



# Full wwPDB X-ray Structure Validation Report ⓘ

Dec 15, 2024 – 03:25 AM EST

PDB ID : 3SGK  
Title : Unique carbohydrate/carbohydrate interactions are required for high affinity binding of FcgIII and antibodies lacking core fucose  
Authors : Ferrara, C.; Grau, S.; Jaeger, C.; Sonderrmann, P.; Bruenker, P.; Waldhauer, I.; Hennig, M.; Ruf, A.; Rufer, A.C.; Stihle, M.; Umana, P.; Benz, J.  
Deposited on : 2011-06-15  
Resolution : 2.40 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity : 4.02b-467  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtriage (Phenix) : 1.21  
EDS : 3.0  
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)  
CCP4 : 9.0.004 (Gargrove)  
Density-Fitness : 1.0.11  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.40

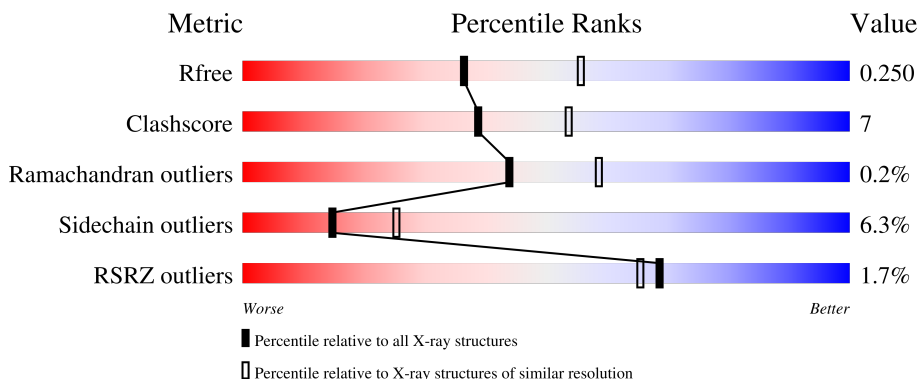
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.40 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))
$R_{free}$	164625	4642 (2.40-2.40)
Clashscore	180529	5218 (2.40-2.40)
Ramachandran outliers	177936	5158 (2.40-2.40)
Sidechain outliers	177891	5159 (2.40-2.40)
RSRZ outliers	164620	4642 (2.40-2.40)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	225	
1	B	225	
2	C	204	
3	D	8	
3	E	8	

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Mol	Chain	Length	Quality of chain
4	F	8	 12%                      50%                      38%
5	G	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
3	NAG	E	1	X	-	-	-
3	MAN	E	4	X	-	-	-
4	MAN	F	4	X	-	-	-
4	MAN	F	6	X	-	-	-
4	MAN	F	7	X	-	-	-
4	MAN	F	8	X	-	-	-

## 2 Entry composition i

There are 7 unique types of molecules in this entry. The entry contains 5163 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 Fc fragment.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	209	1668	1061	281	320	6	0	0	0
1	B	212	1694	1080	284	324	6	0	0	0

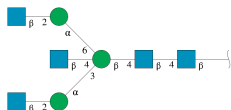
- Molecule 2 is a protein called human Fcg3a receptor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	165	1331	850	229	248	4	0	0	0

There are 18 discrepancies between the modelled and reference sequences:

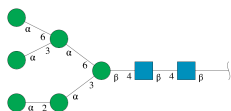
Chain	Residue	Modelled	Actual	Comment	Reference
C	38	GLN	ASN	engineered mutation	UNP P08637
C	74	GLN	ASN	engineered mutation	UNP P08637
C	158	VAL	PHE	SEE REMARK 999	UNP P08637
C	169	GLN	ASN	engineered mutation	UNP P08637
C	191	GLY	-	expression tag	UNP P08637
C	192	LYS	-	expression tag	UNP P08637
C	193	LYS	-	expression tag	UNP P08637
C	194	LYS	-	expression tag	UNP P08637
C	195	LYS	-	expression tag	UNP P08637
C	196	LYS	-	expression tag	UNP P08637
C	197	LYS	-	expression tag	UNP P08637
C	198	GLY	-	expression tag	UNP P08637
C	199	HIS	-	expression tag	UNP P08637
C	200	HIS	-	expression tag	UNP P08637
C	201	HIS	-	expression tag	UNP P08637
C	202	HIS	-	expression tag	UNP P08637
C	203	HIS	-	expression tag	UNP P08637
C	204	HIS	-	expression tag	UNP P08637

- Molecule 3 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-2)-alpha-D-mannopyranose-(1-6)][2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)]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
			Total	C	N	O			
3	D	8	103	58	5	40	0	0	0
3	E	8	103	58	5	40	0	0	0

- Molecule 4 is an oligosaccharide called alpha-D-mannopyranose-(1-2)-alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]alpha-D-mannopyranose-(1-6)]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
			Total	C	N	O			
4	F	8	94	52	2	40	0	0	0

- Molecule 5 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
			Total	C	N	O			
5	G	2	28	16	2	10	0	0	0

- Molecule 6 is MALONATE ION (three-letter code: MLI) (formula: C<sub>3</sub>H<sub>2</sub>O<sub>4</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total C O 7 3 4	0	0

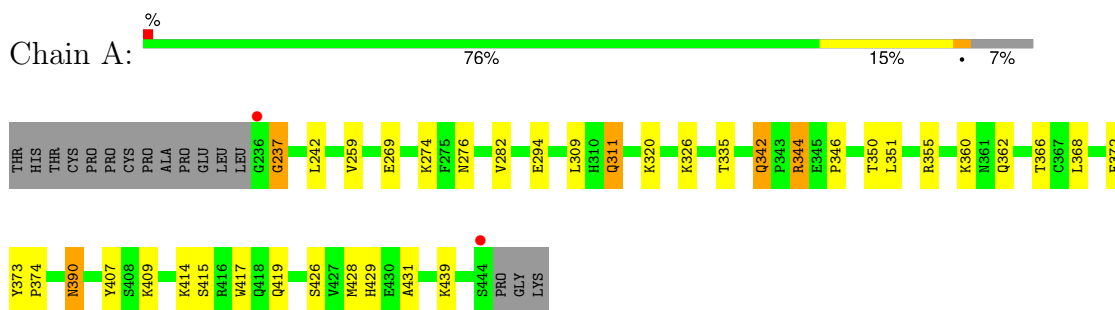
- Molecule 7 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	54	Total O 54 54	0	0
7	B	30	Total O 30 30	0	0
7	C	51	Total O 51 51	0	0

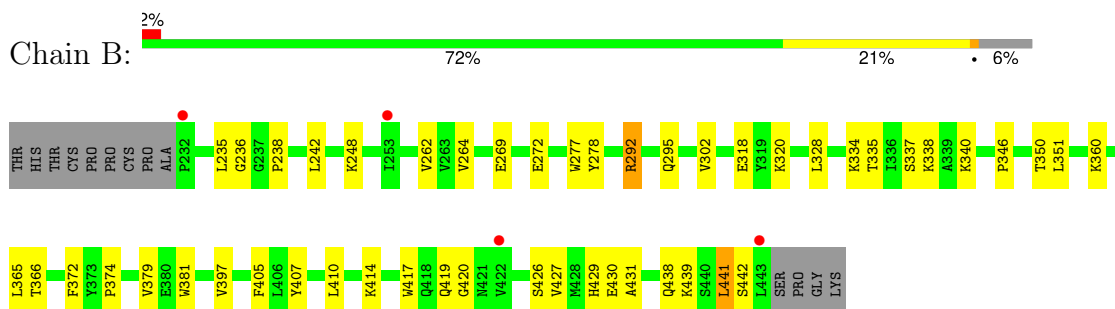
### 3 Residue-property plots [i](#)

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.

