



# Full wwPDB X-ray Structure Validation Report ⓘ

Oct 14, 2023 – 03:31 PM EDT

PDB ID : 7UWW  
Title : Sas6 with alpha-cyclodextrin  
Authors : Photenhauer, A.L.; Koropatkin, N.M.  
Deposited on : 2022-05-04  
Resolution : 1.61 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](mailto: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>.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtrriage (Phenix) : 1.13  
EDS : 2.36  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

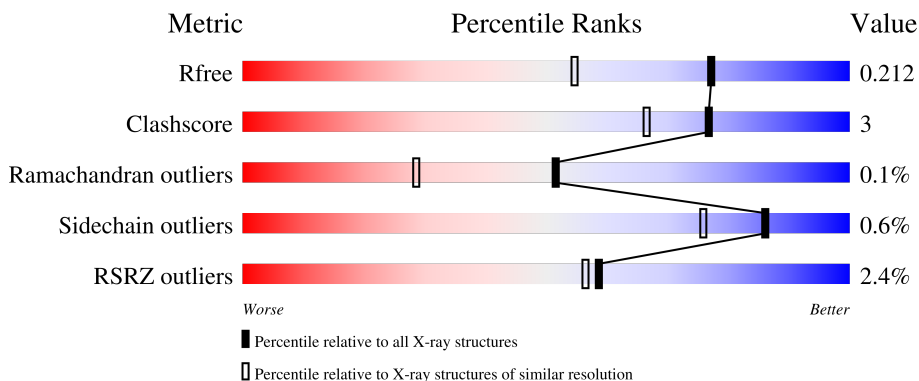
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.61 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))
$R_{free}$	130704	4693 (1.64-1.60)
Clashscore	141614	5002 (1.64-1.60)
Ramachandran outliers	138981	4888 (1.64-1.60)
Sidechain outliers	138945	4887 (1.64-1.60)
RSRZ outliers	127900	4609 (1.64-1.60)

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  $\geq 3$ , 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	635	
1	B	635	
2	D	6	
2	I	6	

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
3	EDO	B	714	-	-	X	-
4	SCN	A	709	-	-	-	X
4	SCN	B	715	-	-	-	X
4	SCN	B	718	-	-	-	X

## 2 Entry composition [i](#)

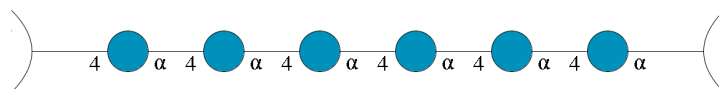
There are 6 unique types of molecules in this entry. The entry contains 20763 atoms, of which 9338 are hydrogens and 0 are deuteriums.

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 Starch Adherence System protein 6 (Sas6).

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	632	9480	3064	4594	782	1023	17	0	12	0
1	B	627	9375	3035	4540	773	1009	18	0	9	0

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



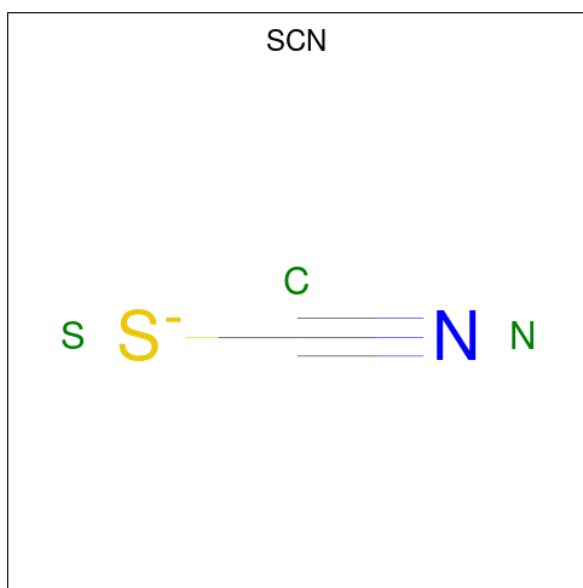
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	H	O			
2	D	6	126	36	60	30	0	0	0
2	I	6	126	36	60	30	0	0	0

- Molecule 3 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	H	O	0	0
			10	2	6	2		
3	A	1	Total	C	H	O	0	0
			10	2	6	2		
3	A	1	Total	C	H	O	0	0
			10	2	6	2		
3	A	1	Total	C	H	O	0	0
			10	2	6	2		
3	B	1	Total	C	H	O	0	0
			10	2	6	2		
3	B	1	Total	C	H	O	0	0
			10	2	6	2		
3	B	1	Total	C	H	O	0	0
			10	2	6	2		
3	B	1	Total	C	H	O	0	0
			10	2	6	2		
3	B	1	Total	C	H	O	0	0
			10	2	6	2		
3	B	1	Total	C	H	O	0	0
			10	2	6	2		
3	B	1	Total	C	H	O	0	0
			10	2	6	2		

- Molecule 4 is THIOCYANATE ION (three-letter code: SCN) (formula: CNS).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	
4	A	1	Total	C	N	S	0	0
			3	1	1	1		
4	A	1	Total	C	N	S	0	0
			3	1	1	1		
4	A	1	Total	C	N	S	0	0
			3	1	1	1		
4	A	1	Total	C	N	S	0	0
			3	1	1	1		
4	A	1	Total	C	N	S	0	0
			3	1	1	1		
4	A	1	Total	C	N	S	0	0
			3	1	1	1		
4	A	1	Total	C	N	S	0	0
			3	1	1	1		
4	A	1	Total	C	N	S	0	0
			3	1	1	1		
4	B	1	Total	C	N	S	0	0
			3	1	1	1		
4	B	1	Total	C	N	S	0	0
			3	1	1	1		

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	B	1	Total	C	N	S	0	0
			3	1	1	1		
4	B	1	Total	C	N	S	0	0
			3	1	1	1		
4	B	1	Total	C	N	S	0	0
			3	1	1	1		
4	B	1	Total	C	N	S	0	0
			3	1	1	1		
4	B	1	Total	C	N	S	0	0
			3	1	1	1		

