Full wwPDB X-ray Structure Validation Report ⓘ

Oct 6, 2026 – 07:28 pm BST

PDB ID	:	9QIQ / pdb_00009qiq
Title	:	Crystal Structure of human MLH3 N-terminal domain C320S with AMP-PNP
Authors	:	Thomsen, M.; Ganichkin, O.; Thieulin-Pardo, G.; Bandera, A.M.; Boudet, J.; Finley, M.; Felsenfeld, D.; Haque, T.; Prasad, B.C.; Monteagudo, E.; Vogt, T.; Stamford, A.
Deposited on	:	2025-03-17
Resolution	:	2.14 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:

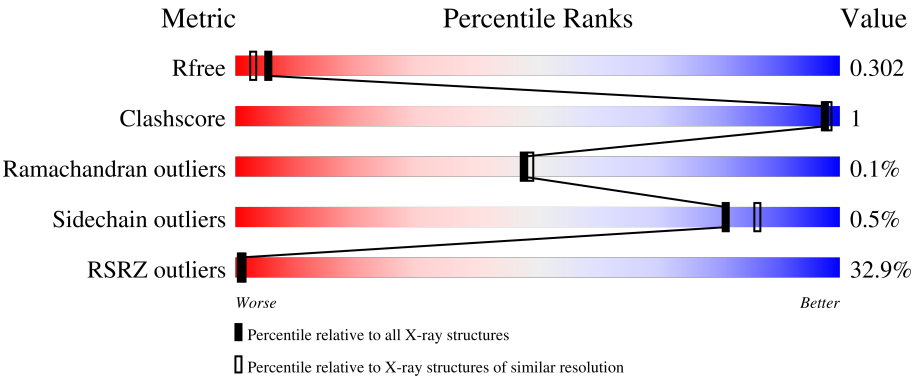
MolProbity	:	4-5-2 with Phenix2.2
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	2.2
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.51

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.14 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	3689 (2.16-2.12)
Clashscore	190562	3812 (2.16-2.12)
Ramachandran outliers	187476	3773 (2.16-2.12)
Sidechain outliers	187428	3772 (2.16-2.12)
RSRZ outliers	180081	3691 (2.16-2.12)

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 <=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	360	31% 96%
1	B	360	36% 94%
1	C	360	32% 98%
1	D	360	28% 92%

2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 11686 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 DNA mismatch repair protein Mlh3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	351	Total	C	N	O	S	102	2	0
			2823	1797	482	523	21			
1	B	349	Total	C	N	O	S	102	5	0
			2820	1796	473	528	23			
1	C	357	Total	C	N	O	S	89	1	0
			2856	1816	485	532	23			
1	D	346	Total	C	N	O	S	75	5	0
			2794	1777	472	522	23			

There are 96 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	expression tag	UNP Q9UHC1
A	0	SER	-	expression tag	UNP Q9UHC1
A	?	-	LYS	deletion	UNP Q9UHC1
A	?	-	PRO	deletion	UNP Q9UHC1
A	?	-	LYS	deletion	UNP Q9UHC1
A	?	-	ASN	deletion	UNP Q9UHC1
A	?	-	GLY	deletion	UNP Q9UHC1
A	?	-	PRO	deletion	UNP Q9UHC1
A	?	-	THR	deletion	UNP Q9UHC1
A	?	-	SER	deletion	UNP Q9UHC1
A	?	-	ARG	deletion	UNP Q9UHC1
A	?	-	GLN	deletion	UNP Q9UHC1
A	?	-	MET	deletion	UNP Q9UHC1
A	?	-	ASN	deletion	UNP Q9UHC1
A	?	-	SER	deletion	UNP Q9UHC1
A	?	-	SER	deletion	UNP Q9UHC1
A	?	-	LEU	deletion	UNP Q9UHC1
A	?	-	ARG	deletion	UNP Q9UHC1
A	?	-	HIS	deletion	UNP Q9UHC1
A	?	-	ARG	deletion	UNP Q9UHC1
A	?	-	SER	deletion	UNP Q9UHC1

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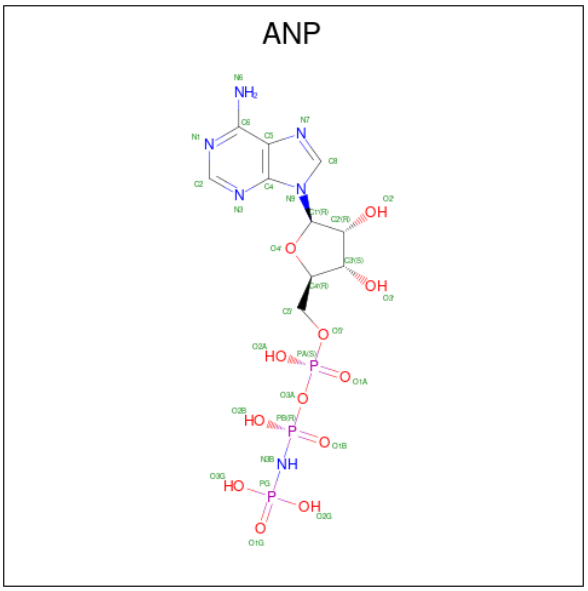
Chain	Residue	Modelled	Actual	Comment	Reference
A	280	GLY	THR	conflict	UNP Q9UHC1
A	300	GLY	PRO	conflict	UNP Q9UHC1
A	320	SER	CYS	engineered mutation	UNP Q9UHC1
B	-1	GLY	-	expression tag	UNP Q9UHC1
B	0	SER	-	expression tag	UNP Q9UHC1
B	?	-	LYS	deletion	UNP Q9UHC1
B	?	-	PRO	deletion	UNP Q9UHC1
B	?	-	LYS	deletion	UNP Q9UHC1
B	?	-	ASN	deletion	UNP Q9UHC1
B	?	-	GLY	deletion	UNP Q9UHC1
B	?	-	PRO	deletion	UNP Q9UHC1
B	?	-	THR	deletion	UNP Q9UHC1
B	?	-	SER	deletion	UNP Q9UHC1
B	?	-	ARG	deletion	UNP Q9UHC1
B	?	-	GLN	deletion	UNP Q9UHC1
B	?	-	MET	deletion	UNP Q9UHC1
B	?	-	ASN	deletion	UNP Q9UHC1
B	?	-	SER	deletion	UNP Q9UHC1
B	?	-	SER	deletion	UNP Q9UHC1
B	?	-	LEU	deletion	UNP Q9UHC1
B	?	-	ARG	deletion	UNP Q9UHC1
B	?	-	HIS	deletion	UNP Q9UHC1
B	?	-	ARG	deletion	UNP Q9UHC1
B	?	-	SER	deletion	UNP Q9UHC1
B	280	GLY	THR	conflict	UNP Q9UHC1
B	281	GLY	PRO	conflict	UNP Q9UHC1
B	320	SER	CYS	engineered mutation	UNP Q9UHC1
C	-1	GLY	-	expression tag	UNP Q9UHC1
C	0	SER	-	expression tag	UNP Q9UHC1
C	?	-	LYS	deletion	UNP Q9UHC1
C	?	-	PRO	deletion	UNP Q9UHC1
C	?	-	LYS	deletion	UNP Q9UHC1
C	?	-	ASN	deletion	UNP Q9UHC1
C	?	-	GLY	deletion	UNP Q9UHC1
C	?	-	PRO	deletion	UNP Q9UHC1
C	?	-	THR	deletion	UNP Q9UHC1
C	?	-	SER	deletion	UNP Q9UHC1
C	?	-	ARG	deletion	UNP Q9UHC1
C	?	-	GLN	deletion	UNP Q9UHC1
C	?	-	MET	deletion	UNP Q9UHC1
C	?	-	ASN	deletion	UNP Q9UHC1
C	?	-	SER	deletion	UNP Q9UHC1

