



## Full wwPDB EM Validation Report ⓘ

Mar 15, 2026 – 12:12 AM JST

PDB ID : 9WZS / pdb\_00009wzs  
EMDB ID : EMD-66407  
Title : Cryo-EM structure of Fks2 in complex with enfumafungin  
Authors : Bai, L.; Wang, L.X.  
Deposited on : 2025-09-29  
Resolution : 3.32 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](mailto: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>.

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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 Phenix2.0  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
EM percentile statistics : **NOT EXECUTED**  
MapQ : **FAILED**  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.48.1

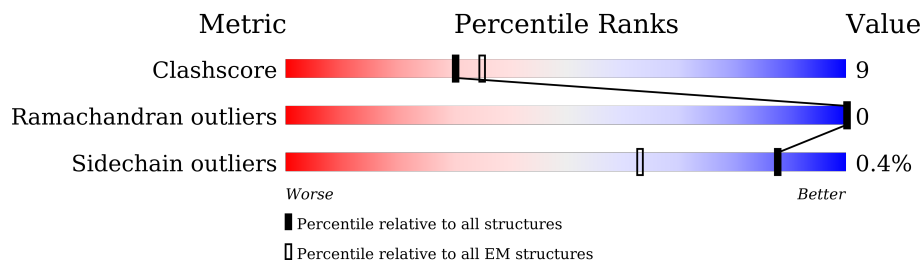
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.32 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  $\geq 3$ , 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	1895	 71% 10% 19%
2	C	2	 100%

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 13280 atoms, of which 323 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 1,3-beta-glucan synthase component GSC2.

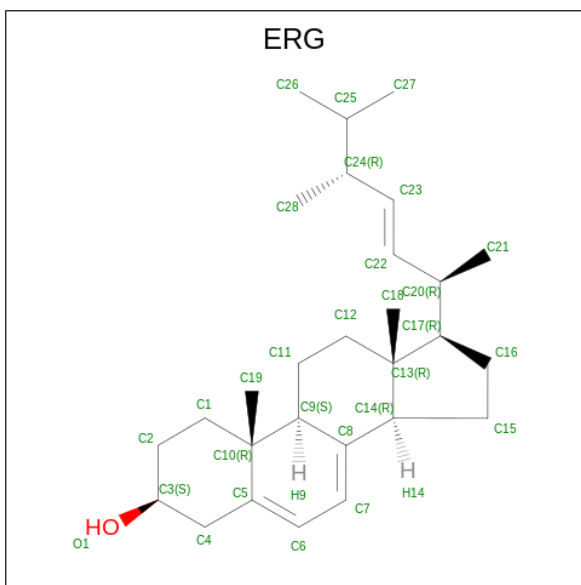
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	1542	12537	8182	2108	2170	77	0	0

- Molecule 2 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



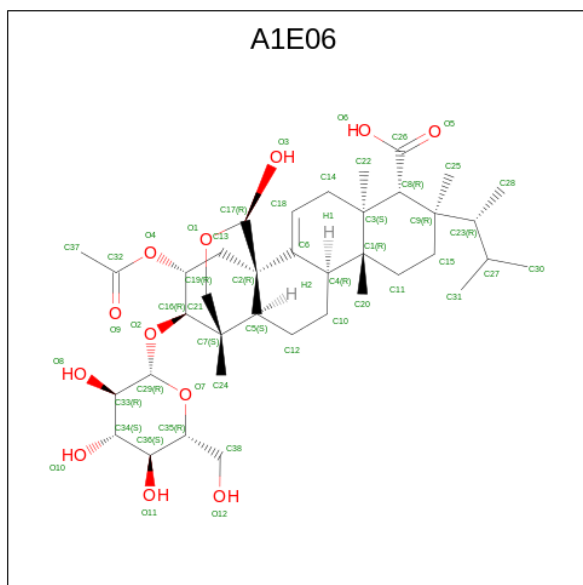
Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
2	C	2	28	16	2	10	0	0

- Molecule 3 is ERGOSTEROL (CCD ID: ERG) (formula: C<sub>28</sub>H<sub>44</sub>O).



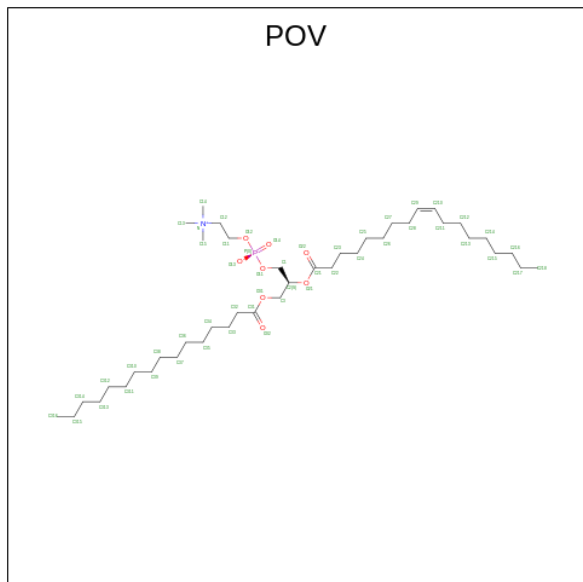
Mol	Chain	Residues	Atoms				AltConf
3	A	1	Total	C	O		0
			29	28	1		
3	A	1	Total	C	O		0
			29	28	1		
3	A	1	Total	C	H	O	0
			73	28	44	1	
3	A	1	Total	C	H	O	0
			73	28	44	1	
3	A	1	Total	C	H	O	0
			73	28	44	1	
3	A	1	Total	C	H	O	0
			73	28	44	1	
3	A	1	Total	C	H	O	0
			73	28	44	1	
3	A	1	Total	C	O		0
			29	28	1		
3	A	1	Total	C	O		0
			29	28	1		

- Molecule 4 is Enfumafungin (CCD ID: A1E06) (formula:  $C_{38}H_{60}O_{12}$ ) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				AltConf
4	A	1	Total	C	H	O	0
			109	38	59	12	

- Molecule 5 is (2S)-3-(hexadecanoyloxy)-2-[(9Z)-octadec-9-enoyloxy]propyl 2-(trimethylammonio)ethyl phosphate (CCD ID: POV) (formula: C<sub>42</sub>H<sub>82</sub>NO<sub>8</sub>P).



Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
5	A	1	52	42	1	8	1	0





- Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain C:  100%



## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	250126	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TECNAI F30	Depositor
Voltage (kV)	200	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	40	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	1800	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: NAG, A1E06, ERG, POV

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	0.34	0/12879	0.50	9/17461 (0.1%)

There are no bond length outliers.

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	1699	ILE	N-CA-C	-8.03	102.43	110.62
1	A	1284	GLY	CA-C-N	8.03	131.03	120.28
1	A	1284	GLY	C-N-CA	8.03	131.03	120.28
1	A	1271	PHE	N-CA-C	7.99	120.77	111.02
1	A	1284	GLY	N-CA-C	-5.71	105.88	112.50
1	A	1854	GLY	N-CA-C	-5.57	99.97	113.18
1	A	1269	LEU	N-CA-C	5.55	115.87	108.38
1	A	1274	ILE	CB-CA-C	-5.38	105.08	111.81
1	A	1026	LEU	N-CA-C	-5.14	107.56	113.88

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	12537	0	12537	189	0
2	C	28	0	25	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	290	264	439	77	0
4	A	50	59	0	1	0
5	A	52	0	82	0	0
All	All	12957	323	13083	230	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 9.

