



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 04:25 AM UTC

PDB ID : 2ACH / pdb_00002ach
Title : CRYSTAL STRUCTURE OF CLEAVED HUMAN ALPHA1-ANTITRYPSIN AT 2.7 ANGSTROMS RESOLUTION AND ITS COMPARISON WITH OTHER SERPINS
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Deposited on : 1993-04-26
Resolution : 2.70 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 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

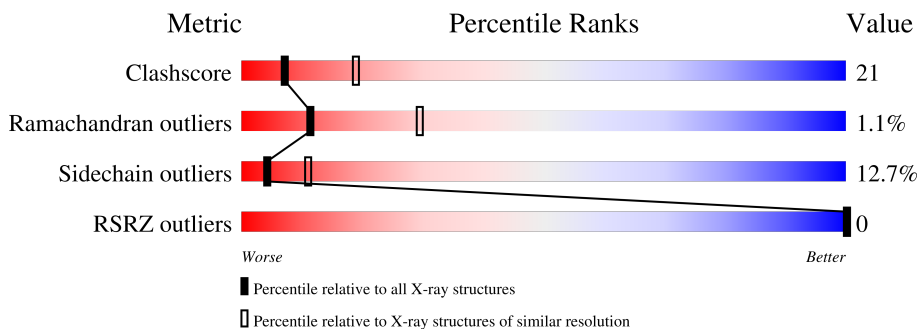
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.70 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))
Clashscore	190562	3843 (2.70-2.70)
Ramachandran outliers	187476	3778 (2.70-2.70)
Sidechain outliers	187428	3778 (2.70-2.70)
RSRZ outliers	180081	3538 (2.70-2.70)

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	360	
2	B	40	
3	C	3	
4	D	2	

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
5	PO4	A	550	-	-	X	-

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 3126 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.

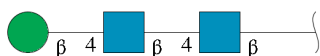
- Molecule 1 is a protein called ALPHA 1-ANTICHYMOTRYPSIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	337	2678	1718	437	512	11	40	0	0

- Molecule 2 is a protein called ALPHA 1-ANTICHYMOTRYPSIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	35	290	188	51	49	2	13	0	0

- Molecule 3 is an oligosaccharide called beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



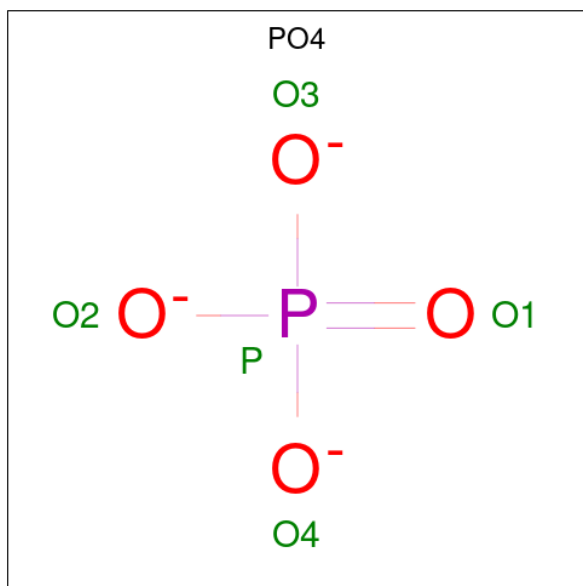
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
3	C	3	39	22	2	15	0	0	0

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



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
4	D	2	28	16	2	10	3	0	0

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



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

- Molecule 6 is water.

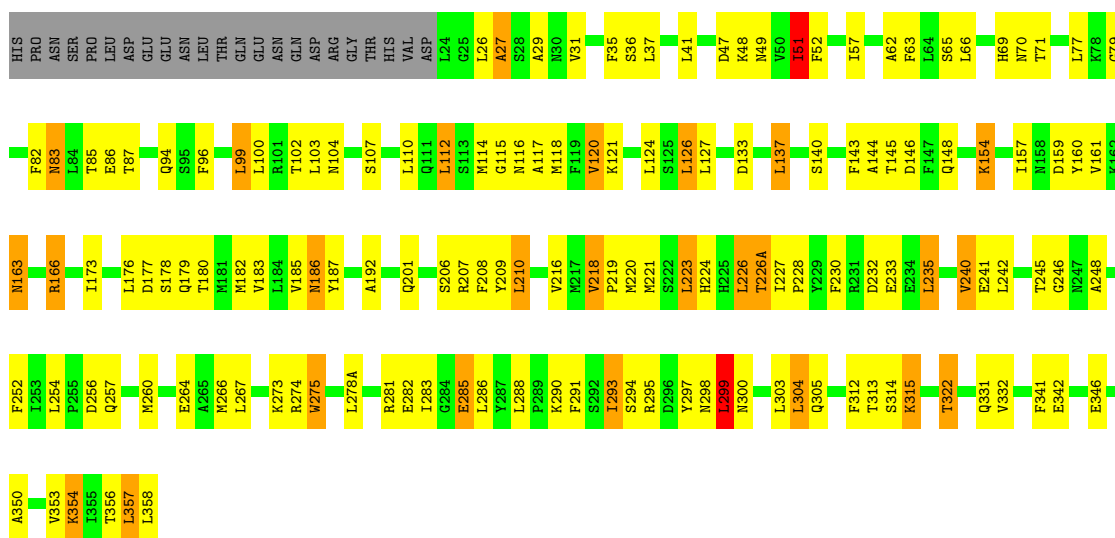
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	80	Total	O	0	0
			80	80		
6	B	6	Total	O	0	0
			6	6		

