



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 10:09 AM UTC

PDB ID : 1B5F / pdb_00001b5f
Title : NATIVE CARDOSIN A FROM CYNARA CARDUNCULUS L.
Authors : Frazao, C.; Bento, I.; Carrondo, M.A.
Deposited on : 1999-01-06
Resolution : 1.72 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

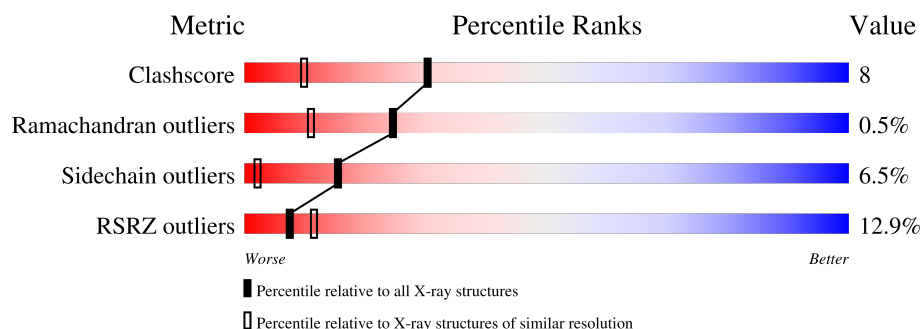
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.72 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))
Clashscore	190562	1049 (1.72-1.72)
Ramachandran outliers	187476	1041 (1.72-1.72)
Sidechain outliers	187428	1041 (1.72-1.72)
RSRZ outliers	180081	1039 (1.72-1.72)

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	239	14% 79% 18% .
1	C	239	15% 72% 26% .
2	B	87	7% 82% 16% .
2	D	87	9% 87% 9% .
3	E	5	100%
4	F	4	25% 50% 25%
4	H	4	100%

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Mol	Chain	Length	Quality of chain
5	G	6	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	BMA	H	3	X	-	-	-

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 5842 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.

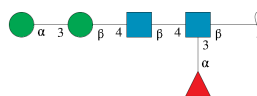
- Molecule 1 is a protein called PROTEIN (CARDOSIN A).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	239	Total	C	N	O	S	0	7	0
			1870	1188	305	369	8			
1	C	238	Total	C	N	O	S	0	8	0
			1870	1189	303	372	6			

- Molecule 2 is a protein called PROTEIN (CARDOSIN A).

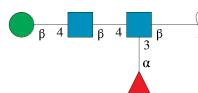
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	87	Total	C	N	O	S	0	1	0
			668	432	103	128	5			
2	D	87	Total	C	N	O	S	0	0	0
			663	429	103	126	5			

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



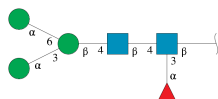
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	E	5	Total	C	N	O	0	0	0
			60	34	2	24			

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



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	F	4	Total	C	N	O	0	1	0
			53	30	3	20			
4	H	4	Total	C	N	O	0	1	0
			59	34	2	23			

- Molecule 5 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-3)]2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	G	6	Total	C	N	O	0	0	0
			71	40	2	29			

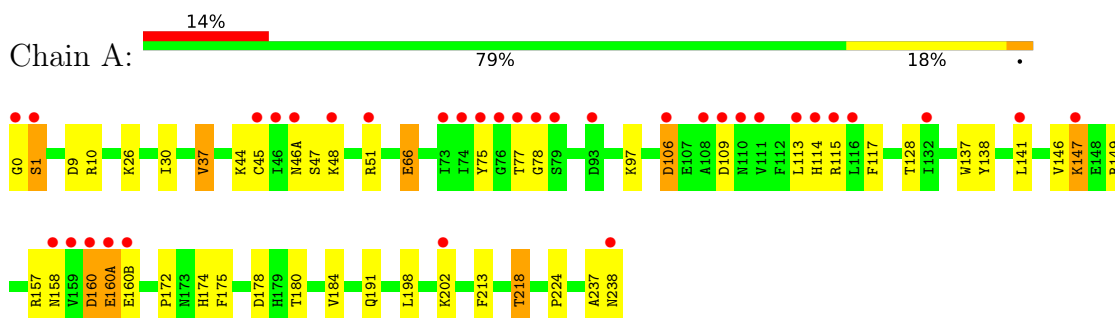
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	193	Total	O	0	0
			193	193		
6	B	73	Total	O	0	0
			73	73		
6	C	194	Total	O	0	0
			194	194		
6	D	68	Total	O	0	0
			68	68		

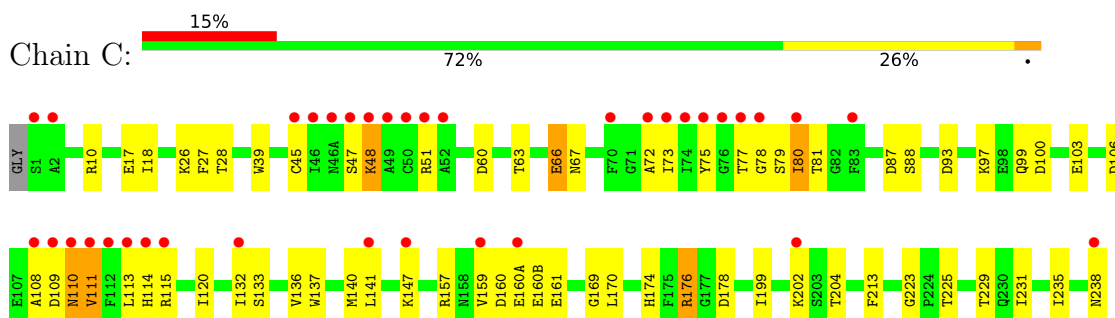
3 Residue-property plots [i](#)

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.

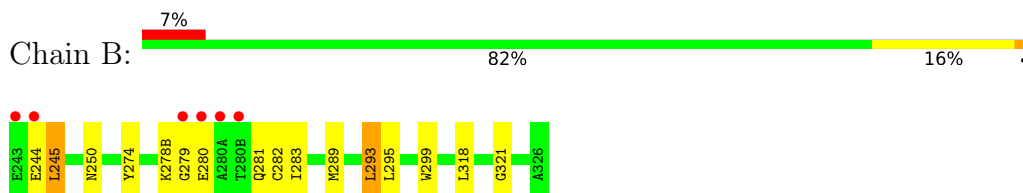
- Molecule 1: PROTEIN (CARDOSIN A)



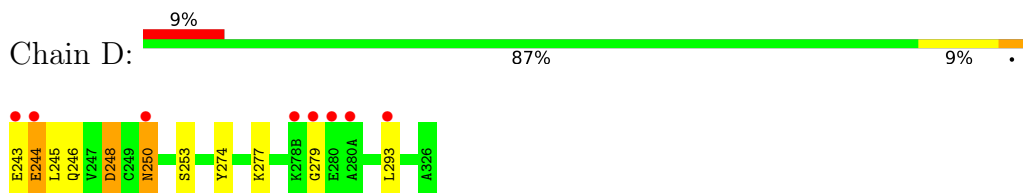
- Molecule 1: PROTEIN (CARDOSIN A)



- Molecule 2: PROTEIN (CARDOSIN A)



- Molecule 2: PROTEIN (CARDOSIN A)

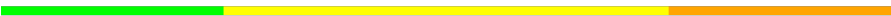


- Molecule 3: α -D-mannopyranose-(1-3)- β -D-mannopyranose-(1-4)-2-acetamido-2-deoxy- β -D-glucopyranose-(1-4)-[α -L-fucopyranose-(1-3)]2-acetamido-2-deoxy- β -D-glucopyranose

