



wwPDB X-ray Structure Validation Summary Report ⓘ

Jun 27, 2023 – 01:42 pm BST

PDB ID : 4CVU
Title : Structure of Fungal beta-mannosidase from Glycoside Hydrolase Family 2 of *Trichoderma harzianum*
Authors : Muniz, J.R.C.; Aparicio, R.; Santos, J.C.; Nascimento, A.S.; Golubev, A.M.; Polikarpov, I.
Deposited on : 2014-03-31
Resolution : 1.90 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

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

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

MolProbity : 4.02b-467
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.33
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) : 2.33

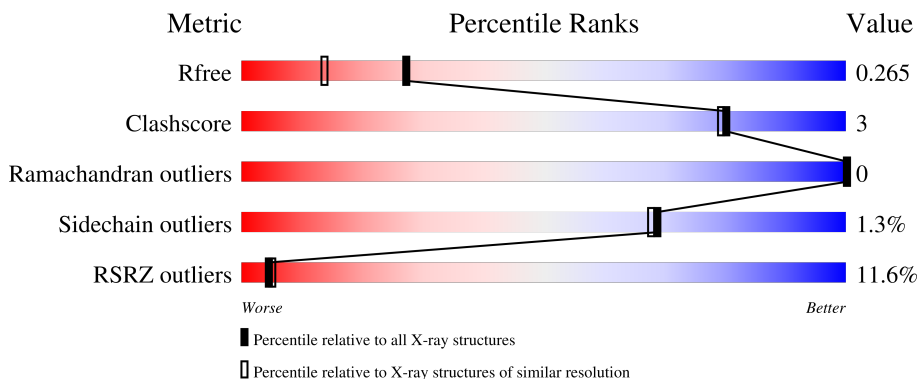
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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	6207 (1.90-1.90)
Clashscore	141614	6847 (1.90-1.90)
Ramachandran outliers	138981	6760 (1.90-1.90)
Sidechain outliers	138945	6760 (1.90-1.90)
RSRZ outliers	127900	6082 (1.90-1.90)

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 ≥ 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	942	
2	B	3	
3	C	8	
4	D	6	
5	E	11	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	MAN	C	4	-	-	-	X

2 Entry composition i

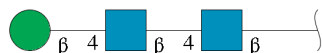
There are 13 unique types of molecules in this entry. The entry contains 8456 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 BETA-MANNOSIDASE.

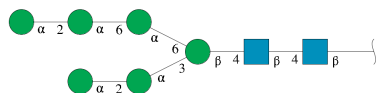
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	913	7241	4645	1208	1371	17	0	6	0

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



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

- Molecule 3 is an oligosaccharide called alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-6)-alpha-D-mannopyranose-(1-6)-[alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.

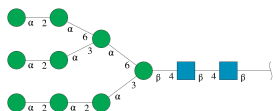


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	C	8	94	52	2	40	0	0	0

- Molecule 4 is an oligosaccharide called alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(2-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.

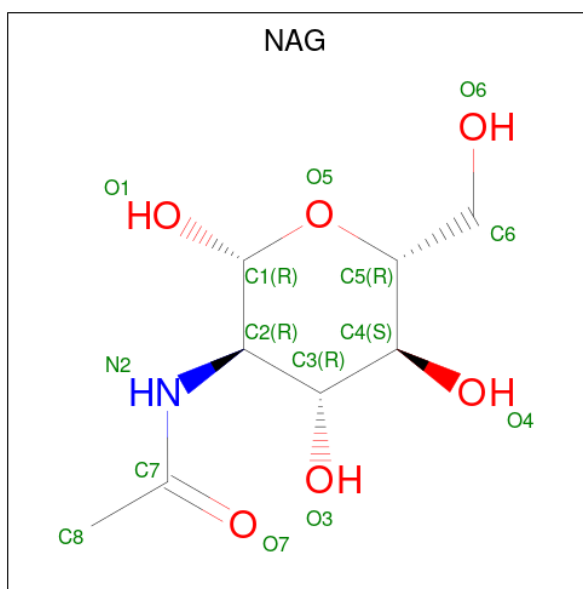
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
4	D	6	72	40	2	30	0	0	0

- Molecule 5 is an oligosaccharide called alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-6)]alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
5	E	11	127	70	2	55	0	0	0

- Molecule 6 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).



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

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

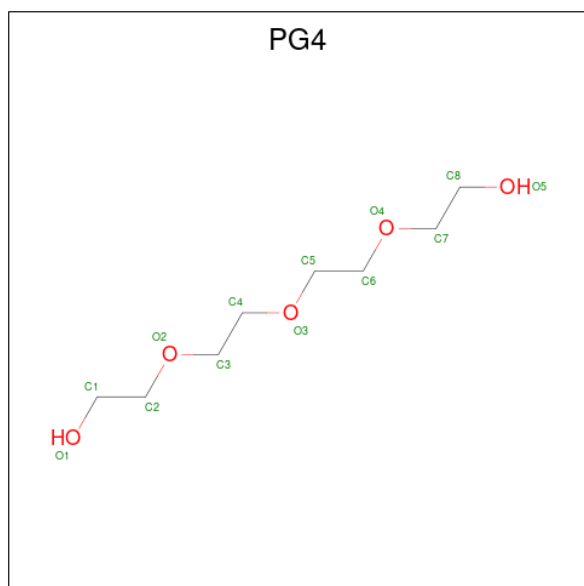
- Molecule 7 is CADMIUM ION (three-letter code: CD) (formula: Cd).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	17	Total	Cd	0	0
			17	17		

- Molecule 8 is SODIUM ION (three-letter code: NA) (formula: Na).

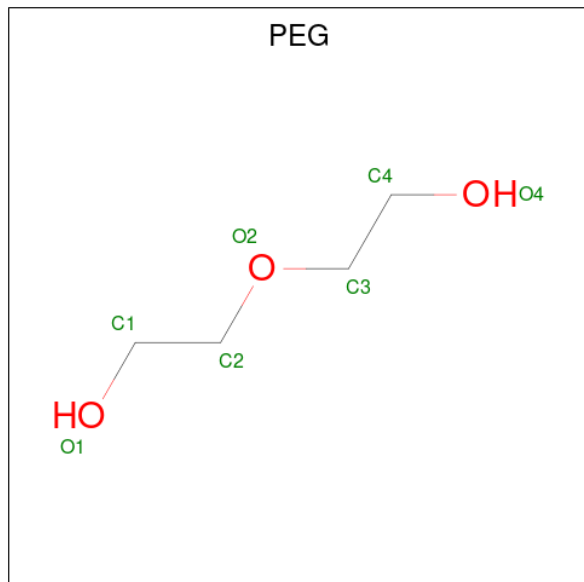
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	6	Total	Na	0	0
			6	6		

