



# wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 20, 2020 – 09:21 PM BST

PDB ID : 4LSV  
Title : Crystal structure of broadly and potently neutralizing antibody 3BNC117 in complex with HIV-1 clade C C1086 gp120  
Authors : Zhou, T.; Moquin, S.; Kwong, P.D.  
Deposited on : 2013-07-23  
Resolution : 3.00 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](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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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 : 2.13.1  
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) : 2.13.1

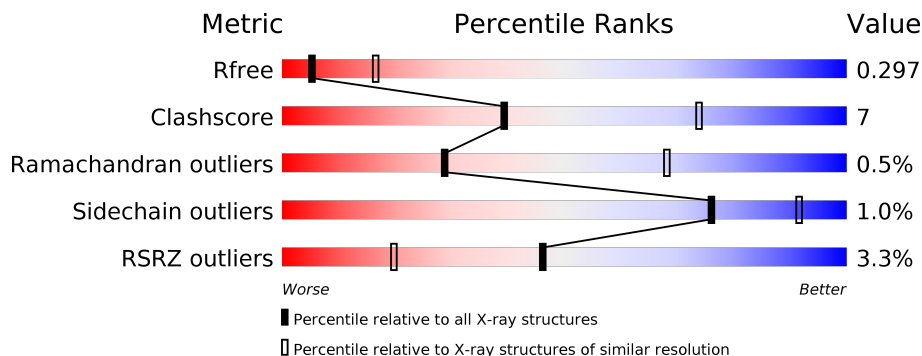
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.00 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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	G	358	 6% 77% 18%
2	H	226	 % 85% 12%
3	L	206	 81% 17%

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
4	NAG	G	505	-	-	X	-

## 2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 6232 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 envelope glycoprotein GP120.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	G	343	2687	1681	468	518	20	0	0	0

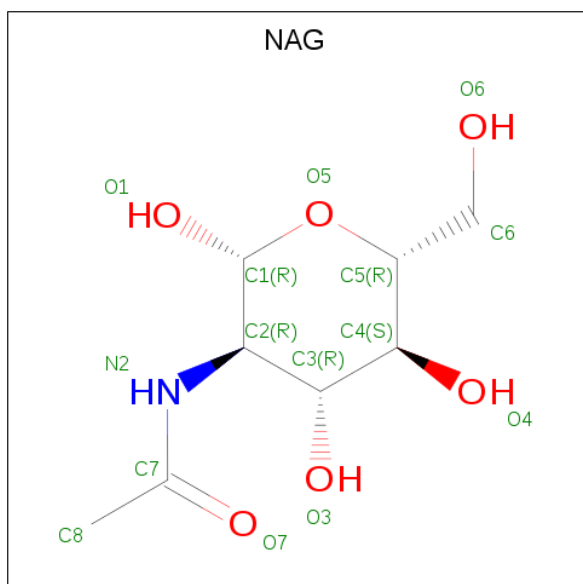
- Molecule 2 is a protein called HEAVY CHAIN OF ANTIBODY 3BNC117.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	H	221	1710	1084	295	326	5	0	0	0

- Molecule 3 is a protein called LIGHT CHAIN OF ANTIBODY 3BNC117.

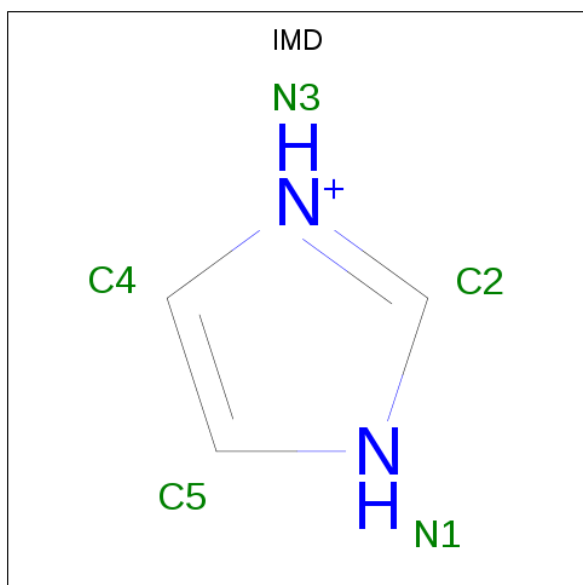
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	L	203	1599	1002	276	316	5	0	0	0

