



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 06:20 AM UTC

PDB ID : 5LWW / pdb_00005lww
Title : Crystal structure of a laccase-like multicopper oxidase McoG from *Aspergillus niger* bound to zinc
Authors : Ferraroni, M.; Briganti, F.; Tamayo-Ramos, J.A.; van Berkel, W.J.H.; Westphal, A.H.
Deposited on : 2016-09-19
Resolution : 2.65 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

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

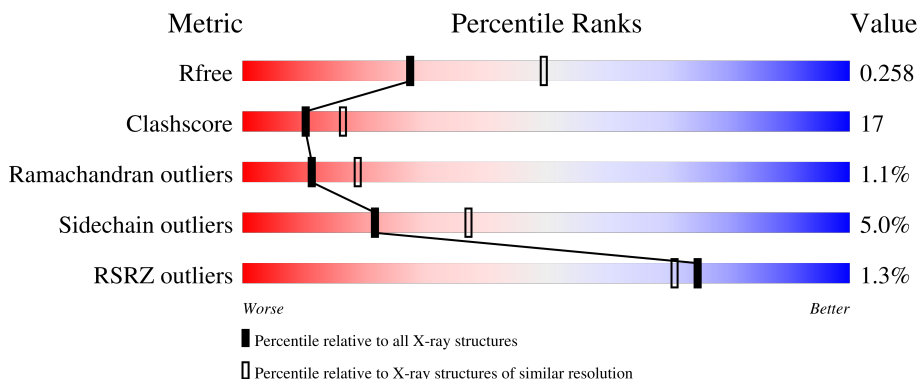
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.65 Å.

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



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	1110 (2.66-2.66)
Clashscore	190562	1141 (2.66-2.66)
Ramachandran outliers	187476	1126 (2.66-2.66)
Sidechain outliers	187428	1126 (2.66-2.66)
RSRZ outliers	180081	1110 (2.66-2.66)

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

Mol	Chain	Length	Quality of chain
1	A	550	<div style="display: flex; align-items: center;"> <div style="width: 2%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 67%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 30%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 1%; height: 10px; background-color: orange; margin-right: 5px;"></div> <div style="width: 1%; height: 10px; background-color: grey;"></div> </div> <p style="text-align: center; margin-top: 5px;">67% 30% .</p>
2	B	2	<div style="display: flex; align-items: center;"> <div style="width: 50%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 50%; height: 10px; background-color: yellow; margin-right: 5px;"></div> </div> <p style="text-align: center; margin-top: 5px;">50% 50%</p>
3	C	2	<div style="display: flex; align-items: center;"> <div style="width: 50%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 50%; height: 10px; background-color: yellow; margin-right: 5px;"></div> </div> <p style="text-align: center; margin-top: 5px;">50% 50%</p>
4	D	4	<div style="display: flex; align-items: center;"> <div style="width: 25%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 75%; height: 10px; background-color: yellow; margin-right: 5px;"></div> </div> <p style="text-align: center; margin-top: 5px;">25% 75%</p>

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
2	NAG	B	1	-	-	X	-

2 Entry composition [i](#)

There are 13 unique types of molecules in this entry. The entry contains 4738 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 Multicopper oxidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	550	4354	2772	738	829	15	0	0	0

- 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
			Total	C	N	O			
2	B	2	28	16	2	10	0	0	0

- Molecule 3 is an oligosaccharide called beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



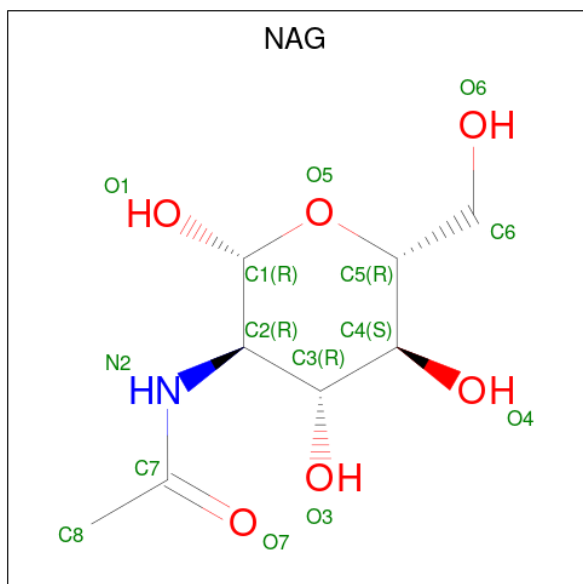
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	C	2	25	14	1	10	0	0	0

- Molecule 4 is an oligosaccharide called alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



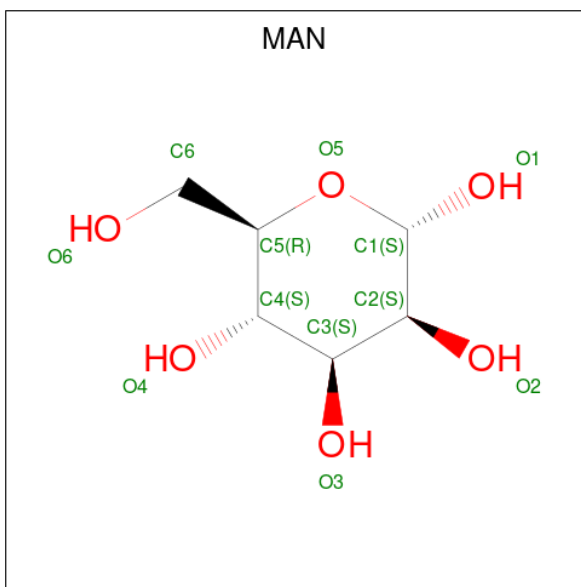
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace	
			Total	C	N				O
4	D	4	50	28	2	20	0	0	0

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



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

- Molecule 6 is alpha-D-mannopyranose (CCD ID: MAN) (formula: $C_6H_{12}O_6$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total	0	0
			C		
			11	6	5

- Molecule 7 is COPPER (II) ION (CCD ID: CU) (formula: Cu).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	4	Total	0	0
			Cu		
			4	4	

- Molecule 8 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	8	Total	0	0
			Zn		
			8	8	