All (230) 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)
3:A:1902:ERG:H122	3:A:1905:ERG:C16	1.38	1.53
1:A:1269:LEU:HD11	1:A:1274:ILE:HG12	1.20	1.15
1:A:1782:ILE:HD11	3:A:1906:ERG:H6	1.16	1.14
3:A:1902:ERG:H14	3:A:1905:ERG:H151	1.19	1.13
3:A:1903:ERG:H161	3:A:1904:ERG:H121	1.24	1.13
1:A:1414:LEU:HD13	3:A:1902:ERG:H151	1.32	1.12
3:A:1902:ERG:H122	3:A:1905:ERG:H161	1.10	1.07
3:A:1902:ERG:C12	3:A:1905:ERG:C16	2.32	1.06
1:A:1782:ILE:CD1	3:A:1906:ERG:H6	1.86	1.05
1:A:1782:ILE:HD11	3:A:1906:ERG:C6	1.88	1.03
3:A:1902:ERG:H9	3:A:1905:ERG:H152	1.37	1.01
3:A:1903:ERG:H14	3:A:1904:ERG:H112	1.44	0.98
1:A:1590:TYR:CD1	3:A:1907:ERG:H21	1.99	0.97
3:A:1902:ERG:C12	3:A:1905:ERG:H161	1.95	0.96
3:A:1902:ERG:H122	3:A:1905:ERG:C15	1.96	0.95
3:A:1902:ERG:H122	3:A:1905:ERG:H162	1.48	0.92
3:A:1902:ERG:C14	3:A:1905:ERG:H151	1.98	0.92
1:A:1782:ILE:CD1	3:A:1906:ERG:C6	2.46	0.92
1:A:1269:LEU:CD1	1:A:1274:ILE:HG12	2.01	0.90
3:A:1903:ERG:H161	3:A:1904:ERG:C12	2.03	0.88
1:A:1126:ASN:ND2	1:A:1131:CYS:SG	2.46	0.88
3:A:1903:ERG:C14	3:A:1904:ERG:H112	2.03	0.88
3:A:1903:ERG:C16	3:A:1904:ERG:H121	2.06	0.86
1:A:1169:ILE:HD13	1:A:1212:TYR:CD1	2.12	0.85
1:A:1647:GLY:O	1:A:1651:GLY:HA3	1.77	0.84
1:A:1414:LEU:CD1	3:A:1902:ERG:H151	2.08	0.83
3:A:1902:ERG:H9	3:A:1905:ERG:C15	2.11	0.81
1:A:1646:SER:HB2	1:A:1650:LEU:HB2	1.63	0.80
3:A:1903:ERG:C15	3:A:1904:ERG:H112	2.11	0.80
3:A:1904:ERG:H271	3:A:1907:ERG:H213	1.66	0.78

