



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 6, 2024 – 12:19 PM EDT

PDB ID : 8TDF
Title : Structure of Alistipes sp. Glucoside-3-dehydrogenase AL3
Authors : Lazarski, A.C.; Worrall, L.J.; Strynadka, N.C.J.
Deposited on : 2023-07-02
Resolution : 2.10 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 : 2.36.2
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) : 2.36.2

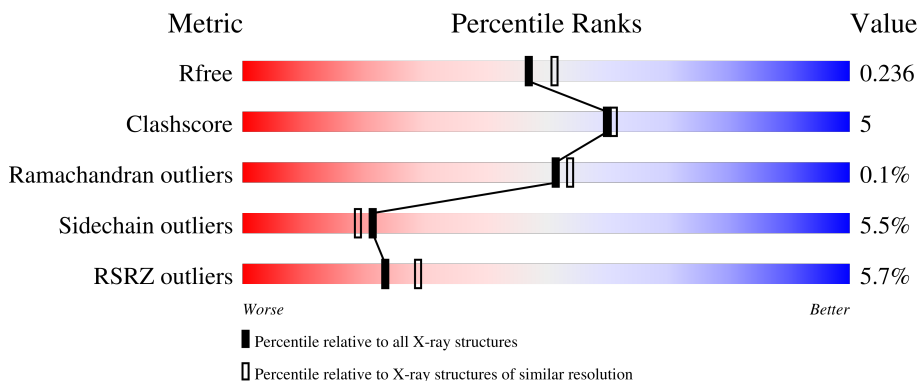
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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	5197 (2.10-2.10)
Clashscore	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)
RSRZ outliers	127900	5083 (2.10-2.10)

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	467	 0% 82% 12% . .
1	B	467	 5% 84% 11% . .
1	C	467	 8% 83% 12% . .
1	D	467	 8% 84% 10% . .

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 14839 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 Dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	452	3565	2274	618	652	21	0	0	0
1	B	452	3565	2274	618	652	21	0	0	0
1	C	452	3561	2271	617	652	21	0	0	0
1	D	452	3558	2270	617	650	21	0	0	0

There are 28 discrepancies between the modelled and reference sequences:

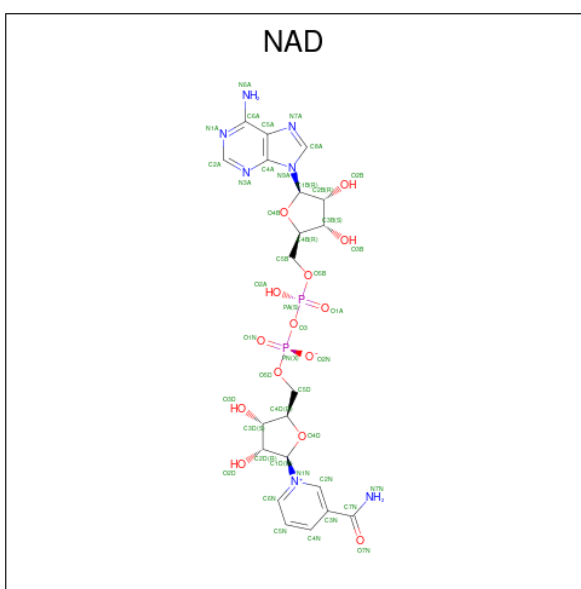
Chain	Residue	Modelled	Actual	Comment	Reference
A	30	MET	-	initiating methionine	UNP A0A4Y1WH70
A	491	HIS	-	expression tag	UNP A0A4Y1WH70
A	492	HIS	-	expression tag	UNP A0A4Y1WH70
A	493	HIS	-	expression tag	UNP A0A4Y1WH70
A	494	HIS	-	expression tag	UNP A0A4Y1WH70
A	495	HIS	-	expression tag	UNP A0A4Y1WH70
A	496	HIS	-	expression tag	UNP A0A4Y1WH70
B	30	MET	-	initiating methionine	UNP A0A4Y1WH70
B	491	HIS	-	expression tag	UNP A0A4Y1WH70
B	492	HIS	-	expression tag	UNP A0A4Y1WH70
B	493	HIS	-	expression tag	UNP A0A4Y1WH70
B	494	HIS	-	expression tag	UNP A0A4Y1WH70
B	495	HIS	-	expression tag	UNP A0A4Y1WH70
B	496	HIS	-	expression tag	UNP A0A4Y1WH70
C	30	MET	-	initiating methionine	UNP A0A4Y1WH70
C	491	HIS	-	expression tag	UNP A0A4Y1WH70
C	492	HIS	-	expression tag	UNP A0A4Y1WH70
C	493	HIS	-	expression tag	UNP A0A4Y1WH70
C	494	HIS	-	expression tag	UNP A0A4Y1WH70
C	495	HIS	-	expression tag	UNP A0A4Y1WH70
C	496	HIS	-	expression tag	UNP A0A4Y1WH70

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Chain	Residue	Modelled	Actual	Comment	Reference
D	30	MET	-	initiating methionine	UNP A0A4Y1WH70
D	491	HIS	-	expression tag	UNP A0A4Y1WH70
D	492	HIS	-	expression tag	UNP A0A4Y1WH70
D	493	HIS	-	expression tag	UNP A0A4Y1WH70
D	494	HIS	-	expression tag	UNP A0A4Y1WH70
D	495	HIS	-	expression tag	UNP A0A4Y1WH70
D	496	HIS	-	expression tag	UNP A0A4Y1WH70

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



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

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	236	Total	O	0	0
			236	236		

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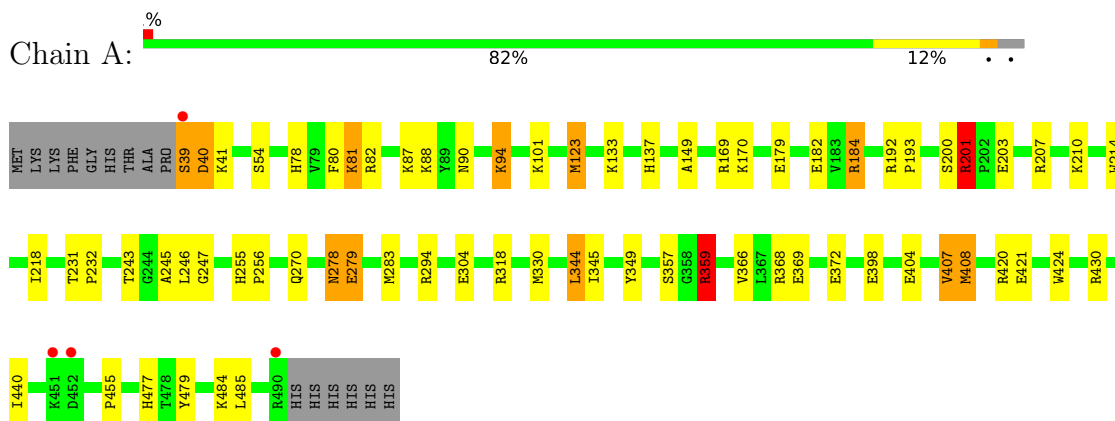
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	87	Total 87	O 87	0	0
3	C	60	Total 60	O 60	0	0
3	D	31	Total 31	O 31	0	0

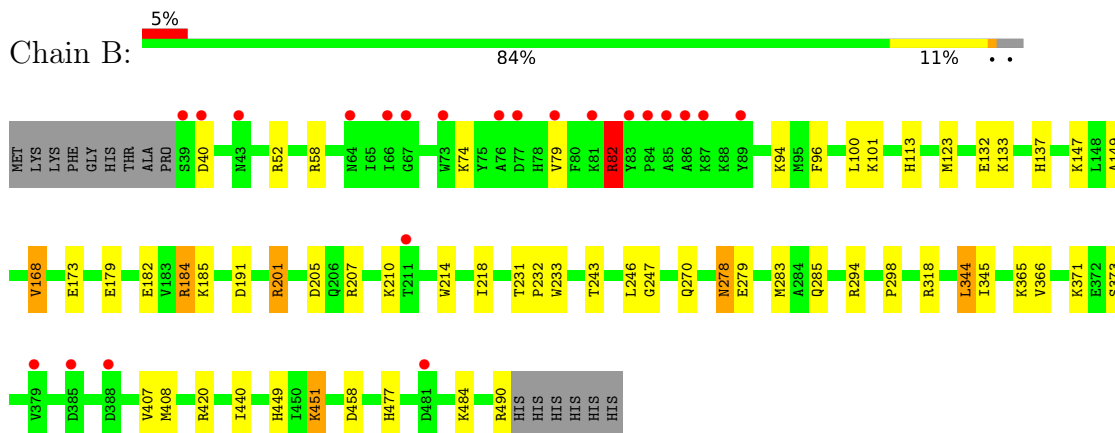
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry 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.

