



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 09:35 PM UTC

PDB ID : 4BYH / pdb_00004byh
Title : Crystal structure of sialylated IgG Fc
Authors : Crispin, M.; Yu, X.; Bowden, T.A.
Deposited on : 2013-07-19
Resolution : 2.30 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

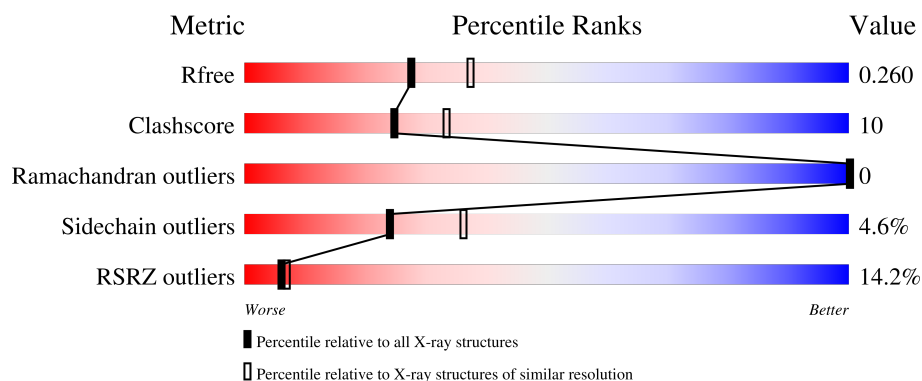
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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	6319 (2.30-2.30)
Clashscore	190562	6919 (2.30-2.30)
Ramachandran outliers	187476	6854 (2.30-2.30)
Sidechain outliers	187428	6854 (2.30-2.30)
RSRZ outliers	180081	6325 (2.30-2.30)

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	233	20% 75% 11% • 11%
1	B	233	5% 79% 9% • 10%
2	C	10	30% 50% 20%
3	D	10	30% 60% 10%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 3780 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 IG GAMMA-1 CHAIN C REGION.

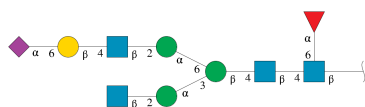
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	207	Total	C	N	O	S	0	0	0
			1661	1057	279	318	7			
1	B	209	Total	C	N	O	S	0	5	0
			1700	1083	286	324	7			

There are 22 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	222	GLY	-	expression tag	UNP P01857
A	356	GLU	ASP	conflict	UNP P01857
A	358	MET	LEU	conflict	UNP P01857
A	447	THR	-	expression tag	UNP P01857
A	448	LYS	-	expression tag	UNP P01857
A	449	HIS	-	expression tag	UNP P01857
A	450	HIS	-	expression tag	UNP P01857
A	451	HIS	-	expression tag	UNP P01857
A	452	HIS	-	expression tag	UNP P01857
A	453	HIS	-	expression tag	UNP P01857
A	454	HIS	-	expression tag	UNP P01857
B	222	GLY	-	expression tag	UNP P01857
B	356	GLU	ASP	conflict	UNP P01857
B	358	MET	LEU	conflict	UNP P01857
B	447	THR	-	expression tag	UNP P01857
B	448	LYS	-	expression tag	UNP P01857
B	449	HIS	-	expression tag	UNP P01857
B	450	HIS	-	expression tag	UNP P01857
B	451	HIS	-	expression tag	UNP P01857
B	452	HIS	-	expression tag	UNP P01857
B	453	HIS	-	expression tag	UNP P01857
B	454	HIS	-	expression tag	UNP P01857

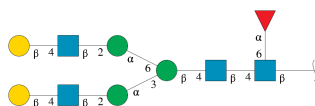
- Molecule 2 is an oligosaccharide called N-acetyl-alpha-neuraminic acid-(2-6)-beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1

-6)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1-3)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	10	Total	C	N	O	0	0	0
			130	73	5	52			

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



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	D	10	Total	C	N	O	0	0	0
			121	68	4	49			

- Molecule 4 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Cl	0	0
			1	1		
4	B	1	Total	Cl	0	0
			1	1		

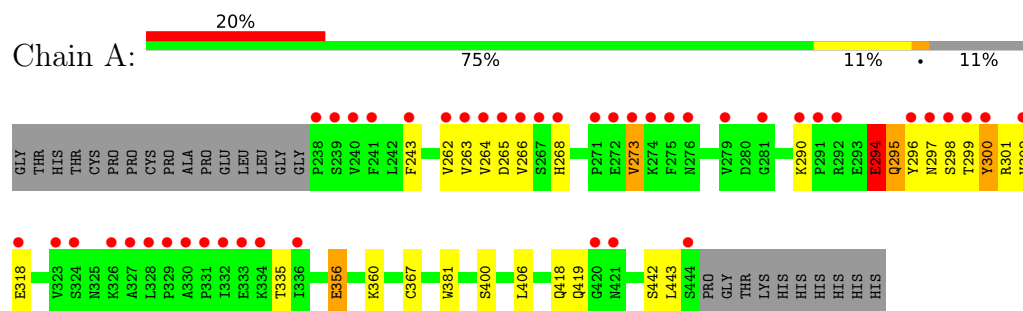
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	61	Total	O	0	0
			61	61		
5	B	105	Total	O	0	0
			105	105		