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1283:ALA:HB1	1:A:1435:ASP:OD2	1.84	0.78
3:A:1903:ERG:H151	3:A:1904:ERG:H112	1.65	0.77
3:A:1903:ERG:H151	3:A:1904:ERG:C11	2.14	0.76
1:A:1278:THR:HG23	1:A:1428:TYR:CE1	2.21	0.76
1:A:1461:TYR:OH	1:A:1762:ASP:OD1	2.03	0.74
1:A:837:ARG:NE	1:A:1129:GLU:OE2	2.20	0.74
1:A:1201:ARG:NH1	1:A:1259:GLU:OE1	2.21	0.74
1:A:1270:GLY:O	1:A:1274:ILE:HG13	1.87	0.74
1:A:1782:ILE:HD13	3:A:1906:ERG:H7	1.69	0.74
1:A:1277:PHE:HA	1:A:1280:LYS:HD2	1.69	0.73
1:A:1169:ILE:HD13	1:A:1212:TYR:HD1	1.52	0.73
1:A:1625:THR:HB	1:A:1698:CYS:SG	2.27	0.73
1:A:1542:ILE:HD12	1:A:1542:ILE:H	1.52	0.73
1:A:1782:ILE:HD13	3:A:1906:ERG:C7	2.19	0.72
1:A:338:ARG:NH1	1:A:1110:ILE:HD11	2.04	0.72
1:A:1212:TYR:OH	1:A:1218:ILE:HD11	1.89	0.71
1:A:1278:THR:HG23	1:A:1428:TYR:CZ	2.26	0.70
1:A:1646:SER:O	1:A:1650:LEU:N	2.26	0.68
1:A:1647:GLY:O	1:A:1651:GLY:CA	2.42	0.68
1:A:1782:ILE:CD1	3:A:1906:ERG:C7	2.72	0.68
1:A:1325:LEU:CD1	3:A:1901:ERG:H7	2.23	0.68
1:A:1325:LEU:HD13	3:A:1901:ERG:H7	1.76	0.67
3:A:1903:ERG:C16	3:A:1904:ERG:C12	2.69	0.67
1:A:1269:LEU:HD11	1:A:1274:ILE:CG1	2.13	0.66
1:A:428:GLU:N	1:A:428:GLU:OE1	2.30	0.65
1:A:1030:LYS:HE3	1:A:1030:LYS:HA	1.77	0.64
1:A:1590:TYR:CG	3:A:1907:ERG:H21	2.33	0.64
3:A:1903:ERG:H14	3:A:1904:ERG:C11	2.26	0.64
1:A:1478:MET:HG2	1:A:1696:VAL:HG21	1.79	0.63
1:A:1553:THR:HB	1:A:1714:LEU:HD21	1.80	0.63
3:A:1902:ERG:C12	3:A:1905:ERG:C15	2.73	0.63
1:A:1646:SER:O	1:A:1651:GLY:N	2.32	0.63
1:A:1279:THR:HG23	1:A:1431:ALA:HB2	1.81	0.62
1:A:370:GLY:O	1:A:374:ASN:ND2	2.31	0.61
1:A:1276:ASN:O	1:A:1280:LYS:HG3	2.01	0.60
1:A:1586:PRO:HA	3:A:1907:ERG:H192	1.83	0.60
1:A:1617:SER:HA	1:A:1620:ARG:HG3	1.85	0.59
1:A:1175:TYR:O	1:A:1176:ILE:HB	2.01	0.59
1:A:739:ARG:HD2	1:A:819:ASP:HA	1.84	0.59
1:A:1590:TYR:CD1	3:A:1907:ERG:C2	2.83	0.59
1:A:1643:SER:HB3	1:A:1661:MET:HE2	1.86	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:1902:ERG:C9	3:A:1905:ERG:C15	2.81	0.58
1:A:1278:THR:HG23	1:A:1428:TYR:CD1	2.38	0.58
1:A:1119:LEU:HD13	1:A:1212:TYR:OH	2.03	0.57
1:A:1779:ILE:HG21	3:A:1906:ERG:H151	1.85	0.57
3:A:1903:ERG:C15	3:A:1904:ERG:C11	2.78	0.57
1:A:1328:GLN:HE21	1:A:1471:MET:HE3	1.68	0.57
1:A:1589:ILE:HG23	3:A:1903:ERG:H271	1.86	0.57
3:A:1903:ERG:H24	3:A:1904:ERG:C22	2.34	0.57
3:A:1905:ERG:H263	3:A:1905:ERG:H20	1.86	0.56
1:A:1279:THR:HG23	1:A:1431:ALA:CB	2.36	0.56
1:A:1586:PRO:O	3:A:1907:ERG:H22A	2.05	0.56
1:A:1853:THR:HA	1:A:1856:PHE:HB2	1.88	0.56
1:A:1669:ALA:HB2	1:A:1756:LEU:HD22	1.87	0.56
1:A:1782:ILE:CD1	3:A:1906:ERG:H7	2.32	0.56
3:A:1901:ERG:H151	3:A:1907:ERG:H152	1.88	0.56
3:A:1904:ERG:H162	3:A:1904:ERG:H282	1.86	0.56
1:A:405:LYS:O	1:A:406:VAL:HG23	2.05	0.56
1:A:1586:PRO:HA	3:A:1907:ERG:C19	2.35	0.56
1:A:1124:GLN:NE2	1:A:1174:GLU:OE2	2.39	0.55
3:A:1902:ERG:C12	3:A:1905:ERG:H162	2.17	0.55
1:A:1782:ILE:HD13	3:A:1906:ERG:C6	2.30	0.55
1:A:563:GLY:N	1:A:564:PRO:HD2	2.22	0.54
1:A:1285:MET:HG3	1:A:1317:HIS:CD2	2.43	0.54
1:A:1304:ASP:OD1	1:A:1305:ARG:N	2.40	0.54
1:A:1313:HIS:HB2	1:A:1314:PRO:HD3	1.88	0.54
3:A:1902:ERG:C9	3:A:1905:ERG:H152	2.25	0.54
1:A:1785:PHE:CD2	3:A:1906:ERG:H181	2.42	0.54
3:A:1903:ERG:H24	3:A:1904:ERG:H22	1.90	0.53
1:A:334:ALA:O	1:A:338:ARG:NH1	2.41	0.53
1:A:1647:GLY:O	1:A:1651:GLY:N	2.41	0.53
1:A:1269:LEU:HG	1:A:1270:GLY:H	1.72	0.53
1:A:681:TYR:HB3	1:A:1616:ASN:HB3	1.90	0.53
1:A:1848:LEU:N	1:A:1848:LEU:HD12	2.24	0.53
1:A:1531:ARG:C	1:A:1540:SER:HG	2.16	0.52
1:A:739:ARG:HH11	1:A:819:ASP:HA	1.73	0.52
1:A:783:GLU:O	1:A:783:GLU:OE2	2.27	0.52
1:A:1586:PRO:CA	3:A:1907:ERG:H192	2.39	0.52
1:A:1604:GLN:HB3	1:A:1607:VAL:HG21	1.90	0.52
1:A:550:ARG:NH1	1:A:604:LEU:O	2.43	0.52
1:A:1542:ILE:HD12	1:A:1542:ILE:N	2.24	0.52
1:A:870:GLU:OE1	1:A:870:GLU:N	2.43	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:749:ILE:O	1:A:749:ILE:HG22	2.10	0.52
1:A:1323:ILE:HD11	1:A:1384:VAL:HG11	1.91	0.52
1:A:1625:THR:HG23	1:A:1626:LEU:HG	1.91	0.52
1:A:862:THR:OG1	1:A:1113:ARG:O	2.28	0.51
1:A:654:GLU:HB2	4:A:1909:A1E06:C25	2.40	0.51
1:A:1853:THR:HA	1:A:1856:PHE:CB	2.40	0.51
1:A:1035:GLU:C	1:A:1035:GLU:OE1	2.53	0.51
1:A:520:THR:OG1	1:A:561:ASN:O	2.29	0.51
1:A:552:TRP:HA	1:A:552:TRP:CE3	2.45	0.50
1:A:1269:LEU:HG	1:A:1270:GLY:N	2.27	0.50
1:A:1283:ALA:CB	1:A:1435:ASP:OD2	2.59	0.50
1:A:1419:MET:HG3	1:A:1420:PHE:N	2.27	0.50
1:A:1528:TRP:NE1	1:A:1539:ASN:O	2.45	0.49
1:A:1278:THR:HG23	1:A:1428:TYR:CE2	2.48	0.49
1:A:1325:LEU:CD2	3:A:1901:ERG:H6	2.42	0.49
1:A:1590:TYR:HB2	3:A:1907:ERG:H21	1.94	0.49
1:A:1331:MET:HB3	1:A:1478:MET:HE3	1.93	0.49
1:A:1622:ILE:HA	1:A:1625:THR:HG22	1.94	0.49
1:A:1783:ASP:OD1	1:A:1784:LYS:N	2.45	0.49
1:A:1501:LEU:O	1:A:1501:LEU:HD23	2.13	0.48
1:A:1027:ALA:C	1:A:1028:LYS:HD2	2.37	0.48
1:A:1325:LEU:HD11	3:A:1901:ERG:H7	1.95	0.48
1:A:476:ILE:HD11	1:A:526:GLN:HG2	1.96	0.48
1:A:516:ALA:HB3	1:A:564:PRO:HB3	1.95	0.48
1:A:1234:LYS:HG2	1:A:1235:GLY:H	1.78	0.48
1:A:1175:TYR:CD2	1:A:1176:ILE:HG13	2.48	0.48
1:A:826:GLU:O	1:A:826:GLU:CG	2.63	0.47
3:A:1902:ERG:H212	3:A:1902:ERG:H121	1.96	0.47
3:A:1904:ERG:H183	3:A:1904:ERG:H212	1.96	0.47
1:A:686:LYS:NZ	3:A:1903:ERG:H42	2.29	0.47
1:A:1604:GLN:HB3	1:A:1607:VAL:CG2	2.44	0.47
1:A:411:ASP:OD1	1:A:1292:ARG:NH2	2.35	0.47
1:A:1119:LEU:CD1	1:A:1212:TYR:OH	2.63	0.47
1:A:783:GLU:OE2	1:A:783:GLU:C	2.57	0.47
1:A:1847:ASP:O	1:A:1847:ASP:CG	2.57	0.47
1:A:1233:GLN:HG2	1:A:1237:HIS:HD2	1.80	0.47
1:A:1417:SER:N	1:A:1418:PRO:CD	2.78	0.47
1:A:1242:ILE:HG22	1:A:1246:MET:HE3	1.98	0.46
1:A:1414:LEU:HD13	3:A:1902:ERG:C15	2.23	0.46
1:A:1360:TYR:HB2	1:A:1361:PRO:HD3	1.98	0.46
1:A:1288:GLN:O	1:A:1291:SER:OG	2.34	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1590:TYR:HD1	3:A:1907:ERG:H21	1.68	0.45
1:A:1815:MET:SD	1:A:1815:MET:N	2.89	0.45
1:A:1389:PHE:CE1	1:A:1393:VAL:HG23	2.52	0.45
1:A:1433:LEU:HD13	3:A:1901:ERG:H42	1.99	0.45
1:A:1795:PRO:O	1:A:1796:SER:OG	2.32	0.45
1:A:622:SER:O	1:A:626:THR:HB	2.16	0.45
1:A:611:TYR:CE2	1:A:613:LYS:HB2	2.53	0.44
1:A:1608:LYS:HA	1:A:1878:LYS:HE3	1.99	0.44
1:A:1847:ASP:C	1:A:1848:LEU:HD12	2.42	0.44
1:A:1325:LEU:HD22	3:A:1901:ERG:H6	2.00	0.44
3:A:1903:ERG:C15	3:A:1904:ERG:C12	2.95	0.44
1:A:192:ASN:O	1:A:366:PRO:HB3	2.18	0.44
1:A:669:ILE:HD13	1:A:1366:ASN:O	2.18	0.44
1:A:1586:PRO:HB3	3:A:1907:ERG:H192	1.99	0.44
3:A:1903:ERG:H17	3:A:1904:ERG:H122	2.00	0.44
1:A:561:ASN:OD1	1:A:591:VAL:HG12	2.18	0.44
1:A:1542:ILE:H	1:A:1542:ILE:CD1	2.25	0.44
3:A:1902:ERG:H122	3:A:1905:ERG:H151	1.92	0.44
1:A:1697:THR:O	1:A:1701:CYS:SG	2.76	0.43
1:A:611:TYR:CZ	1:A:613:LYS:HB2	2.53	0.43
1:A:672:THR:O	1:A:672:THR:OG1	2.33	0.43
1:A:969:LEU:O	1:A:973:ILE:HD12	2.18	0.43
1:A:1531:ARG:O	1:A:1540:SER:OG	2.35	0.43
1:A:1269:LEU:CG	1:A:1274:ILE:HG12	2.47	0.43
1:A:1277:PHE:O	1:A:1280:LYS:HB2	2.19	0.43
1:A:1389:PHE:O	1:A:1389:PHE:CD1	2.72	0.43
1:A:1849:GLY:HA2	1:A:1859:LEU:HD12	2.01	0.43
1:A:1576:ARG:CZ	1:A:1715:THR:HA	2.49	0.43
3:A:1903:ERG:H272	3:A:1904:ERG:H263	2.01	0.43
1:A:826:GLU:O	1:A:826:GLU:HG2	2.19	0.43
1:A:521:VAL:O	1:A:525:ILE:HG12	2.19	0.43
1:A:1375:ARG:CG	1:A:1490:PRO:HG2	2.49	0.43
1:A:1610:THR:O	1:A:1879:SER:HB3	2.19	0.43
1:A:1785:PHE:HD2	3:A:1906:ERG:H152	1.83	0.43
1:A:1621:ILE:HG23	1:A:1698:CYS:SG	2.58	0.43
3:A:1901:ERG:C22	3:A:1901:ERG:H272	2.49	0.42
1:A:1277:PHE:HA	1:A:1280:LYS:CD	2.43	0.42
1:A:1299:THR:HG22	1:A:1299:THR:O	2.17	0.42
1:A:1531:ARG:O	1:A:1542:ILE:HD13	2.19	0.42
1:A:564:PRO:HA	1:A:588:MET:SD	2.60	0.42
1:A:872:ILE:HD12	1:A:872:ILE:N	2.34	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1269:LEU:CG	1:A:1270:GLY:H	2.32	0.42
1:A:1275:LEU:O	1:A:1278:THR:HB	2.20	0.42
1:A:1590:TYR:CB	3:A:1907:ERG:H21	2.48	0.42
1:A:1844:VAL:HG12	1:A:1845:PRO:HD2	2.01	0.42
1:A:406:VAL:O	1:A:456:LYS:NZ	2.52	0.42
1:A:824:GLU:OE1	1:A:824:GLU:HA	2.19	0.42
1:A:552:TRP:HA	1:A:552:TRP:HE3	1.83	0.42
3:A:1902:ERG:C12	3:A:1905:ERG:H151	2.49	0.42
1:A:801:SER:HB3	1:A:808:THR:HG23	2.02	0.42
1:A:868:TYR:CD1	1:A:868:TYR:C	2.98	0.42
1:A:1389:PHE:HE1	1:A:1393:VAL:HG23	1.85	0.42
1:A:1278:THR:HG22	1:A:1279:THR:N	2.34	0.41
1:A:1848:LEU:HD21	3:A:1908:ERG:H42	2.02	0.41
3:A:1901:ERG:C22	3:A:1901:ERG:C27	2.98	0.41
1:A:452:ASP:C	1:A:452:ASP:OD1	2.62	0.41
1:A:1375:ARG:HG3	1:A:1490:PRO:HG2	2.02	0.41
1:A:1425:GLY:O	1:A:1426:GLN:C	2.63	0.41
1:A:1608:LYS:O	1:A:1610:THR:HG23	2.20	0.41
1:A:1643:SER:CB	1:A:1661:MET:HE2	2.50	0.41
1:A:1287:GLU:C	1:A:1287:GLU:CD	2.88	0.41
1:A:1119:LEU:HD11	1:A:1218:ILE:HD12	2.02	0.41
1:A:654:GLU:C	1:A:656:TYR:H	2.28	0.41
1:A:1419:MET:HB2	1:A:1500:ALA:HB1	2.01	0.41
1:A:880:ILE:O	1:A:881:ARG:C	2.63	0.41
1:A:1212:TYR:O	1:A:1241:ASP:HB2	2.19	0.41
1:A:1608:LYS:O	1:A:1609:THR:C	2.64	0.41
1:A:487:ALA:HB1	1:A:514:THR:HB	2.02	0.40
1:A:592:ALA:O	1:A:595:THR:HG22	2.20	0.40
1:A:338:ARG:NH2	1:A:1106:ASN:O	2.54	0.40
3:A:1904:ERG:H182	3:A:1904:ERG:C19	2.51	0.40
1:A:541:TRP:HA	1:A:541:TRP:CE3	2.57	0.40
1:A:1170:VAL:HG23	1:A:1170:VAL:O	2.21	0.40
1:A:1621:ILE:HD13	1:A:1621:ILE:HA	1.92	0.40
1:A:1785:PHE:CD2	3:A:1906:ERG:H152	2.57	0.40
1:A:388:VAL:HG12	1:A:389:TYR:CD1	2.57	0.40
1:A:1285:MET:CE	1:A:1289:MET:HE3	2.52	0.40

