13	0.07
5:A:734:HOH:O	5:C:1136:HOH:O[2_646]	2.16	0.04
1:D:256:GLU:OE2	5:B:689:HOH:O[1_455]	2.16	0.04

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	372/374 (100%)	359 (96%)	13 (4%)	0	100	100
1	B	372/374 (100%)	356 (96%)	16 (4%)	0	100	100
1	C	372/374 (100%)	358 (96%)	14 (4%)	0	100	100
1	D	372/374 (100%)	357 (96%)	15 (4%)	0	100	100
All	All	1488/1496 (100%)	1430 (96%)	58 (4%)	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	308/308 (100%)	302 (98%)	6 (2%)	50	56
1	B	308/308 (100%)	299 (97%)	9 (3%)	37	40
1	C	308/308 (100%)	300 (97%)	8 (3%)	40	44
1	D	308/308 (100%)	300 (97%)	8 (3%)	40	44
All	All	1232/1232 (100%)	1201 (98%)	31 (2%)	42	45

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	120	ARG
1	A	268	VAL
1	A	279	LEU
1	A	302	SER
1	A	309	LEU
1	A	315	LYS
1	B	120	ARG
1	B	257	MET
1	B	268	VAL
1	B	279	LEU
1	B	302	SER
1	B	306	MET
1	B	309	LEU
1	B	315	LYS
1	B	349	VAL
1	C	120	ARG
1	C	131	THR
1	C	251	GLN
1	C	268	VAL
1	C	279	LEU
1	C	309	LEU
1	C	315	LYS
1	C	325	LYS
1	D	120	ARG

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Mol	Chain	Res	Type
1	D	256	GLU
1	D	268	VAL
1	D	279	LEU
1	D	302	SER
1	D	306	MET
1	D	309	LEU
1	D	315	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	225	ASN
1	A	300	ASN
1	B	124	GLN
1	B	191	GLN
1	B	225	ASN
1	C	225	ASN
1	C	299	GLN
1	D	124	GLN
1	D	225	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 16 ligands modelled in this entry, 8 are 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	$\# Z > 2$
3	NAD	D	377	-	46,48,48	2.14	18 (39%)	64,73,73	2.43	19 (29%)
4	SSB	D	378	2	9,10,10	1.16	1 (11%)	8,12,12	1.05	1 (12%)
3	NAD	B	377	-	46,48,48	1.98	14 (30%)	64,73,73	2.27	17 (26%)
3	NAD	C	377	-	46,48,48	2.06	17 (36%)	64,73,73	2.41	17 (26%)
4	SSB	C	378	2	9,10,10	1.10	0	8,12,12	1.47	2 (25%)
4	SSB	B	378	2	9,10,10	1.04	0	8,12,12	1.26	1 (12%)
4	SSB	A	378	2	9,10,10	1.14	0	8,12,12	1.58	2 (25%)
3	NAD	A	377	-	46,48,48	2.07	15 (32%)	64,73,73	2.30	15 (23%)

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	NAD	D	377	-	-	4/30/62/62	0/5/5/5
4	SSB	A	378	2	1/1/2/2	0/4/13/13	0/1/1/1
4	SSB	D	378	2	1/1/2/2	0/4/13/13	0/1/1/1
3	NAD	B	377	-	-	5/30/62/62	0/5/5/5
3	NAD	C	377	-	-	5/30/62/62	0/5/5/5
4	SSB	C	378	2	1/1/2/2	0/4/13/13	0/1/1/1
4	SSB	B	378	2	1/1/2/2	0/4/13/13	0/1/1/1
3	NAD	A	377	-	-	6/30/62/62	0/5/5/5

All (65) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	377	NAD	C3N-C7N	4.87	1.57	1.50
3	D	377	NAD	O4D-C4D	4.70	1.55	1.45
3	D	377	NAD	O4D-C1D	4.62	1.47	1.40
3	A	377	NAD	O4D-C1D	4.46	1.46	1.40
3	C	377	NAD	C2A-N3A	4.43	1.41	1.33
3	B	377	NAD	C3N-C7N	4.35	1.57	1.50
3	A	377	NAD	C3N-C7N	4.26	1.56	1.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	377	NAD	C3N-C7N	4.22	1.56	1.50
3	D	377	NAD	C2N-N1N	4.13	1.39	1.35
3	B	377	NAD	PA-O3	-4.10	1.55	1.59
3	A	377	NAD	O4D-C4D	4.09	1.54	1.45
3	A	377	NAD	PA-O3	-4.02	1.55	1.59
3	D	377	NAD	C2A-N3A	4.01	1.41	1.33
3	C	377	NAD	PA-O3	-3.95	1.55	1.59
3	C	377	NAD	O4D-C4D	3.89	1.53	1.45
3	B	377	NAD	O2B-C2B	-3.75	1.33	1.43
3	B	377	NAD	O4D-C4D	3.69	1.53	1.45
3	B	377	NAD	C2N-N1N	3.63	1.39	1.35
3	A	377	NAD	C4A-N3A	3.42	1.40	1.34
3	C	377	NAD	PN-O3	3.37	1.63	1.59
3	D	377	NAD	C5A-N7A	-3.30	1.33	1.39
3	B	377	NAD	C4A-N3A	3.22	1.40	1.34
3	A	377	NAD	C2A-N3A	3.10	1.39	1.33
3	D	377	NAD	C5A-C6A	3.04	1.49	1.41
3	B	377	NAD	C5A-N7A	-3.02	1.33	1.39
3	C	377	NAD	C2N-N1N	2.98	1.38	1.35
3	A	377	NAD	C5N-C4N	2.96	1.44	1.38
3	A	377	NAD	O2B-C2B	-2.96	1.35	1.43
3	C	377	NAD	C4A-N3A	2.94	1.39	1.34
3	A	377	NAD	C2N-N1N	2.90	1.38	1.35
3	A	377	NAD	C5A-C6A	2.84	1.48	1.41
3	B	377	NAD	C5A-C6A	2.82	1.48	1.41
3	C	377	NAD	C5A-N7A	-2.80	1.34	1.39
3	B	377	NAD	C2N-C3N	-2.78	1.34	1.39
3	C	377	NAD	C4A-N9A	2.77	1.43	1.37
3	D	377	NAD	C5N-C4N	2.77	1.43	1.38
3	C	377	NAD	O4D-C1D	2.77	1.44	1.40
3	A	377	NAD	O4B-C4B	2.76	1.51	1.45
3	A	377	NAD	C4A-N9A	2.75	1.43	1.37
3	C	377	NAD	O2B-C2B	-2.74	1.36	1.43
3	C	377	NAD	C4N-C3N	2.74	1.43	1.39
3	B	377	NAD	C2A-N3A	2.71	1.38	1.33
3	C	377	NAD	O3B-C3B	2.60	1.49	1.43
3	C	377	NAD	C5A-C6A	2.60	1.48	1.41
3	D	377	NAD	O2B-C2B	-2.59	1.36	1.43
3	B	377	NAD	C3D-C4D	2.56	1.59	1.53
3	D	377	NAD	O2D-C2D	-2.56	1.36	1.43
3	B	377	NAD	O2D-C2D	-2.54	1.36	1.43
3	A	377	NAD	O3B-C3B	2.54	1.49	1.43

