



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 24, 2026 – 12:30 AM UTC

PDB ID : 5CG0 / pdb_00005cg0
Title : Crystal structure of Spodoptera frugiperda Beta-glycosidase
Authors : Tamaki, F.K.; Souza, D.P.; Souza, V.P.; Farah, S.C.; Marana, S.R.
Deposited on : 2015-07-08
Resolution : 2.09 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) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

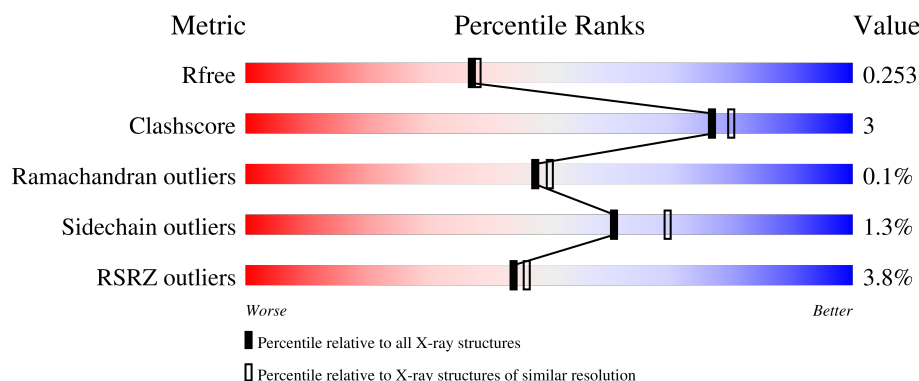
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.09 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.



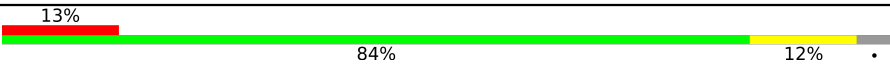
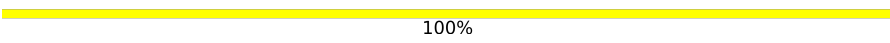
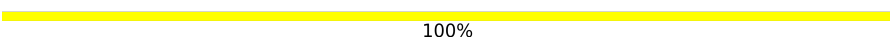
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (2.10-2.10)

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	489	
1	B	489	
1	C	489	
1	D	489	
1	E	489	

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Mol	Chain	Length	Quality of chain
1	F	489	
2	G	2	
2	H	2	
2	I	2	

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	NAG	G	2	X	-	-	-
2	NAG	H	2	X	-	-	-
2	NAG	I	2	X	-	-	-
3	TRS	E	602	-	X	-	-

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 25131 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 Beta-glucosidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	488	Total	C	N	O	S	0	3	0
			3978	2543	656	761	18			
1	B	488	Total	C	N	O	S	0	1	0
			3966	2537	656	755	18			
1	C	488	Total	C	N	O	S	0	3	0
			3967	2538	653	758	18			
1	D	486	Total	C	N	O	S	0	5	0
			3975	2542	658	757	18			
1	E	485	Total	C	N	O	S	0	0	0
			3934	2519	647	750	18			
1	F	471	Total	C	N	O	S	0	0	0
			3819	2448	633	722	16			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	325	PHE	LEU	engineered mutation	UNP O61594
A	326	PHE	ILE	engineered mutation	UNP O61594
B	325	PHE	LEU	engineered mutation	UNP O61594
B	326	PHE	ILE	engineered mutation	UNP O61594
C	325	PHE	LEU	engineered mutation	UNP O61594
C	326	PHE	ILE	engineered mutation	UNP O61594
D	325	PHE	LEU	engineered mutation	UNP O61594
D	326	PHE	ILE	engineered mutation	UNP O61594
E	325	PHE	LEU	engineered mutation	UNP O61594
E	326	PHE	ILE	engineered mutation	UNP O61594
F	325	PHE	LEU	engineered mutation	UNP O61594
F	326	PHE	ILE	engineered mutation	UNP O61594

- Molecule 2 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	G	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	H	2	Total	C	N	O	0	0	0
			28	16	2	10			
2	I	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 3 is 2-AMINO-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (CCD ID: TRS) (formula: C₄H₁₂NO₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			8	4	1	3		
3	B	1	Total	C	N	O	0	0
			8	4	1	3		
3	C	1	Total	C	N	O	0	0
			8	4	1	3		
3	D	1	Total	C	N	O	0	0
			8	4	1	3		
3	E	1	Total	C	N	O	0	0
			8	4	1	3		
3	F	1	Total	C	N	O	0	0
			8	4	1	3		

- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	C	1	Total	C	N	O	0	0
			14	8	1	5		
4	E	1	Total	C	N	O	0	0
			14	8	1	5		
4	F	1	Total	C	N	O	0	0
			14	8	1	5		

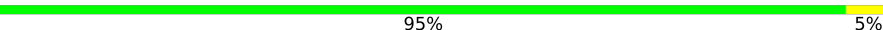
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	333	Total	O	0	0
			333	333		
5	B	269	Total	O	0	0
			269	269		
5	C	271	Total	O	0	0
			271	271		
5	D	168	Total	O	0	0
			168	168		
5	E	165	Total	O	0	0
			165	165		
5	F	112	Total	O	0	0
			112	112		

3 Residue-property plots [i](#)

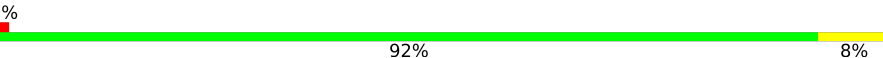
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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.

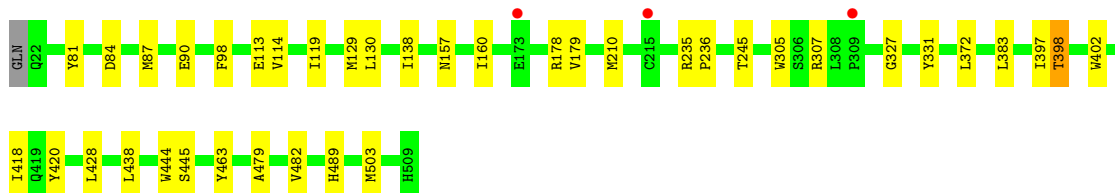
- Molecule 1: Beta-glucosidase

Chain A: 



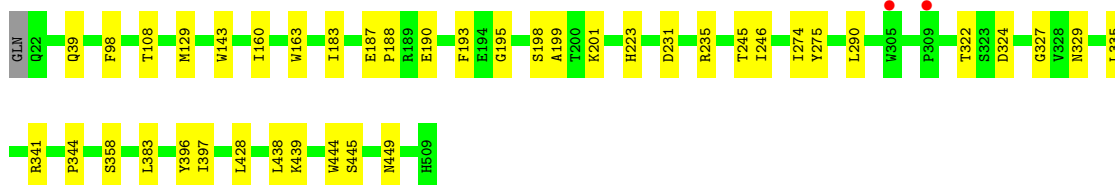
- Molecule 1: Beta-glucosidase

Chain B: 

