



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 25, 2026 – 10:45 PM EDT

PDB ID : 4KU1 / pdb_00004ku1
Title : Role of the hinge and C-gamma-2/C-gamma-3 interface in immunoglobulin G1 Fc domain motions: implications for Fc engineering
Authors : Frank, M.; Walker, R.; Lanzilotta, W.N.; Prestegard, J.H.; Barb, A.W.
Deposited on : 2013-05-21
Resolution : 1.90 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

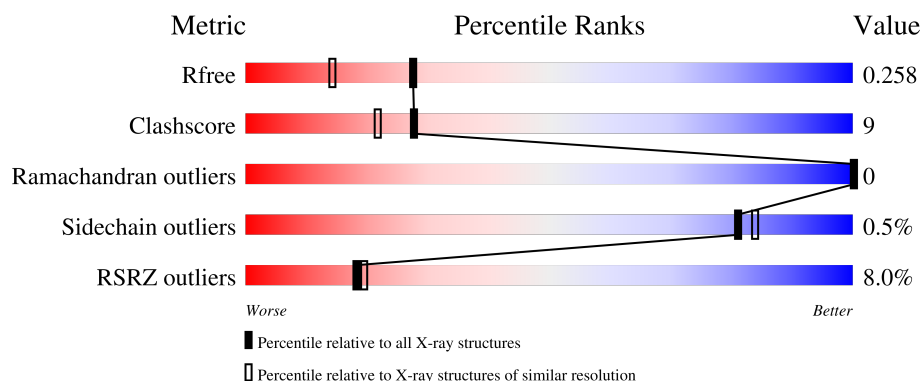
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	7789 (1.90-1.90)
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (1.90-1.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	208	12% 79% 20%
1	B	208	4% 83% 16%
2	C	10	10% 50% 40%
3	D	9	22% 78%

2 Entry composition [i](#)

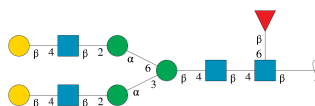
There are 5 unique types of molecules in this entry. The entry contains 3750 atoms, of which 0 are hydrogens and 0 are deuteriums.

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.

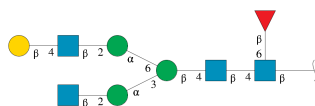
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	207	Total	C	N	O	S	0	2	0
			1672	1065	282	319	6			
1	B	208	Total	C	N	O	S	0	4	0
			1686	1073	283	324	6			

- Molecule 2 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)-[beta-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose.



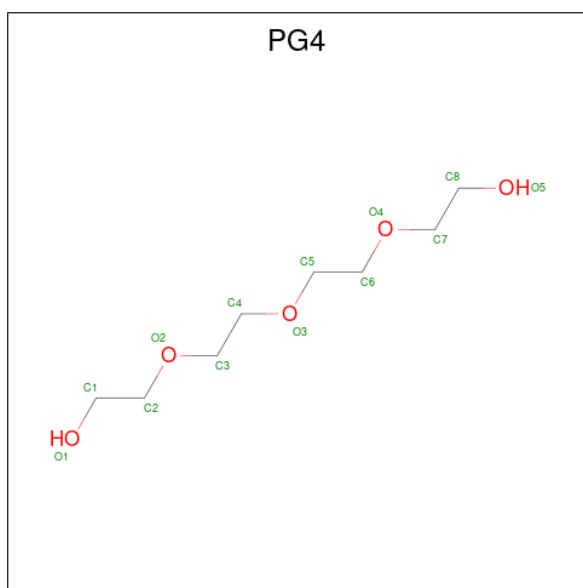
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	10	Total	C	N	O	0	0	0
			121	68	4	49			

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



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	D	9	Total	C	N	O	0	0	0
			110	62	4	44			

- Molecule 4 is TETRAETHYLENE GLYCOL (CCD ID: PG4) (formula: $C_8H_{18}O_5$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			13	8	5		

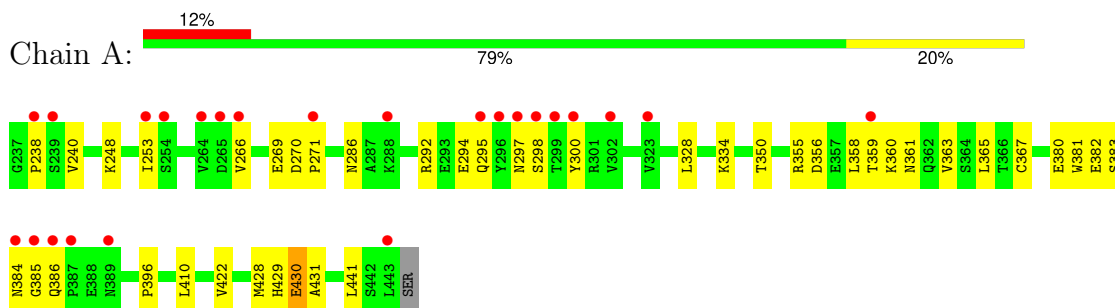
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	66	Total	O	0	0
			66	66		
5	B	82	Total	O	0	0
			82	82		

