



wwPDB EM Validation Summary Report ⓘ

Nov 21, 2022 – 02:04 PM EST

PDB ID : 7RH6
EMDB ID : EMD-24456
Title : Mycobacterial CIII2CIV2 supercomplex, inhibitor free, -Lpqe cyt cc open
Authors : Di Trani, J.M.; Yanofsky, D.J.; Rubinstein, J.L.
Deposited on : 2021-07-16
Resolution : 3.50 Å (reported)

This is a wwPDB EM Validation Summary 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/EMValidationReportHelp>

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:

EMDB validation analysis : 0.0.1.dev43
Mogul : 1.8.5 (274361), CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.9
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.31.3

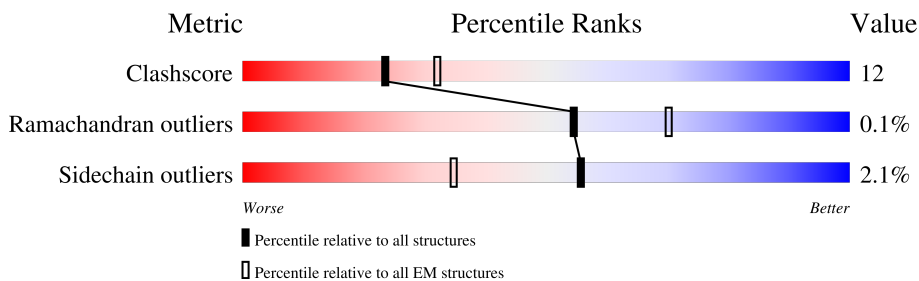
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.50 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	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 $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion $< 40\%$). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	I	223	
1	O	223	
2	L	552	
2	R	552	
3	M	382	
3	Y	382	
4	S	203	
4	X	203	

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Mol	Chain	Length	Quality of chain
5	E	535	
5	F	535	
6	J	100	
6	P	100	
7	D	216	
7	G	216	
8	K	312	
8	Q	312	
9	T	139	
9	Z	139	
10	U	79	
10	a	79	
11	V	145	
11	b	145	
12	c	159	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
13	HEC	O	302	-	-	X	-
17	HEA	L	602	X	-	-	-
17	HEA	L	603	X	-	-	-
17	HEA	R	602	X	-	-	-
17	HEA	R	603	X	-	-	-
18	CDL	L	604	-	-	X	-
18	CDL	S	302	-	-	X	-
18	CDL	T	201	-	-	X	-
18	CDL	T	202	-	-	X	-
18	CDL	T	203	-	-	X	-
18	CDL	X	302	-	-	X	-
18	CDL	X	303	-	-	X	-

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Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
18	CDL	Z	202	-	-	X	-
18	CDL	Z	203	-	-	X	-

2 Entry composition [i](#)

There are 23 unique types of molecules in this entry. The entry contains 92757 atoms, of which 45318 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 Cytochrome bc1 complex cytochrome c subunit.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
1	O	210	3014	948	1483	276	295	12	0	0
1	I	223	3187	1008	1564	289	314	12	0	0

- Molecule 2 is a protein called Cytochrome c oxidase subunit 1.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
2	R	552	8716	2937	4346	695	712	26	0	0
2	L	552	8717	2937	4347	695	712	26	0	0

- Molecule 3 is a protein called Cytochrome bc1 complex Rieske iron-sulfur subunit.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
3	M	382	5961	1924	2984	504	538	11	0	0
3	Y	382	5961	1924	2984	504	538	11	0	0

- Molecule 4 is a protein called Cytochrome aa3 subunit 3.

Mol	Chain	Residues	Atoms						AltConf	Trace
			Total	C	H	N	O	S		
4	S	203	3108	1039	1548	253	260	8	0	0
4	X	203	3108	1039	1548	253	260	8	0	0

- Molecule 5 is a protein called Cytochrome bc1 complex cytochrome b subunit.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
5	E	535	8384	2751	4203	711	701	18	0	0
5	F	535	8381	2751	4200	711	701	18	0	0

- Molecule 6 is a protein called Putative conserved transmembrane protein.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
6	J	92	1454	471	718	136	124	5	0	0
6	P	92	1453	471	717	136	124	5	0	0

- Molecule 7 is a protein called Superoxide dismutase [Cu-Zn].

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
7	D	216	1732	645	640	217	229	1	0	0
7	G	216	1732	645	640	217	229	1	0	0

- Molecule 8 is a protein called Cytochrome aa3 subunit 2.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
8	Q	312	4856	1592	2391	412	451	10	0	0
8	K	312	4857	1592	2392	412	451	10	0	0

- Molecule 9 is a protein called Cytochrome c oxidase polypeptide 4.

Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
9	T	139	2136	719	1059	167	188	3	0	0
9	Z	139	2135	719	1058	167	188	3	0	0

- Molecule 10 is a protein called Cytochrome c oxidase subunit CtaJ.

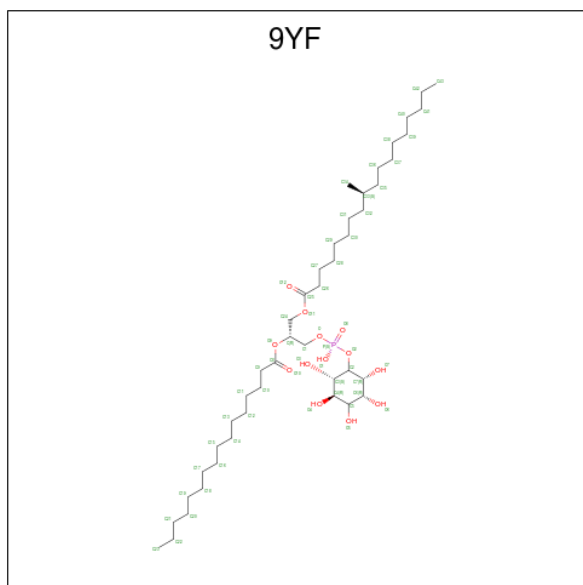
Mol	Chain	Residues	Atoms					AltConf	Trace	
			Total	C	H	N	O			S
10	U	79	1167	381	576	107	101	2	0	0

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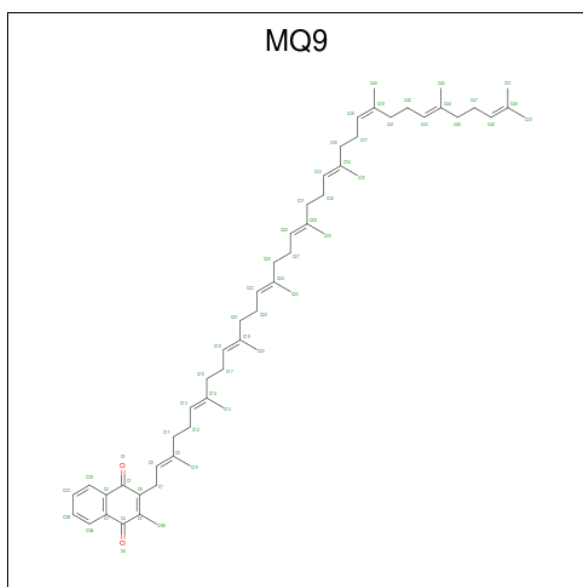
Mol	Chain	Residues	Atoms					AltConf	
			Total	C	Fe	H	N		O
13	I	1	150	68	2	64	8	8	0

- Molecule 14 is (2R)-2-(hexadecanoyloxy)-3-[[[(S)-hydroxy{[(1R,2R,3R,4R,5R,6S)-2,3,4,5,6-pentahydroxycyclohexyl]oxy}phosphoryl]oxy}propyl (9S)-9-methyloctadecanoate (three-letter code: 9YF) (formula: C₄₄H₈₅O₁₃P).



Mol	Chain	Residues	Atoms					AltConf
			Total	C	H	O	P	
14	O	1	142	44	84	13	1	0
14	E	1	142	44	84	13	1	0
14	I	1	142	44	84	13	1	0
14	Y	1	284	88	168	26	2	0
14	Y	1	284	88	168	26	2	0

- Molecule 15 is MENAQUINONE-9 (three-letter code: MQ9) (formula: C₅₆H₈₀O₂).

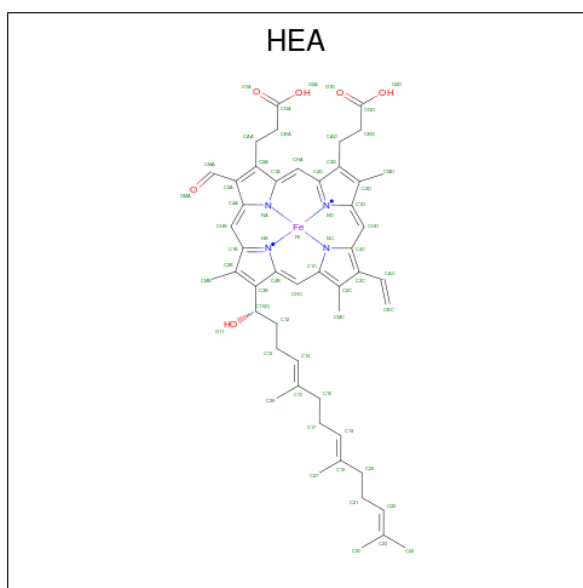


Mol	Chain	Residues	Atoms				AltConf
			Total	C	H	O	
15	O	1	138	56	80	2	0
15	E	1	276	112	160	4	0
15	E	1	276	112	160	4	0
15	F	1	276	112	160	4	0
15	F	1	276	112	160	4	0
15	T	1	138	56	80	2	0
15	Z	1	138	56	80	2	0
15	I	1	138	56	80	2	0

- Molecule 16 is COPPER (II) ION (three-letter code: CU) (formula: Cu).

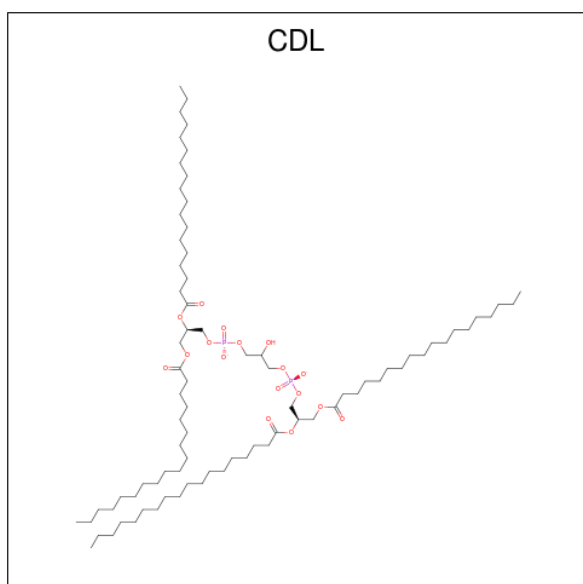
Mol	Chain	Residues	Atoms		AltConf
			Total	Cu	
16	R	1	1	1	0
16	L	1	1	1	0
16	Q	2	2	2	0
16	K	2	2	2	0

- Molecule 17 is HEME-A (three-letter code: HEA) (formula: $C_{49}H_{56}FeN_4O_6$).



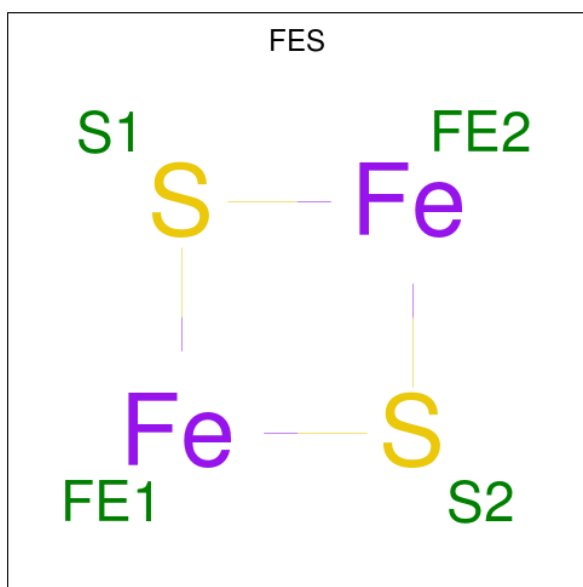
Mol	Chain	Residues	Atoms					AltConf	
			Total	C	Fe	H	N		O
17	R	1	Total	C	Fe	H	N	O	0
			228	98	2	108	8	12	
17	R	1	Total	C	Fe	H	N	O	0
			228	98	2	108	8	12	
17	L	1	Total	C	Fe	H	N	O	0
			228	98	2	108	8	12	
17	L	1	Total	C	Fe	H	N	O	0
			228	98	2	108	8	12	

- Molecule 18 is CARDIOLIPIN (three-letter code: CDL) (formula: $C_{81}H_{156}O_{17}P_2$).



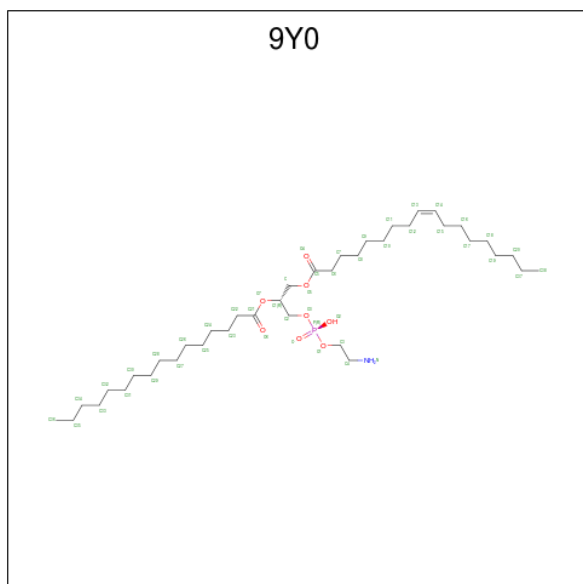
Mol	Chain	Residues	Atoms				AltConf
18	R	1	Total 76	C 57	O 17	P 2	0
18	S	1	Total 76	C 57	O 17	P 2	0
18	E	1	Total 152	C 114	O 34	P 4	0
18	E	1	Total 152	C 114	O 34	P 4	0
18	F	1	Total 152	C 114	O 34	P 4	0
18	F	1	Total 152	C 114	O 34	P 4	0
18	L	1	Total 76	C 57	O 17	P 2	0
18	J	1	Total 76	C 57	O 17	P 2	0
18	T	1	Total 228	C 171	O 51	P 6	0
18	T	1	Total 228	C 171	O 51	P 6	0
18	T	1	Total 228	C 171	O 51	P 6	0
18	P	1	Total 76	C 57	O 17	P 2	0
18	X	1	Total 152	C 114	O 34	P 4	0
18	X	1	Total 152	C 114	O 34	P 4	0
18	Z	1	Total 152	C 114	O 34	P 4	0
18	Z	1	Total 152	C 114	O 34	P 4	0

- Molecule 19 is FE2/S2 (INORGANIC) CLUSTER (three-letter code: FES) (formula: Fe₂S₂).



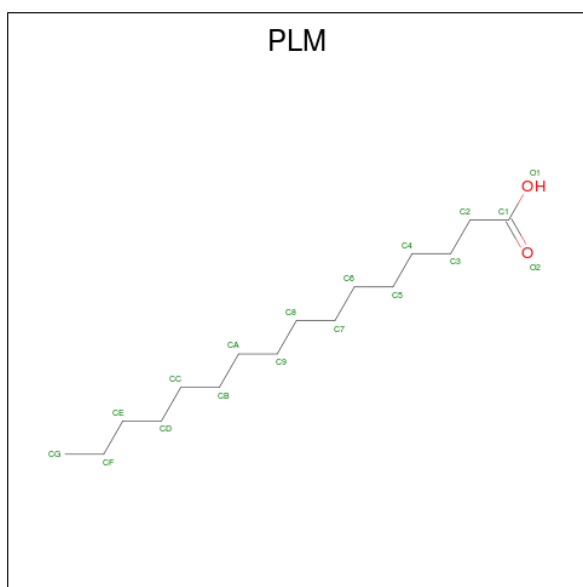
Mol	Chain	Residues	Atoms			AltConf
19	M	1	Total	Fe	S	0
			4	2	2	
19	Y	1	Total	Fe	S	0
			4	2	2	

- Molecule 20 is (2R)-3-(((2-aminoethoxy)(hydroxy)phosphoryl)oxy)-2-(palmitoyloxy)propyl (E)-octadec-9-enoate (three-letter code: 9Y0) (formula: C₃₉H₇₆NO₈P).



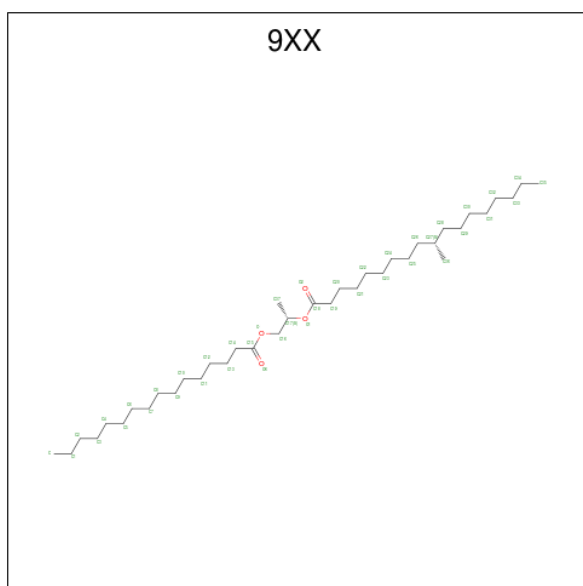
Mol	Chain	Residues	Atoms					AltConf	
20	S	1	Total	C	H	N	O	P	0
			124	39	75	1	8	1	

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Mol	Chain	Residues	Atoms				AltConf
			Total	C	H	O	
22	D	1	27	10	16	1	0
22	G	1	27	10	16	1	0
22	c	1	48	16	31	1	0

- Molecule 23 is (2S)-1-(hexadecanoyloxy)propan-2-yl (10S)-10-methyloctadecanoate (three-letter code: 9XX) (formula: C₃₈H₇₄O₄).

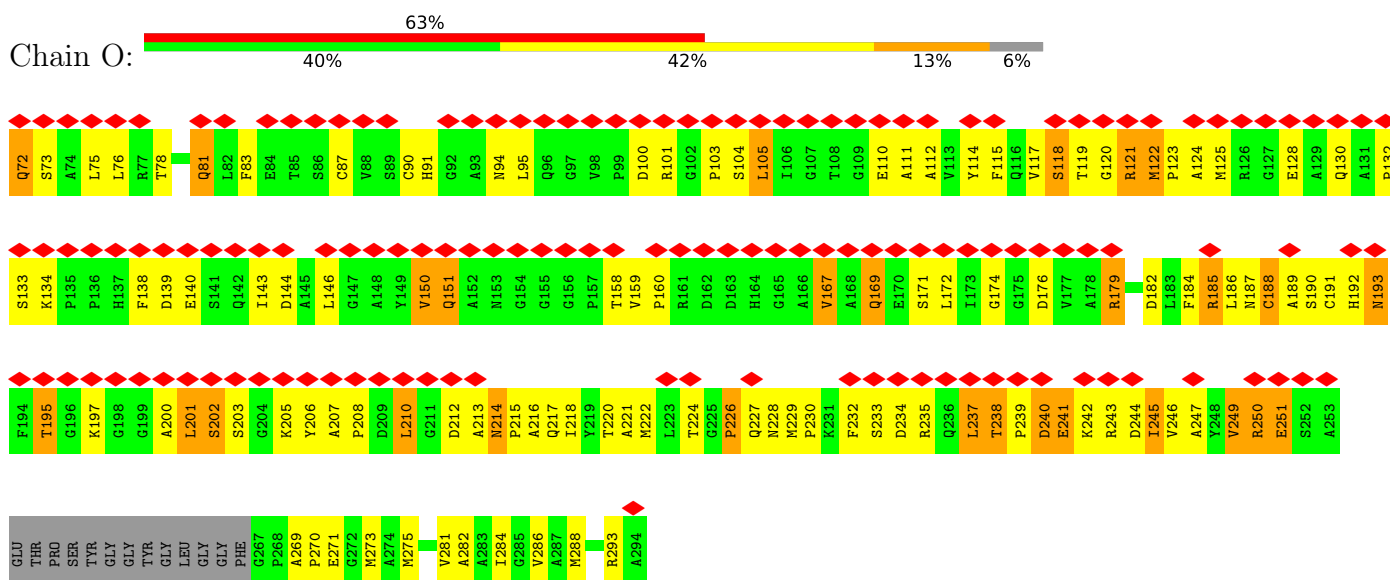


Mol	Chain	Residues	Atoms				AltConf
23	D	1	Total 83	C 28	H 51	O 4	0
23	G	1	Total 83	C 28	H 51	O 4	0
23	c	1	Total 115	C 38	H 73	O 4	0

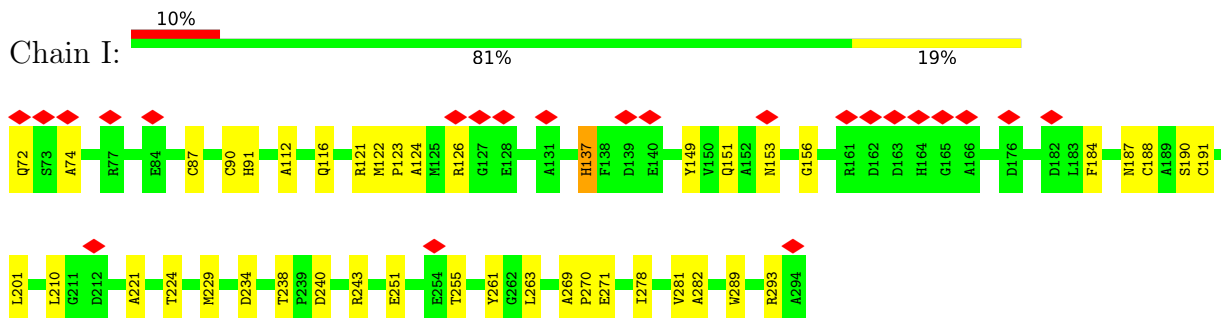
3 Residue-property plots [i](#)

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 and atom inclusion in map density. 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. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). 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.

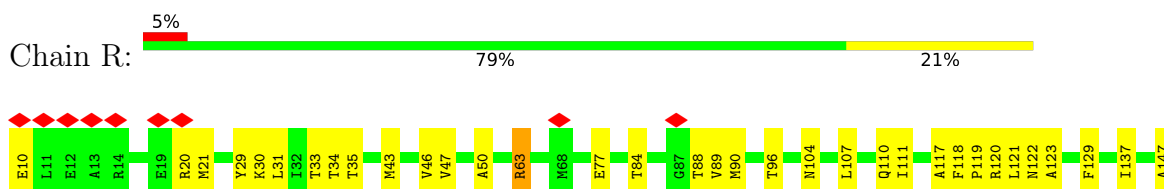
- Molecule 1: Cytochrome bc1 complex cytochrome c subunit

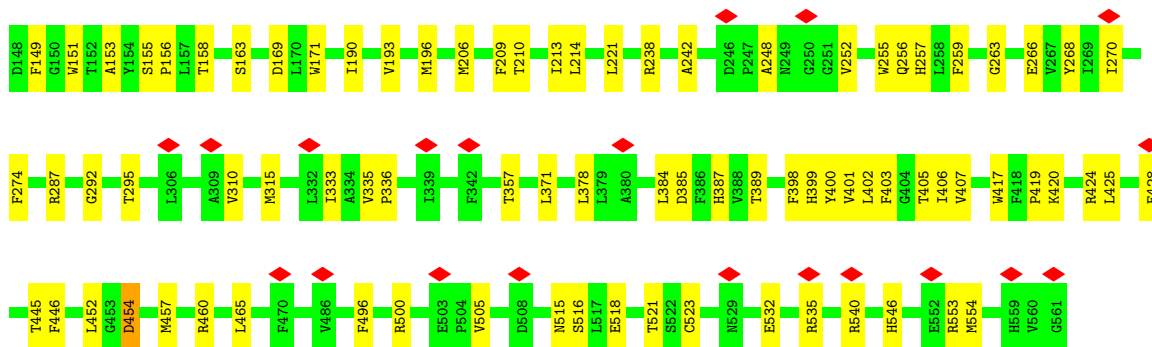


- Molecule 1: Cytochrome bc1 complex cytochrome c subunit

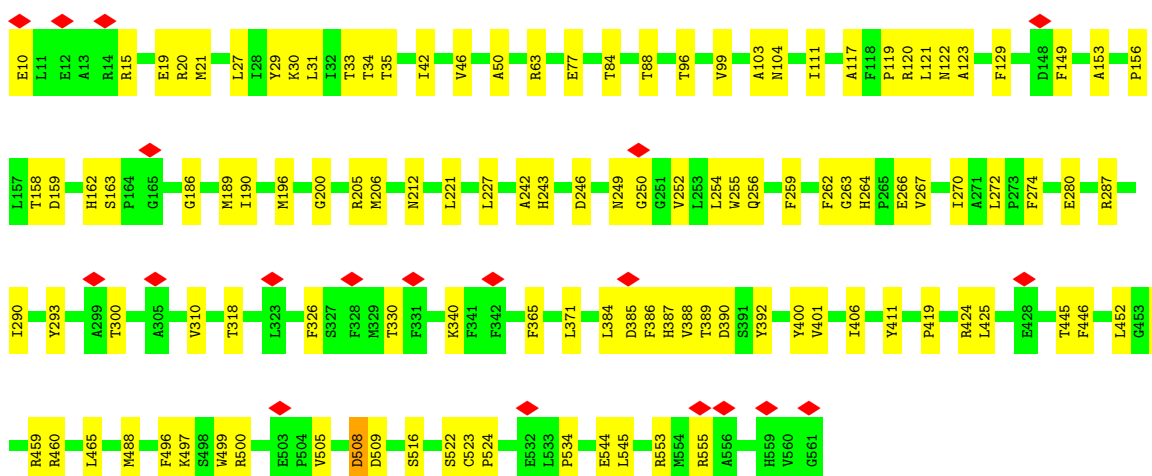
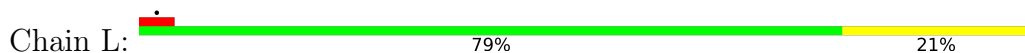


- Molecule 2: Cytochrome c oxidase subunit 1

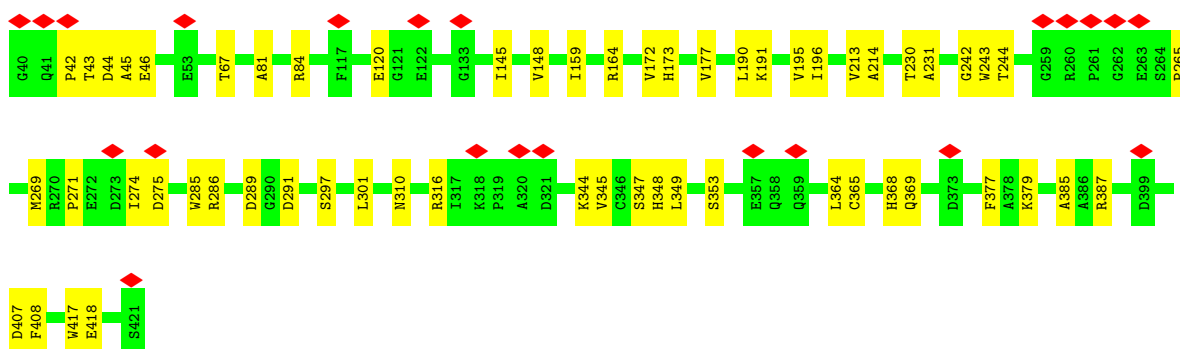
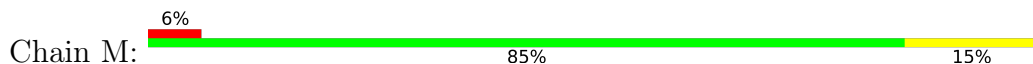




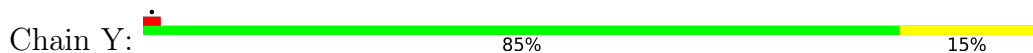
• Molecule 2: Cytochrome c oxidase subunit 1

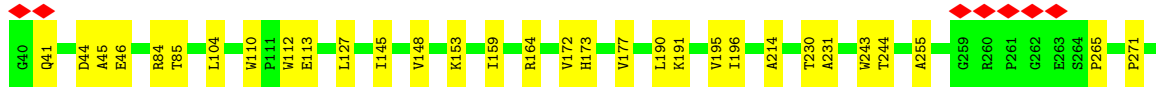


• Molecule 3: Cytochrome bc1 complex Rieske iron-sulfur subunit

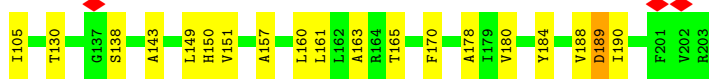
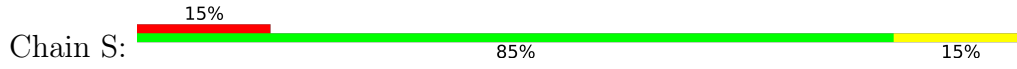


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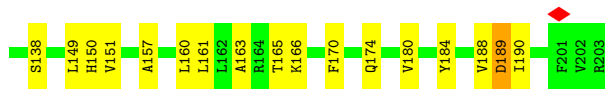
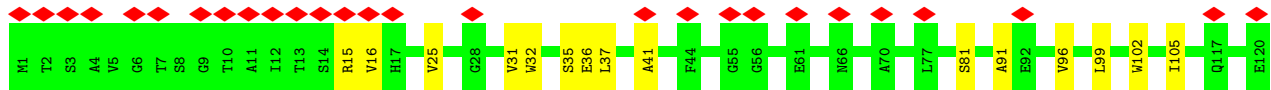
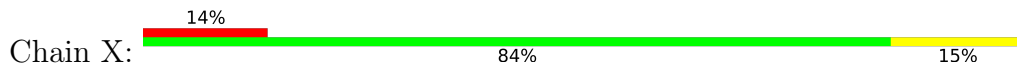




