



# Full wwPDB X-ray Structure Validation Report ⓘ

Dec 9, 2024 – 12:11 PM JST

PDB ID : 9K1G  
Title : COMPLEX STRUCTURE OF ENDO-1,3-FUCANASE (FUN174Sb) FROM GH174 FAMILY WITH FUCOTETRAOSE  
Authors : Chen, G.N.; Chang, Y.G.  
Deposited on : 2024-10-16  
Resolution : 2.50 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](mailto: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>.

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.21  
EDS : 3.0  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.004 (Gargrove)  
Density-Fitness : 1.0.11  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.40

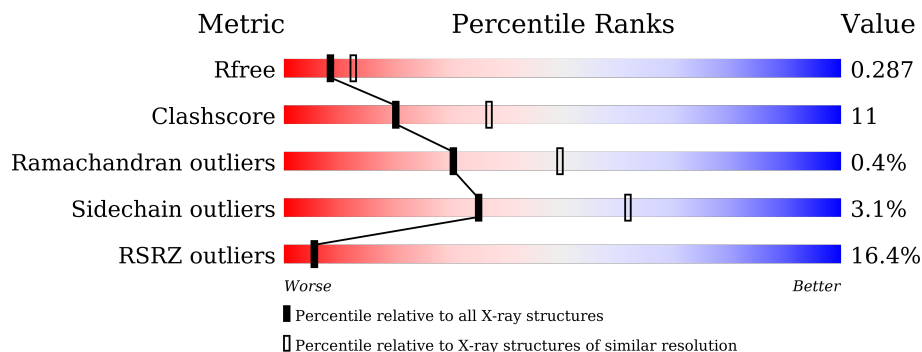
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.50 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))
$R_{free}$	164625	5504 (2.50-2.50)
Clashscore	180529	6282 (2.50-2.50)
Ramachandran outliers	177936	6191 (2.50-2.50)
Sidechain outliers	177891	6193 (2.50-2.50)
RSRZ outliers	164620	5504 (2.50-2.50)

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  $\geq 3$ , 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	497	
1	B	497	
2	C	4	
2	D	4	

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 7597 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 endo-1.3-fucanase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	449	Total 3510	C 2259	N 584	O 653	S 14	0	0	0
1	B	449	Total 3509	C 2258	N 584	O 653	S 14	0	0	0

- Molecule 2 is an oligosaccharide called 2-O-sulfo-alpha-L-fucopyranose-(1-3)-alpha-L-fucopyranose-(1-3)-2,4-di-O-sulfo-alpha-L-fucopyranose-(1-3)-2-O-sulfo-alpha-L-fucopyranose.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	O	S			
2	C	4	Total 57	C 24	O 29	S 4	0	0	0
2	D	4	Total 57	C 24	O 29	S 4	0	0	0

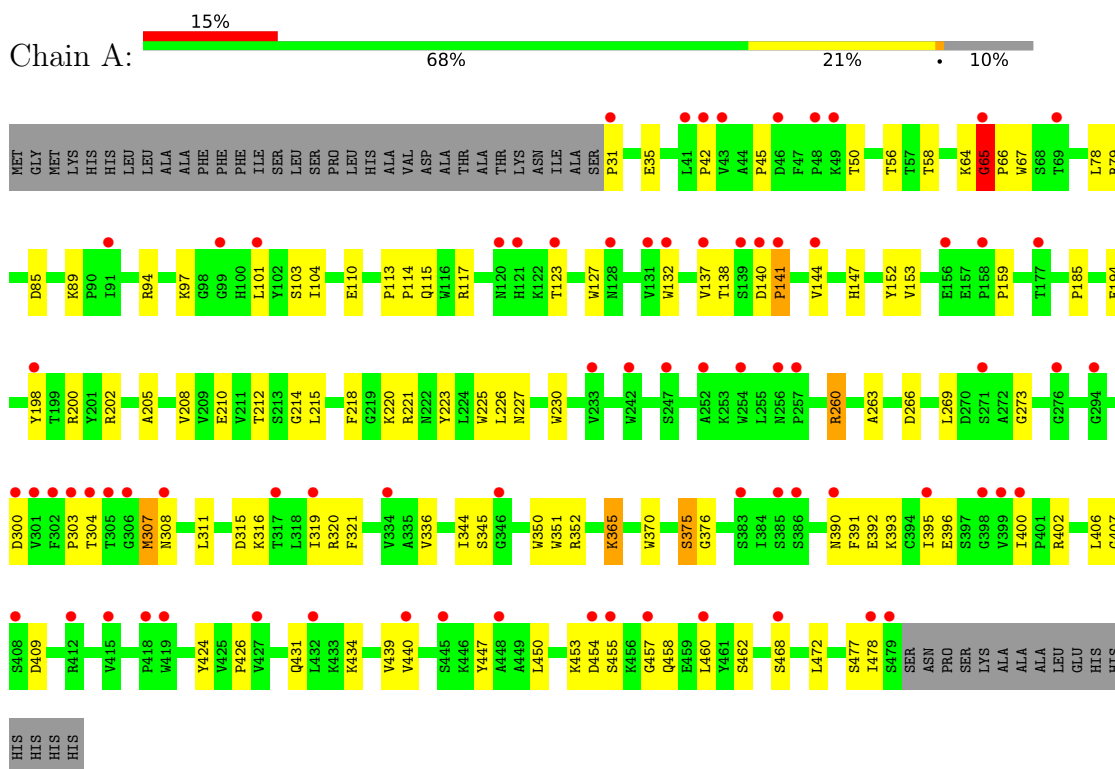
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	A	235	Total 235	O 235	0	0
3	B	229	Total 229	O 229	0	0

