WORLDWIDE wwPDB PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

Feb 4, 2026 – 06:05 AM EST

PDB ID	:	3W82 / pdb_00003w82
Title	:	Human alpha-L-iduronidase in complex with iduronic acid
Authors	:	Maita, N.; Tsukimura, T.; Taniguchi, T.; Saito, S.; Ohno, K.; Taniguchi, H.; Sakuraba, H.
Deposited on	:	2013-03-11
Resolution	:	2.76 Å(reported)

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

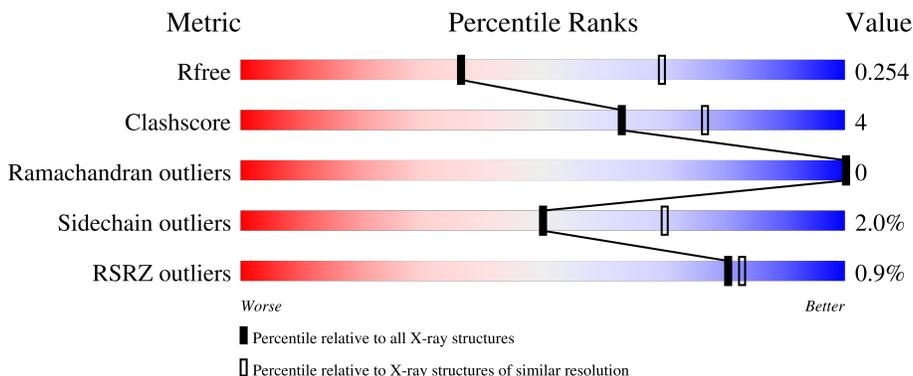|		
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.47

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 2.76 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	Percentile Ranks	Value
Rfree		0.254
Clashscore		4
Ramachandran outliers		0
Sidechain outliers		2.0%
RSRZ outliers		0.9%

Worse — *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	164625	1606 (2.78-2.74)
Clashscore	180529	1689 (2.78-2.74)
Ramachandran outliers	177936	1665 (2.78-2.74)
Sidechain outliers	177891	1665 (2.78-2.74)
RSRZ outliers	164620	1606 (2.78-2.74)

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 <=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	627	87% ... 10% ..
1	B	627	88% ... 10% .
2	C	10	40% 60%
3	D	2	50% 50%
3	G	2	100%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
4	E	9	33% 67%
5	F	2	100%

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
9	CL	A	704	-	-	X	-

2 Entry composition (i)

There are 12 unique types of molecules in this entry. The entry contains 10232 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 Alpha-L-iduronidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	616	Total	C	N	O	S	0	0	0
			4885	3119	885	869	12			
1	B	616	Total	C	N	O	S	0	0	0
			4885	3119	885	869	12			

- Molecule 2 is an oligosaccharide called alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-6)]alpha-D-mannopyranose-(1-6)-[alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.
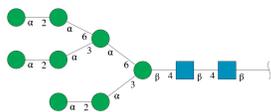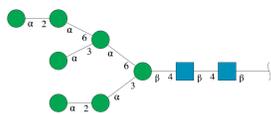

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	10	Total	C	N	O	0	0	0
			116	64	2	50			

- Molecule 3 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
3	D	2	Total	C	N	O	0	0	0
			28	16	2	10			
3	G	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 4 is an oligosaccharide called alpha-D-mannopyranose-(1-2)-alpha-D-mannopyran ose-(1-6)-[alpha-D-mannopyranose-(1-3)]alpha-D-mannopyranose-(1-6)-[alpha-D-mannopyr anose-(1-2)-alpha-D-mannopyranose-(1-3)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deox y-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.
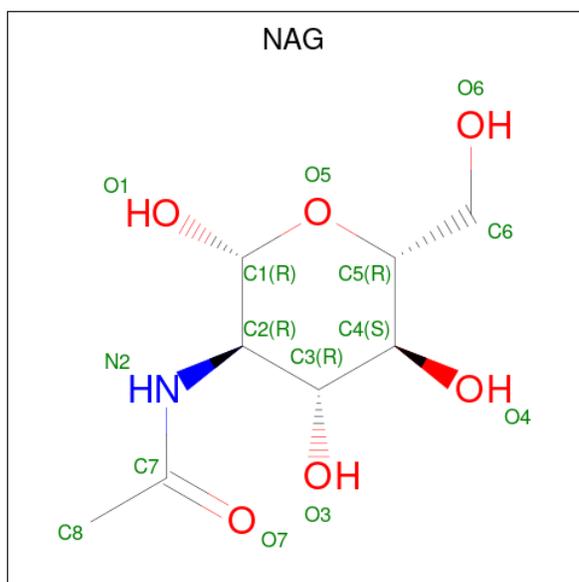

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	E	9	Total 105	C 58	N 2	O 45	0	0	0

- Molecule 5 is an oligosaccharide called alpha-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-bet a-D-glucopyranose.

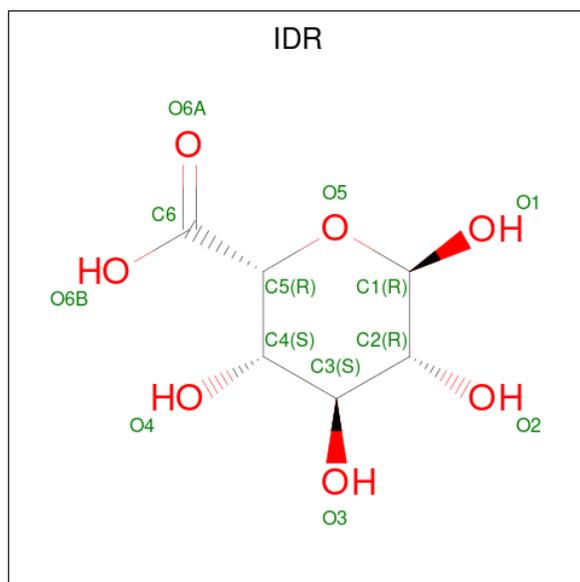| Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	F	2	Total 24	C 14	N 1	O 9	0	0	0

- Molecule 6 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula: $C_8H_{15}NO_6$).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	A	1	Total 14	C 8	N 1	O 5	0	0
6	B	1	Total 14	C 8	N 1	O 5	0	0

- Molecule 7 is alpha-L-idopyranuronic acid (CCD ID: IDR) (formula: $C_6H_{10}O_7$).

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	A	1	Total 13	C 6	O 7	0	0
7	B	1	Total 13	C 6	O 7	0	0

- Molecule 8 is PHOSPHATE ION (CCD ID: PO4) (formula: O_4P).

PO4

O3

O⁻

O2 O⁻ — P = O   O1

P

O⁻

O4
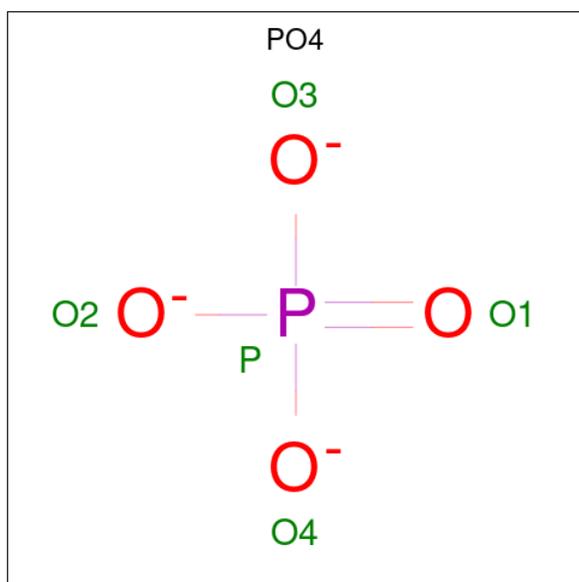
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	A	1	Total O P 5 4 1	0	0
8	B	1	Total O P 5 4 1	0	0

- Molecule 9 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	A	1	Total Cl 1 1	0	0
9	B	1	Total Cl 1 1	0	0

- Molecule 10 is L(+)-TARTARIC ACID (CCD ID: TLA) (formula: $C_4H_6O_6$).
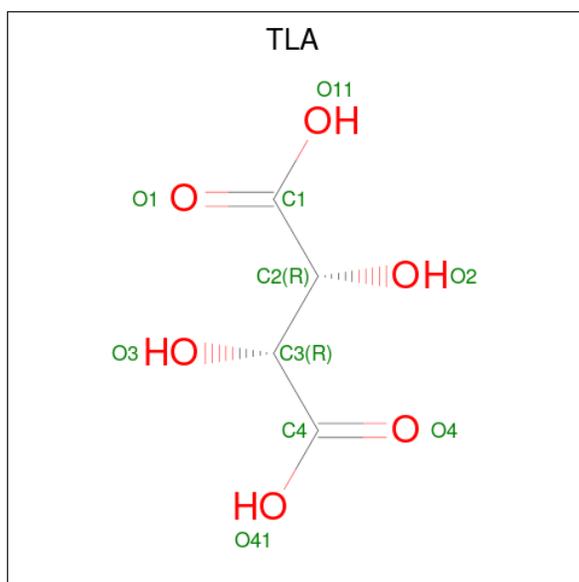
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
10	B	1	Total 10	C 4	O 6	0	0

