



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 11:04 AM UTC

PDB ID : 3INN / pdb_00003inn
Title : Crystal structure of pantoate-beta-alanine-ligase in complex with ATP at low occupancy at 2.1 Å resolution
Authors : Seattle Structural Genomics Center for Infectious Disease (SSGCID)
Deposited on : 2009-08-12
Resolution : 2.10 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

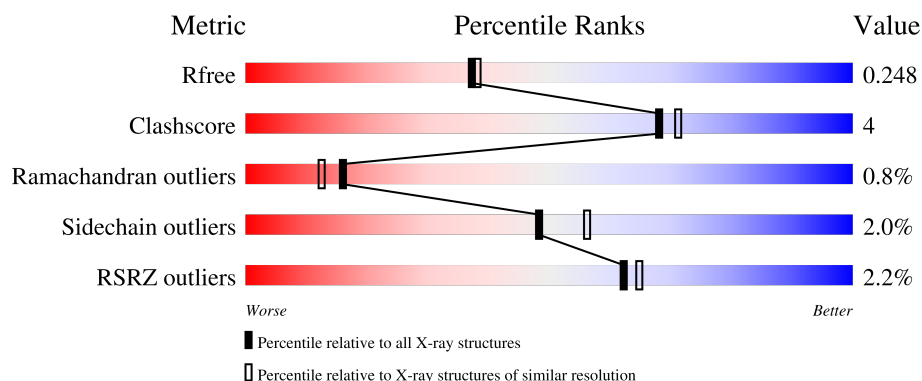
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (2.10-2.10)

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	314	5% 77% 11% • 10%
1	B	314	% 79% 8% • 11%
1	C	314	85% 5% 10%
1	D	314	2% 81% 7% 12%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 9322 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 Pantothenate synthetase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	283	Total	C	N	O	S	8	2	0
			2140	1352	388	392	8			
1	B	278	Total	C	N	O	S	0	3	0
			2165	1373	394	390	8			
1	C	284	Total	C	N	O	S	8	3	0
			2229	1409	407	405	8			
1	D	277	Total	C	N	O	S	8	3	0
			2113	1339	381	385	8			

There are 88 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-20	MET	-	insertion	UNP Q8YFC9
A	-19	ALA	-	insertion	UNP Q8YFC9
A	-18	HIS	-	insertion	UNP Q8YFC9
A	-17	HIS	-	insertion	UNP Q8YFC9
A	-16	HIS	-	insertion	UNP Q8YFC9
A	-15	HIS	-	insertion	UNP Q8YFC9
A	-14	HIS	-	insertion	UNP Q8YFC9
A	-13	HIS	-	insertion	UNP Q8YFC9
A	-12	MET	-	insertion	UNP Q8YFC9
A	-11	GLY	-	insertion	UNP Q8YFC9
A	-10	THR	-	insertion	UNP Q8YFC9
A	-9	LEU	-	insertion	UNP Q8YFC9
A	-8	GLU	-	insertion	UNP Q8YFC9
A	-7	ALA	-	insertion	UNP Q8YFC9
A	-6	GLN	-	insertion	UNP Q8YFC9
A	-5	THR	-	insertion	UNP Q8YFC9
A	-4	GLN	-	insertion	UNP Q8YFC9
A	-3	GLY	-	insertion	UNP Q8YFC9
A	-2	PRO	-	insertion	UNP Q8YFC9
A	-1	GLY	-	insertion	UNP Q8YFC9
A	0	SER	-	insertion	UNP Q8YFC9

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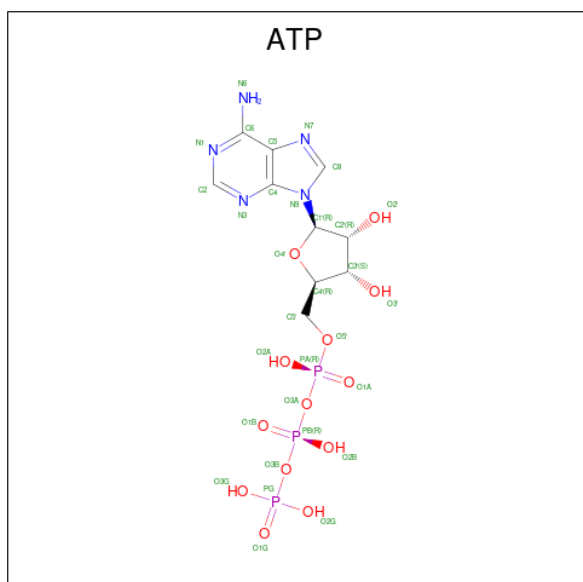
Chain	Residue	Modelled	Actual	Comment	Reference
A	116	ILE	MET	conflict	UNP Q8YFC9
B	-20	MET	-	insertion	UNP Q8YFC9
B	-19	ALA	-	insertion	UNP Q8YFC9
B	-18	HIS	-	insertion	UNP Q8YFC9
B	-17	HIS	-	insertion	UNP Q8YFC9
B	-16	HIS	-	insertion	UNP Q8YFC9
B	-15	HIS	-	insertion	UNP Q8YFC9
B	-14	HIS	-	insertion	UNP Q8YFC9
B	-13	HIS	-	insertion	UNP Q8YFC9
B	-12	MET	-	insertion	UNP Q8YFC9
B	-11	GLY	-	insertion	UNP Q8YFC9
B	-10	THR	-	insertion	UNP Q8YFC9
B	-9	LEU	-	insertion	UNP Q8YFC9
B	-8	GLU	-	insertion	UNP Q8YFC9
B	-7	ALA	-	insertion	UNP Q8YFC9
B	-6	GLN	-	insertion	UNP Q8YFC9
B	-5	THR	-	insertion	UNP Q8YFC9
B	-4	GLN	-	insertion	UNP Q8YFC9
B	-3	GLY	-	insertion	UNP Q8YFC9
B	-2	PRO	-	insertion	UNP Q8YFC9
B	-1	GLY	-	insertion	UNP Q8YFC9
B	0	SER	-	insertion	UNP Q8YFC9
B	116	ILE	MET	conflict	UNP Q8YFC9
C	-20	MET	-	insertion	UNP Q8YFC9
C	-19	ALA	-	insertion	UNP Q8YFC9
C	-18	HIS	-	insertion	UNP Q8YFC9
C	-17	HIS	-	insertion	UNP Q8YFC9
C	-16	HIS	-	insertion	UNP Q8YFC9
C	-15	HIS	-	insertion	UNP Q8YFC9
C	-14	HIS	-	insertion	UNP Q8YFC9
C	-13	HIS	-	insertion	UNP Q8YFC9
C	-12	MET	-	insertion	UNP Q8YFC9
C	-11	GLY	-	insertion	UNP Q8YFC9
C	-10	THR	-	insertion	UNP Q8YFC9
C	-9	LEU	-	insertion	UNP Q8YFC9
C	-8	GLU	-	insertion	UNP Q8YFC9
C	-7	ALA	-	insertion	UNP Q8YFC9
C	-6	GLN	-	insertion	UNP Q8YFC9
C	-5	THR	-	insertion	UNP Q8YFC9
C	-4	GLN	-	insertion	UNP Q8YFC9
C	-3	GLY	-	insertion	UNP Q8YFC9
C	-2	PRO	-	insertion	UNP Q8YFC9

