



# Full wwPDB X-ray Structure Validation Report ⓘ

Jul 15, 2024 – 08:03 AM EDT

PDB ID : 8UZF  
Title : Crystal structure of chimeric RaTG13 RBD complexed with chimeric mouse ACE2  
Authors : Zhang, W.; Shi, K.; Aihara, H.; Li, F.  
Deposited on : 2023-11-15  
Resolution : 3.28 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>.

---

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.37.1  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.37.1

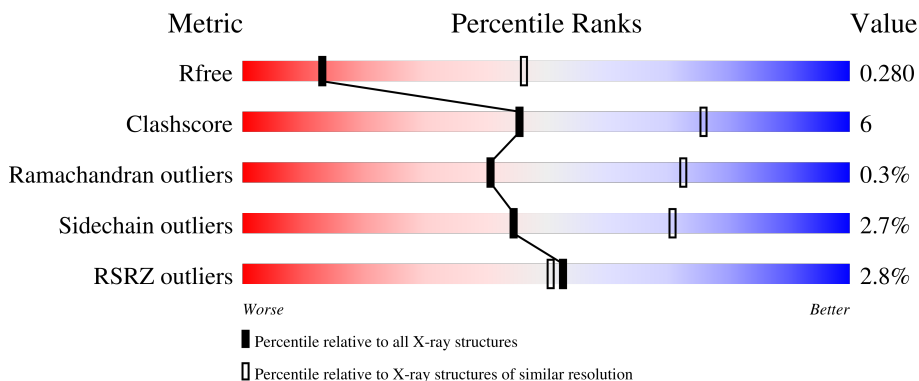
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.28 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))
$R_{free}$	130704	1177 (3.32-3.24)
Clashscore	141614	1044 (3.30-3.26)
Ramachandran outliers	138981	1026 (3.30-3.26)
Sidechain outliers	138945	1025 (3.30-3.26)
RSRZ outliers	127900	1141 (3.32-3.24)

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	597	 2% 79% 20% .
1	B	597	 2% 81% 17% ..
2	E	217	 6% 75% 11% . 13%
2	F	217	 5% 70% 16% . 13%
3	C	2	 100%

Continued on next page...

*Continued from previous page...*

Mol	Chain	Length	Quality of chain
3	D	2	 100%
4	G	3	 100%

## 2 Entry composition i

There are 9 unique types of molecules in this entry. The entry contains 12858 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 Angiotensin-converting enzyme 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	593	Total	C	N	O	S	0	1	0
			4845	3093	811	913	28			
1	B	594	Total	C	N	O	S	0	0	0
			4846	3095	810	913	28			

- Molecule 2 is a protein called Receptor binding domain.

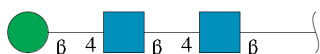
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	E	188	Total	C	N	O	S	0	0	0
			1502	969	243	281	9			
2	F	188	Total	C	N	O	S	0	0	0
			1505	970	244	282	9			

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

- Molecule 4 is an oligosaccharide called 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
4	G	3	Total	C	N	O	0	0	0
			39	22	2	15			

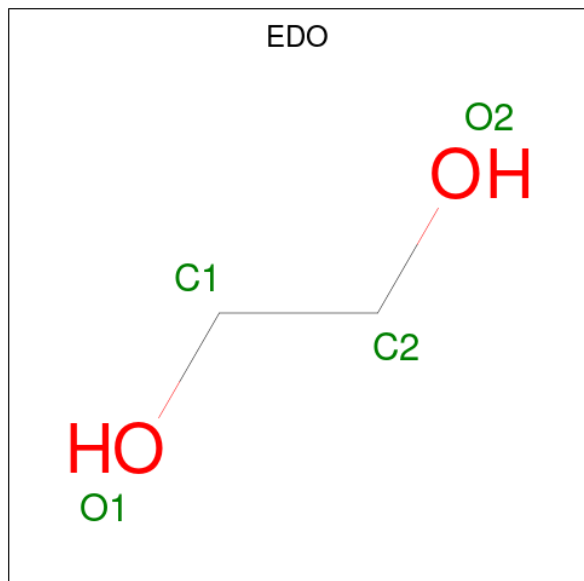
- Molecule 5 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	1	Total	Zn	0	0
			1	1		
5	B	1	Total	Zn	0	0
			1	1		

- Molecule 6 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

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

- Molecule 7 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>).



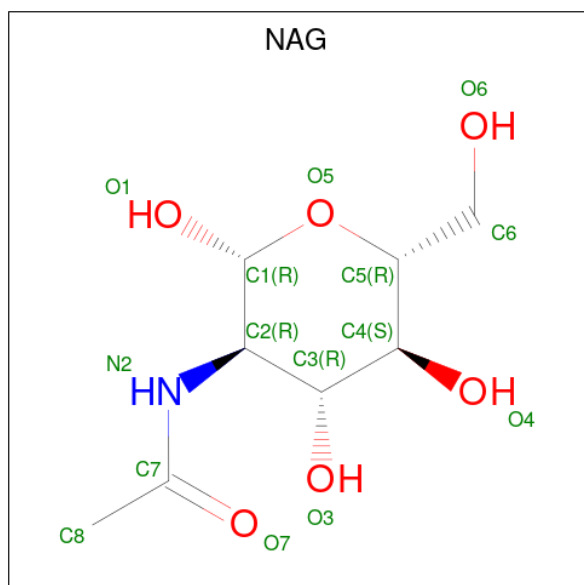
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	A	1	Total	C	O	0	0
			4	2	2		
7	B	1	Total	C	O	0	0
			4	2	2		

*Continued on next page...*

Continued from previous page...

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	B	1	Total	C	O	0	0
			4	2	2		
7	B	1	Total	C	O	0	0
			4	2	2		

- Molecule 8 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula:  $C_8H_{15}NO_6$ ).



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

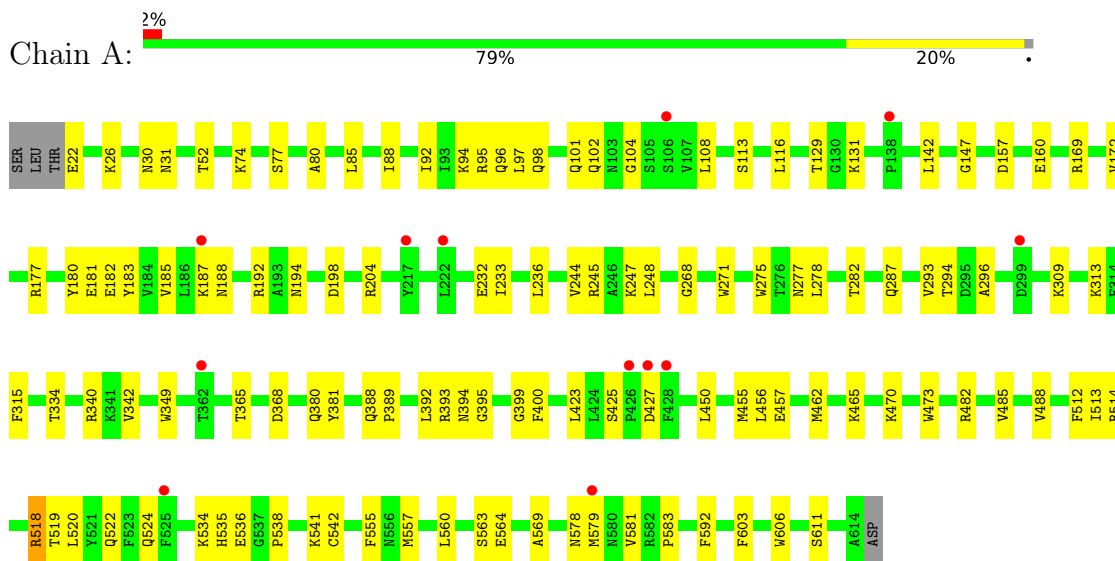
- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	1	Total	O	0	0
			1	1		
9	B	2	Total	O	0	0
			2	2		

