W O R L D W I D E
wwPDB
P R O T E I N   D A T A   B A N K

wwPDB X-ray Structure Validation Summary Report ⓘ

Oct 4, 2023 – 06:05 PM EDT

PDB ID	:	6OB0
Title	:	Compound 2 bound structure of WT Lipoprotein Lipase in Complex with GPIHBP1 Mutant N78D N82D produced in HEK293-F cells
Authors	:	Arora, R.; Horton, P.A.; Benson, T.E.; Romanowski, M.J.
Deposited on	:	2019-03-19
Resolution	:	2.81 Å(reported)

The following versions of software and data (see references ⓘ) were used in the production of this report:

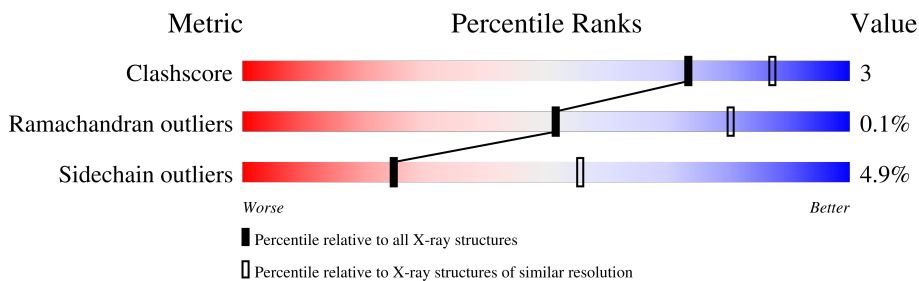|		
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	FAILED
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (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 2.81 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.

Metric	Percentile Ranks	Value
Clashscore		3
Ramachandran outliers		0.1%
Sidechain outliers		4.9%

Worse   *Better*

∎ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	4060 (2.84-2.80)
Ramachandran outliers	138981	3978 (2.84-2.80)
Sidechain outliers	138945	3980 (2.84-2.80)

2 Entity composition ⓘ

There are 8 unique types of molecules in this entry. The entry contains 17194 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 Lipoprotein lipase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	442	Total 3518	C 2236	N 611	O 655	S 16	0	1	0
1	B	442	Total 3511	C 2231	N 609	O 655	S 16	0	0	0
1	C	442	Total 3518	C 2236	N 611	O 655	S 16	0	1	0
1	D	442	Total 3518	C 2236	N 611	O 655	S 16	0	1	0

- Molecule 2 is a protein called Glycosylphosphatidylinositol-anchored high density lipoprotein-binding protein 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	E	83	Total 628	C 378	N 110	O 129	S 11	0	0	0
2	F	81	Total 613	C 367	N 108	O 127	S 11	0	0	0
2	G	81	Total 613	C 367	N 108	O 127	S 11	0	0	0
2	H	81	Total 613	C 367	N 108	O 127	S 11	0	0	0

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	78	ASP	ASN	engineered mutation	UNP Q8IV16
E	82	ASP	ASN	engineered mutation	UNP Q8IV16
F	78	ASP	ASN	engineered mutation	UNP Q8IV16
F	82	ASP	ASN	engineered mutation	UNP Q8IV16
G	78	ASP	ASN	engineered mutation	UNP Q8IV16
G	82	ASP	ASN	engineered mutation	UNP Q8IV16
H	78	ASP	ASN	engineered mutation	UNP Q8IV16
H	82	ASP	ASN	engineered mutation	UNP Q8IV16

- Molecule 3 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total 14	C 8	N 1	O 5	0	0
3	A	1	Total 14	C 8	N 1	O 5	0	0
3	B	1	Total 14	C 8	N 1	O 5	0	0
3	B	1	Total 14	C 8	N 1	O 5	0	0
3	C	1	Total 14	C 8	N 1	O 5	0	0
3	C	1	Total 14	C 8	N 1	O 5	0	0
3	D	1	Total 14	C 8	N 1	O 5	0	0
3	D	1	Total 14	C 8	N 1	O 5	0	0

- Molecule 4 is 7-(3-cyano-4-hydroxyphenyl)-N-[2-(morpholin-4-yl)ethyl]dibenzo[b,f]oxepine-10-carboxamide (three-letter code: M3D) (formula: $C_{28}H_{25}N_3O_4$) (labeled as "Ligand of Interest" by depositor).
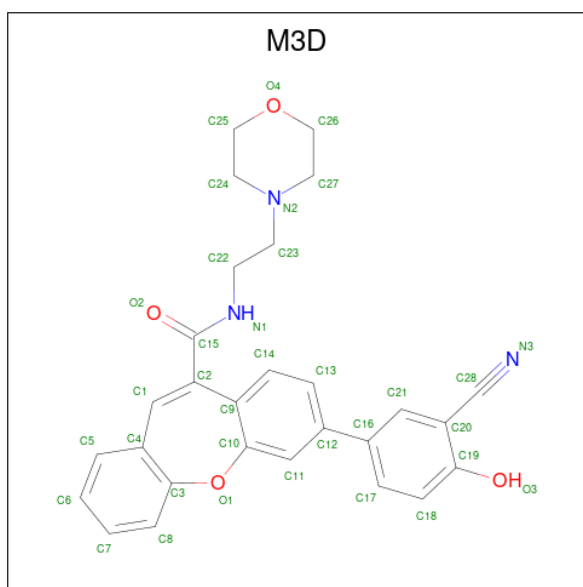
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			35	28	3	4		
4	A	1	Total	C	N	O	0	0
			35	28	3	4		
4	B	1	Total	C	N	O	0	0
			35	28	3	4		
4	B	1	Total	C	N	O	0	0
			35	28	3	4		
4	C	1	Total	C	N	O	0	0
			35	28	3	4		
4	C	1	Total	C	N	O	0	0
			35	28	3	4		
4	D	1	Total	C	N	O	0	0
			35	28	3	4		
4	D	1	Total	C	N	O	0	0
			35	28	3	4		

- Molecule 5 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: $C_2H_6O_2$).