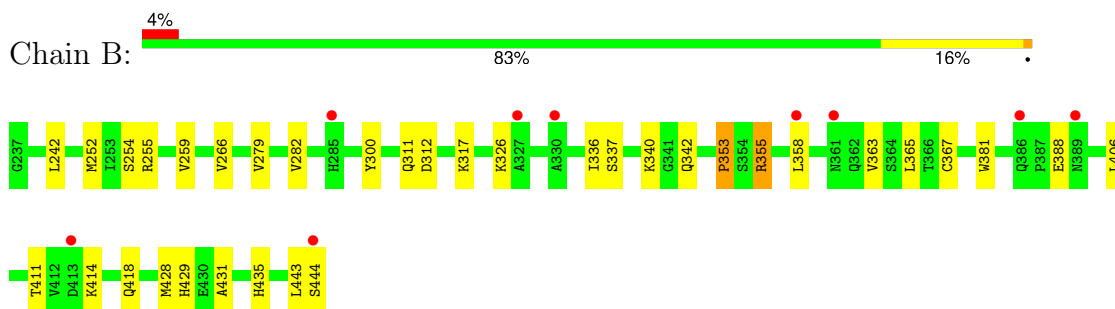
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

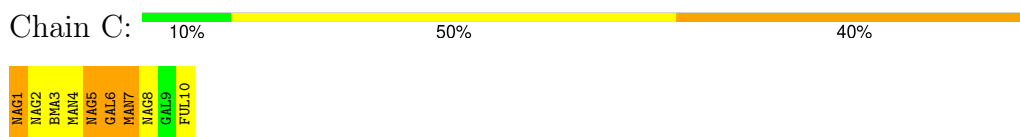
- Molecule 1: Ig gamma-1 chain C region



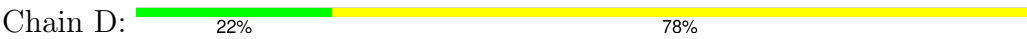
- Molecule 1: Ig gamma-1 chain C region



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



MAG1	MAG2	BKA3	MAN4	MAG5	GAL6	MAN7	MAG8	FUL9
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4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	49.15Å 79.86Å 128.40Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 1.90 50.00 – 1.90	Depositor EDS
% Data completeness (in resolution range)	98.3 (50.00-1.90) 98.3 (50.00-1.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.55 (at 1.91Å)	Xtriage
Refinement program	REFMAC 5.5.0102	Depositor
R, R_{free}	0.212 , 0.258 0.214 , 0.258	Depositor DCC
R_{free} test set	1991 reflections (4.91%)	wwPDB-VP
Wilson B-factor (Å ²)	27.1	Xtriage
Anisotropy	0.195	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 31.3	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	0.94	EDS
Total number of atoms	3750	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 7.13% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: PG4, MAN, FUL, GAL, NAG, 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	1.22	2/1721 (0.1%)	1.10	1/2344 (0.0%)
1	B	1.36	3/1741 (0.2%)	1.22	5/2372 (0.2%)
All	All	1.29	5/3462 (0.1%)	1.17	6/4716 (0.1%)

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

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

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	430	GLU	C-N	-6.70	1.23	1.33
1	B	353	PRO	C-N	-6.53	1.25	1.33
1	A	396	PRO	C-O	6.25	1.30	1.23
1	B	337	SER	N-CA	5.33	1.52	1.46
1	B	282	VAL	CA-CB	5.01	1.60	1.54

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	353	PRO	CA-C-N	7.84	132.58	120.75
1	B	353	PRO	C-N-CA	7.84	132.58	120.75
1	B	388	GLU	N-CA-C	-7.35	101.05	110.53
1	A	286	ASN	N-CA-C	7.03	120.80	112.93
1	B	342	GLN	CA-C-N	-5.11	114.69	119.85
1	B	342	GLN	C-N-CA	-5.11	114.69	119.85

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	430	GLU	Mainchain

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	1672	0	1644	33	0
1	B	1686	0	1657	25	0
2	C	121	0	101	8	0
3	D	110	0	94	0	0
4	A	13	0	18	0	0
5	A	66	0	0	1	0
5	B	82	0	0	6	0
All	All	3750	0	3514	62	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 9.

All (62) 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:297:ASN:HD21	2:C:1:NAG:C1	1.16	1.57
1:A:294:GLU:OE2	1:A:300:TYR:HE1	1.27	1.17
1:A:294:GLU:OE2	1:A:300:TYR:CE1	2.08	1.03
1:A:297:ASN:O	1:A:298:SER:HB2	1.69	0.92
1:A:297:ASN:HD21	2:C:1:NAG:C2	1.83	0.90
1:A:248:LYS:HE3	1:A:428:MET:HE1	1.52	0.90
1:B:411[A]:THR:HG22	5:B:601:HOH:O	1.72	0.89
1:B:411[A]:THR:CG2	5:B:601:HOH:O	2.21	0.88
1:A:380:GLU:OE1	5:A:665:HOH:O	1.92	0.87
2:C:7:MAN:C2	2:C:8:NAG:C1	2.53	0.86
1:B:252:MET:HG2	1:B:428:MET:HE1	1.60	0.82
1:A:429:HIS:HD2	1:A:431:ALA:H	1.29	0.77
1:B:429:HIS:HD2	1:B:431:ALA:H	1.30	0.77