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Chain	Residue	Modelled	Actual	Comment	Reference
C	?	-	SER	deletion	UNP Q9UHC1
C	?	-	LEU	deletion	UNP Q9UHC1
C	?	-	ARG	deletion	UNP Q9UHC1
C	?	-	HIS	deletion	UNP Q9UHC1
C	?	-	ARG	deletion	UNP Q9UHC1
C	?	-	SER	deletion	UNP Q9UHC1
C	280	GLY	THR	conflict	UNP Q9UHC1
C	281	GLY	PRO	conflict	UNP Q9UHC1
C	320	SER	CYS	engineered mutation	UNP Q9UHC1
D	-1	GLY	-	expression tag	UNP Q9UHC1
D	0	SER	-	expression tag	UNP Q9UHC1
D	?	-	LYS	deletion	UNP Q9UHC1
D	?	-	PRO	deletion	UNP Q9UHC1
D	?	-	LYS	deletion	UNP Q9UHC1
D	?	-	ASN	deletion	UNP Q9UHC1
D	?	-	GLY	deletion	UNP Q9UHC1
D	?	-	PRO	deletion	UNP Q9UHC1
D	?	-	THR	deletion	UNP Q9UHC1
D	?	-	SER	deletion	UNP Q9UHC1
D	?	-	ARG	deletion	UNP Q9UHC1
D	?	-	GLN	deletion	UNP Q9UHC1
D	?	-	MET	deletion	UNP Q9UHC1
D	?	-	ASN	deletion	UNP Q9UHC1
D	?	-	SER	deletion	UNP Q9UHC1
D	?	-	SER	deletion	UNP Q9UHC1
D	?	-	LEU	deletion	UNP Q9UHC1
D	?	-	ARG	deletion	UNP Q9UHC1
D	?	-	HIS	deletion	UNP Q9UHC1
D	?	-	ARG	deletion	UNP Q9UHC1
D	?	-	SER	deletion	UNP Q9UHC1
D	280	GLY	THR	conflict	UNP Q9UHC1
D	281	GLY	PRO	conflict	UNP Q9UHC1
D	320	SER	CYS	engineered mutation	UNP Q9UHC1

- Molecule 2 is PHOSPHOAMINOPHOSPHONIC ACID-ADENYLATE ESTER (CCD ID: ANP) (formula: $C_{10}H_{17}N_6O_{12}P_3$) (labeled as "Ligand of Interest" by depositor).

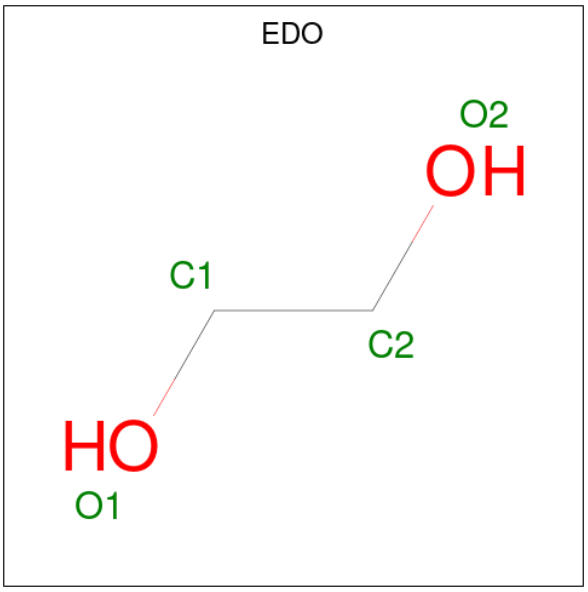


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			31	10	6	12	3		
2	B	1	Total	C	N	O	P	0	0
			31	10	6	12	3		
2	C	1	Total	C	N	O	P	0	0
			31	10	6	12	3		
2	D	1	Total	C	N	O	P	0	0
			31	10	6	12	3		

- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Mg	0	0
			1	1		
3	B	1	Total	Mg	0	0
			1	1		
3	C	1	Total	Mg	0	0
			1	1		
3	D	1	Total	Mg	0	0
			1	1		

- Molecule 4 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: $C_2H_6O_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	1	Total C O 4 2 2	0	0

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

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	B	1	Total Cl 1 1	0	0

- Molecule 6 is water.

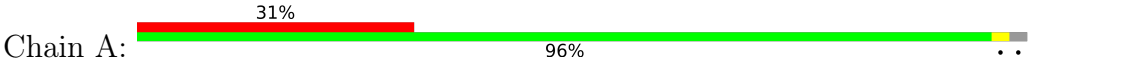
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	67	Total O 67 67	0	0
6	B	69	Total O 69 69	0	0
6	C	60	Total O 60 60	0	0
6	D	64	Total O 64 64	0	0

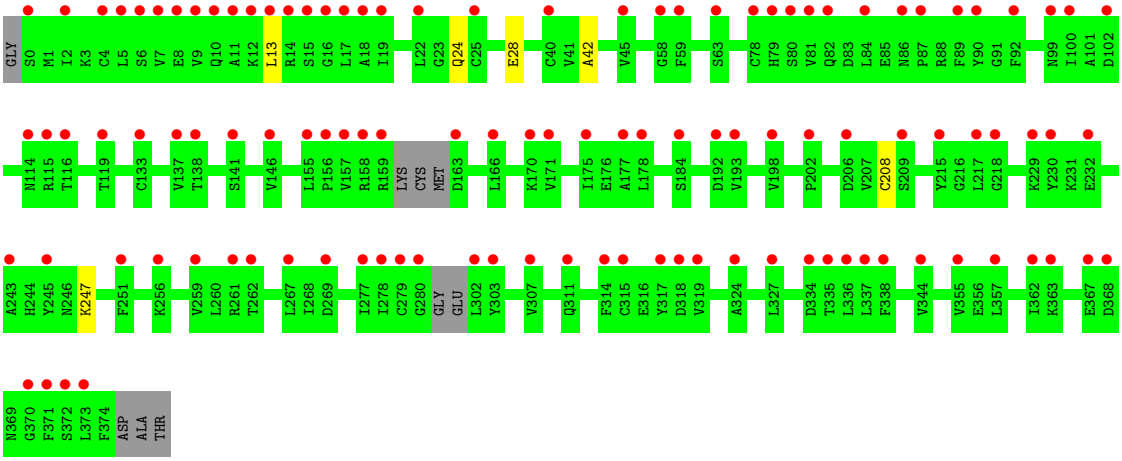
3 Residue-property plots (i)

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

• Molecule 1: DNA mismatch repair protein Mlh3

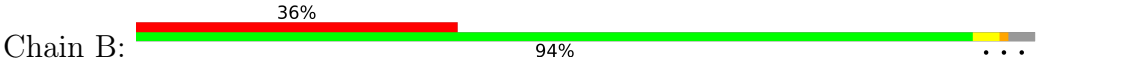
Chain A:

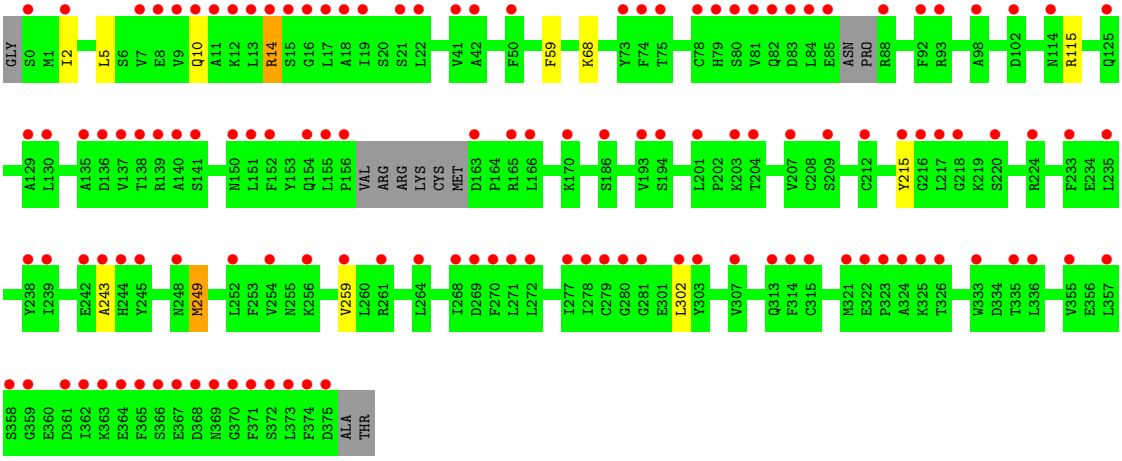




• Molecule 1: DNA mismatch repair protein Mlh3

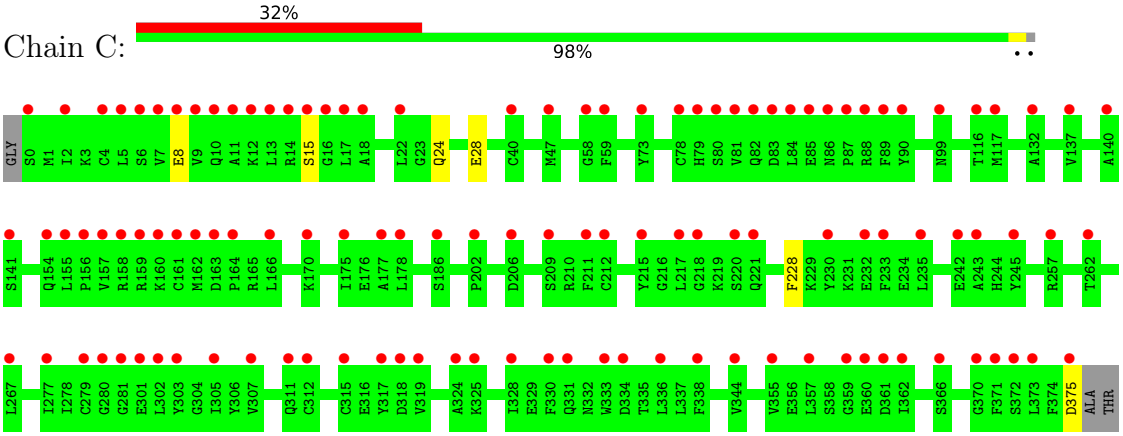
Chain B:





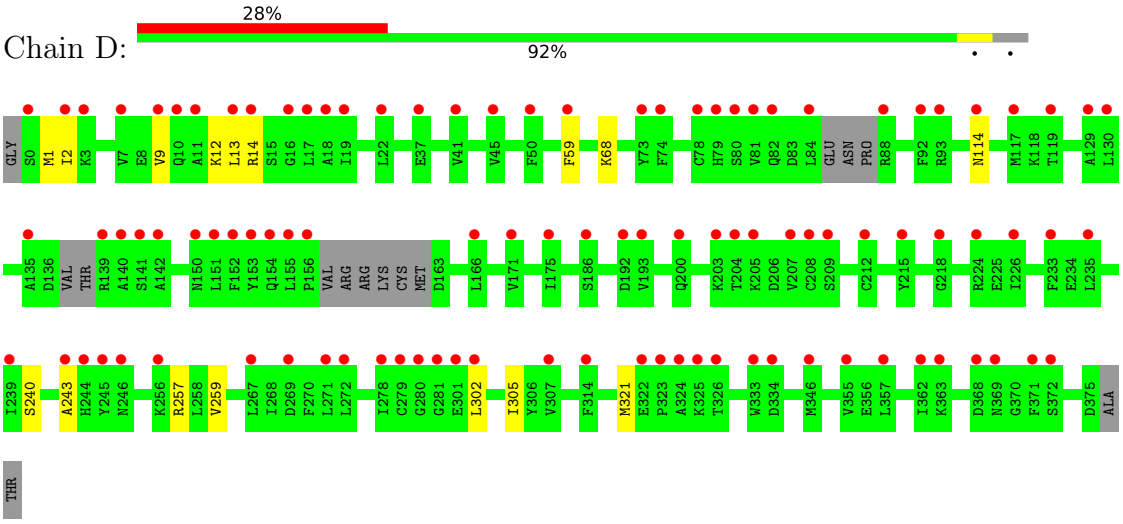
• Molecule 1: DNA mismatch repair protein Mlh3

Chain C:



• Molecule 1: DNA mismatch repair protein Mlh3

Chain D:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	72.68Å 138.88Å 80.19Å 90.00° 95.50° 90.00°	Depositor
Resolution (Å)	79.82 – 2.14 79.82 – 2.14	Depositor EDS
% Data completeness (in resolution range)	55.7 (79.82-2.14) 55.8 (79.82-2.14)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.24	Depositor
$< I/\sigma(I) >$ [1]	1.58 (at 2.14Å)	Xtriage
Refinement program	REFMAC 5.8.0430	Depositor
R, R_{free}	0.281 , 0.301 0.283 , 0.302	Depositor DCC
R_{free} test set	2378 reflections (2.72%)	wwPDB-VP
Wilson B-factor (Å^2)	27.5	Xtriage
Anisotropy	0.051	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.31 , 30.9	EDS
L-test for twinning[2]	$< \|L\| > = 0.51$, $< L^2 > = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.86	EDS
Total number of atoms	11686	wwPDB-VP
Average B, all atoms (Å^2)	30.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 15.97% of the height of the origin peak. No significant pseudotranslation is detected.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: ANP, CL, EDO, MG

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	0.48	0/2867	0.91	0/3843
1	B	0.49	0/2868	0.94	2/3846 (0.1%)
1	C	0.48	0/2902	0.93	1/3892 (0.0%)
1	D	0.49	0/2839	0.94	1/3802 (0.0%)
All	All	0.48	0/11476	0.93	4/15383 (0.0%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	59	PHE	CA-CB-CG	6.73	120.53	113.80
1	D	59	PHE	CA-CB-CG	6.71	120.51	113.80
1	C	375	ASP	CA-CB-CG	6.58	119.18	112.60
1	B	14	ARG	CG-CD-NE	-5.37	100.20	112.00

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	2823	0	2856	5	0
1	B	2820	0	2831	6	0
1	C	2856	0	2888	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	D	2794	0	2812	8	0
2	A	31	0	13	0	0
2	B	31	0	13	0	0
2	C	31	0	13	0	0
2	D	31	0	13	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	B	4	0	6	0	0
5	B	1	0	0	0	0
6	A	67	0	0	1	0
6	B	69	0	0	0	0
6	C	60	0	0	0	0
6	D	64	0	0	0	0
All	All	11686	0	11445	18	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 (18) 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:B:5:LEU:HD13	1:B:14:ARG:HH22	1.61	0.65
1:A:13:LEU:HD12	1:A:13:LEU:O	1.98	0.64
1:B:215:TYR:CE1	1:B:249:MET:HE1	2.45	0.52
1:D:243:ALA:CB	1:D:302:LEU:HB3	2.42	0.50
1:B:243:ALA:CB	1:B:302:LEU:HB3	2.41	0.49
1:A:208:CYS:HB3	1:B:115:ARG:HH12	1.79	0.47
1:D:2:ILE:HG23	1:D:68:LYS:HD2	1.96	0.46
1:B:2:ILE:HG23	1:B:68:LYS:HD2	1.96	0.46
1:C:228:PHE:HA	1:D:1:MET:HE1	1.97	0.46
1:B:10:GLN:HA	1:B:14:ARG:HH21	1.82	0.44
1:A:42:ALA:HB2	1:D:12:LYS:HD3	2.00	0.43
1:D:9:VAL:HG12	1:D:13:LEU:CD1	2.50	0.42
1:D:257[A]:ARG:HD2	1:D:321:MET:HE3	2.02	0.41
1:A:24:GLN:O	1:A:28:GLU:HG2	2.20	0.41
1:C:24:GLN:O	1:C:28:GLU:HG2	2.20	0.41
1:D:240:SER:HB3	1:D:305:ILE:HB	2.03	0.41
1:A:247:LYS:NZ	6:A:504:HOH:O	2.54	0.40
1:C:228:PHE:CA	1:D:1:MET:HE1	2.51	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	347/360 (96%)	336 (97%)	11 (3%)	0	100	100
1	B	348/360 (97%)	336 (97%)	12 (3%)	0	100	100
1	C	356/360 (99%)	345 (97%)	10 (3%)	1 (0%)	36	33
1	D	343/360 (95%)	333 (97%)	10 (3%)	0	100	100
All	All	1394/1440 (97%)	1350 (97%)	43 (3%)	1 (0%)	48	49

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	15	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	315/319 (99%)	315 (100%)	0	100	100
1	B	315/319 (99%)	313 (99%)	2 (1%)	78	84
1	C	319/319 (100%)	318 (100%)	1 (0%)	86	90
1	D	312/319 (98%)	309 (99%)	3 (1%)	68	74
All	All	1261/1276 (99%)	1255 (100%)	6 (0%)	81	86

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

Mol	Chain	Res	Type
1	B	249	MET
1	B	259	VAL
1	C	8	GLU
1	D	14	ARG
1	D	114	ASN
1	D	259	VAL

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

Mol	Chain	Res	Type
1	A	114	ASN
1	A	221	GLN
1	B	150	ASN
1	B	248	ASN
1	B	250	GLN
1	B	313	GLN
1	C	114	ASN
1	C	331	GLN
1	D	250	GLN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

5.6 Ligand geometry (i)

Of 10 ligands modelled in this entry, 5 are monoatomic - leaving 5 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	ANP	B	401	3	32,33,33	1.11	4 (12%)	44,52,52	0.92	2 (4%)
2	ANP	A	400	3	32,33,33	1.08	5 (15%)	44,52,52	0.87	2 (4%)
2	ANP	D	400	3	32,33,33	1.06	3 (9%)	44,52,52	0.91	1 (2%)
4	EDO	B	403	-	3,3,3	0.13	0	2,2,2	0.46	0
2	ANP	C	400	3	32,33,33	1.08	5 (15%)	44,52,52	0.88	2 (4%)

