



wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 1, 2016 – 08:11 PM GMT

PDB ID : 4R4F
Title : Crystal structure of non-neutralizing, A32-like antibody 2.2c in complex with HIV-1 YU2 gp120
Authors : Acharya, P.; Kwong, P.D.
Deposited on : 2014-08-19
Resolution : 3.51 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

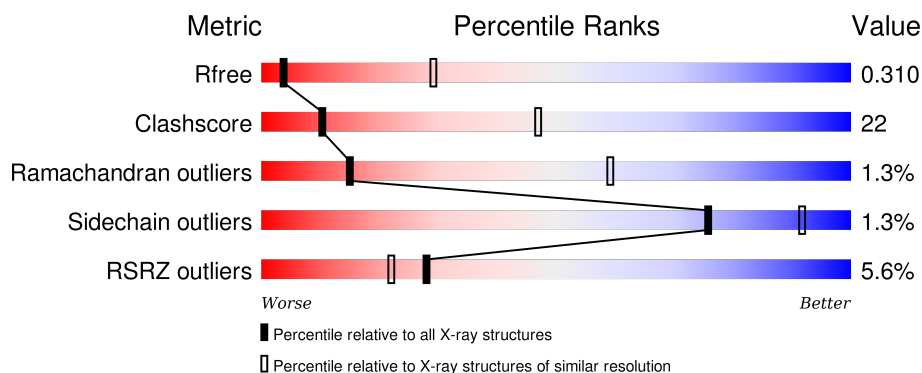
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.51 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}	91344	1089 (3.64-3.40)
Clashscore	102246	1197 (3.64-3.40)
Ramachandran outliers	100387	1159 (3.64-3.40)
Sidechain outliers	100360	1160 (3.64-3.40)
RSRZ outliers	91569	1096 (3.64-3.40)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	376	 8% 63% 26% 10%
2	L	209	 2% 66% 33%
3	H	219	 4% 64% 34%
4	R	28	 82% 18%

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 6316 atoms, of which 30 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 HIV-1 Env gp120.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	340	Total	C	N	O	S	0	0	0
			2669	1672	466	511	20			

- Molecule 2 is a protein called Antibody 2.2c LIGHT CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	L	209	Total	C	N	O	S	0	0	0
			1606	1010	271	320	5			

- Molecule 3 is a protein called Antibody 2.2c heavy CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	H	219	Total	C	N	O	S	0	0	0
			1662	1059	281	317	5			

- Molecule 4 is a protein called M48U1 peptide.

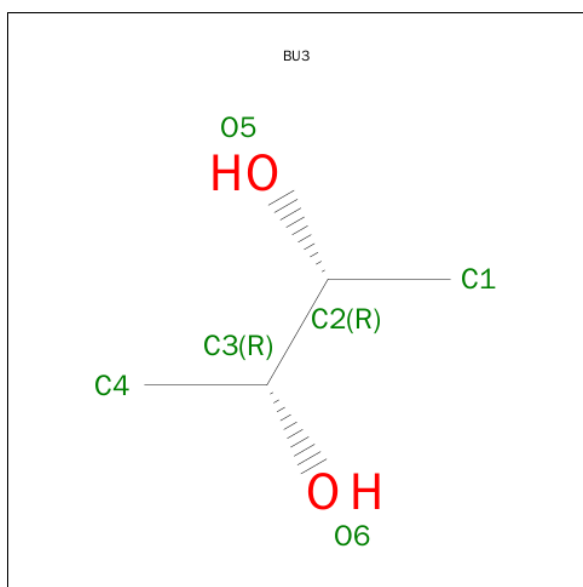
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	R	28	Total	C	N	O	S	0	0	1
			209	133	38	32	6			

- Molecule 5 is SUGAR (N-ACETYL-D-GLUCOSAMINE) (three-letter code: NAG) (formula: C₈H₁₅NO₆).



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

- Molecule 6 is (R,R)-2,3-BUTANEDIOL (three-letter code: BU3) (formula: C₄H₁₀O₂).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	A	1	Total	C	H	O	0	0
			16	4	10	2		
6	A	1	Total	C	H	O	0	0
			16	4	10	2		
6	L	1	Total	C	H	O	0	0
			16	4	10	2		

- Molecule 7 is SULFATE ION (three-letter code: SO₄) (formula: O₄S).

