



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 20, 2024 – 09:26 AM EDT

PDB ID : 3VGG
Title : Crystal structure of glycosyltrehalose trehalohydrolase (E283Q) complexed with maltoheptaose
Authors : Okazaki, N.; Tamada, T.; Feese, M.D.; Kato, M.; Miura, Y.; Komeda, T.; Kobayashi, K.; Kondo, K.; Kuroki, R.
Deposited on : 2011-08-09
Resolution : 2.66 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	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

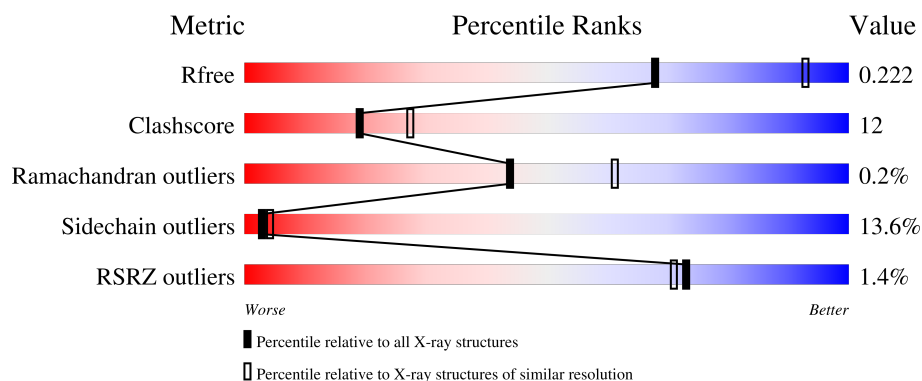
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

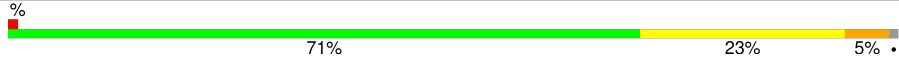

The reported resolution of this entry is 2.66 Å.

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}	164625	1003 (2.66-2.66)
Clashscore	180529	1063 (2.66-2.66)
Ramachandran outliers	177936	1052 (2.66-2.66)
Sidechain outliers	177891	1052 (2.66-2.66)
RSRZ outliers	164620	1003 (2.66-2.66)

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	558	
2	B	5	

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 4768 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.

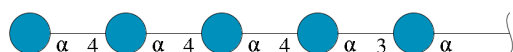
- Molecule 1 is a protein called Malto-oligosyltrehalose trehalohydrolase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	554	Total	C	N	O	S	0	0	0
			4549	2932	747	861	9			

There is a discrepancy between the modelled and reference sequences:

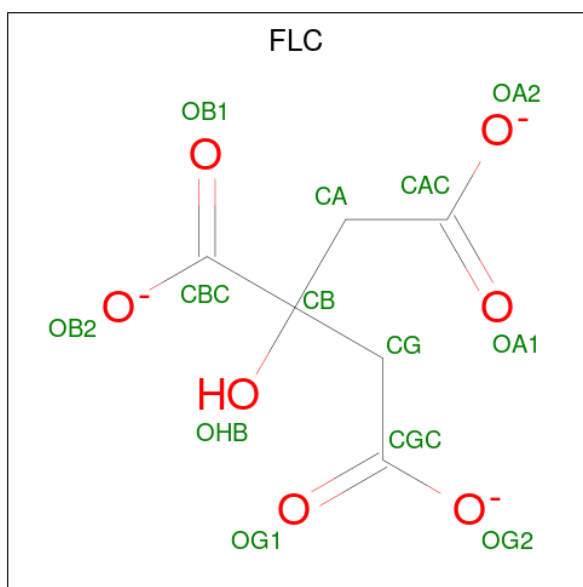
Chain	Residue	Modelled	Actual	Comment	Reference
A	283	GLN	GLU	engineered mutation	UNP Q55088

