Full wwPDB EM Validation Report ⓘ

Mar 15, 2026 – 12:25 AM JST

PDB ID	:	9WZT / pdb_00009wzt
EMDB ID	:	EMD-66408
Title	:	Cryo-EM structure of Fks2 in apo state
Authors	:	Bai, L.; You, Z.L.
Deposited on	:	2025-09-29
Resolution	:	3.64 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:

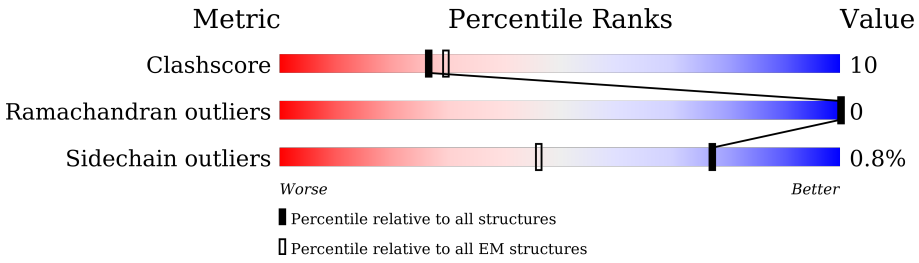
EMDB validation analysis	:	FAILED
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4-5-2 with Phenix2.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
EM percentile statistics	:	NOT EXECUTED
MapQ	:	FAILED
Ideal geometry (proteins)	:	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 3.64 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 <=5%

Mol	Chain	Length	Quality of chain
1	A	1895	63% 18% 19%
2	C	2	100%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 13084 atoms, of which 132 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.

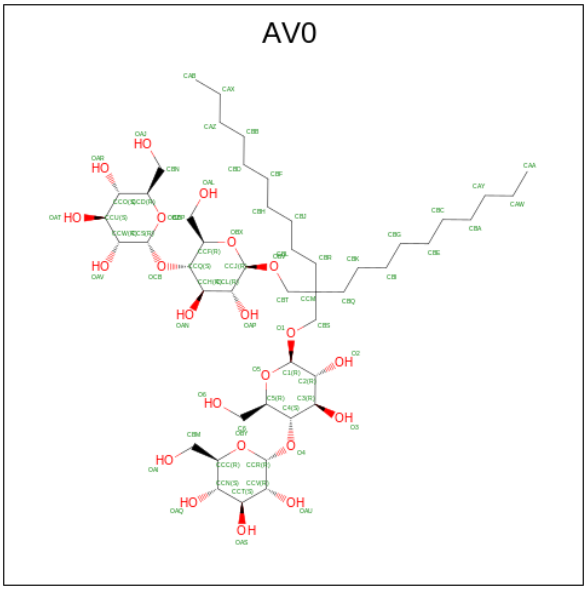
- Molecule 1 is a protein called 1,3-beta-glucan synthase component GSC2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	1526	12473	8140	2101	2155	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.

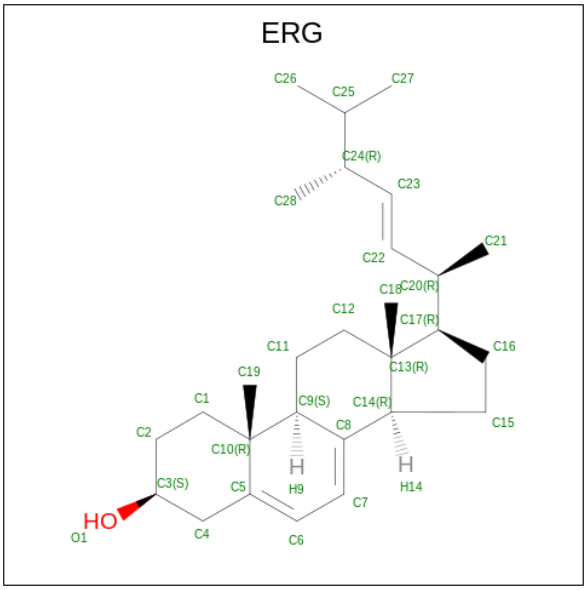
Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
2	C	2	28	16	2	10	0	0

- Molecule 3 is Lauryl Maltose Neopentyl Glycol (CCD ID: AV0) (formula: $C_{47}H_{88}O_{22}$).



Mol	Chain	Residues	Atoms	AltConf
3	A	1	Total C O 69 47 22	0
3	A	1	Total C O 69 47 22	0

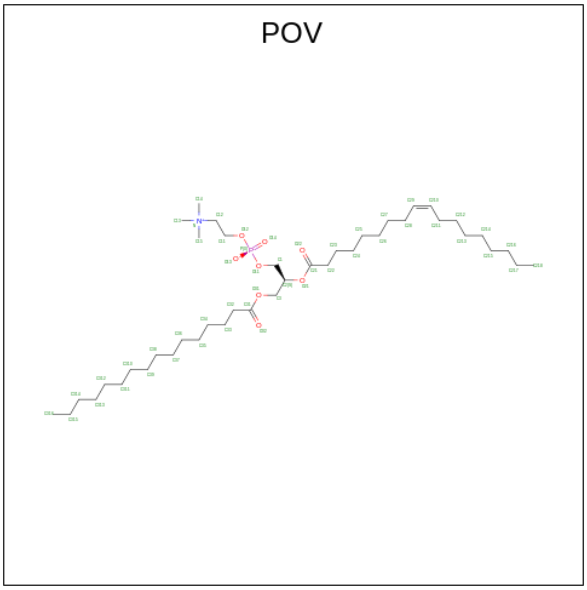
- Molecule 4 is ERGOSTEROL (CCD ID: ERG) (formula: $C_{28}H_{44}O$).



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

- Molecule 5 is (2S)-3-(hexadecanoyloxy)-2-[(9Z)-octadec-9-enoyloxy]propyl 2-(trimethylamm

onio)ethyl phosphate (CCD ID: POV) (formula: $C_{42}H_{82}NO_8P$).



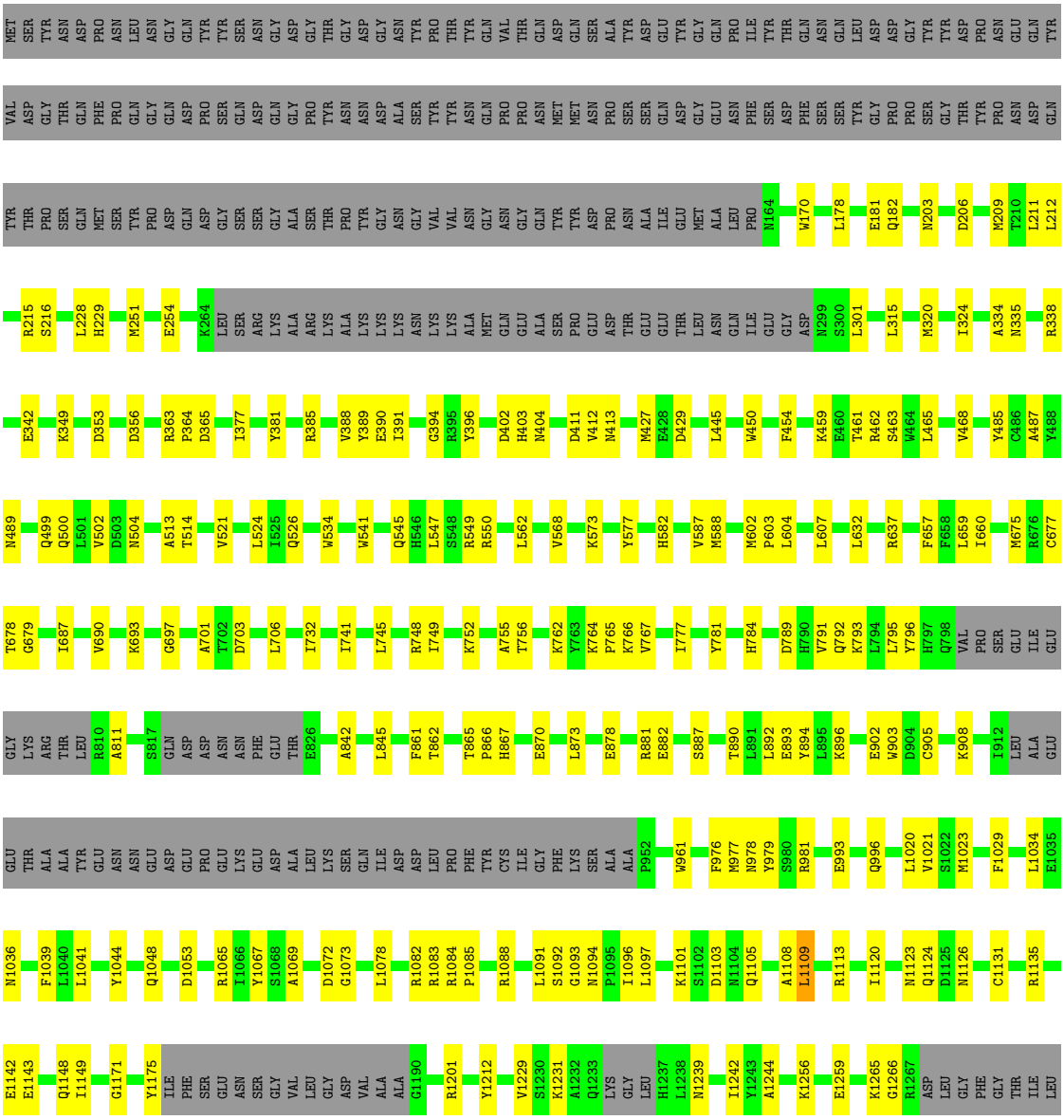
Mol	Chain	Residues	Atoms					AltConf
5	A	1	Total	C	N	O	P	0
			52	42	1	8	1	

