



Full wwPDB X-ray Structure Validation Report ⓘ

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PDB ID : 2CIJ / pdb_00002cij
Title : membrane-bound glutamate carboxypeptidase II (GCPII) with bound methionine
Authors : Barinka, C.; Plechanovova, A.; Rulisek, L.; Mlcochova, P.; Majer, P.; Slusher, B.S.; Hilgenfeld, R.; Mesters, J.R.; Konvalinka, J.
Deposited on : 2006-03-21
Resolution : 2.40 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

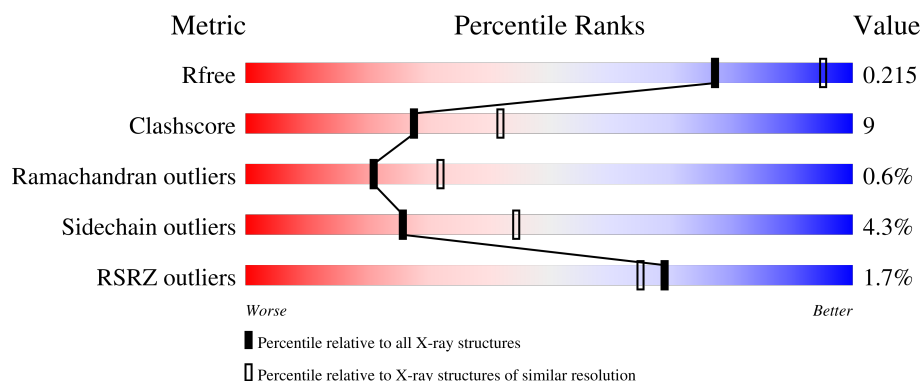
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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	4912 (2.40-2.40)
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (2.40-2.40)
RSRZ outliers	180081	4916 (2.40-2.40)

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	707	2% 79% 15% • •
2	B	2	100%
2	C	2	50% 50%
2	D	2	50% 50%
3	E	4	25% 75%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	MET	A	2000	-	-	X	-

2 Entry composition [i](#)

There are 9 unique types of molecules in this entry. The entry contains 5730 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 II.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	687	Total	C	N	O	S	0	0	0
			5318	3430	881	990	17			

- 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			
2	D	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	E	4	Total	C	N	O	0	0	0
			50	28	2	20			

- Molecule 4 is METHIONINE (CCD ID: MET) (formula: C₅H₁₁NO₂S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	S	0	0
			9	5	1	2	1		

- 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	Cl	0	0
			1	1		

- Molecule 8 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆).



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

- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	223	Total	O	0	0
			223	223		

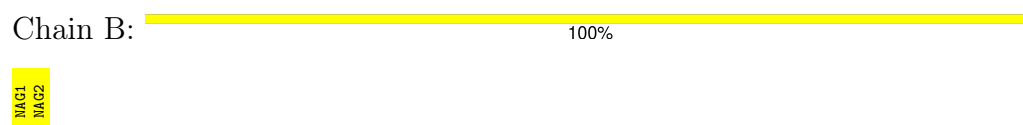
3 Residue-property plots

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 II



- 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



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

Chain D:  50% 50%

MAG1
MAG2

- 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 E:  25% 75%

MAG1
MAG2
EMA3
MAT4

4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	102.69Å 130.78Å 160.30Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 2.40 50.00 – 2.40	Depositor EDS
% Data completeness (in resolution range)	99.9 (50.00-2.40) 99.9 (50.00-2.40)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.73 (at 2.39Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.172 , 0.219 0.167 , 0.215	Depositor DCC
R_{free} test set	1330 reflections (3.12%)	wwPDB-VP
Wilson B-factor (Å ²)	32.8	Xtriage
Anisotropy	0.112	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 47.2	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	0.96	EDS
Total number of atoms	5730	wwPDB-VP
Average B, all atoms (Å ²)	30.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.30% 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: NAG, BMA, ZN, CA, CL, MAN

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	1.02	3/5468 (0.1%)	1.13	29/7431 (0.4%)

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 (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	452	ALA	CA-CB	6.94	1.58	1.53
1	A	611	ILE	CA-CB	5.79	1.62	1.54
1	A	359	ILE	CA-CB	5.20	1.60	1.54

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	156	ASP	N-CA-C	12.07	127.85	107.93
1	A	124	HIS	CA-C-N	8.38	128.40	119.76
1	A	124	HIS	C-N-CA	8.38	128.40	119.76
1	A	655	LYS	CA-C-N	-6.84	109.92	120.31
1	A	655	LYS	C-N-CA	-6.84	109.92	120.31
1	A	549	TYR	N-CA-C	-6.75	101.56	110.40
1	A	652	ASP	N-CA-C	6.53	120.24	112.93
1	A	236	ALA	CA-C-N	6.21	126.58	119.93
1	A	236	ALA	C-N-CA	6.21	126.58	119.93
1	A	338	SER	CA-C-N	6.06	132.60	121.70

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	338	SER	C-N-CA	6.06	132.60	121.70
1	A	142	SER	N-CA-C	5.76	117.73	110.24
1	A	720	ASP	CA-C-N	5.71	125.83	119.32
1	A	720	ASP	C-N-CA	5.71	125.83	119.32
1	A	266	ASP	CA-C-N	5.62	125.99	119.47
1	A	266	ASP	C-N-CA	5.62	125.99	119.47
1	A	338	SER	N-CA-C	5.62	122.76	110.80
1	A	458	GLY	N-CA-C	-5.60	102.57	110.75
1	A	655	LYS	N-CA-C	-5.56	106.34	113.01
1	A	656	SER	N-CA-C	5.48	118.18	111.82
1	A	138	ILE	CB-CA-C	-5.42	104.94	112.04
1	A	654	ASP	N-CA-C	5.35	117.97	109.24
1	A	652	ASP	CB-CA-C	-5.34	101.58	110.81
1	A	653	PHE	CA-C-N	-5.23	115.50	122.72
1	A	653	PHE	C-N-CA	-5.23	115.50	122.72
1	A	483	SER	CA-C-N	-5.10	115.12	120.94
1	A	483	SER	C-N-CA	-5.10	115.12	120.94
1	A	661	LEU	N-CA-C	-5.04	105.25	111.40
1	A	461	THR	N-CA-C	5.02	115.67	108.74