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Chain	Residue	Modelled	Actual	Comment	Reference
C	-1	GLY	-	insertion	UNP Q8YFC9
C	0	SER	-	insertion	UNP Q8YFC9
C	116	ILE	MET	conflict	UNP Q8YFC9
D	-20	MET	-	insertion	UNP Q8YFC9
D	-19	ALA	-	insertion	UNP Q8YFC9
D	-18	HIS	-	insertion	UNP Q8YFC9
D	-17	HIS	-	insertion	UNP Q8YFC9
D	-16	HIS	-	insertion	UNP Q8YFC9
D	-15	HIS	-	insertion	UNP Q8YFC9
D	-14	HIS	-	insertion	UNP Q8YFC9
D	-13	HIS	-	insertion	UNP Q8YFC9
D	-12	MET	-	insertion	UNP Q8YFC9
D	-11	GLY	-	insertion	UNP Q8YFC9
D	-10	THR	-	insertion	UNP Q8YFC9
D	-9	LEU	-	insertion	UNP Q8YFC9
D	-8	GLU	-	insertion	UNP Q8YFC9
D	-7	ALA	-	insertion	UNP Q8YFC9
D	-6	GLN	-	insertion	UNP Q8YFC9
D	-5	THR	-	insertion	UNP Q8YFC9
D	-4	GLN	-	insertion	UNP Q8YFC9
D	-3	GLY	-	insertion	UNP Q8YFC9
D	-2	PRO	-	insertion	UNP Q8YFC9
D	-1	GLY	-	insertion	UNP Q8YFC9
D	0	SER	-	insertion	UNP Q8YFC9
D	116	ILE	MET	conflict	UNP Q8YFC9

- 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	N	O	P	0	0
			31	10	5	13	3		
2	C	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
2	D	1	Total	C	N	O	P	0	0
			31	10	5	13	3		

- Molecule 3 is UNKNOWN ATOM OR ION (CCD ID: UNX) (formula: X).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	3	Total	X	0	0
			3	3		
3	C	3	Total	X	0	0
			3	3		

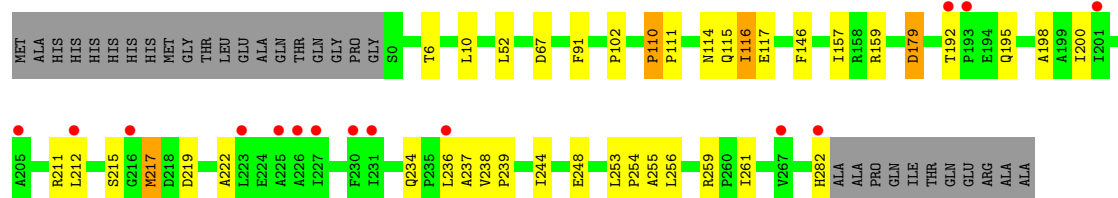
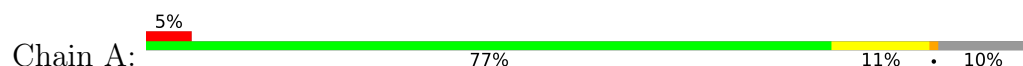
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	90	Total	O	0	0
			90	90		
4	B	188	Total	O	0	0
			188	188		
4	C	213	Total	O	0	0
			213	213		
4	D	85	Total	O	0	0
			85	85		

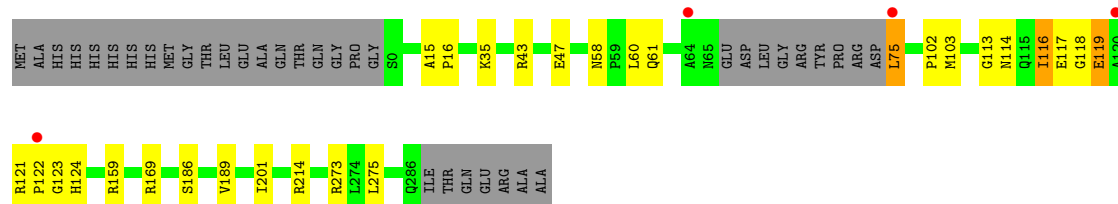
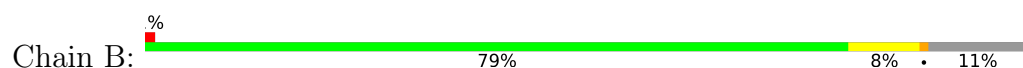
3 Residue-property plots [i](#)

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.

