



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 08:50 PM UTC

PDB ID : 5O6M / pdb_00005o6m
Title : Structure of Polyphosphate Kinase from *Meiothermus ruber* N121D bound to ATP
Authors : Kemper, F.; Gerhardt, S.; Einsle, O.
Deposited on : 2017-06-06
Resolution : 2.30 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

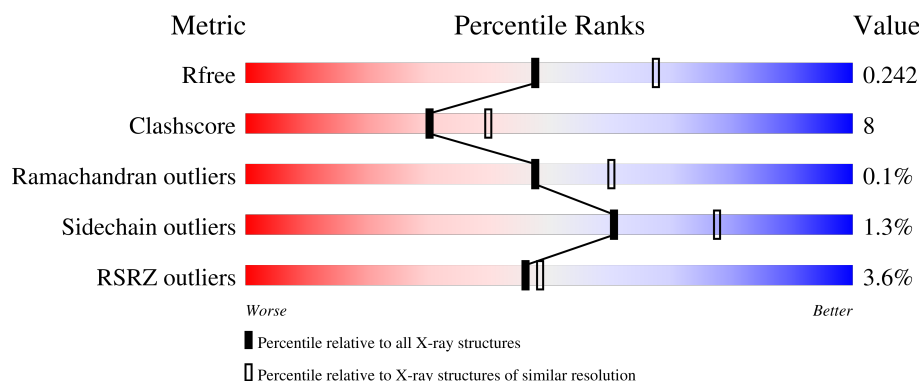
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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	6319 (2.30-2.30)
Clashscore	190562	6919 (2.30-2.30)
Ramachandran outliers	187476	6854 (2.30-2.30)
Sidechain outliers	187428	6854 (2.30-2.30)
RSRZ outliers	180081	6325 (2.30-2.30)

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	267	0% 83% 13% .
1	B	267	3% 82% 15% ..
1	C	267	7% 77% 19% ..
1	D	267	4% 80% 18% ..

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	PO4	A	1006	-	-	X	-
3	PO4	B	302	-	-	X	-
3	PO4	B	304	-	-	X	-
3	PO4	B	307	-	-	X	-

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 9437 atoms, of which 64 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.

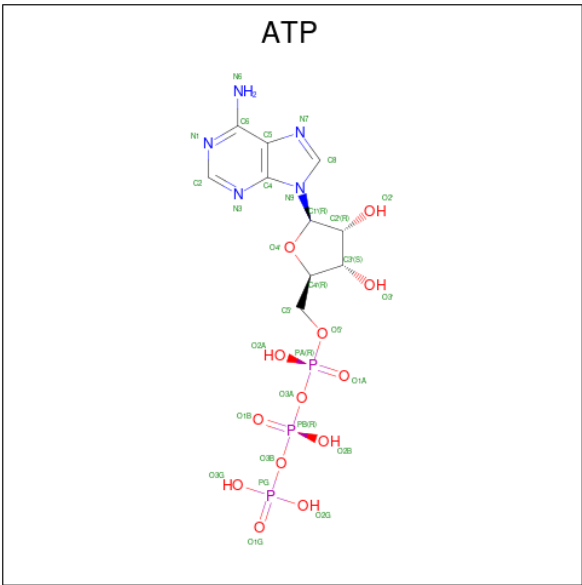
- Molecule 1 is a protein called Polyphosphate:AMP phosphotransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	256	Total	C	N	O	S	0	5	0
			2184	1390	397	391	6			
1	B	261	Total	C	N	O	S	0	5	0
			2229	1417	406	401	5			
1	C	261	Total	C	N	O	S	0	2	0
			2201	1402	399	395	5			
1	D	264	Total	C	N	O	S	0	2	0
			2231	1419	407	400	5			

There are 4 discrepancies between the modelled and reference sequences:

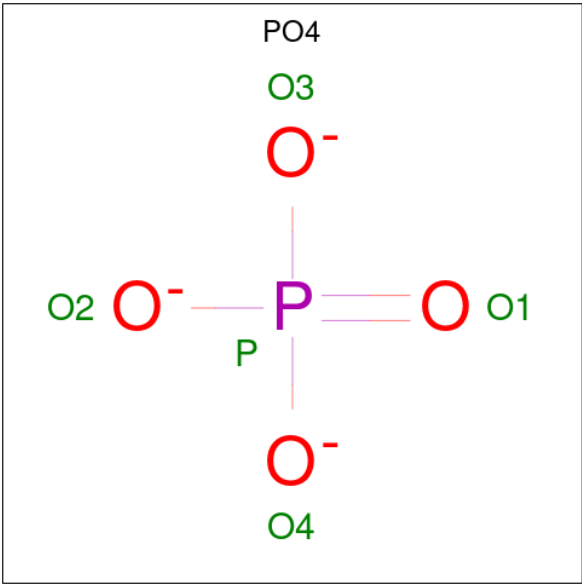
Chain	Residue	Modelled	Actual	Comment	Reference
A	121	ASP	ASN	engineered mutation	UNP A0A0S7ASE9
B	121	ASP	ASN	engineered mutation	UNP A0A0S7ASE9
C	121	ASP	ASN	engineered mutation	UNP A0A0S7ASE9
D	121	ASP	ASN	engineered mutation	UNP A0A0S7ASE9

- Molecule 2 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total	C	H	N	O	P	0	0
			47	10	16	5	13	3		
2	B	1	Total	C	H	N	O	P	0	0
			47	10	16	5	13	3		
2	C	1	Total	C	H	N	O	P	0	0
			47	10	16	5	13	3		
2	D	1	Total	C	H	N	O	P	0	0
			47	10	16	5	13	3		

- Molecule 3 is PHOSPHATE ION (CCD ID: PO4) (formula: O₄P).



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

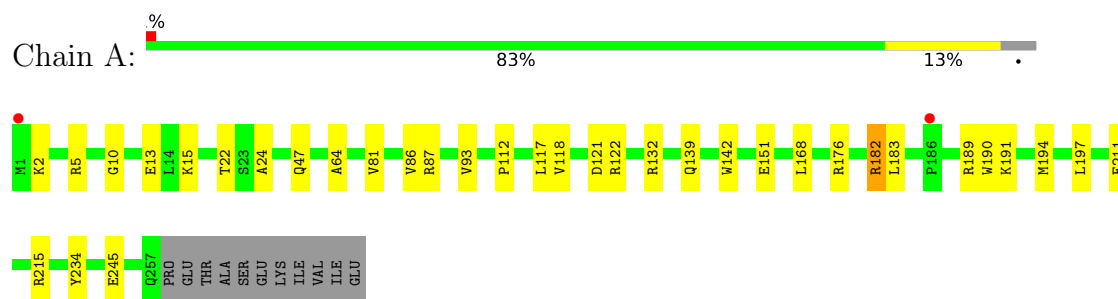
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	107	Total 107	O 107	0	0
4	B	114	Total 114	O 114	0	0
4	C	34	Total 34	O 34	0	0
4	D	39	Total 39	O 39	0	0

