



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 15, 2026 – 11:49 AM UTC

PDB ID : 4MZA / pdb_00004mza
Title : Crystal structure of hPIV3 hemagglutinin-neuraminidase
Authors : Xu, R.; Wilson, I.A.
Deposited on : 2013-09-29
Resolution : 1.65 Å(reported)

This is a Full wwPDB X-ray Structure Validation 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	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

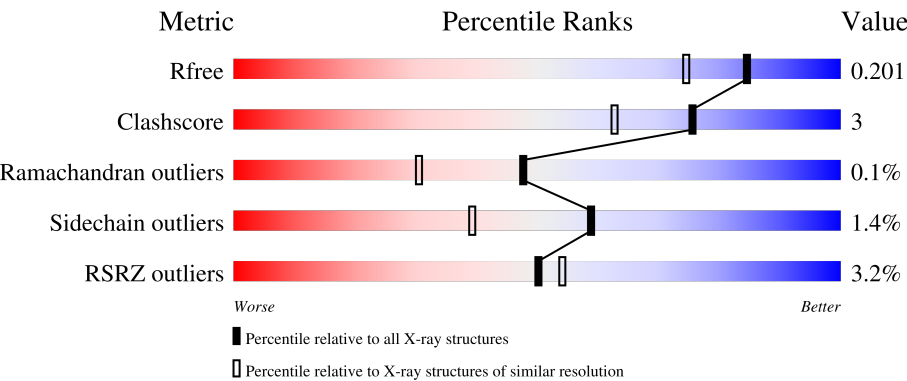
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.65 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}	180053	2563 (1.66-1.66)
Clashscore	190562	2662 (1.66-1.66)
Ramachandran outliers	187476	2621 (1.66-1.66)
Sidechain outliers	187428	2621 (1.66-1.66)
RSRZ outliers	180081	2564 (1.66-1.66)

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	437	3% 91% 8%
1	B	437	3% 92% 7%
2	C	9	11% 78% 11%
3	D	4	100%
4	E	3	67% 33%

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Mol	Chain	Length	Quality of chain
5	F	2	 100%

2 Entry composition [i](#)

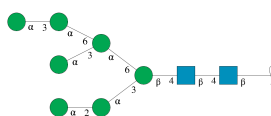
There are 11 unique types of molecules in this entry. The entry contains 7679 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Hemagglutinin-neuraminidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	432	Total	C	N	O	S	0	5	0
			3406	2153	586	647	20			
1	B	437	Total	C	N	O	S	0	2	0
			3435	2170	592	653	20			

- Molecule 2 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-alpha-D-mannopyranose-(1-6)-[alpha-D-mannopyranose-(1-3)]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.



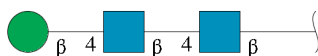
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	9	Total	C	N	O	0	0	0
			105	58	2	45			

- Molecule 3 is an oligosaccharide called 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	D	4	Total	C	N	O	0	0	0
			50	28	2	20			

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



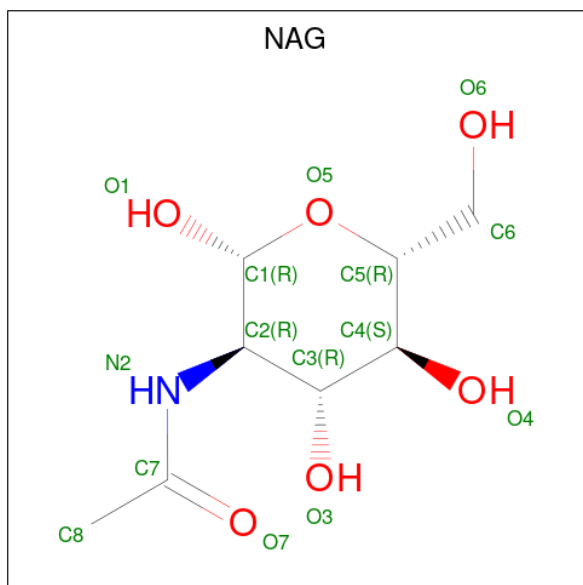
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	E	3	Total	C	N	O	0	0	0
			39	22	2	15			

- Molecule 5 is an oligosaccharide called beta-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	F	2	Total	C	N	O	0	0	0
			24	14	1	9			

- Molecule 6 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆).

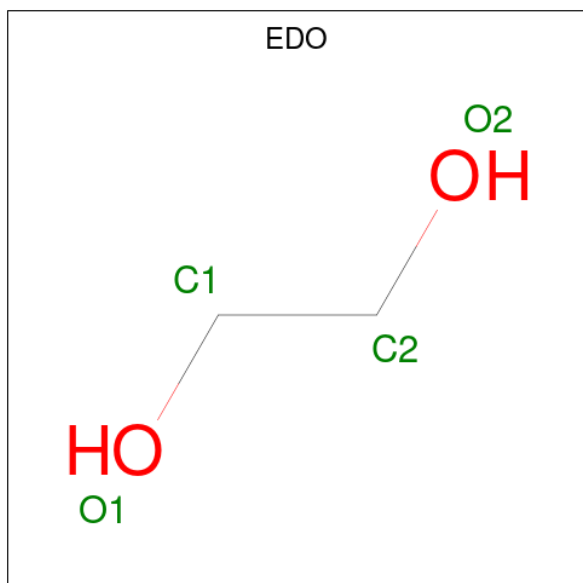


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	A	1	Total	C	N	O	0	0
			14	8	1	5		
6	A	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 7 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	1	Total	Ca	0	0
			1	1		
7	B	1	Total	Ca	0	0
			1	1		

- Molecule 8 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C₂H₆O₂).



