



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 5, 2023 – 04:08 AM EDT

PDB ID : 6VD0
Title : Crystal structure of Arabidopsis thaliana S-adenosylmethionine Synthase 2 (AtMAT2) in complex with free Methionine and AMPCPP
Authors : Sekula, B.; Ruzskowski, M.; Dauter, Z.
Deposited on : 2019-12-23
Resolution : 2.00 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 2.00 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 9 unique types of molecules in this entry. The entry contains 13558 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	392	Total 3052	C 1923	N 528	O 584	S 17	0	3	0
1	B	389	Total 3022	C 1903	N 523	O 580	S 16	0	2	0
1	C	389	Total 3017	C 1900	N 522	O 579	S 16	0	1	0
1	D	388	Total 3014	C 1899	N 522	O 577	S 16	0	2	0

There are 40 discrepancies between the modelled and reference sequences:

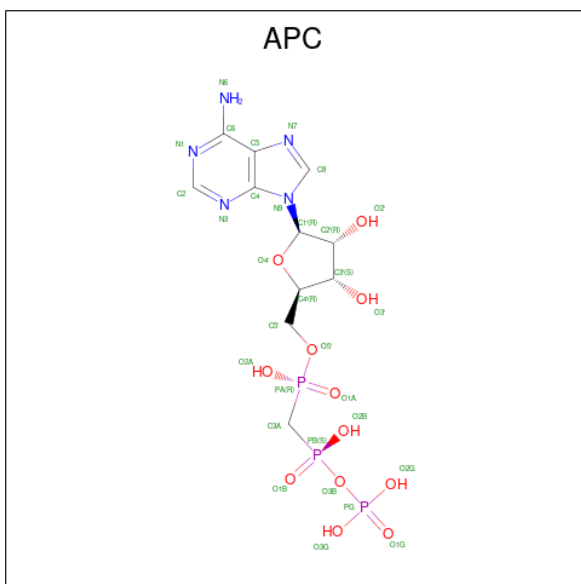
Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	SER	-	expression tag	UNP P17562
A	-1	ASN	-	expression tag	UNP P17562
A	0	ALA	-	expression tag	UNP P17562
A	393	LEU	-	expression tag	UNP P17562
A	394	ASN	-	expression tag	UNP P17562
A	395	ASN	-	expression tag	UNP P17562
A	396	ILE	-	expression tag	UNP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

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

- Molecule 2 is DIPHOSPHOMETHYLPHOSPHONIC ACID ADENOSYL ESTER (three-letter code: APC) (formula: C₁₁H₁₈N₅O₁₂P₃) (labeled as "Ligand of Interest" by depositor).



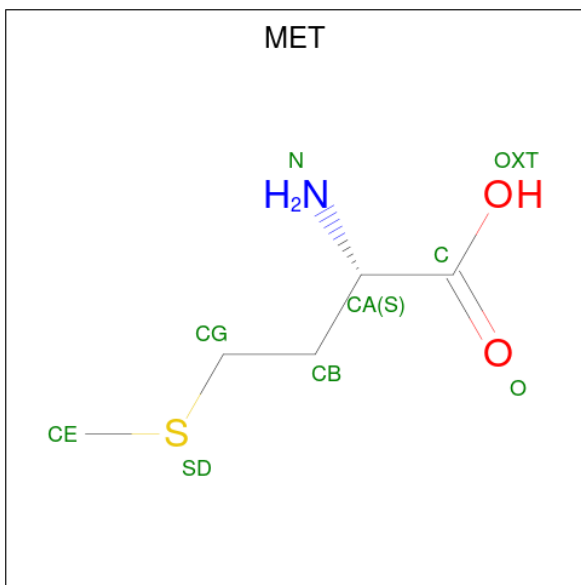
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
			Total	C	N	O			P
2	A	1	31	11	5	12	3	0	0

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	B	1	Total	C	N	O	P	0	0
			31	11	5	12	3		
2	C	1	Total	C	N	O	P	0	0
			31	11	5	12	3		
2	D	1	Total	C	N	O	P	0	0
			31	11	5	12	3		

- Molecule 3 is METHIONINE (three-letter code: MET) (formula: C₅H₁₁NO₂S) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	S	0	0
			9	5	1	2	1		
3	B	1	Total	C	N	O	S	0	0
			9	5	1	2	1		
3	C	1	Total	C	N	O	S	0	0
			9	5	1	2	1		
3	D	1	Total	C	N	O	S	0	0
			9	5	1	2	1		