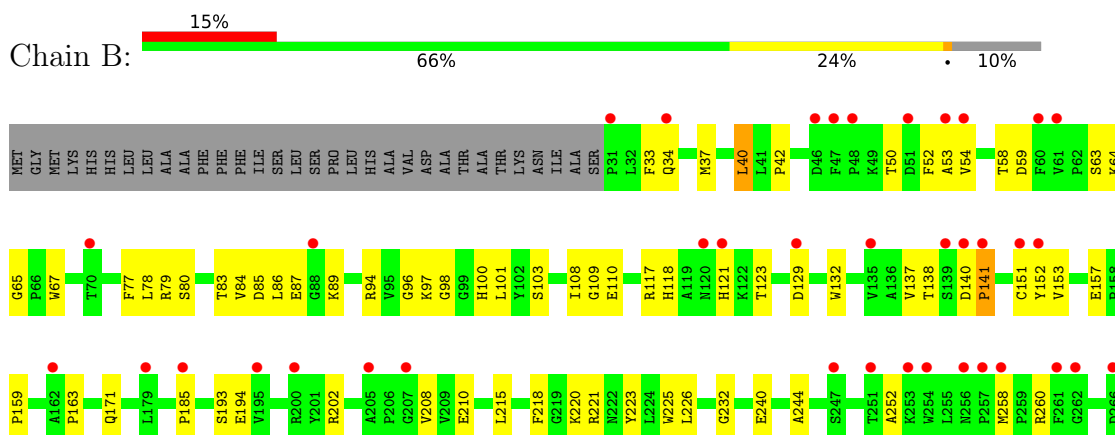
### 3 Residue-property plots [i](#)

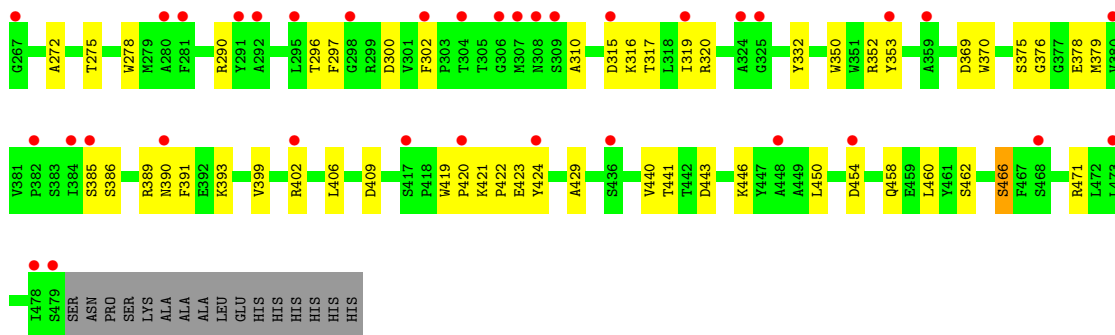
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: endo-1.3-fucanase



- Molecule 1: endo-1.3-fucanase




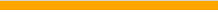


- Molecule 2: 2-O-sulfo-alpha-L-fucopyranose-(1-3)-alpha-L-fucopyranose-(1-3)-2,4-di-O-sulfo-alpha-L-fucopyranose-(1-3)-2-O-sulfo-alpha-L-fucopyranose

Chain C:  100%

X6Y1  
X2Y2  
FUC3  
X6Y4

- Molecule 2: 2-O-sulfo-alpha-L-fucopyranose-(1-3)-alpha-L-fucopyranose-(1-3)-2,4-di-O-sulfo-alpha-L-fucopyranose-(1-3)-2-O-sulfo-alpha-L-fucopyranose

Chain D:  75%  25%

X6Y1  
X2Y2  
FUC3  
X6Y4

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	62.63Å 92.05Å 75.81Å 90.00° 104.53° 90.00°	Depositor
Resolution (Å)	36.66 – 2.50 36.66 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.1 (36.66-2.50) 91.8 (36.66-2.50)	Depositor EDS
$R_{merge}$	0.18	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.73 (at 2.51Å)	Xtrriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, $R_{free}$	0.245 , 0.286 0.246 , 0.287	Depositor DCC
$R_{free}$ test set	26880 reflections (6.89%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	23.0	Xtrriage
Anisotropy	1.068	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 33.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.87	EDS
Total number of atoms	7597	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	28.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 12.45% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: X2Y, X6Y, FUC

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	0.32	1/3621 (0.0%)	0.52	0/4938
1	B	0.29	0/3620	0.52	0/4937
All	All	0.31	1/7241 (0.0%)	0.52	0/9875

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	65	GLY	CA-C	-5.74	1.42	1.51

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	3510	0	3374	80	1
1	B	3509	0	3372	75	0
2	C	57	0	9	0	0
2	D	57	0	9	1	0
3	A	235	0	0	14	0
3	B	229	0	0	14	0
All	All	7597	0	6764	155	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 11.