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	338	SER	Peptide

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	5318	0	5004	92	2
2	B	28	0	25	0	0
2	C	28	0	25	2	0
2	D	28	0	25	4	0
3	E	50	0	43	1	1
4	A	9	0	8	6	0
5	A	2	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	A	1	0	0	0	0
7	A	1	0	0	0	0
8	A	42	0	39	0	0
9	A	223	0	0	6	0
All	All	5730	0	5169	96	2

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 (96) 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:657:ASN:ND2	1:A:660:VAL:HG23	1.48	1.26
1:A:657:ASN:HD22	1:A:660:VAL:CG2	1.61	1.12
1:A:657:ASN:ND2	1:A:660:VAL:CG2	2.21	1.02
1:A:338:SER:N	1:A:339:THR:HB	1.88	0.89
1:A:257:ASN:HD21	4:A:2000:MET:HE2	1.36	0.86
1:A:657:ASN:HD21	1:A:660:VAL:HG23	1.39	0.85
1:A:171:GLU:HG2	1:A:343:LYS:HG3	1.58	0.83
4:A:2000:MET:HE1	9:A:2047:HOH:O	1.81	0.80
1:A:174:LEU:HD22	1:A:342:VAL:HG21	1.66	0.78
1:A:716:GLU:H	1:A:716:GLU:CD	1.92	0.77
1:A:662:ARG:HD2	9:A:2170:HOH:O	1.88	0.73
1:A:138:ILE:O	2:C:1:NAG:H82	1.88	0.73
1:A:476:ASN:HD22	2:D:1:NAG:H83	1.53	0.73
1:A:155:SER:O	1:A:156:ASP:CG	2.31	0.72
1:A:412:PRO:HA	1:A:589:ASN:OD1	1.88	0.72
1:A:427:GLY:HA2	4:A:2000:MET:CE	2.22	0.70
1:A:169:MET:HA	1:A:344:MET:O	1.94	0.68
1:A:427:GLY:HA2	4:A:2000:MET:HE1	1.75	0.67
1:A:660:VAL:O	1:A:664:MET:HG2	1.95	0.66
1:A:257:ASN:HD21	4:A:2000:MET:CE	2.08	0.66
1:A:657:ASN:HD22	1:A:660:VAL:HG21	1.56	0.63
1:A:656:SER:O	1:A:658:PRO:HD3	2.00	0.62
1:A:325:VAL:HB	1:A:326:PRO:HD2	1.81	0.62
1:A:494:TYR:OH	1:A:509:MET:HE2	2.03	0.59
1:A:175:VAL:HG23	1:A:199:LYS:HG2	1.85	0.57
1:A:616:MET:HE3	1:A:622:MET:SD	2.45	0.56
1:A:337:PHE:C	1:A:339:THR:HB	2.31	0.55
1:A:171:GLU:HA	1:A:342:VAL:O	2.06	0.55
1:A:338:SER:HB3	1:A:339:THR:OG1	2.06	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:148:PRO:HG2	1:A:151:TYR:CD2	2.42	0.55
1:A:476:ASN:ND2	2:D:1:NAG:H83	2.22	0.54
1:A:489:GLU:H	1:A:489:GLU:CD	2.14	0.54
1:A:225:VAL:HB	1:A:294:VAL:HG22	1.88	0.54
1:A:487:GLY:CA	1:A:489:GLU:OE2	2.56	0.54
1:A:276:GLU:HG2	9:A:2061:HOH:O	2.07	0.53
1:A:169:MET:HE3	1:A:347:HIS:CE1	2.44	0.53
1:A:110:LEU:CD2	1:A:358:VAL:HG22	2.39	0.53
1:A:616:MET:HA	1:A:616:MET:CE	2.39	0.52
1:A:310:GLY:O	1:A:328:ASN:HB3	2.09	0.52
1:A:138:ILE:O	2:C:1:NAG:C8	2.58	0.52
1:A:169:MET:HE3	1:A:347:HIS:NE2	2.24	0.52
1:A:169:MET:HE2	1:A:345:HIS:ND1	2.25	0.52
1:A:155:SER:O	1:A:156:ASP:CB	2.58	0.51
1:A:605:ARG:NH1	1:A:609:ASP:OD1	2.41	0.51
1:A:343:LYS:HD3	1:A:345:HIS:CE1	2.46	0.51
1:A:334:THR:O	1:A:334:THR:CG2	2.59	0.51
1:A:337:PHE:N	1:A:337:PHE:CD1	2.79	0.50
1:A:205:TYR:CE1	1:A:254:GLN:HB3	2.47	0.50
1:A:427:GLY:HA2	4:A:2000:MET:HE3	1.93	0.49
1:A:616:MET:O	1:A:619:PRO:HD3	2.13	0.49
1:A:131:ILE:HA	1:A:136:ASN:O	2.13	0.49
1:A:141:THR:HG22	1:A:301:ASP:HB3	1.95	0.48
1:A:153:ASN:O	1:A:154:VAL:C	2.57	0.48
1:A:186:PHE:O	1:A:190:ARG:HB2	2.13	0.48
1:A:219:LEU:HD23	1:A:219:LEU:HA	1.71	0.47
1:A:456:ILE:HD13	1:A:573:HIS:CE1	2.49	0.47
1:A:514:LYS:HD2	1:A:692:TYR:HE1	1.80	0.47
1:A:406:LYS:HA	1:A:410:TRP:O	2.15	0.47
1:A:188:LEU:HD11	1:A:329:VAL:HG11	1.97	0.46
1:A:218:GLN:OE1	1:A:291:SER:N	2.38	0.46
1:A:412:PRO:CA	1:A:589:ASN:OD1	2.62	0.46
1:A:345:HIS:C	1:A:346:ILE:HD13	2.41	0.46
1:A:129:SER:HA	1:A:139:PHE:O	2.16	0.46
1:A:334:THR:O	1:A:334:THR:HG23	2.16	0.46
1:A:276:GLU:CG	9:A:2061:HOH:O	2.61	0.46
1:A:716:GLU:CD	1:A:716:GLU:N	2.67	0.46
9:A:2144:HOH:O	2:D:1:NAG:H81	2.16	0.45
1:A:225:VAL:O	1:A:294:VAL:HA	2.17	0.45
1:A:214:VAL:O	1:A:218:GLN:HG3	2.17	0.45
1:A:517:SER:HB2	1:A:694:PRO:HG3	1.98	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:586:GLU:O	1:A:590:SER:HB3	2.17	0.44
1:A:567:ASP:OD2	1:A:570:PHE:HA	2.18	0.43
1:A:691:ILE:O	1:A:704:SER:HA	2.17	0.43
1:A:308:LYS:HB2	1:A:333:PHE:CD2	2.53	0.43
1:A:345:HIS:O	1:A:346:ILE:HD13	2.18	0.43
1:A:719:VAL:O	1:A:721:PRO:HD3	2.17	0.43
1:A:338:SER:CA	1:A:339:THR:HB	2.49	0.43
3:E:1:NAG:H62	3:E:2:NAG:C7	2.48	0.43
1:A:616:MET:HE3	1:A:616:MET:HA	2.00	0.42
1:A:240:LYS:O	1:A:245:GLY:HA3	2.19	0.42
2:D:1:NAG:H82	2:D:1:NAG:H2	1.53	0.42
1:A:263:GLY:HA2	1:A:522:GLU:OE1	2.19	0.42
1:A:468:PRO:HA	1:A:471:TYR:CE1	2.55	0.42
1:A:591:ILE:HG23	1:A:661:LEU:HD21	2.01	0.42
1:A:188:LEU:HD11	1:A:329:VAL:CG1	2.50	0.41
1:A:654:ASP:C	1:A:656:SER:N	2.78	0.41
1:A:323:LEU:HD12	1:A:323:LEU:HA	1.82	0.41
1:A:175:VAL:CG2	1:A:199:LYS:HG2	2.51	0.41
1:A:460:TYR:CD2	1:A:540:ASN:HA	2.55	0.41
1:A:514:LYS:HD2	1:A:692:TYR:CE1	2.56	0.41
1:A:561:LEU:HD11	1:A:566:TYR:HE1	1.86	0.41
1:A:709:TYR:CD2	1:A:709:TYR:C	2.99	0.41
1:A:748:GLU:HG3	9:A:2216:HOH:O	2.19	0.41
1:A:112:HIS:HA	1:A:355:ILE:O	2.21	0.41
1:A:456:ILE:HD12	1:A:566:TYR:HB3	2.03	0.40
1:A:487:GLY:HA2	1:A:489:GLU:OE2	2.20	0.40

