wwPDB EM Validation Summary Report

May 13, 2024 – 11:54 pm BST

PDB ID	:	8QXK
EMDB ID	:	EMD-18730
Title	:	Cryo-EM structure of tetrameric human SAMHD1 State I - Tense
Authors	:	Acton, O.J.; Sheppard, D.; Rosenthal, P.B.; Taylor, I.A.
Deposited on	:	2023-10-24
Resolution	:	2.66 Å(reported)

This is a wwPDB EM Validation Summary 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	:	0.0.1.dev92
Mogul	:	1.8.4, CSD as541be (2020)
MolProbity	:	FAILED
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ	:	FAILED
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 2.66 Å.

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

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

2 Entry composition (i)

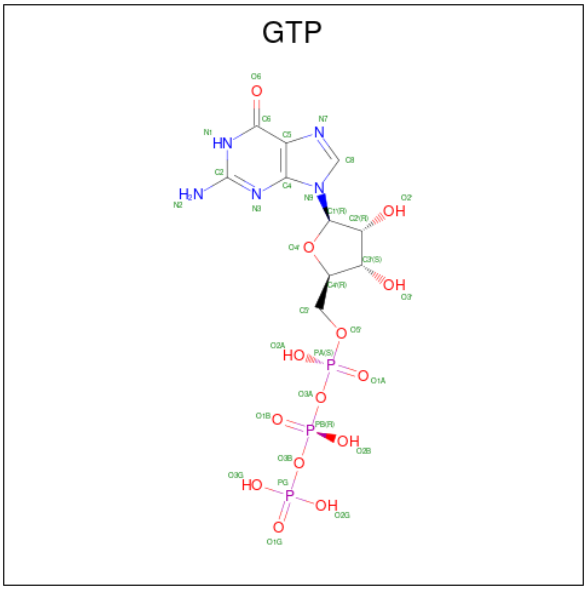
There are 6 unique types of molecules in this entry. The entry contains 15323 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Deoxynucleoside triphosphate triphosphohydrolase SAMHD1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	458	Total	C	N	O	S	0	0
			3738	2395	649	674	20		
1	C	458	Total	C	N	O	S	0	0
			3729	2391	645	673	20		
1	B	458	Total	C	N	O	S	1	0
			3742	2397	651	674	20		
1	D	458	Total	C	N	O	S	0	0
			3738	2395	649	674	20		

- Molecule 2 is GUANOSINE-5'-TRIPHOSPHATE (three-letter code: GTP) (formula: $C_{10}H_{16}N_5O_{14}P_3$).



Mol	Chain	Residues	Atoms					AltConf
2	A	1	Total	C	N	O	P	0
			32	10	5	14	3	
2	C	1	Total	C	N	O	P	0
			32	10	5	14	3	

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Mol	Chain	Residues	Atoms					AltConf
2	B	1	Total	C	N	O	P	0
			32	10	5	14	3	
2	D	1	Total	C	N	O	P	0
			32	10	5	14	3	

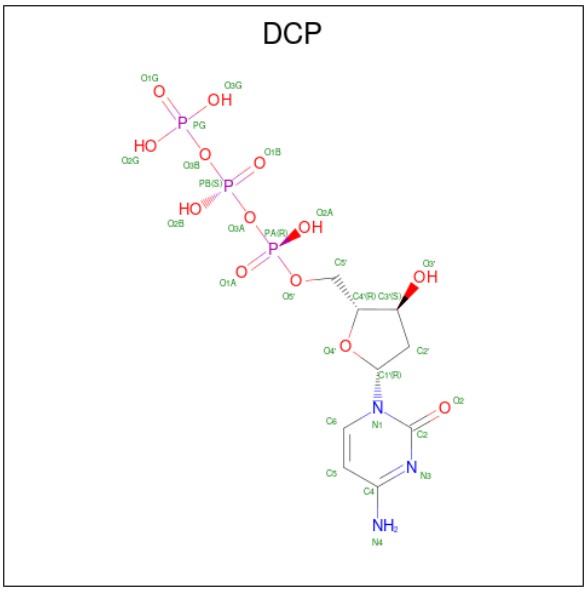
- Molecule 3 is FE (III) ION (three-letter code: FE) (formula: Fe).

Mol	Chain	Residues	Atoms		AltConf
3	A	1	Total	Fe	0
			1	1	
3	C	1	Total	Fe	0
			1	1	
3	B	1	Total	Fe	0
			1	1	
3	D	1	Total	Fe	0
			1	1	

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

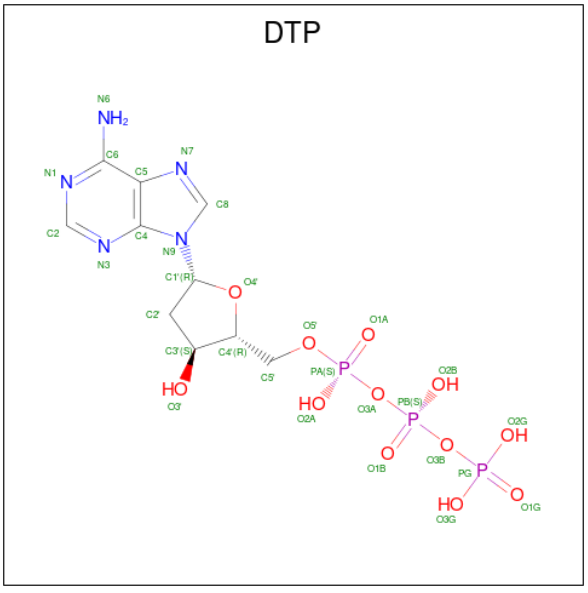
Mol	Chain	Residues	Atoms		AltConf
4	A	3	Total	Mg	0
			3	3	
4	C	3	Total	Mg	0
			3	3	
4	B	3	Total	Mg	0
			3	3	
4	D	3	Total	Mg	0
			3	3	

- Molecule 5 is 2'-DEOXYCYTIDINE-5'-TRIPHOSPHATE (three-letter code: DCP) (formula: $C_9H_{16}N_3O_{13}P_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					AltConf
5	A	1	Total	C	N	O	P	0
			28	9	3	13	3	
5	C	1	Total	C	N	O	P	0
			28	9	3	13	3	
5	B	1	Total	C	N	O	P	0
			28	9	3	13	3	
5	D	1	Total	C	N	O	P	0
			28	9	3	13	3	

- Molecule 6 is 2'-DEOXYADENOSINE 5'-TRIPHOSPHATE (three-letter code: DTP) (formula: $C_{10}H_{16}N_5O_{12}P_3$).