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.

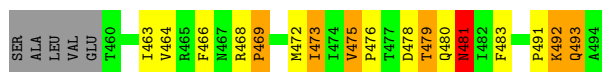
- Molecule 1: ALPHA 1-ANTICHYMOTRYPSIN

Chain A: 



- Molecule 2: ALPHA 1-ANTICHYMOTRYPSIN

Chain B: 



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

Chain C: 



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

Chain D: 

MAG1
MAG2

4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	75.30Å 75.30Å 208.00Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	8.00 – 2.70 8.00 – 2.70	Depositor EDS
% Data completeness (in resolution range)	(Not available) (8.00-2.70) 76.4 (8.00-2.70)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$	-	Xtrriage
Refinement program	X-PLOR	Depositor
R, R_{free}	0.181 , (Not available) 0.183 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	32.2	Xtrriage
Anisotropy	0.161	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.11 , 64.1	EDS
L-test for twinning ¹	$\langle L \rangle = 0.32$, $\langle L^2 \rangle = 0.15$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	3126	wwPDB-VP
Average B, all atoms (Å ²)	23.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.41% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality i

5.1 Standard geometry i

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

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	0.68	0/2728	1.10	18/3686 (0.5%)
2	B	0.75	0/296	1.26	3/399 (0.8%)
All	All	0.69	0/3024	1.12	21/4085 (0.5%)

There are no bond length outliers.

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	124	LEU	N-CA-C	6.72	120.45	109.76
1	A	31	VAL	N-CA-C	-6.64	104.29	110.53
2	B	493	GLN	N-CA-C	-6.61	102.52	112.04
2	B	481	ASN	N-CA-C	-6.53	98.44	108.76
1	A	346	GLU	N-CA-C	-6.46	99.39	109.72
1	A	299	LEU	N-CA-C	6.45	120.76	113.02
1	A	137	LEU	N-CA-C	6.36	118.09	111.03
1	A	291	PHE	N-CA-C	5.96	119.26	109.85
1	A	210	LEU	N-CA-C	-5.84	104.99	111.36
1	A	62	ALA	N-CA-C	-5.82	104.53	111.69
1	A	298	ASN	N-CA-C	-5.82	97.84	108.02
1	A	29	ALA	N-CA-C	-5.82	104.86	111.14
2	B	473	ILE	N-CA-C	5.80	114.71	106.53
1	A	315	LYS	N-CA-C	-5.65	106.18	112.57
1	A	102	THR	N-CA-C	5.48	116.93	111.07
1	A	293	ILE	N-CA-C	5.41	116.46	108.45
1	A	27	ALA	N-CA-C	-5.38	105.85	112.90
1	A	70	ASN	CB-CA-C	-5.36	109.94	117.23
1	A	79	GLY	N-CA-C	-5.35	108.03	114.66
1	A	173	ILE	N-CA-C	-5.09	101.25	108.58
1	A	178	SER	N-CA-C	-5.01	107.14	113.20

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	2678	0	2694	112	0
2	B	290	0	304	26	0
3	C	39	0	34	0	0
4	D	28	0	25	1	0
5	A	5	0	0	2	0
6	A	80	0	0	3	0
6	B	6	0	0	1	0
All	All	3126	0	3057	124	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 21.