- Molecule 5 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	4	Total	Ca	0	0
			4	4		
5	B	4	Total	Ca	0	0
			4	4		

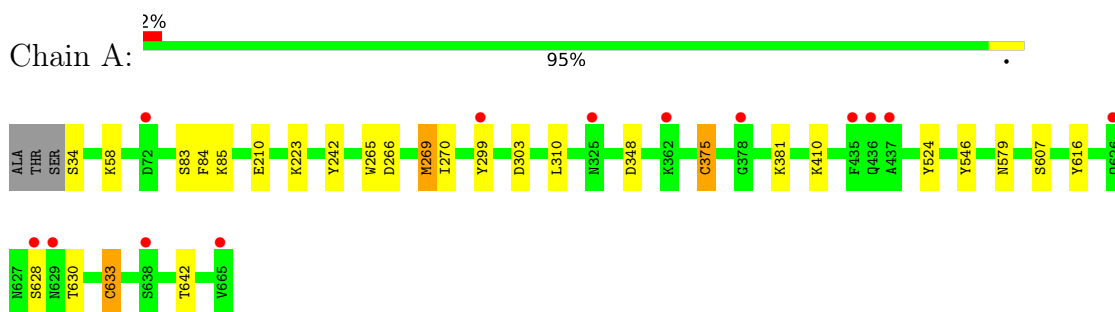
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	745	Total	O	0	0
			745	745		
6	B	706	Total	O	0	0
			706	706		

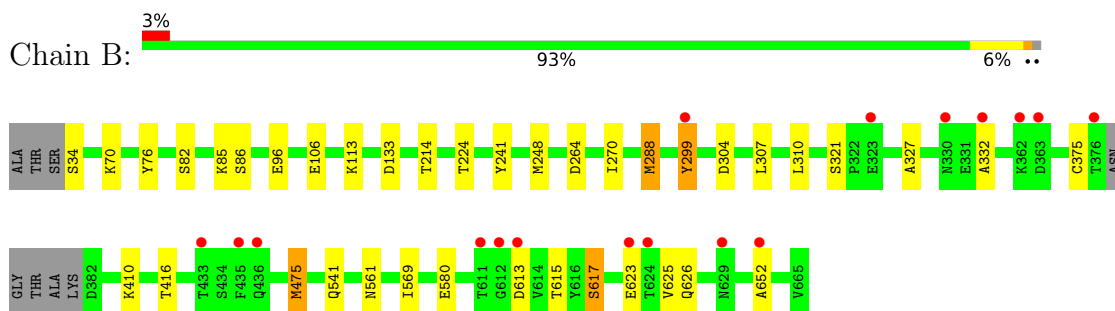
### 3 Residue-property plots [i](#)

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.

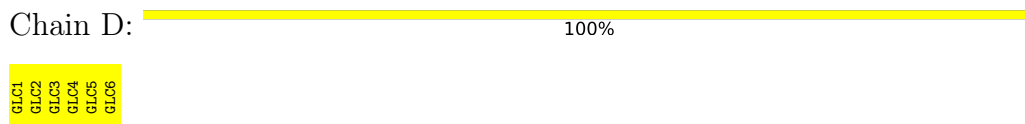
- Molecule 1: Starch Adherence System protein 6 (Sas6)



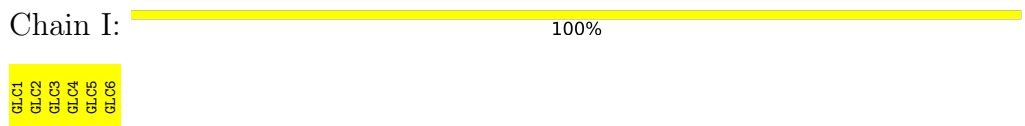
- Molecule 1: Starch Adherence System protein 6 (Sas6)



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



- Molecule 2: Cyclohexakis-(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, $\alpha$ , $\beta$ , $\gamma$	69.45Å 82.53Å 213.47Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	34.99 – 1.61 35.00 – 1.61	Depositor EDS
% Data completeness (in resolution range)	76.8 (34.99-1.61) 76.8 (35.00-1.61)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.28 (at 1.61Å)	Xtrriage
Refinement program	PHENIX 1.16_3549	Depositor
R, $R_{free}$	0.168 , 0.212 0.168 , 0.212	Depositor DCC
$R_{free}$ test set	6093 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	16.1	Xtrriage
Anisotropy	0.000	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 43.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.51$ , $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	20763	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	23.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.48% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: EDO, CA, GLC, SCN

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	0.54	1/5038 (0.0%)	0.69	2/6848 (0.0%)
1	B	0.58	3/4973 (0.1%)	0.71	3/6760 (0.0%)
All	All	0.56	4/10011 (0.0%)	0.70	5/13608 (0.0%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	288	MET	SD-CE	-9.40	1.25	1.77
1	B	288	MET	CG-SD	8.81	2.04	1.81
1	A	633	CYS	CB-SG	-7.06	1.70	1.82
1	B	475	MET	SD-CE	-6.02	1.44	1.77

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	475	MET	CG-SD-CE	10.23	116.57	100.20
1	B	264	ASP	CB-CG-OD1	5.89	123.60	118.30
1	A	269	MET	CG-SD-CE	5.51	109.01	100.20
1	A	303	ASP	CB-CG-OD1	5.45	123.20	118.30
1	B	288	MET	CG-SD-CE	5.08	108.33	100.20

There are no chirality outliers.

There are no planarity outliers.

