



Full wwPDB EM Validation Report ⓘ

Mar 28, 2026 – 11:11 PM UTC

PDB ID : 9UE3 / pdb_00009ue3
EMDB ID : EMD-64076
Title : The structure of FIPV spike glycoprotein
Authors : Sun, J.Q.; Niu, S.
Deposited on : 2025-04-08
Resolution : 2.78 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:

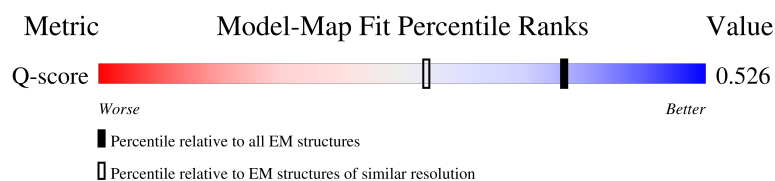
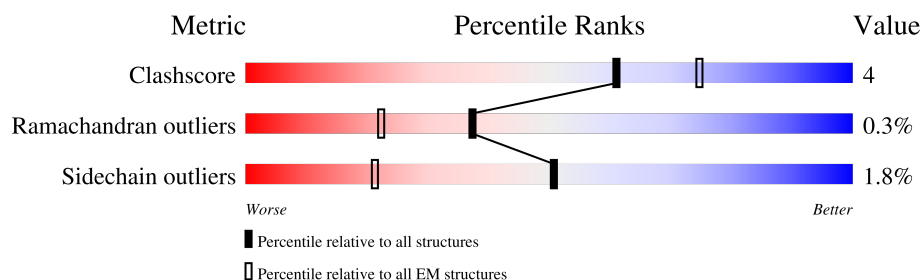
EMDB validation analysis : 0.0.1.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

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 2.78 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)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	10754 (2.28 - 3.28)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion $< 40\%$). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	1451	 65% 10% 25%
2	B	3	 100%
3	C	4	 100%
3	I	4	 50% 50%

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Mol	Chain	Length	Quality of chain
4	E	2	 100%
4	F	2	 50%50%
4	G	2	 50%50%
4	H	2	 100%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 8896 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 Spike glycoprotein,Fibritin.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	1094	Total	C	N	O	S	0	0
			8435	5361	1387	1644	43		

There are 58 discrepancies between the modelled and reference sequences:

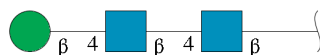
Chain	Residue	Modelled	Actual	Comment	Reference
A	54	ASN	VAL	conflict	UNP P10033
A	401	ILE	ARG	conflict	UNP P10033
A	744	VAL	ALA	variant	UNP P10033
A	1144	PRO	GLU	conflict	UNP P10033
A	1145	PRO	LEU	conflict	UNP P10033
A	1325	GLU	ARG	variant	UNP P10033
A	1392	GLY	-	linker	UNP P10033
A	1393	GLY	-	linker	UNP P10033
A	1394	GLY	-	linker	UNP P10033
A	1395	SER	-	linker	UNP P10033
A	1396	GLY	-	linker	UNP P10033
A	1397	GLY	-	linker	UNP P10033
A	1398	GLY	-	linker	UNP P10033
A	1399	SER	-	linker	UNP P10033
A	1427	GLY	-	expression tag	UNP A0A346FJN8
A	1428	SER	-	expression tag	UNP A0A346FJN8
A	1429	GLY	-	expression tag	UNP A0A346FJN8
A	1430	GLY	-	expression tag	UNP A0A346FJN8
A	1431	GLY	-	expression tag	UNP A0A346FJN8
A	1432	SER	-	expression tag	UNP A0A346FJN8
A	1433	ALA	-	expression tag	UNP A0A346FJN8
A	1434	TRP	-	expression tag	UNP A0A346FJN8
A	1435	SER	-	expression tag	UNP A0A346FJN8
A	1436	HIS	-	expression tag	UNP A0A346FJN8
A	1437	PRO	-	expression tag	UNP A0A346FJN8
A	1438	GLN	-	expression tag	UNP A0A346FJN8
A	1439	PHE	-	expression tag	UNP A0A346FJN8
A	1440	GLU	-	expression tag	UNP A0A346FJN8

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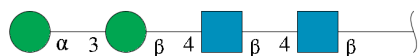
Chain	Residue	Modelled	Actual	Comment	Reference
A	1441	LYS	-	expression tag	UNP A0A346FJN8
A	1442	GLY	-	expression tag	UNP A0A346FJN8
A	1443	GLY	-	expression tag	UNP A0A346FJN8
A	1444	GLY	-	expression tag	UNP A0A346FJN8
A	1445	SER	-	expression tag	UNP A0A346FJN8
A	1446	GLY	-	expression tag	UNP A0A346FJN8
A	1447	GLY	-	expression tag	UNP A0A346FJN8
A	1448	GLY	-	expression tag	UNP A0A346FJN8
A	1449	SER	-	expression tag	UNP A0A346FJN8
A	1450	GLY	-	expression tag	UNP A0A346FJN8
A	1451	GLY	-	expression tag	UNP A0A346FJN8
A	1452	SER	-	expression tag	UNP A0A346FJN8
A	1453	SER	-	expression tag	UNP A0A346FJN8
A	1454	ALA	-	expression tag	UNP A0A346FJN8
A	1455	TRP	-	expression tag	UNP A0A346FJN8
A	1456	SER	-	expression tag	UNP A0A346FJN8
A	1457	HIS	-	expression tag	UNP A0A346FJN8
A	1458	PRO	-	expression tag	UNP A0A346FJN8
A	1459	GLN	-	expression tag	UNP A0A346FJN8
A	1460	PHE	-	expression tag	UNP A0A346FJN8
A	1461	GLU	-	expression tag	UNP A0A346FJN8
A	1462	LYS	-	expression tag	UNP A0A346FJN8
A	1463	HIS	-	expression tag	UNP A0A346FJN8
A	1464	HIS	-	expression tag	UNP A0A346FJN8
A	1465	HIS	-	expression tag	UNP A0A346FJN8
A	1466	HIS	-	expression tag	UNP A0A346FJN8
A	1467	HIS	-	expression tag	UNP A0A346FJN8
A	1468	HIS	-	expression tag	UNP A0A346FJN8
A	1469	HIS	-	expression tag	UNP A0A346FJN8
A	1470	HIS	-	expression tag	UNP A0A346FJN8

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



Mol	Chain	Residues	Atoms				AltConf	Trace
2	B	3	Total	C	N	O	0	0
			39	22	2	15		

- Molecule 3 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



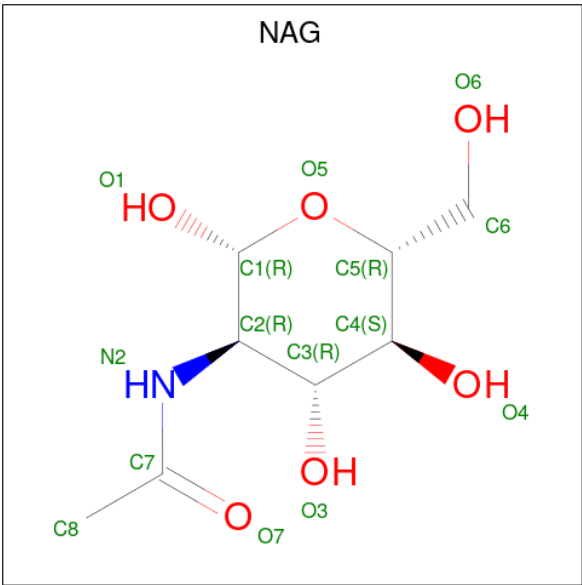
Mol	Chain	Residues	Atoms				AltConf	Trace
3	C	4	Total	C	N	O	0	0
			50	28	2	20		
3	I	4	Total	C	N	O	0	0
			50	28	2	20		

- Molecule 4 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
4	E	2	Total	C	N	O	0	0
			28	16	2	10		
4	F	2	Total	C	N	O	0	0
			28	16	2	10		
4	G	2	Total	C	N	O	0	0
			28	16	2	10		
4	H	2	Total	C	N	O	0	0
			28	16	2	10		

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆) (labeled as "Ligand of Interest" by depositor).



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

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

GLY GLY GLY GLY GLY GLY GLY GLY GLY GLY
SER SER SER SER SER SER SER SER SER SER
ALA TEP SER HIS PRO GLN PHE GLU LYS HIS HIS HIS HIS HIS HIS

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

Chain B:  100%

NAG1
NAG2
BMA3

- Molecule 3: alpha-D-mannopyranose-(1-3)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain C:  100%

NAG1
NAG2
BMA3
MAN4

- Molecule 3: alpha-D-mannopyranose-(1-3)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain I:  50% 50%

NAG1
NAG2
BMA3
MAN4

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

Chain E:  100%

NAG1
NAG2

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

Chain F:  50% 50%

NAG1
NAG2

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

Chain G:  50% 50%

NAG1
NAG2

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

Chain H:  100%

MAG1
MAG2

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	83781	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50.00	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	2000	Depositor
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	1.123	Depositor
Minimum map value	-0.515	Depositor
Average map value	-0.001	Depositor
Map value standard deviation	0.033	Depositor
Recommended contour level	0.182	Depositor
Map size ($\text{\AA}$)	388.8, 388.8, 388.8	wwPDB
Map dimensions	480, 480, 480	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	0.81, 0.81, 0.81	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: BMA, MAN, NAG

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	0.31	0/8612	0.57	0/11742

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	8435	0	8144	76	0
2	B	39	0	34	0	0
3	C	50	0	43	0	0
3	I	50	0	43	0	0
4	E	28	0	25	0	0
4	F	28	0	25	0	0
4	G	28	0	25	0	0
4	H	28	0	25	0	0
5	A	210	0	195	2	0
All	All	8896	0	8559	77	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 4.

All (77) 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:202:ASN:HD21	1:A:329:SER:H	1.29	0.80
1:A:620:LEU:HA	1:A:624:LEU:HD12	1.72	0.71
1:A:41:ARG:C	1:A:43:PHE:H	1.98	0.70
1:A:706:THR:HG22	1:A:708:SER:H	1.58	0.69
1:A:981:ASP:OD1	1:A:1010:GLY:N	2.24	0.68
1:A:258:CYS:SG	1:A:259:THR:HG23	2.36	0.66
1:A:331:CYS:SG	1:A:335:SER:OG	2.56	0.64
1:A:271:GLY:HA2	1:A:336:LEU:HD21	1.79	0.63
1:A:201:ILE:O	1:A:330:GLN:NE2	2.25	0.60
1:A:286:LEU:H	1:A:301:GLN:HE22	1.47	0.60
1:A:846:ILE:HG23	1:A:1223:THR:HG23	1.83	0.59
1:A:205:TRP:CD1	1:A:217:SER:HG	2.21	0.59
1:A:886:CYS:HA	1:A:889:ILE:HD12	1.85	0.59
1:A:376:CYS:HB3	1:A:401:ILE:HG22	1.84	0.59
1:A:302:PRO:HA	1:A:469:TYR:HA	1.85	0.58
1:A:803:PRO:HG3	1:A:819:VAL:HG21	1.86	0.58
1:A:600:ASP:O	1:A:649:ARG:NH2	2.37	0.57
1:A:1047:GLN:OE1	1:A:1064:GLN:NE2	2.39	0.55
1:A:41:ARG:C	1:A:43:PHE:N	2.64	0.55
1:A:981:ASP:CG	1:A:1011:VAL:HG12	2.32	0.54
1:A:407:TYR:OH	5:A:1513:NAG:H81	2.09	0.53
1:A:987:CYS:O	1:A:1002:TYR:OH	2.27	0.52
1:A:370:VAL:HG13	1:A:407:TYR:CE2	2.46	0.51
1:A:301:GLN:O	1:A:303:LEU:N	2.44	0.51
1:A:241:ASN:HB3	1:A:248:THR:OG1	2.11	0.50
1:A:305:ILE:HD13	1:A:467:THR:HG22	1.95	0.49
1:A:270:SER:O	1:A:272:GLY:N	2.46	0.49
1:A:270:SER:HB3	1:A:273:TYR:HD2	1.77	0.48
1:A:588:SER:O	1:A:589:LEU:HD22	2.13	0.48
1:A:51:GLU:HA	1:A:243:THR:HB	1.96	0.47
1:A:841:PRO:HB3	1:A:1227:PRO:HB3	1.96	0.47
1:A:857:THR:HG23	1:A:1176:VAL:HG21	1.97	0.47
1:A:986:ARG:NH2	1:A:995:ASP:OD1	2.47	0.47
1:A:270:SER:OG	1:A:271:GLY:N	2.48	0.47
1:A:203:THR:HG22	1:A:218:THR:HG22	1.96	0.46
1:A:1147:ALA:O	1:A:1151:VAL:HG23	2.16	0.46
1:A:1299:THR:OG1	1:A:1301:ILE:HG12	2.14	0.46
1:A:917:LEU:HD23	1:A:928:ASN:HD22	1.80	0.46
1:A:536:ILE:HG12	1:A:560:LEU:HD23	1.97	0.46
1:A:749:ILE:HD12	1:A:754:VAL:HG21	1.97	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:202:ASN:HD21	1:A:329:SER:N	2.07	0.46
1:A:316:VAL:HG22	1:A:454:THR:HB	1.98	0.46
1:A:851:GLU:HG2	1:A:1220:PHE:HB2	1.97	0.46
1:A:202:ASN:ND2	1:A:328:PHE:HB3	2.30	0.46
1:A:1102:ALA:O	1:A:1106:VAL:HG23	2.16	0.45
1:A:773:THR:OG1	1:A:776:PHE:O	2.27	0.45
1:A:1143:ASP:CG	1:A:1144:PRO:HD2	2.42	0.45
1:A:747:ALA:HB1	1:A:805:ILE:HD11	1.98	0.45
1:A:375:SER:OG	1:A:406:LEU:HD13	2.17	0.44
1:A:242:ASN:HD21	1:A:244:ASN:HB2	1.83	0.44
1:A:1214:ALA:HB2	1:A:1219:ILE:HG12	1.98	0.44
1:A:285:LEU:HD12	1:A:301:GLN:NE2	2.33	0.44
1:A:41:ARG:O	1:A:42:ASP:HB2	2.18	0.44
1:A:421:SER:O	1:A:421:SER:OG	2.25	0.43
1:A:929:LEU:HD11	1:A:1041:PRO:HD3	2.00	0.43
1:A:243:THR:HG23	1:A:247:LYS:HE3	1.99	0.43
1:A:916:LYS:HE3	1:A:916:LYS:HB2	1.83	0.43
1:A:562:MET:HE3	1:A:565:ASN:HA	2.00	0.43
1:A:1017:MET:SD	1:A:1218:MET:HE2	2.59	0.42
1:A:214:SER:OG	1:A:215:ARG:N	2.51	0.42
1:A:960:TYR:O	1:A:1018:THR:HG21	2.20	0.42
1:A:201:ILE:HD12	1:A:309:TRP:HZ2	1.85	0.42
1:A:302:PRO:HG3	1:A:342:VAL:HG21	2.02	0.42
1:A:677:GLY:HA2	1:A:680:ASP:OD2	2.19	0.42
1:A:289:SER:O	1:A:289:SER:OG	2.32	0.42
1:A:588:SER:OG	1:A:589:LEU:N	2.53	0.41
5:A:1502:NAG:H83	5:A:1502:NAG:H2	1.93	0.41
1:A:541:GLY:HA2	1:A:586:LYS:O	2.20	0.41
1:A:957:LYS:NZ	1:A:966:ASP:HB3	2.35	0.41
1:A:57:GLY:H	1:A:313:SER:HG	1.68	0.41
1:A:622:ASN:O	1:A:623:TYR:C	2.63	0.41
1:A:508:TYR:HA	1:A:509:PRO:HD3	1.96	0.41
1:A:1033:LEU:HD23	1:A:1033:LEU:HA	1.87	0.41
1:A:1117:LEU:HD23	1:A:1117:LEU:HA	1.85	0.41
1:A:1258:THR:CG2	1:A:1272:ARG:HE	2.34	0.41
1:A:641:LYS:HE3	1:A:657:SER:OG	2.21	0.40
1:A:1095:GLY:O	1:A:1099:VAL:HG23	2.22	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	1078/1451 (74%)	1014 (94%)	61 (6%)	3 (0%)	36 63

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	678	LEU
1	A	254	ASP
1	A	302	PRO

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	939/1241 (76%)	922 (98%)	17 (2%)	51 79

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	38	ASN
1	A	40	ILE
1	A	49	LYS
1	A	50	GLU
1	A	64	VAL
1	A	209	VAL
1	A	211	LEU
1	A	232	VAL

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Mol	Chain	Res	Type
1	A	236	THR
1	A	238	TYR
1	A	240	LEU
1	A	527	SER
1	A	674	ASP
1	A	678	LEU
1	A	681	LEU
1	A	799	VAL
1	A	1091	GLN

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	38	ASN
1	A	202	ASN
1	A	230	GLN
1	A	242	ASN
1	A	264	ASN
1	A	282	ASN
1	A	301	GLN
1	A	306	ASN
1	A	490	HIS
1	A	582	HIS
1	A	679	HIS
1	A	872	ASN
1	A	881	GLN
1	A	928	ASN
1	A	1013	ASN
1	A	1051	ASN
1	A	1061	ASN
1	A	1063	ASN
1	A	1064	GLN
1	A	1111	ASN
1	A	1115	GLN
1	A	1150	GLN
1	A	1173	GLN
1	A	1194	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

