Full wwPDB X-ray Structure Validation Report ⓘ

Sep 17, 2023 – 02:35 PM EDT

PDB ID	:	4ZCJ
Title	:	Crystal structure of the A/Hong Kong/1/1968 (H3N2) influenza virus hemagglutinin HA1 Cys30, HA2 Cys47 mutant
Authors	:	Lee, P.S.; Wilson, I.A.
Deposited on	:	2015-04-16
Resolution	:	3.00 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:

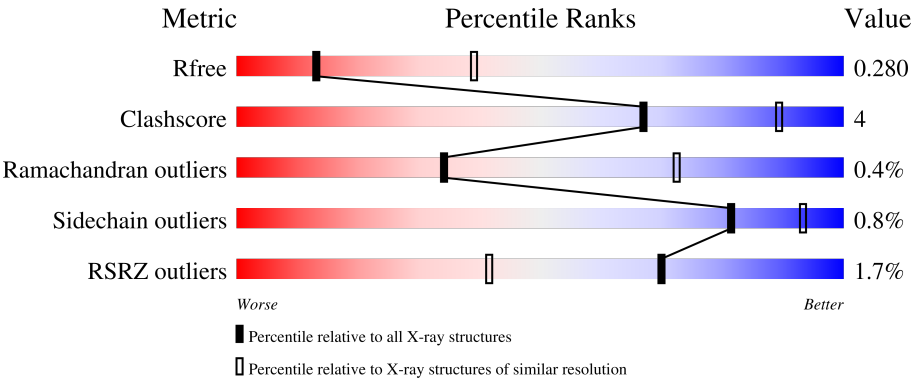
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.35.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35.1

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 Å.

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



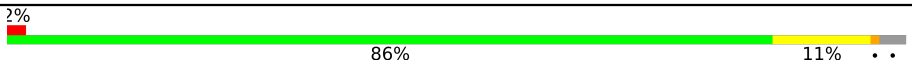
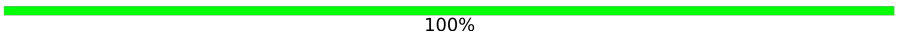
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	2092 (3.00-3.00)
Clashscore	141614	2416 (3.00-3.00)
Ramachandran outliers	138981	2333 (3.00-3.00)
Sidechain outliers	138945	2336 (3.00-3.00)
RSRZ outliers	127900	1990 (3.00-3.00)

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	323	4% 92% 6% ·
1	C	323	2% 89% 8% ·
1	E	323	% 89% 9% ·
2	B	176	85% 12% · ·
2	D	176	83% 14% · ·

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
2	F	176	
3	G	3	
4	H	2	

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 11582 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 Hemagglutinin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	316	Total	C	N	O	S	0	0	0
			2433	1525	428	466	14			
1	C	316	Total	C	N	O	S	0	0	0
			2433	1525	428	466	14			
1	E	316	Total	C	N	O	S	0	0	0
			2433	1525	428	466	14			

There are 15 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	7	ALA	-	expression tag	UNP Q91MA7
A	8	ASP	-	expression tag	UNP Q91MA7
A	9	PRO	-	expression tag	UNP Q91MA7
A	10	GLY	-	expression tag	UNP Q91MA7
A	30	CYS	THR	engineered mutation	UNP Q91MA7
C	7	ALA	-	expression tag	UNP Q91MA7
C	8	ASP	-	expression tag	UNP Q91MA7
C	9	PRO	-	expression tag	UNP Q91MA7
C	10	GLY	-	expression tag	UNP Q91MA7
C	30	CYS	THR	engineered mutation	UNP Q91MA7
E	7	ALA	-	expression tag	UNP Q91MA7
E	8	ASP	-	expression tag	UNP Q91MA7
E	9	PRO	-	expression tag	UNP Q91MA7
E	10	GLY	-	expression tag	UNP Q91MA7
E	30	CYS	THR	engineered mutation	UNP Q91MA7

- Molecule 2 is a protein called Hemagglutinin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	172	Total	C	N	O	S	0	0	0
			1388	861	242	278	7			

Continued on next page...

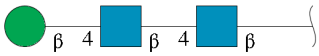
Continued from previous page...

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	D	171	Total	C	N	O	S	0	0	0
			1379	856	240	276	7			
2	F	171	Total	C	N	O	S	0	0	0
			1379	856	240	276	7			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	47	CYS	GLN	engineered mutation	UNP Q91MA7
B	123	GLY	ARG	conflict	UNP Q91MA7
D	47	CYS	GLN	engineered mutation	UNP Q91MA7
D	123	GLY	ARG	conflict	UNP Q91MA7
F	47	CYS	GLN	engineered mutation	UNP Q91MA7
F	123	GLY	ARG	conflict	UNP Q91MA7

- 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.

