



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 11:38 PM UTC

PDB ID : 3KCG / pdb_00003kcg
Title : Crystal structure of the antithrombin-factor IXa-pentasaccharide complex
Authors : Huntington, J.A.; Johnson, D.J.D.
Deposited on : 2009-10-21
Resolution : 1.70 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:

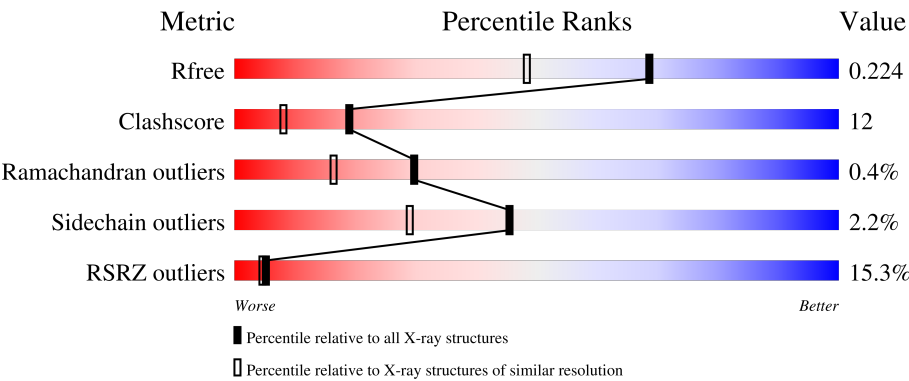
MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (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 1.70 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	5551 (1.70-1.70)
Clashscore	190562	5924 (1.70-1.70)
Ramachandran outliers	187476	5846 (1.70-1.70)
Sidechain outliers	187428	5846 (1.70-1.70)
RSRZ outliers	180081	5554 (1.70-1.70)

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	L	59	54% 75%8%8%8%
2	H	235	6% 85%13%. .
3	I	432	14% 72%24%. .
4	A	2	100%
4	C	2	100%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain	
5	B	3		67%33%
6	D	5		60%40%

2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 6669 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 Coagulation factor IXa light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	L	54	Total	C	N	O	S	0	0	0
			377	231	69	70	7			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
L	84	MET	-	initiating methionine	UNP P00740

- Molecule 2 is a protein called Coagulation factor IXa heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	H	235	Total	C	N	O	S	0	12	0
			1938	1227	341	360	10			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
H	195	ALA	SER	engineered mutation	UNP P00740

- Molecule 3 is a protein called Antithrombin-III.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	I	419	Total	C	N	O	S	0	24	0
			3483	2213	597	653	20			

There is a discrepancy between the modelled and reference sequences:

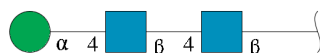
Chain	Residue	Modelled	Actual	Comment	Reference
I	137	ALA	SER	engineered mutation	UNP P01008

- Molecule 4 is an oligosaccharide called alpha-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose.



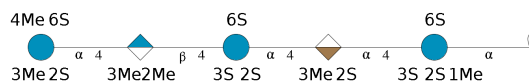
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	A	2	Total	C	N	O	0	0	0
			24	14	1	9			
4	C	2	Total	C	N	O	0	0	0
			24	14	1	9			

- Molecule 5 is an oligosaccharide called alpha-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	B	3	Total	C	N	O	0	0	0
			39	22	2	15			

- Molecule 6 is an oligosaccharide called 3,4-di-O-methyl-2,6-di-O-sulfo-alpha-D-glucopyranoside-(1-4)-2,3-di-O-methyl-beta-D-glucopyranuronic acid-(1-4)-2,3,6-tri-O-sulfo-alpha-D-glucopyranose-(1-4)-3-O-methyl-2-O-sulfo-alpha-L-idopyranuronic acid-(1-4)-methyl 2,3,6-tri-O-sulfo-alpha-D-glucopyranoside.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
6	D	5	Total	C	O	S	0	0	0
			100	36	55	9			

- Molecule 7 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	H	1	Total	Ca	0	0
			1	1		

- Molecule 8 is (4S)-2-METHYL-2,4-PENTANEDIOL (CCD ID: MPD) (formula: C₆H₁₄O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	I	1	Total	C	O	0	0
			8	6	2		
8	I	1	Total	C	O	0	0
			8	6	2		

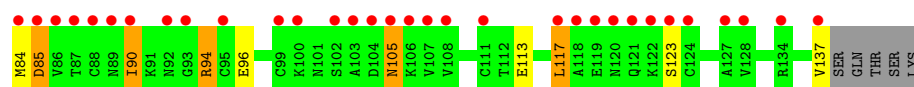
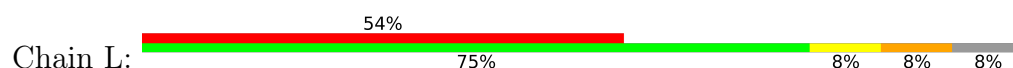
- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	L	28	Total	O	0	0
			28	28		
9	H	292	Total	O	0	0
			292	292		
9	I	347	Total	O	0	0
			347	347		

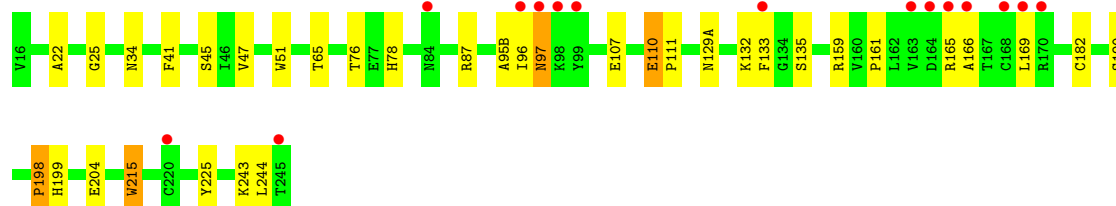
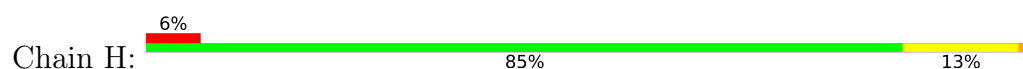
3 Residue-property plots [i](#)

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.

