



Full wwPDB EM Validation Report ⓘ

Jul 7, 2025 – 06:48 PM JST

PDB ID : 8X61 / pdb_00008x61
EMDB ID : EMD-38077
Title : Cryo-EM structure of ATP-bound FtsE(E163Q)X
Authors : Zhang, Z.Y.; Chen, Y.T.
Deposited on : 2023-11-20
Resolution : 3.05 Å(reported)

This is a Full wwPDB EM 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/EMValidationReportHelp>

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:

EMDB validation analysis : **FAILED**
Mogul : 1.8.5 (274361), CSD as541be (2020)
MolProbity : 4-5-2 with Phenix2.0rc1
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.44

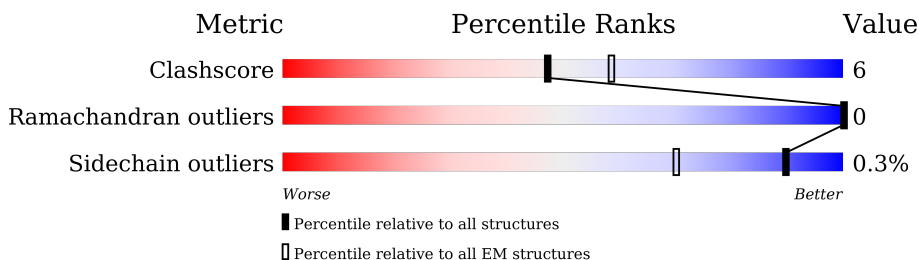
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.05 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)	EM structures (#Entries)
Clashscore	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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 $\leq 5\%$.

Mol	Chain	Length	Quality of chain
1	A	222	86% (green), 12% (yellow), 2% (grey), 0% (orange), 0% (red)
1	B	222	86% (green), 12% (yellow), 2% (grey), 0% (orange), 0% (red)
2	C	352	40% (green), 5% (yellow), 54% (grey), 0% (orange), 0% (red)
2	D	352	38% (green), 8% (yellow), 54% (grey), 0% (orange), 0% (red)

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5737 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 Cell division ATP-binding protein FtsE.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	216	Total	C	N	O	S	0	0
			1680	1060	314	298	8		
1	B	216	Total	C	N	O	S	0	0
			1662	1050	307	297	8		

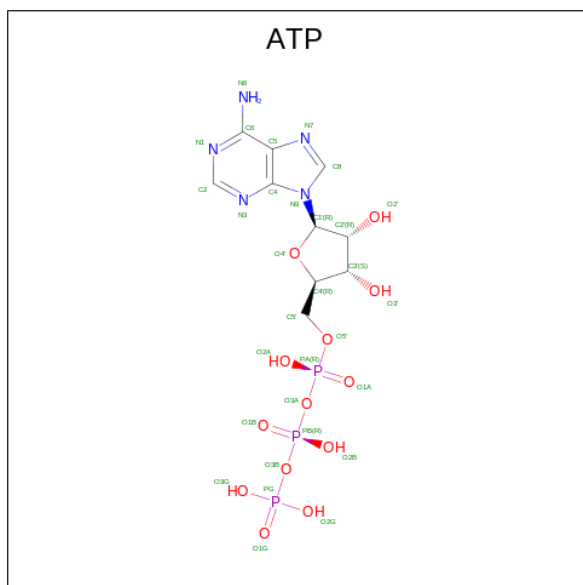
There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	163	GLN	GLU	engineered mutation	UNP P0A9R7
B	163	GLN	GLU	engineered mutation	UNP P0A9R7

- Molecule 2 is a protein called Cell division protein FtsX.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	C	161	Total	C	N	O	S	0	0
			1141	757	186	190	8		
2	D	163	Total	C	N	O	S	0	0
			1192	792	192	200	8		

- Molecule 3 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$) (labeled as "Ligand of Interest" by depositor).