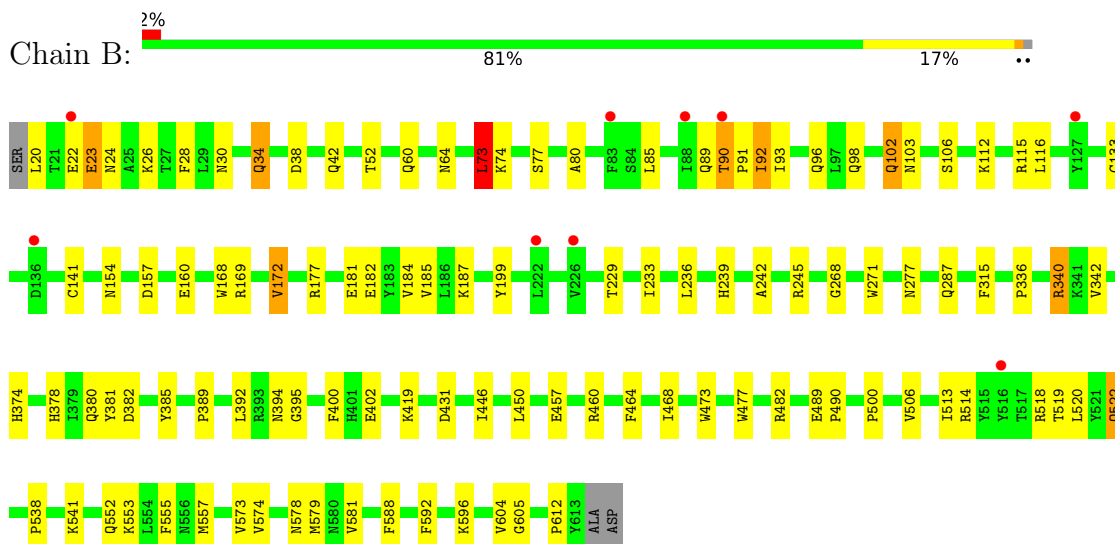
### 3 Residue-property plots

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.

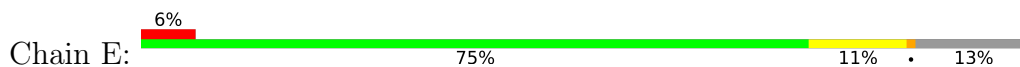
- Molecule 1: Angiotensin-converting enzyme 2

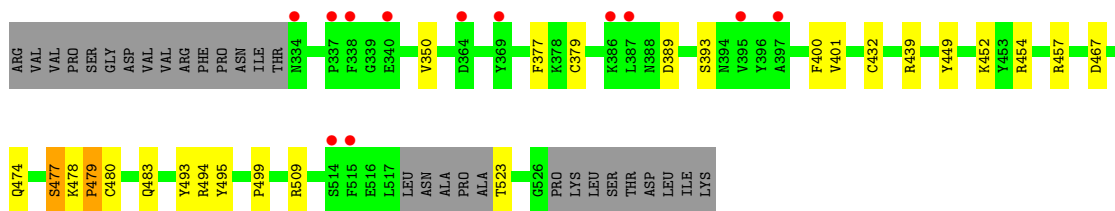


- Molecule 1: Angiotensin-converting enzyme 2

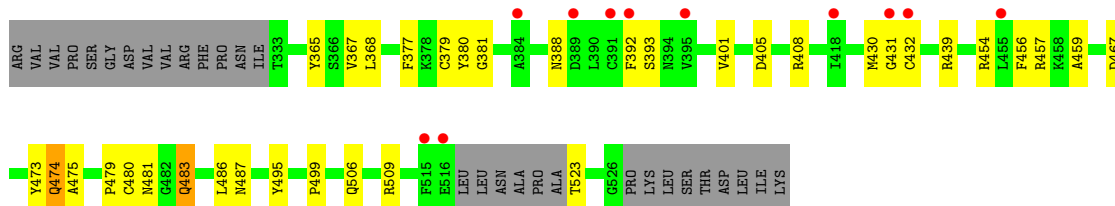


- Molecule 2: Receptor binding domain





- Molecule 2: Receptor binding domain



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



MAG1  
MAG2

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



MAG1  
MAG2

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



MAG1  
MAG2  
BWA3



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	78.56Å 119.00Å 109.08Å 90.00° 95.92° 90.00°	Depositor
Resolution (Å)	108.49 – 3.28 108.49 – 3.28	Depositor EDS
% Data completeness (in resolution range)	50.5 (108.49-3.28) 46.5 (108.49-3.28)	Depositor EDS
$R_{merge}$	0.15	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	0.92 (at 3.26Å)	Xtrriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, $R_{free}$	0.223 , 0.280 0.224 , 0.280	Depositor DCC
$R_{free}$ test set	766 reflections (4.95%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	55.1	Xtrriage
Anisotropy	0.154	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.30 , 44.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.85	EDS
Total number of atoms	12858	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	91.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.66% 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: NAG, ZN, EDO, BMA, CL

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	0.24	0/4982	0.44	0/6766
1	B	0.24	0/4983	0.45	1/6768 (0.0%)
2	E	0.24	0/1544	0.47	0/2099
2	F	0.25	0/1547	0.46	0/2102
All	All	0.24	0/13056	0.45	1/17735 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	73	LEU	CA-CB-CG	5.97	129.03	115.30

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	4845	0	4613	66	0
1	B	4846	0	4618	66	0
2	E	1502	0	1418	15	0
2	F	1505	0	1426	19	0
3	C	28	0	25	0	0
3	D	28	0	25	0	0

*Continued on next page...*

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	G	39	0	34	0	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
6	A	1	0	0	0	0
6	B	1	0	0	1	0
7	A	4	0	6	0	0
7	B	12	0	18	3	0
8	A	14	0	13	1	0
8	B	14	0	13	1	0
8	F	14	0	13	0	0
9	A	1	0	0	0	0
9	B	2	0	0	0	0
All	All	12858	0	12222	161	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 6.

