wwPDB EM Validation Summary Report

Mar 9, 2026 – 09:46 AM UTC

PDB ID	:	8Z7P / pdb_00008z7p
EMDB ID	:	EMD-39822
Title	:	Cryo-EM structure of SARS-CoV-2 S trimer in the early fusion intermediate conformation (E-FIC)
Authors	:	Liu, Z.; Xing, L.
Deposited on	:	2024-04-20
Resolution	:	3.45 Å(reported)

This is a wwPDB EM Validation Summary 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:

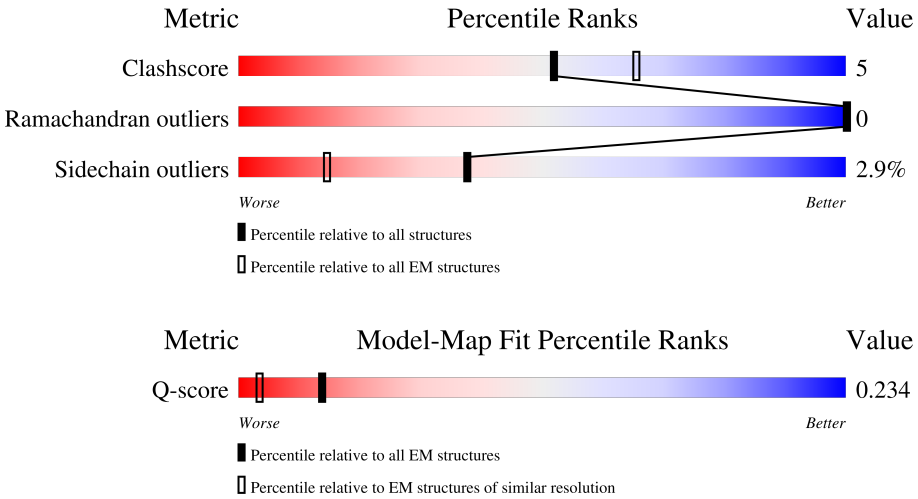
EMDB validation analysis	:	0.0.1.dev132
Mogul	:	2022.3.0, CSD as543be (2022)
MolProbity	:	4-5-2 with Phenix2.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics	:	202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ	:	1.9.13
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 3.45 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	13836 (2.95 - 3.95)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5% 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	D	631	6% 77% 17% 6%
1	E	631	6% 77% 16% 6%
1	F	631	6% 78% 16% • 6%
2	A	1288	• 72% 13% 15%

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Mol	Chain	Length	Quality of chain
2	B	1288	72% 13% 15%
2	C	1288	72% 13% 15%
3	G	2	50% 100%
3	H	2	100%
3	I	2	100%
3	J	2	100%
3	K	2	50% 50%
3	L	2	50% 50%
3	M	2	100%
3	O	2	50% 100%
3	P	2	100%
3	Q	2	100%
3	R	2	100%
3	S	2	50% 50%
3	T	2	50% 50%
3	U	2	100%
3	W	2	50% 100%
3	X	2	100%
3	Y	2	100%
3	Z	2	100%
3	a	2	50% 50%
3	b	2	50% 50%
3	c	2	100%
4	N	3	100%
4	V	3	100%

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Mol	Chain	Length	Quality of chain
4	d	3	100%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 41499 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 Angiotensin-converting enzyme 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	D	595	Total	C	N	O	S	0	0
			4857	3108	804	916	29		
1	E	595	Total	C	N	O	S	0	0
			4857	3108	804	916	29		
1	F	595	Total	C	N	O	S	0	0
			4857	3108	804	916	29		

There are 48 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	616	LEU	-	expression tag	UNP Q9BYF1
D	617	GLU	-	expression tag	UNP Q9BYF1
D	618	VAL	-	expression tag	UNP Q9BYF1
D	619	LEU	-	expression tag	UNP Q9BYF1
D	620	PHE	-	expression tag	UNP Q9BYF1
D	621	GLN	-	expression tag	UNP Q9BYF1
D	622	GLY	-	expression tag	UNP Q9BYF1
D	623	PRO	-	expression tag	UNP Q9BYF1
D	624	HIS	-	expression tag	UNP Q9BYF1
D	625	HIS	-	expression tag	UNP Q9BYF1
D	626	HIS	-	expression tag	UNP Q9BYF1
D	627	HIS	-	expression tag	UNP Q9BYF1
D	628	HIS	-	expression tag	UNP Q9BYF1
D	629	HIS	-	expression tag	UNP Q9BYF1
D	630	HIS	-	expression tag	UNP Q9BYF1
D	631	HIS	-	expression tag	UNP Q9BYF1
E	616	LEU	-	expression tag	UNP Q9BYF1
E	617	GLU	-	expression tag	UNP Q9BYF1
E	618	VAL	-	expression tag	UNP Q9BYF1
E	619	LEU	-	expression tag	UNP Q9BYF1
E	620	PHE	-	expression tag	UNP Q9BYF1
E	621	GLN	-	expression tag	UNP Q9BYF1
E	622	GLY	-	expression tag	UNP Q9BYF1
E	623	PRO	-	expression tag	UNP Q9BYF1

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Chain	Residue	Modelled	Actual	Comment	Reference
E	624	HIS	-	expression tag	UNP Q9BYF1
E	625	HIS	-	expression tag	UNP Q9BYF1
E	626	HIS	-	expression tag	UNP Q9BYF1
E	627	HIS	-	expression tag	UNP Q9BYF1
E	628	HIS	-	expression tag	UNP Q9BYF1
E	629	HIS	-	expression tag	UNP Q9BYF1
E	630	HIS	-	expression tag	UNP Q9BYF1
E	631	HIS	-	expression tag	UNP Q9BYF1
F	616	LEU	-	expression tag	UNP Q9BYF1
F	617	GLU	-	expression tag	UNP Q9BYF1
F	618	VAL	-	expression tag	UNP Q9BYF1
F	619	LEU	-	expression tag	UNP Q9BYF1
F	620	PHE	-	expression tag	UNP Q9BYF1
F	621	GLN	-	expression tag	UNP Q9BYF1
F	622	GLY	-	expression tag	UNP Q9BYF1
F	623	PRO	-	expression tag	UNP Q9BYF1
F	624	HIS	-	expression tag	UNP Q9BYF1
F	625	HIS	-	expression tag	UNP Q9BYF1
F	626	HIS	-	expression tag	UNP Q9BYF1
F	627	HIS	-	expression tag	UNP Q9BYF1
F	628	HIS	-	expression tag	UNP Q9BYF1
F	629	HIS	-	expression tag	UNP Q9BYF1
F	630	HIS	-	expression tag	UNP Q9BYF1
F	631	HIS	-	expression tag	UNP Q9BYF1

- Molecule 2 is a protein called Spike glycoprotein.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	A	1099	Total	C	N	O	S	0	0
			8545	5448	1428	1629	40		
2	B	1099	Total	C	N	O	S	0	0
			8545	5448	1428	1629	40		
2	C	1099	Total	C	N	O	S	0	0
			8545	5448	1428	1629	40		

There are 243 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	614	GLY	ASP	variant	UNP P0DTC2
A	1209	GLY	-	expression tag	UNP P0DTC2
A	1210	SER	-	expression tag	UNP P0DTC2
A	1211	GLY	-	expression tag	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
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
A	1229	GLU	-	expression tag	UNP P0DTC2
A	1230	TRP	-	expression tag	UNP P0DTC2
A	1231	VAL	-	expression tag	UNP P0DTC2
A	1232	PHE	-	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	SER	-	expression tag	UNP P0DTC2
A	1239	GLY	-	expression tag	UNP P0DTC2
A	1240	LEU	-	expression tag	UNP P0DTC2
A	1241	GLU	-	expression tag	UNP P0DTC2
A	1242	VAL	-	expression tag	UNP P0DTC2
A	1243	LEU	-	expression tag	UNP P0DTC2
A	1244	PHE	-	expression tag	UNP P0DTC2
A	1245	GLN	-	expression tag	UNP P0DTC2
A	1246	GLY	-	expression tag	UNP P0DTC2
A	1247	PRO	-	expression tag	UNP P0DTC2
A	1248	GLY	-	expression tag	UNP P0DTC2
A	1249	GLY	-	expression tag	UNP P0DTC2
A	1250	TRP	-	expression tag	UNP P0DTC2
A	1251	SER	-	expression tag	UNP P0DTC2
A	1252	HIS	-	expression tag	UNP P0DTC2
A	1253	PRO	-	expression tag	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
A	1254	GLN	-	expression tag	UNP P0DTC2
A	1255	PHE	-	expression tag	UNP P0DTC2
A	1256	GLU	-	expression tag	UNP P0DTC2
A	1257	LYS	-	expression tag	UNP P0DTC2
A	1258	GLY	-	expression tag	UNP P0DTC2
A	1259	GLY	-	expression tag	UNP P0DTC2
A	1260	GLY	-	expression tag	UNP P0DTC2
A	1261	SER	-	expression tag	UNP P0DTC2
A	1262	GLY	-	expression tag	UNP P0DTC2
A	1263	GLY	-	expression tag	UNP P0DTC2
A	1264	GLY	-	expression tag	UNP P0DTC2
A	1265	SER	-	expression tag	UNP P0DTC2
A	1266	GLY	-	expression tag	UNP P0DTC2
A	1267	GLY	-	expression tag	UNP P0DTC2
A	1268	SER	-	expression tag	UNP P0DTC2
A	1269	ALA	-	expression tag	UNP P0DTC2
A	1270	TRP	-	expression tag	UNP P0DTC2
A	1271	SER	-	expression tag	UNP P0DTC2
A	1272	HIS	-	expression tag	UNP P0DTC2
A	1273	PRO	-	expression tag	UNP P0DTC2
A	1274	GLN	-	expression tag	UNP P0DTC2
A	1275	PHE	-	expression tag	UNP P0DTC2
A	1276	GLU	-	expression tag	UNP P0DTC2
A	1277	LYS	-	expression tag	UNP P0DTC2
A	1278	GLY	-	expression tag	UNP P0DTC2
A	1279	GLY	-	expression tag	UNP P0DTC2
A	1280	SER	-	expression tag	UNP P0DTC2
A	1281	HIS	-	expression tag	UNP P0DTC2
A	1282	HIS	-	expression tag	UNP P0DTC2
A	1283	HIS	-	expression tag	UNP P0DTC2
A	1284	HIS	-	expression tag	UNP P0DTC2
A	1285	HIS	-	expression tag	UNP P0DTC2
A	1286	HIS	-	expression tag	UNP P0DTC2
A	1287	HIS	-	expression tag	UNP P0DTC2
A	1288	HIS	-	expression tag	UNP P0DTC2
B	614	GLY	ASP	variant	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

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Chain	Residue	Modelled	Actual	Comment	Reference
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
B	1229	GLU	-	expression tag	UNP P0DTC2
B	1230	TRP	-	expression tag	UNP P0DTC2
B	1231	VAL	-	expression tag	UNP P0DTC2
B	1232	PHE	-	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	SER	-	expression tag	UNP P0DTC2
B	1239	GLY	-	expression tag	UNP P0DTC2
B	1240	LEU	-	expression tag	UNP P0DTC2
B	1241	GLU	-	expression tag	UNP P0DTC2
B	1242	VAL	-	expression tag	UNP P0DTC2
B	1243	LEU	-	expression tag	UNP P0DTC2
B	1244	PHE	-	expression tag	UNP P0DTC2
B	1245	GLN	-	expression tag	UNP P0DTC2
B	1246	GLY	-	expression tag	UNP P0DTC2
B	1247	PRO	-	expression tag	UNP P0DTC2
B	1248	GLY	-	expression tag	UNP P0DTC2
B	1249	GLY	-	expression tag	UNP P0DTC2
B	1250	TRP	-	expression tag	UNP P0DTC2
B	1251	SER	-	expression tag	UNP P0DTC2
B	1252	HIS	-	expression tag	UNP P0DTC2
B	1253	PRO	-	expression tag	UNP P0DTC2
B	1254	GLN	-	expression tag	UNP P0DTC2
B	1255	PHE	-	expression tag	UNP P0DTC2
B	1256	GLU	-	expression tag	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
B	1257	LYS	-	expression tag	UNP P0DTC2
B	1258	GLY	-	expression tag	UNP P0DTC2
B	1259	GLY	-	expression tag	UNP P0DTC2
B	1260	GLY	-	expression tag	UNP P0DTC2
B	1261	SER	-	expression tag	UNP P0DTC2
B	1262	GLY	-	expression tag	UNP P0DTC2
B	1263	GLY	-	expression tag	UNP P0DTC2
B	1264	GLY	-	expression tag	UNP P0DTC2
B	1265	SER	-	expression tag	UNP P0DTC2
B	1266	GLY	-	expression tag	UNP P0DTC2
B	1267	GLY	-	expression tag	UNP P0DTC2
B	1268	SER	-	expression tag	UNP P0DTC2
B	1269	ALA	-	expression tag	UNP P0DTC2
B	1270	TRP	-	expression tag	UNP P0DTC2
B	1271	SER	-	expression tag	UNP P0DTC2
B	1272	HIS	-	expression tag	UNP P0DTC2
B	1273	PRO	-	expression tag	UNP P0DTC2
B	1274	GLN	-	expression tag	UNP P0DTC2
B	1275	PHE	-	expression tag	UNP P0DTC2
B	1276	GLU	-	expression tag	UNP P0DTC2
B	1277	LYS	-	expression tag	UNP P0DTC2
B	1278	GLY	-	expression tag	UNP P0DTC2
B	1279	GLY	-	expression tag	UNP P0DTC2
B	1280	SER	-	expression tag	UNP P0DTC2
B	1281	HIS	-	expression tag	UNP P0DTC2
B	1282	HIS	-	expression tag	UNP P0DTC2
B	1283	HIS	-	expression tag	UNP P0DTC2
B	1284	HIS	-	expression tag	UNP P0DTC2
B	1285	HIS	-	expression tag	UNP P0DTC2
B	1286	HIS	-	expression tag	UNP P0DTC2
B	1287	HIS	-	expression tag	UNP P0DTC2
B	1288	HIS	-	expression tag	UNP P0DTC2
C	614	GLY	ASP	variant	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

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Chain	Residue	Modelled	Actual	Comment	Reference
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
C	1229	GLU	-	expression tag	UNP P0DTC2
C	1230	TRP	-	expression tag	UNP P0DTC2
C	1231	VAL	-	expression tag	UNP P0DTC2
C	1232	PHE	-	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	SER	-	expression tag	UNP P0DTC2
C	1239	GLY	-	expression tag	UNP P0DTC2
C	1240	LEU	-	expression tag	UNP P0DTC2
C	1241	GLU	-	expression tag	UNP P0DTC2
C	1242	VAL	-	expression tag	UNP P0DTC2
C	1243	LEU	-	expression tag	UNP P0DTC2
C	1244	PHE	-	expression tag	UNP P0DTC2
C	1245	GLN	-	expression tag	UNP P0DTC2
C	1246	GLY	-	expression tag	UNP P0DTC2
C	1247	PRO	-	expression tag	UNP P0DTC2
C	1248	GLY	-	expression tag	UNP P0DTC2
C	1249	GLY	-	expression tag	UNP P0DTC2
C	1250	TRP	-	expression tag	UNP P0DTC2
C	1251	SER	-	expression tag	UNP P0DTC2
C	1252	HIS	-	expression tag	UNP P0DTC2
C	1253	PRO	-	expression tag	UNP P0DTC2
C	1254	GLN	-	expression tag	UNP P0DTC2
C	1255	PHE	-	expression tag	UNP P0DTC2
C	1256	GLU	-	expression tag	UNP P0DTC2
C	1257	LYS	-	expression tag	UNP P0DTC2
C	1258	GLY	-	expression tag	UNP P0DTC2
C	1259	GLY	-	expression tag	UNP P0DTC2

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Chain	Residue	Modelled	Actual	Comment	Reference
C	1260	GLY	-	expression tag	UNP P0DTC2
C	1261	SER	-	expression tag	UNP P0DTC2
C	1262	GLY	-	expression tag	UNP P0DTC2
C	1263	GLY	-	expression tag	UNP P0DTC2
C	1264	GLY	-	expression tag	UNP P0DTC2
C	1265	SER	-	expression tag	UNP P0DTC2
C	1266	GLY	-	expression tag	UNP P0DTC2
C	1267	GLY	-	expression tag	UNP P0DTC2
C	1268	SER	-	expression tag	UNP P0DTC2
C	1269	ALA	-	expression tag	UNP P0DTC2
C	1270	TRP	-	expression tag	UNP P0DTC2
C	1271	SER	-	expression tag	UNP P0DTC2
C	1272	HIS	-	expression tag	UNP P0DTC2
C	1273	PRO	-	expression tag	UNP P0DTC2
C	1274	GLN	-	expression tag	UNP P0DTC2
C	1275	PHE	-	expression tag	UNP P0DTC2
C	1276	GLU	-	expression tag	UNP P0DTC2
C	1277	LYS	-	expression tag	UNP P0DTC2
C	1278	GLY	-	expression tag	UNP P0DTC2
C	1279	GLY	-	expression tag	UNP P0DTC2
C	1280	SER	-	expression tag	UNP P0DTC2
C	1281	HIS	-	expression tag	UNP P0DTC2
C	1282	HIS	-	expression tag	UNP P0DTC2
C	1283	HIS	-	expression tag	UNP P0DTC2
C	1284	HIS	-	expression tag	UNP P0DTC2
C	1285	HIS	-	expression tag	UNP P0DTC2
C	1286	HIS	-	expression tag	UNP P0DTC2
C	1287	HIS	-	expression tag	UNP P0DTC2
C	1288	HIS	-	expression tag	UNP P0DTC2

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



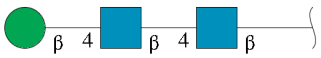
Mol	Chain	Residues	Atoms				AltConf	Trace
3	G	2	Total	C	N	O	0	0
			28	16	2	10		
3	H	2	Total	C	N	O	0	0
			28	16	2	10		

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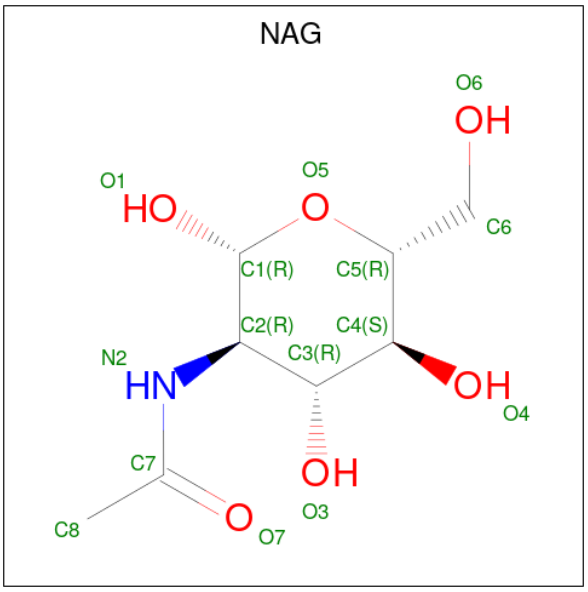
Mol	Chain	Residues	Atoms				AltConf	Trace
3	I	2	Total	C	N	O	0	0
			28	16	2	10		
3	J	2	Total	C	N	O	0	0
			28	16	2	10		
3	K	2	Total	C	N	O	0	0
			28	16	2	10		
3	L	2	Total	C	N	O	0	0
			28	16	2	10		
3	M	2	Total	C	N	O	0	0
			28	16	2	10		
3	O	2	Total	C	N	O	0	0
			28	16	2	10		
3	P	2	Total	C	N	O	0	0
			28	16	2	10		
3	Q	2	Total	C	N	O	0	0
			28	16	2	10		
3	R	2	Total	C	N	O	0	0
			28	16	2	10		
3	S	2	Total	C	N	O	0	0
			28	16	2	10		
3	T	2	Total	C	N	O	0	0
			28	16	2	10		
3	U	2	Total	C	N	O	0	0
			28	16	2	10		
3	W	2	Total	C	N	O	0	0
			28	16	2	10		
3	X	2	Total	C	N	O	0	0
			28	16	2	10		
3	Y	2	Total	C	N	O	0	0
			28	16	2	10		
3	Z	2	Total	C	N	O	0	0
			28	16	2	10		
3	a	2	Total	C	N	O	0	0
			28	16	2	10		
3	b	2	Total	C	N	O	0	0
			28	16	2	10		
3	c	2	Total	C	N	O	0	0
			28	16	2	10		

- Molecule 4 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
4	N	3	Total C N O 39 22 2 15	0	0
4	V	3	Total C N O 39 22 2 15	0	0
4	d	3	Total C N O 39 22 2 15	0	0

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



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

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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	E	1	Total	C	N	O	0
			14	8	1	5	
5	E	1	Total	C	N	O	0
			14	8	1	5	
5	E	1	Total	C	N	O	0
			14	8	1	5	
5	E	1	Total	C	N	O	0
			14	8	1	5	
5	B	1	Total	C	N	O	0
			14	8	1	5	
5	B	1	Total	C	N	O	0
			14	8	1	5	
5	B	1	Total	C	N	O	0
			14	8	1	5	
5	B	1	Total	C	N	O	0
			14	8	1	5	
5	B	1	Total	C	N	O	0
			14	8	1	5	
5	B	1	Total	C	N	O	0
			14	8	1	5	
5	B	1	Total	C	N	O	0
			14	8	1	5	
5	B	1	Total	C	N	O	0
			14	8	1	5	

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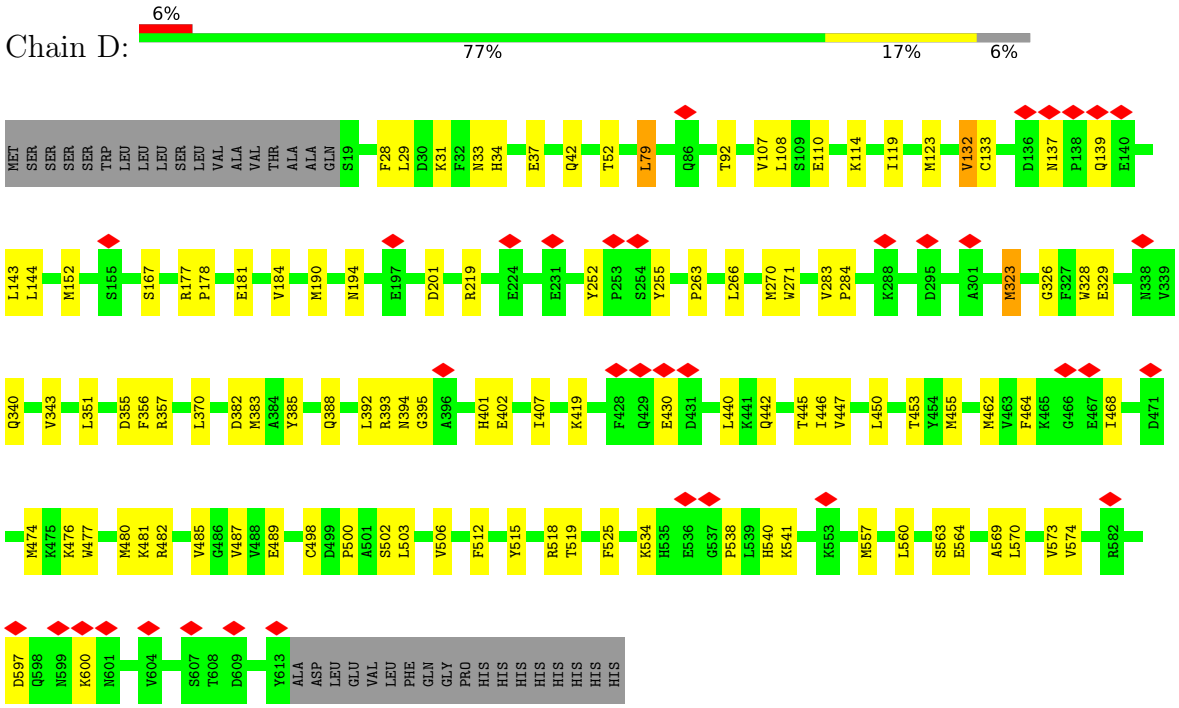
Mol	Chain	Residues	Atoms				AltConf
5	B	1	Total	C	N	O	0
			14	8	1	5	
5	F	1	Total	C	N	O	0
			14	8	1	5	
5	F	1	Total	C	N	O	0
			14	8	1	5	
5	F	1	Total	C	N	O	0
			14	8	1	5	
5	F	1	Total	C	N	O	0
			14	8	1	5	
5	C	1	Total	C	N	O	0
			14	8	1	5	
5	C	1	Total	C	N	O	0
			14	8	1	5	
5	C	1	Total	C	N	O	0
			14	8	1	5	
5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

3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry 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.