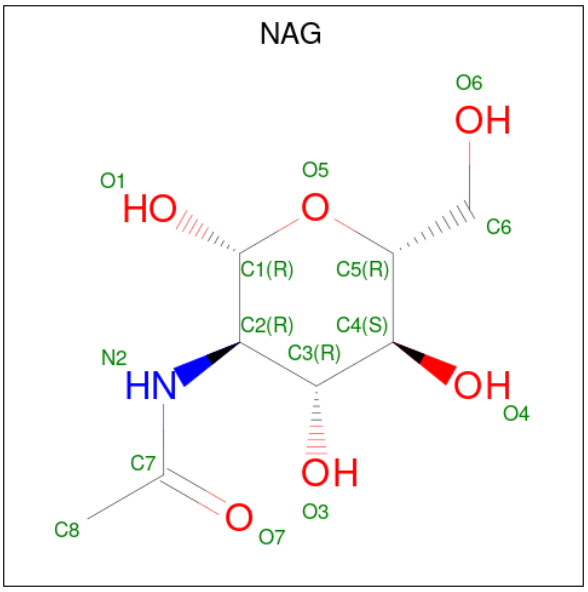


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	G	3	Total	C	N	O	0	0	0
			39	22	2	15			

- 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
4	H	2	Total	C	N	O	0	0	0
			28	16	2	10			

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: $C_8H_{15}NO_6$).

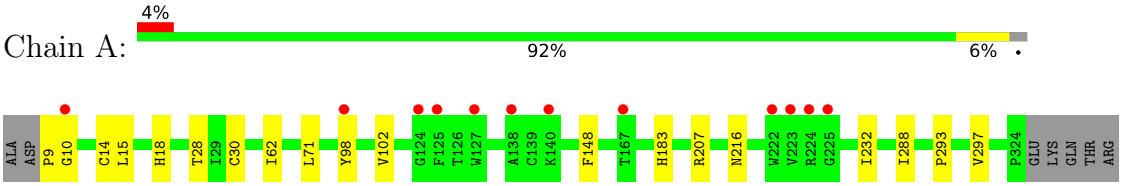


Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total C N O 14 8 1 5	0	0
5	A	1	Total C N O 14 8 1 5	0	0
5	C	1	Total C N O 14 8 1 5	0	0
5	E	1	Total C N O 14 8 1 5	0	0
5	E	1	Total C N O 14 8 1 5	0	0

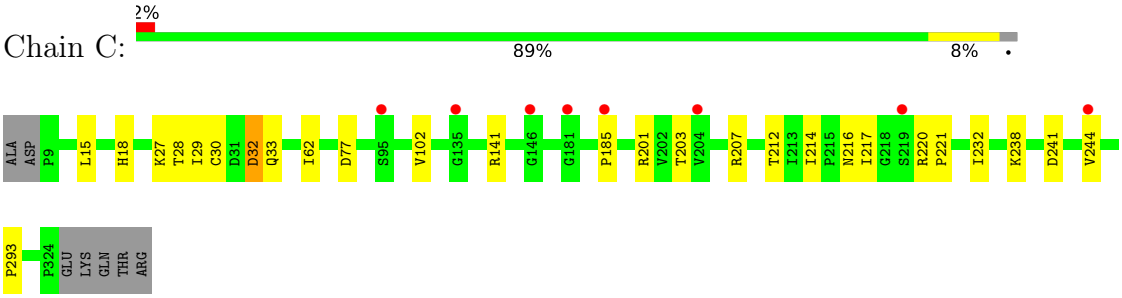
3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