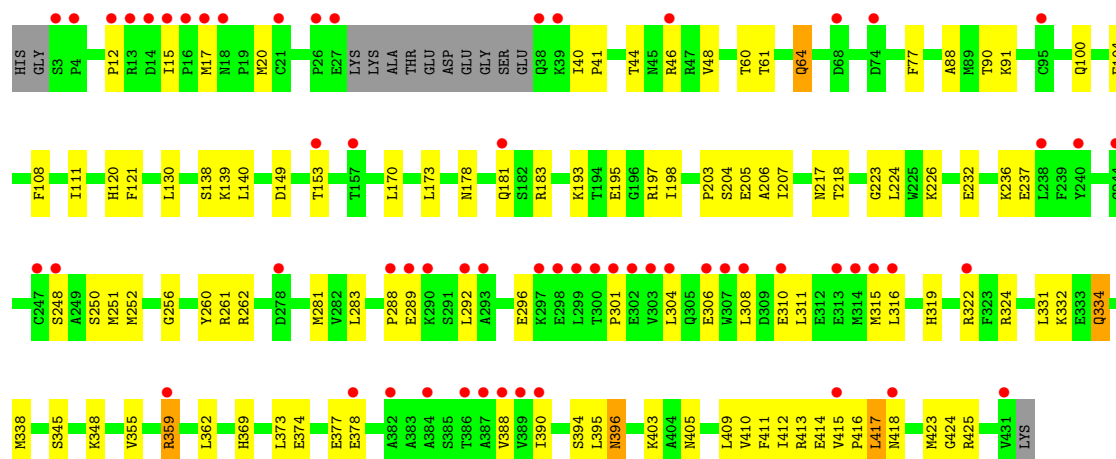
- Molecule 1: Coagulation factor IXa light chain



- Molecule 2: Coagulation factor IXa heavy chain



- Molecule 3: Antithrombin-III



- Molecule 4: alpha-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain A:  100%

MAG1
FUC2

- Molecule 4: alpha-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain C:  100%

MAG1
FUC2

- Molecule 5: alpha-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain B:  67% 33%

MAG1
MAG2
MAN3

- Molecule 6: 3,4-di-O-methyl-2,6-di-O-sulfo-alpha-D-glucopyranose-(1-4)-2,3-di-O-methyl-beta-D-glucopyranuronic acid-(1-4)-2,3,6-tri-O-sulfo-alpha-D-glucopyranose-(1-4)-3-O-methyl-2-O-sulfo-alpha-L-idopyranuronic acid-(1-4)-methyl 2,3,6-tri-O-sulfo-alpha-D-glucopyranoside

Chain D:  60% 40%

Z9L1
Z9K2
G063
G014
Z9H5

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	78.78Å 88.44Å 147.23Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	38.05 – 1.70 38.05 – 1.70	Depositor EDS
% Data completeness (in resolution range)	98.9 (38.05-1.70) 99.1 (38.05-1.70)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.00 (at 1.70Å)	Xtriage
Refinement program	CNS 1.2	Depositor
R, R_{free}	0.208 , 0.230 0.226 , 0.224	Depositor DCC
R_{free} test set	5638 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å ²)	26.4	Xtriage
Anisotropy	0.030	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 42.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	6669	wwPDB-VP
Average B, all atoms (Å ²)	33.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.47% 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: CA, Z9H, FUC, Z9L, MPD, Z9K, GU1, NAG, MAN, GU6

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	L	0.36	0/382	0.93	0/518
2	H	0.38	0/1983	0.95	9/2687 (0.3%)
3	I	0.33	0/3551	0.86	7/4799 (0.1%)
All	All	0.35	0/5916	0.90	16/8004 (0.2%)

There are no bond length outliers.

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	133	PHE	N-CA-C	-9.22	101.21	112.46
2	H	199	HIS	N-CA-C	-7.47	94.95	108.02
2	H	190[A]	SER	N-CA-C	-6.76	101.80	110.53
2	H	190[B]	SER	N-CA-C	-6.76	101.80	110.53
3	I	226	LYS	N-CA-C	-6.57	103.60	111.69
2	H	244	LEU	N-CA-C	-6.17	105.91	113.50
3	I	378	GLU	N-CA-C	6.04	118.76	110.24
3	I	394[A]	SER	N-CA-C	-5.99	102.47	110.55
3	I	394[B]	SER	N-CA-C	-5.99	102.47	110.55
3	I	414	GLU	N-CA-C	-5.81	99.05	108.52
2	H	47	VAL	N-CA-C	-5.69	105.55	111.58
3	I	88	ALA	N-CA-C	-5.56	105.37	111.82
3	I	90	THR	N-CA-C	-5.47	105.73	112.90
2	H	215	TRP	N-CA-C	5.36	115.20	108.45
2	H	22	ALA	N-CA-C	-5.12	103.64	110.55
2	H	51	TRP	N-CA-C	5.08	117.69	109.06

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	L	377	0	335	15	0
2	H	1938	0	1869	30	0
3	I	3483	0	3401	96	0
4	A	24	0	22	0	0
4	C	24	0	22	1	0
5	B	39	0	34	3	0
6	D	100	0	19	3	0
7	H	1	0	0	0	0
8	I	16	0	28	1	0
9	H	292	0	0	4	0
9	I	347	0	0	4	0
9	L	28	0	0	1	0
All	All	6669	0	5730	139	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 12.

All (139) 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)
3:I:359:ARG:HD3	3:I:359:ARG:H	1.13	1.07
3:I:359:ARG:HH21	3:I:359:ARG:HG2	1.15	1.07
3:I:60[A]:THR:HG21	3:I:301:PRO:HG3	1.41	1.02
3:I:359:ARG:HD3	3:I:359:ARG:N	1.84	0.92
3:I:424:GLY:C	3:I:425[A]:ARG:CA	2.44	0.91
3:I:64[A]:GLN:HE21	3:I:64[A]:GLN:HA	1.40	0.85
3:I:359:ARG:H	3:I:359:ARG:CD	1.86	0.83
3:I:20:MET:CE	5:B:1:NAG:H2	2.19	0.73
3:I:292:LEU:HD11	3:I:409:LEU:HG	1.70	0.72
2:H:34:ASN:HB2	2:H:65[B]:THR:HG23	1.73	0.71
3:I:261:ARG:NH1	3:I:310:GLU:HB3	2.06	0.69
3:I:193:LYS:HG3	4:C:2:FUC:O3	1.92	0.69
3:I:183[A]:ARG:HB2	3:I:207:ILE:HD11	1.74	0.69
3:I:359:ARG:HH21	3:I:359:ARG:CG	2.01	0.68
2:H:87[B]:ARG:HB3	2:H:107:GLU:HB3	1.76	0.68