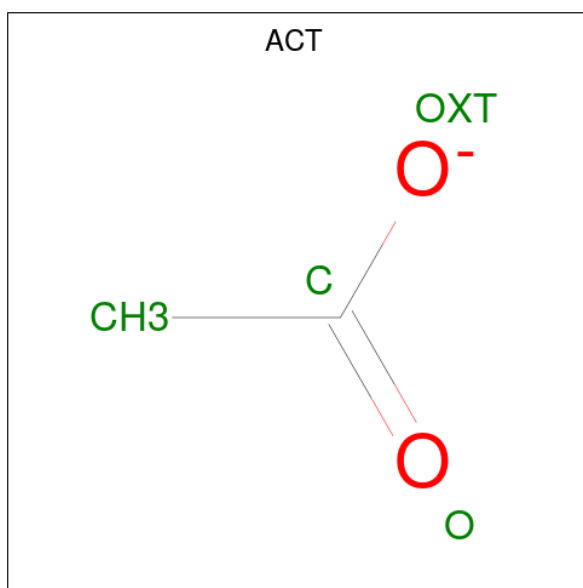
- Molecule 9 is POTASSIUM ION (CCD ID: K) (formula: K).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	A	1	Total	0	0
			K		
			1	1	

- Molecule 10 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

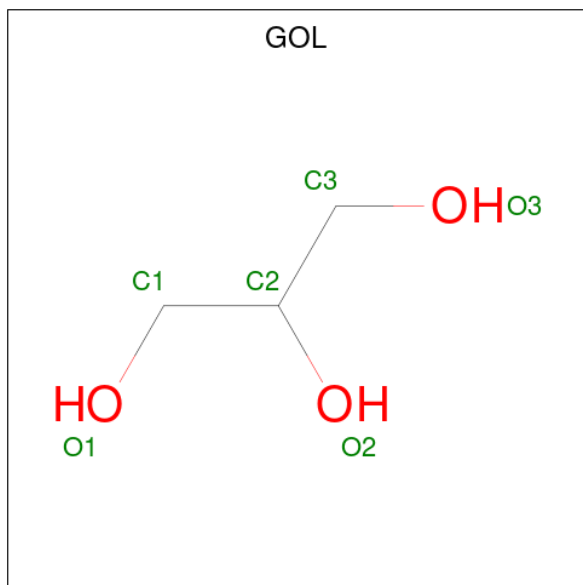
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
10	A	1	Total	0	0
			Cl		
			1	1	

- Molecule 11 is ACETATE ION (CCD ID: ACT) (formula: $C_2H_3O_2$).



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

- Molecule 12 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms		ZeroOcc	AltConf	
12	A	1	Total	C	O	0	0
			6	3	3		

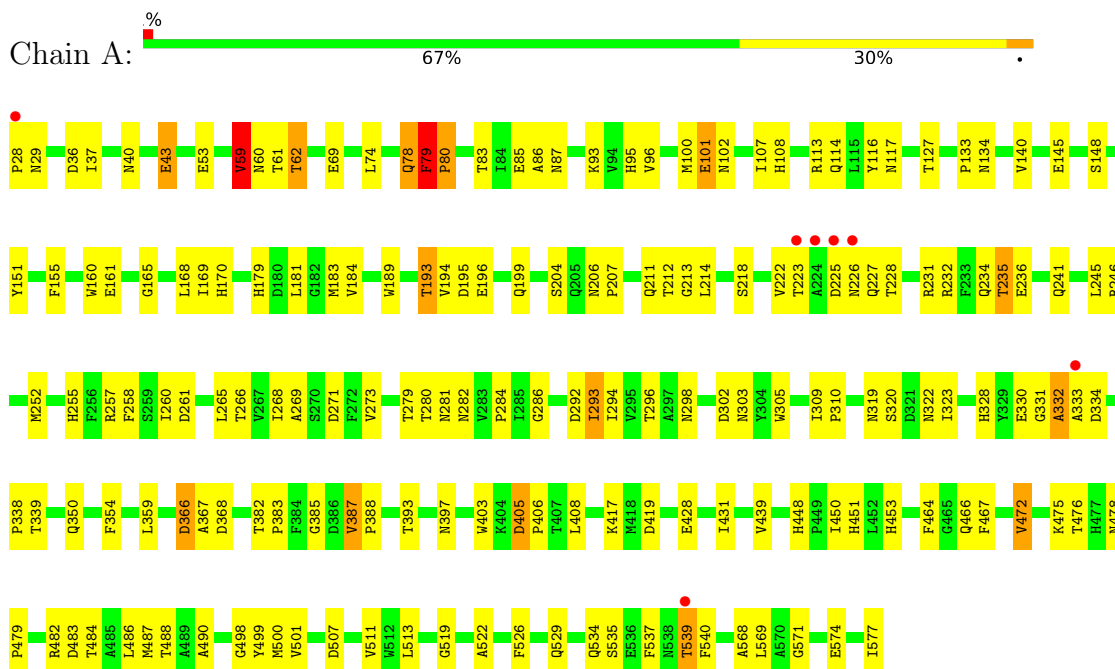
- Molecule 13 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
13	A	218	Total 218	O 218	0	0

3 Residue-property plots [i](#)

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

- Molecule 1: Multicopper oxidase



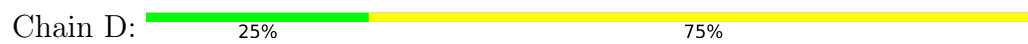
- Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 3: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 4: alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



MAG1	Yellow
MAG2	Yellow
BMA3	Yellow
TM14	Green

4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	88.45Å 128.16Å 134.68Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 2.65 20.00 – 2.65	Depositor EDS
% Data completeness (in resolution range)	99.5 (20.00-2.65) 99.6 (20.00-2.65)	Depositor EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.75 (at 2.64Å)	Xtrriage
Refinement program	REFMAC 5.8.0073	Depositor
R, R_{free}	0.185 , 0.267 0.189 , 0.258	Depositor DCC
R_{free} test set	1156 reflections (5.10%)	wwPDB-VP
Wilson B-factor (Å ²)	23.3	Xtrriage
Anisotropy	0.235	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 45.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	0.016 for -h,-l,-k	Xtrriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	4738	wwPDB-VP
Average B, all atoms (Å ²)	42.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.50% 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: K, ZN, ACT, CL, BMA, CU, NAG, GOL, 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	0.88	0/4495	1.15	22/6161 (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	2

There are no bond length outliers.

