Full wwPDB X-ray Structure Validation Report ⓘ

Oct 5, 2023 – 01:05 AM EDT

PDB ID	:	6VZS
Title	:	Engineered TTLL6 mutant bound to gamma-elongation analog
Authors	:	Mahalingan, K.K.; Keenen, E.K.; Strickland, M.; Li, Y.; Liu, Y.; Ball, H.L.; Tanner, M.E.; Tjandra, N.; Roll-Mecak, A.
Deposited on	:	2020-02-28
Resolution	:	2.66 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)
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 2.66 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 6 unique types of molecules in this entry. The entry contains 13000 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.

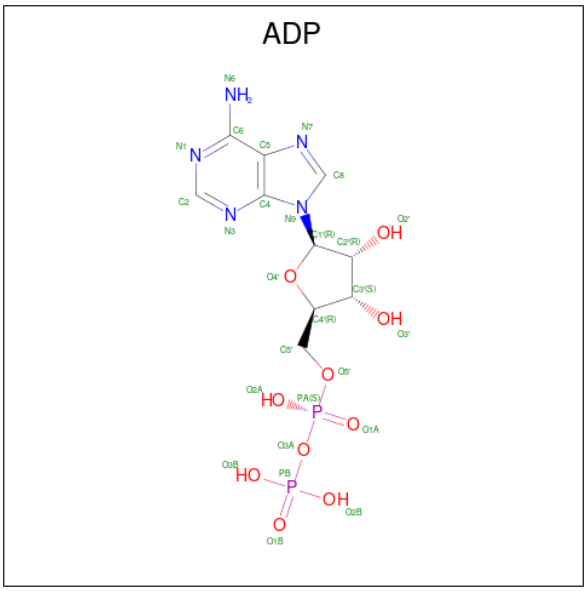
- Molecule 1 is a protein called Tubulin polyglutamylase TTLL6.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	404	Total	C	N	O	S	0	0	0
			3100	1982	531	567	20			
1	B	401	Total	C	N	O	S	0	0	0
			3056	1957	526	554	19			
1	C	404	Total	C	N	O	S	0	1	0
			3131	2011	535	566	19			
1	D	404	Total	C	N	O	S	0	0	0
			3079	1973	520	566	20			

There are 12 discrepancies between the modelled and reference sequences:

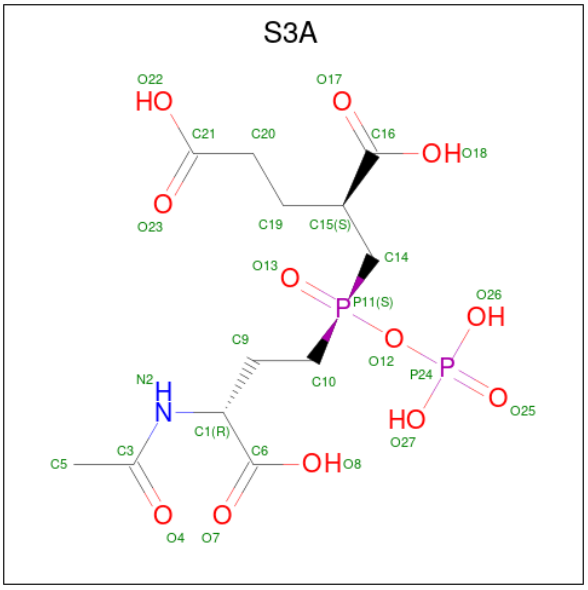
Chain	Residue	Modelled	Actual	Comment	Reference
A	179	ALA	CYS	engineered mutation	UNP A4Q9E8
A	180	ARG	GLN	engineered mutation	UNP A4Q9E8
A	362	ILE	HIS	engineered mutation	UNP A4Q9E8
B	179	ALA	CYS	engineered mutation	UNP A4Q9E8
B	180	ARG	GLN	engineered mutation	UNP A4Q9E8
B	362	ILE	HIS	engineered mutation	UNP A4Q9E8
C	179	ALA	CYS	engineered mutation	UNP A4Q9E8
C	180	ARG	GLN	engineered mutation	UNP A4Q9E8
C	362	ILE	HIS	engineered mutation	UNP A4Q9E8
D	179	ALA	CYS	engineered mutation	UNP A4Q9E8
D	180	ARG	GLN	engineered mutation	UNP A4Q9E8
D	362	ILE	HIS	engineered mutation	UNP A4Q9E8

- Molecule 2 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$) (labeled as "Ligand of Interest" by depositor).



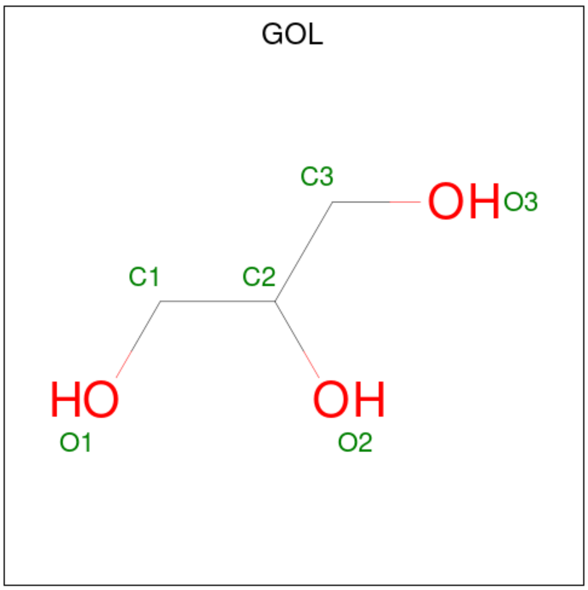
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
2	B	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
2	C	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
2	D	1	Total	C	N	O	P	0	0
			27	10	5	10	2		

- Molecule 3 is (2 {S})-2-[[[(3 {R})-3-acetamido-4-oxidanyl-4-oxidanylidene-butyl]-phosphono oxy-phosphoryl]methyl]pentanedioic acid (three-letter code: S3A) (formula: $C_{12}H_{21}NO_{12}P_2$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total 27	C 12	N 1	O 12	P 2	0	0
3	B	1	Total 27	C 12	N 1	O 12	P 2	0	0
3	C	1	Total 27	C 12	N 1	O 12	P 2	0	0
3	D	1	Total 27	C 12	N 1	O 12	P 2	0	0