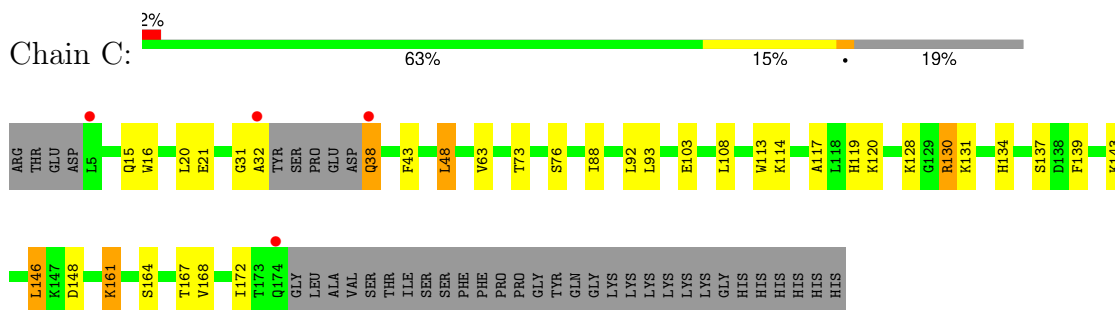
- Molecule 1: Fc fragment



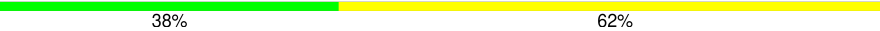
- Molecule 1: Fc fragment



- Molecule 2: human Fcγ3a receptor




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

Chain D:  38% 62%

MAG1  
MAG2  
BMA3  
MAN4  
MAG5  
MANG  
MAG7  
MAG8

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

Chain E:  12% 62% 25%

MAG1  
MAG2  
BMA3  
MAN4  
MAG5  
MANG  
MAG7  
MAG8

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

Chain F:  12% 50% 38%

MAG1  
MAG2  
BMA3  
MAN4  
MAG5  
MANG  
MAG7  
MAG8

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

Chain G:  100%

MAG1  
MAG2



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	67.34Å 88.23Å 141.13Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	50.00 – 2.40 50.00 – 2.40	Depositor EDS
% Data completeness (in resolution range)	99.9 (50.00-2.40) 99.9 (50.00-2.40)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.07	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.80 (at 2.39Å)	Xtrriage
Refinement program	REFMAC 5.6.0112	Depositor
R, $R_{free}$	0.205 , 0.250 0.208 , 0.250	Depositor DCC
$R_{free}$ test set	1687 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	61.2	Xtrriage
Anisotropy	0.056	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 39.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	5163	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	63.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.90% of the height of the origin peak. No significant pseudotranslation is detected.*

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

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality i

### 5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section: MAN, MLI, 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	0.55	1/1714 (0.1%)	0.61	0/2335
1	B	0.54	3/1741 (0.2%)	0.60	0/2372
2	C	0.63	1/1366 (0.1%)	0.67	0/1854
All	All	0.57	5/4821 (0.1%)	0.62	0/6561

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	417	TRP	CD2-CE2	5.42	1.47	1.41
1	A	417	TRP	CD2-CE2	5.35	1.47	1.41
1	B	381	TRP	CD2-CE2	5.17	1.47	1.41
2	C	16	TRP	CD2-CE2	5.14	1.47	1.41
1	B	277	TRP	CD2-CE2	5.04	1.47	1.41

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts i

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1668	0	1633	21	0
1	B	1694	0	1664	26	0
2	C	1331	0	1287	18	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	D	103	0	88	0	0
3	E	103	0	88	1	0
4	F	94	0	79	4	0
5	G	28	0	24	0	0
6	A	7	0	2	0	0
7	A	54	0	0	2	0
7	B	30	0	0	1	0
7	C	51	0	0	3	0
All	All	5163	0	4865	66	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 7.

All (66) 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)
7:C:302:HOH:O	4:F:1:NAG:C8	2.05	1.03
1:B:236:GLY:O	2:C:161:LYS:HE3	1.82	0.79
1:B:350:THR:HB	1:B:441:LEU:HG	1.63	0.79
1:B:338:LYS:HE3	1:B:430:GLU:OE1	1.84	0.77
3:E:5:NAG:H5	3:E:8:NAG:H5	1.65	0.77
7:C:302:HOH:O	4:F:1:NAG:H83	1.77	0.75
1:A:346:PRO:HB3	1:A:372:PHE:HB3	1.68	0.73
1:A:274:LYS:HE3	1:A:276:ASN:HD21	1.55	0.71
1:B:419:GLN:HG3	1:B:420:GLY:HA2	1.73	0.69
2:C:103:GLU:HA	2:C:143:LYS:HB2	1.74	0.69
1:B:238:PRO:HD2	1:B:328:LEU:HD21	1.76	0.68
7:C:302:HOH:O	4:F:1:NAG:H81	1.82	0.68
1:A:326:LYS:HA	1:A:326:LYS:HE2	1.78	0.64
2:C:63:VAL:HG21	2:C:88:ILE:HD11	1.78	0.63
1:A:429:HIS:CD2	1:A:431:ALA:H	2.17	0.62
1:A:429:HIS:HD2	1:A:431:ALA:H	1.49	0.60
1:A:311:GLN:HE21	1:A:311:GLN:HA	1.66	0.60
1:B:379:VAL:HG22	1:B:427:VAL:HG22	1.83	0.60
1:A:428:MET:HE2	7:A:642:HOH:O	2.02	0.59
1:B:238:PRO:HD2	1:B:328:LEU:CD2	2.33	0.56
1:B:374:PRO:O	1:B:429:HIS:HE1	1.87	0.56
1:A:320:LYS:HG3	1:A:335:THR:HG22	1.88	0.55
1:B:338:LYS:HE2	1:B:374:PRO:HG3	1.89	0.54
1:A:415:SER:O	1:A:419:GLN:HG3	2.07	0.54
1:B:360:LYS:O	1:B:414:LYS:HD3	2.07	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:374:PRO:O	1:A:429:HIS:HE1	1.92	0.53
1:B:429:HIS:CD2	1:B:431:ALA:H	2.27	0.53
1:B:429:HIS:HD2	1:B:431:ALA:H	1.58	0.51
1:B:351:LEU:HB2	1:B:366:THR:HB	1.91	0.51
2:C:63:VAL:CG2	2:C:88:ILE:HD11	2.43	0.49
1:B:365:LEU:HD12	1:B:410:LEU:HD23	1.95	0.48
1:A:409:LYS:HB2	1:B:407:TYR:OH	2.13	0.48
1:B:278:TYR:HB2	1:B:320:LYS:HB3	1.96	0.48
1:B:426:SER:HB3	1:B:438:GLN:HG3	1.95	0.48
2:C:20:LEU:HD21	2:C:92:LEU:HB2	1.96	0.48
2:C:43:PHE:CE2	2:C:48:LEU:HD13	2.49	0.48
2:C:93:LEU:HD23	2:C:168:VAL:HG22	1.97	0.47
2:C:73:THR:H	2:C:76:SER:HB2	1.80	0.47
1:B:269:GLU:HB2	7:B:512:HOH:O	2.13	0.47
1:B:419:GLN:HG3	1:B:420:GLY:CA	2.43	0.47
2:C:119:HIS:HD2	2:C:120:LYS:HG3	1.79	0.46
1:A:342:GLN:HB2	7:A:638:HOH:O	2.15	0.46
2:C:130:ARG:NH2	2:C:148:ASP:OD1	2.49	0.45
1:A:360:LYS:O	1:A:414:LYS:HD3	2.16	0.45
4:F:3:BMA:H62	4:F:6:MAN:H2	1.54	0.44
1:A:344:ARG:HG2	1:A:373:TYR:HB3	1.99	0.44
1:A:350:THR:HG23	1:A:439:LYS:HB3	1.99	0.44
1:B:292:ARG:NE	1:B:292:ARG:H	2.15	0.44
1:B:318:GLU:HA	1:B:337:SER:HB3	2.00	0.43
1:A:368:LEU:HD13	1:A:407:TYR:CZ	2.53	0.43
1:B:334:LYS:HA	1:B:334:LYS:HD3	1.83	0.43
1:A:242:LEU:HD11	1:A:259:VAL:CG1	2.49	0.43
1:B:235:LEU:HD21	2:C:117:ALA:HB3	2.01	0.43
2:C:31:GLY:O	2:C:32:ALA:HB3	2.18	0.43
1:A:351:LEU:HB2	1:A:366:THR:HB	2.01	0.42
1:B:318:GLU:OE1	1:B:335:THR:HG21	2.19	0.42
1:B:346:PRO:HB3	1:B:372:PHE:HB3	2.02	0.42
2:C:21:GLU:OE2	2:C:63:VAL:HG23	2.19	0.42
1:A:237:GLY:HA2	2:C:134:HIS:CD2	2.54	0.41
2:C:146:LEU:HD12	2:C:172:ILE:HG22	2.00	0.41
1:B:397:VAL:HB	1:B:405:PHE:CE2	2.55	0.41
2:C:108:LEU:HD12	2:C:139:PHE:HD2	1.85	0.41
1:A:390:ASN:HD22	1:A:390:ASN:HA	1.73	0.41
2:C:113:TRP:CH2	2:C:114:LYS:HE2	2.57	0.40
2:C:38:GLN:HE21	2:C:38:GLN:HB3	1.70	0.40
1:A:414:LYS:HB3	1:A:414:LYS:HE2	1.94	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	207/225 (92%)	202 (98%)	4 (2%)	1 (0%)	25	38
1	B	210/225 (93%)	207 (99%)	3 (1%)	0	100	100
2	C	161/204 (79%)	157 (98%)	4 (2%)	0	100	100
All	All	578/654 (88%)	566 (98%)	11 (2%)	1 (0%)	44	59

