



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 6, 2026 – 09:43 PM UTC

PDB ID : 4WE7 / pdb_00004we7
Title : Structure and receptor binding preferences of recombinant human A(H3N2) virus hemagglutinins
Authors : Yang, H.; Carney, P.J.; Chang, J.C.; Guo, Z.; Villanueva, J.M.; Stevens, J.
Deposited on : 2014-09-09
Resolution : 2.50 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

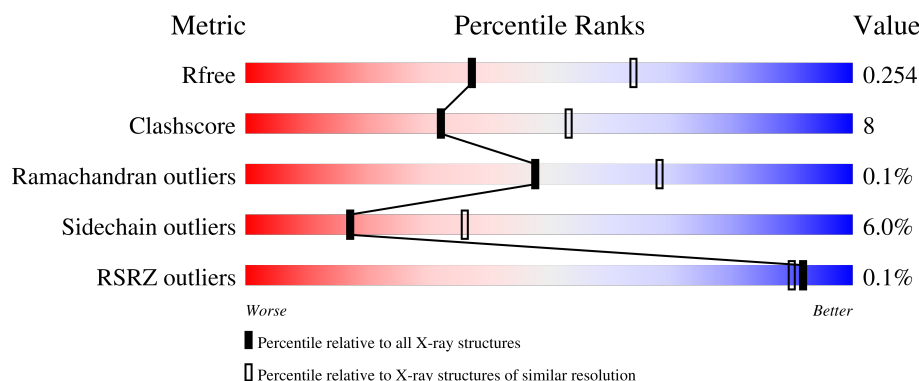
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

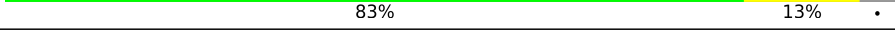
The reported resolution of this entry is 2.50 Å.

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	5829 (2.50-2.50)
Clashscore	190562	6492 (2.50-2.50)
Ramachandran outliers	187476	6378 (2.50-2.50)
Sidechain outliers	187428	6380 (2.50-2.50)
RSRZ outliers	180081	5833 (2.50-2.50)

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	284	
1	B	284	
1	C	284	
1	D	284	

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
2	NAG	A	304	X	-	-	-
2	NAG	C	301	X	-	-	-
2	NAG	D	302	X	-	-	-

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 8827 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 HA1 chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	272	Total	C	N	O	S	0	0	0
			2128	1333	383	402	10			
1	B	272	Total	C	N	O	S	0	0	0
			2128	1333	383	402	10			
1	C	272	Total	C	N	O	S	0	0	0
			2128	1333	383	402	10			
1	D	272	Total	C	N	O	S	0	0	0
			2128	1333	383	402	10			

There are 68 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-4	ALA	-	expression tag	UNP U3N7S5
A	-3	ASP	-	expression tag	UNP U3N7S5
A	-2	LEU	-	expression tag	UNP U3N7S5
A	-1	GLY	-	expression tag	UNP U3N7S5
A	0	SER	-	expression tag	UNP U3N7S5
A	177	VAL	ILE	conflict	UNP U3N7S5
A	269	SER	-	expression tag	UNP U3N7S5
A	270	LYS	-	expression tag	UNP U3N7S5
A	271	GLN	-	expression tag	UNP U3N7S5
A	272	ASN	-	expression tag	UNP U3N7S5
A	273	SER	-	expression tag	UNP U3N7S5
A	274	GLY	-	expression tag	UNP U3N7S5
A	275	ARG	-	expression tag	UNP U3N7S5
A	276	LEU	-	expression tag	UNP U3N7S5
A	277	VAL	-	expression tag	UNP U3N7S5
A	278	PRO	-	expression tag	UNP U3N7S5
A	279	ARG	-	expression tag	UNP U3N7S5
B	-4	ALA	-	expression tag	UNP U3N7S5
B	-3	ASP	-	expression tag	UNP U3N7S5
B	-2	LEU	-	expression tag	UNP U3N7S5
B	-1	GLY	-	expression tag	UNP U3N7S5

