

wwPDB X-ray Structure Validation Summary Report (i)

Aug 21, 2023 – 11:12 PM EDT

PDB ID	:	2PHF
Title	:	Pterocarpus angolensis lectin complexed with Man-6
Authors	:	Garcia-Pino, A.; Buts, L.; Wyns, L.; Imberty, A.; Loris, R.
Deposited on	:	2007-04-11
Resolution	:	2.10 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:

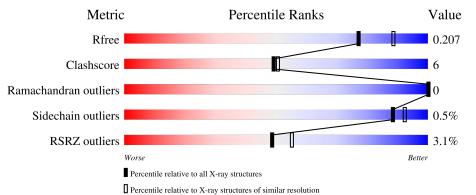
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure: $X\text{-}RAY \, DIFFRACTION$

The reported resolution of this entry is 2.10 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	$\begin{array}{c} \textbf{Whole archive} \\ (\#\textbf{Entries}) \end{array}$	${f Similar\ resolution}\ (\#{ m Entries,\ resolution\ range}({ m \AA}))$
R_{free}	130704	5197(2.10-2.10)
Clashscore	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)
RSRZ outliers	127900	5083 (2.10-2.10)

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	А	252	3% 85%	11%	·
1	В	252	85%	10%	·
2	С	2	100%		
3	D	4	75%	25%	



2 Entry composition (i)

There are 6 unique types of molecules in this entry. The entry contains 4012 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 Lectin.

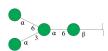
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace	
1	А	241	Total 1852	C 1169	N 313	0 370	0	0	1
1	В	241	Total	С	Ν	0	0	0	1
			1857	1174	313	370			

• Molecule 2 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-alpha-D-mannopyran ose.



Mol	Chain	Residues	At	\mathbf{oms}		ZeroOcc	AltConf	Trace
2	С	2	Total 23	C 12	0 11	0	0	0

• Molecule 3 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]alpha-D-mannopyranose-(1-6)-beta-D-mannopyranose.



Mol	Chain	Residues	At	oms		ZeroOcc	AltConf	Trace
3	D	4	Total 45	C 24	O 21	0	0	0

• Molecule 4 is MANGANESE (II) ION (three-letter code: MN) (formula: Mn).

Mol	Chain	Residues	Ato	ms	ZeroOcc	AltConf
4	А	1	Total 1	Mn 1	0	0
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Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	В	1	Total Mn 1 1	0	0

• Molecule 5 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	А	1	Total Ca 1 1	0	0
5	В	1	Total Ca 1 1	0	0

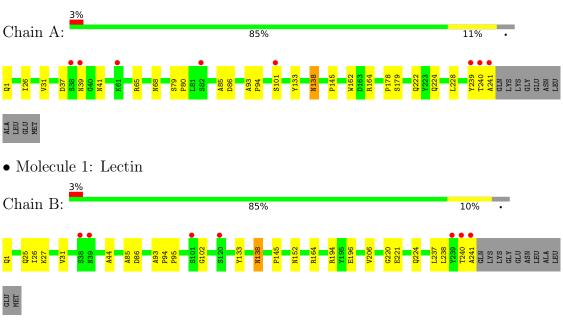
• Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	А	108	Total O 108 108	0	0
6	В	123	Total O 123 123	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: Lectin

• Molecule 2: alpha-D-mannopyranose-(1-3)-alpha-D-mannopyranose

Chain C:

100%

MAN1 MAN2

 \bullet Molecule 3: alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]alpha-D-mannopyranose ose-(1-6)-beta-D-mannopyranose

Chain D:	75%	25%
BMA1 MAN2 MAN3 MAN4		



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants	56.74Å 83.33Å 122.81Å	Depositor
a, b, c, α , β , γ	90.00° 90.00° 90.00°	Depositor
Resolution (Å)	15.00 - 2.10	Depositor
Resolution (A)	14.83 - 2.10	EDS
% Data completeness	(Not available) $(15.00-2.10)$	Depositor
(in resolution range)	$100.0 \ (14.83-2.10)$	EDS
R _{merge}	0.10	Depositor
R _{sym}	(Not available)	Depositor
$< I/\sigma(I) > 1$	$3.97 (at 2.10 \text{\AA})$	Xtriage
Refinement program	CNS 1.0	Depositor
D D.	0.180 , 0.216	Depositor
R, R_{free}	0.172 , 0.207	DCC
R_{free} test set	2788 reflections (8.06%)	wwPDB-VP
Wilson B-factor $(Å^2)$	25.0	Xtriage
Anisotropy	0.193	Xtriage
Bulk solvent $k_{sol}(e/Å^3), B_{sol}(Å^2)$	0.33, 45.8	EDS
L-test for twinning ²	$ \langle L \rangle = 0.50, \langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	4012	wwPDB-VP
Average B, all atoms $(Å^2)$	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: The largest off-origin peak in the Patterson function is 5.45% of the height of the origin peak. No significant pseudotranslation is detected.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.