All (124) 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:303:LEU:HD12	1:A:312:PHE:HZ	1.41	0.86
1:A:110:LEU:HD13	1:A:192:ALA:HB2	1.56	0.85
1:A:230:PHE:CZ	1:A:232:ASP:HB3	2.18	0.78
1:A:103:LEU:HB2	1:A:114:MET:HE1	1.66	0.77
2:B:478:ASP:O	2:B:479:THR:HB	1.81	0.77
1:A:254:LEU:HB2	2:B:466:PHE:CE2	2.20	0.75
1:A:300:ASN:O	1:A:304:LEU:HD12	1.91	0.71
1:A:37:LEU:HD23	1:A:52:PHE:CE2	2.26	0.70
1:A:285:GLU:HB2	2:B:463:ILE:HG12	1.73	0.69
1:A:256:ASP:HA	2:B:468:ARG:HH21	1.59	0.68
1:A:69:HIS:CD2	5:A:550:PO4:O4	2.48	0.66
1:A:117:ALA:HB1	1:A:143:PHE:HE2	1.60	0.66
1:A:110:LEU:CD1	1:A:192:ALA:HB2	2.26	0.66
1:A:177:ASP:HB3	1:A:180:THR:OG1	1.95	0.66
1:A:252:PHE:CZ	2:B:472:MET:HE3	2.32	0.64
1:A:83:ASN:HD21	1:A:85:THR:HB	1.62	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:35:PHE:CE1	1:A:267:LEU:HD22	2.34	0.63
1:A:303:LEU:HD12	1:A:312:PHE:CZ	2.30	0.63
1:A:154:LYS:HG3	1:A:176:LEU:HB2	1.81	0.62
1:A:242:LEU:HD12	1:A:252:PHE:CE1	2.35	0.62
1:A:206:SER:HB2	1:A:220:MET:HB2	1.81	0.62
1:A:37:LEU:HD23	1:A:52:PHE:HE2	1.64	0.61
1:A:226(A):THR:HA	1:A:281:ARG:O	2.01	0.61
2:B:475:VAL:HG23	2:B:476:PRO:HD2	1.83	0.60
1:A:313:THR:HG22	1:A:315:LYS:H	1.66	0.59
1:A:41:LEU:HD22	1:A:297:TYR:CE1	2.38	0.58
1:A:300:ASN:HD22	1:A:300:ASN:N	2.01	0.58
1:A:121:LYS:HA	1:A:145:THR:O	2.03	0.58
1:A:83:ASN:ND2	1:A:86:GLU:HG2	2.18	0.58
1:A:235:LEU:HD12	1:A:274:ARG:HH22	1.69	0.58
1:A:127:LEU:HG	1:A:322:THR:O	2.04	0.57
1:A:313:THR:HG22	1:A:314:SER:N	2.19	0.56
1:A:223:LEU:HD23	1:A:224:HIS:H	1.69	0.56
1:A:186:ASN:C	1:A:186:ASN:ND2	2.63	0.56
2:B:476:PRO:HD2	2:B:481:ASN:O	2.05	0.56
1:A:226:LEU:HD12	1:A:283:ILE:HB	1.88	0.55
1:A:117:ALA:HB1	1:A:143:PHE:CE2	2.42	0.55
1:A:226:LEU:CD1	1:A:283:ILE:HB	2.37	0.55
1:A:300:ASN:HD21	1:A:332:VAL:H	1.55	0.54
2:B:480:GLN:HB3	6:B:617:HOH:O	2.06	0.54
1:A:185:VAL:HG12	1:A:186:ASN:N	2.22	0.54
1:A:207:ARG:HA	1:A:216:VAL:O	2.08	0.54
1:A:356:THR:HG22	1:A:357:LEU:N	2.23	0.53
2:B:492:LYS:O	2:B:492:LYS:HD3	2.08	0.53
1:A:295:ARG:HH21	2:B:493:GLN:NE2	2.05	0.53
1:A:314:SER:HA	1:A:358:LEU:CD2	2.38	0.53
1:A:235:LEU:HD13	1:A:275:TRP:HH2	1.74	0.52
1:A:48:LYS:HB3	1:A:295:ARG:HH12	1.75	0.52
2:B:476:PRO:HB2	2:B:478:ASP:OD1	2.10	0.51
1:A:110:LEU:HD13	1:A:192:ALA:CB	2.36	0.51
1:A:299:LEU:O	1:A:303:LEU:HG	2.10	0.51
1:A:27:ALA:HB1	2:B:481:ASN:ND2	2.26	0.51
1:A:83:ASN:ND2	1:A:85:THR:HB	2.25	0.51
1:A:100:LEU:O	1:A:104:ASN:HB2	2.09	0.51
1:A:159:ASP:O	1:A:163:ASN:HB2	2.10	0.51
1:A:275:TRP:O	1:A:278(A):LEU:HG	2.10	0.51
1:A:69:HIS:HD2	5:A:550:PO4:O4	1.94	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:223:LEU:HD13	1:A:226:LEU:HD23	1.93	0.50
2:B:479:THR:CG2	2:B:480:GLN:N	2.75	0.50
1:A:120:VAL:HG11	1:A:126:LEU:HD21	1.93	0.50
1:A:208:PHE:O	1:A:216:VAL:HG12	2.11	0.50
1:A:186:ASN:C	1:A:186:ASN:HD22	2.19	0.49
1:A:144:ALA:HB2	6:A:668:HOH:O	2.12	0.49
