



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 10:32 AM UTC

PDB ID : 1ZXM / pdb_00001zxm
Title : Human Topo IIa ATPase/AMP-PNP
Authors : Wei, H.; Ruthenburg, A.J.; Bechis, S.K.; Verdine, G.L.
Deposited on : 2005-06-08
Resolution : 1.87 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

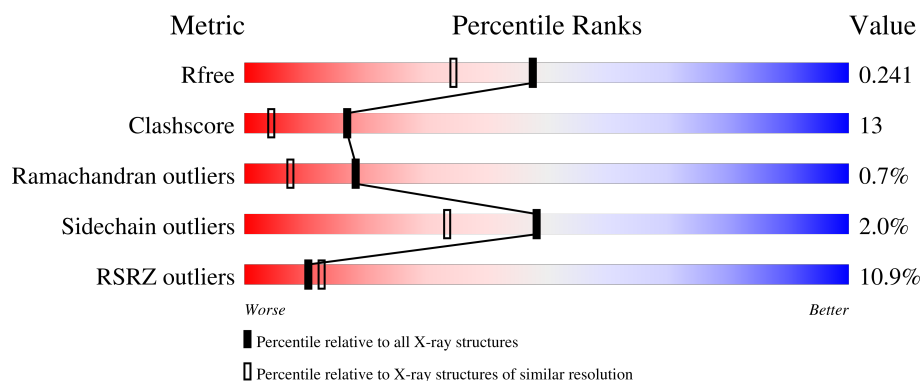
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.87 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	1220 (1.88-1.88)
Clashscore	190562	1234 (1.88-1.88)
Ramachandran outliers	187476	1222 (1.88-1.88)
Sidechain outliers	187428	1222 (1.88-1.88)
RSRZ outliers	180081	1220 (1.88-1.88)

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	400	8% 72% 19% • 7%
1	B	400	12% 67% 26% • 6%

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 6521 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.

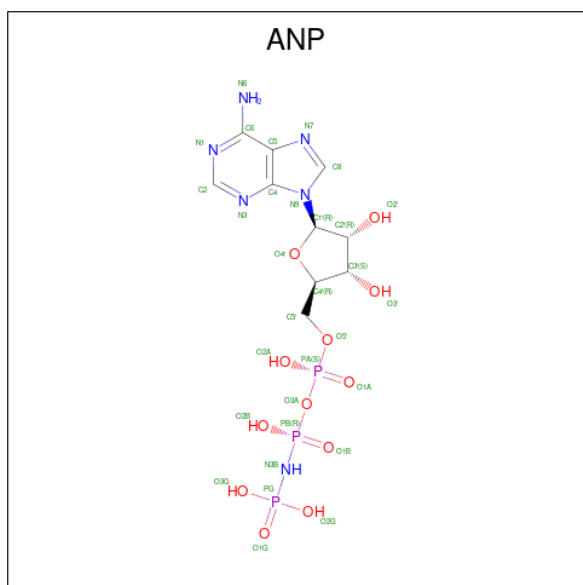
- Molecule 1 is a protein called DNA topoisomerase II, alpha isozyme.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	373	Total	C	N	O	S	0	0	0
			2950	1875	499	558	18			
1	B	378	Total	C	N	O	S	0	0	0
			2979	1896	502	562	19			

- Molecule 2 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Mg	0	0
			1	1		
2	B	1	Total	Mg	0	0
			1	1		

- Molecule 3 is PHOSPHOAMINOPHOSPHONIC ACID-ADENYLATE ESTER (CCD ID: ANP) (formula: C₁₀H₁₇N₆O₁₂P₃).



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

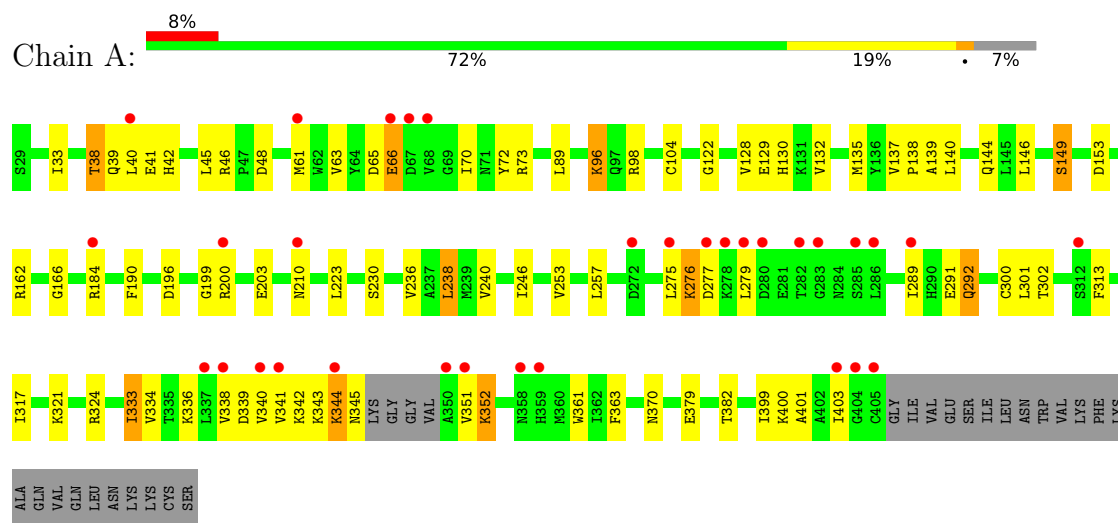
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	281	Total	O	0	0
			281	281		
4	B	247	Total	O	0	0
			247	247		

