Full wwPDB X-ray Structure Validation Report (i)

Nov 18, 2024 – 12:57 PM JST

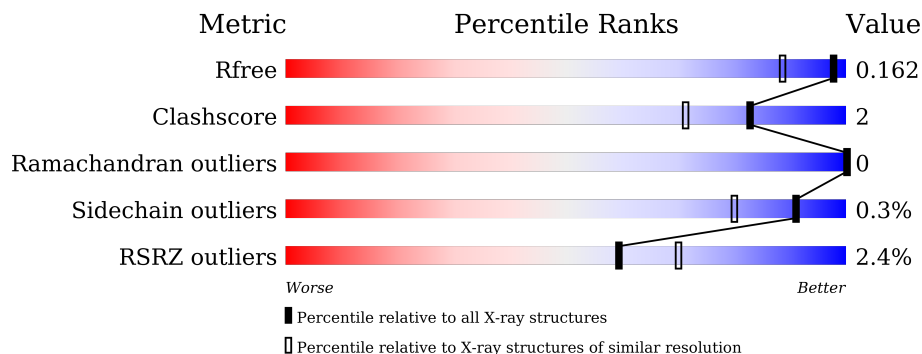|		
PDB ID	:	9JOH
Title	:	COMPLEX STRUCTURE OF ENDO-1,3-FUCANASE (FUN168D) WITH FUCOTETRAOSE FROM ISOSTICHOPUS BADIONOTUS
Authors	:	Chen, G.N.; Chang, Y.G.
Deposited on	:	2024-09-24
Resolution	:	1.36 Å(reported)

1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:
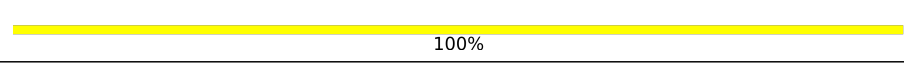*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.36 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	Percentile Ranks	Value
Rfree		0.162
Clashscore		2
Ramachandran outliers		0
Sidechain outliers		0.3%
RSRZ outliers		2.4%

Worse .... Better

▌ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	164625	1089 (1.36-1.36)
Clashscore	180529	1157 (1.36-1.36)
Ramachandran outliers	177936	1146 (1.36-1.36)
Sidechain outliers	177891	1146 (1.36-1.36)
RSRZ outliers	164620	1088 (1.36-1.36)

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 <=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	423	2% • 86% • 12%
1	B	423	2% • 82% • 13%
2	C	4	100%
2	D	4	75% • 25%

2 Entry composition ⓘ

There are 3 unique types of molecules in this entry. The entry contains 13235 atoms, of which 5756 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
1	A	372	Total 5818	C 1905	H 2847	N 475	O 582	S 9	0	2	0
1	B	366	Total 5771	C 1882	H 2833	N 469	O 578	S 9	0	2	0

There are 68 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-33	MET	-	initiating methionine	UNP A0A1B1Y6G8
A	-32	GLY	-	expression tag	UNP A0A1B1Y6G8
A	-31	SER	-	expression tag	UNP A0A1B1Y6G8
A	-30	SER	-	expression tag	UNP A0A1B1Y6G8
A	-29	HIS	-	expression tag	UNP A0A1B1Y6G8
A	-28	HIS	-	expression tag	UNP A0A1B1Y6G8
A	-27	HIS	-	expression tag	UNP A0A1B1Y6G8
A	-26	HIS	-	expression tag	UNP A0A1B1Y6G8
A	-25	HIS	-	expression tag	UNP A0A1B1Y6G8
A	-24	HIS	-	expression tag	UNP A0A1B1Y6G8
A	-23	SER	-	expression tag	UNP A0A1B1Y6G8
A	-22	SER	-	expression tag	UNP A0A1B1Y6G8
A	-21	GLY	-	expression tag	UNP A0A1B1Y6G8
A	-20	LEU	-	expression tag	UNP A0A1B1Y6G8
A	-19	VAL	-	expression tag	UNP A0A1B1Y6G8
A	-18	PRO	-	expression tag	UNP A0A1B1Y6G8
A	-17	ARG	-	expression tag	UNP A0A1B1Y6G8
A	-16	GLY	-	expression tag	UNP A0A1B1Y6G8
A	-15	SER	-	expression tag	UNP A0A1B1Y6G8
A	-14	HIS	-	expression tag	UNP A0A1B1Y6G8
A	-13	MET	-	expression tag	UNP A0A1B1Y6G8
A	-12	ALA	-	expression tag	UNP A0A1B1Y6G8
A	-11	SER	-	expression tag	UNP A0A1B1Y6G8
A	-10	MET	-	expression tag	UNP A0A1B1Y6G8
A	-9	THR	-	expression tag	UNP A0A1B1Y6G8

