



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 01:02 PM UTC

PDB ID : 2BQP / pdb_00002bqp
Title : THE STRUCTURE OF THE PEA LECTIN-D-GLUCOPYRANOSE COM-
PLEX
Authors : Ruzeinikov, S.N.; Mikhailova Yu, I.; Tsygannik, I.N.; Pangborn, W.; Duax,
W.; Pletnev, V.Z.
Deposited on : 1998-12-08
Resolution : 1.90 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

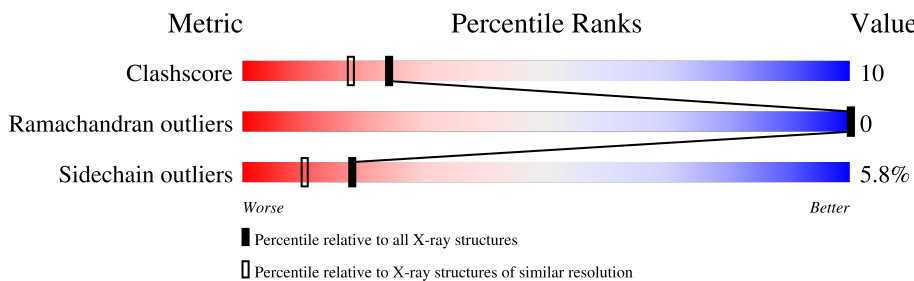
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)

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	234	
1	B	234	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	GLC	A	337[B]	X	-	-	-
2	GLC	B	338[B]	X	-	-	-

2 Entry composition [i](#)

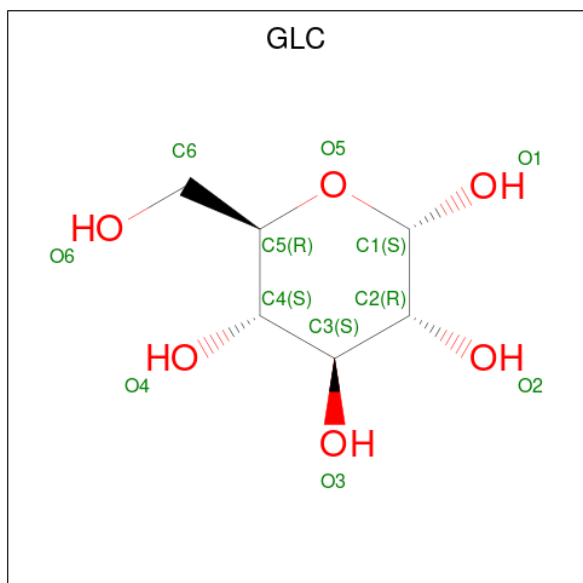
There are 5 unique types of molecules in this entry. The entry contains 4646 atoms, of which 791 are hydrogens and 0 are deuteriums.

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 PROTEIN (PEA LECTIN).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	228	Total	C	H	N	O	395	0	0
			2178	1139	395	290	354			
1	B	228	Total	C	H	N	O	395	0	0
			2178	1139	395	290	354			

- Molecule 2 is alpha-D-glucopyranose (CCD ID: GLC) (formula: C₆H₁₂O₆).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	H	O	1	1
			25	12	1	12		
2	B	1	Total	C	O		0	1
			24	12	12			

- Molecule 3 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total 1	Ca 1	0	0
3	B	1	Total 1	Ca 1	0	0

- Molecule 4 is MANGANESE (II) ION (CCD ID: MN) (formula: Mn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total 1	Mn 1	0	0
4	B	1	Total 1	Mn 1	0	0

- Molecule 5 is water.

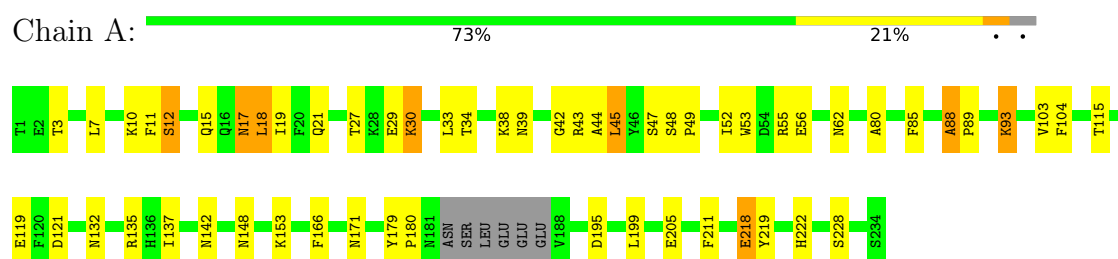
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	127	Total 127	O 127	0	0
5	B	110	Total 110	O 110	0	0

