



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 5, 2023 – 05:03 AM EDT

PDB ID : 6VF0  
Title : DNA Polymerase Mu, 8-oxorGTP:At Reaction State Ternary Complex, 50 mM Mg<sup>2+</sup> (30 min)  
Authors : Jamsen, J.A.; Wilson, S.H.  
Deposited on : 2020-01-03  
Resolution : 1.58 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](mailto: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>.

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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 1.58 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 13 unique types of molecules in this entry. The entry contains 3597 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 DNA-directed DNA/RNA polymerase mu.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	326	2714	1730	491	482	11	0	26	0

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	127	GLY	-	expression tag	UNP Q9NP87
A	128	SER	-	expression tag	UNP Q9NP87
A	129	ALA	-	expression tag	UNP Q9NP87
A	130	ALA	-	expression tag	UNP Q9NP87
A	131	ALA	-	expression tag	UNP Q9NP87
A	?	-	PRO	deletion	UNP Q9NP87
A	?	-	GLY	deletion	UNP Q9NP87
A	?	-	ALA	deletion	UNP Q9NP87
A	?	-	ALA	deletion	UNP Q9NP87
A	?	-	VAL	deletion	UNP Q9NP87
A	?	-	GLY	deletion	UNP Q9NP87
A	?	-	GLY	deletion	UNP Q9NP87
A	?	-	SER	deletion	UNP Q9NP87
A	?	-	THR	deletion	UNP Q9NP87
A	?	-	ARG	deletion	UNP Q9NP87
A	?	-	PRO	deletion	UNP Q9NP87
A	?	-	CYS	deletion	UNP Q9NP87
A	410	GLY	PRO	conflict	UNP Q9NP87

- Molecule 2 is a DNA chain called DNA (5'-D(\*CP\*GP\*GP\*CP\*AP\*TP\*AP\*CP\*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
2	T	9	182	87	36	51	8	0	0	0

- Molecule 3 is a DNA chain called DNA (5'-D(\*CP\*GP\*TP\*AP\*(8GM))-3').

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace	
			Total	C	N	O				P
3	P	5	124	59	25	35	5	0	2	0

- Molecule 4 is a DNA chain called DNA (5'-D(P\*GP\*CP\*CP\*G)-3').

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace	
			Total	C	N	O				P
4	D	4	124	57	24	37	6	0	2	0

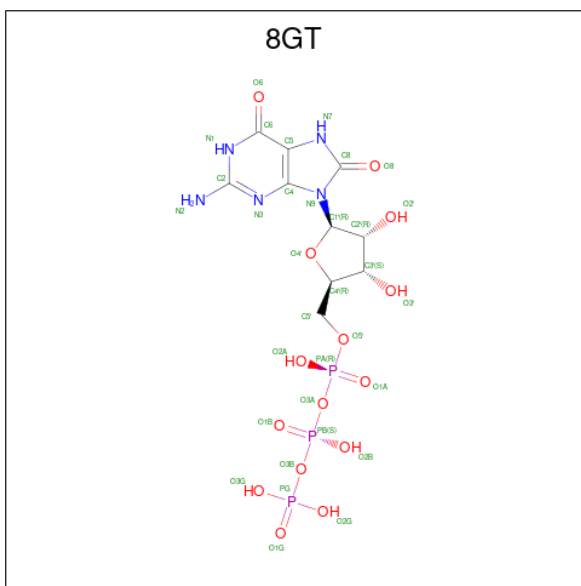
- Molecule 5 is MAGNESIUM ION (three-letter code: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

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

- Molecule 6 is SODIUM ION (three-letter code: NA) (formula: Na) (labeled as "Ligand of Interest" by depositor).

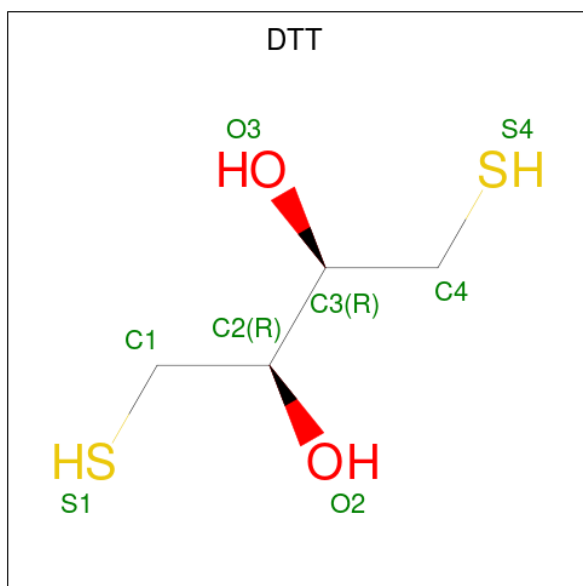
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Na		
6	A	2	2	2	0	0