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

ALA
LEU
GLY
GLU
PHE
ARG
ASN
TRP
SER
GLY
PHE
GLY
GLY
ALA
LEU
ASP
MET
LEU
GLU
GLU
ASN
PRO
LEU
PRO
ALA
VAL
ALA
VAL
VAL
ILE
PRO
LYS
LEU
ASP
PHE
GLN
GLY
THR
GLU
SER
LEU
ASN
THR
LEU
ARG
ASP
ARG
ILE
THR
THR
GLN
ILE
ASN
GLY
ILE
ASP
GLU
VAL
ARG
MET
ASP

ASP
SER
TRP
PHE
ALA
ARG
LEU
ALA
ALA
LEU
THR
THR
GLY
LEU
G510
M513
V514
V517
G522
R526
I529
R532
I536
T545
D546
P552
F553
G564
I570
L579
SER
SER
ALA
VAL
ALA
GLU
VAL
ALA
GLN
VAL
PHE
GLY
THR
LYS
PHE
ASP
I596

L609
Y610
C611
S612
M613
A618
L627
E633

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	370231	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	60.0	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor

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

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	0.16	0/1709	0.31	0/2302
1	B	0.17	0/1691	0.34	0/2280
2	C	0.12	0/1160	0.26	0/1582
2	D	0.18	0/1213	0.31	0/1652
All	All	0.16	0/5773	0.31	0/7816

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	1680	0	1724	21	0
1	B	1662	0	1689	17	0
2	C	1141	0	1142	17	0
2	D	1192	0	1217	21	0
3	A	31	0	12	0	0
3	B	31	0	12	0	0
All	All	5737	0	5796	67	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 6.

All (67) 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)
2:C:605:LEU:O	2:C:609:LEU:HD23	1.75	0.85
2:C:570:ILE:O	2:C:574:ILE:HG12	1.75	0.84
2:C:609:LEU:O	2:C:613:MET:HG2	1.84	0.77
2:C:512:LEU:HD23	2:D:368:LEU:HG	1.70	0.73
2:C:519:LEU:HB3	2:D:361:VAL:HG22	1.71	0.72
1:A:184:ASN:ND2	1:A:188:VAL:O	2.23	0.70
2:D:526:ARG:O	2:D:526:ARG:HD2	1.92	0.69
1:A:86:GLN:NE2	1:B:167:ASN:OD1	2.23	0.68
1:A:100:VAL:HG21	1:A:122:LEU:HD11	1.77	0.66
2:C:374:MET:HE2	2:C:598:GLY:HA3	1.77	0.66
1:A:15:ARG:HH12	1:B:130:LYS:HD3	1.60	0.66
1:A:198:ASN:O	1:A:202:ARG:NH1	2.30	0.65
2:C:516:ALA:O	2:C:520:VAL:HG23	1.96	0.65
2:D:340:ALA:HB1	2:D:552:PRO:HD3	1.80	0.64
2:C:374:MET:HE2	2:C:599:LEU:H	1.63	0.63
2:D:340:ALA:CB	2:D:552:PRO:HD3	2.30	0.62
2:D:526:ARG:HD2	2:D:526:ARG:C	2.25	0.60
2:C:374:MET:CE	2:C:599:LEU:H	2.14	0.60
2:C:374:MET:HG2	2:C:598:GLY:HA2	1.82	0.60
2:D:536:ILE:HD11	2:D:553:PHE:HE2	1.68	0.58
1:B:100:VAL:HG21	1:B:122:LEU:HD21	1.86	0.58
2:C:526:ARG:NH2	2:C:625:GLN:OE1	2.36	0.58
1:A:21:VAL:HG13	1:A:215:LEU:HD22	1.87	0.57
1:B:174:GLU:OE1	1:B:203:ARG:NH1	2.35	0.56
2:D:347:ASP:OD2	2:D:532:ARG:NH1	2.40	0.55
1:A:169:ASP:O	1:A:173:SER:OG	2.22	0.55
2:C:533:ARG:HG2	2:C:533:ARG:HH11	1.70	0.55
2:D:510:GLY:HA2	2:D:513:MET:SD	2.46	0.55
1:A:24:HIS:O	1:A:206:ARG:NH1	2.32	0.54
1:B:169:ASP:OD1	1:B:169:ASP:N	2.42	0.51
2:D:609:LEU:O	2:D:613:MET:HG3	2.11	0.51
1:B:92:MET:SD	1:B:135:PRO:HB2	2.52	0.50
1:B:75:PRO:O	1:B:79:ARG:HG3	2.11	0.50
2:D:342:HIS:O	2:D:342:HIS:ND1	2.45	0.49
1:A:181:GLU:OE2	1:A:205:TYR:OH	2.24	0.49
1:A:169:ASP:N	1:A:169:ASP:OD1	2.44	0.49
1:B:184:ASN:ND2	1:B:188:VAL:O	2.32	0.48
1:A:161:ALA:HB1	1:A:164:PRO:HG3	1.94	0.48
1:B:97:TYR:OH	1:B:115:ARG:HA	2.13	0.48
2:C:374:MET:HE2	2:C:598:GLY:CA	2.42	0.48