19 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	B	1	2,1	14,14,15	0.36	0	17,19,21	0.71	0
2	NAG	B	2	2	14,14,15	0.35	0	17,19,21	0.72	0
2	BMA	B	3	2	11,11,12	0.21	0	15,15,17	0.57	0
3	NAG	C	1	3,1	14,14,15	0.38	0	17,19,21	0.65	0
3	NAG	C	2	3	14,14,15	0.40	0	17,19,21	0.78	0
3	BMA	C	3	3	11,11,12	0.23	0	15,15,17	0.73	0
3	MAN	C	4	3	11,11,12	0.17	0	15,15,17	0.59	0
4	NAG	E	1	4,1	14,14,15	0.34	0	17,19,21	0.75	0
4	NAG	E	2	4	14,14,15	0.29	0	17,19,21	0.59	0
4	NAG	F	1	4,1	14,14,15	0.36	0	17,19,21	1.01	2 (11%)
4	NAG	F	2	4	14,14,15	0.32	0	17,19,21	0.60	0
4	NAG	G	1	4,1	14,14,15	0.36	0	17,19,21	0.74	1 (5%)
4	NAG	G	2	4	14,14,15	0.31	0	17,19,21	0.61	0
4	NAG	H	1	4,1	14,14,15	0.33	0	17,19,21	0.61	0
4	NAG	H	2	4	14,14,15	0.29	0	17,19,21	0.66	0
3	NAG	I	1	3,1	14,14,15	0.44	0	17,19,21	1.18	2 (11%)
3	NAG	I	2	3	14,14,15	0.38	0	17,19,21	0.87	1 (5%)
3	BMA	I	3	3	11,11,12	0.32	0	15,15,17	0.54	0
3	MAN	I	4	3	11,11,12	0.18	0	15,15,17	0.58	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	B	1	2,1	-	2/6/23/26	0/1/1/1
2	NAG	B	2	2	-	2/6/23/26	0/1/1/1
2	BMA	B	3	2	-	0/2/19/22	0/1/1/1
3	NAG	C	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	C	2	3	-	1/6/23/26	0/1/1/1
3	BMA	C	3	3	-	0/2/19/22	0/1/1/1
3	MAN	C	4	3	-	0/2/19/22	0/1/1/1
4	NAG	E	1	4,1	-	2/6/23/26	0/1/1/1
4	NAG	E	2	4	-	0/6/23/26	0/1/1/1
4	NAG	F	1	4,1	-	2/6/23/26	0/1/1/1
4	NAG	F	2	4	-	0/6/23/26	0/1/1/1
4	NAG	G	1	4,1	-	2/6/23/26	0/1/1/1
4	NAG	G	2	4	-	0/6/23/26	0/1/1/1
4	NAG	H	1	4,1	-	0/6/23/26	0/1/1/1
4	NAG	H	2	4	-	0/6/23/26	0/1/1/1
3	NAG	I	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	I	2	3	-	0/6/23/26	0/1/1/1
3	BMA	I	3	3	-	2/2/19/22	0/1/1/1
3	MAN	I	4	3	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	I	1	NAG	C1-O5-C5	2.88	116.05	112.19
4	G	1	NAG	C1-O5-C5	2.30	115.27	112.19
3	I	2	NAG	C2-N2-C7	2.29	125.97	122.90
3	I	1	NAG	O5-C5-C6	-2.26	103.27	107.66
4	F	1	NAG	O5-C1-C2	-2.22	107.86	111.29
4	F	1	NAG	C1-O5-C5	2.14	115.05	112.19

There are no chirality outliers.

All (15) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	1	NAG	C8-C7-N2-C2
2	B	1	NAG	O7-C7-N2-C2
3	I	3	BMA	O5-C5-C6-O6
2	B	2	NAG	C8-C7-N2-C2
3	C	1	NAG	C8-C7-N2-C2

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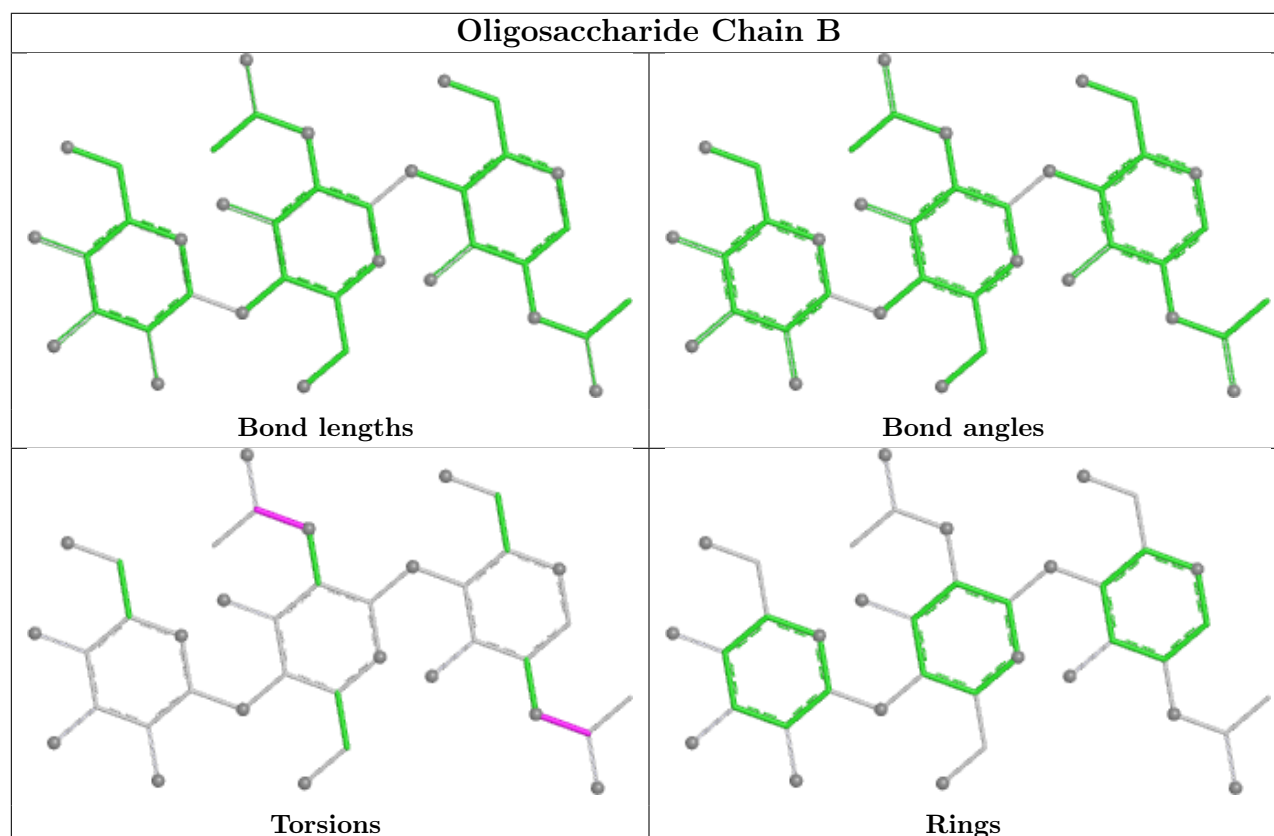
Continued from previous page...

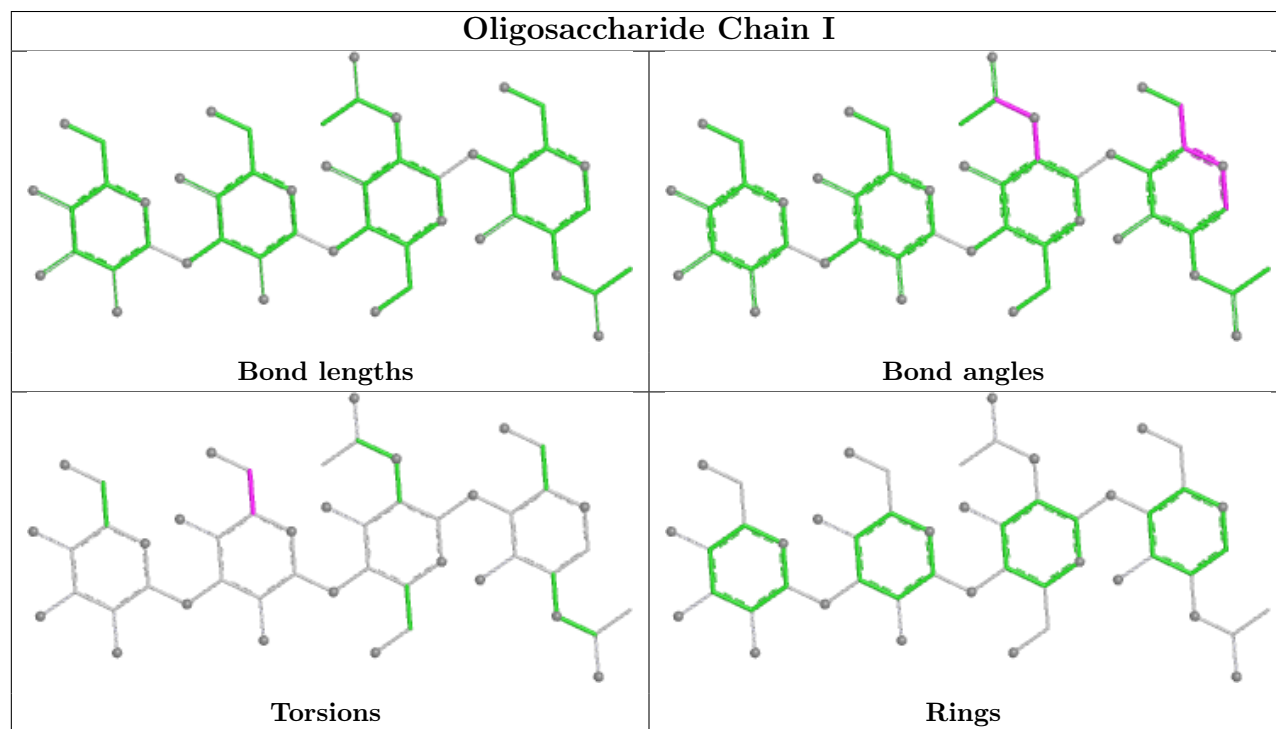
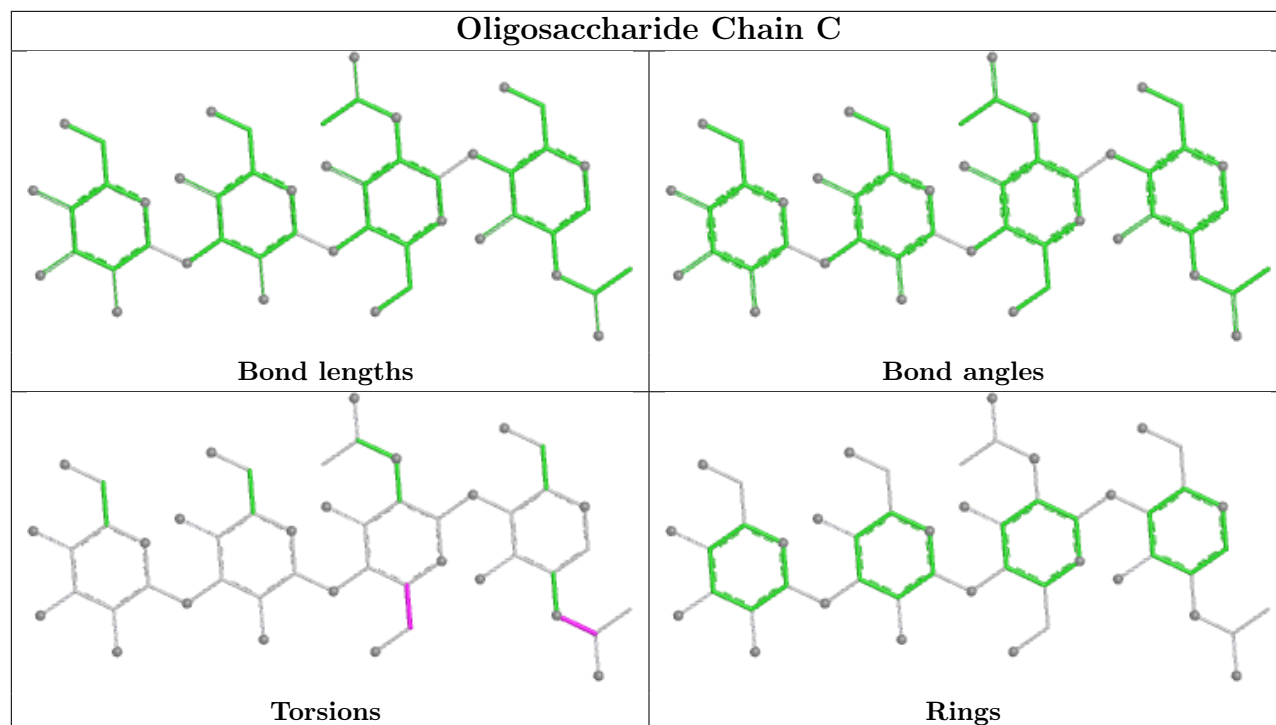
Mol	Chain	Res	Type	Atoms
3	I	3	BMA	C4-C5-C6-O6
3	C	1	NAG	O7-C7-N2-C2
4	G	1	NAG	C8-C7-N2-C2
2	B	2	NAG	O7-C7-N2-C2
4	F	1	NAG	C8-C7-N2-C2
4	G	1	NAG	O7-C7-N2-C2
4	E	1	NAG	C8-C7-N2-C2
4	F	1	NAG	O7-C7-N2-C2
3	C	2	NAG	O5-C5-C6-O6
4	E	1	NAG	O7-C7-N2-C2

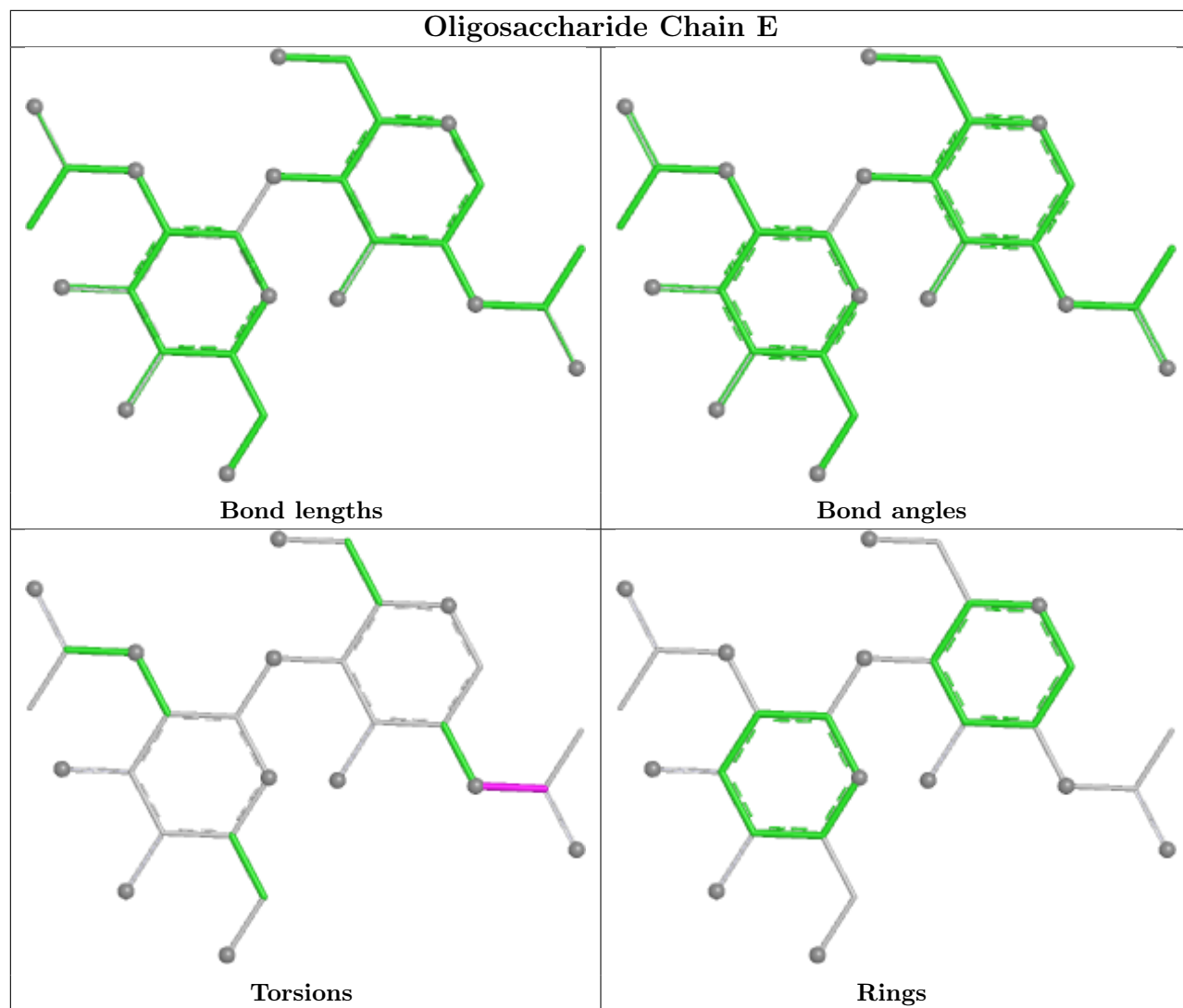
There are no ring outliers.

