



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 5, 2023 – 05:26 AM EDT

PDB ID : 6VD1
Title : Crystal structure of Arabidopsis thaliana S-adenosylmethionine Synthase 2 (AtMAT2) in complex with S-adenosylmethionine and PPNP
Authors : Sekula, B.; Ruzskowski, M.; Dauter, Z.
Deposited on : 2019-12-23
Resolution : 1.32 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)
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 1.32 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 7665 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.

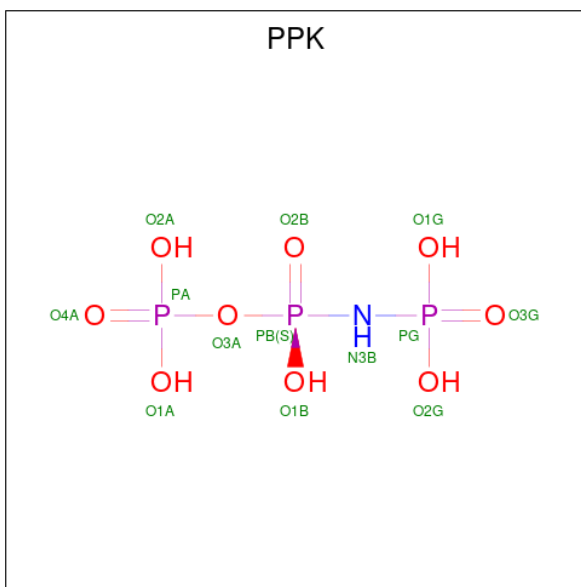
- Molecule 1 is a protein called S-adenosylmethionine synthase 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	395	3124	1975	537	594	18	0	11	0
1	B	392	3130	1982	536	593	19	0	16	0

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	SER	-	expression tag	UNP P17562
A	-1	ASN	-	expression tag	UNP P17562
A	0	ALA	-	expression tag	UNP P17562
A	393	LEU	-	expression tag	UNP P17562
A	394	ASN	-	expression tag	UNP P17562
A	395	ASN	-	expression tag	UNP P17562
A	396	ILE	-	expression tag	UNP P17562
A	397	GLY	-	expression tag	UNP P17562
A	398	SER	-	expression tag	UNP P17562
A	399	GLY	-	expression tag	UNP P17562
B	-2	SER	-	expression tag	UNP P17562
B	-1	ASN	-	expression tag	UNP P17562
B	0	ALA	-	expression tag	UNP P17562
B	393	LEU	-	expression tag	UNP P17562
B	394	ASN	-	expression tag	UNP P17562
B	395	ASN	-	expression tag	UNP P17562
B	396	ILE	-	expression tag	UNP P17562
B	397	GLY	-	expression tag	UNP P17562
B	398	SER	-	expression tag	UNP P17562
B	399	GLY	-	expression tag	UNP P17562

- Molecule 2 is (DIPHOSPHONO)AMINOPHOSPHONIC ACID (three-letter code: PPK) (formula: $\text{H}_6\text{NO}_9\text{P}_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	N	O	P	0	0
			13	1	9	3		
2	B	1	Total	N	O	P	0	0
			13	1	9	3		

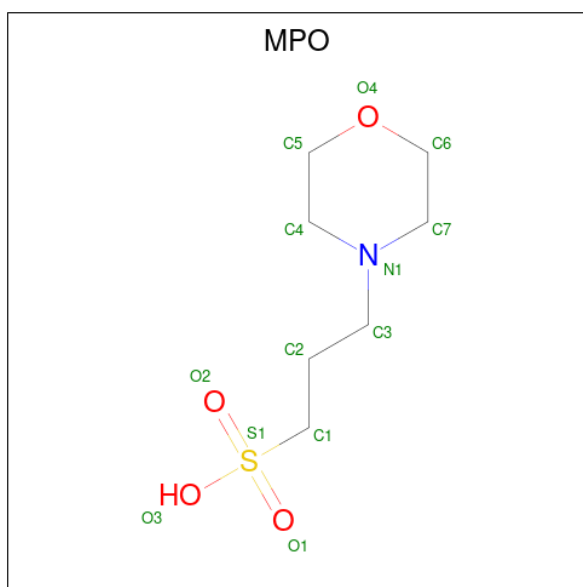
- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	3	Total	Mg	0	0
			3	3		
3	B	1	Total	Mg	0	0
			1	1		

- Molecule 4 is POTASSIUM ION (three-letter code: K) (formula: K) (labeled as "Ligand of Interest" by depositor).

