



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 12, 2024 – 03:52 pm GMT

PDB ID : 8CFL
Title : Crystal structure of S-adenosyl-L-homocysteine hydrolase from *P. aeruginosa* in complex with F2X-Entry library fragment E07
Authors : Malecki, P.H.; Gawel, M.; Stepniewska, M.; Brzezinski, K.
Deposited on : 2023-02-03
Resolution : 1.73 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 : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
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

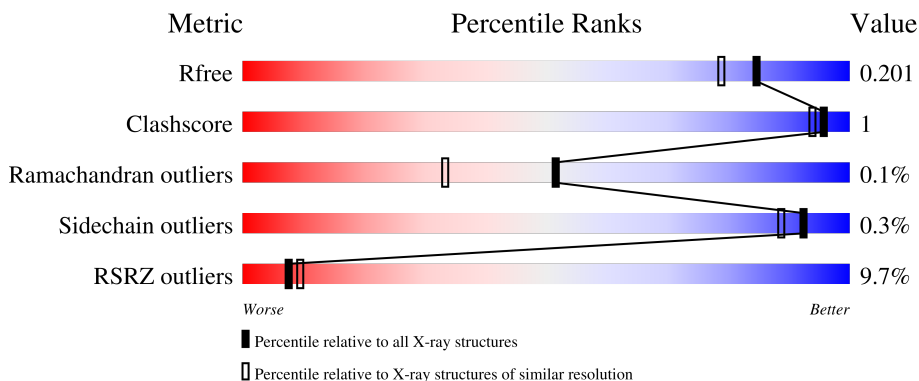
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.73 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	3764 (1.76-1.72)
Clashscore	141614	3923 (1.76-1.72)
Ramachandran outliers	138981	3878 (1.76-1.72)
Sidechain outliers	138945	3878 (1.76-1.72)
RSRZ outliers	127900	3705 (1.76-1.72)

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	472	 11% (upper red bar), 93% (green bar)
1	B	472	 8% (upper red bar), 96% (green bar)
1	C	472	 8% (upper red bar), 92% (green bar), 5% (yellow bar)
1	D	472	 11% (upper red bar), 95% (green bar)

2 Entry composition

There are 8 unique types of molecules in this entry. The entry contains 16219 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.

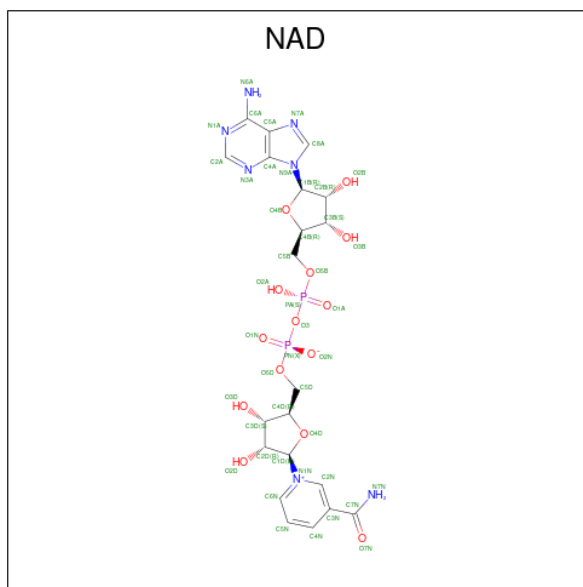
- Molecule 1 is a protein called Adenosylhomocysteinase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	461	3587	2261	622	681	23	0	5	0
1	B	461	3583	2260	620	681	22	0	5	0
1	C	460	3604	2274	624	683	23	0	9	0
1	D	461	3580	2256	618	684	22	0	5	0

There are 12 discrepancies between the modelled and reference sequences:

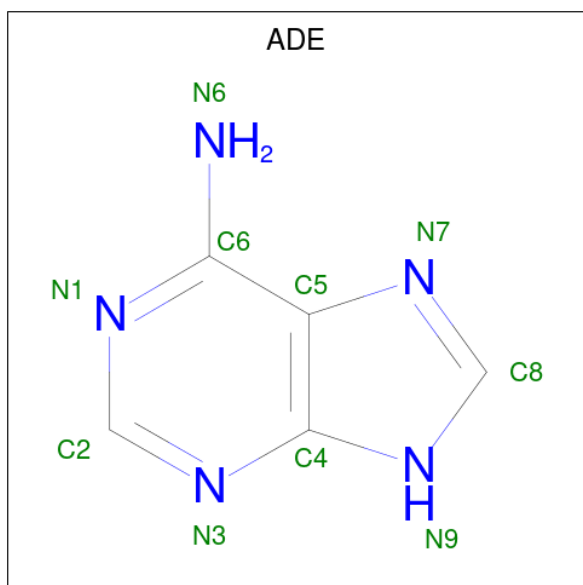
Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	SER	-	expression tag	UNP Q9I685
A	-1	ASN	-	expression tag	UNP Q9I685
A	0	ALA	-	expression tag	UNP Q9I685
B	-2	SER	-	expression tag	UNP Q9I685
B	-1	ASN	-	expression tag	UNP Q9I685
B	0	ALA	-	expression tag	UNP Q9I685
C	-2	SER	-	expression tag	UNP Q9I685
C	-1	ASN	-	expression tag	UNP Q9I685
C	0	ALA	-	expression tag	UNP Q9I685
D	-2	SER	-	expression tag	UNP Q9I685
D	-1	ASN	-	expression tag	UNP Q9I685
D	0	ALA	-	expression tag	UNP Q9I685

- Molecule 2 is NICOTINAMIDE-ADENINE-DINUCLEOTIDE (three-letter code: NAD) (formula: C₂₁H₂₇N₇O₁₄P₂).



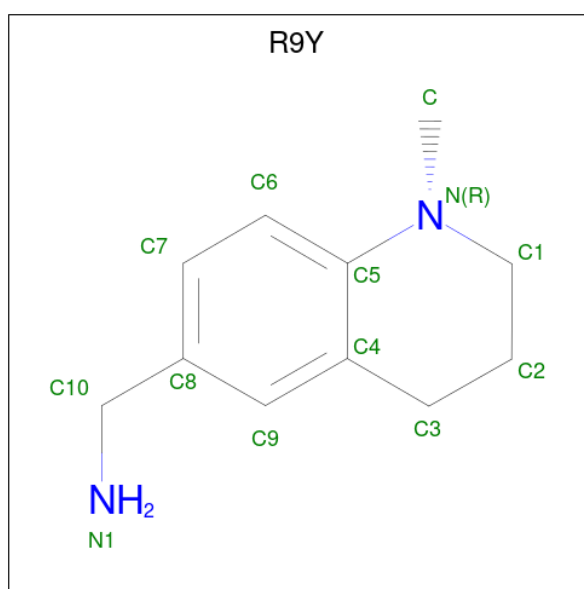
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf		
			Total	C	N	O			P	
2	A	1	Total	44	21	7	14	2	0	0
2	B	1	Total	44	21	7	14	2	0	0
2	C	1	Total	44	21	7	14	2	0	0
2	D	1	Total	44	21	7	14	2	0	0

- Molecule 3 is ADENINE (three-letter code: ADE) (formula: C₅H₅N₅).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C N 10 5 5	0	0
3	B	1	Total C N 10 5 5	0	0
3	C	1	Total C N 10 5 5	0	0
3	D	1	Total C N 10 5 5	0	0

- Molecule 4 is 1-(1-methyl-1,2,3,4-tetrahydroquinolin-6-yl)methanamine (three-letter code: R9Y) (formula: C₁₁H₁₆N₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C N 13 11 2	0	0
4	C	1	Total C N 13 11 2	0	0

- Molecule 5 is POTASSIUM ION (three-letter code: K) (formula: K).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total K 1 1	0	0
5	B	1	Total K 1 1	0	0
5	C	1	Total K 1 1	0	0

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	D	1	Total K 1 1	0	0

- Molecule 6 is PHOSPHATE ION (three-letter code: PO4) (formula: O₄P).