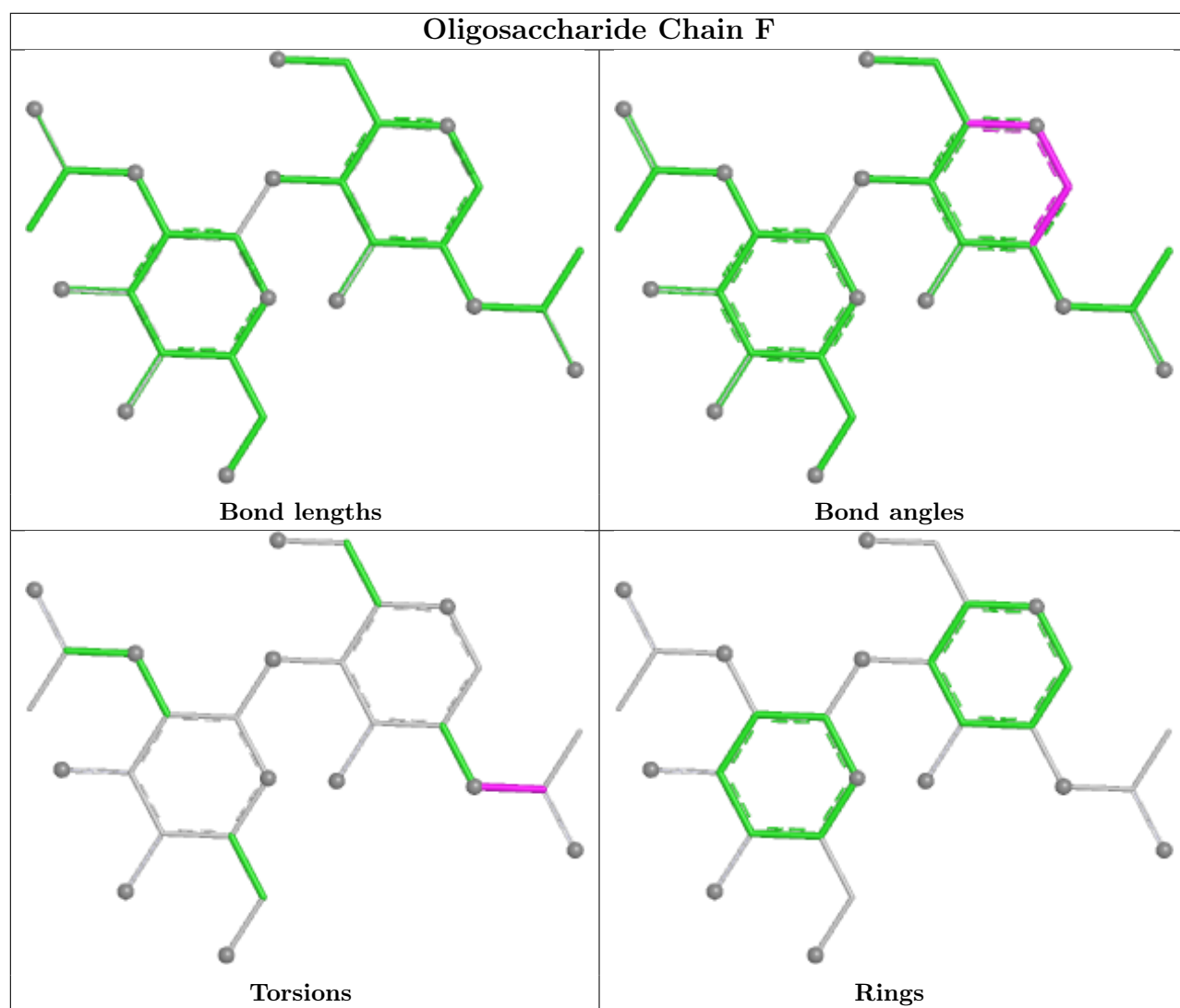
No monomer is involved in short contacts.

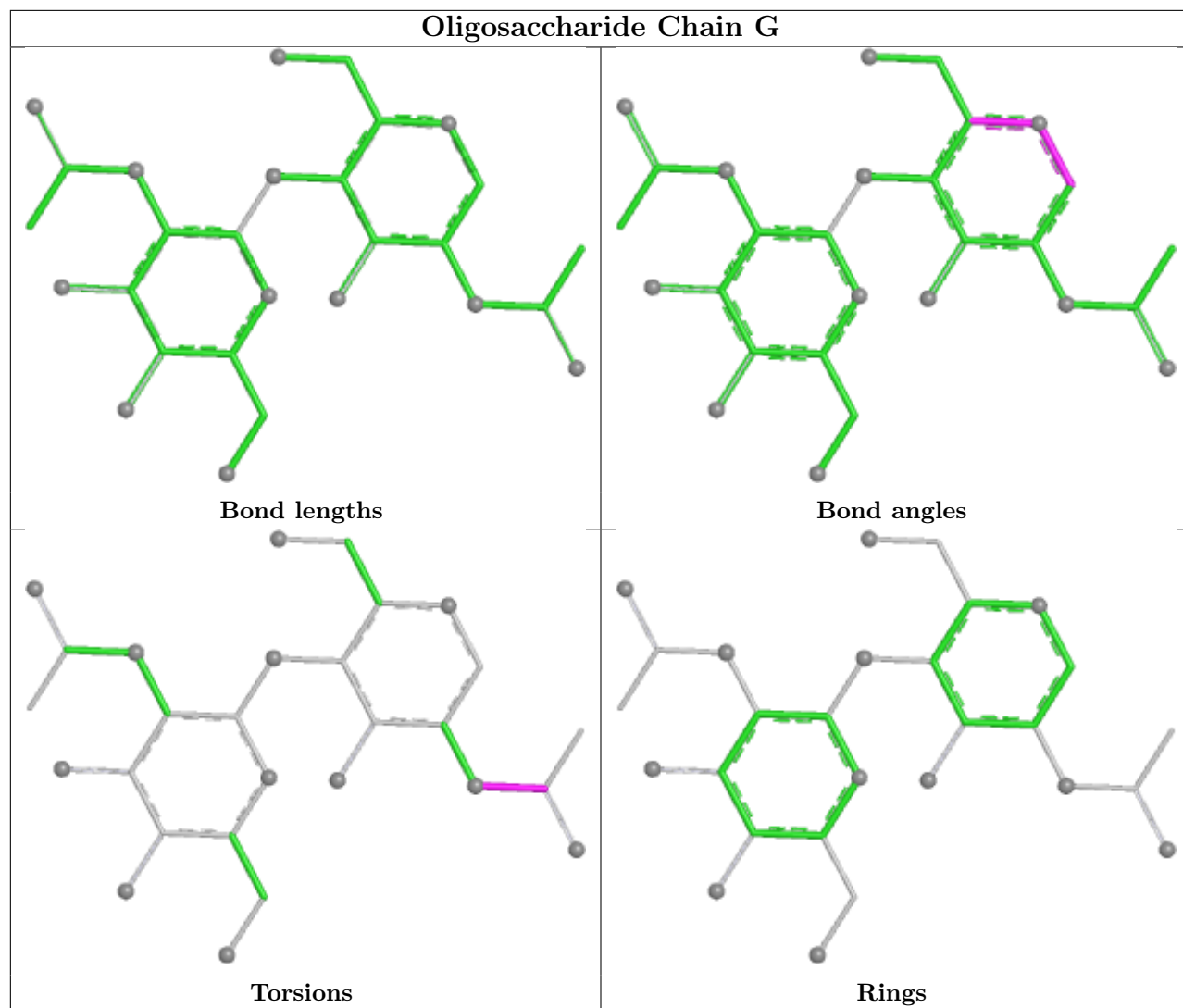
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

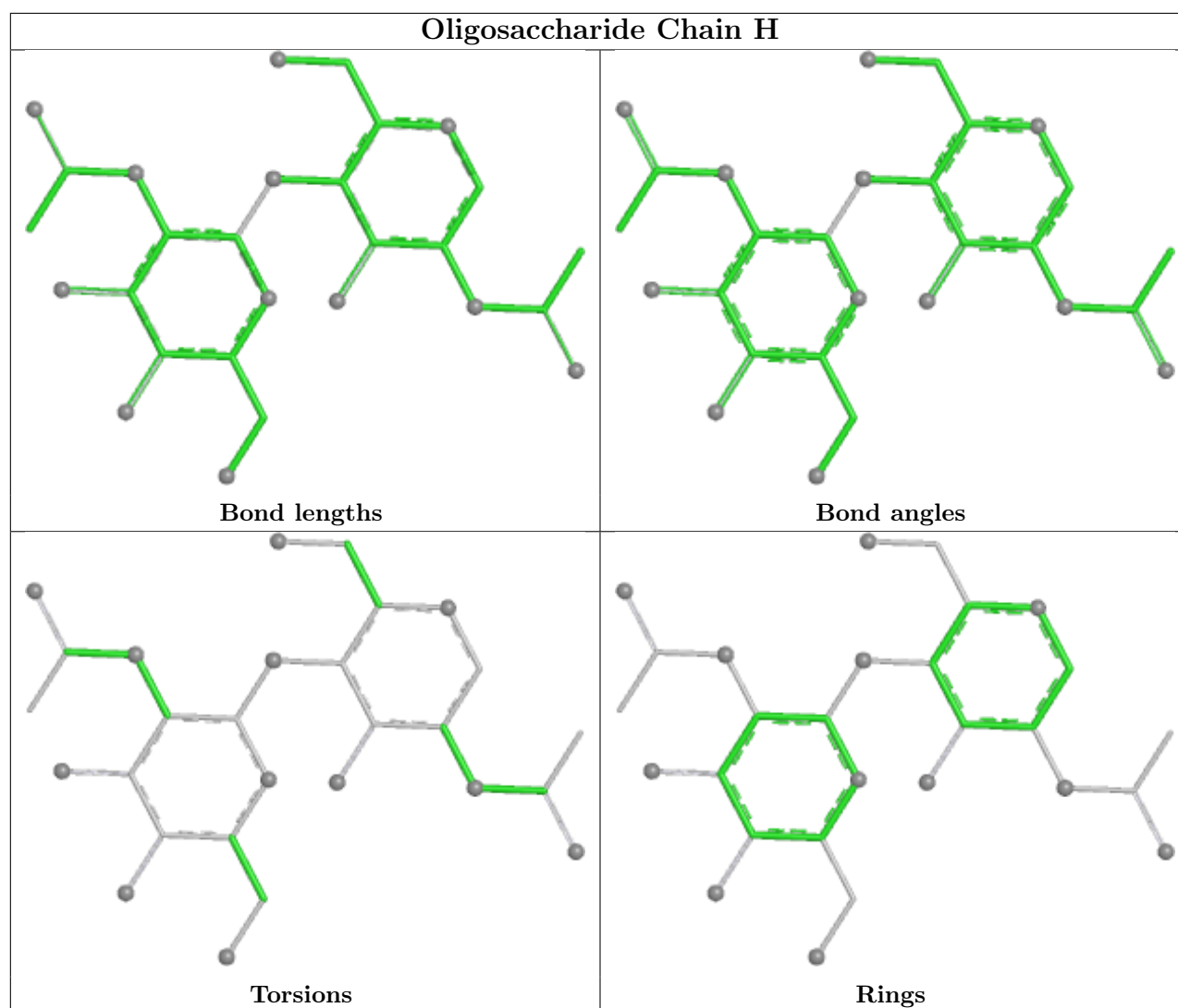












5.6 Ligand geometry [i](#)

15 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	$\# Z > 2$
5	NAG	A	1508	1	14,14,15	0.31	0	17,19,21	0.74	0
5	NAG	A	1505	1	14,14,15	0.32	0	17,19,21	0.62	0
5	NAG	A	1514	1	14,14,15	0.31	0	17,19,21	0.76	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	NAG	A	1502	1	14,14,15	0.36	0	17,19,21	1.18	2 (11%)
5	NAG	A	1504	1	14,14,15	0.29	0	17,19,21	1.31	2 (11%)
5	NAG	A	1501	1	14,14,15	0.27	0	17,19,21	0.56	0
5	NAG	A	1510	1	14,14,15	0.31	0	17,19,21	0.65	0
5	NAG	A	1503	1	14,14,15	0.31	0	17,19,21	0.64	0
5	NAG	A	1511	1	14,14,15	0.30	0	17,19,21	0.89	1 (5%)
5	NAG	A	1512	1	14,14,15	0.40	0	17,19,21	0.76	0
5	NAG	A	1509	1	14,14,15	0.38	0	17,19,21	0.68	0
5	NAG	A	1515	1	14,14,15	0.33	0	17,19,21	1.16	1 (5%)
5	NAG	A	1513	1	14,14,15	0.40	0	17,19,21	0.76	0
5	NAG	A	1506	1	14,14,15	0.26	0	17,19,21	0.52	0
5	NAG	A	1507	1	14,14,15	0.31	0	17,19,21	0.66	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
5	NAG	A	1508	1	-	2/6/23/26	0/1/1/1
5	NAG	A	1505	1	-	2/6/23/26	0/1/1/1
5	NAG	A	1514	1	-	2/6/23/26	0/1/1/1
5	NAG	A	1502	1	-	3/6/23/26	0/1/1/1
5	NAG	A	1504	1	-	3/6/23/26	0/1/1/1
5	NAG	A	1501	1	-	3/6/23/26	0/1/1/1
5	NAG	A	1510	1	-	0/6/23/26	0/1/1/1
5	NAG	A	1503	1	-	0/6/23/26	0/1/1/1
5	NAG	A	1511	1	-	3/6/23/26	0/1/1/1
5	NAG	A	1512	1	-	1/6/23/26	0/1/1/1
5	NAG	A	1509	1	-	0/6/23/26	0/1/1/1
5	NAG	A	1515	1	-	2/6/23/26	0/1/1/1
5	NAG	A	1513	1	-	1/6/23/26	0/1/1/1
5	NAG	A	1506	1	-	2/6/23/26	0/1/1/1
5	NAG	A	1507	1	-	2/6/23/26	0/1/1/1

There are no bond length outliers.

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
5	A	1515	NAG	C1-O5-C5	4.09	117.67	112.19
5	A	1504	NAG	C2-N2-C7	3.80	127.99	122.90
5	A	1502	NAG	C1-O5-C5	3.20	116.47	112.19
5	A	1502	NAG	O5-C1-C2	-2.90	106.81	111.29
5	A	1514	NAG	C1-O5-C5	2.24	115.19	112.19
5	A	1504	NAG	C1-C2-N2	2.19	113.88	110.43
5	A	1511	NAG	C1-O5-C5	2.15	115.06	112.19

There are no chirality outliers.

All (26) torsion outliers are listed below:

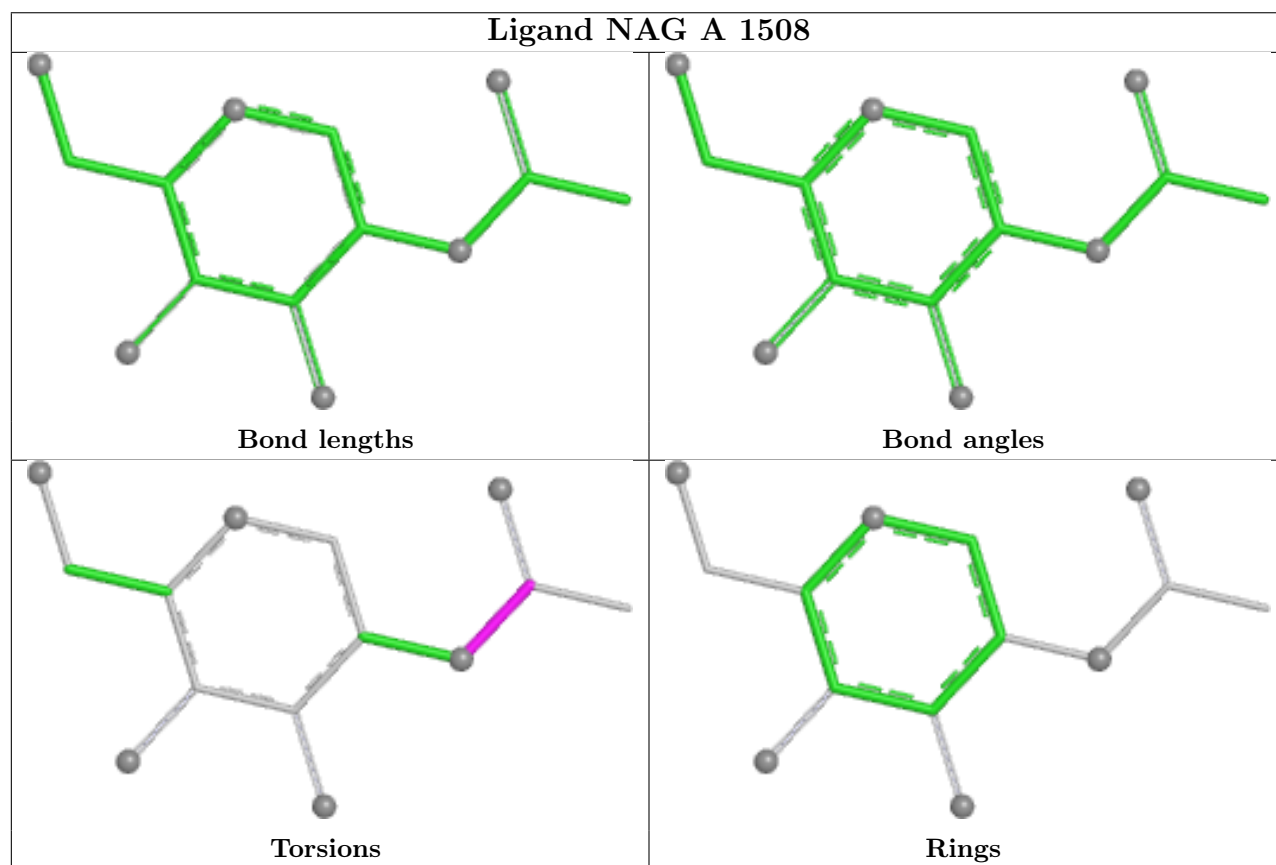
Mol	Chain	Res	Type	Atoms
5	A	1501	NAG	C8-C7-N2-C2
5	A	1501	NAG	O7-C7-N2-C2
5	A	1502	NAG	C8-C7-N2-C2
5	A	1502	NAG	O7-C7-N2-C2
5	A	1504	NAG	C1-C2-N2-C7
5	A	1506	NAG	C8-C7-N2-C2
5	A	1506	NAG	O7-C7-N2-C2
5	A	1514	NAG	O7-C7-N2-C2
5	A	1504	NAG	C8-C7-N2-C2
5	A	1504	NAG	O7-C7-N2-C2
5	A	1511	NAG	C8-C7-N2-C2
5	A	1511	NAG	O7-C7-N2-C2
5	A	1514	NAG	C8-C7-N2-C2
5	A	1507	NAG	C8-C7-N2-C2
5	A	1515	NAG	C8-C7-N2-C2
5	A	1507	NAG	O7-C7-N2-C2
5	A	1515	NAG	O7-C7-N2-C2
5	A	1508	NAG	C8-C7-N2-C2
5	A	1502	NAG	O5-C5-C6-O6
5	A	1501	NAG	O5-C5-C6-O6
5	A	1511	NAG	O5-C5-C6-O6
5	A	1508	NAG	O7-C7-N2-C2
5	A	1505	NAG	C8-C7-N2-C2
5	A	1505	NAG	O7-C7-N2-C2
5	A	1512	NAG	C1-C2-N2-C7
5	A	1513	NAG	C1-C2-N2-C7

There are no ring outliers.

