wwPDB X-ray Structure Validation Summary Report (i)

Nov 18, 2024 – 12:54 PM JST

PDB ID	:	9JOF
Title	:	COMPLEX STRUCTURE OF ENDO-1,3-FUCANASE (FUN168D) FROM GH168 FAMILY WITH FUCOTRIOSE
Authors	:	Chen, G.N.; Chang, Y.G.
Deposited on	:	2024-09-24
Resolution	:	1.50 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 (i) 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 (1)) were used in the production of this report:

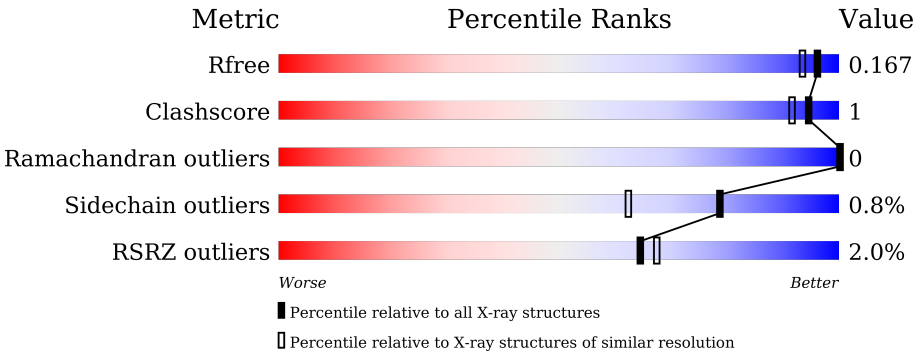
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

1 Overall quality at a glance (i)

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

The reported resolution of this entry is 1.50 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	3717 (1.50-1.50)
Clashscore	180529	4048 (1.50-1.50)
Ramachandran outliers	177936	3970 (1.50-1.50)
Sidechain outliers	177891	3967 (1.50-1.50)
RSRZ outliers	164620	3718 (1.50-1.50)

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 >=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% 13%
1	B	423	2% 83% 13%
2	C	3	100%
2	D	3	100%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 13008 atoms, of which 5654 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	370	Total	C	H	N	O	S	0	1	0
			5739	1879	2805	473	573	9			
1	B	366	Total	C	H	N	O	S	0	0	0
			5708	1869	2791	466	573	9			

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

Continued on next page...

Continued from previous page...

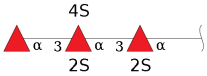
Chain	Residue	Modelled	Actual	Comment	Reference
A	-8	GLY	-	expression tag	UNP A0A1B1Y6G8
A	-7	GLY	-	expression tag	UNP A0A1B1Y6G8
A	-6	GLN	-	expression tag	UNP A0A1B1Y6G8
A	-5	GLN	-	expression tag	UNP A0A1B1Y6G8
A	-4	MET	-	expression tag	UNP A0A1B1Y6G8
A	-3	GLY	-	expression tag	UNP A0A1B1Y6G8
A	-2	ARG	-	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

Continued on next page...

Continued from previous page...

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

- Molecule 2 is an oligosaccharide called 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
2	C	3	Total	C	H	O	S	0	0	0
			72	18	29	22	3			
2	D	3	Total	C	H	O	S	0	0	0
			72	18	29	22	3			

- Molecule 3 is water.

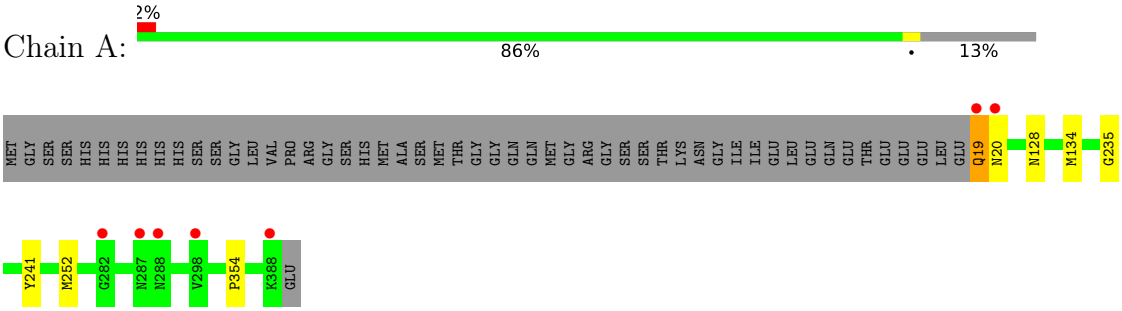
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	706	Total	O	0	0
			706	706		
3	B	711	Total	O	0	0
			711	711		