1:A:230:PHE:CE2	1:A:232:ASP:HB3	2.47	0.49
1:A:118:MET:HB2	1:A:182:MET:HE2	1.95	0.49
1:A:146:ASP:C	1:A:148:GLN:H	2.21	0.48
2:B:478:ASP:O	2:B:479:THR:CB	2.55	0.48
1:A:286:LEU:HA	2:B:464:VAL:O	2.14	0.48
1:A:186:ASN:O	1:A:350:ALA:HA	2.14	0.48
1:A:37:LEU:HD21	1:A:57:ILE:HD13	1.96	0.48
1:A:115:GLY:HA2	4:D:1:NAG:O7	2.14	0.47
1:A:290:LYS:HG3	1:A:341:PHE:HA	1.96	0.47
1:A:295:ARG:HH21	2:B:493:GLN:HE21	1.62	0.47
1:A:96:PHE:O	1:A:100:LEU:HG	2.14	0.47
1:A:260:MET:HG3	1:A:264:GLU:OE2	2.14	0.47
1:A:99:LEU:HD23	1:A:100:LEU:N	2.29	0.47
1:A:235:LEU:HD13	1:A:275:TRP:CH2	2.49	0.47
1:A:232:ASP:OD2	1:A:235:LEU:HB2	2.16	0.46
1:A:112:LEU:HD21	2:B:483:PHE:CE2	2.50	0.46
1:A:157:ILE:O	1:A:161:VAL:HG23	2.15	0.46
1:A:295:ARG:NH2	2:B:493:GLN:HE21	2.14	0.46
1:A:117:ALA:HB2	1:A:160:TYR:CZ	2.50	0.46
1:A:227:ILE:HD12	1:A:240:VAL:HG13	1.98	0.45
1:A:313:THR:CG2	1:A:314:SER:N	2.79	0.45
1:A:120:VAL:O	1:A:145:THR:N	2.47	0.45
2:B:473:ILE:HG22	2:B:475:VAL:HG12	1.97	0.45
1:A:331:GLN:NE2	1:A:354:LYS:NZ	2.64	0.45
1:A:218:VAL:HG22	1:A:219:PRO:HD2	1.99	0.45
1:A:145:THR:HG22	1:A:146:ASP:N	2.32	0.44
1:A:230:PHE:CB	1:A:278(A):LEU:HD23	2.48	0.44
1:A:63:PHE:O	1:A:66:LEU:HB3	2.18	0.44
1:A:218:VAL:HG21	2:B:491:PRO:HB2	1.98	0.44
1:A:37:LEU:HD21	1:A:57:ILE:CD1	2.48	0.44
1:A:230:PHE:HB2	1:A:278(A):LEU:HD23	2.00	0.44
1:A:235:LEU:HD21	1:A:266:MET:HB2	1.99	0.44
1:A:246:GLY:C	1:A:248:ALA:H	2.26	0.43
1:A:133:ASP:O	1:A:137:LEU:HB2	2.18	0.43
1:A:223:LEU:HD23	1:A:224:HIS:N	2.32	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:224:HIS:CD2	1:A:285:GLU:HG3	2.52	0.43
1:A:228:PRO:HB2	1:A:241:GLU:HB3	2.00	0.43
1:A:146:ASP:C	1:A:148:GLN:N	2.77	0.43
1:A:257:GLN:NE2	6:A:637:HOH:O	2.51	0.43
1:A:221:MET:CG	1:A:290:LYS:HB2	2.48	0.43
2:B:475:VAL:HG23	2:B:476:PRO:CD	2.47	0.43
1:A:313:THR:HG21	1:A:315:LYS:HE2	2.00	0.42
1:A:183:VAL:HA	1:A:353:VAL:O	2.19	0.42
1:A:209:TYR:O	2:B:469:PRO:HD3	2.20	0.42
1:A:166:ARG:NH1	6:A:615:HOH:O	2.52	0.42
1:A:283:ILE:HD12	2:B:464:VAL:HG23	2.02	0.42
1:A:115:GLY:HA3	1:A:187:TYR:CE2	2.55	0.41
1:A:233:GLU:C	1:A:235:LEU:H	2.28	0.41
1:A:300:ASN:HD21	1:A:332:VAL:N	2.18	0.41
1:A:47:ASP:OD1	1:A:47:ASP:N	2.53	0.41
1:A:300:ASN:N	1:A:300:ASN:ND2	2.67	0.41
1:A:26:LEU:HD22	1:A:82:PHE:HD1	1.86	0.41
1:A:233:GLU:C	1:A:235:LEU:N	2.78	0.41
1:A:254:LEU:HB2	2:B:466:PHE:HE2	1.81	0.41
1:A:331:GLN:HB3	1:A:354:LYS:HD3	2.02	0.40
2:B:473:ILE:HG22	2:B:473:ILE:O	2.22	0.40
1:A:221:MET:HB2	1:A:288:LEU:O	2.21	0.40
1:A:51:ILE:HG21	1:A:293:ILE:HG13	2.03	0.40
1:A:116:ASN:O	1:A:140:SER:HA	2.22	0.40
1:A:154:LYS:HE2	1:A:154:LYS:HB3	1.85	0.40
2:B:468:ARG:HG2	2:B:468:ARG:HH11	1.86	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	335/360 (93%)	301 (90%)	31 (9%)	3 (1%)	14	35
2	B	33/40 (82%)	28 (85%)	4 (12%)	1 (3%)	3	8
All	All	368/400 (92%)	329 (89%)	35 (10%)	4 (1%)	11	29

