



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 1, 2021 – 02:19 pm BST

PDB ID : 6ZWI
Title : Human butyrylcholinesterase in complex with ((6-((2E,4E)-5-(benzo[d][1,3]dioxol-5-yl)penta-2,4-dienamido)hexyl)triphenylphosphonium bromide)
Authors : Da Silva, O.; Nachon, F.; Dias, J.; Brazzolotto, X.
Deposited on : 2020-07-28
Resolution : 1.85 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 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 : 2.19
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) : 2.19

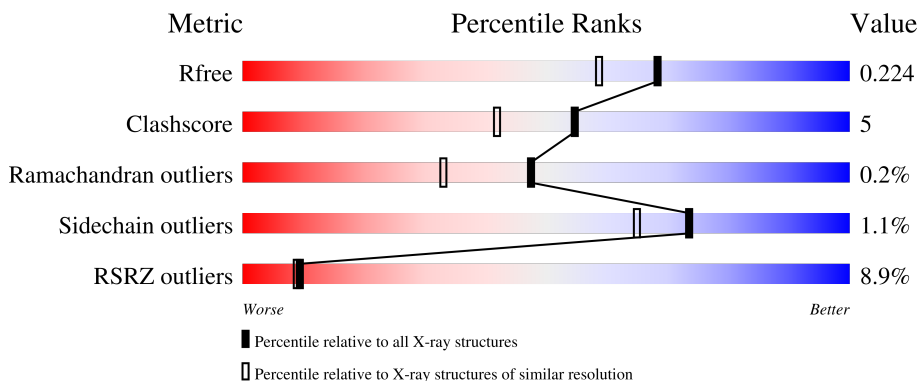
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.85 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.



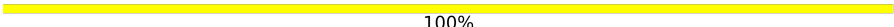
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	2469 (1.86-1.86)
Clashscore	141614	2625 (1.86-1.86)
Ramachandran outliers	138981	2592 (1.86-1.86)
Sidechain outliers	138945	2592 (1.86-1.86)
RSRZ outliers	127900	2436 (1.86-1.86)

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	529	 9% 88% 12%
2	B	5	 60% 40%
3	C	2	 50% 50%
4	D	2	 50% 50%
5	E	3	 33% 67%

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Mol	Chain	Length	Quality of chain
5	F	3	 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
12	BR	A	615[B]	-	-	X	-
2	NAG	B	2	-	-	-	X
5	NAG	E	2	-	-	-	X
7	GOL	A	603	-	-	X	-

2 Entry composition i

There are 13 unique types of molecules in this entry. The entry contains 4808 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.

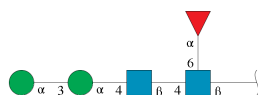
- Molecule 1 is a protein called Cholinesterase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	527	4294	2772	721	785	16	0	15	0

There are 4 discrepancies between the modelled and reference sequences:

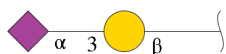
Chain	Residue	Modelled	Actual	Comment	Reference
A	17	GLN	ASN	engineered mutation	UNP P06276
A	455	GLN	ASN	engineered mutation	UNP P06276
A	481	GLN	ASN	engineered mutation	UNP P06276
A	486	GLN	ASN	engineered mutation	UNP P06276

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



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

- Molecule 3 is an oligosaccharide called N-acetyl-alpha-neuraminic acid-(2-3)-beta-D-galactopyranose.



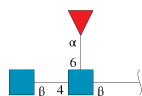
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	C	2	32	17	1	14	0	0	0

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



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

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



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
5	E	3	38	22	2	14	0	0	0
5	F	3	38	22	2	14	0	0	0

- Molecule 6 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: C₈H₁₅NO₆).



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

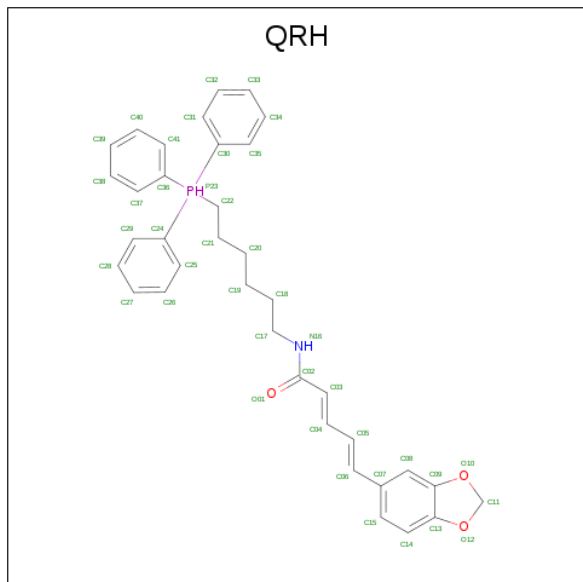
- Molecule 7 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).



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

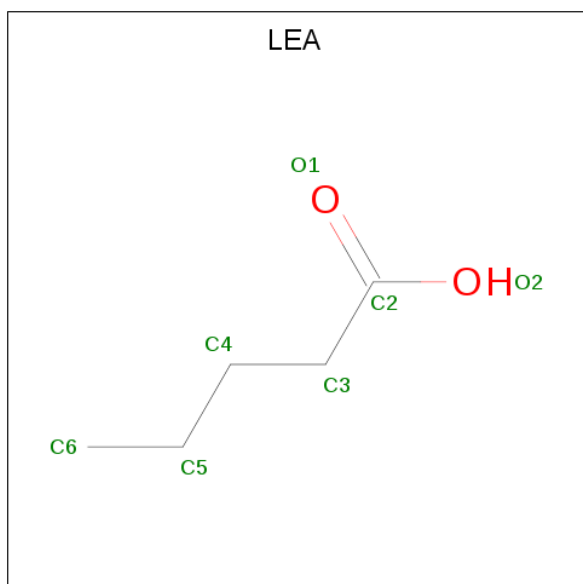
- Molecule 8 is (2 {E},4 {E})-5-(1,3-benzodioxol-5-yl)- {N}-[6-(triphenyl-\$l^{\wedge}\{5\}\$)-phosphany

1)hexyl]penta-2,4-dienamide (three-letter code: QRH) (formula: C₃₆H₃₈NO₃P) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	P		
8	A	1	26	24	1	1	0	1

- Molecule 9 is PENTANOIC ACID (three-letter code: LEA) (formula: C₅H₁₀O₂).