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	A	1522/1895 (80%)	1455 (96%)	67 (4%)	0	100 100

There are no Ramachandran outliers to report.

### 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	A	1352/1647 (82%)	1346 (100%)	6 (0%)	89 93

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	730	LEU
1	A	1233	GLN
1	A	1278	THR
1	A	1416	LEU
1	A	1616	ASN
1	A	1698	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (24) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	313	ASN
1	A	403	HIS

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Mol	Chain	Res	Type
1	A	691	GLN
1	A	967	GLN
1	A	991	ASN
1	A	1032	HIS
1	A	1036	ASN
1	A	1106	ASN
1	A	1126	ASN
1	A	1148	GLN
1	A	1150	HIS
1	A	1237	HIS
1	A	1239	ASN
1	A	1288	GLN
1	A	1319	ASN
1	A	1328	GLN
1	A	1426	GLN
1	A	1575	HIS
1	A	1602	ASN
1	A	1616	ASN
1	A	1767	HIS
1	A	1808	GLN
1	A	1857	HIS
1	A	1873	GLN

### 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](#)

2 monosaccharides are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	NAG	C	1	1,2	14,14,15	0.32	0	17,19,21	0.47	0
2	NAG	C	2	2	14,14,15	0.18	0	17,19,21	0.39	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	C	1	1,2	-	4/6/23/26	0/1/1/1
2	NAG	C	2	2	-	2/6/23/26	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

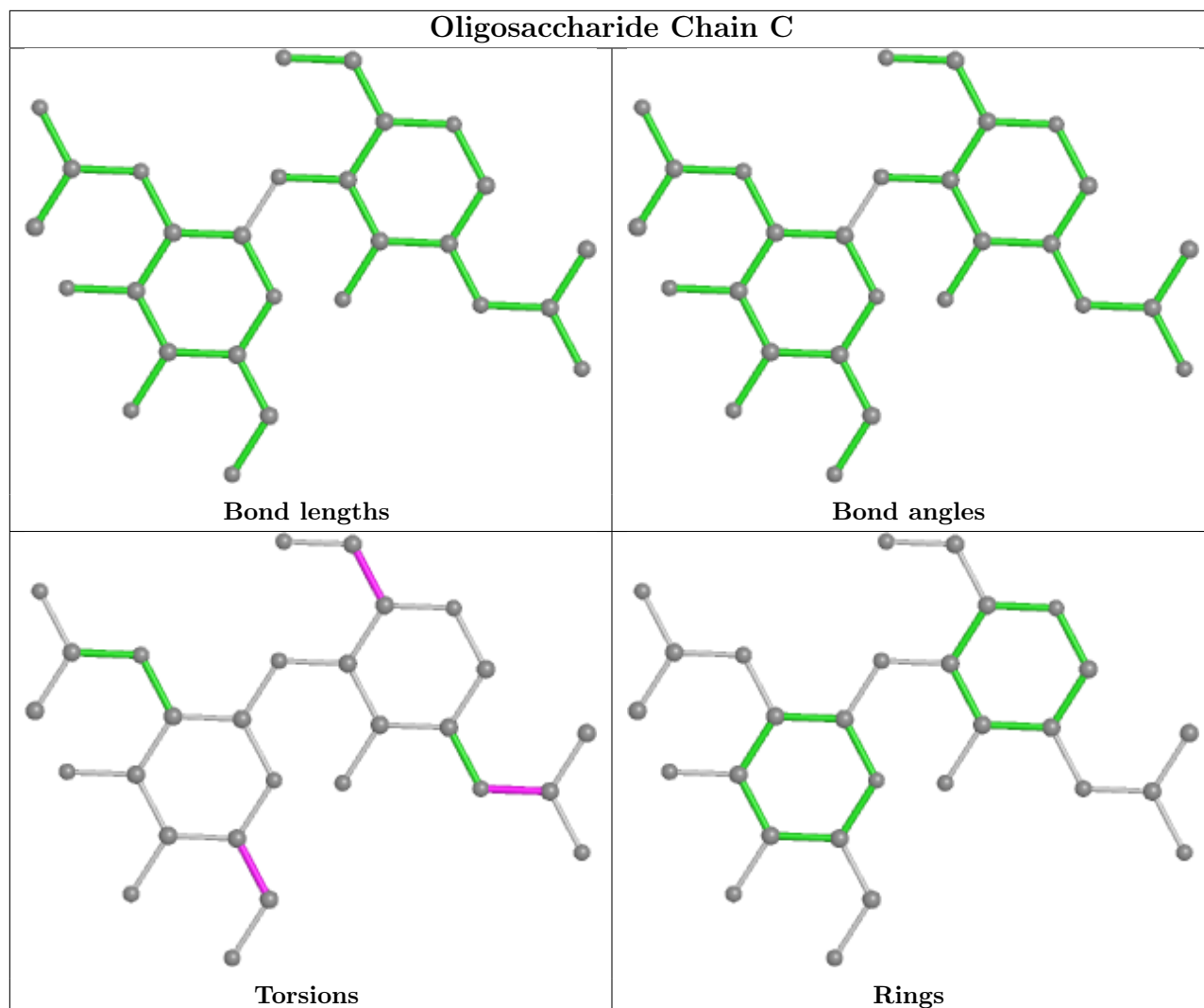
All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	2	NAG	C4-C5-C6-O6
2	C	2	NAG	O5-C5-C6-O6
2	C	1	NAG	C8-C7-N2-C2
2	C	1	NAG	O7-C7-N2-C2
2	C	1	NAG	C4-C5-C6-O6
2	C	1	NAG	O5-C5-C6-O6