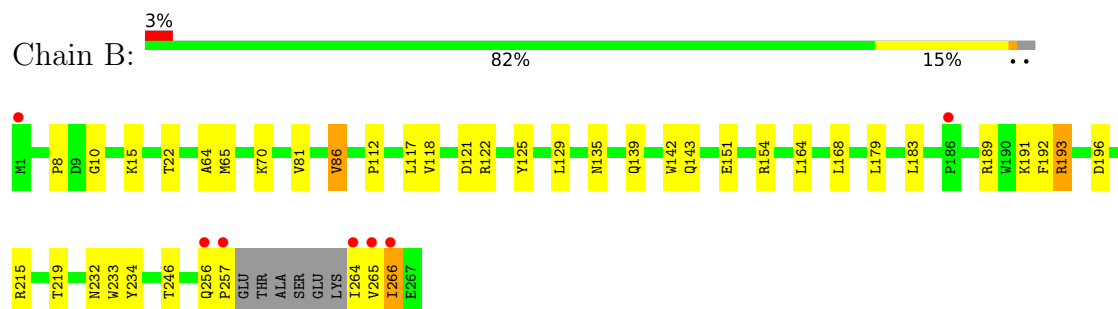
3 Residue-property plots [i](#)

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.

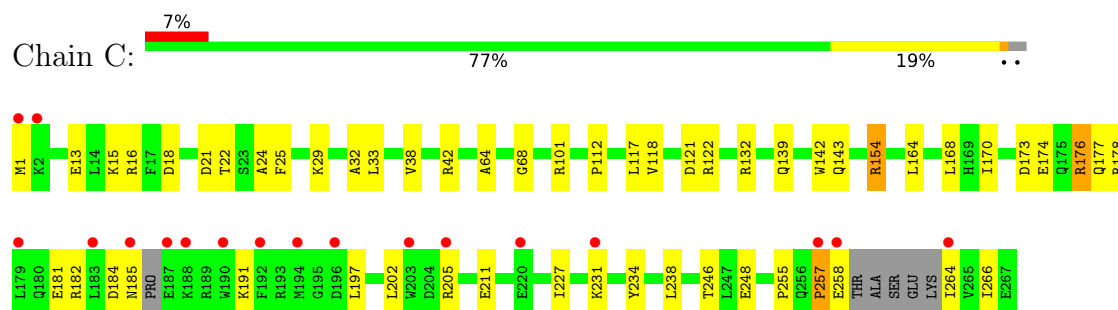
- Molecule 1: Polyphosphate:AMP phosphotransferase



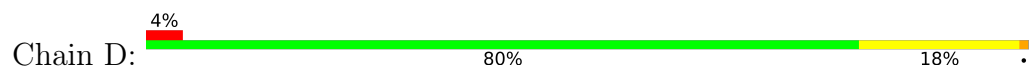
- Molecule 1: Polyphosphate:AMP phosphotransferase

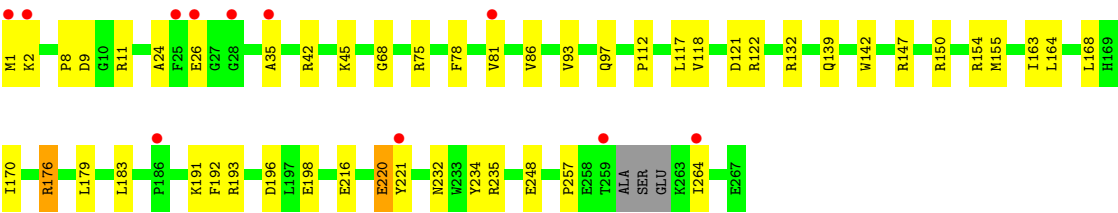


- Molecule 1: Polyphosphate:AMP phosphotransferase



- Molecule 1: Polyphosphate:AMP phosphotransferase





4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α , β , γ	164.62Å 164.62Å 95.12Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.53 – 2.30 47.53 – 2.30	Depositor EDS
% Data completeness (in resolution range)	99.8 (47.53-2.30) 99.8 (47.53-2.30)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.68 (at 2.29Å)	Xtrriage
Refinement program	PHENIX (1.10.1_2155: ???)	Depositor
R, R_{free}	0.195 , 0.239 0.199 , 0.242	Depositor DCC
R_{free} test set	2823 reflections (2.75%)	wwPDB-VP
Wilson B-factor (Å ²)	42.0	Xtrriage
Anisotropy	0.614	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 45.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	9437	wwPDB-VP
Average B, all atoms (Å ²)	56.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 23.32 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 4.7732e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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: ATP, 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	0.17	0/2237	0.37	0/3022
1	B	0.17	0/2282	0.39	0/3081
1	C	0.13	0/2252	0.35	0/3040
1	D	0.14	0/2281	0.36	0/3079
All	All	0.15	0/9052	0.37	0/12222

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 [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	2184	0	2169	37	0
1	B	2229	0	2208	38	0
1	C	2201	0	2187	49	1
1	D	2231	0	2218	44	1
2	A	31	16	12	0	0
2	B	31	16	12	1	0
2	C	31	16	12	0	0
2	D	31	16	12	0	0
3	A	35	0	0	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	30	0	0	7	0
3	C	15	0	0	1	0
3	D	30	0	0	5	0
4	A	107	0	0	3	0
4	B	114	0	0	4	0
4	C	34	0	0	1	0
4	D	39	0	0	3	0
All	All	9373	64	8830	151	1

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 8.