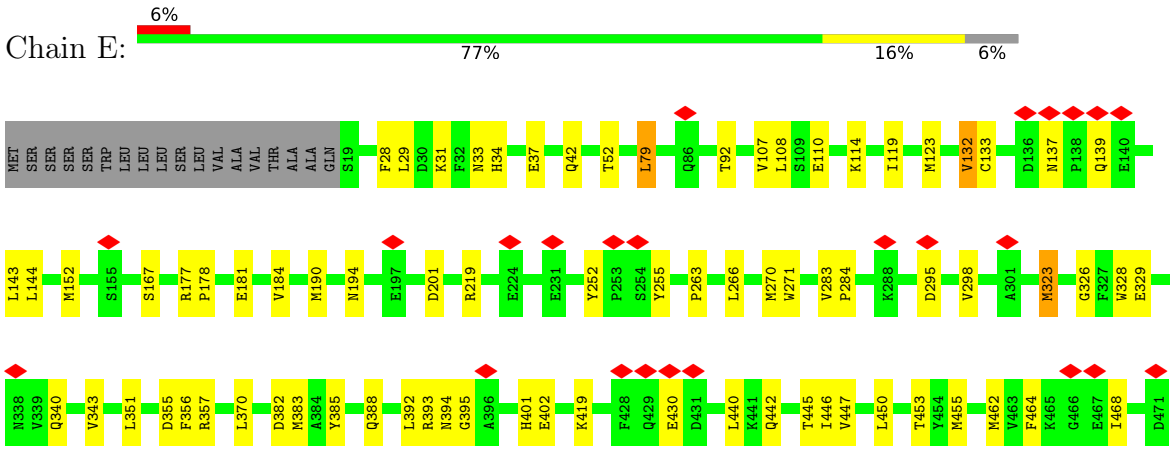
• Molecule 1: Angiotensin-converting enzyme 2

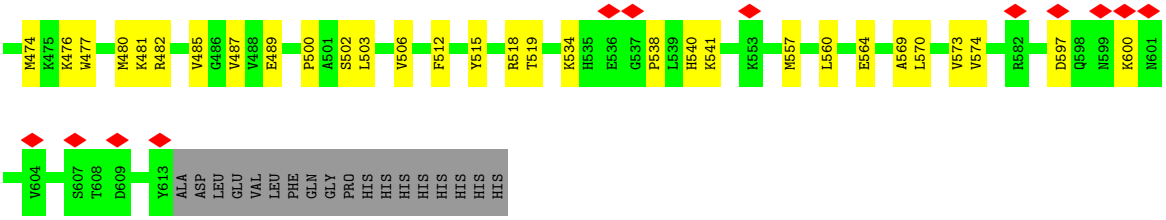
Chain D:



• Molecule 1: Angiotensin-converting enzyme 2

Chain E:

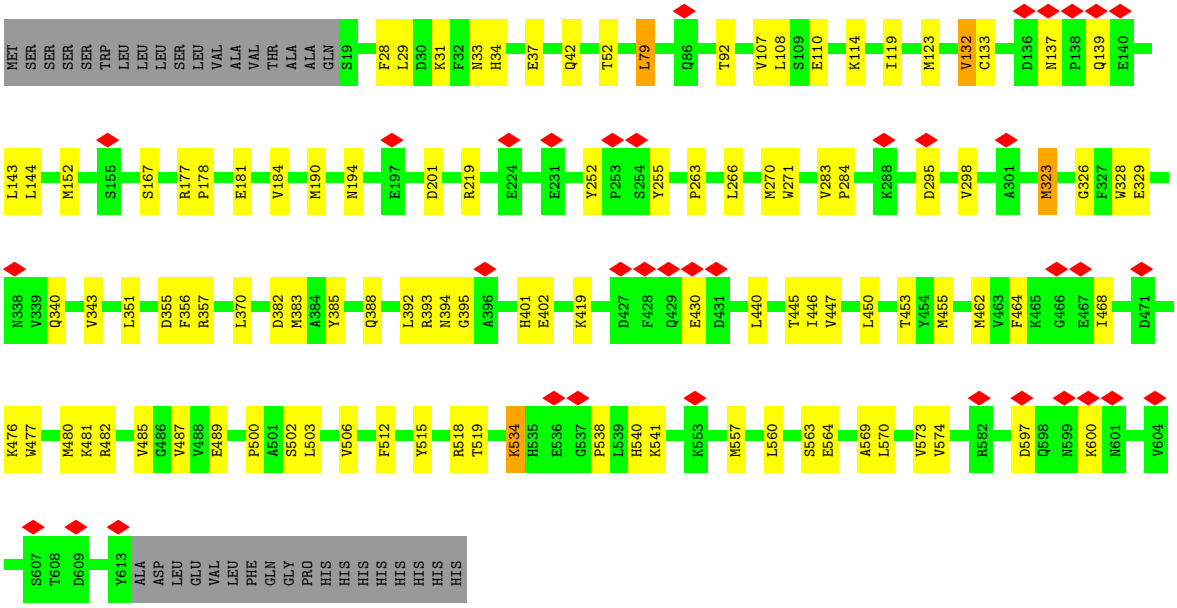




• Molecule 1: Angiotensin-converting enzyme 2

Chain F:

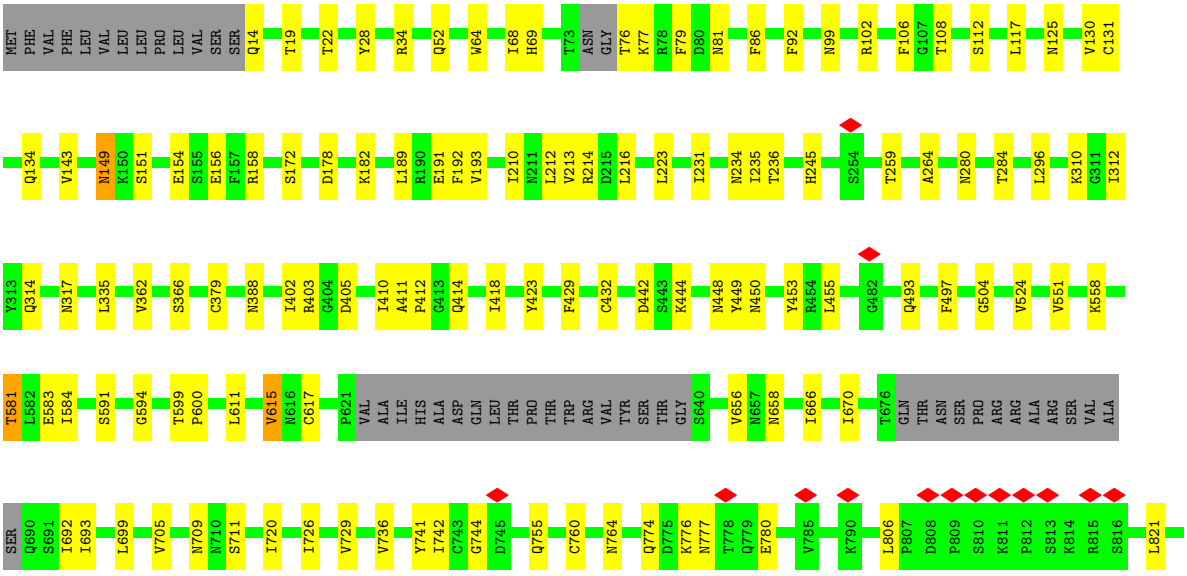


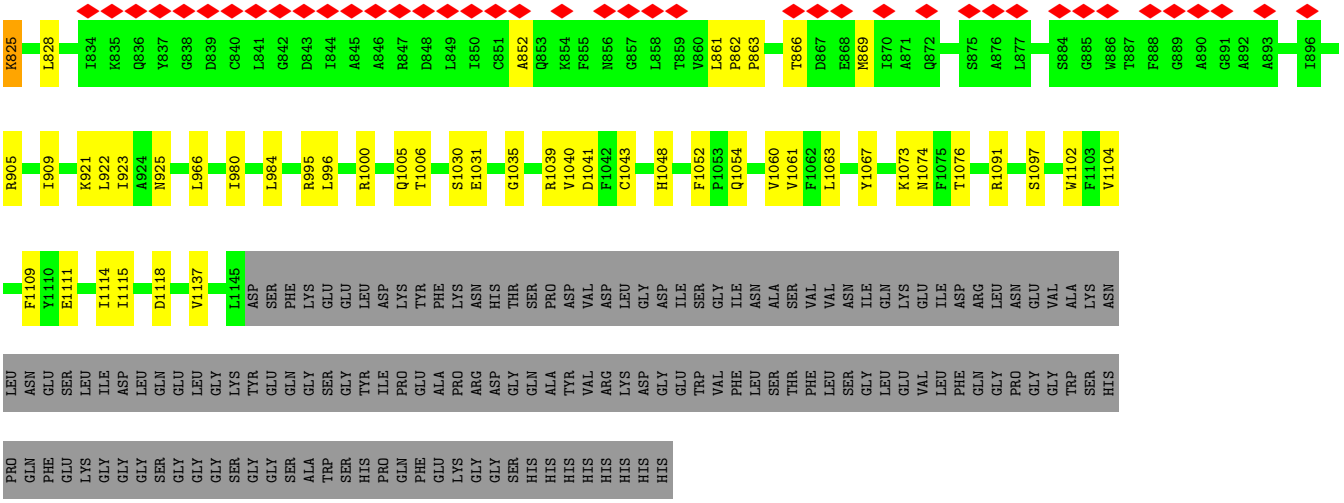


• Molecule 2: Spike glycoprotein

Chain A:



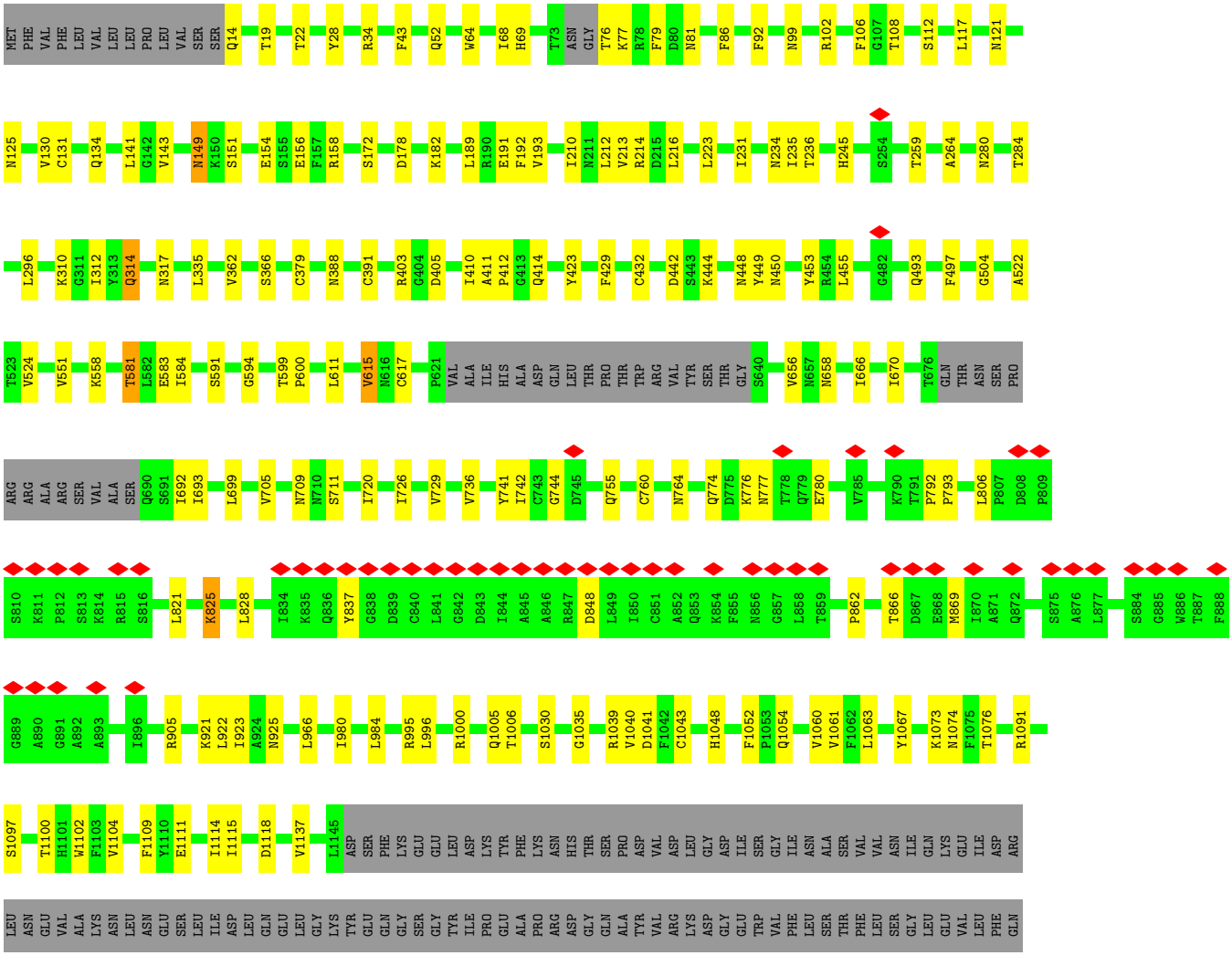




• Molecule 2: Spike glycoprotein

Chain B:



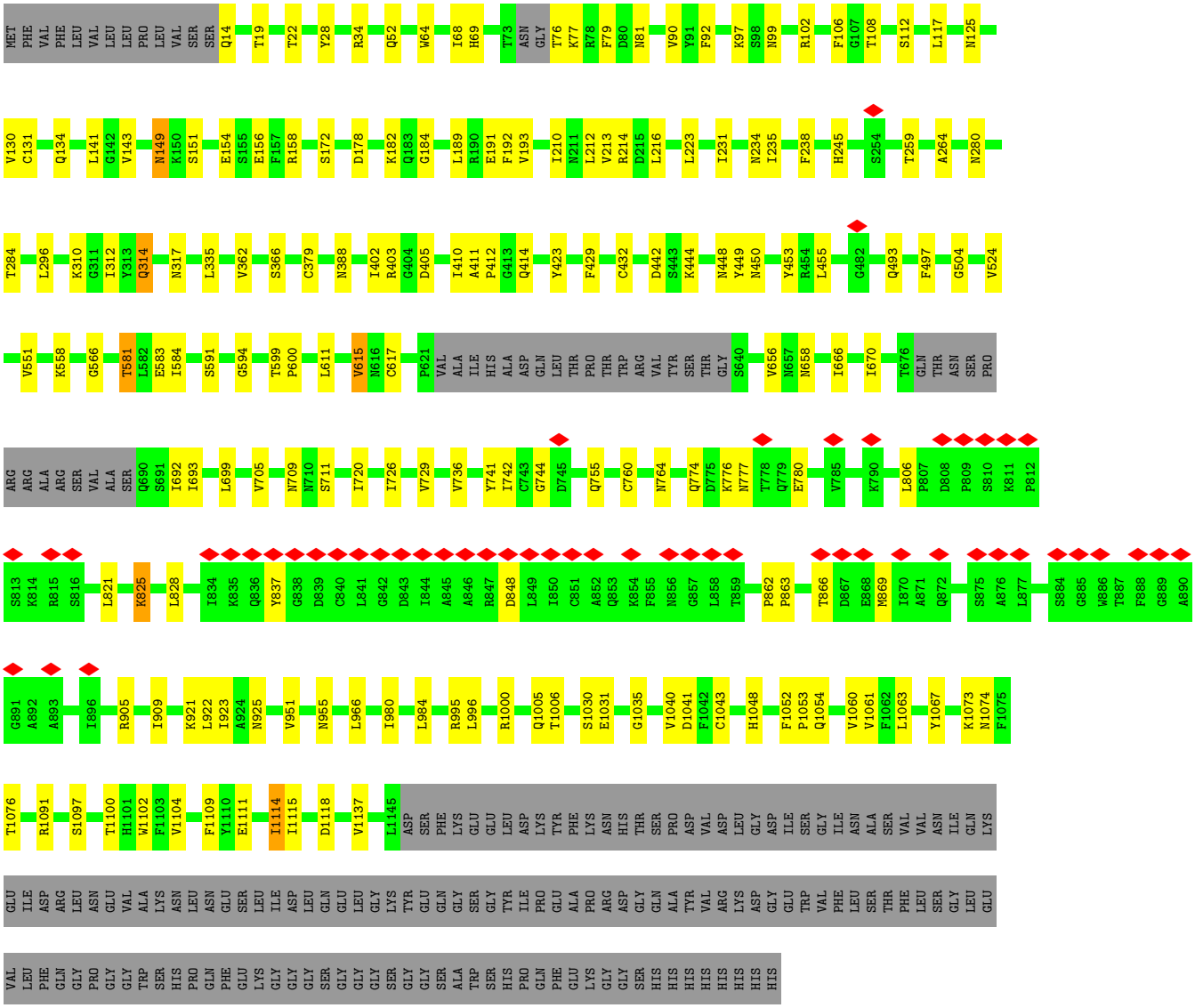




• Molecule 2: Spike glycoprotein

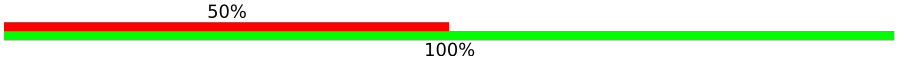
Chain C:





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

Chain G:





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

Chain H:





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

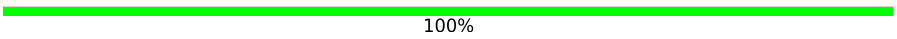
Chain I:





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

Chain J:





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

Chain K:





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

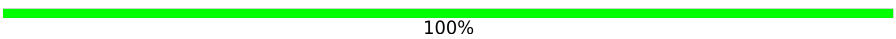
Chain L:





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

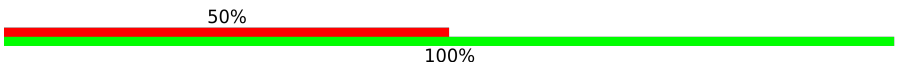
Chain M:





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

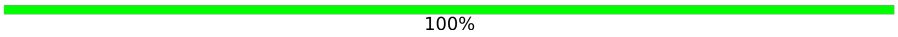
Chain O:





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

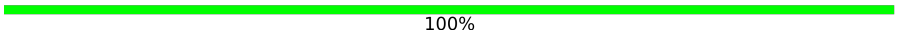
Chain P:





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

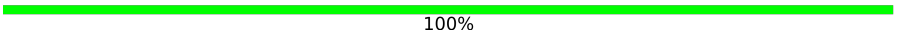
Chain Q:





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

Chain R:





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

Chain S:





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

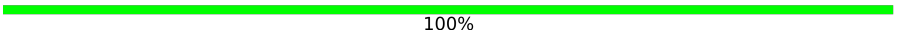
Chain T:





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

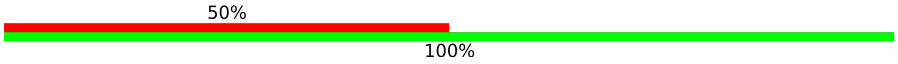
Chain U:





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

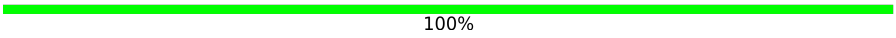
Chain W:





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

Chain X:





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

Chain Y:





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

Chain Z:





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

Chain a:





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

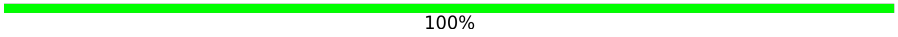
Chain b:





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

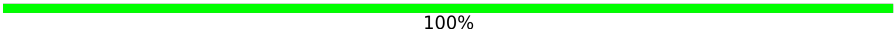
Chain c:





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

Chain N:





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

Chain V:





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

Chain d:





4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C3	Depositor
Number of particles used	179746	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 ($e^-/Å^2$)	50	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	Not provided	
Image detector	FEI FALCON IV (4k x 4k)	Depositor
Maximum map value	4.201	Depositor
Minimum map value	-3.056	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.050	Depositor
Recommended contour level	0.12	Depositor
Map size (Å)	372.8, 372.8, 372.8	wwPDB
Map dimensions	400, 400, 400	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.932, 0.932, 0.932	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, BMA

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	D	0.08	0/4994	0.22	0/6785
1	E	0.08	0/4994	0.22	0/6785
1	F	0.08	0/4994	0.22	0/6785
2	A	0.09	0/8739	0.23	0/11895
2	B	0.09	0/8739	0.23	0/11895
2	C	0.09	0/8739	0.23	0/11895
All	All	0.08	0/41199	0.23	0/56040

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

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	D	4857	0	4628	59	0
1	E	4857	0	4628	57	0
1	F	4857	0	4628	57	0
2	A	8545	0	8294	97	0
2	B	8545	0	8294	102	0
2	C	8545	0	8294	104	0
3	G	28	0	25	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	H	28	0	25	0	0
3	I	28	0	25	0	0
3	J	28	0	25	0	0
3	K	28	0	25	1	0
3	L	28	0	25	1	0
3	M	28	0	25	0	0
3	O	28	0	25	0	0
3	P	28	0	25	0	0
3	Q	28	0	25	0	0
3	R	28	0	25	0	0
3	S	28	0	25	1	0
3	T	28	0	25	1	0
3	U	28	0	25	0	0
3	W	28	0	25	0	0
3	X	28	0	25	0	0
3	Y	28	0	25	0	0
3	Z	28	0	25	0	0
3	a	28	0	25	1	0
3	b	28	0	25	1	0
3	c	28	0	25	0	0
4	N	39	0	34	0	0
4	V	39	0	34	0	0
4	d	39	0	34	0	0
5	A	140	0	130	0	0
5	B	140	0	130	1	0
5	C	140	0	130	1	0
5	D	56	0	52	1	0
5	E	56	0	52	1	0
5	F	56	0	52	1	0
All	All	41499	0	39939	440	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 5.

