

wwPDB X-ray Structure Validation Summary Report (i)

Jul 26, 2023 – 01:08 AM EDT

PDB ID : 1A0T

Title : SUCROSE-SPECIFIC PORIN, WITH BOUND SUCROSE MOLECULES

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: 1997-12-08 Deposited on

2.40 Å(reported) Resolution

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

> 1.8.5 (274361), CSD as541be (2020) Mogul

Xtriage (Phenix) 1.13

EDS 2.34

Percentile statistics 20191225.v01 (using entries in the PDB archive December 25th 2019)

> Refmac 5.8.0158

CCP47.0.044 (Gargrove)

Ideal geometry (proteins) Engh & Huber (2001) Ideal geometry (DNA, RNA) Parkinson et al. (1996)

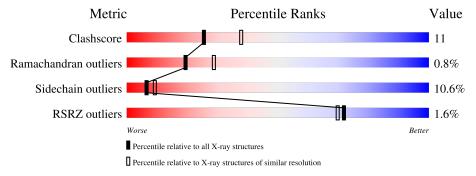
Validation Pipeline (wwPDB-VP) : 2.34

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 2.40 Å.

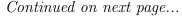
Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive	Similar resolution
Metric	$(\# \mathrm{Entries})$	$(\# ext{Entries}, ext{ resolution range}(ext{Å}))$
Clashscore	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

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 chai	in		
1	Р	413	75%		21%	•
1	Q	413	77%		19%	•
1	R	413	75%		20%	5%
2	A	2	50%	50%		
2	В	2	100%			
2	С	2	100%			
2	D	2	100%			





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Mol	Chain	Length	Quality of chain
2	E	2	100%
2	F	2	100%



2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 10077 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 SUCROSE-SPECIFIC PORIN.

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace		
1	Р	413	Total	С	N	О	S	0	0	0
1	1	410	3202	2011	553	628	10	0	0	U
1	0	413	Total	С	N	О	S	0	0	0
1	Q	410	3202	2011	553	628	10	0	0	
1	R	413	Total	С	N	О	S	0	0	0
1	Ιι.	410	3202	2011	553	628	10	0	0	

• Molecule 2 is an oligosaccharide called beta-D-fructofuranose-(2-1)-alpha-D-glucopyranose.



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf	Trace
2	A	2	Total C O 23 12 11	0	0	0
2	В	2	Total C O 23 12 11	0	0	0
2	С	2	Total C O 23 12 11	0	0	0
2	D	2	Total C O 23 12 11	0	0	0
2	Е	2	Total C O 23 12 11	0	0	0
2	F	2	Total C O 23 12 11	0	0	0

• Molecule 3 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	Р	1	Total Ca 1 1	0	0



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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	Q	1	Total Ca 1 1	0	0
3	R	1	Total Ca 1 1	0	0

• Molecule 4 is water.

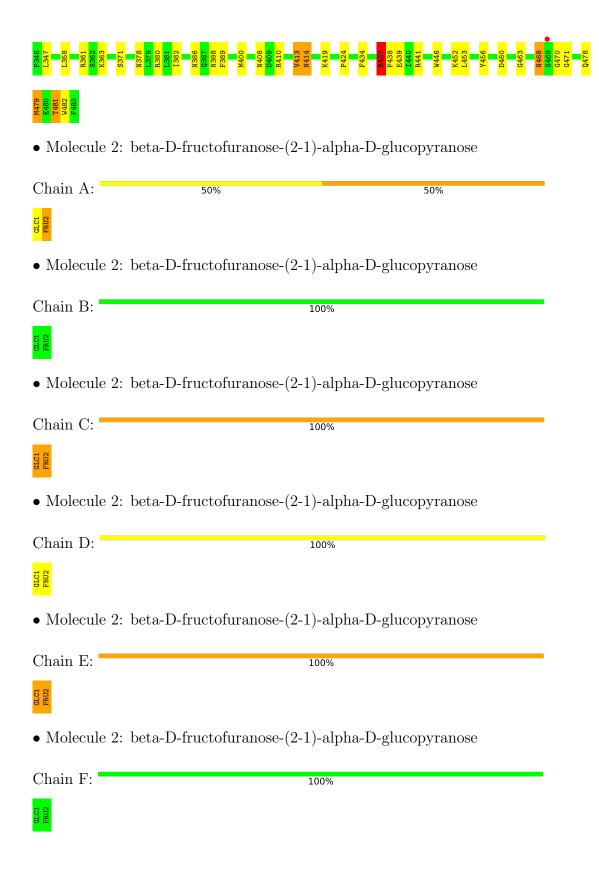
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	Р	109	Total O 109 109	0	0
4	Q	111	Total O 111 111	0	0
4	R	110	Total O 110 110	0	0