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	237	GLY

### 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	194/208 (93%)	183 (94%)	11 (6%)	17	29
1	B	197/208 (95%)	185 (94%)	12 (6%)	15	27
2	C	148/183 (81%)	137 (93%)	11 (7%)	11	19
All	All	539/599 (90%)	505 (94%)	34 (6%)	15	25

All (34) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	269	GLU
1	A	282	VAL
1	A	294	GLU
1	A	309	LEU
1	A	311	GLN
1	A	342	GLN
1	A	344	ARG
1	A	355	ARG
1	A	362	GLN
1	A	390	ASN
1	A	426	SER
1	B	242	LEU
1	B	248	LYS
1	B	262	VAL
1	B	264	VAL
1	B	272	GLU
1	B	292	ARG
1	B	295	GLN
1	B	302	VAL
1	B	340	LYS
1	B	439	LYS
1	B	441	LEU
1	B	442	SER
2	C	15	GLN
2	C	38	GLN
2	C	48	LEU
2	C	128	LYS
2	C	130	ARG
2	C	131	LYS
2	C	137	SER
2	C	146	LEU
2	C	161	LYS
2	C	164	SER
2	C	167	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (19) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	268	HIS
1	A	276	ASN
1	A	311	GLN
1	A	315	ASN
1	A	347	GLN

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Mol	Chain	Res	Type
1	A	362	GLN
1	A	390	ASN
1	A	421	ASN
1	A	429	HIS
1	A	438	GLN
1	B	295	GLN
1	B	390	ASN
1	B	419	GLN
1	B	429	HIS
1	B	435	HIS
2	C	38	GLN
2	C	74	GLN
2	C	119	HIS
2	C	134	HIS

### 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](#)

26 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	D	1	1,3	14,14,15	0.61	0	17,19,21	1.13	1 (5%)
3	NAG	D	2	3	14,14,15	0.71	0	17,19,21	1.48	2 (11%)
3	BMA	D	3	3	11,11,12	0.22	0	15,15,17	0.99	1 (6%)
3	MAN	D	4	3	11,11,12	0.58	0	15,15,17	0.85	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	NAG	D	5	3	14,14,15	0.56	0	17,19,21	1.06	0
3	MAN	D	6	3	11,11,12	0.71	0	15,15,17	1.04	0
3	NAG	D	7	3	14,14,15	0.56	0	17,19,21	1.02	2 (11%)
3	NAG	D	8	3	14,14,15	0.57	0	17,19,21	1.15	2 (11%)
3	NAG	E	1	1,3	14,14,15	0.56	0	17,19,21	1.49	2 (11%)
3	NAG	E	2	3	14,14,15	0.61	0	17,19,21	1.51	3 (17%)
3	BMA	E	3	3	11,11,12	0.62	0	15,15,17	2.58	7 (46%)
3	MAN	E	4	3	11,11,12	0.82	0	15,15,17	1.36	2 (13%)
3	NAG	E	5	3	14,14,15	0.52	0	17,19,21	0.95	1 (5%)
3	MAN	E	6	3	11,11,12	0.71	0	15,15,17	0.88	0
3	NAG	E	7	3	14,14,15	0.54	0	17,19,21	1.64	2 (11%)
3	NAG	E	8	3	14,14,15	0.54	0	17,19,21	1.36	1 (5%)
4	NAG	F	1	2,4	14,14,15	0.86	0	17,19,21	3.34	7 (41%)
4	NAG	F	2	4	14,14,15	0.76	1 (7%)	17,19,21	0.68	0
4	BMA	F	3	4	11,11,12	0.63	0	15,15,17	2.70	5 (33%)
4	MAN	F	4	4	11,11,12	0.83	0	15,15,17	2.82	3 (20%)
4	MAN	F	5	4	11,11,12	0.58	0	15,15,17	1.04	1 (6%)
4	MAN	F	6	4	11,11,12	0.80	0	15,15,17	1.03	1 (6%)
4	MAN	F	7	4	11,11,12	0.62	0	15,15,17	1.20	1 (6%)
4	MAN	F	8	4	11,11,12	0.82	0	15,15,17	0.83	0
5	NAG	G	1	5,2	14,14,15	0.50	0	17,19,21	1.29	2 (11%)
5	NAG	G	2	5	14,14,15	0.52	0	17,19,21	1.51	3 (17%)

