



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 14, 2026 – 02:56 PM UTC

PDB ID : 7O5M / pdb_00007o5m
Title : Crystal structure of S-adenosyl-L-homocysteine hydrolase from *Synechocystis* sp. PCC 6803 cocrystallized with adenosine in the presence of Na⁺ cations
Authors : Malecki, P.H.; Imiolczyk, B.; Barciszewski, J.; Czyrko-Horczak, J.; Brzezinski, K.
Deposited on : 2021-04-08
Resolution : 2.20 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

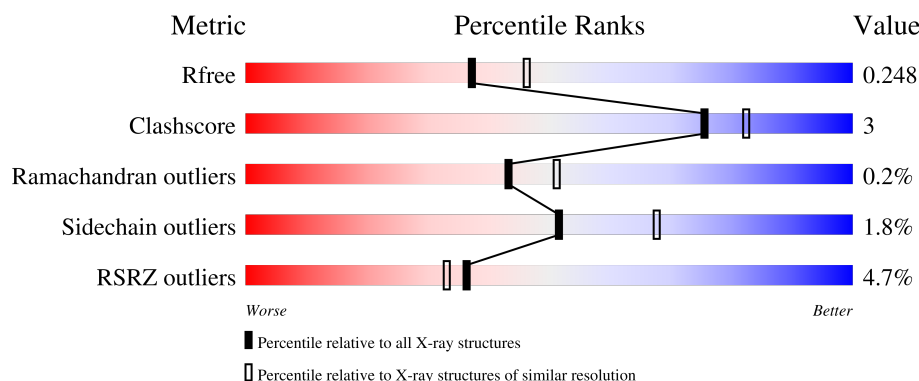
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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	6164 (2.20-2.20)
Clashscore	190562	6851 (2.20-2.20)
Ramachandran outliers	187476	6768 (2.20-2.20)
Sidechain outliers	187428	6769 (2.20-2.20)
RSRZ outliers	180081	6166 (2.20-2.20)

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	425	
1	C	425	

2 Entry composition [i](#)

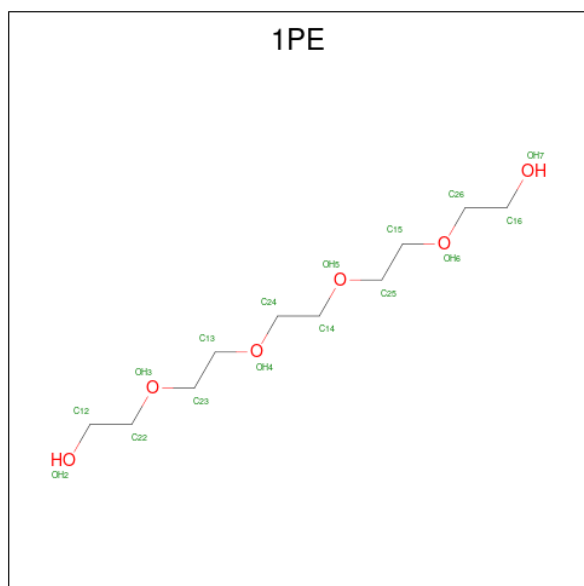
There are 6 unique types of molecules in this entry. The entry contains 6957 atoms, of which 0 are hydrogens and 0 are deuteriums.

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.

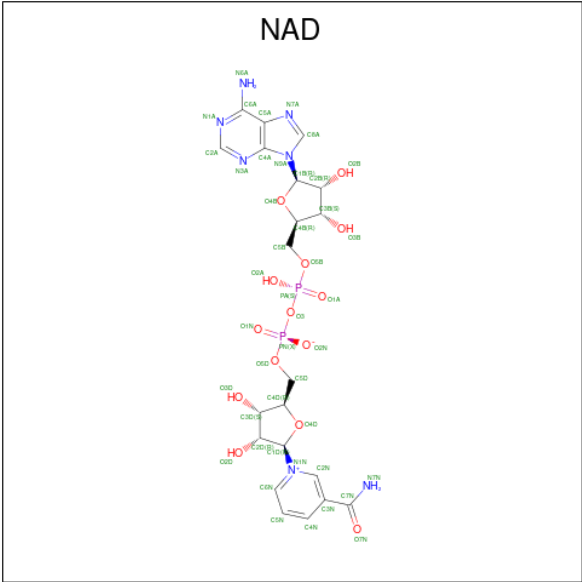
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	414	Total	C	N	O	S	0	1	0
			3175	1993	560	603	19			
1	C	413	Total	C	N	O	S	0	0	0
			3159	1984	555	601	19			