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:117:ARG:NH1	1:A:155:LYS:HE2	2.28	0.48
1:B:4:PHE:HD2	1:B:7:VAL:HG11	1.79	0.47
1:A:15:ARG:NH2	1:B:137:GLN:O	2.48	0.47
1:B:86:GLN:HB2	1:B:162:ASP:OD2	2.15	0.47
1:B:78:ARG:HH11	2:C:541:LEU:HA	1.79	0.47
1:A:15:ARG:NH1	1:B:130:LYS:HD3	2.29	0.46
1:A:79:ARG:HH22	2:D:545:THR:HG23	1.80	0.46
2:C:507:ALA:O	2:C:511:VAL:HG13	2.14	0.46
1:B:45:LEU:HD12	1:B:162:ASP:HB2	1.97	0.46
2:D:529:ILE:HG12	2:D:553:PHE:CD2	2.51	0.46
1:A:117:ARG:HH12	1:A:155:LYS:HE2	1.82	0.45
1:A:79:ARG:NH2	2:D:545:THR:HG23	2.31	0.45
1:B:24:HIS:O	1:B:206:ARG:NH1	2.36	0.45
2:D:366:LEU:HD11	2:D:611:CYS:SG	2.57	0.45
1:A:169:ASP:OD1	1:A:172:LEU:HB2	2.17	0.45
1:A:177:LEU:O	1:A:181:GLU:HG3	2.17	0.44
2:D:546:ASP:OD1	2:D:627:LEU:HD21	2.17	0.44
2:D:570:ILE:HD13	2:D:570:ILE:N	2.33	0.43
2:D:341:PHE:CE2	2:D:345:LEU:HD11	2.53	0.43
2:D:514:VAL:O	2:D:517:VAL:HG12	2.19	0.43
1:B:83:MET:HG2	1:B:85:PHE:CE1	2.54	0.42
1:A:168:LEU:HD22	1:A:172:LEU:HD13	2.01	0.42
1:A:196:ASP:O	1:A:200:ILE:HG23	2.19	0.42
2:C:374:MET:HE2	2:C:599:LEU:N	2.33	0.42
2:D:522:GLY:HA2	2:D:618:ALA:HB1	2.01	0.42
2:D:359:VAL:HG13	2:D:564:GLY:HA2	2.03	0.41
2:C:574:ILE:HG12	2:C:574:ILE:H	1.63	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

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	214/222 (96%)	205 (96%)	9 (4%)	0	100	100
1	B	214/222 (96%)	204 (95%)	10 (5%)	0	100	100
2	C	155/352 (44%)	154 (99%)	1 (1%)	0	100	100
2	D	157/352 (45%)	153 (98%)	4 (2%)	0	100	100
All	All	740/1148 (64%)	716 (97%)	24 (3%)	0	100	100

There are no Ramachandran outliers to report.

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 PDB entries followed by that with respect to all EM entries.