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

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	3	Total	Mg	0	0
			3	3		

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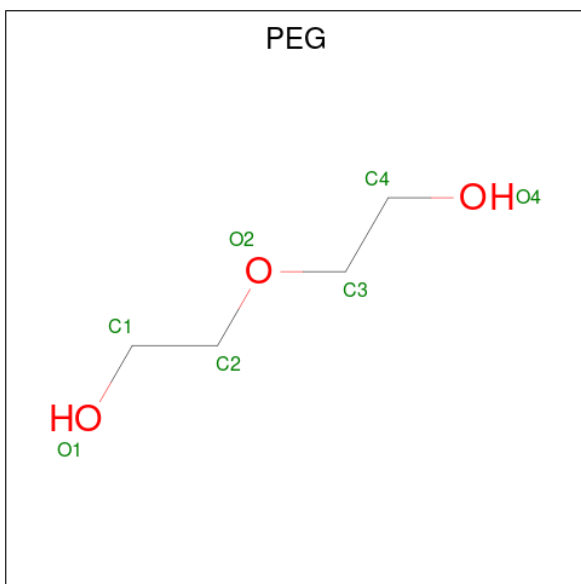
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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	2	Total Mg 2 2	0	0
4	C	3	Total Mg 3 3	0	0
4	D	1	Total Mg 1 1	0	0

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

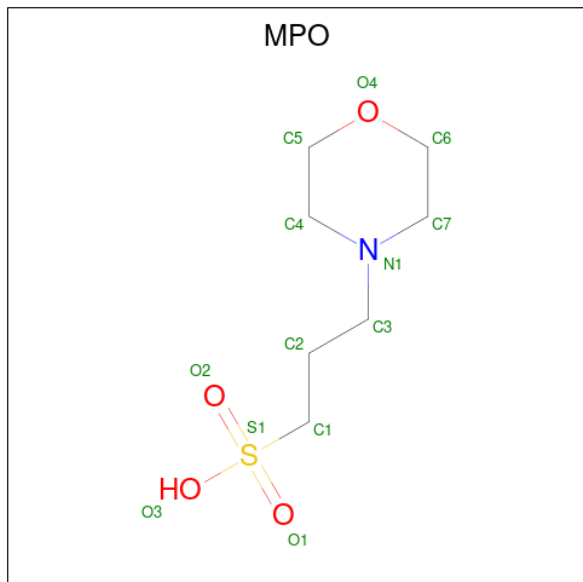
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total K 1 1	0	0
5	B	1	Total K 1 1	0	0
5	C	1	Total K 1 1	0	0
5	D	1	Total K 1 1	0	0

- Molecule 6 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: C₄H₁₀O₃).



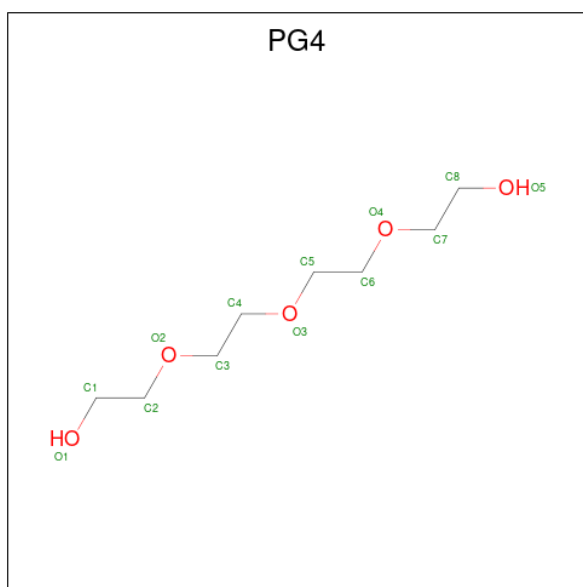
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total C O 7 4 3	0	0
6	B	1	Total C O 7 4 3	0	0

- Molecule 7 is 3[N-MORPHOLINO]PROPANE SULFONIC ACID (three-letter code: MPO) (formula: $C_7H_{15}NO_4S$).



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

- Molecule 8 is TETRAETHYLENE GLYCOL (three-letter code: PG4) (formula: $C_8H_{18}O_5$).



Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	C	1	Total	C O	0	0
			13	8 5		

- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	324	Total	O	0	0
			324	324		
9	B	298	Total	O	0	1
			299	299		
9	C	285	Total	O	0	0
			285	285		
9	D	293	Total	O	0	0
			293	293		