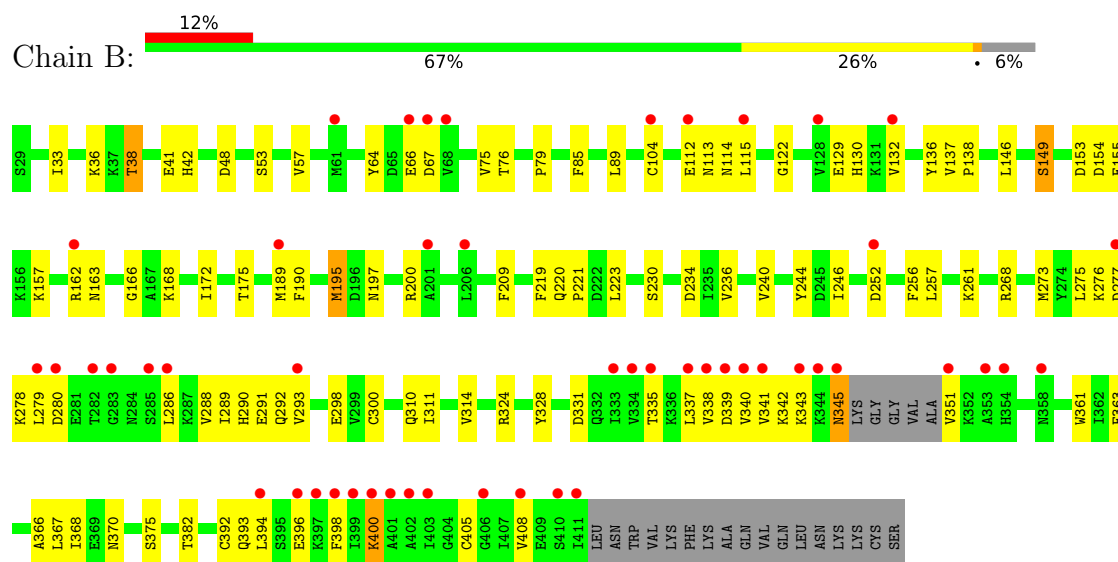
3 Residue-property plots [i](#)

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 topoisomerase II, alpha isozyme



- Molecule 1: DNA topoisomerase II, alpha isozyme



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	70.77Å 75.28Å 164.89Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 1.87 50.00 – 1.87	Depositor EDS
% Data completeness (in resolution range)	(Not available) (50.00-1.87) 96.0 (50.00-1.87)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	0.08	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.89 (at 1.86Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.220 , 0.243 0.216 , 0.241	Depositor DCC
R_{free} test set	3659 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å ²)	28.5	Xtriage
Anisotropy	0.319	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 40.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	6521	wwPDB-VP
Average B, all atoms (Å ²)	35.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.97% 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: MG, ANP

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	0.35	0/3007	0.88	7/4064 (0.2%)
1	B	0.35	0/3035	0.87	9/4099 (0.2%)
All	All	0.35	0/6042	0.88	16/8163 (0.2%)

There are no bond length outliers.

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	154	ASP	N-CA-C	-7.41	103.50	112.54
1	B	163	ASN	N-CA-C	6.98	121.96	113.38
1	A	149	SER	N-CA-C	-6.02	105.11	112.88
1	A	104	CYS	N-CA-C	5.90	118.25	108.99
1	B	104	CYS	N-CA-C	5.72	117.88	109.24
1	B	382	THR	N-CA-C	5.53	120.19	113.38
1	A	333	ILE	N-CA-C	-5.49	105.50	110.82
1	B	122	GLY	N-CA-C	-5.43	103.59	112.83
1	B	38	THR	N-CA-C	-5.42	103.23	110.55
1	B	149	SER	N-CA-C	-5.36	105.97	112.88
1	A	122	GLY	N-CA-C	-5.33	103.76	112.83
1	A	38	THR	N-CA-C	-5.29	103.41	110.55
1	B	85	PHE	N-CA-C	-5.21	105.52	111.14
1	B	48	ASP	N-CA-C	5.19	119.93	111.37
1	A	48	ASP	N-CA-C	5.12	119.81	111.37
1	A	382	THR	N-CA-C	5.05	119.53	113.17

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	2950	0	2899	76	0
1	B	2979	0	2944	80	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	31	0	13	0	0
3	B	31	0	13	0	0
4	A	281	0	0	8	0
4	B	247	0	0	6	0
All	All	6521	0	5869	150	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 13.

