



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 3, 2026 – 01:37 pm BST

PDB ID : 9I5U / pdb_00009i5u
Title : Branching Sucrase BRS-B
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Deposited on : 2025-01-28
Resolution : 3.05 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	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.50

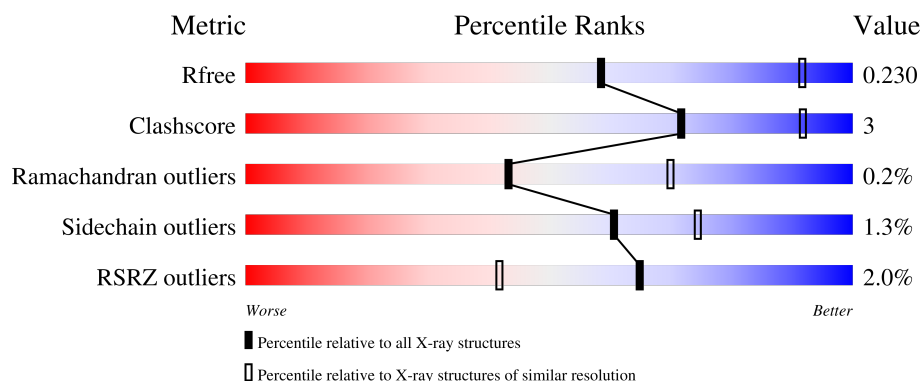
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.05 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}	180053	2469 (3.10-3.02)
Clashscore	190562	2569 (3.10-3.02)
Ramachandran outliers	187476	2424 (3.10-3.02)
Sidechain outliers	187428	2423 (3.10-3.02)
RSRZ outliers	180081	2469 (3.10-3.02)

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	1183	3% 90% 7% ..
1	B	1183	% 90% 7% .
2	C	9	56% 44%
2	E	9	78% 22%
3	D	2	50% 50%

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Mol	Chain	Length	Quality of chain
4	F	5	 80%20%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 18500 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 dextransucrase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	1155	Total	C	N	O	S	0	0	0
			9064	5690	1534	1816	24			
1	B	1155	Total	C	N	O	S	0	0	0
			9099	5709	1545	1821	24			

There are 52 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	151	MET	-	initiating methionine	UNP A0A5A5U0V5
A	152	ALA	-	expression tag	UNP A0A5A5U0V5
A	153	SER	-	expression tag	UNP A0A5A5U0V5
A	709	GLN	GLU	conflict	UNP A0A5A5U0V5
A	768	SER	PHE	conflict	UNP A0A5A5U0V5
A	1103	THR	ALA	conflict	UNP A0A5A5U0V5
A	1314	LYS	-	expression tag	UNP A0A5A5U0V5
A	1315	GLY	-	expression tag	UNP A0A5A5U0V5
A	1316	GLY	-	expression tag	UNP A0A5A5U0V5
A	1317	ARG	-	expression tag	UNP A0A5A5U0V5
A	1318	ALA	-	expression tag	UNP A0A5A5U0V5
A	1319	ASP	-	expression tag	UNP A0A5A5U0V5
A	1320	PRO	-	expression tag	UNP A0A5A5U0V5
A	1321	ALA	-	expression tag	UNP A0A5A5U0V5
A	1322	PHE	-	expression tag	UNP A0A5A5U0V5
A	1323	LEU	-	expression tag	UNP A0A5A5U0V5
A	1324	TYR	-	expression tag	UNP A0A5A5U0V5
A	1325	LYS	-	expression tag	UNP A0A5A5U0V5
A	1326	VAL	-	expression tag	UNP A0A5A5U0V5
A	1327	VAL	-	expression tag	UNP A0A5A5U0V5
A	1328	HIS	-	expression tag	UNP A0A5A5U0V5
A	1329	HIS	-	expression tag	UNP A0A5A5U0V5
A	1330	HIS	-	expression tag	UNP A0A5A5U0V5
A	1331	HIS	-	expression tag	UNP A0A5A5U0V5
A	1332	HIS	-	expression tag	UNP A0A5A5U0V5

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Chain	Residue	Modelled	Actual	Comment	Reference
A	1333	HIS	-	expression tag	UNP A0A5A5U0V5
B	151	MET	-	initiating methionine	UNP A0A5A5U0V5
B	152	ALA	-	expression tag	UNP A0A5A5U0V5
B	153	SER	-	expression tag	UNP A0A5A5U0V5
B	709	GLN	GLU	conflict	UNP A0A5A5U0V5
B	768	SER	PHE	conflict	UNP A0A5A5U0V5
B	1103	THR	ALA	conflict	UNP A0A5A5U0V5
B	1314	LYS	-	expression tag	UNP A0A5A5U0V5
B	1315	GLY	-	expression tag	UNP A0A5A5U0V5
B	1316	GLY	-	expression tag	UNP A0A5A5U0V5
B	1317	ARG	-	expression tag	UNP A0A5A5U0V5
B	1318	ALA	-	expression tag	UNP A0A5A5U0V5
B	1319	ASP	-	expression tag	UNP A0A5A5U0V5
B	1320	PRO	-	expression tag	UNP A0A5A5U0V5
B	1321	ALA	-	expression tag	UNP A0A5A5U0V5
B	1322	PHE	-	expression tag	UNP A0A5A5U0V5
B	1323	LEU	-	expression tag	UNP A0A5A5U0V5
B	1324	TYR	-	expression tag	UNP A0A5A5U0V5
B	1325	LYS	-	expression tag	UNP A0A5A5U0V5
B	1326	VAL	-	expression tag	UNP A0A5A5U0V5
B	1327	VAL	-	expression tag	UNP A0A5A5U0V5
B	1328	HIS	-	expression tag	UNP A0A5A5U0V5
B	1329	HIS	-	expression tag	UNP A0A5A5U0V5
B	1330	HIS	-	expression tag	UNP A0A5A5U0V5
B	1331	HIS	-	expression tag	UNP A0A5A5U0V5
B	1332	HIS	-	expression tag	UNP A0A5A5U0V5
B	1333	HIS	-	expression tag	UNP A0A5A5U0V5

- Molecule 2 is an oligosaccharide called alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose.



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf	Trace
2	C	9	Total C O 99 54 45	0	0	0
2	E	9	Total C O 99 54 45	0	0	0

- Molecule 3 is an oligosaccharide called alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose.



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
3	D	2	Total	C	O	0	0	0
			22	12	10			

- Molecule 4 is an oligosaccharide called alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose.



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
4	F	5	Total	C	O	0	0	0
			56	30	26			

- Molecule 5 is CALCIUM ION (CCD ID: CA) (formula: Ca).