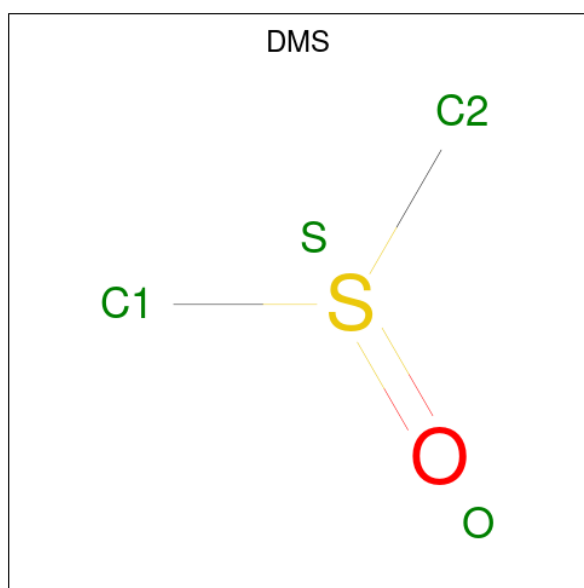
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total O P 5 4 1	0	0
6	A	1	Total O P 5 4 1	0	0
6	A	1	Total O P 5 4 1	0	0
6	A	1	Total O P 5 4 1	0	0
6	B	1	Total O P 5 4 1	0	0
6	B	1	Total O P 5 4 1	0	0
6	C	1	Total O P 5 4 1	0	0
6	C	1	Total O P 5 4 1	0	0
6	C	1	Total O P 5 4 1	0	0
6	C	1	Total O P 5 4 1	0	0

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	C	1	Total O P 5 4 1	0	0
6	D	1	Total O P 5 4 1	0	0
6	D	1	Total O P 5 4 1	0	0
6	D	1	Total O P 5 4 1	0	0
6	D	1	Total O P 5 4 1	0	0

- Molecule 7 is DIMETHYL SULFOXIDE (three-letter code: DMS) (formula: C₂H₆OS).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	C	1	Total C O S 4 2 1 1	0	0
7	D	1	Total C O S 4 2 1 1	0	0

- Molecule 8 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	399	Total O 404 404	0	5
8	B	355	Total O 362 362	0	7

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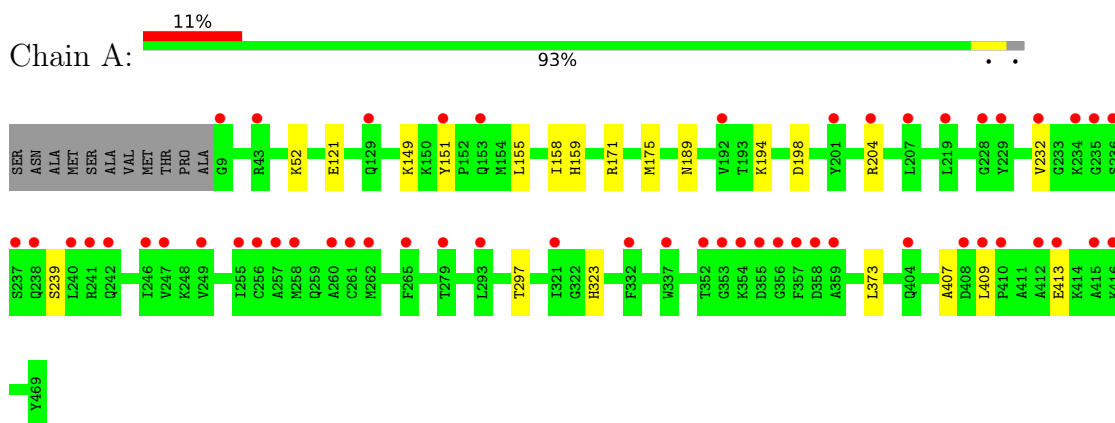
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	C	359	Total 367	O 367	0	8
8	D	395	Total 403	O 403	0	9

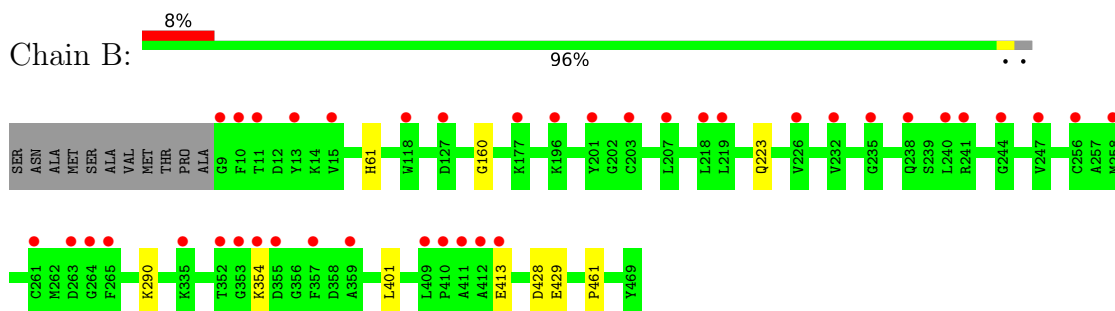
3 Residue-property plots [i](#)

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.

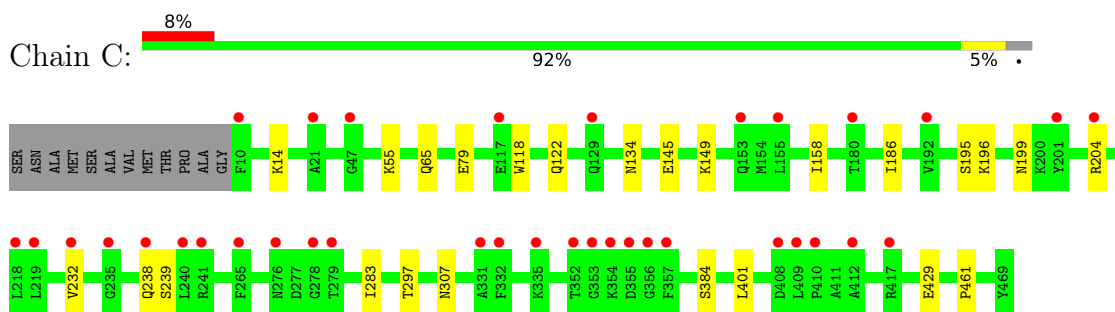
- Molecule 1: Adenosylhomocysteinase



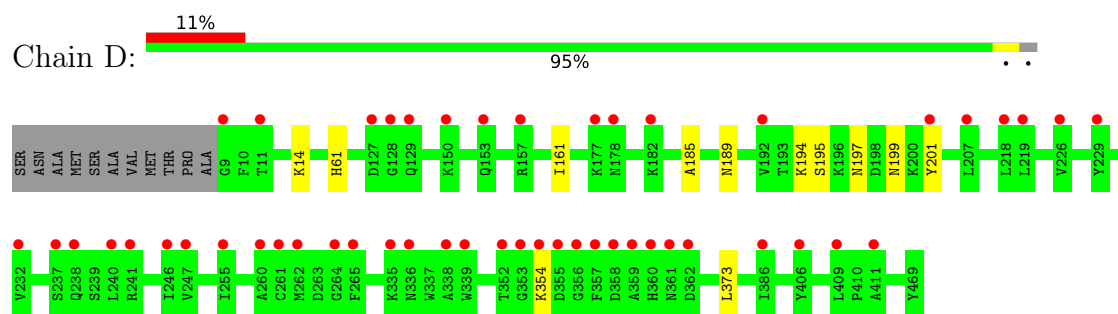
- Molecule 1: Adenosylhomocysteinase



- Molecule 1: Adenosylhomocysteinase



- Molecule 1: Adenosylhomocysteinase



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	178.45Å 104.83Å 107.59Å 90.00° 99.44° 90.00°	Depositor
Resolution (Å)	29.32 – 1.73 47.50 – 1.73	Depositor EDS
% Data completeness (in resolution range)	99.2 (29.32-1.73) 99.3 (47.50-1.73)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.00 (at 1.73Å)	Xtrriage
Refinement program	PHENIX 1.19.2-4158	Depositor
R, R_{free}	0.165 , 0.201 0.166 , 0.201	Depositor DCC
R_{free} test set	2134 reflections (1.05%)	wwPDB-VP
Wilson B-factor (Å ²)	29.8	Xtrriage
Anisotropy	0.124	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 52.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.98	EDS
Total number of atoms	16219	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.85% 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: ADE, DMS, K, NAD, R9Y, PO4