All (150) 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:189:MET:HG3	1:B:209:PHE:HB2	1.41	1.01
1:A:40:LEU:H	1:A:40:LEU:HD12	1.27	0.97
1:B:195:MET:HE2	1:B:200:ARG:HH11	1.29	0.96
1:B:314:VAL:HG13	1:B:368:ILE:HD13	1.53	0.89
1:A:196:ASP:OD2	1:A:200:ARG:HD3	1.73	0.87
1:A:339:ASP:HA	1:A:342:LYS:HD2	1.58	0.82
1:A:240:VAL:HG22	1:A:257:LEU:HD21	1.65	0.79
1:B:324:ARG:HH11	1:B:324:ARG:HG3	1.48	0.78
1:A:63:VAL:HG12	1:A:238:LEU:HD13	1.67	0.76
1:A:292:GLN:HG3	1:A:292:GLN:O	1.86	0.75
1:B:112:GLU:HG3	4:B:990:HOH:O	1.87	0.73
1:A:96:LYS:O	1:A:96:LYS:HD3	1.88	0.73
1:A:135:MET:HE1	4:A:1136:HOH:O	1.90	0.71
1:A:324:ARG:HH11	1:A:324:ARG:HG2	1.57	0.69
1:B:311:ILE:HD13	1:B:361:TRP:HE1	1.56	0.69
1:A:46:ARG:HH11	1:A:46:ARG:HG3	1.57	0.69
1:B:341:VAL:HG11	1:B:351:VAL:HG21	1.76	0.68
1:A:203:GLU:HB3	4:A:1070:HOH:O	1.94	0.67
1:B:310:GLN:C	1:B:311:ILE:HD12	2.20	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:40:LEU:H	1:A:40:LEU:CD1	2.05	0.67
1:B:66:GLU:HG2	4:B:1138:HOH:O	1.95	0.67
1:B:268:ARG:HH12	1:B:288:VAL:HG12	1.60	0.66
1:B:53:SER:O	1:B:79:PRO:HG2	1.94	0.66
1:A:40:LEU:HD12	1:A:40:LEU:N	2.08	0.64
1:A:289:ILE:HD12	1:A:401:ALA:HB1	1.79	0.64
1:A:63:VAL:HG12	1:A:238:LEU:CD1	2.28	0.63
1:B:162:ARG:NH2	1:B:370:ASN:HB3	2.14	0.63
1:B:195:MET:HE2	1:B:200:ARG:NH1	2.09	0.63
1:B:289:ILE:N	1:B:289:ILE:HD12	2.14	0.62
1:B:338:VAL:O	1:B:342:LYS:HG2	2.00	0.61
1:B:367:LEU:C	1:B:368:ILE:HD12	2.26	0.61
1:B:368:ILE:HD12	1:B:368:ILE:N	2.16	0.60
1:B:278:LYS:C	1:B:279:LEU:HD12	2.27	0.60
1:B:324:ARG:HG3	1:B:324:ARG:NH1	2.16	0.60
1:A:184:ARG:HH11	1:A:184:ARG:HG3	1.64	0.59
1:A:403:ILE:HG12	1:A:403:ILE:O	2.03	0.59
1:B:289:ILE:HD11	1:B:405:CYS:HB3	1.83	0.59
1:B:341:VAL:HG22	1:B:408:VAL:HG13	1.85	0.58
1:A:162:ARG:NH2	1:A:370:ASN:HB3	2.18	0.58
1:B:175:THR:HG23	4:B:1060:HOH:O	2.03	0.57
1:A:153:ASP:CG	1:A:162:ARG:HH22	2.12	0.57
1:A:277:ASP:O	1:A:279:LEU:HD22	2.05	0.57
1:B:75:VAL:HG13	1:B:234:ASP:HB3	1.87	0.57
1:A:38:THR:OG1	1:A:41:GLU:HG3	2.05	0.56
1:B:137:VAL:HB	1:B:138:PRO:HD3	1.86	0.56
1:A:130:HIS:CE1	1:A:132:VAL:HB	2.41	0.56
1:B:268:ARG:HH12	1:B:288:VAL:CG1	2.18	0.56
1:A:340:VAL:O	1:A:344:LYS:HD3	2.06	0.55
1:A:135:MET:HE2	1:A:139:ALA:C	2.30	0.55
1:A:61:MET:HB3	4:A:1140:HOH:O	2.07	0.55
1:B:292:GLN:HG3	1:B:298:GLU:HG2	1.88	0.54
1:B:339:ASP:OD1	1:B:343:LYS:HE2	2.08	0.54
1:B:400:LYS:HB3	1:B:400:LYS:NZ	2.23	0.54
1:B:38:THR:OG1	1:B:41:GLU:HG3	2.09	0.53
1:A:324:ARG:HG2	1:A:324:ARG:NH1	2.24	0.53
1:A:135:MET:HE2	1:A:140:LEU:N	2.23	0.53
1:A:130:HIS:HE1	1:A:132:VAL:HB	1.74	0.53
1:A:352:LYS:HA	1:A:352:LYS:HE3	1.91	0.52
1:A:46:ARG:HG3	1:A:46:ARG:NH1	2.25	0.51
1:A:300:CYS:HB2	1:A:363:PHE:HB2	1.93	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:96:LYS:HD3	1:A:96:LYS:C	2.36	0.51
1:B:300:CYS:HB2	1:B:363:PHE:HB2	1.92	0.51
1:A:137:VAL:HB	1:A:138:PRO:HD3	1.94	0.50
1:A:240:VAL:HG13	1:A:257:LEU:CD2	2.42	0.50
1:B:153:ASP:CG	1:B:162:ARG:HH22	2.19	0.50
1:A:61:MET:HA	1:A:72:TYR:CE1	2.46	0.50
1:B:240:VAL:HG13	1:B:257:LEU:HD22	1.94	0.50
1:B:190:PHE:C	1:B:190:PHE:CD2	2.89	0.49
1:A:89:LEU:HG	1:A:246:ILE:HG13	1.93	0.49
1:A:334:VAL:O	1:A:338:VAL:HG23	2.12	0.49
1:A:291:GLU:HG3	4:A:1087:HOH:O	2.10	0.49
1:B:268:ARG:NH1	1:B:290:HIS:HB2	2.26	0.49
1:A:343:LYS:C	1:A:345:ASN:H	2.21	0.49
1:B:311:ILE:CD1	1:B:361:TRP:HE1	2.25	0.49
1:A:45:LEU:O	1:A:46:ARG:HD3	2.13	0.49
1:B:153:ASP:OD1	1:B:162:ARG:NH2	2.41	0.48
