



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 12:58 AM UTC

PDB ID : 5OR4 / pdb_00005or4
Title : Crystal structure of Aspergillus oryzae catechol oxidase in deoxy-form
Authors : Hakulinen, N.; Penttinen, L.; Rutanen, C.; Rouvinen, J.
Deposited on : 2017-08-15
Resolution : 2.44 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

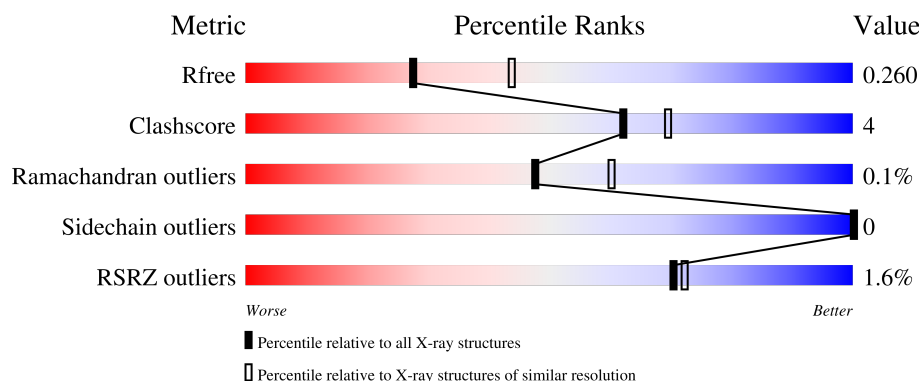
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.44 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.



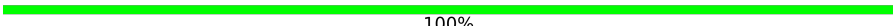
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	2340 (2.46-2.42)
Clashscore	190562	2400 (2.46-2.42)
Ramachandran outliers	187476	2379 (2.46-2.42)
Sidechain outliers	187428	2379 (2.46-2.42)
RSRZ outliers	180081	2340 (2.46-2.42)

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	383	89% 8% .
1	B	383	% 85% 12% .
1	C	383	2% 85% 11% .
1	D	383	3% 89% 8% .
2	E	3	100%

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Mol	Chain	Length	Quality of chain
2	F	3	 33% 67%
2	G	3	 67% 33%
3	H	2	 100%

2 Entry composition [i](#)

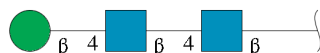
There are 7 unique types of molecules in this entry. The entry contains 12320 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 catechol oxidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	371	Total	C	N	O	S	0	0	0
			2881	1818	494	552	17			
1	B	371	Total	C	N	O	S	0	0	0
			2881	1818	494	552	17			
1	C	370	Total	C	N	O	S	0	0	0
			2874	1814	493	550	17			
1	D	371	Total	C	N	O	S	0	0	0
			2881	1818	494	552	17			

- Molecule 2 is an oligosaccharide called 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
2	E	3	Total	C	N	O	0	0	0
			39	22	2	15			
2	F	3	Total	C	N	O	0	0	0
			39	22	2	15			
2	G	3	Total	C	N	O	0	0	0
			39	22	2	15			

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

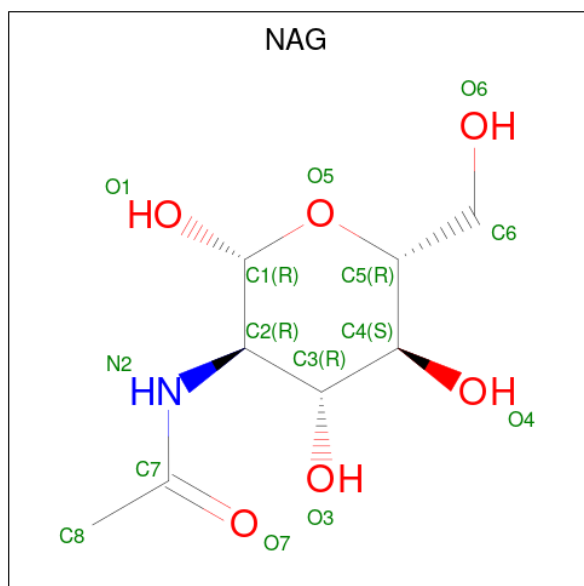


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	H	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 4 is COPPER (II) ION (CCD ID: CU) (formula: Cu).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	2	Total	Cu	0	0
			2	2		
4	B	2	Total	Cu	0	0
			2	2		
4	C	2	Total	Cu	0	0
			2	2		
4	D	2	Total	Cu	0	0
			2	2		

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: C₈H₁₅NO₆).



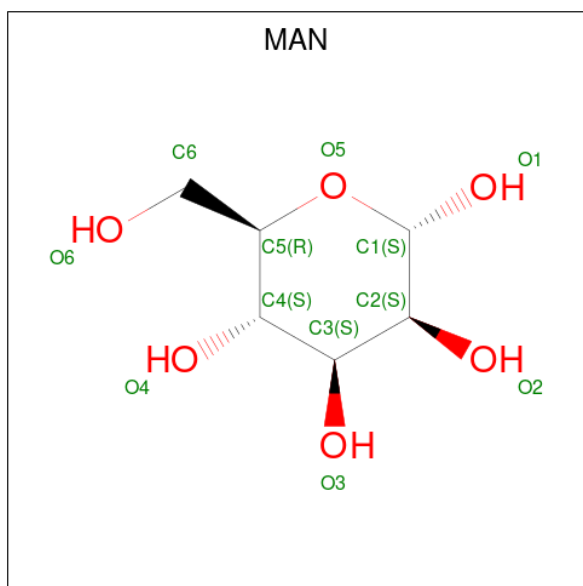
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total	C	N	O	0	0
			14	8	1	5		
5	A	1	Total	C	N	O	0	0
			14	8	1	5		
5	B	1	Total	C	N	O	0	0
			14	8	1	5		
5	B	1	Total	C	N	O	0	0
			14	8	1	5		

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

- 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	C	O	0	0
			11	6	5		
6	B	1	Total	C	O	0	0
			11	6	5		
6	D	1	Total	C	O	0	0
			11	6	5		

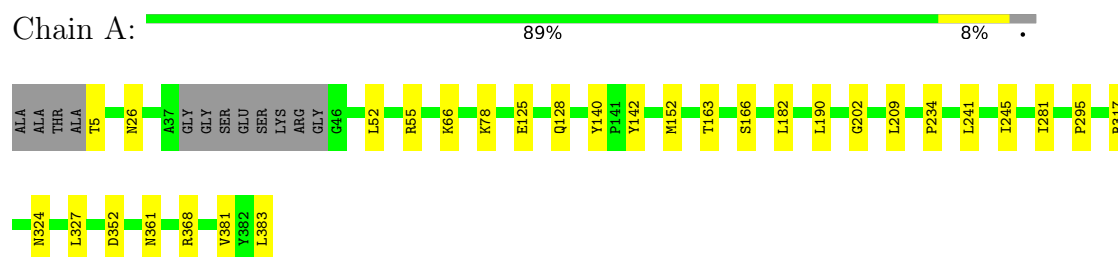
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	148	Total 148	O 148	0	0
7	B	141	Total 141	O 141	0	0
7	C	65	Total 65	O 65	0	0
7	D	109	Total 109	O 109	0	0