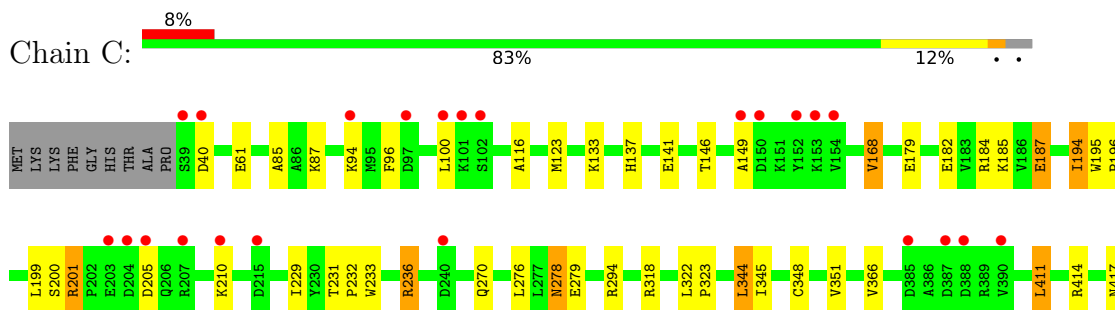
- Molecule 1: Dehydrogenase

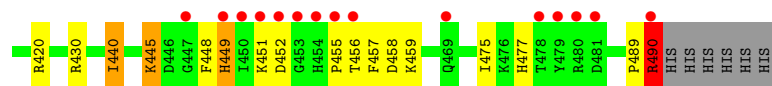


- Molecule 1: Dehydrogenase

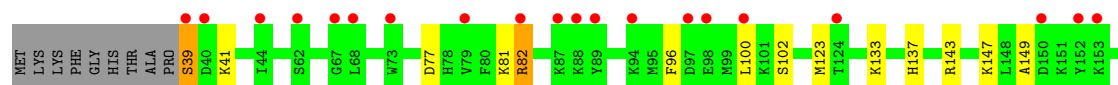
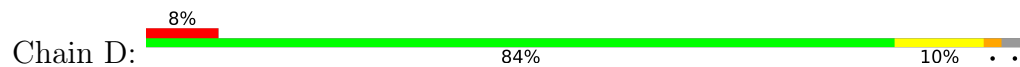


- Molecule 1: Dehydrogenase





- Molecule 1: Dehydrogenase



4 Data and refinement statistics

Property	Value	Source
Space group	I 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	180.63Å 56.75Å 220.45Å 90.00° 108.87° 90.00°	Depositor
Resolution (Å)	48.00 – 2.10 48.00 – 2.10	Depositor EDS
% Data completeness (in resolution range)	99.7 (48.00-2.10) 99.7 (48.00-2.10)	Depositor EDS
R_{merge}	0.17	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.71 (at 2.10Å)	Xtrriage
Refinement program	REFMAC 5.8.0415	Depositor
R, R_{free}	0.198 , 0.233 0.206 , 0.236	Depositor DCC
R_{free} test set	6342 reflections (5.12%)	wwPDB-VP
Wilson B-factor (Å ²)	37.1	Xtrriage
Anisotropy	0.221	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 37.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	14839	wwPDB-VP
Average B, all atoms (Å ²)	53.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.76% 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:
NAD

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	1.03	17/3664 (0.5%)	1.20	19/4977 (0.4%)
1	B	0.73	4/3664 (0.1%)	1.03	7/4977 (0.1%)
1	C	0.72	6/3660 (0.2%)	1.01	5/4973 (0.1%)
1	D	0.63	1/3657 (0.0%)	0.97	3/4969 (0.1%)
All	All	0.79	28/14645 (0.2%)	1.06	34/19896 (0.2%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	6
1	B	0	5
1	C	0	5
1	D	0	5
All	All	0	21

All (28) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	182	GLU	CD-OE1	11.41	1.38	1.25
1	A	182	GLU	CD-OE1	10.35	1.37	1.25
1	A	304	GLU	CD-OE1	-8.75	1.16	1.25
1	A	279	GLU	CD-OE2	-8.66	1.16	1.25
1	C	187	GLU	CD-OE1	-8.08	1.16	1.25
1	A	369	GLU	CD-OE2	7.92	1.34	1.25
1	A	179	GLU	CD-OE1	7.83	1.34	1.25
1	A	404	GLU	CD-OE1	7.70	1.34	1.25
1	A	398	GLU	CD-OE1	7.47	1.33	1.25
1	A	279	GLU	CD-OE1	-7.43	1.17	1.25

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	182	GLU	CD-OE2	7.08	1.33	1.25
1	A	421	GLU	CD-OE1	6.59	1.32	1.25
1	D	187	GLU	CD-OE1	-6.52	1.18	1.25
1	A	330	MET	CG-SD	6.33	1.97	1.81
1	C	182	GLU	CD-OE2	6.25	1.32	1.25
1	C	179	GLU	CD-OE1	6.13	1.32	1.25
1	A	421	GLU	CD-OE2	6.11	1.32	1.25
1	B	132	GLU	CD-OE2	5.56	1.31	1.25
1	A	54	SER	CA-CB	-5.54	1.44	1.52
1	B	182	GLU	CD-OE1	5.53	1.31	1.25
1	A	179	GLU	CD-OE2	5.52	1.31	1.25
1	C	61	GLU	CD-OE1	5.30	1.31	1.25
1	B	179	GLU	CD-OE1	5.29	1.31	1.25
1	B	173	GLU	CD-OE1	5.29	1.31	1.25
1	A	372	GLU	CD-OE2	5.23	1.31	1.25
1	A	359	ARG	CD-NE	-5.13	1.37	1.46
1	C	141	GLU	CD-OE2	5.12	1.31	1.25
1	A	398	GLU	CB-CG	5.10	1.61	1.52