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



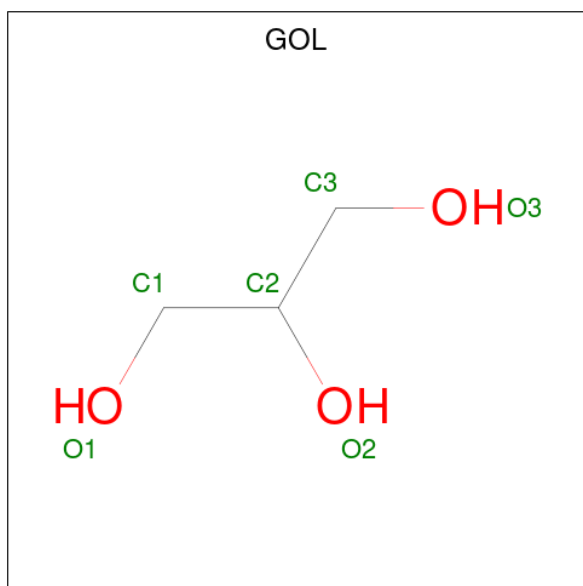
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
2	B	5	Total	C	O	0	0	0
			56	30	26			

- Molecule 3 is CITRATE ANION (three-letter code: FLC) (formula: C₆H₅O₇).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			13	6	7		

- Molecule 4 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			6	3	3		

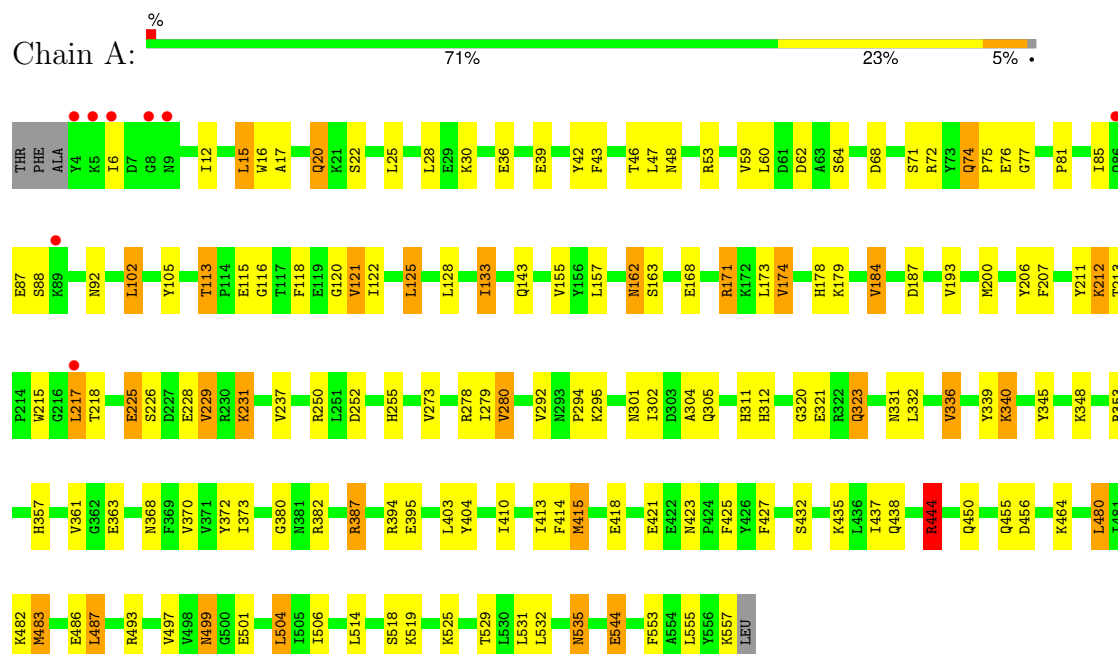
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	144	Total 144	O 144	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: Malto-oligosyltrehalose trehalohydrolase



- Molecule 2: alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose-(1-4)-alpha-D-glucopyranose-(1-3)-alpha-D-glucopyranose



