



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 2, 2023 – 05:16 PM EDT

PDB ID : 6NYA
Title : Crystal Structure of ubiquitin E1 (Uba1) in complex with Ubc3 (Cdc34) and ubiquitin
Authors : Olsen, S.K.; Williams, K.M.; Atkison, J.H.
Deposited on : 2019-02-11
Resolution : 2.06 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 : **FAILED**
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtrriage (Phenix) : 1.13
EDS : **FAILED**
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) : 2.35.1

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 2.06 Å.

There are no overall percentile quality scores available for this entry.

MolProbity and EDS failed to run properly - the sequence quality summary graphics cannot be shown.

2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 20705 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 Ubiquitin-activating enzyme E1 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	987	Total	C	N	O	S	0	0	0
			7800	4979	1288	1510	23			
1	D	987	Total	C	N	O	S	0	0	0
			7796	4977	1288	1508	23			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	8	GLY	-	expression tag	UNP P22515
A	9	ALA	-	expression tag	UNP P22515
A	10	MET	-	expression tag	UNP P22515
D	8	GLY	-	expression tag	UNP P22515
D	9	ALA	-	expression tag	UNP P22515
D	10	MET	-	expression tag	UNP P22515

- Molecule 2 is a protein called Ubiquitin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	78	Total	C	N	O	S	0	0	0
			622	380	121	120	1			
2	E	77	Total	C	N	O	S	0	0	0
			618	378	120	119	1			

There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-8	MET	-	initiating methionine	UNP A0A1D6RLC6
B	-7	HIS	-	expression tag	UNP A0A1D6RLC6
B	-6	HIS	-	expression tag	UNP A0A1D6RLC6
B	-5	HIS	-	expression tag	UNP A0A1D6RLC6
B	-4	HIS	-	expression tag	UNP A0A1D6RLC6
B	-3	HIS	-	expression tag	UNP A0A1D6RLC6

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-2	HIS	-	expression tag	UNP A0A1D6RLC6
B	-1	GLY	-	expression tag	UNP A0A1D6RLC6
B	0	ALA	-	expression tag	UNP A0A1D6RLC6
B	6	ARG	LYS	engineered mutation	UNP A0A1D6RLC6
B	11	ARG	LYS	engineered mutation	UNP A0A1D6RLC6
B	27	ARG	LYS	engineered mutation	UNP A0A1D6RLC6
B	29	ARG	LYS	engineered mutation	UNP A0A1D6RLC6
B	33	ARG	LYS	engineered mutation	UNP A0A1D6RLC6
B	48	ARG	LYS	engineered mutation	UNP A0A1D6RLC6
B	63	ARG	LYS	engineered mutation	UNP A0A1D6RLC6
E	-8	MET	-	initiating methionine	UNP A0A1D6RLC6
E	-7	HIS	-	expression tag	UNP A0A1D6RLC6
E	-6	HIS	-	expression tag	UNP A0A1D6RLC6
E	-5	HIS	-	expression tag	UNP A0A1D6RLC6
E	-4	HIS	-	expression tag	UNP A0A1D6RLC6
E	-3	HIS	-	expression tag	UNP A0A1D6RLC6
E	-2	HIS	-	expression tag	UNP A0A1D6RLC6
E	-1	GLY	-	expression tag	UNP A0A1D6RLC6
E	0	ALA	-	expression tag	UNP A0A1D6RLC6
E	6	ARG	LYS	engineered mutation	UNP A0A1D6RLC6
E	11	ARG	LYS	engineered mutation	UNP A0A1D6RLC6
E	27	ARG	LYS	engineered mutation	UNP A0A1D6RLC6
E	29	ARG	LYS	engineered mutation	UNP A0A1D6RLC6
E	33	ARG	LYS	engineered mutation	UNP A0A1D6RLC6
E	48	ARG	LYS	engineered mutation	UNP A0A1D6RLC6
E	63	ARG	LYS	engineered mutation	UNP A0A1D6RLC6

- Molecule 3 is a protein called Ubiquitin-conjugating enzyme E2-34 kDa.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	170	Total	C	N	O	S	0	0	0
			1381	881	235	260	5			
3	F	167	Total	C	N	O	S	0	0	0
			1356	868	229	254	5			

There are 8 discrepancies between the modelled and reference sequences:

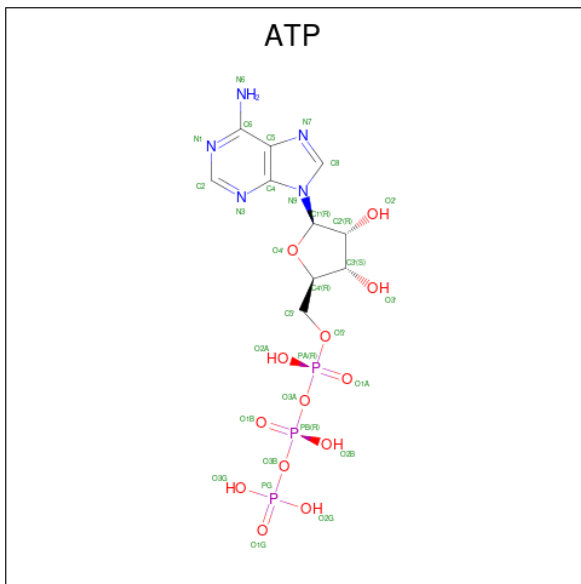
Chain	Residue	Modelled	Actual	Comment	Reference
C	-1	GLY	-	expression tag	UNP P14682
C	0	ALA	-	expression tag	UNP P14682
C	1	MET	-	expression tag	UNP P14682
C	2	ALA	-	expression tag	UNP P14682

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Chain	Residue	Modelled	Actual	Comment	Reference
F	-1	GLY	-	expression tag	UNP P14682
F	0	ALA	-	expression tag	UNP P14682
F	1	MET	-	expression tag	UNP P14682
F	2	ALA	-	expression tag	UNP P14682

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



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

- Molecule 5 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf	
5	A	1	Total	Mg	0	0
			1	1		
5	D	1	Total	Mg	0	0
			1	1		

- Molecule 6 is SULFATE ION (three-letter code: SO4) (formula: O_4S).



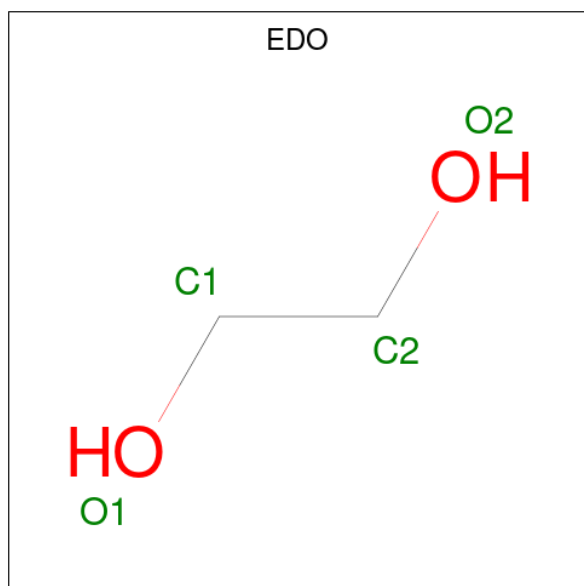
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	O	S		
6	A	1	5	4	1	0	0
6	A	1	5	4	1	0	0
6	A	1	5	4	1	0	0
6	A	1	5	4	1	0	0
6	A	1	5	4	1	0	0
6	A	1	5	4	1	0	0
6	A	1	5	4	1	0	0
6	A	1	5	4	1	0	0
6	D	1	5	4	1	0	0
6	D	1	5	4	1	0	0
6	D	1	5	4	1	0	0
6	D	1	5	4	1	0	0
6	D	1	5	4	1	0	0
6	D	1	5	4	1	0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	D	1	Total	O	S	0	0
			5	4	1		

- Molecule 7 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C₂H₆O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	A	1	Total	C	O	0	0
			4	2	2		
7	A	1	Total	C	O	0	0
			4	2	2		
7	A	1	Total	C	O	0	0
			4	2	2		
7	A	1	Total	C	O	0	0
			4	2	2		
7	A	1	Total	C	O	0	0
			4	2	2		
7	A	1	Total	C	O	0	0
			4	2	2		
7	A	1	Total	C	O	0	0
			4	2	2		
7	A	1	Total	C	O	0	0
			4	2	2		

