



# wwPDB X-ray Structure Validation Summary Report ⓘ

Jun 12, 2024 – 02:38 PM EDT

PDB ID : 3VHN  
Title : Y61G mutant of Cellulase 12A from thermotoga maritima  
Authors : Cheng, Y.-S.; Ko, T.-P.; Guo, R.-T.; Liu, J.-R.  
Deposited on : 2011-08-30  
Resolution : 2.50 Å(reported)

This is a wwPDB X-ray Structure 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/XrayValidationReportHelp>

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:

MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	2.36.2
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

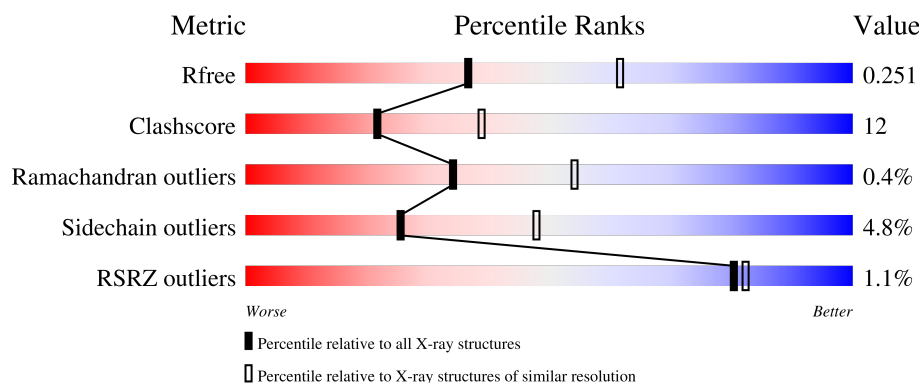
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.50 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)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	4661 (2.50-2.50)
Clashscore	141614	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)
RSRZ outliers	127900	4559 (2.50-2.50)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower 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 electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	265	 73% 22% . .
1	B	265	 68% 25% . .
1	C	265	 68% 26% . .
1	D	265	 76% 18% . .
1	E	265	 73% 22% . .

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Mol	Chain	Length	Quality of chain
1	F	265	<div> <div>3%</div> <div>66%</div> <div>28%</div> <div>• •</div> </div>
1	G	265	<div> <div>%</div> <div>72%</div> <div>22%</div> <div>• •</div> </div>
1	H	265	<div> <div>4%</div> <div>69%</div> <div>26%</div> <div>• •</div> </div>
2	I	2	<div> <div>50%</div> <div>50%</div> </div>
2	J	2	<div> <div>50%</div> <div>50%</div> </div>
2	K	2	<div> <div>50%</div> <div>50%</div> </div>
2	L	2	<div> <div>50%</div> <div>50%</div> </div>
2	M	2	<div> <div>100%</div> </div>
2	N	2	<div> <div>100%</div> </div>
2	O	2	<div> <div>50%</div> <div>50%</div> </div>
2	P	2	<div> <div>100%</div> </div>

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 17709 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, 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 Endo-1,4-beta-glucanase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	255	Total	C	N	O	S	0	0	0
			2079	1359	323	390	7			
1	B	256	Total	C	N	O	S	0	0	0
			2090	1365	327	391	7			
1	C	256	Total	C	N	O	S	0	0	0
			2090	1365	327	391	7			
1	D	255	Total	C	N	O	S	0	0	0
			2079	1359	323	390	7			
1	E	256	Total	C	N	O	S	0	0	0
			2090	1365	327	391	7			
1	F	255	Total	C	N	O	S	0	0	0
			2079	1359	323	390	7			
1	G	256	Total	C	N	O	S	0	0	0
			2090	1365	327	391	7			
1	H	255	Total	C	N	O	S	0	0	0
			2079	1359	323	390	7			

There are 72 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-7	MET	-	expression tag	UNP Q60032
A	-6	GLY	-	expression tag	UNP Q60032
A	-5	HIS	-	expression tag	UNP Q60032
A	-4	HIS	-	expression tag	UNP Q60032
A	-3	HIS	-	expression tag	UNP Q60032
A	-2	HIS	-	expression tag	UNP Q60032
A	-1	HIS	-	expression tag	UNP Q60032
A	0	HIS	-	expression tag	UNP Q60032
A	61	GLY	TYR	engineered mutation	UNP Q60032
B	-7	MET	-	expression tag	UNP Q60032
B	-6	GLY	-	expression tag	UNP Q60032
B	-5	HIS	-	expression tag	UNP Q60032
B	-4	HIS	-	expression tag	UNP Q60032

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-3	HIS	-	expression tag	UNP Q60032
B	-2	HIS	-	expression tag	UNP Q60032
B	-1	HIS	-	expression tag	UNP Q60032
B	0	HIS	-	expression tag	UNP Q60032
B	61	GLY	TYR	engineered mutation	UNP Q60032
C	-7	MET	-	expression tag	UNP Q60032
C	-6	GLY	-	expression tag	UNP Q60032
C	-5	HIS	-	expression tag	UNP Q60032
C	-4	HIS	-	expression tag	UNP Q60032
C	-3	HIS	-	expression tag	UNP Q60032
C	-2	HIS	-	expression tag	UNP Q60032
C	-1	HIS	-	expression tag	UNP Q60032
C	0	HIS	-	expression tag	UNP Q60032
C	61	GLY	TYR	engineered mutation	UNP Q60032
D	-7	MET	-	expression tag	UNP Q60032
D	-6	GLY	-	expression tag	UNP Q60032
D	-5	HIS	-	expression tag	UNP Q60032
D	-4	HIS	-	expression tag	UNP Q60032
D	-3	HIS	-	expression tag	UNP Q60032
D	-2	HIS	-	expression tag	UNP Q60032
D	-1	HIS	-	expression tag	UNP Q60032
D	0	HIS	-	expression tag	UNP Q60032
D	61	GLY	TYR	engineered mutation	UNP Q60032
E	-7	MET	-	expression tag	UNP Q60032
E	-6	GLY	-	expression tag	UNP Q60032
E	-5	HIS	-	expression tag	UNP Q60032
E	-4	HIS	-	expression tag	UNP Q60032
E	-3	HIS	-	expression tag	UNP Q60032
E	-2	HIS	-	expression tag	UNP Q60032
E	-1	HIS	-	expression tag	UNP Q60032
E	0	HIS	-	expression tag	UNP Q60032
E	61	GLY	TYR	engineered mutation	UNP Q60032
F	-7	MET	-	expression tag	UNP Q60032
F	-6	GLY	-	expression tag	UNP Q60032
F	-5	HIS	-	expression tag	UNP Q60032
F	-4	HIS	-	expression tag	UNP Q60032
F	-3	HIS	-	expression tag	UNP Q60032
F	-2	HIS	-	expression tag	UNP Q60032
F	-1	HIS	-	expression tag	UNP Q60032
F	0	HIS	-	expression tag	UNP Q60032
F	61	GLY	TYR	engineered mutation	UNP Q60032
G	-7	MET	-	expression tag	UNP Q60032

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Chain	Residue	Modelled	Actual	Comment	Reference
G	-6	GLY	-	expression tag	UNP Q60032
G	-5	HIS	-	expression tag	UNP Q60032
G	-4	HIS	-	expression tag	UNP Q60032
G	-3	HIS	-	expression tag	UNP Q60032
G	-2	HIS	-	expression tag	UNP Q60032
G	-1	HIS	-	expression tag	UNP Q60032
G	0	HIS	-	expression tag	UNP Q60032
G	61	GLY	TYR	engineered mutation	UNP Q60032
H	-7	MET	-	expression tag	UNP Q60032
H	-6	GLY	-	expression tag	UNP Q60032
H	-5	HIS	-	expression tag	UNP Q60032
H	-4	HIS	-	expression tag	UNP Q60032
H	-3	HIS	-	expression tag	UNP Q60032
H	-2	HIS	-	expression tag	UNP Q60032
H	-1	HIS	-	expression tag	UNP Q60032
H	0	HIS	-	expression tag	UNP Q60032
H	61	GLY	TYR	engineered mutation	UNP Q60032

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



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
2	I	2	Total	C	O	0	0	0
			23	12	11			
2	J	2	Total	C	O	0	0	0
			23	12	11			
2	K	2	Total	C	O	0	0	0
			23	12	11			
2	L	2	Total	C	O	0	0	0
			23	12	11			
2	M	2	Total	C	O	0	0	0
			23	12	11			
2	N	2	Total	C	O	0	0	0
			23	12	11			
2	O	2	Total	C	O	0	0	0
			23	12	11			
2	P	2	Total	C	O	0	0	0
			23	12	11			

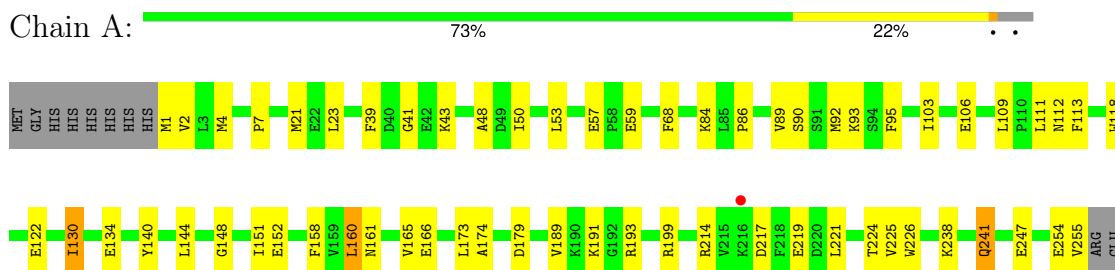
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	141	Total 141	O 141	0	0
3	B	119	Total 119	O 119	0	0
3	C	111	Total 111	O 111	0	0
3	D	122	Total 122	O 122	0	0
3	E	116	Total 116	O 116	0	0
3	F	77	Total 77	O 77	0	0
3	G	90	Total 90	O 90	0	0
3	H	73	Total 73	O 73	0	0