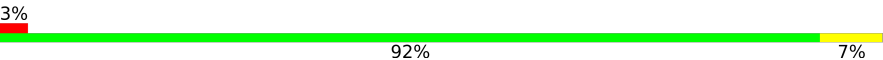


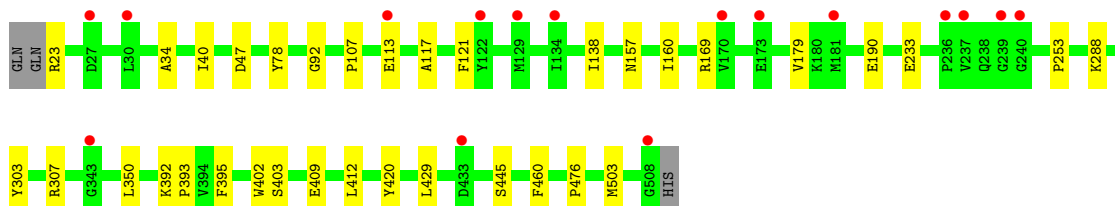
- Molecule 1: Beta-glucosidase

Chain C: 

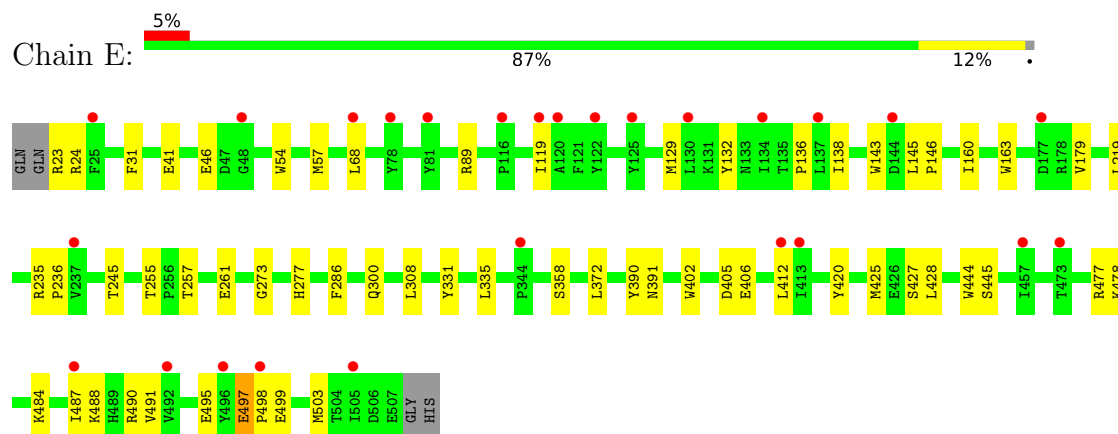


- Molecule 1: Beta-glucosidase

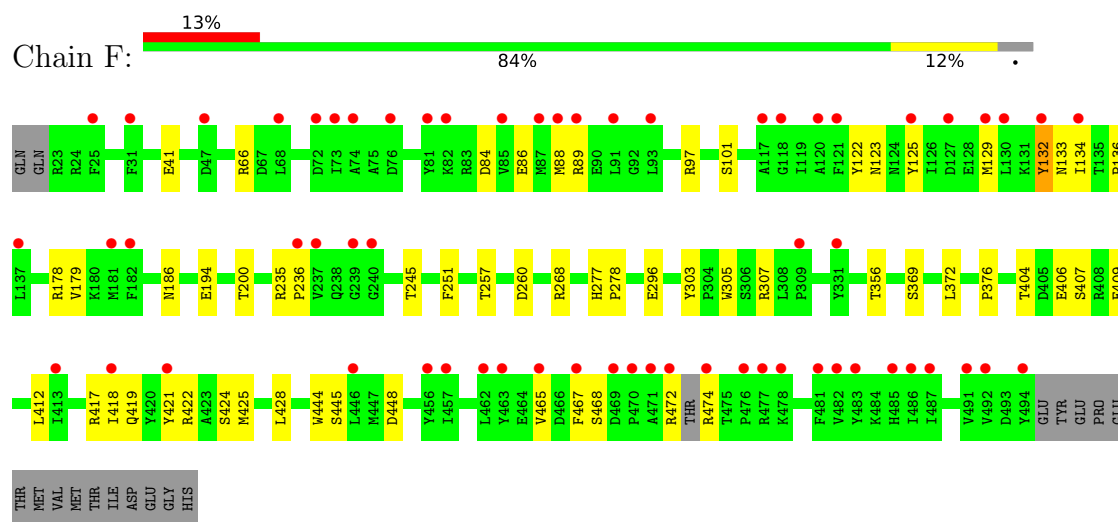
Chain D: 



- Molecule 1: Beta-glucosidase



- Molecule 1: Beta-glucosidase



- Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose



- Molecule 2: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain I:

100%

MAG1
MAG2

4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	53.83Å 64.99Å 257.19Å 93.16° 92.04° 112.18°	Depositor
Resolution (Å)	49.75 – 2.09 49.75 – 2.09	Depositor EDS
% Data completeness (in resolution range)	91.0 (49.75-2.09) 91.0 (49.75-2.09)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.28 (at 2.08Å)	Xtriage
Refinement program	REFMAC 5.8.0073	Depositor
R, R_{free}	0.192 , 0.250 0.198 , 0.253	Depositor DCC
R_{free} test set	8675 reflections (4.56%)	wwPDB-VP
Wilson B-factor (Å ²)	35.4	Xtriage
Anisotropy	0.144	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 24.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.007 for -h,-k,h+k+l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	25131	wwPDB-VP
Average B, all atoms (Å ²)	43.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.67% 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: TRS, NAG

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	0.62	0/4099	0.79	0/5575
1	B	0.60	0/4087	0.79	0/5556
1	C	0.60	0/4094	0.79	0/5566
1	D	0.54	0/4098	0.76	1/5571 (0.0%)
1	E	0.57	0/4051	0.79	1/5510 (0.0%)
1	F	0.53	0/3933	0.77	0/5347
All	All	0.58	0/24362	0.78	2/33125 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	41	GLU	N-CA-C	6.62	118.16	111.07
1	D	40	ILE	N-CA-C	5.74	118.70	112.96

