



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 04:23 PM UTC

PDB ID : 1JND / pdb_00001jnd
Title : Crystal structure of imaginal disc growth factor-2
Authors : Varela, P.F.; Llera, A.S.; Mariuzza, R.A.; Tormo, J.
Deposited on : 2001-07-23
Resolution : 1.30 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

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>.

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

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

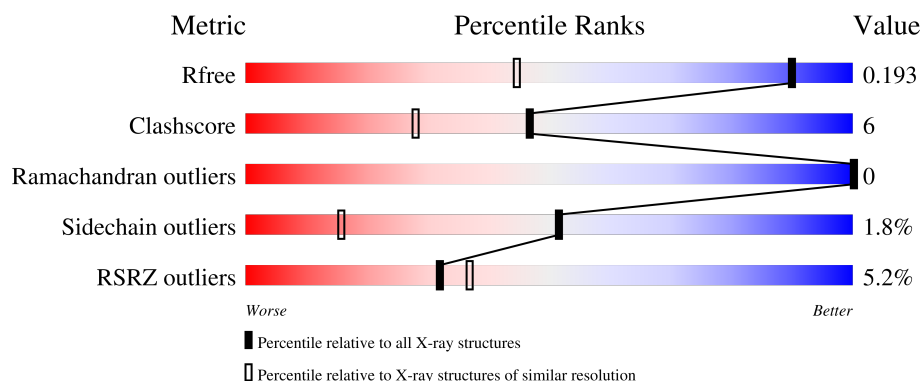
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.30 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}	180053	1553 (1.30-1.30)
Clashscore	190562	1595 (1.30-1.30)
Ramachandran outliers	187476	1551 (1.30-1.30)
Sidechain outliers	187428	1551 (1.30-1.30)
RSRZ outliers	180081	1549 (1.30-1.30)

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 $\leq 5\%$. 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	420	5% 84% 10% • 5%
2	B	4	100%

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 3916 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 Imaginal disc growth factor-2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	400	Total	C	N	O	S	0	0	0
			3166	2025	536	600	5			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	257	PHE	VAL	conflict	GB 4092089

- Molecule 2 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.

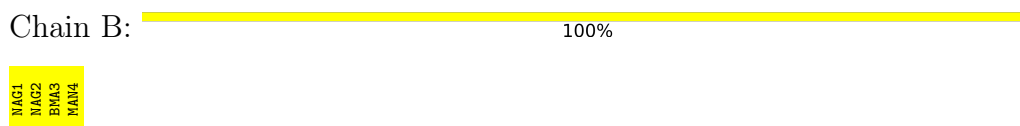


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	B	4	Total	C	N	O	0	0	0
			50	28	2	20			

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	700	Total	O	0	0
			700	700		

- Molecule 1: Imaginal disc growth factor-2



4 Data and refinement statistics

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	106.34Å 106.34Å 89.99Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	100.00 – 1.30 92.10 – 1.30	Depositor EDS
% Data completeness (in resolution range)	98.2 (100.00-1.30) 90.3 (92.10-1.30)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.02	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.16 (at 1.30Å)	Xtriage
Refinement program	SHELXL-97	Depositor
R, R_{free}	0.176 , 0.202 0.167 , 0.193	Depositor DCC
R_{free} test set	2302 reflections (1.77%)	wwPDB-VP
Wilson B-factor (Å ²)	11.7	Xtriage
Anisotropy	0.265	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 50.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.016 for -h,-k,l	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	3916	wwPDB-VP
Average B, all atoms (Å ²)	17.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.54% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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.