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	377	NAD	C3B-C4B	2.52	1.59	1.53
3	D	377	NAD	C4N-C3N	2.51	1.43	1.39
3	D	377	NAD	C4A-N3A	2.50	1.39	1.34
3	A	377	NAD	C5A-N7A	-2.46	1.34	1.39
3	C	377	NAD	C3B-C4B	2.41	1.59	1.53
4	D	378	SSB	O6-S1	-2.25	1.42	1.50
3	C	377	NAD	O4B-C4B	2.23	1.50	1.45
3	D	377	NAD	PA-O3	-2.20	1.57	1.59
3	D	377	NAD	O3D-C3D	-2.18	1.37	1.43
3	D	377	NAD	C2N-C3N	-2.07	1.35	1.39
3	D	377	NAD	O4B-C4B	2.06	1.49	1.45
3	D	377	NAD	PN-O3	2.06	1.61	1.59
3	A	377	NAD	C3B-C4B	2.06	1.58	1.53
3	B	377	NAD	O4D-C1D	2.05	1.43	1.40
3	B	377	NAD	O4B-C4B	2.01	1.49	1.45
3	C	377	NAD	O2D-C2D	-2.01	1.38	1.43

All (74) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	377	NAD	C2N-C3N-C4N	8.97	128.69	118.26
3	A	377	NAD	C5N-C4N-C3N	-8.76	111.75	120.36
3	D	377	NAD	C5N-C4N-C3N	-8.73	111.78	120.36
3	D	377	NAD	C2N-C3N-C4N	8.64	128.31	118.26
3	C	377	NAD	C2N-C3N-C4N	8.48	128.12	118.26
3	C	377	NAD	C5N-C4N-C3N	-8.39	112.11	120.36
3	B	377	NAD	C2N-C3N-C4N	8.08	127.65	118.26
3	B	377	NAD	C5N-C4N-C3N	-8.02	112.48	120.36
3	D	377	NAD	C2A-N1A-C6A	6.42	129.27	118.73
3	B	377	NAD	C2A-N1A-C6A	6.01	128.60	118.73
3	C	377	NAD	C2A-N1A-C6A	5.87	128.38	118.73
3	A	377	NAD	C2A-N1A-C6A	5.35	127.51	118.73
3	C	377	NAD	C6N-N1N-C2N	5.18	126.28	121.88
3	C	377	NAD	N3A-C2A-N1A	-4.64	121.56	128.58
3	D	377	NAD	C4A-N9A-C8A	-4.50	101.01	105.74
3	B	377	NAD	N3A-C2A-N1A	-4.44	121.86	128.58
3	C	377	NAD	C4A-N9A-C8A	-4.34	101.18	105.74
3	D	377	NAD	N3A-C2A-N1A	-3.94	122.61	128.58
3	B	377	NAD	C4A-N9A-C8A	-3.67	101.89	105.74
3	A	377	NAD	N3A-C2A-N1A	-3.66	123.05	128.58
3	A	377	NAD	C4A-N9A-C8A	-3.65	101.90	105.74
3	D	377	NAD	C6N-N1N-C2N	3.47	124.83	121.88