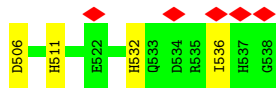
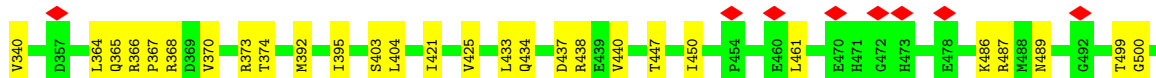
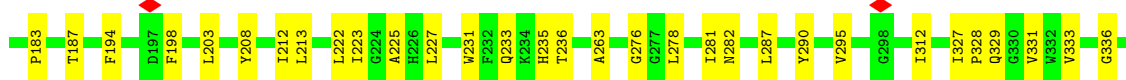
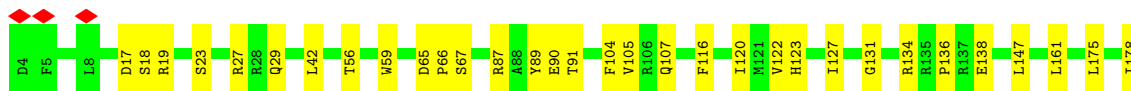
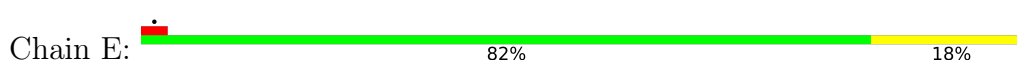
• Molecule 4: Cytochrome aa3 subunit 3



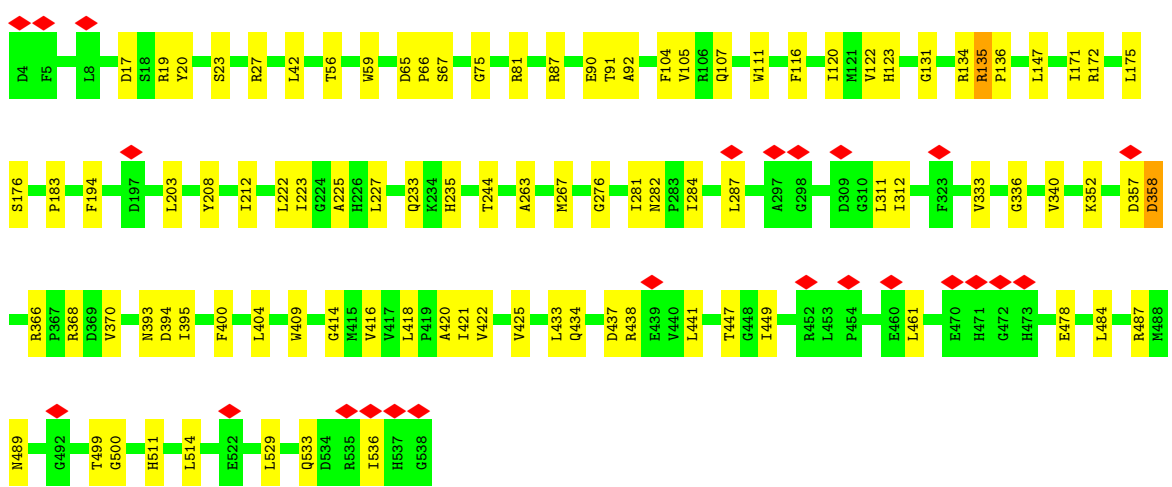
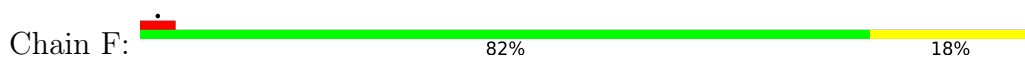
• Molecule 4: Cytochrome aa3 subunit 3



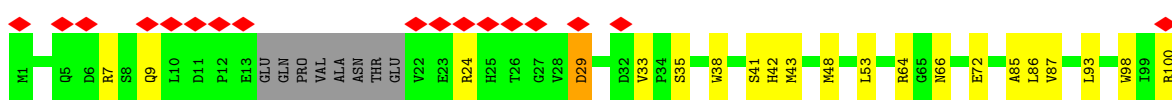
• Molecule 5: Cytochrome bc1 complex cytochrome b subunit



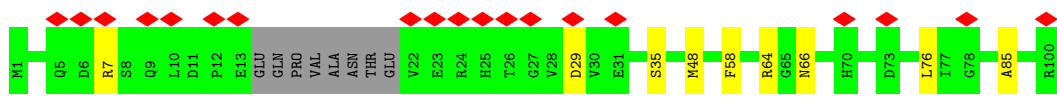
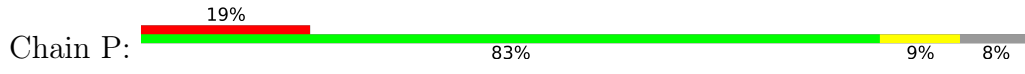
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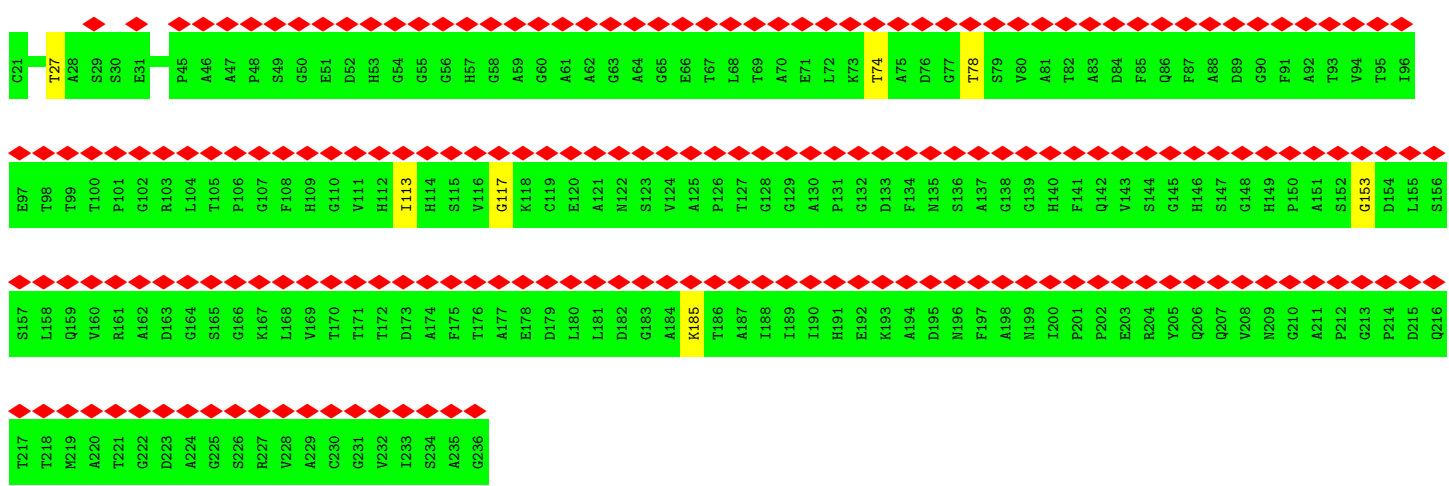
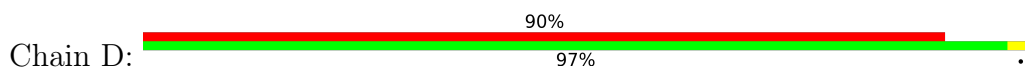
• Molecule 6: Putative conserved transmembrane protein



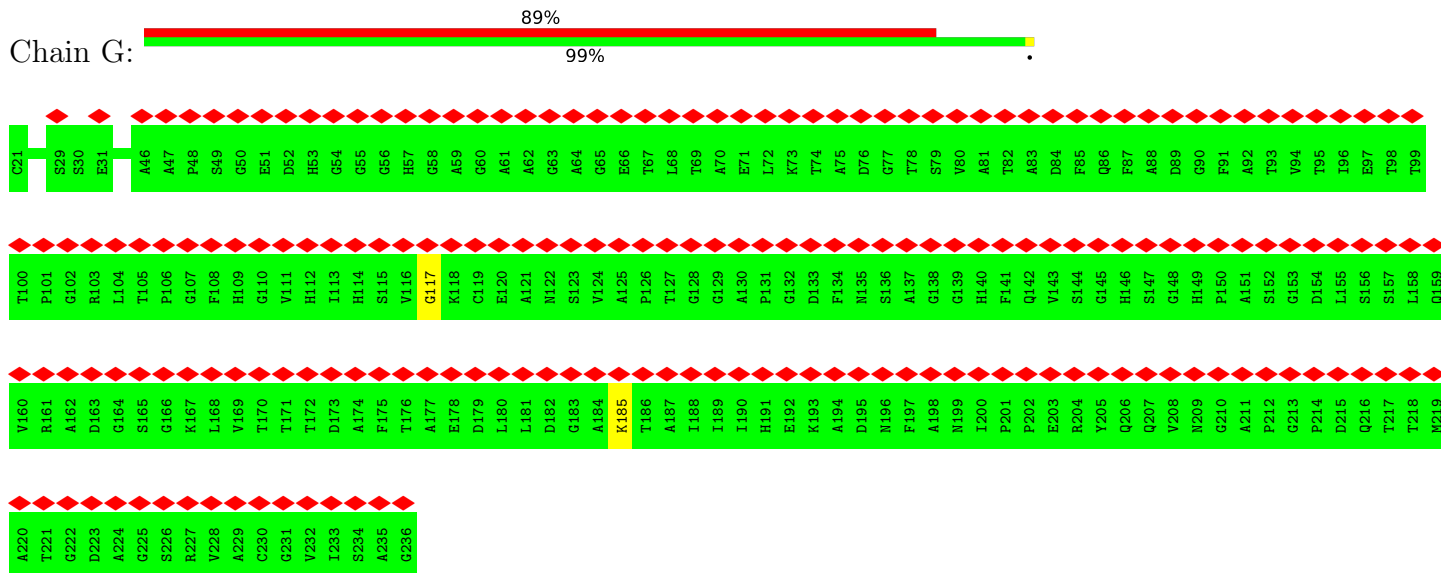
• Molecule 6: Putative conserved transmembrane protein

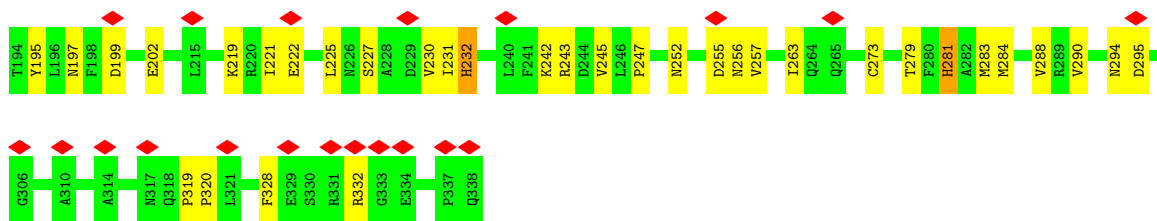


• Molecule 7: Superoxide dismutase [Cu-Zn]

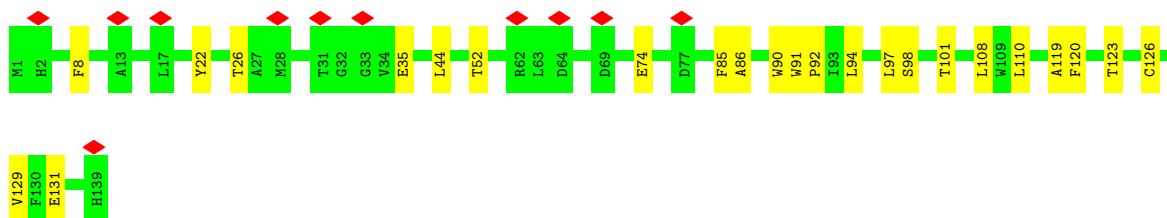
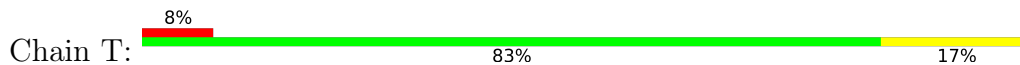


• Molecule 7: Superoxide dismutase [Cu-Zn]

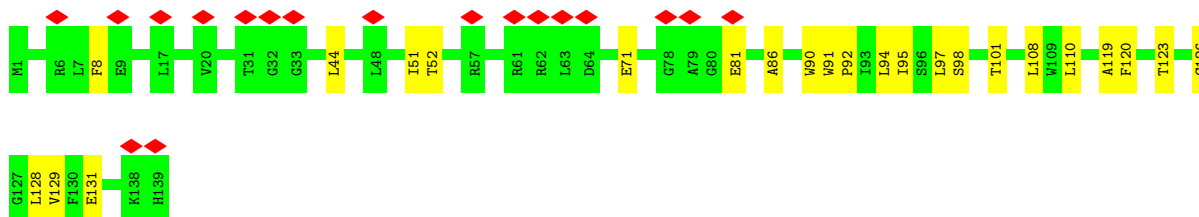
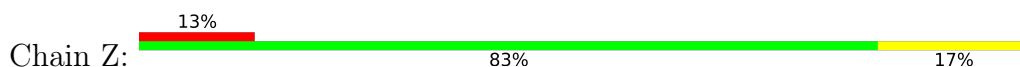




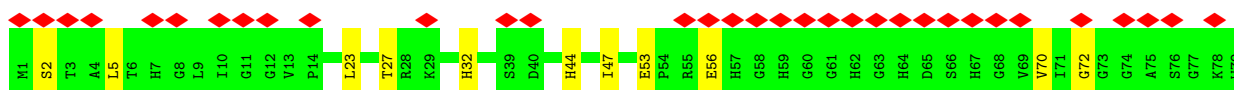
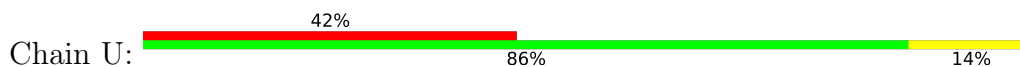
- Molecule 9: Cytochrome c oxidase polypeptide 4



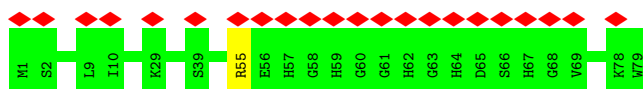
- Molecule 9: Cytochrome c oxidase polypeptide 4



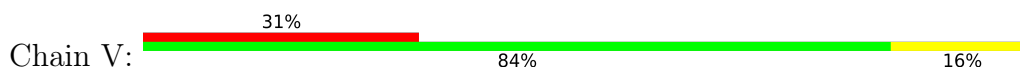
- Molecule 10: Cytochrome c oxidase subunit CtaJ

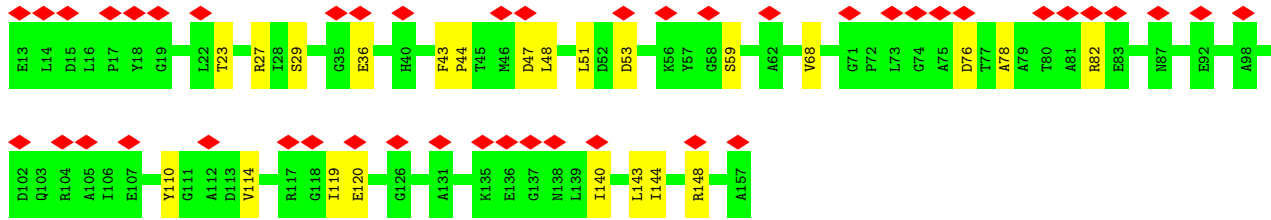


- Molecule 10: Cytochrome c oxidase subunit CtaJ

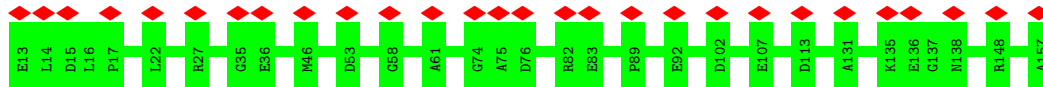


- Molecule 11: Uncharacterized protein MSMEG_4692/MSMEI_4575

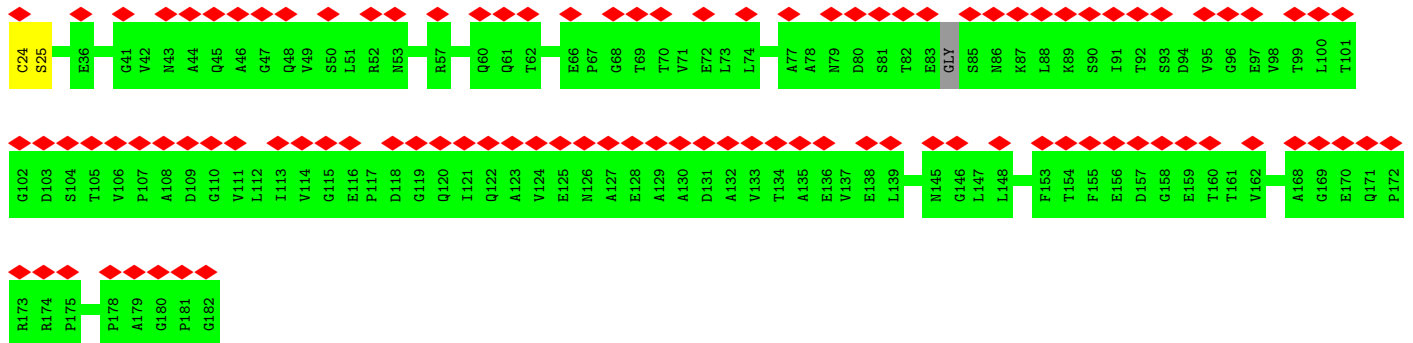




• Molecule 11: Uncharacterized protein MSMEG_4692/MSMEI_4575



• Molecule 12: LpqE protein



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	150885	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	43.5	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	Depositor
Maximum map value	3.300	Depositor
Minimum map value	-1.965	Depositor
Average map value	0.009	Depositor
Map value standard deviation	0.100	Depositor
Recommended contour level	0.634	Depositor
Map size (Å)	339.9, 339.9, 339.9	wwPDB
Map dimensions	330, 330, 330	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.03, 1.03, 1.03	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MQ9, 9YF, PLM, FES, HEM, HEA, HEC, 9Y0, CDL, 9XX, CU

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	I	0.27	0/1660	0.51	0/2250
1	O	0.64	0/1563	0.89	0/2117
2	L	0.28	0/4530	0.46	0/6188
2	R	0.28	0/4530	0.46	0/6188
3	M	0.28	0/3056	0.50	0/4142
3	Y	0.28	0/3056	0.50	0/4142
4	S	0.28	0/1608	0.46	0/2195
4	X	0.29	0/1608	0.47	0/2195
5	E	0.28	0/4314	0.48	0/5882
5	F	0.27	0/4314	0.48	0/5882
6	J	0.24	0/757	0.51	0/1027
6	P	0.25	0/757	0.52	0/1027
7	D	0.26	0/1099	0.47	0/1519
7	G	0.25	0/1099	0.47	0/1519
8	K	0.27	0/2534	0.50	0/3451
8	Q	0.28	0/2534	0.51	0/3451
9	T	0.27	0/1112	0.45	0/1524
9	Z	0.28	0/1112	0.46	0/1524
10	U	0.25	0/613	0.44	0/836
10	a	0.25	0/613	0.44	0/836
11	V	0.28	0/1059	0.52	0/1446
11	b	0.28	0/1059	0.54	0/1446
12	c	0.26	0/1166	0.51	0/1599
All	All	0.29	0/45753	0.50	0/62386

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	I	1623	1564	1564	40	0
1	O	1531	1483	1484	210	0
2	L	4370	4347	4346	95	0
2	R	4370	4346	4345	101	0
3	M	2977	2984	2984	42	0
3	Y	2977	2984	2984	42	0
4	S	1560	1548	1547	62	0
4	X	1560	1548	1547	79	0
5	E	4181	4203	4202	78	0
5	F	4181	4200	4199	80	0
6	J	736	718	717	13	0
6	P	736	717	717	9	0
7	D	1092	640	640	3	0
7	G	1092	640	640	1	0
8	K	2465	2392	2392	34	0
8	Q	2465	2391	2391	66	0
9	T	1077	1059	1058	60	0
9	Z	1077	1058	1058	63	0
10	U	591	576	576	7	0
10	a	591	576	576	0	0
11	V	1041	1052	1052	18	0
11	b	1041	1052	1052	0	0
12	c	1149	1110	1110	0	0
13	I	86	64	64	17	0
13	O	86	64	64	44	0
14	E	58	84	0	0	0
14	I	58	84	0	0	0
14	O	58	84	0	0	0
14	Y	116	168	0	0	0
15	E	116	160	160	6	0
15	F	116	160	160	4	0
15	I	58	80	80	0	0
15	O	58	80	80	2	0
15	T	58	80	80	2	0
15	Z	58	80	80	4	0
16	K	2	0	0	0	0
16	L	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
16	Q	2	0	0	0	0
16	R	1	0	0	0	0
17	L	120	108	108	6	0
17	R	120	108	108	5	0
18	E	152	0	192	14	0
18	F	152	0	192	23	0
18	J	76	0	96	12	0
18	L	76	0	96	24	0
18	P	76	0	96	10	0
18	R	76	0	96	17	0
18	S	76	0	96	49	0
18	T	228	0	288	77	0
18	X	152	0	192	95	0
18	Z	152	0	192	78	0
19	M	4	0	0	0	0
19	Y	4	0	0	1	0
20	F	49	74	0	0	0
20	J	98	150	0	0	0
20	S	49	75	0	0	0
20	X	49	75	0	0	0
21	E	85	57	57	4	0
21	F	85	57	57	5	0
22	D	11	16	16	0	0
22	G	11	16	16	0	0
22	c	17	31	31	0	0
23	D	32	51	0	0	0
23	G	32	51	0	0	0
23	c	42	73	0	0	0
All	All	47439	45318	45878	1098	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 12.

The worst 5 of 1098 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)
4:X:166:LYS:NZ	18:X:302:CDL:H112	1.28	1.48
9:T:120:PHE:CB	18:T:201:CDL:H612	1.47	1.42
1:O:203:SER:CB	8:Q:170:ARG:HG3	1.46	1.41
9:T:120:PHE:HB3	18:T:201:CDL:C61	1.50	1.41
9:Z:120:PHE:CB	18:Z:202:CDL:H612	1.53	1.38

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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	I	221/223 (99%)	199 (90%)	22 (10%)	0	100	100
1	O	206/223 (92%)	187 (91%)	16 (8%)	3 (2%)	10	45
2	L	550/552 (100%)	516 (94%)	34 (6%)	0	100	100
2	R	550/552 (100%)	518 (94%)	32 (6%)	0	100	100
3	M	380/382 (100%)	344 (90%)	36 (10%)	0	100	100
3	Y	380/382 (100%)	347 (91%)	33 (9%)	0	100	100
4	S	201/203 (99%)	193 (96%)	8 (4%)	0	100	100
4	X	201/203 (99%)	192 (96%)	9 (4%)	0	100	100
5	E	533/535 (100%)	490 (92%)	43 (8%)	0	100	100
5	F	533/535 (100%)	489 (92%)	43 (8%)	1 (0%)	47	81
6	J	88/100 (88%)	85 (97%)	3 (3%)	0	100	100
6	P	88/100 (88%)	83 (94%)	5 (6%)	0	100	100
7	D	214/216 (99%)	193 (90%)	20 (9%)	1 (0%)	29	68
7	G	214/216 (99%)	187 (87%)	27 (13%)	0	100	100
8	K	310/312 (99%)	282 (91%)	28 (9%)	0	100	100
8	Q	310/312 (99%)	282 (91%)	28 (9%)	0	100	100
9	T	137/139 (99%)	129 (94%)	8 (6%)	0	100	100
9	Z	137/139 (99%)	130 (95%)	7 (5%)	0	100	100
10	U	77/79 (98%)	70 (91%)	6 (8%)	1 (1%)	12	48
10	a	77/79 (98%)	70 (91%)	7 (9%)	0	100	100
11	V	143/145 (99%)	139 (97%)	4 (3%)	0	100	100
11	b	143/145 (99%)	138 (96%)	5 (4%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
12	c	154/159 (97%)	135 (88%)	19 (12%)	0	100	100
All	All	5847/5931 (99%)	5398 (92%)	443 (8%)	6 (0%)	54	84

5 of 6 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	O	226	PRO
5	F	135	ARG
1	O	202	SER
1	O	249	VAL
7	D	27	THR

5.3.2 Protein sidechains [i](#)

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	I	163/163 (100%)	160 (98%)	3 (2%)	59	81
1	O	155/163 (95%)	112 (72%)	43 (28%)	0	3
2	L	452/453 (100%)	442 (98%)	10 (2%)	52	78
2	R	452/453 (100%)	446 (99%)	6 (1%)	69	86
3	M	312/312 (100%)	310 (99%)	2 (1%)	86	94
3	Y	312/312 (100%)	312 (100%)	0	100	100
4	S	155/161 (96%)	153 (99%)	2 (1%)	69	86
4	X	155/161 (96%)	153 (99%)	2 (1%)	69	86
5	E	429/429 (100%)	425 (99%)	4 (1%)	78	90
5	F	429/429 (100%)	425 (99%)	4 (1%)	78	90
6	J	76/83 (92%)	70 (92%)	6 (8%)	12	41
6	P	76/83 (92%)	75 (99%)	1 (1%)	69	86
7	D	20/151 (13%)	20 (100%)	0	100	100
7	G	20/151 (13%)	20 (100%)	0	100	100
8	K	260/266 (98%)	256 (98%)	4 (2%)	65	84

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
8	Q	260/266 (98%)	257 (99%)	3 (1%)	71	87
9	T	106/106 (100%)	106 (100%)	0	100	100
9	Z	106/106 (100%)	106 (100%)	0	100	100
10	U	59/59 (100%)	59 (100%)	0	100	100
10	a	59/59 (100%)	58 (98%)	1 (2%)	60	82
11	V	107/107 (100%)	106 (99%)	1 (1%)	78	90
11	b	107/107 (100%)	107 (100%)	0	100	100
12	c	127/127 (100%)	125 (98%)	2 (2%)	62	83
All	All	4397/4707 (93%)	4303 (98%)	94 (2%)	56	79

5 of 94 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
5	F	20	TYR
6	J	24	ARG
5	F	357	ASP
2	L	388	VAL
6	J	64	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 60 ligands modelled in this entry, 6 are monoatomic - leaving 54 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	$\# Z > 2$
14	9YF	Y	502	-	58,58,58	1.08	7 (12%)	69,71,71	1.28	7 (10%)
23	9XX	c	202	12	41,41,41	0.95	3 (7%)	44,44,44	1.18	4 (9%)
15	MQ9	Z	201	-	59,59,59	2.33	21 (35%)	72,75,75	1.65	18 (25%)
15	MQ9	I	303	-	59,59,59	2.35	21 (35%)	72,75,75	1.46	18 (25%)
18	CDL	J	203	-	75,75,99	0.33	0	81,87,111	0.45	0
14	9YF	I	304	-	58,58,58	1.07	5 (8%)	69,71,71	1.05	2 (2%)
18	CDL	Z	203	-	75,75,99	1.30	7 (9%)	81,87,111	2.01	9 (11%)
18	CDL	F	706	-	75,75,99	0.37	0	81,87,111	0.45	1 (1%)
15	MQ9	E	603	-	59,59,59	2.40	22 (37%)	72,75,75	1.37	15 (20%)
15	MQ9	E	604	-	59,59,59	2.38	21 (35%)	72,75,75	1.53	16 (22%)
13	HEC	O	301	-	32,50,50	2.34	10 (31%)	24,82,82	2.27	5 (20%)
21	HEM	E	601	5	41,49,50	1.26	2 (4%)	46,81,82	1.30	5 (10%)
20	9Y0	S	301	-	48,48,48	1.14	3 (6%)	51,53,53	0.86	2 (3%)
18	CDL	F	705	-	75,75,99	0.33	0	81,87,111	0.41	0
15	MQ9	T	204	-	59,59,59	2.35	21 (35%)	72,75,75	1.61	15 (20%)
14	9YF	O	303	-	58,58,58	1.01	5 (8%)	69,71,71	1.05	4 (5%)
20	9Y0	J	202	-	48,48,48	1.14	3 (6%)	51,53,53	0.77	2 (3%)
13	HEC	O	302	1	32,50,50	2.40	12 (37%)	24,82,82	2.24	4 (16%)
14	9YF	Y	503	-	58,58,58	1.13	8 (13%)	69,71,71	1.46	9 (13%)
18	CDL	E	607	-	75,75,99	0.36	0	81,87,111	0.41	0
17	HEA	R	603	2	57,67,67	1.42	10 (17%)	61,103,103	1.99	11 (18%)
18	CDL	T	202	-	75,75,99	0.32	0	81,87,111	0.40	0
22	PLM	D	301	7	10,10,17	0.61	0	9,9,17	0.55	0
20	9Y0	J	201	-	48,48,48	1.15	3 (6%)	51,53,53	0.89	2 (3%)
20	9Y0	X	301	-	48,48,48	1.14	3 (6%)	51,53,53	0.89	2 (3%)
18	CDL	P	201	-	75,75,99	0.33	0	81,87,111	0.45	0
19	FES	M	501	3	0,4,4	-	-	-	-	-
20	9Y0	F	704	-	48,48,48	1.15	3 (6%)	51,53,53	0.86	2 (3%)
21	HEM	F	703	5	41,50,50	1.49	3 (7%)	45,82,82	1.36	5 (11%)
18	CDL	E	606	-	75,75,99	0.34	0	81,87,111	0.41	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
22	PLM	c	201	12	16,16,17	0.54	0	15,15,17	0.44	0
18	CDL	R	604	-	75,75,99	0.33	0	81,87,111	0.60	2 (2%)
17	HEA	L	602	2	57,67,67	1.52	10 (17%)	61,103,103	2.22	21 (34%)
22	PLM	G	301	7	10,10,17	0.60	0	9,9,17	0.55	0
15	MQ9	F	701	-	59,59,59	2.41	21 (35%)	72,75,75	1.38	16 (22%)
19	FES	Y	501	3	0,4,4	-	-	-	-	-
18	CDL	X	302	-	75,75,99	0.33	0	81,87,111	0.40	0
23	9XX	D	302	-	31,31,41	1.10	3 (9%)	34,34,44	1.45	4 (11%)
18	CDL	T	203	-	75,75,99	1.30	7 (9%)	81,87,111	2.01	9 (11%)
18	CDL	S	302	-	75,75,99	1.31	7 (9%)	81,87,111	1.96	9 (11%)
23	9XX	G	302	7	31,31,41	1.12	3 (9%)	34,34,44	1.49	4 (11%)
13	HEC	I	301	-	32,50,50	2.17	3 (9%)	24,82,82	1.49	3 (12%)
21	HEM	E	602	5	41,50,50	1.51	4 (9%)	45,82,82	1.33	6 (13%)
15	MQ9	O	304	-	59,59,59	2.36	21 (35%)	72,75,75	1.46	18 (25%)
18	CDL	Z	202	-	75,75,99	1.24	8 (10%)	81,87,111	1.81	15 (18%)
17	HEA	L	603	2	57,67,67	1.43	9 (15%)	61,103,103	1.86	12 (19%)
13	HEC	I	302	1	32,50,50	2.25	3 (9%)	24,82,82	1.61	6 (25%)
18	CDL	T	201	-	75,75,99	1.24	8 (10%)	81,87,111	1.81	15 (18%)
18	CDL	L	604	-	75,75,99	0.33	0	81,87,111	0.60	2 (2%)
14	9YF	E	605	-	58,58,58	1.01	4 (6%)	69,71,71	1.32	7 (10%)
17	HEA	R	602	2	57,67,67	1.52	9 (15%)	61,103,103	2.34	22 (36%)
15	MQ9	F	707	-	59,59,59	2.39	21 (35%)	72,75,75	1.54	14 (19%)
21	HEM	F	702	5	41,49,50	1.24	2 (4%)	46,81,82	1.29	4 (8%)
18	CDL	X	303	-	75,75,99	1.31	7 (9%)	81,87,111	1.96	9 (11%)