4 Data and refinement statistics

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	78.54Å 78.54Å 282.31Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	61.30 – 2.66 61.30 – 2.66	Depositor EDS
% Data completeness (in resolution range)	97.5 (61.30-2.66) 97.5 (61.30-2.66)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.86 (at 2.65Å)	Xtriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.175 , 0.227 0.174 , 0.222	Depositor DCC
R_{free} test set	1491 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å ²)	37.0	Xtriage
Anisotropy	0.128	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 51.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.039 for -h,-k,l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	4768	wwPDB-VP
Average B, all atoms (Å ²)	40.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.77% 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 ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: FLC, GOL, GLC

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	0.87	1/4666 (0.0%)	0.89	8/6304 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	168	GLU	CG-CD	6.61	1.61	1.51

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	387	ARG	NE-CZ-NH1	10.05	125.32	120.30
1	A	535	ASN	CB-CA-C	-7.34	95.72	110.40
1	A	387	ARG	NE-CZ-NH2	-7.27	116.67	120.30
1	A	557	LYS	CA-C-O	6.74	134.25	120.10
1	A	187	ASP	CB-CG-OD1	6.10	123.79	118.30
1	A	187	ASP	CB-CG-OD2	-5.85	113.03	118.30
1	A	444	ARG	NE-CZ-NH1	5.47	123.04	120.30
1	A	102	LEU	CA-CB-CG	5.47	127.88	115.30

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	4549	0	4408	104	0
2	B	56	0	48	3	0
3	A	13	0	5	1	0
4	A	6	0	8	1	0
5	A	144	0	0	14	0
All	All	4768	0	4469	105	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 12.

