



# Full wwPDB X-ray Structure Validation Report

Feb 27, 2014 – 12:12 AM GMT

PDB ID : 3Q1S  
Title : HIV-1 neutralizing antibody Z13e1 in complex with epitope display protein  
Authors : Stanfield, R.L.; Julien, J.-P.; Pejchal, R.; Gach, J.S.; Zwick, M.B.; Wilson, I.A.  
Deposited on : 2010-12-17  
Resolution : 2.15 Å(reported)

This is a full wwPDB validation 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 <http://wwpdb.org/ValidationPDFNotes.html>

---

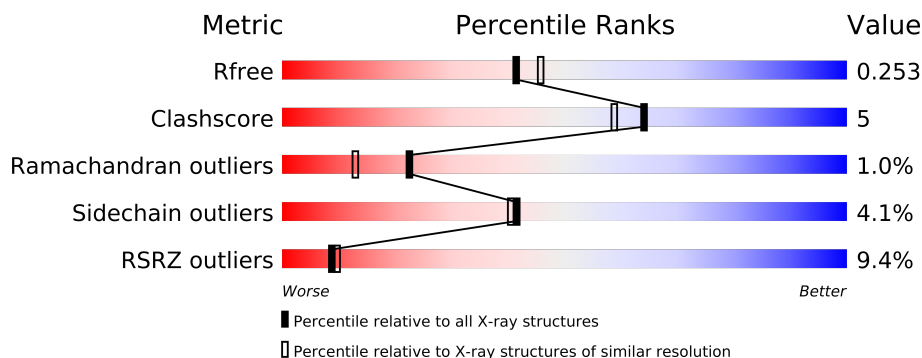
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity	:	4.02b-467
Mogul	:	1.15 2013
Xtriage (Phenix)	:	dev-1323
EDS	:	stable22639
Percentile statistics	:	21963
Refmac	:	5.8.0049
CCP4	:	6.3.0 (Settle)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP)	:	stable22683

# 1 Overall quality at a glance

The reported resolution of this entry is 2.15 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))
$R_{free}$	66092	1094 (2.18-2.14)
Clashscore	79885	1299 (2.18-2.14)
Ramachandran outliers	78287	1272 (2.18-2.14)
Sidechain outliers	78261	1272 (2.18-2.14)
RSRZ outliers	66119	1094 (2.18-2.14)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	L	212	
2	H	230	
3	I	151	

The following table lists non-polymeric compounds that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Geometry	Electron density
5	GOL	H	231	-	X
5	GOL	H	232	-	X
5	GOL	H	234	-	X
5	GOL	L	215	-	X
5	GOL	L	216	-	X

Continued on next page...

*Continued from previous page...*

Mol	Type	Chain	Res	Geometry	Electron density
5	GOL	L	217	-	X
5	GOL	L	218	-	X

## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 4387 atoms, of which 0 are hydrogen and 0 are deuterium.

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 Z13e1 Fab light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	L	209	Total	C	N	O	S	0	0	0
			1604	1002	277	321	4			

- Molecule 2 is a protein called Z13e1 Fab heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	H	211	Total	C	N	O	S	0	0	0
			1603	1025	263	309	6			

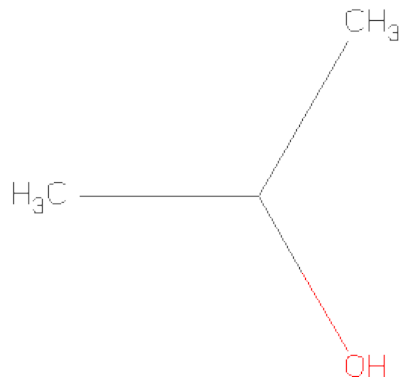
- Molecule 3 is a protein called Interleukin-22.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	I	113	Total	C	N	O	S	0	0	0
			909	572	160	169	8			

There are 5 discrepancies between the modelled and reference sequences:

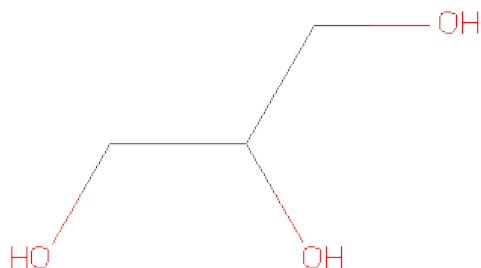
Chain	Residue	Modelled	Actual	Comment	Reference
I	64	TRP	SER	ENGINEERED MUTATION	UNP Q9GZX6
I	65	ASN	LEU	ENGINEERED MUTATION	UNP Q9GZX6
I	66	TRP	ALA	ENGINEERED MUTATION	UNP Q9GZX6
I	68	ASP	ASN	ENGINEERED MUTATION	UNP Q9GZX6
I	69	ILE	ASN	ENGINEERED MUTATION	UNP Q9GZX6

