



## wwPDB EM Validation Summary Report ⓘ

Nov 10, 2024 – 04:41 am GMT

PDB ID : 8QQJ  
EMDB ID : EMD-18593  
Title : CryoEM structure of the type IV pilin PilA5 from *Thermus thermophilus*  
Authors : Gold, V.A.M.; Neuhaus, A.; Gaines, M.; Isupov, M.; McLaren, M.  
Deposited on : 2023-10-04  
Resolution : 2.63 Å (reported)

This is a wwPDB EM Validation Summary Report for a publicly released PDB entry.

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A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

EMDB validation analysis : 0.0.1.dev113  
Mogul : 1.8.4, CSD as541be (2020)  
MolProbity : 4.02b-467  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
MapQ : 1.9.13  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.39

# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:  
*ELECTRON MICROSCOPY*

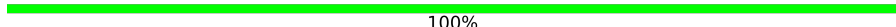
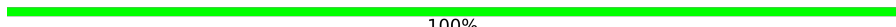
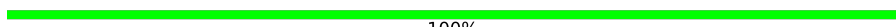
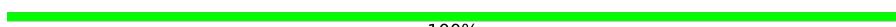





The reported resolution of this entry is 2.63 Å.

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.



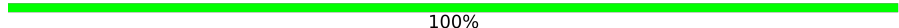
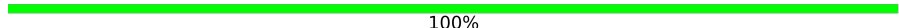

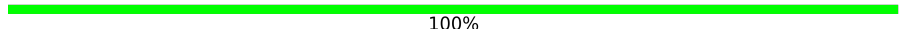
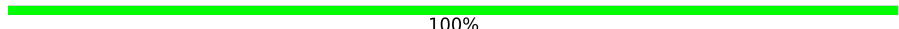
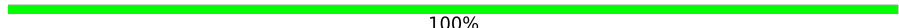
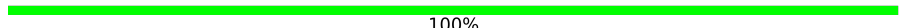
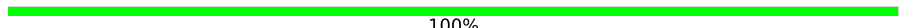
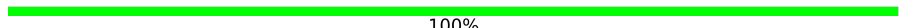
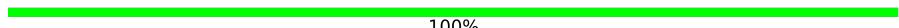
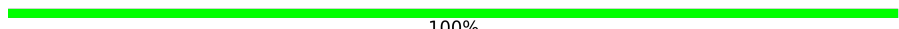
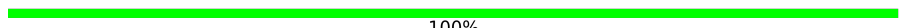
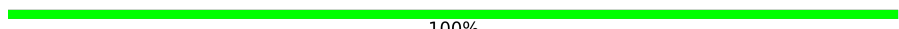
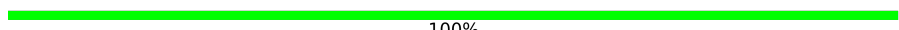
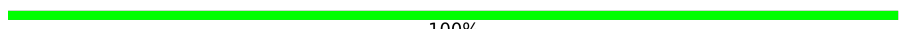
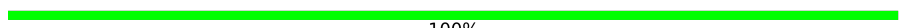
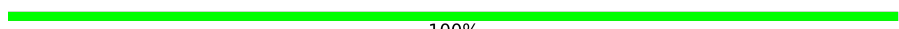
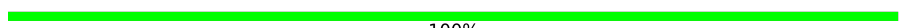
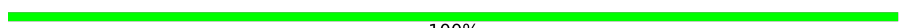
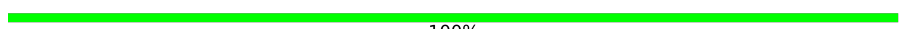
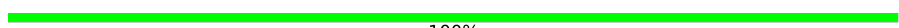


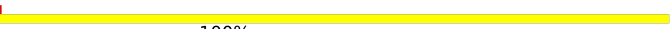




Metric	Whole archive (#Entries)	EM structures (#Entries)
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . 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	111	 100%
1	B	111	 100%
1	C	111	 100%
1	D	111	 100%
1	E	111	 100%
1	F	111	 100%
1	G	111	 100%
1	H	111	 100%
1	I	111	 100%

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Mol	Chain	Length	Quality of chain
1	J	111	 100%
1	K	111	 100%
1	L	111	 100%
1	M	111	 100%
1	N	111	 100%
1	O	111	 100%
1	P	111	 100%
1	Q	111	 100%
1	R	111	 100%
1	S	111	 100%
1	T	111	 100%
1	U	111	 100%
1	V	111	 100%
1	W	111	 100%
1	X	111	 100%
1	Y	111	 100%
1	Z	111	 100%
1	a	111	 100%
1	b	111	 100%
1	c	111	 100%
1	d	111	 100%
1	e	111	 100%
2	0	4	 25%  100%
2	1	4	 25%  100%
2	2	4	 25%  100%

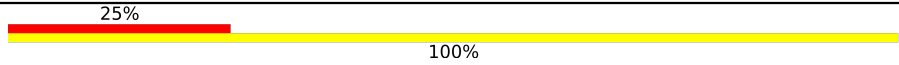
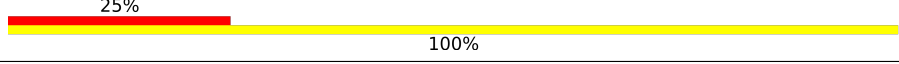
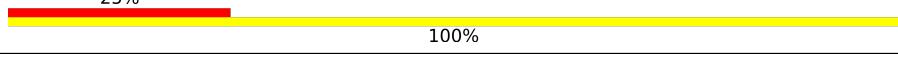
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Mol	Chain	Length	Quality of chain
2	3	4	25%  100%
2	4	4	25%  100%
2	5	4	25%  100%
2	6	4	25%  100%
2	7	4	25%  100%
2	8	4	25%  100%
2	9	4	25%  100%
2	f	4	25%  100%
2	g	4	25%  100%
2	h	4	25%  100%
2	i	4	25%  100%
2	j	4	25%  100%
2	k	4	25%  100%
2	l	4	25%  100%
2	m	4	25%  100%
2	n	4	25%  100%
2	o	4	25%  100%
2	p	4	25%  100%
2	q	4	25%  100%
2	r	4	25%  100%
2	s	4	25%  100%
2	t	4	25%  100%
2	u	4	25%  100%
2	v	4	25%  100%
2	w	4	25%  100%

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Mol	Chain	Length	Quality of chain
2	x	4	 25% 100%
2	y	4	 25% 100%
2	z	4	 25% 100%

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 26815 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 Type IV narrow pilus major component PilA5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	J	111	803	499	137	165	2	0	0
1	A	111	803	499	137	165	2	0	0
1	B	111	803	499	137	165	2	0	0
1	C	111	803	499	137	165	2	0	0
1	D	111	803	499	137	165	2	0	0
1	E	111	803	499	137	165	2	0	0
1	F	111	803	499	137	165	2	0	0
1	G	111	803	499	137	165	2	0	0
1	H	111	803	499	137	165	2	0	0
1	I	111	803	499	137	165	2	0	0
1	K	111	803	499	137	165	2	0	0
1	L	111	803	499	137	165	2	0	0
1	M	111	803	499	137	165	2	0	0
1	N	111	803	499	137	165	2	0	0
1	O	111	803	499	137	165	2	0	0
1	P	111	803	499	137	165	2	0	0
1	Q	111	803	499	137	165	2	0	0

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Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	R	111	803	499	137	165	2	0	0
1	S	111	803	499	137	165	2	0	0
1	T	111	803	499	137	165	2	0	0
1	U	111	803	499	137	165	2	0	0
1	V	111	803	499	137	165	2	0	0
1	W	111	803	499	137	165	2	0	0
1	X	111	803	499	137	165	2	0	0
1	Y	111	803	499	137	165	2	0	0
1	Z	111	803	499	137	165	2	0	0
1	a	111	803	499	137	165	2	0	0
1	b	111	803	499	137	165	2	0	0
1	c	111	803	499	137	165	2	0	0
1	d	111	803	499	137	165	2	0	0
1	e	111	803	499	137	165	2	0	0

There are 31 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
J	67	LEU	PRO	conflict	UNP Q72GL2
A	67	LEU	PRO	conflict	UNP Q72GL2
B	67	LEU	PRO	conflict	UNP Q72GL2
C	67	LEU	PRO	conflict	UNP Q72GL2
D	67	LEU	PRO	conflict	UNP Q72GL2
E	67	LEU	PRO	conflict	UNP Q72GL2
F	67	LEU	PRO	conflict	UNP Q72GL2
G	67	LEU	PRO	conflict	UNP Q72GL2
H	67	LEU	PRO	conflict	UNP Q72GL2
I	67	LEU	PRO	conflict	UNP Q72GL2
K	67	LEU	PRO	conflict	UNP Q72GL2

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Chain	Residue	Modelled	Actual	Comment	Reference
L	67	LEU	PRO	conflict	UNP Q72GL2
M	67	LEU	PRO	conflict	UNP Q72GL2
N	67	LEU	PRO	conflict	UNP Q72GL2
O	67	LEU	PRO	conflict	UNP Q72GL2
P	67	LEU	PRO	conflict	UNP Q72GL2
Q	67	LEU	PRO	conflict	UNP Q72GL2
R	67	LEU	PRO	conflict	UNP Q72GL2
S	67	LEU	PRO	conflict	UNP Q72GL2
T	67	LEU	PRO	conflict	UNP Q72GL2
U	67	LEU	PRO	conflict	UNP Q72GL2
V	67	LEU	PRO	conflict	UNP Q72GL2
W	67	LEU	PRO	conflict	UNP Q72GL2
X	67	LEU	PRO	conflict	UNP Q72GL2
Y	67	LEU	PRO	conflict	UNP Q72GL2
Z	67	LEU	PRO	conflict	UNP Q72GL2
a	67	LEU	PRO	conflict	UNP Q72GL2
b	67	LEU	PRO	conflict	UNP Q72GL2
c	67	LEU	PRO	conflict	UNP Q72GL2
d	67	LEU	PRO	conflict	UNP Q72GL2
e	67	LEU	PRO	conflict	UNP Q72GL2

- Molecule 2 is an oligosaccharide called 7-Acetamido-5-acetimido-3,5,7,9-tetradeoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose.

Mol	Chain	Residues	Atoms				AltConf	Trace
2	f	4	Total	C	N	O	0	0
			61	35	5	21		
2	g	4	Total	C	N	O	0	0
			61	35	5	21		
2	h	4	Total	C	N	O	0	0
			61	35	5	21		
2	i	4	Total	C	N	O	0	0
			61	35	5	21		
2	j	4	Total	C	N	O	0	0
			61	35	5	21		
2	k	4	Total	C	N	O	0	0
			61	35	5	21		
2	l	4	Total	C	N	O	0	0
			61	35	5	21		
2	m	4	Total	C	N	O	0	0
			61	35	5	21		

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Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
2	n	4	61	35	5	21	0	0
2	o	4	61	35	5	21	0	0
2	p	4	61	35	5	21	0	0
2	q	4	61	35	5	21	0	0
2	r	4	61	35	5	21	0	0
2	s	4	61	35	5	21	0	0
2	t	4	61	35	5	21	0	0
2	u	4	61	35	5	21	0	0
2	v	4	61	35	5	21	0	0
2	w	4	61	35	5	21	0	0
2	x	4	61	35	5	21	0	0
2	y	4	61	35	5	21	0	0
2	z	4	61	35	5	21	0	0
2	0	4	61	35	5	21	0	0
2	1	4	61	35	5	21	0	0
2	2	4	61	35	5	21	0	0
2	3	4	61	35	5	21	0	0
2	4	4	61	35	5	21	0	0
2	5	4	61	35	5	21	0	0
2	6	4	61	35	5	21	0	0
2	7	4	61	35	5	21	0	0

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Mol	Chain	Residues	Atoms				AltConf	Trace
			Total	C	N	O		
2	8	4	61	35	5	21	0	0
2	9	4	61	35	5	21	0	0

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		AltConf
3	J	1	Total	Mg	0
			1	1	
3	A	1	Total	Mg	0
			1	1	
3	B	1	Total	Mg	0
			1	1	
3	C	1	Total	Mg	0
			1	1	
3	D	1	Total	Mg	0
			1	1	
3	E	1	Total	Mg	0
			1	1	
3	F	1	Total	Mg	0
			1	1	
3	G	1	Total	Mg	0
			1	1	
3	H	1	Total	Mg	0
			1	1	
3	I	1	Total	Mg	0
			1	1	
3	K	1	Total	Mg	0
			1	1	
3	L	1	Total	Mg	0
			1	1	
3	M	1	Total	Mg	0
			1	1	
3	N	1	Total	Mg	0
			1	1	
3	O	1	Total	Mg	0
			1	1	
3	P	1	Total	Mg	0
			1	1	
3	Q	1	Total	Mg	0
			1	1	

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Mol	Chain	Residues	Atoms		AltConf
3	R	1	Total 1	Mg 1	0
3	S	1	Total 1	Mg 1	0
3	T	1	Total 1	Mg 1	0
3	U	1	Total 1	Mg 1	0
3	V	1	Total 1	Mg 1	0
3	W	1	Total 1	Mg 1	0
3	X	1	Total 1	Mg 1	0
3	Y	1	Total 1	Mg 1	0
3	Z	1	Total 1	Mg 1	0
3	a	1	Total 1	Mg 1	0
3	b	1	Total 1	Mg 1	0
3	c	1	Total 1	Mg 1	0
3	d	1	Total 1	Mg 1	0
3	e	1	Total 1	Mg 1	0

### 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: Type IV narrow pilus major component PilA5

Chain J:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain A:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain B:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain C:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain D:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain E:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain F:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain G:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain H:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain I:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain K:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain L:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain M:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain N:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain O:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain P:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain Q:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain R:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain S:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain T:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain U:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain V:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain W:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain X:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain Y:  100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain Z: 100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain a: 100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain b: 100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain c: 100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain d: 100%

There are no outlier residues recorded for this chain.

- Molecule 1: Type IV narrow pilus major component PilA5

Chain e: 100%

There are no outlier residues recorded for this chain.

- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradeoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose

Chain f: 25% 100%

A261  
A262  
MAM3  
WT84

- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradeoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose

Chain g: 25% 100%



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose







- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose





- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose





- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose





- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetradecoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose

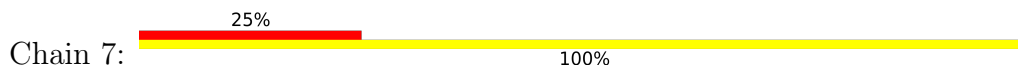




- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetra-deoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetra-deoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetra-deoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



- Molecule 2: 7-Acetamido-5-acetimido-3,5,7,9-tetra-deoxy-L-glycero-L-manno-nonulosonic aci-(1-4)-alpha-D-mannopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose-(1-3)-2-acetamido-2-deoxy-alpha-D-galactopyranose



## 4 Experimental information

Property	Value	Source
EM reconstruction method	HELICAL	Depositor
Imposed symmetry	HELICAL, twist=84.0°, rise=11.25 Å, axial sym=C1	Depositor
Number of segments used	475441	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 ( $e^-/\text{Å}^2$ )	47.6	Depositor
Minimum defocus (nm)	1500	Depositor
Maximum defocus (nm)	4000	Depositor
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	1.000	Depositor
Minimum map value	-0.083	Depositor
Average map value	0.150	Depositor
Map value standard deviation	0.016	Depositor
Recommended contour level	0.2	Depositor
Map size (Å)	536.576, 536.576, 536.576	wwPDB
Map dimensions	512, 512, 512	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.048, 1.048, 1.048	Depositor

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: MG, A2G, WT8, MAN

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	0.33	0/811	0.68	0/1109
1	B	0.33	0/811	0.68	0/1109
1	C	0.32	0/811	0.68	0/1109
1	D	0.33	0/811	0.68	0/1109
1	E	0.33	0/811	0.68	0/1109
1	F	0.33	0/811	0.68	0/1109
1	G	0.33	0/811	0.68	0/1109
1	H	0.33	0/811	0.69	0/1109
1	I	0.33	0/811	0.68	0/1109
1	J	0.33	0/811	0.68	0/1109
1	K	0.33	0/811	0.69	0/1109
1	L	0.33	0/811	0.69	0/1109
1	M	0.33	0/811	0.69	0/1109
1	N	0.33	0/811	0.69	0/1109
1	O	0.33	0/811	0.69	0/1109
1	P	0.33	0/811	0.69	0/1109
1	Q	0.33	0/811	0.69	0/1109
1	R	0.33	0/811	0.69	0/1109
1	S	0.33	0/811	0.69	0/1109
1	T	0.33	0/811	0.69	0/1109
1	U	0.33	0/811	0.69	0/1109
1	V	0.33	0/811	0.69	0/1109
1	W	0.33	0/811	0.69	0/1109
1	X	0.33	0/811	0.69	0/1109
1	Y	0.33	0/811	0.69	0/1109
1	Z	0.33	0/811	0.68	0/1109
1	a	0.33	0/811	0.69	0/1109
1	b	0.32	0/811	0.69	0/1109
1	c	0.32	0/811	0.69	0/1109
1	d	0.32	0/811	0.69	0/1109
1	e	0.32	0/811	0.69	0/1109
All	All	0.33	0/25141	0.69	0/34379