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:655:LYS:O	1:A:656:SER:OG[4_566]	1.68	0.52
1:A:276:GLU:OE2	3:E:3:BMA:O2[2_565]	2.09	0.11

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	681/707 (96%)	650 (95%)	27 (4%)	4 (1%)	21	32

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	154	VAL
1	A	339	THR
1	A	506	PHE
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	536/603 (89%)	513 (96%)	23 (4%)	26	44

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	57	ASN
1	A	155	SER
1	A	174	LEU
1	A	201	VAL
1	A	229	SER
1	A	323	LEU
1	A	334	THR
1	A	396	HIS
1	A	465	ASP
1	A	489	GLU
1	A	509	MET
1	A	536	ARG
1	A	557	GLU

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Mol	Chain	Res	Type
1	A	589	ASN
1	A	591	ILE
1	A	600	TYR
1	A	605	ARG
1	A	616	MET
1	A	654	ASP
1	A	656	SER
1	A	668	LEU
1	A	716	GLU
1	A	719	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	257	ASN
1	A	260	ASN
1	A	657	ASN

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 ⓘ

10 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	1,2	14,14,15	0.76	1 (7%)	17,19,21	1.73	4 (23%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	NAG	B	2	2	14,14,15	0.50	0	17,19,21	2.63	5 (29%)
2	NAG	C	1	1,2	14,14,15	0.76	0	17,19,21	1.38	3 (17%)
2	NAG	C	2	2	14,14,15	0.46	0	17,19,21	1.37	1 (5%)
2	NAG	D	1	1,2	14,14,15	1.05	1 (7%)	17,19,21	2.21	5 (29%)
2	NAG	D	2	2	14,14,15	0.66	0	17,19,21	1.06	1 (5%)
3	NAG	E	1	1,3	14,14,15	0.64	1 (7%)	17,19,21	1.71	4 (23%)
3	NAG	E	2	3	14,14,15	0.82	1 (7%)	17,19,21	1.54	3 (17%)
3	BMA	E	3	3	11,11,12	0.93	1 (9%)	15,15,17	1.64	4 (26%)
3	MAN	E	4	3	11,11,12	0.72	0	15,15,17	1.09	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	B	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	B	2	2	-	4/6/23/26	0/1/1/1
2	NAG	C	1	1,2	-	0/6/23/26	0/1/1/1
2	NAG	C	2	2	-	0/6/23/26	0/1/1/1
2	NAG	D	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	D	2	2	-	0/6/23/26	0/1/1/1
3	NAG	E	1	1,3	-	0/6/23/26	0/1/1/1
3	NAG	E	2	3	-	2/6/23/26	0/1/1/1
3	BMA	E	3	3	-	0/2/19/22	0/1/1/1
3	MAN	E	4	3	-	0/2/19/22	0/1/1/1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	1	NAG	O5-C1	-2.35	1.39	1.43
2	D	1	NAG	O5-C1	-2.18	1.40	1.43
3	E	1	NAG	O5-C1	-2.06	1.40	1.43
3	E	2	NAG	O5-C1	-2.06	1.40	1.43
3	E	3	BMA	O5-C1	-2.03	1.40	1.43

All (32) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	2	NAG	C1-O5-C5	8.41	123.46	112.19
2	D	1	NAG	C2-N2-C7	-6.31	114.45	122.90
2	B	1	NAG	C2-N2-C7	-5.29	115.81	122.90
3	E	3	BMA	C1-C2-C3	4.35	115.98	109.64
2	D	1	NAG	O5-C1-C2	-4.17	104.83	111.29
2	C	2	NAG	C1-O5-C5	3.79	117.27	112.19
2	B	2	NAG	O5-C5-C4	3.67	119.77	110.83
3	E	2	NAG	C3-C4-C5	-3.38	104.10	110.23
2	C	1	NAG	C2-N2-C7	-3.30	118.48	122.90
3	E	1	NAG	C6-C5-C4	-3.21	105.14	113.02
3	E	1	NAG	O5-C1-C2	-3.19	106.35	111.29
3	E	1	NAG	O4-C4-C5	-2.93	102.11	109.32
3	E	2	NAG	C1-O5-C5	-2.91	108.29	112.19
3	E	3	BMA	O2-C2-C3	-2.66	104.65	110.15
2	D	2	NAG	C2-N2-C7	-2.63	119.38	122.90
3	E	1	NAG	C2-N2-C7	-2.62	119.39	122.90
2	B	2	NAG	C2-N2-C7	2.52	126.28	122.90
2	C	1	NAG	C1-C2-N2	2.49	114.35	110.43
2	B	2	NAG	C3-C4-C5	2.45	114.67	110.23
2	D	1	NAG	O5-C5-C4	-2.36	105.09	110.83
2	B	1	NAG	O5-C1-C2	-2.32	107.70	111.29
3	E	3	BMA	O3-C3-C2	-2.29	105.37	110.05
2	B	1	NAG	O5-C5-C6	2.24	112.02	107.66
2	D	1	NAG	C8-C7-N2	-2.19	112.49	116.12
2	B	2	NAG	C6-C5-C4	-2.19	107.65	113.02
2	B	1	NAG	O4-C4-C3	-2.14	105.34	110.38
3	E	4	MAN	O5-C5-C6	2.14	111.82	107.66
3	E	3	BMA	O4-C4-C3	-2.13	105.37	110.38
2	D	1	NAG	O7-C7-N2	2.11	125.71	121.98
2	C	1	NAG	O5-C1-C2	-2.10	108.04	111.29
3	E	2	NAG	C2-N2-C7	-2.02	120.19	122.90
3	E	4	MAN	C3-C4-C5	-2.01	106.58	110.23