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 oligosaccharide.



## 5.6 Ligand geometry [i](#)

12 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	ERG	A	1908	-	31,32,32	0.55	1 (3%)	47,50,50	0.81	3 (6%)
3	ERG	A	1902	-	31,32,32	1.08	3 (9%)	47,50,50	1.36	7 (14%)
3	ERG	A	1906	-	31,32,32	0.64	1 (3%)	47,50,50	0.61	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
4	A1E06	A	1909	-	52,55,55	0.38	0	69,91,91	1.53	6 (8%)
3	ERG	A	1904	-	31,32,32	0.60	1 (3%)	47,50,50	0.97	2 (4%)
3	ERG	A	1903	-	31,32,32	0.65	1 (3%)	47,50,50	0.55	0
3	ERG	A	1907	-	31,32,32	0.67	1 (3%)	47,50,50	0.60	0
3	ERG	A	1911	-	31,32,32	0.50	0	47,50,50	0.66	0
5	POV	A	1910	-	51,51,51	0.52	0	57,59,59	0.51	0
3	ERG	A	1901	-	31,32,32	0.92	1 (3%)	47,50,50	1.29	5 (10%)
3	ERG	A	1905	-	31,32,32	0.67	1 (3%)	47,50,50	0.61	0
3	ERG	A	1912	-	31,32,32	0.50	0	47,50,50	0.79	2 (4%)

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
3	ERG	A	1908	-	-	5/13/71/71	0/4/4/4
3	ERG	A	1902	-	-	2/13/71/71	0/4/4/4
3	ERG	A	1906	-	-	8/13/71/71	0/4/4/4
4	A1E06	A	1909	-	-	3/24/138/138	0/7/6/6
3	ERG	A	1904	-	-	9/13/71/71	0/4/4/4
3	ERG	A	1903	-	-	2/13/71/71	0/4/4/4
3	ERG	A	1907	-	-	6/13/71/71	0/4/4/4
3	ERG	A	1911	-	-	0/13/71/71	0/4/4/4
5	POV	A	1910	-	-	16/55/55/55	-
3	ERG	A	1901	-	-	2/13/71/71	0/4/4/4
3	ERG	A	1905	-	-	3/13/71/71	0/4/4/4
3	ERG	A	1912	-	-	4/13/71/71	0/4/4/4

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1907	ERG	C10-C9	3.24	1.60	1.55
3	A	1905	ERG	C10-C9	3.22	1.60	1.55
3	A	1903	ERG	C10-C9	3.18	1.60	1.55
3	A	1906	ERG	C10-C9	3.09	1.59	1.55
3	A	1901	ERG	C13-C14	-3.08	1.50	1.56
3	A	1902	ERG	C13-C14	-2.88	1.51	1.56

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1902	ERG	C4-C3	2.77	1.57	1.52
3	A	1904	ERG	C10-C9	2.66	1.59	1.55
3	A	1908	ERG	C10-C9	2.47	1.59	1.55
3	A	1902	ERG	C2-C3	2.30	1.57	1.51

All (25) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	1909	A1E06	C7-C5-C2	-8.37	106.07	115.07
4	A	1909	A1E06	C29-O2-C16	6.19	127.01	116.25
3	A	1904	ERG	C14-C8-C9	3.91	120.54	114.66
3	A	1902	ERG	C2-C3-C4	3.77	115.48	110.31
4	A	1909	A1E06	C22-C3-C8	3.26	113.77	110.39
3	A	1901	ERG	C3-C4-C5	-3.23	106.54	112.03
3	A	1901	ERG	C17-C20-C22	-3.20	104.19	110.27
3	A	1902	ERG	O1-C3-C4	2.85	115.78	109.68
3	A	1901	ERG	C13-C14-C8	-2.82	108.03	113.48
4	A	1909	A1E06	C12-C5-C2	2.71	114.78	111.18
3	A	1902	ERG	C13-C17-C20	-2.67	115.98	119.43
3	A	1904	ERG	C14-C8-C7	-2.53	119.39	124.38
3	A	1908	ERG	C1-C2-C3	2.50	113.68	110.47
3	A	1901	ERG	C24-C23-C22	-2.48	117.98	125.67
3	A	1902	ERG	C13-C14-C8	-2.39	108.85	113.48
4	A	1909	A1E06	C22-C3-C14	-2.37	103.76	107.27
3	A	1902	ERG	O1-C3-C2	2.31	116.04	110.16
3	A	1912	ERG	C15-C14-C13	2.21	106.17	104.21
3	A	1912	ERG	C19-C10-C5	-2.14	104.87	108.34
3	A	1901	ERG	C11-C9-C8	-2.13	106.56	111.33
3	A	1902	ERG	C20-C22-C23	-2.11	119.12	125.67
3	A	1908	ERG	C7-C6-C5	-2.06	119.58	123.20
3	A	1908	ERG	C1-C10-C9	2.03	112.49	108.28
4	A	1909	A1E06	C3-C8-C9	-2.03	116.62	118.10
3	A	1902	ERG	C3-C4-C5	-2.01	108.62	112.03

There are no chirality outliers.

All (60) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1904	ERG	C13-C17-C20-C21
3	A	1904	ERG	C20-C22-C23-C24
3	A	1904	ERG	C23-C24-C25-C26
3	A	1904	ERG	C23-C24-C25-C27