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

## 5.2 Too-close contacts [i](#)

Due to software issues we are unable to calculate clashes - this section is therefore empty.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	B	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	C	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	D	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	E	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	F	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	G	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	H	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	I	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	J	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	K	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	L	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	M	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	N	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	O	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	P	109/111 (98%)	105 (96%)	4 (4%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	Q	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	R	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	S	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	T	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	U	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	V	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	W	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	X	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	Y	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	Z	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	a	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	b	109/111 (98%)	105 (96%)	4 (4%)	0	100	100
1	c	109/111 (98%)	106 (97%)	3 (3%)	0	100	100
1	d	109/111 (98%)	106 (97%)	3 (3%)	0	100	100
1	e	109/111 (98%)	106 (97%)	3 (3%)	0	100	100
All	All	3379/3441 (98%)	3258 (96%)	121 (4%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	88/88 (100%)	88 (100%)	0	100	100
1	B	88/88 (100%)	88 (100%)	0	100	100
1	C	88/88 (100%)	88 (100%)	0	100	100
1	D	88/88 (100%)	88 (100%)	0	100	100
1	E	88/88 (100%)	88 (100%)	0	100	100
1	F	88/88 (100%)	88 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	G	88/88 (100%)	88 (100%)	0	100	100
1	H	88/88 (100%)	88 (100%)	0	100	100
1	I	88/88 (100%)	88 (100%)	0	100	100
1	J	88/88 (100%)	88 (100%)	0	100	100
1	K	88/88 (100%)	88 (100%)	0	100	100
1	L	88/88 (100%)	88 (100%)	0	100	100
1	M	88/88 (100%)	88 (100%)	0	100	100
1	N	88/88 (100%)	88 (100%)	0	100	100
1	O	88/88 (100%)	88 (100%)	0	100	100
1	P	88/88 (100%)	88 (100%)	0	100	100
1	Q	88/88 (100%)	88 (100%)	0	100	100
1	R	88/88 (100%)	88 (100%)	0	100	100
1	S	88/88 (100%)	88 (100%)	0	100	100
1	T	88/88 (100%)	88 (100%)	0	100	100
1	U	88/88 (100%)	88 (100%)	0	100	100
1	V	88/88 (100%)	88 (100%)	0	100	100
1	W	88/88 (100%)	88 (100%)	0	100	100
1	X	88/88 (100%)	88 (100%)	0	100	100
1	Y	88/88 (100%)	88 (100%)	0	100	100
1	Z	88/88 (100%)	88 (100%)	0	100	100
1	a	88/88 (100%)	88 (100%)	0	100	100
1	b	88/88 (100%)	88 (100%)	0	100	100
1	c	88/88 (100%)	88 (100%)	0	100	100
1	d	88/88 (100%)	88 (100%)	0	100	100
1	e	88/88 (100%)	88 (100%)	0	100	100
All	All	2728/2728 (100%)	2728 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 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](#)

124 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	A2G	0	1	2,1	14,14,15	0.50	0	17,19,21	1.40	3 (17%)
2	A2G	0	2	2	14,14,15	0.50	0	17,19,21	1.53	3 (17%)
2	MAN	0	3	2	11,11,12	0.78	0	15,15,17	1.32	2 (13%)
2	WT8	0	4	2	20,22,23	0.85	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	1	1	2,1	14,14,15	0.51	0	17,19,21	1.41	3 (17%)
2	A2G	1	2	2	14,14,15	0.49	0	17,19,21	1.54	3 (17%)
2	MAN	1	3	2	11,11,12	0.77	0	15,15,17	1.32	2 (13%)
2	WT8	1	4	2	20,22,23	0.86	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	2	1	2,1	14,14,15	0.50	0	17,19,21	1.40	3 (17%)
2	A2G	2	2	2	14,14,15	0.49	0	17,19,21	1.54	3 (17%)
2	MAN	2	3	2	11,11,12	0.78	0	15,15,17	1.31	2 (13%)
2	WT8	2	4	2	20,22,23	0.85	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	3	1	2,1	14,14,15	0.50	0	17,19,21	1.41	3 (17%)
2	A2G	3	2	2	14,14,15	0.49	0	17,19,21	1.54	3 (17%)
2	MAN	3	3	2	11,11,12	0.79	0	15,15,17	1.32	2 (13%)
2	WT8	3	4	2	20,22,23	0.85	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	4	1	2,1	14,14,15	0.52	0	17,19,21	1.41	3 (17%)
2	A2G	4	2	2	14,14,15	0.49	0	17,19,21	1.54	3 (17%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	MAN	4	3	2	11,11,12	0.78	0	15,15,17	1.31	2 (13%)
2	WT8	4	4	2	20,22,23	0.85	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	5	1	2,1	14,14,15	0.52	0	17,19,21	1.41	3 (17%)
2	A2G	5	2	2	14,14,15	0.49	0	17,19,21	1.52	3 (17%)
2	MAN	5	3	2	11,11,12	0.77	0	15,15,17	1.32	2 (13%)
2	WT8	5	4	2	20,22,23	0.86	2 (10%)	21,31,34	0.94	1 (4%)
2	A2G	6	1	2,1	14,14,15	0.51	0	17,19,21	1.42	3 (17%)
2	A2G	6	2	2	14,14,15	0.49	0	17,19,21	1.54	3 (17%)
2	MAN	6	3	2	11,11,12	0.78	0	15,15,17	1.32	2 (13%)
2	WT8	6	4	2	20,22,23	0.84	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	7	1	2,1	14,14,15	0.51	0	17,19,21	1.41	3 (17%)
2	A2G	7	2	2	14,14,15	0.49	0	17,19,21	1.53	3 (17%)
2	MAN	7	3	2	11,11,12	0.78	0	15,15,17	1.33	2 (13%)
2	WT8	7	4	2	20,22,23	0.86	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	8	1	2,1	14,14,15	0.52	0	17,19,21	1.42	3 (17%)
2	A2G	8	2	2	14,14,15	0.50	0	17,19,21	1.53	3 (17%)
2	MAN	8	3	2	11,11,12	0.78	0	15,15,17	1.34	2 (13%)
2	WT8	8	4	2	20,22,23	0.86	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	9	1	2,1	14,14,15	0.50	0	17,19,21	1.41	3 (17%)
2	A2G	9	2	2	14,14,15	0.47	0	17,19,21	1.53	3 (17%)
2	MAN	9	3	2	11,11,12	0.78	0	15,15,17	1.32	2 (13%)
2	WT8	9	4	2	20,22,23	0.86	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	f	1	2,1	14,14,15	0.50	0	17,19,21	1.41	3 (17%)
2	A2G	f	2	2	14,14,15	0.48	0	17,19,21	1.53	3 (17%)
2	MAN	f	3	2	11,11,12	0.78	0	15,15,17	1.33	2 (13%)
2	WT8	f	4	2	20,22,23	0.86	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	g	1	2,1	14,14,15	0.50	0	17,19,21	1.42	3 (17%)
2	A2G	g	2	2	14,14,15	0.48	0	17,19,21	1.52	3 (17%)
2	MAN	g	3	2	11,11,12	0.78	0	15,15,17	1.32	2 (13%)
2	WT8	g	4	2	20,22,23	0.87	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	h	1	2,1	14,14,15	0.51	0	17,19,21	1.42	3 (17%)
2	A2G	h	2	2	14,14,15	0.50	0	17,19,21	1.54	3 (17%)
2	MAN	h	3	2	11,11,12	0.78	0	15,15,17	1.33	2 (13%)
2	WT8	h	4	2	20,22,23	0.86	2 (10%)	21,31,34	0.94	1 (4%)
2	A2G	i	1	2,1	14,14,15	0.51	0	17,19,21	1.41	3 (17%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	A2G	i	2	2	14,14,15	0.49	0	17,19,21	1.51	3 (17%)
2	MAN	i	3	2	11,11,12	0.77	0	15,15,17	1.32	2 (13%)
2	WT8	i	4	2	20,22,23	0.84	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	j	1	2,1	14,14,15	0.52	0	17,19,21	1.41	3 (17%)
2	A2G	j	2	2	14,14,15	0.51	0	17,19,21	1.54	3 (17%)
2	MAN	j	3	2	11,11,12	0.78	0	15,15,17	1.33	2 (13%)
2	WT8	j	4	2	20,22,23	0.86	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	k	1	2,1	14,14,15	0.52	0	17,19,21	1.40	3 (17%)
2	A2G	k	2	2	14,14,15	0.49	0	17,19,21	1.53	3 (17%)
2	MAN	k	3	2	11,11,12	0.78	0	15,15,17	1.32	2 (13%)
2	WT8	k	4	2	20,22,23	0.87	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	l	1	2,1	14,14,15	0.51	0	17,19,21	1.41	3 (17%)
2	A2G	l	2	2	14,14,15	0.49	0	17,19,21	1.54	3 (17%)
2	MAN	l	3	2	11,11,12	0.77	0	15,15,17	1.33	2 (13%)
2	WT8	l	4	2	20,22,23	0.86	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	m	1	2,1	14,14,15	0.51	0	17,19,21	1.41	3 (17%)
2	A2G	m	2	2	14,14,15	0.49	0	17,19,21	1.53	3 (17%)
2	MAN	m	3	2	11,11,12	0.79	0	15,15,17	1.32	2 (13%)
2	WT8	m	4	2	20,22,23	0.86	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	n	1	2,1	14,14,15	0.51	0	17,19,21	1.41	3 (17%)
2	A2G	n	2	2	14,14,15	0.49	0	17,19,21	1.54	3 (17%)
2	MAN	n	3	2	11,11,12	0.78	0	15,15,17	1.32	2 (13%)
2	WT8	n	4	2	20,22,23	0.85	2 (10%)	21,31,34	0.94	1 (4%)
2	A2G	o	1	2,1	14,14,15	0.51	0	17,19,21	1.41	3 (17%)
2	A2G	o	2	2	14,14,15	0.49	0	17,19,21	1.53	3 (17%)
2	MAN	o	3	2	11,11,12	0.79	0	15,15,17	1.31	2 (13%)
2	WT8	o	4	2	20,22,23	0.83	2 (10%)	21,31,34	0.94	1 (4%)
2	A2G	p	1	2,1	14,14,15	0.51	0	17,19,21	1.40	3 (17%)
2	A2G	p	2	2	14,14,15	0.49	0	17,19,21	1.53	3 (17%)
2	MAN	p	3	2	11,11,12	0.79	0	15,15,17	1.32	2 (13%)
2	WT8	p	4	2	20,22,23	0.85	2 (10%)	21,31,34	0.94	1 (4%)
2	A2G	q	1	2,1	14,14,15	0.50	0	17,19,21	1.41	3 (17%)
2	A2G	q	2	2	14,14,15	0.49	0	17,19,21	1.54	3 (17%)
2	MAN	q	3	2	11,11,12	0.77	0	15,15,17	1.33	2 (13%)
2	WT8	q	4	2	20,22,23	0.87	2 (10%)	21,31,34	0.93	1 (4%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	A2G	r	1	2,1	14,14,15	0.51	0	17,19,21	1.41	3 (17%)
2	A2G	r	2	2	14,14,15	0.50	0	17,19,21	1.54	3 (17%)
2	MAN	r	3	2	11,11,12	0.78	0	15,15,17	1.32	2 (13%)
2	WT8	r	4	2	20,22,23	0.86	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	s	1	2,1	14,14,15	0.50	0	17,19,21	1.41	3 (17%)
2	A2G	s	2	2	14,14,15	0.48	0	17,19,21	1.53	3 (17%)
2	MAN	s	3	2	11,11,12	0.77	0	15,15,17	1.33	2 (13%)
2	WT8	s	4	2	20,22,23	0.87	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	t	1	2,1	14,14,15	0.50	0	17,19,21	1.41	3 (17%)
2	A2G	t	2	2	14,14,15	0.50	0	17,19,21	1.54	3 (17%)
2	MAN	t	3	2	11,11,12	0.79	0	15,15,17	1.32	2 (13%)
2	WT8	t	4	2	20,22,23	0.86	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	u	1	2,1	14,14,15	0.50	0	17,19,21	1.40	3 (17%)
2	A2G	u	2	2	14,14,15	0.49	0	17,19,21	1.53	3 (17%)
2	MAN	u	3	2	11,11,12	0.78	0	15,15,17	1.33	2 (13%)
2	WT8	u	4	2	20,22,23	0.85	2 (10%)	21,31,34	0.92	1 (4%)
2	A2G	v	1	2,1	14,14,15	0.50	0	17,19,21	1.42	3 (17%)
2	A2G	v	2	2	14,14,15	0.50	0	17,19,21	1.54	3 (17%)
2	MAN	v	3	2	11,11,12	0.78	0	15,15,17	1.33	2 (13%)
2	WT8	v	4	2	20,22,23	0.85	2 (10%)	21,31,34	0.94	1 (4%)
2	A2G	w	1	2,1	14,14,15	0.51	0	17,19,21	1.40	3 (17%)
2	A2G	w	2	2	14,14,15	0.48	0	17,19,21	1.52	3 (17%)
2	MAN	w	3	2	11,11,12	0.78	0	15,15,17	1.33	2 (13%)
2	WT8	w	4	2	20,22,23	0.86	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	x	1	2,1	14,14,15	0.52	0	17,19,21	1.40	3 (17%)
2	A2G	x	2	2	14,14,15	0.49	0	17,19,21	1.54	3 (17%)
2	MAN	x	3	2	11,11,12	0.77	0	15,15,17	1.33	2 (13%)
2	WT8	x	4	2	20,22,23	0.87	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	y	1	2,1	14,14,15	0.51	0	17,19,21	1.39	3 (17%)
2	A2G	y	2	2	14,14,15	0.50	0	17,19,21	1.53	3 (17%)
2	MAN	y	3	2	11,11,12	0.79	0	15,15,17	1.33	2 (13%)
2	WT8	y	4	2	20,22,23	0.86	2 (10%)	21,31,34	0.93	1 (4%)
2	A2G	z	1	2,1	14,14,15	0.52	0	17,19,21	1.41	3 (17%)
2	A2G	z	2	2	14,14,15	0.49	0	17,19,21	1.54	3 (17%)
2	MAN	z	3	2	11,11,12	0.78	0	15,15,17	1.33	2 (13%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	WT8	z	4	2	20,22,23	0.85	2 (10%)	21,31,34	0.93	1 (4%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	A2G	0	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	0	2	2	-	4/6/23/26	0/1/1/1
2	MAN	0	3	2	-	2/2/19/22	0/1/1/1
2	WT8	0	4	2	-	1/20/36/40	0/1/1/1
2	A2G	1	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	1	2	2	-	4/6/23/26	0/1/1/1
2	MAN	1	3	2	-	2/2/19/22	0/1/1/1
2	WT8	1	4	2	-	1/20/36/40	0/1/1/1
2	A2G	2	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	2	2	2	-	4/6/23/26	0/1/1/1
2	MAN	2	3	2	-	2/2/19/22	0/1/1/1
2	WT8	2	4	2	-	1/20/36/40	0/1/1/1
2	A2G	3	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	3	2	2	-	4/6/23/26	0/1/1/1
2	MAN	3	3	2	-	2/2/19/22	0/1/1/1
2	WT8	3	4	2	-	1/20/36/40	0/1/1/1
2	A2G	4	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	4	2	2	-	4/6/23/26	0/1/1/1
2	MAN	4	3	2	-	2/2/19/22	0/1/1/1
2	WT8	4	4	2	-	1/20/36/40	0/1/1/1
2	A2G	5	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	5	2	2	-	4/6/23/26	0/1/1/1
2	MAN	5	3	2	-	2/2/19/22	0/1/1/1
2	WT8	5	4	2	-	1/20/36/40	0/1/1/1
2	A2G	6	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	6	2	2	-	4/6/23/26	0/1/1/1
2	MAN	6	3	2	-	2/2/19/22	0/1/1/1
2	WT8	6	4	2	-	1/20/36/40	0/1/1/1
2	A2G	7	1	2,1	-	5/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	A2G	7	2	2	-	4/6/23/26	0/1/1/1
2	MAN	7	3	2	-	2/2/19/22	0/1/1/1
2	WT8	7	4	2	-	1/20/36/40	0/1/1/1
2	A2G	8	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	8	2	2	-	4/6/23/26	0/1/1/1
2	MAN	8	3	2	-	2/2/19/22	0/1/1/1
2	WT8	8	4	2	-	1/20/36/40	0/1/1/1
2	A2G	9	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	9	2	2	-	4/6/23/26	0/1/1/1
2	MAN	9	3	2	-	2/2/19/22	0/1/1/1
2	WT8	9	4	2	-	1/20/36/40	0/1/1/1
2	A2G	f	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	f	2	2	-	4/6/23/26	0/1/1/1
2	MAN	f	3	2	-	2/2/19/22	0/1/1/1
2	WT8	f	4	2	-	1/20/36/40	0/1/1/1
2	A2G	g	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	g	2	2	-	4/6/23/26	0/1/1/1
2	MAN	g	3	2	-	2/2/19/22	0/1/1/1
2	WT8	g	4	2	-	1/20/36/40	0/1/1/1
2	A2G	h	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	h	2	2	-	4/6/23/26	0/1/1/1
2	MAN	h	3	2	-	2/2/19/22	0/1/1/1
2	WT8	h	4	2	-	1/20/36/40	0/1/1/1
2	A2G	i	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	i	2	2	-	4/6/23/26	0/1/1/1
2	MAN	i	3	2	-	2/2/19/22	0/1/1/1
2	WT8	i	4	2	-	1/20/36/40	0/1/1/1
2	A2G	j	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	j	2	2	-	4/6/23/26	0/1/1/1
2	MAN	j	3	2	-	2/2/19/22	0/1/1/1
2	WT8	j	4	2	-	1/20/36/40	0/1/1/1
2	A2G	k	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	k	2	2	-	4/6/23/26	0/1/1/1
2	MAN	k	3	2	-	2/2/19/22	0/1/1/1
2	WT8	k	4	2	-	1/20/36/40	0/1/1/1
2	A2G	l	1	2,1	-	5/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	A2G	l	2	2	-	4/6/23/26	0/1/1/1
2	MAN	l	3	2	-	2/2/19/22	0/1/1/1
2	WT8	l	4	2	-	1/20/36/40	0/1/1/1
2	A2G	m	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	m	2	2	-	4/6/23/26	0/1/1/1
2	MAN	m	3	2	-	2/2/19/22	0/1/1/1
2	WT8	m	4	2	-	1/20/36/40	0/1/1/1
2	A2G	n	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	n	2	2	-	4/6/23/26	0/1/1/1
2	MAN	n	3	2	-	2/2/19/22	0/1/1/1
2	WT8	n	4	2	-	1/20/36/40	0/1/1/1
2	A2G	o	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	o	2	2	-	4/6/23/26	0/1/1/1
2	MAN	o	3	2	-	2/2/19/22	0/1/1/1
2	WT8	o	4	2	-	1/20/36/40	0/1/1/1
2	A2G	p	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	p	2	2	-	4/6/23/26	0/1/1/1
2	MAN	p	3	2	-	2/2/19/22	0/1/1/1
2	WT8	p	4	2	-	1/20/36/40	0/1/1/1
2	A2G	q	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	q	2	2	-	4/6/23/26	0/1/1/1
2	MAN	q	3	2	-	2/2/19/22	0/1/1/1
2	WT8	q	4	2	-	1/20/36/40	0/1/1/1
2	A2G	r	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	r	2	2	-	4/6/23/26	0/1/1/1
2	MAN	r	3	2	-	2/2/19/22	0/1/1/1
2	WT8	r	4	2	-	1/20/36/40	0/1/1/1
2	A2G	s	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	s	2	2	-	4/6/23/26	0/1/1/1
2	MAN	s	3	2	-	2/2/19/22	0/1/1/1
2	WT8	s	4	2	-	1/20/36/40	0/1/1/1
2	A2G	t	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	t	2	2	-	4/6/23/26	0/1/1/1
2	MAN	t	3	2	-	2/2/19/22	0/1/1/1
2	WT8	t	4	2	-	1/20/36/40	0/1/1/1
2	A2G	u	1	2,1	-	5/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	A2G	u	2	2	-	4/6/23/26	0/1/1/1
2	MAN	u	3	2	-	2/2/19/22	0/1/1/1
2	WT8	u	4	2	-	1/20/36/40	0/1/1/1
2	A2G	v	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	v	2	2	-	4/6/23/26	0/1/1/1
2	MAN	v	3	2	-	2/2/19/22	0/1/1/1
2	WT8	v	4	2	-	1/20/36/40	0/1/1/1
2	A2G	w	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	w	2	2	-	4/6/23/26	0/1/1/1
2	MAN	w	3	2	-	2/2/19/22	0/1/1/1
2	WT8	w	4	2	-	1/20/36/40	0/1/1/1
2	A2G	x	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	x	2	2	-	4/6/23/26	0/1/1/1
2	MAN	x	3	2	-	2/2/19/22	0/1/1/1
2	WT8	x	4	2	-	1/20/36/40	0/1/1/1
2	A2G	y	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	y	2	2	-	4/6/23/26	0/1/1/1
2	MAN	y	3	2	-	2/2/19/22	0/1/1/1
2	WT8	y	4	2	-	1/20/36/40	0/1/1/1
2	A2G	z	1	2,1	-	5/6/23/26	0/1/1/1
2	A2G	z	2	2	-	4/6/23/26	0/1/1/1
2	MAN	z	3	2	-	2/2/19/22	0/1/1/1
2	WT8	z	4	2	-	1/20/36/40	0/1/1/1