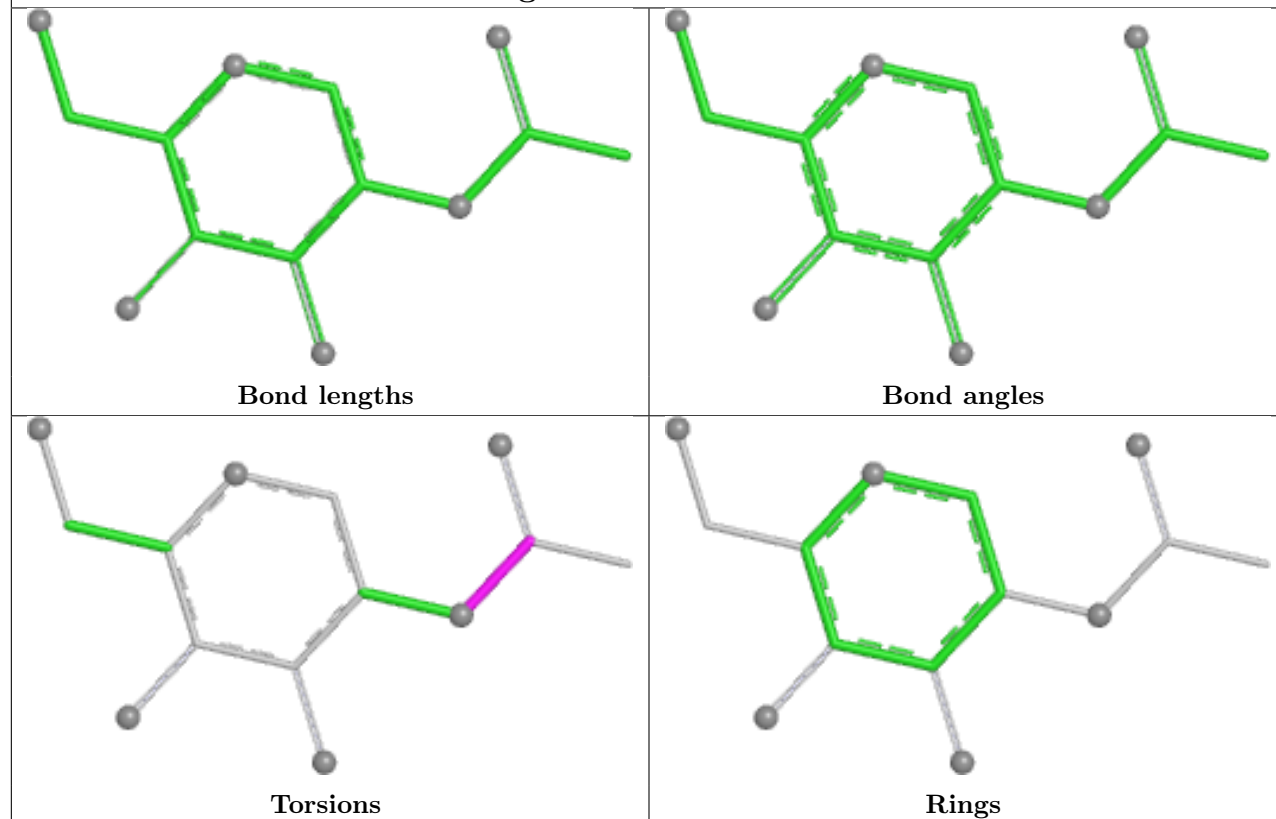
2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	1502	NAG	1	0
5	A	1513	NAG	1	0

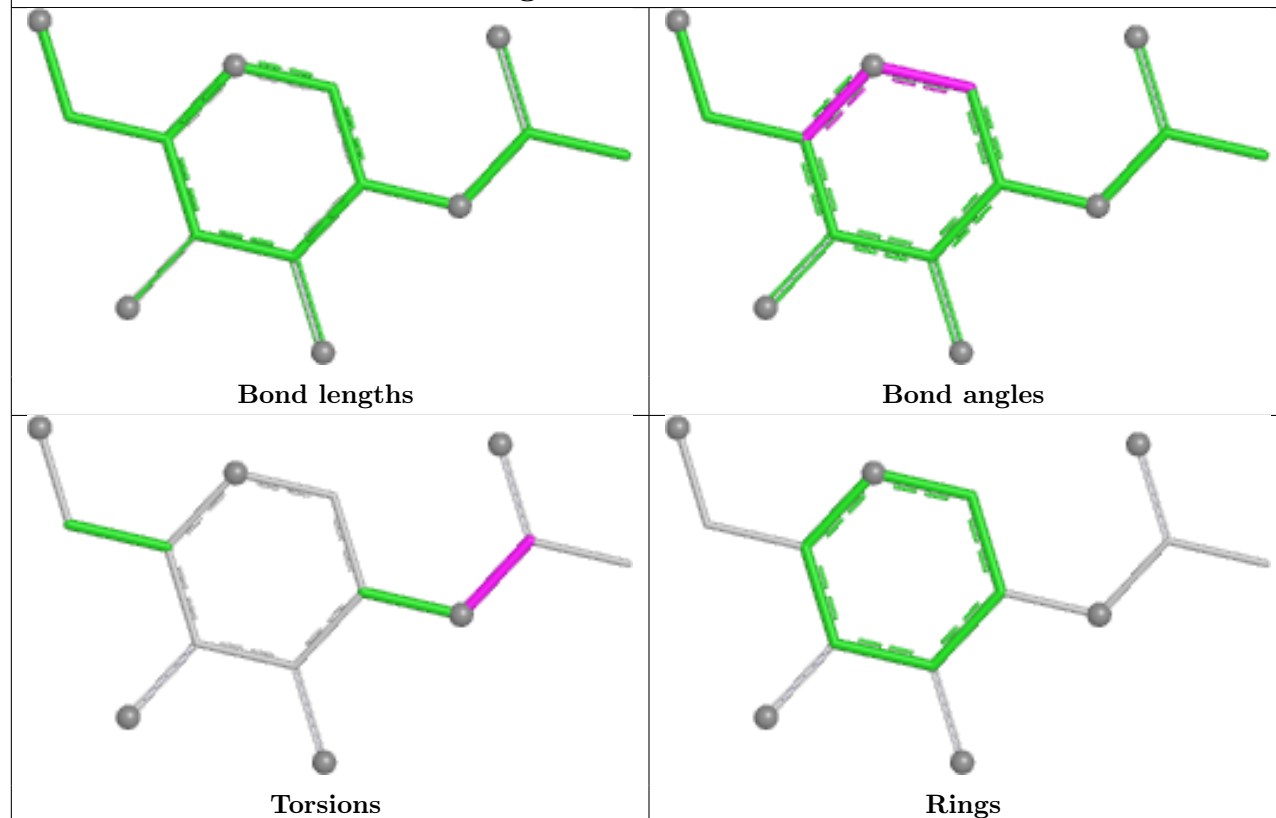
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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



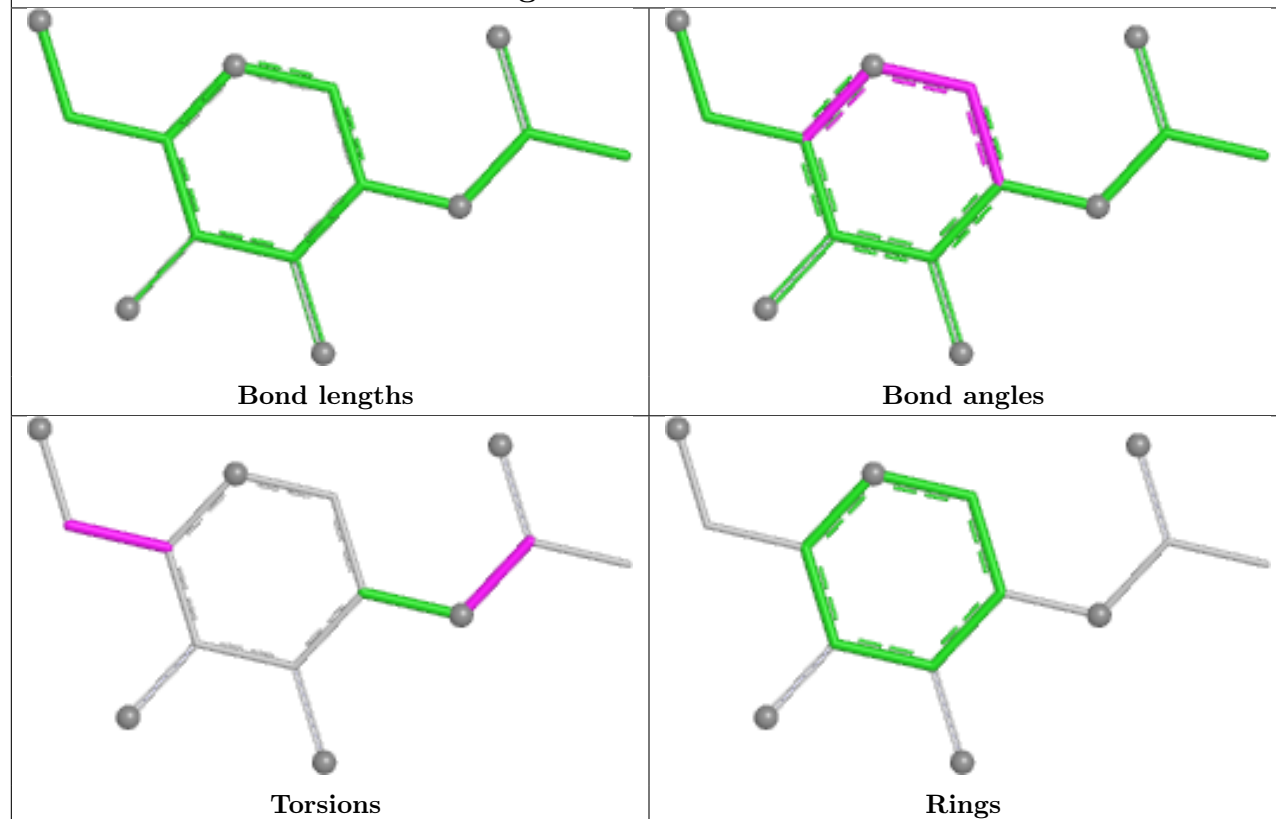
Ligand NAG A 1505



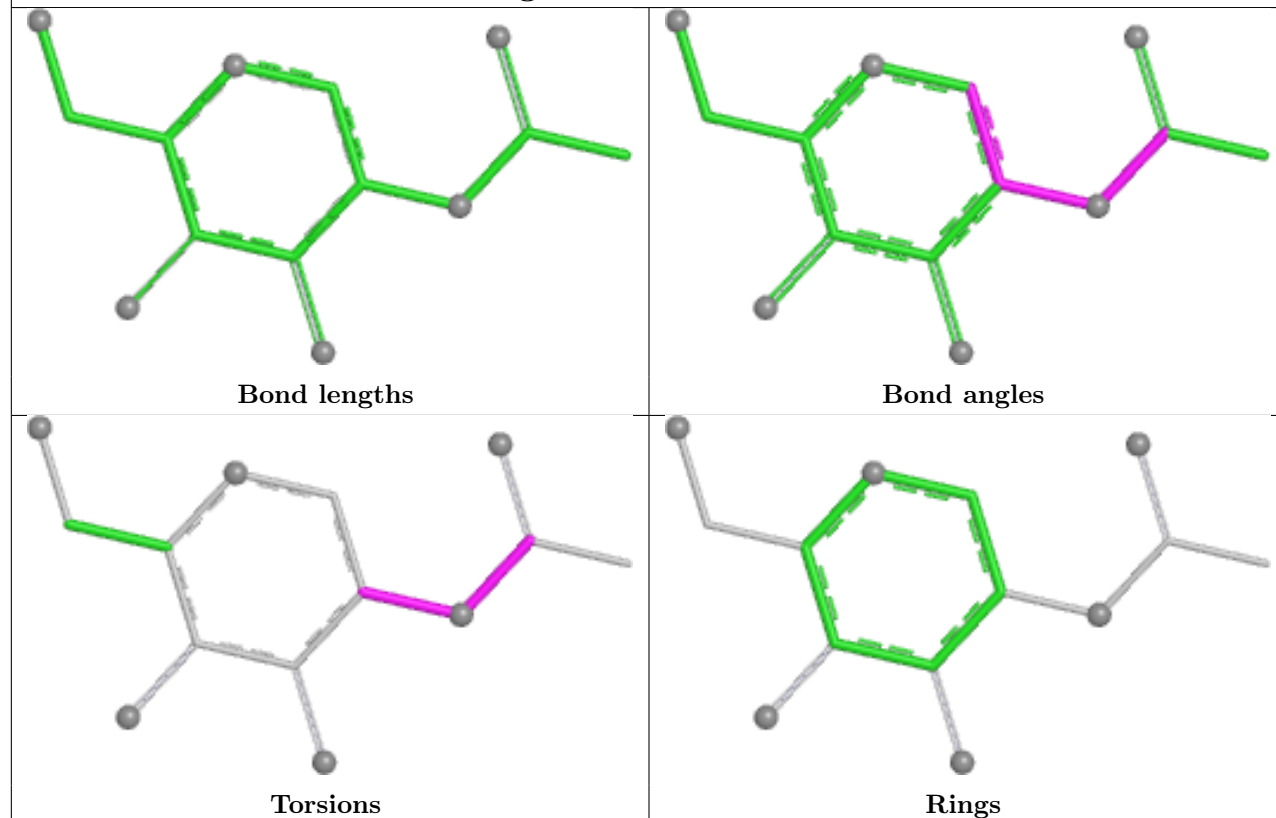
Ligand NAG A 1514

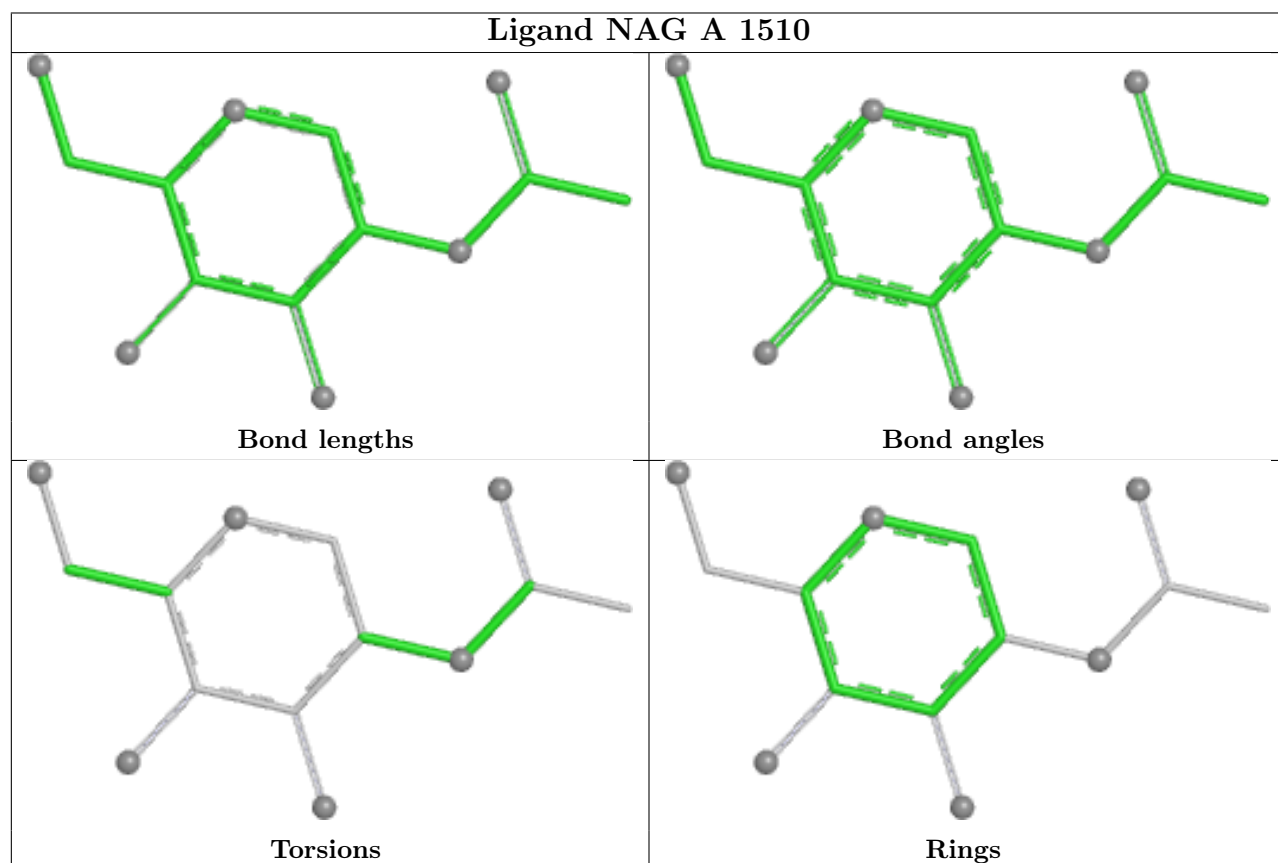
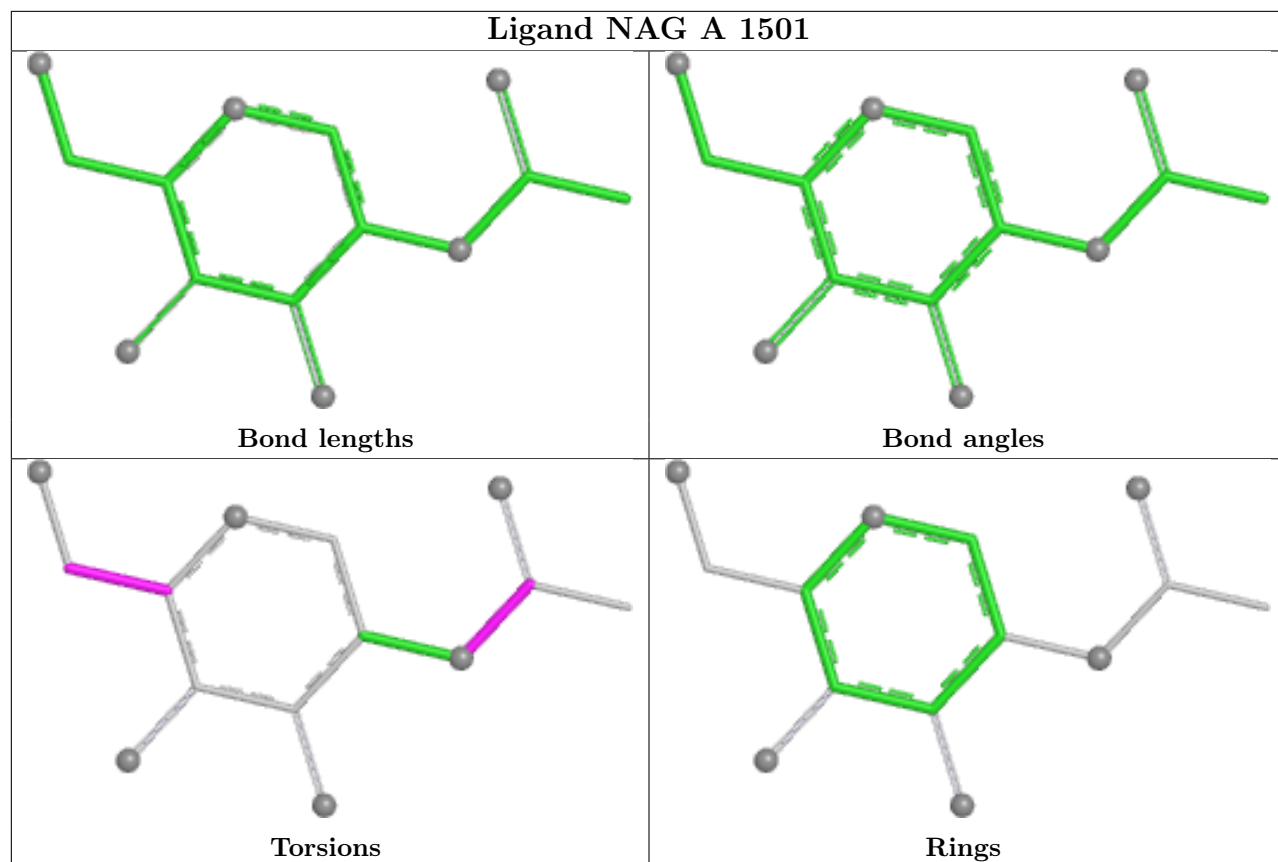