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.

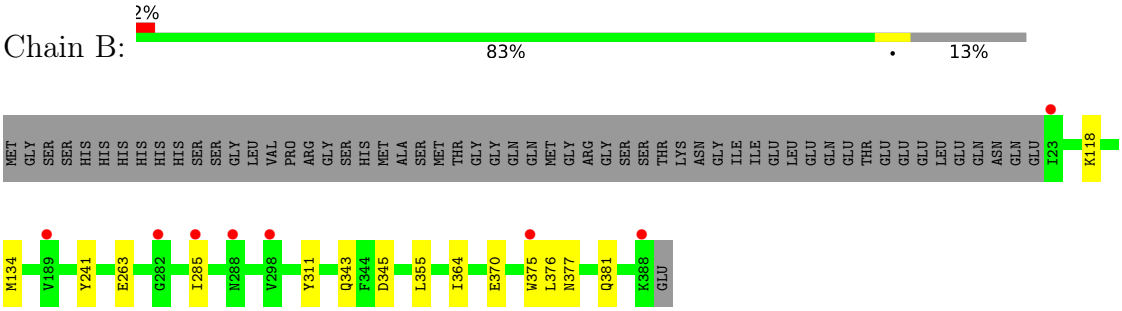
• Molecule 1: endo-1.3-fucanase

Chain A:



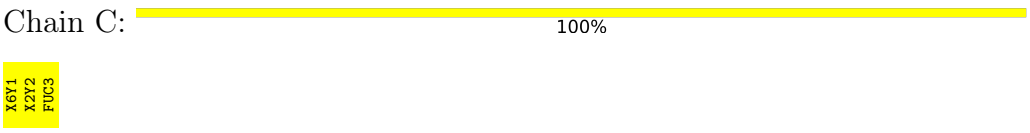
• Molecule 1: endo-1.3-fucanase

Chain B:



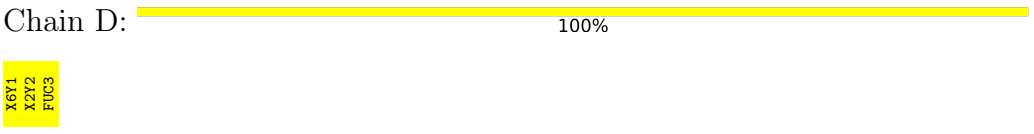
• Molecule 2: alpha-L-fucopyranose-(1-3)-2,4-di-O-sulfo-alpha-L-fucopyranose-(1-3)-2-O-sulfo-alpha-L-fucopyranose

Chain C:



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

Chain D:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	54.82Å 138.33Å 63.06Å 90.00° 113.79° 90.00°	Depositor
Resolution (Å)	30.24 – 1.50 30.24 – 1.50	Depositor EDS
% Data completeness (in resolution range)	98.8 (30.24-1.50) 97.9 (30.24-1.50)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	5.41 (at 1.50Å)	Xtriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, R_{free}	0.141 , 0.169 0.141 , 0.167	Depositor DCC
R_{free} test set	133227 reflections (1.48%)	wwPDB-VP
Wilson B-factor (Å^2)	13.1	Xtriage
Anisotropy	0.330	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.38 , 46.7	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	0.018 for h,-k,-h-l	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	13008	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 5.66% of the height of the origin peak. No significant pseudotranslation is detected.*