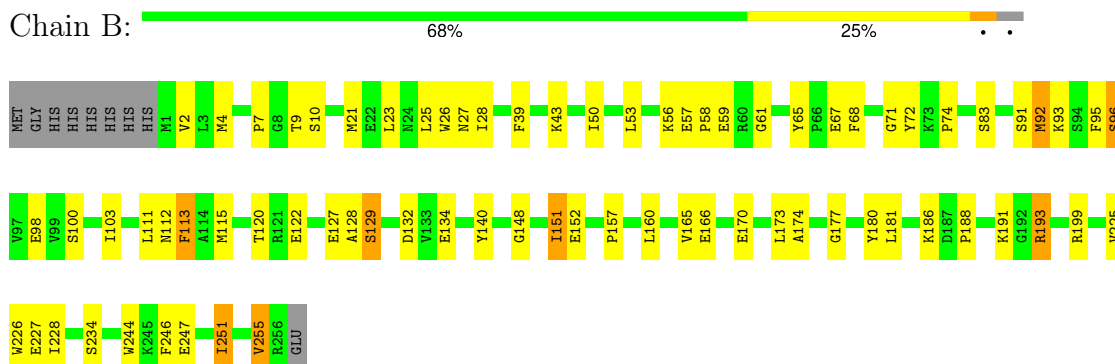
### 3 Residue-property plots

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 electron 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 dot above a residue indicates a poor fit to the electron density ( $RSRZ > 2$ ). 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.

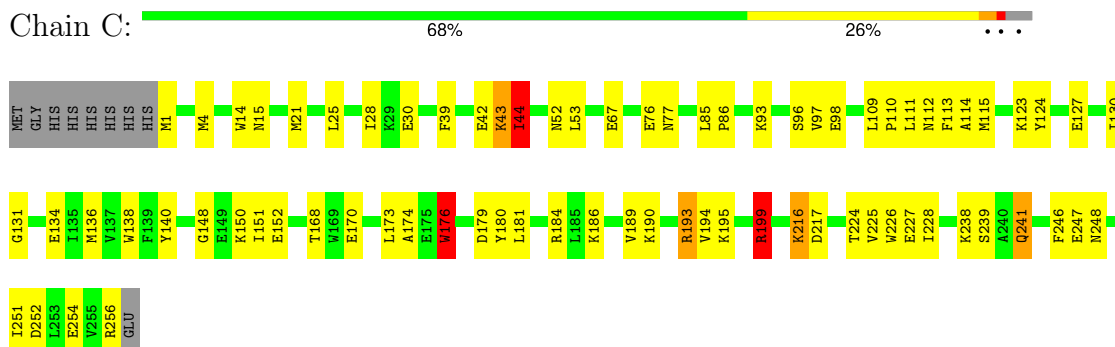
- Molecule 1: Endo-1,4-beta-glucanase



- Molecule 1: Endo-1,4-beta-glucanase

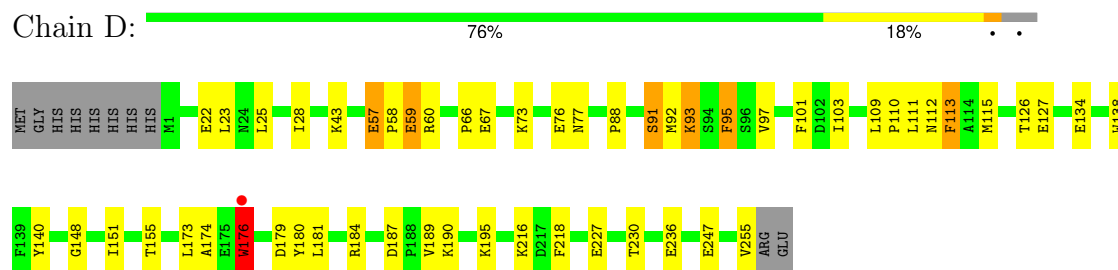


- Molecule 1: Endo-1,4-beta-glucanase

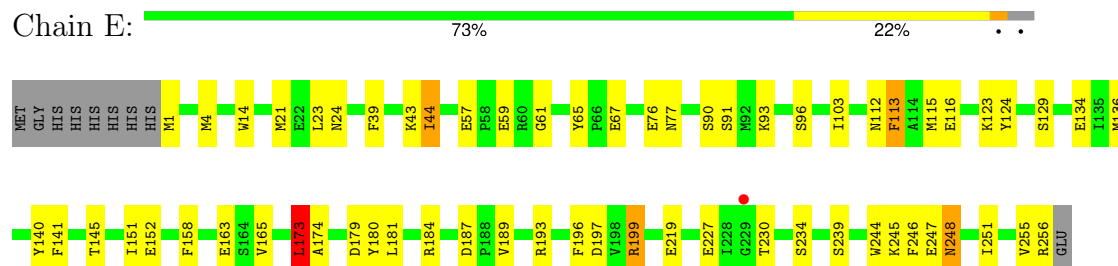


- Molecule 1: Endo-1,4-beta-glucanase

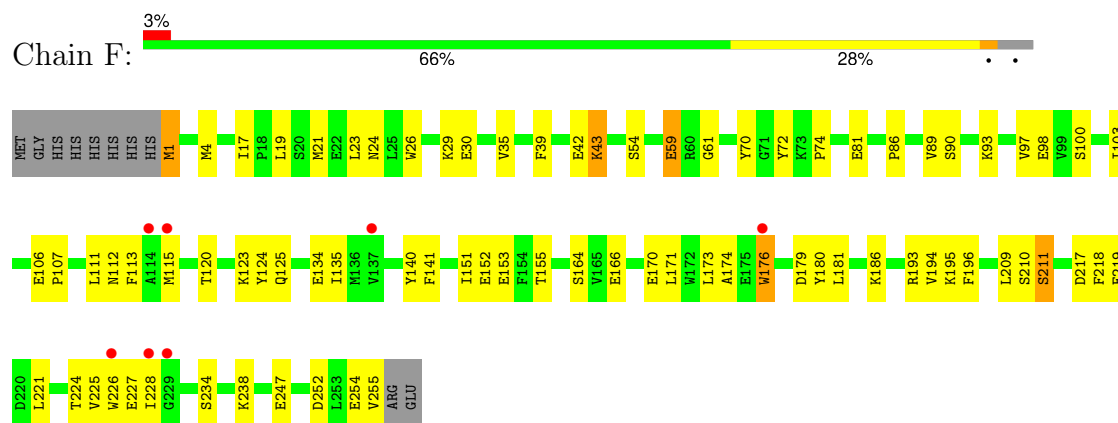




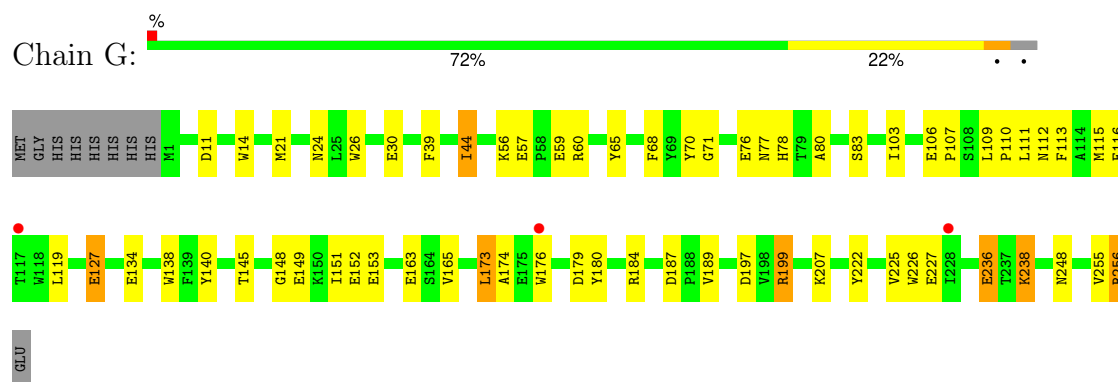
- Molecule 1: Endo-1,4-beta-glucanase



- Molecule 1: Endo-1,4-beta-glucanase

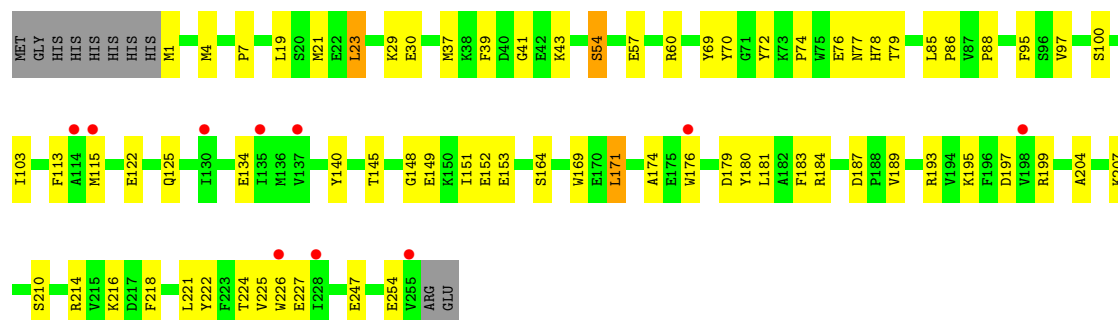


- Molecule 1: Endo-1,4-beta-glucanase



- Molecule 1: Endo-1,4-beta-glucanase





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



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



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



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



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



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

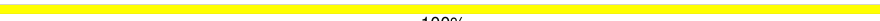


- Molecule 2: beta-D-glucopyranose-(1-4)-beta-D-glucopyranose

Chain O:  50% 50%

BGC1  
BGC2

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

Chain P:  100%

BGC1  
BGC2

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	91.91Å 124.04Å 127.56Å 90.00° 107.06° 90.00°	Depositor
Resolution (Å)	25.00 – 2.50 25.12 – 2.50	Depositor EDS
% Data completeness (in resolution range)	90.5 (25.00-2.50) 90.9 (25.12-2.50)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.23 (at 2.50Å)	Xtriage
Refinement program	CNS	Depositor
R, $R_{free}$	0.185 , 0.245 0.197 , 0.251	Depositor DCC
$R_{free}$ test set	4340 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	28.4	Xtriage
Anisotropy	0.848	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 46.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	17709	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	33.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 38.46 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 3.6758e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality ⓘ