EDO

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

- Molecule 6 is CALCIUM ION (three-letter code: CA) (formula: Ca).

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

- Molecule 7 is 2-AMINO-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (three-letter code: TRS) (formula: $C_4H_{12}NO_3$).
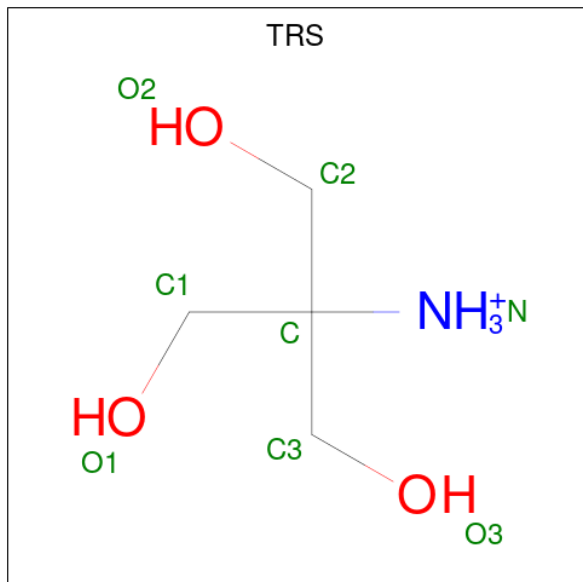
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	B	1	Total	C	N	O	0	0
			8	4	1	3		

- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	63	Total	O	0	0
			63	63		
8	B	50	Total	O	0	0
			50	50		
8	C	48	Total	O	0	0
			48	48		
8	D	58	Total	O	0	0
			58	58		
8	E	2	Total	O	0	0
			2	2		
8	F	2	Total	O	0	0
			2	2		
8	G	2	Total	O	0	0
			2	2		
8	H	1	Total	O	0	0
			1	1		

SEQUENCE-PLOTS INFOmissingINFO

3 Data and refinement statistics ⓘ

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

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α, β, γ	153.43Å 191.42Å 97.18Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	37.15 – 2.81	Depositor
% Data completeness (in resolution range)	99.1 (37.15-2.81)	Depositor
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$<I/\sigma(I)>$ [1]	2.45 (at 2.82Å)	Xtriage
Refinement program	BUSTER 2.11.7	Depositor
R, R_{free}	0.198 , 0.233	Depositor
Wilson B-factor (Å^2)	57.8	Xtriage
Anisotropy	0.722	Xtriage
L-test for twinning[2]	$<\|L\|> = 0.51$, $<L^2> = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	17194	wwPDB-VP
Average B, all atoms (Å^2)	67.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 39.88 % 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 2.9706e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $<\|L\|>$, $<L^2>$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

4 Model quality ⓘ

4.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: CA, TRS, EDO, M3D, NAG

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 $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#$|Z|$ >5	RMSZ	#$|Z|$ >5
1	A	0.52	0/3611	0.70	0/4889
1	B	0.52	0/3600	0.69	0/4874
1	C	0.52	0/3611	0.69	0/4889
1	D	0.52	0/3611	0.68	0/4889
2	E	0.47	0/639	0.71	0/873
2	F	0.49	0/624	0.66	0/852
2	G	0.50	0/624	0.70	0/852
2	H	0.48	0/624	0.70	0/852
All	All	0.51	0/16944	0.69	0/22970

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

4.2 Too-close contacts ⓘ

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3518	0	3438	20	0
1	B	3511	0	3431	24	0
1	C	3518	0	3438	23	0
1	D	3518	0	3438	21	0
2	E	628	0	593	7	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	F	613	0	573	12	0
2	G	613	0	573	9	0
2	H	613	0	573	6	0
3	A	28	0	26	0	0
3	B	28	0	26	0	0
3	C	28	0	26	0	0
3	D	28	0	26	0	0
4	A	70	0	0	0	0
4	B	70	0	0	1	0
4	C	70	0	0	1	0
4	D	70	0	0	1	0
5	A	8	0	12	1	0
5	B	8	0	12	2	0
5	C	8	0	12	3	0
5	D	8	0	12	2	0
6	A	1	0	0	0	0
6	B	1	0	0	0	0
6	C	1	0	0	0	0
6	D	1	0	0	0	0
7	B	8	0	12	0	0
8	A	63	0	0	0	0
8	B	50	0	0	0	0
8	C	48	0	0	0	0
8	D	58	0	0	0	0
8	E	2	0	0	0	0
8	F	2	0	0	0	0
8	G	2	0	0	0	0
8	H	1	0	0	0	0
All	All	17194	0	16221	111	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 3.

The worst 5 of 111 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:80:HIS:HB2	5:B:505:EDO:H21	1.62	0.80
1:D:467:ASP:HB2	2:H:109:TRP:HE1	1.51	0.75
1:B:467:ASP:HB2	2:F:109:TRP:HE1	1.55	0.70
2:H:72:PRO:HD2	2:H:75:GLU:HB2	1.75	0.68
1:D:80:HIS:HB2	5:D:505:EDO:H12	1.77	0.66

There are no symmetry-related clashes.