3 Residue-property plots [i](#)

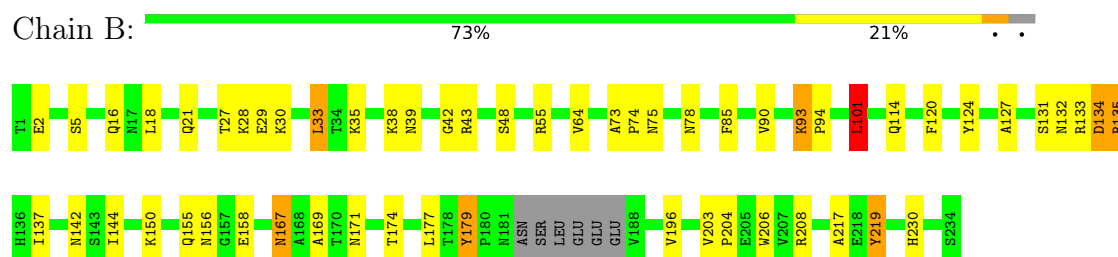
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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: PROTEIN (PEA LECTIN)



• Molecule 1: PROTEIN (PEA LECTIN)



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	62.84Å 135.25Å 54.78Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	8.00 – 1.90	Depositor
% Data completeness (in resolution range)	69.5 (8.00-1.90)	Depositor
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 3.1	Depositor
R, R_{free}	0.161 , 0.188	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4646	wwPDB-VP
Average B, all atoms (Å ²)	17.0	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: GLC, MN, CA

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	0.63	0/1827	1.04	11/2496 (0.4%)
1	B	0.61	0/1827	1.05	12/2496 (0.5%)
All	All	0.62	0/3654	1.05	23/4992 (0.5%)

There are no bond length outliers.

All (23) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	135	ARG	N-CA-C	-8.46	98.57	110.50
1	B	85	PHE	N-CA-C	-8.16	95.59	108.90
1	B	39	ASN	N-CA-C	7.11	121.20	111.17
1	A	39	ASN	N-CA-C	7.02	121.08	111.39
1	B	48	SER	N-CA-C	6.74	118.14	109.65
1	A	47	SER	N-CA-C	6.74	118.62	111.28
1	A	137	ILE	N-CA-C	-6.61	98.95	108.53
1	A	85	PHE	N-CA-C	-6.58	98.48	109.07
1	A	48	SER	N-CA-C	6.53	117.88	109.65
1	B	16	GLN	N-CA-C	6.13	120.36	113.01
1	B	127	ALA	N-CA-C	6.02	119.72	112.38
1	A	56	GLU	N-CA-C	6.02	117.92	111.36
1	B	135	ARG	N-CA-C	-6.00	102.19	110.35
1	B	219	TYR	N-CA-C	5.93	117.22	108.86
1	A	62	ASN	N-CA-C	-5.92	100.01	109.96
1	A	179	TYR	N-CA-C	-5.61	102.37	110.40
1	B	179	TYR	CA-C-N	5.45	124.91	119.24
1	B	179	TYR	C-N-CA	5.45	124.91	119.24
1	A	88	ALA	N-CA-C	5.37	114.32	108.14
1	A	219	TYR	N-CA-C	5.34	116.11	108.74
1	B	101	LEU	N-CA-C	5.26	119.00	112.47
1	B	35	LYS	N-CA-C	-5.24	102.26	110.17

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	137	ILE	N-CA-C	-5.13	101.09	108.53

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	1783	395	1712	42	0
1	B	1783	395	1712	30	0
2	A	24	1	24	0	0
2	B	24	0	24	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
5	A	127	0	0	6	0
5	B	110	0	0	0	0
All	All	3855	791	3472	71	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 10.