The worst 5 of 62 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	k	4	WT8	C1-C10	-2.37	1.50	1.52
2	x	4	WT8	C1-C10	-2.37	1.50	1.52
2	q	4	WT8	C1-C10	-2.35	1.50	1.52
2	s	4	WT8	O12-C10	-2.32	1.22	1.30
2	8	4	WT8	C1-C10	-2.31	1.50	1.52

The worst 5 of 279 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	u	2	A2G	C1-O5-C5	3.91	117.49	112.19
2	q	2	A2G	C1-O5-C5	3.91	117.49	112.19

Continued on next page...

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	2	2	A2G	C1-O5-C5	3.91	117.48	112.19
2	m	2	A2G	C1-O5-C5	3.90	117.48	112.19
2	n	2	A2G	C1-O5-C5	3.89	117.47	112.19

There are no chirality outliers.

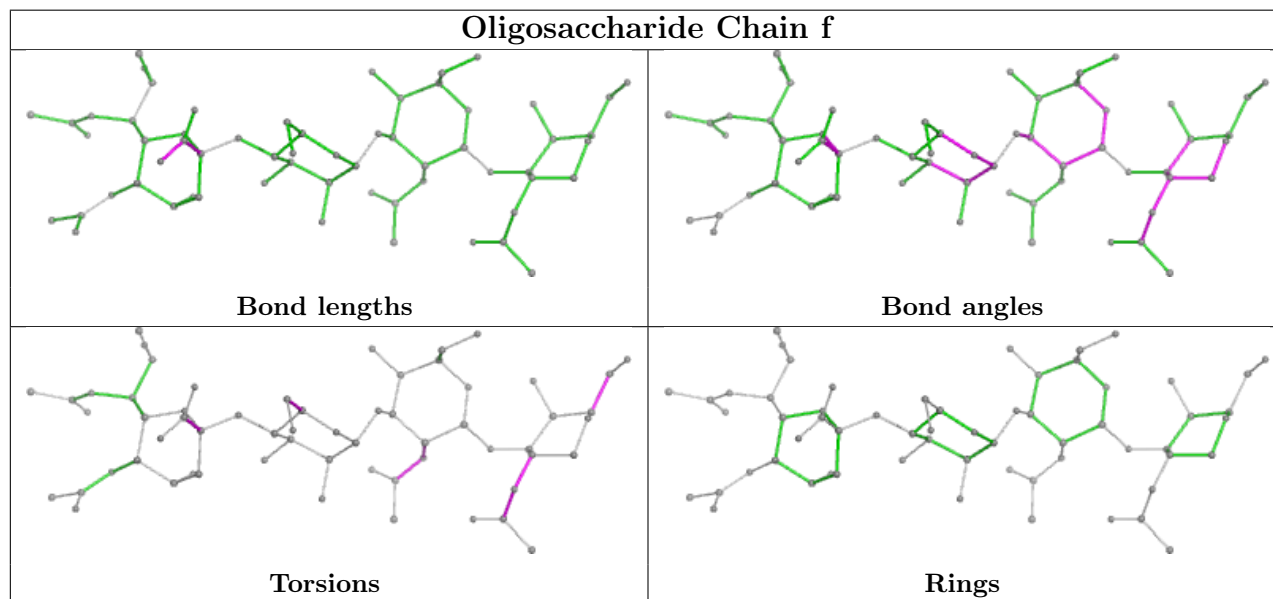
5 of 372 torsion outliers are listed below:

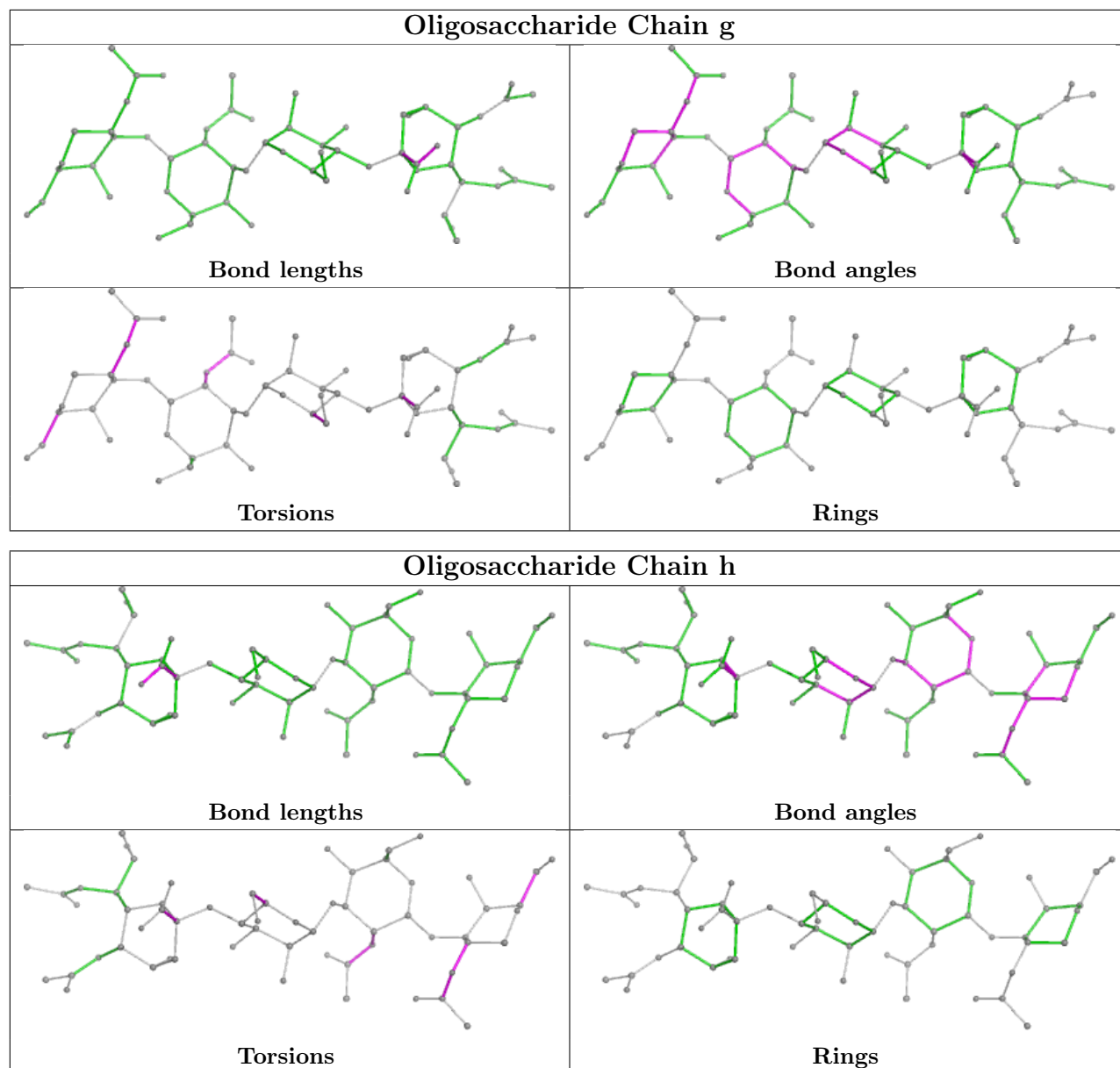
Mol	Chain	Res	Type	Atoms
2	f	1	A2G	C3-C2-N2-C7
2	f	1	A2G	O7-C7-N2-C2
2	f	1	A2G	C8-C7-N2-C2
2	f	2	A2G	O7-C7-N2-C2
2	f	2	A2G	C8-C7-N2-C2

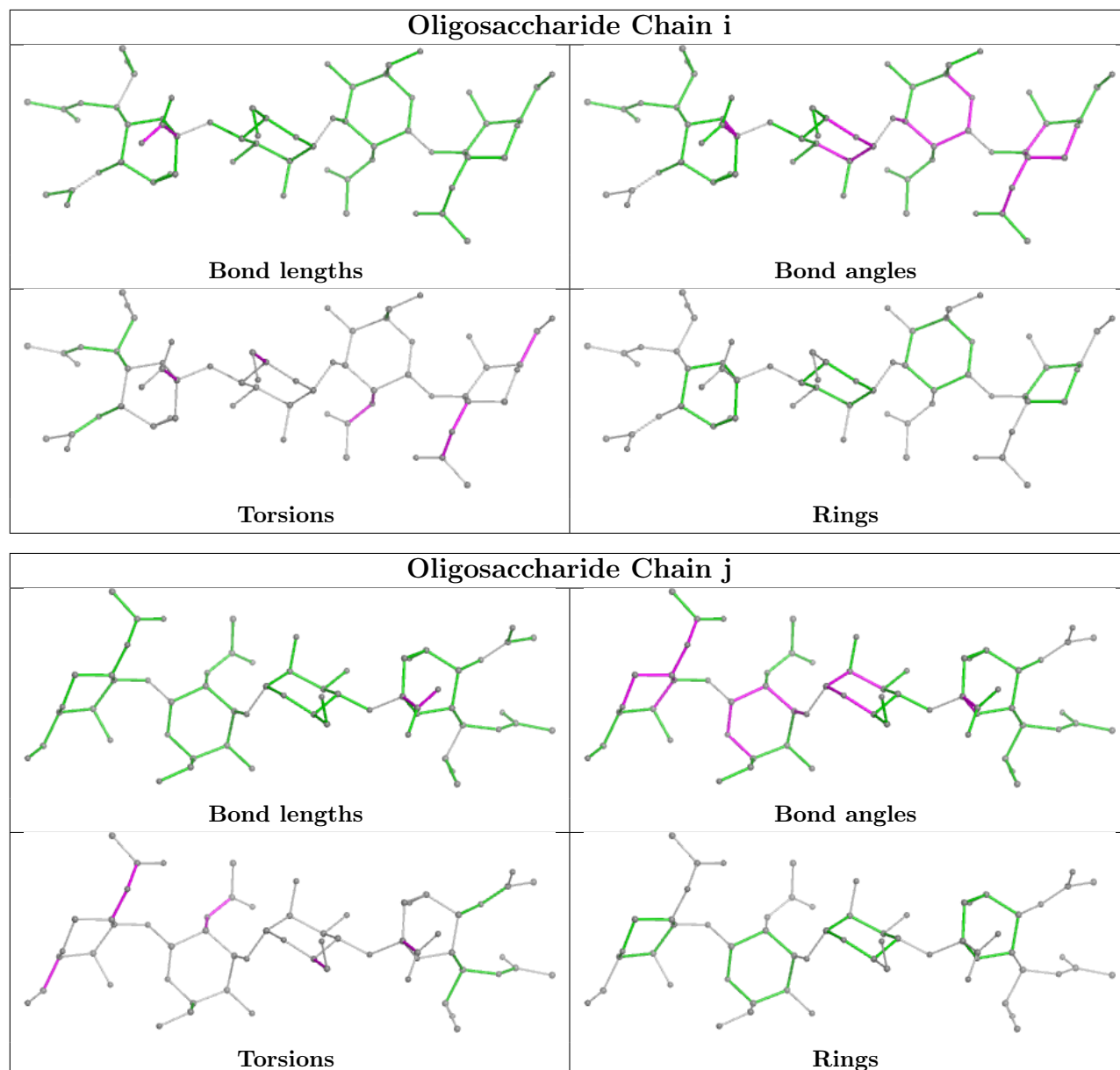
There are no ring outliers.

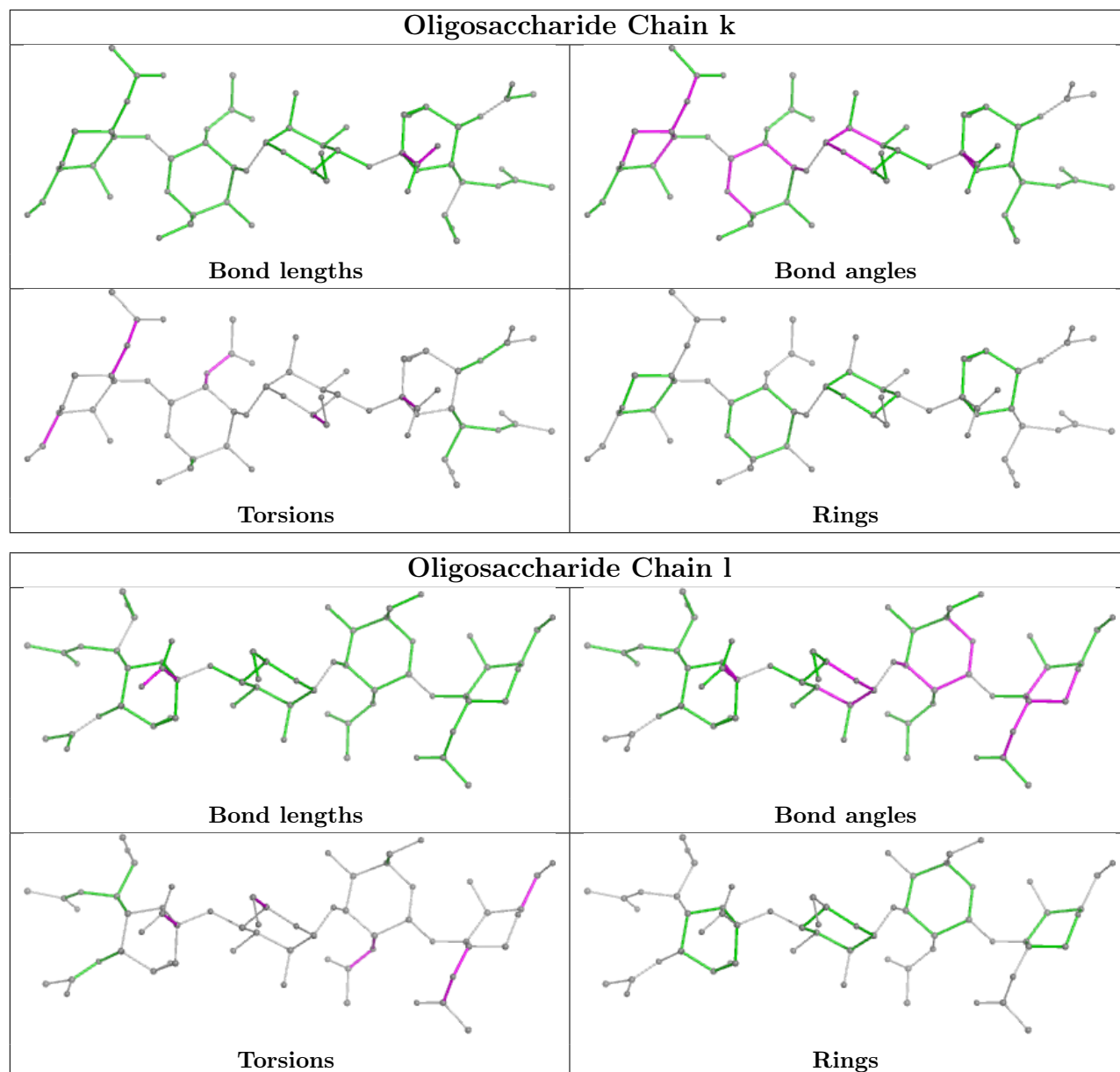
No monomer is involved in short contacts.