There are no chirality outliers.

All (8) torsion outliers are listed below:

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

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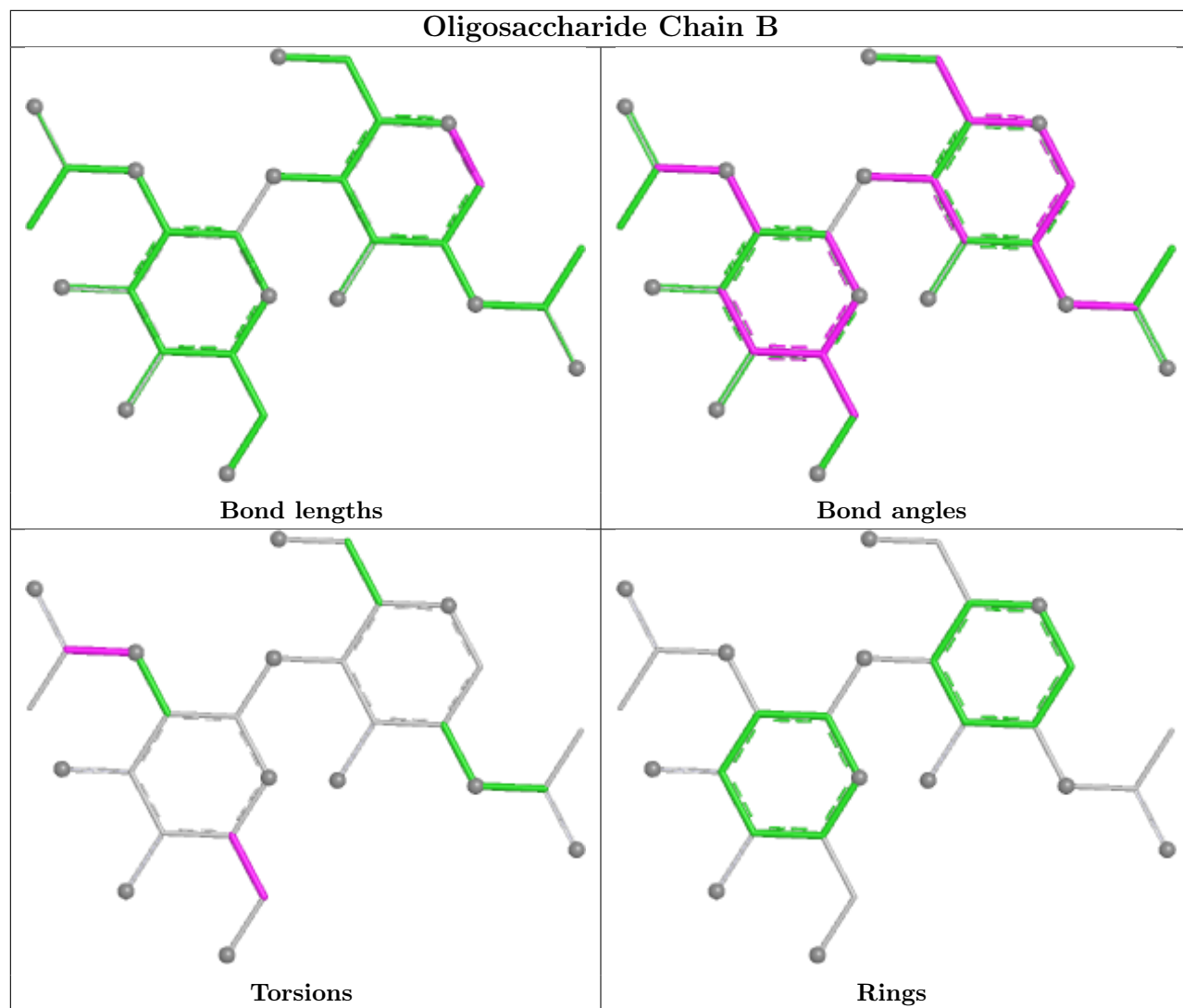
Mol	Chain	Res	Type	Atoms
3	E	2	NAG	O7-C7-N2-C2
2	B	2	NAG	O5-C5-C6-O6

