



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 5, 2023 – 07:51 AM EDT

PDB ID : 6V75  
Title : Crystal Structure of Human PKM2 in Complex with L-aspartate  
Authors : Nandi, S.; Dey, M.  
Deposited on : 2019-12-07  
Resolution : 2.85 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 2.85 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 10 unique types of molecules in this entry. The entry contains 13674 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 Pyruvate kinase PKM.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	C	517	3550	2223	632	671	24	0	0	0
1	A	509	3450	2152	608	667	23	0	0	0
1	B	512	3491	2166	632	671	22	0	0	0
1	D	430	2917	1809	525	563	20	0	0	0

There are 76 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	-18	MET	-	initiating methionine	UNP P14618
C	-17	GLY	-	expression tag	UNP P14618
C	-16	SER	-	expression tag	UNP P14618
C	-15	SER	-	expression tag	UNP P14618
C	-14	HIS	-	expression tag	UNP P14618
C	-13	HIS	-	expression tag	UNP P14618
C	-12	HIS	-	expression tag	UNP P14618
C	-11	HIS	-	expression tag	UNP P14618
C	-10	HIS	-	expression tag	UNP P14618
C	-9	HIS	-	expression tag	UNP P14618
C	-8	SER	-	expression tag	UNP P14618
C	-7	SER	-	expression tag	UNP P14618
C	-6	GLY	-	expression tag	UNP P14618
C	-5	LEU	-	expression tag	UNP P14618
C	-4	VAL	-	expression tag	UNP P14618
C	-3	PRO	-	expression tag	UNP P14618
C	-2	ARG	-	expression tag	UNP P14618
C	-1	GLY	-	expression tag	UNP P14618
C	0	SER	-	expression tag	UNP P14618
A	-18	MET	-	initiating methionine	UNP P14618
A	-17	GLY	-	expression tag	UNP P14618

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-16	SER	-	expression tag	UNP P14618
A	-15	SER	-	expression tag	UNP P14618
A	-14	HIS	-	expression tag	UNP P14618
A	-13	HIS	-	expression tag	UNP P14618
A	-12	HIS	-	expression tag	UNP P14618
A	-11	HIS	-	expression tag	UNP P14618
A	-10	HIS	-	expression tag	UNP P14618
A	-9	HIS	-	expression tag	UNP P14618
A	-8	SER	-	expression tag	UNP P14618
A	-7	SER	-	expression tag	UNP P14618
A	-6	GLY	-	expression tag	UNP P14618
A	-5	LEU	-	expression tag	UNP P14618
A	-4	VAL	-	expression tag	UNP P14618
A	-3	PRO	-	expression tag	UNP P14618
A	-2	ARG	-	expression tag	UNP P14618
A	-1	GLY	-	expression tag	UNP P14618
A	0	SER	-	expression tag	UNP P14618
B	-18	MET	-	initiating methionine	UNP P14618
B	-17	GLY	-	expression tag	UNP P14618
B	-16	SER	-	expression tag	UNP P14618
B	-15	SER	-	expression tag	UNP P14618
B	-14	HIS	-	expression tag	UNP P14618
B	-13	HIS	-	expression tag	UNP P14618
B	-12	HIS	-	expression tag	UNP P14618
B	-11	HIS	-	expression tag	UNP P14618
B	-10	HIS	-	expression tag	UNP P14618
B	-9	HIS	-	expression tag	UNP P14618
B	-8	SER	-	expression tag	UNP P14618
B	-7	SER	-	expression tag	UNP P14618
B	-6	GLY	-	expression tag	UNP P14618
B	-5	LEU	-	expression tag	UNP P14618
B	-4	VAL	-	expression tag	UNP P14618
B	-3	PRO	-	expression tag	UNP P14618
B	-2	ARG	-	expression tag	UNP P14618
B	-1	GLY	-	expression tag	UNP P14618
B	0	SER	-	expression tag	UNP P14618
D	-18	MET	-	initiating methionine	UNP P14618
D	-17	GLY	-	expression tag	UNP P14618
D	-16	SER	-	expression tag	UNP P14618
D	-15	SER	-	expression tag	UNP P14618
D	-14	HIS	-	expression tag	UNP P14618
D	-13	HIS	-	expression tag	UNP P14618

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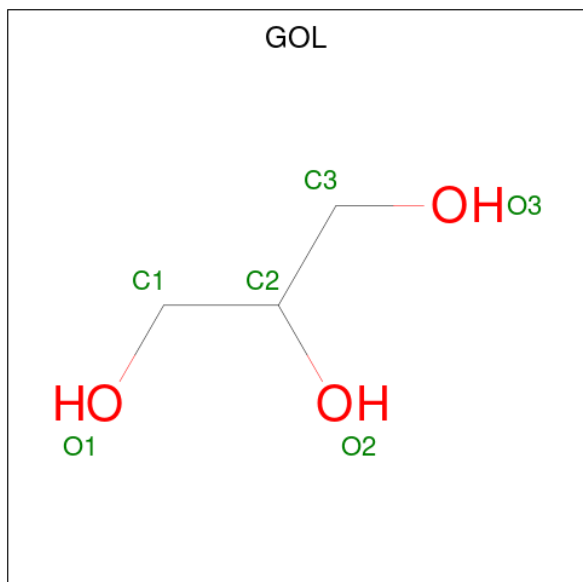
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Chain	Residue	Modelled	Actual	Comment	Reference
D	-12	HIS	-	expression tag	UNP P14618
D	-11	HIS	-	expression tag	UNP P14618
D	-10	HIS	-	expression tag	UNP P14618
D	-9	HIS	-	expression tag	UNP P14618
D	-8	SER	-	expression tag	UNP P14618
D	-7	SER	-	expression tag	UNP P14618
D	-6	GLY	-	expression tag	UNP P14618
D	-5	LEU	-	expression tag	UNP P14618
D	-4	VAL	-	expression tag	UNP P14618
D	-3	PRO	-	expression tag	UNP P14618
D	-2	ARG	-	expression tag	UNP P14618
D	-1	GLY	-	expression tag	UNP P14618
D	0	SER	-	expression tag	UNP P14618