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	387	VAL	CA-C-N	11.48	134.20	119.84
1	A	387	VAL	C-N-CA	11.48	134.20	119.84
1	A	79	PHE	CA-C-N	10.51	132.98	119.84
1	A	79	PHE	C-N-CA	10.51	132.98	119.84
1	A	366	ASP	N-CA-C	7.01	119.78	109.69
1	A	273	VAL	N-CA-C	6.94	115.03	107.60
1	A	319	ASN	N-CA-C	6.00	118.65	110.06
1	A	431	ILE	CA-C-N	5.90	126.83	119.98
1	A	431	ILE	C-N-CA	5.90	126.83	119.98
1	A	405	ASP	CA-C-N	-5.80	113.71	119.92
1	A	405	ASP	C-N-CA	-5.80	113.71	119.92
1	A	273	VAL	CA-C-N	-5.60	114.16	119.76
1	A	273	VAL	C-N-CA	-5.60	114.16	119.76
1	A	334	ASP	N-CA-C	5.55	117.46	110.24
1	A	322	ASN	N-CA-C	5.48	119.59	111.87
1	A	74	LEU	N-CA-C	5.47	118.15	109.50

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	59	VAL	N-CA-C	5.45	117.24	108.85
1	A	280	THR	CA-C-N	5.38	127.93	120.29
1	A	280	THR	C-N-CA	5.38	127.93	120.29
1	A	79	PHE	C-N-CD	-5.25	103.48	125.00
1	A	309	ILE	N-CA-C	5.17	113.56	107.77
1	A	281	ASN	CB-CA-C	-5.09	102.20	110.85

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	387	VAL	Peptide
1	A	79	PHE	Peptide

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	4354	0	4016	145	0
2	B	28	0	25	10	0
3	C	25	0	21	2	0
4	D	50	0	43	1	0
5	A	28	0	25	7	0
6	A	11	0	10	0	0
7	A	4	0	0	0	0
8	A	8	0	0	0	0
9	A	1	0	0	0	0
10	A	1	0	0	0	0
11	A	4	0	3	0	0
12	A	6	0	8	0	0
13	A	218	0	0	22	1
All	All	4738	0	4151	147	1

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 17.