Mol	Chain	Residues	Atoms					AltConf
6	A	1	Total	C	N	O	P	0
			30	10	5	12	3	
6	C	1	Total	C	N	O	P	0
			30	10	5	12	3	
6	B	1	Total	C	N	O	P	0
			30	10	5	12	3	
6	D	1	Total	C	N	O	P	0
			30	10	5	12	3	

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

3 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	78613	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	33	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	3500	Depositor
Magnification	75000	Depositor
Image detector	FEI FALCON III (4k x 4k)	Depositor

4 Model quality

4.1 Standard geometry

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

4.2 Too-close contacts

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4.3 Torsion angles

4.3.1 Protein backbone

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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 28 ligands modelled in this entry, 16 are monoatomic - leaving 12 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	$\#\|Z\| > 2$
2	GTP	C	701	4	26,34,34	1.14	2 (7%)	32,54,54	1.58	8 (25%)
5	DCP	A	706	4	25,29,29	0.87	0	37,45,45	1.18	2 (5%)
5	DCP	D	707	-	25,29,29	0.86	0	37,45,45	1.18	2 (5%)
2	GTP	A	701	4	26,34,34	1.15	2 (7%)	32,54,54	1.59	7 (21%)
6	DTP	D	701	4	26,32,32	0.68	0	30,50,50	0.89	2 (6%)
6	DTP	C	707	4	26,32,32	0.68	0	30,50,50	0.89	2 (6%)
2	GTP	D	702	4	26,34,34	1.15	2 (7%)	32,54,54	1.58	8 (25%)
2	GTP	B	702	4	26,34,34	1.14	2 (7%)	32,54,54	1.58	8 (25%)
5	DCP	C	706	4	25,29,29	0.87	0	37,45,45	1.18	2 (5%)
5	DCP	B	707	4	25,29,29	0.87	0	37,45,45	1.18	2 (5%)
6	DTP	A	707	4	26,32,32	0.68	0	30,50,50	0.89	2 (6%)
6	DTP	B	701	4	26,32,32	0.68	0	30,50,50	0.89	2 (6%)

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
2	GTP	C	701	4	-	7/18/38/38	0/3/3/3
5	DCP	A	706	4	-	11/22/34/34	0/2/2/2
5	DCP	D	707	-	-	11/22/34/34	0/2/2/2
2	GTP	A	701	4	-	7/18/38/38	0/3/3/3
6	DTP	D	701	4	-	8/18/34/34	0/3/3/3
6	DTP	C	707	4	-	8/18/34/34	0/3/3/3
2	GTP	D	702	4	-	8/18/38/38	0/3/3/3
2	GTP	B	702	4	-	8/18/38/38	0/3/3/3
5	DCP	C	706	4	-	7/22/34/34	0/2/2/2
5	DCP	B	707	4	-	7/22/34/34	0/2/2/2
6	DTP	A	707	4	-	10/18/34/34	0/3/3/3
6	DTP	B	701	4	-	8/18/34/34	0/3/3/3

The worst 5 of 8 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	701	GTP	C5-C6	-4.13	1.39	1.47
2	C	701	GTP	C5-C6	-4.12	1.39	1.47
2	D	702	GTP	C5-C6	-4.07	1.39	1.47
2	B	702	GTP	C5-C6	-4.07	1.39	1.47
2	D	702	GTP	C2-N3	2.12	1.38	1.33

The worst 5 of 47 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	702	GTP	PA-O3A-PB	-3.73	120.03	132.83
2	C	701	GTP	PA-O3A-PB	-3.73	120.04	132.83
2	A	701	GTP	PA-O3A-PB	-3.72	120.06	132.83
2	B	702	GTP	PA-O3A-PB	-3.70	120.12	132.83
5	D	707	DCP	PB-O3B-PG	-3.69	120.17	132.83

There are no chirality outliers.

5 of 100 torsion outliers are listed below:

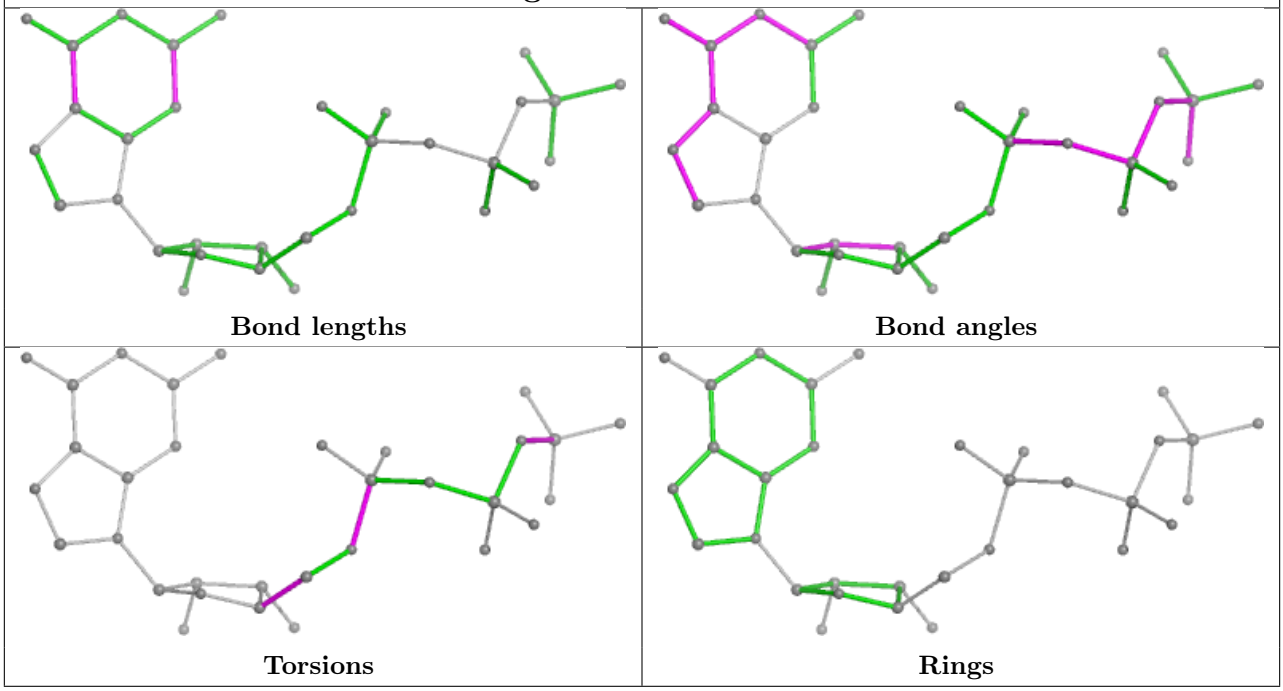
Mol	Chain	Res	Type	Atoms
2	A	701	GTP	PB-O3B-PG-O3G
2	C	701	GTP	PB-O3B-PG-O3G
2	B	702	GTP	PB-O3B-PG-O3G
2	D	702	GTP	PB-O3B-PG-O3G
5	A	706	DCP	C3'-C4'-C5'-O5'

There are no ring outliers.