1:B:277:ASP:HB2	4:B:1145:HOH:O	2.13	0.48
1:A:184:ARG:HG3	1:A:184:ARG:NH1	2.28	0.48
1:A:400:LYS:O	1:A:403:ILE:HG22	2.13	0.48
1:B:286:LEU:HD12	1:B:286:LEU:O	2.14	0.47
1:A:240:VAL:HG13	1:A:257:LEU:HD22	1.96	0.47
1:B:290:HIS:CG	1:B:291:GLU:N	2.83	0.46
1:B:311:ILE:HD12	1:B:311:ILE:N	2.30	0.46
1:B:115:LEU:C	1:B:115:LEU:HD23	2.41	0.46
1:B:89:LEU:HG	1:B:246:ILE:HG13	1.97	0.46
1:A:96:LYS:HG3	1:A:253:VAL:CG2	2.46	0.46
1:B:396:GLU:O	1:B:400:LYS:HG2	2.16	0.45
1:A:275:LEU:O	1:A:276:LYS:C	2.60	0.45
1:B:75:VAL:HG13	1:B:234:ASP:CB	2.47	0.45
1:A:149:SER:HA	1:B:33:ILE:O	2.17	0.45
1:B:172:ILE:O	1:B:197:ASN:HB3	2.17	0.45
1:B:345:ASN:N	1:B:345:ASN:HD22	2.14	0.45
1:B:223:LEU:CD1	1:B:230:SER:HA	2.47	0.44
1:B:375:SER:HB2	4:B:1020:HOH:O	2.17	0.44
1:A:46:ARG:NH1	1:B:162:ARG:O	2.48	0.44
1:A:135:MET:HE3	4:A:964:HOH:O	2.18	0.44
1:B:114:ASN:O	1:B:220:GLN:HG2	2.18	0.44
1:A:200:ARG:HG3	4:A:1020:HOH:O	2.18	0.44
1:A:65:ASP:OD2	1:A:73:ARG:HD3	2.18	0.43
1:A:336:LYS:O	1:A:340:VAL:HG23	2.17	0.43
1:B:113:ASN:O	1:B:114:ASN:C	2.61	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:135:MET:SD	1:A:144:GLN:NE2	2.91	0.43
1:B:337:LEU:O	1:B:340:VAL:HG22	2.18	0.43
1:B:256:PHE:CE2	1:B:261:LYS:HB2	2.54	0.43
1:B:400:LYS:HB3	1:B:400:LYS:HZ3	1.81	0.43
1:A:146:LEU:HD22	1:B:42:HIS:CD2	2.54	0.43
1:A:223:LEU:CD1	1:A:230:SER:HA	2.48	0.43
1:B:75:VAL:HG13	1:B:234:ASP:CG	2.43	0.43
1:A:341:VAL:HG11	1:A:351:VAL:CG2	2.49	0.43
1:B:168:LYS:O	1:B:172:ILE:HG13	2.18	0.43
1:A:236:VAL:O	1:A:240:VAL:HG23	2.18	0.43
1:A:302:THR:HG23	1:A:361:TRP:HB3	2.01	0.43
1:B:244:TYR:HE2	1:B:273:MET:HE1	1.84	0.42
1:A:46:ARG:NH1	1:A:46:ARG:CG	2.82	0.42
1:A:341:VAL:O	1:A:345:ASN:HB2	2.18	0.42
1:B:328:TYR:CE2	1:B:392:CYS:HB3	2.55	0.42
1:A:336:LYS:HG3	1:A:399:ILE:HD12	2.02	0.42
1:A:321:LYS:NZ	1:A:379:GLU:OE1	2.52	0.42
1:A:46:ARG:HD3	1:A:46:ARG:HA	1.82	0.42
1:A:66:GLU:OE1	1:A:66:GLU:HA	2.20	0.41
1:B:130:HIS:CE1	1:B:132:VAL:HB	2.55	0.41
1:A:33:ILE:O	1:B:149:SER:HA	2.20	0.41
1:B:64:TYR:CD1	1:B:64:TYR:C	2.98	0.41
1:B:398:PHE:CD1	1:B:398:PHE:C	2.98	0.41
1:A:302:THR:CG2	1:A:361:TRP:HB3	2.50	0.41
1:B:293:VAL:HG21	1:B:392:CYS:SG	2.60	0.41
1:A:292:GLN:O	1:A:292:GLN:CG	2.61	0.41
1:A:301:LEU:HD22	1:A:333:ILE:HD13	2.03	0.41
1:B:57:VAL:O	1:B:76:THR:HA	2.21	0.41
1:B:345:ASN:HD22	1:B:345:ASN:C	2.27	0.41
1:B:366:ALA:CB	1:B:368:ILE:HD11	2.50	0.41
1:A:190:PHE:CD2	1:A:190:PHE:C	2.99	0.41
1:B:67:ASP:HB3	4:B:1143:HOH:O	2.20	0.41
1:B:368:ILE:N	1:B:368:ILE:CD1	2.84	0.41
1:B:394:LEU:H	1:B:394:LEU:HD22	1.85	0.41
1:A:42:HIS:CD2	1:B:146:LEU:HD22	2.56	0.41
1:A:63:VAL:O	1:A:70:ILE:HA	2.21	0.41
1:A:199:GLY:HA3	4:A:1130:HOH:O	2.21	0.41
1:A:313:PHE:HA	1:A:317:ILE:O	2.21	0.41
1:B:155:GLU:O	1:B:157:LYS:HE2	2.20	0.41
1:B:219:PHE:CE1	1:B:221:PRO:HG3	2.56	0.41
1:B:240:VAL:HG13	1:B:257:LEU:CD2	2.50	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:366:ALA:HB3	1:B:368:ILE:HD11	2.02	0.41
1:A:184:ARG:HH11	1:A:210:ASN:HA	1.86	0.41
1:B:236:VAL:O	1:B:240:VAL:HG23	2.20	0.40
1:B:331:ASP:O	1:B:335:THR:HG23	2.21	0.40
1:A:144:GLN:OE1	1:B:36:LYS:HE3	2.20	0.40
1:A:98:ARG:HD2	4:A:1075:HOH:O	2.21	0.40
1:A:128:VAL:HG22	1:A:129:GLU:N	2.36	0.40
1:B:129:GLU:HA	1:B:136:TYR:HA	2.03	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	369/400 (92%)	357 (97%)	9 (2%)	3 (1%)	16	5
1	B	374/400 (94%)	361 (96%)	11 (3%)	2 (0%)	24	13
All	All	743/800 (93%)	718 (97%)	20 (3%)	5 (1%)	18	7

