



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 7, 2026 – 01:14 AM UTC

PDB ID : 2OOT / pdb_00002oot
Title : A High Resolution Structure of Ligand-free Human Glutamate Carboxypeptidase II
Authors : Barinka, C.; Lubkowski, J.
Deposited on : 2007-01-26
Resolution : 1.64 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

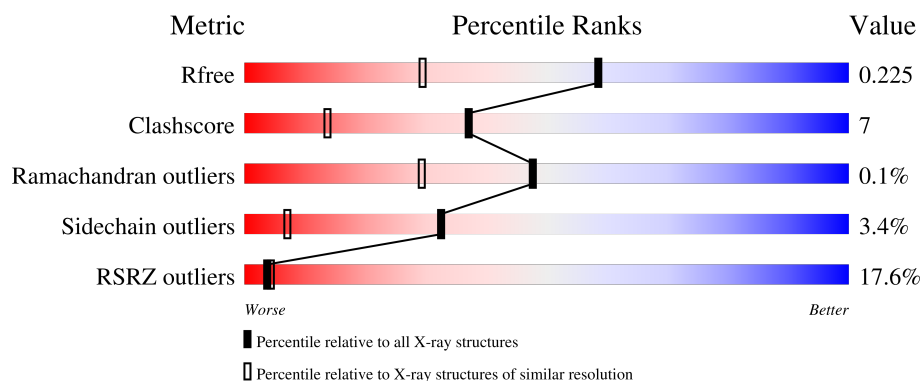
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.64 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	1141 (1.64-1.64)
Clashscore	190562	1171 (1.64-1.64)
Ramachandran outliers	187476	1151 (1.64-1.64)
Sidechain outliers	187428	1150 (1.64-1.64)
RSRZ outliers	180081	1141 (1.64-1.64)

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	709	17% 83% 11% ...
2	B	2	50% 50%
2	C	2	100%
3	D	4	100%

2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 6511 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 Glutamate carboxypeptidase 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	686	Total	C	N	O	S	0	47	0
			5784	3701	974	1088	21			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	42	ARG	-	cloning artifact	UNP Q04609
A	43	SER	-	cloning artifact	UNP Q04609

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



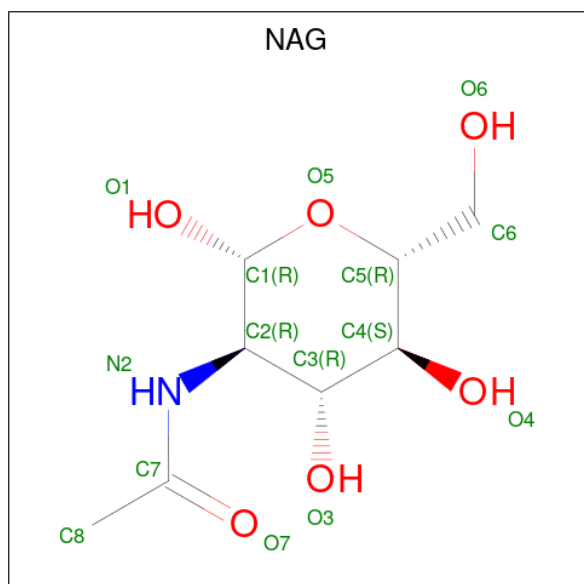
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	B	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	C	2	Total	C	N	O	0	0	0
			28	16	2	10			

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

- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



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

- Molecule 5 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	2	Total	Zn	0	0
			2	2		

- Molecule 6 is CALCIUM ION (CCD ID: CA) (formula: Ca).

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

- Molecule 7 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

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

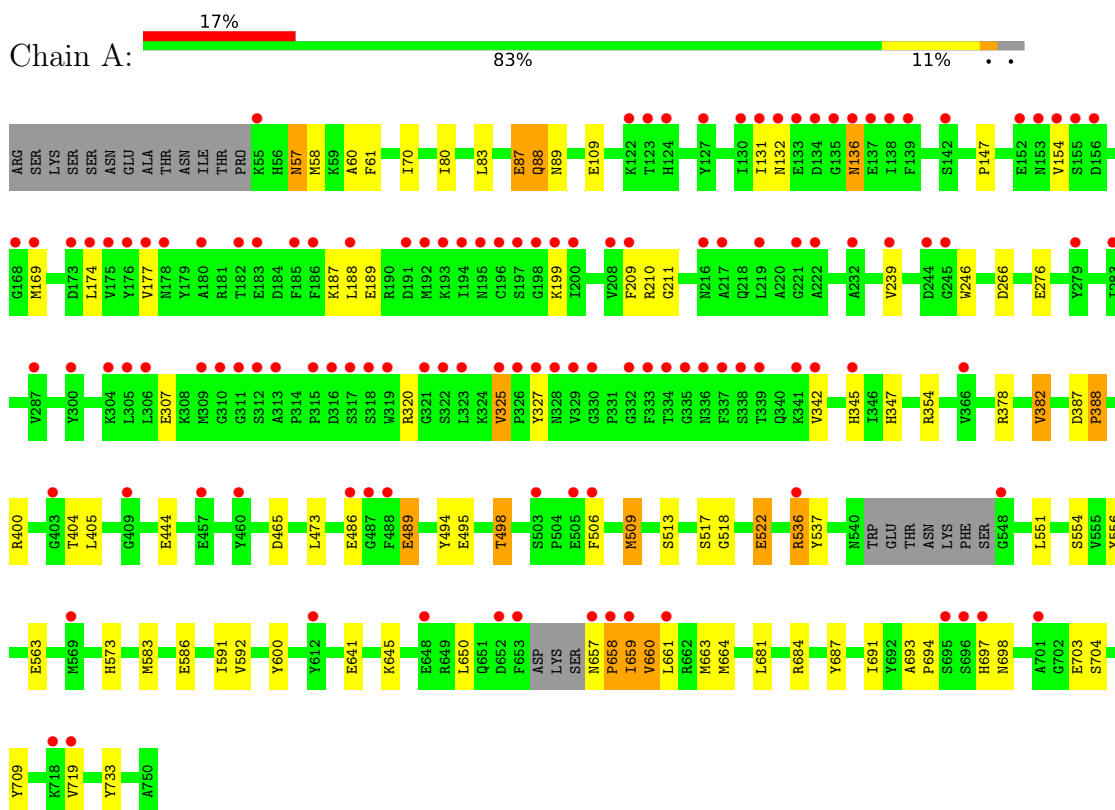
- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	560	Total 561	O 561	0	1