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	3978	0	3730	12	0
1	B	3966	0	3728	25	0
1	C	3967	0	3730	22	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	D	3975	0	3741	18	0
1	E	3934	0	3697	31	0
1	F	3819	0	3593	27	0
2	G	28	0	25	0	0
2	H	28	0	25	0	0
2	I	28	0	25	0	0
3	A	8	0	12	0	0
3	B	8	0	12	0	0
3	C	8	0	12	0	0
3	D	8	0	12	0	0
3	E	8	0	12	0	0
3	F	8	0	12	0	0
4	C	14	0	13	0	0
4	E	14	0	13	0	0
4	F	14	0	13	0	0
5	A	333	0	0	3	0
5	B	269	0	0	1	0
5	C	271	0	0	0	0
5	D	168	0	0	4	0
5	E	165	0	0	3	0
5	F	112	0	0	0	0
All	All	25131	0	22405	135	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 (135) 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:C:274:ILE:HD11	1:C:290:LEU:HD23	1.65	0.78
1:C:231:ASP:OD1	1:C:235:ARG:NH1	2.24	0.70
1:B:114:VAL:CG1	1:B:119:ILE:HD11	2.21	0.70
1:B:210:MET:HE2	1:B:307:ARG:HG2	1.74	0.69
1:A:133[B]:ASN:ND2	5:A:701:HOH:O	2.29	0.64
1:A:245:THR:HG22	1:A:327:GLY:HA3	1.80	0.64
1:D:47:ASP:HB3	1:D:117:ALA:CB	2.31	0.61
1:F:136:PRO:HG2	1:F:179:VAL:HG22	1.85	0.58
1:A:447:MET:HE1	1:A:474:ARG:CZ	2.35	0.57
1:D:403:SER:HB3	1:D:460:PHE:CZ	2.40	0.57
1:C:187:GLU:CD	1:C:329:ASN:HD22	2.13	0.56
1:F:97:ARG:NH2	1:F:186:ASN:OD1	2.39	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:114:VAL:HG11	1:B:119:ILE:HD11	1.86	0.56
1:E:499:GLU:N	1:E:499:GLU:OE1	2.38	0.56
1:C:198:SER:OG	1:C:199:ALA:N	2.38	0.55
1:B:90:GLU:HB3	1:B:503:MET:CG	2.37	0.55
1:E:145:LEU:HD12	1:E:146:PRO:HD2	1.89	0.55
1:D:303:TYR:CE1	1:D:307:ARG:HD2	2.42	0.54
1:C:160:ILE:HD12	1:C:163:TRP:HE3	1.73	0.54
1:B:418:ILE:HD12	1:B:482:VAL:HG21	1.90	0.54
1:F:86:GLU:O	1:F:89:ARG:HG2	2.08	0.54
1:D:169[B]:ARG:NH1	1:D:233:GLU:OE1	2.38	0.53
1:E:484:LYS:HD2	1:E:503:MET:HE1	1.91	0.53
1:B:245:THR:HG22	1:B:327:GLY:HA3	1.91	0.53
1:E:412:LEU:HA	1:E:477:ARG:HG2	1.91	0.52
1:F:303:TYR:CE1	1:F:307:ARG:HD2	2.45	0.52
1:D:92:GLY:HA2	5:D:820:HOH:O	2.08	0.52
1:B:489:HIS:HE1	5:B:841:HOH:O	1.93	0.51
1:B:428:LEU:HD22	1:B:438:LEU:HD21	1.92	0.51
1:F:136:PRO:CG	1:F:179:VAL:HG22	2.41	0.51
1:A:387:ASN:OD1	1:A:392:LYS:HA	2.11	0.51
1:C:183:ILE:HG21	1:C:245:THR:HG23	1.93	0.51
1:D:34:ALA:O	1:D:445:SER:OG	2.26	0.51
1:C:396:TYR:CE2	1:C:439:LYS:HB2	2.46	0.50
1:E:31:PHE:CB	1:E:487:ILE:HD12	2.41	0.50
1:E:89:ARG:HD2	1:E:132:TYR:CD2	2.47	0.50
1:F:448:ASP:HB2	1:F:465:VAL:HG22	1.94	0.50
1:D:393:PRO:HG2	1:D:395:PHE:CZ	2.47	0.50
1:F:88:MET:HE2	1:F:134:ILE:HD13	1.94	0.50
1:C:235:ARG:NH2	1:C:324:ASP:OD2	2.45	0.50
1:E:129:MET:SD	1:E:136:PRO:HB3	2.52	0.49
1:C:335:LEU:O	1:C:358:SER:HA	2.12	0.49
1:B:138:ILE:HD12	1:B:179:VAL:HG21	1.95	0.49
1:F:421:TYR:O	1:F:425:MET:HG2	2.14	0.48
1:D:402:TRP:CE3	1:D:420:TYR:CD2	3.02	0.48
1:F:404:THR:OG1	1:F:417:ARG:NH2	2.39	0.48
1:F:194:GLU:HG2	1:F:200:THR:OG1	2.14	0.47
1:F:406:GLU:HG3	1:F:407:SER:N	2.29	0.47
1:B:98:PHE:CE1	1:B:129:MET:HE1	2.48	0.47
1:B:245:THR:CG2	1:B:398:THR:HG21	2.45	0.47
1:E:138:ILE:HD12	1:E:179:VAL:HG21	1.97	0.47
1:D:253:PRO:HD3	5:D:818:HOH:O	2.15	0.46
1:F:88:MET:HE1	1:F:129:MET:HG2	1.97	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:195:GLY:HA2	1:C:201:LYS:O	2.16	0.46
1:D:412:LEU:HD12	1:D:476:PRO:O	2.15	0.46
1:E:286:PHE:CE2	1:E:308:LEU:HD11	2.51	0.46
1:F:41:GLU:OE2	1:F:122:TYR:OH	2.27	0.46
1:D:409:GLU:N	5:D:701:HOH:O	2.44	0.46
1:D:78:TYR:HA	1:D:121:PHE:CE1	2.51	0.46
1:E:425:MET:HA	1:E:428:LEU:HD12	1.97	0.46
1:F:424:SER:O	1:F:428:LEU:HG	2.16	0.46
1:D:107:PRO:HD2	1:D:113:GLU:HG3	1.98	0.45
1:F:251:PHE:HB2	1:F:268:ARG:HG2	1.98	0.45
1:F:132:TYR:CD1	1:F:132:TYR:N	2.84	0.45
1:E:497:GLU:HG3	1:E:498:PRO:HD3	1.99	0.45
1:E:160:ILE:HA	1:E:163:TRP:CE3	2.52	0.45
1:B:235:ARG:N	1:B:236:PRO:CD	2.80	0.45
1:F:123:ASN:OD1	1:F:178:ARG:NH2	2.41	0.45
1:A:403:SER:HB3	1:A:460:PHE:CZ	2.52	0.45
1:E:23:ARG:HA	5:E:853:HOH:O	2.16	0.45
1:E:405:ASP:OD1	1:E:406:GLU:N	2.49	0.45
1:F:467:PHE:HA	1:F:472:ARG:HH11	1.81	0.45
1:E:402:TRP:CE3	1:E:420:TYR:CD1	3.05	0.44
1:E:273:GLY:O	1:E:277:HIS:HB2	2.18	0.44
1:F:194:GLU:CG	1:F:200:THR:OG1	2.66	0.43
1:B:114:VAL:HG12	1:B:119:ILE:HD11	1.99	0.43
1:D:503:MET:HA	5:D:789:HOH:O	2.18	0.43
1:B:418:ILE:CD1	1:B:479:ALA:HA	2.48	0.43
1:C:183:ILE:CG2	1:C:245:THR:HG23	2.47	0.43
1:E:412:LEU:HB2	5:E:813:HOH:O	2.18	0.43
1:D:138:ILE:CD1	1:D:179:VAL:HG21	2.49	0.43
1:F:444:TRP:HA	1:F:445:SER:HA	1.73	0.43
1:B:331:TYR:HB3	1:B:372:LEU:HD13	2.01	0.43
1:B:81:TYR:O	1:B:84:ASP:HB2	2.18	0.43
1:A:257:THR:HG22	5:A:845:HOH:O	2.19	0.43
1:B:245:THR:HG21	1:B:398:THR:HG21	2.00	0.43
1:A:162:ASP:OD1	1:A:225:LYS:NZ	2.52	0.43
1:F:235:ARG:HB3	1:F:236:PRO:HD3	2.01	0.43
1:A:300:GLN:HB3	5:A:977:HOH:O	2.19	0.42
1:E:255:THR:OG1	1:E:257:THR:HG22	2.19	0.42
1:E:143:TRP:CD1	1:E:143:TRP:N	2.87	0.42
1:C:39:GLN:O	1:C:449:ASN:HB2	2.20	0.42
1:C:108:THR:O	1:C:108:THR:HG22	2.20	0.42
1:A:39:GLN:O	1:A:449:ASN:HB2	2.18	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:114:VAL:HG12	1:A:119:ILE:HD12	2.02	0.42
1:C:187:GLU:HB3	1:C:190:GLU:OE1	2.20	0.42
1:C:223:HIS:NE2	1:C:322:THR:O	2.48	0.42
1:E:219:LEU:C	1:E:219:LEU:HD23	2.45	0.42
1:A:187:GLU:HB3	1:A:190:GLU:OE1	2.20	0.42
1:F:132:TYR:N	1:F:132:TYR:HD1	2.17	0.42
1:B:157:ASN:O	1:B:160:ILE:HG22	2.20	0.42
1:B:383:LEU:HD11	1:B:397:ILE:HD11	2.01	0.42
1:E:54:TRP:CZ3	1:E:57:MET:HE1	2.55	0.41
1:E:390:TYR:O	1:E:391:ASN:C	2.63	0.41
1:F:257:THR:HG23	1:F:260:ASP:H	1.84	0.41
1:E:488:LYS:NZ	5:E:712:HOH:O	2.53	0.41
1:C:383:LEU:HD21	1:C:397:ILE:HD11	2.02	0.41
1:E:497:GLU:HG3	1:E:498:PRO:CD	2.50	0.41
1:B:130:LEU:HD11	1:B:178:ARG:HB3	2.02	0.41
1:F:418:ILE:O	1:F:422:ARG:HG3	2.20	0.41
1:C:193:PHE:O	1:C:198:SER:HB3	2.20	0.41
1:F:84:ASP:OD1	1:F:474:ARG:NH1	2.53	0.41
1:B:87:MET:HE3	1:B:463:TYR:CG	2.56	0.41
1:B:90:GLU:HB3	1:B:503:MET:HG2	2.02	0.41
1:D:23:ARG:HG3	1:D:429:LEU:HD13	2.03	0.41
1:E:31:PHE:CG	1:E:487:ILE:HD12	2.55	0.41
1:E:478:LYS:CG	1:E:498:PRO:HG3	2.50	0.41
1:F:277:HIS:N	1:F:278:PRO:CD	2.84	0.41
1:B:402:TRP:CE3	1:B:420:TYR:CD1	3.09	0.41
1:C:188:PRO:HB2	1:C:275:TYR:CG	2.56	0.41
1:E:24:ARG:HA	1:E:490:ARG:O	2.21	0.41
1:E:235:ARG:N	1:E:236:PRO:CD	2.84	0.41
1:E:331:TYR:HB3	1:E:372:LEU:HD13	2.03	0.41
1:E:335:LEU:O	1:E:358:SER:HA	2.21	0.41
1:D:157:ASN:O	1:D:160:ILE:HG22	2.21	0.40
1:B:418:ILE:HD11	1:B:479:ALA:HA	2.02	0.40
1:C:444:TRP:HA	1:C:445:SER:HA	1.85	0.40
1:A:331:TYR:HB3	1:A:372:LEU:HD13	2.03	0.40
1:C:245:THR:HG22	1:C:327:GLY:HA3	2.02	0.40
1:C:428:LEU:HD22	1:C:438:LEU:HD21	2.02	0.40
1:F:369:SER:HB2	1:F:372:LEU:HB3	2.03	0.40
1:B:444:TRP:HA	1:B:445:SER:HA	1.87	0.40
1:C:98:PHE:CE1	1:C:129:MET:HE1	2.57	0.40
1:D:350:LEU:C	1:D:350:LEU:HD23	2.47	0.40
1:E:444:TRP:HA	1:E:445:SER:HA	1.78	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	489/489 (100%)	471 (96%)	17 (4%)	1 (0%)	43	44
1	B	487/489 (100%)	467 (96%)	20 (4%)	0	100	100
1	C	489/489 (100%)	469 (96%)	18 (4%)	2 (0%)	30	28
1	D	489/489 (100%)	468 (96%)	21 (4%)	0	100	100
1	E	483/489 (99%)	451 (93%)	32 (7%)	0	100	100
1	F	467/489 (96%)	428 (92%)	38 (8%)	1 (0%)	43	44
All	All	2904/2934 (99%)	2754 (95%)	146 (5%)	4 (0%)	48	50