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:429:HIS:CD2	1:A:431:ALA:H	2.05	0.75
1:B:429:HIS:CD2	1:B:431:ALA:H	2.04	0.74
1:B:252:MET:CG	1:B:428:MET:HE1	2.19	0.73
1:A:294:GLU:CD	1:A:300:TYR:HE1	1.96	0.71
1:A:385:GLY:O	1:A:386:GLN:NE2	2.30	0.63
1:A:383:SER:OG	1:A:422:VAL:O	2.10	0.62
1:A:253:ILE:H	1:A:253:ILE:HD12	1.66	0.61
1:A:365:LEU:HD12	1:A:410:LEU:HD23	1.83	0.61
2:C:5:NAG:H62	2:C:6:GAL:C1	2.33	0.58
1:B:259:VAL:HG13	1:B:336:ILE:HD11	1.87	0.56
1:A:297:ASN:CG	2:C:1:NAG:C1	2.76	0.55
1:A:294:GLU:CD	1:A:300:TYR:CE1	2.78	0.55
1:B:358:LEU:HD23	1:B:363:VAL:HG11	1.88	0.55
1:A:269:GLU:HG3	1:A:270:ASP:OD2	2.06	0.54
1:A:355:ARG:HA	1:A:358:LEU:HD12	1.89	0.54
2:C:7:MAN:O2	2:C:8:NAG:C2	2.51	0.53
1:A:266:VAL:HB	1:A:300:TYR:HB2	1.95	0.49
1:B:266:VAL:HB	1:B:300:TYR:HB2	1.95	0.48
1:B:311:GLN:NE2	5:B:634:HOH:O	2.22	0.48
1:A:384:ASN:O	1:A:386:GLN:HG2	2.13	0.48
1:B:340:LYS:HA	5:B:629:HOH:O	2.14	0.47
1:A:350:THR:HB	1:A:441:LEU:HB2	1.96	0.47
1:A:297:ASN:O	1:A:298:SER:CB	2.47	0.47
1:B:312:ASP:CG	1:B:317:LYS:HE2	2.39	0.47
1:B:353:PRO:HD3	1:B:365:LEU:CD2	2.44	0.47
1:A:238:PRO:HD2	1:A:328:LEU:HD21	1.96	0.46
1:B:242:LEU:HD23	1:B:336:ILE:HG23	1.97	0.46
1:B:414:LYS:O	1:B:418[B]:GLN:HG3	2.15	0.46
1:A:294:GLU:OE2	1:A:300:TYR:CD1	2.66	0.46
1:B:443:LEU:HD23	1:B:444:SER:HB3	1.98	0.45
1:A:382:GLU:HB3	1:A:386:GLN:O	2.16	0.45
1:A:367:CYS:HB2	1:A:381:TRP:CZ2	2.52	0.44
1:B:252:MET:HE2	1:B:254:SER:HG	1.82	0.44
1:B:428:MET:HA	1:B:435:HIS:O	2.18	0.44
2:C:7:MAN:H2	2:C:8:NAG:C1	2.42	0.43
1:A:358:LEU:HD23	1:A:363:VAL:HG11	1.99	0.43
1:B:252:MET:HE2	1:B:254:SER:OG	2.19	0.43
1:B:279:VAL:CG1	1:B:317:LYS:HD2	2.49	0.43
1:B:355:ARG:H	1:B:355:ARG:HG2	1.31	0.42
1:A:240:VAL:O	1:A:334:LYS:HE2	2.19	0.42
1:A:359:THR:HG23	1:A:360:LYS:HD3	2.02	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:367:CYS:HB2	1:B:381:TRP:CZ2	2.55	0.41
1:B:406:LEU:HD12	1:B:406:LEU:C	2.43	0.41
1:A:356:ASP:O	1:A:359:THR:HG22	2.19	0.41
1:B:255:ARG:HD2	5:B:665:HOH:O	2.20	0.41
1:B:326:LYS:HG3	5:B:609:HOH:O	2.21	0.41
1:A:271:PRO:HB2	1:A:292:ARG:HH11	1.86	0.40
1:A:297:ASN:ND2	2:C:1:NAG:C2	2.62	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	207/208 (100%)	203 (98%)	4 (2%)	0	100	100
1	B	210/208 (101%)	208 (99%)	2 (1%)	0	100	100
All	All	417/416 (100%)	411 (99%)	6 (1%)	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	195/194 (100%)	194 (100%)	1 (0%)	81	84

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	198/194 (102%)	197 (100%)	1 (0%)	81	84
All	All	393/388 (101%)	391 (100%)	2 (0%)	81	84

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	295	GLN
1	B	355	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	297	ASN
1	A	311	GLN
1	A	347	GLN
1	A	386	GLN
1	A	389	ASN
1	A	418	GLN
1	A	429	HIS
1	A	433	HIS
1	B	268	HIS
1	B	295	GLN
1	B	421	ASN
1	B	429	HIS