Chain E:  100%

NAG1
NAG2
BMA3
MAN4
FUC5

- Molecule 4: β -D-mannopyranose-(1-4)-2-acetamido-2-deoxy- β -D-glucopyranose-(1-4)-[α -L-fucopyranose-(1-3)]2-acetamido-2-deoxy- β -D-glucopyranose

Chain F:  25% 50% 25%

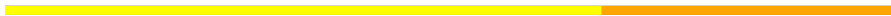
NAG1
NAG2
BMA3
FUC4

- Molecule 4: β -D-mannopyranose-(1-4)-2-acetamido-2-deoxy- β -D-glucopyranose-(1-4)-[α -L-fucopyranose-(1-3)]2-acetamido-2-deoxy- β -D-glucopyranose

Chain H:  100%

NAG1
NAG2
BMA3
FUC4

- Molecule 5: α -D-mannopyranose-(1-3)-[α -D-mannopyranose-(1-6)] β -D-mannopyranose-(1-4)-2-acetamido-2-deoxy- β -D-glucopyranose-(1-4)-[α -L-fucopyranose-(1-3)]2-acetamido-2-deoxy- β -D-glucopyranose

Chain G:  67% 33%

NAG1
NAG2
BMA3
MAN4
MAN5
FUC6

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	116.96Å 87.19Å 81.30Å 90.00° 104.43° 90.00°	Depositor
Resolution (Å)	34.80 – 1.72 34.80 – 1.72	Depositor EDS
% Data completeness (in resolution range)	99.8 (34.80-1.72) 95.6 (34.80-1.72)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.78 (at 1.72Å)	Xtriage
Refinement program	SHELXL-97	Depositor
R, R_{free}	0.206 , 0.256 0.196 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	19.1	Xtriage
Anisotropy	0.292	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 67.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	5842	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.72% 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: MAN, FUC, BMA, 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	0.51	0/1932	1.40	12/2623 (0.5%)
1	C	0.51	0/1944	1.45	12/2639 (0.5%)
2	B	0.52	0/687	1.31	2/930 (0.2%)
2	D	0.53	0/678	1.22	3/918 (0.3%)
All	All	0.51	0/5241	1.39	29/7110 (0.4%)

There are no bond length outliers.

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	213	PHE	CA-CB-CG	9.66	123.46	113.80
1	A	106	ASP	CA-CB-CG	9.12	121.72	112.60
1	A	213	PHE	CA-CB-CG	8.34	122.14	113.80
1	A	46(A)	ASN	CA-CB-CG	8.07	120.67	112.60
1	A	178	ASP	CA-CB-CG	7.40	120.00	112.60
1	C	26[A]	LYS	CA-C-O	7.36	129.38	120.92
1	C	26[B]	LYS	CA-C-O	7.36	129.38	120.92
1	C	178	ASP	CA-CB-CG	7.30	119.90	112.60
1	A	158	ASN	CA-CB-CG	6.54	119.14	112.60
1	C	204	THR	C-N-CA	6.38	135.69	122.30
2	D	250	ASN	CA-CB-CG	-6.32	106.28	112.60
1	C	223	GLY	O-C-N	6.24	128.01	121.77
1	A	128	THR	CA-C-N	6.17	130.65	121.77
1	A	128	THR	C-N-CA	6.17	130.65	121.77
1	A	158	ASN	CA-C-N	6.09	131.32	123.03
1	A	158	ASN	C-N-CA	6.09	131.32	123.03
2	B	250	ASN	CA-CB-CG	5.97	118.57	112.60
1	A	138	TYR	CA-CB-CG	5.81	124.36	113.90
1	A	149	ARG	CD-NE-CZ	5.60	132.23	124.40
1	C	18	ILE	CA-C-N	-5.53	118.29	122.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	18	ILE	C-N-CA	-5.53	118.29	122.33
2	D	274	TYR	CA-CB-CG	5.39	123.61	113.90
1	A	174	HIS	CA-CB-CG	-5.26	108.54	113.80
1	C	174	HIS	CA-CB-CG	-5.26	108.54	113.80
2	B	274	TYR	CA-CB-CG	5.12	123.12	113.90
1	C	93	ASP	CA-C-N	-5.12	115.03	122.65
1	C	93	ASP	C-N-CA	-5.12	115.03	122.65
2	D	248	ASP	CA-CB-CG	5.05	117.65	112.60
1	C	140	MET	CA-C-O	5.01	125.86	120.55

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	1870	0	1763	27	0
1	C	1870	0	1762	40	0
2	B	668	0	651	9	0
2	D	663	0	649	6	0
3	E	60	0	52	0	0
4	F	53	0	42	1	0
4	H	59	0	53	6	0
5	G	71	0	61	4	0
6	A	193	0	0	5	0
6	B	73	0	0	2	0
6	C	194	0	0	7	0
6	D	68	0	0	2	0
All	All	5842	0	5033	87	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 8.