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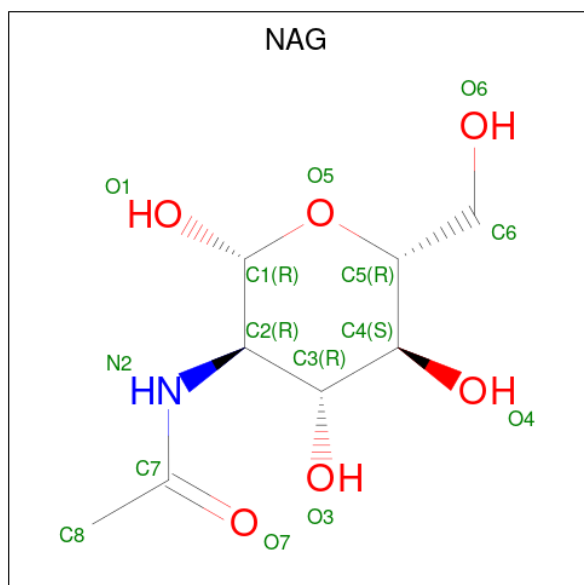
Chain	Residue	Modelled	Actual	Comment	Reference
B	0	SER	-	expression tag	UNP U3N7S5
B	177	VAL	ILE	conflict	UNP U3N7S5
B	269	SER	-	expression tag	UNP U3N7S5
B	270	LYS	-	expression tag	UNP U3N7S5
B	271	GLN	-	expression tag	UNP U3N7S5
B	272	ASN	-	expression tag	UNP U3N7S5
B	273	SER	-	expression tag	UNP U3N7S5
B	274	GLY	-	expression tag	UNP U3N7S5
B	275	ARG	-	expression tag	UNP U3N7S5
B	276	LEU	-	expression tag	UNP U3N7S5
B	277	VAL	-	expression tag	UNP U3N7S5
B	278	PRO	-	expression tag	UNP U3N7S5
B	279	ARG	-	expression tag	UNP U3N7S5
C	-4	ALA	-	expression tag	UNP U3N7S5
C	-3	ASP	-	expression tag	UNP U3N7S5
C	-2	LEU	-	expression tag	UNP U3N7S5
C	-1	GLY	-	expression tag	UNP U3N7S5
C	0	SER	-	expression tag	UNP U3N7S5
C	177	VAL	ILE	conflict	UNP U3N7S5
C	269	SER	-	expression tag	UNP U3N7S5
C	270	LYS	-	expression tag	UNP U3N7S5
C	271	GLN	-	expression tag	UNP U3N7S5
C	272	ASN	-	expression tag	UNP U3N7S5
C	273	SER	-	expression tag	UNP U3N7S5
C	274	GLY	-	expression tag	UNP U3N7S5
C	275	ARG	-	expression tag	UNP U3N7S5
C	276	LEU	-	expression tag	UNP U3N7S5
C	277	VAL	-	expression tag	UNP U3N7S5
C	278	PRO	-	expression tag	UNP U3N7S5
C	279	ARG	-	expression tag	UNP U3N7S5
D	-4	ALA	-	expression tag	UNP U3N7S5
D	-3	ASP	-	expression tag	UNP U3N7S5
D	-2	LEU	-	expression tag	UNP U3N7S5
D	-1	GLY	-	expression tag	UNP U3N7S5
D	0	SER	-	expression tag	UNP U3N7S5
D	177	VAL	ILE	conflict	UNP U3N7S5
D	269	SER	-	expression tag	UNP U3N7S5
D	270	LYS	-	expression tag	UNP U3N7S5
D	271	GLN	-	expression tag	UNP U3N7S5
D	272	ASN	-	expression tag	UNP U3N7S5
D	273	SER	-	expression tag	UNP U3N7S5
D	274	GLY	-	expression tag	UNP U3N7S5

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Chain	Residue	Modelled	Actual	Comment	Reference
D	275	ARG	-	expression tag	UNP U3N7S5
D	276	LEU	-	expression tag	UNP U3N7S5
D	277	VAL	-	expression tag	UNP U3N7S5
D	278	PRO	-	expression tag	UNP U3N7S5
D	279	ARG	-	expression tag	UNP U3N7S5

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



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

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	C	1	Total	C	N	O	0	0
			14	8	1	5		
2	C	1	Total	C	N	O	0	0
			14	8	1	5		
2	C	1	Total	C	N	O	0	0
			14	8	1	5		
2	D	1	Total	C	N	O	0	0
			14	8	1	5		
2	D	1	Total	C	N	O	0	0
			14	8	1	5		
2	D	1	Total	C	N	O	0	0
			14	8	1	5		

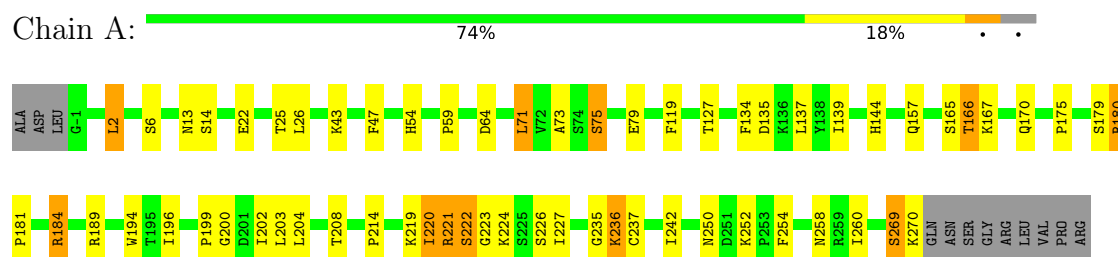
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	19	Total	O	0	0
			19	19		
3	B	38	Total	O	0	0
			38	38		
3	C	17	Total	O	0	0
			17	17		
3	D	45	Total	O	0	0
			45	45		