- Molecule 11 is PHOSPHITE ION (CCD ID: PO3) (formula: O_3P).
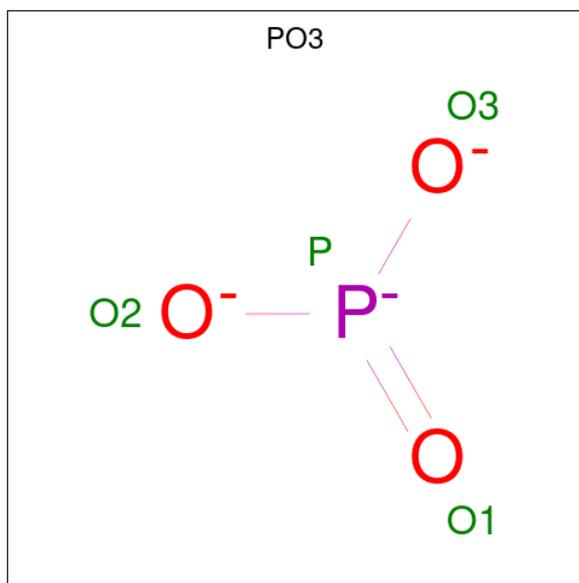
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
11	B	1	Total 4	O 3	P 1	0	0

- Molecule 12 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
12	A	46	Total 46	O 46	0	0
12	B	35	Total 35	O 35	0	0

3 Residue-property plots ⓘ

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 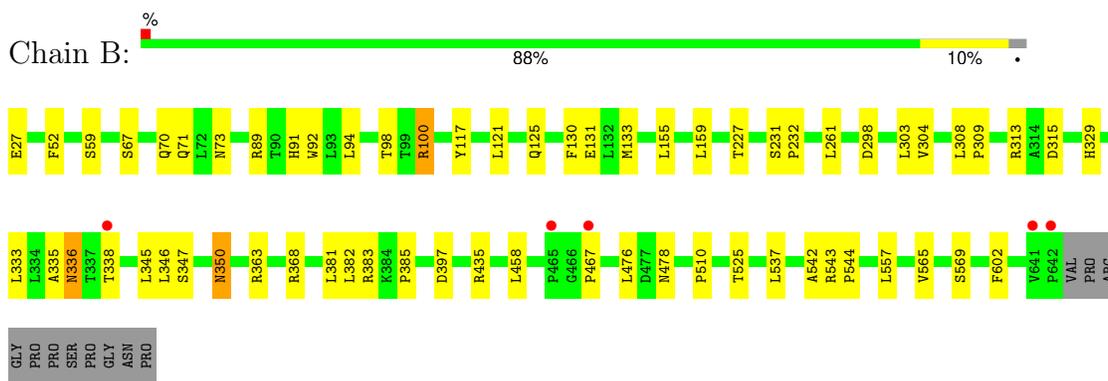outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

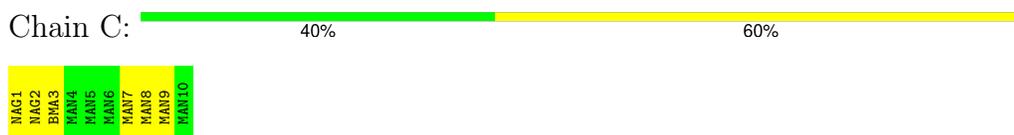- Molecule 1: Alpha-L-iduronidase
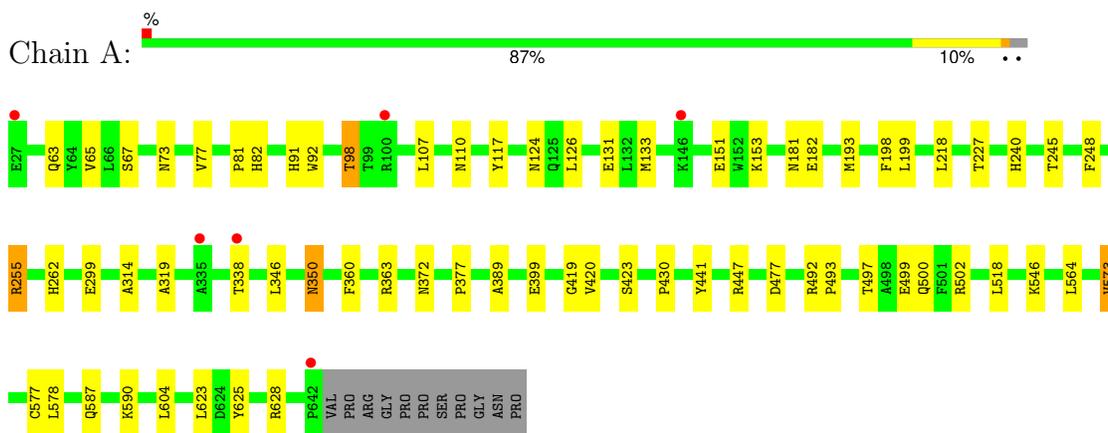
- Molecule 1: Alpha-L-iduronidase

- Molecule 2: alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-6)]alpha-D-mannopyranose-(1-6)-[alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

• Molecule 3: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-gluc opyranose

Chain D:

50% 50%

NAG1 NAG2

• Molecule 3: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-gluc opyranose

Chain G:

100%

NAG1 NAG2

• Molecule 4: alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-6)-[alpha-D-mannopyran ose-(1-3)]alpha-D-mannopyranose-(1-6)-[alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2 -deoxy-beta-D-glucopyranose
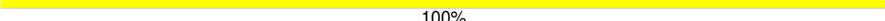
Chain E:

33% 67%

NAG1 NAG2 BMA3 MAN4 MAN5 MAN6 MAN7 MAN8 MAN9

• Molecule 5: alpha-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain F:

100%

NAG1 FUC2

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	H 3	Depositor
Cell constants a, b, c, α, β, γ	259.98Å 259.98Å 65.30Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	37.55 – 2.76 37.55 – 2.76	Depositor EDS
% Data completeness (in resolution range)	95.7 (37.55-2.76) 95.7 (37.55-2.76)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.40 (at 2.77Å)	Xtriage
Refinement program	REFMAC 5.7.0029	Depositor
R, R_{free}	0.195 , 0.254 0.199 , 0.254	Depositor DCC
R_{free} test set	2135 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å^2)	29.6	Xtriage
Anisotropy	0.194	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.32 , 28.5	EDS
L-test for twinning[2]	$< |L| > = 0.47, < L^2 > = 0.30$	Xtriage
Estimated twinning fraction	0.024 for h,-h-k,-l	Xtriage
F_o,F_c correlation	0.91	EDS
Total number of atoms	10232	wwPDB-VP
Average B, all atoms (Å^2)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.33% of the height of the origin peak. No significant pseudotranslation is detected.*

---

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: IDR, CL, MAN, TLA, PO4, BMA, NAG, PO3, FUC

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	0.52	0/5037	0.75	1/6884 (0.0%)
1	B	0.52	0/5037	0.74	0/6884
All	All	0.52	0/10074	0.75	1/13768 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	420	VAL	N-CA-C	5.08	114.89	107.88

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	4885	0	4779	39	0
1	B	4885	0	4778	36	0
2	C	116	0	97	0	0
3	D	28	0	25	1	0
3	G	28	0	25	0	0
4	E	105	0	88	1	0
5	F	24	0	22	1	0
6	A	14	0	13	0	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	B	14	0	13	1	0
7	A	13	0	9	2	0
7	B	13	0	9	2	0
8	A	5	0	0	0	0
8	B	5	0	0	0	0
9	A	1	0	0	2	0
9	B	1	0	0	1	0
10	B	10	0	4	0	0
11	B	4	0	0	0	0
12	A	46	0	0	1	0
12	B	35	0	0	0	0
All	All	10232	0	9862	78	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 4.