- Molecule 4 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula:  $C_8H_{15}NO_6$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	G	1	Total	C	N	O	0	0
			14	8	1	5		
4	G	1	Total	C	N	O	0	0
			14	8	1	5		
4	G	1	Total	C	N	O	0	0
			14	8	1	5		
4	G	1	Total	C	N	O	0	0
			14	8	1	5		
4	G	1	Total	C	N	O	0	0
			14	8	1	5		
4	G	1	Total	C	N	O	0	0
			14	8	1	5		
4	G	1	Total	C	N	O	0	0
			14	8	1	5		
4	G	1	Total	C	N	O	0	0
			14	8	1	5		
4	L	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 5 is IMIDAZOLE (three-letter code: IMD) (formula: C<sub>3</sub>H<sub>5</sub>N<sub>2</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	L	1	Total	C	N		
			5	3	2	0	0

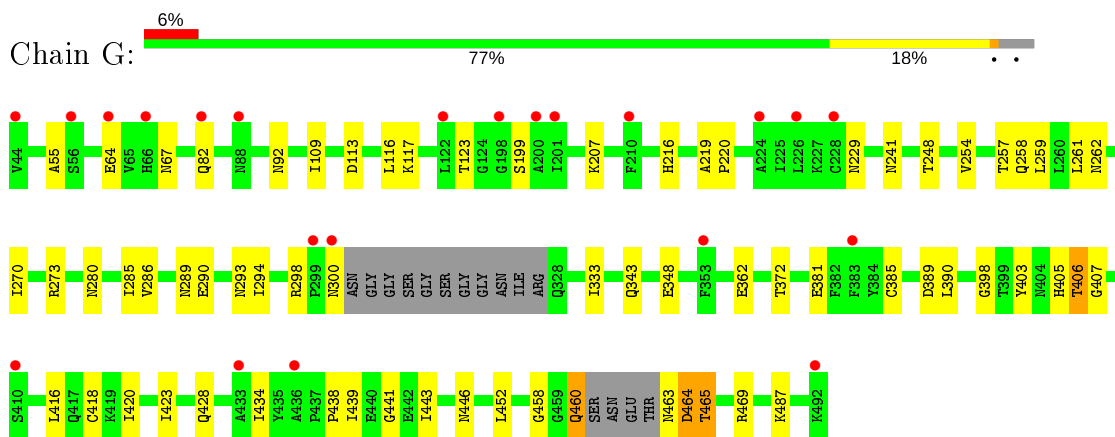
- Molecule 6 is water.

<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
6	G	30	Total 30	O 30	0	0
6	H	24	Total 24	O 24	0	0
6	L	23	Total 23	O 23	0	0

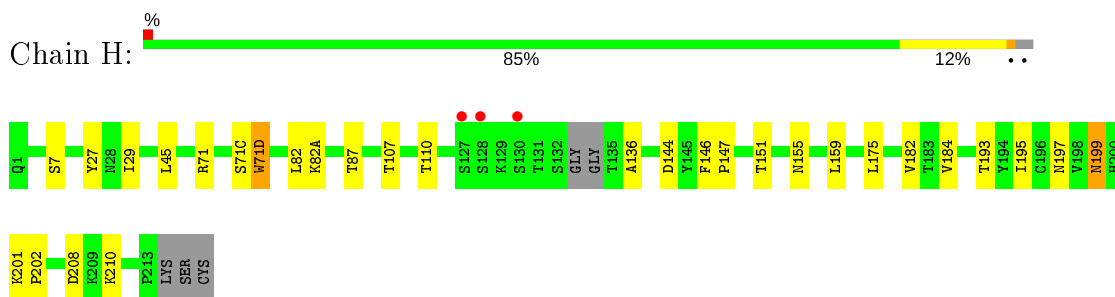
### 3 Residue-property plots [i](#)

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.