All (87) 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:225:THR:O	1:C:229[A]:THR:HG22	1.89	0.72
6:B:443:HOH:O	4:F:1[A]:NAG:H82	1.93	0.68
2:B:245:LEU:HG	6:B:434:HOH:O	1.94	0.68
1:C:229[B]:THR:HG21	6:C:455:HOH:O	1.94	0.68
1:C:238:ASN:OD1	2:D:245:LEU:HA	1.96	0.66
1:A:45[A]:CYS:SG	1:A:47[A]:SER:HB2	2.37	0.65
1:C:147:LYS:HE3	6:C:435:HOH:O	1.97	0.62
1:C:137:TRP:CZ2	1:C:141:LEU:HD21	2.35	0.61
1:A:137:TRP:CZ2	1:A:141:LEU:HD21	2.38	0.59
1:A:66:GLU:HG2	6:A:315:HOH:O	2.03	0.59
1:A:184:VAL:HA	1:A:191:GLN:O	2.04	0.58
4:H:1:NAG:O4	4:H:2:NAG:H83	2.05	0.57
1:C:137:TRP:NE1	1:C:141:LEU:HD11	2.20	0.57
1:C:238:ASN:HB2	2:D:245:LEU:HD22	1.86	0.57
1:C:238:ASN:CG	2:D:246:GLN:H	2.15	0.55
1:A:37:VAL:HG22	6:A:400:HOH:O	2.06	0.54
4:H:3:BMA:O2	4:H:3:BMA:H62	2.07	0.54
1:A:137:TRP:NE1	1:A:141:LEU:HD11	2.23	0.54
1:A:109:ASP:O	1:A:113:LEU:HB3	2.08	0.53
1:C:160(A)[B]:GLU:O	1:C:160(B):GLU:HG3	2.08	0.53
1:A:218:THR:HG21	6:A:321:HOH:O	2.09	0.53
1:C:48:LYS:HD2	1:C:113:LEU:CD2	2.39	0.52
1:A:48:LYS:O	1:A:48:LYS:HG3	2.11	0.51
1:C:114:HIS:HB2	6:C:316:HOH:O	2.09	0.50
1:A:237:ALA:O	1:A:238:ASN:HB3	2.12	0.50
2:B:244:GLU:O	2:B:244:GLU:HG3	2.12	0.50
5:G:1:NAG:O4	5:G:2:NAG:O7	2.30	0.49
1:C:73:ILE:O	1:C:79:SER:HB2	2.12	0.49
1:C:72:ALA:CB	1:C:81:THR:HG22	2.43	0.48
4:H:1:NAG:H4	4:H:4[B]:FUC:O5	2.13	0.48
1:C:159:VAL:CG1	1:C:160(A)[B]:GLU:HG3	2.44	0.48
1:C:157:ARG:HB3	6:C:361:HOH:O	2.14	0.48
1:A:26:LYS:HG3	6:A:456:HOH:O	2.13	0.48
1:A:48:LYS:O	1:A:51:ARG:HG2	2.13	0.48
1:C:78:GLY:HA3	1:C:111:VAL:HG21	1.96	0.47
2:B:282:CYS:C	2:B:283:ILE:HD12	2.40	0.47
1:C:39:TRP:CD2	1:C:80:ILE:HG12	2.49	0.47
1:A:137:TRP:CE2	1:A:141:LEU:HD11	2.50	0.47
1:A:224:PRO:HD2	2:B:299:TRP:CE2	2.49	0.47
1:C:169:GLY:C	1:C:170:LEU:HD23	2.39	0.47
1:C:231:ILE:O	1:C:235:ILE:HG12	2.14	0.47
4:H:1:NAG:O7	4:H:4[B]:FUC:H5	2.14	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:244:GLU:HA	2:B:244:GLU:OE1	2.15	0.47
1:C:132:ILE:HD12	1:C:133:SER:N	2.29	0.46
2:D:243:GLU:O	2:D:244:GLU:HB2	2.16	0.46
1:A:75:TYR:N	1:A:78:GLY:O	2.49	0.45
5:G:1:NAG:H83	5:G:6:FUC:O2	2.16	0.45
1:C:159:VAL:HG13	1:C:160(A)[B]:GLU:HG3	1.98	0.45
1:C:176:ARG:HD2	6:D:408:HOH:O	2.17	0.45
1:A:114:HIS:O	1:A:115:ARG:HD2	2.17	0.45
2:B:278(B):LYS:O	2:B:280:GLU:N	2.50	0.45
1:A:141:LEU:HD23	1:A:146:VAL:CG2	2.46	0.44
1:C:60:ASP:N	1:C:60:ASP:OD1	2.50	0.44
1:A:172:PRO:HA	1:A:175:PHE:CE1	2.52	0.44
2:B:245:LEU:HD23	2:B:245:LEU:N	2.32	0.44
1:C:10:ARG:NE	6:C:314:HOH:O	2.50	0.44
1:A:157:ARG:HG3	1:A:157:ARG:NH1	2.32	0.44
1:A:30:ILE:HD11	1:A:117:PHE:CE2	2.52	0.44
1:C:99:GLN:OE1	1:C:136:VAL:HA	2.18	0.44
1:A:9:ASP:OD2	1:A:10:ARG:NH2	2.50	0.44
1:C:75:TYR:N	1:C:78:GLY:O	2.49	0.44
1:A:157:ARG:NH2	6:A:323:HOH:O	2.50	0.44
1:A:160:ASP:OD1	1:A:160(A):GLU:N	2.51	0.43
1:C:75:TYR:HB2	1:C:78:GLY:O	2.18	0.43
1:C:17[B]:GLU:OE2	1:C:28:THR:OG1	2.29	0.43
1:C:161:GLU:HB3	6:C:395:HOH:O	2.17	0.43
4:H:1:NAG:H2	4:H:4[B]:FUC:O5	2.17	0.43
2:D:277:LYS:NZ	6:D:407:HOH:O	2.50	0.43
1:A:0:GLY:HA2	1:A:147:LYS:HE3	2.01	0.43
5:G:1:NAG:H83	5:G:6:FUC:C1	2.49	0.42
1:C:199:ILE:O	1:C:202[A]:LYS:HB3	2.19	0.42
4:H:1:NAG:H2	4:H:4[B]:FUC:C5	2.49	0.42
1:A:113:LEU:HG	1:A:114:HIS:ND1	2.34	0.42
1:C:66:GLU:HG3	1:C:67:ASN:N	2.24	0.42
1:C:48:LYS:HD2	1:C:113:LEU:HD21	2.01	0.42
1:A:1:SER:OG	1:A:147:LYS:HG2	2.19	0.42
1:C:87:ASP:OD1	1:C:88:SER:N	2.51	0.42
1:C:160:ASP:HA	6:C:394:HOH:O	2.20	0.41
2:B:293:LEU:O	2:B:295:LEU:HB2	2.21	0.41
1:C:100:ASP:OD2	5:G:1:NAG:O6	2.30	0.41
1:C:108:ALA:HB1	1:C:110:ASN:ND2	2.35	0.41
1:C:17[B]:GLU:OE1	1:C:27:PHE:O	2.39	0.41
1:C:45:CYS:SG	1:C:47:SER:HB3	2.60	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:248:ASP:OD1	2:D:250:ASN:HB2	2.21	0.41
1:C:75:TYR:CZ	1:C:120:ILE:HD12	2.55	0.40
1:A:180:THR:O	2:B:321:GLY:HA2	2.21	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	244/239 (102%)	231 (95%)	12 (5%)	1 (0%)	30	16
1	C	244/239 (102%)	235 (96%)	9 (4%)	0	100	100
2	B	86/87 (99%)	83 (96%)	2 (2%)	1 (1%)	10	2
2	D	85/87 (98%)	81 (95%)	3 (4%)	1 (1%)	10	2
All	All	659/652 (101%)	630 (96%)	26 (4%)	3 (0%)	24	11

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	279	GLY
2	D	279	GLY
1	A	1	SER

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	206/199 (104%)	192 (93%)	14 (7%)	14	2
1	C	207/199 (104%)	193 (93%)	14 (7%)	14	2
2	B	72/71 (101%)	67 (93%)	5 (7%)	14	2
2	D	71/71 (100%)	68 (96%)	3 (4%)	26	6
All	All	556/540 (103%)	520 (94%)	36 (6%)	15	2

All (36) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	37	VAL
1	A	44	LYS
1	A	66	GLU
1	A	77	THR
1	A	97[A]	LYS
1	A	97[B]	LYS
1	A	106	ASP
1	A	147	LYS
1	A	160	ASP
1	A	160(A)	GLU
1	A	160(B)	GLU
1	A	198	LEU
1	A	202	LYS
1	A	218	THR
2	B	245	LEU
2	B	281	GLN
2	B	289	MET
2	B	293	LEU
2	B	318	LEU
1	C	48	LYS
1	C	51	ARG
1	C	63	THR
1	C	66	GLU
1	C	77	THR
1	C	80	ILE
1	C	97	LYS
1	C	103	GLU
1	C	106	ASP
1	C	109	ASP
1	C	110	ASN
1	C	111	VAL
1	C	115	ARG
1	C	176	ARG

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Mol	Chain	Res	Type
2	D	244	GLU
2	D	253	SER
2	D	293	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	A	86	GLN
1	A	187	GLN
1	A	191	GLN
1	A	211	GLN
1	A	233	HIS
2	B	317	ASN
1	C	86	GLN
1	C	114	HIS
1	C	126	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 ⓘ