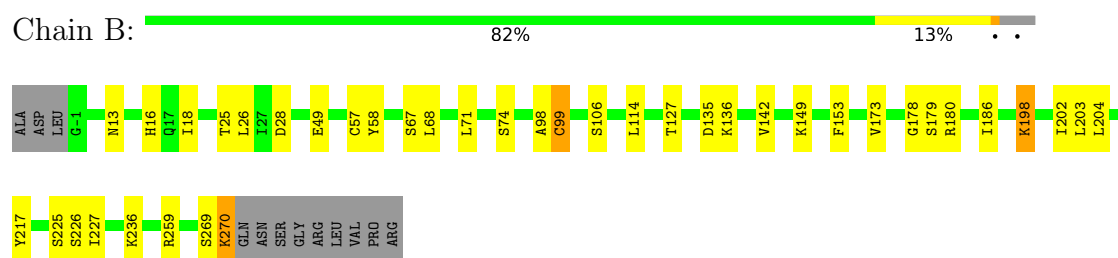
3 Residue-property plots [i](#)

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.

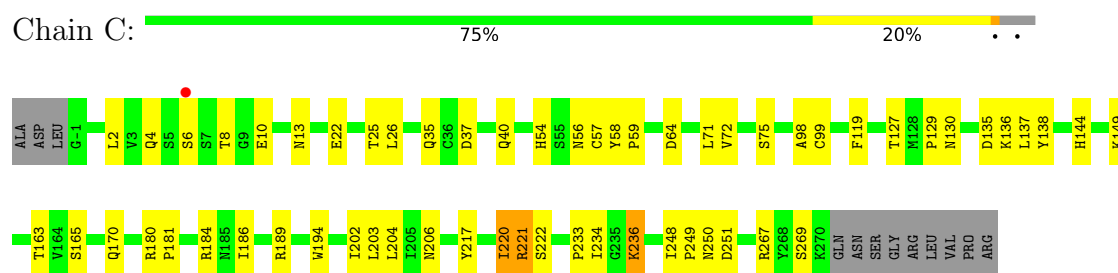
• Molecule 1: Hemagglutinin HA1 chain



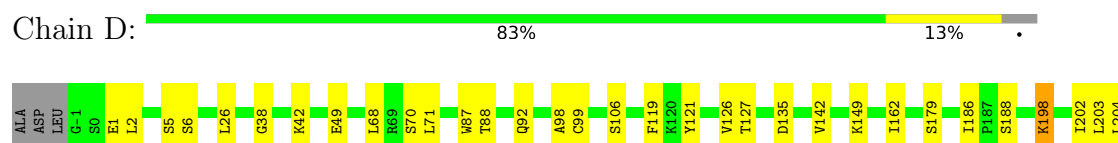
• Molecule 1: Hemagglutinin HA1 chain



• Molecule 1: Hemagglutinin HA1 chain



• Molecule 1: Hemagglutinin HA1 chain



G209	S226	S269	GLN	ASN	SER	GLY	ARG	LEU	VAL	PRO	ARG
I227	I227	K270									

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	48.30Å 214.90Å 101.81Å 90.00° 103.58° 90.00°	Depositor
Resolution (Å)	42.98 – 2.50 42.98 – 2.50	Depositor EDS
% Data completeness (in resolution range)	97.8 (42.98-2.50) 97.8 (42.98-2.50)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.72 (at 2.51Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8_1069)	Depositor
R, R_{free}	0.218 , 0.251 0.222 , 0.254	Depositor DCC
R_{free} test set	3438 reflections (4.95%)	wwPDB-VP
Wilson B-factor (Å ²)	67.6	Xtriage
Anisotropy	0.292	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 58.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.35$	Xtriage
Estimated twinning fraction	0.417 for h,-k,-h-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	8827	wwPDB-VP
Average B, all atoms (Å ²)	50.0	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.*

¹Intensities estimated from amplitudes.

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

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: 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	0.55	0/2180	0.91	2/2962 (0.1%)
1	B	0.56	0/2180	0.90	1/2962 (0.0%)
1	C	0.52	0/2180	0.88	3/2962 (0.1%)
1	D	0.55	0/2180	0.92	1/2962 (0.0%)
All	All	0.55	0/8720	0.90	7/11848 (0.1%)

There are no bond length outliers.