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	377	NAD	C5A-C4A-N3A	-3.32	122.15	126.72
3	B	377	NAD	C6N-C5N-C4N	3.24	124.11	119.45
3	B	377	NAD	C5A-C4A-N3A	-3.22	122.28	126.72
3	B	377	NAD	N6A-C6A-N1A	3.16	125.42	118.38
3	A	377	NAD	C2B-C3B-C4B	3.15	108.70	102.61
3	C	377	NAD	C5A-C4A-N3A	-2.99	122.60	126.72
3	D	377	NAD	N6A-C6A-N1A	2.98	125.01	118.38
3	C	377	NAD	C6A-C5A-C4A	2.89	121.12	117.18
3	C	377	NAD	O2A-PA-O1A	2.89	125.88	112.44
3	C	377	NAD	C2B-C3B-C4B	2.86	108.13	102.61
3	C	377	NAD	C2D-C3D-C4D	2.85	108.12	102.61
3	D	377	NAD	C2B-C3B-C4B	2.84	108.09	102.61
3	D	377	NAD	C6A-C5A-C4A	2.82	121.02	117.18
3	D	377	NAD	C5A-C6A-N1A	-2.81	110.38	117.51
4	A	378	SSB	O6-S1-C2	-2.80	96.98	106.13
3	D	377	NAD	C5A-C4A-N3A	-2.80	122.86	126.72
3	B	377	NAD	C6N-N1N-C2N	2.79	124.25	121.88
3	C	377	NAD	C6N-C5N-C4N	2.75	123.41	119.45
3	A	377	NAD	C2D-C3D-C4D	2.74	107.90	102.61
3	B	377	NAD	O2B-C2B-C3B	2.73	120.57	111.82
3	D	377	NAD	C2N-C3N-C7N	-2.72	111.61	119.46
3	D	377	NAD	C6N-C5N-C4N	2.71	123.36	119.45
3	A	377	NAD	C6A-C5A-C4A	2.69	120.85	117.18
3	D	377	NAD	C3N-C7N-N7N	2.60	120.94	117.74
3	B	377	NAD	C2B-C3B-C4B	2.58	107.59	102.61
4	C	378	SSB	C7-C3-C4	-2.52	105.94	115.45
3	B	377	NAD	C5N-C6N-N1N	-2.47	117.02	120.38
3	A	377	NAD	C6N-N1N-C2N	2.46	123.97	121.88
3	D	377	NAD	O2A-PA-O1A	2.43	123.73	112.44
3	C	377	NAD	C2N-C3N-C7N	-2.42	112.47	119.46
3	A	377	NAD	C2N-C3N-C7N	-2.41	112.50	119.46
4	B	378	SSB	O6-S1-C2	-2.37	98.40	106.13
3	C	377	NAD	C5A-C6A-N1A	-2.35	111.55	117.51
3	A	377	NAD	O2A-PA-O1A	2.33	123.29	112.44
3	A	377	NAD	C5A-C6A-N1A	-2.24	111.84	117.51
3	A	377	NAD	C6N-C5N-C4N	2.21	122.63	119.45
3	B	377	NAD	C2N-C3N-C7N	-2.19	113.15	119.46
4	C	378	SSB	O6-S1-C2	-2.17	99.05	106.13
4	D	378	SSB	C7-C3-C4	-2.17	107.26	115.45
3	D	377	NAD	O3-PA-O1A	-2.15	104.23	110.70
3	B	377	NAD	C5A-C6A-N1A	-2.13	112.10	117.51
3	D	377	NAD	C2D-C3D-C4D	2.11	106.68	102.61

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	377	NAD	C4D-O4D-C1D	-2.10	108.00	109.92
3	B	377	NAD	O2A-PA-O1A	2.09	122.16	112.44
3	A	377	NAD	O2B-C2B-C3B	2.08	118.50	111.82
3	D	377	NAD	C1B-N9A-C8A	2.05	131.65	127.09
3	C	377	NAD	C5N-C6N-N1N	-2.05	117.59	120.38
4	A	378	SSB	O6-S1-C5	-2.04	99.12	106.06
3	B	377	NAD	N3A-C4A-N9A	2.04	130.63	127.17
3	C	377	NAD	O4D-C4D-C3D	-2.04	101.11	105.15
3	C	377	NAD	N6A-C6A-N1A	2.02	122.88	118.38
3	B	377	NAD	O3D-C3D-C4D	-2.00	105.34	111.08

All (4) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
4	A	378	SSB	C3
4	B	378	SSB	C3
4	C	378	SSB	C3
4	D	378	SSB	C3

All (20) torsion outliers are listed below:

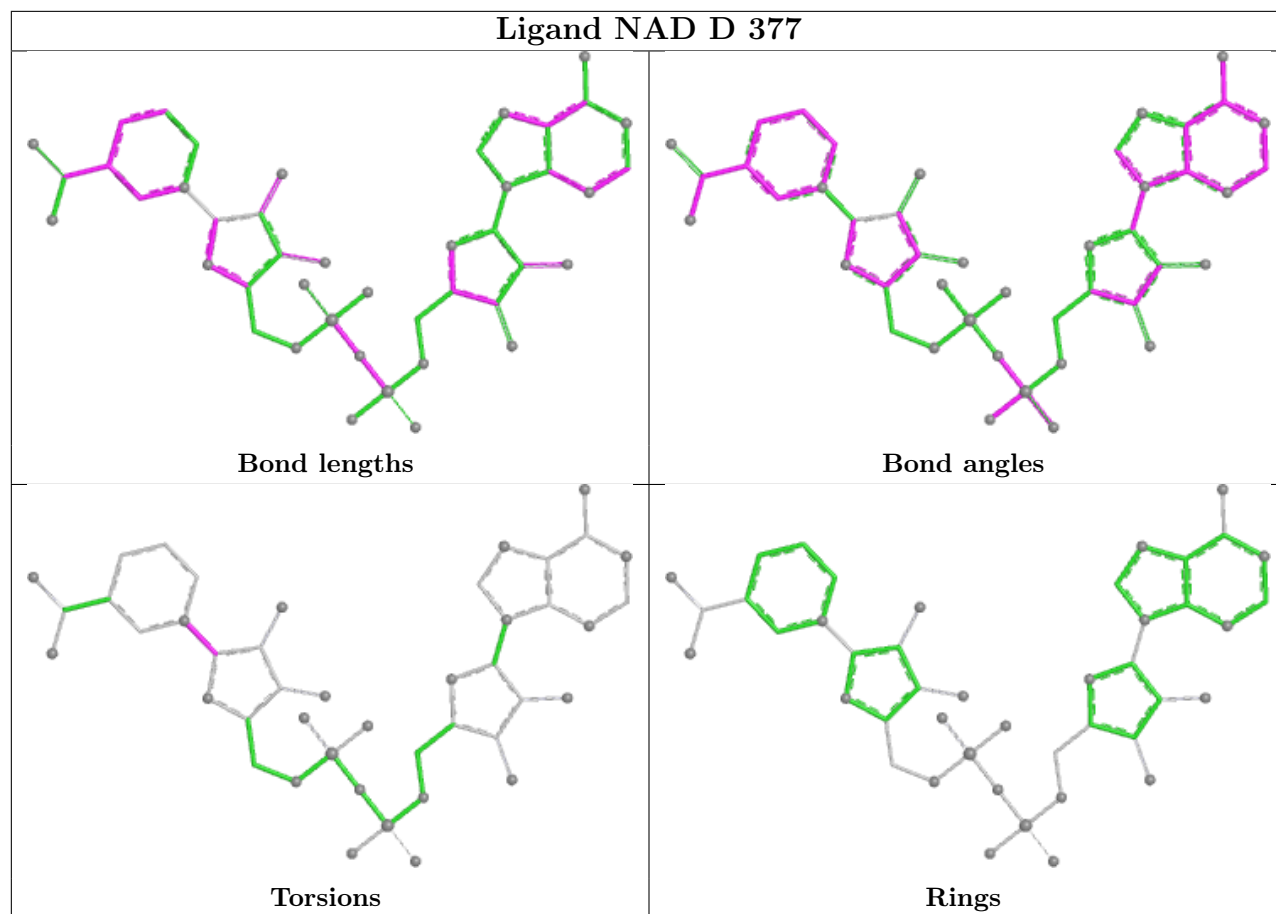
Mol	Chain	Res	Type	Atoms
3	A	377	NAD	O4D-C1D-N1N-C2N
3	A	377	NAD	O4D-C1D-N1N-C6N
3	A	377	NAD	C2D-C1D-N1N-C2N
3	A	377	NAD	C2D-C1D-N1N-C6N
3	B	377	NAD	O4D-C1D-N1N-C2N
3	B	377	NAD	O4D-C1D-N1N-C6N
3	B	377	NAD	C2D-C1D-N1N-C2N
3	B	377	NAD	C2D-C1D-N1N-C6N
3	C	377	NAD	O4D-C1D-N1N-C2N
3	C	377	NAD	O4D-C1D-N1N-C6N
3	C	377	NAD	C2D-C1D-N1N-C2N
3	C	377	NAD	C2D-C1D-N1N-C6N
3	D	377	NAD	O4D-C1D-N1N-C2N
3	D	377	NAD	O4D-C1D-N1N-C6N
3	D	377	NAD	C2D-C1D-N1N-C2N
3	D	377	NAD	C2D-C1D-N1N-C6N
3	C	377	NAD	O4B-C4B-C5B-O5B
3	A	377	NAD	C2B-C1B-N9A-C8A
3	A	377	NAD	O4B-C4B-C5B-O5B
3	B	377	NAD	O4B-C4B-C5B-O5B