- Molecule 2 is POTASSIUM ION (three-letter code: K) (formula: K).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	C	2	Total K 2 2	0	0
2	A	1	Total K 1 1	0	0
2	B	1	Total K 1 1	0	0
2	D	2	Total K 2 2	0	0

- Molecule 3 is GLYCEROL (three-letter code: GOL) (formula: C<sub>3</sub>H<sub>8</sub>O<sub>3</sub>).

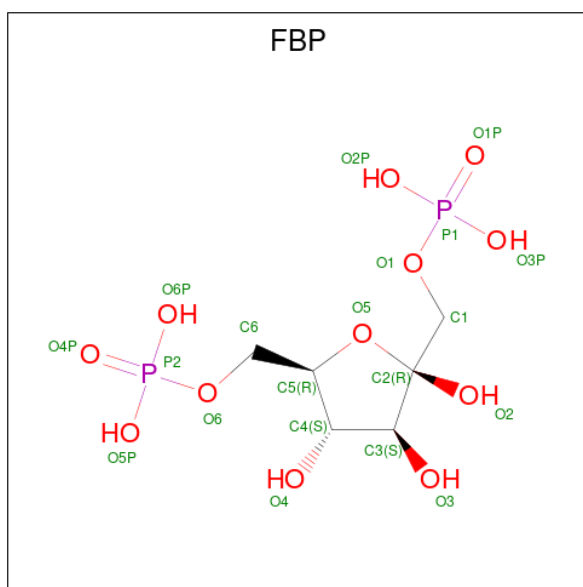


Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	C	1	Total C O 6 3 3	0	0
3	C	1	Total C O 6 3 3	0	0
3	C	1	Total C O 6 3 3	0	0
3	A	1	Total C O 6 3 3	0	0
3	A	1	Total C O 6 3 3	0	0
3	B	1	Total C O 6 3 3	0	0
3	B	1	Total C O 6 3 3	0	0
3	B	1	Total C O 6 3 3	0	0
3	B	1	Total C O 6 3 3	0	0
3	B	1	Total C O 6 3 3	0	0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

- Molecule 4 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	C	1	Total Cl 1 1	0	0

- Molecule 5 is 1,6-di-O-phosphono-beta-D-fructofuranose (three-letter code: FBP) (formula: C<sub>6</sub>H<sub>14</sub>O<sub>12</sub>P<sub>2</sub>).

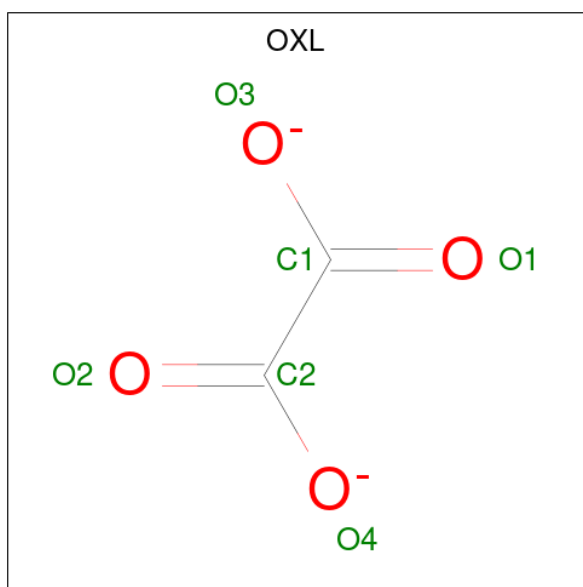


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	C	1	Total	C	O	P	0	0
			20	6	12	2		
5	A	1	Total	C	O	P	0	0
			20	6	12	2		
5	B	1	Total	C	O	P	0	0
			20	6	12	2		
5	D	1	Total	C	O	P	0	0
			20	6	12	2		

- Molecule 6 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

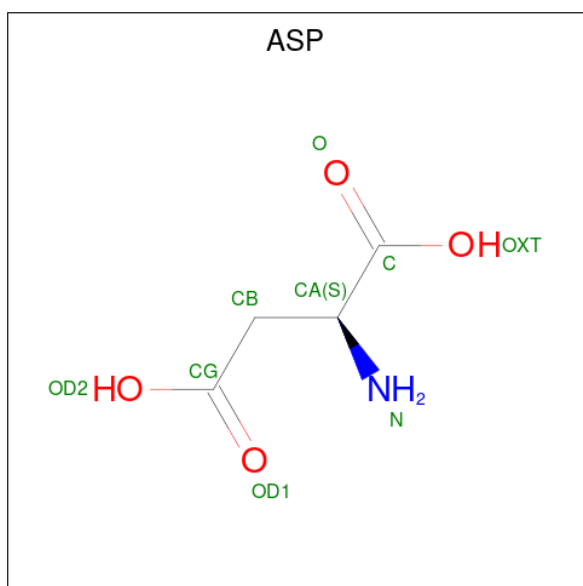
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	C	1	Total	Mg	0	0
			1	1		
6	A	1	Total	Mg	0	0
			1	1		
6	B	1	Total	Mg	0	0
			1	1		
6	D	1	Total	Mg	0	0
			1	1		

