



Full wwPDB EM Validation Report ⓘ

Mar 8, 2026 – 01:57 PM UTC

PDB ID : 7KEC / pdb_00007kec
EMDB ID : EMD-22838
Title : SARS-CoV-2 D614G 1-RBD-up Spike Protein Trimer without the P986-P987 stabilizing mutations (S-GSAS-D614G Sub-Classification)
Authors : Gobeil, S.; Acharya, P.
Deposited on : 2020-10-10
Resolution : 3.84 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:

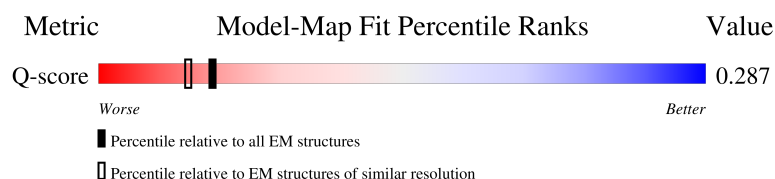
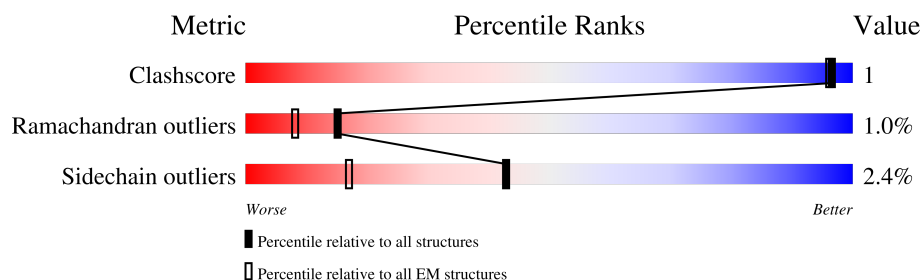
EMDB validation analysis : 0.0.1.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
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

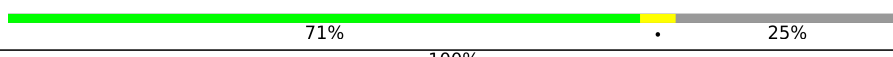
The reported resolution of this entry is 3.84 Å.

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.



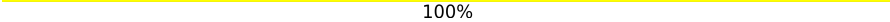
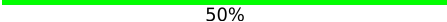
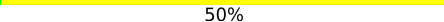
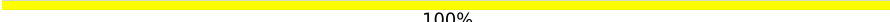
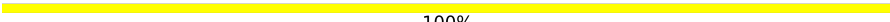
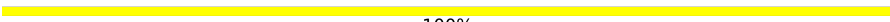
Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	9033 (3.34 - 4.34)

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	1288	
1	B	1288	
1	C	1288	
2	D	2	

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
2	E	2	 100%
2	F	2	 100%
2	G	2	 100%
2	H	2	 100%
2	I	2	 50%  100%
2	J	2	 50%  50%
2	K	2	 100%
2	L	2	 100%
2	M	2	 100%
2	N	2	 100%
2	O	2	 100%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 22337 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.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	966	Total	C	N	O	S	0	0
			7394	4741	1237	1384	32		
1	B	949	Total	C	N	O	S	0	0
			6863	4364	1164	1303	32		
1	C	960	Total	C	N	O	S	0	0
			7282	4667	1223	1360	32		

There are 252 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	614	GLY	ASP	engineered mutation	UNP P0DTC2
A	682	GLY	ARG	engineered mutation	UNP P0DTC2
A	683	SER	ARG	engineered mutation	UNP P0DTC2
A	685	SER	ARG	engineered mutation	UNP P0DTC2
A	1209	GLY	-	expression tag	UNP P0DTC2
A	1210	SER	-	expression tag	UNP P0DTC2
A	1211	GLY	-	expression tag	UNP P0DTC2
A	1212	TYR	-	expression tag	UNP P0DTC2
A	1213	ILE	-	expression tag	UNP P0DTC2
A	1214	PRO	-	expression tag	UNP P0DTC2
A	1215	GLU	-	expression tag	UNP P0DTC2
A	1216	ALA	-	expression tag	UNP P0DTC2
A	1217	PRO	-	expression tag	UNP P0DTC2
A	1218	ARG	-	expression tag	UNP P0DTC2
A	1219	ASP	-	expression tag	UNP P0DTC2
A	1220	GLY	-	expression tag	UNP P0DTC2
A	1221	GLN	-	expression tag	UNP P0DTC2
A	1222	ALA	-	expression tag	UNP P0DTC2
A	1223	TYR	-	expression tag	UNP P0DTC2
A	1224	VAL	-	expression tag	UNP P0DTC2
A	1225	ARG	-	expression tag	UNP P0DTC2
A	1226	LYS	-	expression tag	UNP P0DTC2
A	1227	ASP	-	expression tag	UNP P0DTC2
A	1228	GLY	-	expression tag	UNP P0DTC2

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
A	1229	GLU	-	expression tag	UNP P0DTC2
A	1230	TRP	-	expression tag	UNP P0DTC2
A	1231	VAL	-	expression tag	UNP P0DTC2
A	1232	LEU	-	expression tag	UNP P0DTC2
A	1233	LEU	-	expression tag	UNP P0DTC2
A	1234	SER	-	expression tag	UNP P0DTC2
A	1235	THR	-	expression tag	UNP P0DTC2
A	1236	PHE	-	expression tag	UNP P0DTC2
A	1237	LEU	-	expression tag	UNP P0DTC2
A	1238	GLY	-	expression tag	UNP P0DTC2
A	1239	ARG	-	expression tag	UNP P0DTC2
A	1240	SER	-	expression tag	UNP P0DTC2
A	1241	LEU	-	expression tag	UNP P0DTC2
A	1242	GLU	-	expression tag	UNP P0DTC2
A	1243	VAL	-	expression tag	UNP P0DTC2
A	1244	LEU	-	expression tag	UNP P0DTC2
A	1245	PHE	-	expression tag	UNP P0DTC2
A	1246	GLN	-	expression tag	UNP P0DTC2
A	1247	GLY	-	expression tag	UNP P0DTC2
A	1248	PRO	-	expression tag	UNP P0DTC2
A	1249	GLY	-	expression tag	UNP P0DTC2
A	1250	HIS	-	expression tag	UNP P0DTC2
A	1251	HIS	-	expression tag	UNP P0DTC2
A	1252	HIS	-	expression tag	UNP P0DTC2
A	1253	HIS	-	expression tag	UNP P0DTC2
A	1254	HIS	-	expression tag	UNP P0DTC2
A	1255	HIS	-	expression tag	UNP P0DTC2
A	1256	HIS	-	expression tag	UNP P0DTC2
A	1257	HIS	-	expression tag	UNP P0DTC2
A	1258	SER	-	expression tag	UNP P0DTC2
A	1259	ALA	-	expression tag	UNP P0DTC2
A	1260	TRP	-	expression tag	UNP P0DTC2
A	1261	SER	-	expression tag	UNP P0DTC2
A	1262	HIS	-	expression tag	UNP P0DTC2
A	1263	PRO	-	expression tag	UNP P0DTC2
A	1264	GLN	-	expression tag	UNP P0DTC2
A	1265	PHE	-	expression tag	UNP P0DTC2
A	1266	GLU	-	expression tag	UNP P0DTC2
A	1267	LYS	-	expression tag	UNP P0DTC2
A	1268	GLY	-	expression tag	UNP P0DTC2
A	1269	GLY	-	expression tag	UNP P0DTC2
A	1270	GLY	-	expression tag	UNP P0DTC2

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
A	1271	SER	-	expression tag	UNP P0DTC2
A	1272	GLY	-	expression tag	UNP P0DTC2
A	1273	GLY	-	expression tag	UNP P0DTC2
A	1274	GLY	-	expression tag	UNP P0DTC2
A	1275	GLY	-	expression tag	UNP P0DTC2
A	1276	SER	-	expression tag	UNP P0DTC2
A	1277	GLY	-	expression tag	UNP P0DTC2
A	1278	GLY	-	expression tag	UNP P0DTC2
A	1279	SER	-	expression tag	UNP P0DTC2
A	1280	ALA	-	expression tag	UNP P0DTC2
A	1281	TRP	-	expression tag	UNP P0DTC2
A	1282	SER	-	expression tag	UNP P0DTC2
A	1283	HIS	-	expression tag	UNP P0DTC2
A	1284	PRO	-	expression tag	UNP P0DTC2
A	1285	GLN	-	expression tag	UNP P0DTC2
A	1286	PHE	-	expression tag	UNP P0DTC2
A	1287	GLU	-	expression tag	UNP P0DTC2
A	1288	LYS	-	expression tag	UNP P0DTC2
B	614	GLY	ASP	engineered mutation	UNP P0DTC2
B	682	GLY	ARG	engineered mutation	UNP P0DTC2
B	683	SER	ARG	engineered mutation	UNP P0DTC2
B	685	SER	ARG	engineered mutation	UNP P0DTC2
B	1209	GLY	-	expression tag	UNP P0DTC2
B	1210	SER	-	expression tag	UNP P0DTC2
B	1211	GLY	-	expression tag	UNP P0DTC2
B	1212	TYR	-	expression tag	UNP P0DTC2
B	1213	ILE	-	expression tag	UNP P0DTC2
B	1214	PRO	-	expression tag	UNP P0DTC2
B	1215	GLU	-	expression tag	UNP P0DTC2
B	1216	ALA	-	expression tag	UNP P0DTC2
B	1217	PRO	-	expression tag	UNP P0DTC2
B	1218	ARG	-	expression tag	UNP P0DTC2
B	1219	ASP	-	expression tag	UNP P0DTC2
B	1220	GLY	-	expression tag	UNP P0DTC2
B	1221	GLN	-	expression tag	UNP P0DTC2
B	1222	ALA	-	expression tag	UNP P0DTC2
B	1223	TYR	-	expression tag	UNP P0DTC2
B	1224	VAL	-	expression tag	UNP P0DTC2
B	1225	ARG	-	expression tag	UNP P0DTC2
B	1226	LYS	-	expression tag	UNP P0DTC2
B	1227	ASP	-	expression tag	UNP P0DTC2
B	1228	GLY	-	expression tag	UNP P0DTC2

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
B	1229	GLU	-	expression tag	UNP P0DTC2
B	1230	TRP	-	expression tag	UNP P0DTC2
B	1231	VAL	-	expression tag	UNP P0DTC2
B	1232	LEU	-	expression tag	UNP P0DTC2
B	1233	LEU	-	expression tag	UNP P0DTC2
B	1234	SER	-	expression tag	UNP P0DTC2
B	1235	THR	-	expression tag	UNP P0DTC2
B	1236	PHE	-	expression tag	UNP P0DTC2
B	1237	LEU	-	expression tag	UNP P0DTC2
B	1238	GLY	-	expression tag	UNP P0DTC2
B	1239	ARG	-	expression tag	UNP P0DTC2
B	1240	SER	-	expression tag	UNP P0DTC2
B	1241	LEU	-	expression tag	UNP P0DTC2
B	1242	GLU	-	expression tag	UNP P0DTC2
B	1243	VAL	-	expression tag	UNP P0DTC2
B	1244	LEU	-	expression tag	UNP P0DTC2
B	1245	PHE	-	expression tag	UNP P0DTC2
B	1246	GLN	-	expression tag	UNP P0DTC2
B	1247	GLY	-	expression tag	UNP P0DTC2
B	1248	PRO	-	expression tag	UNP P0DTC2
B	1249	GLY	-	expression tag	UNP P0DTC2
B	1250	HIS	-	expression tag	UNP P0DTC2
B	1251	HIS	-	expression tag	UNP P0DTC2
B	1252	HIS	-	expression tag	UNP P0DTC2
B	1253	HIS	-	expression tag	UNP P0DTC2
B	1254	HIS	-	expression tag	UNP P0DTC2
B	1255	HIS	-	expression tag	UNP P0DTC2
B	1256	HIS	-	expression tag	UNP P0DTC2
B	1257	HIS	-	expression tag	UNP P0DTC2
B	1258	SER	-	expression tag	UNP P0DTC2
B	1259	ALA	-	expression tag	UNP P0DTC2
B	1260	TRP	-	expression tag	UNP P0DTC2
B	1261	SER	-	expression tag	UNP P0DTC2
B	1262	HIS	-	expression tag	UNP P0DTC2
B	1263	PRO	-	expression tag	UNP P0DTC2
B	1264	GLN	-	expression tag	UNP P0DTC2
B	1265	PHE	-	expression tag	UNP P0DTC2
B	1266	GLU	-	expression tag	UNP P0DTC2
B	1267	LYS	-	expression tag	UNP P0DTC2
B	1268	GLY	-	expression tag	UNP P0DTC2
B	1269	GLY	-	expression tag	UNP P0DTC2
B	1270	GLY	-	expression tag	UNP P0DTC2

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
B	1271	SER	-	expression tag	UNP P0DTC2
B	1272	GLY	-	expression tag	UNP P0DTC2
B	1273	GLY	-	expression tag	UNP P0DTC2
B	1274	GLY	-	expression tag	UNP P0DTC2
B	1275	GLY	-	expression tag	UNP P0DTC2
B	1276	SER	-	expression tag	UNP P0DTC2
B	1277	GLY	-	expression tag	UNP P0DTC2
B	1278	GLY	-	expression tag	UNP P0DTC2
B	1279	SER	-	expression tag	UNP P0DTC2
B	1280	ALA	-	expression tag	UNP P0DTC2
B	1281	TRP	-	expression tag	UNP P0DTC2
B	1282	SER	-	expression tag	UNP P0DTC2
B	1283	HIS	-	expression tag	UNP P0DTC2
B	1284	PRO	-	expression tag	UNP P0DTC2
B	1285	GLN	-	expression tag	UNP P0DTC2
B	1286	PHE	-	expression tag	UNP P0DTC2
B	1287	GLU	-	expression tag	UNP P0DTC2
B	1288	LYS	-	expression tag	UNP P0DTC2
C	614	GLY	ASP	engineered mutation	UNP P0DTC2
C	682	GLY	ARG	engineered mutation	UNP P0DTC2
C	683	SER	ARG	engineered mutation	UNP P0DTC2
C	685	SER	ARG	engineered mutation	UNP P0DTC2
C	1209	GLY	-	expression tag	UNP P0DTC2
C	1210	SER	-	expression tag	UNP P0DTC2
C	1211	GLY	-	expression tag	UNP P0DTC2
C	1212	TYR	-	expression tag	UNP P0DTC2
C	1213	ILE	-	expression tag	UNP P0DTC2
C	1214	PRO	-	expression tag	UNP P0DTC2
C	1215	GLU	-	expression tag	UNP P0DTC2
C	1216	ALA	-	expression tag	UNP P0DTC2
C	1217	PRO	-	expression tag	UNP P0DTC2
C	1218	ARG	-	expression tag	UNP P0DTC2
C	1219	ASP	-	expression tag	UNP P0DTC2
C	1220	GLY	-	expression tag	UNP P0DTC2
C	1221	GLN	-	expression tag	UNP P0DTC2
C	1222	ALA	-	expression tag	UNP P0DTC2
C	1223	TYR	-	expression tag	UNP P0DTC2
C	1224	VAL	-	expression tag	UNP P0DTC2
C	1225	ARG	-	expression tag	UNP P0DTC2
C	1226	LYS	-	expression tag	UNP P0DTC2
C	1227	ASP	-	expression tag	UNP P0DTC2
C	1228	GLY	-	expression tag	UNP P0DTC2

Continued on next page...

Continued from previous page...