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	143	TRP
1	C	143	TRP
1	F	468	SER
1	C	344	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	417/415 (100%)	415 (100%)	2 (0%)	81	88

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	415/415 (100%)	412 (99%)	3 (1%)	76	83
1	C	417/415 (100%)	415 (100%)	2 (0%)	81	88
1	D	417/415 (100%)	414 (99%)	3 (1%)	76	83
1	E	412/415 (99%)	402 (98%)	10 (2%)	43	49
1	F	398/415 (96%)	385 (97%)	13 (3%)	33	37
All	All	2476/2490 (99%)	2443 (99%)	33 (1%)	61	69

All (33) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	160	ILE
1	A	198	SER
1	B	113	GLU
1	B	305	TRP
1	B	398	THR
1	C	246	ILE
1	C	341	ARG
1	D	190	GLU
1	D	288	LYS
1	D	392	LYS
1	E	46	GLU
1	E	68	LEU
1	E	119	ILE
1	E	245	THR
1	E	261	GLU
1	E	300	GLN
1	E	427	SER
1	E	491	VAL
1	E	495	GLU
1	E	497	GLU
1	F	66	ARG
1	F	101	SER
1	F	125	TYR
1	F	132	TYR
1	F	133	ASN
1	F	245	THR
1	F	296	GLU
1	F	305	TRP
1	F	356	THR
1	F	376	PRO

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Mol	Chain	Res	Type
1	F	409	GLU
1	F	412	LEU
1	F	419	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	115	ASN
1	B	147	GLN
1	B	150	GLN
1	B	241	GLN
1	C	150	GLN
1	C	241	GLN
1	D	60	ASN
1	D	277	HIS
1	D	385	HIS
1	D	400	ASN
1	E	150	GLN
1	E	485	HIS
1	F	150	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 ⓘ

6 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	NAG	G	1	1,2	14,14,15	0.50	0	17,19,21	0.82	0
2	NAG	G	2	2	14,14,15	0.57	0	17,19,21	1.78	3 (17%)
2	NAG	H	1	1,2	14,14,15	0.56	0	17,19,21	1.31	2 (11%)
2	NAG	H	2	2	14,14,15	0.49	0	17,19,21	1.45	2 (11%)
2	NAG	I	1	1,2	14,14,15	0.53	0	17,19,21	1.18	2 (11%)
2	NAG	I	2	2	14,14,15	0.62	0	17,19,21	1.79	5 (29%)

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	NAG	G	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	G	2	2	1/1/5/7	0/6/23/26	0/1/1/1
2	NAG	H	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	H	2	2	1/1/5/7	2/6/23/26	0/1/1/1
2	NAG	I	1	1,2	-	4/6/23/26	0/1/1/1
2	NAG	I	2	2	1/1/5/7	1/6/23/26	0/1/1/1

There are no bond length outliers.

