



Full wwPDB EM Validation Report ⓘ

Jul 15, 2025 – 08:44 PM JST

PDB ID : 8ZXD / pdb_00008zxd
EMDB ID : EMD-60540
Title : the Planar Cell Polarity Core Protein Vangl1
Authors : Zhang, F.; Chen, S.
Deposited on : 2024-06-14
Resolution : 2.90 Å(reported)

This is a Full wwPDB EM Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/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 : **FAILED**
Mogul : 1.8.5 (274361), CSD as541be (2020)
MolProbity : 4-5-2 with Phenix2.0rc1
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : **FAILED**
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.44

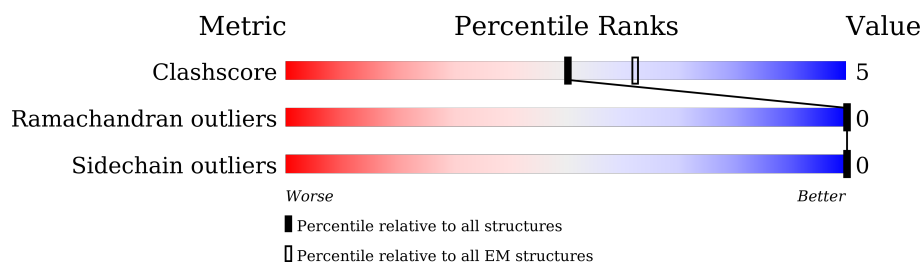
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 2.90 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	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

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 $\leq 5\%$.

Mol	Chain	Length	Quality of chain
1	A	524	62% 12% 26%
1	B	524	62% 12% 26%
1	C	524	61% 13% 26%
1	D	524	63% 11% 26%
1	E	524	62% 12% 26%
1	F	524	61% 13% 26%

2 Entry composition (i)

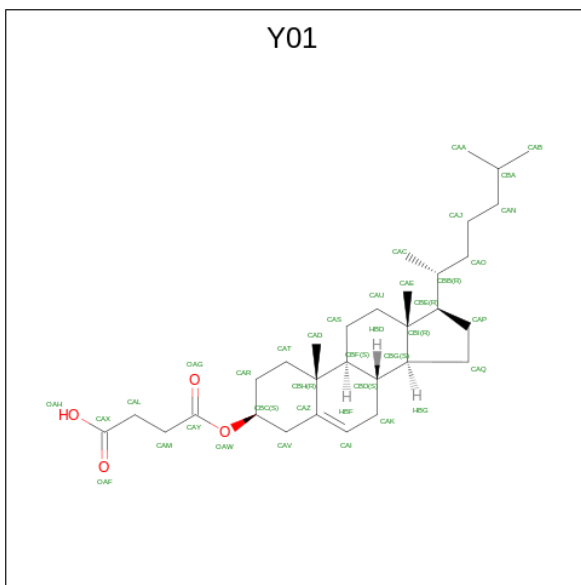
There are 3 unique types of molecules in this entry. The entry contains 19518 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Vang-like protein 1.

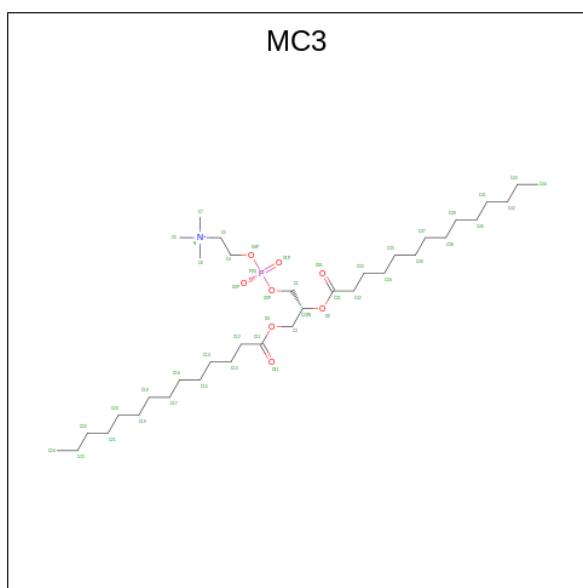
Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	388	Total 3161	C 2058	N 548	O 541	S 14	0	0
1	B	388	Total 3161	C 2058	N 548	O 541	S 14	0	0
1	C	388	Total 3161	C 2058	N 548	O 541	S 14	0	0
1	D	388	Total 3161	C 2058	N 548	O 541	S 14	0	0
1	E	388	Total 3161	C 2058	N 548	O 541	S 14	0	0
1	F	388	Total 3161	C 2058	N 548	O 541	S 14	0	0

- Molecule 2 is CHOLESTEROL HEMISUCCINATE (CCD ID: Y01) (formula: $C_{31}H_{50}O_4$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			AltConf
2	A	1	Total	C	O	0
			35	31	4	
2	A	1	Total	C	O	0
			35	31	4	
2	B	1	Total	C	O	0
			35	31	4	
2	B	1	Total	C	O	0
			35	31	4	
2	C	1	Total	C	O	0
			35	31	4	
2	C	1	Total	C	O	0
			35	31	4	
2	D	1	Total	C	O	0
			35	31	4	
2	D	1	Total	C	O	0
			35	31	4	
2	E	1	Total	C	O	0
			35	31	4	
2	E	1	Total	C	O	0
			35	31	4	
2	F	1	Total	C	O	0
			35	31	4	
2	F	1	Total	C	O	0
			35	31	4	

- Molecule 3 is 1,2-DIMYRISTOYL-RAC-GLYCERO-3-PHOSPHOCHOLINE (CCD ID: MC3) (formula: $C_{36}H_{72}NO_8P$) (labeled as "Ligand of Interest" by depositor).

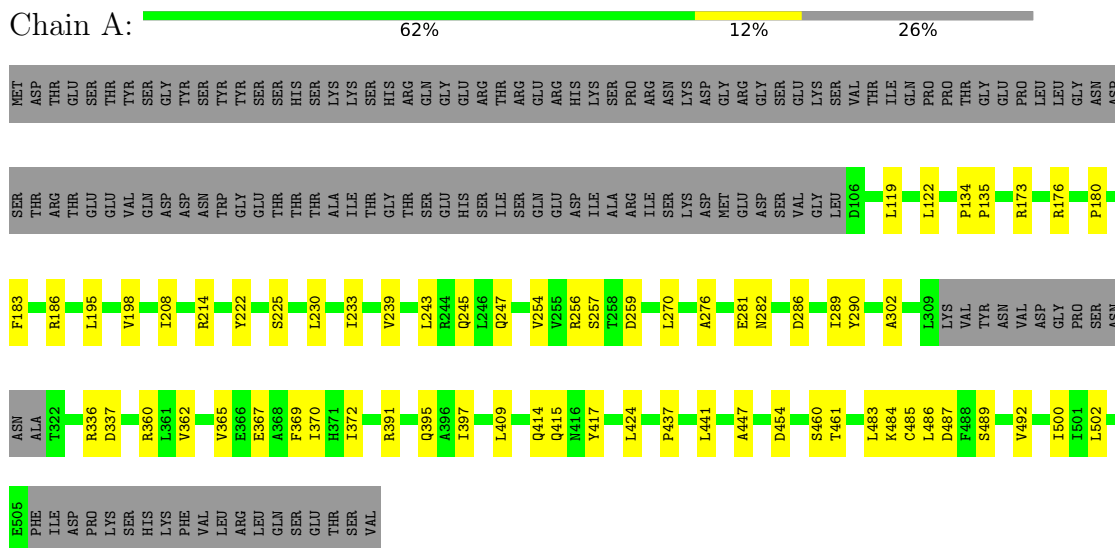


Mol	Chain	Residues	Atoms				AltConf
3	A	1	Total 22	C 14	O 7	P 1	0
3	B	1	Total 22	C 14	O 7	P 1	0
3	C	1	Total 22	C 14	O 7	P 1	0
3	D	1	Total 22	C 14	O 7	P 1	0
3	E	1	Total 22	C 14	O 7	P 1	0
3	F	1	Total 22	C 14	O 7	P 1	0

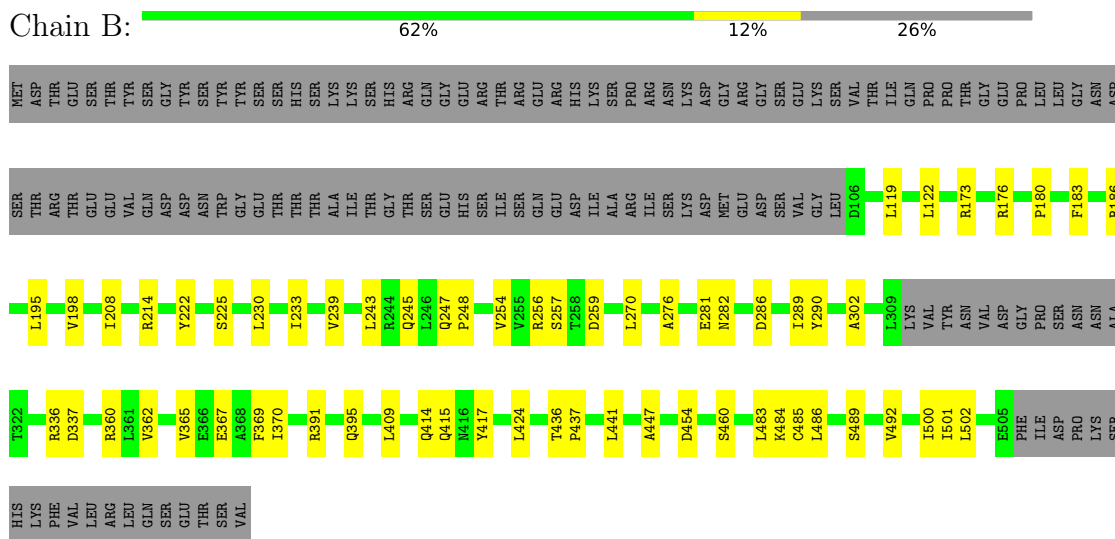
3 Residue-property plots

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: Vang-like protein 1



• Molecule 1: Vang-like protein 1



• Molecule 1: Vang-like protein 1



LYS
SER
HIS
LYS
PHE
VAL
LEU
ARG
LEU
GLN
SER
GLU
THR
SER
VAL

- Molecule 1: Vang-like protein 1



MET
ASP
THR
GLU
SER
THR
TYR
SER
GLY
TYR
SER
ASN
TRP
TYR
SER
SER
HIS
ARG
GLN
GLY
GLU
ARG
THR
SER
ARG
GLU
ARG
HIS
LYS
SER
PRO
ARG
ILE
ASN
LYS
ASP
GLY
MET
GLU
ASP
SER
SER
GLY
LEU
SER
VAL
THR
ILE
GLN
PRO
PRO
THR
GLY
GLU
PRO
LEU
LEU
GLY
ASN
ASP

SER
THR
ARG
THR
GLU
VAL
GLN
ASP
ASP
ASN
TRP
GLY
GLU
THR
THR
THR
ALA
ILE
THR
GLY
SER
THR
SER
GLU
HIS
SER
ILE
ILE
GLN
GLU
ASP
ILE
ALA
ILE
SER
LYS
ASP
MET
GLU
ASP
SER
VAL
GLY
LEU
D106
L119
L122
R173
R176
P180
F183
R186

L195
V198
I208
R214
Y222
S225
A229
L230
L231
F232
I233
V239
L243
R244
Q245
L246
Q247
P248
V254
V255
R256
S257
I258
D259
L270
A276
E281
N282
D286
I289
Y290
A302
L309
LYS
VAL
TYR
ASN
VAL
ASP
GLY
PRO
SER
ASN

ASN
ALA
T322
R336
D337
R360
L361
V362
V365
E366
E367
F369
I370
H371
I372
R391
Q395
A396
I397
L409
Q414
Q415
N416
Y417
L424
T436
P437
L441
A447
D454
S460
T461
L483
K484
C485
L486
D487
F488
S489
V492
I500
I501
L502

E505
PHE
ILE
ASP
PRO
LYS
SER
HIS
LYS
PHE
VAL
LEU
ARG
LEU
GLN
SER
GLU
THR
SER
VAL

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	718127	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TALOS ARCTICA	Depositor
Voltage (kV)	200	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50	Depositor
Minimum defocus (nm)	1500	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: MC3, Y01

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	0.08	0/3230	0.23	0/4369
1	B	0.08	0/3230	0.23	0/4369
1	C	0.08	0/3230	0.22	0/4369
1	D	0.08	0/3230	0.22	0/4369
1	E	0.08	0/3230	0.23	0/4369
1	F	0.08	0/3230	0.22	0/4369
All	All	0.08	0/19380	0.22	0/26214

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 [i](#)

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	3161	0	3251	43	0
1	B	3161	0	3251	42	0
1	C	3161	0	3251	46	0
1	D	3161	0	3251	39	0
1	E	3161	0	3251	42	0
1	F	3161	0	3251	45	0
2	A	70	0	98	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	70	0	98	0	0
2	C	70	0	98	0	0
2	D	70	0	98	0	0
2	E	70	0	98	0	0
2	F	70	0	98	0	0
3	A	22	0	21	0	0
3	B	22	0	21	0	0
3	C	22	0	21	0	0
3	D	22	0	21	0	0
3	E	22	0	21	0	0
3	F	22	0	21	0	0
All	All	19518	0	20220	213	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 5.