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	0.47	0/3659	0.63	1/4945 (0.0%)
1	B	0.47	0/3658	0.62	1/4944 (0.0%)
1	C	0.46	0/3688	0.61	0/4983
1	D	0.46	0/3652	0.61	1/4937 (0.0%)
All	All	0.47	0/14657	0.62	3/19809 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	198	ASP	CB-CG-OD1	5.69	123.42	118.30
1	B	428	ASP	CB-CG-OD1	5.62	123.36	118.30
1	D	373	LEU	CA-CB-CG	5.22	127.31	115.30

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	3587	0	3600	9	0
1	B	3583	0	3600	4	0
1	C	3604	0	3631	14	0
1	D	3580	0	3583	5	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	44	0	26	1	0
2	B	44	0	26	0	0
2	C	44	0	26	0	0
2	D	44	0	26	0	0
3	A	10	0	4	0	0
3	B	10	0	4	0	0
3	C	10	0	4	0	0
3	D	10	0	4	0	0
4	A	13	0	0	0	0
4	C	13	0	0	0	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
5	C	1	0	0	0	0
5	D	1	0	0	0	0
6	A	20	0	0	0	0
6	B	10	0	0	0	0
6	C	25	0	0	0	0
6	D	20	0	0	0	0
7	C	4	0	6	0	0
7	D	4	0	6	0	0
8	A	404	0	0	1	0
8	B	362	0	0	0	0
8	C	367	0	0	1	0
8	D	403	0	0	0	0
All	All	16219	0	14546	33	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 1.

All (33) 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:D:189:ASN:HA	1:D:194:LYS:HD2	1.85	0.58
1:B:223[B]:GLN:OE1	1:B:290:LYS:HE2	2.13	0.48
1:C:145:GLU:OE2	1:C:149:LYS:NZ	2.33	0.46
1:A:409:LEU:HB3	1:A:413:GLU:HB2	1.98	0.46
1:A:232:VAL:HG12	1:A:297:THR:HB	1.98	0.46
1:A:121:GLU:OE1	1:A:151:TYR:OH	2.24	0.46
1:D:14:LYS:HA	1:D:14:LYS:HD2	1.80	0.46
1:B:354:LYS:HA	1:B:354:LYS:HD2	1.81	0.45
1:C:65:GLN:HG3	1:C:384:SER:HA	1.99	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:186:ILE:HG13	1:C:401:LEU:HD11	1.98	0.44
1:C:204[B]:ARG:HA	1:C:239:SER:HB2	1.98	0.44
2:A:501:NAD:H8A	8:A:724:HOH:O	2.17	0.44
1:C:55:LYS:NZ	1:C:79:GLU:OE1	2.52	0.43
1:C:283:ILE:HG13	1:C:307:ASN:HB3	2.00	0.42
1:A:155:LEU:HA	1:A:158:ILE:HD12	2.01	0.42
1:C:134:ASN:HA	1:C:158:ILE:HA	2.00	0.42
1:A:189:ASN:HA	1:A:194:LYS:HD2	2.02	0.42
1:B:160:GLY:HA3	1:B:401:LEU:HD13	2.00	0.42
1:B:429:GLU:OE1	1:B:461:PRO:HA	2.19	0.42
1:C:232:VAL:HG12	1:C:297:THR:HB	2.02	0.42
1:C:204[A]:ARG:HA	1:C:239:SER:HB2	2.00	0.42
1:C:238[B]:GLN:NE2	8:C:608:HOH:O	2.51	0.41
1:C:118:TRP:O	1:C:122:GLN:HG2	2.19	0.41
1:C:14:LYS:HD3	1:C:118:TRP:CH2	2.56	0.41
1:A:159:HIS:CE1	1:A:407:ALA:HB3	2.56	0.41
1:C:195:SER:O	1:C:199:ASN:HB2	2.20	0.41
1:D:161:ILE:O	1:D:185:ALA:HA	2.21	0.41
1:D:195:SER:O	1:D:199:ASN:HB2	2.21	0.40
1:A:204[B]:ARG:HA	1:A:239:SER:HB2	2.04	0.40
1:A:323:HIS:HA	1:A:373:LEU:HD21	2.03	0.40
1:A:171:ARG:O	1:A:175:MET:HG3	2.21	0.40
1:C:429:GLU:OE1	1:C:461:PRO:HA	2.20	0.40
1:D:197:ASN:HA	1:D:201:TYR:HD2	1.86	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	464/472 (98%)	454 (98%)	10 (2%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	464/472 (98%)	453 (98%)	10 (2%)	1 (0%)	47	29
1	C	467/472 (99%)	454 (97%)	13 (3%)	0	100	100
1	D	464/472 (98%)	453 (98%)	10 (2%)	1 (0%)	47	29
All	All	1859/1888 (98%)	1814 (98%)	43 (2%)	2 (0%)	51	33

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	61	HIS
1	D	61	HIS

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	382/385 (99%)	380 (100%)	2 (0%)	88	83
1	B	382/385 (99%)	381 (100%)	1 (0%)	92	89
1	C	386/385 (100%)	384 (100%)	2 (0%)	88	83
1	D	381/385 (99%)	380 (100%)	1 (0%)	92	89
All	All	1531/1540 (99%)	1525 (100%)	6 (0%)	92	86

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	52	LYS
1	A	149	LYS
1	B	413	GLU
1	C	196[A]	LYS
1	C	196[B]	LYS
1	D	354	LYS

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 31 ligands modelled in this entry, 4 are monoatomic - leaving 27 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	D	501	-	42,48,48	0.61	0	50,73,73	0.77	1 (2%)
6	PO4	B	505	-	4,4,4	0.67	0	6,6,6	0.83	0
6	PO4	A	508	-	4,4,4	0.78	0	6,6,6	1.52	2 (33%)
3	ADE	D	502	-	9,11,11	0.95	1 (11%)	7,15,15	1.19	1 (14%)
3	ADE	B	502	-	9,11,11	1.15	1 (11%)	7,15,15	1.05	0
2	NAD	B	501	-	42,48,48	0.55	0	50,73,73	0.76	2 (4%)
7	DMS	C	503	-	3,3,3	0.82	0	3,3,3	0.85	0
6	PO4	A	505	-	4,4,4	0.83	0	6,6,6	0.38	0
3	ADE	C	502	-	9,11,11	1.11	1 (11%)	7,15,15	1.15	1 (14%)
4	R9Y	A	503	-	14,14,14	1.75	3 (21%)	18,19,19	1.00	2 (11%)
6	PO4	B	504	-	4,4,4	1.19	0	6,6,6	0.77	0
6	PO4	D	506	-	4,4,4	0.66	0	6,6,6	0.58	0
2	NAD	A	501	-	42,48,48	0.59	0	50,73,73	0.81	2 (4%)
6	PO4	C	510	-	4,4,4	1.15	0	6,6,6	0.85	0
6	PO4	A	507	-	4,4,4	0.62	0	6,6,6	0.77	0
4	R9Y	C	504	-	14,14,14	1.85	2 (14%)	18,19,19	1.27	2 (11%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
7	DMS	D	503	-	3,3,3	0.70	0	3,3,3	0.54	0
6	PO4	D	507	-	4,4,4	0.89	0	6,6,6	1.06	0
3	ADE	A	502	-	9,11,11	0.95	1 (11%)	7,15,15	1.16	1 (14%)
6	PO4	C	509	-	4,4,4	1.03	0	6,6,6	0.70	0
6	PO4	C	508	-	4,4,4	1.11	0	6,6,6	0.54	0
6	PO4	D	508	-	4,4,4	0.80	0	6,6,6	0.44	0
6	PO4	D	505	-	4,4,4	1.08	0	6,6,6	0.68	0
6	PO4	C	506	-	4,4,4	1.01	0	6,6,6	0.83	0
6	PO4	A	506	-	4,4,4	1.08	0	6,6,6	0.79	0
6	PO4	C	507	-	4,4,4	0.75	0	6,6,6	0.67	0
2	NAD	C	501	-	42,48,48	0.55	0	50,73,73	0.76	1 (2%)

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	ADE	C	502	-	-	-	0/2/2/2
4	R9Y	A	503	-	-	0/2/12/12	0/2/2/2
2	NAD	D	501	-	-	5/26/62/62	0/5/5/5
3	ADE	B	502	-	-	-	0/2/2/2
2	NAD	A	501	-	-	5/26/62/62	0/5/5/5
3	ADE	A	502	-	-	-	0/2/2/2
3	ADE	D	502	-	-	-	0/2/2/2
2	NAD	B	501	-	-	5/26/62/62	0/5/5/5
4	R9Y	C	504	-	-	0/2/12/12	0/2/2/2
2	NAD	C	501	-	-	5/26/62/62	0/5/5/5