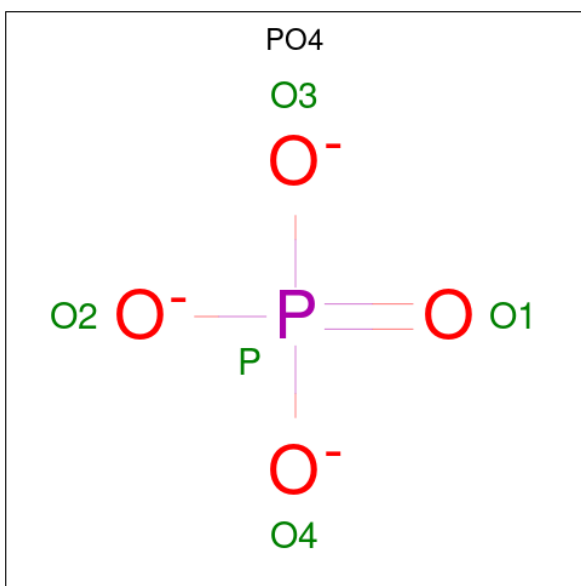
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	A	1	Total	C	O	0	0
			4	2	2		
8	A	1	Total	C	O	0	0
			4	2	2		
8	A	1	Total	C	O	0	0
			4	2	2		
8	B	1	Total	C	O	0	0
			4	2	2		
8	B	1	Total	C	O	0	0
			4	2	2		

- Molecule 9 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	A	1	Total	O	S	0	0
			5	4	1		
9	B	1	Total	O	S	0	0
			5	4	1		

- Molecule 10 is PHOSPHATE ION (CCD ID: PO4) (formula: O_4P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
10	B	1	Total	O	P	0	0
			5	4	1		
10	B	1	Total	O	P	0	0
			5	4	1		

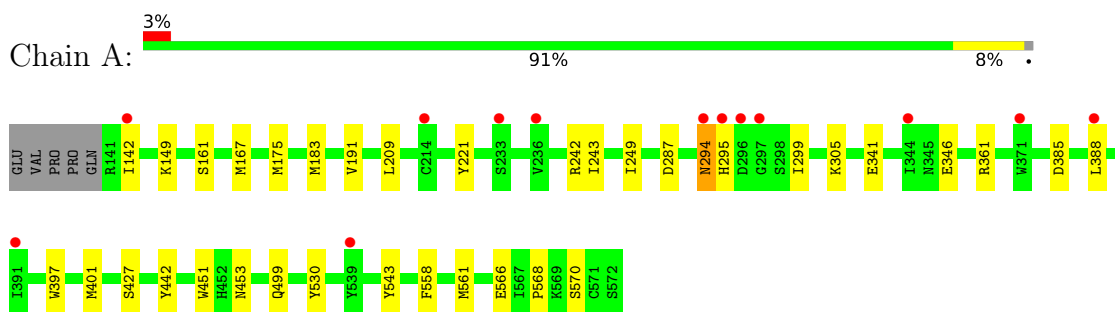
- Molecule 11 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
11	A	300	Total 300	O 300	0	0
11	B	250	Total 250	O 250	0	0

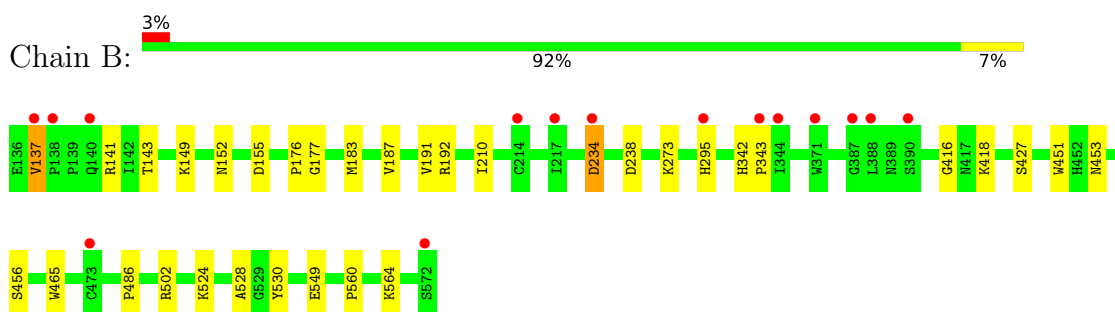
3 Residue-property plots [i](#)

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.

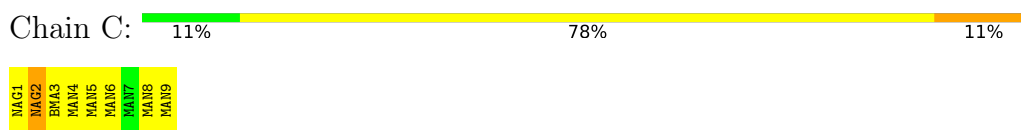
- Molecule 1: Hemagglutinin-neuraminidase



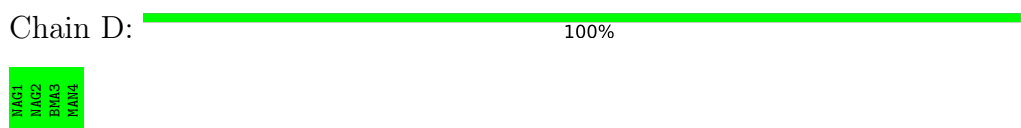
- Molecule 1: Hemagglutinin-neuraminidase



- Molecule 2: alpha-D-mannopyranose-(1-3)-alpha-D-mannopyranose-(1-6)-[alpha-D-mannopyranose-(1-3)]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 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

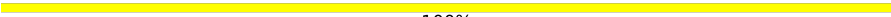


- Molecule 4: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain E:  67% 33%

MAG1
MAG2
BMA3

- Molecule 5: beta-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain F:  100%

MAG1
FOL2

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	83.78Å 94.84Å 105.50Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.42 – 1.65 47.42 – 1.65	Depositor EDS
% Data completeness (in resolution range)	99.7 (47.42-1.65) 99.4 (47.42-1.65)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.34 (at 1.65Å)	Xtriage
Refinement program	PHENIX 1.8_1063	Depositor
R, R_{free}	0.167 , 0.198 0.171 , 0.201	Depositor DCC
R_{free} test set	5027 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å ²)	25.0	Xtriage
Anisotropy	0.264	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 41.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	7679	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.16% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: CA, FUL, SO4, BMA, MAN, PO4, EDO, NAG

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	0.45	0/3502	0.79	1/4770 (0.0%)
1	B	0.43	0/3524	0.80	2/4802 (0.0%)
All	All	0.44	0/7026	0.80	3/9572 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	142	ILE	N-CA-C	-5.68	107.21	112.43
1	B	177	GLY	CA-C-N	5.31	125.07	119.76
1	B	177	GLY	C-N-CA	5.31	125.07	119.76

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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	3406	0	3378	27	0
1	B	3435	0	3396	20	0
2	C	105	0	88	1	0
3	D	50	0	43	0	0
4	E	39	0	34	1	0
5	F	24	0	22	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	A	28	0	26	0	0
7	A	1	0	0	0	0
7	B	1	0	0	0	0
8	A	12	0	18	1	0
8	B	8	0	12	0	0
9	A	5	0	0	0	0
9	B	5	0	0	0	0
10	B	10	0	0	0	0
11	A	300	0	0	5	0
11	B	250	0	0	4	0
All	All	7679	0	7017	43	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 3.