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, BMA, MN, PCA, MAN

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).

Mal	Mol Chain Borner		nd lengths	Bond angles		
			# Z > 5	RMSZ	# Z > 5	
1	А	0.46	1/1892~(0.1%)	0.71	1/2587~(0.0%)	
1	В	0.37	0/1897	0.69	0/2593	
All	All	0.41	1/3789~(0.0%)	0.70	1/5180~(0.0%)	

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	$\mathrm{Ideal}(\mathrm{\AA})$
1	А	101	SER	C-N	-11.85	1.11	1.33

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Ζ	$Observed(^{o})$	$Ideal(^{o})$
1	А	101	SER	C-N-CA	6.03	134.96	122.30

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	А	1852	0	1749	20	0
1	В	1857	0	1763	22	0
2	С	23	0	21	1	0
3	D	45	0	39	2	0

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	Chain	-	- 0	H(added)	Clashes	Symm-Clashes
4	А	1	0	0	0	0
4	В	1	0	0	0	0
5	А	1	0	0	0	0
5	В	1	0	0	0	0
6	А	108	0	0	0	0
6	В	123	0	0	1	0
All	All	4012	0	3572	43	0

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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 6.

The worst 5 of 43 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:221:GLU:HG3	3:D:2:MAN:H61	1.25	1.09
1:A:164:ARG:HE	1:A:224:GLN:HE22	1.24	0.83
1:B:221:GLU:CG	3:D:2:MAN:H61	2.15	0.70
1:A:164:ARG:HE	1:A:224:GLN:NE2	1.90	0.68
1:B:25:GLN:NE2	1:B:27:LYS:HE3	2.14	0.63

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	Percentiles
1	А	239/252~(95%)	232~(97%)	7 (3%)	0	100 100
1	В	239/252~(95%)	232 (97%)	7 (3%)	0	100 100
All	All	478/504~(95%)	464 (97%)	14 (3%)	0	100 100

There are no Ramachandran outliers to report.



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 side chain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	А	204/215~(95%)	203 (100%)	1 (0%)	88 92
1	В	205/215~(95%)	204 (100%)	1 (0%)	88 92
All	All	409/430~(95%)	407 (100%)	2 (0%)	88 92

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

Mol	Chain	Res	Type
1	А	138	ASN
1	В	138	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 7 such sidechains are listed below:

Mol	Chain	Res	Type
1	А	222	GLN
1	А	224	GLN
1	В	224	GLN
1	В	25	GLN
1	А	83	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)

2 non-standard protein/DNA/RNA residues 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



Mol	Type	Chain	n Res Lir		B	ond leng	gths	B	ond ang	gles
10101	туре	Ullaili	nes	Link	Counts	RMSZ	# Z >2	Counts	RMSZ	# Z >2
1	PCA	В	1	1	7,8,9	2.54	2 (28%)	9,10,12	1.77	2 (22%)
1	PCA	А	1	1	7,8,9	2.60	2 (28%)	9,10,12	1.92	3 (33%)

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).

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
1	PCA	В	1	1	-	0/0/11/13	0/1/1/1
1	PCA	А	1	1	-	0/0/11/13	0/1/1/1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	А	1	PCA	CD-N	5.94	1.50	1.34
1	В	1	PCA	CD-N	5.87	1.50	1.34
1	В	1	PCA	CA-N	2.71	1.49	1.46
1	А	1	PCA	CA-N	2.69	1.49	1.46

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Ζ	$Observed(^{o})$	$Ideal(^{o})$
1	А	1	PCA	OE-CD-CG	-3.33	120.96	126.76
1	В	1	PCA	OE-CD-CG	-3.17	121.22	126.76
1	А	1	PCA	OE-CD-N	2.63	130.99	124.86
1	В	1	PCA	OE-CD-N	2.37	130.38	124.86
1	А	1	PCA	CB-CA-C	-2.16	109.73	112.70

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates (i)

6 monosaccharides are modelled in this entry.



