WORLDWIDE wwPDB
PROTEIN DATA BANK

wwPDB EM Validation Summary Report (i)

Nov 20, 2022 – 09:07 AM EST

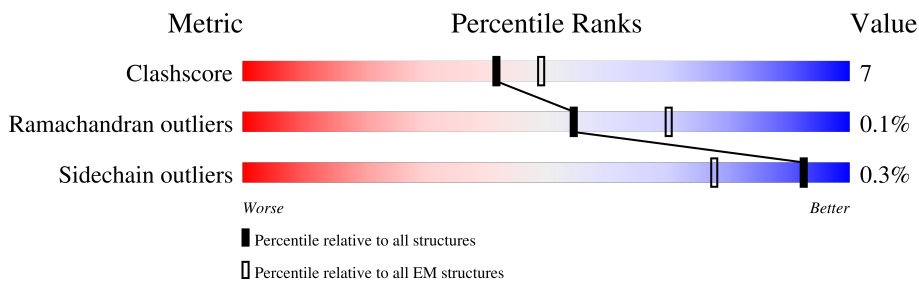|		
PDB ID	:	7MBR
EMDB ID	:	EMD-23744
Title	:	Cryo-EM structure of zebrafish TRPM5 in the presence of 6 uM calcium (apo state)
Authors	:	Ruan, Z.; Lu, W.; Du, J.; Haley, E.
Deposited on	:	2021-04-01
Resolution	:	Not provided

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1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is unknown.

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		7
Ramachandran outliers		0.1%
Sidechain outliers		0.3%

Worse   *Better*

▮ Percentile relative to all structures

▯ Percentile relative to all EM structures

Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5%

| Mol	Chain	Length	Quality of chain
1	A	1165	71% 15% 15%
1	B	1165	71% 15% 15%
1	C	1165	71% 15% 15%
1	D	1165	71% 14% 15%

2   Entry composition ⓘ

There are 4 unique types of molecules in this entry. The entry contains 30708 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 Transient receptor potential melastatin 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	996	Total	C	N	O	S	0	0
			7574	4963	1296	1271	44		
1	B	996	Total	C	N	O	S	0	0
			7574	4963	1296	1271	44		
1	C	996	Total	C	N	O	S	0	0
			7574	4963	1296	1271	44		
1	D	996	Total	C	N	O	S	0	0
			7574	4963	1296	1271	44		

- Molecule 2 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$) (labeled as "Ligand of Interest" by depositor).
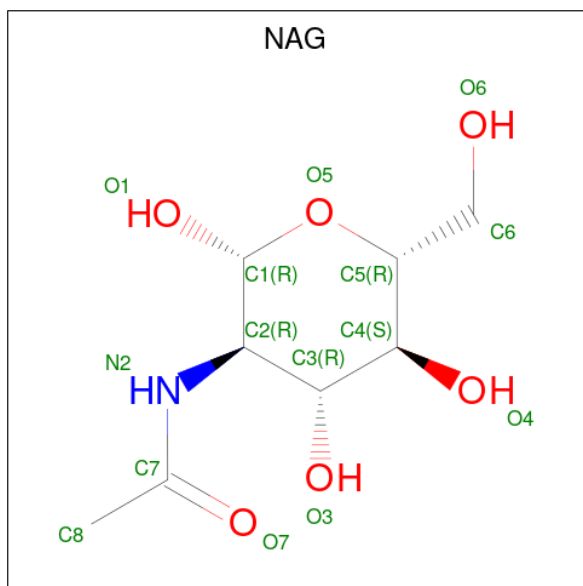
Mol	Chain	Residues	Atoms				AltConf
2	A	1	Total	C	N	O	0
			14	8	1	5	
2	B	1	Total	C	N	O	0
			14	8	1	5	

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Mol	Chain	Residues	Atoms				AltConf
2	C	1	Total	C	N	O	0
			14	8	1	5	
2	D	1	Total	C	N	O	0
			14	8	1	5	

- Molecule 3 is (25R)-14beta,17beta-spirost-5-en-3beta-ol (three-letter code: YUV) (formula: $C_{27}H_{42}O_3$) (labeled as "Ligand of Interest" by depositor).

YUV
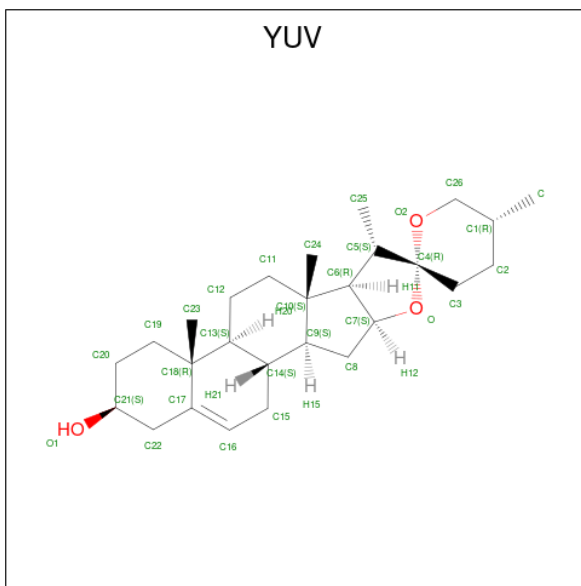
Mol	Chain	Residues	Atoms			AltConf
3	A	1	Total	C	O	0
			30	27	3	
3	B	1	Total	C	O	0
			30	27	3	
3	C	1	Total	C	O	0
			30	27	3	
3	D	1	Total	C	O	0
			30	27	3	