All (78) 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:D:1:NAG:O3	3:D:2:NAG:H61	1.89	0.73
1:A:447:ARG:NH1	12:A:801:HOH:O	2.23	0.72
1:A:497:THR:OG1	1:A:500:GLN:HG3	1.90	0.70
1:A:363:ARG:HD3	9:A:704:CL:CL	2.28	0.70
1:B:335:ALA:O	1:B:336:ASN:C	2.34	0.70
1:A:65:VAL:HG13	1:A:117:TYR:CD2	2.32	0.64
1:B:397:ASP:OD1	1:B:435:ARG:NH1	2.33	0.62
1:B:363:ARG:HD3	9:B:706:CL:CL	2.38	0.60
1:B:298:ASP:HA	1:B:347:SER:HB3	1.84	0.60
1:B:303:LEU:HB3	1:B:313:ARG:HH21	1.68	0.58
1:B:125:GLN:NE2	1:B:569:SER:OG	2.37	0.57
1:A:363:ARG:CD	9:A:704:CL:CL	2.91	0.56
1:A:181:ASN:O	1:A:182:GLU:C	2.49	0.55
1:B:346:LEU:C	1:B:346:LEU:HD23	2.32	0.54
1:B:94:LEU:HD21	1:B:159:LEU:HD11	1.89	0.54
1:B:155:LEU:O	1:B:159:LEU:HB2	2.08	0.53
1:A:363:ARG:NH2	7:A:702:IDR:O4	2.41	0.53
1:A:573:VAL:HG11	1:A:578:LEU:HD11	1.91	0.53
1:B:100:ARG:NH2	6:B:701:NAG:O7	2.42	0.52
1:A:65:VAL:CG1	1:A:117:TYR:CD2	2.93	0.51
1:A:372:ASN:HA	1:A:377:PRO:HB3	1.93	0.50
1:A:604:LEU:C	1:A:604:LEU:HD23	2.36	0.50

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:92:TRP:CE2	1:A:133:MET:HE2	2.47	0.50
5:F:1:NAG:H4	5:F:2:FUC:O5	2.12	0.50
1:B:91:HIS:ND1	1:B:131:GLU:OE1	2.44	0.49
1:B:117:TYR:CE1	1:B:121:LEU:HD11	2.47	0.49
1:A:218:LEU:HB3	1:A:255:ARG:HD3	1.94	0.49
1:B:70:GLN:HE22	1:B:73:ASN:HD22	1.60	0.49
1:A:430:PRO:HB2	1:A:546:LYS:HD3	1.94	0.48
1:A:350:ASN:N	1:A:350:ASN:HD22	2.11	0.48
1:A:98:THR:OG1	1:A:110:ASN:HB3	2.14	0.48
1:A:564:LEU:C	1:A:564:LEU:HD12	2.39	0.48
1:A:81:PRO:HB2	1:A:82:HIS:CD2	2.48	0.47
1:A:587:GLN:O	1:A:590:LYS:HG2	2.14	0.47
1:A:199:LEU:HB3	1:A:240:HIS:CD2	2.49	0.47
1:A:314:ALA:HB1	1:A:360:PHE:HB3	1.94	0.47
1:B:363:ARG:NH2	7:B:702:IDR:O4	2.47	0.47
1:A:350:ASN:HD22	1:A:350:ASN:H	1.61	0.47
1:B:345:LEU:HD13	1:B:346:LEU:N	2.29	0.46
1:B:308:LEU:HD12	1:B:309:PRO:HD2	1.98	0.46
1:A:73:ASN:O	1:A:77:VAL:HG23	2.16	0.46
1:A:477:ASP:C	1:A:477:ASP:OD2	2.59	0.46
1:A:346:LEU:C	1:A:346:LEU:HD23	2.40	0.45
1:B:261:LEU:C	1:B:261:LEU:HD12	2.40	0.45
1:B:231:SER:N	1:B:232:PRO:CD	2.80	0.45
1:A:91:HIS:ND1	1:A:131:GLU:OE1	2.49	0.45
1:B:303:LEU:O	1:B:363:ARG:NH1	2.50	0.45
1:B:557:LEU:HB2	1:B:565:VAL:HB	1.99	0.45
1:B:315:ASP:HB2	1:B:478:ASN:OD1	2.17	0.45
1:A:193:MET:SD	1:A:198:PHE:HA	2.57	0.44
1:B:368:ARG:HA	1:B:381:LEU:HD23	2.00	0.44
1:A:63:GLN:O	1:A:67:SER:HB3	2.17	0.44
1:A:153:LYS:HD3	1:A:248:PHE:CE1	2.52	0.44
1:A:299:GLU:OE1	7:A:702:IDR:H1	2.18	0.44
1:B:329:HIS:O	1:B:333:LEU:HB3	2.18	0.44
1:B:52:PHE:CD2	1:B:52:PHE:C	2.96	0.44
1:A:499:GLU:HA	1:A:502:ARG:NH1	2.33	0.43
1:B:130:PHE:CZ	1:B:159:LEU:HD21	2.54	0.43
1:B:467:PRO:HB2	1:B:543:ARG:HB3	1.99	0.43
1:B:476:LEU:HG	1:B:510:PRO:HB3	2.01	0.43
7:B:702:IDR:H2	4:E:6:MAN:O3	2.18	0.43
1:A:124:ASN:O	1:A:126:LEU:HG	2.18	0.43
1:B:92:TRP:CE2	1:B:133:MET:HE2	2.54	0.43

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:107:LEU:HD22	1:A:151:GLU:OE2	2.19	0.42
1:B:383:ARG:HD3	1:B:602:PHE:CZ	2.54	0.42
1:B:315:ASP:HA	1:B:385:PRO:HG2	2.01	0.42
1:A:419:GLY:HA3	1:A:441:TYR:CZ	2.55	0.42
1:A:492:ARG:N	1:A:493:PRO:CD	2.83	0.42
1:A:262:HIS:CE1	1:A:299:GLU:OE2	2.73	0.42
1:A:577:CYS:HB3	1:A:625:TYR:CD2	2.56	0.41
1:B:303:LEU:HB3	1:B:313:ARG:NH2	2.33	0.41
1:B:67:SER:O	1:B:71:GLN:HG3	2.20	0.41
1:B:542:ALA:O	1:B:544:PRO:HD3	2.20	0.41
1:B:89:ARG:CZ	1:B:131:GLU:OE2	2.69	0.41
1:B:350:ASN:HD22	1:B:350:ASN:C	2.29	0.41
1:A:399:GLU:O	1:A:423:SER:HA	2.22	0.40
1:B:458:LEU:O	1:B:525:THR:HA	2.22	0.40
1:A:319:ALA:HB1	1:A:389:ALA:HB2	2.02	0.40

There are no symmetry-related clashes.

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	614/627 (98%)	584 (95%)	30 (5%)	0	100	100
1	B	614/627 (98%)	585 (95%)	29 (5%)	0	100	100
All	All	1228/1254 (98%)	1169 (95%)	59 (5%)	0	100	100

There are no Ramachandran outliers to report.

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	518/527 (98%)	508 (98%)	10 (2%)	52	71
1	B	518/527 (98%)	507 (98%)	11 (2%)	48	69
All	All	1036/1054 (98%)	1015 (98%)	21 (2%)	50	70

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	98	THR
1	A	227	THR
1	A	245	THR
1	A	255	ARG
1	A	338	THR
1	A	350	ASN
1	A	518	LEU
1	A	573	VAL
1	A	623	LEU
1	A	628	ARG
1	B	27	GLU
1	B	59	SER
1	B	98	THR
1	B	100	ARG
1	B	227	THR
1	B	304	VAL
1	B	336	ASN
1	B	338	THR
1	B	350	ASN
1	B	382	LEU
1	B	537	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (27) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	70	GLN
1	A	82	HIS
1	A	171	HIS
1	A	176	ASN
1	A	190	ASN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	240	HIS
1	A	336	ASN
1	A	348	ASN
1	A	350	ASN
1	A	356	HIS
1	A	358	HIS
1	A	416	HIS
1	A	449	HIS
1	A	561	GLN
1	A	572	HIS
1	B	33	HIS
1	B	63	GLN
1	B	70	GLN
1	B	82	HIS
1	B	125	GLN
1	B	147	GLN
1	B	185	HIS
1	B	226	HIS
1	B	275	GLN
1	B	336	ASN
1	B	350	ASN
1	B	358	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