The worst 5 of 440 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:573:VAL:HG13	1:E:574:VAL:HG13	1.72	0.72
1:F:573:VAL:HG13	1:F:574:VAL:HG13	1.72	0.72
1:D:573:VAL:HG13	1:D:574:VAL:HG13	1.72	0.71
2:B:317:ASN:HA	2:B:594:GLY:HA2	1.76	0.66

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:317:ASN:HA	2:C:594:GLY:HA2	1.78	0.66

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	D	593/631 (94%)	576 (97%)	17 (3%)	0	100	100
1	E	593/631 (94%)	576 (97%)	17 (3%)	0	100	100
1	F	593/631 (94%)	576 (97%)	17 (3%)	0	100	100
2	A	1091/1288 (85%)	1056 (97%)	35 (3%)	0	100	100
2	B	1091/1288 (85%)	1055 (97%)	36 (3%)	0	100	100
2	C	1091/1288 (85%)	1057 (97%)	34 (3%)	0	100	100
All	All	5052/5757 (88%)	4896 (97%)	156 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains (i)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	D	526/557 (94%)	513 (98%)	13 (2%)	42	64
1	E	526/557 (94%)	513 (98%)	13 (2%)	42	64

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	F	526/557 (94%)	513 (98%)	13 (2%)	42	64
2	A	945/1112 (85%)	916 (97%)	29 (3%)	35	61
2	B	945/1112 (85%)	916 (97%)	29 (3%)	35	61
2	C	945/1112 (85%)	916 (97%)	29 (3%)	35	61
All	All	4413/5007 (88%)	4287 (97%)	126 (3%)	38	62

5 of 126 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	68	ILE
2	C	558	LYS
2	B	599	THR
2	C	551	VAL
2	C	705	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 130 such sidechains are listed below:

Mol	Chain	Res	Type
2	C	314	GLN
2	C	536	ASN
1	E	137	ASN
1	E	134	ASN
2	C	751	ASN

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

51 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	$\#\|Z\| > 2$
3	NAG	G	1	3,1	14,14,15	0.22	0	17,19,21	0.44	0
3	NAG	G	2	3	14,14,15	0.24	0	17,19,21	0.46	0
3	NAG	H	1	3,1	14,14,15	0.25	0	17,19,21	0.56	0
3	NAG	H	2	3	14,14,15	0.24	0	17,19,21	0.43	0
3	NAG	I	1	3,2	14,14,15	0.30	0	17,19,21	0.53	0
3	NAG	I	2	3	14,14,15	0.23	0	17,19,21	0.46	0
3	NAG	J	1	3,2	14,14,15	0.21	0	17,19,21	0.44	0
3	NAG	J	2	3	14,14,15	0.24	0	17,19,21	0.43	0
3	NAG	K	1	3,2	14,14,15	0.38	0	17,19,21	0.35	0
3	NAG	K	2	3	14,14,15	0.37	0	17,19,21	0.38	0
3	NAG	L	1	3,2	14,14,15	0.36	0	17,19,21	0.39	0
3	NAG	L	2	3	14,14,15	0.25	0	17,19,21	0.45	0
3	NAG	M	1	3,2	14,14,15	0.22	0	17,19,21	0.44	0
3	NAG	M	2	3	14,14,15	0.25	0	17,19,21	0.43	0
4	NAG	N	1	4,2	14,14,15	0.24	0	17,19,21	0.44	0
4	NAG	N	2	4	14,14,15	0.27	0	17,19,21	0.53	0
4	BMA	N	3	4	11,11,12	0.59	0	15,15,17	0.69	0
3	NAG	O	1	3,1	14,14,15	0.23	0	17,19,21	0.43	0
3	NAG	O	2	3	14,14,15	0.23	0	17,19,21	0.45	0
3	NAG	P	1	3,1	14,14,15	0.27	0	17,19,21	0.56	0
3	NAG	P	2	3	14,14,15	0.24	0	17,19,21	0.43	0
3	NAG	Q	1	3,2	14,14,15	0.29	0	17,19,21	0.53	0
3	NAG	Q	2	3	14,14,15	0.24	0	17,19,21	0.46	0
3	NAG	R	1	3,2	14,14,15	0.21	0	17,19,21	0.43	0
3	NAG	R	2	3	14,14,15	0.24	0	17,19,21	0.43	0
3	NAG	S	1	3,2	14,14,15	0.37	0	17,19,21	0.35	0
3	NAG	S	2	3	14,14,15	0.37	0	17,19,21	0.38	0
3	NAG	T	1	3,2	14,14,15	0.36	0	17,19,21	0.38	0
3	NAG	T	2	3	14,14,15	0.25	0	17,19,21	0.46	0
3	NAG	U	1	3,2	14,14,15	0.23	0	17,19,21	0.45	0
3	NAG	U	2	3	14,14,15	0.24	0	17,19,21	0.44	0
4	NAG	V	1	4,2	14,14,15	0.24	0	17,19,21	0.44	0
4	NAG	V	2	4	14,14,15	0.27	0	17,19,21	0.53	0
4	BMA	V	3	4	11,11,12	0.59	0	15,15,17	0.69	0
3	NAG	W	1	3,1	14,14,15	0.23	0	17,19,21	0.43	0
3	NAG	W	2	3	14,14,15	0.24	0	17,19,21	0.45	0
3	NAG	X	1	3,1	14,14,15	0.28	0	17,19,21	0.55	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
3	NAG	X	2	3	14,14,15	0.24	0	17,19,21	0.44	0
3	NAG	Y	1	3,2	14,14,15	0.30	0	17,19,21	0.52	0
3	NAG	Y	2	3	14,14,15	0.24	0	17,19,21	0.45	0
3	NAG	Z	1	3,2	14,14,15	0.21	0	17,19,21	0.44	0
3	NAG	Z	2	3	14,14,15	0.23	0	17,19,21	0.43	0
3	NAG	a	1	3,2	14,14,15	0.37	0	17,19,21	0.35	0
3	NAG	a	2	3	14,14,15	0.37	0	17,19,21	0.39	0
3	NAG	b	1	3,2	14,14,15	0.36	0	17,19,21	0.38	0
3	NAG	b	2	3	14,14,15	0.26	0	17,19,21	0.46	0
3	NAG	c	1	3,2	14,14,15	0.24	0	17,19,21	0.43	0
3	NAG	c	2	3	14,14,15	0.24	0	17,19,21	0.43	0
4	NAG	d	1	4,2	14,14,15	0.23	0	17,19,21	0.43	0
4	NAG	d	2	4	14,14,15	0.27	0	17,19,21	0.54	0
4	BMA	d	3	4	11,11,12	0.60	0	15,15,17	0.69	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAG	G	1	3,1	-	1/6/23/26	0/1/1/1
3	NAG	G	2	3	-	3/6/23/26	0/1/1/1
3	NAG	H	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	H	2	3	-	2/6/23/26	0/1/1/1
3	NAG	I	1	3,2	-	2/6/23/26	0/1/1/1
3	NAG	I	2	3	-	2/6/23/26	0/1/1/1
3	NAG	J	1	3,2	-	0/6/23/26	0/1/1/1
3	NAG	J	2	3	-	0/6/23/26	0/1/1/1
3	NAG	K	1	3,2	-	2/6/23/26	0/1/1/1
3	NAG	K	2	3	-	2/6/23/26	0/1/1/1
3	NAG	L	1	3,2	-	1/6/23/26	0/1/1/1
3	NAG	L	2	3	-	2/6/23/26	0/1/1/1
3	NAG	M	1	3,2	-	0/6/23/26	0/1/1/1
3	NAG	M	2	3	-	2/6/23/26	0/1/1/1
4	NAG	N	1	4,2	-	2/6/23/26	0/1/1/1
4	NAG	N	2	4	-	2/6/23/26	0/1/1/1
4	BMA	N	3	4	-	0/2/19/22	0/1/1/1
3	NAG	O	1	3,1	-	1/6/23/26	0/1/1/1
3	NAG	O	2	3	-	2/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAG	P	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	P	2	3	-	2/6/23/26	0/1/1/1
3	NAG	Q	1	3,2	-	2/6/23/26	0/1/1/1
3	NAG	Q	2	3	-	2/6/23/26	0/1/1/1
3	NAG	R	1	3,2	-	0/6/23/26	0/1/1/1
3	NAG	R	2	3	-	0/6/23/26	0/1/1/1
3	NAG	S	1	3,2	-	2/6/23/26	0/1/1/1
3	NAG	S	2	3	-	2/6/23/26	0/1/1/1
3	NAG	T	1	3,2	-	1/6/23/26	0/1/1/1
3	NAG	T	2	3	-	2/6/23/26	0/1/1/1
3	NAG	U	1	3,2	-	0/6/23/26	0/1/1/1
3	NAG	U	2	3	-	2/6/23/26	0/1/1/1
4	NAG	V	1	4,2	-	2/6/23/26	0/1/1/1
4	NAG	V	2	4	-	2/6/23/26	0/1/1/1
4	BMA	V	3	4	-	0/2/19/22	0/1/1/1
3	NAG	W	1	3,1	-	1/6/23/26	0/1/1/1
3	NAG	W	2	3	-	2/6/23/26	0/1/1/1
3	NAG	X	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	X	2	3	-	2/6/23/26	0/1/1/1
3	NAG	Y	1	3,2	-	2/6/23/26	0/1/1/1
3	NAG	Y	2	3	-	2/6/23/26	0/1/1/1
3	NAG	Z	1	3,2	-	0/6/23/26	0/1/1/1
3	NAG	Z	2	3	-	0/6/23/26	0/1/1/1
3	NAG	a	1	3,2	-	2/6/23/26	0/1/1/1
3	NAG	a	2	3	-	2/6/23/26	0/1/1/1
3	NAG	b	1	3,2	-	1/6/23/26	0/1/1/1
3	NAG	b	2	3	-	2/6/23/26	0/1/1/1
3	NAG	c	1	3,2	-	0/6/23/26	0/1/1/1
3	NAG	c	2	3	-	2/6/23/26	0/1/1/1
4	NAG	d	1	4,2	-	2/6/23/26	0/1/1/1
4	NAG	d	2	4	-	2/6/23/26	0/1/1/1
4	BMA	d	3	4	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 73 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	K	1	NAG	C4-C5-C6-O6
3	S	1	NAG	C4-C5-C6-O6
3	a	1	NAG	C4-C5-C6-O6
3	K	1	NAG	O5-C5-C6-O6
3	S	1	NAG	O5-C5-C6-O6

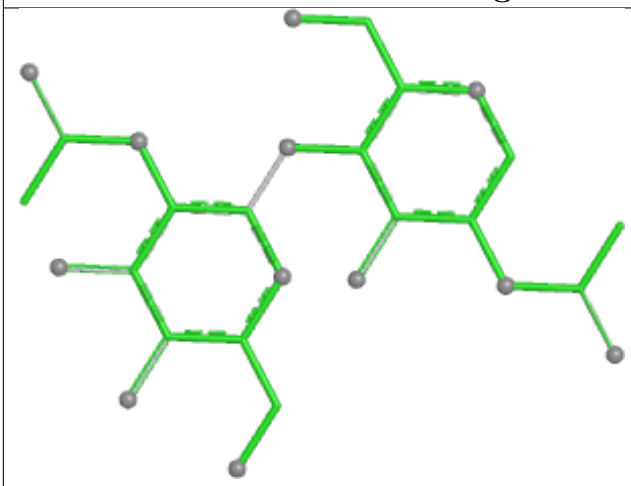
There are no ring outliers.

6 monomers are involved in 6 short contacts:

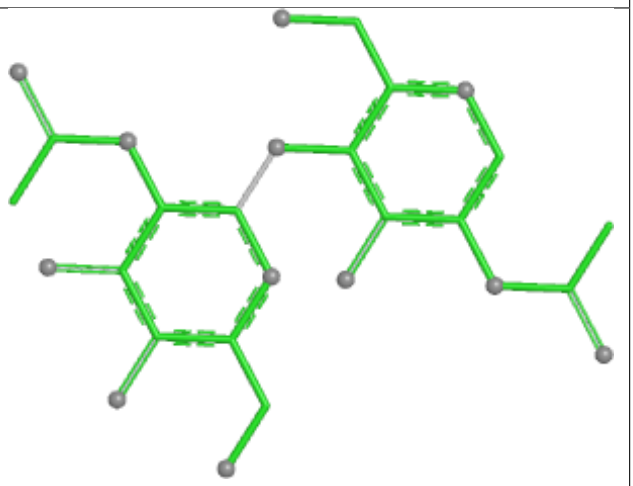
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	a	1	NAG	1	0
3	T	1	NAG	1	0
3	b	1	NAG	1	0
3	S	1	NAG	1	0
3	K	1	NAG	1	0
3	L	1	NAG	1	0