All (151) 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:266:ILE:HD13	1:D:176:ARG:HD2	1.44	0.96
1:C:22:THR:HG21	1:C:231:LYS:HD2	1.51	0.92
1:C:15:LYS:HE3	1:C:16:ARG:HH21	1.38	0.85
1:C:164:LEU:HD11	1:C:246:THR:HG21	1.59	0.84
1:D:1:MET:SD	1:D:2:LYS:HG2	2.18	0.83
1:C:42:ARG:NH2	1:C:248:GLU:OE1	2.13	0.81
1:C:112:PRO:HB3	1:C:118:VAL:HG23	1.63	0.80
1:B:266:ILE:HD13	1:D:176:ARG:CD	2.14	0.78
1:D:191:LYS:HE3	3:D:1004:PO4:O3	1.83	0.78
1:C:182:ARG:HD2	1:C:191:LYS:HB2	1.67	0.76
1:D:97:GLN:HG3	3:D:1007:PO4:O1	1.86	0.75
3:B:304:PO4:O4	4:B:401:HOH:O	2.04	0.74
1:D:183:LEU:HD11	1:D:192:PHE:CD2	2.25	0.71
1:C:22:THR:CG2	1:C:231:LYS:HD2	2.21	0.70
1:A:190:TRP:HB3	1:C:255:PRO:HG2	1.74	0.67
1:D:81:VAL:HG23	1:D:86:VAL:HG11	1.76	0.67
1:A:81:VAL:HG11	1:A:86[B]:VAL:HG21	1.76	0.67
1:D:220:GLU:CD	1:D:220:GLU:H	2.04	0.66
1:B:70:LYS:HG2	3:B:302:PO4:O3	1.97	0.65
1:A:190:TRP:CB	1:C:255:PRO:HG2	2.27	0.65
1:C:13:GLU:HA	1:C:211:GLU:OE2	1.97	0.65
3:B:302:PO4:O1	4:B:402:HOH:O	2.15	0.64
1:A:189:ARG:HD3	1:C:257:PRO:HG3	1.78	0.64
1:A:5:ARG:HD2	4:A:1121:HOH:O	1.99	0.63
1:C:112:PRO:HB3	1:C:118:VAL:CG2	2.27	0.63
1:D:24:ALA:HB3	1:D:234:TYR:OH	2.00	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:93[B]:VAL:HG12	4:A:1123:HOH:O	2.00	0.61
1:C:29:LYS:O	1:C:33:LEU:HD13	1.99	0.61
1:B:183:LEU:HD11	1:B:192:PHE:CD2	2.37	0.60
1:A:112:PRO:HB3	1:A:118:VAL:HG23	1.84	0.60
1:D:81:VAL:CG2	1:D:86:VAL:HG11	2.31	0.59
1:B:266:ILE:HD12	1:B:266:ILE:O	2.03	0.57
1:D:9:ASP:OD1	1:D:11:ARG:HG2	2.05	0.57
1:D:163:ILE:O	1:D:164:LEU:HD23	2.04	0.57
1:A:47:GLN:HG3	1:A:81:VAL:CG1	2.35	0.57
1:C:177:GLN:O	1:C:181:GLU:HG3	2.05	0.56
1:B:232:ASN:ND2	3:B:305:PO4:O1	2.38	0.56
1:C:139:GLN:O	1:C:143:GLN:HG2	2.05	0.56
1:B:264:ILE:HD11	1:D:183:LEU:HD21	1.87	0.56
1:C:202:LEU:HD22	1:C:205:ARG:HD2	1.86	0.55
1:B:10:GLY:O	1:B:215:ARG:HD3	2.06	0.55
1:C:24:ALA:HB3	1:C:234:TYR:OH	2.08	0.54
1:C:139:GLN:HA	1:C:142:TRP:CE2	2.43	0.54
1:D:183:LEU:HD11	1:D:192:PHE:CG	2.43	0.53
1:D:78:PHE:O	1:D:81:VAL:HG22	2.08	0.53
1:C:22:THR:HG21	1:C:231:LYS:CD	2.33	0.53
1:D:193:ARG:O	1:D:196:ASP:HB2	2.08	0.53
1:D:121:ASP:O	1:D:122:ARG:HB2	2.08	0.53
1:A:189:ARG:HD3	1:C:257:PRO:CG	2.38	0.53
1:B:112:PRO:HB3	1:B:118:VAL:HG23	1.89	0.53
1:C:38:VAL:O	1:C:42:ARG:HG3	2.09	0.52
1:C:184:ASP:O	1:C:185:ASN:HB2	2.09	0.52
1:D:75[A]:ARG:NH2	3:D:1006:PO4:O3	2.42	0.52
1:B:121:ASP:O	1:B:122:ARG:HB2	2.09	0.52
1:B:191:LYS:HE2	3:B:307:PO4:P	2.50	0.52
1:D:1:MET:HG3	1:D:2:LYS:H	1.74	0.52
1:B:8:PRO:HB3	1:B:219:THR:HA	1.90	0.52
1:B:193:ARG:O	1:B:196:ASP:HB2	2.09	0.52
1:B:81:VAL:CG2	1:B:86:VAL:HG11	2.40	0.52
1:C:227:ILE:HG23	1:C:238:LEU:HD23	1.92	0.52
1:C:25:PHE:CZ	1:C:32:ALA:HA	2.45	0.51
1:C:121:ASP:O	1:C:122:ARG:HB2	2.10	0.51
1:B:117:LEU:C	1:B:117:LEU:HD23	2.35	0.51
1:C:13:GLU:OE2	1:C:15:LYS:HE2	2.10	0.51
1:A:139:GLN:HA	1:A:142:TRP:NE1	2.26	0.51
1:A:182:ARG:HD2	3:A:1006:PO4:O1	2.11	0.51
1:A:121:ASP:O	1:A:122:ARG:HB2	2.12	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:22:THR:HA	1:C:234:TYR:CZ	2.46	0.50
3:D:1003:PO4:O1	4:D:1101:HOH:O	2.20	0.50
1:B:125:TYR:O	1:B:129:LEU:HG	2.12	0.50
1:B:164:LEU:HD11	1:B:246:THR:HG21	1.94	0.50
1:C:139:GLN:HA	1:C:142:TRP:NE1	2.27	0.50
1:A:197:LEU:HD21	1:C:266:ILE:HD13	1.92	0.50
1:C:176:ARG:NH1	4:C:1102:HOH:O	2.39	0.50
1:B:183:LEU:HD21	1:D:264:ILE:HD11	1.93	0.49
1:D:45:LYS:O	1:D:45:LYS:HD3	2.12	0.49
1:C:154:ARG:NH2	1:D:147:ARG:HH11	2.10	0.49
1:D:35:ALA:HB1	4:D:1135:HOH:O	2.11	0.49
1:C:1:MET:HE3	1:C:24:ALA:O	2.13	0.49
1:A:112:PRO:HB3	1:A:118:VAL:CG2	2.43	0.49
1:B:183:LEU:HD11	1:B:192:PHE:CE2	2.47	0.49
1:C:101:ARG:NH1	3:C:1003:PO4:O3	2.42	0.49
1:A:176:ARG:HG3	1:C:266:ILE:HG22	1.95	0.49
1:B:86:VAL:HA	1:B:117:LEU:O	2.13	0.48
1:D:198:GLU:HG2	4:D:1136:HOH:O	2.12	0.48
1:A:183:LEU:HD13	1:C:264:ILE:HG23	1.95	0.48
1:B:189:ARG:HB3	1:D:257:PRO:HB3	1.95	0.48
1:C:197:LEU:H	1:C:197:LEU:HD22	1.79	0.48
1:A:194:MET:CE	1:A:197:LEU:HD12	2.44	0.48
1:C:64:ALA:HB2	1:C:168:LEU:HB2	1.95	0.48
1:D:179:LEU:O	1:D:183:LEU:HD13	2.14	0.47
1:D:8:PRO:HG2	1:D:220:GLU:HG3	1.96	0.47
1:A:13:GLU:HA	1:A:211:GLU:OE1	2.15	0.47
1:B:64:ALA:HB2	1:B:168:LEU:HB2	1.97	0.47
1:A:132:ARG:HD2	1:A:142:TRP:CH2	2.49	0.47
1:A:189:ARG:HB3	1:C:257:PRO:HG3	1.96	0.47
1:A:10:GLY:O	1:A:215:ARG:HD3	2.15	0.46
1:C:68:GLY:HA2	1:C:170:ILE:HD13	1.98	0.46
1:A:197:LEU:HD21	1:C:266:ILE:CD1	2.46	0.46
1:B:65:MET:HE3	4:B:479:HOH:O	2.14	0.46
1:D:150:ARG:HD3	1:D:216:GLU:O	2.15	0.46
1:D:139:GLN:HA	1:D:142:TRP:NE1	2.31	0.46
1:B:117:LEU:HD23	1:B:118:VAL:N	2.31	0.46
1:A:190:TRP:HB2	1:C:255:PRO:HG2	1.98	0.45
1:B:81:VAL:HG21	1:B:86:VAL:HG11	1.98	0.45
1:D:42:ARG:NH2	1:D:248:GLU:OE2	2.49	0.45
1:B:154:ARG:HD3	4:B:438:HOH:O	2.17	0.45
1:B:256:GLN:HB3	1:B:257:PRO:CD	2.47	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:18:ASP:HB3	1:C:21:ASP:HB2	1.99	0.45
1:A:2:LYS:NZ	1:A:245[A]:GLU:OE1	2.27	0.45
1:B:179:LEU:O	1:B:183:LEU:HD13	2.17	0.45
1:D:9:ASP:CG	1:D:11:ARG:HG2	2.42	0.45
1:C:197:LEU:HD22	1:C:197:LEU:N	2.33	0.44
1:D:264:ILE:C	1:D:264:ILE:HD12	2.43	0.44
1:C:173:ASP:O	1:C:177:GLN:HG3	2.17	0.44
1:B:139[B]:GLN:O	1:B:143:GLN:HB2	2.18	0.44
1:A:191:LYS:HE3	3:A:1006:PO4:O4	2.17	0.44
1:A:151:GLU:HG3	1:B:151:GLU:HG3	2.00	0.44
1:A:87:ARG:HD2	4:A:1106:HOH:O	2.17	0.44
1:D:132:ARG:HD2	1:D:142:TRP:CZ3	2.53	0.44
1:D:1:MET:HG3	1:D:2:LYS:N	2.33	0.43
1:D:155:MET:HE3	1:D:155:MET:HB3	1.93	0.43
1:D:68:GLY:HA2	1:D:170:ILE:HD13	2.01	0.43
1:A:2:LYS:HG3	1:A:5:ARG:CZ	2.47	0.43
1:B:139[A]:GLN:HA	1:B:142:TRP:NE1	2.34	0.43
1:B:264:ILE:HD12	1:B:264:ILE:C	2.44	0.43
1:D:168:LEU:HD13	1:D:235:ARG:HD2	2.01	0.42
1:A:47:GLN:HG3	1:A:81:VAL:HG13	2.00	0.42
1:D:132:ARG:HD2	1:D:142:TRP:CH2	2.54	0.42
1:A:64:ALA:HB2	1:A:168:LEU:HB2	2.01	0.42
1:B:193:ARG:HD3	2:B:301:ATP:O1B	2.20	0.42
1:D:112:PRO:HB3	1:D:118:VAL:HG23	2.00	0.42
1:A:151:GLU:CG	1:B:151:GLU:HG3	2.49	0.42
1:D:154:ARG:HB2	1:D:221:TYR:CZ	2.55	0.42
1:A:22:THR:HA	1:A:234:TYR:CZ	2.55	0.42
1:C:154:ARG:CZ	1:D:147:ARG:HH11	2.32	0.42
1:A:117:LEU:C	1:A:117:LEU:HD23	2.45	0.41
1:D:139:GLN:HA	1:D:142:TRP:CE2	2.55	0.41
1:A:13:GLU:OE1	1:A:15:LYS:HE2	2.20	0.41
1:B:191:LYS:HE2	3:B:307:PO4:O4	2.20	0.41
1:A:194:MET:HE1	1:A:197:LEU:HD12	2.02	0.41
1:B:139[B]:GLN:HA	1:B:142:TRP:NE1	2.36	0.41
1:B:233:TRP:HD1	3:B:304:PO4:O3	2.03	0.41
1:C:132:ARG:HD2	1:C:142:TRP:CH2	2.56	0.41
1:B:22:THR:HA	1:B:234:TYR:CZ	2.55	0.41
1:C:174:GLU:O	1:C:178:ARG:HG3	2.21	0.41
1:D:117:LEU:C	1:D:117:LEU:HD23	2.45	0.41
1:D:232:ASN:HB2	3:D:1005:PO4:O2	2.21	0.41
1:A:24:ALA:HB3	1:A:234:TYR:OH	2.21	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:194:MET:HG3	1:C:258:GLU:OE2	2.21	0.40
1:C:117:LEU:HD23	1:C:117:LEU:C	2.46	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:15:LYS:NZ	1:D:26:GLU:OE2[8_554]	2.07	0.13