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-8	GLY	-	expression tag	UNP A0A1B1Y6G8
A	-7	GLY	-	expression tag	UNP A0A1B1Y6G8
A	-6	GLN	-	expression tag	UNP A0A1B1Y6G8
A	-5	GLN	-	expression tag	UNP A0A1B1Y6G8
A	-4	MET	-	expression tag	UNP A0A1B1Y6G8
A	-3	GLY	-	expression tag	UNP A0A1B1Y6G8
A	-2	ARG	-	expression tag	UNP A0A1B1Y6G8
A	-1	GLY	-	expression tag	UNP A0A1B1Y6G8
A	0	SER	-	expression tag	UNP A0A1B1Y6G8
B	-33	MET	-	initiating methionine	UNP A0A1B1Y6G8
B	-32	GLY	-	expression tag	UNP A0A1B1Y6G8
B	-31	SER	-	expression tag	UNP A0A1B1Y6G8
B	-30	SER	-	expression tag	UNP A0A1B1Y6G8
B	-29	HIS	-	expression tag	UNP A0A1B1Y6G8
B	-28	HIS	-	expression tag	UNP A0A1B1Y6G8
B	-27	HIS	-	expression tag	UNP A0A1B1Y6G8
B	-26	HIS	-	expression tag	UNP A0A1B1Y6G8
B	-25	HIS	-	expression tag	UNP A0A1B1Y6G8
B	-24	HIS	-	expression tag	UNP A0A1B1Y6G8
B	-23	SER	-	expression tag	UNP A0A1B1Y6G8
B	-22	SER	-	expression tag	UNP A0A1B1Y6G8
B	-21	GLY	-	expression tag	UNP A0A1B1Y6G8
B	-20	LEU	-	expression tag	UNP A0A1B1Y6G8
B	-19	VAL	-	expression tag	UNP A0A1B1Y6G8
B	-18	PRO	-	expression tag	UNP A0A1B1Y6G8
B	-17	ARG	-	expression tag	UNP A0A1B1Y6G8
B	-16	GLY	-	expression tag	UNP A0A1B1Y6G8
B	-15	SER	-	expression tag	UNP A0A1B1Y6G8
B	-14	HIS	-	expression tag	UNP A0A1B1Y6G8
B	-13	MET	-	expression tag	UNP A0A1B1Y6G8
B	-12	ALA	-	expression tag	UNP A0A1B1Y6G8
B	-11	SER	-	expression tag	UNP A0A1B1Y6G8
B	-10	MET	-	expression tag	UNP A0A1B1Y6G8
B	-9	THR	-	expression tag	UNP A0A1B1Y6G8
B	-8	GLY	-	expression tag	UNP A0A1B1Y6G8
B	-7	GLY	-	expression tag	UNP A0A1B1Y6G8
B	-6	GLN	-	expression tag	UNP A0A1B1Y6G8
B	-5	GLN	-	expression tag	UNP A0A1B1Y6G8
B	-4	MET	-	expression tag	UNP A0A1B1Y6G8
B	-3	GLY	-	expression tag	UNP A0A1B1Y6G8
B	-2	ARG	-	expression tag	UNP A0A1B1Y6G8
B	-1	GLY	-	expression tag	UNP A0A1B1Y6G8

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Chain	Residue	Modelled	Actual	Comment	Reference
B	0	SER	-	expression tag	UNP A0A1B1Y6G8

- Molecule 2 is an oligosaccharide called 2-O-sulfo-alpha-L-fucopyranose-(1-3)-alpha-L-fucopy ranose-(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
2	D	4	Total 95	C 24	H 38	O 29	S 4	0	0	0
2	C	4	Total 95	C 24	H 38	O 29	S 4	0	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	724	Total 724	O 724	0	0
3	B	732	Total 732	O 732	0	0