- Molecule 4 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total 6	C 3	O 3	0	0
4	A	1	Total 6	C 3	O 3	0	0
4	A	1	Total 6	C 3	O 3	0	0
4	A	1	Total 6	C 3	O 3	0	0
4	A	1	Total 6	C 3	O 3	0	0
4	A	1	Total 6	C 3	O 3	0	0
4	A	1	Total 6	C 3	O 3	0	0
4	A	1	Total 6	C 3	O 3	0	0

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0
4	B	1	Total C O 6 3 3	0	0
4	B	1	Total C O 6 3 3	0	0
4	B	1	Total C O 6 3 3	0	0
4	B	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0

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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	D	1	Total C O 6 3 3	0	0

- Molecule 5 is MAGNESIUM ION (three-letter code: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	2	Total Mg 2 2	0	0
5	B	2	Total Mg 2 2	0	0
5	C	2	Total Mg 2 2	0	0
5	D	2	Total Mg 2 2	0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	80	Total O 80 80	0	0
6	B	37	Total O 37 37	0	0
6	C	57	Total O 57 57	0	0
6	D	38	Total O 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 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	74.74Å 108.65Å 170.89Å 90.00° 90.02° 90.00°	Depositor
Resolution (Å)	45.84 – 2.66	Depositor
% Data completeness (in resolution range)	98.6 (45.84-2.66)	Depositor
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.70 (at 2.65Å)	Xtriage
Refinement program	PHENIX 1.17.1_3660	Depositor
R, R_{free}	0.218 , 0.256	Depositor
Wilson B-factor (Å^2)	50.2	Xtriage
Anisotropy	0.602	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.459 for h,-k,-l	Xtriage
Total number of atoms	13000	wwPDB-VP
Average B, all atoms (Å^2)	67.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 43.20 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.8265e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

[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

4.1 Standard geometry

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

4.2 Too-close contacts

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

4.3 Torsion angles

4.3.1 Protein backbone

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

4.3.2 Protein sidechains

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

4.3.3 RNA

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

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

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

4.5 Carbohydrates

There are no monosaccharides in this entry.

4.6 Ligand geometry

Of 49 ligands modelled in this entry, 8 are monoatomic - leaving 41 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	$\#\|Z\| > 2$
3	S3A	C	1203	5	21,26,26	0.85	0	27,37,37	0.96	1 (3%)
4	GOL	C	1212	-	5,5,5	0.91	0	5,5,5	0.98	0
4	GOL	C	1206	-	5,5,5	0.91	0	5,5,5	0.99	0
4	GOL	A	605	-	5,5,5	0.91	0	5,5,5	0.98	0
4	GOL	A	607	-	5,5,5	0.91	0	5,5,5	0.99	0
3	S3A	D	602	5	21,26,26	0.84	0	27,37,37	1.00	0
4	GOL	A	612	-	5,5,5	0.92	0	5,5,5	0.99	0
4	GOL	C	1207	-	5,5,5	0.93	0	5,5,5	0.98	0
4	GOL	A	606	-	5,5,5	0.90	0	5,5,5	1.00	0
4	GOL	B	606	-	5,5,5	0.91	0	5,5,5	1.00	0
4	GOL	C	1209	-	5,5,5	0.91	0	5,5,5	0.98	0
4	GOL	C	1214	-	5,5,5	0.93	0	5,5,5	0.97	0
4	GOL	C	1213	-	5,5,5	0.91	0	5,5,5	1.00	0
4	GOL	A	608	-	5,5,5	0.93	0	5,5,5	0.99	0
3	S3A	B	602	5	21,26,26	0.85	0	27,37,37	0.88	0
4	GOL	B	605	-	5,5,5	0.91	0	5,5,5	1.01	0
4	GOL	B	604	-	5,5,5	0.89	0	5,5,5	0.99	0
4	GOL	C	1204	-	5,5,5	0.94	0	5,5,5	0.83	0
2	ADP	B	601	5	24,29,29	0.98	1 (4%)	29,45,45	1.31	4 (13%)
4	GOL	C	1211	-	5,5,5	0.91	0	5,5,5	1.00	0
4	GOL	A	603	-	5,5,5	0.93	0	5,5,5	0.96	0
4	GOL	A	610	-	5,5,5	0.90	0	5,5,5	1.00	0
2	ADP	D	601	5	24,29,29	0.96	1 (4%)	29,45,45	1.36	4 (13%)
4	GOL	C	1220	-	5,5,5	0.89	0	5,5,5	1.00	0
4	GOL	C	1208	-	5,5,5	0.91	0	5,5,5	0.99	0
4	GOL	C	1216	-	5,5,5	0.91	0	5,5,5	0.98	0
2	ADP	A	601	5	24,29,29	0.95	1 (4%)	29,45,45	1.33	4 (13%)
4	GOL	C	1201	-	5,5,5	0.93	0	5,5,5	0.99	0
4	GOL	C	1205	-	5,5,5	0.91	0	5,5,5	1.00	0
4	GOL	A	609	-	5,5,5	0.90	0	5,5,5	0.97	0
2	ADP	C	1202	5	24,29,29	0.96	1 (4%)	29,45,45	1.35	4 (13%)
4	GOL	B	603	-	5,5,5	0.93	0	5,5,5	0.96	0
4	GOL	D	603	-	5,5,5	0.99	0	5,5,5	0.84	0
4	GOL	A	611	-	5,5,5	0.90	0	5,5,5	1.00	0
3	S3A	A	602	5	21,26,26	0.85	0	27,37,37	0.94	0
4	GOL	A	604	-	5,5,5	0.91	0	5,5,5	0.99	0
4	GOL	C	1210	-	5,5,5	0.90	0	5,5,5	1.01	0
4	GOL	C	1218	-	5,5,5	0.90	0	5,5,5	1.01	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
4	GOL	C	1219	-	5,5,5	0.92	0	5,5,5	1.01	0
4	GOL	C	1215	-	5,5,5	0.92	0	5,5,5	0.99	0
4	GOL	C	1217	-	5,5,5	0.90	0	5,5,5	0.99	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
3	S3A	C	1203	5	-	2/30/34/34	-
4	GOL	C	1212	-	-	0/4/4/4	-
4	GOL	C	1206	-	-	0/4/4/4	-
4	GOL	A	605	-	-	0/4/4/4	-
4	GOL	A	607	-	-	0/4/4/4	-
3	S3A	D	602	5	-	3/30/34/34	-
4	GOL	A	612	-	-	0/4/4/4	-
4	GOL	C	1207	-	-	1/4/4/4	-
4	GOL	A	606	-	-	2/4/4/4	-
4	GOL	B	606	-	-	0/4/4/4	-
4	GOL	C	1209	-	-	0/4/4/4	-
4	GOL	C	1214	-	-	0/4/4/4	-
4	GOL	C	1213	-	-	0/4/4/4	-
4	GOL	A	608	-	-	0/4/4/4	-
3	S3A	B	602	5	-	3/30/34/34	-
4	GOL	B	605	-	-	0/4/4/4	-
4	GOL	B	604	-	-	0/4/4/4	-
4	GOL	C	1204	-	-	2/4/4/4	-
2	ADP	B	601	5	-	3/12/32/32	0/3/3/3
4	GOL	C	1211	-	-	0/4/4/4	-
4	GOL	A	603	-	-	0/4/4/4	-
4	GOL	A	610	-	-	0/4/4/4	-
2	ADP	D	601	5	-	1/12/32/32	0/3/3/3
4	GOL	C	1220	-	-	0/4/4/4	-
4	GOL	C	1208	-	-	0/4/4/4	-
4	GOL	C	1216	-	-	0/4/4/4	-
2	ADP	A	601	5	-	2/12/32/32	0/3/3/3
4	GOL	C	1201	-	-	0/4/4/4	-
4	GOL	C	1205	-	-	0/4/4/4	-
4	GOL	A	609	-	-	0/4/4/4	-
2	ADP	C	1202	5	-	0/12/32/32	0/3/3/3