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	101.94Å 84.72Å 119.50Å 90.00° 95.67° 90.00°	Depositor
Resolution (Å)	39.83 – 2.00	Depositor
% Data completeness (in resolution range)	98.6 (39.83-2.00)	Depositor
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.33 (at 2.00Å)	Xtrriage
Refinement program	REFMAC 5.8.0238	Depositor
R, R_{free}	0.222 , 0.251	Depositor
Wilson B-factor (Å ²)	24.0	Xtrriage
Anisotropy	0.231	Xtrriage
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	13558	wwPDB-VP
Average B, all atoms (Å ²)	28.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 37.26 % 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 4.4044e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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 28 ligands modelled in this entry, 13 are monoatomic - leaving 15 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	APC	A	401	5,4	27,33,33	1.23	5 (18%)	31,52,52	1.03	2 (6%)
3	MET	D	402	-	7,8,8	0.85	0	7,9,9	0.67	0
7	MPO	D	405	-	13,13,13	1.07	1 (7%)	17,17,17	1.67	4 (23%)
7	MPO	C	408	-	13,13,13	1.16	1 (7%)	17,17,17	1.15	1 (5%)
7	MPO	A	408	-	13,13,13	0.79	1 (7%)	17,17,17	0.83	0
6	PEG	B	406	-	6,6,6	0.32	0	5,5,5	0.17	0
3	MET	C	403	-	7,8,8	0.71	0	7,9,9	1.00	0
3	MET	A	402	-	7,8,8	0.99	0	7,9,9	0.73	0
8	PG4	C	401	-	12,12,12	0.21	0	11,11,11	0.17	0
2	APC	B	401	5,4	27,33,33	0.99	3 (11%)	31,52,52	1.41	7 (22%)
3	MET	B	402	-	7,8,8	0.72	0	7,9,9	1.17	1 (14%)
6	PEG	A	407	-	6,6,6	0.24	0	5,5,5	0.17	0
7	MPO	B	407	-	13,13,13	1.10	1 (7%)	17,17,17	1.43	2 (11%)
2	APC	D	401	5,4	27,33,33	1.06	3 (11%)	31,52,52	1.26	3 (9%)
2	APC	C	402	5,4	27,33,33	0.91	2 (7%)	31,52,52	1.21	6 (19%)

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	APC	A	401	5,4	-	7/15/38/38	0/3/3/3
3	MET	D	402	-	-	4/8/8/8	-
7	MPO	D	405	-	-	3/7/15/15	0/1/1/1
7	MPO	C	408	-	-	1/7/15/15	0/1/1/1
7	MPO	A	408	-	-	1/7/15/15	0/1/1/1
6	PEG	B	406	-	-	2/4/4/4	-
3	MET	C	403	-	-	2/8/8/8	-
3	MET	A	402	-	-	2/8/8/8	-
8	PG4	C	401	-	-	5/10/10/10	-
2	APC	B	401	5,4	-	6/15/38/38	0/3/3/3
3	MET	B	402	-	-	2/8/8/8	-
6	PEG	A	407	-	-	2/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	MPO	B	407	-	-	1/7/15/15	0/1/1/1
2	APC	D	401	5,4	-	8/15/38/38	0/3/3/3
2	APC	C	402	5,4	-	7/15/38/38	0/3/3/3

All (17) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	C	408	MPO	O2-S1	3.91	1.56	1.45
7	D	405	MPO	O2-S1	3.58	1.55	1.45
7	B	407	MPO	O2-S1	3.19	1.54	1.45
2	A	401	APC	PA-O2A	-2.82	1.49	1.56
2	D	401	APC	PA-O2A	-2.82	1.49	1.56
2	A	401	APC	PB-O2B	-2.79	1.49	1.56
2	A	401	APC	PA-O5'	2.74	1.61	1.57
2	C	402	APC	PA-O2A	-2.41	1.50	1.56
2	D	401	APC	PB-O2B	-2.40	1.50	1.56
2	B	401	APC	PA-O2A	-2.30	1.51	1.56
7	A	408	MPO	O3-S1	2.21	1.55	1.47
2	A	401	APC	C8-N7	-2.15	1.30	1.34
2	B	401	APC	PA-O5'	2.15	1.60	1.57
2	C	402	APC	PA-O5'	2.15	1.60	1.57
2	D	401	APC	C8-N7	-2.13	1.30	1.34
2	A	401	APC	C2-N3	2.09	1.35	1.32
2	B	401	APC	C8-N7	-2.03	1.31	1.34

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	B	407	MPO	O3-S1-O1	4.25	121.67	111.27
7	D	405	MPO	O2-S1-C1	-3.69	102.47	106.92
7	D	405	MPO	O3-S1-O1	3.53	119.90	111.27
2	D	401	APC	C2'-C3'-C4'	-3.41	96.01	102.64
7	C	408	MPO	O3-S1-O1	3.24	119.19	111.27
2	C	402	APC	C2'-C3'-C4'	-3.00	96.82	102.64
2	B	401	APC	C2'-C3'-C4'	-2.93	96.94	102.64
2	D	401	APC	O3'-C3'-C4'	2.70	118.86	111.05
2	A	401	APC	C2'-C3'-C4'	-2.65	97.48	102.64
2	A	401	APC	O2A-PA-O1A	2.61	118.77	110.07
7	D	405	MPO	C3-N1-C7	2.54	117.73	111.23
2	B	401	APC	O3G-PG-O2G	2.53	117.30	107.64
2	B	401	APC	O4'-C4'-C3'	-2.52	100.12	105.11
2	B	401	APC	O3'-C3'-C2'	2.50	119.91	111.82