All (43) 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:A:499:GLN:H	8:A:616:EDO:H21	1.47	0.79
1:A:167:MET:HE2	1:A:570:SER:HB3	1.71	0.72
1:A:175:MET:HE3	1:A:566:GLU:HB2	1.73	0.70
1:A:530:TYR:OH	11:A:852:HOH:O	2.08	0.69
1:A:294:ASN:OD1	11:A:883:HOH:O	2.14	0.65
1:A:183:MET:HE1	1:B:183:MET:HE3	1.80	0.64
1:B:416:GLY:O	11:B:764:HOH:O	2.16	0.61
1:A:561:MET:HE1	1:B:187:VAL:HA	1.86	0.58
1:A:442:TYR:OH	11:A:996:HOH:O	2.17	0.57
1:A:175:MET:HE1	1:A:543:TYR:HE2	1.70	0.56
1:B:192:ARG:CZ	1:B:210:ILE:HD11	2.36	0.54
1:A:221:TYR:HE2	1:B:176:PRO:HB2	1.73	0.54
1:B:427:SER:HB3	11:B:785:HOH:O	2.08	0.53
1:A:299:ILE:HB	1:B:137:VAL:HB	1.90	0.52
1:A:361:ARG:NH1	11:A:874:HOH:O	2.43	0.52
1:A:175:MET:HE1	1:A:543:TYR:CE2	2.46	0.50
1:A:346:GLU:HG2	1:A:401:MET:HE3	1.94	0.49
1:A:191:VAL:HG22	1:A:209:LEU:HG	1.95	0.49
1:B:451:TRP:CZ2	1:B:453:ASN:HB2	2.47	0.49
1:A:149:LYS:HB3	1:A:149:LYS:HE2	1.73	0.47
1:A:221:TYR:OH	1:B:234:ASP:OD1	2.25	0.47
1:B:152:ASN:ND2	1:B:155:ASP:OD2	2.48	0.46
1:A:451:TRP:CZ2	2:C:2:NAG:H5	2.50	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:141:ARG:HD3	1:B:143:THR:O	2.16	0.45
1:B:502:ARG:HB3	1:B:528:ALA:O	2.16	0.45
1:B:530:TYR:HB3	1:B:549:GLU:HG3	1.98	0.45
1:B:191:VAL:HB	1:B:560:PRO:HD3	1.99	0.44
1:B:273:LYS:HE3	11:B:887:HOH:O	2.17	0.44
1:A:561:MET:HE2	1:A:561:MET:HB3	1.79	0.44
1:A:167:MET:HG2	1:A:568:PRO:HB2	1.99	0.43
1:A:451:TRP:CZ2	1:A:453:ASN:HB2	2.54	0.43
1:B:418:LYS:NZ	1:B:486:PRO:HB3	2.34	0.43
1:B:238:ASP:OD1	1:B:564:LYS:NZ	2.52	0.43
1:B:456:SER:HB3	1:B:465:TRP:CE2	2.54	0.43
1:A:221:TYR:CE1	1:A:249:ILE:HB	2.54	0.43
1:B:183:MET:HE1	1:B:560:PRO:HD2	2.00	0.43
1:B:342:HIS:HA	1:B:343:PRO:HD3	1.73	0.42
1:A:397:TRP:CD2	1:A:442:TYR:HB3	2.54	0.42
1:A:242:ARG:HD3	1:A:242:ARG:HA	1.86	0.42
11:B:934:HOH:O	4:E:3:BMA:H61	2.20	0.41
1:A:287:ASP:OD1	1:A:305:LYS:HD3	2.20	0.41
1:A:427:SER:HB3	11:A:711:HOH:O	2.20	0.41
1:A:388:LEU:HD12	1:A:388:LEU:HA	1.85	0.40

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	435/437 (100%)	416 (96%)	19 (4%)	0	100	100
1	B	437/437 (100%)	418 (96%)	18 (4%)	1 (0%)	43	27
All	All	872/874 (100%)	834 (96%)	37 (4%)	1 (0%)	48	30

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	137	VAL

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	396/396 (100%)	389 (98%)	7 (2%)	51	30
1	B	398/396 (100%)	394 (99%)	4 (1%)	68	52
All	All	794/792 (100%)	783 (99%)	11 (1%)	59	39

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	161	SER
1	A	243	ILE
1	A	294	ASN
1	A	295	HIS
1	A	341	GLU
1	A	385	ASP
1	A	558	PHE
1	B	149	LYS
1	B	234	ASP
1	B	295	HIS
1	B	524	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	313	GLN
1	A	342	HIS
1	A	360	GLN
1	A	504	ASN
1	A	559	GLN
1	B	294	ASN
1	B	313	GLN

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Mol	Chain	Res	Type
1	B	360	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 ⓘ

18 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	C	1	2,1	14,14,15	0.38	0	17,19,21	1.42	3 (17%)
2	NAG	C	2	2	14,14,15	0.49	0	17,19,21	0.87	1 (5%)
2	BMA	C	3	2	11,11,12	0.71	0	15,15,17	1.01	1 (6%)
2	MAN	C	4	2	11,11,12	0.68	0	15,15,17	0.79	1 (6%)
2	MAN	C	5	2	11,11,12	0.74	0	15,15,17	1.46	2 (13%)
2	MAN	C	6	2	11,11,12	0.49	0	15,15,17	1.14	1 (6%)
2	MAN	C	7	2	11,11,12	0.56	0	15,15,17	0.59	0
2	MAN	C	8	2	11,11,12	0.51	0	15,15,17	1.18	1 (6%)
2	MAN	C	9	2	11,11,12	0.68	0	15,15,17	0.87	1 (6%)
3	NAG	D	1	3,1	14,14,15	0.61	0	17,19,21	0.79	0
3	NAG	D	2	3	14,14,15	0.51	0	17,19,21	0.99	0
3	BMA	D	3	3	11,11,12	0.64	0	15,15,17	0.52	0
3	MAN	D	4	3	11,11,12	0.56	0	15,15,17	0.78	0
4	NAG	E	1	1,4	14,14,15	0.42	0	17,19,21	1.18	2 (11%)
4	NAG	E	2	4	14,14,15	0.49	0	17,19,21	1.34	2 (11%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	BMA	E	3	4	11,11,12	0.55	0	15,15,17	1.01	1 (6%)
5	NAG	F	1	1,5	14,14,15	0.47	0	17,19,21	1.63	3 (17%)
5	FUL	F	2	5	10,10,11	0.65	0	14,14,16	1.20	2 (14%)