- Molecule 2 is PENTAETHYLENE GLYCOL (CCD ID: 1PE) (formula: $C_{10}H_{22}O_6$).



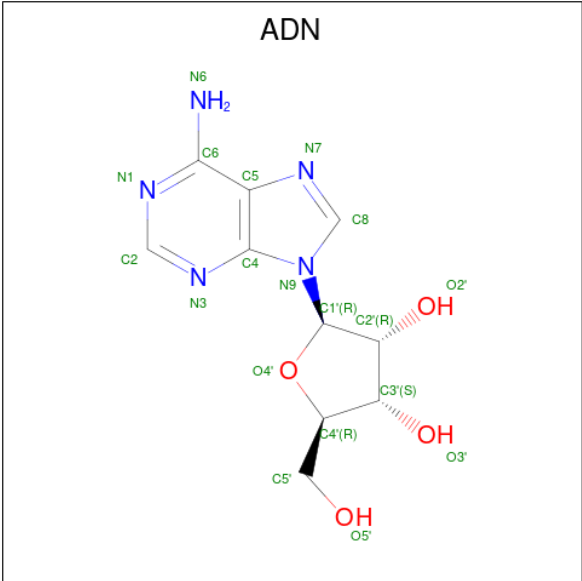
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			16	10	6		

- Molecule 3 is NICOTINAMIDE-ADENINE-DINUCLEOTIDE (CCD ID: NAD) (formula: $C_{21}H_{27}N_7O_{14}P_2$) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 4 is ADENOSINE (CCD ID: ADN) (formula: C₁₀H₁₃N₅O₄) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			19	10	5	4		

- Molecule 5 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total 2	Cl 2	0	1
5	C	1	Total 1	Cl 1	0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	303	Total 309	O 309	0	12
6	C	186	Total 188	O 188	0	3

4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	120.77Å 197.13Å 82.23Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	42.27 – 2.20 42.27 – 2.20	Depositor EDS
% Data completeness (in resolution range)	93.3 (42.27-2.20) 93.4 (42.27-2.20)	Depositor EDS
R_{merge}	0.22	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.22 (at 2.20Å)	Xtriage
Refinement program	PHENIX 1.19	Depositor
R, R_{free}	0.192 , 0.249 0.193 , 0.248	Depositor DCC
R_{free} test set	1033 reflections (2.20%)	wwPDB-VP
Wilson B-factor (Å ²)	22.6	Xtriage
Anisotropy	0.448	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 42.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.000 for 1/2*h-1/2*k,-3/2*h-1/2*k,-l 0.013 for 1/2*h+1/2*k,3/2*h-1/2*k,-l	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	6957	wwPDB-VP
Average B, all atoms (Å ²)	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.72% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CL, ADN, NAD, 1PE

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	0.24	0/3230	0.43	0/4379
1	C	0.22	0/3214	0.41	0/4358
All	All	0.23	0/6444	0.42	0/8737

There are no bond length outliers.

There are no bond angle outliers.

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	3175	0	3172	13	0
1	C	3159	0	3155	25	0
2	A	16	0	22	1	0
3	A	44	0	26	3	0
3	C	44	0	26	2	0
4	A	19	0	13	1	0
5	A	2	0	0	0	0
5	C	1	0	0	0	0
6	A	309	0	0	1	0
6	C	188	0	0	0	0
All	All	6957	0	6414	39	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 3.