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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAG	D	1	1,3	-	0/6/23/26	0/1/1/1
3	NAG	D	2	3	-	0/6/23/26	0/1/1/1
3	BMA	D	3	3	-	0/2/19/22	0/1/1/1
3	MAN	D	4	3	-	1/2/19/22	0/1/1/1
3	NAG	D	5	3	-	2/6/23/26	0/1/1/1
3	MAN	D	6	3	-	0/2/19/22	0/1/1/1
3	NAG	D	7	3	-	2/6/23/26	0/1/1/1
3	NAG	D	8	3	-	2/6/23/26	0/1/1/1
3	NAG	E	1	1,3	1/1/5/7	2/6/23/26	0/1/1/1

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

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	F	2	NAG	O5-C1	-2.10	1.40	1.43

All (49) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	F	4	MAN	C1-C2-C3	-8.18	97.73	109.64
4	F	1	NAG	C1-C2-N2	-7.83	98.10	110.43
4	F	1	NAG	C2-N2-C7	7.14	132.47	122.90
4	F	3	BMA	C1-O5-C5	5.86	120.05	112.19
3	E	3	BMA	C3-C4-C5	-5.78	99.75	110.23
4	F	4	MAN	C1-O5-C5	-5.51	104.80	112.19
4	F	3	BMA	O5-C5-C6	-5.12	97.70	107.66
4	F	3	BMA	O3-C3-C2	4.95	120.16	110.05
3	D	2	NAG	C1-O5-C5	4.84	118.67	112.19
3	E	1	NAG	C1-O5-C5	4.80	118.62	112.19
3	E	3	BMA	O3-C3-C2	4.31	118.85	110.05
4	F	1	NAG	C4-C3-C2	4.19	117.16	111.02
4	F	1	NAG	C8-C7-N2	-4.04	109.41	116.12

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	E	7	NAG	C2-N2-C7	4.00	128.25	122.90
3	E	8	NAG	C1-O5-C5	3.83	117.32	112.19
3	E	7	NAG	C1-O5-C5	3.79	117.26	112.19
5	G	1	NAG	C1-O5-C5	3.77	117.23	112.19
4	F	7	MAN	C1-O5-C5	3.72	117.17	112.19
5	G	2	NAG	C1-O5-C5	3.61	117.03	112.19
4	F	1	NAG	C1-O5-C5	3.61	117.03	112.19
3	E	3	BMA	O4-C4-C3	3.59	118.84	110.38
4	F	1	NAG	C3-C4-C5	-3.48	103.93	110.23
3	E	2	NAG	C2-N2-C7	3.38	127.43	122.90
4	F	1	NAG	O7-C7-N2	3.14	127.52	121.98
3	E	3	BMA	O4-C4-C5	-3.11	101.66	109.32
3	E	3	BMA	O3-C3-C4	2.97	117.38	110.38
4	F	4	MAN	C3-C4-C5	2.89	115.48	110.23
4	F	5	MAN	C1-O5-C5	2.85	116.01	112.19
3	E	4	MAN	C3-C4-C5	2.77	115.26	110.23
3	E	3	BMA	C1-O5-C5	2.70	115.81	112.19
4	F	3	BMA	O3-C3-C4	-2.68	104.07	110.38
3	E	2	NAG	C1-O5-C5	2.63	115.71	112.19
4	F	6	MAN	C1-O5-C5	-2.62	108.68	112.19
3	E	4	MAN	C1-C2-C3	-2.59	105.88	109.64
3	D	8	NAG	O7-C7-N2	2.56	126.51	121.98
5	G	2	NAG	C2-N2-C7	2.56	126.33	122.90
3	D	7	NAG	C1-O5-C5	2.50	115.54	112.19
3	D	1	NAG	C1-O5-C5	2.44	115.46	112.19
5	G	2	NAG	O5-C5-C6	2.38	112.30	107.66
3	E	2	NAG	O4-C4-C3	2.26	115.69	110.38
3	D	3	BMA	O4-C4-C3	-2.23	105.12	110.38
5	G	1	NAG	C6-C5-C4	-2.21	107.60	113.02
3	D	8	NAG	C1-O5-C5	2.20	115.14	112.19
3	E	5	NAG	O5-C1-C2	-2.20	107.89	111.29
3	D	2	NAG	O4-C4-C5	-2.15	104.04	109.32
3	E	3	BMA	O5-C5-C6	2.08	111.71	107.66
3	E	1	NAG	C3-C4-C5	-2.07	106.48	110.23
3	D	7	NAG	O7-C7-N2	2.02	125.56	121.98
4	F	3	BMA	C3-C4-C5	2.01	113.88	110.23

All (6) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	E	1	NAG	C1
3	E	4	MAN	C1

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Mol	Chain	Res	Type	Atom
4	F	4	MAN	C1
4	F	6	MAN	C1
4	F	7	MAN	C1
4	F	8	MAN	C1

All (35) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	F	8	MAN	O5-C5-C6-O6
3	E	7	NAG	O5-C5-C6-O6
5	G	2	NAG	O5-C5-C6-O6
3	D	7	NAG	O5-C5-C6-O6
3	E	1	NAG	O5-C5-C6-O6
4	F	8	MAN	C4-C5-C6-O6
5	G	2	NAG	C4-C5-C6-O6
3	E	8	NAG	O5-C5-C6-O6
4	F	4	MAN	O5-C5-C6-O6
4	F	7	MAN	O5-C5-C6-O6
3	E	7	NAG	C4-C5-C6-O6
3	E	8	NAG	C4-C5-C6-O6
5	G	1	NAG	C4-C5-C6-O6
4	F	3	BMA	O5-C5-C6-O6
3	E	1	NAG	C4-C5-C6-O6
5	G	1	NAG	O5-C5-C6-O6
3	D	7	NAG	C4-C5-C6-O6
4	F	6	MAN	O5-C5-C6-O6
3	D	5	NAG	C8-C7-N2-C2
3	D	5	NAG	O7-C7-N2-C2
3	E	8	NAG	C8-C7-N2-C2
3	E	8	NAG	O7-C7-N2-C2
3	D	8	NAG	O5-C5-C6-O6
3	E	5	NAG	C4-C5-C6-O6
3	E	5	NAG	O5-C5-C6-O6
4	F	4	MAN	C4-C5-C6-O6
4	F	3	BMA	C4-C5-C6-O6
4	F	5	MAN	C4-C5-C6-O6
4	F	6	MAN	C4-C5-C6-O6
3	D	8	NAG	C4-C5-C6-O6
3	D	4	MAN	C4-C5-C6-O6
4	F	7	MAN	C4-C5-C6-O6
3	E	7	NAG	C3-C2-N2-C7
4	F	5	MAN	O5-C5-C6-O6

