



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 5, 2024 – 07:25 AM EDT

PDB ID : 1CGU
Title : CATALYTIC CENTER OF CYCLODEXTRIN GLYCOSYLTRANSFERASE
DERIVED FROM X-RAY STRUCTURE ANALYSIS COMBINED WITH
SITE-DIRECTED MUTAGENESIS
Authors : Klein, C.; Hollender, J.; Bender, H.; Schulz, G.E.
Deposited on : 1992-06-10
Resolution : 2.50 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

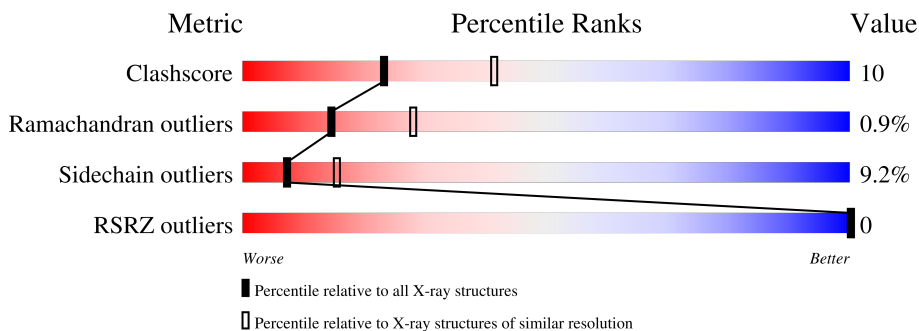
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION



The reported resolution of this entry is 2.50 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	180529	6282 (2.50-2.50)
Ramachandran outliers	177936	6191 (2.50-2.50)
Sidechain outliers	177891	6193 (2.50-2.50)
RSRZ outliers	164620	5504 (2.50-2.50)

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	684	 66% 28% 6%
2	B	2	 50% 50%

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 5766 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 CYCLODEXTRIN GLYCOSYL-TRANSFERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	684	5264	3322	891	1038	13	0	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	229	ALA	ASP	conflict	UNP P30920

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



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
			Total	C	O			
2	B	2	22	12	10	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		

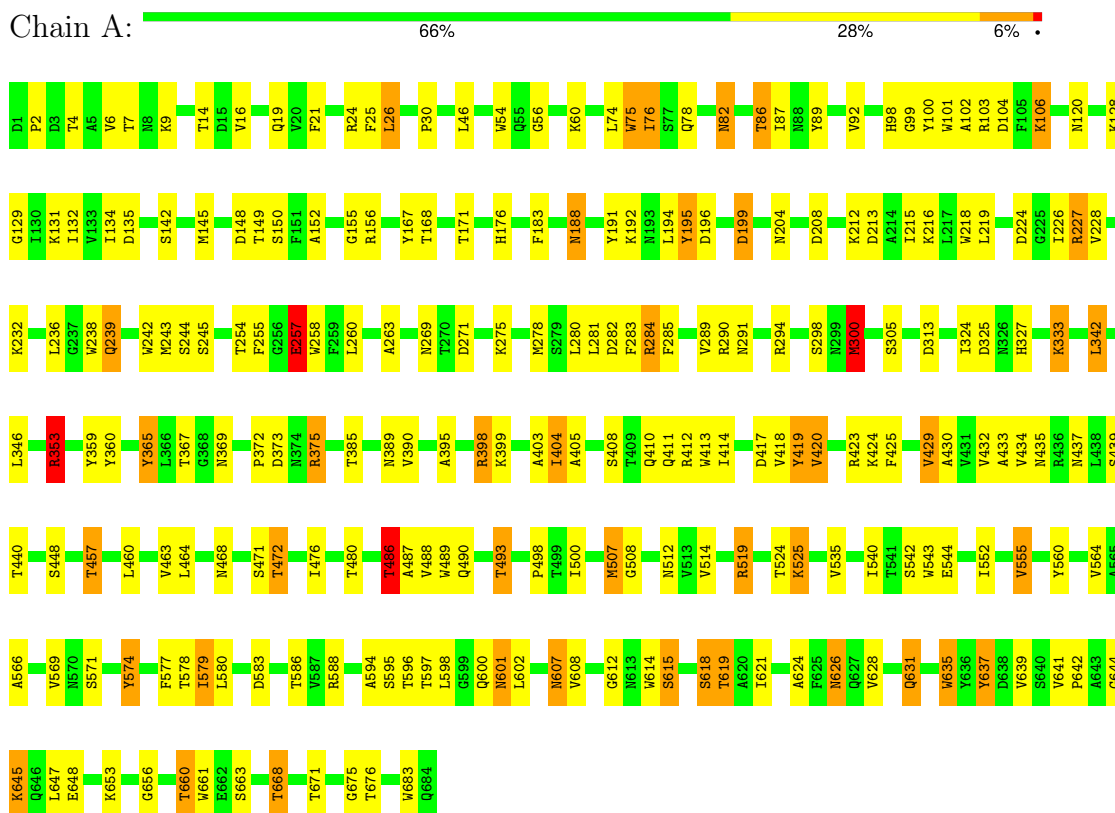
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	478	Total	O	0	0
			478	478		