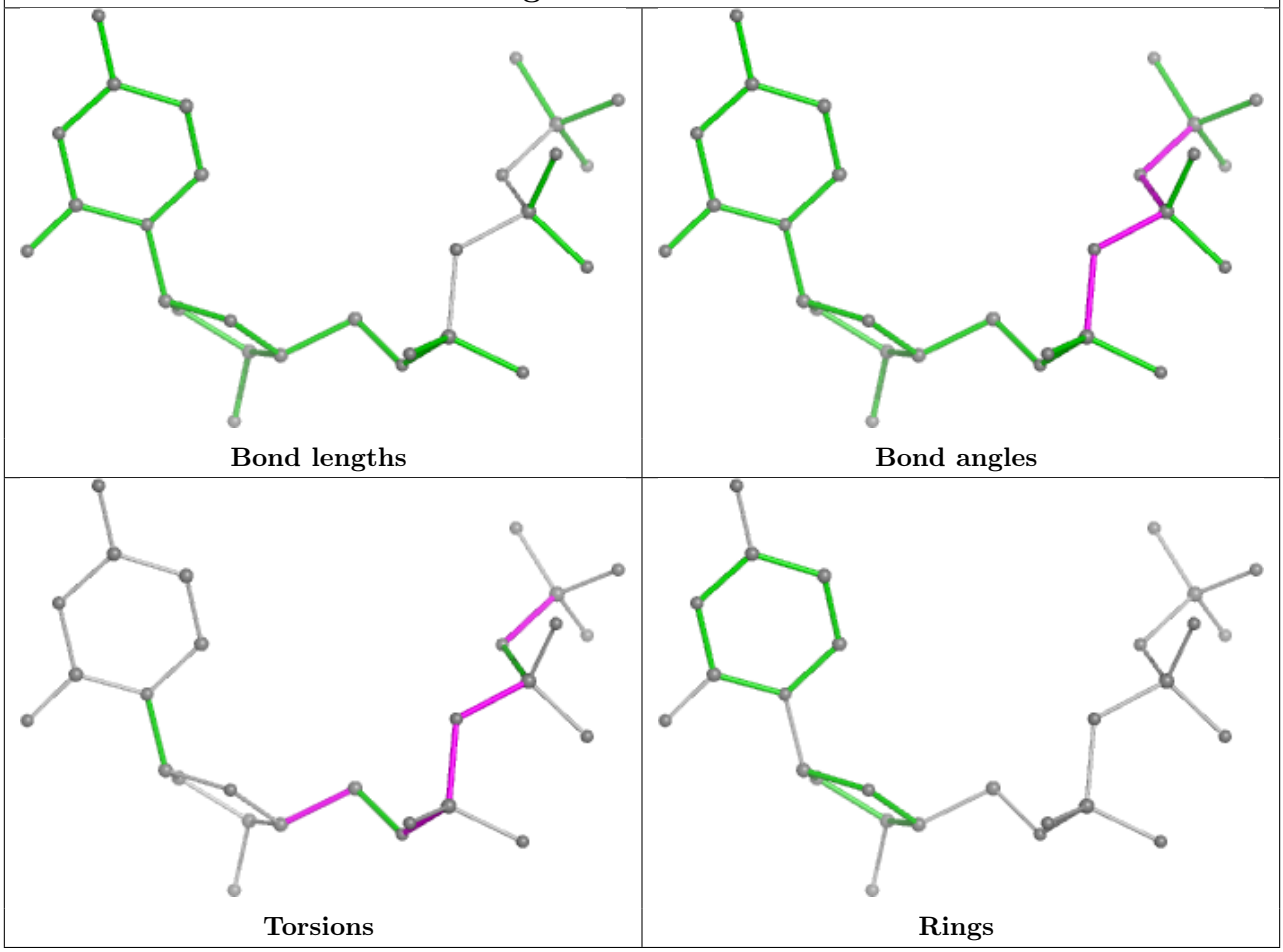
No monomer is involved in short contacts.

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.