4.3 Torsion angles ⓘ

4.3.1 Protein backbone ⓘ

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	441/448 (98%)	423 (96%)	17 (4%)	1 (0%)	47	76
1	B	440/448 (98%)	420 (96%)	20 (4%)	0	100	100
1	C	441/448 (98%)	423 (96%)	18 (4%)	0	100	100
1	D	441/448 (98%)	419 (95%)	22 (5%)	0	100	100
2	E	81/131 (62%)	73 (90%)	7 (9%)	1 (1%)	13	37
2	F	79/131 (60%)	71 (90%)	8 (10%)	0	100	100
2	G	79/131 (60%)	68 (86%)	10 (13%)	1 (1%)	12	34
2	H	79/131 (60%)	73 (92%)	6 (8%)	0	100	100
All	All	2081/2316 (90%)	1970 (95%)	108 (5%)	3 (0%)	51	80

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	31	ARG
2	G	137	ASN
2	E	70	SER

4.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	386/389 (99%)	368 (95%)	18 (5%)	26	57
1	B	385/389 (99%)	371 (96%)	14 (4%)	35	67
1	C	386/389 (99%)	371 (96%)	15 (4%)	32	64
1	D	386/389 (99%)	367 (95%)	19 (5%)	25	55
2	E	78/122 (64%)	73 (94%)	5 (6%)	17	44
2	F	76/122 (62%)	69 (91%)	7 (9%)	9	26
2	G	76/122 (62%)	69 (91%)	7 (9%)	9	26
2	H	76/122 (62%)	71 (93%)	5 (7%)	16	42
All	All	1849/2044 (90%)	1759 (95%)	90 (5%)	25	55

5 of 90 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	250	ARG
2	F	82	ASP
1	D	254	GLU
1	D	450	VAL
2	F	117	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 14 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	429	GLN
1	D	177	ASN
2	H	106	HIS
2	E	142	GLN
2	F	125	GLN

4.3.3　RNA ⓘ

There are no RNA molecules in this entry.

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 29 ligands modelled in this entry, 4 are monoatomic - leaving 25 for Mogul analysis.