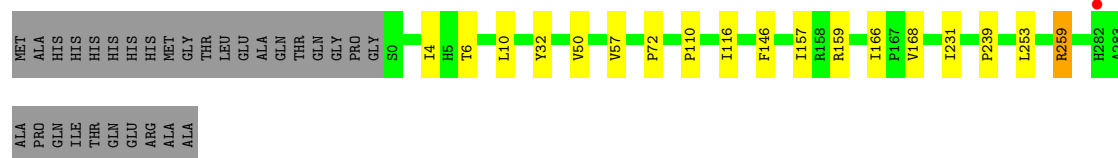
• Molecule 1: Pantothenate synthetase



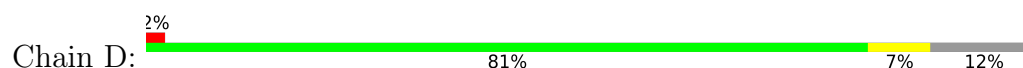
• Molecule 1: Pantothenate synthetase



• Molecule 1: Pantothenate synthetase



• Molecule 1: Pantothenate synthetase





4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	94.32Å 94.32Å 236.93Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	47.95 – 2.10 47.95 – 2.10	Depositor EDS
% Data completeness (in resolution range)	99.8 (47.95-2.10) 99.8 (47.95-2.10)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.56 (at 2.09Å)	Xtriage
Refinement program	REFMAC 5.5.0088	Depositor
R, R_{free}	0.194 , 0.245 0.198 , 0.248	Depositor DCC
R_{free} test set	3633 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	31.6	Xtriage
Anisotropy	0.047	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 35.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.034 for -h,-k,l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	9322	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 2.92% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: ATP, UNX

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	0.78	0/2185	0.87	4/2981 (0.1%)
1	B	0.90	0/2214	0.91	1/3010 (0.0%)
1	C	0.97	1/2281 (0.0%)	0.91	1/3101 (0.0%)
1	D	0.79	0/2159	0.88	1/2939 (0.0%)
All	All	0.86	1/8839 (0.0%)	0.89	7/12031 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	57	VAL	CA-CB	5.70	1.59	1.53

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	110	PRO	N-CA-C	6.30	118.39	110.70
1	A	234	GLN	CA-C-N	5.46	124.92	119.24
1	A	234	GLN	C-N-CA	5.46	124.92	119.24
1	B	121	ARG	N-CA-C	5.38	114.32	108.14
1	C	110	PRO	N-CA-C	5.36	117.24	110.70
1	A	110	PRO	CA-C-N	-5.33	113.42	118.97
1	A	110	PRO	C-N-CA	-5.33	113.42	118.97

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	2140	0	2096	28	0
1	B	2165	0	2205	18	0
1	C	2229	0	2256	10	1
1	D	2113	0	2121	12	0
2	A	31	0	12	0	0
2	C	31	0	12	0	0
2	D	31	0	12	0	0
3	A	3	0	0	0	0
3	C	3	0	0	0	0
4	A	90	0	0	0	0
4	B	188	0	0	3	1
4	C	213	0	0	0	0
4	D	85	0	0	0	0
All	All	9322	0	8714	63	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 4.

All (63) 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:114:ASN:HB3	4:B:444:HOH:O	1.72	0.88
1:C:6:THR:CG2	1:D:169[B]:ARG:HD3	2.10	0.81
1:A:212:LEU:HB3	1:A:217:MET:HE3	1.63	0.79
1:A:212:LEU:HD22	1:A:217:MET:CE	2.12	0.79
1:B:75:LEU:O	1:B:75:LEU:HD13	1.82	0.78
1:D:266:PHE:CD2	1:D:275:LEU:HD22	2.19	0.77
1:B:75:LEU:HD13	1:B:75:LEU:C	2.11	0.76
1:A:111:PRO:O	1:A:115:GLN:NE2	2.24	0.71
1:A:212:LEU:HD22	1:A:217:MET:HE1	1.77	0.65
1:B:75:LEU:C	1:B:75:LEU:CD1	2.71	0.64
1:D:10:LEU:HD11	1:D:52:LEU:HD11	1.82	0.61
1:B:214:ARG:NH2	4:B:385:HOH:O	2.32	0.61
1:A:146:PHE:CE1	1:A:157:ILE:HD13	2.36	0.60
1:A:198:ALA:CB	1:A:236:LEU:HD12	2.32	0.59
1:A:255:ALA:C	1:A:256:LEU:HD23	2.26	0.59
1:A:10:LEU:HD11	1:A:52:LEU:HD11	1.82	0.59
1:B:47:GLU:OE1	1:B:169[A]:ARG:NH2	2.36	0.58
1:B:186:SER:O	1:B:189:VAL:HG12	2.03	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:169[A]:ARG:NE	4:B:731:HOH:O	2.15	0.57
1:A:238:VAL:HG12	1:A:238:VAL:O	2.05	0.56
1:D:47:GLU:OE1	1:D:169[B]:ARG:NH1	2.40	0.55
1:B:58:ASN:HD22	1:B:61:GLN:HE21	1.52	0.55
1:A:253:LEU:HD22	1:A:259:ARG:CZ	2.37	0.55
1:C:253:LEU:HD22	1:C:259:ARG:NH2	2.21	0.54
1:A:116:ILE:HG22	1:A:117:GLU:N	2.23	0.54
1:A:116:ILE:HG22	1:A:117:GLU:H	1.74	0.53
1:A:102:PRO:O	1:D:159[B]:ARG:NH1	2.42	0.52
1:C:166:ILE:HG22	1:C:168:VAL:HG23	1.90	0.52
1:A:219:ASP:HB3	1:A:222:ALA:HB3	1.93	0.50
1:B:102:PRO:O	1:C:159[B]:ARG:NH1	2.44	0.50
1:D:266:PHE:HD2	1:D:275:LEU:HD22	1.74	0.50
1:A:192:THR:H	1:A:195:GLN:NE2	2.11	0.48
1:D:61:GLN:HG2	1:D:128:VAL:HG23	1.95	0.48
1:A:211:ARG:O	1:A:215:SER:N	2.46	0.47
1:A:256:LEU:HD23	1:A:256:LEU:N	2.30	0.47
1:C:146:PHE:CE1	1:C:157:ILE:HD13	2.50	0.47
1:A:198:ALA:HB2	1:A:236:LEU:HD12	1.96	0.46
1:A:159[B]:ARG:HA	1:A:159[B]:ARG:HD3	1.83	0.46
1:B:60:LEU:HD11	1:B:103:MET:HG3	1.99	0.45
1:A:6:THR:CG2	1:B:169[B]:ARG:HD2	2.47	0.45
1:A:67:ASP:OD1	1:A:67:ASP:N	2.49	0.45
1:A:244:ILE:HG23	1:A:261:ILE:HD12	1.99	0.44
1:B:122:PRO:O	1:B:124:HIS:N	2.50	0.44
1:C:6:THR:HG22	1:D:169[B]:ARG:HD3	1.96	0.44
1:A:256:LEU:O	1:A:259:ARG:HG2	2.18	0.44
1:B:118:GLY:O	1:B:119:GLU:C	2.61	0.43
1:C:32:TYR:CG	1:C:72:PRO:HB2	2.53	0.43
1:C:231:ILE:HG21	1:C:239:PRO:HG3	2.00	0.43
1:A:237:ALA:C	1:A:239:PRO:HD3	2.43	0.43
1:C:253:LEU:HD22	1:C:259:ARG:CZ	2.49	0.43
1:D:238:VAL:O	1:D:268:ARG:N	2.37	0.43
1:A:110:PRO:HB3	1:A:114:ASN:HD21	1.84	0.42
1:A:10:LEU:HD22	1:A:91:PHE:CG	2.54	0.42
1:A:192:THR:H	1:A:195:GLN:HE21	1.66	0.42
1:D:116:ILE:HG22	1:D:117:GLU:N	2.35	0.41
1:A:217:MET:HE2	1:A:217:MET:HB2	1.91	0.41
1:B:15:ALA:N	1:B:16:PRO:CD	2.84	0.41
1:B:116:ILE:HG22	1:B:117:GLU:N	2.36	0.41
1:D:118:GLY:O	1:D:119:GLU:CB	2.69	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:201:ILE:HD12	1:B:201:ILE:HA	1.97	0.41
1:C:10:LEU:C	1:C:10:LEU:HD23	2.45	0.41
1:D:232:GLY:C	1:D:234:GLN:N	2.76	0.41
1:B:113:GLY:O	1:B:118:GLY:HA3	2.20	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:259:ARG:NH2	4:B:727:HOH:O[5_555]	2.18	0.02