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
14	9YF	Y	502	-	-	22/54/78/78	0/1/1/1
23	9XX	c	202	12	-	15/43/43/43	-
15	MQ9	Z	201	-	-	12/53/73/73	0/2/2/2
15	MQ9	I	303	-	-	8/53/73/73	0/2/2/2
18	CDL	J	203	-	-	49/86/86/110	-
14	9YF	I	304	-	-	22/54/78/78	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
18	CDL	Z	203	-	-	39/86/86/110	-
18	CDL	F	706	-	-	45/86/86/110	-
15	MQ9	E	603	-	-	6/53/73/73	0/2/2/2
15	MQ9	E	604	-	-	10/53/73/73	0/2/2/2
13	HEC	O	301	-	-	3/10/54/54	-
21	HEM	E	601	5	-	3/12/52/54	-
20	9Y0	S	301	-	-	22/52/52/52	-
18	CDL	F	705	-	-	50/86/86/110	-
15	MQ9	T	204	-	-	13/53/73/73	0/2/2/2
14	9YF	O	303	-	-	29/54/78/78	0/1/1/1
20	9Y0	J	202	-	-	25/52/52/52	-
13	HEC	O	302	1	-	6/10/54/54	-
14	9YF	Y	503	-	-	24/54/78/78	0/1/1/1
18	CDL	E	607	-	-	39/86/86/110	-
17	HEA	R	603	2	3/3/16/16	3/32/76/76	-
18	CDL	T	202	-	-	46/86/86/110	-
22	PLM	D	301	7	-	3/7/8/15	-
20	9Y0	J	201	-	-	19/52/52/52	-
20	9Y0	X	301	-	-	18/52/52/52	-
18	CDL	P	201	-	-	49/86/86/110	-
19	FES	M	501	3	-	-	0/1/1/1
20	9Y0	F	704	-	-	18/52/52/52	-
21	HEM	F	703	5	-	0/12/54/54	-
18	CDL	E	606	-	-	50/86/86/110	-
22	PLM	c	201	12	-	5/13/14/15	-
18	CDL	R	604	-	-	48/86/86/110	-
17	HEA	L	602	2	3/3/16/16	12/32/76/76	-
17	HEA	R	602	2	3/3/16/16	7/32/76/76	-
22	PLM	G	301	7	-	2/7/8/15	-
15	MQ9	F	701	-	-	6/53/73/73	0/2/2/2
19	FES	Y	501	3	-	-	0/1/1/1
18	CDL	X	302	-	-	46/86/86/110	-
23	9XX	D	302	-	-	8/33/33/43	-
18	CDL	T	203	-	-	39/86/86/110	-
18	CDL	S	302	-	-	43/86/86/110	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
23	9XX	G	302	7	-	10/33/33/43	-
21	HEM	E	602	5	-	2/12/54/54	-
15	MQ9	O	304	-	-	8/53/73/73	0/2/2/2
18	CDL	Z	202	-	-	35/86/86/110	-
17	HEA	L	603	2	3/3/16/16	3/32/76/76	-
13	HEC	I	302	1	-	0/10/54/54	-
18	CDL	T	201	-	-	35/86/86/110	-
18	CDL	L	604	-	-	48/86/86/110	-
14	9YF	E	605	-	-	17/54/78/78	0/1/1/1
13	HEC	I	301	-	-	0/10/54/54	-
15	MQ9	F	707	-	-	12/53/73/73	0/2/2/2
21	HEM	F	702	5	-	4/12/52/54	-
18	CDL	X	303	-	-	43/86/86/110	-

The worst 5 of 343 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
15	F	707	MQ9	C6-C5	8.61	1.50	1.35
15	E	604	MQ9	C6-C5	8.60	1.50	1.35
15	F	701	MQ9	C6-C5	8.43	1.50	1.35
15	E	603	MQ9	C6-C5	8.37	1.50	1.35
15	I	303	MQ9	C6-C5	8.33	1.50	1.35

The worst 5 of 356 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
18	T	203	CDL	CB6-CB4-CB3	-9.77	88.68	111.79
18	Z	203	CDL	CB6-CB4-CB3	-9.76	88.70	111.79
18	X	303	CDL	CB6-CB4-CB3	-9.54	89.23	111.79
18	S	302	CDL	CB6-CB4-CB3	-9.52	89.26	111.79
18	T	201	CDL	OB6-CB4-CB6	9.13	141.46	108.40

5 of 12 chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
17	R	602	HEA	NA
17	R	602	HEA	NB
17	R	602	HEA	ND
17	R	603	HEA	NA

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Mol	Chain	Res	Type	Atom
17	R	603	HEA	NB

5 of 1081 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
13	O	302	HEC	C3A-C2A-CAA-CBA
14	O	303	9YF	C-C1-O-P
14	O	303	9YF	C9-C8-O9-C
14	E	605	9YF	C1-O-P-O1
14	E	605	9YF	C1-O-P-O8

There are no ring outliers.

35 monomers are involved in 458 short contacts:

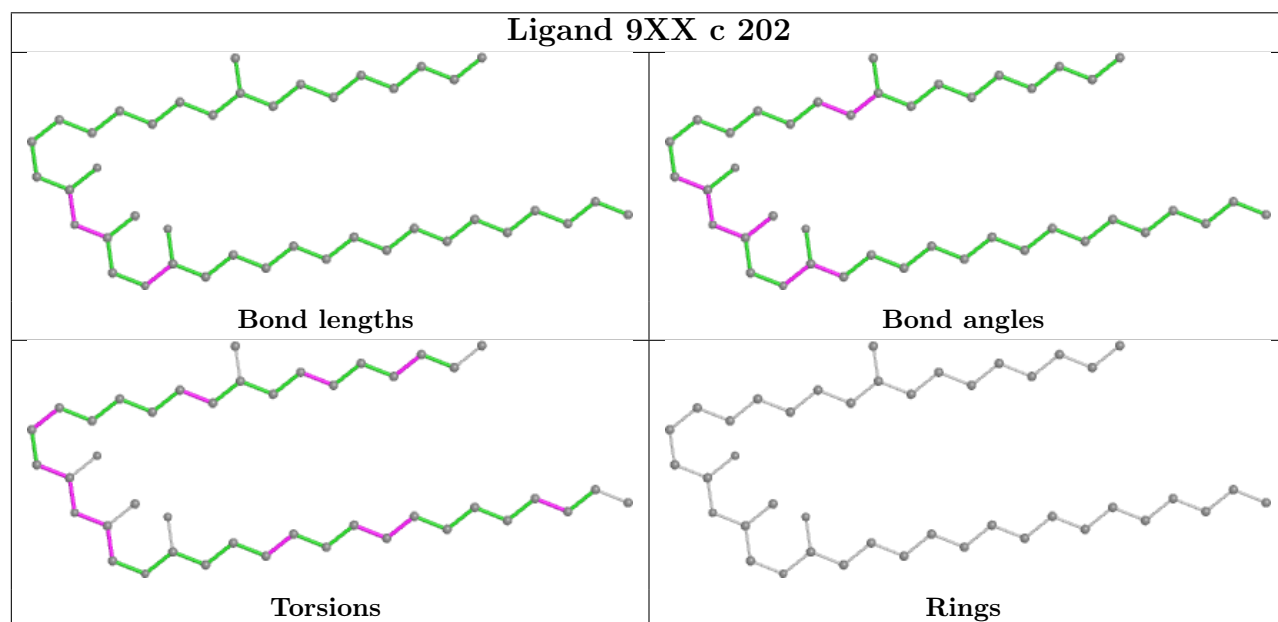
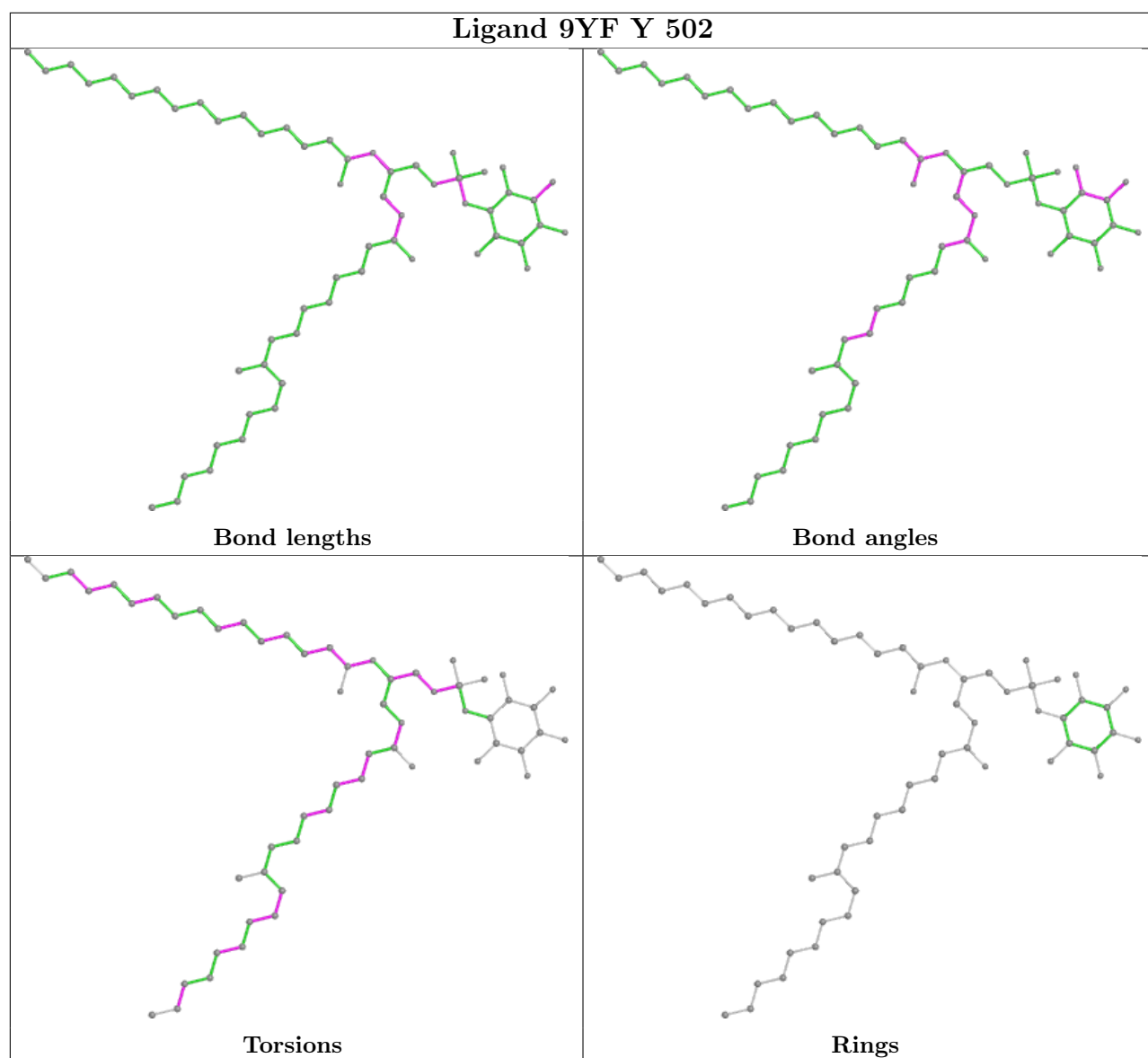
Mol	Chain	Res	Type	Clashes	Symm-Clashes
15	Z	201	MQ9	4	0
18	J	203	CDL	12	0
18	Z	203	CDL	42	0
18	F	706	CDL	12	0
15	E	603	MQ9	2	0
15	E	604	MQ9	4	0
13	O	301	HEC	4	0
21	E	601	HEM	2	0
18	F	705	CDL	11	0
15	T	204	MQ9	2	0
13	O	302	HEC	40	0
18	E	607	CDL	4	0
17	R	603	HEA	4	0
18	T	202	CDL	29	0
18	P	201	CDL	10	0
21	F	703	HEM	4	0
18	E	606	CDL	10	0
18	R	604	CDL	17	0
17	L	602	HEA	3	0
19	Y	501	FES	1	0
18	X	302	CDL	41	0
18	T	203	CDL	34	0
18	S	302	CDL	49	0
13	I	301	HEC	5	0
21	E	602	HEM	2	0
15	O	304	MQ9	2	0
18	Z	202	CDL	36	0

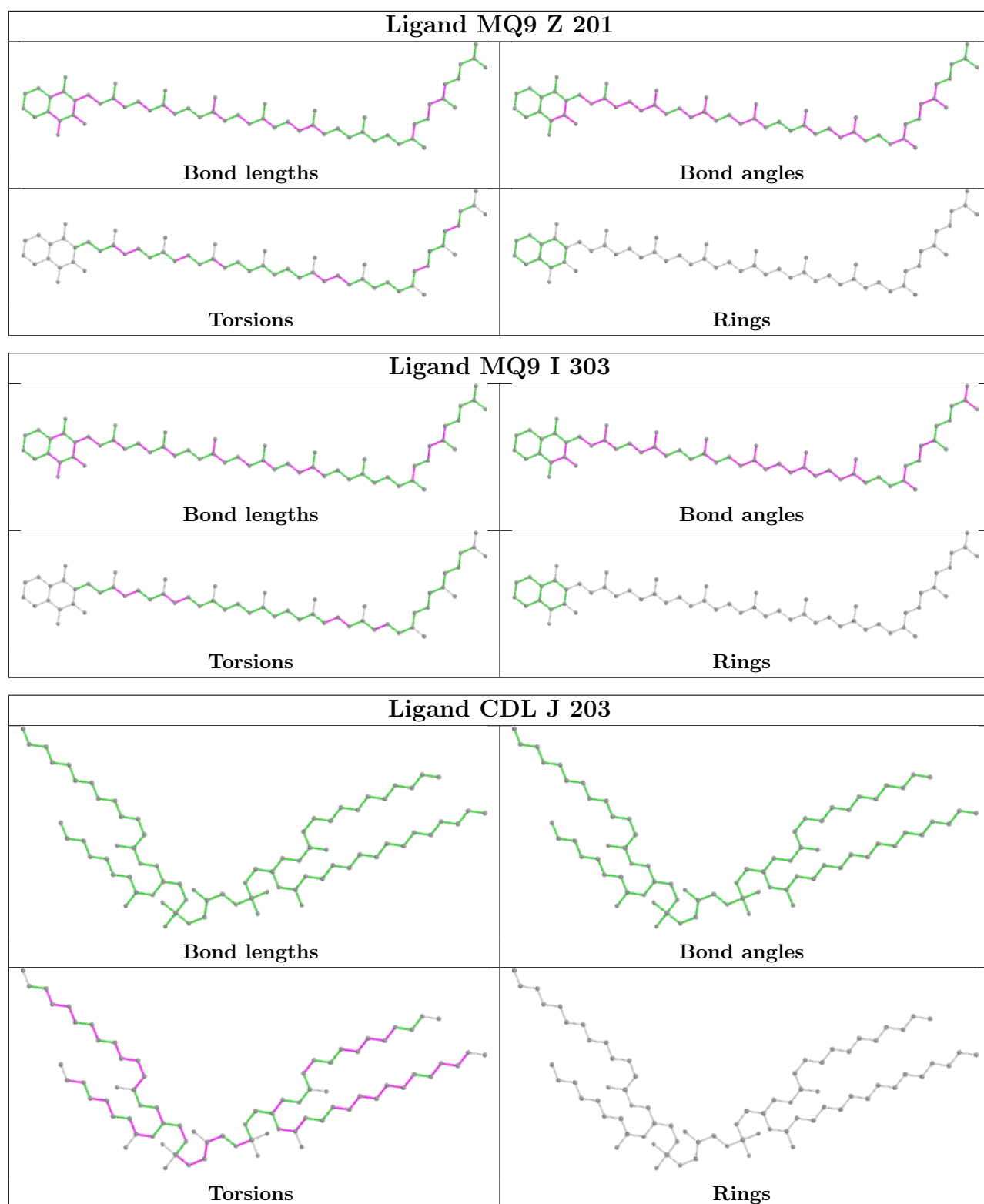
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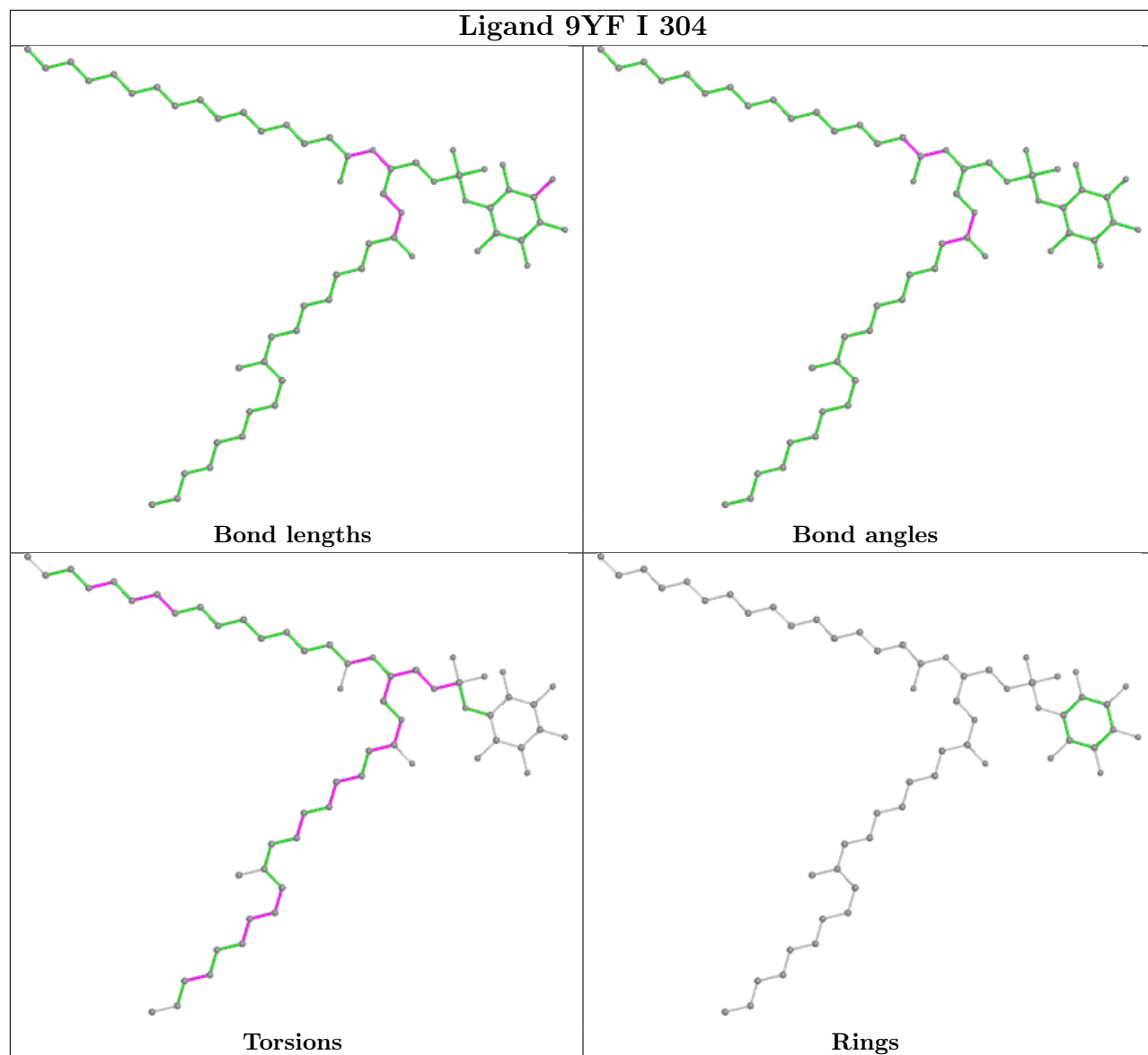
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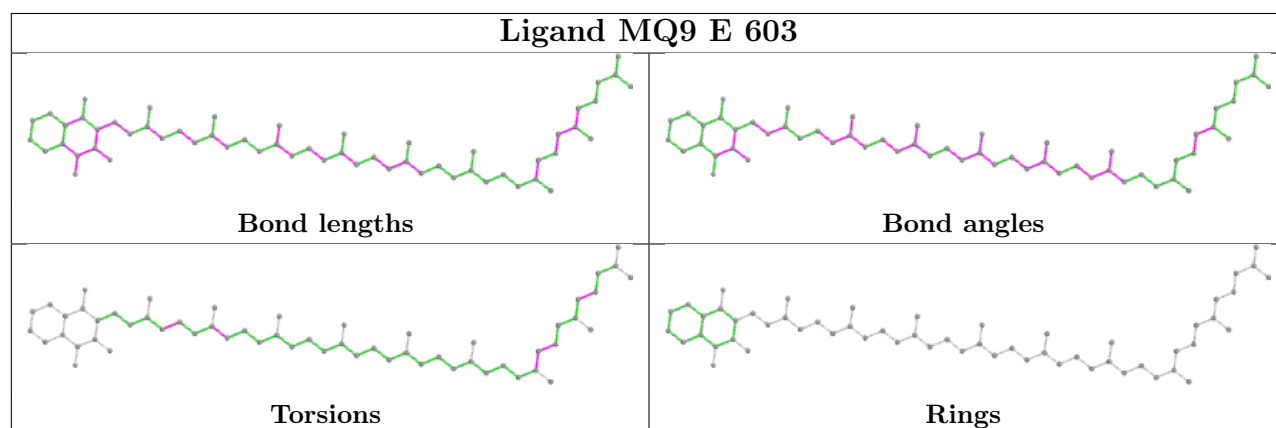
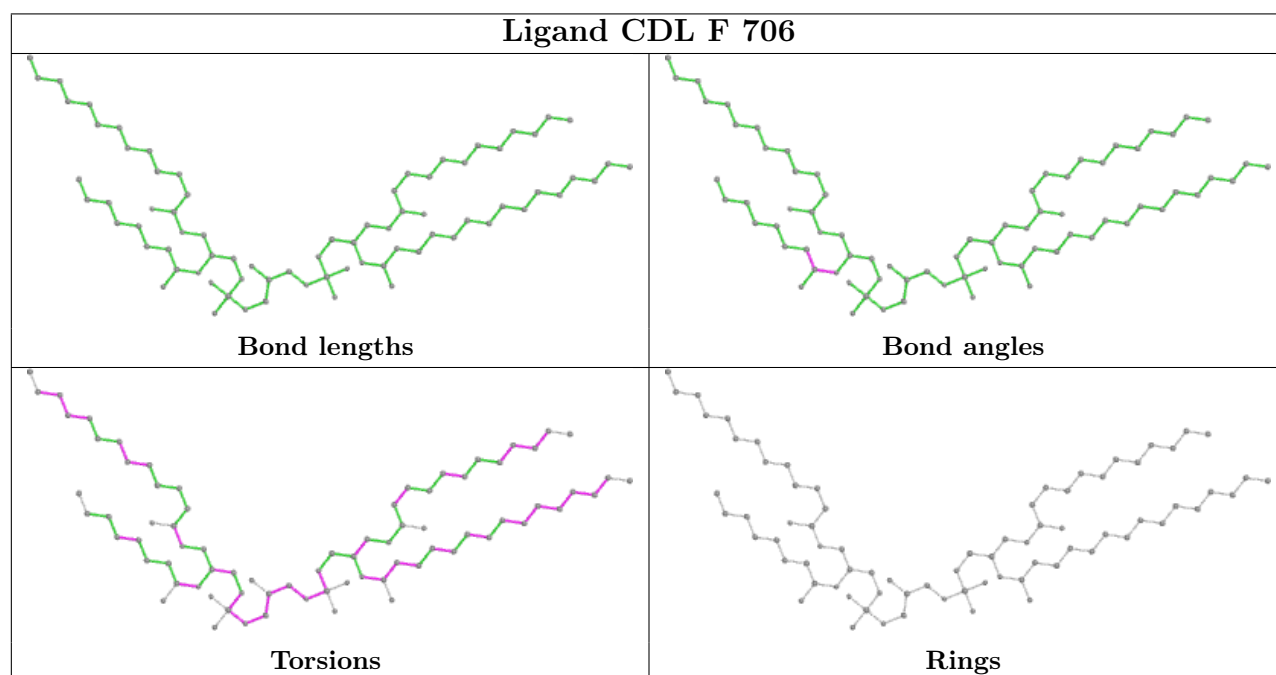
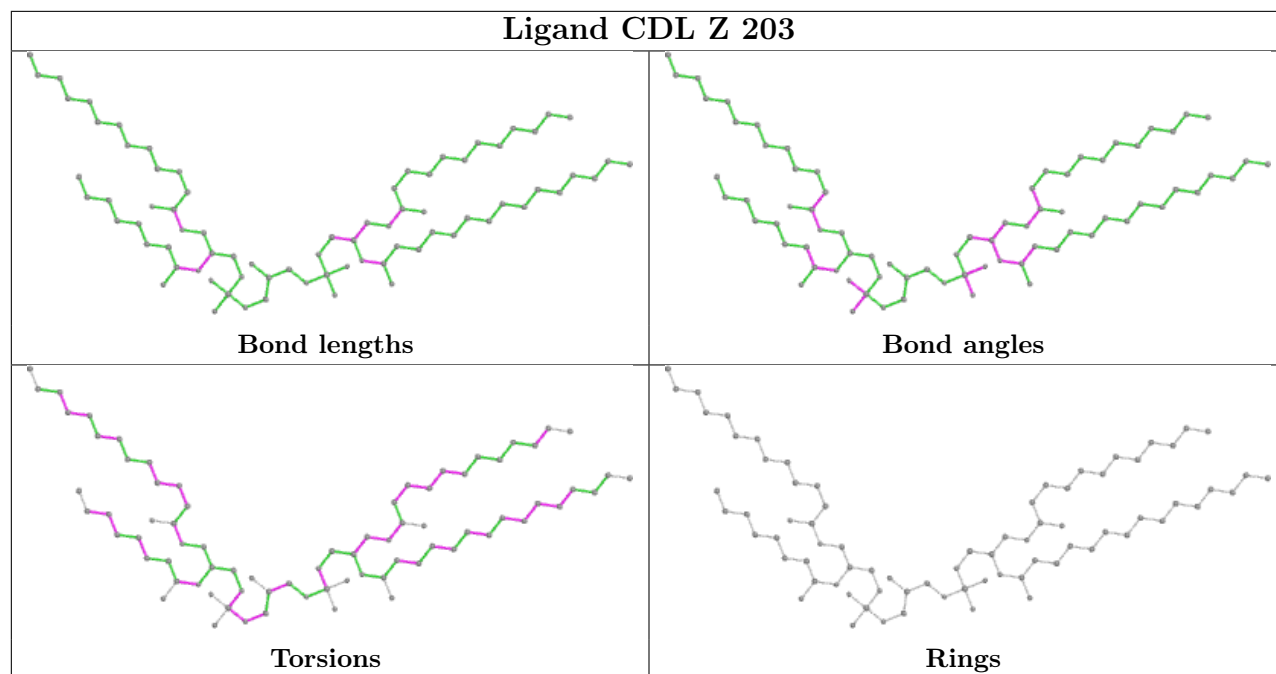
Mol	Chain	Res	Type	Clashes	Symm-Clashes
17	L	603	HEA	3	0
13	I	302	HEC	12	0
18	T	201	CDL	36	0
18	L	604	CDL	24	0
17	R	602	HEA	1	0
15	F	707	MQ9	4	0
21	F	702	HEM	1	0
18	X	303	CDL	54	0