All (34) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	359	ARG	NE-CZ-NH1	16.58	128.59	120.30
1	A	40	ASP	CB-CA-C	-11.40	87.59	110.40
1	A	359	ARG	NE-CZ-NH2	-9.51	115.54	120.30
1	A	169	ARG	NE-CZ-NH2	-9.49	115.55	120.30
1	A	201	ARG	NE-CZ-NH2	-9.37	115.62	120.30
1	A	420	ARG	NE-CZ-NH2	-8.51	116.05	120.30
1	A	430	ARG	NE-CZ-NH1	7.97	124.29	120.30
1	A	123	MET	CG-SD-CE	-7.19	88.70	100.20
1	A	82	ARG	NE-CZ-NH2	-6.56	117.02	120.30
1	A	368	ARG	NE-CZ-NH1	6.43	123.52	120.30
1	D	82	ARG	NE-CZ-NH1	6.35	123.47	120.30
1	A	184	ARG	NE-CZ-NH2	-6.10	117.25	120.30
1	A	359	ARG	CD-NE-CZ	6.10	132.14	123.60
1	A	407	VAL	CA-CB-CG1	6.10	120.05	110.90
1	D	408	MET	CB-CG-SD	-5.99	94.44	112.40
1	A	407	VAL	N-CA-CB	-5.93	98.45	111.50
1	C	168	VAL	CB-CA-C	-5.84	100.31	111.40
1	B	168	VAL	CB-CA-C	-5.83	100.32	111.40
1	A	192	ARG	NE-CZ-NH1	5.82	123.21	120.30
1	C	236	ARG	NE-CZ-NH2	-5.80	117.40	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	168	VAL	CB-CA-C	-5.71	100.56	111.40
1	B	191	ASP	CB-CG-OD2	-5.71	113.17	118.30
1	B	201	ARG	CB-CG-CD	-5.69	96.81	111.60
1	C	201	ARG	CB-CG-CD	-5.66	96.88	111.60
1	C	449	HIS	CB-CA-C	5.63	121.66	110.40
1	C	445	LYS	CB-CA-C	5.62	121.63	110.40
1	A	349	TYR	CB-CG-CD1	5.54	124.32	121.00
1	A	408	MET	CG-SD-CE	-5.47	91.45	100.20
1	B	201	ARG	NE-CZ-NH2	-5.41	117.60	120.30
1	A	201	ARG	CB-CG-CD	-5.40	97.56	111.60
1	B	52	ARG	NE-CZ-NH1	-5.32	117.64	120.30
1	A	82	ARG	NE-CZ-NH1	5.16	122.88	120.30
1	B	184	ARG	NE-CZ-NH2	-5.06	117.77	120.30
1	B	285	GLN	CG-CD-OE1	5.02	131.64	121.60

There are no chirality outliers.

All (21) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	184	ARG	Sidechain
1	A	201	ARG	Sidechain
1	A	207	ARG	Sidechain
1	A	359	ARG	Sidechain
1	A	39	SER	Peptide
1	A	81	LYS	Mainchain
1	B	184	ARG	Sidechain
1	B	420	ARG	Sidechain
1	B	490	ARG	Sidechain
1	B	58	ARG	Sidechain
1	B	82	ARG	Sidechain
1	C	184	ARG	Sidechain
1	C	236	ARG	Sidechain
1	C	420	ARG	Sidechain
1	C	430	ARG	Sidechain
1	C	490	ARG	Sidechain
1	D	184	ARG	Sidechain
1	D	236	ARG	Sidechain
1	D	318	ARG	Sidechain
1	D	490	ARG	Sidechain
1	D	82	ARG	Sidechain

5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3565	0	3493	39	0
1	B	3565	0	3493	32	0
1	C	3561	0	3482	39	0
1	D	3558	0	3480	40	0
2	A	44	0	26	0	0
2	B	44	0	26	1	0
2	C	44	0	26	0	0
2	D	44	0	26	0	0
3	A	236	0	0	5	0
3	B	87	0	0	3	0
3	C	60	0	0	8	0
3	D	31	0	0	7	0
All	All	14839	0	14052	132	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 5.

All (132) 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:283:MET:HE1	1:B:283:MET:SD	2.09	0.92
1:D:160:ASN:HB2	3:D:617:HOH:O	1.71	0.91
1:A:283:MET:CE	1:B:283:MET:HB3	2.03	0.87
1:C:146:THR:OG1	3:C:601:HOH:O	1.96	0.84
1:D:259:LYS:O	3:D:601:HOH:O	1.96	0.84
1:C:185:LYS:HE3	3:C:656:HOH:O	1.78	0.82
1:A:170:LYS:HE2	3:A:816:HOH:O	1.82	0.80
1:B:458:ASP:HB3	3:B:679:HOH:O	1.81	0.79
1:C:270:GLN:HE22	1:D:318:ARG:H	1.31	0.79
1:A:283:MET:HE1	1:B:283:MET:CB	2.13	0.78
1:C:417:ASN:HB2	1:C:440:ILE:HD11	1.66	0.77
1:D:347:GLY:O	3:D:602:HOH:O	2.02	0.77
1:C:318:ARG:H	1:D:270:GLN:HE22	1.31	0.77
1:A:283:MET:CE	1:B:283:MET:SD	2.72	0.76
1:C:185:LYS:CE	3:C:656:HOH:O	2.30	0.76