All (213) 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:E:484:LYS:HD3	1:E:489:SER:HB3	1.78	0.66
1:F:484:LYS:HD3	1:F:489:SER:HB3	1.78	0.65
1:B:484:LYS:HD3	1:B:489:SER:HB3	1.78	0.65
1:C:484:LYS:HD3	1:C:489:SER:HB3	1.78	0.65
1:D:484:LYS:HD3	1:D:489:SER:HB3	1.78	0.64
1:A:484:LYS:HD3	1:A:489:SER:HB3	1.78	0.64
1:B:183:PHE:HD2	1:B:186:ARG:H	1.47	0.62
1:F:183:PHE:HD2	1:F:186:ARG:H	1.48	0.61
1:A:183:PHE:HD2	1:A:186:ARG:H	1.48	0.60
1:B:502:LEU:HB3	1:C:180:PRO:HD3	1.84	0.60
1:D:183:PHE:HD2	1:D:186:ARG:H	1.48	0.60
1:D:502:LEU:HB3	1:E:180:PRO:HD3	1.84	0.60
1:A:502:LEU:HB3	1:B:180:PRO:HD3	1.83	0.60
1:C:183:PHE:HD2	1:C:186:ARG:H	1.48	0.60
1:E:502:LEU:HB3	1:F:180:PRO:HD3	1.84	0.59
1:A:208:ILE:HA	1:A:214:ARG:HG3	1.85	0.59
1:E:183:PHE:HD2	1:E:186:ARG:H	1.48	0.59
1:E:208:ILE:HA	1:E:214:ARG:HG3	1.86	0.58
1:D:208:ILE:HA	1:D:214:ARG:HG3	1.86	0.57
1:B:208:ILE:HA	1:B:214:ARG:HG3	1.85	0.57
1:F:208:ILE:HA	1:F:214:ARG:HG3	1.87	0.57
1:C:208:ILE:HA	1:C:214:ARG:HG3	1.86	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:500:ILE:HA	1:F:460:SER:HB2	1.87	0.56
1:A:460:SER:HB2	1:C:500:ILE:HA	1.87	0.56
1:B:500:ILE:HA	1:C:460:SER:HB2	1.86	0.56
1:D:367:GLU:OE1	1:F:336:ARG:NH1	2.40	0.55
1:D:336:ARG:NH1	1:E:367:GLU:OE1	2.40	0.55
1:D:460:SER:HB2	1:F:500:ILE:HA	1.88	0.55
1:A:500:ILE:HA	1:B:460:SER:HB2	1.89	0.54
1:F:362:VAL:HG22	1:F:441:LEU:HD13	1.90	0.54
1:A:362:VAL:HG22	1:A:441:LEU:HD13	1.89	0.54
1:B:336:ARG:NH1	1:C:367:GLU:OE1	2.41	0.54
1:B:362:VAL:HG22	1:B:441:LEU:HD13	1.89	0.54
1:D:500:ILE:HA	1:E:460:SER:HB2	1.88	0.54
1:C:362:VAL:HG22	1:C:441:LEU:HD13	1.90	0.53
1:A:367:GLU:OE1	1:C:336:ARG:NH1	2.41	0.53
1:E:336:ARG:NH1	1:F:367:GLU:OE1	2.41	0.53
1:A:336:ARG:NH1	1:B:367:GLU:OE1	2.41	0.53
1:E:256:ARG:NE	1:E:259:ASP:OD1	2.39	0.53
1:E:362:VAL:HG22	1:E:441:LEU:HD13	1.90	0.53
1:C:391:ARG:HH12	1:C:424:LEU:HD13	1.74	0.53
1:D:362:VAL:HG22	1:D:441:LEU:HD13	1.89	0.53
1:D:282:ASN:O	1:D:286:ASP:HB2	2.09	0.52
1:E:391:ARG:HH12	1:E:424:LEU:HD13	1.74	0.52
1:F:391:ARG:HH12	1:F:424:LEU:HD13	1.74	0.52
1:B:391:ARG:HH12	1:B:424:LEU:HD13	1.75	0.52
1:D:180:PRO:HD3	1:F:502:LEU:HB3	1.91	0.52
1:B:276:ALA:HB1	1:B:483:LEU:HD21	1.92	0.52
1:A:391:ARG:HH12	1:A:424:LEU:HD13	1.74	0.52
1:C:282:ASN:O	1:C:286:ASP:HB2	2.10	0.52
1:F:282:ASN:O	1:F:286:ASP:HB2	2.10	0.52
1:F:256:ARG:NE	1:F:259:ASP:OD1	2.39	0.52
1:A:282:ASN:O	1:A:286:ASP:HB2	2.10	0.51
1:A:180:PRO:HD3	1:C:502:LEU:HB3	1.92	0.51
1:C:256:ARG:NE	1:C:259:ASP:OD1	2.39	0.51
1:D:391:ARG:HH12	1:D:424:LEU:HD13	1.76	0.51
1:E:282:ASN:O	1:E:286:ASP:HB2	2.10	0.51
1:E:290:TYR:O	1:E:417:TYR:OH	2.26	0.51
1:B:337:ASP:O	1:C:360:ARG:NH1	2.44	0.51
1:E:276:ALA:HB1	1:E:483:LEU:HD21	1.93	0.51
1:A:365:VAL:HG12	1:A:437:PRO:HB3	1.93	0.50
1:B:282:ASN:O	1:B:286:ASP:HB2	2.11	0.50
1:C:276:ALA:HB1	1:C:483:LEU:HD21	1.94	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:365:VAL:HG12	1:C:437:PRO:HB3	1.93	0.50
1:E:365:VAL:HG12	1:E:437:PRO:HB3	1.93	0.50
1:D:195:LEU:HA	1:D:198:VAL:HG22	1.94	0.50
1:A:360:ARG:NH1	1:C:337:ASP:O	2.45	0.50
1:B:256:ARG:NE	1:B:259:ASP:OD1	2.39	0.49
1:F:119:LEU:HD13	1:F:122:LEU:HD21	1.94	0.49
1:F:365:VAL:HG12	1:F:437:PRO:HB3	1.93	0.49
1:D:256:ARG:NE	1:D:259:ASP:OD1	2.39	0.49
1:F:276:ALA:HB1	1:F:483:LEU:HD21	1.94	0.49
1:E:409:LEU:HD13	1:E:415:GLN:HA	1.94	0.49
1:A:119:LEU:HD13	1:A:122:LEU:HD21	1.94	0.49
1:B:119:LEU:HD13	1:B:122:LEU:HD21	1.94	0.49
1:C:119:LEU:HD13	1:C:122:LEU:HD21	1.94	0.49
1:D:276:ALA:HB1	1:D:483:LEU:HD21	1.94	0.49
1:D:360:ARG:NH1	1:F:337:ASP:O	2.45	0.49
1:B:409:LEU:HD13	1:B:415:GLN:HA	1.94	0.49
1:C:290:TYR:OH	1:C:487:ASP:OD2	2.28	0.49
1:C:409:LEU:HD13	1:C:415:GLN:HA	1.94	0.49
1:D:365:VAL:HG12	1:D:437:PRO:HB3	1.93	0.49
1:F:230:LEU:HD12	1:F:233:ILE:HD12	1.95	0.49
1:A:337:ASP:O	1:B:360:ARG:NH1	2.46	0.49
1:B:290:TYR:O	1:B:417:TYR:OH	2.26	0.49
1:C:195:LEU:HA	1:C:198:VAL:HG22	1.95	0.49
1:D:239:VAL:HA	1:D:243:LEU:HB2	1.95	0.49
1:D:290:TYR:O	1:D:417:TYR:OH	2.27	0.49
1:E:195:LEU:HA	1:E:198:VAL:HG22	1.94	0.49
1:F:409:LEU:HD13	1:F:415:GLN:HA	1.94	0.49
1:A:256:ARG:NE	1:A:259:ASP:OD1	2.39	0.49
1:C:239:VAL:HA	1:C:243:LEU:HB2	1.94	0.49
1:D:337:ASP:O	1:E:360:ARG:NH1	2.46	0.49
1:E:337:ASP:O	1:F:360:ARG:NH1	2.45	0.49
1:A:409:LEU:HD13	1:A:415:GLN:HA	1.94	0.48
1:D:119:LEU:HD13	1:D:122:LEU:HD21	1.94	0.48
1:B:239:VAL:HA	1:B:243:LEU:HB2	1.95	0.48
1:B:365:VAL:HG12	1:B:437:PRO:HB3	1.93	0.48
1:D:409:LEU:HD13	1:D:415:GLN:HA	1.94	0.48
1:E:485:CYS:SG	1:E:486:LEU:N	2.86	0.48
1:A:485:CYS:SG	1:A:486:LEU:N	2.86	0.48
1:E:119:LEU:HD13	1:E:122:LEU:HD21	1.94	0.48
1:A:276:ALA:HB1	1:A:483:LEU:HD21	1.95	0.48
1:B:195:LEU:HA	1:B:198:VAL:HG22	1.94	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:485:CYS:SG	1:C:486:LEU:N	2.86	0.48
1:A:290:TYR:O	1:A:417:TYR:OH	2.25	0.48
1:F:485:CYS:SG	1:F:486:LEU:N	2.86	0.48
1:D:485:CYS:SG	1:D:486:LEU:N	2.87	0.48
1:E:239:VAL:HA	1:E:243:LEU:HB2	1.95	0.48
1:A:239:VAL:HA	1:A:243:LEU:HB2	1.95	0.47
1:F:239:VAL:HA	1:F:243:LEU:HB2	1.96	0.47
1:D:245:GLN:HB3	1:D:270:LEU:HD21	1.96	0.47
1:B:485:CYS:SG	1:B:486:LEU:N	2.86	0.47
1:F:195:LEU:HA	1:F:198:VAL:HG22	1.95	0.47
1:A:245:GLN:HB3	1:A:270:LEU:HD21	1.96	0.47
1:A:195:LEU:HA	1:A:198:VAL:HG22	1.95	0.47
1:A:230:LEU:HD12	1:A:233:ILE:HD12	1.96	0.47
1:B:230:LEU:HD12	1:B:233:ILE:HD12	1.96	0.46
1:B:245:GLN:HB3	1:B:270:LEU:HD21	1.97	0.46
1:E:245:GLN:HB3	1:E:270:LEU:HD21	1.97	0.46
1:C:230:LEU:HD12	1:C:233:ILE:HD12	1.97	0.46
1:C:245:GLN:HB3	1:C:270:LEU:HD21	1.96	0.46
1:D:247:GLN:OE1	1:E:173:ARG:NH1	2.42	0.46
1:C:290:TYR:O	1:C:417:TYR:OH	2.26	0.46
1:E:230:LEU:HD12	1:E:233:ILE:HD12	1.97	0.45
1:D:230:LEU:HD12	1:D:233:ILE:HD12	1.97	0.45
1:F:245:GLN:HB3	1:F:270:LEU:HD21	1.97	0.45
1:F:290:TYR:O	1:F:417:TYR:OH	2.26	0.45
1:A:370:ILE:HD11	1:C:302:ALA:HB1	2.00	0.44
1:E:222:TYR:O	1:E:225:SER:HB2	2.17	0.44
1:F:222:TYR:O	1:F:225:SER:HB2	2.17	0.44
1:B:369:PHE:CG	1:B:437:PRO:HG3	2.53	0.44
1:D:289:ILE:HG22	1:D:447:ALA:HB1	1.99	0.44
1:A:289:ILE:HG22	1:A:447:ALA:HB1	1.99	0.44
1:A:454:ASP:OD1	1:A:454:ASP:N	2.50	0.44
1:B:222:TYR:O	1:B:225:SER:HB2	2.17	0.44
1:C:369:PHE:CG	1:C:437:PRO:HG3	2.53	0.44
1:D:222:TYR:O	1:D:225:SER:HB2	2.17	0.44
1:A:222:TYR:O	1:A:225:SER:HB2	2.17	0.44
1:D:369:PHE:CG	1:D:437:PRO:HG3	2.53	0.44
1:E:289:ILE:HG22	1:E:447:ALA:HB1	2.00	0.44
1:B:454:ASP:OD1	1:B:454:ASP:N	2.50	0.44
1:E:302:ALA:HB1	1:F:370:ILE:HD11	2.00	0.44
1:E:369:PHE:CG	1:E:437:PRO:HG3	2.53	0.44
1:F:289:ILE:HG22	1:F:447:ALA:HB1	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:289:ILE:HG22	1:C:447:ALA:HB1	2.00	0.44
1:A:173:ARG:NH1	1:C:247:GLN:OE1	2.41	0.43
1:C:409:LEU:HD22	1:C:414:GLN:HB3	2.00	0.43
1:A:409:LEU:HD22	1:A:414:GLN:HB3	2.00	0.43
1:F:369:PHE:CG	1:F:437:PRO:HG3	2.53	0.43
1:B:289:ILE:HG22	1:B:447:ALA:HB1	2.00	0.43
1:C:222:TYR:O	1:C:225:SER:HB2	2.18	0.43
1:D:409:LEU:HD22	1:D:414:GLN:HB3	1.99	0.43
1:A:290:TYR:OH	1:A:487:ASP:OD2	2.28	0.43
1:C:454:ASP:N	1:C:454:ASP:OD1	2.50	0.43
1:F:409:LEU:HD22	1:F:414:GLN:HB3	2.00	0.43
1:A:302:ALA:HB1	1:B:370:ILE:HD11	2.01	0.43
1:A:369:PHE:CG	1:A:437:PRO:HG3	2.53	0.43
1:B:302:ALA:HB1	1:C:370:ILE:HD11	2.01	0.43
1:D:461:THR:HA	1:F:501:ILE:HB	2.00	0.43
1:F:454:ASP:OD1	1:F:454:ASP:N	2.50	0.43
1:A:257:SER:O	1:B:436:THR:OG1	2.34	0.42
1:A:461:THR:HA	1:C:501:ILE:HB	2.00	0.42
1:D:176:ARG:NH1	1:D:281:GLU:OE1	2.52	0.42
1:D:454:ASP:OD1	1:D:454:ASP:N	2.50	0.42
1:B:176:ARG:NH1	1:B:281:GLU:OE1	2.52	0.42
1:A:247:GLN:OE1	1:B:173:ARG:NH1	2.44	0.42
1:B:501:ILE:HB	1:C:461:THR:HA	2.02	0.42
1:E:409:LEU:HD22	1:E:414:GLN:HB3	2.00	0.42
1:A:176:ARG:NH1	1:A:281:GLU:OE1	2.52	0.42
1:A:391:ARG:O	1:A:395:GLN:HG2	2.20	0.42
1:E:391:ARG:O	1:E:395:GLN:HG2	2.20	0.42
1:B:409:LEU:HD22	1:B:414:GLN:HB3	2.00	0.42
1:F:391:ARG:O	1:F:395:GLN:HG2	2.20	0.42
1:C:391:ARG:O	1:C:395:GLN:HG2	2.20	0.42
1:C:391:ARG:NH1	1:C:395:GLN:OE1	2.53	0.42
1:D:257:SER:O	1:E:436:THR:OG1	2.34	0.42
1:D:436:THR:OG1	1:F:257:SER:O	2.35	0.42
1:E:391:ARG:NH1	1:E:395:GLN:OE1	2.53	0.42
1:D:302:ALA:HB1	1:E:370:ILE:HD11	2.02	0.42
1:D:370:ILE:HD11	1:F:302:ALA:HB1	2.02	0.42
1:B:247:GLN:HA	1:B:248:PRO:HD3	1.92	0.41
1:B:254:VAL:HG13	1:B:492:VAL:HG22	2.02	0.41
1:C:263:ARG:HD3	1:C:263:ARG:HA	1.96	0.41
1:F:254:VAL:HG13	1:F:492:VAL:HG22	2.02	0.41
1:A:254:VAL:HG13	1:A:492:VAL:HG22	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:391:ARG:NH1	1:B:395:GLN:OE1	2.53	0.41
1:E:247:GLN:OE1	1:F:173:ARG:NH1	2.42	0.41
1:A:391:ARG:NH1	1:A:395:GLN:OE1	2.53	0.41
1:B:247:GLN:OE1	1:C:173:ARG:NH1	2.42	0.41
1:B:391:ARG:O	1:B:395:GLN:HG2	2.20	0.41
1:D:254:VAL:HG13	1:D:492:VAL:HG22	2.02	0.41
1:C:408:TYR:O	1:C:412:THR:OG1	2.29	0.41
1:E:257:SER:O	1:F:436:THR:OG1	2.34	0.41
1:F:391:ARG:NH1	1:F:395:GLN:OE1	2.53	0.41
1:E:134:PRO:N	1:E:135:PRO:HD2	2.36	0.41
1:E:176:ARG:NH1	1:E:281:GLU:OE1	2.54	0.41
1:F:229:ALA:O	1:F:232:PHE:HB2	2.21	0.41
1:C:176:ARG:NH1	1:C:281:GLU:OE1	2.54	0.41
1:E:454:ASP:N	1:E:454:ASP:OD1	2.50	0.41
1:F:247:GLN:HA	1:F:248:PRO:HD3	1.92	0.41
1:C:134:PRO:N	1:C:135:PRO:HD2	2.36	0.41
1:F:290:TYR:OH	1:F:487:ASP:OD2	2.28	0.41
1:F:372:ILE:HG12	1:F:397:ILE:HG13	2.03	0.40
1:A:134:PRO:N	1:A:135:PRO:HD2	2.36	0.40
1:C:372:ILE:HG12	1:C:397:ILE:HG13	2.03	0.40
1:D:247:GLN:HA	1:D:248:PRO:HD3	1.92	0.40
1:A:372:ILE:HG12	1:A:397:ILE:HG13	2.03	0.40
1:C:254:VAL:HG13	1:C:492:VAL:HG22	2.02	0.40
1:E:254:VAL:HG13	1:E:492:VAL:HG22	2.02	0.40
1:F:176:ARG:NH1	1:F:281:GLU:OE1	2.54	0.40
1:B:257:SER:O	1:C:436:THR:OG1	2.35	0.40
1:E:501:ILE:HB	1:F:461:THR:HA	2.03	0.40

