wwPDB X-ray Structure Validation Summary Report (i)

Sep 29, 2024 – 11:25 AM EDT

PDB ID	:	3PPS
Title	:	Crystal structure of an ascomycete fungal laccase from Thielavia arenaria
Authors	:	Kallio, J.P.; Rouvinen, J.; Hakulinen, N.
Deposited on	:	2010-11-25
Resolution	:	2.50 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 (i) 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 (i)) were used in the production of this report:

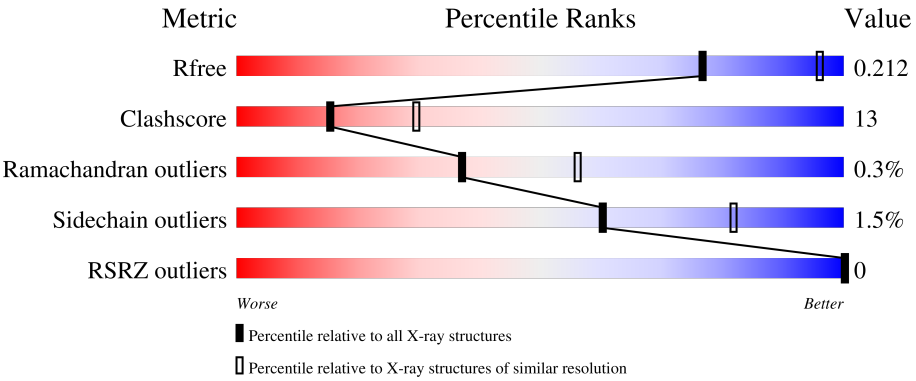
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

1 Overall quality at a glance (i)

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}	164625	5504 (2.50-2.50)
Clashscore	180529	6282 (2.50-2.50)
Ramachandran outliers	177936	6191 (2.50-2.50)
Sidechain outliers	177891	6193 (2.50-2.50)
RSRZ outliers	164620	5504 (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 >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5% The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	604	66% 27% • 7%
1	B	604	70% 23% 7%
1	C	604	70% 23% 7%
1	D	604	65% 27% • 7%
2	E	2	100%

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Mol	Chain	Length	Quality of chain
2	G	2	100%
2	H	2	100%
2	J	2	100%
2	K	2	100%
2	M	2	50% 50%
2	N	2	100%
2	Q	2	100%
3	F	6	33% 50% 17%
4	I	5	20% 40% 40%
4	P	5	20% 40% 40%
5	L	3	33% 67%
5	O	3	33% 33% 33%

2 Entry composition (i)

There are 9 unique types of molecules in this entry. The entry contains 18812 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.

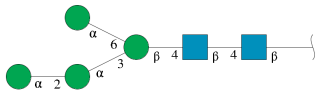
- Molecule 1 is a protein called Laccase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	564	Total	C	N	O	S	0	0	0
			4406	2793	776	821	16			
1	B	564	Total	C	N	O	S	0	0	0
			4406	2793	776	821	16			
1	C	564	Total	C	N	O	S	0	0	0
			4406	2793	776	821	16			
1	D	564	Total	C	N	O	S	0	0	0
			4406	2793	776	821	16			

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

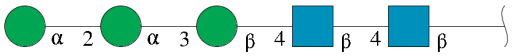
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	E	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	G	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	H	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	J	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	K	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	M	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	N	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	Q	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 3 is an oligosaccharide called alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-[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.



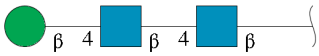
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	F	6	Total	C	N	O	0	0	0
			72	40	2	30			

- Molecule 4 is an oligosaccharide called 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
4	I	5	Total	C	N	O	0	0	0
			61	34	2	25			
4	P	5	Total	C	N	O	0	0	0
			61	34	2	25			

- Molecule 5 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.

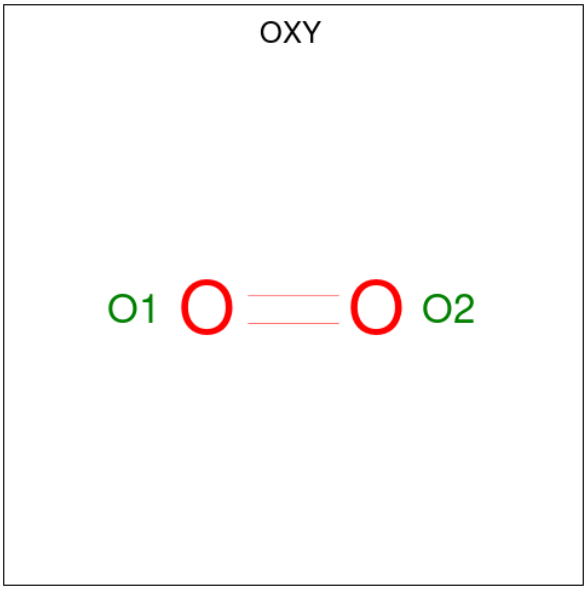


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	L	3	Total	C	N	O	0	0	0
			39	22	2	15			
5	O	3	Total	C	N	O	0	0	0
			39	22	2	15			

- Molecule 6 is COPPER (II) ION (three-letter code: CU) (formula: Cu).

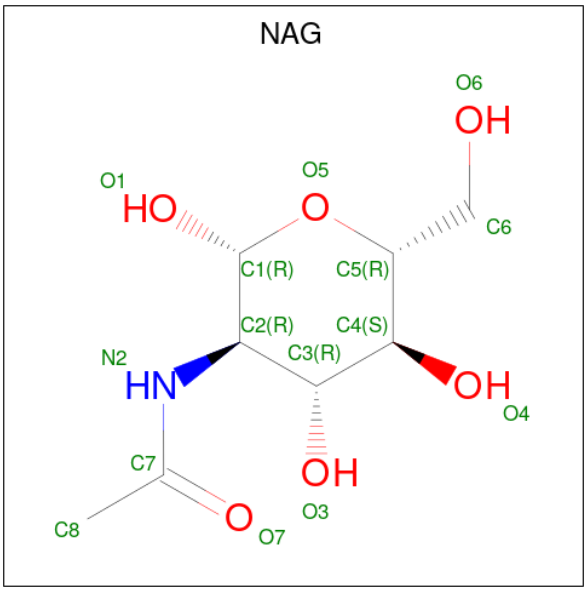
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	4	Total Cu 4 4	0	0
6	B	4	Total Cu 4 4	0	0
6	C	4	Total Cu 4 4	0	0
6	D	4	Total Cu 4 4	0	0

- Molecule 7 is OXYGEN MOLECULE (three-letter code: OXY) (formula: O_2).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total O 2 2	0	0

- Molecule 8 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).



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

- Molecule 9 is water.

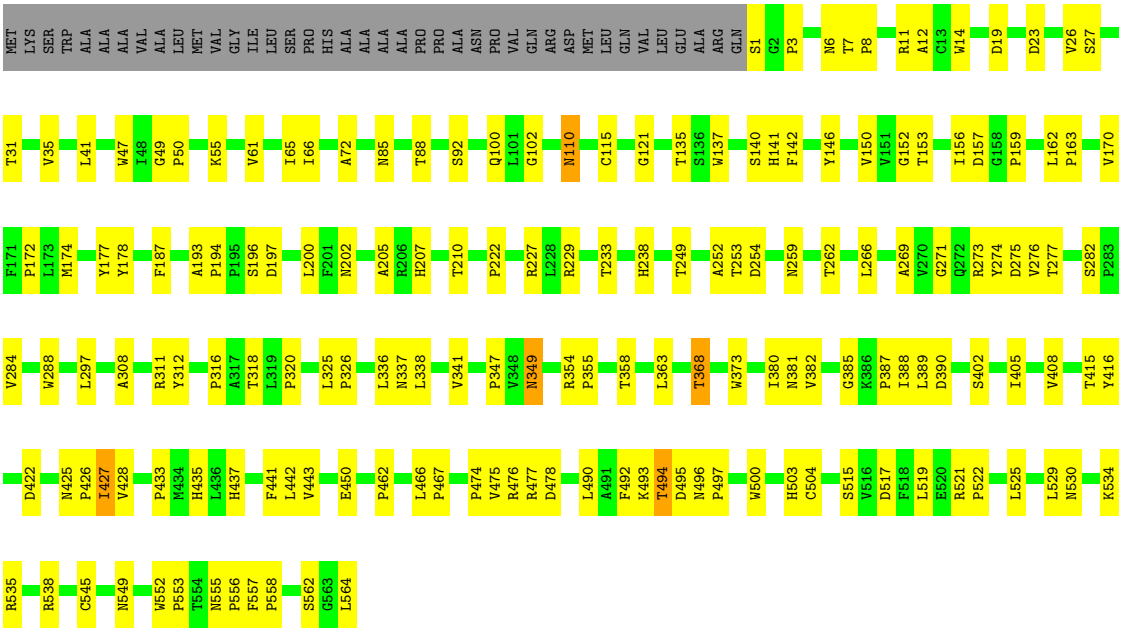
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	A	159	Total O 159 159	0	0
9	B	138	Total O 138 138	0	0
9	C	124	Total O 124 124	0	0
9	D	141	Total O 141 141	0	0

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.

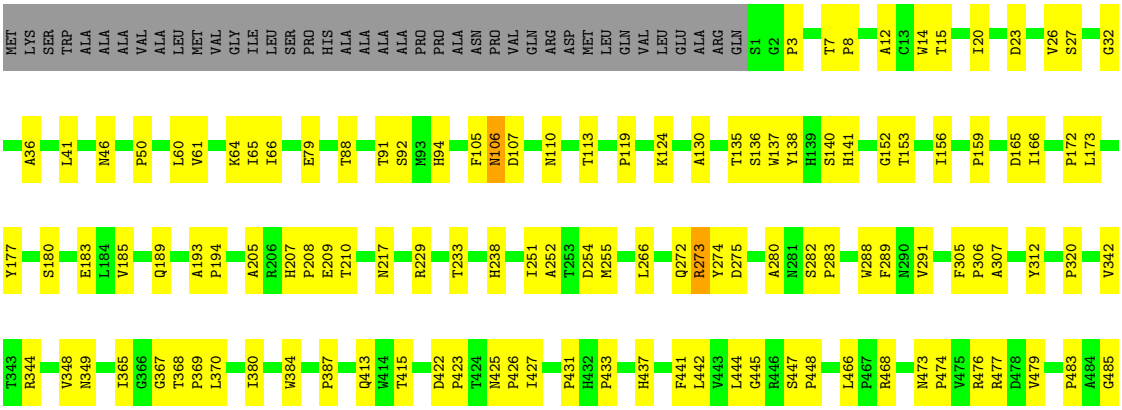
• Molecule 1: Laccase

Chain A:



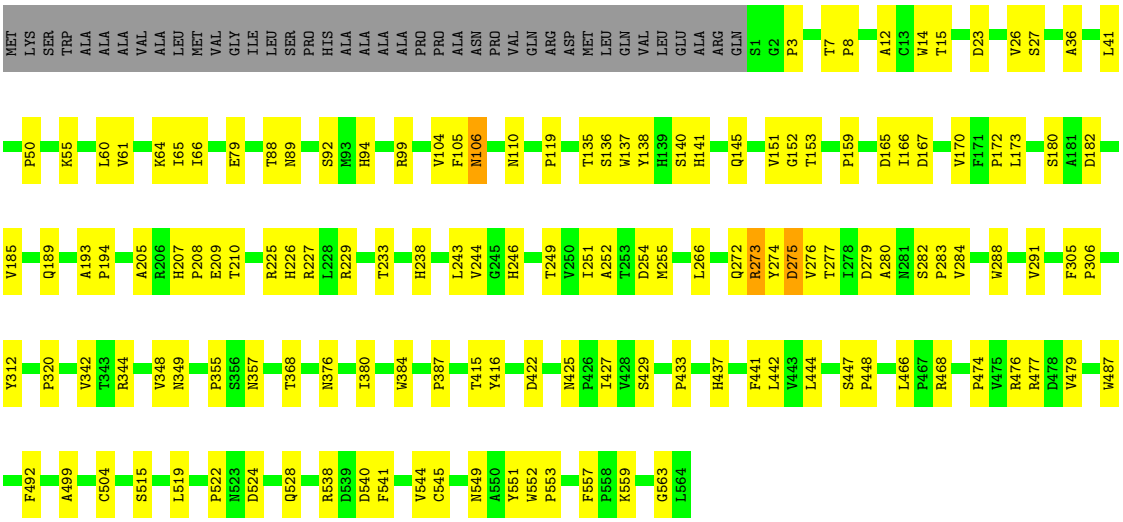
• Molecule 1: Laccase

Chain B:



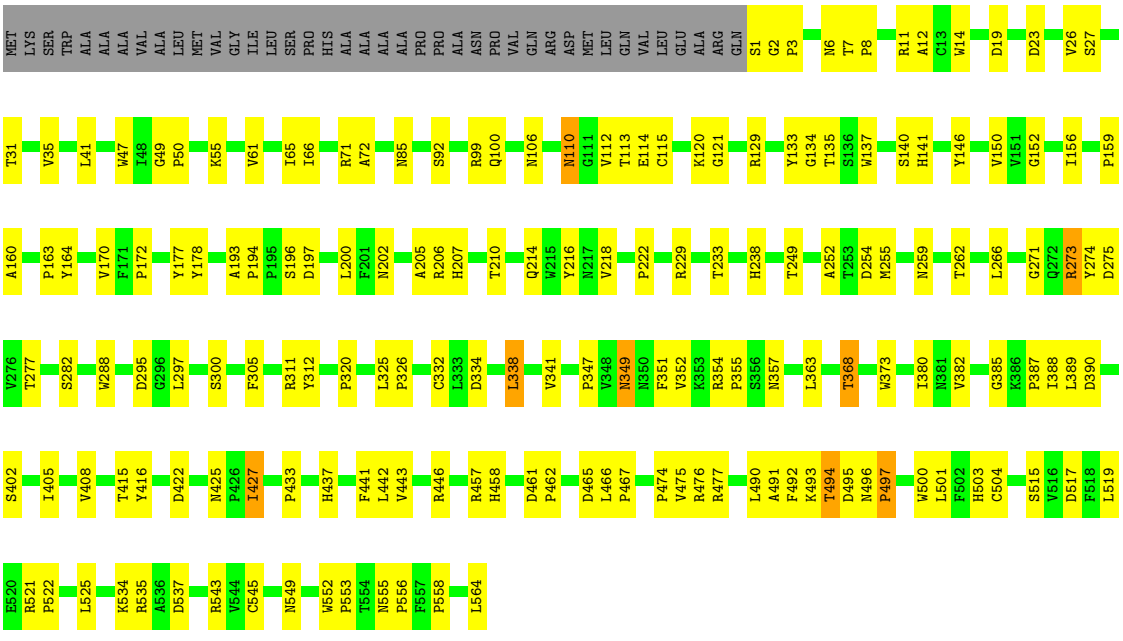
• Molecule 1: Laccase

Chain C:



• Molecule 1: Laccase

Chain D:

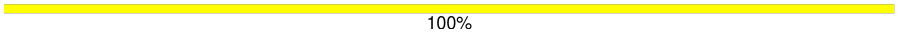


• Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain E:

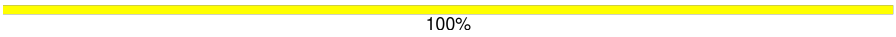
• Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain G:



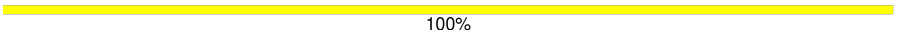
• Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain H:



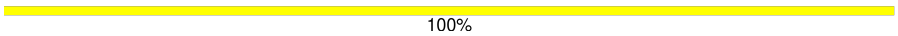
• Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain J:



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

Chain K:



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

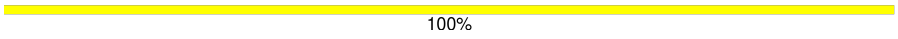
Chain M:

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

Chain N:

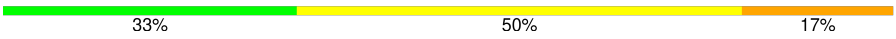
• Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain Q:



• Molecule 3: alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-[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 F:



• Molecule 4: 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

Chain I:

• Molecule 4: 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

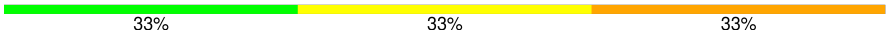
Chain P:

• Molecule 5: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain L:

• Molecule 5: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain O:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	61.36Å 178.95Å 118.13Å 90.00° 90.26° 90.00°	Depositor
Resolution (Å)	42.65 – 2.50 42.65 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.9 (42.65-2.50) 98.6 (42.65-2.50)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.63 (at 2.51Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.5_2)	Depositor
R, R_{free}	0.182 , 0.222 0.182 , 0.212	Depositor DCC
R_{free} test set	4402 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å^2)	12.6	Xtriage
Anisotropy	1.837	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 0.6	EDS
L-test for twinning[2]	$< \|L\| > = 0.39$, $< L^2 > = 0.21$	Xtriage
Estimated twinning fraction	0.319 for h,-k,-l	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	18812	wwPDB-VP
Average B, all atoms (Å^2)	20.0	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 37.22 % 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 4.4366e-04.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: OXY, MAN, NAG, CU, BMA

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\#\|Z\| > 5$	RMSZ	$\#\|Z\| > 5$
1	A	0.36	0/4539	0.53	0/6219
1	B	0.36	0/4539	0.53	0/6219
1	C	0.35	0/4539	0.53	0/6219
1	D	0.35	0/4539	0.53	0/6219
All	All	0.35	0/18156	0.53	0/24876

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4406	0	4223	129	0
1	B	4406	0	4223	105	0
1	C	4406	0	4224	103	0
1	D	4406	0	4225	136	0
2	E	28	0	25	4	0
2	G	28	0	25	0	0
2	H	28	0	25	0	0
2	J	28	0	25	2	0
2	K	28	0	25	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	M	28	0	25	1	0
2	N	28	0	25	4	0
2	Q	28	0	25	0	0
3	F	72	0	61	1	0
4	I	61	0	52	2	0
4	P	61	0	52	4	0
5	L	39	0	34	3	0
5	O	39	0	34	1	0
6	A	4	0	0	0	0
6	B	4	0	0	0	0
6	C	4	0	0	0	0
6	D	4	0	0	0	0
7	A	2	0	0	0	0
8	A	42	0	39	1	0
8	B	42	0	39	0	0
8	C	14	0	13	0	0
8	D	14	0	13	1	0
9	A	159	0	0	12	0
9	B	138	0	0	15	0
9	C	124	0	0	14	0
9	D	141	0	0	28	0
All	All	18812	0	17432	473	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 13.

The worst 5 of 473 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:376:ASN:HD22	2:N:1:NAG:H83	1.35	0.92
1:A:253:THR:HG21	1:A:338:LEU:HD12	1.59	0.83
1:D:207:HIS:HD2	1:D:210:THR:H	1.27	0.82
1:A:207:HIS:HD2	1:A:210:THR:H	1.28	0.81
1:C:104:VAL:HG11	9:C:694:HOH:O	1.79	0.81

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all 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	562/604 (93%)	517 (92%)	42 (8%)	3 (0%)	25	44
1	B	562/604 (93%)	502 (89%)	60 (11%)	0	100	100
1	C	562/604 (93%)	505 (90%)	57 (10%)	0	100	100
1	D	562/604 (93%)	515 (92%)	44 (8%)	3 (0%)	25	44
All	All	2248/2416 (93%)	2039 (91%)	203 (9%)	6 (0%)	37	56

5 of 6 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	494	THR
1	D	494	THR
1	A	284	VAL
1	D	222	PRO
1	D	497	PRO

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	484/513 (94%)	477 (99%)	7 (1%)	62	83
1	B	484/513 (94%)	476 (98%)	8 (2%)	56	79
1	C	484/513 (94%)	477 (99%)	7 (1%)	62	83
1	D	484/513 (94%)	476 (98%)	8 (2%)	56	79
All	All	1936/2052 (94%)	1906 (98%)	30 (2%)	60	82

5 of 30 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	466	LEU
1	D	349	ASN
1	C	141	HIS
1	D	427	ILE
1	D	273	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 17 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	103	ASN
1	D	237	ASN
1	B	240	GLN
1	C	10	ASN
1	C	103	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)

38 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	E	1	1,2	14,14,15	0.50	0	17,19,21	1.64	4 (23%)
2	NAG	E	2	2	14,14,15	0.42	0	17,19,21	1.61	2 (11%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
3	NAG	F	1	3,1	14,14,15	0.55	0	17,19,21	1.01	0
3	NAG	F	2	3	14,14,15	0.61	0	17,19,21	1.70	4 (23%)
3	BMA	F	3	3	11,11,12	0.51	0	15,15,17	1.01	0
3	MAN	F	4	3	11,11,12	0.83	1 (9%)	15,15,17	1.18	3 (20%)
3	MAN	F	5	3	11,11,12	0.88	0	15,15,17	1.72	4 (26%)
3	MAN	F	6	3	11,11,12	0.46	0	15,15,17	0.81	1 (6%)
2	NAG	G	1	1,2	14,14,15	0.67	0	17,19,21	1.29	2 (11%)
2	NAG	G	2	2	14,14,15	0.54	0	17,19,21	1.02	1 (5%)
2	NAG	H	1	1,2	14,14,15	0.52	0	17,19,21	1.54	3 (17%)
2	NAG	H	2	2	14,14,15	0.51	0	17,19,21	1.29	2 (11%)
4	NAG	I	1	4,1	14,14,15	0.75	0	17,19,21	1.15	2 (11%)
4	NAG	I	2	4	14,14,15	0.64	0	17,19,21	0.93	0
4	BMA	I	3	4	11,11,12	0.67	0	15,15,17	0.90	0
4	MAN	I	4	4	11,11,12	0.65	0	15,15,17	1.33	2 (13%)
4	MAN	I	5	4	11,11,12	0.48	0	15,15,17	1.62	5 (33%)
2	NAG	J	1	1,2	14,14,15	0.45	0	17,19,21	0.85	0
2	NAG	J	2	2	14,14,15	0.56	0	17,19,21	0.94	0
2	NAG	K	1	1,2	14,14,15	0.43	0	17,19,21	1.10	1 (5%)
2	NAG	K	2	2	14,14,15	0.52	0	17,19,21	0.86	0
5	NAG	L	1	5,1	14,14,15	0.55	0	17,19,21	0.83	0
5	NAG	L	2	5	14,14,15	0.43	0	17,19,21	1.23	1 (5%)
5	BMA	L	3	5	11,11,12	0.77	0	15,15,17	1.18	2 (13%)
2	NAG	M	1	1,2	14,14,15	0.67	0	17,19,21	1.26	1 (5%)
2	NAG	M	2	2	14,14,15	0.42	0	17,19,21	1.93	5 (29%)
2	NAG	N	1	1,2	14,14,15	0.53	0	17,19,21	1.19	1 (5%)
2	NAG	N	2	2	14,14,15	0.59	0	17,19,21	1.10	1 (5%)
5	NAG	O	1	5,1	14,14,15	0.44	0	17,19,21	1.45	1 (5%)
5	NAG	O	2	5	14,14,15	0.51	0	17,19,21	0.98	1 (5%)
5	BMA	O	3	5	11,11,12	0.60	0	15,15,17	0.60	0
4	NAG	P	1	4,1	14,14,15	0.49	0	17,19,21	1.64	3 (17%)
4	NAG	P	2	4	14,14,15	0.72	0	17,19,21	1.67	3 (17%)
4	BMA	P	3	4	11,11,12	0.66	0	15,15,17	0.81	0
4	MAN	P	4	4	11,11,12	0.74	0	15,15,17	1.50	3 (20%)
4	MAN	P	5	4	11,11,12	0.64	0	15,15,17	1.16	2 (13%)
2	NAG	Q	1	1,2	14,14,15	0.54	0	17,19,21	1.20	1 (5%)
2	NAG	Q	2	2	14,14,15	0.40	0	17,19,21	1.35	2 (11%)

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	E	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	E	2	2	-	2/6/23/26	0/1/1/1
3	NAG	F	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	F	2	3	-	5/6/23/26	0/1/1/1
3	BMA	F	3	3	-	2/2/19/22	0/1/1/1
3	MAN	F	4	3	-	0/2/19/22	0/1/1/1
3	MAN	F	5	3	-	2/2/19/22	0/1/1/1
3	MAN	F	6	3	-	2/2/19/22	0/1/1/1
2	NAG	G	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	G	2	2	-	1/6/23/26	0/1/1/1
2	NAG	H	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	H	2	2	-	4/6/23/26	0/1/1/1
4	NAG	I	1	4,1	-	0/6/23/26	0/1/1/1
4	NAG	I	2	4	-	2/6/23/26	0/1/1/1
4	BMA	I	3	4	-	0/2/19/22	0/1/1/1
4	MAN	I	4	4	-	0/2/19/22	0/1/1/1
4	MAN	I	5	4	-	2/2/19/22	0/1/1/1
2	NAG	J	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	J	2	2	-	2/6/23/26	0/1/1/1
2	NAG	K	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	K	2	2	-	2/6/23/26	0/1/1/1
5	NAG	L	1	5,1	-	1/6/23/26	0/1/1/1
5	NAG	L	2	5	-	3/6/23/26	0/1/1/1
5	BMA	L	3	5	-	0/2/19/22	0/1/1/1
2	NAG	M	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	M	2	2	-	2/6/23/26	0/1/1/1
2	NAG	N	1	1,2	-	3/6/23/26	0/1/1/1
2	NAG	N	2	2	-	0/6/23/26	0/1/1/1
5	NAG	O	1	5,1	-	4/6/23/26	0/1/1/1
5	NAG	O	2	5	-	3/6/23/26	0/1/1/1
5	BMA	O	3	5	-	2/2/19/22	0/1/1/1
4	NAG	P	1	4,1	-	4/6/23/26	0/1/1/1
4	NAG	P	2	4	-	0/6/23/26	0/1/1/1
4	BMA	P	3	4	-	1/2/19/22	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	MAN	P	4	4	-	2/2/19/22	0/1/1/1
4	MAN	P	5	4	-	1/2/19/22	0/1/1/1
2	NAG	Q	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	Q	2	2	-	2/6/23/26	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	F	4	MAN	O5-C1	-2.05	1.40	1.43

The worst 5 of 63 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	E	2	NAG	C1-O5-C5	4.96	118.83	112.19
5	O	1	NAG	C1-O5-C5	4.62	118.38	112.19
4	P	2	NAG	C4-C3-C2	4.60	117.76	111.02
2	M	2	NAG	C1-O5-C5	4.30	117.95	112.19
5	L	2	NAG	C2-N2-C7	-4.20	117.28	122.90

There are no chirality outliers.

5 of 64 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	E	1	NAG	C8-C7-N2-C2
2	E	1	NAG	O7-C7-N2-C2
2	K	2	NAG	C8-C7-N2-C2
2	K	2	NAG	O7-C7-N2-C2
3	F	2	NAG	C1-C2-N2-C7

There are no ring outliers.

18 monomers are involved in 26 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	N	2	NAG	1	0
2	E	2	NAG	1	0
4	I	1	NAG	1	0
2	J	2	NAG	2	0
4	I	4	MAN	1	0
2	E	1	NAG	3	0
5	L	2	NAG	2	0

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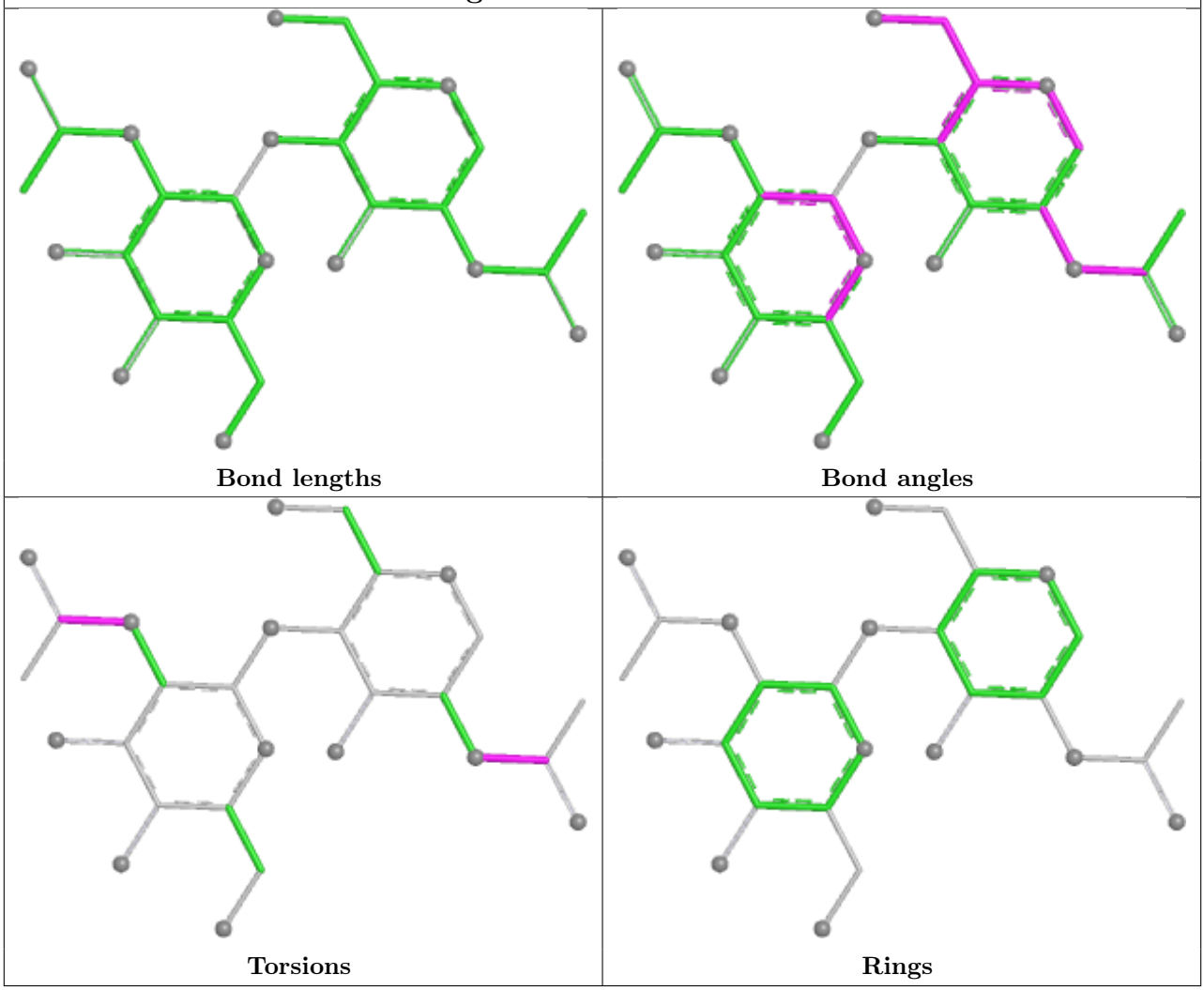
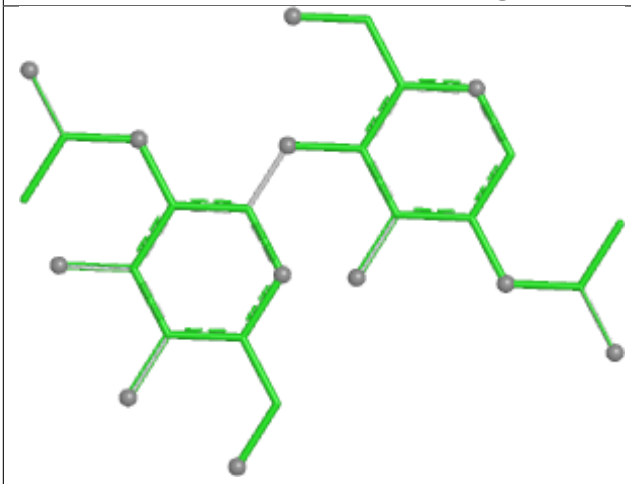
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	L	3	BMA	1	0
5	O	1	NAG	1	0
4	P	2	NAG	1	0
4	I	2	NAG	1	0
3	F	2	NAG	1	0
2	K	2	NAG	4	0
2	N	1	NAG	3	0
2	M	2	NAG	1	0
2	J	1	NAG	1	0
4	P	1	NAG	3	0
5	L	1	NAG	1	0