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	I	2	NAG	O5-C1-C2	4.76	118.66	111.29
2	G	2	NAG	O5-C1-C2	4.62	118.44	111.29
2	H	2	NAG	O5-C1-C2	4.55	118.33	111.29
2	G	2	NAG	C1-O5-C5	3.32	116.64	112.19
2	I	2	NAG	C1-O5-C5	3.02	116.23	112.19
2	H	2	NAG	C1-O5-C5	2.96	116.16	112.19
2	H	1	NAG	C8-C7-N2	2.60	120.43	116.12
2	I	2	NAG	C3-C4-C5	2.45	114.68	110.23
2	H	1	NAG	C2-N2-C7	2.41	126.13	122.90
2	G	2	NAG	O7-C7-C8	-2.35	117.87	122.05
2	I	2	NAG	C4-C3-C2	2.33	114.44	111.02
2	I	1	NAG	C2-N2-C7	2.30	125.98	122.90
2	I	1	NAG	O5-C1-C2	-2.15	107.97	111.29
2	I	2	NAG	O7-C7-C8	-2.04	118.42	122.05

All (3) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	G	2	NAG	C1
2	H	2	NAG	C1
2	I	2	NAG	C1

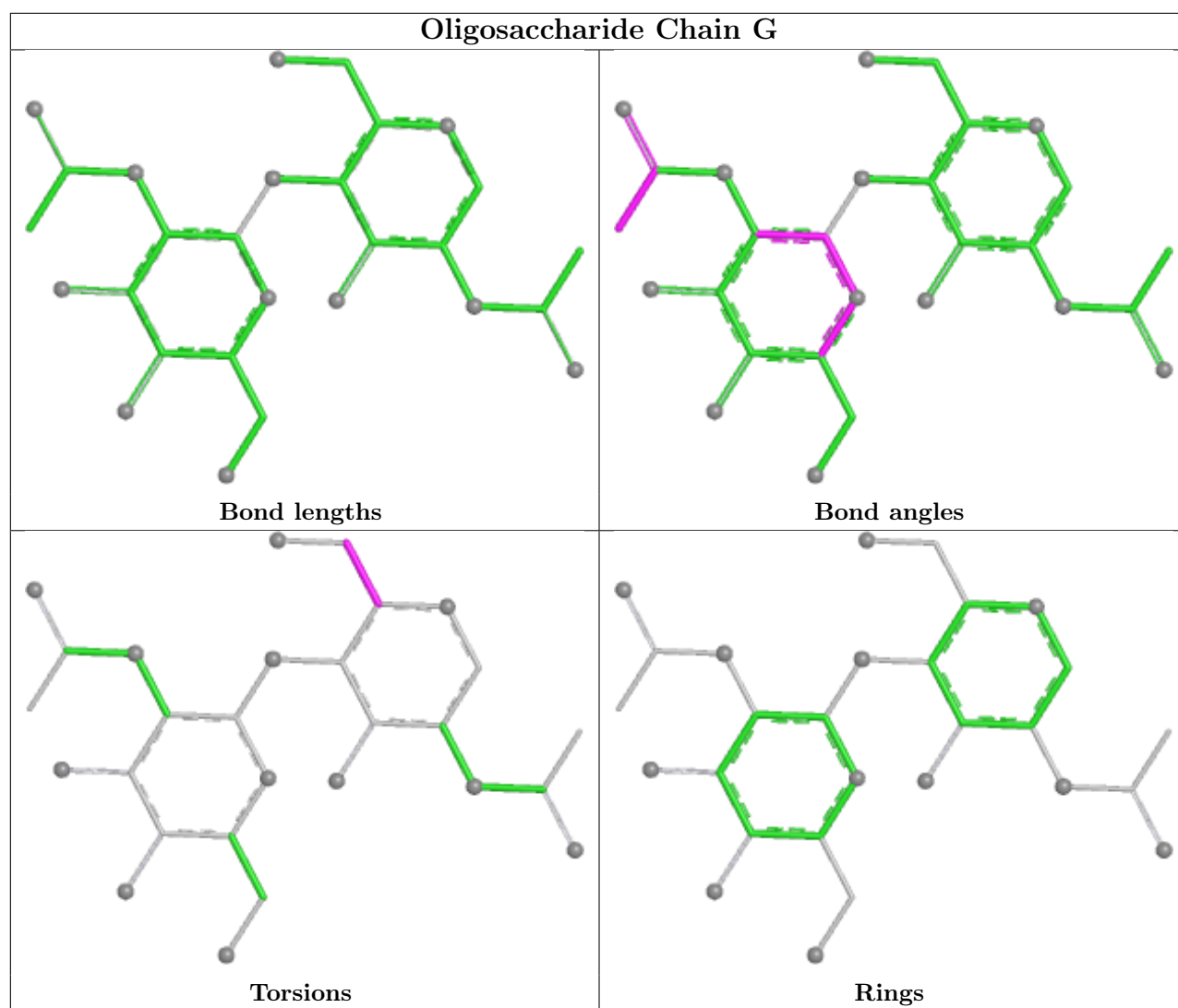
All (11) torsion outliers are listed below:

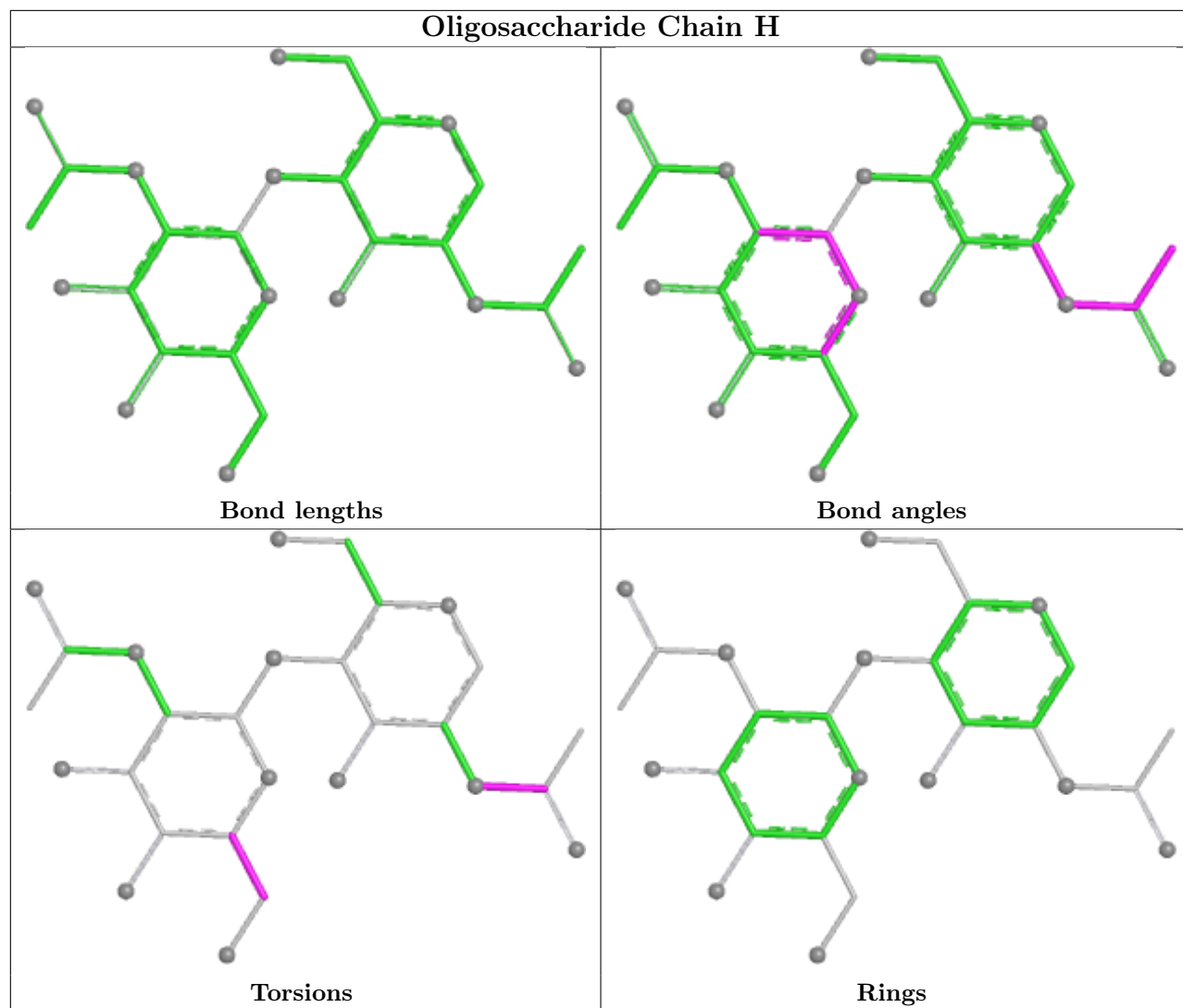
Mol	Chain	Res	Type	Atoms
2	H	2	NAG	O5-C5-C6-O6
2	H	2	NAG	C4-C5-C6-O6
2	H	1	NAG	C8-C7-N2-C2
2	H	1	NAG	O7-C7-N2-C2
2	I	1	NAG	C4-C5-C6-O6
2	I	1	NAG	O5-C5-C6-O6
2	I	2	NAG	O5-C5-C6-O6
2	G	1	NAG	C4-C5-C6-O6
2	I	1	NAG	C3-C2-N2-C7
2	I	1	NAG	C1-C2-N2-C7
2	G	1	NAG	O5-C5-C6-O6