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:270:GLN:HE22	1:B:318:ARG:H	1.33	0.76
1:B:185:LYS:NZ	3:B:601:HOH:O	2.17	0.76
1:A:318:ARG:H	1:B:270:GLN:HE22	1.35	0.73
1:C:195:TRP:HB3	1:C:233:TRP:CZ3	2.24	0.71
1:C:187:GLU:OE2	3:C:602:HOH:O	2.07	0.71
1:A:283:MET:HE3	1:B:283:MET:HB3	1.71	0.70
1:A:40:ASP:HA	3:A:601:HOH:O	1.90	0.69
1:C:123:MET:HE1	1:C:149:ALA:HB2	1.74	0.69
1:A:39:SER:O	3:A:601:HOH:O	2.11	0.69
1:D:285:GLN:NE2	3:D:603:HOH:O	2.25	0.67
1:A:123:MET:HE1	1:A:149:ALA:HB2	1.77	0.67
1:B:123:MET:HE1	1:B:149:ALA:HB2	1.79	0.63
1:D:123:MET:HE1	1:D:149:ALA:HB2	1.80	0.63
1:C:318:ARG:H	1:D:270:GLN:NE2	1.96	0.62
1:A:78:HIS:HD2	3:A:785:HOH:O	1.82	0.62
1:A:137:HIS:ND1	1:A:477:HIS:HE1	1.96	0.62
1:D:137:HIS:ND1	1:D:477:HIS:HE1	1.97	0.62
1:B:137:HIS:ND1	1:B:477:HIS:HE1	1.99	0.60
1:C:137:HIS:ND1	1:C:477:HIS:HE1	1.97	0.60
2:B:501:NAD:N7A	3:B:603:HOH:O	2.32	0.59
1:A:201:ARG:HD2	1:A:279:GLU:OE2	2.03	0.59
1:B:243:THR:OG1	1:B:247:GLY:HA3	2.04	0.58
1:D:194:ILE:HD12	1:D:195:TRP:HE3	1.69	0.58
1:D:123:MET:HE2	1:D:149:ALA:HA	1.86	0.57
1:B:123:MET:HE2	1:B:149:ALA:HA	1.85	0.57
1:C:278:ASN:H	1:C:278:ASN:HD22	1.52	0.57
1:D:344:LEU:HD12	1:D:345:ILE:N	2.19	0.57
1:C:194:ILE:HD11	1:D:455:PRO:HG3	1.86	0.57
1:A:344:LEU:HD12	1:A:345:ILE:N	2.20	0.57
1:B:344:LEU:HD12	1:B:345:ILE:N	2.19	0.56
1:A:243:THR:OG1	1:A:247:GLY:HA3	2.05	0.56
1:B:123:MET:CE	1:B:149:ALA:HA	2.35	0.56
1:A:78:HIS:HE1	3:A:611:HOH:O	1.89	0.55
1:C:276:LEU:HD21	1:C:414:ARG:HA	1.89	0.55
1:A:80:PHE:CG	1:A:88:LYS:HE3	2.42	0.55
1:C:348:CYS:O	1:C:351:VAL:HG13	2.07	0.55
1:D:204:ASP:OD2	1:D:204:ASP:N	2.37	0.55
1:B:278:ASN:H	1:B:278:ASN:HD22	1.56	0.54
1:B:449:HIS:CE1	1:B:451:LYS:HG2	2.43	0.53
1:D:231:THR:OG1	1:D:232:PRO:HA	2.08	0.53
1:C:414:ARG:O	3:C:603:HOH:O	2.19	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:283:MET:CE	1:B:283:MET:CB	2.72	0.52
1:B:231:THR:OG1	1:B:232:PRO:HA	2.09	0.52
1:C:455:PRO:HB2	1:C:457:PHE:CZ	2.44	0.52
1:C:322:LEU:HD12	1:C:323:PRO:HD2	1.91	0.51
1:C:344:LEU:HD12	1:C:345:ILE:N	2.26	0.51
1:C:489:PRO:O	1:C:490:ARG:HB2	2.11	0.51
1:A:80:PHE:CD2	1:A:88:LYS:HE3	2.45	0.50
1:A:357:SER:OG	1:A:359:ARG:HG3	2.11	0.50
1:A:123:MET:HE2	1:A:149:ALA:HA	1.94	0.50
1:D:278:ASN:HD22	1:D:278:ASN:H	1.57	0.50
1:C:231:THR:OG1	1:C:232:PRO:HA	2.12	0.49
1:D:39:SER:HB3	1:D:41:LYS:HB2	1.94	0.49
1:C:96:PHE:O	1:C:100:LEU:HB2	2.12	0.49
1:D:243:THR:OG1	1:D:247:GLY:HA3	2.13	0.49
1:A:231:THR:OG1	1:A:232:PRO:HA	2.13	0.49
1:A:283:MET:HE1	1:B:283:MET:CG	2.42	0.49
1:D:123:MET:CE	1:D:149:ALA:HA	2.42	0.49
1:A:123:MET:CE	1:A:149:ALA:HA	2.42	0.48
1:D:210:LYS:HE3	1:D:210:LYS:HA	1.94	0.48
1:B:201:ARG:HD2	1:B:279:GLU:OE2	2.14	0.48
1:B:96:PHE:O	1:B:100:LEU:HB2	2.14	0.48
1:D:344:LEU:HD12	1:D:344:LEU:C	2.34	0.48
1:D:349:TYR:HA	3:D:614:HOH:O	2.13	0.48
1:A:278:ASN:HD22	1:A:278:ASN:H	1.60	0.47
1:C:185:LYS:HE2	3:C:656:HOH:O	2.03	0.47
1:C:270:GLN:NE2	1:D:318:ARG:H	2.07	0.47
1:D:160:ASN:C	3:D:617:HOH:O	2.51	0.47
1:D:194:ILE:HD12	1:D:195:TRP:CE3	2.48	0.47
1:D:96:PHE:O	1:D:100:LEU:HB2	2.15	0.47
1:C:123:MET:CE	1:C:149:ALA:HA	2.44	0.47
1:C:448:PHE:CE2	1:D:196:PRO:HD3	2.49	0.47
1:B:344:LEU:HD12	1:B:344:LEU:C	2.35	0.47
1:C:201:ARG:HD2	1:C:279:GLU:OE2	2.15	0.46
1:B:79:VAL:HG13	1:B:82:ARG:HH21	1.81	0.46
1:A:344:LEU:HD12	1:A:344:LEU:C	2.36	0.46
1:D:195:TRP:HB2	1:D:196:PRO:HD2	1.97	0.46
1:C:344:LEU:HD12	1:C:344:LEU:C	2.35	0.46
1:B:113:HIS:HA	1:B:137:HIS:HB2	1.98	0.45
1:C:123:MET:HE1	1:C:149:ALA:CB	2.44	0.45
1:C:123:MET:HE2	1:C:149:ALA:HA	1.99	0.45
1:C:85:ALA:HB3	3:C:650:HOH:O	2.17	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:116:ALA:CB	3:C:606:HOH:O	2.66	0.44
1:D:285:GLN:NE2	3:D:607:HOH:O	2.47	0.44
1:A:255:HIS:HB3	1:A:256:PRO:HD3	1.99	0.44
1:D:411:LEU:HD21	1:D:474:LEU:HB3	2.00	0.43
1:A:193:PRO:HD3	1:A:245:ALA:HB2	2.00	0.43
1:A:283:MET:HE2	1:B:283:MET:SD	2.56	0.43
1:C:194:ILE:CD1	1:D:455:PRO:HG3	2.49	0.43
1:B:278:ASN:HD22	1:B:278:ASN:N	2.17	0.43
1:B:371:LYS:HA	1:B:371:LYS:HD3	1.73	0.43
1:D:195:TRP:HB2	1:D:196:PRO:CD	2.49	0.43
1:A:408:MET:HE3	1:A:424:TRP:CE2	2.54	0.42
1:D:214:TRP:CZ2	1:D:218:ILE:HD11	2.54	0.42
1:C:411:LEU:HD11	1:C:475:ILE:HG13	2.01	0.42
1:A:270:GLN:NE2	1:B:318:ARG:H	2.09	0.42
1:D:77:ASP:OD1	1:D:81:LYS:HE3	2.18	0.42
1:A:94:LYS:HE2	1:A:94:LYS:HB3	1.72	0.42
1:C:440:ILE:HD12	1:C:440:ILE:HA	1.72	0.42
1:C:489:PRO:O	1:C:490:ARG:CB	2.68	0.42
1:A:455:PRO:HG3	1:B:233:TRP:CE2	2.55	0.42
1:A:214:TRP:CZ2	1:A:218:ILE:HD11	2.55	0.42
1:B:123:MET:CE	1:B:149:ALA:CA	2.97	0.41
1:D:137:HIS:CE1	1:D:477:HIS:HE1	2.38	0.41
1:B:214:TRP:CZ2	1:B:218:ILE:HD11	2.55	0.41
1:D:229:ILE:HD12	1:D:229:ILE:HA	1.97	0.41
1:C:459:LYS:HB2	1:C:459:LYS:HE2	1.92	0.41
1:D:143:ARG:CD	1:D:147:LYS:HE3	2.50	0.41
1:D:365:LYS:HA	1:D:365:LYS:HD3	1.90	0.41
1:A:40:ASP:HB3	1:A:41:LYS:H	1.67	0.41
1:C:123:MET:HE1	1:C:149:ALA:CA	2.52	0.40
1:D:123:MET:CE	1:D:149:ALA:CA	2.99	0.40
1:A:90:ASN:OD1	1:A:90:ASN:C	2.60	0.40
1:A:479:TYR:CE2	1:A:485:LEU:HG	2.56	0.40
1:C:196:PRO:HB2	1:C:199:LEU:HD11	2.04	0.40
1:D:39:SER:HB2	1:D:41:LYS:H	1.86	0.40
1:A:278:ASN:HD22	1:A:278:ASN:N	2.19	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	450/467 (96%)	439 (98%)	11 (2%)	0	100	100
1	B	450/467 (96%)	439 (98%)	10 (2%)	1 (0%)	47	49
1	C	450/467 (96%)	441 (98%)	9 (2%)	0	100	100
1	D	450/467 (96%)	439 (98%)	11 (2%)	0	100	100
All	All	1800/1868 (96%)	1758 (98%)	41 (2%)	1 (0%)	51	54

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	373	SER

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	376/389 (97%)	360 (96%)	16 (4%)	29	29
1	B	376/389 (97%)	353 (94%)	23 (6%)	18	16
1	C	375/389 (96%)	352 (94%)	23 (6%)	18	16
1	D	374/389 (96%)	353 (94%)	21 (6%)	21	18
All	All	1501/1556 (96%)	1418 (94%)	83 (6%)	21	19

All (83) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	81	LYS
1	A	87	LYS
1	A	94	LYS
1	A	101	LYS
1	A	133	LYS
1	A	200	SER
1	A	203	GLU
1	A	210	LYS
1	A	246	LEU
1	A	278	ASN
1	A	294	ARG
1	A	344	LEU
1	A	366	VAL
1	A	407	VAL
1	A	440	ILE
1	A	484	LYS
1	B	40	ASP
1	B	74	LYS
1	B	82	ARG
1	B	94	LYS
1	B	101	LYS
1	B	133	LYS
1	B	147	LYS
1	B	168	VAL
1	B	205	ASP
1	B	207	ARG
1	B	210	LYS
1	B	246	LEU
1	B	278	ASN
1	B	294	ARG
1	B	298	PRO
1	B	344	LEU
1	B	365	LYS
1	B	366	VAL
1	B	407	VAL
1	B	408	MET
1	B	440	ILE
1	B	451	LYS
1	B	484	LYS
1	C	40	ASP
1	C	87	LYS
1	C	94	LYS
1	C	133	LYS