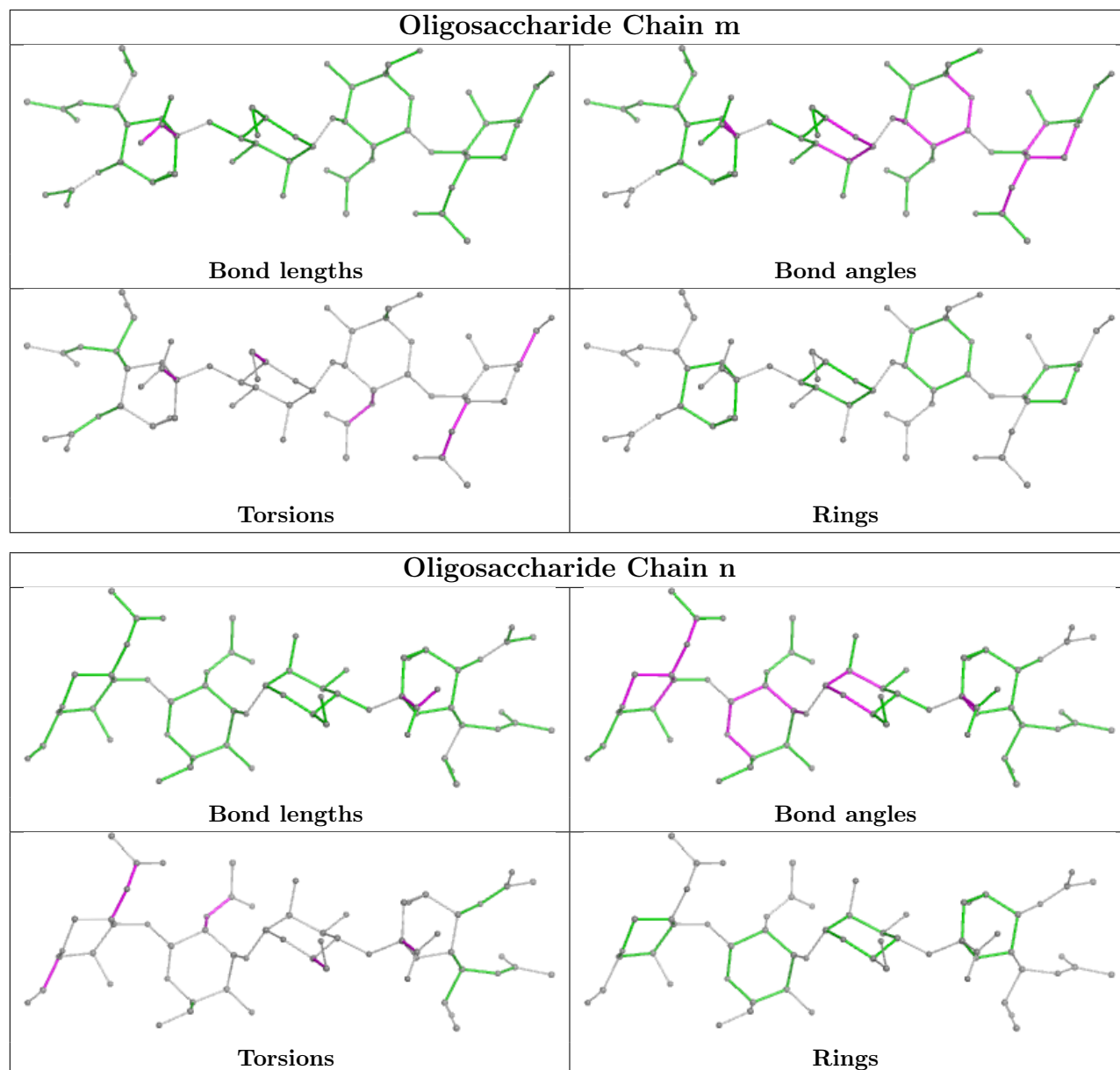
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