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	503	R9Y	C5-N	4.42	1.48	1.38
4	C	504	R9Y	C5-N	4.34	1.48	1.38
4	C	504	R9Y	C3-C4	3.81	1.57	1.51
4	A	503	R9Y	C3-C4	3.22	1.56	1.51
3	B	502	ADE	C4-N3	-2.53	1.33	1.37
3	C	502	ADE	C4-N9	2.28	1.39	1.34
4	A	503	R9Y	C1-N	-2.13	1.43	1.46
3	D	502	ADE	C4-N9	2.11	1.38	1.34
3	A	502	ADE	C4-N3	-2.02	1.34	1.37

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	504	R9Y	C6-C5-N	-3.61	117.79	122.03
4	A	503	R9Y	C2-C1-N	2.42	117.40	110.98
3	D	502	ADE	C5-C6-N6	2.41	124.02	120.35
3	C	502	ADE	C5-C6-N6	2.38	123.96	120.35
2	A	501	NAD	C5A-C6A-N6A	2.32	123.87	120.35
2	C	501	NAD	C5A-C6A-N6A	2.27	123.80	120.35
6	A	508	PO4	O4-P-O2	2.26	115.21	107.97
4	C	504	R9Y	C-N-C1	2.23	120.33	115.25
2	D	501	NAD	C5A-C6A-N6A	2.17	123.65	120.35
6	A	508	PO4	O3-P-O1	-2.16	102.98	110.89
4	A	503	R9Y	C6-C5-N	-2.15	119.51	122.03
2	B	501	NAD	PN-O3-PA	-2.13	125.53	132.83
2	A	501	NAD	PN-O3-PA	-2.11	125.58	132.83
3	A	502	ADE	C5-C6-N6	2.11	123.56	120.35
2	B	501	NAD	C5A-C6A-N6A	2.01	123.40	120.35

There are no chirality outliers.

All (20) torsion outliers are listed below:

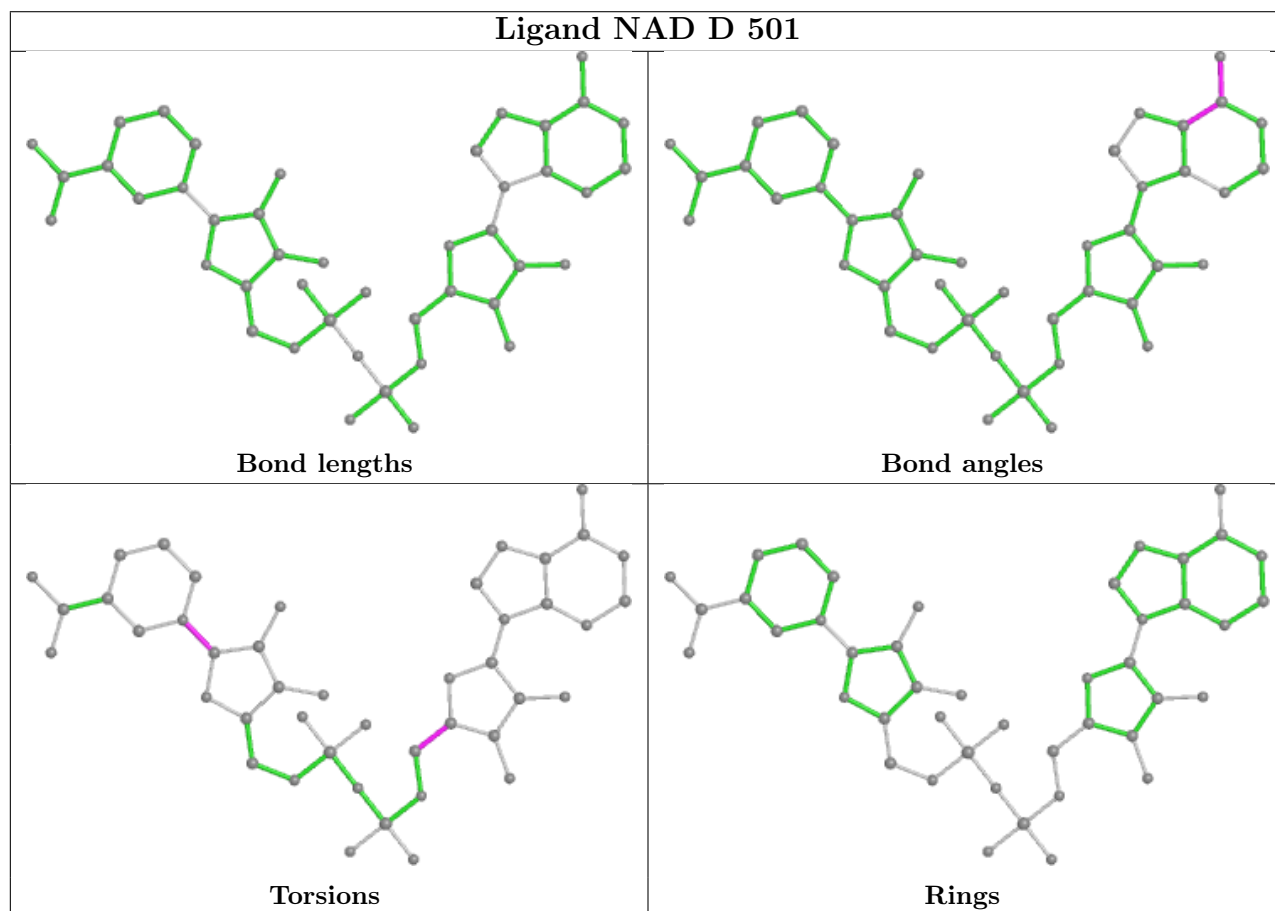
Mol	Chain	Res	Type	Atoms
2	A	501	NAD	O4D-C1D-N1N-C2N
2	A	501	NAD	O4D-C1D-N1N-C6N
2	A	501	NAD	C2D-C1D-N1N-C2N
2	A	501	NAD	C2D-C1D-N1N-C6N
2	B	501	NAD	O4D-C1D-N1N-C2N
2	B	501	NAD	O4D-C1D-N1N-C6N
2	B	501	NAD	C2D-C1D-N1N-C2N
2	B	501	NAD	C2D-C1D-N1N-C6N
2	C	501	NAD	O4D-C1D-N1N-C2N
2	C	501	NAD	O4D-C1D-N1N-C6N
2	C	501	NAD	C2D-C1D-N1N-C2N
2	C	501	NAD	C2D-C1D-N1N-C6N
2	D	501	NAD	O4D-C1D-N1N-C2N
2	D	501	NAD	O4D-C1D-N1N-C6N
2	D	501	NAD	C2D-C1D-N1N-C2N
2	D	501	NAD	C2D-C1D-N1N-C6N
2	A	501	NAD	O4B-C4B-C5B-O5B
2	B	501	NAD	O4B-C4B-C5B-O5B
2	C	501	NAD	O4B-C4B-C5B-O5B
2	D	501	NAD	O4B-C4B-C5B-O5B