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Mol	Chain	Res	Type
1	C	168	VAL
1	C	194	ILE
1	C	200	SER
1	C	205	ASP
1	C	210	LYS
1	C	229	ILE
1	C	278	ASN
1	C	294	ARG
1	C	344	LEU
1	C	366	VAL
1	C	411	LEU
1	C	440	ILE
1	C	445	LYS
1	C	449	HIS
1	C	451	LYS
1	C	452	ASP
1	C	456	THR
1	C	458	ASP
1	C	490	ARG
1	D	39	SER
1	D	102	SER
1	D	133	LYS
1	D	168	VAL
1	D	204	ASP
1	D	207	ARG
1	D	210	LYS
1	D	246	LEU
1	D	278	ASN
1	D	294	ARG
1	D	299	LYS
1	D	320	GLU
1	D	344	LEU
1	D	366	VAL
1	D	371	LYS
1	D	407	VAL
1	D	408	MET
1	D	440	ILE
1	D	445	LYS
1	D	484	LYS
1	D	490	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	78	HIS
1	A	270	GLN
1	A	278	ASN
1	A	469	GLN
1	A	477	HIS
1	B	270	GLN
1	B	278	ASN
1	B	449	HIS
1	B	469	GLN
1	B	477	HIS
1	C	270	GLN
1	C	278	ASN
1	C	477	HIS
1	D	270	GLN
1	D	278	ASN
1	D	477	HIS

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

4 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	NAD	D	501	-	42,48,48	0.94	1 (2%)	50,73,73	1.21	4 (8%)
2	NAD	B	501	-	42,48,48	0.96	1 (2%)	50,73,73	1.21	5 (10%)
2	NAD	C	501	-	42,48,48	0.74	0	50,73,73	1.12	2 (4%)
2	NAD	A	501	-	42,48,48	1.11	1 (2%)	50,73,73	1.27	7 (14%)

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	D	501	-	-	4/26/62/62	0/5/5/5
2	NAD	B	501	-	-	5/26/62/62	0/5/5/5
2	NAD	C	501	-	-	7/26/62/62	0/5/5/5
2	NAD	A	501	-	-	6/26/62/62	0/5/5/5

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	501	NAD	C2N-N1N	4.24	1.40	1.35
2	D	501	NAD	C2N-N1N	3.85	1.39	1.35
2	B	501	NAD	C2N-N1N	3.43	1.39	1.35

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	501	NAD	C6N-N1N-C2N	-4.05	118.28	121.97
2	D	501	NAD	C6N-N1N-C2N	-3.60	118.69	121.97
2	B	501	NAD	C5A-C6A-N6A	3.60	125.82	120.35
2	B	501	NAD	O2A-PA-O1A	3.33	128.69	112.24
2	D	501	NAD	O2D-C2D-C1D	-3.08	99.50	110.85
2	A	501	NAD	C2N-C3N-C4N	-2.98	114.88	118.26
2	D	501	NAD	PN-O3-PA	-2.83	123.10	132.83
2	B	501	NAD	O3D-C3D-C4D	-2.73	103.17	111.05
2	A	501	NAD	C3N-C2N-N1N	2.66	123.03	120.43
2	C	501	NAD	C2N-C3N-C4N	2.65	121.26	118.26
2	B	501	NAD	O2D-C2D-C3D	-2.63	103.33	111.82
2	D	501	NAD	O2A-PA-O1A	2.60	125.08	112.24
2	A	501	NAD	C6N-C5N-C4N	2.58	123.19	119.44
2	A	501	NAD	O2N-PN-O1N	2.45	124.35	112.24

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	501	NAD	C6N-N1N-C2N	-2.40	119.79	121.97
2	A	501	NAD	C3N-C7N-N7N	2.40	120.63	117.75
2	B	501	NAD	C6N-N1N-C2N	-2.20	119.97	121.97
2	A	501	NAD	O5B-C5B-C4B	-2.07	101.88	108.99

There are no chirality outliers.

All (22) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	501	NAD	C5D-O5D-PN-O2N
2	A	501	NAD	O4D-C1D-N1N-C2N
2	A	501	NAD	O4D-C1D-N1N-C6N
2	B	501	NAD	C5D-O5D-PN-O1N
2	B	501	NAD	O4D-C1D-N1N-C2N
2	B	501	NAD	O4D-C1D-N1N-C6N
2	C	501	NAD	C5D-O5D-PN-O2N
2	C	501	NAD	O4D-C1D-N1N-C2N
2	C	501	NAD	O4D-C1D-N1N-C6N
2	C	501	NAD	C2D-C1D-N1N-C2N
2	D	501	NAD	O4D-C1D-N1N-C2N
2	D	501	NAD	O4D-C1D-N1N-C6N
2	C	501	NAD	C5D-O5D-PN-O3
2	B	501	NAD	O4B-C4B-C5B-O5B
2	A	501	NAD	C5D-O5D-PN-O3
2	A	501	NAD	C2D-C1D-N1N-C2N
2	B	501	NAD	C2D-C1D-N1N-C2N
2	D	501	NAD	C2D-C1D-N1N-C6N
2	A	501	NAD	O4B-C4B-C5B-O5B
2	C	501	NAD	O4B-C4B-C5B-O5B
2	C	501	NAD	C5D-O5D-PN-O1N
2	D	501	NAD	O4B-C4B-C5B-O5B

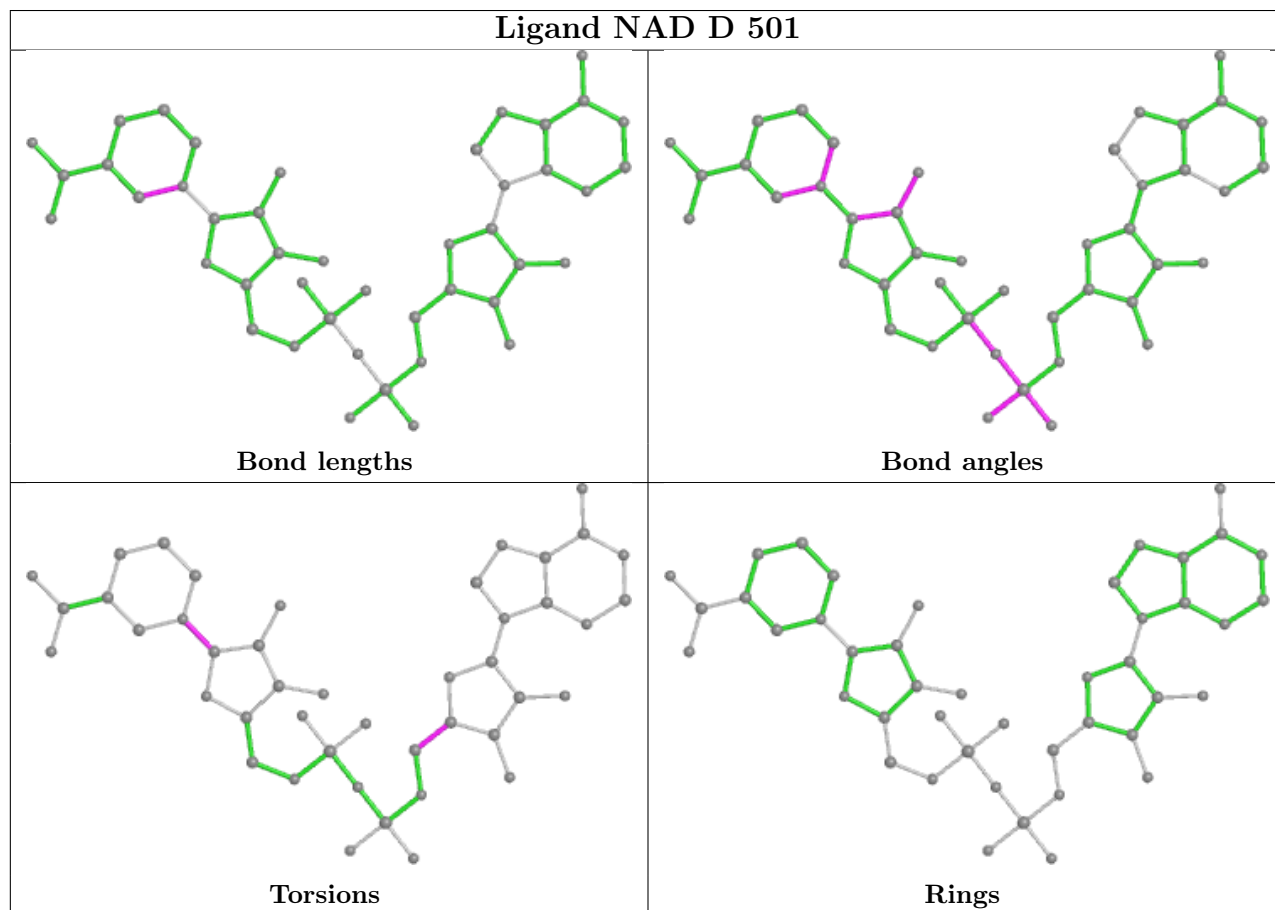
There are no ring outliers.

