



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 07:30 AM UTC

PDB ID : 5OR3 / pdb_00005or3
Title : Crystal structure of Aspergillus oryzae catechol oxidase in met/deoxy-form
Authors : Hakulinen, N.; Penttinen, L.; Rutanen, C.; Rouvinen, J.
Deposited on : 2017-08-15
Resolution : 1.79 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

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

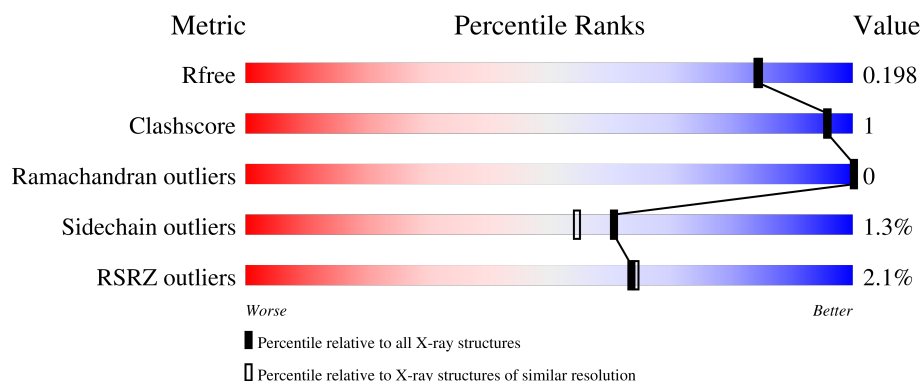
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.79 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	7662 (1.80-1.80)
Clashscore	190562	8479 (1.80-1.80)
Ramachandran outliers	187476	8391 (1.80-1.80)
Sidechain outliers	187428	8390 (1.80-1.80)
RSRZ outliers	180081	7663 (1.80-1.80)

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	94%
1	B	383	92% 5%
1	C	383	2% 95%
1	D	383	5% 93%
2	E	3	100%

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Mol	Chain	Length	Quality of chain
2	G	3	 100%
3	F	4	 100%
4	H	2	 100%

2 Entry composition [i](#)

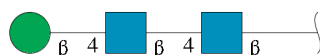
There are 11 unique types of molecules in this entry. The entry contains 24699 atoms, of which 11484 are hydrogens and 0 are deuteriums.

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	H	N	O	S	0	12	0
			5729	1848	2801	503	558	19			
1	B	372	Total	C	H	N	O	S	0	10	0
			5718	1846	2792	502	559	19			
1	C	371	Total	C	H	N	O	S	0	0	0
			5621	1818	2740	494	552	17			
1	D	371	Total	C	H	N	O	S	0	2	0
			5637	1823	2749	495	553	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	H	N	O	0	0	0
			78	22	39	2	15			
2	G	3	Total	C	H	N	O	0	0	0
			78	22	39	2	15			

- Molecule 3 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
3	F	4	Total	C	H	N	O	0	0	0
			100	28	50	2	20			

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

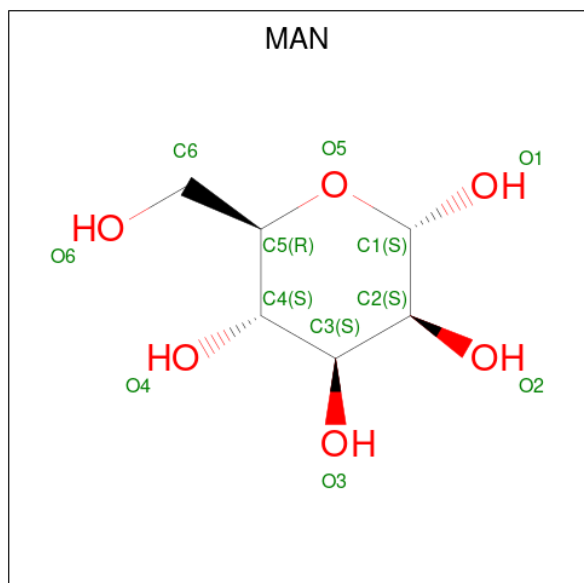


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	H	2	Total	C	H	N	O	0	0	0
			56	16	28	2	10			

- Molecule 5 is COPPER (II) ION (CCD ID: CU) (formula: Cu).

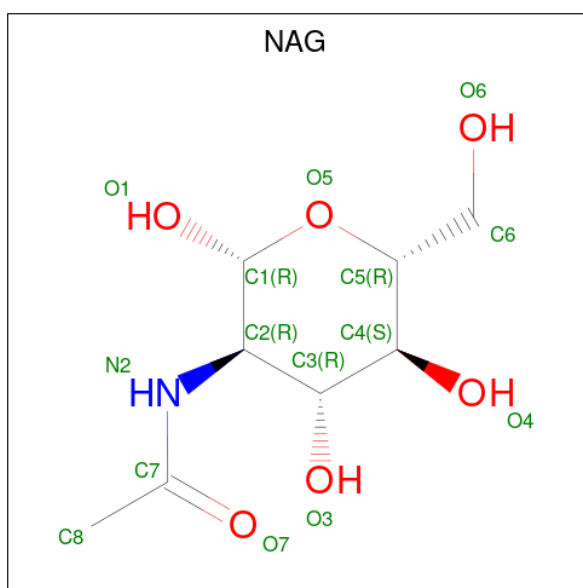
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	2	Total	Cu	0	0
			2	2		
5	B	2	Total	Cu	0	0
			2	2		
5	C	2	Total	Cu	0	0
			2	2		
5	D	2	Total	Cu	0	0
			2	2		

- Molecule 6 is alpha-D-mannopyranose (CCD ID: MAN) (formula: C₆H₁₂O₆).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	A	1	Total	C	H	O	0	0
			22	6	11	5		
6	A	1	Total	C	H	O	0	0
			21	6	10	5		
6	B	1	Total	C	H	O	0	0
			22	6	11	5		
6	C	1	Total	C	H	O	0	0
			22	6	11	5		
6	D	1	Total	C	H	O	0	0
			22	6	11	5		