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

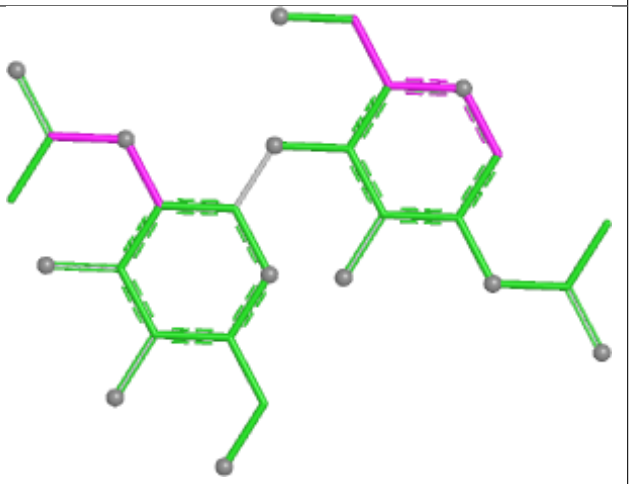
Oligosaccharide Chain E



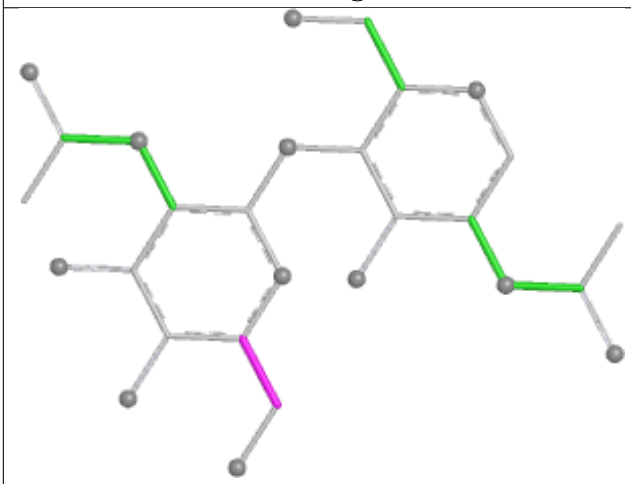
Oligosaccharide Chain G



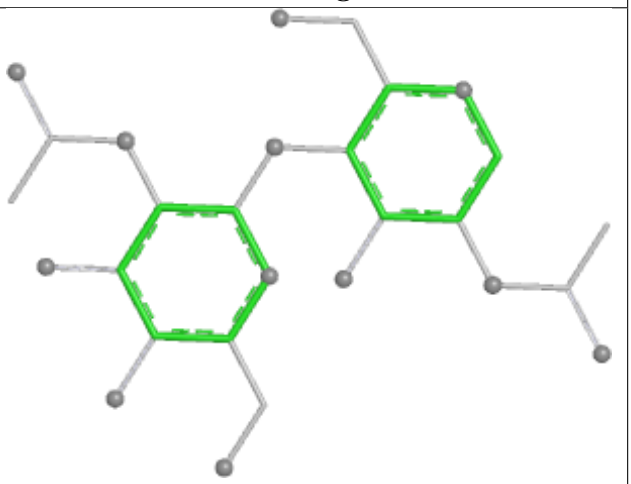
Bond lengths



Bond angles

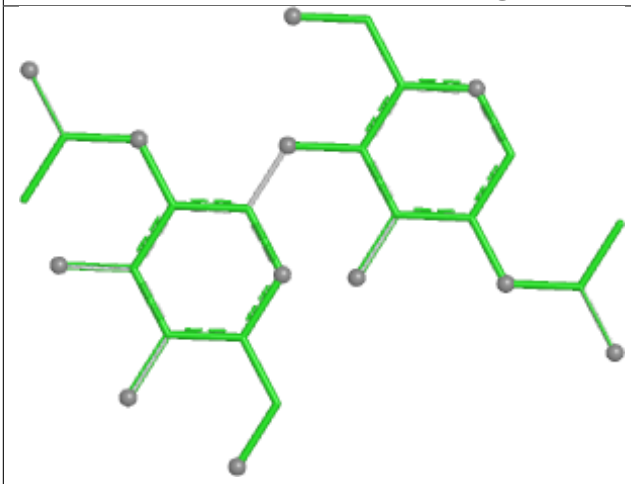


Torsions

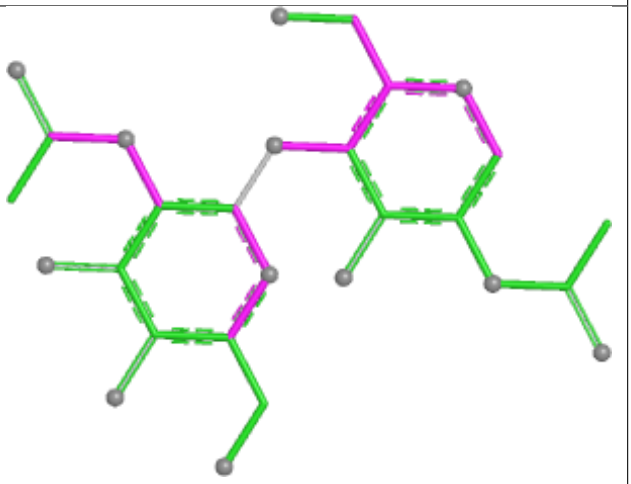


Rings

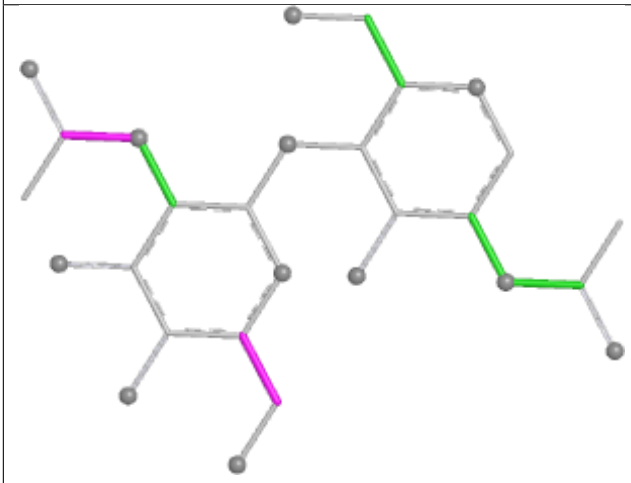
Oligosaccharide Chain H



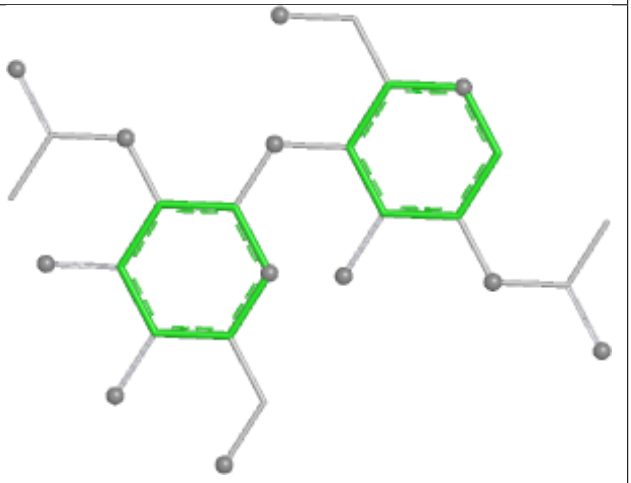
Bond lengths



Bond angles

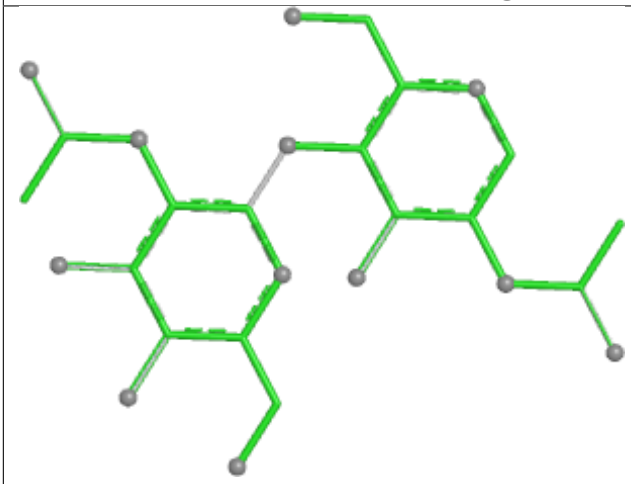


Torsions

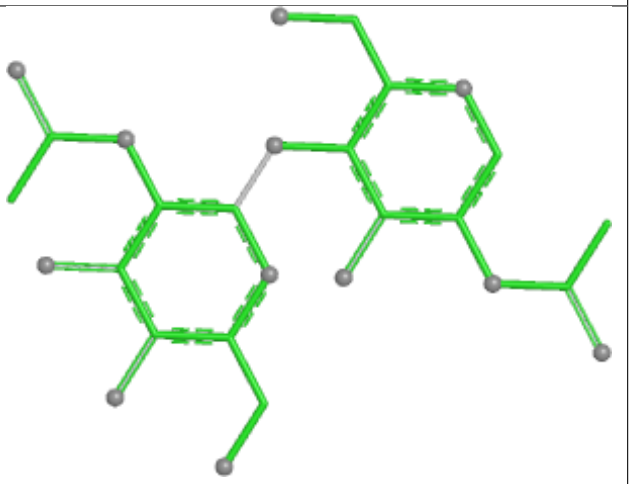


Rings

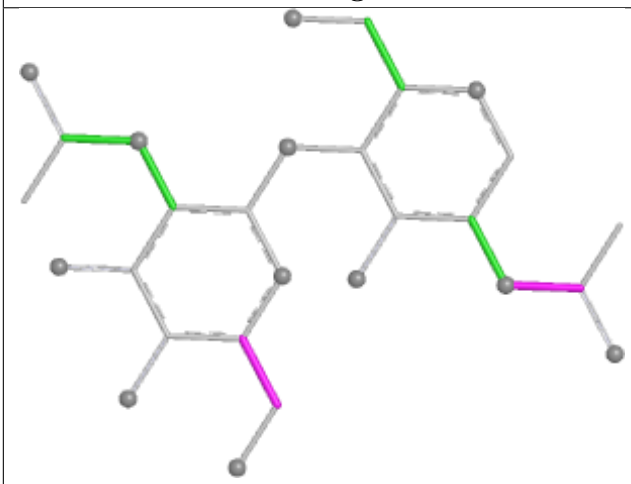
Oligosaccharide Chain J