All (155) 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:65:GLY:HA3	1:B:110:GLU:HB2	1.65	0.77
1:A:137:VAL:HB	1:A:225:TRP:HB3	1.66	0.77
1:B:98:GLY:O	3:B:501:HOH:O	2.06	0.74
1:A:450:LEU:HD12	1:A:460:LEU:HB3	1.71	0.72
1:A:101:LEU:HB3	1:A:132:TRP:HB2	1.71	0.72
1:B:129:ASP:OD2	1:B:152:TYR:OH	2.07	0.70
1:B:215:LEU:HD22	1:B:226:LEU:HD22	1.77	0.67
1:B:157:GLU:O	3:B:503:HOH:O	2.13	0.66
1:B:109:GLY:O	3:B:502:HOH:O	2.15	0.65
1:B:63:SER:HB2	1:B:67:TRP:HE1	1.60	0.65
1:B:350:TRP:HB3	1:B:379:MET:HG3	1.79	0.65
1:A:58:THR:HG22	1:A:79:ARG:HB2	1.79	0.64
1:A:260:ARG:NH1	3:A:514:HOH:O	2.30	0.64
1:B:378:GLU:O	3:B:505:HOH:O	2.16	0.63
1:B:300:ASP:OD2	1:B:316:LYS:HB2	2.00	0.62
1:A:390:ASN:H	1:A:393:LYS:HB2	1.65	0.61
1:A:212:THR:HG23	1:A:352:ARG:HB2	1.82	0.61
1:B:42:PRO:HG3	1:B:350:TRP:CD2	2.35	0.60
1:A:375:SER:OG	1:A:376:GLY:N	2.33	0.60
1:A:450:LEU:HD21	1:A:462:SER:HB3	1.83	0.60
1:B:65:GLY:HA3	1:B:110:GLU:CB	2.32	0.59
1:B:310:ALA:O	3:B:504:HOH:O	2.15	0.59
1:A:300:ASP:OD2	1:A:316:LYS:HB2	2.02	0.59
1:B:429:ALA:HB3	1:B:471:ARG:HB2	1.83	0.59
1:A:42:PRO:HG2	1:A:350:TRP:CD2	2.38	0.59
1:B:53:ALA:O	3:B:506:HOH:O	2.17	0.58
1:B:240:GLU:OE1	1:B:290:ARG:NH2	2.32	0.58
1:B:94:ARG:HB2	1:B:103:SER:HB3	1.86	0.58
1:B:421:LYS:HB3	1:B:422:PRO:HD2	1.86	0.57
1:B:137:VAL:HB	1:B:225:TRP:HB3	1.87	0.57
1:A:210:GLU:OE2	3:A:501:HOH:O	2.18	0.56
1:B:64:LYS:O	1:B:65:GLY:C	2.44	0.56
1:A:198:TYR:HB2	1:A:214:GLY:HA3	1.88	0.56
1:A:198:TYR:O	1:A:214:GLY:N	2.32	0.56
1:B:109:GLY:N	3:B:502:HOH:O	2.39	0.56
1:B:458:GLN:NE2	3:B:527:HOH:O	2.30	0.55
1:A:94:ARG:HB2	1:A:103:SER:HB3	1.89	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:42:PRO:HG2	1:A:350:TRP:CE2	2.43	0.54
1:B:232:GLY:HA3	1:B:332:TYR:HE1	1.73	0.53
1:B:390:ASN:HB3	1:B:393:LYS:HB2	1.90	0.53
1:B:390:ASN:OD1	1:B:391:PHE:N	2.42	0.53
1:A:64:LYS:O	1:A:65:GLY:C	2.46	0.52
1:A:392:GLU:OE2	1:A:392:GLU:HA	2.09	0.52
1:B:406:LEU:HD23	1:B:440:VAL:HB	1.91	0.52
1:A:113:PRO:O	1:A:115:GLN:NE2	2.36	0.52
1:A:200:ARG:NE	3:A:544:HOH:O	2.42	0.52
1:A:208:VAL:HG11	1:A:370:TRP:CE2	2.45	0.52
1:B:390:ASN:OD1	3:B:507:HOH:O	2.18	0.52
1:A:138:THR:HB	1:A:223:TYR:CD2	2.45	0.51
1:A:140:ASP:HB3	1:A:141:PRO:HD3	1.91	0.51
1:A:311:LEU:HD12	3:A:623:HOH:O	2.10	0.51
1:B:409:ASP:OD1	1:B:441:THR:OG1	2.26	0.51
1:B:140:ASP:HB3	1:B:141:PRO:HD3	1.93	0.51
1:A:395:ILE:HG12	1:A:400:ILE:HD11	1.92	0.50
1:A:304:THR:HA	1:A:307:MET:HE3	1.93	0.50
1:A:391:PHE:O	1:A:395:ILE:HG13	2.10	0.50
1:B:151:CYS:HA	1:B:185:PRO:HA	1.94	0.50
1:A:365:LYS:NZ	3:A:527:HOH:O	2.33	0.50
1:B:202:ARG:HB3	1:B:210:GLU:HB3	1.94	0.49
1:B:208:VAL:HG11	1:B:370:TRP:CE2	2.47	0.49
1:B:375:SER:OG	1:B:376:GLY:N	2.45	0.49
1:B:244:ALA:HA	1:B:252:ALA:HA	1.95	0.49
1:A:101:LEU:HD22	1:A:132:TRP:HD1	1.78	0.48
1:B:450:LEU:HD12	1:B:460:LEU:HB3	1.94	0.48
1:A:103:SER:O	3:A:502:HOH:O	2.20	0.48
1:A:67:TRP:HE3	1:A:114:PRO:HA	1.78	0.48
1:B:278:TRP:HB3	1:B:296:THR:HG22	1.95	0.48
1:B:386:SER:HB3	1:B:419:TRP:CH2	2.48	0.48
1:A:56:THR:OG1	1:A:79:ARG:NH1	2.47	0.48
1:A:153:VAL:HG11	1:A:159:PRO:HA	1.96	0.48
1:B:153:VAL:HG11	1:B:159:PRO:HA	1.94	0.48
1:A:147:HIS:CD2	1:A:185:PRO:HB3	2.49	0.47
1:B:54:VAL:O	1:B:171:GLN:NE2	2.38	0.47
1:B:220:LYS:HB3	1:B:220:LYS:HE3	1.71	0.47
1:A:311:LEU:HD21	1:A:344:ILE:HG12	1.95	0.47
1:B:34:GLN:HA	1:B:37:MET:HG3	1.97	0.47
1:B:369:ASP:OD2	3:B:508:HOH:O	2.20	0.47
