wwPDB X-ray Structure Validation Summary Report (i)

Nov 21, 2023 – 09:20 PM JST

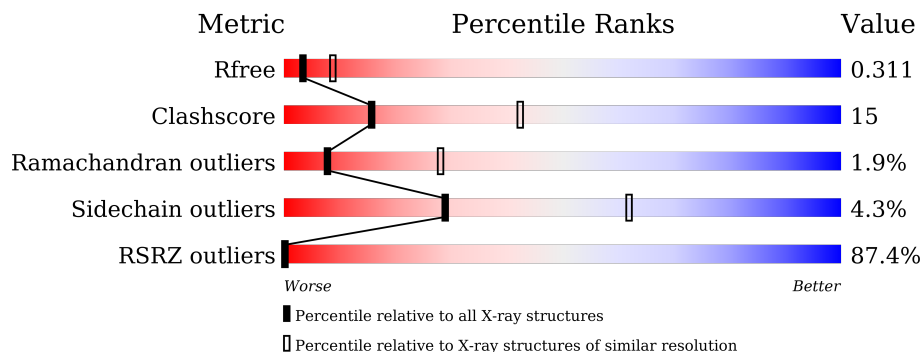|		
PDB ID	:	7WHU
Title	:	Human Neutrophil Elastase in-complex with Ecotin Peptide
Authors	:	Shankar, S.; Jayaraman, S.
Deposited on	:	2021-12-31
Resolution	:	2.89 Å(reported)

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 2.89 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.

Metric	Percentile Ranks	Value
Rfree		0.311
Clashscore		15
Ramachandran outliers		1.9%
Sidechain outliers		4.3%
RSRZ outliers		87.4%

Worse — *Better*

▌Percentile relative to all X-ray structures

▯Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1957 (2.90-2.90)
Clashscore	141614	2172 (2.90-2.90)
Ramachandran outliers	138981	2115 (2.90-2.90)
Sidechain outliers	138945	2117 (2.90-2.90)
RSRZ outliers	127900	1906 (2.90-2.90)

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

Mol	Chain	Length	Quality of chain
1	A	267	72% / 56% 25% • 18%
1	B	267	66% / 55% 25% • 18%
1	C	267	73% / 51% 29% • 18%
1	D	267	73% / 57% 24% • 18%
2	E	8	88% / 62% 38%
2	F	8	100% / 50% 38% 12%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
2	G	8	100% · 50% · 38% · 12%
2	H	8	100% · 50% · 38% · 12%
3	K	3	33% · 67%
3	N	3	67% · 33%
3	O	3	67% · 33%
3	P	3	33% · 67%
4	I	2	50% · 50%
5	J	4	100%
6	L	2	100%
7	M	3	33% · 33% · 33%

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	K	1	-	-	-	X
3	NAG	K	2	-	-	-	X
3	FUC	K	3	-	-	-	X
3	NAG	N	1	-	-	-	X
3	NAG	N	2	-	-	-	X
3	FUC	N	3	-	-	-	X
3	NAG	O	1	-	-	-	X
3	NAG	O	2	-	-	-	X
3	FUC	O	3	-	-	-	X
3	NAG	P	1	-	-	-	X
3	NAG	P	2	-	-	-	X
3	FUC	P	3	-	-	-	X
4	NAG	I	1	-	-	-	X
4	FUC	I	2	-	-	-	X
5	NAG	J	1	-	-	-	X
5	NAG	J	2	-	-	-	X
5	BMA	J	3	-	-	-	X
5	FUC	J	4	-	-	-	X
6	NAG	L	1	-	-	-	X
6	NAG	L	2	-	-	-	X

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
7	NAG	M	1	-	-	-	X
7	NAG	M	3	-	-	-	X
8	GOL	A	301	-	-	-	X
8	GOL	B	303	-	-	-	X
8	GOL	B	305	-	-	-	X
8	GOL	C	301	-	-	-	X
8	GOL	D	301	-	-	-	X
9	SO4	B	301	-	-	-	X
9	SO4	B	302	-	-	-	X
9	SO4	C	302	-	-	-	X
9	SO4	C	303	-	-	-	X
9	SO4	D	302	-	-	-	X

2 Entry composition ⓘ

There are 10 unique types of molecules in this entry. The entry contains 7019 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.
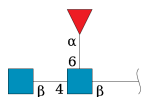
- Molecule 1 is a protein called Neutrophil elastase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	D	218	Total	C	N	O	S	0	0	0
			1597	1001	306	279	11			
1	A	218	Total	C	N	O	S	0	0	0
			1610	1012	308	279	11			
1	B	218	Total	C	N	O	S	0	0	0
			1610	1012	309	278	11			
1	C	218	Total	C	N	O	S	0	0	0
			1627	1019	316	281	11			

- Molecule 2 is a protein called Ecotin Peptide.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	E	8	Total	C	N	O	S	0	0	0
			47	29	8	9	1			
2	F	8	Total	C	N	O	S	0	0	0
			51	31	8	11	1			
2	G	8	Total	C	N	O	S	0	0	0
			51	32	8	10	1			
2	H	8	Total	C	N	O	S	0	0	0
			46	27	8	10	1			

- Molecule 3 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
3	P	3	Total	C	N	O	0	0	0
			38	22	2	14			

Continued on next page...

Continued from previous page...

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

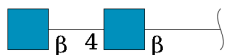- Molecule 4 is an oligosaccharide called alpha-L-fucopyranose-(1-6)-2-acetamido-2-deoxy-beta-D-glucopyranose.

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

- Molecule 5 is an oligosaccharide called beta-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.
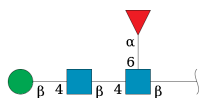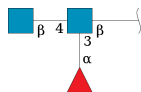

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
5	J	4	Total	C	N	O	0	0	0
			49	28	2	19			

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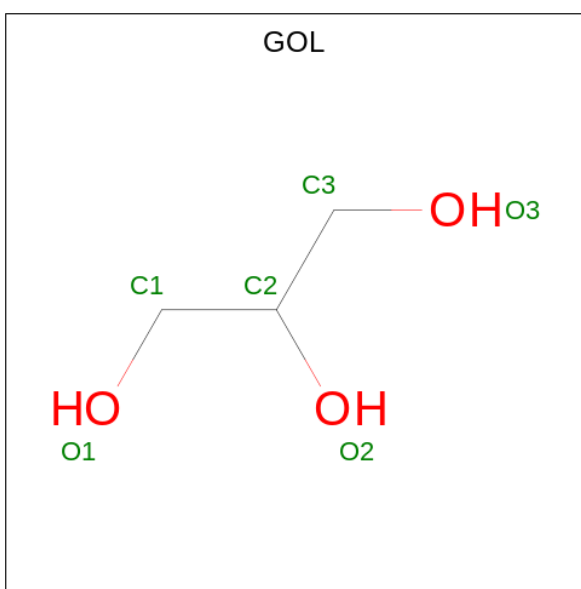

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
6	L	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 7 is an oligosaccharide called alpha-L-fucopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)]2-acetamido-2-deoxy-beta-D-glucopyranose.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
7	M	3	Total 38	C 22	N 2	O 14	0	0	0

- Molecule 8 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
8	D	1	Total 6	C 3	O 3	0	0
8	A	1	Total 6	C 3	O 3	0	0
8	B	1	Total 6	C 3	O 3	0	0
8	B	1	Total 6	C 3	O 3	0	0
8	B	1	Total 6	C 3	O 3	0	0
8	C	1	Total 6	C 3	O 3	0	0

- Molecule 9 is SULFATE ION (three-letter code: SO4) (formula: O_4S).