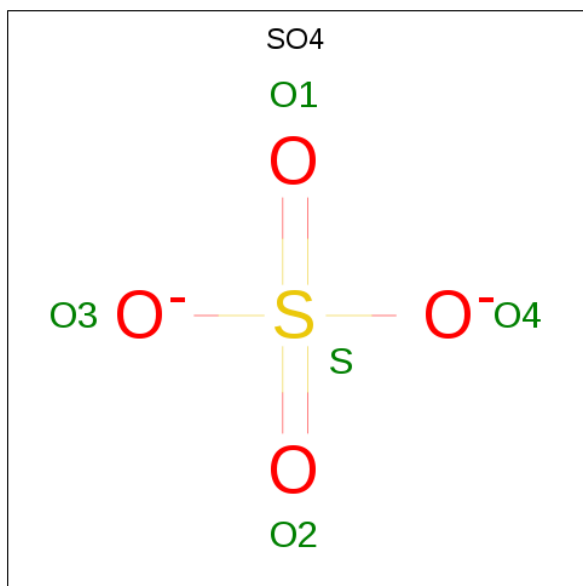


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
9	A	1	7	5	2	0	0

- Molecule 10 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
10	A	4	Total Cl 4 4	0	0

- Molecule 11 is SULFATE ION (three-letter code: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
11	A	1	Total O S 5 4 1	0	0
11	A	1	Total O S 5 4 1	0	0
11	A	1	Total O S 5 4 1	0	0
11	A	1	Total O S 5 4 1	0	0

- Molecule 12 is BROMIDE ION (three-letter code: BR) (formula: Br).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
12	A	2	Total Br 3 3	0	1

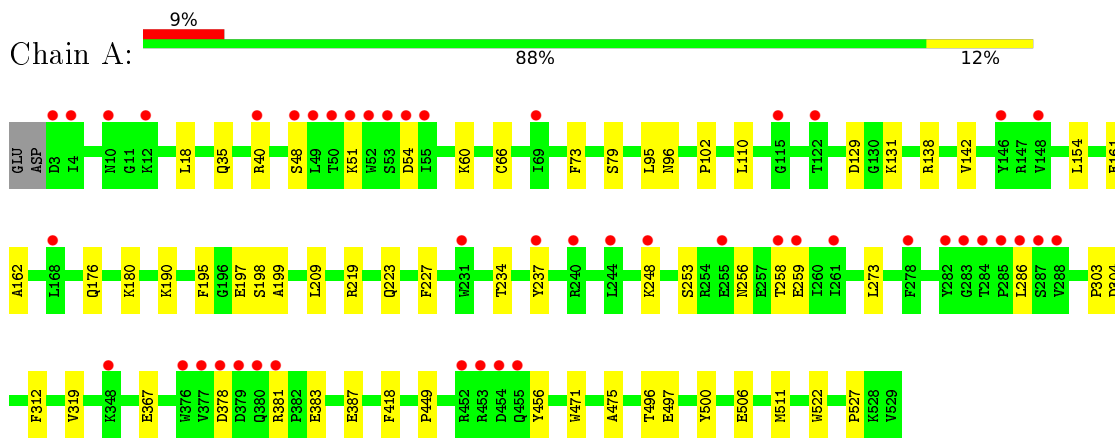
- Molecule 13 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
13	A	228	Total 228	O 228	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: Cholinesterase



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




- Molecule 3: N-acetyl-alpha-neuraminic acid-(2-3)-beta-D-galactopyranose



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

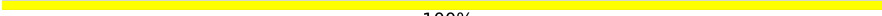


- Molecule 5: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose

Chain E:  33% 67%

IMG1
IMG2
FUC3

- Molecule 5: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose

Chain F:  100%

IMG1
IMG2
FUC3

4 Data and refinement statistics

Property	Value	Source
Space group	I 4 2 2	Depositor
Cell constants a, b, c, α , β , γ	154.30Å 154.30Å 127.70Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.79 – 1.85 48.79 – 1.85	Depositor EDS
% Data completeness (in resolution range)	100.0 (48.79-1.85) 100.0 (48.79-1.85)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.02 (at 1.86Å)	Xtrriage
Refinement program	PHENIX 1.17.1_3660	Depositor
R, R_{free}	0.188 , 0.224 0.188 , 0.224	Depositor DCC
R_{free} test set	1310 reflections (2.00%)	wwPDB-VP
Wilson B-factor (Å ²)	47.1	Xtrriage
Anisotropy	0.056	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 62.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	4808	wwPDB-VP
Average B, all atoms (Å ²)	56.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.53% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: FUC, SIA, LEA, GOL, NAG, CL, QRH, BR, SO4, GAL, MAN

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	0.76	0/4441	0.74	1/6030 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	A	219	ARG	NE-CZ-NH1	-5.10	117.75	120.30

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	4294	0	4185	45	0
2	B	60	0	52	1	0
3	C	32	0	28	1	0
4	D	24	0	22	0	0
5	E	38	0	34	0	0
5	F	38	0	34	0	0
6	A	28	0	26	0	0
7	A	6	0	6	5	0
8	A	26	0	0	0	0
9	A	7	0	9	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
10	A	4	0	0	0	0
11	A	20	0	0	0	0
12	A	3	0	0	2	0
13	A	228	0	0	0	0
All	All	4808	0	4396	47	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 5.

All (47) 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:A:51:LYS:H	1:A:51:LYS:HD2	1.38	0.86
1:A:378:ASP:HB3	1:A:381:ARG:HE	1.41	0.84
1:A:256:ASN:HB3	1:A:259:GLU:HG3	1.60	0.83
1:A:378:ASP:H	1:A:381:ARG:HH21	1.31	0.76
1:A:18:LEU:HD13	7:A:603:GOL:H32	1.75	0.68
1:A:248:LYS:HG2	1:A:253:SER:OG	1.96	0.64
1:A:496:THR:HG23	1:A:497:GLU:HG3	1.80	0.64
1:A:227:PHE:CE2	1:A:303:PRO:HB2	2.34	0.62
1:A:161:GLU:HG3	1:A:258:THR:HG23	1.81	0.61
1:A:131:LYS:HD3	7:A:603:GOL:H31	1.84	0.59
1:A:378:ASP:HB3	1:A:381:ARG:NE	2.15	0.58
1:A:500:TYR:CZ	1:A:511[B]:MET:HB2	2.40	0.55
1:A:378:ASP:H	1:A:381:ARG:NH2	2.06	0.52
1:A:383:GLU:O	1:A:387:GLU:HG3	2.13	0.48
1:A:227:PHE:CD2	1:A:303:PRO:HB2	2.49	0.48
1:A:66:CYS:HB3	1:A:273:LEU:HD11	1.96	0.48
1:A:110:LEU:HD11	1:A:475:ALA:CB	2.43	0.47
1:A:197:GLU:HA	1:A:223:GLN:O	2.14	0.47
1:A:102:PRO:O	1:A:138:ARG:NH2	2.48	0.47
1:A:18:LEU:CD1	7:A:603:GOL:H32	2.44	0.46
1:A:522:TRP:O	1:A:527:PRO:HD3	2.15	0.46
1:A:198:SER:HG	9:A:605:LEA:C2	2.20	0.46
1:A:227:PHE:CD2	1:A:227:PHE:C	2.88	0.46
1:A:154:LEU:HD23	1:A:162:ALA:HB1	1.98	0.46
1:A:73:PHE:HB2	1:A:79:SER:OG	2.17	0.45
1:A:496:THR:HG23	1:A:497:GLU:N	2.31	0.45
1:A:319:VAL:O	1:A:418:PHE:HA	2.17	0.45
1:A:35[B]:GLN:HG3	1:A:48:SER:O	2.16	0.44
1:A:129:ASP:OD1	7:A:603:GOL:H31	2.17	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:131:LYS:HD3	7:A:603:GOL:C3	2.47	0.44
1:A:198:SER:HG	1:A:199:ALA:H	1.64	0.43
1:A:234:THR:OG1	12:A:615[B]:BR:BR	2.76	0.43
1:A:496:THR:HG23	1:A:497:GLU:H	1.83	0.43
1:A:449:PRO:HA	1:A:456:TYR:CD1	2.54	0.43
1:A:60:LYS:HE2	3:C:2:SIA:O1B	2.18	0.43
1:A:51:LYS:H	1:A:51:LYS:CD	2.12	0.42
2:B:2:NAG:H62	2:B:3:MAN:H2	2.00	0.42
1:A:96:ASN:O	1:A:142:VAL:HA	2.20	0.41
1:A:176[B]:GLN:HG3	1:A:180:LYS:HD2	2.01	0.41
1:A:54:ASP:OD1	1:A:54:ASP:N	2.49	0.41
1:A:209:LEU:HD22	1:A:312:PHE:HB3	2.02	0.41
1:A:256:ASN:O	1:A:259:GLU:N	2.49	0.41
1:A:304:ASP:OD2	1:A:304:ASP:N	2.53	0.41
1:A:237:TYR:CD1	1:A:237:TYR:N	2.88	0.40
1:A:95:LEU:C	1:A:95:LEU:HD12	2.42	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	539/529 (102%)	516 (96%)	22 (4%)	1 (0%)	47 33