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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		Dec	Link	Bo	ond leng	ths	Bond angles		
	with Type Chain	Chain	nes		Counts	RMSZ	# Z >2	Counts	RMSZ	# Z > 2
2	MAN	С	1	2	12,12,12	0.50	0	17,17,17	0.42	0
2	MAN	С	2	2	11,11,12	0.48	0	$15,\!15,\!17$	0.57	0
3	BMA	D	1	3	12,12,12	0.65	0	17,17,17	0.45	0
3	MAN	D	2	3	11,11,12	0.52	0	$15,\!15,\!17$	0.52	0
3	MAN	D	3	3	11,11,12	0.49	0	$15,\!15,\!17$	0.52	0
3	MAN	D	4	3	11,11,12	0.54	0	$15,\!15,\!17$	0.53	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	MAN	С	1	2	-	0/2/22/22	0/1/1/1
2	MAN	С	2	2	-	0/2/19/22	0/1/1/1
3	BMA	D	1	3	-	0/2/22/22	0/1/1/1
3	MAN	D	2	3	-	0/2/19/22	0/1/1/1
3	MAN	D	3	3	-	0/2/19/22	0/1/1/1
3	MAN	D	4	3	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

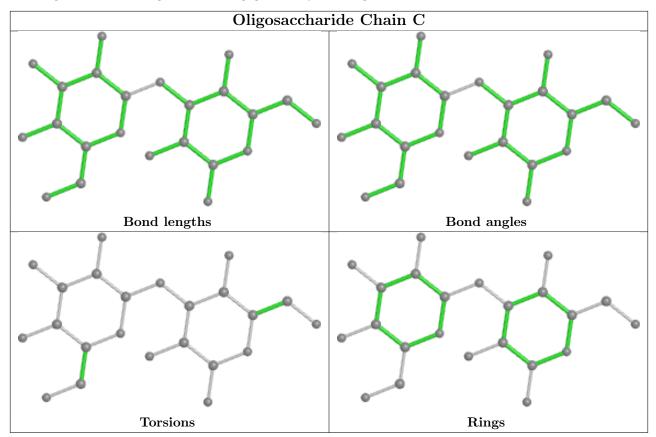
There are no ring outliers.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	С	1	MAN	1	0
3	D	2	MAN	2	0
2	С	2	MAN	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths,

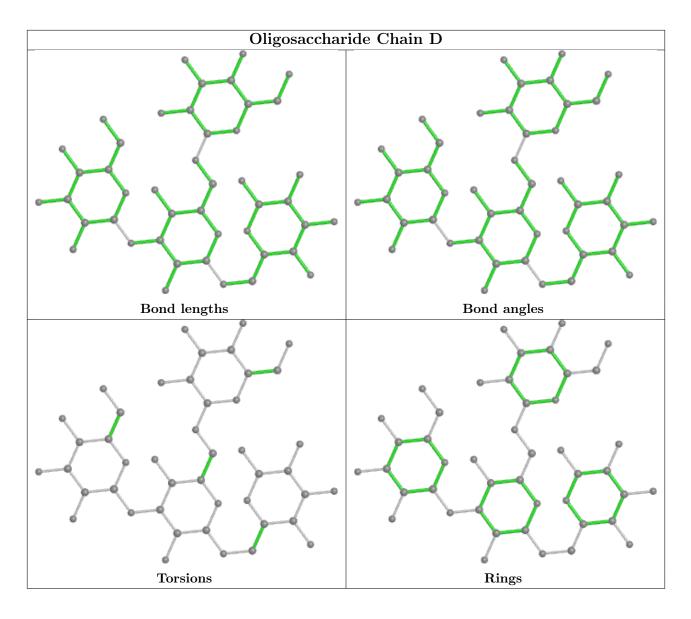




bond angles, torsion angles, and ring geometry for oligosaccharide.