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: SUCROSE-SPECIFIC PORIN Chain P: 75% • Molecule 1: SUCROSE-SPECIFIC PORIN Chain Q: 77% 19% • Molecule 1: SUCROSE-SPECIFIC PORIN Chain R: 75% 20% 5%





4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 32	Depositor
Cell constants	111.80Å 111.80Å 147.80Å	D
a, b, c, α , β , γ	90.00° 90.00° 120.00°	Depositor
Resolution (Å)	100.00 - 2.40	Depositor
Resolution (A)	15.76 - 2.30	EDS
% Data completeness	67.4 (100.00-2.40)	Depositor
(in resolution range)	66.9 (15.76-2.30)	EDS
R_{merge}	(Not available)	Depositor
R_{sum}	0.15	Depositor
$< I/\sigma(I) > 1$	0.19 (at 2.29Å)	Xtriage
Refinement program	X-PLOR 3.851	Depositor
D.D.	0.207 , 0.246	Depositor
R, R_{free}	0.204 , (Not available)	DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	22.0	Xtriage
Anisotropy	0.032	Xtriage
Bulk solvent $k_{sol}(e/Å^3)$, $B_{sol}(Å^2)$	0.33, 51.8	EDS
L-test for twinning ²	$< L >=0.50, < L^2>=0.33$	Xtriage
	0.000 for -h,-k,l	
Estimated twinning fraction	0.050 for h,-h-k,-l	Xtriage
	0.000 for -k,-h,-l	
F_o, F_c correlation	0.93	EDS
Total number of atoms	10077	wwPDB-VP
Average B, all atoms (Å ²)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: The analyses of the Patterson function reveals a significant off-origin peak that is 56.29 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 2.7954e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.

²Theoretical 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.



¹Intensities estimated from amplitudes.

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: CA, GLC, FRU

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		
IVIOI		RMSZ	# Z > 5	RMSZ	# Z > 5	
1	Р	0.56	0/3283	0.81	4/4443 (0.1%)	
1	Q	0.55	0/3283	0.82	$4/4443 \ (0.1\%)$	
1	R	0.56	0/3283	0.82	4/4443 (0.1%)	
All	All	0.56	0/9849	0.82	12/13329 (0.1%)	

There are no bond length outliers.

The worst 5 of 12 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	$Observed(^o)$	$\operatorname{Ideal}({}^{o})$
1	R	437	ARG	N-CA-C	8.26	133.31	111.00
1	Q	437	ARG	N-CA-C	8.26	133.29	111.00
1	Р	437	ARG	N-CA-C	8.23	133.22	111.00
1	Р	263	LEU	CA-CB-CG	6.31	129.82	115.30
1	Р	291	LEU	CA-CB-CG	6.02	129.15	115.30

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	Р	3202	0	2985	69	0
1	Q	3202	0	2985	66	0
1	R	3202	0	2985	75	0



Q 1: 1	C		
Continued	trom	nremous	naae
Continueu	110116	predidus	paye.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	23	0	21	3	0
2	В	23	0	21	0	0
2	С	23	0	21	4	0
2	D	23	0	21	0	0
2	Ε	23	0	21	3	0
2	F	23	0	21	0	0
3	Р	1	0	0	0	0
3	Q	1	0	0	0	0
3	R	1	0	0	0	0
4	Р	109	0	0	3	0
4	Q	111	0	0	4	0
4	R	110	0	0	5	0
All	All	10077	0	9081	200	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 11.

The worst 5 of 200 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	$egin{aligned} & ext{Interatomic} \ & ext{distance} \ & ext{(Å)} \end{aligned}$	$egin{aligned} ext{Clash} \ ext{overlap } (ext{Å}) \end{aligned}$
1:P:110:ARG:HH11	1:P:114:GLN:HE22	1.15	0.93
1:Q:250:ASN:HD21	1:Q:257:GLN:HE21	1.21	0.88
1:R:110:ARG:HH11	1:R:114:GLN:HE22	1.21	0.88
1:P:150:ASP:O	1:Q:161:ARG:HD2	1.76	0.86
1:Q:110:ARG:HH11	1:Q:114:GLN:HE22	1.24	0.85

There are no symmetry-related clashes.