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	C	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	C	2	2	-	0/6/23/26	0/1/1/1
2	BMA	C	3	2	-	0/2/19/22	0/1/1/1
2	MAN	C	4	2	-	0/2/19/22	0/1/1/1
2	MAN	C	5	2	-	2/2/19/22	0/1/1/1
2	MAN	C	6	2	-	0/2/19/22	0/1/1/1
2	MAN	C	7	2	-	2/2/19/22	0/1/1/1
2	MAN	C	8	2	-	0/2/19/22	0/1/1/1
2	MAN	C	9	2	-	2/2/19/22	0/1/1/1
3	NAG	D	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	D	2	3	-	0/6/23/26	0/1/1/1
3	BMA	D	3	3	-	0/2/19/22	0/1/1/1
3	MAN	D	4	3	-	0/2/19/22	0/1/1/1
4	NAG	E	1	1,4	-	2/6/23/26	0/1/1/1
4	NAG	E	2	4	-	2/6/23/26	0/1/1/1
4	BMA	E	3	4	-	2/2/19/22	0/1/1/1
5	NAG	F	1	1,5	-	2/6/23/26	0/1/1/1
5	FUL	F	2	5	-	-	0/1/1/1

There are no bond length outliers.

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	F	1	NAG	C1-O5-C5	3.57	116.97	112.19
2	C	8	MAN	C1-O5-C5	3.39	116.72	112.19
2	C	5	MAN	C3-C4-C5	3.36	116.32	110.23
2	C	1	NAG	C1-O5-C5	3.24	116.53	112.19
2	C	6	MAN	C1-O5-C5	3.20	116.47	112.19
4	E	2	NAG	C1-O5-C5	3.05	116.28	112.19

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	F	1	NAG	C3-C4-C5	2.99	115.65	110.23
4	E	2	NAG	C4-C3-C2	2.92	115.30	111.02
4	E	3	BMA	C1-C2-C3	-2.87	105.46	109.64
4	E	1	NAG	O5-C1-C2	-2.80	106.96	111.29
4	E	1	NAG	C1-O5-C5	2.77	115.90	112.19
5	F	1	NAG	O5-C5-C6	2.66	112.84	107.66
2	C	9	MAN	C1-C2-C3	-2.56	105.91	109.64
2	C	1	NAG	C3-C4-C5	2.40	114.58	110.23
2	C	3	BMA	O3-C3-C2	-2.21	105.53	110.05
2	C	4	MAN	O5-C1-C2	-2.20	105.54	110.79
2	C	1	NAG	O5-C1-C2	-2.18	107.92	111.29
5	F	2	FUL	C1-O5-C5	2.12	117.96	112.97
2	C	5	MAN	O3-C3-C4	-2.12	105.39	110.38
2	C	2	NAG	C2-N2-C7	-2.10	120.08	122.90
5	F	2	FUL	O2-C2-C1	2.07	113.96	109.22

There are no chirality outliers.

All (14) torsion outliers are listed below:

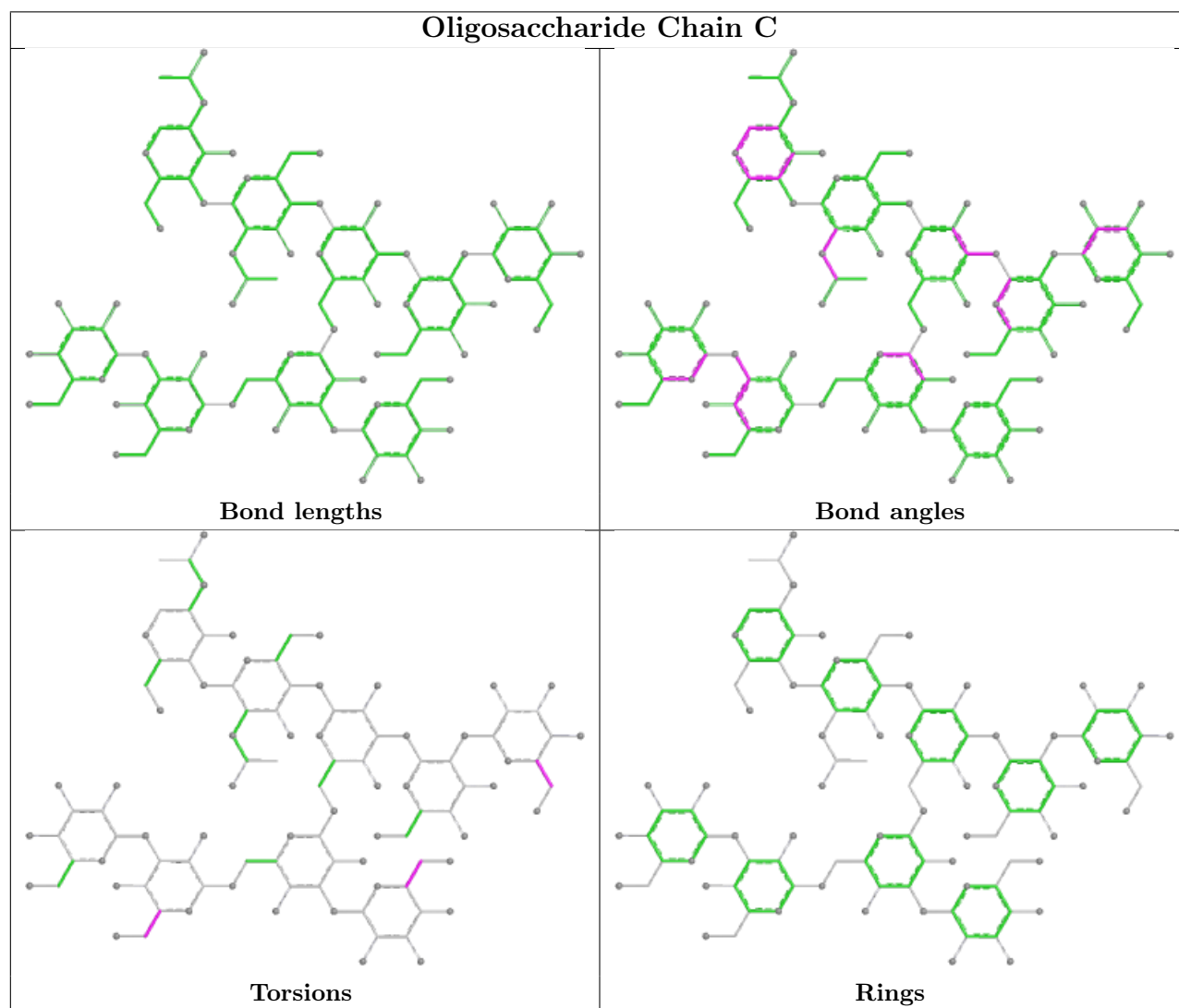
Mol	Chain	Res	Type	Atoms
4	E	2	NAG	O5-C5-C6-O6
2	C	9	MAN	O5-C5-C6-O6
5	F	1	NAG	O5-C5-C6-O6
4	E	2	NAG	C4-C5-C6-O6
2	C	9	MAN	C4-C5-C6-O6
5	F	1	NAG	C4-C5-C6-O6
4	E	1	NAG	C8-C7-N2-C2
2	C	7	MAN	C4-C5-C6-O6
4	E	3	BMA	O5-C5-C6-O6
4	E	1	NAG	O7-C7-N2-C2
2	C	7	MAN	O5-C5-C6-O6
2	C	5	MAN	C4-C5-C6-O6
2	C	5	MAN	O5-C5-C6-O6
4	E	3	BMA	C4-C5-C6-O6