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 ⓘ

19 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	0.55	0	17,19,21	1.32	2 (11%)
2	FUL	C	10	2	10,10,11	0.55	0	14,14,16	1.55	3 (21%)
2	NAG	C	2	2	14,14,15	0.80	0	17,19,21	1.83	4 (23%)
2	BMA	C	3	2	11,11,12	2.82	7 (63%)	15,15,17	3.29	8 (53%)
2	MAN	C	4	2	11,11,12	0.57	0	15,15,17	1.78	2 (13%)
2	NAG	C	5	2	14,14,15	0.69	0	17,19,21	1.38	3 (17%)
2	GAL	C	6	2	11,11,12	1.31	1 (9%)	15,15,17	1.96	4 (26%)
2	MAN	C	7	2	11,11,12	0.56	0	15,15,17	1.00	1 (6%)
2	NAG	C	8	2	14,14,15	0.62	0	17,19,21	0.92	0
2	GAL	C	9	2	11,11,12	0.70	0	15,15,17	1.02	0
3	NAG	D	1	1,3	14,14,15	0.59	0	17,19,21	1.15	1 (5%)
3	NAG	D	2	3	14,14,15	1.45	3 (21%)	17,19,21	1.40	3 (17%)
3	BMA	D	3	3	11,11,12	0.80	0	15,15,17	1.31	3 (20%)
3	MAN	D	4	3	11,11,12	0.94	0	15,15,17	1.58	2 (13%)
3	NAG	D	5	3	14,14,15	0.98	0	17,19,21	1.12	0
3	GAL	D	6	3	11,11,12	0.80	0	15,15,17	1.76	3 (20%)
3	MAN	D	7	3	11,11,12	0.71	0	15,15,17	1.31	2 (13%)
3	NAG	D	8	3	14,14,15	0.30	0	17,19,21	0.57	0
3	FUL	D	9	3	10,10,11	1.02	0	14,14,16	2.13	5 (35%)

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	-	2/6/23/26	0/1/1/1
2	FUL	C	10	2	-	-	0/1/1/1
2	NAG	C	2	2	-	0/6/23/26	0/1/1/1
2	BMA	C	3	2	-	2/2/19/22	0/1/1/1
2	MAN	C	4	2	-	0/2/19/22	0/1/1/1
2	NAG	C	5	2	-	2/6/23/26	0/1/1/1
2	GAL	C	6	2	-	2/2/19/22	0/1/1/1

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

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	3	BMA	O2-C2	-5.29	1.32	1.43
2	C	3	BMA	O3-C3	-4.63	1.31	1.43
2	C	3	BMA	O5-C5	-3.44	1.36	1.43
3	D	2	NAG	O5-C1	-3.25	1.38	1.43
2	C	6	GAL	O6-C6	3.24	1.56	1.42
2	C	3	BMA	O4-C4	-2.79	1.36	1.43
2	C	3	BMA	C6-C5	-2.44	1.43	1.51
3	D	2	NAG	O7-C7	2.22	1.28	1.23
2	C	3	BMA	O6-C6	-2.20	1.33	1.42
2	C	3	BMA	O5-C1	-2.20	1.40	1.43
3	D	2	NAG	O5-C5	-2.08	1.39	1.43

All (46) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	3	BMA	O4-C4-C5	-6.37	93.63	109.32
2	C	6	GAL	C1-C2-C3	-5.78	101.22	109.64
2	C	3	BMA	O2-C2-C3	-5.69	98.36	110.15
2	C	4	MAN	C1-O5-C5	5.59	119.68	112.19
2	C	2	NAG	C1-O5-C5	5.25	119.22	112.19
2	C	3	BMA	C1-C2-C3	5.13	117.11	109.64
3	D	6	GAL	O5-C5-C6	5.06	117.51	107.66
2	C	3	BMA	O2-C2-C1	-4.47	98.99	109.22
3	D	9	FUL	C1-C2-C3	4.06	115.56	109.64
2	C	1	NAG	O5-C5-C6	3.77	115.00	107.66
3	D	4	MAN	C1-O5-C5	3.49	116.87	112.19

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	7	MAN	C1-O5-C5	3.46	116.82	112.19
2	C	3	BMA	O5-C1-C2	3.28	118.62	110.79
3	D	9	FUL	O5-C5-C6	3.18	114.31	107.40
2	C	10	FUL	C1-O5-C5	3.17	120.44	112.97
2	C	3	BMA	C6-C5-C4	3.17	120.79	113.02
3	D	4	MAN	O2-C2-C3	-3.13	103.66	110.15
2	C	2	NAG	C1-C2-N2	3.07	115.28	110.43
3	D	2	NAG	O3-C3-C2	-2.87	103.44	109.40
3	D	9	FUL	O3-C3-C4	2.82	117.03	110.38
2	C	5	NAG	C3-C4-C5	2.73	115.18	110.23
2	C	5	NAG	O4-C4-C5	2.63	115.81	109.32
2	C	10	FUL	C2-C3-C4	2.62	115.47	110.86
3	D	3	BMA	O6-C6-C5	-2.60	102.49	111.33
3	D	9	FUL	O5-C5-C4	2.55	114.15	109.55
2	C	1	NAG	C1-C2-N2	2.54	114.44	110.43
3	D	2	NAG	C1-O5-C5	2.50	115.53	112.19
2	C	2	NAG	O7-C7-C8	-2.42	117.75	122.05
3	D	7	MAN	O2-C2-C3	-2.41	105.16	110.15
2	C	3	BMA	O3-C3-C2	-2.39	105.17	110.05
3	D	6	GAL	O2-C2-C1	2.38	114.67	109.22
3	D	3	BMA	O5-C5-C6	2.36	112.25	107.66
2	C	3	BMA	O5-C5-C4	2.29	116.40	110.83
3	D	6	GAL	O6-C6-C5	-2.25	103.66	111.33
3	D	1	NAG	C3-C4-C5	-2.23	106.19	110.23
2	C	7	MAN	O5-C1-C2	-2.20	105.53	110.79
3	D	2	NAG	O7-C7-C8	2.20	125.97	122.05
2	C	6	GAL	O5-C5-C6	2.19	111.92	107.66
2	C	6	GAL	C1-O5-C5	-2.17	109.28	112.19
2	C	5	NAG	O3-C3-C4	-2.16	105.28	110.38
2	C	2	NAG	O3-C3-C4	-2.12	105.39	110.38
2	C	6	GAL	C3-C4-C5	2.11	114.06	110.23
2	C	10	FUL	C1-C2-C3	2.10	112.70	109.64
3	D	3	BMA	O3-C3-C4	-2.09	105.44	110.38
2	C	4	MAN	C2-C3-C4	-2.08	107.21	110.86
3	D	9	FUL	O5-C1-C2	2.07	115.73	110.79