### 5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: BGC

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	0.84	0/2147	0.90	0/2915
1	B	0.84	0/2158	0.89	2/2929 (0.1%)
1	C	0.84	1/2158 (0.0%)	0.89	2/2929 (0.1%)
1	D	0.82	1/2147 (0.0%)	0.89	3/2915 (0.1%)
1	E	0.81	0/2158	0.89	3/2929 (0.1%)
1	F	0.72	0/2147	0.83	1/2915 (0.0%)
1	G	0.75	0/2158	0.87	0/2929
1	H	0.73	0/2147	0.84	1/2915 (0.0%)
All	All	0.80	2/17220 (0.0%)	0.87	12/23376 (0.1%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	42	GLU	CG-CD	6.84	1.62	1.51
1	D	93	LYS	CD-CE	5.03	1.63	1.51

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	173	LEU	CA-CB-CG	8.26	134.31	115.30
1	C	199	ARG	NE-CZ-NH1	6.23	123.42	120.30
1	E	23	LEU	N-CA-C	-5.76	95.44	111.00
1	D	23	LEU	N-CA-C	-5.73	95.53	111.00
1	E	113	PHE	N-CA-C	-5.40	96.42	111.00

There are no chirality outliers.

There are no planarity outliers.

## 5.2 Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2079	0	1983	52	0
1	B	2090	0	1996	57	0
1	C	2090	0	1996	55	0
1	D	2079	0	1983	37	0
1	E	2090	0	1996	47	0
1	F	2079	0	1983	55	0
1	G	2090	0	1996	45	0
1	H	2079	0	1983	46	0
2	I	23	0	21	1	0
2	J	23	0	21	1	0
2	K	23	0	21	1	0
2	L	23	0	21	1	0
2	M	23	0	21	1	0
2	N	23	0	21	2	0
2	O	23	0	21	0	0
2	P	23	0	21	1	0
3	A	141	0	0	2	0
3	B	119	0	0	0	0
3	C	111	0	0	5	0
3	D	122	0	0	2	0
3	E	116	0	0	0	0
3	F	77	0	0	1	0
3	G	90	0	0	4	0
3	H	73	0	0	2	0
All	All	17709	0	16084	393	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 12.

The worst 5 of 393 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:H:86:PRO:HB3	1:H:224:THR:HA	1.31	1.12
1:C:44:ILE:HD12	1:C:246:PHE:HB2	1.41	1.02
1:G:256:ARG:HA	3:G:640:HOH:O	1.66	0.94

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:151:ILE:HG12	1:B:152:GLU:HG3	1.55	0.86
1:F:180:TYR:O	1:F:181:LEU:HD12	1.78	0.83

There are no symmetry-related clashes.

## 5.3 Torsion angles

### 5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

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	253/265 (96%)	243 (96%)	10 (4%)	0	100	100
1	B	254/265 (96%)	241 (95%)	13 (5%)	0	100	100
1	C	254/265 (96%)	242 (95%)	11 (4%)	1 (0%)	34	54
1	D	253/265 (96%)	241 (95%)	10 (4%)	2 (1%)	19	35
1	E	254/265 (96%)	237 (93%)	17 (7%)	0	100	100
1	F	253/265 (96%)	237 (94%)	14 (6%)	2 (1%)	19	35
1	G	254/265 (96%)	235 (92%)	17 (7%)	2 (1%)	19	35
1	H	253/265 (96%)	237 (94%)	15 (6%)	1 (0%)	34	54
All	All	2028/2120 (96%)	1913 (94%)	107 (5%)	8 (0%)	34	54

5 of 8 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	176	TRP
1	D	218	PHE
1	F	210	SER
1	H	210	SER
1	D	176	TRP

### 5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

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	224/233 (96%)	215 (96%)	9 (4%)	31	56
1	B	225/233 (97%)	213 (95%)	12 (5%)	22	43
1	C	225/233 (97%)	211 (94%)	14 (6%)	18	35
1	D	224/233 (96%)	215 (96%)	9 (4%)	31	56
1	E	225/233 (97%)	215 (96%)	10 (4%)	28	52
1	F	224/233 (96%)	212 (95%)	12 (5%)	22	42
1	G	225/233 (97%)	214 (95%)	11 (5%)	25	47
1	H	224/233 (96%)	215 (96%)	9 (4%)	31	56
All	All	1796/1864 (96%)	1710 (95%)	86 (5%)	25	48

5 of 86 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	F	54	SER
1	G	187	ASP
1	F	81	GLU
1	F	255	VAL
1	G	248	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 22 such sidechains are listed below:

Mol	Chain	Res	Type
1	F	104	HIS
1	G	104	HIS
1	G	52	ASN
1	G	248	ASN
1	C	241	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.



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

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

## 5.5 Carbohydrates ⓘ

16 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	BGC	I	1	2	12,12,12	0.48	0	17,17,17	0.78	0
2	BGC	I	2	2	11,11,12	0.31	0	15,15,17	0.90	0
2	BGC	J	1	2	12,12,12	0.47	0	17,17,17	0.87	1 (5%)
2	BGC	J	2	2	11,11,12	0.35	0	15,15,17	0.94	1 (6%)
2	BGC	K	1	2	12,12,12	0.48	0	17,17,17	0.80	0
2	BGC	K	2	2	11,11,12	0.30	0	15,15,17	0.70	0
2	BGC	L	1	2	12,12,12	0.49	0	17,17,17	0.86	0
2	BGC	L	2	2	11,11,12	0.28	0	15,15,17	0.74	0
2	BGC	M	1	2	12,12,12	0.47	0	17,17,17	0.78	0
2	BGC	M	2	2	11,11,12	0.31	0	15,15,17	0.95	1 (6%)
2	BGC	N	1	2	12,12,12	0.48	0	17,17,17	0.75	0
2	BGC	N	2	2	11,11,12	0.38	0	15,15,17	1.24	2 (13%)
2	BGC	O	1	2	12,12,12	0.51	0	17,17,17	0.66	0
2	BGC	O	2	2	11,11,12	0.40	0	15,15,17	0.93	1 (6%)
2	BGC	P	1	2	12,12,12	0.47	0	17,17,17	0.85	0
2	BGC	P	2	2	11,11,12	0.35	0	15,15,17	1.06	1 (6%)

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	BGC	I	1	2	-	0/2/22/22	0/1/1/1
2	BGC	I	2	2	-	0/2/19/22	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	BGC	J	1	2	-	0/2/22/22	0/1/1/1
2	BGC	J	2	2	-	0/2/19/22	0/1/1/1
2	BGC	K	1	2	-	1/2/22/22	0/1/1/1
2	BGC	K	2	2	-	0/2/19/22	0/1/1/1
2	BGC	L	1	2	-	0/2/22/22	0/1/1/1
2	BGC	L	2	2	-	0/2/19/22	0/1/1/1
2	BGC	M	1	2	-	0/2/22/22	0/1/1/1
2	BGC	M	2	2	-	0/2/19/22	0/1/1/1
2	BGC	N	1	2	-	0/2/22/22	0/1/1/1
2	BGC	N	2	2	-	0/2/19/22	0/1/1/1
2	BGC	O	1	2	-	0/2/22/22	0/1/1/1
2	BGC	O	2	2	-	0/2/19/22	0/1/1/1
2	BGC	P	1	2	-	0/2/22/22	0/1/1/1
2	BGC	P	2	2	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	N	2	BGC	C6-C5-C4	-3.27	104.99	113.02
2	J	2	BGC	C6-C5-C4	-2.57	106.71	113.02
2	J	1	BGC	C1-O5-C5	-2.56	108.69	113.65
2	P	2	BGC	C6-C5-C4	-2.54	106.77	113.02
2	M	2	BGC	C6-C5-C4	-2.40	107.13	113.02

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	K	1	BGC	C4-C5-C6-O6

There are no ring outliers.