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	ANP	B	401	3	-	4/18/38/38	0/3/3/3
2	ANP	A	400	3	-	3/18/38/38	0/3/3/3
2	ANP	D	400	3	-	4/18/38/38	0/3/3/3
4	EDO	B	403	-	-	0/1/1/1	-
2	ANP	C	400	3	-	3/18/38/38	0/3/3/3

All (17) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	401	ANP	PG-O1G	3.58	1.51	1.46
2	D	400	ANP	PG-O1G	3.22	1.51	1.46
2	C	400	ANP	PG-O1G	3.15	1.51	1.46
2	A	400	ANP	PG-O1G	3.08	1.51	1.46
2	D	400	ANP	PB-O1B	3.02	1.50	1.46
2	B	401	ANP	PB-O1B	2.96	1.50	1.46
2	A	400	ANP	PB-O1B	2.91	1.50	1.46
2	C	400	ANP	PB-O1B	2.82	1.50	1.46
2	B	401	ANP	PB-O2B	-2.32	1.50	1.56
2	A	400	ANP	PG-O2G	-2.32	1.50	1.56
2	C	400	ANP	PG-O2G	-2.29	1.50	1.56
2	D	400	ANP	PB-O2B	-2.29	1.50	1.56
2	A	400	ANP	PB-O2B	-2.28	1.50	1.56
2	C	400	ANP	PB-O2B	-2.26	1.50	1.56

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	400	ANP	PG-O3G	-2.17	1.50	1.56
2	B	401	ANP	PG-O2G	-2.11	1.51	1.56
2	C	400	ANP	PG-O3G	-2.06	1.51	1.56

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	400	ANP	O2B-PB-O1B	4.43	119.21	109.92
2	B	401	ANP	O2B-PB-O1B	4.26	118.86	109.92
2	C	400	ANP	O2B-PB-O1B	4.11	118.54	109.92
2	A	400	ANP	O2B-PB-O1B	3.99	118.29	109.92
2	C	400	ANP	O2G-PG-O1G	-2.40	107.42	113.45
2	A	400	ANP	O2G-PG-O1G	-2.29	107.70	113.45
2	B	401	ANP	O2G-PG-O1G	-2.26	107.78	113.45

There are no chirality outliers.

All (14) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	400	ANP	PG-N3B-PB-O1B
2	A	400	ANP	PA-O3A-PB-O1B
2	A	400	ANP	PA-O3A-PB-O2B
2	B	401	ANP	PB-N3B-PG-O1G
2	B	401	ANP	PG-N3B-PB-O1B
2	B	401	ANP	PA-O3A-PB-O1B
2	B	401	ANP	PA-O3A-PB-O2B
2	C	400	ANP	PG-N3B-PB-O1B
2	C	400	ANP	PA-O3A-PB-O1B
2	C	400	ANP	PA-O3A-PB-O2B
2	D	400	ANP	PB-N3B-PG-O1G
2	D	400	ANP	PG-N3B-PB-O1B
2	D	400	ANP	PA-O3A-PB-O1B
2	D	400	ANP	PA-O3A-PB-O2B

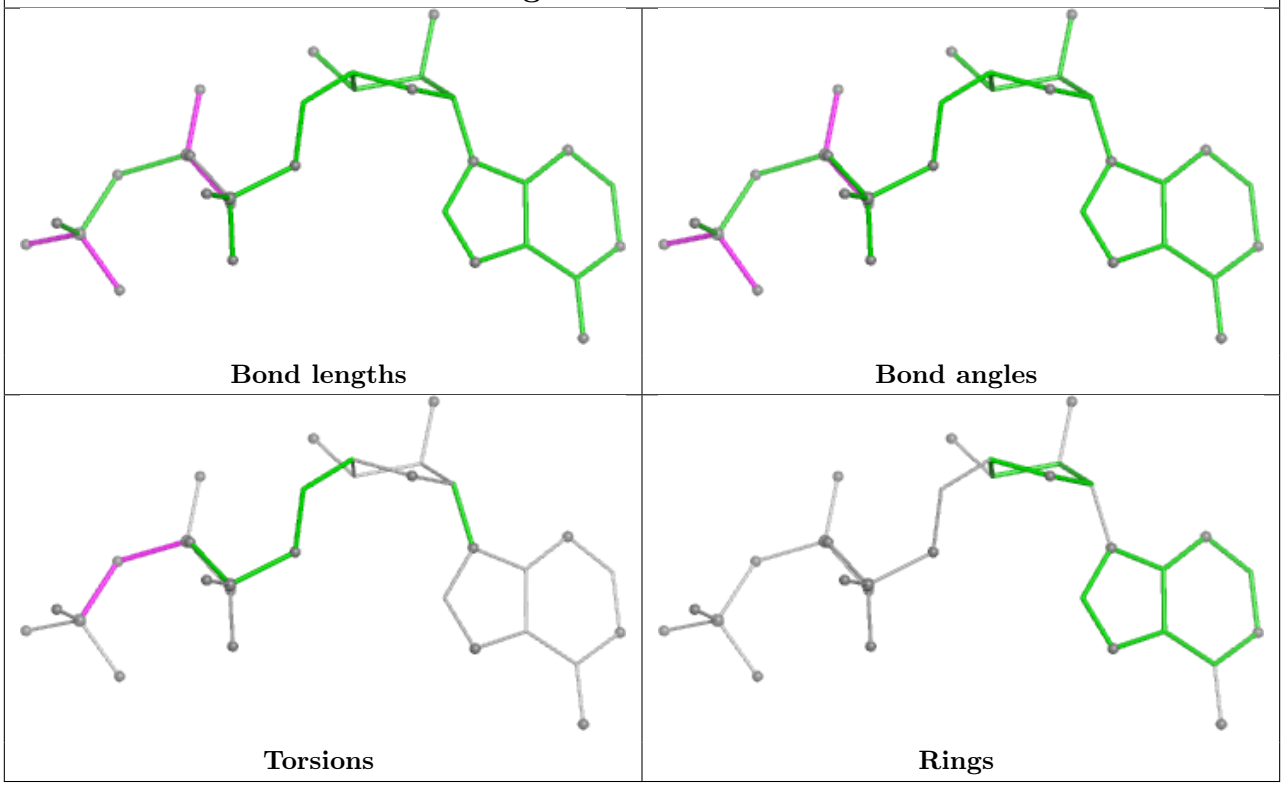
There are no ring outliers.

No monomer is involved in short contacts.

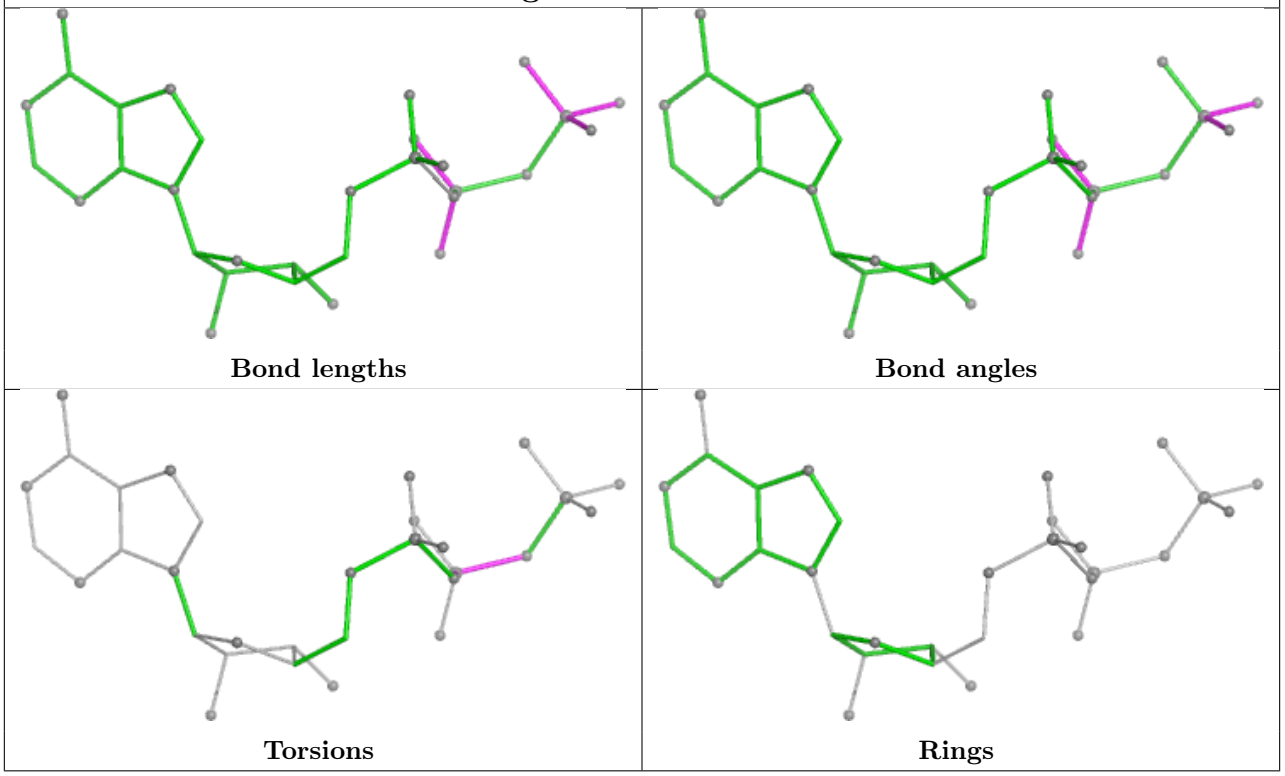
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