There are no bond length outliers.
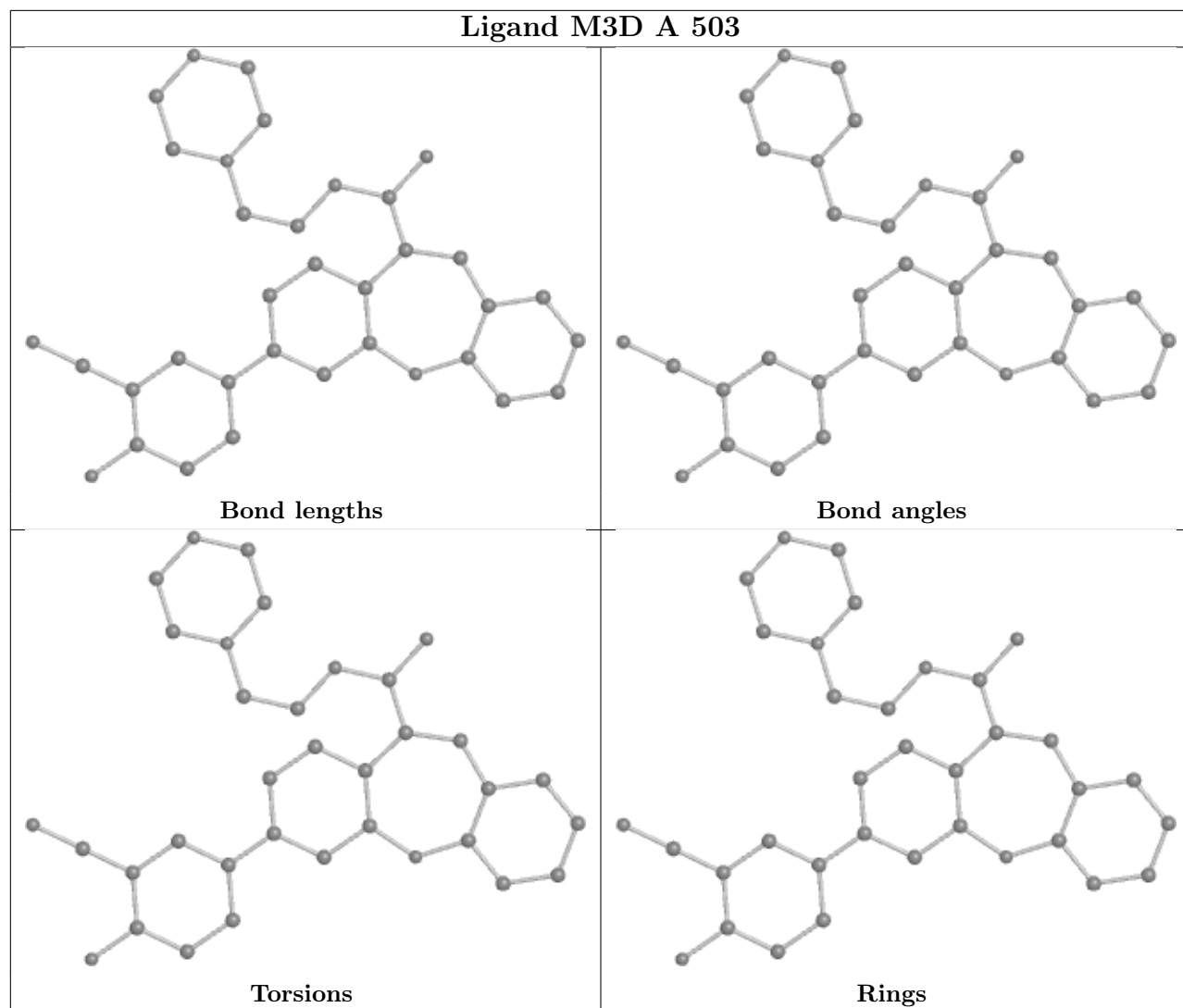
There are no bond angle outliers.