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

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	21	Total	O	0	0
			21	21		
6	B	38	Total	O	0	0
			38	38		

a-D-glucopyranose-(1-6)-alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose

Chain C:  56% 44%



- Molecule 2: alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose

Chain E:  78% 22%



- Molecule 3: alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose

Chain D:  50% 50%



- Molecule 4: alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose-(1-6)-alpha-D-glucopyranose

Chain F:  80% 20%



4 Data and refinement statistics

Property	Value	Source
Space group	H 3 2	Depositor
Cell constants a, b, c, α , β , γ	252.90Å 252.90Å 344.35Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	48.01 – 3.05 48.01 – 3.05	Depositor EDS
% Data completeness (in resolution range)	99.9 (48.01-3.05) 99.9 (48.01-3.05)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.63 (at 3.07Å)	Xtriage
Refinement program	REFMAC 5.8.0425	Depositor
R, R_{free}	0.212 , 0.230 0.213 , 0.230	Depositor DCC
R_{free} test set	3993 reflections (4.97%)	wwPDB-VP
Wilson B-factor (Å ²)	71.0	Xtriage
Anisotropy	0.185	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 39.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	18500	wwPDB-VP
Average B, all atoms (Å ²)	78.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 1.79% 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: GLC, 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	0.46	0/9252	0.85	4/12559 (0.0%)
1	B	0.44	0/9289	0.84	0/12604
All	All	0.45	0/18541	0.84	4/25163 (0.0%)

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
1	B	0	1
All	All	0	2

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	686	ASP	CA-CB-CG	6.07	118.67	112.60
1	A	448	ASP	CA-CB-CG	5.80	118.40	112.60
1	A	967	ASP	CA-CB-CG	5.08	117.68	112.60
1	A	387	ASP	CA-CB-CG	5.07	117.67	112.60

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	594	GLY	Peptide
1	B	594	GLY	Peptide

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	9064	0	8625	62	0
1	B	9099	0	8683	58	0
2	C	99	0	82	0	0
2	E	99	0	82	0	0
3	D	22	0	19	0	0
4	F	56	0	48	0	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
6	A	21	0	0	1	0
6	B	38	0	0	0	0
All	All	18500	0	17539	118	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 (118) 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:B:268:ILE:CD1	1:B:367:VAL:HG23	1.86	1.06
1:A:268:ILE:CD1	1:A:367:VAL:HG23	1.86	1.05
1:A:850:THR:O	1:A:930:ARG:HD2	1.60	1.01
1:A:268:ILE:HD13	1:A:367:VAL:HG23	1.51	0.89
1:B:268:ILE:HD13	1:B:367:VAL:HG23	1.54	0.88
1:A:268:ILE:CD1	1:A:367:VAL:CG2	2.57	0.83
1:B:1202:GLN:HG2	1:B:1220:THR:HG22	1.61	0.82
1:B:268:ILE:CD1	1:B:367:VAL:CG2	2.58	0.81
1:A:1202:GLN:HG2	1:A:1220:THR:HG22	1.62	0.81
1:B:268:ILE:HD11	1:B:367:VAL:HG23	1.62	0.80
1:A:268:ILE:HD11	1:A:367:VAL:HG23	1.64	0.79
1:B:268:ILE:HD11	1:B:367:VAL:CG2	2.14	0.77
1:A:268:ILE:HD11	1:A:367:VAL:CG2	2.15	0.76
1:B:743:THR:HG23	1:B:919:THR:HG23	1.73	0.70
1:B:1283:VAL:HG12	1:B:1287:TYR:CG	2.26	0.69
1:A:1283:VAL:HG12	1:A:1287:TYR:CG	2.28	0.68
1:B:153:SER:HA	1:B:165:ILE:O	1.96	0.66