25 monosaccharides are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#$\|Z\|>2$	Counts	RMSZ	#$\|Z\|>2$
2	NAG	C	1	1,2	14,14,15	0.69	0	17,19,21	1.34	3 (17%)
2	MAN	C	10	2	11,11,12	0.64	0	15,15,17	0.77	0
2	NAG	C	2	2	14,14,15	0.62	0	17,19,21	1.13	2 (11%)
2	BMA	C	3	2	11,11,12	0.27	0	15,15,17	1.05	1 (6%)
2	MAN	C	4	2	11,11,12	0.95	0	15,15,17	1.00	0
2	MAN	C	5	2	11,11,12	0.70	0	15,15,17	0.81	0
2	MAN	C	6	2	11,11,12	0.60	0	15,15,17	0.53	0
2	MAN	C	7	2	11,11,12	0.57	0	15,15,17	1.22	1 (6%)
2	MAN	C	8	2	11,11,12	0.63	0	15,15,17	1.06	1 (6%)
2	MAN	C	9	2	11,11,12	0.54	0	15,15,17	1.25	2 (13%)
3	NAG	D	1	1,3	14,14,15	0.63	0	17,19,21	0.81	0
3	NAG	D	2	3	14,14,15	0.48	0	17,19,21	1.97	2 (11%)
4	NAG	E	1	4,1	14,14,15	0.72	0	17,19,21	1.21	1 (5%)
4	NAG	E	2	4	14,14,15	0.58	0	17,19,21	0.85	1 (5%)
4	BMA	E	3	4	11,11,12	0.25	0	15,15,17	0.63	0
4	MAN	E	4	4	11,11,12	0.88	0	15,15,17	1.00	0
4	MAN	E	5	4	11,11,12	0.59	0	15,15,17	0.84	1 (6%)
4	MAN	E	6	4	11,11,12	0.62	0	15,15,17	0.66	0
4	MAN	E	7	4	11,11,12	0.63	0	15,15,17	0.71	0
4	MAN	E	8	4	11,11,12	0.63	0	15,15,17	0.89	1 (6%)
4	MAN	E	9	4	11,11,12	0.69	0	15,15,17	0.88	1 (6%)
5	NAG	F	1	5,1	14,14,15	0.53	0	17,19,21	1.48	1 (5%)
5	FUC	F	2	5	10,10,11	0.53	0	14,14,16	1.42	2 (14%)
3	NAG	G	1	1,3	14,14,15	0.70	0	17,19,21	1.77	4 (23%)
3	NAG	G	2	3	14,14,15	0.39	0	17,19,21	1.26	1 (5%)

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	C	1	1,2	-	1/6/23/26	0/1/1/1
2	MAN	C	10	2	-	2/2/19/22	0/1/1/1
2	NAG	C	2	2	-	1/6/23/26	0/1/1/1
2	BMA	C	3	2	-	0/2/19/22	0/1/1/1
2	MAN	C	4	2	-	0/2/19/22	0/1/1/1
2	MAN	C	5	2	-	0/2/19/22	0/1/1/1
2	MAN	C	6	2	-	2/2/19/22	0/1/1/1

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	MAN	C	7	2	-	<mark>2/2/19/22</mark>	0/1/1/1
2	MAN	C	8	2	-	<mark>2/2/19/22</mark>	0/1/1/1
2	MAN	C	9	2	-	<mark>2/2/19/22</mark>	0/1/1/1
3	NAG	D	1	1,3	-	<mark>2/6/23/26</mark>	0/1/1/1
3	NAG	D	2	3	-	<mark>2/6/23/26</mark>	0/1/1/1
4	NAG	E	1	4,1	-	0/6/23/26	0/1/1/1
4	NAG	E	2	4	-	0/6/23/26	0/1/1/1
4	BMA	E	3	4	-	0/2/19/22	0/1/1/1
4	MAN	E	4	4	-	0/2/19/22	0/1/1/1
4	MAN	E	5	4	-	0/2/19/22	0/1/1/1
4	MAN	E	6	4	-	<mark>2/2/19/22</mark>	0/1/1/1
4	MAN	E	7	4	-	1/2/19/22	0/1/1/1
4	MAN	E	8	4	-	<mark>2/2/19/22</mark>	0/1/1/1
4	MAN	E	9	4	-	0/2/19/22	0/1/1/1
5	NAG	F	1	5,1	-	<mark>2/6/23/26</mark>	0/1/1/1
5	FUC	F	2	5	-	-	0/1/1/1
3	NAG	G	1	1,3	-	<mark>2/6/23/26</mark>	0/1/1/1
3	NAG	G	2	3	-	1/6/23/26	0/1/1/1

There are no bond length outliers.

All (25) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	D	2	NAG	C1-O5-C5	6.88	121.41	112.19
5	F	1	NAG	C1-O5-C5	4.62	118.38	112.19
3	G	2	NAG	C1-O5-C5	4.05	117.62	112.19
3	G	1	NAG	C1-O5-C5	3.82	117.31	112.19
5	F	2	FUC	C1-O5-C5	3.41	121.02	112.97
5	F	2	FUC	C1-C2-C3	3.26	114.39	109.64
2	C	8	MAN	C1-O5-C5	3.05	116.27	112.19
3	G	1	NAG	O5-C5-C6	-3.02	101.78	107.66
2	C	9	MAN	O2-C2-C1	2.94	115.95	109.22
4	E	1	NAG	O5-C1-C2	-2.81	106.94	111.29
2	C	1	NAG	C1-O5-C5	2.69	115.79	112.19
3	G	1	NAG	O5-C1-C2	-2.68	107.15	111.29
2	C	7	MAN	O2-C2-C3	-2.62	104.73	110.15
3	D	2	NAG	C1-C2-N2	-2.39	106.67	110.43
2	C	3	BMA	O3-C3-C2	-2.23	105.50	110.05
2	C	1	NAG	O3-C3-C2	-2.16	104.92	109.40
4	E	5	MAN	O2-C2-C3	-2.15	105.70	110.15

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	G	1	NAG	O4-C4-C3	-2.15	105.31	110.38
2	C	9	MAN	C3-C4-C5	2.13	114.09	110.23
2	C	1	NAG	C6-C5-C4	-2.13	107.80	113.02
4	E	2	NAG	O5-C1-C2	-2.07	108.08	111.29
2	C	2	NAG	O5-C5-C6	2.04	111.64	107.66
2	C	2	NAG	C6-C5-C4	-2.04	108.00	113.02
4	E	8	MAN	C1-C2-C3	2.02	112.58	109.64
4	E	9	MAN	C2-C3-C4	2.01	114.39	110.86

There are no chirality outliers.

All (26) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	7	MAN	O5-C5-C6-O6
2	C	8	MAN	O5-C5-C6-O6
3	D	2	NAG	O5-C5-C6-O6
2	C	7	MAN	C4-C5-C6-O6
2	C	8	MAN	C4-C5-C6-O6
2	C	9	MAN	C4-C5-C6-O6
2	C	9	MAN	O5-C5-C6-O6
4	E	8	MAN	C4-C5-C6-O6
4	E	8	MAN	O5-C5-C6-O6
5	F	1	NAG	C4-C5-C6-O6
3	G	1	NAG	C4-C5-C6-O6
5	F	1	NAG	O5-C5-C6-O6
4	E	6	MAN	C4-C5-C6-O6
3	G	1	NAG	O5-C5-C6-O6
2	C	6	MAN	C4-C5-C6-O6
4	E	6	MAN	O5-C5-C6-O6
4	E	7	MAN	O5-C5-C6-O6
3	D	2	NAG	C4-C5-C6-O6
2	C	6	MAN	O5-C5-C6-O6
2	C	10	MAN	C4-C5-C6-O6
2	C	1	NAG	C4-C5-C6-O6
2	C	10	MAN	O5-C5-C6-O6
2	C	2	NAG	O5-C5-C6-O6
3	D	1	NAG	C4-C5-C6-O6
3	G	2	NAG	O5-C5-C6-O6
3	D	1	NAG	O5-C5-C6-O6

There are no ring outliers.

5 monomers are involved in 3 short contacts:

| Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	E	6	MAN	1	0
3	D	2	NAG	1	0
3	D	1	NAG	1	0
5	F	1	NAG	1	0
5	F	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.