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	258/267 (97%)	253 (98%)	5 (2%)	0	100	100
1	B	262/267 (98%)	257 (98%)	5 (2%)	0	100	100
1	C	257/267 (96%)	251 (98%)	5 (2%)	1 (0%)	30	38
1	D	262/267 (98%)	254 (97%)	8 (3%)	0	100	100
All	All	1039/1068 (97%)	1015 (98%)	23 (2%)	1 (0%)	48	60

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	257	PRO

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	230/235 (98%)	229 (100%)	1 (0%)	84	92
1	B	235/235 (100%)	229 (97%)	6 (3%)	40	59
1	C	232/235 (99%)	230 (99%)	2 (1%)	70	84
1	D	235/235 (100%)	232 (99%)	3 (1%)	61	77
All	All	932/940 (99%)	920 (99%)	12 (1%)	61	77

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

Mol	Chain	Res	Type
1	A	182	ARG
1	B	15	LYS
1	B	86	VAL
1	B	135	ASN
1	B	193	ARG
1	B	265	VAL
1	B	266	ILE
1	C	154	ARG
1	C	176	ARG
1	D	93	VAL
1	D	176	ARG
1	D	220	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	180	GLN
1	B	232	ASN
1	C	207	GLN
1	D	40	ASN
1	D	169	HIS
1	D	177	GLN
1	D	207	GLN
1	D	232	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 ⓘ

26 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	PO4	A	1008	-	4,4,4	0.92	0	6,6,6	0.47	0
3	PO4	B	307	-	4,4,4	0.90	0	6,6,6	0.46	0
3	PO4	A	1004	-	4,4,4	0.96	0	6,6,6	0.43	0
3	PO4	A	1006	-	4,4,4	0.92	0	6,6,6	0.47	0
3	PO4	D	1007	-	4,4,4	0.93	0	6,6,6	0.59	0
3	PO4	A	1007	-	4,4,4	0.94	0	6,6,6	0.47	0
3	PO4	A	1003	-	4,4,4	0.93	0	6,6,6	0.51	0
3	PO4	D	1006	-	4,4,4	0.95	0	6,6,6	0.44	0
3	PO4	B	304	-	4,4,4	0.95	0	6,6,6	0.42	0
3	PO4	D	1004	-	4,4,4	0.91	0	6,6,6	0.57	0
3	PO4	D	1002	-	4,4,4	0.99	0	6,6,6	0.41	0
2	ATP	C	1001	-	32,33,33	0.28	0	48,52,52	0.31	0
2	ATP	B	301	-	32,33,33	0.29	0	48,52,52	0.33	0
3	PO4	C	1003	-	4,4,4	0.98	0	6,6,6	0.42	0
3	PO4	C	1004	-	4,4,4	0.91	0	6,6,6	0.47	0
3	PO4	A	1005	-	4,4,4	0.96	0	6,6,6	0.45	0
3	PO4	B	302	-	4,4,4	0.95	0	6,6,6	0.44	0
2	ATP	A	1001	-	32,33,33	0.35	0	48,52,52	0.62	1 (2%)
3	PO4	B	303	-	4,4,4	0.99	0	6,6,6	0.44	0
2	ATP	D	1001	-	32,33,33	0.37	0	48,52,52	0.57	1 (2%)
3	PO4	B	305	-	4,4,4	0.92	0	6,6,6	0.50	0
3	PO4	A	1002	-	4,4,4	0.94	0	6,6,6	0.48	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	PO4	D	1005	-	4,4,4	0.93	0	6,6,6	0.46	0
3	PO4	C	1002	-	4,4,4	0.94	0	6,6,6	0.48	0
3	PO4	D	1003	-	4,4,4	0.95	0	6,6,6	0.44	0
3	PO4	B	306	-	4,4,4	0.91	0	6,6,6	0.52	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
2	ATP	D	1001	-	-	7/22/38/38	0/3/3/3
2	ATP	C	1001	-	-	3/22/38/38	0/3/3/3
2	ATP	B	301	-	-	3/22/38/38	0/3/3/3
2	ATP	A	1001	-	-	1/22/38/38	0/3/3/3