21 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	$\# Z > 2$
3	NAG	E	1	3,1	14,14,15	0.76	0	17,19,21	1.54	4 (23%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	NAG	E	2	3	14,14,15	1.01	1 (7%)	17,19,21	1.63	3 (17%)
3	BMA	E	3	3	11,11,12	1.06	1 (9%)	15,15,17	1.79	5 (33%)
3	MAN	E	4	3	11,11,12	0.79	0	15,15,17	1.58	3 (20%)
3	FUC	E	5	3	10,10,11	0.79	0	14,14,16	0.90	1 (7%)
4	NAG	F	1[A]	-	14,14,15	0.88	0	17,19,21	1.04	1 (5%)
4	NAG	F	1[B]	-	14,14,15	0.89	0	17,19,21	0.71	0
4	NAG	F	2	4	14,14,15	0.87	0	17,19,21	1.19	2 (11%)
4	BMA	F	3	4	11,11,12	0.53	0	15,15,17	1.71	3 (20%)
4	FUC	F	4	4	10,10,11	0.82	0	14,14,16	0.92	0
5	NAG	G	1	5,1	14,14,15	0.75	0	17,19,21	1.75	4 (23%)
5	NAG	G	2	5	14,14,15	0.69	0	17,19,21	1.03	2 (11%)
5	BMA	G	3	5	11,11,12	0.76	0	15,15,17	1.22	1 (6%)
5	MAN	G	4	5	11,11,12	0.89	0	15,15,17	1.28	1 (6%)
5	MAN	G	5	5	11,11,12	0.77	0	15,15,17	2.16	2 (13%)
5	FUC	G	6	5	10,10,11	0.88	0	14,14,16	0.92	0
4	NAG	H	1	4,2	14,14,15	0.88	0	17,19,21	1.32	2 (11%)
4	NAG	H	2	4	14,14,15	0.86	1 (7%)	17,19,21	1.16	1 (5%)
4	BMA	H	3	4	11,11,12	0.97	0	15,15,17	2.15	5 (33%)
4	FUC	H	4[A]	4	10,10,11	0.89	0	14,14,16	1.10	1 (7%)
4	FUC	H	4[B]	4	10,10,11	0.95	0	14,14,16	1.65	3 (21%)

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	NAG	E	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	E	2	3	-	4/6/23/26	0/1/1/1
3	BMA	E	3	3	-	0/2/19/22	0/1/1/1
3	MAN	E	4	3	-	0/2/19/22	0/1/1/1
3	FUC	E	5	3	-	-	0/1/1/1
4	NAG	F	1[A]	-	-	2/6/23/26	0/1/1/1
4	NAG	F	1[B]	-	-	3/6/23/26	0/1/1/1
4	NAG	F	2	4	-	4/6/23/26	0/1/1/1
4	BMA	F	3	4	-	1/2/19/22	0/1/1/1
4	FUC	F	4	4	-	-	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	G	1	5,1	-	2/6/23/26	0/1/1/1
5	NAG	G	2	5	-	3/6/23/26	0/1/1/1
5	BMA	G	3	5	-	0/2/19/22	0/1/1/1
5	MAN	G	4	5	-	1/2/19/22	0/1/1/1
5	MAN	G	5	5	-	2/2/19/22	0/1/1/1
5	FUC	G	6	5	-	-	0/1/1/1
4	NAG	H	1	4,2	-	2/6/23/26	0/1/1/1
4	NAG	H	2	4	-	4/6/23/26	0/1/1/1
4	BMA	H	3	4	1/1/4/5	1/2/19/22	1/1/1/1
4	FUC	H	4[A]	4	-	-	0/1/1/1
4	FUC	H	4[B]	4	-	-	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	E	2	NAG	O5-C1	-2.90	1.38	1.43
3	E	3	BMA	C2-C3	2.50	1.56	1.52
4	H	2	NAG	O5-C1	-2.36	1.39	1.43

All (44) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	G	5	MAN	O2-C2-C3	5.39	121.31	110.15
5	G	1	NAG	C1-O5-C5	5.29	119.27	112.19
4	H	4[B]	FUC	C1-C2-C3	4.99	116.91	109.64
4	F	3	BMA	O2-C2-C3	4.73	119.94	110.15
3	E	4	MAN	C1-C2-C3	-4.25	103.45	109.64
4	H	3	BMA	O2-C2-C3	4.12	118.68	110.15
4	H	3	BMA	C1-O5-C5	4.11	117.69	112.19
3	E	2	NAG	C1-O5-C5	3.85	117.34	112.19
3	E	1	NAG	C2-N2-C7	-3.80	117.81	122.90
5	G	5	MAN	C1-C2-C3	-3.75	104.18	109.64
4	H	2	NAG	C1-O5-C5	3.73	117.19	112.19
4	H	3	BMA	O5-C5-C6	3.64	114.76	107.66
4	H	3	BMA	C1-C2-C3	-3.53	104.50	109.64
3	E	3	BMA	C2-C3-C4	-3.46	104.77	110.86
3	E	3	BMA	O3-C3-C4	-3.18	102.88	110.38
3	E	2	NAG	C8-C7-N2	-3.17	110.86	116.12
5	G	4	MAN	C1-C2-C3	-3.13	105.08	109.64
4	H	1	NAG	C1-O5-C5	3.00	116.20	112.19
4	H	4[A]	FUC	C2-C3-C4	-2.95	105.67	110.86

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	H	1	NAG	C2-N2-C7	-2.90	119.02	122.90
5	G	3	BMA	O3-C3-C4	-2.77	103.84	110.38
4	F	2	NAG	C4-C3-C2	2.75	115.04	111.02
3	E	3	BMA	C1-O5-C5	2.73	115.84	112.19
4	F	3	BMA	C1-C2-C3	-2.70	105.71	109.64
3	E	4	MAN	O2-C2-C3	2.64	115.63	110.15
3	E	3	BMA	C1-C2-C3	-2.56	105.91	109.64
5	G	2	NAG	C1-O5-C5	2.50	115.53	112.19
3	E	1	NAG	C1-O5-C5	2.47	115.49	112.19
3	E	4	MAN	C6-C5-C4	2.46	119.07	113.02
3	E	2	NAG	O3-C3-C4	2.46	116.17	110.38
5	G	1	NAG	C4-C3-C2	-2.38	107.53	111.02
4	F	2	NAG	C2-N2-C7	-2.34	119.77	122.90
3	E	1	NAG	C1-C2-N2	2.33	114.10	110.43
3	E	1	NAG	O3-C3-C4	-2.21	105.17	110.38
3	E	5	FUC	C1-C2-C3	2.19	112.83	109.64
4	H	3	BMA	O3-C3-C2	2.18	114.50	110.05
5	G	1	NAG	C8-C7-N2	-2.17	112.51	116.12
4	F	1[A]	NAG	O7-C7-N2	2.16	125.81	121.98
4	H	4[B]	FUC	C1-O5-C5	2.15	118.04	112.97
3	E	3	BMA	O2-C2-C3	-2.11	105.77	110.15
5	G	2	NAG	C8-C7-N2	-2.10	112.64	116.12
4	H	4[B]	FUC	O5-C1-C2	2.06	115.70	110.79
5	G	1	NAG	O7-C7-N2	2.05	125.61	121.98
4	F	3	BMA	O5-C5-C6	2.00	111.56	107.66

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
4	H	3	BMA	C1

All (31) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	E	2	NAG	O7-C7-N2-C2
4	F	1[B]	NAG	C1-C2-N2-C7
4	F	1[B]	NAG	C8-C7-N2-C2
4	F	1[B]	NAG	O7-C7-N2-C2
4	F	2	NAG	C8-C7-N2-C2
4	F	2	NAG	O7-C7-N2-C2
4	H	2	NAG	C1-C2-N2-C7
4	H	2	NAG	C8-C7-N2-C2