1:A:144:VAL:N	3:A:526:HOH:O	2.48	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:308:ASN:HB3	1:A:311:LEU:HD12	1.96	0.47
1:B:83:THR:OG1	1:B:84:VAL:N	2.45	0.47
1:B:101:LEU:HB3	1:B:132:TRP:HB2	1.96	0.47
1:A:67:TRP:CE3	1:A:114:PRO:HA	2.50	0.47
1:A:431:GLN:HG2	1:A:468:SER:HB2	1.96	0.46
1:B:275:THR:HG1	1:B:297:PHE:HE1	1.62	0.46
1:A:393:LYS:HA	1:A:396:GLU:HG2	1.95	0.46
1:B:33:PHE:CE2	1:B:389:ARG:HD3	2.50	0.46
1:B:78:LEU:HB2	1:B:97:LYS:HA	1.98	0.46
1:B:443:ASP:OD2	1:B:446:LYS:HB2	2.16	0.46
1:A:127:TRP:HE3	3:A:505:HOH:O	1.98	0.46
1:A:439:VAL:HG21	1:A:447:TYR:CZ	2.51	0.45
1:B:121:HIS:O	1:B:123:THR:N	2.41	0.45
1:B:141:PRO:HG3	1:B:221:ARG:NH1	2.32	0.45
1:B:462:SER:O	1:B:466:SER:OG	2.20	0.45
1:A:406:LEU:HD23	1:A:440:VAL:HB	1.97	0.45
1:A:104:ILE:O	1:A:110:GLU:HA	2.17	0.45
1:A:205:ALA:HB3	1:A:208:VAL:HB	1.98	0.45
1:B:353:TYR:O	3:B:509:HOH:O	2.21	0.45
1:B:320:ARG:NH2	2:D:2:X2Y:O10	2.46	0.45
1:A:65:GLY:O	1:A:66:PRO:C	2.54	0.45
1:A:101:LEU:HD21	1:A:104:ILE:HG13	1.99	0.44
1:A:269:LEU:HG	1:A:320:ARG:HG2	1.99	0.44
1:B:108:ILE:HG13	3:B:502:HOH:O	2.16	0.44
1:A:78:LEU:HB2	1:A:97:LYS:HA	2.00	0.44
1:B:50:THR:HB	1:B:52:PHE:HE1	1.83	0.44
1:A:194:GLU:HA	1:A:218:PHE:CZ	2.53	0.44
1:A:220:LYS:O	1:A:345:SER:OG	2.33	0.44
1:A:263:ALA:HB1	1:A:266:ASP:HB3	1.98	0.44
1:A:316:LYS:HB2	1:A:316:LYS:HE3	1.71	0.44
1:A:65:GLY:HA3	1:A:110:GLU:HG3	2.00	0.43
1:A:152:TYR:CE2	1:A:185:PRO:HB2	2.52	0.43
1:A:351:TRP:CE3	1:A:376:GLY:HA3	2.53	0.43
1:A:31:PRO:HD2	3:A:702:HOH:O	2.18	0.43
1:A:230:TRP:CE3	1:A:336:VAL:HB	2.53	0.43
1:B:406:LEU:HD23	1:B:406:LEU:HA	1.83	0.43
1:A:45:PRO:O	1:A:202:ARG:NH2	2.50	0.43
1:A:152:TYR:CD2	1:A:185:PRO:HB2	2.54	0.43
1:B:40:LEU:HD13	1:B:420:PRO:HD2	2.00	0.43
1:B:422:PRO:O	1:B:423:GLU:HG2	2.19	0.43
1:A:227:ASN:HD22	1:A:230:TRP:HB2	1.84	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:273:GLY:O	3:A:504:HOH:O	2.21	0.43
1:A:454:ASP:HB3	1:A:458:GLN:H	1.84	0.43
1:B:352:ARG:HG2	3:B:509:HOH:O	2.18	0.42
1:A:319:ILE:HG22	1:A:321:PHE:CD2	2.54	0.42
1:B:194:GLU:HA	1:B:218:PHE:CZ	2.54	0.42
1:A:406:LEU:HD23	1:A:406:LEU:HA	1.66	0.42
1:B:97:LYS:HE2	1:B:163:PRO:HA	2.01	0.42
1:A:426:PRO:HB2	1:A:472:LEU:HD11	2.01	0.42
1:A:117:ARG:NH2	3:A:559:HOH:O	2.52	0.42
1:A:215:LEU:HD22	1:A:226:LEU:HD22	2.02	0.42
1:A:300:ASP:OD2	1:A:316:LYS:HE3	2.20	0.42
1:B:399:VAL:O	1:B:471:ARG:NH1	2.51	0.42
1:B:86:LEU:HB2	1:B:87:GLU:OE2	2.20	0.41
1:B:272:ALA:HB2	1:B:317:THR:HB	2.02	0.41
1:B:85:ASP:OD2	1:B:89:LYS:HB2	2.20	0.41
1:A:453:LYS:HD2	1:A:458:GLN:O	2.21	0.41
1:B:138:THR:HB	1:B:223:TYR:CD2	2.54	0.41
1:B:77:PHE:N	3:B:519:HOH:O	2.53	0.41
1:A:395:ILE:HG22	1:A:402:ARG:HD2	2.01	0.41
1:A:407:GLY:C	1:A:409:ASP:H	2.23	0.41
1:A:123:THR:O	3:A:507:HOH:O	2.22	0.41
1:A:202:ARG:HB3	1:A:210:GLU:HB3	2.02	0.41
1:A:85:ASP:OD2	1:A:89:LYS:HB2	2.21	0.41
1:B:77:PHE:HE1	1:B:80:SER:HB3	1.86	0.41
1:B:350:TRP:CZ3	1:B:376:GLY:HA2	2.55	0.41
1:B:421:LYS:HD3	1:B:424:TYR:CE2	2.56	0.40
1:A:304:THR:O	1:A:307:MET:HB3	2.21	0.40
1:B:58:THR:HG22	1:B:79:ARG:HB2	2.02	0.40
1:B:96:GLY:HA3	1:B:100:HIS:CE1	2.56	0.40
1:B:244:ALA:HB2	1:B:278:TRP:CE2	2.56	0.40
1:A:307:MET:N	3:A:562:HOH:O	2.53	0.40
1:A:424:TYR:CE1	1:A:477:SER:HB2	2.56	0.40
1:B:42:PRO:HG3	1:B:350:TRP:CE3	2.57	0.40
1:A:447:TYR:OH	3:A:503:HOH:O	2.21	0.40
1:A:478:ILE:HG13	1:A:478:ILE:O	2.22	0.40
1:B:302:PHE:H	1:B:302:PHE:HD1	1.69	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)
1:A:35:GLU:OE2	1:A:260:ARG:NH1[2_555]	2.19	0.01