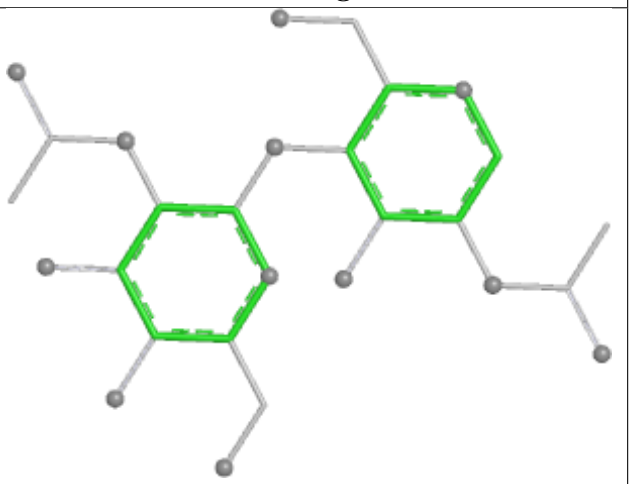
Bond lengths



Bond angles

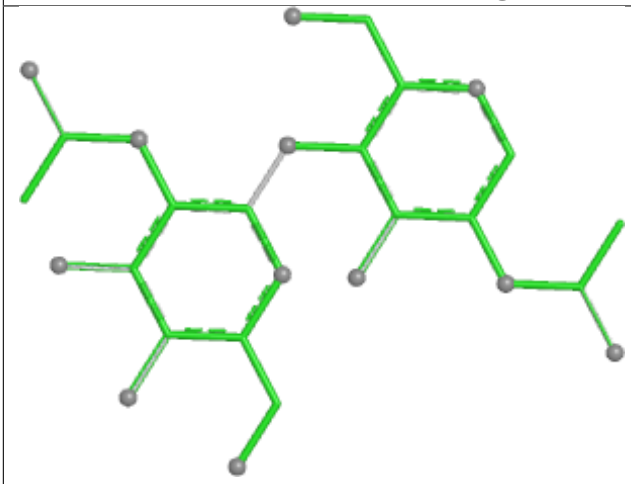


Torsions

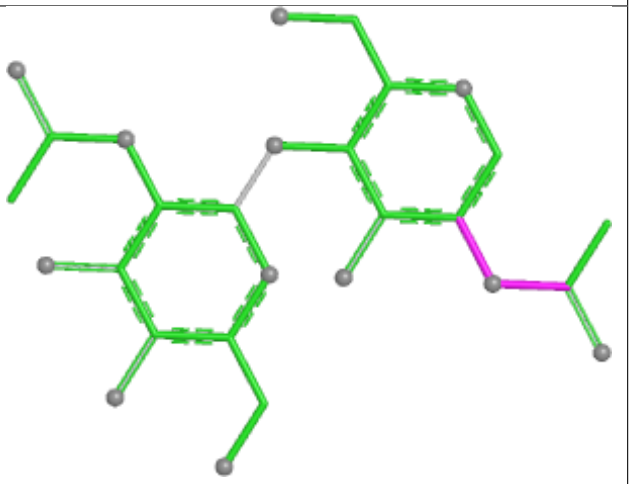


Rings

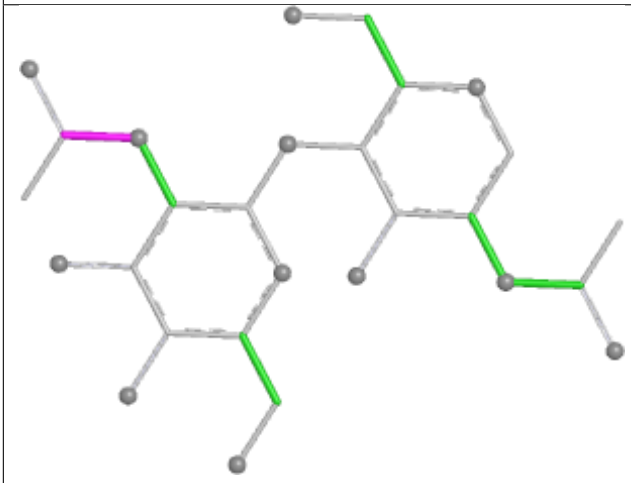
Oligosaccharide Chain K



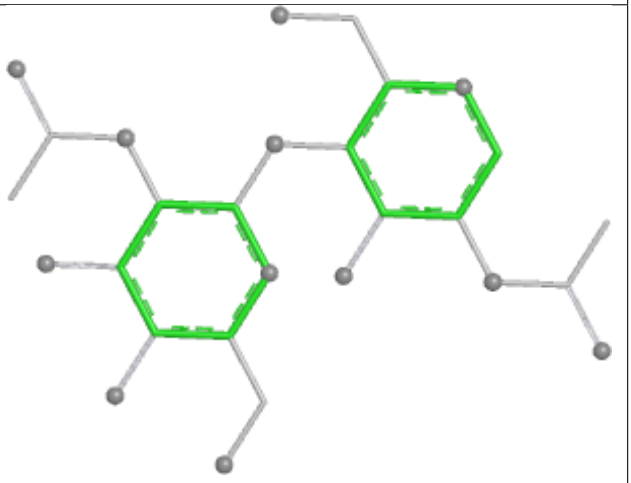
Bond lengths



Bond angles

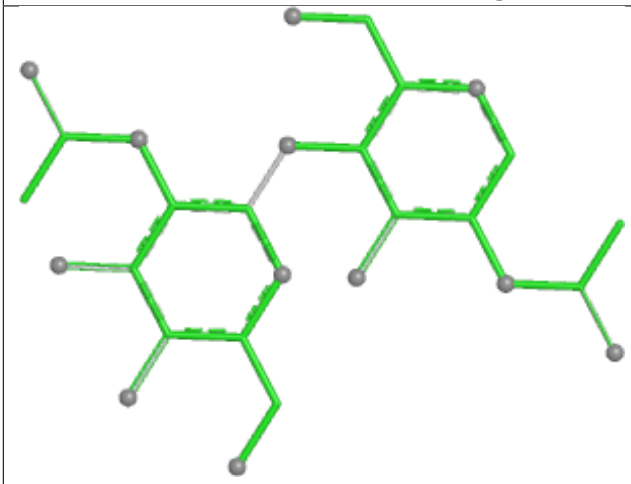


Torsions

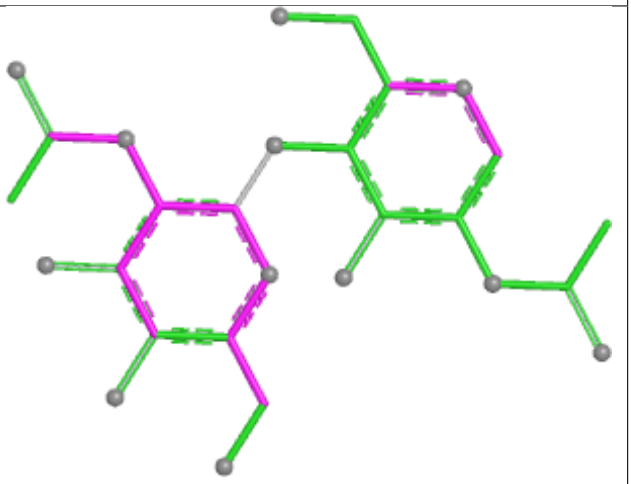


Rings

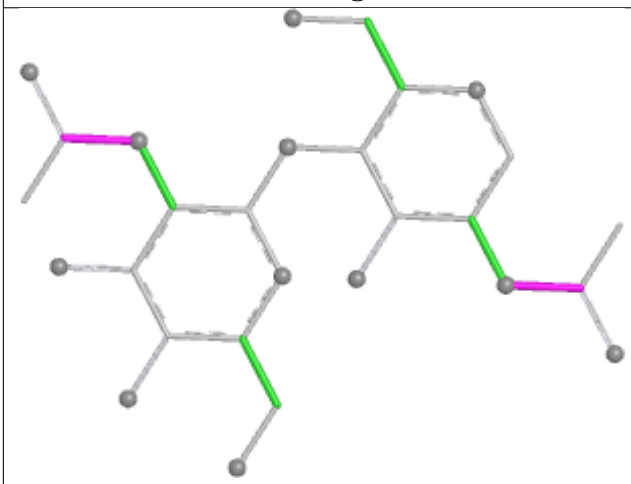
Oligosaccharide Chain M



Bond lengths



Bond angles



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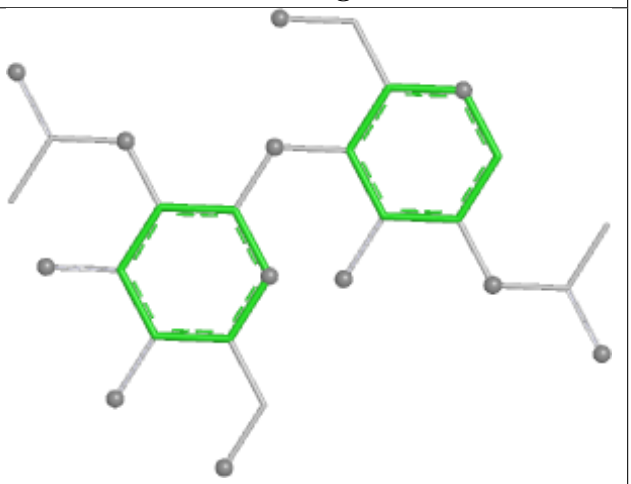
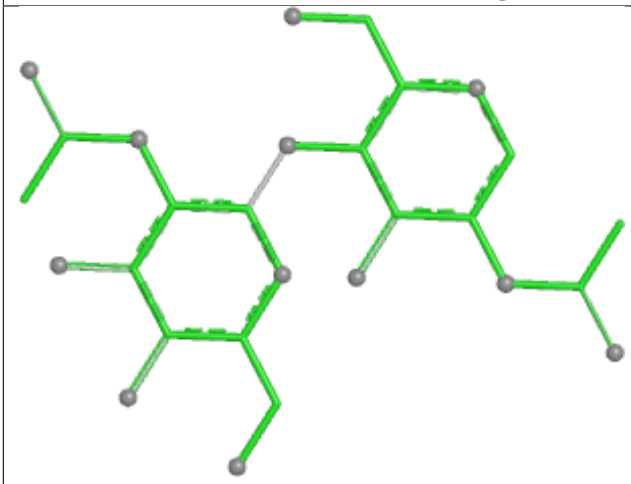
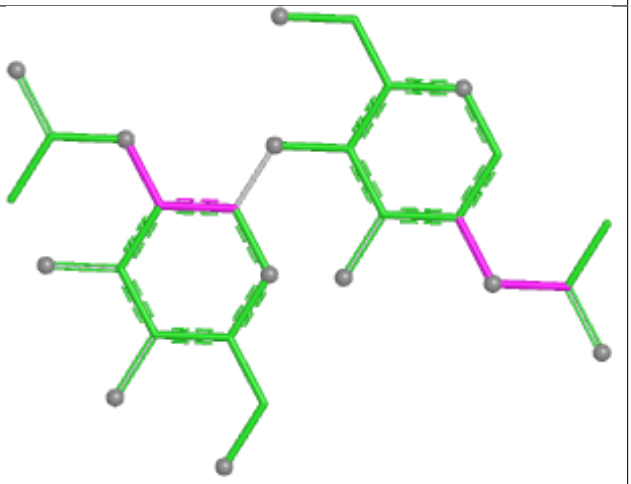