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	Perce	entiles
1	Р	411/413 (100%)	387 (94%)	21 (5%)	3 (1%)	22	32
1	Q	411/413 (100%)	389 (95%)	18 (4%)	4 (1%)	15	23
1	R	411/413 (100%)	390 (95%)	18 (4%)	3 (1%)	22	32
All	All	1233/1239 (100%)	1166 (95%)	57 (5%)	10 (1%)	19	29

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	Р	218	ASN
1	Q	218	ASN
1	R	218	ASN
1	Q	220	GLY
1	R	220	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	Р	327/327 (100%)	292 (89%)	35 (11%)		6	9	
1	Q	327/327 (100%)	293 (90%)	34 (10%)		7	10	
1	R	327/327 (100%)	292 (89%)	35 (11%)		6	9	
All	All	981/981 (100%)	877 (89%)	104 (11%)		6	9	

5 of 104 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	Q	380	ARG
1	R	111	LEU
1	R	460	ASP
1	Q	408	ASN
1	Q	468	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 49 such sidechains are listed below:



Mol	Chain	Res	Type
1	Q	387	GLN
1	R	162	GLN
1	Q	398	GLN
1	Q	478	GLN
1	R	218	ASN

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)

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).

Mal	Mol Type Chain Res				Res Link Bond lengths				Bond angles			
Mol	Type	Chain	Res	Link	Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2		
2	GLC	A	1	2	11,11,12	0.93	0	15,15,17	0.95	0		
2	FRU	A	2	2	11,12,12	1.23	1 (9%)	10,18,18	0.79	0		
2	GLC	В	1	2	11,11,12	0.69	0	15,15,17	0.79	0		
2	FRU	В	2	2	11,12,12	0.69	0	10,18,18	0.57	0		
2	GLC	С	1	2	11,11,12	1.06	1 (9%)	15,15,17	0.98	1 (6%)		
2	FRU	С	2	2	11,12,12	1.39	1 (9%)	10,18,18	0.94	0		
2	GLC	D	1	2	11,11,12	0.56	0	15,15,17	1.06	1 (6%)		
2	FRU	D	2	2	11,12,12	0.91	1 (9%)	10,18,18	0.60	0		
2	GLC	Е	1	2	11,11,12	1.00	1 (9%)	15,15,17	0.95	0		
2	FRU	Е	2	2	11,12,12	1.27	1 (9%)	10,18,18	0.96	1 (10%)		
2	GLC	F	1	2	11,11,12	0.68	0	15,15,17	0.75	0		
2	FRU	F	2	2	11,12,12	0.70	0	10,18,18	0.58	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	GLC	A	1	2	-	2/2/19/22	0/1/1/1
2	FRU	A	2	2	-	4/5/24/24	0/1/1/1
2	GLC	В	1	2	-	2/2/19/22	0/1/1/1
2	FRU	В	2	2	-	0/5/24/24	0/1/1/1
2	GLC	С	1	2	-	2/2/19/22	0/1/1/1
2	FRU	С	2	2	-	5/5/24/24	0/1/1/1
2	GLC	D	1	2	-	0/2/19/22	0/1/1/1
2	FRU	D	2	2	-	0/5/24/24	0/1/1/1
2	GLC	E	1	2	-	2/2/19/22	0/1/1/1
2	FRU	E	2	2	-	3/5/24/24	0/1/1/1
2	GLC	F	1	2	-	2/2/19/22	0/1/1/1
2	FRU	F	2	2	-	2/5/24/24	0/1/1/1

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	\mathbf{Z}	$\mathbf{Observed}(\mathbf{\mathring{A}})$	$Ideal(\AA)$
2	С	2	FRU	O2-C2	4.26	1.48	1.40
2	Е	2	FRU	O2-C2	3.79	1.47	1.40
2	A	2	FRU	O2-C2	3.67	1.47	1.40
2	D	2	FRU	O2-C2	2.30	1.44	1.40
2	Е	1	GLC	O5-C1	2.05	1.47	1.43

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	\mathbf{Z}	$\mathbf{Observed}(^{o})$	$\operatorname{Ideal}({}^o)$
2	Е	2	FRU	O1-C1-C2	-2.28	107.02	111.86
2	D	1	GLC	C1-O5-C5	2.16	115.11	112.19
2	С	1	GLC	O5-C1-C2	-2.06	107.60	110.77

There are no chirality outliers.

