



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 04:09 PM UTC

PDB ID : 7A59 / pdb\_00007a59  
Title : Crimean-Congo Hemorrhagic Fever Virus Envelope Glycoprotein Gc W1191H/W1197A/W1199A Mutant in Postfusion Conformation (Orthorhombic Crystal Form)  
Authors : Hellert, J.; Guardado-Calvo, P.; Rey, F.A.  
Deposited on : 2020-08-20  
Resolution : 2.20 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	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

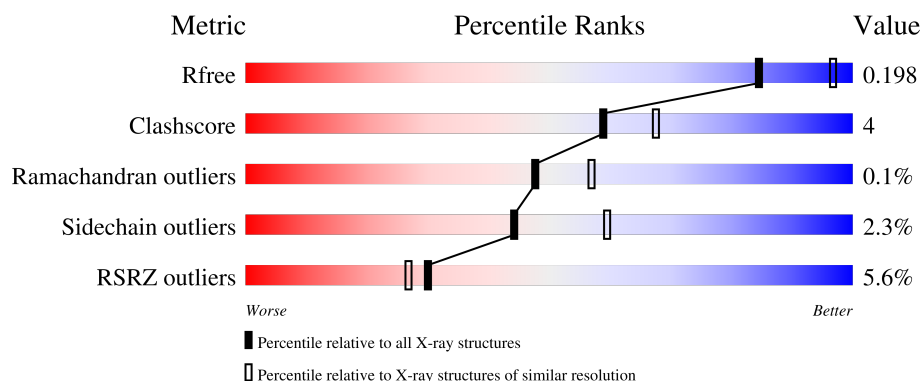
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.20 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))
$R_{free}$	180053	6164 (2.20-2.20)
Clashscore	190562	6851 (2.20-2.20)
Ramachandran outliers	187476	6768 (2.20-2.20)
Sidechain outliers	187428	6769 (2.20-2.20)
RSRZ outliers	180081	6166 (2.20-2.20)

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	538	<div> <div>5%</div> <div> <div></div> <div>82%</div> <div>10%</div> <div>7%</div> </div> </div>
1	B	538	<div> <div>6%</div> <div> <div></div> <div>80%</div> <div>15%</div> <div>5%</div> </div> </div>
1	C	538	<div> <div>5%</div> <div> <div></div> <div>82%</div> <div>10%</div> <div>7%</div> </div> </div>
2	D	5	<div> <div></div> <div> <div>60%</div> <div>40%</div> </div> </div>

## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 12589 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 Envelopment polypeptide.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	499	Total	C	N	O	S	0	0	0
			3874	2430	659	750	35			
1	B	513	Total	C	N	O	S	0	0	0
			3998	2511	680	772	35			
1	C	501	Total	C	N	O	S	0	0	0
			3889	2439	662	753	35			

There are 60 discrepancies between the modelled and reference sequences:

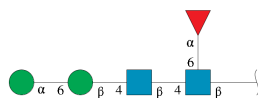
Chain	Residue	Modelled	Actual	Comment	Reference
A	1191	HIS	TRP	engineered mutation	UNP Q8JSZ3
A	1197	ALA	TRP	engineered mutation	UNP Q8JSZ3
A	1199	ALA	TRP	engineered mutation	UNP Q8JSZ3
A	1562	GLU	-	expression tag	UNP Q8JSZ3
A	1563	ASN	-	expression tag	UNP Q8JSZ3
A	1564	LEU	-	expression tag	UNP Q8JSZ3
A	1565	TYR	-	expression tag	UNP Q8JSZ3
A	1566	PHE	-	expression tag	UNP Q8JSZ3
A	1567	GLN	-	expression tag	UNP Q8JSZ3
A	1568	SER	-	expression tag	UNP Q8JSZ3
A	1569	ALA	-	expression tag	UNP Q8JSZ3
A	1570	GLY	-	expression tag	UNP Q8JSZ3
A	1571	TRP	-	expression tag	UNP Q8JSZ3
A	1572	SER	-	expression tag	UNP Q8JSZ3
A	1573	HIS	-	expression tag	UNP Q8JSZ3
A	1574	PRO	-	expression tag	UNP Q8JSZ3
A	1575	GLN	-	expression tag	UNP Q8JSZ3
A	1576	PHE	-	expression tag	UNP Q8JSZ3
A	1577	GLU	-	expression tag	UNP Q8JSZ3
A	1578	LYS	-	expression tag	UNP Q8JSZ3
B	1191	HIS	TRP	engineered mutation	UNP Q8JSZ3
B	1197	ALA	TRP	engineered mutation	UNP Q8JSZ3
B	1199	ALA	TRP	engineered mutation	UNP Q8JSZ3