- Molecule 7 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



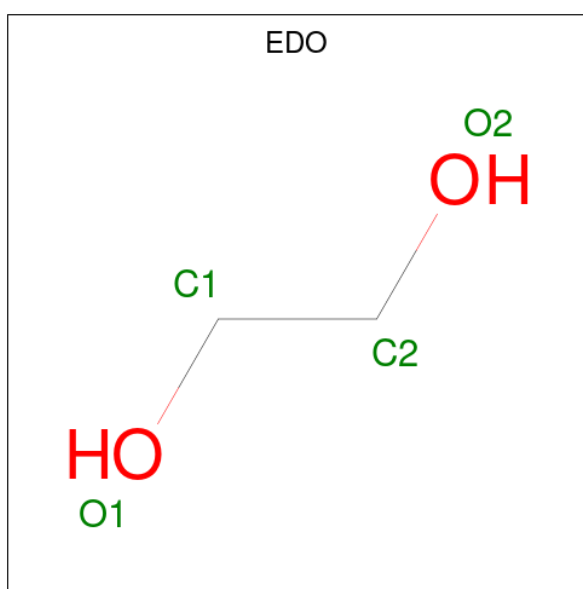
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
7	A	1	Total 28	C 8	H 14	N 1	O 5	0	0
7	A	1	Total 28	C 8	H 14	N 1	O 5	0	0
7	A	1	Total 28	C 8	H 14	N 1	O 5	0	0
7	B	1	Total 28	C 8	H 14	N 1	O 5	0	0
7	B	1	Total 28	C 8	H 14	N 1	O 5	0	0
7	C	1	Total 28	C 8	H 14	N 1	O 5	0	0

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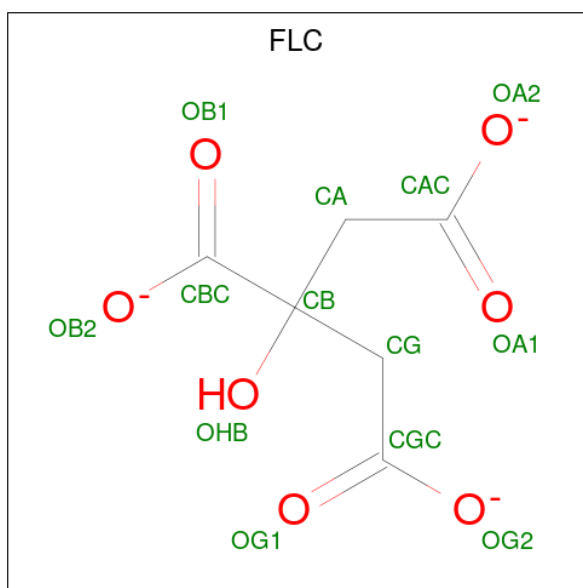
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
7	C	1	Total	C	H	N	O	0	0
			28	8	14	1	5		
7	D	1	Total	C	H	N	O	0	0
			28	8	14	1	5		
7	D	1	Total	C	H	N	O	0	0
			28	8	14	1	5		
7	D	1	Total	C	H	N	O	0	0
			28	8	14	1	5		

- Molecule 8 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: $C_2H_6O_2$).



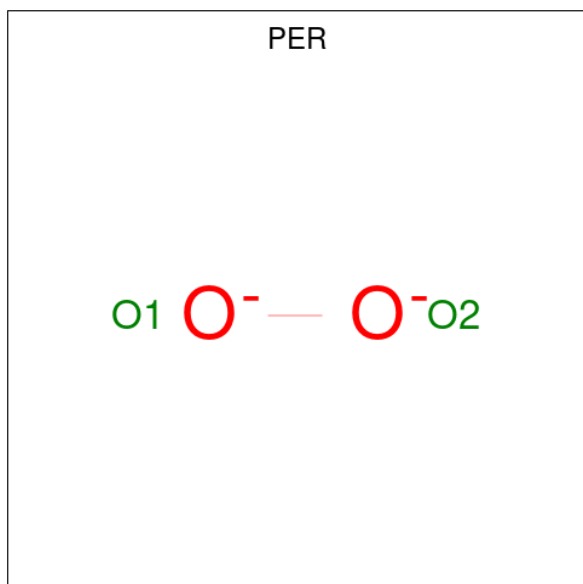
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
8	A	1	Total	C	H	O	0	0
			10	2	6	2		
8	A	1	Total	C	H	O	0	0
			10	2	6	2		
8	A	1	Total	C	H	O	0	0
			10	2	6	2		
8	B	1	Total	C	H	O	0	0
			10	2	6	2		
8	B	1	Total	C	H	O	0	0
			10	2	6	2		
8	B	1	Total	C	H	O	0	0
			10	2	6	2		
8	B	1	Total	C	H	O	0	0
			10	2	6	2		

- Molecule 9 is CITRATE ANION (CCD ID: FLC) (formula: $C_6H_5O_7$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
9	B	1	Total	C	H	O	0	0
			18	6	5	7		
9	B	1	Total	C	H	O	0	0
			18	6	5	7		

- Molecule 10 is PEROXIDE ION (CCD ID: PER) (formula: O_2).



Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	C	1	Total	O	0	0
			2	2		

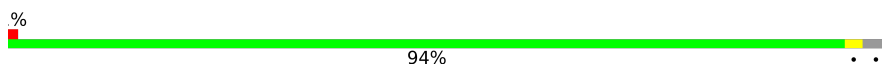
- Molecule 11 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
11	A	351	Total 351	O 351	0	0
11	B	380	Total 380	O 380	0	0
11	C	239	Total 239	O 239	0	0
11	D	207	Total 207	O 207	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

Chain A:  94%

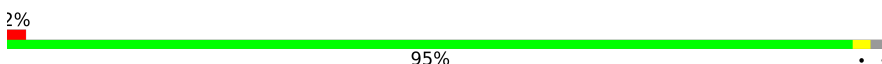


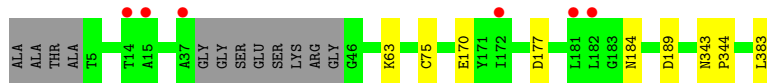
- Molecule 1: catechol oxidase

Chain B:  92% 5%

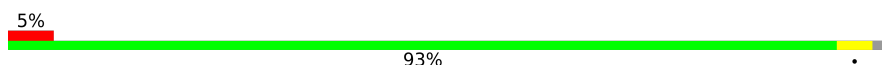


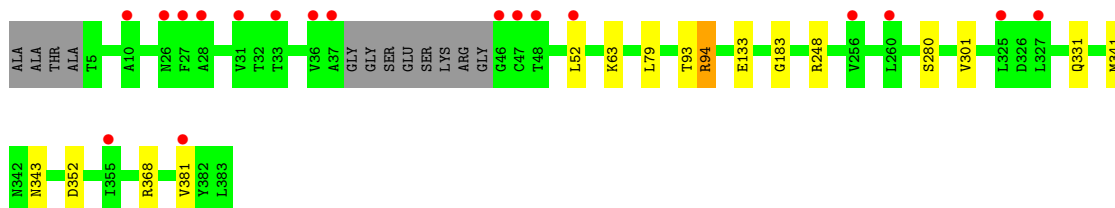
- Molecule 1: catechol oxidase

Chain C:  95% 2%



- Molecule 1: catechol oxidase

Chain D:  93% 5%



- 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 G:  100%



- Molecule 3: 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

Chain F:  100%



- Molecule 4: 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	60.63Å 81.39Å 82.20Å 87.19° 89.23° 73.89°	Depositor
Resolution (Å)	29.12 – 1.79 29.12 – 1.79	Depositor EDS
% Data completeness (in resolution range)	97.1 (29.12-1.79) 97.1 (29.12-1.79)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.99 (at 1.79Å)	Xtriage
Refinement program	PHENIX (1.11.1_2575: ???)	Depositor
R, R_{free}	0.176 , 0.207 (Not available) , 0.198	Depositor DCC
R_{free} test set	6842 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	22.5	Xtriage
Anisotropy	0.508	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 37.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.050 for -h,-k,l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	24699	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.87% 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: FLC, MAN, PER, CU, NAG, EDO, BMA

