W O R L D W I D E
wwPDB
P R O T E I N   D A T A   B A N K

wwPDB X-ray Structure Validation Summary Report (i)

May 29, 2020 – 07:54 am BST

PDB ID	:	1JST
Title	:	PHOSPHORYLATED CYCLIN-DEPENDENT KINASE-2 BOUND TO CY-CLIN A
Authors	:	Russo, A.A.; Jeffrey, P.D.; Pavletich, N.P.
Deposited on	:	1996-07-03
Resolution	:	2.60 Å(reported)

The following versions of software and data (see references (1)) were used in the production of this report:

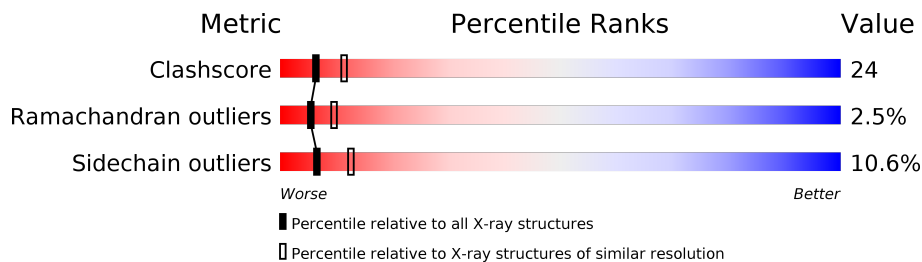|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

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 2.60 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	Percentile Ranks	Value
Clashscore		24
Ramachandran outliers		2.5%
Sidechain outliers		10.6%

Worse   *Better*

■ Percentile relative to all X-ray structures
▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	3518 (2.60-2.60)
Ramachandran outliers	138981	3455 (2.60-2.60)
Sidechain outliers	138945	3455 (2.60-2.60)

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 on 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%

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	298	53% 40% 7%
1	C	298	48% 44% 7% •
2	B	258	60% 34% 5%
2	D	258	53% 43% •

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 9134 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 CYCLIN-DEPENDENT KINASE-2.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	298	Total 2402	C 1559	N 408	O 426	P 1	S 8	0	0	0
1	C	298	Total 2402	C 1559	N 408	O 426	P 1	S 8	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	160	TPO	THR	MODIFIED RESIDUE	UNP P24941
C	160	TPO	THR	MODIFIED RESIDUE	UNP P24941

- Molecule 2 is a protein called CYCLIN A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	258	Total 2084	C 1350	N 339	O 384	S 11	0	0	0
2	D	258	Total 2084	C 1350	N 339	O 384	S 11	0	0	0

- Molecule 3 is MANGANESE (II) ION (three-letter code: MN) (formula: Mn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total 1	Mn 1	0	0
3	C	1	Total 1	Mn 1	0	0

- Molecule 4 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$).
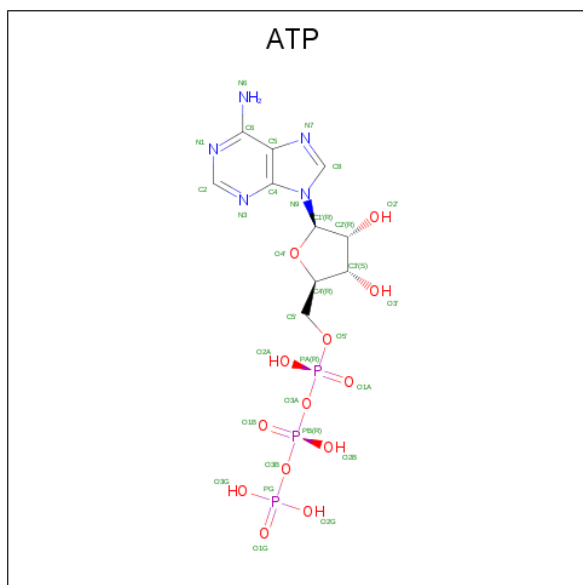
ATP

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
4	C	1	Total	C	N	O	P	0	0
			31	10	5	13	3		

• Molecule 5 is water.