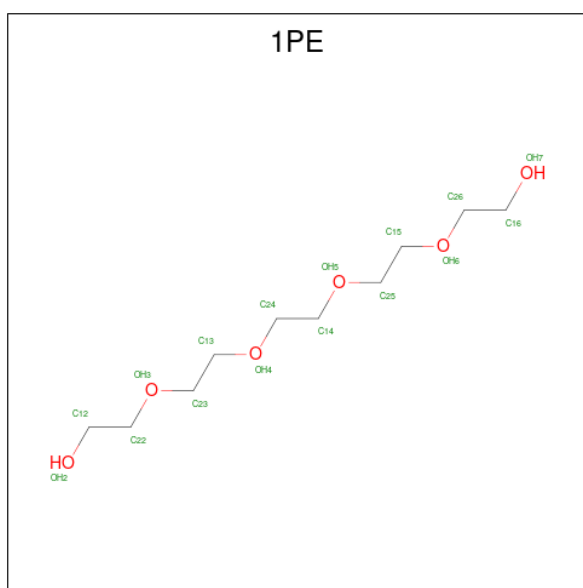
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	K	0	0
			1	1		
4	B	1	Total	K	0	0
			1	1		

- Molecule 5 is 3[N-MORPHOLINO]PROPANE SULFONIC ACID (three-letter code: MPO) (formula: C₇H₁₅NO₄S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
5	A	1	13	7	1	4	1	0	0
5	B	1	13	7	1	4	1	0	0

- Molecule 6 is PENTAETHYLENE GLYCOL (three-letter code: 1PE) (formula: $C_{10}H_{22}O_6$).



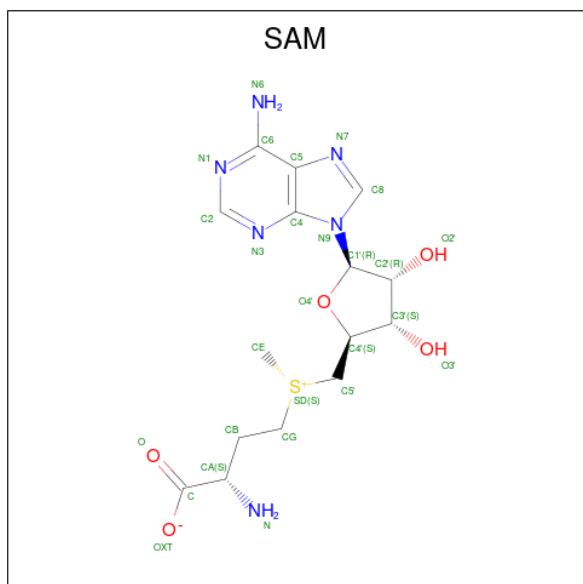
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
6	A	1	16	10	6	0	0

- Molecule 7 is TRIETHYLENE GLYCOL (three-letter code: PGE) (formula: $C_6H_{14}O_4$).



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

- Molecule 8 is S-ADENOSYLMETHIONINE (three-letter code: SAM) (formula: $C_{15}H_{22}N_6O_5S$) (labeled as "Ligand of Interest" by depositor).