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

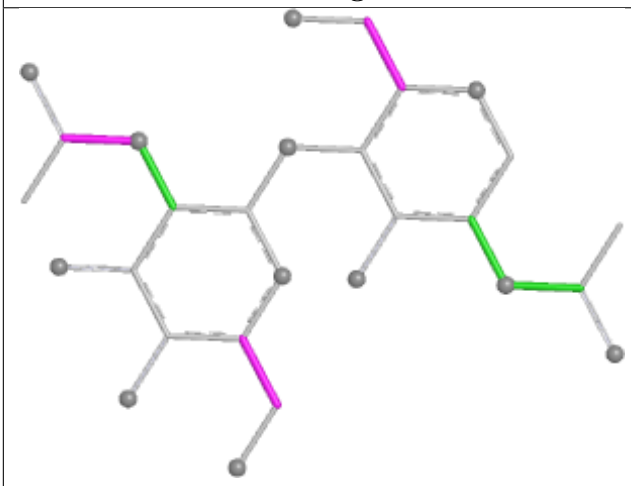
Oligosaccharide Chain G



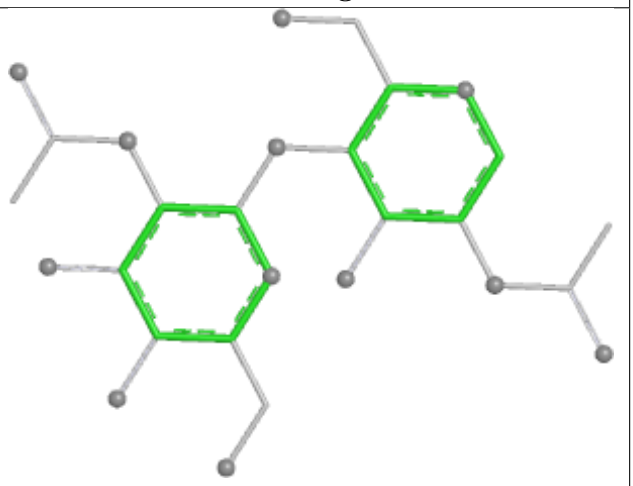
Bond lengths



Bond angles

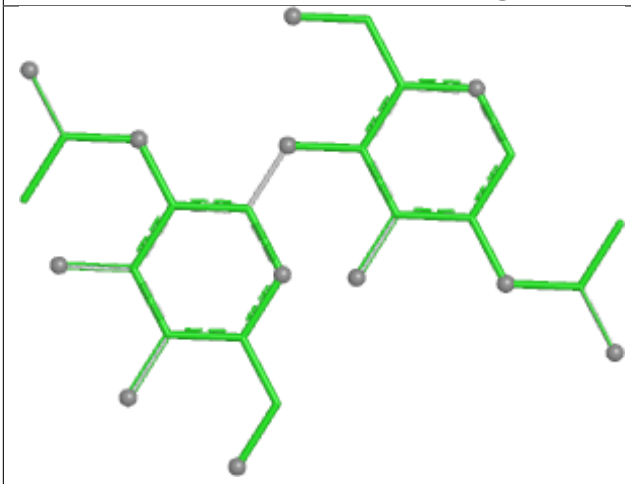


Torsions

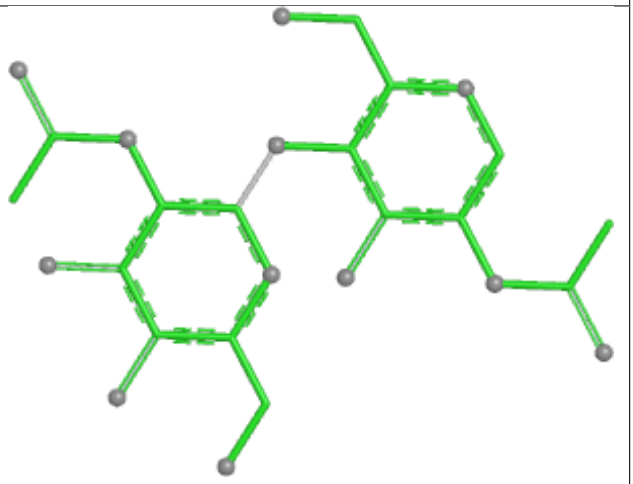


Rings

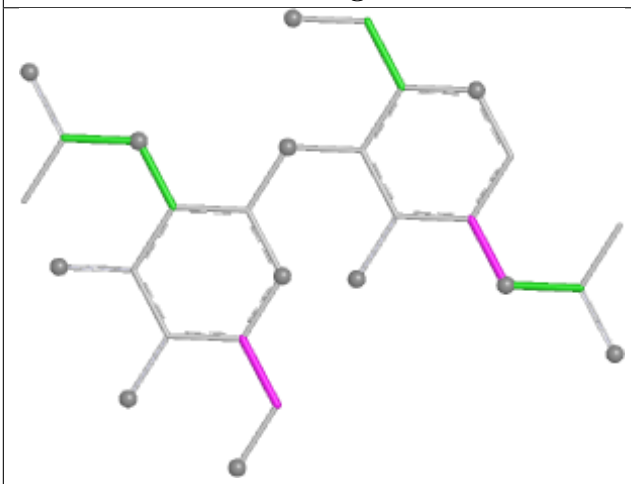
Oligosaccharide Chain H



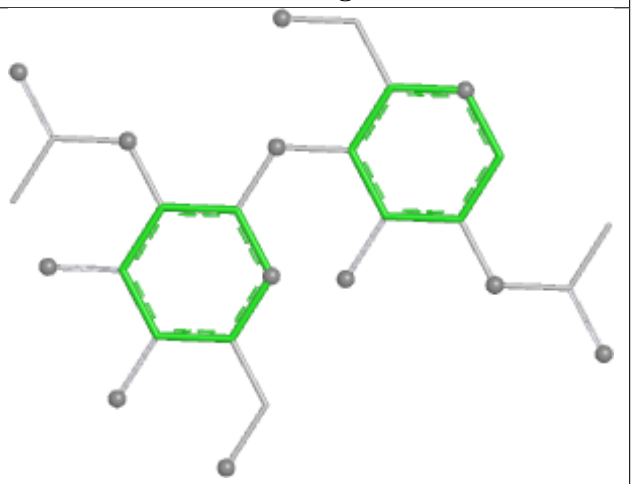
Bond lengths



Bond angles

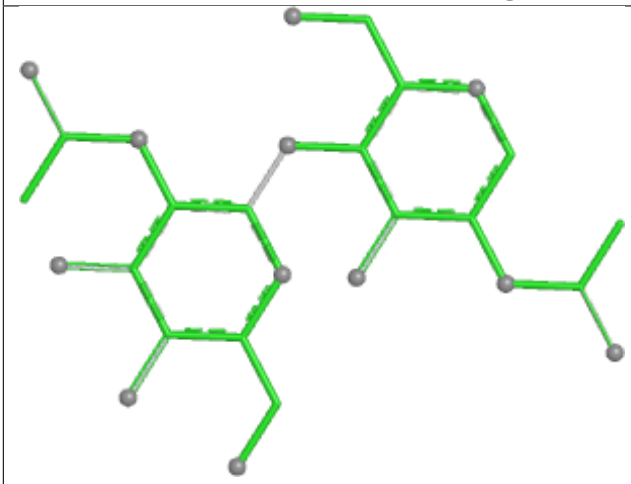


Torsions

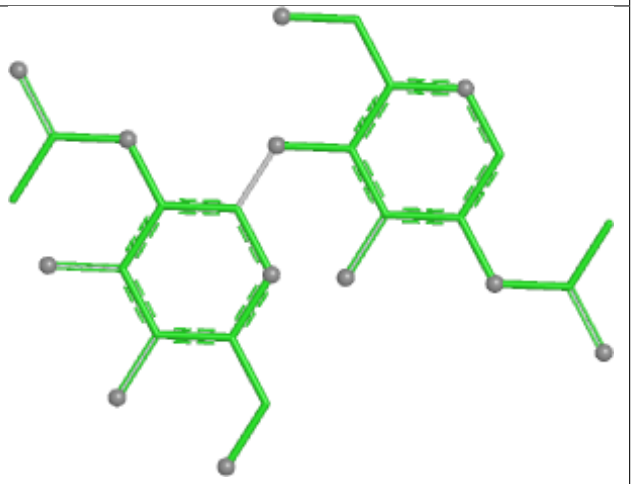


Rings

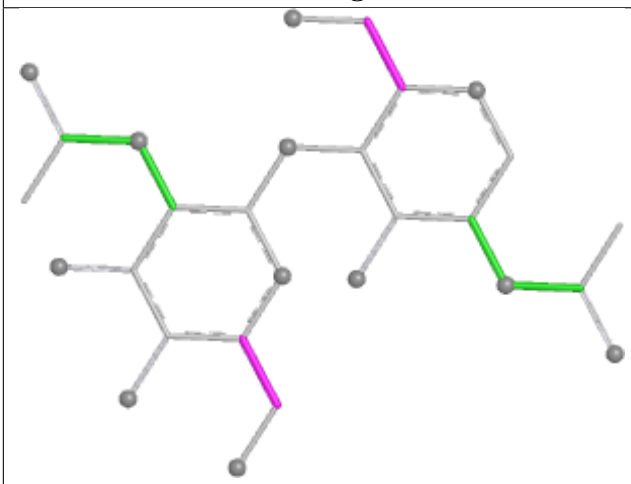
Oligosaccharide Chain I



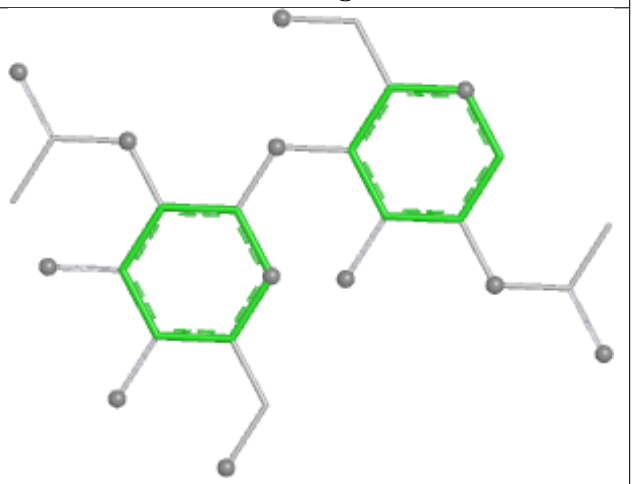
Bond lengths



Bond angles

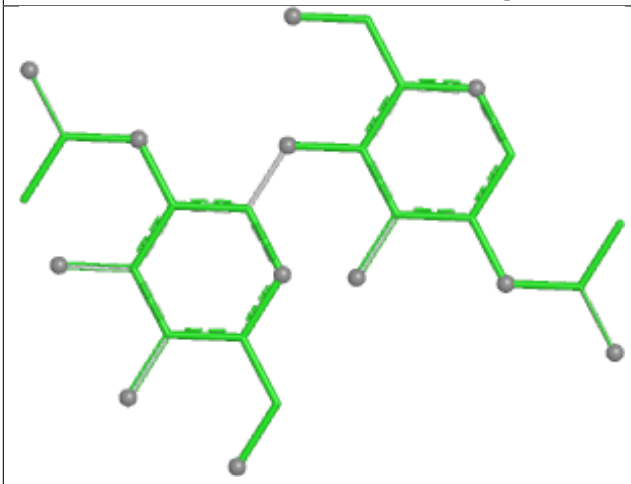


Torsions

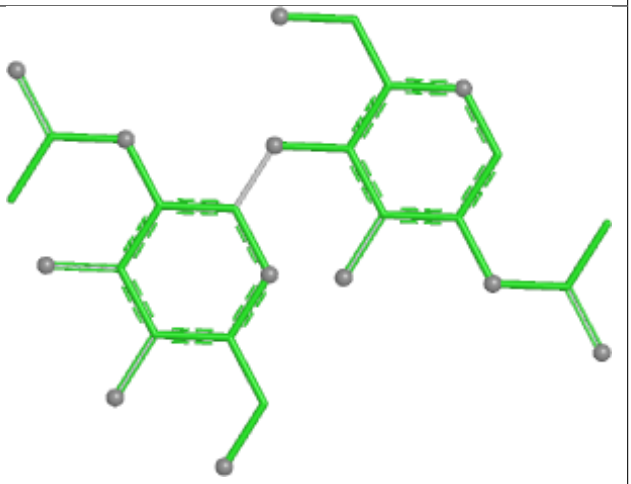


Rings

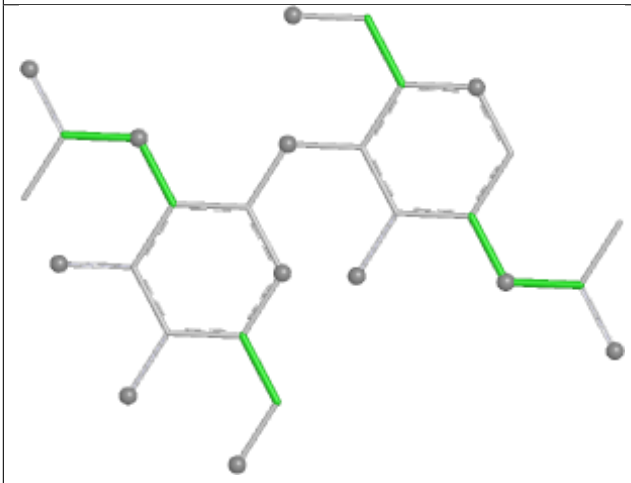
Oligosaccharide Chain J



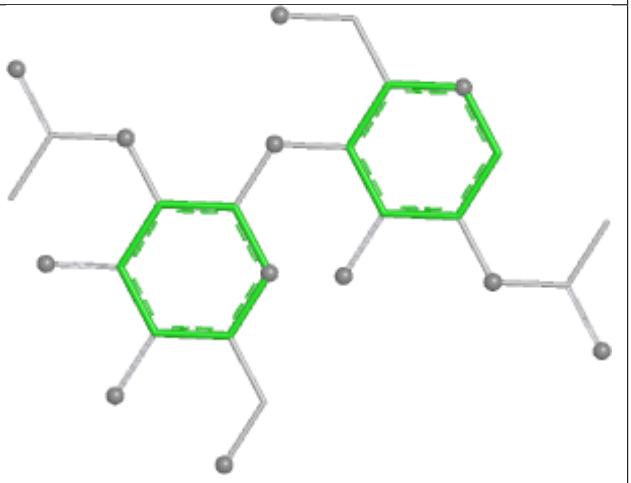
Bond lengths



Bond angles

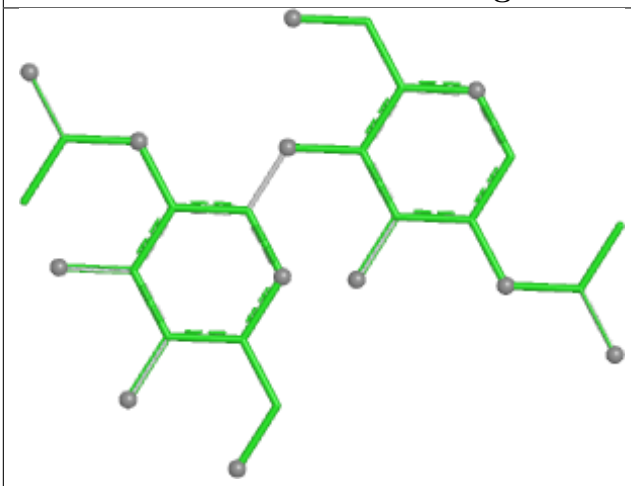


Torsions

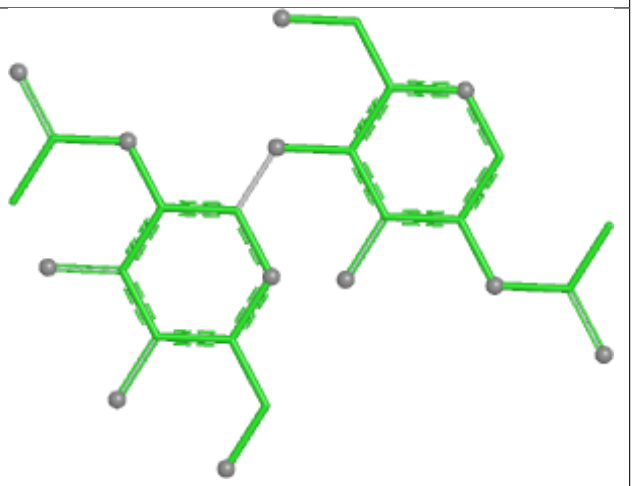


Rings

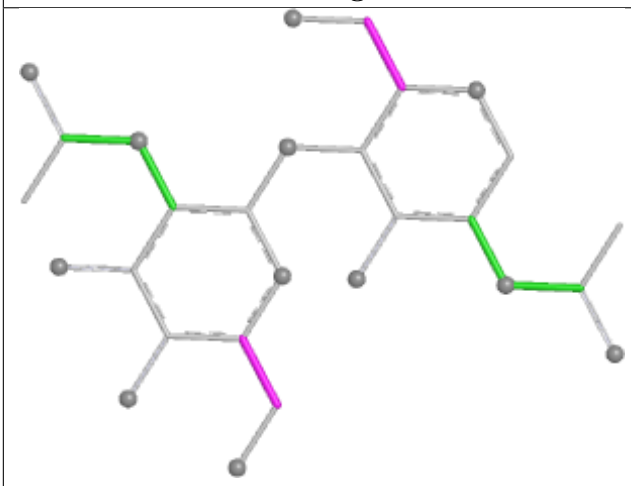
Oligosaccharide Chain K



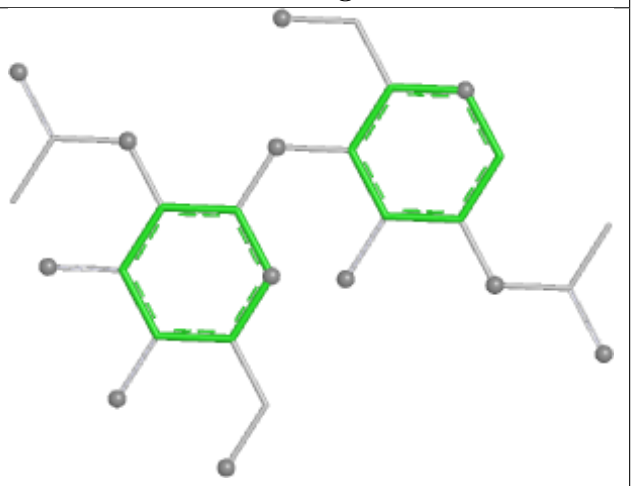
Bond lengths



Bond angles

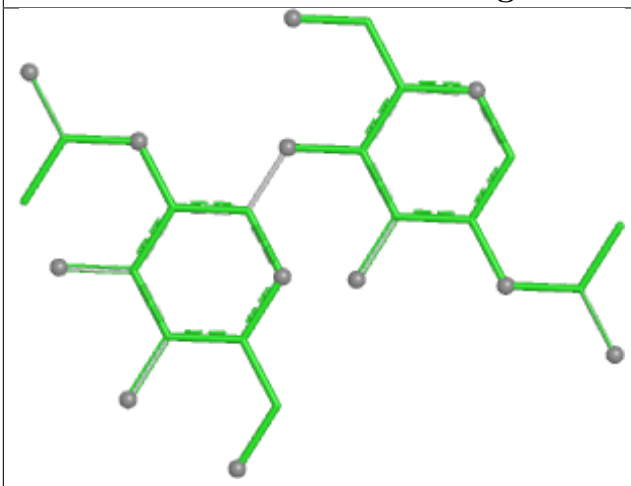


Torsions

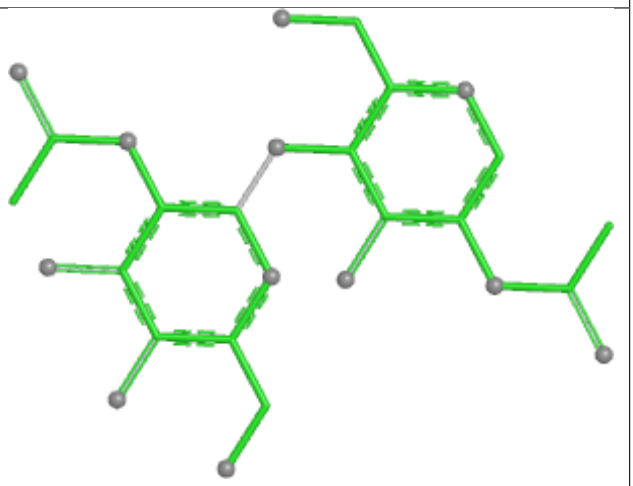


Rings

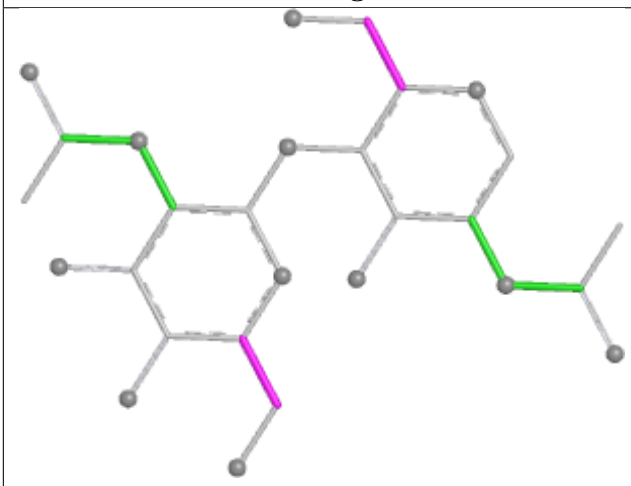
Oligosaccharide Chain L



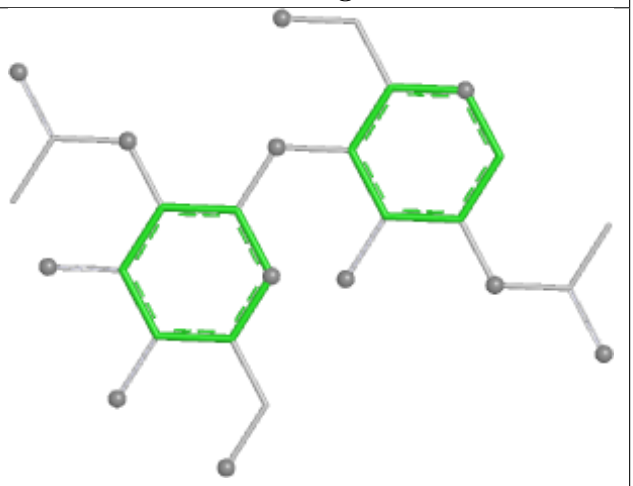
Bond lengths



Bond angles

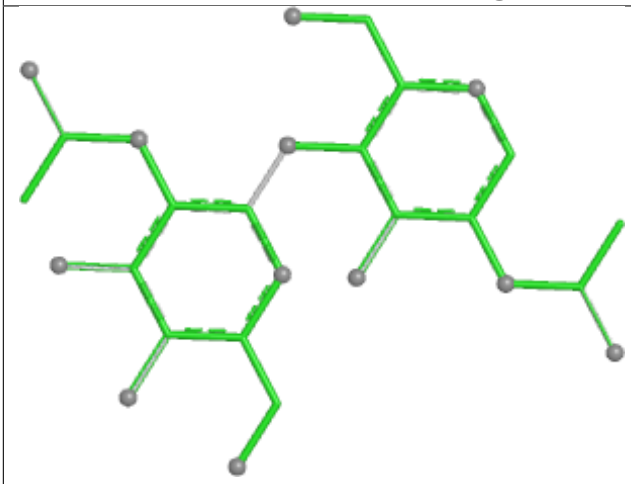


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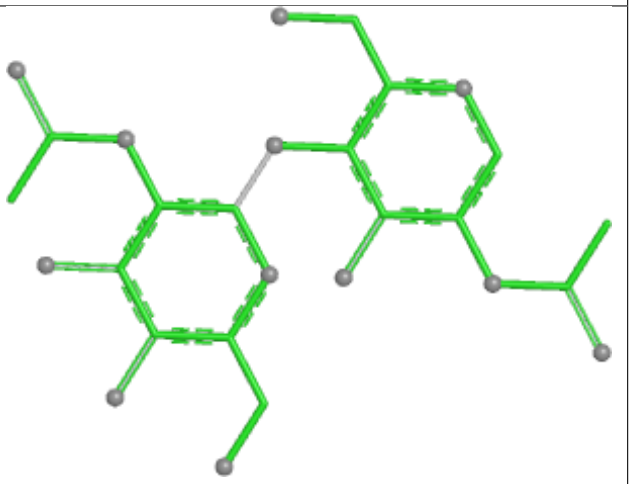


Rings

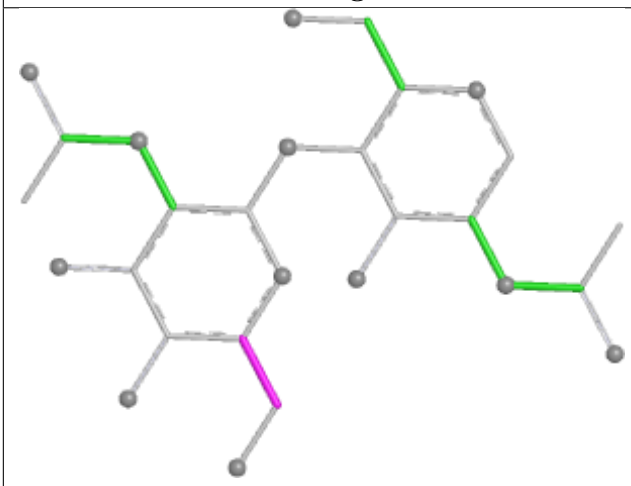
Oligosaccharide Chain M



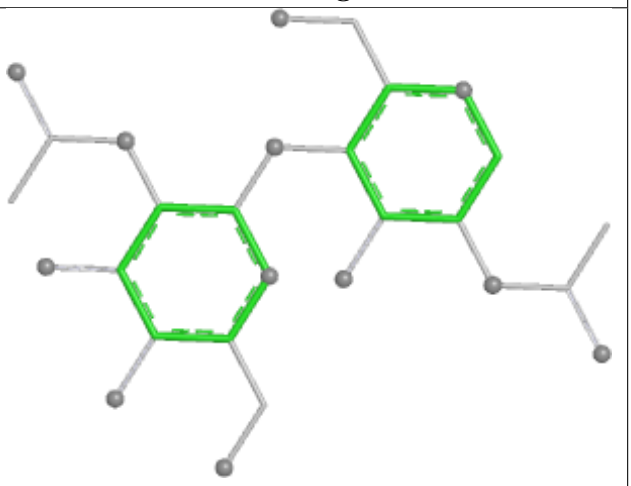
Bond lengths



Bond angles

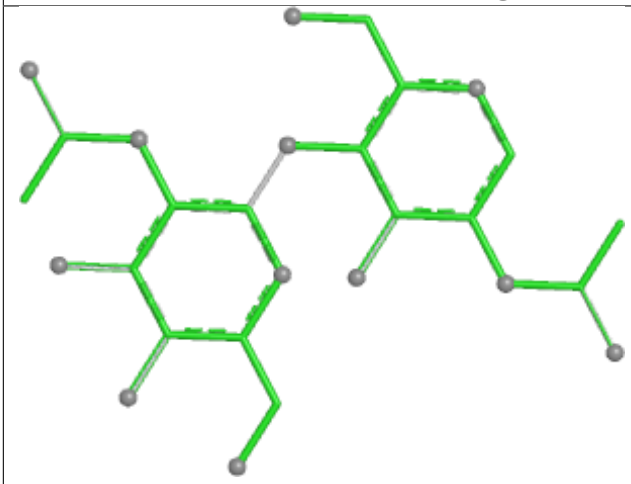


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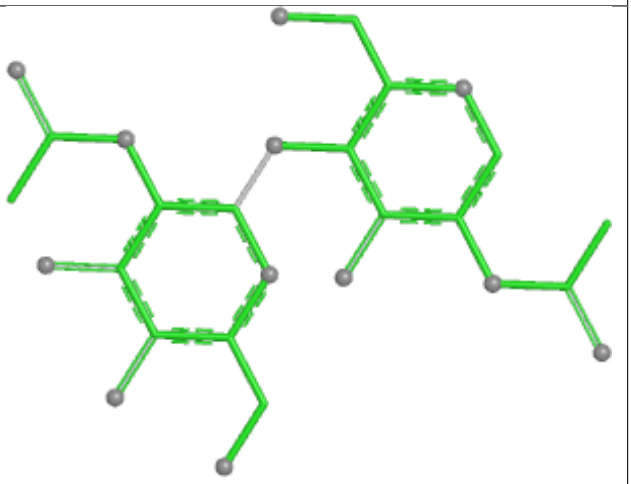


Rings

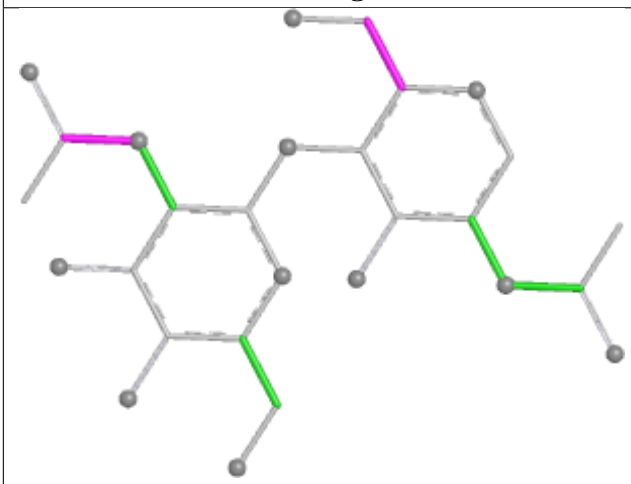
Oligosaccharide Chain O



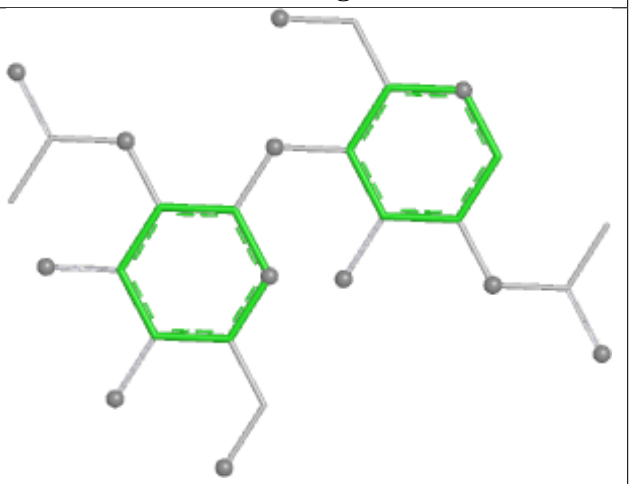
Bond lengths



Bond angles

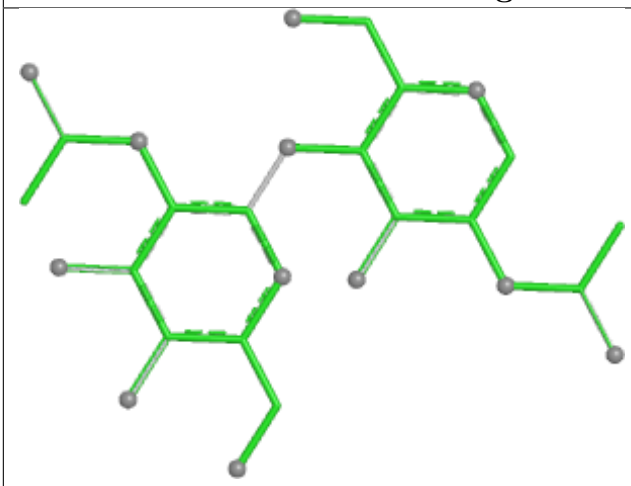


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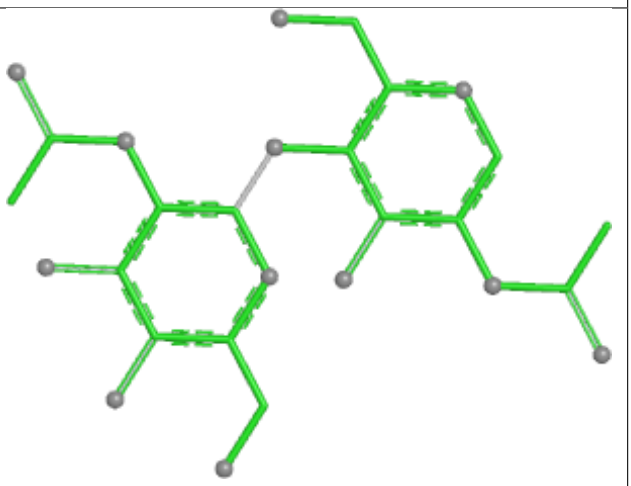


Rings

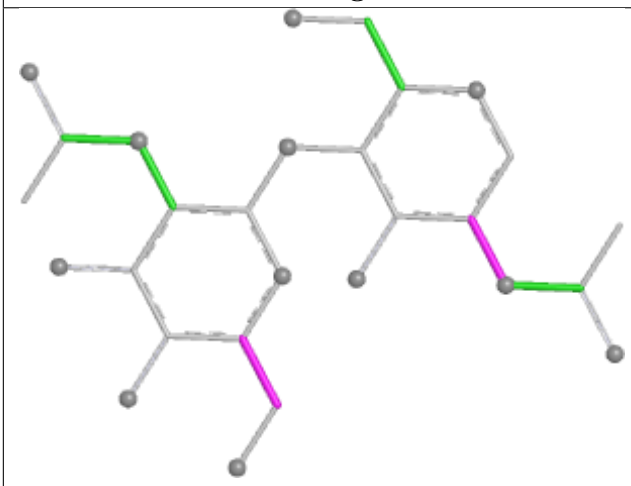
Oligosaccharide Chain P



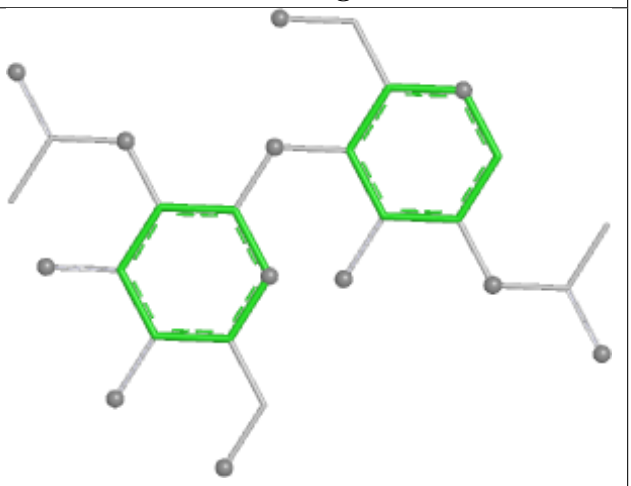
Bond lengths



Bond angles

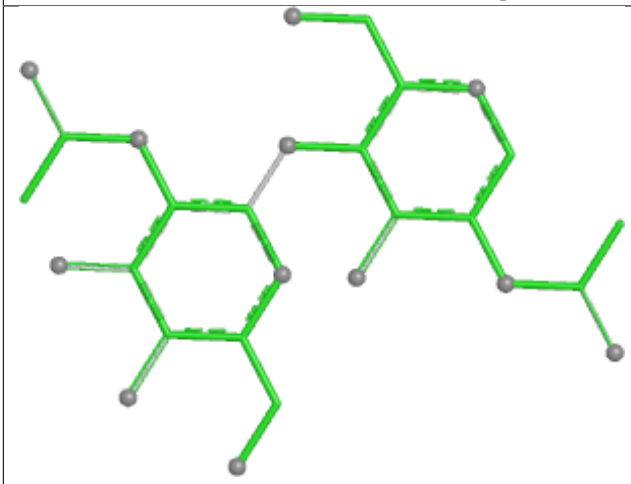


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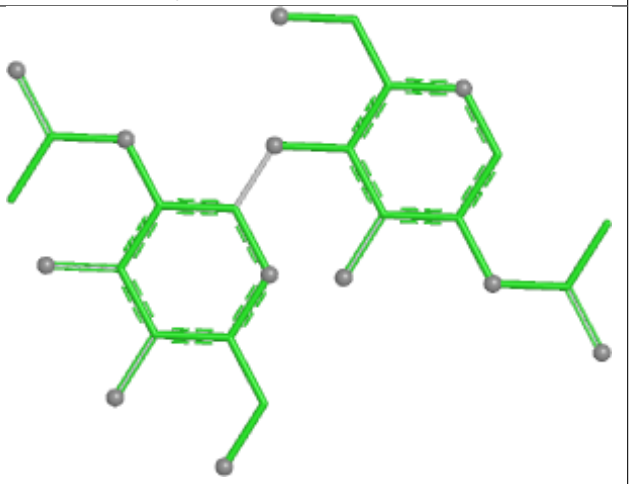


Rings

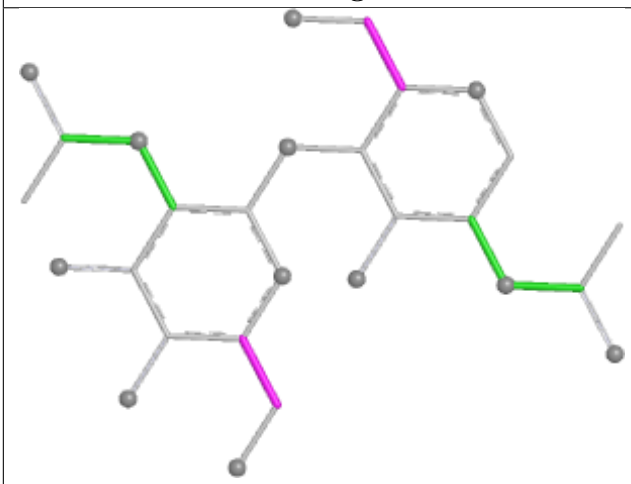
Oligosaccharide Chain Q



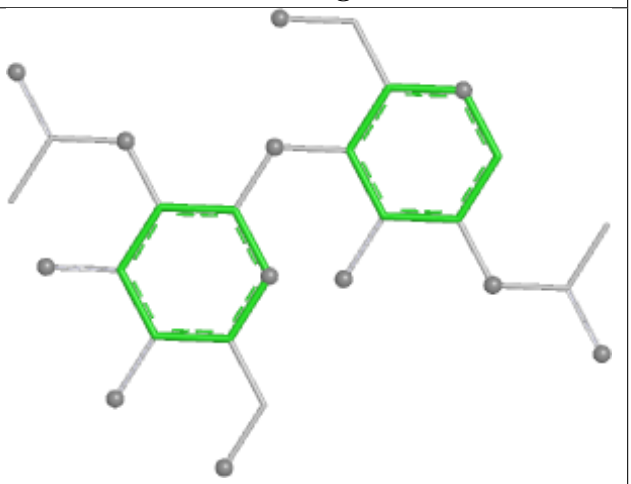
Bond lengths



Bond angles

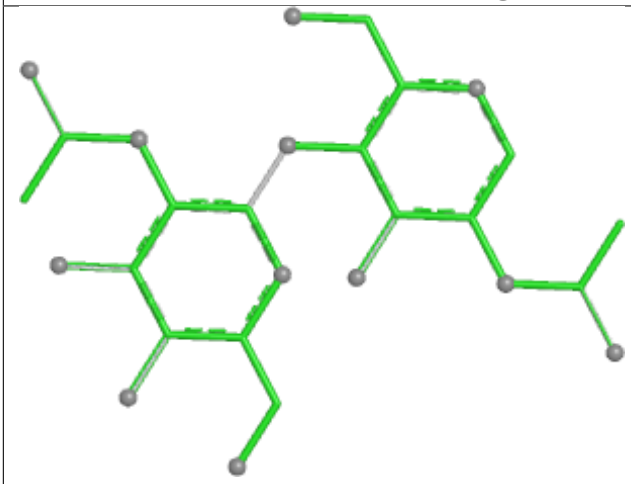


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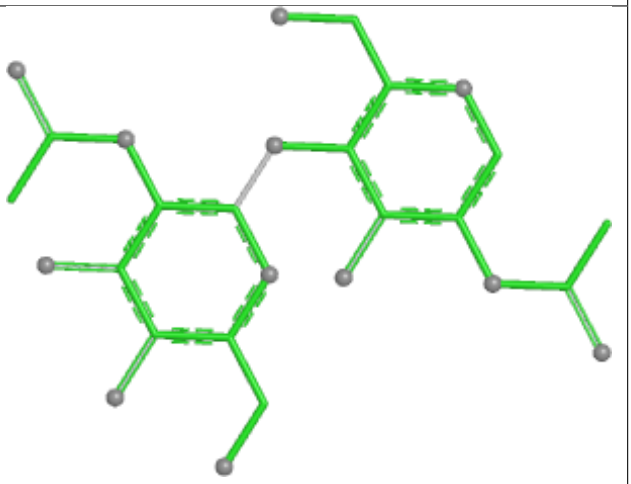