- Molecule 9 is TETRAETHYLENE GLYCOL (three-letter code: PG4) (formula: C₈H₁₈O₅).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	A	1	Total	C	O	0	0
			12	8	4		

- Molecule 10 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: $C_4H_{10}O_3$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
10	A	1	Total C O 7 4 3	0	0

- Molecule 11 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
11	A	1	Total Ca 1 1	0	0

- Molecule 12 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
12	A	1	Total Cl 1 1	0	0

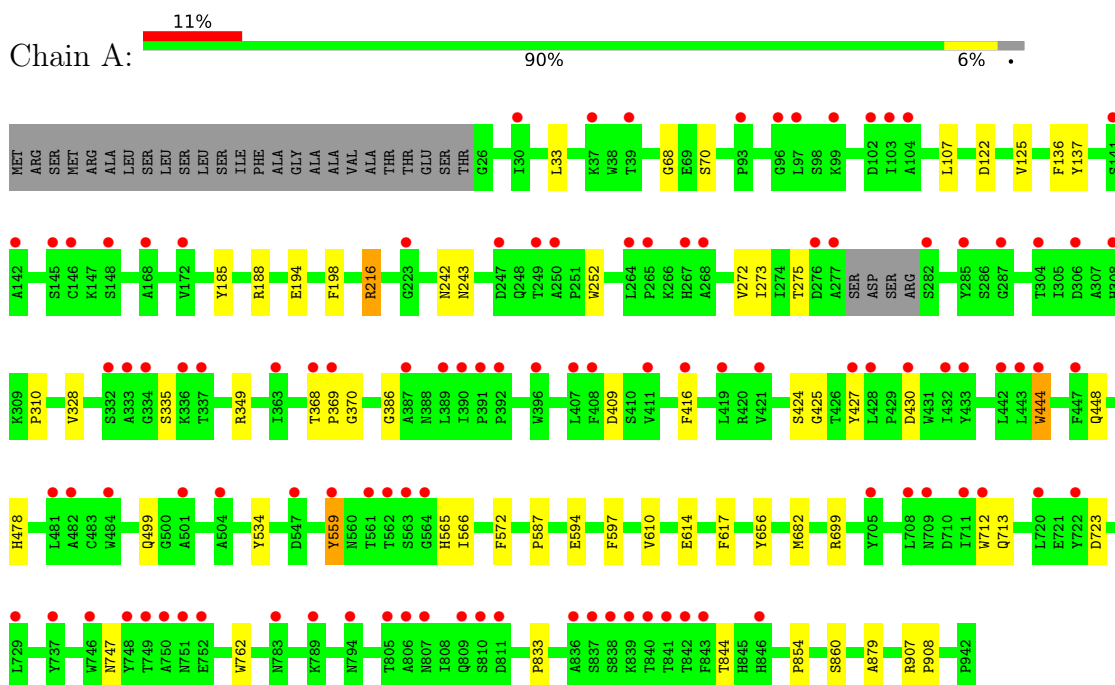
- Molecule 13 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
13	A	741	Total O 741 741	0	0

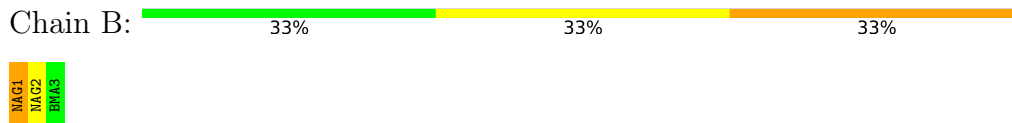
3 Residue-property plots [i](#)

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

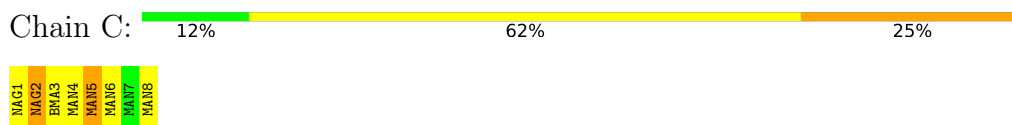
- Molecule 1: BETA-MANNOSIDASE



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



- Molecule 3: alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-6)-alpha-D-mannopyranose-(1-6)-[alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 4: alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(2-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain D:

100%

MAG1
MAG2
BMA3
MAN4
MAN5
MAN6

- Molecule 5: alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-6)]alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain E:

100%

MAG1
MAG2
BMA3
MAN4
MAN5
MAN6
MAN7
MAN8
MAN9
MAN10
MAN11

4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	166.46Å 166.46Å 121.45Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	117.70 – 1.90 48.30 – 1.90	Depositor EDS
% Data completeness (in resolution range)	98.8 (117.70-1.90) 98.8 (48.30-1.90)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.21 (at 1.90Å)	Xtrriage
Refinement program	REFMAC 5.8.0049	Depositor
R, R_{free}	0.234 , 0.263 0.239 , 0.265	Depositor DCC
R_{free} test set	6636 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	25.4	Xtrriage
Anisotropy	0.511	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 52.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	8456	wwPDB-VP
Average B, all atoms (Å ²)	47.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.01% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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: NA, NAG, MAN, CL, BMA, CA, PG4, PEG, CD

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	0.67	0/7479	0.72	4/10243 (0.0%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	723	ASP	CB-CG-OD1	6.79	124.41	118.30
1	A	409	ASP	CB-CG-OD1	6.43	124.09	118.30
1	A	723	ASP	CB-CG-OD2	-6.22	112.70	118.30
1	A	188	ARG	NE-CZ-NH2	5.04	122.82	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	424	SER	Peptide

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	7241	0	6832	39	0
2	B	39	0	34	1	0
3	C	94	0	79	1	0
4	D	72	0	61	0	0
5	E	127	0	105	0	0
6	A	98	0	90	0	0
7	A	17	0	0	0	1
8	A	6	0	0	0	0
9	A	12	0	15	0	0
10	A	7	0	10	0	0
11	A	1	0	0	0	0
12	A	1	0	0	1	0
13	A	741	0	0	7	1
All	All	8456	0	7226	40	1

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 3.