3 Residue-property plots ⓘ

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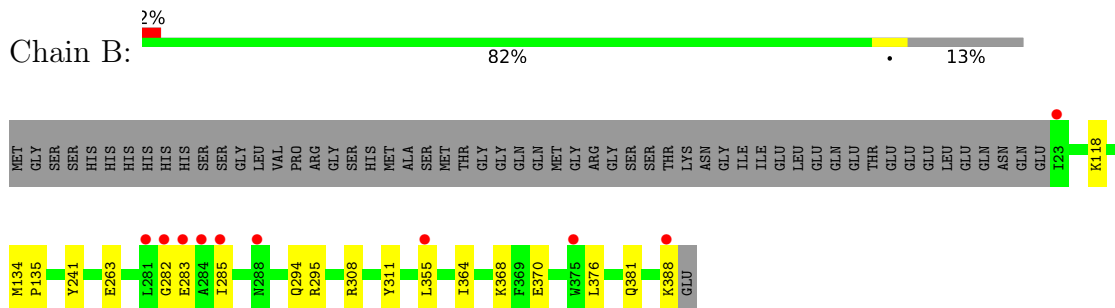 residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

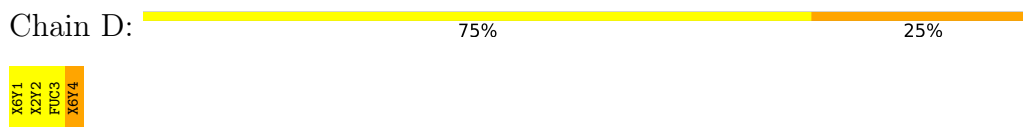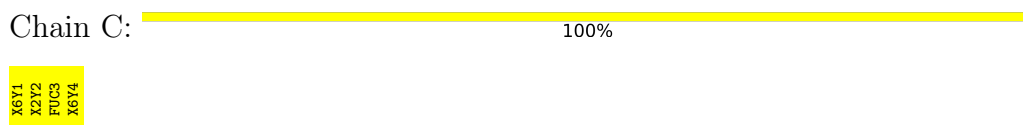• Molecule 1: endo-1.3-fucanase
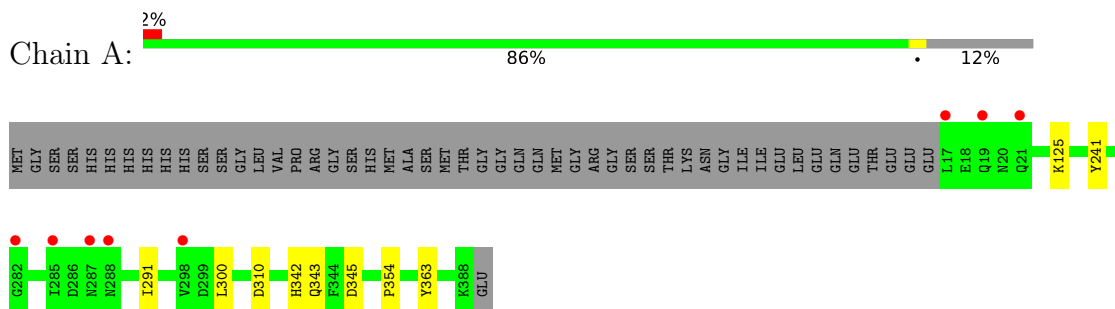
Chain A:

• Molecule 1: endo-1.3-fucanase

Chain B:

• 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:

• 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:

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	54.66Å 138.58Å 63.04Å 90.00° 113.77° 90.00°	Depositor
Resolution (Å)	30.22 – 1.36 30.22 – 1.36	Depositor EDS
% Data completeness (in resolution range)	99.6 (30.22-1.36) 96.6 (30.22-1.36)	Depositor EDS
R_{merge}	0.03	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.01 (at 1.36Å)	Xtriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, R_{free}	0.146 , 0.163 0.146 , 0.162	Depositor DCC
R_{free} test set	180662 reflections (1.08%)	wwPDB-VP
Wilson B-factor (Å^2)	13.1	Xtriage
Anisotropy	0.248	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 42.9	EDS
L-test for twinning[2]	$< |L| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.016 for h,-k,-h-l	Xtriage
F_o,F_c correlation	0.98	EDS
Total number of atoms	13235	wwPDB-VP
Average B, all atoms (Å^2)	20.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.50% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: FUC, X2Y, X6Y

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	0.61	0/3048	0.77	1/4137 (0.0%)
1	B	0.62	0/3014	0.79	0/4090
All	All	0.62	0/6062	0.78	1/8227 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	310	ASP	CB-CG-OD1	5.23	123.01	118.30

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	2971	2847	2837	9	0
1	B	2938	2833	2823	17	0
2	C	57	38	9	0	0
2	D	57	38	9	1	0
3	A	724	0	0	7	2
3	B	732	0	0	9	2
All	All	7479	5756	5678	27	2

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 2.