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: Glutamate carboxypeptidase 2



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



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



NAG1
NAG2

- Molecule 3: 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 D:

100%

NAG1
NAG2
BMA3
MAN4

4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	101.76Å 130.13Å 158.87Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 1.64 30.00 – 1.64	Depositor EDS
% Data completeness (in resolution range)	98.0 (30.00-1.64) 97.9 (30.00-1.64)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.59 (at 1.64Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.206 , 0.228 0.204 , 0.225	Depositor DCC
R_{free} test set	3784 reflections (2.95%)	wwPDB-VP
Wilson B-factor (Å ²)	21.7	Xtriage
Anisotropy	0.595	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.39 , 62.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	6511	wwPDB-VP
Average B, all atoms (Å ²)	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.81% 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: ZN, NAG, MAN, CA, CL, 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	1.08	5/5955 (0.1%)	1.08	7/8064 (0.1%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	83	LEU	CG-CD2	6.63	1.74	1.52
1	A	382	VAL	CA-CB	6.27	1.62	1.54
1	A	592	VAL	CA-CB	-6.21	1.46	1.54
1	A	554[A]	SER	CA-C	6.03	1.61	1.53
1	A	554[B]	SER	CA-C	6.03	1.61	1.53

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	660	VAL	N-CA-C	-9.04	101.40	110.62
1	A	147	PRO	O-C-N	5.75	123.85	121.15
1	A	657	ASN	CA-C-N	5.45	125.07	119.56
1	A	657	ASN	C-N-CA	5.45	125.07	119.56
1	A	210	ARG	N-CA-C	5.18	117.67	111.71
1	A	659	ILE	N-CA-C	-5.10	105.44	111.00
1	A	658	PRO	CB-CA-C	-5.02	104.35	111.68

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	5784	0	5588	82	0
2	B	28	0	25	1	0
2	C	28	0	25	0	0
3	D	50	0	43	0	0
4	A	56	0	52	1	0
5	A	2	0	0	0	0
6	A	1	0	0	0	0
7	A	1	0	0	0	0
8	A	561	0	0	16	0
All	All	6511	0	5733	83	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 7.