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	222	SER	N-CA-C	-5.93	101.26	110.10
1	D	226	SER	N-CA-C	5.79	116.20	108.38
1	A	180	ARG	N-CA-C	-5.51	103.23	110.39
1	C	144	HIS	CA-C-N	5.22	125.13	119.85
1	C	144	HIS	C-N-CA	5.22	125.13	119.85
1	A	226	SER	N-CA-C	5.08	115.24	108.38
1	B	226	SER	N-CA-C	5.03	115.17	108.38

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2128	0	2069	56	2
1	B	2128	0	2071	18	0
1	C	2128	0	2068	48	2
1	D	2128	0	2071	17	0
2	A	56	0	52	1	0
2	B	42	0	39	0	0
2	C	56	0	52	2	0
2	D	42	0	39	2	0
3	A	19	0	0	3	0
3	B	38	0	0	3	0
3	C	17	0	0	2	0
3	D	45	0	0	3	0
All	All	8827	0	8461	138	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 8.

All (138) 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:75:SER:HA	1:A:221:ARG:CG	1.72	1.18
1:A:75:SER:CA	1:A:221:ARG:CG	2.24	1.14
1:A:220:ILE:N	1:A:220:ILE:HD12	1.56	1.13
1:A:75:SER:HA	1:A:221:ARG:HG3	1.16	1.12
1:C:220:ILE:HD12	1:C:220:ILE:N	1.54	1.12
1:C:220:ILE:H	1:C:220:ILE:CD1	1.63	1.12
1:C:221:ARG:HH21	1:C:221:ARG:HG2	0.96	1.08
1:A:220:ILE:HD12	1:A:220:ILE:H	0.92	1.08
1:A:220:ILE:H	1:A:220:ILE:CD1	1.67	1.07
1:A:75:SER:CA	1:A:221:ARG:HG2	1.85	1.03
1:A:75:SER:CB	1:A:221:ARG:HG2	1.93	0.97
1:C:220:ILE:HD12	1:C:220:ILE:H	0.78	0.94
1:C:221:ARG:HH21	1:C:221:ARG:CG	1.78	0.94
1:A:75:SER:CA	1:A:221:ARG:HG3	1.89	0.94
1:C:4:GLN:HE22	1:C:249:PRO:HD2	1.33	0.91
1:A:26:LEU:HD22	1:A:227:ILE:HD11	1.53	0.88
1:C:54:HIS:HE1	2:C:301:NAG:H61	1.38	0.86
2:D:303:NAG:O7	3:D:438:HOH:O	1.95	0.84
1:C:221:ARG:HG2	1:C:221:ARG:NH2	1.64	0.84
1:C:4:GLN:NE2	1:C:249:PRO:HD2	1.93	0.82
1:A:221:ARG:O	1:A:222:SER:CB	2.30	0.80
1:D:135:ASP:OD2	3:D:401:HOH:O	2.00	0.79