All (161) 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:B:74:LYS:HE3	1:B:106:SER:HB3	1.68	0.74
1:B:374:HIS:CE1	1:B:402:GLU:OE1	2.39	0.73
1:B:91:PRO:HG2	1:B:93:ILE:HG13	1.70	0.72
1:B:77:SER:OG	1:B:102:GLN:O	2.09	0.70
1:A:534:LYS:HE3	1:B:431:ASP:HA	1.78	0.66
1:A:268:GLY:O	1:A:277:ASN:ND2	2.27	0.65
1:A:457:GLU:HG2	1:A:513:ILE:HB	1.78	0.64
1:B:245:ARG:NH2	1:B:605:GLY:O	2.30	0.64
1:A:26:LYS:O	1:A:30:ASN:ND2	2.32	0.62
1:B:457:GLU:HG2	1:B:513:ILE:HB	1.82	0.62
2:E:478:LYS:NZ	2:E:479:PRO:O	2.26	0.61
1:B:336:PRO:HB2	1:B:340:ARG:HD3	1.81	0.61
1:B:520:LEU:HD22	1:B:579:MET:HE2	1.82	0.61
1:B:552:GLN:OE1	7:B:704:EDO:O1	2.17	0.61
1:A:538:PRO:HD2	1:A:541:LYS:HD3	1.83	0.60
1:B:160:GLU:OE2	7:B:703:EDO:O2	2.20	0.59
1:B:182:GLU:HA	1:B:185:VAL:HG12	1.83	0.59
2:F:381:GLY:HA3	2:F:430:MET:HG3	1.84	0.59
1:A:293:VAL:HG21	1:A:423:LEU:HB3	1.84	0.59
1:B:460:ARG:HD3	1:B:506:VAL:HG13	1.85	0.58
2:F:405:ASP:O	2:F:408:ARG:NH1	2.36	0.58

Continued on next page...

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:52:THR:HA	1:A:342:VAL:HG22	1.86	0.58
1:B:90:THR:HB	1:B:91:PRO:HD3	1.86	0.58
1:A:80:ALA:O	1:A:101:GLN:NE2	2.37	0.57
1:B:538:PRO:HD2	1:B:541:LYS:HD3	1.85	0.57
2:F:480:CYS:HB2	2:F:483:GLN:HB2	1.86	0.57
1:A:116:LEU:HD11	1:A:187:LYS:HG3	1.86	0.57
1:B:26:LYS:HE2	1:B:93:ILE:HD11	1.86	0.57
2:F:475:ALA:HB3	2:F:487:ASN:HB3	1.87	0.57
1:A:180:TYR:HA	1:A:183:TYR:HB3	1.88	0.56
1:A:294:THR:HG23	1:A:365:THR:HA	1.87	0.56
2:E:393:SER:O	2:E:523:THR:OG1	2.24	0.56
1:B:490:PRO:HA	1:B:612:PRO:HG2	1.86	0.56
2:F:457:ARG:NH1	2:F:459:ALA:O	2.35	0.56
1:A:488:VAL:HG21	1:A:611:SER:HA	1.88	0.55
1:A:293:VAL:HG22	1:A:296:ALA:HB3	1.87	0.55
1:B:24:ASN:HD21	2:F:475:ALA:HB1	1.70	0.55
2:F:474:GLN:HG3	2:F:479:PRO:HA	1.88	0.55
1:B:268:GLY:O	1:B:277:ASN:ND2	2.34	0.55
1:A:188:ASN:HB3	1:A:192:ARG:HE	1.72	0.54
1:A:389:PRO:HG2	1:A:392:LEU:HB2	1.89	0.54
1:A:157:ASP:HB3	1:A:160:GLU:HB3	1.89	0.54
1:A:96:GLN:HG2	1:A:392:LEU:HD13	1.89	0.54
1:A:232:GLU:HB2	1:A:581:VAL:HG11	1.90	0.54
1:A:365:THR:HG23	1:A:368:ASP:H	1.72	0.54
1:B:74:LYS:NZ	1:B:103:ASN:O	2.26	0.53
1:B:187:LYS:HD3	1:B:199:TYR:CE2	2.44	0.53
2:E:379:CYS:HA	2:E:432:CYS:HA	1.91	0.53
1:B:378:HIS:CE1	1:B:402:GLU:OE2	2.63	0.52
1:B:242:ALA:HB2	1:B:604:VAL:HA	1.92	0.52
1:A:524:GLN:HG2	1:A:583:PRO:HG2	1.91	0.51
1:B:177:ARG:NH1	1:B:181:GLU:OE2	2.42	0.51
1:A:88:ILE:HB	1:A:94:LYS:HG2	1.92	0.51
2:E:439:ARG:HD3	2:E:499:PRO:HA	1.92	0.51
2:E:452:LYS:HG2	2:E:494:ARG:HG2	1.92	0.51
2:F:393:SER:O	2:F:523:THR:OG1	2.28	0.51
2:E:480:CYS:HB3	2:E:483:GLN:O	2.11	0.51
1:B:52:THR:HA	1:B:342:VAL:HG22	1.93	0.50
1:A:77:SER:OG	1:A:102:GLN:O	2.30	0.50
1:A:248:LEU:HD21	1:A:278:LEU:HD22	1.94	0.49
1:A:182:GLU:HA	1:A:185:VAL:HG12	1.94	0.49
1:B:239:HIS:CE1	1:B:596:LYS:HG2	2.48	0.49

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:245:ARG:NH2	1:A:603:PHE:O	2.45	0.49
2:E:350:VAL:HA	2:E:400:PHE:HB2	1.96	0.48
2:E:474:GLN:NE2	2:E:477:SER:O	2.45	0.48
2:F:380:TYR:N	2:F:431:GLY:O	2.44	0.48
1:A:142:LEU:HB3	1:A:147:GLY:HA3	1.96	0.48
1:B:157:ASP:HB3	1:B:160:GLU:HB3	1.96	0.48
2:F:365:TYR:HB2	2:F:388:ASN:HA	1.96	0.48
1:B:96:GLN:HG2	1:B:392:LEU:HD13	1.96	0.48
1:B:116:LEU:HD11	1:B:187:LYS:HG3	1.96	0.48
1:B:60:GLN:O	1:B:64:ASN:ND2	2.47	0.47
1:B:169:ARG:HH22	1:B:271:TRP:HA	1.79	0.47
2:E:452:LYS:HE3	2:E:494:ARG:HE	1.79	0.47
2:F:365:TYR:HH	2:F:392:PHE:HE2	1.63	0.47
2:F:401:VAL:HG22	2:F:509:ARG:HG2	1.96	0.47
1:B:154:ASN:HA	7:B:705:EDO:H22	1.96	0.47
1:B:394:ASN:OD1	1:B:395:GLY:N	2.47	0.47
1:A:31:ASN:ND2	2:E:493:TYR:OH	2.47	0.47
1:A:388:GLN:O	1:A:393:ARG:NH1	2.48	0.47
1:B:315:PHE:CD2	1:B:380:GLN:HG3	2.50	0.47
2:F:439:ARG:HD3	2:F:499:PRO:HA	1.97	0.47
1:A:92:ILE:O	1:A:96:GLN:HG3	2.15	0.47
1:A:177:ARG:NH1	1:A:181:GLU:OE2	2.48	0.47
1:A:315:PHE:CD1	1:A:380:GLN:HG3	2.50	0.47
1:A:394:ASN:OD1	1:A:395:GLY:N	2.46	0.47
1:A:204:ARG:HH22	1:A:465:LYS:HZ1	1.62	0.46
1:A:536:GLU:OE1	1:B:419:LYS:NZ	2.45	0.46
1:B:477:TRP:CD2	1:B:500:PRO:HG3	2.50	0.46
1:A:95:ARG:HD3	1:A:563:SER:O	2.15	0.46
1:B:30:ASN:O	1:B:34:GLN:HB2	2.16	0.46
1:B:184:VAL:HG22	1:B:464:PHE:HE1	1.80	0.46
1:B:233:ILE:HD13	1:B:450:LEU:HD13	1.98	0.46
1:B:133:CYS:HA	1:B:141:CYS:HA	1.98	0.46
1:B:553:LYS:HE3	1:B:573:VAL:HG23	1.97	0.46
1:B:236:LEU:HD13	1:B:592:PHE:HB2	1.98	0.46
1:B:477:TRP:CE3	1:B:500:PRO:HG3	2.51	0.46
1:A:169:ARG:HH22	1:A:271:TRP:HA	1.81	0.46
2:E:401:VAL:HG22	2:E:509:ARG:HG2	1.98	0.46
1:A:520:LEU:HD22	1:A:579:MET:HE2	1.98	0.45
1:A:560:LEU:HD21	1:A:564:GLU:HB2	1.99	0.45
1:B:477:TRP:HZ2	6:B:702:CL:CL	2.36	0.45
1:A:462:MET:HE3	1:A:462:MET:HB2	1.83	0.45