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	D	405	MPO	C3-N1-C4	2.39	117.34	111.23
2	B	401	APC	O1A-PA-C3A	2.32	115.20	109.07
2	C	402	APC	C5-C6-N6	2.27	123.80	120.35
2	B	401	APC	O2A-PA-O1A	2.26	117.60	110.07
2	D	401	APC	C5-C6-N6	2.22	123.73	120.35
2	B	401	APC	O1B-PB-C3A	-2.20	103.26	109.07
3	B	402	MET	O-C-CA	-2.08	114.81	122.14
2	C	402	APC	O2A-PA-O1A	2.07	116.98	110.07
2	C	402	APC	O2B-PB-O1B	2.06	116.95	110.07
2	C	402	APC	O3G-PG-O2G	2.05	115.46	107.64
2	C	402	APC	O4'-C4'-C3'	-2.05	101.07	105.11
7	B	407	MPO	O3-S1-O2	-2.01	106.36	111.27

There are no chirality outliers.

All (53) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	401	APC	PB-O3B-PG-O2G
2	A	401	APC	C5'-O5'-PA-O1A
2	A	401	APC	C5'-O5'-PA-C3A
2	A	401	APC	O4'-C4'-C5'-O5'
2	A	401	APC	C3'-C4'-C5'-O5'
2	B	401	APC	O4'-C4'-C5'-O5'
2	B	401	APC	C3'-C4'-C5'-O5'
2	C	402	APC	PB-O3B-PG-O3G
2	C	402	APC	C5'-O5'-PA-O2A
2	C	402	APC	O4'-C4'-C5'-O5'
2	C	402	APC	C3'-C4'-C5'-O5'
2	D	401	APC	PB-O3B-PG-O3G
2	D	401	APC	C5'-O5'-PA-O1A
2	D	401	APC	C5'-O5'-PA-O2A
2	D	401	APC	C5'-O5'-PA-C3A
2	D	401	APC	O4'-C4'-C5'-O5'
2	D	401	APC	C3'-C4'-C5'-O5'
7	D	405	MPO	C2-C3-N1-C4
8	C	401	PG4	O2-C3-C4-O3
2	C	402	APC	C5'-O5'-PA-O1A
2	B	401	APC	C5'-O5'-PA-C3A
2	C	402	APC	C5'-O5'-PA-C3A
6	A	407	PEG	O1-C1-C2-O2
7	C	408	MPO	C2-C3-N1-C7
2	B	401	APC	C5'-O5'-PA-O1A