All (39) 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:39:ARG:HG3	1:C:69:ALA:HA	1.69	0.75
1:C:153:GLY:HA3	1:C:373:LEU:HD22	1.72	0.72
3:A:502:NAD:C4N	4:A:503:ADN:H3'	2.29	0.63
1:A:153:GLY:HA3	1:A:373:LEU:HD22	1.86	0.57
1:A:64:ALA:O	1:A:68:ILE:HG12	2.05	0.56
1:C:345:LEU:HD12	1:C:345:LEU:H	1.71	0.54
1:C:390:GLU:CD	1:C:390:GLU:H	2.16	0.52
1:A:104:TYR:HB3	1:A:117:HIS:CD2	2.46	0.51
1:A:32:MET:HA	1:A:360:ASP:CG	2.37	0.50
1:C:167:ALA:O	1:C:171:ASP:HB2	2.12	0.49
1:C:363:PHE:HA	1:C:366:GLN:HB2	1.94	0.49
1:C:39:ARG:HH21	1:C:40:GLU:HG3	1.77	0.48
1:A:210:ILE:HD11	1:A:215:LYS:HE2	1.95	0.48
1:C:152:ILE:HD12	1:C:377:LYS:HG3	1.94	0.48
1:C:302:HIS:O	1:C:345:LEU:HD11	2.14	0.48
1:A:152:ILE:HD11	2:A:501:1PE:H261	1.95	0.48
1:C:156:GLU:CD	1:C:161:GLY:HA3	2.42	0.45
1:A:192:ASN:O	1:A:225:CYS:HA	2.15	0.45
1:C:345:LEU:HD23	3:C:501:NAD:N7N	2.32	0.45
1:C:279:ASN:O	1:C:306:GLU:HG2	2.17	0.45
1:C:81:ALA:HB2	1:C:105:ALA:HB1	1.99	0.44
1:A:279:ASN:ND2	3:A:502:NAD:N7A	2.65	0.44
1:A:52:ARG:NH2	6:A:614:HOH:O	2.50	0.44
1:C:32:MET:HA	1:C:360:ASP:CG	2.42	0.44
1:C:301:GLY:HA3	1:C:306:GLU:OE2	2.17	0.44
1:A:144:ARG:HB3	1:A:147:GLN:HB2	2.00	0.43
1:C:186:THR:HA	1:C:190:TYR:CE2	2.52	0.43
1:C:13:LYS:HB2	1:C:106:ILE:HG23	2.01	0.43
1:C:162:ILE:O	1:C:166:ARG:HG3	2.19	0.42
1:C:220:ALA:HB3	1:C:275:THR:HA	2.01	0.42
1:A:182:ASN:HA	1:A:187:LYS:HD2	2.02	0.42
1:A:223:GLY:HA3	3:A:502:NAD:O5B	2.21	0.41
1:A:156:GLU:CD	1:A:161:GLY:HA3	2.45	0.41
1:C:125:ARG:NE	1:C:150:ASP:OD2	2.52	0.41
1:C:9:LYS:HD2	1:C:10:TYR:CE2	2.56	0.41
1:C:285:PRO:HG3	1:C:311:SER:CB	2.51	0.41
1:C:58:HIS:CE1	1:C:348:LEU:HD13	2.55	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:223:GLY:HA3	3:C:501:NAD:O5B	2.21	0.40
1:C:9:LYS:HG3	1:C:10:TYR:N	2.36	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	413/425 (97%)	400 (97%)	12 (3%)	1 (0%)	43	51
1	C	411/425 (97%)	395 (96%)	15 (4%)	1 (0%)	43	51
All	All	824/850 (97%)	795 (96%)	27 (3%)	2 (0%)	43	51

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	345	LEU
1	A	345	LEU

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	336/344 (98%)	331 (98%)	5 (2%)	57	73
1	C	335/344 (97%)	328 (98%)	7 (2%)	47	63

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	671/688 (98%)	659 (98%)	12 (2%)	51 68