Ligand NAG A 1502

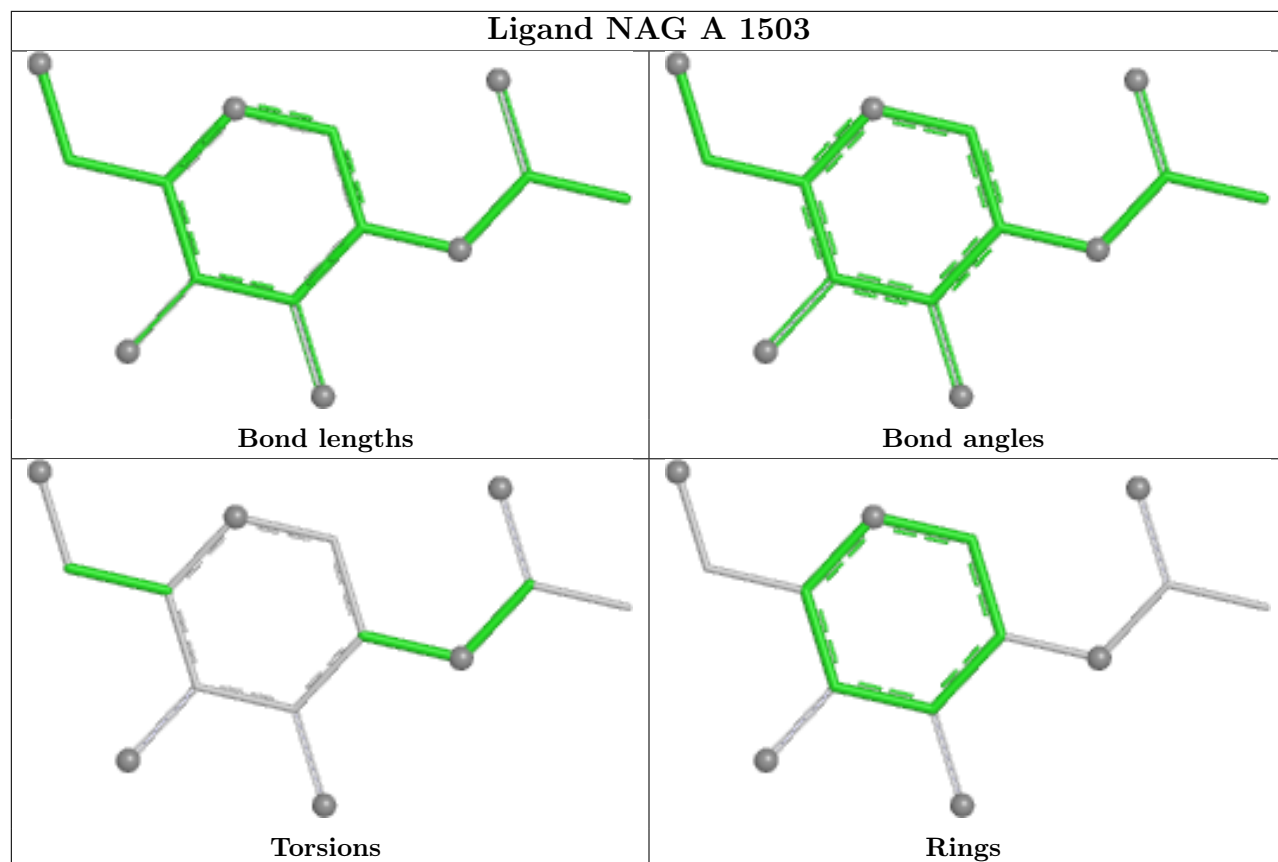


Ligand NAG A 1504

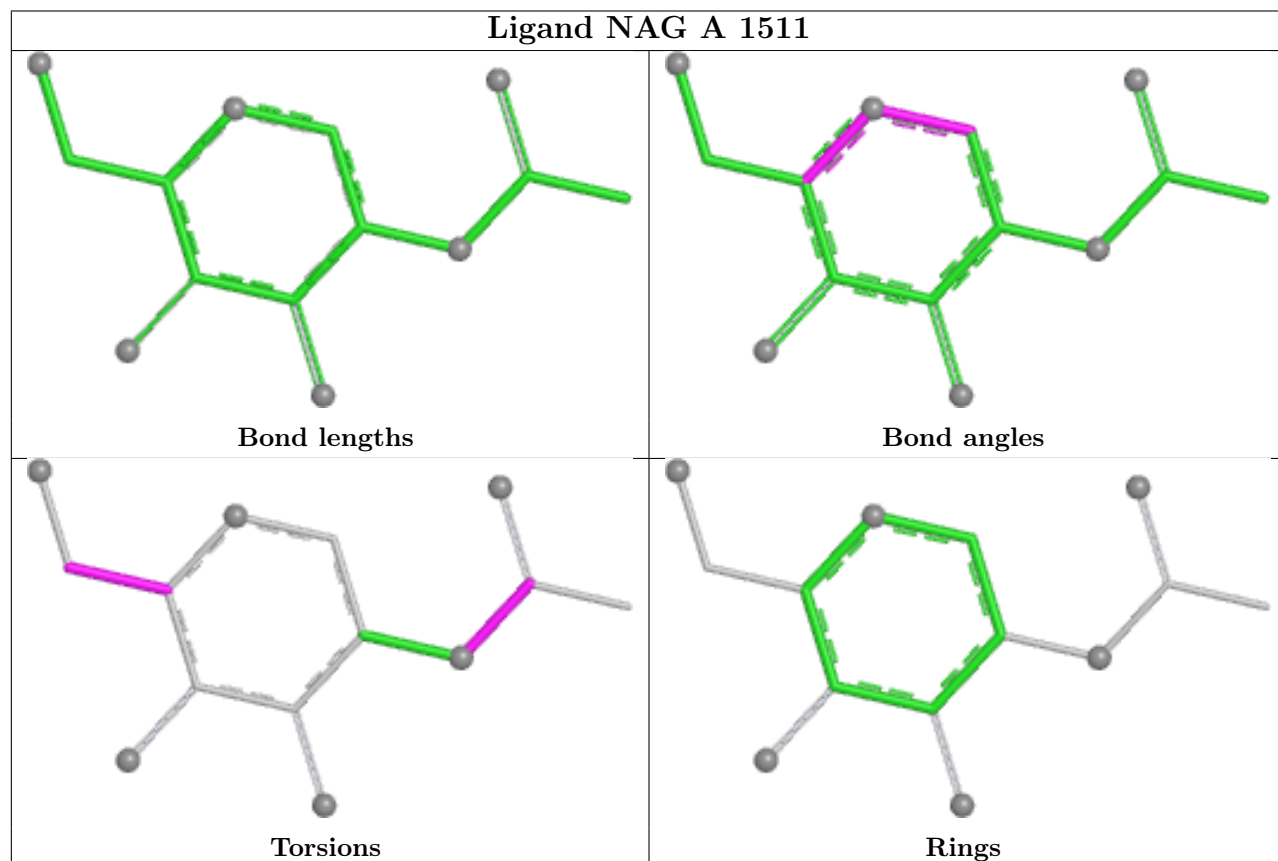




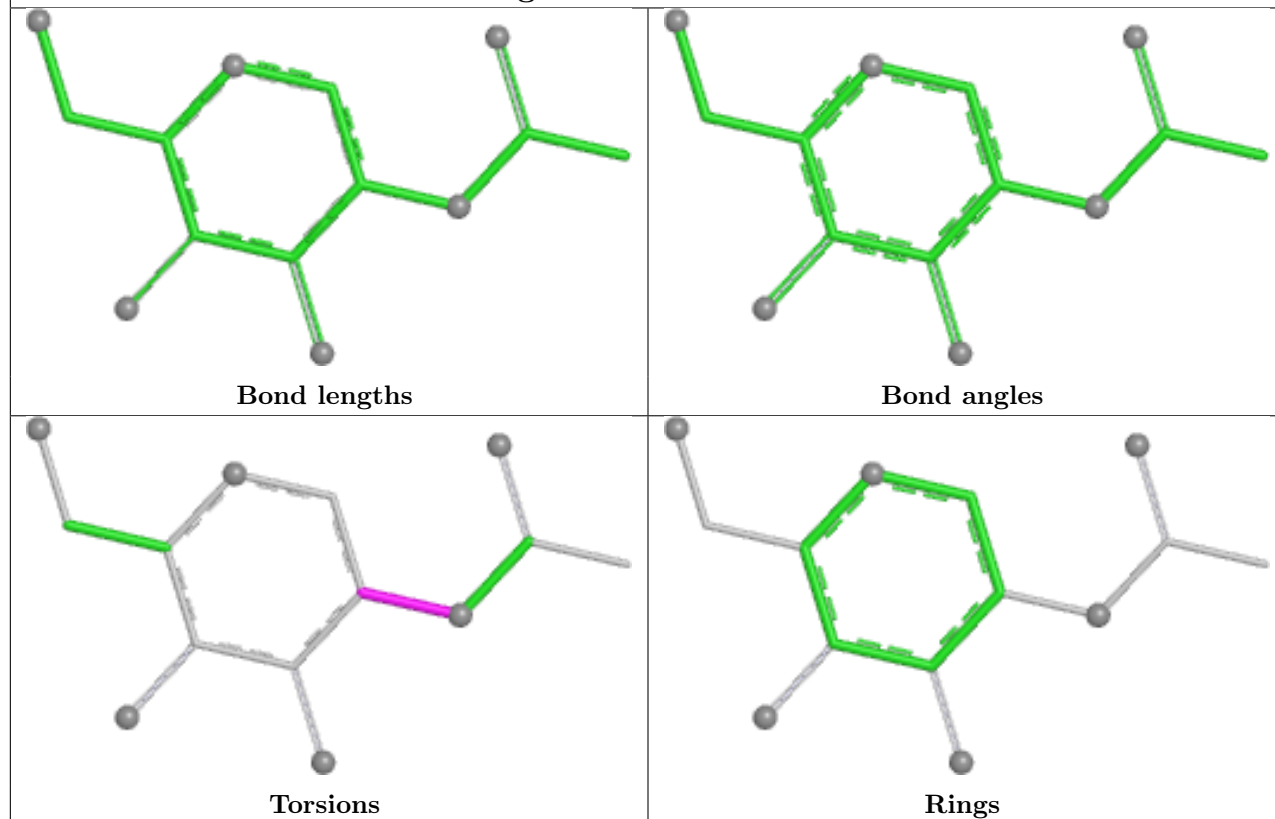
Ligand NAG A 1503



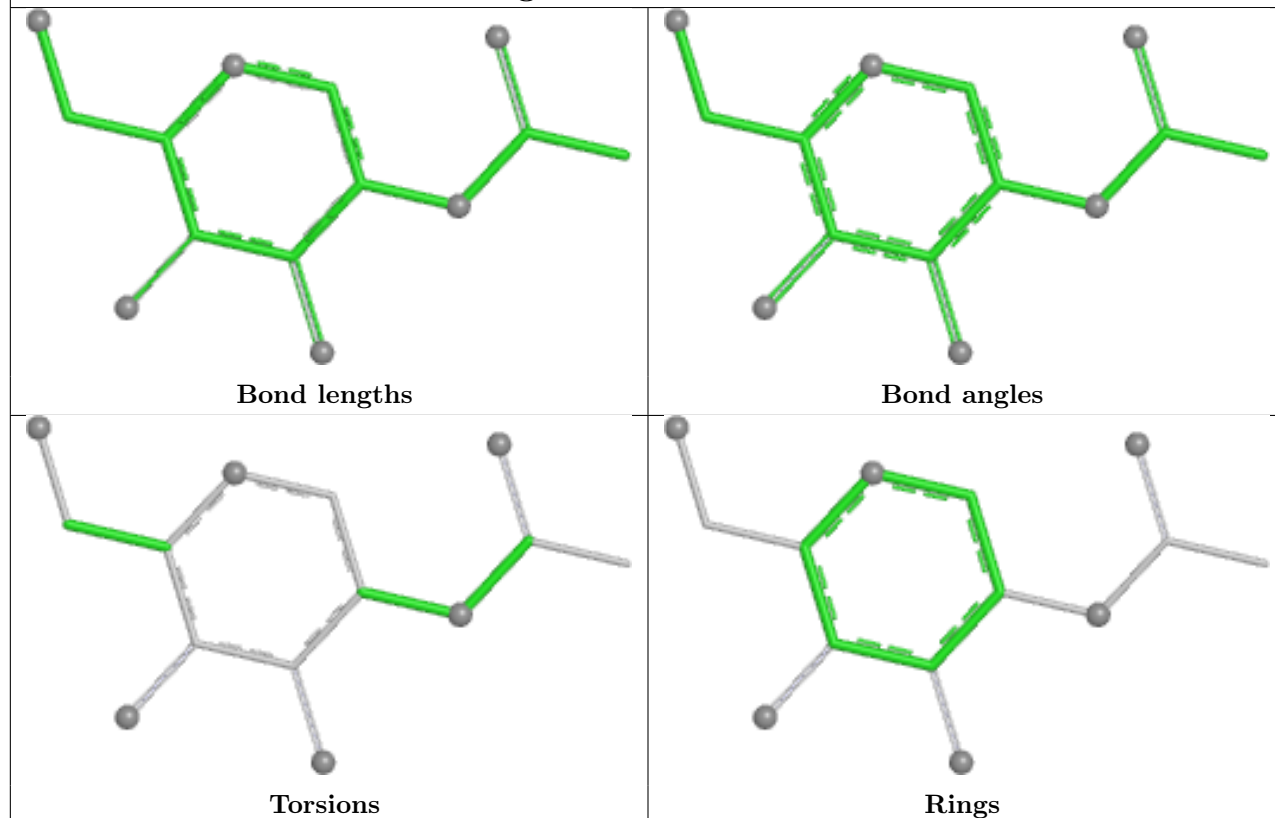
Ligand NAG A 1511

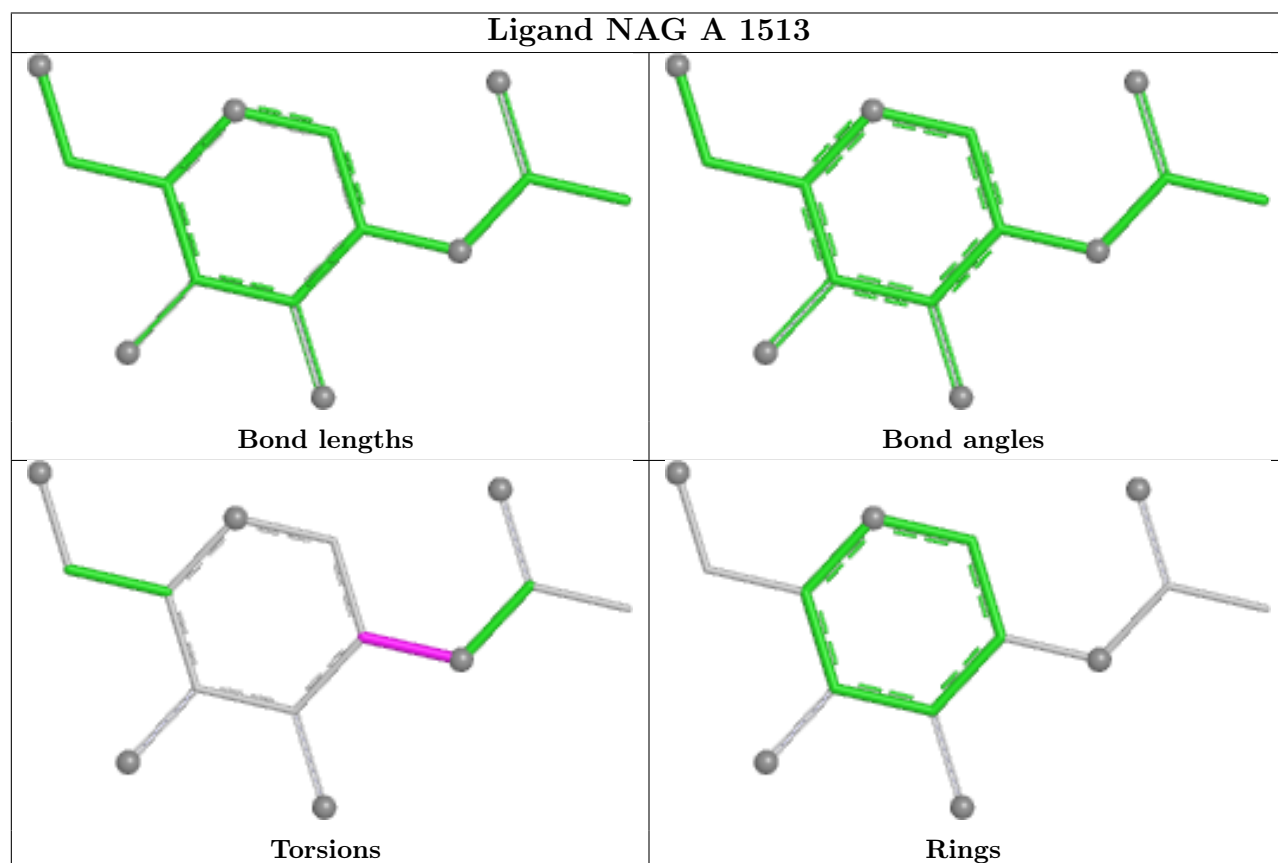
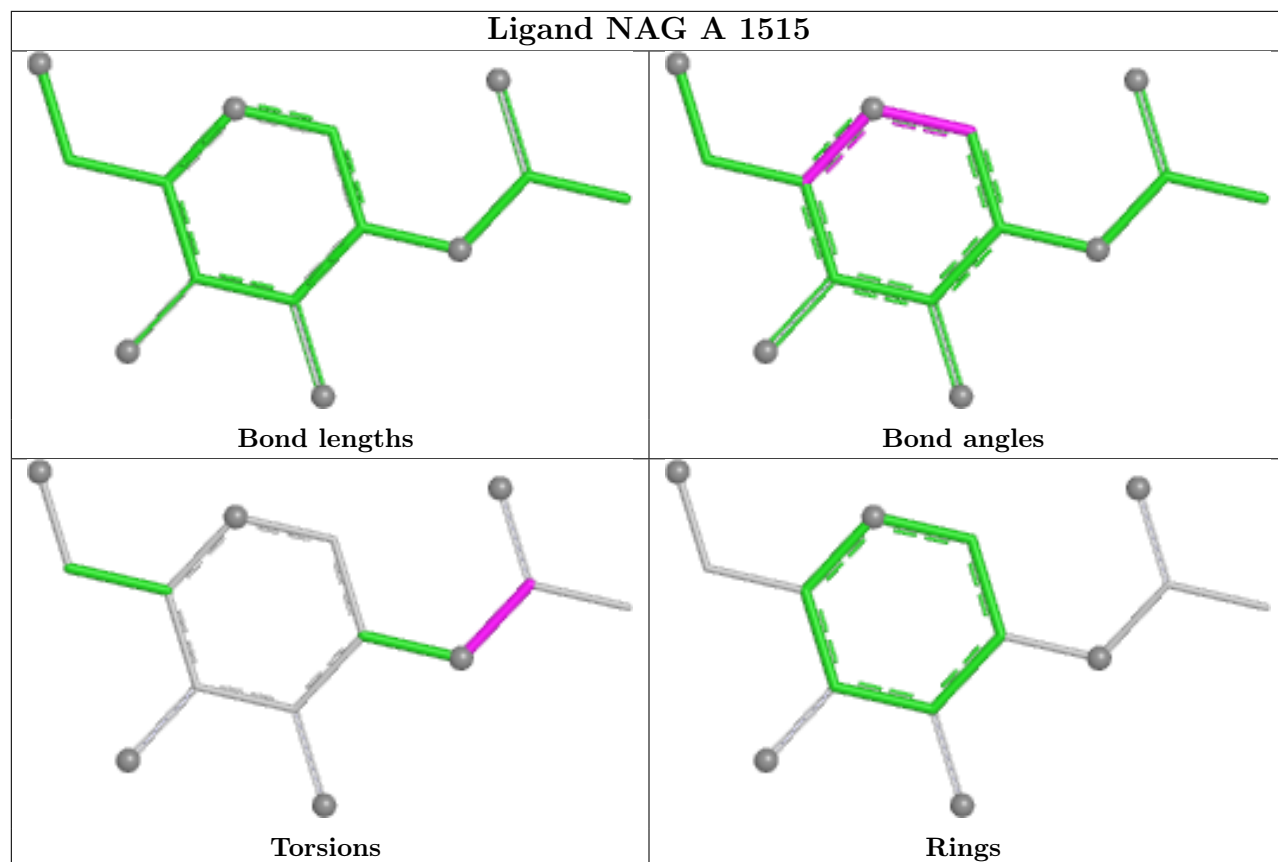


Ligand NAG A 1512

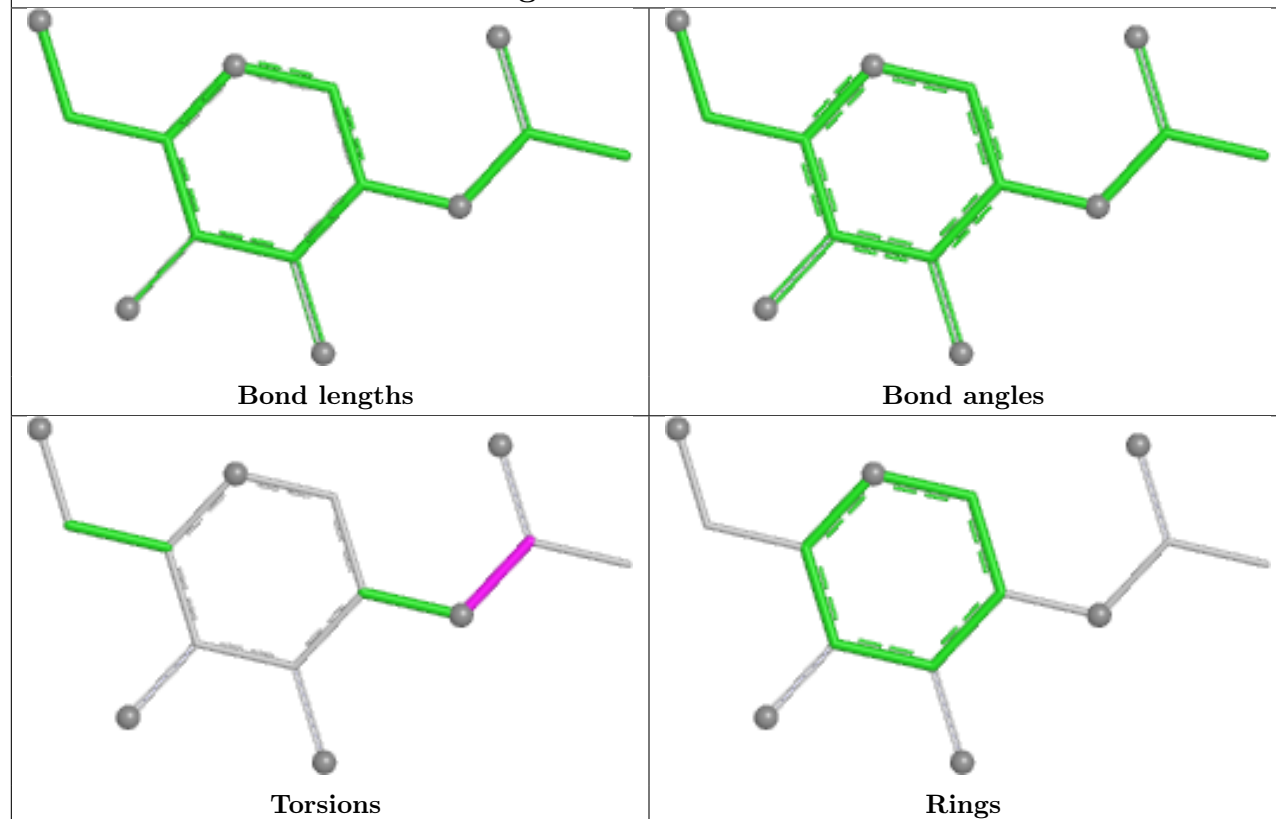


Ligand NAG A 1509

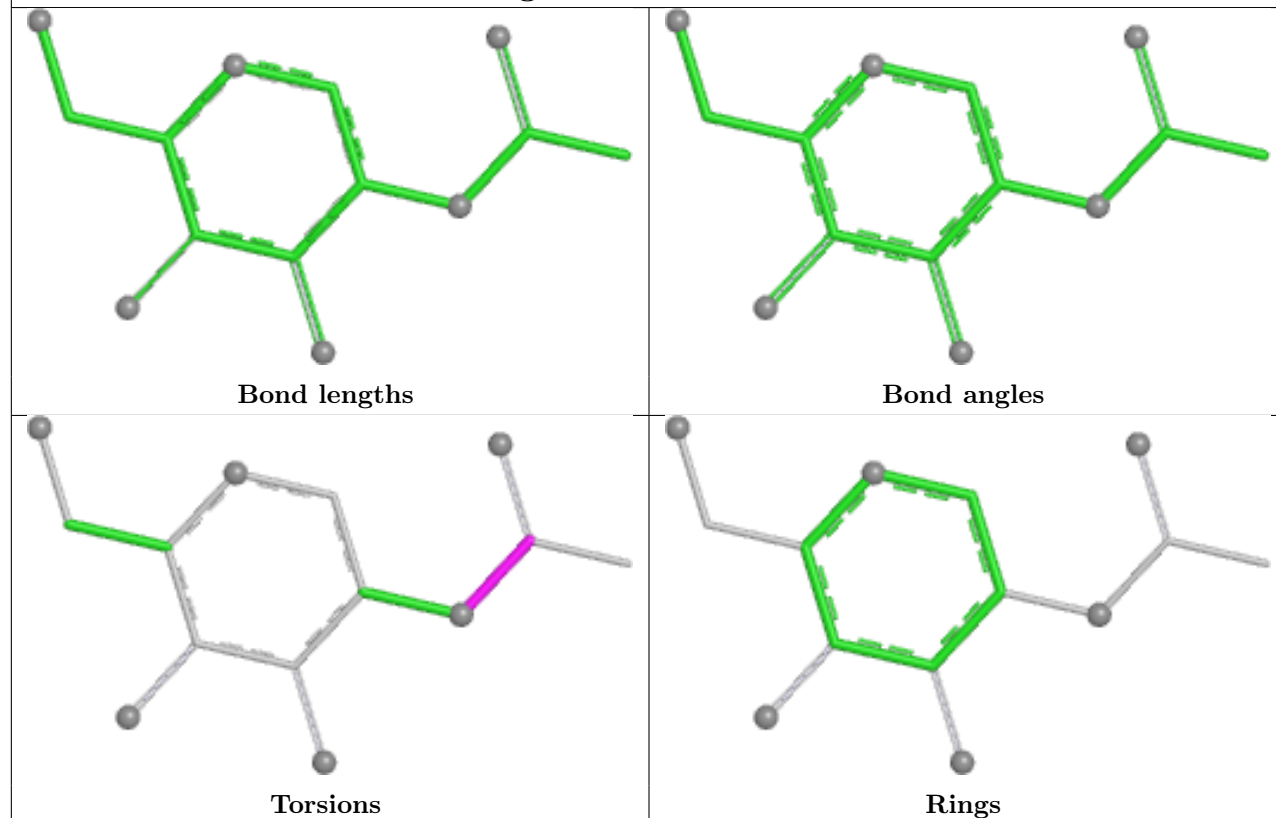




Ligand NAG A 1506



Ligand NAG A 1507



5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

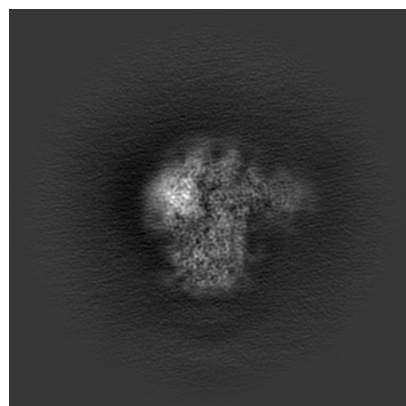
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-64076. These allow visual inspection of the internal detail of the map and identification of artifacts.

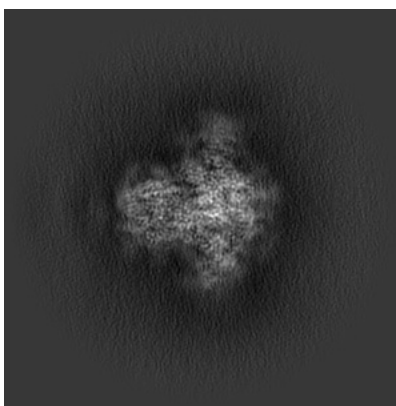