- Molecule 7 is 8-OXO-GUANOSINE-5'-TRIPHOSPHATE (three-letter code: 8GT) (formula: C<sub>10</sub>H<sub>16</sub>N<sub>5</sub>O<sub>15</sub>P<sub>3</sub>) (labeled as "Ligand of Interest" by depositor).



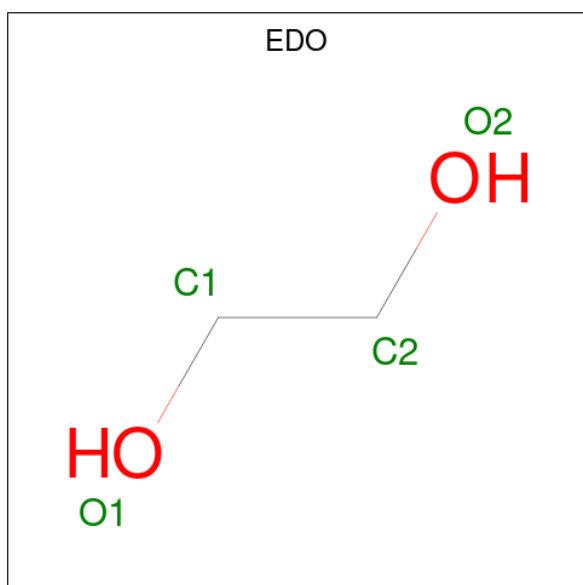
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
7	A	1	33	10	5	15	3	0	1

- Molecule 8 is 2,3-DIHYDROXY-1,4-DITHIOBUTANE (three-letter code: DTT) (formula:  $C_4H_{10}O_2S_2$ ).



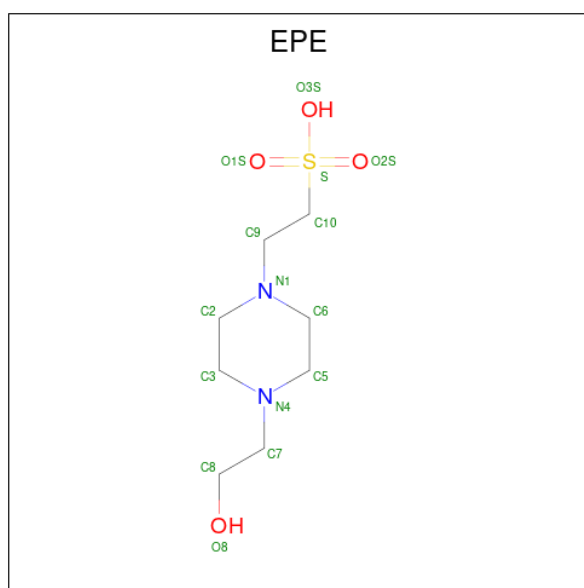
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	1	Total	S	0	1
			1	1		

- Molecule 9 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula:  $C_2H_6O_2$ ).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	A	1	Total C O 4 2 2	0	0
9	A	1	Total C O 3 2 1	0	0
9	A	1	Total C O 3 2 1	0	0
9	A	1	Total C O 3 2 1	0	0
9	P	1	Total C O 4 2 2	0	0

- Molecule 10 is 4-(2-HYDROXYETHYL)-1-PIPERAZINE ETHANESULFONIC ACID (three-letter code: EPE) (formula: C<sub>8</sub>H<sub>18</sub>N<sub>2</sub>O<sub>4</sub>S).