Oligosaccharide Chain C

Bond lengths

Bond angles

Torsions

Rings

Full wwPDB X-ray Structure Validation Report

Oligosaccharide Chain D

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain G

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain E

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain F
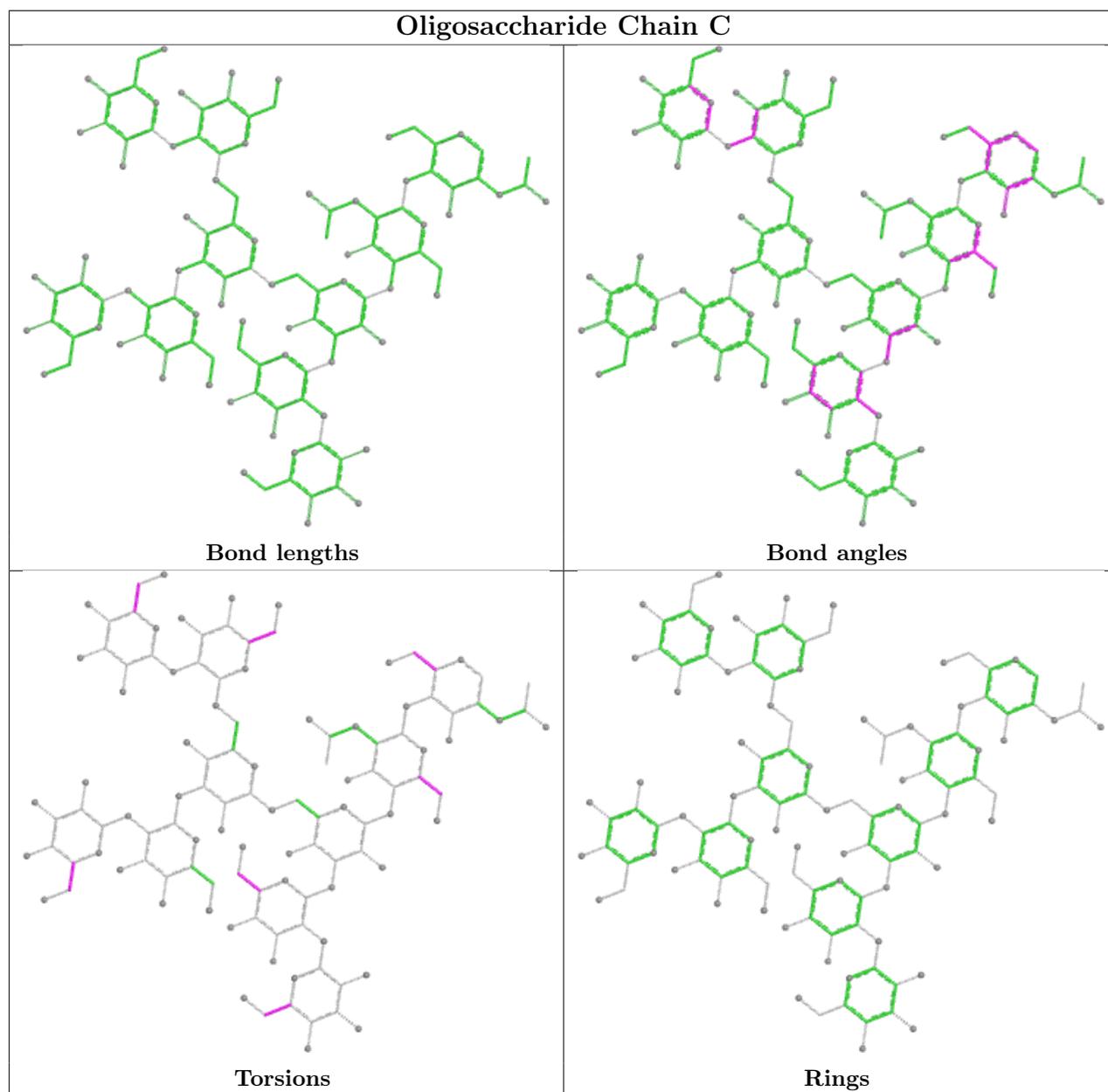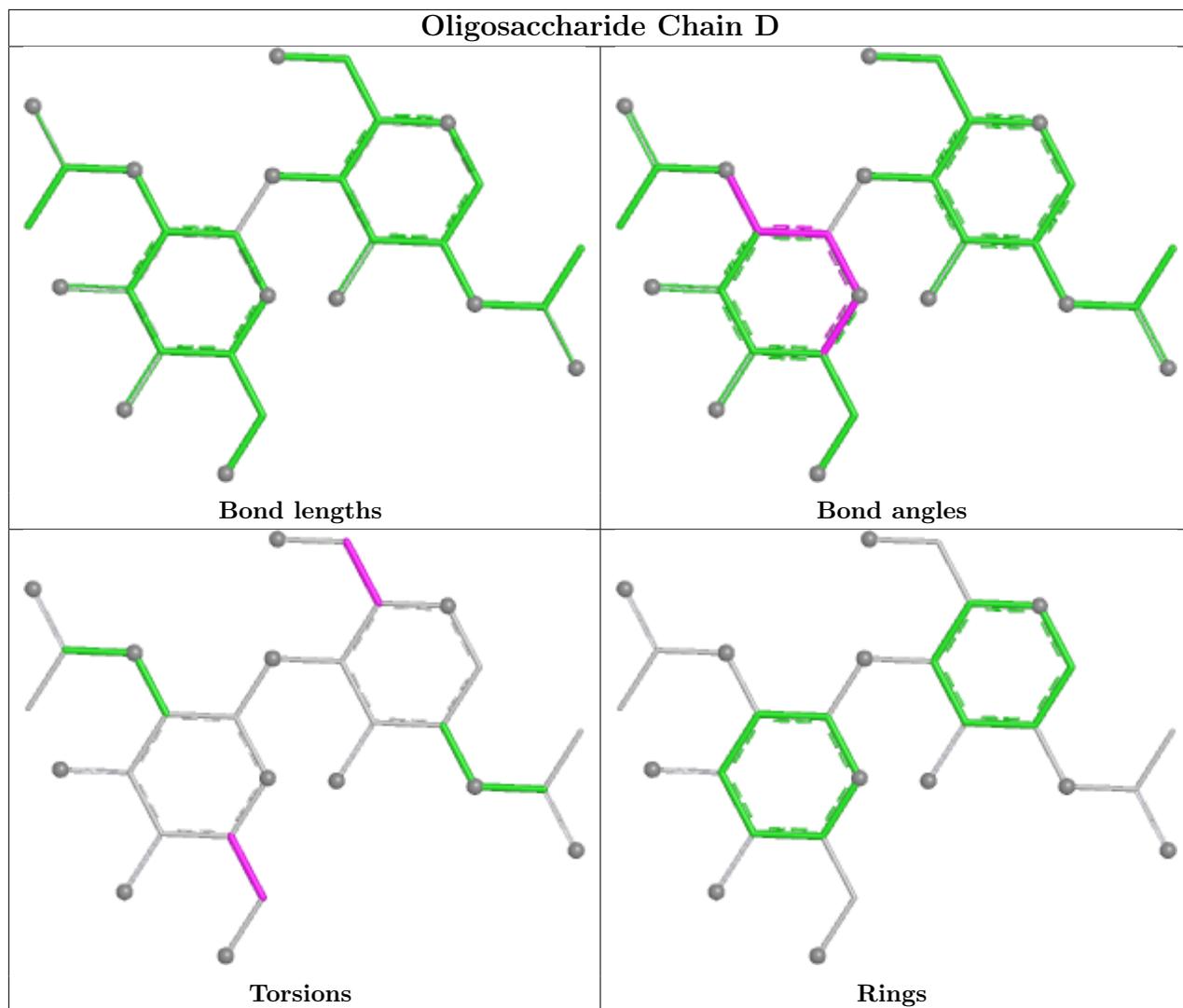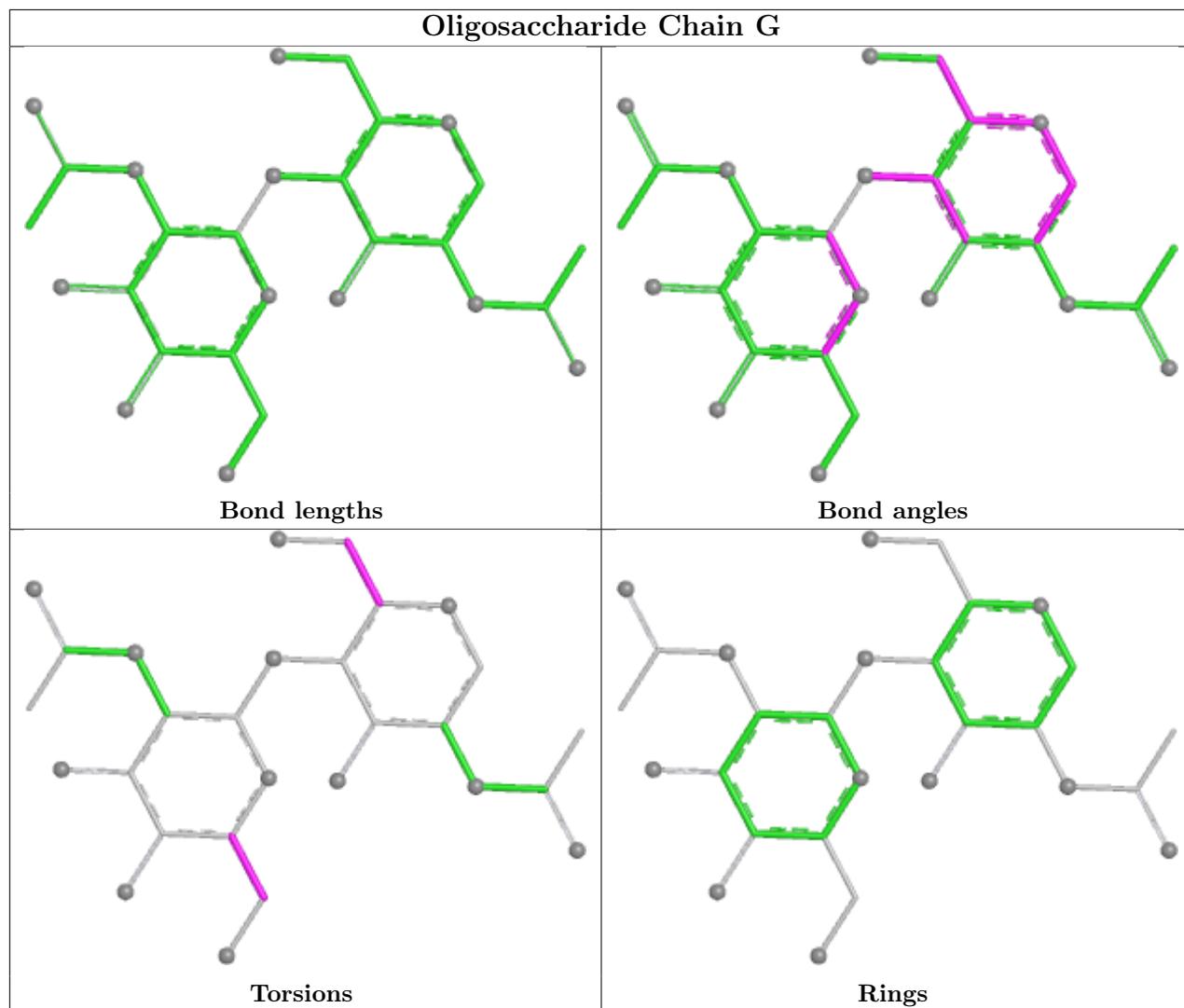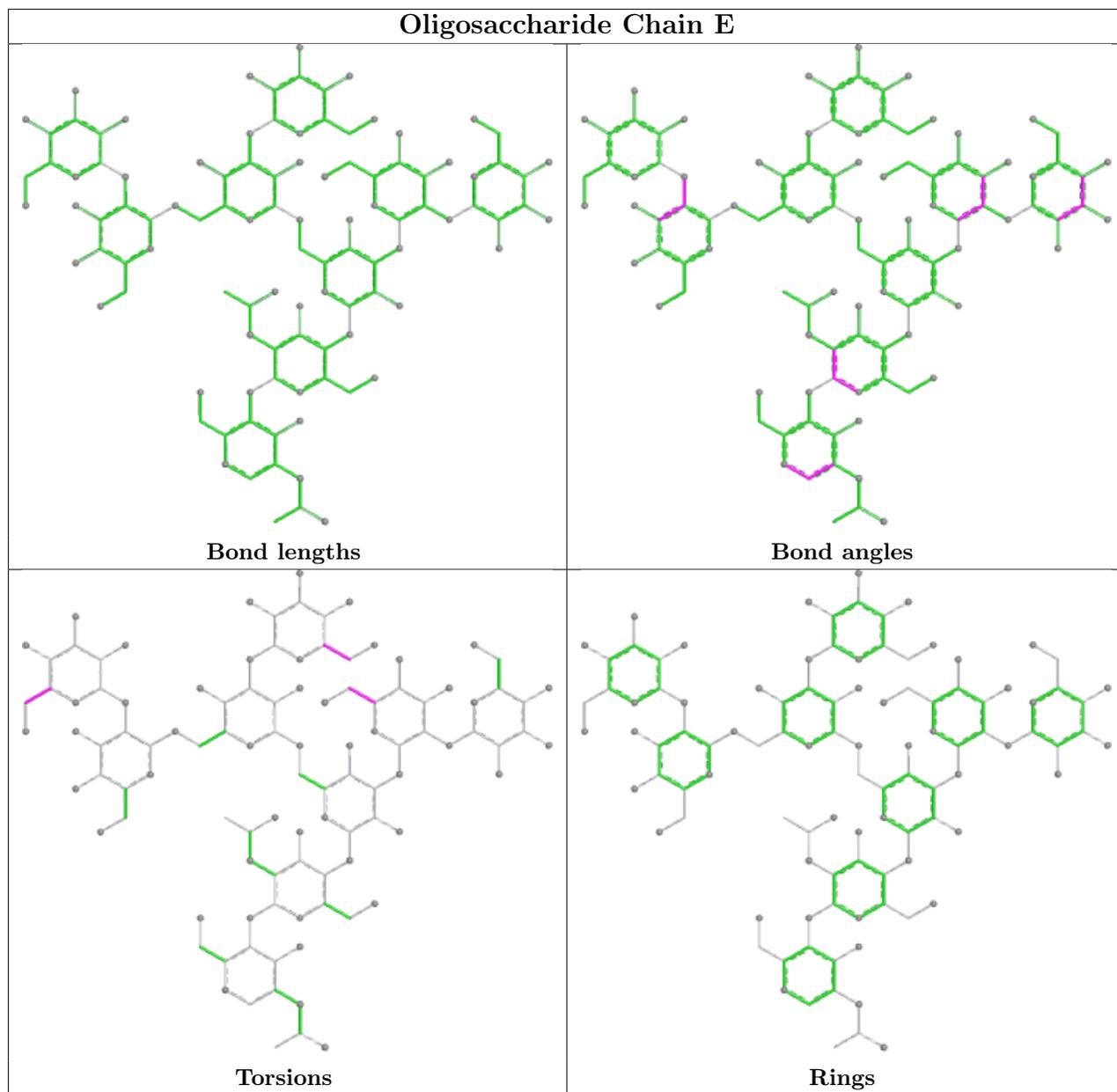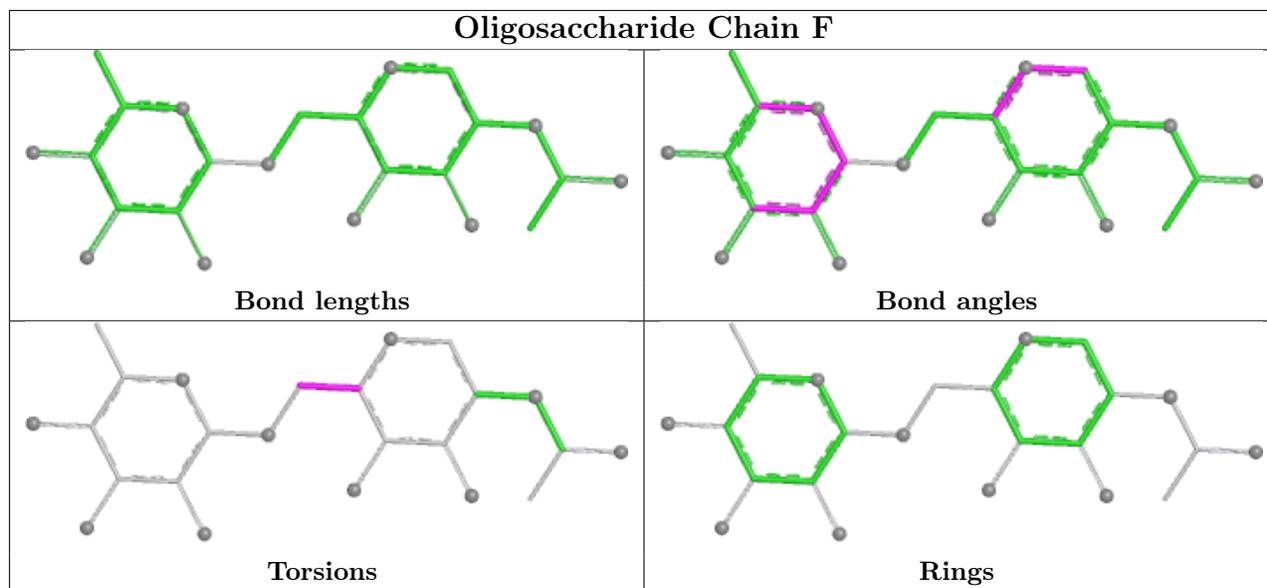
5.6 Ligand geometry ⓘ