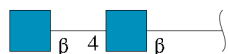
Chain	Residue	Modelled	Actual	Comment	Reference
C	1229	GLU	-	expression tag	UNP P0DTC2
C	1230	TRP	-	expression tag	UNP P0DTC2
C	1231	VAL	-	expression tag	UNP P0DTC2
C	1232	LEU	-	expression tag	UNP P0DTC2
C	1233	LEU	-	expression tag	UNP P0DTC2
C	1234	SER	-	expression tag	UNP P0DTC2
C	1235	THR	-	expression tag	UNP P0DTC2
C	1236	PHE	-	expression tag	UNP P0DTC2
C	1237	LEU	-	expression tag	UNP P0DTC2
C	1238	GLY	-	expression tag	UNP P0DTC2
C	1239	ARG	-	expression tag	UNP P0DTC2
C	1240	SER	-	expression tag	UNP P0DTC2
C	1241	LEU	-	expression tag	UNP P0DTC2
C	1242	GLU	-	expression tag	UNP P0DTC2
C	1243	VAL	-	expression tag	UNP P0DTC2
C	1244	LEU	-	expression tag	UNP P0DTC2
C	1245	PHE	-	expression tag	UNP P0DTC2
C	1246	GLN	-	expression tag	UNP P0DTC2
C	1247	GLY	-	expression tag	UNP P0DTC2
C	1248	PRO	-	expression tag	UNP P0DTC2
C	1249	GLY	-	expression tag	UNP P0DTC2
C	1250	HIS	-	expression tag	UNP P0DTC2
C	1251	HIS	-	expression tag	UNP P0DTC2
C	1252	HIS	-	expression tag	UNP P0DTC2
C	1253	HIS	-	expression tag	UNP P0DTC2
C	1254	HIS	-	expression tag	UNP P0DTC2
C	1255	HIS	-	expression tag	UNP P0DTC2
C	1256	HIS	-	expression tag	UNP P0DTC2
C	1257	HIS	-	expression tag	UNP P0DTC2
C	1258	SER	-	expression tag	UNP P0DTC2
C	1259	ALA	-	expression tag	UNP P0DTC2
C	1260	TRP	-	expression tag	UNP P0DTC2
C	1261	SER	-	expression tag	UNP P0DTC2
C	1262	HIS	-	expression tag	UNP P0DTC2
C	1263	PRO	-	expression tag	UNP P0DTC2
C	1264	GLN	-	expression tag	UNP P0DTC2
C	1265	PHE	-	expression tag	UNP P0DTC2
C	1266	GLU	-	expression tag	UNP P0DTC2
C	1267	LYS	-	expression tag	UNP P0DTC2
C	1268	GLY	-	expression tag	UNP P0DTC2
C	1269	GLY	-	expression tag	UNP P0DTC2
C	1270	GLY	-	expression tag	UNP P0DTC2

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
C	1271	SER	-	expression tag	UNP P0DTC2
C	1272	GLY	-	expression tag	UNP P0DTC2
C	1273	GLY	-	expression tag	UNP P0DTC2
C	1274	GLY	-	expression tag	UNP P0DTC2
C	1275	GLY	-	expression tag	UNP P0DTC2
C	1276	SER	-	expression tag	UNP P0DTC2
C	1277	GLY	-	expression tag	UNP P0DTC2
C	1278	GLY	-	expression tag	UNP P0DTC2
C	1279	SER	-	expression tag	UNP P0DTC2
C	1280	ALA	-	expression tag	UNP P0DTC2
C	1281	TRP	-	expression tag	UNP P0DTC2
C	1282	SER	-	expression tag	UNP P0DTC2
C	1283	HIS	-	expression tag	UNP P0DTC2
C	1284	PRO	-	expression tag	UNP P0DTC2
C	1285	GLN	-	expression tag	UNP P0DTC2
C	1286	PHE	-	expression tag	UNP P0DTC2
C	1287	GLU	-	expression tag	UNP P0DTC2
C	1288	LYS	-	expression tag	UNP P0DTC2

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



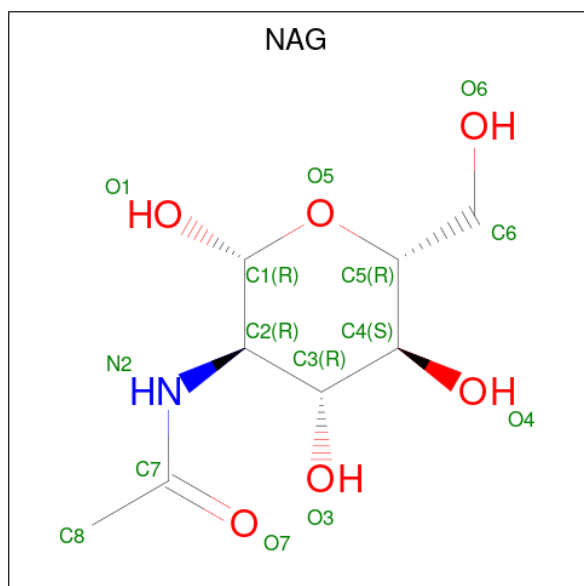
Mol	Chain	Residues	Atoms				AltConf	Trace
2	D	2	Total	C	N	O	0	0
			28	16	2	10		
2	E	2	Total	C	N	O	0	0
			28	16	2	10		
2	F	2	Total	C	N	O	0	0
			28	16	2	10		
2	G	2	Total	C	N	O	0	0
			28	16	2	10		
2	H	2	Total	C	N	O	0	0
			28	16	2	10		
2	I	2	Total	C	N	O	0	0
			28	16	2	10		
2	J	2	Total	C	N	O	0	0
			28	16	2	10		

Continued on next page...

Continued from previous page...

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

- Molecule 3 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



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

Continued on next page...

Continued from previous page...

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

Continued on next page...

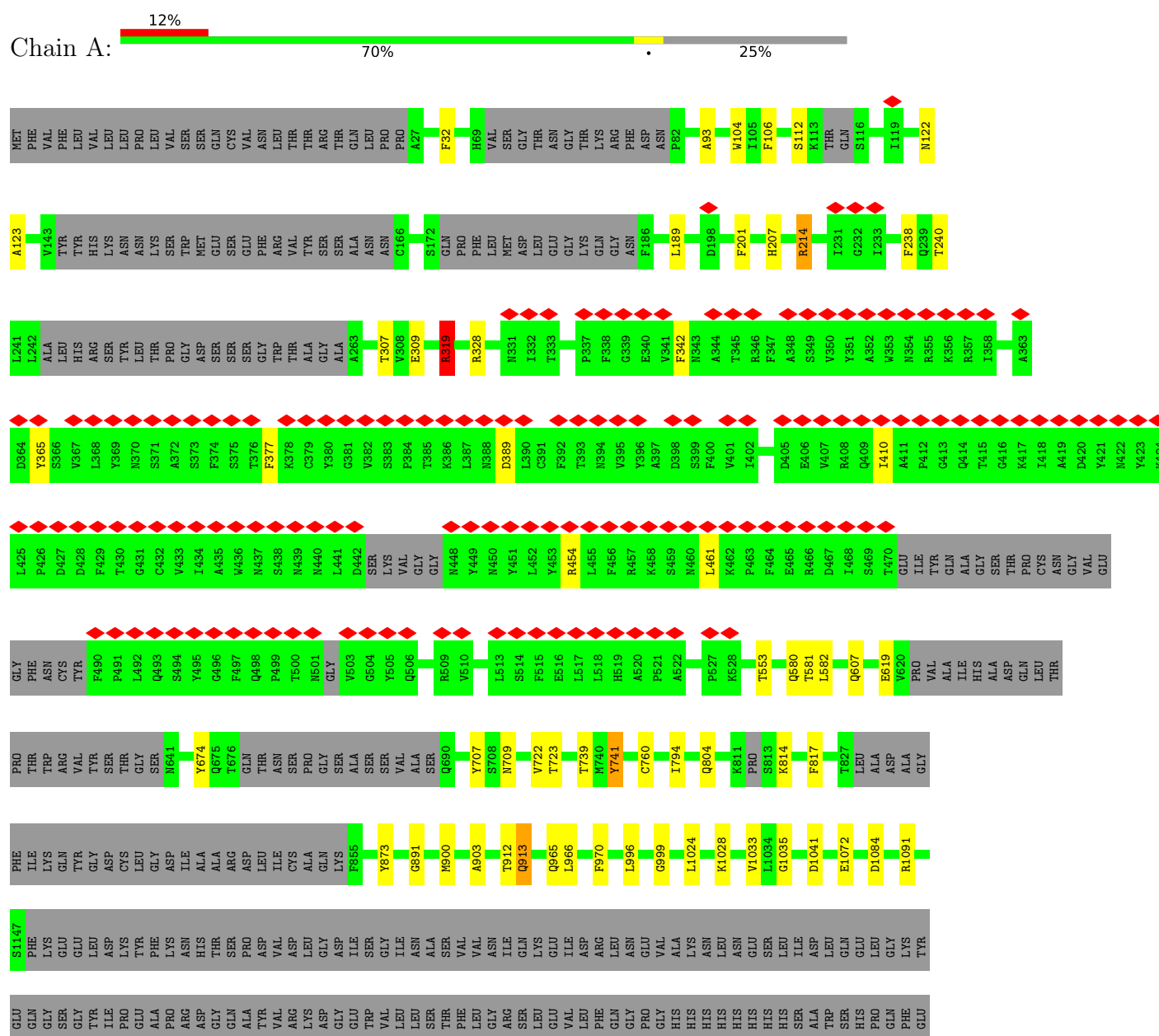
Continued from previous page...

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

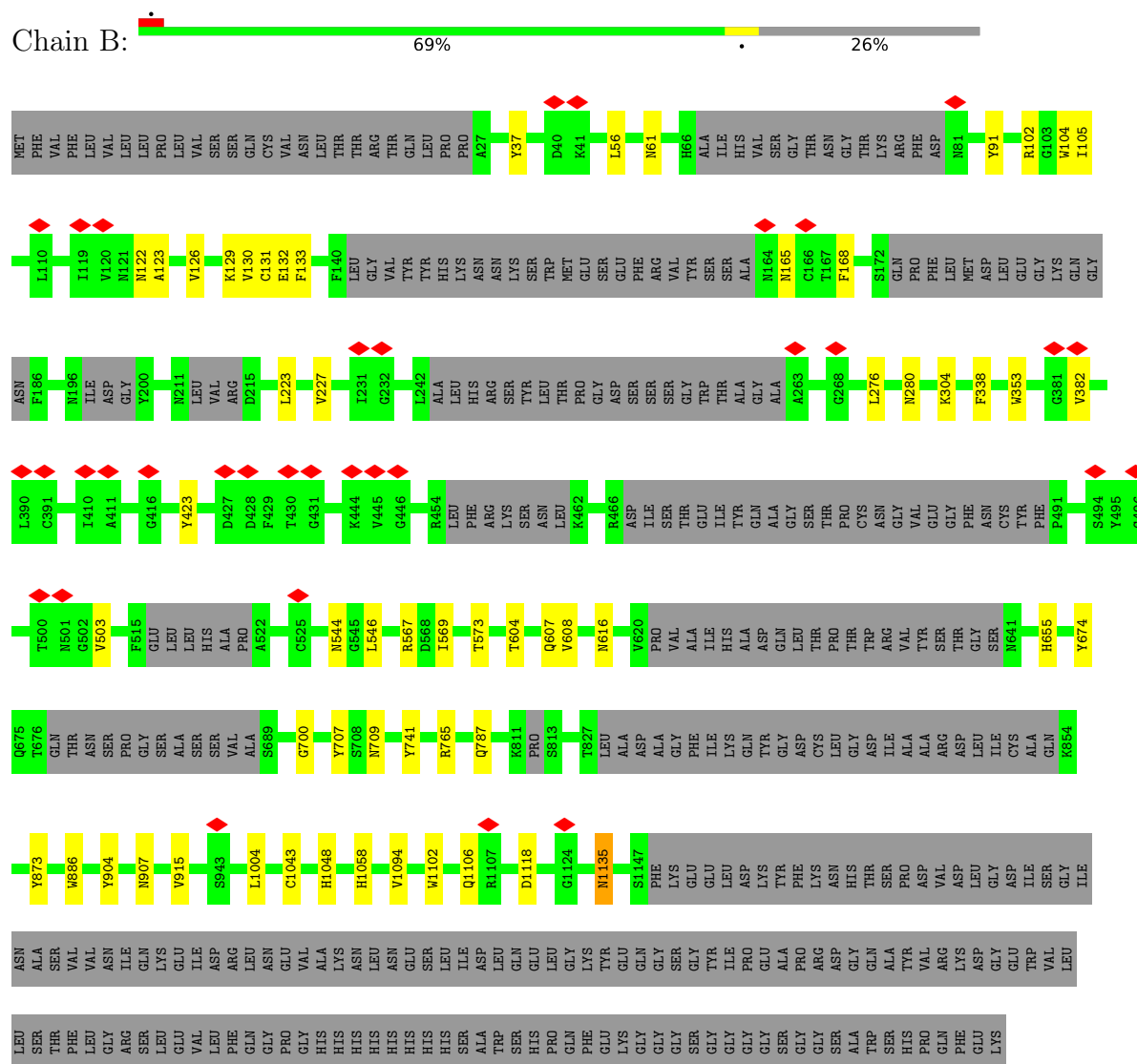
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

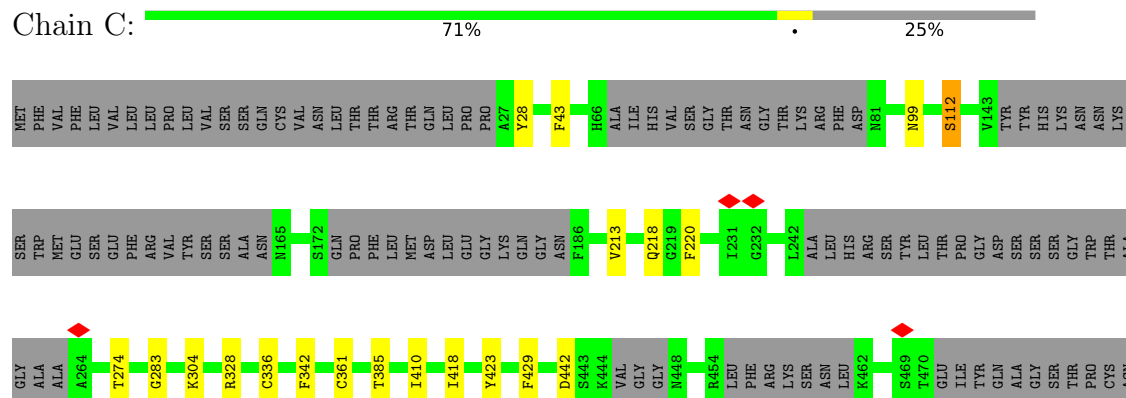
• Molecule 1: Spike glycoprotein

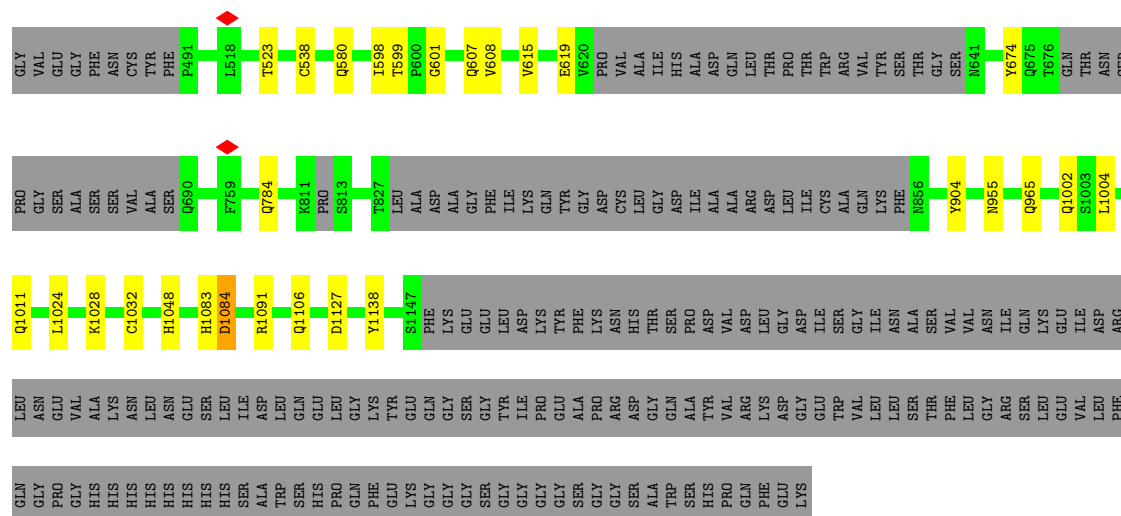


Chain B:



Chain C:





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



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



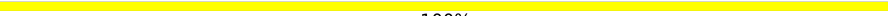
- Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



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

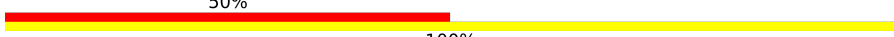


- Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain H:  100%

MAG1
MAG2

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

Chain I:  50% 100%

MAG1
MAG2

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

Chain J:  50% 50%

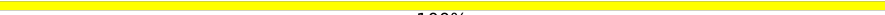
MAG1
MAG2

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

Chain K:  100%

MAG1
MAG2

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

Chain L:  100%

MAG1
MAG2

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

Chain M:  100%

MAG1
MAG2

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

Chain N:  100%

MAG1
MAG2

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

Chain O:

100%

MAG1
MAG2

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	58580	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	51.8	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.832	Depositor
Minimum map value	-0.324	Depositor
Average map value	-0.001	Depositor
Map value standard deviation	0.037	Depositor
Recommended contour level	0.2	Depositor
Map size ($\text{\AA}$)	317.4, 317.4, 317.4	wwPDB
Map dimensions	300, 300, 300	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing ($\text{\AA}$)	1.058, 1.058, 1.058	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: 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	0.72	0/7553	1.27	9/10286 (0.1%)
1	B	0.69	0/6994	1.28	6/9544 (0.1%)
1	C	0.69	0/7440	1.26	9/10141 (0.1%)
All	All	0.70	0/21987	1.27	24/29971 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	5
1	B	0	4
1	C	0	4
All	All	0	13

There are no bond length outliers.

All (24) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	319	ARG	CD-NE-CZ	7.14	134.39	124.40
1	A	817	PHE	CA-CB-CG	7.12	120.92	113.80
1	A	377	PHE	CA-CB-CG	6.81	120.61	113.80
1	A	122	ASN	CA-CB-CG	6.27	118.87	112.60
1	A	201	PHE	CA-CB-CG	6.14	119.94	113.80
1	B	133	PHE	N-CA-C	5.95	117.73	110.41
1	A	965	GLN	OE1-CD-NE2	-5.71	116.89	122.60
1	C	385	THR	CA-C-N	5.45	128.13	120.28
1	C	385	THR	C-N-CA	5.45	128.13	120.28
1	B	165	ASN	CB-CG-ND2	-5.40	108.30	116.40

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	99	ASN	CA-C-N	5.36	128.94	120.47
1	C	99	ASN	C-N-CA	5.36	128.94	120.47
1	A	106	PHE	CA-CB-CG	5.26	119.06	113.80
1	C	112	SER	N-CA-C	5.25	121.97	110.80
1	A	454	ARG	NE-CZ-NH2	5.24	123.91	119.20
1	C	965	GLN	OE1-CD-NE2	-5.19	117.41	122.60
1	C	1011	GLN	OE1-CD-NE2	-5.19	117.41	122.60
1	C	955	ASN	CA-CB-CG	5.15	117.75	112.60
1	A	207	HIS	CA-CB-CG	5.14	118.94	113.80
1	B	655	HIS	CB-CG-CD2	-5.06	124.63	131.20
1	B	787	GLN	OE1-CD-NE2	-5.05	117.55	122.60
1	B	131	CYS	N-CA-C	5.04	116.44	110.19
1	C	1002	GLN	OE1-CD-NE2	-5.02	117.58	122.60
1	B	1058	HIS	CB-CG-CD2	-5.01	124.69	131.20

There are no chirality outliers.