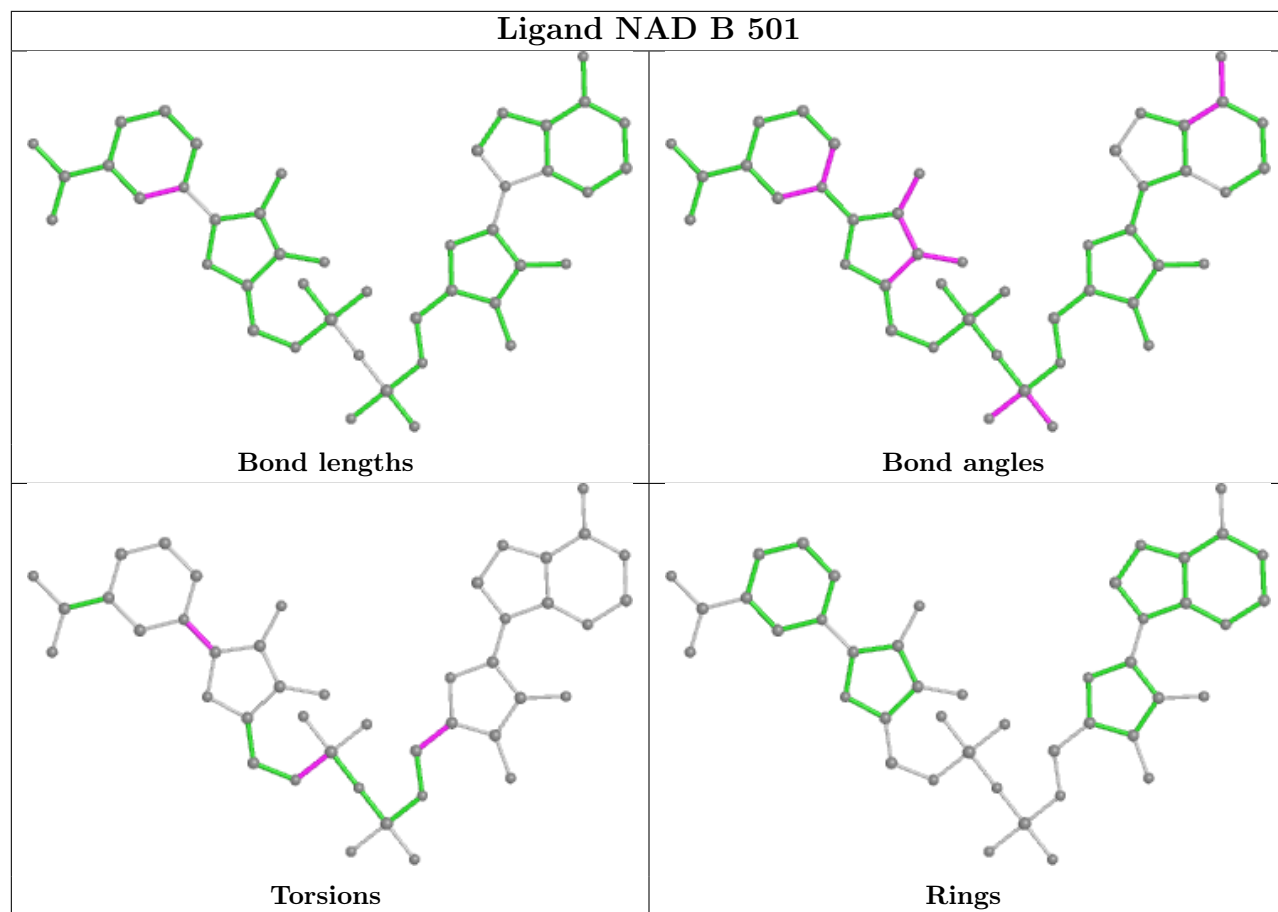
1 monomer is involved in 1 short contact:

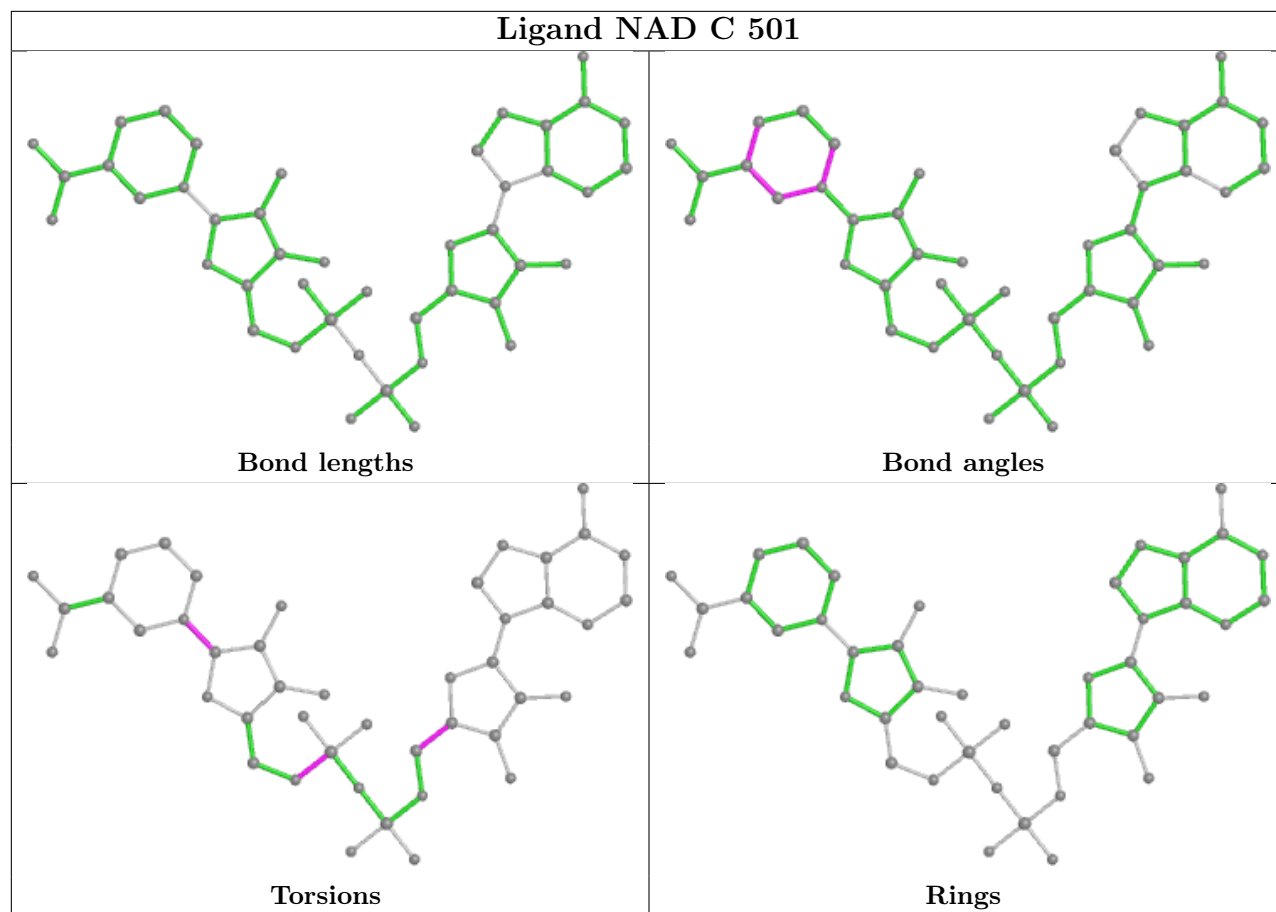
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	501	NAD	1	0