- Molecule 4 is (2R)-2-(hydroxymethyl)-4-{[(25R)-10alpha,14beta,17beta-spirost-5-en-3beta-yl]oxy}butyl 4-O-alpha-D-glucopyranosyl-beta-D-glucopyranoside (three-letter code: YUY) (formula: $C_{44}H_{72}O_{15}$) (labeled as "Ligand of Interest" by depositor).
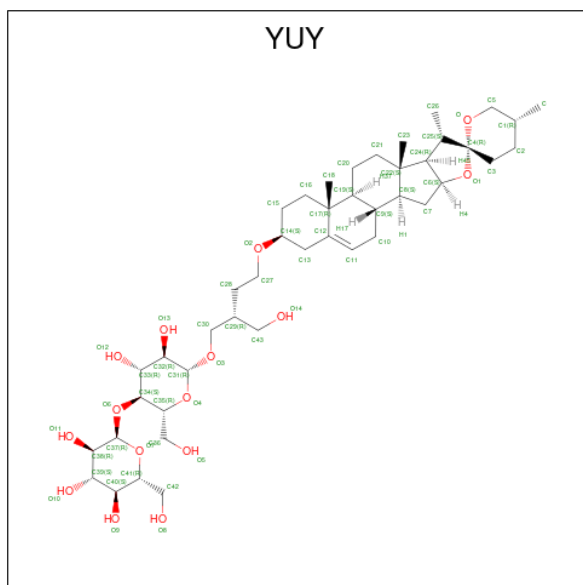
Mol	Chain	Residues	Atoms			AltConf
4	A	1	Total	C	O	0
			59	44	15	
4	B	1	Total	C	O	0
			59	44	15	
4	C	1	Total	C	O	0
			59	44	15	
4	D	1	Total	C	O	0
			59	44	15	

3   Residue-property plots ⓘ

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in 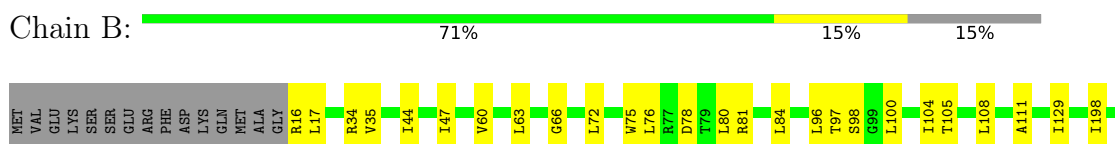geometry. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: Transient receptor potential melastatin 5

Chain A: 71%   15%   15%

• Molecule 1: Transient receptor potential melastatin 5

Chain B: 71%   15%   15%

• Molecule 1: Transient receptor potential melastatin 5

Chain C:

VAL ARG TYR CYS GLU GLY VAL LEU SER TRP ILE ALA GLU GLY CYS PHE HIS LYS SER THR LEU LYS CYS ASP ARG ASP ALA PRO LYS ALA PRO ARG SER ILE ALA GLY SER SER ARG ASP GLN GLN PRO GLN GLY ALA LYS ARG GLN GLN PRO GLY GLY HIS PRO ALA TYR THR ASP LYS

LYS LEU PRO PHE ILE ASP HIS

• Molecule 1: Transient receptor potential melastatin 5

Chain D:

71%   14%   15%

MET VAL GLU LYS SER SER GLU ARG PHE ASP LYS GLN MET ALA GLY R16 L17 R34 V35 I44 I47 V60 L63 G66 L72 W75 L76 R77 D78 T79 L80 R81 L84 L96 T97 S98 G99 L100 I104 T105 L108 A111 I129 I198

Q201 R202 S210 I213 L216 C217 L218 L219 V220 H221 G222 E223 I226 L227 I234 L241 I242 L243 G248 V249 A250 D251 V254 L271 W287 I294 D313 T314 D348 L374 D387 T397 E410 L414 H415 K421 L429 ALA ARG LYS

ARG MET SER GLY ASN PRO ASN ASN GLU LEU GLY ASP ARG K446 K459 D463 L473 PRO ALA GLU ARG MET GLY LYS GLY ARG LEU PHE HIS SER GLN LYS N489 R496 R502 L510 R513 Q514 E515 M516 A517 F520 G524 G534 C535 K536 I537 M538 A542

K555 Y559 L566 Y571 E575 C588 T593 V594 L595 A601 L616 V619 R625 T626 D627 V634 E653 GLU GLN VAL SER LYS ASP GLU GLY GLU PRO PHE ALA GLU LEU ASP SER LEU GLU THR GLU GLN ALA LEU LEU LEU THR ASP ASP GLY ASP PRO

VAL ALA GLY GLU GLY SER ALA GLU THR ALA ALA ARG SER CYS S698 T718 M721 F728 A729 F730 L738 P744 P745 P746 P747 Y748 G749 P750 F759 W760 T763 D797 R811 T822 A825 L826 M829 V830 R834 L835 I841 H842 K843 Q844 L845

I849 I850 I851 R854 M855 V859 F862 I871 A872 Y873 G874 L880 L881 P886 R887 V891 A895 L896 Y900 L901 H902 I903 P908 E911 A914 M917 N921 C922 V926 I929 L934 C937 N943 V951 L955 V956 T957 L960

L965 Y971 V975 V976 W984 Y989 N990 L991 L1001 P1004 F1005 I1006 S1009 K1020 LYS THR GLU ASN THR GLN D1027 L1028 W1044 Q1048 K1049 E1062 R1067 K1074 L1079 M1092 ALA THR VAL GLU THR GLU VAL ARG TYR CYS GLY GLU VAL LEU

SER TRP ILE ALA GLU CYS PHE HIS LYS LYS SER THR LEU LYS CYS ASP ARG ASP ALA PRO LYS ALA PRO ARG SER ILE ALA GLY SER SER ARG ASP GLN GLN PRO GLN GLY ALA LYS ARG GLN GLN GLN PRO GLY GLY HIS PRO ALA TYR THR ASP LYS LYS LEU PRO PHE ILE ASP HIS