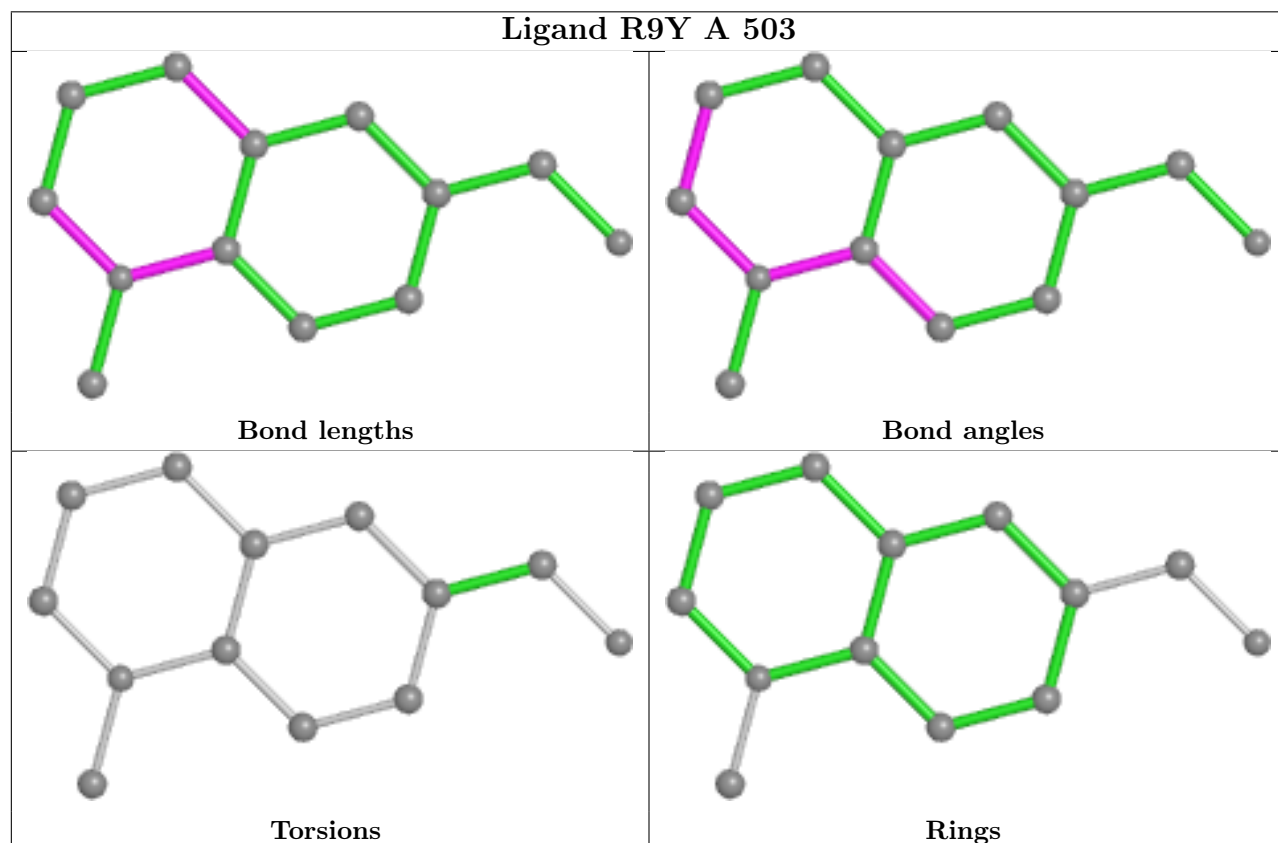
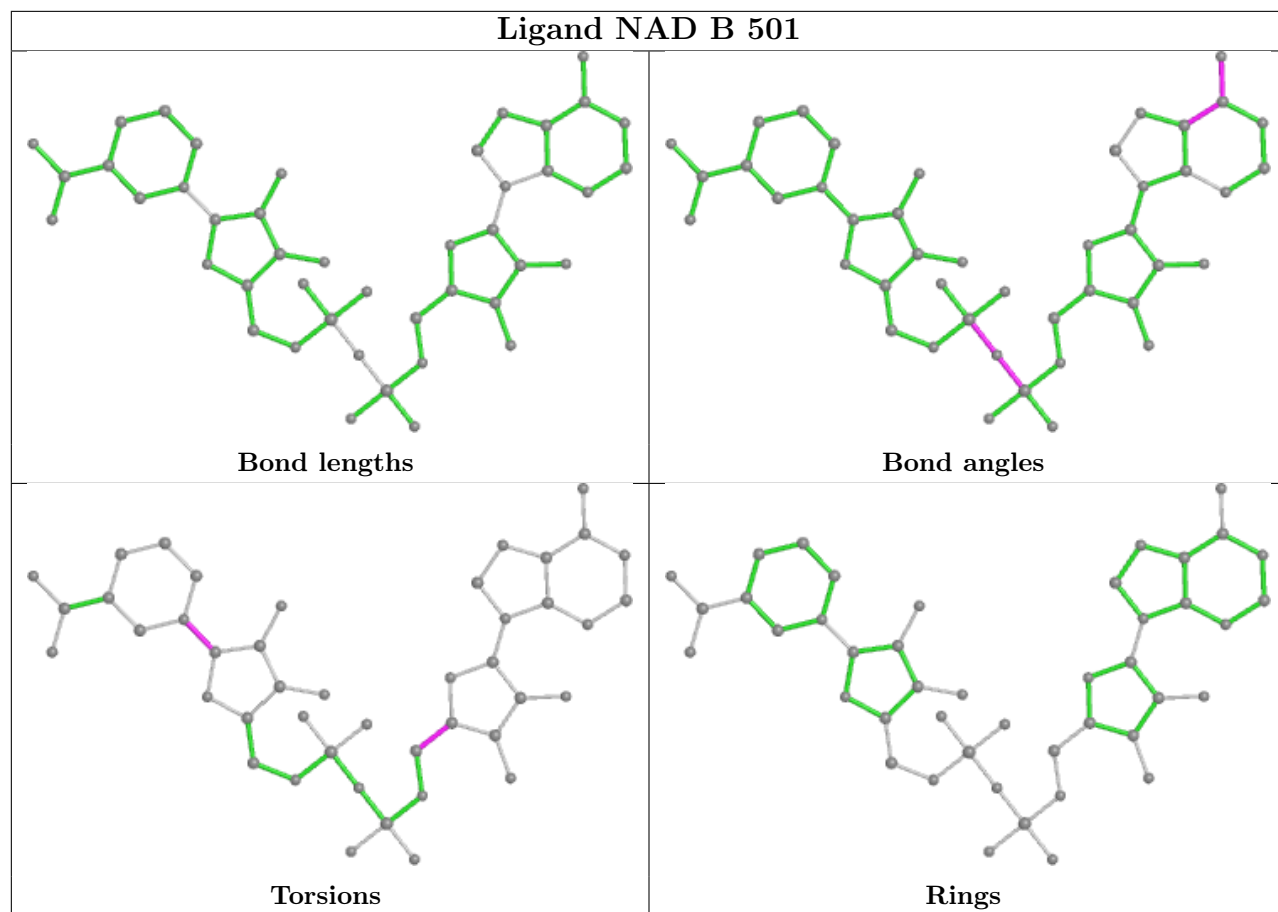
There are no ring outliers.

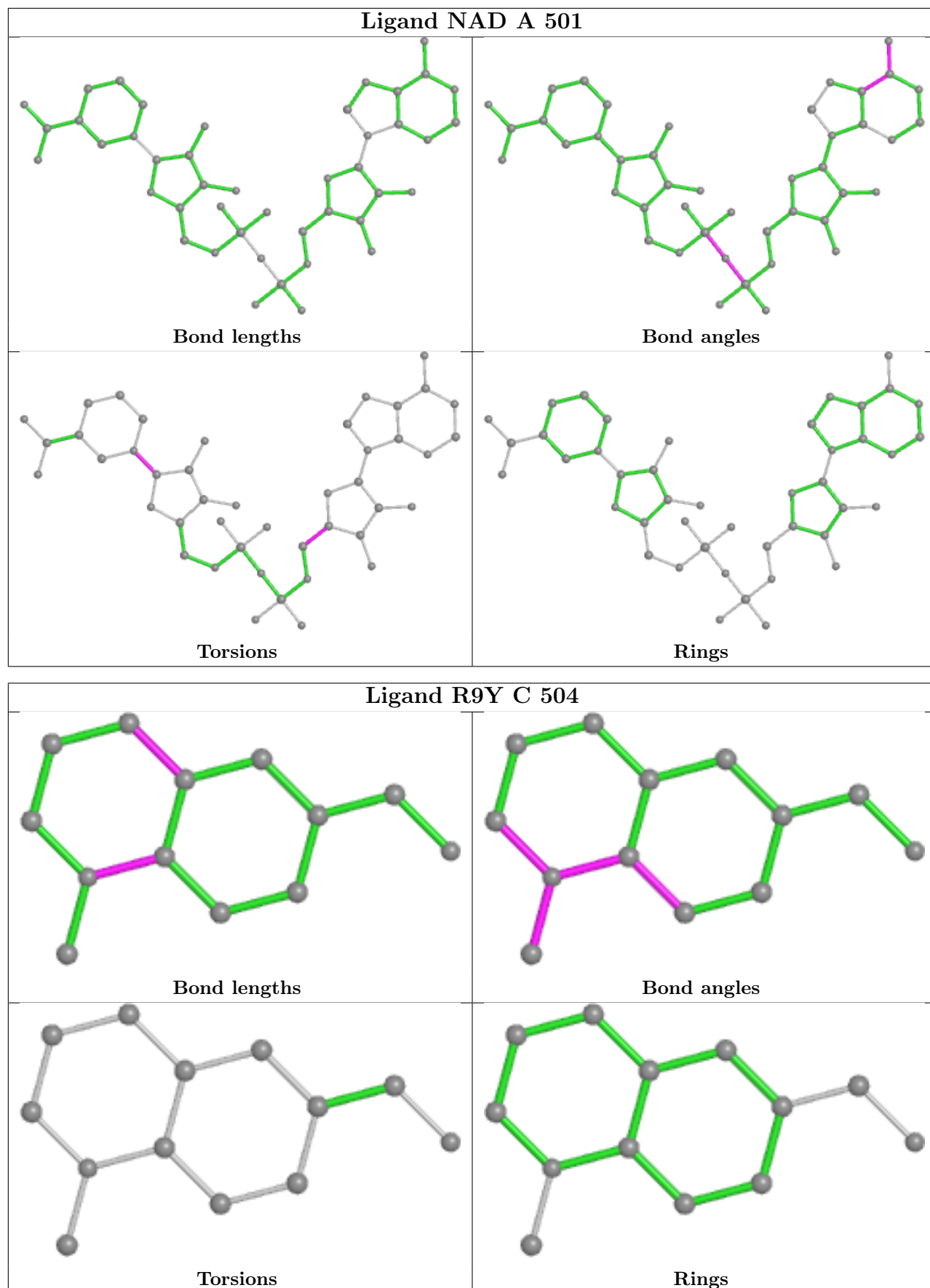
1 monomer is involved in 1 short contact:

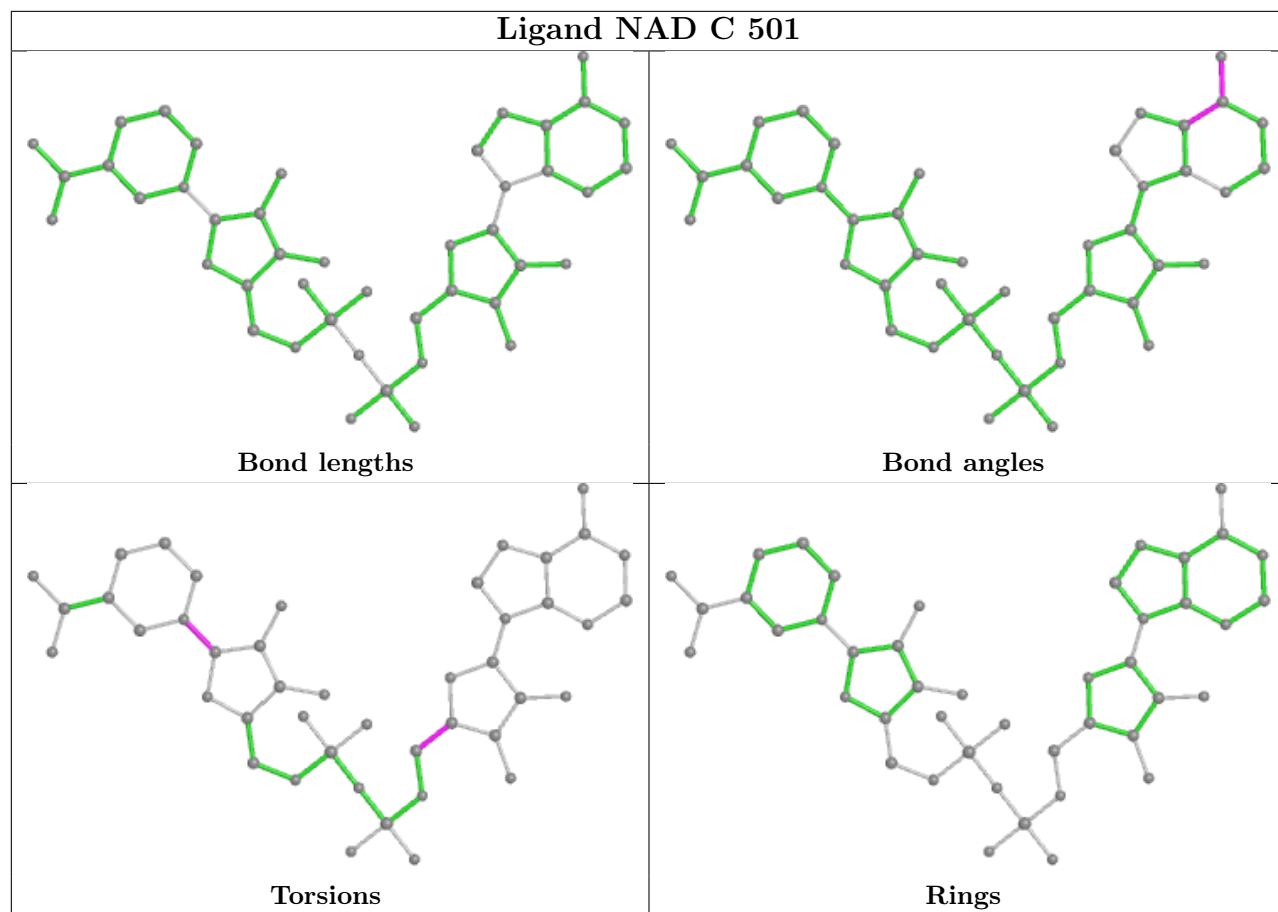
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	501	NAD	1	0

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









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	461/472 (97%)	0.55	53 (11%) 4 6	25, 35, 54, 79	0
1	B	461/472 (97%)	0.49	40 (8%) 10 12	23, 35, 53, 76	0
1	C	460/472 (97%)	0.50	36 (7%) 13 17	25, 36, 55, 80	0
1	D	461/472 (97%)	0.58	50 (10%) 5 7	24, 35, 55, 79	0
All	All	1843/1888 (97%)	0.53	179 (9%) 7 9	23, 35, 55, 80	0

All (179) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	412	ALA	5.1
1	D	355	ASP	4.6
1	A	355	ASP	4.6
1	C	355	ASP	4.4
1	C	412	ALA	4.4
1	A	415	ALA	4.4
1	A	232	VAL	4.3
1	D	357	PHE	4.2
1	C	409	LEU	4.2
1	C	335	LYS	4.2
1	A	265	PHE	4.2
1	B	9	GLY	4.1
1	B	411	ALA	4.1
1	C	356	GLY	3.9
1	A	129	GLN	3.8
1	D	354	LYS	3.8
1	A	9	GLY	3.7
1	D	358	ASP	3.6
1	A	240	LEU	3.6
1	A	357	PHE	3.5
1	B	240	LEU	3.5

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Mol	Chain	Res	Type	RSRZ
1	A	229	TYR	3.4
1	A	409	LEU	3.4
1	A	249	VAL	3.3
1	D	247	VAL	3.3
1	B	359	ALA	3.3
1	C	192	VAL	3.3
1	C	21	ALA	3.3
1	A	235	GLY	3.2
1	D	265	PHE	3.2
1	D	9	GLY	3.2
1	A	410	PRO	3.2
1	B	264	GLY	3.2
1	C	204[A]	ARG	3.2
1	B	219	LEU	3.2
1	D	356	GLY	3.1
1	D	335	LYS	3.1
1	A	204[A]	ARG	3.1
1	B	201	TYR	3.1
1	A	261	CYS	3.0
1	D	352	THR	3.0
1	A	354	LYS	3.0
1	A	260	ALA	3.0
1	B	355	ASP	3.0
1	B	335	LYS	3.0
1	D	338	ALA	3.0
1	D	336	ASN	3.0
1	D	127	ASP	3.0
1	D	229	TYR	3.0
1	B	10	PHE	3.0
1	B	353	GLY	3.0
1	C	219	LEU	2.9
1	A	359	ALA	2.9
1	B	258[A]	MET	2.9
1	C	10	PHE	2.8
1	A	356	GLY	2.8
1	B	247	VAL	2.8
1	B	218	LEU	2.8
1	D	153	GLN	2.8
1	A	234	LYS	2.8
1	C	265	PHE	2.8
1	C	276	ASN	2.7
1	D	240	LEU	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	219	LEU	2.7
1	D	192	VAL	2.7
1	A	207	LEU	2.7
1	C	218	LEU	2.7
1	B	232	VAL	2.6
1	C	129	GLN	2.6
1	C	279	THR	2.6
1	A	236	SER	2.6
1	C	331	ALA	2.6
1	D	128	GLY	2.6
1	A	262	MET	2.6
1	A	247	VAL	2.6
1	D	360	HIS	2.6
1	C	201	TYR	2.6
1	B	235	GLY	2.6
1	C	357	PHE	2.6
1	C	47	GLY	2.6
1	D	406	TYR	2.6
1	B	177	LYS	2.6
1	A	353	GLY	2.5
1	C	352	THR	2.5
1	A	237	SER	2.5
1	A	416	LYS	2.5
1	D	201	TYR	2.5
1	D	260	ALA	2.5
1	B	226	VAL	2.5
1	D	409	LEU	2.5
1	A	256	CYS	2.5
1	B	256	CYS	2.5
1	B	412	ALA	2.5
1	A	413	GLU	2.5
1	A	337	TRP	2.5
1	B	207	LEU	2.5
1	A	228	GLY	2.5
1	B	238	GLN	2.5
1	A	352	THR	2.5
1	B	357	PHE	2.5
1	D	411	ALA	2.4
1	D	232	VAL	2.4
1	B	352	THR	2.4
1	B	410	PRO	2.4
1	C	153[A]	GLN	2.4