### 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	447/497 (90%)	419 (94%)	25 (6%)	3 (1%)	19	35
1	B	447/497 (90%)	418 (94%)	28 (6%)	1 (0%)	44	64
All	All	894/994 (90%)	837 (94%)	53 (6%)	4 (0%)	30	49

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	65	GLY
1	B	141	PRO
1	A	141	PRO
1	A	457	GLY

#### 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	376/418 (90%)	366 (97%)	10 (3%)	40	67
1	B	376/418 (90%)	363 (96%)	13 (4%)	31	57
All	All	752/836 (90%)	729 (97%)	23 (3%)	35	62

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

Mol	Chain	Res	Type
1	A	50	THR
1	A	221	ARG
1	A	260	ARG
1	A	303	PRO
1	A	307	MET
1	A	315	ASP
1	A	365	LYS
1	A	375	SER
1	A	434	LYS
1	A	455	SER
1	B	40	LEU
1	B	59	ASP
1	B	117	ARG
1	B	118	HIS
1	B	193	SER
1	B	258	MET
1	B	260	ARG
1	B	315	ASP
1	B	319	ILE
1	B	385	SER
1	B	402	ARG
1	B	454	ASP
1	B	466	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	34	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	X6Y	C	1	2	15,15,15	1.50	3 (20%)	17,23,23	2.05	5 (29%)
2	X2Y	C	2	2	18,18,19	2.12	5 (27%)	19,28,30	1.29	3 (15%)
2	FUC	C	3	2	10,10,11	1.77	4 (40%)	14,14,16	1.03	1 (7%)
2	X6Y	C	4	2	14,14,15	1.78	3 (21%)	17,21,23	1.54	3 (17%)
2	X6Y	D	1	2	15,15,15	1.48	3 (20%)	17,23,23	1.32	3 (17%)
2	X2Y	D	2	2	18,18,19	2.08	5 (27%)	19,28,30	1.26	3 (15%)
2	FUC	D	3	2	10,10,11	1.84	4 (40%)	14,14,16	1.08	1 (7%)
2	X6Y	D	4	2	14,14,15	1.78	3 (21%)	17,21,23	1.55	5 (29%)

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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	X6Y	C	1	2	-	2/5/25/25	0/1/1/1
2	X2Y	C	2	2	-	3/10/27/30	0/1/1/1
2	FUC	C	3	2	-	-	0/1/1/1
2	X6Y	C	4	2	-	3/5/22/25	0/1/1/1
2	X6Y	D	1	2	-	5/5/25/25	0/1/1/1
2	X2Y	D	2	2	-	5/10/27/30	0/1/1/1
2	FUC	D	3	2	-	-	0/1/1/1
2	X6Y	D	4	2	-	1/5/22/25	0/1/1/1

All (30) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	2	X2Y	O5-C5	4.06	1.52	1.43

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	2	X2Y	O5-C5	4.06	1.52	1.43
2	C	2	X2Y	O4-S2	4.03	1.69	1.57
2	D	2	X2Y	O4-S2	3.98	1.69	1.57
2	D	2	X2Y	O2-S1	3.79	1.68	1.57
2	C	2	X2Y	O2-S1	3.79	1.68	1.57
2	D	3	FUC	O5-C1	3.68	1.49	1.43
2	C	3	FUC	O5-C1	3.51	1.49	1.43
2	C	4	X6Y	O2-C2	-3.29	1.42	1.47
2	D	4	X6Y	O5-C5	3.08	1.50	1.43
2	C	1	X6Y	O2-S1	2.88	1.65	1.57
2	D	2	X2Y	O2-C2	-2.86	1.42	1.47
2	C	4	X6Y	O5-C5	2.86	1.49	1.43
2	C	2	X2Y	O2-C2	-2.80	1.43	1.47
2	D	4	X6Y	O2-C2	-2.72	1.43	1.47
2	D	1	X6Y	O2-S1	2.67	1.65	1.57
2	D	3	FUC	C2-C3	-2.65	1.48	1.52
2	C	1	X6Y	O5-C5	2.64	1.50	1.44
2	D	4	X6Y	O2-S1	2.55	1.64	1.57
2	C	3	FUC	C2-C3	-2.53	1.48	1.52
2	C	4	X6Y	O2-S1	2.39	1.64	1.57
2	D	3	FUC	O3-C3	2.24	1.48	1.43
2	C	1	X6Y	O3-C3	2.22	1.48	1.43
2	D	1	X6Y	C3-C4	-2.18	1.46	1.52
2	D	2	X2Y	O3-C3	2.18	1.48	1.43
2	C	3	FUC	O3-C3	2.15	1.48	1.43
2	D	3	FUC	O5-C5	2.15	1.48	1.43
2	C	2	X2Y	O3-C3	2.13	1.48	1.43
2	C	3	FUC	O5-C5	2.11	1.48	1.43
2	D	1	X6Y	O5-C5	2.01	1.49	1.44

All (24) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	1	X6Y	C3-C4-C5	4.84	117.32	109.77
2	C	1	X6Y	O5-C5-C4	3.99	116.67	109.52
2	C	4	X6Y	C3-C4-C5	3.46	115.17	109.77
2	C	1	X6Y	O8-S1-O6	-3.00	100.18	112.22
2	D	4	X6Y	O8-S1-O6	-2.88	100.66	112.22
2	D	4	X6Y	O2-C2-C3	2.87	110.96	106.95
2	C	4	X6Y	O8-S1-O6	-2.73	101.28	112.22
2	D	4	X6Y	C2-O2-S1	2.72	121.45	117.91
2	D	1	X6Y	O8-S1-O6	-2.71	101.34	112.22

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	1	X6Y	O2-C2-C1	2.68	111.18	107.58
2	D	1	X6Y	C6-C5-C4	-2.55	108.35	113.07
2	D	3	FUC	C6-C5-C4	-2.49	108.47	113.07
2	C	2	X2Y	C6-C5-C4	-2.45	109.68	113.41
2	D	4	X6Y	C6-C5-C4	-2.29	108.84	113.07
2	D	4	X6Y	O5-C5-C4	2.28	113.60	109.52
2	D	2	X2Y	C6-C5-C4	-2.27	109.94	113.41
2	C	2	X2Y	C2-O2-S1	-2.27	114.95	117.91
2	C	3	FUC	C6-C5-C4	-2.27	108.89	113.07
2	C	4	X6Y	O5-C5-C4	2.19	113.45	109.52
2	D	2	X2Y	O6-S1-O8	-2.17	100.94	108.49
2	C	1	X6Y	C4-C3-C2	2.11	114.50	109.68
2	D	1	X6Y	O3-C3-C4	-2.05	105.60	110.35
2	C	2	X2Y	O6-S1-O8	-2.04	101.41	108.49
2	D	2	X2Y	O11-S2-O9	-2.02	101.46	108.49

There are no chirality outliers.