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	384/524 (73%)	376 (98%)	8 (2%)	0	100	100
1	B	384/524 (73%)	376 (98%)	8 (2%)	0	100	100
1	C	384/524 (73%)	376 (98%)	8 (2%)	0	100	100
1	D	384/524 (73%)	376 (98%)	8 (2%)	0	100	100
1	E	384/524 (73%)	376 (98%)	8 (2%)	0	100	100
1	F	384/524 (73%)	376 (98%)	8 (2%)	0	100	100
All	All	2304/3144 (73%)	2256 (98%)	48 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	337/460 (73%)	337 (100%)	0	100	100
1	B	337/460 (73%)	337 (100%)	0	100	100
1	C	337/460 (73%)	337 (100%)	0	100	100
1	D	337/460 (73%)	337 (100%)	0	100	100
1	E	337/460 (73%)	337 (100%)	0	100	100
1	F	337/460 (73%)	337 (100%)	0	100	100
All	All	2022/2760 (73%)	2022 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (20) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	217	GLN
1	A	418	HIS
1	A	473	ASN
1	B	217	GLN
1	B	371	HIS

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Mol	Chain	Res	Type
1	B	418	HIS
1	C	217	GLN
1	C	273	GLN
1	C	371	HIS
1	C	418	HIS
1	D	217	GLN
1	D	221	GLN
1	D	371	HIS
1	D	418	HIS
1	E	217	GLN
1	E	221	GLN
1	E	418	HIS
1	F	217	GLN
1	F	221	GLN
1	F	418	HIS

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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

18 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	Y01	A	701	-	38,38,38	0.53	0	57,57,57	0.54	0
2	Y01	D	703	-	38,38,38	0.54	0	57,57,57	0.57	0
3	MC3	B	702	-	21,21,45	0.98	2 (9%)	24,25,53	1.37	3 (12%)
3	MC3	A	702	-	21,21,45	0.98	2 (9%)	24,25,53	1.37	3 (12%)
2	Y01	B	703	-	38,38,38	0.54	0	57,57,57	0.56	0
2	Y01	B	701	-	38,38,38	0.53	0	57,57,57	0.54	0
2	Y01	D	701	-	38,38,38	0.53	0	57,57,57	0.55	0
2	Y01	C	602	-	38,38,38	0.54	0	57,57,57	0.55	0
2	Y01	E	703	-	38,38,38	0.54	0	57,57,57	0.57	0
3	MC3	C	603	-	21,21,45	0.98	2 (9%)	24,25,53	1.37	3 (12%)
3	MC3	D	702	-	21,21,45	0.97	2 (9%)	24,25,53	1.37	3 (12%)
3	MC3	E	702	-	21,21,45	0.98	2 (9%)	24,25,53	1.37	3 (12%)
3	MC3	F	603	-	21,21,45	0.98	2 (9%)	24,25,53	1.37	3 (12%)
2	Y01	E	701	-	38,38,38	0.54	0	57,57,57	0.54	0
2	Y01	C	601	-	38,38,38	0.54	0	57,57,57	0.57	0
2	Y01	F	602	-	38,38,38	0.54	0	57,57,57	0.54	0
2	Y01	F	601	-	38,38,38	0.54	0	57,57,57	0.56	0
2	Y01	A	703	-	38,38,38	0.54	0	57,57,57	0.56	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	Y01	A	701	-	-	3/19/77/77	0/4/4/4
2	Y01	D	703	-	-	3/19/77/77	0/4/4/4
3	MC3	B	702	-	-	8/22/22/49	-
3	MC3	A	702	-	-	8/22/22/49	-
2	Y01	B	703	-	-	4/19/77/77	0/4/4/4
2	Y01	B	701	-	-	3/19/77/77	0/4/4/4
2	Y01	D	701	-	-	3/19/77/77	0/4/4/4
2	Y01	C	602	-	-	3/19/77/77	0/4/4/4
2	Y01	E	703	-	-	4/19/77/77	0/4/4/4
3	MC3	C	603	-	-	8/22/22/49	-
3	MC3	D	702	-	-	8/22/22/49	-
3	MC3	E	702	-	-	8/22/22/49	-
3	MC3	F	603	-	-	8/22/22/49	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	Y01	E	701	-	-	3/19/77/77	0/4/4/4
2	Y01	C	601	-	-	3/19/77/77	0/4/4/4
2	Y01	F	602	-	-	3/19/77/77	0/4/4/4
2	Y01	F	601	-	-	5/19/77/77	0/4/4/4
2	Y01	A	703	-	-	3/19/77/77	0/4/4/4

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	702	MC3	P-O4P	2.74	1.65	1.54
3	E	702	MC3	P-O4P	2.73	1.65	1.54
3	B	702	MC3	P-O4P	2.73	1.65	1.54
3	F	603	MC3	P-O4P	2.73	1.65	1.54
3	D	702	MC3	P-O4P	2.72	1.65	1.54
3	C	603	MC3	P-O4P	2.72	1.65	1.54
3	F	603	MC3	O2-C31	-2.59	1.33	1.42
3	A	702	MC3	O2-C31	-2.57	1.33	1.42
3	B	702	MC3	O2-C31	-2.57	1.33	1.42
3	C	603	MC3	O2-C31	-2.56	1.33	1.42
3	D	702	MC3	O2-C31	-2.56	1.33	1.42
3	E	702	MC3	O2-C31	-2.55	1.33	1.42

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	702	MC3	O4P-P-O3P	-5.04	93.33	106.73
3	E	702	MC3	O4P-P-O3P	-5.02	93.36	106.73
3	F	603	MC3	O4P-P-O3P	-5.02	93.38	106.73
3	A	702	MC3	O4P-P-O3P	-5.02	93.38	106.73
3	C	603	MC3	O4P-P-O3P	-5.01	93.41	106.73
3	D	702	MC3	O4P-P-O3P	-5.00	93.42	106.73
3	A	702	MC3	C31-O2-C2	2.47	119.89	113.87
3	F	603	MC3	C31-O2-C2	2.47	119.88	113.87
3	E	702	MC3	C31-O2-C2	2.46	119.86	113.87
3	D	702	MC3	C31-O2-C2	2.45	119.83	113.87
3	C	603	MC3	C31-O2-C2	2.44	119.81	113.87
3	B	702	MC3	C31-O2-C2	2.44	119.81	113.87
3	B	702	MC3	O2P-P-O1P	2.32	119.78	110.68
3	A	702	MC3	O2P-P-O1P	2.31	119.73	110.68
3	D	702	MC3	O2P-P-O1P	2.31	119.72	110.68
3	E	702	MC3	O2P-P-O1P	2.31	119.72	110.68

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	603	MC3	O2P-P-O1P	2.30	119.69	110.68
3	F	603	MC3	O2P-P-O1P	2.30	119.69	110.68

There are no chirality outliers.