5.6 Ligand geometry (i)

Of 4 ligands modelled in this entry, 4 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)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	А	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	101:SER	С	102:GLY	N	1.11



$6 \quad \text{Fit of model and data} \quad (i)$

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	$\langle RSRZ \rangle$	#RSRZ>2	$OWAB(Å^2)$	Q<0.9
1	А	240/252~(95%)	-0.10	8 (3%) 46 53	16, 24, 47, 58	0
1	В	240/252~(95%)	-0.17	7 (2%) 51 57	14, 22, 40, 60	0
All	All	480/504~(95%)	-0.13	15 (3%) 49 55	14, 23, 43, 60	0

The worst 5 of 15 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	В	241	ALA	9.9
1	В	239	TYR	5.8
1	А	241	ALA	5.5
1	А	39	ASN	4.3
1	А	239	TYR	4.1

6.2 Non-standard residues in protein, DNA, RNA chains (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	B-factors(Å ²)	Q < 0.9
1	PCA	В	1	8/9	0.97	0.12	18,19,20,22	0
1	PCA	А	1	8/9	0.98	0.10	17,18,19,23	0

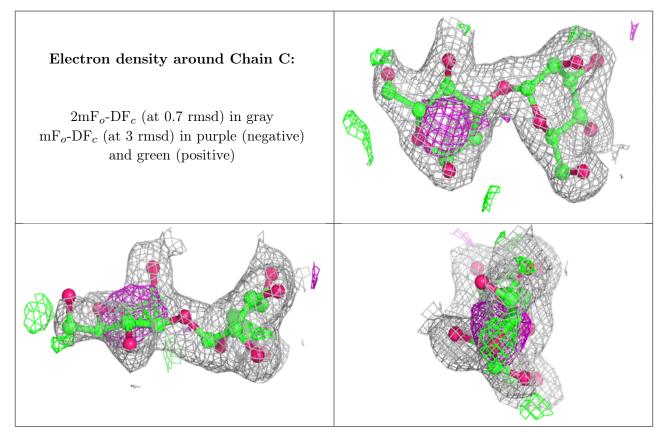
6.3 Carbohydrates (i)

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.

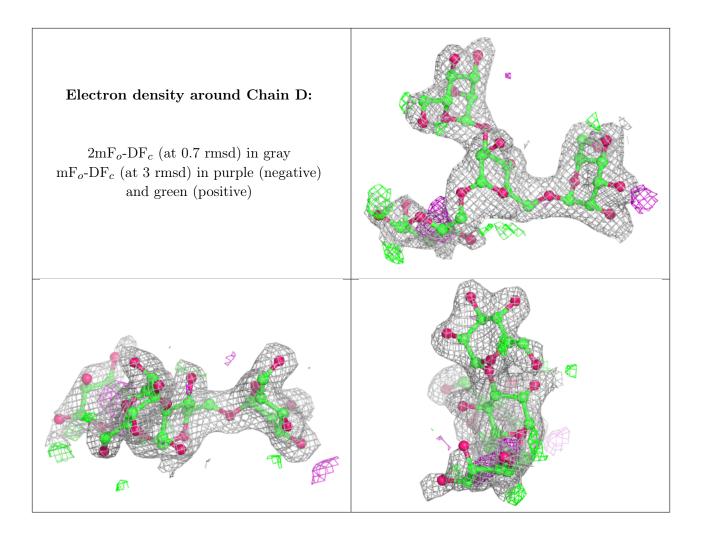


Mol	Type	Chain	Res	Atoms	RSCC	RSR	$\mathbf{B} ext{-factors}(\mathrm{\AA}^2)$	Q<0.9
3	BMA	D	1	12/12	0.67	0.39	44,57,59,61	0
2	MAN	С	1	12/12	0.86	0.22	33,39,44,50	0
3	MAN	D	3	11/12	0.92	0.21	42,44,47,49	0
3	MAN	D	2	11/12	0.95	0.12	27,37,41,42	0
2	MAN	С	2	11/12	0.97	0.08	22,26,29,29	0
3	MAN	D	4	11/12	0.97	0.08	21,25,27,29	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)

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	$\mathbf{B} ext{-factors}(\mathrm{\AA}^2)$	Q < 0.9
4	MN	В	257	1/1	0.99	0.07	18,18,18,18	0
5	CA	В	258	1/1	0.99	0.06	$17,\!17,\!17,\!17$	0
5	CA	А	256	1/1	1.00	0.03	16,16,16,16	0
4	MN	А	255	1/1	1.00	0.07	$17,\!17,\!17,\!17$	0

6.5 Other polymers (i)

There are no such residues in this entry.