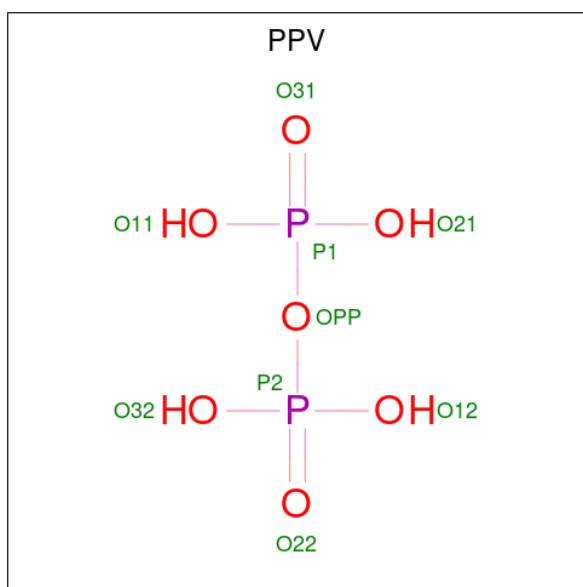


Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
10	A	1	Total O S 4 3 1	0	0

- Molecule 11 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
11	A	1	Total Cl 1 1	0	1

- Molecule 12 is PYROPHOSPHATE (three-letter code: PPV) (formula: H<sub>4</sub>O<sub>7</sub>P<sub>2</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
12	P	1	Total	O	P	0	1
			5	4	1		

- Molecule 13 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
13	A	303	Total	O	0	26
			312	312		
13	T	40	Total	O	0	1
			41	41		
13	P	18	Total	O	0	0
			18	18		
13	D	17	Total	O	0	2
			17	17		

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

### 3 Data and refinement statistics

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

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	59.98Å 68.44Å 110.61Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	34.96 – 1.58	Depositor
% Data completeness (in resolution range)	99.5 (34.96-1.58)	Depositor
$R_{merge}$	0.10	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.22 (at 1.58Å)	Xtrriage
Refinement program	PHENIX 1.15.2_3472	Depositor
R, $R_{free}$	0.164 , 0.187	Depositor
Wilson B-factor (Å <sup>2</sup> )	22.2	Xtrriage
Anisotropy	0.192	Xtrriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	3597	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	29.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.62% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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 14 ligands modelled in this entry, 5 are monoatomic and 1 is modelled with single atom - leaving 8 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
7	8GT	A	505[A]	5	31,35,35	4.18	20 (64%)	45,56,56	2.58	14 (31%)
12	PPV	P	102[B]	5	4,4,8	1.18	1 (25%)	6,6,13	1.28	1 (16%)
9	EDO	A	510	-	2,2,3	0.52	0	1,1,2	0.27	0
9	EDO	A	507	-	3,3,3	0.46	0	2,2,2	0.32	0
9	EDO	P	101	-	3,3,3	0.46	0	2,2,2	0.43	0
10	EPE	A	511	-	0,3,15	-	-	0,3,20	-	-
9	EDO	A	509	-	2,2,3	0.46	0	1,1,2	0.37	0
9	EDO	A	508	-	2,2,3	0.48	0	1,1,2	0.33	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
9	EDO	P	101	-	-	0/1/1/1	-
7	8GT	A	505[A]	5	-	3/22/38/38	0/3/3/3
9	EDO	A	507	-	-	0/1/1/1	-

All (21) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	A	505[A]	8GT	C2'-C3'	-11.80	1.21	1.53
7	A	505[A]	8GT	C8-N7	7.28	1.52	1.38
7	A	505[A]	8GT	C2-N3	6.05	1.47	1.33
7	A	505[A]	8GT	O4'-C1'	-5.79	1.28	1.42
7	A	505[A]	8GT	C2'-C1'	5.57	1.71	1.53
7	A	505[A]	8GT	C4-N3	5.57	1.47	1.34
7	A	505[A]	8GT	C8-N9	4.92	1.49	1.40
7	A	505[A]	8GT	C2-N2	4.83	1.45	1.34
7	A	505[A]	8GT	C5'-C4'	-4.48	1.37	1.51
7	A	505[A]	8GT	C5-N7	4.41	1.44	1.37
7	A	505[A]	8GT	C3'-C4'	4.39	1.64	1.53
7	A	505[A]	8GT	C2-N1	4.07	1.47	1.37
7	A	505[A]	8GT	C5-C4	3.89	1.42	1.37
7	A	505[A]	8GT	C6-N1	3.66	1.45	1.38
7	A	505[A]	8GT	C5-C6	3.65	1.51	1.42

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	A	505[A]	8GT	C1'-N9	-3.58	1.40	1.46
7	A	505[A]	8GT	C4-N9	3.21	1.44	1.39
7	A	505[A]	8GT	O4'-C4'	3.01	1.51	1.45
7	A	505[A]	8GT	O6-C6	-2.53	1.18	1.23
7	A	505[A]	8GT	O3'-C3'	2.28	1.48	1.43
12	P	102[B]	PPV	P1-OPP	2.11	1.60	1.54