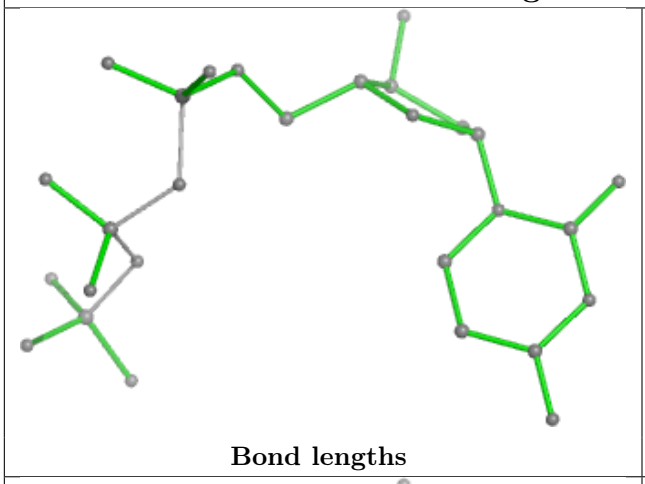
Ligand GTP C 701



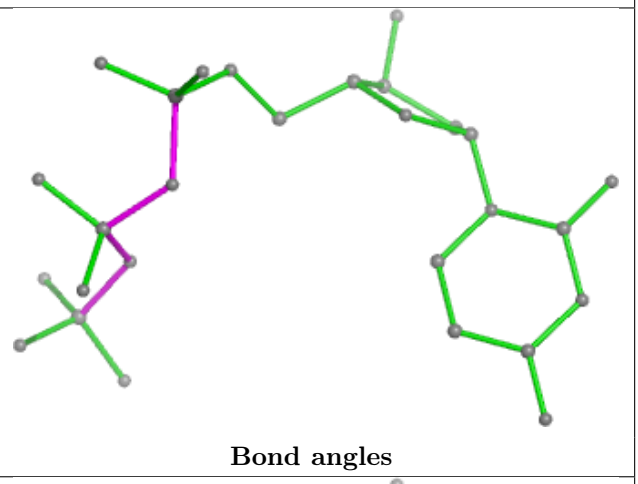
Ligand DCP A 706



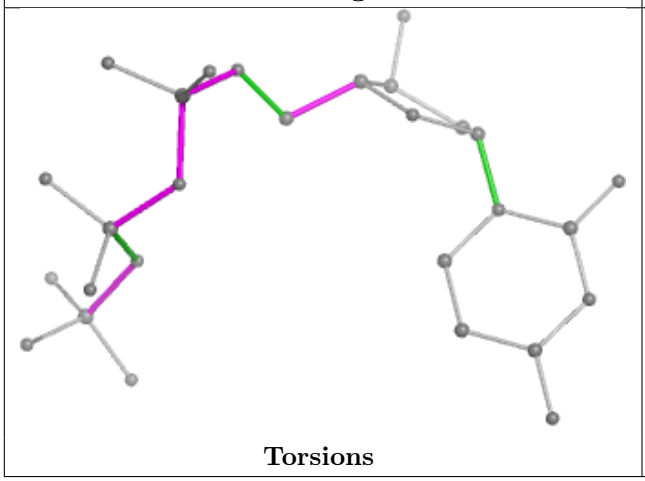
Ligand DCP D 707



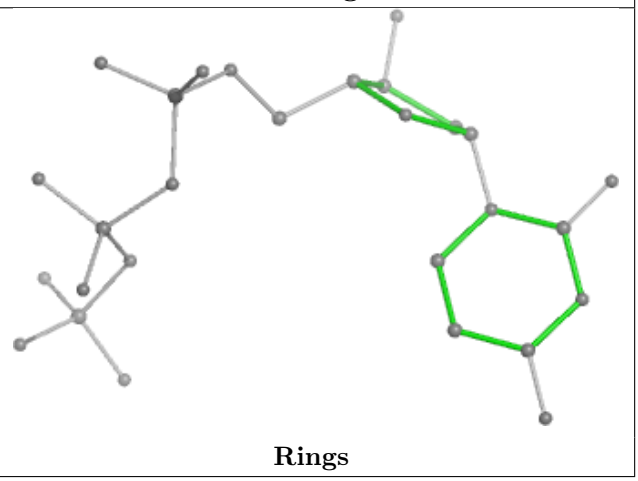
Bond lengths



Bond angles

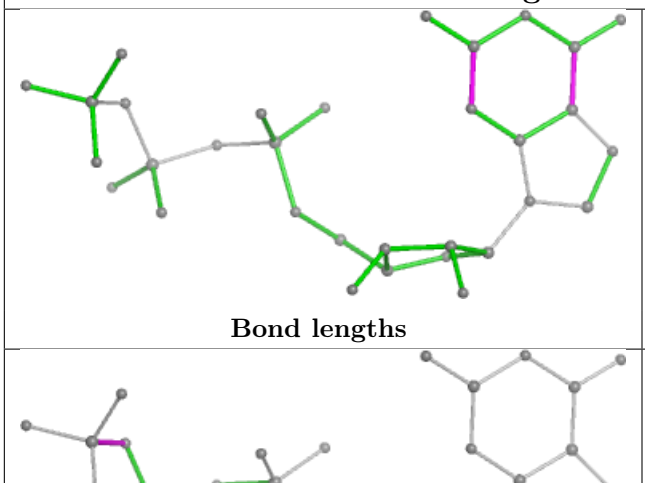


Torsions

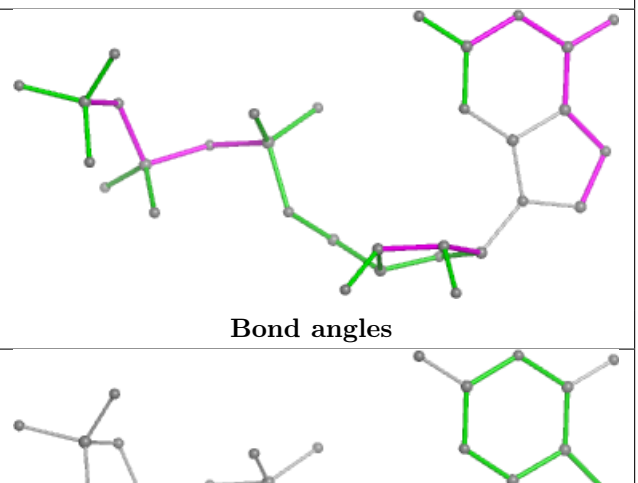


Rings

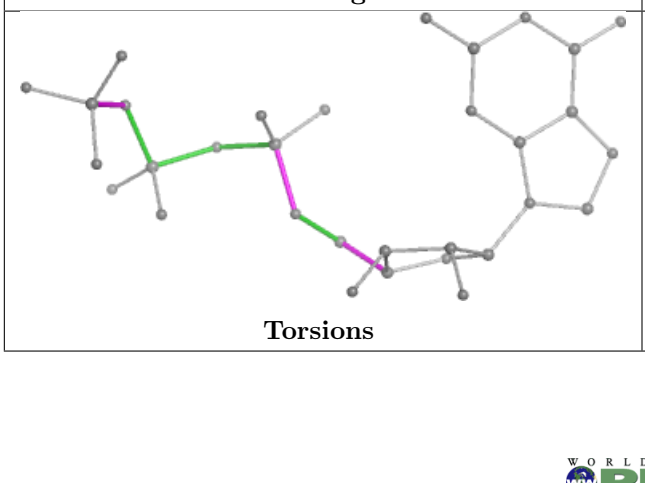
Ligand GTP A 701