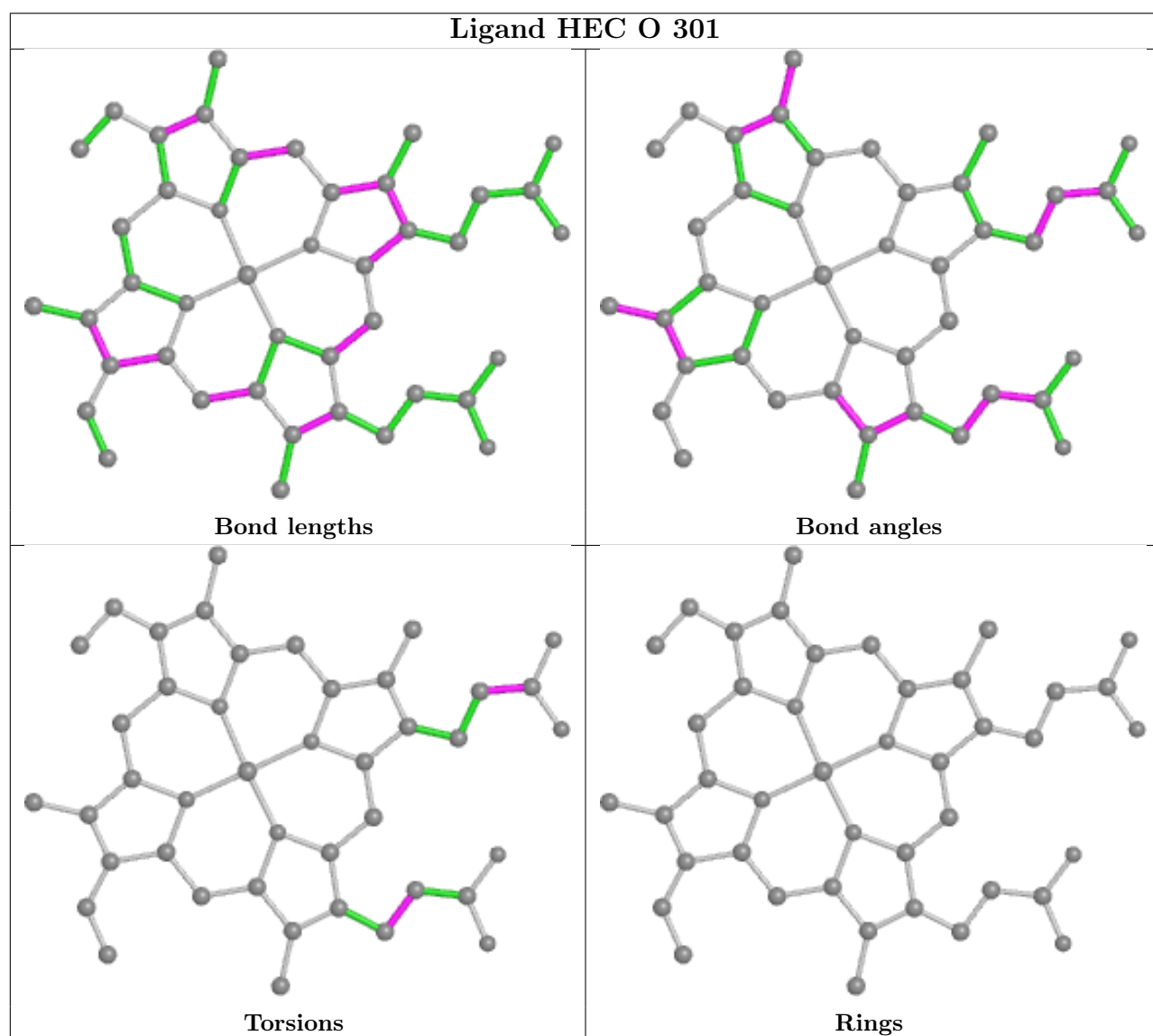
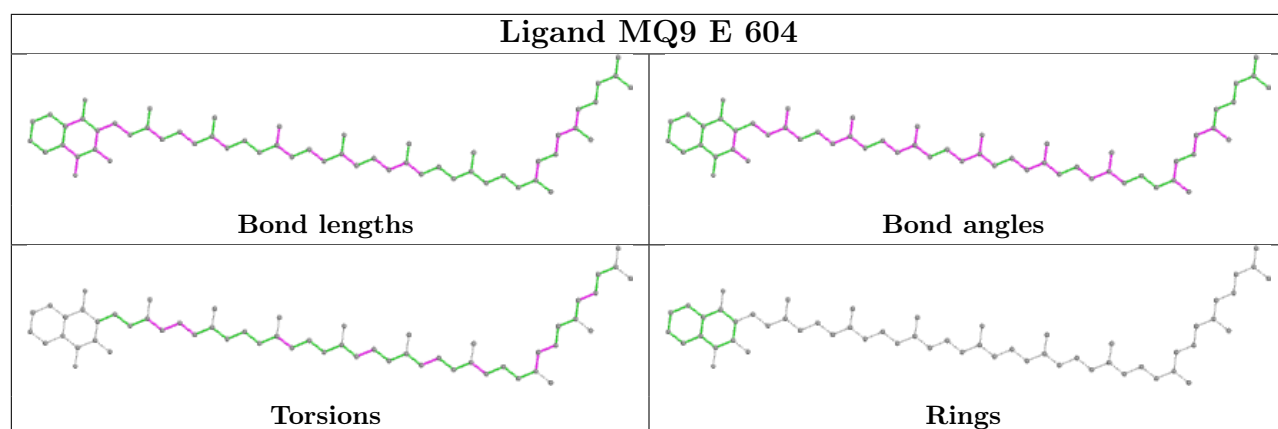
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

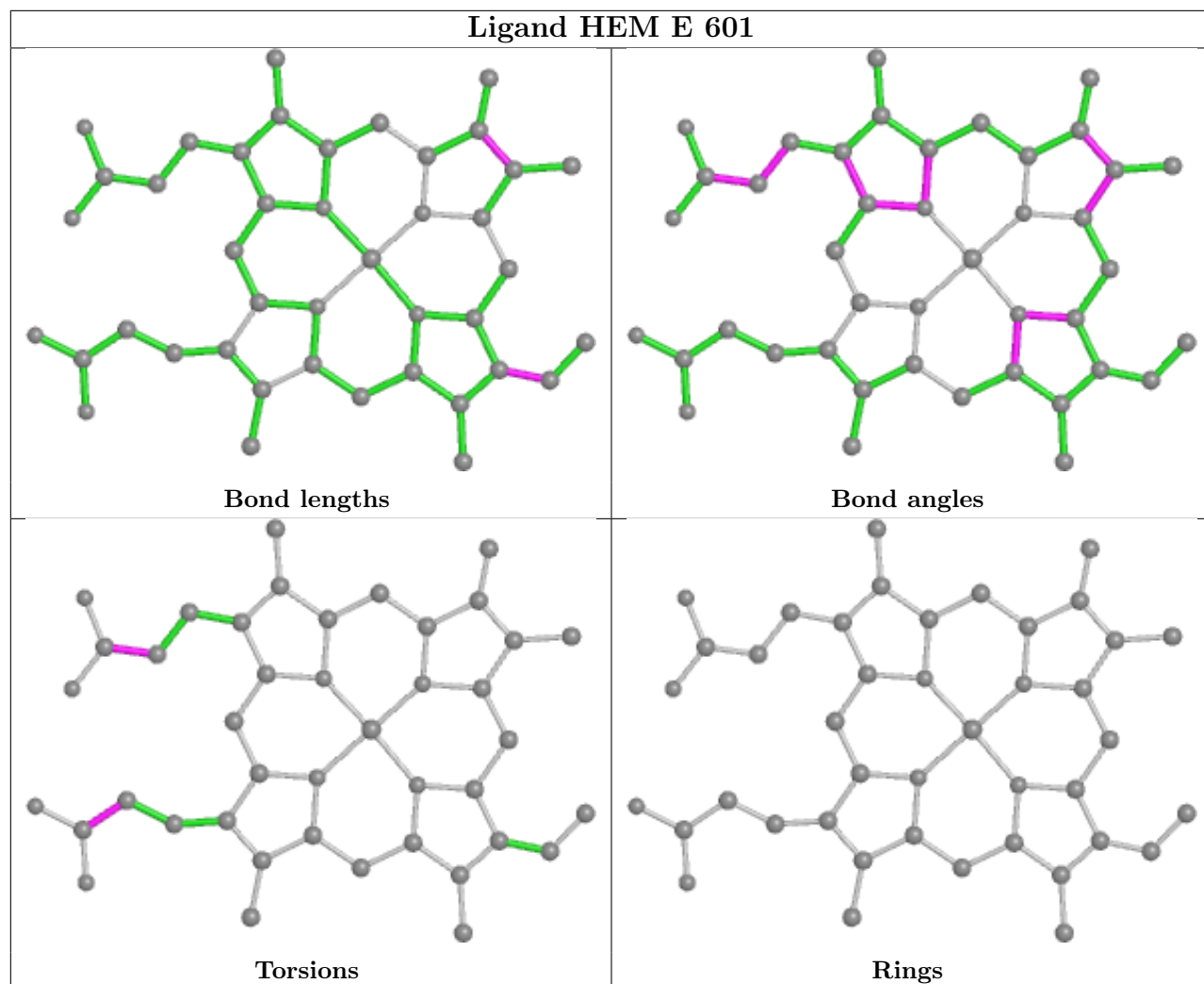


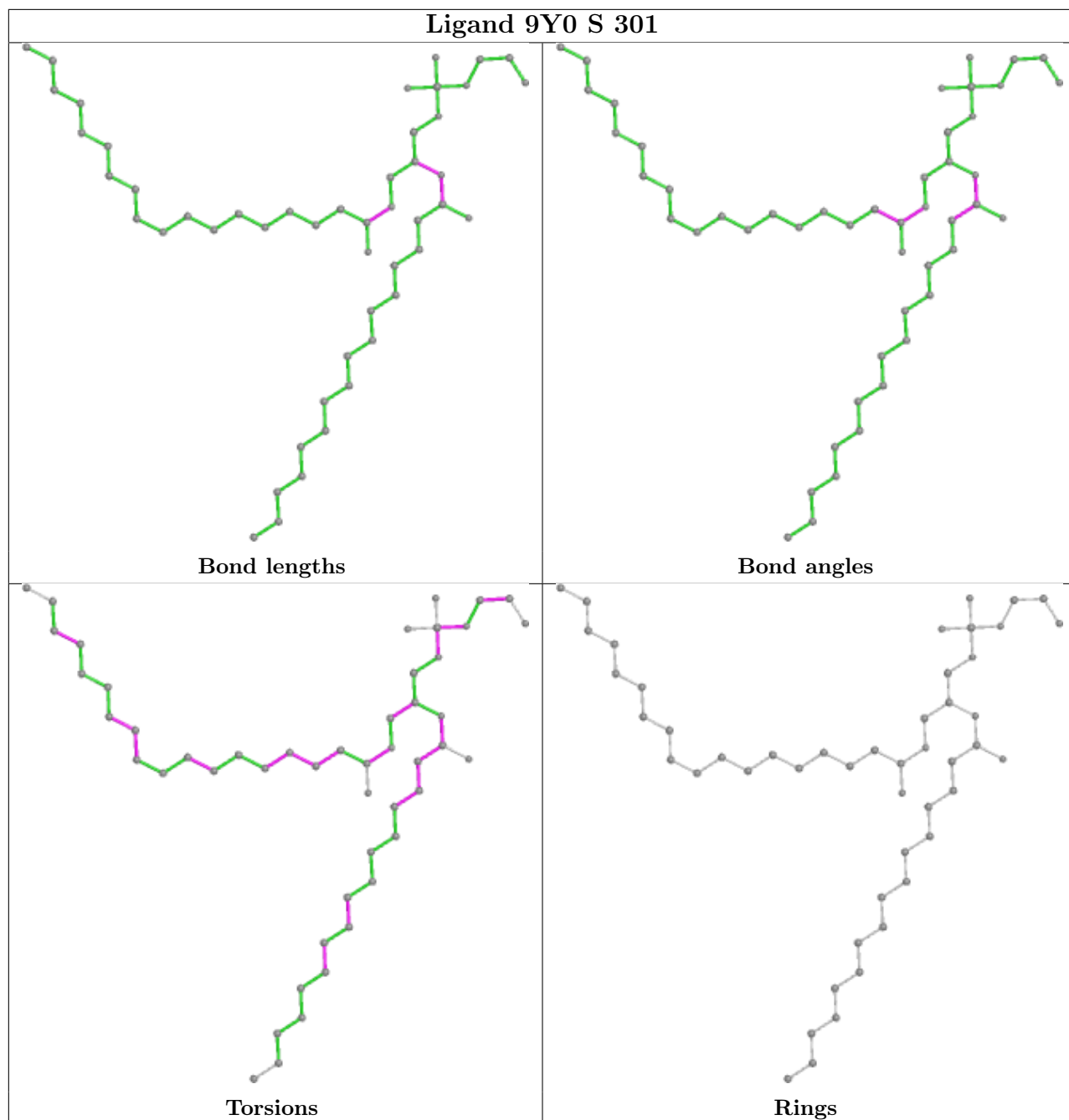


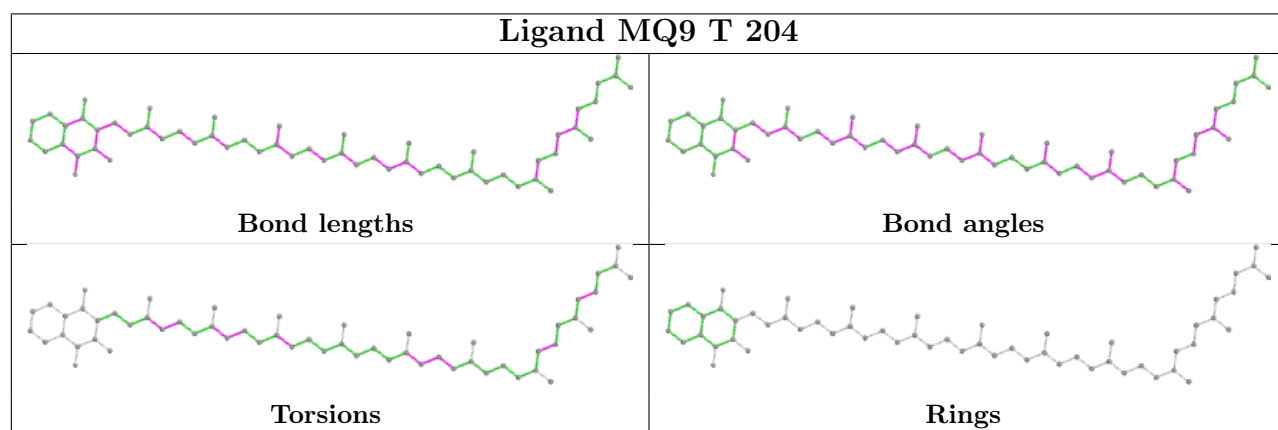
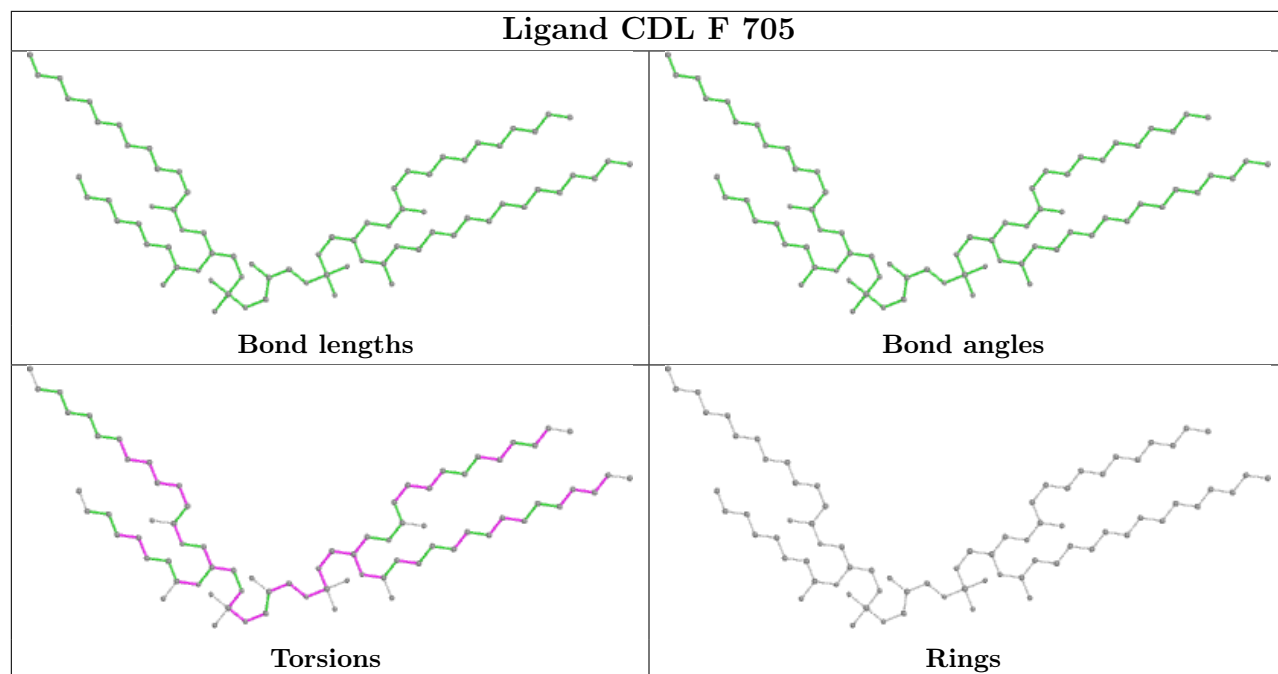