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: MAN, NAG, BMA

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	1.01	1/3248 (0.0%)	1.55	28/4409 (0.6%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	420	LEU	C-OXT	19.22	1.61	1.23

All (28) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	117	GLU	CB-CG-CD	-8.76	97.72	112.60
1	A	64	PHE	CA-CB-CG	7.30	121.10	113.80
1	A	408	ASP	CA-CB-CG	-6.76	105.84	112.60
1	A	58	ASP	CA-CB-CG	6.45	119.05	112.60
1	A	336	ASN	CA-CB-CG	-6.37	106.23	112.60
1	A	47	ASN	O-C-N	6.19	128.84	122.09
1	A	367	TRP	O-C-N	5.88	130.16	123.27
1	A	357	PRO	O-C-N	5.87	130.08	123.04
1	A	367	TRP	CA-C-O	-5.81	114.08	120.24
1	A	414	ARG	NE-CZ-NH1	-5.59	115.91	121.50
1	A	207	ILE	N-CA-CB	-5.56	106.11	110.45
1	A	177	VAL	O-C-N	5.53	127.23	121.87
1	A	260	GLU	CB-CG-CD	5.42	121.81	112.60
1	A	215	ASP	CA-CB-CG	-5.36	107.24	112.60
1	A	309	GLN	OE1-CD-NE2	-5.27	117.33	122.60
1	A	92	ASP	CA-CB-CG	-5.25	107.35	112.60
1	A	372	ASP	CA-CB-CG	5.22	117.82	112.60
1	A	16	GLU	CA-C-O	-5.20	114.60	120.43
1	A	13	TYR	O-C-N	5.18	128.28	122.22
1	A	387	ASN	CA-CB-CG	-5.16	107.44	112.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	107	ARG	CA-C-N	-5.12	113.42	120.28
1	A	107	ARG	C-N-CA	-5.12	113.42	120.28
1	A	113	ARG	O-C-N	5.07	127.93	122.15
1	A	60	TYR	CA-CB-CG	-5.06	104.79	113.90
1	A	297	VAL	CA-C-O	5.04	122.12	119.15
1	A	343	VAL	O-C-N	5.03	128.69	123.26
1	A	62	HIS	CA-C-N	-5.01	112.70	120.31
1	A	62	HIS	C-N-CA	-5.01	112.70	120.31

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	3166	0	3081	36	0
2	B	50	0	43	0	0
3	A	700	0	0	25	2
All	All	3916	0	3124	36	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 6.

All (36) 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:A:140:LYS:HE2	3:A:1480:HOH:O	0.95	1.13
1:A:140:LYS:CE	3:A:1278:HOH:O	1.99	1.07
1:A:140:LYS:HE3	3:A:1278:HOH:O	1.53	1.04
1:A:378:ASN:HB2	3:A:1479:HOH:O	1.70	0.89
1:A:161:ILE:HD13	3:A:1640:HOH:O	1.89	0.72
1:A:161:ILE:CD1	3:A:1640:HOH:O	2.38	0.70
1:A:102:GLU:OE2	1:A:169:HIS:HE1	1.74	0.70
1:A:163:ASP:OD2	1:A:169:HIS:HD2	1.76	0.69
1:A:107:ARG:HH11	1:A:107:ARG:HG2	1.59	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:55:GLU:OE1	3:A:1325:HOH:O	2.14	0.66
1:A:140:LYS:O	1:A:141:VAL:HB	1.95	0.65
1:A:248:ASP:CB	3:A:1491:HOH:O	2.43	0.65
1:A:2:SER:N	3:A:1694:HOH:O	2.31	0.63
1:A:374:ASP:OD2	3:A:1560:HOH:O	2.15	0.63
1:A:140:LYS:HE2	3:A:1278:HOH:O	1.81	0.63
1:A:92:ASP:OD1	3:A:1619:HOH:O	2.15	0.62
1:A:107:ARG:HG2	1:A:107:ARG:NH1	2.13	0.61
1:A:165:HIS:CD2	3:A:1595:HOH:O	2.56	0.58
1:A:242:HIS:HD2	3:A:1007:HOH:O	1.87	0.57
1:A:106:VAL:HG11	3:A:1609:HOH:O	2.06	0.55
1:A:248:ASP:HB3	3:A:1491:HOH:O	2.04	0.55
1:A:106:VAL:CG1	3:A:1609:HOH:O	2.57	0.53
1:A:161:ILE:HD11	3:A:1648:HOH:O	2.08	0.53
1:A:248:ASP:CG	3:A:1491:HOH:O	2.51	0.53
1:A:30:LEU:HD11	1:A:70:LEU:HD13	1.92	0.52
1:A:161:ILE:HD11	3:A:1640:HOH:O	2.11	0.48
1:A:140:LYS:HA	1:A:140:LYS:HD3	1.69	0.47
1:A:242:HIS:HE1	3:A:1158:HOH:O	1.98	0.46
1:A:107:ARG:HH11	1:A:107:ARG:CG	2.25	0.46
1:A:248:ASP:OD1	3:A:1506:HOH:O	2.21	0.44
1:A:92:ASP:CG	3:A:1619:HOH:O	2.60	0.44
1:A:185:ARG:HD3	3:A:1628:HOH:O	2.18	0.43
1:A:46:GLU:HG2	1:A:47:ASN:N	2.34	0.43
1:A:23:ASN:N	1:A:24:PRO:CD	2.83	0.42
1:A:55:GLU:HG3	3:A:1147:HOH:O	2.21	0.41
1:A:247:LYS:O	1:A:248:ASP:HB2	2.21	0.41