4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	32000	Depositor
Resolution determination method	Not provided	
CTF correction method	PHASE FLIPPING ONLY	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose $(e^-/\text{Å}^2)$	49.6	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor

5   Model quality ⓘ

5.1   Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: NAG, YUV, YUY

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	0.25	0/7763	0.44	0/10588
1	B	0.25	0/7763	0.44	0/10588
1	C	0.25	0/7763	0.44	0/10588
1	D	0.25	0/7763	0.44	0/10588
All	All	0.25	0/31052	0.44	0/42352

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2   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	7574	0	7394	119	0
1	B	7574	0	7394	116	0
1	C	7574	0	7394	118	0
1	D	7574	0	7394	114	0
2	A	14	0	13	0	0
2	B	14	0	13	0	0
2	C	14	0	13	0	0
2	D	14	0	13	0	0
3	A	30	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	30	0	0	0	0
3	C	30	0	0	0	0
3	D	30	0	0	0	0
4	A	59	0	0	1	0
4	B	59	0	0	1	0
4	C	59	0	0	1	0
4	D	59	0	0	1	0
All	All	30708	0	29628	438	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 7.

The worst 5 of 438 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:760:TRP:CZ3	1:B:1004:PRO:HD3	1.77	1.19
1:D:760:TRP:CZ3	1:D:1004:PRO:HD3	1.77	1.19
1:A:760:TRP:CZ3	1:A:1004:PRO:HD3	1.77	1.18
1:C:760:TRP:CZ3	1:C:1004:PRO:HD3	1.77	1.16
1:A:760:TRP:CZ3	1:A:1004:PRO:CD	2.58	0.86

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 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 PDB entries followed by that with respect to all EM entries.

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	986/1165 (85%)	958 (97%)	27 (3%)	1 (0%)	51	51
1	B	986/1165 (85%)	958 (97%)	27 (3%)	1 (0%)	51	51
1	C	986/1165 (85%)	958 (97%)	27 (3%)	1 (0%)	51	51
1	D	986/1165 (85%)	957 (97%)	28 (3%)	1 (0%)	51	51

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	3944/4660 (85%)	3831 (97%)	109 (3%)	4 (0%)	54	51

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1006	ILE
1	B	1006	ILE
1	C	1006	ILE
1	D	1006	ILE

5.3.2 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 PDB entries followed by that with respect to all EM entries.

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	743/1018 (73%)	741 (100%)	2 (0%)	92	92
1	B	743/1018 (73%)	741 (100%)	2 (0%)	92	92
1	C	743/1018 (73%)	741 (100%)	2 (0%)	92	92
1	D	743/1018 (73%)	741 (100%)	2 (0%)	92	92
All	All	2972/4072 (73%)	2964 (100%)	8 (0%)	92	92

5 of 8 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	D	921	ASN
1	D	811	ARG
1	C	811	ARG
1	B	921	ASN
1	C	921	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 15 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	514	GLN

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Mol	Chain	Res	Type
1	D	943	ASN
1	C	794	ASN
1	D	1010	HIS
1	D	514	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

12 ligands are modelled in this entry.

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	NAG	B	1501	1	14,14,15	0.30	0	17,19,21	0.73	0
3	YUV	A	1502	-	35,35,35	0.12	0	58,58,58	0.18	0
4	YUY	C	1503	-	66,66,66	0.13	0	100,102,102	0.21	0
3	YUV	B	1502	-	35,35,35	0.12	0	58,58,58	0.19	0
2	NAG	C	1501	1	14,14,15	0.31	0	17,19,21	0.74	0
3	YUV	D	3003	-	35,35,35	0.13	0	58,58,58	0.18	0
4	YUY	D	3001	-	66,66,66	0.13	0	100,102,102	0.21	0
2	NAG	D	3002	1	14,14,15	0.31	0	17,19,21	0.73	0
4	YUY	B	1503	-	66,66,66	0.13	0	100,102,102	0.21	0
3	YUV	C	1502	-	35,35,35	0.11	0	58,58,58	0.19	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\lvert Z \rvert > 2$	Counts	RMSZ	$\#\lvert Z \rvert > 2$
2	NAG	A	1501	1	14,14,15	0.29	0	17,19,21	0.75	0
4	YUY	A	1503	-	66,66,66	0.13	0	100,102,102	0.21	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
2	NAG	B	1501	1	-	1/6/23/26	0/1/1/1
3	YUV	A	1502	-	-	-	0/6/6/6
4	YUY	C	1503	-	-	16/21/149/149	0/8/8/8
3	YUV	B	1502	-	-	-	0/6/6/6
2	NAG	C	1501	1	-	1/6/23/26	0/1/1/1
4	YUY	D	3001	-	-	16/21/149/149	0/8/8/8
3	YUV	D	3003	-	-	-	0/6/6/6
2	NAG	D	3002	1	-	1/6/23/26	0/1/1/1
4	YUY	B	1503	-	-	16/21/149/149	0/8/8/8
3	YUV	C	1502	-	-	-	0/6/6/6
2	NAG	A	1501	1	-	1/6/23/26	0/1/1/1
4	YUY	A	1503	-	-	16/21/149/149	0/8/8/8

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 68 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	1503	YUY	C43-C29-C30-O3
4	A	1503	YUY	C28-C29-C43-O14
4	B	1503	YUY	C43-C29-C30-O3
4	B	1503	YUY	C28-C29-C43-O14
4	C	1503	YUY	C43-C29-C30-O3