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Mol	Chain	Res	Type	Atoms
3	A	1904	ERG	C28-C24-C25-C26
3	A	1904	ERG	C28-C24-C25-C27
3	A	1905	ERG	C20-C22-C23-C24
3	A	1905	ERG	C22-C23-C24-C25
3	A	1906	ERG	C20-C22-C23-C24
3	A	1906	ERG	C22-C23-C24-C25
3	A	1907	ERG	C20-C22-C23-C24
3	A	1908	ERG	C20-C22-C23-C24
3	A	1908	ERG	C22-C23-C24-C25
5	A	1910	POV	C1-O11-P-O14
5	A	1910	POV	O21-C2-C3-O31
4	A	1909	A1E06	O7-C29-O2-C16
4	A	1909	A1E06	C33-C29-O2-C16
3	A	1903	ERG	C22-C23-C24-C25
3	A	1903	ERG	C22-C23-C24-C28
3	A	1905	ERG	C22-C23-C24-C28
3	A	1904	ERG	C16-C17-C20-C22
3	A	1907	ERG	C22-C23-C24-C25
5	A	1910	POV	C22-C21-O21-C2
5	A	1910	POV	O22-C21-O21-C2
4	A	1909	A1E06	O7-C35-C38-O12
3	A	1906	ERG	C23-C24-C25-C27
3	A	1907	ERG	C23-C24-C25-C27
5	A	1910	POV	C1-C2-C3-O31
3	A	1906	ERG	C21-C20-C22-C23
3	A	1904	ERG	C16-C17-C20-C21
3	A	1912	ERG	C13-C17-C20-C21
3	A	1912	ERG	C13-C17-C20-C22
3	A	1912	ERG	C16-C17-C20-C21
3	A	1912	ERG	C16-C17-C20-C22
3	A	1901	ERG	C22-C23-C24-C28
3	A	1906	ERG	C23-C24-C25-C26
5	A	1910	POV	C24-C25-C26-C27
3	A	1908	ERG	C22-C23-C24-C28
5	A	1910	POV	C34-C35-C36-C37
5	A	1910	POV	C1-O11-P-O12
3	A	1906	ERG	C28-C24-C25-C26
3	A	1908	ERG	C28-C24-C25-C26
3	A	1906	ERG	C17-C20-C22-C23
3	A	1907	ERG	C22-C23-C24-C28
5	A	1910	POV	C213-C214-C215-C216
5	A	1910	POV	O32-C31-O31-C3

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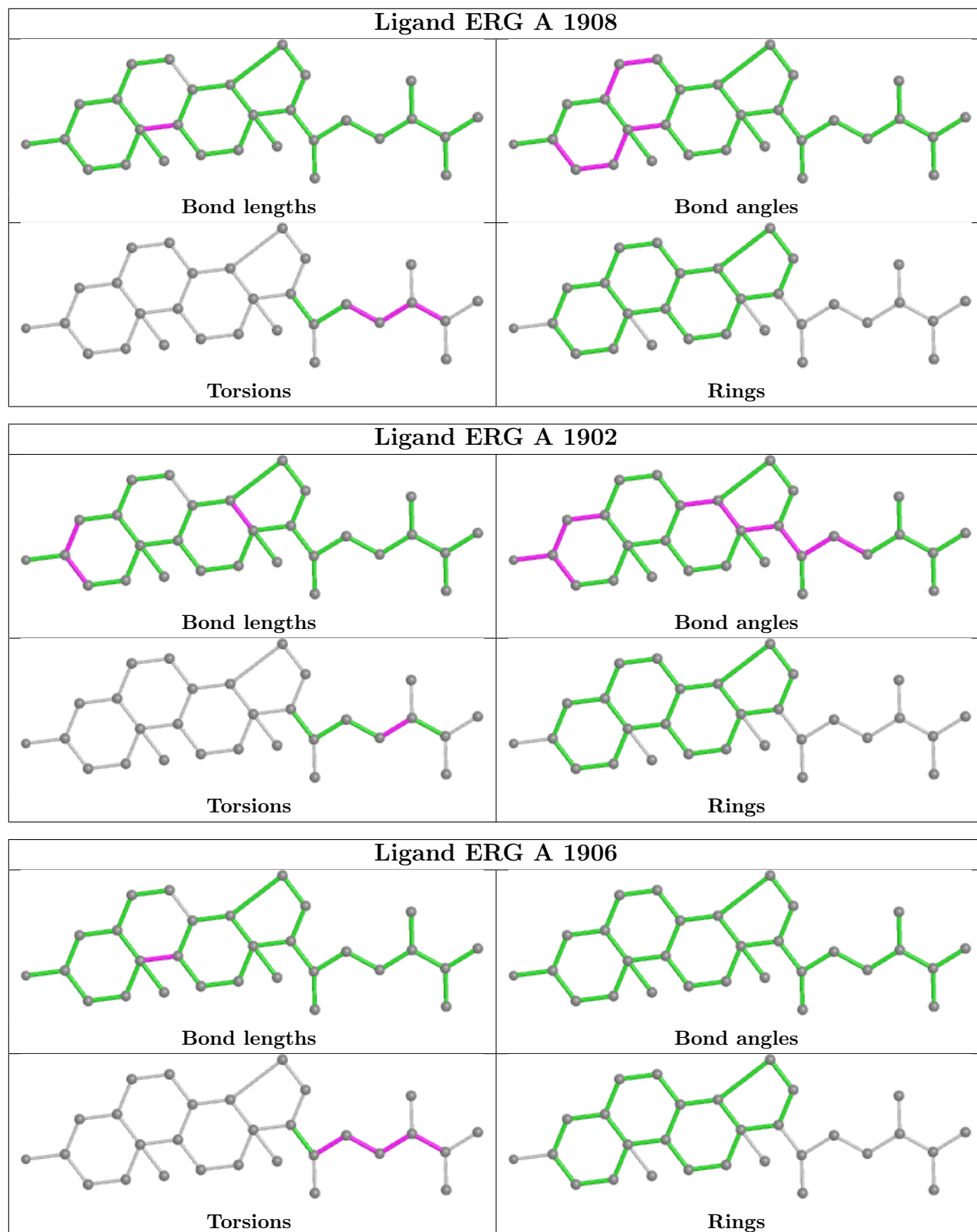
Mol	Chain	Res	Type	Atoms
5	A	1910	POV	C32-C31-O31-C3
5	A	1910	POV	C11-O12-P-O11
3	A	1906	ERG	C28-C24-C25-C27
3	A	1907	ERG	C23-C24-C25-C26
3	A	1908	ERG	C23-C24-C25-C26
3	A	1901	ERG	C22-C23-C24-C25
3	A	1904	ERG	C13-C17-C20-C22
5	A	1910	POV	C37-C38-C39-C310
3	A	1902	ERG	C22-C23-C24-C25
3	A	1902	ERG	C22-C23-C24-C28
5	A	1910	POV	C26-C27-C28-C29
5	A	1910	POV	C211-C212-C213-C214
3	A	1907	ERG	C28-C24-C25-C26
5	A	1910	POV	C1-O11-P-O13