All (13) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	1091	ARG	Sidechain
1	A	214	ARG	Sidechain
1	A	365	TYR	Sidechain
1	A	707	TYR	Sidechain
1	A	741	TYR	Sidechain
1	B	567	ARG	Sidechain
1	B	707	TYR	Sidechain
1	B	741	TYR	Sidechain
1	B	765	ARG	Sidechain
1	C	1091	ARG	Sidechain
1	C	1138	TYR	Sidechain
1	C	423	TYR	Sidechain
1	C	904	TYR	Sidechain

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	7394	0	7140	12	0
1	B	6863	0	6299	12	0
1	C	7282	0	6962	12	0
2	D	28	0	25	0	0
2	E	28	0	25	0	0
2	F	28	0	25	0	0
2	G	28	0	25	0	0
2	H	28	0	25	0	0
2	I	28	0	25	0	0
2	J	28	0	25	0	0
2	K	28	0	25	0	0
2	L	28	0	25	0	0
2	M	28	0	25	0	0
2	N	28	0	25	0	0
2	O	28	0	25	0	0
3	A	140	0	130	2	0
3	B	168	0	156	2	0
3	C	154	0	143	3	0
All	All	22337	0	21130	36	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 1.

All (36) 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:C:607:GLN:OE1	1:C:674:TYR:HE1	1.38	1.04
1:C:607:GLN:OE1	1:C:674:TYR:CE1	2.28	0.83
1:A:607:GLN:OE1	1:A:674:TYR:HE1	1.67	0.77
1:A:93:ALA:HB1	1:A:189:LEU:HD11	1.74	0.67
1:B:607:GLN:OE1	1:B:674:TYR:HE1	1.78	0.66
1:B:1102:TRP:CG	1:B:1135:ASN:HD21	2.25	0.55
1:A:607:GLN:OE1	1:A:674:TYR:CE1	2.56	0.55
1:B:132:GLU:CB	3:B:1301:NAG:H81	2.39	0.51
1:A:104:TRP:CD1	1:A:240:THR:HG1	2.29	0.51
1:A:342:PHE:HB2	3:A:1305:NAG:H82	1.94	0.48
1:C:28:TYR:CD2	3:C:1301:NAG:H81	2.48	0.48
1:C:1083:HIS:CG	1:C:1084:ASP:H	2.31	0.48
1:C:1083:HIS:CD2	1:C:1084:ASP:H	2.32	0.48
1:C:342:PHE:HB2	3:C:1305:NAG:H82	1.96	0.47
1:A:580:GLN:HA	3:A:1304:NAG:H82	1.96	0.46
1:A:741:TYR:CE1	1:A:966:LEU:HD21	2.51	0.45

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1024:LEU:HD11	1:A:1028:LYS:HE2	1.99	0.45
1:C:1024:LEU:HD11	1:C:1028:LYS:HE2	1.98	0.44
1:B:1043:CYS:HB3	1:B:1048:HIS:CD2	2.52	0.44
1:C:43:PHE:CE1	1:C:283:GLY:HA3	2.52	0.43
1:C:599:THR:HG22	1:C:601:GLY:H	1.83	0.43
1:B:280:ASN:ND2	3:B:1302:NAG:H81	2.34	0.43
1:B:886:TRP:CH2	1:B:904:TYR:CD2	3.07	0.42
1:B:56:LEU:HD22	1:B:91:TYR:CD2	2.55	0.42
1:A:1033:VAL:C	1:A:1035:GLY:H	2.28	0.42
1:A:319:ARG:HH11	1:A:319:ARG:HG2	1.84	0.42
1:B:915:VAL:HG21	1:B:1106:GLN:HE22	1.85	0.42
1:C:598:ILE:H	1:C:598:ILE:HD12	1.85	0.42
1:B:37:TYR:HA	1:B:223:LEU:H	1.85	0.41
1:A:903:ALA:HB1	1:A:913:GLN:HB2	2.01	0.41
1:C:1032:CYS:SG	1:C:1048:HIS:CE1	3.14	0.41
1:B:353:TRP:H	1:B:423:TYR:CB	2.34	0.41
1:C:580:GLN:HA	3:C:1302:NAG:H82	2.03	0.40
1:A:970:PHE:CG	1:A:999:GLY:HA3	2.55	0.40
1:B:546:LEU:HD12	1:B:546:LEU:C	2.47	0.40
1:B:130:VAL:HG22	1:B:168:PHE:H	1.85	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	940/1288 (73%)	854 (91%)	75 (8%)	11 (1%)	10	41
1	B	921/1288 (72%)	817 (89%)	94 (10%)	10 (1%)	11	43
1	C	936/1288 (73%)	844 (90%)	84 (9%)	8 (1%)	14	47
All	All	2797/3864 (72%)	2515 (90%)	253 (9%)	29 (1%)	15	45

All (29) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	582	LEU
1	A	709	ASN
1	B	123	ALA
1	B	569	ILE
1	C	112	SER
1	C	418	ILE
1	C	1084	ASP
1	A	32	PHE
1	A	123	ALA
1	A	389	ASP
1	B	573	THR
1	C	304	LYS
1	B	61	ASN
1	B	304	LYS
1	B	709	ASN
1	C	213	VAL
1	C	442	ASP
1	A	619	GLU
1	B	544	ASN
1	C	784	GLN
1	A	112	SER
1	A	410	ILE
1	A	814	LYS
1	B	382	VAL
1	B	700	GLY
1	A	722	VAL
1	A	891	GLY
1	C	410	ILE
1	B	503	VAL

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	801/1112 (72%)	779 (97%)	22 (3%)	39 60

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	681/1112 (61%)	663 (97%)	18 (3%)	40	61
1	C	775/1112 (70%)	760 (98%)	15 (2%)	50	66
All	All	2257/3336 (68%)	2202 (98%)	55 (2%)	43	63

All (55) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	214	ARG
1	A	238	PHE
1	A	307	THR
1	A	309	GLU
1	A	319	ARG
1	A	328	ARG
1	A	461	LEU
1	A	553	THR
1	A	581	THR
1	A	723	THR
1	A	739	THR
1	A	760	CYS
1	A	794	ILE
1	A	804	GLN
1	A	873	TYR
1	A	900	MET
1	A	912	THR
1	A	913	GLN
1	A	996	LEU
1	A	1041	ASP
1	A	1072	GLU
1	A	1084	ASP
1	B	102	ARG
1	B	104	TRP
1	B	105	ILE
1	B	122	ASN
1	B	126	VAL
1	B	129	LYS
1	B	227	VAL
1	B	276	LEU
1	B	338	PHE
1	B	604	THR
1	B	608	VAL
1	B	616	ASN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	B	873	TYR
1	B	907	ASN
1	B	1004	LEU
1	B	1094	VAL
1	B	1118	ASP
1	B	1135	ASN
1	C	218	GLN
1	C	220	PHE
1	C	274	THR
1	C	328	ARG
1	C	336	CYS
1	C	361	CYS
1	C	429	PHE
1	C	523	THR
1	C	538	CYS
1	C	608	VAL
1	C	615	VAL
1	C	619	GLU
1	C	1004	LEU
1	C	1106	GLN
1	C	1127	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (28) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	354	ASN
1	A	437	ASN
1	A	450	ASN
1	A	506	GLN
1	A	613	GLN
1	A	690	GLN
1	A	804	GLN
1	A	914	ASN
1	A	919	ASN
1	A	1002	GLN
1	A	1005	GLN
1	B	540	ASN
1	B	613	GLN
1	B	764	ASN
1	B	856	ASN
1	B	935	GLN
1	B	969	ASN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	B	1088	HIS
1	C	121	ASN
1	C	519	HIS
1	C	544	ASN
1	C	690	GLN
1	C	1002	GLN
1	C	1011	GLN
1	C	1058	HIS
1	C	1083	HIS
1	C	1135	ASN
1	C	1142	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 ⓘ

24 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	D	1	1,2	14,14,15	1.51	4 (28%)	17,19,21	1.13	1 (5%)
2	NAG	D	2	2	14,14,15	1.46	3 (21%)	17,19,21	0.90	1 (5%)
2	NAG	E	1	1,2	14,14,15	1.13	1 (7%)	17,19,21	0.54	0
2	NAG	E	2	2	14,14,15	1.26	2 (14%)	17,19,21	0.81	1 (5%)
2	NAG	F	1	1,2	14,14,15	1.12	1 (7%)	17,19,21	0.54	0
2	NAG	F	2	2	14,14,15	1.24	2 (14%)	17,19,21	0.93	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	NAG	G	1	1,2	14,14,15	1.12	1 (7%)	17,19,21	0.91	0
2	NAG	G	2	2	14,14,15	1.15	1 (7%)	17,19,21	0.71	0
2	NAG	H	1	1,2	14,14,15	1.16	2 (14%)	17,19,21	0.67	0
2	NAG	H	2	2	14,14,15	1.25	2 (14%)	17,19,21	0.64	0
2	NAG	I	1	1,2	14,14,15	1.13	1 (7%)	17,19,21	0.79	0
2	NAG	I	2	2	14,14,15	1.21	1 (7%)	17,19,21	0.63	0
2	NAG	J	1	1,2	14,14,15	1.08	0	17,19,21	0.85	0
2	NAG	J	2	2	14,14,15	1.24	1 (7%)	17,19,21	0.74	0
2	NAG	K	1	1,2	14,14,15	1.14	1 (7%)	17,19,21	1.12	1 (5%)
2	NAG	K	2	2	14,14,15	1.18	1 (7%)	17,19,21	0.65	0
2	NAG	L	1	1,2	14,14,15	1.05	1 (7%)	17,19,21	0.73	0
2	NAG	L	2	2	14,14,15	1.27	2 (14%)	17,19,21	0.79	0
2	NAG	M	1	1,2	14,14,15	1.19	2 (14%)	17,19,21	0.87	1 (5%)
2	NAG	M	2	2	14,14,15	1.20	1 (7%)	17,19,21	0.75	0
2	NAG	N	1	1,2	14,14,15	1.20	1 (7%)	17,19,21	1.03	1 (5%)
2	NAG	N	2	2	14,14,15	1.20	1 (7%)	17,19,21	0.78	0
2	NAG	O	1	1,2	14,14,15	1.07	1 (7%)	17,19,21	0.82	0
2	NAG	O	2	2	14,14,15	1.21	2 (14%)	17,19,21	0.91	1 (5%)

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	D	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	D	2	2	-	1/6/23/26	0/1/1/1
2	NAG	E	1	1,2	-	1/6/23/26	0/1/1/1
2	NAG	E	2	2	-	0/6/23/26	0/1/1/1
2	NAG	F	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	F	2	2	-	0/6/23/26	0/1/1/1
2	NAG	G	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	G	2	2	-	0/6/23/26	0/1/1/1
2	NAG	H	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	H	2	2	-	0/6/23/26	0/1/1/1
2	NAG	I	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	I	2	2	-	0/6/23/26	0/1/1/1
2	NAG	J	1	1,2	-	2/6/23/26	0/1/1/1

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	J	2	2	-	0/6/23/26	0/1/1/1
2	NAG	K	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	K	2	2	-	0/6/23/26	0/1/1/1
2	NAG	L	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	L	2	2	-	0/6/23/26	0/1/1/1
2	NAG	M	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	M	2	2	-	0/6/23/26	0/1/1/1
2	NAG	N	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	N	2	2	-	0/6/23/26	0/1/1/1
2	NAG	O	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	O	2	2	-	0/6/23/26	0/1/1/1

All (35) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	2	NAG	O5-C5	2.96	1.49	1.43
2	L	2	NAG	O5-C5	2.88	1.49	1.43
2	E	2	NAG	O5-C5	2.82	1.48	1.43
2	N	2	NAG	O5-C5	2.81	1.48	1.43
2	D	1	NAG	C1-C2	2.75	1.56	1.52
2	D	1	NAG	O5-C5	2.75	1.48	1.43
2	H	2	NAG	O5-C5	2.74	1.48	1.43
2	F	2	NAG	O5-C5	2.73	1.48	1.43
2	D	2	NAG	O5-C1	2.72	1.48	1.43
2	I	2	NAG	O5-C5	2.71	1.48	1.43
2	J	2	NAG	O5-C5	2.70	1.48	1.43
2	M	2	NAG	O5-C5	2.67	1.48	1.43
2	G	2	NAG	O5-C5	2.65	1.48	1.43
2	O	2	NAG	O5-C5	2.64	1.48	1.43
2	K	2	NAG	O5-C5	2.63	1.48	1.43
2	N	1	NAG	O5-C5	2.61	1.48	1.43
2	G	1	NAG	O5-C5	2.55	1.48	1.43
2	M	1	NAG	O5-C5	2.54	1.48	1.43
2	D	2	NAG	C1-C2	2.46	1.55	1.52
2	K	1	NAG	O5-C5	2.46	1.48	1.43
2	D	1	NAG	O4-C4	2.36	1.48	1.43
2	F	1	NAG	O5-C5	2.29	1.47	1.43
2	E	1	NAG	O5-C5	2.27	1.47	1.43
2	E	2	NAG	O5-C1	2.27	1.47	1.43
2	L	2	NAG	O5-C1	2.26	1.47	1.43
2	L	1	NAG	O5-C5	2.24	1.47	1.43
2	O	1	NAG	O5-C5	2.23	1.47	1.43

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	I	1	NAG	O5-C5	2.16	1.47	1.43
2	H	1	NAG	O5-C5	2.15	1.47	1.43
2	D	1	NAG	O5-C1	2.14	1.47	1.43
2	M	1	NAG	O4-C4	2.10	1.48	1.43
2	H	2	NAG	O5-C1	2.08	1.47	1.43
2	O	2	NAG	O5-C1	2.04	1.47	1.43
2	F	2	NAG	O5-C1	2.02	1.47	1.43
2	H	1	NAG	C1-C2	2.02	1.55	1.52

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	1	NAG	C1-O5-C5	3.68	117.12	112.19
2	F	2	NAG	C1-O5-C5	2.93	116.11	112.19
2	O	2	NAG	C1-O5-C5	2.83	115.98	112.19
2	K	1	NAG	C3-C4-C5	2.70	115.14	110.23
2	N	1	NAG	C3-C4-C5	2.49	114.75	110.23
2	D	2	NAG	C1-O5-C5	2.46	115.49	112.19
2	E	2	NAG	C1-O5-C5	2.03	114.91	112.19
2	M	1	NAG	C1-O5-C5	2.02	114.89	112.19

There are no chirality outliers.