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:I:359:ARG:HG2	3:I:359:ARG:NH2	1.94	0.67
3:I:183[B]:ARG:HB2	3:I:207:ILE:HD11	1.76	0.66
2:H:159[B]:ARG:HH22	2:H:161:PRO:HB3	1.61	0.66
3:I:198:ILE:HD13	3:I:218:THR:HB	1.78	0.64
3:I:324:ARG:HG2	3:I:374:GLU:HG3	1.79	0.63
2:H:34:ASN:HB2	2:H:65[B]:THR:CG2	2.29	0.63
6:D:4:GU1:H82	6:D:4:GU1:O2	1.99	0.63
3:I:319:HIS:HB2	3:I:403[A]:LYS:HA	1.80	0.63
3:I:319:HIS:HB2	3:I:403[B]:LYS:HA	1.80	0.62
2:H:76:THR:HG22	2:H:78[A]:HIS:HD2	1.65	0.61
2:H:41:PHE:HA	3:I:395:LEU:HB2	1.83	0.60
3:I:308:LEU:HD13	3:I:413:ARG:NH1	2.17	0.60
3:I:203:PRO:HG2	3:I:206:ALA:HB2	1.82	0.59
1:L:94:ARG:HH11	1:L:94:ARG:CG	2.15	0.59
2:H:45:SER:OG	2:H:198:PRO:HB3	2.03	0.58
1:L:113:GLU:HG3	9:H:587:HOH:O	2.03	0.58
1:L:85:ASP:HB3	1:L:105:ASN:OD1	2.04	0.58
6:D:3:GU6:O4	6:D:4:GU1:H73	2.04	0.57
1:L:84:MET:O	1:L:85:ASP:HB2	2.03	0.57
3:I:252:MET:SD	3:I:377:GLU:HG3	2.44	0.57
3:I:359:ARG:NH2	9:I:571:HOH:O	2.37	0.57
3:I:415:VAL:HB	3:I:416:PRO:HD3	1.87	0.57
2:H:165[A]:ARG:O	2:H:169:LEU:HD13	2.06	0.56
3:I:60[A]:THR:CG2	3:I:301:PRO:HG3	2.26	0.56
3:I:304:LEU:HD23	3:I:304:LEU:C	2.31	0.56
3:I:108:PHE:O	3:I:111:ILE:HG12	2.06	0.56
3:I:261:ARG:HD3	3:I:262:ARG:N	2.21	0.55
3:I:60[A]:THR:HG21	3:I:301:PRO:CG	2.28	0.55
3:I:283:LEU:CD2	3:I:410:VAL:HG12	2.37	0.54
1:L:94:ARG:NH1	1:L:94:ARG:HG2	2.22	0.54
3:I:417:LEU:O	3:I:418:ASN:HB2	2.08	0.54
2:H:97[B]:ASN:O	2:H:97[B]:ASN:OD1	2.26	0.53
2:H:95(B):ALA:C	2:H:96:ILE:HD13	2.32	0.53
2:H:110[A]:GLU:OE1	2:H:111:PRO:HD2	2.09	0.53
3:I:236:LYS:HD2	3:I:248:SER:OG	2.09	0.53
3:I:332[A]:LYS:HE2	9:I:616:HOH:O	2.09	0.52
3:I:183[B]:ARG:CB	3:I:207:ILE:HD11	2.39	0.52
3:I:44:THR:HG21	3:I:417:LEU:HD11	1.91	0.52
3:I:281:MET:HE2	3:I:412[B]:ILE:HD11	1.90	0.52
3:I:120:HIS:H	3:I:120:HIS:CD2	2.27	0.52
3:I:60[B]:THR:HG21	3:I:301:PRO:HD3	1.91	0.51

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:H:96:ILE:O	2:H:97[A]:ASN:CB	2.57	0.51
3:I:288:PRO:O	3:I:289:GLU:CB	2.58	0.51
3:I:251[B]:MET:HE1	3:I:405:ASN:HA	1.91	0.51
2:H:96:ILE:O	2:H:97[A]:ASN:HB2	2.11	0.51
3:I:232[A]:GLU:H	3:I:232[A]:GLU:CD	2.19	0.51
2:H:215:TRP:CE3	3:I:390:ILE:HG23	2.46	0.50
3:I:15:ILE:O	3:I:17:MET:HE2	2.11	0.50
3:I:91:LYS:HD3	3:I:91:LYS:C	2.37	0.50
2:H:182[B]:CYS:SG	2:H:225:TYR:HB2	2.52	0.50
2:H:129(A):ASN:O	2:H:132[A]:LYS:HG2	2.12	0.50
1:L:137:VAL:HG21	2:H:25:GLY:HA3	1.93	0.49
1:L:94:ARG:CG	1:L:94:ARG:NH1	2.74	0.49
2:H:135:SER:OG	2:H:159[B]:ARG:NE	2.43	0.49
3:I:60[A]:THR:O	3:I:64[A]:GLN:HG2	2.13	0.49
1:L:90:ILE:O	1:L:90:ILE:HG13	2.12	0.49
1:L:94:ARG:HH11	1:L:94:ARG:CB	2.26	0.49
3:I:139:LYS:HE3	3:I:197:ARG:NH2	2.27	0.48
3:I:359:ARG:CG	3:I:359:ARG:NH2	2.67	0.48
3:I:355:VAL:HB	3:I:362:LEU:HD22	1.94	0.48
2:H:165[B]:ARG:HH11	2:H:165[B]:ARG:CG	2.26	0.48
9:H:659:HOH:O	3:I:388:VAL:HA	2.13	0.47
3:I:237:GLU:OE1	3:I:251[A]:MET:HG2	2.14	0.47
3:I:411:PHE:HE1	3:I:423:MET:HE3	1.79	0.47
2:H:165[B]:ARG:NH1	2:H:165[B]:ARG:HG2	2.28	0.47
3:I:20:MET:HE3	5:B:1:NAG:H2	1.95	0.47
3:I:140:LEU:C	3:I:140:LEU:HD23	2.40	0.47
1:L:113:GLU:HG2	9:L:584:HOH:O	2.14	0.47
2:H:96:ILE:O	2:H:97[B]:ASN:ND2	2.48	0.47
3:I:130:LEU:HB2	8:I:5276:MPD:HM2	1.96	0.47
1:L:94:ARG:HH11	1:L:94:ARG:HG2	1.79	0.47
3:I:44:THR:HG21	3:I:417:LEU:CD1	2.45	0.47
3:I:261:ARG:HH12	3:I:310:GLU:HB3	1.77	0.47
2:H:165[B]:ARG:HG3	9:H:664:HOH:O	2.15	0.46
3:I:261:ARG:HD3	3:I:262:ARG:H	1.79	0.46
3:I:138:SER:CB	3:I:223:GLY:HA2	2.46	0.46
1:L:117:LEU:HD23	1:L:123:SER:O	2.15	0.46
2:H:76:THR:HG22	2:H:78[A]:HIS:CD2	2.49	0.46
3:I:181:GLN:HG3	9:I:756:HOH:O	2.16	0.46
3:I:64[A]:GLN:HE21	3:I:64[A]:GLN:CA	2.14	0.46
3:I:331[B]:LEU:HD11	3:I:369:HIS:HB2	1.98	0.45
1:L:90:ILE:O	1:L:90:ILE:CG1	2.64	0.45