[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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: X2Y, FUC, 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	0.43	0/3006	0.66	1/4077 (0.0%)
1	B	0.44	0/2982	0.66	1/4049 (0.0%)
All	All	0.43	0/5988	0.66	2/8126 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	134	MET	CA-CB-CG	-7.29	100.91	113.30
1	B	134	MET	CA-CB-CG	-5.02	104.77	113.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

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	2934	2805	2814	3	0
1	B	2917	2791	2796	11	0
2	C	43	29	10	0	0
2	D	43	29	10	0	0
3	A	706	0	0	2	8
3	B	711	0	0	5	10
All	All	7354	5654	5630	14	10

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.

The worst 5 of 14 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:285:ILE:HB	3:B:416:HOH:O	1.77	0.83
1:B:343:GLN:NE2	3:B:406:HOH:O	2.35	0.60
1:B:375:TRP:CH2	1:B:377:ASN:HB2	2.38	0.58
1:B:285:ILE:O	1:B:285:ILE:HG22	2.10	0.52
1:B:285:ILE:O	1:B:285:ILE:CG2	2.57	0.52

The worst 5 of 10 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:778:HOH:O	3:B:882:HOH:O[2_546]	1.98	0.22
3:A:881:HOH:O	3:B:538:HOH:O[1_454]	2.00	0.20
3:B:830:HOH:O	3:B:834:HOH:O[1_455]	2.00	0.20
3:A:425:HOH:O	3:B:748:HOH:O[2_546]	2.03	0.17
3:A:918:HOH:O	3:B:976:HOH:O[1_454]	2.04	0.16

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	369/423 (87%)	359 (97%)	10 (3%)	0	100	100
1	B	364/423 (86%)	350 (96%)	14 (4%)	0	100	100
All	All	733/846 (87%)	709 (97%)	24 (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	313/368 (85%)	309 (99%)	4 (1%)	65 41
1	B	311/368 (84%)	310 (100%)	1 (0%)	91 82
All	All	624/736 (85%)	619 (99%)	5 (1%)	79 62

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	19	GLN
1	A	128	ASN
1	A	241	TYR
1	A	252	MET
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	A	19	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

6 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	1.19	2 (13%)	17,23,23	0.90	1 (5%)
2	X2Y	C	2	2	18,18,19	1.73	5 (27%)	19,28,30	1.01	0
2	FUC	C	3	2	10,10,11	1.28	1 (10%)	14,14,16	0.75	0
2	X6Y	D	1	2	15,15,15	1.29	2 (13%)	17,23,23	0.82	1 (5%)
2	X2Y	D	2	2	18,18,19	1.85	5 (27%)	19,28,30	1.15	2 (10%)
2	FUC	D	3	2	10,10,11	1.39	1 (10%)	14,14,16	0.76	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	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	D	1	2	-	0/5/25/25	0/1/1/1
2	X2Y	D	2	2	-	3/10/27/30	0/1/1/1
2	FUC	D	3	2	-	-	0/1/1/1

The worst 5 of 16 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	2	X2Y	O2-C2	-4.35	1.40	1.47
2	C	2	X2Y	O2-C2	-4.30	1.40	1.47
2	D	3	FUC	C2-C3	-3.02	1.48	1.52
2	C	3	FUC	C2-C3	-3.02	1.48	1.52
2	C	2	X2Y	O2-S1	3.02	1.66	1.57

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	2	X2Y	C1-C2-C3	3.32	114.37	109.40
2	D	2	X2Y	O2-C2-C3	2.38	110.28	106.95

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	1	X6Y	O5-C5-C4	2.20	113.46	109.52
2	C	1	X6Y	O5-C5-C4	2.07	113.23	109.52

There are no chirality outliers.