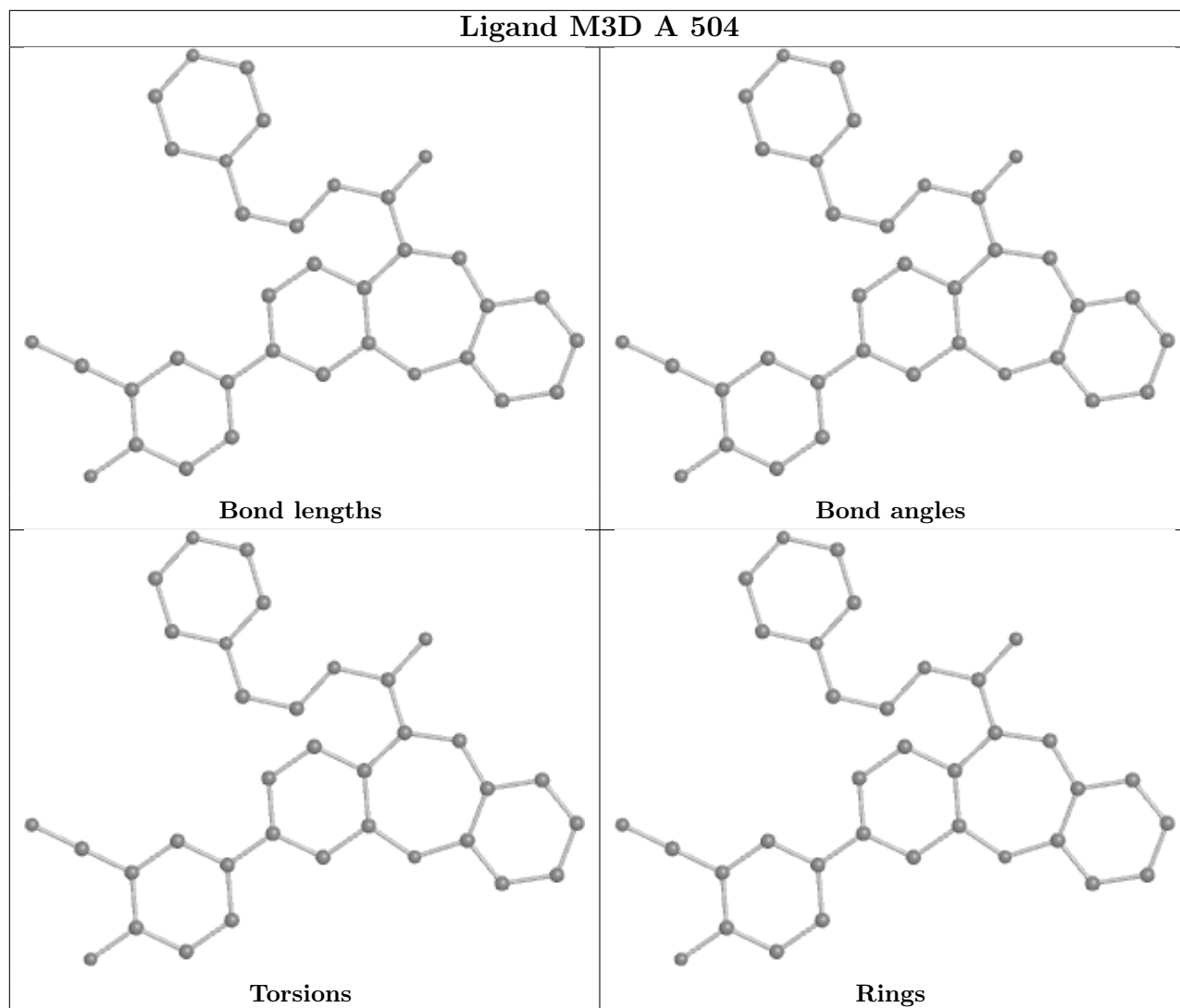
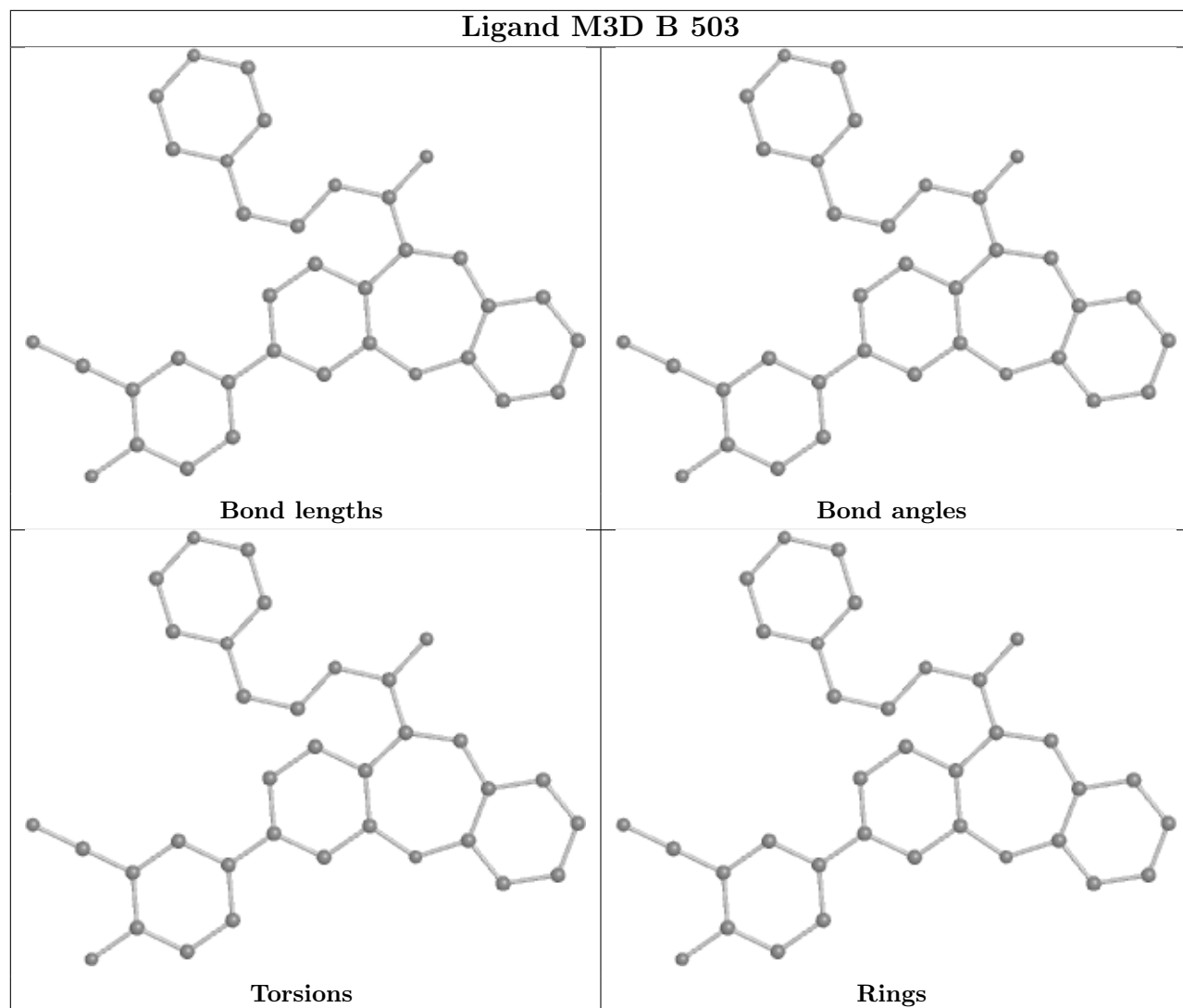There are no chirality outliers.