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:184:ARG:HH11	1:A:184:ARG:HG3	1.49	0.76
1:A:260:ILE:O	3:A:418:HOH:O	2.04	0.76
1:C:75:SER:O	1:C:221:ARG:CD	2.37	0.73
1:A:135:ASP:O	1:A:220:ILE:HD11	1.90	0.71
2:D:303:NAG:H2	3:D:438:HOH:O	1.89	0.71
1:A:13:ASN:HD21	1:A:236:LYS:HA	1.56	0.71
1:A:180:ARG:HG3	1:A:181:PRO:HD2	1.71	0.71
1:C:75:SER:O	1:C:221:ARG:NE	2.24	0.70
1:A:221:ARG:O	1:A:222:SER:HB2	1.92	0.69
1:C:75:SER:O	1:C:221:ARG:HD2	1.93	0.69
1:B:127:THR:HB	1:B:202:ILE:HD11	1.75	0.68
1:C:54:HIS:CE1	2:C:301:NAG:H61	2.27	0.67
1:C:4:GLN:NE2	1:C:248:ILE:HB	2.10	0.67
1:A:73:ALA:HB2	1:A:227:ILE:HD12	1.77	0.66
1:A:242:ILE:O	3:A:416:HOH:O	2.13	0.65
1:B:16:HIS:HB2	3:B:431:HOH:O	1.97	0.65
1:B:114:LEU:O	3:B:406:HOH:O	2.15	0.64
1:A:13:ASN:HD21	1:A:236:LYS:HG2	1.64	0.63
1:C:4:GLN:HE22	1:C:248:ILE:HB	1.63	0.62
1:A:166:THR:OG1	1:A:167:LYS:N	2.33	0.61
1:A:47:PHE:HB3	1:A:227:ILE:HG12	1.83	0.60
1:A:184:ARG:HG3	1:A:184:ARG:NH1	2.17	0.60
1:C:137:LEU:HB2	1:C:220:ILE:HG13	1.83	0.60
1:A:254:PHE:HD1	1:A:269:SER:HB2	1.67	0.58
1:B:178:GLY:O	1:B:180:ARG:NH1	2.36	0.57
1:D:1:GLU:OE1	1:D:1:GLU:N	2.26	0.56
1:A:54:HIS:HE1	2:A:301:NAG:O5	1.89	0.56
1:C:251:ASP:OD1	3:C:401:HOH:O	2.18	0.56
1:A:222:SER:H	1:A:223:GLY:HA3	1.72	0.55
1:D:49:GLU:HG3	1:D:227:ILE:HD11	1.88	0.55
1:D:87:TRP:HB2	1:D:92:GLN:NE2	2.21	0.55
1:C:10:GLU:HG2	1:C:233:PRO:HG2	1.87	0.55
1:A:13:ASN:ND2	1:A:236:LYS:HA	2.20	0.54
1:A:135:ASP:O	1:A:220:ILE:CD1	2.56	0.54
1:D:127:THR:HB	1:D:202:ILE:HD11	1.90	0.54
1:B:25:THR:HG23	1:B:28:ASP:H	1.74	0.53
1:A:135:ASP:C	1:A:220:ILE:HD11	2.33	0.52
1:C:130:ASN:HB2	1:C:136:LYS:HE2	1.91	0.52
1:A:26:LEU:HD22	1:A:227:ILE:CD1	2.32	0.52
1:B:49:GLU:HG3	1:B:227:ILE:HD11	1.93	0.51
1:C:4:GLN:HE22	1:C:249:PRO:CD	2.15	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:222:SER:N	1:A:223:GLY:HA3	2.25	0.51
1:A:75:SER:HB2	1:A:221:ARG:HG2	1.88	0.50
1:B:153:PHE:O	3:B:409:HOH:O	2.20	0.50
1:A:64:ASP:HB3	1:A:194:TRP:CH2	2.46	0.50
1:A:13:ASN:ND2	1:A:235:GLY:O	2.45	0.50
1:B:13:ASN:HA	1:B:18:ILE:HD12	1.94	0.50
1:A:258:ASN:HB3	3:A:418:HOH:O	2.11	0.50
1:C:181:PRO:O	1:C:189:ARG:NH2	2.29	0.50
1:A:144:HIS:CE1	1:A:175:PRO:HA	2.47	0.49
1:C:64:ASP:HB3	1:C:194:TRP:CZ3	2.47	0.49
1:A:71:LEU:HD11	1:A:196:ILE:HD11	1.93	0.49
1:C:13:ASN:OD1	1:C:236:LYS:HD2	2.12	0.49
1:A:137:LEU:HB2	1:A:220:ILE:HG13	1.94	0.49
1:A:75:SER:HB2	1:A:221:ARG:H	1.76	0.49
1:A:47:PHE:HB3	1:A:227:ILE:CG1	2.43	0.49
1:B:135:ASP:OD1	1:B:198:LYS:HE2	2.13	0.49
1:D:87:TRP:HB2	1:D:92:GLN:HE21	1.77	0.49
1:A:221:ARG:O	1:A:222:SER:OG	2.30	0.48
1:C:64:ASP:HB3	1:C:194:TRP:CH2	2.48	0.48
1:A:165:SER:HB3	1:A:170:GLN:HG3	1.96	0.48
1:C:8:THR:HG23	3:C:411:HOH:O	2.13	0.48
1:C:13:ASN:OD1	1:C:236:LYS:HA	2.14	0.48
1:C:119:PHE:CE2	1:D:149:LYS:HD2	2.48	0.48
1:C:135:ASP:C	1:C:220:ILE:HD11	2.39	0.47
1:C:35:GLN:OE1	1:C:54:HIS:NE2	2.46	0.47
1:D:38:GLY:O	1:D:42:LYS:HE3	2.14	0.47
1:C:163:THR:HB	1:C:206:ASN:HB2	1.97	0.47
1:A:139:ILE:O	1:A:214:PRO:HB3	2.15	0.47
1:C:59:PRO:HB2	1:C:189:ARG:HD3	1.97	0.46
1:A:59:PRO:HB2	1:A:189:ARG:HD3	1.97	0.46
1:B:98:ALA:HB2	1:B:186:ILE:HG13	1.96	0.46
1:A:43:LYS:HZ1	1:A:79:GLU:CD	2.24	0.45
1:A:75:SER:OG	1:A:221:ARG:HG2	2.15	0.45
1:A:254:PHE:CD1	1:A:269:SER:HB2	2.49	0.45
1:A:64:ASP:HB3	1:A:194:TRP:CZ3	2.51	0.45
1:B:269:SER:OG	1:B:270:LYS:N	2.50	0.45
1:D:98:ALA:HB2	1:D:186:ILE:HG13	1.99	0.44
1:C:165:SER:HB3	1:C:170:GLN:HG3	2.00	0.44
1:C:129:PRO:HA	1:C:202:ILE:HG13	1.99	0.44
1:C:136:LYS:HE3	1:C:138:TYR:HE2	1.83	0.44
1:C:136:LYS:HD2	1:C:217:TYR:CD2	2.53	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:35:GLN:NE2	1:C:56:ASN:HB2	2.32	0.43
1:B:142:VAL:HG21	1:B:173:VAL:HG11	2.00	0.43
1:A:119:PHE:CE2	1:B:149:LYS:HD2	2.53	0.43
1:C:57:CYS:SG	1:C:58:TYR:N	2.88	0.43
1:C:37:ASP:O	1:C:40:GLN:HG3	2.18	0.43
1:D:99:CYS:O	1:D:106:SER:N	2.49	0.43
1:A:134:PHE:CZ	1:A:219:LYS:HE3	2.53	0.43
1:C:75:SER:CA	1:C:221:ARG:HD2	2.49	0.43
1:B:57:CYS:SG	1:B:58:TYR:N	2.90	0.43
1:C:136:LYS:HE3	1:C:138:TYR:CE2	2.54	0.43
1:C:180:ARG:HB3	1:C:181:PRO:HD2	2.01	0.42
1:A:2:LEU:O	1:A:252:LYS:HB3	2.19	0.42
1:C:220:ILE:N	1:C:220:ILE:CD1	2.30	0.42
1:D:142:VAL:HG22	1:D:162:ILE:HD12	2.00	0.42
1:A:181:PRO:O	1:A:189:ARG:NH2	2.33	0.42
1:A:167:LYS:NZ	1:A:200:GLY:O	2.45	0.42
1:D:121:TYR:CZ	1:D:209:GLY:HA2	2.54	0.42
1:D:135:ASP:OD1	1:D:198:LYS:HE2	2.20	0.42
1:C:220:ILE:C	1:C:221:ARG:HG3	2.45	0.42
1:A:157:GLN:NE2	1:A:208:THR:O	2.49	0.42
1:A:127:THR:HB	1:A:202:ILE:HD11	2.01	0.42
1:C:98:ALA:HB2	1:C:186:ILE:HG13	2.02	0.42
1:B:236:LYS:N	1:B:236:LYS:HD2	2.34	0.41
1:B:136:LYS:HD2	1:B:217:TYR:CD2	2.55	0.41
1:A:135:ASP:OD1	1:A:199:PRO:HD3	2.21	0.41
1:D:87:TRP:CZ3	1:D:126:VAL:HG11	2.56	0.41
1:C:149:LYS:HD2	1:D:119:PHE:CE2	2.56	0.41
1:D:270:LYS:HZ3	1:D:270:LYS:HG3	1.70	0.41
1:B:74:SER:HA	1:B:225:SER:O	2.20	0.41
1:B:99:CYS:O	1:B:106:SER:N	2.53	0.41
1:C:75:SER:C	1:C:221:ARG:HD2	2.44	0.41
1:C:127:THR:HB	1:C:202:ILE:HD11	2.03	0.41
1:D:135:ASP:CG	1:D:198:LYS:HE2	2.46	0.40
1:C:26:LEU:HD21	1:C:72:VAL:HG12	2.03	0.40