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	506	GLU

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	465/454 (102%)	460 (99%)	5 (1%)	73 65

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	40	ARG
1	A	190	LYS
1	A	195	PHE
1	A	367	GLU
1	A	471	TRP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	71	GLN
1	A	517	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

15 monosaccharides are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The

Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	NAG	B	1	1,2	14,14,15	0.62	1 (7%)	17,19,21	0.56	0
2	NAG	B	2	2	14,14,15	0.67	1 (7%)	17,19,21	0.49	0
2	MAN	B	3	2	11,11,12	1.72	3 (27%)	15,15,17	1.64	3 (20%)
2	MAN	B	4	2	11,11,12	1.65	3 (27%)	15,15,17	1.23	2 (13%)
2	FUC	B	5	2	10,10,11	0.95	0	14,14,16	1.28	2 (14%)
3	GAL	C	1	3	12,12,12	1.42	2 (16%)	17,17,17	1.33	2 (11%)
3	SIA	C	2	3	17,20,21	1.14	1 (5%)	21,28,31	1.45	3 (14%)
4	NAG	D	1	4,1	14,14,15	0.58	0	17,19,21	0.48	0
4	FUC	D	2	4	10,10,11	1.61	1 (10%)	14,14,16	1.24	2 (14%)
5	NAG	E	1	5,1	14,14,15	0.36	0	17,19,21	0.52	0
5	NAG	E	2	5	14,14,15	0.85	2 (14%)	17,19,21	0.71	1 (5%)
5	FUC	E	3	5	10,10,11	1.28	2 (20%)	14,14,16	1.32	2 (14%)
5	NAG	F	1	5,1	14,14,15	0.72	1 (7%)	17,19,21	0.63	0
5	NAG	F	2	5	14,14,15	1.06	1 (7%)	17,19,21	1.15	2 (11%)
5	FUC	F	3	5	10,10,11	1.52	2 (20%)	14,14,16	1.04	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
2	NAG	B	1	1,2	-	4/6/23/26	0/1/1/1
2	NAG	B	2	2	-	2/6/23/26	0/1/1/1
2	MAN	B	3	2	-	1/2/19/22	0/1/1/1
2	MAN	B	4	2	-	1/2/19/22	1/1/1/1
2	FUC	B	5	2	-	-	0/1/1/1
3	GAL	C	1	3	-	2/2/22/22	0/1/1/1
3	SIA	C	2	3	-	2/14/34/38	0/1/1/1
4	NAG	D	1	4,1	-	0/6/23/26	0/1/1/1
4	FUC	D	2	4	-	-	0/1/1/1
5	NAG	E	1	5,1	-	0/6/23/26	0/1/1/1
5	NAG	E	2	5	-	2/6/23/26	0/1/1/1
5	FUC	E	3	5	-	-	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	F	1	5,1	-	1/6/23/26	0/1/1/1
5	NAG	F	2	5	-	2/6/23/26	0/1/1/1
5	FUC	F	3	5	-	-	0/1/1/1

All (20) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	3	MAN	C1-C2	3.74	1.60	1.52
5	F	2	NAG	O5-C1	-3.73	1.37	1.43
4	D	2	FUC	C4-C3	3.39	1.61	1.52
3	C	1	GAL	O3-C3	3.13	1.50	1.43
5	F	3	FUC	C2-C3	3.11	1.57	1.52
2	B	4	MAN	C1-C2	3.04	1.59	1.52
2	B	4	MAN	C2-C3	3.02	1.57	1.52
5	E	3	FUC	C4-C5	2.99	1.59	1.52
2	B	4	MAN	O5-C5	2.68	1.48	1.43
3	C	1	GAL	C1-C2	2.46	1.58	1.52
2	B	3	MAN	C2-C3	2.36	1.56	1.52
5	E	2	NAG	C1-C2	2.19	1.55	1.52
2	B	3	MAN	O5-C5	2.17	1.47	1.43
5	F	3	FUC	C4-C5	2.16	1.57	1.52
2	B	2	NAG	C1-C2	2.16	1.55	1.52
3	C	2	SIA	O6-C2	2.14	1.49	1.43
5	E	3	FUC	C1-C2	2.13	1.57	1.52
5	E	2	NAG	O5-C1	2.11	1.47	1.43
5	F	1	NAG	C1-C2	2.10	1.55	1.52
2	B	1	NAG	O5-C1	2.00	1.46	1.43

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	3	MAN	C1-O5-C5	4.05	117.68	112.19
3	C	1	GAL	O5-C5-C4	3.14	115.40	109.69
3	C	2	SIA	C6-O6-C2	3.02	117.80	111.34
3	C	2	SIA	C4-C3-C2	2.90	115.00	109.81
5	F	2	NAG	C3-C4-C5	2.89	115.40	110.24
2	B	3	MAN	C1-C2-C3	2.87	113.19	109.67
5	F	2	NAG	C1-O5-C5	2.75	115.91	112.19
4	D	2	FUC	C1-O5-C5	2.64	118.77	112.78
2	B	4	MAN	C1-O5-C5	2.56	115.66	112.19
3	C	1	GAL	C1-O5-C5	2.53	118.44	113.66
3	C	2	SIA	O7-C7-C8	2.53	114.92	108.81

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	5	FUC	C1-C2-C3	2.51	112.75	109.67
2	B	4	MAN	O3-C3-C2	2.35	114.50	109.99
5	E	3	FUC	O5-C5-C4	2.34	113.71	109.52
2	B	3	MAN	O2-C2-C3	-2.33	105.47	110.14
5	E	2	NAG	C1-O5-C5	2.31	115.32	112.19
2	B	5	FUC	C1-O5-C5	2.29	117.98	112.78
4	D	2	FUC	O5-C5-C4	2.05	113.19	109.52
5	E	3	FUC	O4-C4-C5	2.02	114.14	109.67

There are no chirality outliers.