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

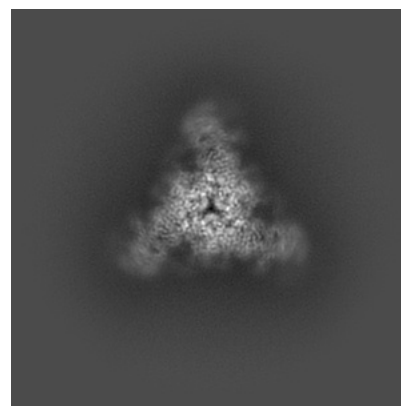
6.1.1 Primary map



X

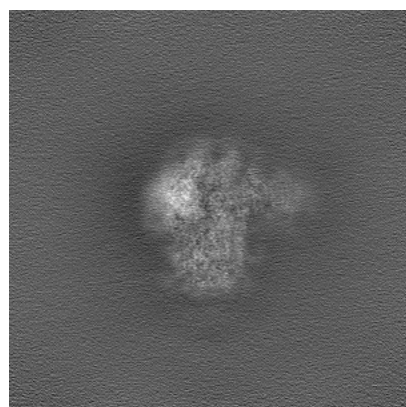


Y

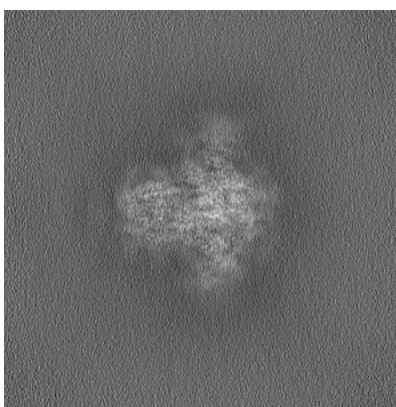


Z

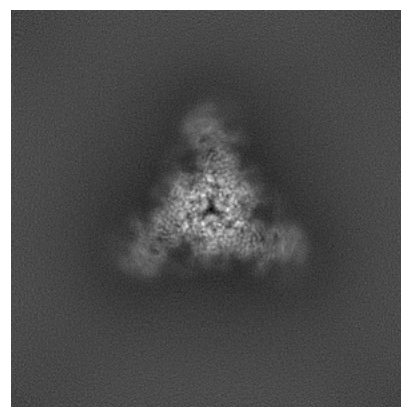
6.1.2 Raw map



X



Y

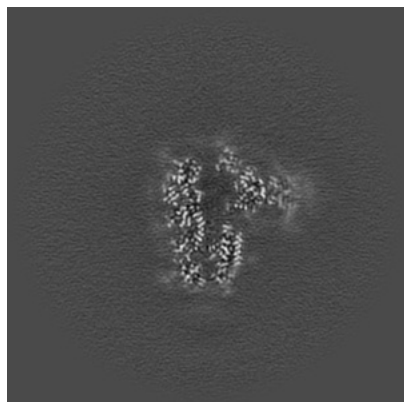


Z

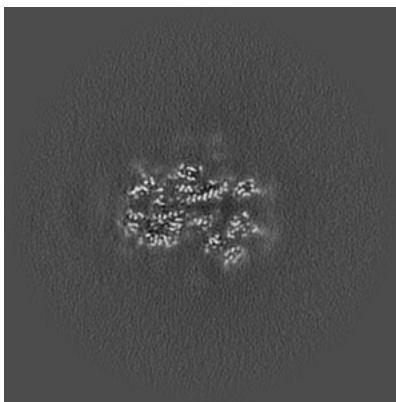
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

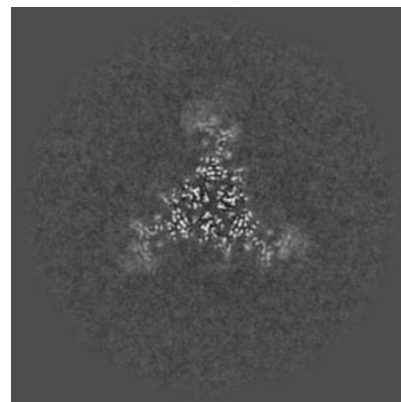
6.2.1 Primary map



X Index: 240

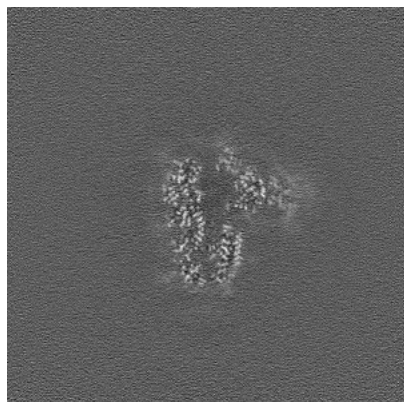


Y Index: 240

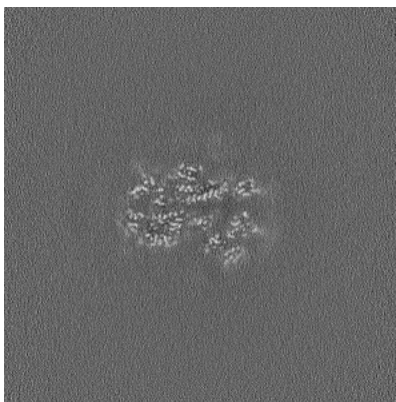


Z Index: 240

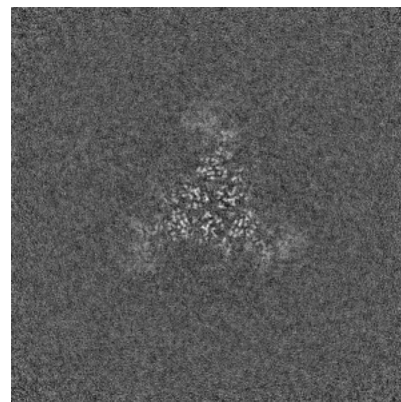
6.2.2 Raw map



X Index: 240



Y Index: 240

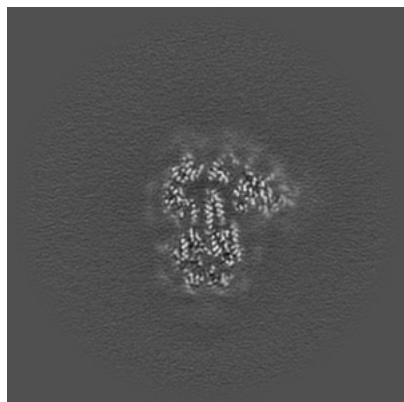


Z Index: 240

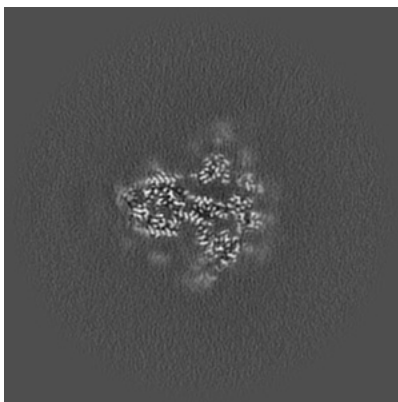
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