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	276	LYS
1	B	276	LYS
1	A	344	LYS
1	B	166	GLY
1	A	166	GLY

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	323/358 (90%)	317 (98%)	6 (2%)	50	36
1	B	327/358 (91%)	320 (98%)	7 (2%)	47	32
All	All	650/716 (91%)	637 (98%)	13 (2%)	48	33

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	39	GLN
1	A	66	GLU
1	A	96	LYS
1	A	238	LEU
1	A	292	GLN
1	A	352	LYS
1	B	195	MET
1	B	252	ASP
1	B	275	LEU
1	B	280	ASP
1	B	345	ASN
1	B	393	GLN
1	B	400	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	39	GLN
1	A	60	GLN
1	A	97	GLN
1	A	113	ASN
1	A	192	GLN
1	A	358	ASN
1	B	97	GLN
1	B	113	ASN
1	B	163	ASN

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Mol	Chain	Res	Type
1	B	192	GLN
1	B	197	ASN
1	B	220	GLN
1	B	290	HIS
1	B	309	GLN
1	B	345	ASN
1	B	354	HIS
1	B	393	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 4 ligands modelled in this entry, 2 are monoatomic - leaving 2 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	ANP	B	902	2	33,33,33	1.82	10 (30%)	45,52,52	2.18	11 (24%)
3	ANP	A	901	2	33,33,33	1.85	9 (27%)	45,52,52	2.12	12 (26%)

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	ANP	B	902	2	-	4/18/38/38	0/3/3/3
3	ANP	A	901	2	-	4/18/38/38	0/3/3/3

All (19) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	902	ANP	C2-N1	5.33	1.43	1.33
3	A	901	ANP	C2-N1	5.25	1.43	1.33
3	B	902	ANP	C5-N7	-4.43	1.31	1.39
3	A	901	ANP	C5-N7	-4.23	1.31	1.39
3	B	902	ANP	PB-O2B	-3.09	1.48	1.56
3	A	901	ANP	O5'-C5'	-2.92	1.33	1.44
3	A	901	ANP	PG-O1G	2.89	1.50	1.46
3	A	901	ANP	O4'-C4'	-2.70	1.39	1.45
3	B	902	ANP	O4'-C4'	-2.65	1.39	1.45
3	A	901	ANP	PB-O2B	-2.60	1.49	1.56
3	A	901	ANP	C4-N9	-2.58	1.32	1.37
3	B	902	ANP	O5'-C5'	-2.49	1.35	1.44
3	A	901	ANP	C6-N1	2.29	1.42	1.35
3	B	902	ANP	C5-C4	2.28	1.43	1.39
3	A	901	ANP	C5-C4	2.22	1.43	1.39
3	B	902	ANP	C6-N1	2.20	1.41	1.35
3	B	902	ANP	PG-O1G	2.17	1.49	1.46
3	B	902	ANP	C1'-N9	2.10	1.52	1.46
3	B	902	ANP	C4-N9	-2.09	1.33	1.37

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	902	ANP	N3-C2-N1	-7.03	117.94	128.58
3	A	901	ANP	N3-C2-N1	-6.88	118.17	128.58
3	A	901	ANP	O4'-C1'-N9	-5.76	97.03	108.09
3	B	902	ANP	O4'-C1'-N9	-5.46	97.60	108.09
3	B	902	ANP	C2-N3-C4	4.80	123.55	111.83
3	A	901	ANP	C2-N3-C4	4.69	123.28	111.83
3	B	902	ANP	C5-C4-N3	-4.60	120.39	126.72
3	A	901	ANP	C5-C4-N3	-4.36	120.71	126.72
3	B	902	ANP	N3-C4-N9	3.88	133.77	127.17
3	A	901	ANP	N3-C4-N9	3.66	133.39	127.17
3	B	902	ANP	O1G-PG-N3B	3.16	116.43	111.77

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	902	ANP	C4-N9-C1'	2.84	133.27	126.63
3	B	902	ANP	C1'-N9-C8	-2.71	121.08	127.09
3	A	901	ANP	C1'-N9-C8	-2.57	121.40	127.09
3	A	901	ANP	O4'-C4'-C5'	-2.56	101.13	109.33
3	A	901	ANP	C4-N9-C1'	2.56	132.61	126.63
3	A	901	ANP	O5'-PA-O1A	2.47	118.72	108.94
3	A	901	ANP	O3A-PB-N3B	-2.42	99.88	106.59
3	B	902	ANP	C3'-C2'-C1'	2.26	105.74	101.46
3	B	902	ANP	O4'-C4'-C5'	-2.20	102.29	109.33
3	A	901	ANP	O1G-PG-N3B	2.02	114.74	111.77
3	B	902	ANP	O2B-PB-O1B	2.01	114.18	109.87
3	A	901	ANP	C3'-C2'-C1'	2.00	105.25	101.46

There are no chirality outliers.