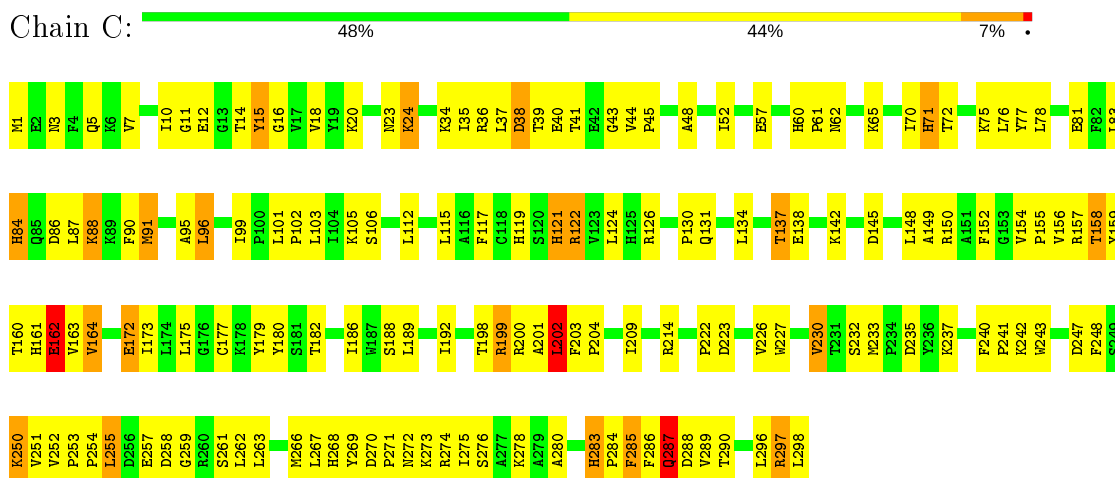| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	38	Total	O	0	0
			38	38		
5	B	24	Total	O	0	0
			24	24		
5	C	20	Total	O	0	0
			20	20		
5	D	16	Total	O	0	0
			16	16		

3 Residue-property plots ⓘ

These plots are drawn for all protein, RNA and DNA 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. 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. 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.

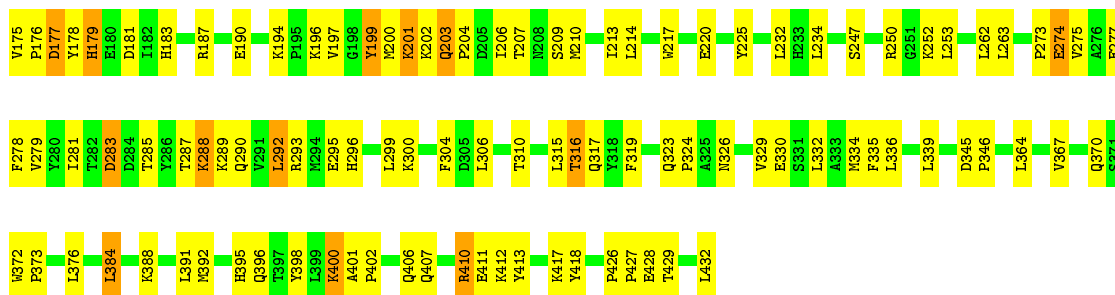Note EDS was not executed.

• Molecule 1: CYCLIN-DEPENDENT KINASE-2

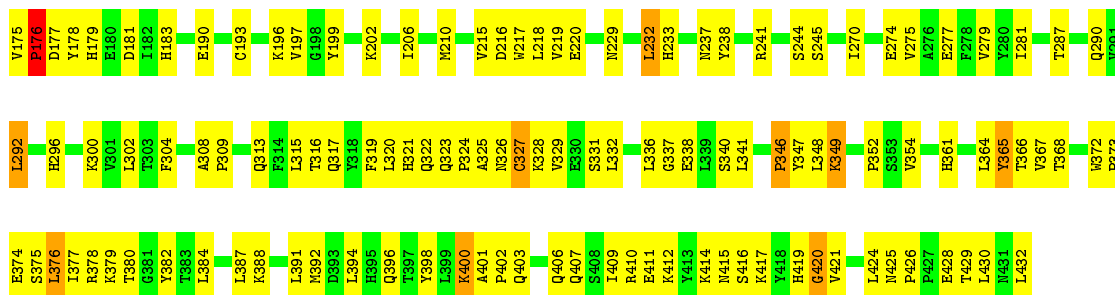Chain A:

• Molecule 1: CYCLIN-DEPENDENT KINASE-2

Chain C:

• Molecule 2: CYCLIN A

Chain B:

V175 P176 D177 Y178 H179 E180 D181 I182 H183 R187 E190 K194 P195 K196 V197 G198 Y199 M200 K201 K202 Q203 P204 D205 I206 T207 N208 S209 M210 L213 L214 W217 E220 Y225 L232 H233 L234 S247 R250 G251 K252 L253 L262 L263 P273 E274 V275 A276 E277

F278 V279 Y280 I281 T282 D283 D284 T285 Y286 T287 K288 K289 Q290 V291 L292 R293 M294 E295 H296 L299 K300 F304 D305 L306 T310 L315 T316 Q317 Y318 F319 Q323 P324 A325 N326 V329 E330 S331 L332 A333 M334 F335 L336 L339 D345 P346 L364 V367 Q370 S371

W372 P373 L376 L384 K388 L391 M392 H395 Q396 T397 Y398 L399 K400 A401 P402 Q406 Q407 R410 E411 K412 Y413 K417 Y418 P426 P427 E428 T429 L432

● Molecule 2: CYCLIN A

Chain D:

53%   43%   •

V175 P176 D177 Y178 H179 E180 D181 I182 H183 E190 C193 K196 V197 G198 Y199 K202 I206 M210 V215 D216 W217 L218 V219 E220 N229 L232 H233 N237 Y238 R241 S244 S245 I270 E274 V275 A276 E277 F278 V279 Y280 I281 T287 Q290 V291

L292 H296 K300 V301 L302 T303 F304 A308 P309 Q313 F314 L315 T316 Q317 Y318 F319 L320 H321 Q322 Q323 P324 A325 N326 C327 K328 V329 E330 S331 L332 L336 G337 E338 L339 S340 L341 P346 Y347 L348 K349 P352 S353 V354 H361 L364 Y365 T366 V367 T368 W372 P373

E374 S375 L376 I377 R378 K379 T380 G381 Y382 T383 L384 L387 K388 L391 M392 D393 L394 H395 Q396 T397 Y398 L399 K400 A401 P402 Q403 Q406 Q407 S408 I409 R410 E411 K412 Y413 K414 N415 S416 K417 Y418 H419 G420 V421 L424 N425 P426 P427 E428 T429 L430 N431 L432

4 Data and refinement statistics (i)

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	139.60Å 149.10Å 74.20Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	7.00 – 2.60	Depositor
% Data completeness (in resolution range)	98.9 (7.00-2.60)	Depositor
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	TNT	Depositor
R, R_{free}	0.200 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	9134	wwPDB-VP
Average B, all atoms (Å²)	36.0	wwPDB-VP

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: TPO, MN, ATP

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	0.70	0/2452	0.87	1/3325 (0.0%)
1	C	0.61	0/2452	0.86	2/3325 (0.1%)
2	B	0.69	0/2134	0.81	1/2897 (0.0%)
2	D	0.60	0/2134	0.79	2/2897 (0.1%)
All	All	0.65	0/9172	0.84	6/12444 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
2	D	0	1

There are no bond length outliers.

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	76	LEU	CA-CB-CG	8.68	135.26	115.30
2	B	345	ASP	N-CA-C	-6.05	94.67	111.00
1	A	217	ARG	NE-CZ-NH2	-5.76	117.42	120.30
1	C	202	LEU	CA-CB-CG	5.64	128.27	115.30
2	D	241	ARG	NE-CZ-NH1	5.44	123.02	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	D	347	TYR	Sidechain

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	2402	0	2449	132	0
1	C	2402	0	2449	141	0
2	B	2084	0	2107	78	0
2	D	2084	0	2107	108	0
3	A	1	0	0	0	0
3	C	1	0	0	0	0
4	A	31	0	12	8	0
4	C	31	0	12	4	0
5	A	38	0	0	1	0
5	B	24	0	0	1	0
5	C	20	0	0	0	0
5	D	16	0	0	2	0
All	All	9134	0	9136	438	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 24.