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:454:ARG:NH1	2:E:467:ASP:O	2.48	0.45
1:A:340:ARG:HD3	8:A:704:NAG:H82	1.99	0.45
2:E:454:ARG:HD3	2:E:457:ARG:HD2	1.97	0.45
1:A:425:SER:OG	1:A:427:ASP:OD1	2.30	0.45
1:B:85:LEU:HD21	1:B:98:GLN:HG2	1.98	0.45
1:B:20:LEU:HD22	1:B:23:GLU:HB2	1.98	0.45
1:B:112:LYS:HA	1:B:115:ARG:HB3	1.99	0.44
1:A:470:LYS:HA	1:A:473:TRP:CD1	2.53	0.44
1:B:168:TRP:O	1:B:172:VAL:HG22	2.18	0.44
1:A:450:LEU:HD21	1:A:519:THR:HG21	2.00	0.44
1:A:456:LEU:HD23	1:A:512:PHE:CD2	2.53	0.44
1:A:578:ASN:OD1	1:A:579:MET:N	2.46	0.43
1:B:229:THR:OG1	1:B:581:VAL:HB	2.18	0.43
2:F:379:CYS:HA	2:F:432:CYS:HA	2.00	0.43
1:A:482:ARG:O	1:A:606:TRP:NE1	2.51	0.43
1:A:560:LEU:HD22	1:A:569:ALA:HB2	2.00	0.43
2:E:389:ASP:OD1	2:E:389:ASP:N	2.47	0.43
1:B:389:PRO:HG2	1:B:392:LEU:HB2	2.01	0.43
1:A:233:ILE:HD13	1:A:450:LEU:HD13	2.01	0.43
1:A:275:TRP:HB3	1:A:278:LEU:HD12	2.01	0.43
1:B:26:LYS:HE3	1:B:26:LYS:HB2	1.78	0.43
1:B:519:THR:O	1:B:522:GLN:HG2	2.18	0.43
1:A:236:LEU:HD13	1:A:592:PHE:HB2	2.01	0.42
1:A:519:THR:O	1:A:522:GLN:HG2	2.19	0.42
1:B:73:LEU:O	1:B:77:SER:N	2.47	0.42
2:E:449:TYR:HB3	2:E:494:ARG:HD3	2.01	0.42
2:F:454:ARG:NH1	2:F:467:ASP:O	2.51	0.42
1:A:74:LYS:HA	1:A:74:LYS:HD2	1.84	0.42
1:B:102:GLN:HA	8:B:706:NAG:H82	2.01	0.42
1:B:578:ASN:OD1	1:B:579:MET:N	2.45	0.42
1:A:244:VAL:HG13	1:A:282:THR:HG21	2.01	0.42
1:A:535:HIS:CD2	1:A:542:CYS:HB2	2.54	0.42
1:A:85:LEU:HD13	1:A:101:GLN:HG3	2.00	0.42
1:A:204:ARG:HH22	1:A:465:LYS:NZ	2.17	0.42
1:A:85:LEU:HD21	1:A:98:GLN:HG2	2.02	0.42
1:A:97:LEU:O	1:A:101:GLN:HG2	2.19	0.42
1:B:450:LEU:HD21	1:B:519:THR:HG21	2.01	0.42
2:F:439:ARG:HG3	2:F:506:GLN:HG2	2.02	0.42
1:A:455:MET:HE2	1:A:485:VAL:HG21	2.02	0.42
2:F:456:PHE:HB3	2:F:473:TYR:CG	2.55	0.42
1:A:97:LEU:O	1:A:101:GLN:N	2.53	0.41

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:309:LYS:O	1:A:313:LYS:HG2	2.20	0.41
1:B:446:ILE:HD12	1:B:588:PHE:HZ	1.84	0.41
1:B:38:ASP:O	1:B:42:GLN:HG2	2.20	0.41
1:B:20:LEU:HD23	1:B:20:LEU:HA	1.85	0.41
1:B:89:GLN:HB2	1:B:90:THR:H	1.56	0.41
1:A:108:LEU:HD23	1:A:113:SER:HA	2.02	0.41
1:A:198:ASP:N	1:A:198:ASP:OD1	2.54	0.41
1:B:24:ASN:ND2	2:F:475:ALA:HB1	2.34	0.41
1:B:28:PHE:CE1	1:B:80:ALA:HB2	2.56	0.41
1:B:482:ARG:NH2	1:B:489:GLU:OE2	2.53	0.41
1:A:104:GLY:O	1:A:194:ASN:ND2	2.50	0.41
1:A:399:GLY:O	1:A:518:ARG:HB2	2.21	0.41
1:B:468:ILE:HG22	1:B:473:TRP:HD1	1.86	0.41
1:A:247:LYS:HB2	1:A:282:THR:HG22	2.04	0.40
1:B:382:ASP:HA	1:B:385:TYR:CZ	2.57	0.40
1:B:573:VAL:HG13	1:B:574:VAL:HG13	2.04	0.40
2:F:367:VAL:O	2:F:368:LEU:HB2	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	592/597 (99%)	563 (95%)	29 (5%)	0	100	100
1	B	592/597 (99%)	560 (95%)	30 (5%)	2 (0%)	41	72
2	E	184/217 (85%)	162 (88%)	20 (11%)	2 (1%)	14	46
2	F	184/217 (85%)	162 (88%)	22 (12%)	0	100	100
All	All	1552/1628 (95%)	1447 (93%)	101 (6%)	4 (0%)	41	72

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	90	THR
1	B	92	ILE
2	E	477	SER
2	E	479	PRO

### 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	523/526 (99%)	510 (98%)	13 (2%)	47 72
1	B	524/526 (100%)	508 (97%)	16 (3%)	40 67
2	E	162/189 (86%)	160 (99%)	2 (1%)	71 83
2	F	163/189 (86%)	157 (96%)	6 (4%)	34 62
All	All	1372/1430 (96%)	1335 (97%)	37 (3%)	44 71

All (37) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	22	GLU
1	A	129	THR
1	A	131	LYS
1	A	172	VAL
1	A	287	GLN
1	A	334	THR
1	A	349	TRP
1	A	381	TYR
1	A	400	PHE
1	A	514	ARG
1	A	518	ARG
1	A	555	PHE
1	A	557	MET
1	B	22	GLU
1	B	23	GLU
1	B	34	GLN
1	B	73	LEU
1	B	92	ILE