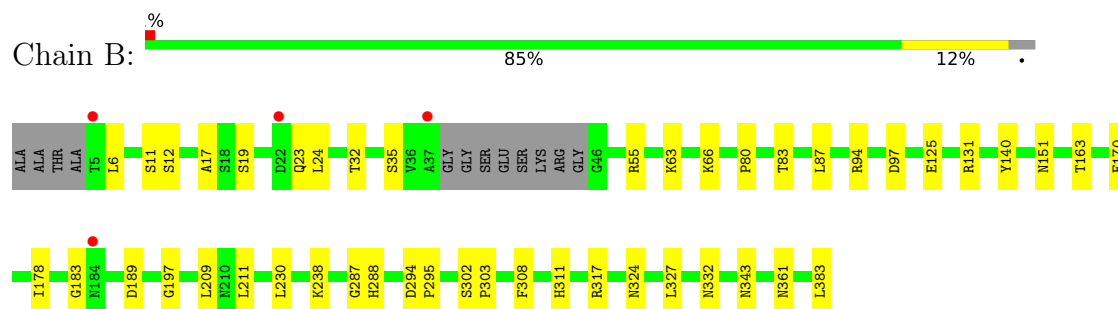
3 Residue-property plots [i](#)

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.

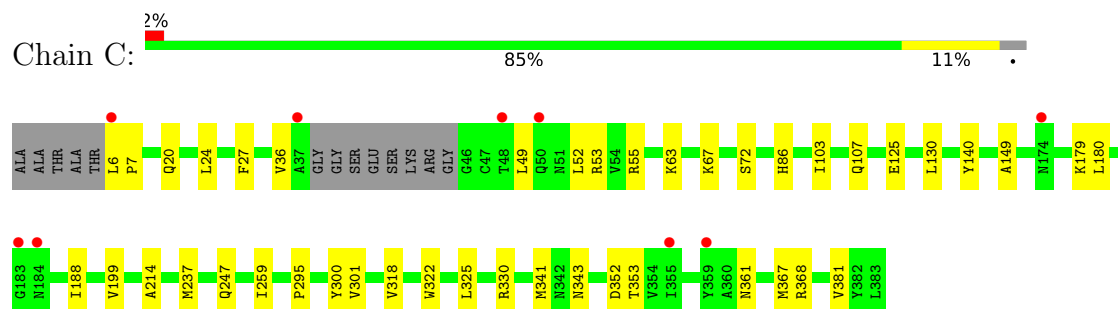
- Molecule 1: catechol oxidase



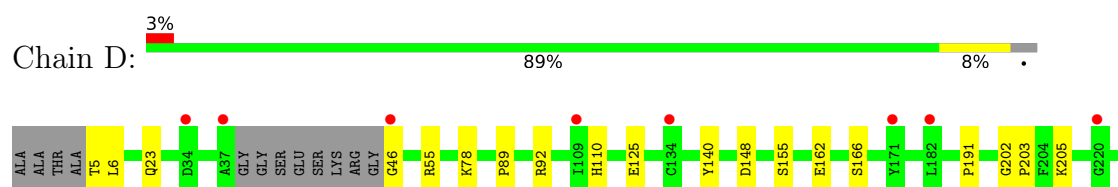
- Molecule 1: catechol oxidase



- Molecule 1: catechol oxidase



- Molecule 1: catechol oxidase





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

Chain E: 100%



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

Chain F: 33% 67%



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

Chain G: 67% 33%



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

Chain H: 100%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	60.86Å 81.88Å 82.70Å 87.15° 89.04° 73.86°	Depositor
Resolution (Å)	47.78 – 2.44 47.78 – 2.44	Depositor EDS
% Data completeness (in resolution range)	94.3 (47.78-2.44) 94.3 (47.78-2.44)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.80 (at 2.45Å)	Xtriage
Refinement program	PHENIX (1.11.1_2575: ???)	Depositor
R, R_{free}	0.203 , 0.261 0.203 , 0.260	Depositor DCC
R_{free} test set	2674 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	25.0	Xtriage
Anisotropy	0.180	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 37.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.074 for -h,-k,l	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	12320	wwPDB-VP
Average B, all atoms (Å ²)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.04% 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: CU, MAN, BMA, NAG

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	0.12	0/2959	0.32	0/4031
1	B	0.10	0/2959	0.31	0/4031
1	C	0.15	0/2952	0.36	0/4021
1	D	0.10	0/2959	0.31	0/4031
All	All	0.12	0/11829	0.32	0/16114

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2881	0	2740	19	0
1	B	2881	0	2739	32	0
1	C	2874	0	2733	29	0
1	D	2881	0	2741	20	0
2	E	39	0	34	0	0
2	F	39	0	34	1	0
2	G	39	0	34	0	0
3	H	28	0	25	0	0
4	A	2	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	2	0	0	0	0
4	C	2	0	0	0	0
4	D	2	0	0	0	0
5	A	28	0	26	1	0
5	B	42	0	39	0	0
5	C	42	0	39	0	0
5	D	42	0	39	0	0
6	A	11	0	10	0	0
6	B	11	0	10	0	0
6	D	11	0	10	0	0
7	A	148	0	0	2	0
7	B	141	0	0	4	0
7	C	65	0	0	3	0
7	D	109	0	0	3	0
All	All	12320	0	11253	95	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 4.