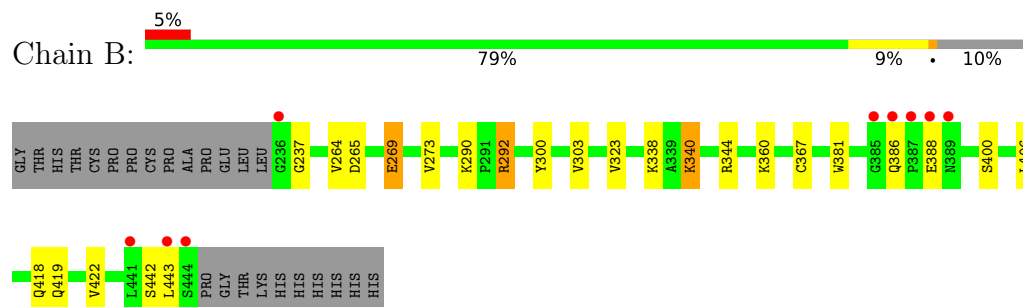
3 Residue-property plots [i](#)

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: IG GAMMA-1 CHAIN C REGION



• Molecule 1: IG GAMMA-1 CHAIN C REGION



• Molecule 2: N-acetyl-alpha-neuraminic acid-(2-6)-beta-D-galactopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1-6)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1-3)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose



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

Chain D: 30% 60% 10%

NAG1	NAG2	BMA3	MAN4	NAG5	GAL6	MAN7	NAG8	GAL9	FUC10
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4 Data and refinement statistics

Property	Value	Source
Space group	P 61 2 2	Depositor
Cell constants a, b, c, α , β , γ	153.00Å 153.00Å 111.85Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	66.34 – 2.30 66.34 – 2.30	Depositor EDS
% Data completeness (in resolution range)	99.0 (66.34-2.30) 99.0 (66.34-2.30)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.72 (at 2.29Å)	Xtriage
Refinement program	REFMAC 5.7.0032	Depositor
R, R_{free}	0.222 , 0.262 0.226 , 0.260	Depositor DCC
R_{free} test set	1745 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å ²)	47.0	Xtriage
Anisotropy	0.575	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 48.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	3780	wwPDB-VP
Average B, all atoms (Å ²)	67.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.05% 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: CL, GAL, MAN, SIA, BMA, FUC, 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	0.59	0/1707	0.77	2/2324 (0.1%)
1	B	0.70	0/1758	0.82	4/2393 (0.2%)
All	All	0.65	0/3465	0.79	6/4717 (0.1%)

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	386	GLN	N-CA-C	5.84	118.34	110.29
1	B	340	LYS	N-CA-C	5.75	119.47	112.23
1	A	294	GLU	N-CA-C	5.69	120.97	112.94
1	A	298	SER	N-CA-C	5.30	117.80	111.71
1	B	237	GLY	CA-C-N	-5.04	114.76	119.85
1	B	237	GLY	C-N-CA	-5.04	114.76	119.85

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	1661	0	1628	53	0
1	B	1700	0	1677	15	0
2	C	130	0	110	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	D	121	0	103	1	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
5	A	61	0	0	1	0
5	B	105	0	0	3	0
All	All	3780	0	3518	70	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 10.

