



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 21, 2020 – 05:04 PM BST

PDB ID : 4AYP
Title : Structure of The GH47 processing alpha-1,2-mannosidase from Caulobacter strain K31 in complex with thiomannobioside
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Deposited on : 2012-06-21
Resolution : 0.85 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 following versions of software and data (see [references ⓘ](#)) 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 : **FAILED**
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.14.6

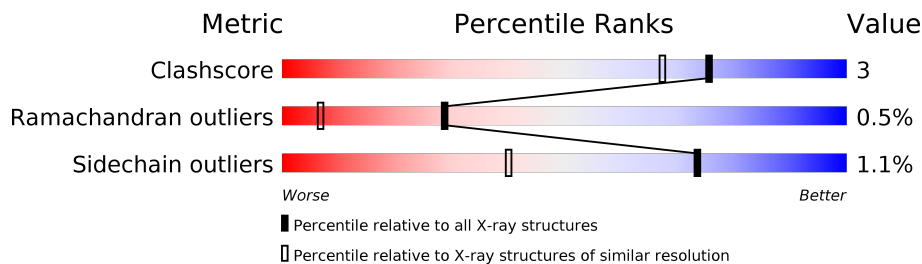
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 0.85 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))
Clashscore	141614	1143 (1.04-0.68)
Ramachandran outliers	138981	1065 (1.04-0.68)
Sidechain outliers	138945	1066 (1.04-0.68)

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 on 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 $\leq 5\%$.

Note EDS failed to run properly.

Mol	Chain	Length	Quality of chain
1	A	447	
2	B	2	

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 4452 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 MANNOSYL-OLIGOSACCHARIDE 1,2-ALPHA-MANNOSIDASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	434	3589	2302	618	654	15	0	24	0

There are 11 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	24	MET	-	expression tag	UNP B0SWV2
A	25	ALA	-	expression tag	UNP B0SWV2
A	26	SER	-	expression tag	UNP B0SWV2
A	463	LEU	-	expression tag	UNP B0SWV2
A	464	GLU	-	expression tag	UNP B0SWV2
A	465	HIS	-	expression tag	UNP B0SWV2
A	466	HIS	-	expression tag	UNP B0SWV2
A	467	HIS	-	expression tag	UNP B0SWV2
A	468	HIS	-	expression tag	UNP B0SWV2
A	469	HIS	-	expression tag	UNP B0SWV2
A	470	HIS	-	expression tag	UNP B0SWV2

- Molecule 2 is an oligosaccharide called alpha-D-mannopyranose-(1-2)-methyl 2-thio-alpha-D-mannopyranoside.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	O	S			
2	B	2	24	13	10	1	0	0	0

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

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	2	Total	Ca	0	0
			2	2		

- Molecule 4 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total Na 1 1	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	781	Total O 836 836	0	54

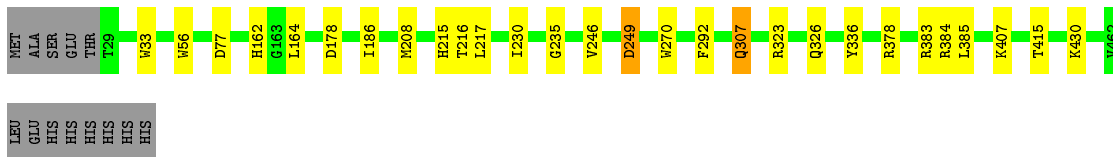
3 Residue-property plots [i](#)

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. 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. 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.

Note EDS failed to run properly.

- Molecule 1: MANNOSYL-OLIGOSACCHARIDE 1,2-ALPHA-MANNOSIDASE

Chain A:  91% 6%



- Molecule 2: alpha-D-mannopyranose-(1-2)-methyl 2-thio-alpha-D-mannopyranoside

Chain B:  50% 50%



4 Data and refinement statistics i

EDS failed to run properly - this section is therefore incomplete.