All (19) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	1	X6Y	C3-C2-O2-S1
2	C	1	X6Y	C1-C2-O2-S1
2	C	2	X2Y	C4-O4-S2-O10
2	C	2	X2Y	C4-O4-S2-O11
2	C	4	X6Y	C2-O2-S1-O6
2	C	4	X6Y	C2-O2-S1-O7
2	D	1	X6Y	C2-O2-S1-O7
2	D	1	X6Y	C2-O2-S1-O8
2	D	2	X2Y	C2-O2-S1-O6
2	D	2	X2Y	C4-O4-S2-O10
2	D	2	X2Y	C4-O4-S2-O11
2	D	4	X6Y	C1-C2-O2-S1
2	C	2	X2Y	C4-O4-S2-O9
2	C	4	X6Y	C2-O2-S1-O8
2	D	2	X2Y	C2-O2-S1-O7
2	D	2	X2Y	C4-O4-S2-O9
2	D	1	X6Y	C1-C2-O2-S1
2	D	1	X6Y	C3-C2-O2-S1
2	D	1	X6Y	C2-O2-S1-O6

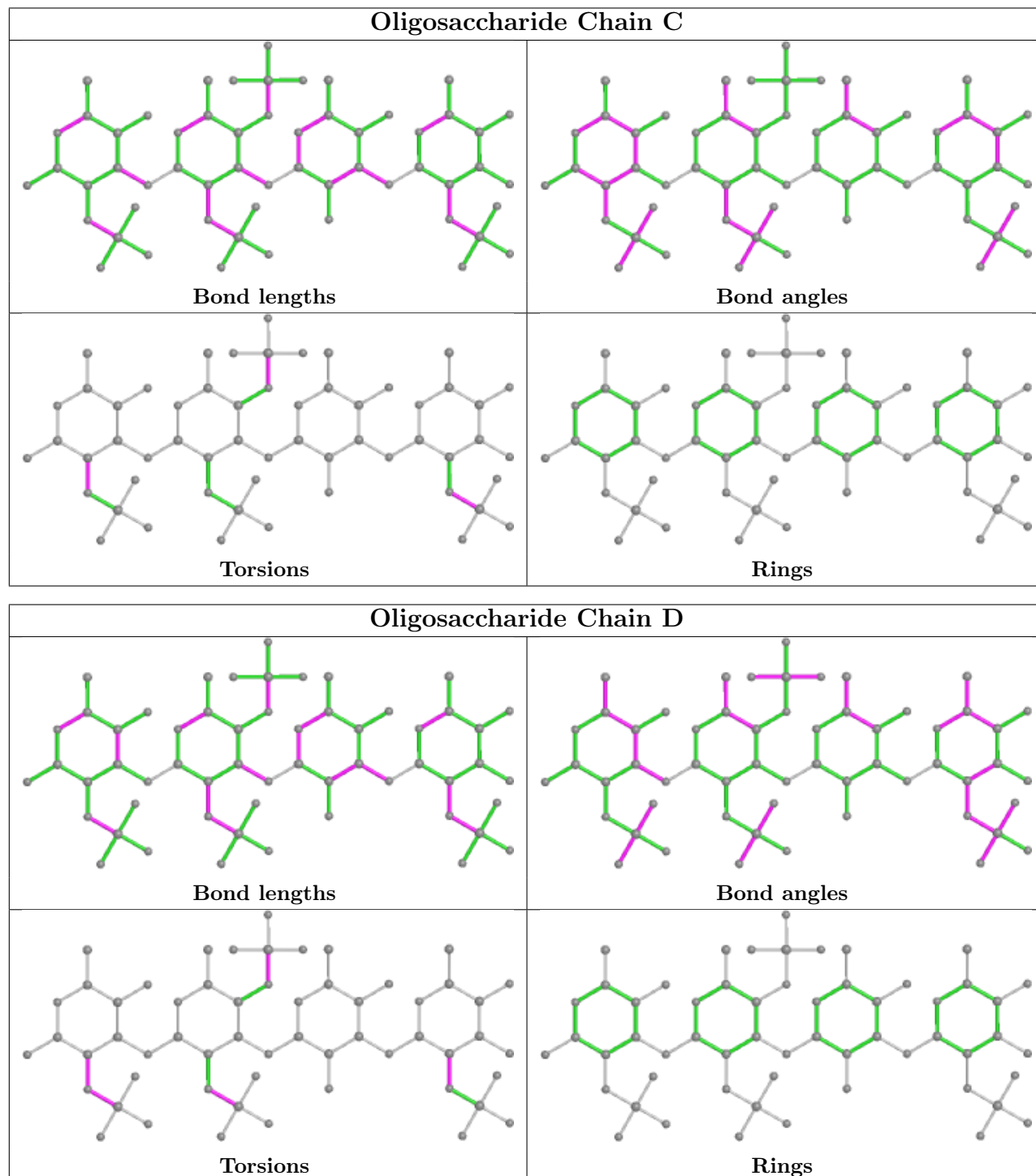
There are no ring outliers.

1 monomer is involved in 1 short contact:



Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	2	X2Y	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](#)

There are no ligands in this entry.