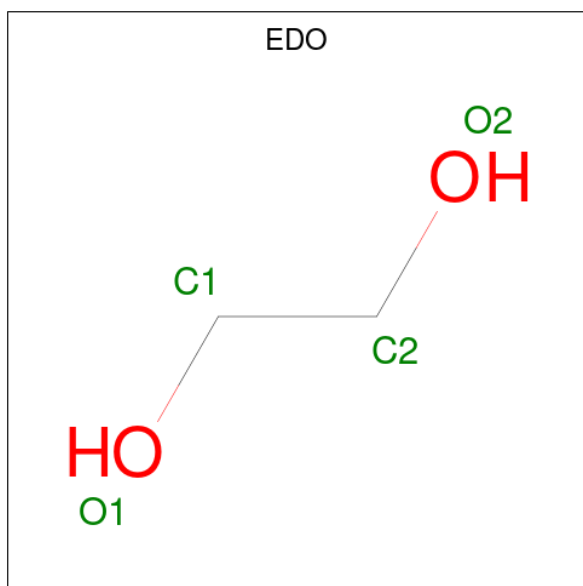
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
8	A	1	Total	C	N	O	S	0	0
			27	15	6	5	1		

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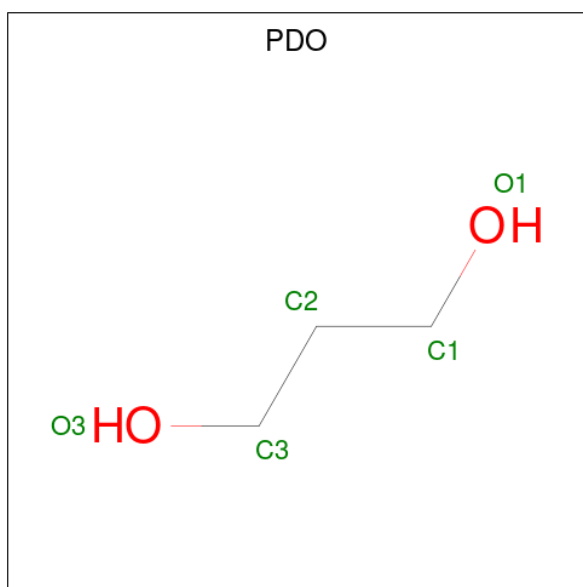
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	S		
8	B	1	27	15	6	5	1	0	0

- Molecule 9 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C₂H₆O₂).



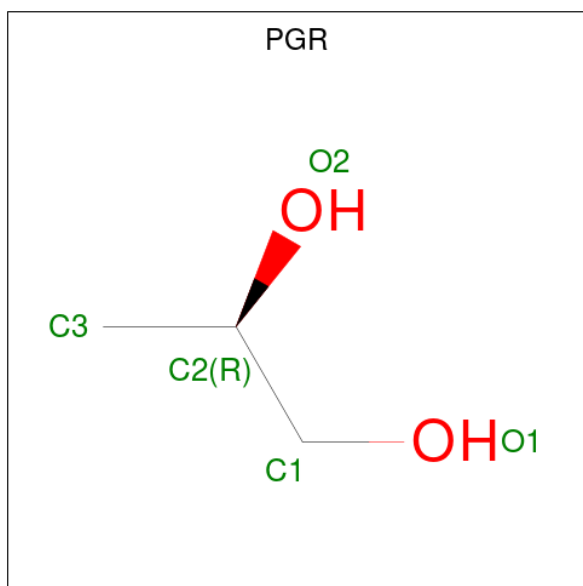
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
9	A	1	4	2	2	0	0
9	B	1	4	2	2	0	0

- Molecule 10 is 1,3-PROPANDIOL (three-letter code: PDO) (formula: C₃H₈O₂).