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	283/314 (90%)	268 (95%)	12 (4%)	3 (1%)	11	8
1	B	277/314 (88%)	270 (98%)	4 (1%)	3 (1%)	11	8
1	C	285/314 (91%)	280 (98%)	4 (1%)	1 (0%)	30	28
1	D	274/314 (87%)	268 (98%)	4 (2%)	2 (1%)	18	15
All	All	1119/1256 (89%)	1086 (97%)	24 (2%)	9 (1%)	16	12

All (9) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	123	GLY
1	D	116	ILE
1	A	254	PRO
1	A	116	ILE
1	B	116	ILE
1	B	119	GLU

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Mol	Chain	Res	Type
1	C	116	ILE
1	D	233	ARG
1	A	179	ASP

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	216/258 (84%)	211 (98%)	5 (2%)	44	51
1	B	228/258 (88%)	222 (97%)	6 (3%)	40	46
1	C	236/258 (92%)	233 (99%)	3 (1%)	61	69
1	D	219/258 (85%)	215 (98%)	4 (2%)	51	60
All	All	899/1032 (87%)	881 (98%)	18 (2%)	48	56

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	179	ASP
1	A	200	ILE
1	A	217	MET
1	A	248	GLU
1	A	282	HIS
1	B	35	LYS
1	B	43	ARG
1	B	75	LEU
1	B	159	ARG
1	B	273	ARG
1	B	275	LEU
1	C	4	ILE
1	C	50	VAL
1	C	259	ARG
1	D	43	ARG
1	D	101	ARG
1	D	178	GLU
1	D	240	GLU

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	19	GLN
1	A	104	GLN
1	A	114	ASN
1	A	195	GLN
1	A	234	GLN
1	A	257	GLN
1	A	277	ASN
1	B	2	GLN
1	B	58	ASN
1	C	48	ASN
1	C	153	GLN
1	C	204	GLN
1	D	2	GLN
1	D	48	ASN
1	D	104	GLN
1	D	152	GLN
1	D	153	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 9 ligands modelled in this entry, 6 are unknown - leaving 3 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	ATP	D	300	-	32,33,33	1.62	8 (25%)	48,52,52	1.89	12 (25%)
2	ATP	A	300	-	32,33,33	1.61	8 (25%)	48,52,52	1.95	13 (27%)
2	ATP	C	300	-	32,33,33	1.65	8 (25%)	48,52,52	1.95	13 (27%)

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	300	-	-	6/22/38/38	0/3/3/3
2	ATP	A	300	-	-	5/22/38/38	0/3/3/3
2	ATP	C	300	-	-	4/22/38/38	0/3/3/3

All (24) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	300	ATP	PB-O3B	5.07	1.65	1.59
2	A	300	ATP	C5-C4	4.25	1.46	1.39
2	C	300	ATP	C5-C4	4.10	1.46	1.39
2	D	300	ATP	C5-C4	4.09	1.46	1.39
2	D	300	ATP	PA-O3A	3.89	1.63	1.59
2	D	300	ATP	PB-O3A	3.59	1.63	1.59
2	A	300	ATP	PB-O3A	3.43	1.63	1.59
2	D	300	ATP	PB-O3B	3.19	1.62	1.59
2	A	300	ATP	PB-O3B	3.13	1.62	1.59
2	A	300	ATP	PA-O3A	3.03	1.62	1.59
2	A	300	ATP	C5-C6	2.75	1.48	1.41
2	D	300	ATP	C5-C6	2.56	1.48	1.41
2	C	300	ATP	C4-N9	-2.56	1.32	1.37
2	A	300	ATP	C8-N7	2.55	1.36	1.31
2	C	300	ATP	PB-O3A	2.53	1.62	1.59
2	C	300	ATP	C5-C6	2.40	1.47	1.41
2	A	300	ATP	C4-N9	-2.37	1.32	1.37
2	D	300	ATP	C4-N9	-2.33	1.32	1.37
2	C	300	ATP	PG-O1G	2.31	1.57	1.50
2	C	300	ATP	C8-N7	2.29	1.36	1.31
2	D	300	ATP	C8-N7	2.19	1.35	1.31