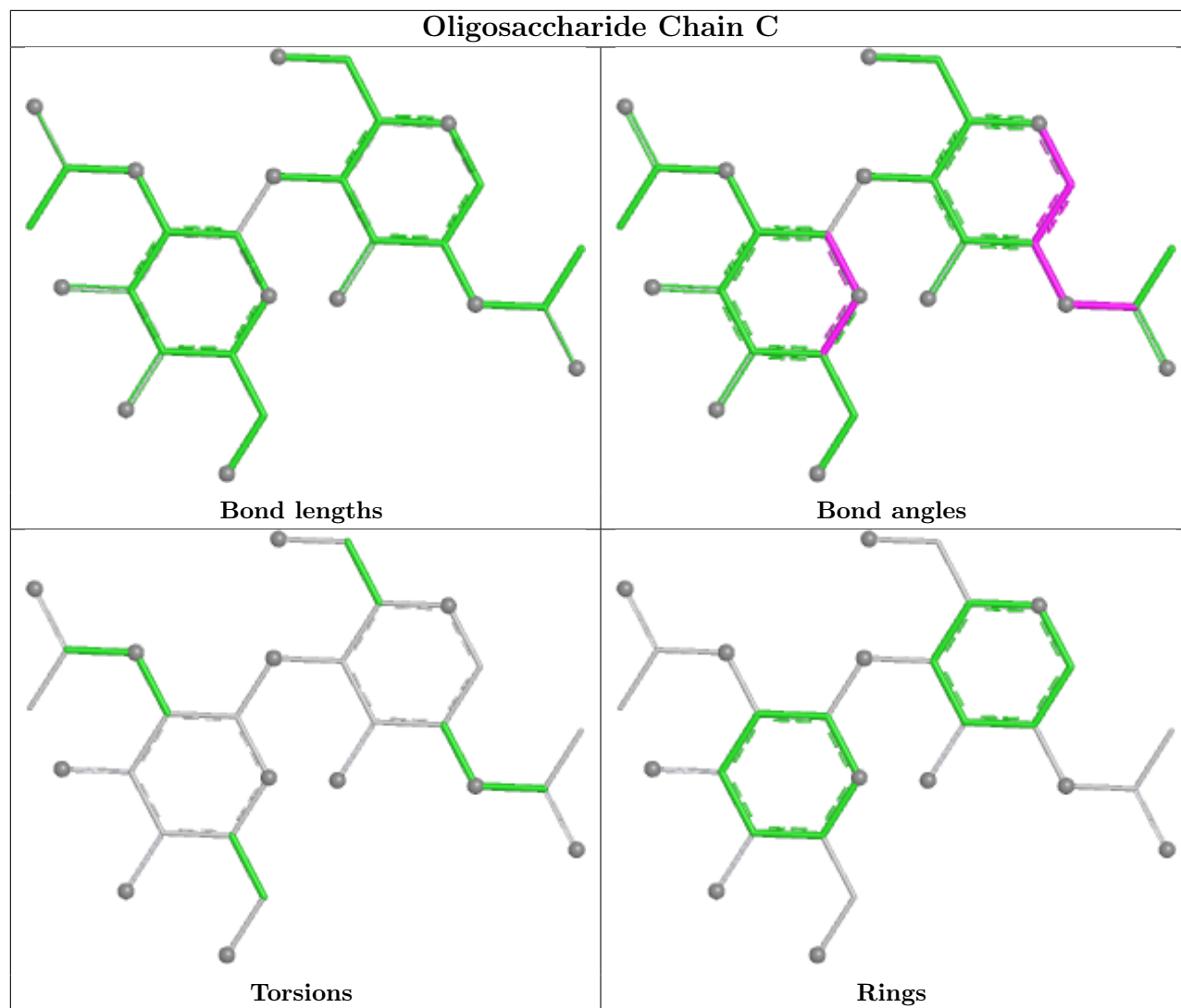
There are no ring outliers.

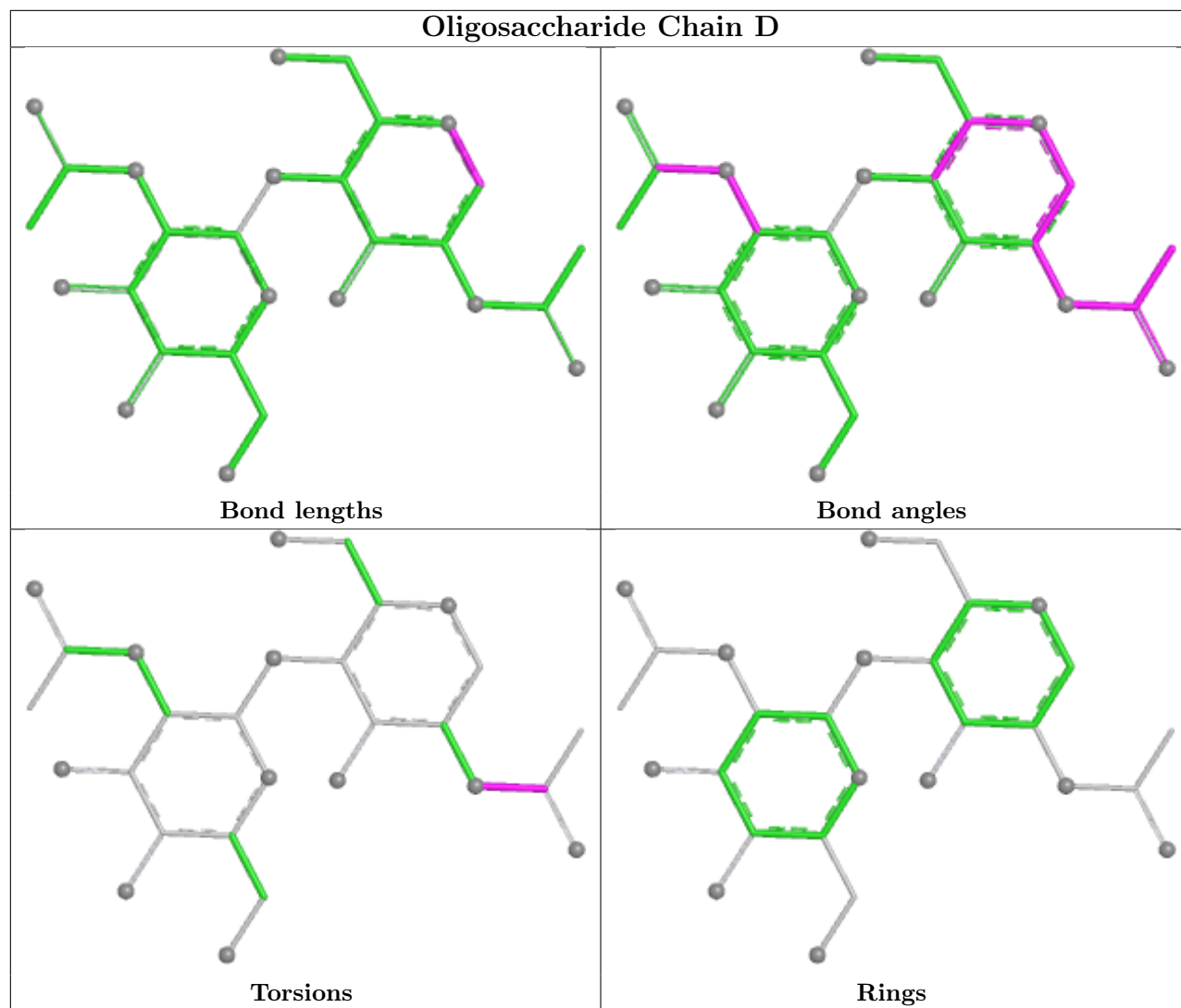
5 monomers are involved in 8 short contacts:

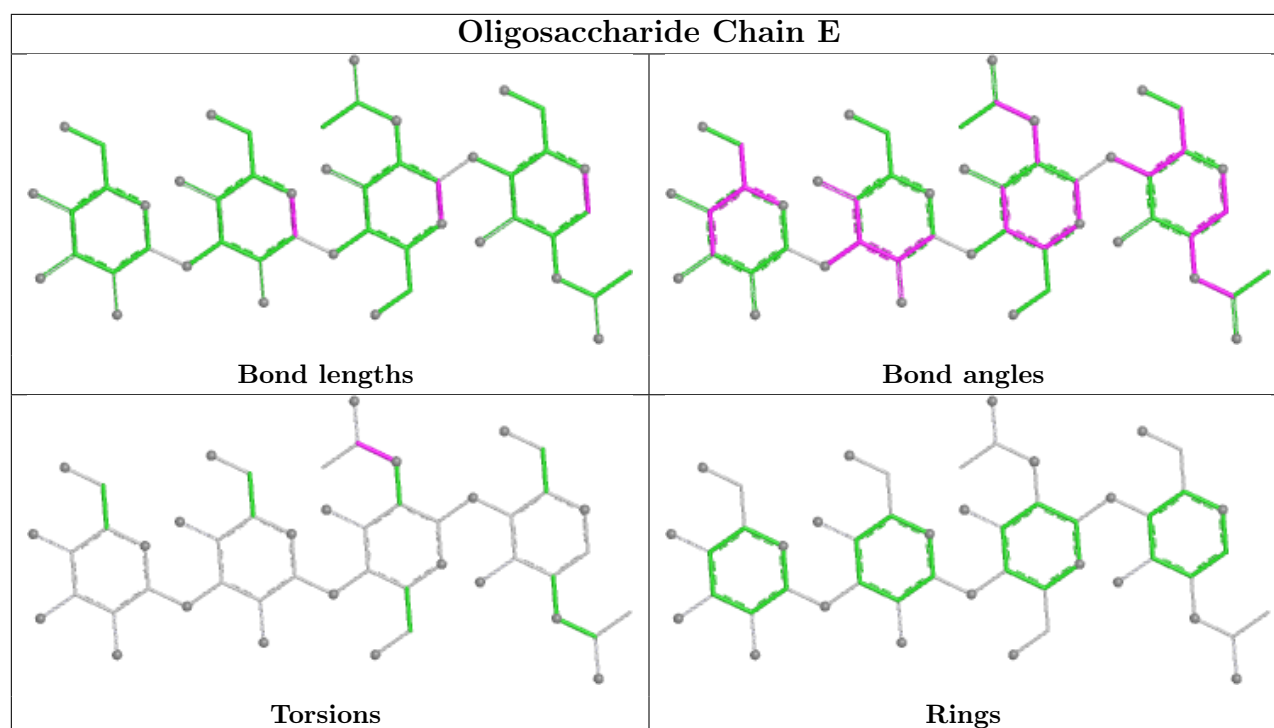
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	1	NAG	2	0
3	E	2	NAG	1	0
3	E	3	BMA	0	1
3	E	1	NAG	1	0
2	D	1	NAG	4	0

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	$\# Z > 2$
8	NAG	A	1761	1	14,14,15	0.50	0	17,19,21	2.54	7 (41%)
4	MET	A	2000	-	7,8,8	0.97	0	5,9,9	1.12	0
8	NAG	A	1760	1	14,14,15	0.47	0	17,19,21	1.02	1 (5%)
8	NAG	A	1757	1	14,14,15	0.50	0	17,19,21	1.50	4 (23%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
8	NAG	A	1761	1	-	1/6/23/26	0/1/1/1
4	MET	A	2000	-	-	1/8/8/8	-
8	NAG	A	1760	1	-	3/6/23/26	0/1/1/1
8	NAG	A	1757	1	-	3/6/23/26	0/1/1/1

There are no bond length outliers.

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	A	1761	NAG	C1-O5-C5	7.47	122.19	112.19
8	A	1761	NAG	C4-C3-C2	-3.49	105.91	111.02
8	A	1760	NAG	C1-O5-C5	3.10	116.34	112.19
8	A	1761	NAG	O5-C5-C6	2.74	112.99	107.66
8	A	1761	NAG	O5-C1-C2	2.72	115.50	111.29
8	A	1761	NAG	C6-C5-C4	-2.72	106.34	113.02
8	A	1757	NAG	C4-C3-C2	-2.70	107.06	111.02
8	A	1757	NAG	C2-N2-C7	-2.65	119.34	122.90
8	A	1757	NAG	C3-C4-C5	-2.63	105.46	110.23
8	A	1761	NAG	C2-N2-C7	-2.62	119.39	122.90
8	A	1761	NAG	O5-C5-C4	2.14	116.03	110.83
8	A	1757	NAG	C1-O5-C5	2.13	115.04	112.19

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
8	A	1760	NAG	C8-C7-N2-C2
8	A	1760	NAG	O7-C7-N2-C2
8	A	1757	NAG	C8-C7-N2-C2
8	A	1757	NAG	O7-C7-N2-C2
4	A	2000	MET	CB-CG-SD-CE
8	A	1761	NAG	O5-C5-C6-O6
8	A	1760	NAG	O5-C5-C6-O6
8	A	1757	NAG	O5-C5-C6-O6

There are no ring outliers.