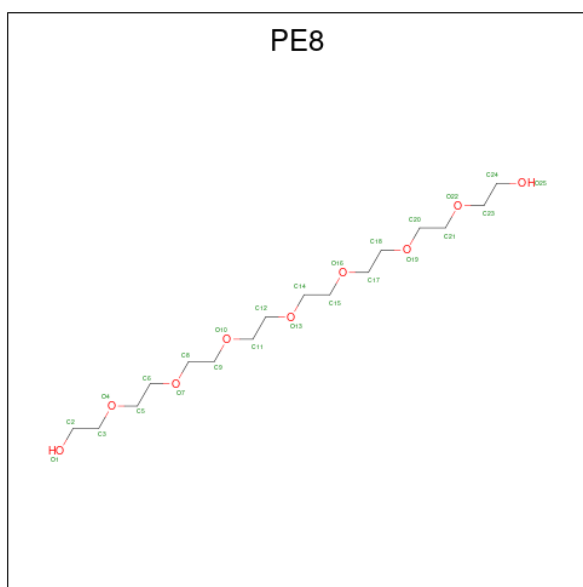
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
10	B	1	5	3	2	0	0

- Molecule 11 is R-1,2-PROPANEDIOL (three-letter code: PGR) (formula: $C_3H_8O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
11	B	1	5	3	2	0	0

- Molecule 12 is 3,6,9,12,15,18,21-HEPTAOXATRICOSANE-1,23-DIOL (three-letter code: PE8) (formula: $C_{16}H_{34}O_9$).



Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
12	B	1	Total	C O	0	0
			25	16 9		

- Molecule 13 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
13	A	587	Total	O	0	10
			596	596		
13	B	611	Total	O	0	14
			624	624		

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, α , β , γ	61.20Å 101.48Å 84.33Å 90.00° 99.37° 90.00°	Depositor
Resolution (Å)	47.09 – 1.32	Depositor
% Data completeness (in resolution range)	97.8 (47.09-1.32)	Depositor
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.87 (at 1.32Å)	Xtrriage
Refinement program	REFMAC 5.8.0238	Depositor
R, R_{free}	0.142 , 0.173	Depositor
Wilson B-factor (Å ²)	9.6	Xtrriage
Anisotropy	1.053	Xtrriage
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	7665	wwPDB-VP
Average B, all atoms (Å ²)	17.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 11.23% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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 20 ligands modelled in this entry, 6 are monoatomic - leaving 14 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	PGE	A	408	-	9,9,9	0.19	0	8,8,8	0.26	0
6	1PE	A	407	-	15,15,15	0.59	0	14,14,14	0.67	0
9	EDO	A	410	-	3,3,3	0.09	0	2,2,2	0.20	0
10	PDO	B	402	-	4,4,4	0.37	0	3,3,3	0.46	0
8	SAM	B	409	-	24,29,29	0.80	1 (4%)	23,42,42	1.60	2 (8%)
5	MPO	A	406	-	13,13,13	1.36	1 (7%)	17,17,17	1.19	2 (11%)
2	PPK	A	401	4,3	11,12,12	2.60	5 (45%)	15,20,20	1.62	4 (26%)
7	PGE	B	408	-	9,9,9	0.23	0	8,8,8	0.17	0
5	MPO	B	407	-	13,13,13	0.48	0	17,17,17	0.79	1 (5%)
11	PGR	B	403	-	3,4,4	0.23	0	1,4,4	0.08	0
2	PPK	B	401	4,3	11,12,12	1.64	4 (36%)	15,20,20	2.12	5 (33%)
8	SAM	A	409	-	24,29,29	0.75	1 (4%)	23,42,42	1.58	2 (8%)
12	PE8	B	405	-	24,24,24	0.69	0	23,23,23	0.70	0
9	EDO	B	410	-	3,3,3	0.14	0	2,2,2	0.34	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
7	PGE	A	408	-	-	1/7/7/7	-
6	1PE	A	407	-	-	4/13/13/13	-
9	EDO	A	410	-	-	1/1/1/1	-
10	PDO	B	402	-	-	1/2/2/2	-
8	SAM	B	409	-	-	2/12/33/33	0/3/3/3
5	MPO	A	406	-	-	1/7/15/15	0/1/1/1
2	PPK	A	401	4,3	-	1/8/12/12	-
7	PGE	B	408	-	-	6/7/7/7	-
5	MPO	B	407	-	-	0/7/15/15	0/1/1/1
11	PGR	B	403	-	-	2/2/2/2	-
2	PPK	B	401	4,3	-	2/8/12/12	-
8	SAM	A	409	-	-	2/12/33/33	0/3/3/3
12	PE8	B	405	-	-	13/22/22/22	-
9	EDO	B	410	-	-	1/1/1/1	-