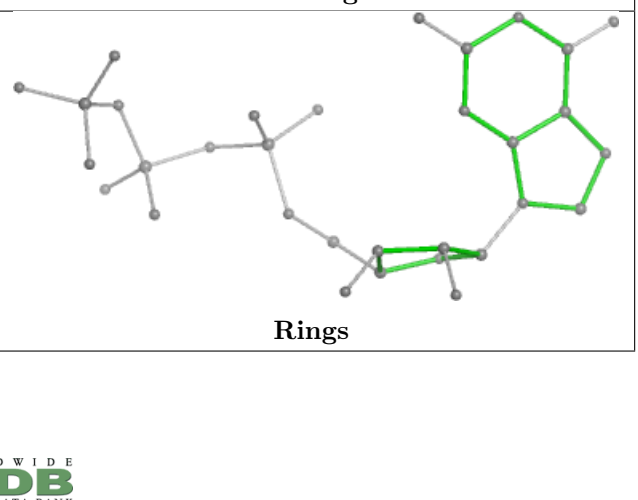
Bond lengths



Bond angles

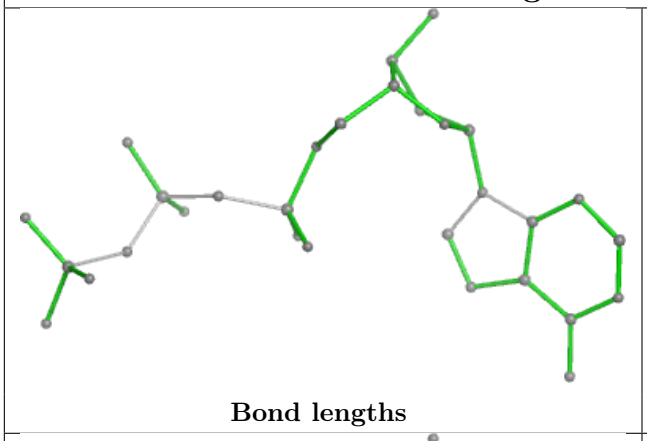


Torsions

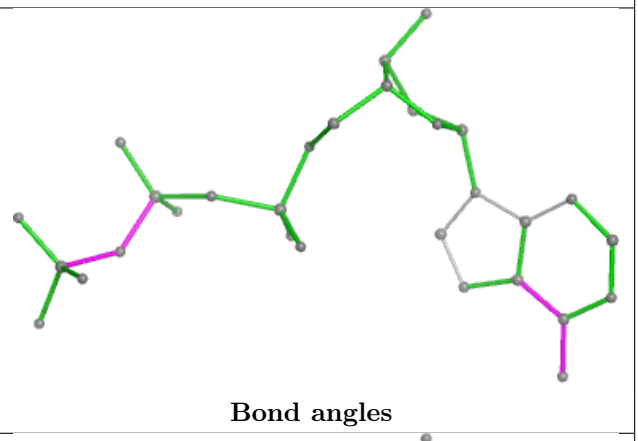


Rings

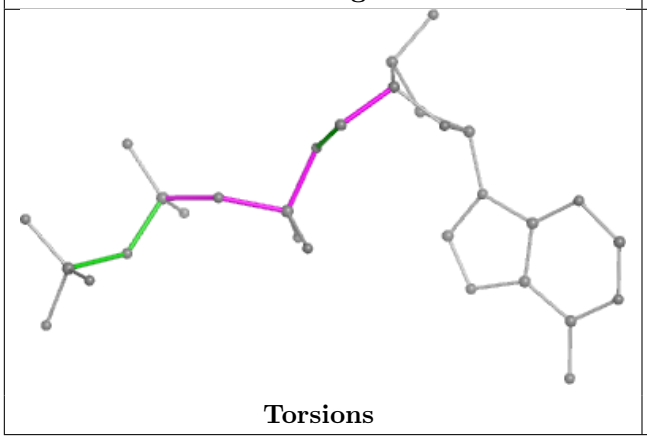
Ligand DTP D 701



Bond lengths



Bond angles



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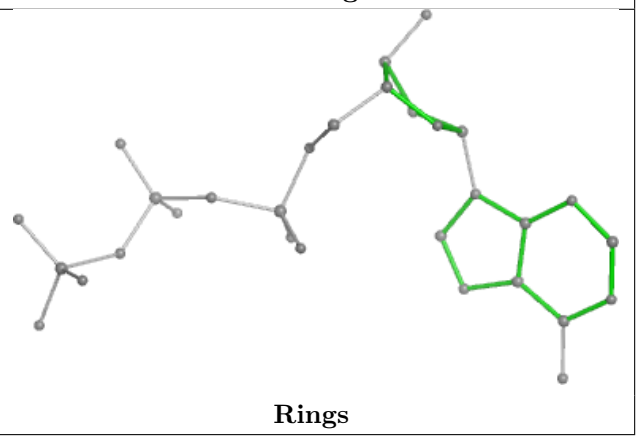
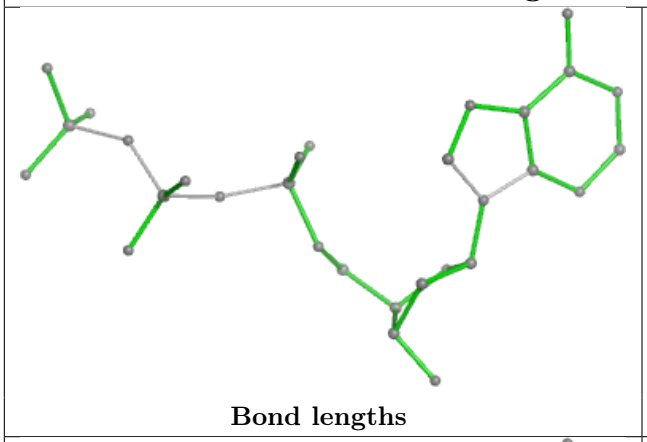
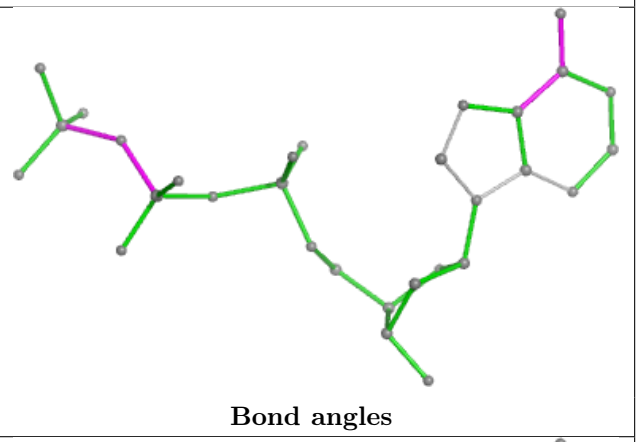