All (17) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	2	NAG	O5-C5-C6-O6
5	E	2	NAG	O5-C5-C6-O6
2	B	2	NAG	C4-C5-C6-O6
3	C	1	GAL	O5-C5-C6-O6
5	F	2	NAG	O5-C5-C6-O6
2	B	1	NAG	C8-C7-N2-C2
2	B	1	NAG	O7-C7-N2-C2
3	C	2	SIA	C11-C10-N5-C5
3	C	2	SIA	O10-C10-N5-C5
5	E	2	NAG	C4-C5-C6-O6
2	B	1	NAG	O5-C5-C6-O6
2	B	4	MAN	O5-C5-C6-O6
2	B	1	NAG	C4-C5-C6-O6
5	F	2	NAG	C4-C5-C6-O6
2	B	3	MAN	O5-C5-C6-O6
3	C	1	GAL	C4-C5-C6-O6
5	F	1	NAG	C4-C5-C6-O6

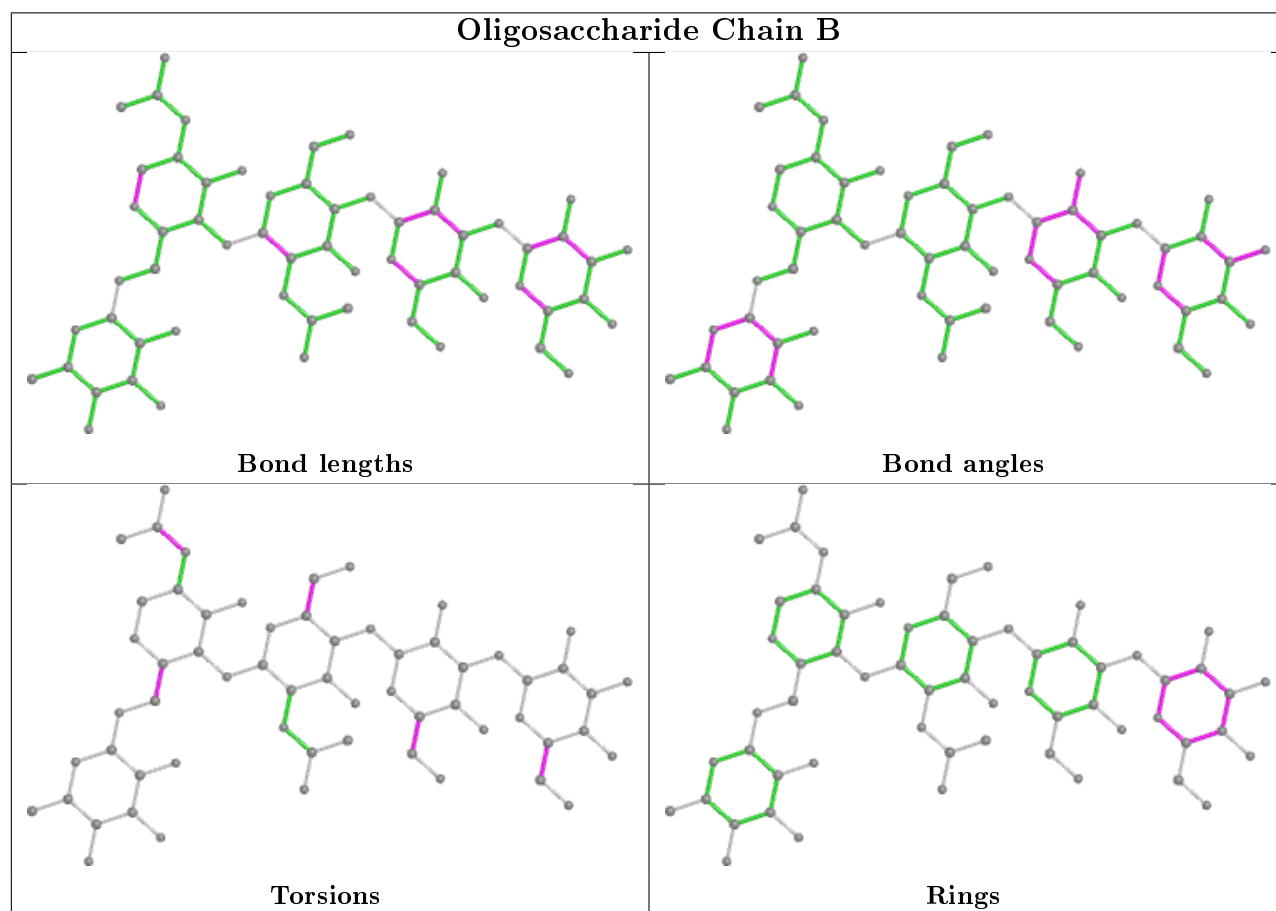
All (1) ring outliers are listed below:

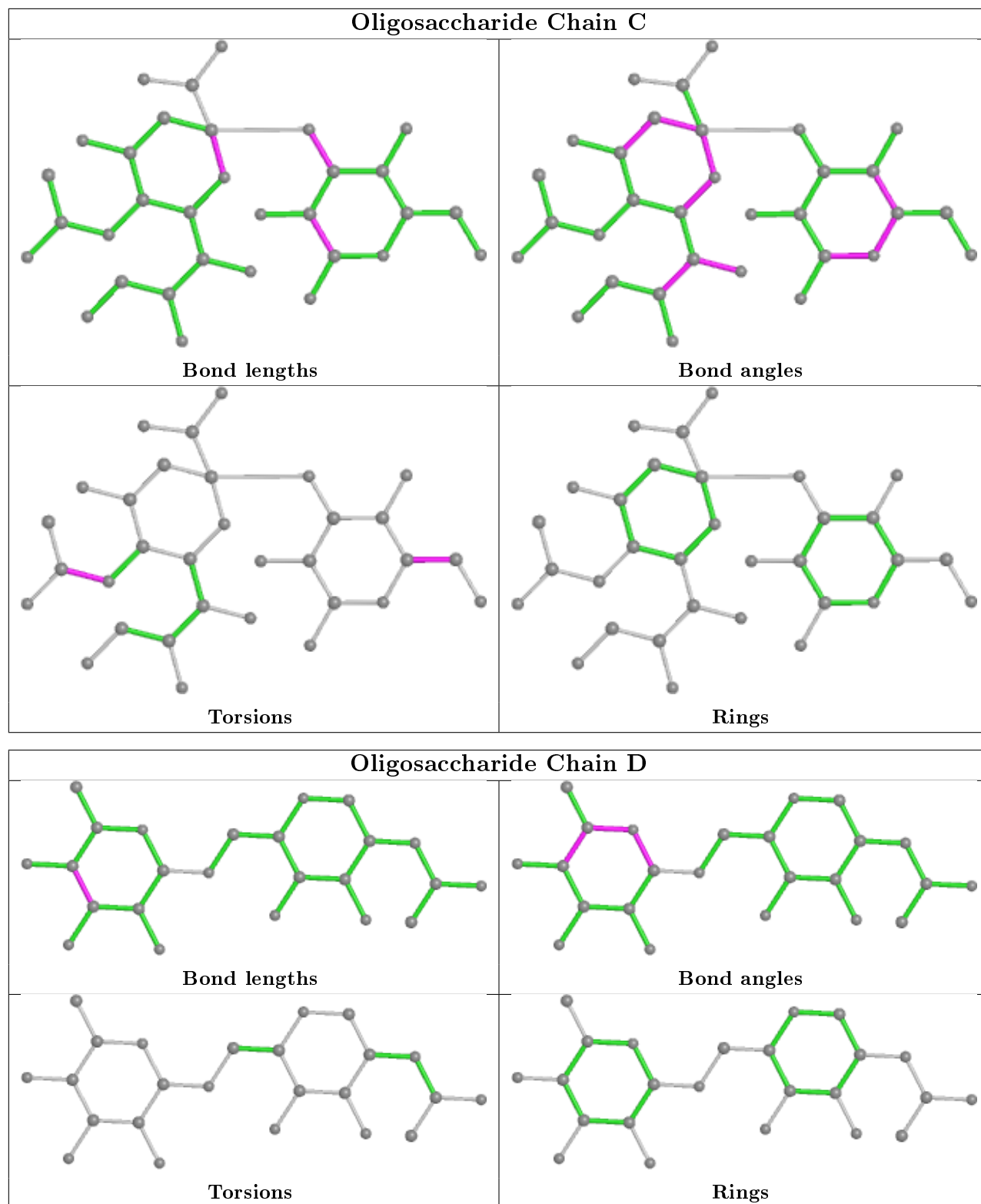
Mol	Chain	Res	Type	Atoms
2	B	4	MAN	C1-C2-C3-C4-C5-O5