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: CYCLODEXTRIN GLYCOSYL-TRANSFERASE



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



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	94.10Å 105.00Å 113.90Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 2.50 10.00 – 2.56	Depositor EDS
% Data completeness (in resolution range)	(Not available) (10.00-2.50) 61.8 (10.00-2.56)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$	-	Xtrriage
Refinement program	X-PLOR	Depositor
R, R_{free}	0.187 , (Not available) 0.248 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	8.3	Xtrriage
Anisotropy	0.198	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.27 , 30.5	EDS
L-test for twinning ¹	$\langle L \rangle = 0.31$, $\langle L^2 \rangle = 0.15$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.89	EDS
Total number of atoms	5766	wwPDB-VP
Average B, all atoms (Å ²)	13.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.98% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Theoretical 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: CA, 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	0.97	0/5395	1.82	122/7362 (1.7%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

There are no bond length outliers.

All (122) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	353	ARG	NE-CZ-NH2	-13.62	113.49	120.30
1	A	398	ARG	NE-CZ-NH2	-13.28	113.66	120.30
1	A	412	ARG	NE-CZ-NH2	-12.82	113.89	120.30
1	A	284	ARG	CB-CG-CD	-11.52	81.65	111.60
1	A	365	TYR	CB-CG-CD2	-10.73	114.56	121.00
1	A	398	ARG	NE-CZ-NH1	10.41	125.50	120.30
1	A	588	ARG	NE-CZ-NH2	-9.75	115.42	120.30
1	A	683	TRP	CD1-CG-CD2	9.19	113.65	106.30
1	A	103	ARG	NE-CZ-NH2	-9.05	115.78	120.30
1	A	101	TRP	CD1-CG-CD2	9.02	113.51	106.30
1	A	353	ARG	NE-CZ-NH1	8.99	124.80	120.30
1	A	294	ARG	NE-CZ-NH1	8.64	124.62	120.30
1	A	635	TRP	CD1-CG-CD2	8.63	113.21	106.30
1	A	101	TRP	CE2-CD2-CG	-8.51	100.50	107.30
1	A	683	TRP	CE2-CD2-CG	-8.44	100.55	107.30
1	A	156	ARG	NE-CZ-NH2	-8.37	116.12	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	472	THR	CA-C-N	-8.19	99.19	117.20
1	A	413	TRP	CD1-CG-CD2	8.15	112.82	106.30
1	A	258	TRP	CD1-CG-CD2	8.09	112.78	106.30
1	A	342	LEU	CA-CB-CG	8.09	133.91	115.30
1	A	635	TRP	CE2-CD2-CG	-7.97	100.92	107.30
1	A	412	ARG	NE-CZ-NH1	7.93	124.27	120.30
1	A	417	ASP	CB-CG-OD1	7.75	125.28	118.30
1	A	413	TRP	CE2-CD2-CG	-7.67	101.16	107.30
1	A	614	TRP	CE2-CD2-CG	-7.65	101.18	107.30
1	A	54	TRP	CE2-CD2-CG	-7.57	101.24	107.30
1	A	560	TYR	CB-CG-CD1	-7.53	116.48	121.00
1	A	359	TYR	CB-CG-CD2	-7.52	116.49	121.00
1	A	486	THR	CA-C-N	-7.47	100.76	117.20
1	A	597	THR	CA-CB-CG2	7.40	122.76	112.40
1	A	24	ARG	NE-CZ-NH2	-7.38	116.61	120.30
1	A	258	TRP	CE2-CD2-CG	-7.38	101.40	107.30
1	A	75	TRP	CE2-CD2-CG	-7.36	101.42	107.30
1	A	614	TRP	CD1-CG-CD2	7.33	112.17	106.30