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total C O 4 2 2	0	0
7	C	1	Total C O 4 2 2	0	0
7	D	1	Total C O 4 2 2	0	0
7	D	1	Total C O 4 2 2	0	0
7	D	1	Total C O 4 2 2	0	0
7	D	1	Total C O 4 2 2	0	0
7	D	1	Total C O 4 2 2	0	0
7	D	1	Total C O 4 2 2	0	0
7	D	1	Total C O 4 2 2	0	0
7	D	1	Total C O 4 2 2	0	0
7	D	1	Total C O 4 2 2	0	0

- Molecule 8 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	471	Total O 471 471	0	0
8	B	29	Total O 29 29	0	0
8	C	9	Total O 9 9	0	0
8	D	373	Total O 373 373	0	0
8	E	21	Total O 21 21	0	0
8	F	6	Total O 6 6	0	0

MolProbity and EDS failed to run properly - this section is therefore empty.

3 Data and refinement statistics i

EDS failed to run properly - this section is therefore incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	126.44Å 68.54Å 171.72Å 90.00° 110.72° 90.00°	Depositor
Resolution (Å)	117.03 – 2.06	Depositor
% Data completeness (in resolution range)	99.0 (117.03-2.06)	Depositor
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.88 (at 2.07Å)	Xtrriage
Refinement program	PHENIX (1.10.1_2155)	Depositor
R, R_{free}	0.187 , 0.217	Depositor
Wilson B-factor (Å ²)	27.1	Xtrriage
Anisotropy	0.261	Xtrriage
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	0.019 for h,-k,-h-l	Xtrriage
Total number of atoms	20705	wwPDB-VP
Average B, all atoms (Å ²)	48.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.85% 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.

4 Model quality [i](#)

4.1 Standard geometry [i](#)

MolProbity failed to run properly - this section is therefore empty.

4.2 Too-close contacts [i](#)

MolProbity failed to run properly - this section is therefore empty.

4.3 Torsion angles [i](#)

4.3.1 Protein backbone [i](#)

MolProbity failed to run properly - this section is therefore empty.

4.3.2 Protein sidechains [i](#)

MolProbity failed to run properly - this section is therefore empty.

4.3.3 RNA [i](#)

MolProbity failed to run properly - this section is therefore empty.