Rings

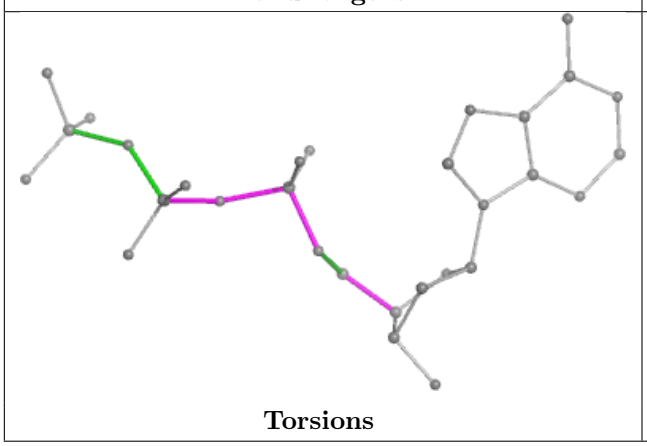
Ligand DTP C 707



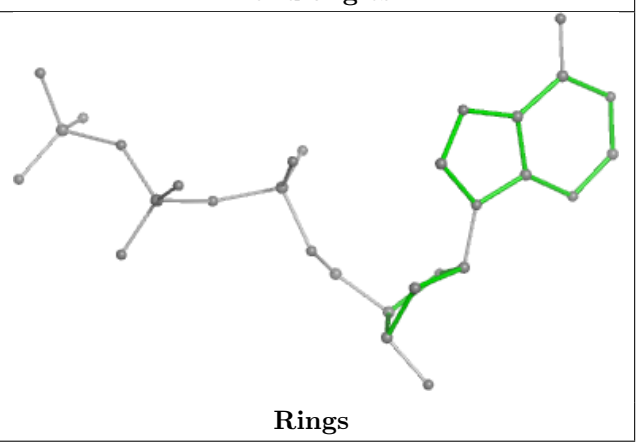
Bond lengths



Bond angles



Torsions



Rings

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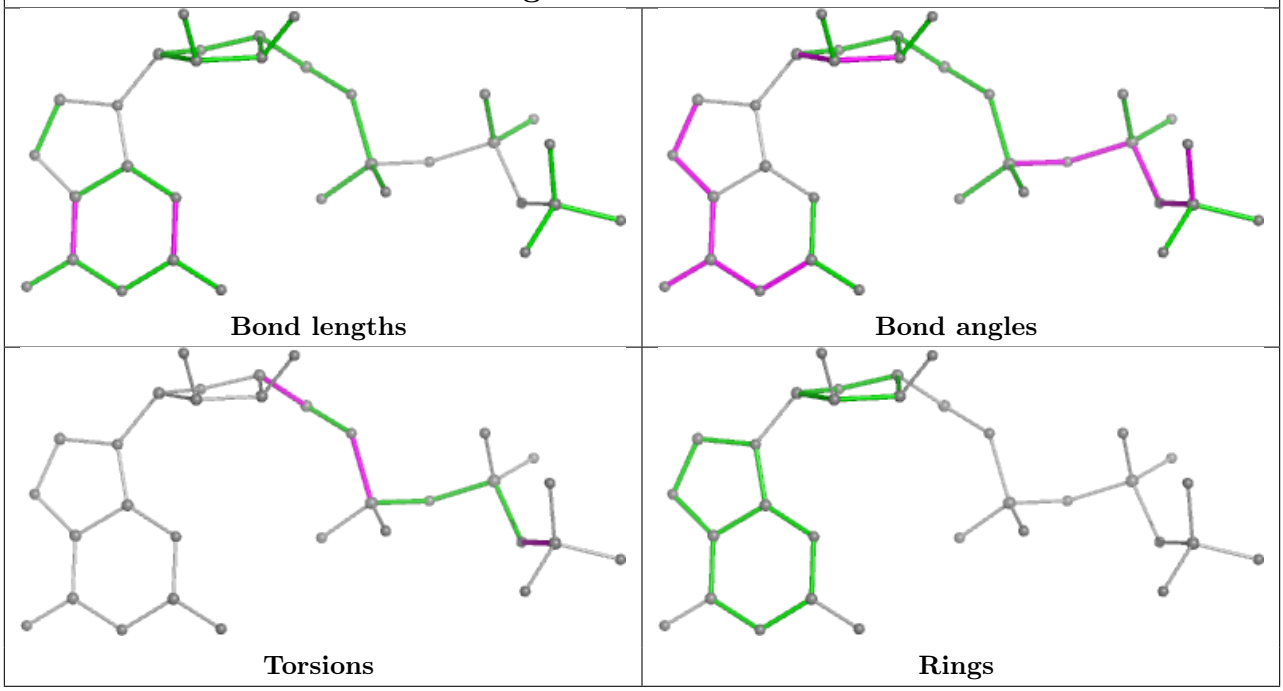

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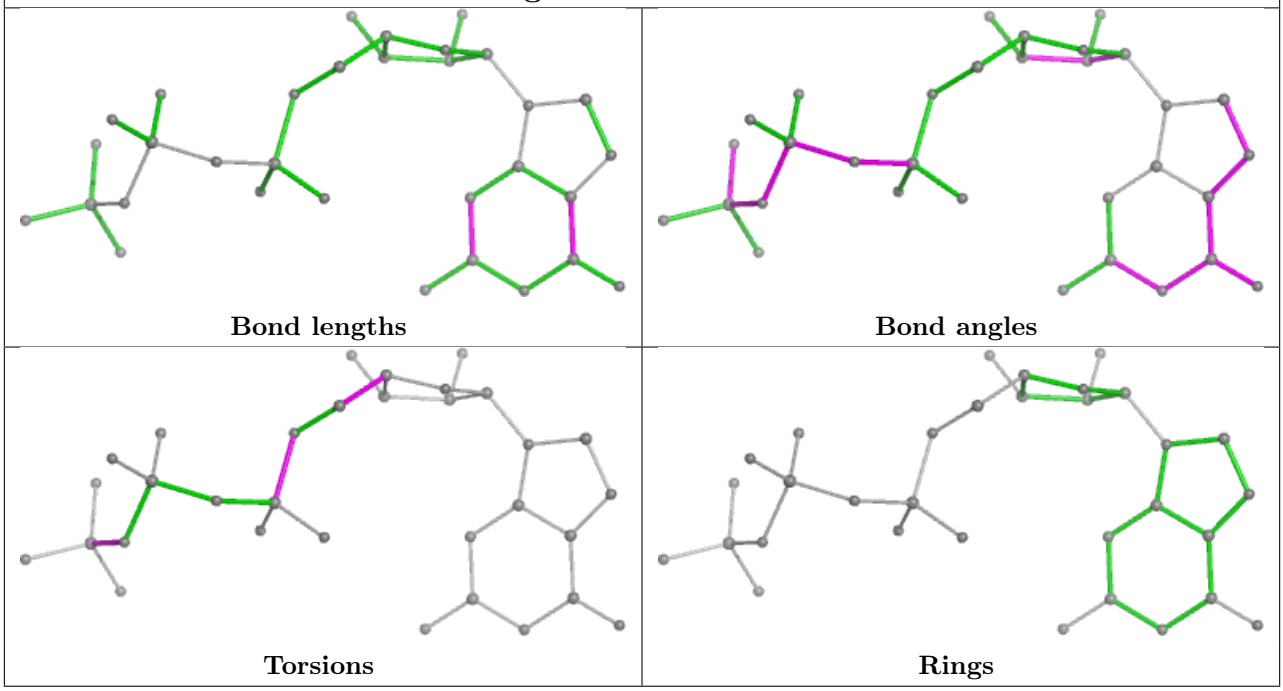
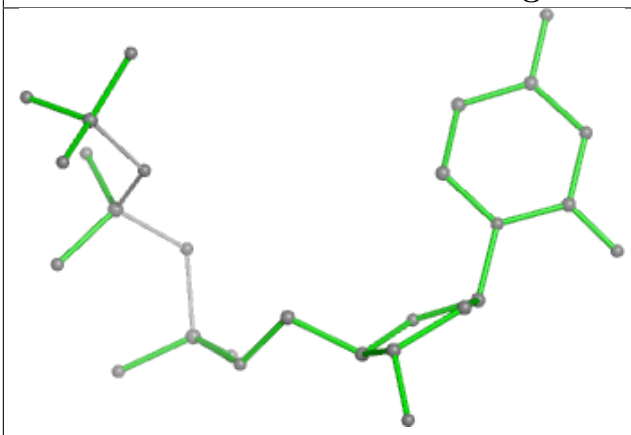
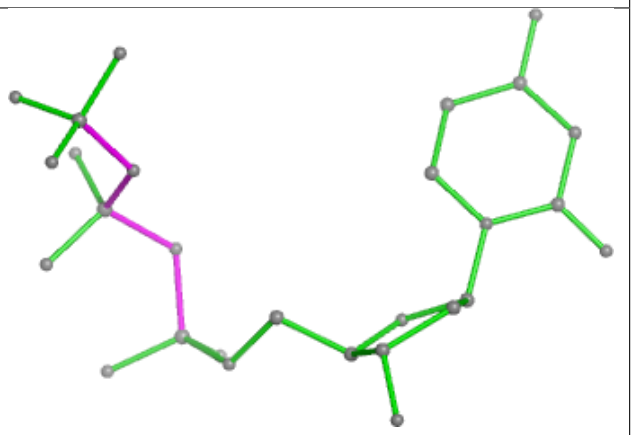