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	134	SER
1	A	149	SER
1	A	171	ASP
1	A	276	VAL
1	A	300	SER
1	C	22	ARG
1	C	40	GLU
1	C	171	ASP
1	C	300	SER
1	C	323	ARG
1	C	386	SER
1	C	390	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	C	324	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 7 ligands modelled in this entry, 3 are monoatomic - leaving 4 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	A	502	-	46,48,48	0.36	0	64,73,73	0.54	0
4	ADN	A	503	-	21,21,21	0.24	0	31,31,31	0.50	0
2	1PE	A	501	-	15,15,15	0.18	0	14,14,14	0.07	0
3	NAD	C	501	-	46,48,48	0.34	0	64,73,73	0.47	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAD	A	502	-	-	5/30/62/62	0/5/5/5
4	ADN	A	503	-	-	1/6/22/22	0/3/3/3
2	1PE	A	501	-	-	6/13/13/13	-
3	NAD	C	501	-	-	4/30/62/62	0/5/5/5

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (16) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	502	NAD	O4D-C1D-N1N-C2N
3	A	502	NAD	O4D-C1D-N1N-C6N
3	A	502	NAD	C2D-C1D-N1N-C2N
3	A	502	NAD	C2D-C1D-N1N-C6N
3	C	501	NAD	O4D-C1D-N1N-C2N
3	C	501	NAD	O4D-C1D-N1N-C6N
3	C	501	NAD	C2D-C1D-N1N-C2N
3	C	501	NAD	C2D-C1D-N1N-C6N
2	A	501	1PE	OH5-C14-C24-OH4
2	A	501	1PE	OH4-C13-C23-OH3