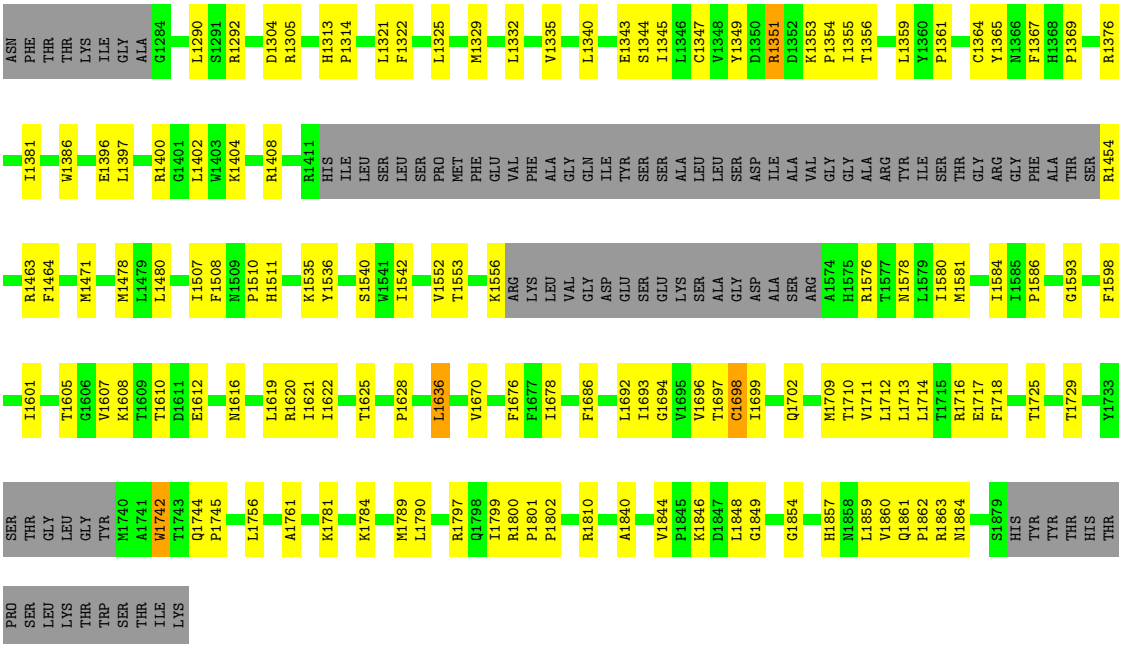
3 Residue-property plots (i)

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. 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: 1,3-beta-glucan synthase component GSC2

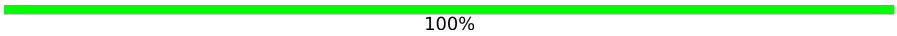
Chain A:





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

Chain C:



4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	97369	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 ($e^-/Å^2$)	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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: POV, NAG, AV0, ERG

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	0.29	0/12822	0.43	2/17385 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	1699	ILE	N-CA-C	-5.82	103.78	111.05
1	A	679	GLY	CA-C-O	-5.09	118.21	122.33

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	12473	0	12409	243	0
2	C	28	0	25	0	0
3	A	138	0	0	0	0
4	A	261	132	396	22	0
5	A	52	0	82	2	0
All	All	12952	132	12912	253	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 10.