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1001	ATP	C4'-O4'-C1'	-2.82	103.23	109.47
2	D	1001	ATP	C4'-O4'-C1'	-2.36	104.26	109.47

There are no chirality outliers.

All (14) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	1001	ATP	PB-O3B-PG-O2G
2	D	1001	ATP	PB-O3B-PG-O2G
2	D	1001	ATP	PB-O3B-PG-O3G
2	D	1001	ATP	PB-O3A-PA-O5'
2	C	1001	ATP	PB-O3B-PG-O3G
2	C	1001	ATP	PG-O3B-PB-O1B
2	D	1001	ATP	PA-O3A-PB-O3B
2	A	1001	ATP	PG-O3B-PB-O2B
2	B	301	ATP	PG-O3B-PB-O2B
2	D	1001	ATP	PG-O3B-PB-O1B
2	D	1001	ATP	PG-O3B-PB-O2B
2	D	1001	ATP	PA-O3A-PB-O1B
2	B	301	ATP	PG-O3B-PB-O1B

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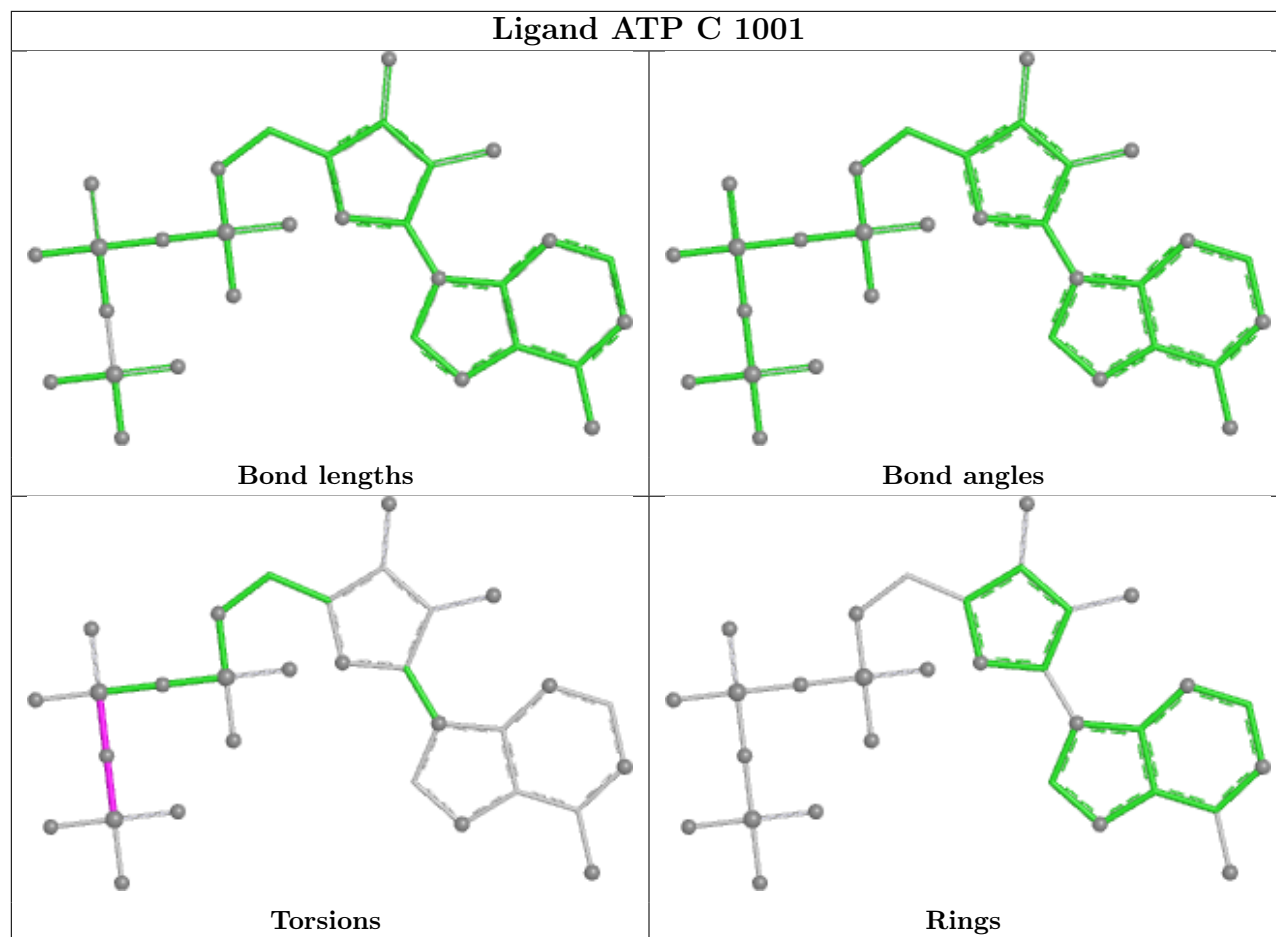
Mol	Chain	Res	Type	Atoms
2	B	301	ATP	PB-O3A-PA-O2A