- Molecule 7 is OXALATE ION (three-letter code: OXL) (formula: C<sub>2</sub>O<sub>4</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	C	1	Total	C	O	0	0
			6	2	4		

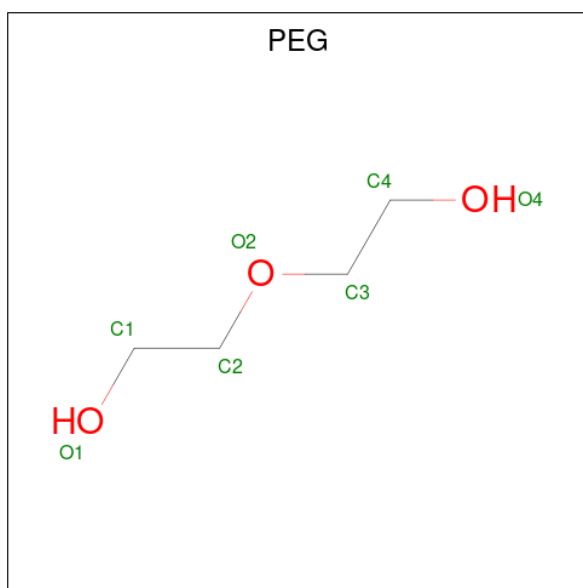
- Molecule 8 is ASPARTIC ACID (three-letter code: ASP) (formula: C<sub>4</sub>H<sub>7</sub>NO<sub>4</sub>) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
8	C	1	Total	C	N	O	0	0
			9	4	1	4		
8	B	1	Total	C	N	O	0	0
			9	4	1	4		



- Molecule 9 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: C<sub>4</sub>H<sub>10</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	A	1	Total C O 7 4 3	0	0
9	A	1	Total C O 7 4 3	0	0
9	B	1	Total C O 7 4 3	0	0

- Molecule 10 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
10	C	15	Total O 15 15	0	0
10	A	24	Total O 24 24	0	0
10	B	7	Total O 7 7	0	0
10	D	12	Total O 12 12	0	0

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 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	82.52Å 157.96Å 93.03Å 90.00° 101.08° 90.00°	Depositor
Resolution (Å)	55.52 – 2.85	Depositor
% Data completeness (in resolution range)	99.3 (55.52-2.85)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.06	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.97 (at 2.86Å)	Xtriage
Refinement program	PHENIX 1.17.1_3660	Depositor
R, $R_{free}$	0.246 , 0.284	Depositor
Wilson B-factor (Å <sup>2</sup> )	69.0	Xtriage
Anisotropy	0.076	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	13674	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	67.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.60% 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 33 ligands modelled in this entry, 11 are monoatomic - leaving 22 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	GOL	D	604	-	5,5,5	0.93	0	5,5,5	0.97	0
3	GOL	C	604	-	5,5,5	0.94	0	5,5,5	1.00	0
3	GOL	A	602	-	5,5,5	0.93	0	5,5,5	0.98	0
3	GOL	B	603	-	5,5,5	0.91	0	5,5,5	0.95	0
3	GOL	A	603	-	5,5,5	0.93	0	5,5,5	0.93	0
5	FBP	D	605	-	18,20,20	0.92	1 (5%)	23,32,32	0.74	0
5	FBP	C	607	-	18,20,20	1.90	6 (33%)	23,32,32	1.67	8 (34%)
9	PEG	A	606	-	6,6,6	0.48	0	5,5,5	0.46	0
7	OXL	C	609	6	5,5,5	1.80	1 (20%)	6,6,6	1.25	0
3	GOL	B	604	-	5,5,5	0.90	0	5,5,5	1.04	0
3	GOL	B	606	-	5,5,5	0.92	0	5,5,5	0.98	0
8	ASP	B	610	-	6,8,8	1.15	0	8,10,10	0.95	0
3	GOL	B	605	-	5,5,5	0.92	0	5,5,5	0.99	0
3	GOL	D	603	-	5,5,5	0.88	0	5,5,5	0.99	0
3	GOL	C	605	-	5,5,5	0.91	0	5,5,5	1.01	0
3	GOL	C	603	-	5,5,5	0.92	0	5,5,5	1.01	0
8	ASP	C	610	-	6,8,8	1.19	1 (16%)	8,10,10	1.44	2 (25%)
9	PEG	B	608	-	6,6,6	0.48	0	5,5,5	0.39	0
3	GOL	B	602	-	5,5,5	0.87	0	5,5,5	1.01	0
5	FBP	A	604	-	18,20,20	0.93	1 (5%)	23,32,32	0.65	0
9	PEG	A	605	-	6,6,6	0.50	0	5,5,5	0.46	0
5	FBP	B	607	-	18,20,20	0.92	1 (5%)	23,32,32	0.85	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	GOL	D	604	-	-	2/4/4/4	-
3	GOL	C	604	-	-	0/4/4/4	-
3	GOL	A	602	-	-	0/4/4/4	-
3	GOL	B	603	-	-	2/4/4/4	-
3	GOL	A	603	-	-	2/4/4/4	-
5	FBP	D	605	-	-	7/13/32/32	0/1/1/1
5	FBP	C	607	-	-	5/13/32/32	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
9	PEG	A	606	-	-	0/4/4/4	-
7	OXL	C	609	6	-	1/4/4/4	-
3	GOL	B	604	-	-	1/4/4/4	-
3	GOL	B	606	-	-	0/4/4/4	-
8	ASP	B	610	-	-	4/8/8/8	-
3	GOL	B	605	-	-	0/4/4/4	-
3	GOL	D	603	-	-	2/4/4/4	-
3	GOL	C	605	-	-	4/4/4/4	-
3	GOL	C	603	-	-	0/4/4/4	-
8	ASP	C	610	-	-	5/8/8/8	-
9	PEG	B	608	-	-	2/4/4/4	-
3	GOL	B	602	-	-	2/4/4/4	-
5	FBP	A	604	-	-	4/13/32/32	0/1/1/1
9	PEG	A	605	-	-	1/4/4/4	-
5	FBP	B	607	-	-	11/13/32/32	0/1/1/1