5 of 24 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	С	2	FRU	O1-C1-C2-C3
2	С	2	FRU	O1-C1-C2-O2
2	Е	2	FRU	C4-C5-C6-O6



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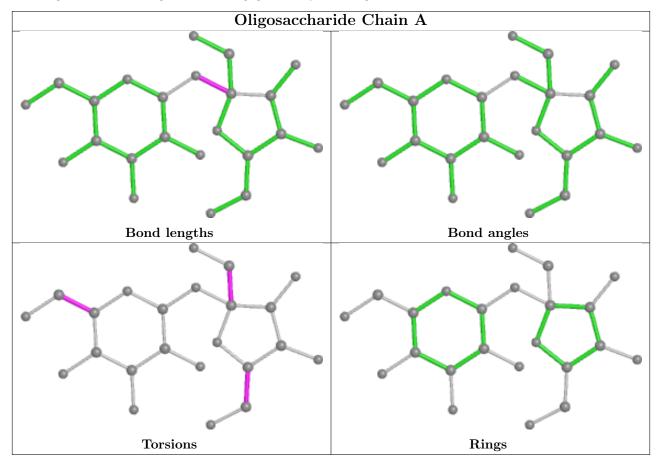
Mol	Chain	Res	Type	Atoms
2	A	2	FRU	C4-C5-C6-O6
2	A	2	FRU	O5-C5-C6-O6

There are no ring outliers.

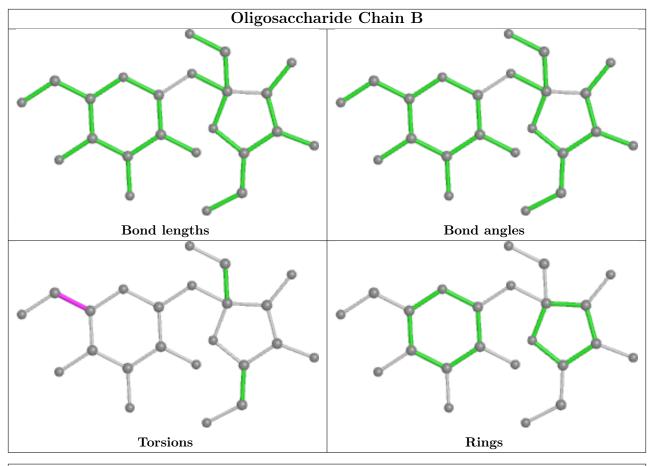
6 monomers are involved in 10 short contacts:

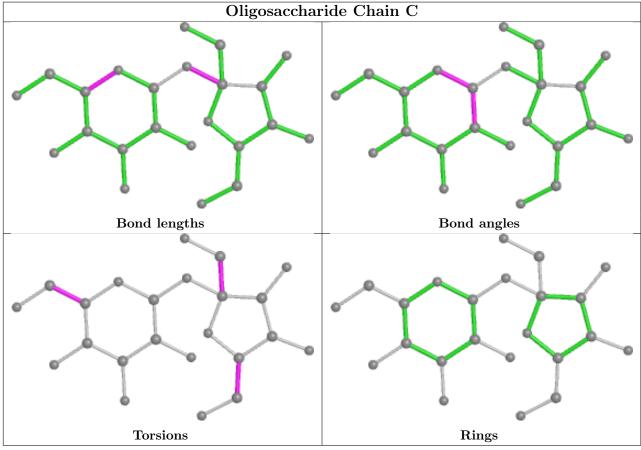
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	С	2	FRU	2	0
2	С	1	GLC	2	0
2	Е	2	FRU	2	0
2	A	2	FRU	2	0
2	A	1	GLC	1	0
2	Е	1	GLC	1	0