*Continued on next page...*



*Continued from previous page...*

Mol	Chain	Res	Type
1	B	102	GLN
1	B	172	VAL
1	B	287	GLN
1	B	340	ARG
1	B	381	TYR
1	B	400	PHE
1	B	514	ARG
1	B	518	ARG
1	B	522	GLN
1	B	555	PHE
1	B	557	MET
2	E	377	PHE
2	E	495	TYR
2	F	377	PHE
2	F	474	GLN
2	F	481	ASN
2	F	483	GLN
2	F	486	LEU
2	F	495	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	31	ASN
1	A	34	GLN
1	A	98	GLN
1	A	117	ASN
1	A	239	HIS
1	A	373	HIS
1	B	24	ASN
1	B	81	GLN
1	B	195	HIS
2	E	487	ASN
2	F	474	GLN
2	F	487	ASN

### 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](#)

7 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	C	1	1,3	14,14,15	0.47	0	17,19,21	0.73	0
3	NAG	C	2	3	14,14,15	0.20	0	17,19,21	0.48	0
3	NAG	D	1	1,3	14,14,15	0.67	0	17,19,21	0.70	0
3	NAG	D	2	3	14,14,15	0.63	0	17,19,21	0.37	0
4	NAG	G	1	1,4	14,14,15	0.41	0	17,19,21	0.47	0
4	NAG	G	2	4	14,14,15	0.21	0	17,19,21	0.61	0
4	BMA	G	3	4	11,11,12	0.79	0	15,15,17	0.71	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAG	C	1	1,3	-	1/6/23/26	0/1/1/1
3	NAG	C	2	3	-	2/6/23/26	0/1/1/1
3	NAG	D	1	1,3	-	4/6/23/26	0/1/1/1
3	NAG	D	2	3	-	1/6/23/26	0/1/1/1
4	NAG	G	1	1,4	-	4/6/23/26	0/1/1/1
4	NAG	G	2	4	-	4/6/23/26	0/1/1/1
4	BMA	G	3	4	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

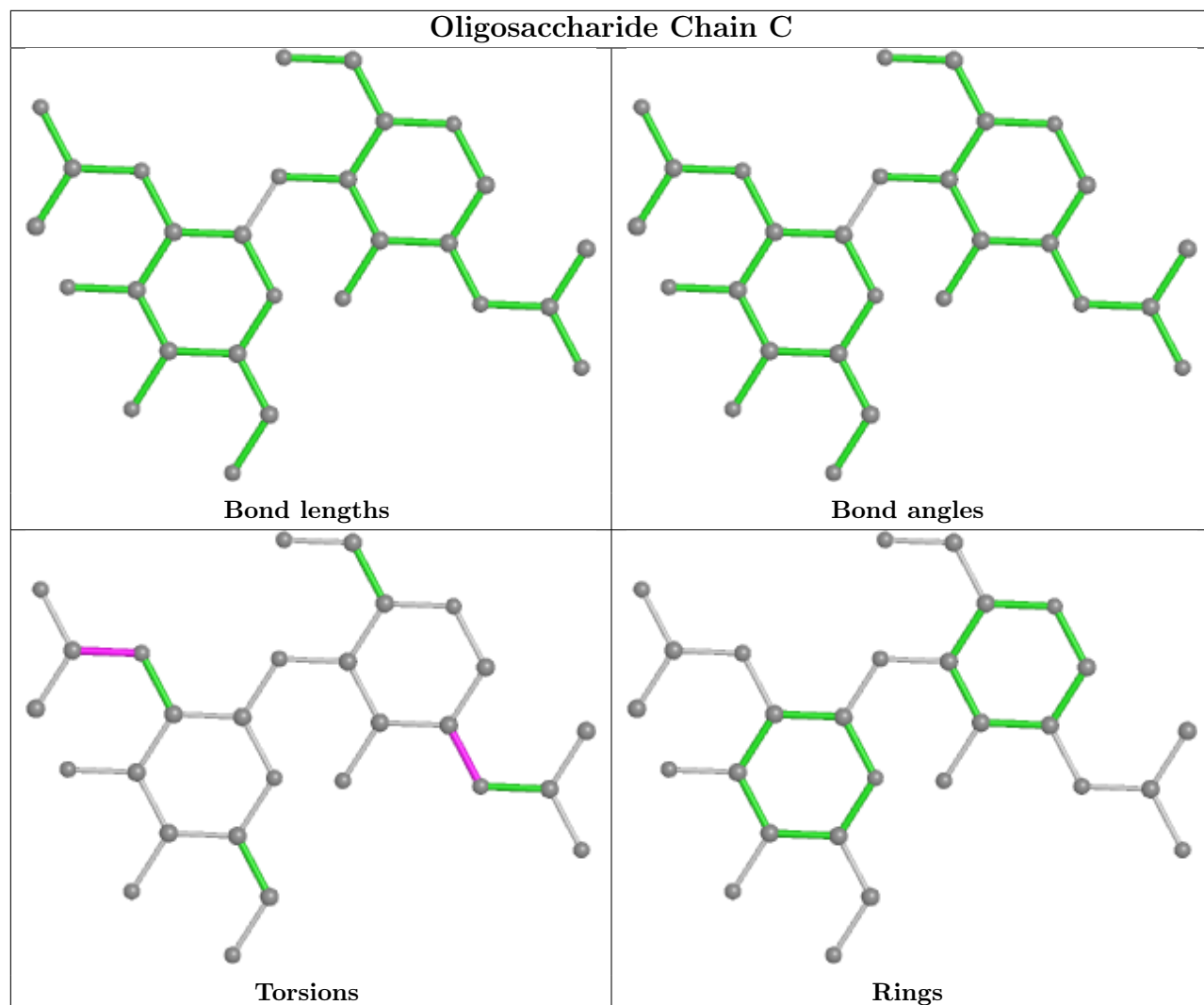
All (16) torsion outliers are listed below:

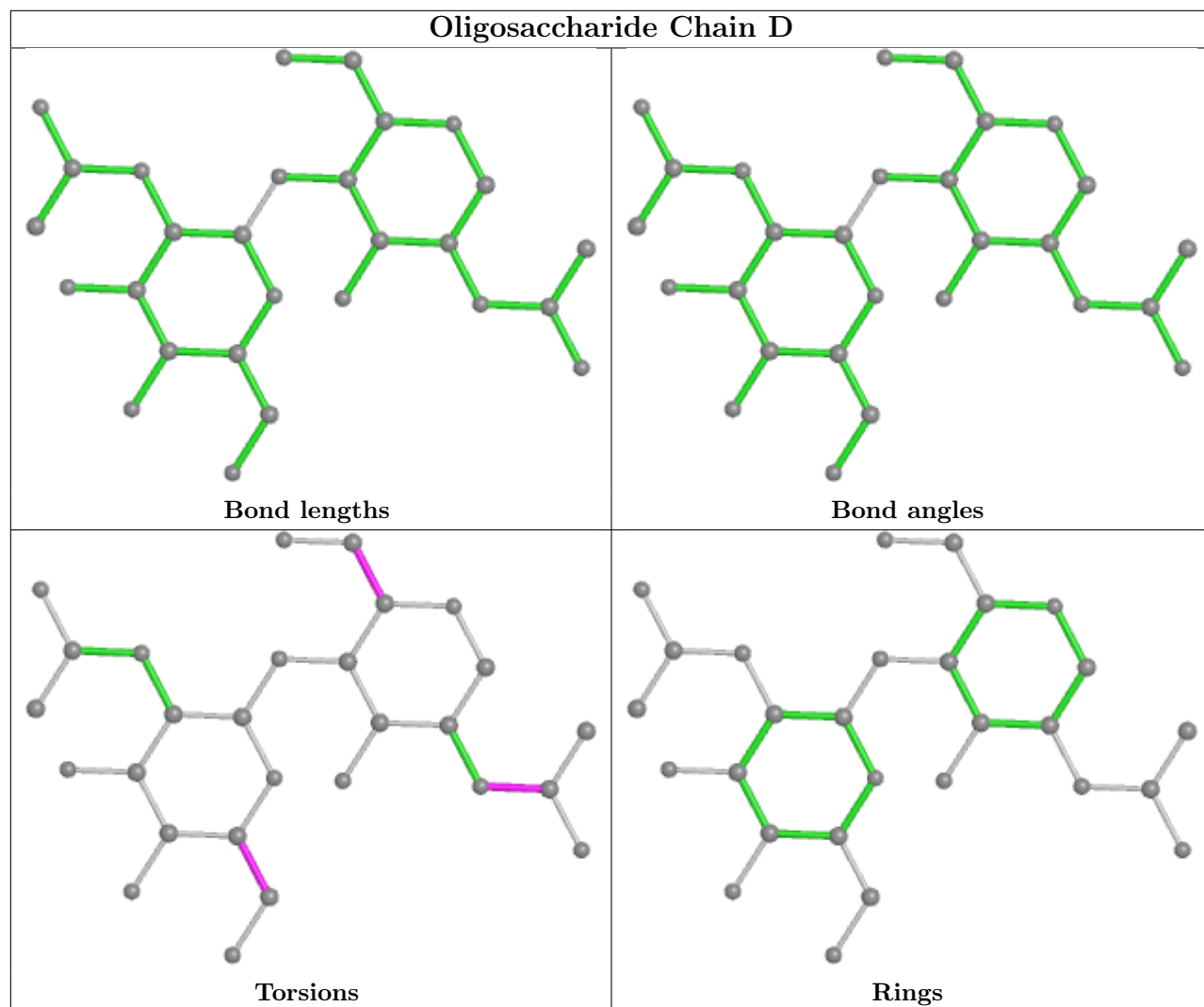
Mol	Chain	Res	Type	Atoms
4	G	2	NAG	O5-C5-C6-O6
3	C	2	NAG	C8-C7-N2-C2
3	C	2	NAG	O7-C7-N2-C2
3	D	1	NAG	C8-C7-N2-C2
3	D	1	NAG	O7-C7-N2-C2
4	G	1	NAG	C8-C7-N2-C2
4	G	1	NAG	O7-C7-N2-C2
4	G	1	NAG	O5-C5-C6-O6
4	G	2	NAG	C4-C5-C6-O6
4	G	1	NAG	C4-C5-C6-O6
3	D	2	NAG	O5-C5-C6-O6
3	D	1	NAG	C4-C5-C6-O6
3	D	1	NAG	O5-C5-C6-O6
3	C	1	NAG	C3-C2-N2-C7
4	G	2	NAG	C3-C2-N2-C7
4	G	2	NAG	C1-C2-N2-C7

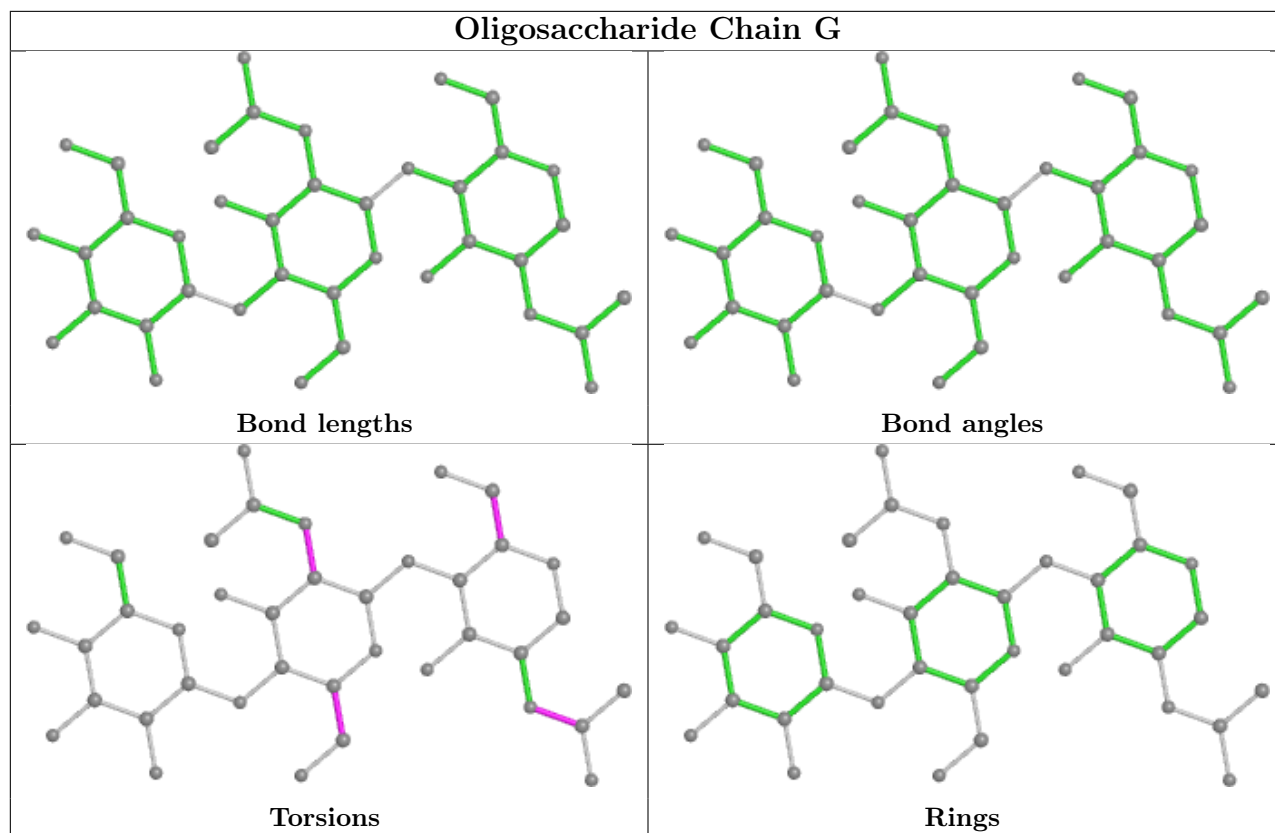
There are no ring outliers.

No monomer is involved in short contacts.