There are no chirality outliers.

All (14) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	7	MAN	O5-C5-C6-O6
2	C	3	BMA	O5-C5-C6-O6

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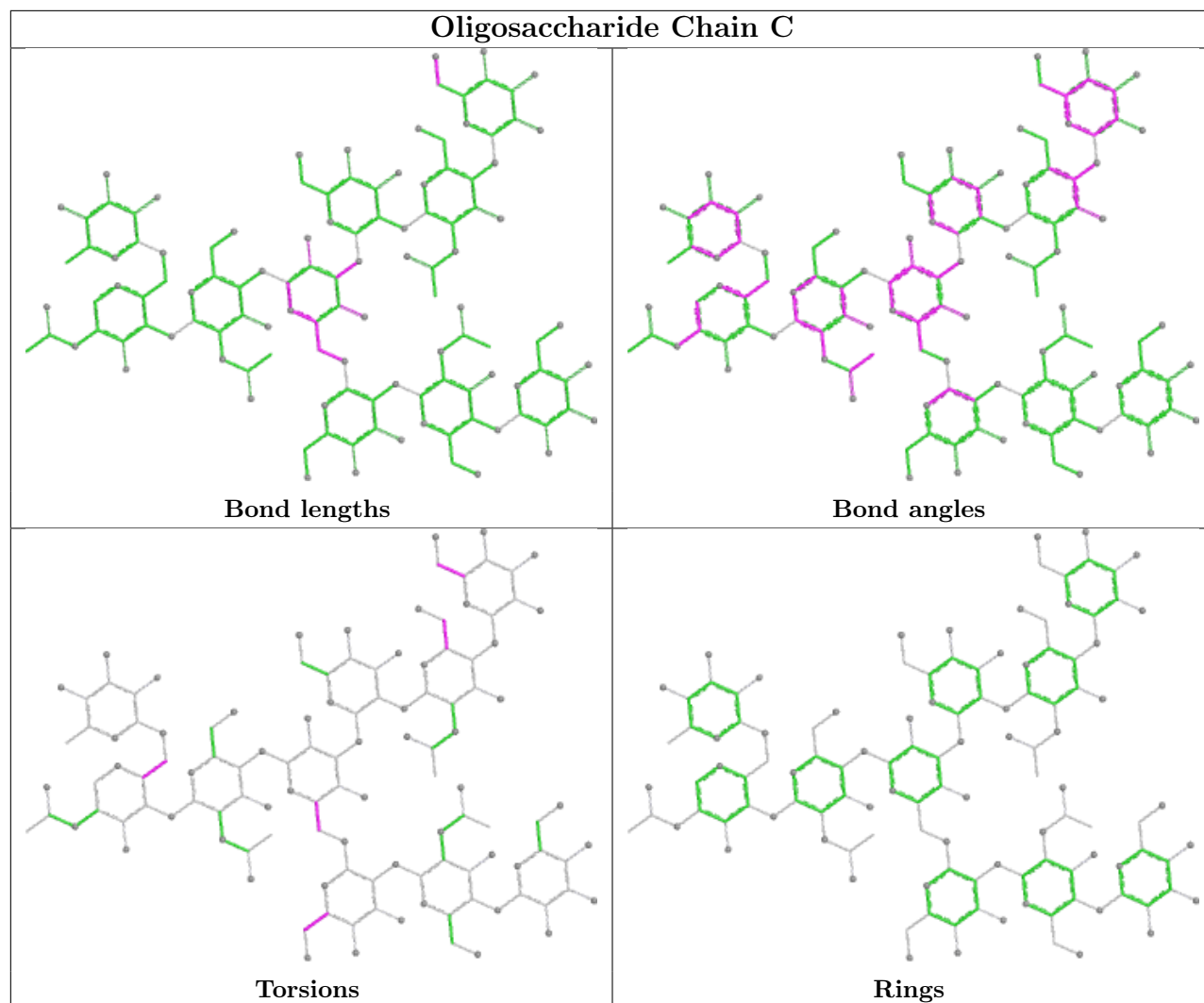
Mol	Chain	Res	Type	Atoms
2	C	6	GAL	O5-C5-C6-O6
2	C	7	MAN	C4-C5-C6-O6
2	C	1	NAG	C4-C5-C6-O6
2	C	1	NAG	O5-C5-C6-O6
2	C	6	GAL	C4-C5-C6-O6
3	D	7	MAN	C4-C5-C6-O6
3	D	8	NAG	O5-C5-C6-O6
3	D	7	MAN	O5-C5-C6-O6
2	C	5	NAG	C4-C5-C6-O6
2	C	5	NAG	O5-C5-C6-O6
2	C	3	BMA	C4-C5-C6-O6
3	D	6	GAL	O5-C5-C6-O6