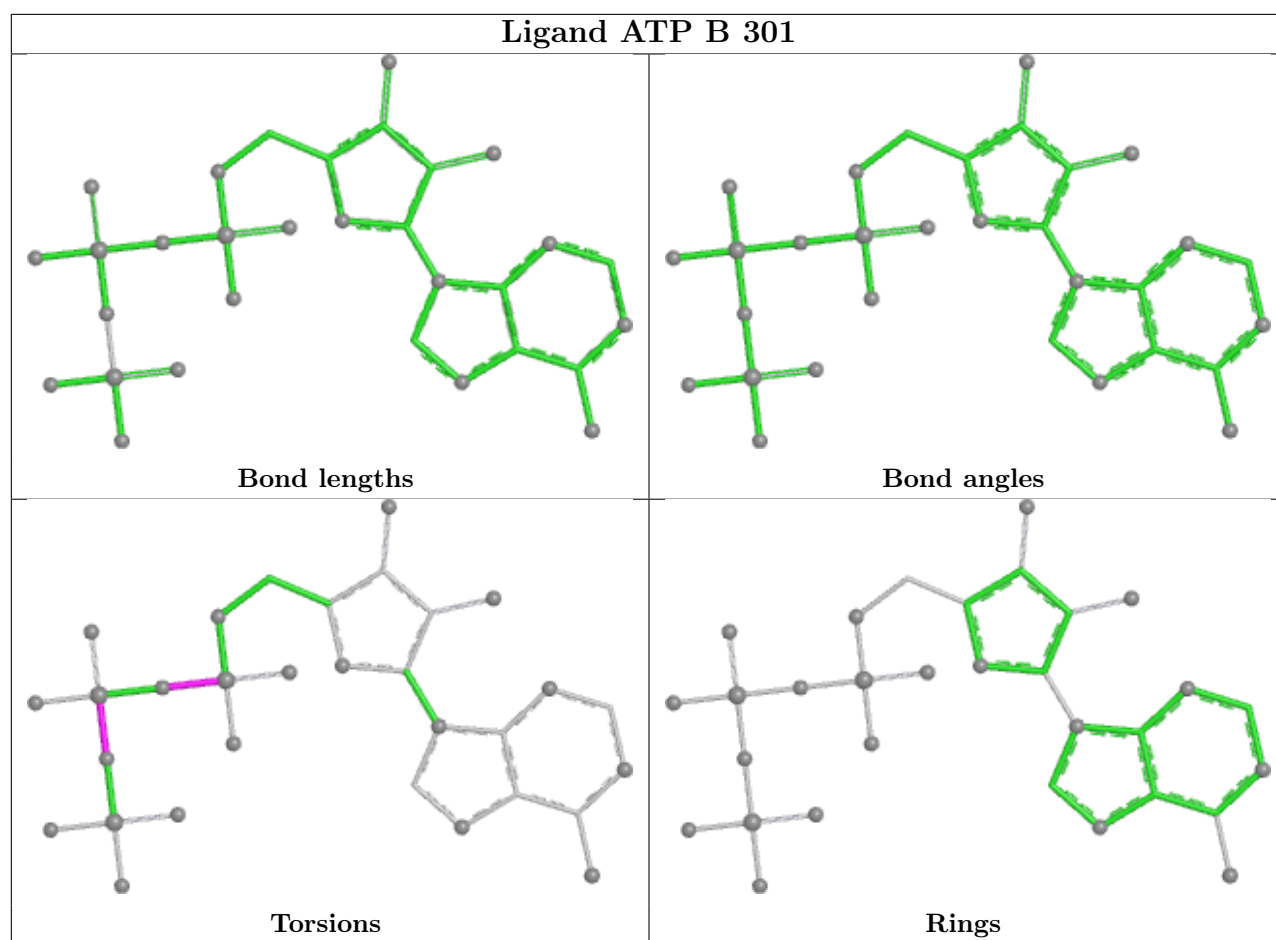
There are no ring outliers.

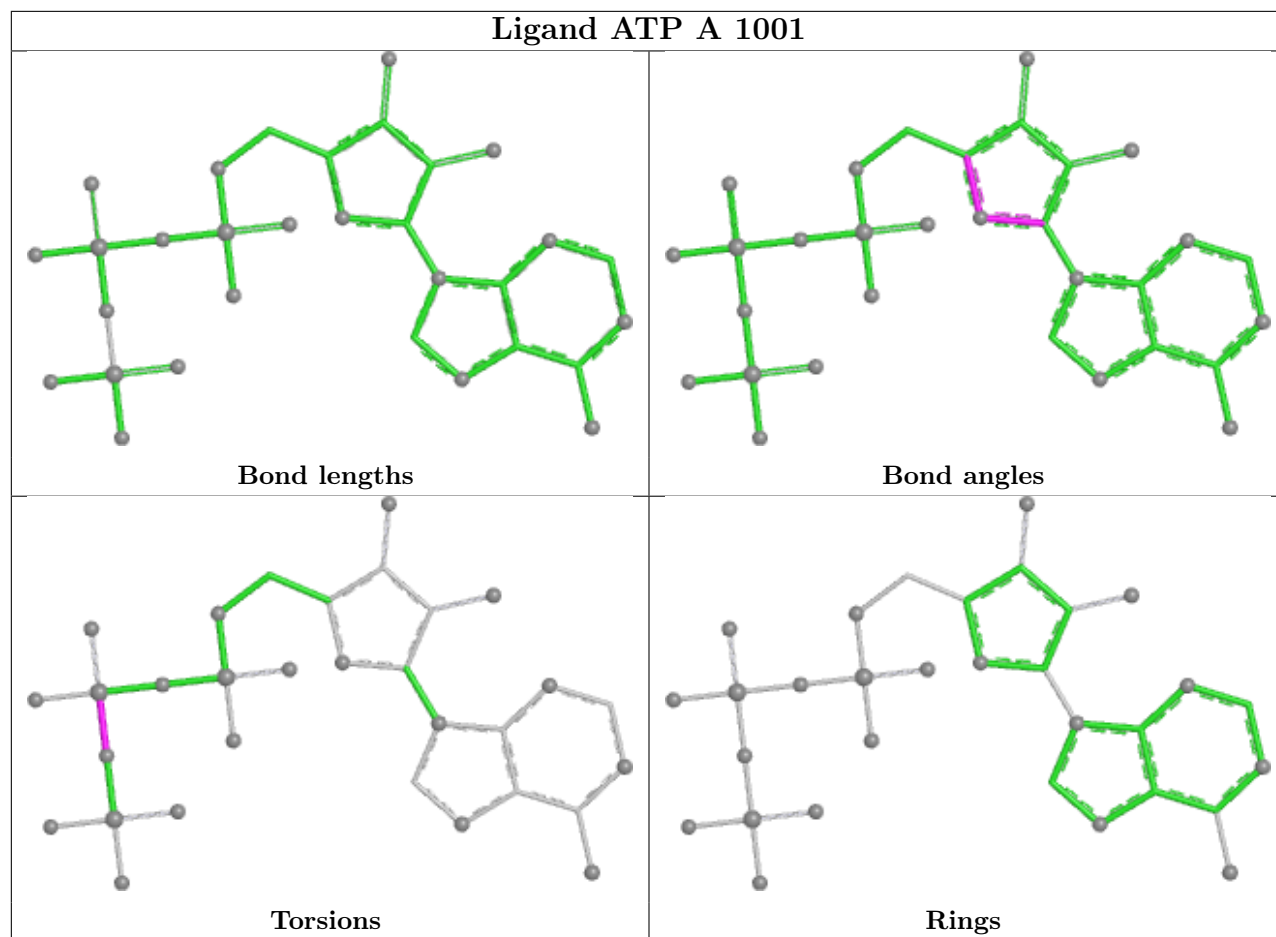
12 monomers are involved in 16 short contacts:

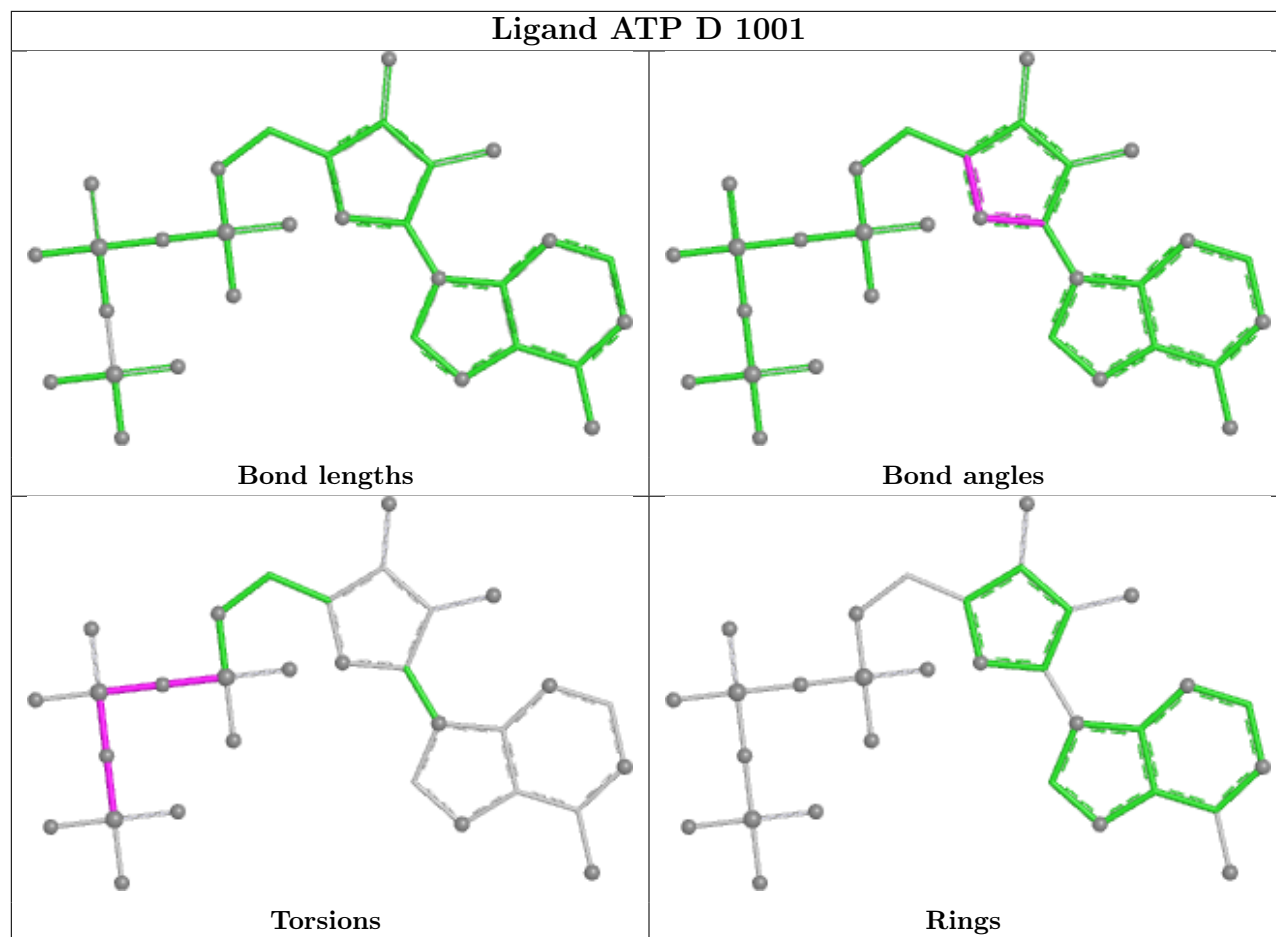
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	307	PO4	2	0
3	A	1006	PO4	2	0
3	D	1007	PO4	1	0
3	D	1006	PO4	1	0
3	B	304	PO4	2	0
3	D	1004	PO4	1	0
2	B	301	ATP	1	0
3	C	1003	PO4	1	0
3	B	302	PO4	2	0
3	B	305	PO4	1	0
3	D	1005	PO4	1	0
3	D	1003	PO4	1	0

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









5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	256/267 (95%)	-0.15	2 (0%) 82 83	15, 41, 79, 114	5 (1%)
1	B	261/267 (97%)	-0.15	7 (2%) 56 58	16, 39, 79, 99	5 (1%)
1	C	261/267 (97%)	0.63	18 (6%) 23 25	21, 67, 110, 132	2 (0%)
1	D	264/267 (98%)	0.50	11 (4%) 40 42	21, 60, 92, 102	2 (0%)
All	All	1042/1068 (97%)	0.21	38 (3%) 46 48	15, 51, 94, 132	14 (1%)

All (38) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1[A]	MET	3.8
1	D	1	MET	3.7
1	B	1	MET	3.5
1	B	264	ILE	3.3
1	B	266	ILE	3.2
1	B	257	PRO	3.1
1	D	2	LYS	3.1
1	C	183	LEU	2.8
1	C	264	ILE	2.8
1	D	221	TYR	2.8
1	C	196	ASP	2.7
1	C	258	GLU	2.6
1	C	185	ASN	2.6
1	D	259	THR	2.6
1	D	264	ILE	2.6
1	D	35	ALA	2.5
1	D	26	GLU	2.5
1	C	1	MET	2.4
1	B	256	GLN	2.4
1	C	205	ARG	2.4
1	D	25	PHE	2.4

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Mol	Chain	Res	Type	RSRZ
1	C	220	GLU	2.4
1	C	257	PRO	2.3
1	C	2	LYS	2.3
1	B	186	PRO	2.3
1	C	190	TRP	2.3
1	C	179	LEU	2.2
1	D	81	VAL	2.2
1	C	192	PHE	2.2
1	D	28	GLY	2.2
1	C	188	LYS	2.2
1	B	265	VAL	2.1
1	C	187	GLU	2.1
1	D	186	PRO	2.1
1	C	203	TRP	2.1
1	C	231	LYS	2.0
1	C	194	MET	2.0
1	A	186	PRO	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	PO4	D	1005	5/5	0.50	0.12	95,98,108,113	0
3	PO4	D	1004	5/5	0.51	0.15	83,89,96,114	0
3	PO4	C	1004	5/5	0.56	0.12	91,98,103,123	0
3	PO4	A	1008	5/5	0.63	0.13	76,79,98,112	0
3	PO4	B	307	5/5	0.66	0.16	67,78,91,100	0
3	PO4	B	306	5/5	0.72	0.12	60,75,82,88	0