SO4

O1

O

O3 O⁻ — S — O⁻ O4

S

O

O2

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
9	D	1	Total	O	S	0	0
			5	4	1		
9	B	1	Total	O	S	0	0
			5	4	1		
9	B	1	Total	O	S	0	0
			5	4	1		
9	C	1	Total	O	S	0	0
			5	4	1		
9	C	1	Total	O	S	0	0
			5	4	1		

- Molecule 10 is water.

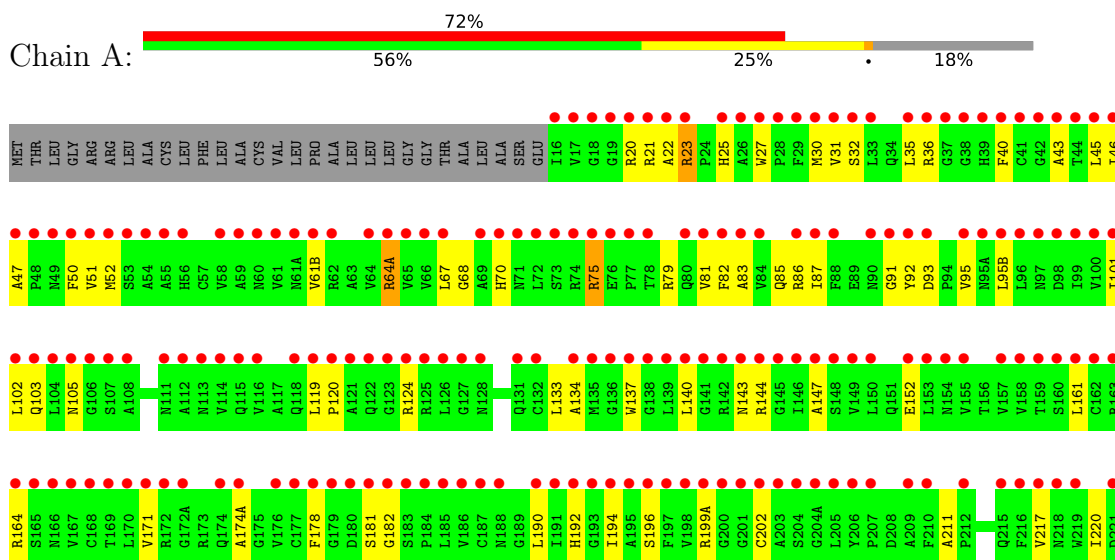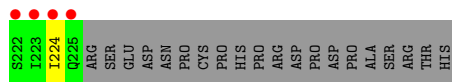| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
10	D	2	Total	O	0	0
			2	2		
10	A	11	Total	O	0	0
			11	11		
10	B	11	Total	O	0	0
			11	11		
10	C	2	Total	O	0	0
			2	2		
10	F	1	Total	O	0	0
			1	1		
10	G	1	Total	O	0	0
			1	1		

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.
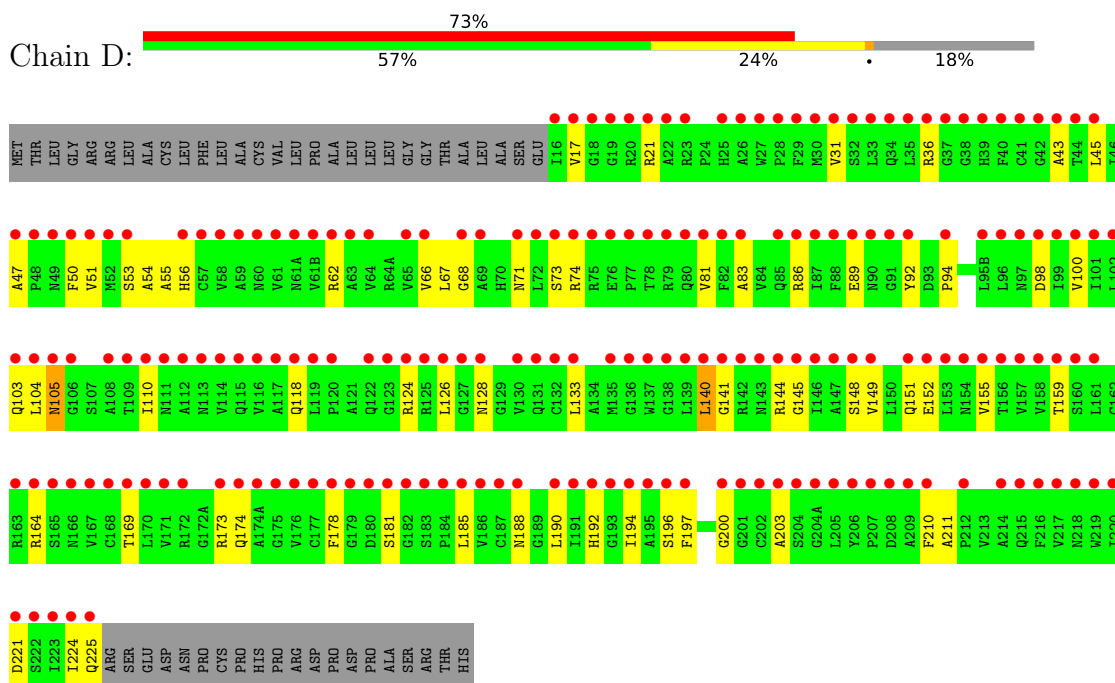
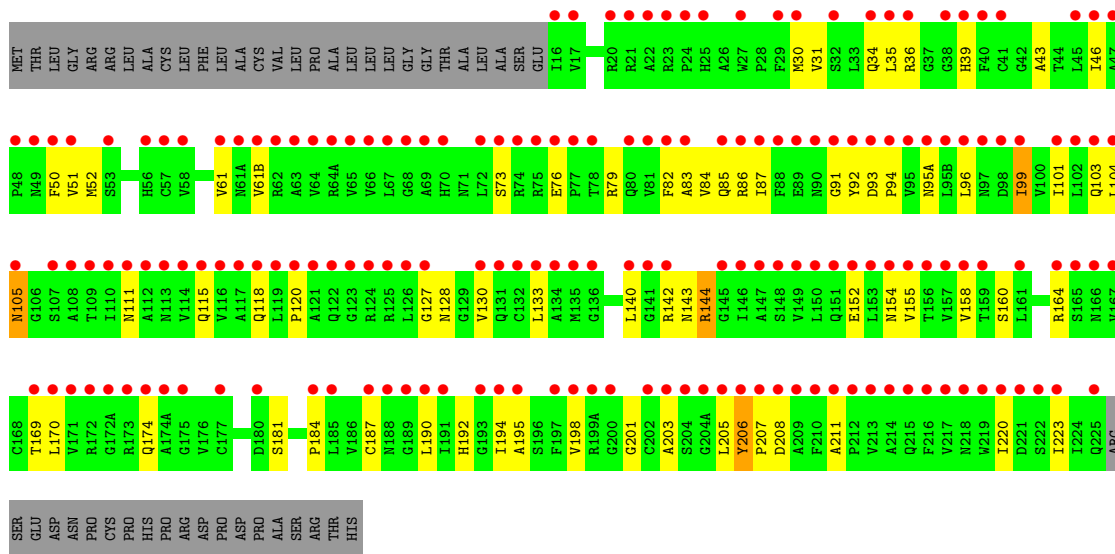- Molecule 1: Neutrophil elastase
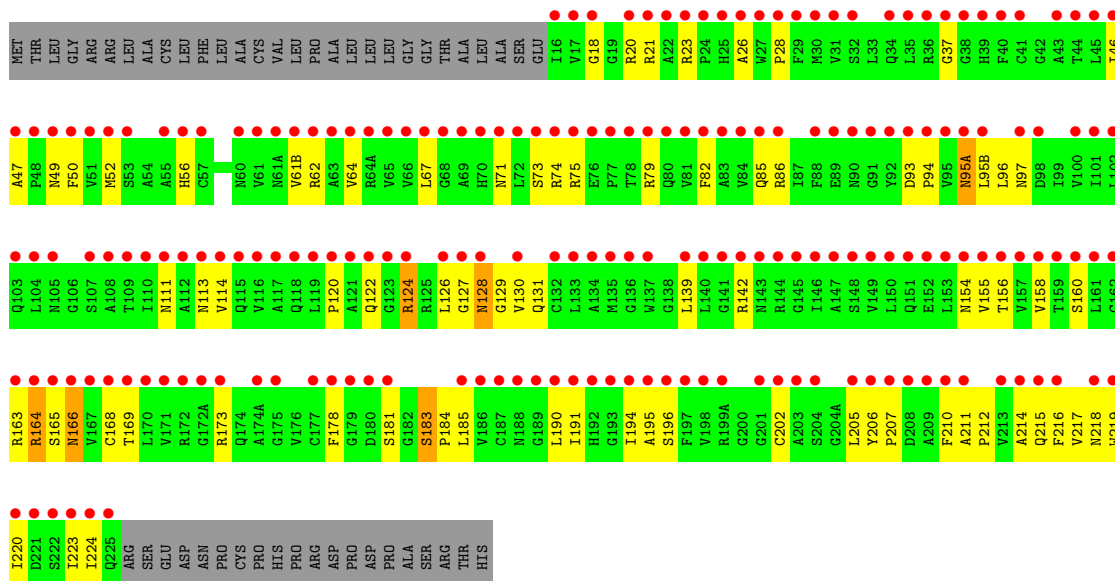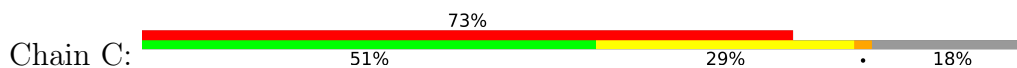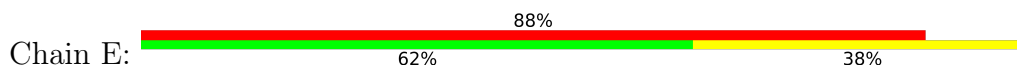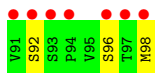