*Continued on next page...*

*Continued from previous page...*

Chain	Residue	Modelled	Actual	Comment	Reference
B	1562	GLU	-	expression tag	UNP Q8JSZ3
B	1563	ASN	-	expression tag	UNP Q8JSZ3
B	1564	LEU	-	expression tag	UNP Q8JSZ3
B	1565	TYR	-	expression tag	UNP Q8JSZ3
B	1566	PHE	-	expression tag	UNP Q8JSZ3
B	1567	GLN	-	expression tag	UNP Q8JSZ3
B	1568	SER	-	expression tag	UNP Q8JSZ3
B	1569	ALA	-	expression tag	UNP Q8JSZ3
B	1570	GLY	-	expression tag	UNP Q8JSZ3
B	1571	TRP	-	expression tag	UNP Q8JSZ3
B	1572	SER	-	expression tag	UNP Q8JSZ3
B	1573	HIS	-	expression tag	UNP Q8JSZ3
B	1574	PRO	-	expression tag	UNP Q8JSZ3
B	1575	GLN	-	expression tag	UNP Q8JSZ3
B	1576	PHE	-	expression tag	UNP Q8JSZ3
B	1577	GLU	-	expression tag	UNP Q8JSZ3
B	1578	LYS	-	expression tag	UNP Q8JSZ3
C	1191	HIS	TRP	engineered mutation	UNP Q8JSZ3
C	1197	ALA	TRP	engineered mutation	UNP Q8JSZ3
C	1199	ALA	TRP	engineered mutation	UNP Q8JSZ3
C	1562	GLU	-	expression tag	UNP Q8JSZ3
C	1563	ASN	-	expression tag	UNP Q8JSZ3
C	1564	LEU	-	expression tag	UNP Q8JSZ3
C	1565	TYR	-	expression tag	UNP Q8JSZ3
C	1566	PHE	-	expression tag	UNP Q8JSZ3
C	1567	GLN	-	expression tag	UNP Q8JSZ3
C	1568	SER	-	expression tag	UNP Q8JSZ3
C	1569	ALA	-	expression tag	UNP Q8JSZ3
C	1570	GLY	-	expression tag	UNP Q8JSZ3
C	1571	TRP	-	expression tag	UNP Q8JSZ3
C	1572	SER	-	expression tag	UNP Q8JSZ3
C	1573	HIS	-	expression tag	UNP Q8JSZ3
C	1574	PRO	-	expression tag	UNP Q8JSZ3
C	1575	GLN	-	expression tag	UNP Q8JSZ3
C	1576	PHE	-	expression tag	UNP Q8JSZ3
C	1577	GLU	-	expression tag	UNP Q8JSZ3
C	1578	LYS	-	expression tag	UNP Q8JSZ3

- Molecule 2 is an oligosaccharide called alpha-D-mannopyranose-(1-6)-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
2	D	5	Total	C	N	O	0	0	0
			60	34	2	24			

- Molecule 3 is 2-acetamido-2-deoxy-beta-D-glucopyranose (CCD ID: NAG) (formula:  $C_8H_{15}NO_6$ ).



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

- Molecule 4 is CHLORIDE ION (CCD ID: CL) (formula:  $Cl$ ).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	3	Total	Cl	0	0
			3	3		
4	B	1	Total	Cl	0	0
			1	1		
4	C	2	Total	Cl	0	0
			2	2		

- Molecule 5 is PHOSPHATE ION (CCD ID: PO4) (formula:  $O_4P$ ).



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

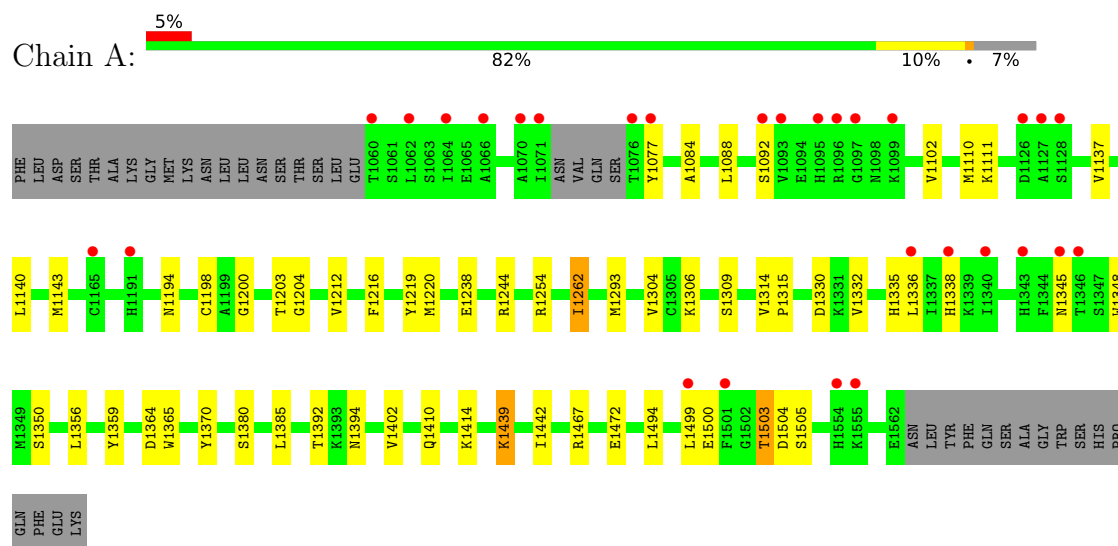
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	241	Total	O	0	0
			241	241		
6	B	245	Total	O	0	0
			245	245		
6	C	243	Total	O	0	0
			243	243		