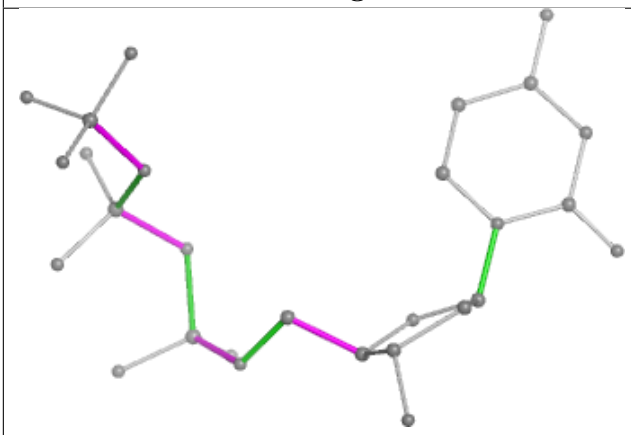
Ligand DCP C 706



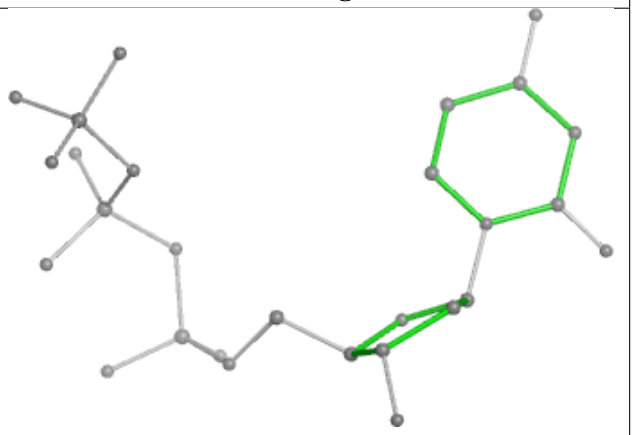
Bond lengths



Bond angles

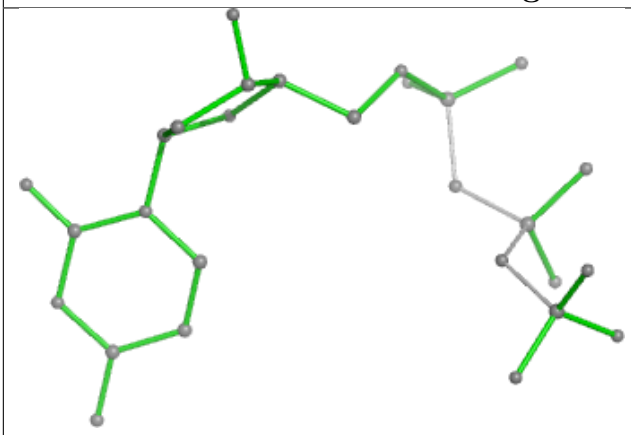


Torsions

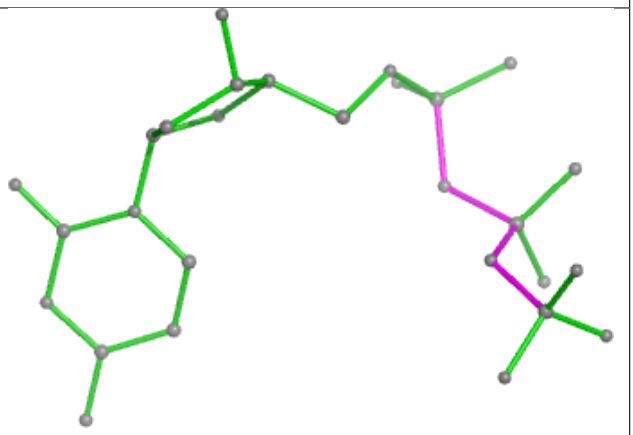


Rings

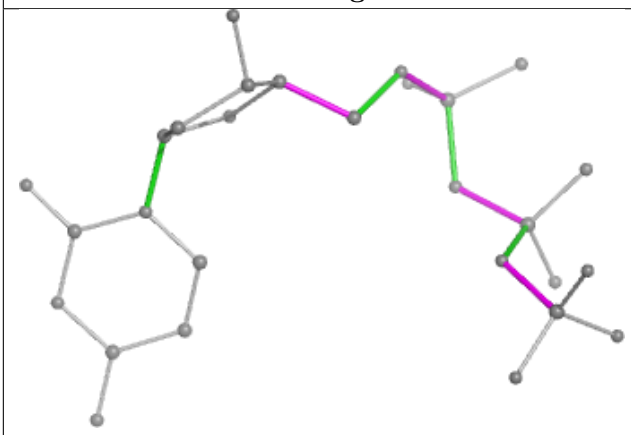
Ligand DCP B 707



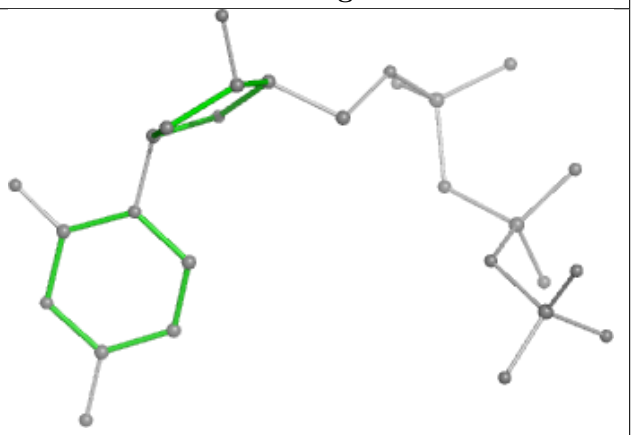
Bond lengths



Bond angles

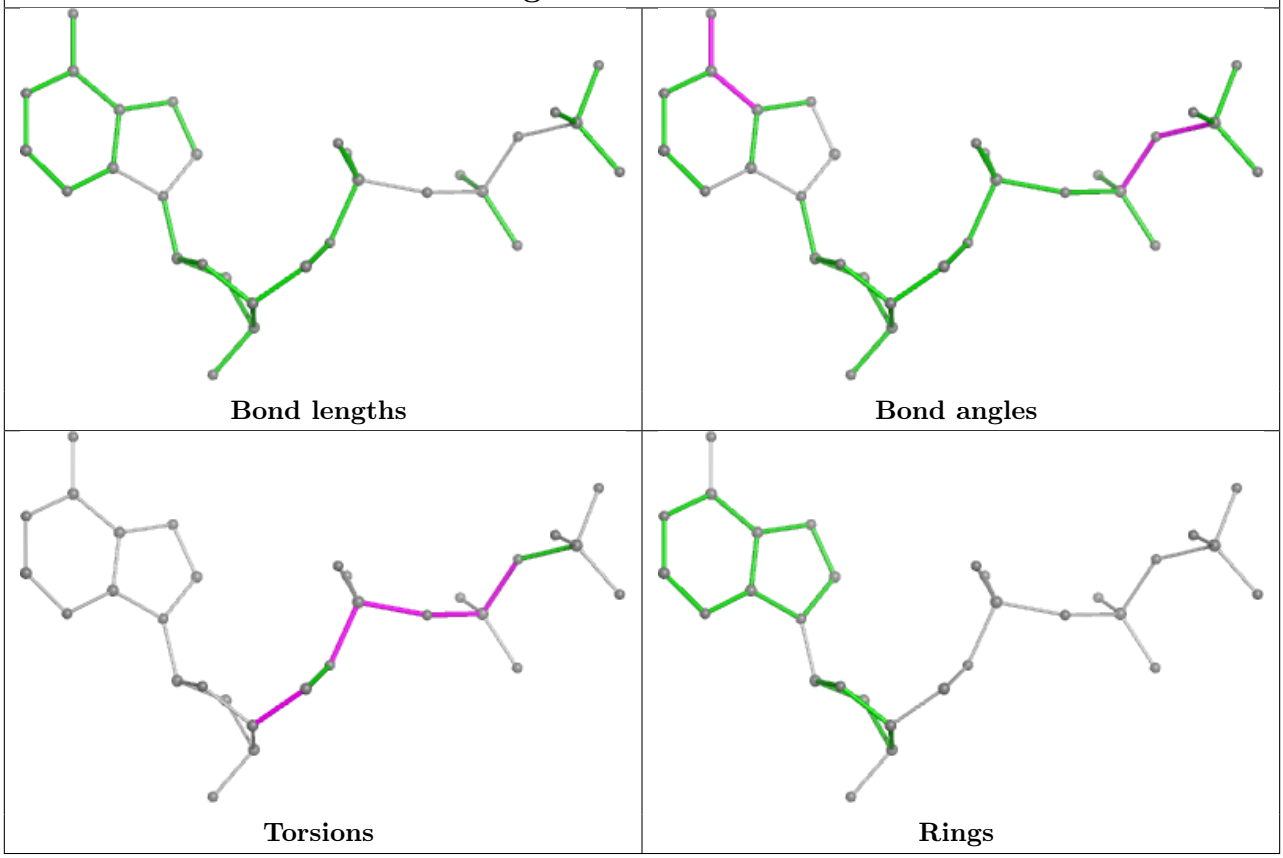


Torsions

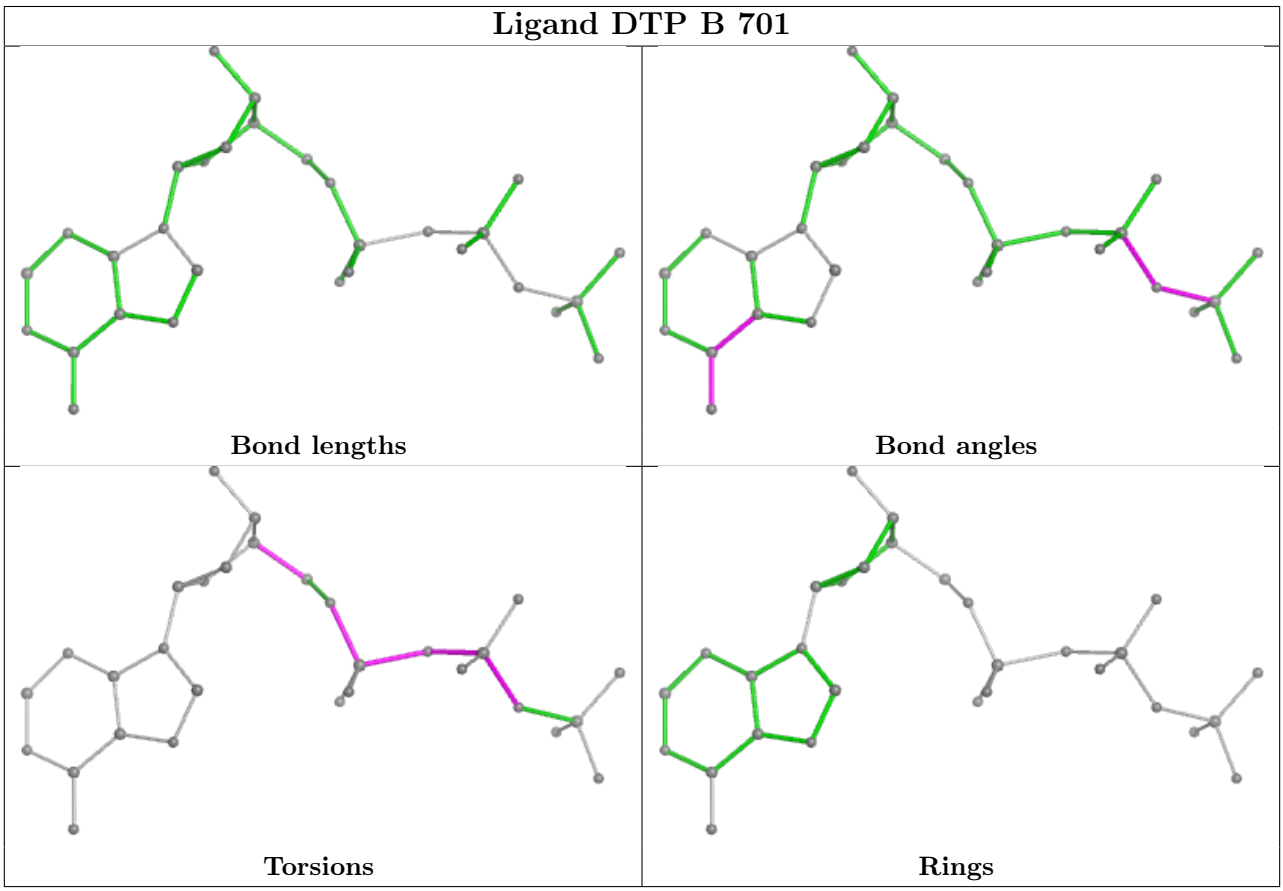


Rings

Ligand DTP A 707



Ligand DTP B 701



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 Map visualisation

This section contains visualisations of the EMDB entry EMD-18730. These allow visual inspection of the internal detail of the map and identification of artifacts.

Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

5.1 Orthogonal projections

This section was not generated.

5.2 Central slices

This section was not generated.

5.3 Largest variance slices

This section was not generated.

5.4 Orthogonal standard-deviation projections (False-color)

This section was not generated.

5.5 Orthogonal surface views

This section was not generated.

5.6 Mask visualisation

This section was not generated. No masks/segmentation were deposited.

6 Map analysis

This section contains the results of statistical analysis of the map.

6.1 Map-value distribution

This section was not generated.

6.2 Volume estimate versus contour level

This section was not generated.

6.3 Rotationally averaged power spectrum

This section was not generated. The rotationally averaged power spectrum had issues being displayed.

7 Fourier-Shell correlation (i)

This section was not generated. No FSC curve or half-maps provided.

8 Map-model fit

This section was not generated.