- Molecule 4 is ISOPROPYL ALCOHOL (three-letter code: IPA) (formula: C<sub>3</sub>H<sub>8</sub>O).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	L	1	Total	C	O	0	0
			4	3	1		
4	L	1	Total	C	O	0	0
			4	3	1		

- Molecule 5 is GLYCEROL (three-letter code: GOL) (formula:  $C_3H_8O_3$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	L	1	Total	C	O	0	0
			6	3	3		
5	L	1	Total	C	O	0	0
			6	3	3		

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	L	1	Total C O 6 3 3	0	0
5	L	1	Total C O 6 3 3	0	0
5	H	1	Total C O 6 3 3	0	0
5	H	1	Total C O 6 3 3	0	0
5	H	1	Total C O 6 3 3	0	0
5	H	1	Total C O 6 3 3	0	0
5	I	1	Total C O 6 3 3	0	0
5	I	1	Total C O 6 3 3	0	0

- Molecule 6 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	L	85	Total O 85 85	0	0
6	H	93	Total O 93 93	0	0
6	I	25	Total O 25 25	0	0

### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

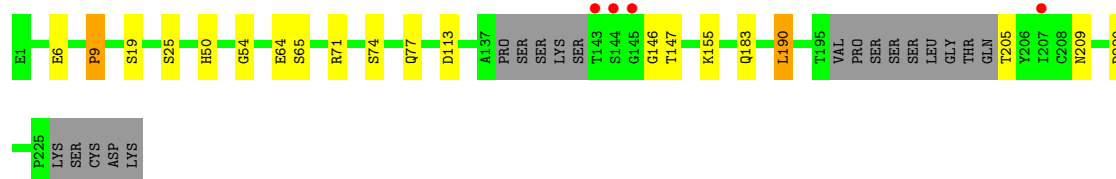
- Molecule 1: Z13e1 Fab light chain

Chain L: 



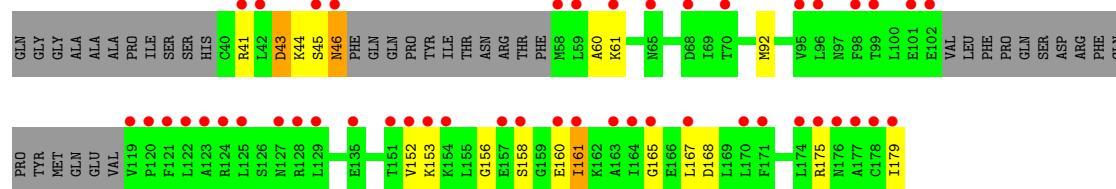
- Molecule 2: Z13e1 Fab heavy chain

Chain H: 



- Molecule 3: Interleukin-22

Chain I: 



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	56.62Å 99.22Å 105.53Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.63 – 2.15 49.89 – 2.15	Depositor EDS
% Data completeness (in resolution range)	99.8 (49.63-2.15) 99.8 (49.89-2.15)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.12	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.99 (at 2.16Å)	Xtriage
Refinement program	REFMAC 5.5.0110	Depositor
R, $R_{free}$	0.207 , 0.260 0.242 , 0.253	Depositor DCC
$R_{free}$ test set	1672 reflections (5.33%)	DCC
Wilson B-factor (Å <sup>2</sup> )	30.8	Xtriage
Anisotropy	0.108	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 31.2	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 33021 reflections	Xtriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	4387	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	45.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.56% of the height of the origin peak. No significant pseudotranslation is detected.*

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



## 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: GOL, IPA

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	L	0.83	0/1637	0.79	0/2223
2	H	0.92	2/1644 (0.1%)	0.91	3/2245 (0.1%)
3	I	0.64	0/919	0.75	0/1228
All	All	0.83	2/4200 (0.0%)	0.83	3/5696 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
2	H	0	1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	H	19	SER	CB-OG	-6.19	1.34	1.42
2	H	64	GLU	CB-CG	-5.31	1.42	1.52

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	190	LEU	CA-CB-CG	7.07	131.55	115.30
2	H	113	ASP	CB-CG-OD1	6.05	123.75	118.30
2	H	6	GLU	CB-CA-C	-5.12	100.16	110.40

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	H	146	GLY	Peptide

## 5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	L	1604	0	0	7	0
2	H	1603	0	0	8	0
3	I	909	0	0	7	0
4	L	8	0	16	3	0
5	H	24	0	32	3	0
5	I	12	0	16	2	0
5	L	24	0	32	2	0
6	H	93	0	0	2	0
6	I	25	0	0	0	0
6	L	85	0	0	0	0
All	All	4387	0	96	22	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 5.