The worst 5 of 40 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)
3:C:2:NAG:H81	3:C:5:MAN:O6	1.81	0.80
1:A:194:GLU:HG3	1:A:425:GLY:HA2	1.67	0.75
1:A:597:PHE:HB2	1:A:682:MET:CE	2.26	0.66
1:A:565:HIS:NE2	12:A:1033:CL:CL	2.58	0.65
1:A:597:PHE:HB2	1:A:682:MET:HE1	1.80	0.64

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:A:1011:CD:CD	13:A:1192:HOH:O[3_545]	2.16	0.04

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 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	915/942 (97%)	891 (97%)	24 (3%)	0	100 100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all 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	777/811 (96%)	766 (99%)	11 (1%)	67 65

5 of 11 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	559	TYR
1	A	699	ARG
1	A	907	ARG
1	A	712	TRP
1	A	349[B]	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	123	HIS
1	A	243	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

28 monosaccharides are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	NAG	B	1	2,1	14,14,15	0.65	0	17,19,21	1.16	1 (5%)
2	NAG	B	2	2	14,14,15	0.65	0	17,19,21	0.93	1 (5%)
2	BMA	B	3	2	11,11,12	0.52	0	15,15,17	0.76	0
3	NAG	C	1	3,1	14,14,15	0.80	1 (7%)	17,19,21	0.90	0
3	NAG	C	2	3	14,14,15	0.66	0	17,19,21	1.30	2 (11%)
3	BMA	C	3	3	11,11,12	0.78	0	15,15,17	1.10	2 (13%)
3	MAN	C	4	3	11,11,12	0.61	0	15,15,17	2.07	3 (20%)
3	MAN	C	5	3	11,11,12	0.77	0	15,15,17	1.50	2 (13%)
3	MAN	C	6	3	11,11,12	0.68	0	15,15,17	0.87	1 (6%)
3	MAN	C	7	3	11,11,12	0.62	0	15,15,17	0.87	0
3	MAN	C	8	3	11,11,12	0.53	0	15,15,17	1.04	1 (6%)
4	NAG	D	1	4,1	14,14,15	0.52	0	17,19,21	1.00	1 (5%)
4	NAG	D	2	4	14,14,15	0.74	0	17,19,21	1.21	1 (5%)
4	BMA	D	3	4	11,11,12	0.59	0	15,15,17	1.10	1 (6%)
4	MAN	D	4	4	11,11,12	0.63	0	15,15,17	1.27	2 (13%)
4	MAN	D	5	4	11,11,12	0.59	0	15,15,17	1.03	1 (6%)
4	MAN	D	6	4	11,11,12	0.95	0	13,15,17	2.05	2 (15%)
5	NAG	E	1	5,1	14,14,15	0.69	0	17,19,21	1.10	2 (11%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
5	MAN	E	10	5	11,11,12	0.78	1 (9%)	15,15,17	0.87	0
5	MAN	E	11	5	11,11,12	0.65	0	15,15,17	0.72	1 (6%)
5	NAG	E	2	5	14,14,15	0.79	0	17,19,21	0.97	1 (5%)
5	BMA	E	3	5	11,11,12	0.53	0	15,15,17	0.87	1 (6%)
5	MAN	E	4	5	11,11,12	0.58	0	15,15,17	1.12	2 (13%)
5	MAN	E	5	5	11,11,12	1.02	1 (9%)	15,15,17	1.11	2 (13%)
5	MAN	E	6	5	11,11,12	0.62	0	15,15,17	1.12	1 (6%)
5	MAN	E	7	5	11,11,12	1.40	1 (9%)	15,15,17	3.23	2 (13%)
5	MAN	E	8	5	11,11,12	0.75	0	15,15,17	1.52	4 (26%)
5	MAN	E	9	5	11,11,12	0.71	0	15,15,17	1.34	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	NAG	B	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	B	2	2	-	0/6/23/26	0/1/1/1
2	BMA	B	3	2	-	0/2/19/22	0/1/1/1
3	NAG	C	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	C	2	3	-	2/6/23/26	0/1/1/1
3	BMA	C	3	3	-	1/2/19/22	0/1/1/1
3	MAN	C	4	3	-	2/2/19/22	0/1/1/1
3	MAN	C	5	3	-	0/2/19/22	0/1/1/1
3	MAN	C	6	3	-	0/2/19/22	0/1/1/1
3	MAN	C	7	3	-	0/2/19/22	0/1/1/1
3	MAN	C	8	3	-	0/2/19/22	0/1/1/1
4	NAG	D	1	4,1	-	0/6/23/26	0/1/1/1
4	NAG	D	2	4	-	0/6/23/26	0/1/1/1
4	BMA	D	3	4	-	0/2/19/22	0/1/1/1
4	MAN	D	4	4	-	0/2/19/22	0/1/1/1
4	MAN	D	5	4	-	0/2/19/22	0/1/1/1
4	MAN	D	6	4	-	1/2/18/22	0/1/1/1
5	NAG	E	1	5,1	-	0/6/23/26	0/1/1/1
5	MAN	E	10	5	-	0/2/19/22	0/1/1/1
5	MAN	E	11	5	-	0/2/19/22	0/1/1/1
5	NAG	E	2	5	-	0/6/23/26	0/1/1/1
5	BMA	E	3	5	-	0/2/19/22	0/1/1/1
5	MAN	E	4	5	-	0/2/19/22	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	MAN	E	5	5	-	0/2/19/22	0/1/1/1
5	MAN	E	6	5	-	2/2/19/22	0/1/1/1
5	MAN	E	7	5	-	0/2/19/22	0/1/1/1
5	MAN	E	8	5	-	0/2/19/22	0/1/1/1
5	MAN	E	9	5	-	1/2/19/22	0/1/1/1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	E	7	MAN	O3-C3	-4.02	1.33	1.43
5	E	10	MAN	O5-C5	-2.19	1.39	1.43
3	C	1	NAG	C1-C2	2.07	1.55	1.52
5	E	5	MAN	O5-C1	-2.02	1.40	1.43

The worst 5 of 38 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	E	7	MAN	O3-C3-C2	11.67	132.35	109.99
3	C	4	MAN	C1-O5-C5	5.86	120.14	112.19
4	D	6	MAN	C3-C4-C5	5.27	115.22	109.97
4	D	6	MAN	C1-C2-C3	-4.50	100.55	110.91
3	C	4	MAN	O5-C5-C4	3.48	119.30	110.83

There are no chirality outliers.

5 of 9 torsion outliers are listed below:

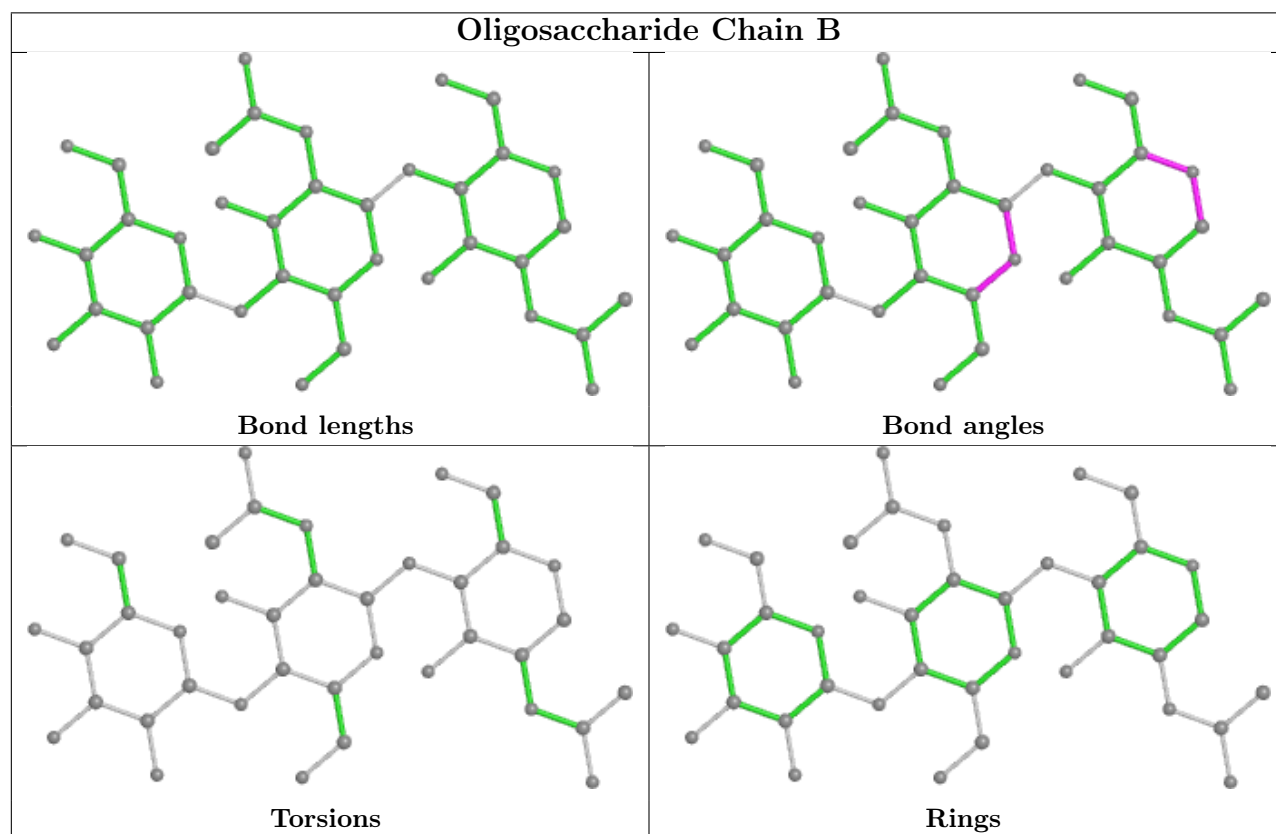
Mol	Chain	Res	Type	Atoms
3	C	4	MAN	O5-C5-C6-O6
3	C	2	NAG	C8-C7-N2-C2
3	C	2	NAG	O7-C7-N2-C2
5	E	6	MAN	O5-C5-C6-O6
5	E	6	MAN	C4-C5-C6-O6

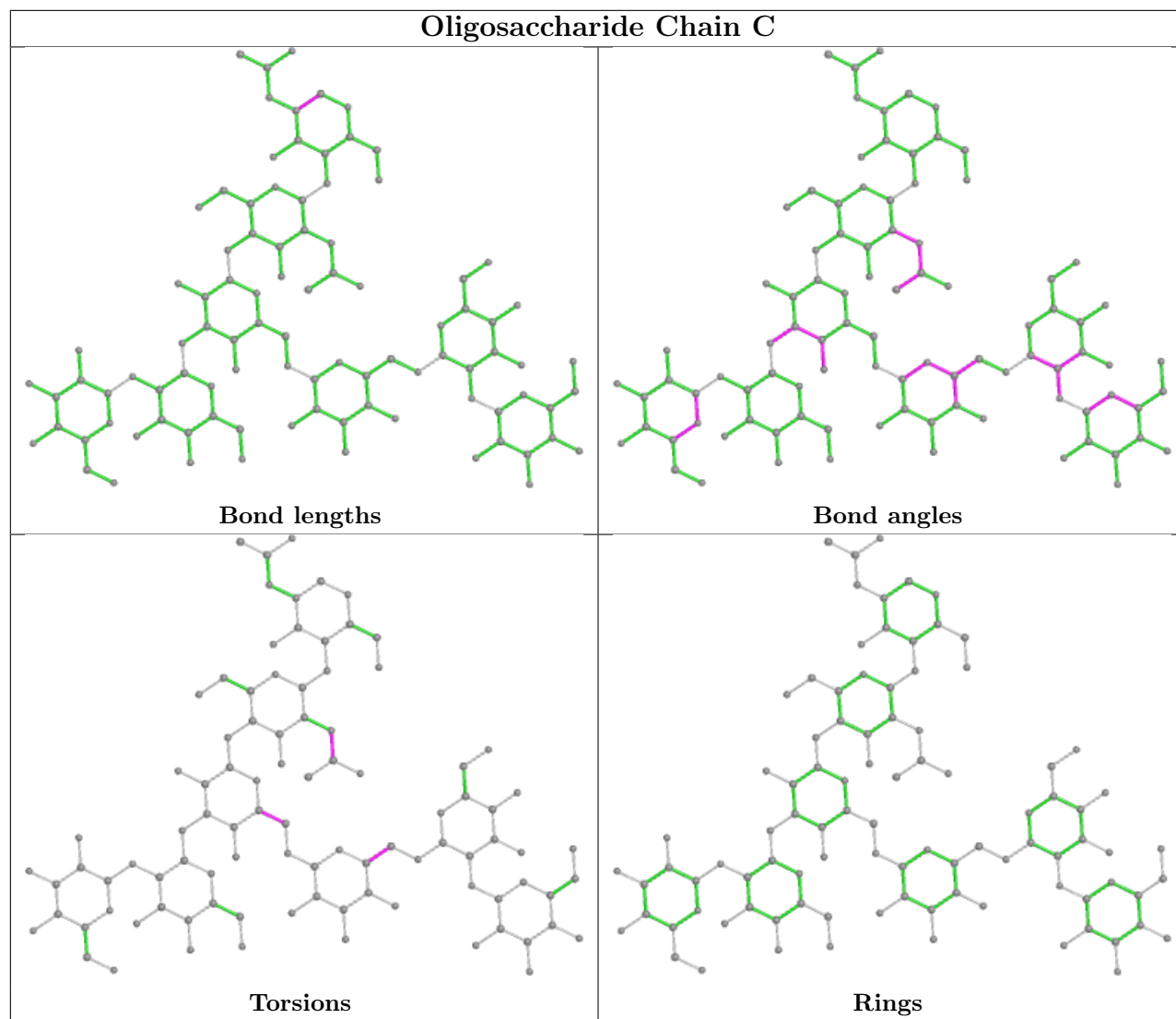
There are no ring outliers.