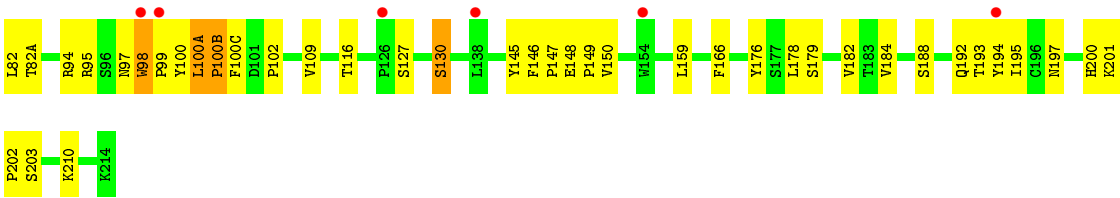


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	A	1	Total	O	S	0	0
			5	4	1		

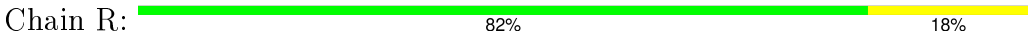
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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	H	1	Total	O	S	0	0
			5	4	1		



● Molecule 4: M48U1 peptide



4 Data and refinement statistics

Property	Value	Source
Space group	F 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	158.32Å 171.23Å 227.97Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	35.75 – 3.51 35.75 – 3.51	Depositor EDS
% Data completeness (in resolution range)	82.3 (35.75-3.51) 83.0 (35.75-3.51)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.24 (at 3.48Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.9_1692)	Depositor
R, R_{free}	0.251 , 0.295 0.282 , 0.310	Depositor DCC
R_{free} test set	1635 reflections (11.27%)	DCC
Wilson B-factor (Å ²)	49.8	Xtriage
Anisotropy	0.299	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 178.2	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Outliers	3 of 16141 reflections (0.019%)	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	6316	wwPDB-VP
Average B, all atoms (Å ²)	223.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.69% 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, 0.375 respectively for untwinned datasets, and 0.333, 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: DPR, BU3, MPT, OAS, SO4, NH2, U2X, 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	0.34	0/2725	0.51	0/3698
2	L	0.37	0/1630	0.61	0/2209
3	H	0.38	0/1711	0.59	0/2340
4	R	0.32	0/176	0.59	0/231
All	All	0.36	0/6242	0.56	0/8478

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 [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	2669	0	2590	121	0
2	L	1606	0	1577	61	0
3	H	1662	0	1636	95	0
4	R	209	0	212	6	0
5	A	98	0	91	5	0
5	H	14	0	13	3	0
6	A	12	20	20	2	0
6	L	6	10	10	3	0
7	A	5	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
7	H	5	0	0	0	0
All	All	6286	30	6149	269	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 22.

The worst 5 of 269 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)
3:H:98:TRP:HB3	3:H:100:TYR:H	1.11	1.11
1:A:84:VAL:HB	1:A:244:THR:HG23	1.35	1.08
1:A:55:ALA:HB3	1:A:216:HIS:HB2	1.34	1.06
3:H:57:PRO:HB2	3:H:59:TYR:HE1	1.17	1.03
3:H:100(A):LEU:HB3	3:H:100(B):PRO:HA	1.44	0.99

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	334/376 (89%)	314 (94%)	17 (5%)	3 (1%)	21	67
2	L	206/209 (99%)	193 (94%)	10 (5%)	3 (2%)	13	56
3	H	217/219 (99%)	204 (94%)	9 (4%)	4 (2%)	11	52
4	R	24/28 (86%)	24 (100%)	0	0	100	100
All	All	781/832 (94%)	735 (94%)	36 (5%)	10 (1%)	15	59

5 of 10 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	84	VAL

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Mol	Chain	Res	Type
1	A	245	VAL
2	L	9	SER
2	L	157	GLY
3	H	98	TRP

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	301/328 (92%)	293 (97%)	8 (3%)	52	83
2	L	181/181 (100%)	181 (100%)	0	100	100
3	H	190/190 (100%)	189 (100%)	1 (0%)	92	97
4	R	20/20 (100%)	20 (100%)	0	100	100
All	All	692/719 (96%)	683 (99%)	9 (1%)	76	92

5 of 9 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	211	GLU
3	H	197	ASN
1	A	245	VAL
1	A	83	GLU
1	A	244	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	66	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

3 non-standard protein/DNA/RNA residues 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	OAS	L	30	2	7,8,9	0.84	0	6,9,11	0.52	0
4	DPR	R	21	4	6,7,8	0.61	0	7,8,10	1.23	1 (14%)
4	U2X	R	23	4	19,20,21	2.34	4 (21%)	22,25,27	1.75	7 (31%)

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	OAS	L	30	2	-	0/5/7/9	0/0/0/0
4	DPR	R	21	4	-	0/0/9/11	0/1/1/1
4	U2X	R	23	4	-	0/9/19/21	0/2/2/2

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	R	23	U2X	C4-C3	2.59	1.59	1.52
4	R	23	U2X	CE1-CZ	2.67	1.44	1.38
4	R	23	U2X	CE1-CD1	4.65	1.47	1.38
4	R	23	U2X	CE2-CD2	7.21	1.51	1.38