All (22) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:L:93:LEU:CD1	4:L:2:IPA:H11	1.81	1.09
1:L:42:GLN:NE2	5:L:217:GOL:O3	2.12	0.83
1:L:93:LEU:CD1	4:L:2:IPA:C1	2.60	0.78
2:H:74:SER:O	5:H:231:GOL:H11	1.97	0.65
3:I:61:LYS:O	5:I:9:GOL:C1	2.49	0.60
1:L:54:ARG:NH1	1:L:62:PHE:O	2.37	0.57
2:H:9:PRO:CD	2:H:9:PRO:O	2.54	0.55
3:I:152:VAL:CG1	3:I:152:VAL:O	2.56	0.54
1:L:93:LEU:CG	4:L:2:IPA:H11	2.39	0.53
1:L:69:THR:CG2	1:L:70:ASP:OD1	2.58	0.52
1:L:198:HIS:N	5:L:215:GOL:HO1	2.08	0.52
3:I:168:ASP:N	3:I:168:ASP:OD1	2.43	0.51
3:I:43:ASP:O	3:I:46:ASN:N	2.45	0.50

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Distance(Å)	Clash(Å)
2:H:65:SER:N	6:H:246:HOH:O	2.44	0.50
2:H:155:LYS:NZ	2:H:183:GLN:OE1	2.48	0.47
2:H:209:ASN:ND2	2:H:220:ASP:OD1	2.50	0.45
2:H:54:GLY:O	5:H:233:GOL:H32	2.18	0.44
3:I:153:LYS:O	3:I:156:GLY:N	2.52	0.42
2:H:77:GLN:NE2	6:H:311:HOH:O	2.53	0.42
3:I:161:ILE:O	3:I:165:GLY:N	2.52	0.42
2:H:74:SER:O	5:H:231:GOL:C1	2.67	0.42
3:I:61:LYS:O	5:I:9:GOL:H12	2.18	0.41

There are no symmetry-related clashes.

## 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	L	207/212 (98%)	199 (96%)	8 (4%)	0	100	100
2	H	205/230 (89%)	194 (95%)	10 (5%)	1 (0%)	38	31
3	I	107/151 (71%)	97 (91%)	6 (6%)	4 (4%)	5	1
All	All	519/593 (88%)	490 (94%)	24 (5%)	5 (1%)	22	13

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	H	147	THR
3	I	167	LEU
3	I	45	SER
3	I	44	LYS
3	I	60	ALA

### 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	L	180/182 (99%)	176 (98%)	4 (2%)	64	70
2	H	180/198 (91%)	174 (97%)	6 (3%)	50	51
3	I	102/135 (76%)	93 (91%)	9 (9%)	14	9
All	All	462/515 (90%)	443 (96%)	19 (4%)	41	40

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	L	3	GLU
1	L	33	LEU
1	L	69	THR
1	L	181	LEU
2	H	9	PRO
2	H	25	SER
2	H	50	HIS
2	H	71	ARG
2	H	190	LEU
2	H	205	THR
3	I	41	ARG
3	I	43	ASP
3	I	46	ASN
3	I	92	MET
3	I	158	SER
3	I	160	GLU
3	I	161	ILE
3	I	175	ARG
3	I	179	ILE

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 5.3.3 RNA ⓘ

There are no RNA chains 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 carbohydrates in this entry.

## 5.6 Ligand geometry

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	$\# Z  > 2$
5	GOL	H	231	-	5,5,5	0.81	0	5,5,5	1.22	1 (20%)
5	GOL	H	232	-	5,5,5	0.58	0	5,5,5	0.66	0
5	GOL	H	233	-	5,5,5	0.44	0	5,5,5	0.85	0
5	GOL	H	234	-	5,5,5	0.41	0	5,5,5	0.50	0
5	GOL	I	2	-	5,5,5	0.52	0	5,5,5	0.44	0
5	GOL	I	9	-	5,5,5	0.49	0	5,5,5	0.51	0
4	IPA	L	1	-	3,3,3	0.70	0	3,3,3	0.27	0
4	IPA	L	2	-	3,3,3	0.67	0	3,3,3	0.46	0
5	GOL	L	215	-	5,5,5	0.44	0	5,5,5	0.58	0
5	GOL	L	216	-	5,5,5	0.48	0	5,5,5	1.03	0
5	GOL	L	217	-	5,5,5	0.48	0	5,5,5	0.97	0
5	GOL	L	218	-	5,5,5	0.89	0	5,5,5	0.51	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	GOL	H	231	-	-	0/4/4/4	0/0/0/0
5	GOL	H	232	-	-	0/4/4/4	0/0/0/0
5	GOL	H	233	-	-	0/4/4/4	0/0/0/0
5	GOL	H	234	-	-	0/4/4/4	0/0/0/0
5	GOL	I	2	-	-	0/4/4/4	0/0/0/0
5	GOL	I	9	-	-	0/4/4/4	0/0/0/0
4	IPA	L	1	-	-	0/0/0/0	0/0/0/0
4	IPA	L	2	-	-	0/0/0/0	0/0/0/0