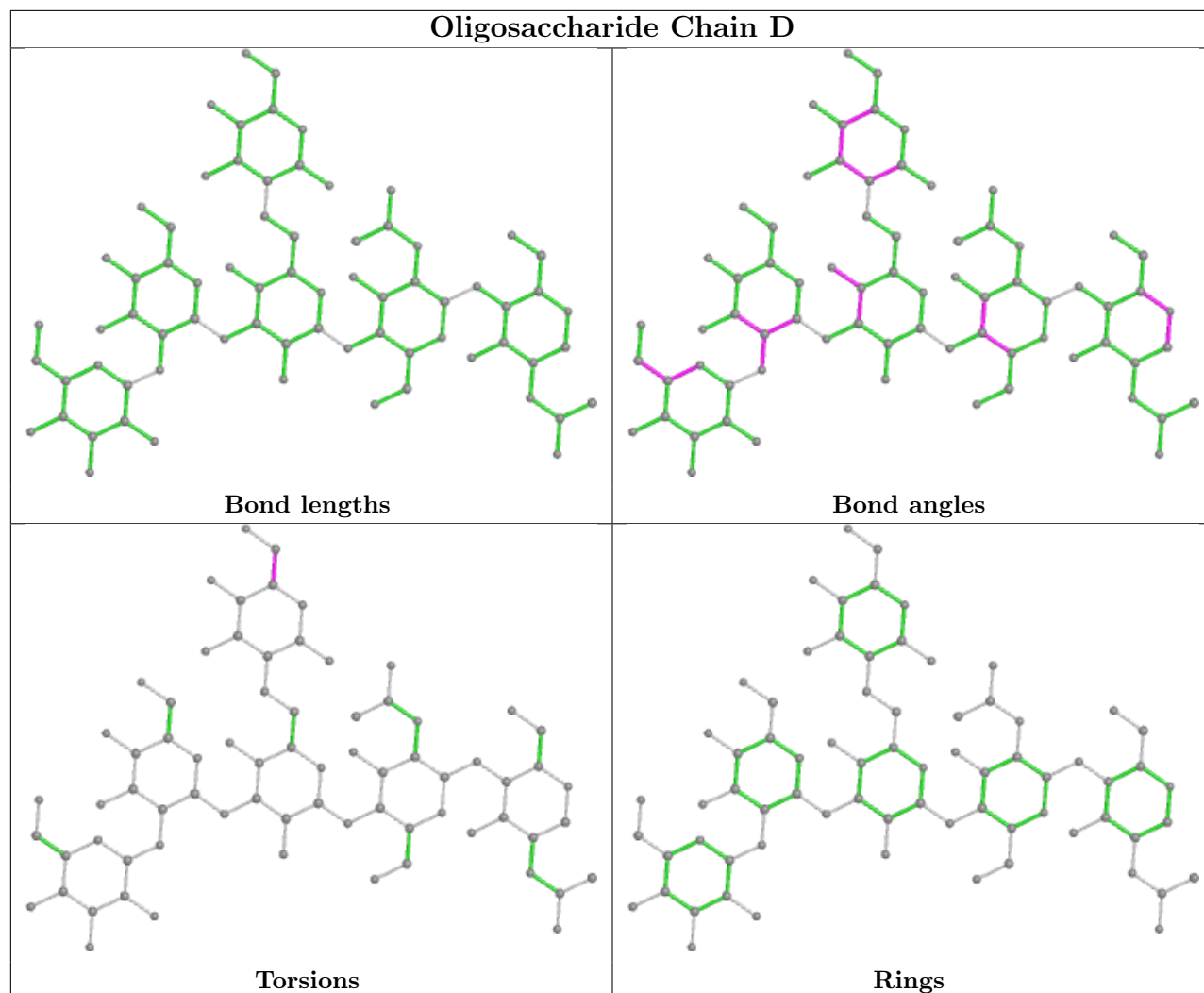
3 monomers are involved in 2 short contacts:

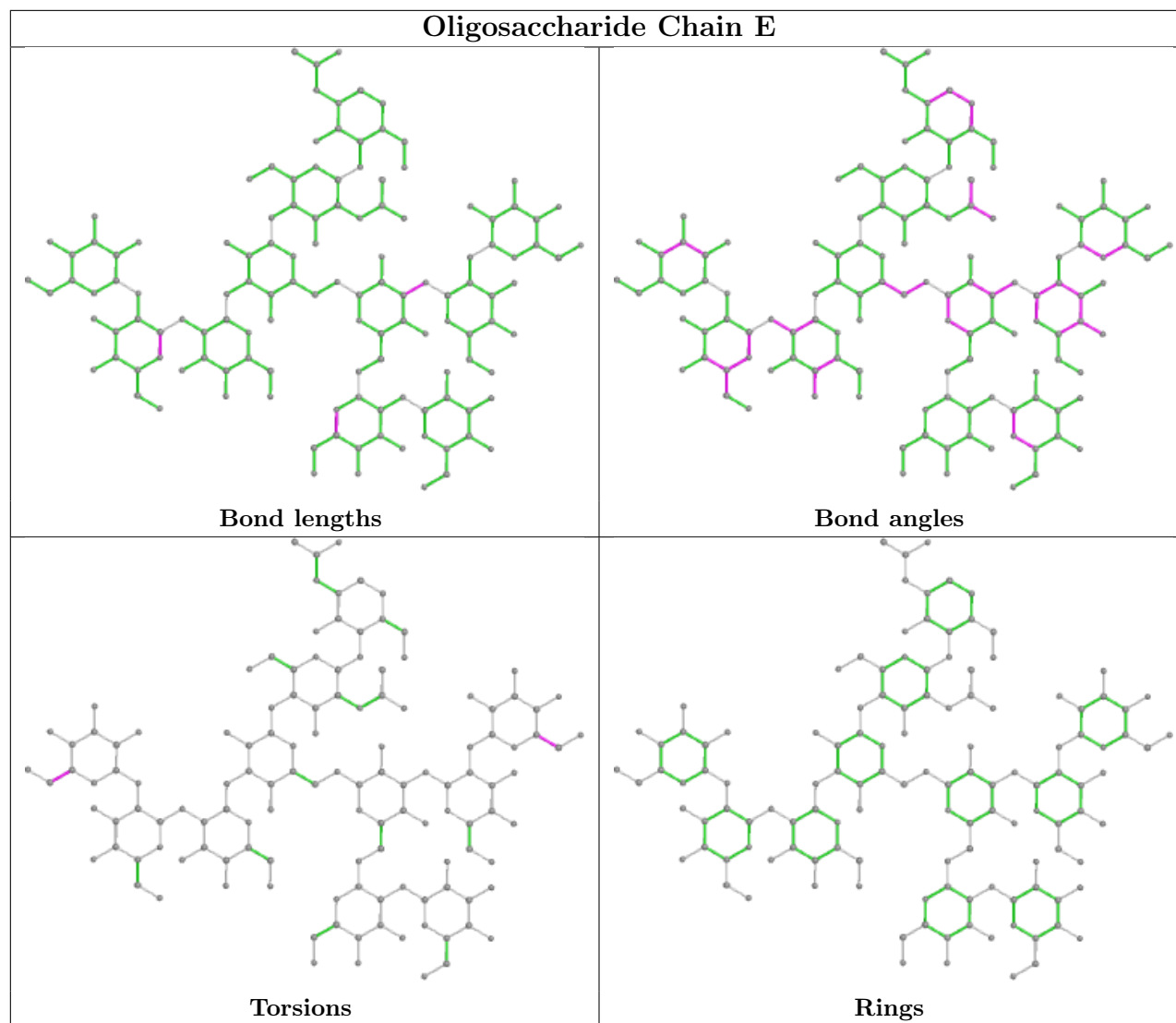
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	1	NAG	1	0
3	C	2	NAG	1	0
3	C	5	MAN	1	0