## 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	449/497 (90%)	1.26	74 (16%) 5 5	17, 27, 44, 55	0
1	B	449/497 (90%)	1.26	73 (16%) 5 5	15, 27, 41, 56	0
All	All	898/994 (90%)	1.26	147 (16%) 5 5	15, 27, 43, 56	0

All (147) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	47	PHE	6.1
1	B	120	ASN	4.1
1	B	257	PRO	4.0
1	A	65	GLY	3.8
1	B	380	VAL	3.8
1	A	46	ASP	3.7
1	B	298	GLY	3.6
1	A	294	GLY	3.6
1	B	256	ASN	3.6
1	A	257	PRO	3.5
1	B	48	PRO	3.5
1	A	120	ASN	3.5
1	B	247	SER	3.5
1	A	41	LEU	3.3
1	B	306	GLY	3.3
1	B	473	LEU	3.2
1	A	140	ASP	3.1
1	B	267	GLY	3.1
1	A	440	VAL	3.1
1	A	334	VAL	3.1
1	A	305	THR	3.1
1	B	304	THR	3.1
1	A	400	ILE	3.0
1	B	140	ASP	3.0

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	B	448	ALA	3.0
1	A	302	PHE	3.0
1	A	398	GLY	3.0
1	B	31	PRO	2.9
1	B	384	ILE	2.9
1	A	198	TYR	2.9
1	A	158	PRO	2.9
1	B	307	MET	2.9
1	B	151	CYS	2.9
1	A	303	PRO	2.8
1	A	271	SER	2.8
1	A	385	SER	2.8
1	B	454	ASP	2.8
1	B	139	SER	2.8
1	B	280	ALA	2.8
1	B	266	ASP	2.7
1	B	258	MET	2.7
1	B	420	PRO	2.7
1	A	233	VAL	2.7
1	A	49	LYS	2.7
1	A	427	VAL	2.7
1	A	177	THR	2.7
1	A	408	SER	2.7
1	B	353	TYR	2.7
1	A	123	THR	2.7
1	A	48	PRO	2.7
1	B	141	PRO	2.7
1	B	309	SER	2.7
1	A	390	ASN	2.6
1	B	60	PHE	2.6
1	A	457	GLY	2.6
1	B	54	VAL	2.6
1	A	121	HIS	2.6
1	B	308	ASN	2.6
1	B	254	TRP	2.5
1	A	399	VAL	2.5
1	B	61	VAL	2.5
1	A	479	SER	2.5
1	B	88	GLY	2.5
1	B	302	PHE	2.5
1	A	252	ALA	2.5
1	A	460	LEU	2.5

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	A	99	GLY	2.5
1	B	51	ASP	2.5
1	A	418	PRO	2.4
1	B	292	ALA	2.4
1	A	42	PRO	2.4
1	A	43	VAL	2.4
1	A	455	SER	2.4
1	B	207	GLY	2.4
1	B	200	ARG	2.4
1	B	478	ILE	2.4
1	A	317	THR	2.4
1	B	315	ASP	2.4
1	B	281	PHE	2.4
1	B	34	GLN	2.4
1	B	382	PRO	2.3
1	B	162	ALA	2.3
1	A	319	ILE	2.3
1	B	319	ILE	2.3
1	B	205	ALA	2.3
1	A	445	SER	2.3
1	A	308	ASN	2.3
1	B	53	ALA	2.3
1	A	386	SER	2.2
1	A	137	VAL	2.2
1	A	478	ILE	2.2
1	B	179	LEU	2.2
1	B	325	GLY	2.2
1	A	139	SER	2.2
1	B	129	ASP	2.2
1	A	131	VAL	2.2
1	A	301	VAL	2.2
1	B	424	TYR	2.2
1	A	383	SER	2.2
1	B	261	PHE	2.2
1	B	385	SER	2.2
1	B	468	SER	2.2
1	A	156	GLU	2.2
1	A	454	ASP	2.2
1	A	419	TRP	2.2
1	B	195	VAL	2.2
1	B	295	LEU	2.1
1	A	69	THR	2.1

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	A	91	ILE	2.1
1	A	254	TRP	2.1
1	A	101	LEU	2.1
1	B	324	ALA	2.1
1	B	359	ALA	2.1
1	A	346	GLY	2.1
1	B	251	THR	2.1
1	A	468	SER	2.1
1	B	185	PRO	2.1
1	B	479	SER	2.1
1	B	390	ASN	2.1
1	A	395	ILE	2.1
1	B	262	GLY	2.1
1	A	300	ASP	2.1
1	A	415	VAL	2.1
1	A	432	LEU	2.1
1	B	135	VAL	2.1
1	A	242	TRP	2.1
1	A	448	ALA	2.1
1	B	291	TYR	2.1
1	A	247	SER	2.1
1	A	128	ASN	2.1
1	A	256	ASN	2.1
1	B	46	ASP	2.1
1	A	144	VAL	2.0
1	A	412	ARG	2.0
1	B	402	ARG	2.0
1	A	132	TRP	2.0
1	A	276	GLY	2.0
1	A	31	PRO	2.0
1	A	304	THR	2.0
1	B	417	SER	2.0
1	B	436	SER	2.0
1	B	121	HIS	2.0
1	A	306	GLY	2.0
1	B	253	LYS	2.0
1	A	141	PRO	2.0
1	B	70	THR	2.0
1	B	152	TYR	2.0