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	GOL	B	603	-	-	0/4/4/4	-
4	GOL	D	603	-	-	2/4/4/4	-
4	GOL	A	611	-	-	0/4/4/4	-
3	S3A	A	602	5	-	3/30/34/34	-
4	GOL	A	604	-	-	0/4/4/4	-
4	GOL	C	1210	-	-	0/4/4/4	-
4	GOL	C	1218	-	-	0/4/4/4	-
4	GOL	C	1219	-	-	1/4/4/4	-
4	GOL	C	1215	-	-	0/4/4/4	-
4	GOL	C	1217	-	-	0/4/4/4	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	601	ADP	C5-C4	2.50	1.47	1.40
2	C	1202	ADP	C5-C4	2.50	1.47	1.40
2	B	601	ADP	C5-C4	2.49	1.47	1.40
2	D	601	ADP	C5-C4	2.49	1.47	1.40

All (17) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	601	ADP	C3'-C2'-C1'	3.19	105.78	100.98
2	C	1202	ADP	C3'-C2'-C1'	3.18	105.76	100.98
2	C	1202	ADP	N3-C2-N1	-3.13	123.78	128.68
2	D	601	ADP	N3-C2-N1	-3.13	123.78	128.68
2	D	601	ADP	C3'-C2'-C1'	3.12	105.67	100.98
2	A	601	ADP	N3-C2-N1	-3.11	123.81	128.68
2	B	601	ADP	N3-C2-N1	-3.11	123.82	128.68
2	B	601	ADP	C3'-C2'-C1'	3.10	105.64	100.98
2	D	601	ADP	PA-O3A-PB	-2.66	123.69	132.83
2	B	601	ADP	C4-C5-N7	-2.65	106.64	109.40
2	D	601	ADP	C4-C5-N7	-2.63	106.66	109.40
2	C	1202	ADP	C4-C5-N7	-2.54	106.76	109.40
2	A	601	ADP	C4-C5-N7	-2.51	106.79	109.40
2	C	1202	ADP	PA-O3A-PB	-2.44	124.46	132.83
2	A	601	ADP	PA-O3A-PB	-2.41	124.56	132.83
3	C	1203	S3A	O26-P24-O12	2.16	111.87	104.64
2	B	601	ADP	PA-O3A-PB	-2.10	125.61	132.83

There are no chirality outliers.

All (25) torsion outliers are listed below:

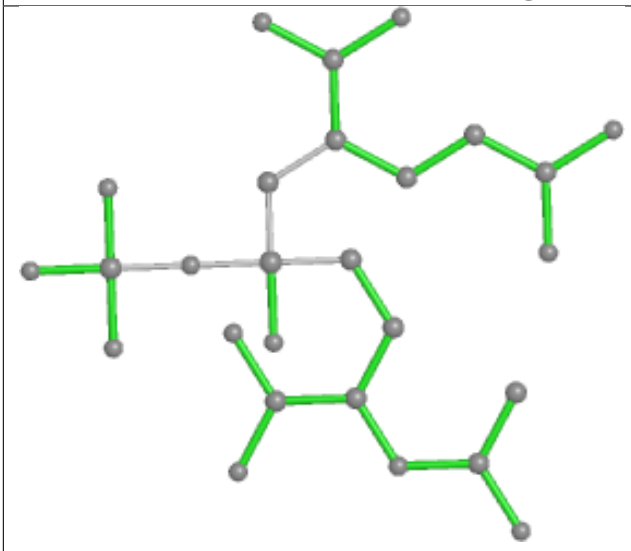
Mol	Chain	Res	Type	Atoms
2	B	601	ADP	PA-O3A-PB-O2B
2	B	601	ADP	PA-O3A-PB-O3B
4	C	1204	GOL	C1-C2-C3-O3
4	C	1204	GOL	O2-C2-C3-O3
4	D	603	GOL	O1-C1-C2-O2
4	D	603	GOL	O1-C1-C2-C3
4	C	1207	GOL	O1-C1-C2-C3
3	A	602	S3A	N2-C1-C6-O7
3	A	602	S3A	N2-C1-C6-O8
3	C	1203	S3A	C14-C15-C16-O18
3	D	602	S3A	C19-C20-C21-O23
3	D	602	S3A	C19-C20-C21-O22
3	C	1203	S3A	C14-C15-C19-C20
3	B	602	S3A	C9-C1-C6-O8
2	A	601	ADP	PB-O3A-PA-O1A
4	A	606	GOL	C1-C2-C3-O3
2	B	601	ADP	PA-O3A-PB-O1B
3	B	602	S3A	C9-C1-C6-O7
4	A	606	GOL	O2-C2-C3-O3
2	D	601	ADP	PB-O3A-PA-O1A
4	C	1219	GOL	O1-C1-C2-C3
2	A	601	ADP	C5'-O5'-PA-O1A
3	A	602	S3A	P11-C14-C15-C16
3	B	602	S3A	P11-C14-C15-C16
3	D	602	S3A	P11-C14-C15-C16