All (70) 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:262:VAL:CG1	1:A:301:ARG:HH21	1.38	1.35
1:A:295:GLN:HB3	1:A:296:TYR:CD1	1.66	1.27
1:A:295:GLN:HB3	1:A:296:TYR:CE1	1.75	1.22
1:A:295:GLN:HG2	1:A:296:TYR:CE1	1.84	1.12
1:A:295:GLN:CB	1:A:296:TYR:CD1	2.32	1.12
1:A:262:VAL:HG11	1:A:301:ARG:HH21	1.10	1.10
1:A:263:VAL:O	1:A:301:ARG:HA	1.59	1.02
1:A:262:VAL:CG1	1:A:301:ARG:NH2	2.22	1.01
1:A:295:GLN:HG2	1:A:296:TYR:HE1	1.15	1.00
1:A:295:GLN:CB	1:A:296:TYR:CE1	2.44	0.99
1:A:295:GLN:CG	1:A:296:TYR:CE1	2.48	0.96
1:A:268:HIS:HA	1:A:300:TYR:OH	1.68	0.93
1:A:262:VAL:HG13	1:A:301:ARG:HH21	1.33	0.92
1:A:262:VAL:HG11	1:A:301:ARG:NH2	1.84	0.87
5:B:691:HOH:O	2:C:1:NAG:H81	1.79	0.82
1:A:318:GLU:HG2	1:A:335:THR:CG2	2.11	0.80
1:A:273:VAL:HG21	1:A:302:VAL:HG21	1.62	0.80
1:A:262:VAL:HG13	1:A:301:ARG:NH2	1.95	0.77
1:A:295:GLN:CG	1:A:296:TYR:CD1	2.71	0.71
1:A:295:GLN:CG	1:A:296:TYR:HE1	1.94	0.69
1:A:265:ASP:HA	1:A:299:THR:OG1	1.93	0.68
1:B:290:LYS:HE2	1:B:303[A]:VAL:CG2	2.24	0.68
1:A:263:VAL:O	1:A:301:ARG:CA	2.40	0.67
1:B:418:GLN:HA	1:B:443:LEU:HD22	1.80	0.64
1:A:297:ASN:OD1	1:A:297:ASN:C	2.40	0.63
1:A:295:GLN:CA	1:A:296:TYR:CD1	2.82	0.62
1:A:266:VAL:O	1:A:300:TYR:CD1	2.53	0.61
1:A:418:GLN:HA	1:A:443:LEU:HD22	1.81	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:265:ASP:HA	1:A:299:THR:HG21	1.82	0.60
1:A:295:GLN:HG2	1:A:296:TYR:CD1	2.30	0.60
1:A:266:VAL:O	1:A:300:TYR:CE1	2.56	0.59
1:B:292:ARG:HD3	5:B:655:HOH:O	2.02	0.58
1:B:290:LYS:HE2	1:B:303[A]:VAL:HG21	1.83	0.58
1:A:262:VAL:HG22	1:A:303:VAL:HG13	1.84	0.58
1:A:264:VAL:HG12	1:A:301:ARG:HB3	1.87	0.56
1:A:265:ASP:HA	1:A:299:THR:CB	2.36	0.54
1:A:266:VAL:N	1:A:299:THR:HB	2.21	0.54
1:A:300:TYR:CD1	1:A:300:TYR:N	2.75	0.54
1:A:262:VAL:CG2	1:A:301:ARG:NH2	2.71	0.53
1:B:292:ARG:HG3	1:B:300:TYR:CD1	2.42	0.53
1:B:422:VAL:HG22	1:B:442:SER:OG	2.10	0.52
5:B:703:HOH:O	3:D:8:NAG:H83	2.09	0.52
1:A:356:GLU:HG2	5:A:620:HOH:O	2.11	0.51
1:A:265:ASP:HA	1:A:299:THR:CG2	2.40	0.50
1:B:418:GLN:O	1:B:419:GLN:HG2	2.10	0.50
1:A:290:LYS:HD3	1:A:303:VAL:HB	1.92	0.50
1:A:418:GLN:O	1:A:419:GLN:HG2	2.12	0.50
1:B:269[A]:GLU:H	1:B:269[A]:GLU:CD	2.19	0.48
1:A:295:GLN:HA	1:A:296:TYR:HA	1.55	0.48
1:A:406:LEU:C	1:A:406:LEU:HD12	2.39	0.48
1:B:406:LEU:HD12	1:B:406:LEU:C	2.39	0.47
1:A:295:GLN:HA	1:A:296:TYR:CD1	2.50	0.47
1:A:418:GLN:O	1:A:419:GLN:CG	2.65	0.45
1:A:265:ASP:CA	1:A:299:THR:OG1	2.64	0.45
1:B:418:GLN:O	1:B:419:GLN:CG	2.64	0.45
1:A:266:VAL:HG12	1:A:300:TYR:CE1	2.52	0.44
1:B:264:VAL:O	1:B:265:ASP:HB2	2.16	0.44
1:A:295:GLN:HA	1:A:296:TYR:HD1	1.83	0.43
1:A:418:GLN:O	1:A:419:GLN:CB	2.66	0.43
1:A:262:VAL:CG2	1:A:301:ARG:HH21	2.31	0.43
1:A:243:PHE:CG	2:C:5:NAG:H5	2.54	0.42
1:A:290:LYS:HG3	1:A:303:VAL:O	2.19	0.42
1:B:418:GLN:O	1:B:419:GLN:CB	2.66	0.42
1:A:262:VAL:CB	1:A:301:ARG:HH21	2.19	0.42
1:A:266:VAL:HB	1:A:300:TYR:O	2.20	0.41
1:B:367:CYS:HB2	1:B:381:TRP:CZ2	2.55	0.41
1:A:294:GLU:HG2	1:A:300:TYR:HD2	1.86	0.41
1:A:367:CYS:HB2	1:A:381:TRP:CZ2	2.56	0.41
1:B:273:VAL:HG13	1:B:323:VAL:HG13	2.03	0.40

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	205/233 (88%)	200 (98%)	5 (2%)	0	100	100
1	B	212/233 (91%)	208 (98%)	4 (2%)	0	100	100
All	All	417/466 (90%)	408 (98%)	9 (2%)	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	194/215 (90%)	184 (95%)	10 (5%)	21	31
1	B	199/215 (93%)	190 (96%)	9 (4%)	24	37
All	All	393/430 (91%)	374 (95%)	19 (5%)	24	35

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	273	VAL
1	A	294	GLU
1	A	295	GLN
1	A	300	TYR
1	A	303	VAL

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Mol	Chain	Res	Type
1	A	311	GLN
1	A	356	GLU
1	A	360	LYS
1	A	400	SER
1	A	442	SER
1	B	269[A]	GLU
1	B	269[B]	GLU
1	B	292	ARG
1	B	338	LYS
1	B	340	LYS
1	B	344	ARG
1	B	360	LYS
1	B	388	GLU
1	B	400	SER