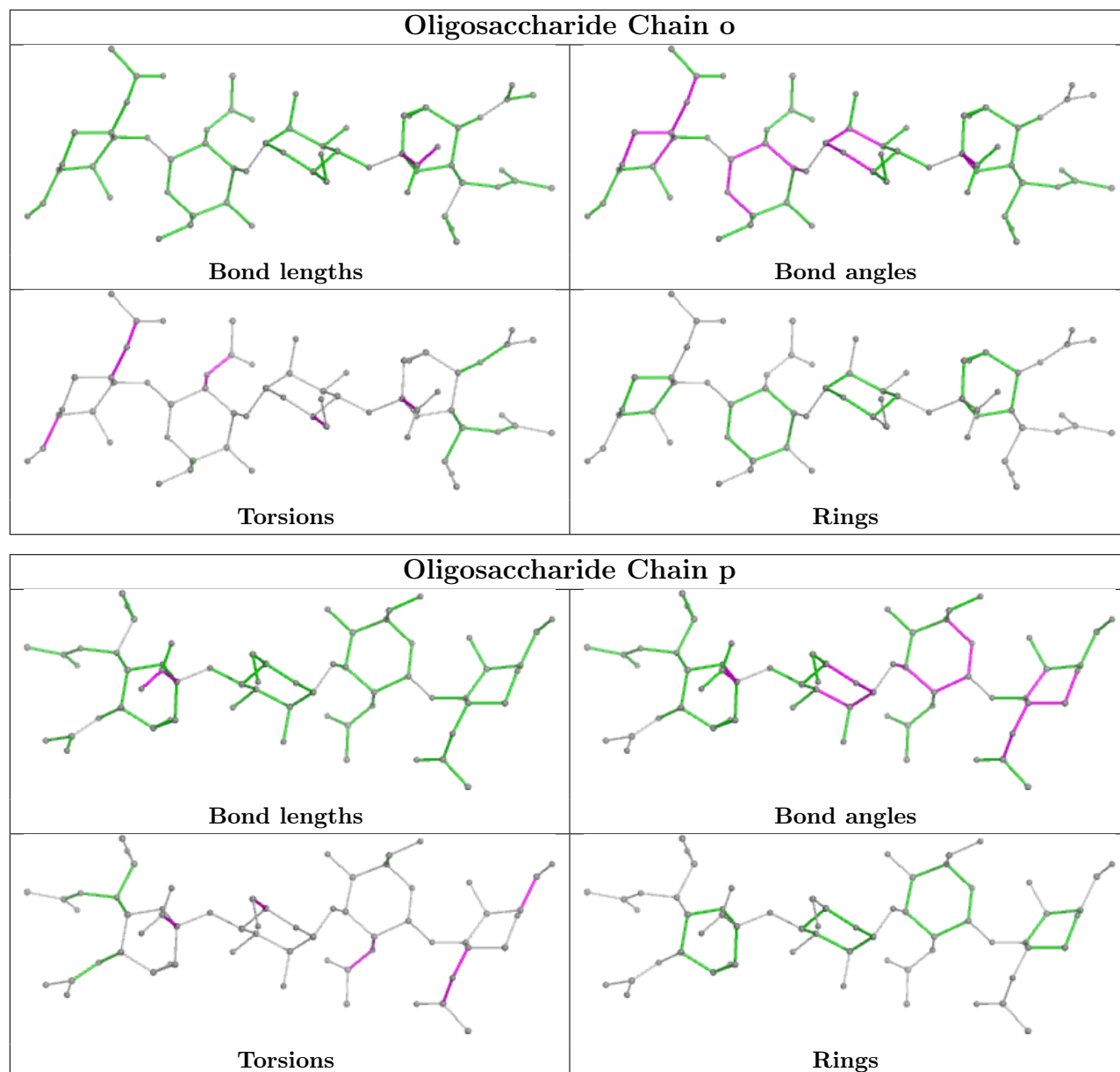




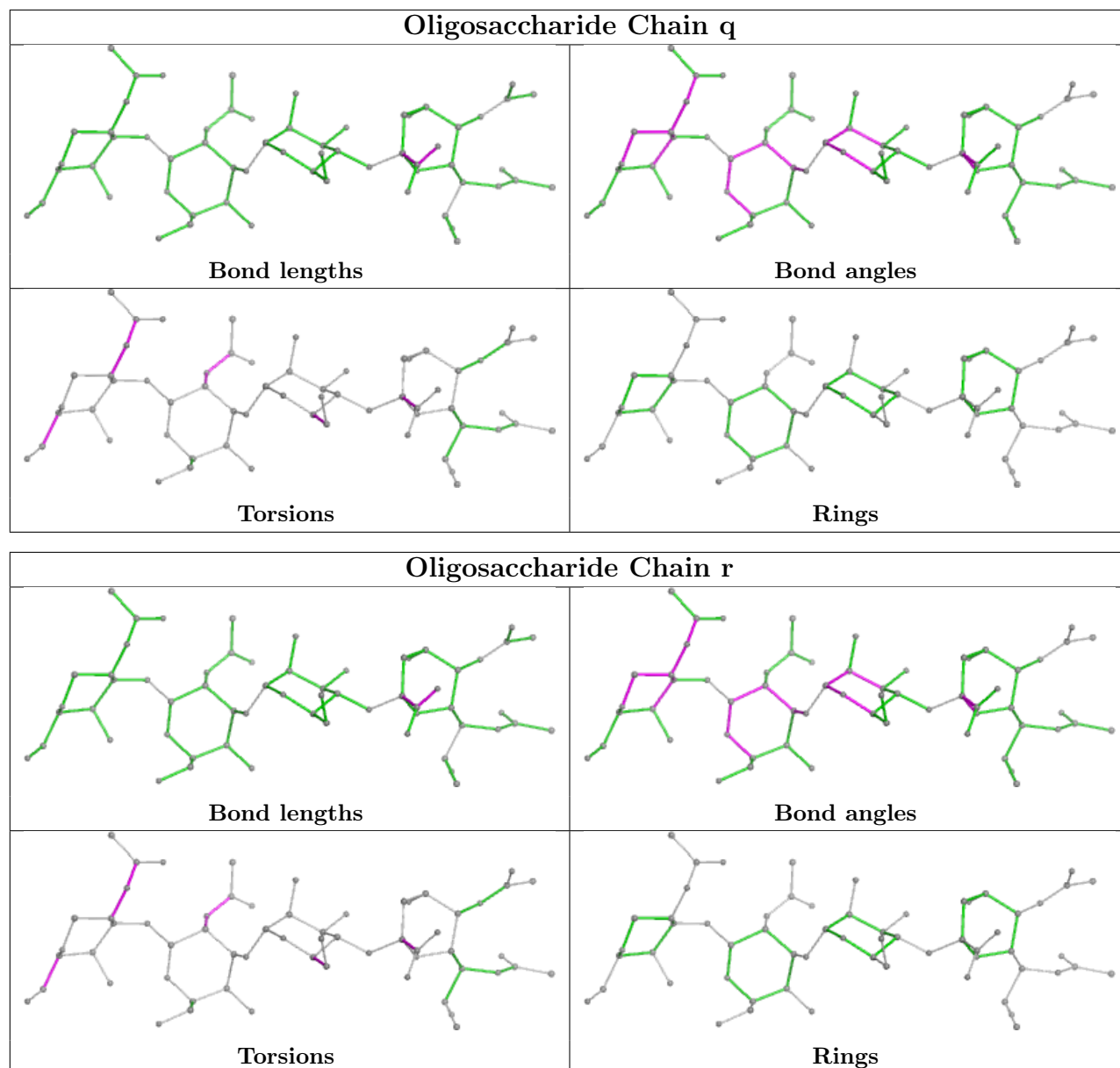


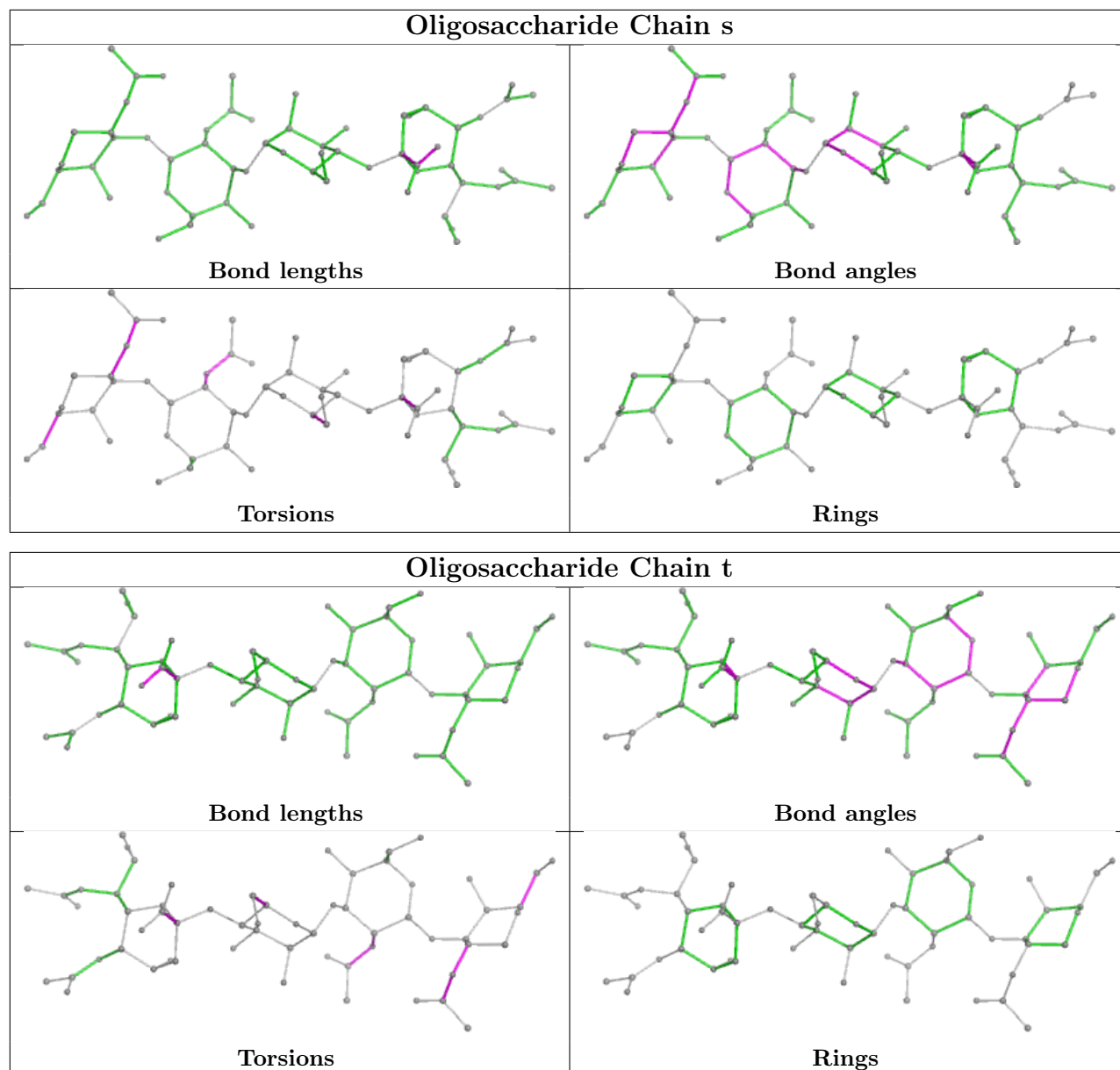


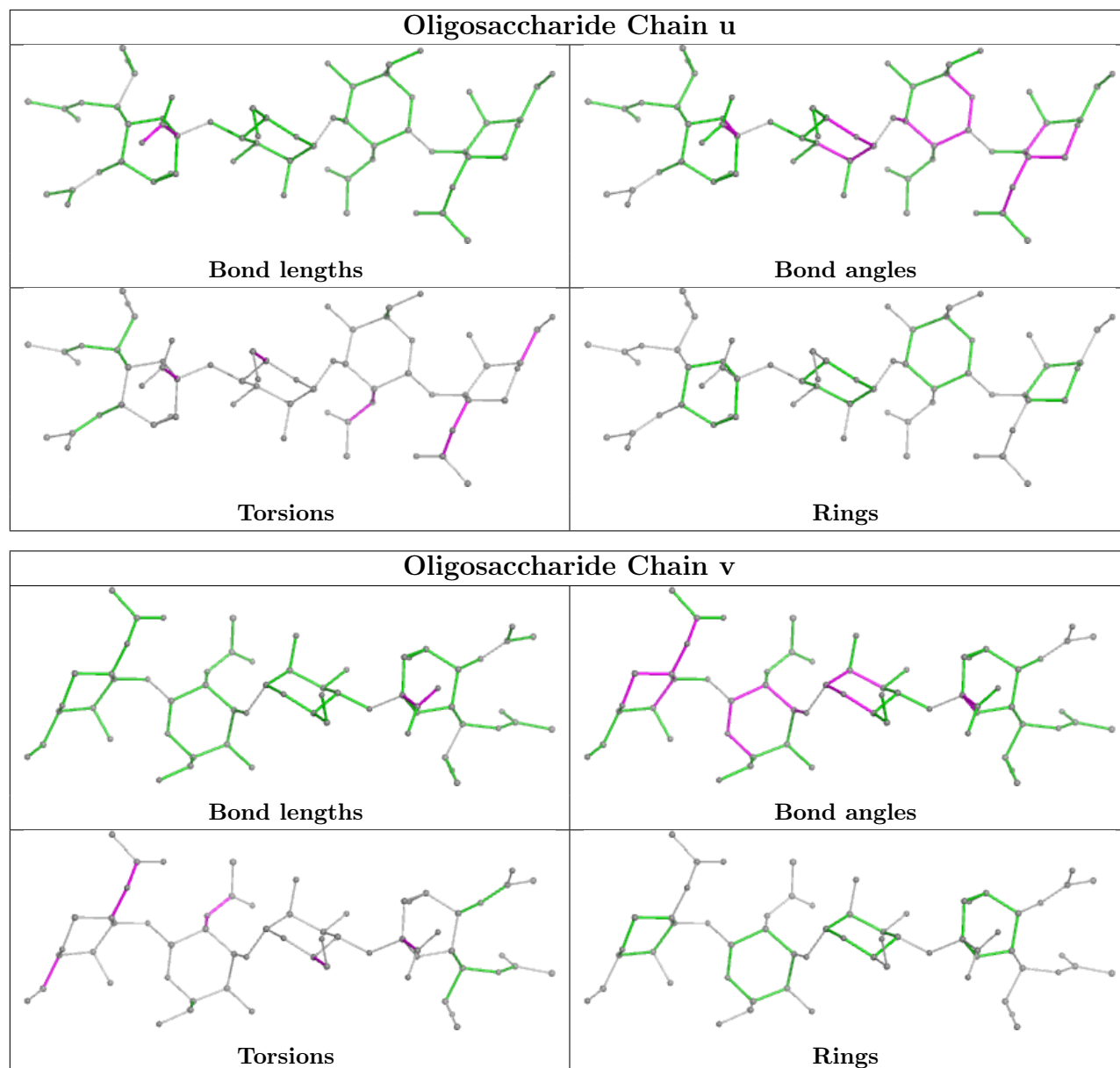


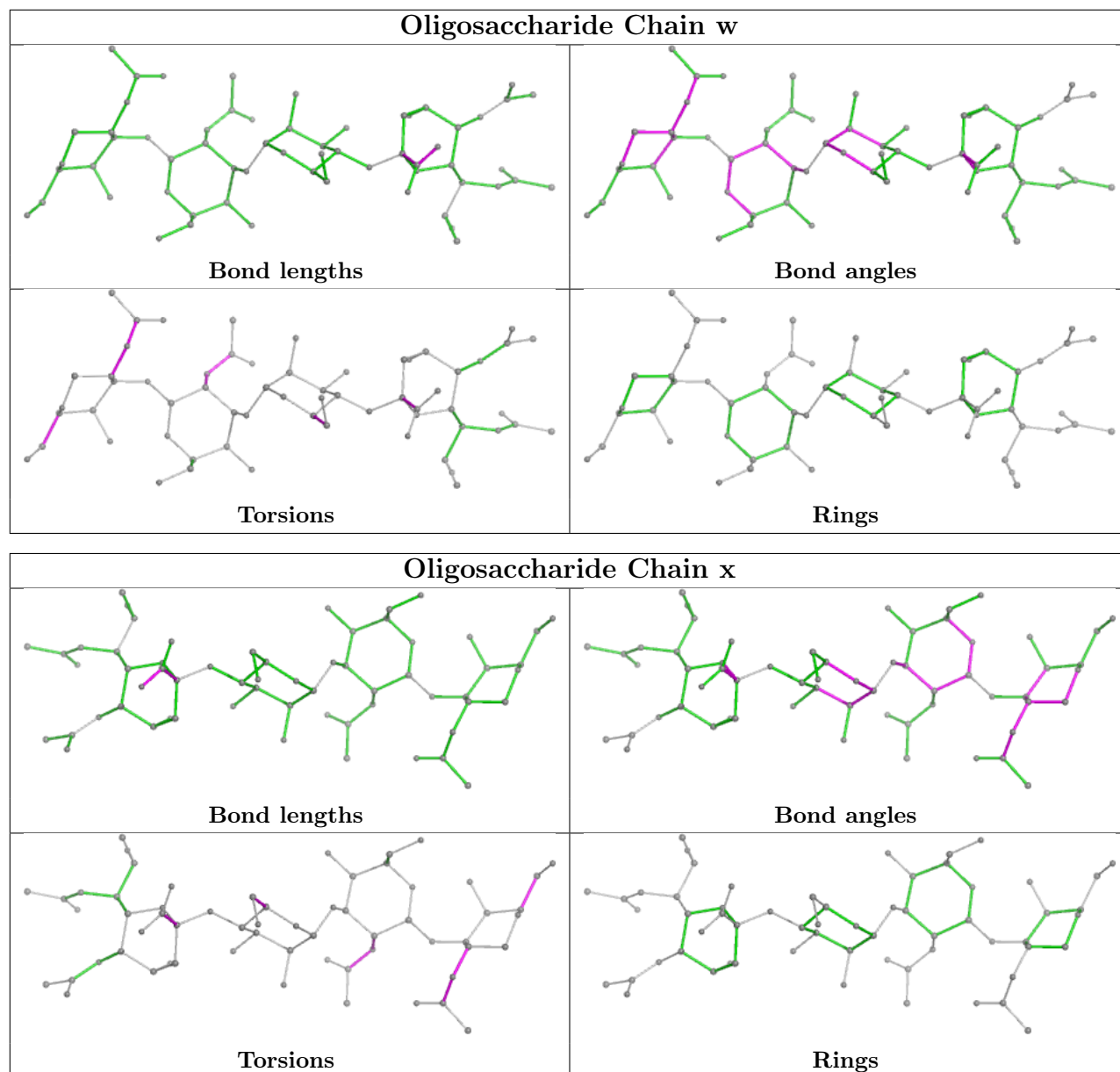


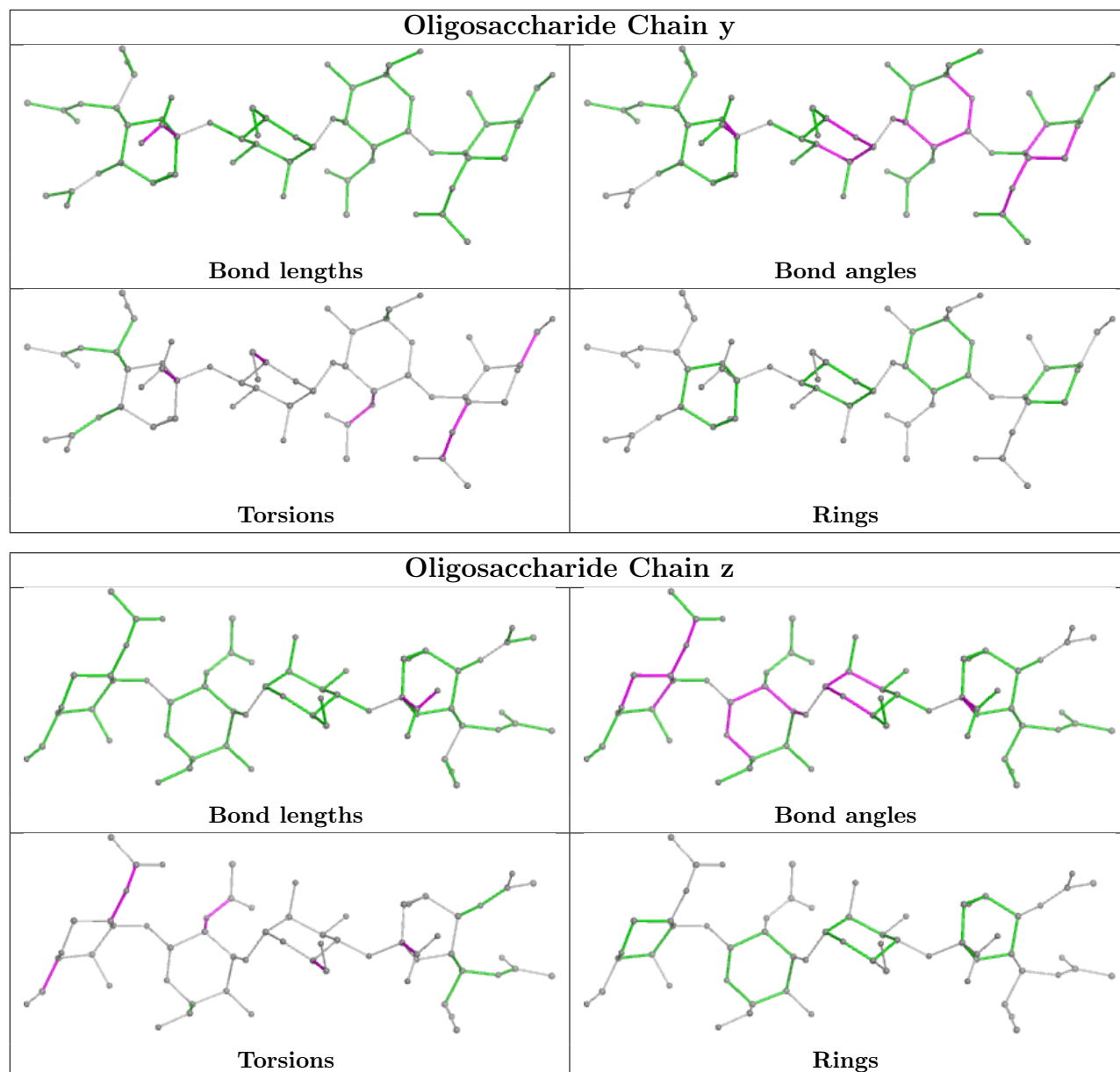


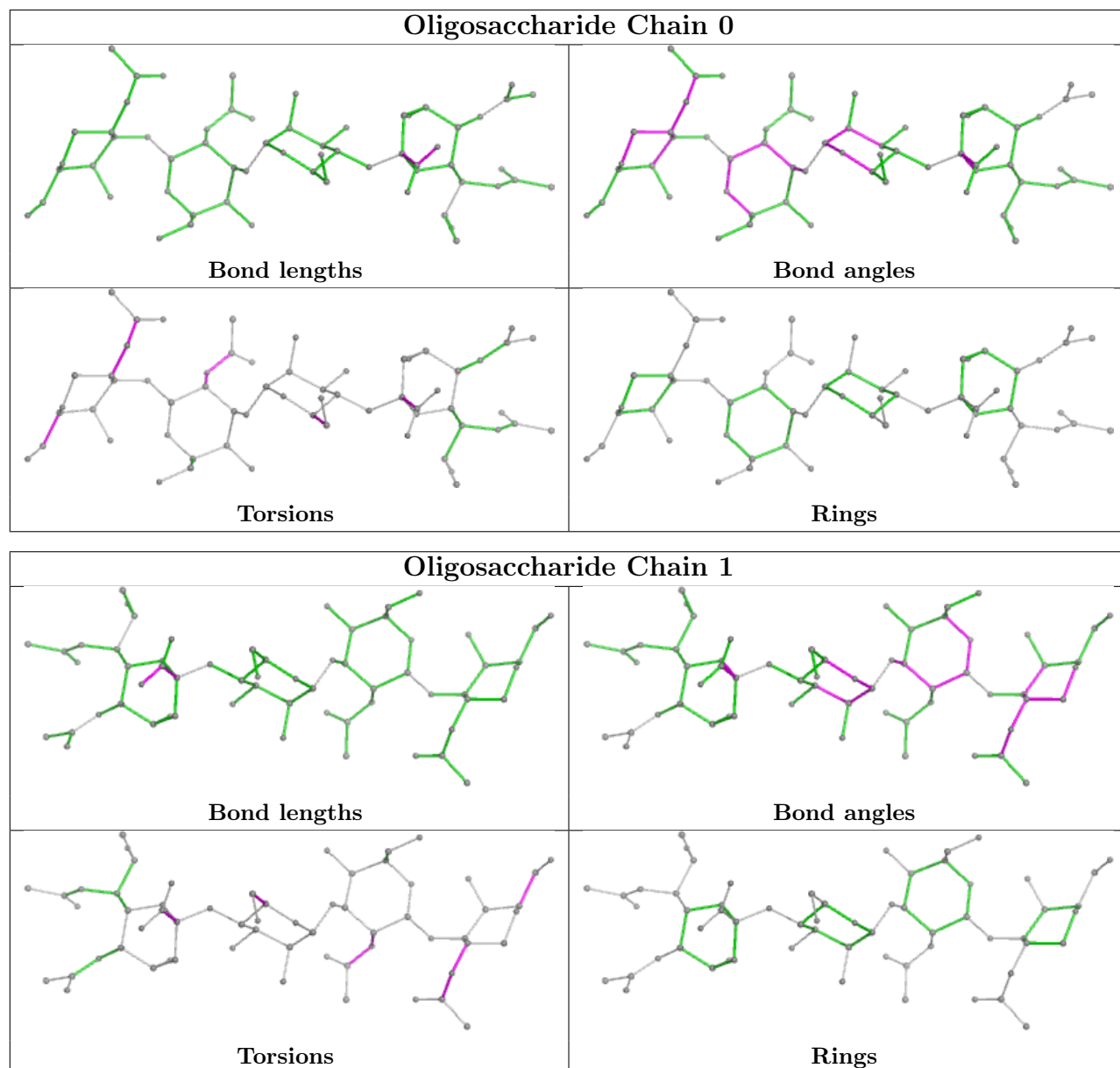


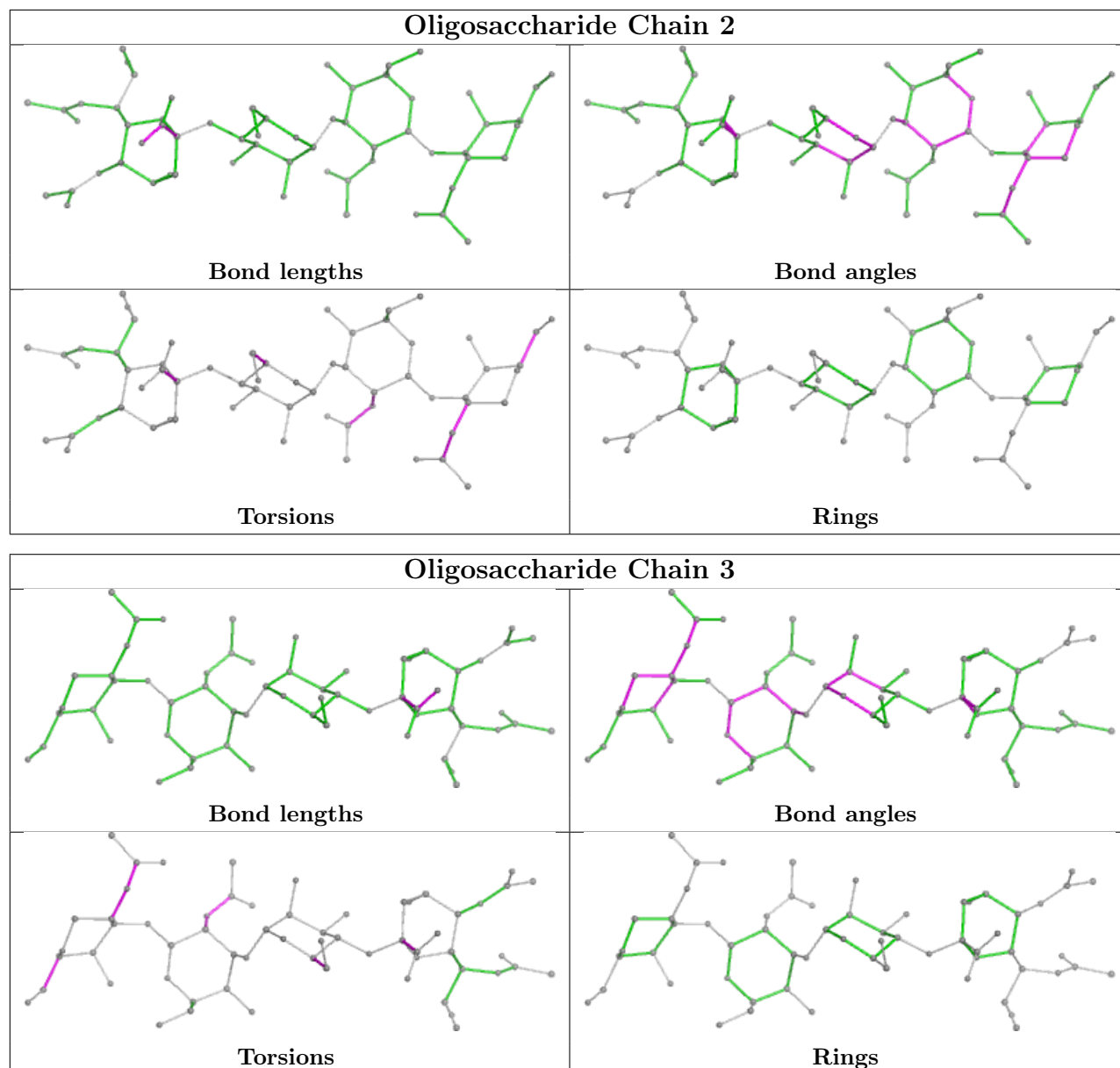


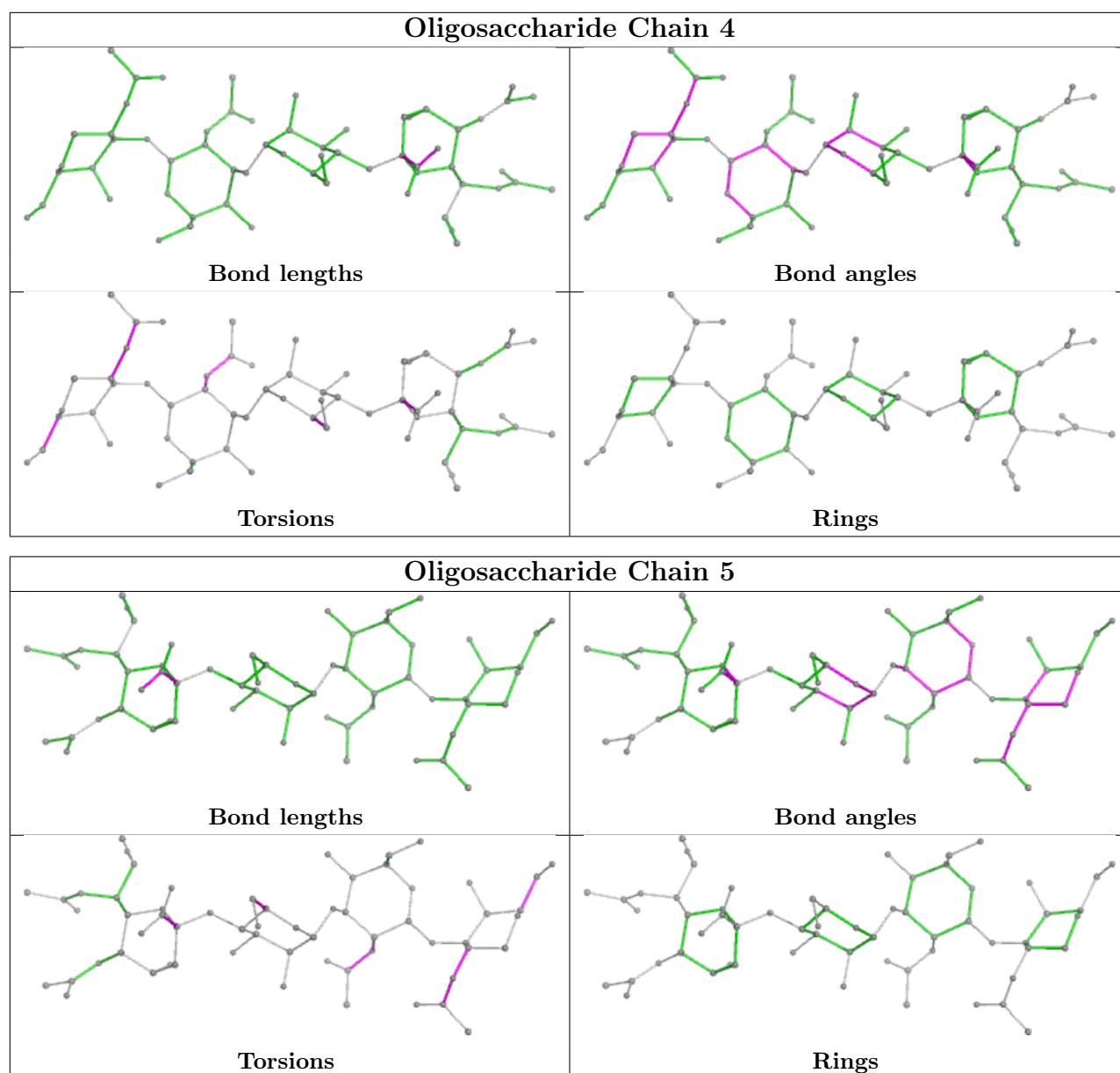




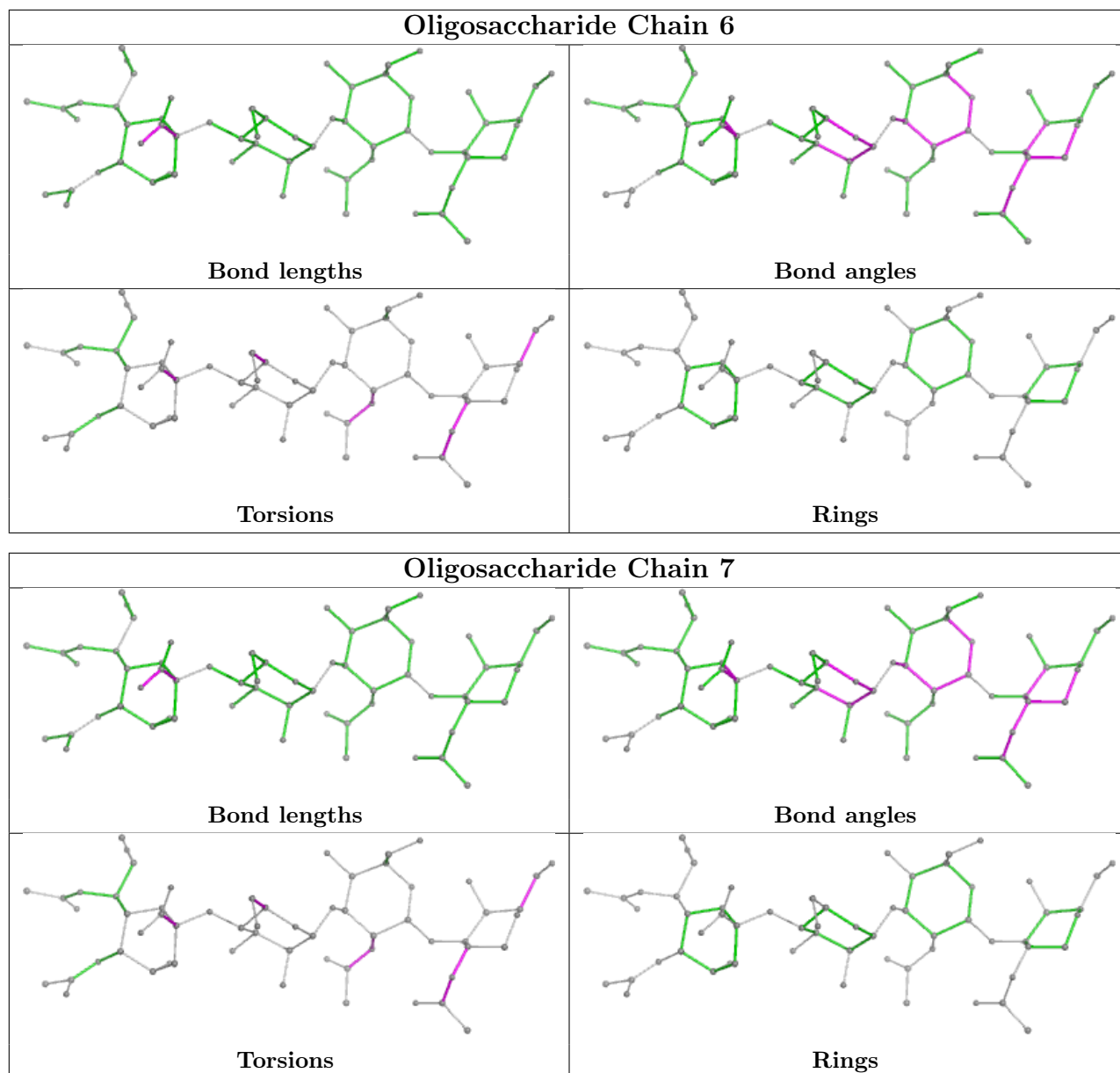


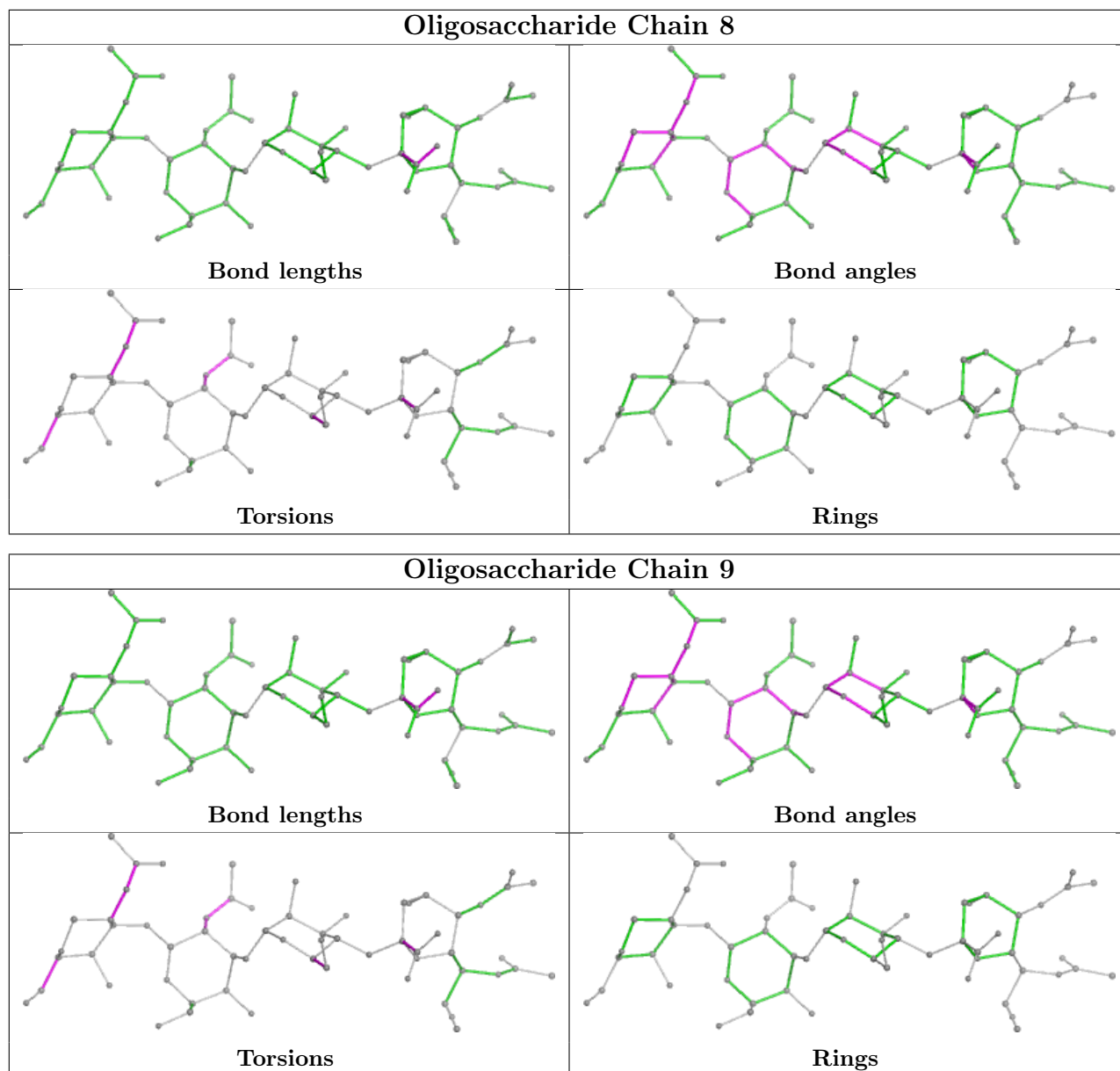












## 5.6 Ligand geometry [i](#)

Of 31 ligands modelled in this entry, 31 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

## 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.

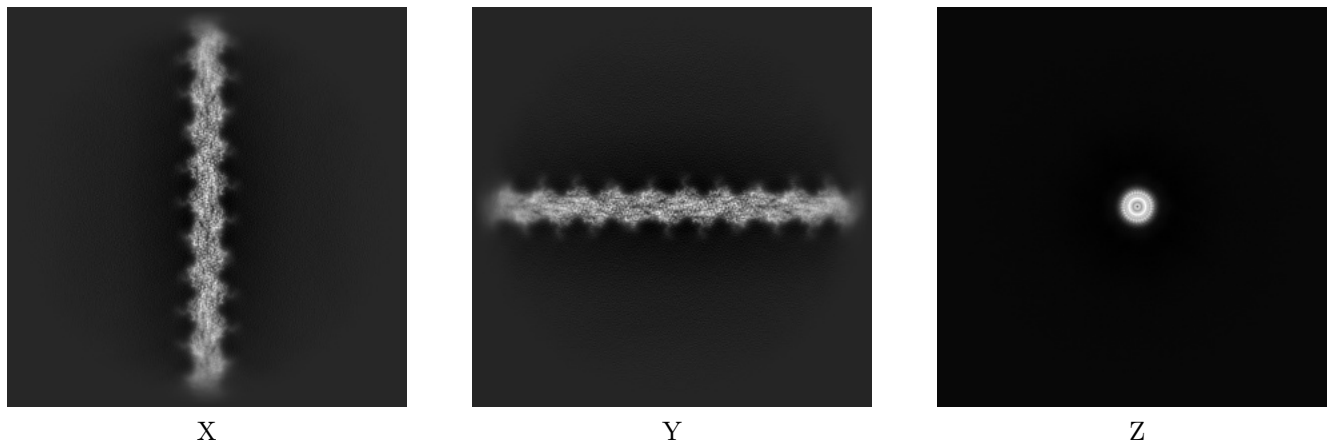
## 6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-18593. These allow visual inspection of the internal detail of the map and identification of artifacts.

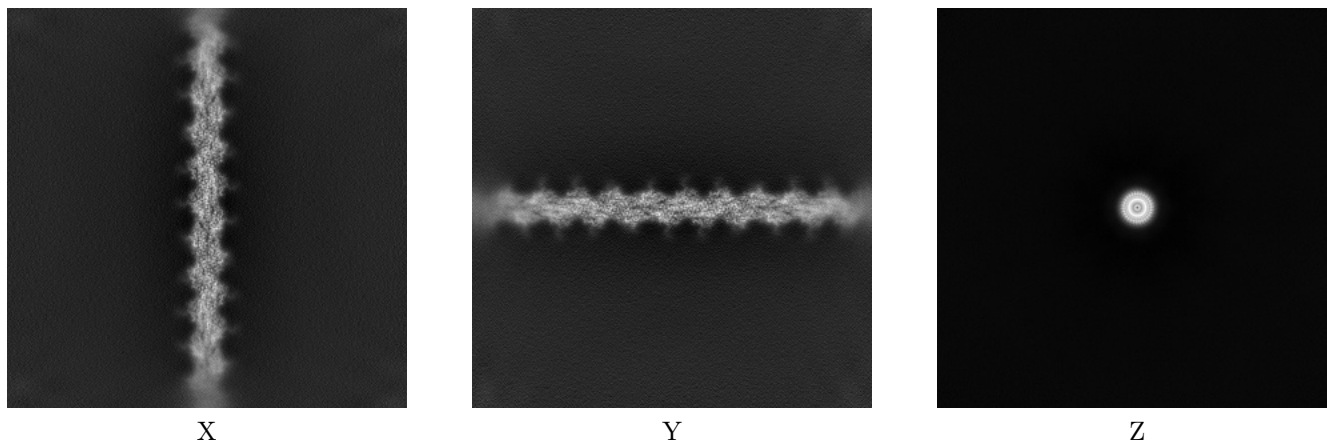