All (88) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	702	MC3	O2-C2-C3-O3
3	A	702	MC3	C1-C2-O2-C31
3	A	702	MC3	C1-O3P-P-O1P
3	A	702	MC3	C1-O3P-P-O2P
3	A	702	MC3	C1-O3P-P-O4P
3	B	702	MC3	O2-C2-C3-O3
3	B	702	MC3	C1-C2-O2-C31
3	B	702	MC3	C1-O3P-P-O2P
3	B	702	MC3	C1-O3P-P-O4P
3	C	603	MC3	O2-C2-C3-O3
3	C	603	MC3	C1-C2-O2-C31
3	C	603	MC3	C1-O3P-P-O2P
3	C	603	MC3	C1-O3P-P-O4P
3	D	702	MC3	O2-C2-C3-O3
3	D	702	MC3	C1-C2-O2-C31
3	D	702	MC3	C1-O3P-P-O1P
3	D	702	MC3	C1-O3P-P-O2P
3	D	702	MC3	C1-O3P-P-O4P
3	E	702	MC3	O2-C2-C3-O3
3	E	702	MC3	C1-C2-O2-C31
3	E	702	MC3	C1-O3P-P-O2P
3	E	702	MC3	C1-O3P-P-O4P
3	F	603	MC3	O2-C2-C3-O3
3	F	603	MC3	C1-C2-O2-C31
3	F	603	MC3	C1-O3P-P-O2P
3	F	603	MC3	C1-O3P-P-O4P
2	A	701	Y01	CAN-CAJ-CAO-CBB
2	B	701	Y01	CAN-CAJ-CAO-CBB
2	C	602	Y01	CAN-CAJ-CAO-CBB
2	D	701	Y01	CAN-CAJ-CAO-CBB
2	E	701	Y01	CAN-CAJ-CAO-CBB
2	F	602	Y01	CAN-CAJ-CAO-CBB
3	B	702	MC3	C1-O3P-P-O1P
3	C	603	MC3	C1-O3P-P-O1P
3	E	702	MC3	C1-O3P-P-O1P

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Mol	Chain	Res	Type	Atoms
3	F	603	MC3	C1-O3P-P-O1P
3	A	702	MC3	O3P-C1-C2-C3
3	B	702	MC3	O3P-C1-C2-C3
3	C	603	MC3	O3P-C1-C2-C3
3	D	702	MC3	O3P-C1-C2-C3
3	E	702	MC3	O3P-C1-C2-C3
3	F	603	MC3	O3P-C1-C2-C3
3	A	702	MC3	C1-C2-C3-O3
3	B	702	MC3	C1-C2-C3-O3
3	C	603	MC3	C1-C2-C3-O3
3	D	702	MC3	C1-C2-C3-O3
3	E	702	MC3	C1-C2-C3-O3
3	F	603	MC3	C1-C2-C3-O3
2	F	601	Y01	CAN-CAJ-CAO-CBB
3	A	702	MC3	O3P-C1-C2-O2
3	B	702	MC3	O3P-C1-C2-O2
3	C	603	MC3	O3P-C1-C2-O2
3	D	702	MC3	O3P-C1-C2-O2
3	E	702	MC3	O3P-C1-C2-O2
3	F	603	MC3	O3P-C1-C2-O2
2	C	601	Y01	CAN-CAJ-CAO-CBB
2	D	703	Y01	CAN-CAJ-CAO-CBB
2	D	703	Y01	CAM-CAL-CAX-OAF
2	A	703	Y01	CAM-CAL-CAX-OAF
2	B	703	Y01	CAM-CAL-CAX-OAF
2	C	601	Y01	CAM-CAL-CAX-OAF
2	E	703	Y01	CAM-CAL-CAX-OAF
2	F	601	Y01	CAM-CAL-CAX-OAF
2	F	602	Y01	CAM-CAL-CAX-OAH
2	A	701	Y01	CAM-CAL-CAX-OAH
2	B	701	Y01	CAM-CAL-CAX-OAH
2	C	602	Y01	CAM-CAL-CAX-OAH
2	D	701	Y01	CAM-CAL-CAX-OAH
2	D	703	Y01	CAM-CAL-CAX-OAH
2	E	701	Y01	CAM-CAL-CAX-OAH
2	F	601	Y01	CAM-CAL-CAX-OAH
2	A	703	Y01	CAM-CAL-CAX-OAH
2	B	703	Y01	CAM-CAL-CAX-OAH
2	C	601	Y01	CAM-CAL-CAX-OAH
2	E	701	Y01	CAM-CAL-CAX-OAF
2	E	703	Y01	CAM-CAL-CAX-OAH
2	A	701	Y01	CAM-CAL-CAX-OAF

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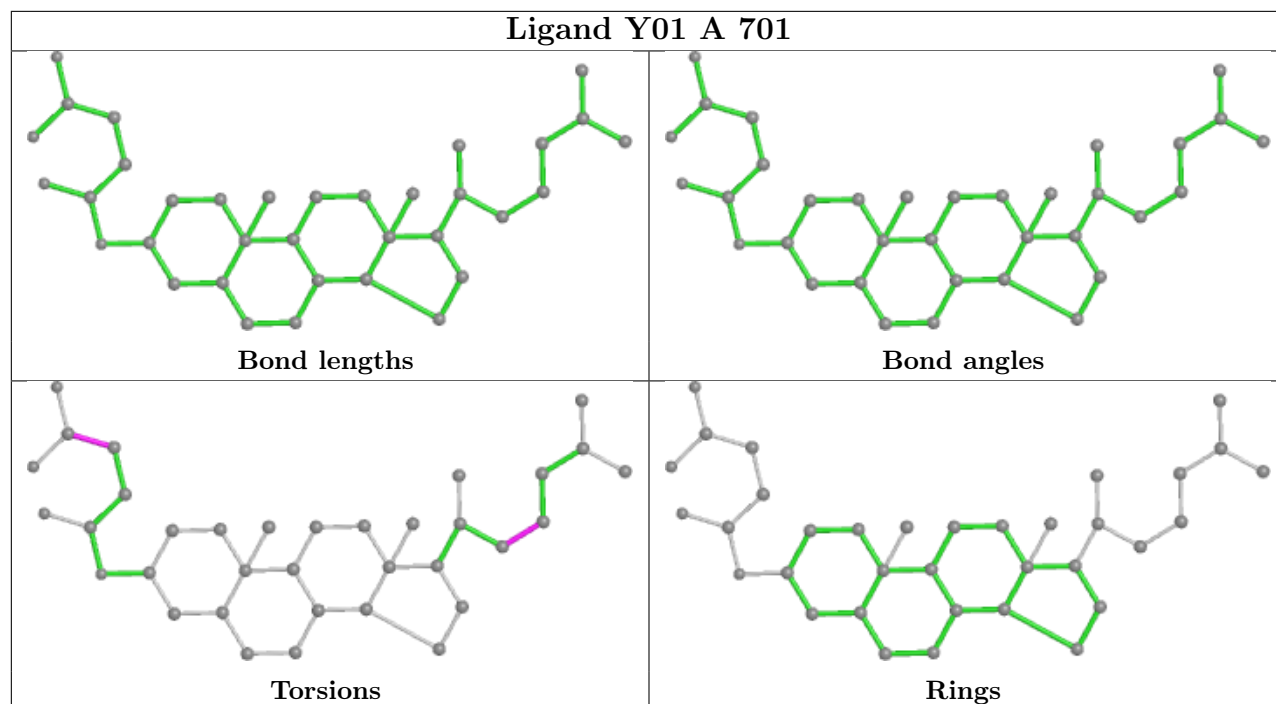
Mol	Chain	Res	Type	Atoms
2	B	701	Y01	CAM-CAL-CAX-OAF
2	C	602	Y01	CAM-CAL-CAX-OAF
2	D	701	Y01	CAM-CAL-CAX-OAF
2	F	602	Y01	CAM-CAL-CAX-OAF
2	E	703	Y01	CAN-CAJ-CAO-CBB
2	B	703	Y01	CAN-CAJ-CAO-CBB
2	F	601	Y01	OAG-CAY-OAW-CBC
2	B	703	Y01	OAG-CAY-OAW-CBC
2	E	703	Y01	OAG-CAY-OAW-CBC
2	A	703	Y01	CAN-CAJ-CAO-CBB
2	F	601	Y01	CAM-CAY-OAW-CBC

There are no ring outliers.

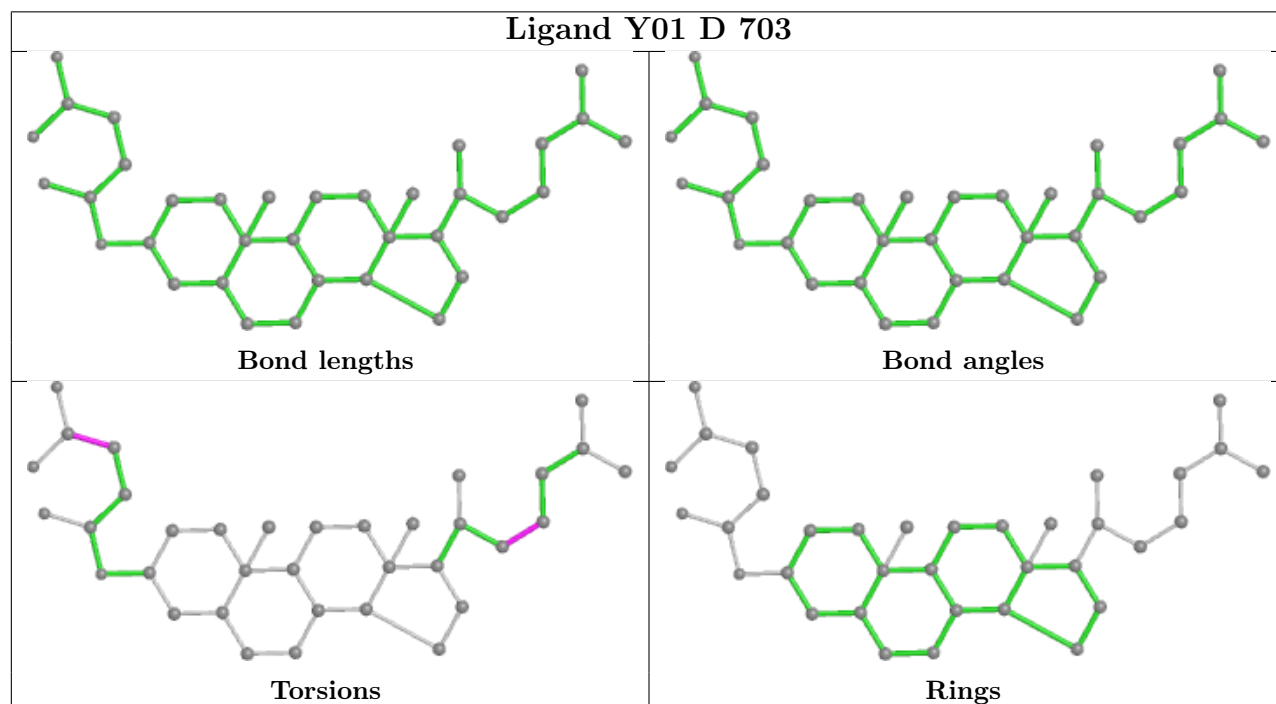
No monomer is involved in short contacts.