All (147) 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:102:ASN:H	2:B:1:NAG:C8	1.58	1.16
1:A:569:LEU:HD11	5:A:605:NAG:H61	1.27	1.10
1:A:193:THR:HG21	3:C:1:NAG:O7	1.56	1.05
1:A:102:ASN:H	2:B:1:NAG:H81	1.21	1.02
1:A:569:LEU:CD1	5:A:605:NAG:H61	1.88	1.02
1:A:193:THR:HG22	1:A:196:GLU:H	1.21	1.01
1:A:179:HIS:ND1	13:A:701:HOH:O	1.91	1.00
1:A:569:LEU:HD11	5:A:605:NAG:C6	1.93	0.97
1:A:257:ARG:HD2	1:A:282:ASN:ND2	1.82	0.94
1:A:366:ASP:HB2	1:A:476:THR:O	1.68	0.92
1:A:102:ASN:H	2:B:1:NAG:H82	1.37	0.89
1:A:168:LEU:HB2	1:A:183:MET:HE1	1.53	0.88
1:A:366:ASP:HB3	1:A:478:ASN:H	1.37	0.87
5:A:605:NAG:O7	5:A:605:NAG:O3	1.94	0.85
1:A:102:ASN:N	2:B:1:NAG:C8	2.40	0.85
1:A:86:ALA:HB3	1:A:169:ILE:HD13	1.59	0.84
1:A:393:THR:HG22	13:A:795:HOH:O	1.77	0.84
1:A:193:THR:HG22	1:A:196:GLU:N	1.97	0.80
1:A:40:ASN:ND2	1:A:43:GLU:HG3	1.97	0.79
1:A:102:ASN:N	2:B:1:NAG:H82	1.97	0.78
1:A:28:PRO:O	1:A:29:ASN:HB2	1.85	0.76
1:A:245:LEU:HB2	1:A:293:ILE:HG22	1.67	0.76
1:A:95:HIS:HE1	13:A:817:HOH:O	1.67	0.76
1:A:257:ARG:CD	1:A:282:ASN:ND2	2.47	0.76
1:A:428:GLU:HB2	13:A:728:HOH:O	1.87	0.74
1:A:127:THR:HA	1:A:408:LEU:HD12	1.71	0.73
1:A:93:LYS:HG3	1:A:140:VAL:HG22	1.71	0.73
1:A:257:ARG:CD	1:A:282:ASN:HD22	2.03	0.71
1:A:101:GLU:H	2:B:1:NAG:C8	2.05	0.70
1:A:193:THR:CG2	3:C:1:NAG:O7	2.39	0.66
1:A:95:HIS:NE2	13:A:702:HOH:O	2.26	0.66
1:A:101:GLU:H	2:B:1:NAG:H81	1.61	0.65
1:A:296:THR:HG22	1:A:298:ASN:HB3	1.78	0.64
1:A:382:THR:HG22	1:A:383:PRO:HD2	1.79	0.64
1:A:366:ASP:CB	1:A:478:ASN:H	2.09	0.64
1:A:245:LEU:HB2	1:A:293:ILE:CG2	2.28	0.63
1:A:179:HIS:CE1	13:A:701:HOH:O	2.43	0.63
1:A:101:GLU:HB3	13:A:874:HOH:O	1.97	0.63
1:A:116:TYR:HD2	1:A:539:THR:HG21	1.65	0.62
1:A:266:THR:OG1	1:A:279:THR:HG22	1.99	0.61
1:A:382:THR:CG2	1:A:383:PRO:HD2	2.30	0.61
1:A:134:ASN:ND2	13:A:703:HOH:O	2.24	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:511:VAL:HG23	1:A:511:VAL:O	2.00	0.61
1:A:236:GLU:HA	1:A:328:HIS:O	2.01	0.60
1:A:102:ASN:N	2:B:1:NAG:H81	2.04	0.60
1:A:86:ALA:HB3	1:A:169:ILE:CD1	2.30	0.59
1:A:466:GLN:HB3	13:A:766:HOH:O	2.02	0.58
1:A:213:GLY:HA3	1:A:323:ILE:HD13	1.86	0.57
1:A:350:GLN:NE2	13:A:710:HOH:O	2.36	0.57
1:A:522:ALA:HB1	1:A:577:ILE:HD11	1.85	0.57
1:A:257:ARG:HD3	1:A:282:ASN:HD22	1.68	0.57
1:A:232:ARG:HD3	13:A:765:HOH:O	2.04	0.56
1:A:199:GLN:HE22	1:A:571:GLY:C	2.13	0.56
1:A:393:THR:HG21	13:A:792:HOH:O	2.05	0.56
1:A:116:TYR:HD2	1:A:539:THR:CG2	2.18	0.56
1:A:574:GLU:HB3	13:A:755:HOH:O	2.05	0.56
1:A:467:PHE:HD2	13:A:815:HOH:O	1.89	0.55
1:A:305:TRP:CH2	1:A:338:PRO:HD2	2.42	0.55
1:A:193:THR:HG23	1:A:195:ASP:H	1.71	0.54
1:A:161:GLU:OE2	1:A:195:ASP:OD2	2.25	0.54
1:A:330:GLU:O	1:A:332:ALA:N	2.40	0.54
1:A:475:LYS:HG2	1:A:479:PRO:HB3	1.90	0.53
5:A:605:NAG:HO3	5:A:605:NAG:C7	2.10	0.53
1:A:100:MET:O	1:A:133:PRO:HB3	2.08	0.53
1:A:241:GLN:NE2	13:A:713:HOH:O	2.42	0.52
1:A:488:THR:O	1:A:498:GLY:HA3	2.10	0.51
1:A:95:HIS:CE1	13:A:702:HOH:O	2.63	0.50
1:A:116:TYR:CD2	1:A:539:THR:HG21	2.46	0.49
1:A:53:GLU:OE2	13:A:702:HOH:O	2.18	0.49
1:A:235:THR:HG23	13:A:740:HOH:O	2.12	0.49
1:A:59:VAL:HG12	1:A:60:ASN:N	2.28	0.49
1:A:161:GLU:OE2	1:A:193:THR:HG23	2.13	0.49
1:A:513:LEU:HD13	1:A:577:ILE:HG21	1.94	0.49
1:A:450:ILE:O	1:A:484:THR:HA	2.13	0.49
1:A:269:ALA:HB3	1:A:292:ASP:HB2	1.95	0.48
1:A:87:ASN:HD22	1:A:170:HIS:HB2	1.77	0.48
1:A:108:HIS:CE1	1:A:453:HIS:CE1	3.02	0.48
1:A:513:LEU:CD1	1:A:577:ILE:HG21	2.44	0.48
1:A:472:VAL:HG21	1:A:499:TYR:OH	2.14	0.48
1:A:160:TRP:CB	1:A:252:MET:HE2	2.43	0.47
1:A:189:TRP:HB3	1:A:212:THR:HG23	1.97	0.47
1:A:114:GLN:NE2	1:A:114:GLN:HA	2.30	0.47
1:A:184:VAL:HG22	4:D:1:NAG:H82	1.97	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:271:ASP:OD2	1:A:482:ARG:HB2	2.15	0.46
1:A:265:LEU:HD13	1:A:293:ILE:HD11	1.97	0.46
1:A:114:GLN:HE22	1:A:117:ASN:ND2	2.13	0.46
1:A:101:GLU:H	2:B:1:NAG:H83	1.81	0.46
1:A:535:SER:HB2	13:A:844:HOH:O	2.15	0.46
1:A:101:GLU:N	2:B:1:NAG:H81	2.28	0.45
1:A:113:ARG:NH2	1:A:507:ASP:OD2	2.49	0.45
1:A:155:PHE:HZ	13:A:810:HOH:O	1.99	0.45
1:A:354:PHE:HB2	1:A:359:LEU:HD11	1.99	0.45
1:A:222:VAL:O	1:A:223:THR:HG23	2.16	0.45
1:A:540:PHE:C	1:A:540:PHE:CD1	2.94	0.45
1:A:96:VAL:HG21	1:A:107:ILE:HD12	1.99	0.44
1:A:268:ILE:HG21	1:A:294:ILE:HD12	1.98	0.44
1:A:127:THR:HA	1:A:408:LEU:CD1	2.44	0.44
1:A:227:GLN:HG3	1:A:228:THR:N	2.32	0.44
1:A:114:GLN:HE21	1:A:117:ASN:HB3	1.82	0.44
1:A:87:ASN:ND2	1:A:170:HIS:HB2	2.33	0.44
1:A:193:THR:CG2	1:A:195:ASP:H	2.30	0.44
1:A:36:ASP:HB2	1:A:37:ILE:H	1.67	0.44
1:A:78:GLN:HA	13:A:869:HOH:O	2.18	0.44
1:A:160:TRP:HB2	1:A:252:MET:HE2	2.00	0.44
1:A:448:HIS:HD2	1:A:487:MET:CE	2.30	0.43
1:A:302:ASP:CG	1:A:303:ASN:H	2.26	0.43
1:A:568:ALA:C	1:A:569:LEU:HD12	2.43	0.43
1:A:193:THR:HB	1:A:196:GLU:HG3	2.00	0.43
1:A:222:VAL:HG23	1:A:227:GLN:O	2.19	0.43
1:A:526:PHE:C	1:A:526:PHE:CD1	2.97	0.42
1:A:83:THR:HG23	1:A:183:MET:HE3	2.02	0.42
1:A:293:ILE:HG21	1:A:293:ILE:HD13	1.63	0.42
1:A:367:ALA:O	1:A:368:ASP:C	2.61	0.42
1:A:61:THR:OG1	1:A:62:THR:N	2.52	0.42
1:A:310:PRO:HD2	1:A:320:SER:HB3	2.01	0.42
1:A:148:SER:OG	1:A:246:ARG:HD3	2.19	0.42
1:A:405:ASP:O	1:A:406:PRO:C	2.62	0.42
1:A:511:VAL:O	1:A:511:VAL:CG2	2.67	0.42
1:A:252:MET:SD	1:A:519:GLY:HA3	2.60	0.42
1:A:260:ILE:O	1:A:261:ASP:C	2.62	0.41
1:A:181:LEU:HD13	1:A:235:THR:HG21	2.02	0.41
1:A:417:LYS:HG3	1:A:419:ASP:OD1	2.20	0.41
1:A:59:VAL:CG1	13:A:816:HOH:O	2.68	0.41
1:A:255:HIS:CD2	1:A:286:GLY:HA2	2.56	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:526:PHE:C	1:A:526:PHE:HD1	2.28	0.41
1:A:451:HIS:HA	1:A:483:ASP:O	2.20	0.41
1:A:83:THR:CG2	1:A:183:MET:HE3	2.50	0.41
1:A:206:ASN:HA	1:A:207:PRO:HD3	1.95	0.41
1:A:127:THR:CA	1:A:408:LEU:HD12	2.47	0.41
1:A:193:THR:CG2	1:A:195:ASP:N	2.83	0.41
1:A:258:PHE:O	1:A:282:ASN:HA	2.21	0.41
1:A:284:PRO:HD2	1:A:354:PHE:CZ	2.56	0.41
1:A:464:PHE:HB3	1:A:490:ALA:HB2	2.03	0.41
1:A:419:ASP:OD1	1:A:419:ASP:N	2.51	0.41
1:A:450:ILE:HB	1:A:500:MET:HE3	2.02	0.41
1:A:79:PHE:CD1	1:A:80:PRO:HD3	2.56	0.40
1:A:160:TRP:CG	1:A:252:MET:HE2	2.56	0.40
1:A:218:SER:HB3	1:A:231:ARG:O	2.21	0.40
1:A:439:VAL:HG22	1:A:501:VAL:HG22	2.04	0.40
1:A:569:LEU:HD11	5:A:605:NAG:H62	1.96	0.40
1:A:40:ASN:ND2	1:A:43:GLU:CG	2.76	0.40
1:A:151:TYR:CZ	1:A:165:GLY:HA3	2.57	0.40
1:A:385:GLY:HA3	1:A:569:LEU:HD23	2.03	0.40
1:A:467:PHE:HB2	1:A:499:TYR:CG	2.56	0.40
1:A:206:ASN:H	1:A:206:ASN:ND2	2.18	0.40
1:A:534:GLN:HA	1:A:537:PHE:CE1	2.56	0.40
1:A:403:TRP:HH2	5:A:606:NAG:H81	1.86	0.40