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:1202:GLN:CG	1:B:1220:THR:HG22	2.24	0.66
1:A:1202:GLN:CG	1:A:1220:THR:HG22	2.26	0.65
1:A:457:ASN:ND2	6:A:1601:HOH:O	2.25	0.65
1:A:852:LYS:HB2	1:A:930:ARG:HH12	1.62	0.65
1:A:259:SER:HB2	1:A:538:LEU:HD11	1.80	0.63
1:B:614:THR:HG22	1:B:615:ASN:N	2.13	0.63
1:A:557:GLU:HG3	1:B:557:GLU:CB	2.29	0.63
1:A:522:ILE:HG22	1:A:524:ILE:HD13	1.82	0.61
1:B:621:HIS:HA	1:B:625:GLU:HG3	1.83	0.60
1:A:734:MET:CE	1:A:784:VAL:HG13	2.32	0.60
1:B:746:LYS:C	1:B:747:LEU:HD12	2.28	0.59
1:B:743:THR:CG2	1:B:919:THR:HG23	2.33	0.59
1:B:734:MET:CE	1:B:784:VAL:HG13	2.32	0.59
1:B:641:ALA:HB1	1:B:1242:LEU:HD11	1.85	0.58
1:A:621:HIS:HA	1:A:625:GLU:HG3	1.84	0.58
1:A:983:ARG:HD2	1:A:999:ASP:HA	1.85	0.58
1:A:1243:ASP:O	1:A:1244:THR:C	2.47	0.58
1:B:973:MET:HA	1:B:973:MET:HE2	1.86	0.57
1:A:973:MET:HA	1:A:973:MET:HE2	1.87	0.56
1:B:894:ARG:NH2	1:B:1076:ASP:O	2.39	0.56
1:A:894:ARG:NH2	1:A:1076:ASP:O	2.39	0.55
1:A:870:ASP:OD1	1:A:871:LEU:N	2.40	0.55
1:A:485:SER:N	1:A:489:ASP:O	2.40	0.55
1:A:522:ILE:HD11	1:A:567:LEU:HD11	1.88	0.55
1:A:734:MET:HE1	1:A:784:VAL:HG13	1.89	0.55
1:B:734:MET:HE1	1:B:784:VAL:HG13	1.89	0.54
1:B:407:ASP:HB3	1:B:410:THR:O	2.08	0.54
1:B:891:MET:HE2	1:B:1112:TRP:HB3	1.90	0.53
1:A:387:ASP:O	1:A:389:ASN:N	2.36	0.53
1:B:735:LYS:HD3	1:B:790:ASP:OD2	2.09	0.53
1:B:1228:VAL:HA	1:B:1270:TRP:O	2.09	0.53
1:A:852:LYS:HB2	1:A:930:ARG:NH1	2.23	0.53
1:A:1228:VAL:HA	1:A:1270:TRP:O	2.09	0.53
1:B:1283:VAL:CG1	1:B:1287:TYR:CG	2.92	0.53
1:A:387:ASP:C	1:A:389:ASN:H	2.17	0.53
1:B:377:LYS:HE3	1:B:386:LEU:HD11	1.90	0.53
1:A:891:MET:HE2	1:A:1112:TRP:HB3	1.90	0.52
1:B:1016:THR:HG23	1:B:1018:GLN:H	1.73	0.52
1:A:522:ILE:HD11	1:A:567:LEU:CD1	2.40	0.52
1:A:454:ASN:O	1:A:1312:GLN:O	2.28	0.51
1:A:1283:VAL:CG1	1:A:1287:TYR:CG	2.93	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1236:LYS:HD2	1:A:1237:TYR:CE2	2.47	0.50
1:A:259:SER:HB2	1:A:538:LEU:CD1	2.41	0.49
1:A:715:THR:O	1:A:718:THR:HG22	2.12	0.49
1:B:249:VAL:HG23	1:B:249:VAL:O	2.12	0.48
1:B:1239:GLY:HA2	1:B:1242:LEU:HD23	1.96	0.48
1:B:900:GLY:O	1:B:930:ARG:NH1	2.47	0.48
1:A:1301:LEU:O	1:A:1303:LYS:N	2.47	0.47
1:A:1236:LYS:HD2	1:A:1237:TYR:CZ	2.48	0.47
1:A:464:PHE:HB2	1:A:467:LEU:HD11	1.96	0.47
1:B:485:SER:N	1:B:489:ASP:O	2.47	0.47
1:B:249:VAL:O	1:B:249:VAL:CG2	2.63	0.46
1:B:614:THR:CG2	1:B:615:ASN:N	2.78	0.46
1:A:1243:ASP:C	1:A:1245:ILE:N	2.74	0.46
1:B:1281:PRO:O	1:B:1283:VAL:HG23	2.16	0.46
1:A:1235:ALA:O	1:A:1268:LYS:HD2	2.16	0.45
1:B:1235:ALA:O	1:B:1268:LYS:HD2	2.15	0.45
1:A:914:ILE:HG22	1:A:915:ASN:O	2.17	0.45
1:A:233:GLN:HE21	1:A:262:ASN:ND2	2.15	0.45
1:B:453:HIS:HB3	1:B:490:TRP:CZ3	2.52	0.45
1:B:614:THR:HG22	1:B:615:ASN:H	1.82	0.45
1:A:791:ILE:O	1:A:792:GLN:C	2.60	0.44
1:A:1062:LYS:N	1:A:1062:LYS:HD2	2.33	0.44
1:B:511:ILE:CD1	1:B:582:GLN:HB3	2.48	0.44
1:A:522:ILE:CG2	1:A:524:ILE:HD13	2.48	0.44
1:A:971:LEU:HB3	1:A:973:MET:HE3	2.00	0.44
1:A:511:ILE:CD1	1:A:582:GLN:HB3	2.49	0.43
1:B:408:LEU:O	1:B:409:ALA:HB3	2.18	0.43
1:B:791:ILE:O	1:B:792:GLN:C	2.61	0.43
1:A:387:ASP:C	1:A:389:ASN:N	2.76	0.43
1:A:841:ILE:HB	1:A:842:PRO:HD3	2.01	0.43
1:B:1302:ASP:O	1:B:1303:LYS:C	2.62	0.43
1:A:1302:ASP:O	1:A:1303:LYS:C	2.61	0.43
1:B:971:LEU:HB3	1:B:973:MET:HE3	2.00	0.43
1:A:1281:PRO:O	1:A:1283:VAL:HG23	2.19	0.42
1:B:606:SER:HB3	1:B:609:THR:HG22	2.01	0.42
1:B:876:TYR:HD2	1:B:1101:VAL:CG2	2.32	0.42
1:B:915:ASN:OD1	1:B:919:THR:HG22	2.19	0.42
1:A:167:GLN:HB2	1:B:801:ILE:HG12	2.01	0.42
1:A:606:SER:HB3	1:A:609:THR:HG22	2.01	0.42
1:A:262:ASN:N	1:A:262:ASN:HD22	2.17	0.42
1:B:919:THR:HG22	1:B:920:ASN:O	2.20	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:466:ASN:O	1:B:476:THR:HG22	2.20	0.42
1:B:459:LEU:N	1:B:459:LEU:HD12	2.35	0.42
1:B:841:ILE:HB	1:B:842:PRO:HD3	2.02	0.42
1:A:484:LEU:HA	1:A:490:TRP:HA	2.01	0.42
1:B:478:TYR:CE2	1:B:1313:LEU:HD22	2.54	0.41
1:B:859:PHE:CE2	1:B:861:GLY:HA3	2.55	0.41
1:B:1080:MET:HG2	1:B:1116:ASP:HB2	2.02	0.41
1:A:859:PHE:CE2	1:A:861:GLY:HA3	2.55	0.41
1:A:484:LEU:HD12	1:A:490:TRP:CE2	2.56	0.41
1:A:872:ASP:O	1:A:873:GLY:C	2.64	0.41
1:B:673:ILE:HD13	1:B:715:THR:HG21	2.02	0.41
1:B:914:ILE:HG22	1:B:915:ASN:O	2.20	0.41
1:A:1110:LYS:HD3	1:A:1176:ALA:HB1	2.03	0.41
1:B:609:THR:HG23	1:B:609:THR:O	2.21	0.41
1:A:458:ASN:OD1	1:A:458:ASN:N	2.53	0.41
1:A:734:MET:HE2	1:A:784:VAL:HG13	2.03	0.40
1:A:466:ASN:O	1:A:476:THR:HG22	2.20	0.40
1:B:156:VAL:HG22	1:B:163:VAL:CG2	2.51	0.40
1:B:872:ASP:O	1:B:873:GLY:C	2.64	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	1151/1183 (97%)	1097 (95%)	51 (4%)	3 (0%)	36	63
1	B	1151/1183 (97%)	1097 (95%)	53 (5%)	1 (0%)	48	75
All	All	2302/2366 (97%)	2194 (95%)	104 (4%)	4 (0%)	43	70

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1305	GLY
1	A	1302	ASP
1	A	592	PRO
1	B	592	PRO

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	973/1007 (97%)	960 (99%)	13 (1%)	61	74
1	B	982/1007 (98%)	969 (99%)	13 (1%)	61	74
All	All	1955/2014 (97%)	1929 (99%)	26 (1%)	61	74

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	258	LEU
1	A	332	ILE
1	A	483	ILE
1	A	524	ILE
1	A	574	ASN
1	A	709	GLN
1	A	967	ASP
1	A	973	MET
1	A	1007	THR
1	A	1190	TYR
1	A	1228	VAL
1	A	1243	ASP
1	A	1244	THR
1	B	156	VAL
1	B	188	LYS
1	B	249	VAL
1	B	430	GLN
1	B	458	ASN
1	B	659	ASN
1	B	709	GLN

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Mol	Chain	Res	Type
1	B	726	VAL
1	B	920	ASN
1	B	973	MET
1	B	1007	THR
1	B	1190	TYR
1	B	1228	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (25) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	262	ASN
1	A	382	ASN
1	A	454	ASN
1	A	535	ASN
1	A	574	ASN
1	A	575	GLN
1	A	652	ASN
1	A	709	GLN
1	A	865	GLN
1	A	939	GLN
1	A	972	HIS
1	A	1051	ASN
1	A	1052	GLN
1	A	1070	HIS
1	A	1221	GLN
1	A	1299	HIS
1	B	299	GLN
1	B	430	GLN
1	B	482	GLN
1	B	622	ASN
1	B	697	ASN
1	B	865	GLN
1	B	939	GLN
1	B	972	HIS
1	B	1052	GLN