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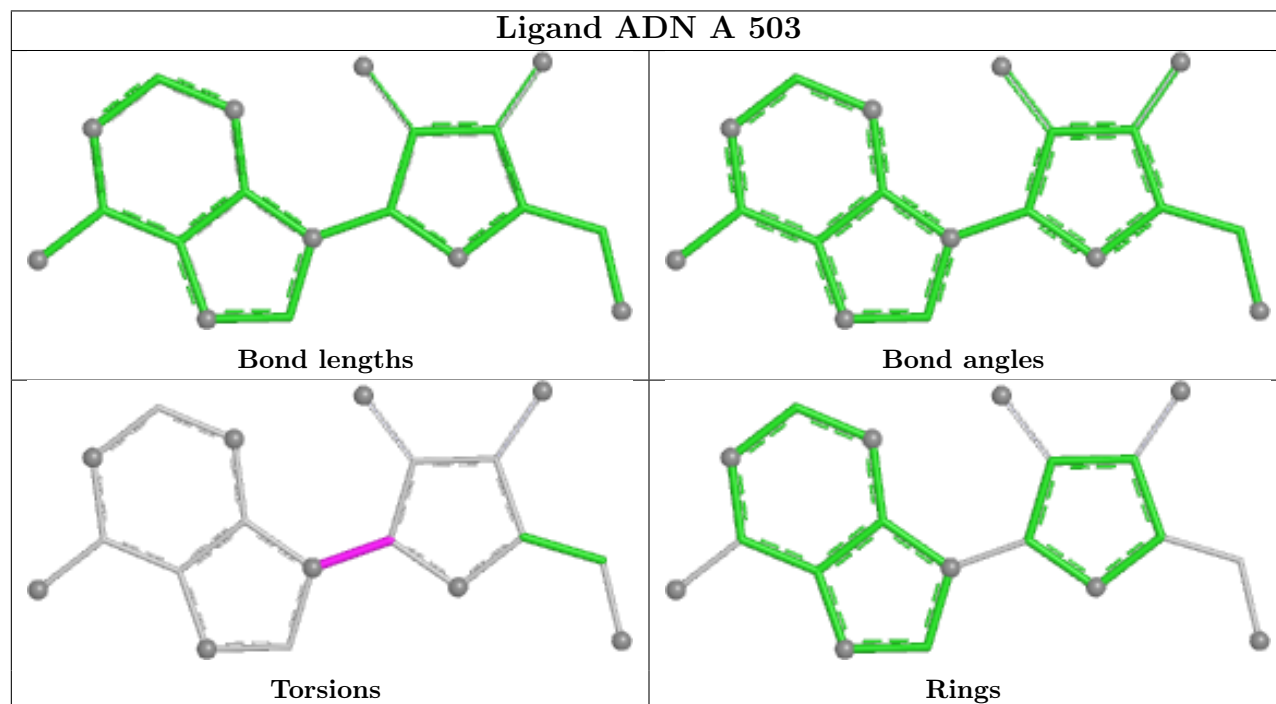
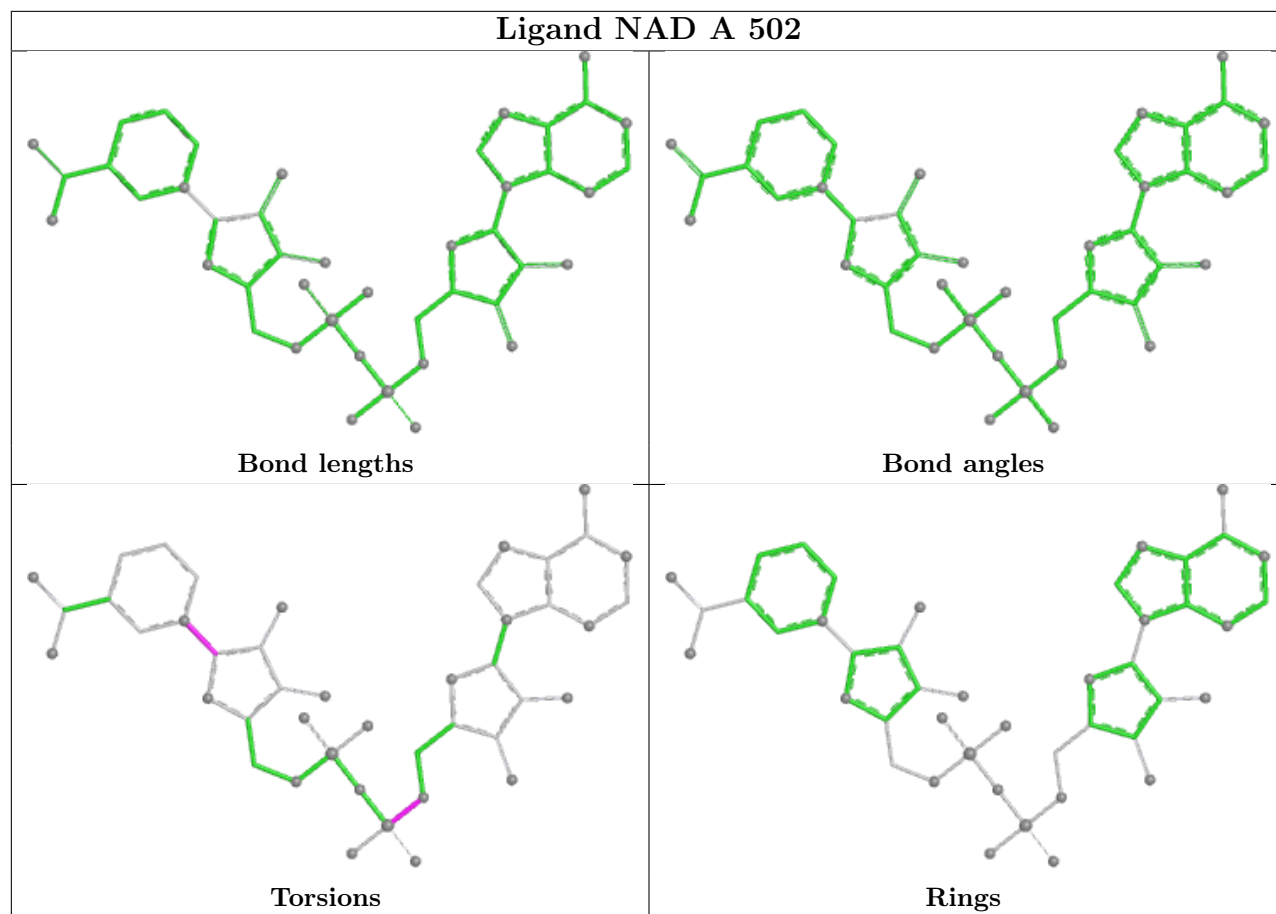
Mol	Chain	Res	Type	Atoms
2	A	501	1PE	C24-C14-OH5-C25
2	A	501	1PE	C23-C13-OH4-C24
2	A	501	1PE	C16-C26-OH6-C15
3	A	502	NAD	C5B-O5B-PA-O1A
2	A	501	1PE	C15-C25-OH5-C14
4	A	503	ADN	C2'-C1'-N9-C8