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	C	607	FBP	P2-O6P	-3.37	1.41	1.54
5	C	607	FBP	P2-O5P	-3.10	1.42	1.54
7	C	609	OXL	C2-C1	-2.81	1.46	1.54
5	C	607	FBP	P1-O3P	-2.77	1.44	1.54
5	B	607	FBP	O2-C2	2.75	1.45	1.40
5	A	604	FBP	O2-C2	2.71	1.45	1.40
5	D	605	FBP	O2-C2	2.70	1.45	1.40
5	C	607	FBP	O5-C2	-2.56	1.39	1.43
5	C	607	FBP	P1-O2P	-2.28	1.46	1.54
8	C	610	ASP	OXT-C	-2.17	1.23	1.30
5	C	607	FBP	P2-O6	-2.06	1.53	1.60

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	C	607	FBP	O6P-P2-O6	-3.02	98.70	106.73
5	C	607	FBP	P2-O6-C6	2.69	125.71	118.30
8	C	610	ASP	OXT-C-O	-2.59	118.22	124.09
5	C	607	FBP	O2P-P1-O1P	2.58	120.78	110.68
5	C	607	FBP	O3-C3-C4	-2.29	105.40	113.32
8	C	610	ASP	OXT-C-CA	2.24	121.01	113.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	C	607	FBP	O2-C2-O5	-2.20	105.26	109.50
5	C	607	FBP	O5-C5-C6	2.08	114.03	109.45
5	C	607	FBP	O4-C4-C3	-2.03	106.09	112.15
5	C	607	FBP	O6P-P2-O4P	2.02	118.58	110.68

There are no chirality outliers.

All (55) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	C	605	GOL	O1-C1-C2-O2
3	C	605	GOL	O1-C1-C2-C3
3	C	605	GOL	C1-C2-C3-O3
3	A	603	GOL	C1-C2-C3-O3
3	B	602	GOL	O1-C1-C2-C3
3	B	603	GOL	O1-C1-C2-C3
3	D	603	GOL	O1-C1-C2-O2
3	D	603	GOL	O1-C1-C2-C3
3	D	604	GOL	O1-C1-C2-C3
5	C	607	FBP	O1-C1-C2-O2
5	C	607	FBP	O1-C1-C2-C3
5	C	607	FBP	O1-C1-C2-O5
5	C	607	FBP	C4-C5-C6-O6
5	A	604	FBP	O1-C1-C2-O2
5	A	604	FBP	O1-C1-C2-C3
5	A	604	FBP	O1-C1-C2-O5
5	B	607	FBP	C1-O1-P1-O1P
5	B	607	FBP	C1-O1-P1-O2P
5	B	607	FBP	C1-O1-P1-O3P
5	B	607	FBP	O1-C1-C2-O2
5	B	607	FBP	O1-C1-C2-C3
5	B	607	FBP	O1-C1-C2-O5
5	B	607	FBP	C4-C5-C6-O6
5	B	607	FBP	C6-O6-P2-O4P
5	B	607	FBP	C6-O6-P2-O5P
5	B	607	FBP	C6-O6-P2-O6P
5	D	605	FBP	O1-C1-C2-O2
5	D	605	FBP	O1-C1-C2-C3
5	D	605	FBP	O1-C1-C2-O5
5	D	605	FBP	C6-O6-P2-O5P
5	D	605	FBP	C6-O6-P2-O6P
8	C	610	ASP	O-C-CA-N
8	C	610	ASP	N-CA-CB-CG