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 ⓘ

25 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	C	1	2	11,11,12	0.35	0	15,15,17	0.67	1 (6%)
2	GLC	C	2	2	11,11,12	0.32	0	15,15,17	0.72	1 (6%)
2	GLC	C	3	2	11,11,12	0.39	0	15,15,17	0.65	0
2	GLC	C	4	2	11,11,12	0.31	0	15,15,17	0.47	0
2	GLC	C	5	2	11,11,12	0.27	0	15,15,17	0.56	0
2	GLC	C	6	2	11,11,12	0.31	0	15,15,17	0.70	1 (6%)
2	GLC	C	7	2	11,11,12	0.27	0	15,15,17	0.79	1 (6%)
2	GLC	C	8	2	11,11,12	0.28	0	15,15,17	0.68	0
2	GLC	C	9	2	11,11,12	0.31	0	15,15,17	0.65	0
3	GLC	D	1	3	11,11,12	0.30	0	15,15,17	0.78	1 (6%)
3	GLC	D	2	3	11,11,12	0.26	0	15,15,17	0.63	0
2	GLC	E	1	2	11,11,12	0.30	0	15,15,17	0.67	1 (6%)
2	GLC	E	2	2	11,11,12	0.31	0	15,15,17	0.59	0
2	GLC	E	3	2	11,11,12	0.36	0	15,15,17	0.68	0
2	GLC	E	4	2	11,11,12	0.27	0	15,15,17	0.50	0
2	GLC	E	5	2	11,11,12	0.32	0	15,15,17	0.61	0
2	GLC	E	6	2	11,11,12	0.27	0	15,15,17	0.59	0
2	GLC	E	7	2	11,11,12	0.32	0	15,15,17	0.76	1 (6%)
2	GLC	E	8	2	11,11,12	0.25	0	15,15,17	0.54	0
2	GLC	E	9	2	11,11,12	0.40	0	15,15,17	0.82	0
4	GLC	F	1	4	12,12,12	0.23	0	17,17,17	0.27	0
4	GLC	F	2	4	11,11,12	0.47	0	15,15,17	2.08	3 (20%)
4	GLC	F	3	4	11,11,12	0.28	0	15,15,17	0.62	0
4	GLC	F	4	4	11,11,12	0.35	0	15,15,17	0.48	0
4	GLC	F	5	4	11,11,12	0.27	0	15,15,17	0.69	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	C	1	2	-	2/2/19/22	0/1/1/1
2	GLC	C	2	2	-	0/2/19/22	0/1/1/1
2	GLC	C	3	2	-	0/2/19/22	0/1/1/1
2	GLC	C	4	2	-	0/2/19/22	0/1/1/1
2	GLC	C	5	2	-	0/2/19/22	0/1/1/1
2	GLC	C	6	2	-	0/2/19/22	0/1/1/1
2	GLC	C	7	2	-	0/2/19/22	0/1/1/1
2	GLC	C	8	2	-	0/2/19/22	0/1/1/1
2	GLC	C	9	2	-	0/2/19/22	0/1/1/1
3	GLC	D	1	3	-	0/2/19/22	0/1/1/1
3	GLC	D	2	3	-	1/2/19/22	0/1/1/1
2	GLC	E	1	2	-	2/2/19/22	0/1/1/1
2	GLC	E	2	2	-	0/2/19/22	0/1/1/1
2	GLC	E	3	2	-	0/2/19/22	0/1/1/1
2	GLC	E	4	2	-	0/2/19/22	0/1/1/1
2	GLC	E	5	2	-	0/2/19/22	0/1/1/1
2	GLC	E	6	2	-	0/2/19/22	0/1/1/1
2	GLC	E	7	2	-	0/2/19/22	0/1/1/1
2	GLC	E	8	2	-	0/2/19/22	0/1/1/1
2	GLC	E	9	2	-	1/2/19/22	0/1/1/1
4	GLC	F	1	4	-	2/2/22/22	0/1/1/1
4	GLC	F	2	4	-	0/2/19/22	0/1/1/1
4	GLC	F	3	4	-	0/2/19/22	0/1/1/1
4	GLC	F	4	4	-	0/2/19/22	0/1/1/1
4	GLC	F	5	4	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	F	2	GLC	C1-C2-C3	5.35	116.24	109.67
4	F	2	GLC	C1-O5-C5	5.27	119.33	112.19
2	C	7	GLC	C1-C2-C3	2.38	112.59	109.67
3	D	1	GLC	C1-C2-C3	2.33	112.53	109.67
2	E	7	GLC	C1-C2-C3	2.31	112.51	109.67
2	E	1	GLC	C1-C2-C3	2.29	112.48	109.67
2	C	2	GLC	C1-O5-C5	2.26	115.26	112.19
4	F	2	GLC	O5-C1-C2	2.25	114.24	110.77

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	1	GLC	C1-C2-C3	2.16	112.32	109.67
2	C	6	GLC	C1-O5-C5	2.06	114.98	112.19

There are no chirality outliers.

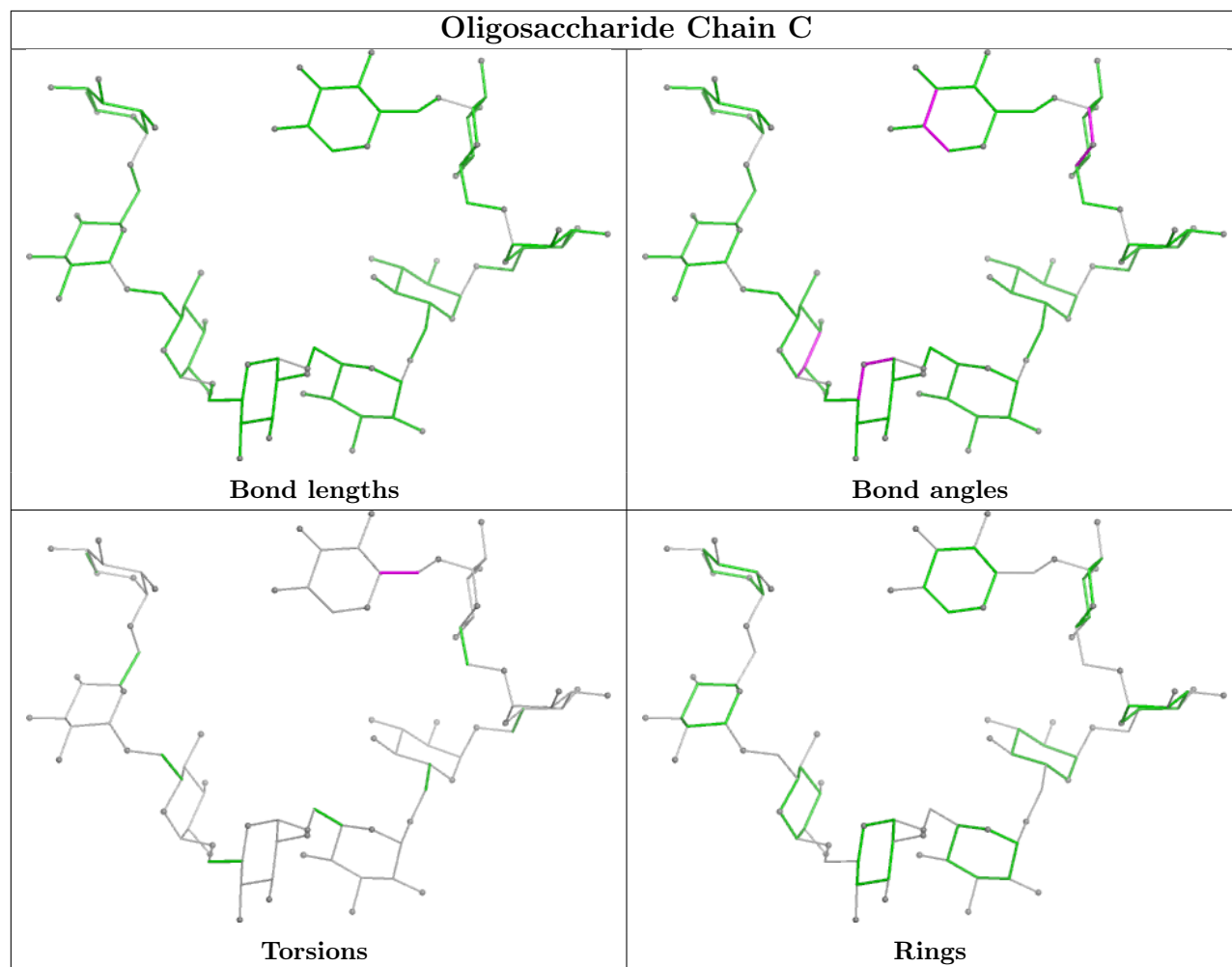
All (8) torsion outliers are listed below:

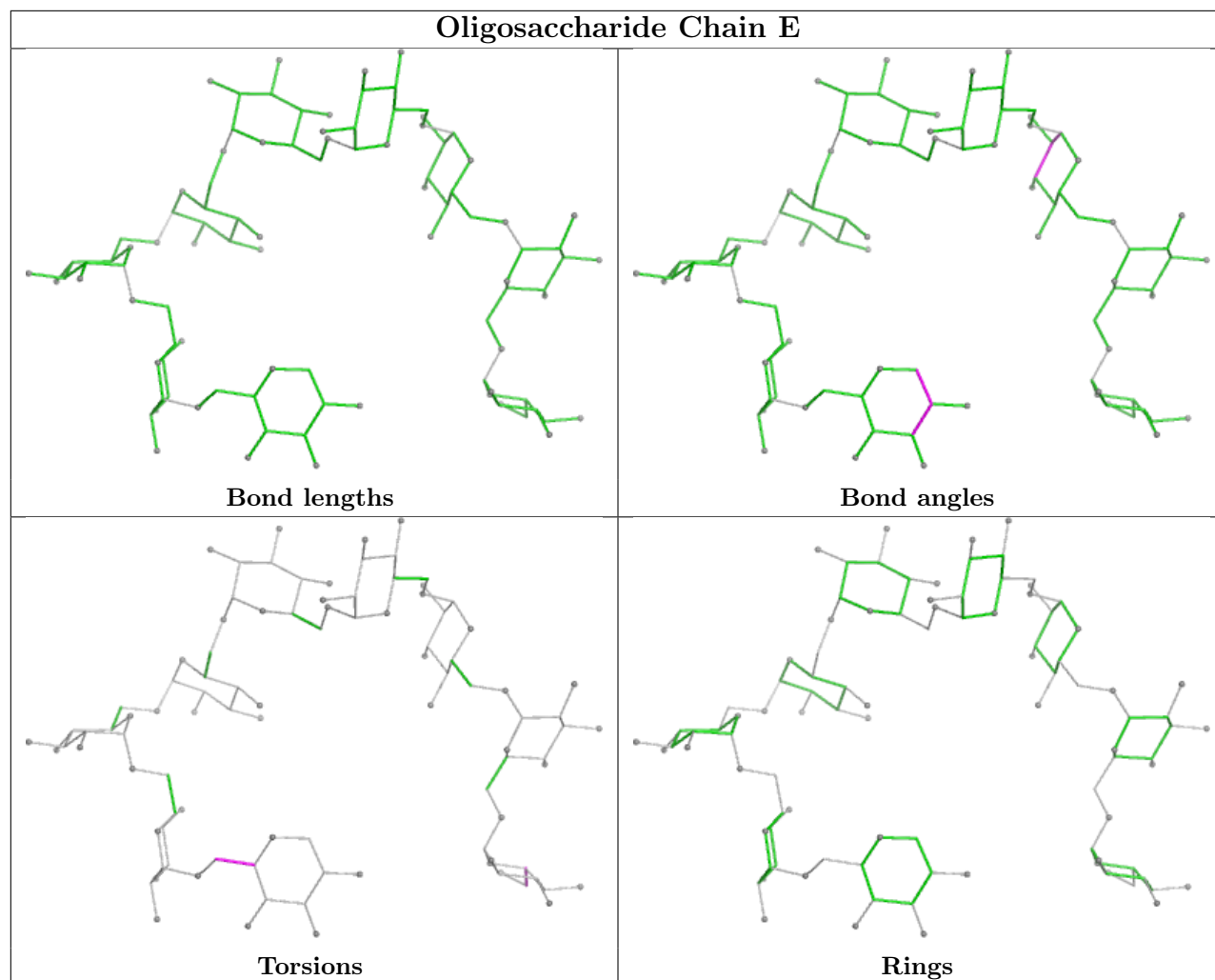
Mol	Chain	Res	Type	Atoms
2	C	1	GLC	O5-C5-C6-O6
2	E	1	GLC	O5-C5-C6-O6
2	C	1	GLC	C4-C5-C6-O6
4	F	1	GLC	O5-C5-C6-O6
2	E	1	GLC	C4-C5-C6-O6
2	E	9	GLC	O5-C5-C6-O6
3	D	2	GLC	O5-C5-C6-O6
4	F	1	GLC	C4-C5-C6-O6