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	421	ASN
1	B	362	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 ⓘ

20 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	1,2	14,14,15	0.68	0	17,19,21	1.52	4 (23%)
2	FUC	C	10	2	10,10,11	0.81	0	14,14,16	0.86	0
2	NAG	C	2	2	14,14,15	0.77	0	17,19,21	1.43	3 (17%)
2	BMA	C	3	2	11,11,12	0.57	0	15,15,17	1.54	3 (20%)
2	MAN	C	4	2	11,11,12	0.62	0	15,15,17	1.08	0
2	NAG	C	5	2	14,14,15	0.76	0	17,19,21	0.88	1 (5%)
2	GAL	C	6	2	11,11,12	0.68	0	15,15,17	0.76	1 (6%)
2	SIA	C	7	2	20,20,21	0.81	0	21,28,31	1.20	3 (14%)
2	MAN	C	8	2	11,11,12	0.67	0	15,15,17	0.88	0
2	NAG	C	9	2	14,14,15	0.46	0	17,19,21	1.39	2 (11%)
3	NAG	D	1	1,3	14,14,15	0.48	0	17,19,21	0.93	0
3	FUC	D	10	3	10,10,11	0.87	0	14,14,16	2.10	4 (28%)
3	NAG	D	2	3	14,14,15	0.80	0	17,19,21	0.73	0
3	BMA	D	3	3	11,11,12	0.50	0	15,15,17	1.31	3 (20%)
3	MAN	D	4	3	11,11,12	0.61	0	15,15,17	1.07	1 (6%)
3	NAG	D	5	3	14,14,15	0.62	0	17,19,21	1.52	3 (17%)
3	GAL	D	6	3	11,11,12	0.51	0	15,15,17	0.76	0
3	MAN	D	7	3	11,11,12	0.74	0	15,15,17	1.54	2 (13%)
3	NAG	D	8	3	14,14,15	0.67	0	17,19,21	1.46	3 (17%)
3	GAL	D	9	3	11,11,12	0.68	0	15,15,17	1.33	2 (13%)

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	1,2	-	2/6/23/26	0/1/1/1
2	FUC	C	10	2	-	-	0/1/1/1
2	NAG	C	2	2	-	2/6/23/26	0/1/1/1
2	BMA	C	3	2	-	1/2/19/22	0/1/1/1
2	MAN	C	4	2	-	2/2/19/22	0/1/1/1
2	NAG	C	5	2	-	0/6/23/26	0/1/1/1
2	GAL	C	6	2	-	1/2/19/22	0/1/1/1
2	SIA	C	7	2	-	11/18/34/38	0/1/1/1
2	MAN	C	8	2	-	1/2/19/22	0/1/1/1
2	NAG	C	9	2	-	2/6/23/26	0/1/1/1
3	NAG	D	1	1,3	-	0/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	FUC	D	10	3	-	-	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	-	2/2/19/22	0/1/1/1
3	NAG	D	5	3	-	4/6/23/26	0/1/1/1
3	GAL	D	6	3	-	0/2/19/22	0/1/1/1
3	MAN	D	7	3	-	0/2/19/22	0/1/1/1
3	NAG	D	8	3	-	2/6/23/26	0/1/1/1
3	GAL	D	9	3	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

All (35) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	10	FUC	C1-C2-C3	-5.51	101.63	109.64
3	D	8	NAG	C8-C7-N2	3.94	122.66	116.12
3	D	5	NAG	C8-C7-N2	3.61	122.10	116.12
3	D	10	FUC	C1-O5-C5	-3.56	104.56	112.97
3	D	7	MAN	C1-C2-C3	3.47	114.70	109.64
2	C	3	BMA	C1-O5-C5	3.31	116.62	112.19
3	D	7	MAN	O2-C2-C3	-3.19	103.54	110.15
2	C	2	NAG	C4-C3-C2	2.97	115.37	111.02
3	D	5	NAG	O7-C7-C8	-2.91	116.86	122.05
3	D	8	NAG	O7-C7-C8	-2.81	117.05	122.05
3	D	5	NAG	C2-N2-C7	2.75	126.59	122.90
3	D	4	MAN	C1-O5-C5	2.74	115.86	112.19
2	C	9	NAG	C8-C7-N2	2.71	120.62	116.12
2	C	2	NAG	O7-C7-C8	-2.64	117.35	122.05
2	C	5	NAG	O5-C1-C2	-2.58	107.30	111.29
2	C	3	BMA	C3-C4-C5	2.57	114.89	110.23
3	D	10	FUC	O5-C5-C6	2.57	112.97	107.40
3	D	10	FUC	O4-C4-C5	-2.56	104.09	109.74
2	C	1	NAG	C1-O5-C5	2.52	115.56	112.19
2	C	7	SIA	O6-C2-C1	2.50	112.43	107.72
2	C	9	NAG	O5-C1-C2	-2.45	107.50	111.29
2	C	1	NAG	O6-C6-C5	-2.44	103.01	111.33
2	C	7	SIA	O1B-C1-C2	2.33	118.76	112.71
2	C	2	NAG	O5-C5-C6	2.31	112.16	107.66
2	C	1	NAG	C8-C7-N2	2.30	119.94	116.12
3	D	3	BMA	O6-C6-C5	-2.26	103.64	111.33
2	C	1	NAG	O5-C1-C2	-2.23	107.84	111.29