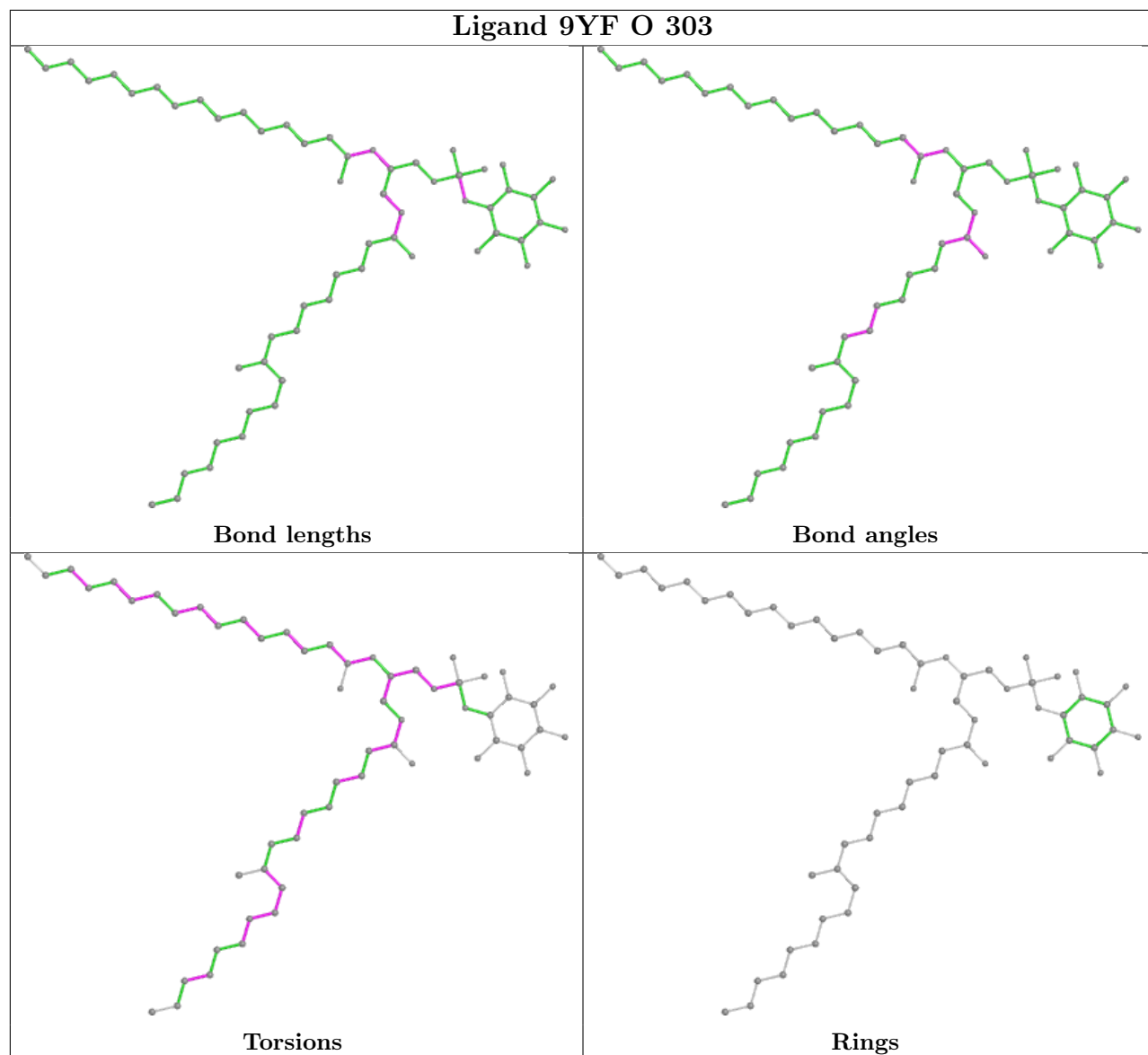


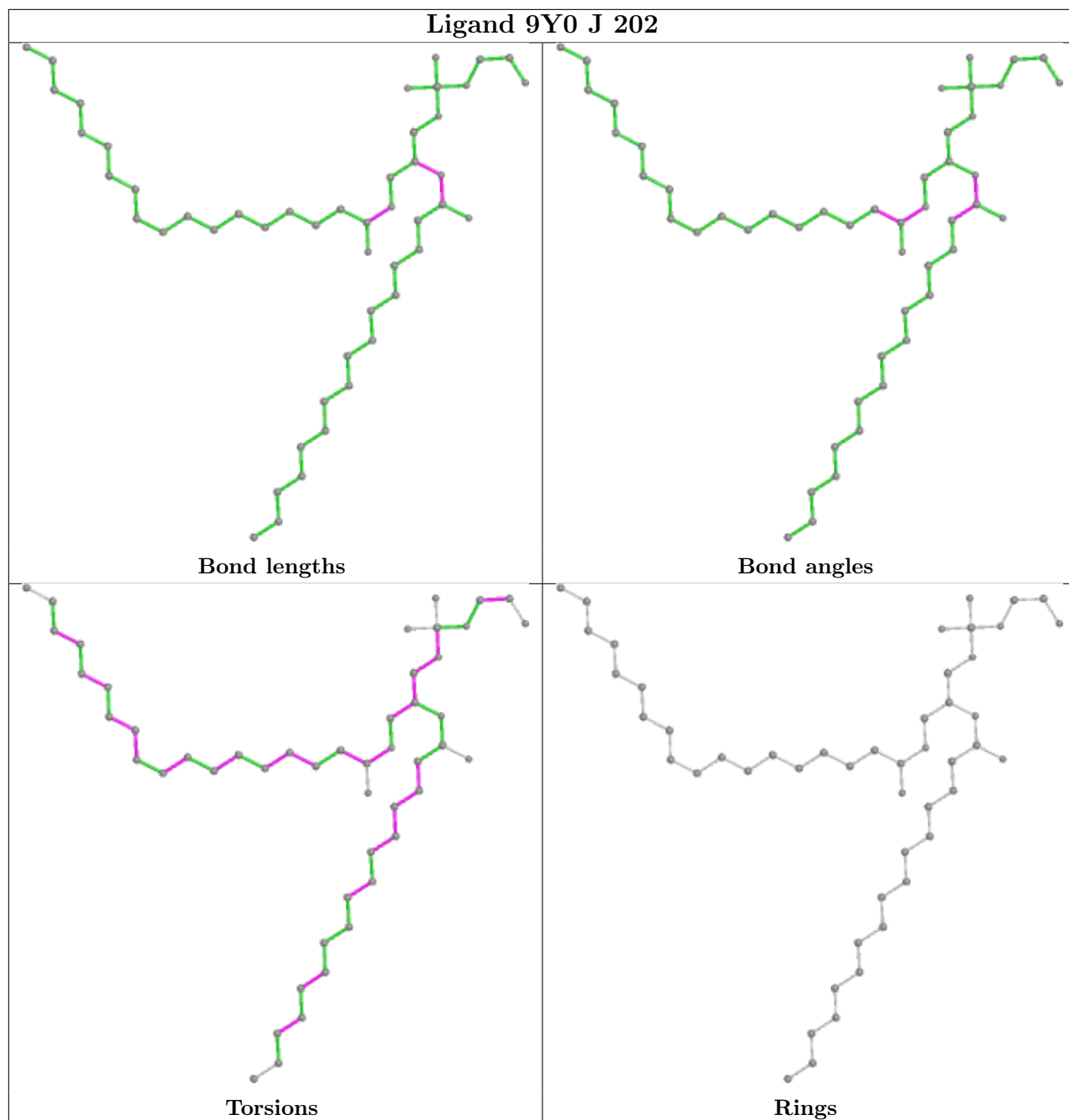


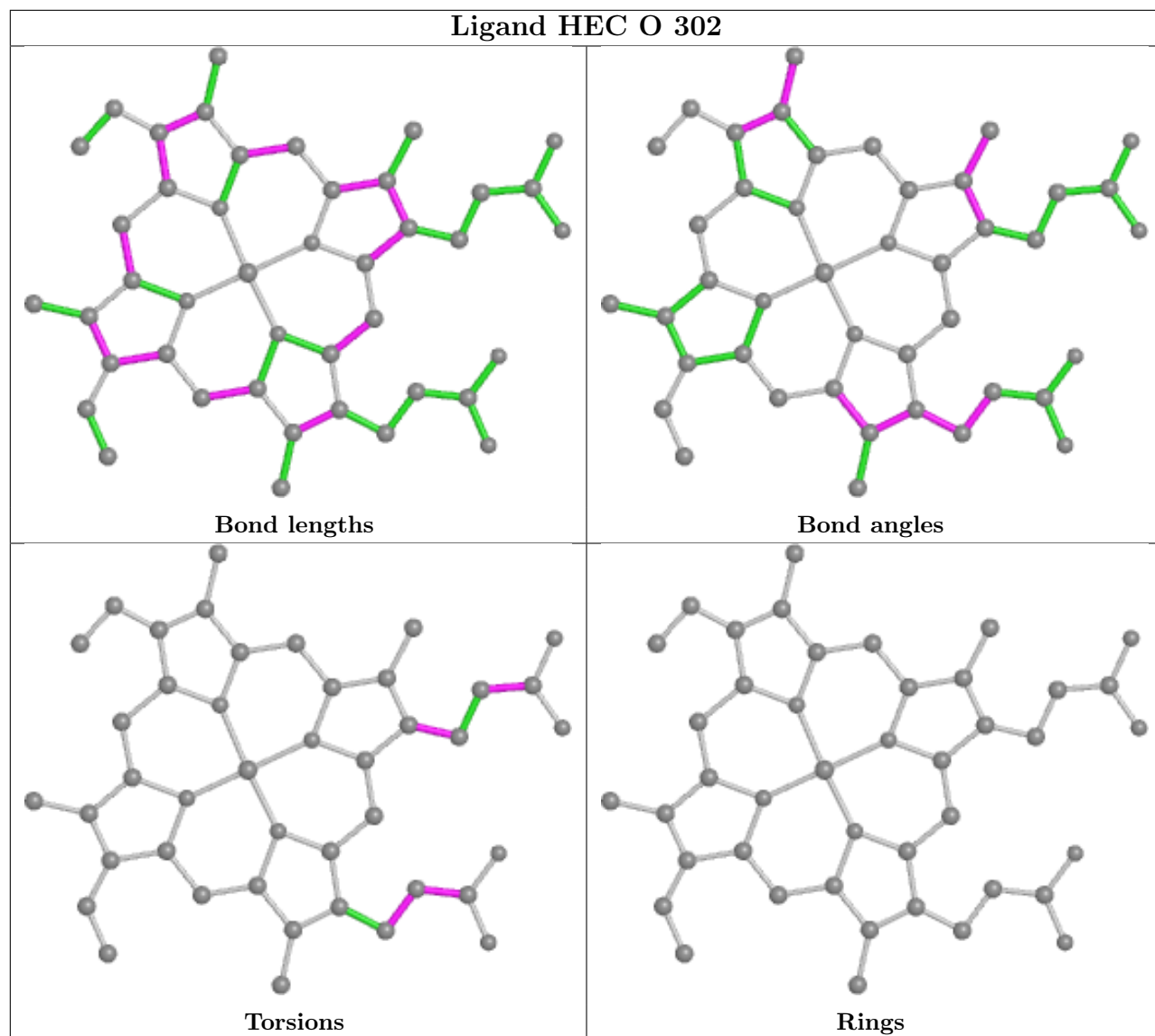


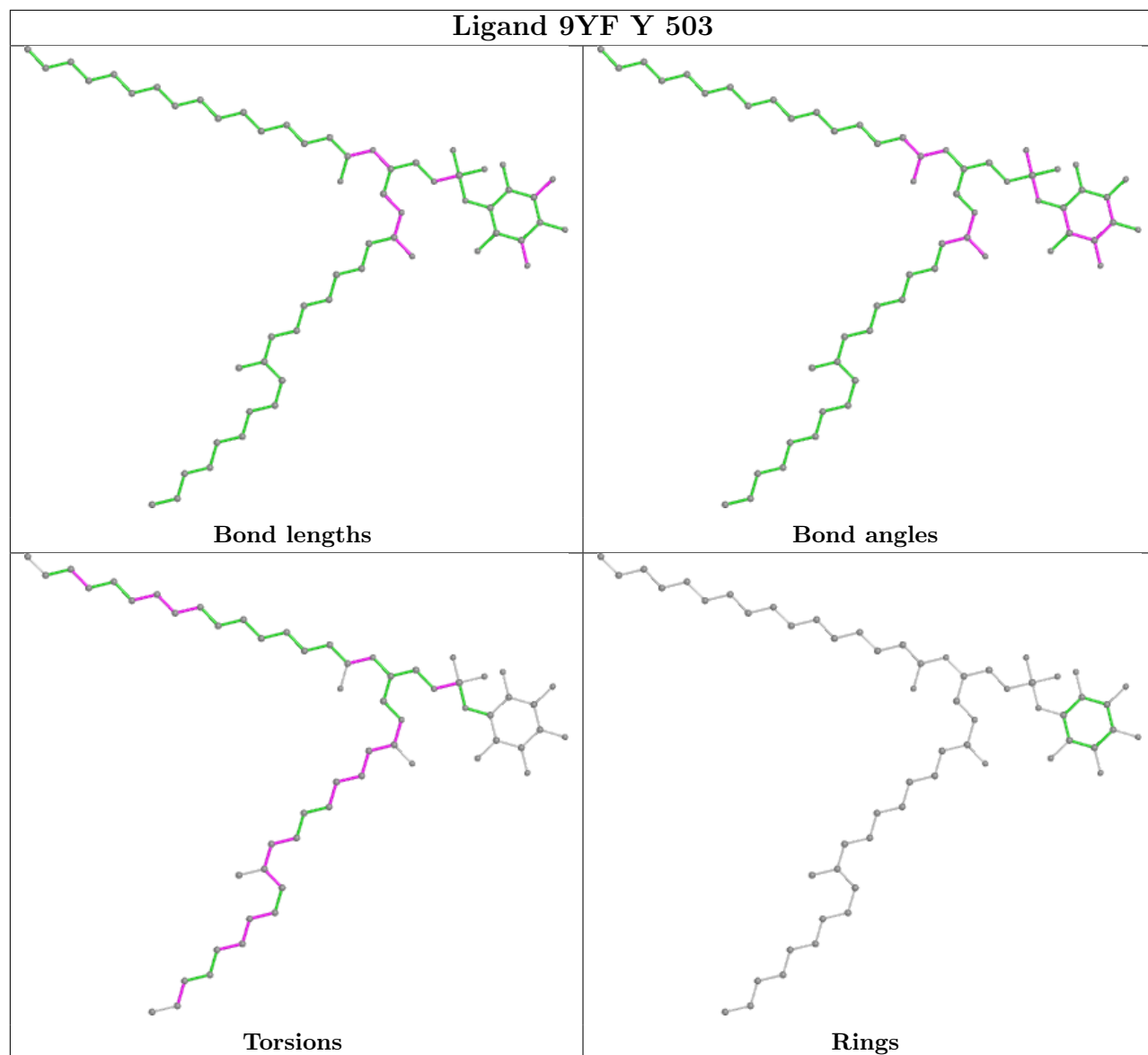


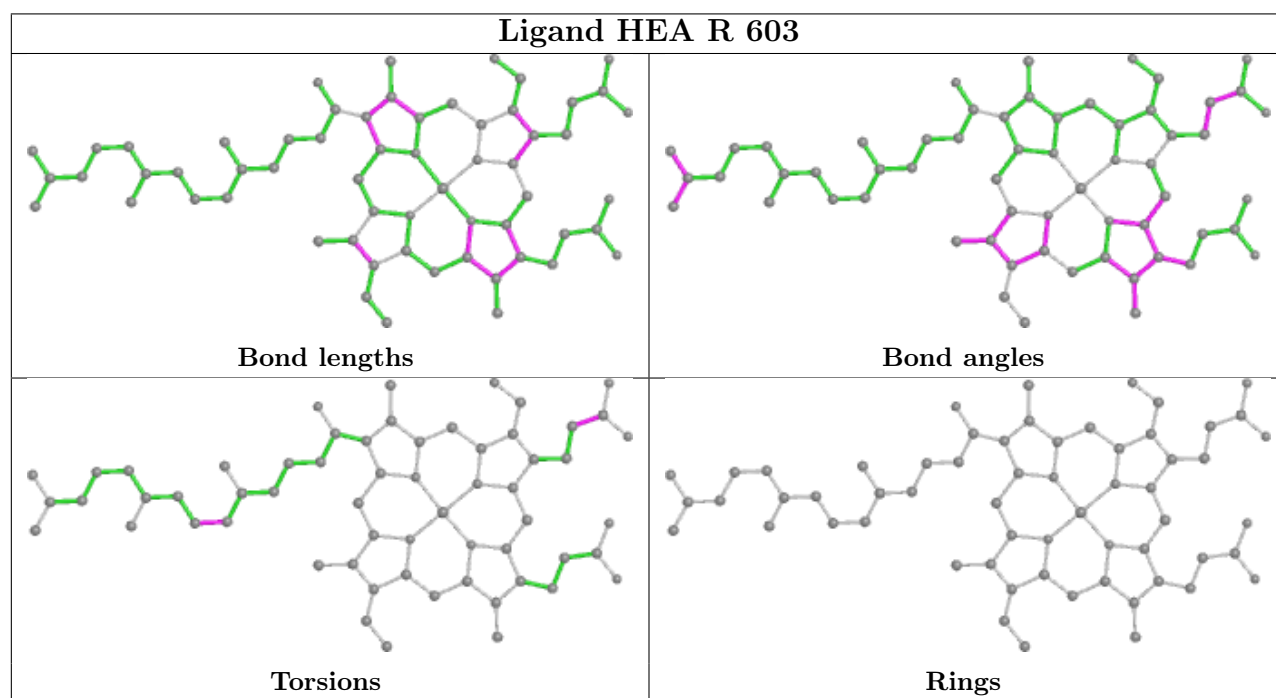
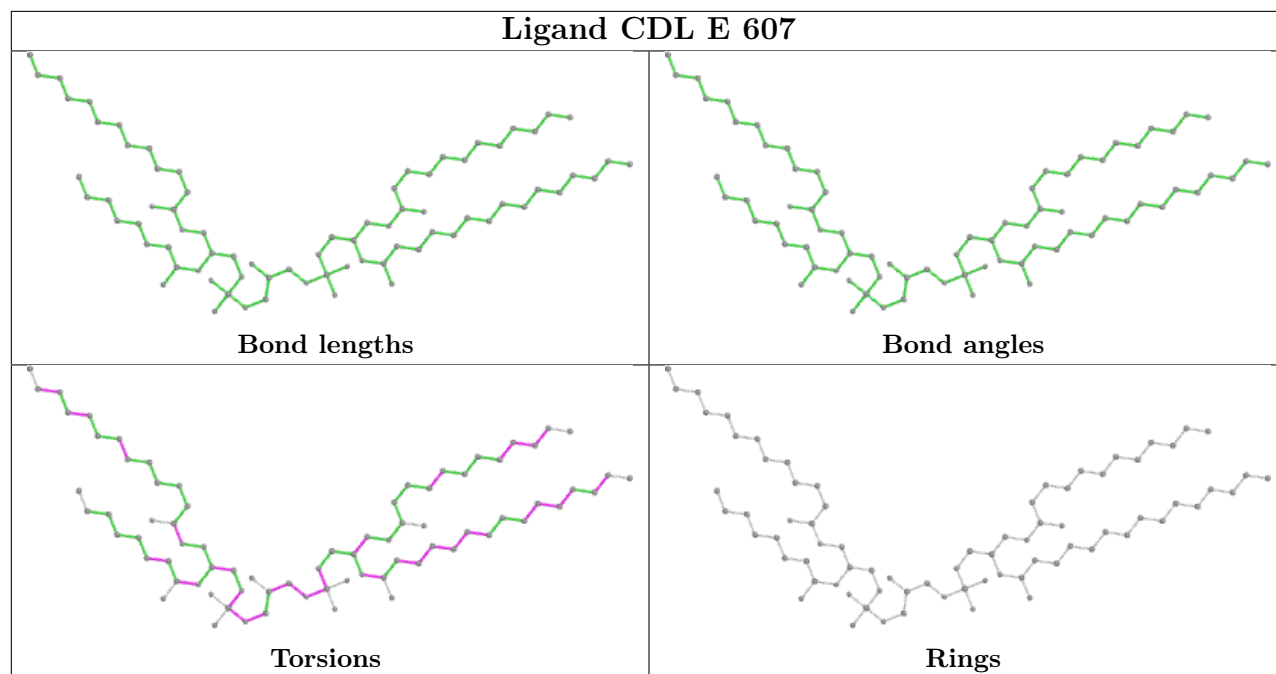


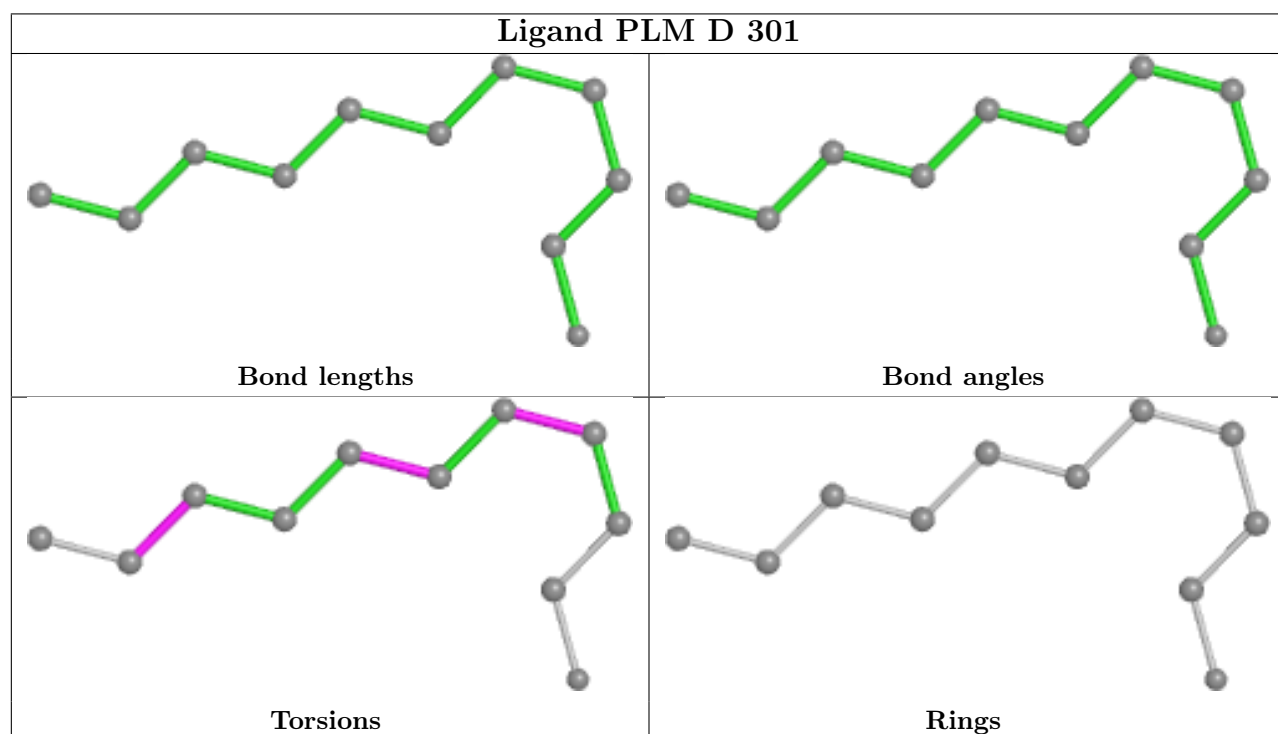
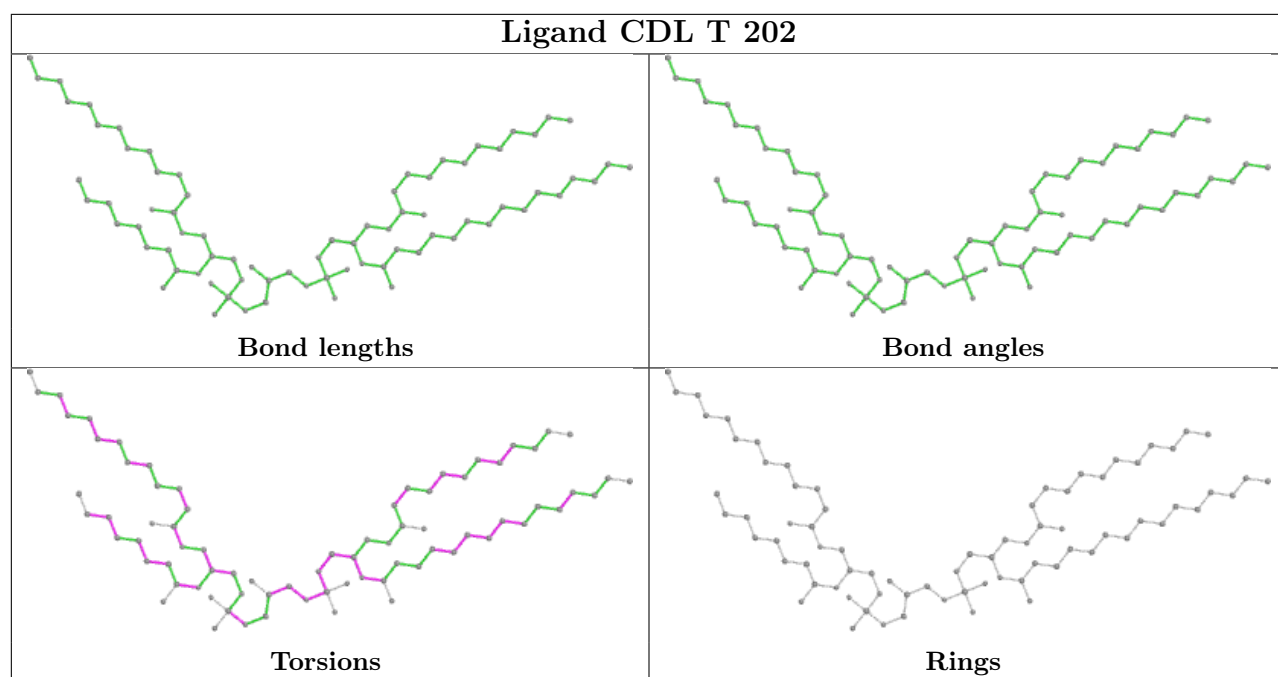