There are no ring outliers.

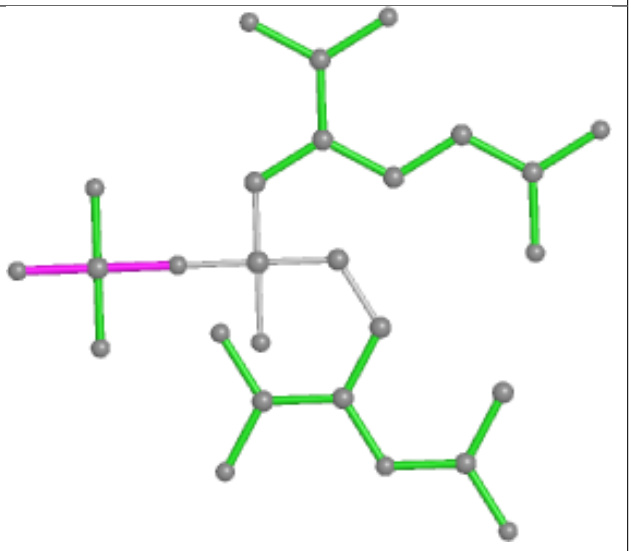
No monomer is involved in short contacts.

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.

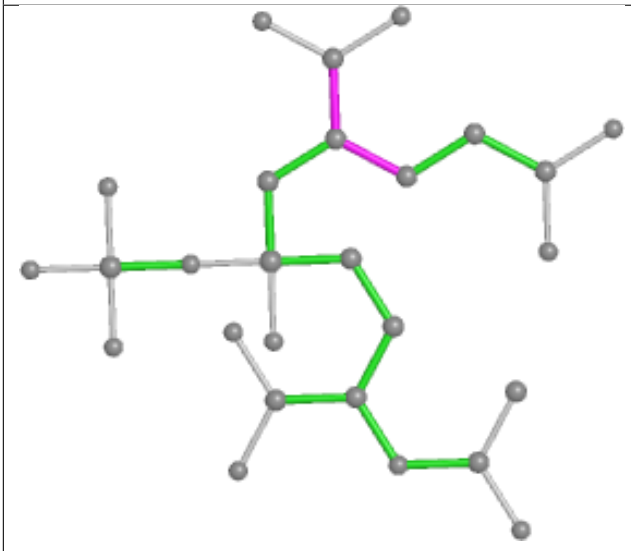
Ligand S3A C 1203



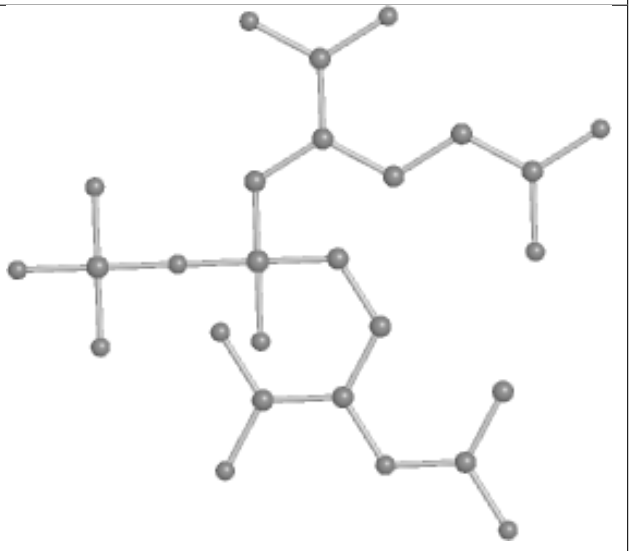
Bond lengths



Bond angles

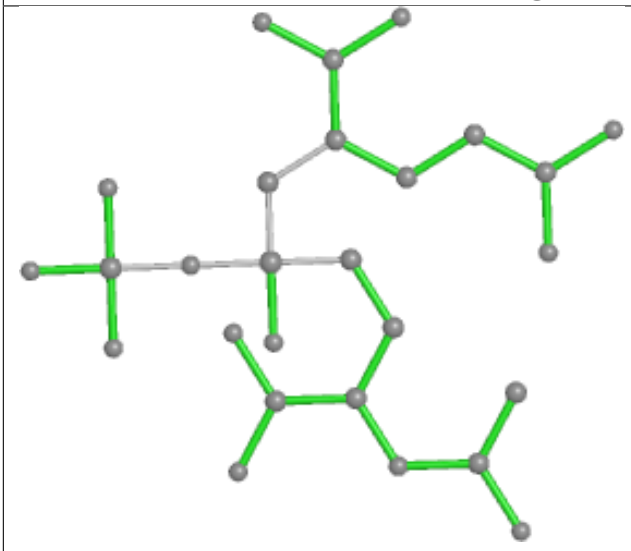


Torsions

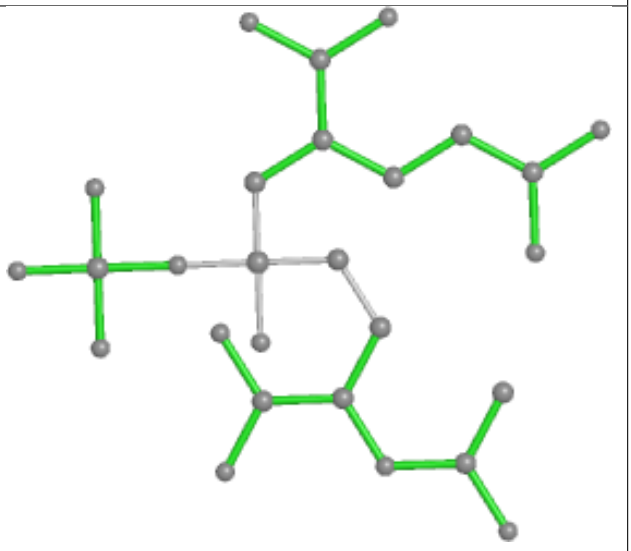