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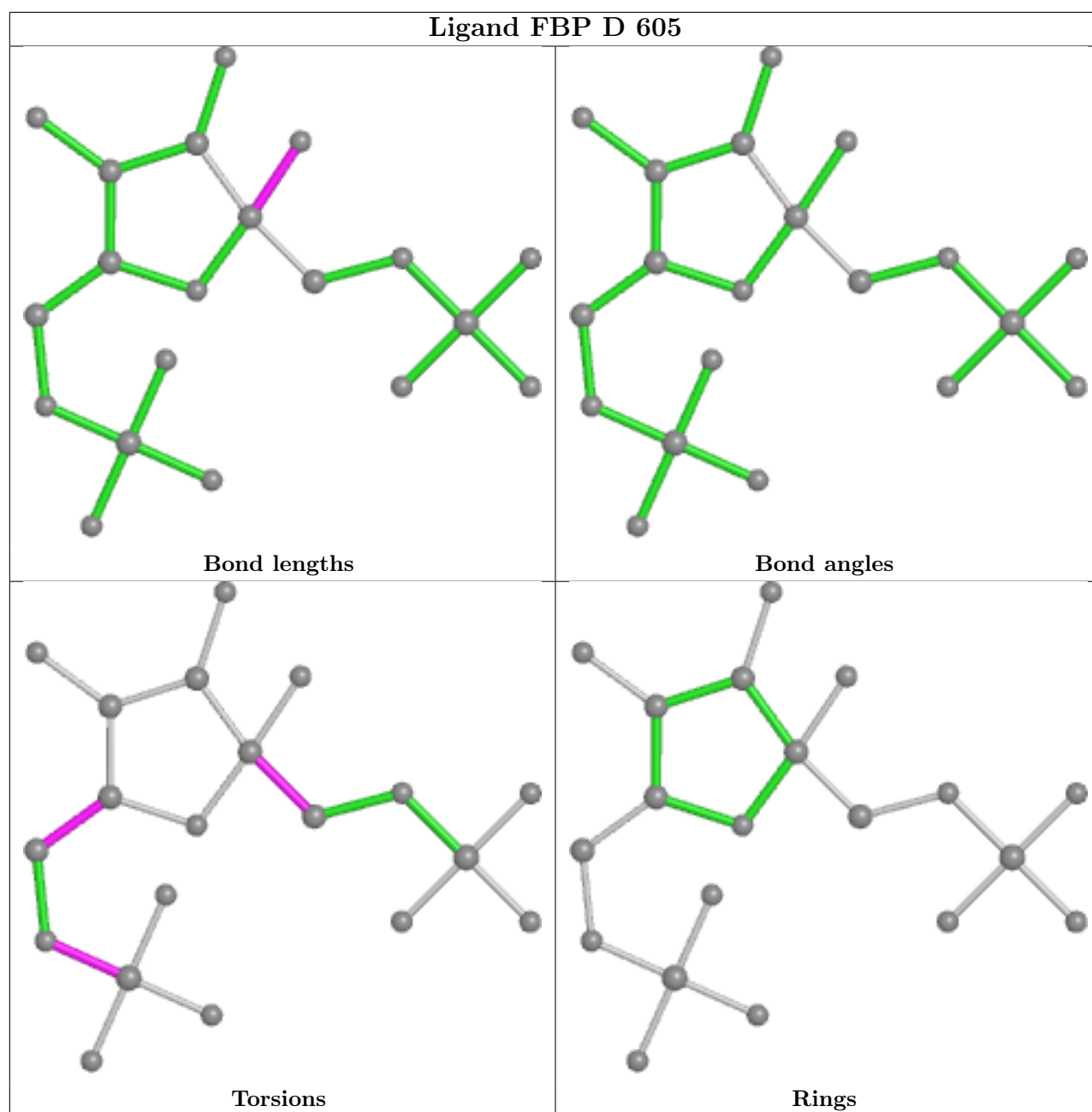
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Mol	Chain	Res	Type	Atoms
8	C	610	ASP	OXT-C-CA-N
8	B	610	ASP	OXT-C-CA-N
3	C	605	GOL	O2-C2-C3-O3
5	B	607	FBP	O5-C5-C6-O6
9	B	608	PEG	O2-C3-C4-O4
3	B	602	GOL	O1-C1-C2-O2
5	C	607	FBP	O5-C5-C6-O6
3	D	604	GOL	O1-C1-C2-O2
5	D	605	FBP	C6-O6-P2-O4P
3	A	603	GOL	O2-C2-C3-O3
8	B	610	ASP	O-C-CA-N
9	A	605	PEG	C4-C3-O2-C2
3	B	603	GOL	O1-C1-C2-O2
8	B	610	ASP	N-CA-CB-CG
8	C	610	ASP	O-C-CA-CB
8	C	610	ASP	OXT-C-CA-CB
3	B	604	GOL	O1-C1-C2-O2
8	B	610	ASP	CA-CB-CG-OD1
5	A	604	FBP	O5-C5-C6-O6
5	D	605	FBP	C4-C5-C6-O6
9	B	608	PEG	C4-C3-O2-C2
7	C	609	OXL	O3-C1-C2-O4

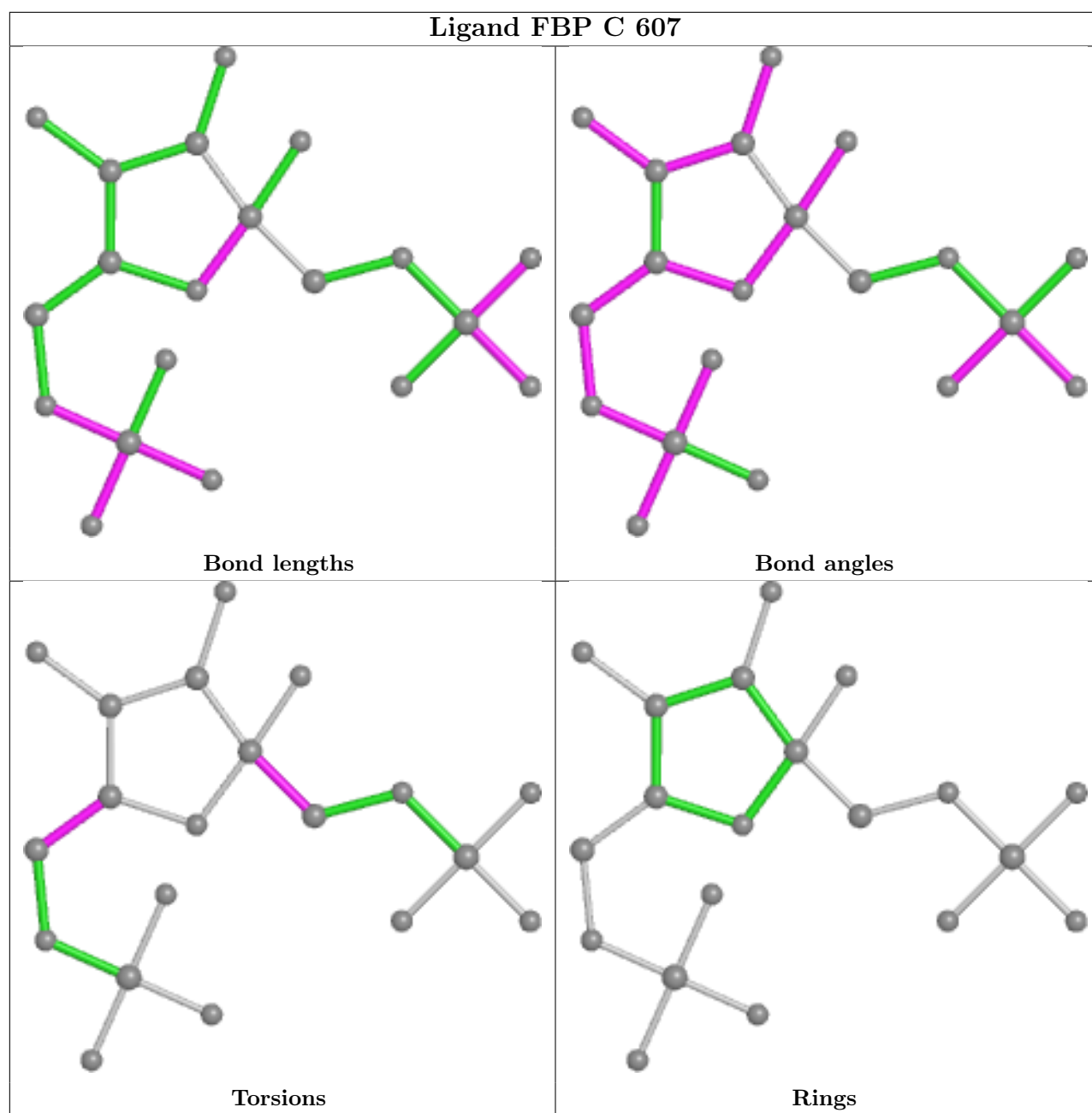
There are no ring outliers.