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:A:224:LYS:O	1:C:267:ARG:NH2[2_546]	2.05	0.15
1:A:250:ASN:O	1:C:250:ASN:ND2[2_546]	2.18	0.02

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	270/284 (95%)	255 (94%)	14 (5%)	1 (0%)	30	49
1	B	270/284 (95%)	258 (96%)	12 (4%)	0	100	100
1	C	270/284 (95%)	259 (96%)	11 (4%)	0	100	100
1	D	270/284 (95%)	256 (95%)	14 (5%)	0	100	100
All	All	1080/1136 (95%)	1028 (95%)	51 (5%)	1 (0%)	48	68

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	222	SER

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	239/249 (96%)	221 (92%)	18 (8%)	12	26
1	B	239/249 (96%)	228 (95%)	11 (5%)	24	48
1	C	239/249 (96%)	225 (94%)	14 (6%)	18	37
1	D	239/249 (96%)	225 (94%)	14 (6%)	18	37
All	All	956/996 (96%)	899 (94%)	57 (6%)	17	36

All (57) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2	LEU
1	A	6	SER
1	A	14	SER
1	A	22	GLU
1	A	25	THR
1	A	71	LEU
1	A	75	SER
1	A	166	THR
1	A	179	SER
1	A	184	ARG
1	A	203	LEU
1	A	204	LEU
1	A	220	ILE
1	A	221	ARG
1	A	236	LYS
1	A	237	CYS
1	A	269	SER
1	A	270	LYS
1	B	26	LEU
1	B	67	SER
1	B	68	LEU
1	B	71	LEU
1	B	99	CYS
1	B	179	SER
1	B	198	LYS
1	B	203	LEU
1	B	204	LEU
1	B	259	ARG
1	B	270	LYS
1	C	2	LEU
1	C	6	SER
1	C	22	GLU
1	C	25	THR
1	C	71	LEU
1	C	99	CYS
1	C	184	ARG
1	C	203	LEU
1	C	204	LEU
1	C	220	ILE
1	C	221	ARG
1	C	234	ILE
1	C	236	LYS
1	C	269	SER