All (105) 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:143:GLN:HE22	1:A:162:ASN:H	1.14	0.93
1:A:113:THR:HG22	1:A:116:GLY:H	1.36	0.91
4:A:1101:GOL:H2	5:A:2067:HOH:O	1.71	0.91
1:A:311:HIS:HD2	1:A:312:HIS:ND1	1.70	0.88
1:A:133:ILE:HD11	1:A:413:ILE:HD12	1.60	0.83
1:A:394:ARG:HD3	5:A:2124:HOH:O	1.78	0.82
1:A:162:ASN:HD22	1:A:163:SER:H	1.32	0.78
1:A:387:ARG:HD2	1:A:423:ASN:O	1.86	0.75
1:A:323:GLN:HE21	1:A:323:GLN:H	1.33	0.75
1:A:217:LEU:HD12	1:A:217:LEU:H	1.53	0.73
1:A:231:LYS:HG2	5:A:2016:HOH:O	1.89	0.72
1:A:321:GLU:HB3	1:A:323:GLN:NE2	2.05	0.71
1:A:122:ILE:HA	1:A:125:LEU:HD22	1.73	0.70
1:A:321:GLU:HB3	1:A:323:GLN:HE22	1.57	0.68
1:A:544:GLU:HB3	5:A:2144:HOH:O	1.93	0.68
1:A:311:HIS:CD2	1:A:312:HIS:ND1	2.61	0.66
1:A:273:VAL:HG21	1:A:280:VAL:HG22	1.78	0.66
1:A:162:ASN:HD22	1:A:163:SER:N	1.93	0.65
1:A:143:GLN:NE2	1:A:162:ASN:H	1.93	0.64
1:A:415:MET:O	1:A:415:MET:HG3	1.97	0.64
1:A:12:ILE:HG22	1:A:46:THR:OG1	1.99	0.63
1:A:231:LYS:CE	1:A:231:LYS:HA	2.29	0.62
1:A:113:THR:HG21	1:A:120:GLY:HA3	1.81	0.62
1:A:113:THR:HG22	1:A:116:GLY:N	2.13	0.60
1:A:323:GLN:H	1:A:323:GLN:NE2	2.00	0.59
1:A:499:ASN:HD22	1:A:499:ASN:H	1.49	0.59
1:A:499:ASN:HD22	1:A:499:ASN:N	2.00	0.59
1:A:16:TRP:HZ2	1:A:225:GLU:HG2	1.68	0.58
1:A:444:ARG:HH11	1:A:450:GLN:HE21	1.51	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:444:ARG:NH1	1:A:450:GLN:HE21	2.02	0.58
1:A:336:VAL:O	1:A:340:LYS:HG2	2.04	0.58
1:A:294:PRO:HA	1:A:301:ASN:HD22	1.70	0.57
1:A:444:ARG:NH1	1:A:450:GLN:NE2	2.52	0.57
1:A:231:LYS:HA	1:A:231:LYS:HE3	1.88	0.56
1:A:464:LYS:HE2	5:A:2022:HOH:O	2.07	0.55
1:A:493:ARG:HD2	5:A:2033:HOH:O	2.05	0.55
1:A:226:SER:HA	1:A:229:VAL:HG13	1.89	0.55
1:A:92:ASN:O	1:A:278:ARG:NH2	2.40	0.55
1:A:200:MET:HE2	1:A:207:PHE:CZ	2.43	0.54
1:A:162:ASN:ND2	1:A:163:SER:N	2.56	0.54
1:A:255:HIS:NE2	2:B:1:GLC:H1	2.24	0.53
1:A:71:SER:OG	1:A:74:GLN:NE2	2.43	0.52
1:A:113:THR:HG23	1:A:115:GLU:H	1.76	0.51
1:A:215:TRP:CD2	2:B:2:GLC:H62	2.46	0.50
1:A:217:LEU:H	1:A:217:LEU:CD1	2.23	0.50
1:A:482:LYS:HD2	1:A:486:GLU:OE2	2.11	0.50
1:A:62:ASP:HB3	1:A:64:SER:H	1.76	0.50
1:A:273:VAL:CG2	1:A:280:VAL:HG22	2.40	0.50
1:A:16:TRP:HB2	1:A:42:TYR:CE1	2.47	0.50
1:A:345:TYR:CE2	1:A:348:LYS:HE2	2.47	0.49
1:A:252:ASP:OD1	2:B:2:GLC:H2	2.12	0.49
1:A:395:GLU:OE1	1:A:535:ASN:ND2	2.45	0.49
1:A:427:PHE:HB3	1:A:450:GLN:HE22	1.75	0.49
1:A:74:GLN:HG3	1:A:77:GLY:O	2.13	0.49
1:A:113:THR:CG2	1:A:116:GLY:H	2.16	0.48
1:A:200:MET:HE2	1:A:207:PHE:HZ	1.79	0.48
1:A:353:ARG:HB3	5:A:2130:HOH:O	2.14	0.48
1:A:171:ARG:HA	1:A:171:ARG:HD2	1.48	0.47
1:A:213:THR:HG23	1:A:218:THR:HB	1.97	0.47
1:A:143:GLN:HE22	1:A:162:ASN:N	1.96	0.46
1:A:162:ASN:ND2	1:A:163:SER:H	2.07	0.46
1:A:295:LYS:HE2	5:A:2135:HOH:O	2.15	0.46
1:A:504:LEU:HD11	1:A:506:ILE:HD11	1.97	0.46
1:A:200:MET:CE	1:A:207:PHE:CZ	2.98	0.46
1:A:382:ARG:HB3	3:A:1001:FLC:HA1	1.98	0.46
1:A:414:PHE:O	1:A:415:MET:C	2.54	0.45
1:A:174:VAL:HB	1:A:184:VAL:HG11	1.98	0.45
1:A:200:MET:HB3	1:A:206:TYR:CD1	2.52	0.45
1:A:48:ASN:OD1	1:A:48:ASN:N	2.50	0.45
1:A:212:LYS:N	1:A:212:LYS:CD	2.79	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:36:GLU:O	1:A:43:PHE:HA	2.18	0.44
1:A:118:PHE:HA	1:A:121:VAL:HG13	1.97	0.44
1:A:370:VAL:HA	1:A:410:ILE:O	2.16	0.44
1:A:174:VAL:HG23	1:A:178:HIS:CE1	2.52	0.44
1:A:432:SER:HB2	5:A:2065:HOH:O	2.18	0.44
1:A:320:GLY:HA2	5:A:2126:HOH:O	2.16	0.44
1:A:380:GLY:HA2	1:A:425:PHE:O	2.18	0.44
1:A:278:ARG:C	1:A:279:ILE:HD13	2.37	0.43
1:A:373:ILE:HG12	1:A:404:TYR:CE2	2.53	0.43
1:A:403:LEU:HD23	1:A:403:LEU:HA	1.91	0.43
1:A:20:GLN:OE1	1:A:60:LEU:HB3	2.18	0.43
1:A:105:TYR:HB2	1:A:133:ILE:HG12	2.00	0.43
1:A:331:ASN:HB3	5:A:2100:HOH:O	2.18	0.43
1:A:357:HIS:HE1	5:A:2019:HOH:O	2.01	0.43
1:A:311:HIS:HB2	1:A:372:TYR:O	2.19	0.43
1:A:304:ALA:HA	1:A:368:ASN:O	2.18	0.43
1:A:212:LYS:N	1:A:212:LYS:HD2	2.34	0.43
1:A:480:LEU:HD13	1:A:532:LEU:CD2	2.49	0.43
1:A:311:HIS:CD2	1:A:311:HIS:C	2.92	0.42
1:A:113:THR:HG23	1:A:115:GLU:N	2.34	0.42
1:A:68:ASP:O	1:A:71:SER:HB2	2.19	0.42
1:A:53:ARG:HG2	5:A:2137:HOH:O	2.20	0.42
1:A:280:VAL:HB	1:A:302:ILE:HG23	2.02	0.42
1:A:294:PRO:HA	1:A:301:ASN:ND2	2.35	0.41
1:A:311:HIS:HE1	5:A:2023:HOH:O	2.02	0.41
1:A:278:ARG:O	1:A:279:ILE:HD13	2.20	0.41
1:A:6:ILE:HD12	1:A:87:GLU:HB2	2.01	0.41
1:A:105:TYR:HB2	1:A:133:ILE:CG1	2.51	0.41
1:A:437:ILE:HG23	1:A:455:GLN:HG3	2.03	0.41
1:A:75:PRO:HD2	1:A:81:PRO:O	2.20	0.41
1:A:113:THR:HG23	1:A:115:GLU:OE2	2.21	0.40
1:A:121:VAL:HG22	1:A:173:LEU:CD1	2.51	0.40
1:A:518:SER:O	1:A:519:LYS:C	2.60	0.40
1:A:15:LEU:HD13	1:A:17:ALA:HB2	2.03	0.40
1:A:483:MET:O	1:A:487:LEU:HB2	2.22	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	552/558 (99%)	519 (94%)	32 (6%)	1 (0%)	44	61