1	A	101	TRP	CG-CD2-CE3	7.33	140.50	133.90
1	A	543	TRP	CD1-CG-CD2	7.33	112.16	106.30
1	A	54	TRP	CG-CD2-CE3	7.27	140.44	133.90
1	A	683	TRP	CG-CD2-CE3	7.27	140.44	133.90
1	A	195	TYR	CB-CG-CD2	-7.26	116.64	121.00
1	A	280	LEU	CA-CB-CG	7.26	131.99	115.30
1	A	245	SER	CA-CB-OG	7.23	130.72	111.20
1	A	238	TRP	CE2-CD2-CG	-7.13	101.60	107.30
1	A	238	TRP	CD1-CG-CD2	7.04	111.94	106.30
1	A	257	GLU	CA-C-N	-7.01	101.78	117.20
1	A	597	THR	CA-CB-OG1	-6.97	94.37	109.00
1	A	218	TRP	CD1-CG-CD2	6.87	111.80	106.30
1	A	191	TYR	CB-CG-CD2	-6.86	116.88	121.00
1	A	54	TRP	CD1-CG-CD2	6.79	111.73	106.30
1	A	75	TRP	CD1-CG-CD2	6.74	111.69	106.30
1	A	218	TRP	CE2-CD2-CG	-6.72	101.92	107.30
1	A	86	THR	N-CA-CB	-6.63	97.71	110.30
1	A	614	TRP	CG-CD2-CE3	6.60	139.84	133.90
1	A	242	TRP	CE2-CD2-CG	-6.58	102.03	107.30
1	A	661	TRP	CE2-CD2-CG	-6.52	102.09	107.30
1	A	519	ARG	NE-CZ-NH2	-6.36	117.12	120.30
1	A	367	THR	CA-CB-CG2	-6.36	103.50	112.40
1	A	661	TRP	CD1-CG-CD2	6.30	111.34	106.30
1	A	242	TRP	CD1-CG-CD2	6.24	111.29	106.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	683	TRP	CG-CD1-NE1	-6.15	103.95	110.10
1	A	104	ASP	CB-CG-OD1	6.12	123.81	118.30
1	A	493	THR	CA-CB-CG2	6.08	120.91	112.40
1	A	242	TRP	CG-CD2-CE3	6.05	139.35	133.90
1	A	543	TRP	CE2-CD2-CG	-6.05	102.46	107.30
1	A	278	MET	CA-CB-CG	6.04	123.57	113.30
1	A	313	ASP	CB-CG-OD1	6.03	123.73	118.30
1	A	294	ARG	NE-CZ-NH2	-5.92	117.34	120.30
1	A	656	GLY	CA-C-N	-5.92	104.18	117.20
1	A	417	ASP	CB-CG-OD2	-5.92	112.98	118.30
1	A	257	GLU	O-C-N	5.86	132.07	122.70
1	A	75	TRP	CG-CD2-CE3	5.84	139.16	133.90
1	A	423	ARG	NE-CZ-NH2	-5.82	117.39	120.30
1	A	420	VAL	CG1-CB-CG2	-5.80	101.62	110.90
1	A	282	ASP	CA-C-N	-5.79	104.46	117.20
1	A	74	LEU	CB-CG-CD1	-5.70	101.31	111.00
1	A	574	TYR	CB-CG-CD2	-5.60	117.64	121.00
1	A	228	VAL	CG1-CB-CG2	-5.59	101.96	110.90
1	A	408	SER	N-CA-CB	-5.59	102.11	110.50
1	A	54	TRP	CB-CG-CD1	-5.59	119.74	127.00
1	A	101	TRP	CG-CD1-NE1	-5.57	104.53	110.10
1	A	614	TRP	CB-CG-CD1	-5.56	119.77	127.00
1	A	390	VAL	CG1-CB-CG2	-5.56	102.01	110.90
1	A	419	TYR	CB-CG-CD2	-5.55	117.67	121.00
1	A	196	ASP	CB-CG-OD1	5.53	123.28	118.30
1	A	290	ARG	NE-CZ-NH2	-5.52	117.54	120.30
1	A	239	GLN	CA-CB-CG	-5.51	101.28	113.40
1	A	54	TRP	NE1-CE2-CZ2	-5.50	124.35	130.40
1	A	227	ARG	NE-CZ-NH1	5.48	123.04	120.30
1	A	346	LEU	CB-CG-CD2	-5.46	101.71	111.00
1	A	598	LEU	CA-C-N	-5.40	105.39	116.20
1	A	683	TRP	CB-CG-CD1	-5.38	120.00	127.00
1	A	128	LYS	CA-CB-CG	-5.38	101.57	113.40
1	A	313	ASP	CB-CG-OD2	-5.37	113.47	118.30
1	A	641	VAL	N-CA-CB	-5.36	99.70	111.50
1	A	89	TYR	CB-CG-CD2	-5.36	117.79	121.00
1	A	472	THR	CA-CB-CG2	-5.35	104.91	112.40
1	A	430	ALA	CB-CA-C	-5.29	102.16	110.10
1	A	104	ASP	CB-CG-OD2	-5.29	113.54	118.30
1	A	489	TRP	CD1-CG-CD2	5.29	110.53	106.30
1	A	101	TRP	CB-CG-CD1	-5.27	120.14	127.00
1	A	628	VAL	CG1-CB-CG2	-5.27	102.46	110.90