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

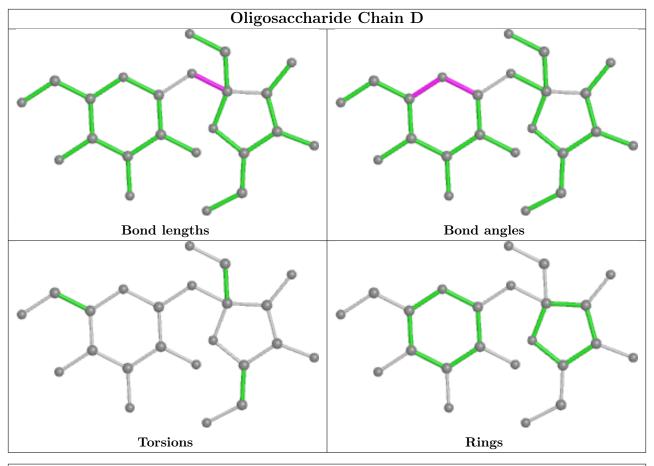


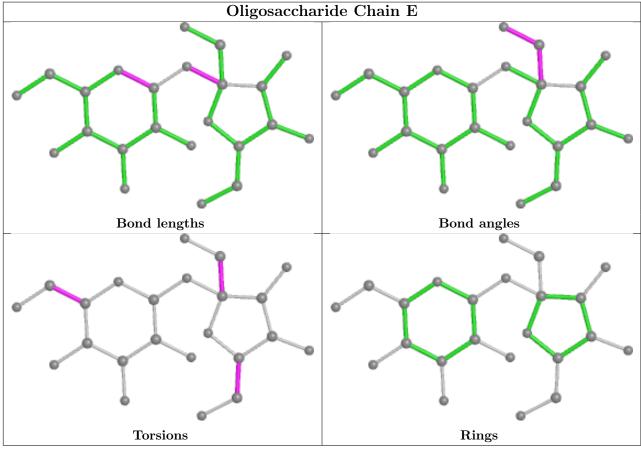




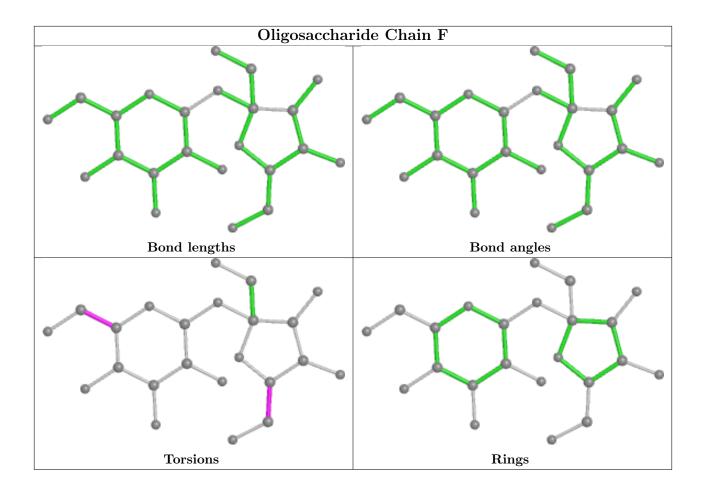












5.6 Ligand geometry (i)

Of 3 ligands modelled in this entry, 3 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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 (i)

6.1 Protein, DNA and RNA chains (i)

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>	# RSRZ > 2		$OWAB(A^2)$	Q<0.9
1	Р	413/413 (100%)	-0.74	7 (1%) 70	68	11, 25, 52, 84	0
1	Q	413/413 (100%)	-0.72	6 (1%) 73	72	11, 24, 51, 84	0
1	R	413/413 (100%)	-0.73	7 (1%) 70	68	10, 24, 51, 83	0
All	All	1239/1239 (100%)	-0.73	20 (1%) 72	70	10, 25, 52, 84	0

The worst 5 of 20 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	Q	274	SER	7.9
1	Q	71	SER	7.6
1	R	274	SER	4.9
1	Р	71	SER	4.7
1	Р	274	SER	4.3

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^{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.