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:I:100:GLN:O	3:I:104:GLU:HG3	2.17	0.45
3:I:261:ARG:HB3	3:I:311:LEU:HD23	1.98	0.45
2:H:165[B]:ARG:O	2:H:166:ALA:C	2.59	0.45
3:I:334:GLN:HE21	3:I:334:GLN:N	2.02	0.45
1:L:96:GLU:HG3	2:H:204:GLU:HG2	1.98	0.45
2:H:96:ILE:O	2:H:97[B]:ASN:CB	2.63	0.45
3:I:40:ILE:HD12	3:I:46[B]:ARG:NH1	2.31	0.45
3:I:61:THR:HG22	3:I:338:MET:HE3	1.98	0.45
3:I:20:MET:HE2	5:B:1:NAG:H2	1.96	0.45
3:I:306:GLU:O	3:I:310:GLU:HG3	2.17	0.45
3:I:283:LEU:HD22	3:I:410:VAL:HG12	1.99	0.44
3:I:292:LEU:O	3:I:296:GLU:HG3	2.17	0.44
3:I:17:MET:HG3	3:I:120:HIS:HE1	1.82	0.44
3:I:170:LEU:C	3:I:170:LEU:HD23	2.42	0.43
2:H:132[B]:LYS:HE2	2:H:132[B]:LYS:HB2	1.75	0.43
3:I:153[B]:THR:HG23	9:I:450:HOH:O	2.18	0.43
3:I:395:LEU:O	3:I:396:ASN:HB3	2.18	0.43
3:I:195:GLU:HB2	3:I:197:ARG:NH1	2.34	0.43
3:I:260:TYR:CG	3:I:261:ARG:N	2.87	0.42
1:L:105:ASN:HD22	1:L:105:ASN:HA	1.57	0.42
3:I:316:LEU:HD12	3:I:316:LEU:C	2.44	0.42
2:H:165[B]:ARG:CG	2:H:165[B]:ARG:NH1	2.83	0.42
3:I:40:ILE:HA	3:I:41:PRO:HD3	1.92	0.42
3:I:149:ASP:HA	3:I:173:LEU:O	2.20	0.42
3:I:256:GLY:HA2	3:I:315:MET:HE1	2.02	0.41
2:H:132[A]:LYS:HD2	9:H:624:HOH:O	2.19	0.41
3:I:40:ILE:HD12	3:I:46[B]:ARG:CZ	2.51	0.41
3:I:183[A]:ARG:NE	3:I:204:SER:HA	2.36	0.41
2:H:96:ILE:O	2:H:97[B]:ASN:CG	2.64	0.41
3:I:183[A]:ARG:CA	3:I:207:ILE:HD11	2.51	0.41
3:I:204:SER:O	3:I:205:GLU:HB2	2.21	0.41
3:I:395:LEU:HD23	3:I:395:LEU:HA	1.97	0.41
3:I:12:PRO:HG3	3:I:121:PHE:CE2	2.56	0.40
3:I:345:SER:HB3	3:I:348:LYS:HB2	2.04	0.40
3:I:178:ASN:OD1	3:I:181:GLN:NE2	2.54	0.40
3:I:48:VAL:HG21	6:D:5:Z9H:O12	2.21	0.40
3:I:77:PHE:CE2	3:I:373:LEU:HB2	2.57	0.40
3:I:250:SER:HB2	3:I:322[A]:ARG:CG	2.51	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	L	52/59 (88%)	46 (88%)	5 (10%)	1 (2%)	6	1
2	H	245/235 (104%)	237 (97%)	6 (2%)	2 (1%)	16	5
3	I	439/432 (102%)	426 (97%)	12 (3%)	1 (0%)	43	28
All	All	736/726 (101%)	709 (96%)	23 (3%)	4 (0%)	30	12

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	H	97[A]	ASN
2	H	97[B]	ASN
1	L	85	ASP
3	I	396	ASN

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	L	38/53 (72%)	34 (90%)	4 (10%)	6	1
2	H	206/197 (105%)	202 (98%)	4 (2%)	50	34
3	I	374/382 (98%)	367 (98%)	7 (2%)	50	34
All	All	618/632 (98%)	603 (98%)	15 (2%)	45	26

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	L	90	ILE
1	L	94	ARG
1	L	105	ASN
1	L	117	LEU
2	H	110[A]	GLU
2	H	110[B]	GLU
2	H	198	PRO
2	H	243	LYS
3	I	64[A]	GLN
3	I	64[B]	GLN
3	I	217	ASN
3	I	224	LEU
3	I	334	GLN
3	I	359	ARG
3	I	417	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	L	89	ASN
2	H	147	HIS
3	I	55	ASN
3	I	120	HIS
3	I	171	GLN
3	I	181	GLN
3	I	268	GLN
3	I	334	GLN
3	I	336	GLN

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	$\# Z > 2$
4	NAG	A	1	3,4	14,14,15	0.51	0	17,19,21	0.74	0
4	FUC	A	2	4	10,10,11	0.48	0	14,14,16	0.34	0
5	NAG	B	1	3,5	14,14,15	0.54	0	17,19,21	0.70	1 (5%)
5	NAG	B	2	5	14,14,15	0.67	0	17,19,21	1.03	2 (11%)
5	MAN	B	3	5	11,11,12	1.11	1 (9%)	15,15,17	1.25	2 (13%)
4	NAG	C	1	3,4	14,14,15	0.53	0	17,19,21	0.71	1 (5%)
4	FUC	C	2	4	10,10,11	0.53	0	14,14,16	0.44	0
6	Z9L	D	1	6	25,25,25	1.84	4 (16%)	34,39,39	1.11	4 (11%)
6	Z9K	D	2	6	17,17,18	1.45	2 (11%)	17,25,27	0.97	0
6	GU6	D	3	6	23,23,24	1.92	4 (17%)	28,36,38	1.03	2 (7%)
6	GU1	D	4	6	14,14,15	0.68	0	15,19,21	0.76	0
6	Z9H	D	5	6	21,21,22	1.70	3 (14%)	26,31,33	1.26	3 (11%)

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
4	NAG	A	1	3,4	-	2/6/23/26	0/1/1/1
4	FUC	A	2	4	-	-	0/1/1/1
5	NAG	B	1	3,5	-	4/6/23/26	0/1/1/1
5	NAG	B	2	5	-	4/6/23/26	0/1/1/1
5	MAN	B	3	5	-	2/2/19/22	0/1/1/1
4	NAG	C	1	3,4	-	5/6/23/26	0/1/1/1
4	FUC	C	2	4	-	-	0/1/1/1
6	Z9L	D	1	6	-	0/18/38/38	0/1/1/1
6	Z9K	D	2	6	-	0/11/28/31	0/1/1/1
6	GU6	D	3	6	-	0/16/33/36	0/1/1/1
6	GU1	D	4	6	-	0/8/25/28	0/1/1/1
6	Z9H	D	5	6	-	0/15/32/35	0/1/1/1