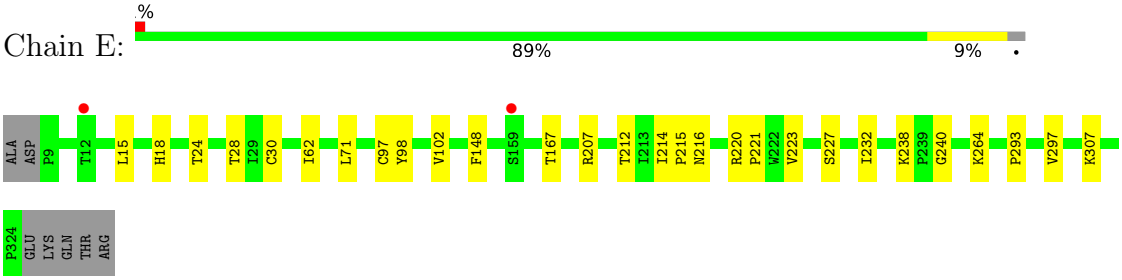
• Molecule 1: Hemagglutinin



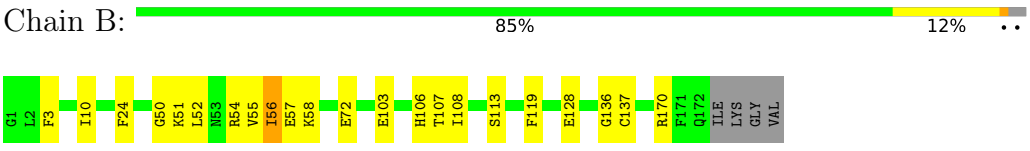
• Molecule 1: Hemagglutinin



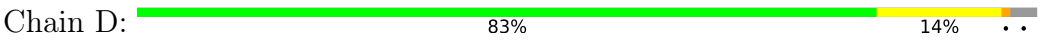
• Molecule 1: Hemagglutinin



• Molecule 2: Hemagglutinin

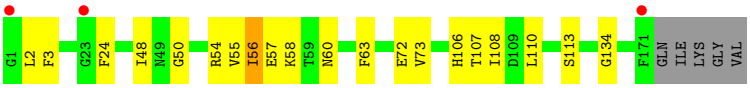


• Molecule 2: Hemagglutinin



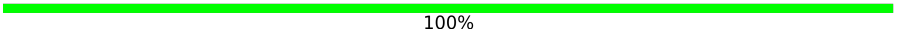
• Molecule 2: Hemagglutinin

Chain F:



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

Chain G:



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

Chain H:

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	78.44Å 117.26Å 234.93Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.02 – 3.00 47.01 – 3.00	Depositor EDS
% Data completeness (in resolution range)	99.0 (47.02-3.00) 99.4 (47.01-3.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.12	Depositor
$< I/\sigma(I) >$ [1]	2.28 (at 3.01Å)	Xtriage
Refinement program	PHENIX 1.9_1692	Depositor
R, R_{free}	0.247 , 0.275 0.254 , 0.280	Depositor DCC
R_{free} test set	2234 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å^2)	74.2	Xtriage
Anisotropy	0.967	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.29 , 57.5	EDS
L-test for twinning[2]	$< \|L\| > = 0.45$, $< L^2 > = 0.27$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	11582	wwPDB-VP
Average B, all atoms (Å^2)	117.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.89% of the height of the origin peak. No significant pseudotranslation is detected.*

[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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: 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	0.26	0/2490	0.51	0/3393
1	C	0.27	0/2490	0.53	0/3393
1	E	0.27	0/2490	0.52	0/3393
2	B	0.29	0/1412	0.59	0/1898
2	D	0.30	0/1403	0.62	1/1886 (0.1%)
2	F	0.30	0/1403	0.59	0/1886
All	All	0.28	0/11688	0.55	1/15849 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	51	LYS	N-CA-C	5.68	126.33	111.00

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	2433	0	2382	16	0
1	C	2433	0	2384	23	0
1	E	2433	0	2382	23	0
2	B	1388	0	1303	22	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	D	1379	0	1295	24	0
2	F	1379	0	1295	19	0
3	G	39	0	34	0	0
4	H	28	0	25	1	0
5	A	28	0	26	0	0
5	C	14	0	13	0	0
5	E	28	0	26	1	0
All	All	11582	0	11165	89	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 (89) 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)
2:F:57:GLU:HG3	2:F:58:LYS:H	1.30	0.96
2:B:57:GLU:HG3	2:B:58:LYS:H	1.38	0.88
2:D:57:GLU:HG3	2:D:58:LYS:H	1.39	0.85
1:C:293:PRO:HG3	2:D:52:LEU:HD21	1.61	0.83
2:F:55:VAL:O	2:F:56:ILE:HG12	1.90	0.71
2:B:55:VAL:O	2:B:56:ILE:HG12	1.89	0.71
1:E:167:THR:HG21	4:H:2:NAG:H82	1.77	0.66
2:D:55:VAL:O	2:D:56:ILE:HG12	1.97	0.65
1:C:77:ASP:OD2	1:C:141:ARG:NH1	2.26	0.64
2:F:57:GLU:CG	2:F:58:LYS:H	2.05	0.64
1:C:293:PRO:HB3	2:D:56:ILE:HD12	1.80	0.62
2:D:50:GLY:HA3	2:D:54:ARG:HH21	1.65	0.60
2:B:57:GLU:CG	2:B:58:LYS:H	2.13	0.59
1:C:201:ARG:HG3	1:C:214:ILE:HD13	1.84	0.59
2:D:50:GLY:C	2:D:54:ARG:HE	2.08	0.58
1:A:216:ASN:ND2	1:E:212:THR:OG1	2.37	0.57
2:D:50:GLY:CA	2:D:54:ARG:HH21	2.18	0.56
2:D:106:HIS:HE1	1:E:30:CYS:SG	2.29	0.56
1:C:185:PRO:O	1:C:217:ILE:HA	2.07	0.55
1:A:28:THR:HG21	2:B:108:ILE:HD12	1.87	0.55
1:E:28:THR:HG21	2:F:108:ILE:HD12	1.88	0.54
2:D:3:PHE:HZ	2:F:2:LEU:HB3	1.73	0.54
2:B:106:HIS:HE1	1:C:30:CYS:SG	2.30	0.53
2:B:72:GLU:OE2	1:E:238:LYS:NZ	2.42	0.53
1:C:15:LEU:HD13	2:D:119:PHE:HA	1.90	0.53
1:A:288:ILE:HG21	1:A:297:VAL:HG21	1.90	0.53

