



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 17, 2026 – 11:51 PM UTC

PDB ID : 1CEN / pdb_00001cen
Title : CELLULASE (CELC) MUTANT WITH GLU 140 REPLACED BY GLN
COMPLEXED WITH CELLOHEXAOSE
Authors : Dominguez, R.; Alzari, P.M.
Deposited on : 1995-12-04
Resolution : 2.30 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)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

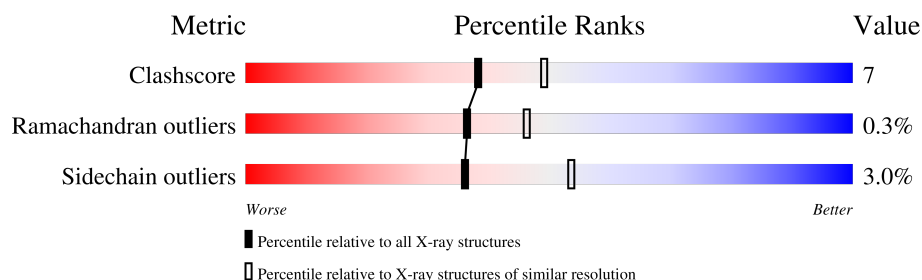
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 Å.

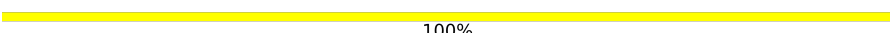
Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	190562	6919 (2.30-2.30)
Ramachandran outliers	187476	6854 (2.30-2.30)
Sidechain outliers	187428	6854 (2.30-2.30)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	343	 79% 17% . .
2	B	2	 100%

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 3048 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 CELLULASE CELC.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	334	2804	1811	459	521	13	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	140	GLN	GLU	engineered mutation	UNP P07985
A	156	CYS	TYR	conflict	UNP P07985

- Molecule 2 is an oligosaccharide called beta-D-glucopyranose-(1-4)-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
			Total	C	O			
2	B	2	23	12	11	0	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	221	Total	O	0	0
			221	221		

3 Residue-property plots

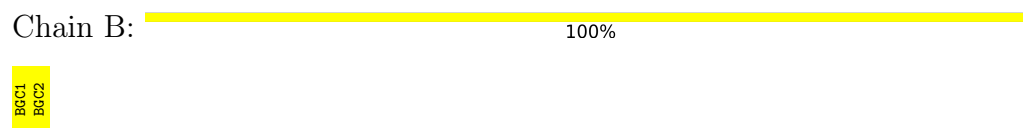
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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 was not executed.

- Molecule 1: CELLULASE CELC



- Molecule 2: beta-D-glucopyranose-(1-4)-beta-D-glucopyranose



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	51.40Å 84.33Å 87.50Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 2.30	Depositor
% Data completeness (in resolution range)	(Not available) (10.00-2.30)	Depositor
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, R_{free}	0.178 , 0.246	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3048	wwPDB-VP
Average B, all atoms (Å ²)	22.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: BGC

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	0.53	0/2879	0.93	6/3888 (0.2%)

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	137	LEU	N-CA-C	7.53	120.20	111.02
1	A	322	ILE	N-CA-C	-6.93	106.03	112.96
1	A	321	GLU	N-CA-C	6.59	119.53	110.24
1	A	324	ASN	N-CA-C	-5.37	103.60	110.53
1	A	147	THR	N-CA-C	5.12	117.25	111.11
1	A	338	LEU	N-CA-C	5.03	117.66	111.82

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	2804	0	2699	38	0
2	B	23	0	21	0	0
3	A	221	0	0	10	0
All	All	3048	0	2720	38	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 7.