All (14) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	D	5	Z9H	O6-S1	-4.97	1.43	1.56
6	D	1	Z9L	O6-S1	-4.94	1.43	1.56
6	D	3	GU6	O6-S6	-4.91	1.43	1.56
6	D	3	GU6	O2-S2	-4.59	1.43	1.57
6	D	5	Z9H	O2-S2	-4.55	1.43	1.57
6	D	2	Z9K	O2-S1	-4.54	1.43	1.57
6	D	1	Z9L	O3-S2	-4.52	1.43	1.57
6	D	3	GU6	O3-S3	-4.51	1.43	1.57
6	D	1	Z9L	O2-S3	-4.50	1.43	1.57
5	B	3	MAN	C1-C2	2.93	1.59	1.52
6	D	5	Z9H	O2-C2	-2.61	1.43	1.47
6	D	3	GU6	O2-C2	-2.47	1.43	1.47
6	D	2	Z9K	O2-C2	-2.44	1.43	1.47
6	D	1	Z9L	O1-C1	2.28	1.44	1.40

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	3	MAN	C1-C2-C3	3.47	114.70	109.64
6	D	1	Z9L	C2-O2-S3	-3.18	111.41	119.04
6	D	5	Z9H	O2-C2-C3	3.01	109.99	106.65
6	D	3	GU6	O2-C2-C3	2.96	109.93	106.65
6	D	5	Z9H	O6-C6-C5	2.90	112.73	107.57
6	D	5	Z9H	C6-C5-C4	-2.62	107.03	113.35
6	D	1	Z9L	C3-O3-S2	-2.44	113.20	119.04
6	D	3	GU6	C3-O3-S3	-2.33	113.44	119.04
6	D	1	Z9L	C7-O1-C1	-2.33	109.72	113.26
5	B	3	MAN	C3-C4-C5	-2.28	106.09	110.23
5	B	1	NAG	C2-N2-C7	-2.19	119.96	122.90
6	D	1	Z9L	O6-C6-C5	2.12	111.34	107.57
5	B	2	NAG	C2-N2-C7	-2.12	120.06	122.90
5	B	2	NAG	C4-C3-C2	-2.08	107.98	111.02
4	C	1	NAG	C2-N2-C7	-2.04	120.17	122.90

There are no chirality outliers.

All (17) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	1	NAG	C8-C7-N2-C2
4	A	1	NAG	O7-C7-N2-C2
4	C	1	NAG	C8-C7-N2-C2

Continued on next page...

Continued from previous page...

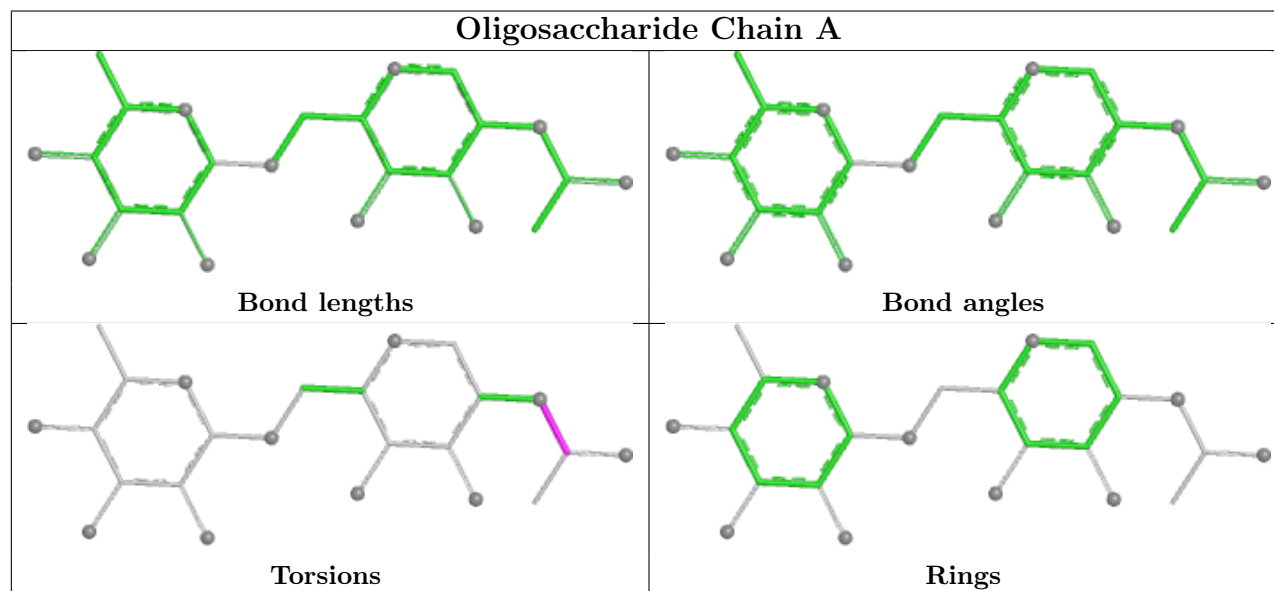
Mol	Chain	Res	Type	Atoms
4	C	1	NAG	O7-C7-N2-C2
5	B	1	NAG	C8-C7-N2-C2
5	B	1	NAG	O7-C7-N2-C2
5	B	2	NAG	C8-C7-N2-C2
5	B	2	NAG	O7-C7-N2-C2
5	B	3	MAN	O5-C5-C6-O6
5	B	2	NAG	O5-C5-C6-O6
5	B	3	MAN	C4-C5-C6-O6
4	C	1	NAG	O5-C5-C6-O6
5	B	2	NAG	C4-C5-C6-O6
4	C	1	NAG	C4-C5-C6-O6
5	B	1	NAG	C4-C5-C6-O6
4	C	1	NAG	C3-C2-N2-C7
5	B	1	NAG	O5-C5-C6-O6