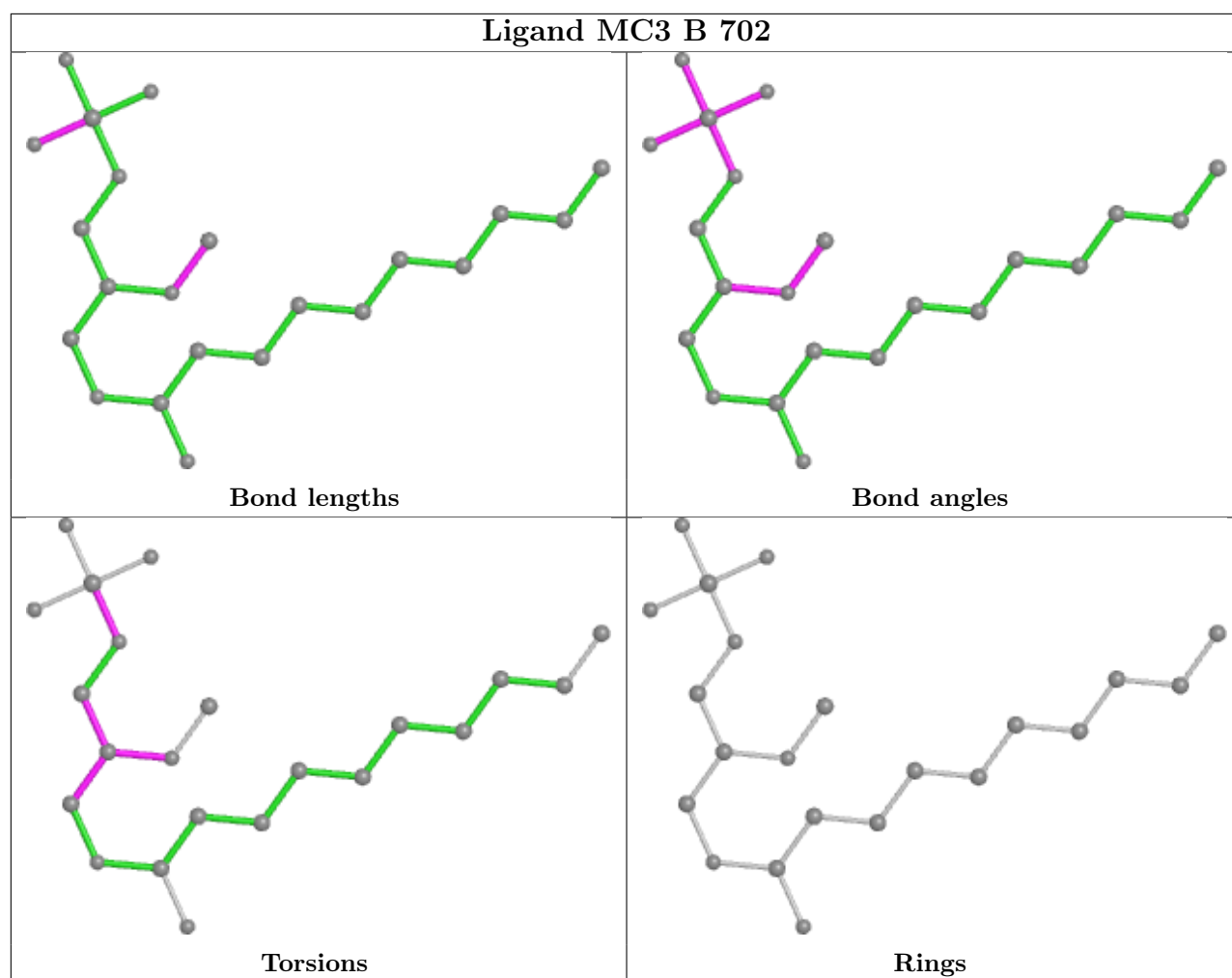
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

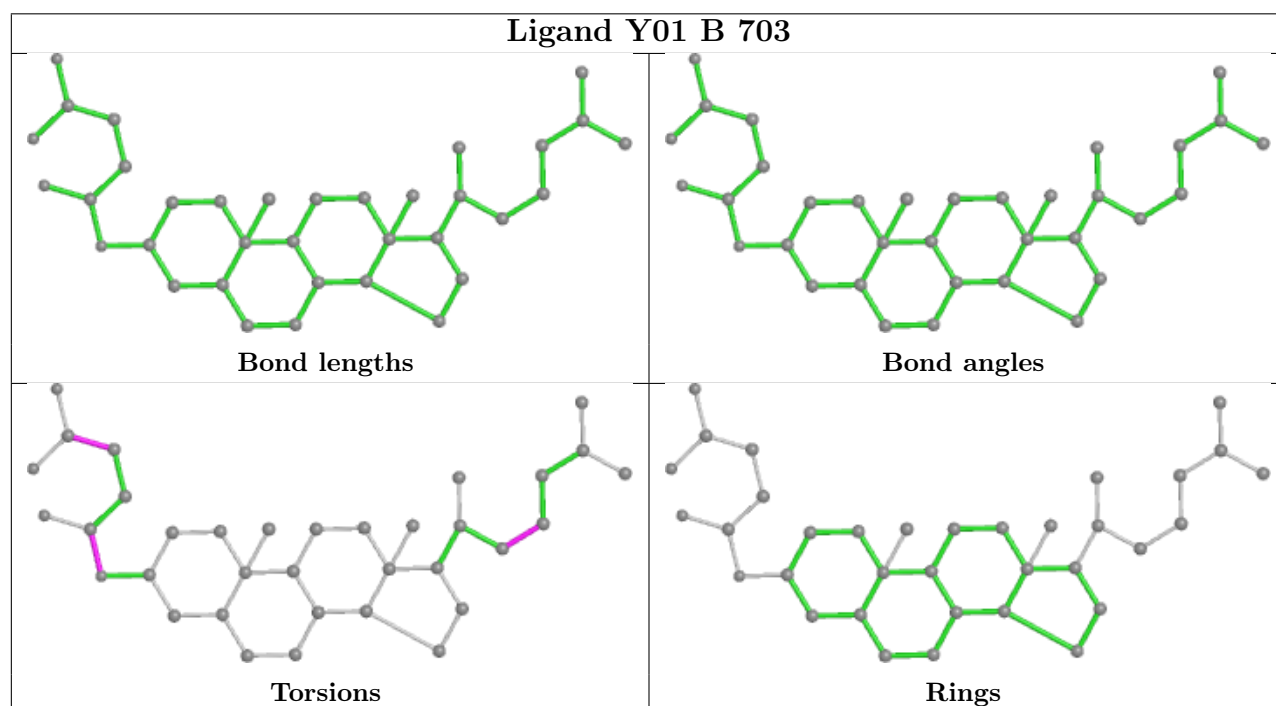
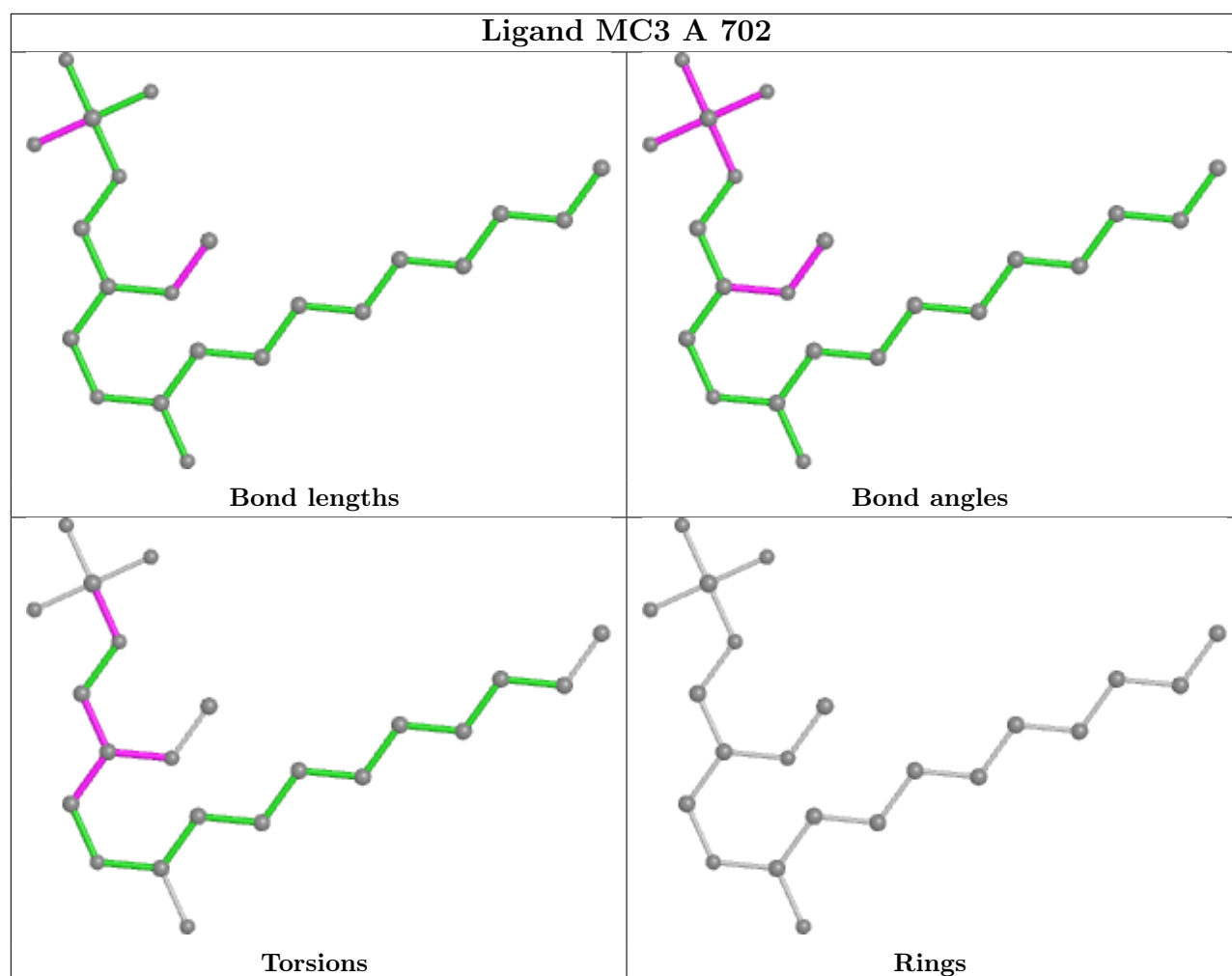
Ligand Y01 A 701