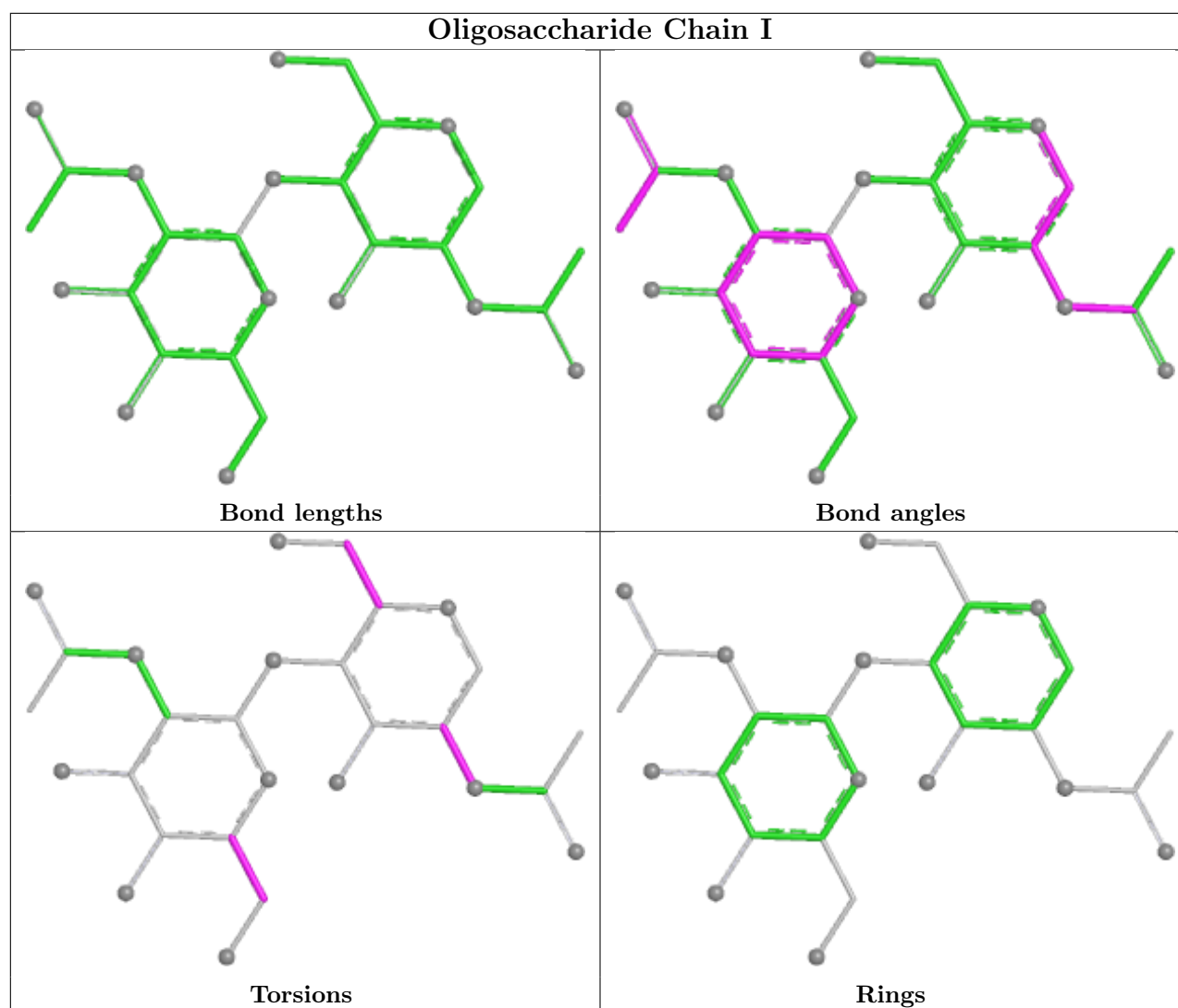
There are no ring outliers.

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](#)

9 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	TRS	A	603	-	7,7,7	0.35	0	9,9,9	0.43	0
4	NAG	C	601	1	14,14,15	0.53	0	17,19,21	1.09	2 (11%)
4	NAG	E	601	1	14,14,15	0.50	0	17,19,21	1.28	2 (11%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	TRS	E	602	-	7,7,7	0.52	0	9,9,9	4.82	6 (66%)
3	TRS	D	603	-	7,7,7	0.26	0	9,9,9	0.27	0
4	NAG	F	601	1	14,14,15	0.36	0	17,19,21	1.48	1 (5%)
3	TRS	B	603	-	7,7,7	0.39	0	9,9,9	0.24	0
3	TRS	C	602	-	7,7,7	0.31	0	9,9,9	0.55	0
3	TRS	F	602	-	7,7,7	0.32	0	9,9,9	0.46	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
3	TRS	A	603	-	-	5/9/9/9	-
4	NAG	C	601	1	-	2/6/23/26	0/1/1/1
4	NAG	E	601	1	-	2/6/23/26	0/1/1/1
3	TRS	E	602	-	-	7/9/9/9	-
3	TRS	D	603	-	-	7/9/9/9	-
4	NAG	F	601	1	-	3/6/23/26	0/1/1/1
3	TRS	B	603	-	-	5/9/9/9	-
3	TRS	C	602	-	-	6/9/9/9	-
3	TRS	F	602	-	-	6/9/9/9	-

There are no bond length outliers.

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	E	602	TRS	C1-C-N	-8.01	87.75	108.17
3	E	602	TRS	C3-C-N	-7.50	89.04	108.17
3	E	602	TRS	C2-C-N	-7.15	89.94	108.17
4	F	601	NAG	C1-O5-C5	4.48	118.19	112.19
3	E	602	TRS	C3-C-C2	3.82	120.83	110.66
3	E	602	TRS	C3-C-C1	3.64	120.34	110.66
3	E	602	TRS	C2-C-C1	3.03	118.72	110.66
4	E	601	NAG	C2-N2-C7	2.78	126.62	122.90
4	E	601	NAG	C8-C7-N2	2.66	120.54	116.12
4	C	601	NAG	C1-O5-C5	2.52	115.56	112.19
4	C	601	NAG	C1-C2-N2	-2.36	106.71	110.43

There are no chirality outliers.