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









5.6 Ligand geometry [i](#)

Of 34 ligands modelled in this entry, 25 are monoatomic - leaving 9 for Mogul analysis.

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	$\# Z > 2$
9	PG4	A	1030	-	11,11,12	0.54	0	10,10,11	0.44	0
6	NAG	A	1007	1	14,14,15	0.50	0	17,19,21	1.08	0
6	NAG	A	1004	1	14,14,15	0.48	0	17,19,21	1.12	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
6	NAG	A	1001	1	14,14,15	0.96	1 (7%)	17,19,21	1.22	1 (5%)
10	PEG	A	1031	-	6,6,6	0.53	0	5,5,5	0.28	0
6	NAG	A	1002	-	14,14,15	0.66	0	19,19,21	2.14	7 (36%)
6	NAG	A	1006	1	14,14,15	0.54	0	17,19,21	1.02	1 (5%)
6	NAG	A	1003	1	14,14,15	0.93	1 (7%)	17,19,21	1.36	1 (5%)
6	NAG	A	1005	1	14,14,15	0.44	0	17,19,21	1.44	3 (17%)

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
9	PG4	A	1030	-	-	4/9/9/10	-
6	NAG	A	1007	1	-	0/6/23/26	0/1/1/1
6	NAG	A	1004	1	-	2/6/23/26	0/1/1/1
6	NAG	A	1001	1	-	0/6/23/26	0/1/1/1
10	PEG	A	1031	-	-	3/4/4/4	-
6	NAG	A	1002	-	-	4/6/22/26	0/1/1/1
6	NAG	A	1006	1	-	2/6/23/26	0/1/1/1
6	NAG	A	1003	1	-	0/6/23/26	0/1/1/1
6	NAG	A	1005	1	-	2/6/23/26	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	1001	NAG	O5-C1	-2.16	1.40	1.43
6	A	1003	NAG	O5-C1	-2.03	1.40	1.43

The worst 5 of 14 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	1002	NAG	C8-C7-N2	5.15	124.83	116.10
6	A	1003	NAG	C1-O5-C5	4.66	118.51	112.19
6	A	1002	NAG	C2-N2-C7	4.10	128.75	122.90
6	A	1004	NAG	C1-O5-C5	3.51	116.95	112.19
6	A	1001	NAG	C1-O5-C5	3.24	116.58	112.19

There are no chirality outliers.

5 of 17 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	1005	NAG	O5-C5-C6-O6
6	A	1005	NAG	C4-C5-C6-O6
6	A	1002	NAG	C8-C7-N2-C2
6	A	1002	NAG	O7-C7-N2-C2
6	A	1004	NAG	O5-C5-C6-O6

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 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, 95th 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 ²)	Q<0.9
1	A	913/942 (96%)	0.74	106 (11%) 4 5	28, 45, 69, 105	1 (0%)

The worst 5 of 106 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	749	THR	7.7
1	A	839	LYS	6.2
1	A	750	ALA	5.9
1	A	334	GLY	5.7
1	A	838	SER	5.4

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, 95th 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 ²)	Q<0.9
3	MAN	C	4	11/12	0.64	0.44	63,65,67,68	0
4	MAN	D	6	11/12	0.72	0.23	65,66,68,70	0
3	NAG	C	2	14/15	0.80	0.19	44,48,53,54	0
5	MAN	E	7	11/12	0.80	0.20	47,51,53,53	0
2	BMA	B	3	11/12	0.82	0.34	54,57,59,62	0
5	MAN	E	6	11/12	0.83	0.21	52,57,61,65	0
3	MAN	C	8	11/12	0.84	0.18	57,61,64,69	0

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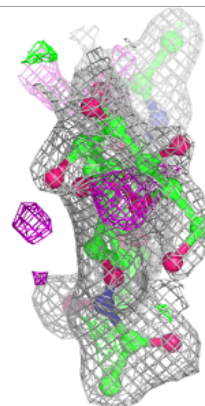
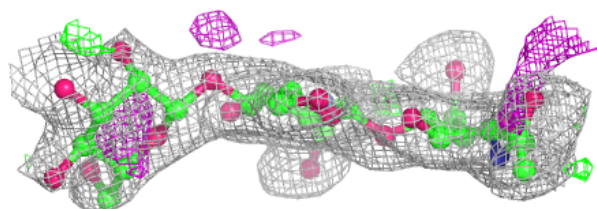
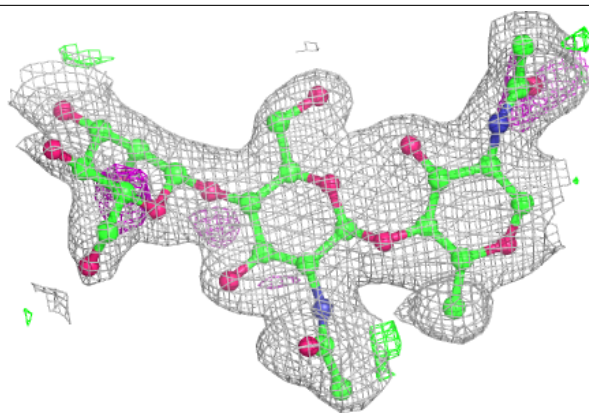
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
3	NAG	C	1	14/15	0.85	0.18	40,43,47,49	0
3	MAN	C	6	11/12	0.85	0.28	52,60,62,64	0
4	NAG	D	2	14/15	0.86	0.15	44,48,50,58	0
3	MAN	C	5	11/12	0.86	0.26	51,60,62,64	0
3	BMA	C	3	11/12	0.87	0.27	50,55,57,59	0
4	BMA	D	3	11/12	0.88	0.20	48,51,55,58	0
3	MAN	C	7	11/12	0.88	0.27	57,60,64,64	0
5	MAN	E	8	11/12	0.88	0.15	48,55,62,63	0
4	MAN	D	4	11/12	0.89	0.15	43,46,47,48	0
4	MAN	D	5	11/12	0.89	0.17	43,47,53,56	0
4	NAG	D	1	14/15	0.89	0.16	44,46,47,47	0
5	MAN	E	9	11/12	0.89	0.18	51,53,54,56	0
5	MAN	E	4	11/12	0.90	0.11	43,44,47,48	0
5	MAN	E	11	11/12	0.90	0.11	49,51,52,52	0
5	NAG	E	1	14/15	0.91	0.13	42,45,51,51	0
5	NAG	E	2	14/15	0.91	0.12	41,44,47,48	0
5	MAN	E	5	11/12	0.92	0.17	45,48,53,57	0
2	NAG	B	1	14/15	0.92	0.12	35,38,42,45	0
2	NAG	B	2	14/15	0.92	0.18	46,50,51,52	0
5	MAN	E	10	11/12	0.93	0.12	46,50,52,53	0
5	BMA	E	3	11/12	0.95	0.12	43,45,50,50	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.