Of 10 ligands modelled in this entry, 2 are monoatomic - leaving 8 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	PO4	A	703	-	4,4,4	0.88	0	6,6,6	0.43	0
10	TLA	B	703	-	9,9,9	1.18	0	12,12,12	1.38	2 (16%)
6	NAG	A	701	1	14,14,15	0.49	0	17,19,21	0.91	1 (5%)
7	IDR	A	702	-	13,13,13	1.07	0	18,19,19	0.80	0
11	PO3	B	704	-	0,3,3	-	-	0,3,3	-	-
8	PO4	B	705	-	4,4,4	0.85	0	6,6,6	0.44	0
6	NAG	B	701	1	14,14,15	0.55	0	17,19,21	1.40	2 (11%)
7	IDR	B	702	-	13,13,13	0.92	0	18,19,19	0.60	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
10	TLA	B	703	-	-	0/12/12/12	-
6	NAG	A	701	1	-	0/6/23/26	0/1/1/1
7	IDR	A	702	-	-	0/4/24/24	0/1/1/1
6	NAG	B	701	1	-	1/6/23/26	0/1/1/1
7	IDR	B	702	-	-	1/4/24/24	0/1/1/1

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
6	B	701	NAG	C1-O5-C5	3.95	117.49	112.19
10	B	703	TLA	O41-C4-C3	2.69	120.78	113.31
6	B	701	NAG	O7-C7-C8	-2.28	117.99	122.05
10	B	703	TLA	O2-C2-C1	-2.21	105.97	110.69
6	A	701	NAG	C1-O5-C5	2.18	115.11	112.19

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	B	701	NAG	O5-C5-C6-O6
7	B	702	IDR	O5-C5-C6-O6B

There are no ring outliers.