All (27) 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)
3:A:868:HOH:O	2:D:4:X6Y:O4	1.92	0.86
1:B:283:GLU:O	3:B:401:HOH:O	1.99	0.79
1:A:363:TYR:OH	3:A:401:HOH:O	2.12	0.67
1:A:345:ASP:OD2	3:A:402:HOH:O	2.13	0.66
1:B:294:GLN:NE2	3:B:402:HOH:O	2.25	0.66
1:A:125:LYS:NZ	3:A:405:HOH:O	2.28	0.65
1:B:295:ARG:NH1	3:B:405:HOH:O	2.29	0.64
1:B:355:LEU:HD12	1:B:368:LYS:HG2	1.81	0.62
1:B:308:ARG:NH2	3:B:410:HOH:O	2.38	0.54
1:A:291:ILE:HD12	3:A:1086:HOH:O	2.09	0.52
1:B:118:LYS:HG3	3:B:493:HOH:O	2.08	0.52
1:B:355:LEU:HD21	1:B:370:GLU:HG3	1.91	0.51
1:B:285:ILE:HB	3:B:703:HOH:O	2.14	0.48
1:B:388:LYS:N	1:B:388:LYS:HD3	2.27	0.48
1:A:354:PRO:HG2	3:A:413:HOH:O	2.14	0.47
1:B:263:GLU:HG3	3:B:507:HOH:O	2.15	0.45
1:B:355:LEU:HD12	1:B:368:LYS:CG	2.44	0.45
1:A:300:LEU:HD13	1:A:342[B]:HIS:CG	2.51	0.45
1:A:342[B]:HIS:CG	1:A:343:GLN:N	2.84	0.45
1:B:118:LYS:HD2	3:B:895:HOH:O	2.17	0.44
1:B:364:ILE:HA	1:B:376:LEU:O	2.18	0.44
1:B:134:MET:HB3	1:B:135:PRO:CD	2.48	0.43
1:A:342[B]:HIS:CD2	3:A:747:HOH:O	2.73	0.41
1:A:343:GLN:HG3	1:A:343:GLN:O	2.20	0.41
1:B:282:GLY:HA2	3:B:703:HOH:O	2.20	0.40
1:B:134:MET:HB3	1:B:135:PRO:HD2	2.03	0.40
1:B:311:TYR:CE1	1:B:381:GLN:HA	2.56	0.40

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

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:917:HOH:O	3:B:923:HOH:O[2_546]	1.98	0.22
3:A:798:HOH:O	3:B:963:HOH:O[1_554]	2.05	0.15

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	372/423 (88%)	363 (98%)	9 (2%)	0	100	100
1	B	366/423 (86%)	354 (97%)	12 (3%)	0	100	100
All	All	738/846 (87%)	717 (97%)	21 (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	318/368 (86%)	317 (100%)	1 (0%)	91	80
1	B	318/368 (86%)	317 (100%)	1 (0%)	91	80
All	All	636/736 (86%)	634 (100%)	2 (0%)	91	80

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	241	TYR
1	B	241	TYR

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

Mol	Chain	Res	Type
1	B	343	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 ⓘ

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	1.03	1 (6%)	17,23,23	1.04	1 (5%)
2	X2Y	C	2	2	18,18,19	1.61	4 (22%)	19,28,30	1.37	2 (10%)
2	FUC	C	3	2	10,10,11	1.66	3 (30%)	14,14,16	2.17	7 (50%)
2	X6Y	C	4	2	14,14,15	2.18	6 (42%)	17,21,23	1.91	3 (17%)
2	X6Y	D	1	2	15,15,15	1.02	1 (6%)	17,23,23	0.88	0
2	X2Y	D	2	2	18,18,19	1.37	4 (22%)	19,28,30	1.31	3 (15%)
2	FUC	D	3	2	10,10,11	1.62	3 (30%)	14,14,16	1.48	2 (14%)
2	X6Y	D	4	2	14,14,15	1.87	6 (42%)	17,21,23	1.11	1 (5%)