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	PPK	PG-O3G	5.40	1.54	1.46
5	A	406	MPO	O2-S1	4.43	1.58	1.45
2	A	401	PPK	PG-O1G	-3.56	1.47	1.56
2	A	401	PPK	PB-O2B	3.23	1.51	1.46
2	A	401	PPK	PB-O1B	-2.85	1.49	1.56
2	A	401	PPK	PB-O3A	2.84	1.62	1.59
2	B	401	PPK	PG-O3G	2.56	1.50	1.46
8	A	409	SAM	C8-N7	-2.36	1.30	1.34
2	B	401	PPK	PB-O3A	2.25	1.61	1.59
2	B	401	PPK	PG-O2G	-2.17	1.50	1.56
2	B	401	PPK	PB-O1B	-2.16	1.51	1.56
8	B	409	SAM	OXT-C	-2.05	1.23	1.30

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	A	409	SAM	CG-SD-C5'	-6.00	88.10	103.40
8	B	409	SAM	CG-SD-C5'	-5.75	88.73	103.40
2	B	401	PPK	O3G-PG-N3B	-4.83	104.66	111.77
2	A	401	PPK	O1B-PB-O2B	4.09	118.51	109.92
2	B	401	PPK	O1G-PG-O2G	3.85	117.89	107.64
2	B	401	PPK	O1B-PB-O2B	3.70	117.67	109.92
8	B	409	SAM	C5-C6-N6	2.91	124.78	120.35
2	A	401	PPK	O3G-PG-N3B	-2.59	107.96	111.77
8	A	409	SAM	C5-C6-N6	2.32	123.88	120.35
5	A	406	MPO	O3-S1-O1	2.28	116.85	111.27
2	B	401	PPK	O1G-PG-O3G	-2.27	107.75	113.45
2	A	401	PPK	O1G-PG-O3G	-2.24	107.81	113.45
2	B	401	PPK	O2B-PB-N3B	-2.21	108.52	111.77
5	A	406	MPO	C6-C7-N1	2.16	113.37	110.10
2	A	401	PPK	O1G-PG-O2G	2.04	113.07	107.64
5	B	407	MPO	C6-C7-N1	2.04	113.19	110.10

There are no chirality outliers.

All (37) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	401	PPK	PG-N3B-PB-O3A
2	B	401	PPK	PB-N3B-PG-O3G
2	B	401	PPK	PG-N3B-PB-O3A
10	B	402	PDO	O1-C1-C2-C3