7 monomers are involved in 8 short contacts:

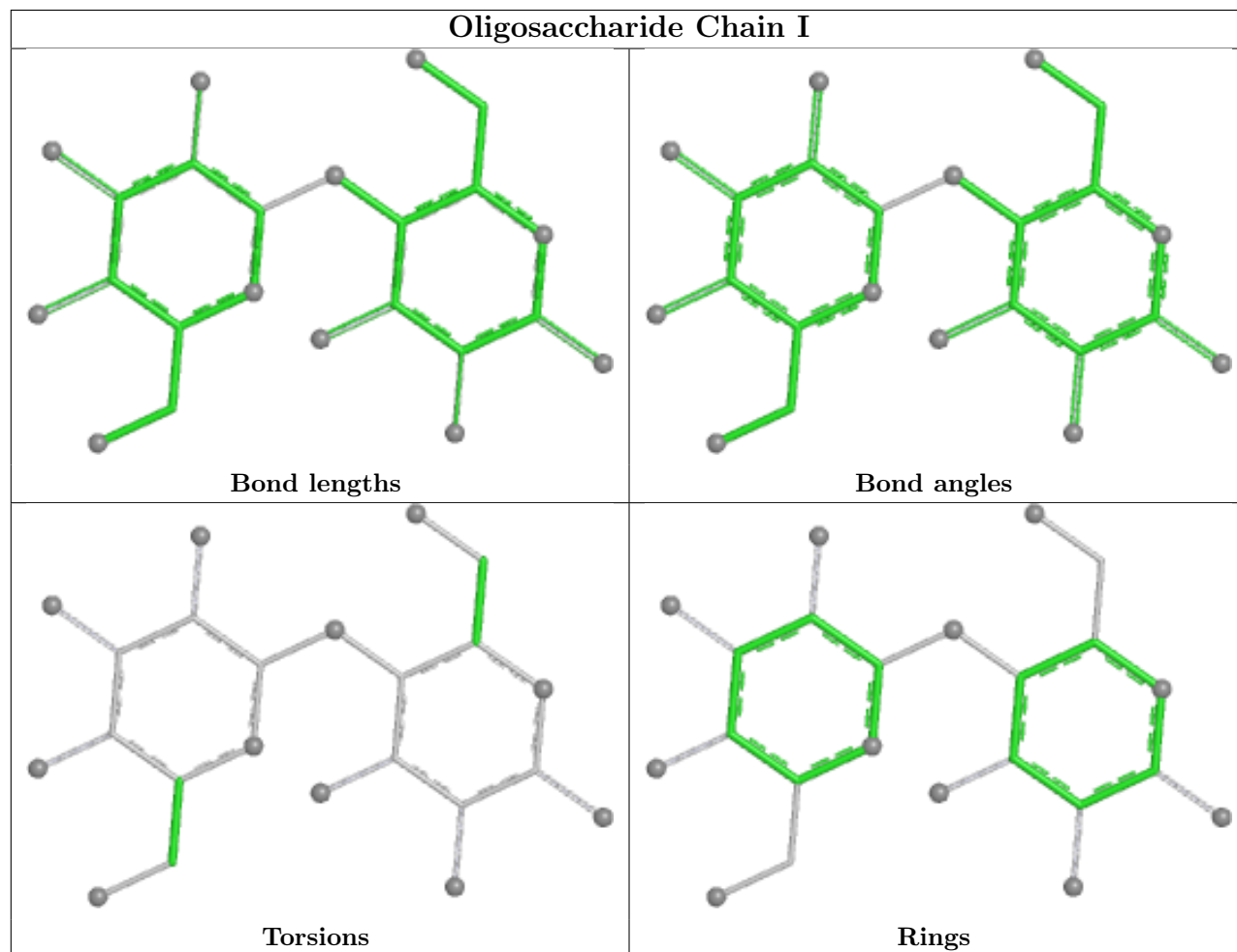
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	M	1	BGC	1	0
2	L	1	BGC	1	0
2	J	1	BGC	1	0
2	K	1	BGC	1	0
2	P	1	BGC	1	0
2	I	1	BGC	1	0