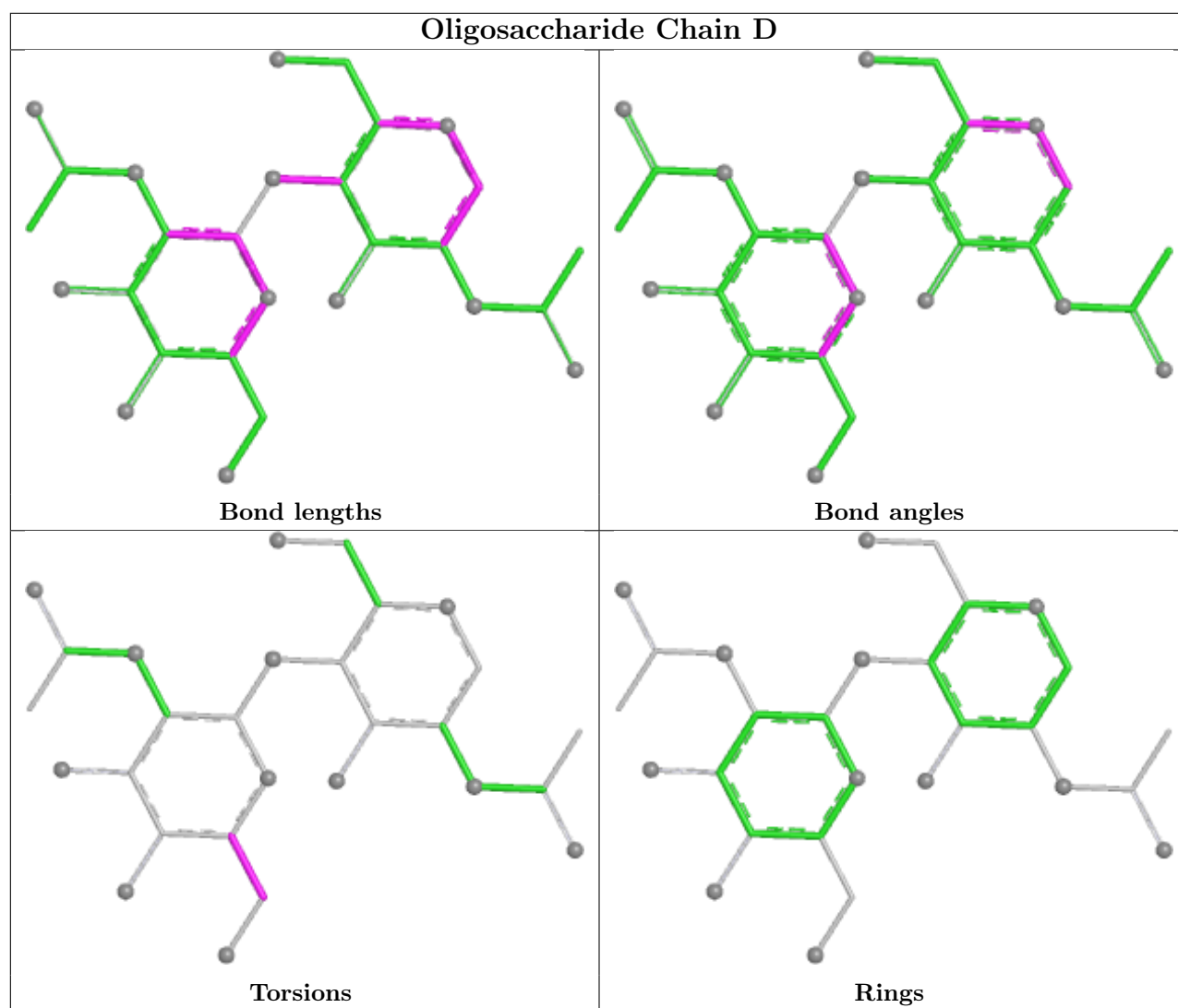
All (6) torsion outliers are listed below:

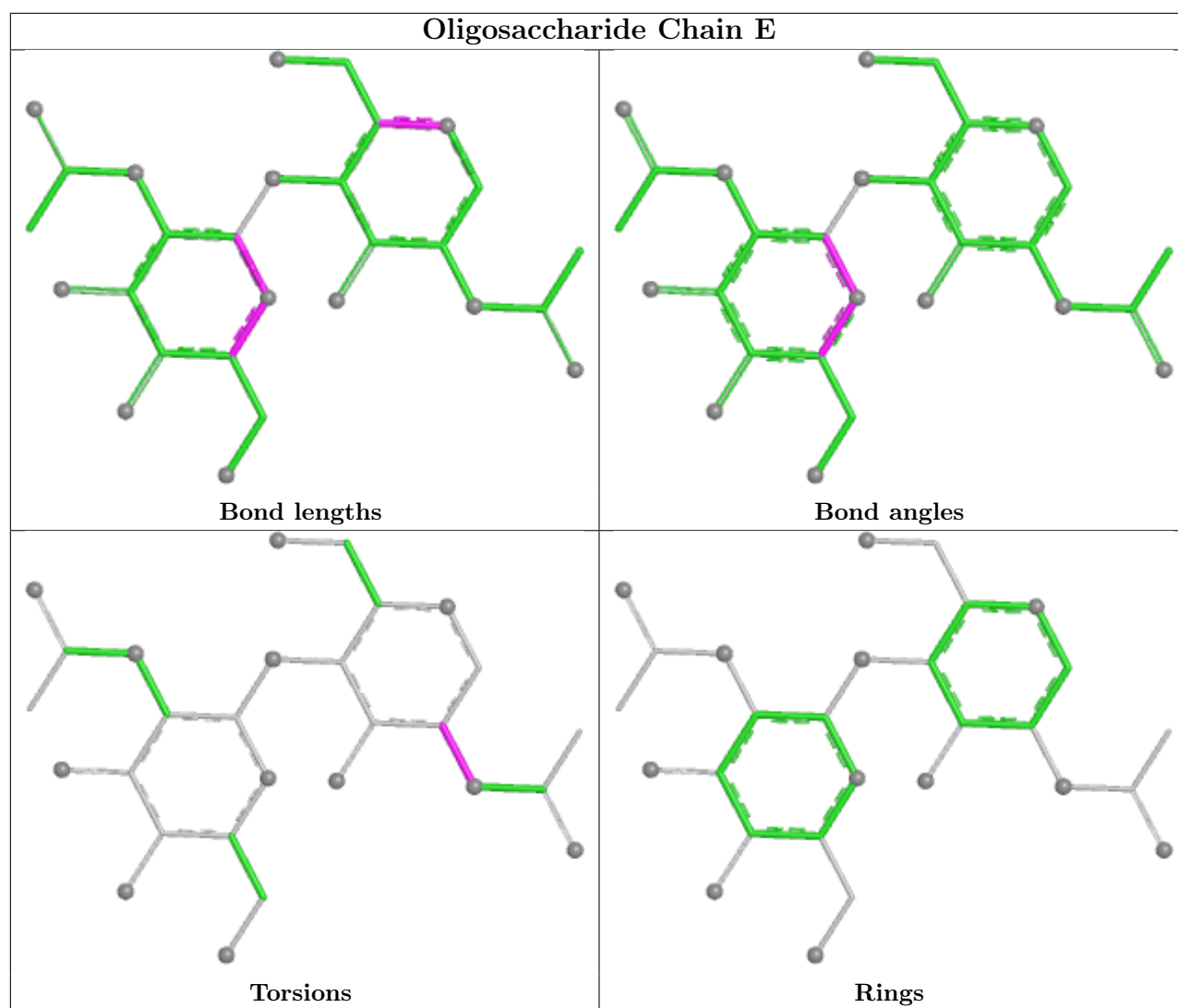
Mol	Chain	Res	Type	Atoms
2	M	1	NAG	O5-C5-C6-O6
2	J	1	NAG	O5-C5-C6-O6
2	M	1	NAG	C4-C5-C6-O6
2	D	2	NAG	O5-C5-C6-O6
2	J	1	NAG	C4-C5-C6-O6
2	E	1	NAG	C1-C2-N2-C7

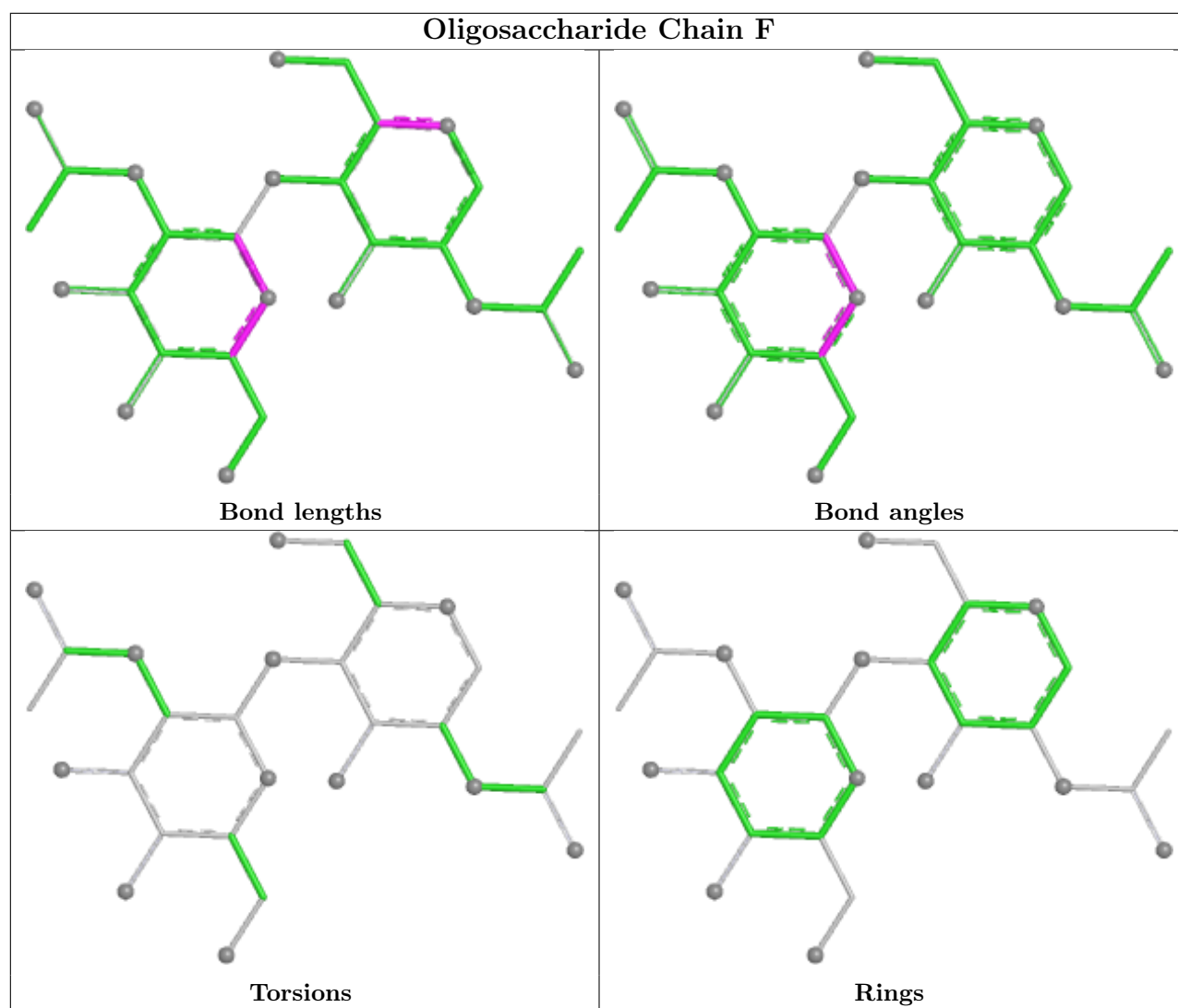
There are no ring outliers.

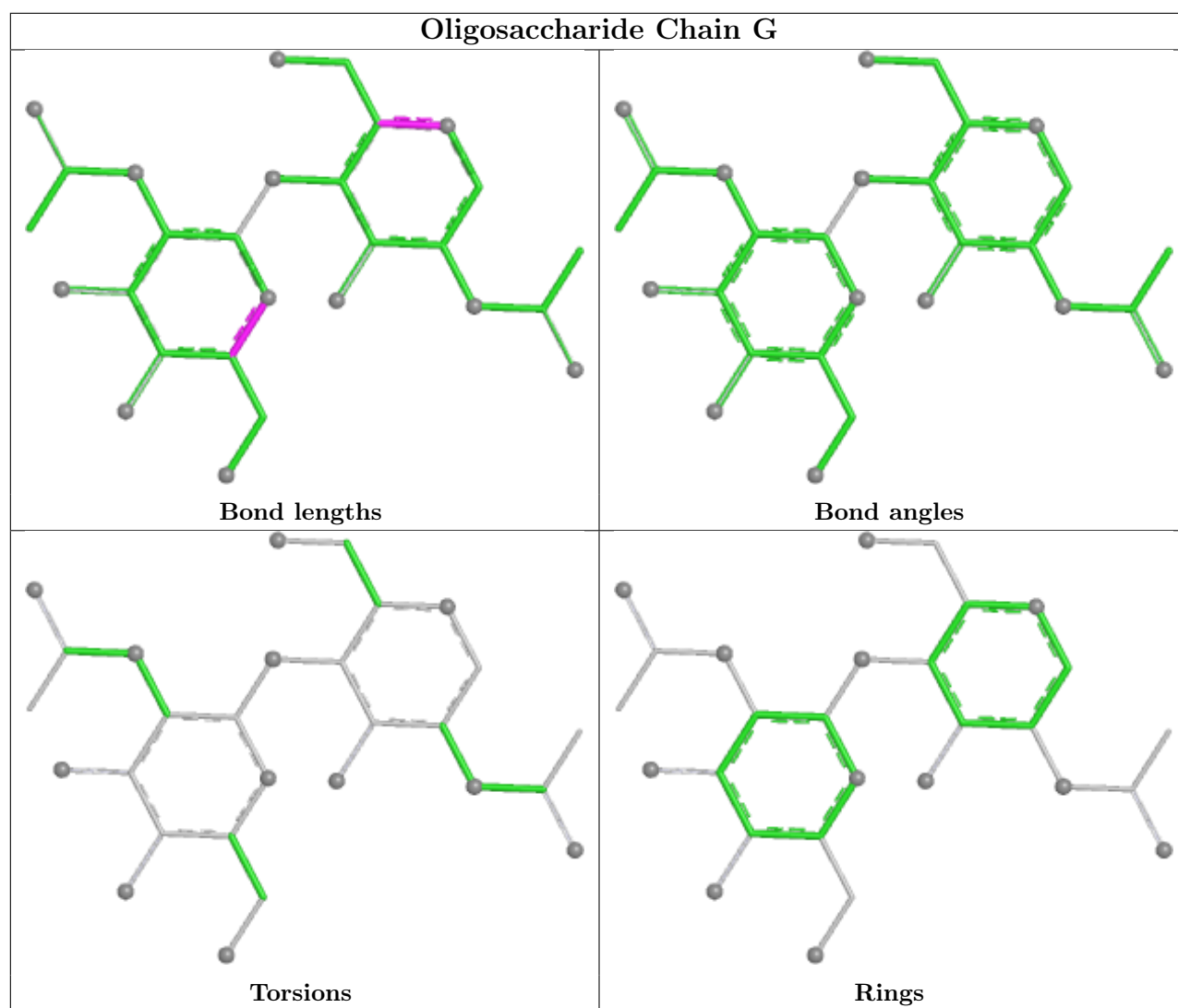
No monomer is involved in short contacts.

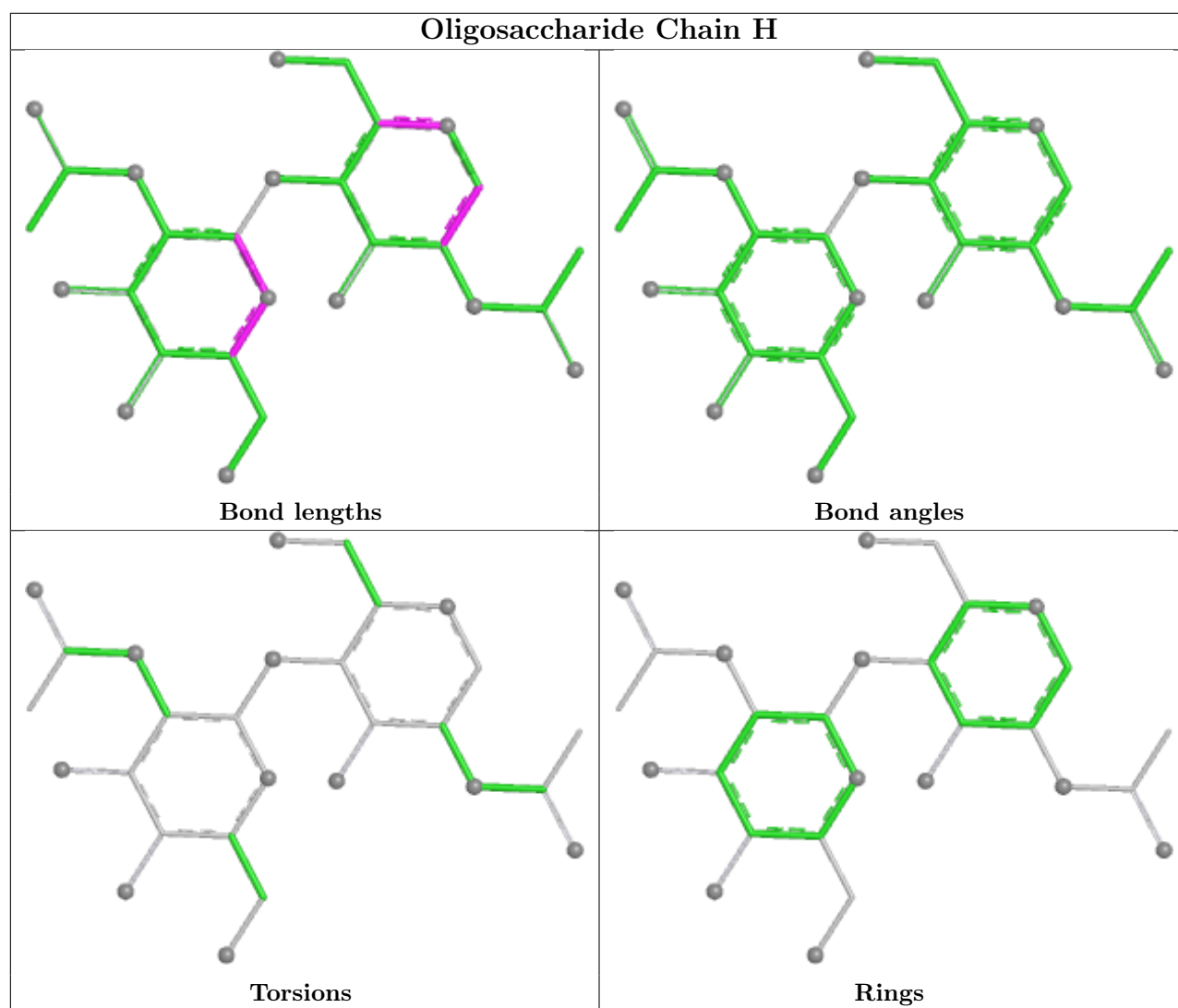
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