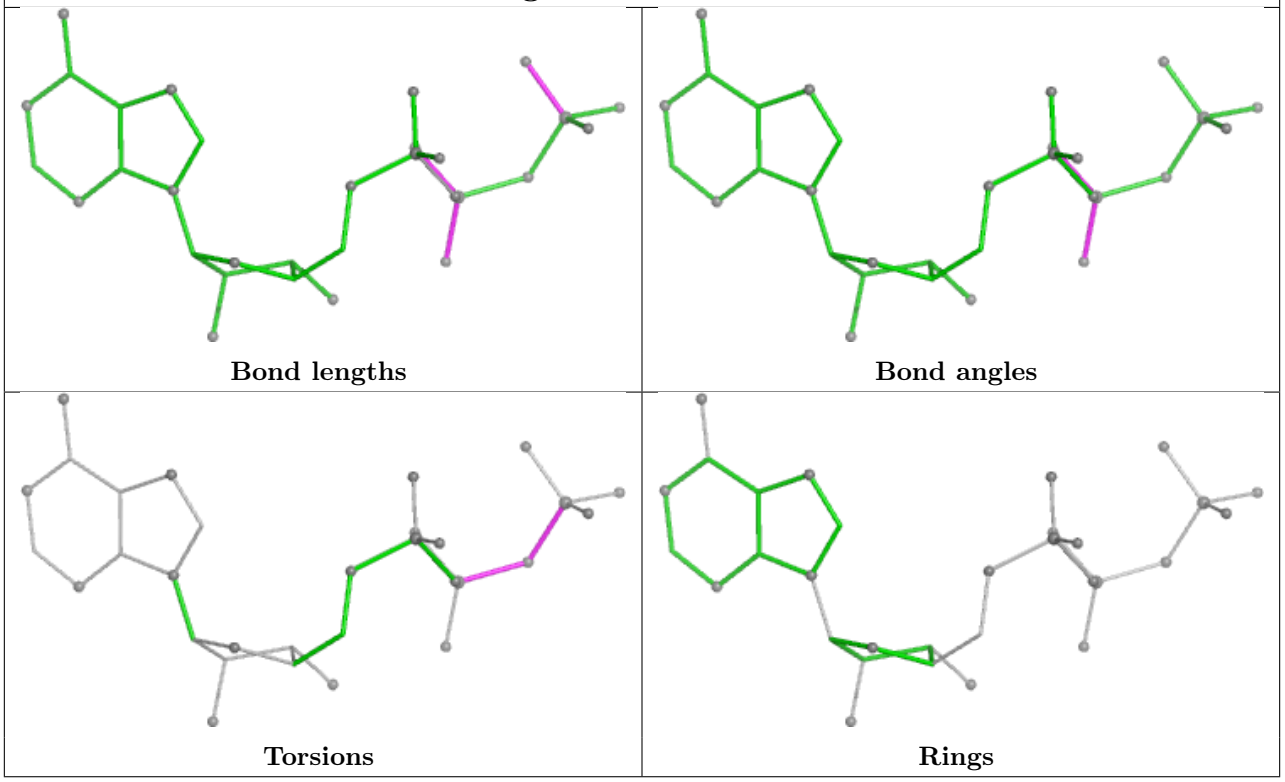
Ligand ANP B 401



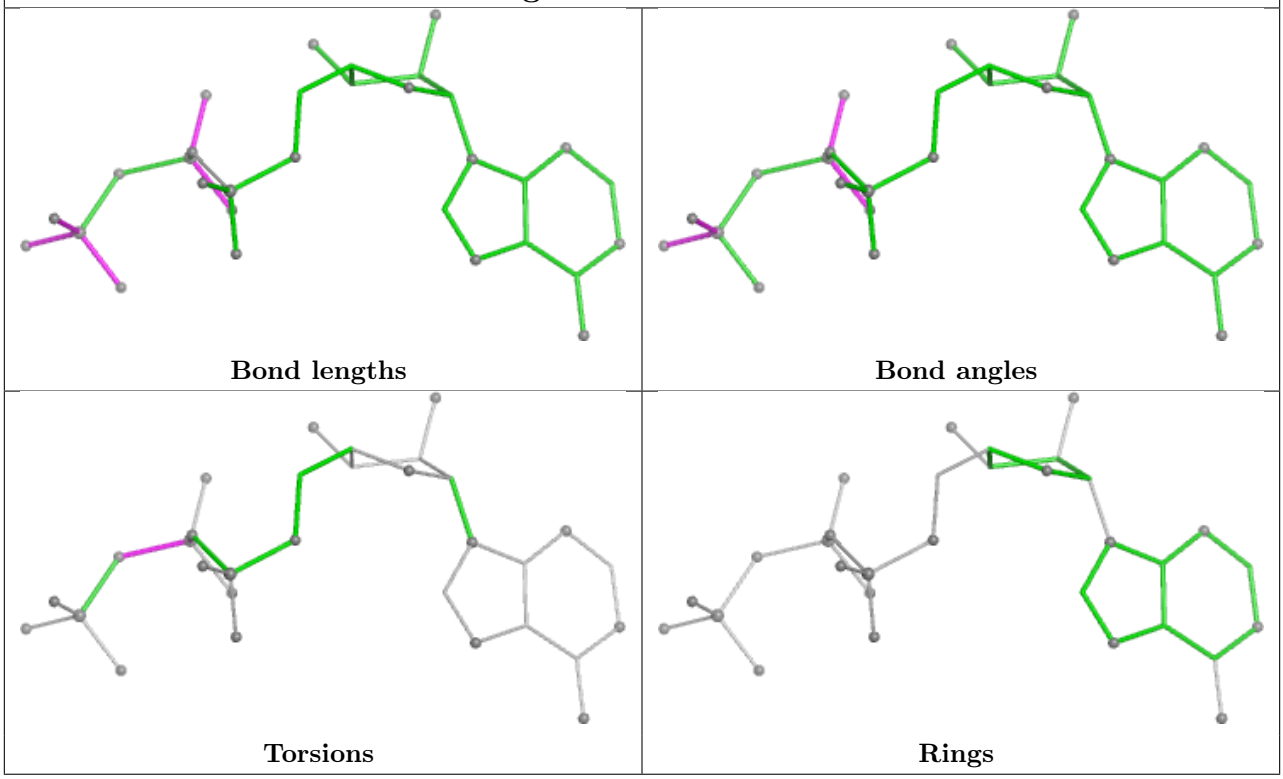
Ligand ANP A 400



Ligand ANP D 400



Ligand ANP C 400



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, 95^{th} 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	351/360 (97%)	1.74	113 (32%)	1	1	11, 28, 47, 69	40 (11%)
1	B	349/360 (96%)	1.96	131 (37%)	1	1	10, 27, 55, 75	39 (11%)
1	C	357/360 (99%)	1.80	117 (32%)	1	1	10, 27, 51, 78	35 (9%)
1	D	346/360 (96%)	1.63	101 (29%)	1	1	10, 27, 46, 64	32 (9%)
All	All	1403/1440 (97%)	1.78	462 (32%)	1	1	10, 27, 50, 78	146 (10%)

All (462) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	13	LEU	9.4
1	B	84	LEU	8.7
1	A	14	ARG	8.4
1	B	85	GLU	8.4
1	B	14	ARG	7.5
1	A	11	ALA	7.2
1	A	17	LEU	7.2
1	C	13	LEU	7.0
1	D	84	LEU	6.9
1	D	81	VAL	6.7
1	B	235	LEU	6.5
1	B	17	LEU	6.4
1	B	16	GLY	5.8
1	B	333[A]	TRP	5.8
1	D	245	TYR	5.7
1	B	13	LEU	5.7
1	B	137	VAL	5.7
1	C	281	GLY	5.6
1	A	15	SER	5.6
1	B	15	SER	5.6
1	C	7	VAL	5.5