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

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	0.21	0/3065	0.42	0/4176
1	B	0.21	0/3051	0.43	0/4157
1	C	0.17	0/2959	0.39	0/4031
1	D	0.17	0/2979	0.39	0/4059
All	All	0.19	0/12054	0.41	0/16423

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	2928	2801	2755	6	0
1	B	2926	2792	2760	13	0
1	C	2881	2740	2740	4	0
1	D	2888	2749	2739	8	0
2	E	39	39	34	0	0
2	G	39	39	34	0	0
3	F	50	50	43	0	0
4	H	28	28	25	0	0
5	A	2	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	B	2	0	0	0	0
5	C	2	0	0	0	0
5	D	2	0	0	0	0
6	A	22	21	20	0	0
6	B	11	11	10	0	0
6	C	11	11	10	0	0
6	D	11	11	10	0	0
7	A	42	42	39	1	0
7	B	28	28	26	0	0
7	C	28	28	26	0	0
7	D	42	42	39	0	0
8	A	12	18	18	0	0
8	B	16	24	24	0	0
9	B	26	10	10	0	0
10	C	2	0	0	0	0
11	A	351	0	0	0	0
11	B	380	0	0	3	0
11	C	239	0	0	1	0
11	D	207	0	0	0	0
All	All	13215	11484	11362	26	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 1.

All (26) 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:5:THR:O	1:B:23:GLN:NE2	2.33	0.62
1:D:352:ASP:OD1	1:D:368:ARG:NH2	2.32	0.62
1:A:183:GLY:HA2	1:D:341:MET:O	2.05	0.57
1:B:331:GLN:NE2	11:B:2105:HOH:O	2.43	0.52
1:A:26[A]:ASN:OD1	7:A:2004:NAG:N2	2.40	0.51
1:B:383:LEU:OXT	11:B:2101:HOH:O	2.19	0.51
1:A:209[B]:LEU:O	1:A:234:PRO:HA	2.13	0.48
1:B:29:TYR:CE2	1:B:383:LEU:HD11	2.48	0.47
1:D:52:LEU:HD21	1:D:381:VAL:HG21	1.94	0.47
1:B:54:VAL:HG11	1:B:383:LEU:HD22	1.96	0.46
1:D:301:VAL:O	1:D:301:VAL:HG12	2.18	0.44
1:B:121:TYR:CD2	1:B:355:ILE:HD11	2.52	0.44
1:D:94:ARG:HD3	1:D:133:GLU:OE1	2.17	0.44
1:B:32:THR:HG21	1:B:381[B]:VAL:HG12	2.00	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:301:VAL:HG12	1:B:301:VAL:O	2.18	0.44
1:A:341:MET:O	1:D:183:GLY:HA2	2.17	0.43
1:B:208:LYS:NZ	11:B:2107:HOH:O	2.48	0.43
1:B:343:ASN:OD1	1:C:343:ASN:ND2	2.52	0.42
1:A:182:LEU:HD11	1:D:343:ASN:OD1	2.20	0.42
1:B:162[B]:GLU:H	1:B:162[B]:GLU:CD	2.28	0.42
1:D:79:LEU:O	1:D:93:THR:HA	2.21	0.41
1:A:301:VAL:HG12	1:A:301:VAL:O	2.20	0.41
1:C:184:ASN:HB2	11:C:2287:HOH:O	2.20	0.40
1:B:182:LEU:HD22	1:B:276:PRO:HA	2.03	0.40
1:C:177:ASP:OD2	1:C:189:ASP:OD1	2.39	0.40
1:B:107:GLN:HG2	1:C:344:PRO:CD	2.51	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	379/383 (99%)	366 (97%)	13 (3%)	0	100	100
1	B	378/383 (99%)	365 (97%)	13 (3%)	0	100	100
1	C	367/383 (96%)	357 (97%)	10 (3%)	0	100	100
1	D	369/383 (96%)	358 (97%)	11 (3%)	0	100	100
All	All	1493/1532 (98%)	1446 (97%)	47 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	320/314 (102%)	315 (98%)	5 (2%)	55	47
1	B	318/314 (101%)	315 (99%)	3 (1%)	70	67
1	C	308/314 (98%)	304 (99%)	4 (1%)	61	54
1	D	310/314 (99%)	305 (98%)	5 (2%)	55	47
All	All	1256/1256 (100%)	1239 (99%)	17 (1%)	61	52

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	75[A]	CYS
1	A	75[B]	CYS
1	A	182	LEU
1	A	189	ASP
1	A	356	ASP
1	B	49	LEU
1	B	184	ASN
1	B	189	ASP
1	C	63	LYS
1	C	75	CYS
1	C	170	GLU
1	C	383	LEU
1	D	63	LYS
1	D	94	ARG
1	D	248	ARG
1	D	280	SER
1	D	331	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	23	GLN
1	A	105	GLN
1	B	105	GLN
1	B	107	GLN
1	B	331	GLN
1	B	332	ASN

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Mol	Chain	Res	Type
1	C	86	HIS
1	C	105	GLN
1	C	174	ASN
1	C	343	ASN
1	D	175	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

12 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	0.52	0	17,19,21	0.38	0
2	NAG	E	2	2	14,14,15	0.17	0	17,19,21	0.55	0
2	BMA	E	3	2	11,11,12	0.24	0	15,15,17	0.76	0
3	NAG	F	1	3,1	14,14,15	0.27	0	17,19,21	0.48	0
3	NAG	F	2	3	14,14,15	0.18	0	17,19,21	0.49	0
3	BMA	F	3	3	11,11,12	0.31	0	15,15,17	0.68	0
3	MAN	F	4	3	11,11,12	0.85	0	15,15,17	0.96	0
2	NAG	G	1	2,1	14,14,15	0.46	0	17,19,21	0.34	0
2	NAG	G	2	2	14,14,15	0.21	0	17,19,21	0.46	0
2	BMA	G	3	2	11,11,12	0.24	0	15,15,17	0.81	0
4	NAG	H	1	1,4	14,14,15	0.15	0	17,19,21	0.60	0
4	NAG	H	2	4	14,14,15	0.23	0	17,19,21	0.45	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	-	0/6/23/26	0/1/1/1
2	NAG	E	2	2	-	0/6/23/26	0/1/1/1
2	BMA	E	3	2	-	0/2/19/22	0/1/1/1
3	NAG	F	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	F	2	3	-	0/6/23/26	0/1/1/1
3	BMA	F	3	3	-	0/2/19/22	0/1/1/1
3	MAN	F	4	3	-	2/2/19/22	0/1/1/1
2	NAG	G	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	G	2	2	-	2/6/23/26	0/1/1/1
2	BMA	G	3	2	-	0/2/19/22	0/1/1/1
4	NAG	H	1	1,4	-	0/6/23/26	0/1/1/1
4	NAG	H	2	4	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