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	X6Y	C	1	2	-	0/5/25/25	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	-	0/5/22/25	0/1/1/1
2	X6Y	D	1	2	-	0/5/25/25	0/1/1/1

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

All (28) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	4	X6Y	O2-C2	-4.32	1.40	1.47
2	C	2	X2Y	O4-S2	3.84	1.68	1.57
2	C	4	X6Y	O5-C5	3.30	1.50	1.43
2	D	4	X6Y	O2-C2	-3.20	1.42	1.47
2	C	3	FUC	O3-C3	3.07	1.50	1.43
2	C	2	X2Y	O5-C5	3.03	1.50	1.43
2	D	4	X6Y	O2-S1	2.82	1.65	1.57
2	D	2	X2Y	O5-C5	2.78	1.49	1.43
2	C	4	X6Y	C3-C4	-2.71	1.45	1.52
2	C	4	X6Y	O3-C3	2.59	1.49	1.43
2	C	2	X2Y	O2-S1	2.57	1.64	1.57
2	D	2	X2Y	O2-S1	2.57	1.64	1.57
2	C	2	X2Y	C1-C2	2.57	1.55	1.51
2	D	2	X2Y	O4-S2	2.54	1.64	1.57
2	C	4	X6Y	O2-S1	2.53	1.64	1.57
2	C	1	X6Y	O3-C3	2.51	1.48	1.43
2	D	3	FUC	O3-C3	2.51	1.48	1.43
2	D	4	X6Y	O5-C5	2.40	1.48	1.43
2	D	3	FUC	C1-C2	2.37	1.57	1.52
2	C	4	X6Y	C1-C2	2.36	1.55	1.51
2	C	3	FUC	O5-C5	2.31	1.48	1.43
2	D	3	FUC	O5-C5	2.27	1.48	1.43
2	D	4	X6Y	C3-C2	-2.24	1.48	1.53
2	D	4	X6Y	O3-C3	2.23	1.48	1.43
2	D	4	X6Y	O4-C4	2.22	1.48	1.43
2	D	2	X2Y	O2-C2	-2.16	1.44	1.47
2	D	1	X6Y	C1-C2	-2.15	1.50	1.52
2	C	3	FUC	C1-C2	2.11	1.57	1.52

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	C	4	X6Y	C1-C2-C3	5.20	117.18	109.40
2	C	3	FUC	C1-C2-C3	-3.57	105.28	109.67
2	C	3	FUC	O5-C1-C2	3.53	116.22	110.77

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	C	4	X6Y	O5-C5-C4	3.26	115.37	109.52
2	D	2	X2Y	O11-S2-O10	3.21	119.66	108.49
2	C	2	X2Y	O11-S2-O10	3.17	119.51	108.49
2	D	4	X6Y	C1-C2-C3	3.05	113.96	109.40
2	C	4	X6Y	C2-O2-S1	-3.02	113.98	117.91
2	C	3	FUC	C6-C5-C4	2.96	118.54	113.07
2	D	3	FUC	O5-C1-C2	2.95	115.32	110.77
2	C	2	X2Y	O2-C2-C3	2.53	110.48	106.95
2	C	3	FUC	O4-C4-C5	2.47	115.15	109.67
2	D	2	X2Y	C2-O2-S1	-2.34	114.86	117.91
2	D	3	FUC	C6-C5-C4	2.18	117.09	113.07
2	C	1	X6Y	O2-C2-C1	2.17	110.50	107.58
2	D	2	X2Y	O6-S1-O8	2.17	116.02	108.49
2	C	3	FUC	C2-C3-C4	-2.16	107.17	110.89
2	C	3	FUC	O4-C4-C3	-2.14	105.41	110.35
2	C	3	FUC	C3-C4-C5	2.02	112.92	109.77

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	2	X2Y	C4-O4-S2-O11
2	C	2	X2Y	C4-O4-S2-O9
2	C	2	X2Y	C4-O4-S2-O10
2	D	2	X2Y	C4-O4-S2-O10
2	D	2	X2Y	C4-O4-S2-O9

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	4	X6Y	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.