Rings

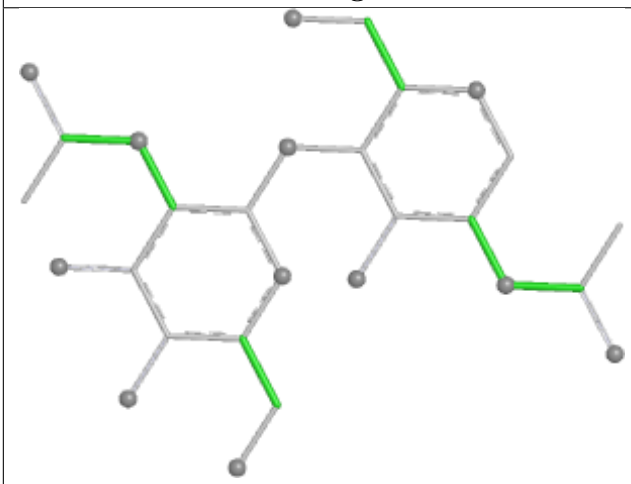
Oligosaccharide Chain R



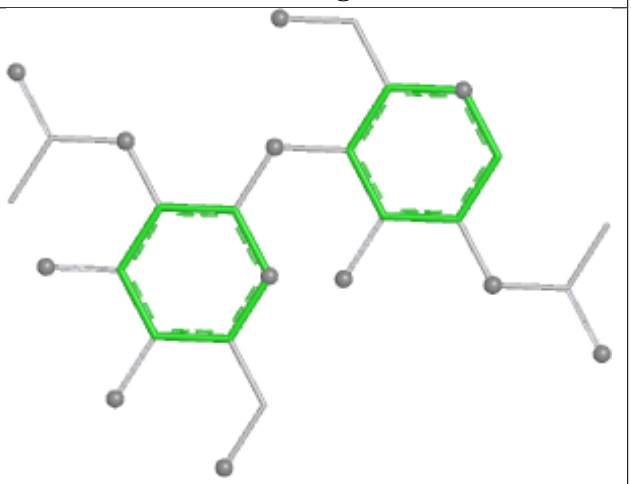
Bond lengths



Bond angles

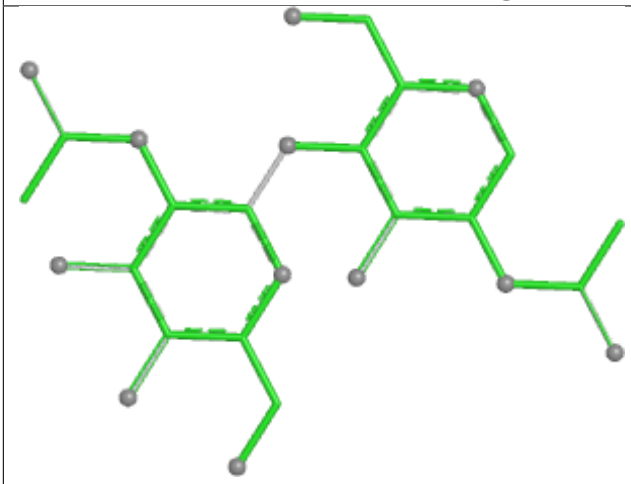


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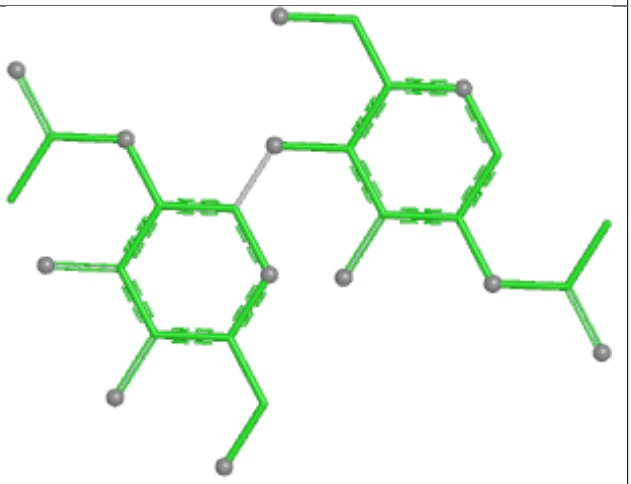


Rings

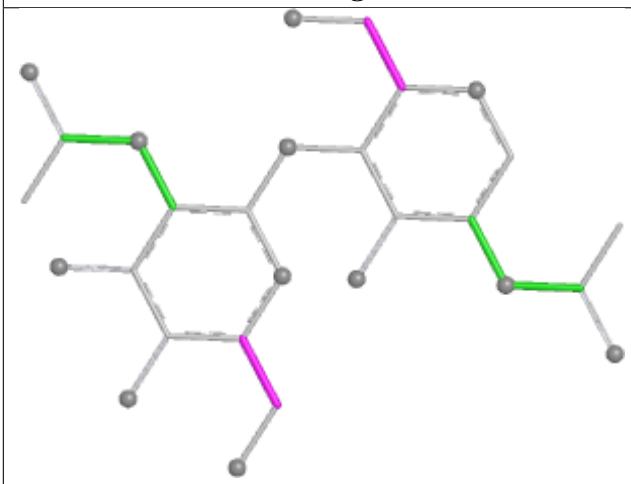
Oligosaccharide Chain S



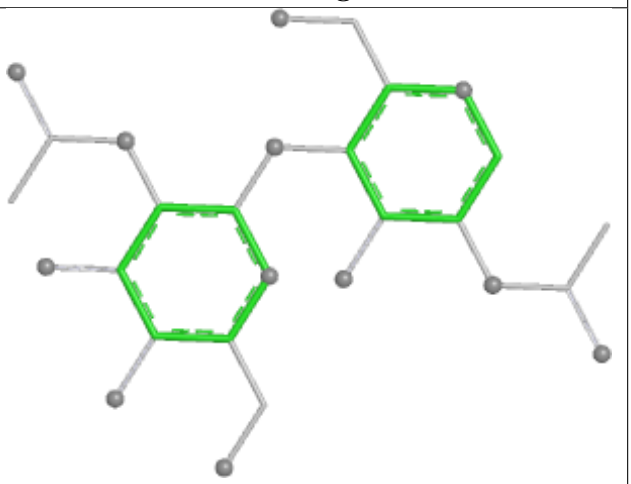
Bond lengths



Bond angles

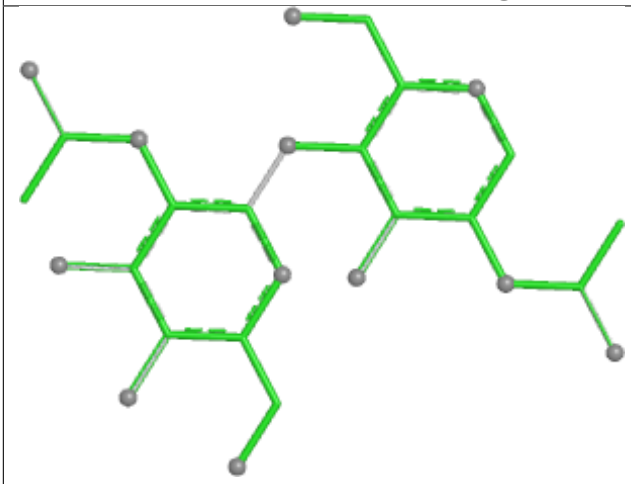


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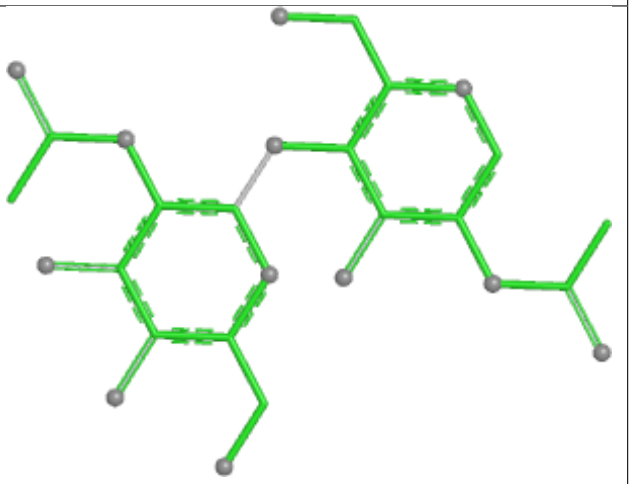


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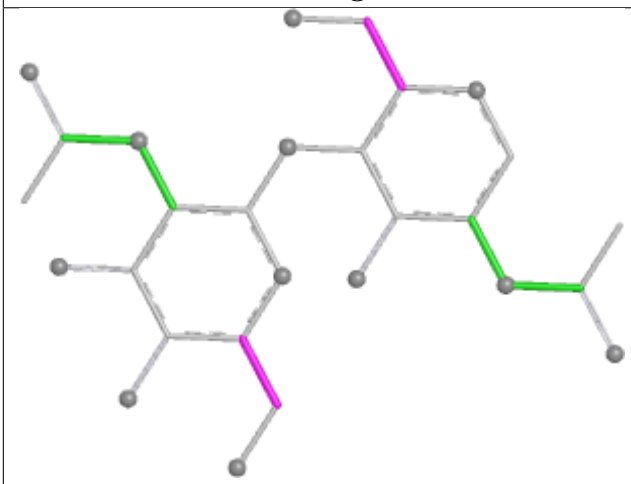
Oligosaccharide Chain T



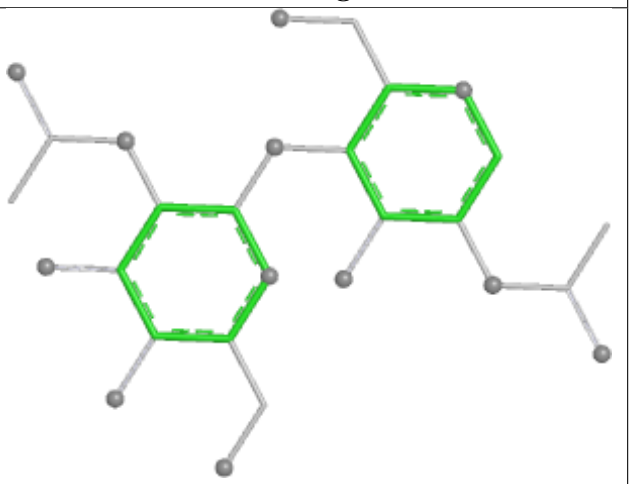
Bond lengths



Bond angles

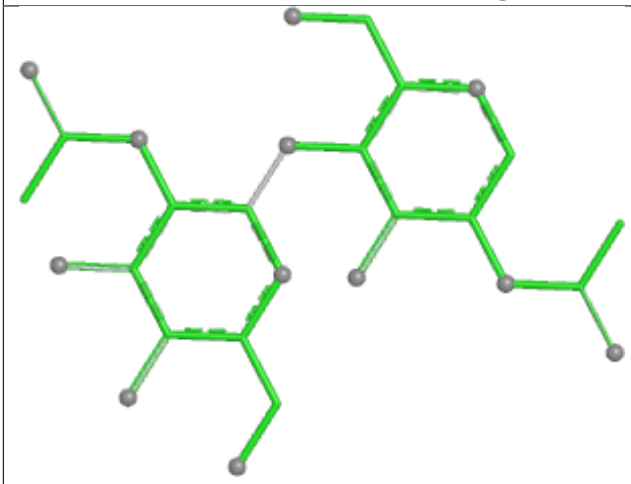


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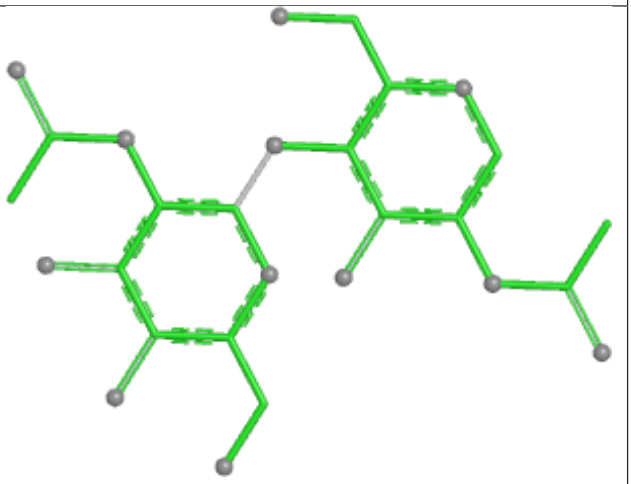


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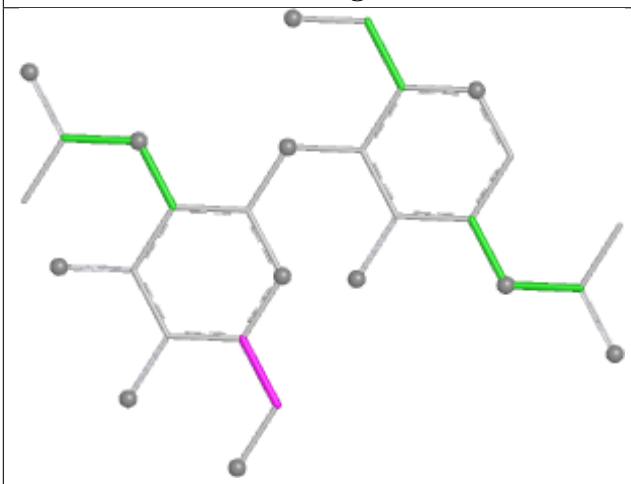
Oligosaccharide Chain U



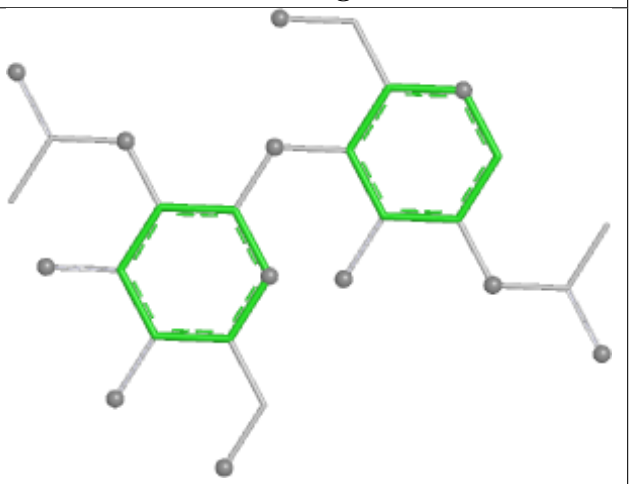
Bond lengths



Bond angles

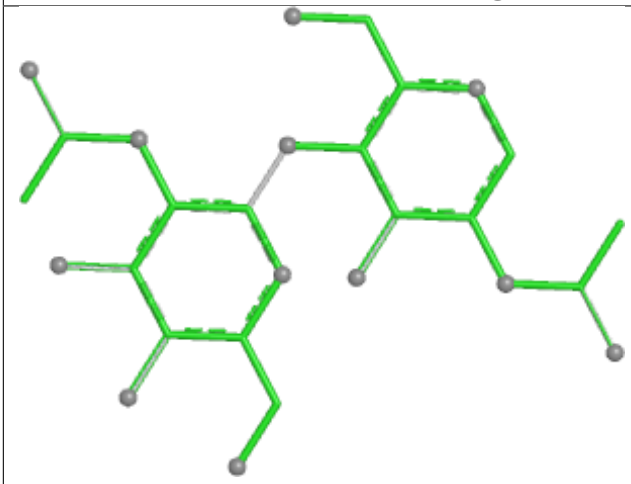


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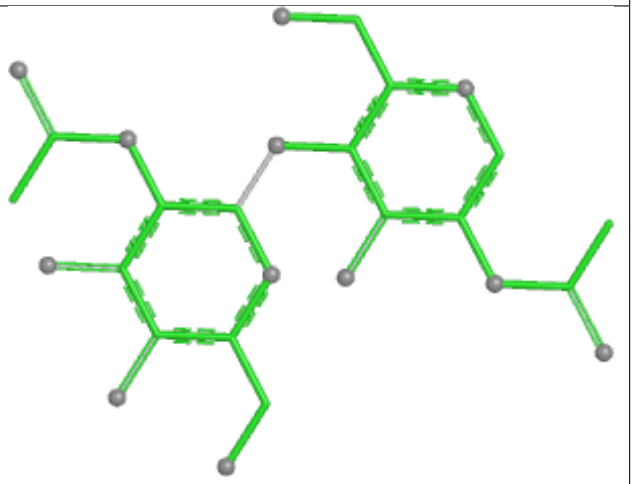


Rings

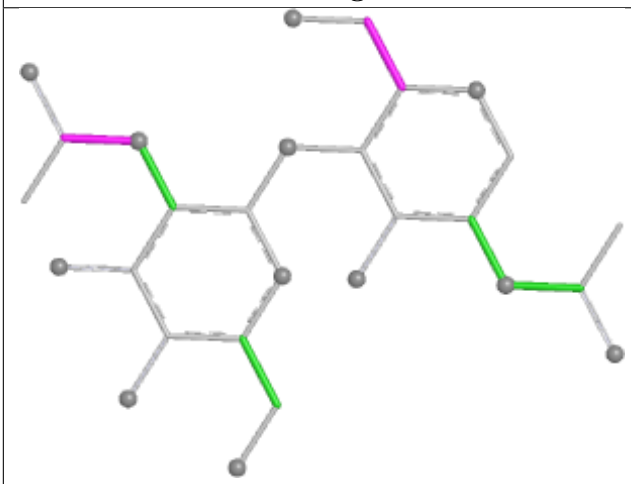
Oligosaccharide Chain W



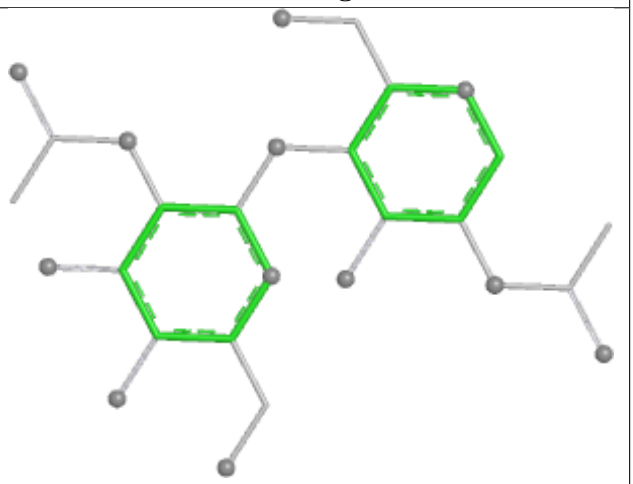
Bond lengths



Bond angles

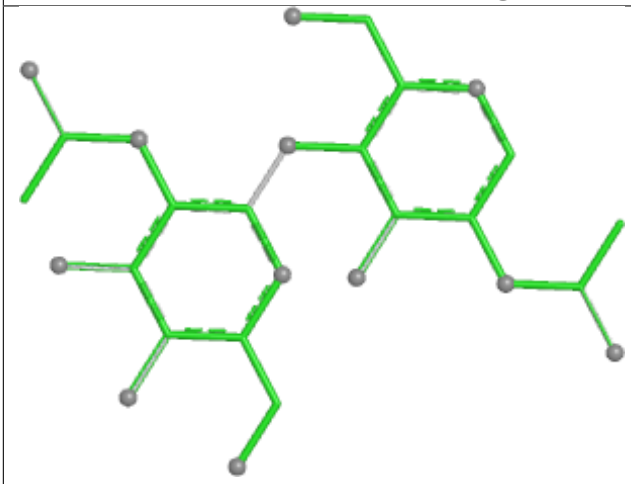


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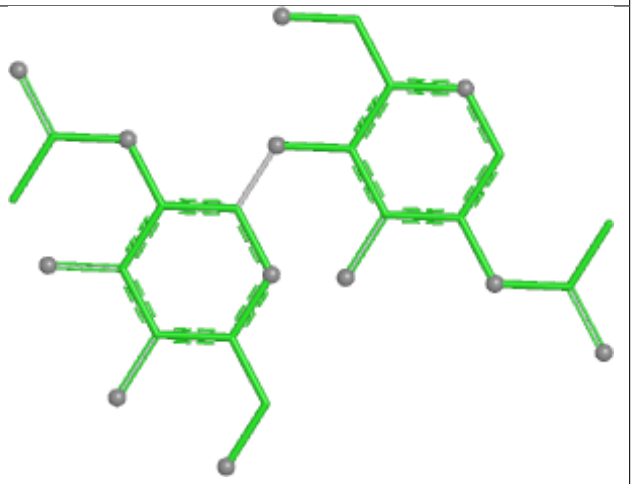