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	505[A]	8GT	C2'-C1'-N9	-10.07	102.56	115.94
7	A	505[A]	8GT	C5-C4-N3	-7.08	120.49	127.80
7	A	505[A]	8GT	C2-N3-C4	4.20	119.78	112.30
7	A	505[A]	8GT	O4'-C1'-N9	4.11	114.81	108.72
7	A	505[A]	8GT	PB-O3B-PG	-3.55	120.66	132.83
7	A	505[A]	8GT	N9-C4-N3	3.33	129.61	125.81
7	A	505[A]	8GT	O6-C6-C5	-3.31	119.65	127.24
7	A	505[A]	8GT	C2-N1-C6	-3.13	119.38	125.10
7	A	505[A]	8GT	O2'-C2'-C1'	-2.95	100.16	110.02
7	A	505[A]	8GT	O4'-C4'-C3'	-2.78	99.62	105.11
7	A	505[A]	8GT	C5-C6-N1	2.50	119.75	112.31
12	P	102[B]	PPV	O21-P1-O11	2.42	115.74	107.97
7	A	505[A]	8GT	C3'-C2'-C1'	2.41	106.00	101.43
7	A	505[A]	8GT	O2'-C2'-C3'	2.38	119.53	111.82
7	A	505[A]	8GT	C4'-O4'-C1'	-2.15	104.72	109.47

There are no chirality outliers.

All (3) torsion outliers are listed below:

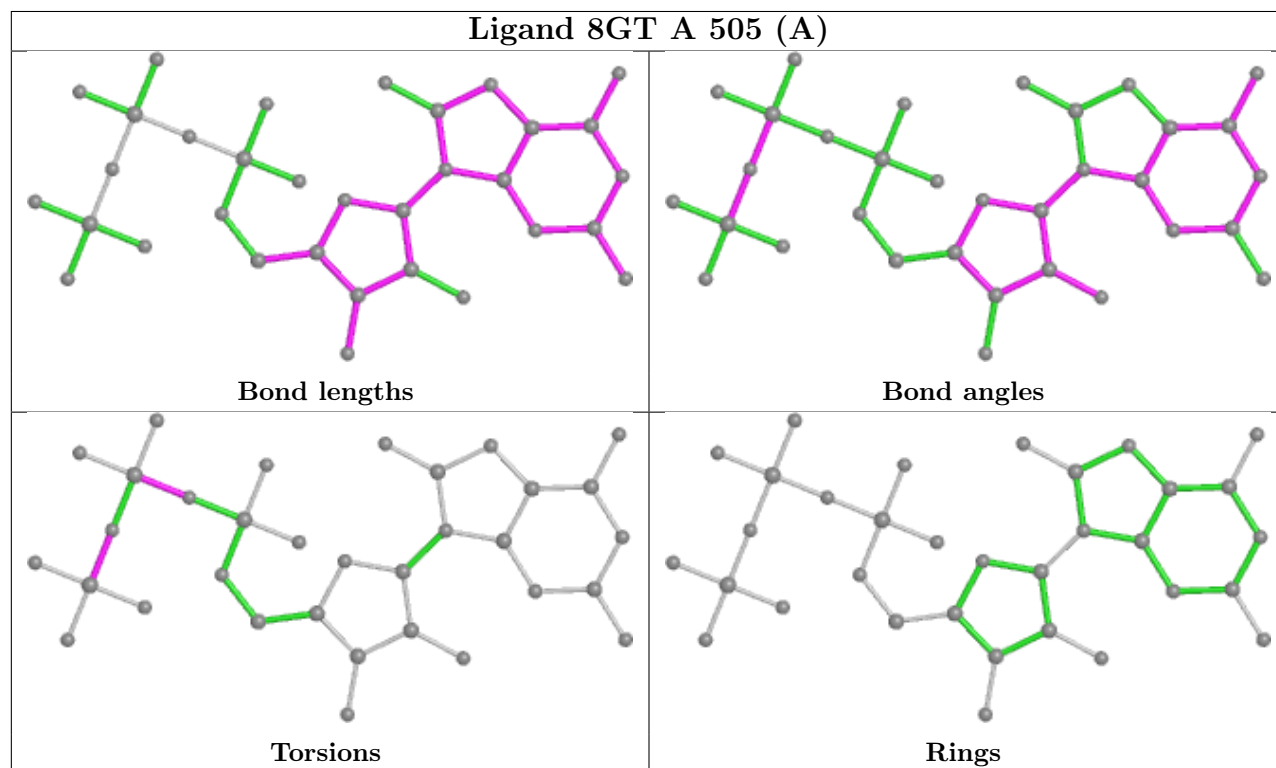
Mol	Chain	Res	Type	Atoms
7	A	505[A]	8GT	PA-O3A-PB-O2B
7	A	505[A]	8GT	PB-O3B-PG-O3G
7	A	505[A]	8GT	PA-O3A-PB-O1B