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Mol	Chain	Res	Type	RSRZ
1	A	155	LEU	5.4
1	A	9	VAL	5.3
1	C	324	ALA	5.2
1	A	7	VAL	5.2
1	B	81	VAL	5.2
1	D	280	GLY	5.1
1	C	11	ALA	5.1
1	D	17	LEU	5.1
1	B	367	GLU	5.1
1	A	84	LEU	5.0
1	C	155	LEU	5.0
1	B	375	ASP	5.0
1	D	18	ALA	5.0
1	A	318	ASP	4.9
1	D	13	LEU	4.8
1	B	371	PHE	4.8
1	B	307	VAL	4.8
1	C	79	HIS	4.7
1	A	2	ILE	4.6
1	C	157	VAL	4.6
1	A	8	GLU	4.6
1	B	280	GLY	4.5
1	B	155	LEU	4.5
1	C	14	ARG	4.5
1	C	280	GLY	4.4
1	B	368	ASP	4.4
1	A	18	ALA	4.4
1	C	366	SER	4.4
1	A	334	ASP	4.4
1	B	82	GLN	4.3
1	B	245	TYR	4.3
1	D	323	PRO	4.3
1	B	154	GLN	4.3
1	C	15	SER	4.3
1	A	157	VAL	4.3
1	D	82	GLN	4.3
1	A	5	LEU	4.2
1	C	117	MET	4.2
1	B	140	ALA	4.2
1	C	161	CYS	4.2
1	B	314	PHE	4.2
1	B	365	PHE	4.2

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Mol	Chain	Res	Type	RSRZ
1	C	279	CYS	4.1
1	A	4	CYS	4.1
1	B	156	PRO	4.1
1	C	371	PHE	4.1
1	D	2	ILE	4.1
1	C	318	ASP	4.0
1	B	372	SER	4.0
1	A	82	GLN	4.0
1	A	16	GLY	4.0
1	B	8	GLU	4.0
1	B	281	GLY	4.0
1	C	375	ASP	4.0
1	C	277	ILE	4.0
1	C	16	GLY	4.0
1	A	324	ALA	3.9
1	C	5	LEU	3.9
1	B	268	ILE	3.9
1	D	114	ASN	3.9
1	C	160	LYS	3.9
1	C	8	GLU	3.9
1	A	79	HIS	3.9
1	B	11	ALA	3.9
1	B	80	SER	3.9
1	B	114	ASN	3.9
1	B	2	ILE	3.8
1	C	217	LEU	3.8
1	A	87	PRO	3.8
1	B	279	CYS	3.8
1	C	317	TYR	3.8
1	C	82	GLN	3.8
1	B	370	GLY	3.8
1	B	138	THR	3.7
1	A	229	LYS	3.7
1	B	359	GLY	3.7
1	A	141	SER	3.7
1	B	92	PHE	3.7
1	D	156	PRO	3.7
1	A	218	GLY	3.7
1	B	186	SER	3.7
1	D	0	SER	3.7
1	C	303	TYR	3.7
1	A	280	GLY	3.7

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Mol	Chain	Res	Type	RSRZ
1	C	86	ASN	3.7
1	B	0	SER	3.7
1	C	6	SER	3.7
1	C	301	GLU	3.7
1	B	18	ALA	3.7
1	D	235	LEU	3.6
1	B	78	CYS	3.6
1	B	136	ASP	3.6
1	A	59	PHE	3.6
1	D	371	PHE	3.6
1	C	81	VAL	3.5
1	B	217	LEU	3.5
1	D	155	LEU	3.5
1	C	372	SER	3.5
1	B	88	ARG	3.5
1	A	12	LYS	3.5
1	C	9	VAL	3.5
1	D	140	ALA	3.5
1	B	373	LEU	3.5
1	A	315	CYS	3.5
1	B	303	TYR	3.5
1	C	215	TYR	3.5
1	C	245	TYR	3.5
1	B	374	PHE	3.4
1	C	330	PHE	3.4
1	A	40	CYS	3.4
1	C	87	PRO	3.4
1	C	233	PHE	3.4
1	D	92	PHE	3.4
1	A	115[A]	ARG	3.4
1	B	79	HIS	3.4
1	D	129	ALA	3.4
1	D	279	CYS	3.4
1	B	366	SER	3.4
1	B	129	ALA	3.4
1	C	18	ALA	3.4
1	B	270	PHE	3.4
1	C	257[A]	ARG	3.3
1	D	278	ILE	3.3
1	B	269[A]	ASP	3.3
1	D	372	SER	3.3
1	A	355	VAL	3.3

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Mol	Chain	Res	Type	RSRZ
1	B	9	VAL	3.3
1	D	93	ARG	3.3
1	C	162	MET	3.3
1	C	17	LEU	3.3
1	C	166	LEU	3.3
1	D	246	ASN	3.3
1	B	326	THR	3.2
1	C	315	CYS	3.2
1	B	216	GLY	3.2
1	A	335	THR	3.2
1	C	218	GLY	3.2
1	C	344	VAL	3.2
1	B	324	ALA	3.2
1	B	336	LEU	3.2
1	C	360	GLU	3.2
1	C	12	LYS	3.2
1	B	261	ARG	3.1
1	B	141	SER	3.1
1	B	152	PHE	3.1
1	D	204	THR	3.1
1	C	154	GLN	3.1
1	C	312	CYS	3.1
1	B	7	VAL	3.1
1	B	272	LEU	3.1
1	B	278	ILE	3.1
1	C	186	SER	3.1
1	A	89	PHE	3.1
1	C	338	PHE	3.1
1	D	208[A]	CYS	3.1
1	B	207	VAL	3.1
1	D	11	ALA	3.1
1	D	281	GLY	3.1
1	B	83	ASP	3.1
1	A	279	CYS	3.1
1	C	78	CYS	3.1
1	A	170	LYS	3.1
1	C	84	LEU	3.1
1	D	226	ILE	3.1
1	D	80	SER	3.1
1	A	370	GLY	3.0
1	C	262	THR	3.0
1	D	78	CYS	3.0

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Mol	Chain	Res	Type	RSRZ
1	A	373	LEU	3.0
1	A	19	ILE	3.0
1	B	19	ILE	3.0
1	A	119	THR	3.0
1	D	314	PHE	3.0
1	A	269	ASP	3.0
1	B	135	ALA	3.0
1	B	212	CYS	3.0
1	D	324	ALA	3.0
1	B	193	VAL	3.0
1	C	235	LEU	3.0
1	A	159	ARG	3.0
1	C	159	ARG	3.0
1	D	326	THR	3.0
1	A	371	PHE	3.0
1	C	158	ARG	3.0
1	C	4	CYS	3.0
1	C	373	LEU	3.0
1	D	7	VAL	3.0
1	D	322	GLU	3.0
1	B	362	ILE	3.0
1	D	74	PHE	3.0
1	A	6	SER	2.9
1	C	141	SER	2.9
1	D	9	VAL	2.9
1	C	334	ASP	2.9
1	B	98	ALA	2.9
1	A	217	LEU	2.9
1	B	102	ASP	2.9
1	D	79	HIS	2.9
1	B	313	GLN	2.9
1	A	317	TYR	2.9
1	A	338	PHE	2.9
1	B	74	PHE	2.9
1	D	73	TYR	2.9
1	A	243	ALA	2.9
1	B	41	VAL	2.9
1	B	355	VAL	2.9
1	C	116	THR	2.9
1	C	175	ILE	2.9
1	B	215	TYR	2.9
1	B	151	LEU	2.8

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Mol	Chain	Res	Type	RSRZ
1	A	303	TYR	2.8
1	D	153	TYR	2.8
1	D	346	MET	2.8
1	A	90	TYR	2.8
1	A	215	TYR	2.8
1	C	22	LEU	2.8
1	A	45	VAL	2.8
1	A	81	VAL	2.8
1	D	171	VAL	2.8
1	C	2	ILE	2.8
1	B	248	ASN	2.8
1	A	63	SER	2.8
1	C	361	ASP	2.8
1	D	269[A]	ASP	2.8
1	B	166	LEU	2.8
1	A	262	THR	2.8
1	B	363	LYS	2.8
1	A	259	VAL	2.8
1	C	10	GLN	2.7
1	B	21	SER	2.7
1	A	92	PHE	2.7
1	A	156	PRO	2.7
1	B	323	PRO	2.7
1	D	88	ARG	2.7
1	A	198	VAL	2.7
1	C	137	VAL	2.7
1	A	175	ILE	2.7
1	D	333	TRP	2.7
1	D	16	GLY	2.7
1	A	357	LEU	2.7
1	D	14	ARG	2.7
1	D	22	LEU	2.7
1	D	302	LEU	2.7
1	D	218	GLY	2.7
1	C	359	GLY	2.7
1	B	243	ALA	2.6
1	B	325	LYS	2.6
1	D	207	VAL	2.6
1	D	355	VAL	2.6
1	B	163	ASP	2.6
1	C	132	ALA	2.6
1	C	211	PHE	2.6