All (253) 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:A:659:LEU:HA	1:A:1376:ARG:NH1	1.50	1.27
4:A:1904:ERG:H271	4:A:1905:ERG:H283	1.24	1.17
1:A:659:LEU:CG	1:A:1376:ARG:HH12	1.78	0.95
4:A:1904:ERG:C27	4:A:1905:ERG:H283	1.98	0.92
1:A:659:LEU:HA	1:A:1376:ARG:HH12	1.32	0.89
1:A:659:LEU:HG	1:A:1376:ARG:HH12	1.41	0.86
1:A:659:LEU:CA	1:A:1376:ARG:NH1	2.38	0.83
1:A:659:LEU:CA	1:A:1376:ARG:HH12	1.95	0.78
1:A:489:ASN:HD22	1:A:660:ILE:HG22	1.49	0.77
1:A:363:ARG:HD2	1:A:364:PRO:HD2	1.67	0.75
4:A:1904:ERG:H271	4:A:1905:ERG:C28	2.13	0.73
1:A:1846:LYS:HA	1:A:1863:ARG:HH21	1.54	0.73
1:A:678:THR:HG23	1:A:1610:THR:HB	1.70	0.73
1:A:659:LEU:HD12	1:A:1376:ARG:NH1	2.04	0.72
1:A:462:ARG:HB3	1:A:465:LEU:HD12	1.72	0.71
1:A:764:LYS:HD2	1:A:765:PRO:HD2	1.74	0.70
1:A:690:VAL:HG22	4:A:1905:ERG:H22A	1.75	0.69
1:A:693:LYS:HB3	4:A:1905:ERG:H112	1.73	0.69
1:A:1580:ILE:HG13	1:A:1584:ILE:HD11	1.76	0.68
1:A:866:PRO:HG3	1:A:1105:GLN:HE21	1.61	0.66
1:A:1844:VAL:HG12	1:A:1846:LYS:H	1.61	0.66
1:A:1859:LEU:HG	1:A:1860:VAL:HG13	1.78	0.65
1:A:659:LEU:CB	1:A:1376:ARG:HH12	2.10	0.64
1:A:878:GLU:N	1:A:878:GLU:OE1	2.31	0.63
1:A:659:LEU:HG	1:A:1376:ARG:NH1	2.12	0.62
1:A:1711:VAL:HG13	1:A:1712:LEU:HD22	1.80	0.62
1:A:1799:ILE:HG13	1:A:1801:PRO:HD3	1.82	0.62
1:A:1848:LEU:HB2	1:A:1860:VAL:HG11	1.80	0.62
1:A:485:TYR:HD2	1:A:660:ILE:HG13	1.65	0.62
1:A:659:LEU:CD1	1:A:1376:ARG:HH12	2.13	0.61
1:A:1078:LEU:HD11	1:A:1084:ARG:HB3	1.82	0.61
1:A:659:LEU:CG	1:A:1376:ARG:NH1	2.59	0.61
1:A:427:MET:HE1	1:A:429:ASP:HB2	1.83	0.61
1:A:1601:ILE:HG21	1:A:1693:ILE:HG21	1.83	0.60
1:A:632:LEU:O	1:A:637:ARG:NH1	2.34	0.60
1:A:465:LEU:HA	1:A:468:VAL:HG12	1.83	0.60
1:A:1020:LEU:HD21	1:A:1108:ALA:HB1	1.84	0.59
1:A:1329:MET:HE3	4:A:1911:ERG:H182	1.84	0.59
1:A:659:LEU:CD1	1:A:1376:ARG:NH1	2.65	0.59
1:A:1400:ARG:NH2	1:A:1404:LYS:O	2.36	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:1904:ERG:C27	4:A:1905:ERG:C28	2.76	0.58
1:A:1231:LYS:HB3	1:A:1244:ALA:HB2	1.84	0.58
1:A:1212:TYR:HB3	1:A:1242:ILE:HB	1.86	0.58
1:A:1621:ILE:HG23	1:A:1698:CYS:SG	2.44	0.58
1:A:461:THR:OG1	1:A:462:ARG:N	2.38	0.57
1:A:1454:ARG:HB3	1:A:1510:PRO:HB2	1.87	0.57
1:A:1041:LEU:HD21	1:A:1073:GLY:HA2	1.86	0.57
1:A:1620:ARG:NH2	1:A:1861:GLN:OE1	2.37	0.57
1:A:1355:ILE:HG13	1:A:1356:THR:HG23	1.87	0.56
1:A:170:TRP:NE1	1:A:178:LEU:O	2.39	0.56
4:A:1907:ERG:H271	4:A:1911:ERG:H262	1.87	0.56
1:A:463:SER:HA	1:A:1290:LEU:HD21	1.87	0.56
1:A:500:GLN:HE22	1:A:1359:LEU:HG	1.70	0.55
1:A:862:THR:OG1	1:A:1113:ARG:O	2.24	0.55
1:A:513:ALA:HB2	1:A:568:VAL:HG12	1.88	0.55
1:A:993:GLU:OE1	1:A:993:GLU:N	2.33	0.54
1:A:1628:PRO:HG3	1:A:1676:PHE:HD2	1.72	0.54
1:A:534:TRP:HB2	1:A:547:LEU:HD21	1.90	0.54
1:A:1535:LYS:NZ	1:A:1536:TYR:O	2.39	0.54
1:A:881:ARG:NH2	1:A:882:GLU:OE2	2.40	0.54
1:A:693:LYS:HB3	4:A:1905:ERG:C11	2.38	0.54
1:A:1454:ARG:N	1:A:1511:HIS:O	2.41	0.54
1:A:1552:VAL:HG21	5:A:1906:POV:H14B	1.90	0.54
1:A:1053:ASP:OD2	1:A:1088:ARG:NH1	2.41	0.54
1:A:1480:LEU:HG	1:A:1692:LEU:HD11	1.90	0.54
1:A:893:GLU:HA	1:A:896:LYS:HG2	1.90	0.53
1:A:1096:ILE:HA	1:A:1103:ASP:OD2	2.07	0.53
1:A:1023:MET:HE2	1:A:1029:PHE:HZ	1.74	0.53
1:A:1361:PRO:HD2	1:A:1364:CYS:HB2	1.90	0.53
1:A:1400:ARG:HH21	1:A:1404:LYS:HZ3	1.57	0.53
1:A:335:ASN:HD22	1:A:1092:SER:H	1.57	0.52
1:A:677:CYS:HA	1:A:1605:THR:HA	1.90	0.52
1:A:349:LYS:NZ	1:A:353:ASP:OD2	2.42	0.52
1:A:784:HIS:HB3	1:A:905:CYS:HB2	1.91	0.52
1:A:1347:CYS:N	1:A:1364:CYS:SG	2.83	0.52
1:A:550:ARG:NH1	1:A:604:LEU:O	2.43	0.52
1:A:545:GLN:O	1:A:549:ARG:HG2	2.10	0.51
4:A:1903:ERG:H182	4:A:1903:ERG:H191	1.91	0.51
1:A:867:HIS:HD2	1:A:870:GLU:HB2	1.76	0.51
1:A:1742:TRP:HA	1:A:1742:TRP:CE3	2.45	0.51
1:A:697:GLY:HA3	4:A:1905:ERG:H211	1.93	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1709:MET:O	1:A:1713:LEU:HB2	2.11	0.51
1:A:1335:VAL:HG21	1:A:1478:MET:HG2	1.93	0.51
1:A:755:ALA:H	1:A:1135:ARG:HH22	1.58	0.51
1:A:1201:ARG:NH1	1:A:1259:GLU:OE2	2.44	0.51
1:A:687:ILE:HD13	4:A:1904:ERG:H112	1.93	0.50
1:A:1471:MET:HA	1:A:1471:MET:HE2	1.93	0.50
1:A:1148:GLN:NE2	1:A:1149:ILE:O	2.45	0.50
1:A:206:ASP:OD1	1:A:1113:ARG:NE	2.30	0.50
1:A:1321:LEU:O	1:A:1325:LEU:HG	2.11	0.50
1:A:1322:PHE:HD1	1:A:1325:LEU:HD12	1.75	0.50
1:A:882:GLU:HB3	1:A:890:THR:HA	1.94	0.50
1:A:1616:ASN:ND2	1:A:1854:GLY:O	2.45	0.50
1:A:1364:CYS:SG	1:A:1365:TYR:N	2.85	0.50
1:A:1094:ASN:HD21	1:A:1096:ILE:HG23	1.76	0.49
1:A:212:LEU:O	1:A:216:SER:OG	2.22	0.49
1:A:602:MET:SD	1:A:603:PRO:HD2	2.52	0.49
1:A:678:THR:OG1	1:A:1610:THR:HG21	2.13	0.49
4:A:1905:ERG:C18	4:A:1907:ERG:H181	2.43	0.49
1:A:1625:THR:OG1	1:A:1698:CYS:SG	2.62	0.48
1:A:1313:HIS:HB2	1:A:1314:PRO:HD3	1.96	0.48
1:A:203:ASN:OD1	1:A:1113:ARG:NH2	2.39	0.48
1:A:1507:ILE:HG22	1:A:1508:PHE:CD1	2.47	0.48
1:A:411:ASP:OD1	1:A:1292:ARG:NH2	2.39	0.48
1:A:526:GLN:HE21	1:A:607:LEU:HD21	1.78	0.48
1:A:865:THR:HB	1:A:1021:VAL:HG23	1.95	0.48
1:A:870:GLU:OE1	1:A:870:GLU:N	2.47	0.48
1:A:1709:MET:HA	1:A:1713:LEU:HD23	1.96	0.48
1:A:334:ALA:HA	1:A:377:ILE:HD13	1.95	0.47
1:A:402:ASP:OD1	1:A:403:HIS:N	2.47	0.47
1:A:1034:LEU:HD11	1:A:1082:ARG:HH21	1.79	0.47
1:A:1332:LEU:HD11	1:A:1593:GLY:HA3	1.95	0.47
4:A:1905:ERG:H272	4:A:1907:ERG:H281	1.96	0.47
1:A:1069:ALA:HB1	1:A:1085:PRO:HB3	1.96	0.47
1:A:1789:MET:N	1:A:1789:MET:HE2	2.29	0.47
1:A:251:MET:HE3	1:A:301:LEU:HA	1.94	0.47
1:A:1023:MET:HE3	1:A:1023:MET:HA	1.97	0.47
1:A:1065:ARG:NH2	1:A:1067:TYR:OH	2.48	0.47
1:A:1396:GLU:OE2	1:A:1408:ARG:NH1	2.48	0.47
1:A:1725:THR:O	1:A:1729:THR:OG1	2.27	0.47
1:A:745:LEU:HD23	1:A:842:ALA:HA	1.95	0.47
1:A:1041:LEU:HD22	1:A:1083:ARG:NH2	2.30	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1716:ARG:HG2	1:A:1717:GLU:HG3	1.96	0.47
1:A:521:VAL:HA	1:A:524:LEU:HG	1.97	0.47
1:A:741:ILE:O	1:A:745:LEU:HB2	2.15	0.47
1:A:1175:TYR:O	1:A:1266:GLY:N	2.43	0.47
1:A:604:LEU:HD12	1:A:607:LEU:HD22	1.97	0.46