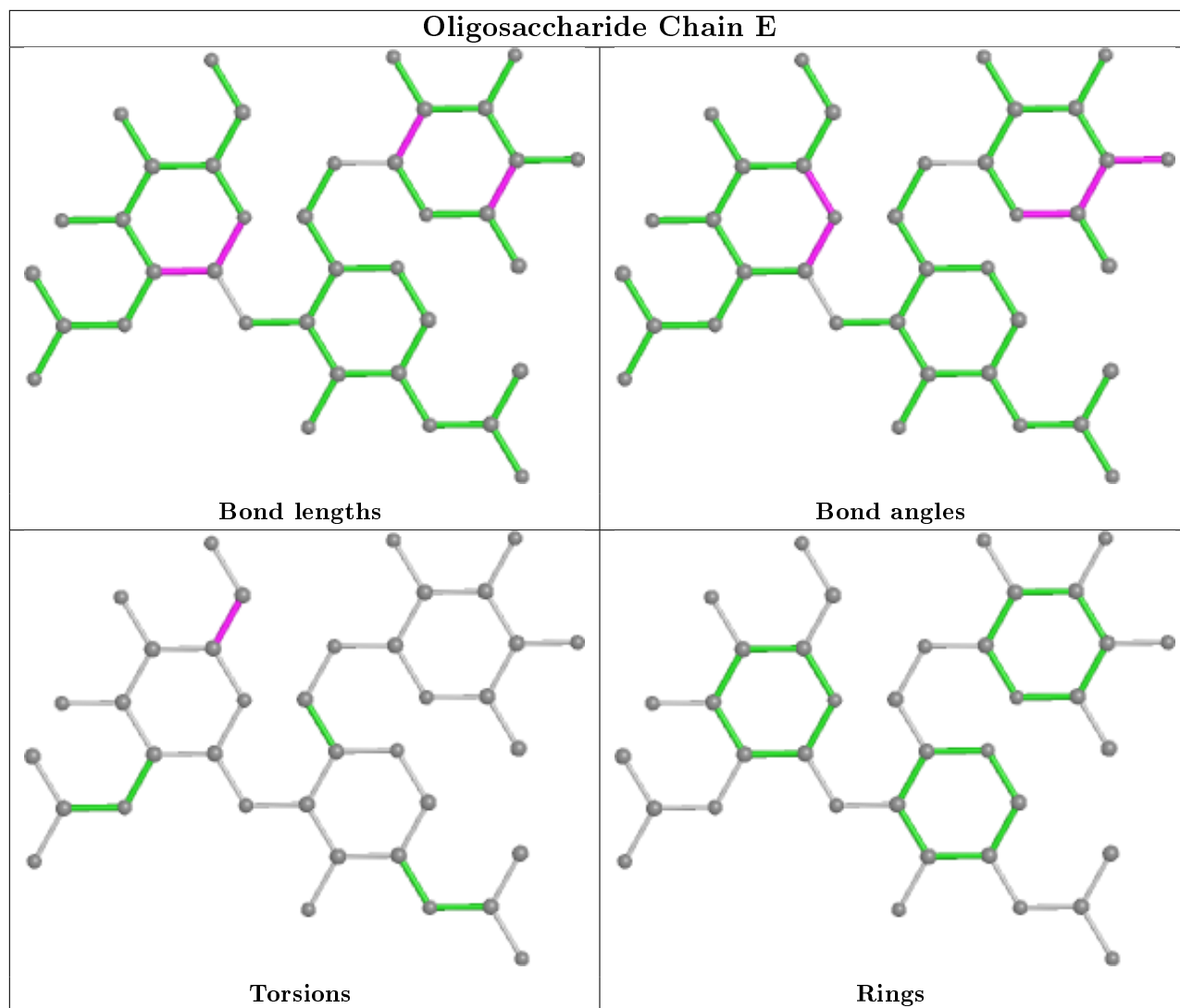
3 monomers are involved in 2 short contacts:

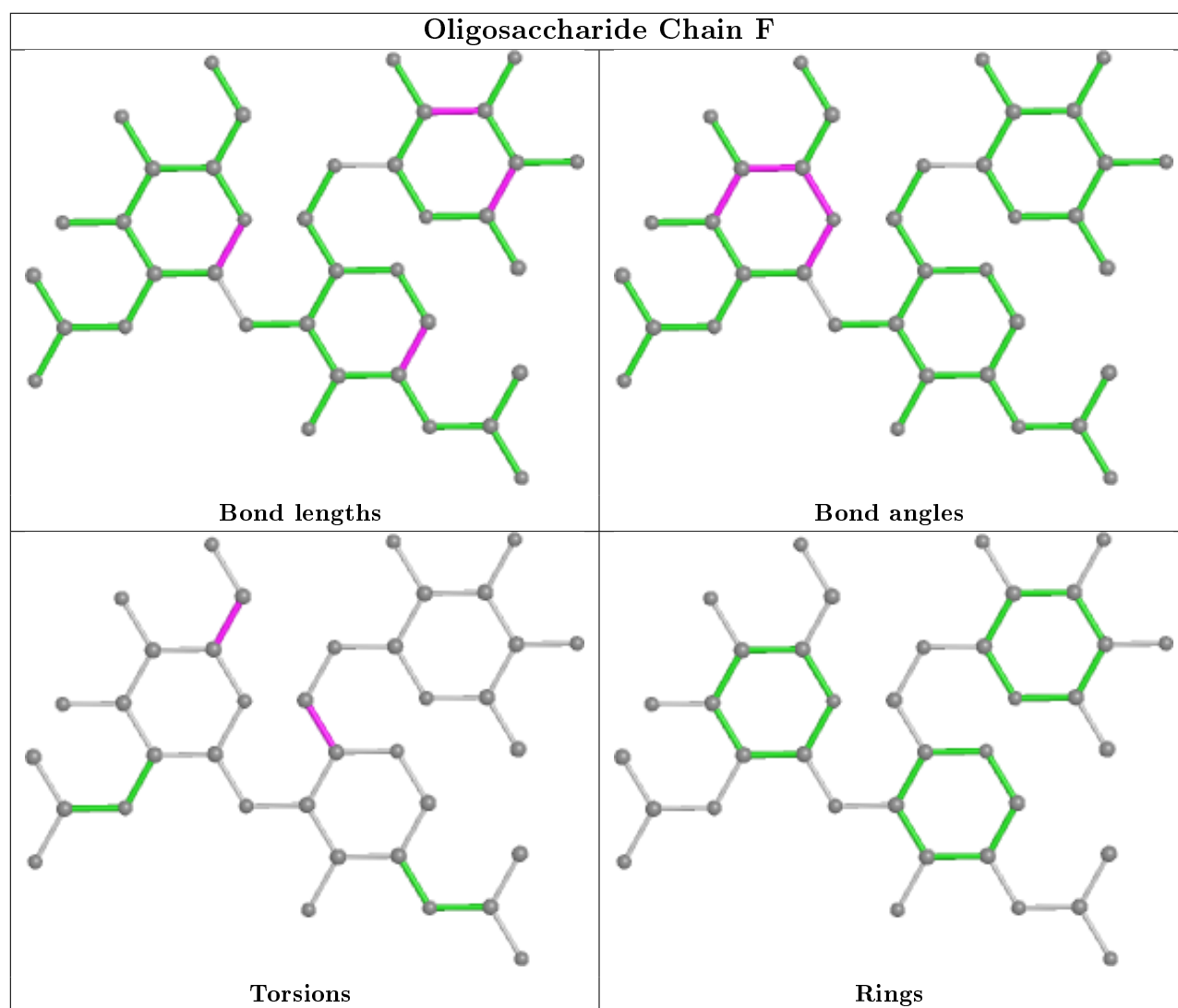
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	2	NAG	1	0
3	C	2	SIA	1	0
2	B	3	MAN	1	0

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









5.6 Ligand geometry [i](#)

Of 16 ligands modelled in this entry, 7 are monoatomic - leaving 9 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$
11	SO4	A	613	-	4,4,4	0.14	0	6,6,6	0.14	0
6	NAG	A	602	1	14,14,15	0.74	0	17,19,21	0.71	0
9	LEA	A	605	-	3,6,6	0.42	0	2,6,6	1.23	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
6	NAG	A	601	1	14,14,15	0.68	1 (7%)	17,19,21	0.66	0
11	SO4	A	612	-	4,4,4	0.15	0	6,6,6	0.19	0
11	SO4	A	611	-	4,4,4	0.20	0	6,6,6	0.28	0
11	SO4	A	610	-	4,4,4	0.19	0	6,6,6	0.38	0
7	GOL	A	603	-	5,5,5	1.87	2 (40%)	5,5,5	1.16	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
9	LEA	A	605	-	-	1/2/4/4	-
7	GOL	A	603	-	-	1/4/4/4	-
6	NAG	A	602	1	-	0/6/23/26	0/1/1/1
6	NAG	A	601	1	-	1/6/23/26	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	A	603	GOL	O3-C3	-3.44	1.27	1.42
7	A	603	GOL	O2-C2	-2.31	1.36	1.43
6	A	601	NAG	C1-C2	2.26	1.55	1.52

There are no bond angle outliers.

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
9	A	605	LEA	C2-C3-C4-C5
6	A	601	NAG	C3-C2-N2-C7
7	A	603	GOL	O1-C1-C2-C3

There are no ring outliers.

2 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
9	A	605	LEA	1	0
7	A	603	GOL	5	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	527/529 (99%)	0.59	47 (8%) 9 9	37, 49, 78, 109	1 (0%)

All (47) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	286[A]	LEU	15.3
1	A	285[A]	PRO	10.0
1	A	282[A]	TYR	7.8
1	A	284[A]	THR	7.6
1	A	377	VAL	5.4
1	A	51	LYS	5.2
1	A	255	GLU	5.2
1	A	3	ASP	5.1
1	A	379	ASP	4.7
1	A	53	SER	4.6
1	A	237	TYR	4.3
1	A	455	GLN	4.2
1	A	452	ARG	3.9
1	A	49	LEU	3.9
1	A	54	ASP	3.9
1	A	261	ILE	3.6
1	A	55	ILE	3.6
1	A	4	ILE	3.6
1	A	258	THR	3.4
1	A	380	GLN	3.4
1	A	376	TRP	3.3
1	A	69	ILE	3.3
1	A	283[A]	GLY	3.2
1	A	454	ASP	3.1
1	A	50	THR	3.0
1	A	10	ASN	3.0
1	A	278	PHE	2.9

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Mol	Chain	Res	Type	RSRZ
1	A	248	LYS	2.9
1	A	148	VAL	2.8
1	A	231	TRP	2.8
1	A	52	TRP	2.7
1	A	115	GLY	2.7
1	A	381	ARG	2.6
1	A	453	ARG	2.6
1	A	288[A]	VAL	2.5
1	A	244	LEU	2.5
1	A	259	GLU	2.4
1	A	40	ARG	2.3
1	A	378	ASP	2.3
1	A	48	SER	2.2
1	A	12	LYS	2.2
1	A	287[A]	SER	2.2
1	A	146	TYR	2.1
1	A	240	ARG	2.1
1	A	348	LYS	2.1
1	A	168	LEU	2.1
1	A	122	THR	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.