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	156	ARG	NE-CZ-NH1	5.26	122.93	120.30
1	A	579	ILE	CA-CB-CG1	-5.25	101.03	111.00
1	A	325	ASP	CB-CG-OD2	-5.23	113.59	118.30
1	A	637	TYR	CB-CG-CD2	-5.23	117.86	121.00
1	A	258	TRP	CG-CD1-NE1	-5.21	104.89	110.10
1	A	167	TYR	CB-CG-CD2	-5.19	117.89	121.00
1	A	535	VAL	CG1-CB-CG2	-5.18	102.61	110.90
1	A	269	ASN	CB-CG-ND2	5.18	129.13	116.70
1	A	493	THR	CA-CB-OG1	-5.16	98.17	109.00
1	A	280	LEU	CB-CA-C	-5.14	100.43	110.20
1	A	284	ARG	CA-CB-CG	5.14	124.71	113.40
1	A	305	SER	N-CA-CB	5.14	118.21	110.50
1	A	543	TRP	CG-CD1-NE1	-5.12	104.98	110.10
1	A	213	ASP	CA-CB-CG	5.12	124.65	113.40
1	A	30	PRO	CA-N-CD	-5.11	104.35	111.50
1	A	385	THR	CA-CB-CG2	-5.10	105.25	112.40
1	A	588	ARG	NE-CZ-NH1	5.10	122.85	120.30
1	A	2	PRO	CA-C-N	-5.10	105.98	117.20
1	A	258	TRP	CG-CD2-CE3	5.10	138.49	133.90
1	A	413	TRP	CB-CG-CD1	-5.05	120.43	127.00
1	A	305	SER	CB-CA-C	-5.05	100.51	110.10
1	A	434	VAL	CB-CA-C	-5.04	101.82	111.40

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	360	TYR	Sidechain

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	5264	0	5009	104	0
2	B	22	0	19	1	0
3	A	2	0	0	0	0
4	A	478	0	0	18	1

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	5766	0	5028	104	1

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 10.