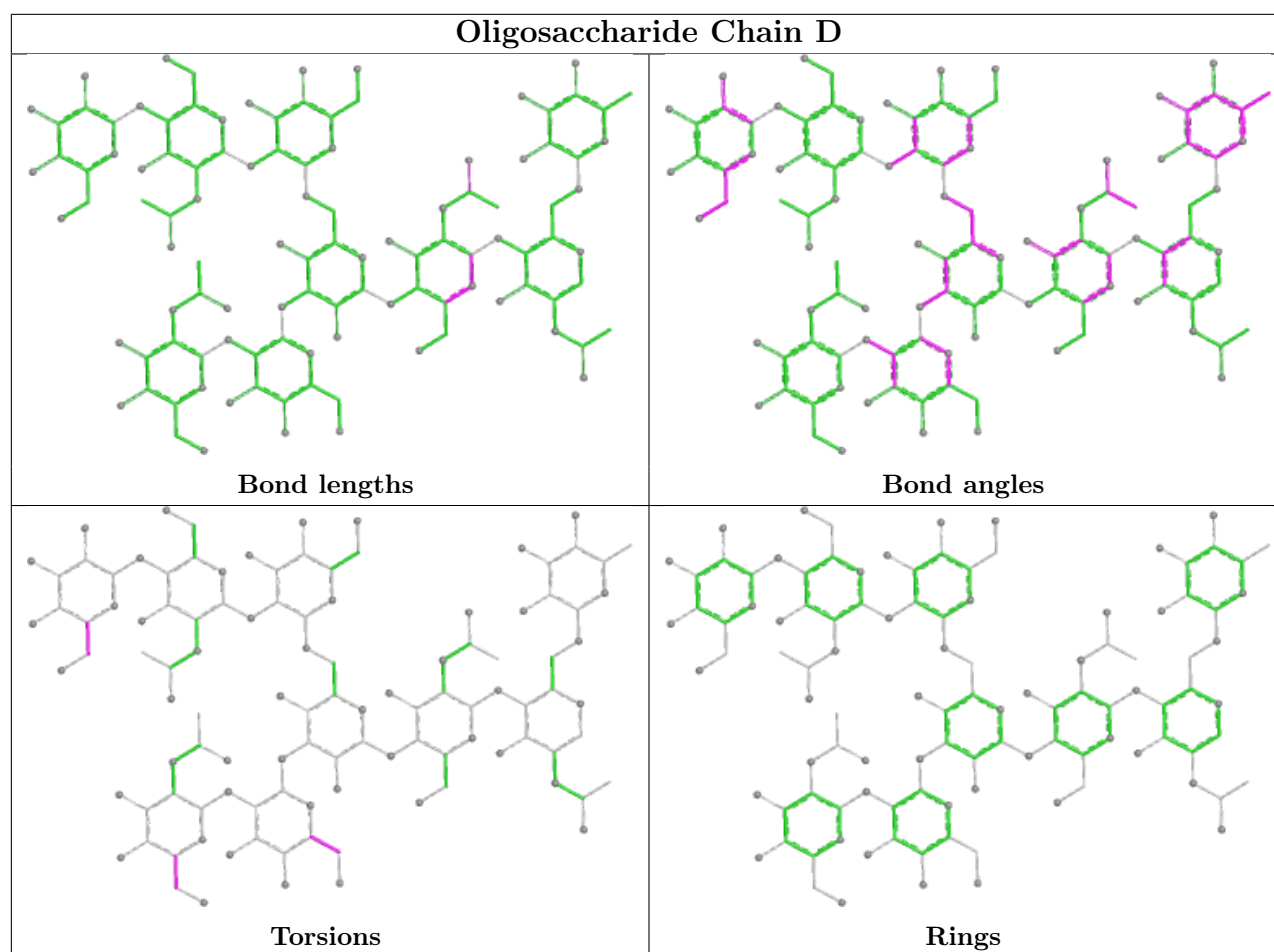
There are no ring outliers.

5 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	6	GAL	1	0
2	C	7	MAN	3	0
2	C	8	NAG	3	0
2	C	1	NAG	4	0
2	C	5	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](#)

1 ligand is 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	$\# Z > 2$
4	PG4	A	511	-	12,12,12	0.45	0	11,11,11	0.88	0

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
4	PG4	A	511	-	-	5/10/10/10	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	511	PG4	O4-C7-C8-O5
4	A	511	PG4	O2-C3-C4-O3
4	A	511	PG4	C5-C6-O4-C7
4	A	511	PG4	C3-C4-O3-C5
4	A	511	PG4	C1-C2-O2-C3

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

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	207/208 (99%)	0.66	24 (11%) 9 10	11, 31, 55, 67	2 (0%)
1	B	208/208 (100%)	0.21	9 (4%) 40 42	13, 26, 41, 55	4 (1%)
All	All	415/416 (99%)	0.43	33 (7%) 18 19	11, 28, 50, 67	6 (1%)