Property	Value	Source
Space group	H 3	Depositor
Cell constants a, b, c, α , β , γ	144.13Å 144.13Å 50.30Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	39.16 – 0.85	Depositor
% Data completeness (in resolution range)	97.2 (39.16-0.85)	Depositor
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.65 (at 0.85Å)	Xtriage
Refinement program	REFMAC 5.7.0025	Depositor
R, R_{free}	0.096 , 0.106	Depositor
Wilson B-factor (Å ²)	6.0	Xtriage
Anisotropy	0.261	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.013 for h,-h-k,-l	Xtriage
Total number of atoms	4452	wwPDB-VP
Average B, all atoms (Å ²)	10.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.07% of the height of the origin peak. No significant pseudotranslation is detected.*

¹ Intensities estimated from amplitudes.

² Theoretical 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: NA, CA, Z5L, 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).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# $ Z > 5$	RMSZ	# $ Z > 5$
1	A	0.51	1/3757 (0.0%)	0.72	2/5096 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	56	TRP	CD2-CE2	5.75	1.48	1.41

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	378	ARG	NE-CZ-NH1	5.69	123.15	120.30
1	A	249	ASP	CB-CG-OD2	-5.22	113.60	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	3589	0	3528	22	0
2	B	24	0	8	0	0
3	A	2	0	0	0	0
4	A	1	0	0	0	0
5	A	836	0	0	9	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	4452	0	3536	22	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 3.

All (22) 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:323:ARG:HD2	5:A:2568[B]:HOH:O	1.69	0.91
1:A:246[A]:VAL:HG22	5:A:2519:HOH:O	1.72	0.88
1:A:326[B]:GLN:HE21	1:A:326[B]:GLN:H	1.26	0.84
1:A:383:ARG:C	1:A:384[B]:ARG:CA	2.47	0.82
1:A:384[B]:ARG:CA	1:A:385:LEU:N	2.45	0.80
1:A:292:PHE:H	1:A:307:GLN:HE22	1.36	0.73
1:A:384[B]:ARG:NH2	5:A:2720:HOH:O	2.22	0.68
1:A:216:THR:HG22	1:A:230:ILE:HD13	1.78	0.66
1:A:208[B]:MET:HE2	5:A:2457:HOH:O	1.98	0.61
1:A:208[B]:MET:CE	5:A:2457:HOH:O	2.55	0.55
1:A:323:ARG:CZ	5:A:2559[B]:HOH:O	2.54	0.55
1:A:215[A]:HIS:HE1	1:A:235:GLY:O	1.91	0.53
1:A:292:PHE:H	1:A:307:GLN:NE2	2.06	0.52
1:A:186[B]:ILE:HD11	1:A:216:THR:HG21	1.92	0.52
1:A:326[B]:GLN:NE2	1:A:326[B]:GLN:H	2.02	0.50
1:A:162[A]:HIS:HD2	5:A:2378:HOH:O	1.94	0.50
1:A:215[A]:HIS:HD2	5:A:2377:HOH:O	1.95	0.49
1:A:33:TRP:CH2	1:A:383:ARG:HB3	2.55	0.42
1:A:384[A]:ARG:NH2	5:A:2721:HOH:O	2.51	0.42
1:A:407:LYS:HE2	1:A:415[B]:THR:HG22	2.02	0.41
1:A:164:LEU:HD22	1:A:186[B]:ILE:HD13	2.02	0.40
1:A:217:LEU:HD13	1:A:270:TRP:CD2	2.56	0.40

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	A	457/447 (102%)	442 (97%)	13 (3%)	2 (0%)	34 10

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	249	ASP
1	A	178	ASP

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	A	373/362 (103%)	369 (99%)	4 (1%)	73 40

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	77	ASP
1	A	307	GLN
1	A	336	TYR
1	A	430	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	282	GLN
1	A	307	GLN
1	A	338	GLN
1	A	416	GLN

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](#)

2 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	Z5L	B	1	2	12,13,13	0.45	0	14,18,18	0.36	0
2	MAN	B	2	3,2	11,11,12	0.54	0	15,15,17	1.57	2 (13%)

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	Z5L	B	1	2	-	0/4/24/24	0/1/1/1
2	MAN	B	2	3,2	-	0/2/19/22	1/1/1/1

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	2	MAN	C1-O5-C5	4.41	118.16	112.19
2	B	2	MAN	C1-C2-C3	2.16	112.32	109.67

There are no chirality outliers.