Oligosaccharide Chain D

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain C

Bond lengths

Bond angles

Torsions

Rings
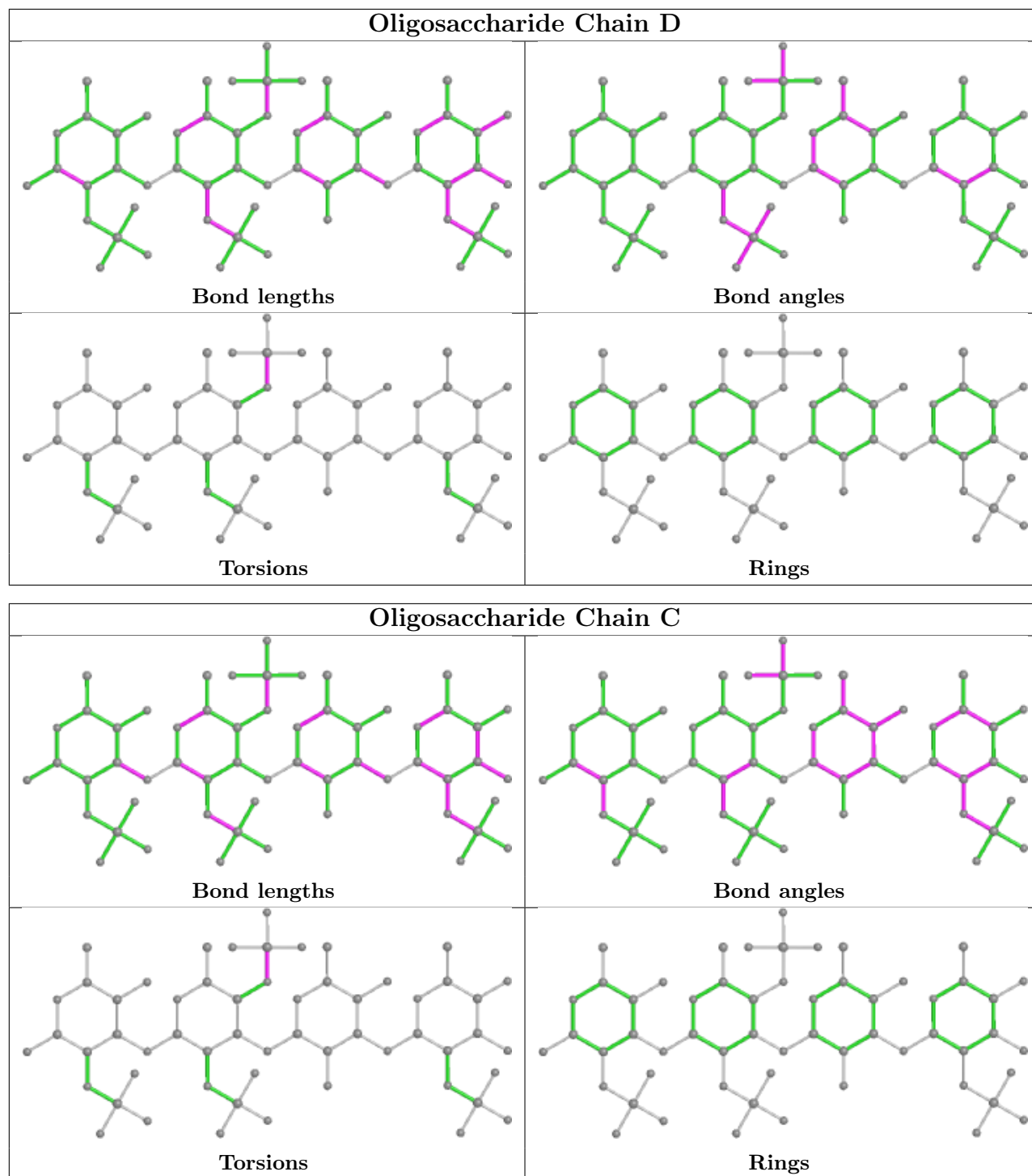
5.6 Ligand geometry ⓘ

There are no ligands in this entry.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

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(Å²)	Q<0.9
1	A	372/423 (87%)	-0.29	8 (2%)	62	73	11, 17, 35, 50	1 (0%)
1	B	366/423 (86%)	-0.20	10 (2%)	56	66	12, 17, 30, 53	1 (0%)
All	All	738/846 (87%)	-0.25	18 (2%)	59	70	11, 17, 33, 53	2 (0%)