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Mol	Chain	Res	Type	RSRZ
1	C	240	LEU	2.4
1	D	238	GLN	2.4
1	B	413	GLU	2.4
1	C	241	ARG	2.4
1	B	118	TRP	2.4
1	D	207	LEU	2.3
1	D	129	GLN	2.3
1	A	358	ASP	2.3
1	D	219	LEU	2.3
1	A	246	ILE	2.3
1	D	255	ILE	2.3
1	B	241	ARG	2.3
1	C	332	PHE	2.3
1	B	263	ASP	2.3
1	D	339	TRP	2.3
1	A	257	ALA	2.3
1	C	353	GLY	2.3
1	B	15	VAL	2.3
1	B	409	LEU	2.3
1	D	261	CYS	2.3
1	A	332	PHE	2.2
1	C	410	PRO	2.2
1	D	359	ALA	2.2
1	B	196[A]	LYS	2.2
1	D	237	SER	2.2
1	A	404	GLN	2.2
1	C	278	GLY	2.2
1	A	293	LEU	2.2
1	D	218	LEU	2.2
1	D	262	MET	2.2
1	C	408	ASP	2.2
1	D	362	ASP	2.2
1	A	255	ILE	2.2
1	C	354	LYS	2.2
1	A	238	GLN	2.2
1	A	241	ARG	2.2
1	C	238[A]	GLN	2.2
1	A	279	THR	2.2
1	A	151	TYR	2.2
1	A	408	ASP	2.2
1	A	321	ILE	2.2
1	B	11	THR	2.2

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Mol	Chain	Res	Type	RSRZ
1	D	150	LYS	2.2
1	B	354	LYS	2.1
1	D	177	LYS	2.1
1	B	244	GLY	2.1
1	D	11	THR	2.1
1	D	157	ARG	2.1
1	D	178	ASN	2.1
1	C	235	GLY	2.1
1	D	353	GLY	2.1
1	B	261	CYS	2.1
1	D	246	ILE	2.1
1	C	117	GLU	2.1
1	A	43	ARG	2.1
1	D	386	ILE	2.1
1	D	182	LYS	2.1
1	B	13	TYR	2.1
1	C	417	ARG	2.1
1	B	265	PHE	2.1
1	B	203	CYS	2.1
1	A	242	GLN	2.0
1	A	201	TYR	2.0
1	A	258[A]	MET	2.0
1	D	264	GLY	2.0
1	A	192	VAL	2.0
1	D	361	ASN	2.0
1	C	180	THR	2.0
1	D	241	ARG	2.0
1	A	153	GLN	2.0
1	C	232	VAL	2.0
1	D	226	VAL	2.0
1	C	155	LEU	2.0
1	B	127	ASP	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

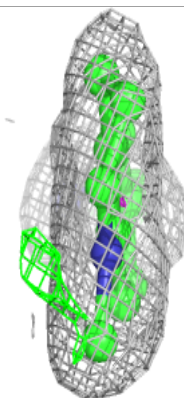
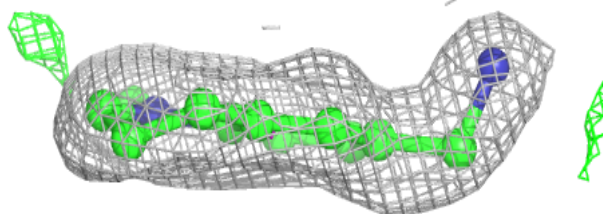
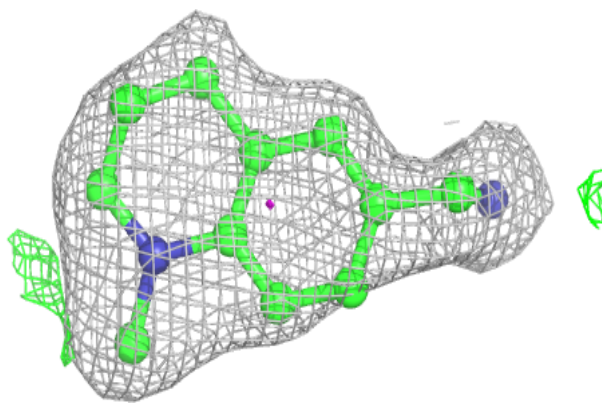
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	R9Y	C	504	13/13	0.77	0.15	44,46,58,58	0
4	R9Y	A	503	13/13	0.86	0.14	38,45,54,56	0
6	PO4	C	508	5/5	0.87	0.16	41,48,49,50	5
6	PO4	D	508	5/5	0.88	0.23	42,46,52,52	5
6	PO4	C	509	5/5	0.89	0.18	41,45,50,50	5
7	DMS	C	503	4/4	0.90	0.12	34,37,57,65	0
6	PO4	A	506	5/5	0.93	0.15	42,42,44,48	5
6	PO4	B	504	5/5	0.93	0.23	36,38,39,46	5
7	DMS	D	503	4/4	0.94	0.27	65,71,83,93	0
6	PO4	D	505	5/5	0.95	0.15	38,39,40,41	5
3	ADE	A	502	10/10	0.95	0.09	26,30,32,32	0
2	NAD	B	501	44/44	0.96	0.10	21,27,30,33	0
3	ADE	C	502	10/10	0.96	0.10	29,32,33,34	0
3	ADE	D	502	10/10	0.96	0.08	32,33,35,36	0
6	PO4	B	505	5/5	0.96	0.11	29,32,36,38	5
2	NAD	C	501	44/44	0.96	0.08	24,30,33,34	0
6	PO4	C	507	5/5	0.97	0.11	28,31,36,40	5
6	PO4	A	505	5/5	0.97	0.19	41,44,48,51	0
2	NAD	A	501	44/44	0.97	0.10	22,28,30,33	0
6	PO4	C	510	5/5	0.97	0.18	40,42,43,48	5
6	PO4	A	507	5/5	0.97	0.15	37,43,46,48	0
6	PO4	D	506	5/5	0.97	0.13	37,43,49,52	0
6	PO4	D	507	5/5	0.97	0.11	29,31,35,40	5
3	ADE	B	502	10/10	0.97	0.10	26,29,33,33	0
2	NAD	D	501	44/44	0.97	0.09	22,29,32,34	0
6	PO4	C	506	5/5	0.97	0.09	33,38,40,41	5
6	PO4	A	508	5/5	0.98	0.12	26,30,34,36	5
5	K	C	505	1/1	0.99	0.13	29,29,29,29	0
5	K	A	504	1/1	0.99	0.11	29,29,29,29	0
5	K	D	504	1/1	1.00	0.15	28,28,28,28	0
5	K	B	503	1/1	1.00	0.11	29,29,29,29	0