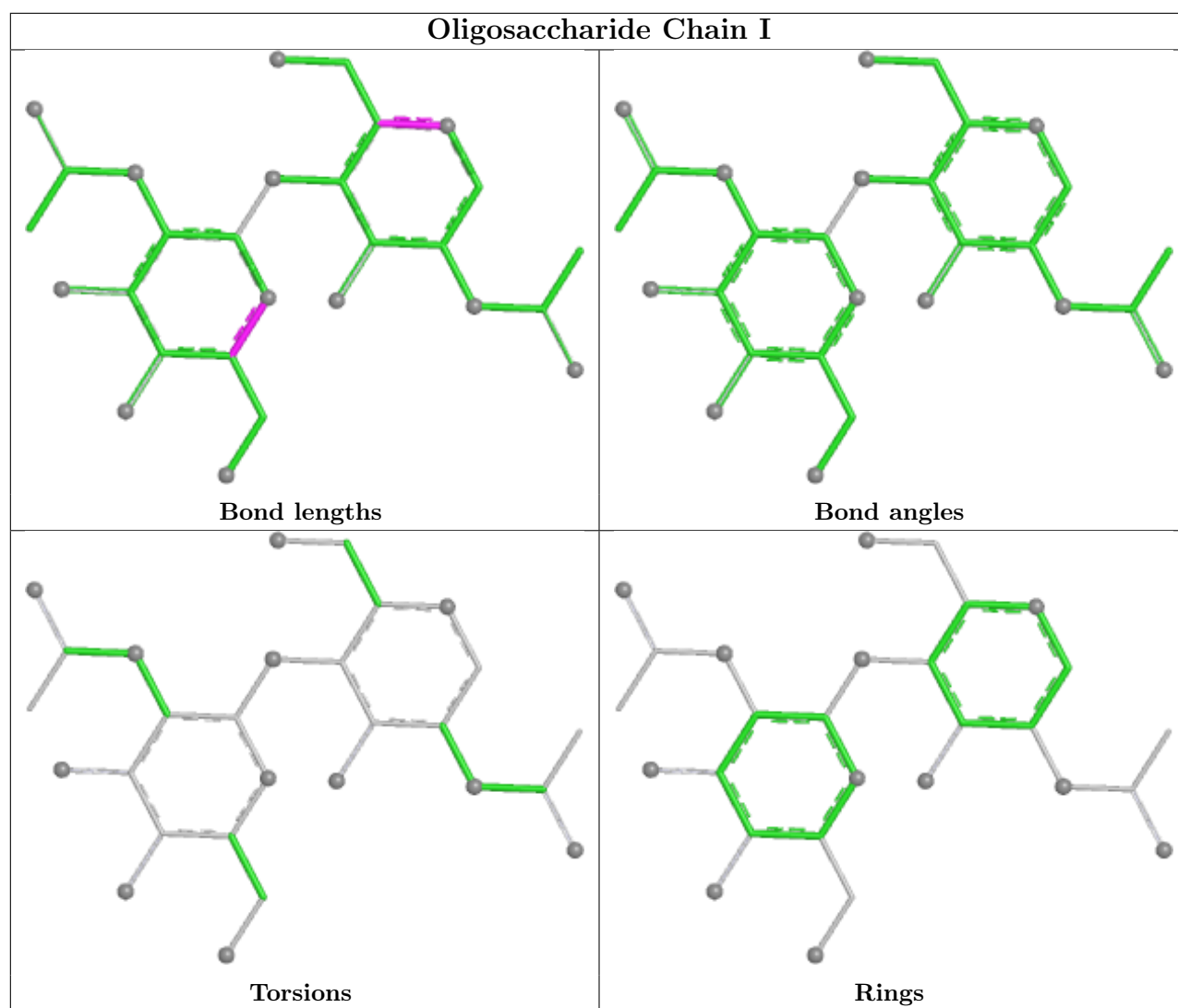


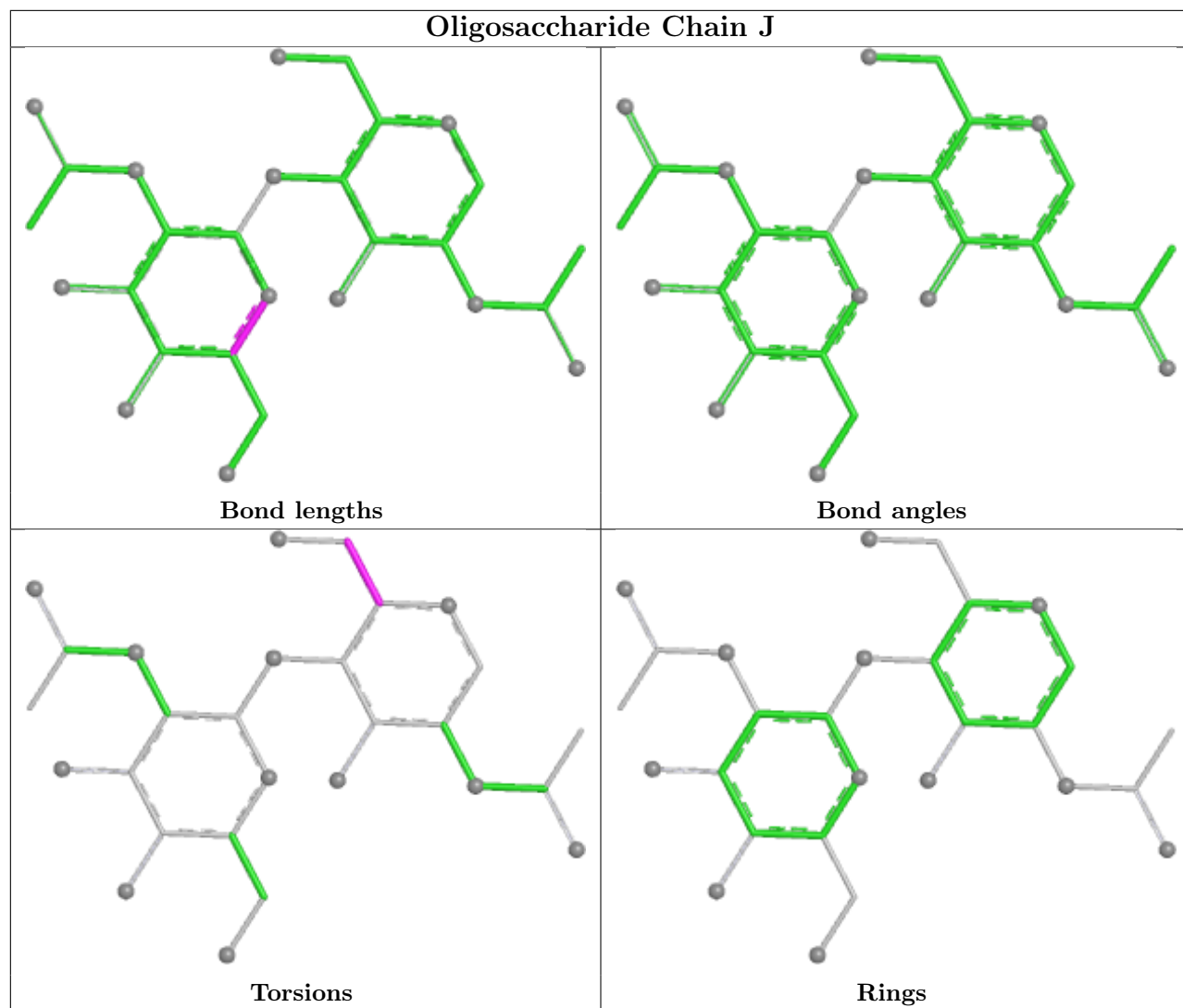


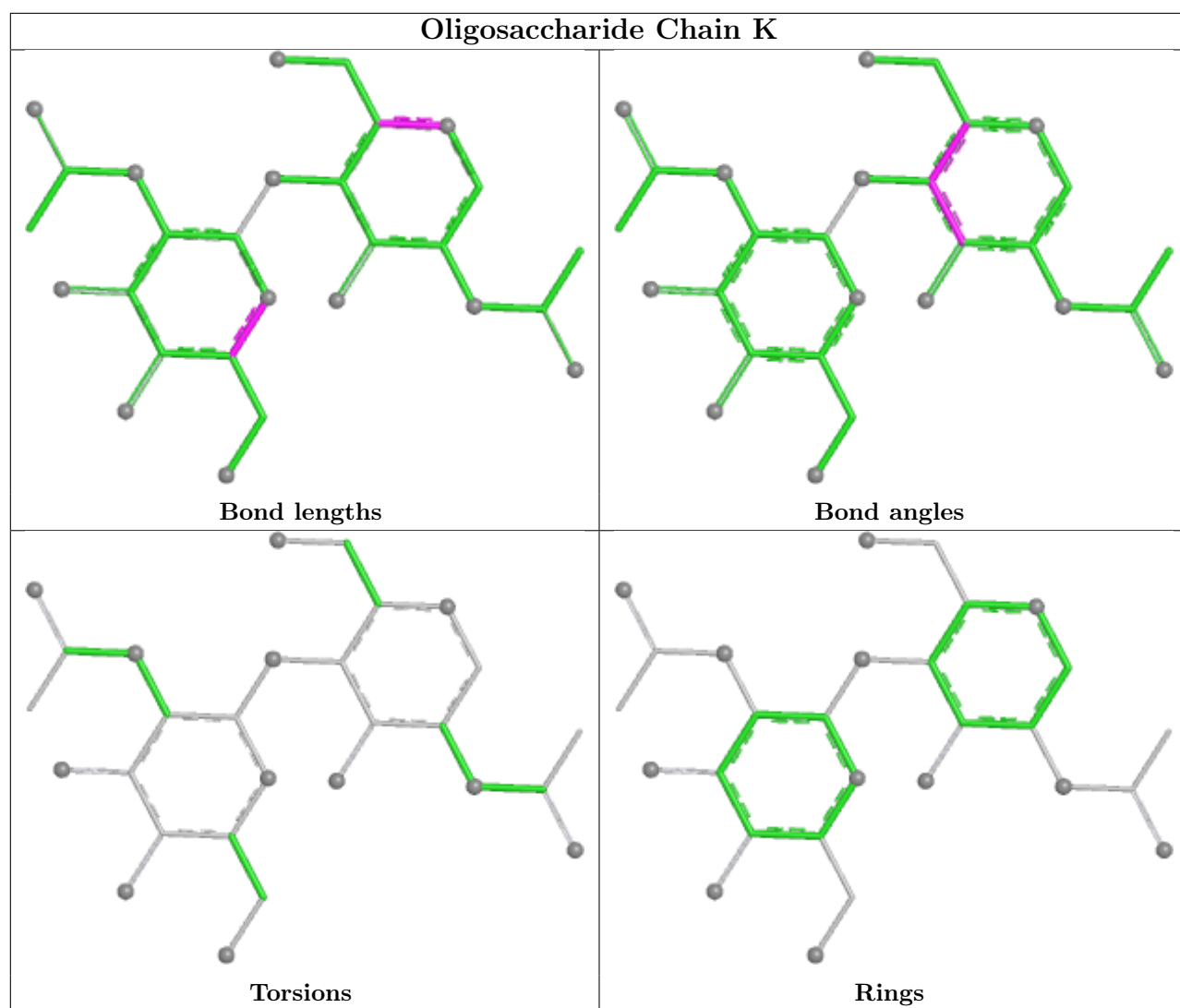


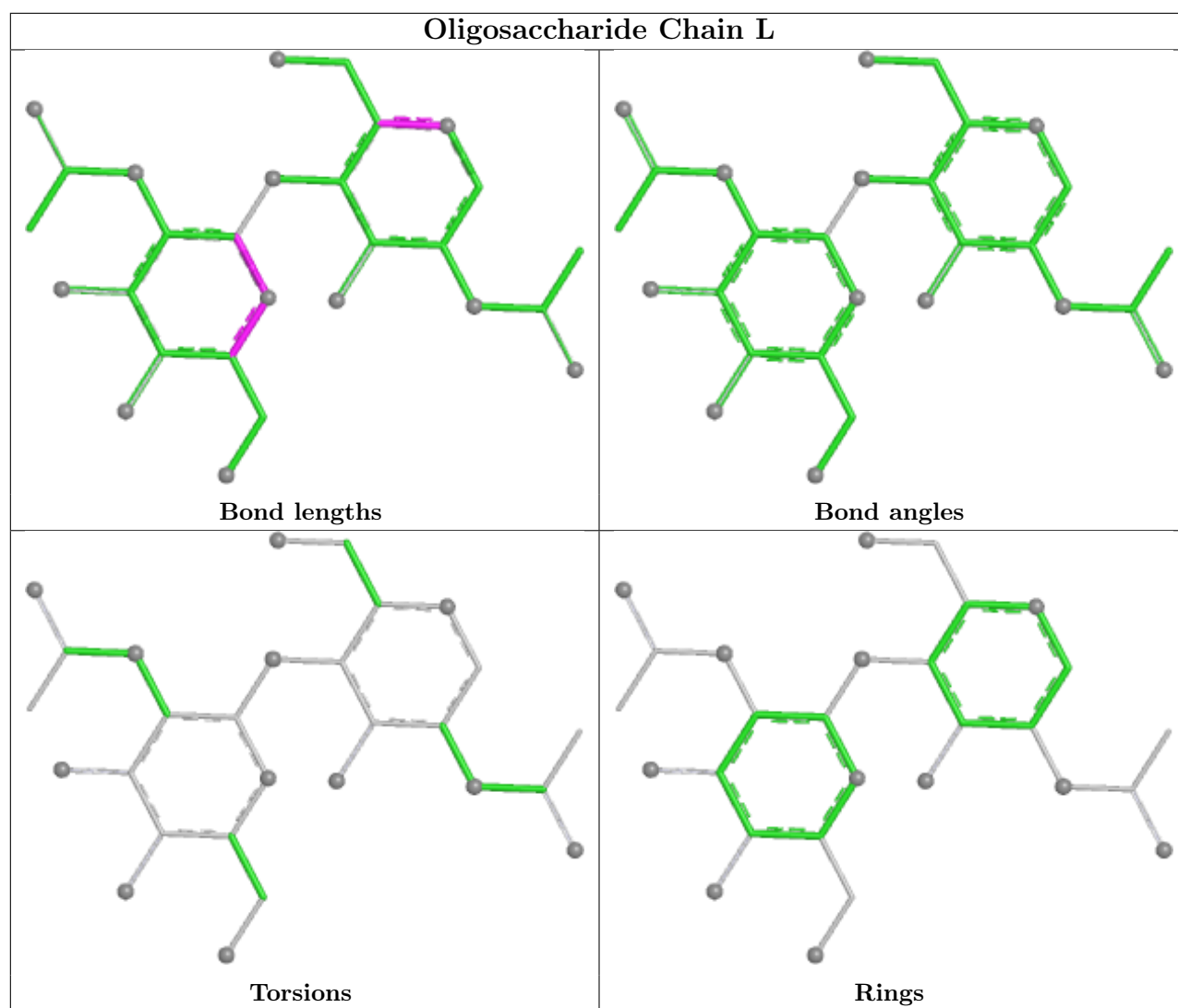


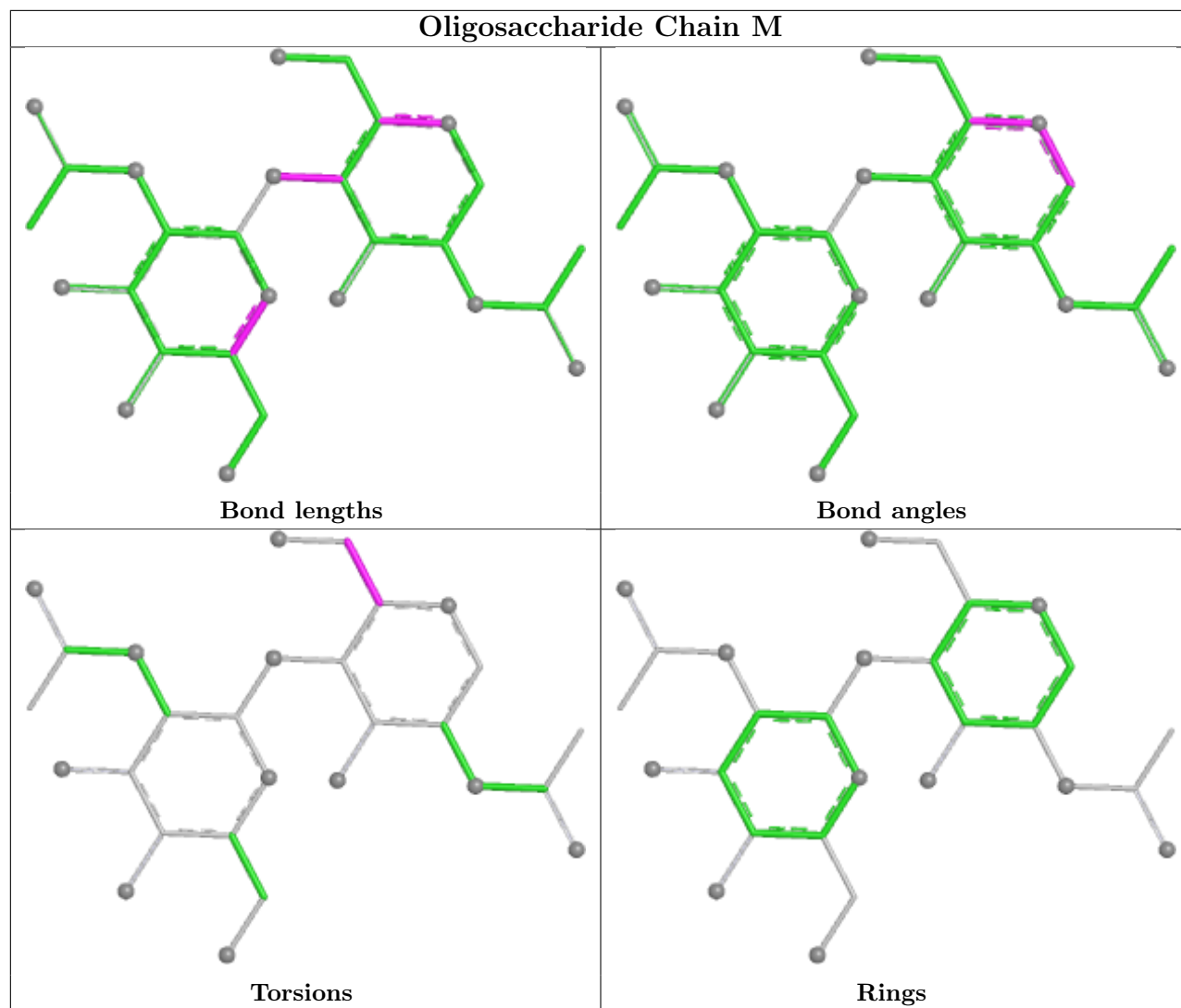


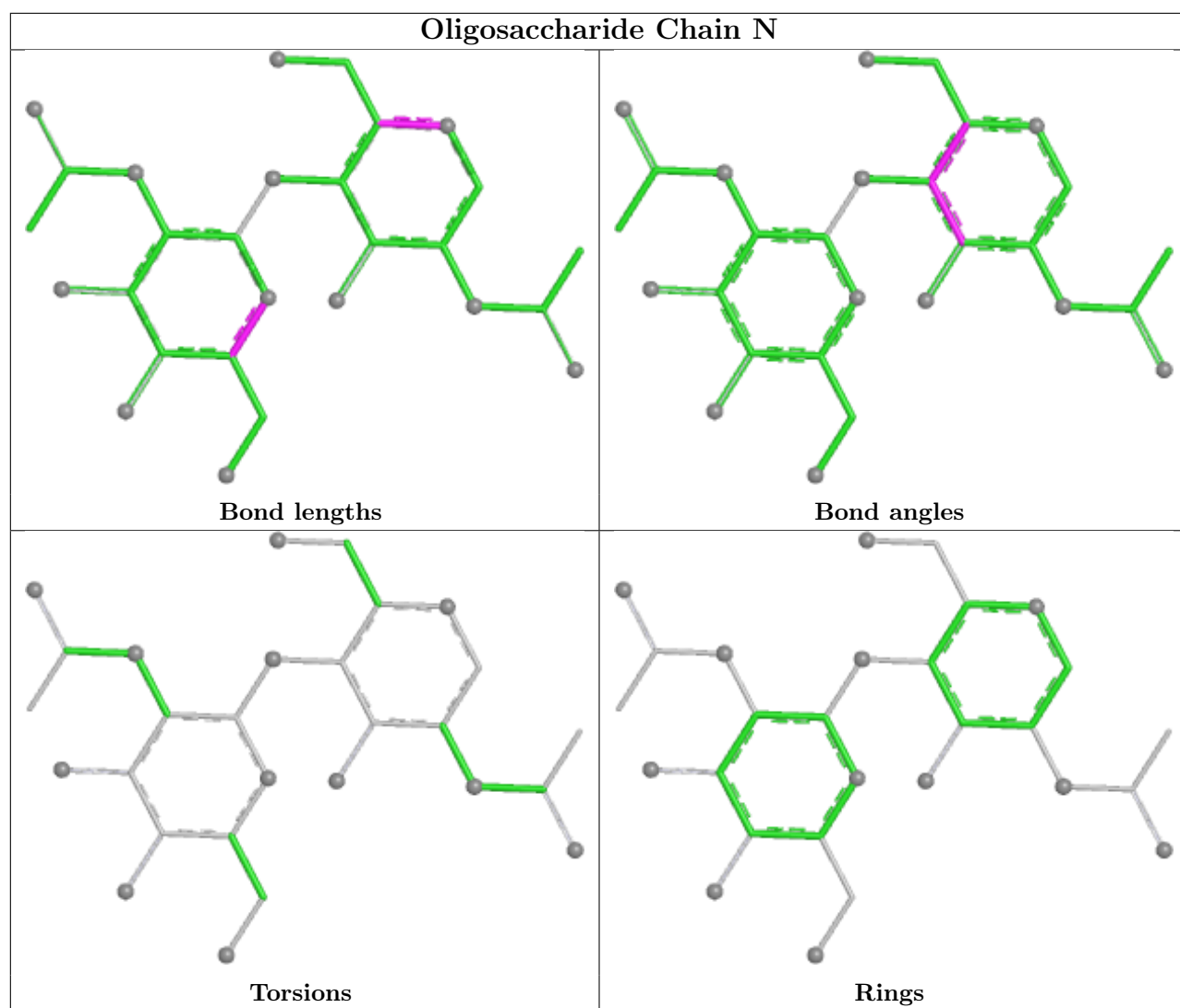


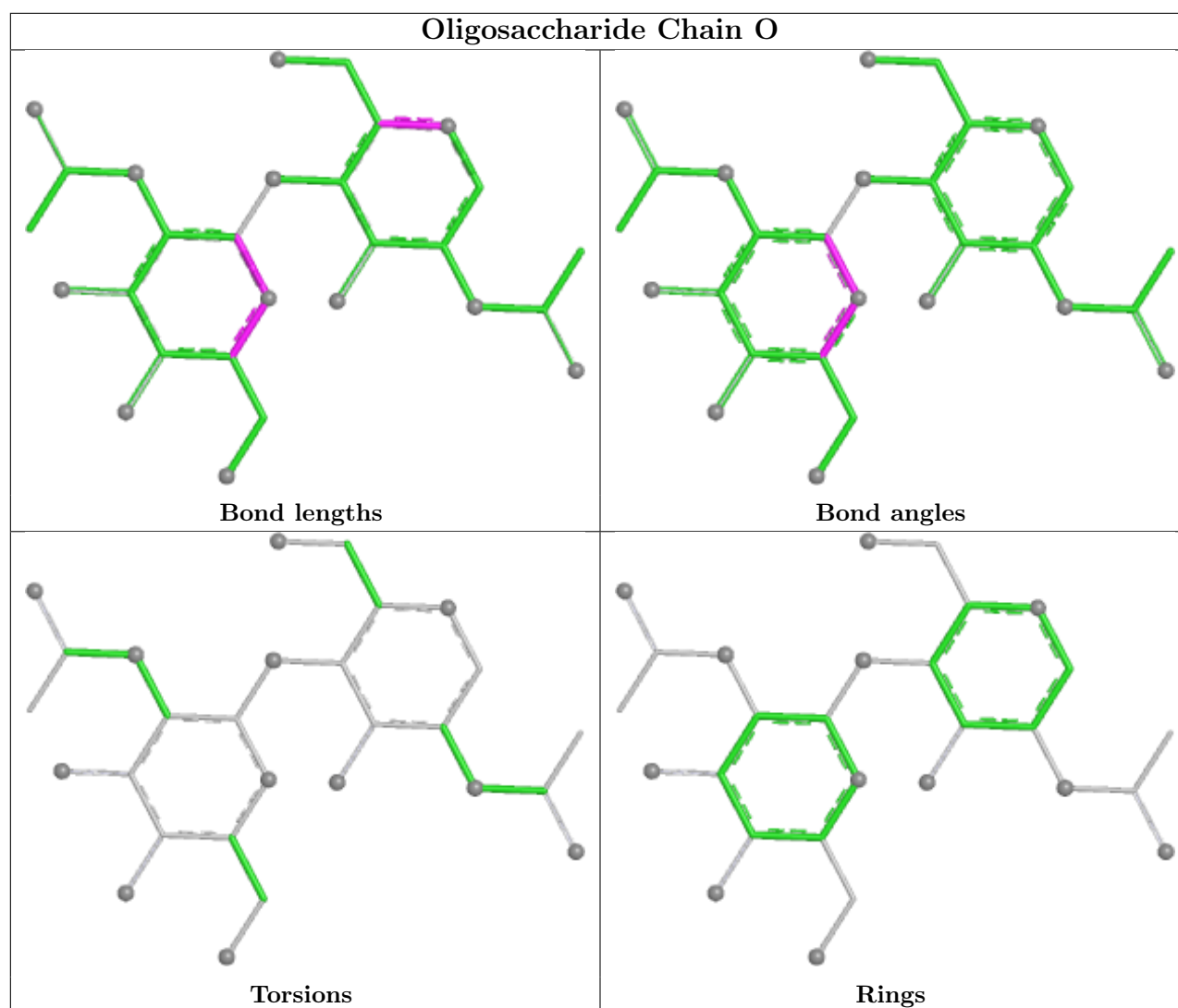












5.6 Ligand geometry [i](#)

33 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	NAG	A	1310	1	14,14,15	1.34	3 (21%)	17,19,21	1.05	1 (5%)
3	NAG	B	1311	1	14,14,15	1.21	2 (14%)	17,19,21	0.83	1 (5%)
3	NAG	C	1311	1	14,14,15	1.16	1 (7%)	17,19,21	0.71	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	NAG	B	1306	1	14,14,15	1.17	2 (14%)	17,19,21	0.73	1 (5%)
3	NAG	C	1303	1	14,14,15	1.26	1 (7%)	17,19,21	0.83	0
3	NAG	B	1308	1	14,14,15	1.23	2 (14%)	17,19,21	0.89	0
3	NAG	C	1309	1	14,14,15	1.29	2 (14%)	17,19,21	0.90	0
3	NAG	B	1307	1	14,14,15	1.25	2 (14%)	17,19,21	2.21	3 (17%)
3	NAG	B	1305	1	14,14,15	1.30	3 (21%)	17,19,21	0.96	1 (5%)
3	NAG	C	1310	1	14,14,15	1.28	2 (14%)	17,19,21	0.92	1 (5%)
3	NAG	C	1301	1	14,14,15	1.32	3 (21%)	17,19,21	0.75	1 (5%)
3	NAG	A	1309	1	14,14,15	1.23	1 (7%)	17,19,21	0.71	0
3	NAG	B	1309	1	14,14,15	1.36	3 (21%)	17,19,21	0.67	0
3	NAG	B	1301	1	14,14,15	1.32	3 (21%)	17,19,21	1.30	1 (5%)
3	NAG	A	1304	1	14,14,15	1.36	3 (21%)	17,19,21	1.09	1 (5%)
3	NAG	C	1304	1	14,14,15	1.30	3 (21%)	17,19,21	0.79	0
3	NAG	C	1306	1	14,14,15	1.29	3 (21%)	17,19,21	0.74	1 (5%)
3	NAG	A	1301	1	14,14,15	1.25	2 (14%)	17,19,21	0.84	1 (5%)
3	NAG	A	1307	1	14,14,15	1.26	2 (14%)	17,19,21	0.90	1 (5%)
3	NAG	B	1302	1	14,14,15	1.28	2 (14%)	17,19,21	0.76	0
3	NAG	C	1302	1	14,14,15	1.33	2 (14%)	17,19,21	1.03	1 (5%)
3	NAG	A	1302	1	14,14,15	1.24	1 (7%)	17,19,21	0.78	0
3	NAG	B	1303	1	14,14,15	1.16	2 (14%)	17,19,21	1.23	2 (11%)
3	NAG	A	1303	1	14,14,15	1.27	2 (14%)	17,19,21	0.94	1 (5%)
3	NAG	C	1305	1	14,14,15	1.35	3 (21%)	17,19,21	1.04	1 (5%)
3	NAG	A	1306	1	14,14,15	1.17	2 (14%)	17,19,21	0.65	0
3	NAG	B	1304	1	14,14,15	1.30	2 (14%)	17,19,21	0.56	0
3	NAG	A	1308	1	14,14,15	1.26	2 (14%)	17,19,21	0.60	0
3	NAG	C	1308	1	14,14,15	1.16	2 (14%)	17,19,21	0.75	0
3	NAG	A	1305	1	14,14,15	1.29	1 (7%)	17,19,21	1.25	2 (11%)
3	NAG	C	1307	1	14,14,15	1.19	2 (14%)	17,19,21	0.61	0
3	NAG	B	1312	1	14,14,15	1.27	2 (14%)	17,19,21	0.78	1 (5%)
3	NAG	B	1310	1	14,14,15	1.10	1 (7%)	17,19,21	0.83	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
3	NAG	A	1310	1	-	1/6/23/26	0/1/1/1
3	NAG	B	1311	1	-	0/6/23/26	0/1/1/1
3	NAG	C	1311	1	-	0/6/23/26	0/1/1/1
3	NAG	B	1306	1	-	2/6/23/26	0/1/1/1
3	NAG	C	1303	1	-	0/6/23/26	0/1/1/1
3	NAG	B	1308	1	-	0/6/23/26	0/1/1/1
3	NAG	C	1309	1	-	2/6/23/26	0/1/1/1
3	NAG	B	1307	1	-	0/6/23/26	0/1/1/1