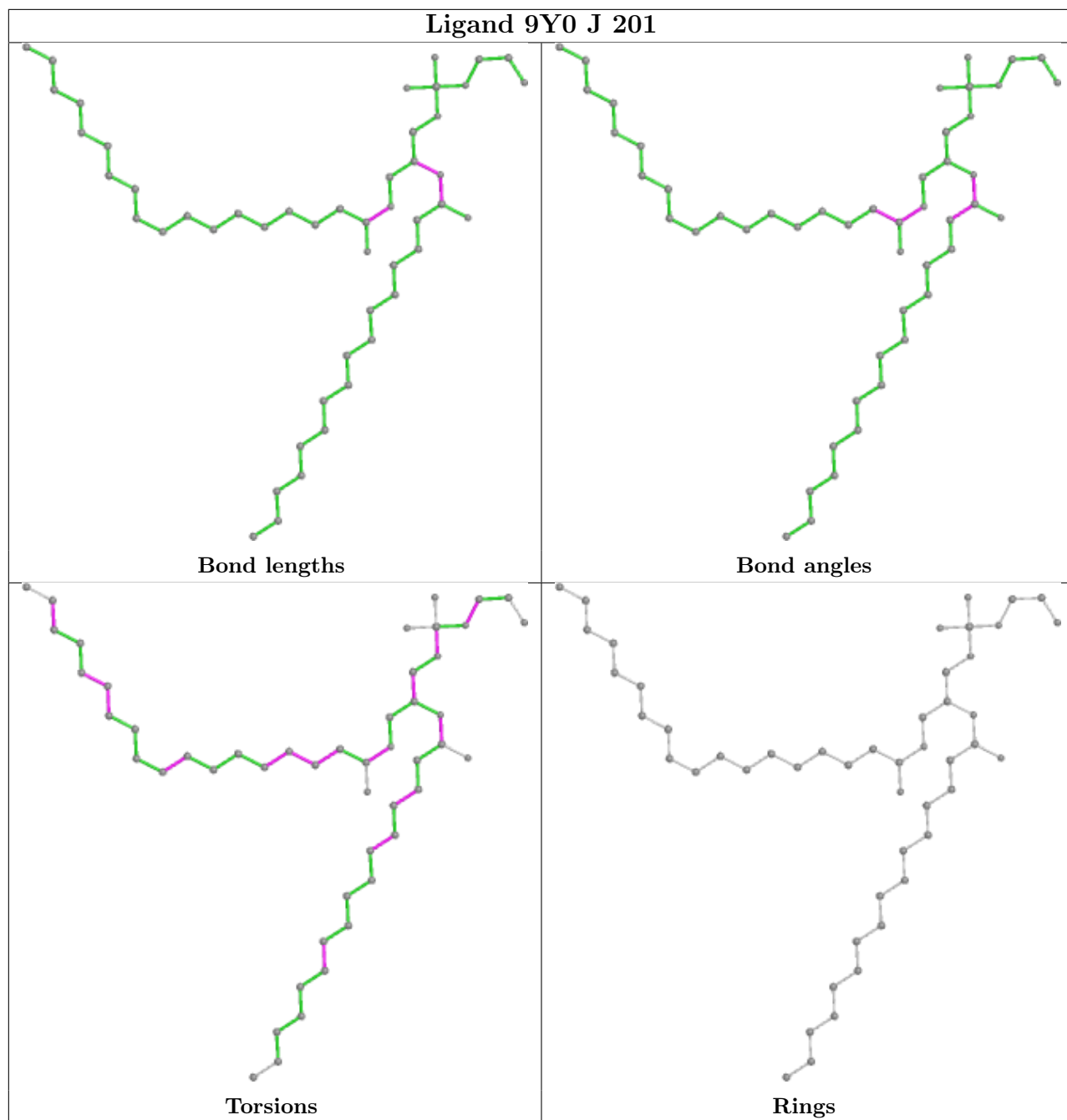


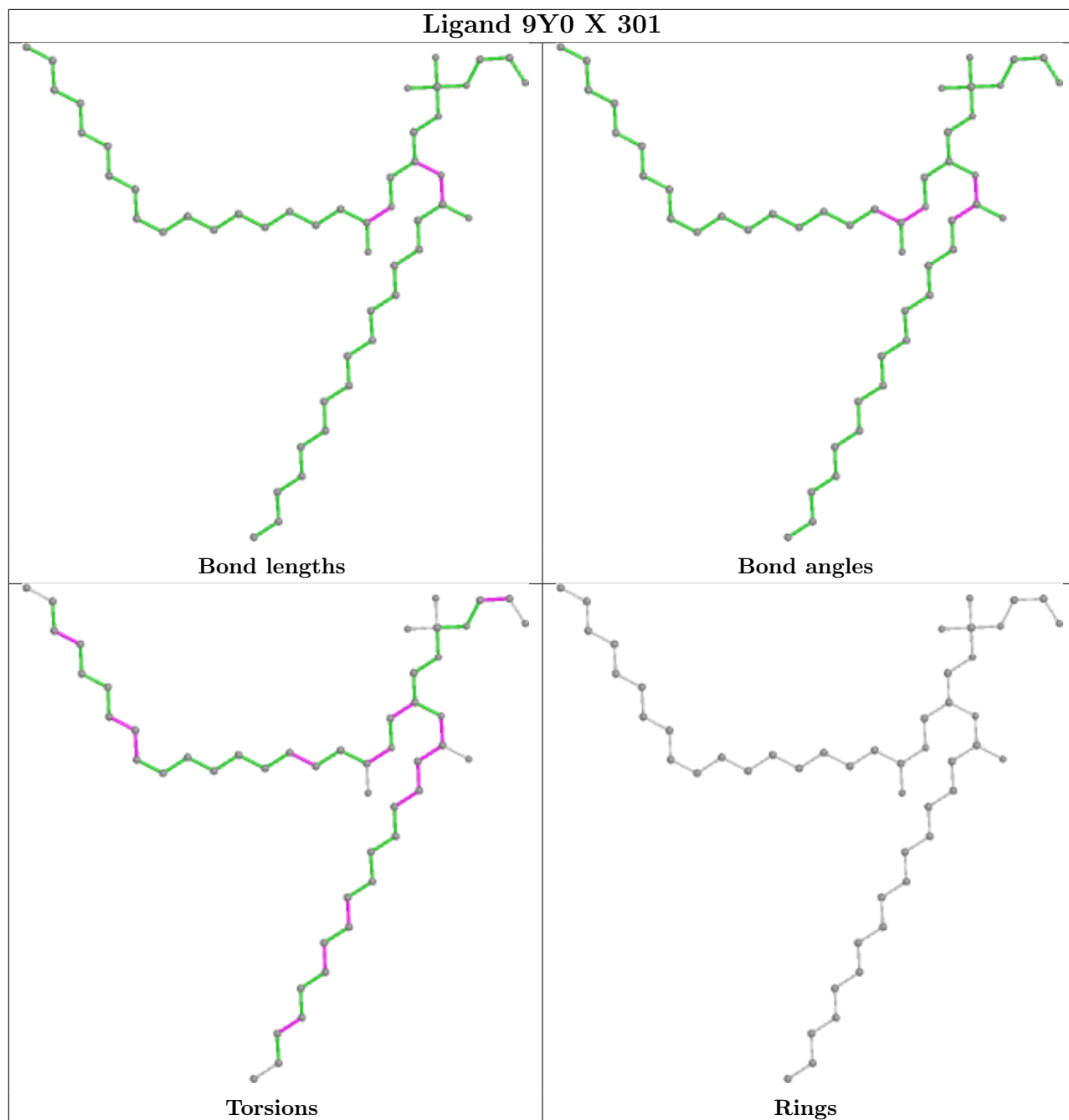


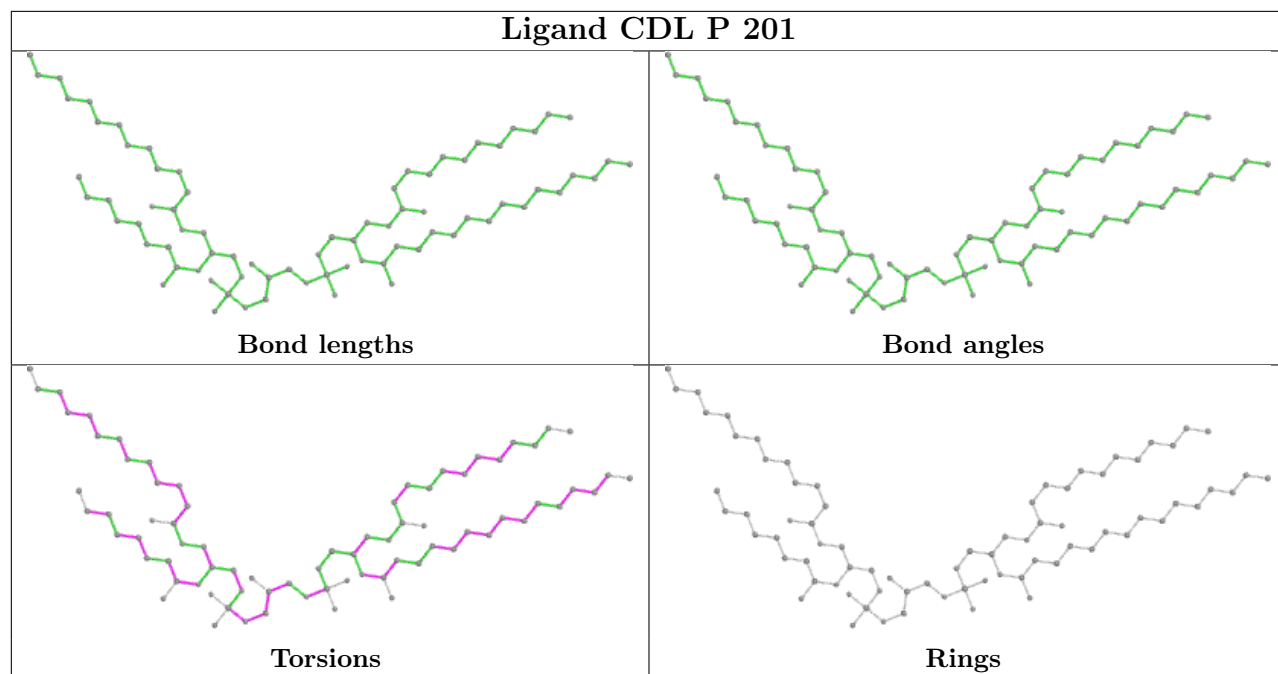


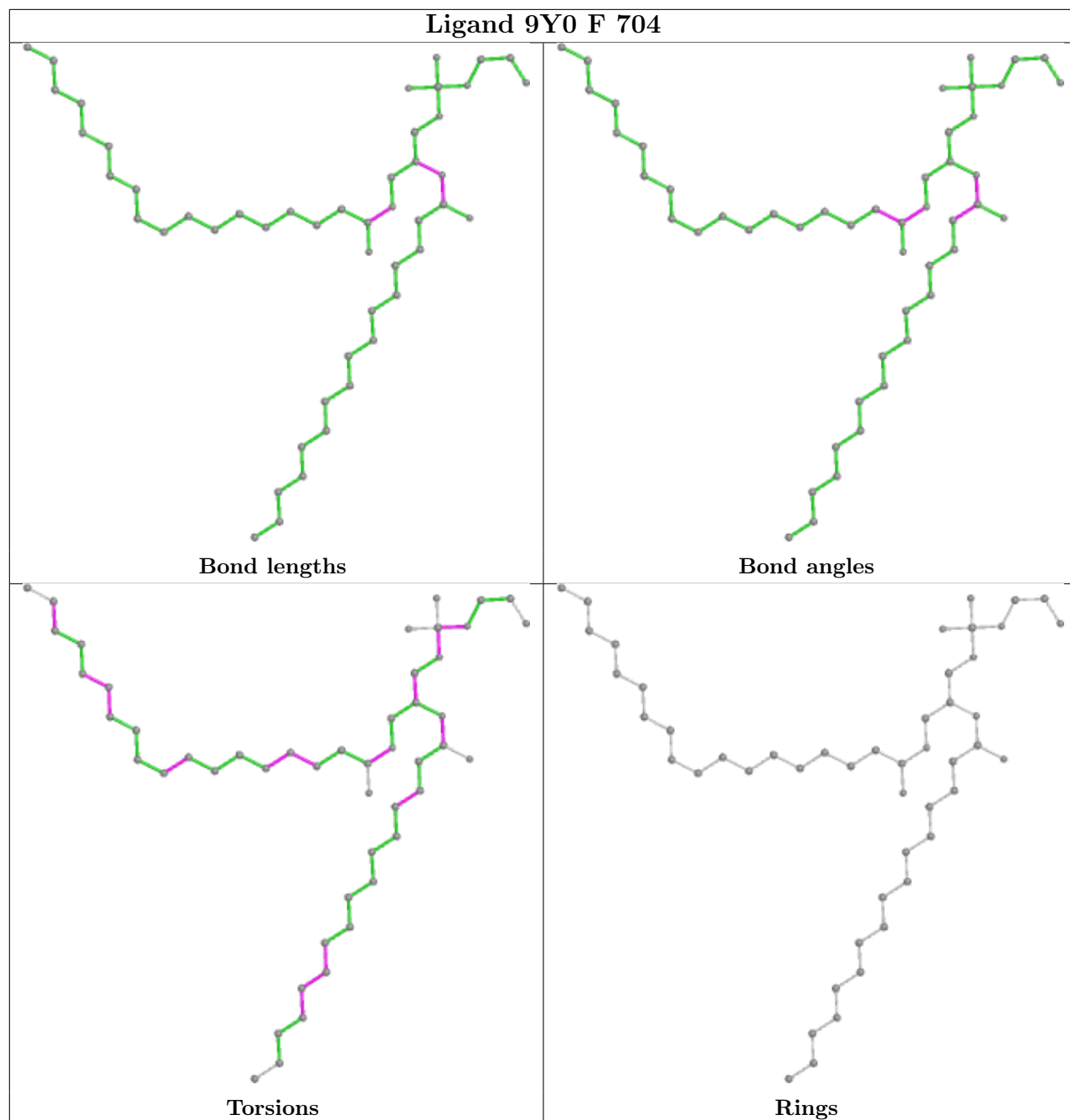


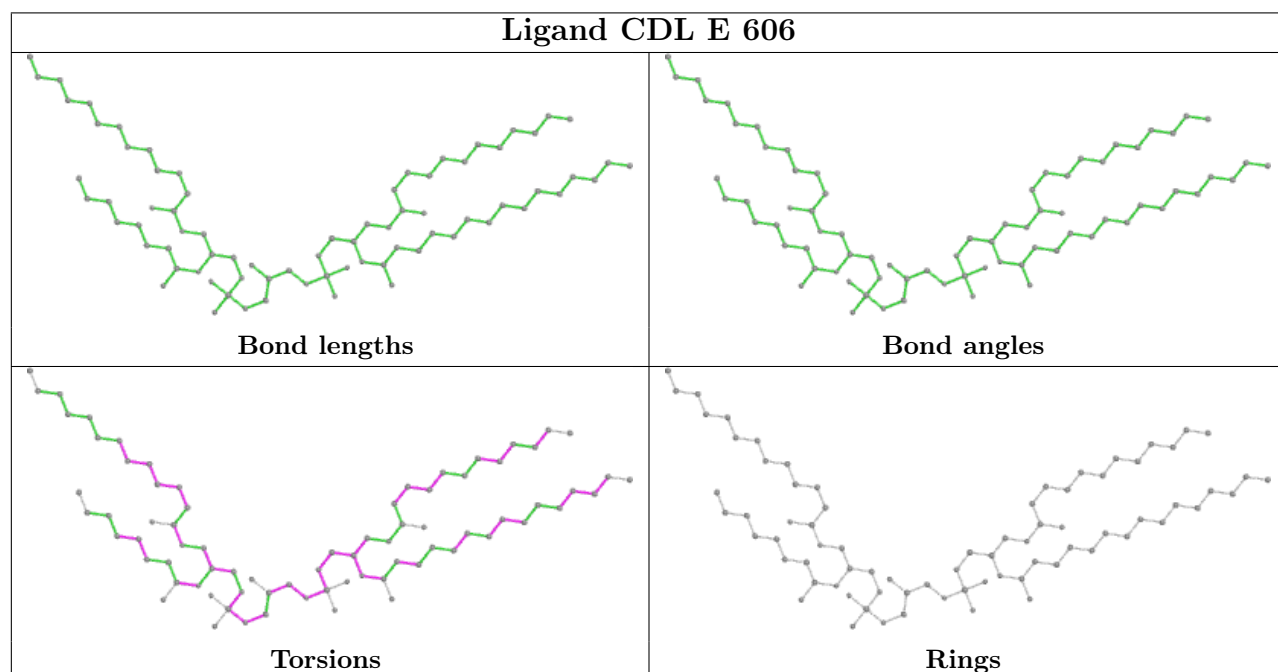
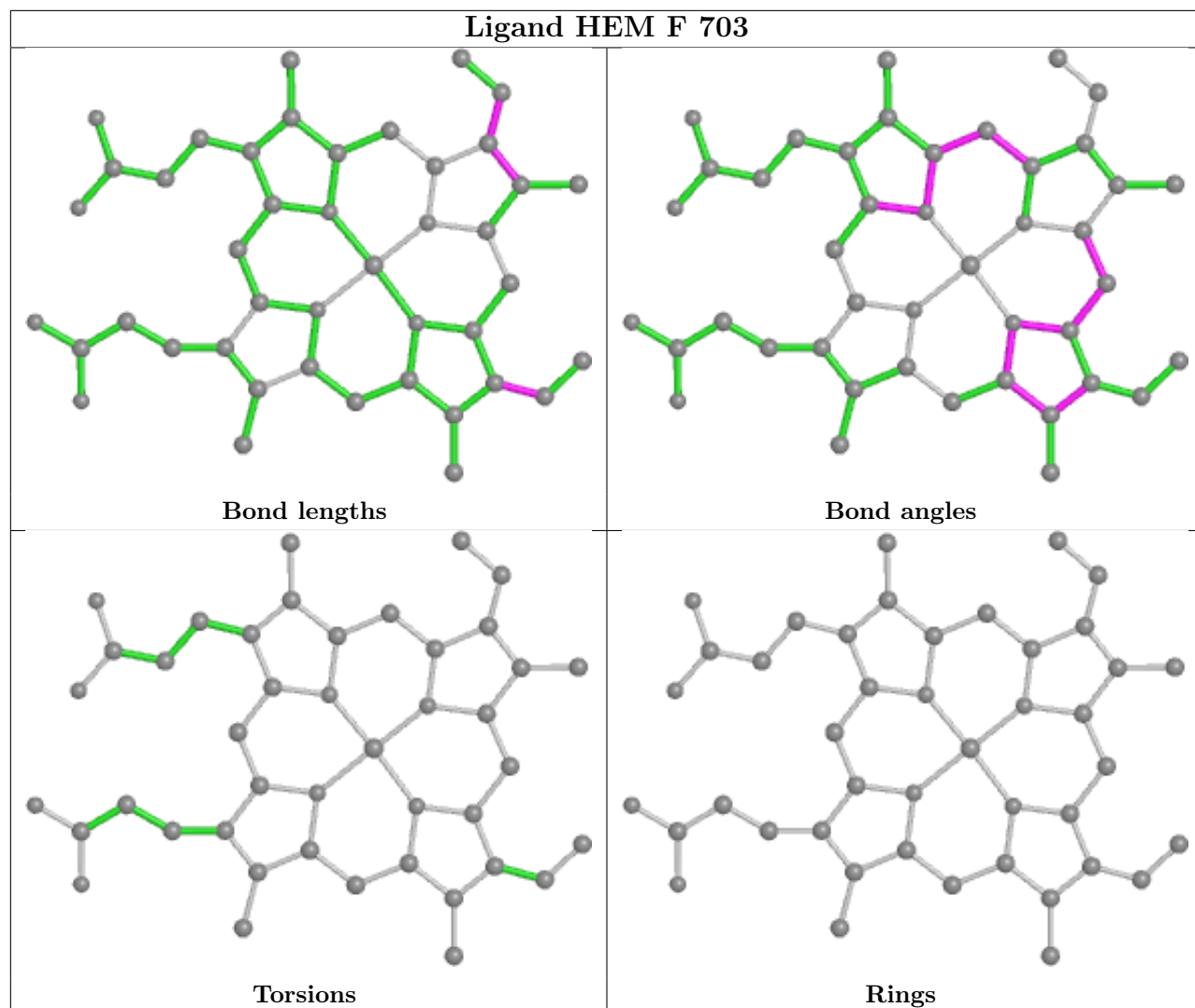


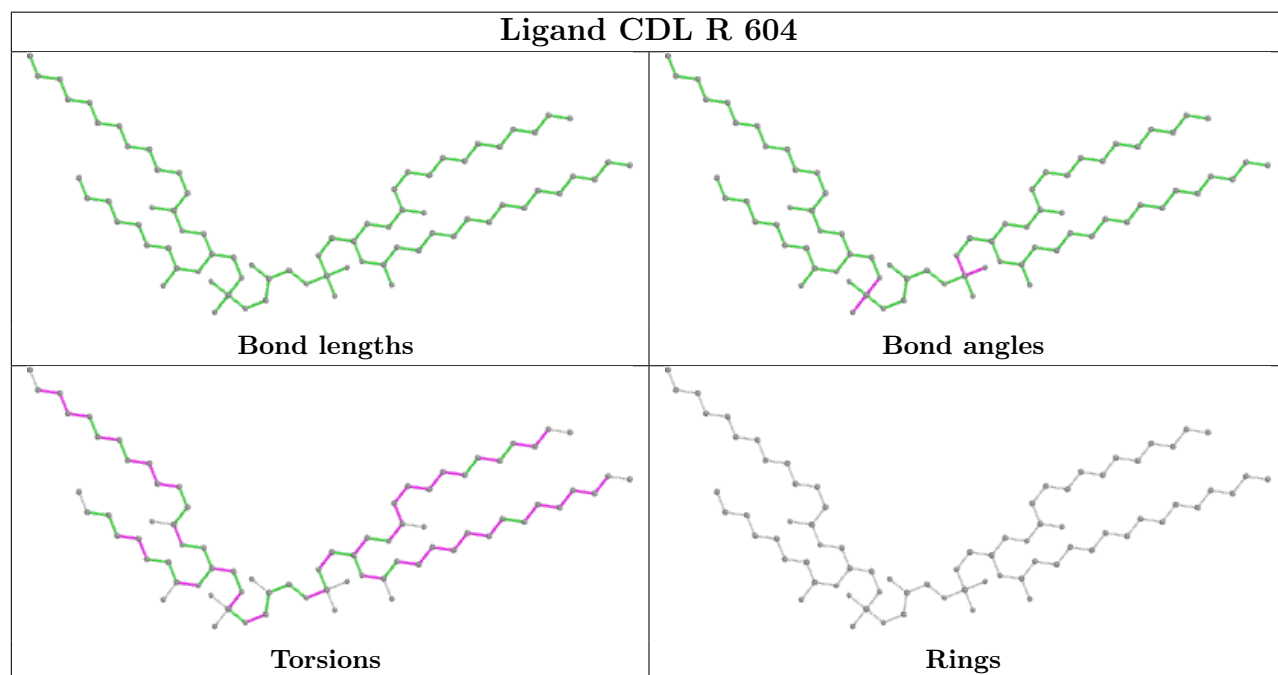
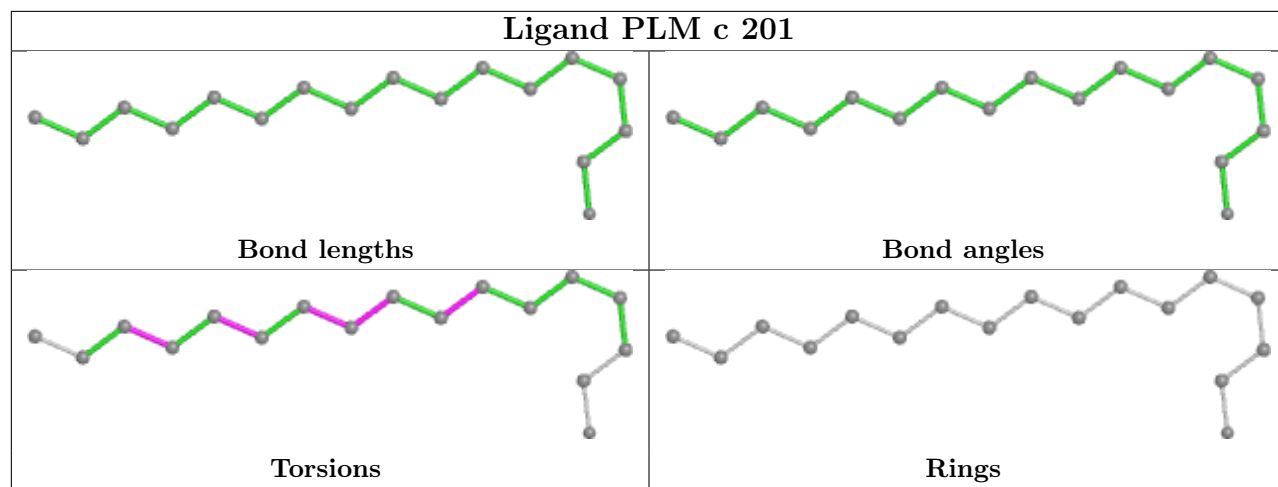


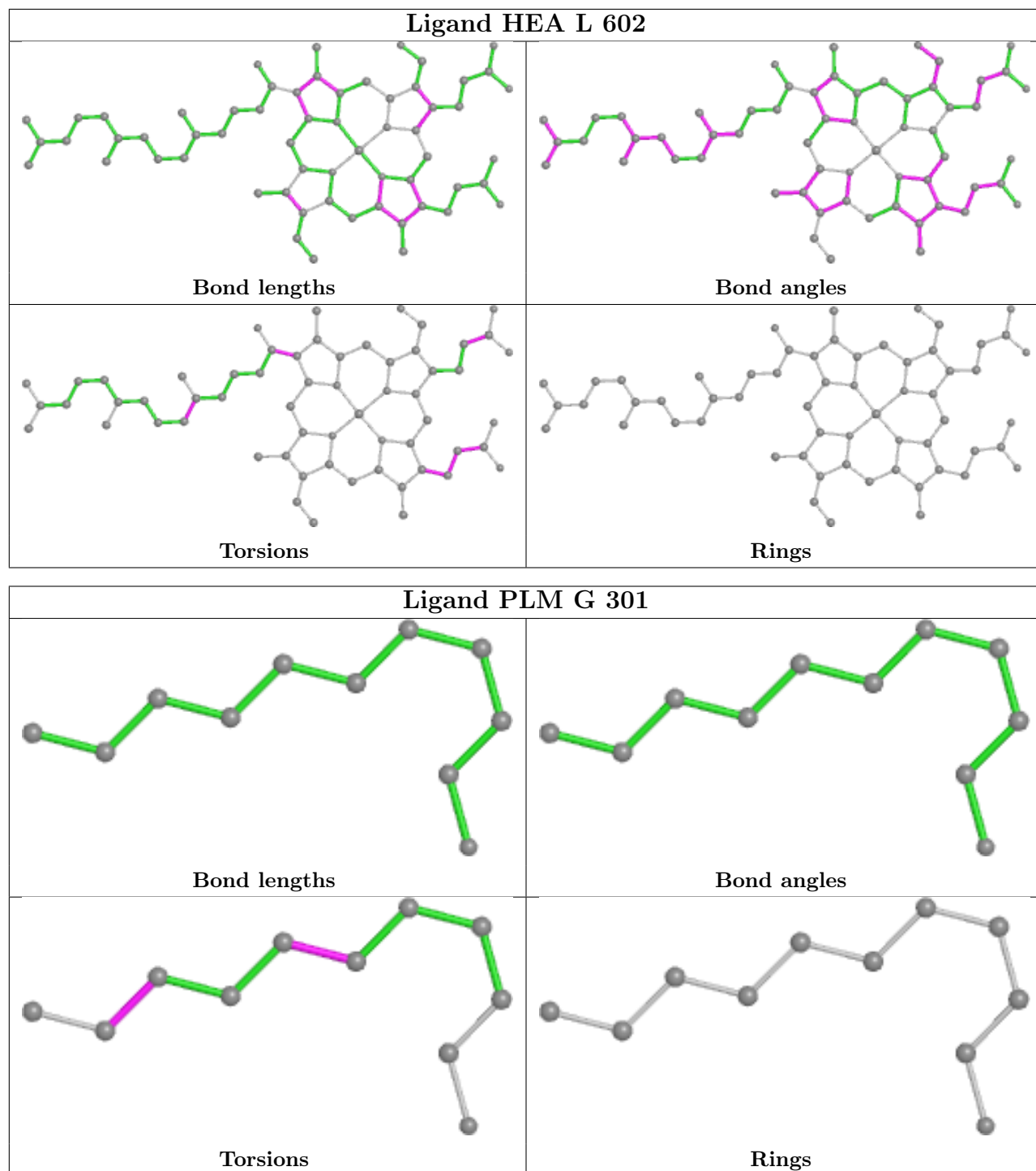


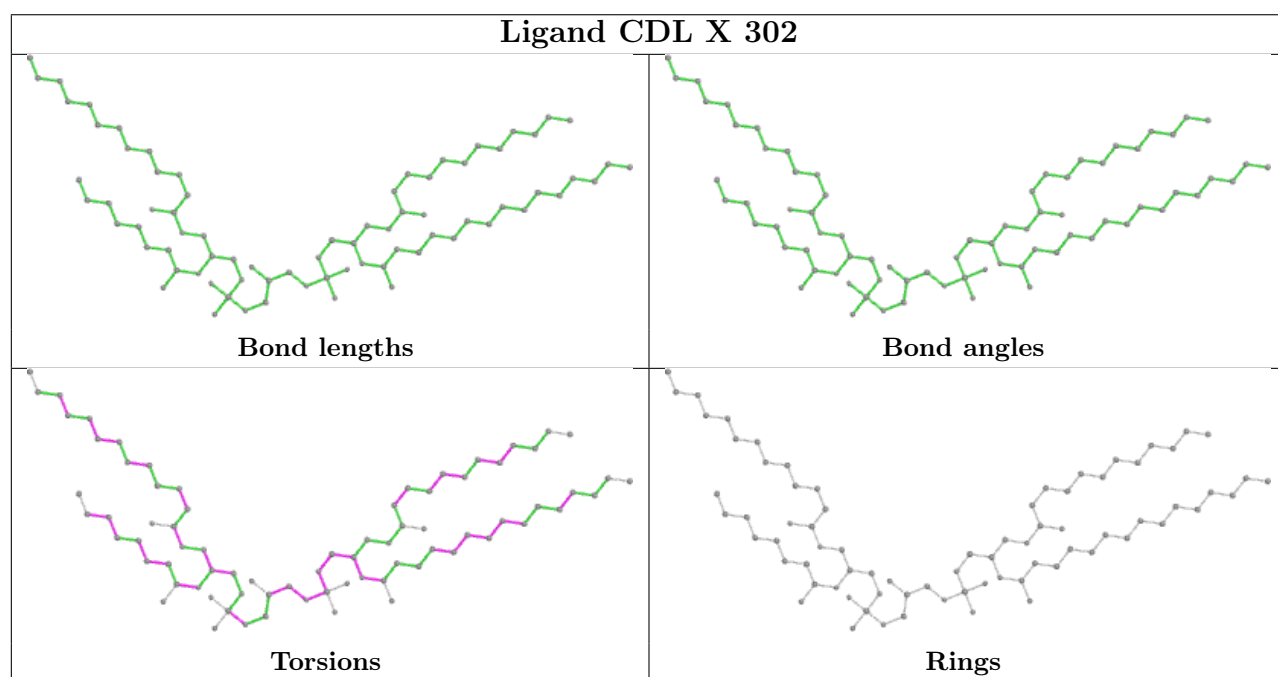
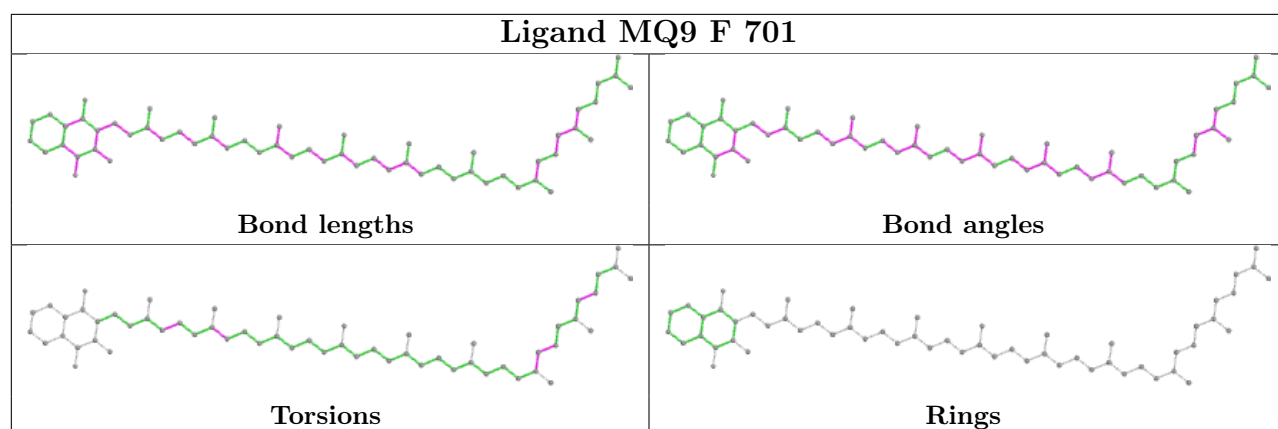


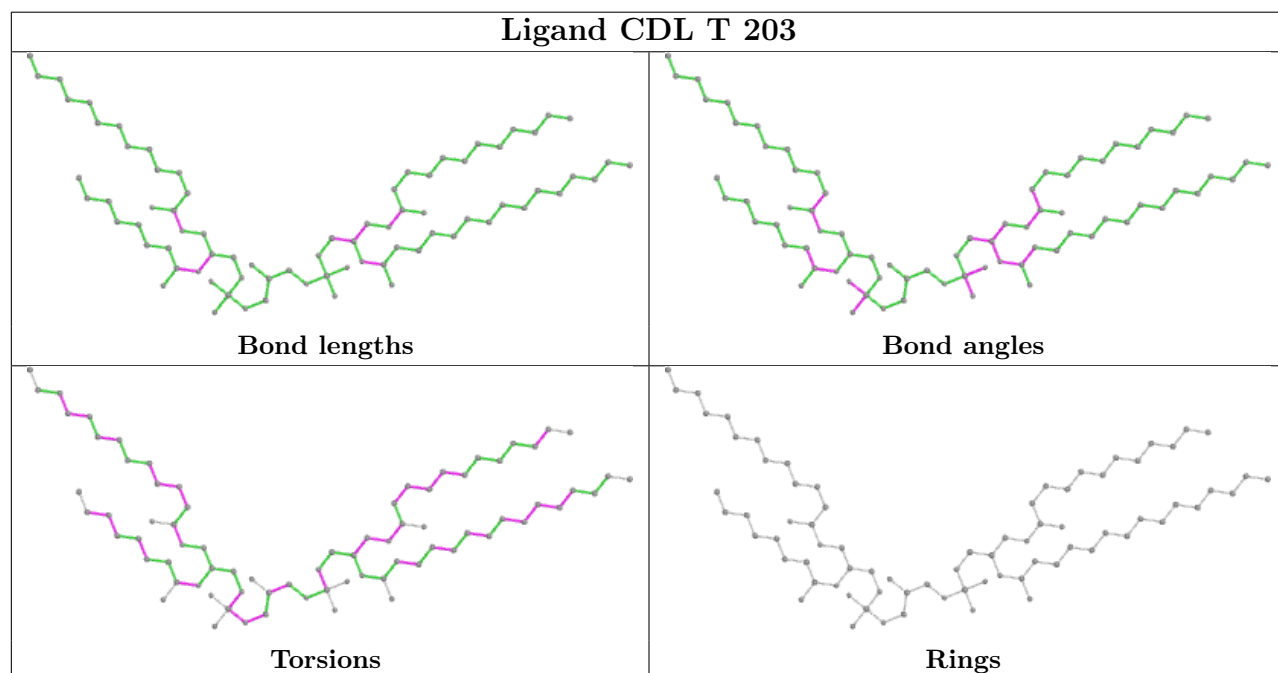
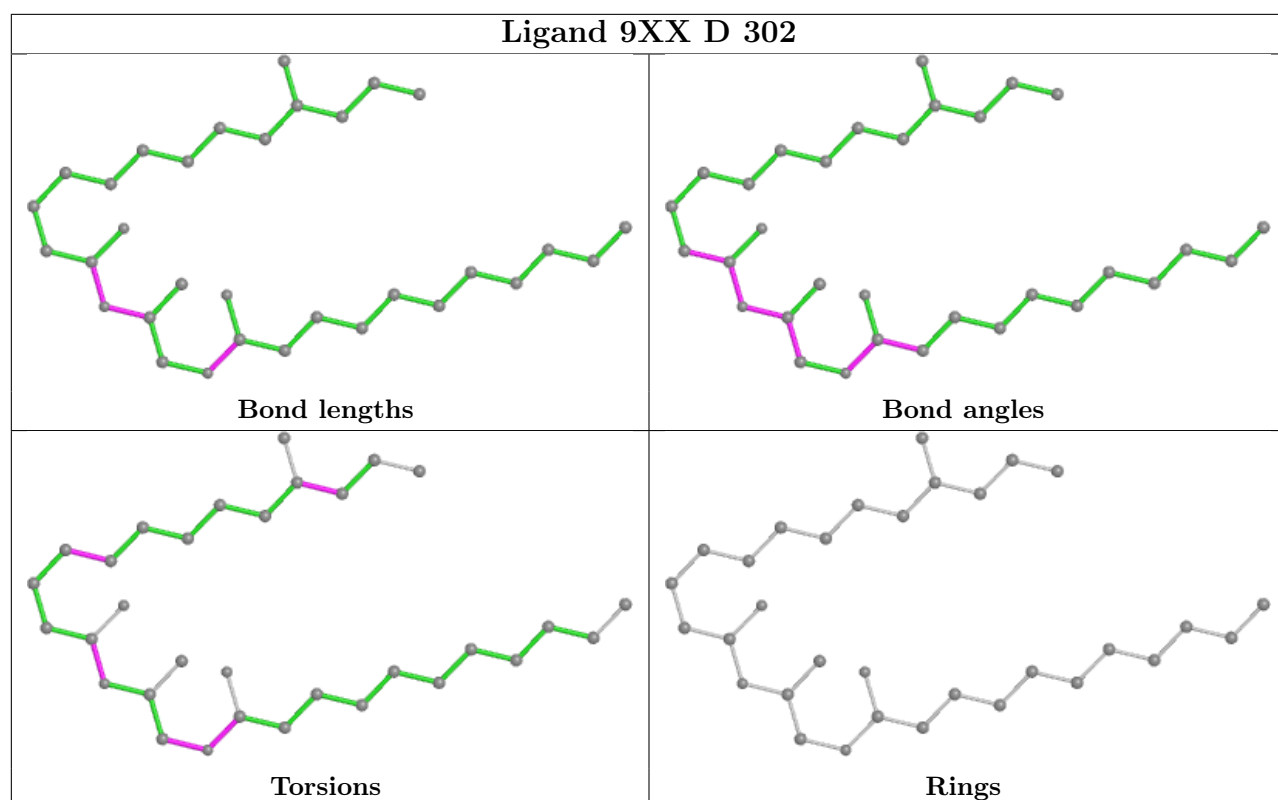


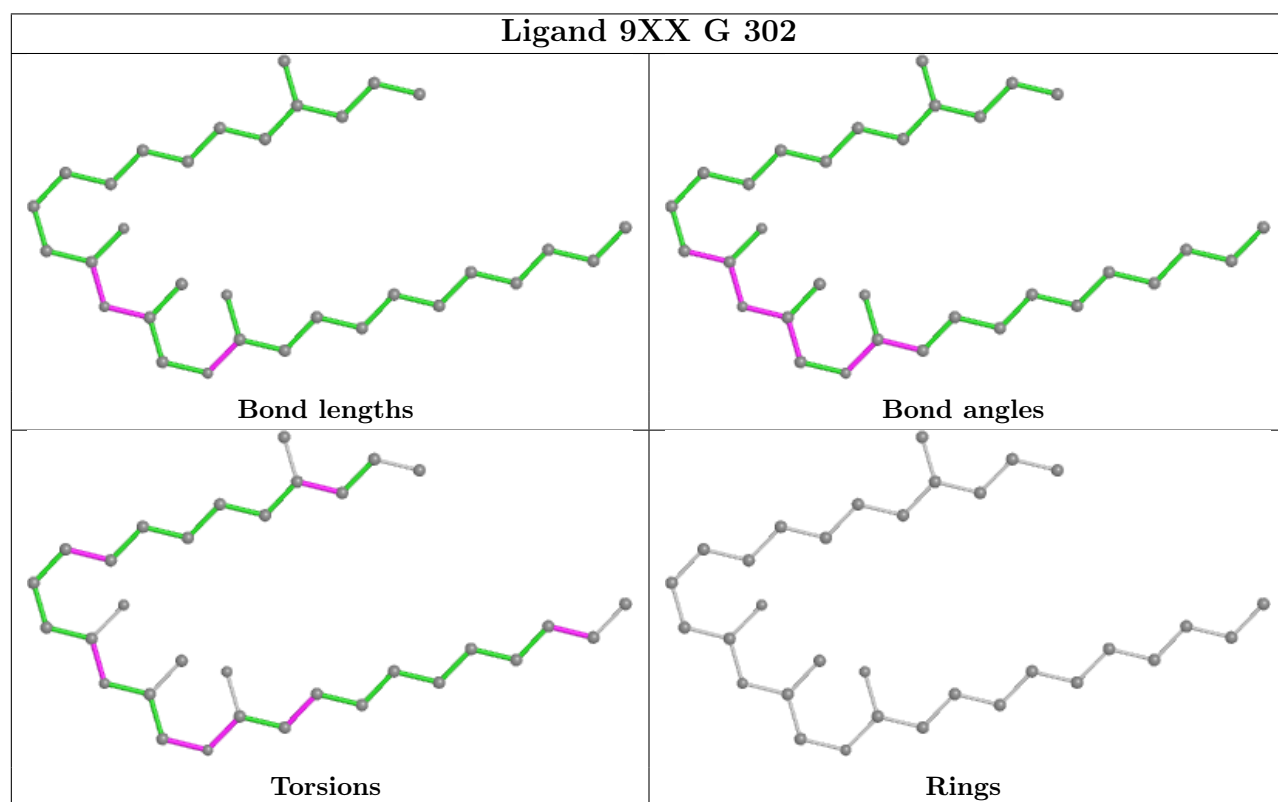
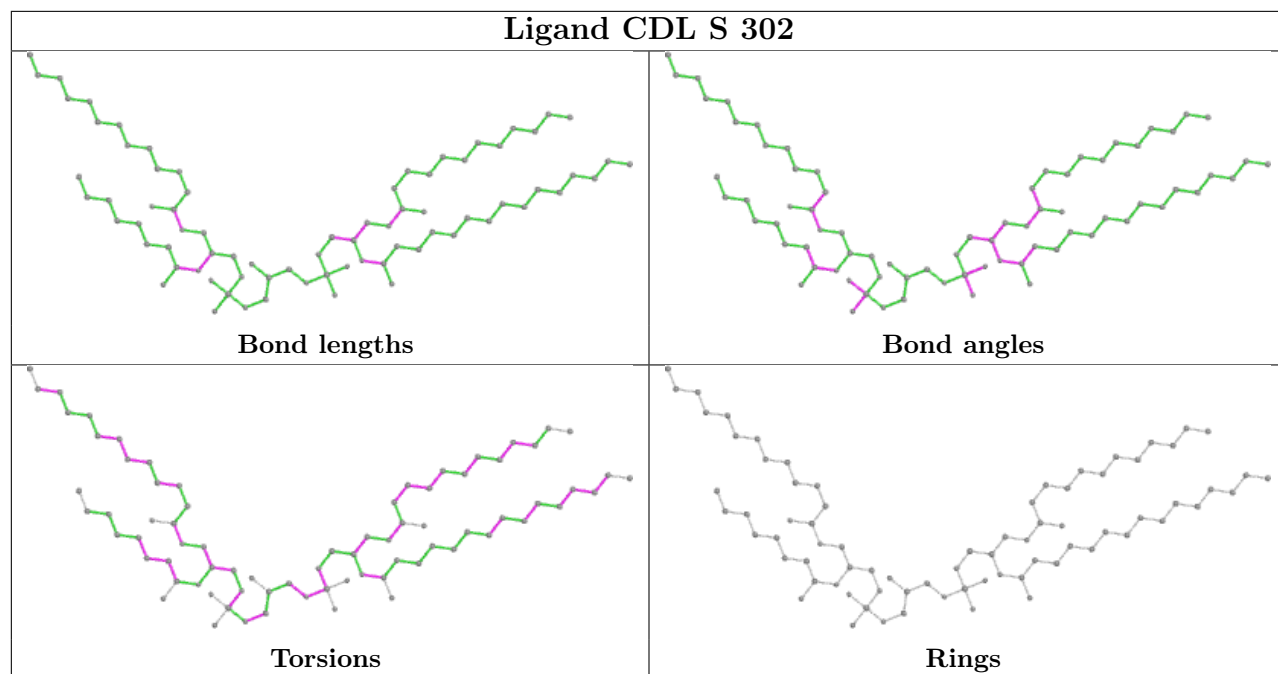