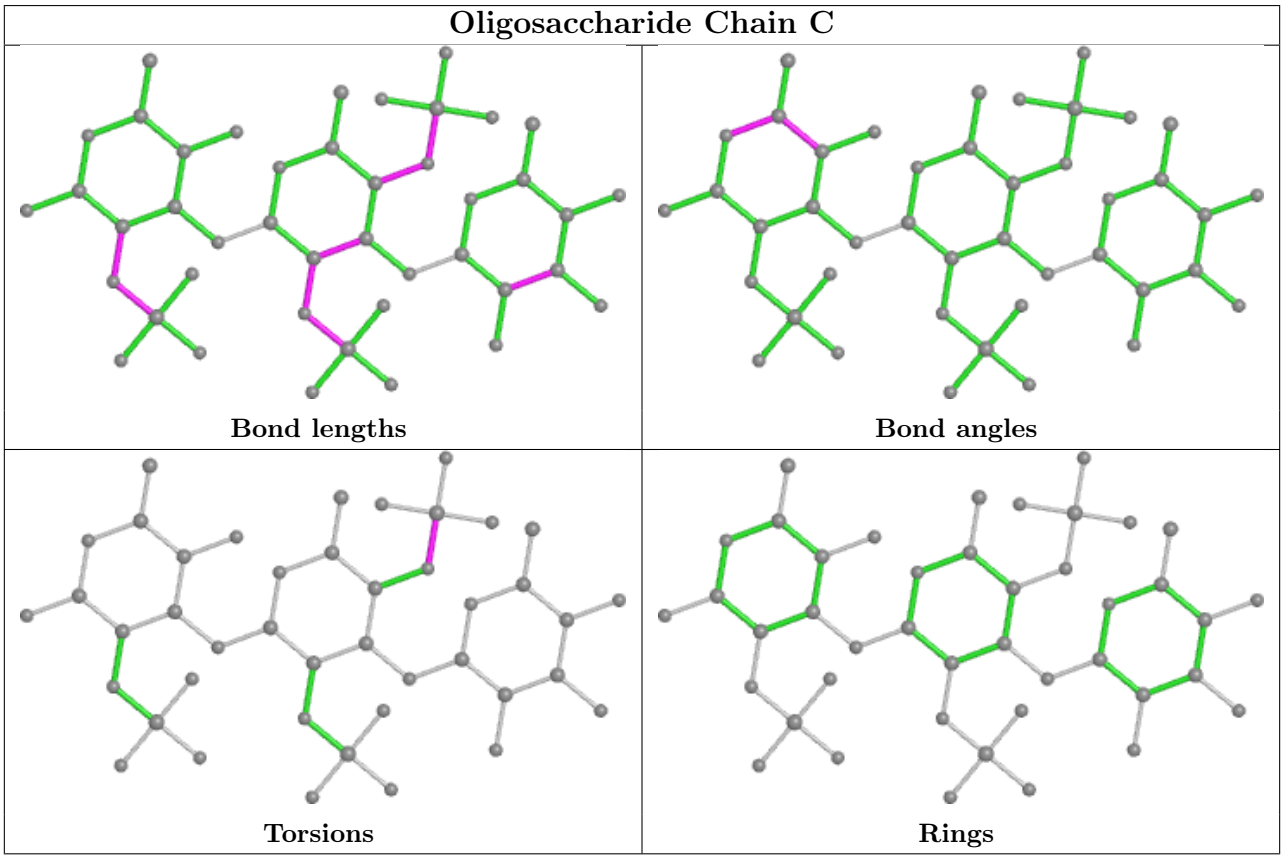
5 of 6 torsion outliers are listed below:

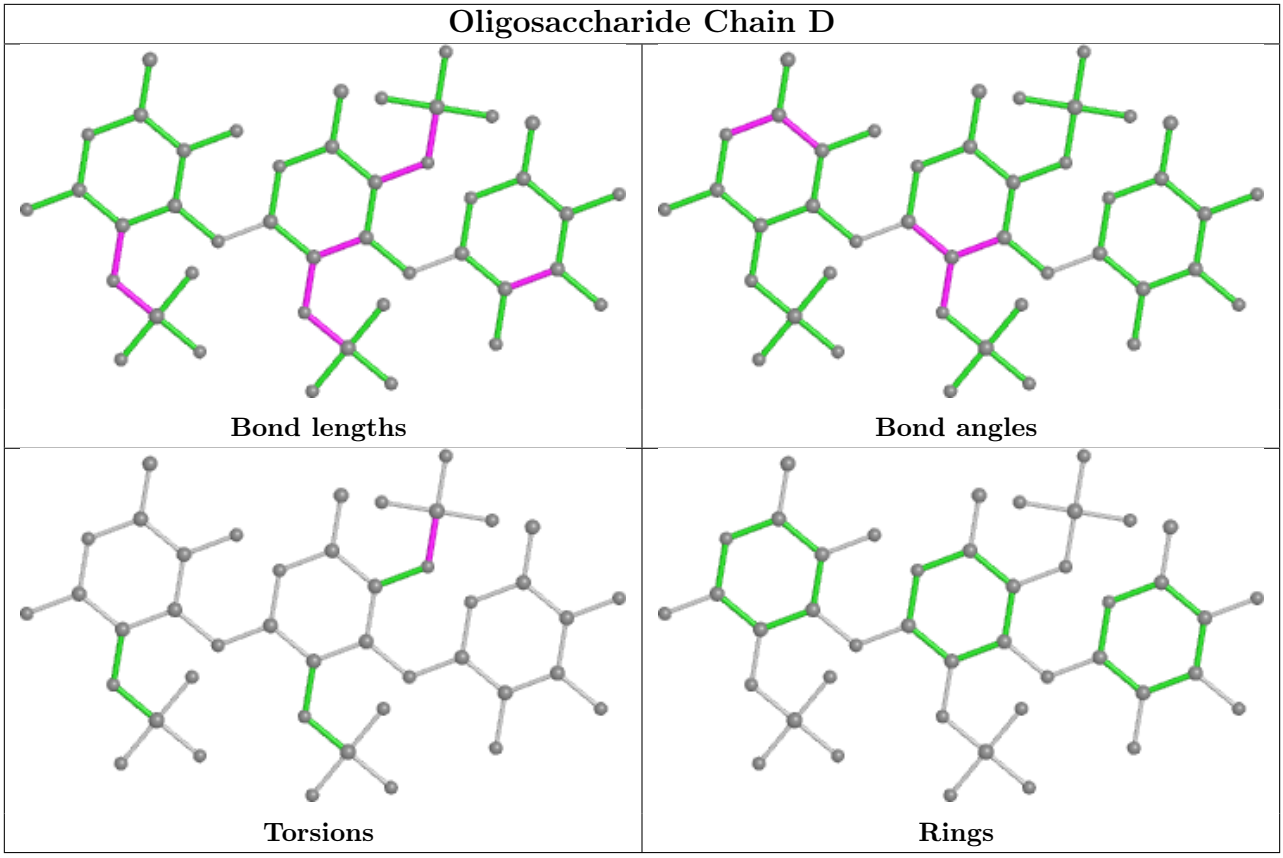
Mol	Chain	Res	Type	Atoms
2	C	2	X2Y	C4-O4-S2-O11
2	D	2	X2Y	C4-O4-S2-O9
2	D	2	X2Y	C4-O4-S2-O11
2	C	2	X2Y	C4-O4-S2-O9
2	D	2	X2Y	C4-O4-S2-O10

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

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, 95^{th} 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	370/423 (87%)	-0.52	7 (1%)	66	69	11, 16, 34, 42	1 (0%)
1	B	366/423 (86%)	-0.43	8 (2%)	62	65	11, 17, 31, 45	0
All	All	736/846 (86%)	-0.47	15 (2%)	64	67	11, 17, 33, 45	1 (0%)

The worst 5 of 15 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	375	TRP	8.5
1	B	285	ILE	4.5
1	B	23	ILE	3.9
1	A	287	ASN	3.7
1	B	189	VAL	3.3

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

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^{th} 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	1	15/15	0.96	0.07	13,17,20,21	0
2	FUC	D	3	10/11	0.96	0.06	15,20,24,28	0
2	X2Y	D	2	18/19	0.97	0.06	15,19,23,25	0
2	FUC	C	3	10/11	0.98	0.04	11,16,19,20	0
2	X6Y	C	1	15/15	0.99	0.04	11,12,15,15	0

Continued on next page...