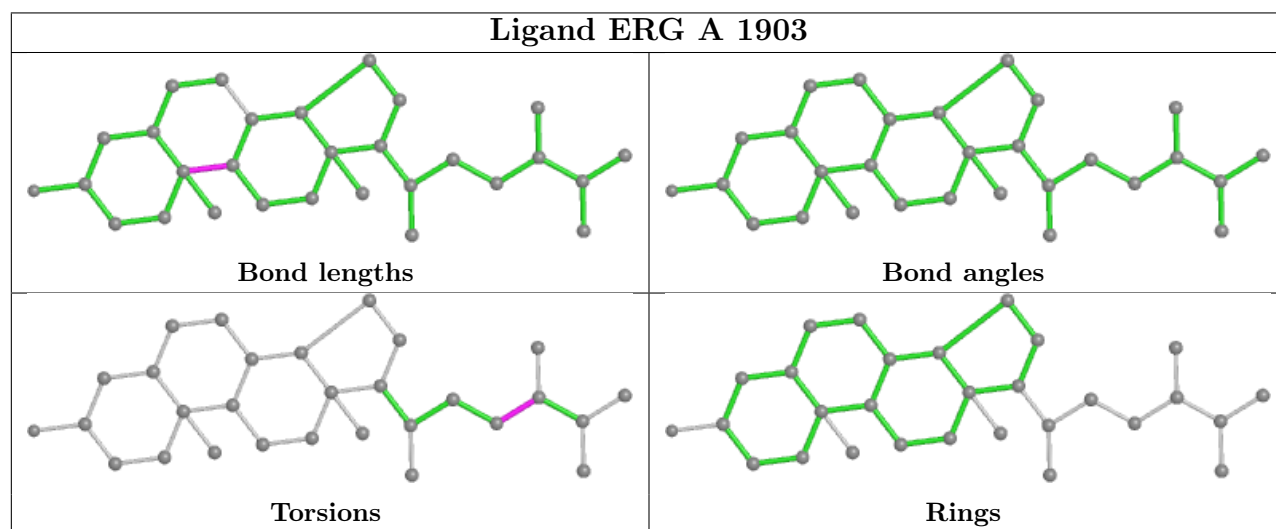
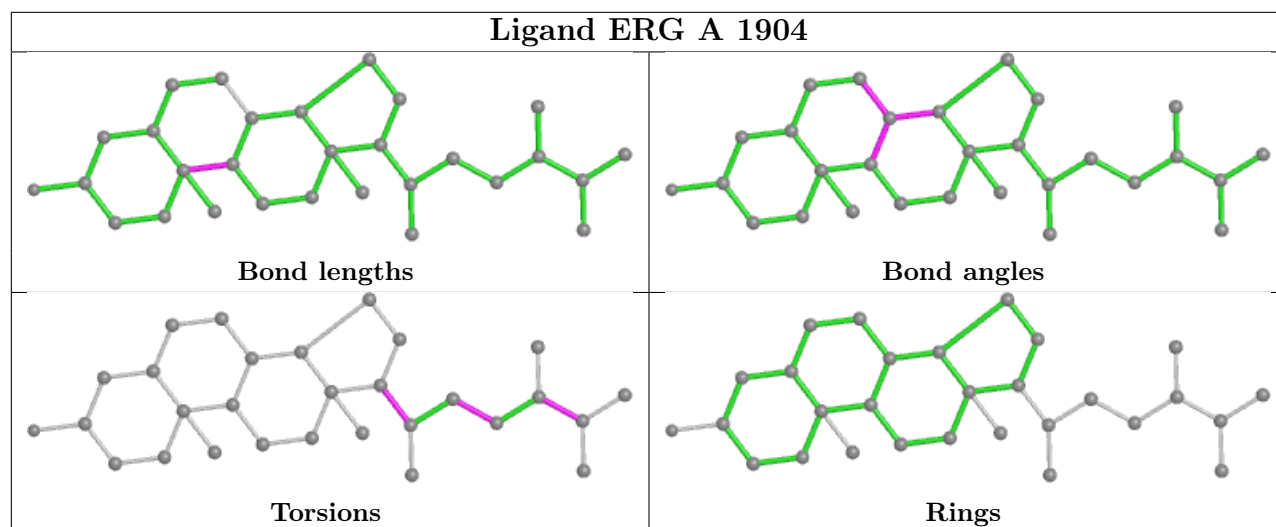
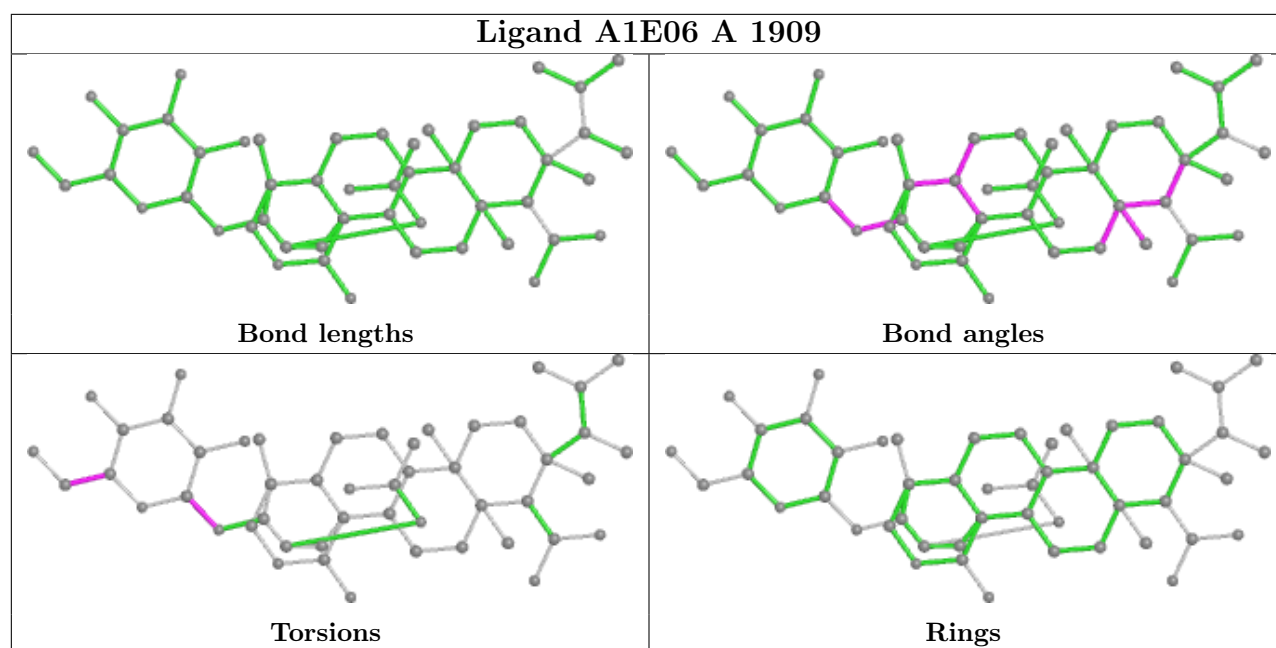
There are no ring outliers.