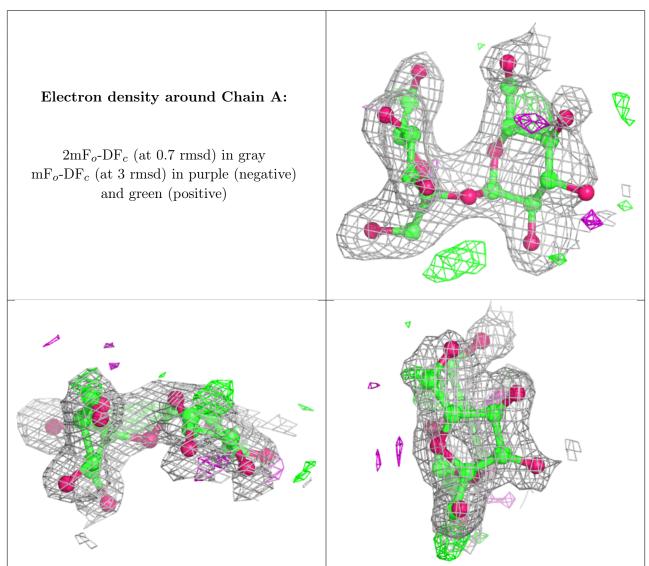
Mol	Type	Chain	Res	Atoms	RSCC	RSR	$\mathbf{B} ext{-}\mathbf{factors}(\mathbf{\mathring{A}}^2)$	Q < 0.9
2	GLC	Е	1	11/12	0.80	0.26	24,30,32,33	11
2	GLC	С	1	11/12	0.83	0.23	25,30,32,33	11
2	GLC	A	1	11/12	0.83	0.25	26,30,32,33	11



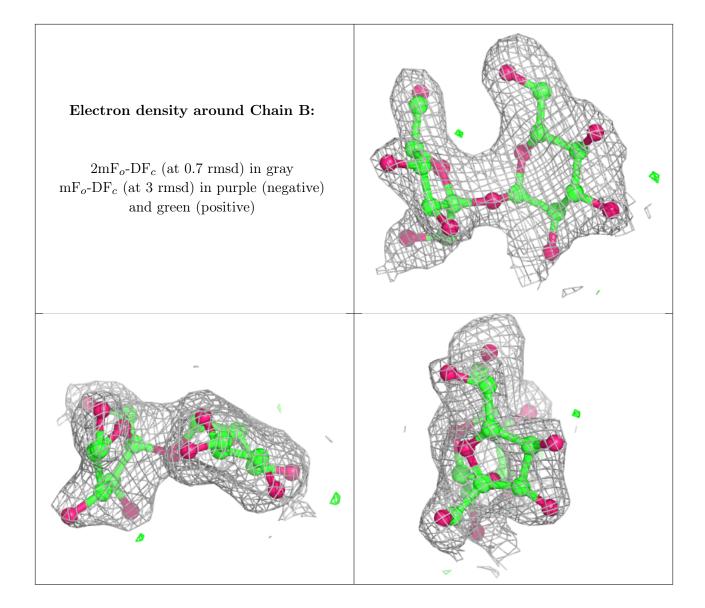
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	$\mathbf{B} ext{-}\mathbf{factors}(\mathbf{\mathring{A}}^2)$	Q<0.9
2	FRU	С	2	12/12	0.84	0.22	21,28,29,31	12
2	FRU	D	2	12/12	0.88	0.19	32,35,35,36	12
2	FRU	A	2	12/12	0.90	0.16	20,27,29,30	12
2	FRU	E	2	12/12	0.90	0.18	20,28,30,30	12
2	GLC	D	1	11/12	0.92	0.13	29,31,33,33	11
2	FRU	В	2	12/12	0.93	0.19	32,35,36,37	12
2	GLC	F	1	11/12	0.93	0.10	29,31,33,33	11
2	FRU	F	2	12/12	0.93	0.17	32,34,35,36	12
2	GLC	В	1	11/12	0.95	0.10	29,31,33,33	11

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.