All (18) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	285	ILE	6.2
1	B	282	GLY	5.7
1	A	298	VAL	4.7
1	B	375	TRP	3.6
1	A	17	LEU	3.5
1	A	282	GLY	3.3
1	B	281	LEU	3.0
1	B	284	ALA	2.9
1	B	388	LYS	2.7
1	B	23	ILE	2.7
1	B	355	LEU	2.5
1	A	287	ASN	2.4
1	B	283	GLU	2.4
1	A	19	GLN	2.4
1	A	285	ILE	2.3
1	B	288	ASN	2.1
1	A	21	GLN	2.1
1	A	288	ASN	2.1

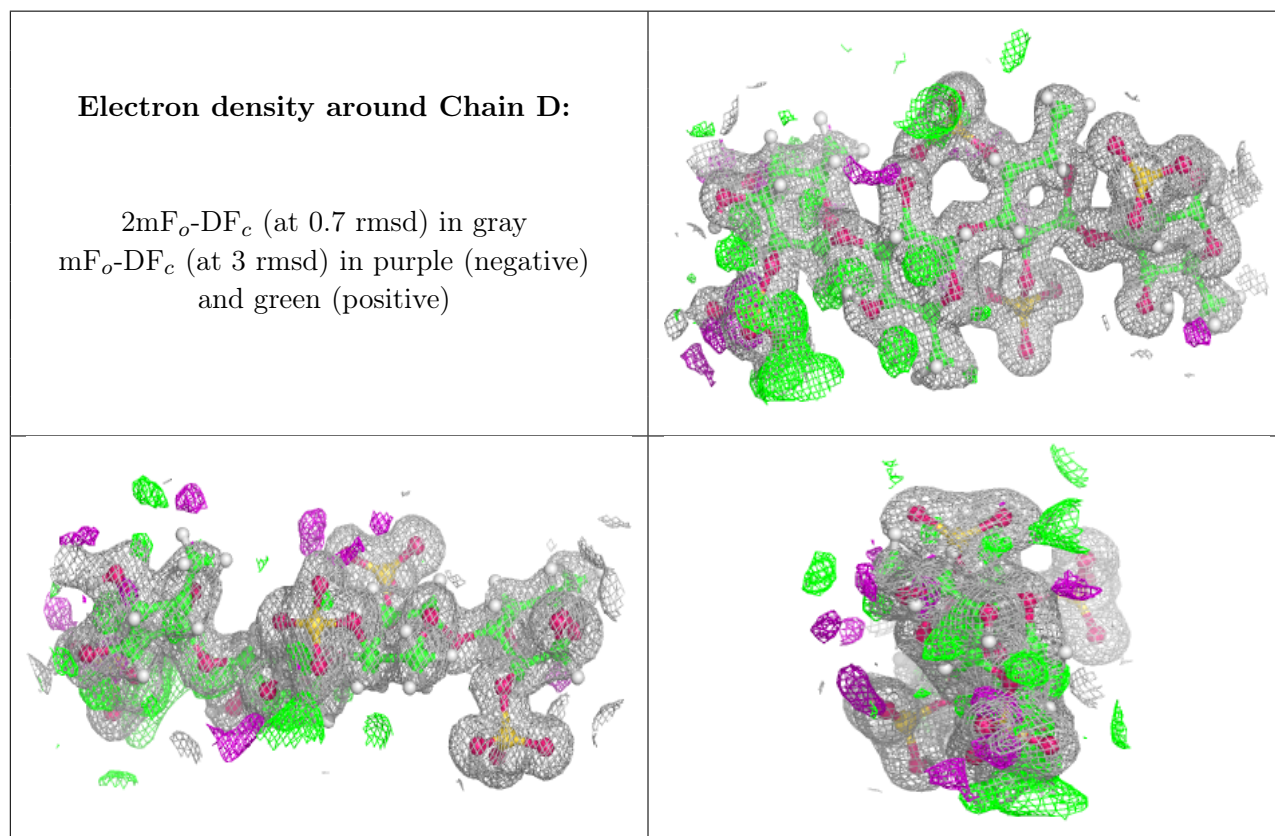## 6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