All (83) 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:697[B]:HIS:O	1:A:698[B]:ASN:ND2	1.60	1.33
1:A:517:SER:OG	1:A:522[B]:GLU:OE2	1.80	0.98
1:A:494:TYR:O	1:A:498[A]:THR:HG23	1.67	0.95
1:A:89[B]:ASN:HD21	1:A:378:ARG:HH21	1.04	0.94
1:A:465[A]:ASP:OD1	1:A:536[A]:ARG:NH1	2.01	0.91
1:A:693[B]:ALA:HB2	8:A:1773:HOH:O	1.67	0.91
1:A:58:MET:HE1	1:A:586:GLU:HG2	1.56	0.87
1:A:89[B]:ASN:ND2	1:A:378:ARG:HH21	1.74	0.83
1:A:660:VAL:O	1:A:664[B]:MET:HG2	1.78	0.82
1:A:684:ARG:NH2	1:A:694[B]:PRO:O	2.14	0.80
1:A:697[B]:HIS:O	1:A:698[B]:ASN:CG	2.26	0.77
1:A:58:MET:CE	1:A:586:GLU:HG2	2.16	0.76
1:A:89[B]:ASN:HD21	1:A:378:ARG:NH2	1.83	0.70
1:A:641:GLU:HG3	8:A:2310:HOH:O	1.89	0.70
1:A:641:GLU:CG	8:A:2310:HOH:O	2.40	0.69
1:A:506:PHE:HB2	1:A:509:MET:HG3	1.75	0.69
1:A:266:ASP:N	8:A:2022:HOH:O	2.24	0.67
1:A:704[A]:SER:OG	8:A:2309:HOH:O	2.14	0.65
1:A:733:TYR:HE2	8:A:2038:HOH:O	1.82	0.63
1:A:87[A]:GLU:HG2	1:A:88:GLN:HE21	1.63	0.62
1:A:87[A]:GLU:H	1:A:87[A]:GLU:CD	2.08	0.61
1:A:703[B]:GLU:HB2	1:A:709:TYR:CD1	2.36	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:517:SER:HB2	1:A:694[A]:PRO:HG3	1.84	0.59
1:A:174:LEU:HD22	1:A:342:VAL:HG21	1.84	0.59
1:A:659:ILE:O	1:A:663[A]:MET:HG3	2.03	0.59
1:A:169:MET:HE2	1:A:345:HIS:HD2	1.66	0.58
1:A:465[A]:ASP:OD2	1:A:513:SER:HB2	2.04	0.57
1:A:681:LEU:HD11	1:A:693[B]:ALA:HB3	1.87	0.57
1:A:551:LEU:HD22	1:A:556:TYR:HB2	1.88	0.56
1:A:307:GLU:HA	1:A:325:VAL:HG22	1.87	0.55
1:A:465[A]:ASP:OD1	1:A:536[A]:ARG:NH2	2.39	0.55
1:A:684:ARG:NH1	1:A:694[B]:PRO:O	2.38	0.55
1:A:465[A]:ASP:OD1	1:A:536[A]:ARG:CZ	2.53	0.55
1:A:347:HIS:HE1	8:A:2065:HOH:O	1.90	0.54
1:A:693[B]:ALA:CB	8:A:1773:HOH:O	2.41	0.52
1:A:473:LEU:HG	1:A:583[B]:MET:SD	2.52	0.50
1:A:89[B]:ASN:C	1:A:89[B]:ASN:HD22	2.20	0.50
1:A:486:GLU:HG2	8:A:2107:HOH:O	2.11	0.49
1:A:494:TYR:CE2	1:A:498[A]:THR:HG21	2.47	0.49
1:A:80:ILE:HD12	1:A:88:GLN:HG2	1.95	0.48
1:A:154:VAL:HG22	8:A:2037:HOH:O	2.13	0.48
1:A:506:PHE:CB	1:A:509:MET:HG3	2.43	0.48
1:A:320:ARG:HG2	1:A:327:TYR:HB2	1.95	0.48
1:A:691:ILE:O	1:A:704[A]:SER:HA	2.15	0.47
1:A:684:ARG:CZ	1:A:694[B]:PRO:O	2.61	0.47
1:A:473:LEU:HD23	1:A:583[B]:MET:HE1	1.96	0.47
1:A:687:TYR:CZ	1:A:694[A]:PRO:HG2	2.50	0.47
1:A:209:PHE:CE2	1:A:211:GLY:HA3	2.50	0.47
1:A:400:ARG:O	1:A:404[B]:THR:HG23	2.15	0.46
1:A:473:LEU:HD23	1:A:583[B]:MET:CE	2.45	0.46
1:A:645[B]:LYS:HE3	8:A:2311:HOH:O	2.14	0.46
1:A:132:ASN:ND2	1:A:136:ASN:HB3	2.31	0.45
1:A:489:GLU:H	1:A:489:GLU:CD	2.24	0.45
1:A:169:MET:HE3	1:A:347:HIS:NE2	2.32	0.45
8:A:1991:HOH:O	2:B:2:NAG:H81	2.16	0.45
1:A:276:GLU:OE2	1:A:354:ARG:NH2	2.46	0.44
1:A:87[A]:GLU:HG2	1:A:88:GLN:NE2	2.32	0.44
1:A:650:LEU:HD12	1:A:664[A]:MET:HG2	1.98	0.44
1:A:494:TYR:OH	1:A:509:MET:HE2	2.18	0.44
1:A:154:VAL:CG2	8:A:2037:HOH:O	2.66	0.44
1:A:57:ASN:ND2	1:A:60:ALA:H	2.16	0.43
1:A:591[A]:ILE:HG22	1:A:661:LEU:HD21	2.00	0.43
1:A:246:TRP:CD1	4:A:1760:NAG:H83	2.53	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:387:ASP:HA	1:A:388:PRO:HA	1.90	0.43
1:A:109[A]:GLU:OE2	8:A:1968:HOH:O	2.21	0.43
1:A:663[B]:MET:HE3	1:A:663[B]:MET:HB2	1.64	0.43
1:A:57:ASN:C	1:A:57:ASN:HD22	2.26	0.43
1:A:658:PRO:HA	1:A:661:LEU:HB3	2.01	0.43
1:A:169:MET:HE3	1:A:347:HIS:CE1	2.54	0.42
1:A:681:LEU:HD11	1:A:693[B]:ALA:CB	2.48	0.42
1:A:177:VAL:HG12	1:A:188:LEU:HD11	2.00	0.42
1:A:320:ARG:HD2	8:A:2192:HOH:O	2.19	0.42
1:A:70:ILE:HG21	1:A:573:HIS:HB3	2.02	0.42
1:A:444:GLU:OE1	1:A:444:GLU:HA	2.20	0.42
1:A:645[A]:LYS:HA	1:A:645[A]:LYS:HD3	1.85	0.42
1:A:61:PHE:HB2	1:A:405[A]:LEU:HD11	2.03	0.41
1:A:89[B]:ASN:ND2	1:A:89[B]:ASN:C	2.79	0.41
1:A:517:SER:OG	1:A:518:GLY:N	2.52	0.41
1:A:132:ASN:HD21	1:A:136:ASN:HB3	1.86	0.40
1:A:495:GLU:HG3	8:A:2288:HOH:O	2.20	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	725/709 (102%)	708 (98%)	16 (2%)	1 (0%)	48 29

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	382	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	625/605 (103%)	600 (96%)	25 (4%)	28 5

All (25) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	57	ASN
1	A	87[A]	GLU
1	A	87[B]	GLU
1	A	88	GLN
1	A	131	ILE
1	A	136	ASN
1	A	187	LYS
1	A	189	GLU
1	A	199	LYS
1	A	239[A]	VAL
1	A	239[B]	VAL
1	A	325	VAL
1	A	388	PRO
1	A	489	GLU
1	A	498[A]	THR
1	A	498[B]	THR
1	A	509	MET
1	A	522[A]	GLU
1	A	522[B]	GLU
1	A	536[A]	ARG
1	A	536[B]	ARG
1	A	537	TYR
1	A	563	GLU
1	A	600	TYR
1	A	719	VAL

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	57	ASN
1	A	88	GLN
1	A	95	GLN
1	A	97	GLN
1	A	136	ASN
1	A	347	HIS
1	A	618	HIS
1	A	667	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 ⓘ