All (104) 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:4:THR:HG23	1:A:399:LYS:HD2	1.61	0.82
1:A:226:ILE:HB	1:A:254:THR:HG23	1.71	0.73
1:A:76:ILE:HD11	1:A:134:ILE:HG22	1.70	0.70
1:A:227:ARG:NH1	1:A:257:GLU:HG2	2.08	0.69
1:A:300:MET:HG3	1:A:419:TYR:HB2	1.75	0.68
1:A:291:ASN:HB3	1:A:298:SER:HB2	1.77	0.66
1:A:9:LYS:HD3	1:A:224:ASP:HA	1.78	0.65
1:A:653:LYS:HB2	1:A:660:THR:HG23	1.79	0.65
1:A:498:PRO:HB2	1:A:571:SER:HB3	1.80	0.64
1:A:414:ILE:HA	1:A:418:VAL:O	2.00	0.62
1:A:75:TRP:CZ2	1:A:227:ARG:HG3	2.34	0.61
1:A:460:LEU:HB3	1:A:463:VAL:HG22	1.83	0.60
1:A:410:GLN:HA	4:A:888:HOH:O	2.01	0.59
1:A:6:VAL:HA	1:A:131:LYS:HE2	1.85	0.59
1:A:596:THR:HB	1:A:600:GLN:HB3	1.84	0.58
1:A:92:VAL:HA	4:A:1210:HOH:O	2.03	0.57
1:A:580:LEU:HD23	4:A:731:HOH:O	2.06	0.56
1:A:586:THR:HB	1:A:676:THR:HG22	1.87	0.55
1:A:512:ASN:O	1:A:552:ILE:HG12	2.07	0.55
1:A:87:ILE:HG12	1:A:152:ALA:HB2	1.87	0.55
1:A:26:LEU:O	1:A:56:GLY:HA3	2.07	0.54
1:A:525:LYS:HD2	1:A:540:ILE:HB	1.89	0.54
1:A:263:ALA:O	1:A:284:ARG:HD3	2.07	0.53
1:A:432:VAL:HG22	1:A:488:VAL:HG22	1.90	0.53
1:A:25:PHE:HE2	1:A:60:LYS:HG3	1.74	0.53
1:A:463:VAL:HG23	1:A:464:LEU:HG	1.90	0.52
1:A:260:LEU:HB2	1:A:283:PHE:HB3	1.92	0.52
1:A:424:LYS:HG3	1:A:429:VAL:HG13	1.91	0.51
1:A:420:VAL:HG22	1:A:433:ALA:HA	1.94	0.50
1:A:612:GLY:HA2	1:A:619:THR:HB	1.94	0.50
1:A:648:GLU:HG3	1:A:668:THR:HG23	1.93	0.50
1:A:176:HIS:HB2	1:A:199:ASP:HB3	1.92	0.50
1:A:215:ILE:O	1:A:219:LEU:HG	2.12	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:285:PHE:CE1	1:A:289:VAL:HG21	2.47	0.49
1:A:78:GLN:HB3	1:A:99:GLY:O	2.13	0.49
1:A:25:PHE:CE2	1:A:60:LYS:HG3	2.47	0.48
1:A:98:HIS:HD2	1:A:100:TYR:H	1.60	0.48
1:A:612:GLY:O	1:A:615:SER:HB2	2.13	0.48
1:A:544:GLU:HB3	4:A:808:HOH:O	2.13	0.48
1:A:500:ILE:HD11	1:A:564:VAL:HG23	1.93	0.48
1:A:145:MET:HB2	1:A:148:ASP:HB3	1.96	0.48
1:A:464:LEU:HB3	1:A:486:THR:HG23	1.96	0.48
1:A:500:ILE:HG21	1:A:574:TYR:HB2	1.96	0.47
1:A:14:THR:HB	1:A:399:LYS:HD3	1.97	0.47
1:A:16:VAL:HG21	1:A:395:ALA:HB1	1.97	0.47
1:A:424:LYS:HZ2	1:A:429:VAL:HG22	1.79	0.47
1:A:621:ILE:HG21	1:A:639:VAL:HG22	1.96	0.46
1:A:6:VAL:HG11	1:A:129:GLY:HA2	1.97	0.46
1:A:232:LYS:NZ	4:A:757:HOH:O	2.48	0.46
1:A:608:VAL:HA	4:A:1191:HOH:O	2.16	0.46
1:A:168:THR:HA	4:A:916:HOH:O	2.16	0.46
1:A:19:GLN:HB2	1:A:75:TRP:CE3	2.51	0.46
1:A:403:ALA:HA	1:A:425:PHE:HB2	1.96	0.46
1:A:607:ASN:HB2	4:A:1268:HOH:O	2.16	0.46
1:A:142:SER:OG	1:A:155:GLY:HA2	2.15	0.45
1:A:398:ARG:O	1:A:405:ALA:HB2	2.16	0.45
1:A:435:ASN:OD1	1:A:437:ASN:HB3	2.15	0.45
1:A:637:TYR:HE2	4:A:767:HOH:O	1.99	0.45
1:A:507:MET:HG3	1:A:578:THR:HB	1.98	0.45
1:A:188:ASN:OD1	1:A:192:LYS:HD2	2.17	0.45
1:A:327:HIS:O	1:A:375:ARG:NH1	2.50	0.45
1:A:324:ILE:HD13	1:A:324:ILE:HG21	1.76	0.45
1:A:239:GLN:O	1:A:243:MET:HB2	2.17	0.45
1:A:131:LYS:HE3	4:A:762:HOH:O	2.17	0.45
1:A:457:THR:HA	1:A:468:ASN:OD1	2.17	0.45
1:A:626:ASN:O	1:A:631:GLN:HA	2.17	0.45
1:A:601:ASN:O	1:A:653:LYS:HA	2.17	0.44
1:A:132:ILE:HA	1:A:132:ILE:HD13	1.72	0.44
1:A:216:LYS:HA	1:A:219:LEU:HD12	2.00	0.44
1:A:98:HIS:CD2	1:A:100:TYR:H	2.36	0.44
1:A:566:ALA:O	1:A:569:VAL:HG22	2.18	0.44
1:A:82:ASN:HA	1:A:102:ALA:HA	2.00	0.44
1:A:271:ASP:O	1:A:275:LYS:HG3	2.18	0.43
1:A:106:LYS:NZ	4:A:1263:HOH:O	2.50	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:369:ASN:O	1:A:373:ASP:HB2	2.18	0.43
1:A:602:LEU:HD12	1:A:602:LEU:HA	1.82	0.43
1:A:333:LYS:NZ	4:A:1178:HOH:O	2.52	0.42
1:A:398:ARG:HG2	1:A:404:ILE:CG2	2.49	0.42
1:A:594:ALA:HB3	1:A:635:TRP:CD1	2.54	0.42
1:A:647:LEU:O	1:A:668:THR:HA	2.20	0.42
1:A:644:GLY:HA2	1:A:671:THR:O	2.20	0.42
1:A:257:GLU:OE2	2:B:1:GLC:C1	2.68	0.42
1:A:624:ALA:HA	1:A:637:TYR:CD1	2.54	0.42
1:A:389:ASN:OD1	1:A:463:VAL:HG11	2.20	0.42
1:A:76:ILE:HD11	1:A:134:ILE:CG2	2.44	0.42
1:A:471:SER:HA	1:A:476:ILE:HD13	2.02	0.42
1:A:621:ILE:HD13	1:A:639:VAL:HG11	2.02	0.42
1:A:645:LYS:NZ	4:A:1032:HOH:O	2.53	0.42
1:A:183:PHE:N	1:A:188:ASN:HD21	2.18	0.42
1:A:195:TYR:HA	4:A:835:HOH:O	2.20	0.41
1:A:555:VAL:CG2	1:A:579:ILE:HD12	2.50	0.41
1:A:208:ASP:O	1:A:212:LYS:HG3	2.20	0.41
1:A:519:ARG:HA	1:A:519:ARG:HD3	1.62	0.41
1:A:188:ASN:HB2	4:A:897:HOH:O	2.21	0.41
1:A:353:ARG:O	1:A:353:ARG:HD3	2.20	0.41
1:A:433:ALA:HB3	1:A:487:ALA:HB3	2.02	0.41
1:A:583:ASP:O	1:A:642:PRO:HA	2.21	0.41
1:A:618:SER:HA	4:A:945:HOH:O	2.20	0.41
1:A:60:LYS:NZ	4:A:1247:HOH:O	2.53	0.40
1:A:514:VAL:HG13	1:A:552:ILE:HD11	2.02	0.40
1:A:514:VAL:HG11	1:A:577:PHE:CZ	2.55	0.40
1:A:257:GLU:HB3	1:A:281:LEU:HD12	2.03	0.40
1:A:508:GLY:HA3	1:A:512:ASN:HD22	1.86	0.40
1:A:675:GLY:HA3	4:A:1044:HOH:O	2.20	0.40