### 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	4886	4594	4586	20	1
1	B	4835	4540	4539	37	1
2	D	66	60	54	0	0
2	I	66	60	54	0	0
3	A	16	24	24	0	0
3	B	40	60	59	4	0
4	A	33	0	0	0	0
4	B	24	0	0	3	0
5	A	4	0	0	0	0
5	B	4	0	0	0	0
6	A	745	0	0	7	1
6	B	706	0	0	15	1
All	All	11425	9338	9316	58	2

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 (58) 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:288:MET:SD	1:B:288:MET:CG	2.04	1.46
1:A:299:TYR:OH	6:A:801:HOH:O	1.89	0.88
1:B:623:GLU:OE1	6:B:801:HOH:O	1.97	0.81
3:B:714:EDO:H22	6:B:807:HOH:O	1.83	0.78
4:B:709:SCN:S	6:B:831:HOH:O	2.43	0.77
1:B:299:TYR:OH	6:B:802:HOH:O	1.98	0.73
1:B:288:MET:CG	1:B:288:MET:CE	2.70	0.64
1:B:96:GLU:OE1	6:B:804:HOH:O	2.15	0.64
1:B:416:THR:OG1	6:B:803:HOH:O	2.15	0.63
1:B:133:ASP:O	3:B:714:EDO:H11	1.98	0.63
1:A:410:LYS:HG3	6:A:892:HOH:O	2.02	0.58
1:A:210[A]:GLU:OE2	6:A:803:HOH:O	2.18	0.57
1:B:613:ASP:OD1	6:B:805:HOH:O	2.17	0.57
1:A:270:ILE:HG12	1:A:299:TYR:CE2	2.40	0.56
1:B:625:VAL:HG12	1:B:625:VAL:O	2.05	0.56
1:B:248:MET:SD	6:B:1369:HOH:O	2.58	0.55
1:A:628:SER:HB2	1:A:630:THR:HG23	1.89	0.54
1:A:381:LYS:HE2	1:A:546:TYR:OH	2.07	0.54
1:B:410:LYS:HG2	6:B:945:HOH:O	2.07	0.54
1:A:579[A]:ASN:OD1	6:A:804:HOH:O	2.18	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:270:ILE:HG12	1:B:299:TYR:CE2	2.43	0.53
1:B:304:ASP:N	6:B:810:HOH:O	2.41	0.53
1:B:617:SER:HA	1:B:626:GLN:O	2.09	0.51
1:B:70:LYS:HE2	1:B:76:TYR:OH	2.10	0.51
1:B:615:THR:HG22	6:B:1334:HOH:O	2.10	0.51
1:B:561:ASN:HB3	4:B:717:SCN:S	2.51	0.50
1:A:265:TRP:CE3	1:A:269:MET:HE1	2.46	0.50
1:B:241:TYR:HE1	1:B:475:MET:HE3	1.77	0.50
1:B:288:MET:SD	1:B:288:MET:CB	2.93	0.49
1:A:58:LYS:HD2	1:A:83:SER:HB2	1.95	0.48
1:A:607:SER:HB3	1:A:616:TYR:OH	2.14	0.48
1:B:241:TYR:CE1	1:B:475:MET:CE	2.97	0.48
1:A:85:LYS:NZ	6:A:817:HOH:O	2.45	0.48
1:B:133:ASP:O	3:B:714:EDO:C1	2.62	0.47
1:B:86[A]:SER:HA	1:B:113:LYS:HD2	1.96	0.47
1:B:327:ALA:HA	1:B:332:ALA:HB2	1.97	0.47
1:B:82:SER:O	1:B:85:LYS:HE3	2.15	0.46
1:B:241:TYR:CE1	1:B:475:MET:HE3	2.50	0.46
1:B:541:GLN:NE2	6:B:831:HOH:O	2.49	0.46
1:B:86[B]:SER:HA	1:B:113:LYS:HD2	1.97	0.46
1:B:106[A]:GLU:HG2	6:B:1141:HOH:O	2.16	0.46
1:B:299:TYR:HB2	1:B:310:LEU:HB3	1.97	0.46
1:A:642:THR:HB	1:B:652:ALA:HB1	1.98	0.45
1:A:265:TRP:CE3	1:A:269:MET:CE	2.99	0.45
1:A:348:ASP:HB3	6:A:854:HOH:O	2.17	0.45
1:A:348:ASP:CB	6:A:854:HOH:O	2.64	0.45
1:B:307:LEU:HD11	1:B:569:ILE:HD13	1.99	0.44
1:A:266:ASP:O	1:A:299:TYR:HE1	2.00	0.43
1:B:214:THR:HG22	4:B:712:SCN:S	2.59	0.42
1:B:106[A]:GLU:HG3	6:B:881:HOH:O	2.19	0.42
1:B:70:LYS:HG3	1:B:76:TYR:CZ	2.55	0.42
1:B:224:THR:HG23	1:B:580:GLU:HA	2.03	0.41
1:B:34:SER:HB3	6:B:1320:HOH:O	2.19	0.41
1:B:133:ASP:N	3:B:714:EDO:H11	2.35	0.41
1:A:299:TYR:HB2	1:A:310:LEU:HB3	2.03	0.40
1:A:223:LYS:NZ	1:A:242:TYR:O	2.53	0.40
1:A:266:ASP:O	1:A:299:TYR:CE1	2.74	0.40
1:A:83:SER:HG	1:A:84:PHE:HD1	1.68	0.40

All (2) 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)
1:A:375:CYS:HG	1:B:375:CYS:SG[3_845]	1.17	0.43
6:A:1027:HOH:O	6:B:1380:HOH:O[3_745]	2.09	0.11

### 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	642/635 (101%)	619 (96%)	22 (3%)	1 (0%)	47	26
1	B	632/635 (100%)	607 (96%)	25 (4%)	0	100	100
All	All	1274/1270 (100%)	1226 (96%)	47 (4%)	1 (0%)	51	28

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	375	CYS

#### 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	530/520 (102%)	527 (99%)	3 (1%)	86	76
1	B	523/520 (101%)	520 (99%)	3 (1%)	86	76
All	All	1053/1040 (101%)	1047 (99%)	6 (1%)	86	76

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	34	SER
1	A	524	TYR
1	A	633	CYS
1	B	299	TYR
1	B	321	SER
1	B	617	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	541	GLN
1	B	627	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](#)