The worst 5 of 438 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:A:15:TYR:HB3	1:A:35:ILE:HG12	1.41	0.99
1:C:60:HIS:HD2	1:C:62:ASN:H	1.06	0.98
1:A:156:VAL:HG22	1:A:159:TYR:CE2	2.04	0.93
1:A:1:MET:CE	1:A:70:ILE:HG13	1.99	0.92
1:A:88:LYS:HD2	1:A:131:GLN:HG2	1.52	0.91

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	295/298 (99%)	264 (90%)	21 (7%)	10 (3%)	3	5
1	C	295/298 (99%)	258 (88%)	24 (8%)	13 (4%)	2	3
2	B	256/258 (99%)	241 (94%)	12 (5%)	3 (1%)	13	27
2	D	256/258 (99%)	241 (94%)	13 (5%)	2 (1%)	19	39
All	All	1102/1112 (99%)	1004 (91%)	70 (6%)	28 (2%)	5	9

5 of 28 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	18	VAL
1	C	162	GLU
1	C	164	VAL
1	C	287	GLN
2	D	176	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	262/262 (100%)	230 (88%)	32 (12%)	5	9
1	C	262/262 (100%)	225 (86%)	37 (14%)	3	6
2	B	232/232 (100%)	209 (90%)	23 (10%)	8	15
2	D	232/232 (100%)	219 (94%)	13 (6%)	21	42
All	All	988/988 (100%)	883 (89%)	105 (11%)	6	12

5 of 105 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	334	MET
1	C	24	LYS
2	D	300	LYS

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Mol	Chain	Res	Type
2	B	346	PRO
2	B	428	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 21 such sidechains are listed below:

Mol	Chain	Res	Type
2	B	313	GLN
2	B	370	GLN
2	D	313	GLN
2	B	296	HIS
2	D	317	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)

2 non-standard protein/DNA/RNA residues 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	$\#|Z| > 2$
1	TPO	A	160	1	8,10,11	1.09	0	10,14,16	1.19	0
1	TPO	C	160	1	8,10,11	1.62	1 (12%)	10,14,16	1.41	2 (20%)

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
1	TPO	A	160	1	-	1/9/11/13	-
1	TPO	C	160	1	-	1/9/11/13	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	160	TPO	P-OG1	-3.90	1.51	1.59

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	C	160	TPO	OG1-P-O1P	-2.29	100.56	109.39
1	C	160	TPO	O3P-P-O2P	2.01	115.34	107.64

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	160	TPO	CB-OG1-P-O3P
1	C	160	TPO	C-CA-CB-CG2

There are no ring outliers.

1 monomer is involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	C	160	TPO	3	0

5.5 Carbohydrates (i)

There are no carbohydrates 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	$\#|Z| > 2$
4	ATP	C	300	3	26,33,33	1.31	4 (15%)	31,52,52	2.01	10 (32%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#$|Z| > 2$	Counts	RMSZ	#$|Z| > 2$
4	ATP	A	300	3	26,33,33	1.34	2 (7%)	31,52,52	1.45	4 (12%)

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
4	ATP	C	300	3	-	5/18/38/38	0/3/3/3
4	ATP	A	300	3	-	7/18/38/38	0/3/3/3

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	300	ATP	C2'-C1'	3.45	1.59	1.53
4	C	300	ATP	O4'-C1'	3.29	1.45	1.41
4	A	300	ATP	PA-O5'	2.84	1.70	1.59
4	C	300	ATP	C2'-C1'	2.81	1.58	1.53
4	C	300	ATP	C8-N7	-2.58	1.30	1.34

The worst 5 of 14 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	C	300	ATP	O5'-C5'-C4'	6.16	130.21	108.99
4	C	300	ATP	PA-O3A-PB	3.80	145.88	132.83
4	A	300	ATP	C3'-C2'-C1'	3.63	106.44	100.98
4	C	300	ATP	O4'-C4'-C3'	3.58	112.19	105.11
4	A	300	ATP	PA-O5'-C5'	3.27	140.84	121.68