- Molecule 1: Neutrophil elastase

S222 I223 I224 Q225 ARG SER GLU ASP ASN PRO CYS PRO HIS PRO ARG PRO ASP PRO ALA SER ARG THR HIS

• Molecule 1: Neutrophil elastase

Chain B:

66%

55%　　　25%　•　18%

MET THR LEU GLY ARG ARG LEU ALA CYS LEU PHE LEU ALA CYS VAL LEU PRO ALA LEU LEU LEU GLY GLY THR ALA LEU ALA SER GLU I16 V17 R20 R21 A22 R23 P24 H25 A26 W27 P28 F29 M30 V31 S32 L33 Q34 L35 R36 G37 G38 H39 F40 C41 G42 A43 T44 L45 I46 A47

P48 N49 F50 V51 M52 S53 H56 C57 V58 V61 N61A V61B R62 A63 V64 R64A V65 V66 L67 G68 A69 H70 N71 L72 S73 R74 R75 E76 P77 T78 R79 Q80 V81 F82 A83 V84 Q85 R86 I87 F88 E89 N90 G91 Y92 D93 P94 V95 N95A L95B L96 N97 D98 I99 V100 I101 L102 Q103 L104

N105 G106 S107 A108 T109 I110 N111 A112 N113 V114 Q115 V116 A117 Q118 L119 P120 A121 Q122 G123 R124 R125 L126 G127 N128 G129 V130 Q131 C132 L133 A134 M135 G136 L140 G141 R142 N143 R144 G145 I146 A147 S148 V149 L150 Q151 E152 L153 N154 V155 T156 V157 V158 T159 S160 L161 R164 S165 N166 V167

C168 T169 L170 V171 R172 G172A R173 Q174 A174A G175 V176 C177 D180 S181 P184 L185 V186 C187 N188 G189 L190 I191 H192 G193 I194 A195 S196 F197 V198 R199A G200 G201 C202 A203 S204 G204A L205 Y206 P207 D208 A209 F210 A211 P212 V213 A214 Q215 F216 V217 N218 W219 I220 D221 S222 I223 I224 Q225 ARG

SER GLU ASP ASN PRO CYS PRO HIS PRO ARG PRO ASP PRO ALA SER ARG THR HIS

• Molecule 1: Neutrophil elastase

Chain C:

73%

51%　　　29%　•　18%

MET THR LEU GLY ARG ARG LEU ALA CYS LEU PHE LEU ALA CYS VAL LEU PRO ALA LEU LEU LEU GLY GLY THR ALA LEU ALA SER GLU I16 V17 G18 G19 R20 R21 A22 R23 P24 H25 A26 W27 P28 F29 M30 V31 S32 L33 Q34 L35 R36 G37 G38 H39 F40 C41 G42 A43 T44 L45 I46

A47 P48 N49 F50 V51 M52 S53 A54 A55 H56 C57 N60 V61 N61A V61B R62 A63 V64 R64A V65 V66 L67 G68 A69 H70 N71 L72 S73 R74 R75 E76 P77 T78 R79 Q80 V81 F82 A83 V84 Q85 R86 I87 F88 E89 N90 G91 Y92 D93 P94 V95 N95A L95B L96 N97 D98 I99 V100 I101 L102

Q103 L104 N105 G106 S107 A108 T109 I110 N111 A112 N113 V114 Q115 V116 A117 Q118 L119 P120 A121 Q122 G123 R124 R125 L126 G127 N128 G129 V130 Q131 C132 L133 A134 M135 G136 W137 G138 L139 L140 G141 R142 N143 R144 G145 I146 A147 S148 V149 L150 Q151 E152 L153 N154 V155 T156 V157 V158 T159 S160 L161 C162

R163 R164 S165 N166 V167 C168 T169 L170 V171 R172 G172A R173 Q174 A174A G175 V176 C177 F178 G179 D180 S181 G182 S183 P184 L185 V186 C187 N188 G189 L190 I191 H192 G193 I194 A195 S196 F197 V198 R199A G200 G201 C202 A203 S204 G204A L205 Y206 P207 D208 A209 F210 A211 P212 V213 A214 Q215 F216 V217 N218 W219

I220 D221 S222 I223 I224 Q225 ARG SER GLU ASP ASN PRO CYS PRO HIS PRO ARG PRO ASP PRO ALA SER ARG THR HIS

• Molecule 2: Ecotin Peptide

Chain E:

88%

62%　　　38%

V91 S92 S93 P94 V95 S96 T97 M98

• Molecule 2: Ecotin Peptide

Chain F:

100%

50% 38% 12%

V91 S92 S93 P94 V95 S96 T97 M98

• Molecule 2: Ecotin Peptide

Chain G:

100%

50% 38% 12%

V91 S92 S93 P94 V95 S96 T97 M98

• Molecule 2: Ecotin Peptide

Chain H:

100%

50% 38% 12%

V91 S92 S93 P94 V95 S96 T97 M98

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

Chain P:

33% 67%

NAG1 NAG2 FUC3

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

Chain K:

33% 67%

NAG1 NAG2 FUC3

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

Chain N:

67% 33%

NAG1 NAG2 FUC3

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

Chain O:

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

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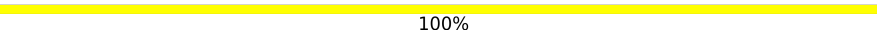
• Molecule 5: beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose
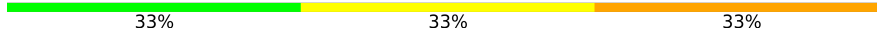
Chain J:

• Molecule 6: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain L:

• Molecule 7: alpha-L-fucopyranose-(1-3)-[2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)]2-acetamido-2-deoxy-beta-D-glucopyranose

Chain M:

4   Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	57.24Å 68.91Å 130.85Å 90.00° 89.90° 90.00°	Depositor
Resolution (Å)	47.45 – 2.89 47.45 – 2.89	Depositor EDS
% Data completeness (in resolution range)	99.3 (47.45-2.89) 99.2 (47.45-2.89)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.01	Depositor
$< I/\sigma(I) >$ [1]	51.05 (at 2.91Å)	Xtriage
Refinement program	PHENIX (1.19.2_4158: ???)	Depositor
R, R_{free}	0.252 , 0.306 0.253 , 0.311	Depositor DCC
R_{free} test set	2006 reflections (8.78%)	wwPDB-VP
Wilson B-factor (Å^2)	38.9	Xtriage
Anisotropy	0.505	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 13.7	EDS
L-test for twinning[2]	$< |L| > = 0.43, < L^2 > = 0.26$	Xtriage
Estimated twinning fraction	0.408 for h,-k,-l	Xtriage
F_o,F_c correlation	0.88	EDS
Total number of atoms	7019	wwPDB-VP
Average B, all atoms (Å^2)	26.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 43.88 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.6532e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

---

[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: GOL, SO4, NAG, FUC, BMA

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	0.47	1/1636 (0.1%)	0.80	7/2227 (0.3%)
1	B	0.34	0/1640	0.59	0/2231
1	C	0.34	0/1657	0.64	0/2252
1	D	0.35	0/1626	0.66	2/2213 (0.1%)
2	E	0.34	0/47	0.70	0/62
2	F	0.37	0/51	0.67	0/69
2	G	0.28	0/51	0.59	0/69
2	H	0.32	0/45	0.69	0/58
All	All	0.38	1/6753 (0.0%)	0.68	9/9181 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	B	0	1
1	D	0	2
All	All	0	3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	23	ARG	CG-CD	-7.72	1.32	1.51

The worst 5 of 9 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	75	ARG	CB-CG-CD	-10.81	83.48	111.60
1	A	23	ARG	NE-CZ-NH1	8.38	124.49	120.30

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	23	ARG	CA-CB-CG	-8.25	95.25	113.40
1	A	23	ARG	CB-CG-CD	7.75	131.74	111.60
1	A	75	ARG	NE-CZ-NH1	6.89	123.74	120.30

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	104	LEU	Peptide
1	D	104	LEU	Peptide
1	D	73	SER	Peptide

5.2 Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1610	0	1589	50	0
1	B	1610	0	1604	59	0
1	C	1627	0	1627	54	2
1	D	1597	0	1558	42	2
2	E	47	0	40	4	0
2	F	51	0	45	4	0
2	G	51	0	47	5	0
2	H	46	0	35	3	0
3	K	38	0	34	1	0
3	N	38	0	34	1	0
3	O	38	0	34	0	0
3	P	38	0	34	0	0
4	I	24	0	22	0	0
5	J	49	0	43	0	0
6	L	28	0	25	2	0
7	M	38	0	34	1	0
8	A	6	0	8	1	0
8	B	18	0	23	0	0
8	C	6	0	8	1	0
8	D	6	0	8	0	0
9	B	10	0	0	1	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
9	C	10	0	0	0	0
9	D	5	0	0	0	0
10	A	11	0	0	4	0
10	B	11	0	0	9	0
10	C	2	0	0	2	0
10	D	2	0	0	0	0
10	F	1	0	0	0	0
10	G	1	0	0	1	0
All	All	7019	0	6852	204	2

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 15.

The worst 5 of 204 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:D:178:PHE:HA	2:H:98:MET:HB3	1.59	0.85
1:A:147:ALA:O	10:A:401:HOH:O	1.96	0.82
1:D:194:ILE:HB	1:D:211:ALA:HB3	1.62	0.80
1:C:183:SER:O	10:C:401:HOH:O	2.00	0.79
1:B:61(B):VAL:HG12	1:B:84:VAL:HG21	1.63	0.79

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:62:ARG:NH1	1:C:94:PRO:O[1_655]	1.93	0.27
1:D:94:PRO:O	1:C:62:ARG:NH2[1_655]	2.16	0.04

5.3   Torsion angles ⓘ

5.3.1   Protein backbone ⓘ

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	216/267 (81%)	191 (88%)	23 (11%)	2 (1%)	17	48
1	B	216/267 (81%)	192 (89%)	19 (9%)	5 (2%)	6	23
1	C	216/267 (81%)	191 (88%)	23 (11%)	2 (1%)	17	48
1	D	216/267 (81%)	192 (89%)	21 (10%)	3 (1%)	11	36
2	E	6/8 (75%)	1 (17%)	4 (67%)	1 (17%)	0	0
2	F	6/8 (75%)	5 (83%)	1 (17%)	0	100	100
2	G	6/8 (75%)	3 (50%)	1 (17%)	2 (33%)	0	0
2	H	6/8 (75%)	1 (17%)	3 (50%)	2 (33%)	0	0
All	All	888/1100 (81%)	776 (87%)	95 (11%)	17 (2%)	8	28

5 of 17 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	105	ASN
1	B	105	ASN
2	G	97	THR
2	H	95	VAL
1	B	144	ARG

5.3.2 Protein sidechains ⓘ

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	164/212 (77%)	156 (95%)	8 (5%)	25	57
1	B	166/212 (78%)	162 (98%)	4 (2%)	49	79
1	C	169/212 (80%)	159 (94%)	10 (6%)	19	49
1	D	160/212 (76%)	156 (98%)	4 (2%)	47	78
2	E	5/8 (62%)	5 (100%)	0	100	100
2	F	6/8 (75%)	5 (83%)	1 (17%)	2	6
2	G	6/8 (75%)	5 (83%)	1 (17%)	2	6
2	H	5/8 (62%)	4 (80%)	1 (20%)	1	4

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	681/880 (77%)	652 (96%)	29 (4%)	29 62

5 of 29 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	164	ARG
2	G	95	VAL
1	C	82	PHE
1	C	166	ASN
1	C	21	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	225	GLN
1	B	128	ASN
1	C	97	ASN
1	C	128	ASN
1	C	166	ASN

5.3.3   RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5   Carbohydrates ⓘ

23 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	$\#\|Z\| > 2$
4	NAG	I	1	4,1	14,14,15	0.49	0	17,19,21	0.63	0
4	FUC	I	2	4	10,10,11	0.69	0	14,14,16	1.21	2 (14%)
5	NAG	J	1	5,1	14,14,15	0.23	0	17,19,21	0.46	0
5	NAG	J	2	5	14,14,15	0.33	0	17,19,21	0.54	0
5	BMA	J	3	5	11,11,12	0.89	0	15,15,17	0.76	0
5	FUC	J	4	5	10,10,11	0.76	0	14,14,16	1.04	0
3	NAG	K	1	3,1	14,14,15	0.46	0	17,19,21	0.54	0
3	NAG	K	2	3	14,14,15	0.28	0	17,19,21	0.66	0
3	FUC	K	3	3	10,10,11	1.53	2 (20%)	14,14,16	1.80	3 (21%)
6	NAG	L	1	6,1	14,14,15	0.37	0	17,19,21	0.55	0
6	NAG	L	2	6	14,14,15	0.31	0	17,19,21	0.67	0
7	NAG	M	1	7,1	14,14,15	1.64	3 (21%)	17,19,21	1.32	2 (11%)
7	FUC	M	2	7	10,10,11	0.99	1 (10%)	14,14,16	1.96	4 (28%)
7	NAG	M	3	7	14,14,15	0.25	0	17,19,21	0.46	0
3	NAG	N	1	3,1	14,14,15	0.23	0	17,19,21	0.95	1 (5%)
3	NAG	N	2	3	14,14,15	0.44	0	17,19,21	0.54	0
3	FUC	N	3	3	10,10,11	1.04	1 (10%)	14,14,16	0.63	0
3	NAG	O	1	3,1	14,14,15	0.47	0	17,19,21	0.59	0
3	NAG	O	2	3	14,14,15	0.16	0	17,19,21	0.61	1 (5%)
3	FUC	O	3	3	10,10,11	0.93	0	14,14,16	0.87	0
3	NAG	P	1	3	14,14,15	0.87	1 (7%)	17,19,21	0.78	1 (5%)
3	NAG	P	2	3	14,14,15	0.22	0	17,19,21	0.43	0
3	FUC	P	3	3	10,10,11	0.71	0	14,14,16	0.87	1 (7%)