All (71) 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:80:ALA:HB3	1:A:218:GLU:HB2	1.60	0.83
1:A:80:ALA:CB	1:A:218:GLU:HB2	2.14	0.78
1:B:73:ALA:H	1:B:156:ASN:HD21	1.38	0.71
1:A:33:LEU:O	1:A:42:GLY:HA3	1.92	0.70
1:A:12:SER:H	1:A:15:GLN:NE2	1.91	0.68
1:A:93:LYS:HB2	1:A:93:LYS:NZ	2.07	0.68
1:A:27:THR:O	1:A:30:LYS:HG2	1.97	0.64
1:A:17:ASN:H	1:A:17:ASN:HD22	1.46	0.64
1:B:101:LEU:HD22	1:B:144:ILE:HD11	1.81	0.62

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:5:SER:OG	1:B:230:HIS:HD2	1.84	0.60
1:B:43:ARG:HD2	1:B:94:PRO:HG3	1.84	0.58
1:B:21:GLN:OE1	1:B:43:ARG:HD3	2.04	0.57
1:B:38:LYS:HE3	1:B:217:ALA:HA	1.86	0.57
1:A:103:VAL:HG23	1:A:104:PHE:CD2	2.40	0.57
1:A:148:ASN:HB2	1:A:195:ASP:OD2	2.07	0.55
1:A:30:LYS:NZ	1:A:30:LYS:HB3	2.21	0.54
1:A:153:LYS:N	1:A:153:LYS:HD2	2.22	0.54
1:B:155:GLN:HB2	1:B:179:TYR:CE1	2.43	0.54
1:A:21:GLN:HB2	1:A:43:ARG:HB2	1.90	0.53
1:A:17:ASN:H	1:A:17:ASN:ND2	2.05	0.53
1:A:17:ASN:HD22	1:A:17:ASN:N	2.04	0.53
1:B:90:VAL:HG13	1:B:208:ARG:NH1	2.23	0.53
1:A:93:LYS:HB2	1:A:93:LYS:HZ3	1.72	0.53
1:B:120:PHE:CE2	1:B:177:LEU:HD12	2.43	0.53
1:A:119:GLU:OE2	1:A:121:ASP:HB2	2.09	0.53
1:A:7:LEU:HD13	1:A:228:SER:HB3	1.92	0.52
1:A:34:THR:OG1	1:A:222:HIS:HD2	1.93	0.51
1:A:33:LEU:HD11	1:A:211:PHE:HB3	1.91	0.51
1:A:15:GLN:HG2	1:A:18:LEU:HD22	1.92	0.50
1:B:38:LYS:HE3	1:B:217:ALA:O	2.12	0.49
1:A:12:SER:H	1:A:15:GLN:HE21	1.61	0.48
1:A:38:LYS:HG3	5:A:377:HOH:O	2.14	0.47
1:A:55:ARG:HB2	1:A:205:GLU:OE2	2.14	0.47
1:A:11:PHE:O	1:A:29:GLU:HA	2.15	0.47
1:B:132:ASN:ND2	1:B:134:ASP:HB2	2.29	0.47
1:A:93:LYS:HG2	5:A:366:HOH:O	2.14	0.47
1:B:124:TYR:CE2	1:B:133:ARG:HG2	2.50	0.46
1:B:204:PRO:HG2	1:B:206:TRP:O	2.16	0.46
1:A:19:ILE:HB	1:A:45:LEU:HB2	1.98	0.46
1:A:7:LEU:O	1:B:2:GLU:HA	2.17	0.45
1:A:30:LYS:HB3	1:A:30:LYS:HZ2	1.81	0.45
1:B:75:ASN:ND2	1:B:78:ASN:OD1	2.51	0.44
1:B:74:PRO:HG2	1:B:219:TYR:HE1	1.82	0.44
1:A:80:ALA:HB2	1:A:218:GLU:HB2	1.95	0.44
1:A:222:HIS:CE1	5:A:341:HOH:O	2.70	0.44
1:B:167:ASN:C	1:B:167:ASN:HD22	2.26	0.44
1:B:28:LYS:O	1:B:29:GLU:HB2	2.18	0.43
1:B:167:ASN:HD22	1:B:169:ALA:H	1.65	0.43
1:A:52:ILE:HG23	1:A:53:TRP:HD1	1.84	0.43
1:B:131:SER:O	1:B:133:ARG:HG3	2.18	0.43