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Mol	Chain	Res	Type	Atoms
4	H	2	NAG	O7-C7-N2-C2
3	E	2	NAG	C8-C7-N2-C2
4	F	2	NAG	O5-C5-C6-O6
4	F	2	NAG	C4-C5-C6-O6
5	G	1	NAG	C8-C7-N2-C2
5	G	5	MAN	O5-C5-C6-O6
5	G	1	NAG	O7-C7-N2-C2
4	F	1[A]	NAG	C8-C7-N2-C2
4	F	1[A]	NAG	O7-C7-N2-C2
3	E	1	NAG	C8-C7-N2-C2
3	E	1	NAG	O7-C7-N2-C2
4	F	3	BMA	O5-C5-C6-O6
3	E	2	NAG	C4-C5-C6-O6
5	G	5	MAN	C4-C5-C6-O6
4	H	3	BMA	O5-C5-C6-O6
4	H	2	NAG	C3-C2-N2-C7
5	G	2	NAG	C8-C7-N2-C2
5	G	2	NAG	C4-C5-C6-O6
5	G	2	NAG	O7-C7-N2-C2
5	G	4	MAN	O5-C5-C6-O6
4	H	1	NAG	O5-C5-C6-O6
4	H	1	NAG	C4-C5-C6-O6
3	E	2	NAG	O5-C5-C6-O6

All (1) ring outliers are listed below:

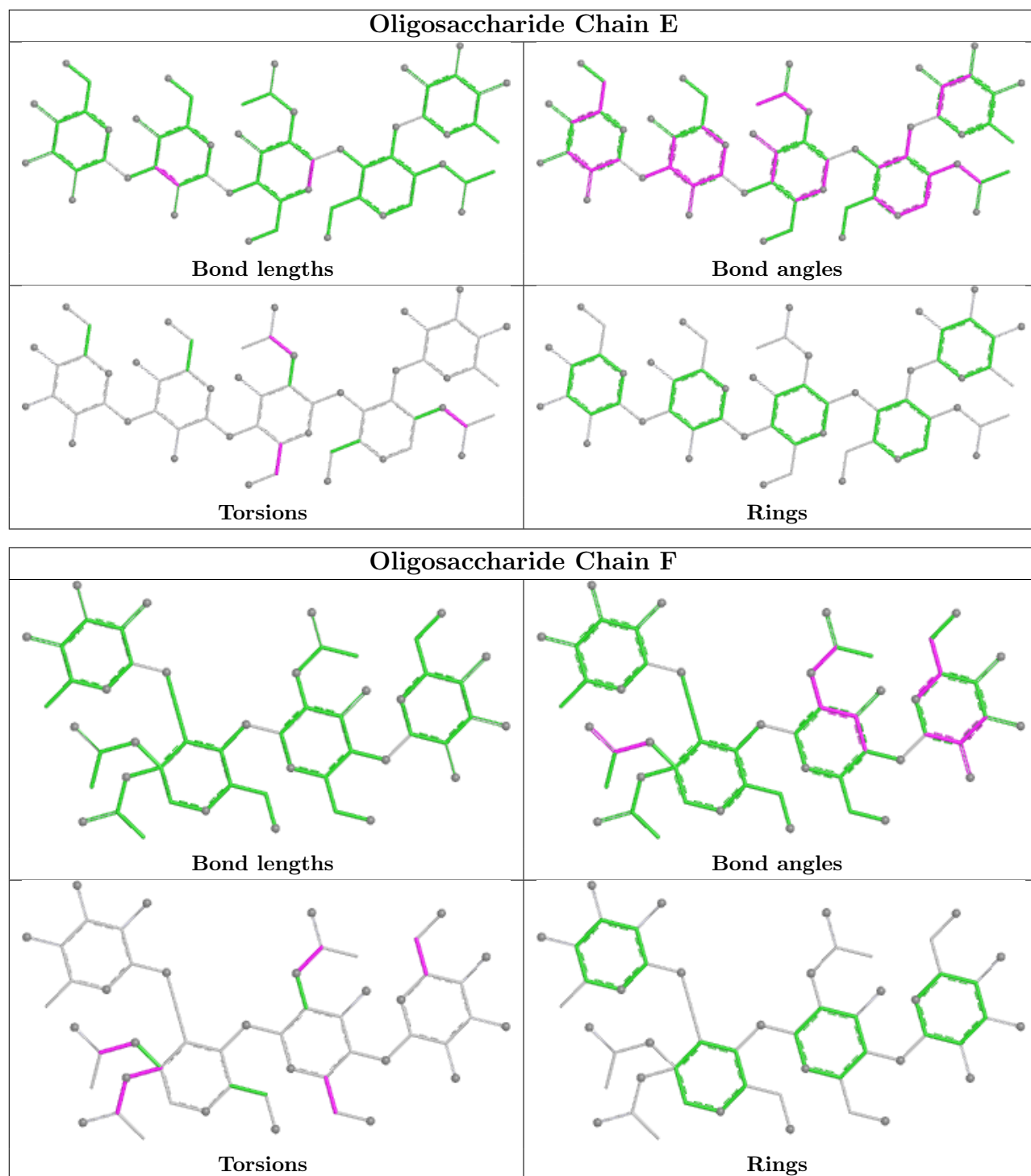
Mol	Chain	Res	Type	Atoms
4	H	3	BMA	C1-C2-C3-C4-C5-O5