8 monosaccharides are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	NAG	B	1	2,1	14,14,15	0.53	0	17,19,21	1.32	1 (5%)
2	NAG	B	2	2	14,14,15	0.66	0	17,19,21	0.93	1 (5%)
2	NAG	C	1	2,1	14,14,15	0.85	1 (7%)	17,19,21	1.22	3 (17%)
2	NAG	C	2	2	14,14,15	0.43	0	17,19,21	1.11	1 (5%)
3	NAG	D	1	3,1	14,14,15	0.83	1 (7%)	17,19,21	1.11	2 (11%)
3	NAG	D	2	3	14,14,15	0.70	1 (7%)	17,19,21	1.44	3 (17%)
3	BMA	D	3	3	11,11,12	0.83	1 (9%)	15,15,17	0.88	0
3	MAN	D	4	3	11,11,12	0.47	0	15,15,17	0.89	1 (6%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral

centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	B	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	B	2	2	-	2/6/23/26	0/1/1/1
2	NAG	C	1	2,1	-	2/6/23/26	0/1/1/1
2	NAG	C	2	2	-	2/6/23/26	0/1/1/1
3	NAG	D	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	D	2	3	-	3/6/23/26	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

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	1	NAG	O7-C7	2.25	1.28	1.23
3	D	1	NAG	C1-C2	2.23	1.55	1.52
3	D	3	BMA	O5-C1	-2.16	1.40	1.43
3	D	2	NAG	O5-C1	-2.13	1.40	1.43

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	1	NAG	O5-C1-C2	-3.68	105.59	111.29
3	D	2	NAG	C1-O5-C5	3.24	116.53	112.19
3	D	1	NAG	C6-C5-C4	-2.60	106.62	113.02
2	C	1	NAG	O5-C1-C2	-2.51	107.41	111.29
3	D	2	NAG	C8-C7-N2	2.50	120.27	116.12
3	D	2	NAG	O7-C7-C8	-2.50	117.61	122.05
2	B	2	NAG	C2-N2-C7	2.47	126.21	122.90
2	C	2	NAG	C8-C7-N2	2.38	120.06	116.12
2	C	1	NAG	C2-N2-C7	2.30	125.99	122.90
2	C	1	NAG	O5-C5-C4	-2.20	105.47	110.83
3	D	1	NAG	C1-C2-N2	2.09	113.73	110.43
3	D	4	MAN	C1-O5-C5	2.05	114.94	112.19

There are no chirality outliers.

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	2	NAG	C8-C7-N2-C2

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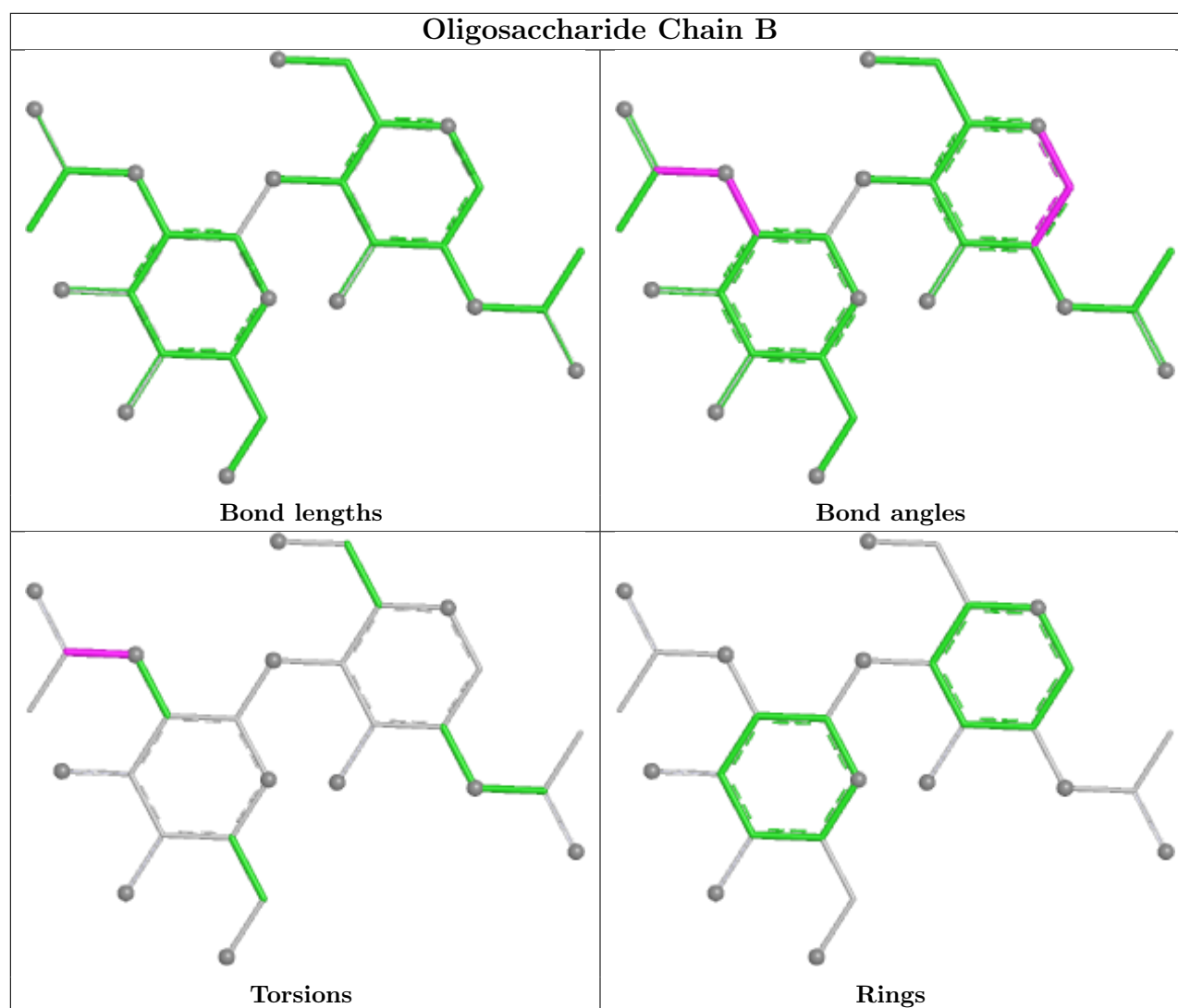
Mol	Chain	Res	Type	Atoms
2	B	2	NAG	O7-C7-N2-C2
2	C	1	NAG	C8-C7-N2-C2
2	C	1	NAG	O7-C7-N2-C2
2	C	2	NAG	C8-C7-N2-C2
2	C	2	NAG	O7-C7-N2-C2
3	D	2	NAG	C8-C7-N2-C2
3	D	2	NAG	O7-C7-N2-C2
3	D	2	NAG	C4-C5-C6-O6