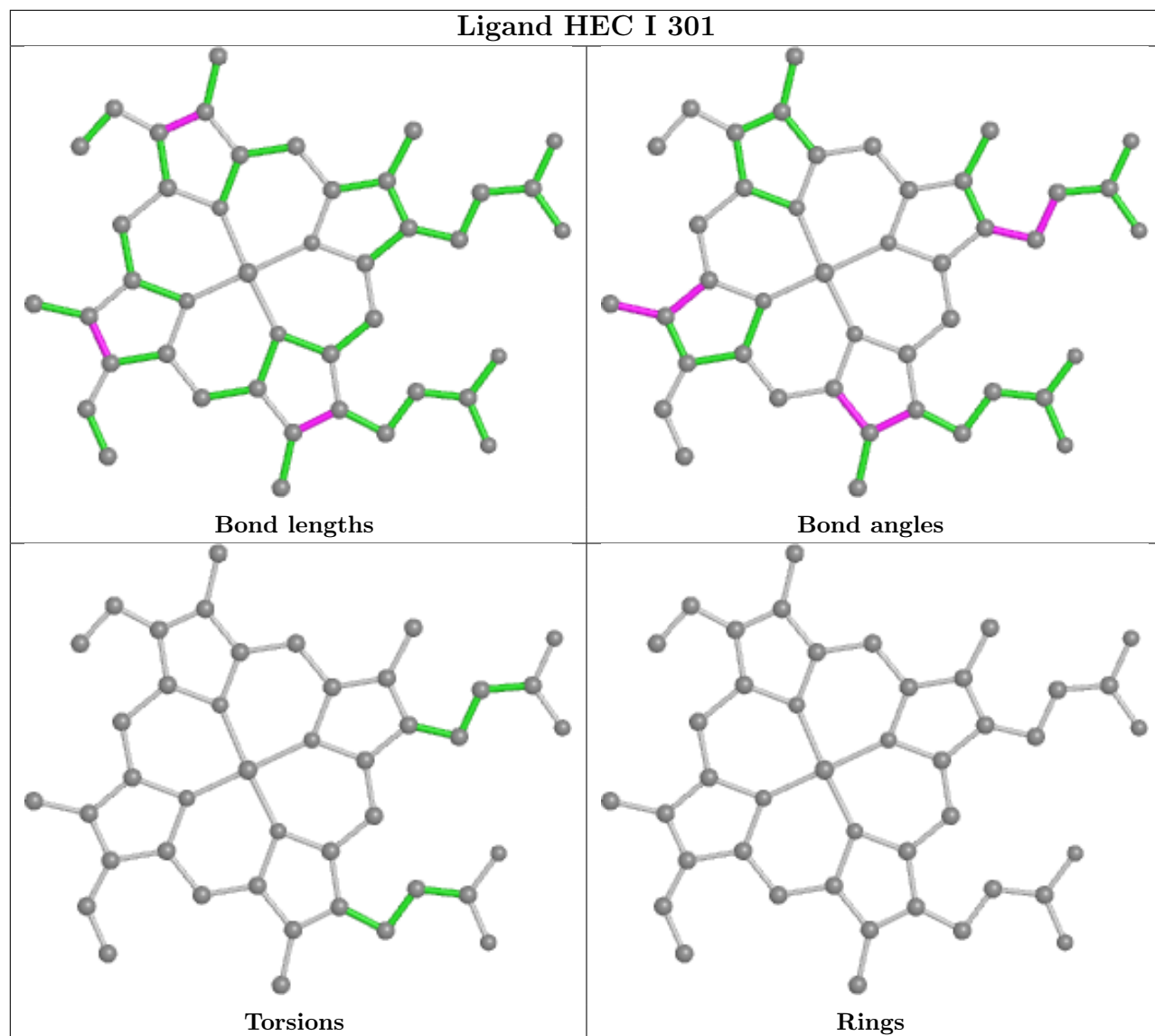


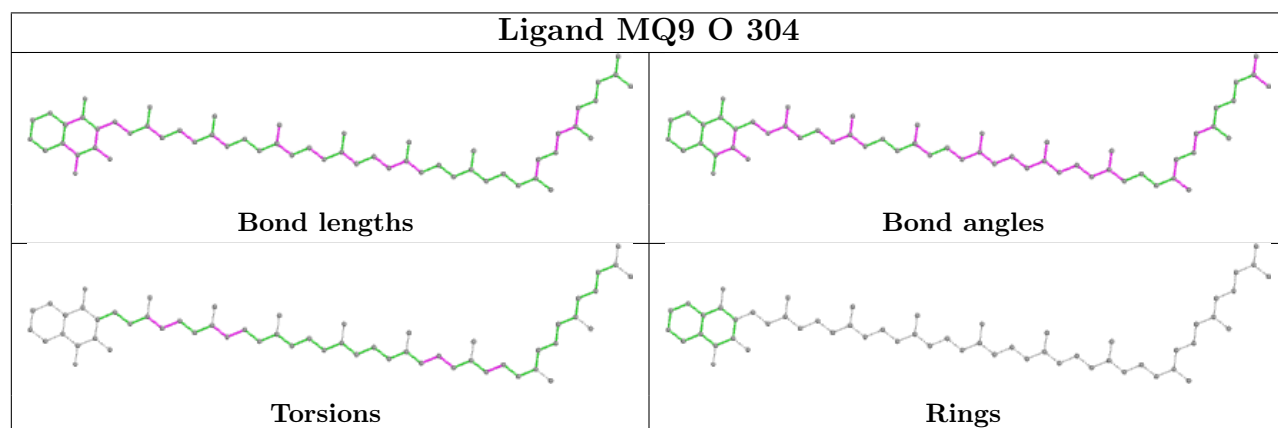
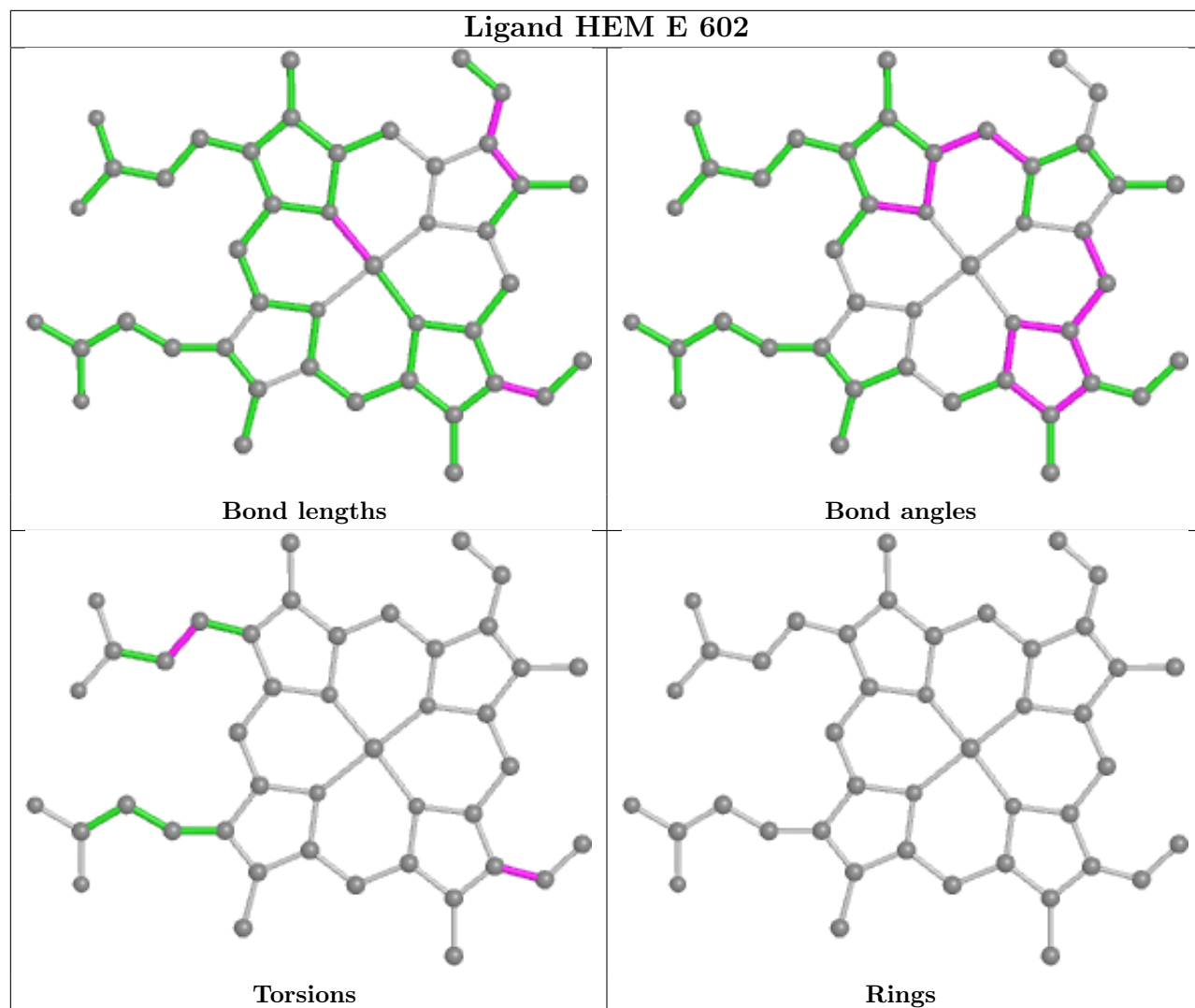


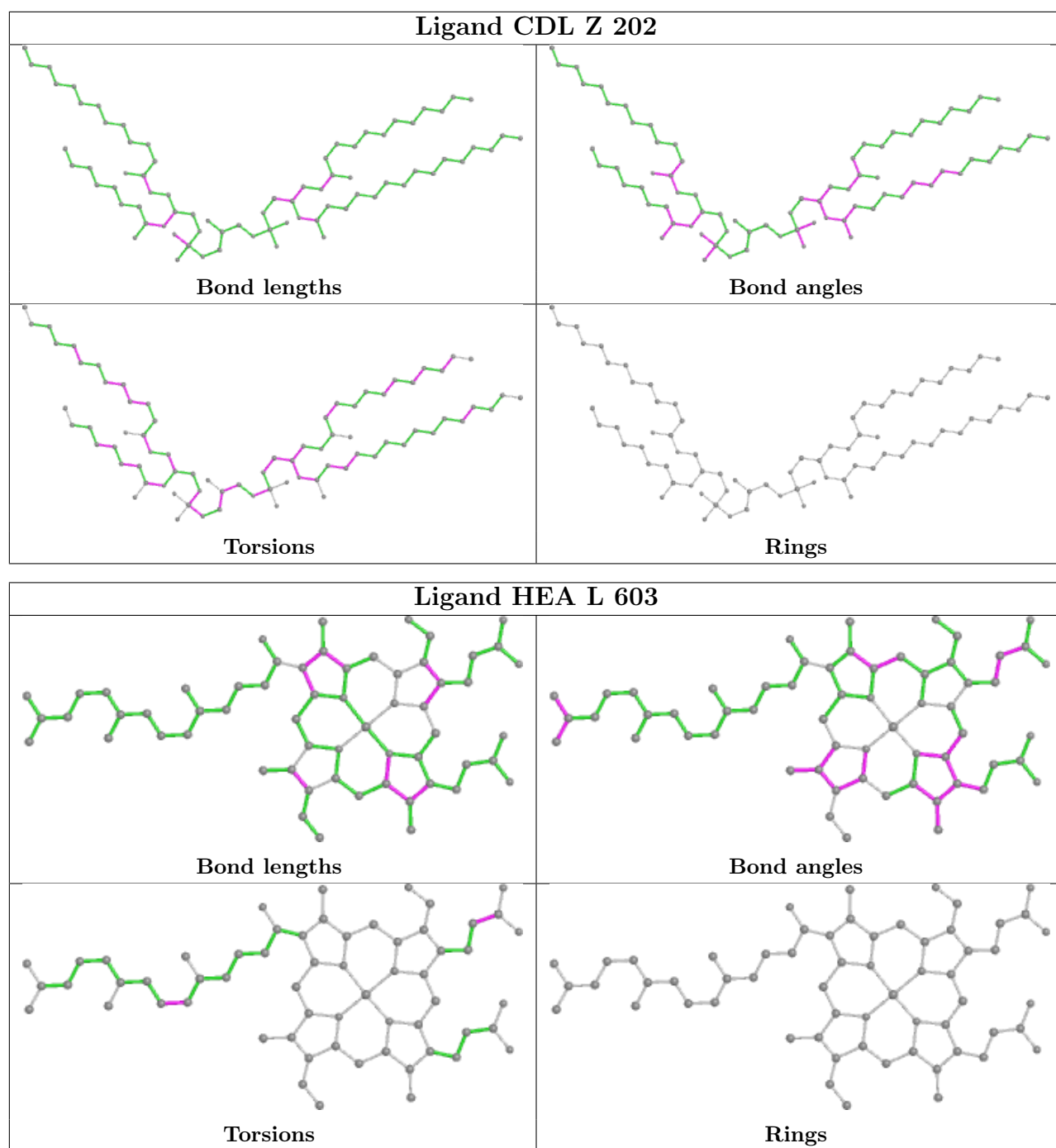


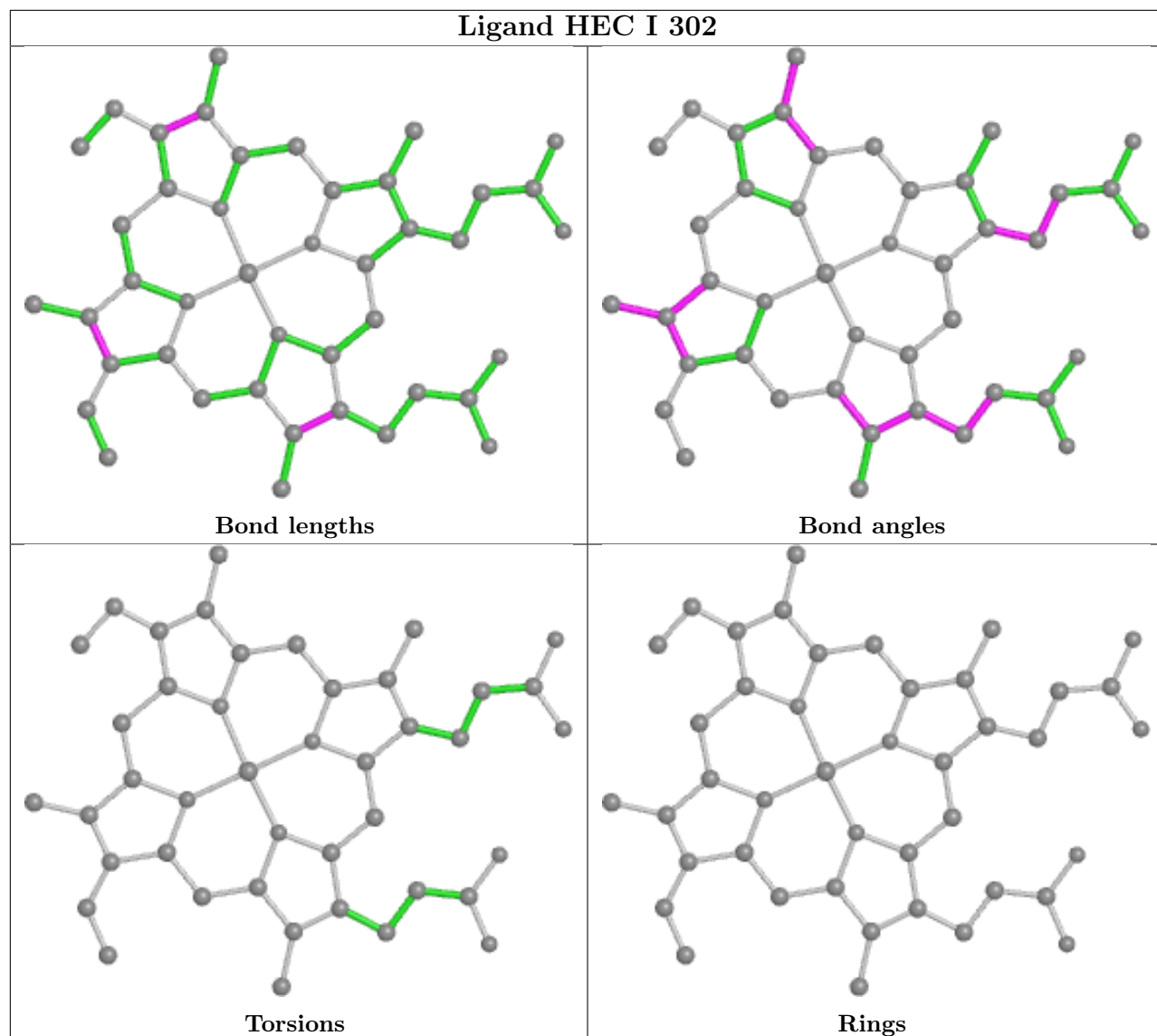


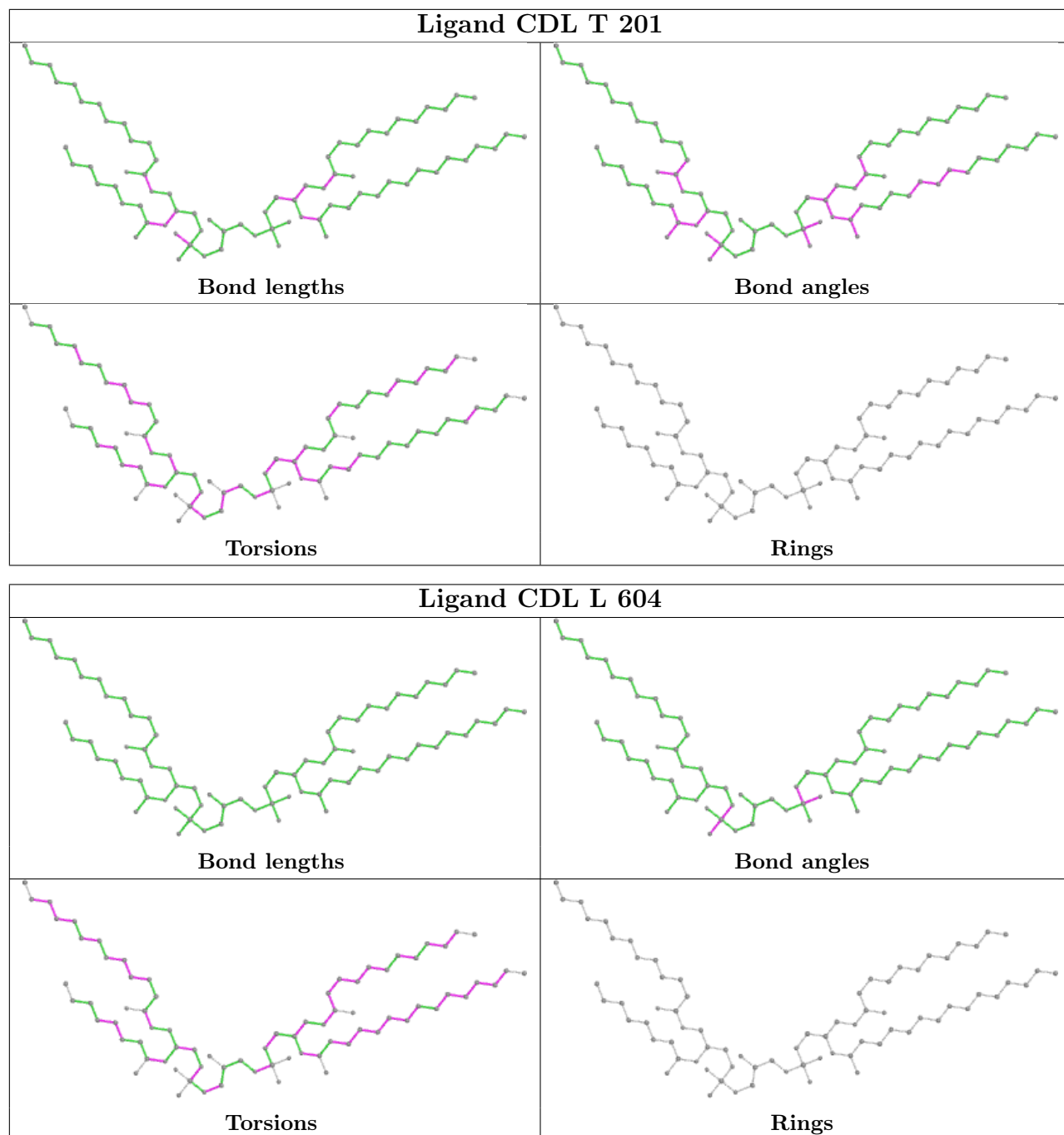


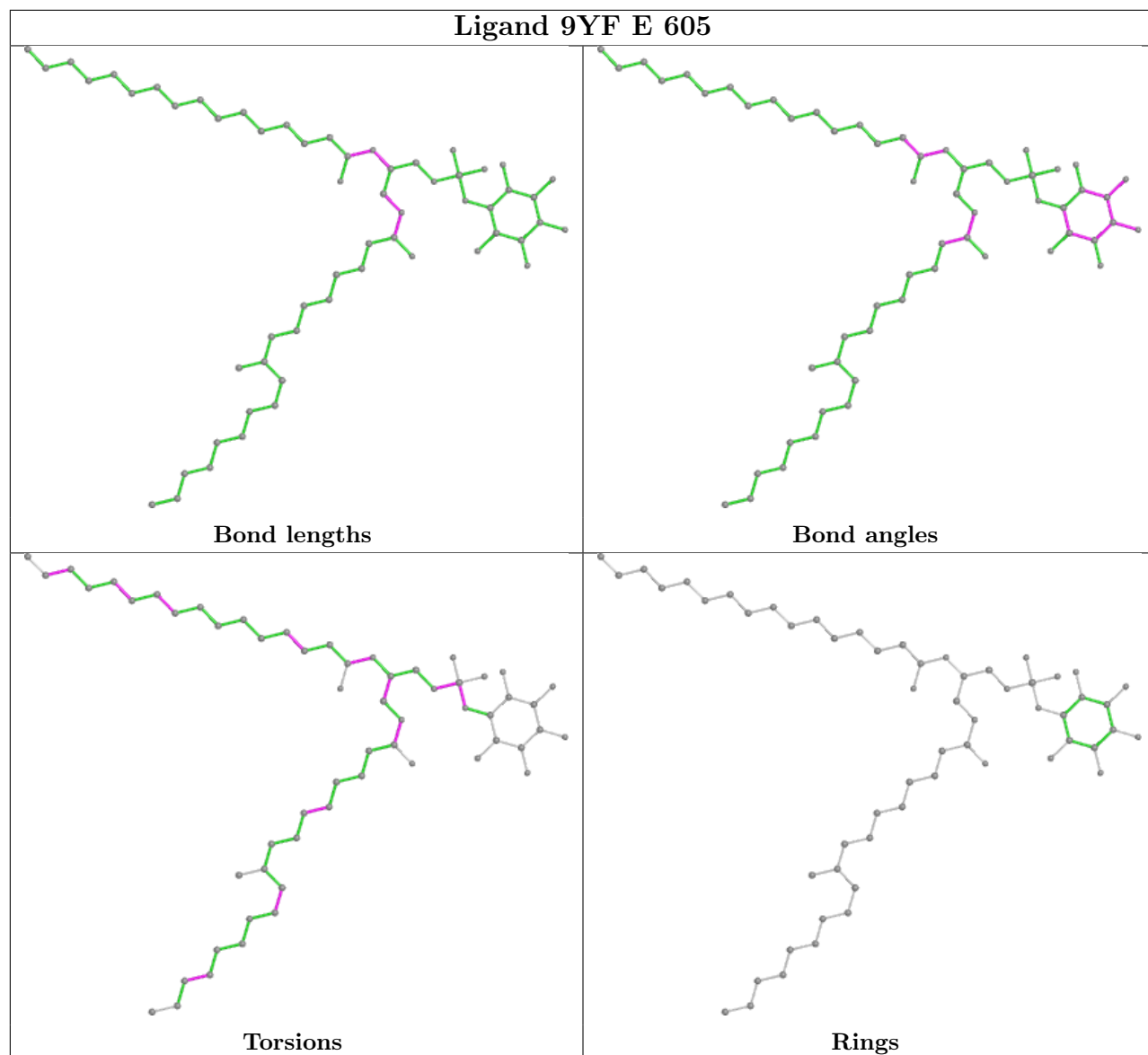


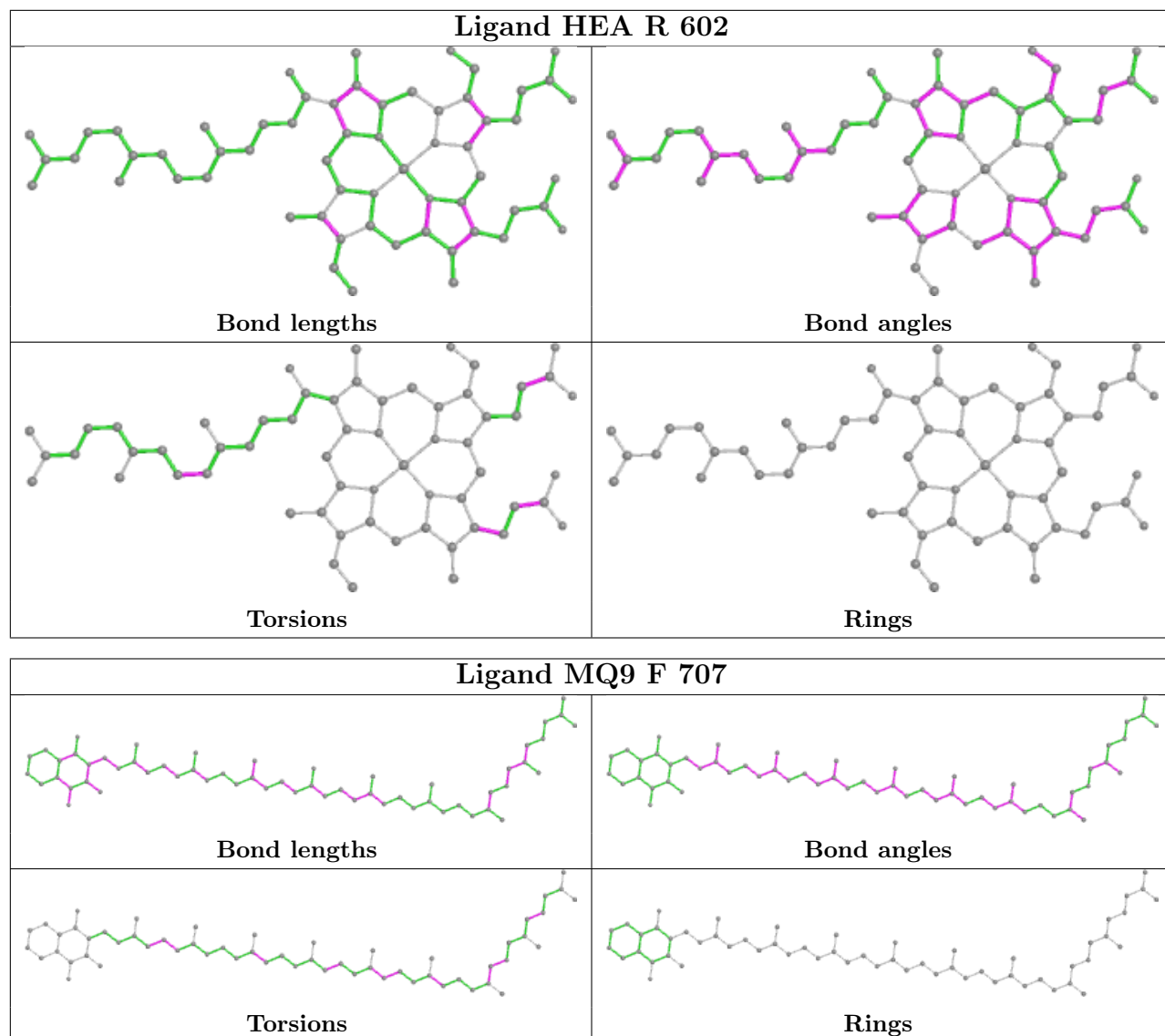


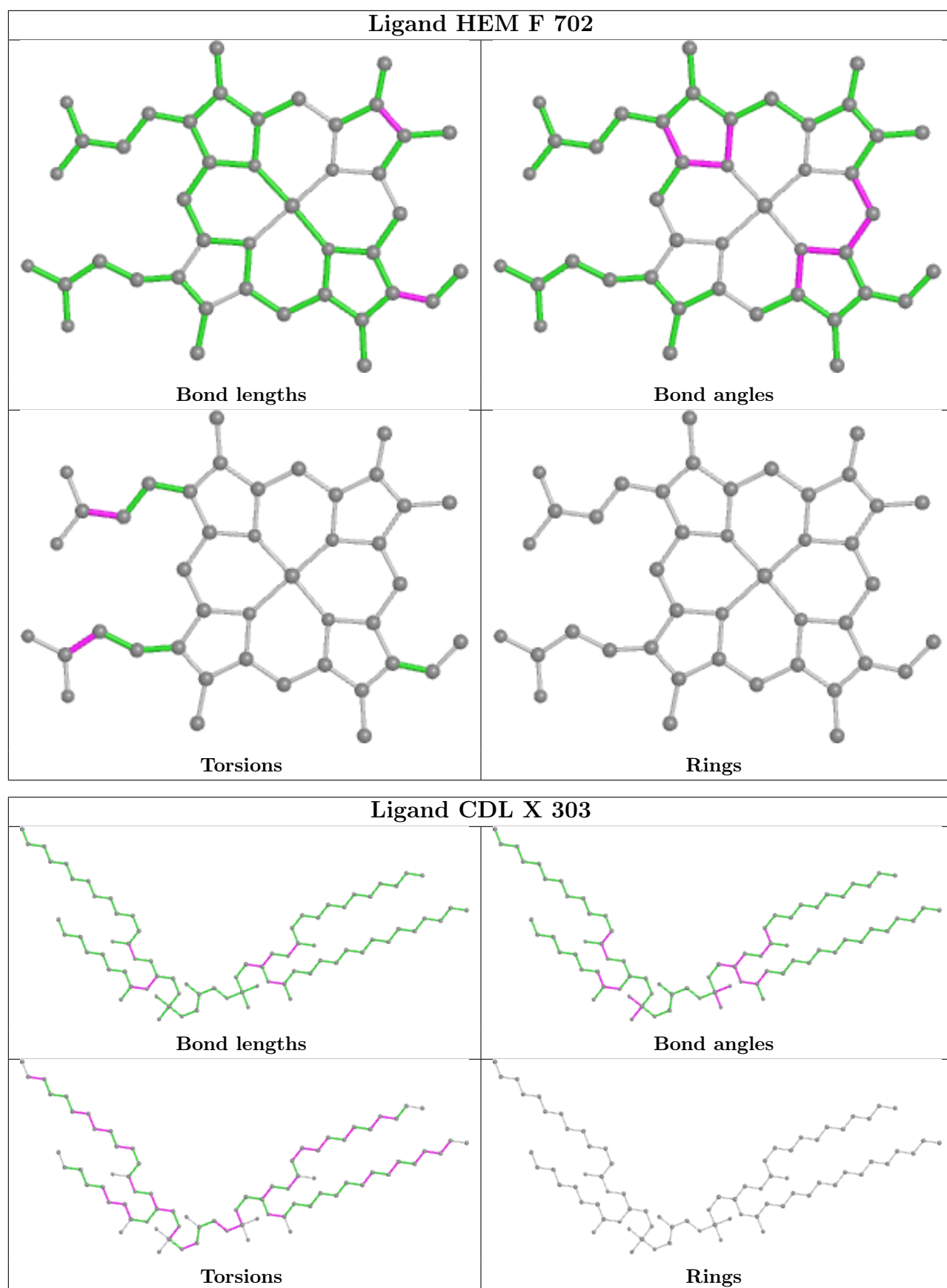












5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

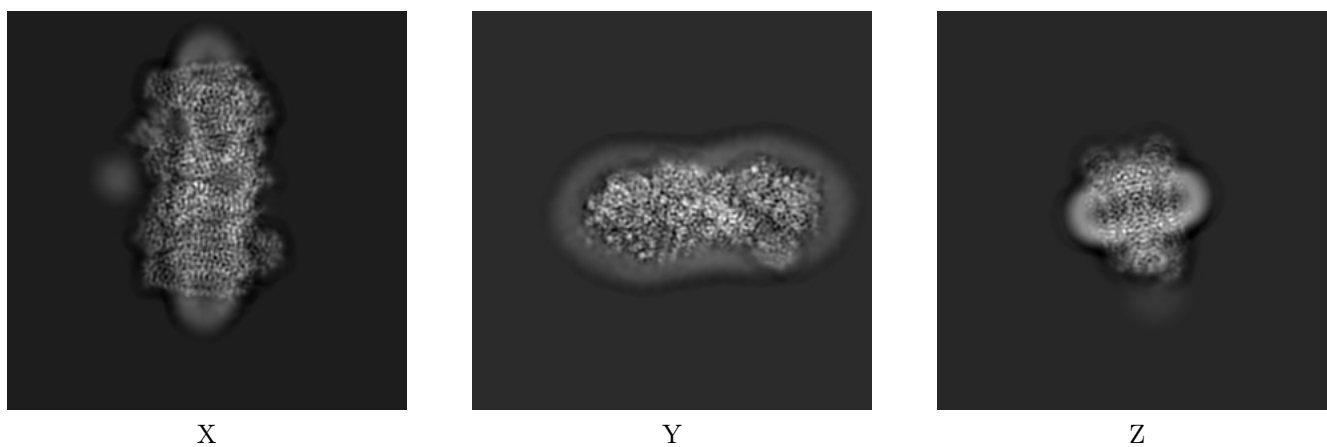
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-24456. 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 [i](#)