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	479	THR
1	A	107	SER
1	A	154	LYS
1	A	51	ILE

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	296/318 (93%)	258 (87%)	38 (13%)	4	11
2	B	34/38 (90%)	30 (88%)	4 (12%)	5	13
All	All	330/356 (93%)	288 (87%)	42 (13%)	4	11

All (42) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	36	SER
1	A	49	ASN
1	A	51	ILE
1	A	65	SER
1	A	71	THR
1	A	77	LEU
1	A	83	ASN
1	A	87	THR
1	A	94	GLN
1	A	99	LEU
1	A	112	LEU
1	A	120	VAL

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Mol	Chain	Res	Type
1	A	126	LEU
1	A	163	ASN
1	A	166	ARG
1	A	179	GLN
1	A	186	ASN
1	A	201	GLN
1	A	210	LEU
1	A	218	VAL
1	A	223	LEU
1	A	226	LEU
1	A	226(A)	THR
1	A	235	LEU
1	A	240	VAL
1	A	245	THR
1	A	273	LYS
1	A	275	TRP
1	A	282	GLU
1	A	285	GLU
1	A	294	SER
1	A	299	LEU
1	A	304	LEU
1	A	305	GLN
1	A	322	THR
1	A	342	GLU
1	A	354	LYS
1	A	357	LEU
2	B	469	PRO
2	B	475	VAL
2	B	481	ASN
2	B	492	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	69	HIS
1	A	83	ASN
1	A	148	GLN
1	A	163	ASN
1	A	186	ASN
1	A	201	GLN
1	A	204	HIS
1	A	298	ASN

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Mol	Chain	Res	Type
1	A	300	ASN
1	A	331	GLN
2	B	480	GLN
2	B	481	ASN
2	B	493	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](#)

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
3	NAG	C	1	1,3	14,14,15	0.57	0	17,19,21	1.05	1 (5%)
3	NAG	C	2	3	14,14,15	0.94	1 (7%)	17,19,21	1.55	3 (17%)
3	BMA	C	3	3	11,11,12	0.53	0	15,15,17	0.83	0
4	NAG	D	1	1,4	14,14,15	0.77	0	17,19,21	1.46	3 (17%)
4	NAG	D	2	4	14,14,15	0.69	0	17,19,21	1.28	1 (5%)

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

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

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	2	NAG	C4-C3	2.50	1.58	1.52

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	1	NAG	C4-C3-C2	-4.37	104.61	111.02
4	D	2	NAG	C1-C2-N2	-4.01	104.11	110.43
3	C	2	NAG	O4-C4-C3	3.95	119.70	110.38
3	C	2	NAG	C4-C3-C2	-3.19	106.34	111.02
3	C	1	NAG	C1-C2-N2	-2.64	106.27	110.43
3	C	2	NAG	O3-C3-C2	-2.39	104.43	109.40
4	D	1	NAG	O4-C4-C3	2.25	115.67	110.38
4	D	1	NAG	C2-N2-C7	2.20	125.85	122.90

There are no chirality outliers.