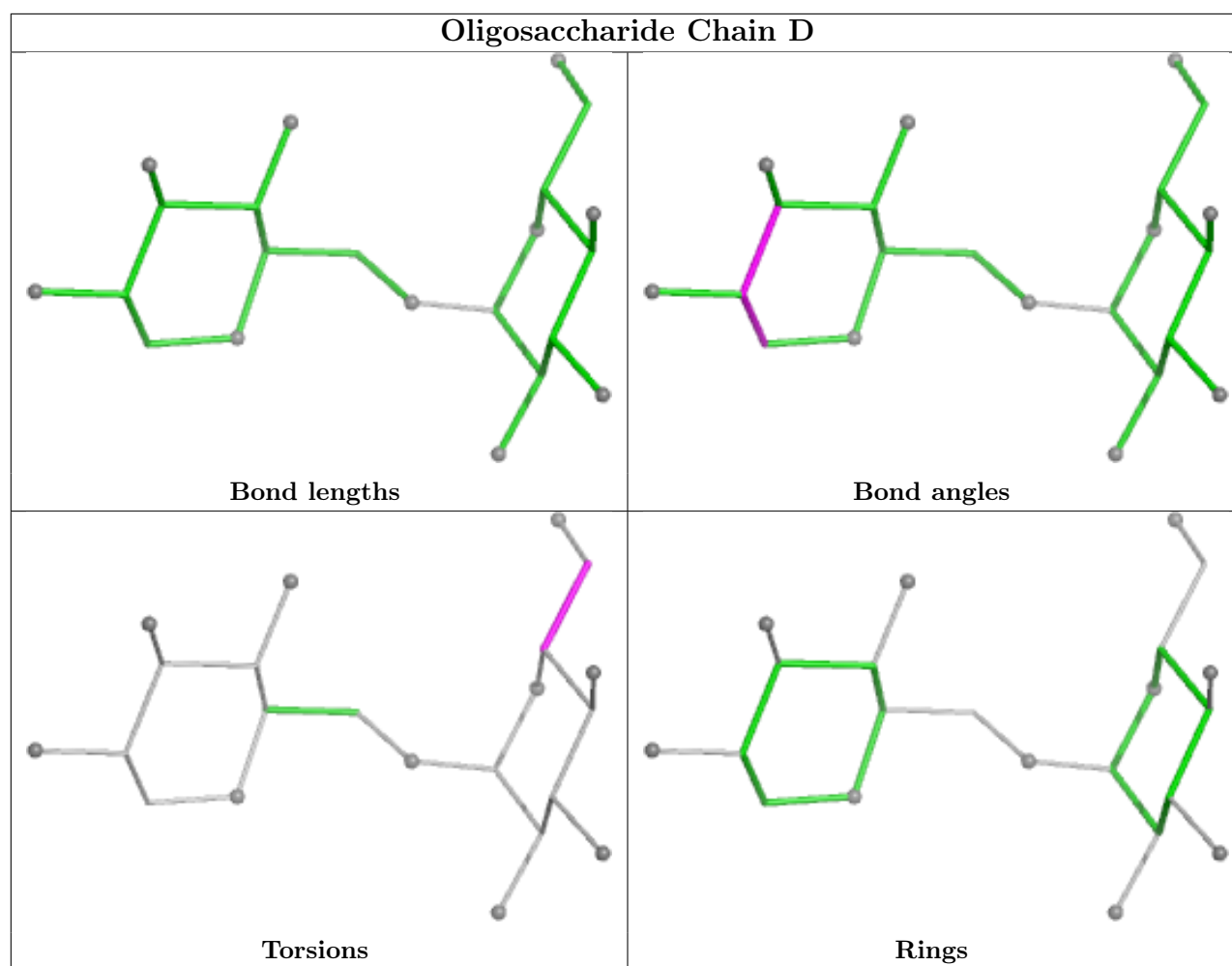
There are no ring outliers.

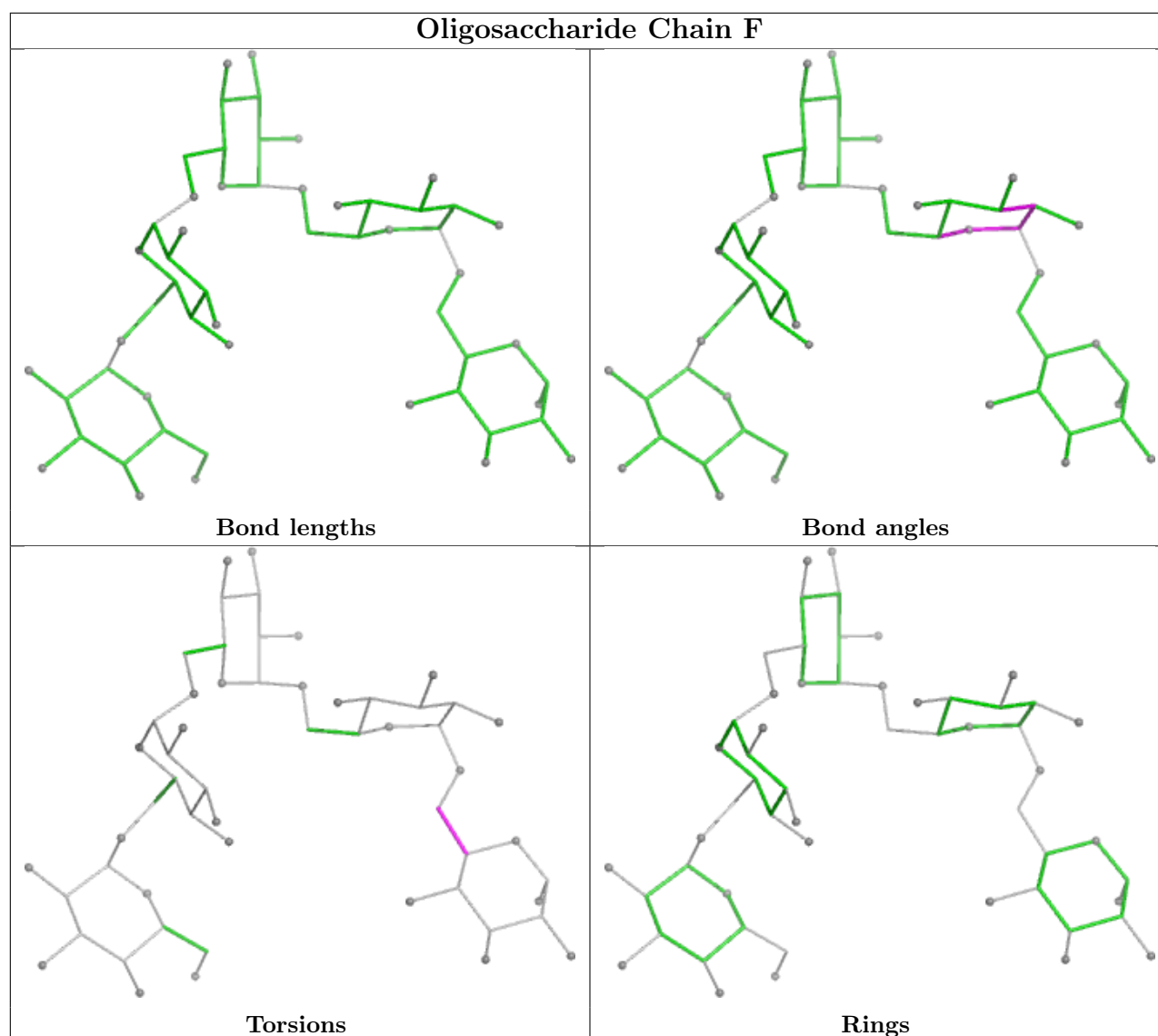
No monomer is involved in short contacts.