12 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	D	1	2	11,11,12	1.40	2 (18%)	15,15,17	1.09	0
2	GLC	D	2	2	11,11,12	2.76	3 (27%)	15,15,17	2.13	5 (33%)
2	GLC	D	3	2	11,11,12	1.62	1 (9%)	15,15,17	1.16	2 (13%)
2	GLC	D	4	2	11,11,12	1.11	0	15,15,17	1.45	3 (20%)
2	GLC	D	5	2	11,11,12	1.51	3 (27%)	15,15,17	1.14	2 (13%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	GLC	D	6	2	11,11,12	1.25	0	15,15,17	1.38	4 (26%)
2	GLC	I	1	2	11,11,12	1.39	1 (9%)	15,15,17	1.05	0
2	GLC	I	2	2	11,11,12	1.53	3 (27%)	15,15,17	0.74	0
2	GLC	I	3	2	11,11,12	1.48	3 (27%)	15,15,17	1.92	5 (33%)
2	GLC	I	4	2	11,11,12	0.99	1 (9%)	15,15,17	1.31	4 (26%)
2	GLC	I	5	2	11,11,12	2.55	2 (18%)	15,15,17	1.77	3 (20%)
2	GLC	I	6	2	11,11,12	1.79	3 (27%)	15,15,17	1.02	1 (6%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	GLC	D	1	2	-	2/2/19/22	0/1/1/1
2	GLC	D	2	2	-	2/2/19/22	0/1/1/1
2	GLC	D	3	2	-	0/2/19/22	0/1/1/1
2	GLC	D	4	2	-	1/2/19/22	0/1/1/1
2	GLC	D	5	2	-	0/2/19/22	0/1/1/1
2	GLC	D	6	2	-	2/2/19/22	0/1/1/1
2	GLC	I	1	2	-	0/2/19/22	0/1/1/1
2	GLC	I	2	2	-	0/2/19/22	0/1/1/1
2	GLC	I	3	2	-	1/2/19/22	0/1/1/1
2	GLC	I	4	2	-	0/2/19/22	0/1/1/1
2	GLC	I	5	2	-	0/2/19/22	0/1/1/1
2	GLC	I	6	2	-	0/2/19/22	0/1/1/1

All (22) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	2	GLC	O5-C1	6.91	1.54	1.43
2	I	5	GLC	O5-C1	6.29	1.53	1.43
2	D	2	GLC	O4-C4	4.39	1.53	1.43
2	I	5	GLC	O4-C4	4.25	1.53	1.43
2	I	6	GLC	C2-C3	3.76	1.58	1.52
2	D	3	GLC	C2-C3	3.29	1.57	1.52
2	D	5	GLC	C2-C3	3.10	1.57	1.52
2	D	1	GLC	C2-C3	3.03	1.57	1.52
2	I	1	GLC	O5-C1	-2.63	1.39	1.43
2	D	2	GLC	C4-C5	-2.57	1.47	1.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	I	6	GLC	O2-C2	-2.50	1.38	1.43
2	I	2	GLC	O4-C4	2.49	1.48	1.43
2	I	3	GLC	C6-C5	2.48	1.60	1.51
2	I	2	GLC	C2-C3	2.46	1.56	1.52
2	I	2	GLC	C1-C2	2.44	1.57	1.52
2	D	5	GLC	O2-C2	-2.30	1.38	1.43
2	I	6	GLC	O5-C1	-2.20	1.40	1.43
2	I	3	GLC	O5-C1	2.17	1.47	1.43
2	I	4	GLC	O4-C4	2.15	1.48	1.43
2	D	5	GLC	O4-C4	2.12	1.48	1.43
2	I	3	GLC	O4-C4	2.12	1.48	1.43
2	D	1	GLC	O4-C4	2.06	1.47	1.43

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	I	5	GLC	O4-C4-C3	-4.26	100.50	110.35
2	D	2	GLC	O4-C4-C3	-4.07	100.95	110.35
2	D	2	GLC	O5-C5-C6	-3.93	101.04	107.20
2	D	2	GLC	O5-C5-C4	3.66	119.73	110.83
2	I	3	GLC	O5-C5-C4	3.58	119.53	110.83
2	I	3	GLC	O4-C4-C3	-3.32	102.67	110.35
2	I	3	GLC	C3-C4-C5	3.19	115.93	110.24
2	I	4	GLC	O5-C1-C2	2.98	115.38	110.77
2	I	5	GLC	O5-C5-C6	-2.92	102.62	107.20
2	D	2	GLC	C3-C4-C5	2.89	115.39	110.24
2	D	6	GLC	O5-C5-C4	2.80	117.64	110.83
2	D	4	GLC	C1-O5-C5	2.80	115.98	112.19
2	D	4	GLC	O5-C5-C6	-2.69	102.98	107.20
2	I	3	GLC	C6-C5-C4	-2.46	107.24	113.00
2	D	4	GLC	O5-C5-C4	2.42	116.72	110.83
2	I	5	GLC	C2-C3-C4	2.41	115.07	110.89
2	D	3	GLC	O4-C4-C3	-2.40	104.81	110.35
2	I	4	GLC	C1-C2-C3	2.35	112.55	109.67
2	I	6	GLC	C1-O5-C5	2.32	115.33	112.19
2	D	6	GLC	C6-C5-C4	-2.29	107.63	113.00
2	D	3	GLC	O5-C5-C4	2.28	116.36	110.83
2	D	5	GLC	C3-C4-C5	2.25	114.25	110.24
2	D	6	GLC	O4-C4-C3	-2.24	105.16	110.35
2	I	3	GLC	O5-C5-C6	-2.22	103.72	107.20
2	D	5	GLC	O2-C2-C1	2.20	113.66	109.15
2	D	2	GLC	C6-C5-C4	-2.11	108.06	113.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	I	4	GLC	C2-C3-C4	2.10	114.53	110.89
2	D	6	GLC	O5-C1-C2	2.04	113.92	110.77
2	I	4	GLC	O4-C4-C3	-2.02	105.68	110.35

There are no chirality outliers.