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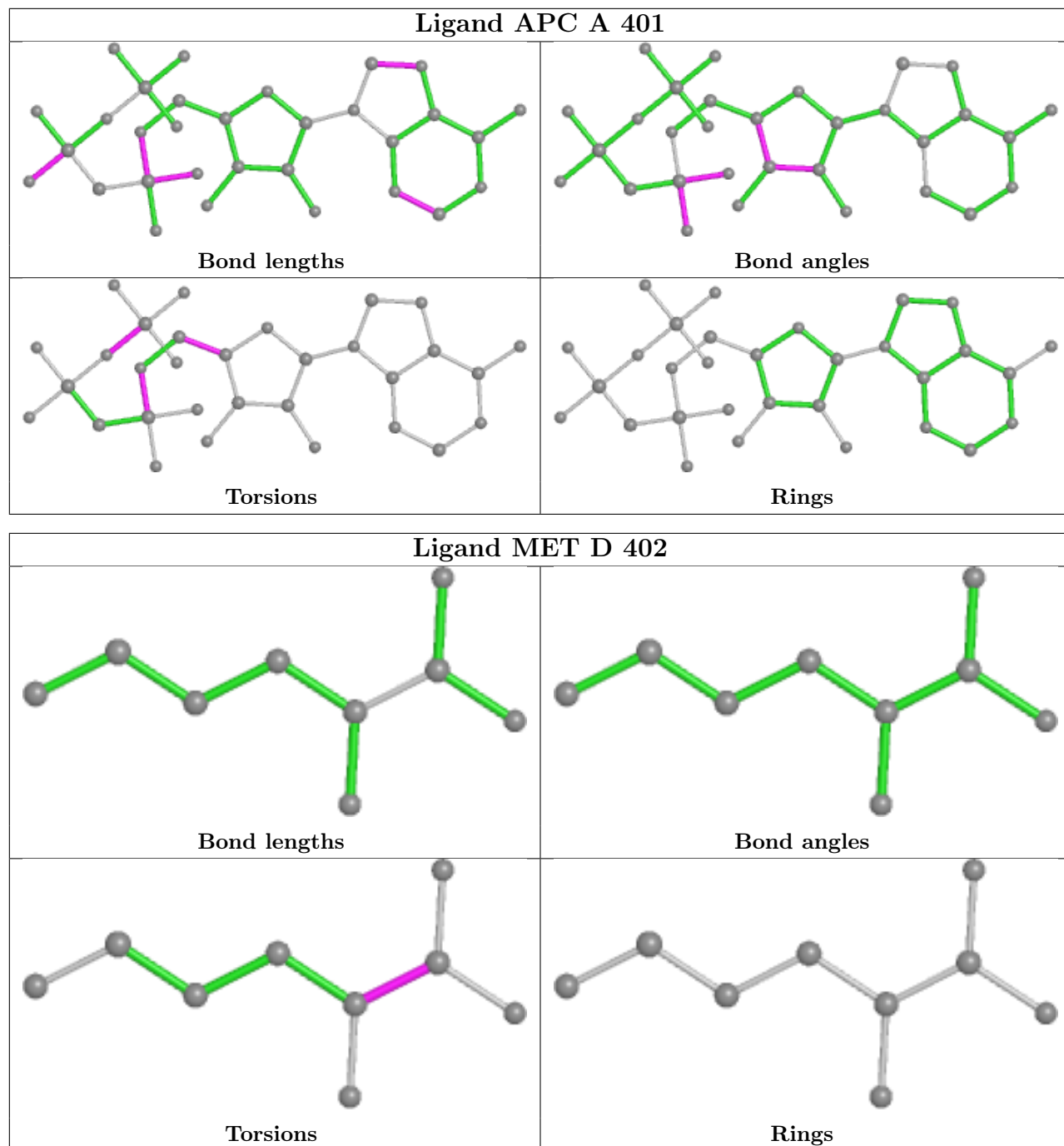
Mol	Chain	Res	Type	Atoms
3	B	402	MET	O-C-CA-CB
3	D	402	MET	OXT-C-CA-CB
7	D	405	MPO	C2-C3-N1-C7
6	B	406	PEG	O1-C1-C2-O2
3	D	402	MET	O-C-CA-CB
8	C	401	PG4	O1-C1-C2-O2
3	A	402	MET	OXT-C-CA-CB
3	B	402	MET	OXT-C-CA-CB
8	C	401	PG4	O4-C7-C8-O5
7	A	408	MPO	C2-C3-N1-C7
3	A	402	MET	O-C-CA-CB
8	C	401	PG4	C4-C3-O2-C2
6	B	406	PEG	O2-C3-C4-O4
3	D	402	MET	OXT-C-CA-N
8	C	401	PG4	C3-C4-O3-C5
3	C	403	MET	O-C-CA-CB
6	A	407	PEG	C4-C3-O2-C2
7	B	407	MPO	C1-C2-C3-N1
3	C	403	MET	OXT-C-CA-CB
3	D	402	MET	O-C-CA-N
2	A	401	APC	C5'-O5'-PA-O2A
2	B	401	APC	PB-O3B-PG-O1G
2	D	401	APC	PB-O3B-PG-O1G
2	A	401	APC	PB-O3B-PG-O3G
2	B	401	APC	PB-O3B-PG-O2G
2	C	402	APC	PB-O3B-PG-O2G
2	D	401	APC	PB-O3B-PG-O2G
7	D	405	MPO	C2-C1-S1-O1