3	NAG	B	1305	1	-	0/6/23/26	0/1/1/1
3	NAG	C	1310	1	-	0/6/23/26	0/1/1/1
3	NAG	C	1301	1	-	0/6/23/26	0/1/1/1
3	NAG	A	1309	1	-	0/6/23/26	0/1/1/1
3	NAG	B	1309	1	-	0/6/23/26	0/1/1/1
3	NAG	B	1301	1	-	0/6/23/26	0/1/1/1
3	NAG	A	1304	1	-	2/6/23/26	0/1/1/1
3	NAG	C	1304	1	-	0/6/23/26	0/1/1/1
3	NAG	C	1306	1	-	0/6/23/26	0/1/1/1
3	NAG	A	1301	1	-	0/6/23/26	0/1/1/1
3	NAG	A	1307	1	-	1/6/23/26	0/1/1/1
3	NAG	B	1302	1	-	0/6/23/26	0/1/1/1
3	NAG	C	1302	1	-	0/6/23/26	0/1/1/1
3	NAG	A	1302	1	-	1/6/23/26	0/1/1/1
3	NAG	B	1303	1	-	1/6/23/26	0/1/1/1
3	NAG	A	1303	1	-	0/6/23/26	0/1/1/1
3	NAG	C	1305	1	-	0/6/23/26	0/1/1/1
3	NAG	A	1306	1	-	0/6/23/26	0/1/1/1
3	NAG	B	1304	1	-	0/6/23/26	0/1/1/1
3	NAG	A	1308	1	-	0/6/23/26	0/1/1/1
3	NAG	C	1308	1	-	0/6/23/26	0/1/1/1
3	NAG	A	1305	1	-	0/6/23/26	0/1/1/1
3	NAG	C	1307	1	-	0/6/23/26	0/1/1/1
3	NAG	B	1312	1	-	0/6/23/26	0/1/1/1
3	NAG	B	1310	1	-	0/6/23/26	0/1/1/1

All (69) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	1304	NAG	O5-C5	3.13	1.49	1.43
3	A	1305	NAG	O5-C5	3.12	1.49	1.43
3	C	1305	NAG	O5-C5	3.07	1.49	1.43
3	C	1302	NAG	O5-C5	3.05	1.49	1.43
3	B	1305	NAG	O5-C5	3.00	1.49	1.43
3	B	1309	NAG	O5-C5	2.95	1.49	1.43

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1303	NAG	O5-C5	2.92	1.49	1.43
3	B	1302	NAG	O5-C5	2.90	1.49	1.43
3	C	1311	NAG	O5-C5	2.89	1.49	1.43
3	C	1303	NAG	O5-C5	2.88	1.49	1.43
3	A	1310	NAG	O5-C5	2.87	1.49	1.43
3	A	1302	NAG	O5-C5	2.86	1.49	1.43
3	C	1301	NAG	O5-C5	2.85	1.49	1.43
3	C	1306	NAG	O5-C5	2.79	1.48	1.43
3	B	1308	NAG	O5-C5	2.75	1.48	1.43
3	A	1309	NAG	O5-C5	2.75	1.48	1.43
3	A	1308	NAG	O5-C5	2.75	1.48	1.43
3	C	1309	NAG	O5-C5	2.75	1.48	1.43
3	B	1311	NAG	O5-C5	2.72	1.48	1.43
3	C	1307	NAG	O5-C5	2.69	1.48	1.43
3	B	1307	NAG	O5-C5	2.68	1.48	1.43
3	A	1304	NAG	O5-C5	2.66	1.48	1.43
3	B	1304	NAG	C1-C2	2.64	1.55	1.52
3	B	1301	NAG	C1-C2	2.64	1.55	1.52
3	A	1301	NAG	O5-C5	2.62	1.48	1.43
3	B	1304	NAG	O5-C5	2.56	1.48	1.43
3	C	1310	NAG	O5-C5	2.56	1.48	1.43
3	B	1312	NAG	O5-C5	2.55	1.48	1.43
3	C	1310	NAG	C1-C2	2.53	1.55	1.52
3	B	1306	NAG	O5-C5	2.51	1.48	1.43
3	A	1304	NAG	C1-C2	2.51	1.55	1.52
3	B	1301	NAG	O5-C5	2.47	1.48	1.43
3	B	1310	NAG	O5-C5	2.44	1.48	1.43
3	A	1306	NAG	O5-C5	2.42	1.48	1.43
3	A	1310	NAG	C1-C2	2.41	1.55	1.52
3	B	1309	NAG	C1-C2	2.40	1.55	1.52
3	A	1307	NAG	O5-C5	2.40	1.48	1.43
3	C	1301	NAG	C1-C2	2.37	1.55	1.52
3	C	1306	NAG	C1-C2	2.36	1.55	1.52
3	C	1308	NAG	O5-C5	2.31	1.47	1.43
3	B	1303	NAG	C1-C2	2.31	1.55	1.52
3	A	1301	NAG	C1-C2	2.26	1.55	1.52
3	A	1307	NAG	C1-C2	2.24	1.55	1.52
3	A	1308	NAG	C1-C2	2.24	1.55	1.52
3	B	1307	NAG	O5-C1	2.23	1.47	1.43
3	B	1312	NAG	C1-C2	2.23	1.55	1.52
3	A	1304	NAG	O5-C1	2.22	1.47	1.43
3	C	1305	NAG	O5-C1	2.21	1.47	1.43