There are no torsion outliers.

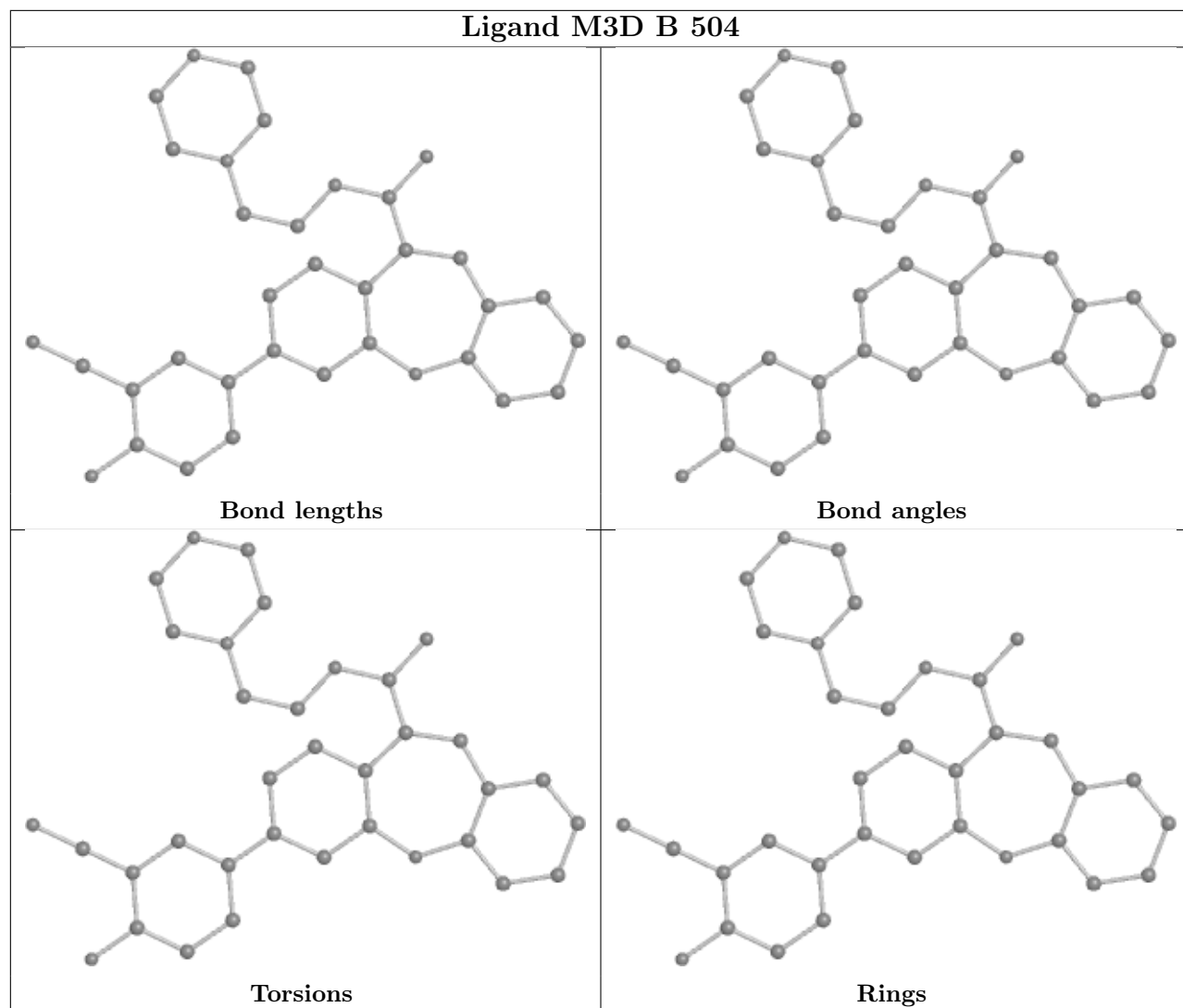There are no ring outliers.