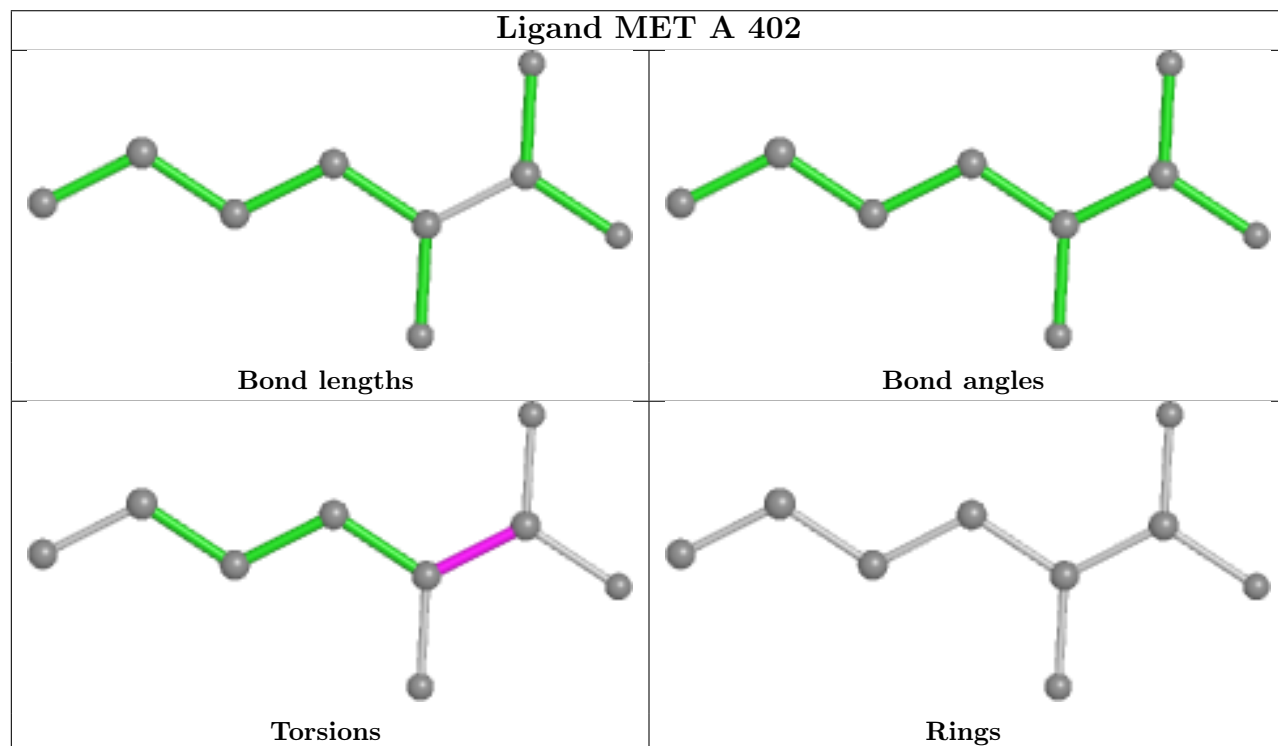
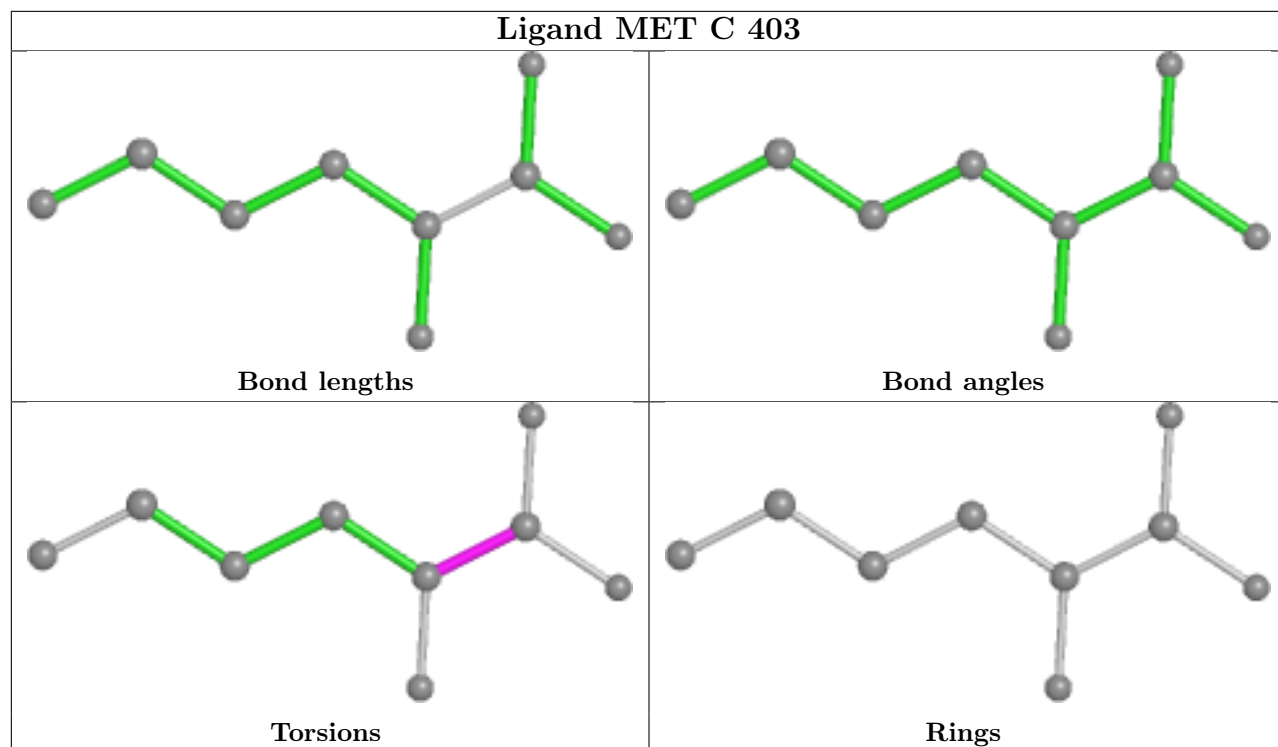
There are no ring outliers.