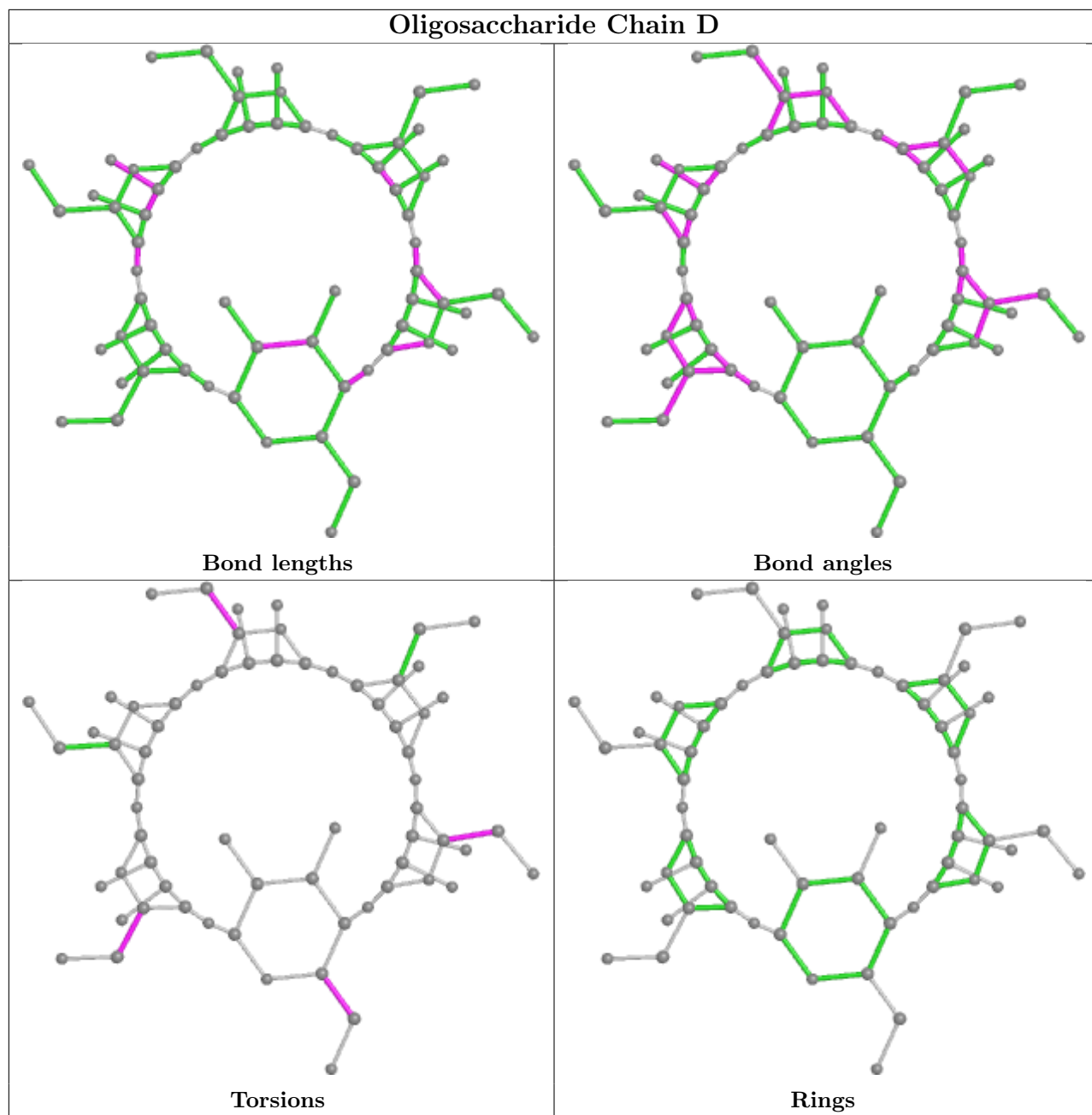
All (8) torsion outliers are listed below:

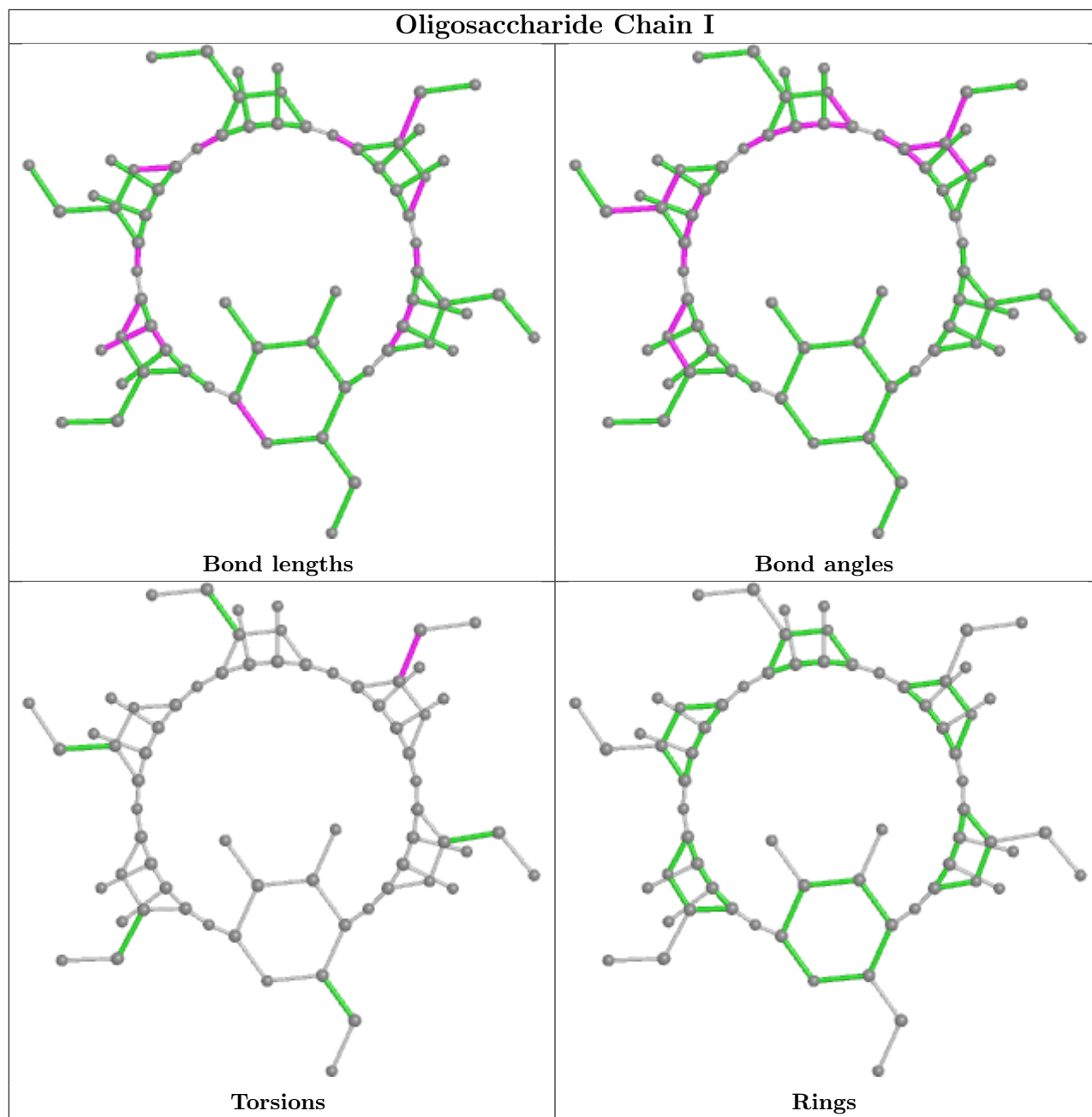
Mol	Chain	Res	Type	Atoms
2	D	6	GLC	O5-C5-C6-O6
2	D	1	GLC	O5-C5-C6-O6
2	D	6	GLC	C4-C5-C6-O6
2	D	1	GLC	C4-C5-C6-O6
2	D	2	GLC	C4-C5-C6-O6
2	I	3	GLC	O5-C5-C6-O6
2	D	2	GLC	O5-C5-C6-O6
2	D	4	GLC	C4-C5-C6-O6