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	300	ATP	C5-N7	-2.08	1.35	1.39
2	A	300	ATP	C5-N7	-2.06	1.35	1.39
2	D	300	ATP	C5-N7	-2.03	1.35	1.39

All (38) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	300	ATP	C5-C4-N3	-5.14	119.64	126.72
2	D	300	ATP	C5-C4-N3	-4.74	120.20	126.72
2	C	300	ATP	C5-C4-N3	-4.65	120.31	126.72
2	C	300	ATP	N3-C2-N1	-4.58	121.64	128.58
2	C	300	ATP	N3-C4-N9	4.47	134.78	127.17
2	C	300	ATP	C4-N9-C8	4.43	110.39	105.74
2	A	300	ATP	N3-C2-N1	-4.23	122.18	128.58
2	D	300	ATP	N3-C2-N1	-4.17	122.27	128.58
2	D	300	ATP	N3-C4-N9	4.11	134.16	127.17
2	A	300	ATP	N3-C4-N9	4.11	134.15	127.17
2	A	300	ATP	C2-N3-C4	4.01	121.63	111.83
2	D	300	ATP	C4-N9-C8	4.00	109.94	105.74
2	A	300	ATP	O4'-C1'-N9	4.00	115.77	108.09
2	D	300	ATP	O4'-C1'-N9	3.83	115.44	108.09
2	C	300	ATP	C2-N3-C4	3.82	121.17	111.83
2	D	300	ATP	C2-N3-C4	3.76	121.01	111.83
2	A	300	ATP	C4-N9-C8	3.58	109.50	105.74
2	A	300	ATP	C4-C5-N7	-3.37	106.72	110.58
2	D	300	ATP	C4-C5-N7	-3.09	107.05	110.58
2	D	300	ATP	N9-C8-N7	-2.95	109.75	113.94
2	A	300	ATP	C6-C5-N7	2.84	137.57	132.09
2	C	300	ATP	N9-C8-N7	-2.79	109.98	113.94
2	A	300	ATP	N9-C8-N7	-2.70	110.11	113.94
2	D	300	ATP	C5-N7-C8	2.65	107.62	103.45
2	C	300	ATP	C6-C5-N7	2.60	137.10	132.09
2	A	300	ATP	C2'-C1'-N9	-2.55	106.98	113.30
2	A	300	ATP	C5-N7-C8	2.54	107.44	103.45
2	D	300	ATP	C6-C5-N7	2.50	136.91	132.09
2	C	300	ATP	O4'-C1'-N9	2.44	112.78	108.09
2	D	300	ATP	C2-N1-C6	2.30	122.52	118.73
2	C	300	ATP	C4-C5-N7	-2.23	108.03	110.58
2	C	300	ATP	C2-N1-C6	2.22	122.37	118.73
2	A	300	ATP	C5'-C4'-C3'	-2.20	107.30	115.21
2	C	300	ATP	C5'-C4'-C3'	-2.12	107.58	115.21
2	C	300	ATP	O2B-PB-O3B	2.12	113.00	107.27

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	300	ATP	C2-N1-C6	2.10	122.18	118.73
2	C	300	ATP	C5-N7-C8	2.06	106.69	103.45
2	D	300	ATP	C4-N9-C1'	-2.02	121.90	126.63

There are no chirality outliers.

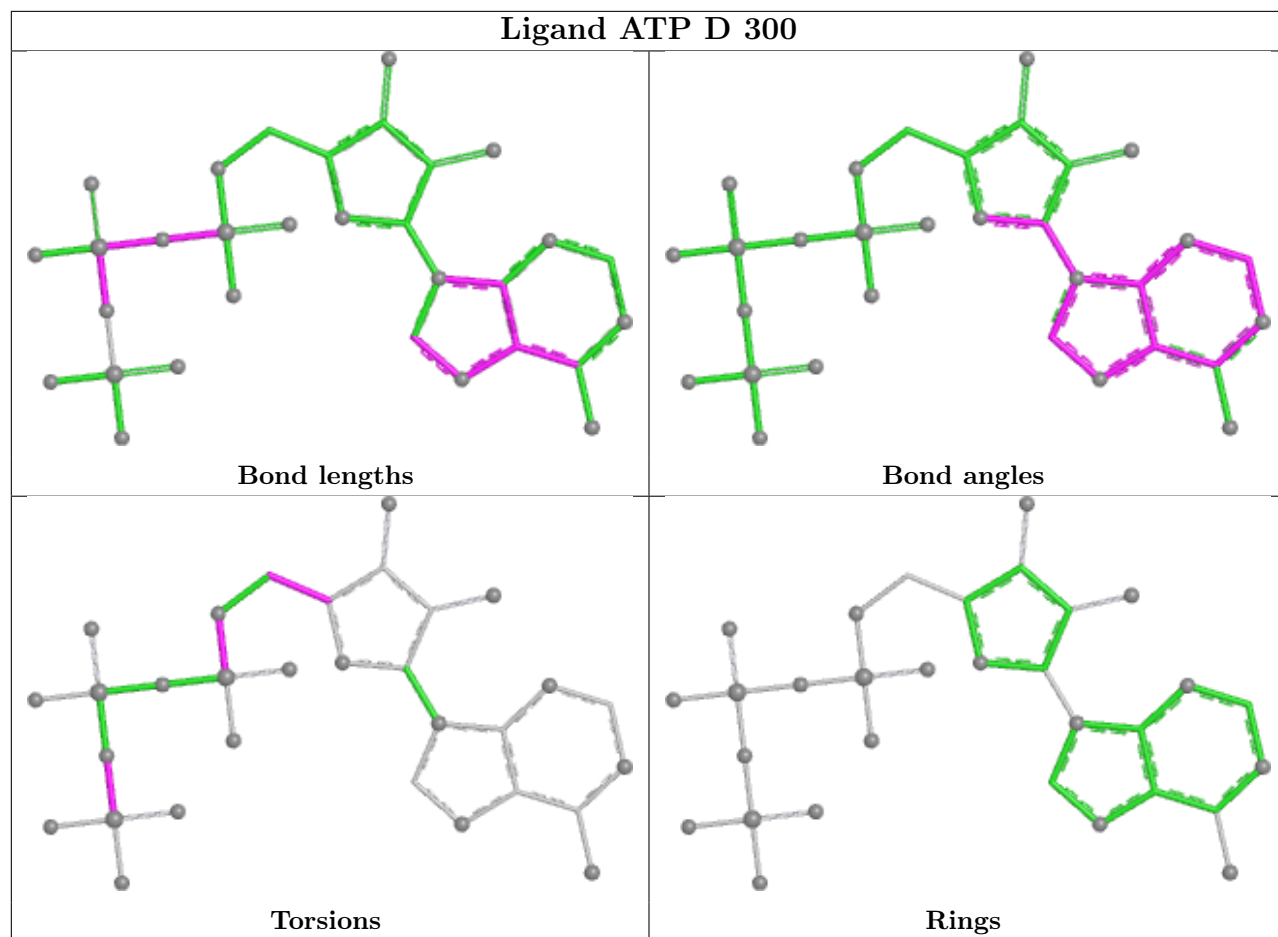
All (15) torsion outliers are listed below:

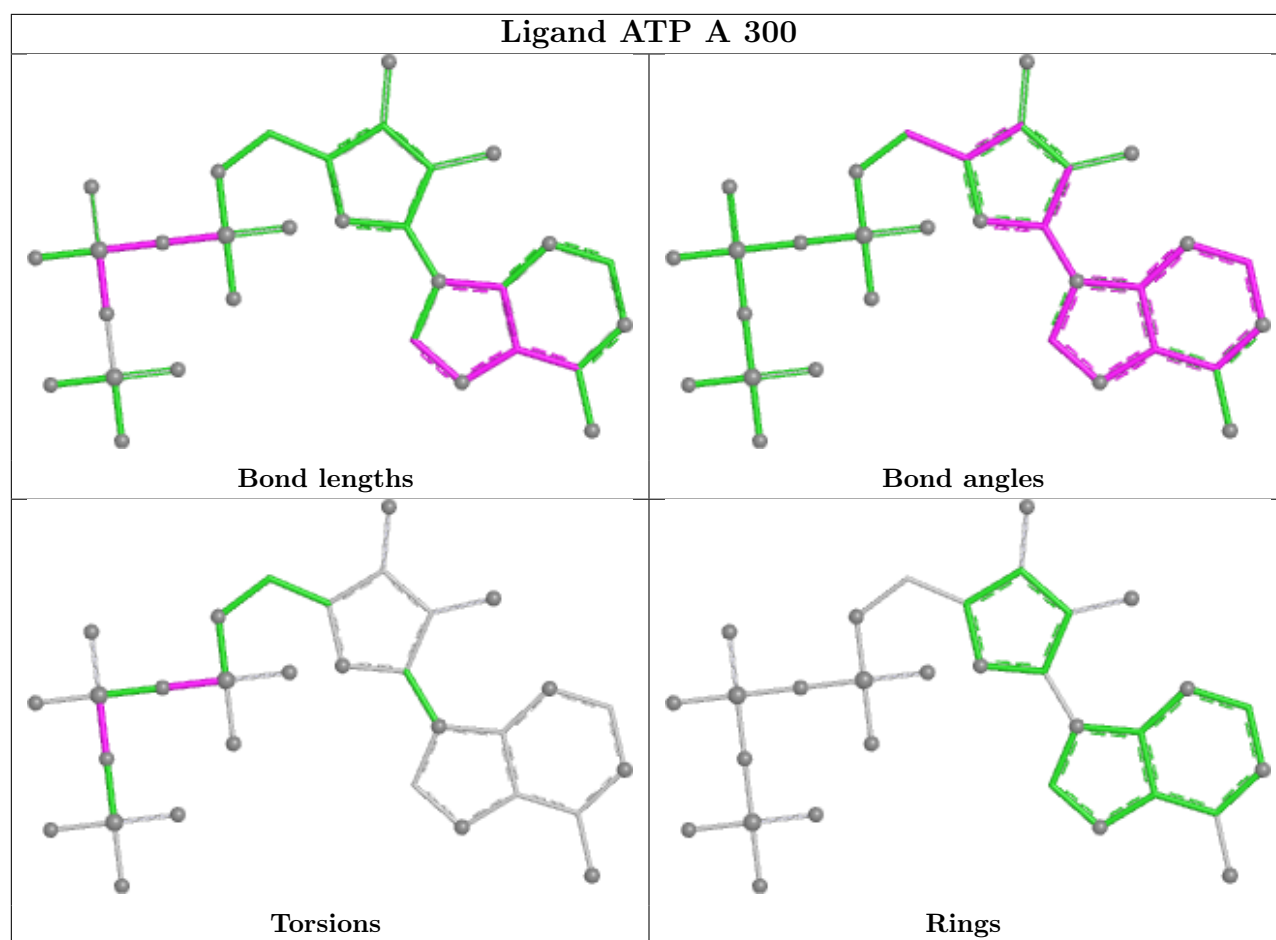
Mol	Chain	Res	Type	Atoms
2	A	300	ATP	PB-O3A-PA-O5'
2	D	300	ATP	PB-O3B-PG-O2G
2	D	300	ATP	C5'-O5'-PA-O2A
2	C	300	ATP	PB-O3A-PA-O5'
2	C	300	ATP	PG-O3B-PB-O2B
2	D	300	ATP	O4'-C4'-C5'-O5'
2	D	300	ATP	C5'-O5'-PA-O1A
2	D	300	ATP	C5'-O5'-PA-O3A
2	D	300	ATP	PB-O3B-PG-O1G
2	A	300	ATP	PG-O3B-PB-O1B
2	A	300	ATP	PG-O3B-PB-O2B
2	A	300	ATP	PB-O3A-PA-O1A
2	A	300	ATP	PB-O3A-PA-O2A
2	C	300	ATP	PG-O3B-PB-O1B
2	C	300	ATP	PB-O3A-PA-O1A