Rings

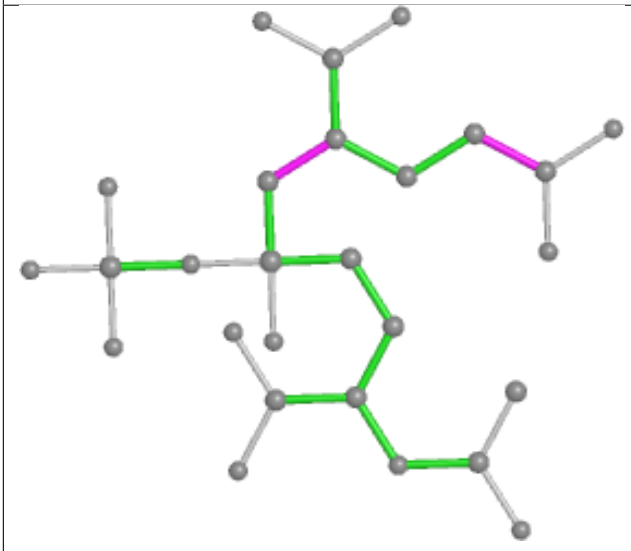
Ligand S3A D 602



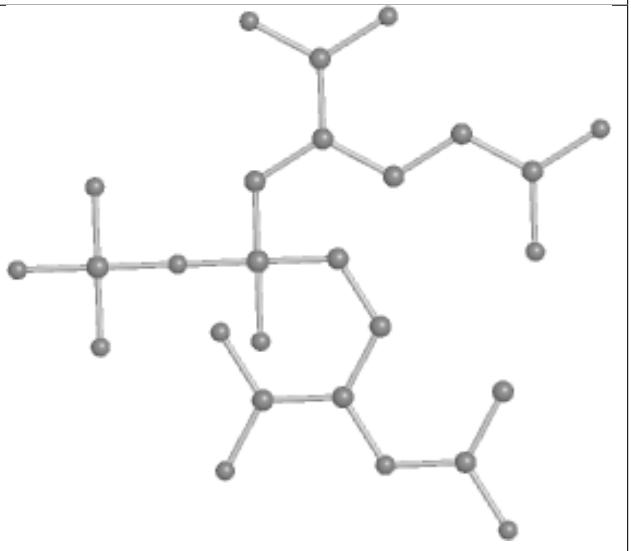
Bond lengths



Bond angles

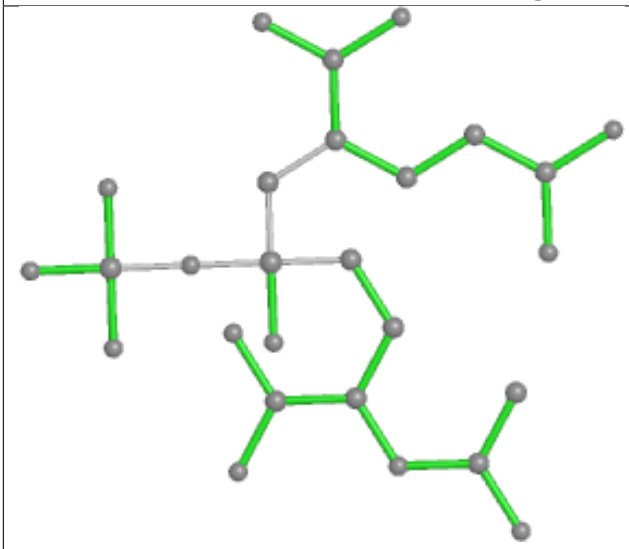


Torsions

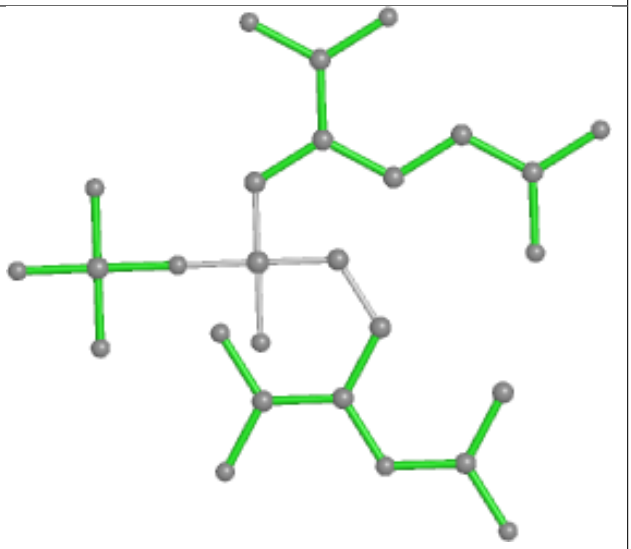


Rings

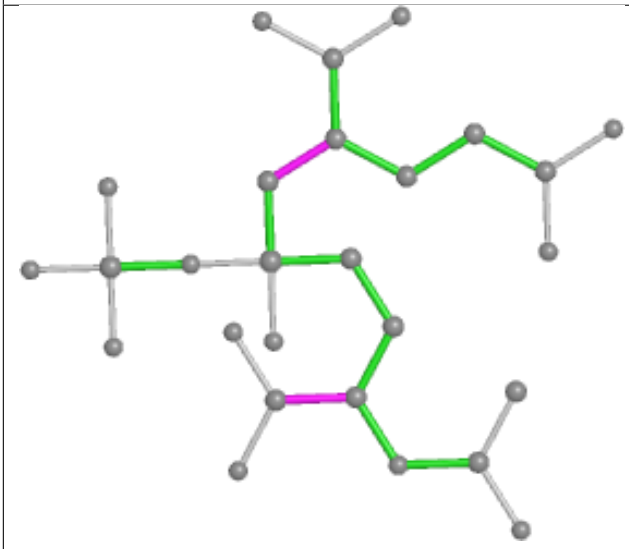
Ligand S3A B 602



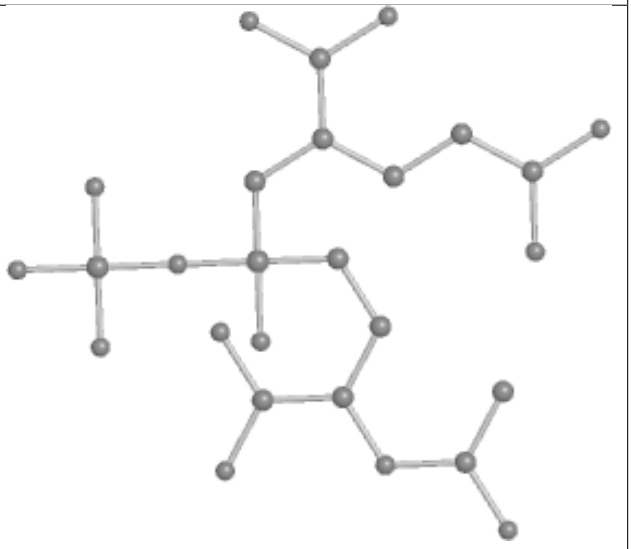
Bond lengths