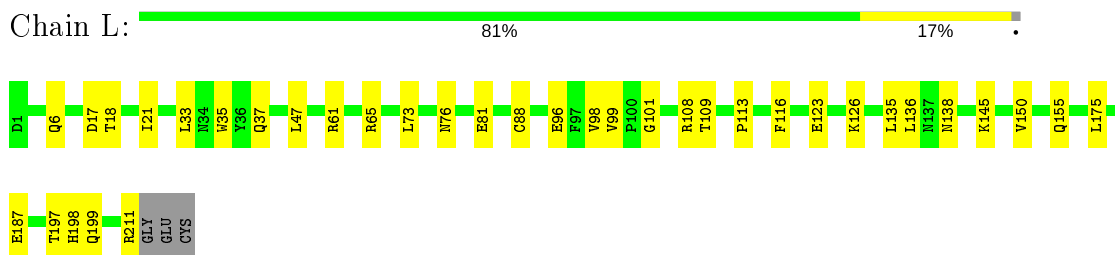
- Molecule 1: envelope glycoprotein GP120



- Molecule 2: HEAVY CHAIN OF ANTIBODY 3BNC117



- Molecule 3: LIGHT CHAIN OF ANTIBODY 3BNC117



## 4 Data and refinement statistics

Property	Value	Source
Space group	I 4 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	191.62Å 191.62Å 103.95Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.32 – 3.00 47.32 – 2.85	Depositor EDS
% Data completeness (in resolution range)	99.2 (47.32-3.00) 99.0 (47.32-2.85)	Depositor EDS
$R_{merge}$	0.09	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.30 (at 2.86Å)	Xtrriage
Refinement program	PHENIX dev_998	Depositor
R, $R_{free}$	0.260 , 0.299 0.257 , 0.297	Depositor DCC
$R_{free}$ test set	1148 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	51.8	Xtrriage
Anisotropy	0.984	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 70.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.29$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.89	EDS
Total number of atoms	6232	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	88.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.39% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

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



## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

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

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	G	0.21	0/2744	0.39	0/3722
2	H	0.21	0/1760	0.38	0/2404
3	L	0.21	0/1633	0.38	0/2217
All	All	0.21	0/6137	0.38	0/8343

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	G	2687	0	2593	53	0
2	H	1710	0	1643	15	0
3	L	1599	0	1561	21	0
4	G	140	0	130	10	1
4	L	14	0	13	1	0
5	L	5	0	5	1	0
6	G	30	0	0	2	0
6	H	24	0	0	0	0
6	L	23	0	0	0	0
All	All	6232	0	5945	89	1

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 7.

The worst 5 of 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)
1:G:289:ASN:CG	4:G:505:NAG:H82	1.56	1.25
1:G:460:GLN:OE1	1:G:460:GLN:HA	1.55	1.00
4:G:505:NAG:O6	6:G:625:HOH:O	1.93	0.87
1:G:290:GLU:HB2	4:G:505:NAG:H83	1.60	0.80
1:G:463:ASN:O	1:G:465:THR:CG2	2.30	0.79

All (1) 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)
4:G:502:NAG:O4	4:G:502:NAG:O4[7_554]	2.16	0.04

## 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	G	337/358 (94%)	307 (91%)	28 (8%)	2 (1%)	25	64
2	H	217/226 (96%)	202 (93%)	14 (6%)	1 (0%)	29	68
3	L	201/206 (98%)	190 (94%)	10 (5%)	1 (0%)	29	68
All	All	755/790 (96%)	699 (93%)	52 (7%)	4 (0%)	29	68

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	G	116	LEU
1	G	406	THR

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Mol	Chain	Res	Type
2	H	82(A)	LYS
3	L	138	ASN

### 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	G	302/312 (97%)	299 (99%)	3 (1%)	76	91
2	H	190/193 (98%)	187 (98%)	3 (2%)	62	86
3	L	181/183 (99%)	180 (99%)	1 (1%)	86	95
All	All	673/688 (98%)	666 (99%)	7 (1%)	76	91

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	H	71	ARG
3	L	96	GLU
2	H	71(D)	TRP
1	G	464	ASP
2	H	199	ASN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	G	428	GLN
3	L	147	GLN
3	L	155	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](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