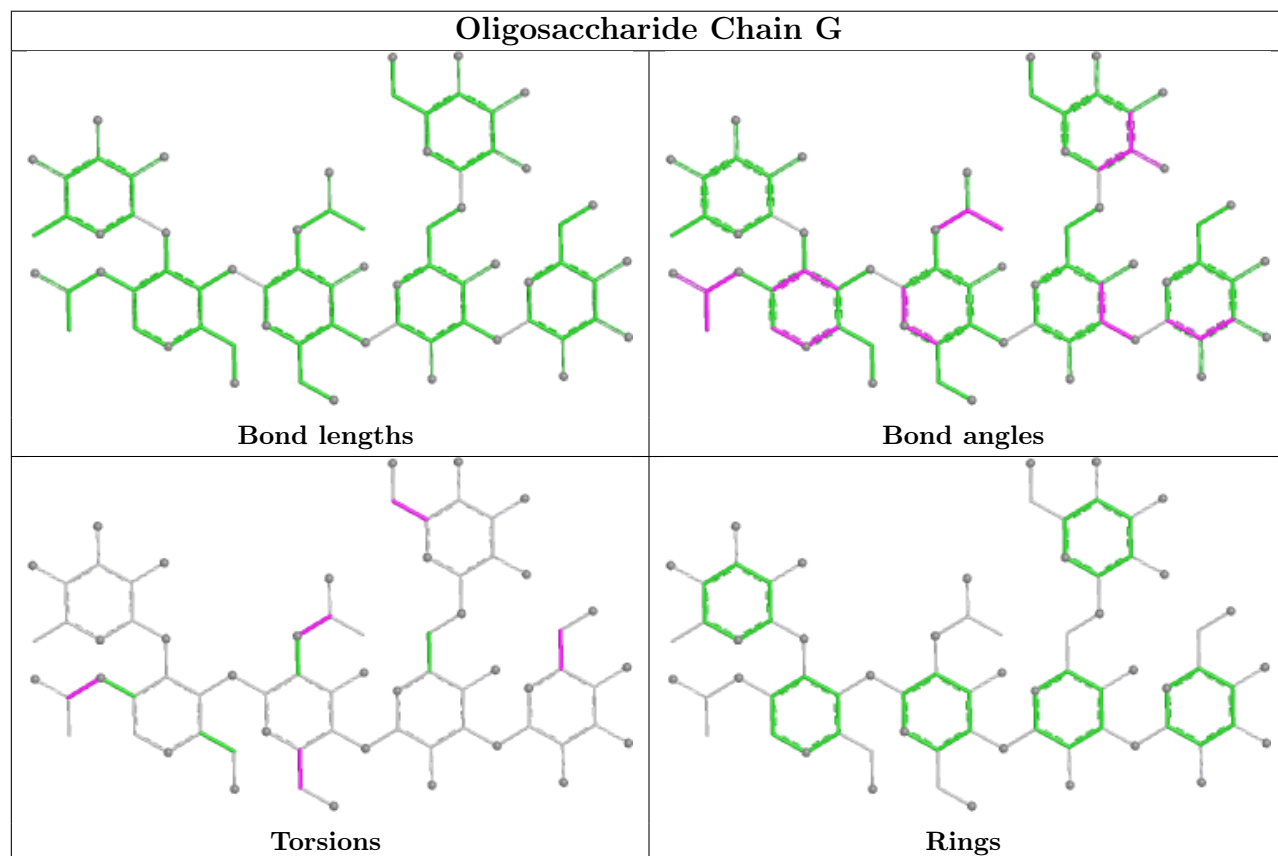
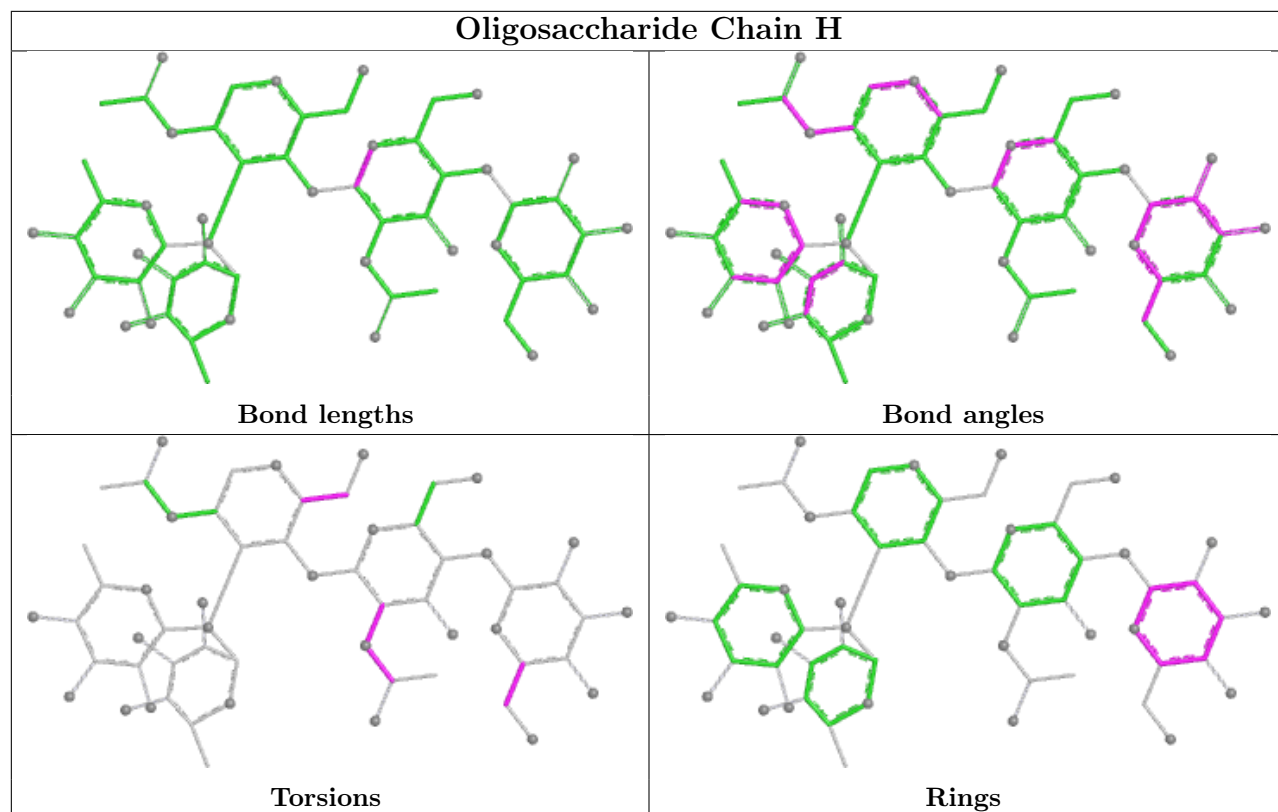
8 monomers are involved in 11 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	F	1[A]	NAG	1	0
4	H	3	BMA	1	0
4	H	2	NAG	1	0
5	G	2	NAG	1	0
5	G	1	NAG	4	0
4	H	1	NAG	5	0
5	G	6	FUC	2	0
4	H	4[B]	FUC	4	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

There are no ligands in this entry.

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	239/239 (100%)	0.69	34 (14%) 6 9	11, 24, 69, 132	7 (2%)
1	C	238/239 (99%)	0.88	36 (15%) 5 8	13, 26, 64, 132	8 (3%)
2	B	87/87 (100%)	0.35	6 (6%) 23 28	14, 21, 63, 89	1 (1%)
2	D	87/87 (100%)	0.42	8 (9%) 14 20	13, 22, 63, 97	0
All	All	651/652 (99%)	0.68	84 (12%) 7 11	11, 24, 68, 132	16 (2%)

All (84) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	74	ILE	6.7
1	A	77	THR	6.7
1	A	159	VAL	6.1
1	A	78	GLY	6.1
1	A	46	ILE	6.0
1	A	160	ASP	5.9
1	A	76	GLY	5.7
1	C	74	ILE	5.5
1	A	46(A)	ASN	5.2
1	C	46	ILE	4.9
1	C	45	CYS	4.7
1	A	75	TYR	4.5
1	C	78	GLY	4.4
1	C	50	CYS	4.4
1	C	76	GLY	4.2
1	C	46(A)	ASN	4.2
1	C	160(A)[A]	GLU	4.2
1	A	0	GLY	4.2
1	A	114	HIS	4.1
2	D	279	GLY	4.0
1	A	51	ARG	4.0

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Mol	Chain	Res	Type	RSRZ
1	C	77	THR	3.9
2	D	243	GLU	3.9
1	C	70	PHE	3.9
1	A	238	ASN	3.7
1	C	238	ASN	3.7
2	D	280(A)	ALA	3.7
1	A	111	VAL	3.6
1	C	108	ALA	3.6
2	B	279	GLY	3.5
1	C	80	ILE	3.5
1	C	114	HIS	3.4
1	C	132	ILE	3.4
1	C	141	LEU	3.3
1	C	109	ASP	3.3
1	C	75	TYR	3.2
1	A	160(A)	GLU	3.2
1	A	48	LYS	3.2
2	B	280(A)	ALA	3.2
2	B	244	GLU	3.1
2	B	280	GLU	3.0
1	C	110	ASN	3.0
1	C	111	VAL	2.9
1	A	141	LEU	2.9
1	A	45[A]	CYS	2.9
1	C	48	LYS	2.8
1	C	1	SER	2.8
1	C	115	ARG	2.8
1	C	73	ILE	2.8
2	D	293	LEU	2.7
2	B	243	GLU	2.7
1	A	1	SER	2.7
1	A	110	ASN	2.7
1	A	108	ALA	2.7
1	A	115	ARG	2.6
1	C	51	ARG	2.6
2	D	278(B)	LYS	2.6
1	A	147	LYS	2.6
1	C	113	LEU	2.5
1	C	112	PHE	2.5
1	C	72	ALA	2.5
1	A	160(B)	GLU	2.5
1	A	79	SER	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	106	ASP	2.4
2	D	244	GLU	2.4
1	A	202	LYS	2.3
1	A	132	ILE	2.3
1	A	116	LEU	2.3
1	C	202[A]	LYS	2.3
1	A	73	ILE	2.3
1	C	83	PHE	2.2
2	D	280	GLU	2.2
2	D	250	ASN	2.2
1	A	113	LEU	2.2
1	C	47	SER	2.2
1	C	147	LYS	2.1
1	A	158	ASN	2.1
1	A	93	ASP	2.1
1	C	49	ALA	2.1
1	C	52	ALA	2.1
1	C	159	VAL	2.1
2	B	280(B)	THR	2.1
1	C	2	ALA	2.0
1	A	109	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.