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Mol	Chain	Res	Type
1	D	2	LEU
1	D	5	SER
1	D	6	SER
1	D	26	LEU
1	D	68	LEU
1	D	70	SER
1	D	71	LEU
1	D	88	THR
1	D	179	SER
1	D	188	SER
1	D	198	LYS
1	D	203	LEU
1	D	204	LEU
1	D	269	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	13	ASN
1	A	16	HIS
1	A	54	HIS
1	A	245	ASN
1	B	4	GLN
1	B	92	GLN
1	B	245	ASN
1	C	4	GLN
1	C	245	ASN
1	D	35	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 ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry

14 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$
2	NAG	C	302	1	14,14,15	0.41	0	17,19,21	0.97	1 (5%)
2	NAG	D	303	1	14,14,15	0.46	0	17,19,21	1.04	0
2	NAG	C	301	1	14,14,15	0.76	0	17,19,21	1.61	3 (17%)
2	NAG	A	302	1	14,14,15	0.44	0	17,19,21	1.39	3 (17%)
2	NAG	C	303	1	14,14,15	0.47	0	17,19,21	0.79	1 (5%)
2	NAG	C	304	1	14,14,15	1.17	2 (14%)	17,19,21	2.26	6 (35%)
2	NAG	B	301	1	14,14,15	0.35	0	17,19,21	1.50	3 (17%)
2	NAG	B	303	1	14,14,15	0.50	0	17,19,21	1.26	2 (11%)
2	NAG	A	301	1	14,14,15	0.43	0	17,19,21	1.07	2 (11%)
2	NAG	D	302	1	14,14,15	0.58	0	17,19,21	1.40	3 (17%)
2	NAG	A	304	1	14,14,15	0.38	0	17,19,21	2.05	2 (11%)
2	NAG	B	302	1	14,14,15	0.52	0	17,19,21	1.20	1 (5%)
2	NAG	A	303	1	14,14,15	0.47	0	17,19,21	0.77	1 (5%)
2	NAG	D	301	1	14,14,15	0.30	0	17,19,21	1.66	3 (17%)

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	C	302	1	-	1/6/23/26	0/1/1/1
2	NAG	D	303	1	-	1/6/23/26	0/1/1/1
2	NAG	C	301	1	1/1/5/7	4/6/23/26	0/1/1/1
2	NAG	A	302	1	-	2/6/23/26	0/1/1/1
2	NAG	C	303	1	-	4/6/23/26	0/1/1/1
2	NAG	C	304	1	-	2/6/23/26	0/1/1/1
2	NAG	B	301	1	-	1/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	B	303	1	-	1/6/23/26	0/1/1/1
2	NAG	A	301	1	-	4/6/23/26	0/1/1/1
2	NAG	D	302	1	1/1/5/7	2/6/23/26	0/1/1/1
2	NAG	A	304	1	1/1/5/7	2/6/23/26	0/1/1/1
2	NAG	B	302	1	-	0/6/23/26	0/1/1/1
2	NAG	A	303	1	-	2/6/23/26	0/1/1/1
2	NAG	D	301	1	-	0/6/23/26	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	304	NAG	O5-C5	-2.50	1.38	1.43
2	C	304	NAG	O5-C1	-2.07	1.40	1.43

All (31) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	304	NAG	C1-O5-C5	6.48	120.88	112.19
2	D	301	NAG	C1-O5-C5	4.70	118.48	112.19
2	C	301	NAG	O5-C1-C2	-4.65	104.09	111.29
2	C	304	NAG	C2-N2-C7	-4.61	116.72	122.90
2	A	304	NAG	O5-C1-C2	4.55	118.33	111.29
2	B	301	NAG	C1-O5-C5	4.05	117.62	112.19
2	C	304	NAG	C1-O5-C5	3.94	117.47	112.19
2	A	302	NAG	C1-O5-C5	3.94	117.47	112.19
2	B	302	NAG	C1-O5-C5	3.88	117.39	112.19
2	C	304	NAG	O7-C7-C8	-3.63	115.59	122.05
2	D	302	NAG	C4-C3-C2	3.51	116.16	111.02
2	D	301	NAG	C6-C5-C4	-3.05	105.54	113.02
2	A	301	NAG	C1-O5-C5	2.98	116.17	112.19
2	C	304	NAG	C1-C2-N2	2.96	115.10	110.43
2	C	301	NAG	C6-C5-C4	-2.95	105.77	113.02
2	C	304	NAG	O5-C5-C6	2.66	112.84	107.66
2	B	303	NAG	O5-C1-C2	-2.65	107.19	111.29
2	C	302	NAG	C1-O5-C5	2.47	115.49	112.19
2	D	302	NAG	O5-C1-C2	-2.45	107.50	111.29
2	D	302	NAG	C3-C4-C5	2.35	114.50	110.23
2	A	303	NAG	C1-O5-C5	2.30	115.27	112.19
2	B	303	NAG	C1-O5-C5	2.29	115.26	112.19
2	B	301	NAG	C6-C5-C4	-2.24	107.51	113.02
2	A	301	NAG	O5-C1-C2	-2.23	107.85	111.29