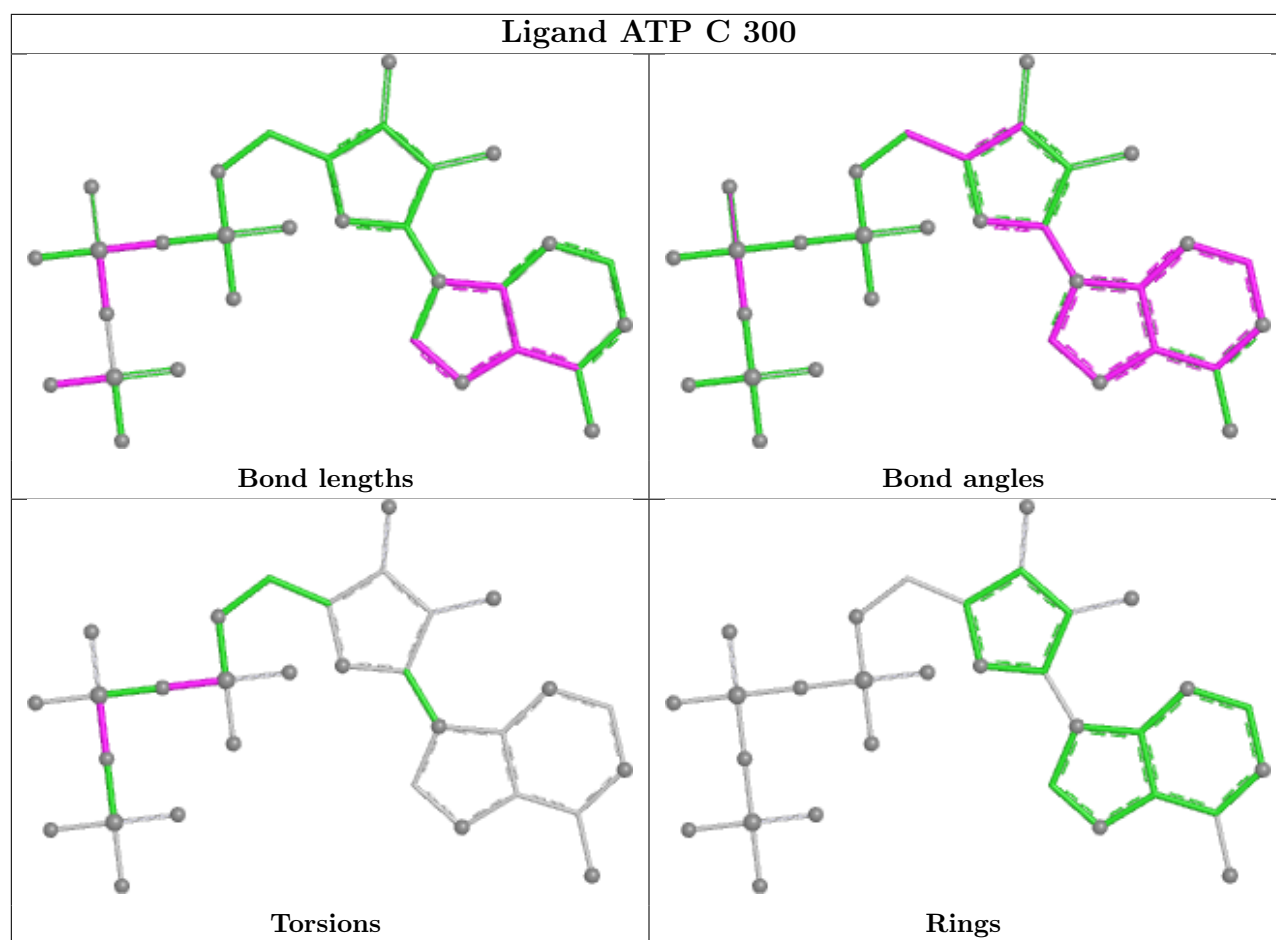
There are no ring outliers.

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	283/314 (90%)	0.32	15 (5%) 32 34	21, 40, 70, 72	2 (0%)
1	B	278/314 (88%)	-0.32	4 (1%) 73 75	13, 28, 45, 63	3 (1%)
1	C	284/314 (90%)	-0.54	1 (0%) 88 90	13, 25, 35, 48	3 (1%)
1	D	277/314 (88%)	0.23	5 (1%) 67 70	15, 43, 56, 66	3 (1%)
All	All	1122/1256 (89%)	-0.08	25 (2%) 62 65	13, 32, 60, 72	11 (0%)

All (25) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	122	PRO	6.4
1	A	223	LEU	3.8
1	A	230	PHE	3.4
1	B	64	ALA	3.3
1	A	225	ALA	3.0
1	A	226	ALA	3.0
1	B	120	ALA	2.9
1	A	201	ILE	2.8
1	A	236	LEU	2.8
1	A	227	ILE	2.6
1	D	62	PHE	2.6
1	D	122	PRO	2.5
1	B	75	LEU	2.5
1	A	216	GLY	2.4
1	A	212	LEU	2.3
1	C	282	HIS	2.2
1	A	267	VAL	2.2
1	A	231	ILE	2.2
1	A	192	THR	2.2
1	D	65	ASN	2.2
1	D	74	ASP	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	205	ALA	2.1
1	A	282	HIS	2.1
1	D	190	TYR	2.0
1	A	193	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](#)