All (33) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	298	SER	6.4
1	A	387	PRO	4.2
1	A	296	TYR	3.9
1	A	389	ASN	3.5
1	A	385	GLY	3.5
1	A	297	ASN	3.5
1	A	266	VAL	3.4
1	A	239	SER	3.1
1	A	264	VAL	2.9
1	A	300	TYR	2.8
1	B	361	ASN	2.8
1	A	384	ASN	2.7
1	A	238	PRO	2.6
1	A	443	LEU	2.6
1	A	386	GLN	2.5
1	B	444	SER	2.5
1	A	271	PRO	2.4
1	B	358	LEU	2.4
1	B	386	GLN	2.4
1	A	288	LYS	2.2
1	A	254	SER	2.2
1	A	302	VAL	2.2
1	A	299	THR	2.2
1	A	359	THR	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	285	HIS	2.2
1	A	265	ASP	2.2
1	B	389	ASN	2.1
1	A	253	ILE	2.1
1	A	323	VAL	2.1
1	B	327	ALA	2.1
1	B	330	ALA	2.1
1	A	295	GLN	2.1
1	B	413	ASP	2.1

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

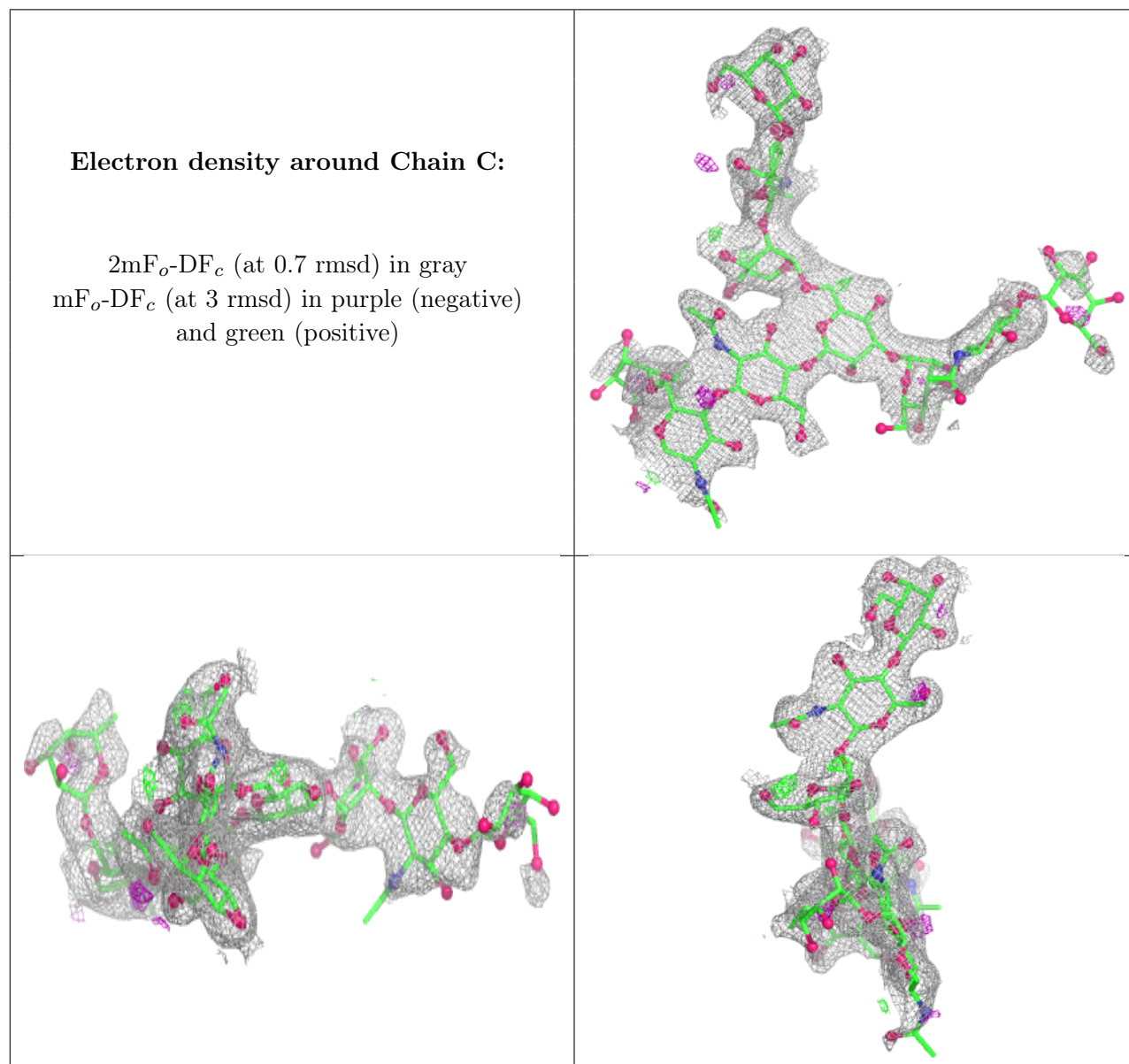
There are no non-standard protein/DNA/RNA residues in this entry.