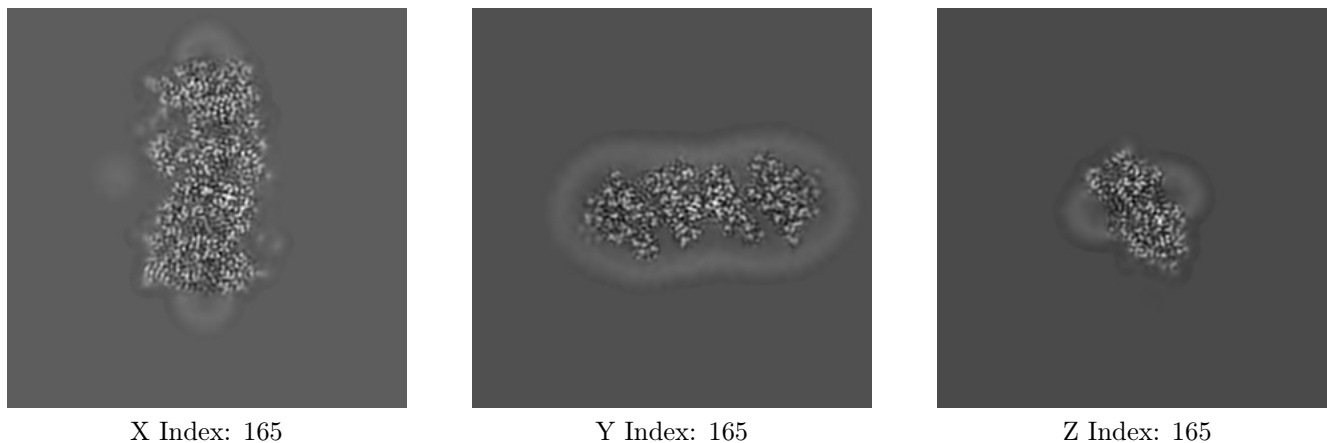
6.1.1 Primary map



The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

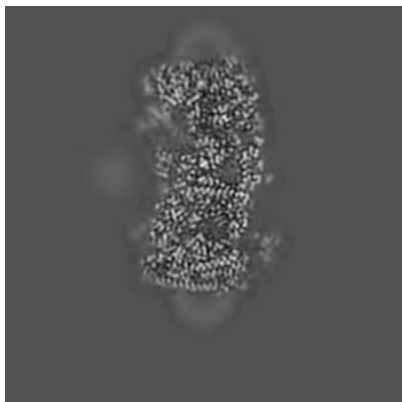
6.2.1 Primary map



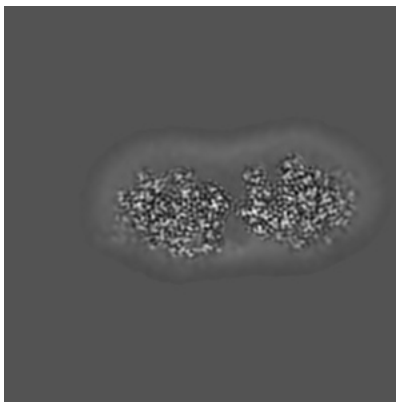
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

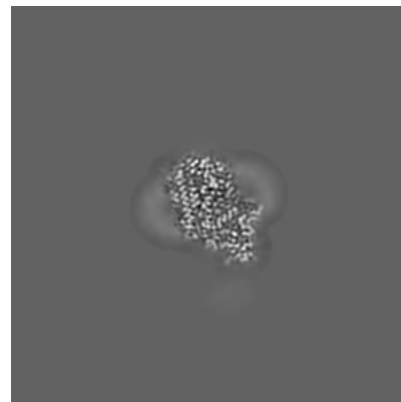
6.3.1 Primary map



X Index: 170



Y Index: 182

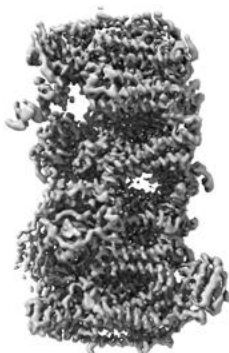


Z Index: 172

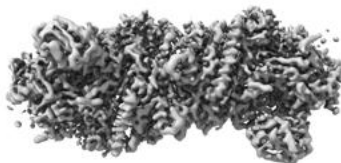
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal surface views [i](#)

6.4.1 Primary map



X



Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.634. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

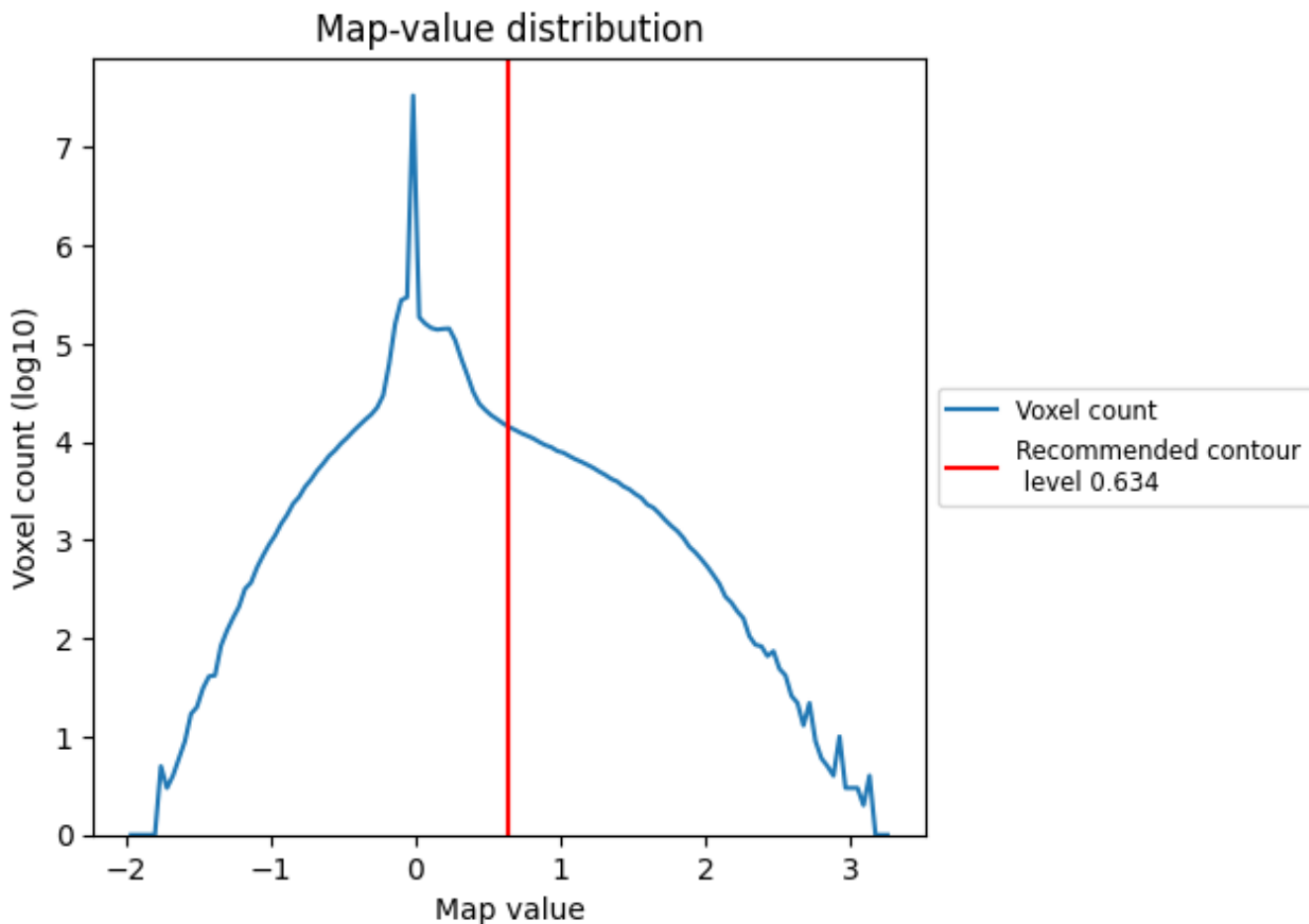
6.5 Mask visualisation

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

7 Map analysis [i](#)

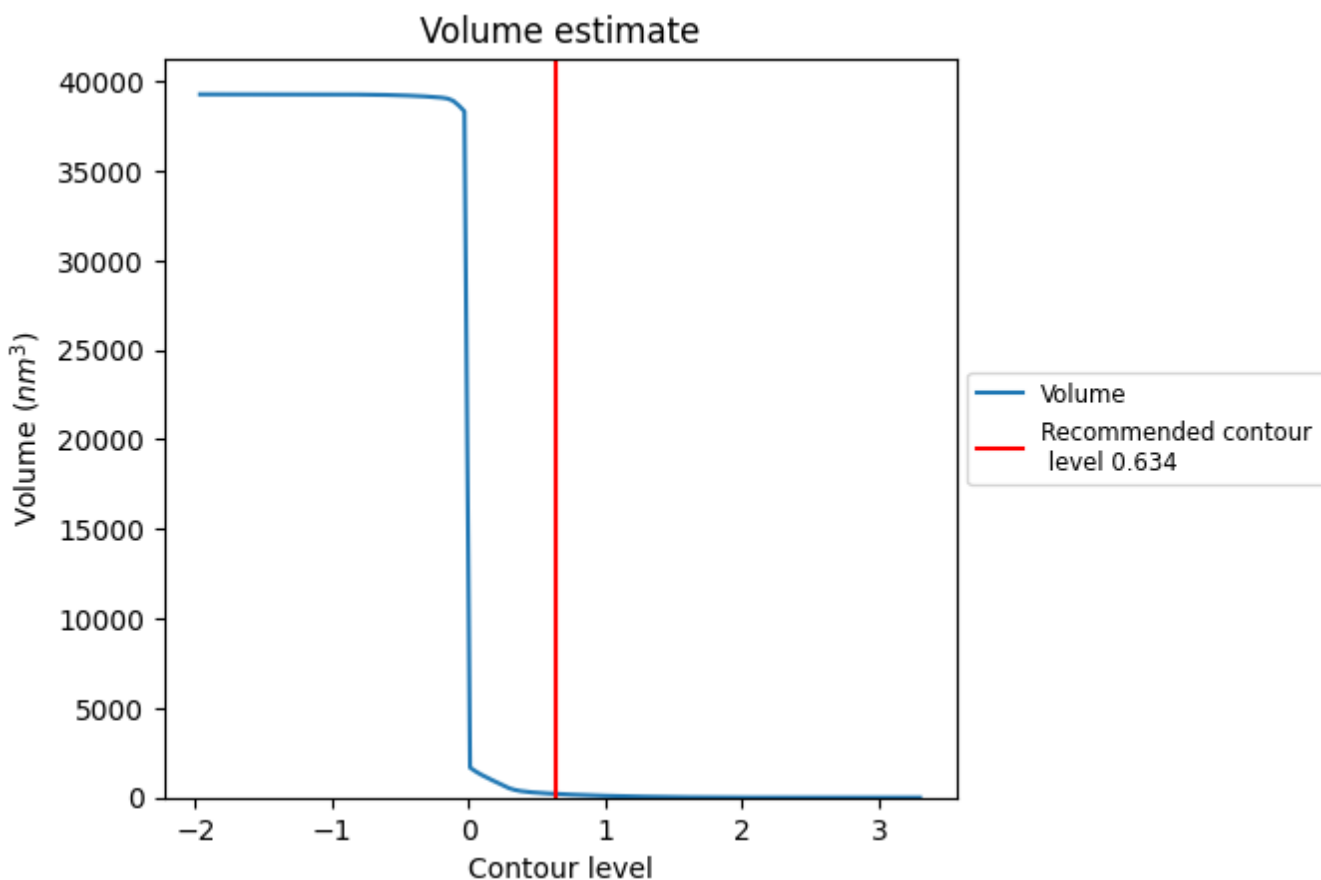
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

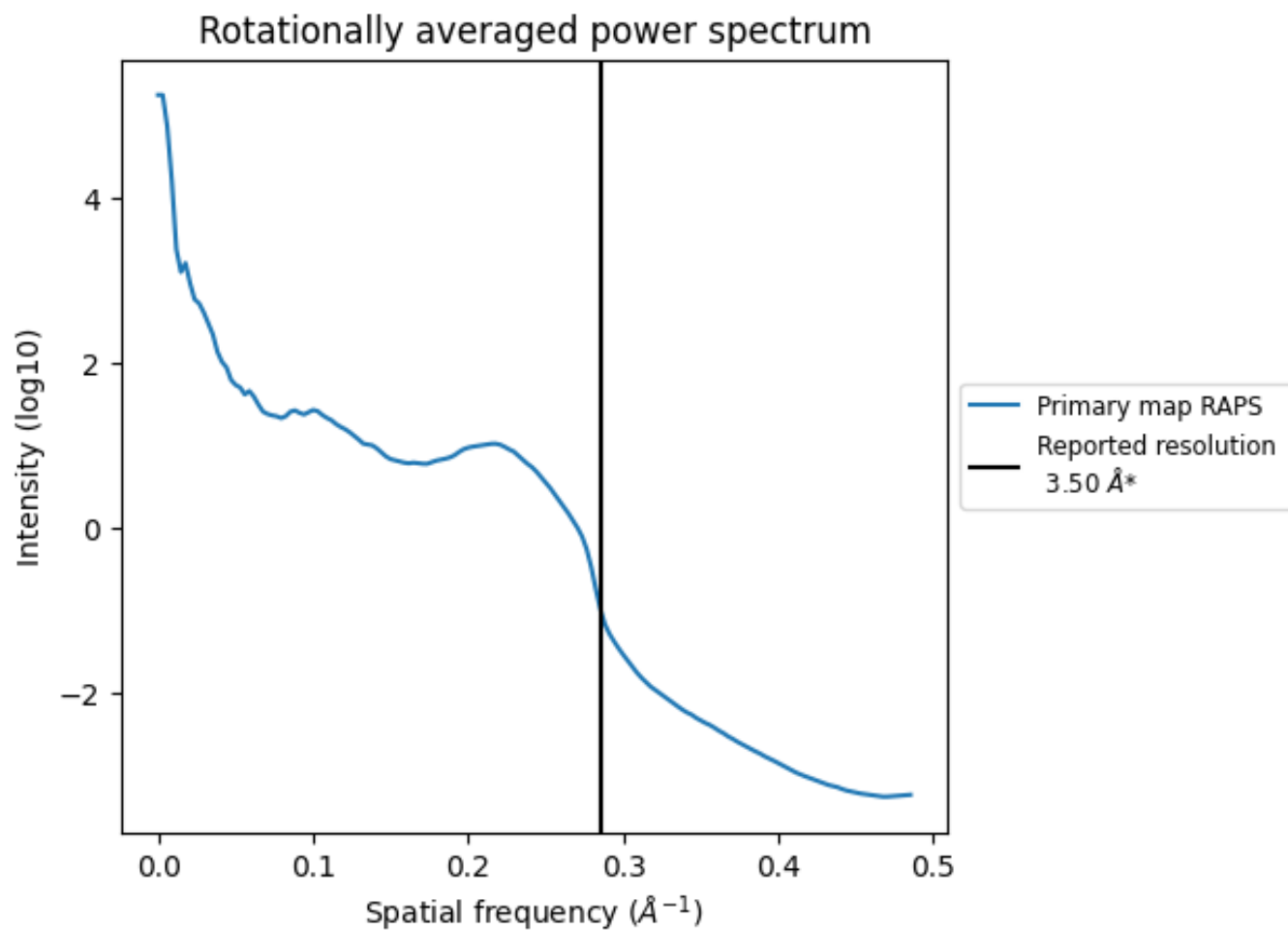
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 206 nm³; this corresponds to an approximate mass of 186 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

7.3 Rotationally averaged power spectrum [i](#)



*Reported resolution corresponds to spatial frequency of 0.286 Å⁻¹

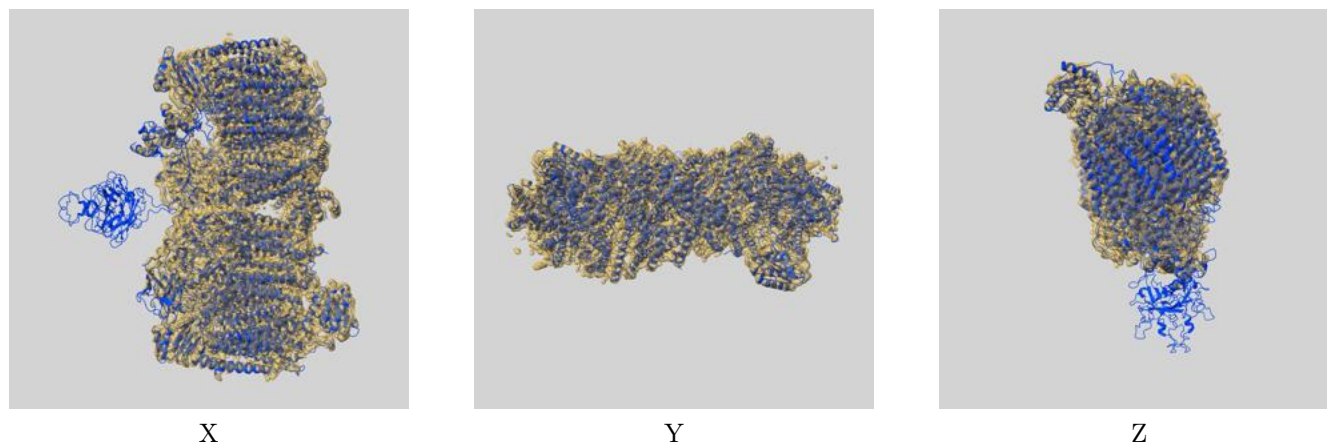
8 Fourier-Shell correlation

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

9 Map-model fit [i](#)

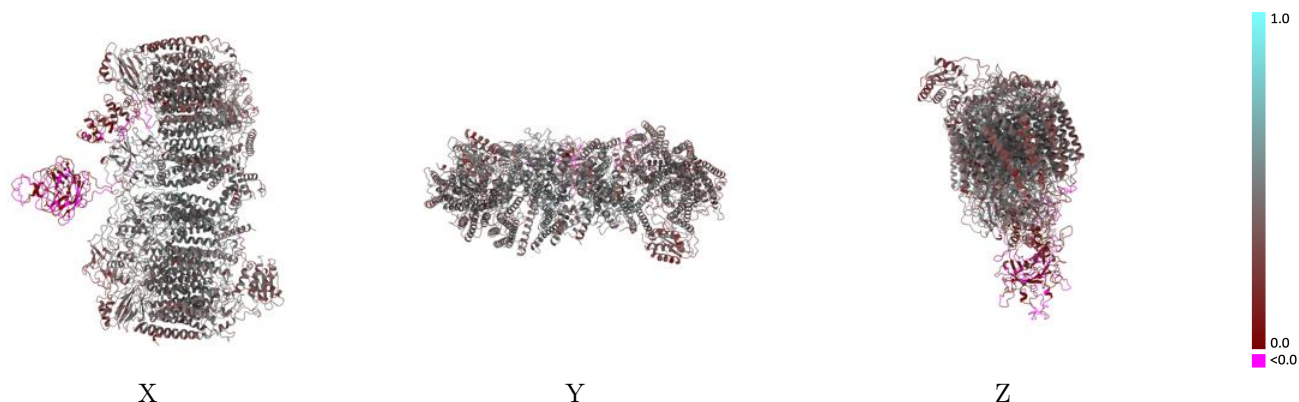
This section contains information regarding the fit between EMDB map EMD-24456 and PDB model 7RH6. Per-residue inclusion information can be found in section 3 on page 16.

9.1 Map-model overlay [i](#)



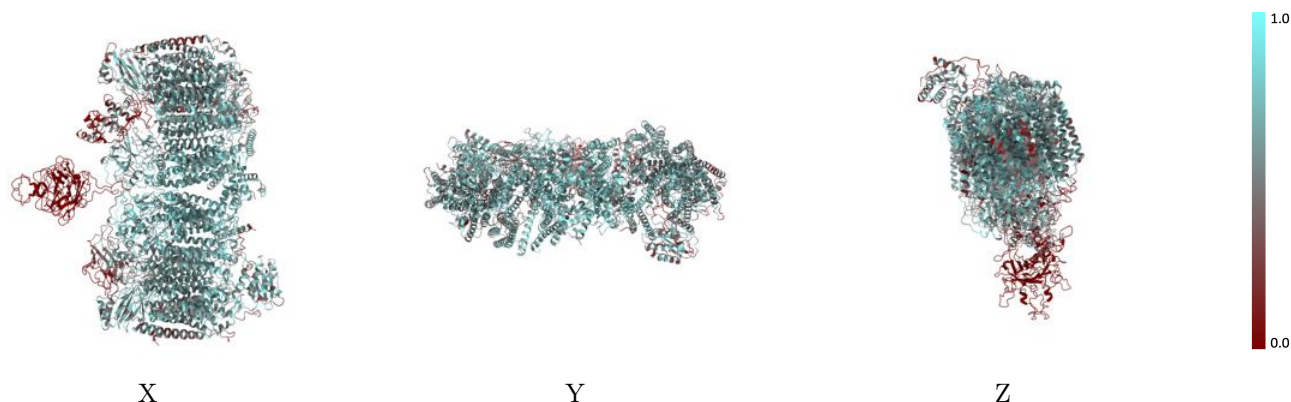
The images above show the 3D surface view of the map at the recommended contour level 0.634 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2 Q-score mapped to coordinate model [\(i\)](#)



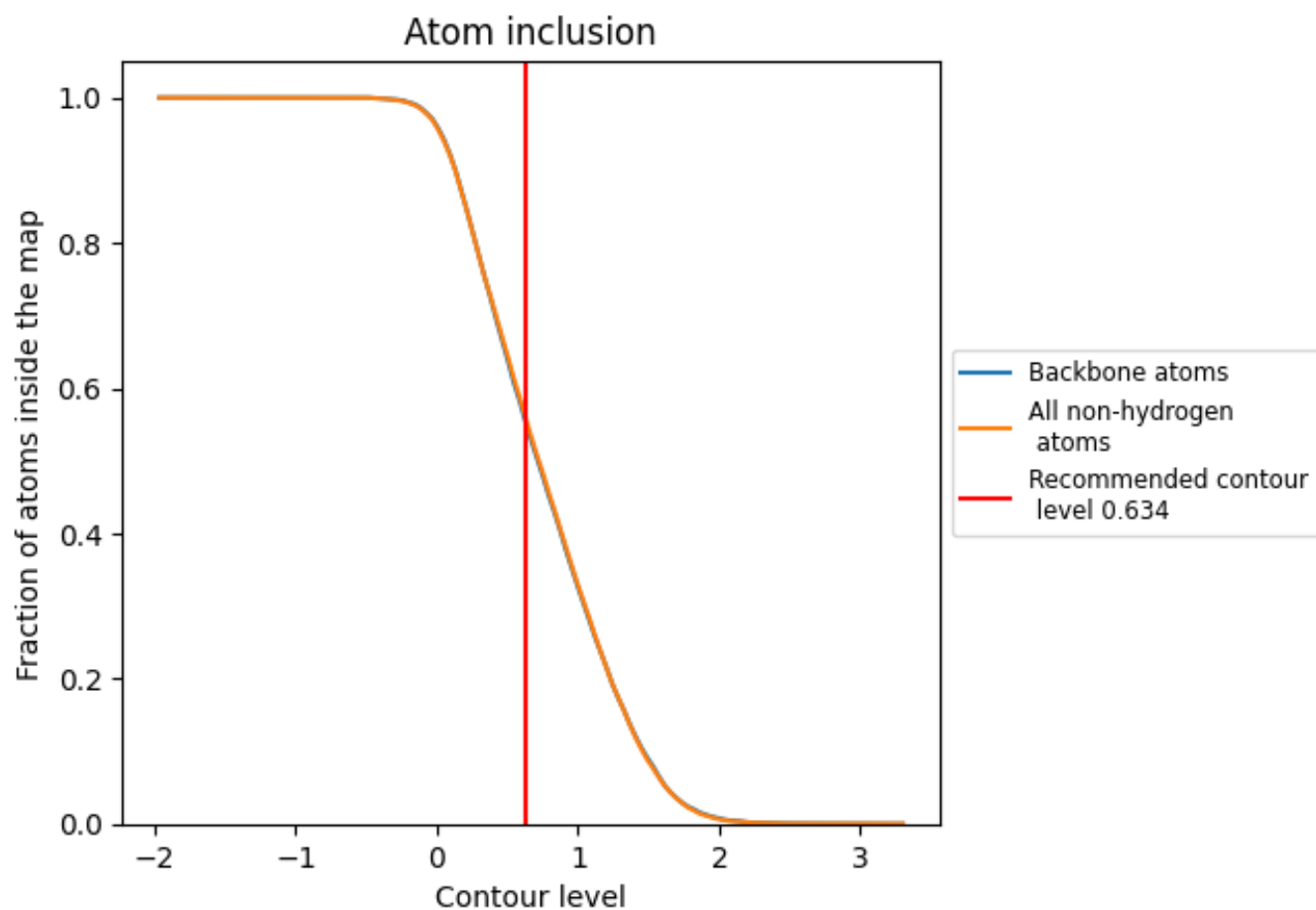
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

9.3 Atom inclusion mapped to coordinate model [\(i\)](#)



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.634).

















































9.4 Atom inclusion [i](#)



At the recommended contour level, 55% of all backbone atoms, 56% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary

The table lists the average atom inclusion at the recommended contour level (0.634) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.5551	 0.3950
D	 0.1058	 0.1100
E	 0.6897	 0.4680
F	 0.6822	 0.4590
G	 0.1049	 0.1110
I	 0.6221	 0.4400
J	 0.4944	 0.3960
K	 0.5246	 0.3690
L	 0.6428	 0.4400
M	 0.6782	 0.4330
O	 0.2783	 0.2240
P	 0.5063	 0.3970
Q	 0.4676	 0.3200
R	 0.6214	 0.4240
S	 0.5619	 0.3930
T	 0.5168	 0.3960
U	 0.3945	 0.3330
V	 0.5039	 0.3380
X	 0.5638	 0.4150
Y	 0.6944	 0.4470
Z	 0.5572	 0.4110
a	 0.4751	 0.3570
b	 0.5685	 0.3640
c	 0.2696	 0.3450