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







## 5.6 Ligand geometry [i](#)

Of 11 ligands modelled in this entry, 4 are monoatomic - leaving 7 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	NAG	B	706	1	14,14,15	0.26	0	17,19,21	0.32	0
7	EDO	A	703	-	3,3,3	0.46	0	2,2,2	0.35	0
7	EDO	B	703	-	3,3,3	0.42	0	2,2,2	0.44	0
8	NAG	F	601	2	14,14,15	0.35	0	17,19,21	0.47	0
7	EDO	B	704	-	3,3,3	0.43	0	2,2,2	0.40	0
8	NAG	A	704	1	14,14,15	0.38	0	17,19,21	0.62	1 (5%)
7	EDO	B	705	-	3,3,3	0.43	0	2,2,2	0.38	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral

centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
8	NAG	B	706	1	-	0/6/23/26	0/1/1/1
7	EDO	A	703	-	-	0/1/1/1	-
7	EDO	B	703	-	-	0/1/1/1	-
8	NAG	F	601	2	-	1/6/23/26	0/1/1/1
7	EDO	B	704	-	-	1/1/1/1	-
8	NAG	A	704	1	-	1/6/23/26	0/1/1/1
7	EDO	B	705	-	-	0/1/1/1	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	A	704	NAG	C1-O5-C5	2.10	115.03	112.19

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
8	F	601	NAG	O5-C5-C6-O6
7	B	704	EDO	O1-C1-C2-O2
8	A	704	NAG	O5-C5-C6-O6

There are no ring outliers.

5 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	B	706	NAG	1	0
7	B	703	EDO	1	0
7	B	704	EDO	1	0
8	A	704	NAG	1	0
7	B	705	EDO	1	0

## 5.7 Other polymers [i](#)

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, 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	593/597 (99%)	0.24	12 (2%) 65 63	49, 91, 132, 196	0
1	B	594/597 (99%)	0.16	9 (1%) 73 71	39, 77, 136, 183	0
2	E	188/217 (86%)	0.48	12 (6%) 19 19	53, 87, 149, 228	0
2	F	188/217 (86%)	0.49	11 (5%) 22 22	67, 105, 153, 207	0
All	All	1563/1628 (96%)	0.27	44 (2%) 53 51	39, 88, 141, 228	0

All (44) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	E	334	ASN	7.0
2	E	395	VAL	4.1
2	F	432	CYS	4.1
1	A	299	ASP	4.1
2	E	515	PHE	3.8
2	E	387	LEU	3.7
1	A	426	PRO	3.7
2	F	391	CYS	3.6
2	E	338	PHE	3.5
2	F	392	PHE	3.4
1	A	106	SER	3.3
2	F	431	GLY	3.3
1	A	222	LEU	3.2
1	B	90	THR	3.1
2	E	369	TYR	3.0
2	F	515	PHE	3.0
2	E	386	LYS	2.8
2	F	389	ASP	2.8
2	F	516	GLU	2.7
2	E	337	PRO	2.6
1	B	83	PHE	2.6

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
1	B	22	GLU	2.6
1	B	136	ASP	2.6
2	F	418	ILE	2.6
1	B	516	TYR	2.5
1	A	217	TYR	2.5
2	E	514	SER	2.5
2	F	395	VAL	2.4
2	E	397	ALA	2.3
1	A	428	PHE	2.3
1	B	222	LEU	2.3
2	E	364	ASP	2.2
1	B	88	ILE	2.2
2	E	340	GLU	2.2
1	B	127	TYR	2.2
1	A	427	ASP	2.2
1	A	187	LYS	2.2
1	B	226	VAL	2.1
1	A	362	THR	2.1
1	A	525	PHE	2.1
2	F	384	ALA	2.1
2	F	455	LEU	2.1
1	A	579	MET	2.0
1	A	138	PRO	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, 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.

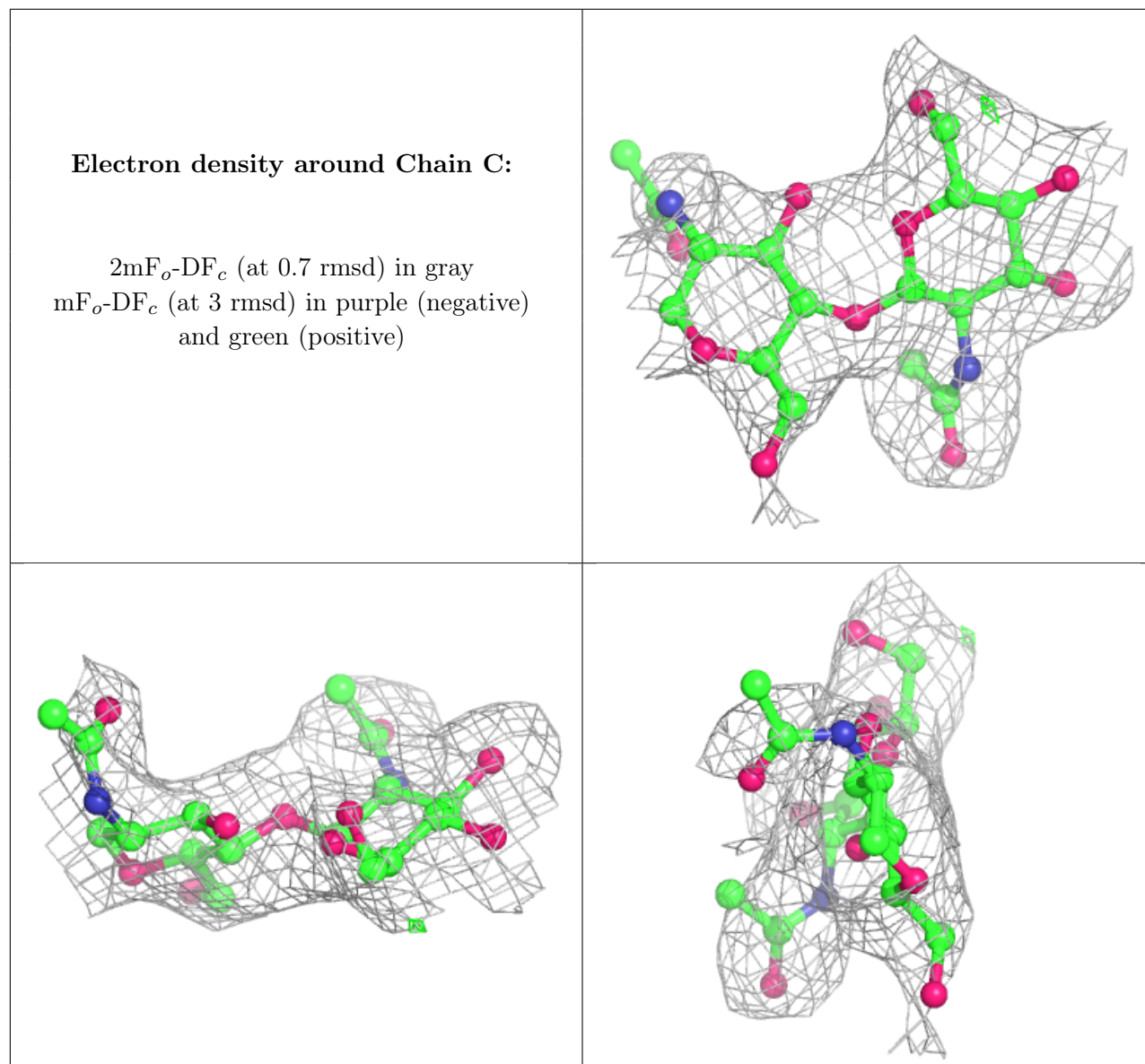
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
3	NAG	D	1	14/15	0.83	0.23	91,109,116,117	0
3	NAG	D	2	14/15	0.83	0.21	98,110,114,115	0
3	NAG	C	1	14/15	0.85	0.25	91,113,122,124	0
4	NAG	G	1	14/15	0.86	0.17	69,81,87,89	0
3	NAG	C	2	14/15	0.87	0.19	82,88,98,98	0

*Continued on next page...*

Continued from previous page...