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:1412:HOH:O	3:A:1567:HOH:O[6_765]	2.13	0.07
3:A:1371:HOH:O	3:A:1388:HOH:O[5_665]	2.15	0.05

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	396/420 (94%)	391 (99%)	5 (1%)	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	341/356 (96%)	335 (98%)	6 (2%)	51	16

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	105	LYS
1	A	107	ARG
1	A	140	LYS
1	A	141	VAL
1	A	161	ILE
1	A	270	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	3	ASN
1	A	62	HIS

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Mol	Chain	Res	Type
1	A	165	HIS
1	A	169	HIS
1	A	242	HIS
1	A	270	ASN
1	A	281	ASN
1	A	311	GLN
1	A	331	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 ⓘ

4 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	NAG	B	1	2,1	14,14,15	0.91	0	17,19,21	1.50	3 (17%)
2	NAG	B	2	2	14,14,15	1.06	1 (7%)	17,19,21	1.56	4 (23%)
2	BMA	B	3	2	11,11,12	0.80	0	15,15,17	1.34	2 (13%)
2	MAN	B	4	2	11,11,12	0.72	0	15,15,17	1.77	4 (26%)

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	NAG	B	1	2,1	-	0/6/23/26	0/1/1/1
2	NAG	B	2	2	-	0/6/23/26	0/1/1/1
2	BMA	B	3	2	-	0/2/19/22	0/1/1/1
2	MAN	B	4	2	-	2/2/19/22	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	2	NAG	C1-C2	2.25	1.55	1.52

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	3	BMA	C1-O5-C5	-3.74	107.17	112.19
2	B	4	MAN	C2-C3-C4	-3.49	104.72	110.86
2	B	4	MAN	C1-O5-C5	3.35	116.68	112.19
2	B	1	NAG	O5-C1-C2	-3.31	106.17	111.29
2	B	1	NAG	C4-C3-C2	-3.14	106.41	111.02
2	B	2	NAG	C8-C7-N2	-2.96	111.21	116.12
2	B	2	NAG	O7-C7-N2	2.91	127.12	121.98
2	B	2	NAG	C2-N2-C7	-2.47	119.59	122.90
2	B	4	MAN	O3-C3-C2	-2.33	105.30	110.05
2	B	1	NAG	C8-C7-N2	2.24	119.83	116.12
2	B	4	MAN	O2-C2-C3	-2.16	105.68	110.15
2	B	2	NAG	O5-C1-C2	-2.15	107.96	111.29
2	B	3	BMA	O5-C5-C4	-2.13	105.66	110.83

There are no chirality outliers.