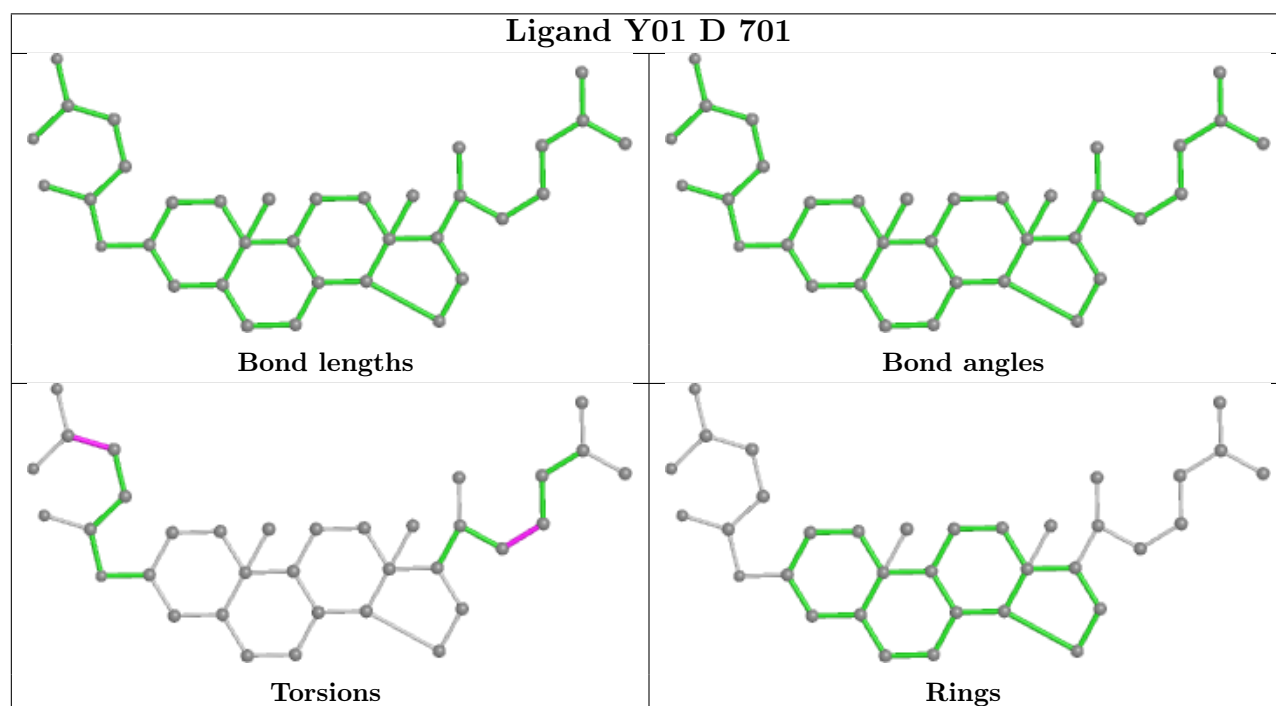
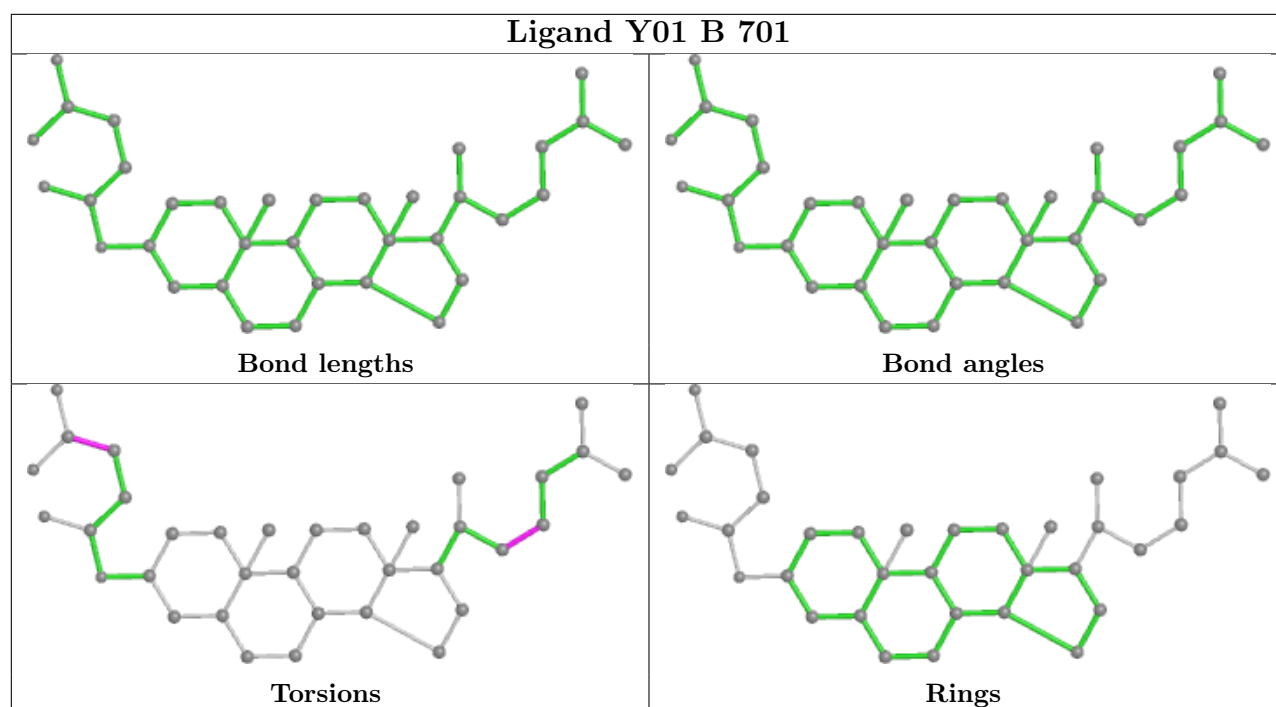