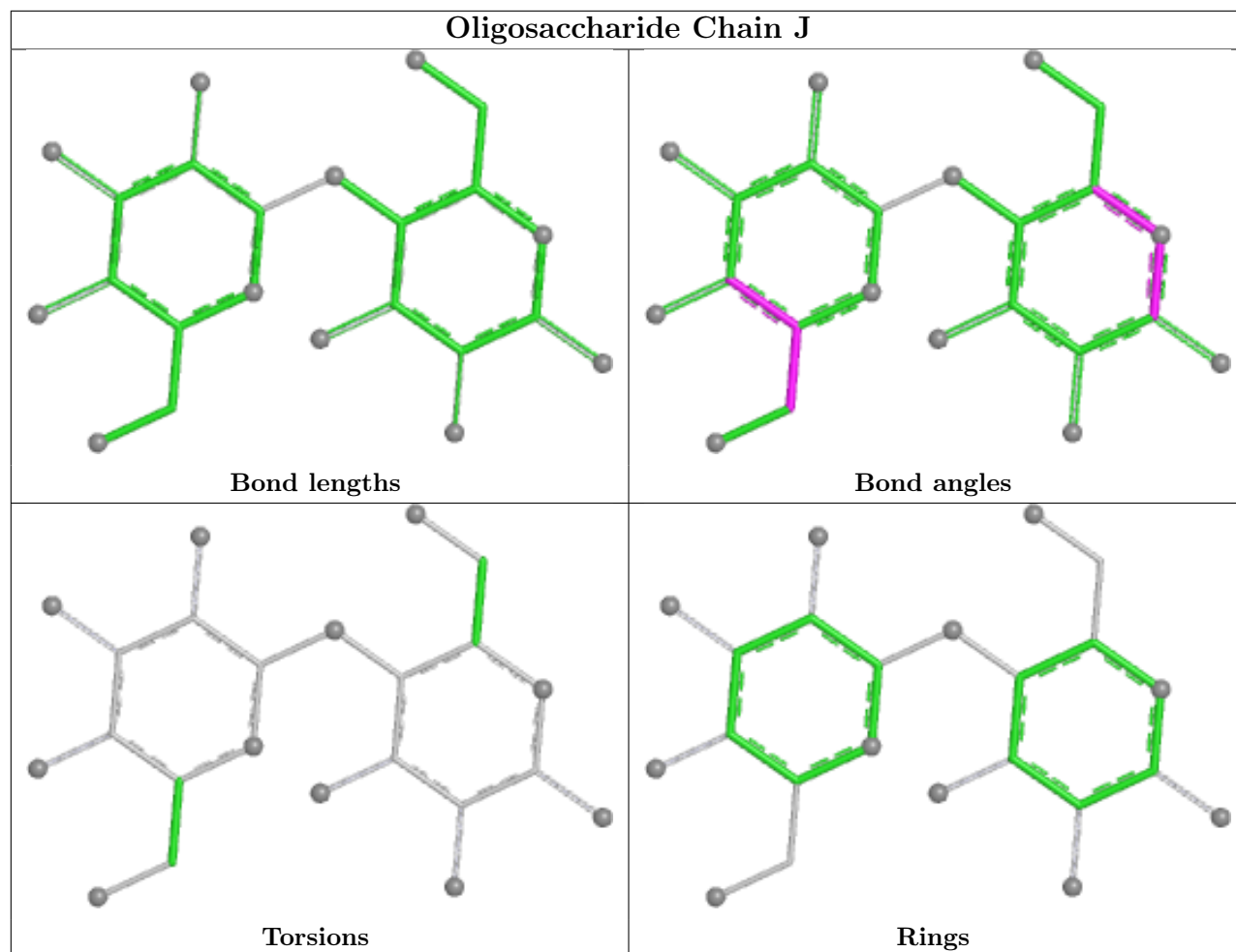
*Continued on next page...*

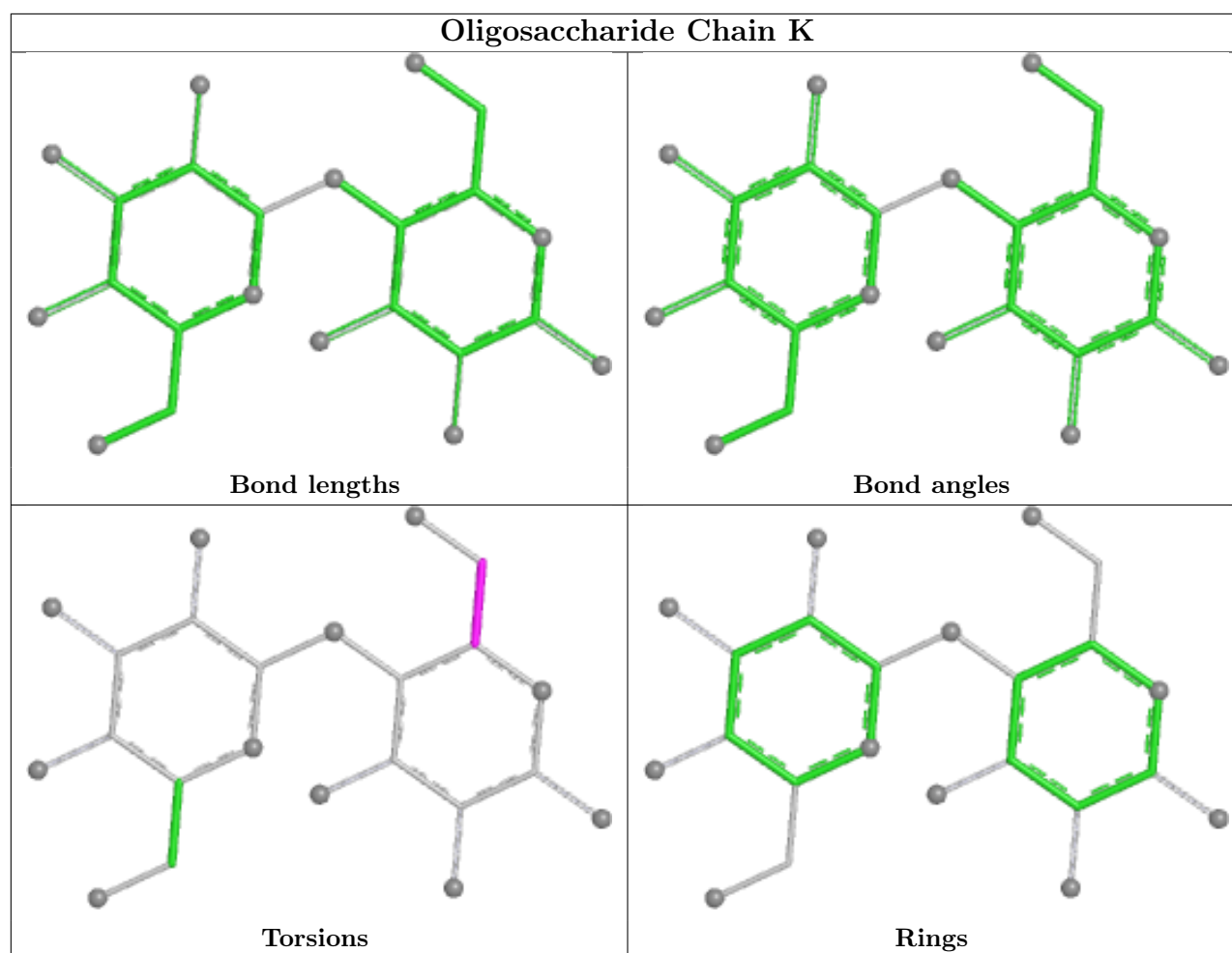
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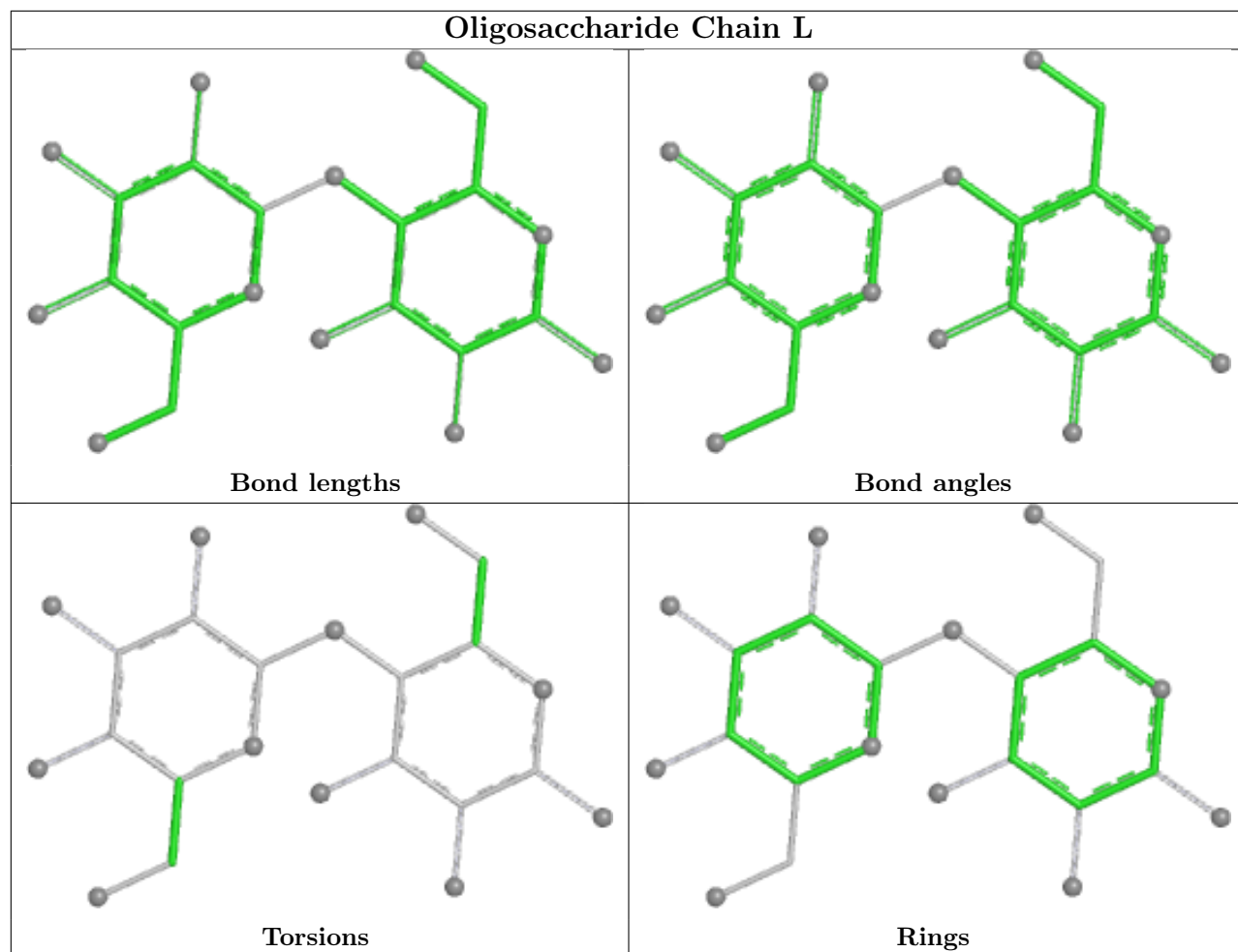
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	N	1	BGC	2	0

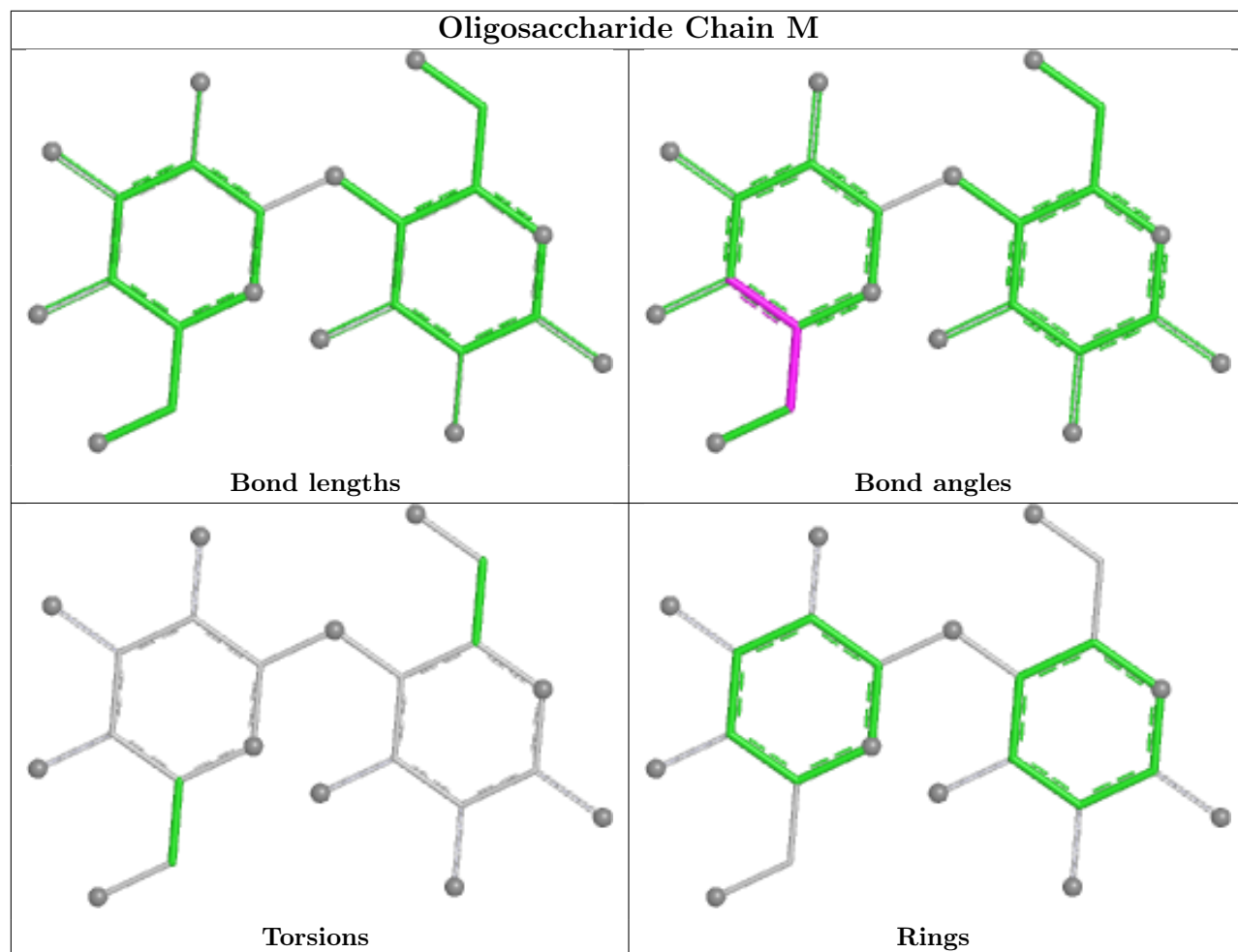
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.