All (95) 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:B:343:ASN:HD22	1:C:343:ASN:HD22	1.16	0.93
1:B:343:ASN:HD22	1:C:343:ASN:ND2	1.81	0.77
1:C:52:LEU:HD11	1:C:381:VAL:HG23	1.69	0.75
1:C:107:GLN:CD	1:C:107:GLN:H	2.00	0.70
1:A:78:LYS:NZ	7:A:2103:HOH:O	2.25	0.67
1:A:66:LYS:HD3	1:A:163:THR:HB	1.75	0.67
1:C:125:GLU:HB3	1:C:361:ASN:HB3	1.79	0.64
1:B:209:LEU:HD11	1:B:295:PRO:HD3	1.80	0.63
1:C:55:ARG:HG2	1:C:140:TYR:HB3	1.81	0.62
1:C:352:ASP:OD1	1:C:368:ARG:NH2	2.34	0.61
1:D:162:GLU:H	1:D:162:GLU:CD	2.08	0.61
1:C:36:VAL:HG21	1:C:49:LEU:HD13	1.81	0.60
1:B:324:ASN:HA	1:B:327:LEU:HD13	1.83	0.60
1:A:317:ARG:NH1	1:A:383:LEU:OXT	2.35	0.59
1:C:179:LYS:NZ	7:C:2105:HOH:O	2.35	0.59
1:D:162:GLU:HA	1:D:203:PRO:HD3	1.84	0.59
1:B:66:LYS:HD3	1:B:163:THR:HB	1.86	0.57
1:D:244:GLU:O	1:D:248:ARG:HG3	2.06	0.56
1:A:352:ASP:OD1	1:A:368:ARG:NH1	2.38	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:55:ARG:HG2	1:A:140:TYR:HB3	1.89	0.55
1:A:182:LEU:HD12	1:A:281:ILE:HG22	1.89	0.55
1:A:142:TYR:OH	1:A:317:ARG:NH1	2.40	0.54
1:A:209:LEU:HD11	1:A:295:PRO:HD3	1.90	0.54
1:D:236:CYS:SG	1:D:237:MET:N	2.80	0.54
1:D:205:LYS:NZ	7:D:2112:HOH:O	2.40	0.53
1:A:166:SER:HA	1:A:202:GLY:HA3	1.91	0.53
1:A:324:ASN:HA	1:A:327:LEU:HD13	1.90	0.53
1:D:5:THR:O	1:D:23:GLN:NE2	2.42	0.52
1:B:17:ALA:HB2	7:B:2177:HOH:O	2.09	0.52
1:C:199:VAL:HG22	1:C:237:MET:O	2.10	0.52
1:B:287:GLY:HA3	1:B:311:HIS:CE1	2.46	0.51
1:D:166:SER:HA	1:D:202:GLY:HA3	1.91	0.51
1:C:103:ILE:HD11	1:C:301:VAL:HG23	1.91	0.51
1:B:332:ASN:ND2	7:B:2113:HOH:O	2.41	0.51
1:B:125:GLU:HB3	1:B:361:ASN:HB3	1.93	0.50
1:B:343:ASN:ND2	1:C:343:ASN:ND2	2.56	0.50
1:B:32:THR:O	1:B:35:SER:OG	2.27	0.50
1:B:317:ARG:NH1	1:B:383:LEU:OXT	2.45	0.49
1:B:63:LYS:HG3	1:B:163:THR:HG21	1.94	0.49
1:B:131:ARG:NH1	7:B:2114:HOH:O	2.42	0.49
1:A:209:LEU:O	1:A:234:PRO:HA	2.12	0.48
1:B:170:GLU:HB2	1:B:197:GLY:HA3	1.95	0.48
1:C:6:LEU:HD11	1:C:27:PHE:CD1	2.48	0.48
1:D:320:TRP:CZ3	1:D:382:TYR:HB2	2.49	0.48
1:C:72:SER:HB3	1:C:130:LEU:HD22	1.96	0.48
1:C:86:HIS:ND1	7:C:2107:HOH:O	2.36	0.48
1:D:125:GLU:HB3	1:D:361:ASN:HB3	1.96	0.48
1:D:191:PRO:HD3	1:D:248:ARG:HH11	1.79	0.47
1:B:83:THR:OG1	1:B:97:ASP:OD1	2.25	0.47
1:B:6:LEU:HD22	1:B:24:LEU:HD23	1.97	0.47
1:D:162:GLU:OE1	1:D:162:GLU:N	2.32	0.47
1:A:52:LEU:HD11	1:A:381:VAL:HG13	1.97	0.46
1:C:259:ILE:HD11	1:C:318:VAL:HG13	1.96	0.46
1:B:19:SER:O	1:B:23:GLN:HG3	2.15	0.46
1:C:149:ALA:O	1:C:247:GLN:HG3	2.17	0.45
1:D:46:GLY:N	7:D:2119:HOH:O	2.50	0.45
1:C:63:LYS:O	1:C:67:LYS:HG3	2.17	0.45
1:D:78:LYS:NZ	7:D:2118:HOH:O	2.50	0.44
1:D:228:ASN:O	1:D:231:THR:HG22	2.18	0.44
1:C:214:ALA:HB3	1:C:300:TYR:HB2	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:327:LEU:HD12	1:A:327:LEU:HA	1.88	0.43
1:A:5:THR:O	1:A:5:THR:HG23	2.19	0.43
1:C:53:ARG:NH2	7:C:2104:HOH:O	2.31	0.43
1:C:353:THR:O	1:C:367:MET:HG2	2.17	0.43
1:B:343:ASN:ND2	1:C:343:ASN:HD22	1.99	0.43
1:A:190:LEU:HD22	1:A:245:ILE:HG12	2.01	0.43
1:C:295:PRO:CB	1:C:301:VAL:HG13	2.49	0.43
1:B:211:LEU:HD22	1:B:230:LEU:HA	2.01	0.43
1:D:268:PHE:HZ	1:D:318:VAL:HG12	1.83	0.43
1:A:152:MET:HE2	1:A:241:LEU:HD22	2.01	0.43
1:D:89:PRO:O	1:D:92:ARG:NH1	2.50	0.42
1:B:288:HIS:HE1	1:B:308:PHE:CD2	2.38	0.42
1:B:383:LEU:HD23	1:B:383:LEU:HA	1.85	0.42
1:C:24:LEU:HD22	1:C:325:LEU:HD11	2.01	0.42
1:A:125:GLU:HB3	1:A:361:ASN:HB3	2.00	0.41
1:A:128:GLN:NE2	7:A:2115:HOH:O	2.47	0.41
1:D:320:TRP:O	1:D:324:ASN:ND2	2.45	0.41
1:D:148:ASP:HB3	1:D:155:SER:HB2	2.02	0.41
1:B:238:LYS:HB2	1:B:294:ASP:H	1.86	0.41
1:C:180:LEU:HB2	1:C:188:ILE:HB	2.03	0.41
1:B:178:ILE:O	1:B:189:ASP:HA	2.20	0.41
1:A:26:ASN:OD1	5:A:2006:NAG:N2	2.49	0.41
1:B:6:LEU:HD23	1:B:6:LEU:HA	1.88	0.41
1:B:11:SER:OG	1:B:12:SER:N	2.54	0.41
1:B:302:SER:N	1:B:303:PRO:HD2	2.36	0.41
1:D:55:ARG:HG2	1:D:140:TYR:HB3	2.03	0.41
1:B:87:LEU:HB3	2:F:1:NAG:H83	2.02	0.41
1:B:80:PRO:O	1:B:94:ARG:HG3	2.21	0.40
1:C:107:GLN:CD	1:C:107:GLN:N	2.76	0.40
1:D:6:LEU:HD23	1:D:6:LEU:HA	1.95	0.40
1:B:55:ARG:HG2	1:B:140:TYR:HB3	2.04	0.40
1:B:151:ASN:ND2	7:B:2126:HOH:O	2.54	0.40
1:B:183:GLY:HA2	1:C:341:MET:O	2.22	0.40
1:C:7:PRO:HB3	1:C:20:GLN:HG2	2.02	0.40
1:C:322:TRP:CZ3	1:C:330:ARG:HB3	2.57	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	367/383 (96%)	356 (97%)	11 (3%)	0	100	100
1	B	367/383 (96%)	352 (96%)	15 (4%)	0	100	100
1	C	366/383 (96%)	348 (95%)	18 (5%)	0	100	100
1	D	367/383 (96%)	349 (95%)	17 (5%)	1 (0%)	36	44
All	All	1467/1532 (96%)	1405 (96%)	61 (4%)	1 (0%)	48	60