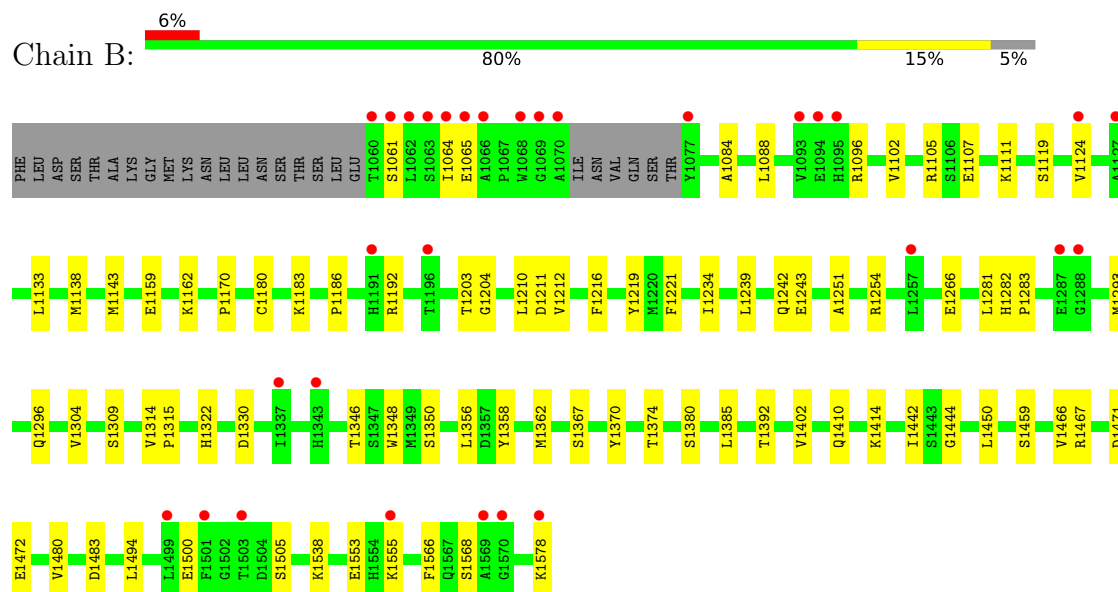
### 3 Residue-property plots [i](#)

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.

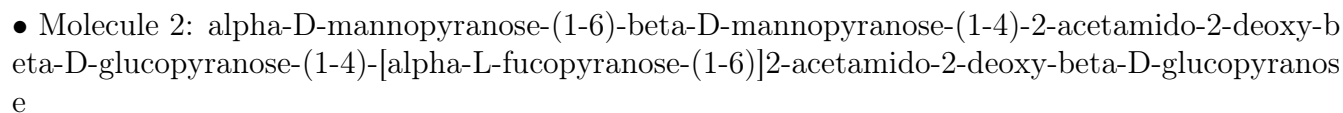
- Molecule 1: Envelopment polyprotein



- Molecule 1: Envelopment polyprotein



- Molecule 1: Envelopment polyprotein





## 4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	69.96Å 216.08Å 274.28Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.91 – 2.20 48.91 – 2.20	Depositor EDS
% Data completeness (in resolution range)	99.7 (48.91-2.20) 92.1 (48.91-2.20)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	0.86 (at 2.20Å)	Xtriage
Refinement program	PHENIX 1.10.1_2155	Depositor
R, $R_{free}$	0.161 , 0.194 0.164 , 0.198	Depositor DCC
$R_{free}$ test set	1997 reflections (1.88%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	45.5	Xtriage
Anisotropy	0.296	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 56.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	12589	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	72.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.02% 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

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MAN, PO4, FUC, CL, BMA, NAG

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 5$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
1	A	0.28	0/3960	0.49	0/5369
1	B	0.27	0/4091	0.49	0/5545
1	C	0.28	0/3975	0.50	0/5389
All	All	0.27	0/12026	0.49	0/16303

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3874	0	3769	32	0
1	B	3998	0	3872	47	0
1	C	3889	0	3784	33	0
2	D	60	0	52	1	0
3	A	14	0	13	0	0
3	B	14	0	13	1	0
4	A	3	0	0	0	0
4	B	1	0	0	0	0
4	C	2	0	0	0	0
5	A	5	0	0	0	0

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	A	241	0	0	2	0
6	B	245	0	0	4	0
6	C	243	0	0	1	0
All	All	12589	0	11503	102	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 4.