1 monomer is involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	2000	MET	6	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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	687/707 (97%)	-0.41	12 (1%) 69 65	13, 28, 50, 66	0

All (12) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	656	SER	3.6
1	A	155	SER	3.5
1	A	194	ILE	3.2
1	A	547	SER	3.2
1	A	654	ASP	3.2
1	A	506	PHE	2.4
1	A	338	SER	2.3
1	A	546	PHE	2.2
1	A	339	THR	2.2
1	A	334	THR	2.2
1	A	655	LYS	2.1
1	A	507	SER	2.0

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

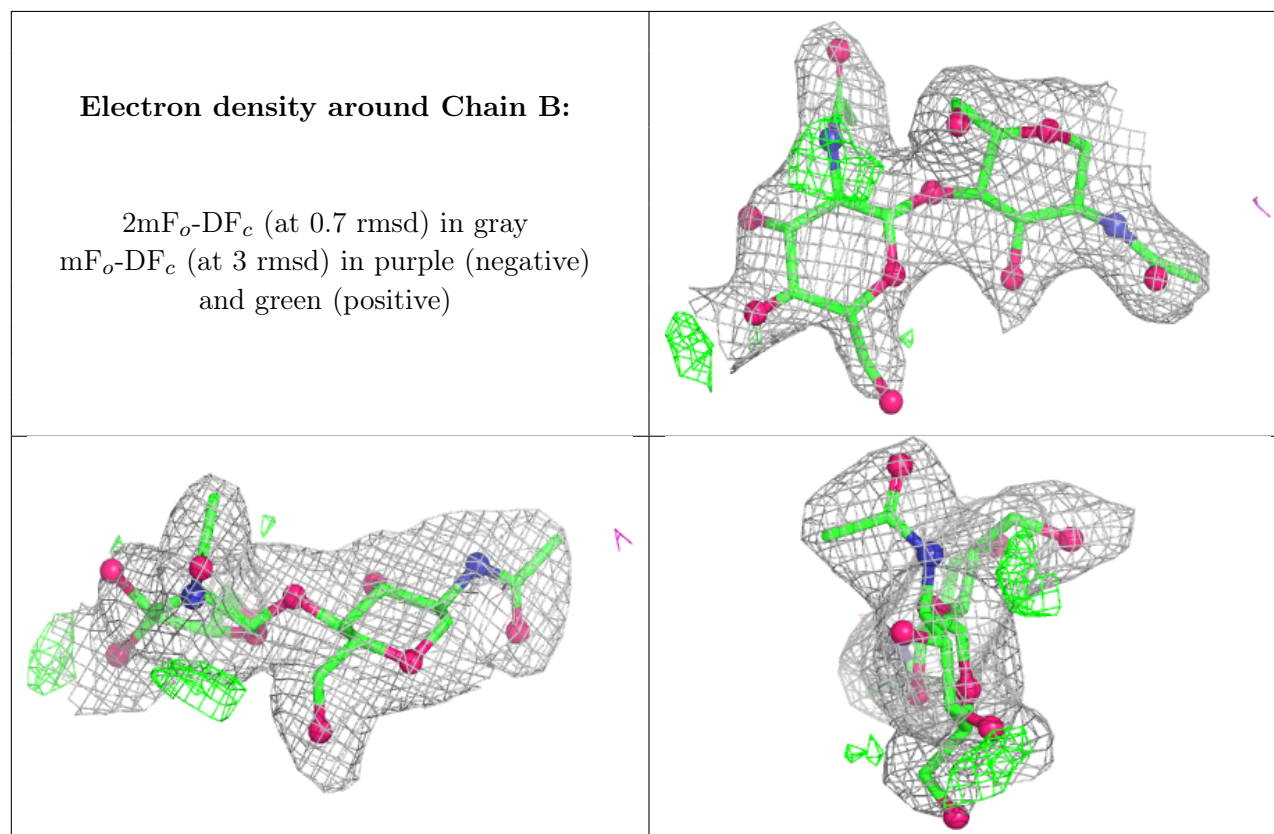
There are no non-standard protein/DNA/RNA residues in this entry.

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.

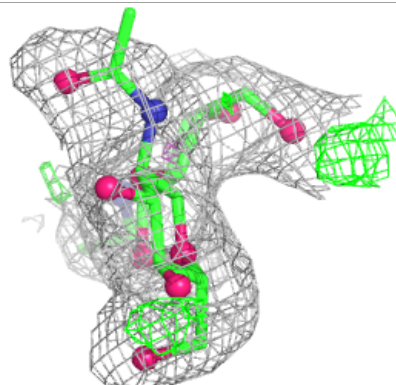
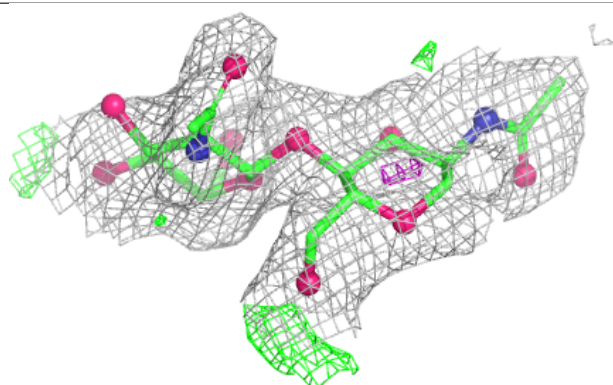
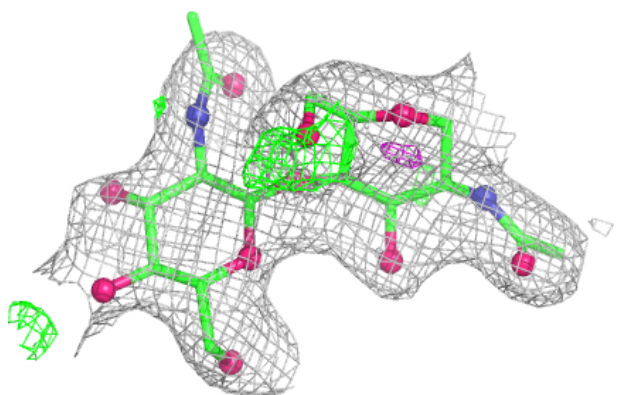
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	NAG	C	2	14/15	0.70	0.15	65,66,70,72	0
2	NAG	B	2	14/15	0.73	0.15	56,60,64,65	0
2	NAG	C	1	14/15	0.82	0.11	47,52,56,61	0
3	MAN	E	4	11/12	0.83	0.12	61,63,66,70	0
3	BMA	E	3	11/12	0.87	0.09	50,53,55,58	0
2	NAG	D	2	14/15	0.88	0.09	49,53,55,56	0
3	NAG	E	2	14/15	0.88	0.10	44,48,53,56	0
2	NAG	B	1	14/15	0.93	0.08	39,44,47,51	0
2	NAG	D	1	14/15	0.93	0.08	34,41,46,46	0
3	NAG	E	1	14/15	0.97	0.05	16,27,41,41	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.