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:F:50:GLY:CA	2:F:54:ARG:HH21	2.21	0.53
1:A:98:TYR:HH	1:A:183:HIS:HE2	1.57	0.53
1:C:15:LEU:HD21	2:D:24:PHE:CE2	2.44	0.53
2:F:3:PHE:CE1	2:F:113:SER:HB2	2.44	0.52
2:B:51:LYS:NZ	2:B:107:THR:OG1	2.40	0.51
1:A:30:CYS:SG	2:F:106:HIS:HE1	2.34	0.51
1:C:102:VAL:HG22	1:C:232:ILE:HB	1.91	0.51
2:F:48:ILE:HD11	2:F:107:THR:HG23	1.92	0.51
1:E:216:ASN:O	1:E:220:ARG:NH2	2.44	0.50
1:C:27:LYS:NZ	2:D:97:GLU:OE2	2.40	0.50
2:B:57:GLU:HG3	2:B:58:LYS:N	2.18	0.49
1:E:307:LYS:HE3	2:F:60:ASN:ND2	2.27	0.49
2:F:57:GLU:HG3	2:F:58:LYS:N	2.13	0.49
2:B:128:GLU:O	2:B:170:ARG:NH1	2.46	0.48
1:C:238:LYS:NZ	2:F:72:GLU:OE2	2.46	0.48
2:D:10:ILE:HD13	2:D:136:GLY:HA3	1.95	0.48
1:E:102:VAL:HG22	1:E:232:ILE:HB	1.96	0.48
1:E:297:VAL:HA	5:E:504:NAG:H82	1.96	0.47
1:A:14:CYS:HA	2:B:137:CYS:HA	1.96	0.47
1:C:207:ARG:HG3	1:E:221:PRO:HB2	1.95	0.47
1:E:207:ARG:NH1	1:E:240:GLY:O	2.40	0.47
2:D:3:PHE:CZ	2:F:2:LEU:HB3	2.49	0.46
2:B:54:ARG:NH1	1:C:29:ILE:O	2.46	0.46
2:D:54:ARG:NH1	1:E:30:CYS:C	2.68	0.46
1:E:293:PRO:HB3	2:F:56:ILE:CD1	2.46	0.46
1:A:293:PRO:HB3	2:B:56:ILE:CD1	2.46	0.46
1:A:9:PRO:HB2	1:A:10:GLY:H	1.52	0.45
1:E:71:LEU:O	1:E:148:PHE:HB3	2.16	0.45
1:A:15:LEU:HD21	2:B:24:PHE:CE2	2.52	0.45
1:A:102:VAL:HG22	1:A:232:ILE:HB	1.98	0.45
2:B:51:LYS:HE2	2:B:103:GLU:OE1	2.17	0.45
2:B:3:PHE:CE1	2:B:113:SER:HB2	2.53	0.45
1:C:212:THR:HG21	1:E:216:ASN:HB3	1.98	0.45
2:F:50:GLY:HA3	2:F:54:ARG:HH21	1.82	0.44
1:A:293:PRO:HB3	2:B:56:ILE:HD12	1.99	0.44
2:D:54:ARG:HH12	1:E:30:CYS:C	2.19	0.44
1:A:207:ARG:HG3	1:C:221:PRO:HB2	1.99	0.44
2:B:3:PHE:HZ	2:D:2:LEU:HB3	1.83	0.44
1:C:32:ASP:N	1:C:32:ASP:OD1	2.51	0.44
2:F:57:GLU:CG	2:F:58:LYS:N	2.77	0.44
2:D:165:GLU:O	2:D:168:ASN:HB3	2.17	0.44