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

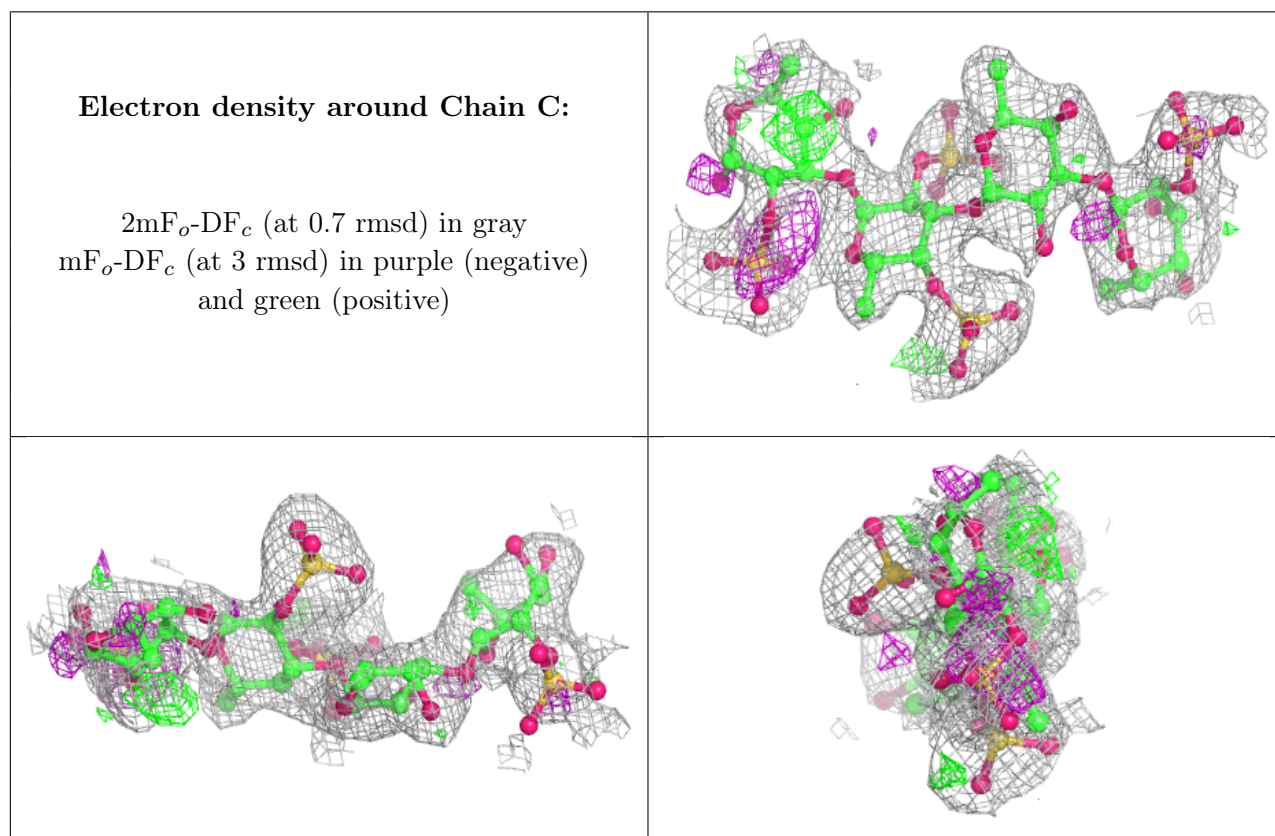
There are no non-standard protein/DNA/RNA residues in this entry.

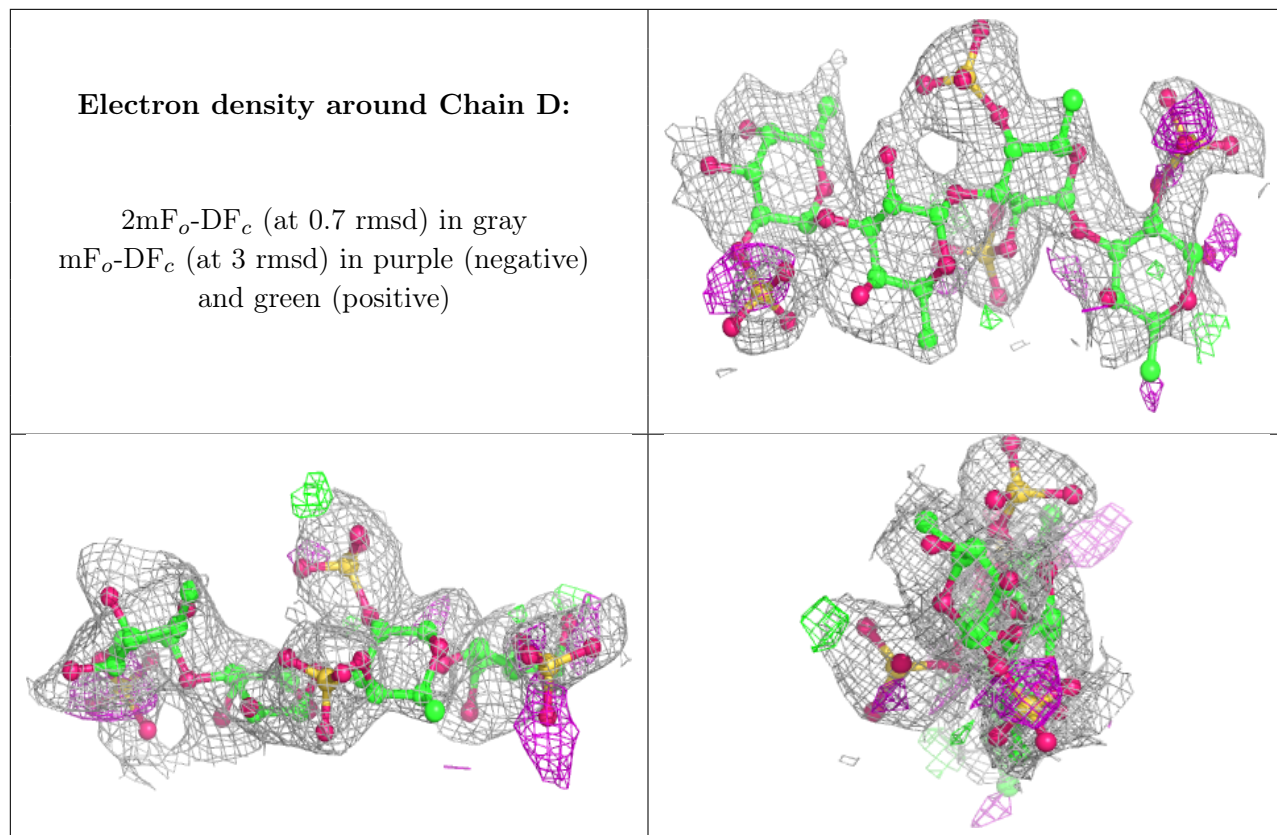
## 6.3 Carbohydrates [i](#)

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
2	X6Y	C	1	15/15	0.51	0.25	23,30,42,44	0
2	X6Y	D	1	15/15	0.58	0.24	29,35,52,63	0
2	X6Y	D	4	14/15	0.60	0.21	23,29,40,46	0
2	X6Y	C	4	14/15	0.63	0.19	29,37,48,54	0
2	FUC	C	3	10/11	0.69	0.15	22,29,32,33	0
2	FUC	D	3	10/11	0.82	0.11	21,24,26,27	0
2	X2Y	D	2	18/19	0.92	0.11	21,27,29,35	0
2	X2Y	C	2	18/19	0.93	0.10	20,26,29,31	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.





## 6.4 Ligands [i](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.