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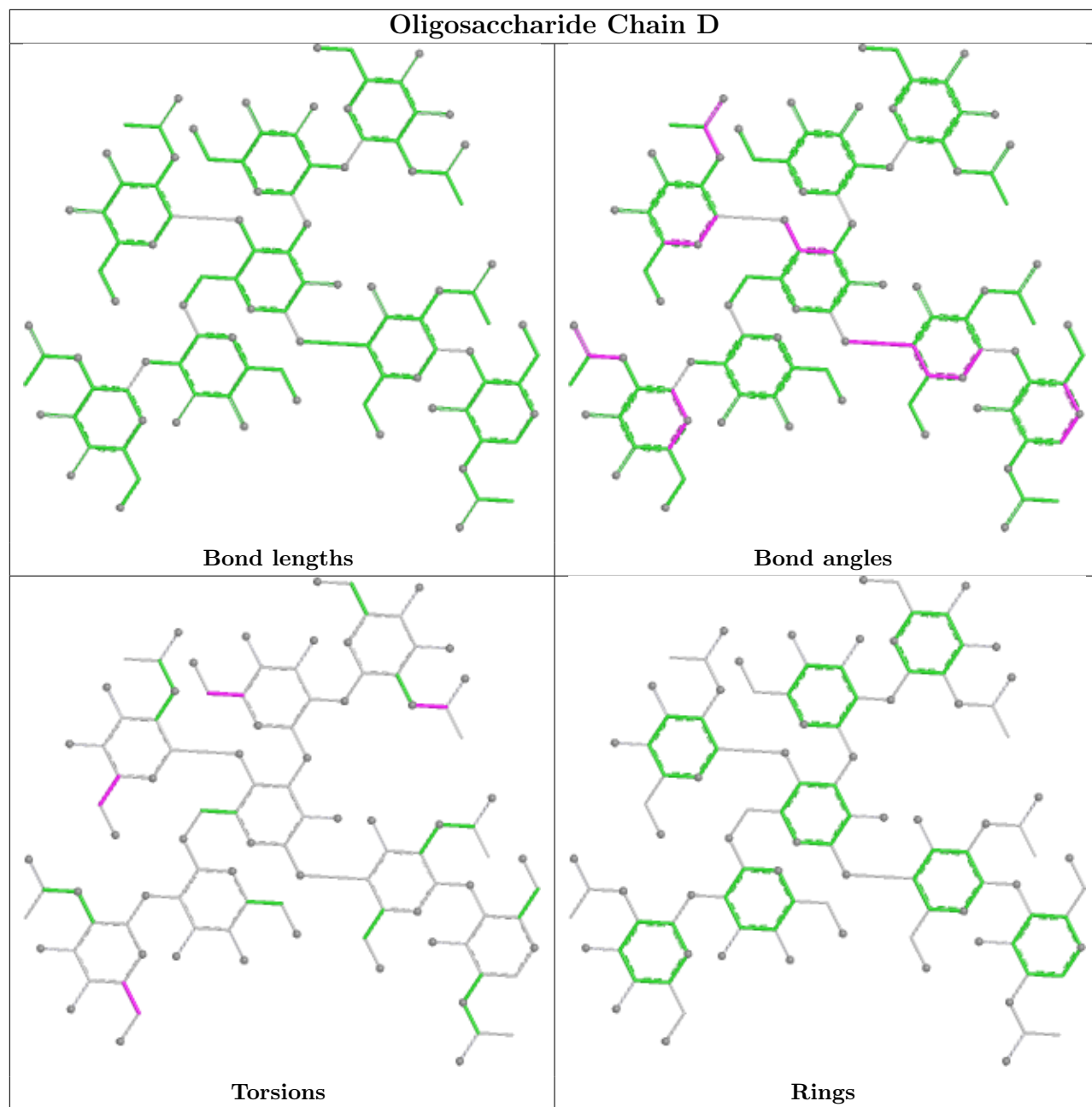
Mol	Chain	Res	Type	Atoms
3	E	4	MAN	O5-C5-C6-O6

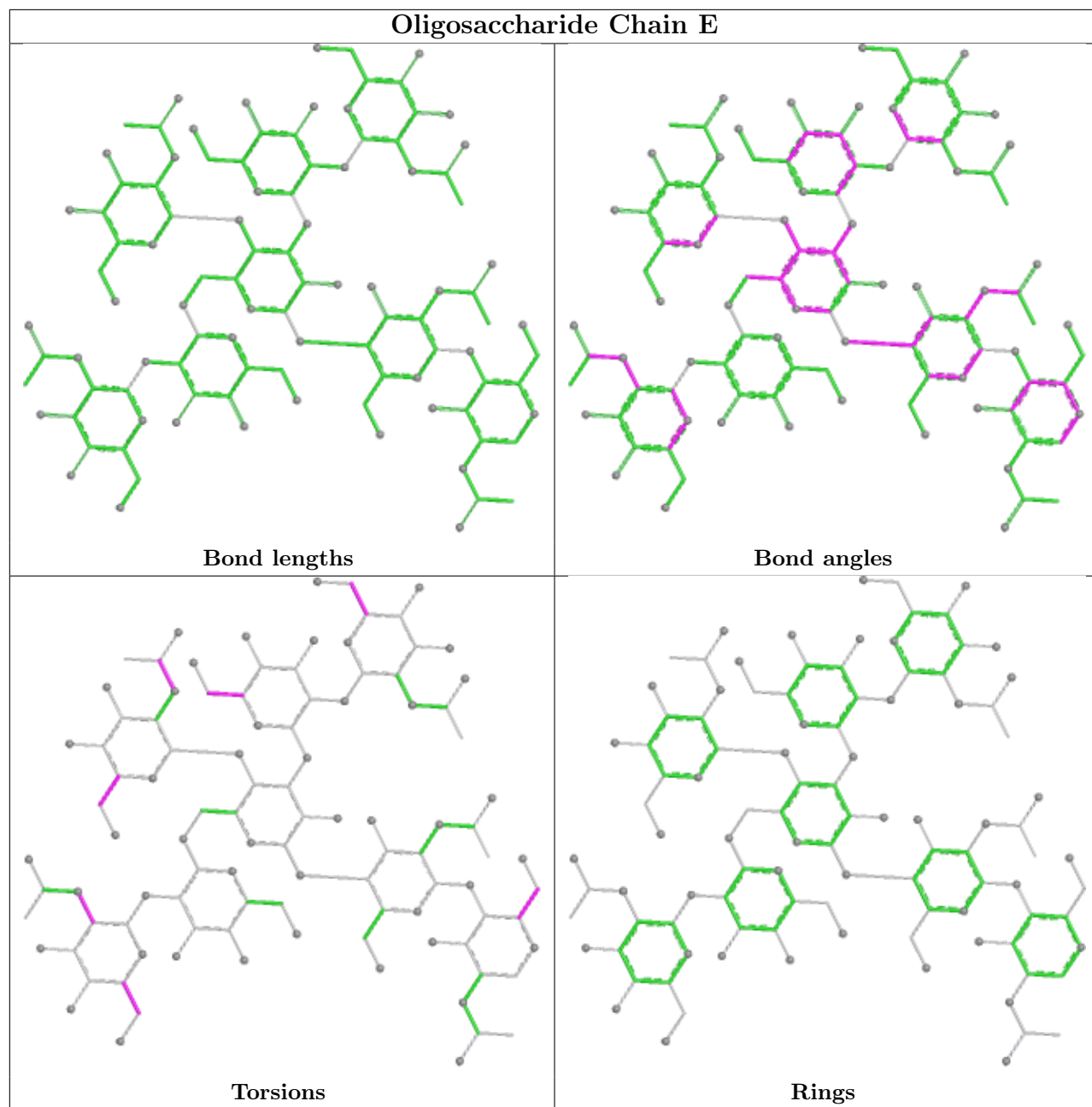
There are no ring outliers.