Bond angles

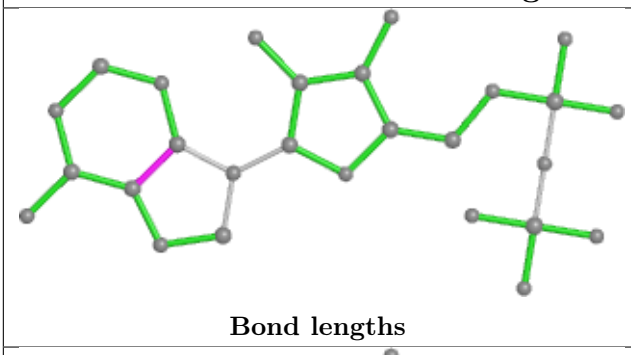


Torsions

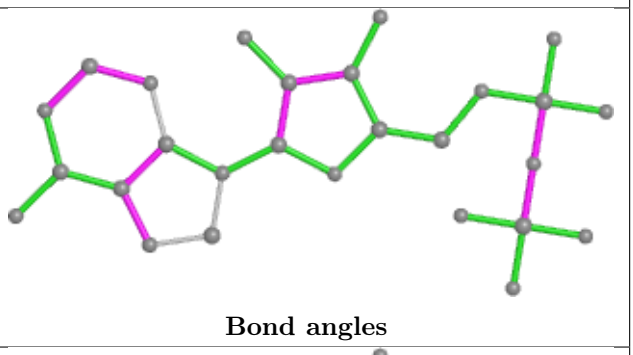


Rings

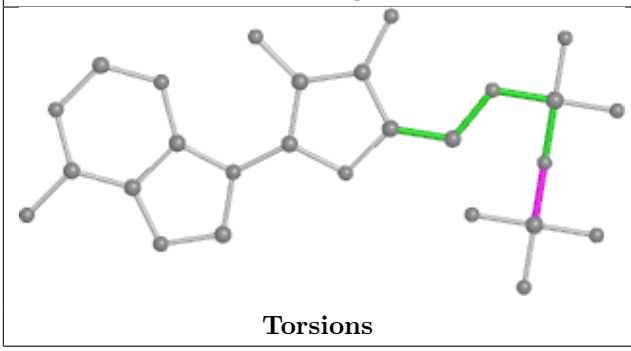
Ligand ADP B 601



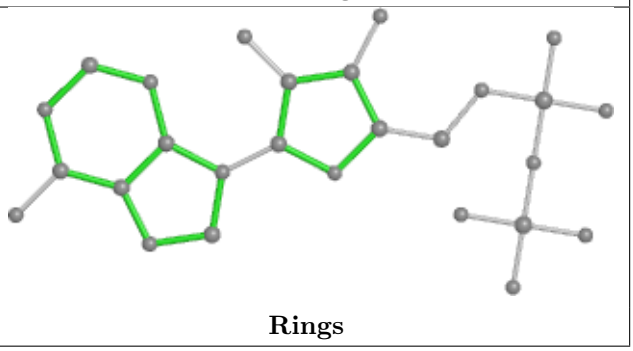
Bond lengths



Bond angles

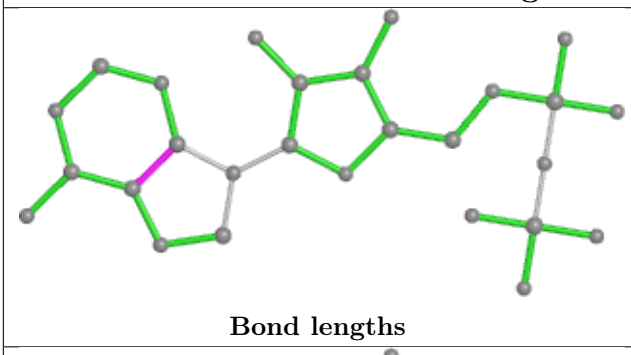


Torsions

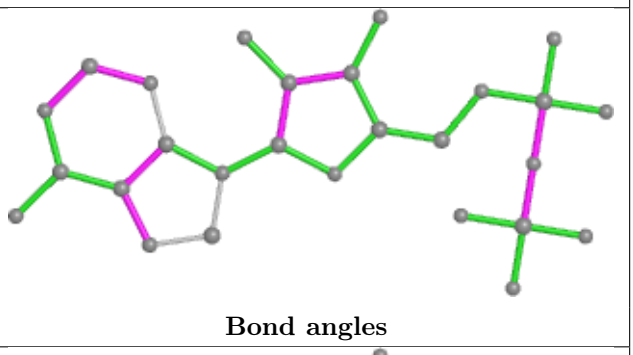


Rings

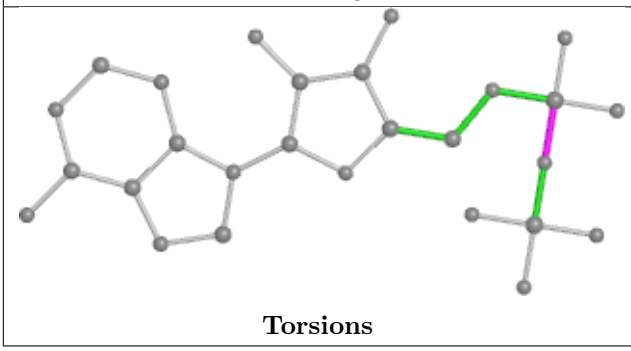