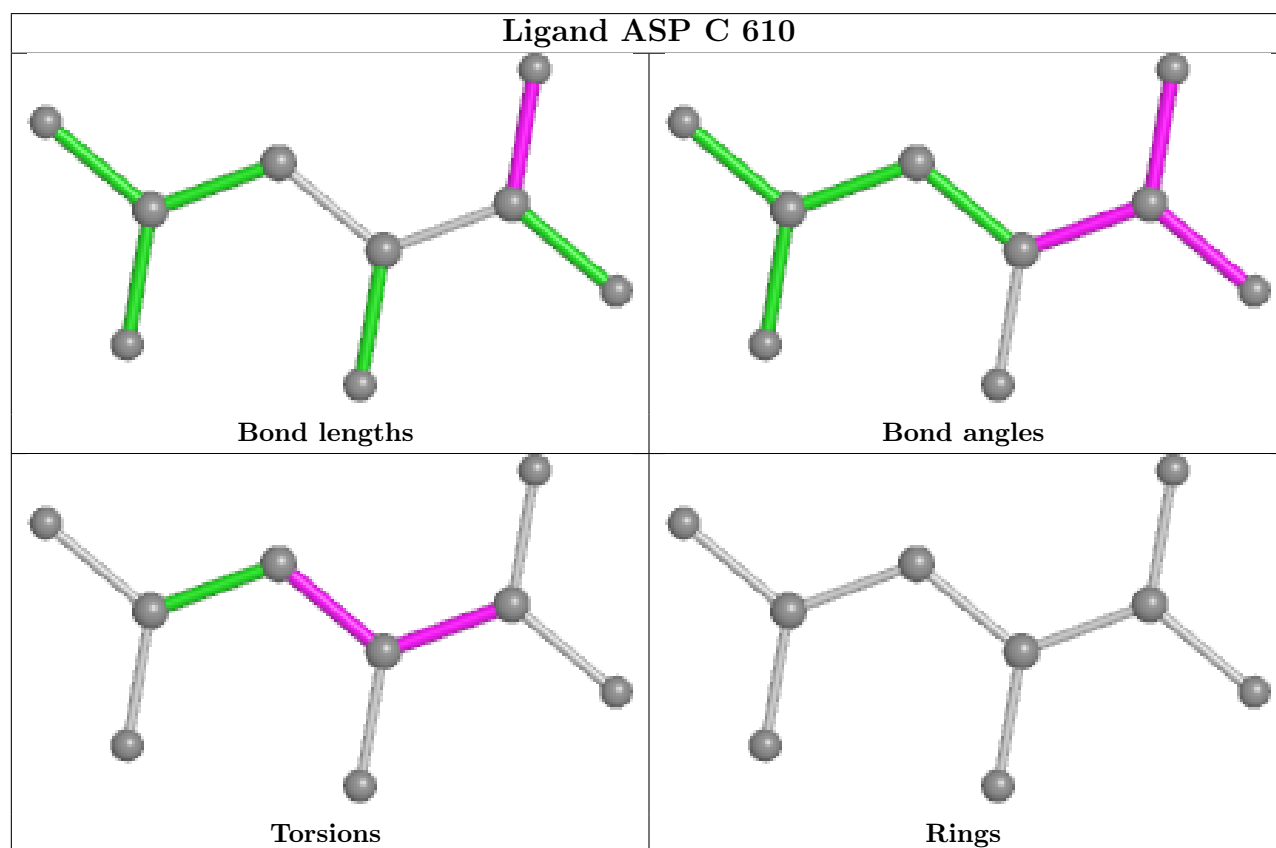
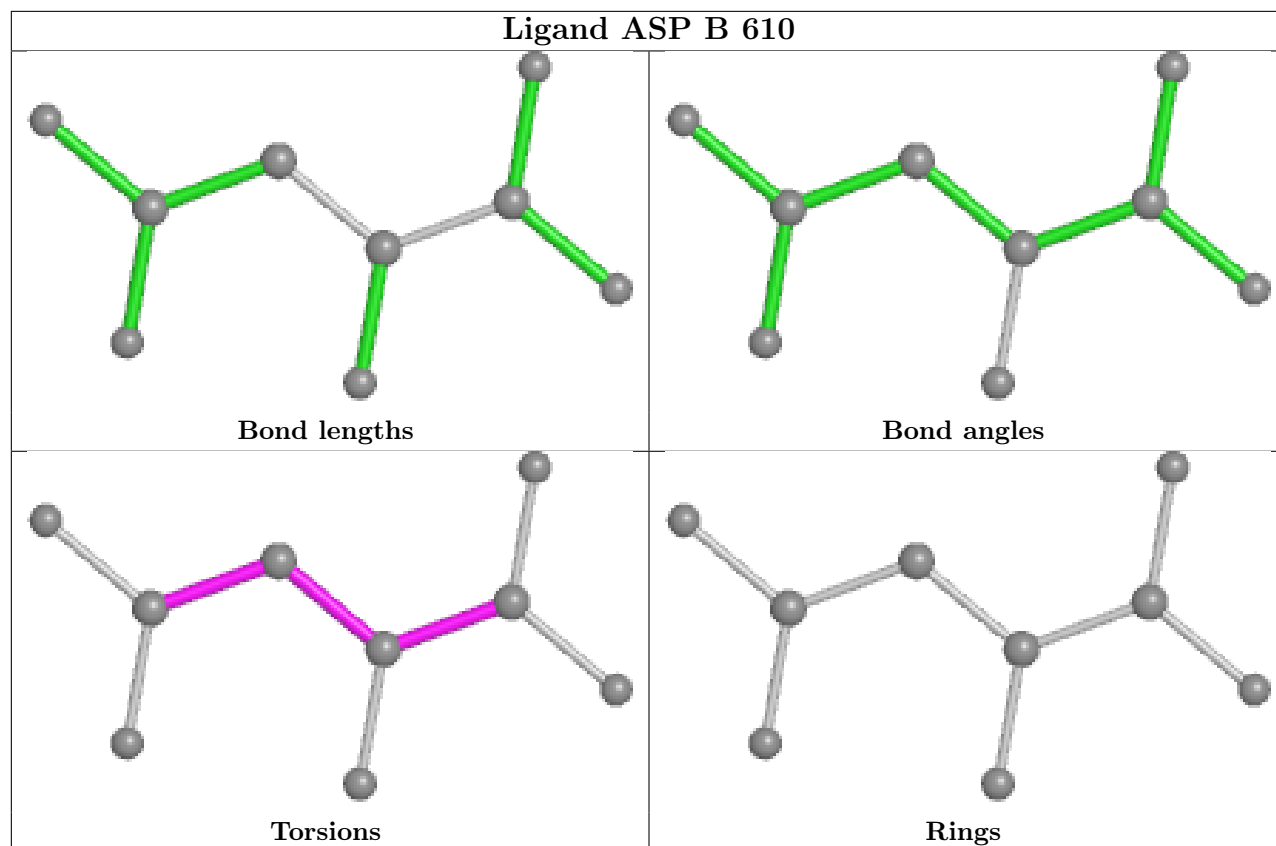
No monomer is involved in short contacts.