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	415	MET

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	491/494 (99%)	424 (86%)	67 (14%)	3	4

All (67) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	15	LEU
1	A	20	GLN
1	A	22	SER
1	A	25	LEU
1	A	28	LEU
1	A	30	LYS
1	A	39	GLU
1	A	47	LEU
1	A	59	VAL
1	A	72	ARG

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Mol	Chain	Res	Type
1	A	74	GLN
1	A	76	GLU
1	A	85	ILE
1	A	88	SER
1	A	102	LEU
1	A	113	THR
1	A	121	VAL
1	A	125	LEU
1	A	128	LEU
1	A	133	ILE
1	A	155	VAL
1	A	157	LEU
1	A	162	ASN
1	A	171	ARG
1	A	174	VAL
1	A	179	LYS
1	A	184	VAL
1	A	193	VAL
1	A	211	TYR
1	A	212	LYS
1	A	217	LEU
1	A	225	GLU
1	A	228	GLU
1	A	229	VAL
1	A	231	LYS
1	A	237	VAL
1	A	250	ARG
1	A	280	VAL
1	A	292	VAL
1	A	305	GLN
1	A	323	GLN
1	A	332	LEU
1	A	336	VAL
1	A	339	TYR
1	A	340	LYS
1	A	361	VAL
1	A	363	GLU
1	A	418	GLU
1	A	421	GLU
1	A	435	LYS
1	A	438	GLN
1	A	444	ARG