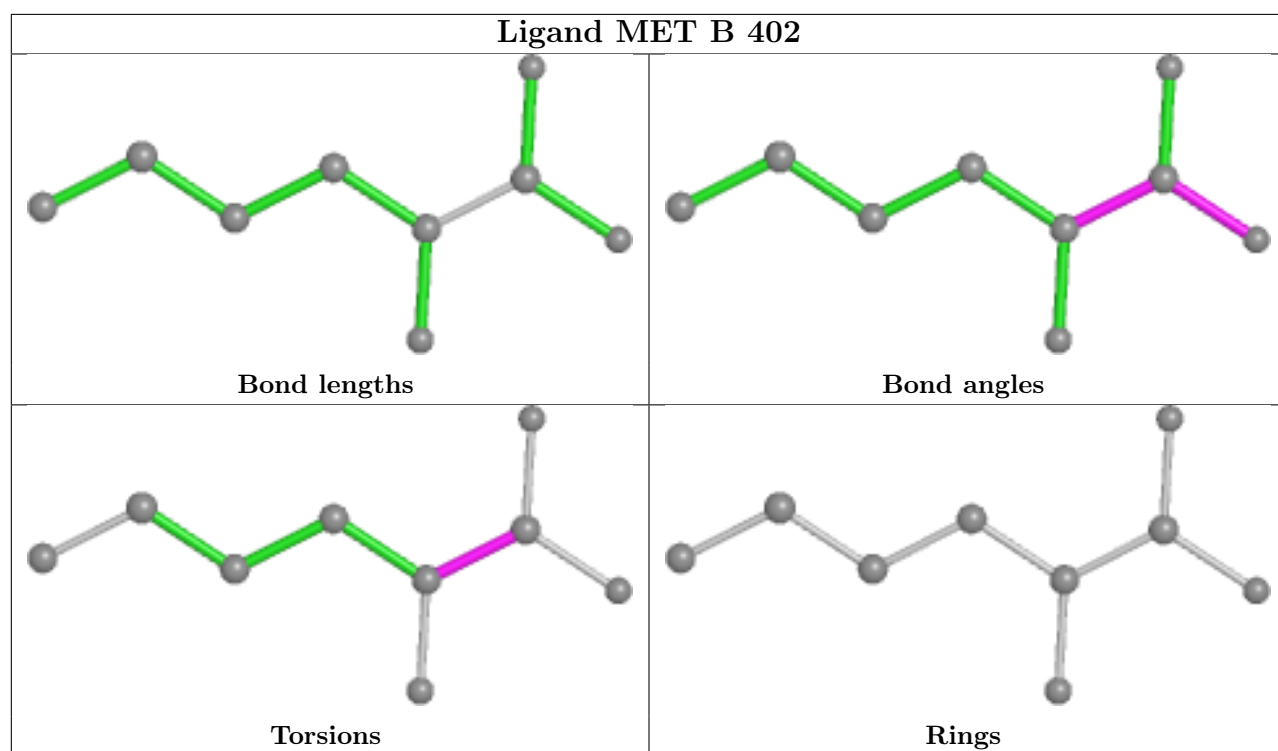
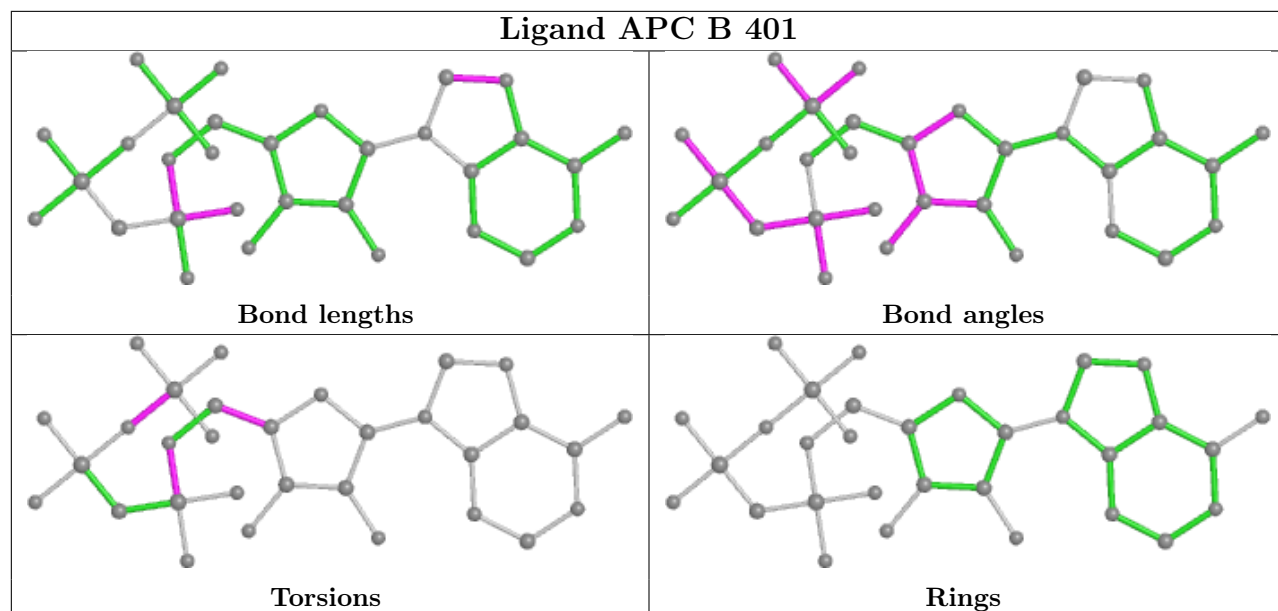
No monomer is involved in short contacts.