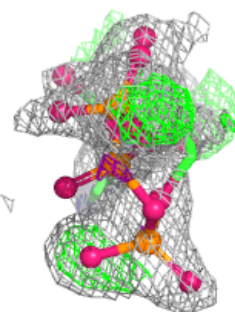
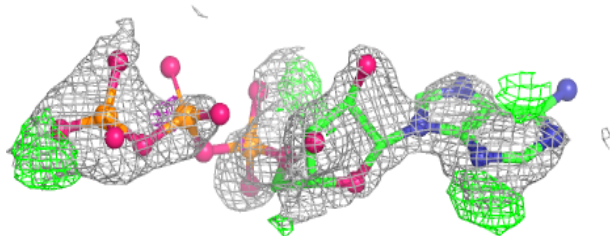
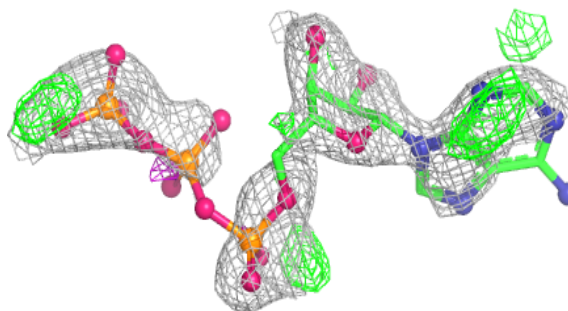
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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
2	ATP	D	300	31/31	0.67	0.20	33,39,53,54	31
2	ATP	A	300	31/31	0.72	0.19	29,39,45,45	31
3	UNX	A	301	1/1	0.76	0.28	53,53,53,53	0
2	ATP	C	300	31/31	0.80	0.16	14,24,33,38	31
3	UNX	C	302	1/1	0.84	0.33	44,44,44,44	0
3	UNX	C	301	1/1	0.85	0.29	45,45,45,45	0
3	UNX	C	303	1/1	0.85	0.28	39,39,39,39	0
3	UNX	A	302	1/1	0.86	0.31	48,48,48,48	0
3	UNX	A	303	1/1	0.94	0.24	34,34,34,34	0

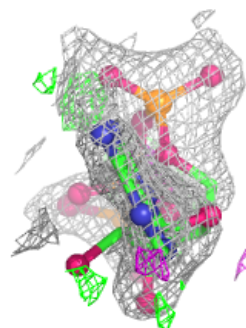
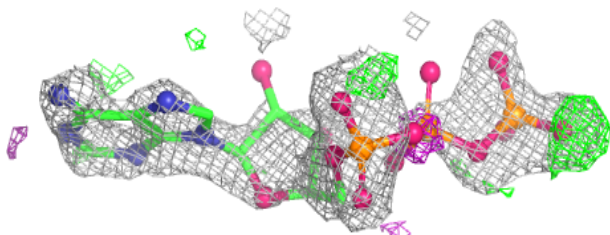
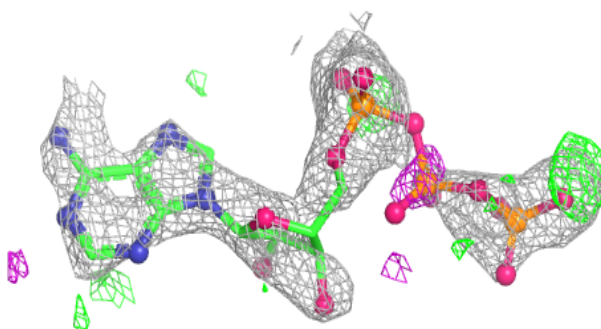
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

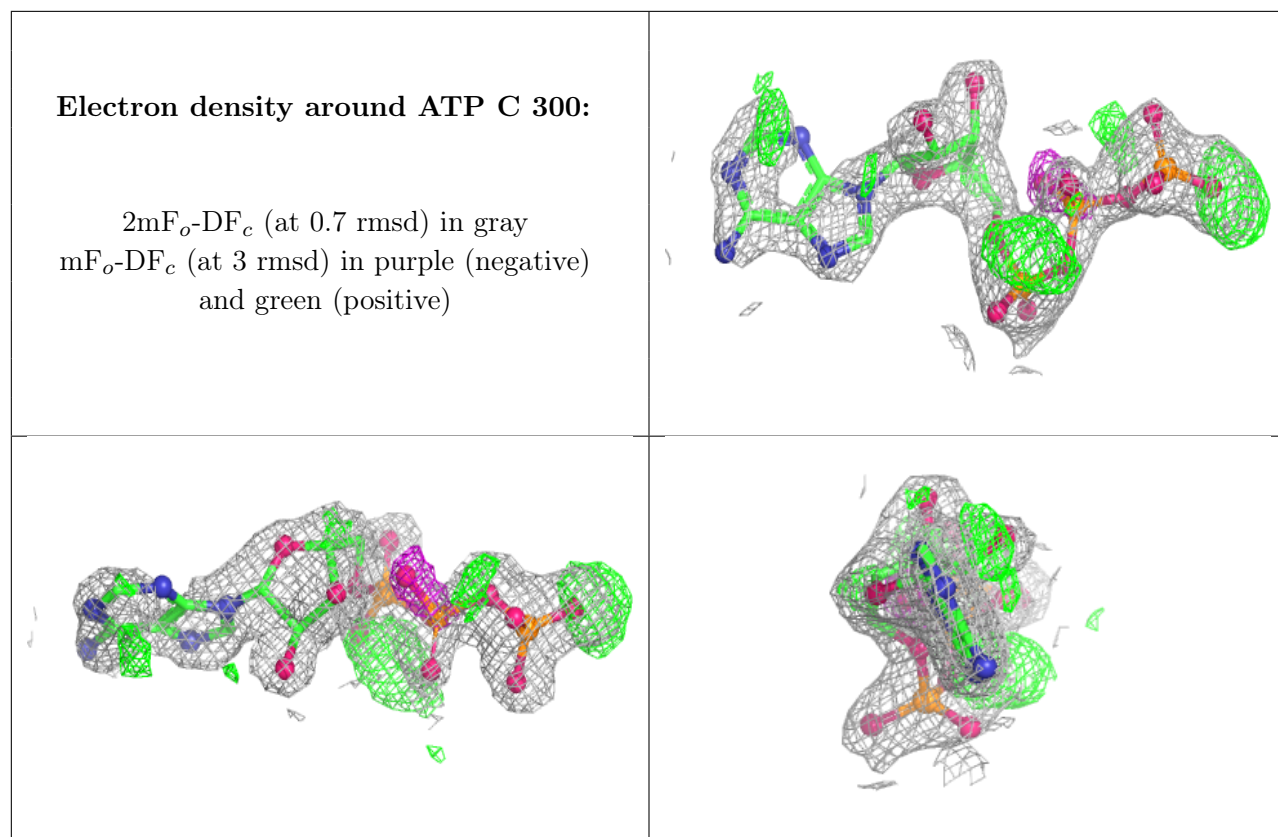
Electron density around ATP D 300:

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

**Electron density around ATP A 300:**

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





6.5 Other polymers ⓘ

There are no such residues in this entry.