All (1) torsion outliers are listed below:

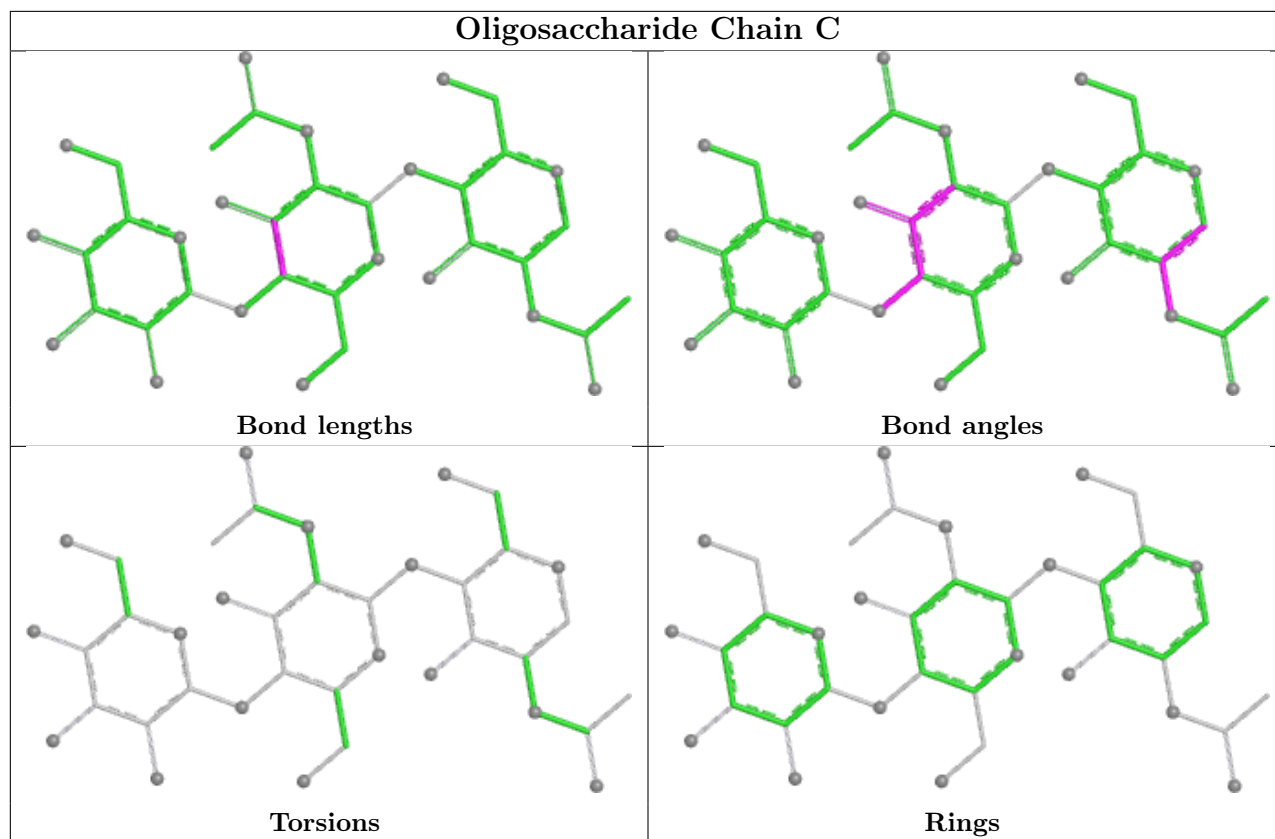
Mol	Chain	Res	Type	Atoms
4	D	1	NAG	C3-C2-N2-C7