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	178/181 (98%)	178 (100%)	0	100	100
1	B	174/181 (96%)	174 (100%)	0	100	100
2	C	110/289 (38%)	109 (99%)	1 (1%)	75	86
2	D	122/289 (42%)	121 (99%)	1 (1%)	79	88
All	All	584/940 (62%)	582 (100%)	2 (0%)	90	94

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	C	539	GLN
2	D	368	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	16	GLN
1	A	19	GLN
1	B	26	GLN
1	B	89	HIS
1	B	137	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](#)

2 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	ATP	B	301	-	26,33,33	0.69	0	31,52,52	0.80	1 (3%)
3	ATP	A	301	-	26,33,33	0.70	0	31,52,52	0.80	1 (3%)

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	ATP	B	301	-	-	0/18/38/38	0/3/3/3
3	ATP	A	301	-	-	0/18/38/38	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(°)
3	B	301	ATP	C5-C6-N6	2.26	123.78	120.35
3	A	301	ATP	C5-C6-N6	2.25	123.78	120.35

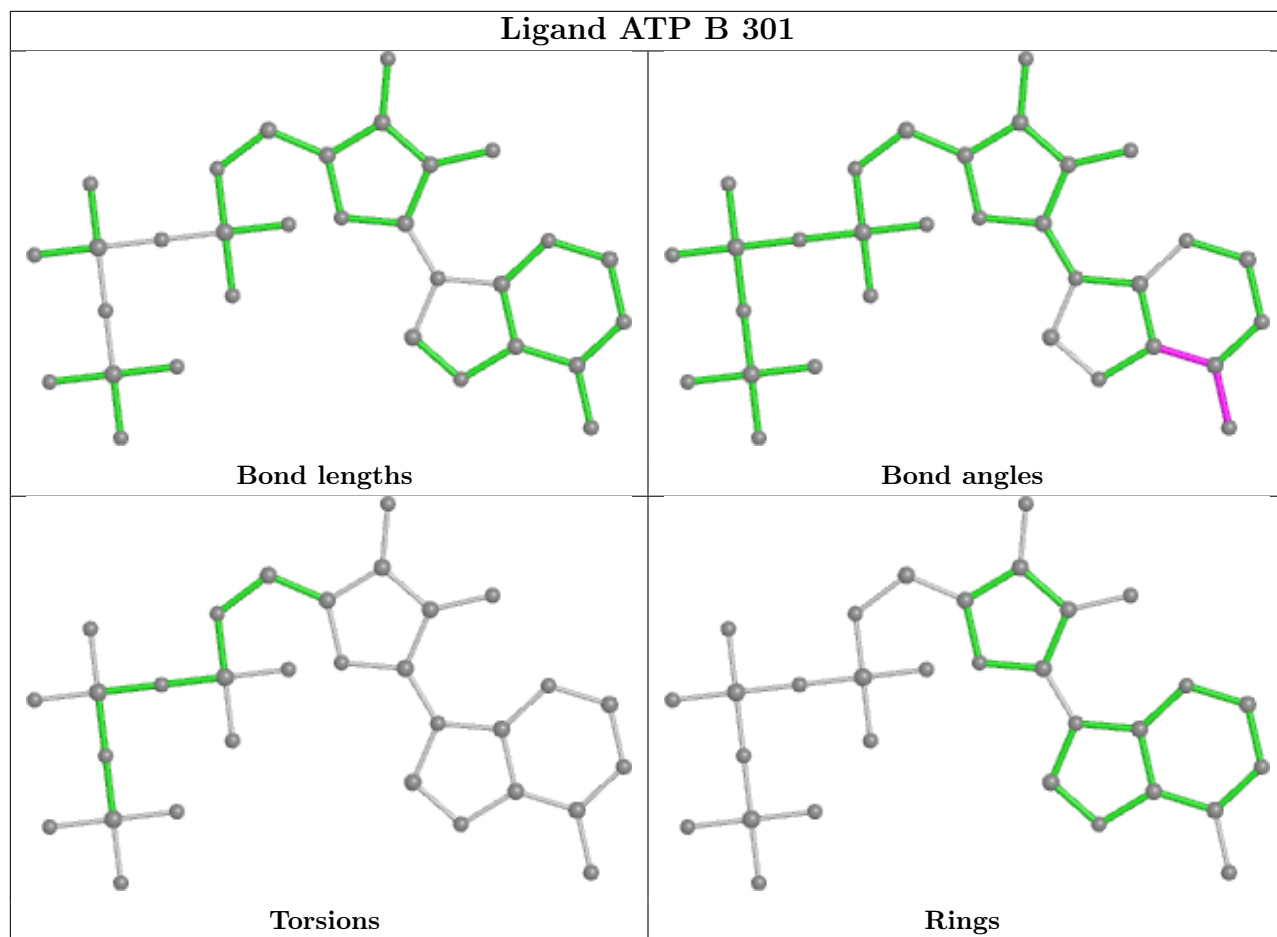
There are no chirality outliers.