All (38) 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:171:ILE:HD12	1:A:193:ILE:HG23	1.75	0.69
1:A:167:MET:SD	3:A:617:HOH:O	2.50	0.68
1:A:161:ARG:NH2	1:A:192:TYR:HB2	2.10	0.67
1:A:120:ARG:HD3	3:A:436:HOH:O	1.98	0.62
1:A:167:MET:HE3	3:A:420:HOH:O	1.98	0.62
1:A:175:ASN:HB3	3:A:598:HOH:O	2.01	0.60
1:A:153:MET:O	1:A:157:ILE:HG12	2.04	0.57
1:A:324:ASN:HD22	1:A:328:LYS:HB2	1.70	0.55
1:A:175:ASN:HB3	3:A:611:HOH:O	2.08	0.53
1:A:140:GLN:HB3	1:A:176:TYR:HA	1.90	0.52
1:A:161:ARG:HH22	1:A:192:TYR:HB2	1.74	0.52
1:A:312:VAL:HG11	1:A:338:LEU:HD13	1.92	0.51
1:A:197:PHE:O	1:A:278:CYS:HA	2.11	0.50
1:A:90:HIS:HA	1:A:139:ASN:HB3	1.93	0.49
1:A:95:TYR:OH	1:A:141:VAL:HA	2.11	0.49
1:A:167:MET:CE	3:A:617:HOH:O	2.62	0.48
1:A:53:ILE:O	1:A:67:GLY:HA3	2.14	0.48
1:A:224:LYS:HD2	1:A:288:ASP:OD1	2.14	0.47
1:A:94:GLY:O	1:A:103:SER:HA	2.15	0.46
1:A:124:LYS:HG3	1:A:163:ILE:HD13	1.97	0.46
1:A:167:MET:HE1	3:A:617:HOH:O	2.15	0.46
1:A:110:ASN:O	1:A:114:ARG:HG3	2.15	0.45
1:A:213:SER:HB3	1:A:216:ALA:HB3	1.99	0.45
1:A:244:PHE:O	1:A:247:GLU:HG2	2.17	0.45
1:A:151:LYS:HE3	3:A:473:HOH:O	2.17	0.44
1:A:329:PRO:HB3	1:A:335:VAL:HG21	1.99	0.43
1:A:171:ILE:HD12	1:A:193:ILE:CG2	2.45	0.43
1:A:254:ASN:O	1:A:257:LEU:HB3	2.18	0.43
1:A:209:LYS:HE2	1:A:220:ASN:OD1	2.18	0.43
1:A:237:LYS:HG2	3:A:599:HOH:O	2.18	0.42
1:A:60:VAL:HG11	1:A:114:ARG:HG2	2.02	0.42
1:A:256:GLU:HG3	3:A:453:HOH:O	2.19	0.42
1:A:48:PRO:HA	1:A:88:ASP:O	2.21	0.41
1:A:140:GLN:CB	1:A:176:TYR:HA	2.51	0.41
1:A:68:LEU:HD13	1:A:125:ARG:NH1	2.36	0.40
1:A:171:ILE:CD1	1:A:193:ILE:HD12	2.51	0.40
1:A:25:PHE:HB3	1:A:70:TYR:CZ	2.57	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:92:ALA:HB3	1:A:95:TYR:HB3	2.03	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	330/343 (96%)	318 (96%)	11 (3%)	1 (0%)	36 46

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	140	GLN

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	302/311 (97%)	293 (97%)	9 (3%)	36 53

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	32	LYS
1	A	88	ASP

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Mol	Chain	Res	Type
1	A	158	LYS
1	A	162	GLU
1	A	224	LYS
1	A	263	LYS
1	A	294	LYS
1	A	316	LYS
1	A	325	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	16	GLN
1	A	90	HIS
1	A	112	GLN
1	A	132	HIS
1	A	201	ASN
1	A	324	ASN

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 ⓘ

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	BGC	B	1	2	12,12,12	1.65	1 (8%)	17,17,17	2.04	8 (47%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	BGC	B	2	2	11,11,12	1.30	1 (9%)	15,15,17	1.14	1 (6%)

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	BGC	B	1	2	-	0/2/22/22	0/1/1/1
2	BGC	B	2	2	-	0/2/19/22	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	1	BGC	C1-C2	4.93	1.63	1.52
2	B	2	BGC	C4-C3	3.20	1.60	1.52

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	1	BGC	O2-C2-C1	3.84	118.11	109.25
2	B	1	BGC	C4-C3-C2	-3.76	104.23	110.83
2	B	1	BGC	O2-C2-C3	-2.53	104.41	110.38
2	B	2	BGC	C1-O5-C5	2.42	115.43	112.19
2	B	1	BGC	O3-C3-C4	2.30	115.80	110.38
2	B	1	BGC	C3-C4-C5	-2.16	106.32	110.23
2	B	1	BGC	O5-C1-C2	2.14	114.07	110.30
2	B	1	BGC	C6-C5-C4	2.06	118.08	113.02
2	B	1	BGC	O5-C5-C4	-2.04	106.03	109.70