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

### 6.1 Orthogonal projections [i](#)

#### 6.1.1 Primary map



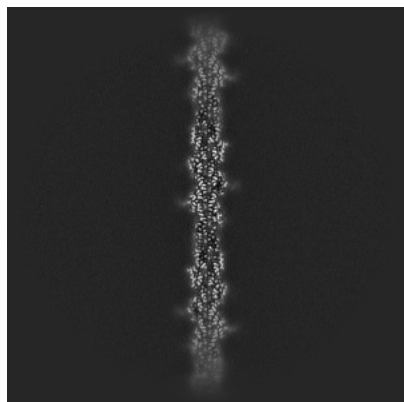
#### 6.1.2 Raw map



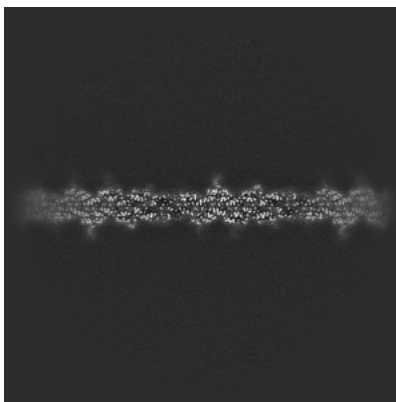
The images above show the map projected in three orthogonal directions.

## 6.2 Central slices [i](#)

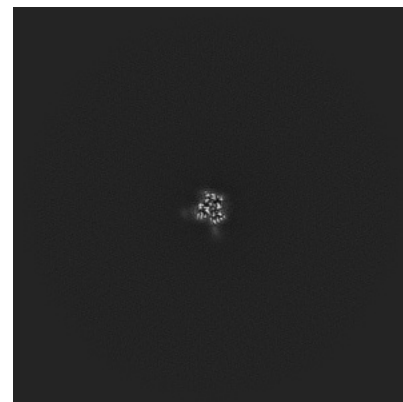
### 6.2.1 Primary map



X Index: 256

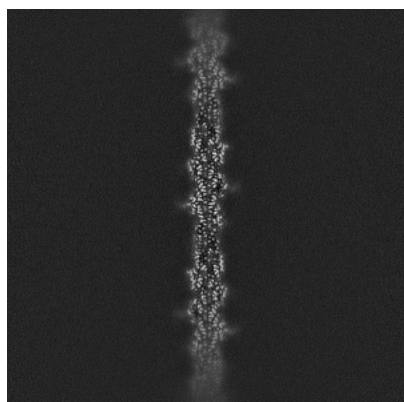


Y Index: 256

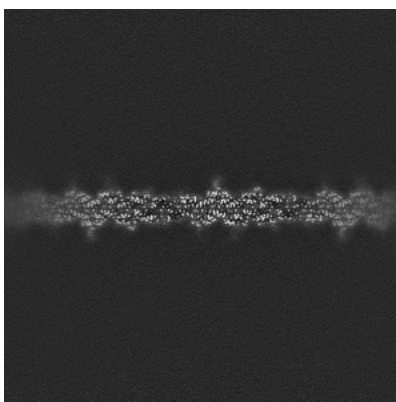


Z Index: 256

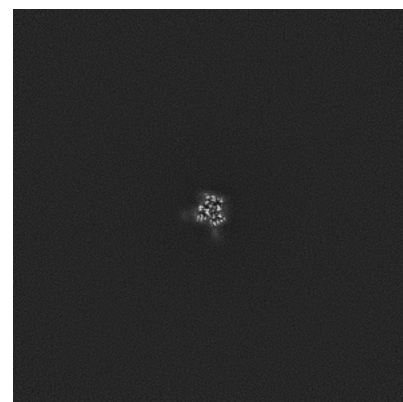
### 6.2.2 Raw map



X Index: 256



Y Index: 256

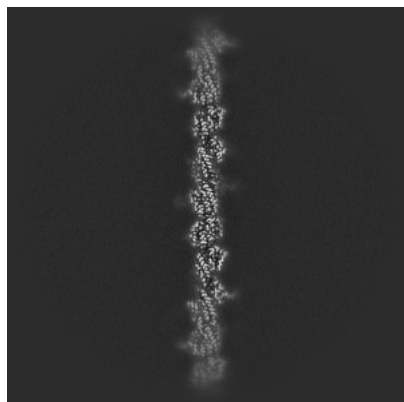


Z Index: 256

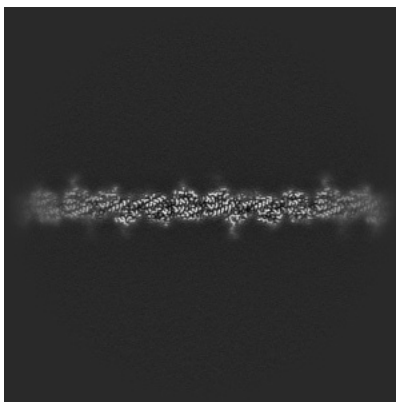
The images above show central slices of the map in three orthogonal directions.