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 41 ligands modelled in this entry, 8 are monoatomic - leaving 33 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
3	EDO	B	705	-	3,3,3	0.60	0	2,2,2	0.09	0
4	SCN	B	712	-	1,2,2	0.77	0	0,1,1	-	-
4	SCN	B	713	-	1,2,2	1.42	0	0,1,1	-	-
3	EDO	B	704	5	3,3,3	0.59	0	2,2,2	0.07	0
3	EDO	B	701	-	3,3,3	0.48	0	2,2,2	0.42	0
3	EDO	B	706	-	3,3,3	0.62	0	2,2,2	0.17	0
4	SCN	A	705	-	1,2,2	0.82	0	0,1,1	-	-
4	SCN	B	717	-	1,2,2	1.09	0	0,1,1	-	-
4	SCN	A	709	-	1,2,2	0.67	0	0,1,1	-	-
3	EDO	B	707	-	3,3,3	0.71	0	2,2,2	0.19	0
4	SCN	B	718	-	1,2,2	0.85	0	0,1,1	-	-
4	SCN	A	713	-	1,2,2	0.97	0	0,1,1	-	-
3	EDO	B	716	-	3,3,3	0.67	0	2,2,2	0.13	0
4	SCN	A	706	-	1,2,2	0.82	0	0,1,1	-	-
3	EDO	A	704	-	3,3,3	0.46	0	2,2,2	0.49	0
4	SCN	A	708	-	1,2,2	0.70	0	0,1,1	-	-
4	SCN	A	710	-	1,2,2	0.83	0	0,1,1	-	-
4	SCN	A	714	-	1,2,2	0.70	0	0,1,1	-	-
4	SCN	B	715	-	1,2,2	0.93	0	0,1,1	-	-
4	SCN	A	715	-	1,2,2	0.12	0	0,1,1	-	-
4	SCN	B	710	-	1,2,2	0.60	0	0,1,1	-	-
3	EDO	B	703	-	3,3,3	0.74	0	2,2,2	0.04	0
4	SCN	B	711	-	1,2,2	1.82	0	0,1,1	-	-
3	EDO	A	701	-	3,3,3	0.54	0	2,2,2	0.46	0
4	SCN	B	709	-	1,2,2	1.82	0	0,1,1	-	-
3	EDO	B	708	-	3,3,3	0.57	0	2,2,2	0.22	0
4	SCN	A	707	-	1,2,2	0.80	0	0,1,1	-	-
3	EDO	A	702	-	3,3,3	0.59	0	2,2,2	0.12	0
4	SCN	A	712	-	1,2,2	0.38	0	0,1,1	-	-
3	EDO	B	714	-	3,3,3	0.94	0	2,2,2	0.33	0
3	EDO	B	702	-	3,3,3	0.46	0	2,2,2	0.24	0
3	EDO	A	703	-	3,3,3	0.36	0	2,2,2	0.47	0
4	SCN	A	711	-	1,2,2	3.04	1 (100%)	0,1,1	-	-

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	EDO	B	708	-	-	1/1/1/1	-
3	EDO	B	705	-	-	0/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	EDO	B	707	-	-	1/1/1/1	-
3	EDO	A	702	-	-	0/1/1/1	-
3	EDO	B	704	5	-	0/1/1/1	-
3	EDO	B	701	-	-	0/1/1/1	-
3	EDO	B	714	-	-	1/1/1/1	-
3	EDO	A	704	-	-	0/1/1/1	-
3	EDO	B	716	-	-	1/1/1/1	-
3	EDO	B	702	-	-	0/1/1/1	-
3	EDO	A	703	-	-	1/1/1/1	-
3	EDO	B	703	-	-	1/1/1/1	-
3	EDO	B	706	-	-	0/1/1/1	-
3	EDO	A	701	-	-	0/1/1/1	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	711	SCN	C-N	3.04	1.25	1.15

There are no bond angle outliers.

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	716	EDO	O1-C1-C2-O2
3	B	707	EDO	O1-C1-C2-O2
3	B	714	EDO	O1-C1-C2-O2
3	B	703	EDO	O1-C1-C2-O2
3	B	708	EDO	O1-C1-C2-O2
3	A	703	EDO	O1-C1-C2-O2

There are no ring outliers.