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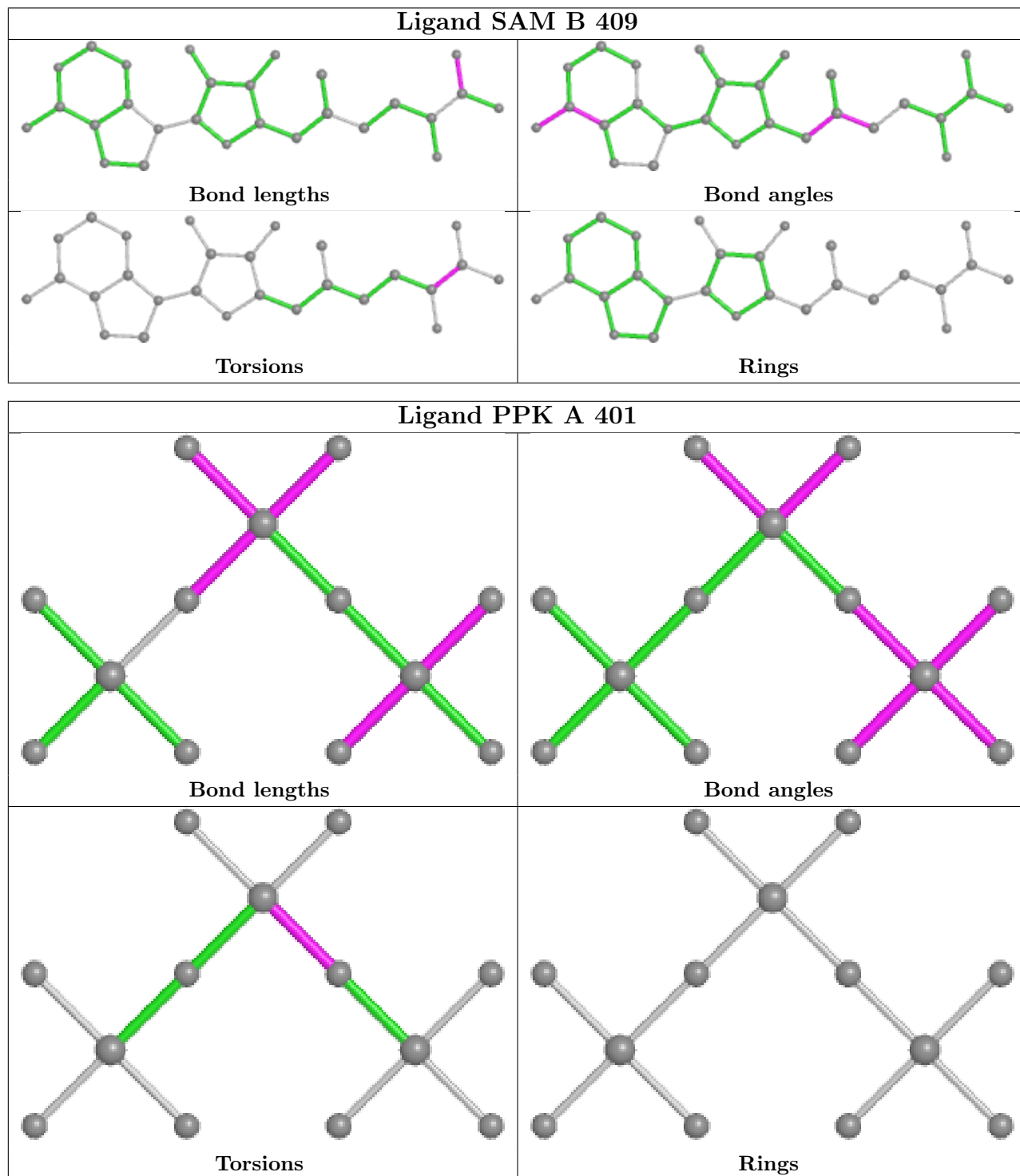
Mol	Chain	Res	Type	Atoms
11	B	403	PGR	O1-C1-C2-O2
12	B	405	PE8	O7-C8-C9-O10
6	A	407	1PE	OH6-C15-C25-OH5
7	B	408	PGE	O1-C1-C2-O2
9	A	410	EDO	O1-C1-C2-O2
12	B	405	PE8	O16-C17-C18-O19
12	B	405	PE8	O13-C14-C15-O16
6	A	407	1PE	OH7-C16-C26-OH6
8	B	409	SAM	O-C-CA-CB
7	A	408	PGE	O3-C5-C6-O4
8	A	409	SAM	O-C-CA-CB
7	B	408	PGE	O3-C5-C6-O4
7	B	408	PGE	C6-C5-O3-C4
8	A	409	SAM	OXT-C-CA-CB
8	B	409	SAM	OXT-C-CA-CB
11	B	403	PGR	O1-C1-C2-C3
6	A	407	1PE	C15-C25-OH5-C14
12	B	405	PE8	C8-C9-O10-C11
12	B	405	PE8	C15-C14-O13-C12
12	B	405	PE8	C12-C11-O10-C9
9	B	410	EDO	O1-C1-C2-O2
6	A	407	1PE	C12-C22-OH3-C23
12	B	405	PE8	C11-C12-O13-C14
7	B	408	PGE	C3-C4-O3-C5
12	B	405	PE8	C2-C3-O4-C5
12	B	405	PE8	O10-C11-C12-O13
5	A	406	MPO	C1-C2-C3-N1
7	B	408	PGE	O2-C3-C4-O3
7	B	408	PGE	C4-C3-O2-C2
12	B	405	PE8	C14-C15-O16-C17
12	B	405	PE8	O19-C20-C21-O22
12	B	405	PE8	C24-C23-O22-C21
12	B	405	PE8	O4-C5-C6-O7