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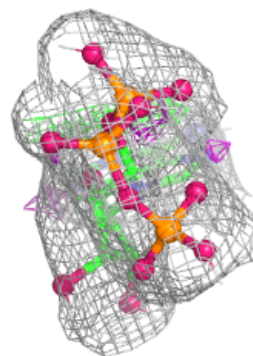
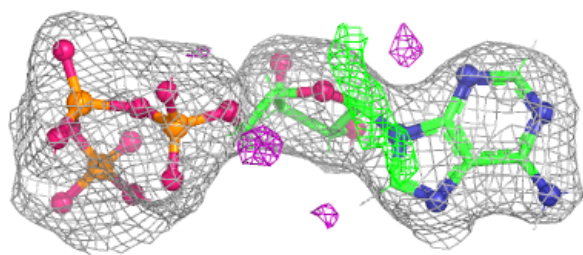
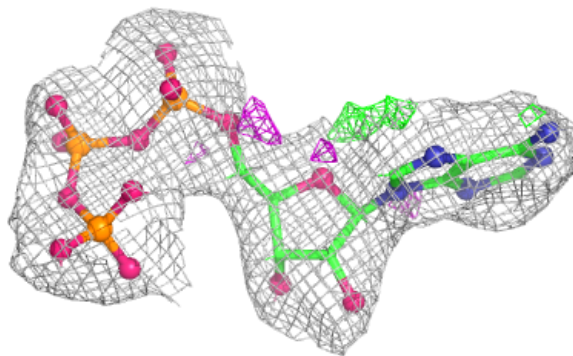
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	PO4	D	1006	5/5	0.74	0.12	67,73,83,89	5
3	PO4	A	1006	5/5	0.76	0.11	91,96,98,111	0
3	PO4	C	1003	5/5	0.81	0.12	72,80,84,86	0
3	PO4	A	1004	5/5	0.82	0.11	45,52,61,61	5
3	PO4	B	304	5/5	0.83	0.12	42,48,61,62	5
3	PO4	A	1007	5/5	0.85	0.13	62,68,76,76	0
3	PO4	B	305	5/5	0.85	0.11	46,49,58,65	5
3	PO4	D	1002	5/5	0.85	0.10	53,58,71,71	0
3	PO4	A	1005	5/5	0.86	0.10	57,63,73,75	1
3	PO4	D	1007	5/5	0.87	0.09	69,69,75,83	0
2	ATP	C	1001	31/31	0.88	0.09	55,76,102,117	0
3	PO4	D	1003	5/5	0.88	0.07	73,77,88,95	0
3	PO4	C	1002	5/5	0.89	0.09	75,77,86,88	0
2	ATP	D	1001	31/31	0.91	0.08	47,67,84,104	0
3	PO4	B	302	5/5	0.94	0.08	39,40,53,57	0
3	PO4	A	1003	5/5	0.95	0.08	45,55,72,74	0
3	PO4	B	303	5/5	0.95	0.07	44,56,71,72	0
2	ATP	B	301	31/31	0.95	0.06	34,49,72,85	0
2	ATP	A	1001	31/31	0.96	0.06	31,46,63,76	0
3	PO4	A	1002	5/5	0.98	0.06	44,44,52,53	0

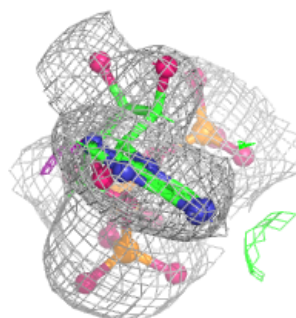
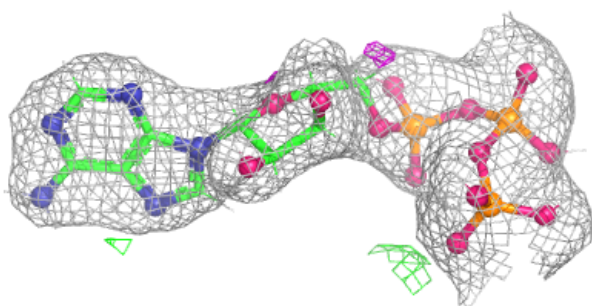
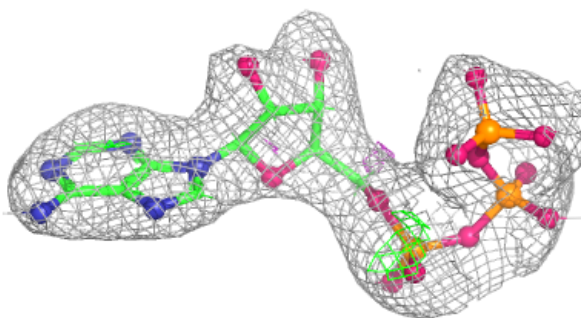
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around ATP C 1001:

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

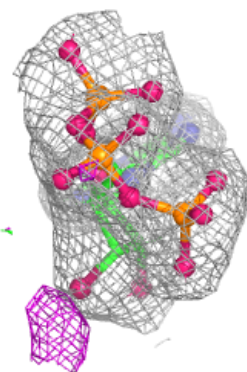
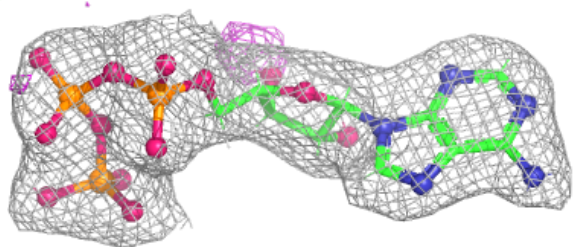
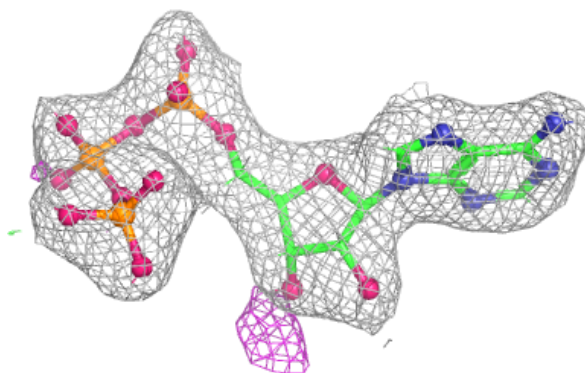
**Electron density around ATP D 1001:**

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

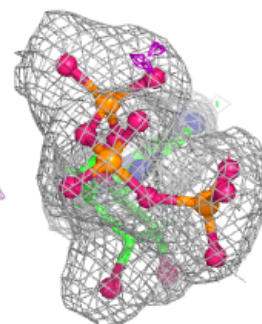
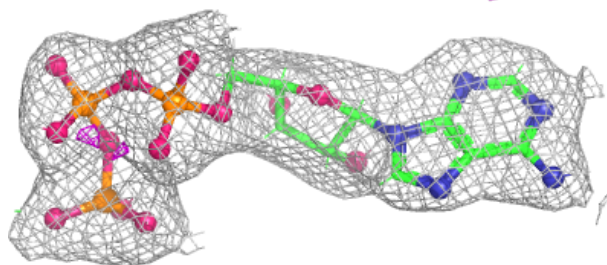
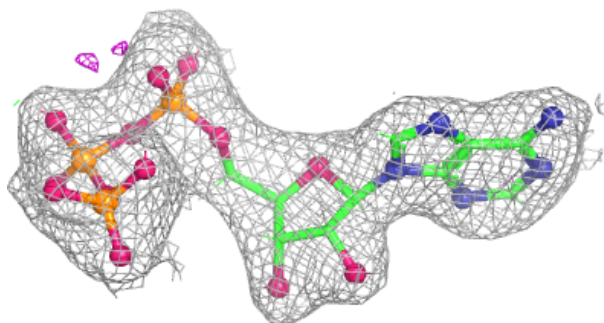


Electron density around ATP B 301:

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

**Electron density around ATP A 1001:**

$2mF_o-DF_c$ (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.