All (102) 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:1578:LYS:HG2	1:C:1172:ARG:HG2	1.62	0.79
1:A:1309:SER:HB2	1:C:1314:VAL:HG21	1.67	0.76
1:B:1254:ARG:NH1	6:B:1701:HOH:O	2.22	0.73
1:B:1315:PRO:HD3	1:B:1380:SER:HB3	1.72	0.70
1:A:1494:LEU:HD22	1:A:1505:SER:HB3	1.75	0.69
1:C:1467:ARG:NH2	1:C:1502:GLY:O	2.26	0.69
1:B:1467:ARG:HH11	1:B:1500:GLU:HB2	1.57	0.69
1:B:1578:LYS:HE3	1:C:1182:HIS:HE1	1.57	0.68
1:A:1314:VAL:HG21	1:B:1309:SER:HB2	1.76	0.66
1:C:1143:MET:HE1	1:C:1414:LYS:NZ	2.14	0.63
1:C:1138:MET:HE2	1:C:1234:ILE:HG21	1.80	0.63
1:C:1143:MET:HE1	1:C:1414:LYS:HZ2	1.65	0.61
1:A:1467:ARG:HE	1:A:1500:GLU:HG3	1.66	0.61
1:C:1364:ASP:OD1	1:C:1365:TRP:N	2.33	0.60
1:B:1555:LYS:NZ	6:B:1702:HOH:O	2.30	0.60
1:A:1238:GLU:HG2	1:A:1244:ARG:HG3	1.83	0.59
1:B:1314:VAL:HG21	1:C:1309:SER:HB2	1.86	0.58
1:A:1293:MET:HE2	1:A:1330:ASP:HA	1.85	0.58
3:B:1601:NAG:H83	3:B:1601:NAG:H3	1.86	0.58
1:A:1088:LEU:HD11	1:B:1105:ARG:HD2	1.86	0.57
1:A:1092:SER:HB2	1:C:1090:TRP:HB2	1.86	0.56
1:C:1494:LEU:HD22	1:C:1505:SER:HB3	1.87	0.56
1:B:1096:ARG:NH2	6:B:1705:HOH:O	2.32	0.56
1:C:1239:LEU:HD23	1:C:1242:GLN:HG3	1.88	0.55
1:A:1143:MET:HE1	1:A:1414:LYS:NZ	2.22	0.54
1:A:1315:PRO:HD3	1:A:1380:SER:HB3	1.89	0.53
1:B:1578:LYS:HE3	1:C:1182:HIS:CE1	2.43	0.53
1:C:1356:LEU:HD22	1:C:1370:TYR:CD2	2.44	0.53
1:B:1239:LEU:HD23	1:B:1242:GLN:HG3	1.91	0.52
1:C:1374:THR:HG23	1:C:1553:GLU:HG2	1.92	0.52

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1364:ASP:OD1	1:A:1365:TRP:N	2.38	0.52
1:A:1194:ASN:ND2	1:A:1200:GLY:O	2.39	0.52
1:B:1192:ARG:HB2	1:B:1362:MET:HE2	1.92	0.52
1:B:1348:TRP:CH2	1:B:1350:SER:HB2	2.46	0.51
1:C:1162:LYS:HD3	1:C:1170:PRO:HG2	1.93	0.51
1:B:1138:MET:HE2	1:B:1234:ILE:HG21	1.93	0.51
1:A:1345:ASN:OD1	1:A:1345:ASN:N	2.40	0.51
1:A:1335:HIS:ND1	1:A:1336:LEU:HG	2.26	0.50
1:B:1356:LEU:HD22	1:B:1370:TYR:CD2	2.47	0.50
1:B:1578:LYS:CG	1:C:1172:ARG:HG2	2.38	0.49
1:C:1277:GLU:OE1	6:C:1701:HOH:O	2.19	0.49
1:C:1466:VAL:HG11	1:C:1494:LEU:HD13	1.95	0.49
1:B:1219:TYR:CE1	1:B:1385:LEU:HD11	2.48	0.49
1:B:1293:MET:HG3	1:B:1330:ASP:OD1	2.12	0.49
1:B:1159:GLU:HG3	1:B:1210:LEU:HD13	1.94	0.49
1:C:1081:VAL:HG11	1:C:1473:PRO:HG2	1.95	0.48
1:B:1296:GLN:NE2	6:B:1713:HOH:O	2.45	0.48
1:A:1203:THR:OG1	6:A:1701:HOH:O	2.20	0.48
1:B:1084:ALA:HB1	1:B:1111:LYS:HD3	1.95	0.48
1:A:1254:ARG:HA	1:A:1262:ILE:O	2.14	0.48
1:A:1356:LEU:HD22	1:A:1370:TYR:CD2	2.49	0.48
1:C:1119:SER:HB3	1:C:1132:LEU:HD11	1.96	0.47
1:A:1359:TYR:CG	1:B:1186:PRO:HD2	2.51	0.46
1:B:1221:PHE:HB3	1:B:1281:LEU:HD23	1.98	0.46
1:A:1220:MET:SD	1:A:1332:VAL:HG21	2.55	0.46
1:B:1162:LYS:HD3	1:B:1170:PRO:HG2	1.98	0.46
1:B:1494:LEU:HD22	1:B:1505:SER:HB3	1.98	0.45
2:D:3:BMA:H62	2:D:4:MAN:H2	1.44	0.45
1:C:1254:ARG:HA	1:C:1262:ILE:O	2.16	0.45
1:A:1203:THR:OG1	1:A:1204:GLY:N	2.50	0.45
1:A:1306:LYS:NZ	6:A:1714:HOH:O	2.50	0.45
1:B:1143:MET:HE1	1:B:1414:LYS:NZ	2.31	0.44
1:B:1444:GLY:HA3	1:B:1471:ASP:OD2	2.17	0.44
1:B:1450:LEU:HB3	1:B:1538:LYS:HD3	1.99	0.44
1:C:1183:LYS:HE2	1:C:1185:TRP:CZ2	2.53	0.44
1:B:1322:HIS:HD2	1:B:1346:THR:HB	1.82	0.44
1:B:1442:ILE:HA	1:B:1472:GLU:O	2.17	0.44
1:A:1194:ASN:HB3	1:A:1198:CYS:HB3	1.99	0.44
1:A:1467:ARG:HH21	1:A:1500:GLU:HB3	1.82	0.44
1:A:1402:VAL:HA	1:A:1410:GLN:O	2.18	0.43
1:B:1211:ASP:OD1	1:B:1212:VAL:N	2.49	0.43