*Continued on next page...*

*Continued from previous page...*

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	GOL	L	215	-	-	0/4/4/4	0/0/0/0
5	GOL	L	216	-	-	0/4/4/4	0/0/0/0
5	GOL	L	217	-	-	0/4/4/4	0/0/0/0
5	GOL	L	218	-	-	0/4/4/4	0/0/0/0

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	H	231	GOL	O1-C1-C2	2.34	121.15	109.71

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

## 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 ⓘ

### 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<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	L	209/212 (98%)	0.15	0 100 100	23, 37, 60, 71	0
2	H	211/230 (91%)	0.45	4 (1%) 64 69	20, 35, 69, 79	0
3	I	113/151 (74%)	1.81	47 (41%) 1 1	43, 75, 122, 135	0
All	All	533/593 (89%)	0.62	51 (9%) 9 9	20, 40, 95, 135	0

All (51) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	H	144	SER	12.1
3	I	163	ALA	8.4
3	I	164	ILE	8.2
3	I	171	PHE	6.9
2	H	143	THR	6.5
3	I	125	LEU	5.9
2	H	145	GLY	5.3
3	I	158	SER	4.9
3	I	121	PHE	4.8
3	I	179	ILE	4.5
3	I	99	THR	4.3
3	I	167	LEU	4.2
3	I	98	PHE	4.1
3	I	42	LEU	3.8
3	I	95	VAL	3.7
3	I	122	LEU	3.7
3	I	59	LEU	3.6
3	I	120	PRO	3.5
3	I	177	ALA	3.4
3	I	135	GLU	3.4
3	I	61	LYS	3.4
3	I	58	MET	3.4
3	I	128	ARG	3.4

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
3	I	153	LYS	3.3
3	I	152	VAL	3.1
3	I	41	ARG	2.9
3	I	174	LEU	2.7
3	I	123	ALA	2.7
3	I	70	THR	2.7
3	I	178	CYS	2.7
3	I	154	LYS	2.7
3	I	129	LEU	2.7
3	I	45	SER	2.7
3	I	46	ASN	2.6
3	I	161	ILE	2.6
3	I	127	ASN	2.6
3	I	96	LEU	2.5
3	I	119	VAL	2.5
3	I	124	ARG	2.4
3	I	101	GLU	2.4
3	I	102	GLU	2.4
3	I	176	ASN	2.3
3	I	65	ASN	2.2
3	I	165	GLY	2.2
3	I	175	ARG	2.1
3	I	170	LEU	2.1
3	I	160	GLU	2.1
2	H	207	ILE	2.1
3	I	68	ASP	2.1
3	I	151	THR	2.1
3	I	157	GLU	2.0

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

There are no non-standard protein/DNA/RNA residues in this entry.

## 6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 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. 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, 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	RSR	LLDF	B-factors(Å <sup>2</sup> )	Q<0.9
5	GOL	L	217	6/6	0.33	13.22	33,39,42,43	0
5	GOL	L	215	6/6	0.27	11.40	42,46,46,49	0
5	GOL	L	216	6/6	0.33	9.45	45,46,48,48	0
5	GOL	H	234	6/6	0.26	5.90	40,46,47,49	0
5	GOL	L	218	6/6	0.16	5.76	43,47,47,48	0
5	GOL	H	231	6/6	0.25	5.36	36,36,40,41	0
5	GOL	H	232	6/6	0.27	4.97	39,42,47,47	0
5	GOL	I	2	6/6	0.26	1.92	39,44,46,46	0
5	GOL	I	9	6/6	0.26	0.69	42,46,49,49	0
5	GOL	H	233	6/6	0.20	0.14	44,45,47,47	0
4	IPA	L	2	4/4	0.15	-1.52	41,42,42,42	0
4	IPA	L	1	4/4	0.10	-2.24	41,41,42,43	0

## 6.5 Other polymers ⓘ

There are no such residues in this entry.