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Mol	Chain	Res	Type
1	A	456	ASP
1	A	480	LEU
1	A	483	MET
1	A	487	LEU
1	A	497	VAL
1	A	499	ASN
1	A	501	GLU
1	A	504	LEU
1	A	514	LEU
1	A	525	LYS
1	A	529	THR
1	A	531	LEU
1	A	544	GLU
1	A	553	PHE
1	A	555	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	74	GLN
1	A	143	GLN
1	A	162	ASN
1	A	245	ASN
1	A	301	ASN
1	A	311	HIS
1	A	323	GLN
1	A	331	ASN
1	A	357	HIS
1	A	368	ASN
1	A	423	ASN
1	A	450	GLN
1	A	499	ASN
1	A	535	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 ⓘ

5 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	GLC	B	1	2	12,12,12	1.36	1 (8%)	17,17,17	1.90	7 (41%)
2	GLC	B	2	2	11,11,12	0.60	0	15,15,17	2.52	6 (40%)
2	GLC	B	3	2	11,11,12	0.85	1 (9%)	15,15,17	2.07	6 (40%)
2	GLC	B	4	2	11,11,12	0.72	0	15,15,17	2.82	2 (13%)
2	GLC	B	5	2	11,11,12	0.82	0	15,15,17	1.76	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	GLC	B	1	2	-	2/2/22/22	0/1/1/1
2	GLC	B	2	2	-	1/2/19/22	0/1/1/1
2	GLC	B	3	2	-	0/2/19/22	0/1/1/1
2	GLC	B	4	2	-	2/2/19/22	0/1/1/1
2	GLC	B	5	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	GLC	C4-C5	2.57	1.58	1.53
2	B	3	GLC	C1-C2	2.03	1.57	1.52

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	4	GLC	C1-O5-C5	10.19	125.84	112.19
2	B	2	GLC	C1-O5-C5	6.81	121.32	112.19
2	B	5	GLC	C1-O5-C5	5.03	118.93	112.19
2	B	3	GLC	C1-O5-C5	4.58	118.33	112.19
2	B	1	GLC	O3-C3-C2	4.02	119.86	110.38
2	B	3	GLC	C1-C2-C3	3.45	114.66	109.64
2	B	2	GLC	O2-C2-C1	3.18	116.50	109.22
2	B	1	GLC	O3-C3-C4	2.92	117.26	110.38
2	B	4	GLC	O5-C5-C4	2.87	117.82	110.83
2	B	2	GLC	O5-C1-C2	-2.79	104.13	110.79
2	B	2	GLC	O5-C5-C4	2.79	117.61	110.83
2	B	3	GLC	O2-C2-C3	-2.68	104.59	110.15
2	B	1	GLC	C6-C5-C4	2.64	119.51	113.02
2	B	1	GLC	O4-C4-C3	-2.63	104.17	110.38
2	B	1	GLC	O5-C5-C4	2.51	114.22	109.70
2	B	1	GLC	O1-C1-C2	2.45	116.09	108.98
2	B	5	GLC	C3-C4-C5	-2.35	105.97	110.23
2	B	3	GLC	O2-C2-C1	2.30	114.48	109.22
2	B	2	GLC	O4-C4-C5	-2.23	103.84	109.32
2	B	3	GLC	C2-C3-C4	2.10	114.55	110.86
2	B	1	GLC	O6-C6-C5	2.06	118.33	111.33
2	B	2	GLC	O5-C5-C6	2.05	111.66	107.66
2	B	3	GLC	O4-C4-C5	2.03	114.32	109.32

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	4	GLC	O5-C5-C6-O6
2	B	1	GLC	C4-C5-C6-O6
2	B	1	GLC	O5-C5-C6-O6
2	B	4	GLC	C4-C5-C6-O6
2	B	2	GLC	C4-C5-C6-O6