All (1) 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)
4:A:1160:HOH:O	4:A:1235:HOH:O[3_645]	2.11	0.09

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	682/684 (100%)	618 (91%)	58 (8%)	6 (1%)	14 28

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	626	ASN
1	A	607	ASN
1	A	300	MET
1	A	365	TYR
1	A	7	THR
1	A	525	LYS

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	565/565 (100%)	513 (91%)	52 (9%)	7 15

All (52) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	21	PHE
1	A	26	LEU
1	A	46	LEU
1	A	76	ILE
1	A	82	ASN

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Mol	Chain	Res	Type
1	A	86	THR
1	A	106	LYS
1	A	120	ASN
1	A	135	ASP
1	A	149	THR
1	A	150	SER
1	A	171	THR
1	A	188	ASN
1	A	194	LEU
1	A	199	ASP
1	A	204	ASN
1	A	236	LEU
1	A	244	SER
1	A	255	PHE
1	A	257	GLU
1	A	300	MET
1	A	333	LYS
1	A	342	LEU
1	A	353	ARG
1	A	372	PRO
1	A	375	ARG
1	A	404	ILE
1	A	411	GLN
1	A	429	VAL
1	A	439	SER
1	A	440	THR
1	A	448	SER
1	A	457	THR
1	A	472	THR
1	A	480	THR
1	A	486	THR
1	A	490	GLN
1	A	493	THR
1	A	507	MET
1	A	524	THR
1	A	542	SER
1	A	555	VAL
1	A	595	SER
1	A	601	ASN
1	A	615	SER
1	A	618	SER
1	A	619	THR

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Mol	Chain	Res	Type
1	A	631	GLN
1	A	645	LYS
1	A	660	THR
1	A	663	SER
1	A	668	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	98	HIS
1	A	204	ASN
1	A	416	ASN
1	A	570	ASN
1	A	575	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](#)

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	GLC	B	1	2	11,11,12	0.93	0	15,15,17	2.47	6 (40%)
2	GLC	B	2	2	11,11,12	0.98	0	15,15,17	1.72	3 (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
2	GLC	B	1	2	-	0/2/19/22	0/1/1/1
2	GLC	B	2	2	-	2/2/19/22	0/1/1/1

There are no bond length outliers.