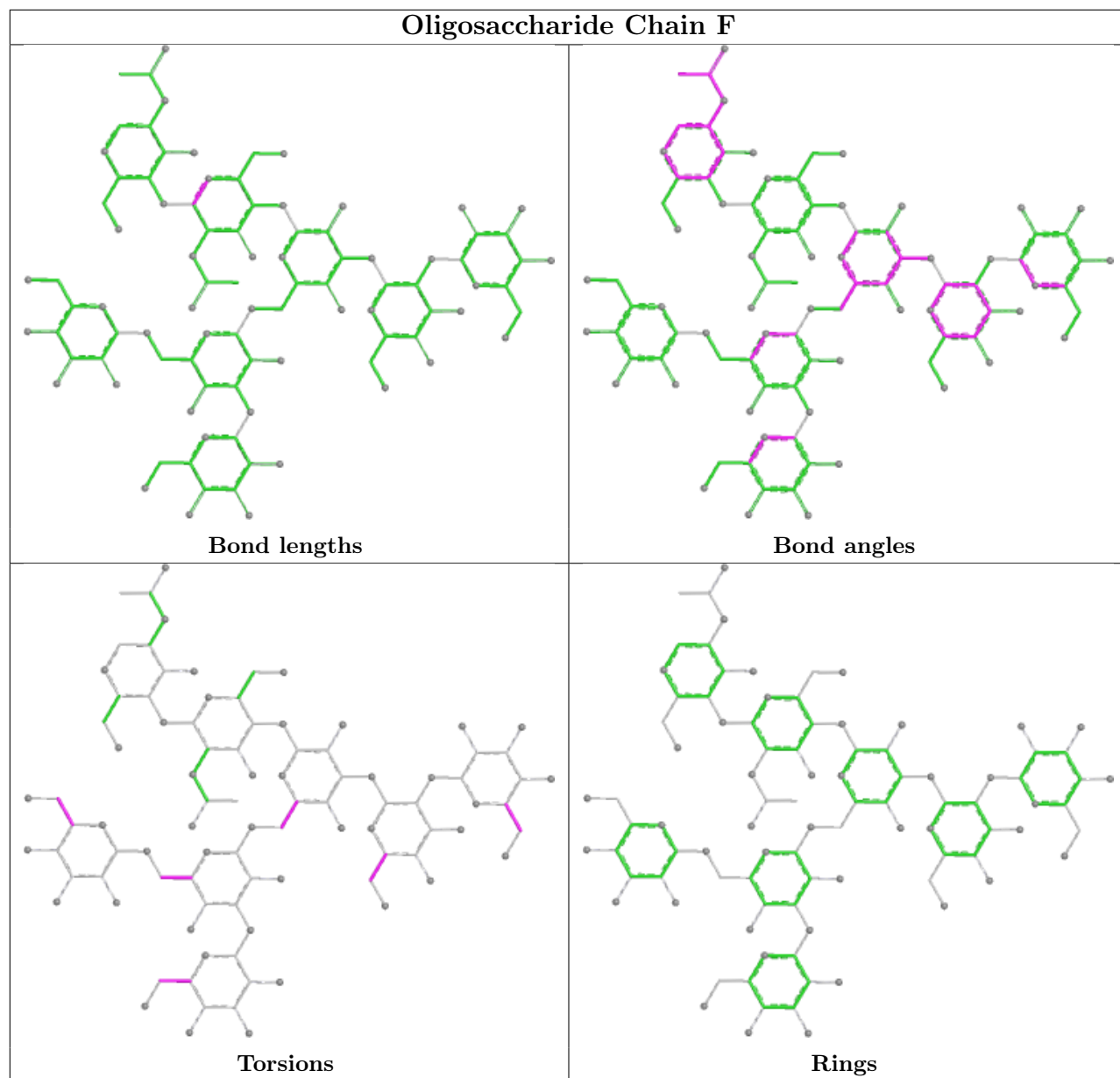
5 monomers are involved in 5 short contacts:

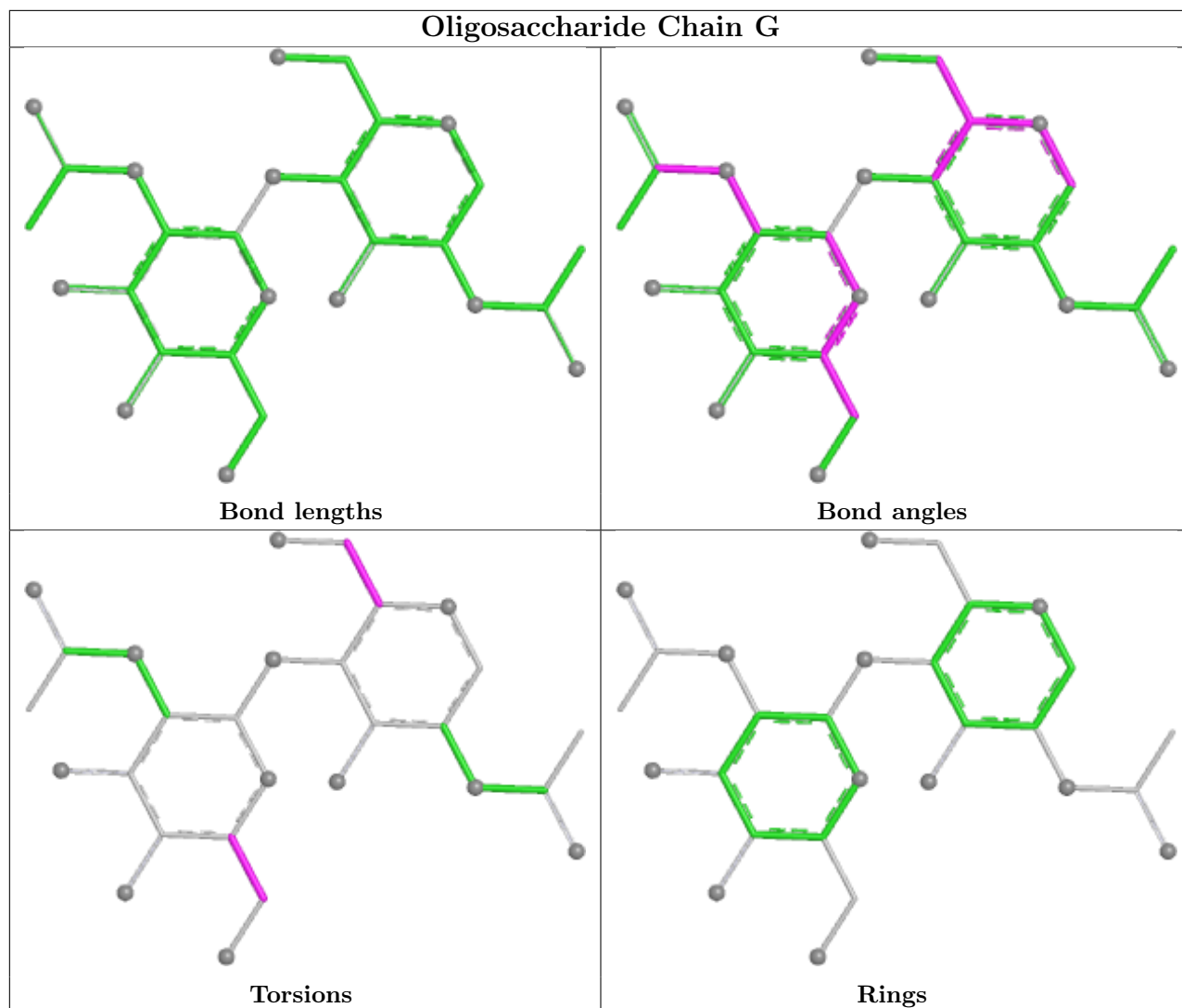
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	E	8	NAG	1	0
4	F	3	BMA	1	0
4	F	6	MAN	1	0
4	F	1	NAG	3	0
3	E	5	NAG	1	0

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](#)

1 ligand is 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	$\# Z  > 2$
6	MLI	A	501	-	6,6,6	1.21	0	7,7,7	0.83	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
6	MLI	A	501	-	-	2/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	501	MLI	C3-C1-C2-O7
6	A	501	MLI	C3-C1-C2-O6

There are no ring outliers.