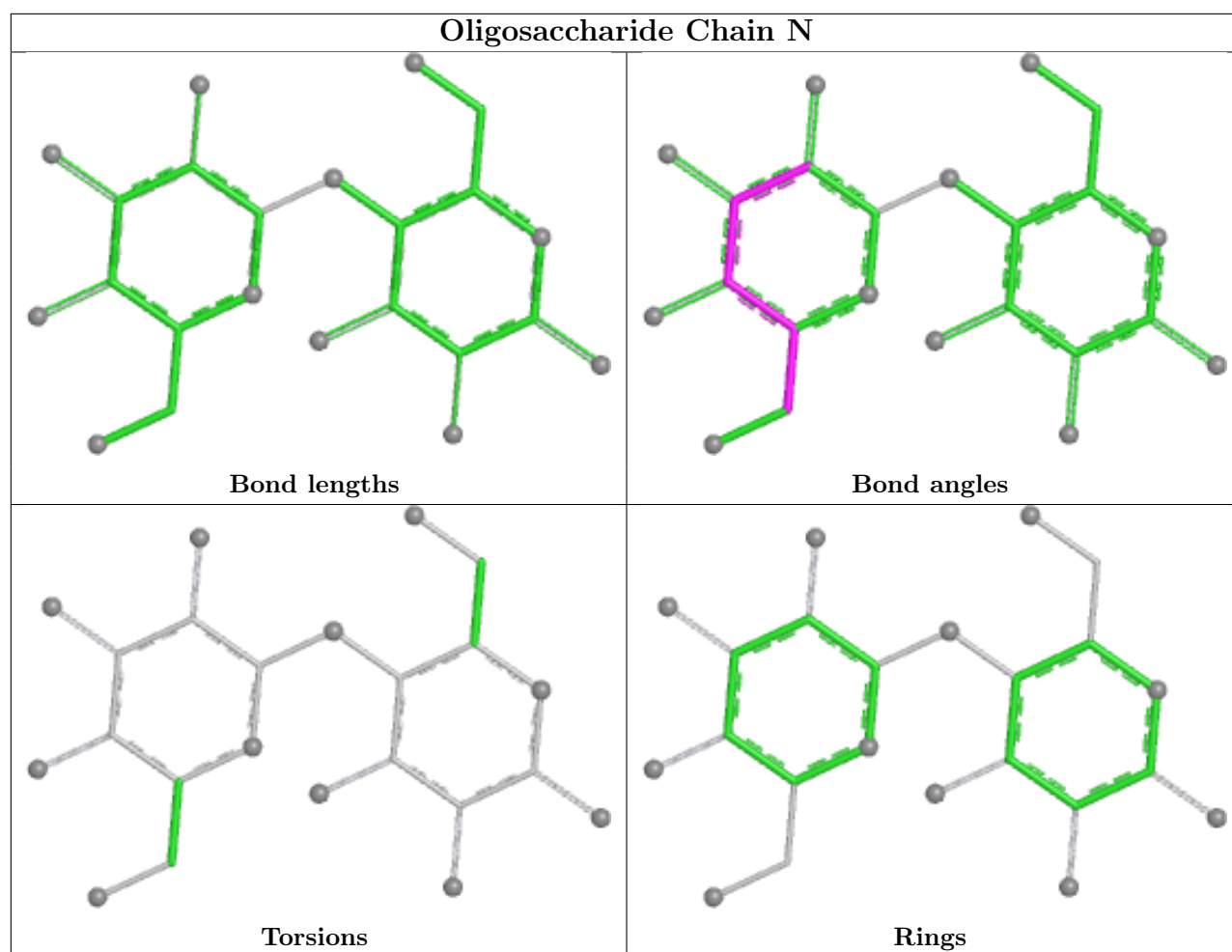




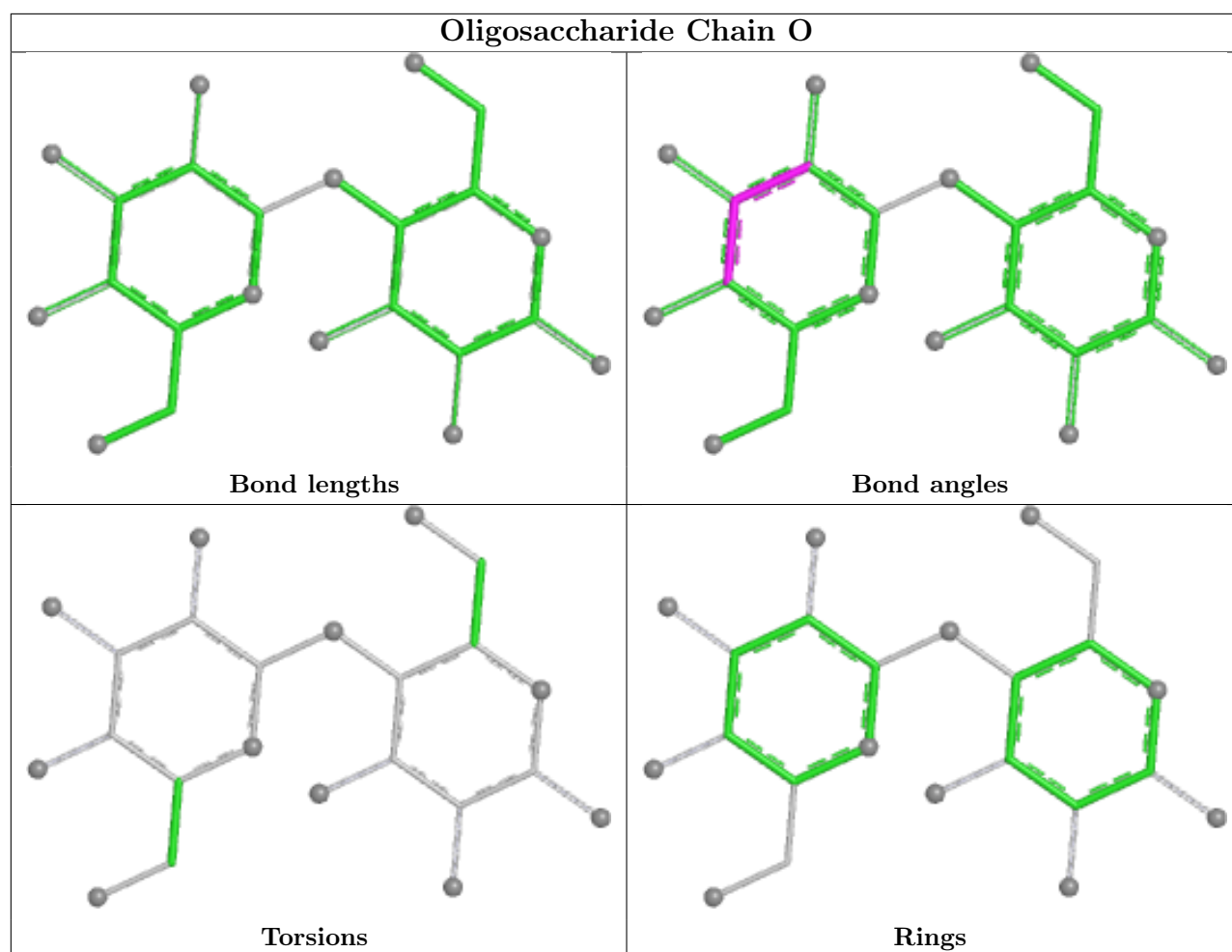


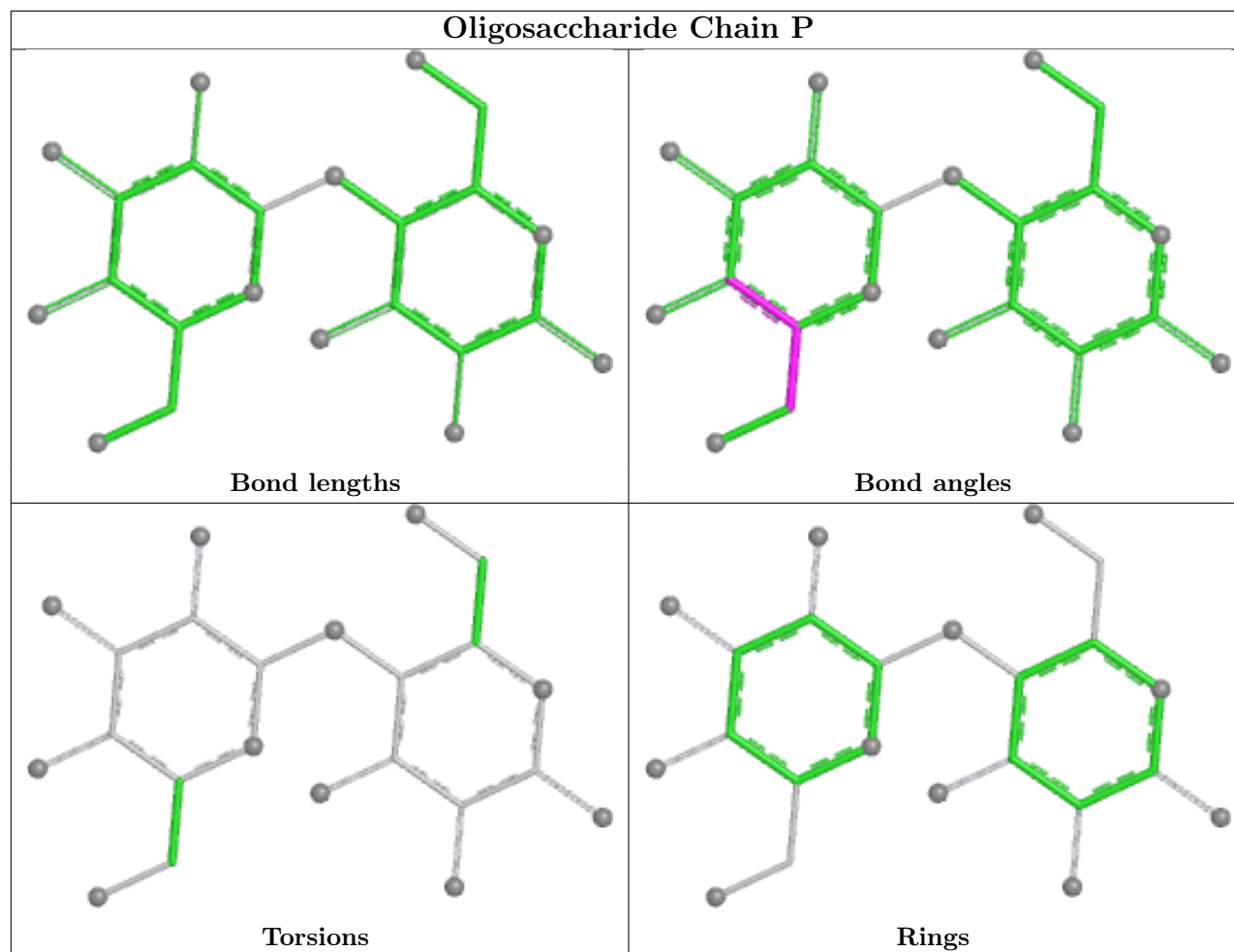












## 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

## 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 Fit of model and data [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	255/265 (96%)	-0.48	1 (0%) 92 93	12, 26, 44, 59	0
1	B	256/265 (96%)	-0.43	0 100 100	14, 30, 47, 58	0
1	C	256/265 (96%)	-0.42	0 100 100	14, 29, 47, 54	0
1	D	255/265 (96%)	-0.42	1 (0%) 92 93	15, 29, 46, 57	0
1	E	256/265 (96%)	-0.34	1 (0%) 92 93	15, 29, 46, 55	0
1	F	255/265 (96%)	-0.16	7 (2%) 54 58	23, 36, 54, 66	0
1	G	256/265 (96%)	-0.19	3 (1%) 79 80	21, 35, 52, 64	0
1	H	255/265 (96%)	-0.05	10 (3%) 39 42	25, 39, 56, 70	0
All	All	2044/2120 (96%)	-0.31	23 (1%) 80 82	12, 32, 51, 70	0

The worst 5 of 23 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	F	176	TRP	4.1
1	H	176	TRP	3.4
1	H	226	TRP	3.1
1	F	228	ILE	2.8
1	H	114	ALA	2.6

### 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

### 6.3 Carbohydrates [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

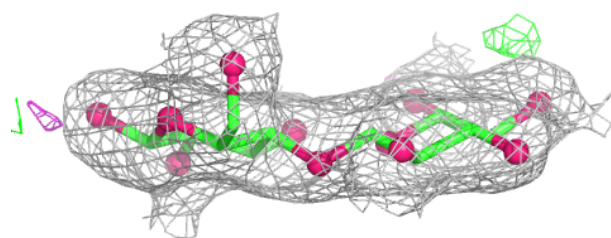
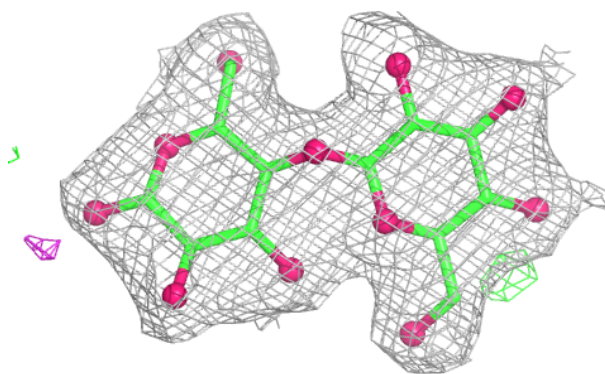
median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
2	BGC	P	2	11/12	0.93	0.14	33,34,37,38	0
2	BGC	N	2	11/12	0.94	0.11	29,31,33,34	0