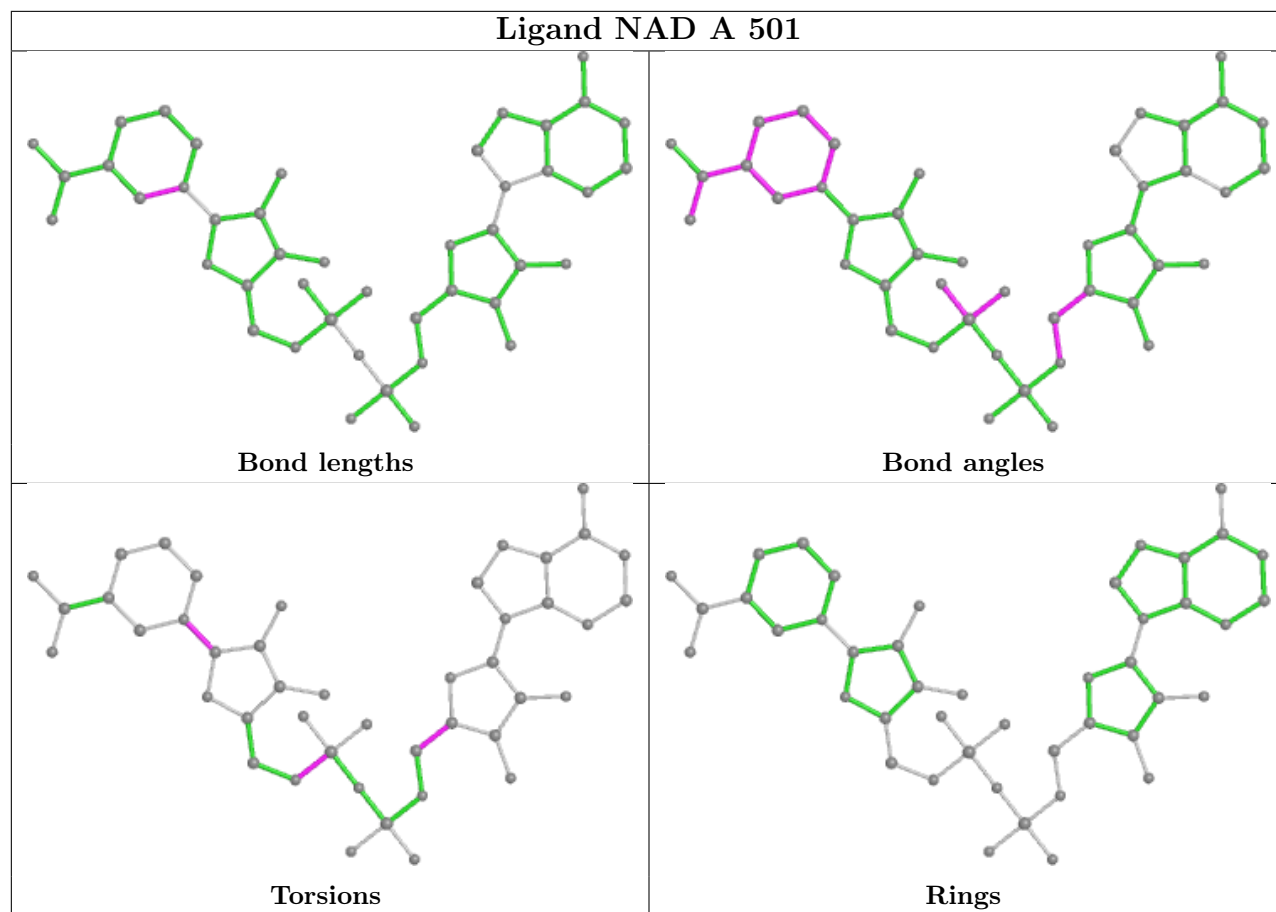
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will

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.









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

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	452/467 (96%)	-0.16	4 (0%) 84 86	18, 29, 55, 97	0
1	B	452/467 (96%)	0.26	22 (4%) 29 35	26, 49, 88, 109	0
1	C	452/467 (96%)	0.46	38 (8%) 11 14	31, 57, 97, 122	0
1	D	452/467 (96%)	0.59	39 (8%) 10 13	41, 64, 98, 128	0
All	All	1808/1868 (96%)	0.29	103 (5%) 23 29	18, 51, 92, 128	0

All (103) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	73	TRP	6.2
1	C	39	SER	5.8
1	D	67	GLY	5.4
1	C	205	ASP	4.7
1	D	98	GLU	4.7
1	B	67	GLY	4.3
1	C	204	ASP	4.3
1	C	447	GLY	4.2
1	C	451	LYS	4.1
1	B	39	SER	4.0
1	D	386	ALA	4.0
1	C	452	ASP	3.9
1	C	207	ARG	3.8
1	D	97	ASP	3.8
1	C	40	ASP	3.7
1	C	454	HIS	3.6
1	B	89	TYR	3.5
1	C	387	ASP	3.5
1	B	77	ASP	3.4
1	C	453	GLY	3.4
1	C	154	VAL	3.3

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Mol	Chain	Res	Type	RSRZ
1	C	449	HIS	3.3
1	B	84	PRO	3.3
1	D	246	LEU	3.3
1	D	203	GLU	3.2
1	B	83	TYR	3.2
1	C	210	LYS	3.1
1	D	152	TYR	3.0
1	D	489	PRO	3.0
1	D	89	TYR	3.0
1	C	97	ASP	2.9
1	C	388	ASP	2.9
1	C	150	ASP	2.9
1	D	204	ASP	2.8
1	D	214	TRP	2.8
1	D	87	LYS	2.7
1	A	452	ASP	2.7
1	D	209	PRO	2.7
1	D	490	ARG	2.7
1	C	152	TYR	2.7
1	D	73	TRP	2.7
1	D	205	ASP	2.7
1	C	203	GLU	2.6
1	D	79	VAL	2.6
1	C	478	THR	2.6
1	D	196	PRO	2.6
1	D	44	ILE	2.6
1	B	87	LYS	2.6
1	C	455	PRO	2.6
1	B	385	ASP	2.5
1	D	68	LEU	2.6
1	A	39	SER	2.5
1	D	62	SER	2.5
1	D	82	ARG	2.5
1	D	94	LYS	2.5
1	D	210	LYS	2.5
1	B	85	ALA	2.5
1	C	149	ALA	2.5
1	C	153	LYS	2.5
1	B	379	VAL	2.5
1	D	452	ASP	2.4
1	C	390	VAL	2.4
1	B	40	ASP	2.4