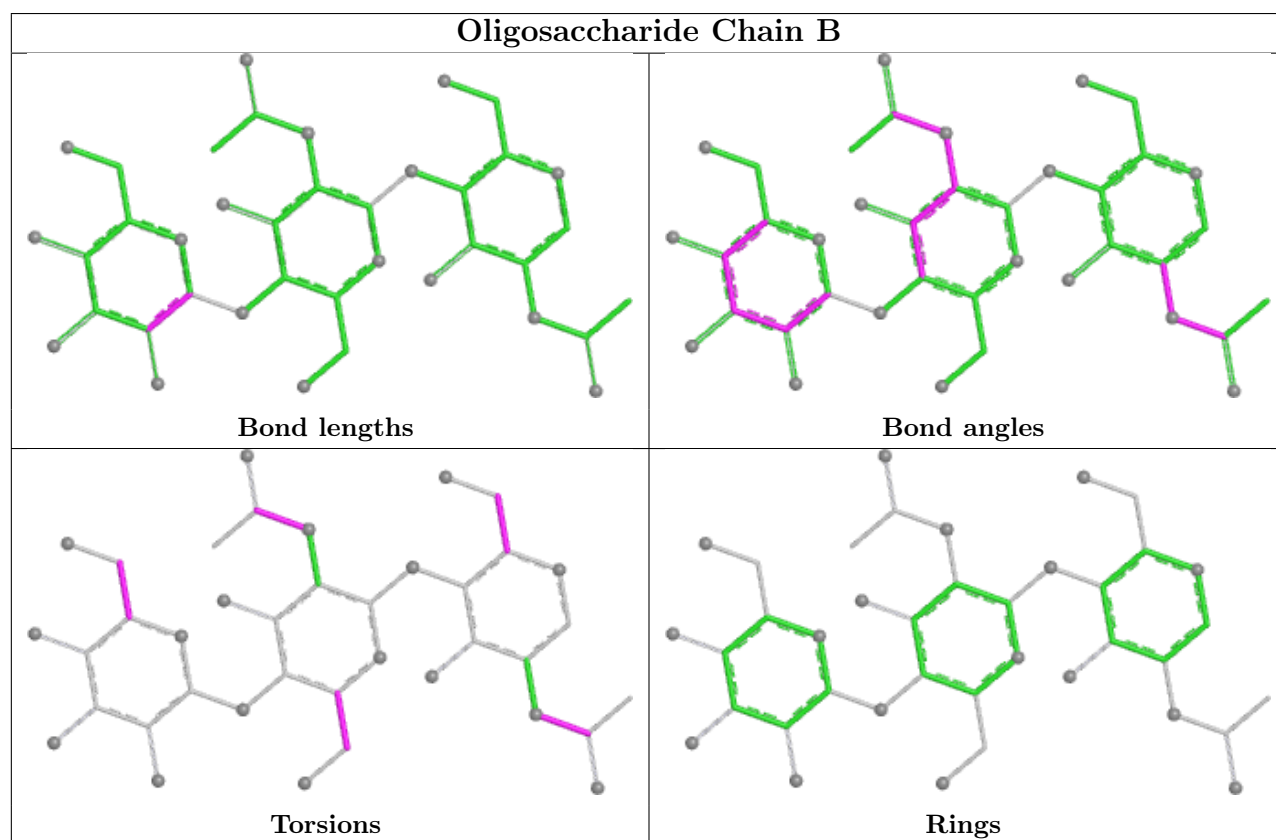
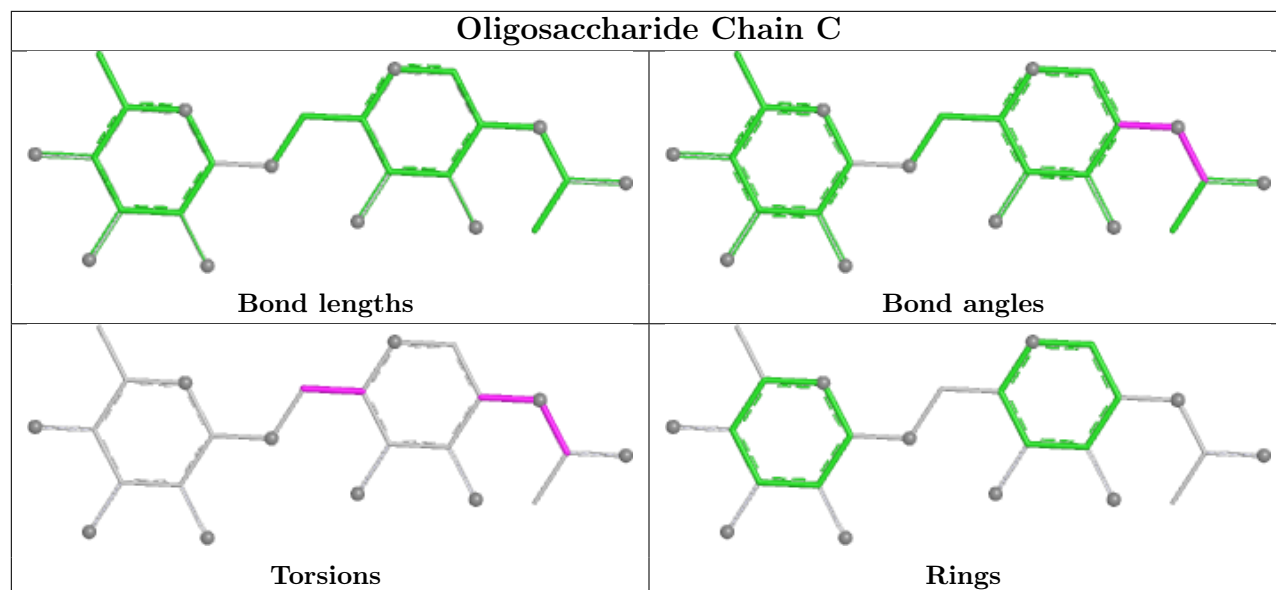
There are no ring outliers.

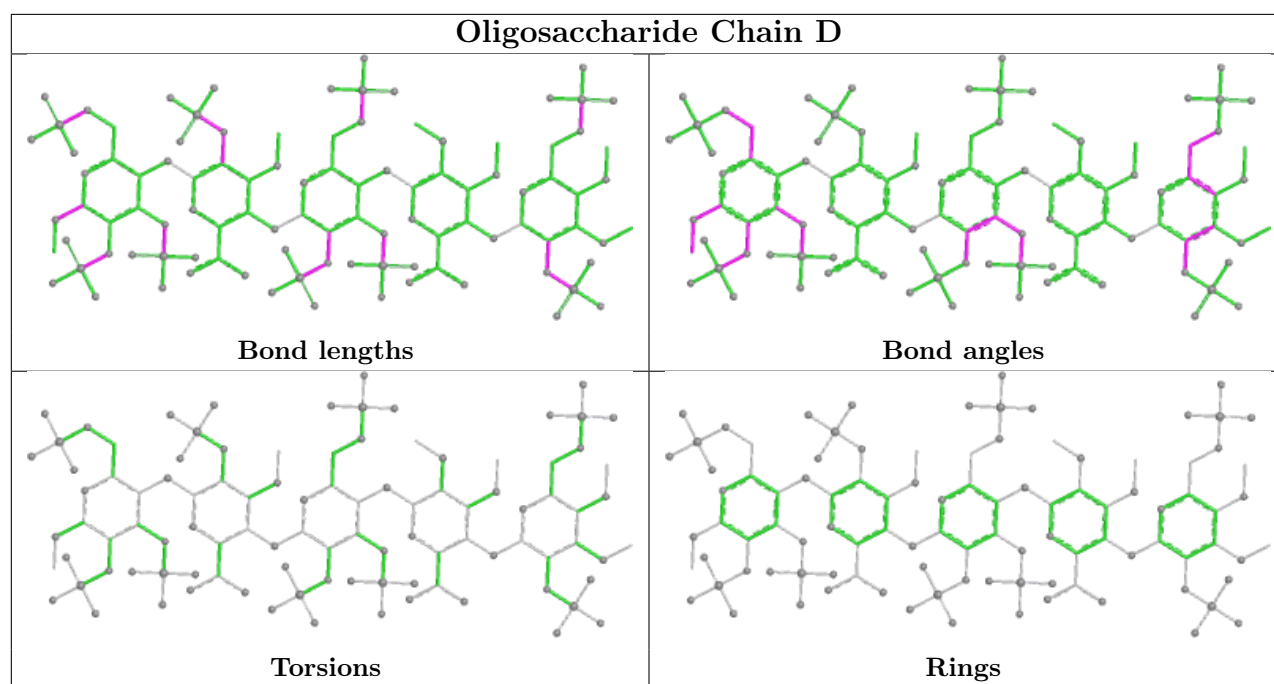
5 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	D	3	GU6	1	0
6	D	4	GU1	2	0
6	D	5	Z9H	1	0
5	B	1	NAG	3	0
4	C	2	FUC	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.