There are no ring outliers.
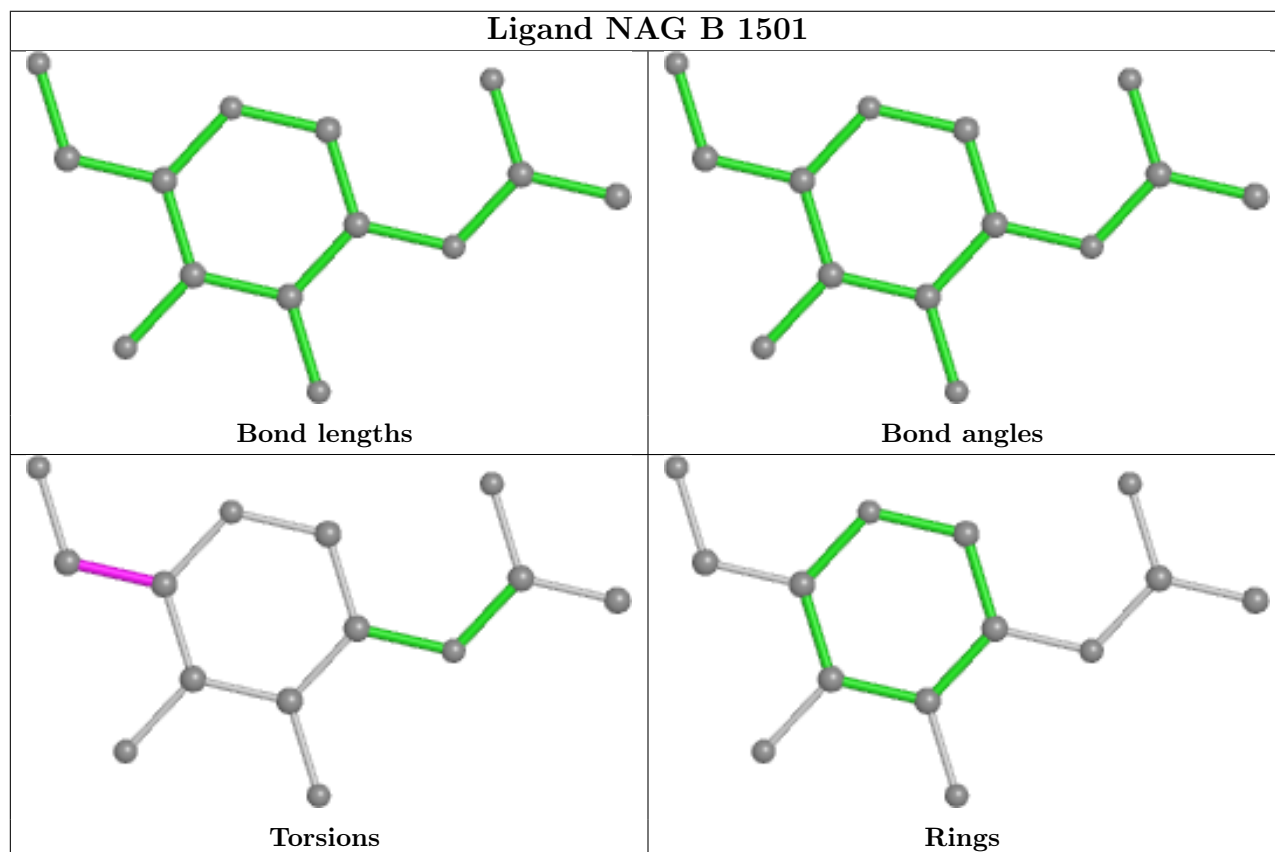
4 monomers are involved in 4 short contacts:

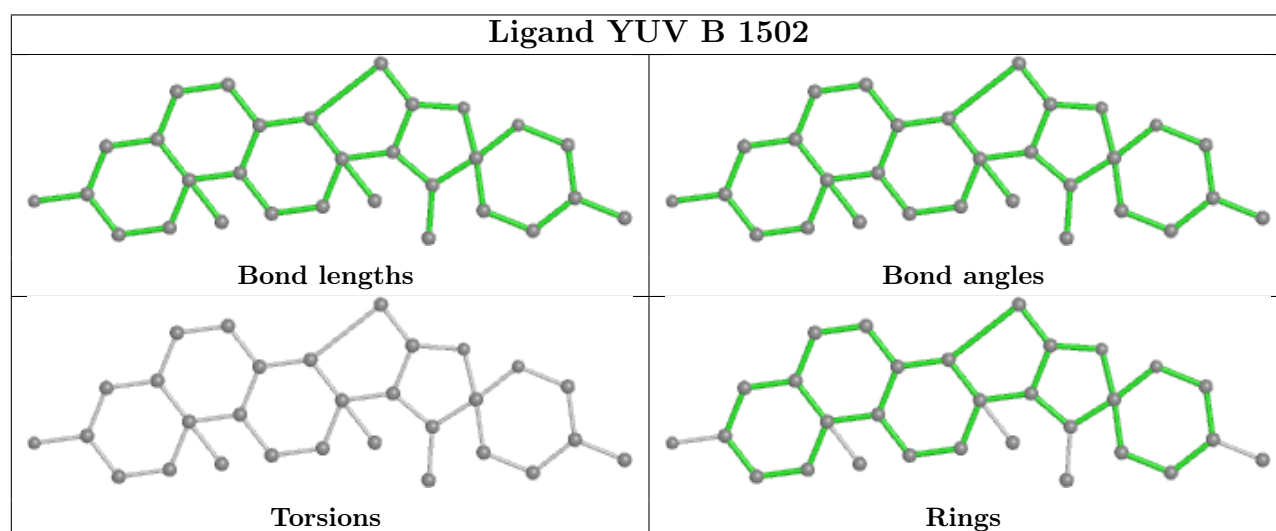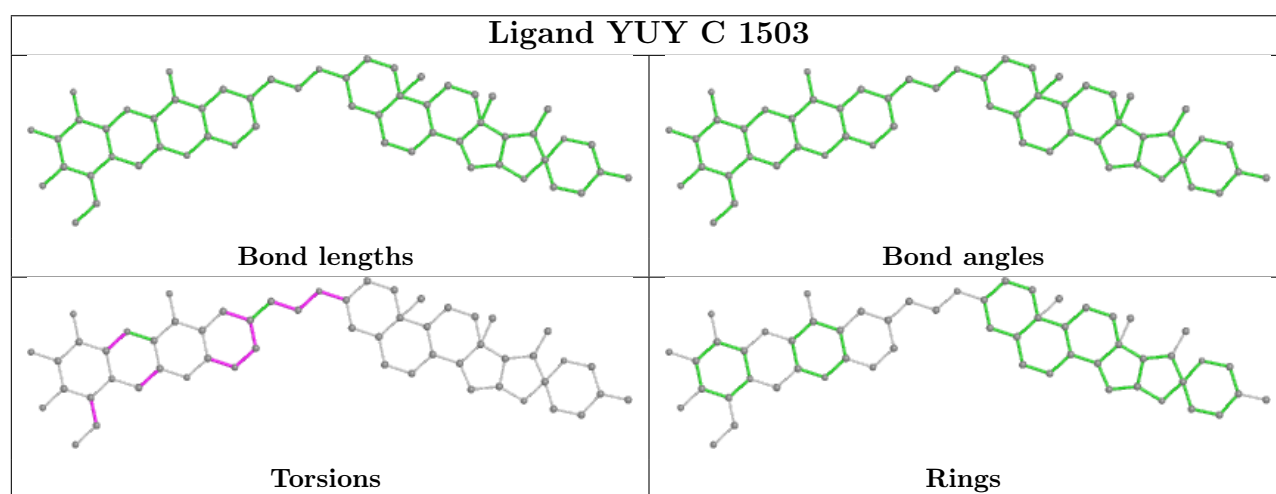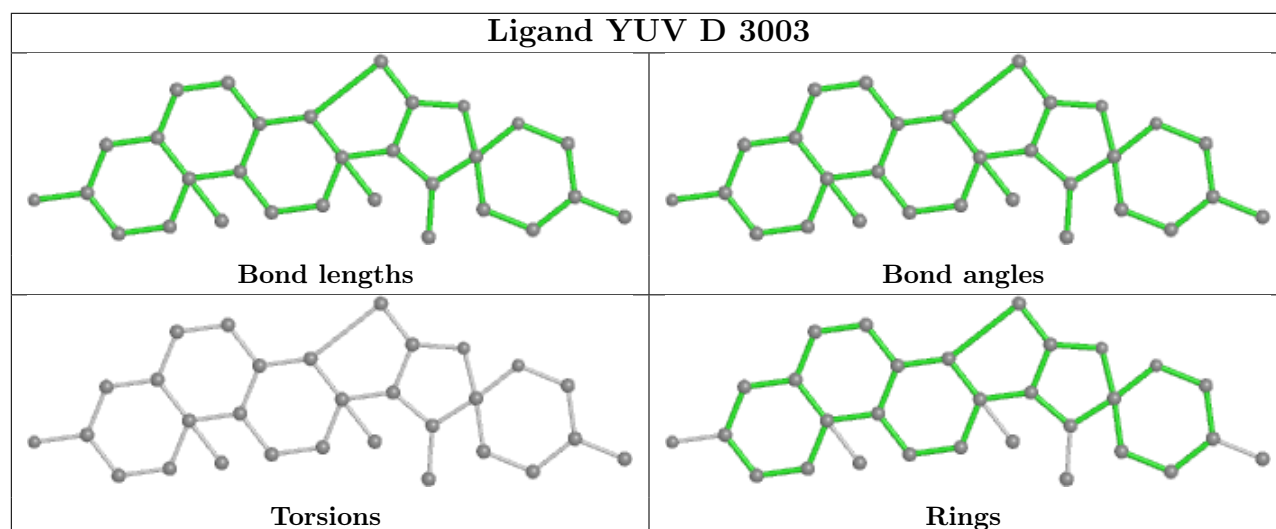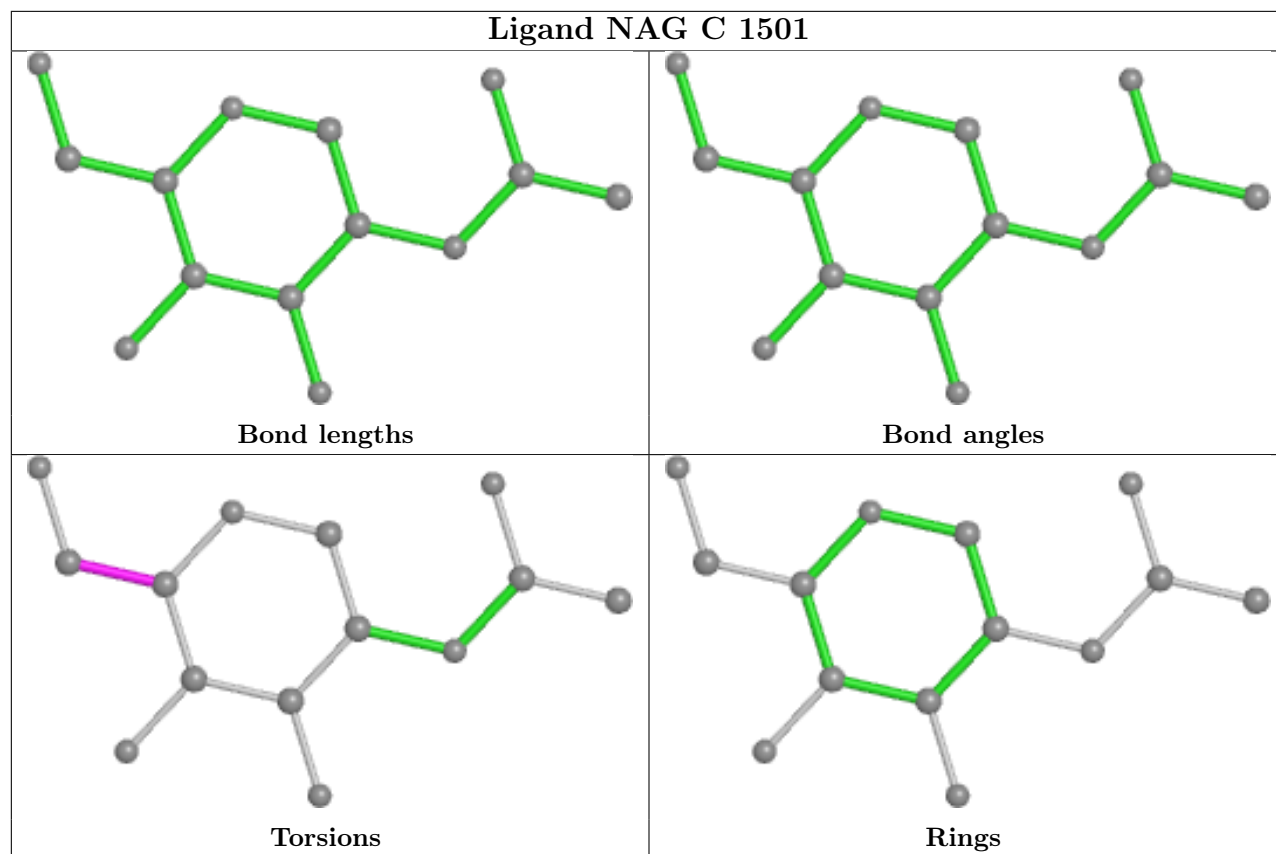| Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	C	1503	YUY	1	0
4	D	3001	YUY	1	0