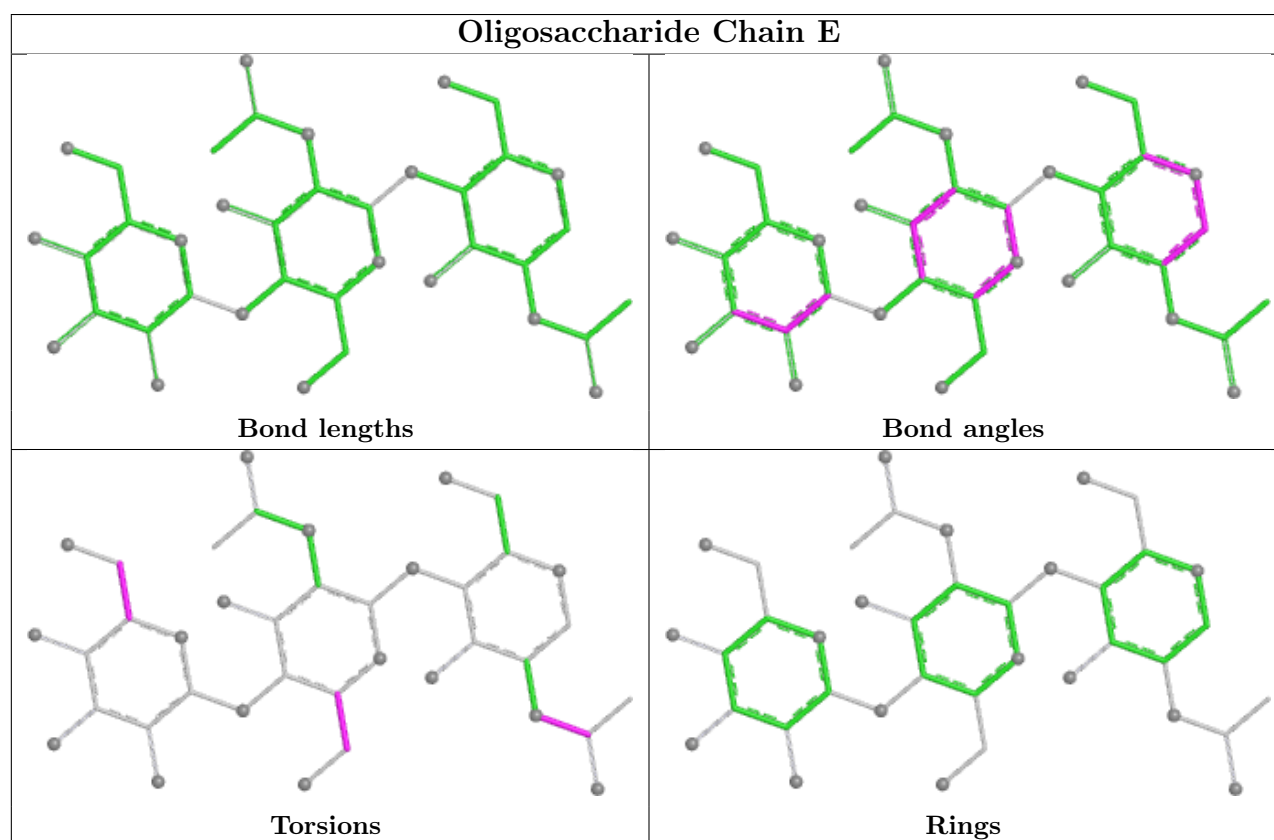
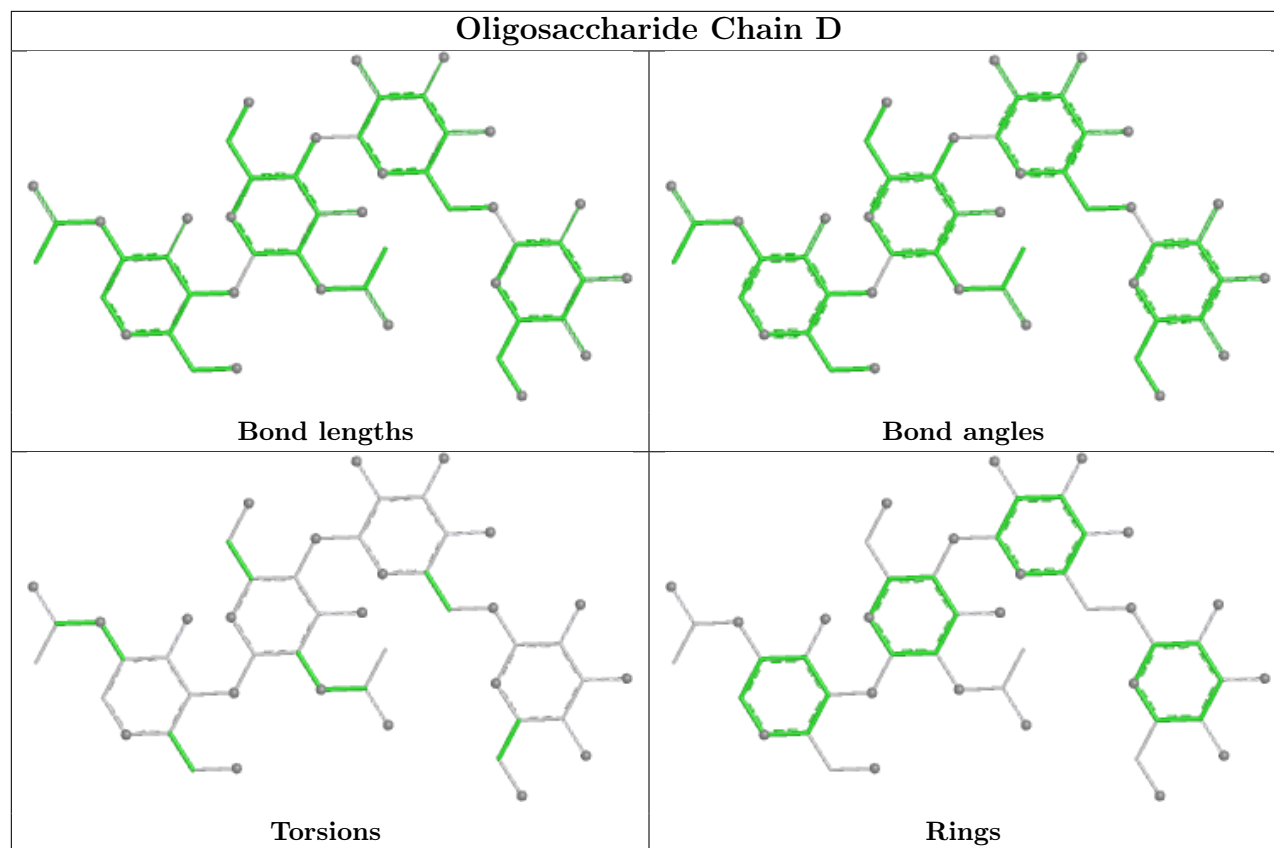
There are no ring outliers.