5.6 Ligand geometry [i](#)

Of 3 ligands modelled in this entry, 1 is monoatomic - leaving 2 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	$\# Z > 2$
8	MPD	I	5277	-	7,7,7	0.42	0	9,10,10	0.38	0
8	MPD	I	5276	-	7,7,7	0.44	0	9,10,10	0.45	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
8	MPD	I	5277	-	-	0/5/5/5	-
8	MPD	I	5276	-	-	0/5/5/5	-

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.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	I	5276	MPD	1	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, 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	L	54/59 (91%)	2.24	32 (59%) 0 0	25, 45, 60, 62	0
2	H	235/235 (100%)	0.27	15 (6%) 25 27	9, 22, 39, 52	14 (5%)
3	I	419/432 (96%)	0.84	61 (14%) 6 5	10, 31, 58, 75	24 (5%)
All	All	708/726 (97%)	0.76	108 (15%) 5 4	9, 29, 57, 75	38 (5%)

All (108) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	H	220	CYS	9.6
2	H	84	ASN	6.4
3	I	303	VAL	5.9
3	I	300	THR	5.6
3	I	4	PRO	5.2
1	L	90	ILE	4.8
3	I	3	SER	4.7
1	L	86	VAL	4.7
1	L	87	THR	4.6
3	I	301	PRO	4.4
3	I	17	MET	4.4
3	I	299	LEU	4.4
1	L	103	ALA	4.3
3	I	304	LEU	4.2
3	I	382	ALA	4.2
2	H	97[A]	ASN	4.1
1	L	88	CYS	4.0
1	L	102	SER	4.0
1	L	107	VAL	4.0
1	L	117	LEU	4.0
3	I	288	PRO	3.9
1	L	108	VAL	3.9
3	I	415	VAL	3.9

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
2	H	245	THR	3.8
1	L	118	ALA	3.8
1	L	124	CYS	3.8
3	I	386	THR	3.6
3	I	26	PRO	3.6
3	I	431	VAL	3.5
3	I	302	GLU	3.4
3	I	390	ILE	3.4
3	I	389	VAL	3.3
3	I	315	MET	3.2
3	I	289	GLU	3.2
3	I	18	ASN	3.2
1	L	93	GLY	3.2
3	I	27	GLU	3.2
3	I	292	LEU	3.1
2	H	165[A]	ARG	3.1
3	I	12	PRO	3.1
2	H	99	TYR	3.0
2	H	168	CYS	3.0
1	L	89	ASN	3.0
3	I	38	GLN	2.9
3	I	388	VAL	2.9
3	I	68	ASP	2.9
1	L	120	ASN	2.9
2	H	163	VAL	2.9
1	L	84	MET	2.8
3	I	14	ASP	2.8
3	I	153[A]	THR	2.8
2	H	96	ILE	2.7
2	H	164	ASP	2.7
1	L	134	ARG	2.7
3	I	387	ALA	2.7
1	L	119	GLU	2.6
3	I	293	ALA	2.6
1	L	92	ASN	2.6
3	I	15	ILE	2.6
3	I	322[A]	ARG	2.5
2	H	166	ALA	2.5
1	L	100	LYS	2.5
3	I	21	CYS	2.5
3	I	384	ALA	2.5
3	I	314	MET	2.5

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
3	I	359	ARG	2.5
1	L	104	ASP	2.4
1	L	128	VAL	2.4
1	L	137	VAL	2.4
1	L	121	GLN	2.4
2	H	98	LYS	2.4
2	H	170	ARG	2.4
3	I	13	ARG	2.4
3	I	308	LEU	2.4
3	I	290	LYS	2.4
3	I	298	GLU	2.4
3	I	297	LYS	2.4
3	I	157	THR	2.3
3	I	278[A]	ASP	2.3
3	I	16	PRO	2.3
1	L	111	CYS	2.3
2	H	169	LEU	2.3
3	I	307	TRP	2.3
1	L	106	LYS	2.3
1	L	122	LYS	2.3
1	L	105	ASN	2.2
1	L	95	CYS	2.2
1	L	123	SER	2.2
3	I	39	LYS	2.2
1	L	85	ASP	2.2
3	I	74	ASP	2.2
3	I	310	GLU	2.2
3	I	316	LEU	2.2
2	H	133	PHE	2.2
3	I	418	ASN	2.2
3	I	181	GLN	2.1
3	I	95[A]	CYS	2.1
3	I	238	LEU	2.1
3	I	248	SER	2.1
3	I	244	GLY	2.1
3	I	378	GLU	2.1
3	I	240	TYR	2.1
1	L	127	ALA	2.1
3	I	306	GLU	2.1
3	I	46[A]	ARG	2.1
3	I	313	GLU	2.0
1	L	99	CYS	2.0

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
3	I	247	CYS	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](#)

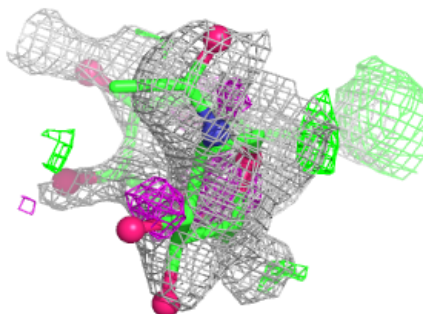
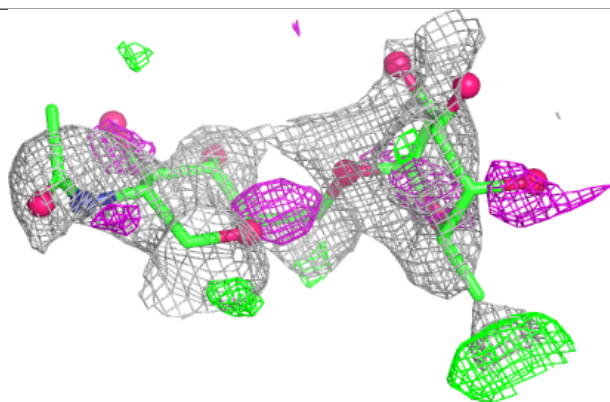
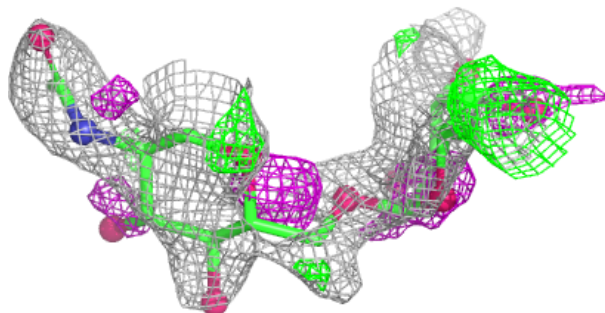
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	NAG	A	1	14/15	-	-	62,68,70,73	0
4	FUC	A	2	10/11	-	-	75,75,76,77	0
4	NAG	C	1	14/15	-	-	64,68,71,73	0
4	FUC	C	2	10/11	-	-	75,76,76,77	0
5	NAG	B	1	14/15	-	-	49,54,55,60	0
5	NAG	B	2	14/15	-	-	62,66,67,70	0
5	MAN	B	3	11/12	-	-	74,76,77,78	0
6	Z9L	D	1	25/25	-	-	28,31,35,36	0
6	Z9K	D	2	17/18	-	-	28,29,32,32	0
6	GU6	D	3	23/24	-	-	26,31,36,37	0
6	GU1	D	4	14/15	-	-	32,34,36,37	0
6	Z9H	D	5	21/22	-	-	29,37,41,42	0