No monomer is involved in short contacts.

## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	209/225 (92%)	-0.38	2 (0%) 79 76	35, 56, 101, 118	0
1	B	212/225 (94%)	0.03	4 (1%) 66 62	47, 74, 96, 108	0
2	C	165/204 (80%)	-0.34	4 (2%) 59 56	39, 53, 82, 102	0
All	All	586/654 (89%)	-0.22	10 (1%) 69 65	35, 61, 95, 118	0

All (10) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	C	5	LEU	4.3
2	C	32	ALA	3.5
2	C	38	GLN	3.5
1	B	232	PRO	3.2
1	B	443	LEU	3.0
1	B	253	ILE	2.8
1	A	236	GLY	2.7
1	B	422	VAL	2.5
1	A	444	SER	2.5
2	C	174	GLN	2.3

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

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

### 6.3 Carbohydrates [i](#)

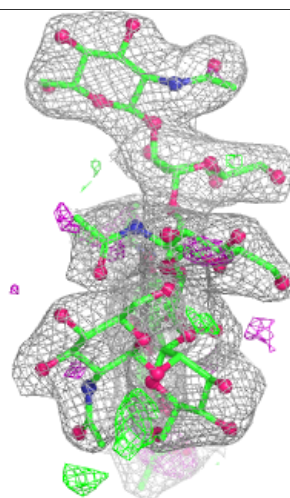
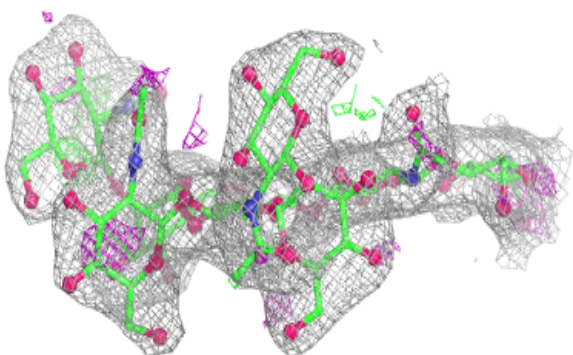
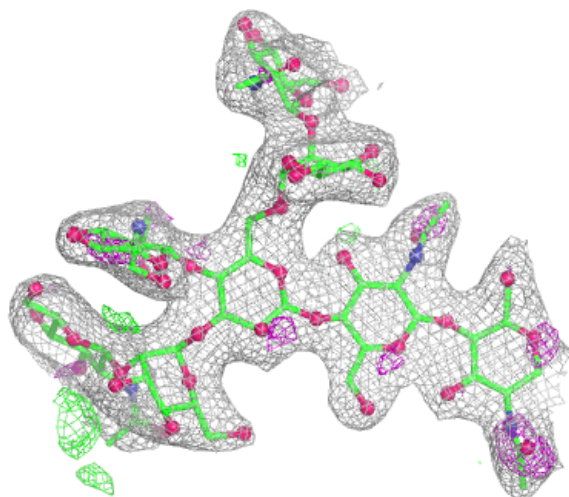
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
4	MAN	F	7	11/12	0.54	0.14	72,80,82,83	0
4	MAN	F	8	11/12	0.60	0.15	82,87,90,90	0
3	NAG	D	5	14/15	0.77	0.12	60,67,71,72	0
4	MAN	F	5	11/12	0.79	0.13	50,54,56,56	0
4	MAN	F	6	11/12	0.80	0.11	62,70,83,85	0
3	NAG	E	8	14/15	0.82	0.12	72,80,83,92	0
5	NAG	G	2	14/15	0.83	0.10	50,55,60,63	0
3	NAG	E	7	14/15	0.85	0.12	63,71,78,80	0
4	BMA	F	3	11/12	0.87	0.08	38,44,51,58	0
3	MAN	D	4	11/12	0.88	0.09	51,56,63,64	0
3	NAG	E	5	14/15	0.89	0.09	65,70,75,77	0
4	MAN	F	4	11/12	0.90	0.09	43,49,52,56	0
3	MAN	E	4	11/12	0.90	0.08	59,62,65,65	0
3	NAG	E	1	14/15	0.91	0.09	40,43,47,50	0
3	NAG	D	8	14/15	0.91	0.09	50,54,64,67	0
3	BMA	E	3	11/12	0.93	0.07	52,55,62,68	0
4	NAG	F	1	14/15	0.93	0.07	28,31,33,34	0
5	NAG	G	1	14/15	0.93	0.07	33,37,46,47	0
3	NAG	D	7	14/15	0.93	0.07	40,50,56,58	0
3	MAN	E	6	11/12	0.94	0.05	56,58,64,65	0
4	NAG	F	2	14/15	0.95	0.07	30,32,35,37	0
3	NAG	E	2	14/15	0.95	0.07	40,42,47,51	0
3	MAN	D	6	11/12	0.95	0.06	39,41,45,45	0
3	NAG	D	1	14/15	0.96	0.07	23,28,30,32	0
3	BMA	D	3	11/12	0.97	0.05	35,37,42,48	0
3	NAG	D	2	14/15	0.97	0.05	29,32,35,36	0

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

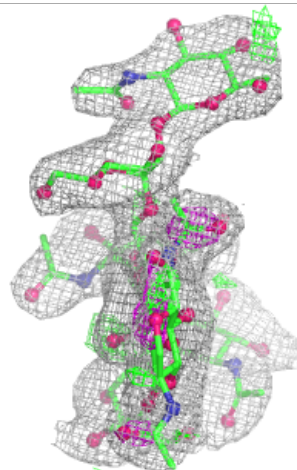
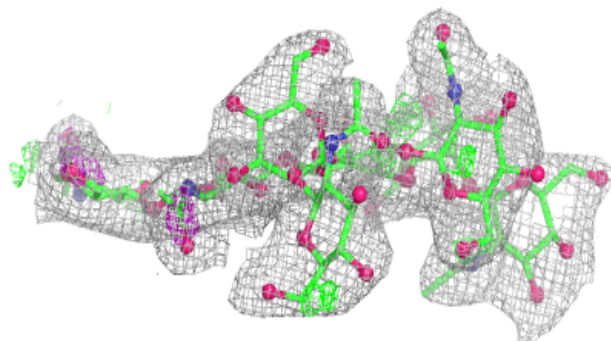
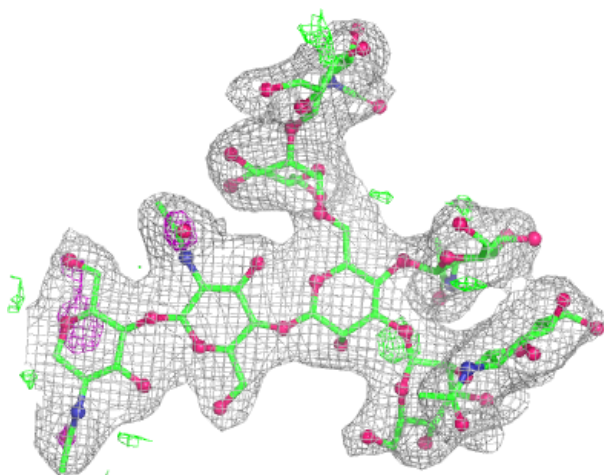
**Electron density around Chain D:**