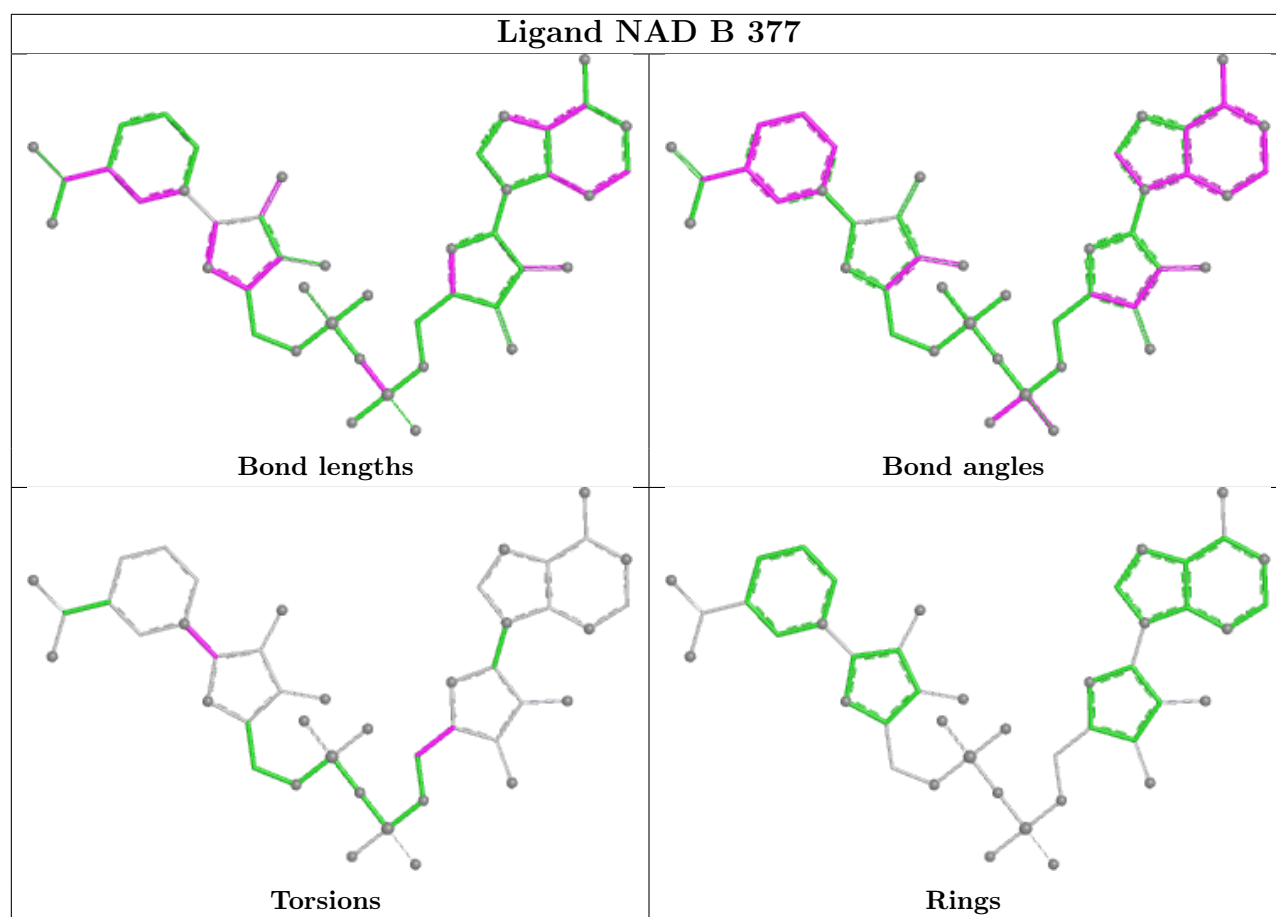
There are no ring outliers.

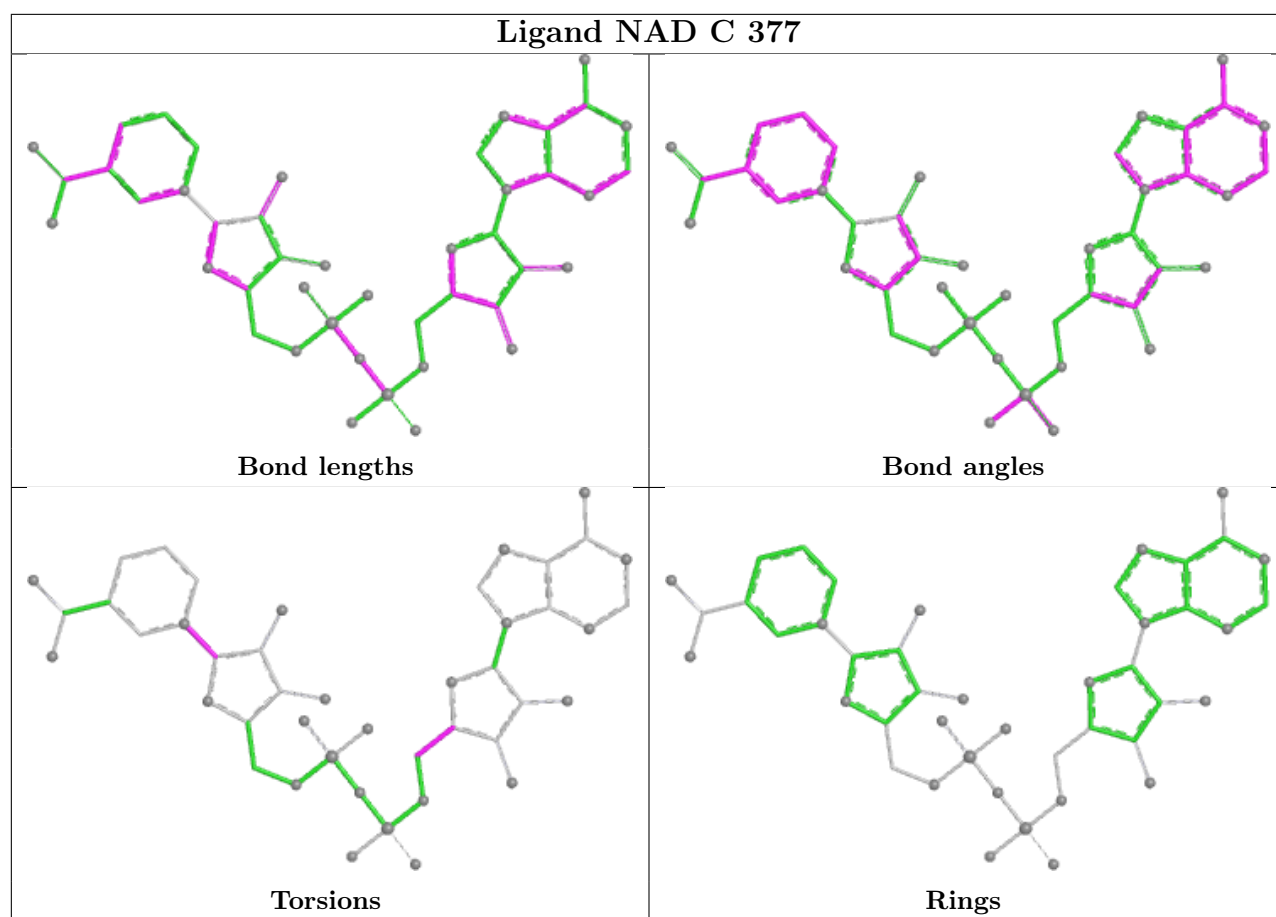
8 monomers are involved in 14 short contacts:

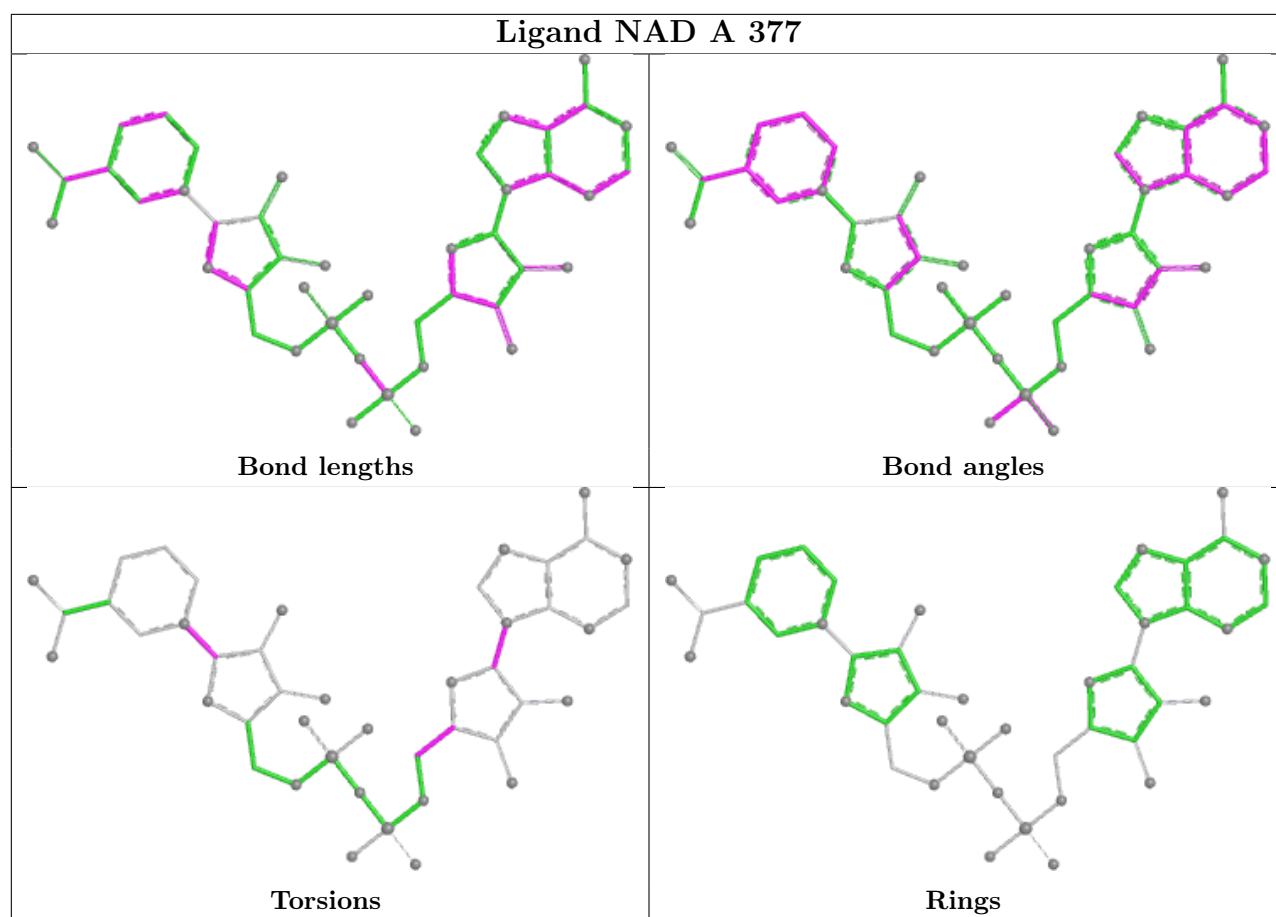
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	377	NAD	1	0
4	D	378	SSB	1	0
3	B	377	NAD	2	0
3	C	377	NAD	2	0
4	C	378	SSB	2	0
4	B	378	SSB	1	0
4	A	378	SSB	2	0
3	A	377	NAD	3	0

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](#)

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	374/374 (100%)	-0.49	0 100 100	9, 15, 27, 39	0
1	B	374/374 (100%)	-0.49	1 (0%) 90 89	9, 15, 27, 39	0
1	C	374/374 (100%)	-0.38	1 (0%) 90 89	9, 16, 27, 39	0
1	D	374/374 (100%)	-0.41	1 (0%) 90 89	9, 16, 27, 39	0
All	All	1496/1496 (100%)	-0.44	3 (0%) 91 90	9, 16, 27, 39	0

All (3) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	247	LYS	3.0
1	C	247	LYS	2.7
1	D	133	ARG	2.1