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:244:VAL:HG23	1:E:221:PRO:HG3	2.00	0.43
2:D:57:GLU:HG3	2:D:58:LYS:N	2.20	0.43
2:D:48:ILE:HD11	2:D:107:THR:HG23	2.01	0.43
2:B:50:GLY:HA3	2:B:54:ARG:NH2	2.34	0.43
1:C:28:THR:HG21	2:D:108:ILE:HD12	2.00	0.43
1:C:203:THR:OG1	1:C:212:THR:HG22	2.20	0.42
2:D:47:CYS:O	2:D:54:ARG:NH2	2.52	0.42
1:A:293:PRO:HG3	2:B:52:LEU:HD21	2.02	0.42
1:A:15:LEU:CD1	2:B:119:PHE:HA	2.50	0.42
2:B:10:ILE:HD13	2:B:136:GLY:HA3	2.00	0.42
1:C:207:ARG:HB2	1:C:241:ASP:OD1	2.20	0.42
1:E:264:LYS:HB2	2:F:63:PHE:CD1	2.55	0.42
1:A:15:LEU:HD13	2:B:119:PHE:HA	2.02	0.42
1:C:216:ASN:HB3	1:C:220:ARG:NH2	2.34	0.41
1:E:214:ILE:HA	1:E:215:PRO:HD3	1.83	0.41
2:D:124:ARG:HD3	2:F:134:GLY:HA2	2.02	0.41
1:E:97:CYS:SG	1:E:98:TYR:N	2.92	0.41
1:E:15:LEU:HD21	2:F:24:PHE:CE2	2.56	0.40
1:E:220:ARG:N	1:E:227:SER:OG	2.50	0.40
1:C:15:LEU:CD1	2:D:119:PHE:HA	2.50	0.40
1:C:207:ARG:HG2	1:E:223:VAL:CG2	2.51	0.40
1:A:71:LEU:O	1:A:148:PHE:HB3	2.22	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	314/323 (97%)	307 (98%)	6 (2%)	1 (0%)	41	76
1	C	314/323 (97%)	308 (98%)	5 (2%)	1 (0%)	41	76
1	E	314/323 (97%)	308 (98%)	5 (2%)	1 (0%)	41	76

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
2	B	170/176 (97%)	163 (96%)	6 (4%)	1 (1%)	25 64
2	D	169/176 (96%)	161 (95%)	7 (4%)	1 (1%)	25 64
2	F	169/176 (96%)	161 (95%)	7 (4%)	1 (1%)	25 64
All	All	1450/1497 (97%)	1408 (97%)	36 (2%)	6 (0%)	34 72

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	56	ILE
2	D	56	ILE
2	F	56	ILE
1	A	62	ILE
1	C	62	ILE
1	E	62	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	277/283 (98%)	276 (100%)	1 (0%)	91 97
1	C	277/283 (98%)	274 (99%)	3 (1%)	73 90
1	E	277/283 (98%)	275 (99%)	2 (1%)	84 94
2	B	146/149 (98%)	146 (100%)	0	100 100
2	D	145/149 (97%)	143 (99%)	2 (1%)	67 88
2	F	145/149 (97%)	143 (99%)	2 (1%)	67 88
All	All	1267/1296 (98%)	1257 (99%)	10 (1%)	81 93

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	18	HIS
1	C	18	HIS

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	C	32	ASP
1	C	33	GLN
2	D	53	ASN
2	D	100	VAL
1	E	18	HIS
1	E	24	THR
2	F	73	VAL
2	F	110	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (18) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	54	ASN
1	A	171	ASN
1	A	216	ASN
2	B	27	GLN
2	B	53	ASN
2	B	106	HIS
1	C	18	HIS
1	C	54	ASN
1	C	171	ASN
1	C	211	GLN
1	C	216	ASN
2	D	27	GLN
1	E	18	HIS
1	E	54	ASN
1	E	211	GLN
2	F	27	GLN
2	F	60	ASN
2	F	125	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	G	1	1,3	14,14,15	0.34	0	17,19,21	0.39	0
3	NAG	G	2	3	14,14,15	0.34	0	17,19,21	0.40	0
3	BMA	G	3	3	11,11,12	0.65	0	15,15,17	0.78	0
4	NAG	H	1	4,1	14,14,15	0.27	0	17,19,21	0.59	0
4	NAG	H	2	4	14,14,15	0.70	0	17,19,21	0.52	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	G	1	1,3	-	0/6/23/26	0/1/1/1
3	NAG	G	2	3	-	0/6/23/26	0/1/1/1
3	BMA	G	3	3	-	2/2/19/22	0/1/1/1
4	NAG	H	1	4,1	-	0/6/23/26	0/1/1/1
4	NAG	H	2	4	-	2/6/23/26	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (4) torsion outliers are listed below:

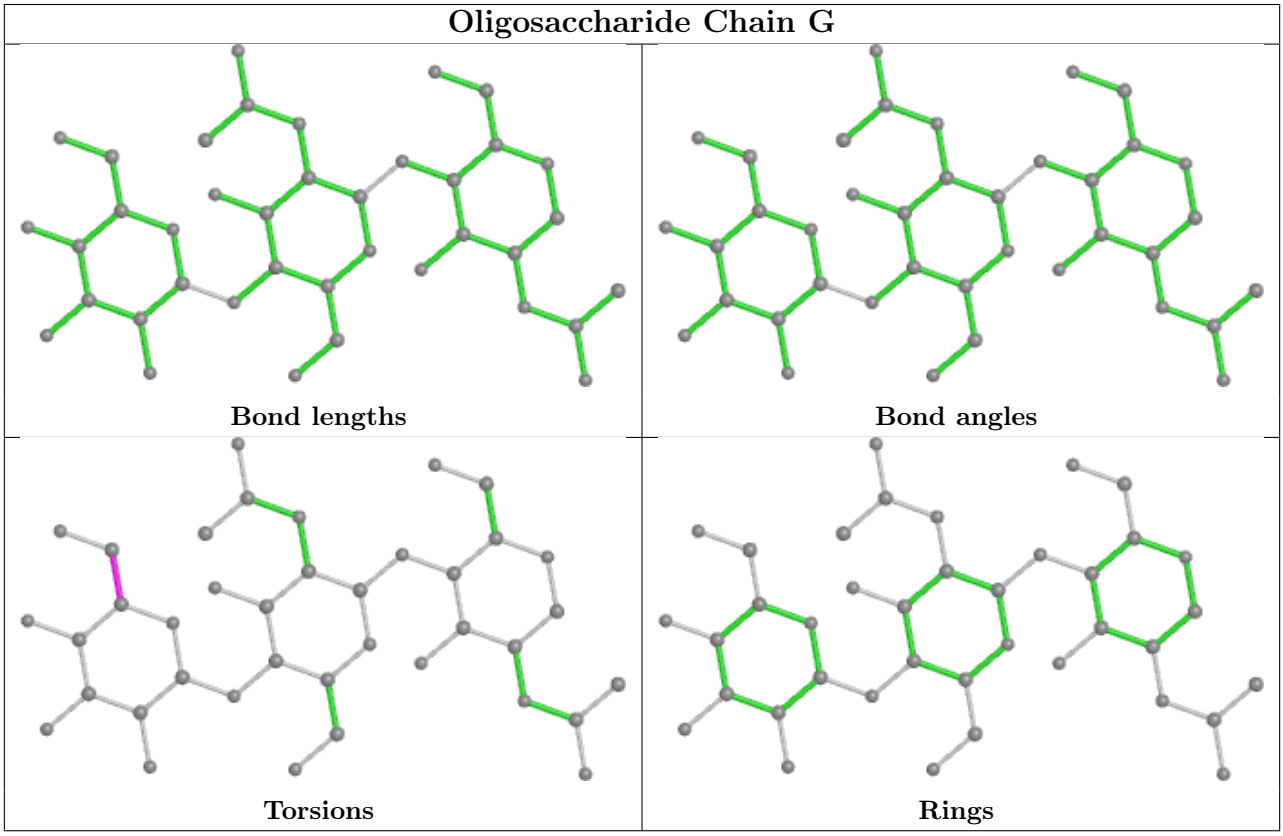
Mol	Chain	Res	Type	Atoms
4	H	2	NAG	C4-C5-C6-O6
3	G	3	BMA	O5-C5-C6-O6
3	G	3	BMA	C4-C5-C6-O6
4	H	2	NAG	O5-C5-C6-O6

There are no ring outliers.