All (1) 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)
13:A:736:HOH:O	13:A:736:HOH:O[3_455]	1.88	0.32

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	548/550 (100%)	495 (90%)	47 (9%)	6 (1%)	11 19

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	80	PRO
1	A	225	ASP
1	A	331	GLY
1	A	332	ALA
1	A	333	ALA
1	A	388	PRO

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	463/469 (99%)	440 (95%)	23 (5%)	22 37

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

Mol	Chain	Res	Type
1	A	43	GLU
1	A	59	VAL
1	A	62	THR
1	A	69	GLU
1	A	78	GLN
1	A	85	GLU
1	A	101	GLU
1	A	145	GLU
1	A	193	THR
1	A	194	VAL
1	A	204	SER
1	A	211	GLN
1	A	214	LEU
1	A	226	ASN
1	A	234	GLN

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Mol	Chain	Res	Type
1	A	235	THR
1	A	293	ILE
1	A	339	THR
1	A	397	ASN
1	A	472	VAL
1	A	486	LEU
1	A	529	GLN
1	A	539	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	47	GLN
1	A	114	GLN
1	A	158	GLN
1	A	199	GLN
1	A	206	ASN
1	A	211	GLN
1	A	226	ASN
1	A	234	GLN
1	A	241	GLN
1	A	255	HIS
1	A	262	ASN
1	A	282	ASN
1	A	311	GLN
1	A	350	GLN
1	A	409	GLN
1	A	441	GLN
1	A	529	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates i

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	0.25	0	17,19,21	0.60	0
2	NAG	B	2	2	14,14,15	0.30	0	17,19,21	0.51	0
3	NAG	C	1	3	14,14,15	0.27	0	17,19,21	0.55	0
3	BMA	C	2	3	11,11,12	0.26	0	15,15,17	0.61	0
4	NAG	D	1	1,4	14,14,15	0.48	0	17,19,21	0.80	0
4	NAG	D	2	4	14,14,15	0.46	0	17,19,21	1.47	2 (11%)
4	BMA	D	3	4	11,11,12	0.24	0	15,15,17	0.83	1 (6%)
4	MAN	D	4	4	11,11,12	0.24	0	15,15,17	0.52	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
2	NAG	B	1	2,1	-	2/6/23/26	0/1/1/1
2	NAG	B	2	2	-	0/6/23/26	0/1/1/1
3	NAG	C	1	3	-	1/6/23/26	0/1/1/1
3	BMA	C	2	3	-	0/2/19/22	0/1/1/1
4	NAG	D	1	1,4	-	2/6/23/26	0/1/1/1
4	NAG	D	2	4	-	0/6/23/26	0/1/1/1
4	BMA	D	3	4	-	0/2/19/22	0/1/1/1
4	MAN	D	4	4	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	2	NAG	C1-O5-C5	3.76	117.22	112.19
4	D	2	NAG	O5-C1-C2	-3.75	105.49	111.29

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	3	BMA	C1-O5-C5	2.35	115.34	112.19

There are no chirality outliers.

All (5) torsion outliers are listed below:

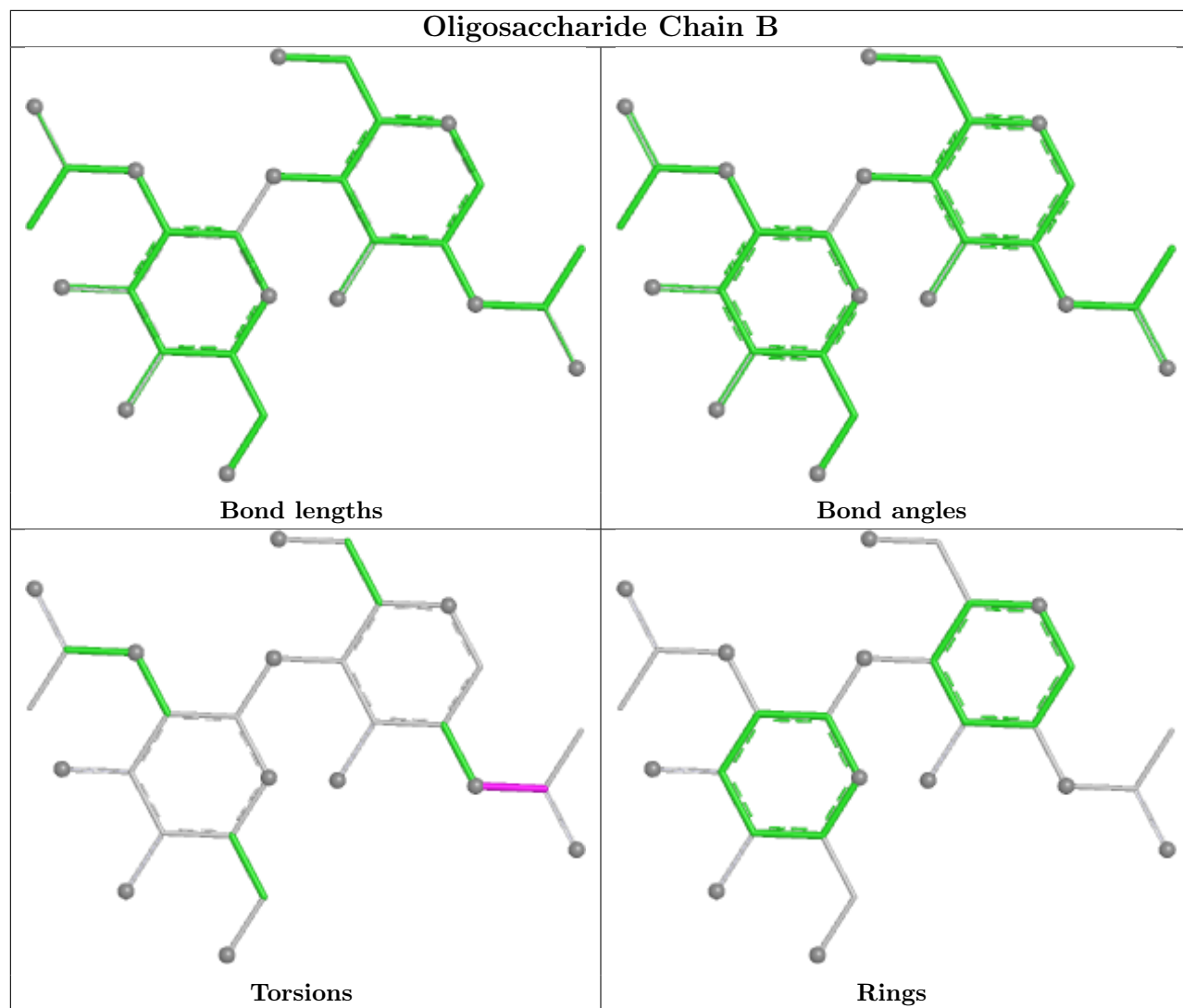
Mol	Chain	Res	Type	Atoms
2	B	1	NAG	C8-C7-N2-C2
2	B	1	NAG	O7-C7-N2-C2
4	D	1	NAG	C4-C5-C6-O6
4	D	1	NAG	O5-C5-C6-O6
3	C	1	NAG	C4-C5-C6-O6