1:A:209:MET:HE3	1:A:209:MET:HA	1.98	0.46
1:A:1094:ASN:ND2	1:A:1096:ILE:O	2.48	0.46
1:A:748:ARG:O	1:A:752:LYS:N	2.48	0.46
1:A:1344:SER:HB2	1:A:1365:TYR:HD2	1.80	0.46
1:A:1593:GLY:HA2	4:A:1904:ERG:H281	1.98	0.46
1:A:1800:ARG:O	1:A:1802:PRO:HD3	2.16	0.46
1:A:534:TRP:HA	1:A:547:LEU:HD11	1.97	0.46
1:A:756:THR:O	1:A:762:LYS:NZ	2.39	0.46
1:A:978:ASN:OD1	1:A:981:ARG:NH2	2.48	0.46
1:A:577:TYR:HH	1:A:582:HIS:HD1	1.64	0.46
1:A:896:LYS:HD2	1:A:903:TRP:CG	2.51	0.46
1:A:391:ILE:HA	1:A:396:TYR:HA	1.97	0.46
1:A:412:VAL:HA	1:A:454:PHE:CD2	2.51	0.46
1:A:777:ILE:O	1:A:781:TYR:N	2.43	0.46
1:A:1744:GLN:N	1:A:1745:PRO:HD2	2.31	0.46
1:A:381:TYR:HE2	1:A:1093:GLY:HA3	1.81	0.45
1:A:887:SER:HA	1:A:1799:ILE:HG12	1.98	0.45
1:A:1023:MET:HE2	1:A:1029:PHE:CZ	2.51	0.45
4:A:1903:ERG:H282	4:A:1903:ERG:H213	1.98	0.45
1:A:404:ASN:OD1	1:A:459:LYS:NZ	2.49	0.45
1:A:861:PHE:HZ	1:A:979:TYR:CE1	2.35	0.45
1:A:890:THR:HG23	1:A:893:GLU:H	1.82	0.45
1:A:1636:LEU:HD11	1:A:1756:LEU:HD11	1.97	0.45
1:A:703:ASP:OD1	1:A:1376:ARG:NH2	2.49	0.45
1:A:1463:ARG:HD2	1:A:1464:PHE:HE1	1.82	0.45
1:A:1353:LYS:N	1:A:1354:PRO:HD3	2.31	0.45
1:A:1612:GLU:OE1	1:A:1612:GLU:N	2.50	0.45
1:A:450:TRP:HE3	1:A:454:PHE:HE1	1.65	0.45
1:A:534:TRP:HE3	1:A:547:LEU:HD13	1.82	0.45
1:A:1864:ASN:OD1	1:A:1864:ASN:N	2.50	0.45
1:A:562:LEU:HD12	1:A:562:LEU:O	2.17	0.45
1:A:873:LEU:HD23	1:A:1036:ASN:HD22	1.81	0.45
1:A:1619:LEU:HD12	1:A:1622:ILE:HD11	1.99	0.45
1:A:993:GLU:O	1:A:996:GLN:HG3	2.17	0.44
1:A:1857:HIS:HE1	1:A:1862:PRO:HG3	1.81	0.44
1:A:781:TYR:OH	1:A:908:LYS:NZ	2.50	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1846:LYS:HB2	1:A:1863:ARG:HE	1.83	0.44
1:A:385:ARG:HA	1:A:388:VAL:HG12	1.99	0.44
1:A:1142:GLU:O	1:A:1143:GLU:C	2.61	0.44
1:A:1351:ARG:HD3	1:A:1351:ARG:HA	1.49	0.44
1:A:1694:GLY:O	1:A:1697:THR:HG22	2.18	0.44
1:A:229:HIS:CG	1:A:320:MET:HG2	2.53	0.44
1:A:764:LYS:HB3	1:A:767:VAL:HG23	1.99	0.44
1:A:1048:GLN:HG2	1:A:1072:ASP:HB3	1.99	0.44
1:A:427:MET:CE	1:A:429:ASP:H	2.31	0.44
1:A:867:HIS:CD2	1:A:870:GLU:HB2	2.52	0.44
1:A:229:HIS:HB2	1:A:324:ILE:HD11	2.00	0.44
1:A:1239:ASN:O	1:A:1242:ILE:HG13	2.18	0.44
1:A:1576:ARG:HB3	1:A:1578:ASN:OD1	2.18	0.44
1:A:181:GLU:HG2	1:A:182:GLN:N	2.33	0.43
1:A:659:LEU:HA	1:A:1376:ARG:HH11	1.65	0.43
1:A:1508:PHE:HA	1:A:1790:LEU:HD21	2.00	0.43
1:A:1761:ALA:HB2	5:A:1906:POV:H26A	2.00	0.43
1:A:1625:THR:HG23	1:A:1702:GLN:HG2	2.00	0.43
1:A:1840:ALA:O	1:A:1844:VAL:HG23	2.17	0.43
1:A:315:LEU:HD23	1:A:315:LEU:HA	1.90	0.43
1:A:587:VAL:HG13	1:A:588:MET:HE2	2.01	0.43
1:A:215:ARG:HG3	1:A:228:LEU:HD13	2.01	0.43
1:A:389:TYR:HB3	1:A:396:TYR:HD1	1.83	0.43
1:A:390:GLU:OE2	1:A:390:GLU:N	2.52	0.43
1:A:1109:LEU:HD21	1:A:1229:VAL:HG13	2.00	0.43
1:A:1849:GLY:HA2	1:A:1859:LEU:HD21	2.01	0.43
1:A:541:TRP:HA	1:A:541:TRP:CE3	2.54	0.43
1:A:693:LYS:CB	4:A:1905:ERG:H112	2.43	0.43
1:A:1124:GLN:HG2	1:A:1265:LYS:HD3	2.01	0.43
1:A:902:GLU:OE1	1:A:961:TRP:NE1	2.52	0.43
1:A:1556:LYS:HE2	1:A:1556:LYS:HB2	1.88	0.43
1:A:748:ARG:HD3	1:A:845:LEU:HB3	2.00	0.43
1:A:1478:MET:HG3	1:A:1696:VAL:HG21	2.00	0.43
1:A:1686:PHE:CE2	1:A:1844:VAL:HG21	2.54	0.43
1:A:356:ASP:OD1	1:A:356:ASP:N	2.47	0.42
1:A:977:MET:HG2	1:A:1044:TYR:CD1	2.54	0.42
1:A:796:TYR:CE1	1:A:811:ALA:HA	2.54	0.42
1:A:1607:VAL:HG23	1:A:1608:LYS:H	1.84	0.42
1:A:487:ALA:HB1	1:A:514:THR:HB	2.01	0.42
1:A:504:ASN:OD1	1:A:504:ASN:N	2.52	0.42
1:A:365:ASP:OD1	1:A:365:ASP:C	2.63	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:573:LYS:HE2	1:A:573:LYS:HA	2.01	0.42
1:A:1171:GLY:N	1:A:1256:LYS:O	2.48	0.42
4:A:1905:ERG:H25	4:A:1907:ERG:H281	2.02	0.42
1:A:766:LYS:HE2	1:A:796:TYR:HE1	1.85	0.42
1:A:873:LEU:HD22	1:A:1039:PHE:CD2	2.54	0.42
1:A:976:PHE:CE2	1:A:1120:ILE:HG21	2.55	0.42
1:A:251:MET:SD	1:A:254:GLU:HB2	2.60	0.42
1:A:1381:ILE:HD12	1:A:1381:ILE:HA	1.87	0.42
1:A:391:ILE:HD11	1:A:394:GLY:HA2	2.02	0.42
1:A:706:LEU:HD23	1:A:706:LEU:HA	1.87	0.42
1:A:792:GLN:NE2	1:A:793:LYS:HG2	2.35	0.42
1:A:1349:TYR:CZ	1:A:1369:PRO:HG3	2.55	0.42
1:A:1581:MET:O	1:A:1586:PRO:HD3	2.20	0.42
1:A:445:LEU:O	1:A:445:LEU:HD23	2.20	0.41
1:A:1085:PRO:HG2	1:A:1088:ARG:HD3	2.02	0.41
1:A:1386:TRP:HA	1:A:1386:TRP:CE3	2.55	0.41
1:A:1553:THR:OG1	1:A:1718:PHE:HE2	2.03	0.41
1:A:1693:ILE:HA	1:A:1696:VAL:HG12	2.02	0.41
1:A:229:HIS:CD2	1:A:320:MET:HG2	2.55	0.41
1:A:687:ILE:HD12	4:A:1904:ERG:H122	2.02	0.41
1:A:1304:ASP:OD1	1:A:1305:ARG:N	2.53	0.41
1:A:1540:SER:HB2	1:A:1542:ILE:HG22	2.01	0.41
1:A:499:GLN:HB3	1:A:502:VAL:HB	2.01	0.41
1:A:894:TYR:CD2	1:A:1797:ARG:HG3	2.55	0.41
1:A:334:ALA:O	1:A:338:ARG:NH1	2.53	0.41
1:A:701:ALA:HB2	4:A:1907:ERG:H262	2.02	0.41
1:A:1123:ASN:OD1	1:A:1265:LYS:NZ	2.40	0.41
1:A:1126:ASN:ND2	1:A:1131:CYS:SG	2.94	0.41
1:A:335:ASN:ND2	1:A:1091:LEU:HB3	2.35	0.41
1:A:1340:LEU:HD11	1:A:1367:PHE:CE2	2.55	0.41
1:A:1810:ARG:HA	1:A:1810:ARG:HD2	1.73	0.41
1:A:178:LEU:HD23	1:A:178:LEU:HA	1.87	0.41
1:A:873:LEU:HD23	1:A:1036:ASN:ND2	2.35	0.41
1:A:342:GLU:HB2	1:A:413:ASN:OD1	2.21	0.41
1:A:791:VAL:HG13	1:A:795:LEU:HD21	2.02	0.41
1:A:1101:LYS:HB3	1:A:1101:LYS:HE3	1.79	0.41
1:A:749:ILE:H	1:A:749:ILE:HG12	1.63	0.41
1:A:211:LEU:HD23	1:A:211:LEU:HA	1.92	0.41
1:A:1598:PHE:HD1	1:A:1693:ILE:HG23	1.86	0.41
1:A:1678:ILE:HD13	1:A:1678:ILE:HA	1.89	0.41
1:A:1710:THR:HA	1:A:1714:LEU:HD12	2.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1784:LYS:HE2	1:A:1784:LYS:HB3	1.72	0.41
1:A:678:THR:HG23	1:A:1610:THR:CB	2.47	0.40
1:A:892:LEU:HG	1:A:896:LYS:HE2	2.03	0.40
1:A:1343:GLU:O	1:A:1605:THR:HG21	2.22	0.40
1:A:690:VAL:HG21	4:A:1904:ERG:H11	2.03	0.40
1:A:789:ASP:O	1:A:793:LYS:HG3	2.22	0.40
1:A:657:PHE:HZ	4:A:1912:ERG:H12	1.85	0.40
1:A:1397:LEU:HD22	1:A:1402:LEU:HD23	2.03	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	1504/1895 (79%)	1434 (95%)	70 (5%)	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	1340/1647 (81%)	1329 (99%)	11 (1%)	79	87