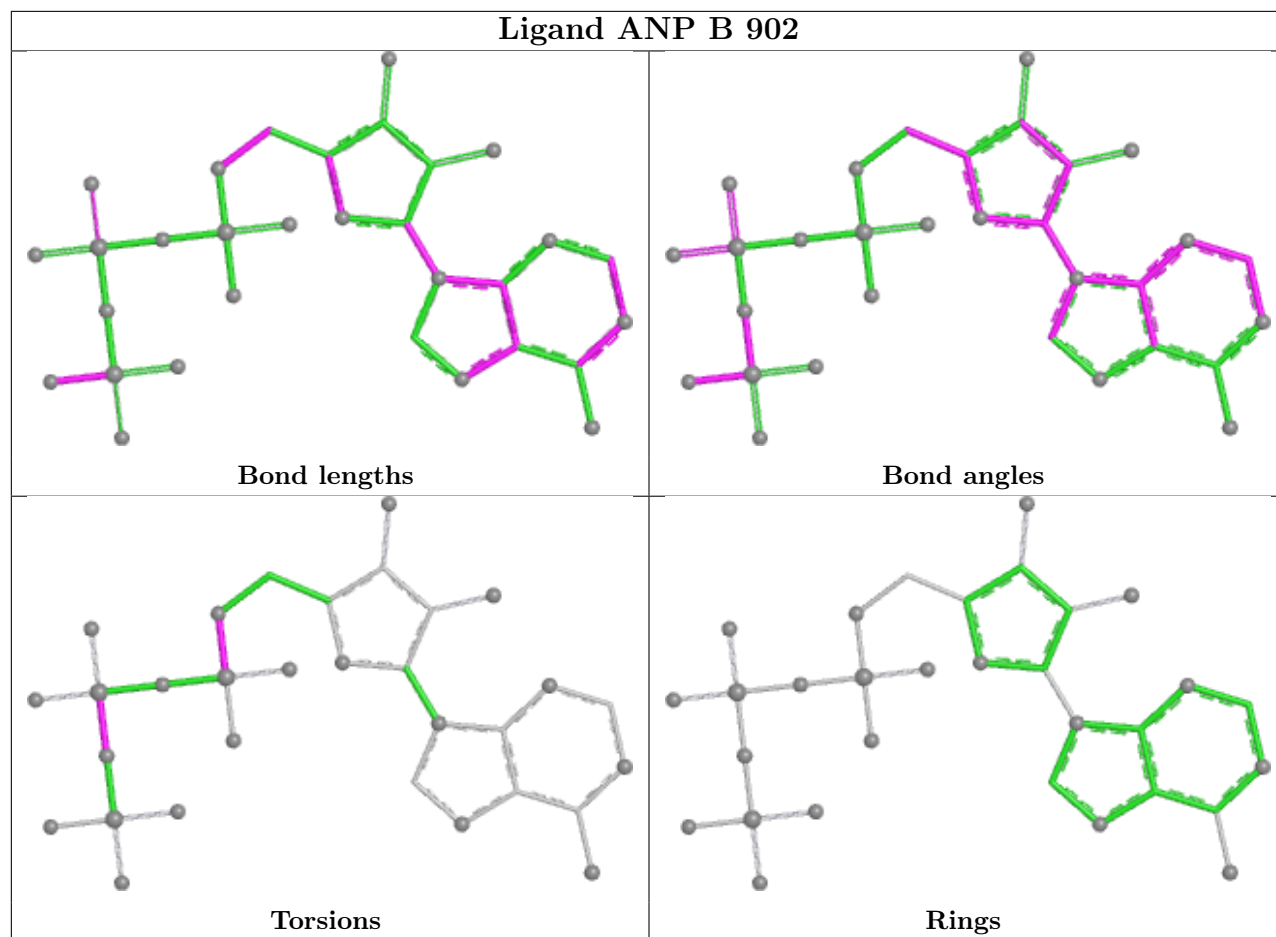
All (8) torsion outliers are listed below:

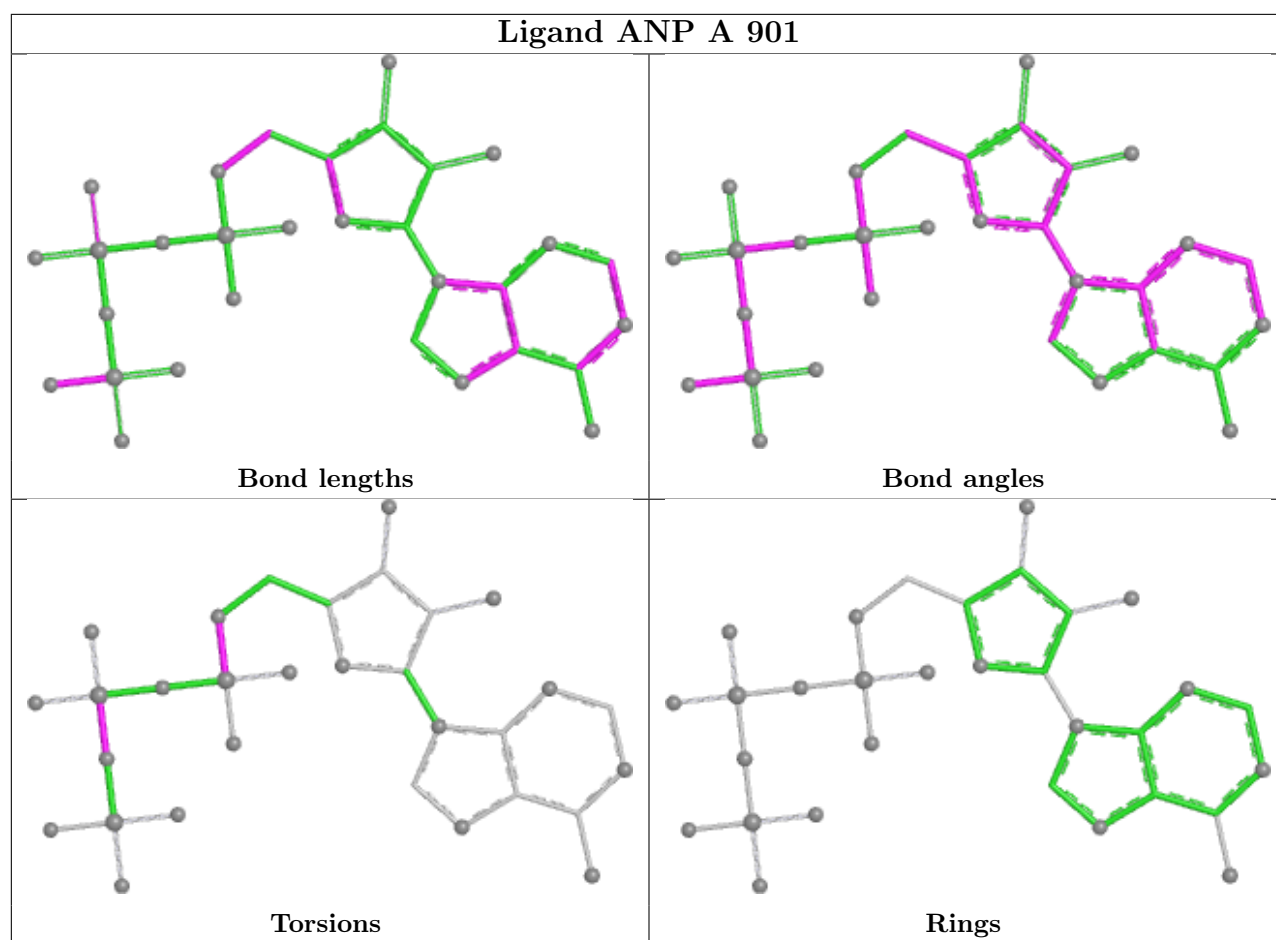
Mol	Chain	Res	Type	Atoms
3	A	901	ANP	PG-N3B-PB-O1B
3	A	901	ANP	C5'-O5'-PA-O1A
3	A	901	ANP	C5'-O5'-PA-O2A
3	A	901	ANP	C5'-O5'-PA-O3A
3	B	902	ANP	PG-N3B-PB-O1B
3	B	902	ANP	C5'-O5'-PA-O1A
3	B	902	ANP	C5'-O5'-PA-O2A
3	B	902	ANP	C5'-O5'-PA-O3A

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 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	373/400 (93%)	0.55	32 (8%) 16 18	19, 31, 64, 86	0
1	B	378/400 (94%)	0.77	50 (13%) 7 8	20, 33, 58, 82	0
All	All	751/800 (93%)	0.66	82 (10%) 10 13	19, 32, 61, 86	0

All (82) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	340	VAL	4.6
1	A	405	CYS	4.4
1	B	403	ILE	4.2
1	B	411	ILE	4.2
1	A	341	VAL	4.1
1	A	279	LEU	4.1
1	B	343	LYS	3.9
1	A	278	LYS	3.9
1	A	350	ALA	3.8
1	B	280	ASP	3.7
1	B	341	VAL	3.5
1	A	358	ASN	3.5
1	B	406	GLY	3.5
1	B	277	ASP	3.5
1	A	286	LEU	3.4
1	A	404	GLY	3.4
1	B	345	ASN	3.3
1	A	340	VAL	3.3
1	A	280	ASP	3.3
1	A	337	LEU	3.3
1	B	279	LEU	3.3
1	B	394	LEU	3.2
1	B	61	MET	3.2
1	B	67	ASP	3.2