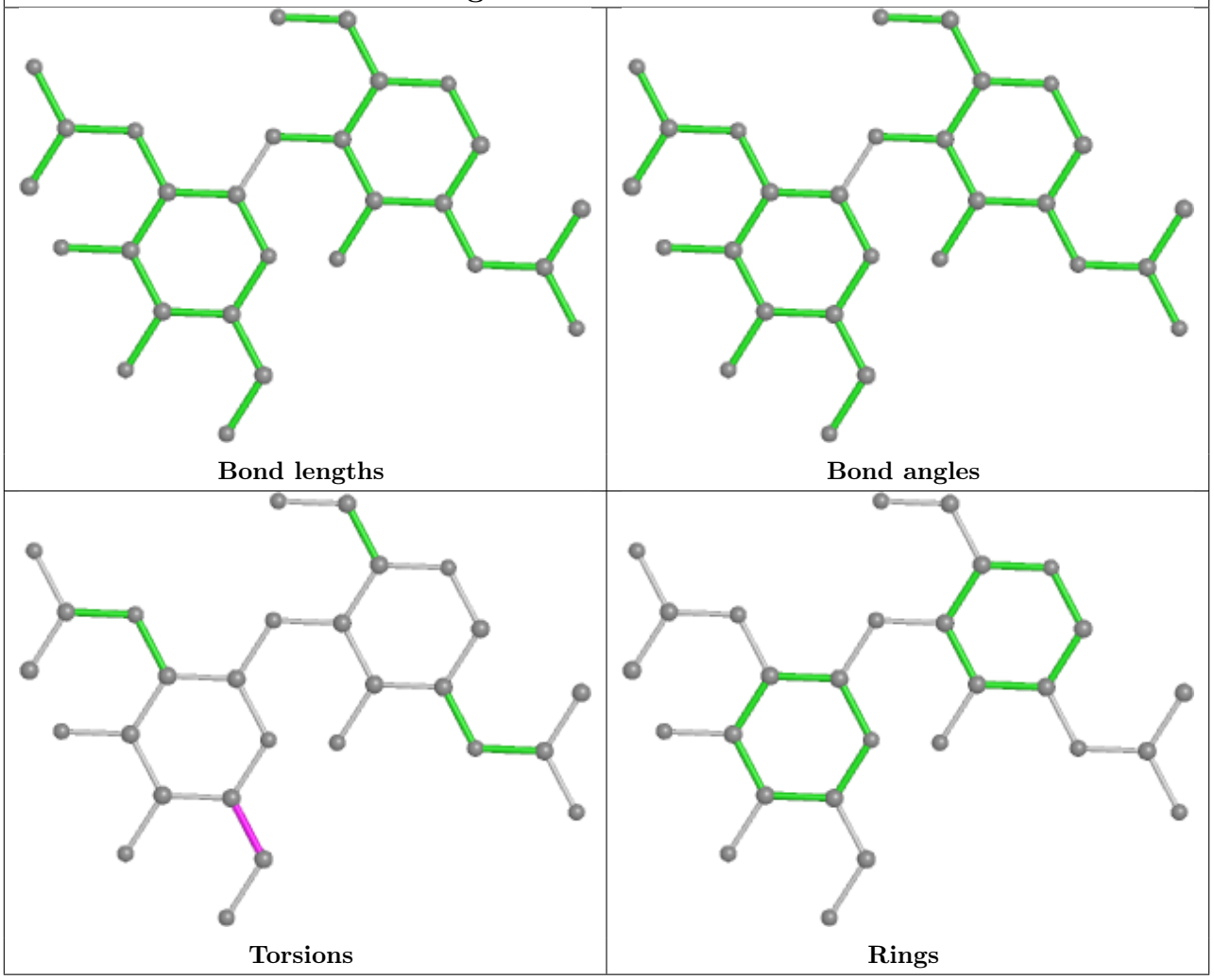
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	H	2	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 H



5.6 Ligand geometry (i)

5 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	$\#\|Z\| > 2$
5	NAG	E	501	1	14,14,15	0.25	0	17,19,21	0.35	0
5	NAG	E	504	1	14,14,15	0.29	0	17,19,21	0.41	0
5	NAG	A	505	1	14,14,15	0.22	0	17,19,21	0.38	0
5	NAG	A	501	1	14,14,15	0.34	0	17,19,21	0.51	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\|>2$	Counts	RMSZ	$\#\|Z\|>2$
5	NAG	C	701	1	14,14,15	0.28	0	17,19,21	0.38	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	NAG	E	501	1	-	0/6/23/26	0/1/1/1
5	NAG	E	504	1	-	0/6/23/26	0/1/1/1
5	NAG	A	505	1	-	0/6/23/26	0/1/1/1
5	NAG	A	501	1	-	1/6/23/26	0/1/1/1
5	NAG	C	701	1	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	501	NAG	C4-C5-C6-O6

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	E	504	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^{th} 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	316/323 (97%)	0.07	12 (3%) 40 16	71, 131, 184, 205	0
1	C	316/323 (97%)	0.12	8 (2%) 57 29	80, 134, 192, 212	0
1	E	316/323 (97%)	-0.09	2 (0%) 89 72	75, 108, 150, 162	0
2	B	172/176 (97%)	0.01	0 100 100	68, 92, 124, 148	0
2	D	171/176 (97%)	0.07	0 100 100	73, 105, 130, 137	0
2	F	171/176 (97%)	0.14	3 (1%) 68 40	72, 103, 146, 155	0
All	All	1462/1497 (97%)	0.05	25 (1%) 70 41	68, 112, 178, 212	0

All (25) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	10	GLY	4.3
1	A	127	TRP	4.0
1	A	167	THR	3.9
1	C	219	SER	3.7
1	C	146	GLY	3.6
1	A	140	LYS	3.3
1	A	125	PHE	3.1
1	A	98	TYR	3.1
2	F	1	GLY	2.9
1	E	159	SER	2.8
1	A	224	ARG	2.8
1	C	185	PRO	2.8
1	C	135	GLY	2.7
1	A	223	VAL	2.7
1	A	124	GLY	2.7
1	C	204	VAL	2.6
2	F	23	GLY	2.6
1	A	138	ALA	2.5
1	A	222	TRP	2.4