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	1	GLC	O4-C4-C3	-5.17	98.20	110.38
2	B	2	GLC	C1-O5-C5	4.73	118.53	112.19
2	B	1	GLC	C1-C2-C3	-4.37	103.29	109.64
2	B	1	GLC	C1-O5-C5	4.36	118.03	112.19
2	B	1	GLC	O2-C2-C1	3.17	116.49	109.22
2	B	2	GLC	C3-C4-C5	-2.32	106.03	110.23
2	B	1	GLC	O4-C4-C5	2.26	114.89	109.32
2	B	1	GLC	O2-C2-C3	2.04	114.37	110.15
2	B	2	GLC	O4-C4-C5	2.03	114.32	109.32

There are no chirality outliers.

All (2) torsion outliers are listed below:

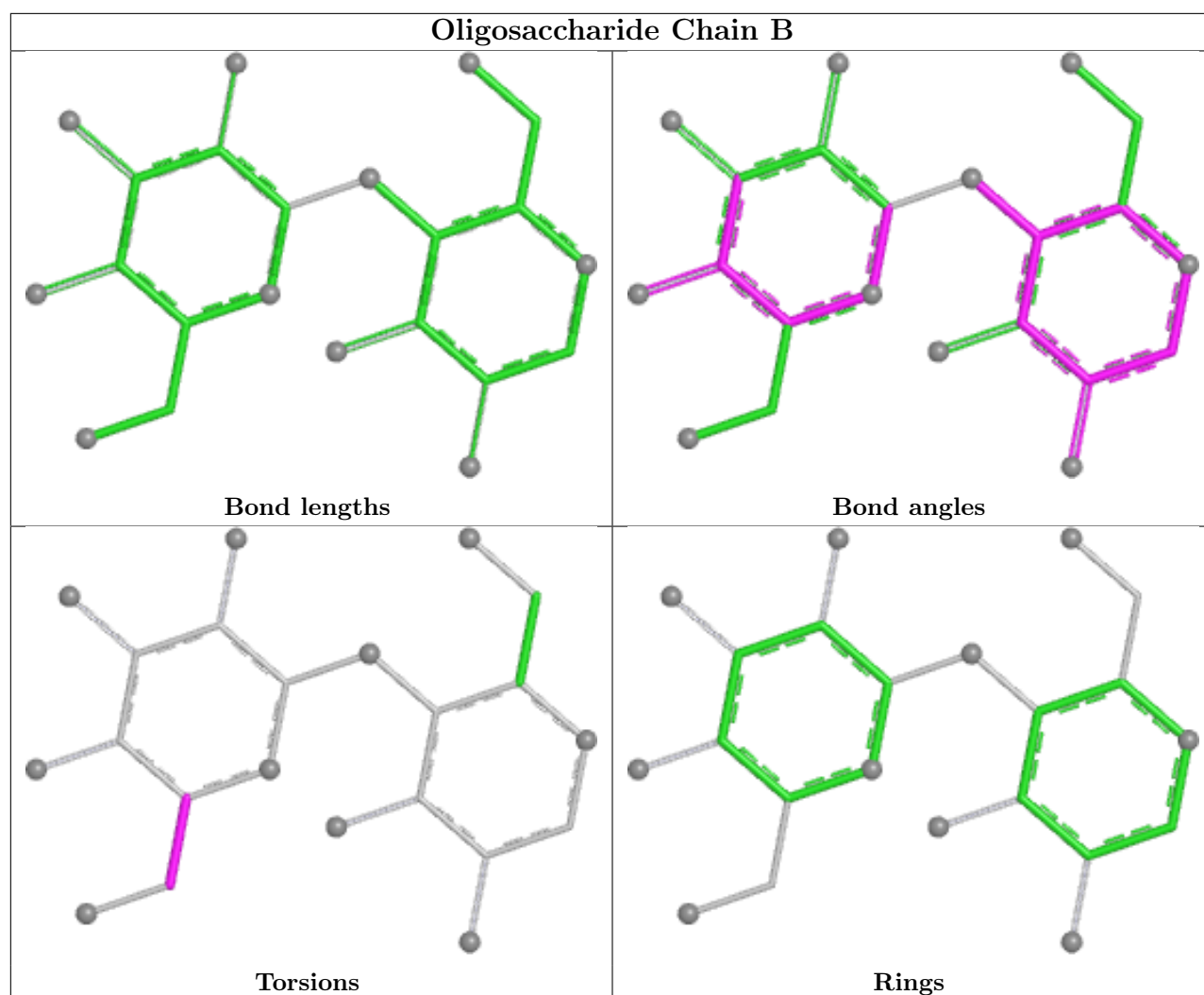
Mol	Chain	Res	Type	Atoms
2	B	2	GLC	O5-C5-C6-O6
2	B	2	GLC	C4-C5-C6-O6

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	1	GLC	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 2 ligands modelled in this entry, 2 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

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	684/684 (100%)	-1.75	0 100 100	2, 11, 29, 40	0

There are no RSRZ outliers to report.