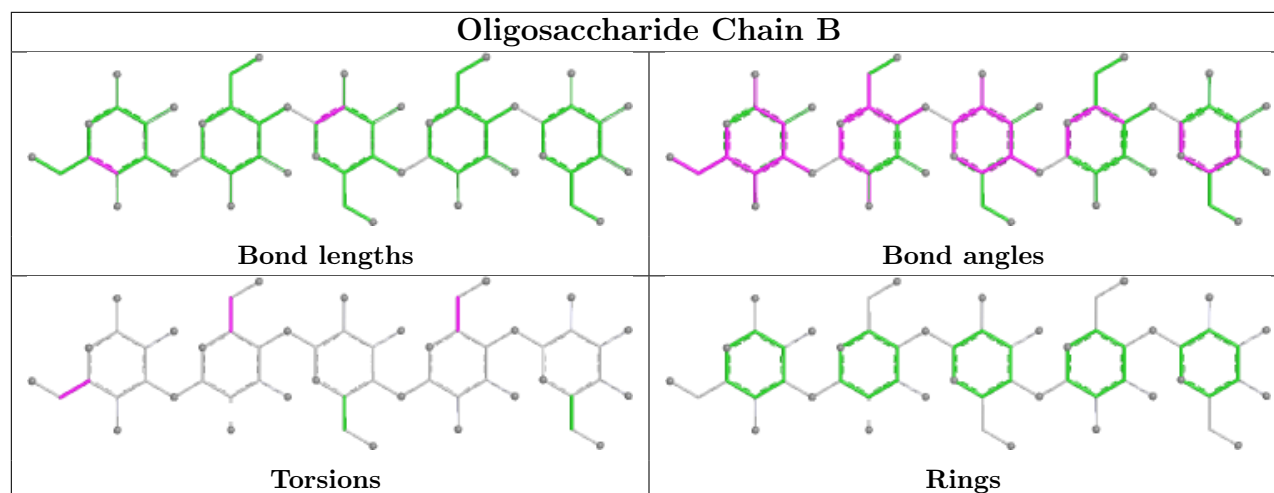
There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	1	GLC	1	0
2	B	2	GLC	2	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](#)

2 ligands 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	$\# Z > 2$
3	FLC	A	1001	-	12,12,12	0.89	0	17,17,17	1.61	5 (29%)
4	GOL	A	1101	-	5,5,5	0.60	0	5,5,5	1.32	1 (20%)

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
3	FLC	A	1001	-	-	4/16/16/16	-
4	GOL	A	1101	-	-	3/4/4/4	-

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	1001	FLC	OB2-CBC-CB	3.24	119.35	113.14
4	A	1101	GOL	O2-C2-C3	2.39	119.08	109.18
3	A	1001	FLC	OG1-CGC-CG	-2.22	116.66	122.95
3	A	1001	FLC	OG2-CGC-CG	2.14	121.14	114.35
3	A	1001	FLC	OHB-CB-CG	-2.06	104.69	109.38
3	A	1001	FLC	OA1-CAC-CA	-2.03	117.21	122.95

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	1101	GOL	O1-C1-C2-C3
4	A	1101	GOL	O1-C1-C2-O2
4	A	1101	GOL	O2-C2-C3-O3
3	A	1001	FLC	CB-CA-CAC-OA1
3	A	1001	FLC	CB-CG-CGC-OG2
3	A	1001	FLC	CB-CG-CGC-OG1
3	A	1001	FLC	CB-CA-CAC-OA2

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1001	FLC	1	0
4	A	1101	GOL	1	0

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	554/558 (99%)	-0.74	8 (1%) 73 71	19, 34, 75, 110	0

All (8) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	6	ILE	5.7
1	A	4	TYR	4.2
1	A	8	GLY	3.8
1	A	5	LYS	3.4
1	A	217	LEU	2.9
1	A	89	LYS	2.7
1	A	86	GLN	2.0
1	A	9	ASN	2.0

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.