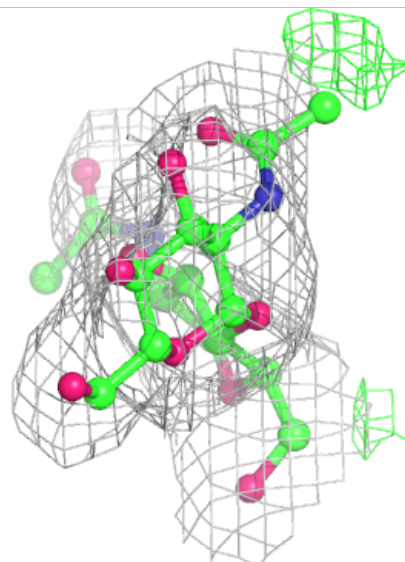
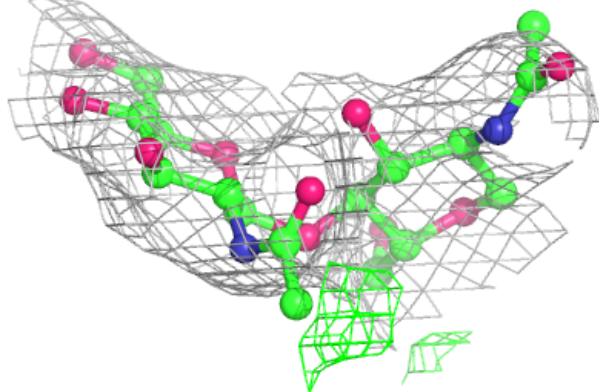
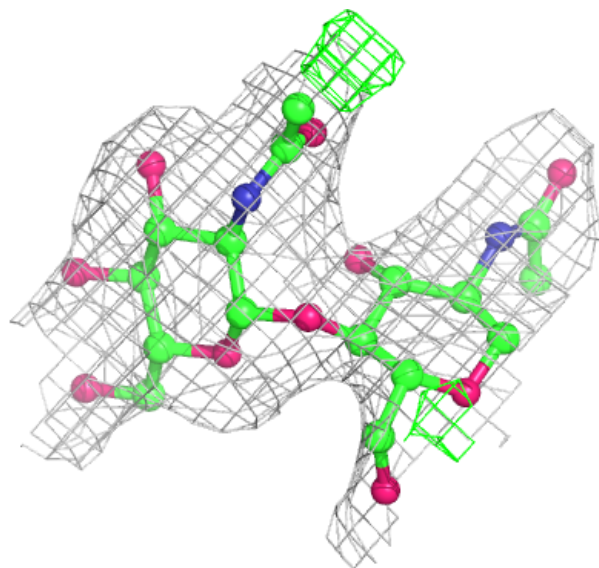
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
4	BMA	G	3	11/12	0.87	0.19	84,93,104,105	0
4	NAG	G	2	14/15	0.90	0.17	73,93,97,104	0

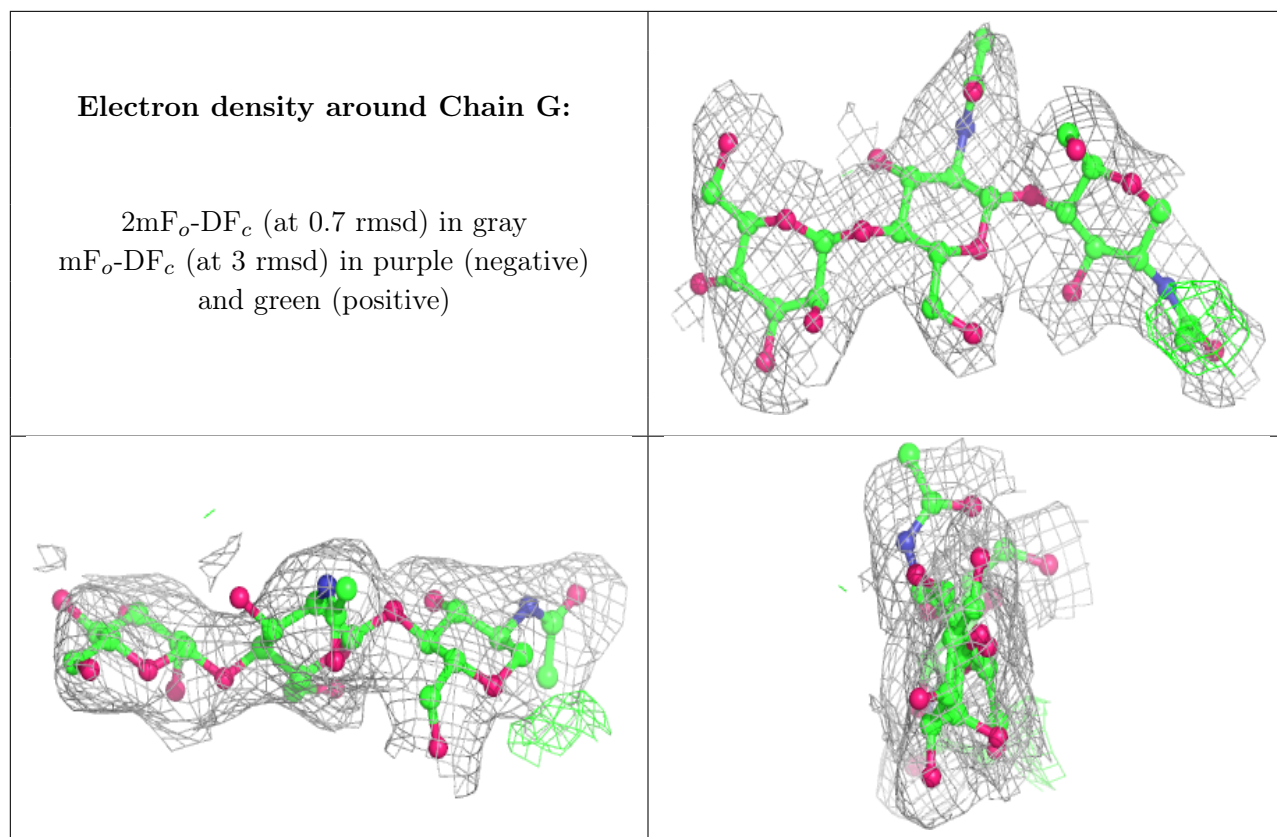
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.



**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)





## 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
8	NAG	B	706	14/15	0.78	0.40	116,136,150,150	0
7	EDO	A	703	4/4	0.82	0.32	59,60,60,64	0
8	NAG	A	704	14/15	0.83	0.23	85,91,101,102	0
8	NAG	F	601	14/15	0.87	0.18	95,112,119,119	0
7	EDO	B	705	4/4	0.88	0.28	52,53,54,59	0
7	EDO	B	703	4/4	0.88	0.21	62,64,65,69	0
6	CL	B	702	1/1	0.93	0.14	60,60,60,60	0
6	CL	A	702	1/1	0.96	0.22	52,52,52,52	0
7	EDO	B	704	4/4	0.96	0.16	41,42,51,54	0
5	ZN	B	701	1/1	0.97	0.15	64,64,64,64	0
5	ZN	A	701	1/1	0.98	0.07	90,90,90,90	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.