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:1114:GLU:HG3	1:C:1115:ARG:HH21	1.83	0.43
1:B:1061:SER:O	1:B:1065:GLU:HG2	2.19	0.43
1:A:1439:LYS:H	1:A:1439:LYS:NZ	2.17	0.43
1:B:1061:SER:HA	1:B:1064:ILE:HG22	2.00	0.43
1:B:1107:GLU:HB3	1:C:1107:GLU:OE2	2.18	0.43
1:B:1566:PHE:CE2	1:B:1568:SER:HB3	2.52	0.43
1:C:1150:TYR:OH	1:C:1304:VAL:HG13	2.19	0.43
1:A:1212:VAL:O	1:A:1338:HIS:NE2	2.52	0.43
1:B:1467:ARG:HE	1:B:1500:GLU:HB2	1.84	0.43
1:A:1219:TYR:CE1	1:A:1385:LEU:HD11	2.54	0.43
1:B:1203:THR:OG1	1:B:1204:GLY:N	2.51	0.43
1:A:1503:THR:HG22	1:A:1504:ASP:H	1.83	0.42
1:A:1110:MET:HE3	1:A:1137:VAL:HG23	2.00	0.42
1:B:1362:MET:HE3	1:B:1362:MET:HB2	1.84	0.42
1:B:1466:VAL:HG11	1:B:1494:LEU:HD13	2.00	0.42
1:A:1348:TRP:CH2	1:A:1350:SER:HB2	2.55	0.42
1:B:1358:TYR:HA	1:B:1367:SER:O	2.20	0.42
1:C:1499:LEU:HD12	1:C:1500:GLU:H	1.83	0.42
1:C:1315:PRO:HD3	1:C:1380:SER:HB3	2.01	0.42
1:B:1251:ALA:HB2	1:B:1266:GLU:HB3	2.02	0.41
1:B:1282:HIS:HA	1:B:1283:PRO:HD3	1.95	0.41
1:B:1402:VAL:HA	1:B:1410:GLN:O	2.20	0.41
1:B:1119:SER:HA	1:B:1133:LEU:O	2.20	0.41
1:A:1084:ALA:HB1	1:A:1111:LYS:HD3	2.03	0.41
1:C:1442:ILE:HA	1:C:1472:GLU:O	2.20	0.41
1:A:1442:ILE:HA	1:A:1472:GLU:O	2.20	0.41
1:C:1119:SER:HA	1:C:1133:LEU:O	2.20	0.41
1:B:1088:LEU:HD11	1:C:1429:GLU:HG2	2.02	0.41
1:B:1374:THR:HG23	1:B:1553:GLU:HG2	2.02	0.41
1:C:1439:LYS:HE2	1:C:1441:GLU:HG2	2.04	0.40
1:C:1122:LEU:HD11	1:C:1430:VAL:HG21	2.03	0.40

There are no symmetry-related clashes.

## 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	495/538 (92%)	485 (98%)	10 (2%)	0	100	100
1	B	509/538 (95%)	491 (96%)	18 (4%)	0	100	100
1	C	497/538 (92%)	483 (97%)	13 (3%)	1 (0%)	43	51
All	All	1501/1614 (93%)	1459 (97%)	41 (3%)	1 (0%)	48	57

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	1161	PRO

### 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	442/477 (93%)	431 (98%)	11 (2%)	42	56
1	B	454/477 (95%)	443 (98%)	11 (2%)	43	58
1	C	444/477 (93%)	435 (98%)	9 (2%)	48	64
All	All	1340/1431 (94%)	1309 (98%)	31 (2%)	44	59

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1077	TYR
1	A	1102	VAL
1	A	1140	LEU
1	A	1216	PHE
1	A	1262	ILE
1	A	1304	VAL
1	A	1392	THR
1	A	1394	ASN
1	A	1439	LYS

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type
1	A	1499	LEU
1	A	1503	THR
1	B	1102	VAL
1	B	1124	VAL
1	B	1180	CYS
1	B	1183	LYS
1	B	1216	PHE
1	B	1243	GLU
1	B	1304	VAL
1	B	1392	THR
1	B	1459	SER
1	B	1480	VAL
1	B	1483	ASP
1	C	1100	ILE
1	C	1140	LEU
1	C	1216	PHE
1	C	1243	GLU
1	C	1304	VAL
1	C	1392	THR
1	C	1430	VAL
1	C	1447	PHE
1	C	1562	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (11) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	1095	HIS
1	A	1256	ASN
1	A	1296	GLN
1	A	1343	HIS
1	A	1375	GLN
1	B	1322	HIS
1	B	1361	ASN
1	C	1156	GLN
1	C	1256	ASN
1	C	1343	HIS
1	C	1546	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