Ligand Y01 D 703

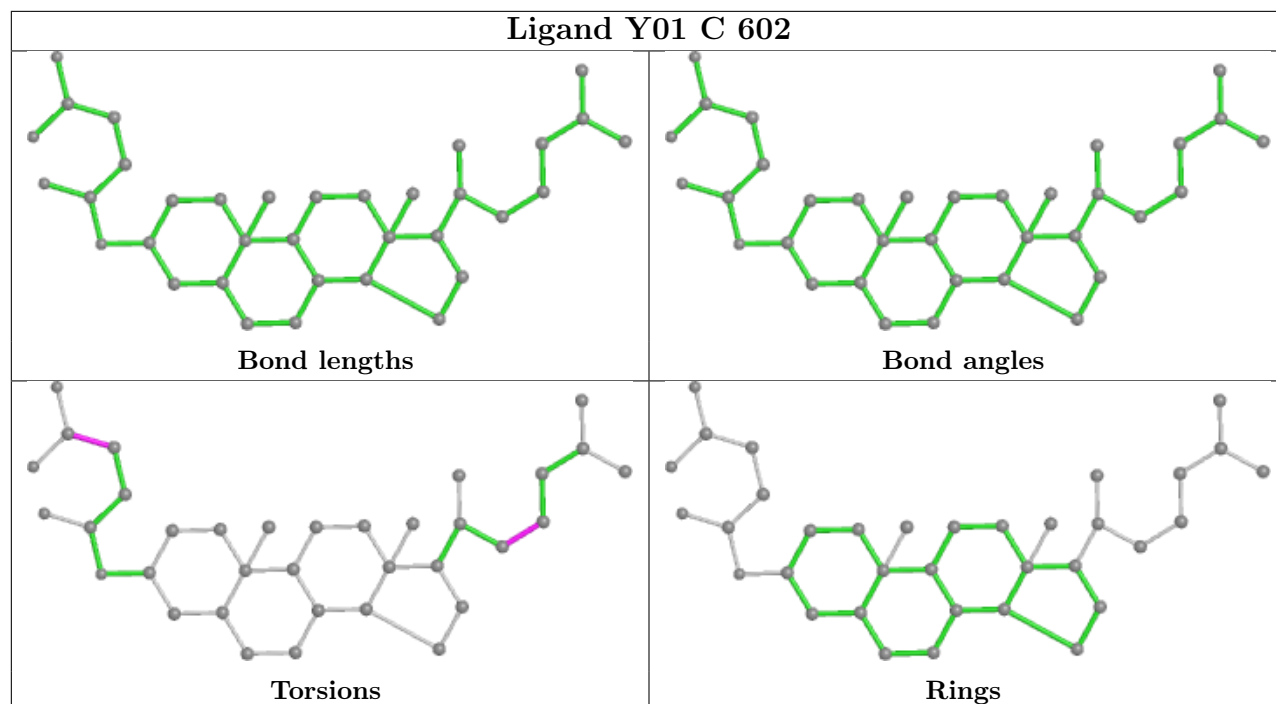




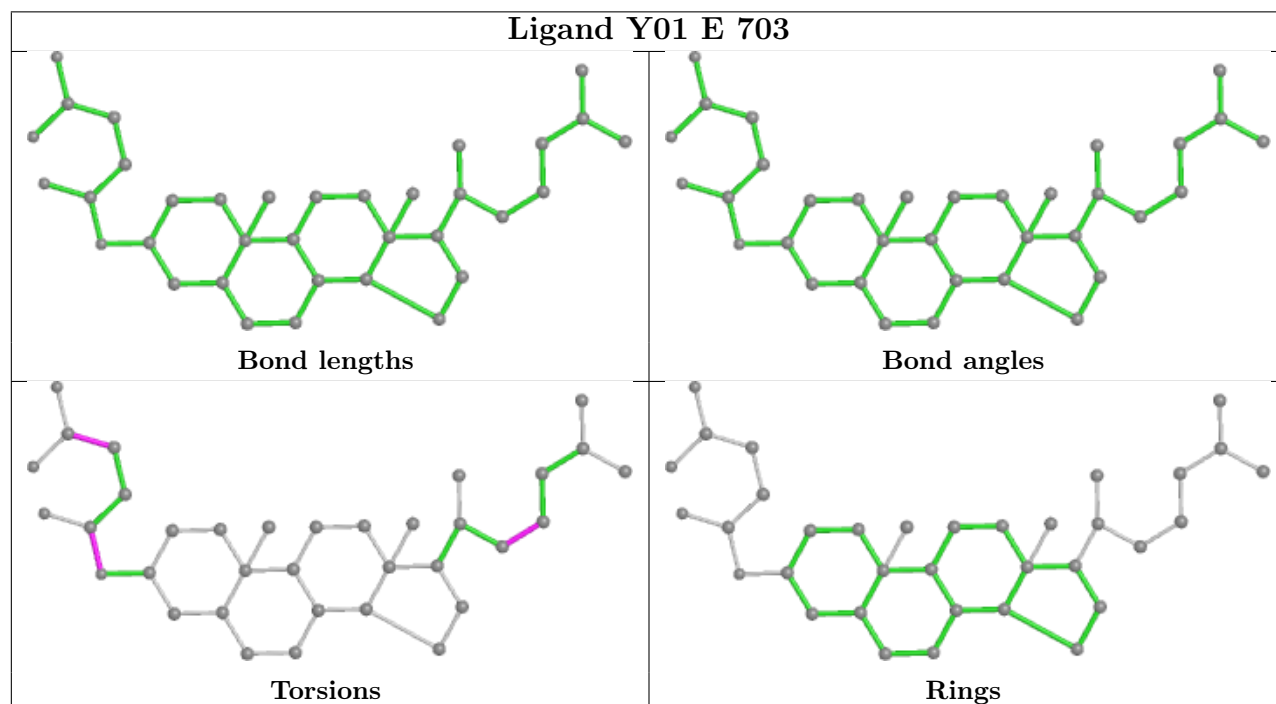


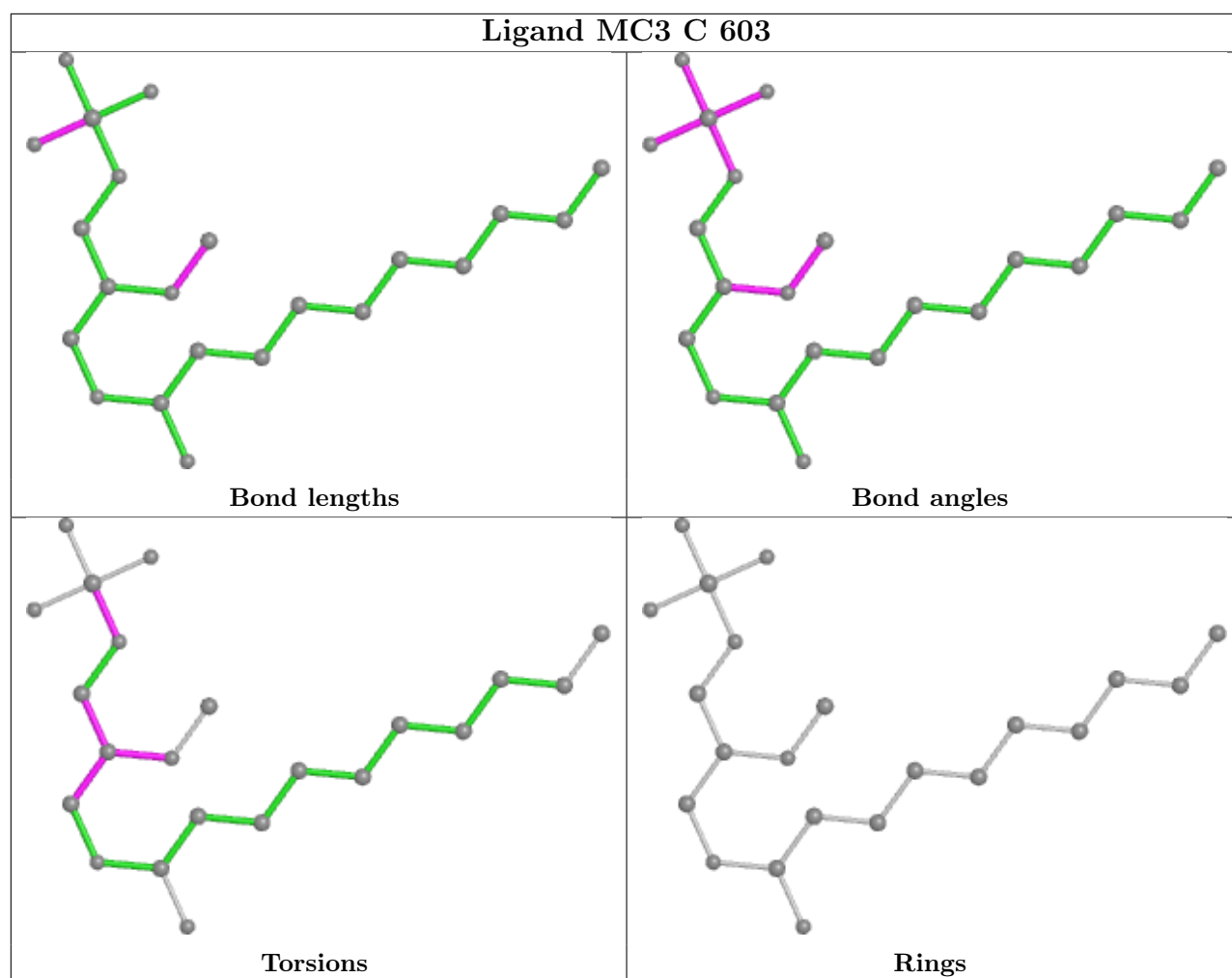


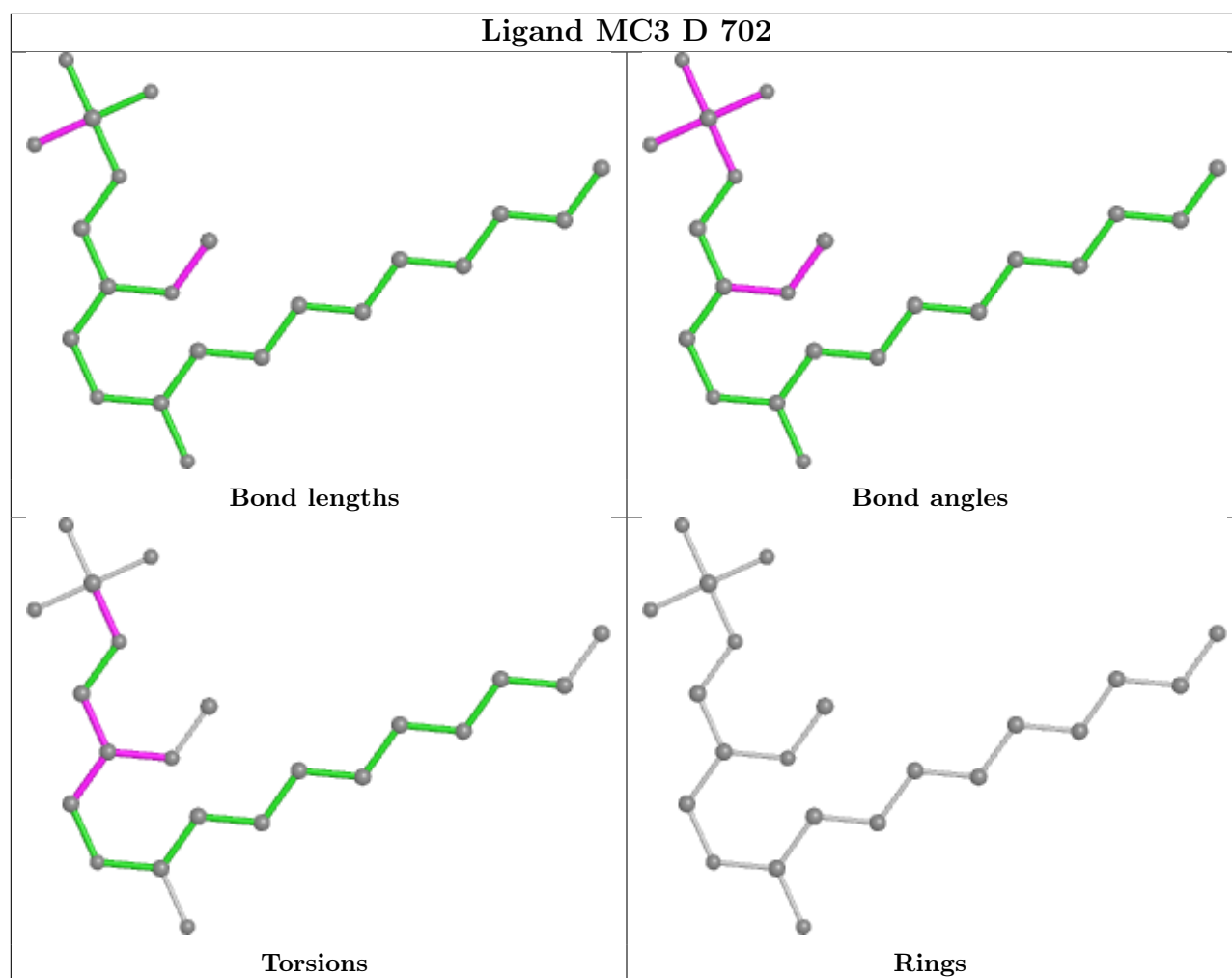
Ligand Y01 C 602

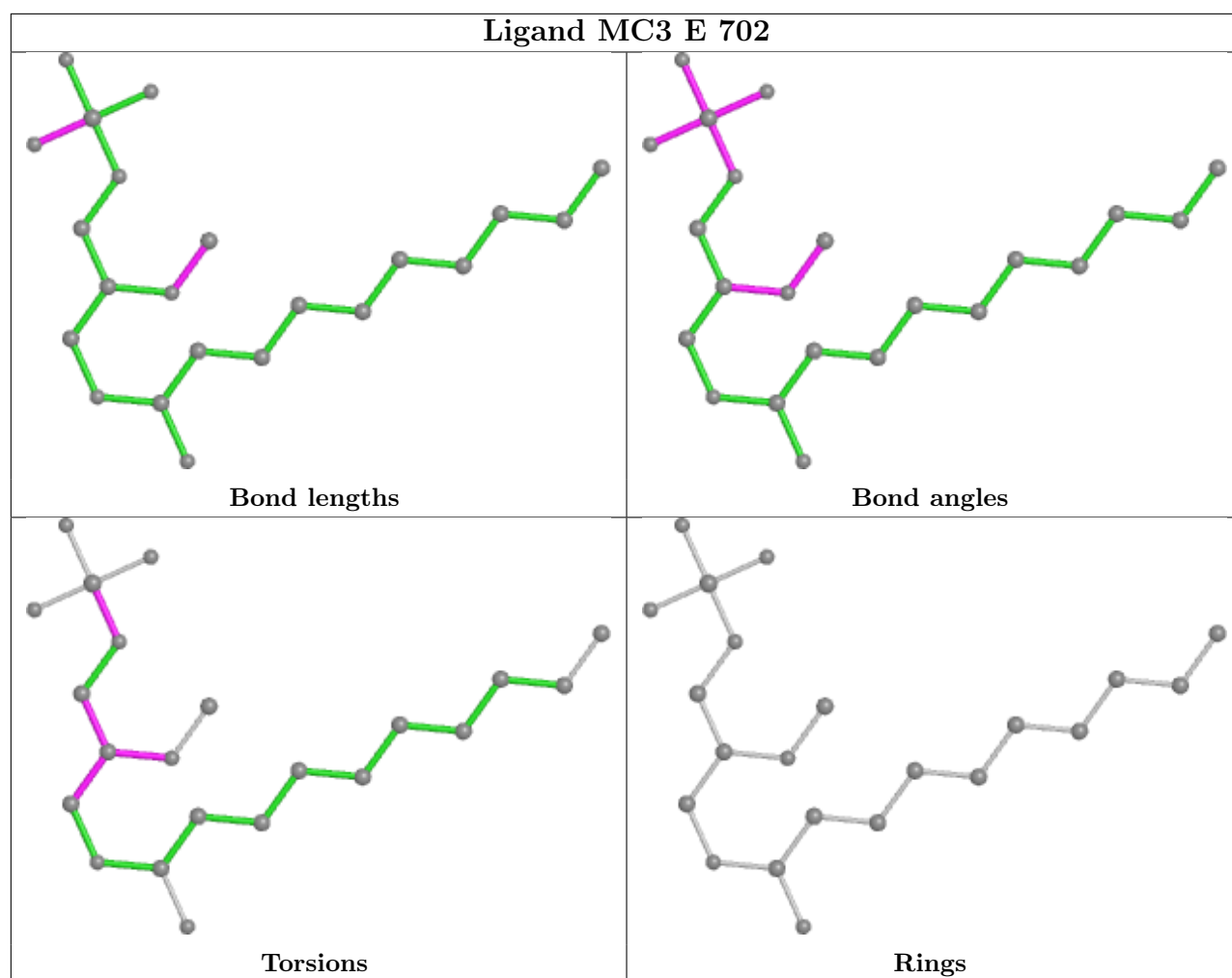


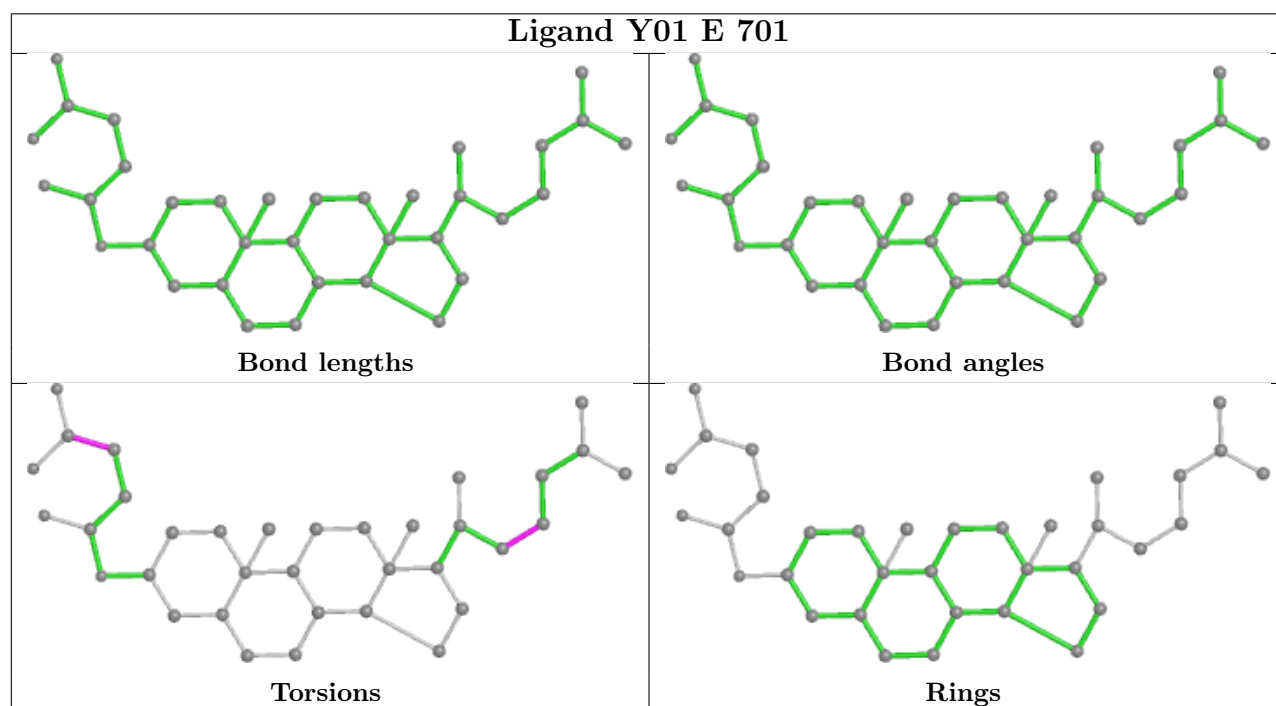
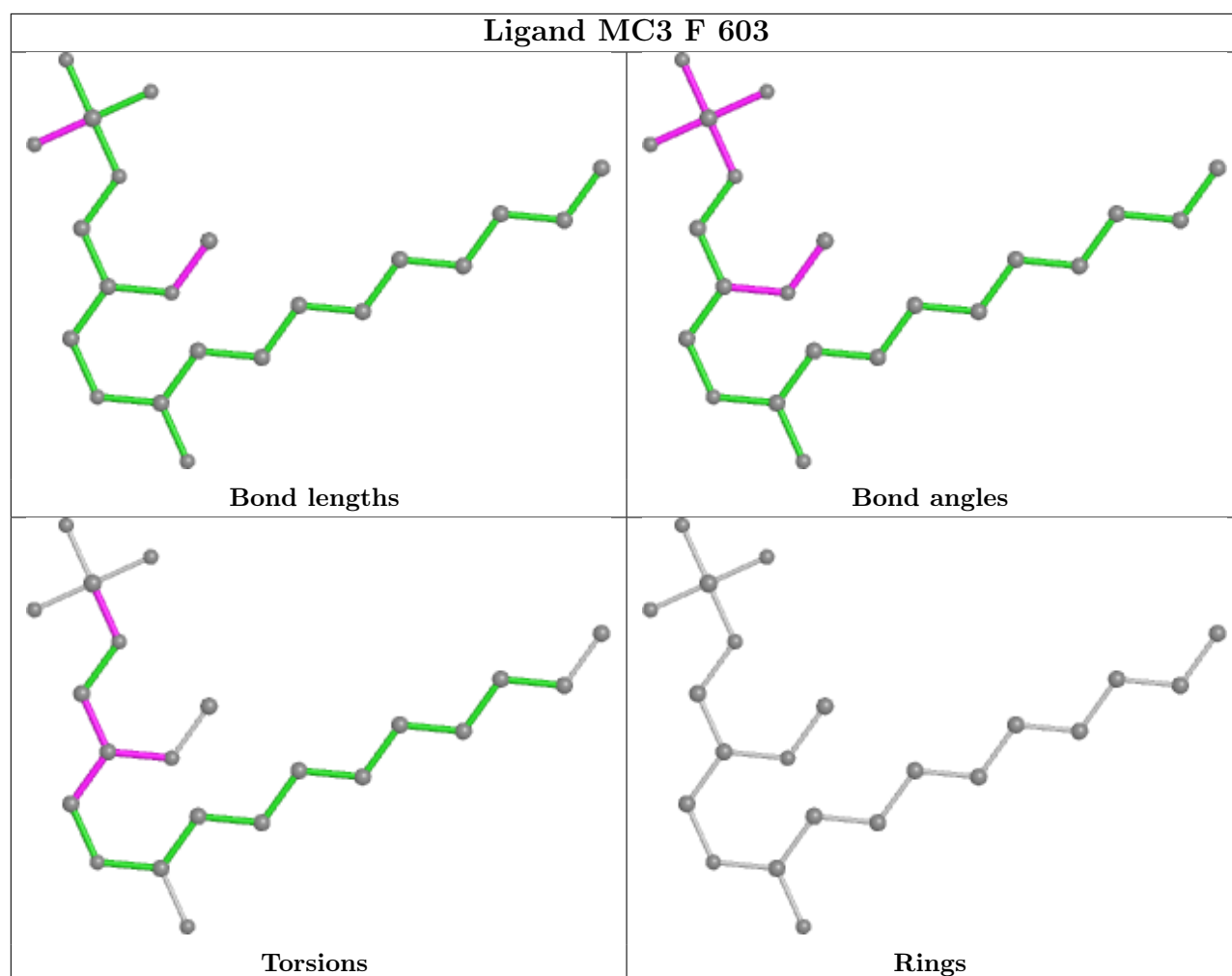
Ligand Y01 E 703