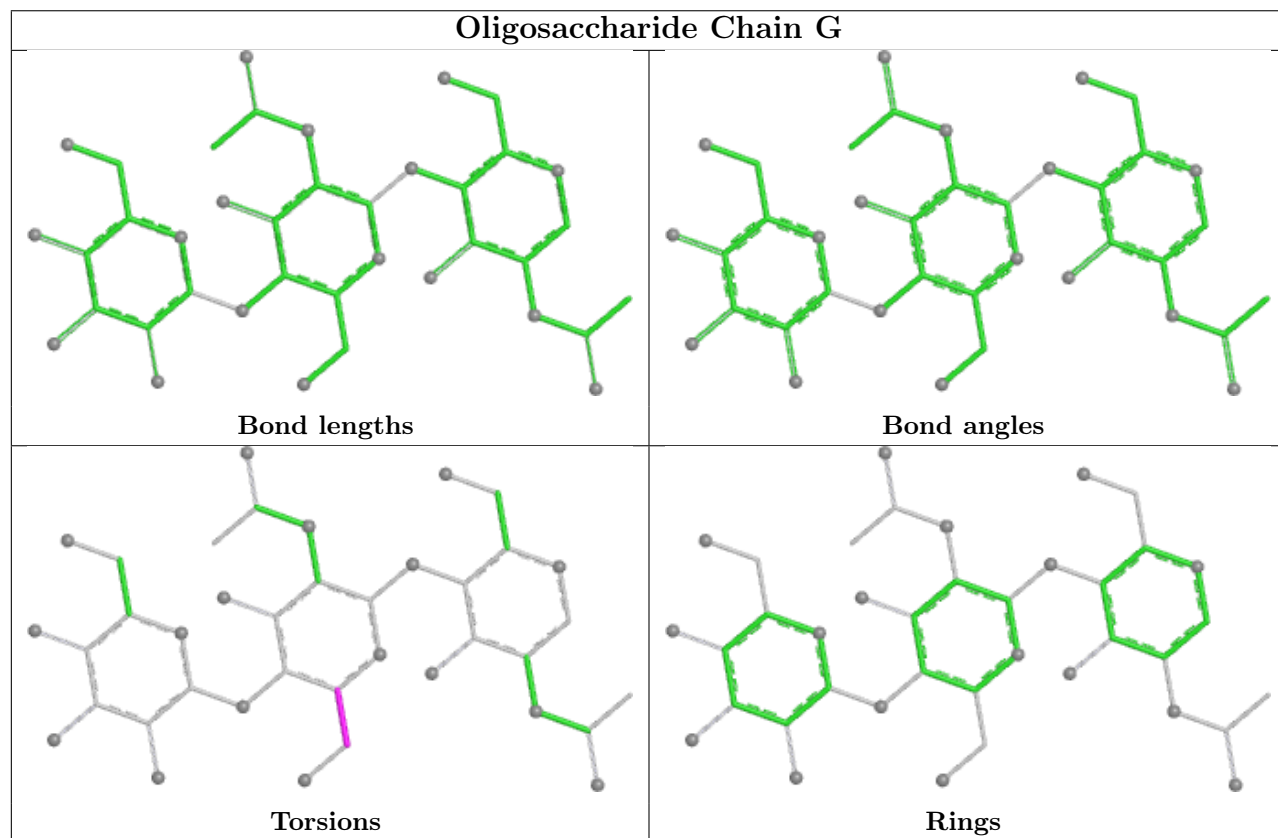
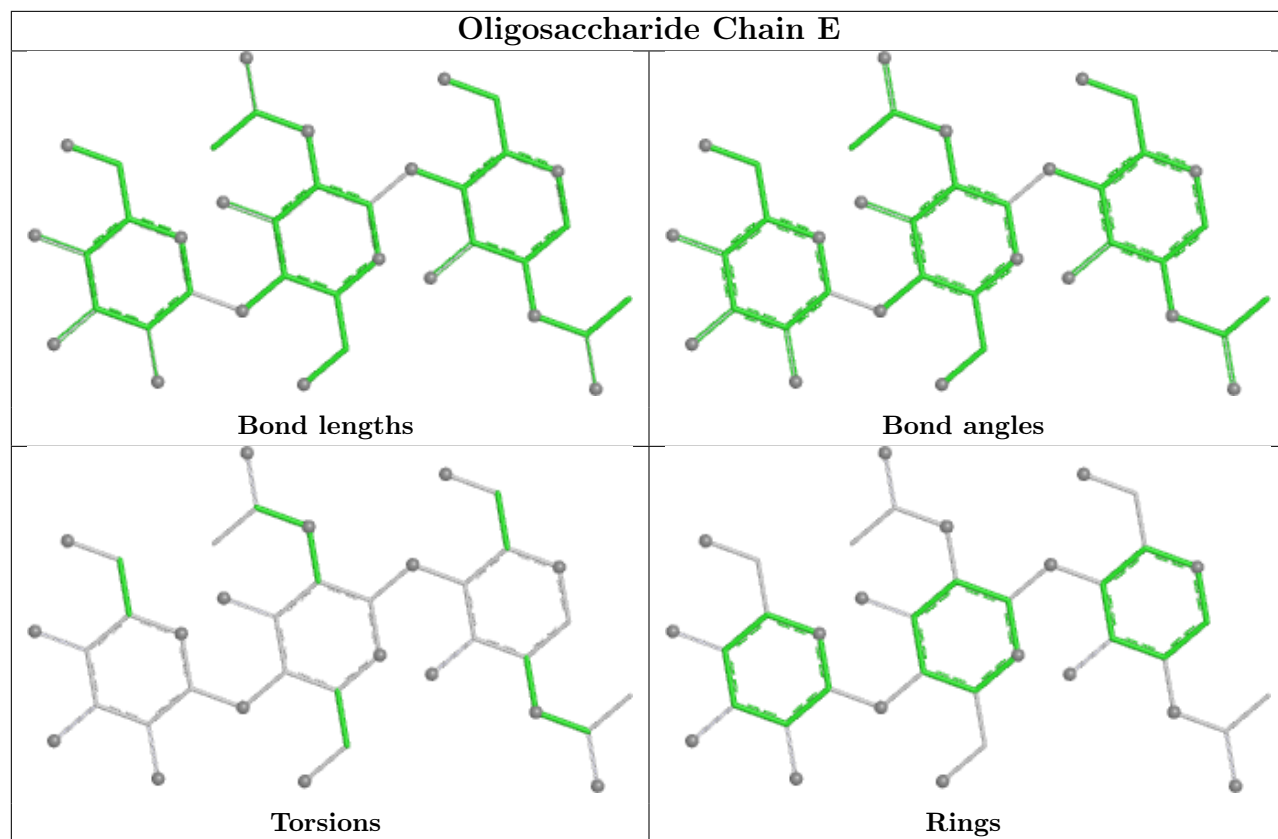
All (4) torsion outliers are listed below:

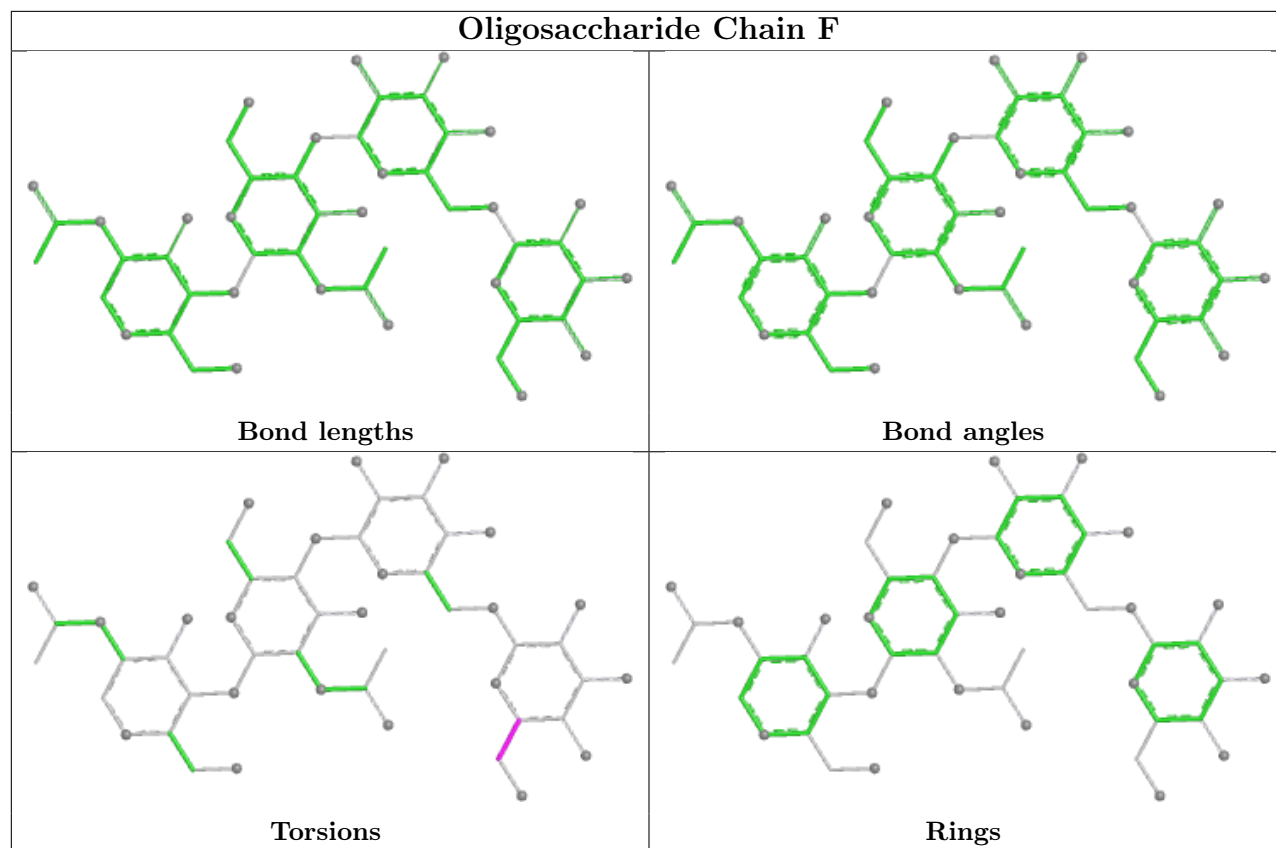
Mol	Chain	Res	Type	Atoms
3	F	4	MAN	O5-C5-C6-O6
3	F	4	MAN	C4-C5-C6-O6
2	G	2	NAG	C4-C5-C6-O6
2	G	2	NAG	O5-C5-C6-O6