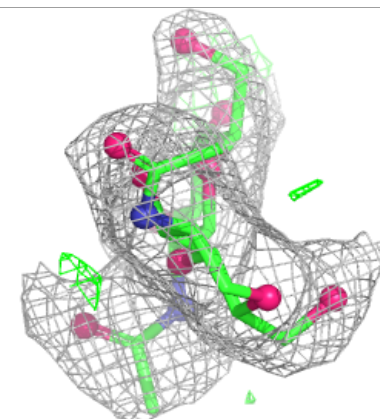
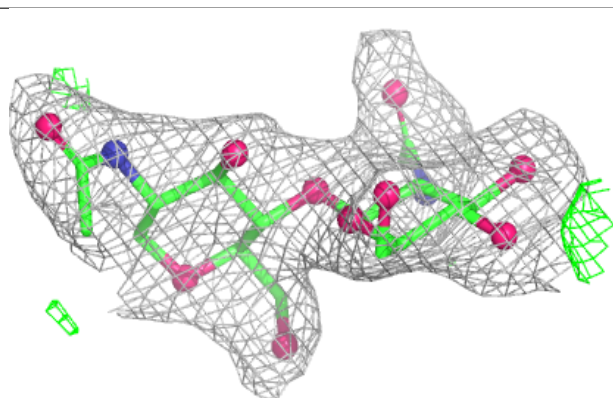
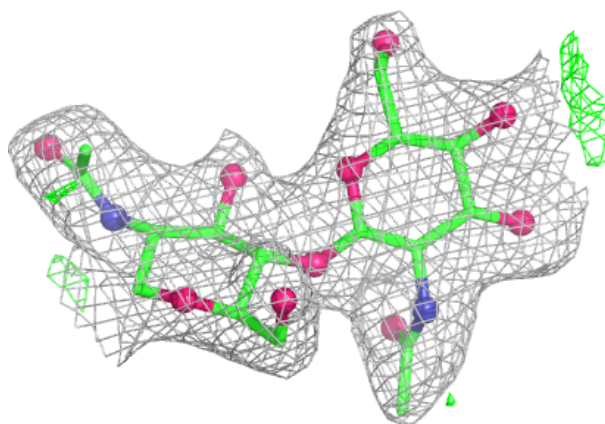


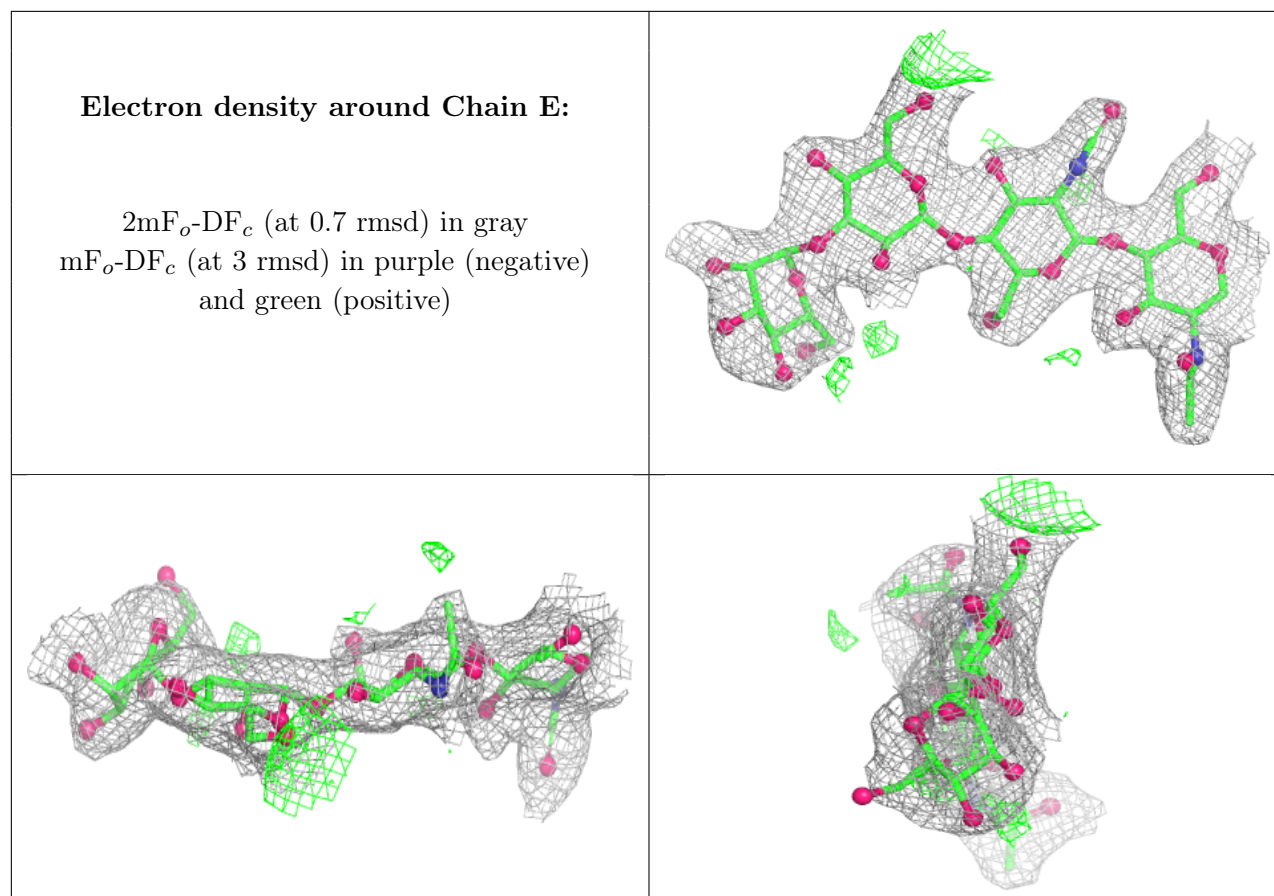
Electron density around Chain C:

$2mF_o-DF_c$ (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)





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
8	NAG	A	1760	14/15	0.63	0.17	74,79,80,80	0
8	NAG	A	1757	14/15	0.70	0.15	59,63,69,72	0
8	NAG	A	1761	14/15	0.86	0.11	36,52,59,60	0
4	MET	A	2000	9/9	0.93	0.09	12,20,22,32	0
7	CL	A	1754	1/1	0.99	0.04	23,23,23,23	0
6	CA	A	1753	1/1	0.99	0.01	14,14,14,14	0
5	ZN	A	1752	1/1	1.00	0.01	18,18,18,18	0
5	ZN	A	1751	1/1	1.00	0.02	18,18,18,18	0

6.5 Other polymers [i](#)

There are no such residues in this entry.