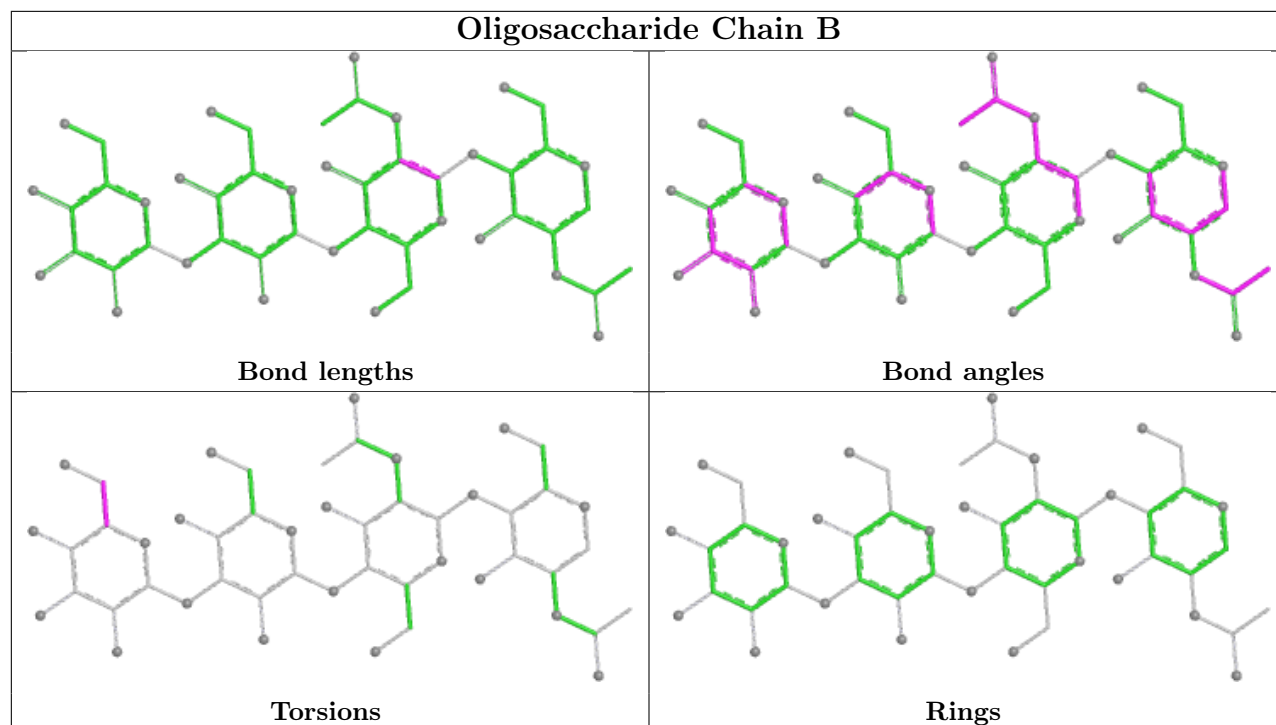
All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	4	MAN	O5-C5-C6-O6
2	B	4	MAN	C4-C5-C6-O6

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 [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 [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, 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(Å ²)	Q<0.9
1	A	400/420 (95%)	0.12	21 (5%) 32 37	8, 12, 27, 70	0

All (21) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	141	VAL	12.1
1	A	161	ILE	5.4
1	A	418	TYR	4.9
1	A	106	VAL	4.4
1	A	92	ASP	3.9
1	A	420	LEU	3.7
1	A	140	LYS	3.5
1	A	46	GLU	3.4
1	A	419	ARG	3.2
1	A	72	ARG	3.1
1	A	75	PRO	3.1
1	A	107	ARG	2.9
1	A	105	LYS	2.9
1	A	76	HIS	2.5
1	A	74	TYR	2.4
1	A	117	GLU	2.4
1	A	405	CYS	2.4
1	A	185	ARG	2.3
1	A	287	LYS	2.3
1	A	248	ASP	2.3
1	A	385	VAL	2.2