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
4	NAG	I	1	4,1	-	2/6/23/26	0/1/1/1
4	FUC	I	2	4	-	-	0/1/1/1
5	NAG	J	1	5,1	-	2/6/23/26	0/1/1/1
5	NAG	J	2	5	-	2/6/23/26	0/1/1/1
5	BMA	J	3	5	-	0/2/19/22	0/1/1/1
5	FUC	J	4	5	-	-	0/1/1/1
3	NAG	K	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	K	2	3	-	2/6/23/26	0/1/1/1
3	FUC	K	3	3	-	-	0/1/1/1

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	NAG	L	1	6,1	-	0/6/23/26	0/1/1/1
6	NAG	L	2	6	-	2/6/23/26	0/1/1/1
7	NAG	M	1	7,1	-	2/6/23/26	0/1/1/1
7	FUC	M	2	7	-		0/1/1/1
7	NAG	M	3	7	-	3/6/23/26	0/1/1/1
3	NAG	N	1	3,1	-	2/6/23/26	0/1/1/1
3	NAG	N	2	3	-	1/6/23/26	0/1/1/1
3	FUC	N	3	3	-		0/1/1/1
3	NAG	O	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	O	2	3	-	4/6/23/26	0/1/1/1
3	FUC	O	3	3	-		0/1/1/1
3	NAG	P	1	3	-	0/6/23/26	0/1/1/1
3	NAG	P	2	3	-	1/6/23/26	0/1/1/1
3	FUC	P	3	3	-	-	0/1/1/1

The worst 5 of 8 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	M	1	NAG	C1-C2	4.37	1.58	1.52
7	M	1	NAG	O5-C1	-3.54	1.38	1.43
3	K	3	FUC	C4-C5	3.42	1.60	1.52
3	P	1	NAG	O5-C1	-3.08	1.38	1.43
3	N	3	FUC	O5-C1	-2.51	1.39	1.43

The worst 5 of 15 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
7	M	2	FUC	C1-O5-C5	4.74	123.53	112.78
3	K	3	FUC	O5-C5-C4	4.41	117.43	109.52
7	M	1	NAG	C4-C3-C2	4.29	117.30	111.02
3	K	3	FUC	C3-C4-C5	3.48	115.19	109.77
7	M	2	FUC	O5-C1-C2	3.19	115.70	110.77

There are no chirality outliers.

5 of 25 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	L	2	NAG	C4-C5-C6-O6
6	L	2	NAG	O5-C5-C6-O6
3	O	2	NAG	C4-C5-C6-O6

Continued on next page...

Mol	Chain	Res	Type	Atoms
3	K	2	NAG	O5-C5-C6-O6
3	O	2	NAG	O5-C5-C6-O6

There are no ring outliers.

6 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	K	1	NAG	1	0
6	L	1	NAG	1	0
3	N	2	NAG	1	0
7	M	1	NAG	1	0
6	L	2	NAG	2	0
3	N	1	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.

Oligosaccharide Chain P

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain K

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain N

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain O

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain I

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain J

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain L

Bond lengths

Bond angles

Torsions

Rings

Oligosaccharide Chain M

Bond lengths   Bond angles

Torsions   Rings

5.6 Ligand geometry ⓘ

11 ligands 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	$\#|Z| > 2$
8	GOL	D	301	-	5,5,5	1.11	0	5,5,5	0.97	0
9	SO4	B	302	-	4,4,4	0.18	0	6,6,6	0.17	0
8	GOL	B	304	-	5,5,5	1.16	0	5,5,5	0.93	0
8	GOL	C	301	-	5,5,5	1.03	0	5,5,5	0.86	0
9	SO4	C	303	-	4,4,4	0.18	0	6,6,6	0.10	0
8	GOL	B	303	-	5,5,5	1.03	0	5,5,5	1.00	0
8	GOL	A	301	-	5,5,5	1.03	0	5,5,5	0.93	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
9	SO4	D	302	-	4,4,4	0.16	0	6,6,6	0.12	0
9	SO4	B	301	-	4,4,4	0.18	0	6,6,6	0.15	0
8	GOL	B	305	-	5,5,5	1.01	0	5,5,5	0.94	0
9	SO4	C	302	-	4,4,4	0.16	0	6,6,6	0.08	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	GOL	D	301	-	-	3/4/4/4	-
8	GOL	B	304	-	-	2/4/4/4	-
8	GOL	C	301	-	-	0/4/4/4	-
8	GOL	B	303	-	-	2/4/4/4	-
8	GOL	A	301	-	-	2/4/4/4	-
8	GOL	B	305	-	-	2/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 11 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
8	D	301	GOL	O1-C1-C2-C3
8	A	301	GOL	O1-C1-C2-C3
8	B	303	GOL	O1-C1-C2-C3
8	B	304	GOL	O1-C1-C2-C3
8	B	305	GOL	O1-C1-C2-C3

There are no ring outliers.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	C	301	GOL	1	0
8	A	301	GOL	1	0
9	B	301	SO4	1	0

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	A	218/267 (81%)	3.73	193 (88%)	0	0	16, 24, 38, 50	0
1	B	218/267 (81%)	3.39	176 (80%)	0	0	17, 24, 29, 37	0
1	C	218/267 (81%)	3.90	195 (89%)	0	0	19, 27, 38, 56	0
1	D	218/267 (81%)	3.70	195 (89%)	0	0	15, 25, 31, 40	0
2	E	8/8 (100%)	4.03	7 (87%)	0	0	27, 31, 35, 36	0
2	F	8/8 (100%)	4.33	8 (100%)	0	0	22, 28, 32, 32	0
2	G	8/8 (100%)	4.53	8 (100%)	0	0	27, 37, 40, 44	0
2	H	8/8 (100%)	3.73	8 (100%)	0	0	22, 32, 35, 37	0
All	All	904/1100 (82%)	3.70	790 (87%)	0	0	15, 25, 35, 56	0

The worst 5 of 790 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	139	LEU	16.5
1	A	37	GLY	13.6
1	A	141	GLY	11.5
1	D	138	GLY	11.4
1	B	121	ALA	10.9