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	675	MET
1	A	732	ILE
1	A	1097	LEU
1	A	1109	LEU
1	A	1345	ILE
1	A	1351	ARG
1	A	1636	LEU
1	A	1670	VAL
1	A	1698	CYS
1	A	1742	TRP
1	A	1781	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (18) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	335	ASN
1	A	500	GLN
1	A	545	GLN
1	A	784	HIS
1	A	792	GLN
1	A	1036	ASN
1	A	1094	ASN
1	A	1105	GLN
1	A	1126	ASN
1	A	1161	GLN
1	A	1164	ASN
1	A	1288	GLN
1	A	1407	GLN
1	A	1488	GLN
1	A	1602	ASN
1	A	1857	HIS
1	A	1858	ASN
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	0.25	0	17,19,21	0.42	0
2	NAG	C	2	2	14,14,15	0.16	0	17,19,21	0.46	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:

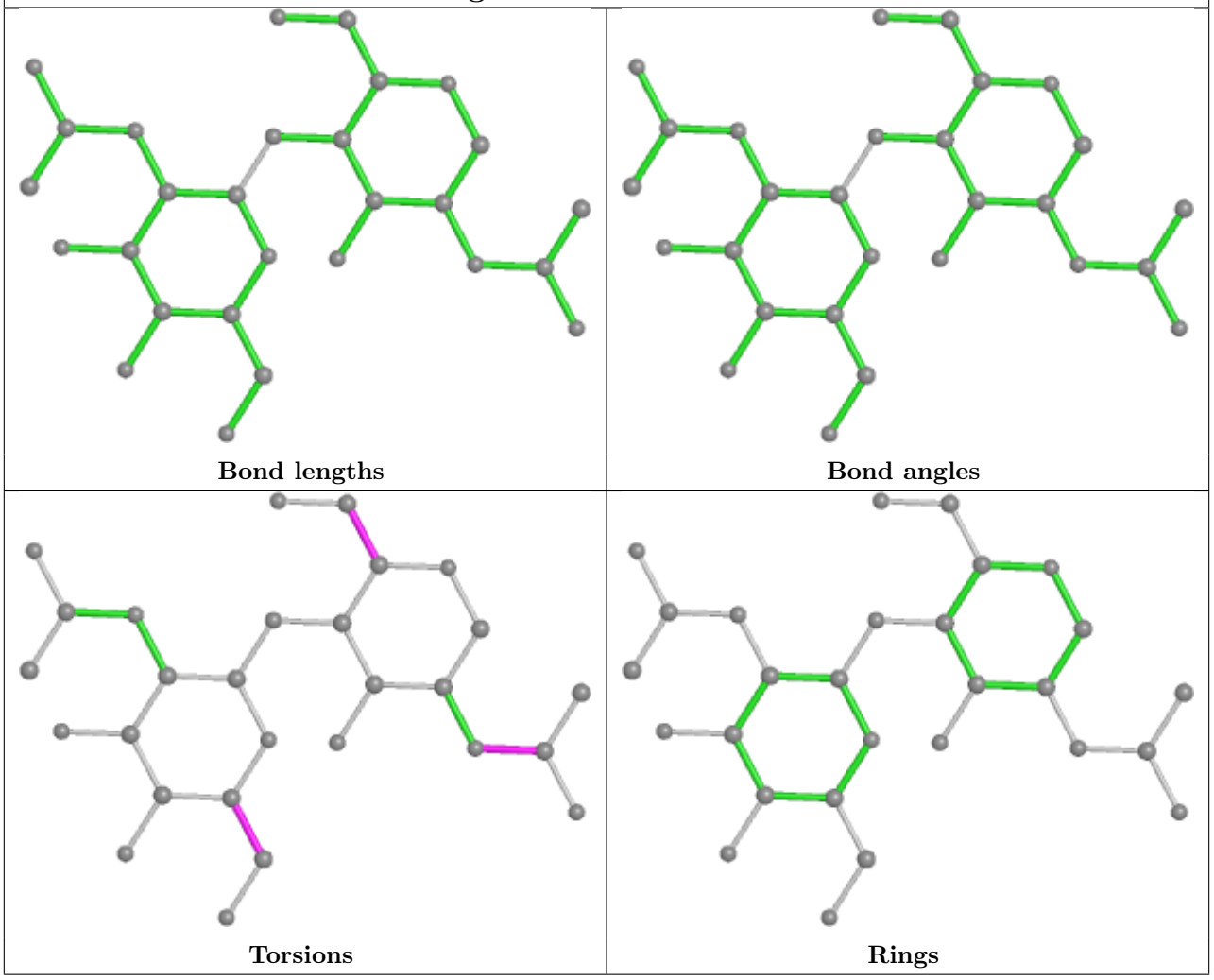
Mol	Chain	Res	Type	Atoms
2	C	2	NAG	C4-C5-C6-O6
2	C	2	NAG	O5-C5-C6-O6
2	C	1	NAG	C8-C7-N2-C2
2	C	1	NAG	O7-C7-N2-C2
2	C	1	NAG	O5-C5-C6-O6
2	C	1	NAG	C4-C5-C6-O6

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.

Oligosaccharide Chain C



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	$\#\|Z\| > 2$
4	ERG	A	1904	-	31,32,32	0.61	1 (3%)	47,50,50	0.83	2 (4%)
4	ERG	A	1910	-	31,32,32	0.47	0	47,50,50	0.79	0
4	ERG	A	1908	-	31,32,32	0.47	0	47,50,50	0.75	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
4	ERG	A	1911	-	31,32,32	0.62	1 (3%)	47,50,50	0.68	0
4	ERG	A	1907	-	31,32,32	0.47	0	47,50,50	0.78	0
4	ERG	A	1909	-	31,32,32	0.47	0	47,50,50	0.74	0
4	ERG	A	1905	-	31,32,32	0.60	1 (3%)	47,50,50	0.62	0
4	ERG	A	1912	-	31,32,32	0.52	0	47,50,50	0.91	1 (2%)
3	AV0	A	1902	-	72,72,72	0.52	0	96,98,98	0.62	0
3	AV0	A	1901	-	72,72,72	0.52	0	96,98,98	0.81	3 (3%)
5	POV	A	1906	-	51,51,51	0.50	0	57,59,59	0.47	0
4	ERG	A	1903	-	31,32,32	0.56	1 (3%)	47,50,50	0.69	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
4	ERG	A	1904	-	-	7/13/71/71	0/4/4/4
4	ERG	A	1910	-	-	6/13/71/71	0/4/4/4
4	ERG	A	1908	-	-	5/13/71/71	0/4/4/4
4	ERG	A	1911	-	-	4/13/71/71	0/4/4/4
4	ERG	A	1907	-	-	6/13/71/71	0/4/4/4
4	ERG	A	1909	-	-	6/13/71/71	0/4/4/4
4	ERG	A	1905	-	-	4/13/71/71	0/4/4/4
4	ERG	A	1912	-	-	6/13/71/71	0/4/4/4
3	AV0	A	1902	-	-	18/50/130/130	0/4/4/4
3	AV0	A	1901	-	-	21/50/130/130	0/4/4/4
5	POV	A	1906	-	-	12/55/55/55	-
4	ERG	A	1903	-	-	2/13/71/71	0/4/4/4

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	1911	ERG	C10-C9	2.92	1.59	1.55
4	A	1905	ERG	C10-C9	2.82	1.59	1.55
4	A	1904	ERG	C10-C9	2.79	1.59	1.55
4	A	1903	ERG	C10-C9	2.45	1.59	1.55

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	A	1912	ERG	C16-C15-C14	-3.57	99.41	105.30
3	A	1901	AV0	CCR-O4-C4	3.31	126.16	117.96
4	A	1904	ERG	C14-C8-C9	2.90	119.02	114.66
3	A	1901	AV0	O4-CCR-CCV	2.54	114.68	108.10
3	A	1901	AV0	OAU-CCV-CCR	2.27	115.57	110.05
4	A	1904	ERG	C14-C8-C7	-2.11	120.23	124.38

There are no chirality outliers.

All (97) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1901	AV0	C2-C1-O1-CBS
3	A	1901	AV0	O5-C1-O1-CBS
3	A	1901	AV0	CBK-CBQ-CCM-CBR
3	A	1901	AV0	CBK-CBQ-CCM-CBS
3	A	1901	AV0	CBL-CBR-CCM-CBQ
3	A	1901	AV0	CBL-CBR-CCM-CBS
3	A	1901	AV0	CBL-CBR-CCM-CBT
3	A	1901	AV0	O1-CBS-CCM-CBQ
3	A	1901	AV0	O1-CBS-CCM-CBR
3	A	1902	AV0	O5-C1-O1-CBS
3	A	1902	AV0	CBK-CBQ-CCM-CBR
3	A	1902	AV0	CBK-CBQ-CCM-CBS
3	A	1902	AV0	CBK-CBQ-CCM-CBT
3	A	1902	AV0	O1-CBS-CCM-CBQ
3	A	1902	AV0	O1-CBS-CCM-CBR
4	A	1903	ERG	C20-C22-C23-C24
4	A	1904	ERG	C20-C22-C23-C24
4	A	1904	ERG	C22-C23-C24-C25
4	A	1905	ERG	C20-C22-C23-C24
4	A	1907	ERG	C13-C17-C20-C21
4	A	1907	ERG	C13-C17-C20-C22
4	A	1907	ERG	C16-C17-C20-C21
4	A	1907	ERG	C16-C17-C20-C22
4	A	1907	ERG	C17-C20-C22-C23
4	A	1909	ERG	C23-C24-C25-C26
4	A	1909	ERG	C23-C24-C25-C27
4	A	1909	ERG	C28-C24-C25-C26
4	A	1909	ERG	C28-C24-C25-C27
4	A	1911	ERG	C17-C20-C22-C23
4	A	1911	ERG	C22-C23-C24-C25
4	A	1912	ERG	C13-C17-C20-C21
4	A	1912	ERG	C13-C17-C20-C22

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Mol	Chain	Res	Type	Atoms
4	A	1912	ERG	C16-C17-C20-C21
4	A	1912	ERG	C16-C17-C20-C22
5	A	1906	POV	C11-O12-P-O11
5	A	1906	POV	C11-O12-P-O14
5	A	1906	POV	O21-C2-C3-O31
3	A	1901	AV0	CCV-CCR-O4-C4
3	A	1901	AV0	O1-CBS-CCM-CBT
3	A	1902	AV0	C4-C5-C6-O6
3	A	1902	AV0	C2-C1-O1-CBS
3	A	1901	AV0	CCF-CCQ-OCB-CCS
4	A	1903	ERG	C17-C20-C22-C23
4	A	1905	ERG	C22-C23-C24-C25
4	A	1908	ERG	C17-C20-C22-C23
3	A	1901	AV0	OAI-CBM-CCC-OBY
3	A	1901	AV0	CCH-CCQ-OCB-CCS
4	A	1904	ERG	C28-C24-C25-C26
4	A	1904	ERG	C22-C23-C24-C28
3	A	1902	AV0	O5-C5-C6-O6
4	A	1905	ERG	C22-C23-C24-C28
4	A	1908	ERG	C22-C23-C24-C28
3	A	1901	AV0	C5-C4-O4-CCR
3	A	1902	AV0	O1-CBS-CCM-CBT
5	A	1906	POV	C22-C21-O21-C2
3	A	1901	AV0	OBY-CCR-O4-C4
5	A	1906	POV	O22-C21-O21-C2
3	A	1901	AV0	C3-C4-O4-CCR
5	A	1906	POV	C25-C26-C27-C28
4	A	1904	ERG	C23-C24-C25-C26
3	A	1902	AV0	OAJ-CBN-CCD-OBZ
3	A	1901	AV0	CBK-CBQ-CCM-CBT
3	A	1902	AV0	CBL-CBR-CCM-CBS
4	A	1908	ERG	C22-C23-C24-C25
4	A	1907	ERG	C21-C20-C22-C23
3	A	1902	AV0	CCW-CCS-OCB-CCQ
3	A	1902	AV0	OBZ-CCS-OCB-CCQ
4	A	1910	ERG	C13-C17-C20-C21
4	A	1910	ERG	C13-C17-C20-C22
4	A	1910	ERG	C16-C17-C20-C21
3	A	1902	AV0	CBL-CBR-CCM-CBQ
5	A	1906	POV	C1-C2-C3-O31
4	A	1904	ERG	C21-C20-C22-C23
4	A	1909	ERG	C21-C20-C22-C23

Continued on next page...