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:132:ASN:ND2	5:A:350:HOH:O	2.51	0.43
1:B:132:ASN:CG	1:B:134:ASP:HB2	2.44	0.43
1:A:180:PRO:HD2	5:A:386:HOH:O	2.19	0.43
1:A:166:PHE:HZ	1:A:171:ASN:HD22	1.67	0.43
1:A:115:THR:H	1:A:142:ASN:ND2	2.16	0.43
1:B:27:THR:O	1:B:30:LYS:HG2	2.19	0.43
1:A:10:LYS:HD2	1:A:29:GLU:CD	2.43	0.42
1:A:44:ALA:C	1:A:45:LEU:HD22	2.44	0.42
1:A:222:HIS:HE1	5:A:341:HOH:O	2.01	0.42
1:A:88:ALA:HB1	1:A:89:PRO:CD	2.50	0.42
1:B:93:LYS:HB2	1:B:93:LYS:NZ	2.34	0.41
1:B:167:ASN:ND2	1:B:169:ALA:H	2.18	0.41
1:B:171:ASN:HD22	1:B:171:ASN:HA	1.70	0.41
1:A:17:ASN:ND2	1:A:17:ASN:N	2.66	0.41
1:A:27:THR:O	1:A:27:THR:HG23	2.21	0.41
1:A:52:ILE:HD12	1:A:52:ILE:HA	1.95	0.41
1:B:132:ASN:O	1:B:133:ARG:HB2	2.21	0.41
1:B:33:LEU:O	1:B:42:GLY:HA3	2.21	0.40
1:B:30:LYS:HB3	1:B:30:LYS:HE2	1.73	0.40
1:B:203:VAL:HB	1:B:204:PRO:HD2	2.03	0.40
1:B:114:GLN:N	1:B:142:ASN:HD21	2.19	0.40

There are no symmetry-related clashes.

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	224/234 (96%)	214 (96%)	10 (4%)	0	100	100
1	B	224/234 (96%)	217 (97%)	7 (3%)	0	100	100
All	All	448/468 (96%)	431 (96%)	17 (4%)	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	197/203 (97%)	187 (95%)	10 (5%)	21	13
1	B	197/203 (97%)	184 (93%)	13 (7%)	15	8
All	All	394/406 (97%)	371 (94%)	23 (6%)	18	10

All (23) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3	THR
1	A	12	SER
1	A	17	ASN
1	A	18	LEU
1	A	30	LYS
1	A	45	LEU
1	A	49	PRO
1	A	93	LYS
1	A	199	LEU
1	A	218	GLU
1	B	18	LEU
1	B	33	LEU
1	B	55	ARG
1	B	64	VAL
1	B	93	LYS
1	B	101	LEU
1	B	134	ASP
1	B	135	ARG
1	B	150	LYS
1	B	158	GLU
1	B	167	ASN
1	B	174	THR
1	B	196	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (18)

such sidechains are listed below:

Mol	Chain	Res	Type
1	A	15	GLN
1	A	17	ASN
1	A	72	ASN
1	A	142	ASN
1	A	155	GLN
1	A	171	ASN
1	A	222	HIS
1	A	230	HIS
1	B	39	ASN
1	B	62	ASN
1	B	75	ASN
1	B	78	ASN
1	B	105	ASN
1	B	142	ASN
1	B	156	ASN
1	B	167	ASN
1	B	171	ASN
1	B	230	HIS

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](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 8 ligands modelled in this entry, 4 are monoatomic - leaving 4 for Mogul analysis.

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	338[A]	-	12,12,12	0.27	0	17,17,17	0.46	0
2	GLC	A	337[B]	-	12,12,12	0.26	0	17,17,17	0.50	0
2	GLC	B	338[B]	-	12,12,12	0.30	0	17,17,17	0.60	0
2	GLC	A	337[A]	-	12,12,12	0.21	0	17,17,17	0.39	0

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	338[B]	-	1/1/5/5	1/2/22/22	0/1/1/1
2	GLC	A	337[A]	-	-	0/2/22/22	0/1/1/1
2	GLC	A	337[B]	-	1/1/5/5	1/2/22/22	0/1/1/1
2	GLC	B	338[A]	-	-	0/2/22/22	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

All (2) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	A	337[B]	GLC	C1
2	B	338[B]	GLC	C1

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	338[B]	GLC	C4-C5-C6-O6
2	A	337[B]	GLC	C4-C5-C6-O6

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

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.