Rings

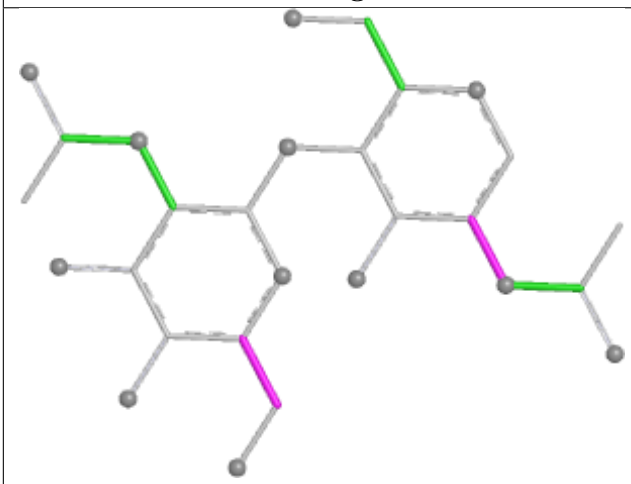
Oligosaccharide Chain X



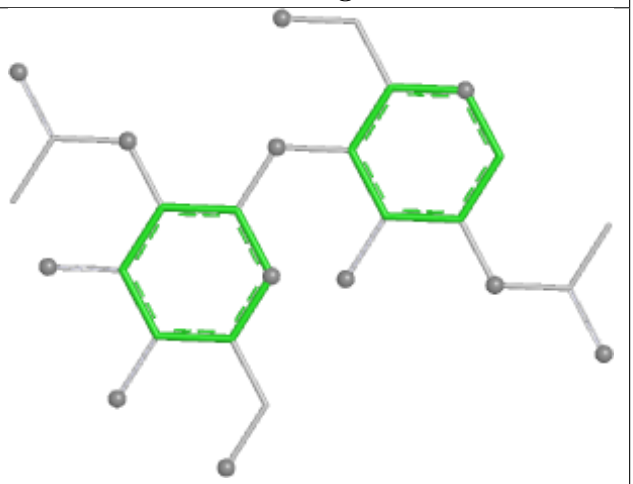
Bond lengths



Bond angles

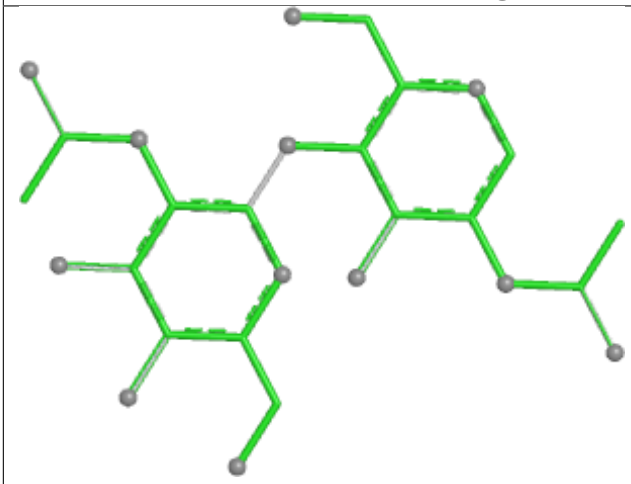


Torsions

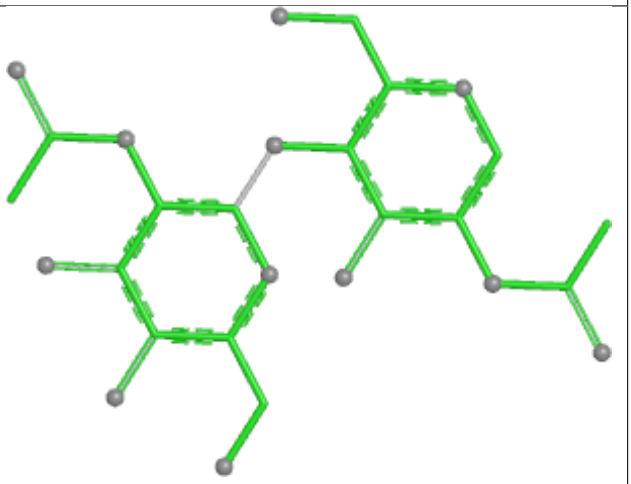


Rings

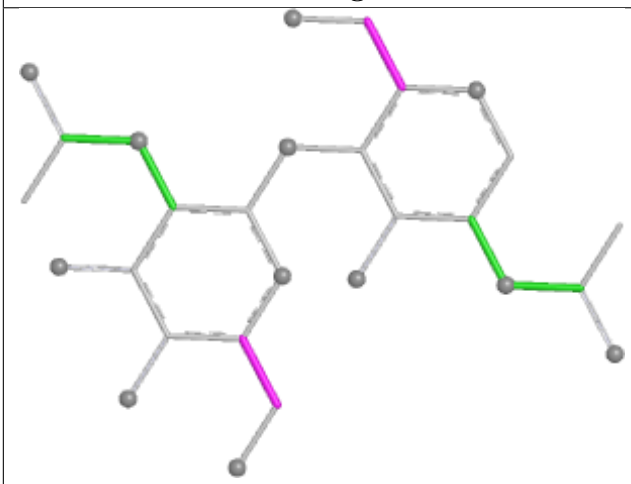
Oligosaccharide Chain Y



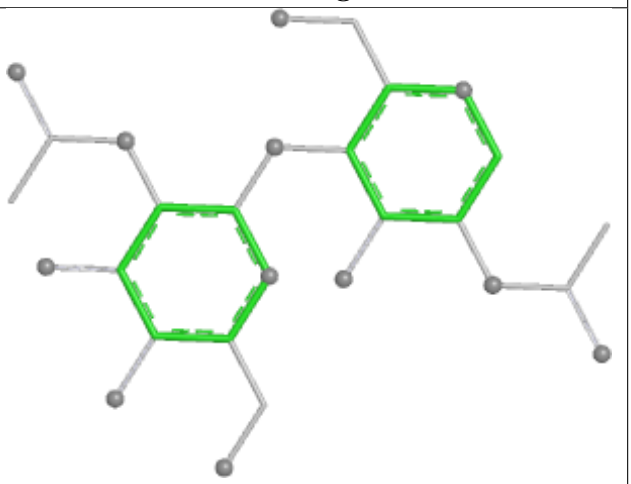
Bond lengths



Bond angles

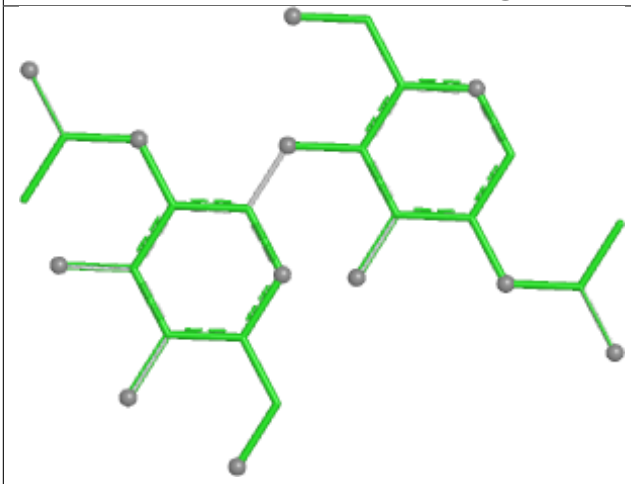


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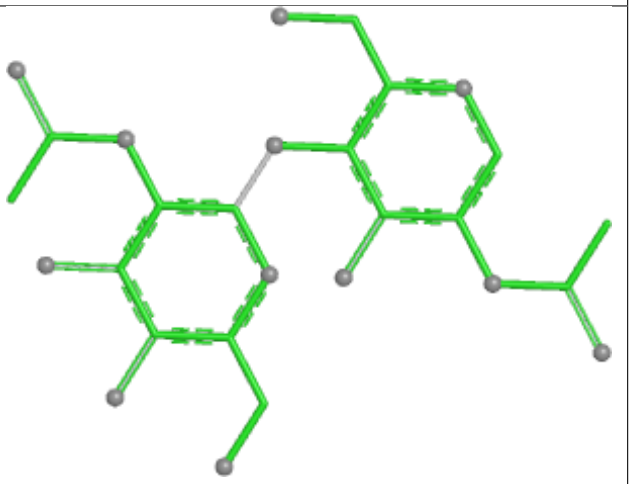


Rings

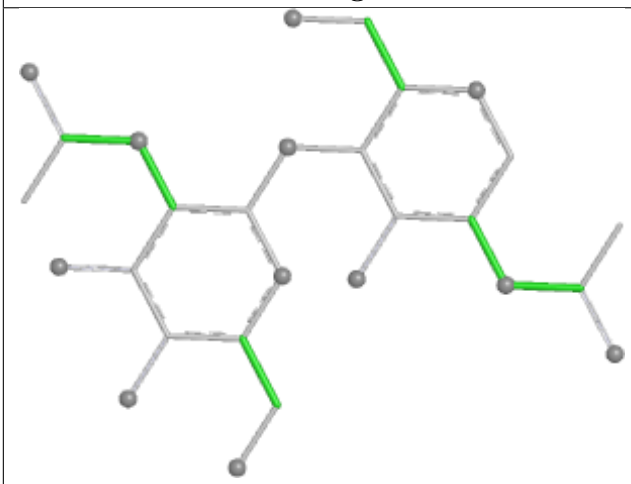
Oligosaccharide Chain Z



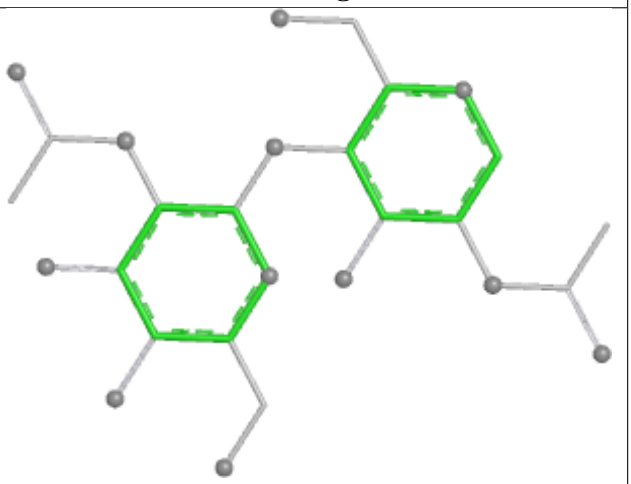
Bond lengths



Bond angles

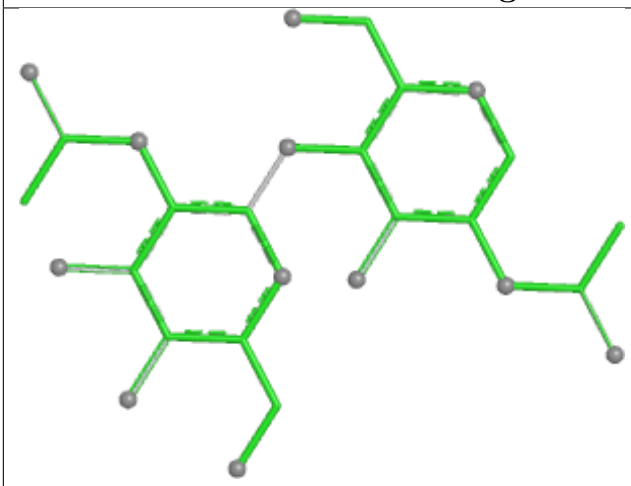


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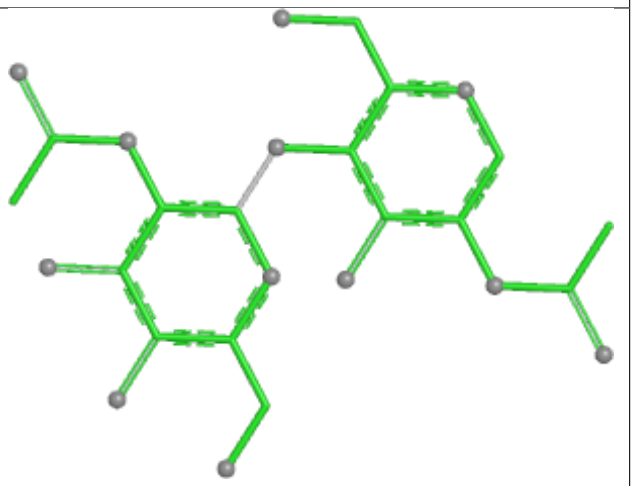