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](#)

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

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

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	1155/1183 (97%)	0.18	32 (2%) 55 32	54, 78, 135, 186	0
1	B	1155/1183 (97%)	-0.02	14 (1%) 76 55	45, 70, 102, 139	0
All	All	2310/2366 (97%)	0.08	46 (1%) 65 42	45, 75, 120, 186	0

All (46) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	449	VAL	3.8
1	A	446	VAL	3.7
1	B	449	VAL	3.4
1	A	486	HIS	3.2
1	B	445	VAL	3.2
1	B	1303	LYS	3.1
1	A	561	THR	3.0
1	B	301	THR	3.0
1	B	309	THR	3.0
1	A	447	LYS	2.9
1	B	917	ASP	2.9
1	B	447	LYS	2.9
1	A	1301	LEU	2.9
1	A	491	VAL	2.7
1	B	459	LEU	2.7
1	B	300	THR	2.7
1	B	487	GLY	2.6
1	A	450	TYR	2.6
1	A	549	ILE	2.6
1	A	1299	HIS	2.6
1	A	555	VAL	2.6
1	A	558	THR	2.5
1	A	451	SER	2.5
1	A	497	ASP	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	483	ILE	2.5
1	A	563	TRP	2.5
1	A	499	ARG	2.5
1	A	462	ASN	2.5
1	A	560	ASN	2.4
1	A	496	LYS	2.4
1	A	459	LEU	2.3
1	A	301	THR	2.3
1	A	1244	THR	2.2
1	A	492	ALA	2.2
1	A	498	PHE	2.2
1	A	448	ASP	2.2
1	B	188	LYS	2.2
1	B	448	ASP	2.1
1	A	316	ASP	2.1
1	A	377	LYS	2.1
1	B	1271	SER	2.0
1	A	1247	LYS	2.0
1	B	690	LYS	2.0
1	A	445	VAL	2.0
1	A	309	THR	2.0
1	A	871	LEU	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
4	GLC	F	5	11/12	0.58	0.15	107,115,118,122	0
4	GLC	F	1	12/12	0.61	0.12	93,117,120,121	0
2	GLC	C	1	11/12	0.63	0.17	87,90,92,93	0
3	GLC	D	2	11/12	0.67	0.15	89,93,97,98	0
3	GLC	D	1	11/12	0.74	0.12	90,94,96,98	0
2	GLC	E	1	11/12	0.78	0.13	76,96,102,105	0

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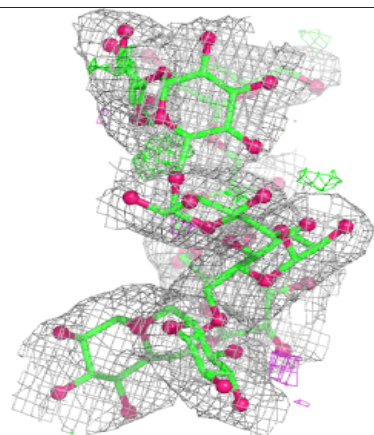
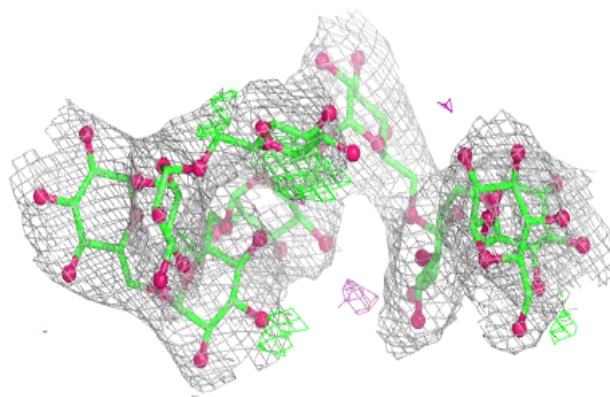
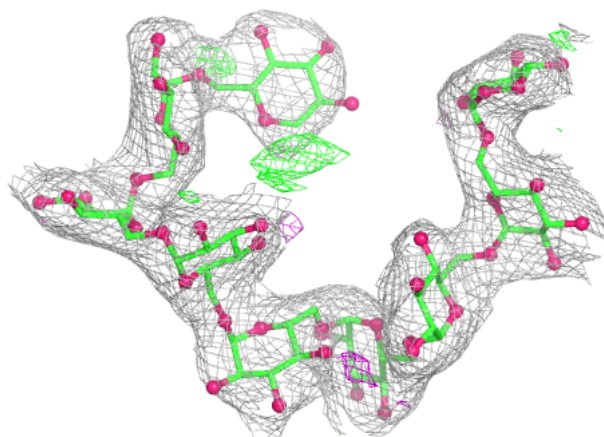
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	GLC	C	9	11/12	0.84	0.12	80,81,82,83	0
2	GLC	E	9	11/12	0.87	0.14	69,70,72,72	0
4	GLC	F	4	11/12	0.89	0.10	97,101,108,112	0
2	GLC	C	4	11/12	0.91	0.10	70,74,76,76	0
2	GLC	E	5	11/12	0.91	0.09	67,68,70,73	0
2	GLC	C	2	11/12	0.92	0.11	77,81,86,87	0
4	GLC	F	2	11/12	0.92	0.09	73,78,84,86	0
2	GLC	C	5	11/12	0.93	0.08	66,68,70,70	0
4	GLC	F	3	11/12	0.94	0.09	68,72,83,91	0
2	GLC	E	2	11/12	0.94	0.07	63,67,71,71	0
2	GLC	E	4	11/12	0.94	0.07	60,61,62,64	0
2	GLC	C	7	11/12	0.95	0.07	60,62,65,65	0
2	GLC	C	6	11/12	0.96	0.06	63,66,69,71	0
2	GLC	C	3	11/12	0.96	0.09	75,76,78,78	0
2	GLC	E	6	11/12	0.96	0.06	59,62,64,64	0
2	GLC	E	8	11/12	0.96	0.07	55,59,65,68	0
2	GLC	C	8	11/12	0.96	0.08	66,67,73,76	0
2	GLC	E	3	11/12	0.96	0.07	58,60,62,63	0
2	GLC	E	7	11/12	0.97	0.06	54,55,57,57	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.

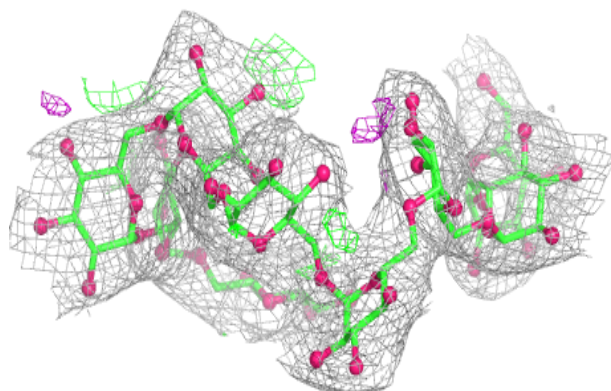
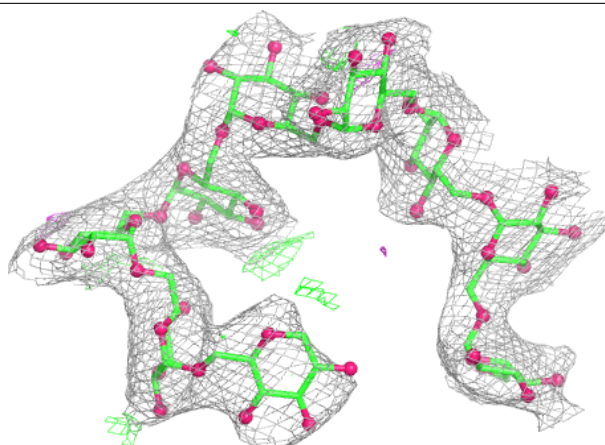
Electron density around Chain C:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