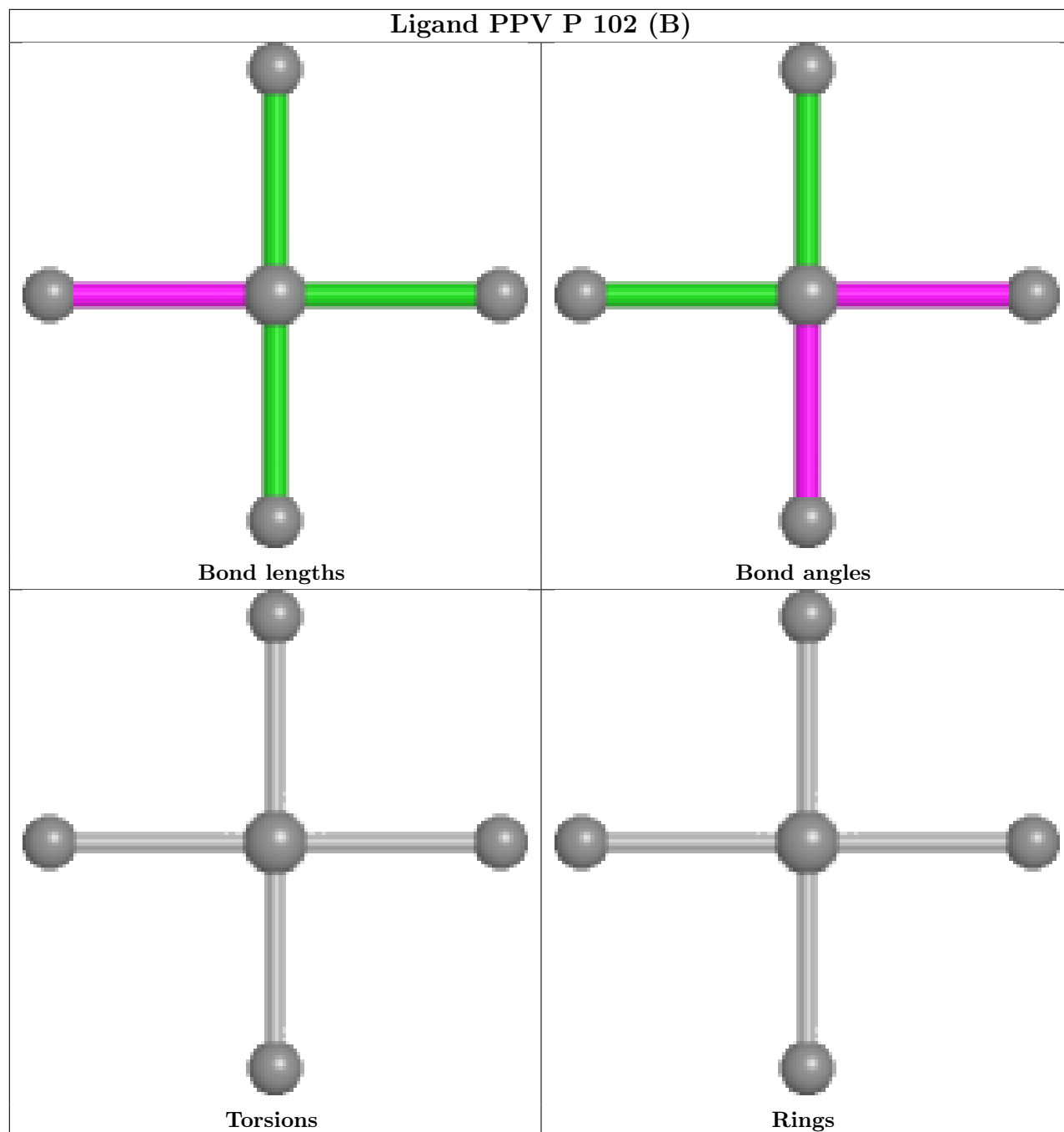
There are no ring outliers.

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.