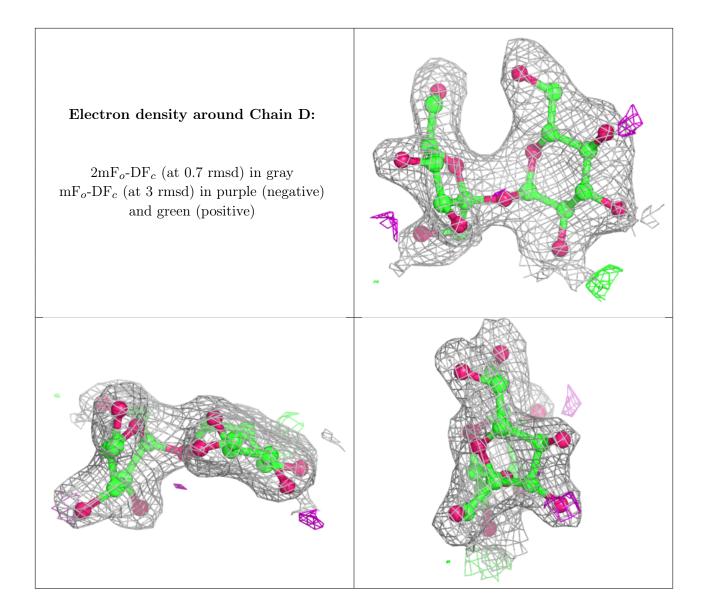




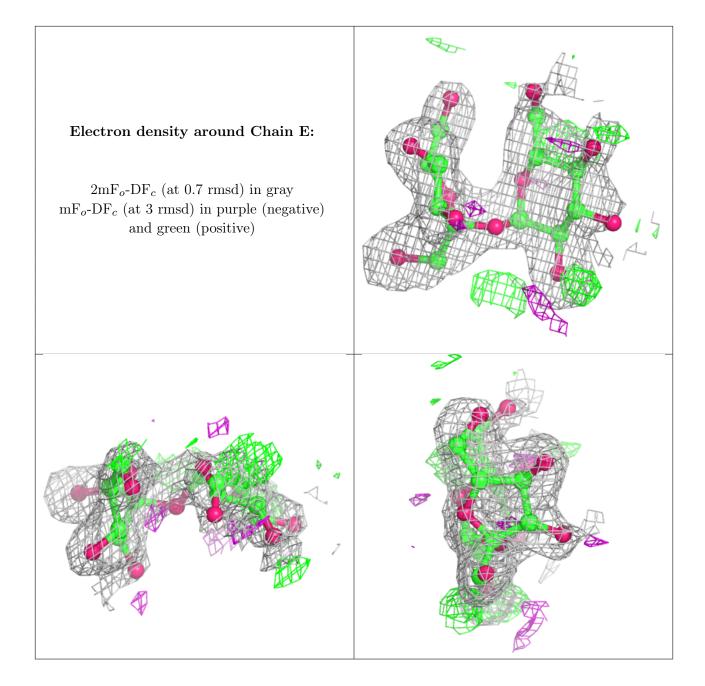


Electron density around Chain C: $2 {\rm mF}_o\text{-}{\rm DF}_c$ (at 0.7 rmsd) in gray ${\rm mF}_o\text{-}{\rm DF}_c$ (at 3 rmsd) in purple (negative) and green (positive)

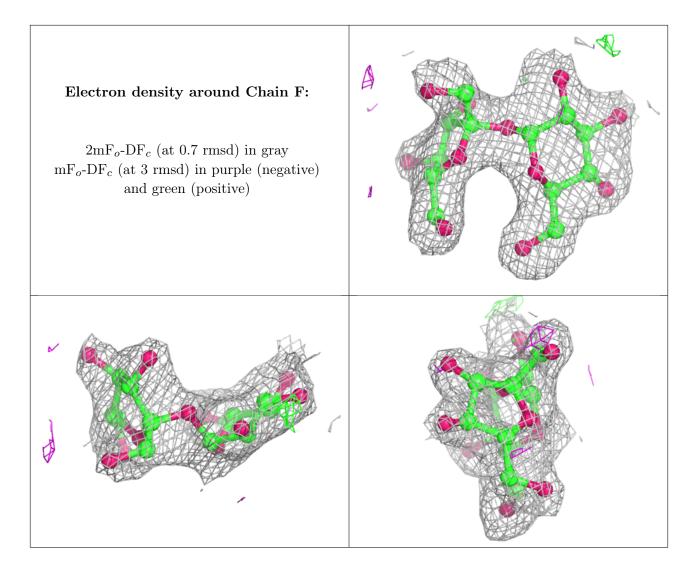












6.4 Ligands (i)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 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	$ m B ext{-}factors(\AA^2)$	Q<0.9
3	CA	Р	10	1/1	0.97	0.07	30,30,30,30	0
3	CA	Q	10	1/1	0.99	0.04	29,29,29,29	0
3	CA	R	10	1/1	0.99	0.06	27,27,27,27	0

6.5 Other polymers (i)

There are no such residues in this entry.