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	3	BMA	C1-C2-C3	2.19	112.84	109.64
3	D	9	GAL	C1-O5-C5	2.17	115.09	112.19
2	C	3	BMA	O3-C3-C4	-2.16	105.29	110.38
3	D	3	BMA	C1-O5-C5	2.15	115.07	112.19
2	C	7	SIA	O6-C2-C3	-2.08	107.76	110.56
3	D	8	NAG	C1-O5-C5	2.03	114.91	112.19
2	C	6	GAL	C1-O5-C5	2.02	114.89	112.19
3	D	9	GAL	C3-C4-C5	2.01	113.87	110.23

There are no chirality outliers.

All (30) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	7	SIA	C5-C6-C7-C8
2	C	7	SIA	C5-C6-C7-O7
2	C	7	SIA	O6-C6-C7-O7
2	C	7	SIA	C7-C8-C9-O9
2	C	7	SIA	O8-C8-C9-O9
2	C	2	NAG	O5-C5-C6-O6
3	D	4	MAN	C4-C5-C6-O6
2	C	4	MAN	O5-C5-C6-O6
3	D	5	NAG	O5-C5-C6-O6
2	C	4	MAN	C4-C5-C6-O6
3	D	4	MAN	O5-C5-C6-O6
2	C	2	NAG	C4-C5-C6-O6
2	C	1	NAG	C8-C7-N2-C2
2	C	1	NAG	O7-C7-N2-C2
2	C	9	NAG	C8-C7-N2-C2
2	C	9	NAG	O7-C7-N2-C2
3	D	5	NAG	C8-C7-N2-C2
3	D	5	NAG	O7-C7-N2-C2
3	D	8	NAG	C8-C7-N2-C2
3	D	8	NAG	O7-C7-N2-C2
3	D	5	NAG	C4-C5-C6-O6
2	C	8	MAN	O5-C5-C6-O6
2	C	7	SIA	O7-C7-C8-C9
2	C	6	GAL	O5-C5-C6-O6
2	C	7	SIA	O7-C7-C8-O8
2	C	7	SIA	C6-C7-C8-C9
2	C	3	BMA	O5-C5-C6-O6
2	C	7	SIA	O6-C6-C7-C8
2	C	7	SIA	C6-C7-C8-O8

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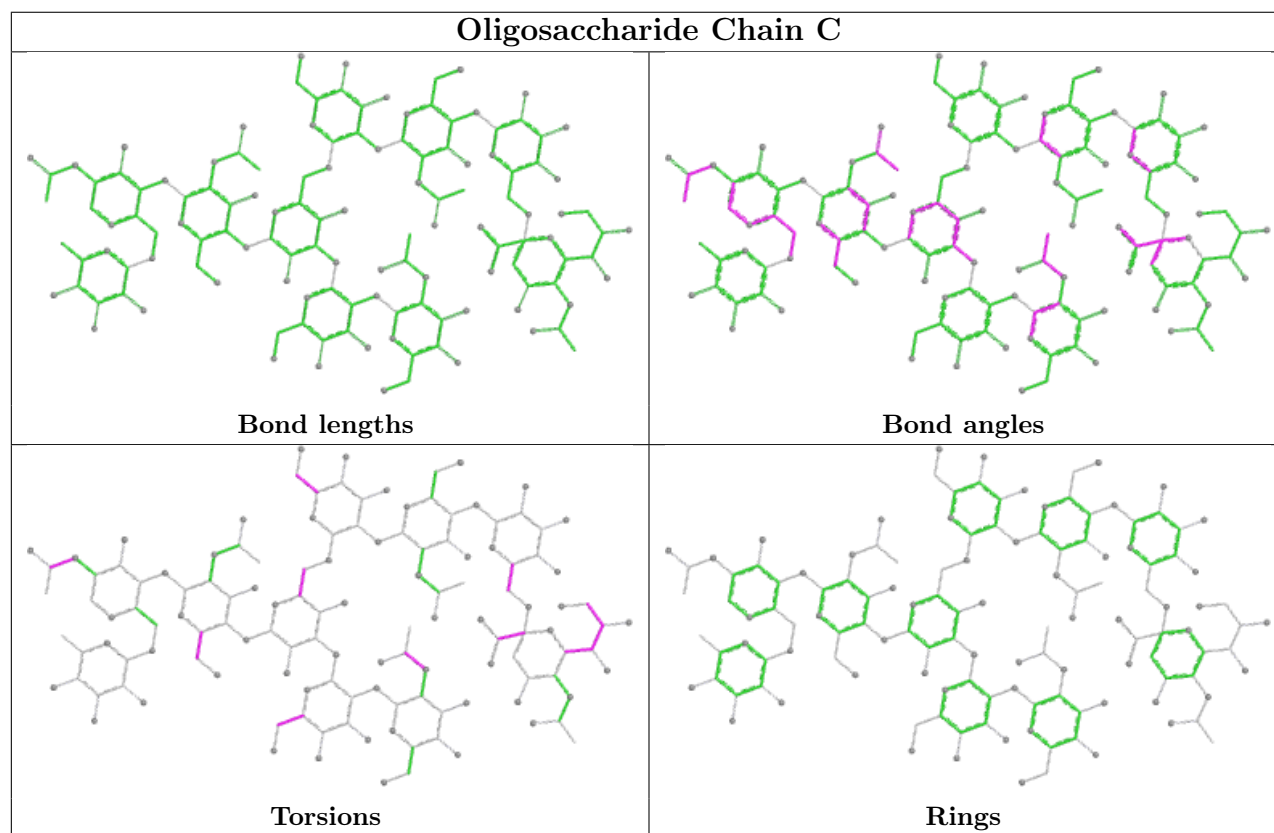
Mol	Chain	Res	Type	Atoms
2	C	7	SIA	O1A-C1-C2-O6