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Mol	Chain	Res	Type	Atoms
4	A	1910	ERG	C16-C17-C20-C22
3	A	1901	AV0	CBB-CBD-CBF-CBH
4	A	1910	ERG	C21-C20-C22-C23
4	A	1904	ERG	C23-C24-C25-C27
5	A	1906	POV	C24-C25-C26-C27
5	A	1906	POV	C34-C35-C36-C37
5	A	1906	POV	C23-C24-C25-C26
4	A	1911	ERG	C21-C20-C22-C23
4	A	1911	ERG	C22-C23-C24-C28
3	A	1901	AV0	CAZ-CBB-CBD-CBF
5	A	1906	POV	C22-C23-C24-C25
4	A	1905	ERG	C23-C24-C25-C27
3	A	1902	AV0	OBY-CCR-O4-C4
4	A	1912	ERG	C21-C20-C22-C23
4	A	1912	ERG	C22-C23-C24-C28
5	A	1906	POV	C310-C311-C312-C313
4	A	1908	ERG	C21-C20-C22-C23
4	A	1910	ERG	C22-C23-C24-C28
4	A	1908	ERG	C28-C24-C25-C26
3	A	1902	AV0	CBD-CBF-CBH-CBJ
3	A	1902	AV0	CCV-CCR-O4-C4
4	A	1909	ERG	C22-C23-C24-C28
3	A	1901	AV0	OBZ-CCS-OCB-CCQ

There are no ring outliers.

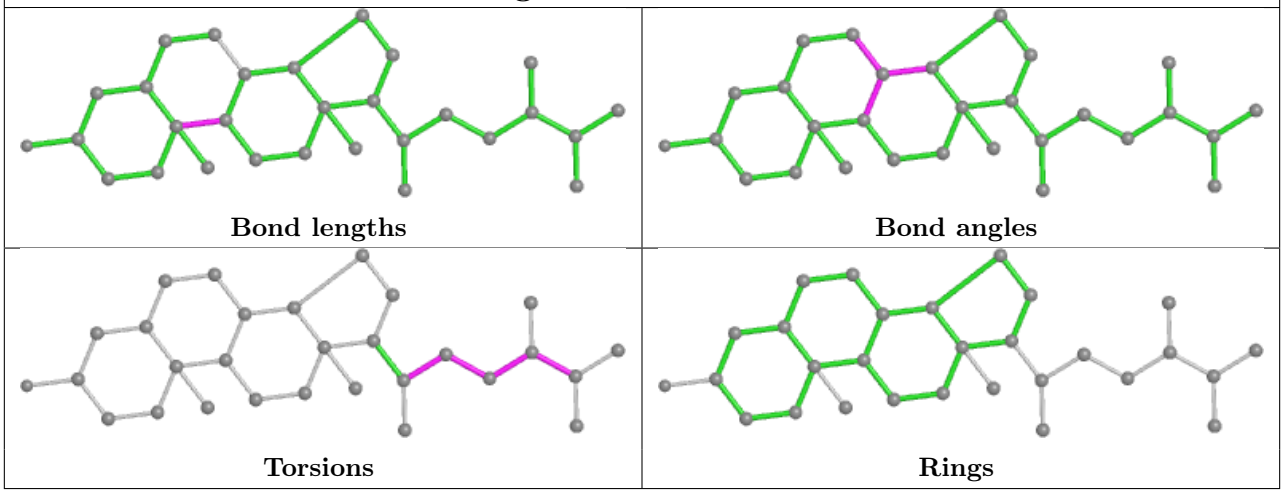
7 monomers are involved in 24 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	1904	ERG	8	0
4	A	1911	ERG	2	0
4	A	1907	ERG	5	0
4	A	1905	ERG	12	0
4	A	1912	ERG	1	0
5	A	1906	POV	2	0
4	A	1903	ERG	2	0

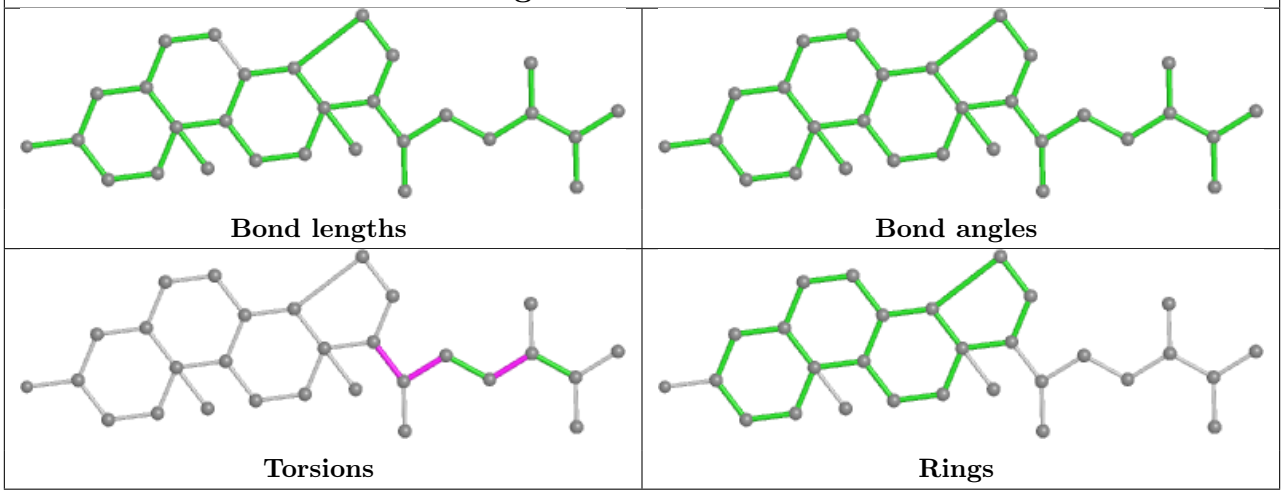
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be

highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

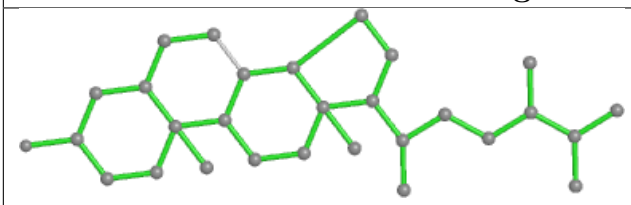
Ligand ERG A 1904



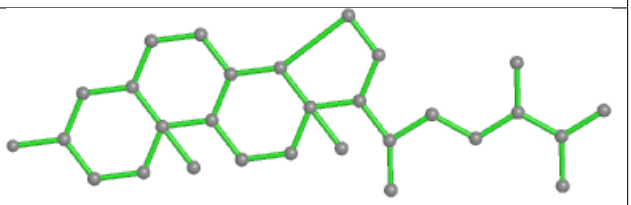
Ligand ERG A 1910



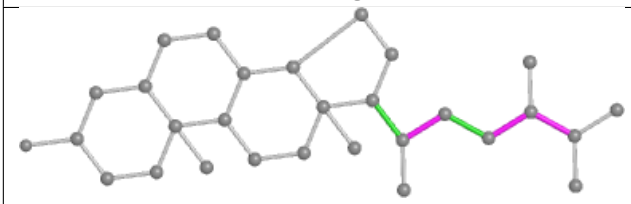
Ligand ERG A 1908



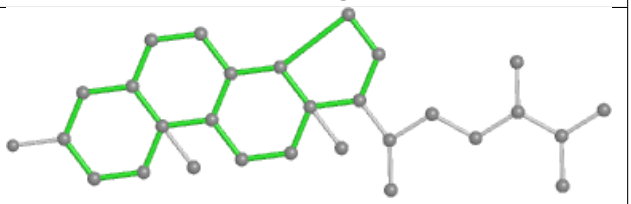
Bond lengths



Bond angles

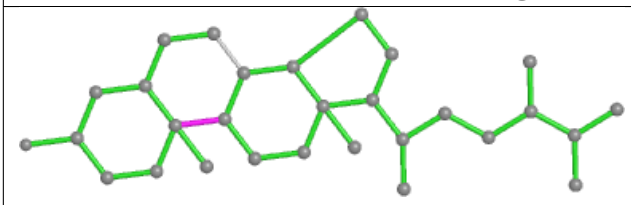


Torsions

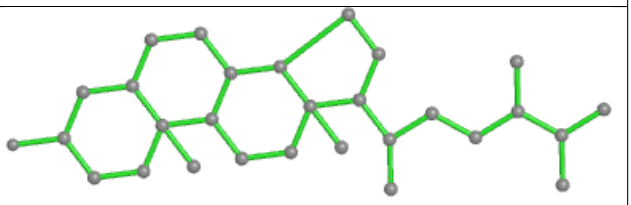


Rings

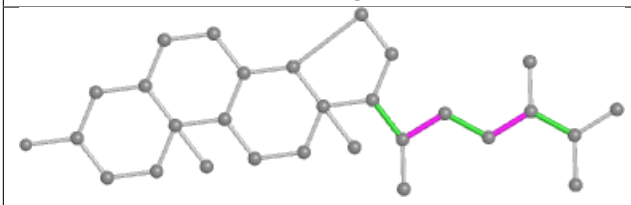
Ligand ERG A 1911



Bond lengths



Bond angles



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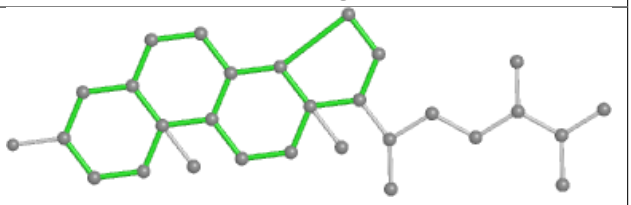
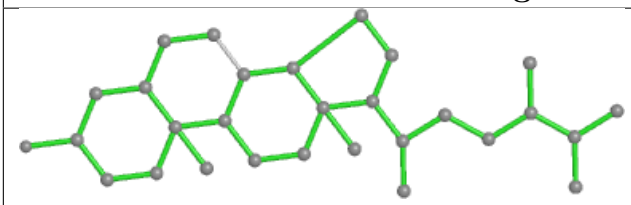
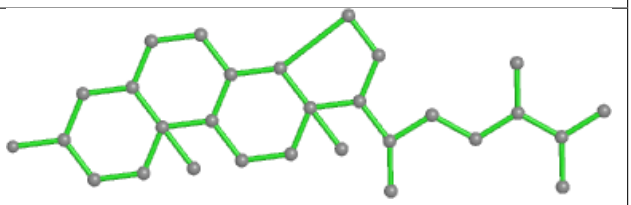