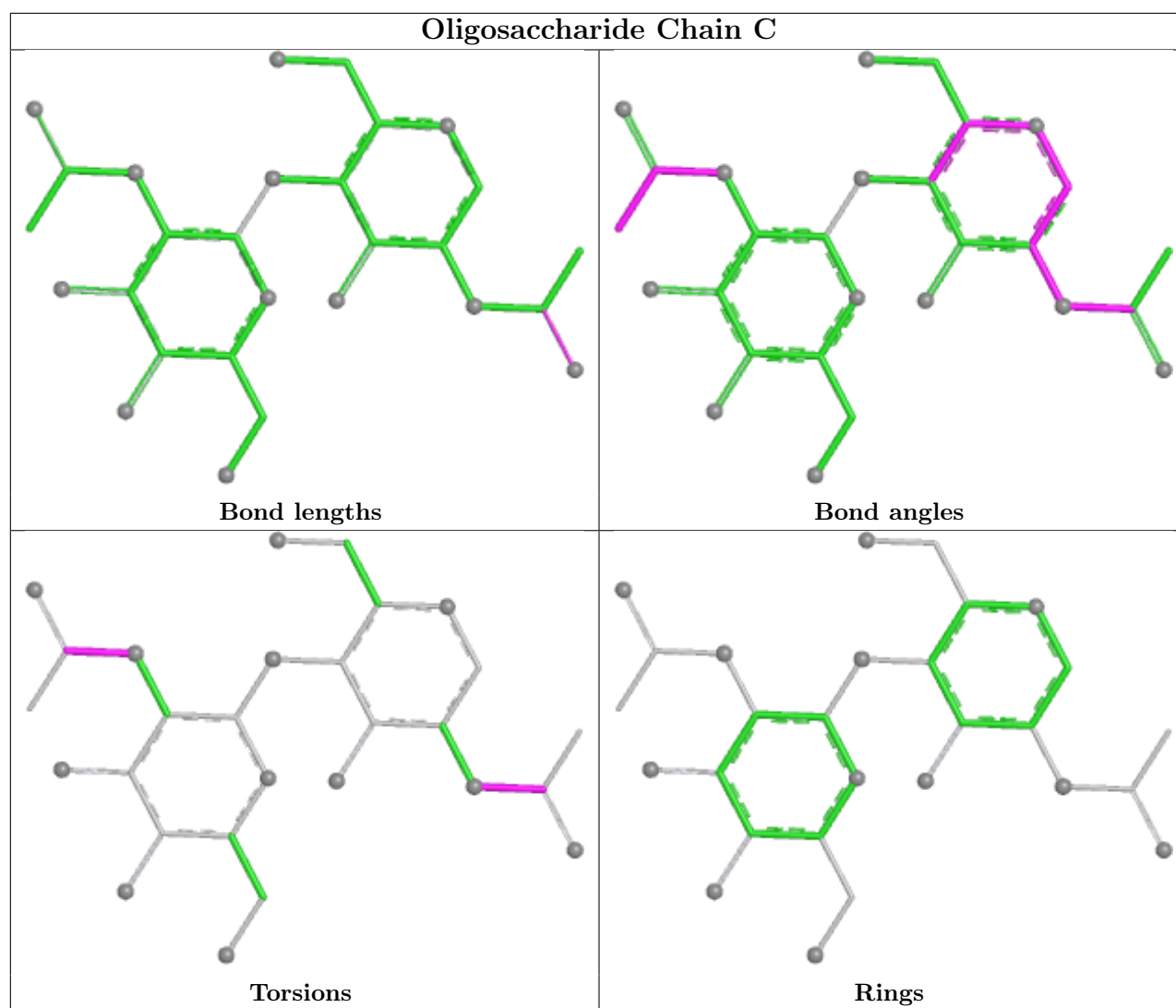
There are no ring outliers.