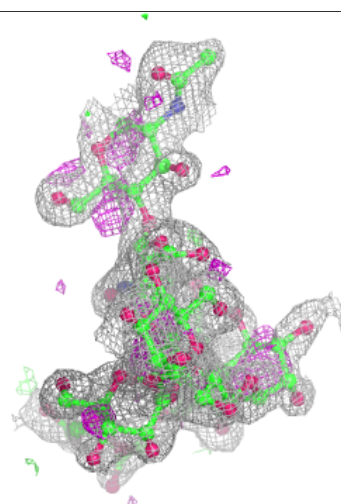
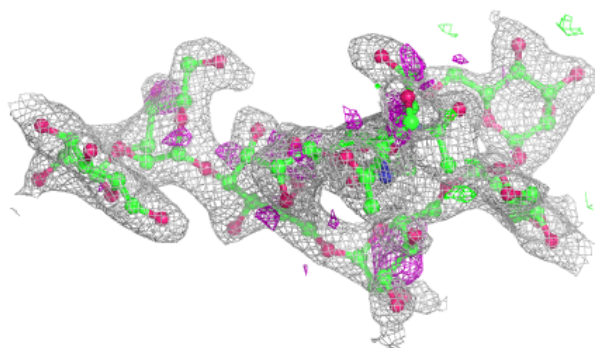
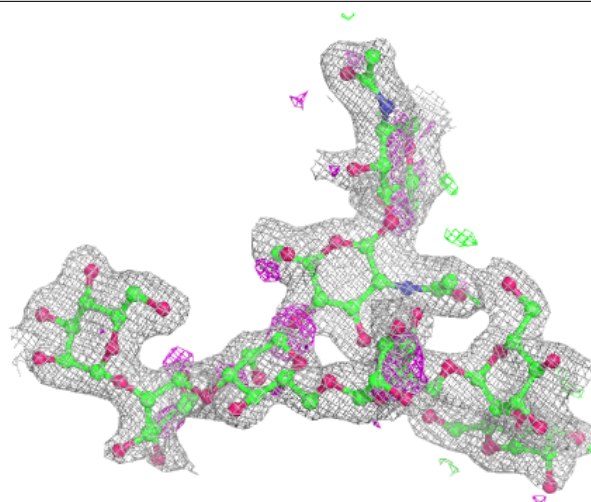
Electron density around Chain B:

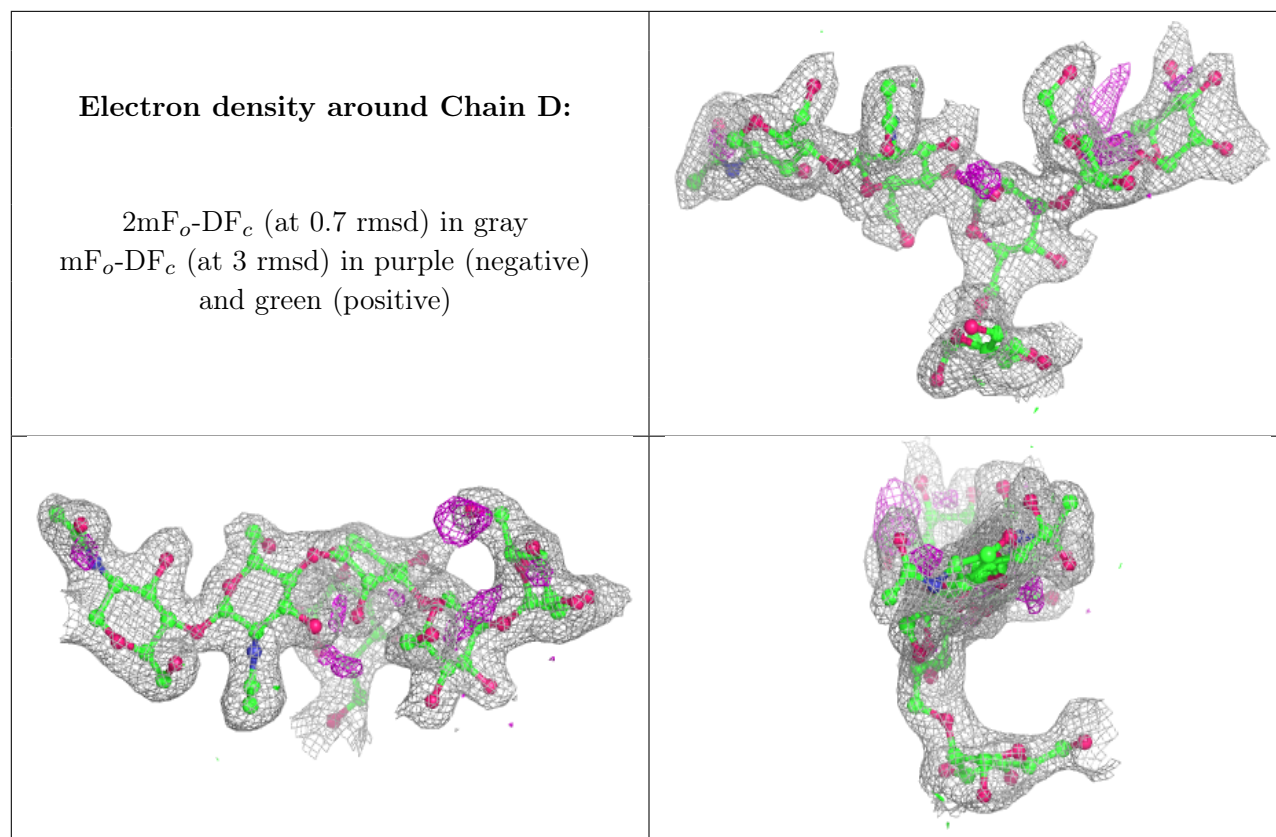
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

