Full wwPDB X-ray Structure Validation Report (i)

Oct 2, 2023 – 03:24 AM EDT

PDB ID	:	6N9A
Title	:	Crystal Structure of Thermotoga maritima threonylcarbamoyladenosine biosynthesis complex TsaB2D2E2 bound to ATP and carboxy-AMP
Authors	:	Swairjo, M.A.; Stec, B.
Deposited on	:	2018-12-01
Resolution	:	2.50 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 (i) 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 (1)) were used in the production of this report:

MolProbity	:	FAILED
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (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 (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.50 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 11 unique types of molecules in this entry. The entry contains 5755 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 tRNA threonylcarbamoyladenosine biosynthesis protein TsaB.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	B	211	1650	1059	277	310	4	0	0	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	-4	GLY	-	expression tag	UNP Q9WZX7
B	-3	SER	-	expression tag	UNP Q9WZX7
B	-2	HIS	-	expression tag	UNP Q9WZX7
B	-1	MET	-	expression tag	UNP Q9WZX7
B	0	ALA	-	expression tag	UNP Q9WZX7
B	1	SER	-	expression tag	UNP Q9WZX7

- Molecule 2 is a protein called tRNA N6-adenosine threonylcarbamoyltransferase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	D	330	2534	1625	431	468	10	0	0	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	-2	GLU	-	expression tag	UNP Q9WXZ2
D	-1	GLY	-	expression tag	UNP Q9WXZ2
D	0	ARG	-	expression tag	UNP Q9WXZ2

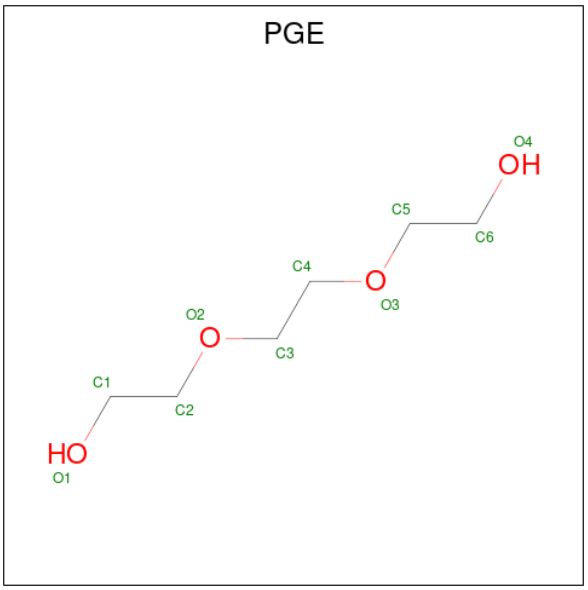
- Molecule 3 is a protein called tRNA threonylcarbamoyladenosine biosynthesis protein TsaE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	E	161	1306	836	215	251	4	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

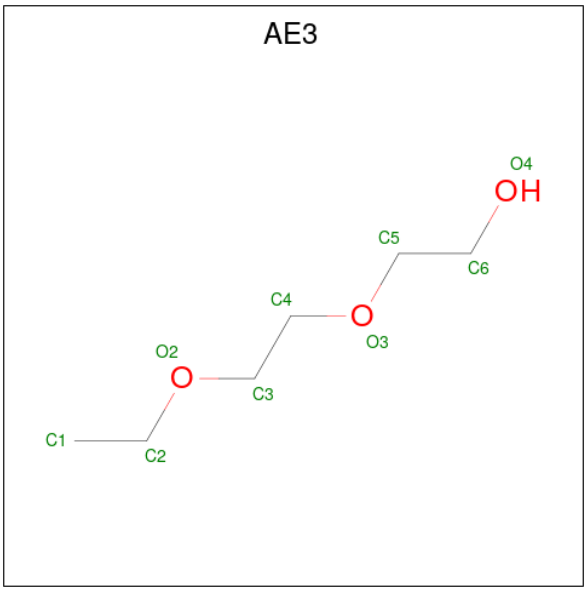
Chain	Residue	Modelled	Actual	Comment	Reference
E	0	ALA	-	expression tag	UNP Q9X1W7
E	1	SER	-	expression tag	UNP Q9X1W7

- Molecule 4 is TRIETHYLENE GLYCOL (three-letter code: PGE) (formula: $C_6H_{14}O_4$).