All (43) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	B	603	TRS	N-C-C3-O3
3	C	602	TRS	C1-C-C2-O2
3	C	602	TRS	C3-C-C2-O2
3	C	602	TRS	N-C-C2-O2
3	C	602	TRS	N-C-C3-O3
3	D	603	TRS	C1-C-C3-O3
3	D	603	TRS	C2-C-C3-O3
3	D	603	TRS	N-C-C3-O3
3	E	602	TRS	C3-C-C1-O1
3	E	602	TRS	C1-C-C2-O2
3	F	602	TRS	C2-C-C1-O1
3	F	602	TRS	C3-C-C1-O1
3	F	602	TRS	N-C-C1-O1
3	F	602	TRS	N-C-C3-O3
4	C	601	NAG	O5-C5-C6-O6
4	F	601	NAG	O5-C5-C6-O6
4	E	601	NAG	C8-C7-N2-C2
4	E	601	NAG	O7-C7-N2-C2
4	C	601	NAG	C4-C5-C6-O6
3	C	602	TRS	C1-C-C3-O3
3	D	603	TRS	C2-C-C1-O1
3	F	602	TRS	C1-C-C3-O3
4	F	601	NAG	C4-C5-C6-O6
4	F	601	NAG	C3-C2-N2-C7
3	A	603	TRS	C2-C-C1-O1
3	A	603	TRS	C3-C-C1-O1
3	B	603	TRS	C1-C-C2-O2
3	B	603	TRS	N-C-C2-O2
3	C	602	TRS	C2-C-C3-O3
3	D	603	TRS	N-C-C1-O1
3	E	602	TRS	N-C-C1-O1
3	B	603	TRS	C3-C-C2-O2
3	D	603	TRS	C3-C-C1-O1
3	E	602	TRS	C1-C-C3-O3
3	E	602	TRS	C2-C-C3-O3
3	A	603	TRS	N-C-C1-O1
3	A	603	TRS	C2-C-C3-O3
3	E	602	TRS	C3-C-C2-O2
3	F	602	TRS	C2-C-C3-O3
3	B	603	TRS	C1-C-C3-O3

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Mol	Chain	Res	Type	Atoms
3	D	603	TRS	C1-C-C2-O2
3	A	603	TRS	N-C-C3-O3
3	E	602	TRS	N-C-C2-O2

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 [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, 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	488/489 (99%)	-0.30	0	100 100	15, 31, 49, 71	3 (0%)
1	B	488/489 (99%)	-0.16	3 (0%)	85 87	15, 35, 54, 76	1 (0%)
1	C	488/489 (99%)	-0.14	2 (0%)	88 90	18, 34, 54, 75	3 (0%)
1	D	486/489 (99%)	0.34	16 (3%)	49 51	18, 46, 65, 83	5 (1%)
1	E	485/489 (99%)	0.61	26 (5%)	31 33	30, 48, 71, 95	0
1	F	471/489 (96%)	0.82	62 (13%)	7 7	30, 53, 79, 101	0
All	All	2906/2934 (99%)	0.19	109 (3%)	44 46	15, 40, 69, 101	12 (0%)

All (109) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	F	73	ILE	5.3
1	F	134	ILE	3.7
1	F	465	VAL	3.6
1	F	481	PHE	3.5
1	F	476	PRO	3.5
1	F	446	LEU	3.3
1	E	498	PRO	3.2
1	F	74	ALA	3.2
1	F	472	ARG	3.1
1	F	118	GLY	3.1
1	F	309	PRO	3.1
1	E	134	ILE	3.0
1	E	492	VAL	3.0
1	F	413	ILE	3.0
1	F	471	ALA	3.0
1	F	487	ILE	3.0
1	D	239	GLY	2.9
1	F	117	ALA	2.9
1	F	485	HIS	2.9

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Mol	Chain	Res	Type	RSRZ
1	F	474	ARG	2.9
1	F	88	MET	2.8
1	D	433	ASP	2.8
1	F	120	ALA	2.8
1	F	239	GLY	2.8
1	E	116	PRO	2.8
1	F	478	LYS	2.8
1	E	48	GLY	2.8
1	F	93	LEU	2.8
1	E	81	TYR	2.8
1	F	85	VAL	2.8
1	F	482	VAL	2.8
1	E	487	ILE	2.8
1	F	31	PHE	2.7
1	F	68	LEU	2.7
1	F	492	VAL	2.7
1	E	120	ALA	2.7
1	E	122	TYR	2.7
1	E	505	ILE	2.7
1	E	457	ILE	2.7
1	F	81	TYR	2.6
1	E	78	TYR	2.6
1	E	413	ILE	2.6
1	F	457	ILE	2.6
1	D	508	GLY	2.6
1	D	236	PRO	2.6
1	F	467	PHE	2.5
1	F	491	VAL	2.5
1	D	343	GLY	2.5
1	F	494	TYR	2.5
1	F	236	PRO	2.5
1	E	125	TYR	2.5
1	E	144	ASP	2.5
1	E	412	LEU	2.5
1	F	463	TYR	2.4
1	F	462	LEU	2.4
1	D	173	GLU	2.4
1	F	418	ILE	2.4
1	B	215	CYS	2.4
1	F	125	TYR	2.4
1	C	309	PRO	2.4
1	F	240	GLY	2.4

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Mol	Chain	Res	Type	RSRZ
1	F	47	ASP	2.4
1	F	483	TYR	2.3
1	E	177	ASP	2.3
1	E	119	ILE	2.3
1	D	122	TYR	2.3
1	E	496	TYR	2.3
1	E	130	LEU	2.3
1	F	91	LEU	2.3
1	F	477	ARG	2.3
1	F	121	PHE	2.3
1	D	27	ASP	2.3
1	F	469	ASP	2.3
1	F	132	TYR	2.3
1	F	87	MET	2.2
1	F	129	MET	2.2
1	F	130	LEU	2.2
1	F	331	TYR	2.2
1	D	170	VAL	2.2
1	F	470	PRO	2.2
1	F	486	ILE	2.2
1	F	456	TYR	2.2
1	E	237	VAL	2.2
1	F	237	VAL	2.2
1	D	240	GLY	2.2
1	E	68	LEU	2.2
1	F	137	LEU	2.2
1	D	129	MET	2.2
1	C	305	TRP	2.1
1	E	25	PHE	2.1
1	D	30	LEU	2.1
1	E	137	LEU	2.1
1	F	76	ASP	2.1
1	F	421	TYR	2.1
1	F	25	PHE	2.1
1	F	182	PHE	2.1
1	D	113	GLU	2.1
1	F	181	MET	2.1
1	D	134	ILE	2.1
1	F	127	ASP	2.0
1	F	89	ARG	2.0
1	B	309	PRO	2.0
1	E	344	PRO	2.0

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Mol	Chain	Res	Type	RSRZ
1	E	473	THR	2.0
1	F	82	LYS	2.0
1	B	173	GLU	2.0
1	D	237	VAL	2.0
1	D	181	MET	2.0
1	F	72	ASP	2.0