3 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	A	702	IDR	2	0
6	B	701	NAG	1	0
7	B	702	IDR	2	0

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å²)	Q<0.9
1	A	616/627 (98%)	-0.22	6 (0%)	79	82	15, 24, 48, 75	0
1	B	616/627 (98%)	-0.22	5 (0%)	82	84	15, 26, 51, 76	0
All	All	1232/1254 (98%)	-0.22	11 (0%)	81	83	15, 25, 48, 76	0

All (11) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	642	PRO	3.3
1	A	338	THR	2.8
1	A	27	GLU	2.8
1	B	465	PRO	2.6
1	B	467	PRO	2.6
1	B	641	VAL	2.6
1	A	335	ALA	2.2
1	A	100	ARG	2.1
1	A	146	LYS	2.1
1	B	338	THR	2.1
1	B	642	PRO	2.0

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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

6.3 Carbohydrates ⓘ

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
5	FUC	F	2	10/11	0.62	0.21	83,87,91,91	0
4	MAN	E	9	11/12	0.70	0.17	61,65,69,69	0
5	NAG	F	1	14/15	0.72	0.17	60,72,83,84	0
2	MAN	C	10	11/12	0.74	0.14	50,55,58,59	0
3	NAG	D	2	14/15	0.75	0.19	69,74,83,85	0
4	MAN	E	8	11/12	0.80	0.13	54,55,61,62	0
3	NAG	G	2	14/15	0.80	0.14	61,65,67,68	0
4	MAN	E	7	11/12	0.81	0.13	50,53,56,57	0
4	MAN	E	6	11/12	0.84	0.18	62,66,67,68	0
4	MAN	E	5	11/12	0.87	0.15	52,58,61,63	0
4	MAN	E	4	11/12	0.90	0.12	44,49,52,59	0
3	NAG	D	1	14/15	0.90	0.10	41,44,51,62	0
4	BMA	E	3	11/12	0.92	0.09	39,40,43,49	0
3	NAG	G	1	14/15	0.92	0.09	35,41,46,53	0
2	MAN	C	9	11/12	0.92	0.09	38,41,43,46	0
2	MAN	C	6	11/12	0.93	0.10	26,28,29,30	0
2	MAN	C	7	11/12	0.93	0.08	26,27,27,28	0
4	NAG	E	1	14/15	0.93	0.09	28,30,32,34	0
2	BMA	C	3	11/12	0.93	0.09	24,26,27,33	0
2	MAN	C	8	11/12	0.94	0.08	24,25,26,27	0
2	MAN	C	4	11/12	0.94	0.09	23,25,27,27	0
4	NAG	E	2	14/15	0.94	0.09	31,33,35,38	0
2	MAN	C	5	11/12	0.94	0.09	25,26,28,28	0
2	NAG	C	2	14/15	0.96	0.07	19,20,21,22	0
2	NAG	C	1	14/15	0.96	0.07	16,17,18,19	0

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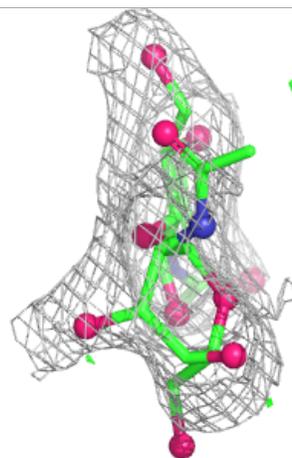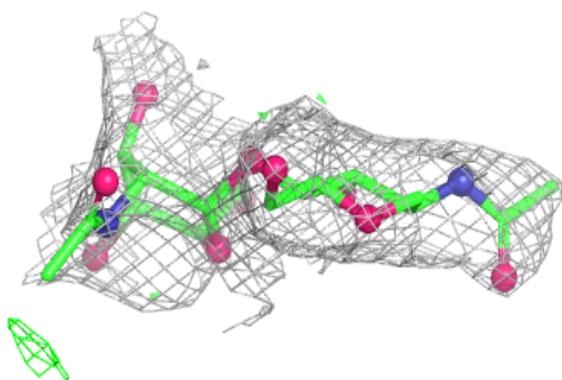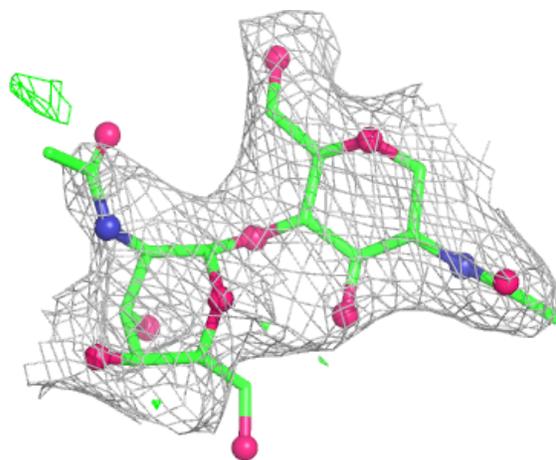
Electron density around Chain C:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
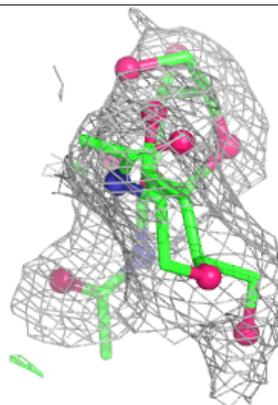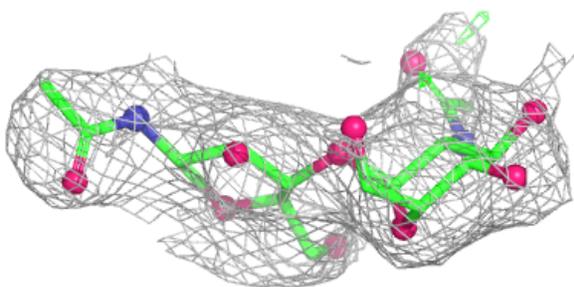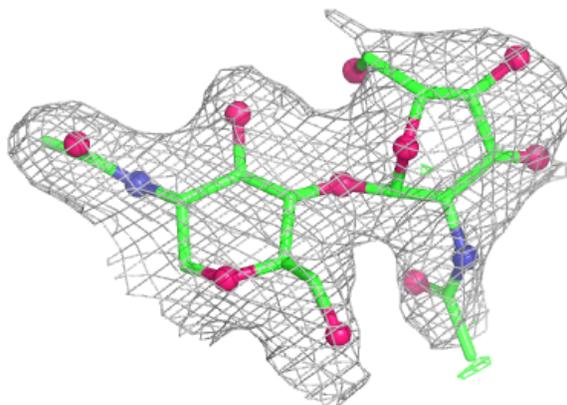mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)
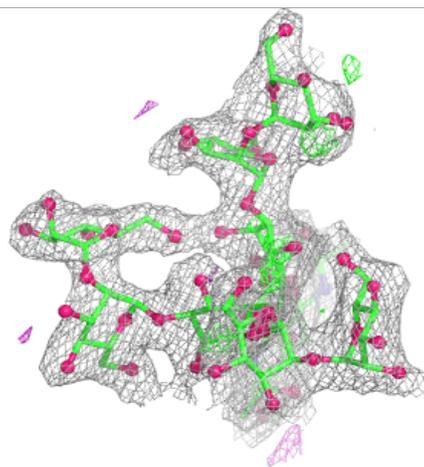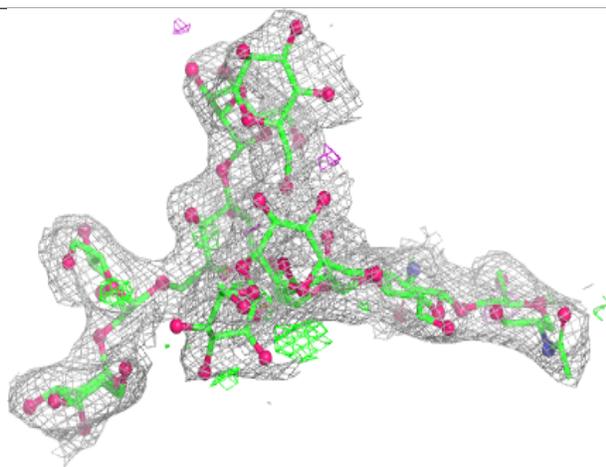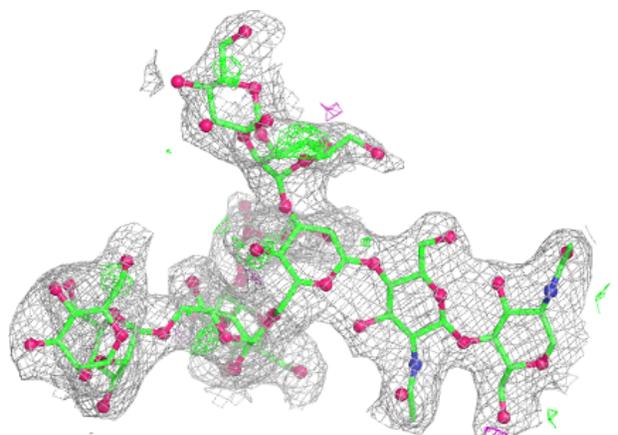
Electron density around Chain D:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)