4 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	712	SCN	1	0
4	B	717	SCN	1	0
4	B	709	SCN	1	0
3	B	714	EDO	4	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

### 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	632/635 (99%)	-0.25	13 (2%) 63 62	8, 18, 36, 59	0
1	B	627/635 (98%)	-0.22	17 (2%) 54 51	9, 19, 39, 57	0
All	All	1259/1270 (99%)	-0.24	30 (2%) 59 56	8, 19, 38, 59	0

All (30) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	628	SER	4.0
1	B	629	ASN	3.7
1	B	652	ALA	3.7
1	A	638	SER	3.5
1	B	612	GLY	3.5
1	B	330	ASN	3.4
1	A	378	GLY	3.4
1	B	362	LYS	3.2
1	A	435	PHE	2.9
1	B	376	THR	2.9
1	A	325	ASN	2.9
1	A	437	ALA	2.8
1	A	72	ASP	2.8
1	A	299	TYR	2.7
1	A	665	VAL	2.7
1	B	363	ASP	2.7
1	A	626	GLN	2.5
1	A	436	GLN	2.5
1	B	436	GLN	2.4
1	B	623	GLU	2.4
1	A	362	LYS	2.3
1	A	629	ASN	2.3
1	B	299	TYR	2.3
1	B	613	ASP	2.3

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Mol	Chain	Res	Type	RSRZ
1	B	611	THR	2.3
1	B	323	GLU	2.3
1	B	435	PHE	2.3
1	B	433	THR	2.1
1	B	332	ALA	2.1
1	B	624	THR	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, 95<sup>th</sup> 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.

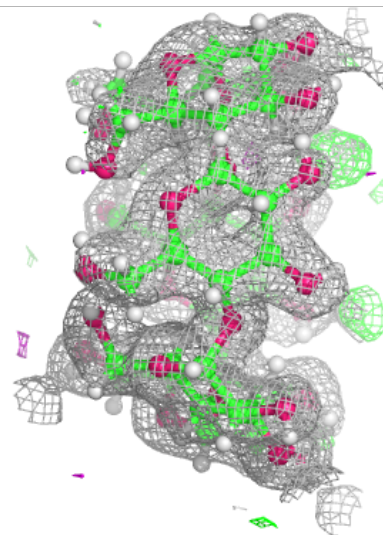
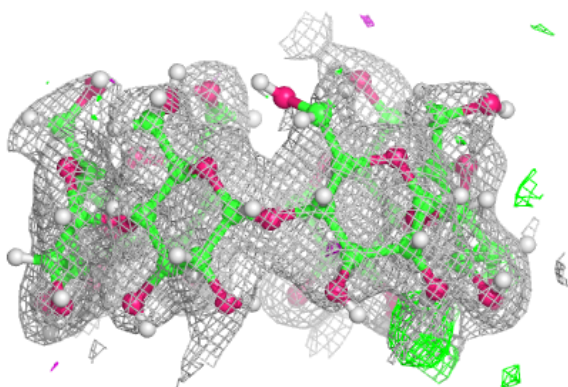
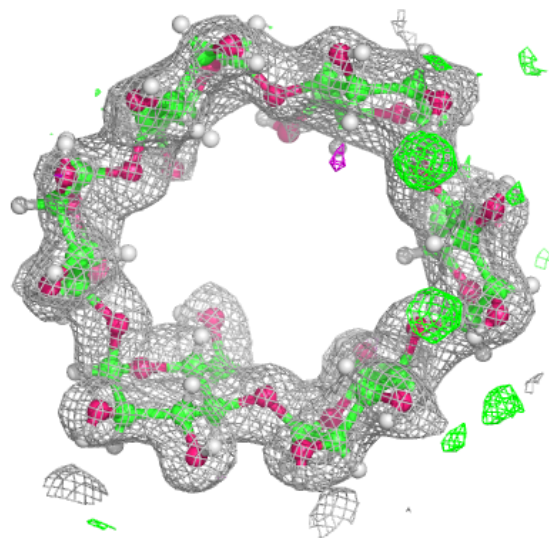
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
2	GLC	I	3	11/12	0.84	0.19	34,48,59,64	0
2	GLC	I	2	11/12	0.86	0.18	29,37,46,53	0
2	GLC	D	6	11/12	0.86	0.18	39,49,61,71	0
2	GLC	D	5	11/12	0.88	0.16	31,42,51,59	0
2	GLC	D	1	11/12	0.88	0.19	35,48,56,59	0
2	GLC	I	4	11/12	0.88	0.18	30,45,53,56	0
2	GLC	I	5	11/12	0.88	0.19	22,30,41,49	0
2	GLC	D	2	11/12	0.93	0.21	27,36,53,55	0
2	GLC	D	4	11/12	0.93	0.08	24,32,38,41	0
2	GLC	D	3	11/12	0.95	0.09	21,27,35,35	0
2	GLC	I	1	11/12	0.95	0.08	17,24,29,30	0
2	GLC	I	6	11/12	0.96	0.07	16,21,24,26	0