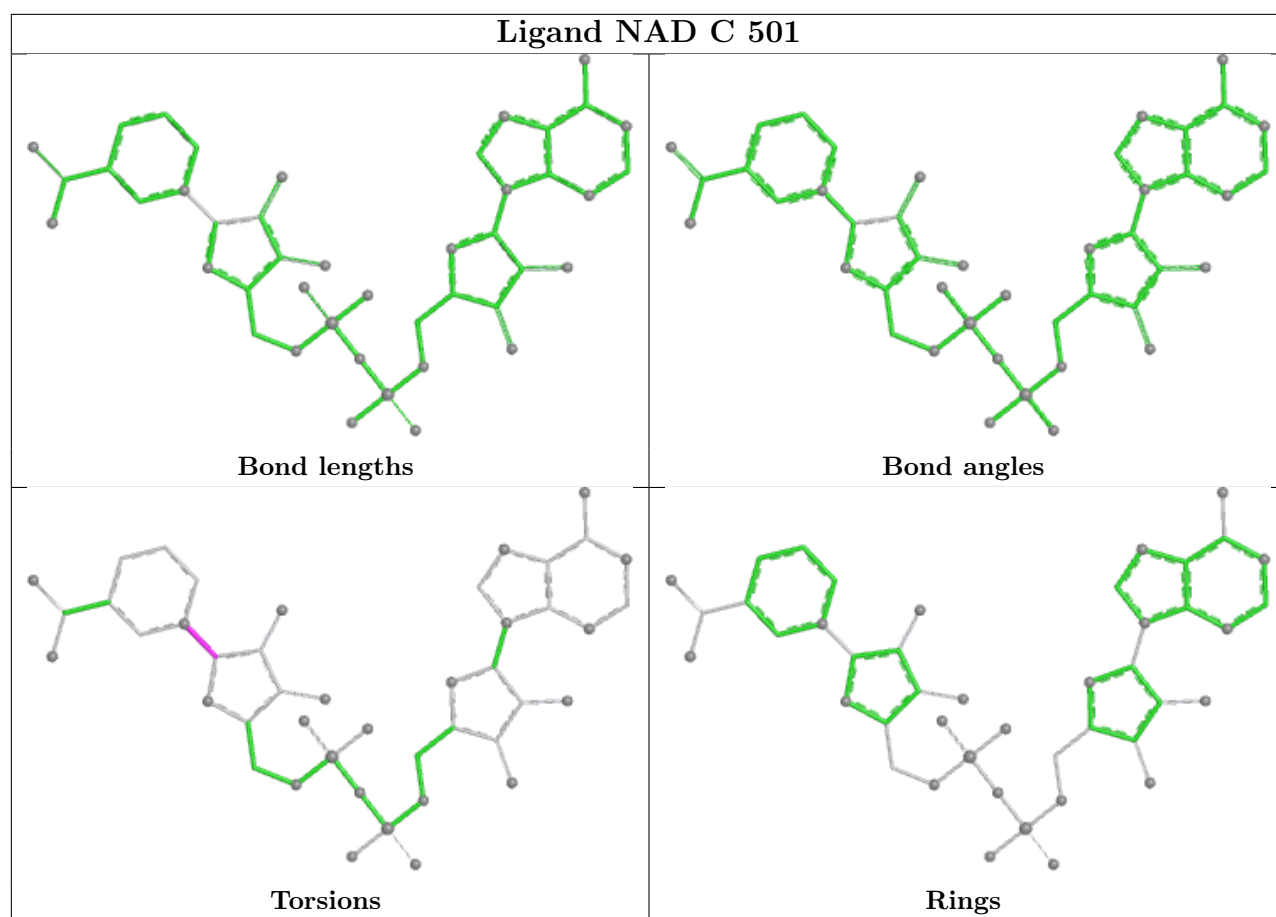
There are no ring outliers.