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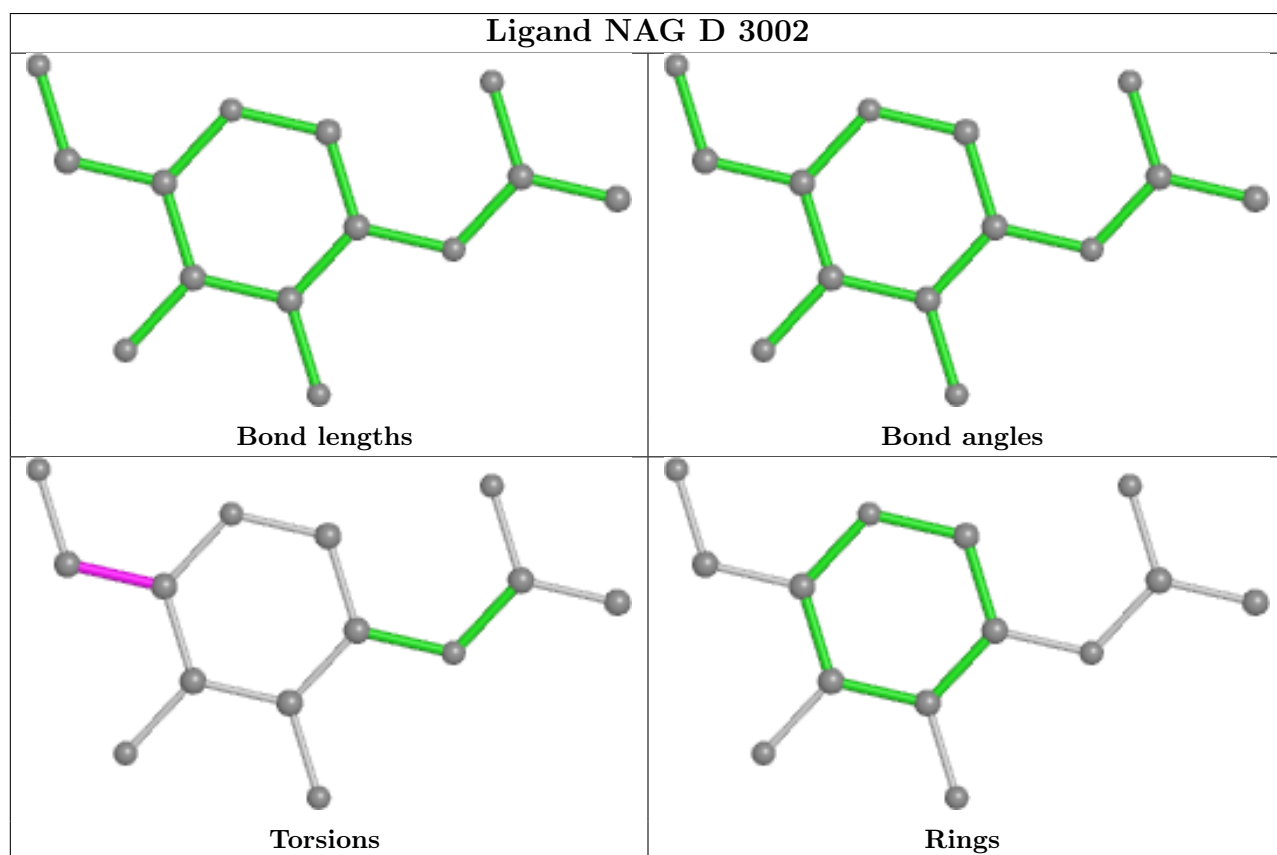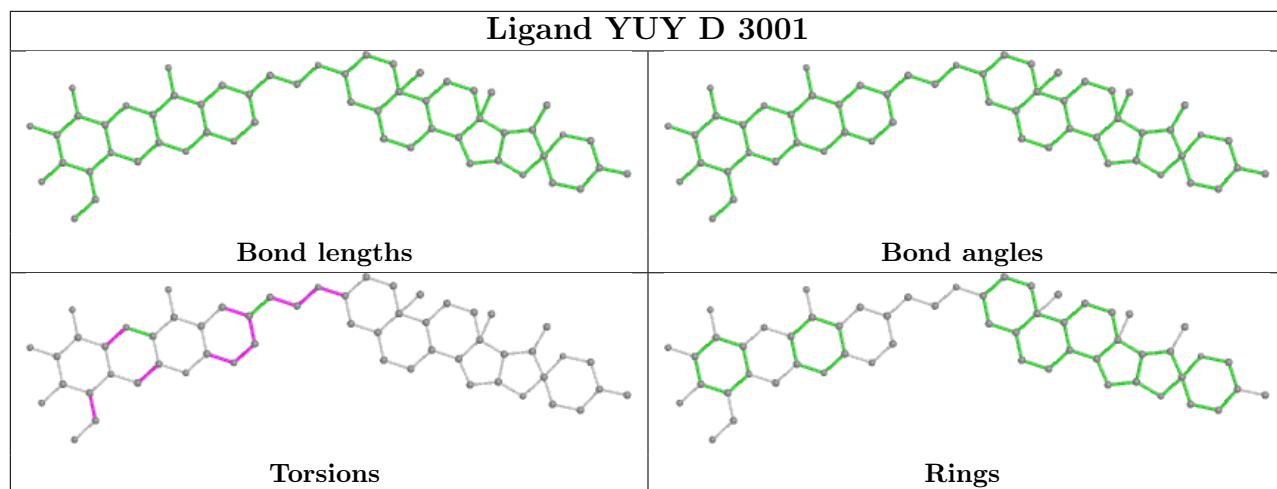| Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	1503	YUY	1	0
4	A	1503	YUY	1	0