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

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

6.3 Carbohydrates ⓘ

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
3	FUC	P	3	10/11	0.11	0.74	28,33,35,37	0
4	NAG	I	1	14/15	0.11	0.83	31,38,50,53	0
3	FUC	K	3	10/11	0.12	0.76	35,39,42,44	0
6	NAG	L	1	14/15	0.12	0.59	32,35,39,39	0
5	NAG	J	1	14/15	0.19	0.56	38,41,47,48	0
5	BMA	J	3	11/12	0.23	0.49	65,69,72,72	0
7	NAG	M	3	14/15	0.25	1.03	46,48,50,50	0
4	FUC	I	2	10/11	0.27	0.76	44,47,49,50	0
3	NAG	N	2	14/15	0.33	0.52	38,39,42,42	0
3	NAG	P	2	14/15	0.34	0.76	45,47,49,49	0
3	NAG	K	1	14/15	0.34	0.58	31,35,39,46	0
3	FUC	O	3	10/11	0.35	0.73	26,31,33,34	0
7	NAG	M	1	14/15	0.39	0.42	35,41,45,46	0
6	NAG	L	2	14/15	0.40	0.55	37,41,45,48	0
5	NAG	J	2	14/15	0.41	0.58	45,55,61,65	0
3	NAG	P	1	14/15	0.42	0.46	38,42,45,46	0
3	NAG	N	1	14/15	0.43	0.44	37,40,42,48	0
3	NAG	K	2	14/15	0.43	0.56	38,41,42,43	0
7	FUC	M	2	10/11	0.44	0.39	44,47,51,65	0
3	NAG	O	2	14/15	0.47	0.74	50,54,58,58	0
3	FUC	N	3	10/11	0.53	0.44	36,39,42,45	0
3	NAG	O	1	14/15	0.53	0.54	36,41,45,47	0