Ligand ADP D 601



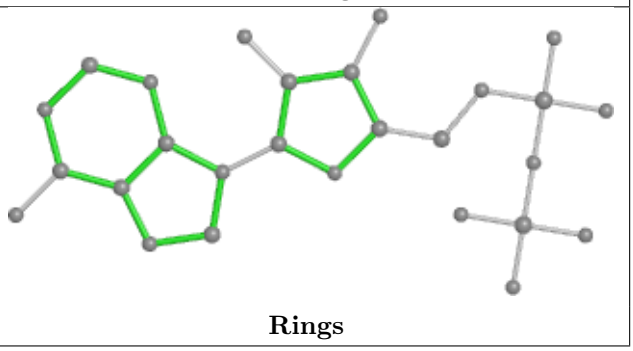
Bond lengths



Bond angles

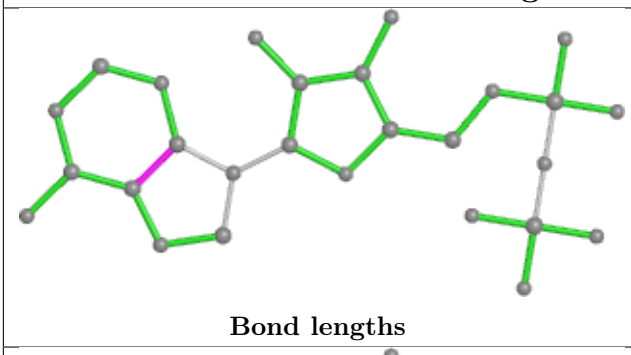


Torsions

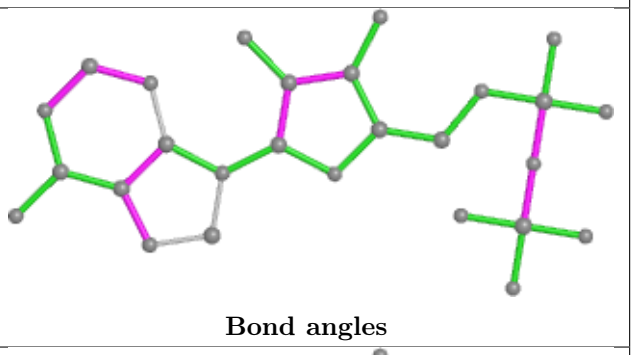


Rings

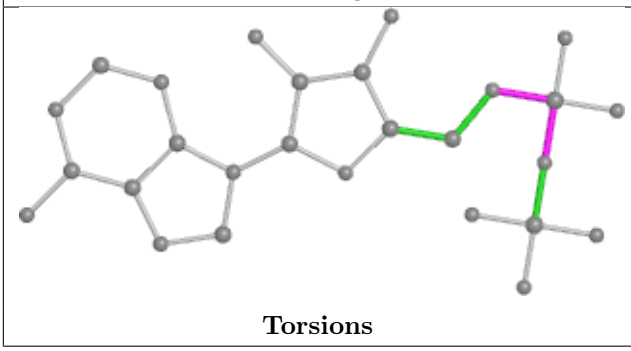
Ligand ADP A 601



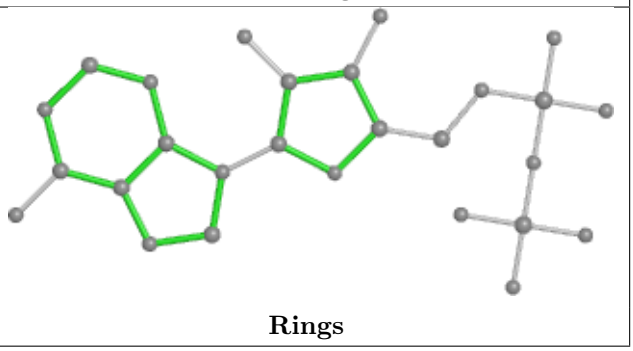
Bond lengths



Bond angles

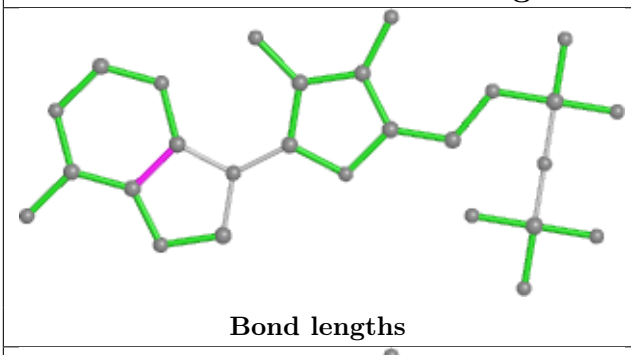