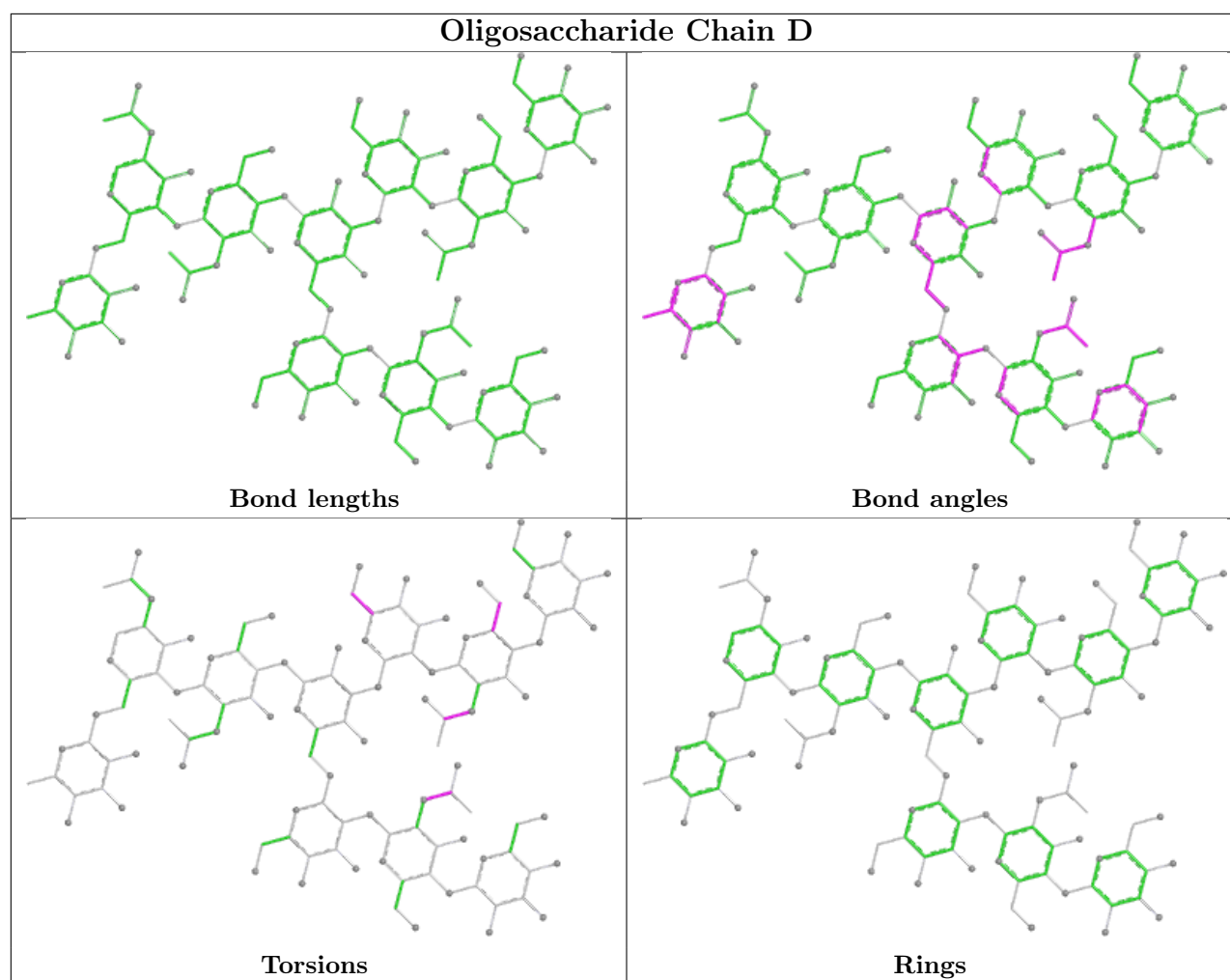
There are no ring outliers.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	5	NAG	1	0
3	D	8	NAG	1	0
2	C	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.