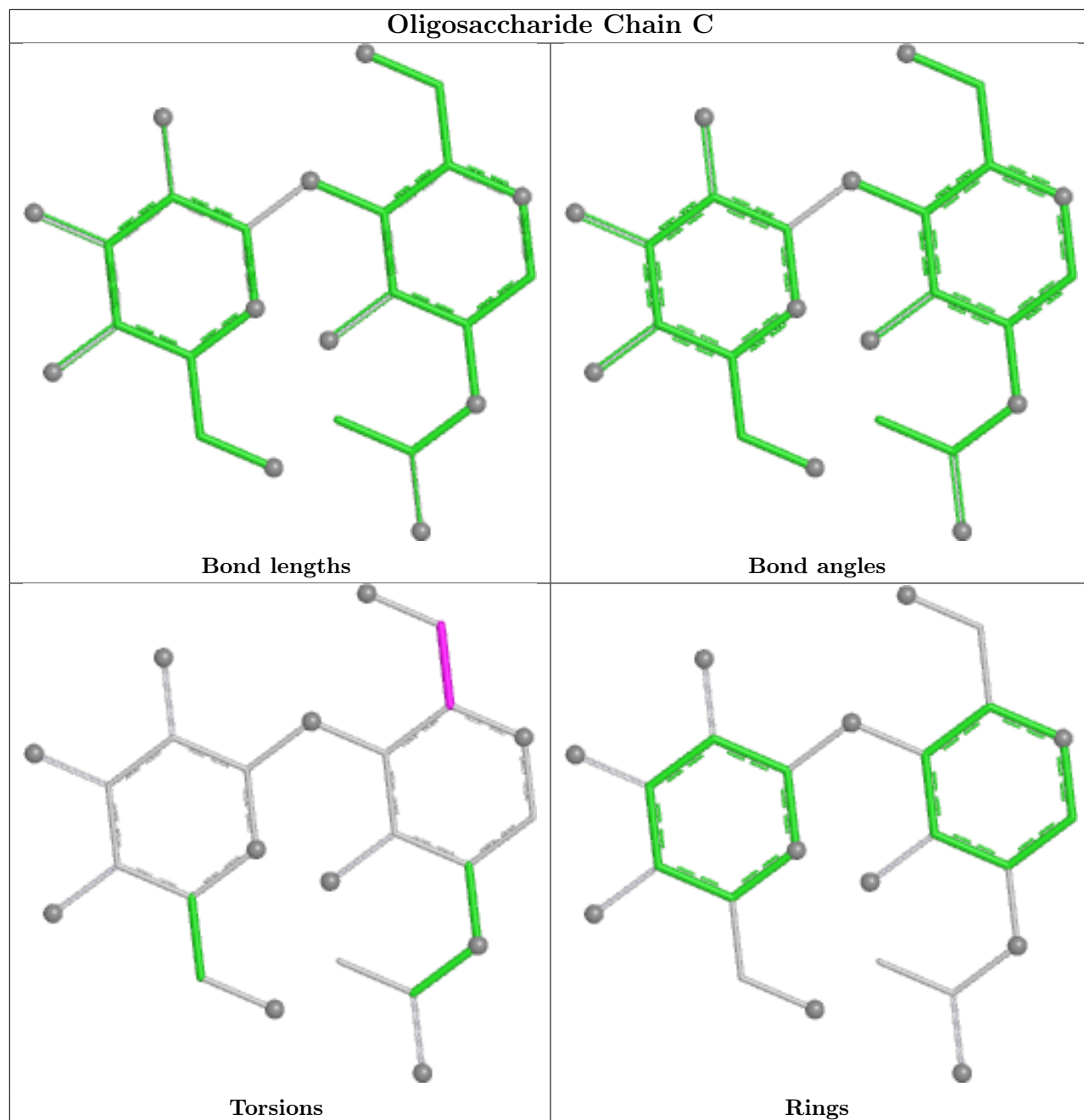
There are no ring outliers.