Torsions

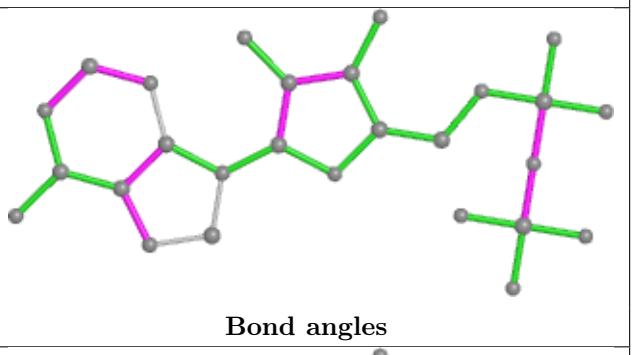


Rings

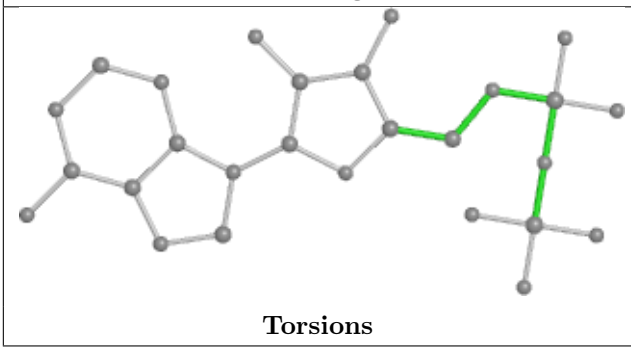
Ligand ADP C 1202



Bond lengths



Bond angles



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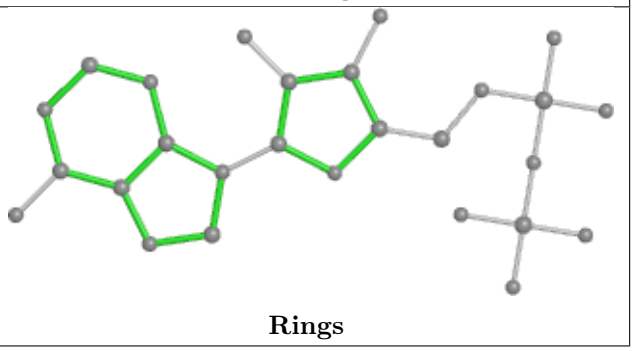
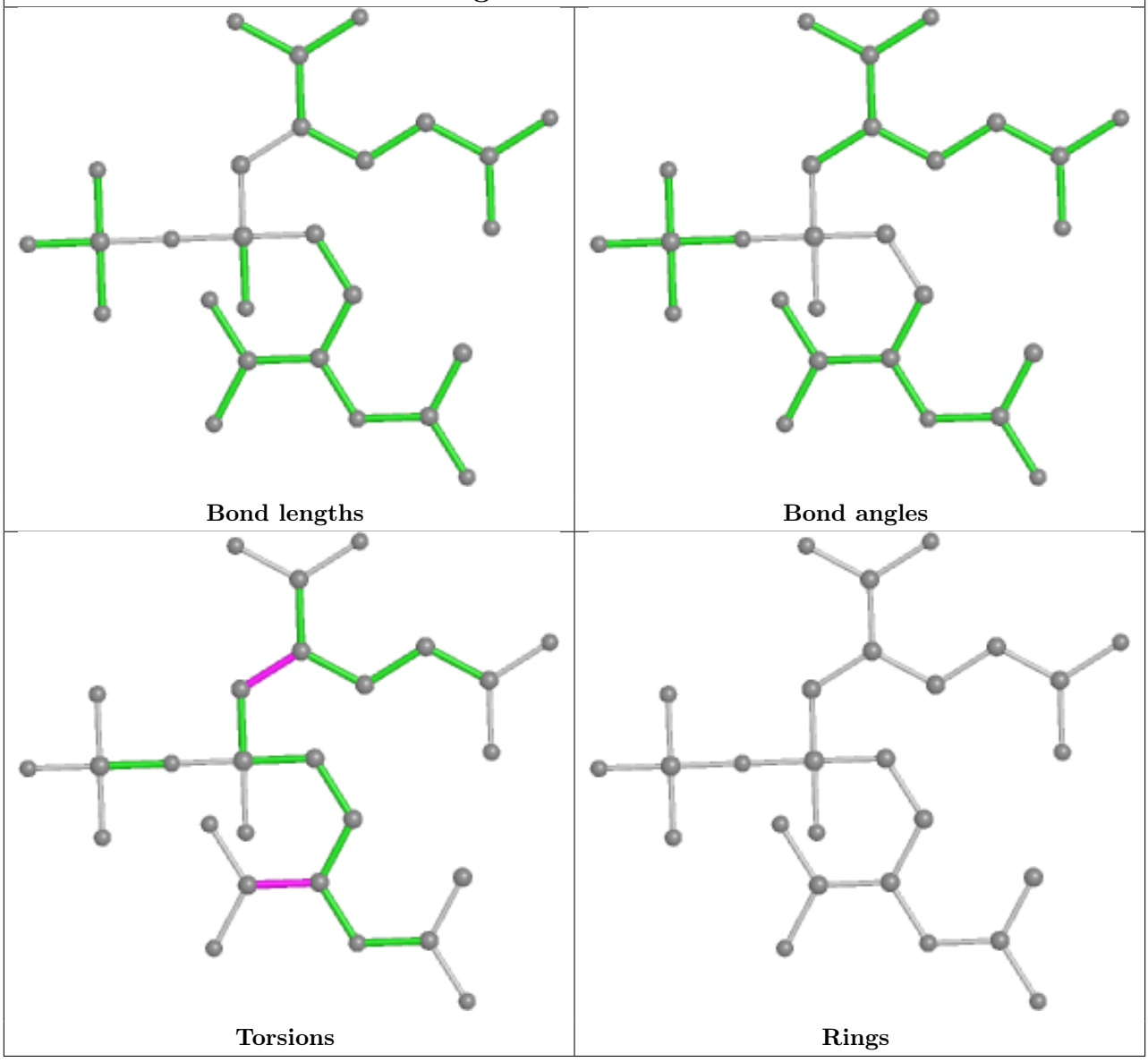


Rings

Ligand S3A A 602



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.