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	110	HIS

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	308/314 (98%)	308 (100%)	0	100	100
1	B	308/314 (98%)	308 (100%)	0	100	100
1	C	307/314 (98%)	307 (100%)	0	100	100
1	D	308/314 (98%)	308 (100%)	0	100	100
All	All	1231/1256 (98%)	1231 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (20) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	105	GLN
1	A	128	GLN
1	A	210	ASN
1	A	324	ASN
1	A	343	ASN
1	B	23	GLN
1	B	105	GLN
1	B	107	GLN
1	B	151	ASN
1	B	175	GLN
1	B	184	ASN
1	B	331	GLN
1	B	332	ASN
1	B	343	ASN
1	C	128	GLN
1	C	210	ASN
1	C	324	ASN
1	C	332	ASN
1	D	332	ASN
1	D	343	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 ⓘ

11 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	E	1	2,1	14,14,15	0.25	0	17,19,21	0.54	0
2	NAG	E	2	2	14,14,15	0.23	0	17,19,21	0.61	0
2	BMA	E	3	2	11,11,12	0.35	0	15,15,17	0.57	0
2	NAG	F	1	2,1	14,14,15	0.20	0	17,19,21	0.43	0
2	NAG	F	2	2	14,14,15	0.30	0	17,19,21	0.64	0
2	BMA	F	3	2	11,11,12	0.44	0	15,15,17	1.28	2 (13%)
2	NAG	G	1	2,1	14,14,15	0.21	0	17,19,21	0.57	0
2	NAG	G	2	2	14,14,15	0.25	0	17,19,21	0.52	0
2	BMA	G	3	2	11,11,12	0.40	0	15,15,17	1.15	1 (6%)
3	NAG	H	1	3,1	14,14,15	0.16	0	17,19,21	0.51	0
3	NAG	H	2	3	14,14,15	0.20	0	17,19,21	0.50	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	E	1	2,1	-	1/6/23/26	0/1/1/1
2	NAG	E	2	2	-	2/6/23/26	0/1/1/1
2	BMA	E	3	2	-	1/2/19/22	0/1/1/1
2	NAG	F	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	F	2	2	-	2/6/23/26	0/1/1/1
2	BMA	F	3	2	-	2/2/19/22	0/1/1/1
2	NAG	G	1	2,1	-	2/6/23/26	0/1/1/1
2	NAG	G	2	2	-	2/6/23/26	0/1/1/1
2	BMA	G	3	2	-	2/2/19/22	0/1/1/1
3	NAG	H	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	H	2	3	-	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(°)
2	F	3	BMA	O5-C1-C2	-2.89	103.91	110.79
2	F	3	BMA	C1-C2-C3	-2.27	106.34	109.64
2	G	3	BMA	O5-C1-C2	-2.08	105.82	110.79

There are no chirality outliers.

All (16) torsion outliers are listed below:

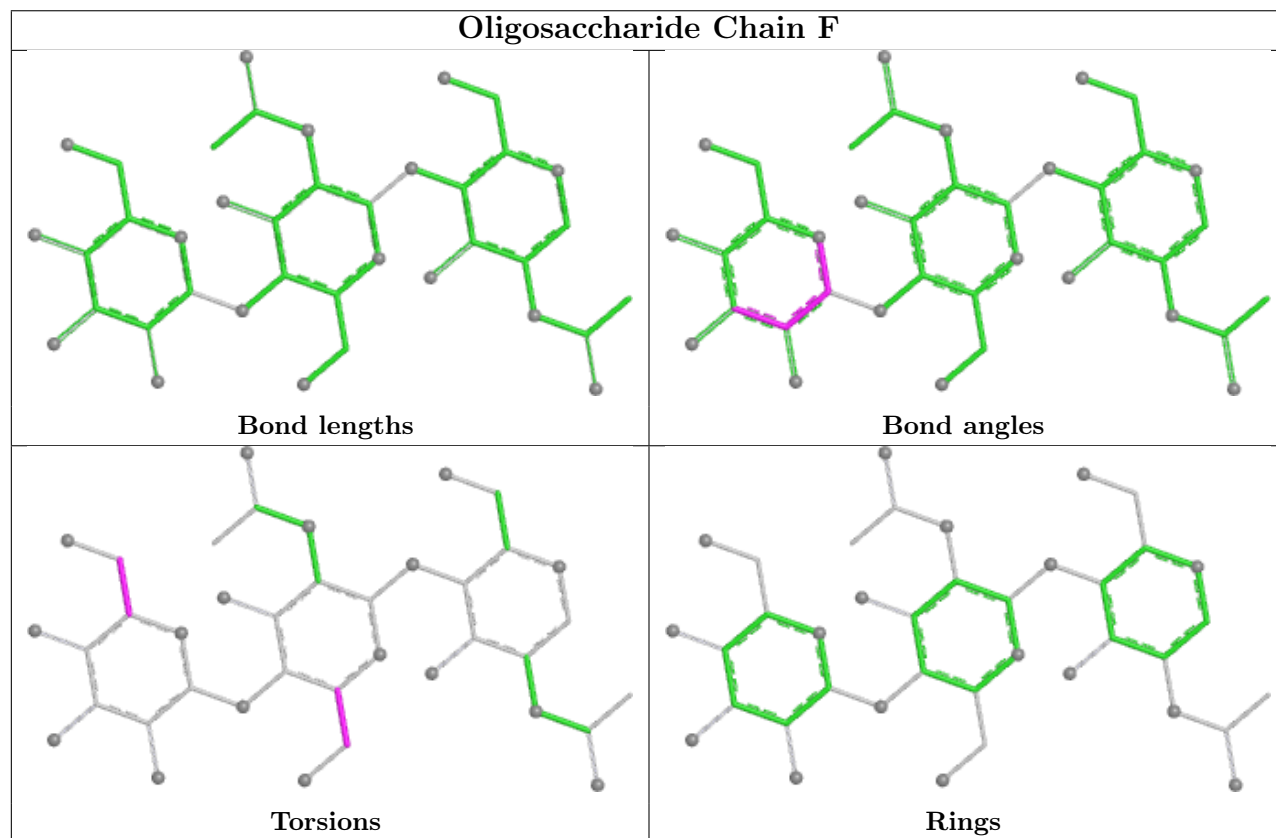
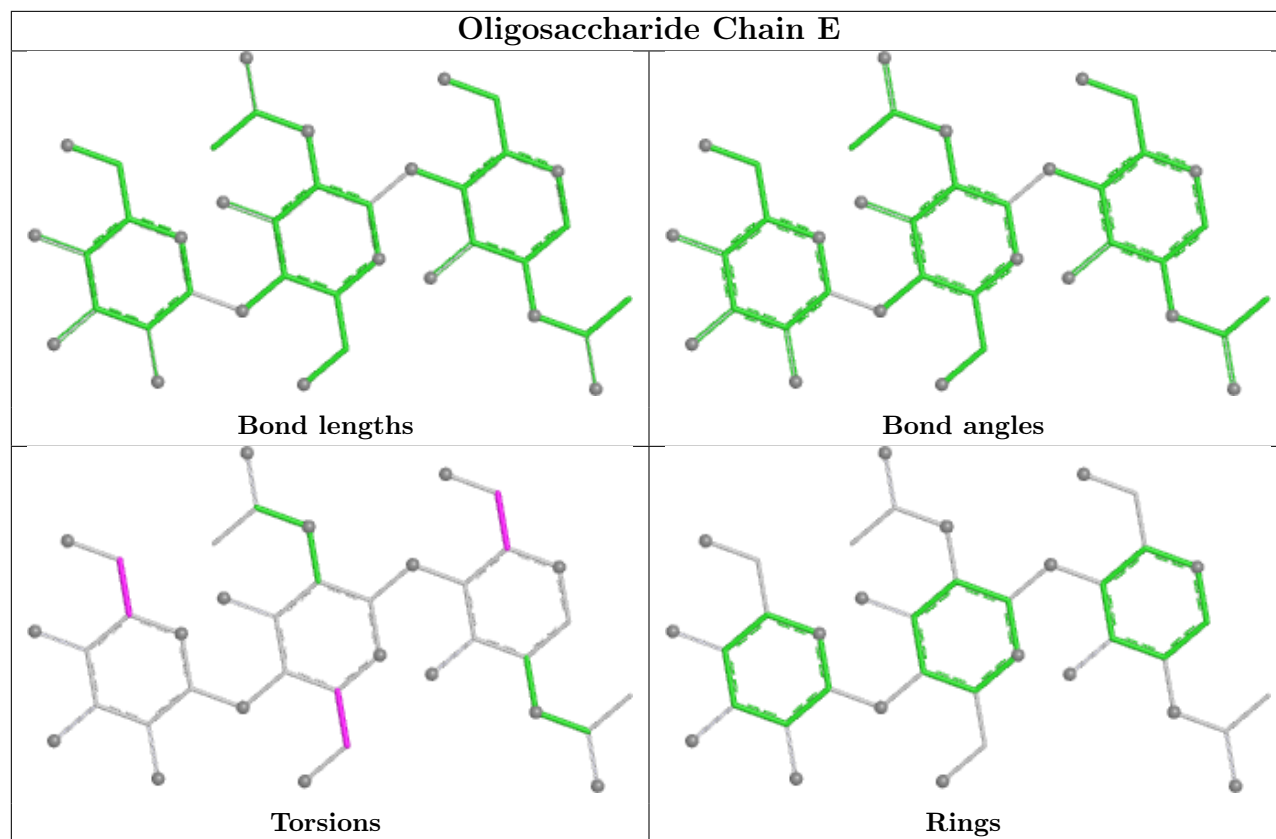
Mol	Chain	Res	Type	Atoms
2	F	2	NAG	O5-C5-C6-O6
2	G	2	NAG	O5-C5-C6-O6
3	H	1	NAG	O5-C5-C6-O6
2	E	2	NAG	O5-C5-C6-O6
2	G	2	NAG	C4-C5-C6-O6
2	E	2	NAG	C4-C5-C6-O6
2	F	2	NAG	C4-C5-C6-O6
2	G	1	NAG	O5-C5-C6-O6
2	G	1	NAG	C4-C5-C6-O6
3	H	1	NAG	C4-C5-C6-O6
2	G	3	BMA	C4-C5-C6-O6
2	F	3	BMA	C4-C5-C6-O6
2	G	3	BMA	O5-C5-C6-O6
2	E	3	BMA	O5-C5-C6-O6
2	F	3	BMA	O5-C5-C6-O6
2	E	1	NAG	C4-C5-C6-O6