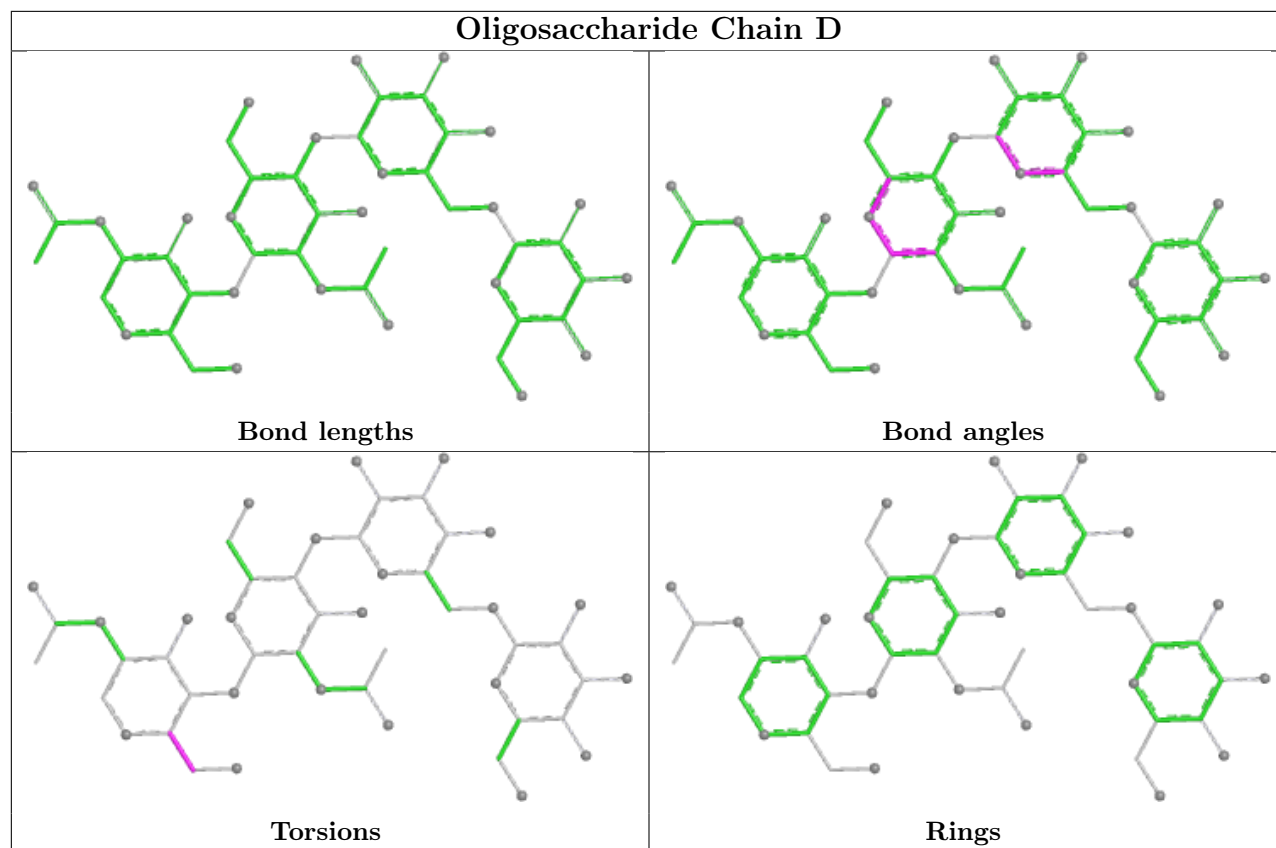
3 monomers are involved in 13 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	D	1	NAG	1	0
2	B	1	NAG	10	0
3	C	1	NAG	2	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 19 ligands modelled in this entry, 14 are monoatomic - leaving 5 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$
6	MAN	A	611	-	11,11,12	0.75	0	15,15,17	1.58	2 (13%)
12	GOL	A	627	-	5,5,5	0.73	0	5,5,5	1.60	1 (20%)
11	ACT	A	626	8	3,3,3	0.91	0	3,3,3	0.60	0
5	NAG	A	605	-	14,14,15	0.32	0	17,19,21	0.52	0
5	NAG	A	606	-	14,14,15	0.30	0	17,19,21	0.55	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
12	GOL	A	627	-	-	4/4/4/4	-
6	MAN	A	611	-	-	0/2/19/22	0/1/1/1
5	NAG	A	605	-	-	3/6/23/26	0/1/1/1
5	NAG	A	606	-	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	611	MAN	C1-O5-C5	3.52	116.91	112.19
12	A	627	GOL	O1-C1-C2	-2.34	99.84	110.38
6	A	611	MAN	O2-C2-C3	2.29	114.90	110.15

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
12	A	627	GOL	O1-C1-C2-C3
5	A	605	NAG	O5-C5-C6-O6
5	A	605	NAG	C4-C5-C6-O6
12	A	627	GOL	C1-C2-C3-O3
12	A	627	GOL	O1-C1-C2-O2
12	A	627	GOL	O2-C2-C3-O3
5	A	605	NAG	C3-C2-N2-C7

There are no ring outliers.

2 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	605	NAG	6	0
5	A	606	NAG	1	0

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 [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	550/550 (100%)	-0.17	7 (1%) 75 71	27, 40, 60, 90	0

All (7) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	28	PRO	3.8
1	A	223	THR	3.5
1	A	333	ALA	2.5
1	A	224	ALA	2.4
1	A	226	ASN	2.3
1	A	225	ASP	2.1
1	A	539	THR	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.

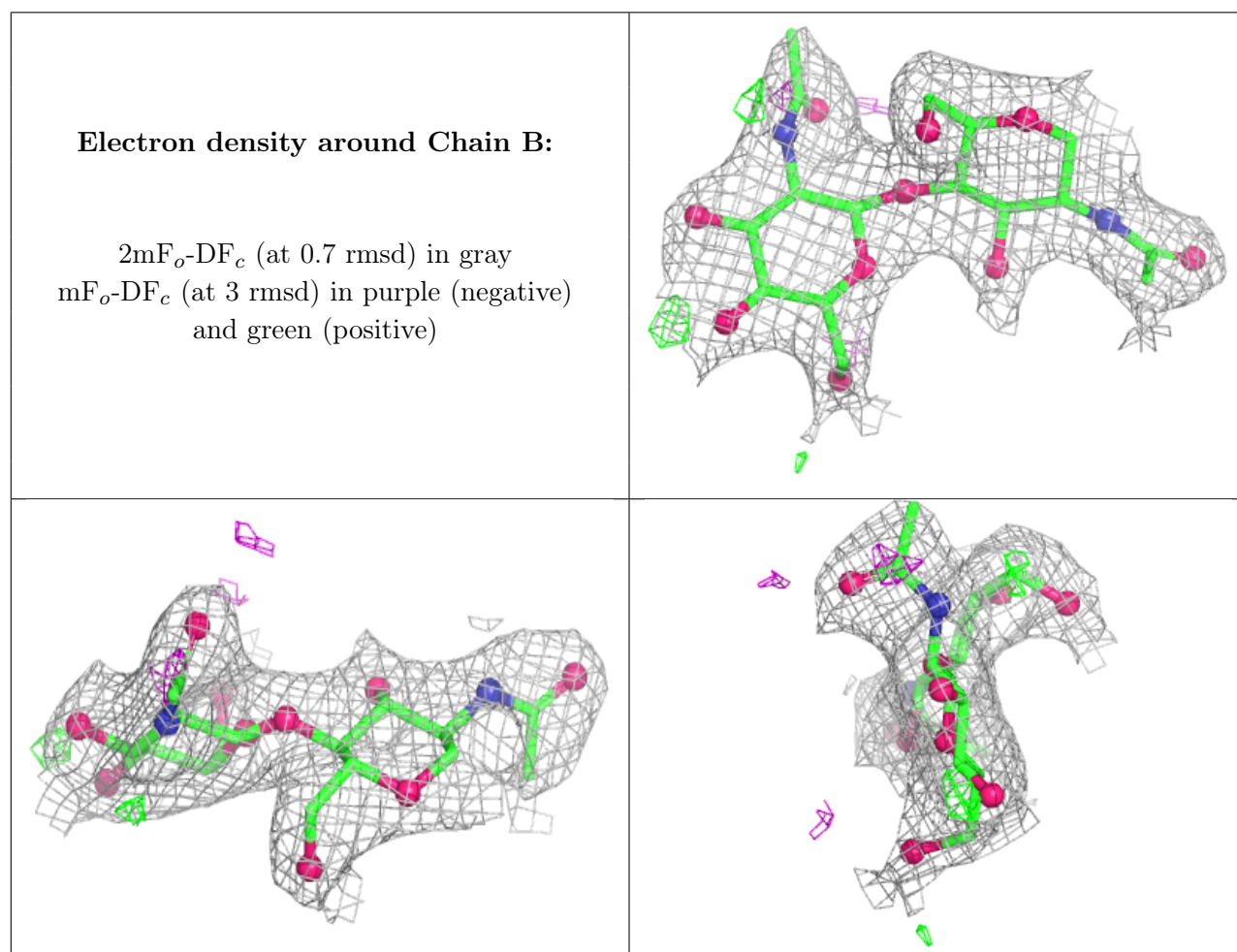
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	MAN	D	4	11/12	0.80	0.15	39,45,47,50	0
3	BMA	C	2	11/12	0.82	0.12	34,39,44,44	0
4	BMA	D	3	11/12	0.84	0.14	42,50,54,54	0
2	NAG	B	2	14/15	0.88	0.12	38,42,48,52	0
4	NAG	D	2	14/15	0.90	0.11	44,50,55,58	0