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	E	12	THR	2.3
1	C	181	GLY	2.2
2	F	171	PHE	2.2
1	C	95	SER	2.2
1	C	244	VAL	2.1
1	A	225	GLY	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)

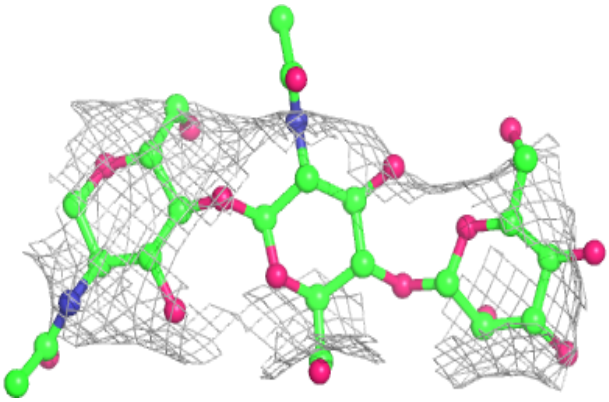
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9'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

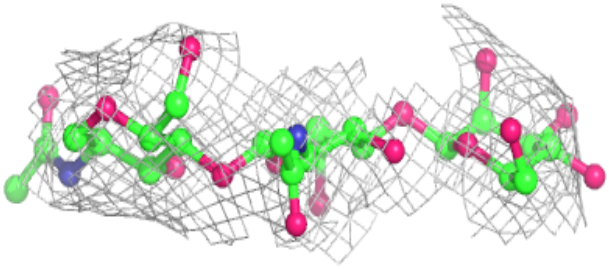
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	NAG	H	2	14/15	0.70	0.35	159,180,189,191	0
3	BMA	G	3	11/12	0.82	0.23	195,205,211,214	0
4	NAG	H	1	14/15	0.88	0.24	157,177,179,181	0
3	NAG	G	2	14/15	0.88	0.29	175,197,207,208	0
3	NAG	G	1	14/15	0.92	0.18	180,195,200,201	0

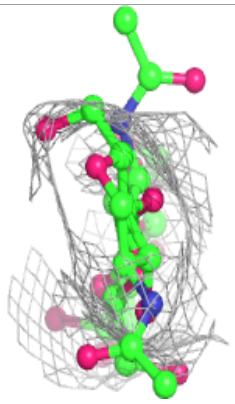
The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around Chain G:

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

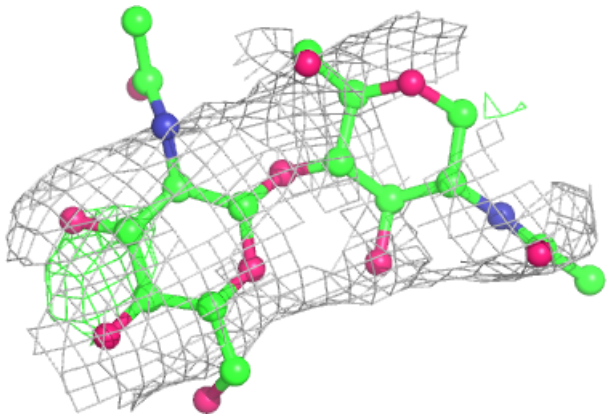


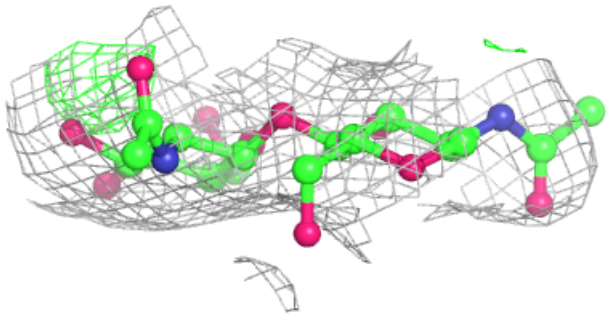


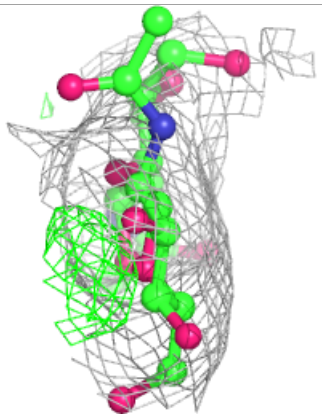


Electron density around Chain H:

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







6.4 Ligands

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^{th} 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	NAG	A	505	14/15	0.72	0.26	94,103,109,109	0
5	NAG	E	501	14/15	0.84	0.15	100,115,121,121	0
5	NAG	C	701	14/15	0.88	0.16	107,116,121,121	0
5	NAG	A	501	14/15	0.88	0.29	93,107,111,113	0
5	NAG	E	504	14/15	0.88	0.29	91,102,107,109	0

6.5 Other polymers

There are no such residues in this entry.