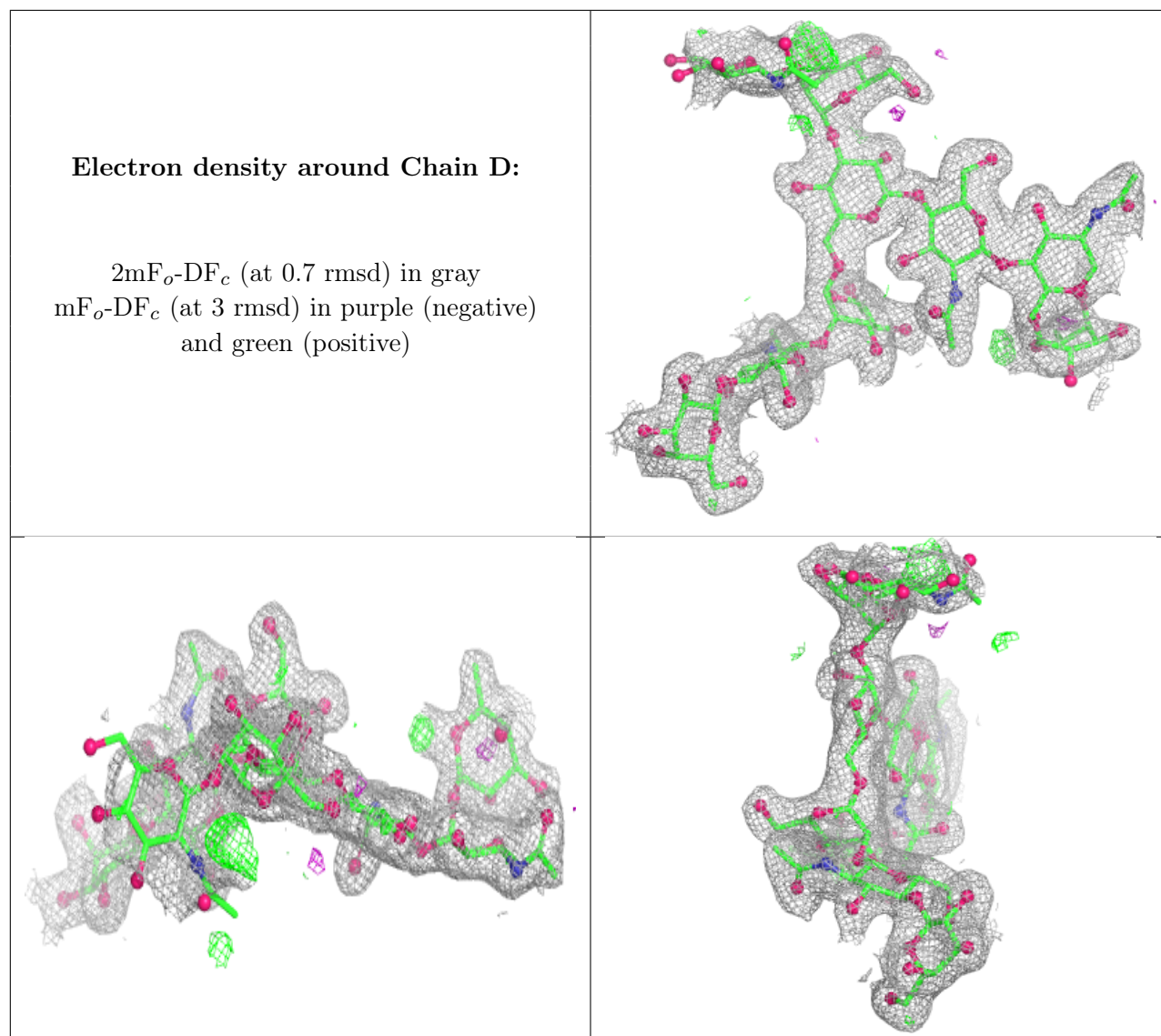
6.3 Carbohydrates [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	GAL	C	6	11/12	0.31	0.20	97,99,100,101	0
3	NAG	D	8	14/15	0.47	0.23	85,89,90,90	0
2	FUL	C	10	10/11	0.50	0.19	84,87,87,88	0
2	NAG	C	5	14/15	0.63	0.15	81,87,88,93	0
3	FUL	D	9	10/11	0.69	0.18	52,57,60,61	0
2	NAG	C	1	14/15	0.74	0.16	55,60,66,70	0
2	MAN	C	7	11/12	0.77	0.13	51,52,53,56	0
2	MAN	C	4	11/12	0.77	0.14	59,64,68,74	0
2	BMA	C	3	11/12	0.79	0.13	51,52,57,58	0
2	NAG	C	2	14/15	0.80	0.13	51,53,55,56	0
3	MAN	D	7	11/12	0.87	0.11	41,46,48,48	0
2	NAG	C	8	14/15	0.89	0.10	39,44,51,51	0
3	NAG	D	1	14/15	0.90	0.10	31,34,39,42	0
3	NAG	D	2	14/15	0.91	0.09	25,29,34,40	0
3	MAN	D	4	11/12	0.92	0.09	27,29,37,39	0
2	GAL	C	9	11/12	0.92	0.08	33,36,43,47	0
3	BMA	D	3	11/12	0.93	0.08	27,31,34,37	0
3	NAG	D	5	14/15	0.94	0.07	23,28,37,38	0
3	GAL	D	6	11/12	0.96	0.07	21,22,26,32	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.





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	PG4	A	511	13/13	0.88	0.14	42,44,49,50	0

6.5 Other polymers [i](#)

There are no such residues in this entry.