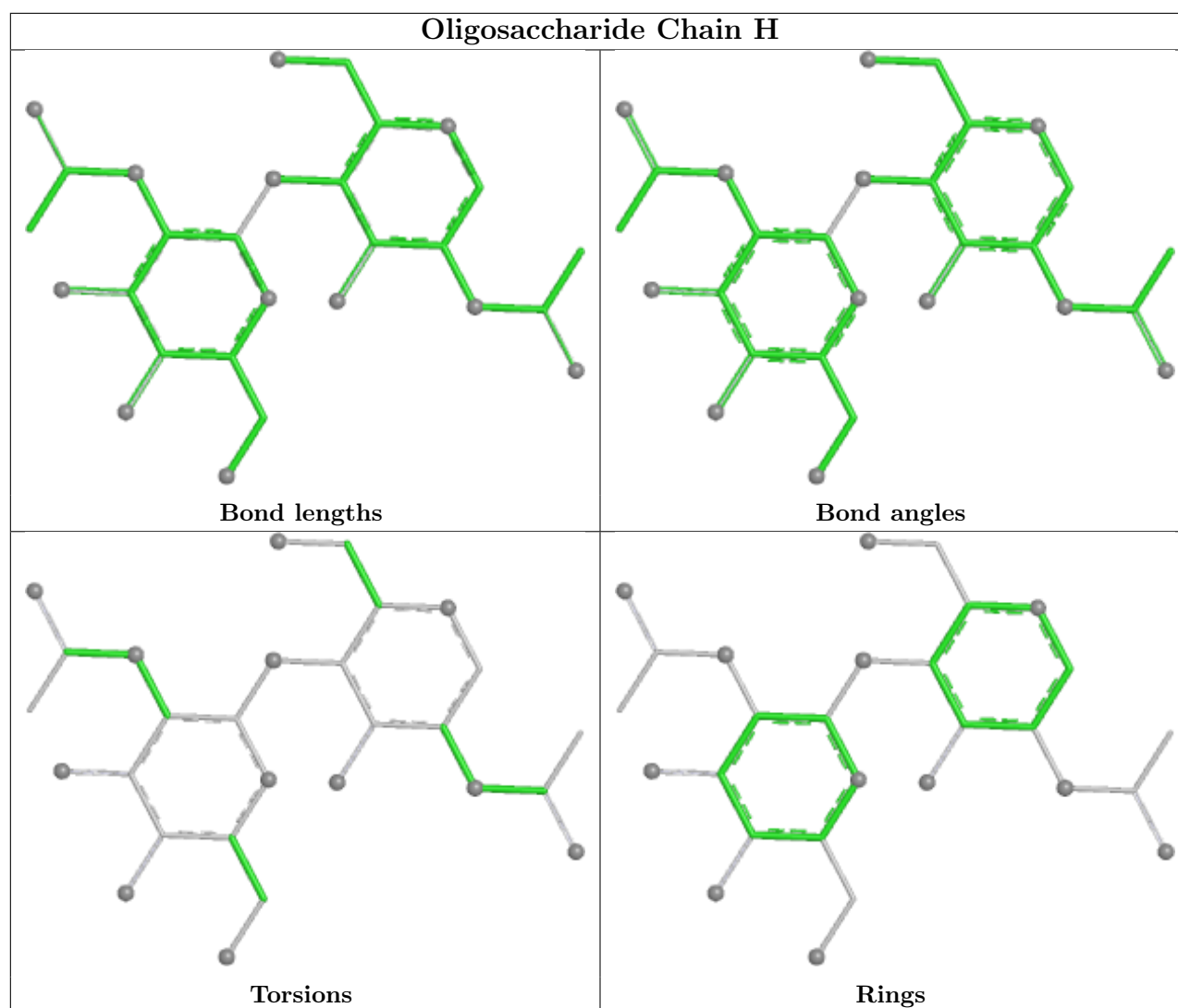
There are no ring outliers.

No monomer is involved in short contacts.

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 33 ligands modelled in this entry, 8 are monoatomic - leaving 25 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	2010	1	11,11,12	1.07	1 (9%)	15,15,17	1.03	1 (6%)
9	FLC	B	2011	-	12,12,12	1.05	0	17,17,17	1.54	1 (5%)
7	NAG	D	2004	1	14,14,15	0.25	0	17,19,21	0.50	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
7	NAG	B	2004	1	14,14,15	0.30	0	17,19,21	0.38	0
7	NAG	A	2008	1	14,14,15	0.18	0	17,19,21	0.49	0
9	FLC	B	2010	-	12,12,12	1.08	0	17,17,17	1.36	1 (5%)
8	EDO	B	2015	-	3,3,3	0.46	0	2,2,2	0.28	0
6	MAN	D	2003	1	11,11,12	0.66	0	15,15,17	1.13	2 (13%)
7	NAG	A	2004	1	14,14,15	0.28	0	17,19,21	0.37	0
6	MAN	C	2003	1	11,11,12	0.65	0	15,15,17	0.90	1 (6%)
6	MAN	A	2003	1	11,11,12	1.02	1 (9%)	15,15,17	0.96	2 (13%)
8	EDO	A	2011	-	3,3,3	0.39	0	2,2,2	0.28	0
7	NAG	C	2008	1	14,14,15	0.26	0	17,19,21	0.42	0
8	EDO	A	2012	-	3,3,3	0.42	0	2,2,2	0.59	0
7	NAG	D	2008	1	14,14,15	0.44	0	17,19,21	0.41	0
8	EDO	B	2014	-	3,3,3	0.40	0	2,2,2	0.36	0
7	NAG	D	2007	1	14,14,15	0.43	0	17,19,21	0.42	0
7	NAG	C	2007	1	14,14,15	0.35	0	17,19,21	0.36	0
6	MAN	B	2003	1	11,11,12	0.86	1 (9%)	15,15,17	0.90	2 (13%)
10	PER	C	2009	5	1,1,1	0.21	0	-		
8	EDO	B	2013	-	3,3,3	0.52	0	2,2,2	0.51	0
8	EDO	B	2012	-	3,3,3	0.42	0	2,2,2	0.45	0
7	NAG	B	2009	1	14,14,15	0.27	0	17,19,21	0.39	0
8	EDO	A	2013	-	3,3,3	0.44	0	2,2,2	0.54	0
7	NAG	A	2009	1	14,14,15	0.50	0	17,19,21	0.40	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
6	MAN	A	2010	1	-	1/2/19/22	0/1/1/1
9	FLC	B	2011	-	-	4/16/16/16	-
7	NAG	D	2004	1	-	0/6/23/26	0/1/1/1
7	NAG	B	2004	1	-	0/6/23/26	0/1/1/1
7	NAG	A	2008	1	-	0/6/23/26	0/1/1/1
9	FLC	B	2010	-	-	2/16/16/16	-
8	EDO	B	2015	-	-	0/1/1/1	-
6	MAN	D	2003	1	-	0/2/19/22	0/1/1/1
7	NAG	A	2004	1	-	0/6/23/26	0/1/1/1
6	MAN	C	2003	1	-	0/2/19/22	0/1/1/1
6	MAN	A	2003	1	-	1/2/19/22	0/1/1/1
8	EDO	A	2011	-	-	0/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	NAG	C	2008	1	-	2/6/23/26	0/1/1/1
8	EDO	A	2012	-	-	1/1/1/1	-
7	NAG	D	2008	1	-	0/6/23/26	0/1/1/1
8	EDO	B	2014	-	-	0/1/1/1	-
7	NAG	D	2007	1	-	0/6/23/26	0/1/1/1
7	NAG	C	2007	1	-	0/6/23/26	0/1/1/1
6	MAN	B	2003	1	-	2/2/19/22	0/1/1/1
8	EDO	B	2013	-	-	0/1/1/1	-
8	EDO	B	2012	-	-	0/1/1/1	-
7	NAG	B	2009	1	-	2/6/23/26	0/1/1/1
8	EDO	A	2013	-	-	0/1/1/1	-
7	NAG	A	2009	1	-	0/6/23/26	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	2003	MAN	O5-C1	-2.73	1.39	1.43
6	A	2010	MAN	O5-C1	-2.70	1.39	1.43
6	B	2003	MAN	O5-C1	-2.16	1.40	1.43

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	B	2011	FLC	OB2-CBC-CB	4.00	120.82	113.14
9	B	2010	FLC	OB2-CBC-CB	3.83	120.49	113.14
6	D	2003	MAN	C1-O5-C5	2.78	115.91	112.19
6	A	2003	MAN	O2-C2-C3	-2.44	105.09	110.15
6	B	2003	MAN	C1-O5-C5	2.25	115.21	112.19
6	D	2003	MAN	O2-C2-C3	-2.24	105.52	110.15
6	A	2003	MAN	C1-O5-C5	2.20	115.14	112.19
6	B	2003	MAN	O2-C2-C3	-2.13	105.73	110.15
6	A	2010	MAN	O2-C2-C3	-2.12	105.77	110.15
6	C	2003	MAN	O2-C2-C3	-2.09	105.83	110.15

There are no chirality outliers.