## 5.5 Carbohydrates ⓘ

5 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	D	1	2,1	14,14,15	0.36	0	17,19,21	0.54	0
2	NAG	D	2	2	14,14,15	0.28	0	17,19,21	0.78	0
2	BMA	D	3	2	11,11,12	0.98	1 (9%)	15,15,17	0.93	0
2	MAN	D	4	2	11,11,12	1.59	1 (9%)	15,15,17	1.51	3 (20%)
2	FUC	D	5	2	10,10,11	1.08	0	14,14,16	0.81	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	D	1	2,1	-	2/6/23/26	0/1/1/1
2	NAG	D	2	2	-	2/6/23/26	0/1/1/1
2	BMA	D	3	2	-	0/2/19/22	0/1/1/1
2	MAN	D	4	2	-	1/2/19/22	0/1/1/1
2	FUC	D	5	2	-	-	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	4	MAN	C1-C2	4.43	1.62	1.52
2	D	3	BMA	C1-C2	2.49	1.58	1.52

All (3) bond angle outliers are listed below:



Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	4	MAN	C1-O5-C5	3.55	116.95	112.19
2	D	4	MAN	C1-C2-C3	2.99	114.00	109.64
2	D	4	MAN	O2-C2-C3	-2.17	105.65	110.15

There are no chirality outliers.

All (5) torsion outliers are listed below:

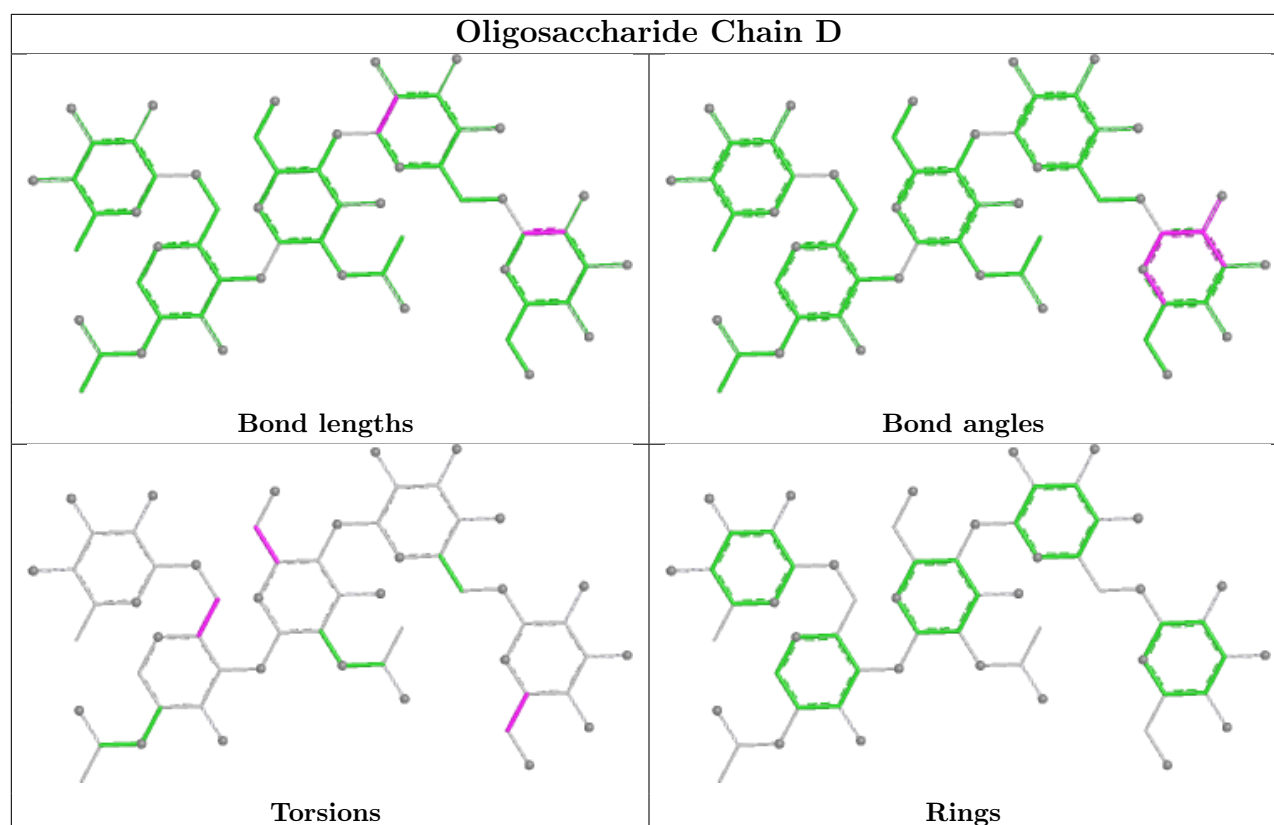
Mol	Chain	Res	Type	Atoms
2	D	2	NAG	O5-C5-C6-O6
2	D	1	NAG	O5-C5-C6-O6
2	D	1	NAG	C4-C5-C6-O6
2	D	2	NAG	C4-C5-C6-O6
2	D	4	MAN	C4-C5-C6-O6

There are no ring outliers.