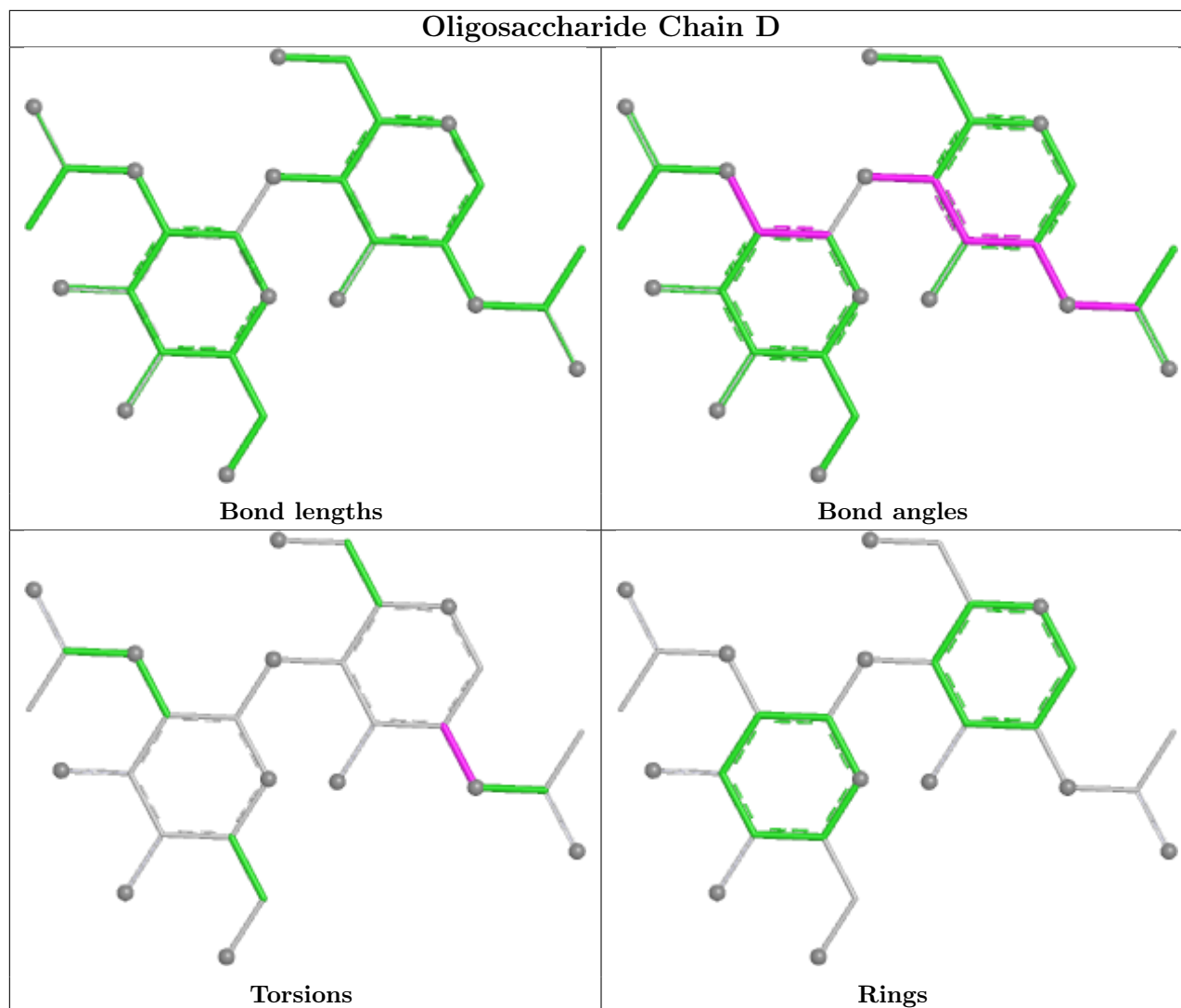
There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	D	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.





5.6 Ligand geometry [i](#)

1 ligand is modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
5	PO4	A	550	-	4,4,4	0.77	0	6,6,6	0.46	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	550	PO4	2	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 [i](#)

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

In the following table, the column labelled '#RSRZ > 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	337/360 (93%)	-0.88	0 100 100	3, 19, 45, 59	10 (2%)
2	B	35/40 (87%)	-0.75	0 100 100	5, 16, 51, 55	4 (11%)
All	All	372/400 (93%)	-0.87	0 100 100	3, 19, 46, 59	14 (3%)

There are no RSRZ outliers to report.

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](#)

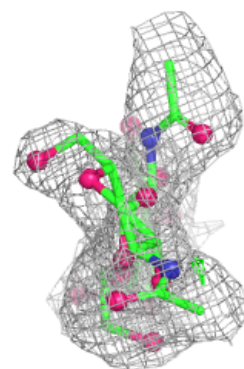
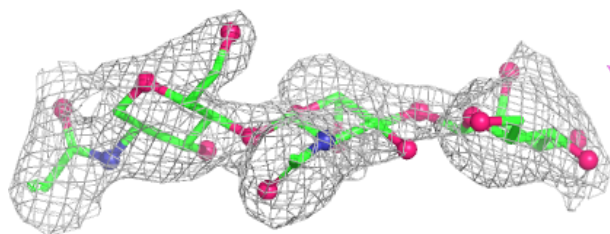
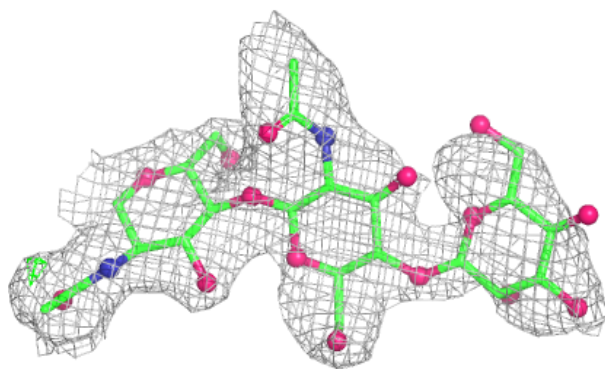
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q < 0.9' lists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