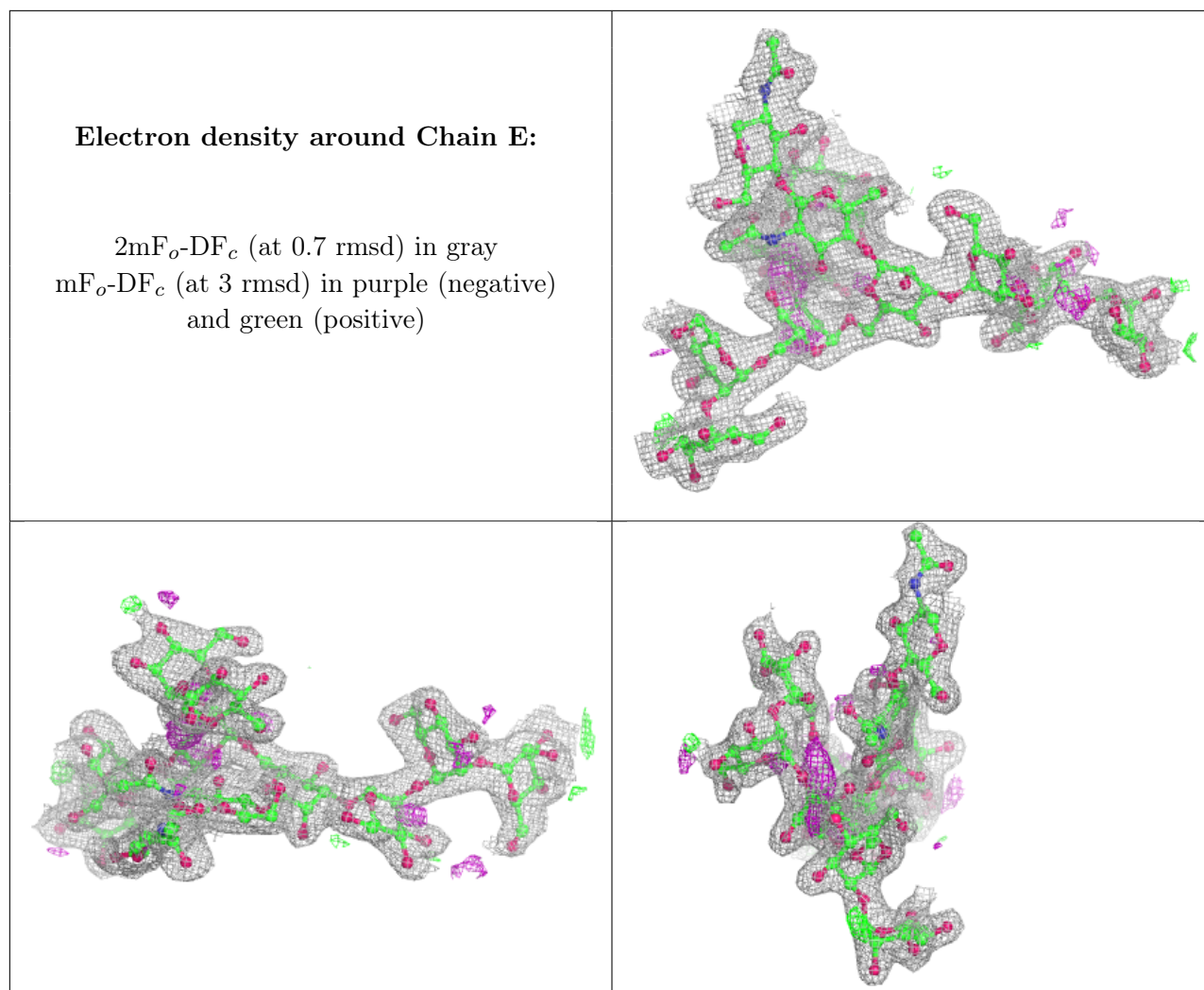


Electron density around Chain C:

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







6.4 Ligands [\(i\)](#)

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, 95th 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 ²)	Q<0.9
8	NA	A	1025	1/1	0.68	0.29	54,54,54,54	0
7	CD	A	1021	1/1	0.71	0.21	125,125,125,125	1
10	PEG	A	1031	7/7	0.78	0.19	58,60,62,64	0
9	PG4	A	1030	12/13	0.79	0.17	57,61,66,66	0
6	NAG	A	1005	14/15	0.79	0.31	56,60,63,68	0
6	NAG	A	1002	14/15	0.84	0.29	67,73,78,80	0
6	NAG	A	1006	14/15	0.84	0.31	54,59,68,70	0
6	NAG	A	1004	14/15	0.88	0.14	54,59,64,67	0
8	NA	A	1028	1/1	0.88	0.17	40,40,40,40	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
6	NAG	A	1003	14/15	0.89	0.14	39,44,48,48	0
6	NAG	A	1007	14/15	0.90	0.18	40,43,46,47	0
6	NAG	A	1001	14/15	0.90	0.20	46,51,55,57	0
12	CL	A	1033	1/1	0.90	0.14	49,49,49,49	0
7	CD	A	1023	1/1	0.91	0.39	44,44,44,44	0
7	CD	A	1012	1/1	0.91	0.06	72,72,72,72	0
7	CD	A	1024	1/1	0.92	0.62	44,44,44,44	0
7	CD	A	1019	1/1	0.93	0.05	80,80,80,80	0
8	NA	A	1027	1/1	0.93	0.28	30,30,30,30	0
7	CD	A	1014	1/1	0.94	0.08	76,76,76,76	0
8	NA	A	1029	1/1	0.95	0.19	33,33,33,33	0
11	CA	A	1032	1/1	0.95	0.09	54,54,54,54	0
8	NA	A	1026	1/1	0.95	0.29	48,48,48,48	0
7	CD	A	1022	1/1	0.96	0.17	87,87,87,87	1
7	CD	A	1020	1/1	0.96	0.10	77,77,77,77	0
7	CD	A	1013	1/1	0.96	0.08	52,52,52,52	0
8	NA	A	1034	1/1	0.97	0.33	37,37,37,37	0
7	CD	A	1011	1/1	0.98	0.07	50,50,50,50	0
7	CD	A	1015	1/1	0.98	0.09	51,51,51,51	0
7	CD	A	1016	1/1	0.98	0.05	59,59,59,59	0
7	CD	A	1017	1/1	0.98	0.08	81,81,81,81	0
7	CD	A	1018	1/1	0.98	0.07	74,74,74,74	0
7	CD	A	1009	1/1	0.98	0.08	43,43,43,43	0
7	CD	A	1010	1/1	0.98	0.10	58,58,58,58	0
7	CD	A	1008	1/1	0.99	0.10	39,39,39,39	0

6.5 Other polymers [\(i\)](#)

There are no such residues in this entry.