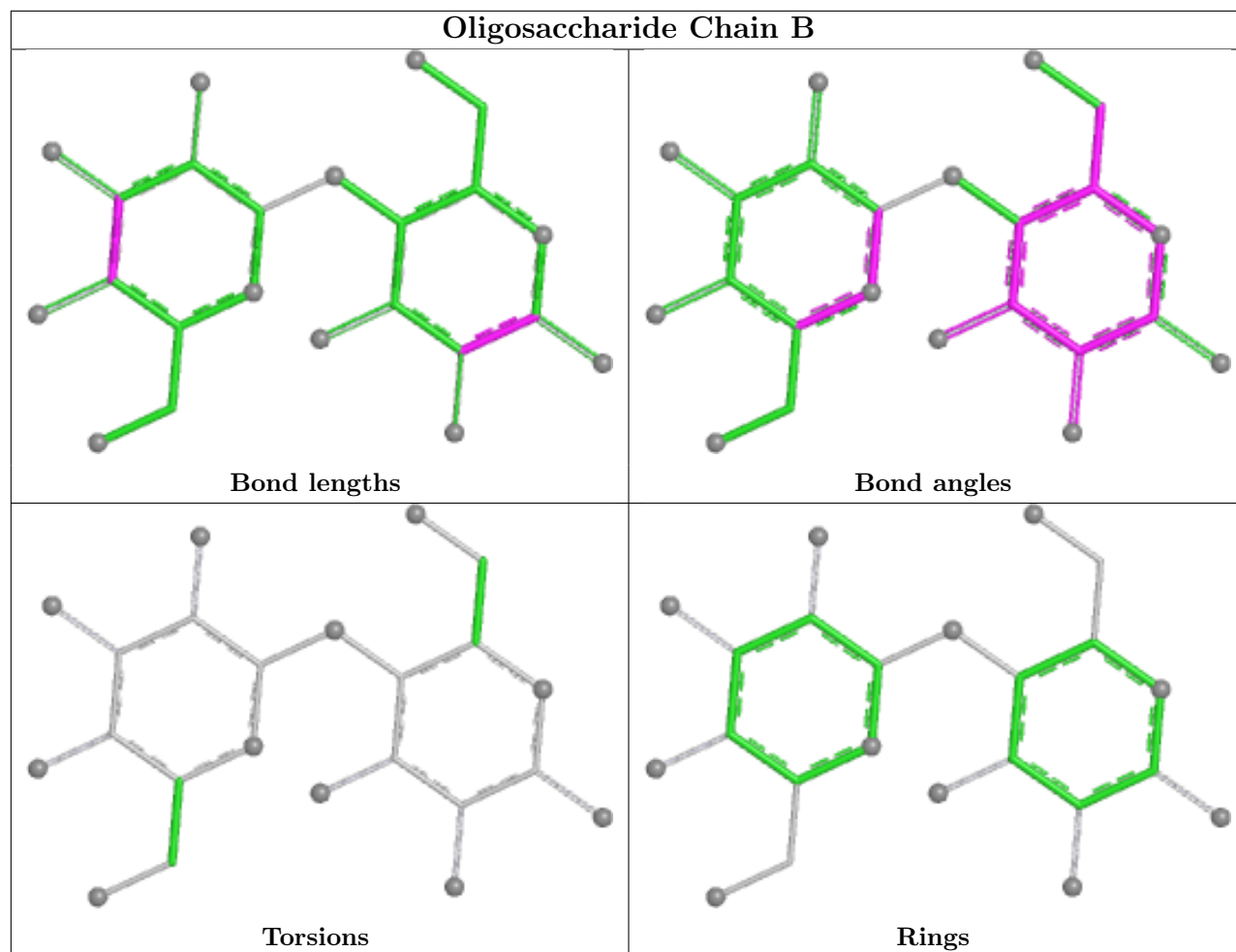
There are no chirality outliers.

There are no torsion outliers.

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

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.