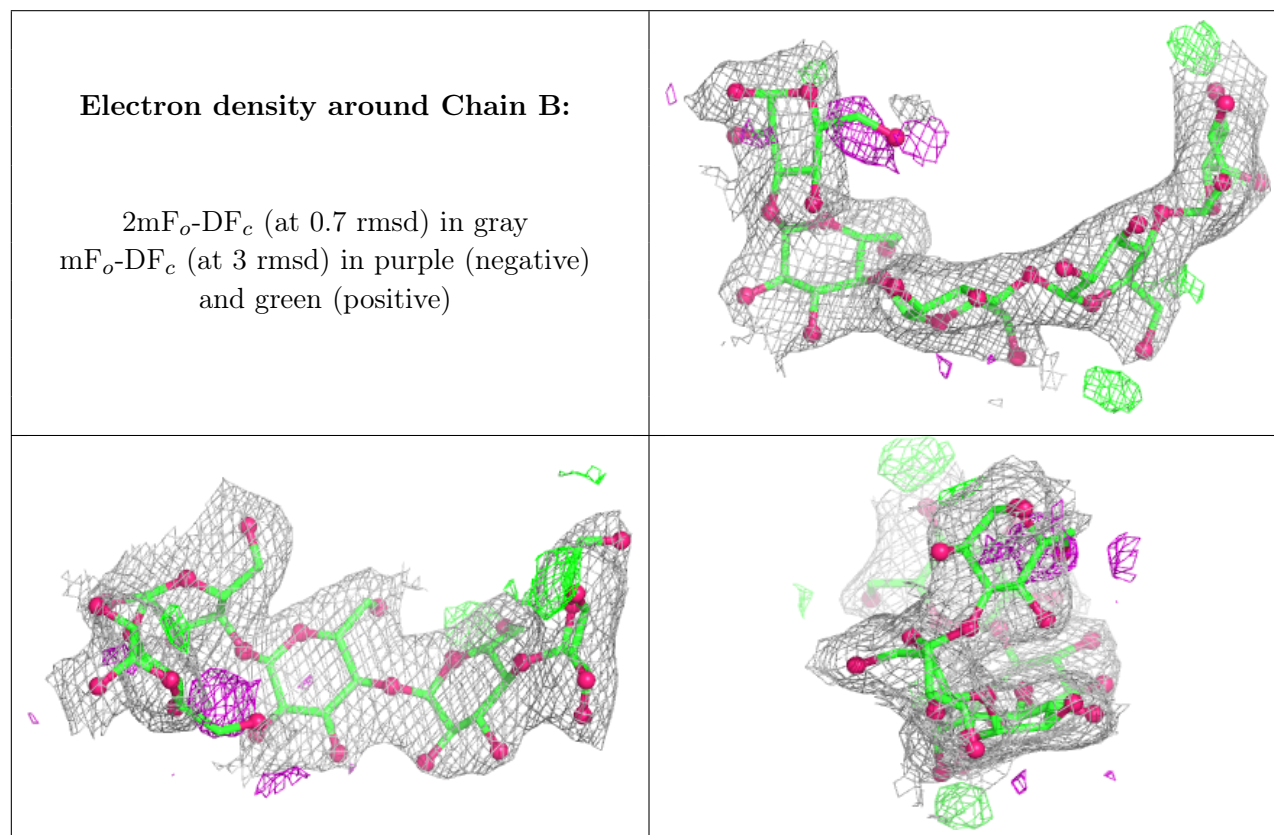
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	GLC	B	5	11/12	0.79	0.14	71,73,77,77	0
2	GLC	B	1	12/12	0.88	0.16	52,58,66,70	0
2	GLC	B	4	11/12	0.91	0.10	60,65,69,70	0
2	GLC	B	2	11/12	0.96	0.08	41,46,49,52	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	GLC	B	3	11/12	0.96	0.08	52,54,56,58	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 ⓘ

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(\AA^2)	Q<0.9
4	GOL	A	1101	6/6	0.75	0.19	53,57,59,59	0
3	FLC	A	1001	13/13	0.93	0.08	48,54,57,57	0

6.5 Other polymers ⓘ

There are no such residues in this entry.