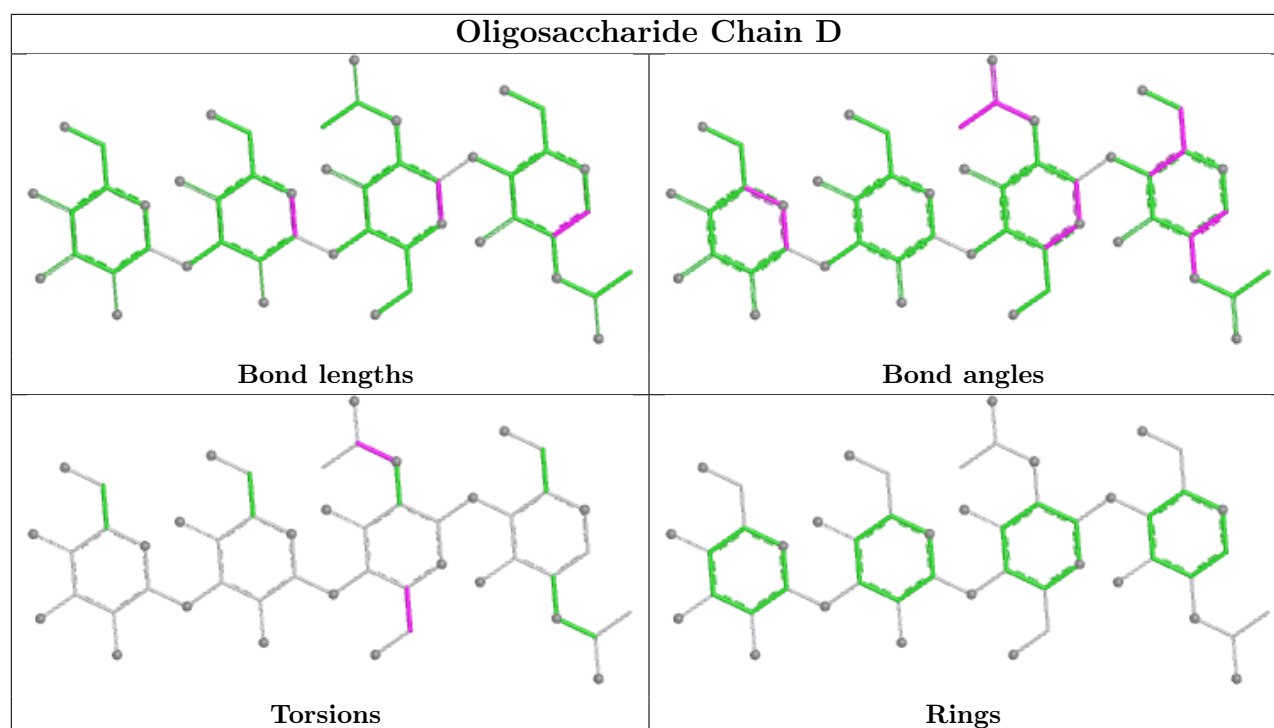
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	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 8 ligands modelled in this entry, 4 are monoatomic - leaving 4 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	$\# Z > 2$
4	NAG	A	1758	1	14,14,15	0.81	1 (7%)	17,19,21	1.11	2 (11%)
4	NAG	A	1760	1	14,14,15	0.54	0	17,19,21	1.53	3 (17%)
4	NAG	A	1757	1	14,14,15	0.55	0	17,19,21	1.75	3 (17%)
4	NAG	A	1759	1	14,14,15	0.40	0	17,19,21	1.18	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
4	NAG	A	1758	1	-	0/6/23/26	0/1/1/1
4	NAG	A	1760	1	-	0/6/23/26	0/1/1/1
4	NAG	A	1757	1	-	2/6/23/26	0/1/1/1
4	NAG	A	1759	1	-	3/6/23/26	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	1758	NAG	C1-C2	2.17	1.55	1.52

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	1757	NAG	C1-O5-C5	5.01	118.91	112.19
4	A	1760	NAG	C1-O5-C5	3.48	116.85	112.19
4	A	1757	NAG	O5-C5-C6	3.27	114.02	107.66
4	A	1760	NAG	C3-C4-C5	2.97	115.61	110.23
4	A	1758	NAG	O5-C1-C2	-2.87	106.85	111.29
4	A	1759	NAG	C1-O5-C5	2.67	115.77	112.19
4	A	1757	NAG	C8-C7-N2	2.37	120.04	116.12
4	A	1759	NAG	C4-C3-C2	-2.33	107.61	111.02
4	A	1758	NAG	C1-O5-C5	2.29	115.25	112.19
4	A	1760	NAG	O5-C1-C2	-2.21	107.88	111.29

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	1759	NAG	C8-C7-N2-C2
4	A	1759	NAG	O7-C7-N2-C2
4	A	1757	NAG	C8-C7-N2-C2
4	A	1757	NAG	O7-C7-N2-C2
4	A	1759	NAG	O5-C5-C6-O6

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	1760	NAG	1	0

5.7 Other polymers

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	686/709 (96%)	0.78	121 (17%) 4 4	8, 25, 51, 64	47 (6%)

All (121) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	135	GLY	5.5
1	A	335	GLY	4.9
1	A	334	THR	4.8
1	A	337	PHE	4.6
1	A	132	ASN	4.6
1	A	131	ILE	4.5
1	A	182	THR	4.3
1	A	188	LEU	4.2
1	A	194	ILE	4.1
1	A	333	PHE	4.1
1	A	701[A]	ALA	4.0
1	A	659	ILE	3.9
1	A	332	GLY	3.9
1	A	506	PHE	3.7
1	A	311	GLY	3.7
1	A	186	PHE	3.7
1	A	342	VAL	3.6
1	A	657	ASN	3.6
1	A	198	GLY	3.6
1	A	316	ASP	3.6
1	A	319	TRP	3.5
1	A	219	LEU	3.5
1	A	134	ASP	3.4
1	A	138	ILE	3.4
1	A	548	GLY	3.4
1	A	153	ASN	3.4
1	A	313	ALA	3.3

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Mol	Chain	Res	Type	RSRZ
1	A	697[A]	HIS	3.3
1	A	152	GLU	3.3
1	A	221	GLY	3.3
1	A	653	PHE	3.3
1	A	155[A]	SER	3.2
1	A	310	GLY	3.2
1	A	338	SER	3.2
1	A	325	VAL	3.1
1	A	195	ASN	3.1
1	A	191	ASP	3.1
1	A	312[A]	SER	3.1
1	A	658	PRO	3.0
1	A	55	LYS	3.0
1	A	239[A]	VAL	3.0
1	A	130	ILE	3.0
1	A	136	ASN	3.0
1	A	719	VAL	2.9
1	A	196	CYS	2.9
1	A	306	LEU	2.9
1	A	315	PRO	2.9
1	A	139	PHE	2.8
1	A	329	VAL	2.8
1	A	174	LEU	2.8
1	A	652	ASP	2.8
1	A	318	SER	2.8
1	A	127	TYR	2.8
1	A	327	TYR	2.8
1	A	192	MET	2.8
1	A	200	ILE	2.8
1	A	222	ALA	2.7
1	A	199	LYS	2.7
1	A	661	LEU	2.7
1	A	339	THR	2.7
1	A	409	GLY	2.7
1	A	244	ASP	2.7
1	A	154	VAL	2.7
1	A	133	GLU	2.7
1	A	178	ASN	2.7
1	A	175	VAL	2.7
1	A	341	LYS	2.7
1	A	330	GLY	2.6
1	A	208	VAL	2.6