2 monomers are involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	3	BMA	1	0
2	D	4	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 9 ligands modelled in this entry, 6 are monoatomic - leaving 3 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	$\# Z  > 2$
3	NAG	B	1601	1	14,14,15	0.91	1 (7%)	17,19,21	1.42	3 (17%)
5	PO4	A	1605	-	4,4,4	0.85	0	6,6,6	0.47	0
3	NAG	A	1601	1	14,14,15	0.50	0	17,19,21	0.39	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	B	1601	1	-	5/6/23/26	0/1/1/1
3	NAG	A	1601	1	-	2/6/23/26	0/1/1/1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	1601	NAG	C1-C2	2.63	1.55	1.52

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	1601	NAG	C2-N2-C7	4.49	128.92	122.90
3	B	1601	NAG	C1-O5-C5	2.35	115.33	112.19
3	B	1601	NAG	C1-C2-N2	2.18	113.86	110.43

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1601	NAG	O5-C5-C6-O6
3	A	1601	NAG	C4-C5-C6-O6
3	B	1601	NAG	C8-C7-N2-C2
3	B	1601	NAG	O7-C7-N2-C2
3	B	1601	NAG	O5-C5-C6-O6
3	B	1601	NAG	C1-C2-N2-C7
3	B	1601	NAG	C3-C2-N2-C7

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	1601	NAG	1	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, 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	499/538 (92%)	0.22	29 (5%)	29 25	37, 67, 131, 211	0
1	B	513/538 (95%)	0.22	30 (5%)	29 25	37, 66, 130, 184	0
1	C	501/538 (93%)	0.19	25 (4%)	34 31	36, 65, 124, 184	0
All	All	1513/1614 (93%)	0.21	84 (5%)	30 27	36, 66, 128, 211	0

All (84) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	1071	ILE	6.1
1	A	1071	ILE	5.9
1	B	1064	ILE	5.5
1	B	1069	GLY	4.7
1	C	1340	ILE	4.5
1	B	1077	TYR	4.4
1	A	1499	LEU	4.1
1	A	1077	TYR	4.1
1	C	1124	VAL	4.0
1	A	1340	ILE	3.9
1	C	1064	ILE	3.9
1	B	1068	TRP	3.8
1	C	1564	LEU	3.7
1	C	1076	THR	3.6
1	C	1501	PHE	3.5
1	A	1191	HIS	3.5
1	B	1569	ALA	3.4
1	B	1343	HIS	3.3
1	C	1070	ALA	3.3
1	A	1095	HIS	3.3
1	A	1338	HIS	3.3
1	B	1501	PHE	3.3
1	A	1097	GLY	3.2

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
1	A	1555	LYS	3.2
1	C	1068	TRP	3.1
1	A	1093	VAL	3.0
1	C	1075	SER	3.0
1	B	1062	LEU	2.9
1	C	1077	TYR	2.9
1	B	1287	GLU	2.8
1	C	1066	ALA	2.8
1	C	1499	LEU	2.8
1	C	1191	HIS	2.7
1	A	1070	ALA	2.7
1	B	1070	ALA	2.7
1	A	1076	THR	2.7
1	B	1124	VAL	2.7
1	C	1093	VAL	2.7
1	B	1095	HIS	2.7
1	C	1338	HIS	2.6
1	B	1288	GLY	2.6
1	A	1336	LEU	2.6
1	A	1501	PHE	2.6
1	C	1069	GLY	2.6
1	B	1578	LYS	2.5
1	A	1554	HIS	2.5
1	B	1499	LEU	2.4
1	B	1065	GLU	2.4
1	C	1365	TRP	2.4
1	A	1060	THR	2.4
1	B	1060	THR	2.4
1	A	1096	ARG	2.4
1	A	1092	SER	2.4
1	A	1343	HIS	2.4
1	A	1062	LEU	2.3
1	B	1063	SER	2.3
1	C	1061	SER	2.3
1	B	1093	VAL	2.3
1	A	1345	ASN	2.3
1	B	1061	SER	2.3
1	B	1191	HIS	2.3
1	A	1165	CYS	2.3
1	A	1066	ALA	2.2
1	B	1094	GLU	2.2
1	A	1128	SER	2.2

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
1	B	1555	LYS	2.2
1	B	1066	ALA	2.2
1	B	1127	ALA	2.2
1	C	1431	ALA	2.2
1	C	1494	LEU	2.2
1	A	1099	LYS	2.2
1	A	1126	ASP	2.2
1	B	1570	GLY	2.1
1	C	1207	CYS	2.1
1	B	1196	THR	2.1
1	C	1343	HIS	2.1
1	A	1127	ALA	2.1
1	B	1337	ILE	2.1
1	B	1257	LEU	2.0
1	C	1203	THR	2.0
1	A	1064	ILE	2.0
1	C	1062	LEU	2.0
1	A	1346	THR	2.0
1	B	1503	THR	2.0