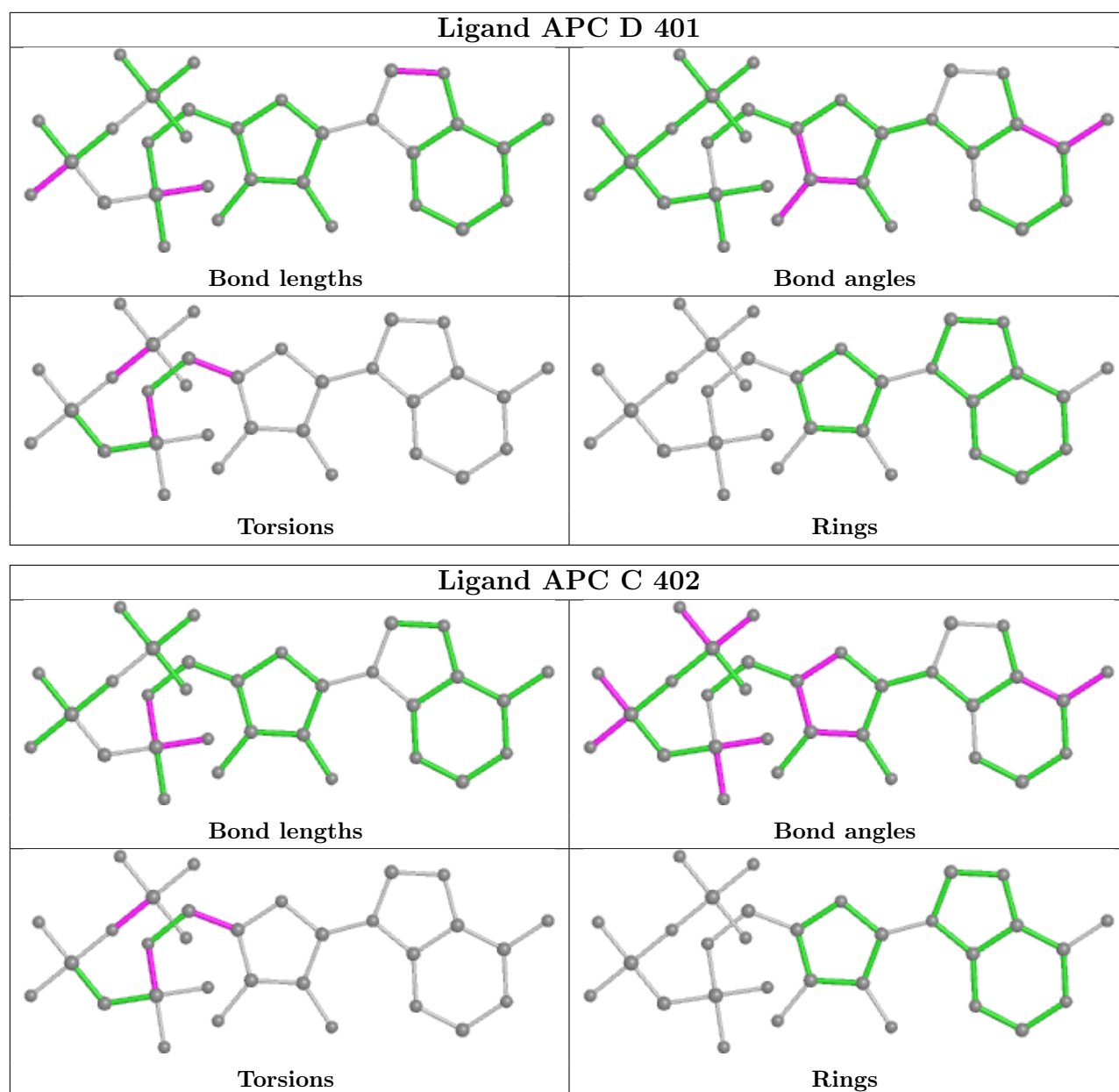
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

5.1 Protein, DNA and RNA chains [i](#)

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

5.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

5.3 Carbohydrates [i](#)

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

5.4 Ligands [i](#)

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

5.5 Other polymers [i](#)

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