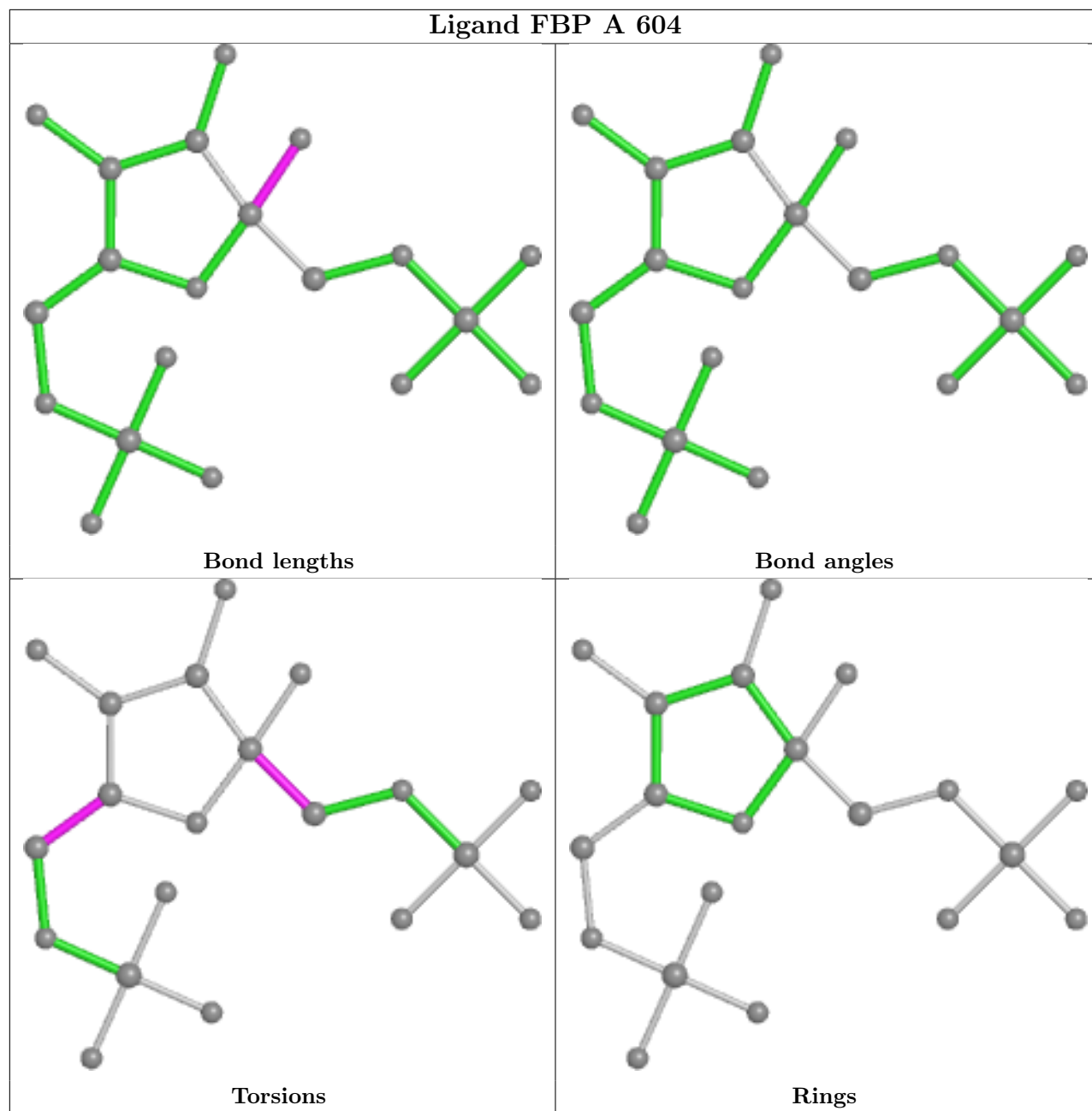
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