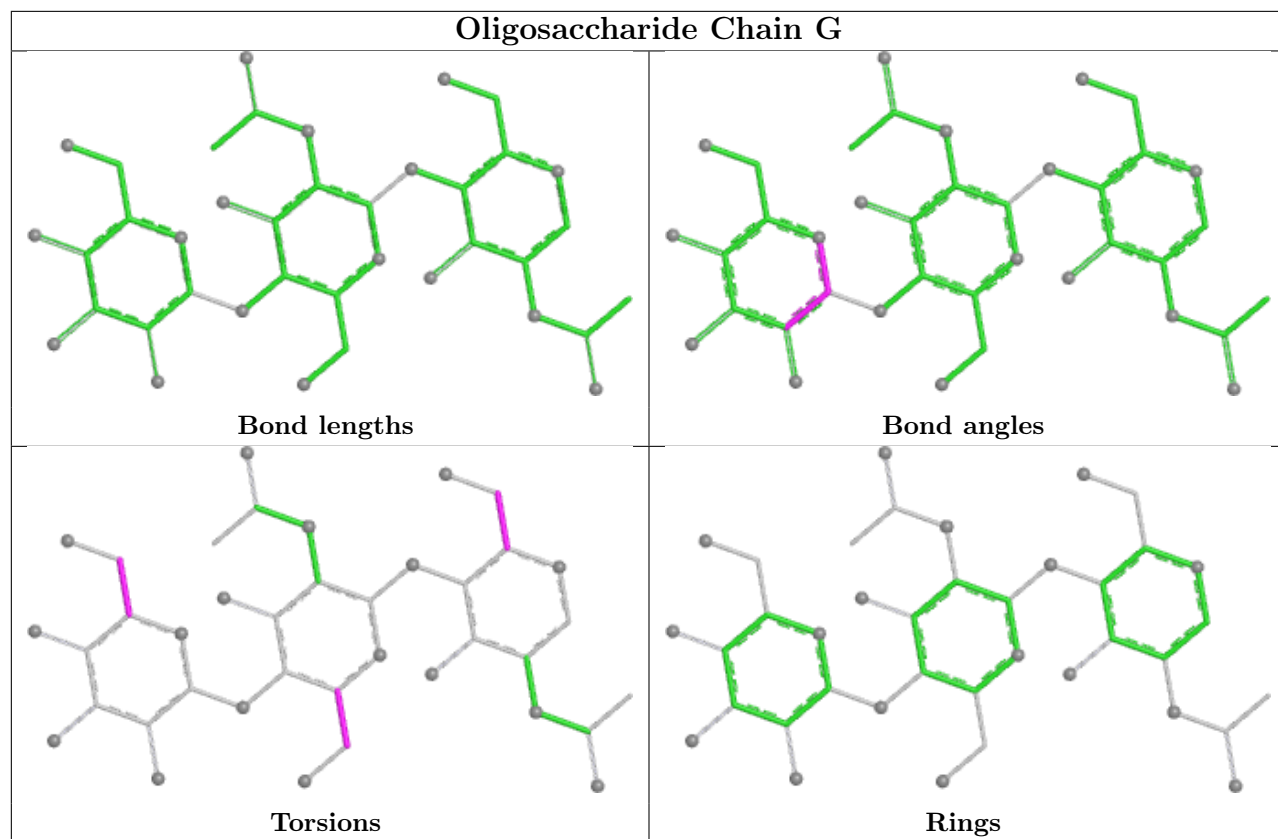
There are no ring outliers.