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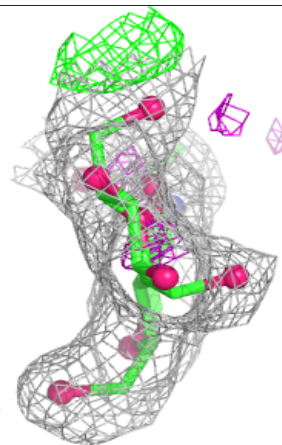
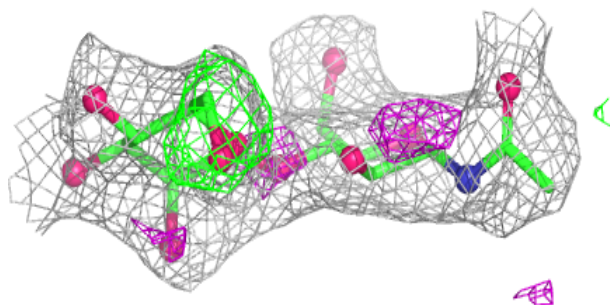
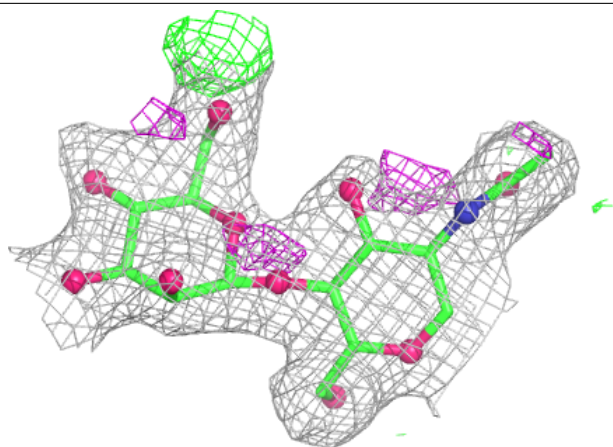
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
3	NAG	C	1	14/15	0.91	0.10	34,36,43,43	0
4	NAG	D	1	14/15	0.92	0.09	36,38,50,50	0
2	NAG	B	1	14/15	0.94	0.08	34,38,43,45	0

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.

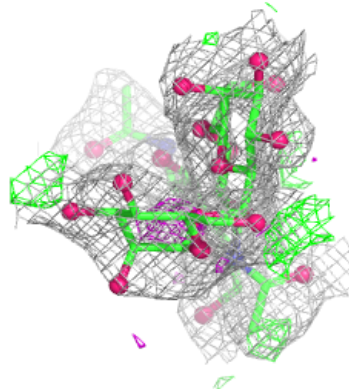
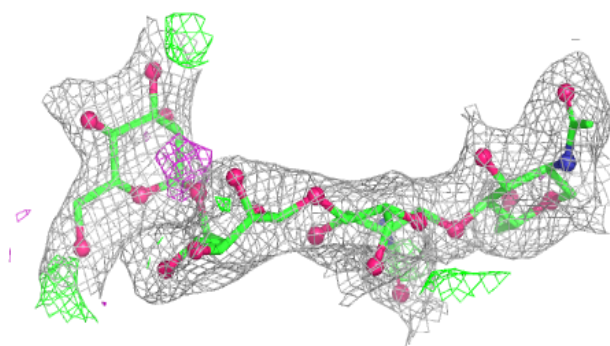
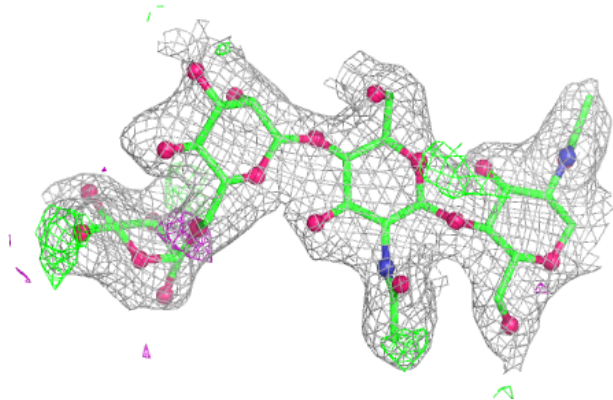


Electron density around Chain C:

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

**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(Å ²)	Q<0.9
5	NAG	A	605	14/15	0.85	0.13	48,52,60,64	0
10	CL	A	625	1/1	0.90	0.09	48,48,48,48	0
12	GOL	A	627	6/6	0.92	0.12	27,28,31,33	0
6	MAN	A	611	11/12	0.93	0.08	44,45,47,54	0
8	ZN	A	621	1/1	0.93	0.09	77,77,77,77	0
5	NAG	A	606	14/15	0.95	0.08	36,37,39,39	0
9	K	A	624	1/1	0.97	0.04	42,42,42,42	0
8	ZN	A	620	1/1	0.97	0.06	56,56,56,56	0
11	ACT	A	626	4/4	0.97	0.07	25,25,27,28	4
8	ZN	A	619	1/1	0.97	0.08	54,54,54,54	0
8	ZN	A	616	1/1	0.99	0.04	39,39,39,39	0
8	ZN	A	622	1/1	0.99	0.05	65,65,65,65	1
8	ZN	A	623	1/1	0.99	0.07	66,66,66,66	1
8	ZN	A	617	1/1	0.99	0.04	54,54,54,54	0
8	ZN	A	618	1/1	0.99	0.04	44,44,44,44	0
7	CU	A	613	1/1	0.99	0.05	42,42,42,42	0
7	CU	A	615	1/1	0.99	0.07	42,42,42,42	0
7	CU	A	614	1/1	1.00	0.05	57,57,57,57	0
7	CU	A	612	1/1	1.00	0.03	44,44,44,44	0

6.5 Other polymers [i](#)

There are no such residues in this entry.