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

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

6.3 Carbohydrates [i](#)

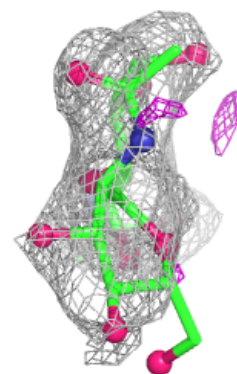
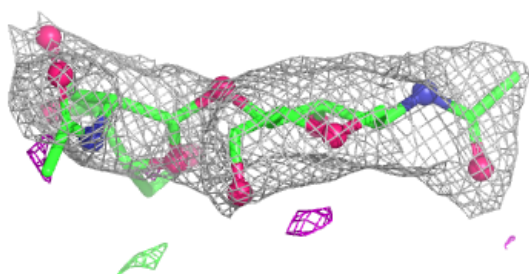
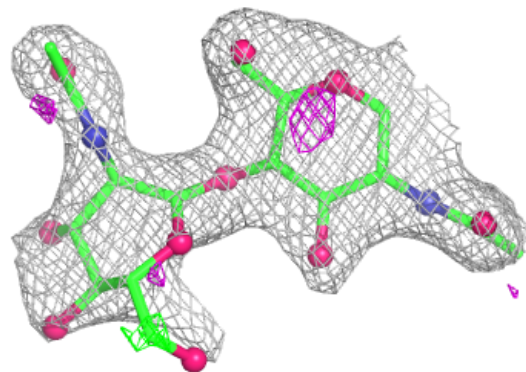
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q < 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	NAG	I	2	14/15	0.52	0.15	88,93,98,99	0
2	NAG	H	2	14/15	0.64	0.12	94,99,104,105	0
2	NAG	G	2	14/15	0.67	0.15	60,76,84,84	0
2	NAG	I	1	14/15	0.72	0.13	66,73,78,87	0
2	NAG	H	1	14/15	0.72	0.12	62,66,75,88	0
2	NAG	G	1	14/15	0.90	0.08	50,60,62,71	0

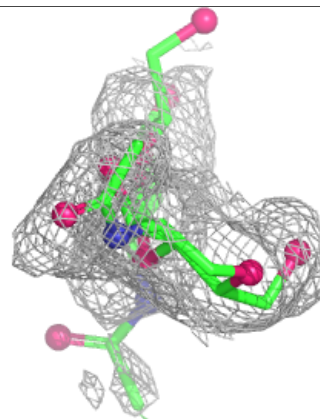
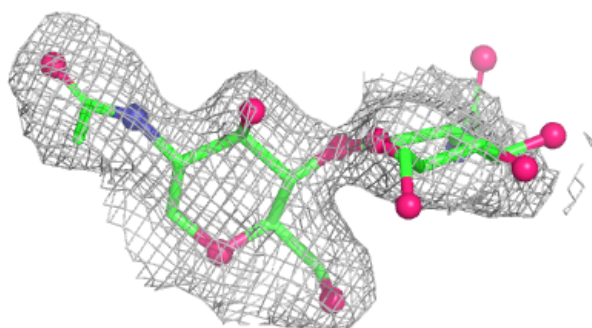
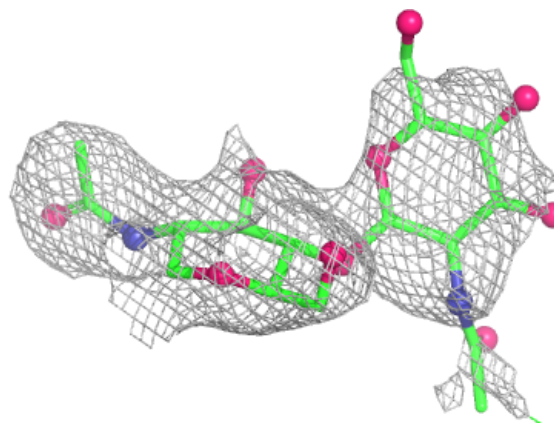
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

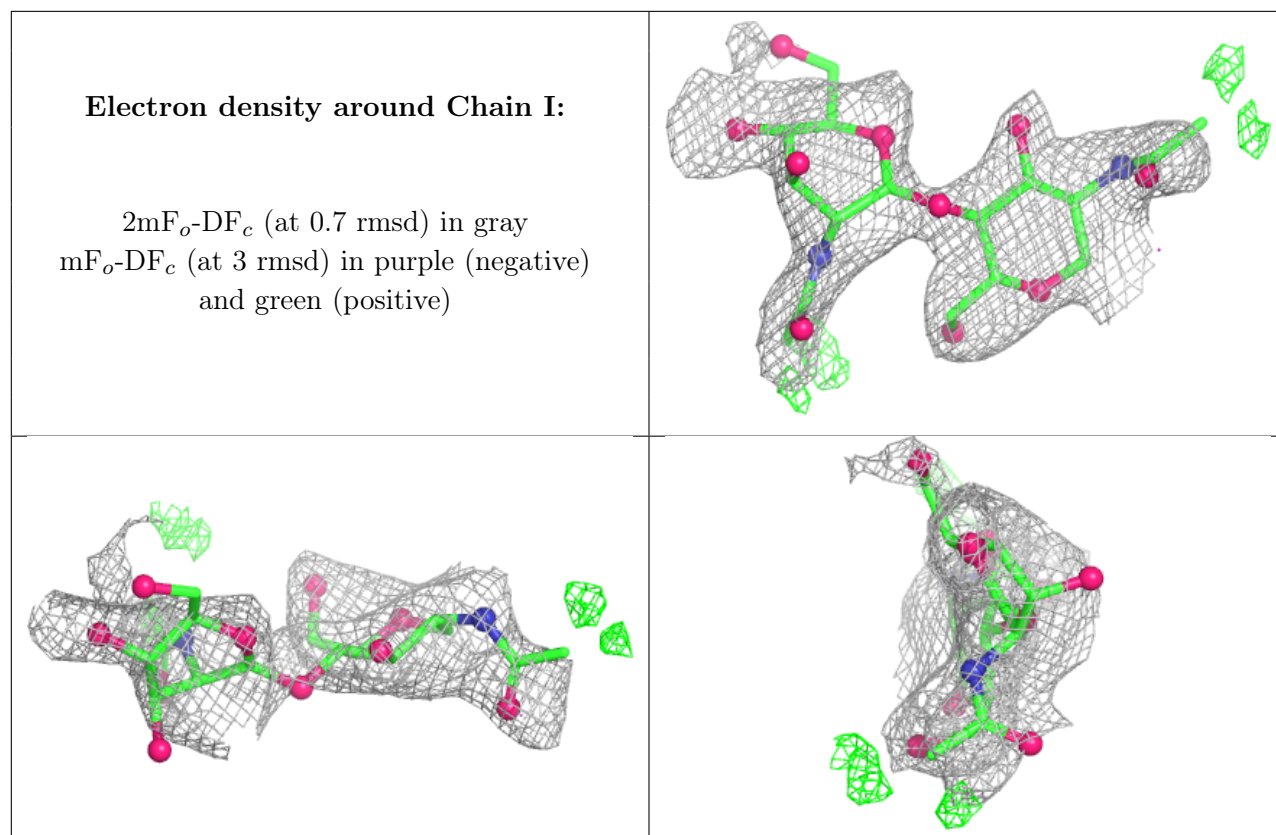
Electron density around Chain G:

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

**Electron density around Chain H:**

$2mF_o-DF_c$ (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($\text{\AA}^2$)	Q<0.9
4	NAG	E	601	14/15	0.67	0.15	64,69,76,79	0
4	NAG	F	601	14/15	0.77	0.10	73,79,81,82	0
4	NAG	C	601	14/15	0.80	0.10	64,69,73,74	0
3	TRS	E	602	8/8	0.87	0.19	74,78,79,79	0
3	TRS	D	603	8/8	0.87	0.13	68,69,71,71	0
3	TRS	F	602	8/8	0.88	0.20	82,85,88,91	0
3	TRS	A	603	8/8	0.88	0.14	58,64,66,69	0
3	TRS	B	603	8/8	0.89	0.12	50,56,59,62	0
3	TRS	C	602	8/8	0.91	0.13	56,59,60,60	0

6.5 Other polymers [i](#)

There are no such residues in this entry.