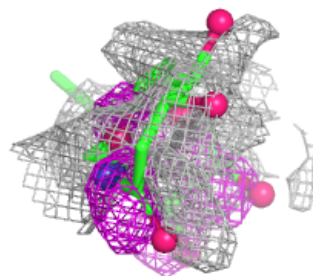
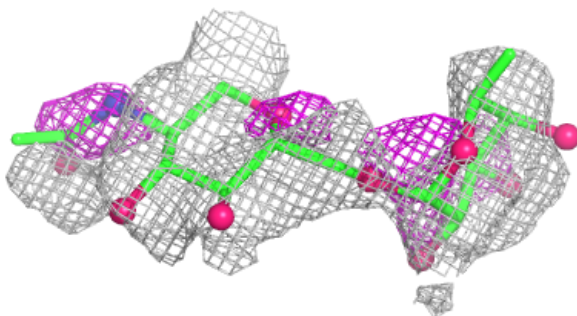
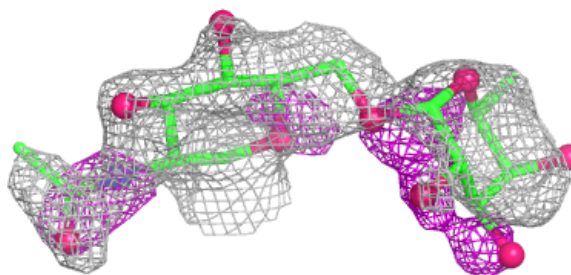
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around Chain A:

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

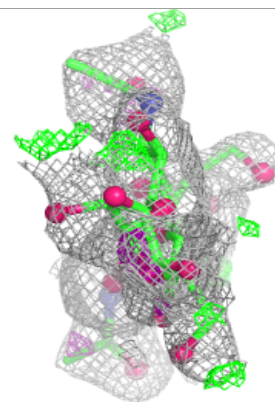
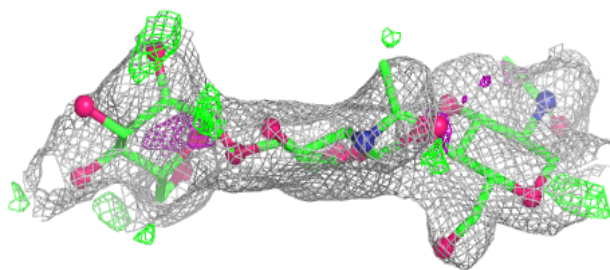
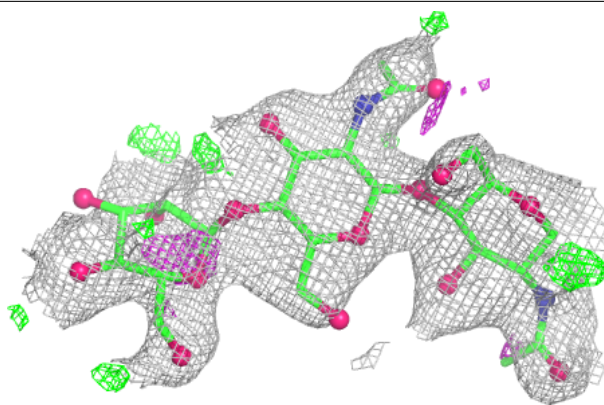
**Electron density around Chain C:**

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

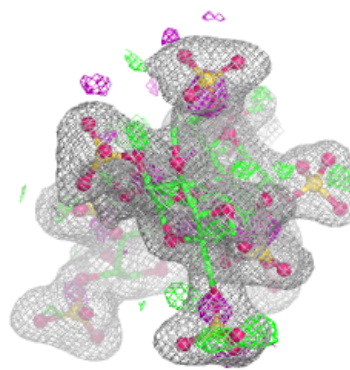
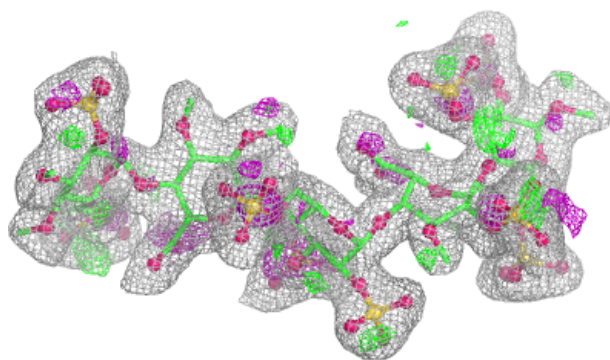
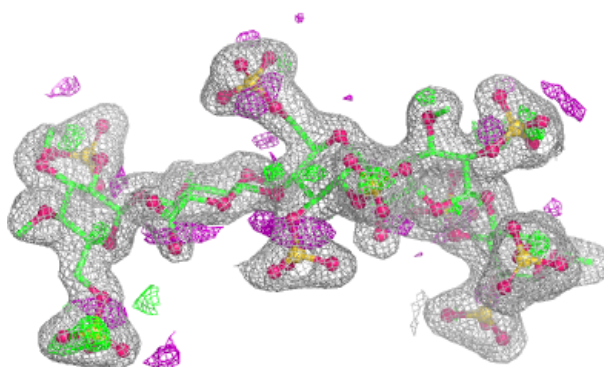


Electron density around Chain B:

$2mF_o-DF_c$ (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($\text{\AA}^2$)	Q<0.9
8	MPD	I	5276	8/8	0.88	0.31	61,62,63,63	0
8	MPD	I	5277	8/8	0.88	0.23	61,62,62,63	0
7	CA	H	500	1/1	0.97	0.04	23,23,23,23	0

6.5 Other polymers [i](#)

There are no such residues in this entry.