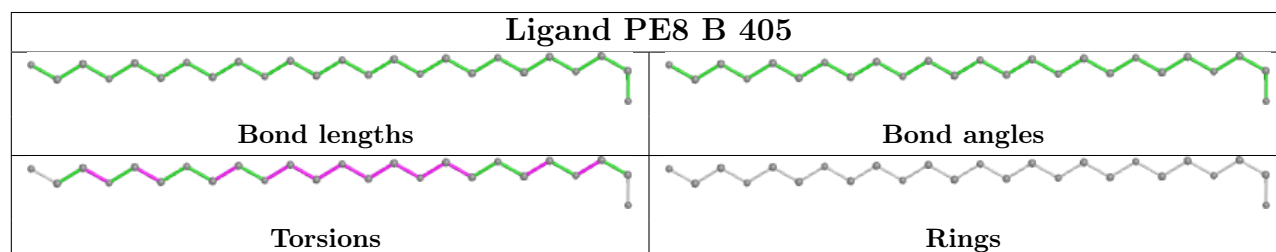
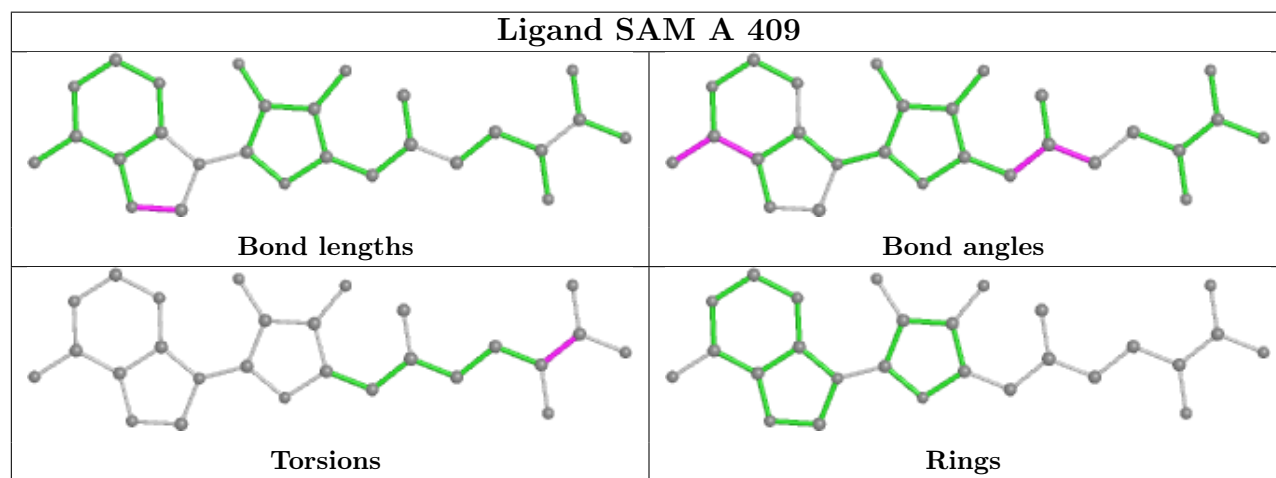
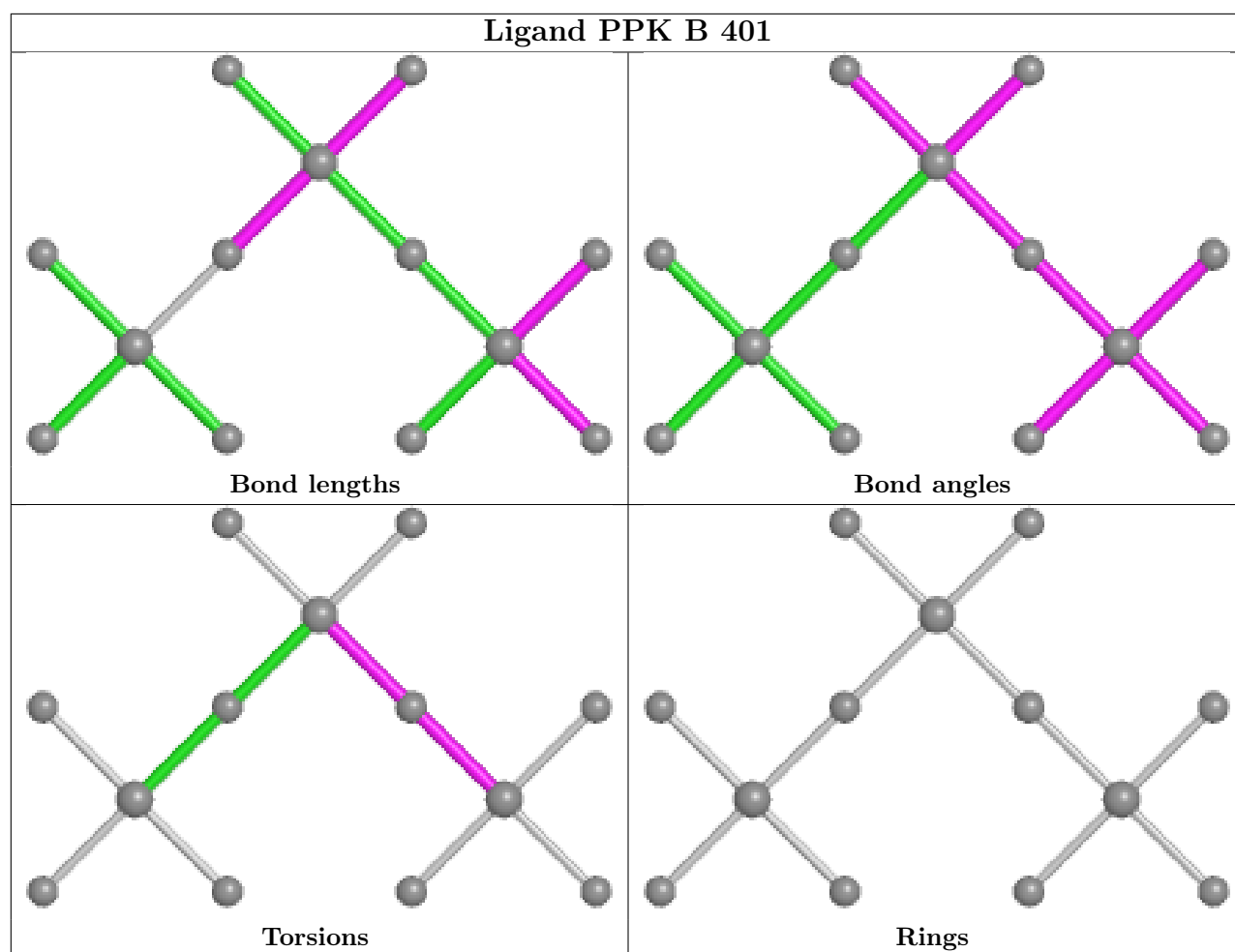
There are no ring outliers.

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.