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

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	R	23	U2X	C1-C2-C3	-3.98	105.80	112.22
4	R	23	U2X	O-C-CA	-2.14	119.91	125.49
4	R	21	DPR	O-C-CA	-2.13	119.82	125.44
4	R	23	U2X	C6-C1-C2	-2.01	107.22	111.44
4	R	23	U2X	OH-C7-C3	2.44	113.60	107.97

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	L	30	OAS	1	0
4	R	23	U2X	3	0

5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

5.6 Ligand geometry [i](#)

13 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	A	501	1	14,14,15	0.30	0	15,19,21	0.41	0
5	NAG	A	502	1	14,14,15	0.27	0	15,19,21	0.51	0
5	NAG	A	503	1	14,14,15	0.34	0	15,19,21	0.24	0
5	NAG	A	504	1	14,14,15	0.40	0	15,19,21	0.48	0
5	NAG	A	505	1	14,14,15	0.51	0	15,19,21	0.38	0
5	NAG	A	506	1	14,14,15	0.38	0	15,19,21	0.32	0
5	NAG	A	507	1	14,14,15	0.35	0	15,19,21	0.45	0
6	BU3	A	508	-	4,5,5	0.51	0	6,6,6	0.35	0
6	BU3	A	509	-	4,5,5	0.44	0	6,6,6	0.20	0
7	SO4	A	510	-	4,4,4	0.14	0	6,6,6	0.13	0
7	SO4	H	301	-	4,4,4	0.16	0	6,6,6	0.07	0
5	NAG	H	302	3	14,14,15	0.28	0	15,19,21	0.33	0
6	BU3	L	301	-	4,5,5	0.47	0	6,6,6	0.30	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	A	501	1	-	0/6/23/26	0/1/1/1
5	NAG	A	502	1	-	0/6/23/26	0/1/1/1
5	NAG	A	503	1	-	0/6/23/26	0/1/1/1
5	NAG	A	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	506	1	-	0/6/23/26	0/1/1/1
5	NAG	A	507	1	-	0/6/23/26	0/1/1/1
6	BU3	A	508	-	-	0/4/4/4	0/0/0/0
6	BU3	A	509	-	-	0/4/4/4	0/0/0/0
7	SO4	A	510	-	-	0/0/0/0	0/0/0/0
7	SO4	H	301	-	-	0/0/0/0	0/0/0/0
5	NAG	H	302	3	-	0/6/23/26	0/1/1/1
6	BU3	L	301	-	-	0/4/4/4	0/0/0/0

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.

6 monomers are involved in 13 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	502	NAG	1	0
5	A	503	NAG	1	0
5	A	506	NAG	3	0
6	A	508	BU3	2	0
5	H	302	NAG	3	0
6	L	301	BU3	3	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, 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	340/376 (90%)	0.41	31 (9%) 11 10	171, 231, 310, 417	0
2	L	208/209 (99%)	0.17	5 (2%) 62 52	171, 204, 260, 357	0
3	H	219/219 (100%)	0.16	8 (3%) 45 36	171, 203, 270, 314	0
4	R	24/28 (85%)	-0.22	0 100 100	238, 269, 298, 318	0
All	All	791/832 (95%)	0.26	44 (5%) 28 22	171, 213, 296, 417	0

The worst 5 of 44 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	466	GLU	5.5
1	A	353	PHE	4.8
1	A	359	ILE	4.7
1	A	360	ILE	4.4
1	A	224	ALA	4.3

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

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors(Å ²)	Q<0.9
4	U2X	R	23	19/20	0.86	0.37	-	237,257,278,281	0
2	OAS	L	30	9/10	0.81	0.20	-	195,197,200,202	0
4	DPR	R	21	7/8	0.93	0.24	-	237,239,244,244	0

6.3 Carbohydrates [i](#)

There are no carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors(Å ²)	Q<0.9
5	NAG	A	503	14/15	0.71	0.35	1.76	269,280,288,293	0
5	NAG	H	302	14/15	0.65	0.24	0.11	264,268,273,274	0
5	NAG	A	505	14/15	0.71	0.31	-0.01	243,254,258,260	0
5	NAG	A	507	14/15	0.88	0.23	-0.47	257,262,271,272	0
6	BU3	A	508	6/6	0.79	0.13	-0.70	209,209,284,287	0
5	NAG	A	506	14/15	0.94	0.21	-1.02	200,205,209,210	0
5	NAG	A	501	14/15	0.91	0.19	-	250,254,261,262	0
5	NAG	A	504	14/15	0.77	0.31	-	234,246,257,257	0
7	SO4	H	301	5/5	0.78	0.42	-	248,248,250,253	0
5	NAG	A	502	14/15	0.91	0.15	-	244,254,261,262	0
7	SO4	A	510	5/5	0.70	0.24	-	209,209,209,210	0
6	BU3	L	301	6/6	0.91	0.17	-	209,209,251,253	0
6	BU3	A	509	6/6	0.89	1.58	-	209,209,265,266	16

6.5 Other polymers [i](#)

There are no such residues in this entry.