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Mol	Chain	Res	Type	RSRZ
1	B	335	THR	3.2
1	B	189	MET	3.1
1	B	353	ALA	3.1
1	B	351	VAL	3.1
1	B	400	LYS	3.1
1	B	339	ASP	3.0
1	B	132	VAL	2.9
1	B	104	CYS	2.9
1	B	286	LEU	2.9
1	B	334	VAL	2.8
1	A	351	VAL	2.8
1	A	66	GLU	2.8
1	A	67	ASP	2.8
1	B	337	LEU	2.7
1	A	285	SER	2.7
1	A	40	LEU	2.7
1	A	275	LEU	2.7
1	A	200	ARG	2.6
1	B	162	ARG	2.6
1	B	399	ILE	2.6
1	A	68	VAL	2.6
1	A	283	GLY	2.5
1	B	358	ASN	2.5
1	A	184	ARG	2.5
1	B	201	ALA	2.5
1	B	338	VAL	2.5
1	B	344	LYS	2.5
1	B	410	SER	2.5
1	A	338	VAL	2.5
1	A	61	MET	2.4
1	A	403	ILE	2.4
1	B	397	LYS	2.4
1	A	277	ASP	2.4
1	B	398	PHE	2.4
1	B	408	VAL	2.4
1	B	285	SER	2.4
1	B	128	VAL	2.3
1	B	402	ALA	2.3
1	A	289	ILE	2.3
1	B	66	GLU	2.2
1	B	333	ILE	2.2
1	B	206	LEU	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	354	HIS	2.2
1	A	344	LYS	2.2
1	B	396	GLU	2.1
1	B	252	ASP	2.1
1	B	115	LEU	2.1
1	B	112	GLU	2.1
1	A	282	THR	2.1
1	B	401	ALA	2.1
1	A	312	SER	2.1
1	B	283	GLY	2.1
1	B	68	VAL	2.1
1	A	272	ASP	2.1
1	A	210	ASN	2.0
1	A	359	HIS	2.0
1	B	282	THR	2.0
1	B	293	VAL	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.

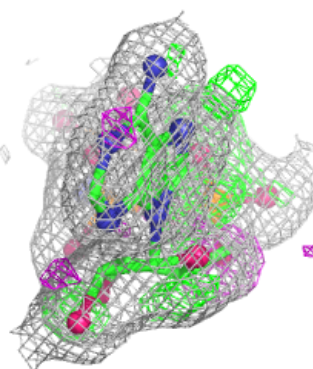
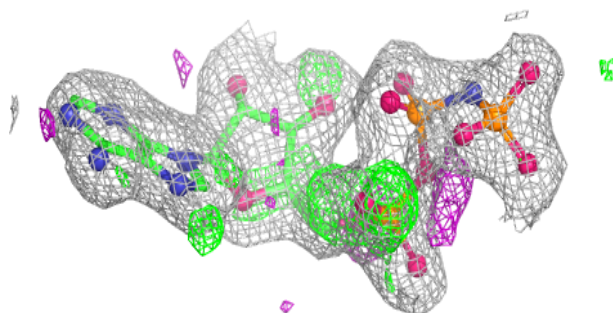
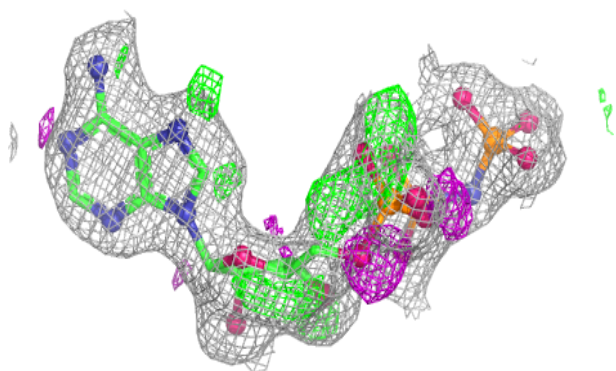
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	ANP	B	902	31/31	0.91	0.12	23,27,35,35	0
3	ANP	A	901	31/31	0.92	0.12	20,25,35,35	0
2	MG	B	904	1/1	0.97	0.03	20,20,20,20	0
2	MG	A	903	1/1	0.99	0.02	20,20,20,20	0

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.

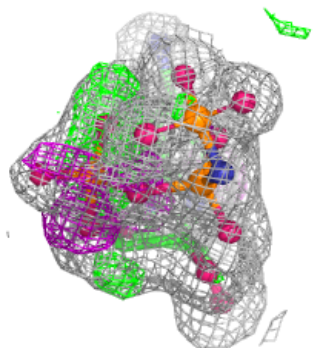
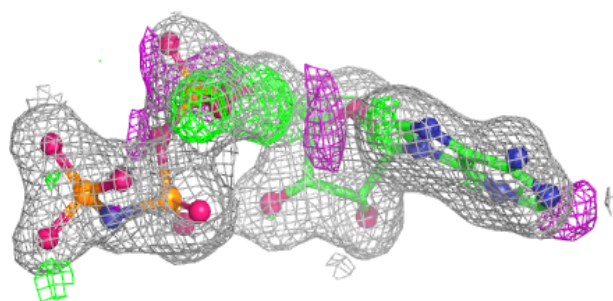
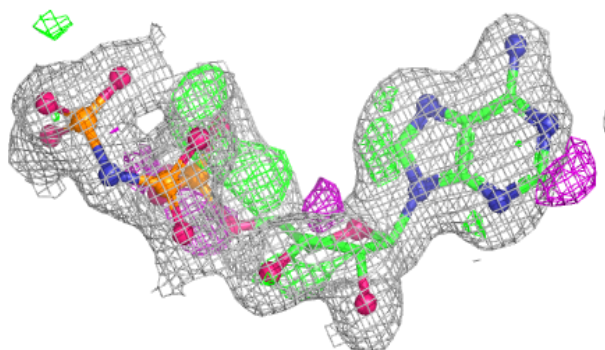
Electron density around ANP B 902:

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



Electron density around ANP A 901:

$2mF_o-DF_c$ (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.