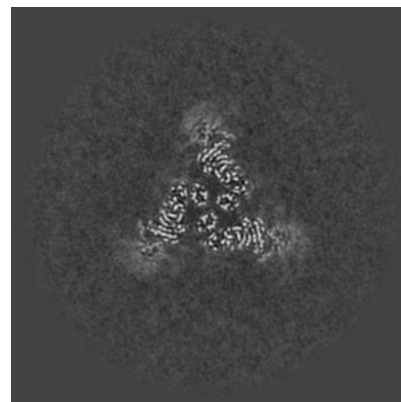
6.3.1 Primary map



X Index: 250

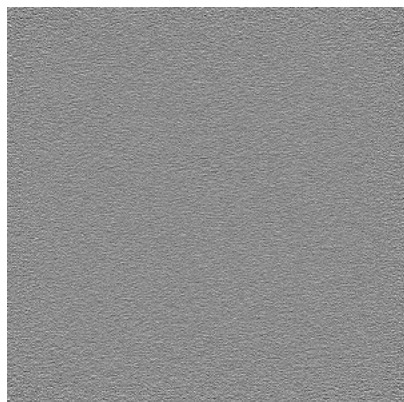


Y Index: 223

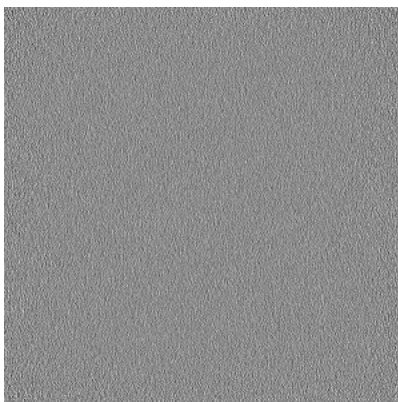


Z Index: 254

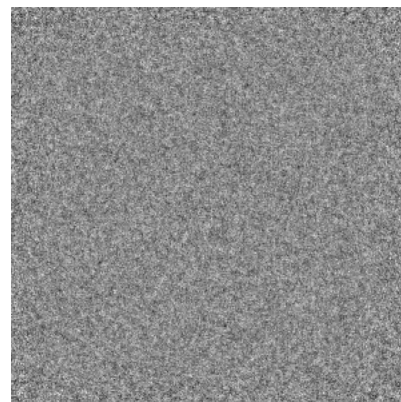
6.3.2 Raw map



X Index: 0



Y Index: 0

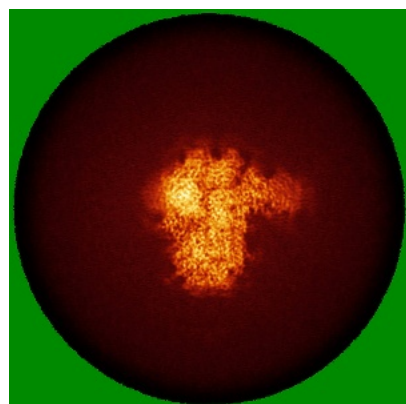


Z Index: 479

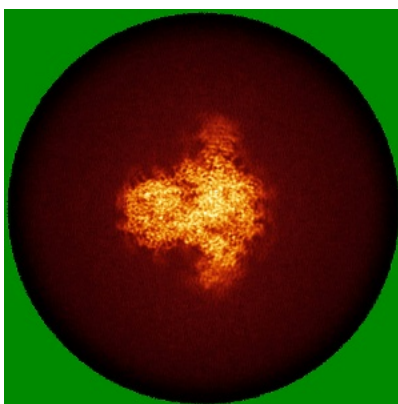
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) [i](#)

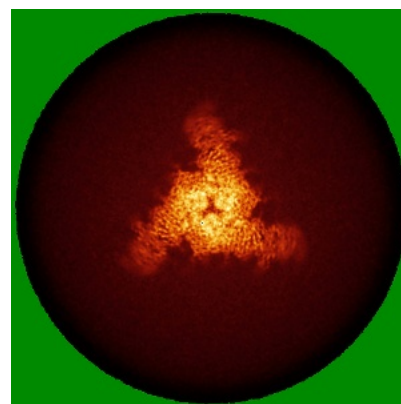
6.4.1 Primary map



X

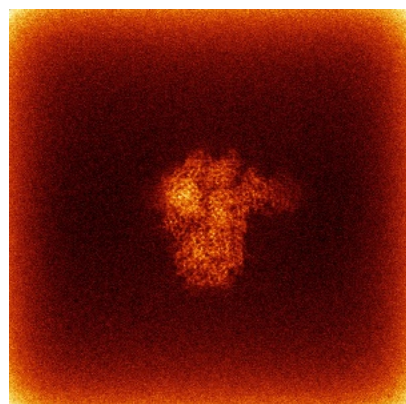


Y

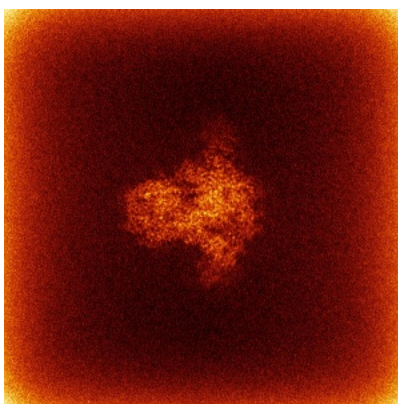


Z

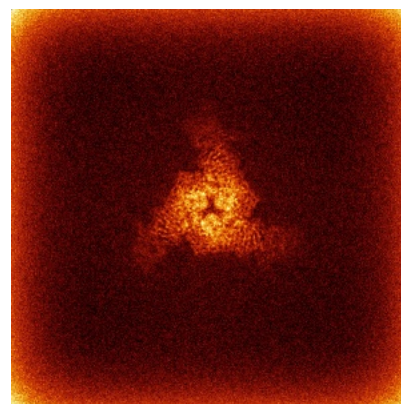
6.4.2 Raw map



X



Y

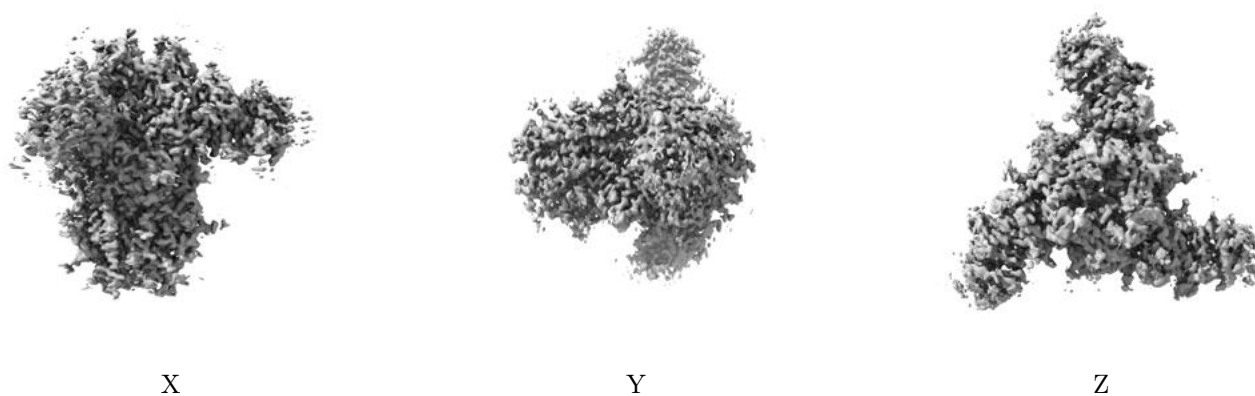


Z

The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

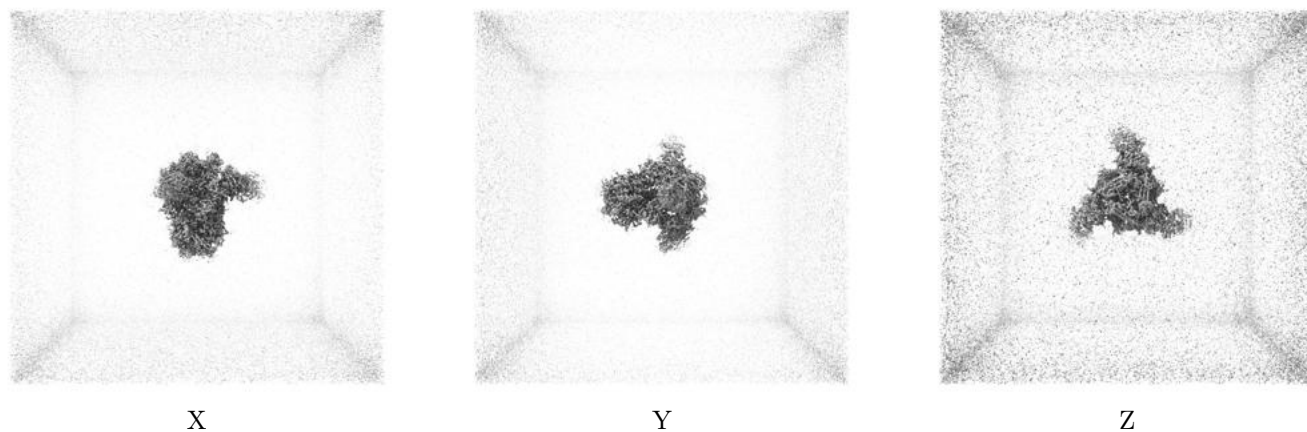
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.182. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map



These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

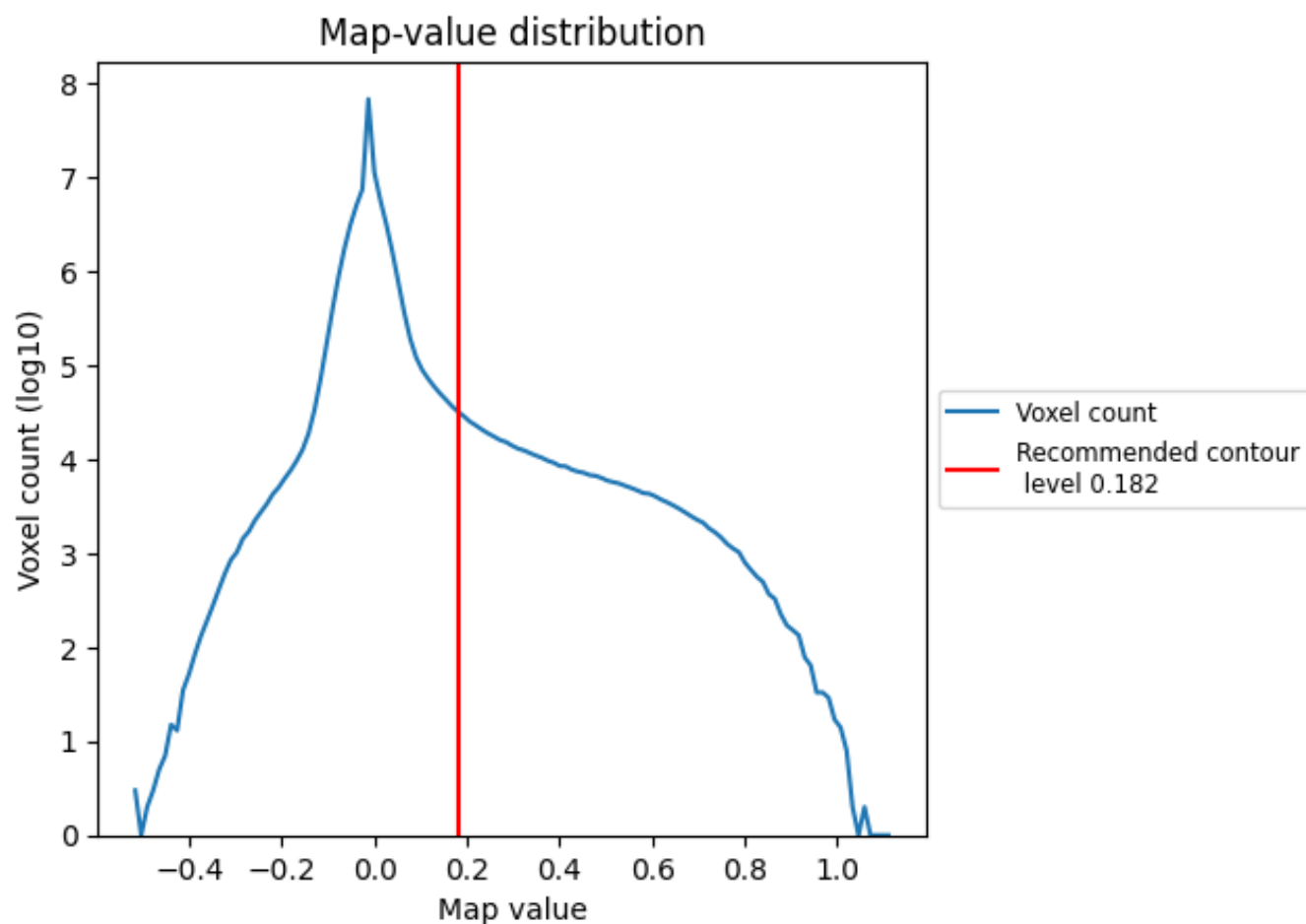
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

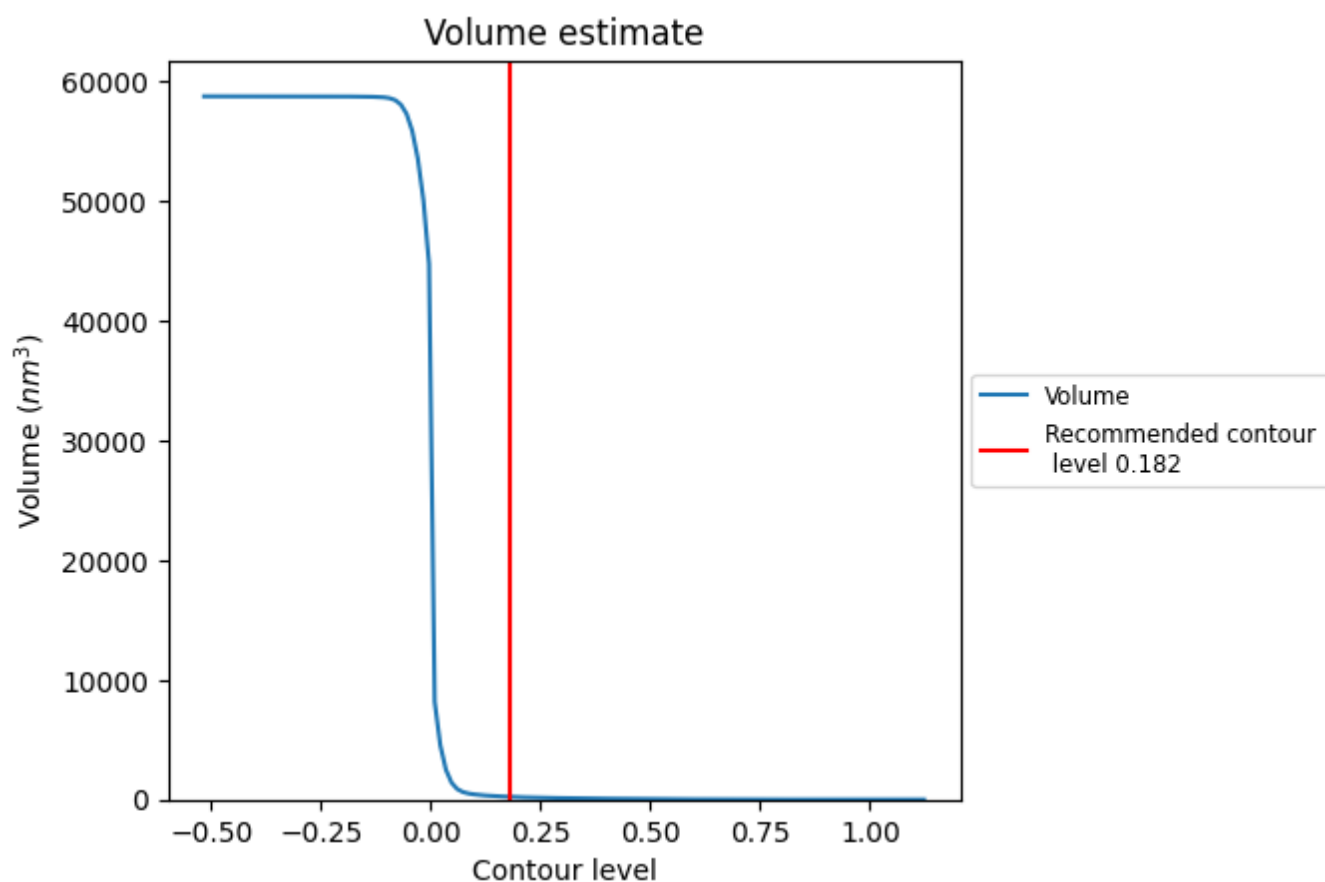
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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