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.
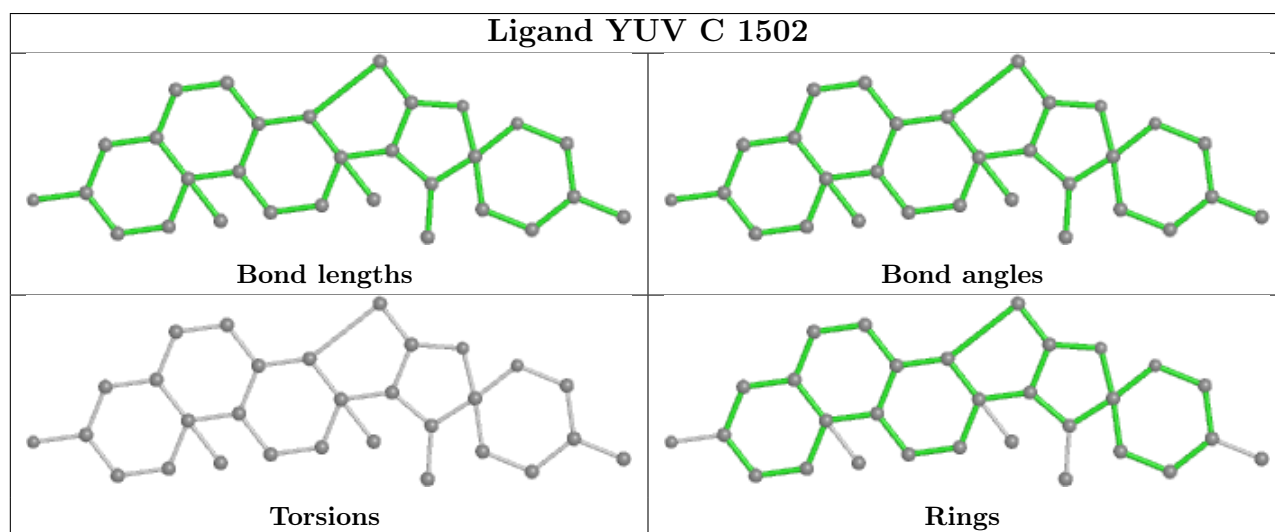