2	BGC	O	1	12/12	0.94	0.14	36,38,41,42	0
2	BGC	O	2	11/12	0.94	0.14	37,38,40,40	0
2	BGC	P	1	12/12	0.94	0.14	34,38,39,40	0
2	BGC	N	1	12/12	0.94	0.13	27,35,37,38	0
2	BGC	L	2	11/12	0.95	0.13	26,28,31,33	0
2	BGC	M	2	11/12	0.95	0.14	23,25,26,30	0
2	BGC	J	2	11/12	0.96	0.10	22,25,27,31	0
2	BGC	M	1	12/12	0.96	0.12	25,26,28,30	0
2	BGC	L	1	12/12	0.96	0.14	29,34,36,41	0
2	BGC	K	1	12/12	0.97	0.14	29,31,32,36	0
2	BGC	K	2	11/12	0.97	0.12	28,29,31,32	0
2	BGC	I	2	11/12	0.98	0.13	16,19,24,26	0
2	BGC	J	1	12/12	0.98	0.15	24,26,27,28	0
2	BGC	I	1	12/12	0.98	0.13	21,24,26,27	0

The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

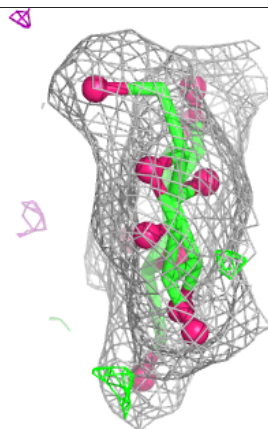
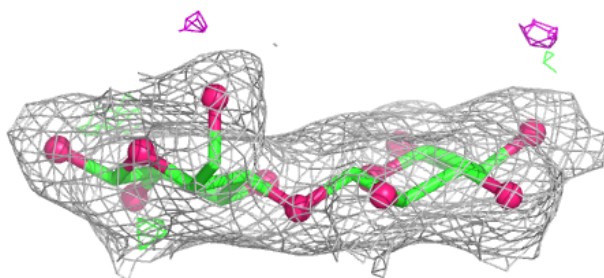
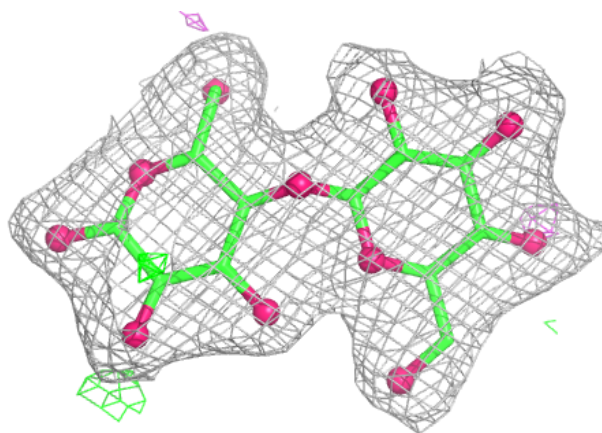
**Electron density around Chain I:**

$2mF_o - DF_c$  (at 0.7 rmsd) in gray  
 $mF_o - DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

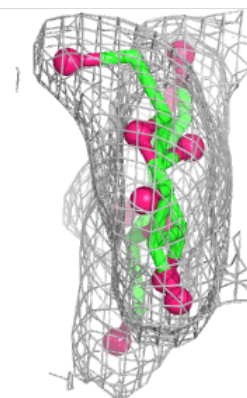
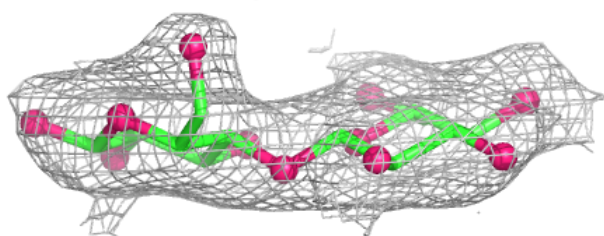
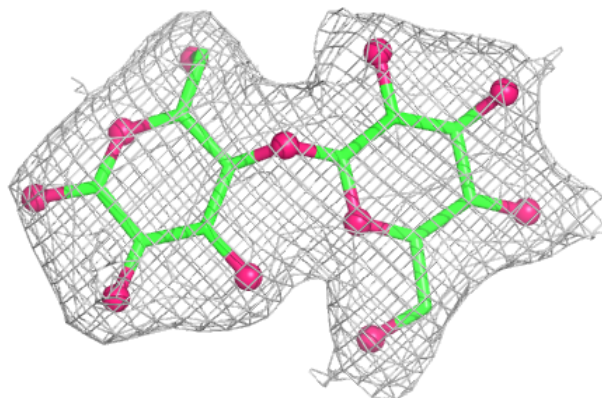


**Electron density around Chain J:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

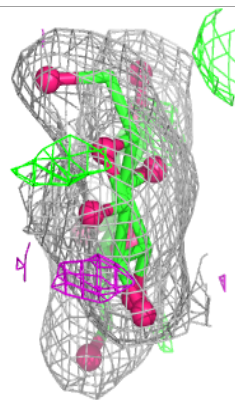
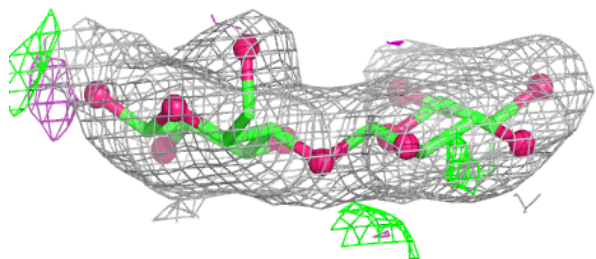
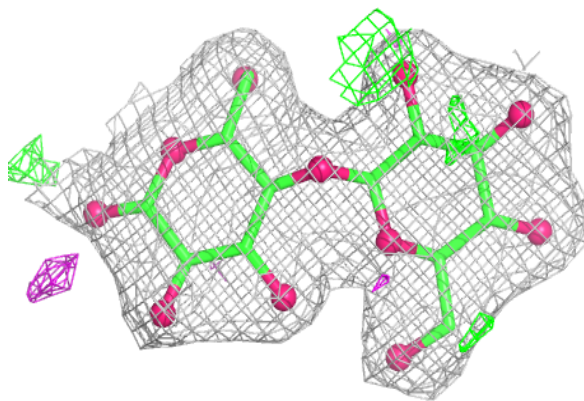
**Electron density around Chain K:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around Chain L:**