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	1309	NAG	C1-C2	2.21	1.55	1.52
3	B	1305	NAG	O5-C1	2.21	1.47	1.43
3	B	1305	NAG	C1-C2	2.19	1.55	1.52
3	A	1306	NAG	C1-C2	2.18	1.55	1.52
3	C	1308	NAG	C1-C2	2.14	1.55	1.52
3	B	1309	NAG	O5-C1	2.14	1.47	1.43
3	B	1311	NAG	C1-C2	2.13	1.55	1.52
3	C	1302	NAG	C1-C2	2.13	1.55	1.52
3	A	1310	NAG	O5-C1	2.12	1.47	1.43
3	A	1303	NAG	C1-C2	2.11	1.55	1.52
3	C	1304	NAG	C1-C2	2.10	1.55	1.52
3	C	1305	NAG	C1-C2	2.08	1.55	1.52
3	C	1301	NAG	O5-C1	2.08	1.47	1.43
3	C	1306	NAG	O5-C1	2.07	1.47	1.43
3	B	1301	NAG	O5-C1	2.07	1.47	1.43
3	B	1308	NAG	C1-C2	2.03	1.55	1.52
3	B	1306	NAG	C1-C2	2.02	1.55	1.52
3	B	1303	NAG	O5-C5	2.02	1.47	1.43
3	C	1304	NAG	O5-C1	2.01	1.47	1.43
3	B	1302	NAG	O5-C1	2.01	1.47	1.43
3	C	1307	NAG	C1-C2	2.00	1.55	1.52

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	1307	NAG	C1-O5-C5	7.91	122.79	112.19
3	B	1301	NAG	C1-O5-C5	4.46	118.17	112.19
3	A	1310	NAG	C1-O5-C5	3.70	117.14	112.19
3	A	1304	NAG	C1-O5-C5	3.43	116.79	112.19
3	A	1303	NAG	C1-O5-C5	2.84	115.99	112.19
3	A	1301	NAG	C1-O5-C5	2.75	115.87	112.19
3	B	1311	NAG	C1-O5-C5	2.66	115.76	112.19
3	B	1305	NAG	C1-O5-C5	2.64	115.72	112.19
3	A	1305	NAG	O5-C1-C2	-2.59	107.28	111.29
3	B	1303	NAG	C2-N2-C7	2.55	126.32	122.90
3	B	1307	NAG	C4-C3-C2	-2.41	107.48	111.02
3	B	1303	NAG	C1-C2-N2	-2.41	106.63	110.43
3	C	1302	NAG	C1-O5-C5	2.35	115.33	112.19
3	A	1307	NAG	C1-O5-C5	2.34	115.32	112.19
3	B	1307	NAG	O5-C1-C2	2.26	114.79	111.29
3	C	1301	NAG	C1-O5-C5	2.23	115.18	112.19
3	B	1312	NAG	C1-O5-C5	2.21	115.15	112.19

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	1306	NAG	C1-O5-C5	2.14	115.06	112.19
3	A	1305	NAG	C1-C2-N2	2.04	113.65	110.43
3	C	1305	NAG	C1-O5-C5	2.04	114.92	112.19
3	C	1306	NAG	C1-O5-C5	2.03	114.90	112.19
3	C	1310	NAG	C1-O5-C5	2.01	114.88	112.19

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1304	NAG	C8-C7-N2-C2
3	A	1310	NAG	O5-C5-C6-O6
3	A	1307	NAG	O5-C5-C6-O6
3	A	1304	NAG	O7-C7-N2-C2
3	B	1306	NAG	C1-C2-N2-C7
3	B	1306	NAG	O5-C5-C6-O6
3	B	1303	NAG	C3-C2-N2-C7
3	C	1309	NAG	C8-C7-N2-C2
3	A	1302	NAG	O5-C5-C6-O6
3	C	1309	NAG	O7-C7-N2-C2

There are no ring outliers.

7 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	1301	NAG	1	0
3	B	1301	NAG	1	0
3	A	1304	NAG	1	0
3	B	1302	NAG	1	0
3	C	1302	NAG	1	0
3	C	1305	NAG	1	0
3	A	1305	NAG	1	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

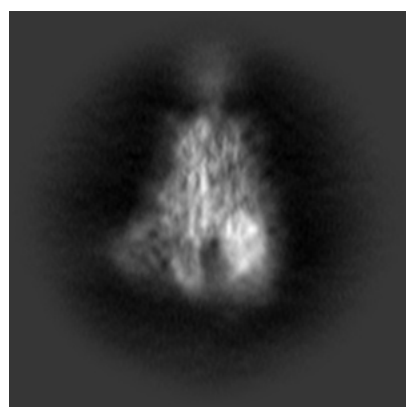
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-22838. These allow visual inspection of the internal detail of the map and identification of artifacts.

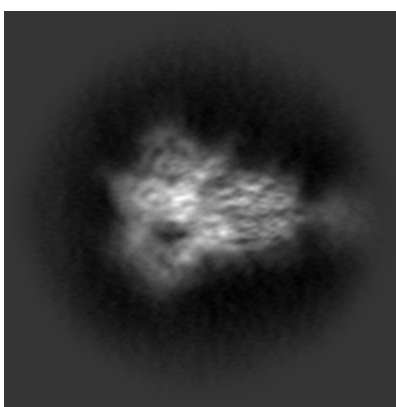
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

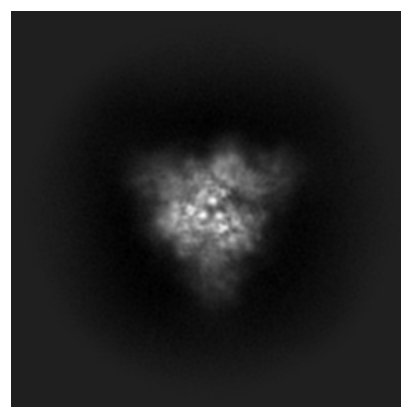
6.1.1 Primary map



X



Y

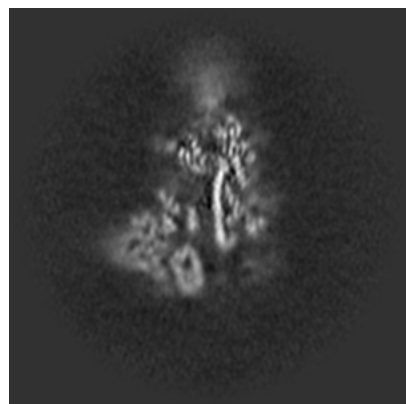


Z

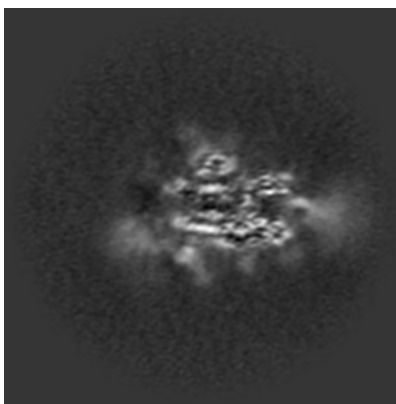
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

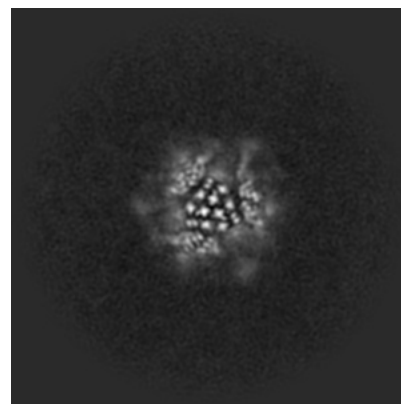
6.2.1 Primary map



X Index: 150



Y Index: 150

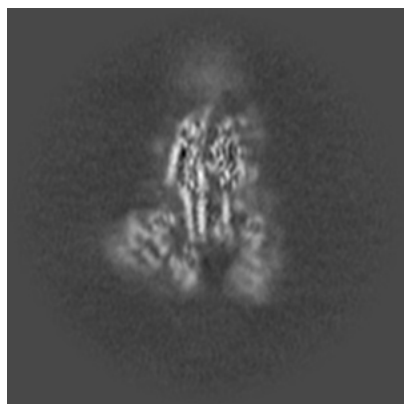


Z Index: 150

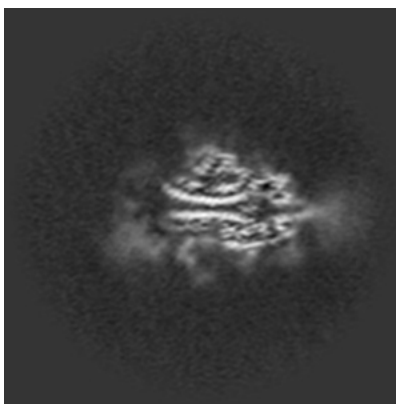
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

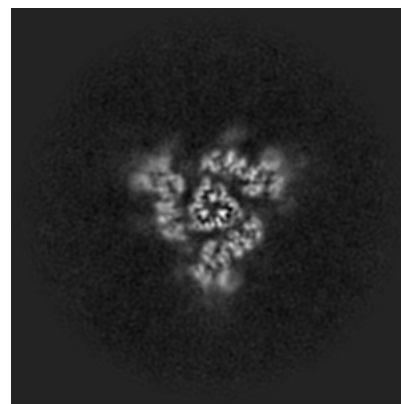
6.3.1 Primary map



X Index: 157



Y Index: 146

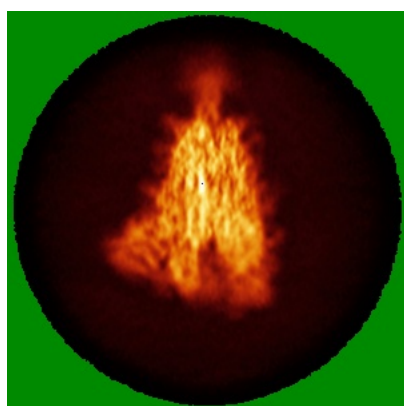


Z Index: 135

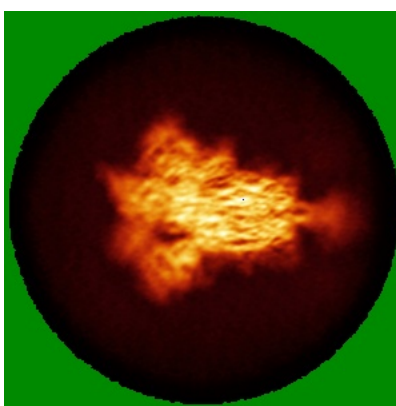
The images above show the largest variance slices of the map in three orthogonal directions.

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

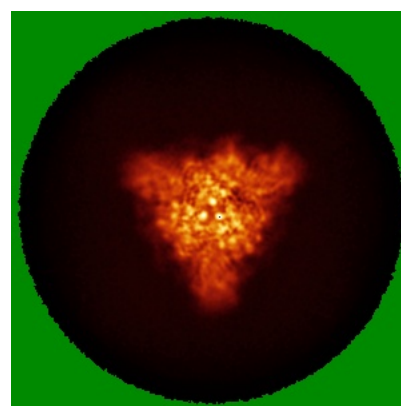
6.4.1 Primary map



X



Y

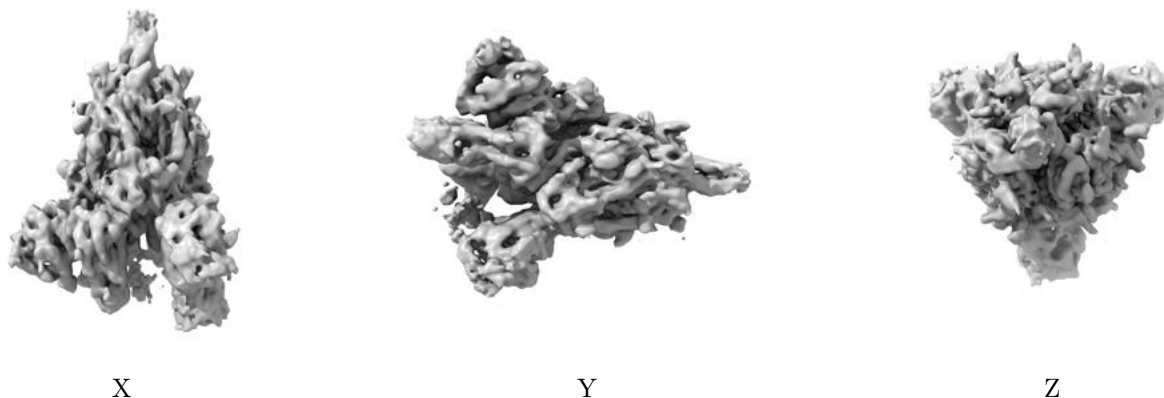


Z

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 0.2. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

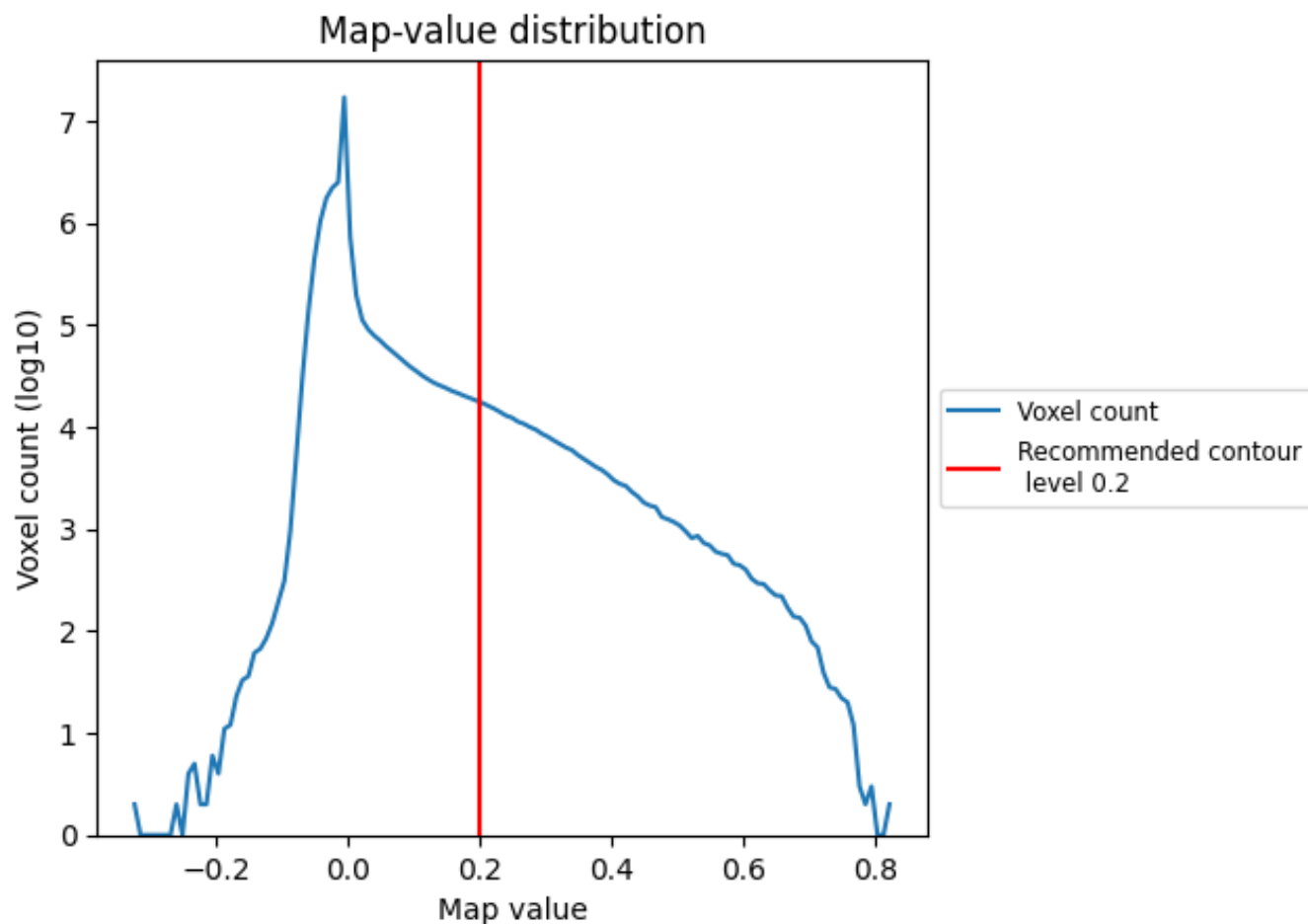
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