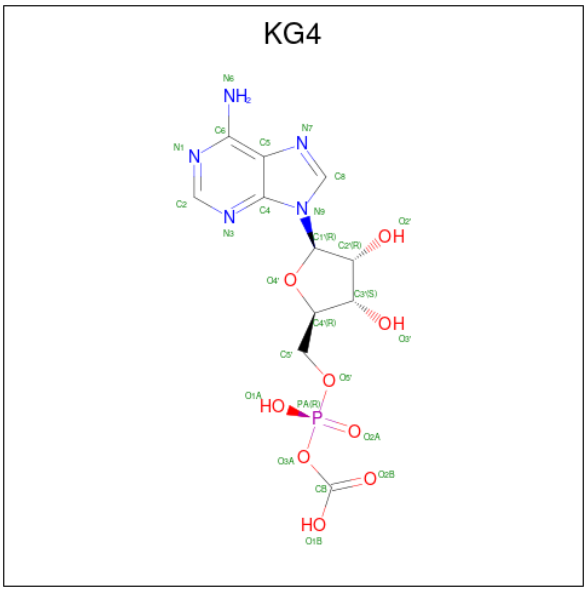
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
4	B	1	10	6	4	0	0

- Molecule 5 is 2-(2-ETHOXYETHOXY)ETHANOL (three-letter code: AE3) (formula: $C_6H_{14}O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
5	B	1	9	6	3	0	0

- Molecule 6 is 5'-O-[(R)-(carboxyoxy)(hydroxy)phosphoryl]adenosine (three-letter code: KG4) (formula: $C_{11}H_{14}N_5O_9P$).

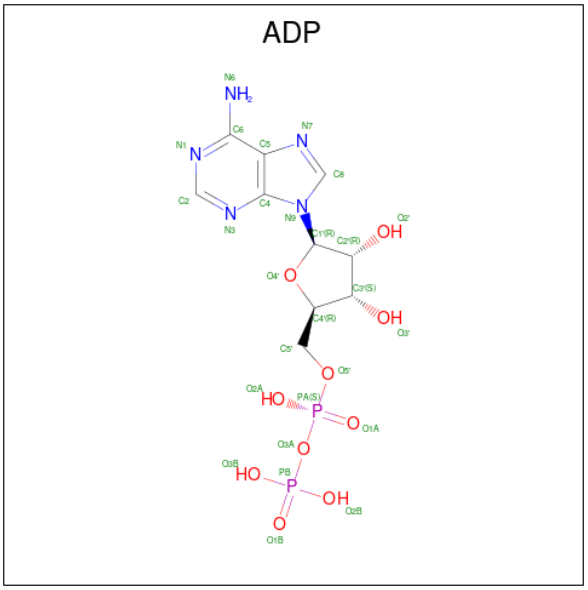


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
6	D	1	26	11	5	9	1	0	0

- Molecule 7 is ZINC ION (three-letter code: ZN) (formula: Zn).

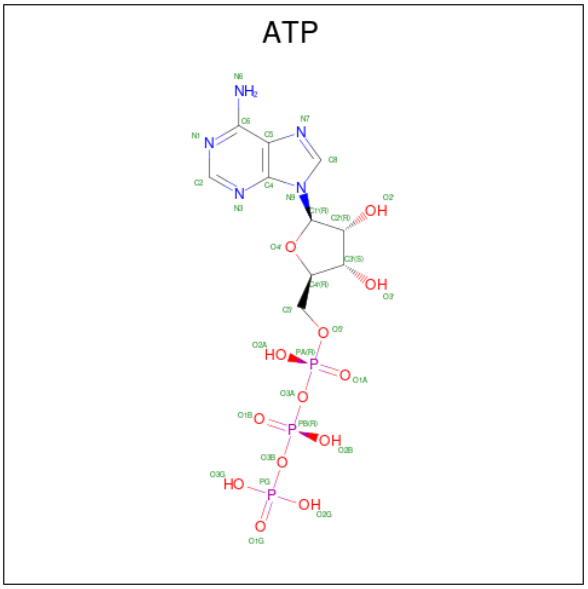
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Zn		
7	D	1	1	1	0	0

- Molecule 8 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
8	D	1	27	10	5	10	2	0	0

- Molecule 9 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		
9	E	1	31	10	5	13	3	0	0

- Molecule 10 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Mg		
10	E	1	1	1	0	0