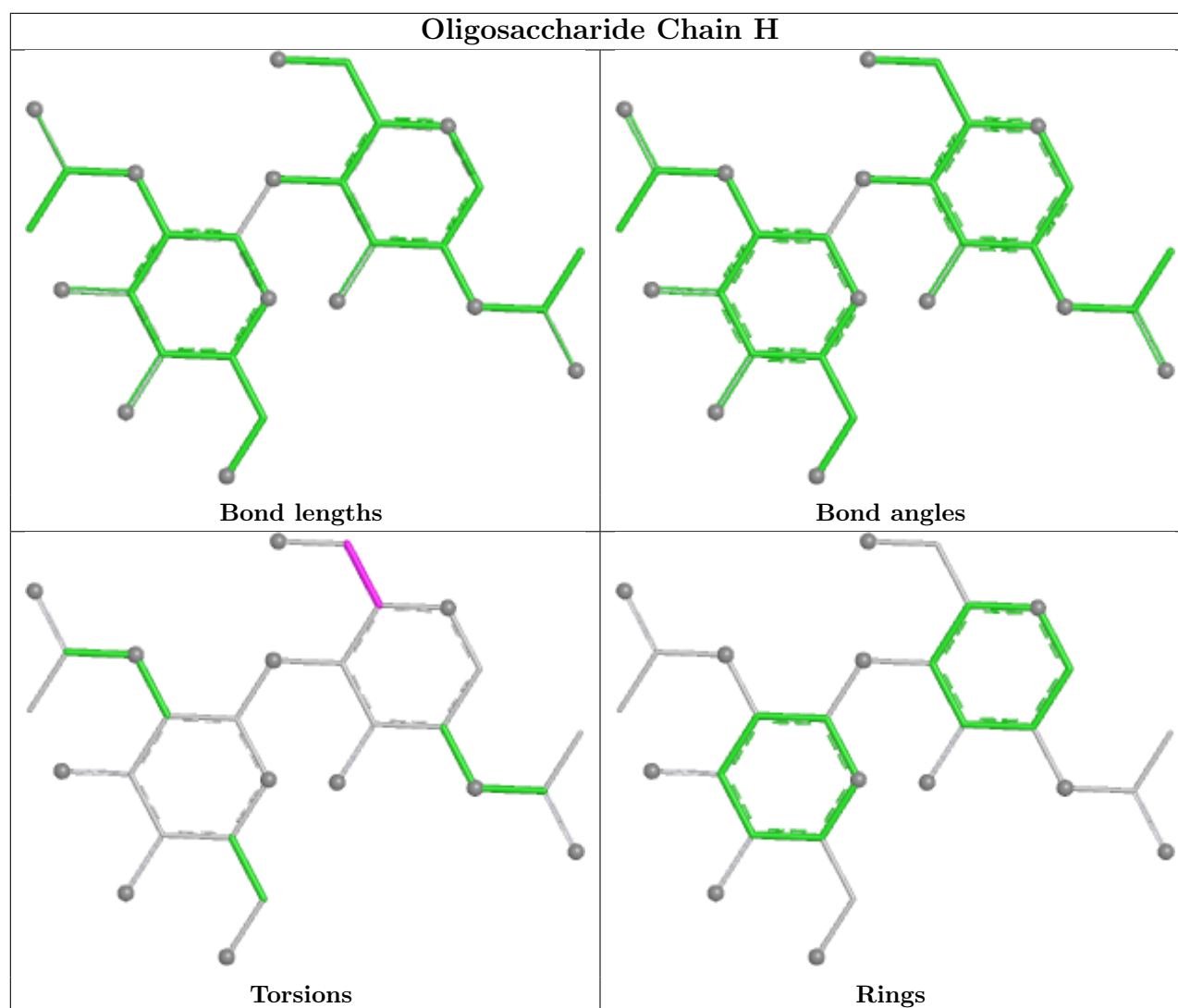
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	F	1	NAG	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.







5.6 Ligand geometry [i](#)

Of 22 ligands modelled in this entry, 8 are monoatomic - leaving 14 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	$\# Z > 2$
5	NAG	A	2006	1	14,14,15	0.30	0	17,19,21	0.51	0
6	MAN	D	2007	1	11,11,12	0.98	1 (9%)	15,15,17	0.93	1 (6%)
5	NAG	C	2006	1	14,14,15	0.37	0	17,19,21	0.52	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
6	MAN	B	2008	1	11,11,12	0.71	0	15,15,17	0.95	2 (13%)
5	NAG	D	2006	1	14,14,15	0.48	0	17,19,21	0.61	0
5	NAG	D	2005	1	14,14,15	0.35	0	17,19,21	0.70	1 (5%)
5	NAG	B	2007	1	14,14,15	0.67	1 (7%)	17,19,21	0.91	1 (5%)
5	NAG	A	2007	1	14,14,15	0.63	1 (7%)	17,19,21	0.64	0
5	NAG	B	2009	1	14,14,15	0.67	1 (7%)	17,19,21	0.85	1 (5%)
6	MAN	A	2008	1	11,11,12	0.77	0	15,15,17	0.93	2 (13%)
5	NAG	C	2008	1	14,14,15	0.90	0	17,19,21	2.48	3 (17%)
5	NAG	C	2007	1	14,14,15	0.60	1 (7%)	17,19,21	0.77	1 (5%)
5	NAG	B	2006	1	14,14,15	0.43	0	17,19,21	0.49	0
5	NAG	D	2008	1	14,14,15	0.46	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
5	NAG	A	2006	1	-	2/6/23/26	0/1/1/1
6	MAN	D	2007	1	-	0/2/19/22	0/1/1/1
5	NAG	C	2006	1	-	0/6/23/26	0/1/1/1
6	MAN	B	2008	1	-	1/2/19/22	0/1/1/1
5	NAG	D	2006	1	-	2/6/23/26	0/1/1/1
5	NAG	D	2005	1	-	2/6/23/26	0/1/1/1
5	NAG	B	2007	1	-	2/6/23/26	0/1/1/1
5	NAG	A	2007	1	-	2/6/23/26	0/1/1/1
5	NAG	B	2009	1	-	0/6/23/26	0/1/1/1
6	MAN	A	2008	1	-	0/2/19/22	0/1/1/1
5	NAG	C	2008	1	-	2/6/23/26	0/1/1/1
5	NAG	C	2007	1	-	1/6/23/26	0/1/1/1
5	NAG	B	2006	1	-	0/6/23/26	0/1/1/1
5	NAG	D	2008	1	-	0/6/23/26	0/1/1/1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	2009	NAG	C1-C2	2.37	1.55	1.52
5	B	2007	NAG	C1-C2	2.35	1.55	1.52
6	D	2007	MAN	O5-C1	-2.32	1.39	1.43

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	2007	NAG	C1-C2	2.16	1.55	1.52
5	C	2007	NAG	C1-C2	2.12	1.55	1.52

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	C	2008	NAG	C1-O5-C5	8.13	123.08	112.19
5	C	2008	NAG	C3-C4-C5	-3.92	103.12	110.23
5	C	2008	NAG	C2-N2-C7	3.67	127.81	122.90
5	B	2007	NAG	C1-O5-C5	3.14	116.40	112.19
5	B	2009	NAG	C1-O5-C5	2.81	115.95	112.19
5	C	2007	NAG	C1-O5-C5	2.48	115.51	112.19
6	B	2008	MAN	C1-O5-C5	2.43	115.45	112.19
5	D	2005	NAG	C1-O5-C5	2.43	115.45	112.19
6	A	2008	MAN	C1-O5-C5	2.30	115.27	112.19
6	A	2008	MAN	O2-C2-C3	-2.18	105.63	110.15
6	B	2008	MAN	O2-C2-C3	-2.08	105.85	110.15
6	D	2007	MAN	O2-C2-C3	-2.04	105.92	110.15

There are no chirality outliers.