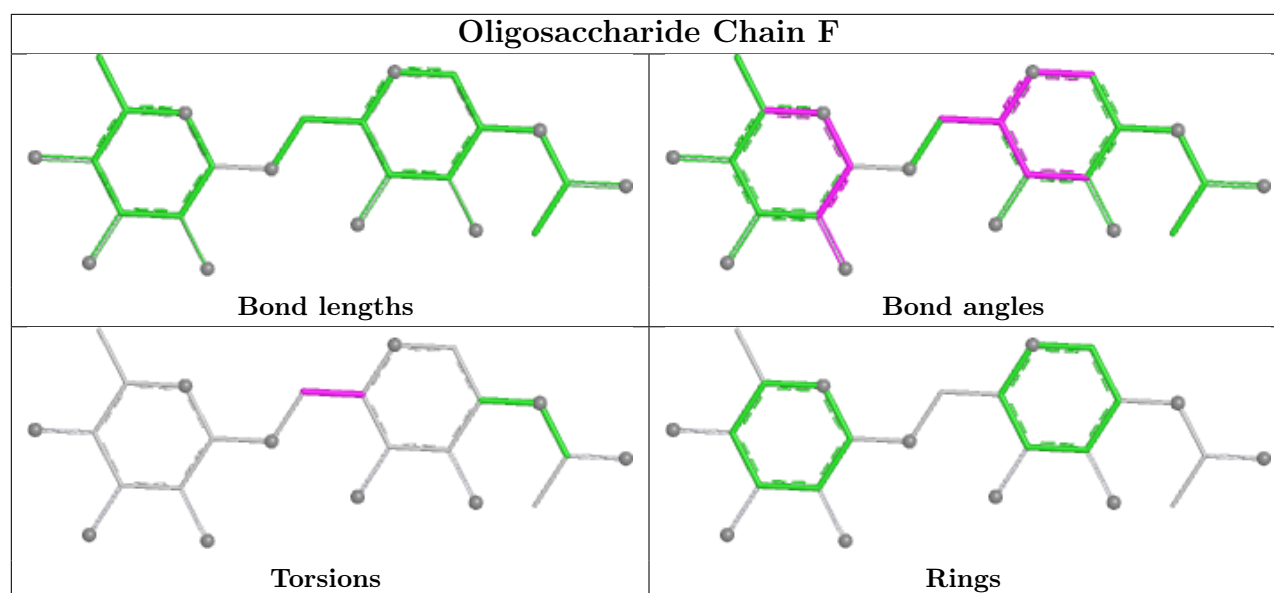
2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	E	3	BMA	1	0
2	C	2	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.







5.6 Ligand geometry [i](#)

Of 13 ligands modelled in this entry, 2 are monoatomic - leaving 11 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	$\# Z > 2$
10	PO4	B	612	-	4,4,4	0.99	0	6,6,6	0.42	0
8	EDO	A	615	-	3,3,3	0.44	0	2,2,2	0.37	0
8	EDO	A	616	-	3,3,3	0.48	0	2,2,2	0.32	0
9	SO4	B	613	-	4,4,4	0.22	0	6,6,6	0.12	0
6	NAG	A	601	1	14,14,15	0.52	0	17,19,21	0.63	0
8	EDO	B	614	-	3,3,3	0.64	0	2,2,2	0.17	0
8	EDO	B	615	-	3,3,3	0.40	0	2,2,2	0.55	0
9	SO4	A	614	-	4,4,4	0.27	0	6,6,6	0.08	0
10	PO4	B	611	-	4,4,4	0.90	0	6,6,6	0.61	0
8	EDO	A	613	-	3,3,3	0.56	0	2,2,2	0.22	0
6	NAG	A	611	1	14,14,15	0.48	0	17,19,21	1.19	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
8	EDO	A	615	-	-	0/1/1/1	-
8	EDO	A	616	-	-	1/1/1/1	-
6	NAG	A	601	1	-	1/6/23/26	0/1/1/1
8	EDO	B	614	-	-	0/1/1/1	-
8	EDO	B	615	-	-	0/1/1/1	-
8	EDO	A	613	-	-	0/1/1/1	-
6	NAG	A	611	1	-	2/6/23/26	0/1/1/1