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Mol	Chain	Res	Type	RSRZ
1	A	173	ASP	2.6
1	A	304	LYS	2.6
1	A	336	ASN	2.6
1	A	123	THR	2.6
1	A	486	GLU	2.6
1	A	176	TYR	2.6
1	A	326	PRO	2.6
1	A	321	GLY	2.6
1	A	305	LEU	2.6
1	A	328	ASN	2.6
1	A	487	GLY	2.5
1	A	287	VAL	2.5
1	A	322	SER	2.5
1	A	156	ASP	2.4
1	A	323	LEU	2.4
1	A	217	ALA	2.4
1	A	283	ILE	2.4
1	A	503	SER	2.4
1	A	122	LYS	2.4
1	A	695[A]	SER	2.4
1	A	245	GLY	2.3
1	A	168	GLY	2.3
1	A	505	GLU	2.3
1	A	345	HIS	2.3
1	A	488	PHE	2.3
1	A	183	GLU	2.3
1	A	197	SER	2.3
1	A	696[A]	SER	2.3
1	A	193	LYS	2.3
1	A	317	SER	2.3
1	A	300	TYR	2.3
1	A	309	MET	2.2
1	A	460	TYR	2.2
1	A	232	ALA	2.2
1	A	142[A]	SER	2.2
1	A	137	GLU	2.2
1	A	612	TYR	2.2
1	A	569	MET	2.2
1	A	124	HIS	2.2
1	A	185	PHE	2.2
1	A	209	PHE	2.2
1	A	169	MET	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	718	LYS	2.1
1	A	177	VAL	2.1
1	A	180	ALA	2.1
1	A	403	GLY	2.1
1	A	457	GLU	2.1
1	A	648	GLU	2.1
1	A	279[A]	TYR	2.1
1	A	366	VAL	2.1
1	A	216	ASN	2.0
1	A	536[A]	ARG	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](#)

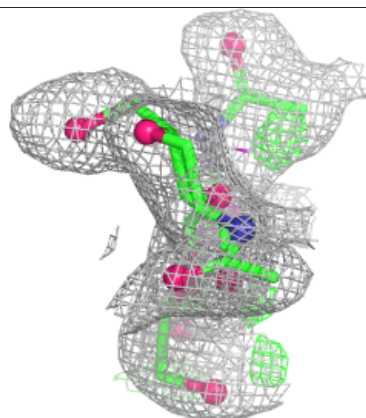
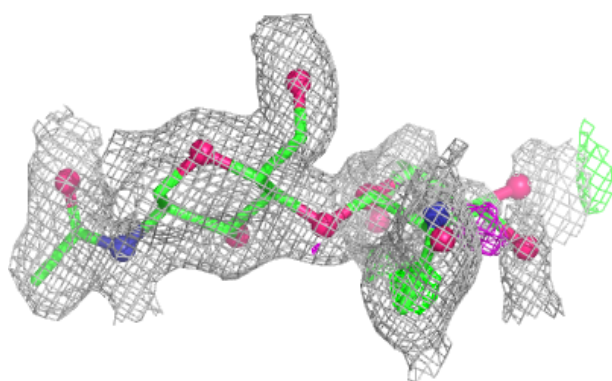
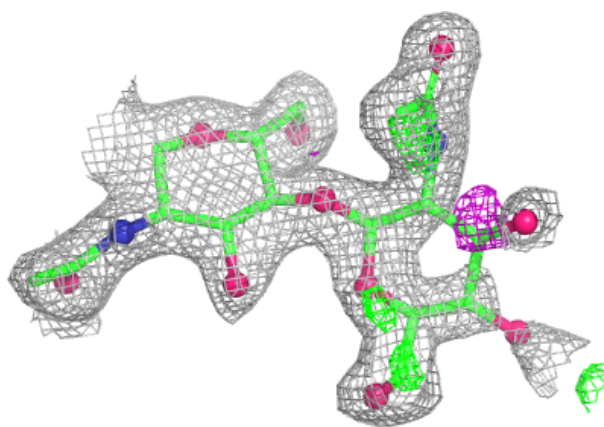
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q<0.9' lists 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
2	NAG	B	2	14/15	0.74	0.18	38,47,51,54	0
3	MAN	D	4	11/12	0.82	0.15	43,46,49,51	0
3	NAG	D	2	14/15	0.83	0.14	33,36,45,46	0
3	BMA	D	3	11/12	0.87	0.14	37,40,41,42	0
2	NAG	C	2	14/15	0.88	0.12	30,37,43,44	0
2	NAG	C	1	14/15	0.90	0.10	27,29,35,39	0
2	NAG	B	1	14/15	0.92	0.12	31,37,43,46	0
3	NAG	D	1	14/15	0.94	0.10	20,25,32,40	0