There are no chirality outliers.
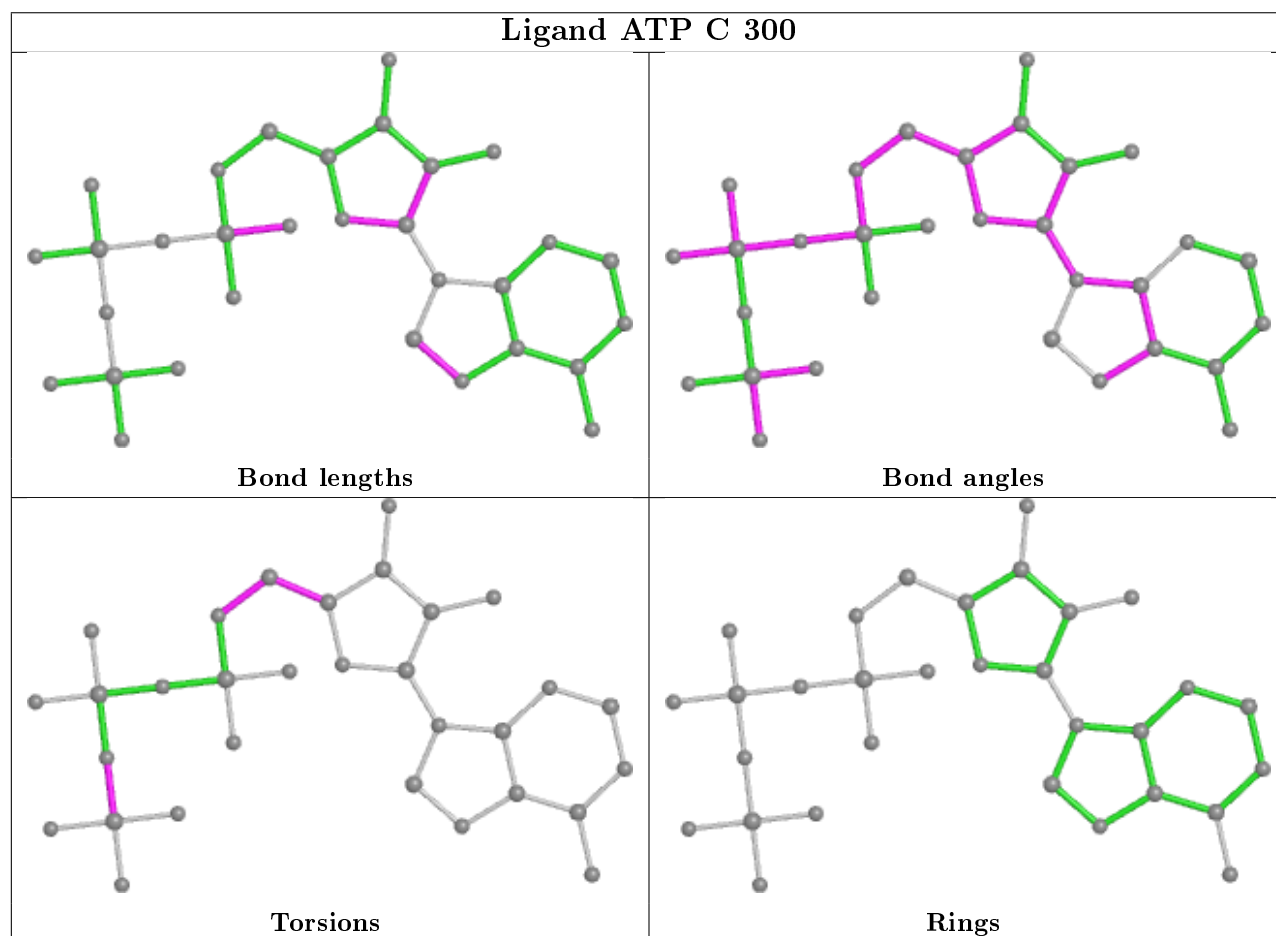
5 of 12 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	C	300	ATP	PB-O3B-PG-O2G
4	A	300	ATP	C5'-O5'-PA-O1A
4	A	300	ATP	C5'-O5'-PA-O2A
4	A	300	ATP	C5'-O5'-PA-O3A
4	C	300	ATP	C4'-C5'-O5'-PA

There are no ring outliers.