5.6 Ligand geometry [i](#)

Of 2 ligands modelled in this entry, 2 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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	207/233 (88%)	1.27	47 (22%) 2 2	40, 71, 141, 165	0
1	B	209/233 (89%)	0.45	12 (5%) 29 31	16, 46, 108, 131	6 (2%)
All	All	416/466 (89%)	0.86	59 (14%) 6 7	16, 59, 128, 165	6 (1%)

All (59) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	302	VAL	6.3
1	A	273	VAL	5.3
1	A	329	PRO	5.1
1	A	330	ALA	5.0
1	B	387	PRO	4.8
1	A	266	VAL	4.8
1	B	385	GLY	4.6
1	A	240	VAL	4.6
1	A	326	LYS	4.5
1	A	300	TYR	4.3
1	A	291	PRO	4.2
1	A	241	PHE	4.2
1	A	238	PRO	4.2
1	A	267	SER	4.0
1	A	271	PRO	3.9
1	A	263	VAL	3.8
1	A	332	ILE	3.8
1	B	444	SER	3.7
1	A	298	SER	3.6
1	A	296	TYR	3.4
1	A	299	THR	3.4
1	A	444	SER	3.4
1	A	328	LEU	3.3
1	A	303	VAL	3.3

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Mol	Chain	Res	Type	RSRZ
1	B	236	GLY	3.1
1	A	276	ASN	3.0
1	A	324	SER	2.9
1	A	264	VAL	2.9
1	A	243	PHE	2.9
1	A	275	PHE	2.9
1	A	331	PRO	2.8
1	A	297	ASN	2.8
1	B	388	GLU	2.8
1	A	327	ALA	2.8
1	A	333	GLU	2.7
1	A	292	ARG	2.7
1	A	279	VAL	2.7
1	A	262	VAL	2.7
1	A	281	GLY	2.7
1	A	239	SER	2.6
1	A	265	ASP	2.6
1	A	268	HIS	2.6
1	A	323	VAL	2.5
1	A	421	ASN	2.5
1	B	389	ASN	2.3
1	A	274	LYS	2.3
1	A	334	LYS	2.3
1	A	290	LYS	2.2
1	A	336	ILE	2.2
1	A	420	GLY	2.2
1	A	318	GLU	2.2
1	B	386	GLN	2.2
1	B	443	LEU	2.1
1	B	413	ASP	2.1
1	B	415	SER	2.1
1	A	272	GLU	2.1
1	B	412	VAL	2.1
1	B	441	LEU	2.0
1	A	317	LYS	2.0

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 ⓘ

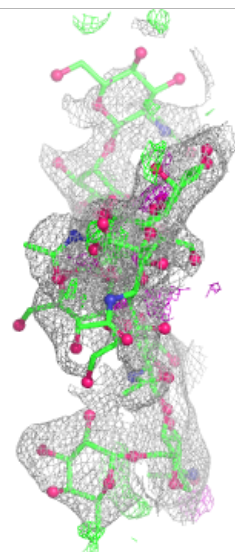
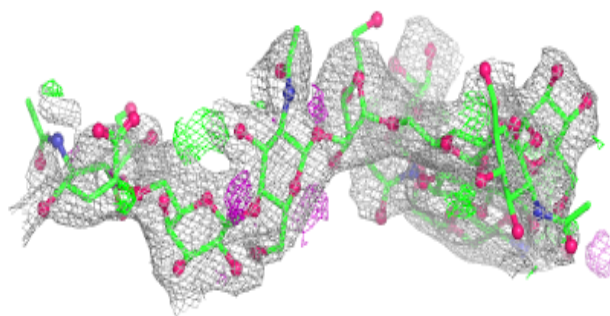
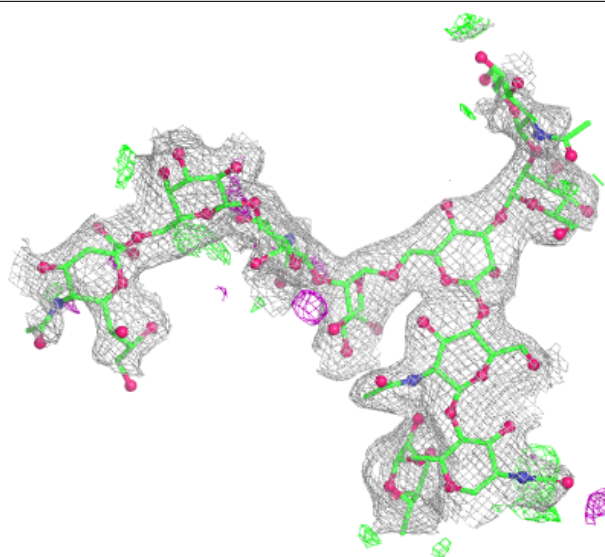
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