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

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

6.3 Carbohydrates [i](#)

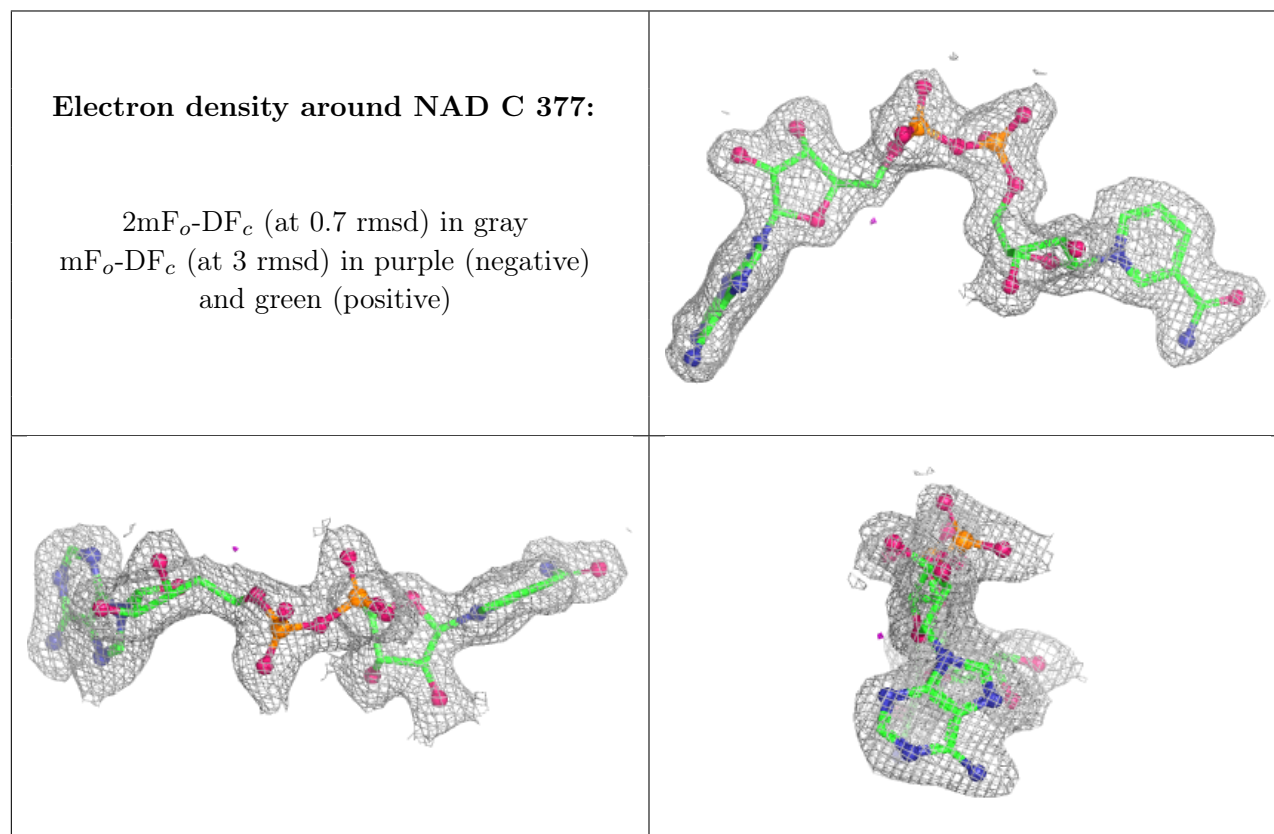
There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

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

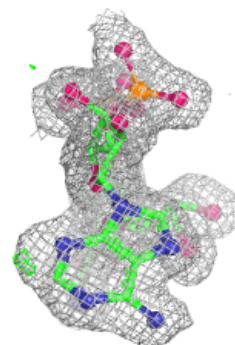
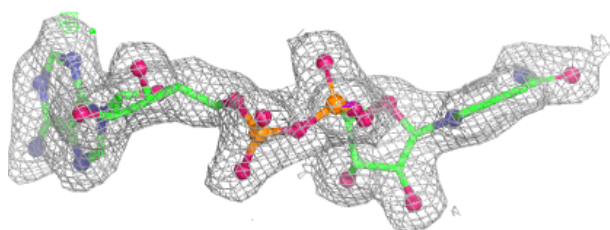
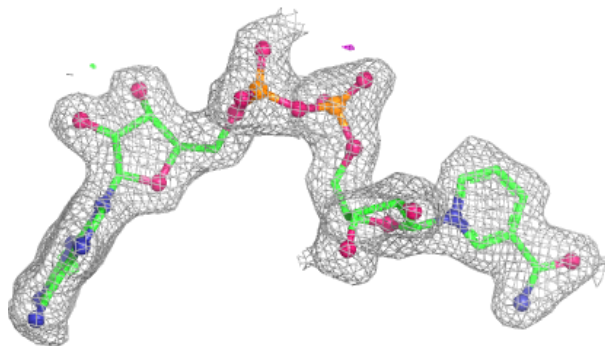
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	NAD	C	377	44/44	0.97	0.05	8,13,15,17	0
4	SSB	C	378	10/10	0.97	0.07	11,15,21,22	0
3	NAD	B	377	44/44	0.98	0.04	8,13,15,16	0
2	ZN	D	376	1/1	0.98	0.03	15,15,15,15	0
3	NAD	D	377	44/44	0.98	0.04	8,13,15,16	0
4	SSB	A	378	10/10	0.98	0.06	10,15,21,22	0
4	SSB	B	378	10/10	0.98	0.06	11,15,21,22	0
3	NAD	A	377	44/44	0.98	0.04	8,13,15,17	0
4	SSB	D	378	10/10	0.98	0.07	11,15,21,22	0
2	ZN	B	376	1/1	0.99	0.03	15,15,15,15	0
2	ZN	C	376	1/1	0.99	0.02	15,15,15,15	0
2	ZN	D	375	1/1	0.99	0.01	14,14,14,14	0
2	ZN	A	375	1/1	0.99	0.02	12,12,12,12	0
2	ZN	A	376	1/1	0.99	0.02	14,14,14,14	0
2	ZN	B	375	1/1	0.99	0.02	12,12,12,12	0
2	ZN	C	375	1/1	1.00	0.01	15,15,15,15	0