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

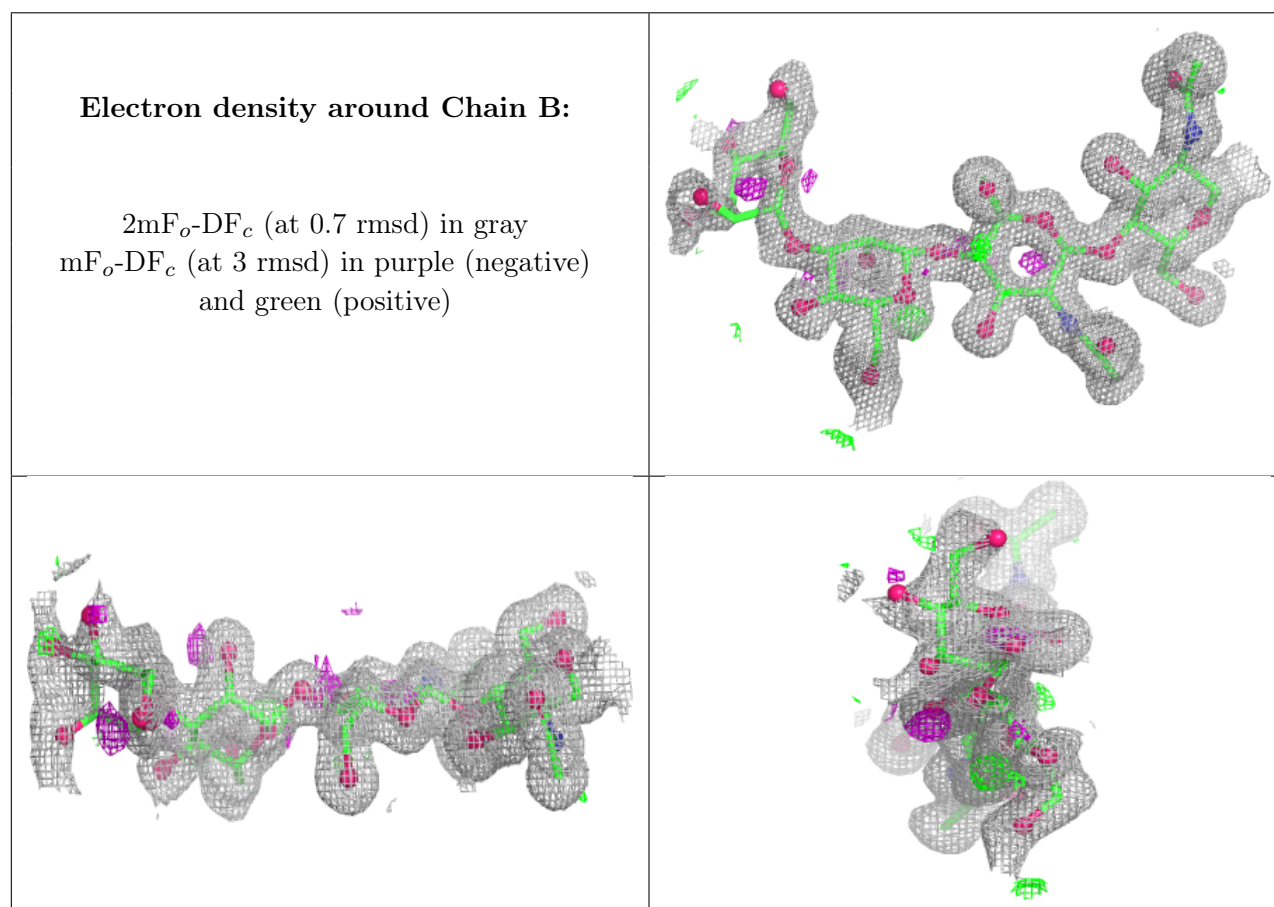
There are no non-standard protein/DNA/RNA residues in this entry.

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, 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($\text{\AA}^2$)	Q<0.9
2	MAN	B	4	11/12	0.69	0.19	44,46,58,72	0
2	BMA	B	3	11/12	0.82	0.14	26,33,42,45	0
2	NAG	B	2	14/15	0.94	0.10	16,21,26,28	0
2	NAG	B	1	14/15	0.98	0.05	10,12,15,16	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 ⓘ

There are no such residues in this entry.