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	611	NAG	O5-C1-C2	-2.63	107.22	111.29
6	A	611	NAG	C1-O5-C5	2.31	115.29	112.19

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	611	NAG	O5-C5-C6-O6
6	A	611	NAG	C4-C5-C6-O6
8	A	616	EDO	O1-C1-C2-O2
6	A	601	NAG	C4-C5-C6-O6

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	A	616	EDO	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, 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	432/437 (98%)	-0.06	13 (3%)	52	57	11, 25, 49, 83	5 (1%)
1	B	437/437 (100%)	0.03	15 (3%)	48	52	12, 28, 54, 88	2 (0%)
All	All	869/874 (99%)	-0.02	28 (3%)	50	54	11, 26, 52, 88	7 (0%)

All (28) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	137	VAL	5.0
1	A	344	ILE	4.7
1	A	297	GLY	4.4
1	B	371	TRP	3.7
1	A	294	ASN	3.2
1	B	138	PRO	3.1
1	B	234	ASP	2.8
1	A	371	TRP	2.7
1	B	387	GLY	2.7
1	A	142	ILE	2.7
1	B	344	ILE	2.7
1	A	214	CYS	2.6
1	A	236	VAL	2.6
1	B	214	CYS	2.6
1	A	391	ILE	2.6
1	A	388	LEU	2.5
1	B	388	LEU	2.5
1	A	295	HIS	2.5
1	B	572	SER	2.4
1	A	233	SER	2.4
1	A	296	ASP	2.3
1	B	390	SER	2.3
1	B	140	GLN	2.3
1	A	539	TYR	2.3

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Mol	Chain	Res	Type	RSRZ
1	B	217	ILE	2.2
1	B	295	HIS	2.2
1	B	343	PRO	2.0
1	B	473	CYS	2.0

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](#)

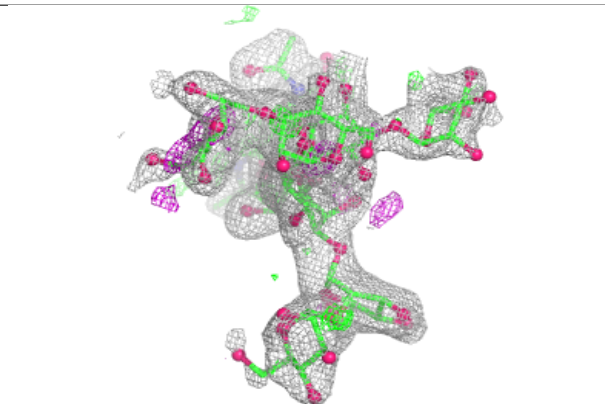
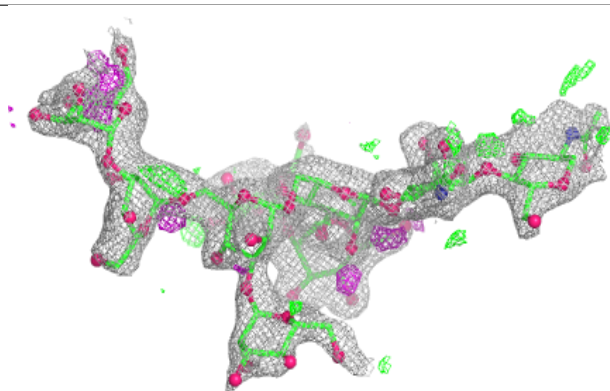
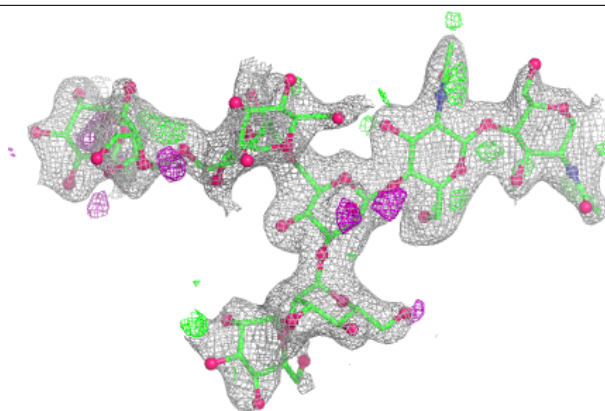
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	BMA	E	3	11/12	0.51	0.15	75,84,87,91	0
3	NAG	D	2	14/15	0.55	0.15	53,62,67,68	0
3	BMA	D	3	11/12	0.57	0.13	54,65,70,74	0
2	MAN	C	9	11/12	0.58	0.14	78,87,91,95	0
2	MAN	C	7	11/12	0.61	0.12	71,75,77,78	0
5	NAG	F	1	14/15	0.70	0.13	45,70,77,81	0
2	MAN	C	5	11/12	0.71	0.14	57,71,74,78	0
5	FUL	F	2	10/11	0.71	0.12	77,85,91,91	0
3	NAG	D	1	14/15	0.78	0.11	38,47,60,62	0
2	MAN	C	6	11/12	0.81	0.14	41,47,52,55	0
2	MAN	C	4	11/12	0.82	0.12	40,51,57,65	0
3	MAN	D	4	11/12	0.83	0.12	28,43,52,55	0
2	BMA	C	3	11/12	0.85	0.10	31,40,47,48	0
4	NAG	E	1	14/15	0.86	0.12	52,57,65,66	0
2	MAN	C	8	11/12	0.87	0.09	35,39,44,56	0
4	NAG	E	2	14/15	0.88	0.10	52,56,64,73	0
2	NAG	C	1	14/15	0.89	0.11	27,37,55,59	0
2	NAG	C	2	14/15	0.92	0.10	30,36,41,42	0