Rings

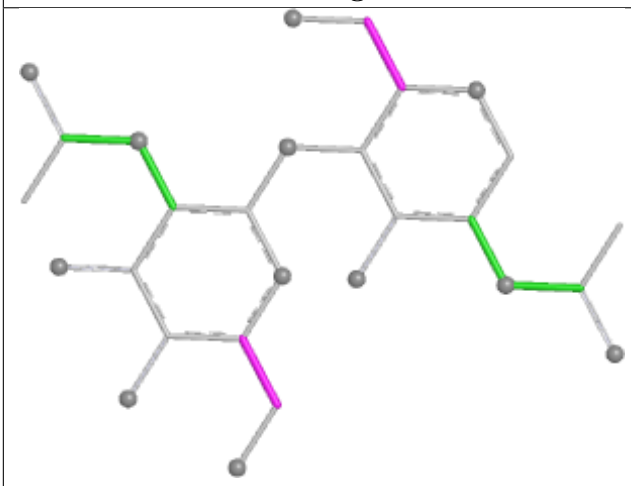
Oligosaccharide Chain a



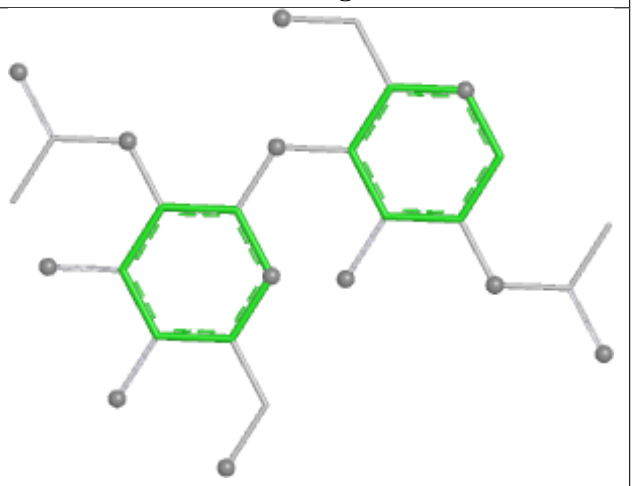
Bond lengths



Bond angles

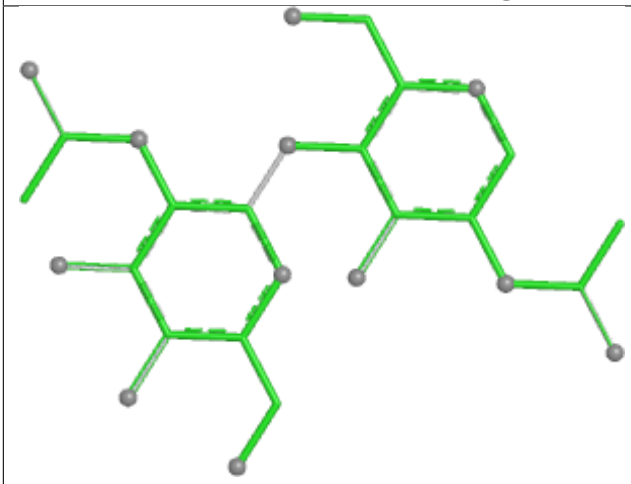


Torsions

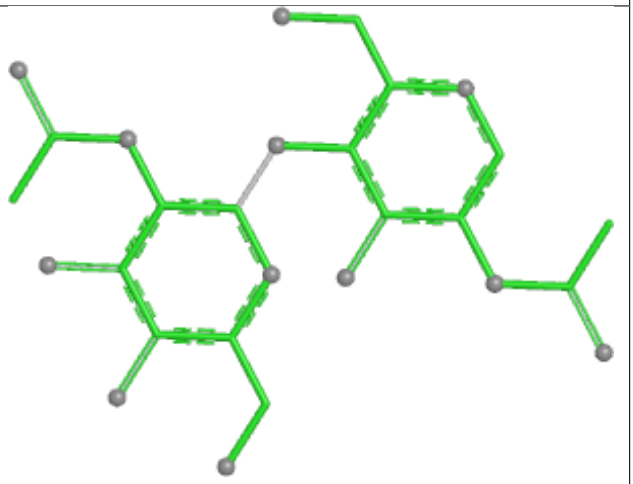


Rings

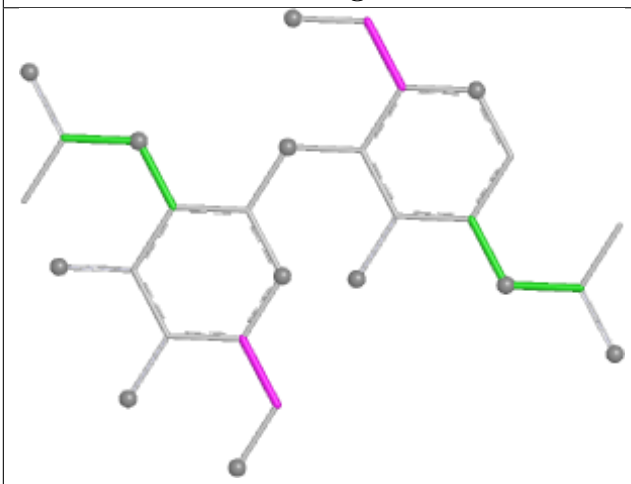
Oligosaccharide Chain b



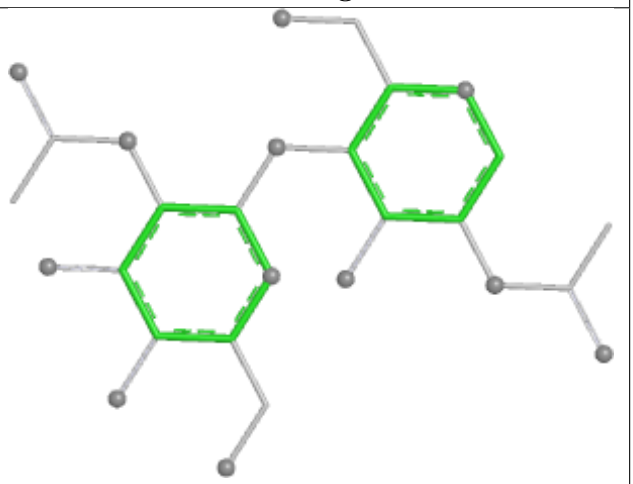
Bond lengths



Bond angles

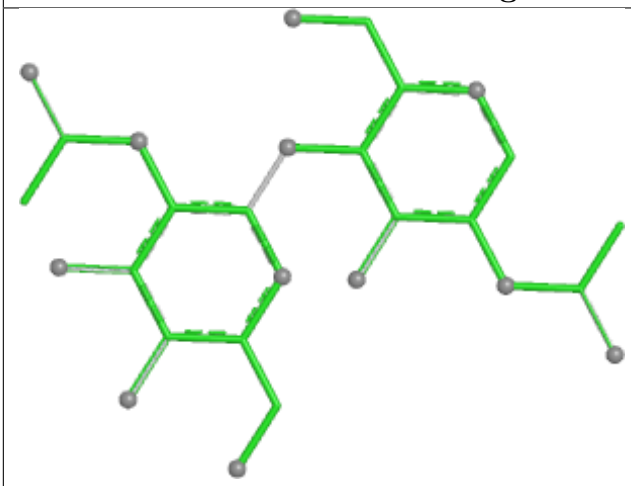


Torsions

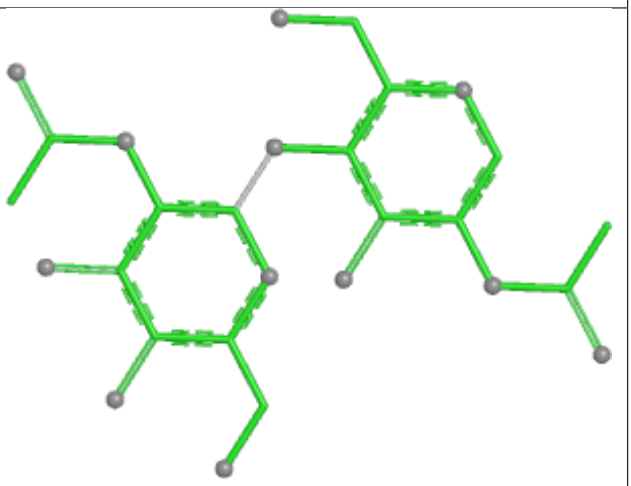


Rings

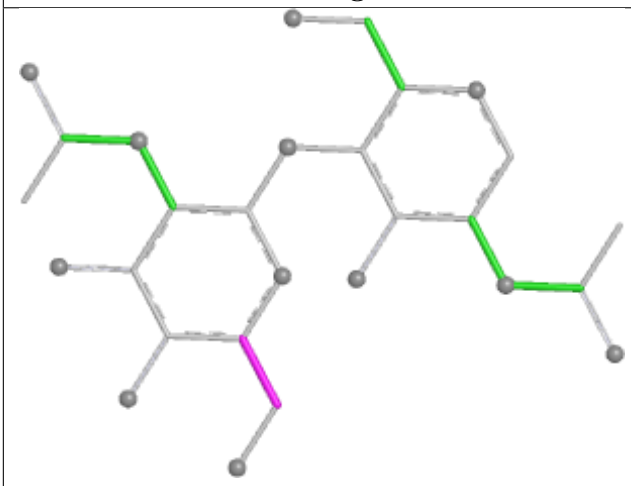
Oligosaccharide Chain c



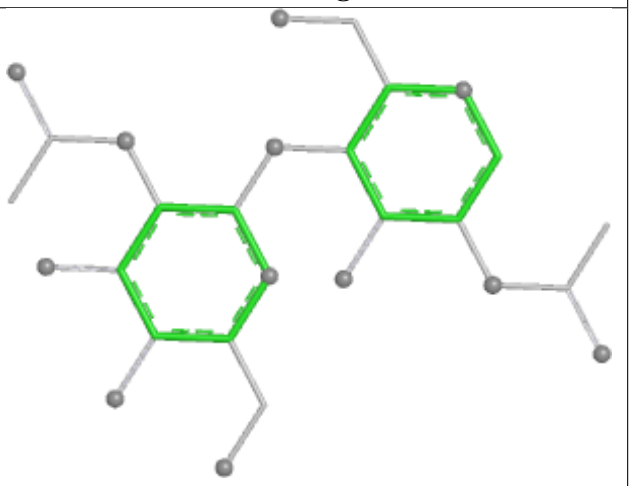
Bond lengths



Bond angles

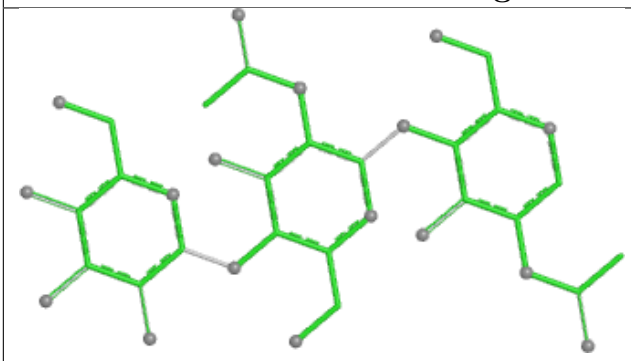


Torsions

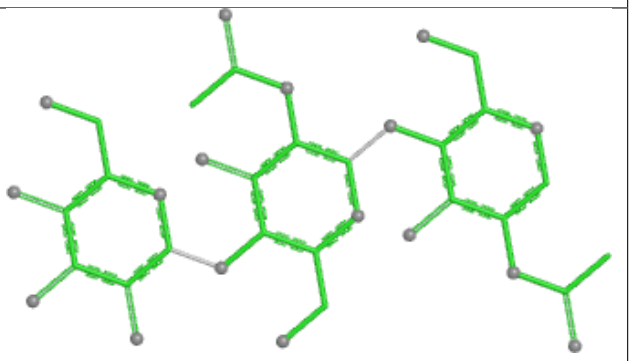


Rings

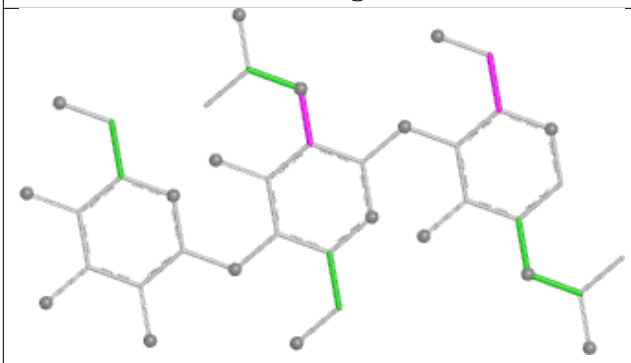
Oligosaccharide Chain N



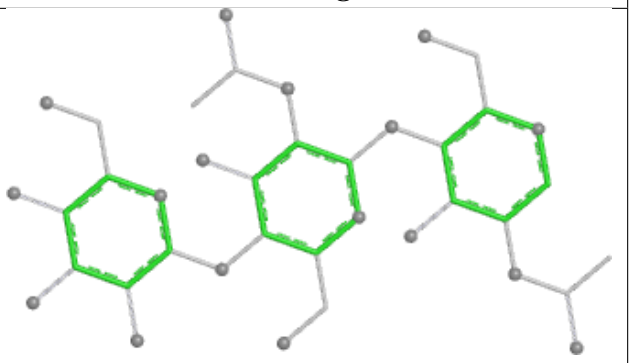
Bond lengths



Bond angles

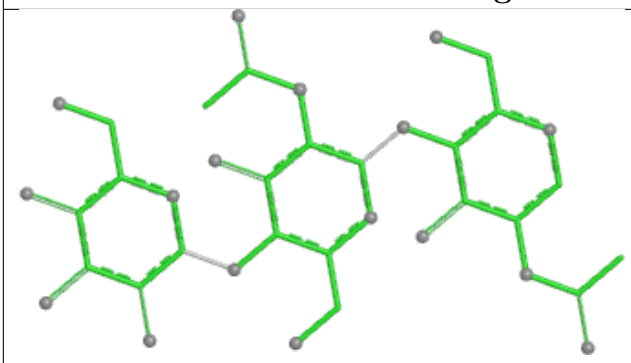


Torsions

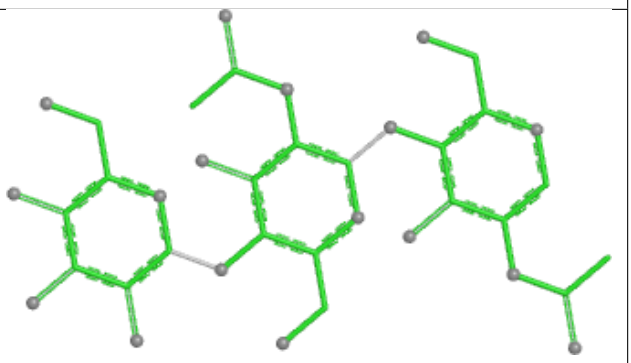


Rings

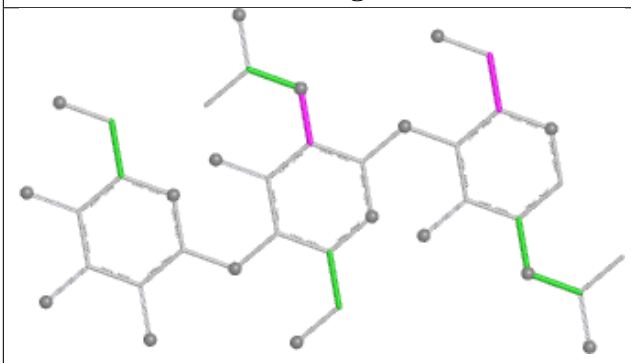
Oligosaccharide Chain V



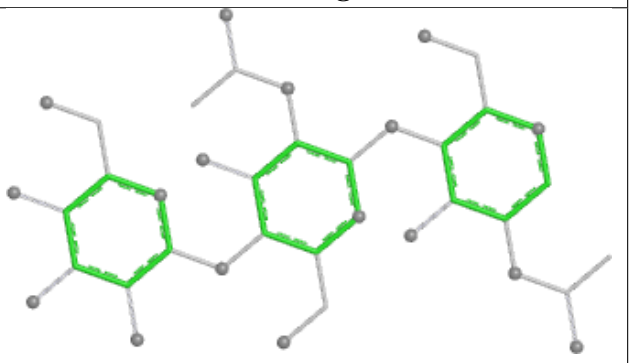
Bond lengths



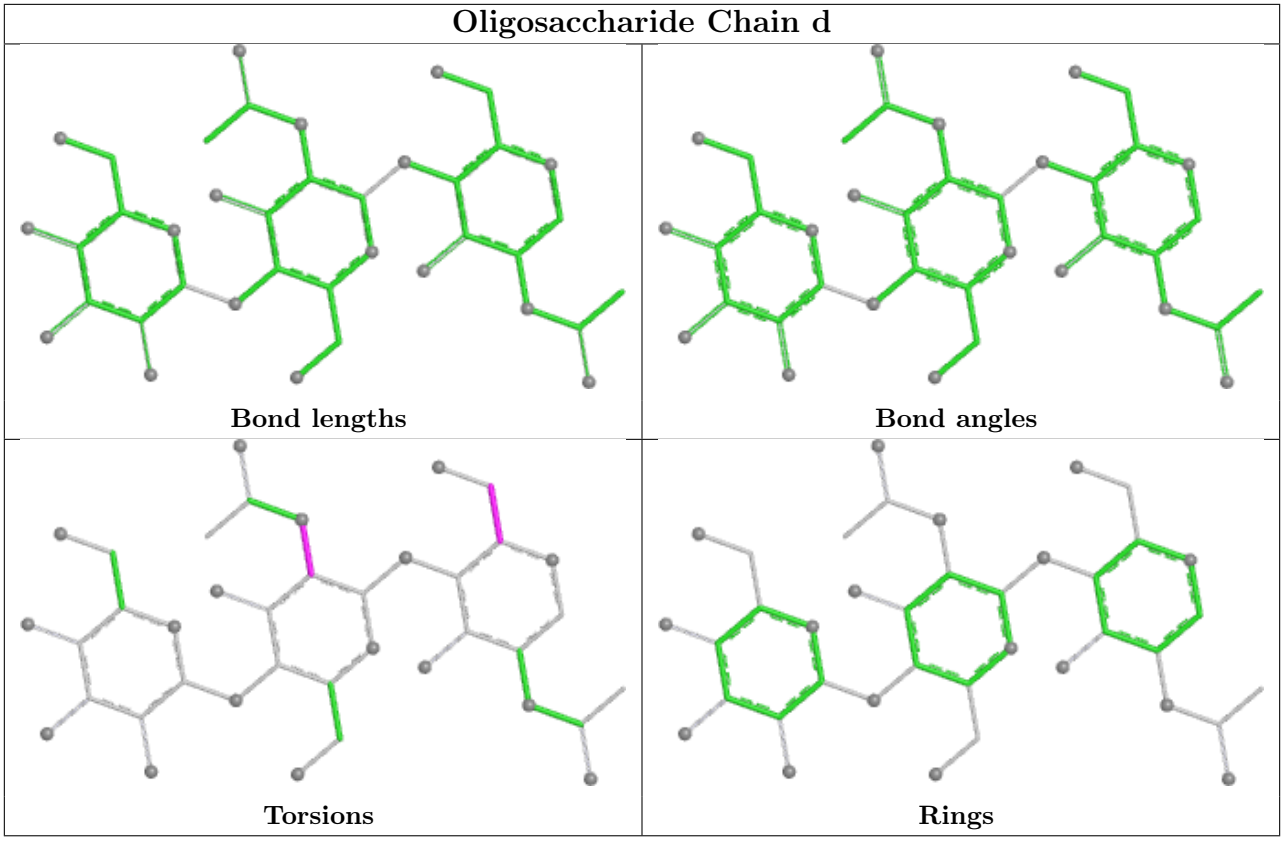
Bond angles



Torsions



Rings



5.6 Ligand geometry (i)

42 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	B	1306	2	14,14,15	0.22	0	17,19,21	0.45	0
5	NAG	C	1307	2	14,14,15	0.23	0	17,19,21	0.46	0
5	NAG	A	1303	2	14,14,15	0.26	0	17,19,21	0.44	0
5	NAG	A	1306	2	14,14,15	0.22	0	17,19,21	0.45	0
5	NAG	A	1301	2	14,14,15	0.24	0	17,19,21	0.44	0
5	NAG	B	1301	2	14,14,15	0.26	0	17,19,21	0.44	0
5	NAG	B	1308	2	14,14,15	0.24	0	17,19,21	0.45	0
5	NAG	E	703	1	14,14,15	0.23	0	17,19,21	0.44	0
5	NAG	F	701	1	14,14,15	0.23	0	17,19,21	0.44	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
5	NAG	C	1301	2	14,14,15	0.25	0	17,19,21	0.43	0
5	NAG	C	1310	2	14,14,15	0.23	0	17,19,21	0.43	0
5	NAG	E	702	1	14,14,15	0.23	0	17,19,21	0.43	0
5	NAG	B	1302	2	14,14,15	0.27	0	17,19,21	0.57	0
5	NAG	E	701	1	14,14,15	0.23	0	17,19,21	0.44	0
5	NAG	D	704	1	14,14,15	0.22	0	17,19,21	0.44	0
5	NAG	B	1304	2	14,14,15	0.26	0	17,19,21	0.44	0
5	NAG	D	703	1	14,14,15	0.23	0	17,19,21	0.44	0
5	NAG	A	1304	2	14,14,15	0.26	0	17,19,21	0.45	0
5	NAG	A	1305	2	14,14,15	0.22	0	17,19,21	0.43	0
5	NAG	C	1309	2	14,14,15	0.22	0	17,19,21	0.43	0
5	NAG	F	702	1	14,14,15	0.24	0	17,19,21	0.43	0
5	NAG	B	1305	2	14,14,15	0.23	0	17,19,21	0.44	0
5	NAG	D	702	1	14,14,15	0.24	0	17,19,21	0.43	0
5	NAG	D	701	1	14,14,15	0.23	0	17,19,21	0.44	0
5	NAG	A	1308	2	14,14,15	0.24	0	17,19,21	0.45	0
5	NAG	B	1307	2	14,14,15	0.22	0	17,19,21	0.45	0
5	NAG	C	1304	2	14,14,15	0.25	0	17,19,21	0.44	0
5	NAG	B	1310	2	14,14,15	0.22	0	17,19,21	0.45	0
5	NAG	F	704	1	14,14,15	0.24	0	17,19,21	0.45	0
5	NAG	A	1302	2	14,14,15	0.28	0	17,19,21	0.56	0
5	NAG	C	1303	2	14,14,15	0.26	0	17,19,21	0.45	0
5	NAG	C	1306	2	14,14,15	0.24	0	17,19,21	0.44	0
5	NAG	B	1303	2	14,14,15	0.24	0	17,19,21	0.44	0
5	NAG	C	1308	2	14,14,15	0.24	0	17,19,21	0.45	0
5	NAG	B	1309	2	14,14,15	0.24	0	17,19,21	0.43	0
5	NAG	C	1305	2	14,14,15	0.22	0	17,19,21	0.43	0
5	NAG	A	1309	2	14,14,15	0.22	0	17,19,21	0.44	0
5	NAG	C	1302	2	14,14,15	0.27	0	17,19,21	0.56	0
5	NAG	A	1307	2	14,14,15	0.22	0	17,19,21	0.46	0
5	NAG	A	1310	2	14,14,15	0.24	0	17,19,21	0.44	0
5	NAG	F	703	1	14,14,15	0.23	0	17,19,21	0.44	0
5	NAG	E	704	1	14,14,15	0.23	0	17,19,21	0.45	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	B	1306	2	-	4/6/23/26	0/1/1/1
5	NAG	C	1307	2	-	2/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	A	1303	2	-	2/6/23/26	0/1/1/1
5	NAG	A	1306	2	-	4/6/23/26	0/1/1/1
5	NAG	A	1301	2	-	0/6/23/26	0/1/1/1
5	NAG	B	1301	2	-	0/6/23/26	0/1/1/1
5	NAG	B	1308	2	-	2/6/23/26	0/1/1/1
5	NAG	E	703	1	-	4/6/23/26	0/1/1/1
5	NAG	F	701	1	-	0/6/23/26	0/1/1/1
5	NAG	C	1301	2	-	0/6/23/26	0/1/1/1
5	NAG	C	1310	2	-	1/6/23/26	0/1/1/1
5	NAG	E	702	1	-	2/6/23/26	0/1/1/1
5	NAG	B	1302	2	-	2/6/23/26	0/1/1/1
5	NAG	E	701	1	-	0/6/23/26	0/1/1/1
5	NAG	D	704	1	-	2/6/23/26	0/1/1/1
5	NAG	B	1304	2	-	2/6/23/26	0/1/1/1
5	NAG	D	703	1	-	4/6/23/26	0/1/1/1
5	NAG	A	1304	2	-	2/6/23/26	0/1/1/1
5	NAG	A	1305	2	-	2/6/23/26	0/1/1/1
5	NAG	C	1309	2	-	4/6/23/26	0/1/1/1
5	NAG	F	702	1	-	2/6/23/26	0/1/1/1
5	NAG	B	1305	2	-	2/6/23/26	0/1/1/1
5	NAG	D	702	1	-	2/6/23/26	0/1/1/1
5	NAG	D	701	1	-	0/6/23/26	0/1/1/1
5	NAG	A	1308	2	-	2/6/23/26	0/1/1/1
5	NAG	B	1307	2	-	2/6/23/26	0/1/1/1
5	NAG	C	1304	2	-	2/6/23/26	0/1/1/1
5	NAG	B	1310	2	-	1/6/23/26	0/1/1/1
5	NAG	F	704	1	-	2/6/23/26	0/1/1/1
5	NAG	A	1302	2	-	2/6/23/26	0/1/1/1
5	NAG	C	1303	2	-	2/6/23/26	0/1/1/1
5	NAG	C	1306	2	-	4/6/23/26	0/1/1/1
5	NAG	B	1303	2	-	2/6/23/26	0/1/1/1
5	NAG	C	1308	2	-	2/6/23/26	0/1/1/1
5	NAG	B	1309	2	-	4/6/23/26	0/1/1/1
5	NAG	C	1305	2	-	2/6/23/26	0/1/1/1
5	NAG	A	1309	2	-	4/6/23/26	0/1/1/1
5	NAG	C	1302	2	-	2/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	A	1307	2	-	2/6/23/26	0/1/1/1
5	NAG	A	1310	2	-	1/6/23/26	0/1/1/1
5	NAG	F	703	1	-	4/6/23/26	0/1/1/1
5	NAG	E	704	1	-	2/6/23/26	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 87 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	C	1303	NAG	C4-C5-C6-O6
5	D	703	NAG	O5-C5-C6-O6
5	E	703	NAG	O5-C5-C6-O6
5	F	703	NAG	O5-C5-C6-O6
5	A	1303	NAG	C4-C5-C6-O6

There are no ring outliers.

5 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	E	702	NAG	1	0
5	B	1302	NAG	1	0
5	F	702	NAG	1	0
5	D	702	NAG	1	0
5	C	1302	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.

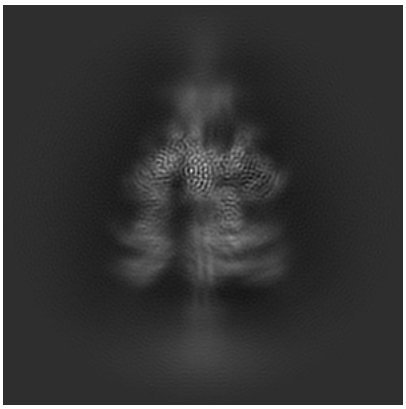
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-39822. These allow visual inspection of the internal detail of the map and identification of artifacts.

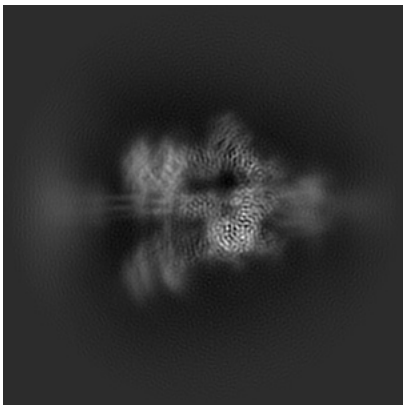
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections

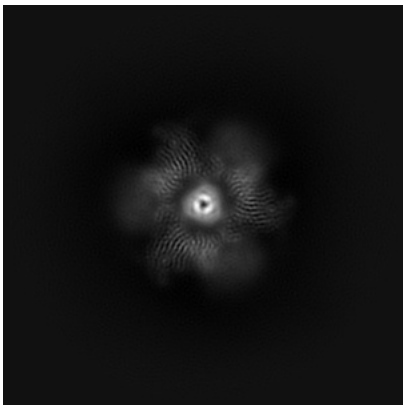
6.1.1 Primary map



X

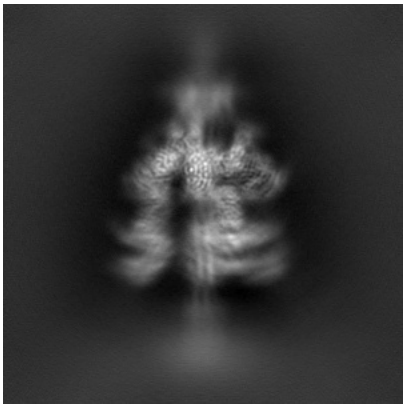


Y

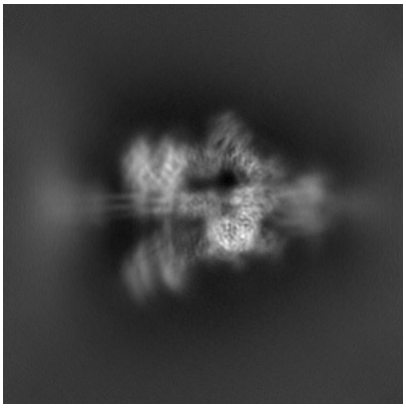


Z

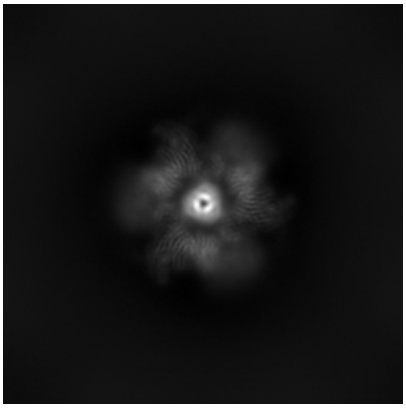
6.1.2 Raw map



X



Y

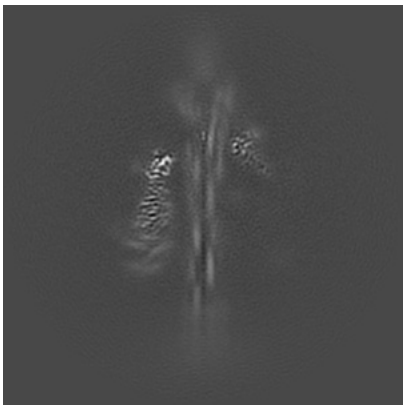


Z

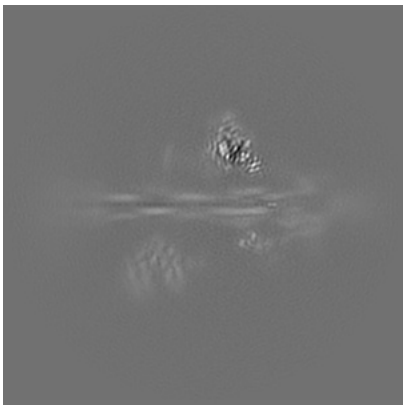
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

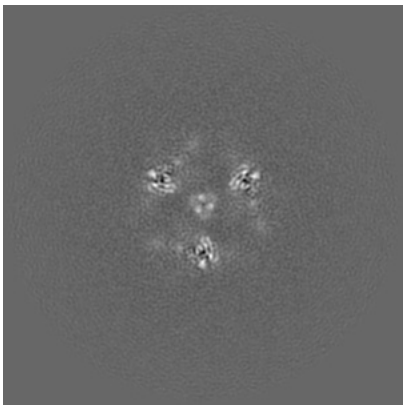
6.2.1 Primary map



X Index: 200



Y Index: 200

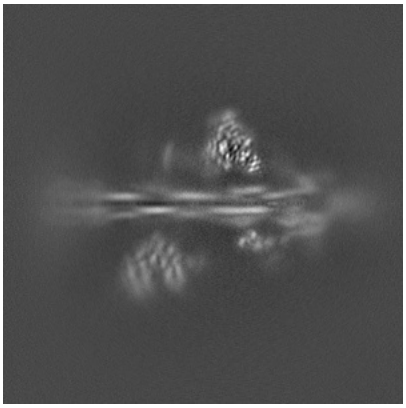


Z Index: 200

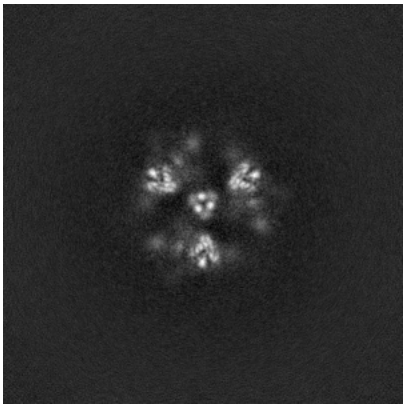
6.2.2 Raw map



X Index: 200



Y Index: 200

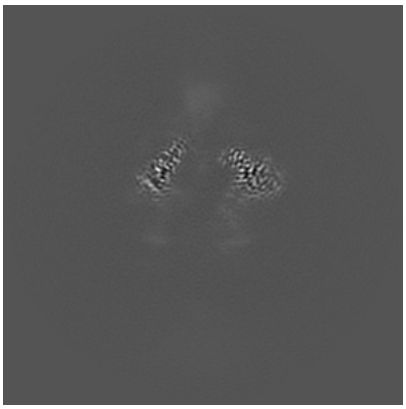


Z Index: 200

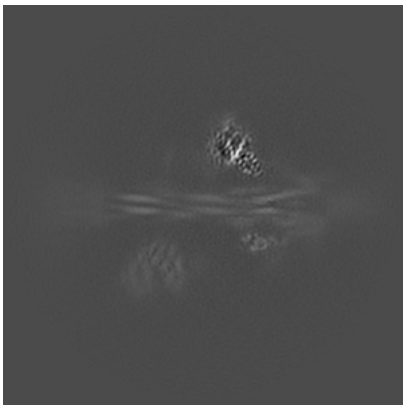
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

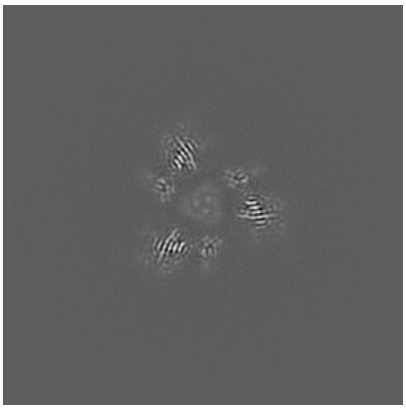
6.3.1 Primary map



X Index: 176



Y Index: 197

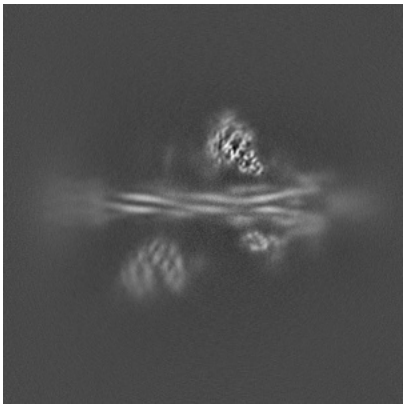


Z Index: 234

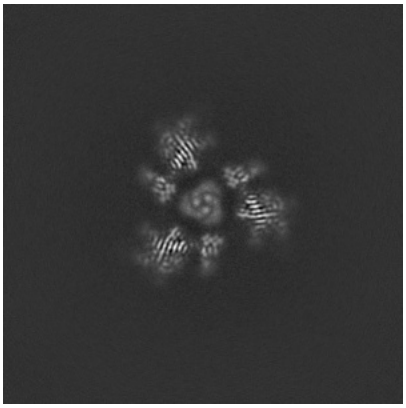
6.3.2 Raw map



X Index: 204



Y Index: 196

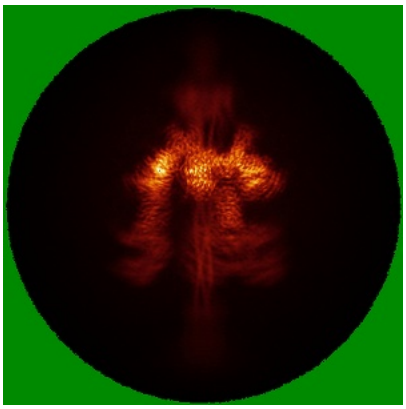


Z Index: 234

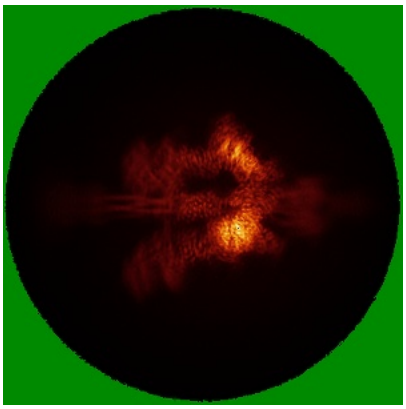
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) (i)

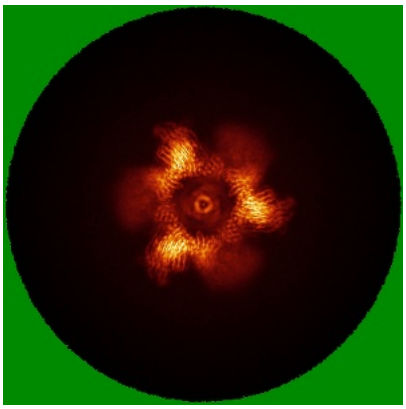
6.4.1 Primary map



X

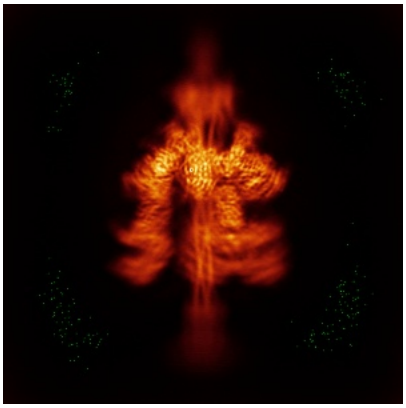


Y

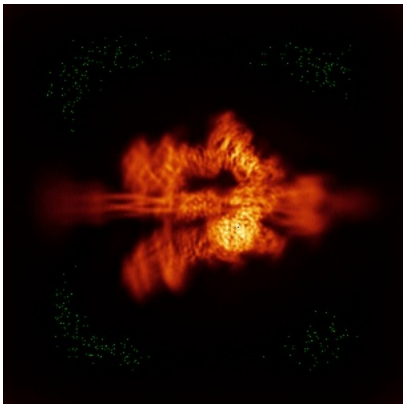


Z

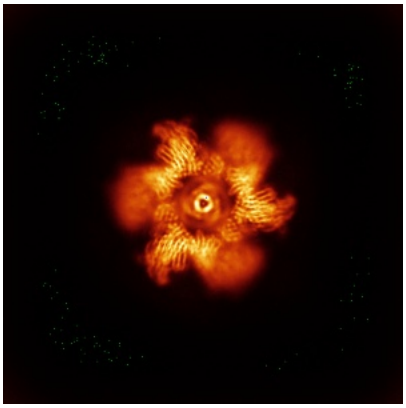
6.4.2 Raw map



X



Y

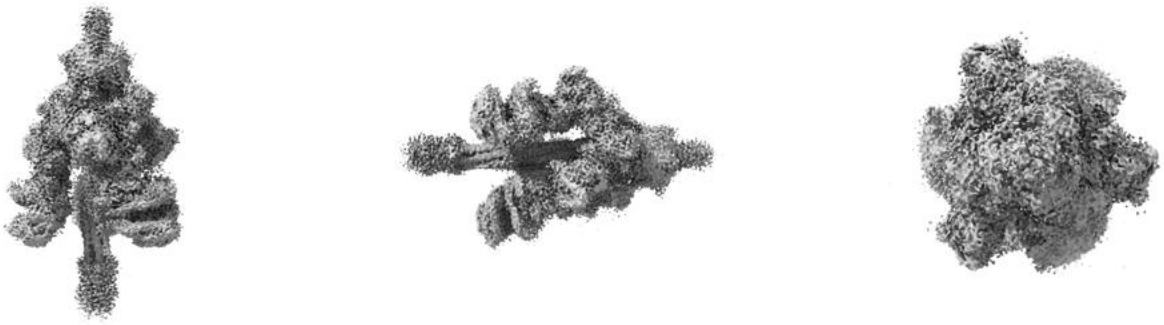


Z

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



X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.12. 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



X Y Z

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.