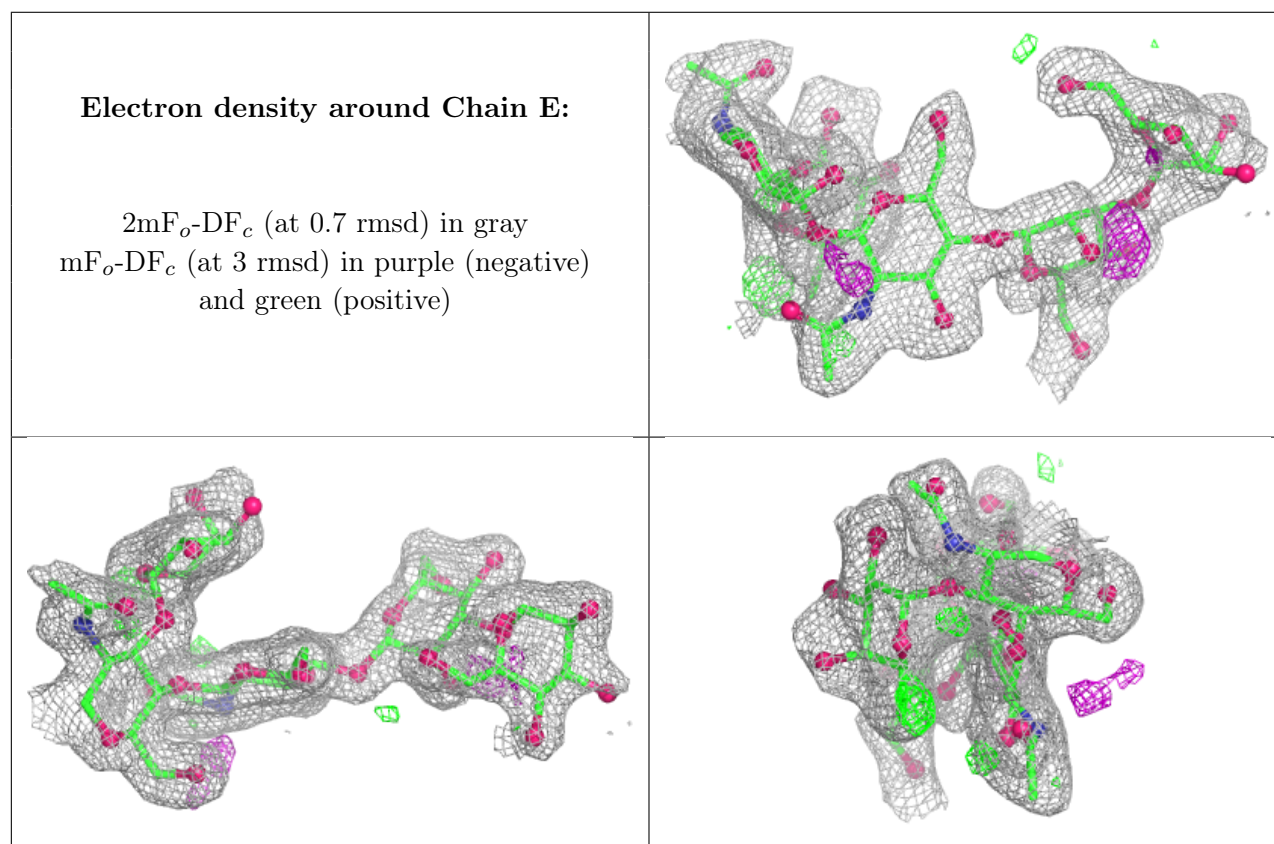
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	BMA	H	3	11/12	0.06	0.20	134,142,148,153	0
4	BMA	F	3	11/12	0.44	0.19	99,103,112,136	0
4	FUC	H	4[A]	10/11	0.46	0.28	54,79,103,105	10
4	FUC	H	4[B]	10/11	0.46	0.28	45,69,79,82	10
4	NAG	H	2	14/15	0.50	0.22	62,88,125,127	0
5	MAN	G	5	11/12	0.51	0.21	105,124,135,137	0
4	FUC	F	4	10/11	0.69	0.22	65,75,82,89	0

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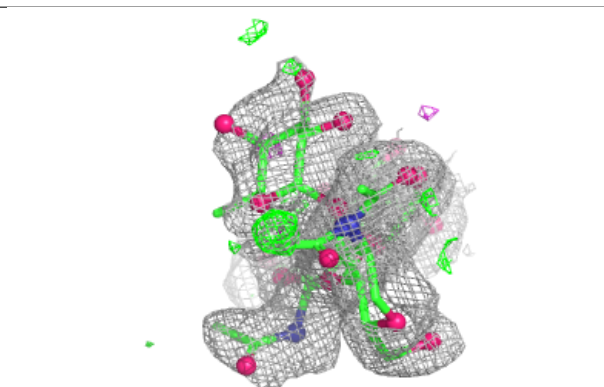
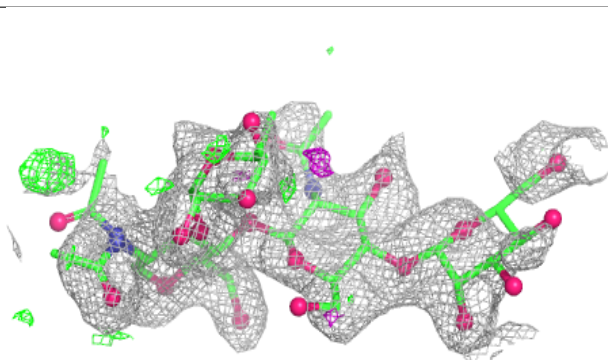
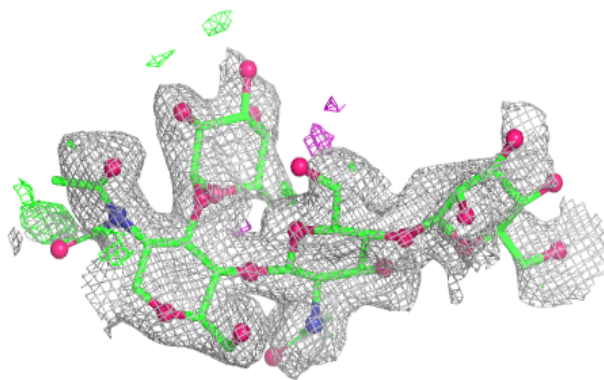
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	NAG	F	2	14/15	0.74	0.18	40,59,87,94	0
3	FUC	E	5	10/11	0.75	0.16	42,54,60,86	0
5	FUC	G	6	10/11	0.76	0.18	50,57,80,81	0
3	BMA	E	3	11/12	0.79	0.14	38,47,54,60	0
3	MAN	E	4	11/12	0.81	0.15	46,52,63,79	0
5	NAG	G	1	14/15	0.81	0.15	32,47,65,87	0
4	NAG	H	1	14/15	0.82	0.16	32,54,65,66	0
3	NAG	E	2	14/15	0.87	0.12	28,35,51,79	0
5	MAN	G	4	11/12	0.87	0.13	27,34,40,44	0
4	NAG	F	1[A]	14/15	0.88	0.12	29,41,54,57	4
4	NAG	F	1[B]	14/15	0.88	0.12	29,41,54,57	4
5	NAG	G	2	14/15	0.90	0.13	24,33,70,80	0
5	BMA	G	3	11/12	0.92	0.10	27,36,56,89	0
3	NAG	E	1	14/15	0.93	0.10	21,30,53,53	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.