Rings

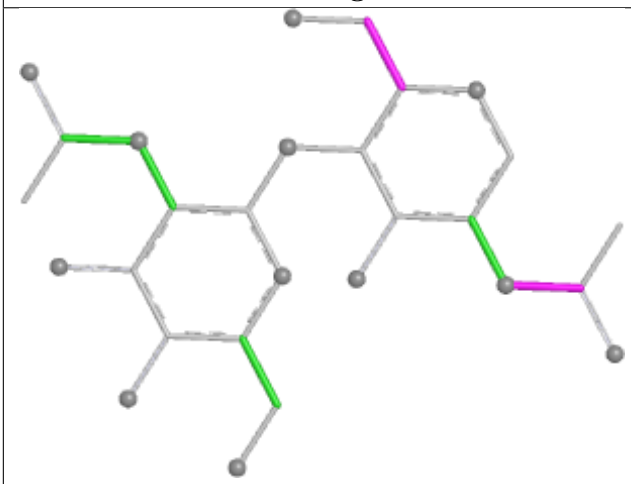
Oligosaccharide Chain N



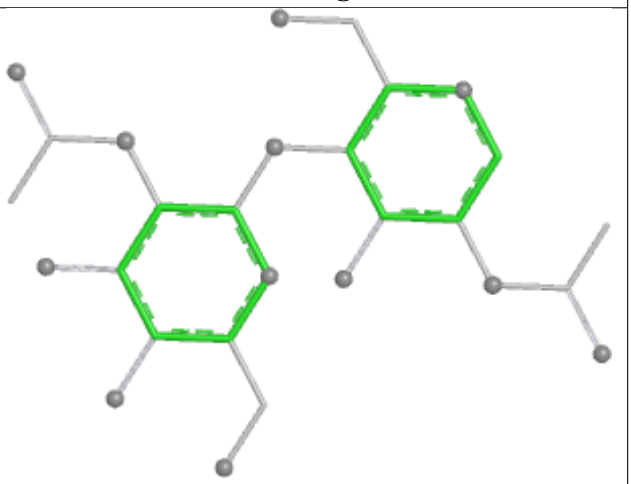
Bond lengths



Bond angles

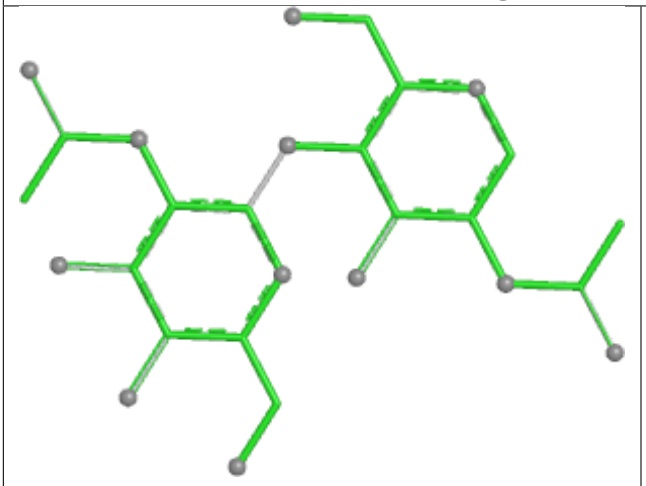


Torsions

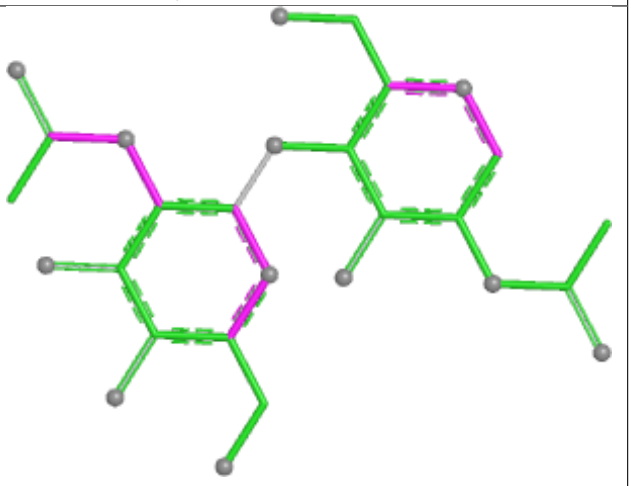


Rings

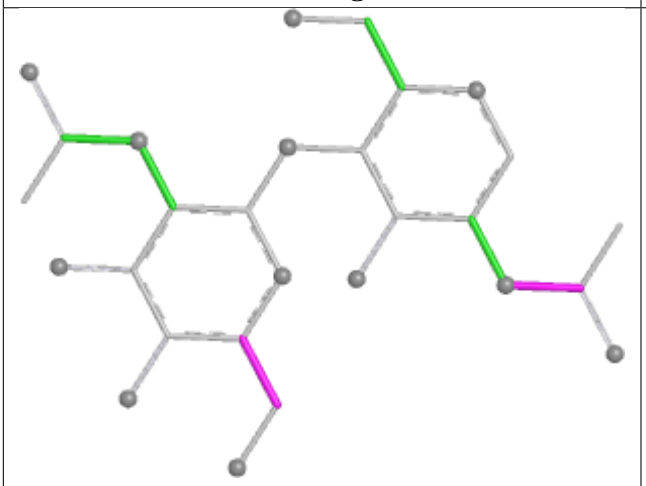
Oligosaccharide Chain Q



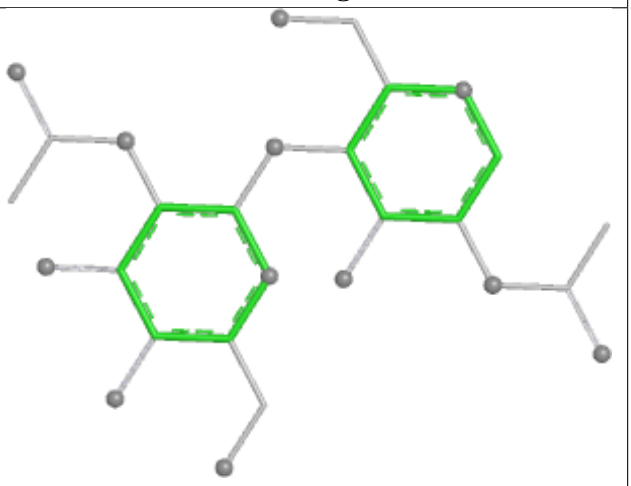
Bond lengths



Bond angles

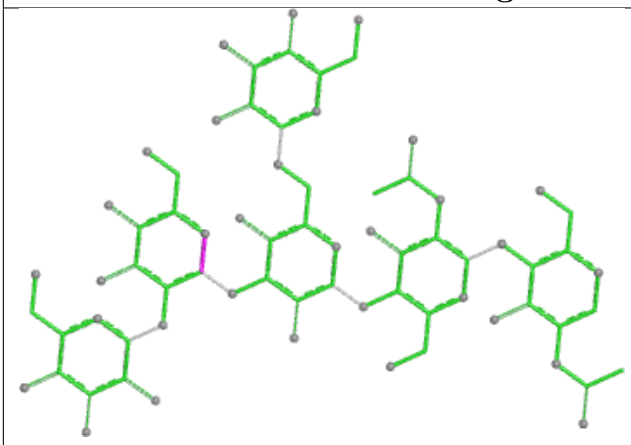


Torsions

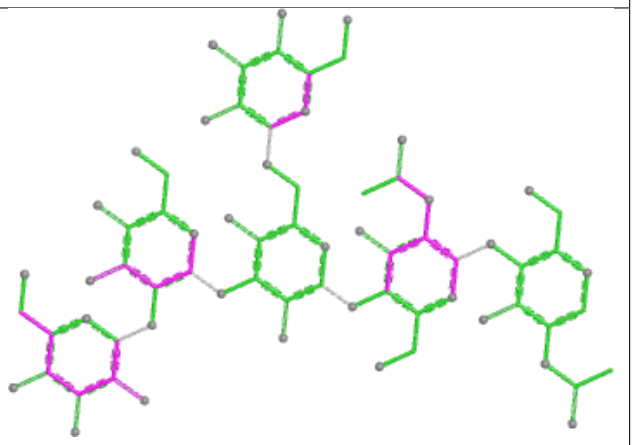


Rings

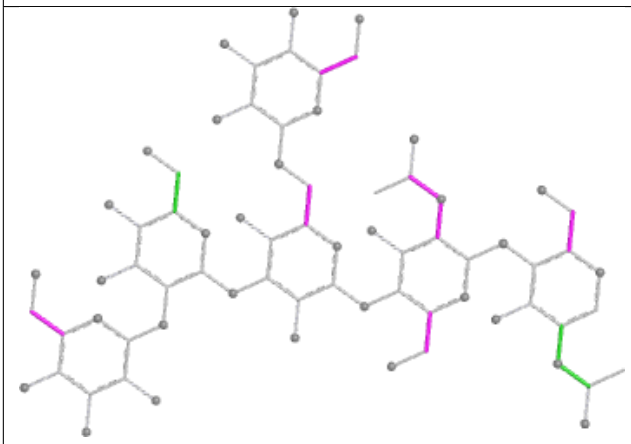
Oligosaccharide Chain F



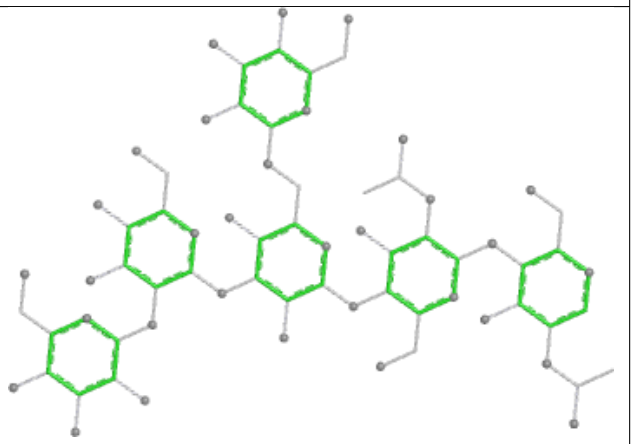
Bond lengths



Bond angles

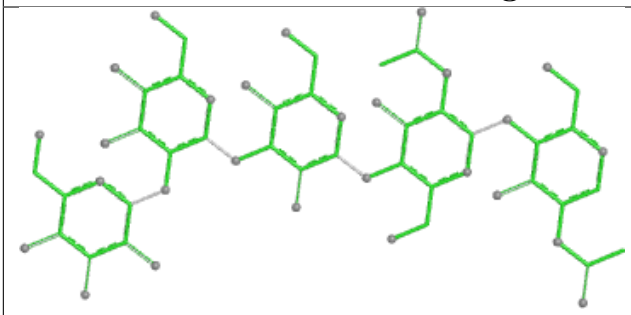


Torsions

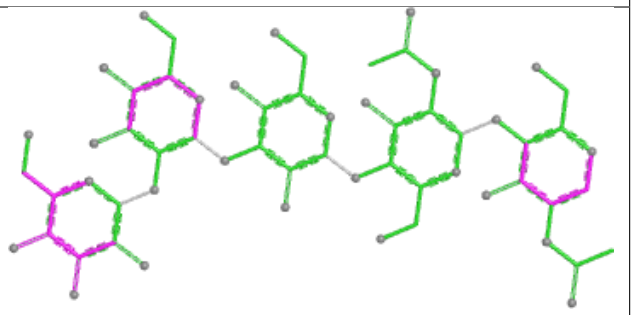


Rings

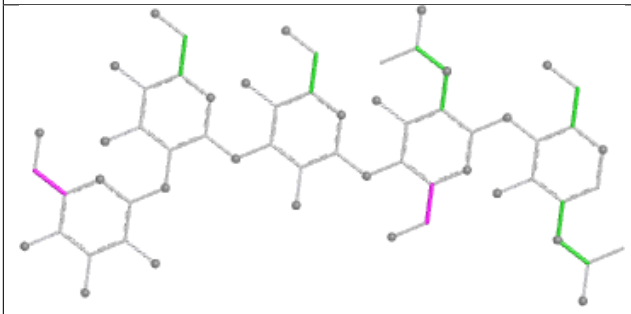
Oligosaccharide Chain I



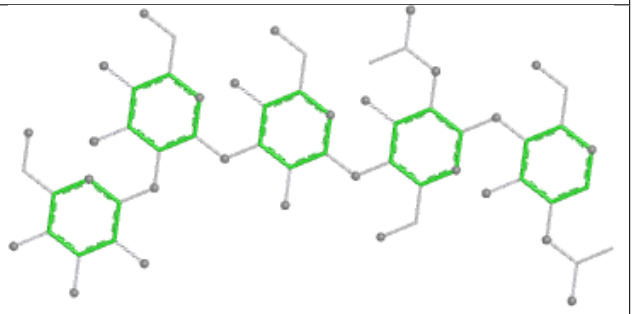
Bond lengths



Bond angles

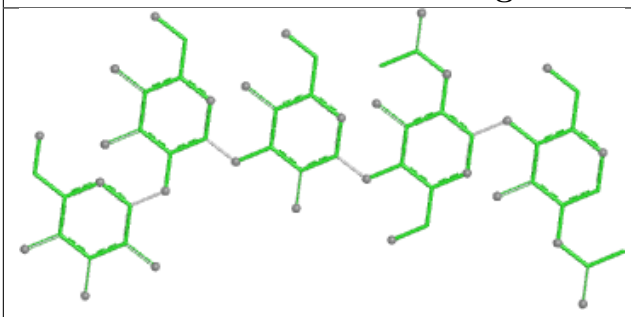


Torsions

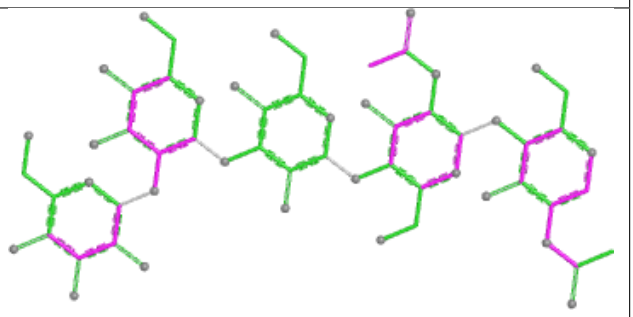


Rings

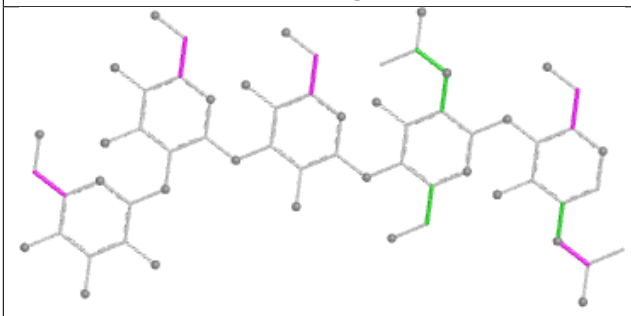
Oligosaccharide Chain P



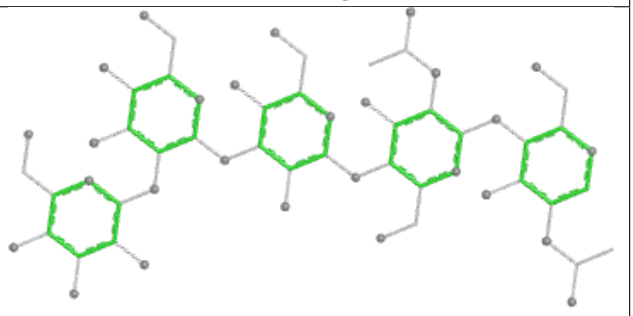
Bond lengths



Bond angles

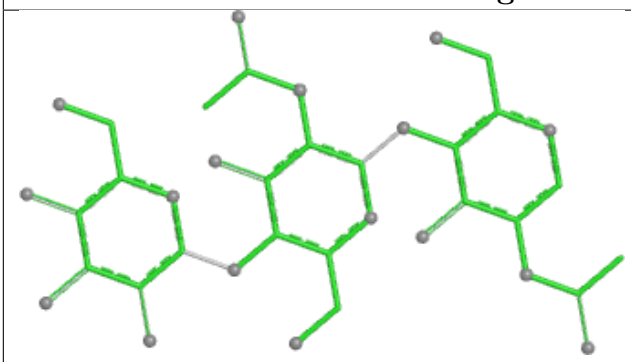


Torsions

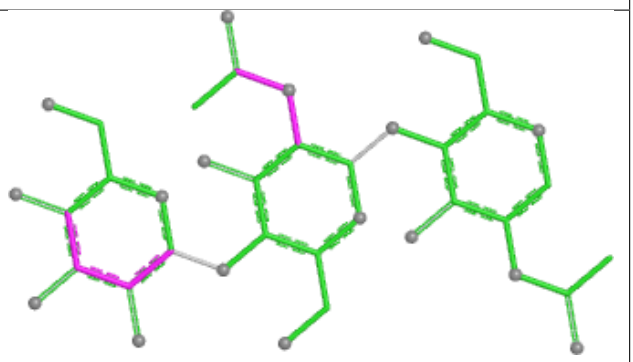


Rings

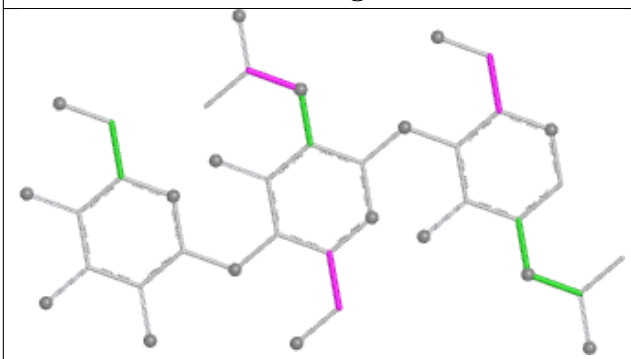
Oligosaccharide Chain L



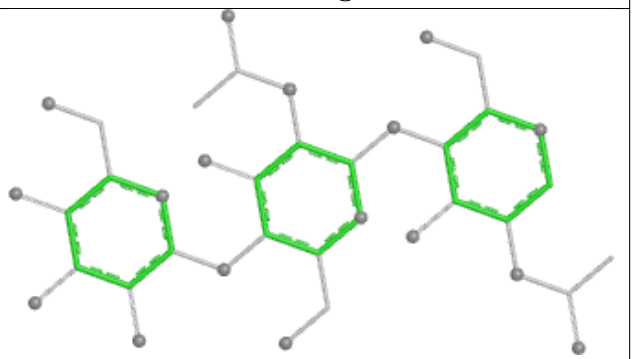
Bond lengths



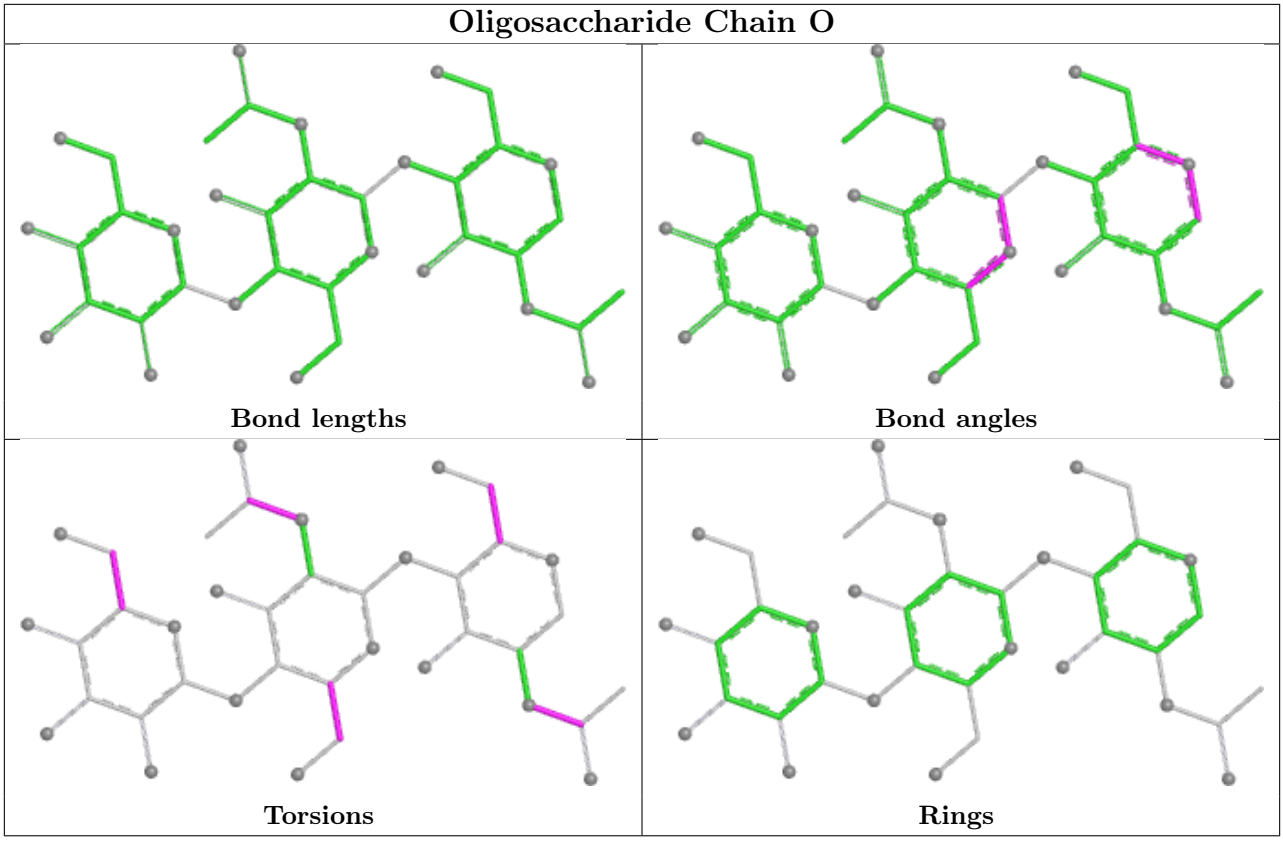
Bond angles



Torsions



Rings



5.6 Ligand geometry (i)

Of 25 ligands modelled in this entry, 16 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	$\#\|Z\| > 2$
8	NAG	B	720	1	14,14,15	0.53	0	17,19,21	1.06	1 (5%)
8	NAG	A	760	1	14,14,15	0.64	0	17,19,21	1.37	1 (5%)
8	NAG	A	730	1	14,14,15	0.60	0	17,19,21	1.53	2 (11%)
8	NAG	B	770	1	14,14,15	0.58	0	17,19,21	1.34	3 (17%)
8	NAG	A	720	1	14,14,15	0.58	0	17,19,21	1.03	1 (5%)
8	NAG	B	760	1	14,14,15	0.57	0	17,19,21	1.57	3 (17%)
7	OXY	A	620	6	1,1,1	0.17	0	-		
8	NAG	C	730	1	14,14,15	0.47	0	17,19,21	1.64	2 (11%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
8	NAG	D	720	1	14,14,15	0.54	0	17,19,21	1.52	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
8	NAG	B	720	1	-	2/6/23/26	0/1/1/1
8	NAG	A	760	1	-	2/6/23/26	0/1/1/1
8	NAG	A	730	1	-	2/6/23/26	0/1/1/1
8	NAG	B	770	1	-	2/6/23/26	0/1/1/1
8	NAG	B	760	1	-	2/6/23/26	0/1/1/1
8	NAG	A	720	1	-	4/6/23/26	0/1/1/1
8	NAG	C	730	1	-	4/6/23/26	0/1/1/1
8	NAG	D	720	1	-	2/6/23/26	0/1/1/1

There are no bond length outliers.

The worst 5 of 16 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
8	A	760	NAG	C2-N2-C7	-4.27	117.17	122.90
8	B	760	NAG	C2-N2-C7	-4.27	117.18	122.90
8	A	730	NAG	C1-O5-C5	3.72	117.17	112.19
8	C	730	NAG	C1-O5-C5	3.69	117.14	112.19
8	D	720	NAG	C1-O5-C5	3.64	117.06	112.19

There are no chirality outliers.

5 of 20 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
8	B	770	NAG	C8-C7-N2-C2
8	B	770	NAG	O7-C7-N2-C2
8	A	720	NAG	O5-C5-C6-O6
8	A	720	NAG	C4-C5-C6-O6
8	B	720	NAG	O5-C5-C6-O6