5	FUC	J	4	10/11	0.64	0.45	27,33,38,39	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 P:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
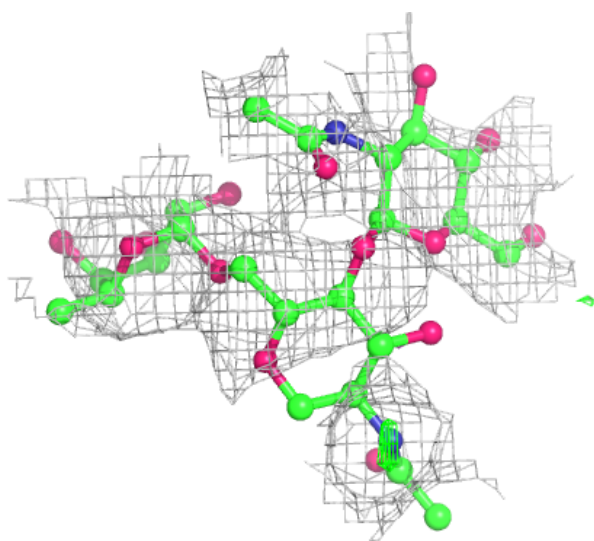and green (positive)
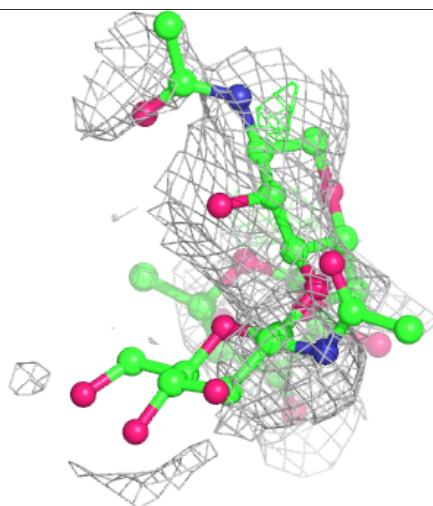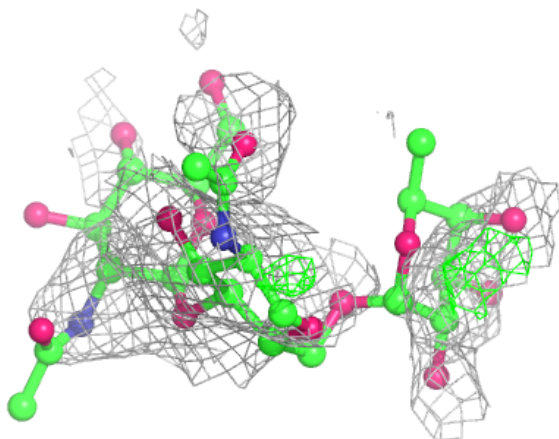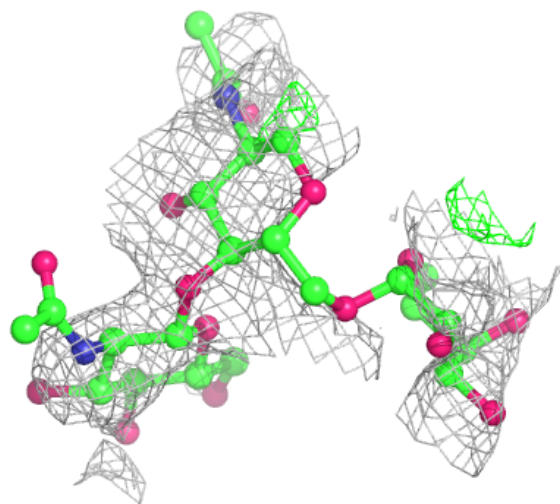
Electron density around Chain K:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
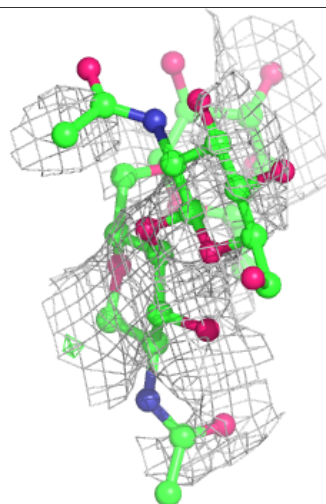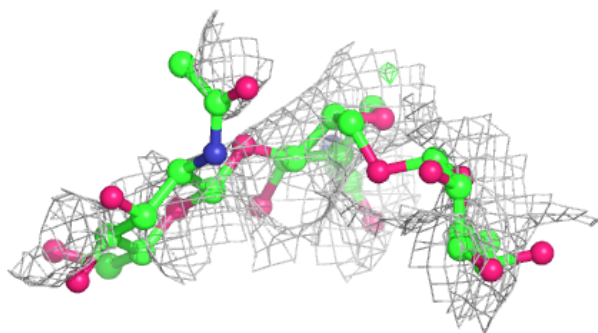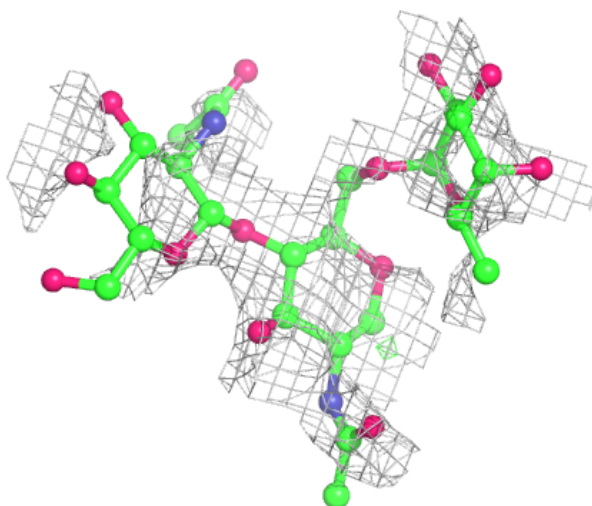$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
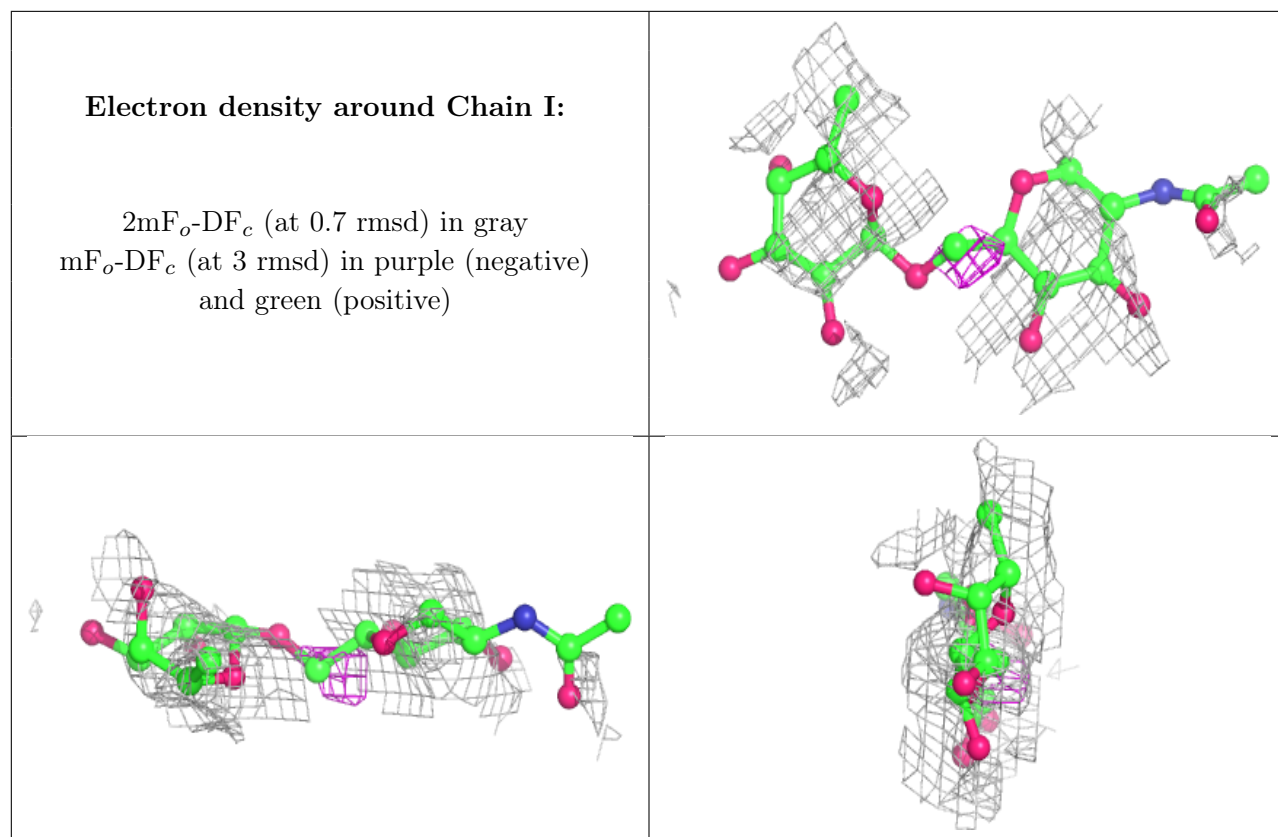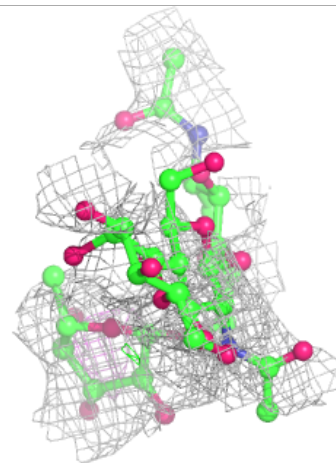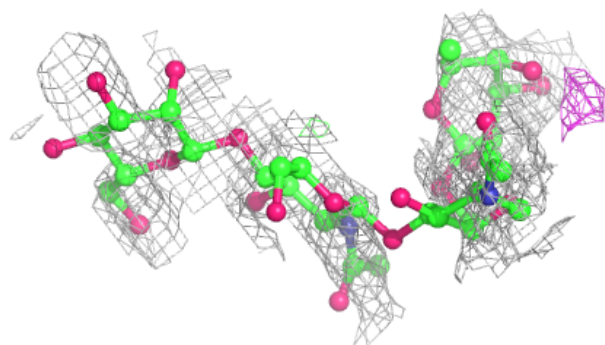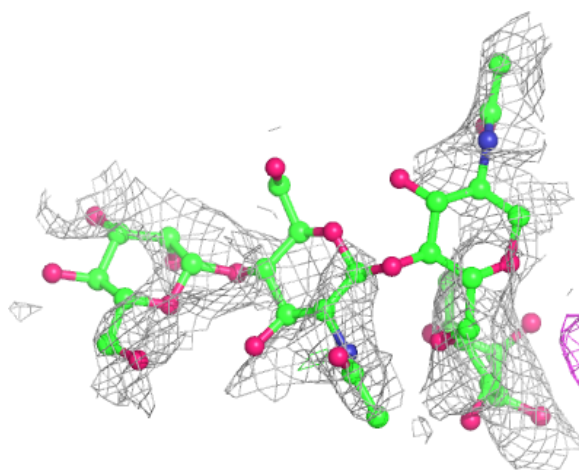and green (positive)
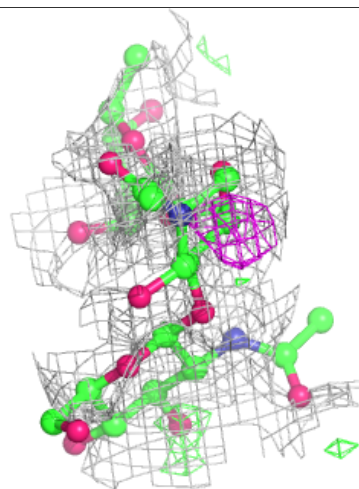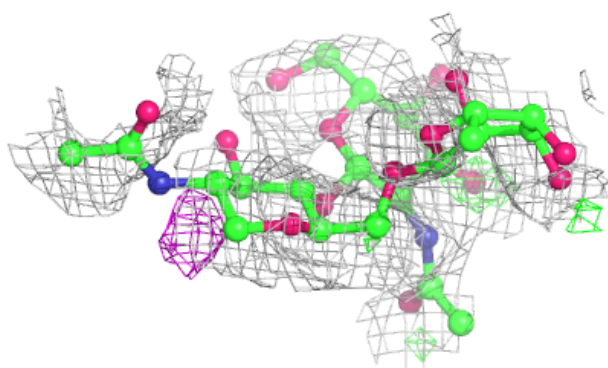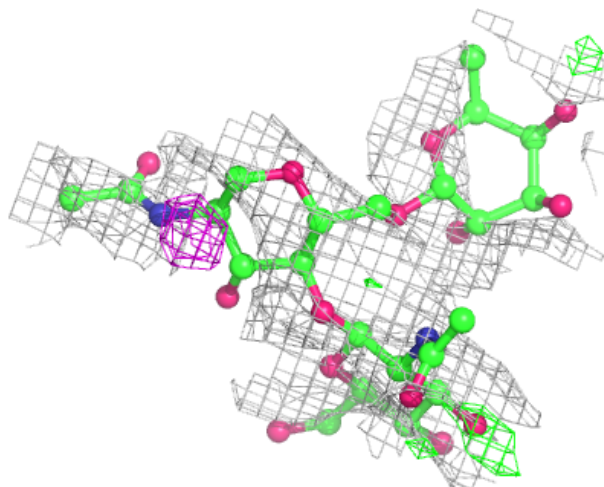
Electron density around Chain N:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
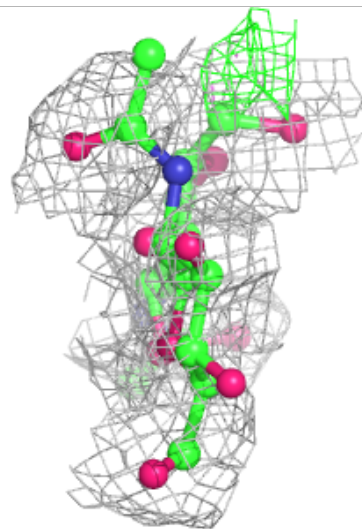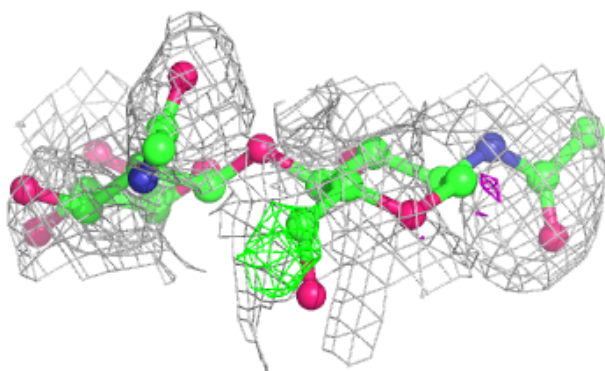and green (positive)
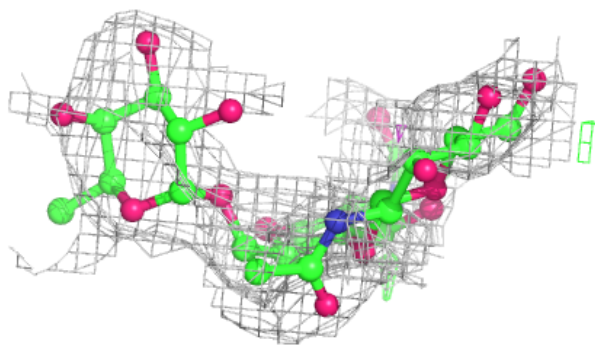
Electron density around Chain O:

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

Electron density around Chain I:

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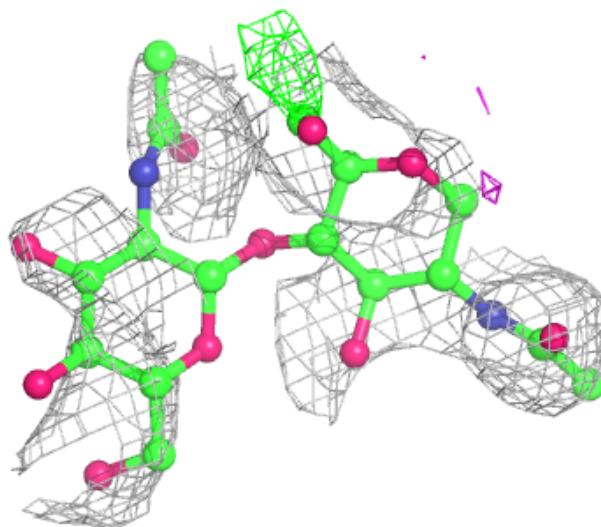and green (positive)

Electron density around Chain J:

$2mF_o$-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 L:

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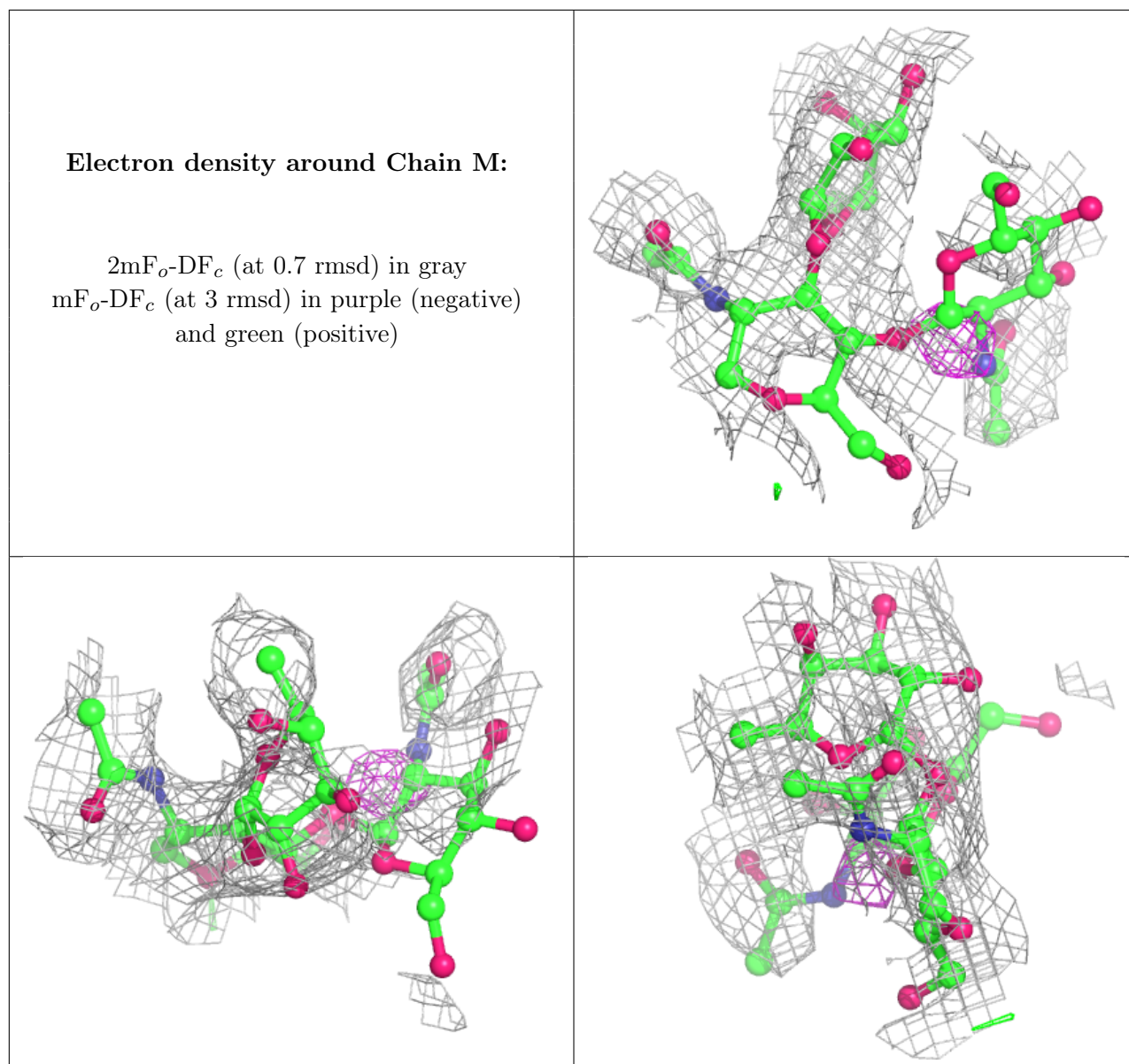
Electron density around Chain M:

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

6.4 Ligands ⓘ

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
9	SO4	C	302	5/5	0.21	0.89	58,58,67,70	0
8	GOL	C	301	6/6	0.26	0.77	31,33,33,34	0
8	GOL	B	305	6/6	0.30	0.44	14,15,15,15	0
9	SO4	B	302	5/5	0.34	0.67	31,31,37,40	0
9	SO4	D	302	5/5	0.42	0.77	40,53,54,65	0

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
8	GOL	B	303	6/6	0.47	0.49	20,22,26,33	0
8	GOL	A	301	6/6	0.50	0.54	24,26,28,28	0
8	GOL	D	301	6/6	0.56	0.55	17,20,20,21	0
8	GOL	B	304	6/6	0.57	0.34	12,13,15,15	0
9	SO4	B	301	5/5	0.66	0.50	39,42,44,56	0
9	SO4	C	303	5/5	0.67	0.45	41,43,46,51	0

6.5 Other polymers ⓘ

There are no such residues in this entry.