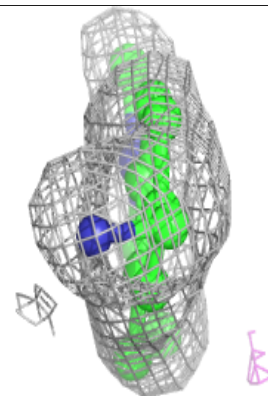
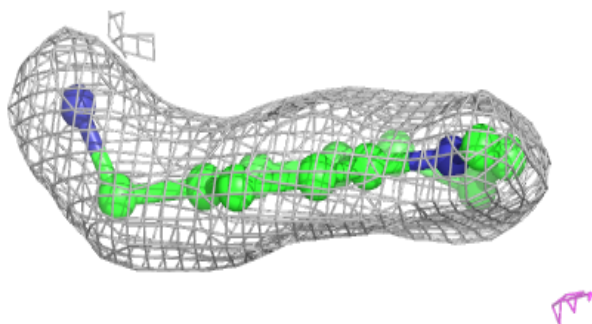
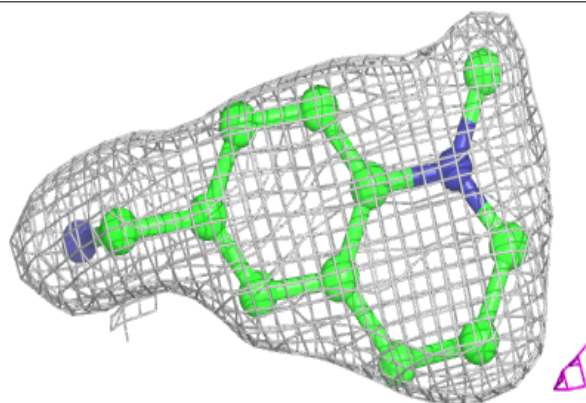
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around R9Y C 504:

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

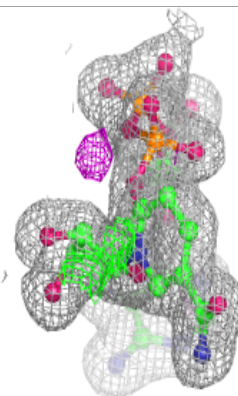
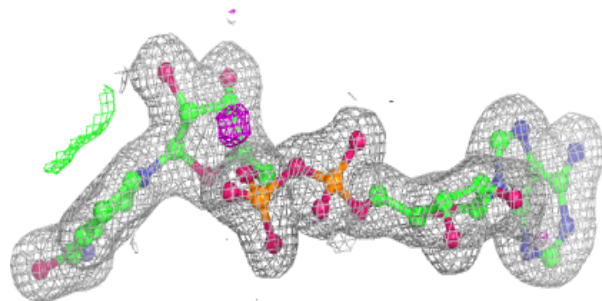
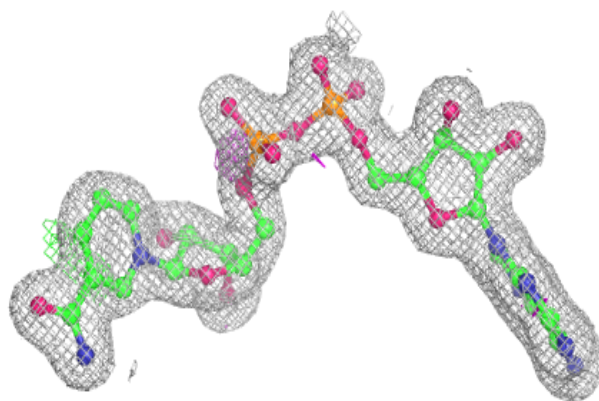
**Electron density around R9Y A 503:**

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

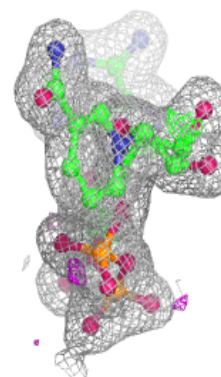
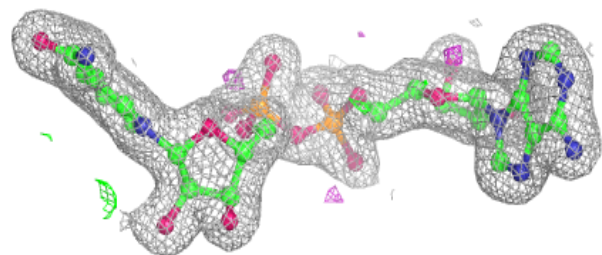
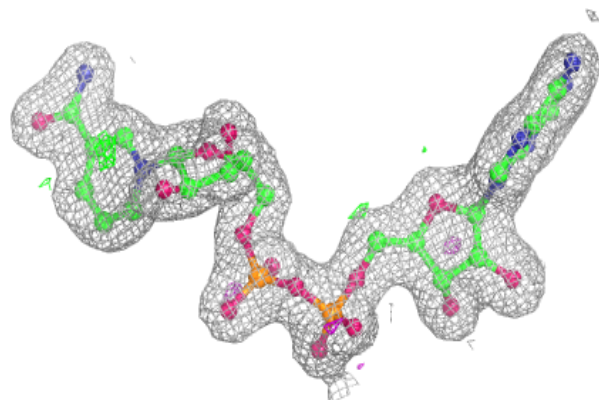


Electron density around NAD B 501:

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

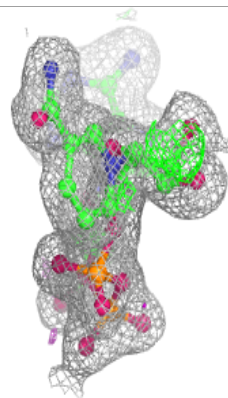
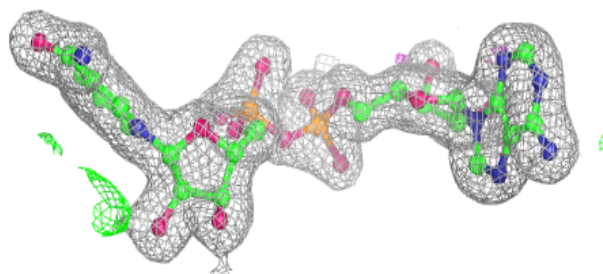
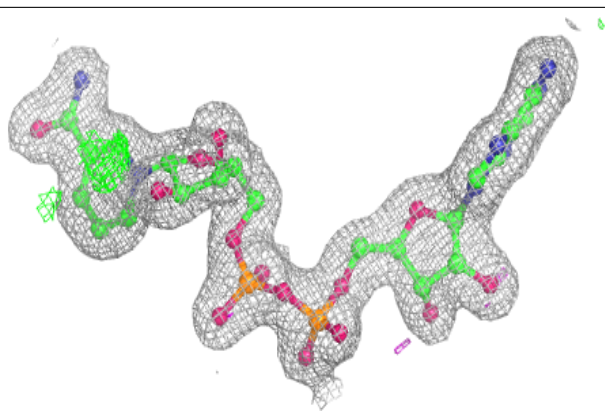
**Electron density around NAD C 501:**

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

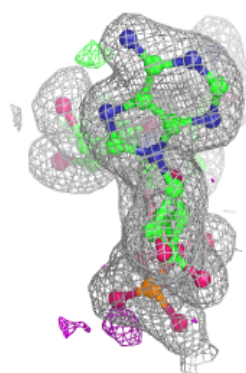
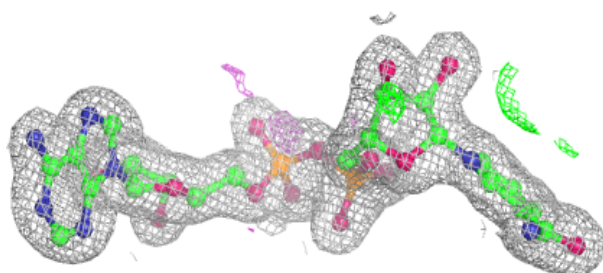
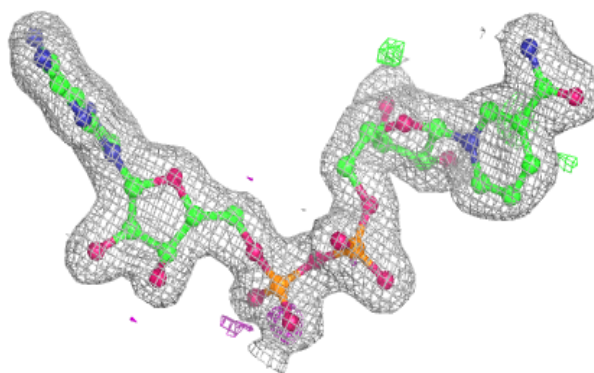


Electron density around NAD A 501:

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

**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)



6.5 Other polymers [i](#)

There are no such residues in this entry.