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

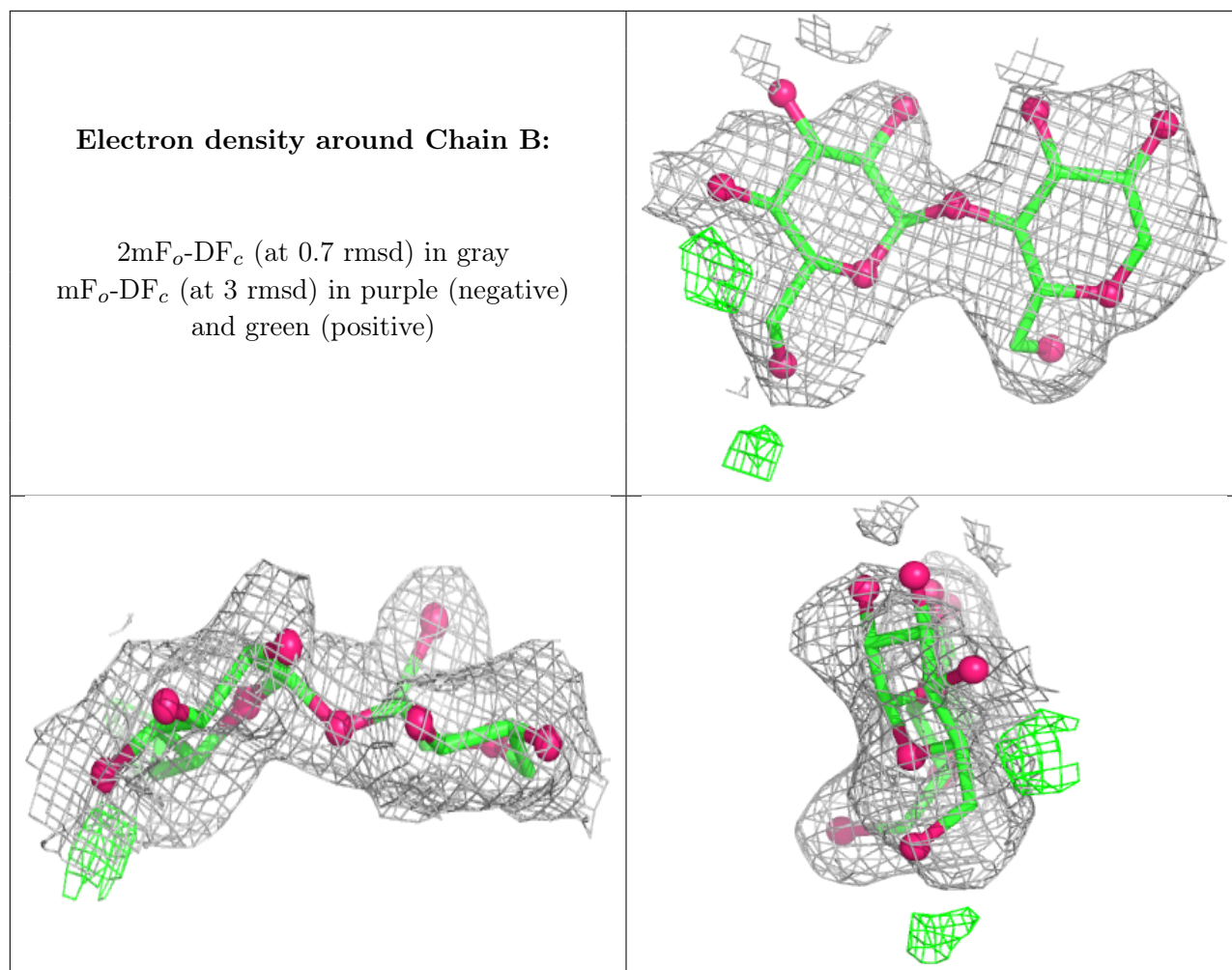
There are no non-standard protein/DNA/RNA residues in this entry.

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	1	11/12	0.99	0.04	25,28,37,40	11
2	GLC	B	2	11/12	0.99	0.05	24,35,39,44	11

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, 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
3	CA	A	685	1/1	0.98	0.03	4,4,4,4	0
3	CA	A	686	1/1	1.00	0.04	5,5,5,5	0

6.5 Other polymers [i](#)

There are no such residues in this entry.