All (15) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	B	2003	MAN	O5-C5-C6-O6
6	B	2003	MAN	C4-C5-C6-O6

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Mol	Chain	Res	Type	Atoms
7	B	2009	NAG	C4-C5-C6-O6
7	C	2008	NAG	C4-C5-C6-O6
7	B	2009	NAG	O5-C5-C6-O6
6	A	2010	MAN	O5-C5-C6-O6
7	C	2008	NAG	O5-C5-C6-O6
6	A	2003	MAN	O5-C5-C6-O6
9	B	2010	FLC	CA-CB-CG-CGC
9	B	2010	FLC	OHB-CB-CG-CGC
9	B	2011	FLC	CA-CB-CG-CGC
9	B	2011	FLC	OHB-CB-CG-CGC
9	B	2011	FLC	CB-CG-CGC-OG1
8	A	2012	EDO	O1-C1-C2-O2
9	B	2011	FLC	CB-CG-CGC-OG2

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	A	2004	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%)	-0.26	4 (1%) 78 78	10, 23, 37, 64	7 (1%)
1	B	372/383 (97%)	-0.30	3 (0%) 82 83	10, 22, 37, 66	6 (1%)
1	C	371/383 (96%)	0.28	6 (1%) 70 71	22, 35, 51, 65	0
1	D	371/383 (96%)	0.64	18 (4%) 35 33	14, 40, 59, 73	1 (0%)
All	All	1485/1532 (96%)	0.09	31 (2%) 63 64	10, 30, 51, 73	14 (0%)

All (31) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	4	ALA	4.7
1	A	37	ALA	4.2
1	A	184	ASN	3.4
1	A	5	THR	3.4
1	D	37	ALA	3.3
1	C	181	LEU	3.1
1	C	182	LEU	3.1
1	C	37	ALA	3.1
1	D	46	GLY	2.9
1	D	52	LEU	2.8
1	C	15	ALA	2.7
1	D	260	LEU	2.5
1	D	256	VAL	2.5
1	B	37	ALA	2.4
1	B	182	LEU	2.4
1	D	47	CYS	2.3
1	D	36	VAL	2.3
1	A	182	LEU	2.2
1	D	327	LEU	2.2
1	D	26	ASN	2.2
1	D	325	LEU	2.2

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Mol	Chain	Res	Type	RSRZ
1	D	27	PHE	2.2
1	D	10	ALA	2.2
1	C	172	ILE	2.1
1	D	33	THR	2.1
1	D	355	ILE	2.1
1	D	381	VAL	2.1
1	D	48	THR	2.1
1	D	28	ALA	2.0
1	C	14	THR	2.0
1	D	31	VAL	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](#)

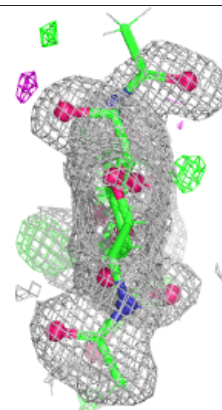
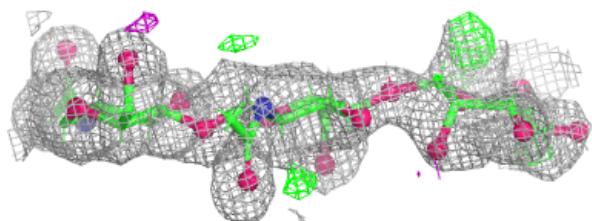
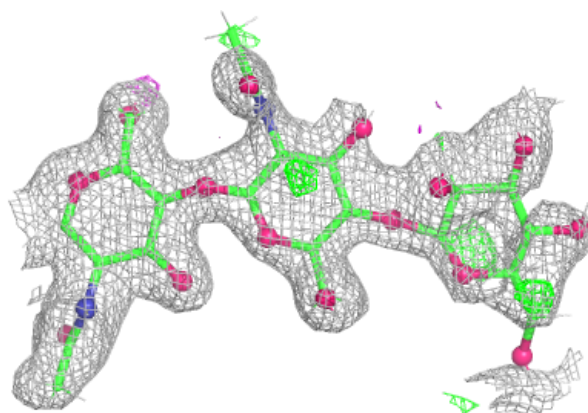
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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	E	3	11/12	0.43	0.17	67,78,88,94	0
2	BMA	G	3	11/12	0.56	0.17	57,78,90,105	0
3	MAN	F	4	11/12	0.57	0.16	50,67,75,87	0
4	NAG	H	2	14/15	0.64	0.14	53,69,92,101	0
2	NAG	G	2	14/15	0.82	0.12	37,61,77,83	0
2	NAG	E	2	14/15	0.83	0.14	48,63,76,82	0
3	BMA	F	3	11/12	0.86	0.10	36,49,58,62	0
3	NAG	F	2	14/15	0.88	0.10	30,38,51,51	0
4	NAG	H	1	14/15	0.90	0.09	42,52,63,69	0
3	NAG	F	1	14/15	0.91	0.08	22,30,37,38	0
2	NAG	E	1	14/15	0.92	0.08	27,36,49,59	0
2	NAG	G	1	14/15	0.93	0.08	30,40,51,53	0

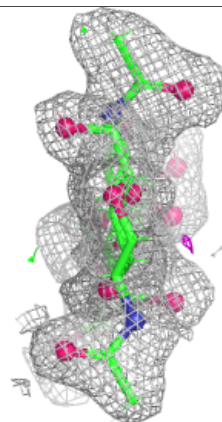
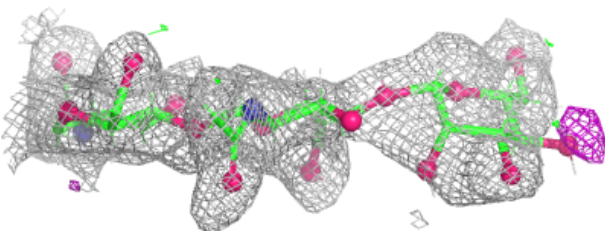
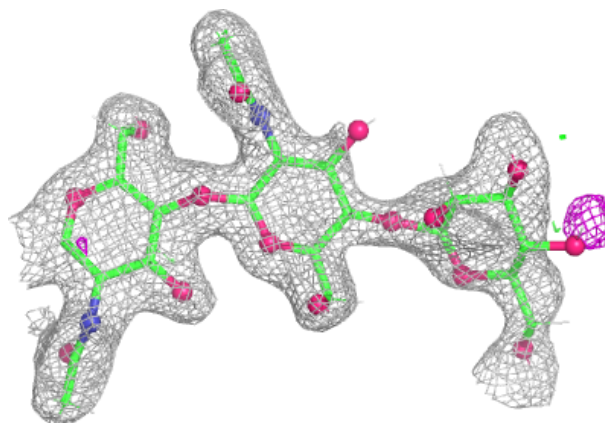
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