12 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
4	NAG	G	508	1	14,14,15	0.47	0	17,19,21	0.81	0
4	NAG	G	503	1	14,14,15	0.50	0	17,19,21	0.68	0
4	NAG	G	507	1	14,14,15	0.53	0	17,19,21	0.69	0
4	NAG	G	504	1	14,14,15	0.48	0	17,19,21	0.76	0
4	NAG	G	505	1	14,14,15	0.29	0	17,19,21	0.64	0
4	NAG	G	509	1	14,14,15	0.52	0	17,19,21	0.64	0
5	IMD	L	302	-	3,5,5	0.41	0	4,5,5	0.58	0
4	NAG	G	502	1	14,14,15	0.50	0	17,19,21	0.89	0
4	NAG	G	506	1	14,14,15	0.53	0	17,19,21	0.95	1 (5%)
4	NAG	G	501	1	14,14,15	0.51	0	17,19,21	0.76	0
4	NAG	L	301	3	14,14,15	0.54	0	17,19,21	0.71	0
4	NAG	G	510	1	14,14,15	0.49	0	17,19,21	0.71	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
4	NAG	G	508	1	-	2/6/23/26	0/1/1/1
4	NAG	G	503	1	-	2/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	NAG	G	507	1	-	2/6/23/26	0/1/1/1
4	NAG	G	504	1	-	3/6/23/26	0/1/1/1
4	NAG	G	505	1	-	4/6/23/26	0/1/1/1
4	NAG	G	509	1	-	0/6/23/26	0/1/1/1
5	IMD	L	302	-	-	-	0/1/1/1
4	NAG	G	502	1	-	0/6/23/26	0/1/1/1
4	NAG	G	506	1	-	2/6/23/26	0/1/1/1
4	NAG	G	501	1	-	0/6/23/26	0/1/1/1
4	NAG	L	301	3	-	2/6/23/26	0/1/1/1
4	NAG	G	510	1	-	3/6/23/26	0/1/1/1

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	G	506	NAG	C1-O5-C5	2.14	115.09	112.19

There are no chirality outliers.

5 of 20 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	G	508	NAG	C8-C7-N2-C2
4	G	508	NAG	O7-C7-N2-C2
4	G	503	NAG	C8-C7-N2-C2
4	G	503	NAG	O7-C7-N2-C2
4	G	504	NAG	C8-C7-N2-C2

There are no ring outliers.

5 monomers are involved in 13 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	G	505	NAG	9	0
5	L	302	IMD	1	0
4	G	502	NAG	0	1
4	G	506	NAG	1	0
4	L	301	NAG	1	0

## 5.7 Other polymers

There are no such residues in this entry.

## 5.8 Polymer linkage issues

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, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	G	343/358 (95%)	0.57	22 (6%) 19 6	71, 113, 144, 181	0
2	H	221/226 (97%)	-0.09	3 (1%) 75 49	41, 68, 126, 178	0
3	L	203/206 (98%)	-0.15	0 100 100	33, 62, 103, 122	0
All	All	767/790 (97%)	0.19	25 (3%) 46 20	33, 91, 139, 181	0

The worst 5 of 25 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	H	127	SER	5.2
1	G	200	ALA	4.9
1	G	88	ASN	4.3
1	G	299	PRO	3.8
1	G	383	PHE	3.1

### 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 monosaccharides 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, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 0.9’ lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
4	NAG	G	506	14/15	0.67	0.33	84,88,89,89	0
4	NAG	G	510	14/15	0.67	0.31	81,88,91,92	0
4	NAG	G	509	14/15	0.72	0.33	83,91,94,94	0
4	NAG	G	505	14/15	0.74	0.36	80,81,87,89	0
4	NAG	G	502	14/15	0.74	0.31	81,83,91,92	0
4	NAG	G	503	14/15	0.82	0.23	61,69,72,75	0
4	NAG	G	501	14/15	0.85	0.20	57,65,70,71	0
4	NAG	G	507	14/15	0.87	0.20	52,56,61,61	0
4	NAG	G	508	14/15	0.89	0.17	61,63,64,64	0
4	NAG	L	301	14/15	0.91	0.23	46,52,66,69	0
4	NAG	G	504	14/15	0.95	0.15	37,46,55,56	0
5	IMD	L	302	5/5	0.96	0.14	63,63,65,66	0

## 6.5 Other polymers [\(i\)](#)

There are no such residues in this entry.