Rings

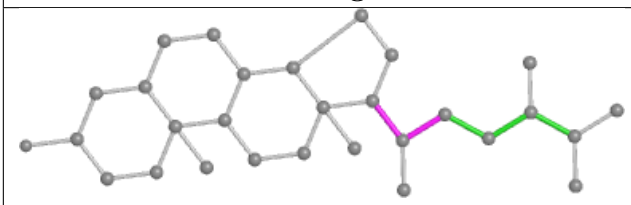
Ligand ERG A 1907



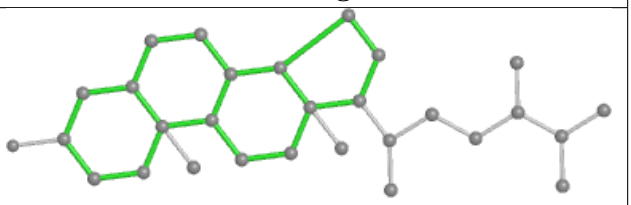
Bond lengths



Bond angles

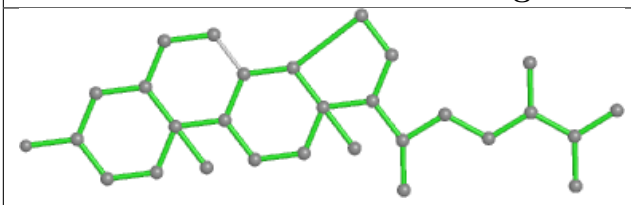


Torsions

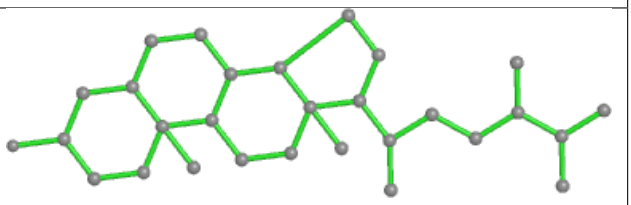


Rings

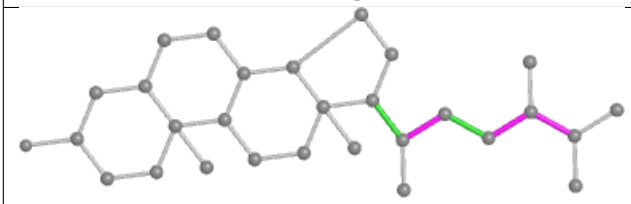
Ligand ERG A 1909



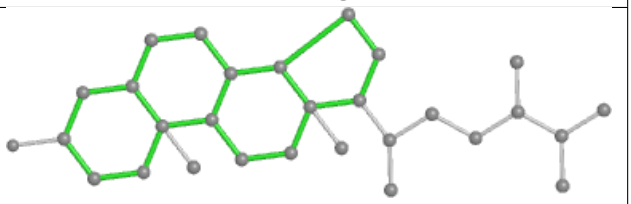
Bond lengths



Bond angles

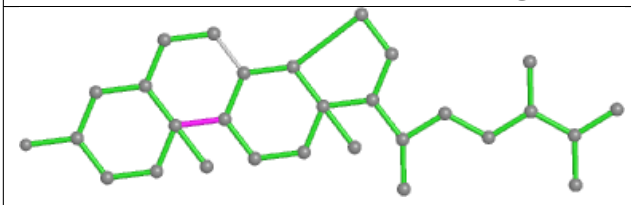


Torsions

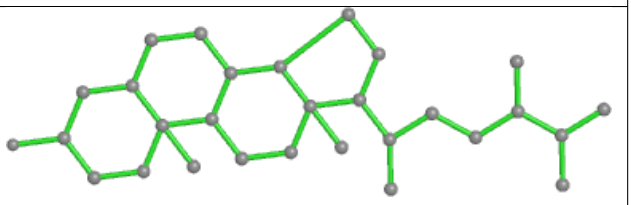


Rings

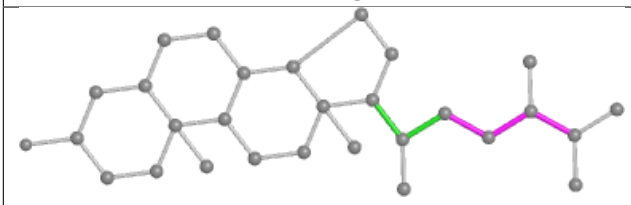
Ligand ERG A 1905



Bond lengths



Bond angles



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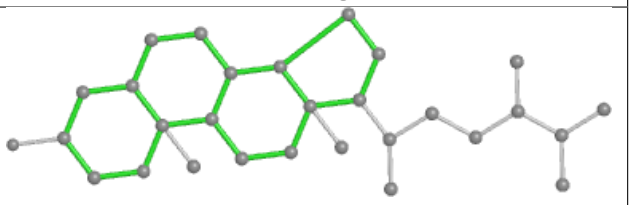
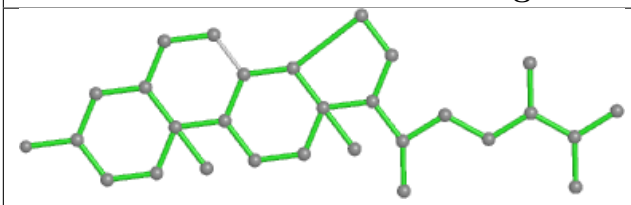
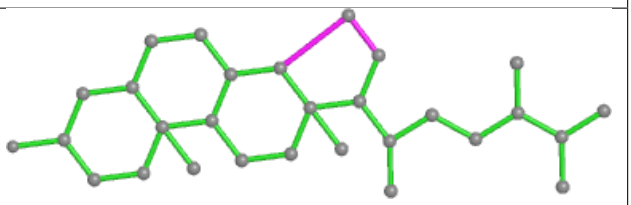


Rings

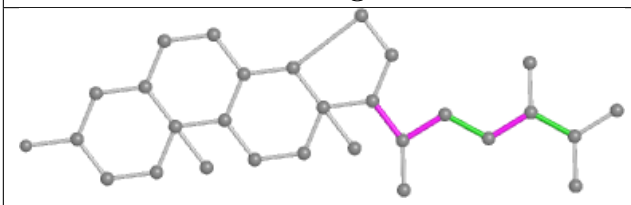
Ligand ERG A 1912



Bond lengths



Bond angles



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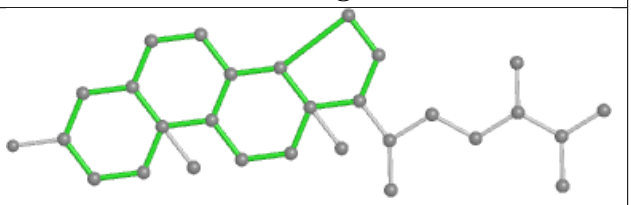
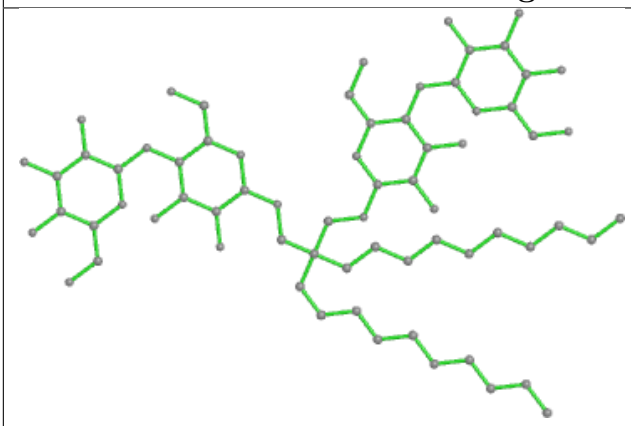
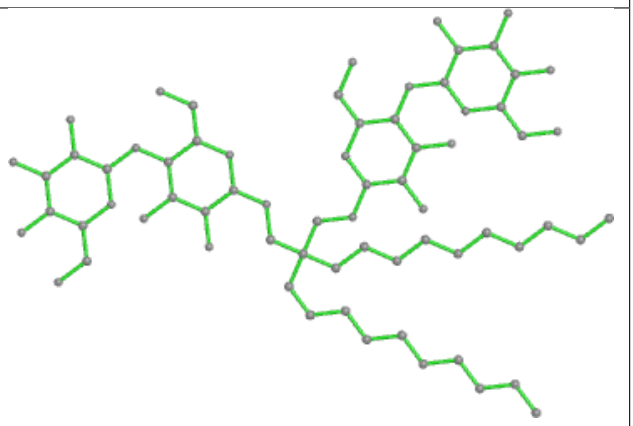