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)

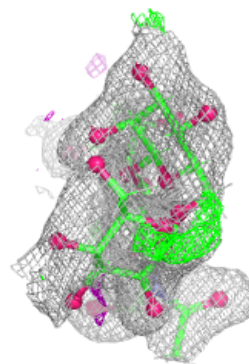
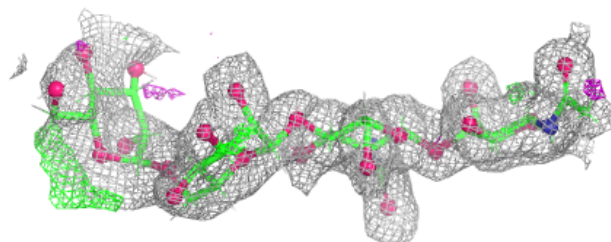
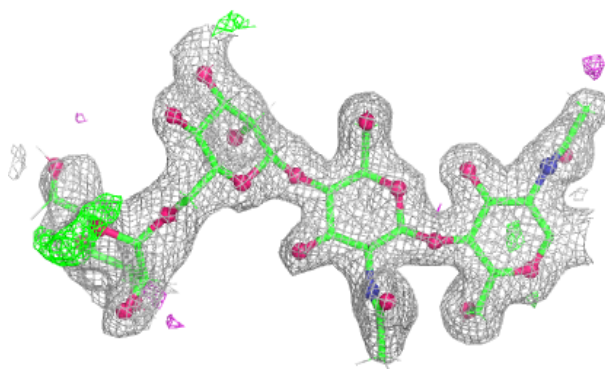
**Electron density around Chain G:**

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

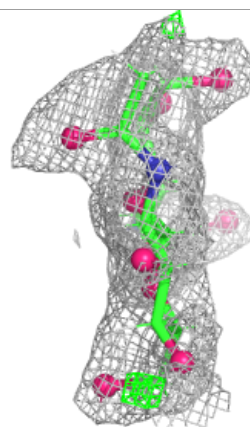
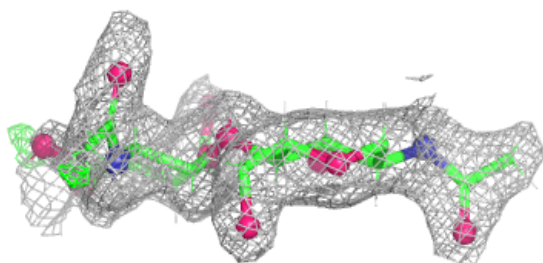
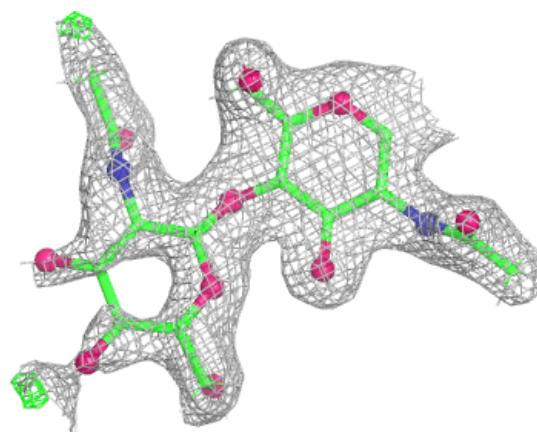


Electron density around Chain F:

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

**Electron density around Chain H:**

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



6.4 Ligands ⓘ

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
7	NAG	C	2007	14/15	0.54	0.13	70,84,94,106	0
7	NAG	A	2009	14/15	0.67	0.16	45,67,80,86	0
6	MAN	A	2010	11/12	0.67	0.17	54,68,80,90	0
7	NAG	D	2008	14/15	0.68	0.14	44,60,75,82	0
7	NAG	A	2008	14/15	0.69	0.13	45,62,75,79	0
7	NAG	D	2007	14/15	0.72	0.13	53,62,71,74	0
7	NAG	D	2004	14/15	0.75	0.14	46,55,64,64	0
7	NAG	B	2009	14/15	0.77	0.12	43,54,64,70	0
6	MAN	D	2003	11/12	0.78	0.12	47,64,74,83	0
7	NAG	C	2008	14/15	0.81	0.11	43,56,71,88	0
7	NAG	A	2004	14/15	0.86	0.09	34,44,54,63	0
6	MAN	C	2003	11/12	0.86	0.10	37,44,53,54	0
6	MAN	A	2003	11/12	0.86	0.10	32,41,48,50	0
7	NAG	B	2004	14/15	0.88	0.09	28,34,40,51	0
6	MAN	B	2003	11/12	0.90	0.09	33,39,44,47	0
9	FLC	B	2011	13/13	0.93	0.08	20,26,34,35	0
10	PER	C	2009	2/2	0.93	0.20	30,30,30,37	0
9	FLC	B	2010	13/13	0.95	0.06	21,24,30,30	0
8	EDO	A	2012	4/4	0.95	0.09	26,31,39,39	0
8	EDO	A	2013	4/4	0.95	0.08	22,26,31,31	0
8	EDO	B	2012	4/4	0.96	0.08	19,23,25,25	0
8	EDO	A	2011	4/4	0.96	0.06	19,22,24,24	0
8	EDO	B	2015	4/4	0.97	0.06	22,28,33,33	0
8	EDO	B	2013	4/4	0.97	0.05	20,24,24,25	0
8	EDO	B	2014	4/4	0.98	0.04	19,23,23,24	0
5	CU	B	2002	1/1	0.99	0.04	25,25,25,25	0
5	CU	D	2001	1/1	0.99	0.06	30,30,30,30	0
5	CU	A	2002	1/1	0.99	0.06	28,28,28,28	0
5	CU	A	2001	1/1	1.00	0.07	31,31,31,31	0
5	CU	C	2001	1/1	1.00	0.04	27,27,27,27	0
5	CU	C	2002	1/1	1.00	0.02	31,31,31,31	0
5	CU	B	2001	1/1	1.00	0.03	24,24,24,24	0
5	CU	D	2002	1/1	1.00	0.04	35,35,35,35	0

6.5 Other polymers [i](#)

There are no such residues in this entry.