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	A	760	NAG	1	0
8	D	720	NAG	1	0

5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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^{th} 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	564/604 (93%)	-1.68	0	100	100	11, 19, 31, 50	0
1	B	564/604 (93%)	-1.68	0	100	100	9, 19, 34, 47	0
1	C	564/604 (93%)	-1.65	0	100	100	10, 20, 34, 48	0
1	D	564/604 (93%)	-1.58	0	100	100	11, 20, 32, 51	0
All	All	2256/2416 (93%)	-1.65	0	100	100	9, 19, 33, 51	0

There are no RSRZ outliers to report.

6.2 Non-standard residues in protein, DNA, RNA chains

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

6.3 Carbohydrates

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^{th} 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
5	BMA	O	3	11/12	0.96	0.05	38,51,61,65	0
4	BMA	P	3	11/12	0.97	0.04	32,48,57,68	0
3	MAN	F	6	11/12	0.98	0.05	16,32,37,42	0
2	NAG	G	2	14/15	0.98	0.04	19,25,31,35	0
4	MAN	P	5	11/12	0.98	0.05	32,50,60,63	0
2	NAG	N	2	14/15	0.98	0.04	18,33,42,48	0
2	NAG	J	1	14/15	0.99	0.03	8,24,32,34	0
2	NAG	J	2	14/15	0.99	0.03	17,28,33,34	0
2	NAG	K	1	14/15	0.99	0.03	12,20,28,29	0

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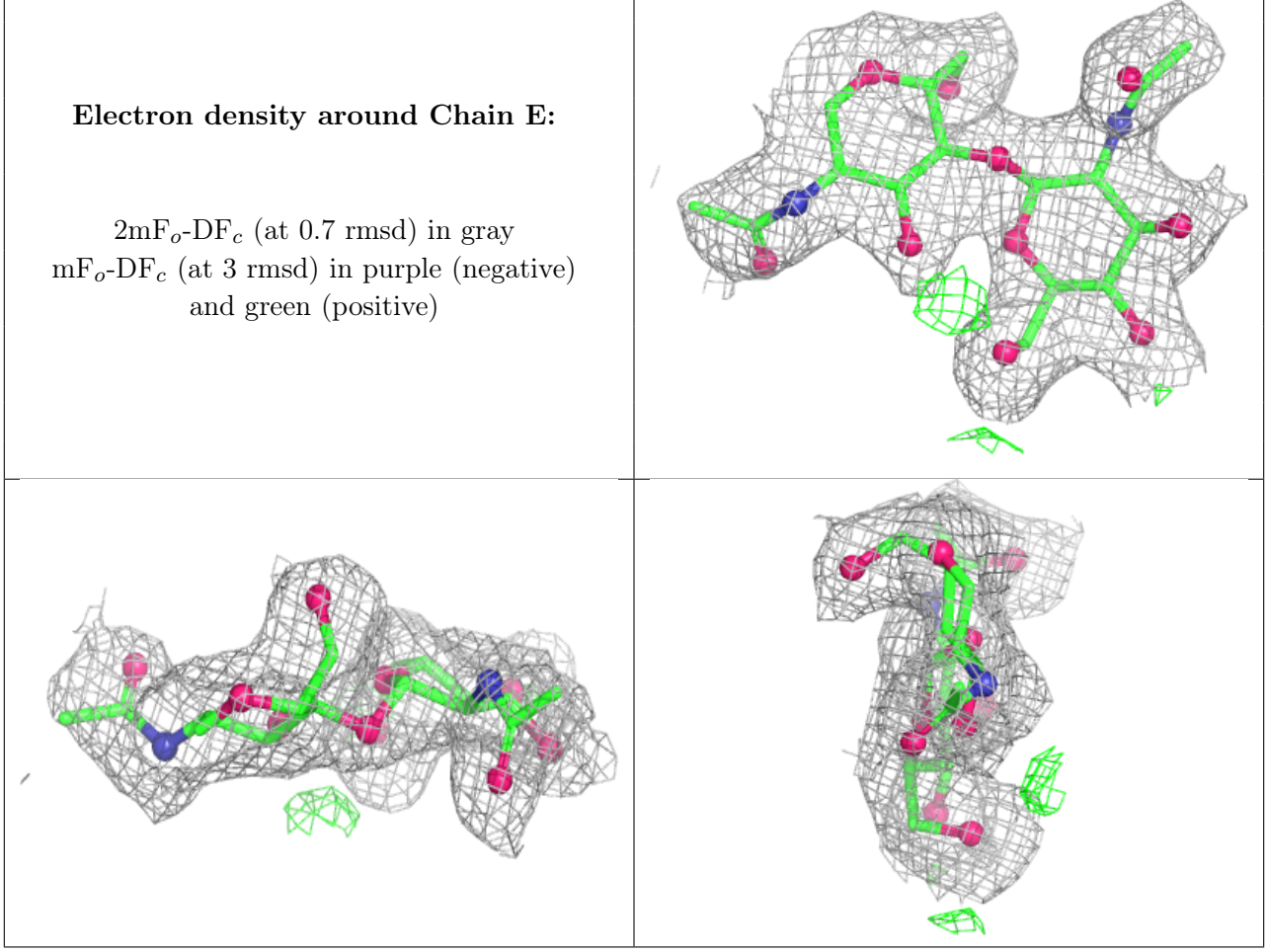
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	NAG	K	2	14/15	0.99	0.03	14,28,40,40	0
2	NAG	M	1	14/15	0.99	0.03	13,23,30,36	0
2	NAG	M	2	14/15	0.99	0.03	12,24,29,34	0
2	NAG	N	1	14/15	0.99	0.04	8,27,36,45	0
2	NAG	E	2	14/15	0.99	0.03	12,19,29,30	0
2	NAG	Q	1	14/15	0.99	0.03	12,23,34,35	0
2	NAG	Q	2	14/15	0.99	0.03	16,36,42,44	0
3	NAG	F	1	14/15	0.99	0.03	11,15,24,25	0
3	NAG	F	2	14/15	0.99	0.03	7,18,25,28	0
3	BMA	F	3	11/12	0.99	0.03	12,25,33,34	0
3	MAN	F	4	11/12	0.99	0.03	17,24,33,39	0
3	MAN	F	5	11/12	0.99	0.05	18,26,37,41	0
2	NAG	G	1	14/15	0.99	0.03	11,16,25,28	0
4	NAG	I	1	14/15	0.99	0.03	12,19,27,34	0
4	NAG	I	2	14/15	0.99	0.03	8,22,28,30	0
4	BMA	I	3	11/12	0.99	0.04	9,24,28,40	0
4	MAN	I	4	11/12	0.99	0.03	16,30,35,37	0
4	MAN	I	5	11/12	0.99	0.04	18,29,36,38	0
4	NAG	P	1	14/15	0.99	0.03	17,28,32,33	0
4	NAG	P	2	14/15	0.99	0.04	21,28,39,44	0
2	NAG	E	1	14/15	0.99	0.03	9,16,22,30	0
4	MAN	P	4	11/12	0.99	0.04	24,41,53,54	0
2	NAG	H	1	14/15	0.99	0.03	8,16,23,26	0
5	NAG	L	1	14/15	0.99	0.03	12,20,29,29	0
5	NAG	L	2	14/15	0.99	0.04	19,25,33,38	0
5	BMA	L	3	11/12	0.99	0.04	12,28,36,37	0
5	NAG	O	1	14/15	0.99	0.03	13,18,25,25	0
5	NAG	O	2	14/15	0.99	0.04	15,26,42,54	0
2	NAG	H	2	14/15	0.99	0.03	10,14,25,26	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.

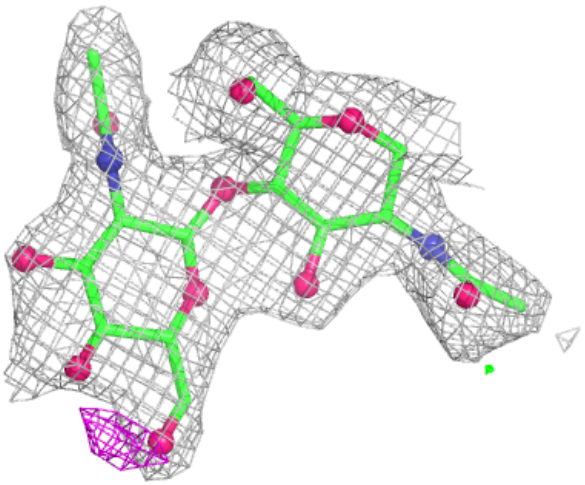
Electron density around Chain E:

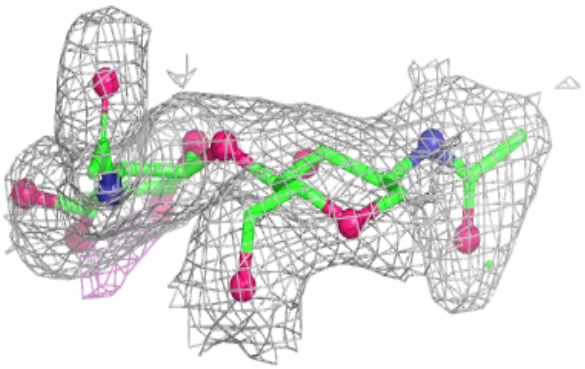
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

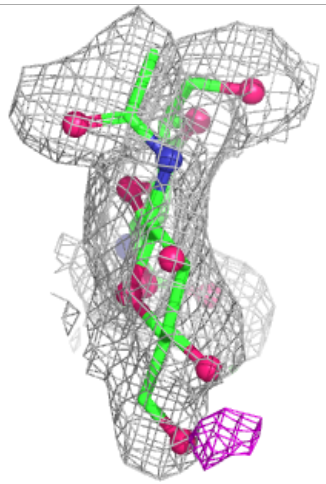


Electron density around Chain G:

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

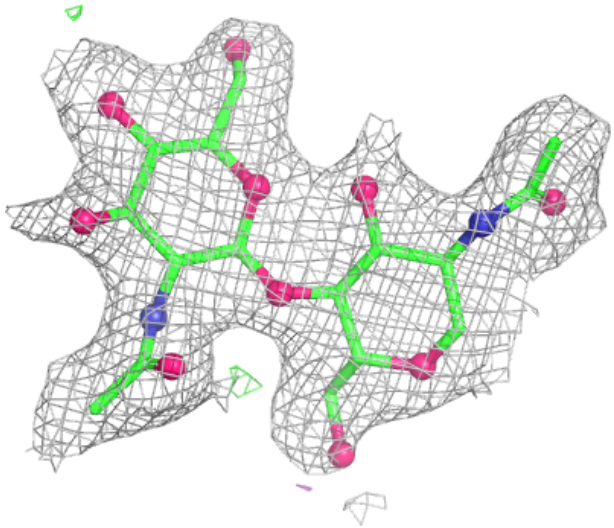


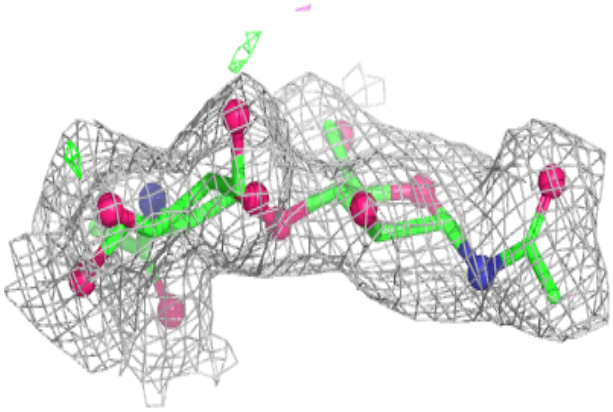




Electron density around Chain H:

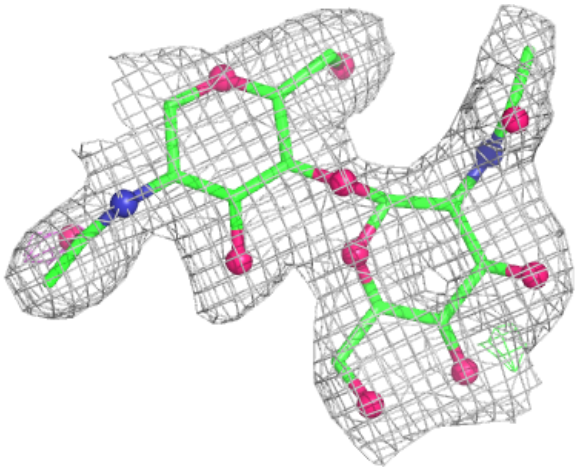
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

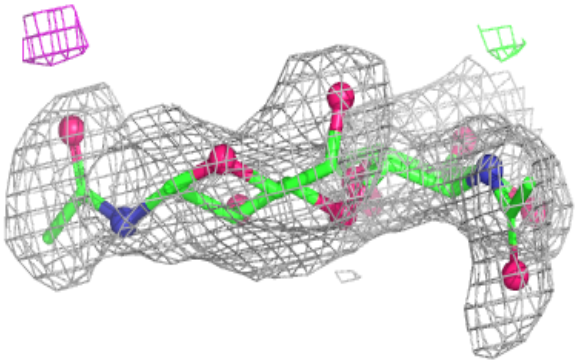


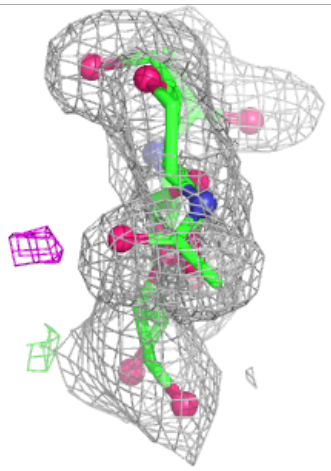


Electron density around Chain J:

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

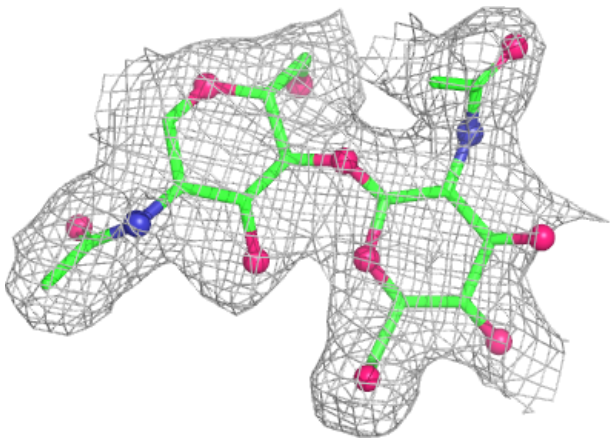


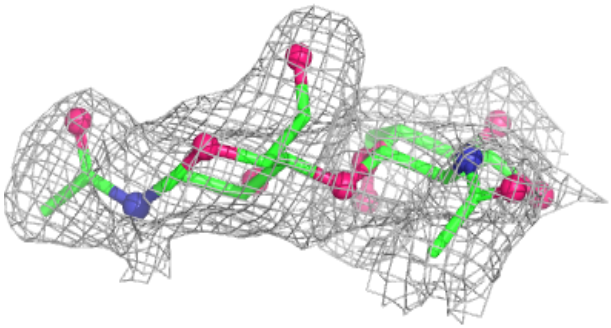


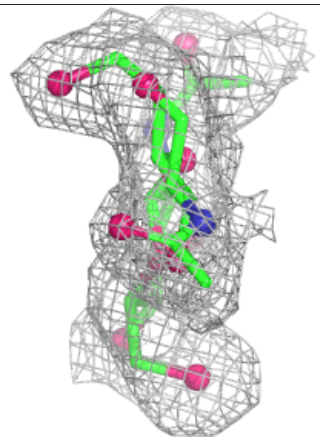


Electron density around Chain K:

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

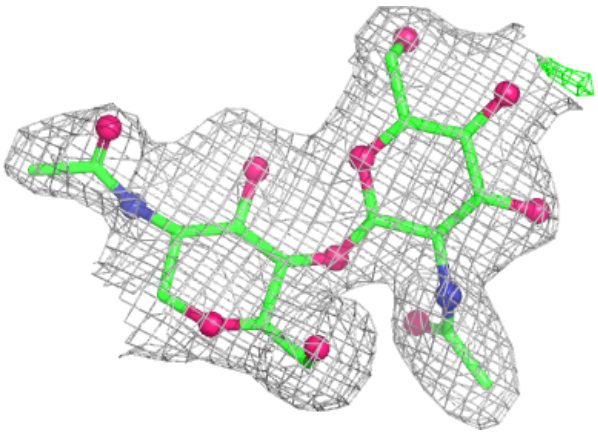


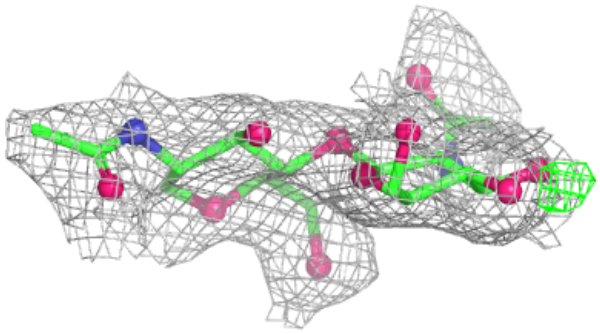


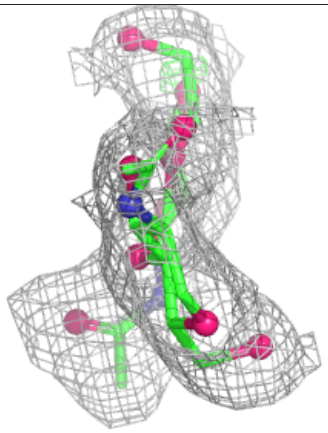


Electron density around Chain M:

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

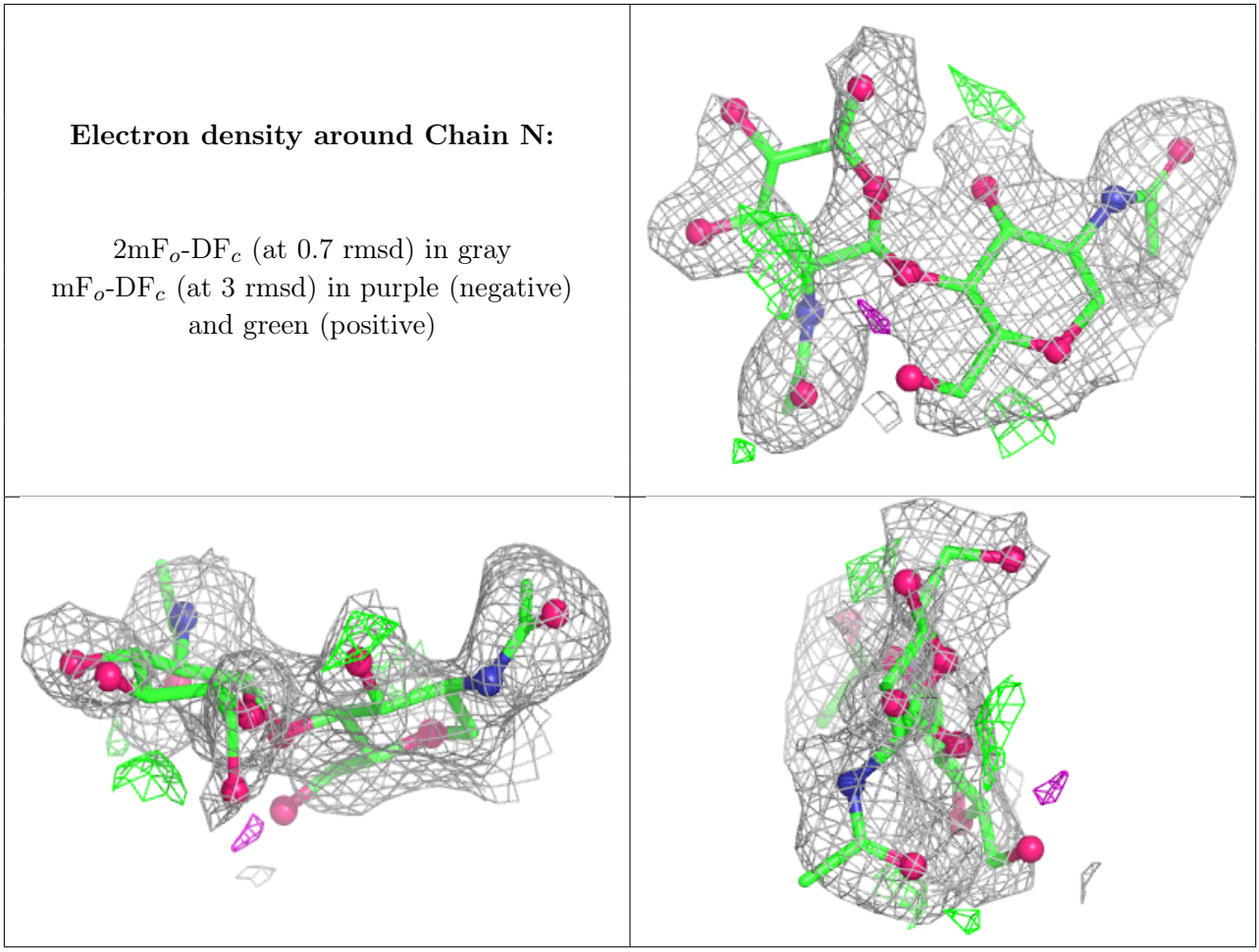






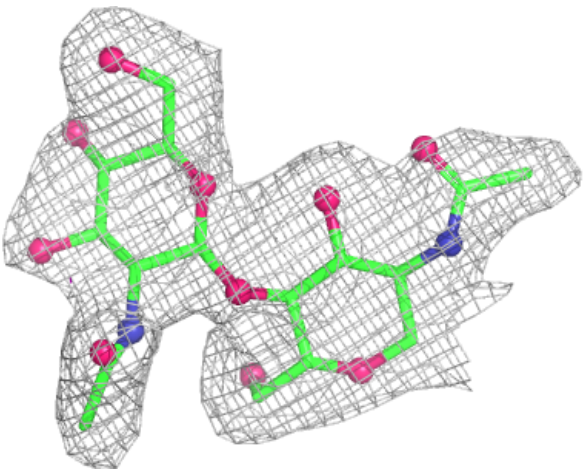
Electron density around Chain N:

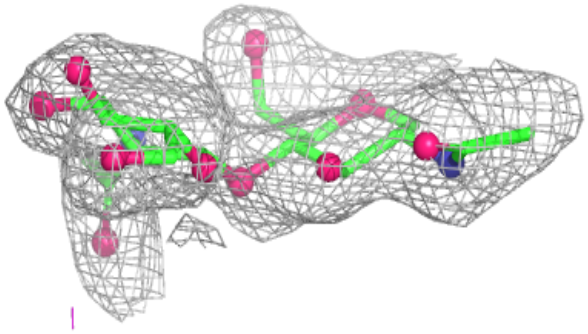
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

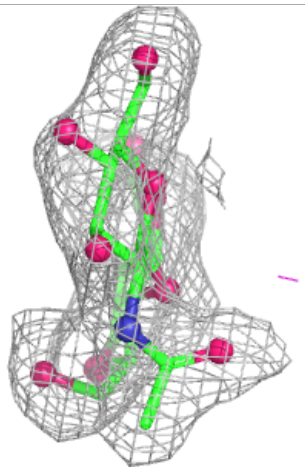


Electron density around Chain Q:

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

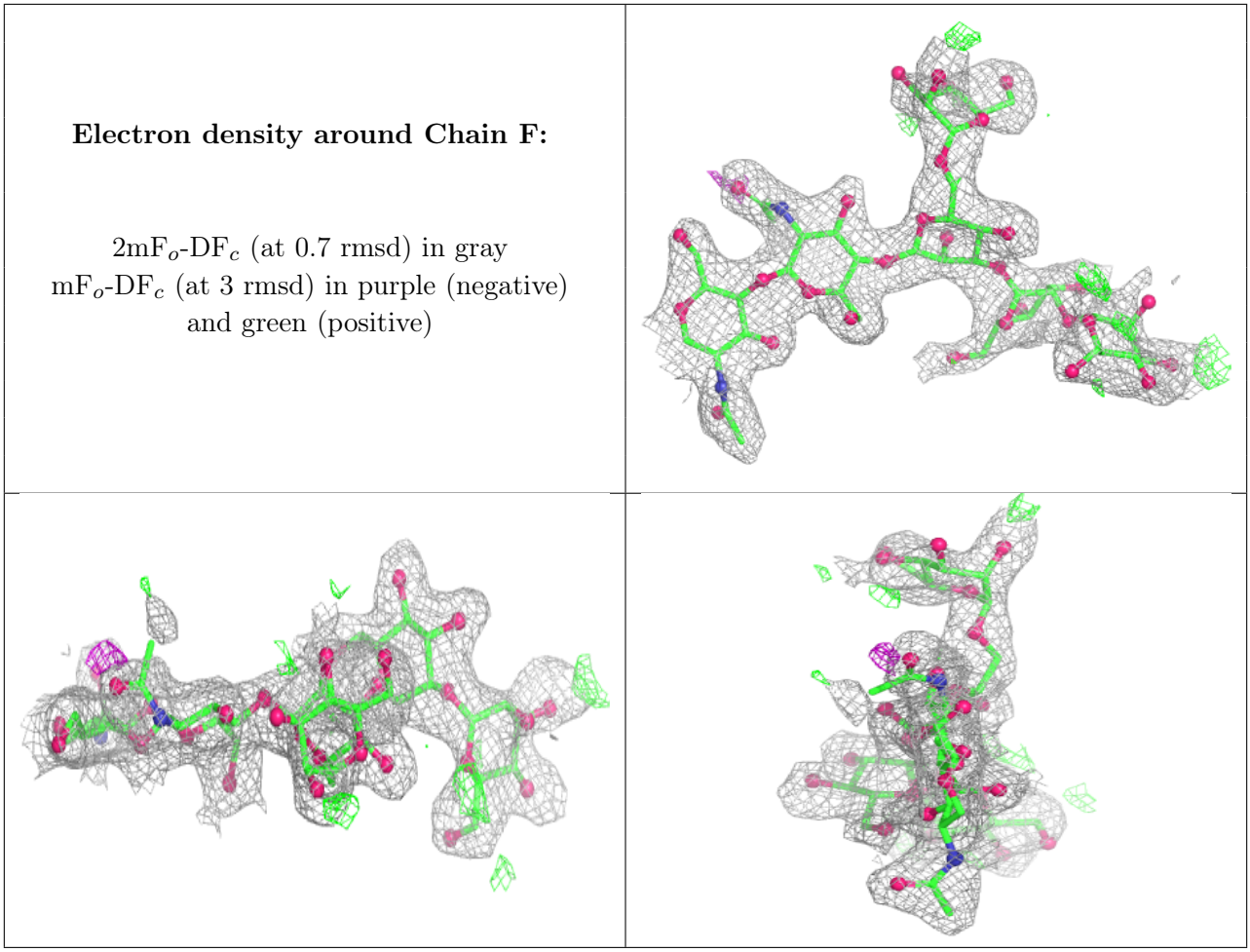






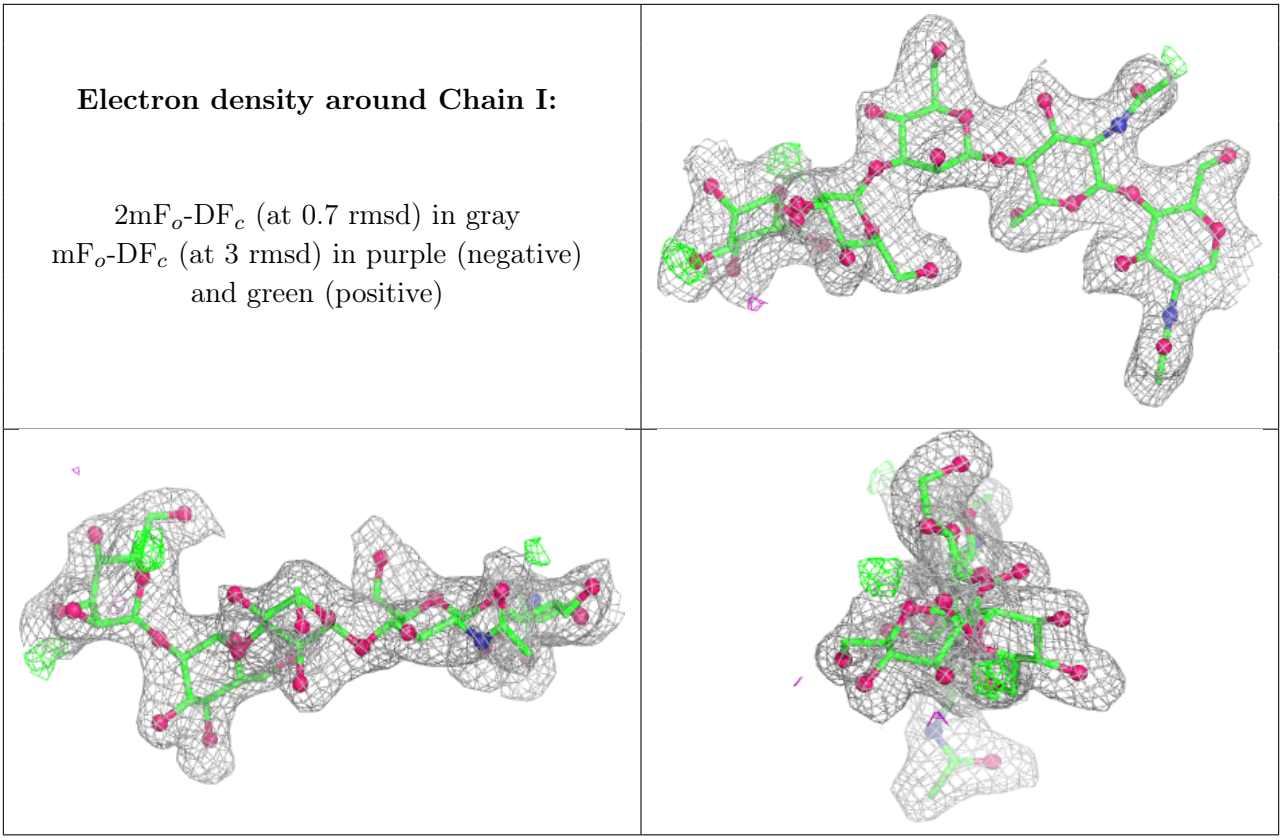
Electron density around Chain F:

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



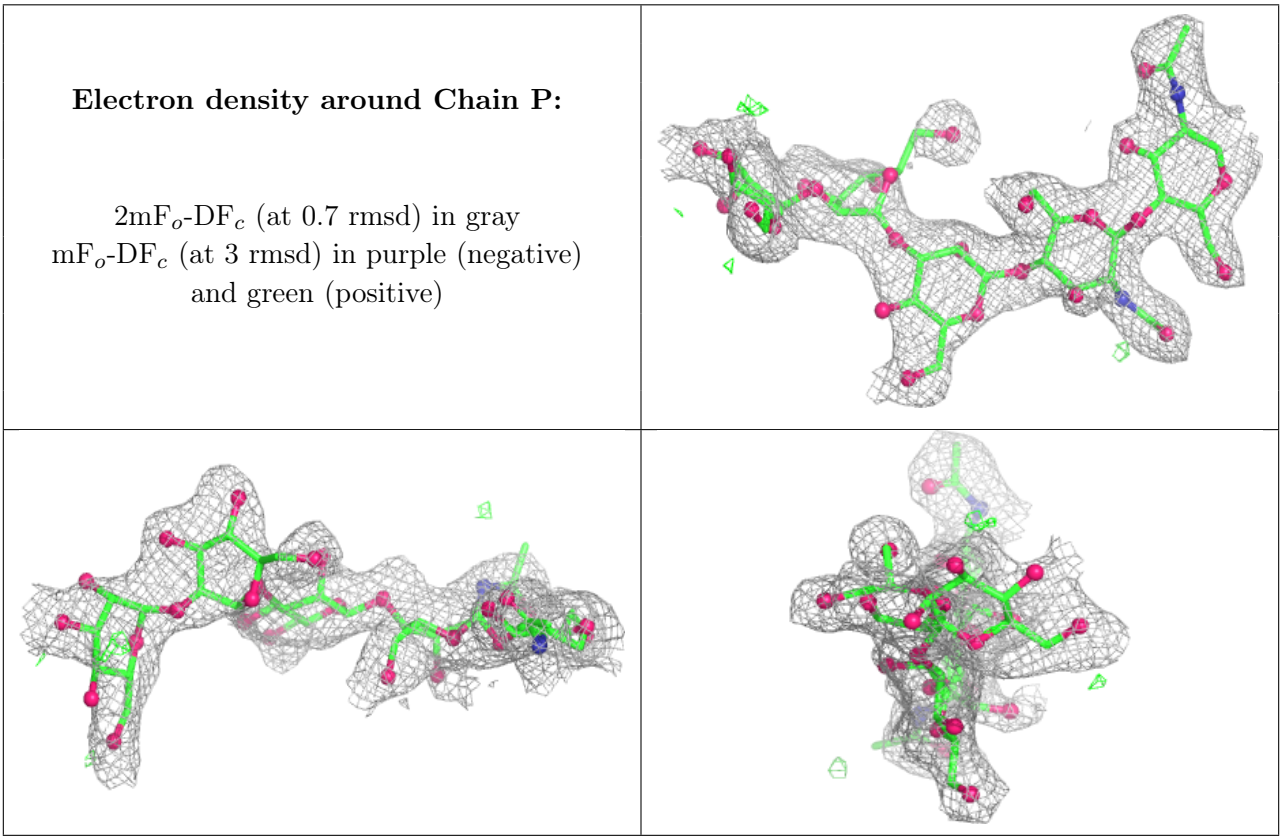
Electron density around Chain I:

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



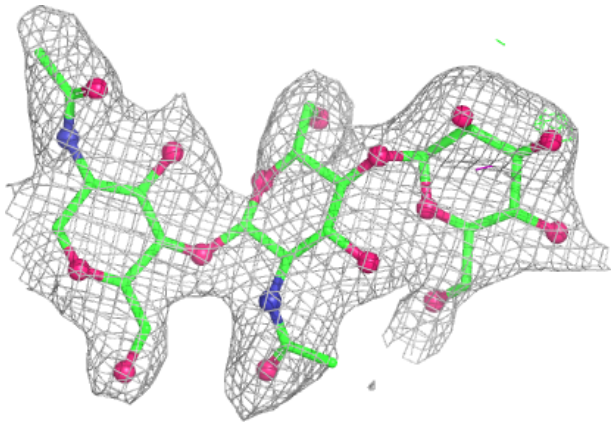
Electron density around Chain P:

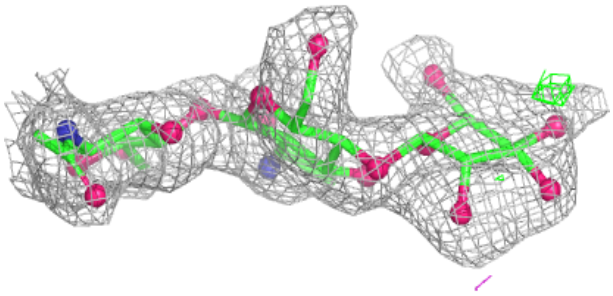
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

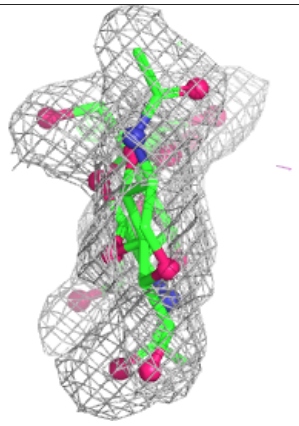


Electron density around Chain L:

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

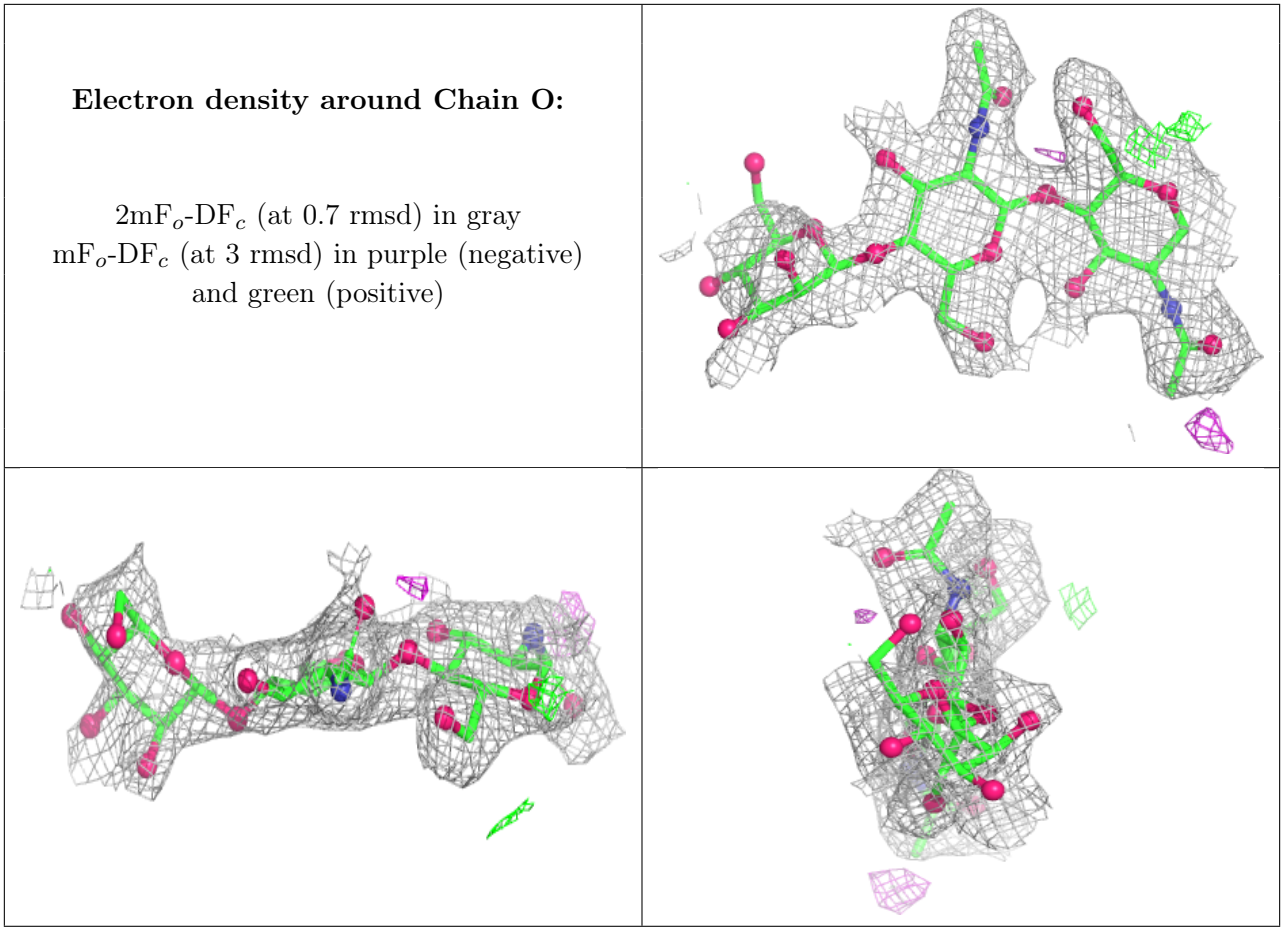






Electron density around Chain O:

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



6.4 Ligands

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^{th} 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	NAG	C	730	14/15	0.98	0.04	19,29,44,58	0
8	NAG	A	730	14/15	0.99	0.04	13,31,41,56	0
8	NAG	A	760	14/15	0.99	0.04	12,21,25,30	0
8	NAG	B	720	14/15	0.99	0.03	13,23,35,36	0
8	NAG	B	760	14/15	0.99	0.03	6,15,25,28	0
8	NAG	B	770	14/15	0.99	0.03	17,27,34,34	0
8	NAG	A	720	14/15	0.99	0.03	15,20,29,44	0
8	NAG	D	720	14/15	0.99	0.04	14,20,28,32	0
6	CU	C	601	1/1	1.00	0.01	21,21,21,21	0
6	CU	C	602	1/1	1.00	0.01	21,21,21,21	0
6	CU	C	603	1/1	1.00	0.01	18,18,18,18	0
6	CU	C	604	1/1	1.00	0.01	30,30,30,30	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
6	CU	D	601	1/1	1.00	0.01	19,19,19,19	0
6	CU	D	602	1/1	1.00	0.01	26,26,26,26	0
6	CU	D	603	1/1	1.00	0.01	20,20,20,20	0
6	CU	D	604	1/1	1.00	0.01	33,33,33,33	0
7	OXY	A	620	2/2	1.00	0.04	5,5,5,8	0
6	CU	A	601	1/1	1.00	0.01	31,31,31,31	0
6	CU	A	602	1/1	1.00	0.00	11,11,11,11	0
6	CU	A	603	1/1	1.00	0.01	14,14,14,14	0
6	CU	A	604	1/1	1.00	0.01	27,27,27,27	0
6	CU	B	601	1/1	1.00	0.01	21,21,21,21	0
6	CU	B	602	1/1	1.00	0.01	17,17,17,17	0
6	CU	B	603	1/1	1.00	0.01	13,13,13,13	0
6	CU	B	604	1/1	1.00	0.02	26,26,26,26	0

6.5 Other polymers (i)

There are no such residues in this entry.