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

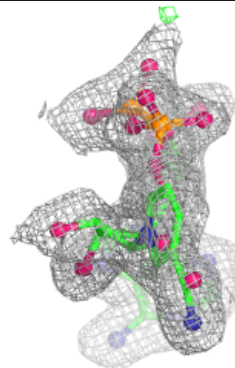
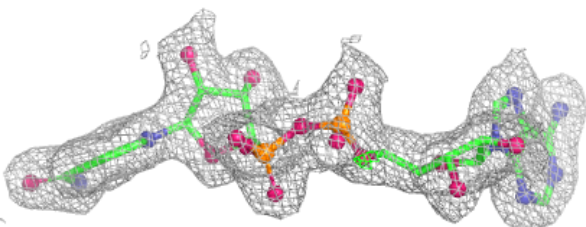
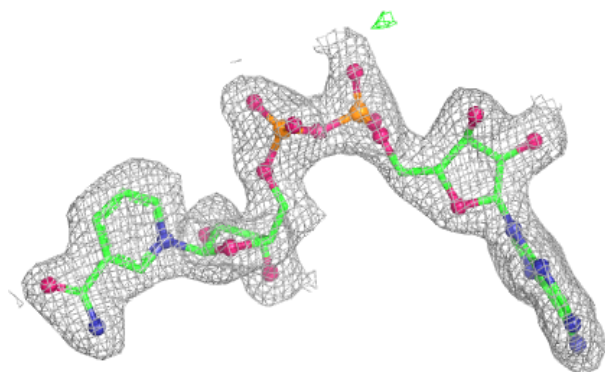


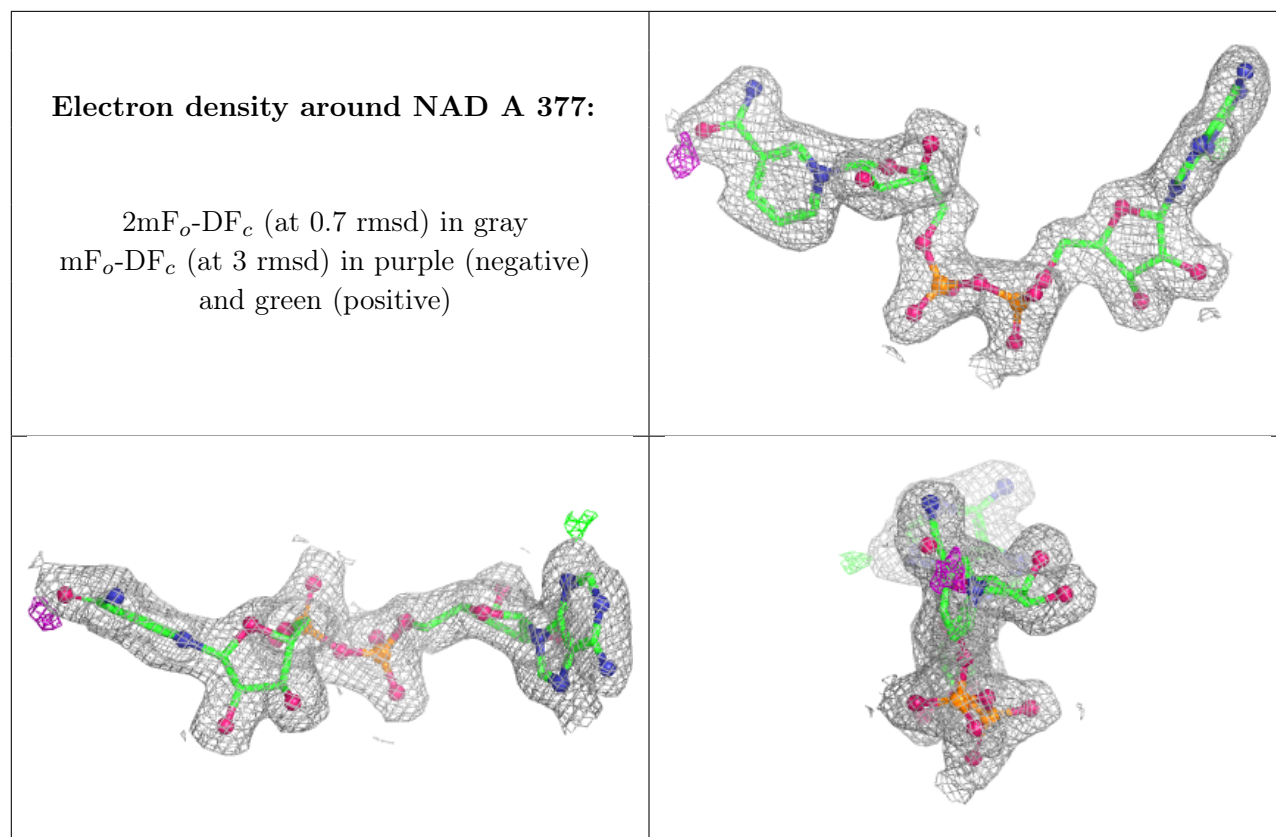
Electron density around NAD B 377:

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

**Electron density around NAD D 377:**

$2mF_o-DF_c$ (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.