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

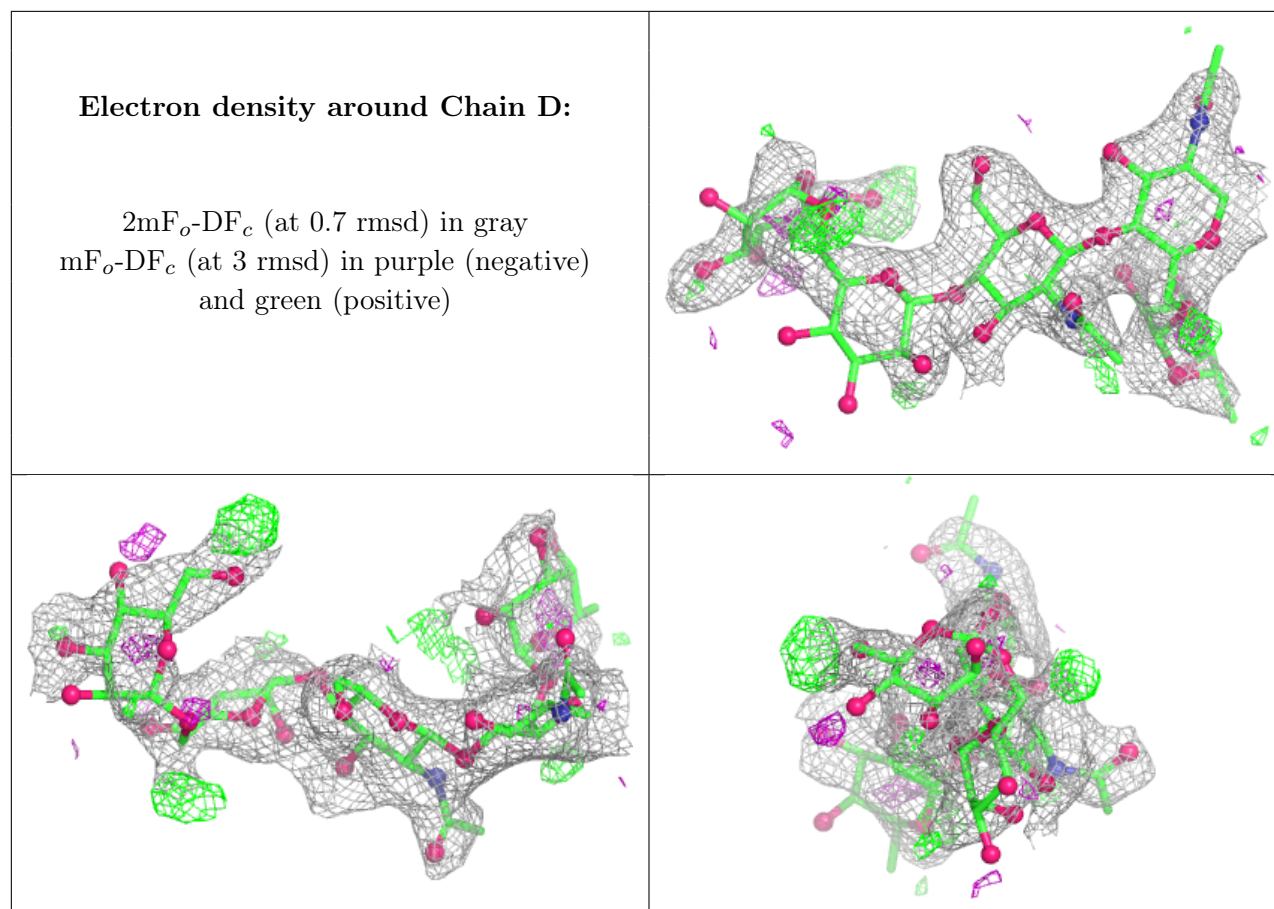
There are no non-standard protein/DNA/RNA residues in this entry.

## 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, 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
2	BMA	D	3	11/12	0.24	0.14	150,154,157,158	0
2	FUC	D	5	10/11	0.28	0.20	136,139,142,144	0
2	MAN	D	4	11/12	0.66	0.18	131,148,154,154	0
2	NAG	D	2	14/15	0.72	0.13	111,125,136,144	0
2	NAG	D	1	14/15	0.85	0.11	72,101,116,128	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.



## 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( $\text{\AA}^2$ )	Q<0.9
3	NAG	A	1601	14/15	0.35	0.18	117,135,139,140	0
3	NAG	B	1601	14/15	0.44	0.18	106,120,124,125	0
5	PO4	A	1605	5/5	0.84	0.15	111,112,116,116	0
4	CL	B	1602	1/1	0.89	0.14	94,94,94,94	0
4	CL	C	1602	1/1	0.90	0.13	90,90,90,90	0
4	CL	A	1604	1/1	0.91	0.18	84,84,84,84	0
4	CL	C	1601	1/1	0.92	0.12	94,94,94,94	0
4	CL	A	1603	1/1	0.99	0.07	49,49,49,49	0
4	CL	A	1602	1/1	0.99	0.09	46,46,46,46	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.