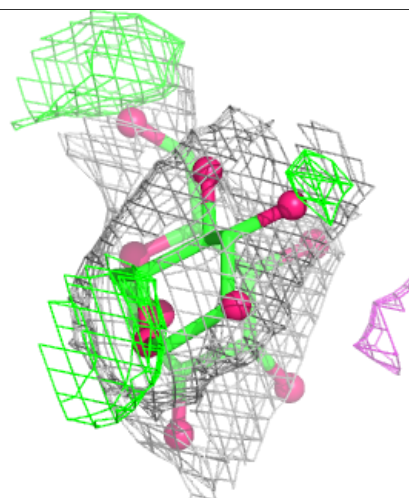
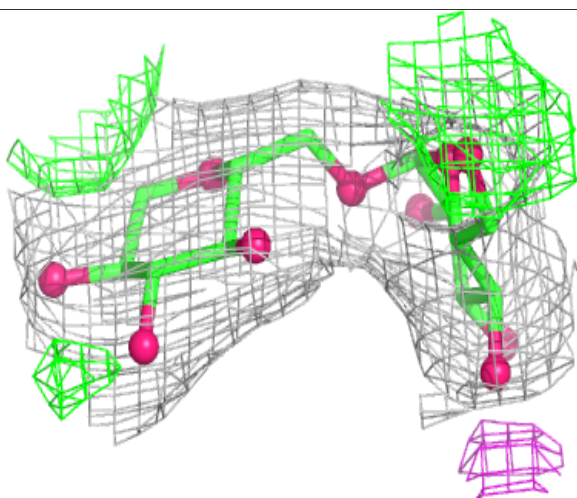
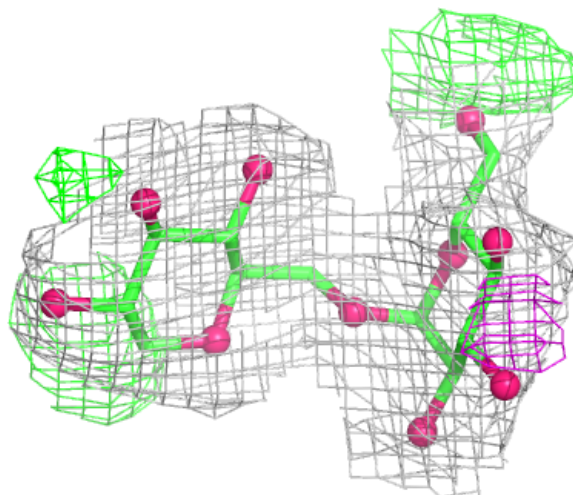
Electron density around Chain E:

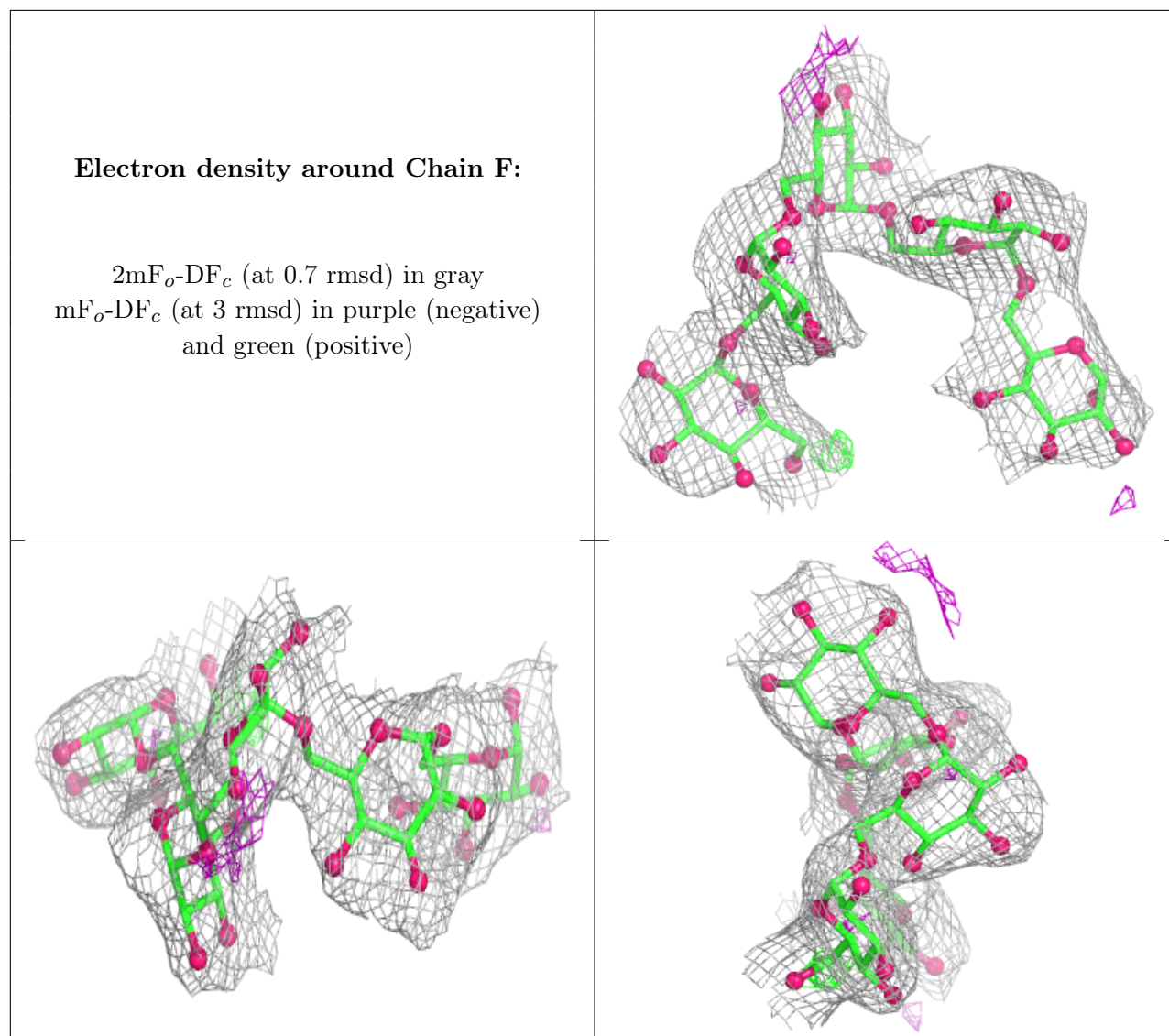
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around Chain D:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





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
5	CA	B	1500	1/1	0.95	0.06	61,61,61,61	0
5	CA	A	1500	1/1	0.97	0.05	65,65,65,65	0

6.5 Other polymers [i](#)

There are no such residues in this entry.