Rings

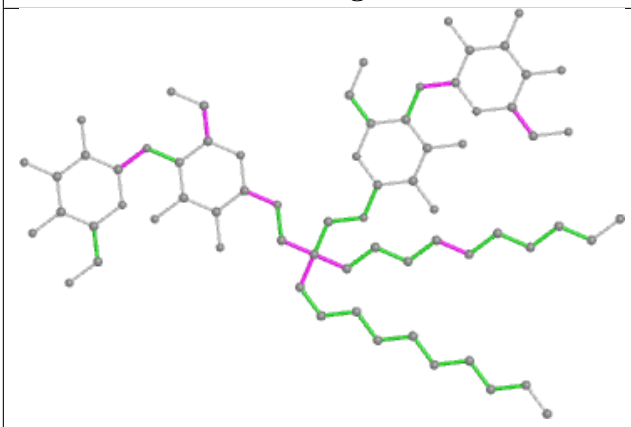
Ligand AV0 A 1902



Bond lengths



Bond angles



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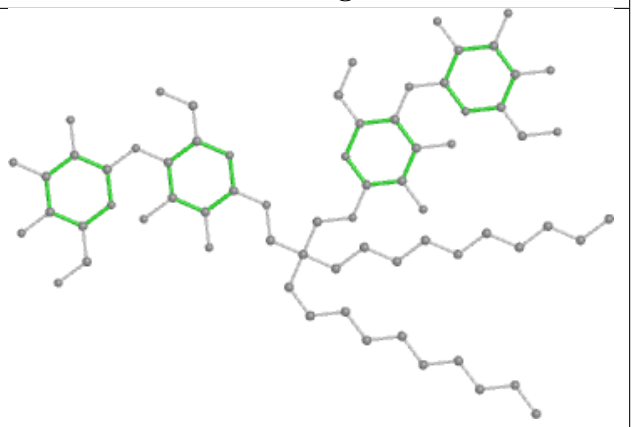
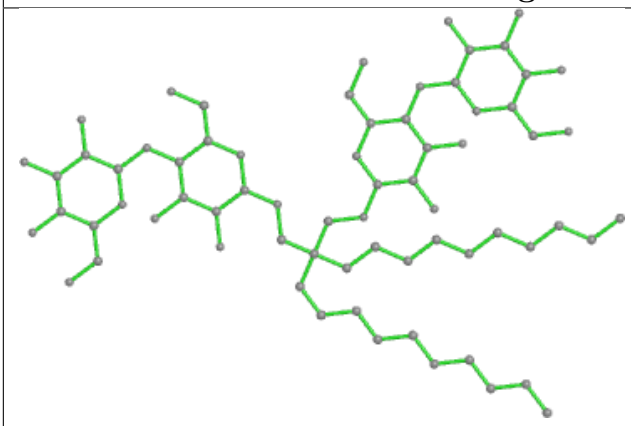


Rings

Ligand AV0 A 1901



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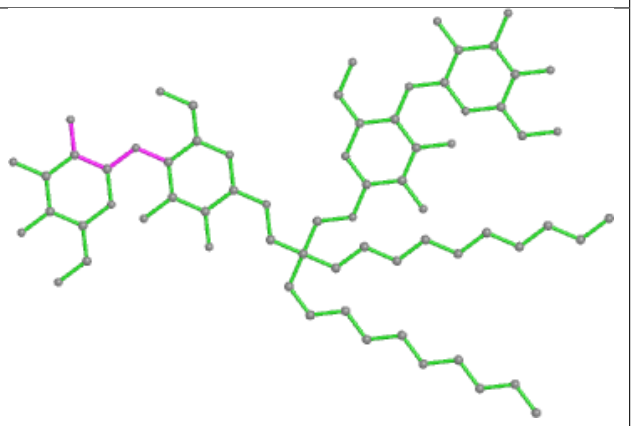
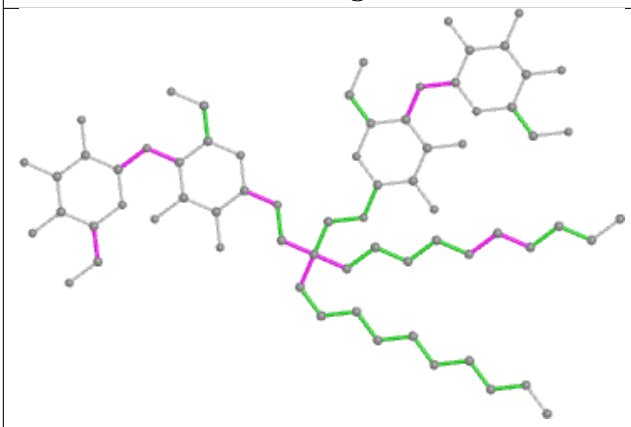
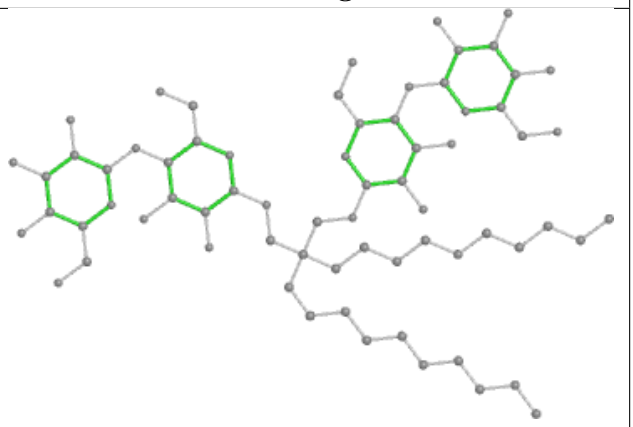


Bond angles

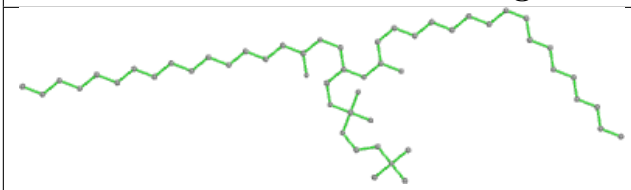


Torsions

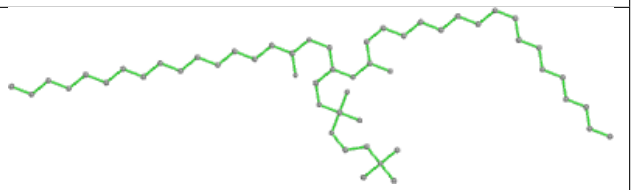


Rings

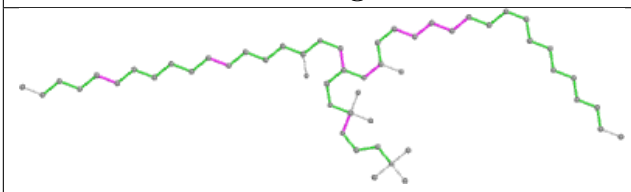
Ligand POV A 1906



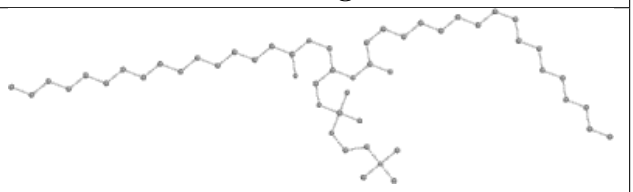
Bond lengths



Bond angles

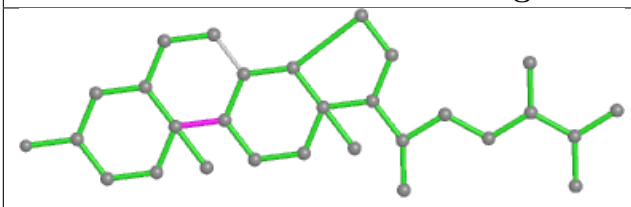


Torsions

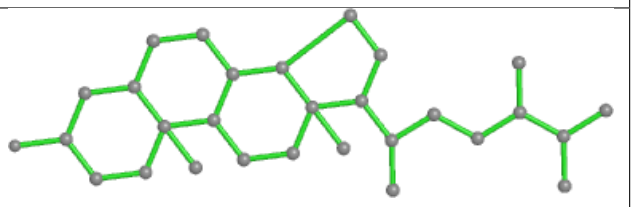


Rings

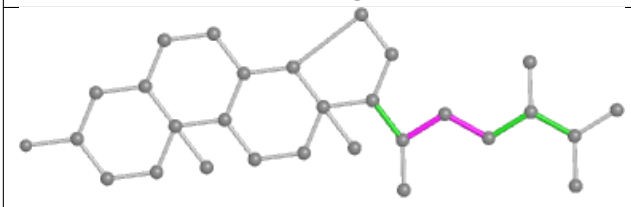
Ligand ERG A 1903



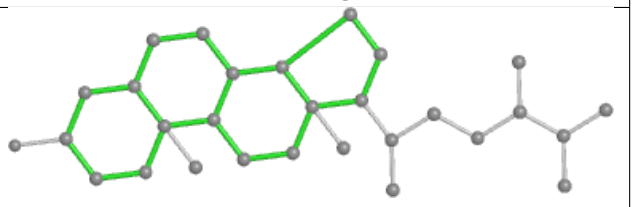
Bond lengths



Bond angles



Torsions



Rings

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.