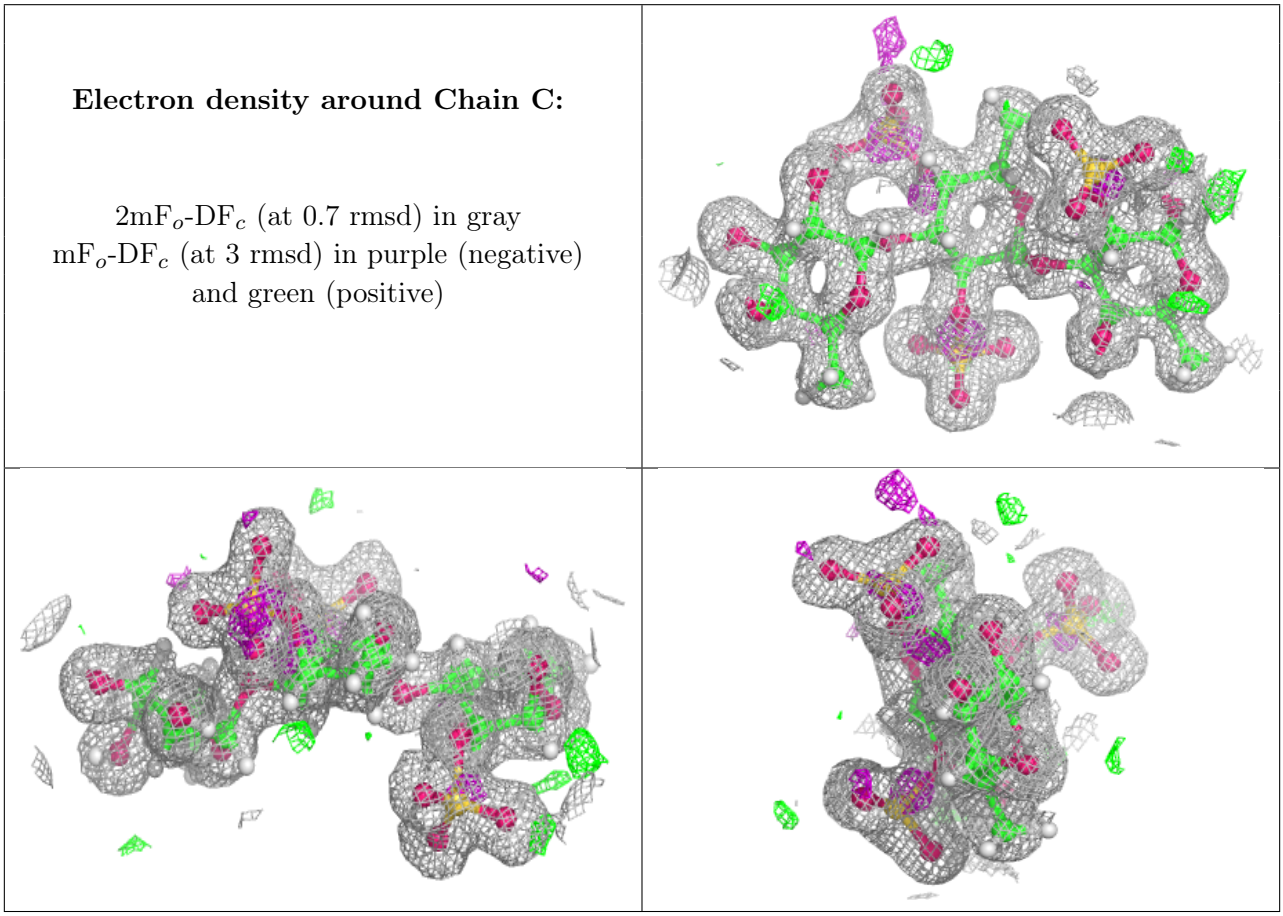
Continued from previous page...