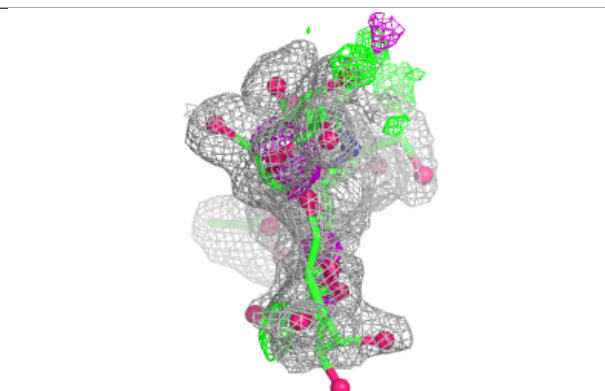
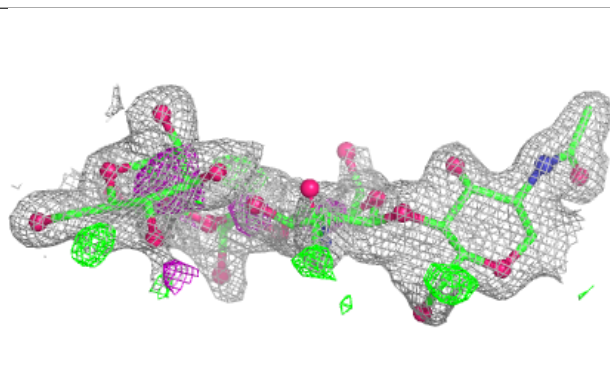
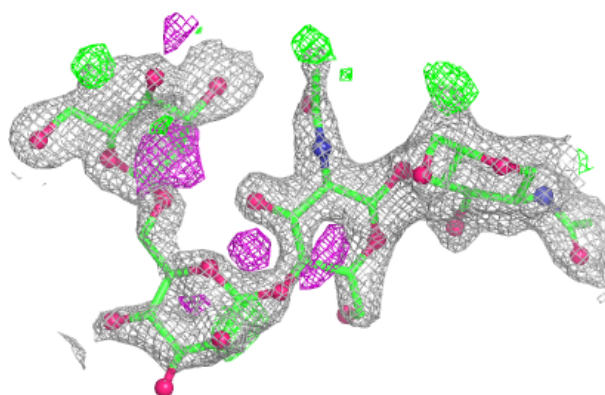
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around Chain C:

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

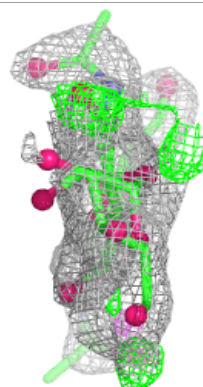
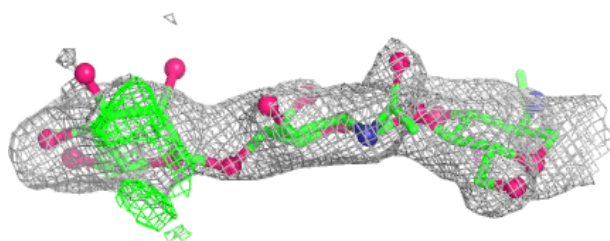
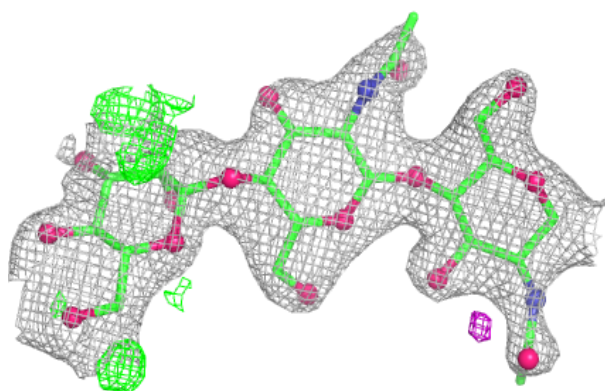
**Electron density around Chain D:**

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

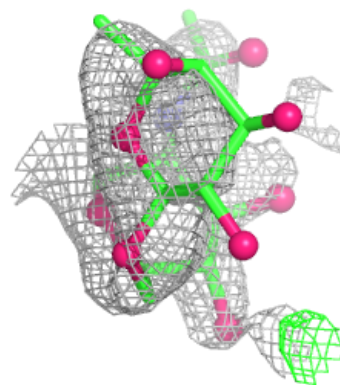
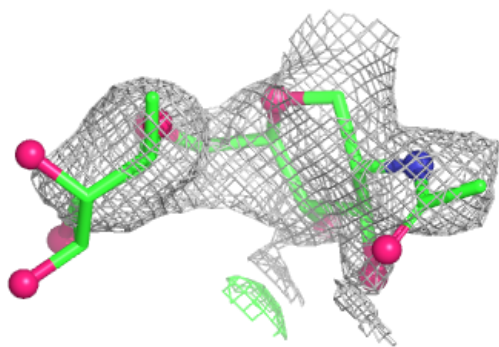
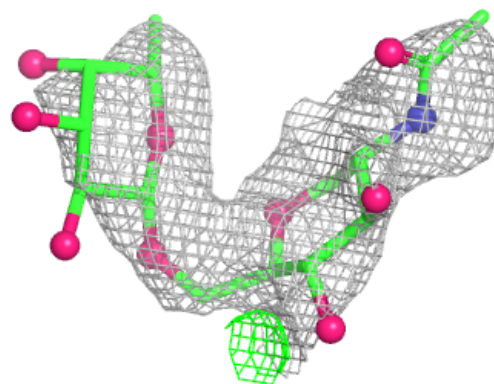


Electron density around Chain E:

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

**Electron density around Chain F:**

$2mF_o-DF_c$ (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
6	NAG	A	601	14/15	0.70	0.12	53,60,69,73	0
9	SO4	B	613	5/5	0.76	0.12	103,103,104,105	0
9	SO4	A	614	5/5	0.81	0.12	49,59,60,63	0
6	NAG	A	611	14/15	0.84	0.10	35,48,59,63	0
8	EDO	A	616	4/4	0.85	0.12	29,38,40,45	0
8	EDO	B	615	4/4	0.86	0.12	37,38,39,42	0
10	PO4	B	612	5/5	0.88	0.08	69,69,73,73	0
8	EDO	A	615	4/4	0.92	0.10	34,34,36,37	0
8	EDO	B	614	4/4	0.92	0.09	20,20,24,25	0
10	PO4	B	611	5/5	0.96	0.07	32,33,34,39	0
8	EDO	A	613	4/4	0.96	0.06	19,22,25,25	0
7	CA	A	612	1/1	0.98	0.03	22,22,22,22	0
7	CA	B	610	1/1	0.99	0.04	24,24,24,24	0

6.5 Other polymers [i](#)

There are no such residues in this entry.