## 6.3 Largest variance slices [i](#)

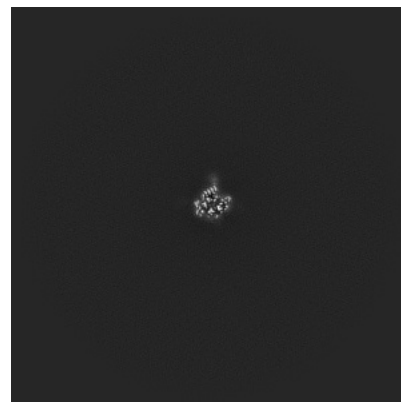
### 6.3.1 Primary map



X Index: 265

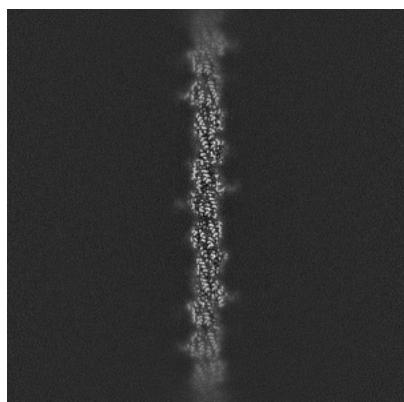


Y Index: 264

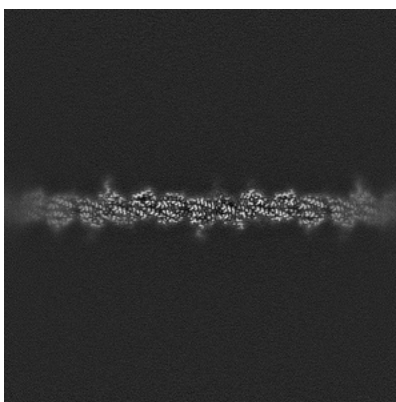


Z Index: 283

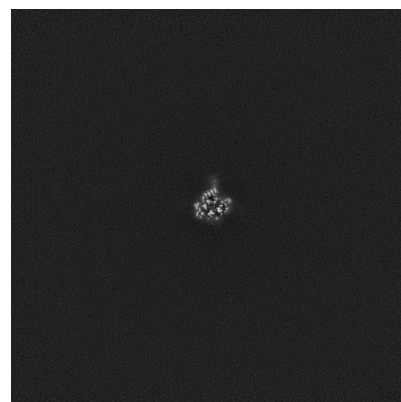
### 6.3.2 Raw map



X Index: 263



Y Index: 249

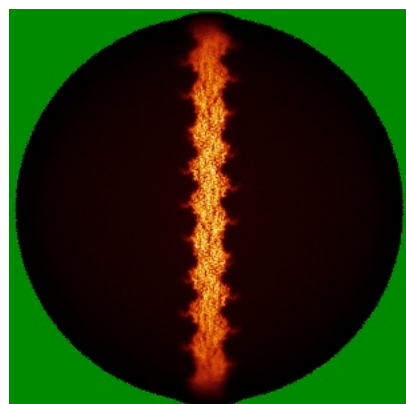


Z Index: 283

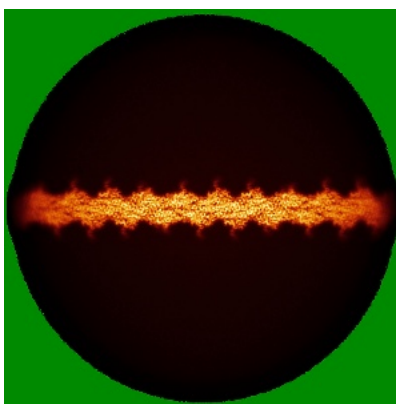
The images above show the largest variance slices of the map in three orthogonal directions.

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

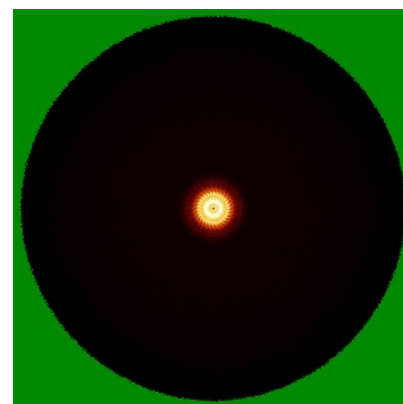
### 6.4.1 Primary map



X

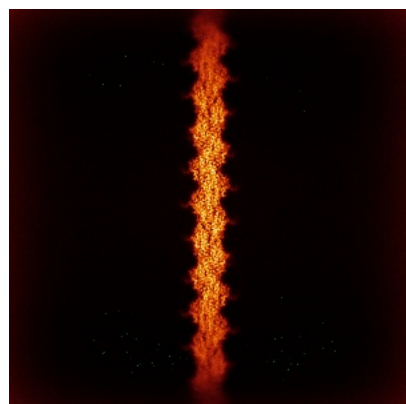


Y

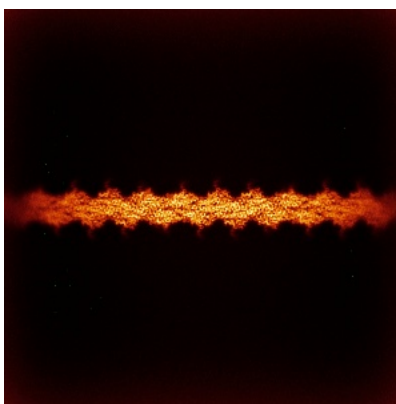


Z

### 6.4.2 Raw map



X



Y



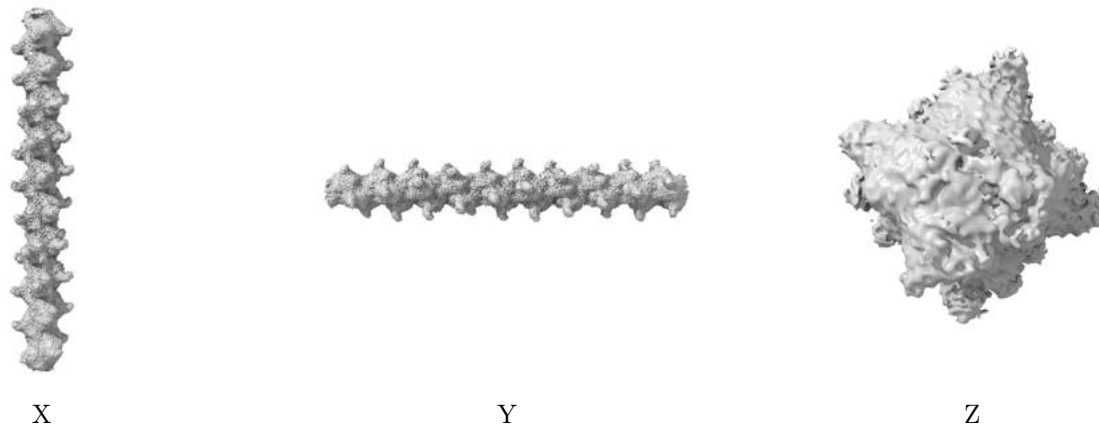
Z

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



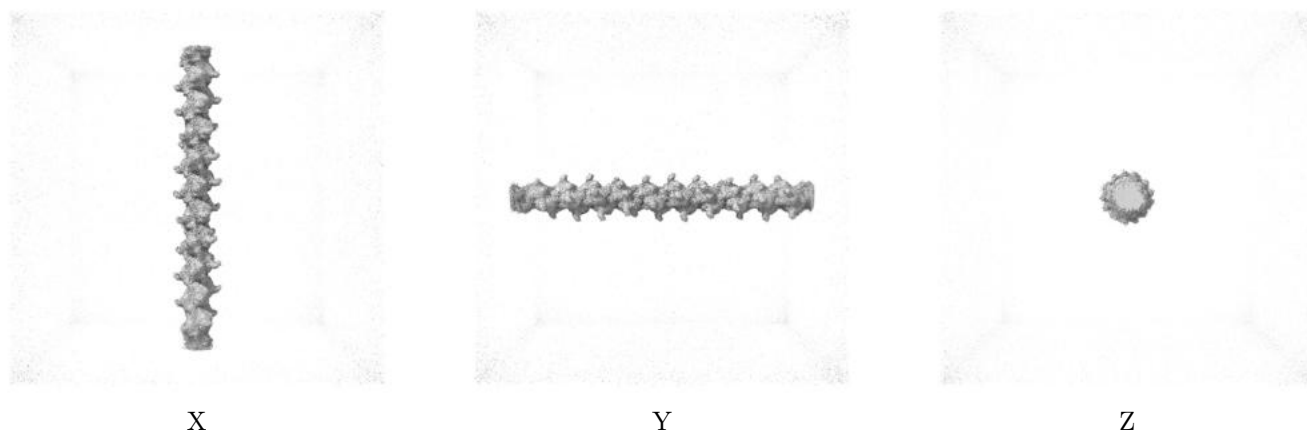
## 6.5 Orthogonal surface views [i](#)

### 6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.2. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

### 6.5.2 Raw map



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

## 6.6 Mask visualisation [i](#)

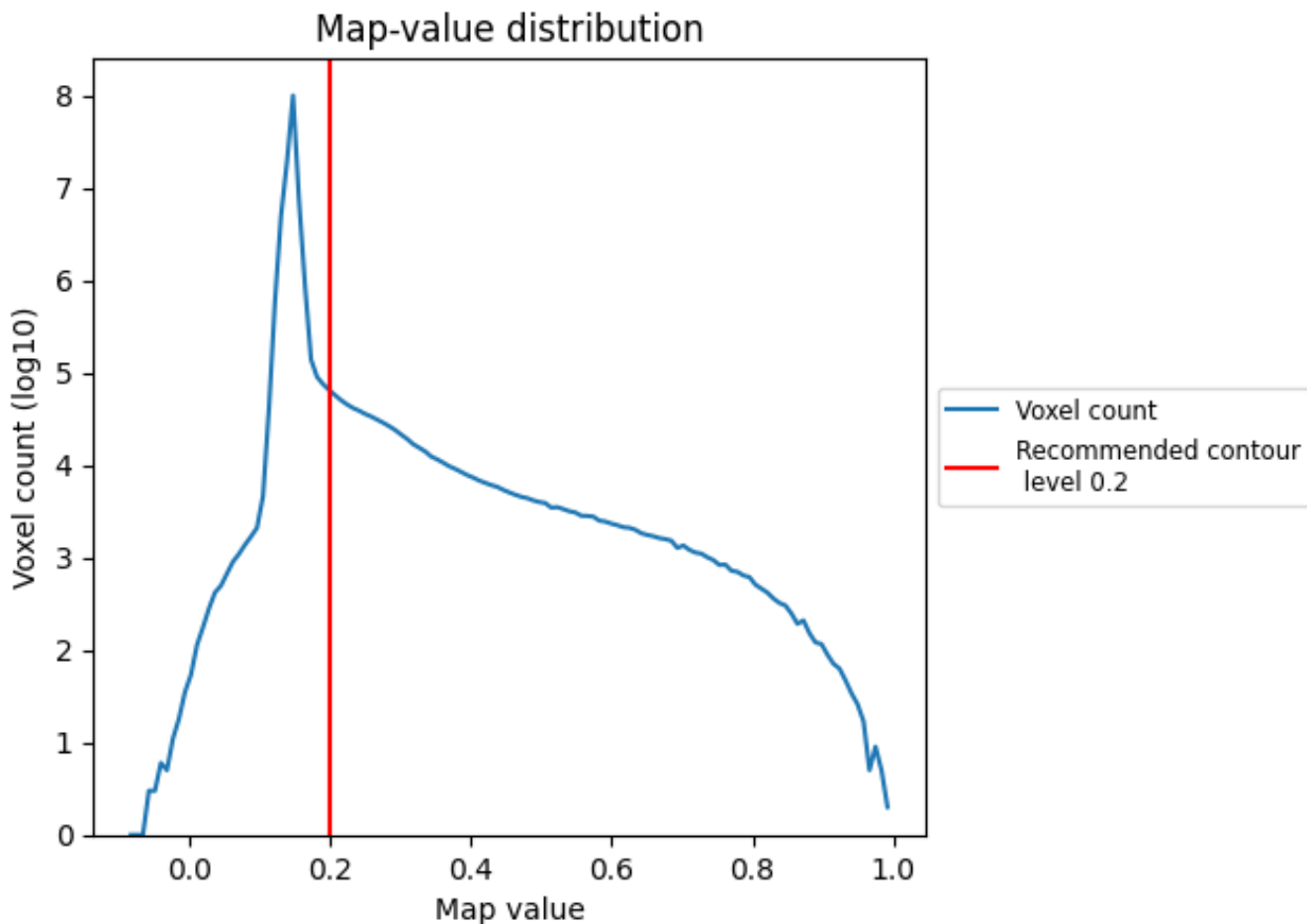
This section was not generated. No masks/segmentation were deposited.



## 7 Map analysis [i](#)

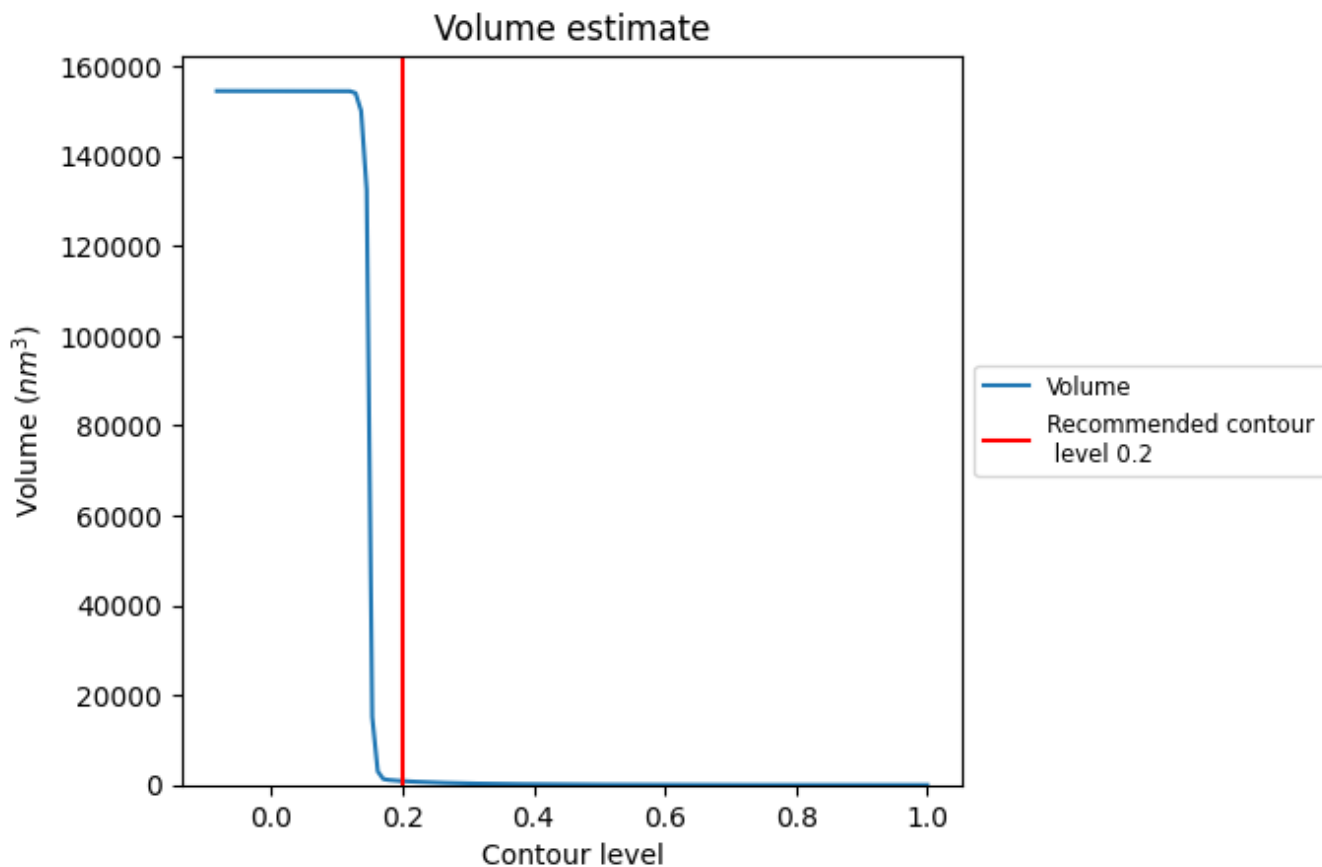
This section contains the results of statistical analysis of the map.