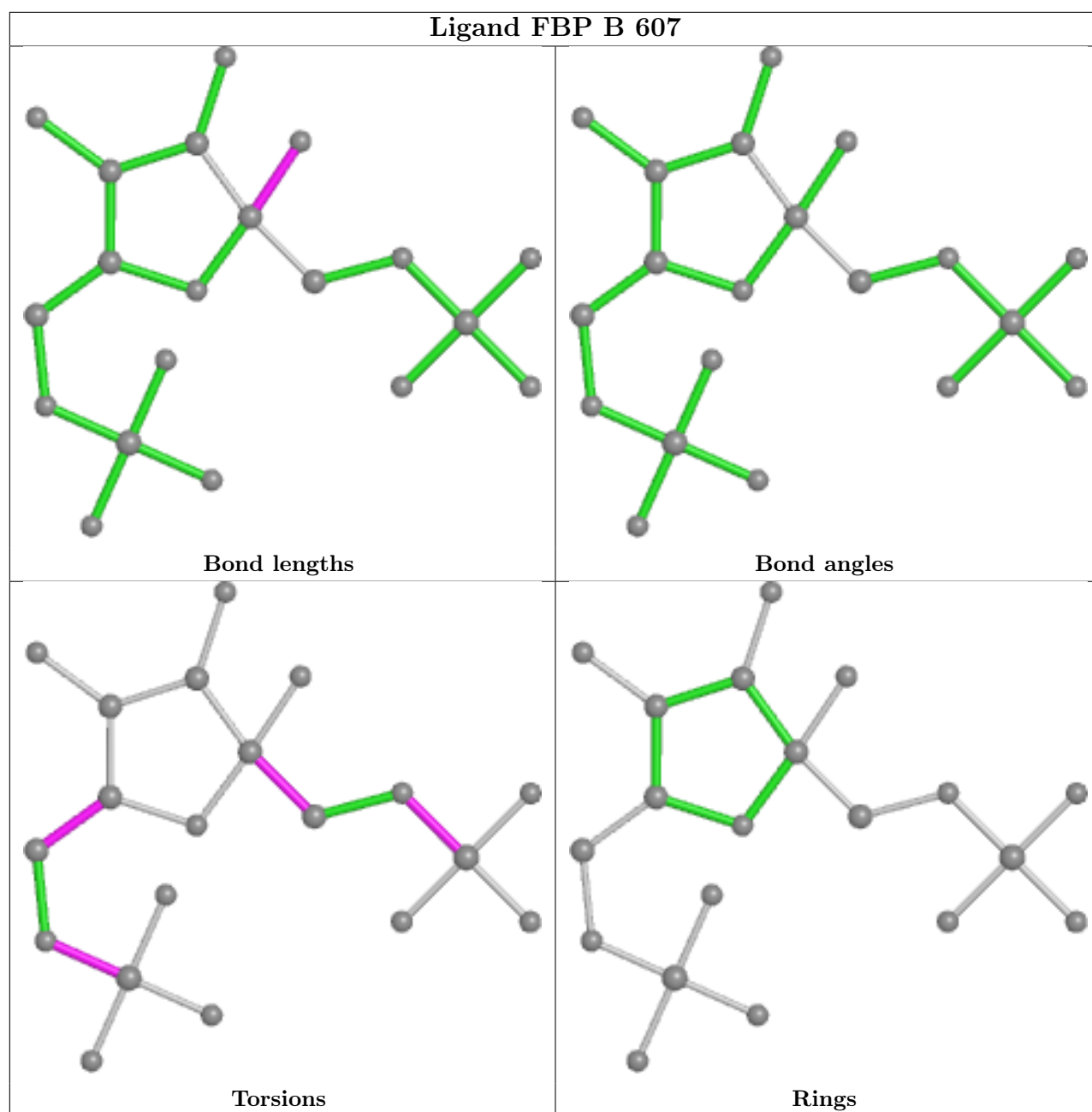












#### 4.7 Other polymers [i](#)

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.