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Mol	Chain	Res	Type	RSRZ
1	C	88	ARG	2.6
1	D	224[A]	ARG	2.6
1	A	193	VAL	2.6
1	C	230	TYR	2.6
1	C	331	GLN	2.6
1	D	154	GLN	2.6
1	B	322	GLU	2.6
1	A	99	ASN	2.6
1	C	177	ALA	2.6
1	D	243	ALA	2.6
1	A	311	GLN	2.5
1	C	311	GLN	2.5
1	B	364	GLU	2.5
1	D	37	GLU	2.5
1	A	116	THR	2.5
1	A	138	THR	2.5
1	B	204	THR	2.5
1	A	10	GLN	2.5
1	B	201	LEU	2.5
1	A	232	GLU	2.5
1	A	362	ILE	2.5
1	A	363	LYS	2.5
1	B	50	PHE	2.5
1	A	230	TYR	2.5
1	B	264	LEU	2.5
1	B	357	LEU	2.5
1	B	233	PHE	2.5
1	D	325	LYS	2.5
1	C	333	TRP	2.5
1	B	242	GLU	2.4
1	B	73	TYR	2.4
1	C	90	TYR	2.4
1	A	267	LEU	2.4
1	A	337	LEU	2.4
1	B	12	LYS	2.4
1	C	267	LEU	2.4
1	A	158	ARG	2.4
1	A	192	ASP	2.4
1	A	202	PRO	2.4
1	B	203	LYS	2.4
1	A	22	LEU	2.4
1	C	302	LEU	2.4

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Mol	Chain	Res	Type	RSRZ
1	C	336	LEU	2.4
1	D	151	LEU	2.4
1	C	58	GLY	2.4
1	B	369	ASN	2.4
1	D	150	ASN	2.4
1	A	367	GLU	2.4
1	A	319	VAL	2.4
1	B	220	SER	2.4
1	A	78	CYS	2.4
1	B	224[A]	ARG	2.4
1	D	205	LYS	2.4
1	D	135	ALA	2.4
1	A	302	LEU	2.4
1	D	357	LEU	2.4
1	D	301	GLU	2.4
1	A	368	ASP	2.4
1	B	361	ASP	2.4
1	A	0	SER	2.4
1	D	363	LYS	2.4
1	C	243	ALA	2.3
1	B	150	ASN	2.3
1	D	166	LEU	2.3
1	B	139	ARG	2.3
1	C	89	PHE	2.3
1	A	344	VAL	2.3
1	B	194	SER	2.3
1	B	259	VAL	2.3
1	C	220	SER	2.3
1	B	244	HIS	2.3
1	A	133	CYS	2.3
1	B	10	GLN	2.3
1	A	114	ASN	2.3
1	C	99	ASN	2.3
1	A	58	GLY	2.3
1	B	302	LEU	2.3
1	D	271	LEU	2.3
1	D	152	PHE	2.3
1	C	0	SER	2.3
1	C	85	GLU	2.3
1	C	242	GLU	2.3
1	A	25	CYS	2.3
1	C	140	ALA	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	178	LEU	2.3
1	A	336	LEU	2.3
1	B	165	ARG	2.3
1	C	83	ASP	2.3
1	C	370	GLY	2.3
1	C	328	ILE	2.3
1	B	335	THR	2.3
1	A	102	ASP	2.3
1	A	206	ASP	2.3
1	D	368	ASP	2.3
1	B	271	LEU	2.3
1	C	47	MET	2.3
1	C	357	LEU	2.3
1	C	73	TYR	2.3
1	C	232	GLU	2.2
1	B	125	GLN	2.2
1	C	80	SER	2.2
1	D	141	SER	2.2
1	A	251	PHE	2.2
1	C	59	PHE	2.2
1	A	278	ILE	2.2
1	C	156	PRO	2.2
1	B	42	ALA	2.2
1	B	321	MET	2.2
1	B	22	LEU	2.2
1	D	267	LEU	2.2
1	D	244	HIS	2.2
1	C	362	ILE	2.2
1	D	369	ASN	2.2
1	C	355	VAL	2.2
1	D	41	VAL	2.2
1	D	45	VAL	2.2
1	D	307	VAL	2.2
1	B	130	LEU	2.2
1	D	130	LEU	2.2
1	B	238	TYR	2.2
1	A	80	SER	2.2
1	C	209	SER	2.2
1	A	86	ASN	2.2
1	B	239	ILE	2.2
1	D	59	PHE	2.2
1	D	233	PHE	2.2

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Mol	Chain	Res	Type	RSRZ
1	C	206	ASP	2.2
1	D	192	ASP	2.2
1	D	334	ASP	2.2
1	D	362	ILE	2.2
1	A	307	VAL	2.2
1	A	166	LEU	2.2
1	B	315	CYS	2.2
1	A	372	SER	2.2
1	B	358	SER	2.2
1	A	163	ASP	2.2
1	B	75	THR	2.2
1	D	50	PHE	2.1
1	D	239	ILE	2.1
1	A	137	VAL	2.1
1	A	171	VAL	2.1
1	D	200	GLN	2.1
1	D	142	ALA	2.1
1	A	327	LEU	2.1
1	C	40	CYS	2.1
1	A	209	SER	2.1
1	D	186	SER	2.1
1	C	325	LYS	2.1
1	D	203	LYS	2.1
1	A	100	ILE	2.1
1	C	305	ILE	2.1
1	B	218	GLY	2.1
1	C	319	VAL	2.1
1	D	193	VAL	2.1
1	A	177	ALA	2.1
1	A	256	LYS	2.1
1	B	256	LYS	2.1
1	C	212	CYS	2.1
1	D	117	MET	2.1
1	C	164	PRO	2.1
1	C	221	GLN	2.1
1	A	277	ILE	2.1
1	A	314	PHE	2.1
1	B	254	VAL	2.1
1	B	252	LEU	2.1
1	D	209	SER	2.1
1	C	202	PRO	2.1
1	D	119	THR	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	146	VAL	2.1
1	C	307	VAL	2.1
1	D	272	LEU	2.0
1	D	10	GLN	2.0
1	D	212	CYS	2.0
1	A	261	ARG	2.0
1	D	139	ARG	2.0
1	D	215	TYR	2.0
1	D	256	LYS	2.0
1	B	277	ILE	2.0
1	D	19	ILE	2.0
1	D	175	ILE	2.0
1	A	184	SER	2.0
1	B	209	SER	2.0
1	C	178	LEU	2.0
1	C	163	ASP	2.0
1	B	93	ARG	2.0
1	B	170	LYS	2.0
1	C	170	LYS	2.0
1	D	3	LYS	2.0
1	A	245	TYR	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, 95^{th} 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	EDO	B	403	4/4	0.73	0.20	27,28,28,28	0
5	CL	B	404	1/1	0.87	0.19	53,53,53,53	0

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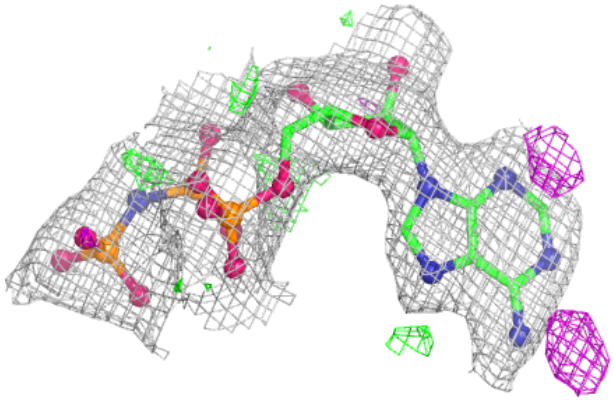
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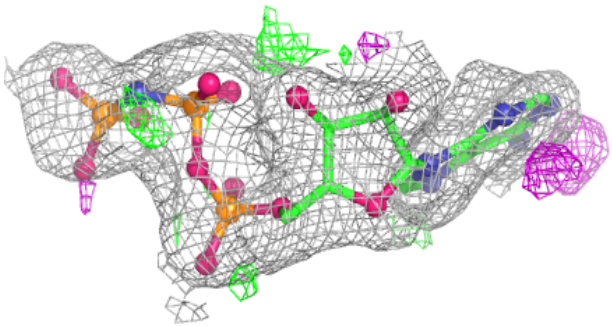
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	ANP	C	400	31/31	0.90	0.11	15,16,18,19	0
2	ANP	B	401	31/31	0.91	0.10	18,18,19,19	0
3	MG	C	401	1/1	0.91	0.06	17,17,17,17	0
2	ANP	D	400	31/31	0.93	0.09	15,15,16,17	0
2	ANP	A	400	31/31	0.93	0.10	16,16,18,19	0
3	MG	A	401	1/1	0.94	0.06	16,16,16,16	0
3	MG	D	401	1/1	0.97	0.13	15,15,15,15	0
3	MG	B	402	1/1	0.98	0.03	17,17,17,17	0