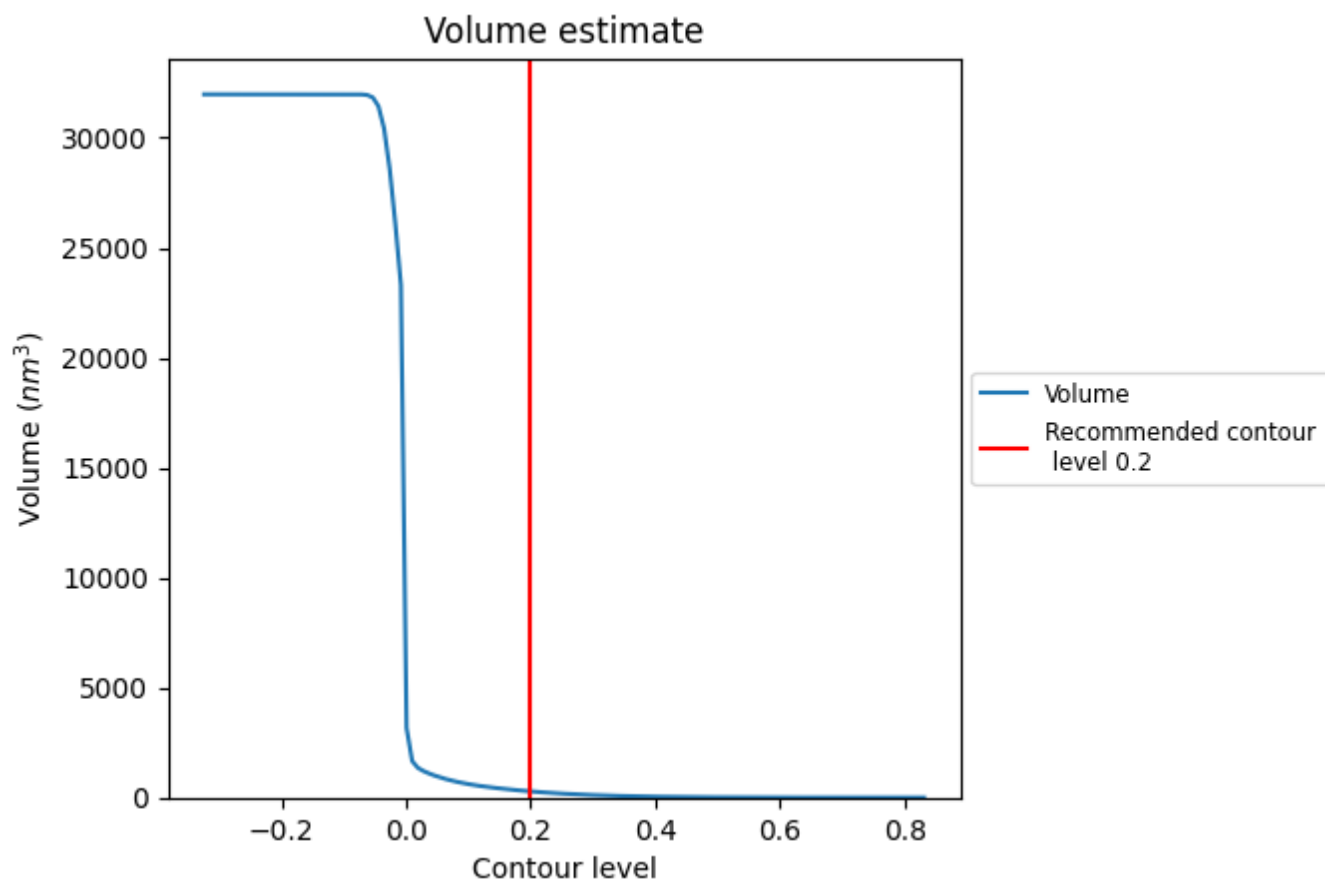
This section contains the results of statistical analysis of the map.

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.

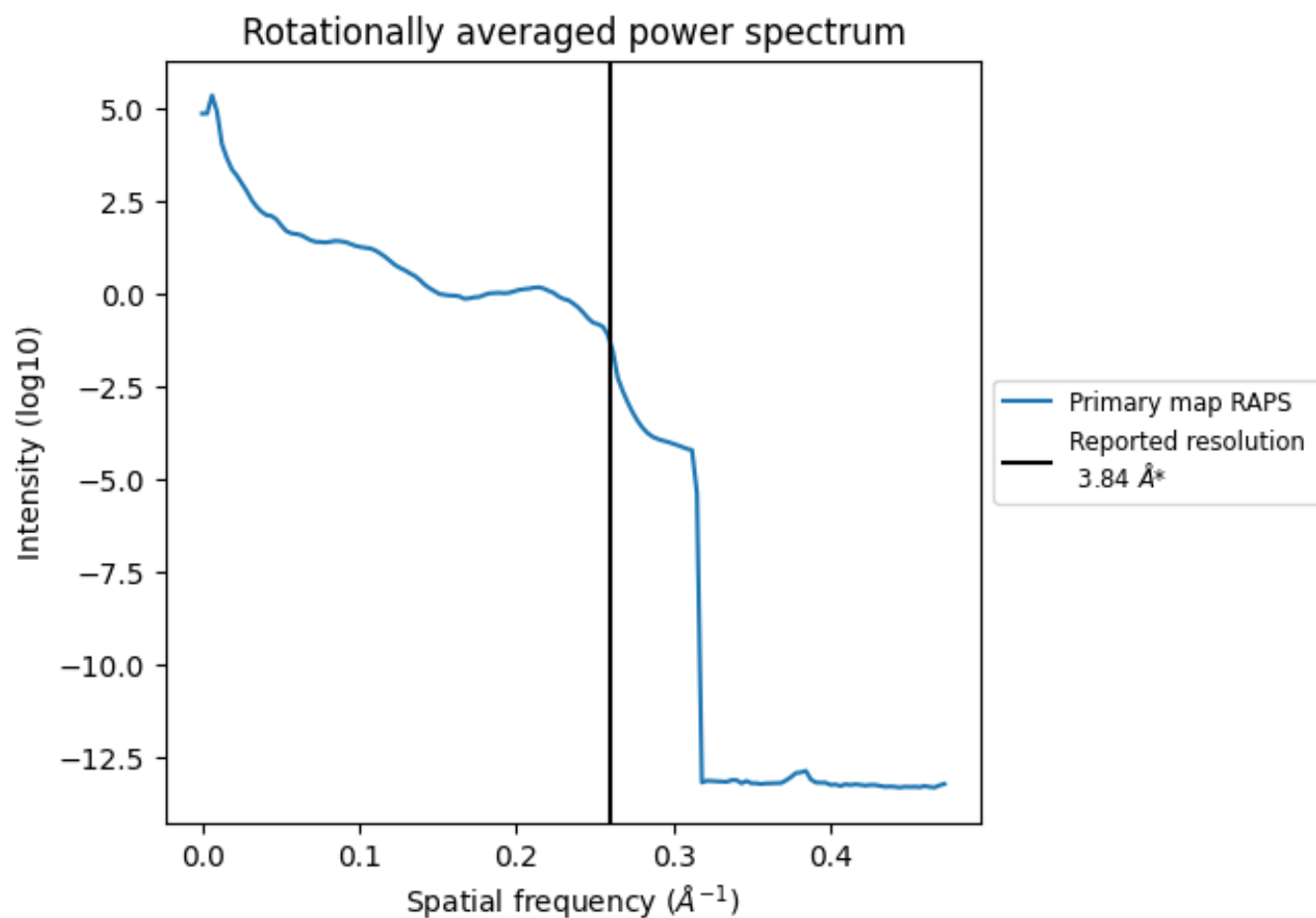
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 280 nm³; this corresponds to an approximate mass of 253 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 0.260 Å⁻¹

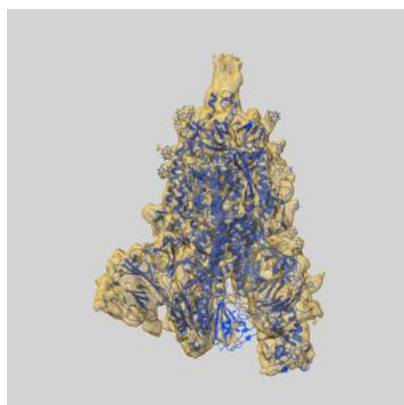
8 Fourier-Shell correlation

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

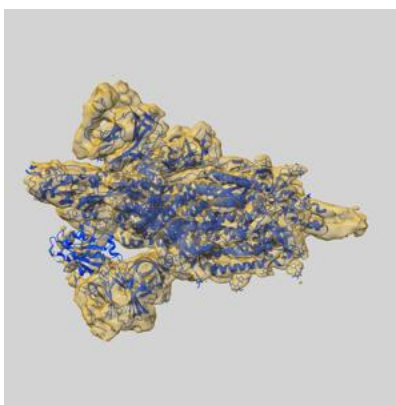
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-22838 and PDB model 7KEC. Per-residue inclusion information can be found in section 3 on page 14.

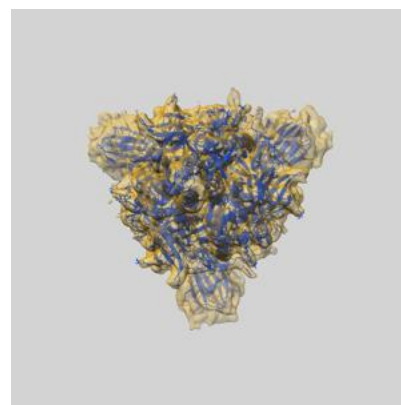
9.1 Map-model overlay [i](#)



X



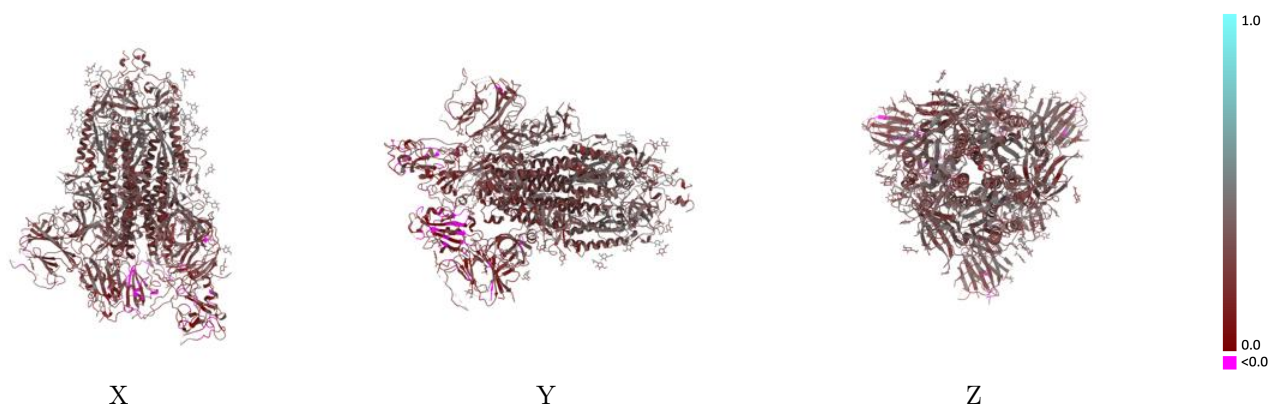
Y



Z

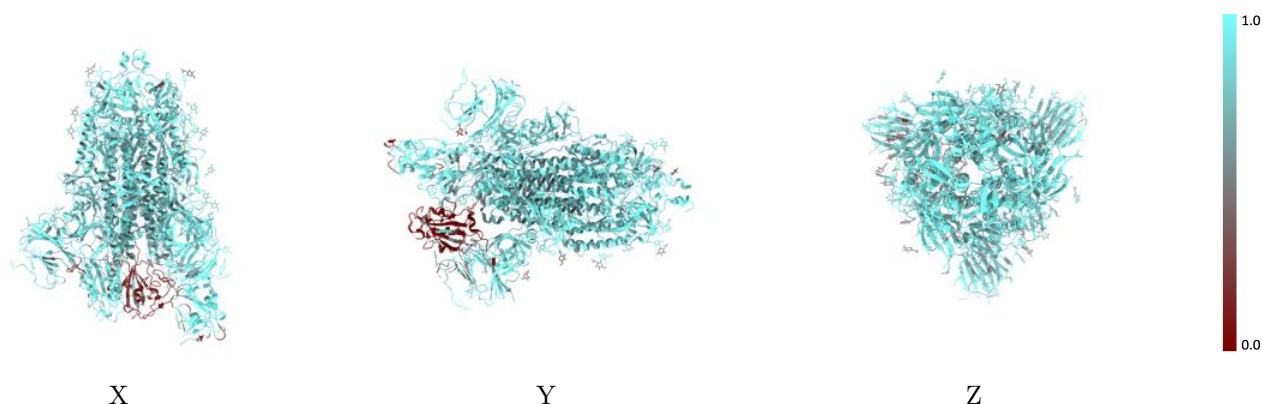
The images above show the 3D surface view of the map at the recommended contour level 0.2 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



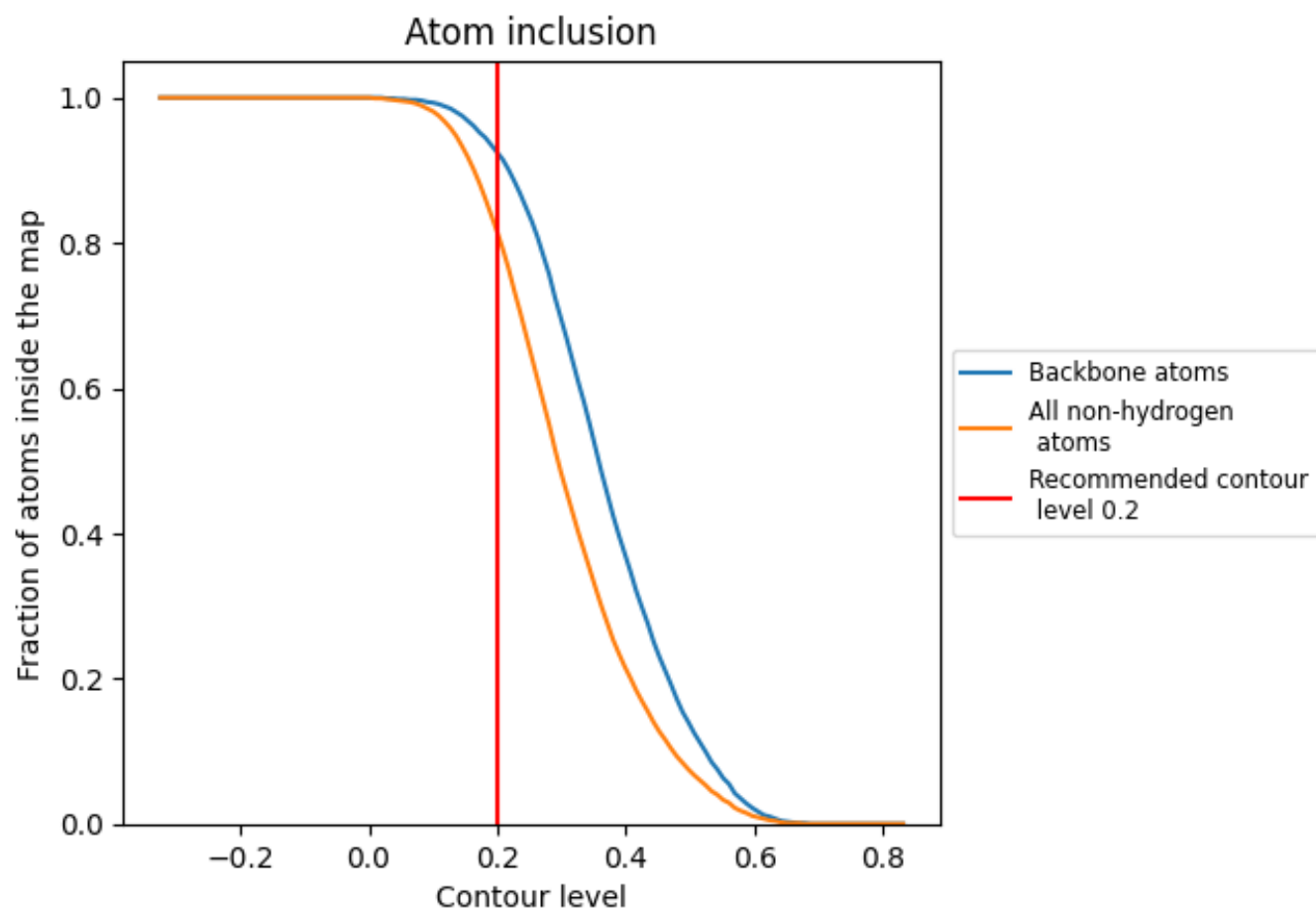
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.2).

9.4 Atom inclusion [i](#)



At the recommended contour level, 92% of all backbone atoms, 82% 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 (0.2) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8150	 0.2870
A	 0.7370	 0.2730
B	 0.8530	 0.2800
C	 0.8630	 0.3040
D	 0.0360	 0.2060
E	 0.7860	 0.4440
F	 0.7860	 0.4350
G	 0.8570	 0.3450
H	 0.7500	 0.3960
I	 0.6790	 0.4220
J	 0.7860	 0.3810
K	 0.8210	 0.3520
L	 0.7140	 0.4230
M	 0.7860	 0.3930
N	 0.8570	 0.3340
O	 0.7500	 0.4000