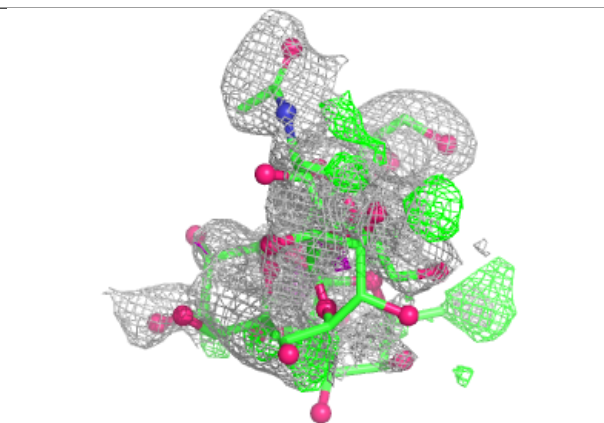
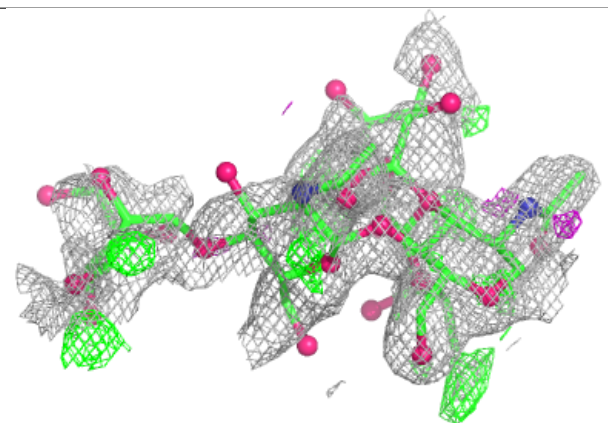
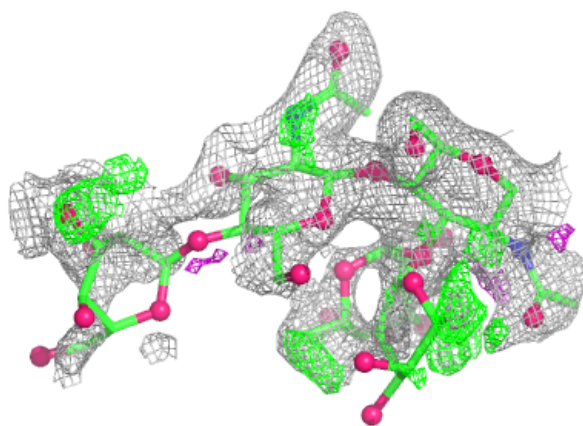


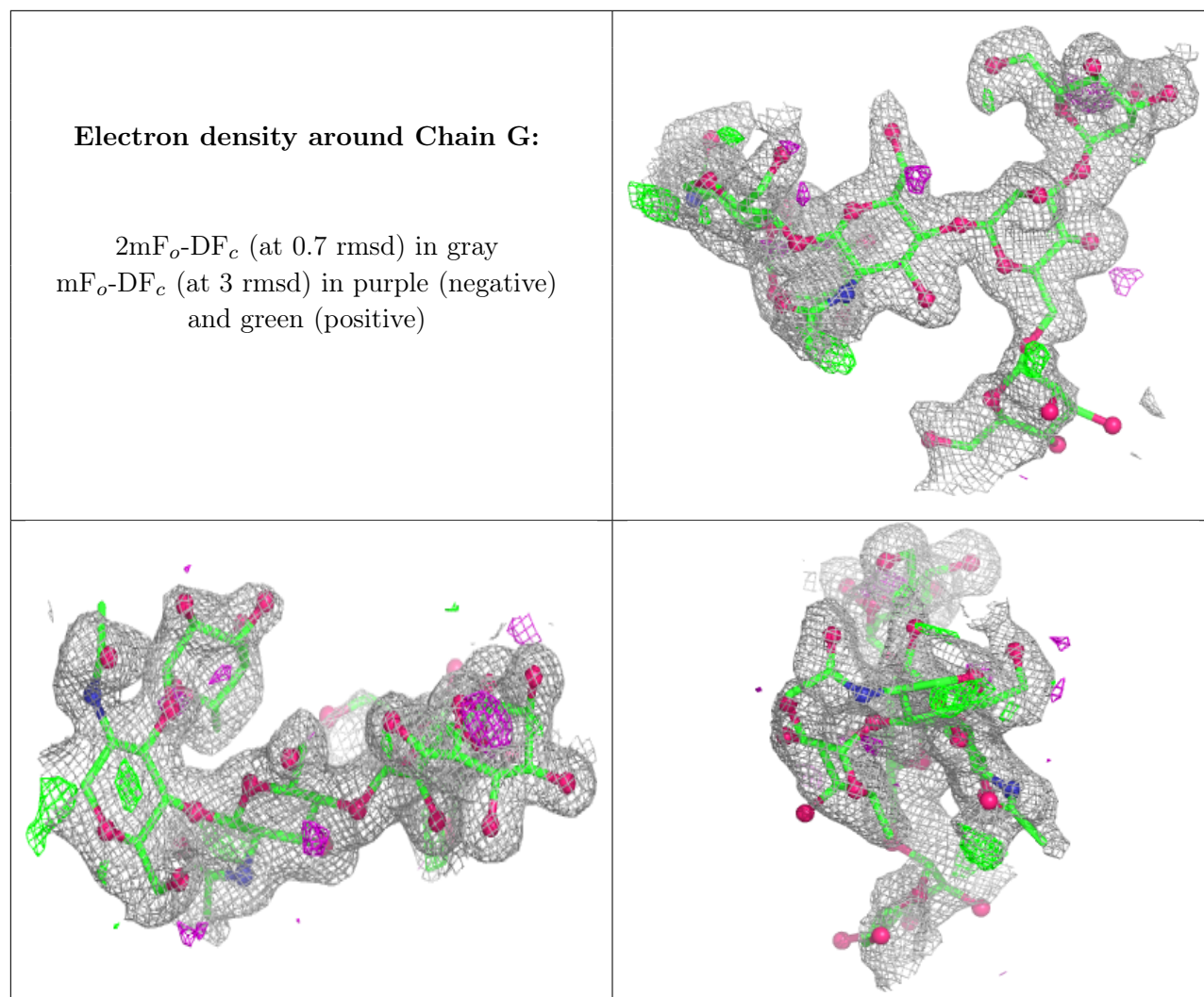
Electron density around Chain F:

$2mF_o-DF_c$ (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](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.