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	X2Y	C	2	18/19	0.99	0.04	11,14,16,18	0

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

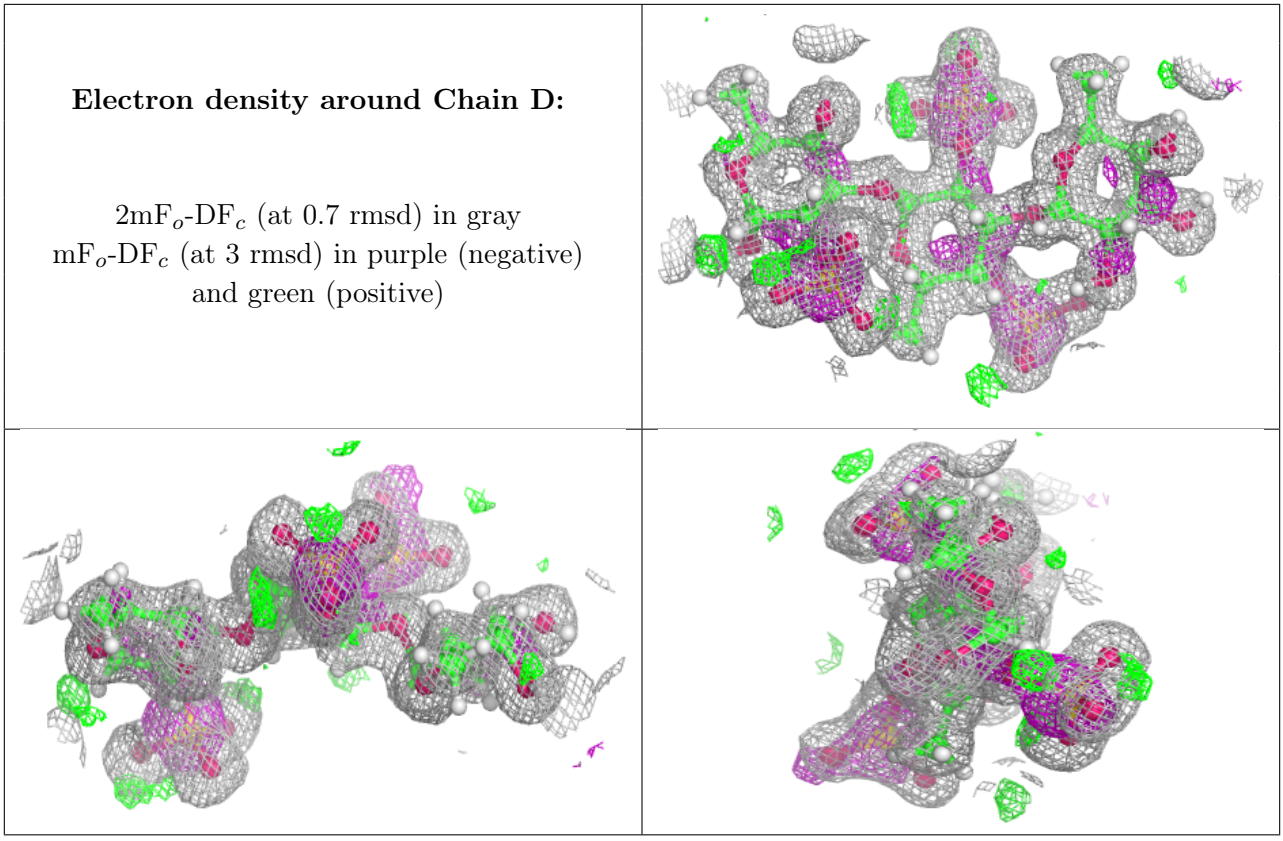
Electron density around Chain C:

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



Electron density around Chain D:

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



6.4 Ligands

There are no ligands in this entry.

6.5 Other polymers

There are no such residues in this entry.