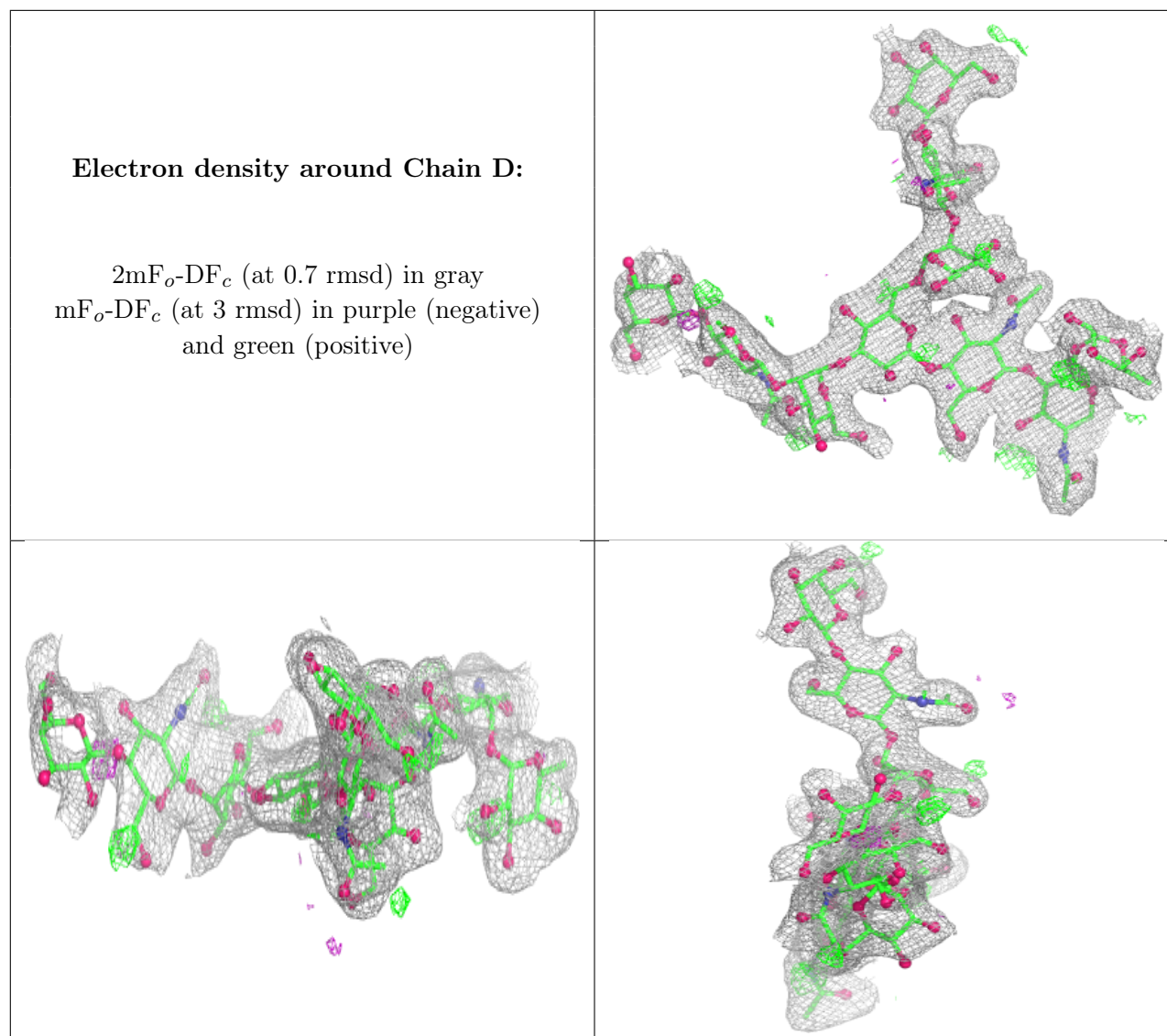
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	NAG	C	9	14/15	0.24	0.26	116,126,138,140	0
3	GAL	D	6	11/12	0.37	0.19	111,121,130,134	0
2	SIA	C	7	20/21	0.40	0.18	122,131,136,136	0
3	NAG	D	5	14/15	0.60	0.18	98,102,117,129	0
2	FUC	C	10	10/11	0.67	0.15	94,103,106,108	0
2	NAG	C	1	14/15	0.68	0.18	84,91,97,98	0
2	MAN	C	4	11/12	0.80	0.15	74,77,84,94	0
2	MAN	C	8	11/12	0.85	0.13	80,89,93,108	0
2	NAG	C	5	14/15	0.86	0.16	64,70,75,76	0
2	GAL	C	6	11/12	0.86	0.12	58,63,72,89	0
3	MAN	D	4	11/12	0.89	0.10	64,73,81,83	0
2	BMA	C	3	11/12	0.90	0.09	64,69,73,74	0
3	NAG	D	8	14/15	0.91	0.10	44,46,54,59	0
3	FUC	D	10	10/11	0.91	0.10	42,45,48,51	0
2	NAG	C	2	14/15	0.92	0.12	71,81,88,88	0
3	BMA	D	3	11/12	0.94	0.07	41,44,52,55	0
3	GAL	D	9	11/12	0.94	0.08	43,47,55,61	0
3	MAN	D	7	11/12	0.94	0.07	42,49,55,59	0
3	NAG	D	1	14/15	0.96	0.07	32,37,40,42	0
3	NAG	D	2	14/15	0.97	0.06	27,36,44,45	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)





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
4	CL	A	501	1/1	0.98	0.06	44,44,44,44	1
4	CL	B	501	1/1	0.99	0.05	38,38,38,38	1

6.5 Other polymers [i](#)

There are no such residues in this entry.