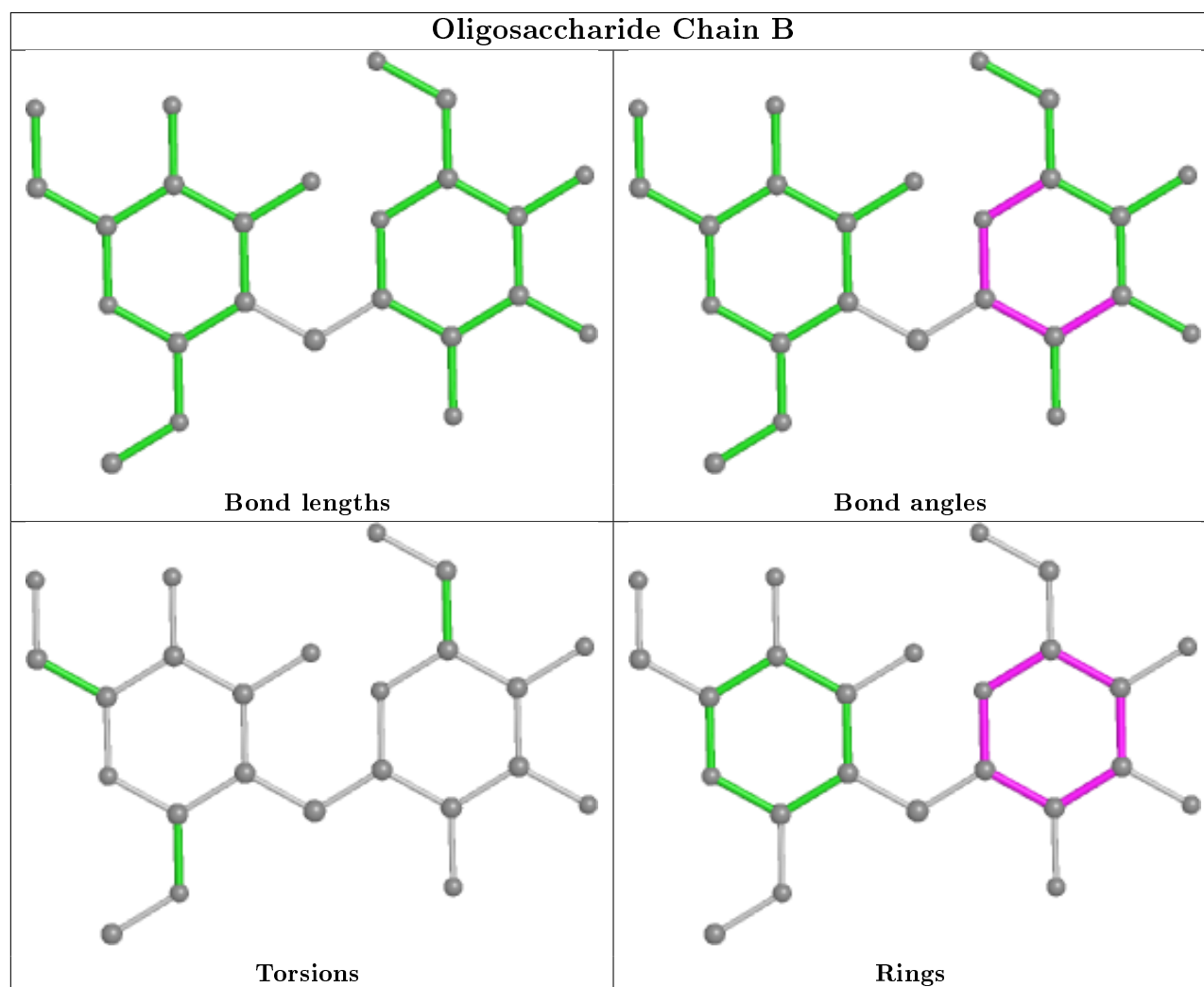
There are no torsion outliers.

All (1) ring outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	2	MAN	C1-C2-C3-C4-C5-O5

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](#)

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

6.1 Protein, DNA and RNA chains

EDS failed to run properly - this section is therefore empty.

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

EDS failed to run properly - this section is therefore empty.

6.3 Carbohydrates

EDS failed to run properly - this section is therefore empty.

6.4 Ligands

EDS failed to run properly - this section is therefore empty.

6.5 Other polymers

EDS failed to run properly - this section is therefore empty.