All (14) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	B	2007	NAG	O5-C5-C6-O6
5	D	2005	NAG	O5-C5-C6-O6
5	B	2007	NAG	C4-C5-C6-O6
5	A	2007	NAG	O5-C5-C6-O6
5	A	2006	NAG	O5-C5-C6-O6
5	D	2005	NAG	C4-C5-C6-O6
5	C	2008	NAG	O5-C5-C6-O6
5	A	2007	NAG	C4-C5-C6-O6
5	D	2006	NAG	C4-C5-C6-O6
5	A	2006	NAG	C4-C5-C6-O6
5	C	2008	NAG	C4-C5-C6-O6
5	D	2006	NAG	O5-C5-C6-O6
5	C	2007	NAG	C1-C2-N2-C7
6	B	2008	MAN	O5-C5-C6-O6

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	2006	NAG	1	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

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	371/383 (96%)	-0.01	0 100 100	13, 20, 31, 45	0
1	B	371/383 (96%)	0.08	4 (1%) 78 79	14, 21, 32, 50	0
1	C	370/383 (96%)	0.62	9 (2%) 59 60	22, 37, 50, 67	0
1	D	371/383 (96%)	0.38	10 (2%) 56 55	19, 33, 43, 56	0
All	All	1483/1532 (96%)	0.27	23 (1%) 70 72	13, 27, 44, 67	0

All (23) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	220	GLY	3.2
1	B	37	ALA	3.1
1	D	37	ALA	3.1
1	C	6	LEU	3.0
1	D	46	GLY	2.9
1	D	328	ARG	2.7
1	B	5	THR	2.7
1	D	134	CYS	2.6
1	C	37	ALA	2.5
1	D	236	CYS	2.3
1	C	174	ASN	2.3
1	D	182	LEU	2.3
1	B	184	ASN	2.3
1	C	183	GLY	2.2
1	D	34	ASP	2.2
1	D	109	ILE	2.2
1	C	50	GLN	2.1
1	B	22	ASP	2.1
1	C	184	ASN	2.1
1	C	355	ILE	2.1
1	D	171	TYR	2.0

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Mol	Chain	Res	Type	RSRZ
1	C	48	THR	2.0
1	C	359	TYR	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](#)

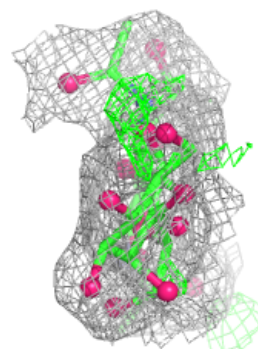
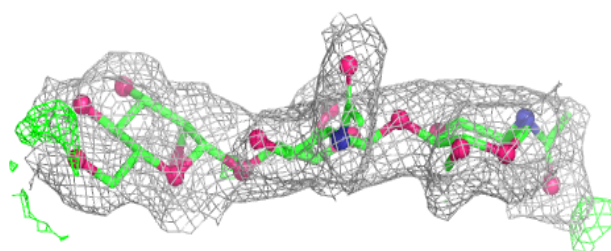
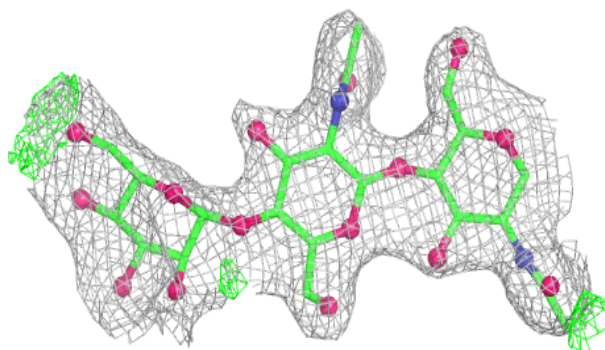
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q<0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	BMA	G	3	11/12	0.61	0.17	58,66,70,70	0
2	NAG	G	2	14/15	0.65	0.17	57,62,71,76	0
3	NAG	H	2	14/15	0.69	0.15	42,53,59,61	0
2	BMA	F	3	11/12	0.73	0.14	36,51,55,56	0
2	BMA	E	3	11/12	0.73	0.14	37,42,47,48	0
2	NAG	F	2	14/15	0.77	0.15	41,49,54,54	0
3	NAG	H	1	14/15	0.82	0.12	35,42,50,54	0
2	NAG	F	1	14/15	0.84	0.13	25,34,42,44	0
2	NAG	E	1	14/15	0.85	0.11	25,29,36,37	0
2	NAG	E	2	14/15	0.88	0.10	31,38,40,41	0
2	NAG	G	1	14/15	0.88	0.12	38,43,50,53	0

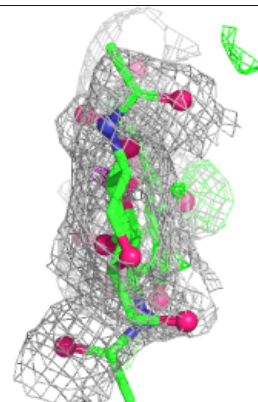
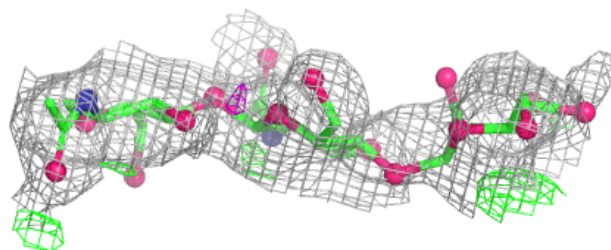
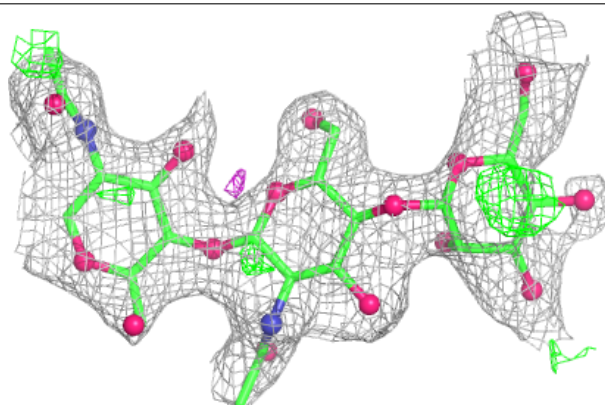
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around Chain E:

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

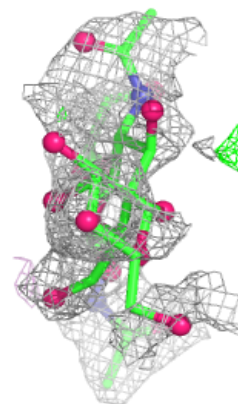
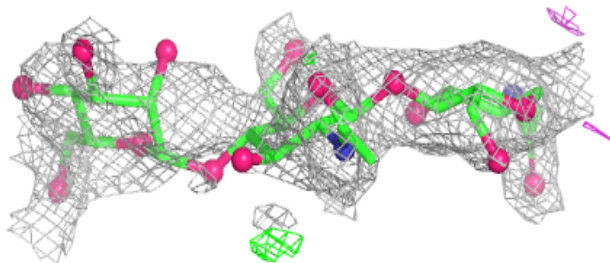
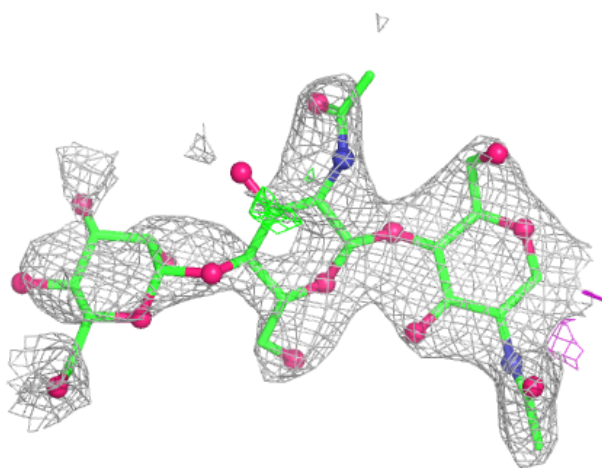
**Electron density around Chain F:**

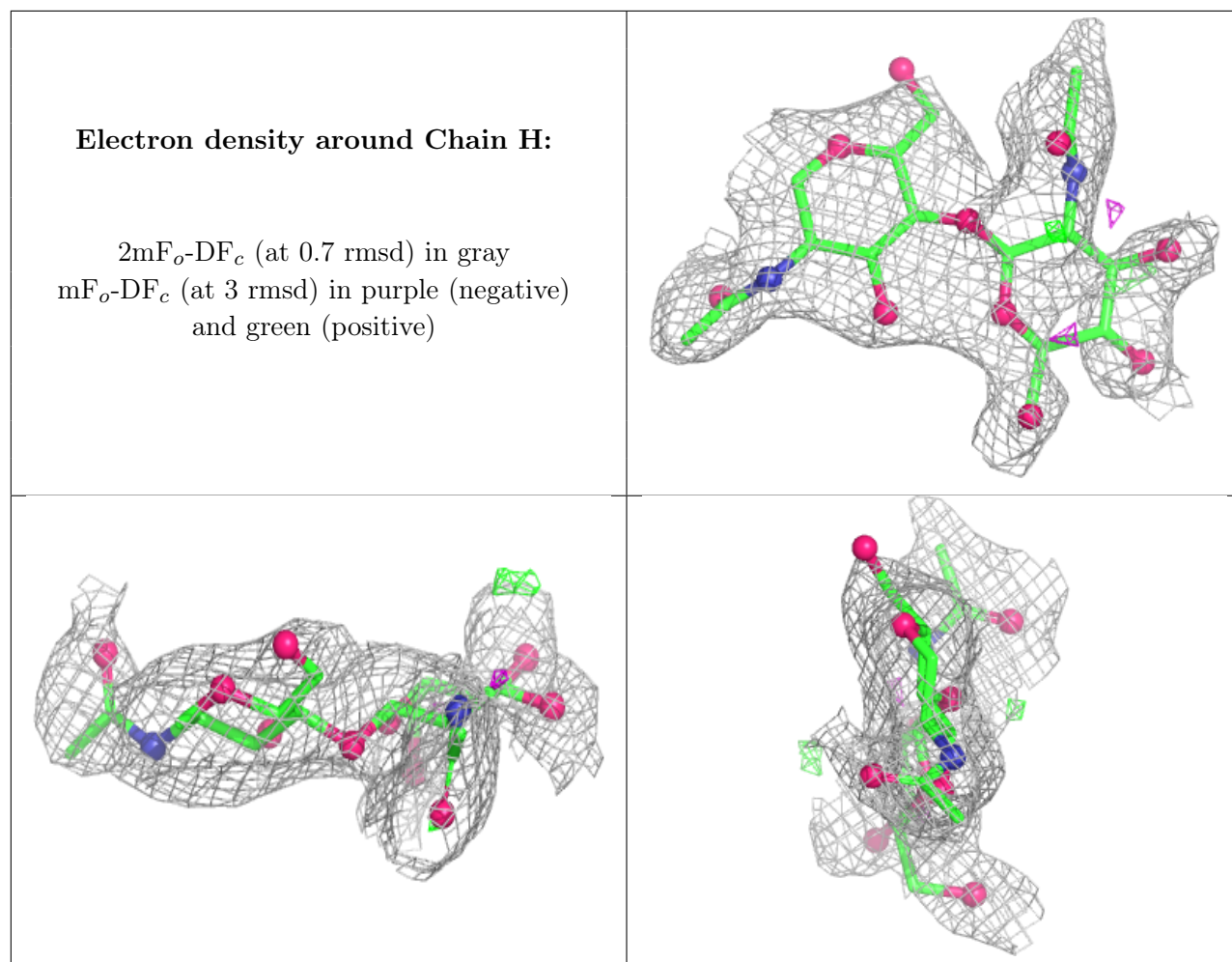
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around Chain G:

$2mF_o-DF_c$ (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
5	NAG	B	2009	14/15	0.49	0.20	46,52,60,65	0
5	NAG	D	2005	14/15	0.55	0.16	50,59,66,69	0
5	NAG	C	2008	14/15	0.64	0.17	49,53,58,58	0
5	NAG	A	2007	14/15	0.70	0.16	39,43,50,50	0
5	NAG	D	2008	14/15	0.73	0.14	62,67,71,71	0
5	NAG	C	2007	14/15	0.74	0.14	32,47,57,60	0
5	NAG	D	2006	14/15	0.76	0.15	34,44,47,52	0
5	NAG	B	2007	14/15	0.77	0.14	45,48,54,56	0
5	NAG	C	2006	14/15	0.78	0.13	43,47,52,53	0
6	MAN	B	2008	11/12	0.84	0.12	31,32,36,36	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
5	NAG	A	2006	14/15	0.85	0.12	22,27,33,40	0
6	MAN	A	2008	11/12	0.86	0.10	28,31,35,36	0
6	MAN	D	2007	11/12	0.87	0.10	36,39,41,42	0
5	NAG	B	2006	14/15	0.89	0.10	26,35,46,46	0
4	CU	C	2001	1/1	0.90	0.08	36,36,36,36	0
4	CU	D	2001	1/1	0.94	0.07	32,32,32,32	0
4	CU	B	2001	1/1	0.96	0.07	32,32,32,32	0
4	CU	A	2001	1/1	0.97	0.04	25,25,25,25	0
4	CU	C	2002	1/1	0.98	0.06	39,39,39,39	0
4	CU	A	2002	1/1	0.98	0.04	30,30,30,30	0
4	CU	B	2002	1/1	0.99	0.06	32,32,32,32	0
4	CU	D	2002	1/1	0.99	0.03	36,36,36,36	0

6.5 Other polymers [i](#)

There are no such residues in this entry.