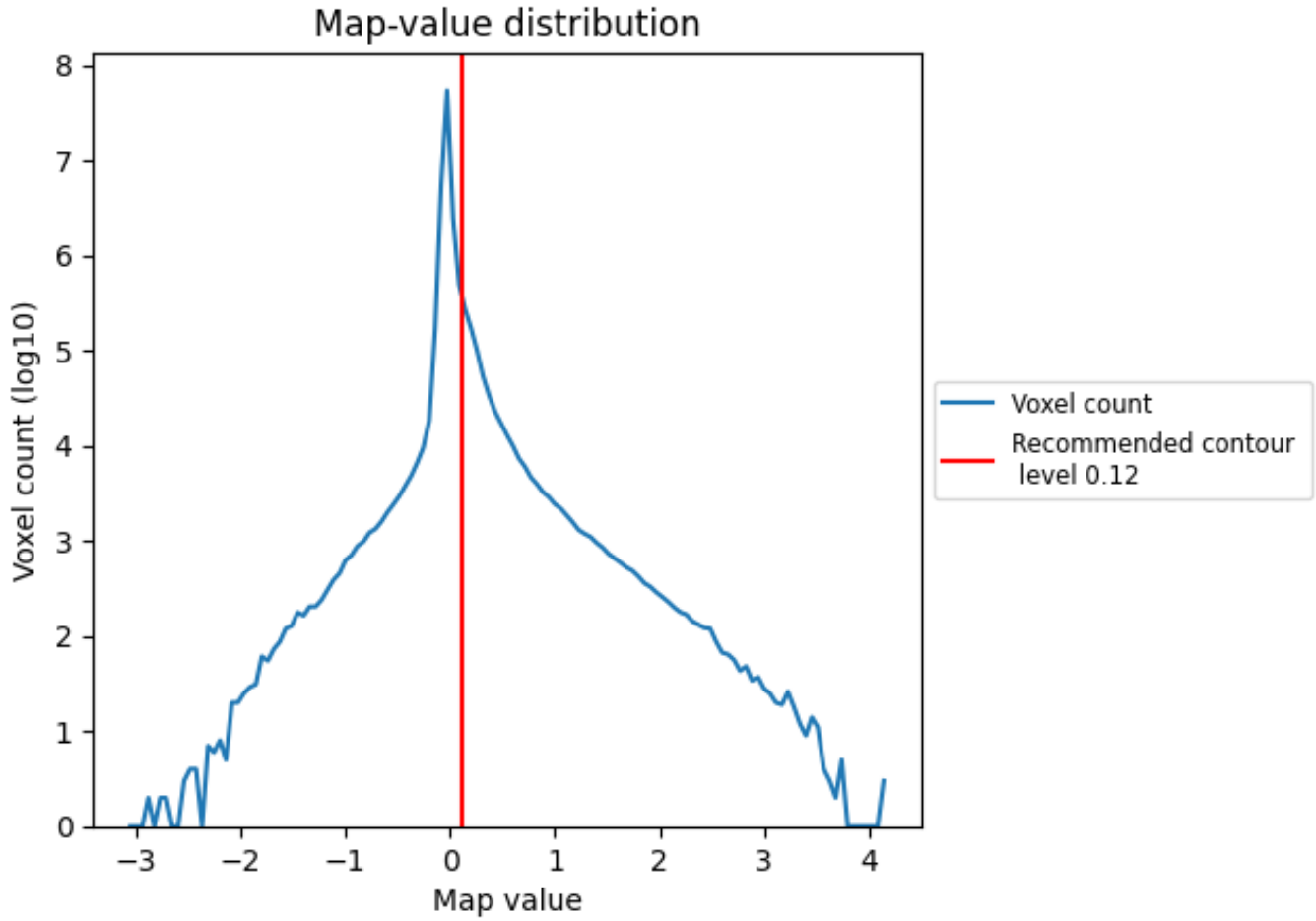
6.6 Mask visualisation (i)

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

7 Map analysis

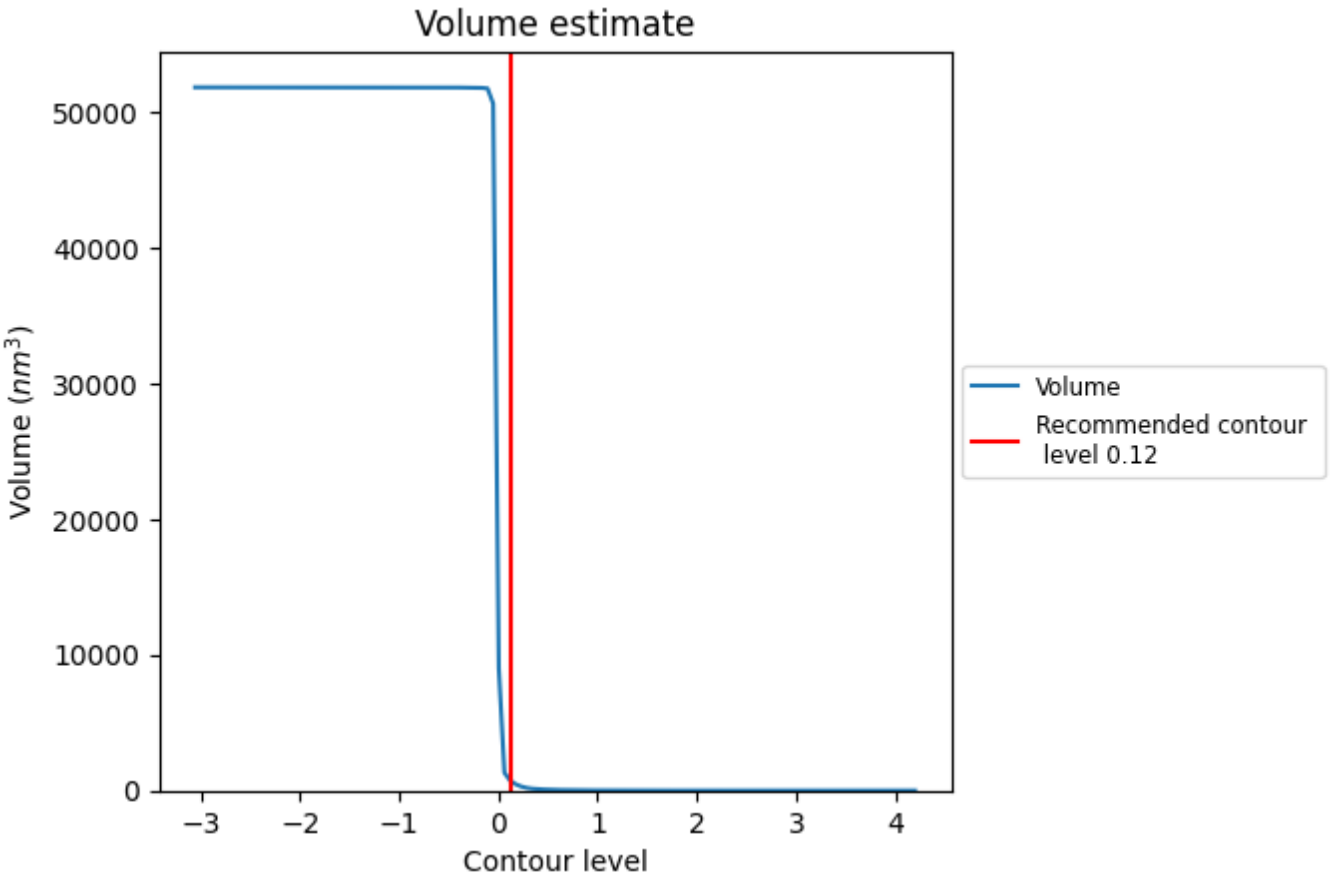
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution



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.

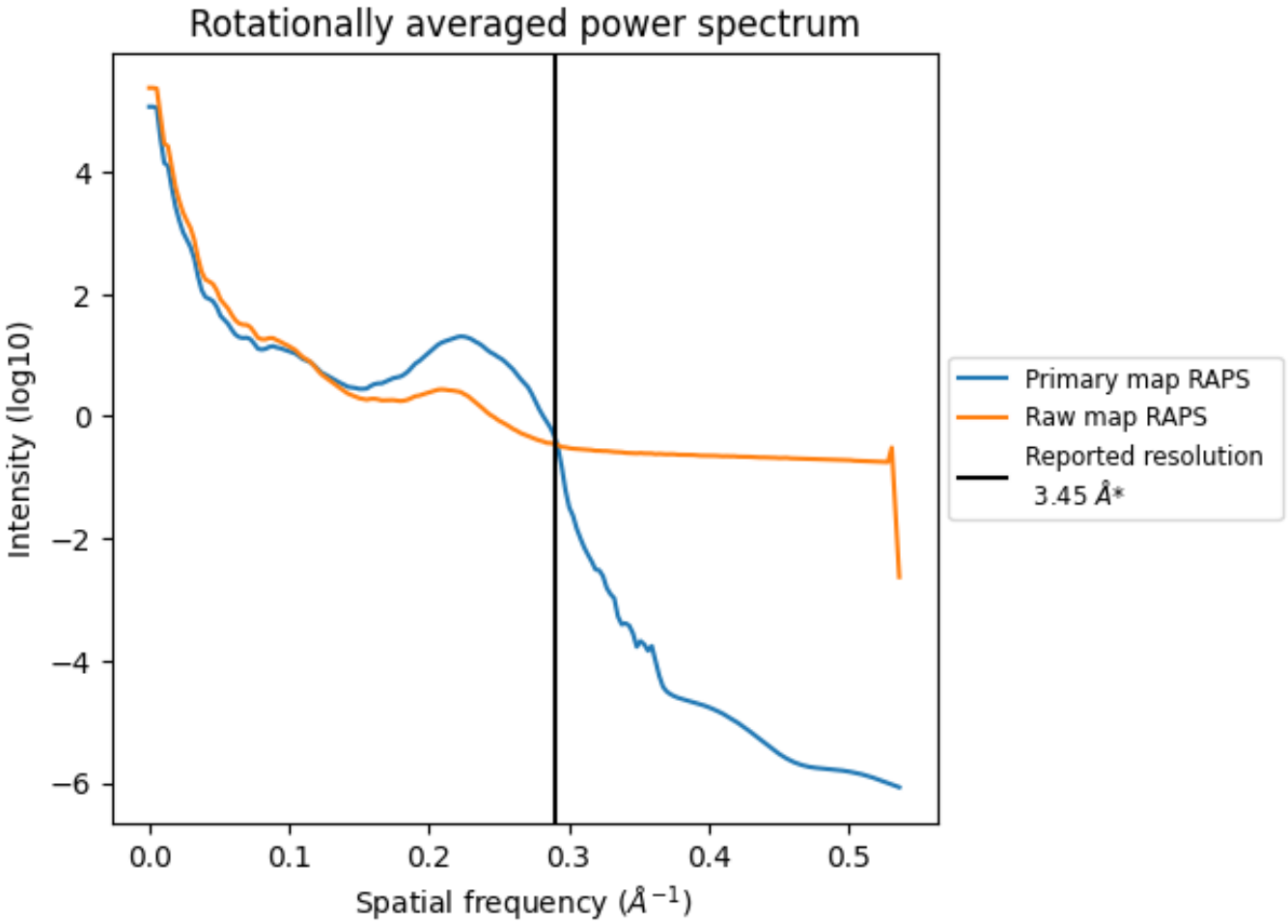
7.2 Volume estimate (i)



The volume at the recommended contour level is 736 nm^3; this corresponds to an approximate mass of 665 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 (i)

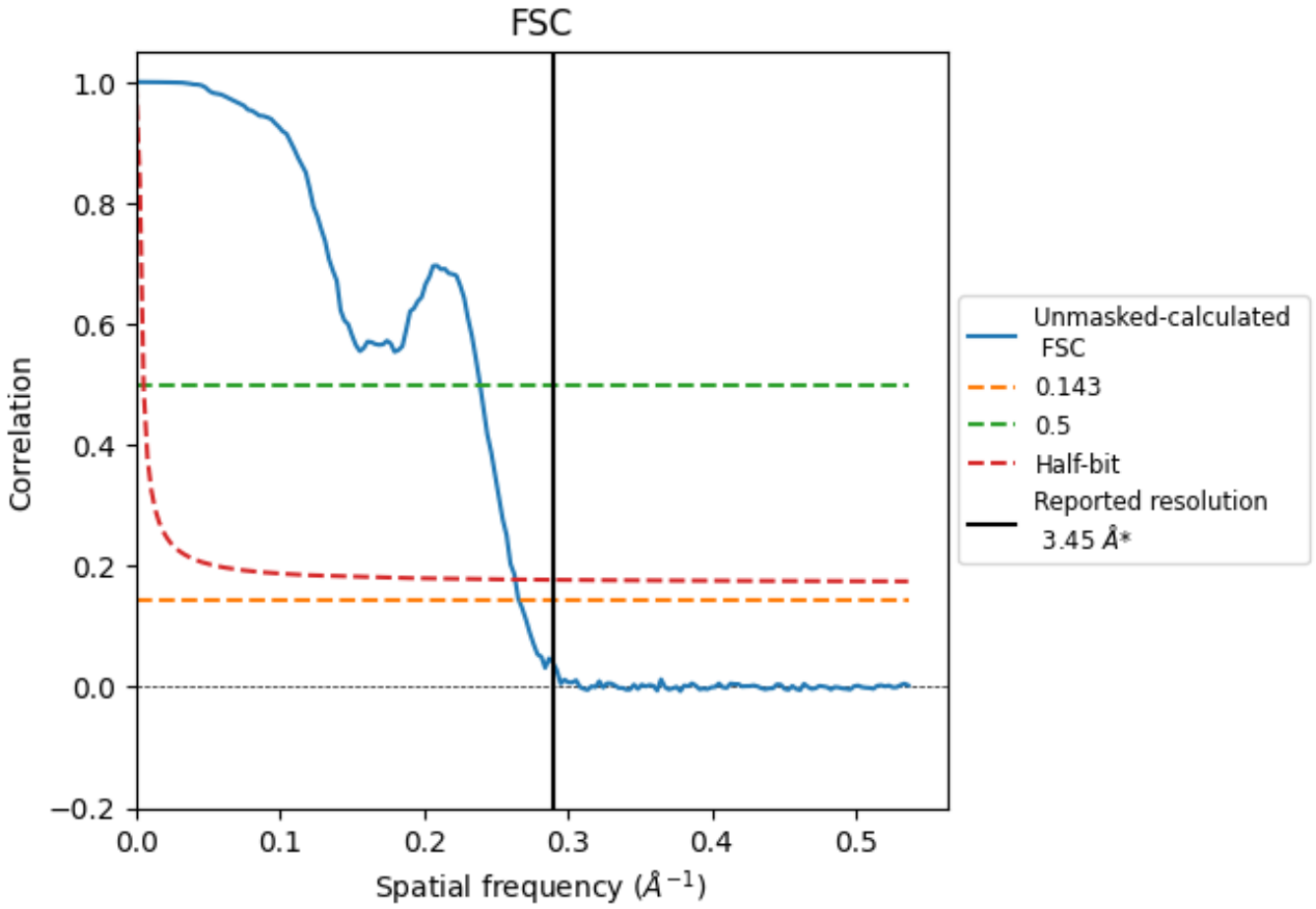


*Reported resolution corresponds to spatial frequency of 0.290 Å^{-1}

8 Fourier-Shell correlation

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



*Reported resolution corresponds to spatial frequency of 0.290 Å^{-1}

8.2 Resolution estimates (i)

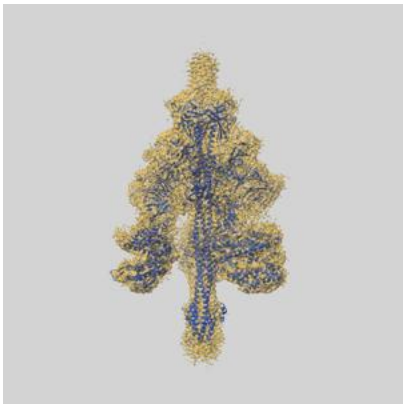
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.45	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.76	4.18	3.80

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps.

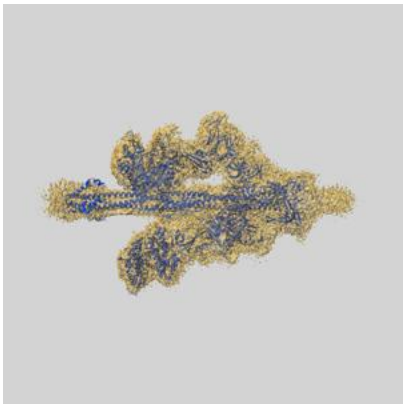
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-39822 and PDB model 8Z7P. Per-residue inclusion information can be found in section 3 on page 17.

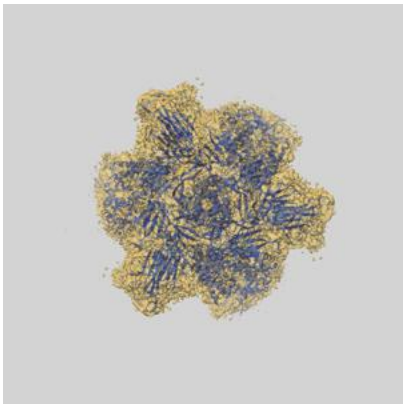
9.1 Map-model overlay



X



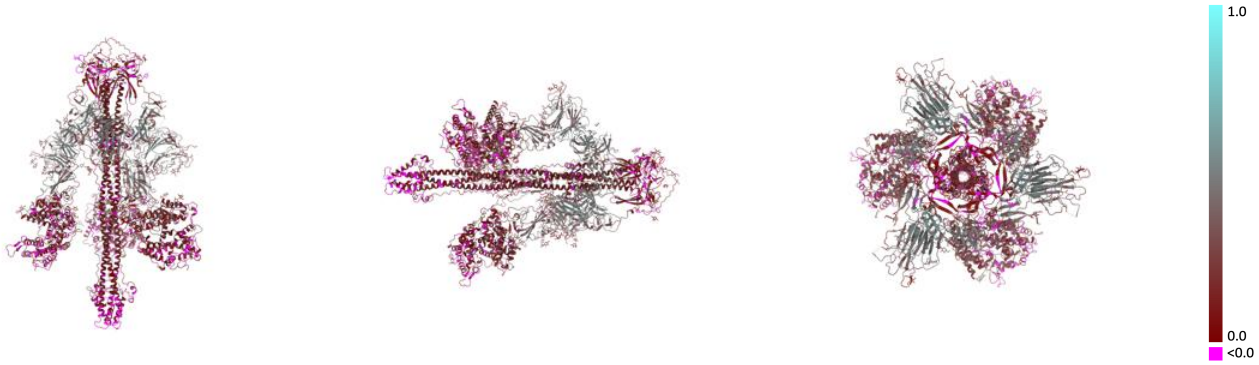
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.12 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.

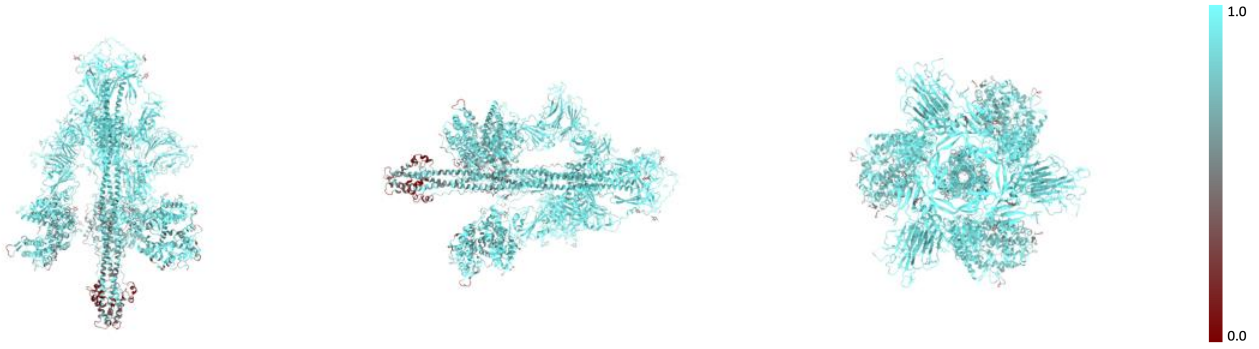
9.2 Q-score mapped to coordinate model (i)



X Y Z

The images above show the model with each residue coloured according 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.

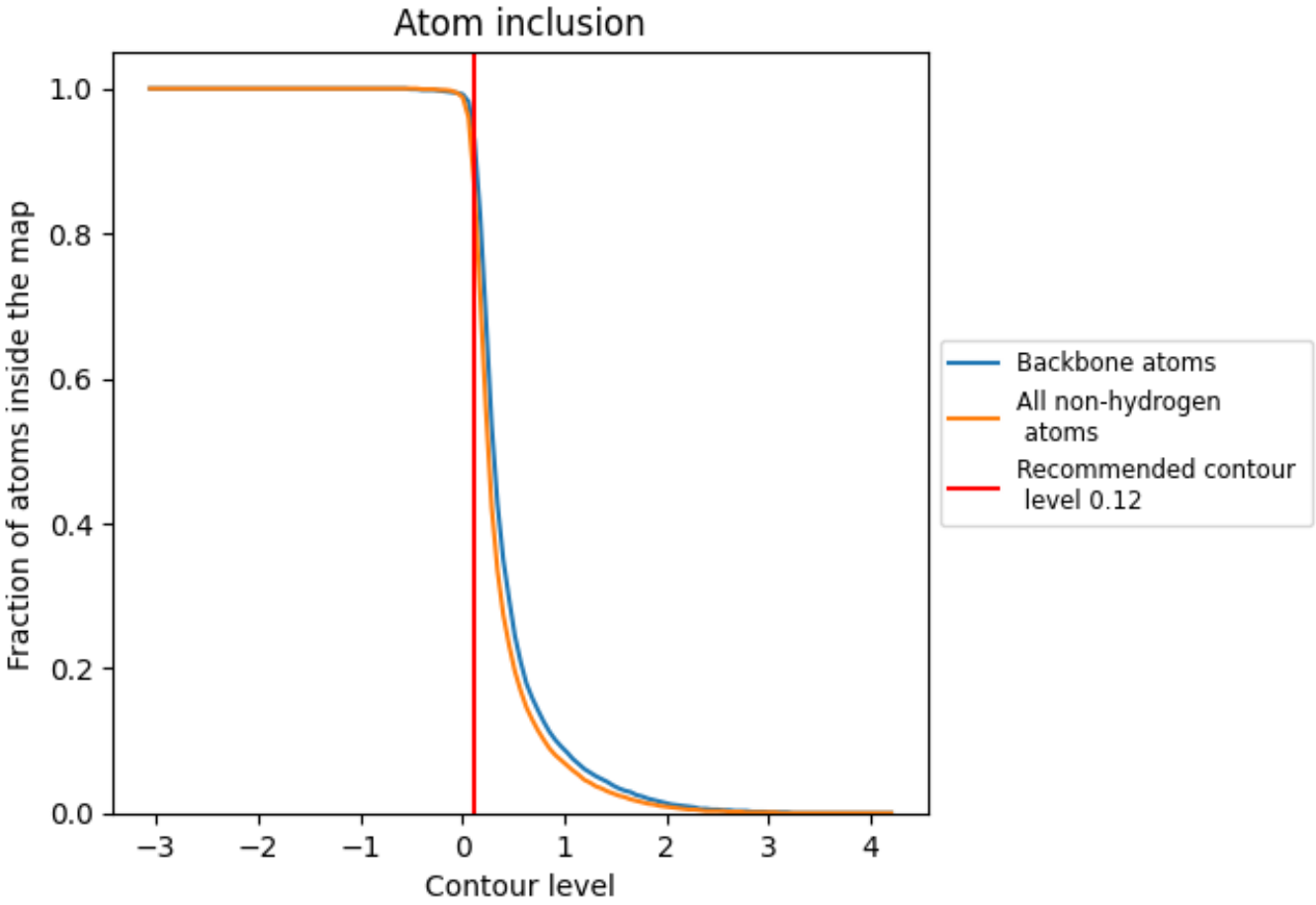
9.3 Atom inclusion mapped to coordinate model (i)



X Y Z

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 (0.12).

9.4 Atom inclusion (i)



At the recommended contour level, 93% of all backbone atoms, 86% 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 (0.12) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.8630	0.2340
A	0.8770	0.2850
B	0.8770	0.2830
C	0.8780	0.2830
D	0.8400	0.1480
E	0.8390	0.1500
F	0.8410	0.1460
G	0.4640	0.0370
H	0.7860	0.0620
I	0.8930	0.2020
J	0.8930	0.4370
K	1.0000	0.0570
L	0.7860	0.1640
M	0.8930	0.2740
N	0.8720	0.2640
O	0.4640	0.0440
P	0.7500	0.0640
Q	0.9290	0.1970
R	0.8930	0.4360
S	1.0000	0.0470
T	0.7860	0.1680
U	0.8930	0.2690
V	0.8720	0.2680
W	0.4640	0.0570
X	0.7140	0.0530
Y	0.8930	0.2010
Z	0.8930	0.4420
a	1.0000	0.0480
b	0.8210	0.1610
c	0.8930	0.2690
d	0.8460	0.2730