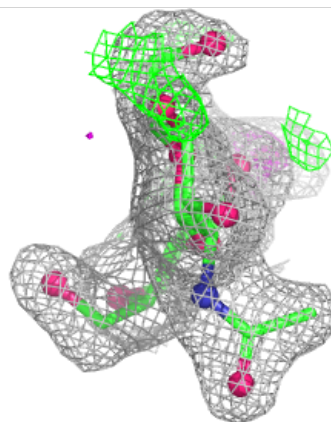
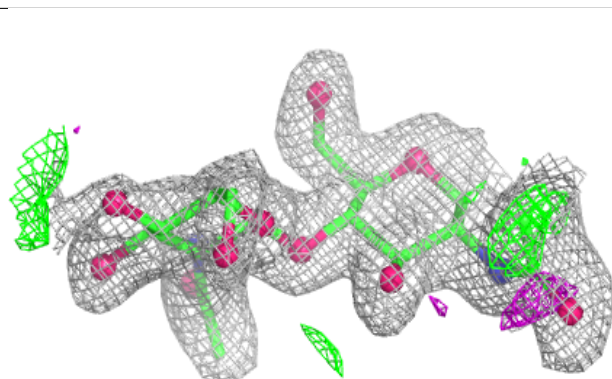
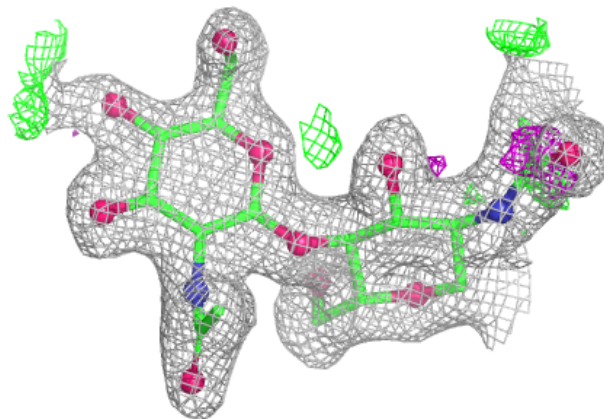
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

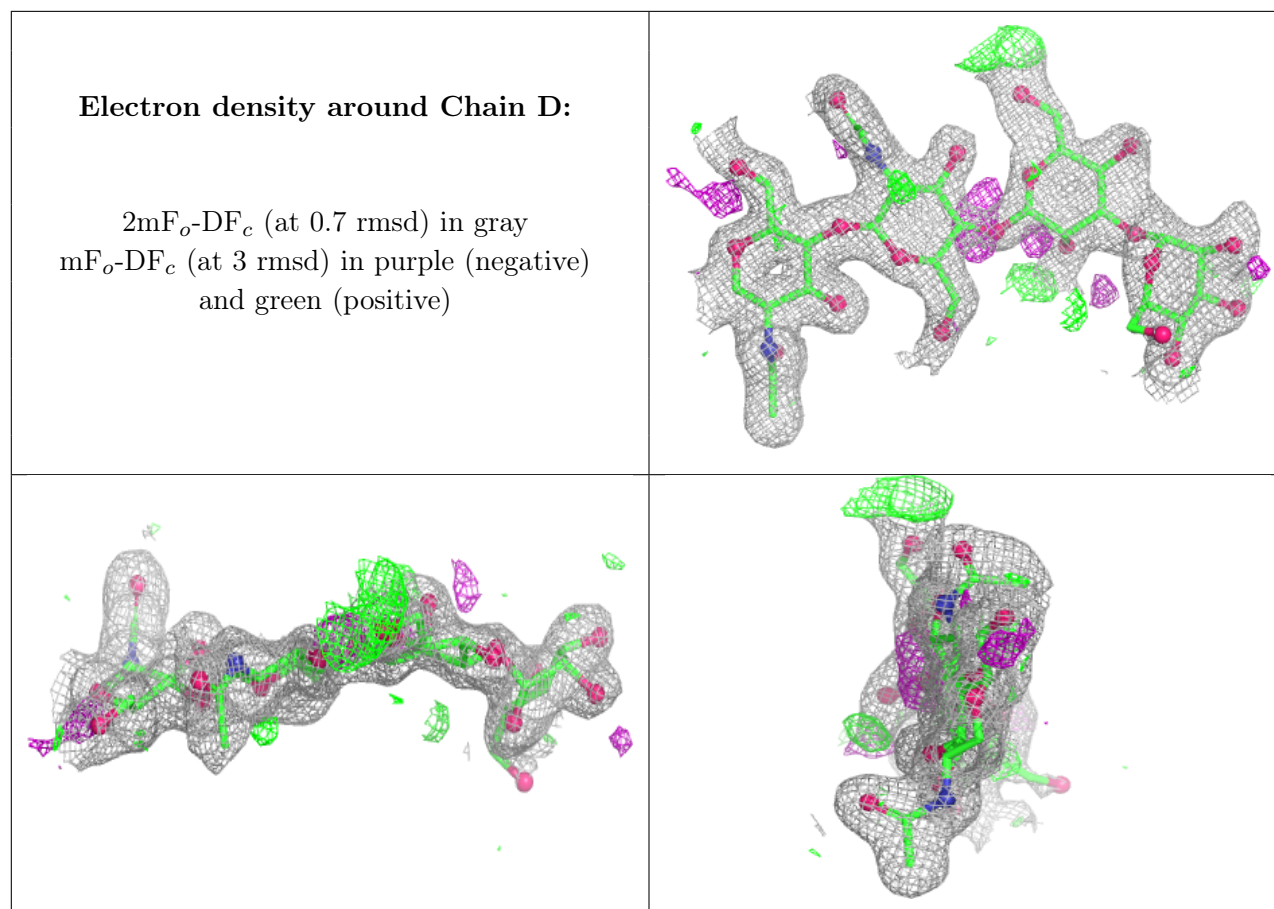
Electron density around Chain B:

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

**Electron density around Chain C:**

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





6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	NAG	A	1757	14/15	0.70	0.18	47,53,56,57	0
4	NAG	A	1759	14/15	0.77	0.18	70,73,75,77	0
4	NAG	A	1760	14/15	0.78	0.17	32,46,53,54	0
4	NAG	A	1758	14/15	0.80	0.15	41,48,51,52	0
5	ZN	A	1751	1/1	1.00	0.01	21,21,21,21	0
5	ZN	A	1752	1/1	1.00	0.01	18,18,18,18	0
6	CA	A	1753	1/1	1.00	0.01	14,14,14,14	0
7	CL	A	1754	1/1	1.00	0.06	25,25,25,25	0

6.5 Other polymers [i](#)

There are no such residues in this entry.