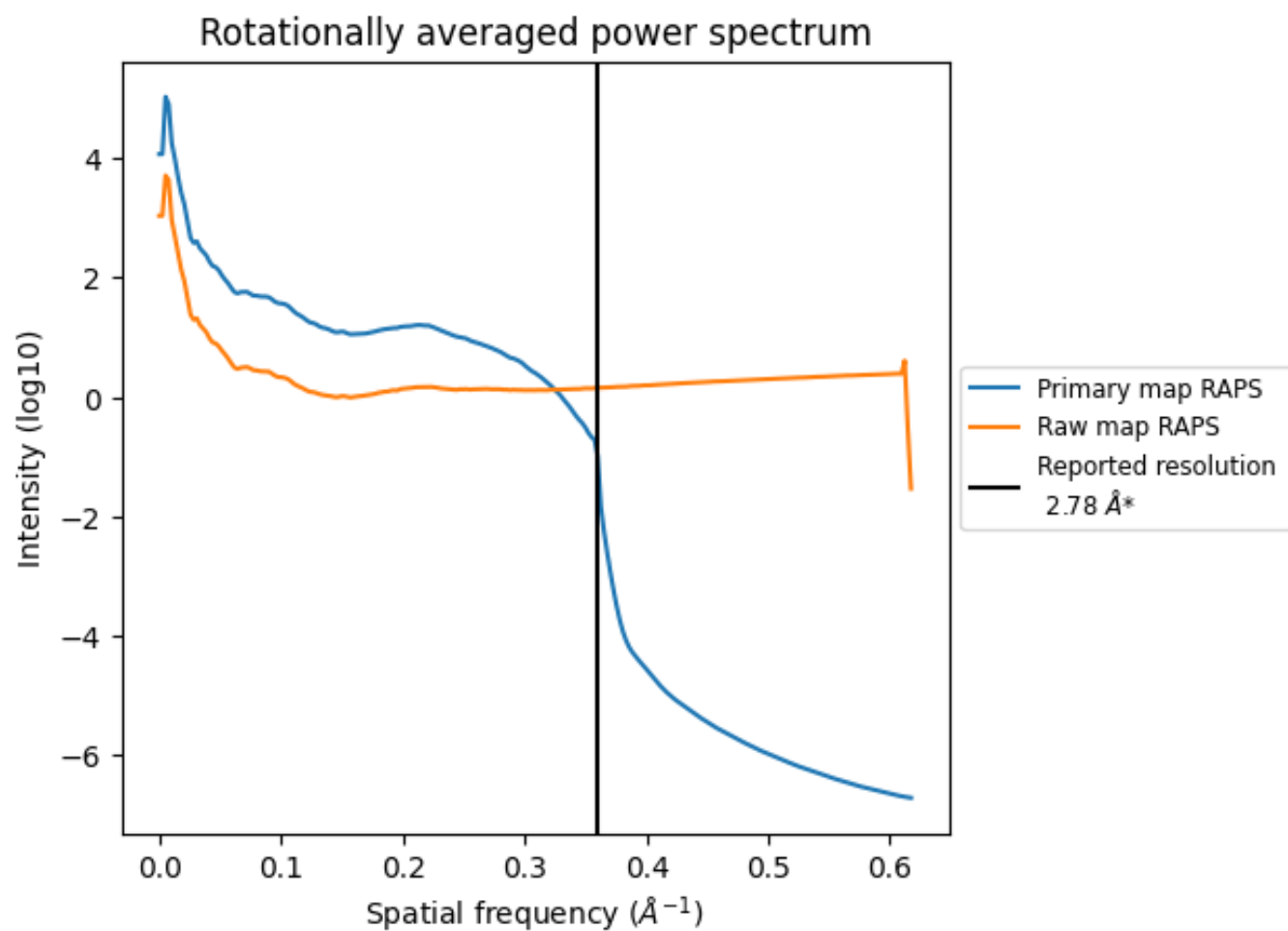
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 226 nm³; this corresponds to an approximate mass of 204 kDa.

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

7.3 Rotationally averaged power spectrum ⓘ

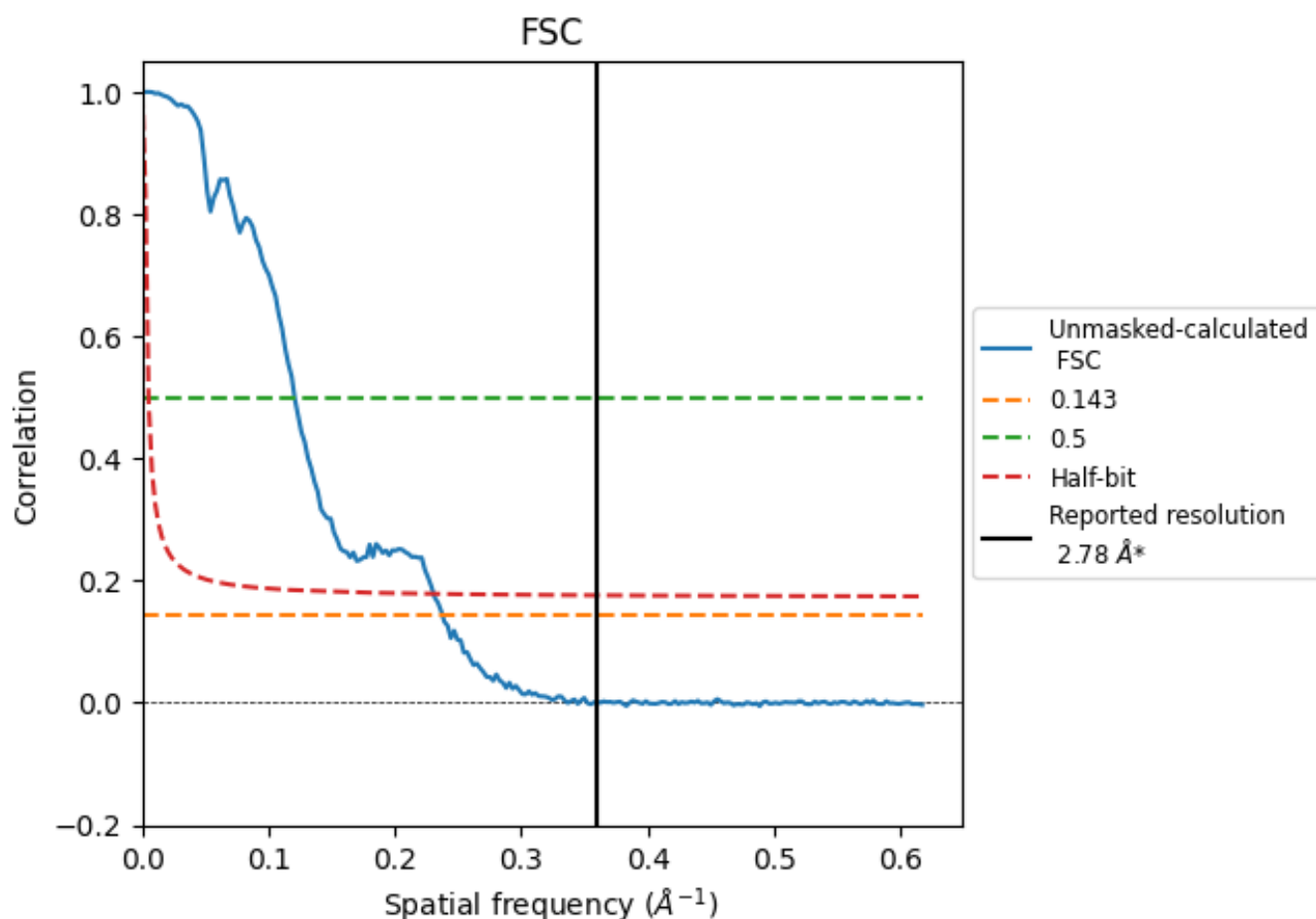


*Reported resolution corresponds to spatial frequency of 0.360 $\text{\AA}^{-1}$

8 Fourier-Shell correlation [i](#)

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of 0.360 Å⁻¹

8.2 Resolution estimates [i](#)

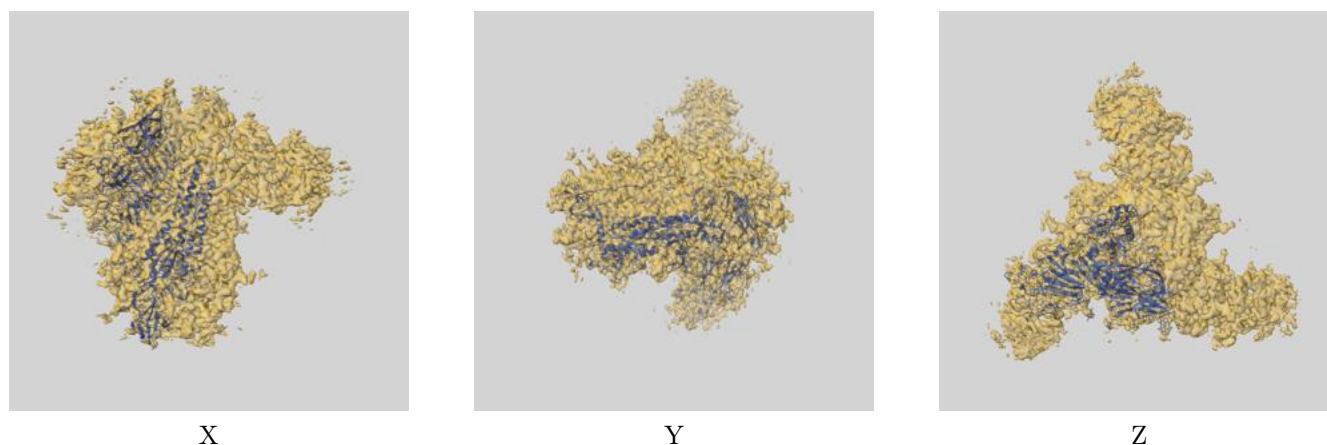
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.78	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	4.21	8.29	4.34

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 4.21 differs from the reported value 2.78 by more than 10 %

9 Map-model fit [i](#)

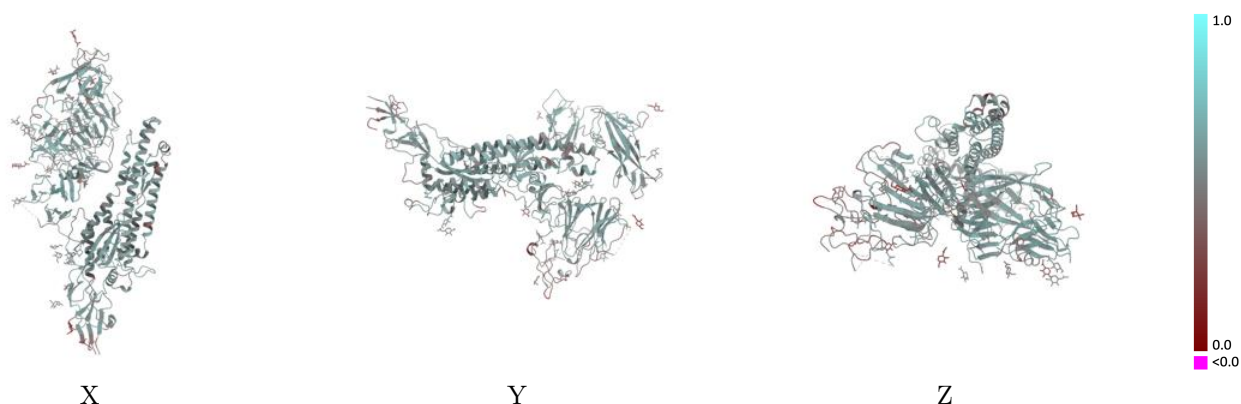
This section contains information regarding the fit between EMDB map EMD-64076 and PDB model 9UE3. Per-residue inclusion information can be found in section [3](#) on page [9](#).

9.1 Map-model overlay [i](#)



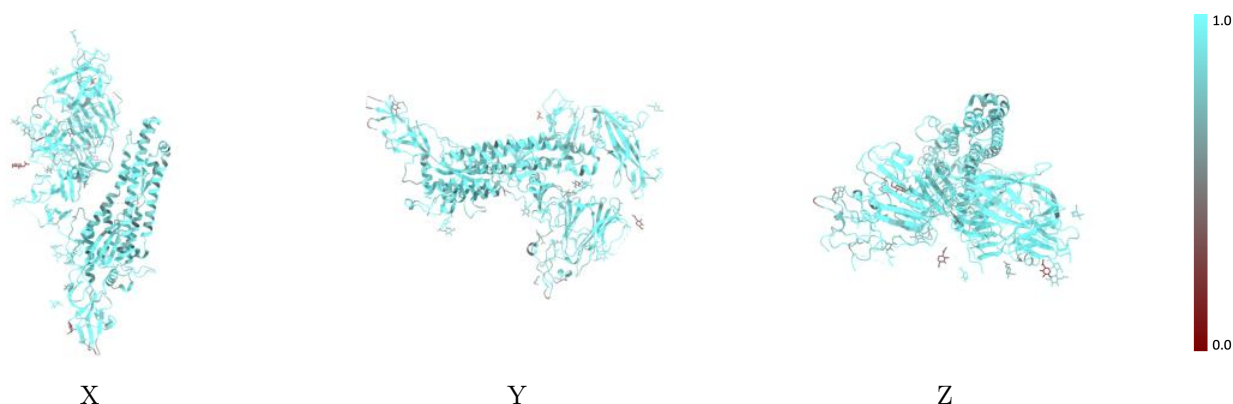
The images above show the 3D surface view of the map at the recommended contour level 0.182 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



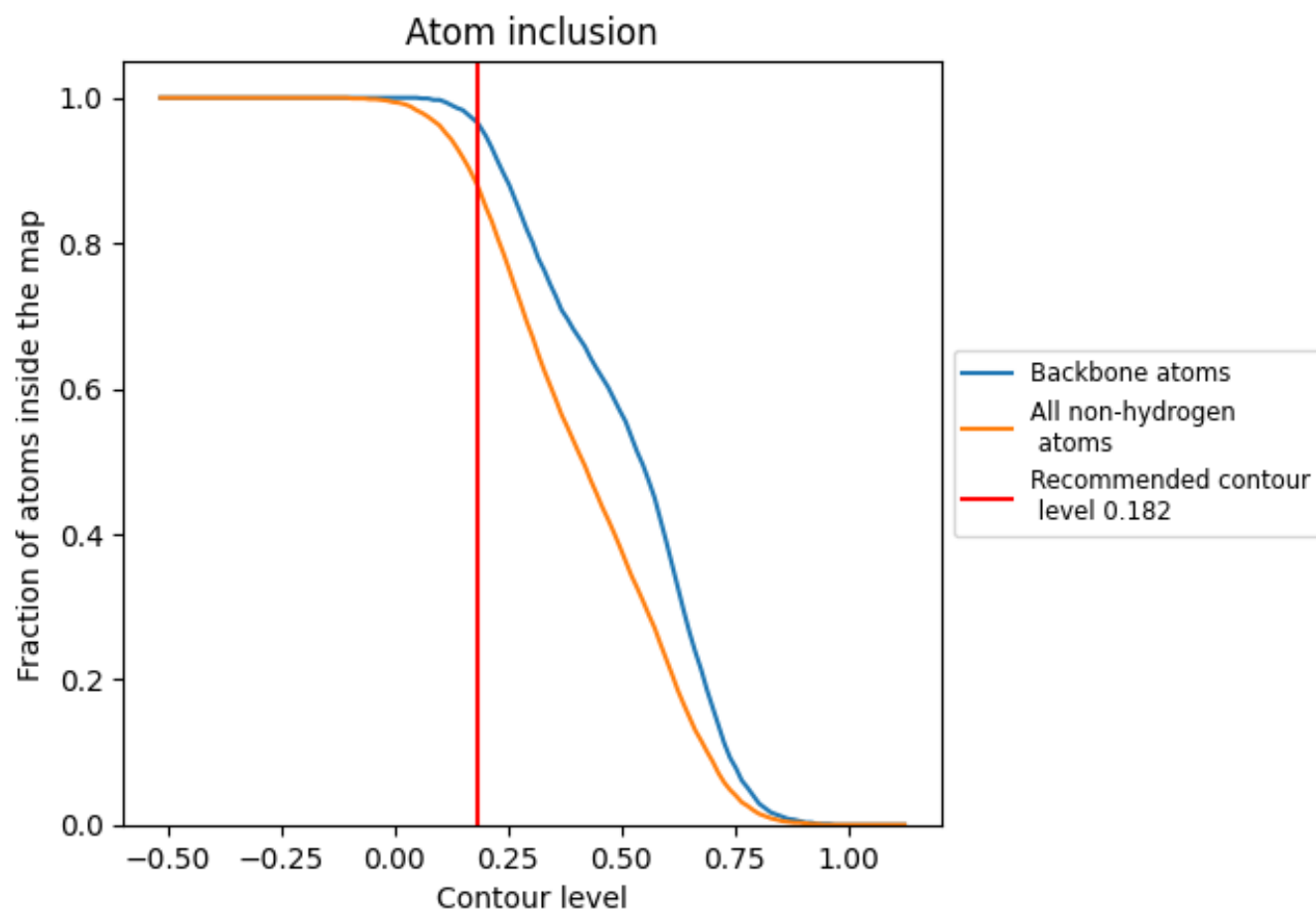
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions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

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



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.182).

9.4 Atom inclusion [i](#)



At the recommended contour level, 97% of all backbone atoms, 88% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.182) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8800	0.5260
A	0.8810	0.5280
B	0.7950	0.4980
C	0.8000	0.4770
E	0.7500	0.4590
F	0.9290	0.4970
G	0.7860	0.4880
H	0.8570	0.4890
I	0.9200	0.5050

1.0

0.0

<0.0