Ligand NAG B 1501

Bond lengths

Bond angles

Torsions

Rings

Ligand YUV A 1502

Bond lengths

Bond angles

Torsions

Rings

Ligand YUY C 1503

Bond lengths

Bond angles

Torsions

Rings

Ligand YUV B 1502

Bond lengths

Bond angles

Torsions

Rings

Ligand NAG C 1501

Bond lengths

Bond angles

Torsions

Rings

Ligand YUV D 3003

Bond lengths

Bond angles

Torsions

Rings

Ligand YUY D 3001

Bond lengths

Bond angles

Torsions

Rings

Ligand NAG D 3002

Bond lengths

Bond angles

Torsions

Rings

Ligand YUY B 1503

Bond lengths

Bond angles

Torsions

Rings

Ligand YUV C 1502

Bond lengths

Bond angles

Torsions

Rings

Ligand NAG A 1501

Bond lengths

Bond angles

Torsions

Rings

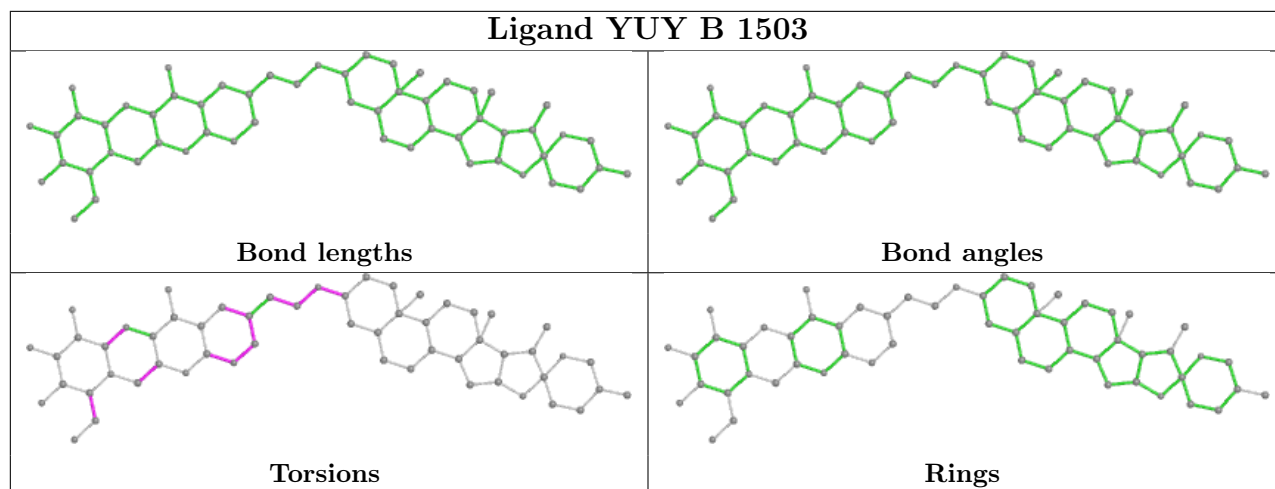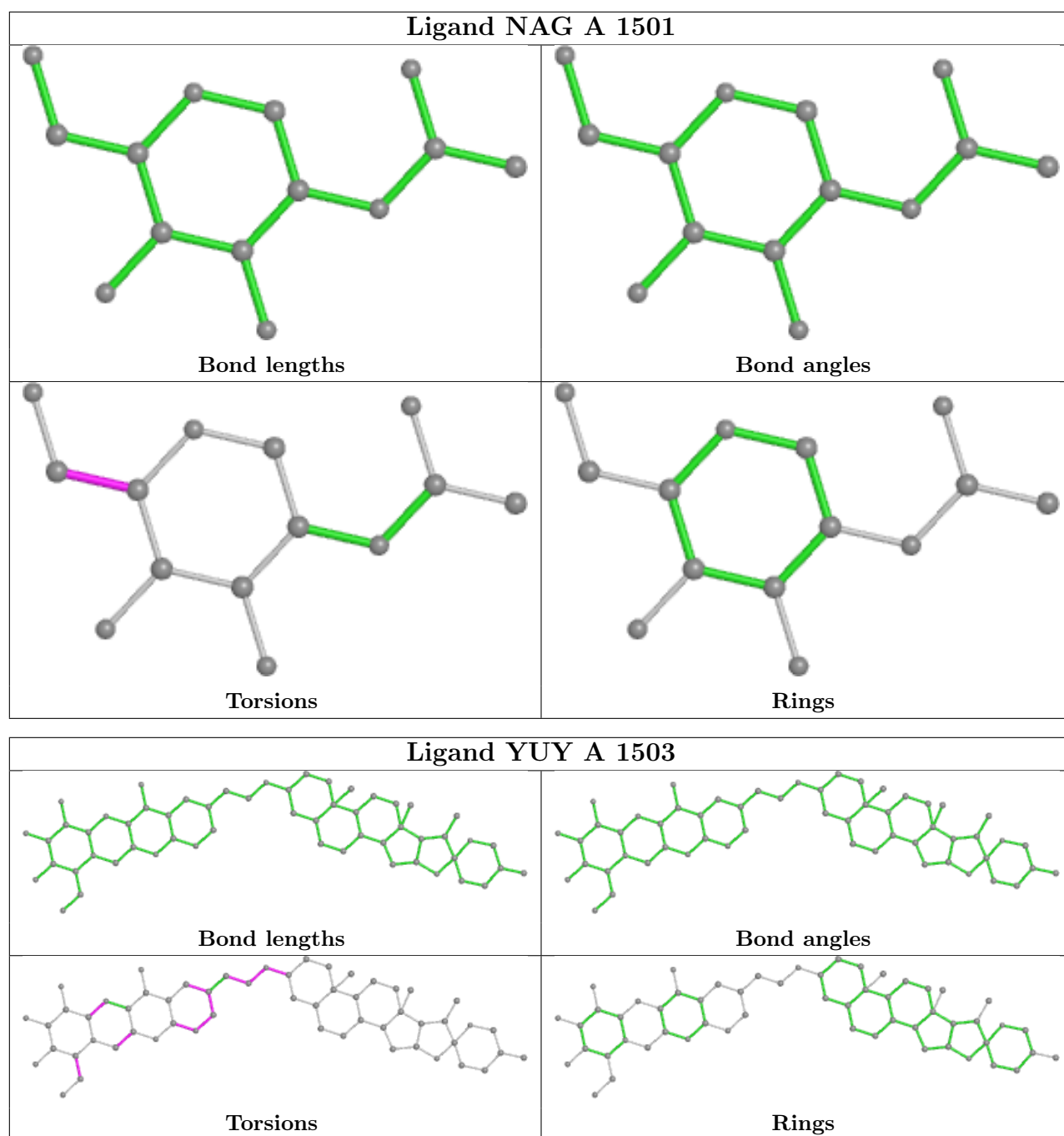**Ligand YUY A 1503**

Bond lengths

Bond angles

Torsions

Rings

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Map visualisation ⓘ

This section contains visualisations of the EMDB entry EMD-23744. These allow visual inspection of the internal detail of the map and identification of artifacts.

No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections ⓘ

This section was not generated.

6.2 Central slices ⓘ

This section was not generated.

6.3 Largest variance slices ⓘ

This section was not generated.

6.4 Orthogonal surface views ⓘ

This section was not generated.

6.5 Mask visualisation ⓘ

This section was not generated. No masks/segmentation were deposited.

7 Map analysis ⓘ

This section contains the results of statistical analysis of the map.

7.1 Map-value distribution ⓘ

This section was not generated.

7.2 Volume estimate versus contour level ⓘ

This section was not generated.

7.3 Rotationally averaged power spectrum ⓘ

This section was not generated. The rotationally averaged power spectrum had issues being displayed.

8 Fourier-Shell correlation (i)

This section was not generated. No FSC curve or half-maps provided.

9   Map-model fit (i)

This section was not generated.