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Mol	Chain	Res	Type	RSRZ
1	C	215	ASP	2.4
1	D	388	ASP	2.4
1	D	447	GLY	2.4
1	C	480	ARG	2.4
1	B	81	LYS	2.4
1	D	457	PHE	2.4
1	C	481	ASP	2.4
1	B	211	THR	2.4
1	D	88	LYS	2.3
1	B	79	VAL	2.3
1	A	451	LYS	2.3
1	C	101	LYS	2.3
1	B	64	ASN	2.3
1	A	490	ARG	2.3
1	B	66	ILE	2.2
1	B	76	ALA	2.2
1	C	100	LEU	2.2
1	C	456	THR	2.2
1	D	211	THR	2.2
1	C	450	ILE	2.2
1	C	490	ARG	2.2
1	D	124	THR	2.2
1	D	207	ARG	2.2
1	B	43	ASN	2.1
1	D	100	LEU	2.1
1	D	153	LYS	2.1
1	D	362	ASN	2.1
1	C	479	TYR	2.1
1	C	385	ASP	2.1
1	D	39	SER	2.1
1	B	481	ASP	2.1
1	D	40	ASP	2.1
1	C	94	LYS	2.1
1	D	212	LEU	2.1
1	B	388	ASP	2.1
1	C	240	ASP	2.1
1	C	469	GLN	2.1
1	B	86	ALA	2.0
1	D	150	ASP	2.0
1	C	102	SER	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](#)

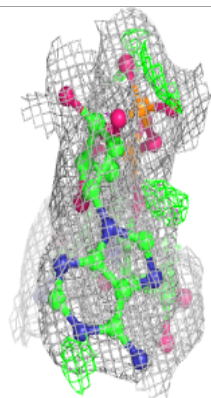
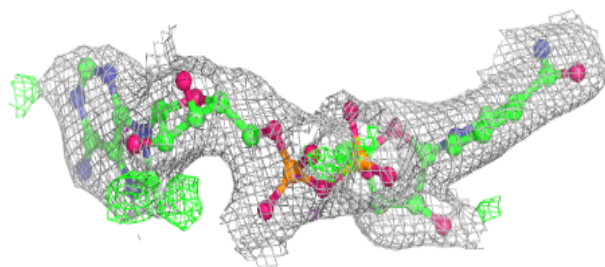
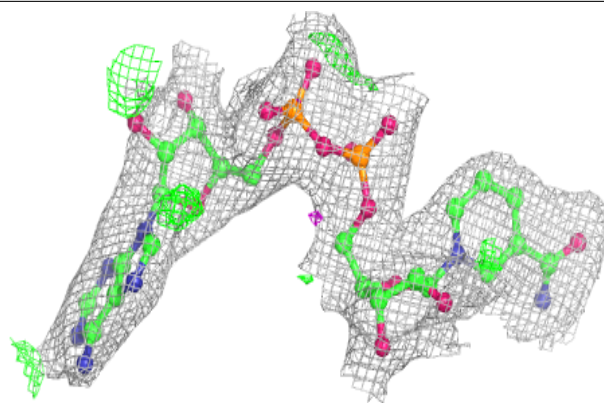
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	NAD	D	501	44/44	0.94	0.11	50,56,63,64	0
2	NAD	C	501	44/44	0.96	0.11	44,49,60,63	0
2	NAD	B	501	44/44	0.96	0.11	38,46,55,58	0
2	NAD	A	501	44/44	0.98	0.10	18,22,24,25	0

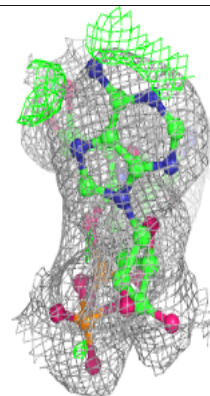
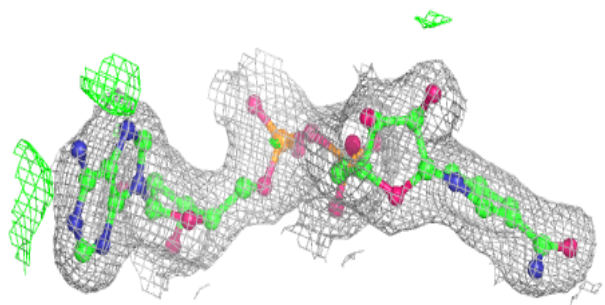
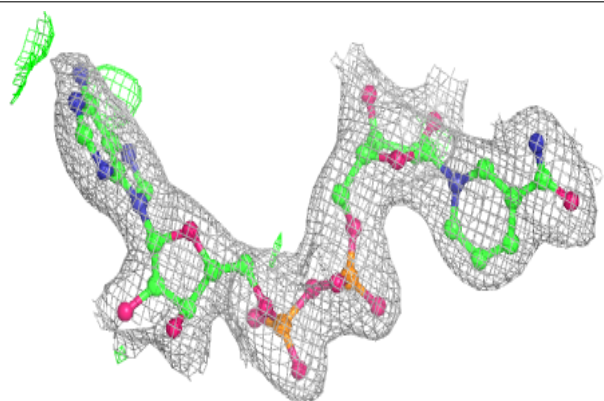
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around NAD D 501:

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

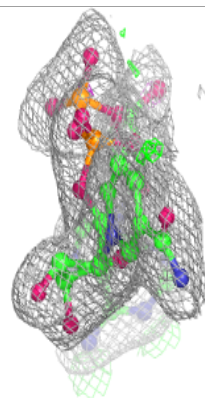
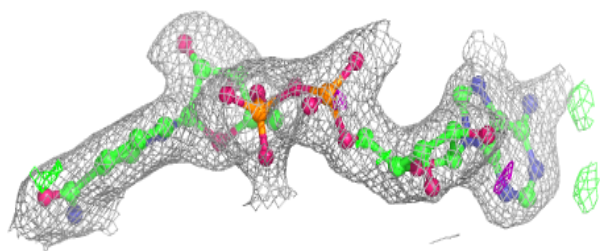
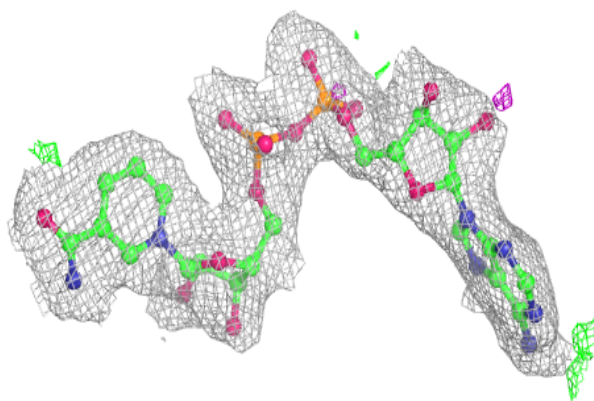
**Electron density around NAD C 501:**

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

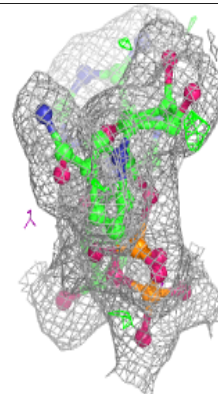
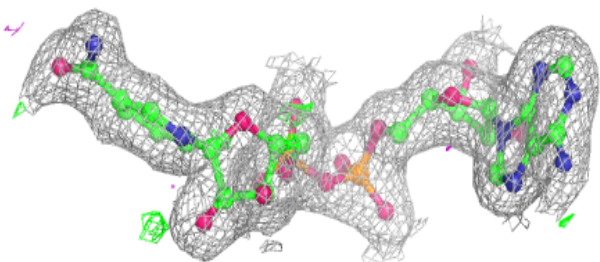
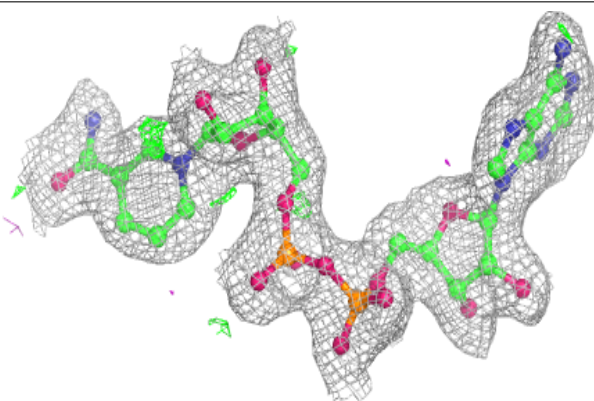


Electron density around NAD B 501:

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

**Electron density around NAD A 501:**

$2mF_o-DF_c$ (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.