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



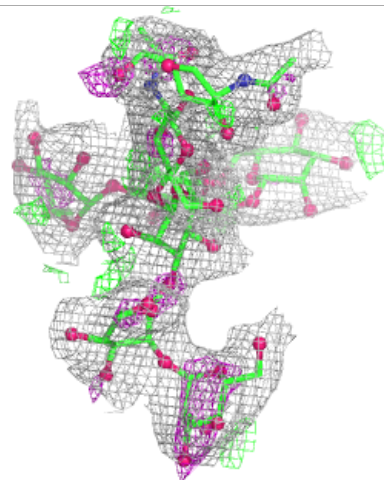
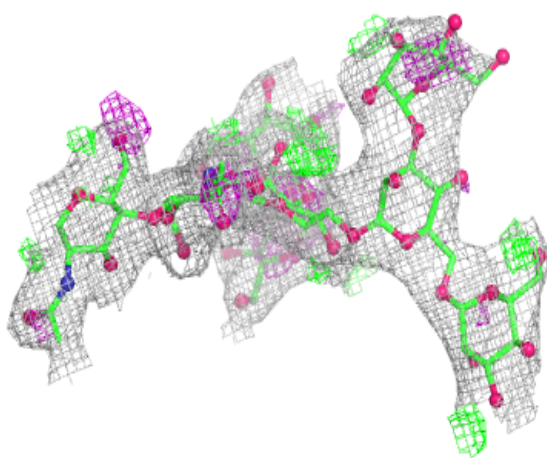
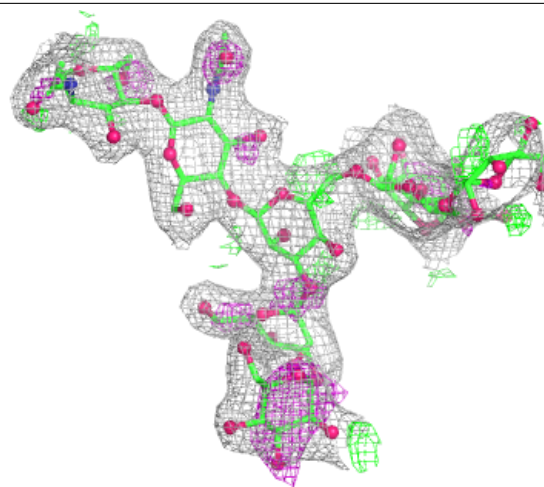
**Electron density around Chain E:**

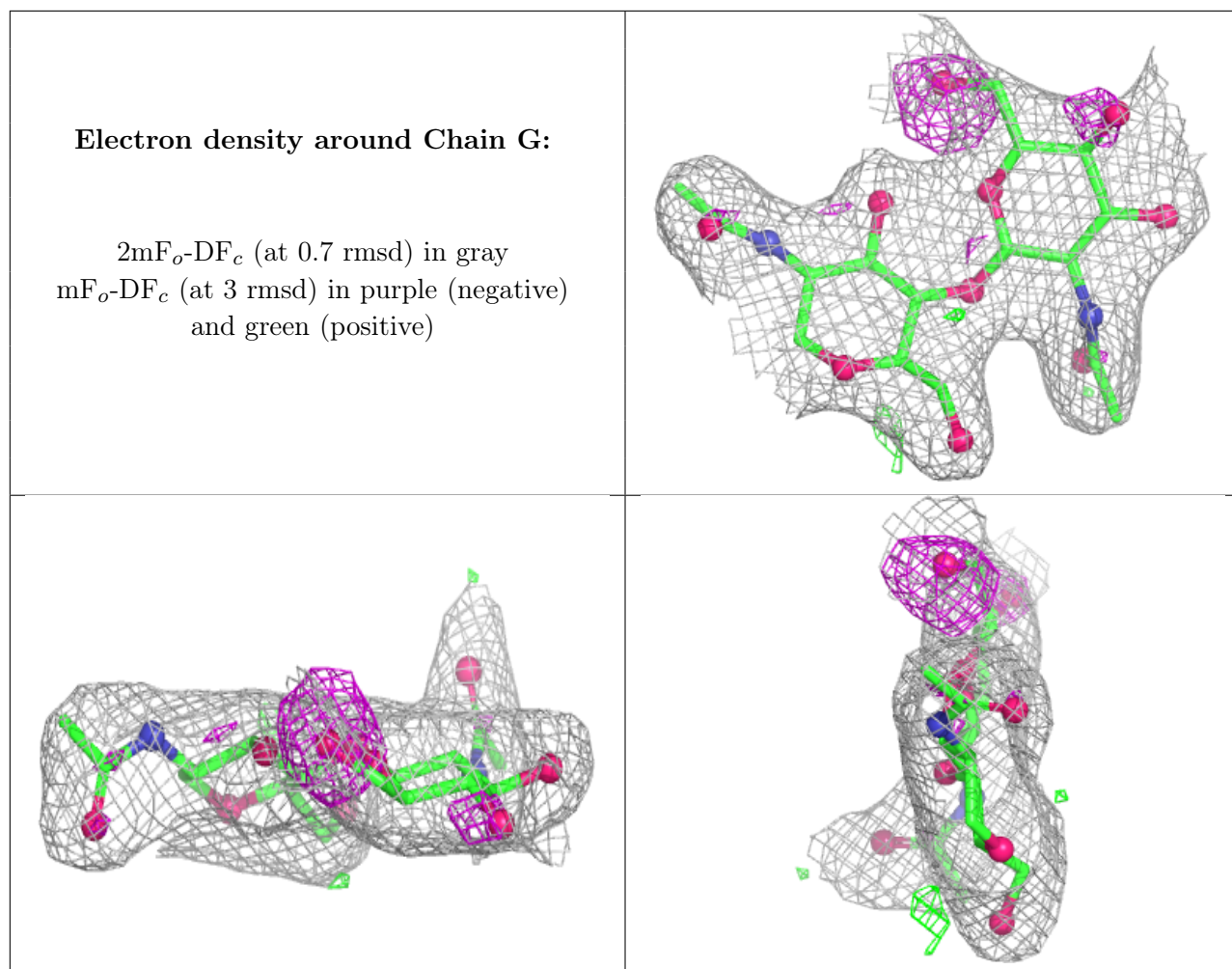
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around Chain F:**

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





## 6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
6	MLI	A	501	7/7	0.82	0.13	59,60,67,76	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.