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	302	NAG	O5-C1-C2	2.18	114.67	111.29
2	C	301	NAG	C1-C2-N2	2.09	113.73	110.43
2	C	303	NAG	C1-O5-C5	2.07	114.96	112.19
2	A	302	NAG	C2-N2-C7	-2.06	120.13	122.90
2	C	304	NAG	O7-C7-N2	2.02	125.56	121.98
2	B	301	NAG	C2-N2-C7	-2.02	120.19	122.90
2	D	301	NAG	C3-C4-C5	2.01	113.88	110.23

All (3) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	A	304	NAG	C1
2	C	301	NAG	C1
2	D	302	NAG	C1

All (26) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	301	NAG	C8-C7-N2-C2
2	A	301	NAG	O7-C7-N2-C2
2	C	301	NAG	C8-C7-N2-C2
2	C	301	NAG	O7-C7-N2-C2
2	D	302	NAG	C8-C7-N2-C2
2	D	302	NAG	O7-C7-N2-C2
2	A	303	NAG	O5-C5-C6-O6
2	C	301	NAG	O5-C5-C6-O6
2	C	303	NAG	O5-C5-C6-O6
2	A	303	NAG	C4-C5-C6-O6
2	A	304	NAG	C8-C7-N2-C2
2	A	301	NAG	C4-C5-C6-O6
2	C	301	NAG	C4-C5-C6-O6
2	A	304	NAG	O7-C7-N2-C2
2	A	301	NAG	O5-C5-C6-O6
2	B	303	NAG	O5-C5-C6-O6
2	C	303	NAG	C4-C5-C6-O6
2	C	304	NAG	O5-C5-C6-O6
2	C	303	NAG	C8-C7-N2-C2
2	D	303	NAG	O5-C5-C6-O6
2	C	302	NAG	O5-C5-C6-O6
2	C	303	NAG	O7-C7-N2-C2
2	A	302	NAG	C4-C5-C6-O6
2	C	304	NAG	C4-C5-C6-O6

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Mol	Chain	Res	Type	Atoms
2	A	302	NAG	O5-C5-C6-O6
2	B	301	NAG	C4-C5-C6-O6

There are no ring outliers.

3 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	D	303	NAG	2	0
2	C	301	NAG	2	0
2	A	301	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 [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	272/284 (95%)	-0.80	0 100 100	24, 62, 92, 109	0
1	B	272/284 (95%)	-1.18	0 100 100	13, 35, 67, 100	0
1	C	272/284 (95%)	-0.82	1 (0%) 88 86	25, 62, 95, 114	0
1	D	272/284 (95%)	-1.18	0 100 100	14, 34, 66, 103	0
All	All	1088/1136 (95%)	-0.99	1 (0%) 92 90	13, 47, 88, 114	0

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	6	SER	3.0

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](#)

There are no oligosaccharides in this entry.

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
2	NAG	A	302	14/15	0.93	0.10	93,104,109,110	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	NAG	C	302	14/15	0.93	0.10	116,126,129,130	0
2	NAG	A	304	14/15	0.94	0.09	91,108,110,111	0
2	NAG	C	304	14/15	0.94	0.07	90,97,104,104	0
2	NAG	D	302	14/15	0.94	0.12	83,93,103,103	0
2	NAG	C	301	14/15	0.95	0.09	75,101,105,106	0
2	NAG	D	303	14/15	0.95	0.05	52,67,77,80	0
2	NAG	A	301	14/15	0.96	0.09	86,92,97,103	0
2	NAG	B	301	14/15	0.96	0.07	44,59,69,73	0
2	NAG	B	302	14/15	0.96	0.07	62,83,90,91	0
2	NAG	A	303	14/15	0.96	0.07	56,67,73,73	0
2	NAG	B	303	14/15	0.97	0.06	35,59,78,90	0
2	NAG	D	301	14/15	0.97	0.06	46,60,68,70	0
2	NAG	C	303	14/15	0.98	0.05	63,74,80,82	0

6.5 Other polymers [i](#)

There are no such residues in this entry.