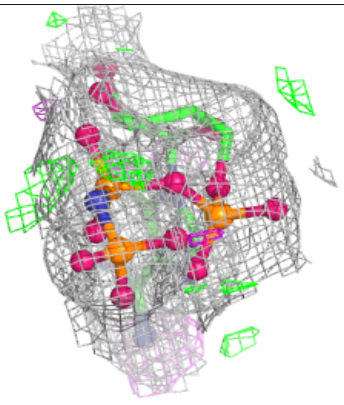
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around ANP C 400:

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

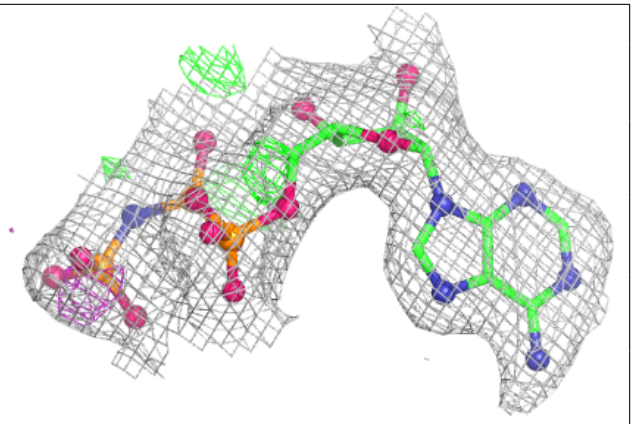


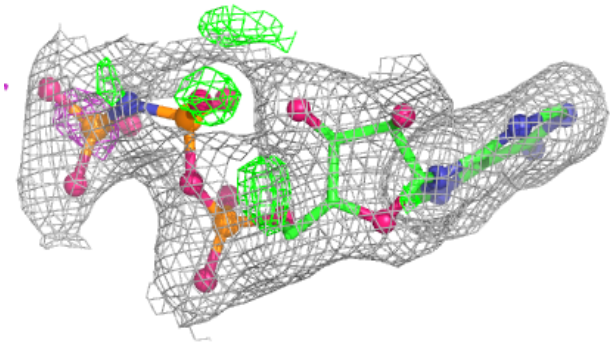


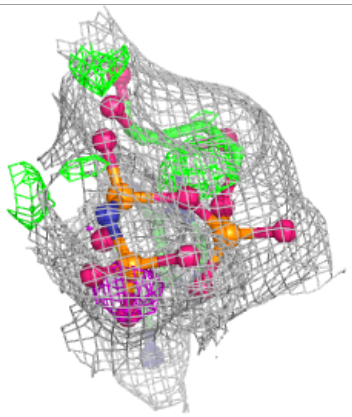


Electron density around ANP B 401:

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

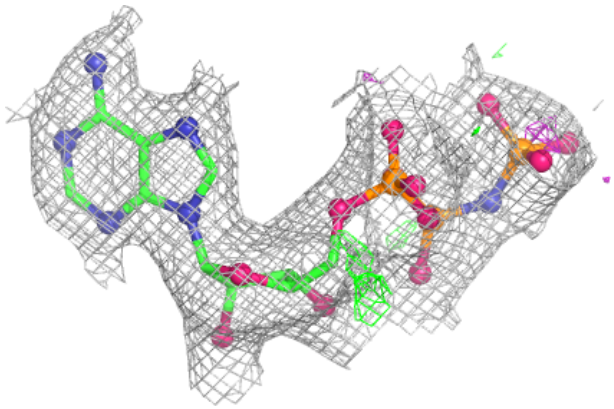


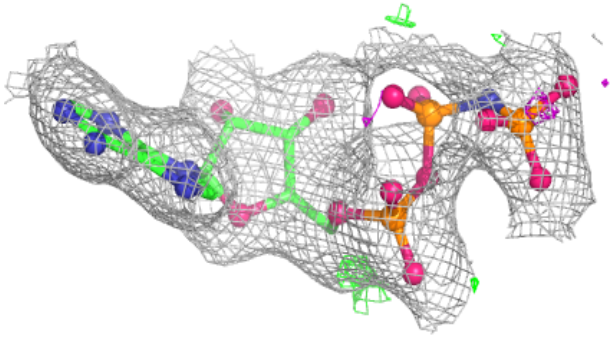


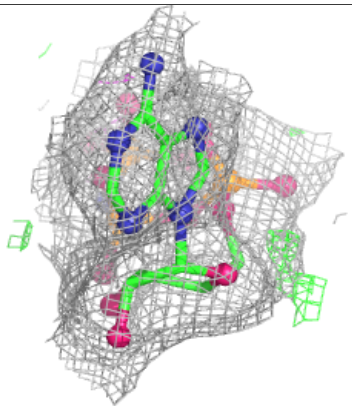


Electron density around ANP D 400:

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

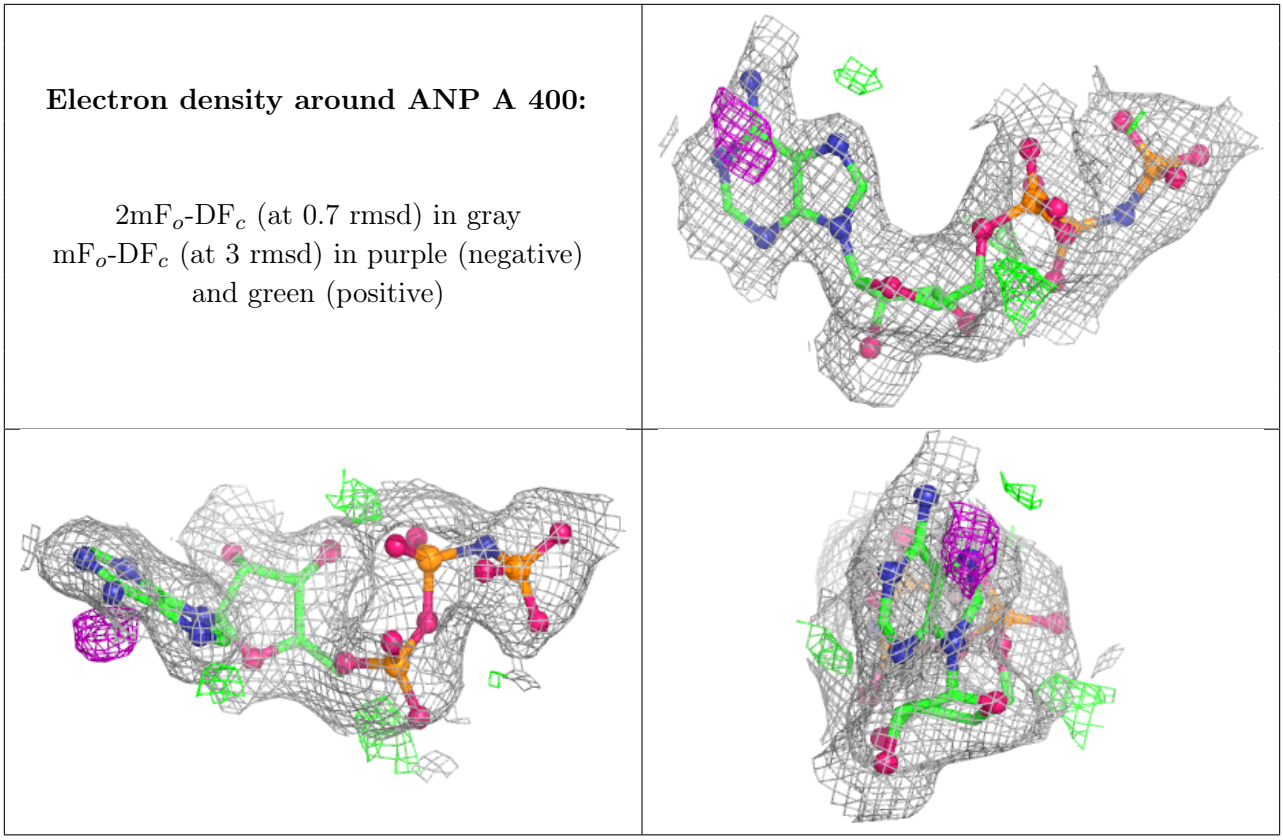






Electron density around ANP A 400:

$2mF_o$-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.