- Molecule 11 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
11	B	41	41	41	0	0
			Total	O		
11	D	81	81	81	0	0
			Total	O		
11	E	38	38	38	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 31 2 1	Depositor
Cell constants a, b, c, α, β, γ	124.05Å 124.05Å 119.03Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	42.94 – 2.50	Depositor
% Data completeness (in resolution range)	89.1 (42.94-2.50)	Depositor
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.30 (at 2.51Å)	Xtriage
Refinement program	REFMAC 5.8.0222	Depositor
R, R_{free}	0.122 , 0.214	Depositor
Wilson B-factor (Å^2)	58.1	Xtriage
Anisotropy	0.423	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.033 for -h,-k,l	Xtriage
Total number of atoms	5755	wwPDB-VP
Average B, all atoms (Å^2)	79.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.34% of the height of the origin peak. No significant pseudotranslation is detected.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ 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 7 ligands modelled in this entry, 2 are monoatomic - leaving 5 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	$\#\|Z\| > 2$
8	ADP	D	403	-	24,29,29	0.99	1 (4%)	29,45,45	1.41	5 (17%)
5	AE3	B	302	-	8,8,8	0.59	0	7,7,7	0.18	0
4	PGE	B	301	-	9,9,9	0.48	0	8,8,8	0.16	0
9	ATP	E	201	10	26,33,33	0.94	1 (3%)	31,52,52	1.38	5 (16%)
6	KG4	D	401	-	25,28,28	1.46	1 (4%)	26,42,42	1.27	2 (7%)

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
8	ADP	D	403	-	-	3/12/32/32	0/3/3/3
5	AE3	B	302	-	-	3/6/6/6	-
4	PGE	B	301	-	-	4/7/7/7	-
9	ATP	E	201	10	-	1/18/38/38	0/3/3/3
6	KG4	D	401	-	-	3/9/31/31	0/3/3/3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	D	401	KG4	O3A-CB	6.08	1.46	1.36
8	D	403	ADP	C5-C4	2.53	1.47	1.40
9	E	201	ATP	C5-C4	2.42	1.47	1.40

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
6	D	401	KG4	N3-C2-N1	-4.23	122.07	128.68
8	D	403	ADP	N3-C2-N1	-3.77	122.78	128.68
9	E	201	ATP	N3-C2-N1	-3.46	123.26	128.68
9	E	201	ATP	PA-O3A-PB	-3.46	120.96	132.83
8	D	403	ADP	PA-O3A-PB	-3.06	122.31	132.83
8	D	403	ADP	C3'-C2'-C1'	2.84	105.26	100.98
9	E	201	ATP	PB-O3B-PG	-2.80	123.21	132.83
8	D	403	ADP	C4-C5-N7	-2.68	106.61	109.40
6	D	401	KG4	O3A-PA-O5'	2.57	110.43	102.92

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
8	D	403	ADP	C2-N1-C6	2.10	122.34	118.75
9	E	201	ATP	C2-N1-C6	2.01	122.20	118.75
9	E	201	ATP	C4-C5-N7	-2.01	107.30	109.40

There are no chirality outliers.

All (14) torsion outliers are listed below:

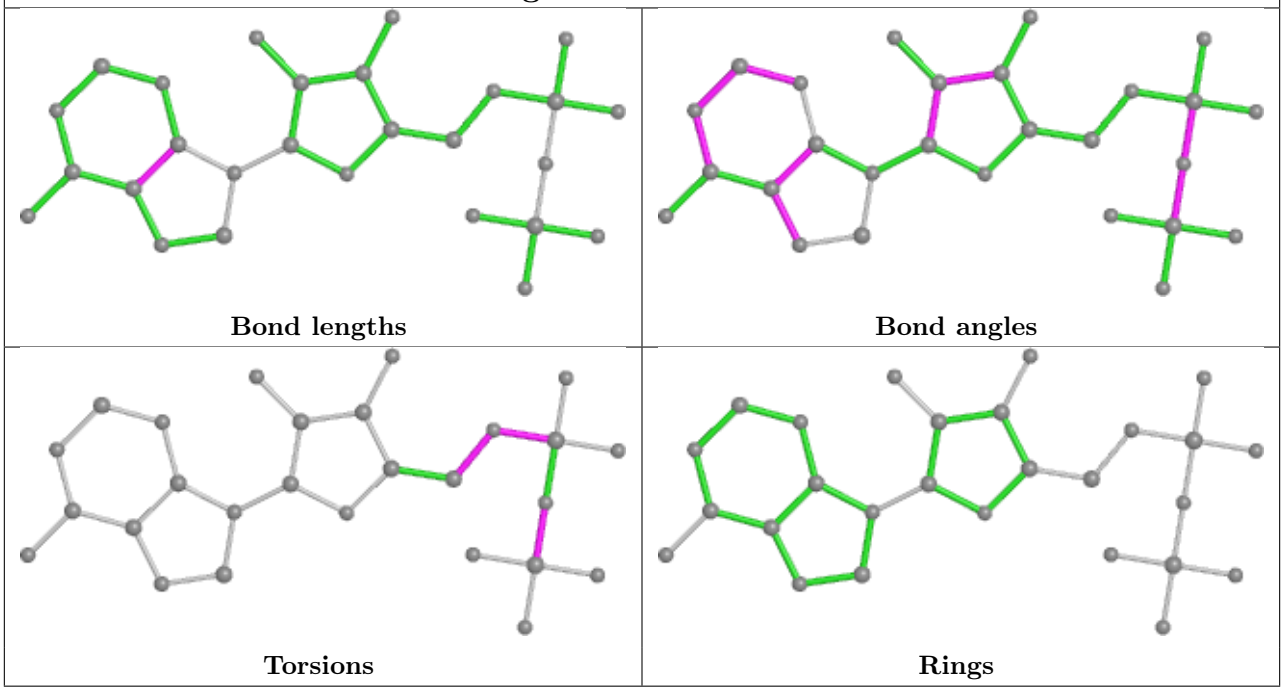
Mol	Chain	Res	Type	Atoms
6	D	401	KG4	C5'-O5'-PA-O2A
8	D	403	ADP	PA-O3A-PB-O3B
8	D	403	ADP	C5'-O5'-PA-O1A
8	D	403	ADP	C4'-C5'-O5'-PA
4	B	301	PGE	O1-C1-C2-O2
6	D	401	KG4	C5'-O5'-PA-O3A
4	B	301	PGE	O3-C5-C6-O4
5	B	302	AE3	O3-C5-C6-O4
4	B	301	PGE	C6-C5-O3-C4
6	D	401	KG4	C5'-O5'-PA-O1A
9	E	201	ATP	O4'-C4'-C5'-O5'
5	B	302	AE3	C4-C3-O2-C2
5	B	302	AE3	O2-C3-C4-O3
4	B	301	PGE	O2-C3-C4-O3

There are no ring outliers.

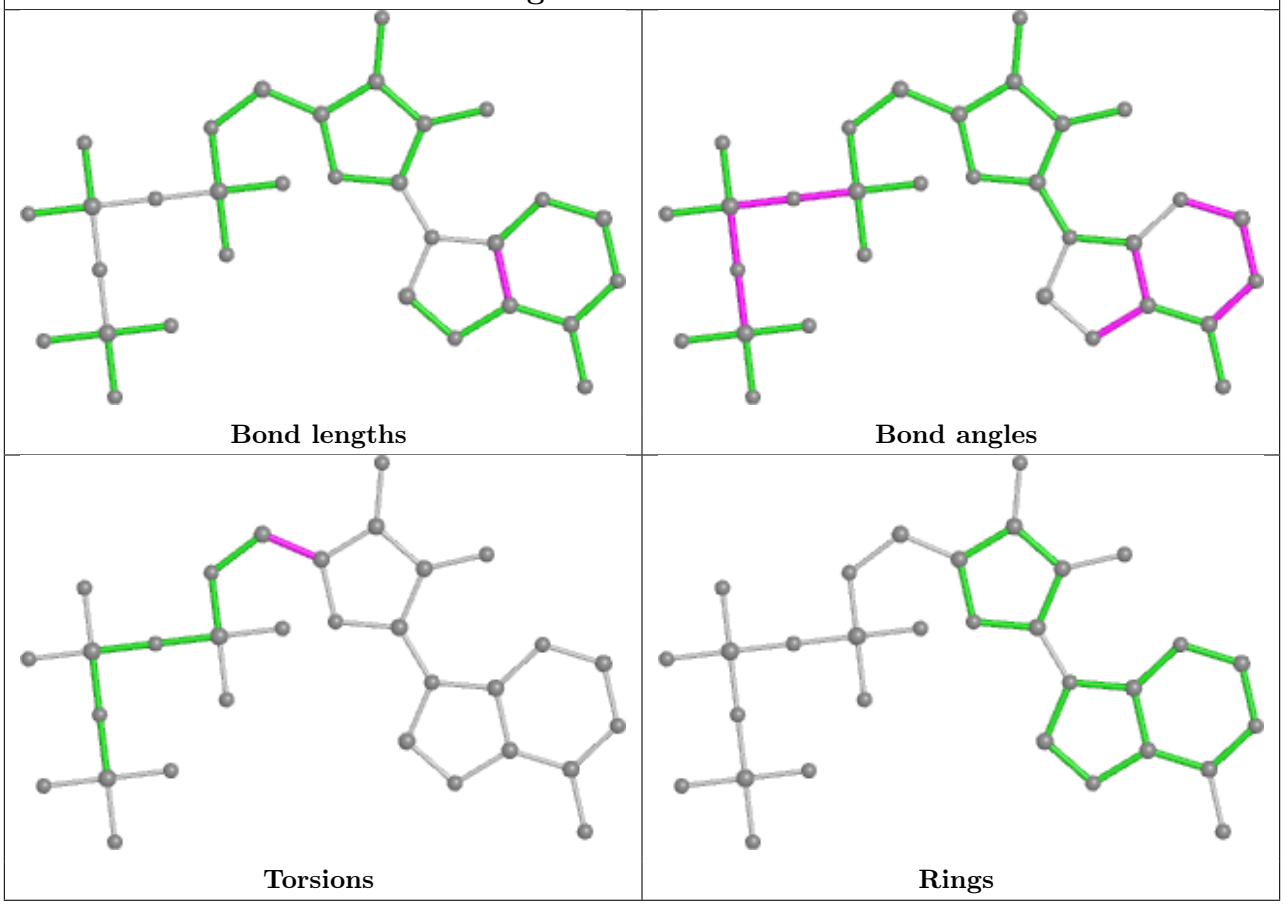
No monomer is involved in short contacts.