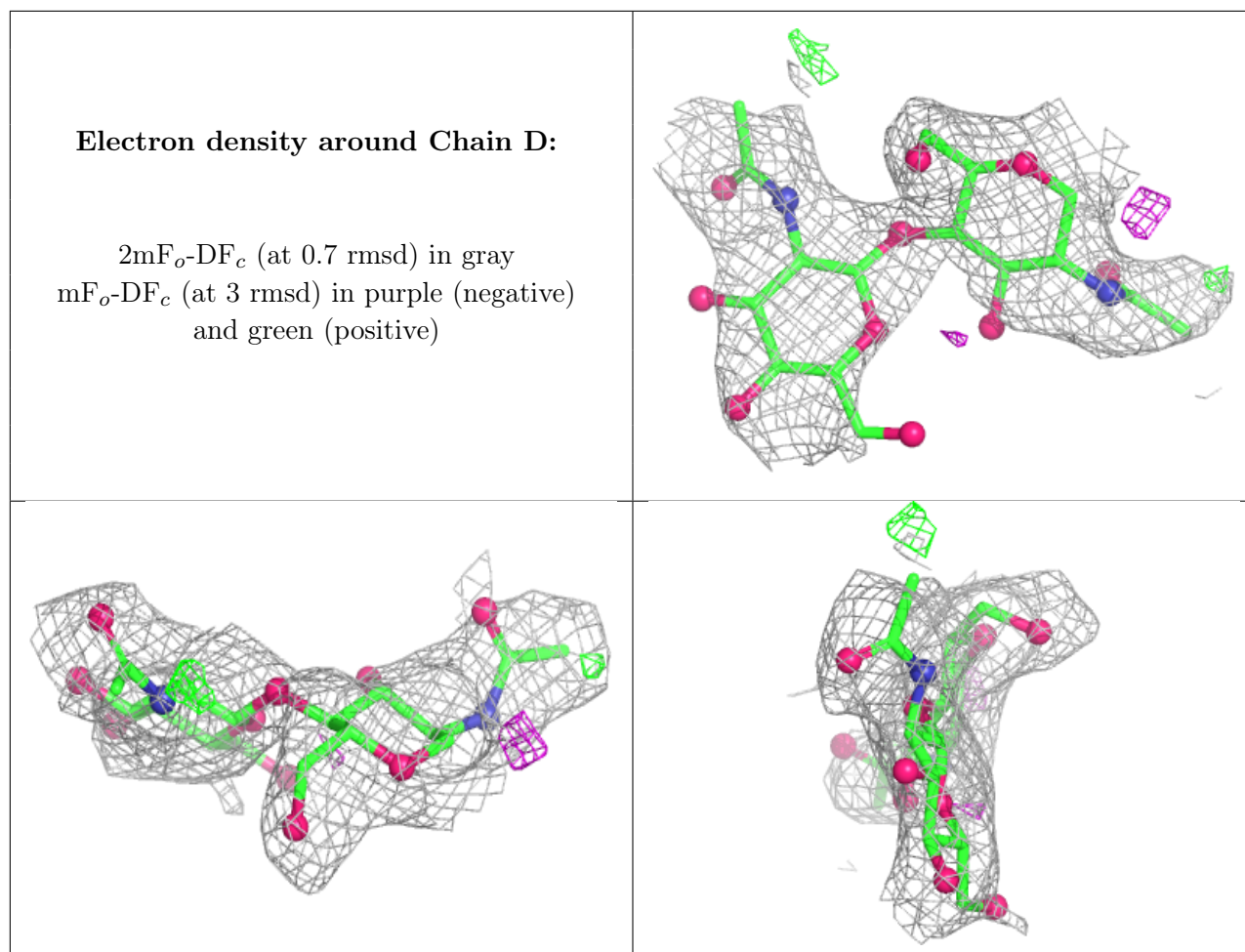
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	BMA	C	3	11/12	0.75	0.12	65,69,72,75	0
4	NAG	D	2	14/15	0.80	0.09	61,65,72,72	3
3	NAG	C	1	14/15	0.91	0.08	27,30,37,38	0
4	NAG	D	1	14/15	0.92	0.09	38,46,59,59	0
3	NAG	C	2	14/15	0.92	0.07	27,45,54,57	0

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)





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
5	PO4	A	550	5/5	0.99	0.19	22,22,22,22	5

6.5 Other polymers [i](#)

There are no such residues in this entry.