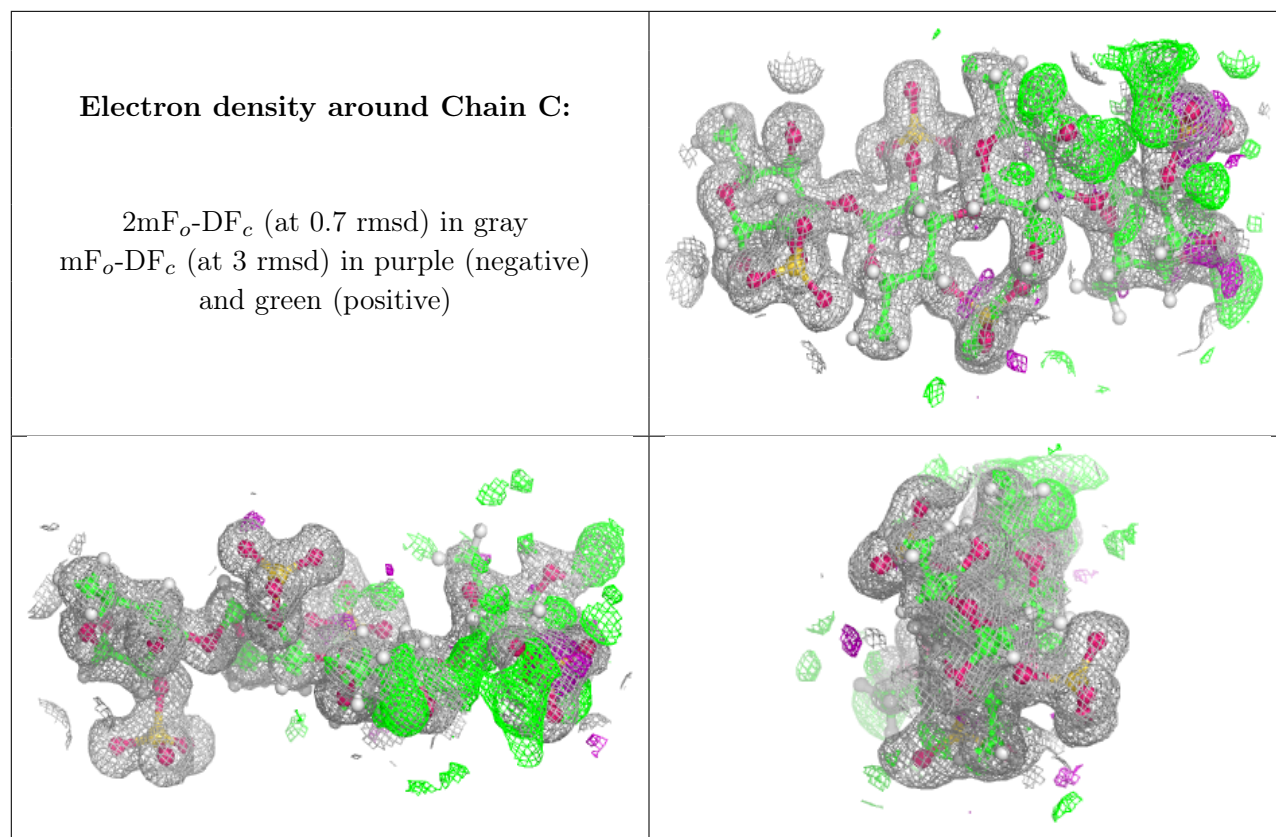There are no non-standard protein/DNA/RNA residues in this entry.

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	X6Y	D	4	14/15	0.92	0.12	14,23,29,36	0
2	FUC	D	3	10/11	0.93	0.08	13,17,21,24	0
2	X6Y	C	4	14/15	0.93	0.11	12,24,34,38	0
2	FUC	C	3	10/11	0.95	0.07	13,16,23,24	0
2	X2Y	D	2	18/19	0.98	0.05	11,14,19,27	0
2	X6Y	C	1	15/15	0.99	0.03	10,11,13,13	0
2	X2Y	C	2	18/19	0.99	0.04	11,13,20,25	0
2	X6Y	D	1	15/15	1.00	0.03	10,12,14,14	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 D:

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

Electron density around Chain C:

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

6.4 Ligands (i)

There are no ligands in this entry.

6.5 Other polymers (i)

There are no such residues in this entry.