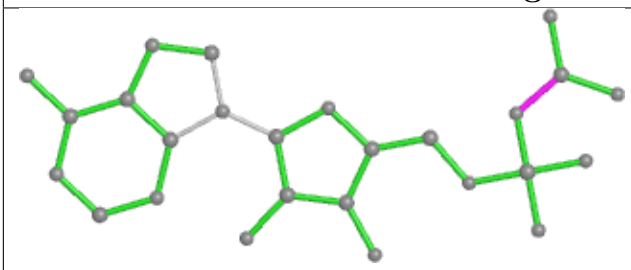
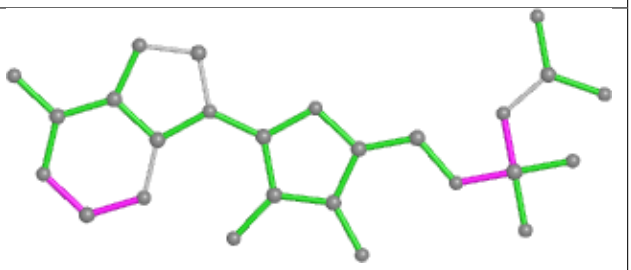
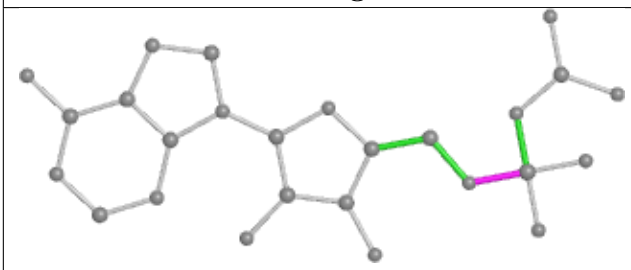
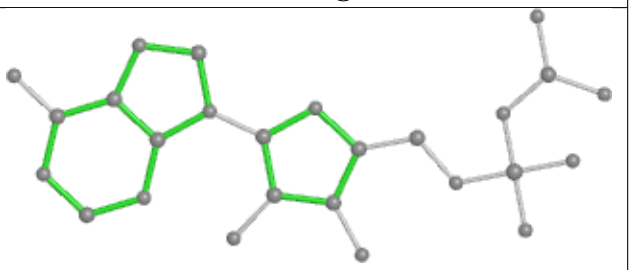
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less 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 ADP D 403



Ligand ATP E 201



Ligand KG4 D 401	
 Bond lengths	 Bond angles
 Torsions	 Rings

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 (i)

5.1 Protein, DNA and RNA chains (i)

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

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

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

5.3 Carbohydrates (i)

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

5.4 Ligands (i)

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

5.5 Other polymers (i)

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