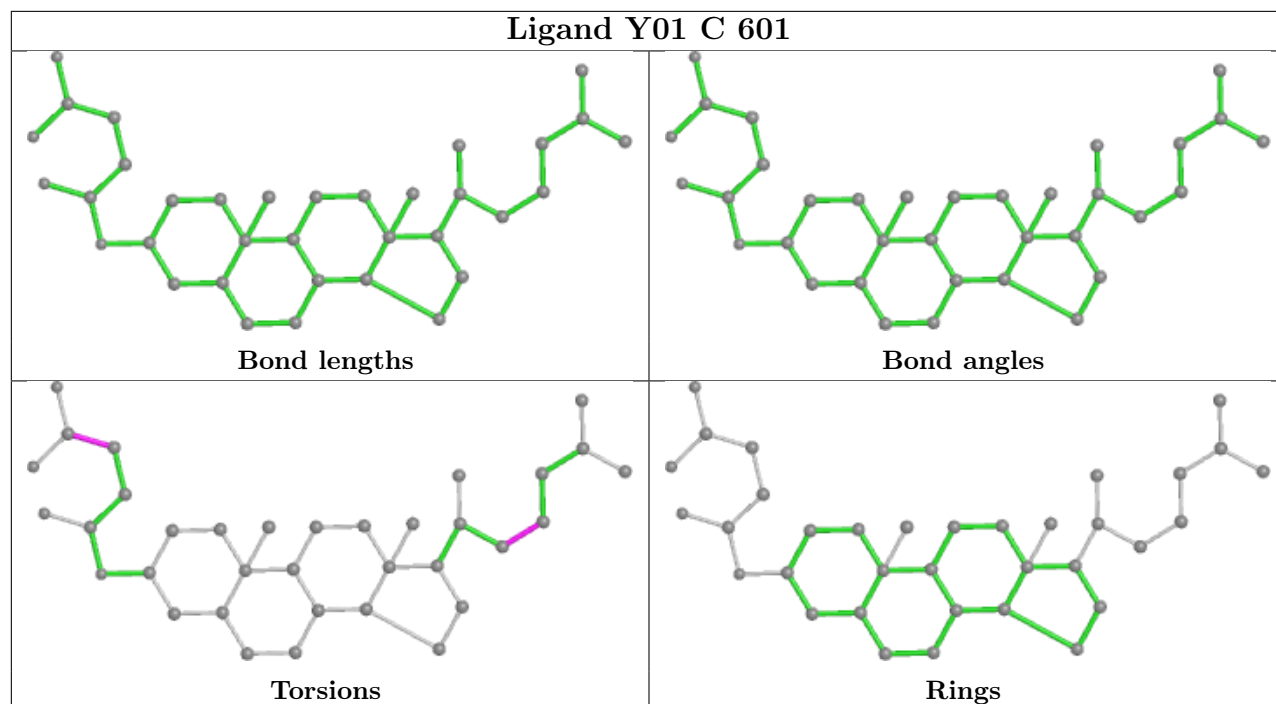




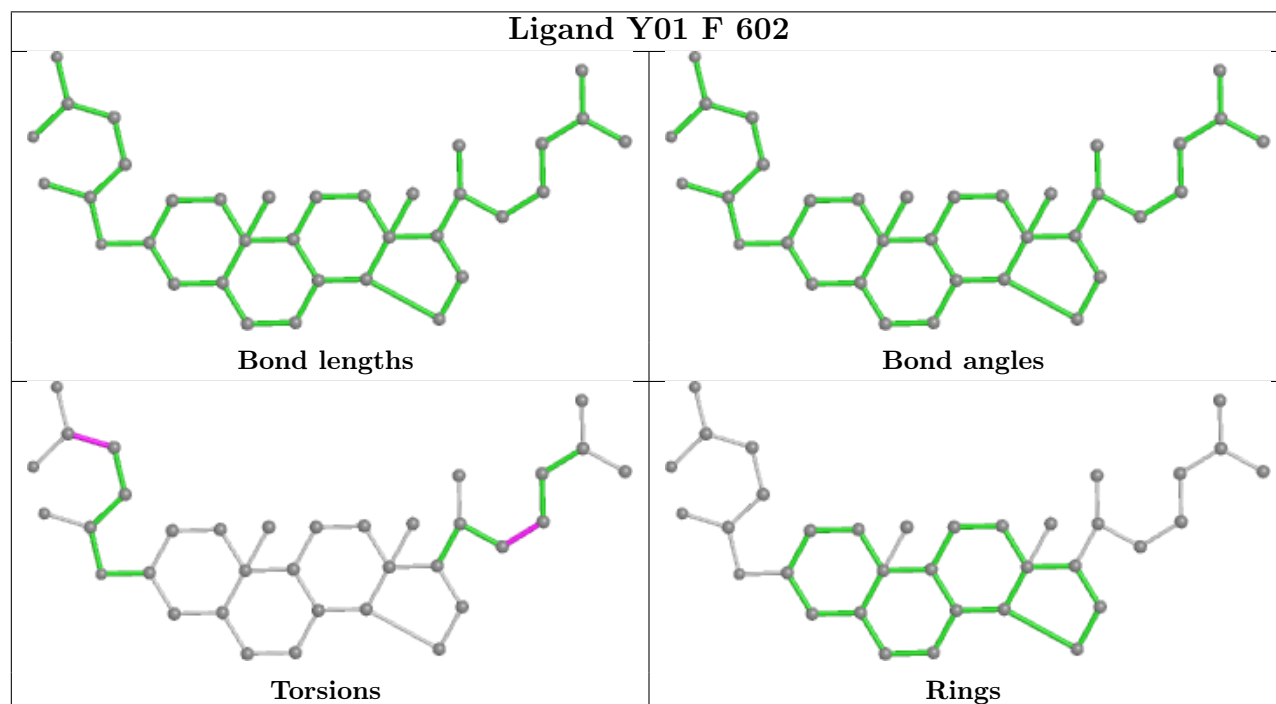


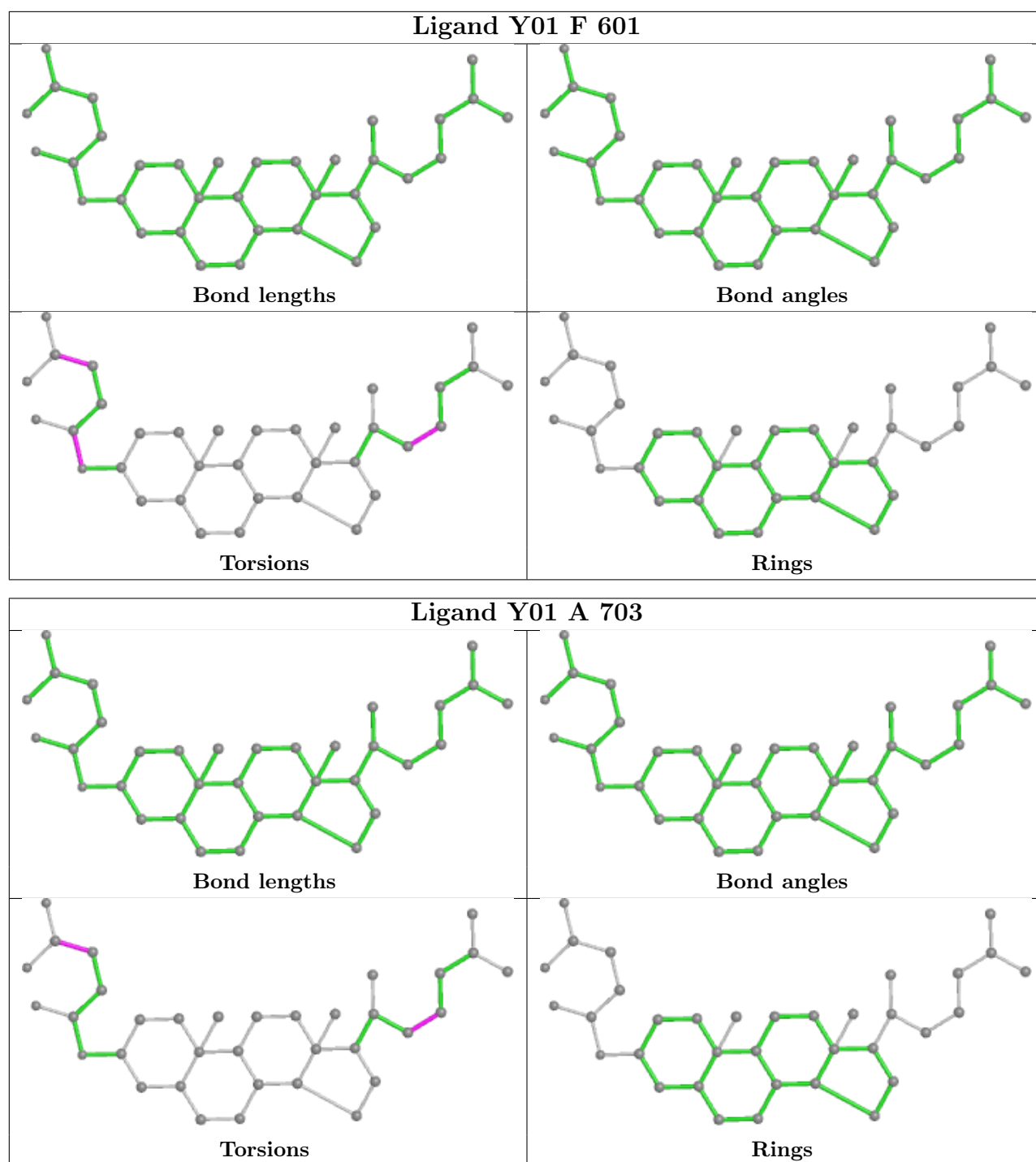


Ligand Y01 C 601



Ligand Y01 F 602





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.