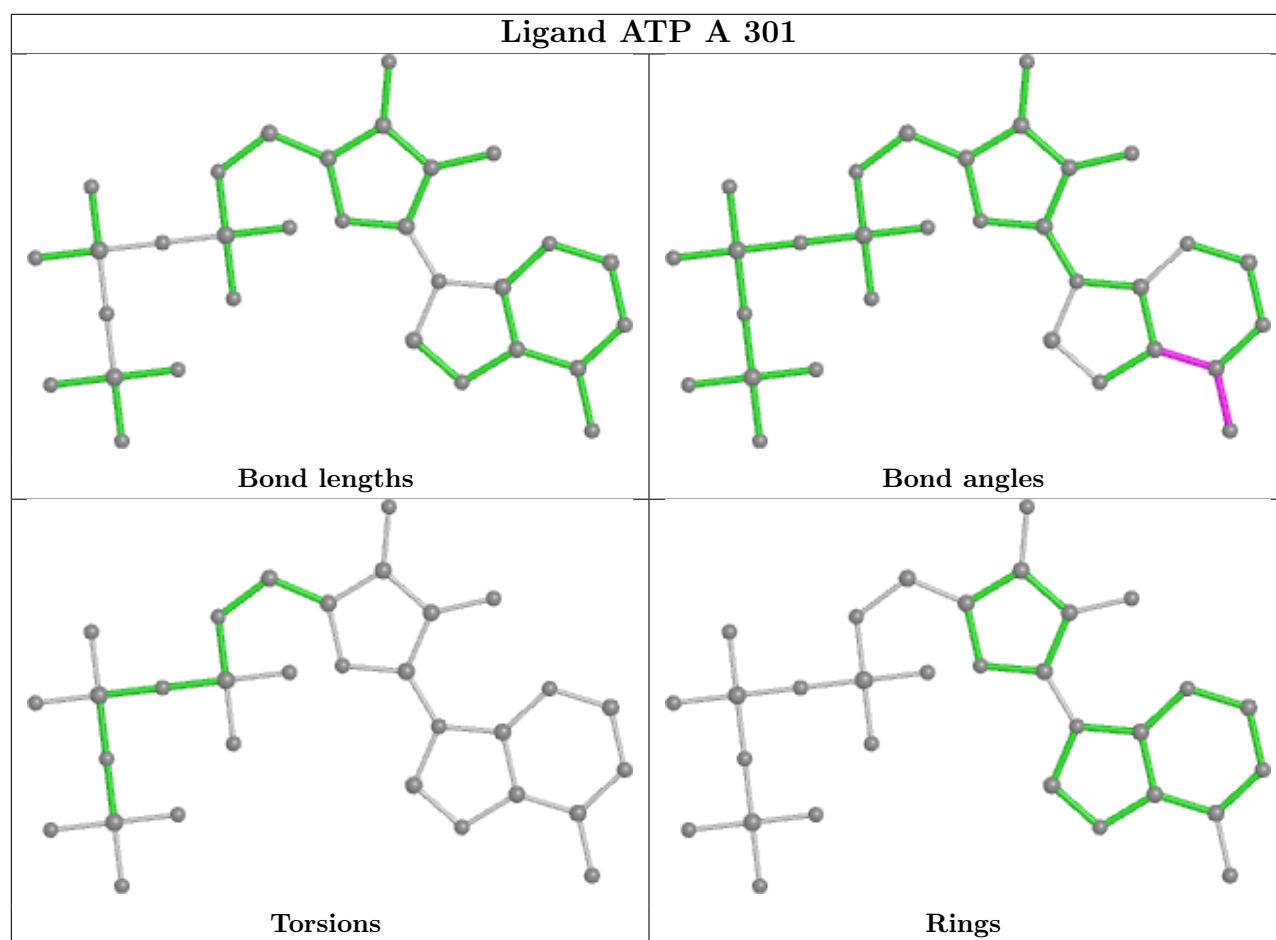
There are no torsion outliers.

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.