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.
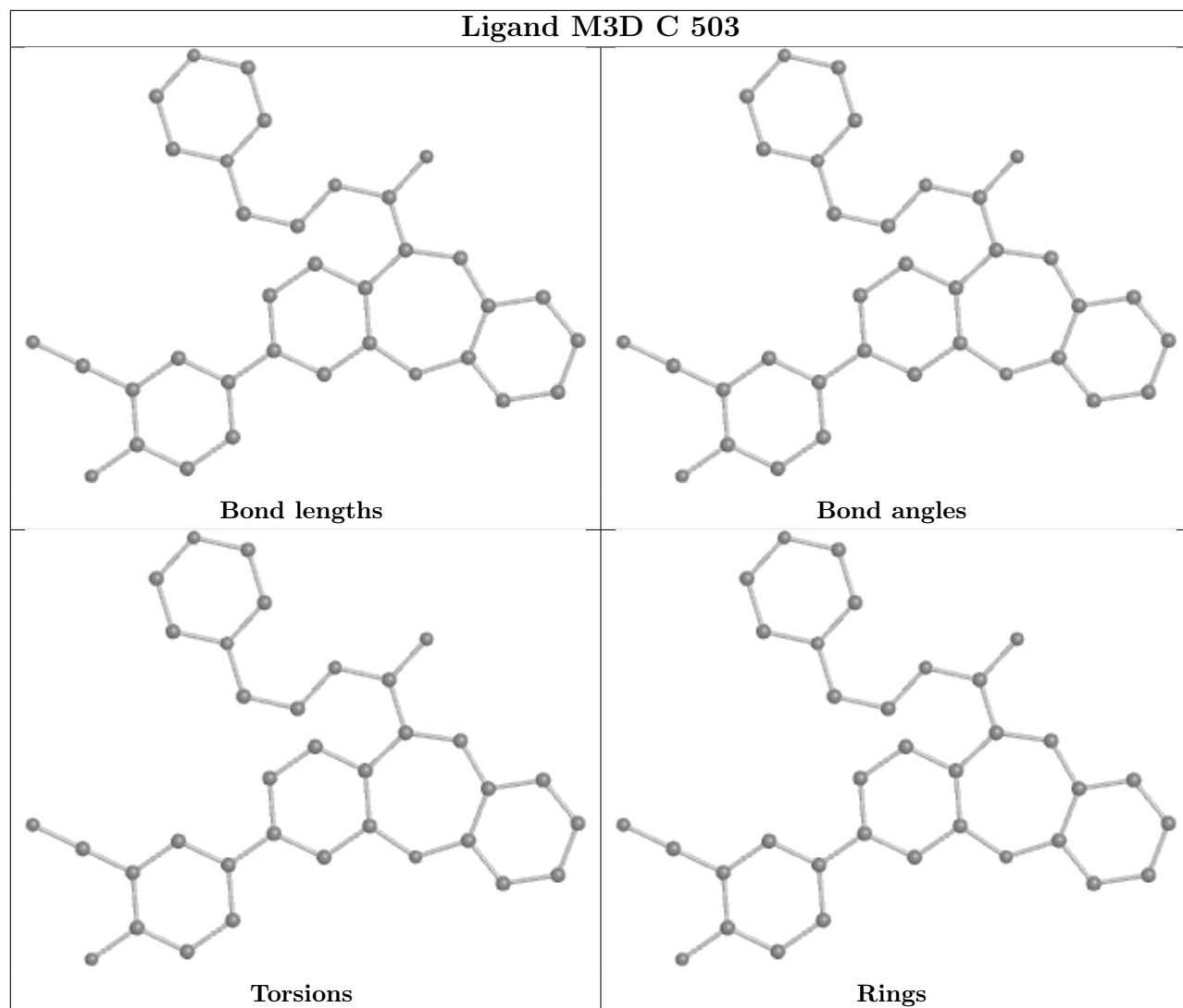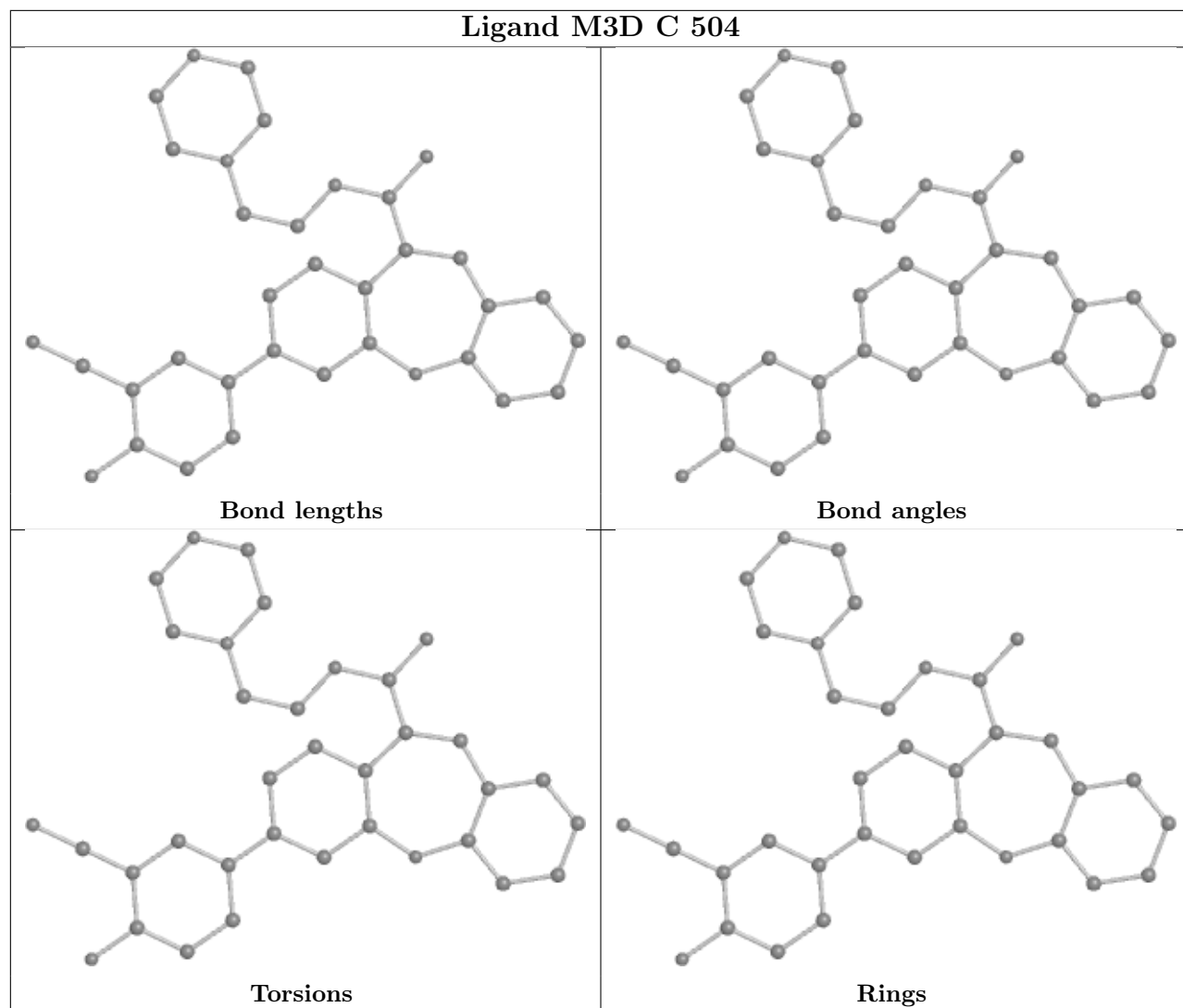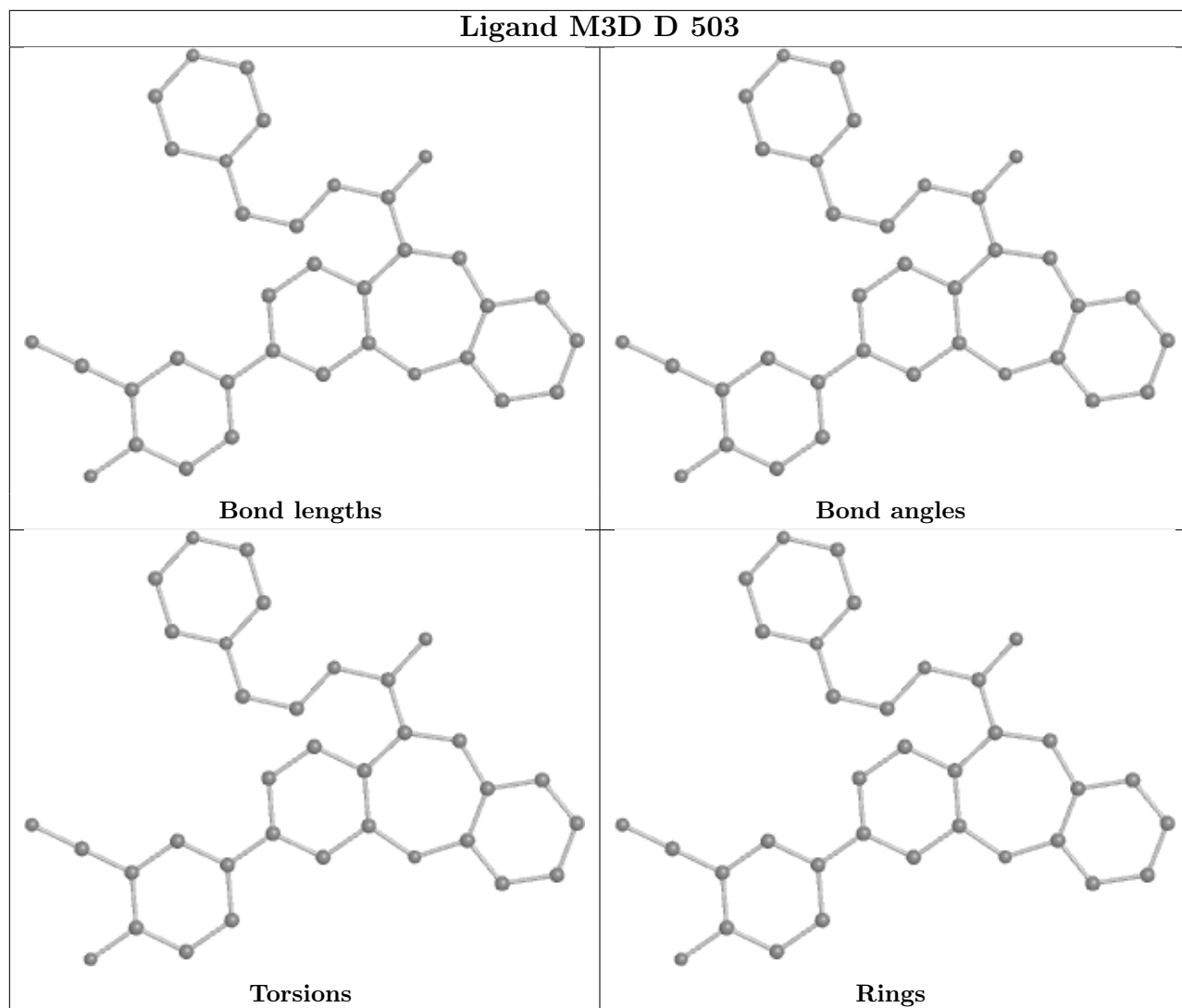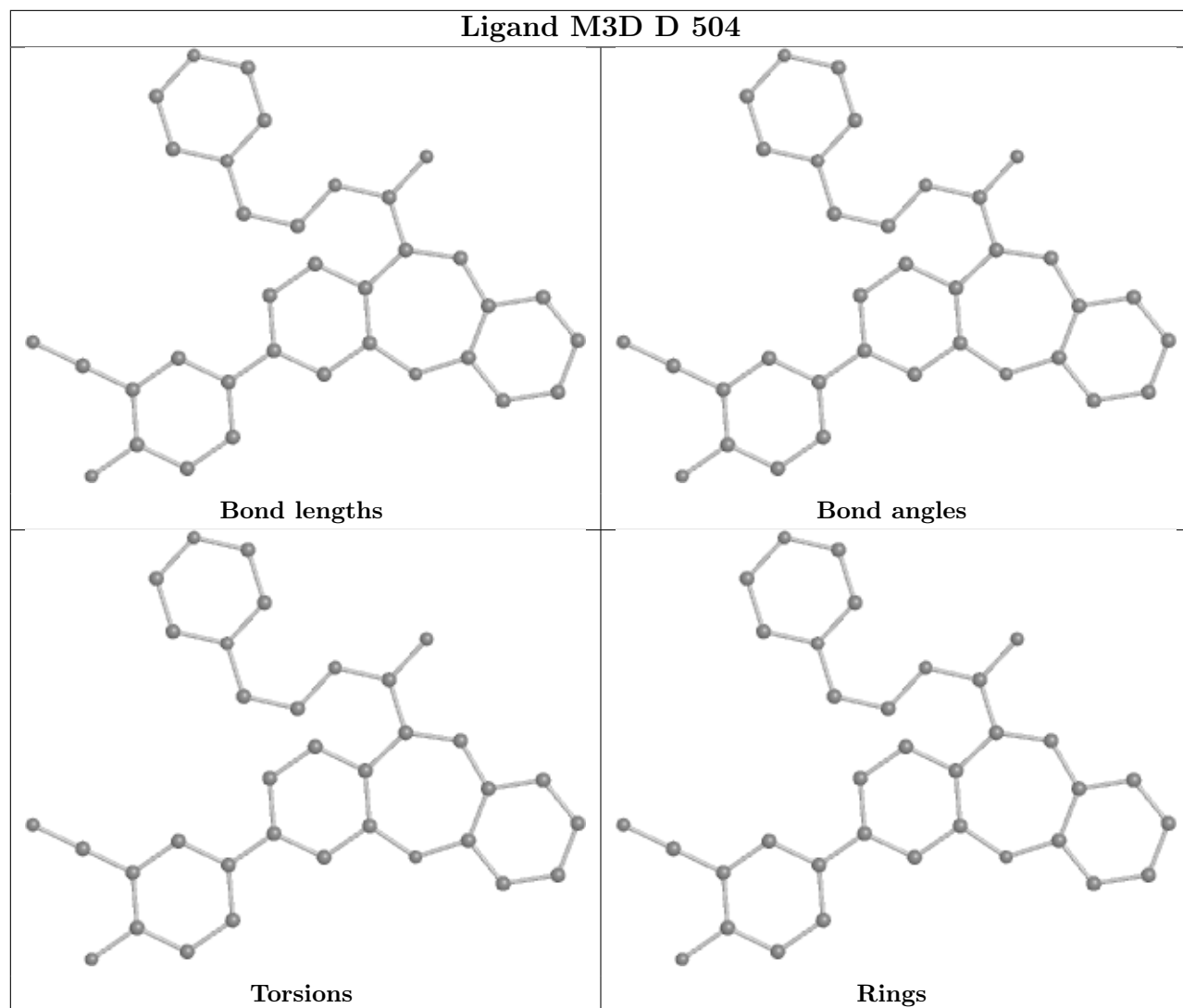
Ligand M3D A 503

Bond lengths

Bond angles

Torsions

Rings

Ligand M3D A 504

Bond lengths

Bond angles

Torsions

Rings

Ligand M3D B 503

Bond lengths

Bond angles

Torsions

Rings

Ligand M3D B 504

Bond lengths

Bond angles

Torsions

Rings

Ligand M3D C 503

Bond lengths

Bond angles

Torsions

Rings

Ligand M3D C 504

Bond lengths

Bond angles

Torsions

Rings

Ligand M3D D 503

Bond lengths

Bond angles

Torsions

Rings

Ligand M3D D 504

Bond lengths

Bond angles

Torsions

Rings

4.7 Other polymers ⓘ

There are no such residues in this entry.

4.8 Polymer linkage issues ⓘ

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.