4 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	502	NAD	3	0
4	A	503	ADN	1	0
2	A	501	1PE	1	0
3	C	501	NAD	2	0

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





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [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	414/425 (97%)	-0.40	0	100 100	10, 22, 35, 51	1 (0%)
1	C	413/425 (97%)	0.49	39 (9%)	14 11	13, 35, 60, 85	0
All	All	827/850 (97%)	0.04	39 (4%)	36 33	10, 24, 55, 85	1 (0%)

All (39) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	118	VAL	4.2
1	C	96	VAL	4.1
1	C	99	TYR	3.5
1	C	18	ALA	3.3
1	C	302	HIS	3.2
1	C	114	TYR	3.1
1	C	126	PRO	3.1
1	C	108	GLY	3.1
1	C	28	ALA	3.0
1	C	121	ALA	2.9
1	C	22	ARG	2.9
1	C	122	LEU	2.8
1	C	103	VAL	2.8
1	C	70	LEU	2.8
1	C	21	GLY	2.7
1	C	111	ASN	2.6
1	C	176	PHE	2.6
1	C	100	GLY	2.6
1	C	51	ILE	2.5
1	C	71	HIS	2.5
1	C	373	LEU	2.5
1	C	15	ILE	2.5
1	C	169	PHE	2.4
1	C	145	GLN	2.4

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Mol	Chain	Res	Type	RSRZ
1	C	120	ILE	2.4
1	C	101	ILE	2.4
1	C	44	GLN	2.4
1	C	151	ILE	2.3
1	C	38	ILE	2.3
1	C	369	ALA	2.3
1	C	370	CYS	2.2
1	C	95	LEU	2.2
1	C	43	ALA	2.1
1	C	148	LEU	2.1
1	C	162	ILE	2.1
1	C	58	HIS	2.0
1	C	368	LEU	2.0
1	C	152	ILE	2.0
1	C	48	PHE	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 oligosaccharides in this entry.

6.4 Ligands [i](#)

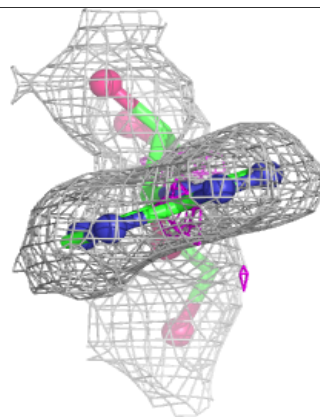
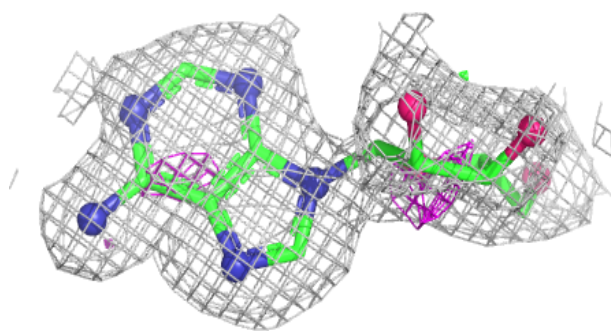
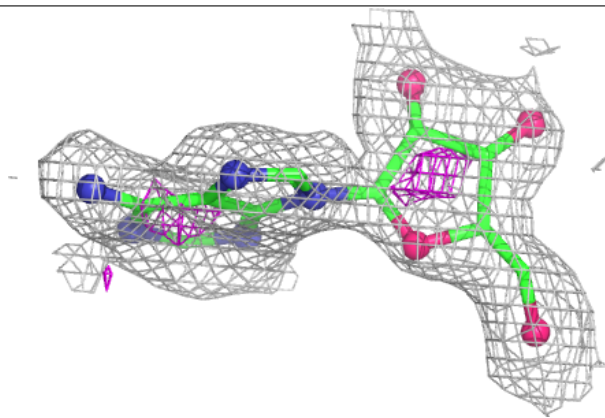
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q < 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	1PE	A	501	16/16	0.81	0.14	29,35,41,42	16
5	CL	C	502	1/1	0.84	0.18	65,65,65,65	0
4	ADN	A	503	19/19	0.90	0.11	14,25,35,36	0
5	CL	A	504[B]	1/1	0.93	0.25	26,26,26,26	1
5	CL	A	504[A]	1/1	0.93	0.25	39,39,39,39	1
3	NAD	A	502	44/44	0.97	0.06	11,18,23,24	0
3	NAD	C	501	44/44	0.97	0.06	11,19,23,27	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.