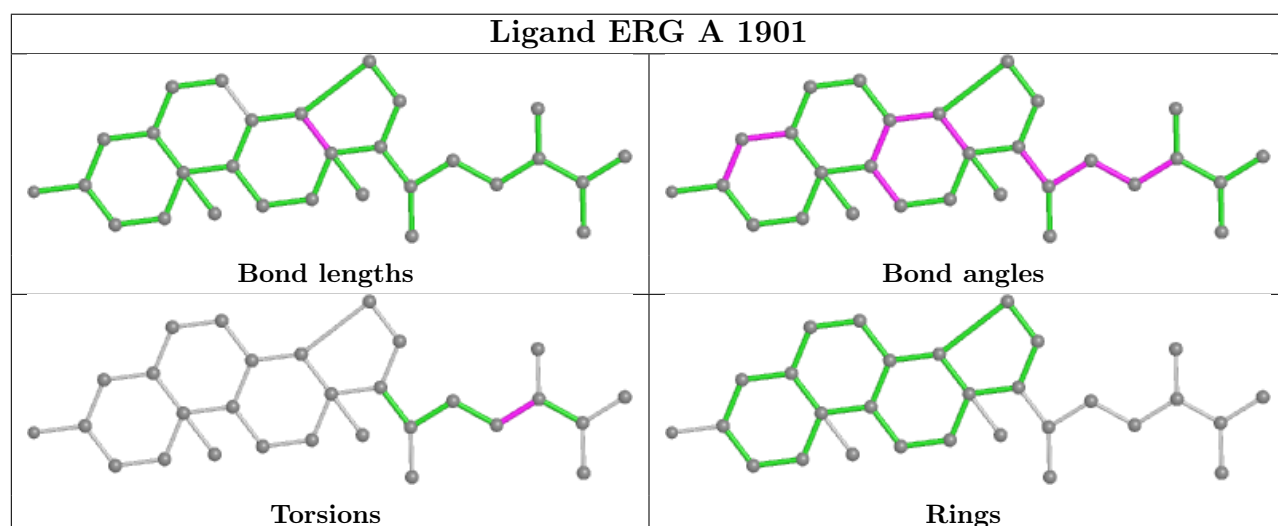
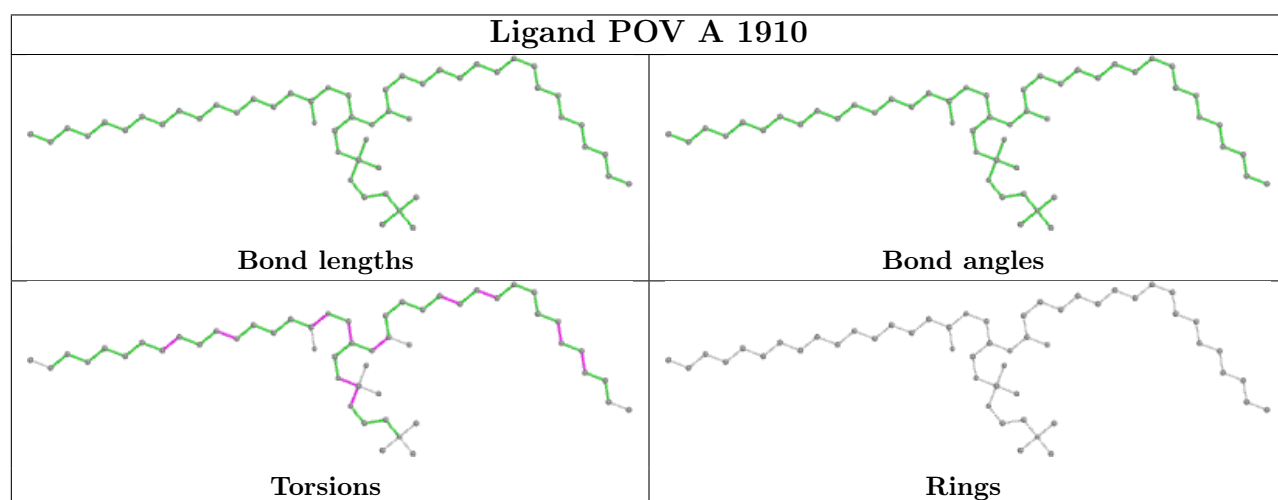
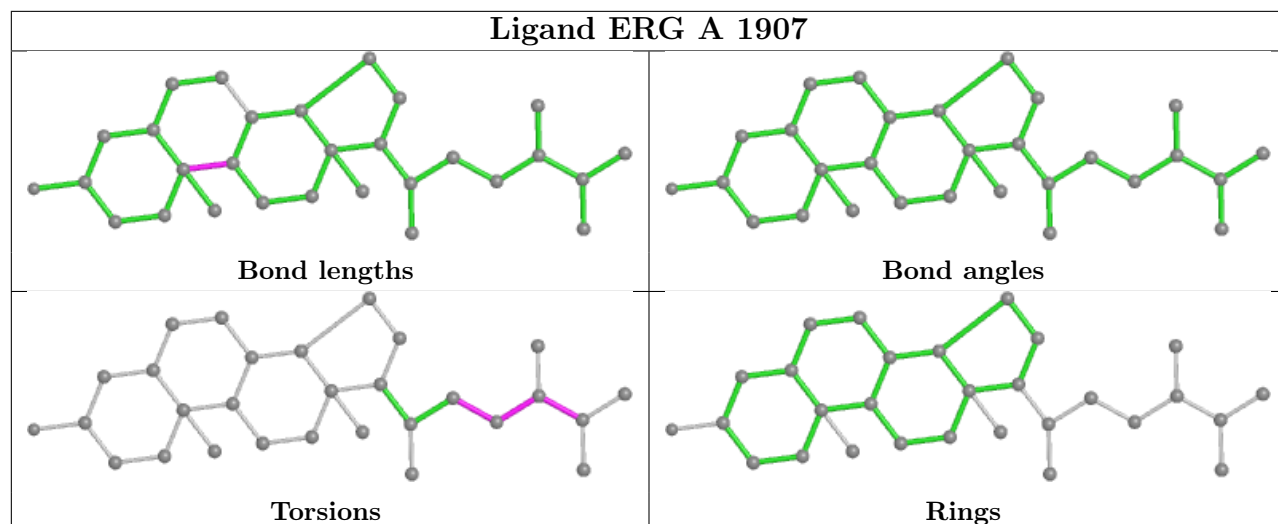
9 monomers are involved in 78 short contacts:

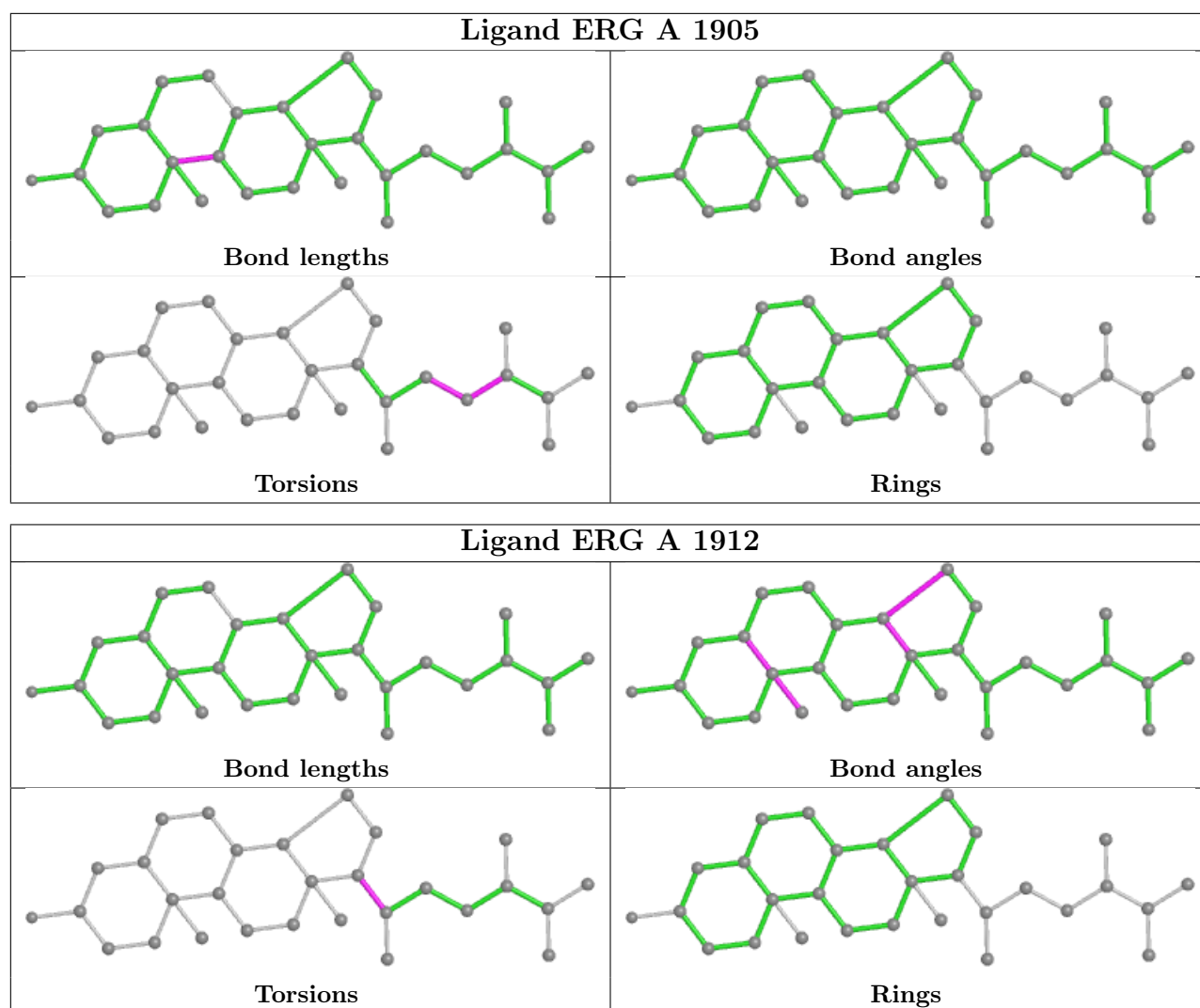
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1908	ERG	1	0
3	A	1902	ERG	20	0
3	A	1906	ERG	13	0
4	A	1909	A1E06	1	0
3	A	1904	ERG	20	0
3	A	1903	ERG	18	0
3	A	1907	ERG	13	0
3	A	1901	ERG	9	0
3	A	1905	ERG	17	0

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.