4.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

4.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

4.6 Ligand geometry [i](#)

Of 40 ligands modelled in this entry, 2 are monoatomic - leaving 38 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
6	SO4	A	1106	-	4,4,4	0.15	0	6,6,6	0.06	0
6	SO4	D	1208	-	4,4,4	0.14	0	6,6,6	0.09	0
6	SO4	A	1110	-	4,4,4	0.14	0	6,6,6	0.07	0
7	EDO	A	1114	-	3,3,3	0.44	0	2,2,2	0.38	0
6	SO4	D	1206	-	4,4,4	0.13	0	6,6,6	0.08	0
7	EDO	A	1117	-	3,3,3	0.47	0	2,2,2	0.19	0
7	EDO	D	1213	-	3,3,3	0.38	0	2,2,2	0.38	0
7	EDO	C	201	-	3,3,3	0.49	0	2,2,2	0.17	0
6	SO4	D	1209	-	4,4,4	0.14	0	6,6,6	0.06	0
6	SO4	D	1207	-	4,4,4	0.14	0	6,6,6	0.07	0
7	EDO	D	1212	-	3,3,3	0.46	0	2,2,2	0.34	0
6	SO4	A	1103	-	4,4,4	0.14	0	6,6,6	0.06	0
6	SO4	A	1107	-	4,4,4	0.14	0	6,6,6	0.05	0
6	SO4	A	1108	-	4,4,4	0.14	0	6,6,6	0.12	0
7	EDO	D	1214	-	3,3,3	0.42	0	2,2,2	0.49	0
7	EDO	A	1112	-	3,3,3	0.42	0	2,2,2	0.39	0
6	SO4	D	1203	-	4,4,4	0.14	0	6,6,6	0.05	0
4	ATP	A	1101	5	26,33,33	0.88	1 (3%)	31,52,52	1.37	4 (12%)
7	EDO	A	1119	-	3,3,3	0.45	0	2,2,2	0.43	0
4	ATP	D	1202	5	26,33,33	0.93	1 (3%)	31,52,52	1.37	4 (12%)
7	EDO	D	1217	-	3,3,3	0.49	0	2,2,2	0.23	0
6	SO4	D	1205	-	4,4,4	0.14	0	6,6,6	0.05	0
7	EDO	A	1121	-	3,3,3	0.47	0	2,2,2	0.32	0
7	EDO	D	1210	-	3,3,3	0.44	0	2,2,2	0.45	0
7	EDO	A	1116	-	3,3,3	0.41	0	2,2,2	0.35	0
7	EDO	D	1216	-	3,3,3	0.48	0	2,2,2	0.35	0
7	EDO	D	1215	-	3,3,3	0.47	0	2,2,2	0.24	0
6	SO4	A	1109	-	4,4,4	0.14	0	6,6,6	0.08	0
7	EDO	A	1118	-	3,3,3	0.46	0	2,2,2	0.38	0
7	EDO	A	1120	-	3,3,3	0.53	0	2,2,2	0.19	0
7	EDO	D	1211	-	3,3,3	0.41	0	2,2,2	0.47	0
7	EDO	A	1115	-	3,3,3	0.42	0	2,2,2	0.57	0
6	SO4	A	1104	-	4,4,4	0.14	0	6,6,6	0.04	0
7	EDO	A	1113	-	3,3,3	0.43	0	2,2,2	0.32	0
7	EDO	A	1111	-	3,3,3	0.40	0	2,2,2	0.47	0
6	SO4	A	1105	-	4,4,4	0.14	0	6,6,6	0.05	0
7	EDO	D	1218	-	3,3,3	0.46	0	2,2,2	0.35	0
6	SO4	D	1204	-	4,4,4	0.16	0	6,6,6	0.05	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
7	EDO	A	1114	-	-	0/1/1/1	-
7	EDO	D	1213	-	-	0/1/1/1	-
7	EDO	A	1117	-	-	0/1/1/1	-
7	EDO	C	201	-	-	0/1/1/1	-
7	EDO	D	1212	-	-	0/1/1/1	-
7	EDO	D	1214	-	-	0/1/1/1	-
7	EDO	A	1112	-	-	0/1/1/1	-
4	ATP	A	1101	5	-	4/18/38/38	0/3/3/3
7	EDO	A	1119	-	-	0/1/1/1	-
4	ATP	D	1202	5	-	4/18/38/38	0/3/3/3
7	EDO	D	1217	-	-	0/1/1/1	-
7	EDO	A	1121	-	-	0/1/1/1	-
7	EDO	D	1210	-	-	0/1/1/1	-
7	EDO	A	1116	-	-	0/1/1/1	-
7	EDO	D	1216	-	-	0/1/1/1	-
7	EDO	D	1215	-	-	0/1/1/1	-
7	EDO	A	1118	-	-	0/1/1/1	-
7	EDO	A	1120	-	-	0/1/1/1	-
7	EDO	D	1211	-	-	0/1/1/1	-
7	EDO	A	1115	-	-	0/1/1/1	-
7	EDO	A	1113	-	-	0/1/1/1	-
7	EDO	A	1111	-	-	0/1/1/1	-
7	EDO	D	1218	-	-	0/1/1/1	-

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	1202	ATP	C5-C4	2.46	1.47	1.40
4	A	1101	ATP	C5-C4	2.31	1.47	1.40

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	1101	ATP	N3-C2-N1	-3.38	123.39	128.68
4	D	1202	ATP	N3-C2-N1	-3.15	123.75	128.68
4	D	1202	ATP	PA-O3A-PB	-2.89	122.90	132.83
4	D	1202	ATP	C4-C5-N7	-2.65	106.64	109.40
4	A	1101	ATP	PA-O3A-PB	-2.62	123.84	132.83

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	1202	ATP	PB-O3B-PG	-2.51	124.23	132.83
4	A	1101	ATP	C4-C5-N7	-2.35	106.95	109.40
4	A	1101	ATP	PB-O3B-PG	-2.23	125.16	132.83

There are no chirality outliers.