### 7.1 Map-value distribution [i](#)



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

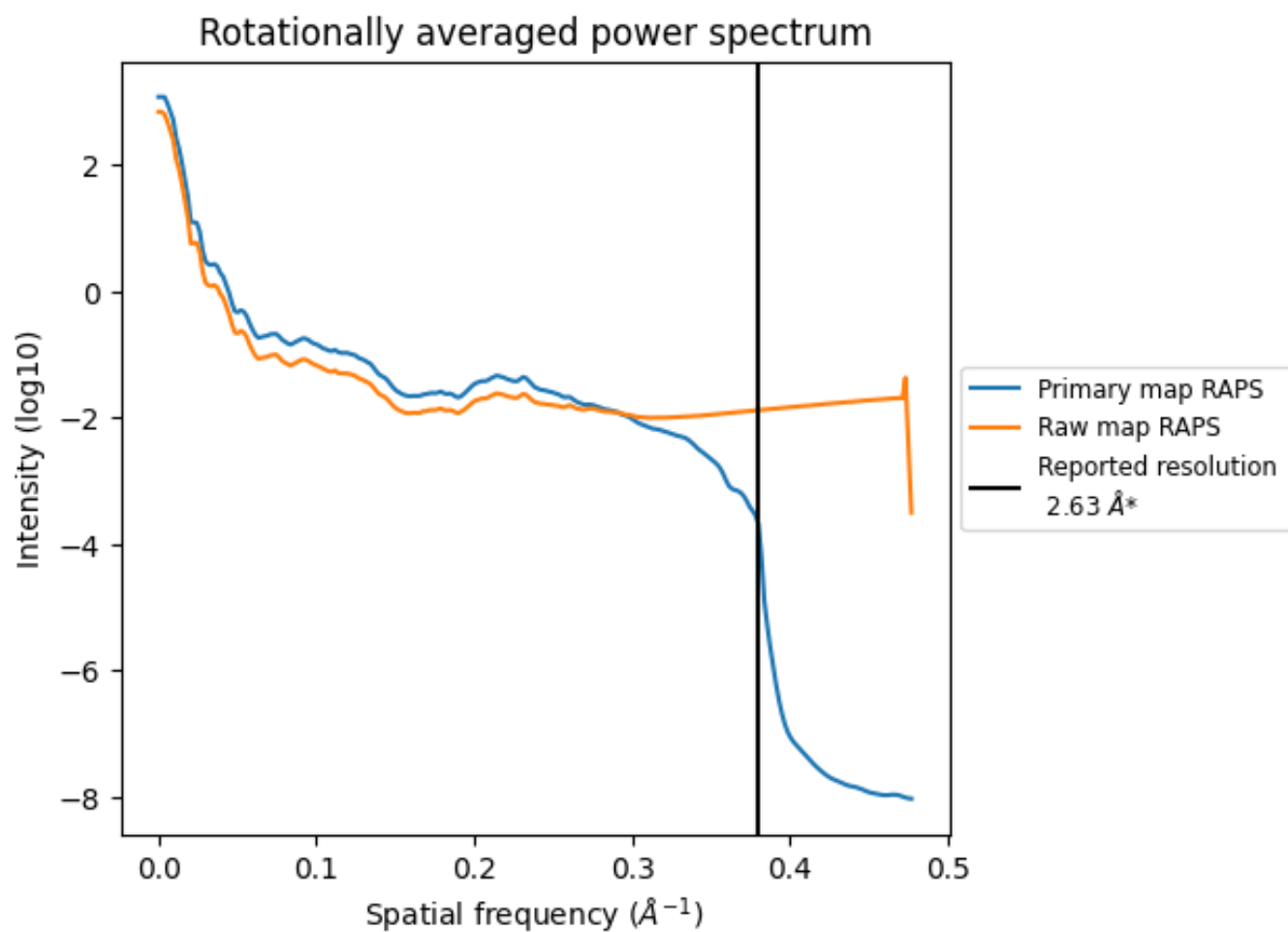
## 7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 876 nm<sup>3</sup>; this corresponds to an approximate mass of 791 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

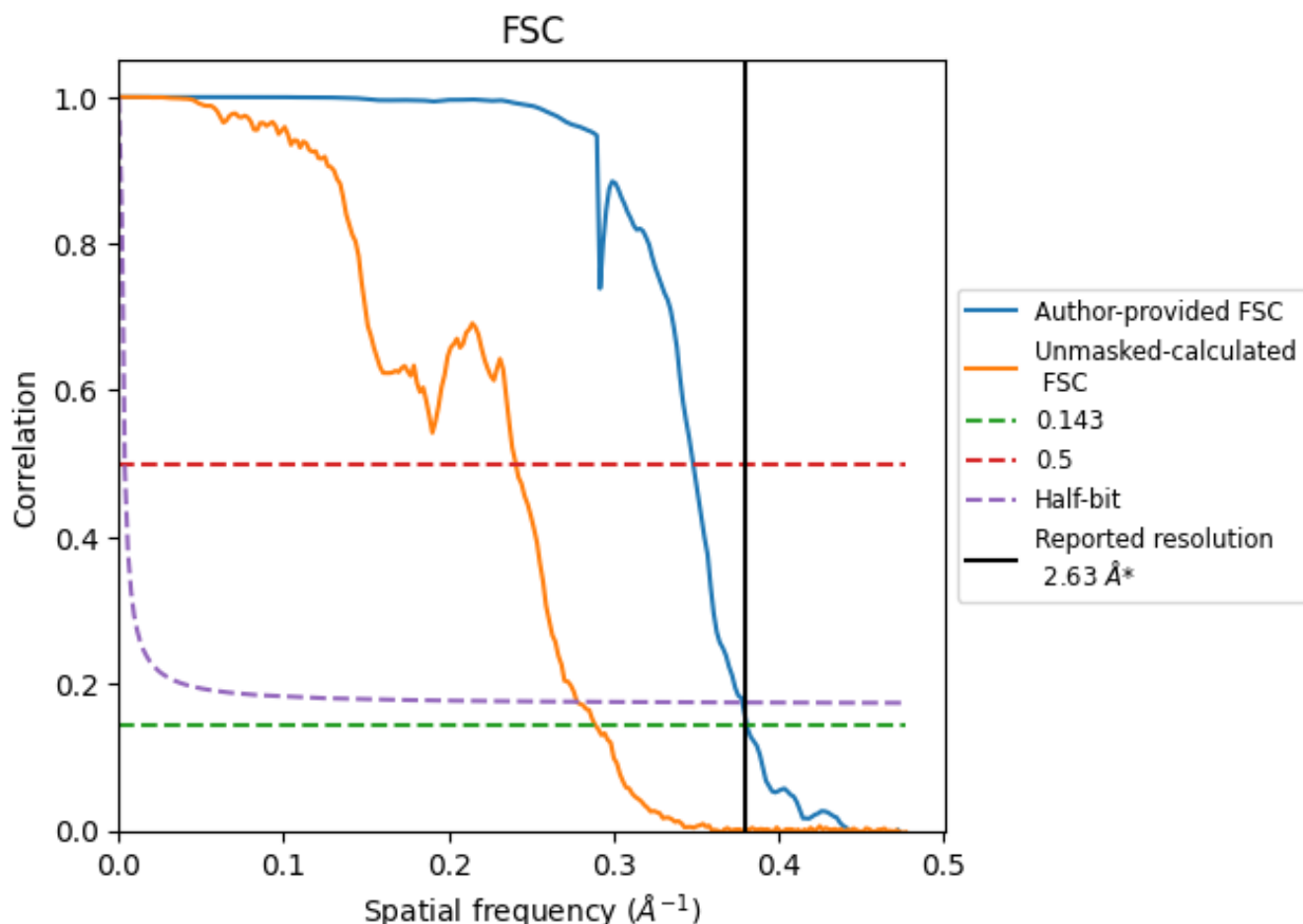


\*Reported resolution corresponds to spatial frequency of 0.380 Å<sup>-1</sup>

## 8 Fourier-Shell correlation [i](#)

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

### 8.1 FSC [i](#)



\*Reported resolution corresponds to spatial frequency of 0.380 Å<sup>-1</sup>

## 8.2 Resolution estimates [i](#)

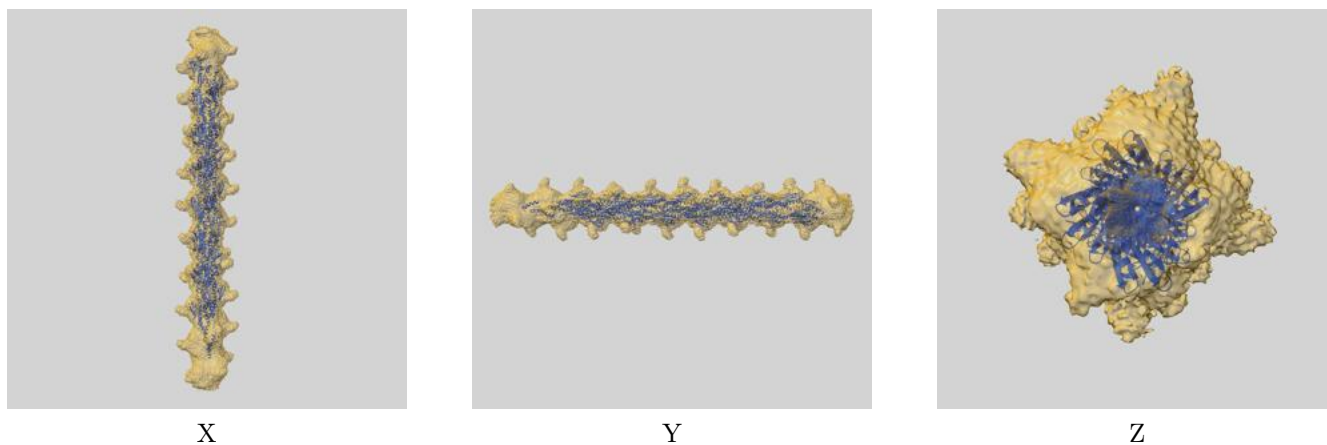
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	2.63	-	-
Author-provided FSC curve	2.63	2.87	2.65
Unmasked-calculated*	3.46	4.15	3.60

\*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 3.46 differs from the reported value 2.63 by more than 10 %

## 9 Map-model fit [i](#)

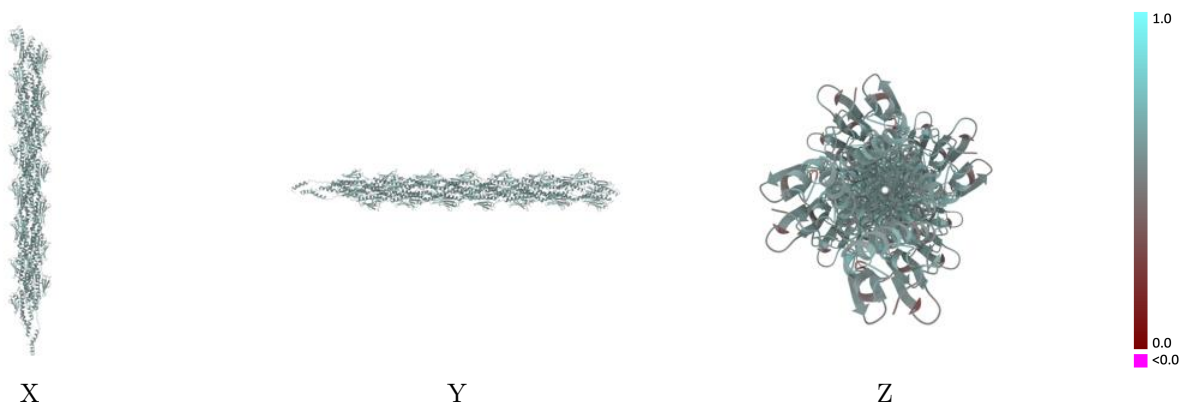
This section contains information regarding the fit between EMDB map EMD-18593 and PDB model 8QQJ. Per-residue inclusion information can be found in section 3 on page 12.

### 9.1 Map-model overlay [i](#)



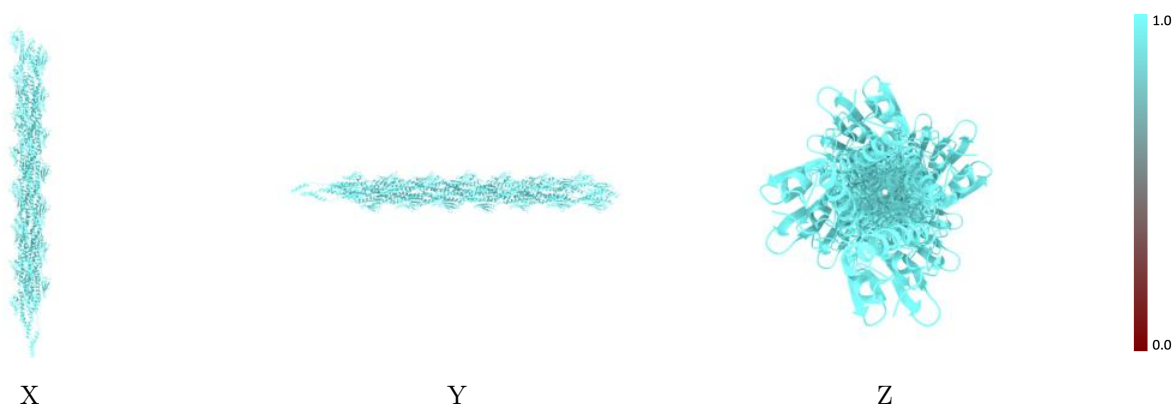
The images above show the 3D surface view of the map at the recommended contour level 0.2 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



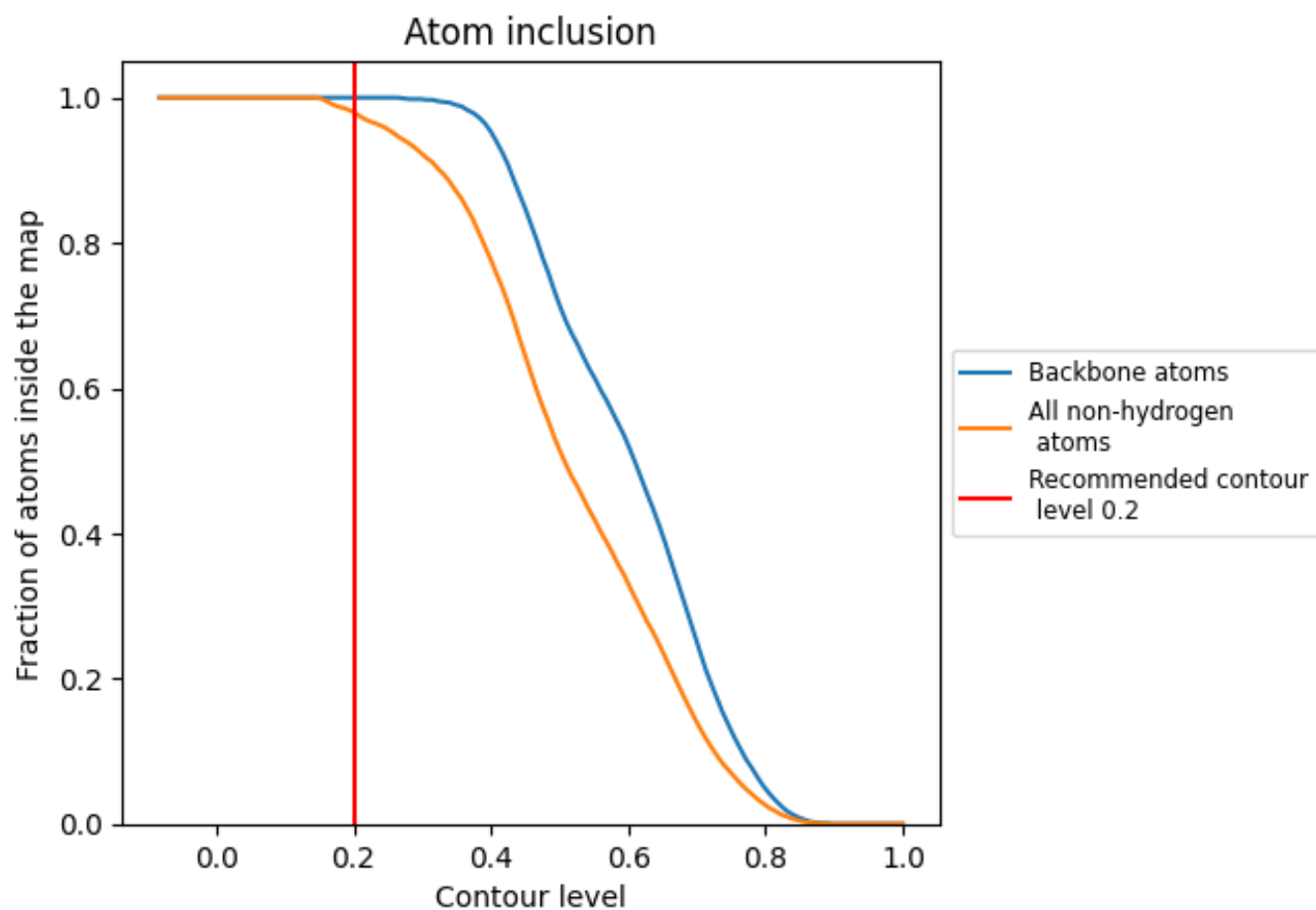
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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, 100% of all backbone atoms, 98% 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	 0.9800	 0.5400
0	 0.7380	 0.1930
1	 0.7700	 0.1940
2	 0.7540	 0.1690
3	 0.7380	 0.1910
4	 0.7210	 0.1870
5	 0.6890	 0.1910
6	 0.7380	 0.1840
7	 0.7210	 0.1410
8	 0.7380	 0.1670
9	 0.7380	 0.1700
A	 1.0000	 0.5400
B	 1.0000	 0.5490
C	 1.0000	 0.5540
D	 1.0000	 0.5590
E	 1.0000	 0.5600
F	 1.0000	 0.5660
G	 1.0000	 0.5700
H	 1.0000	 0.5680
I	 0.9990	 0.5690
J	 1.0000	 0.5760
K	 1.0000	 0.5780
L	 1.0000	 0.5750
M	 1.0000	 0.5720
N	 0.9990	 0.5750
O	 1.0000	 0.5760
P	 0.9980	 0.5760
Q	 0.9990	 0.5750
R	 1.0000	 0.5750
S	 1.0000	 0.5770
T	 1.0000	 0.5750
U	 1.0000	 0.5760
V	 1.0000	 0.5750
W	 0.9990	 0.5730
X	 0.9990	 0.5740



*Continued on next page...*

Continued from previous page...

Chain	Atom inclusion	Q-score
Y	 1.0000	 0.5730
Z	 1.0000	 0.5670
a	 1.0000	 0.5670
b	 1.0000	 0.5650
c	 1.0000	 0.5630
d	 1.0000	 0.5560
e	 1.0000	 0.5500
f	 0.7380	 0.2070
g	 0.6560	 0.1170
h	 0.6390	 0.1020
i	 0.6390	 0.1020
j	 0.6560	 0.1020
k	 0.6890	 0.1320
l	 0.7380	 0.1690
m	 0.7380	 0.2040
n	 0.7540	 0.1850
o	 0.7210	 0.1740
p	 0.7540	 0.2290
q	 0.7540	 0.2310
r	 0.7380	 0.2420
s	 0.7380	 0.2400
t	 0.7210	 0.2010
u	 0.7540	 0.1880
v	 0.7210	 0.1830
w	 0.7050	 0.2020
x	 0.7380	 0.1920
y	 0.7210	 0.1930
z	 0.7380	 0.2010