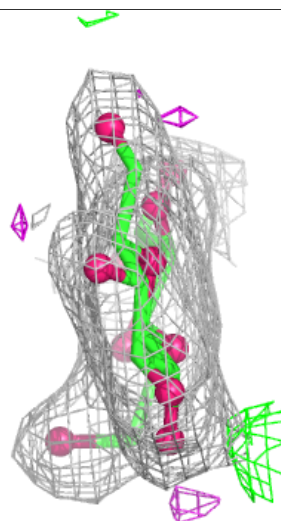
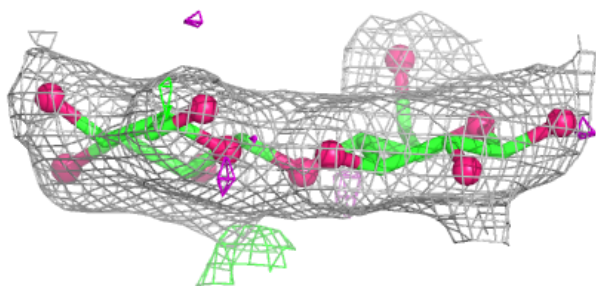
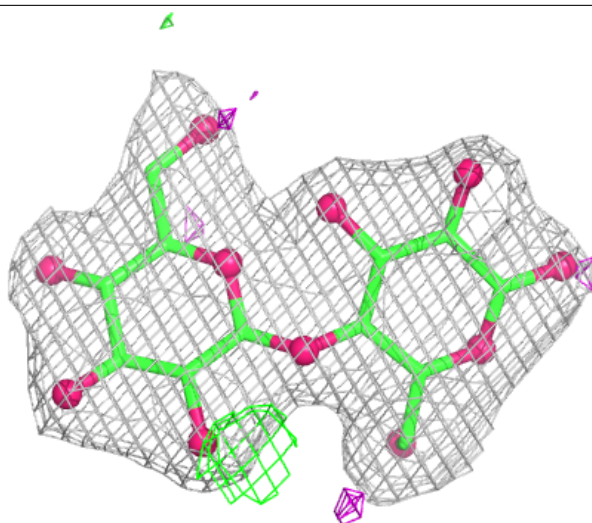
$2mF_o - DF_c$  (at 0.7 rmsd) in gray  
 $mF_o - DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)





**Electron density around Chain M:**

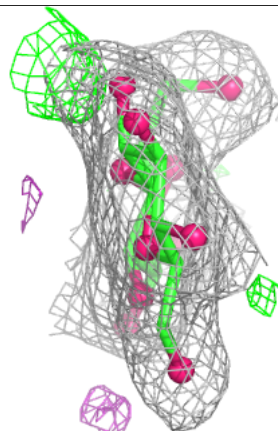
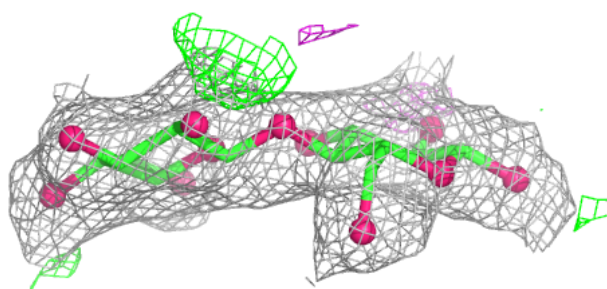
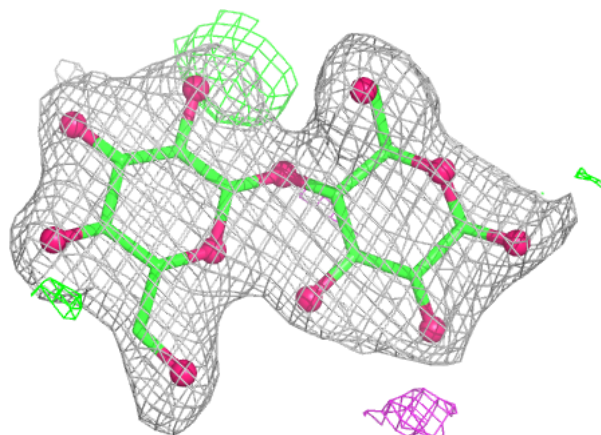
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



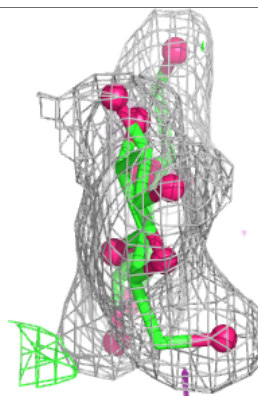
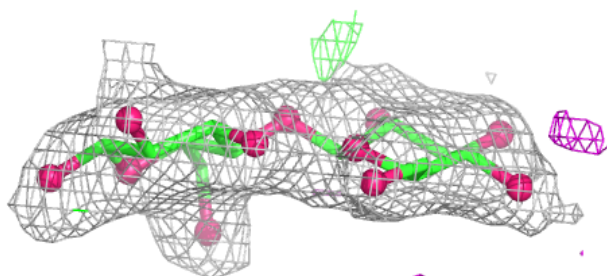
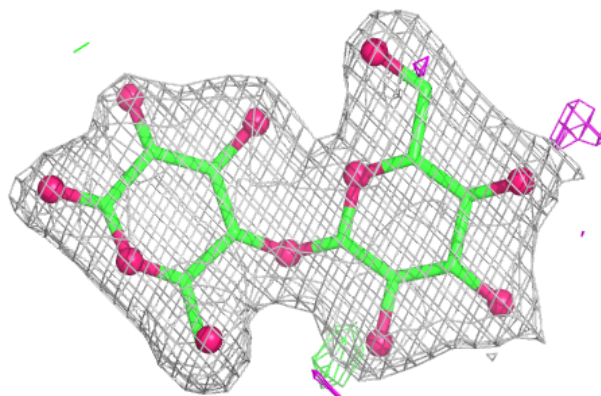


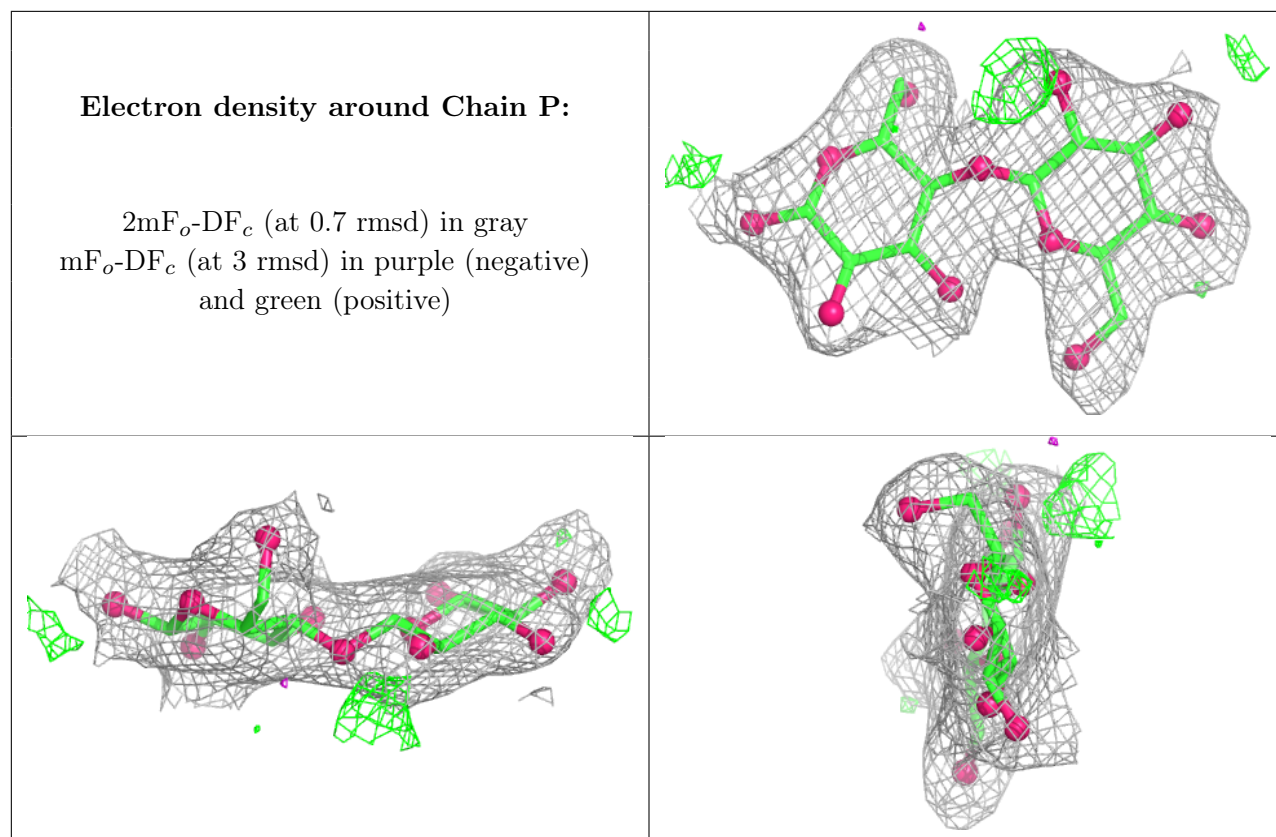
**Electron density around Chain N:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

**Electron density around Chain O:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)





## 6.4 Ligands [i](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.