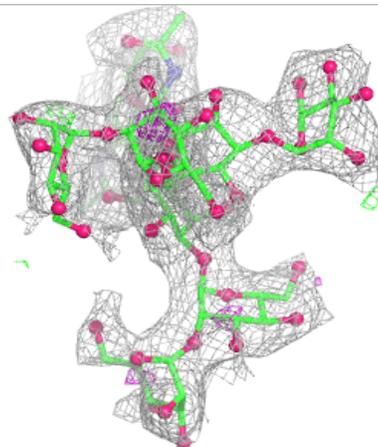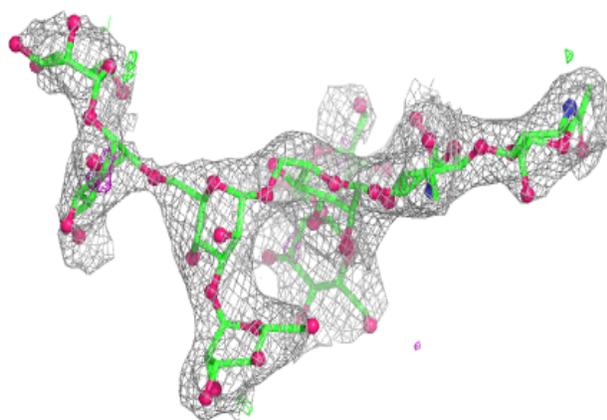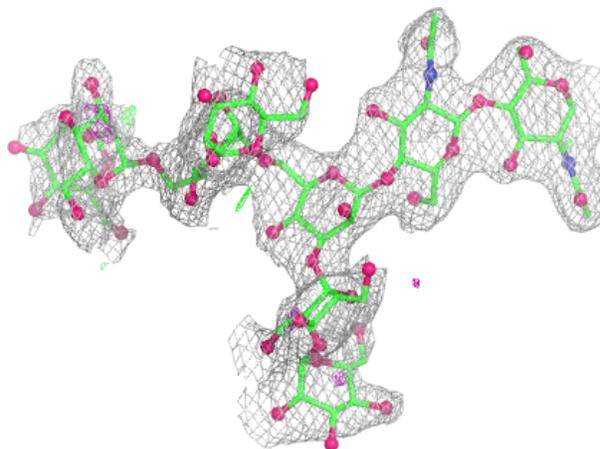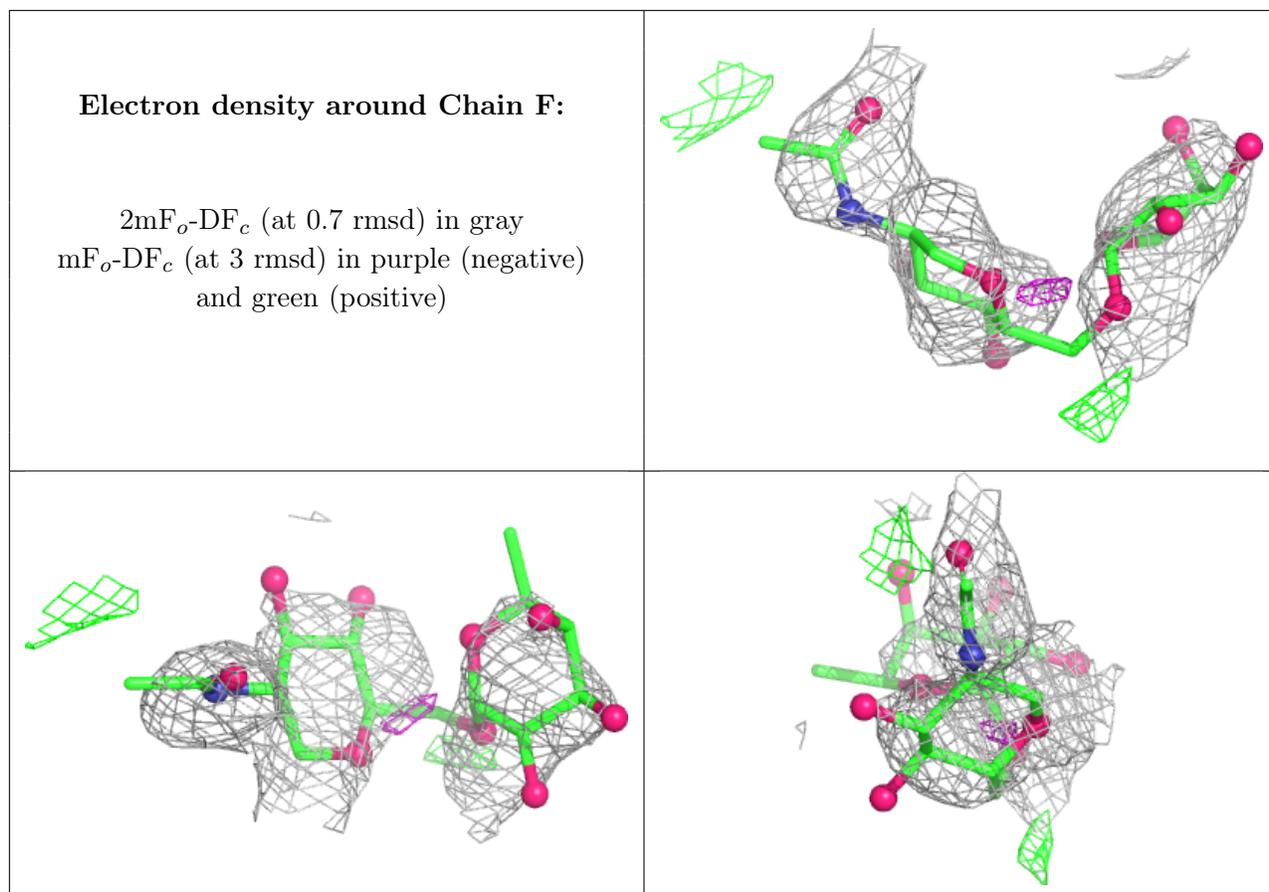**Electron density around Chain G:**

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 E:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around Chain F:

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

6.4 Ligands ⓘ

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
8	PO4	A	703	5/5	0.66	0.21	95,95,99,100	0
11	PO3	B	704	4/4	0.86	0.16	45,45,49,50	0
6	NAG	B	701	14/15	0.87	0.12	30,34,39,39	0
8	PO4	B	705	5/5	0.90	0.14	54,55,57,58	0
10	TLA	B	703	10/10	0.90	0.09	36,38,38,39	0
6	NAG	A	701	14/15	0.90	0.10	38,40,44,45	0
7	IDR	B	702	13/13	0.92	0.10	30,35,37,38	0
7	IDR	A	702	13/13	0.95	0.08	21,22,23,23	0
9	CL	B	706	1/1	0.99	0.07	15,15,15,15	0
9	CL	A	704	1/1	1.00	0.01	18,18,18,18	0

6.5 Other polymers (i)

There are no such residues in this entry.