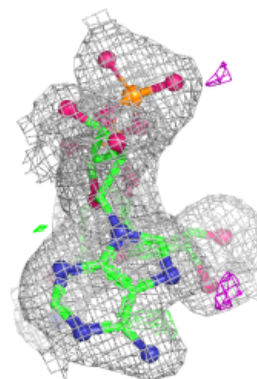
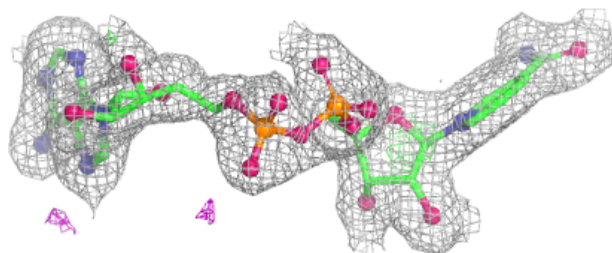
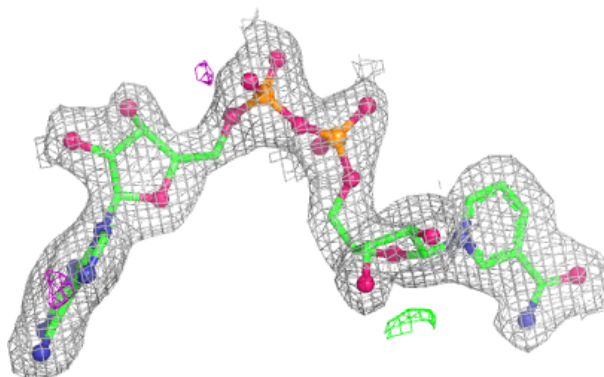
Electron density around ADN A 503:

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

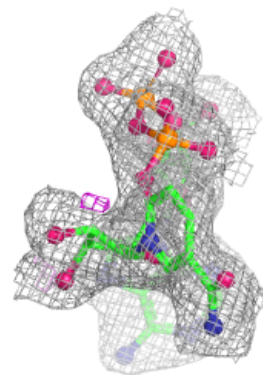
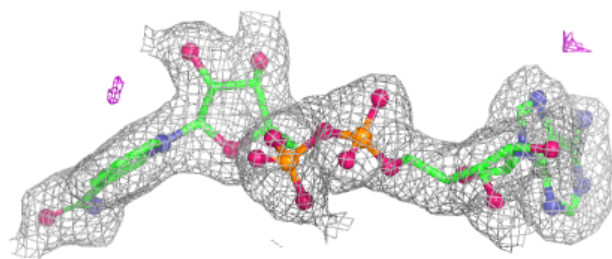
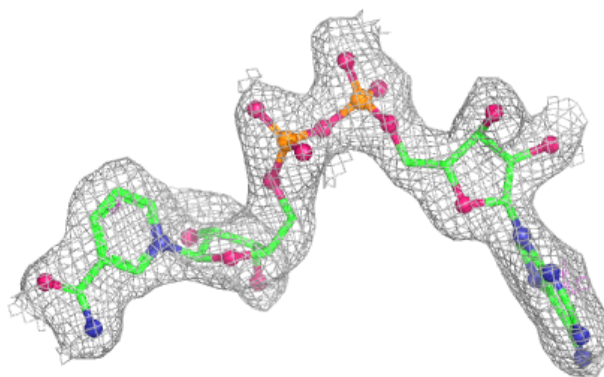


Electron density around NAD A 502:

$2mF_o-DF_c$ (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)



6.5 Other polymers [i](#)

There are no such residues in this entry.