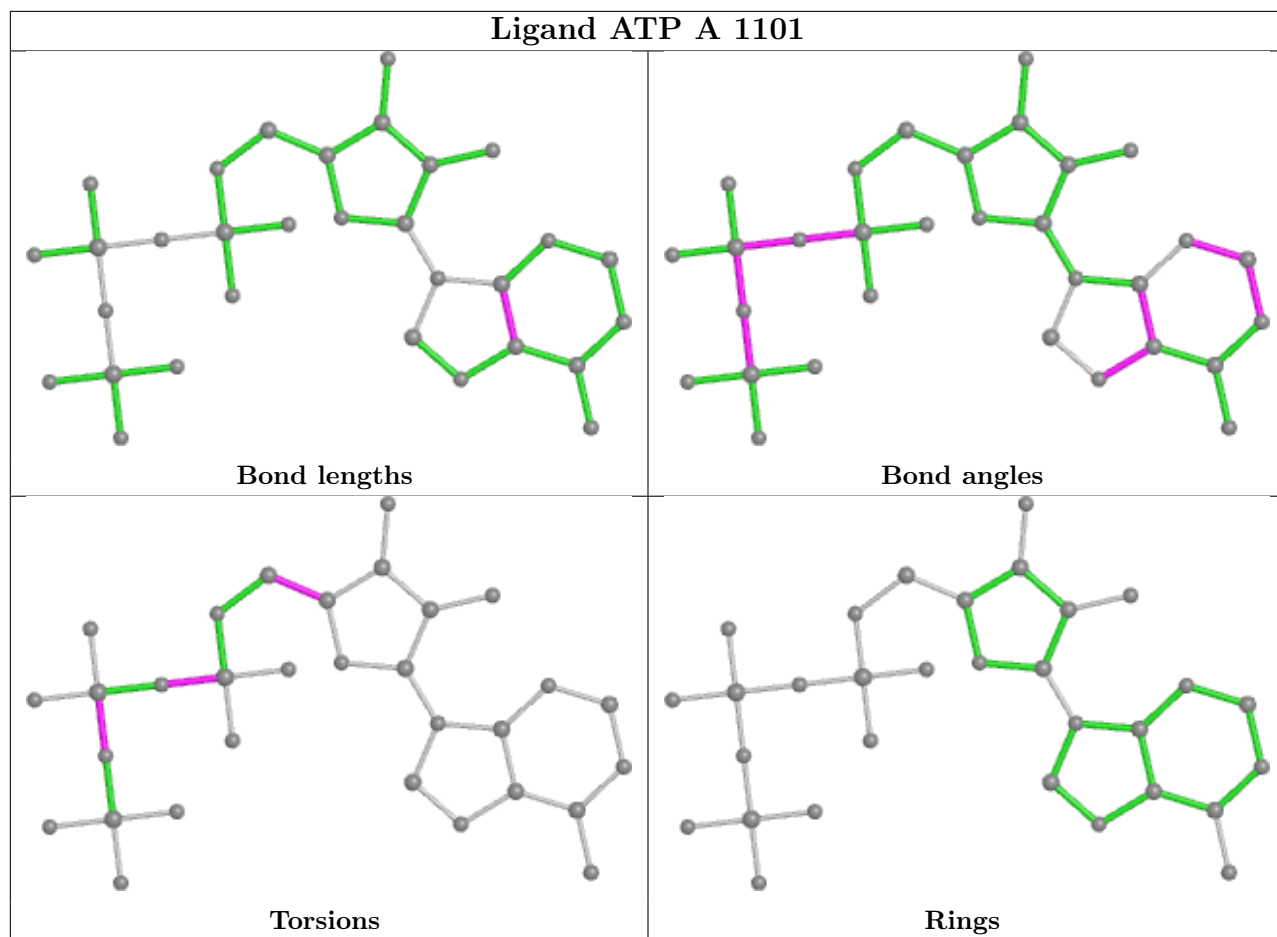
All (8) torsion outliers are listed below:

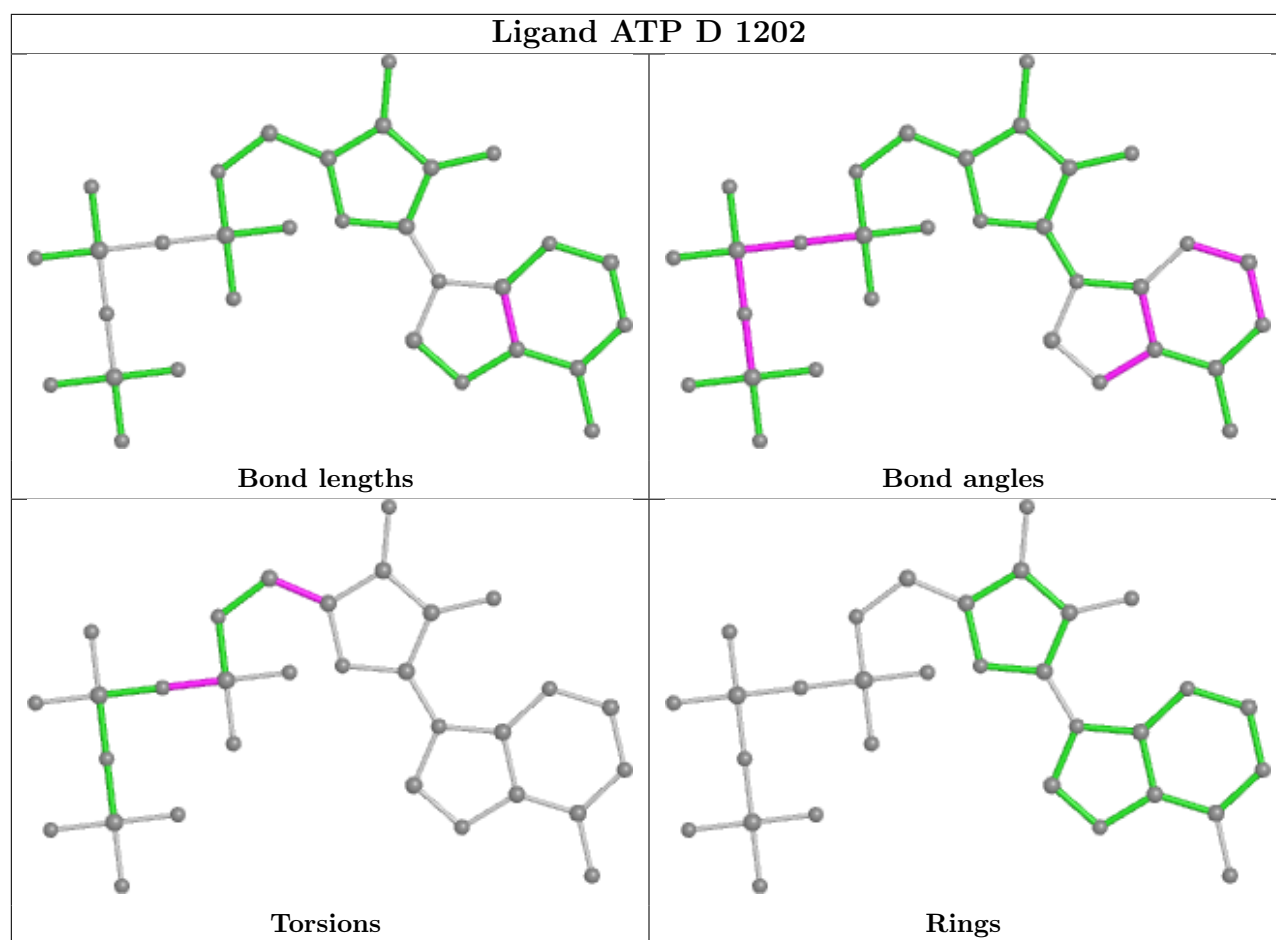
Mol	Chain	Res	Type	Atoms
4	D	1202	ATP	O4'-C4'-C5'-O5'
4	A	1101	ATP	O4'-C4'-C5'-O5'
4	D	1202	ATP	C3'-C4'-C5'-O5'
4	A	1101	ATP	C3'-C4'-C5'-O5'
4	D	1202	ATP	PB-O3A-PA-O2A
4	A	1101	ATP	PB-O3A-PA-O2A
4	A	1101	ATP	PG-O3B-PB-O1B
4	D	1202	ATP	PB-O3A-PA-O1A

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.





4.7 Other polymers [i](#)

There are no such residues in this entry.

4.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

5 Fit of model and data

5.1 Protein, DNA and RNA chains

EDS failed to run properly - this section is therefore empty.

5.2 Non-standard residues in protein, DNA, RNA chains

EDS failed to run properly - this section is therefore empty.

5.3 Carbohydrates

EDS failed to run properly - this section is therefore empty.

5.4 Ligands

EDS failed to run properly - this section is therefore empty.

5.5 Other polymers

EDS failed to run properly - this section is therefore empty.