2 monomers are involved in 12 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	300	ATP	4	0
4	A	300	ATP	8	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 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 ATP C 300

Bond lengths   Bond angles

Torsions   Rings

Ligand ATP A 300

Bond lengths

Bond angles

Torsions

Rings
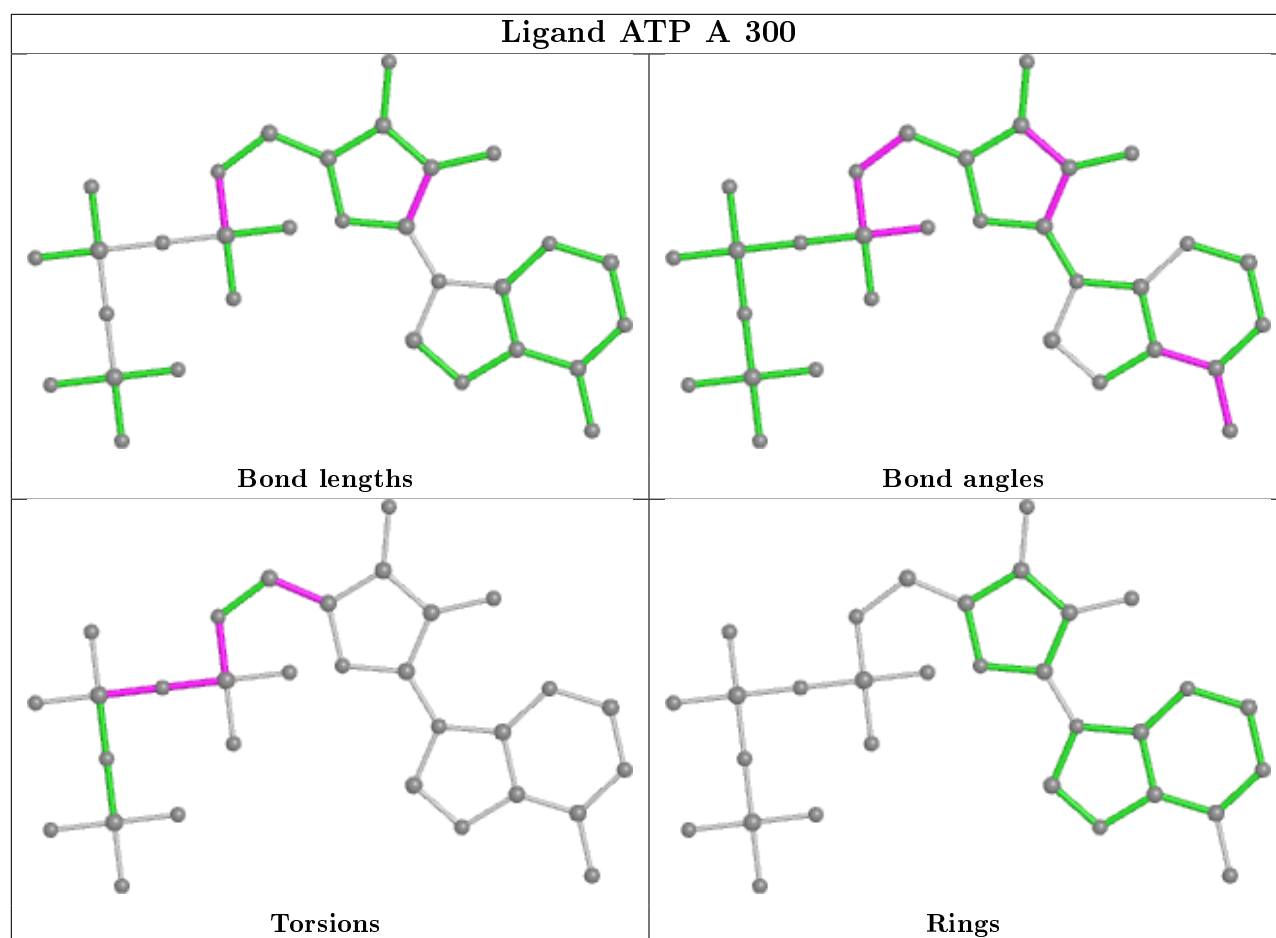
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data (i)

6.1 Protein, DNA and RNA chains (i)

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates (i)

EDS was not executed - this section is therefore empty.

6.4 Ligands (i)

EDS was not executed - this section is therefore empty.

6.5 Other polymers (i)

EDS was not executed - this section is therefore empty.