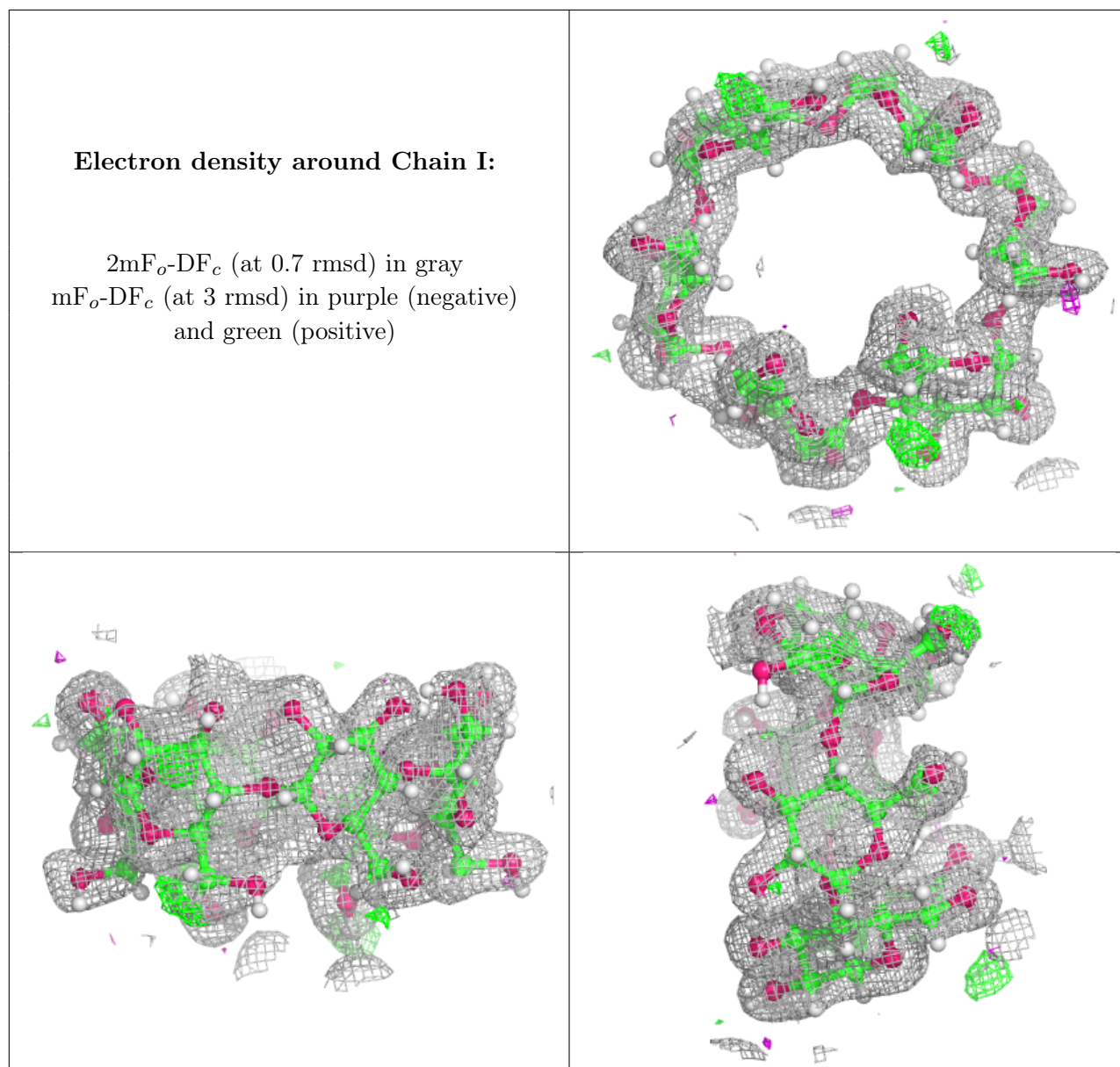
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.



**Electron density around Chain 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
4	SCN	A	709	3/3	0.36	0.49	48,48,52,73	0
4	SCN	B	715	3/3	0.56	0.48	48,48,51,78	0
4	SCN	B	709	3/3	0.58	0.23	34,34,43,62	0
4	SCN	A	713	3/3	0.59	0.33	44,44,46,48	0
4	SCN	A	706	3/3	0.63	0.25	43,43,54,58	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
4	SCN	B	711	3/3	0.65	0.29	35,35,49,73	0
4	SCN	A	714	3/3	0.65	0.28	38,38,53,55	0
4	SCN	B	713	3/3	0.66	0.38	38,38,48,69	0
3	EDO	B	714	4/4	0.67	0.28	29,38,46,49	0
4	SCN	A	707	3/3	0.69	0.34	44,44,47,65	0
4	SCN	B	717	3/3	0.69	0.32	41,41,47,61	0
3	EDO	B	708	4/4	0.70	0.28	43,51,57,57	0
4	SCN	A	708	3/3	0.70	0.17	39,39,39,53	0
4	SCN	A	705	3/3	0.71	0.23	35,35,39,51	0
3	EDO	B	707	4/4	0.72	0.25	35,45,50,54	0
4	SCN	A	710	3/3	0.75	0.21	38,38,44,50	0
3	EDO	B	716	4/4	0.77	0.21	31,40,48,50	0
4	SCN	B	718	3/3	0.78	0.40	49,49,55,60	0
4	SCN	A	711	3/3	0.81	0.12	26,26,36,51	0
4	SCN	B	710	3/3	0.83	0.16	39,39,47,49	0
3	EDO	B	702	4/4	0.87	0.15	26,33,39,46	0
3	EDO	B	703	4/4	0.88	0.13	19,23,35,35	0
3	EDO	B	706	4/4	0.89	0.15	18,25,28,33	0
3	EDO	B	701	4/4	0.89	0.33	33,42,51,51	0
4	SCN	A	712	3/3	0.89	0.32	43,43,55,56	0
3	EDO	B	704	4/4	0.91	0.17	25,34,41,41	0
4	SCN	A	715	3/3	0.92	0.15	29,29,40,41	0
3	EDO	A	701	4/4	0.94	0.06	29,35,39,42	0
3	EDO	A	703	4/4	0.95	0.08	19,23,26,27	0
3	EDO	A	704	4/4	0.96	0.06	18,27,32,35	0
3	EDO	B	705	4/4	0.98	0.14	15,19,30,30	0
3	EDO	A	702	4/4	0.98	0.10	13,15,18,18	0
4	SCN	B	712	3/3	0.99	0.10	25,25,33,37	0
5	CA	B	719	1/1	0.99	0.10	10,10,10,10	0
5	CA	B	722	1/1	0.99	0.08	19,19,19,19	0
5	CA	A	718	1/1	1.00	0.07	9,9,9,9	0
5	CA	A	719	1/1	1.00	0.07	13,13,13,13	0
5	CA	A	716	1/1	1.00	0.09	12,12,12,12	0
5	CA	B	720	1/1	1.00	0.09	10,10,10,10	0
5	CA	B	721	1/1	1.00	0.08	10,10,10,10	0
5	CA	A	717	1/1	1.00	0.07	12,12,12,12	0

## 6.5 Other polymers [\(i\)](#)

There are no such residues in this entry.