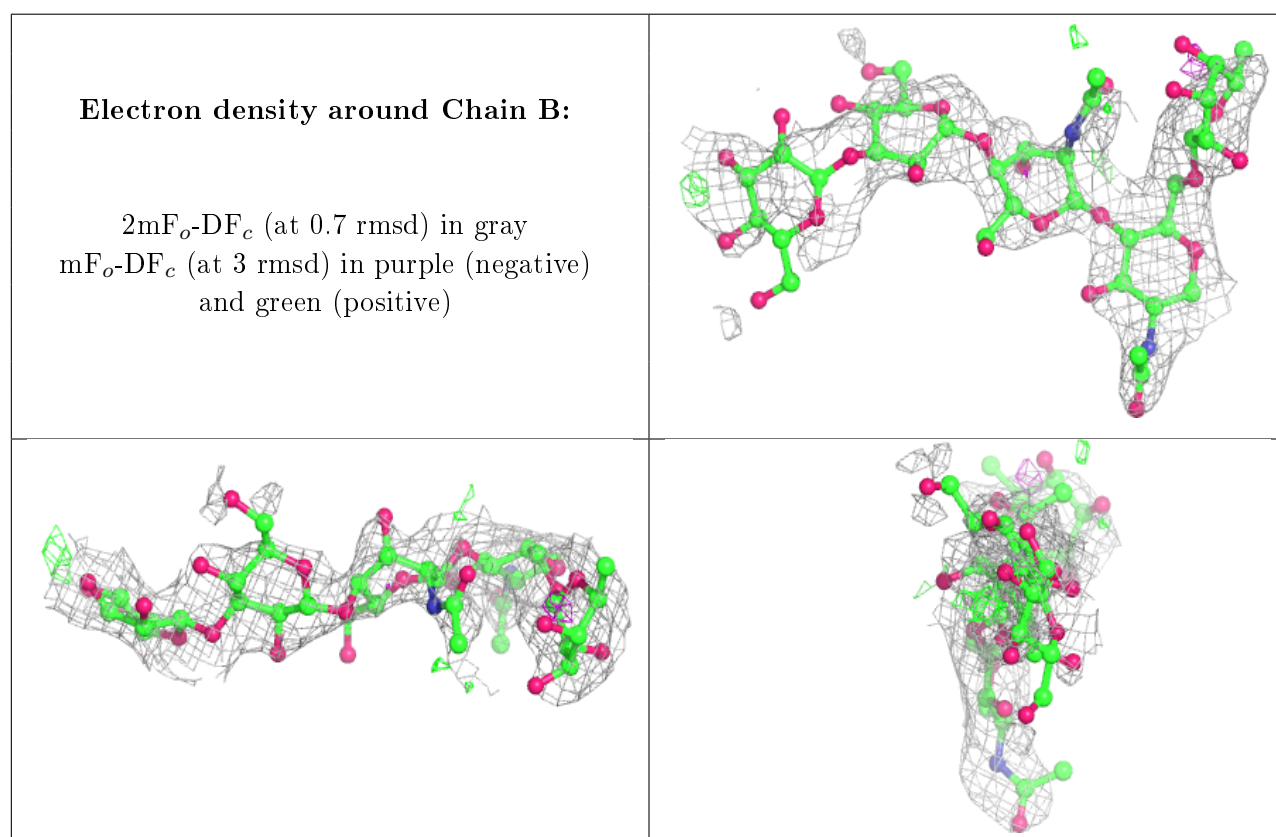
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	MAN	B	4	11/12	0.55	0.30	126,133,138,138	0
5	NAG	E	2	14/15	0.69	0.45	102,115,122,123	0
4	NAG	D	1	14/15	0.74	0.18	78,91,104,105	0
5	NAG	F	2	14/15	0.75	0.23	78,85,94,95	0
2	MAN	B	3	11/12	0.77	0.32	126,130,134,136	0
2	FUC	B	5	10/11	0.79	0.38	119,124,133,134	0
2	NAG	B	2	14/15	0.80	0.49	120,126,128,130	0
3	SIA	C	2	20/21	0.81	0.25	57,73,97,99	0

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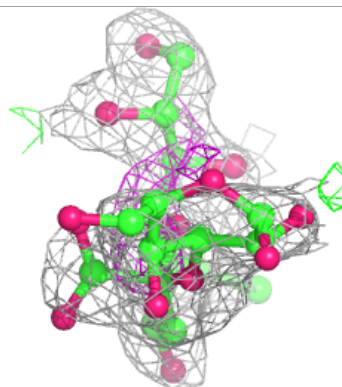
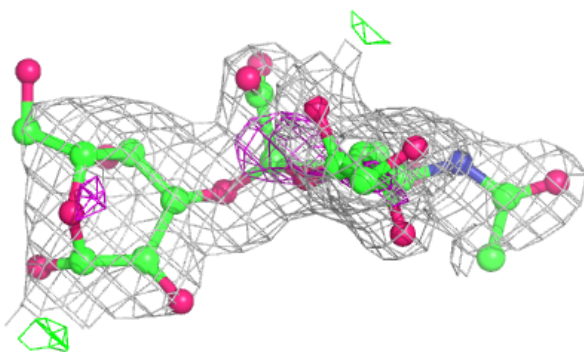
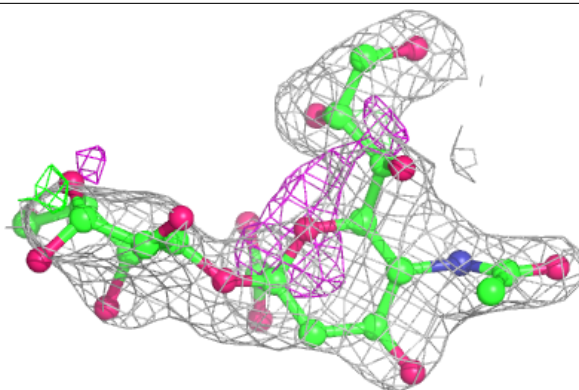
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
4	FUC	D	2	10/11	0.82	0.53	96,103,114,116	0
3	GAL	C	1	12/12	0.83	0.32	99,107,114,116	0
2	NAG	B	1	14/15	0.86	0.32	86,96,110,115	0
5	FUC	F	3	10/11	0.87	0.32	65,76,81,83	0
5	FUC	E	3	10/11	0.88	0.28	73,86,94,101	0
5	NAG	E	1	14/15	0.89	0.26	94,103,110,111	0
5	NAG	F	1	14/15	0.93	0.15	57,65,71,75	0

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

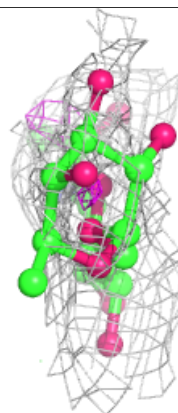
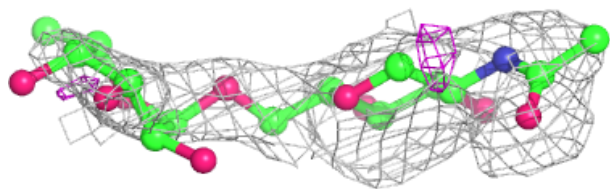
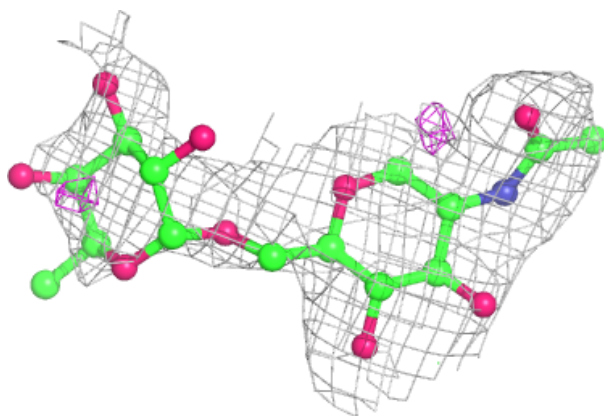


Electron density around Chain C:

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

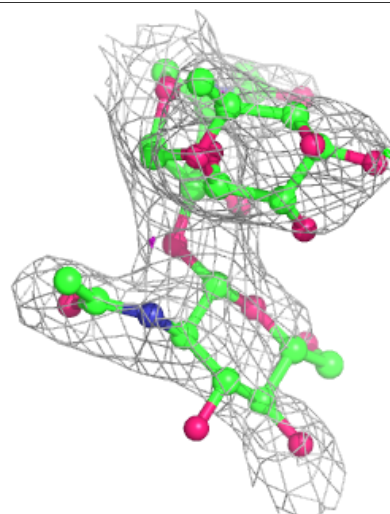
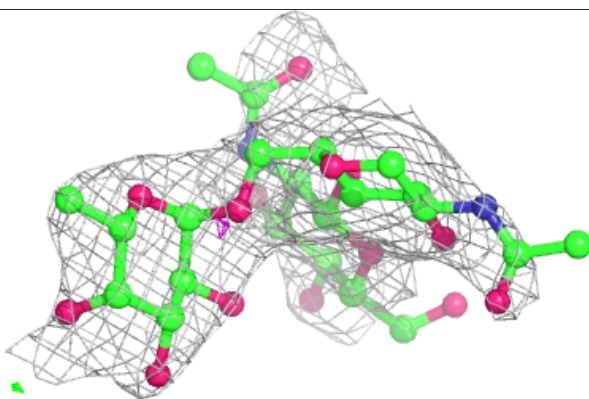
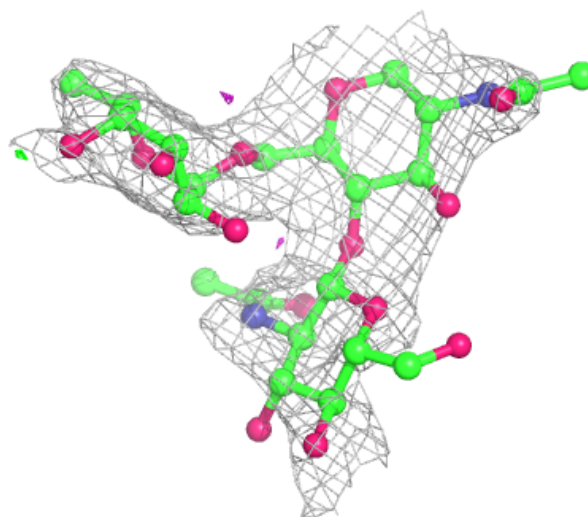
**Electron density around Chain D:**

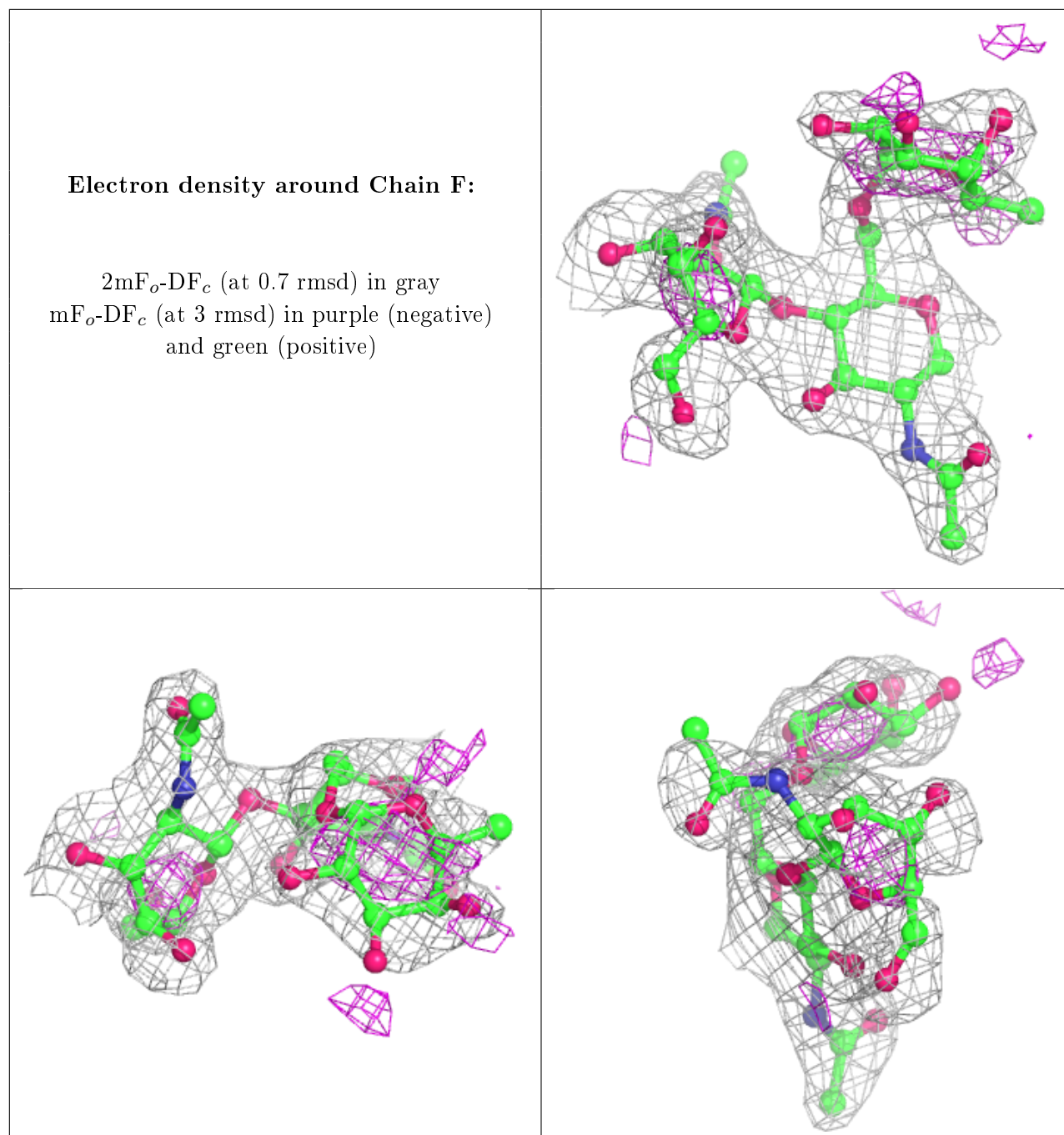
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around Chain E:

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





6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
11	SO4	A	613	5/5	0.44	0.29	143,152,158,161	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
6	NAG	A	601	14/15	0.64	0.39	127,135,139,141	0
9	LEA	A	605	7/7	0.76	0.24	54,60,63,63	0
6	NAG	A	602	14/15	0.78	0.23	61,87,100,100	0
12	BR	A	614	1/1	0.81	0.08	137,137,137,137	1
11	SO4	A	612	5/5	0.87	0.25	99,100,108,110	0
10	CL	A	608	1/1	0.87	0.15	78,78,78,78	0
10	CL	A	609	1/1	0.87	0.17	80,80,80,80	0
10	CL	A	607	1/1	0.92	0.06	84,84,84,84	0
8	QRH	A	604[B]	26/41	0.92	0.20	45,59,65,71	2
7	GOL	A	603	6/6	0.92	0.12	55,59,62,67	0
11	SO4	A	610	5/5	0.93	0.28	72,76,86,89	0
10	CL	A	606	1/1	0.93	0.05	92,92,92,92	0
12	BR	A	615[A]	1/1	0.94	0.14	106,106,106,106	1
12	BR	A	615[B]	1/1	0.94	0.14	61,61,61,61	1
11	SO4	A	611	5/5	0.95	0.28	68,78,89,90	0

6.5 Other polymers [i](#)

There are no such residues in this entry.