



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 19, 2024 – 05:12 AM EDT

PDB ID : 3ZL4  
Title : Antibody structural organization: Role of kappa - lambda chain constant domain switch in catalytic functionality  
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Deposited on : 2013-01-28  
Resolution : 1.95 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](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.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	2.37.1
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)	:	2.37.1

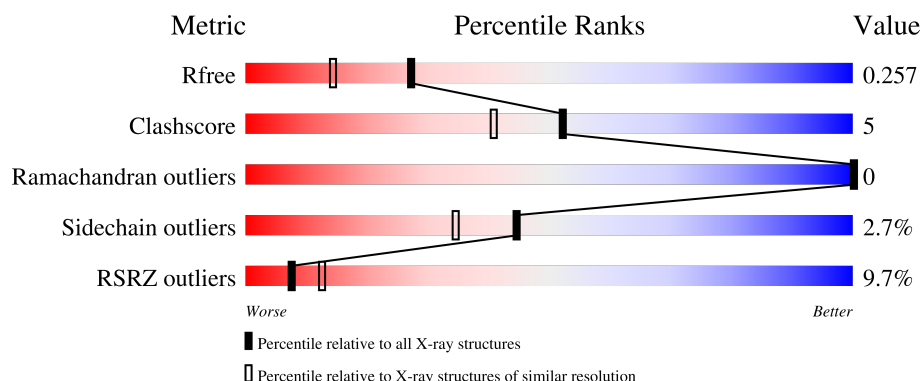
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.95 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	2580 (1.96-1.96)
Clashscore	141614	2705 (1.96-1.96)
Ramachandran outliers	138981	2678 (1.96-1.96)
Sidechain outliers	138945	2678 (1.96-1.96)
RSRZ outliers	127900	2539 (1.96-1.96)

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  $\geq 3$ , 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	H	255	
2	L	247	

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
3	MES	L	1217	-	-	X	-

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 3648 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.

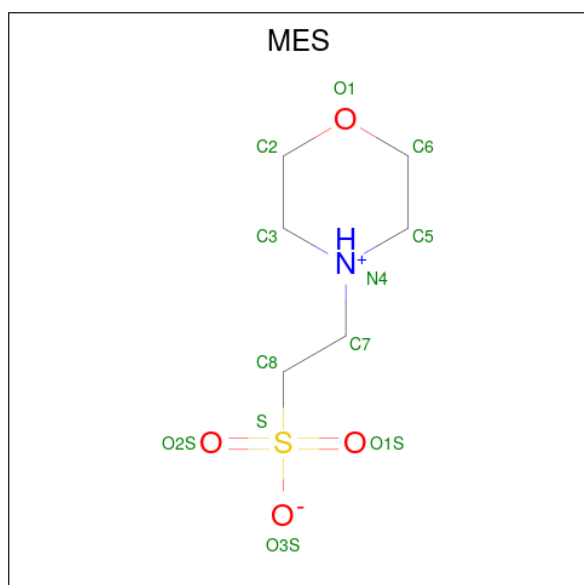
- Molecule 1 is a protein called A17 ANTIBODY FAB FRAGMENT HEAVY CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	H	231	Total	C	N	O	S	0	2	0
			1734	1092	286	350	6			

- Molecule 2 is a protein called A17 ANTIBODY FAB FRAGMENT LAMBDA LIGHT CHAIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	L	214	Total	C	N	O	S	0	2	0
			1592	994	265	328	5			

- Molecule 3 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (three-letter code: MES) (formula: C<sub>6</sub>H<sub>13</sub>NO<sub>4</sub>S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	L	1	Total	C	N	O	S	0	0
			12	6	1	4	1		

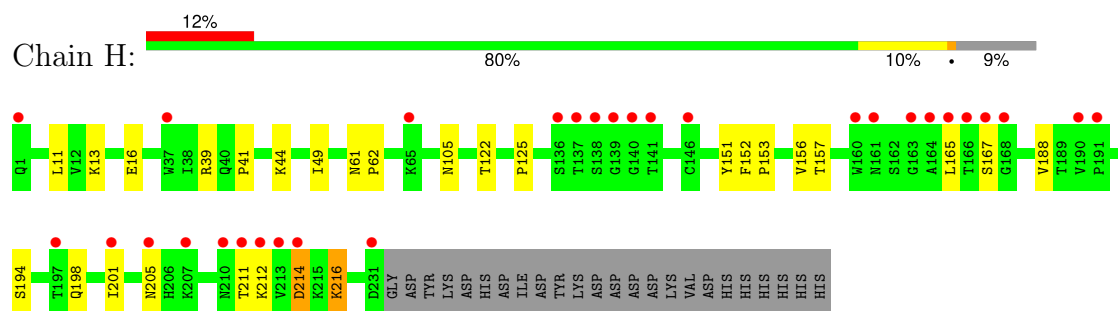
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	H	173	Total 173	O 173	0	0
4	L	137	Total 137	O 137	0	0

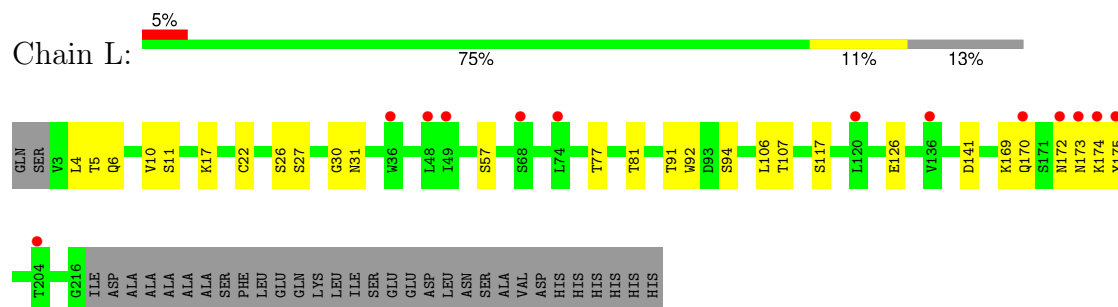
### 3 Residue-property plots [i](#)

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: A17 ANTIBODY FAB FRAGMENT HEAVY CHAIN



#### • Molecule 2: A17 ANTIBODY FAB FRAGMENT LAMBDA LIGHT CHAIN



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	60.63Å 60.63Å 279.64Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	24.40 – 1.95 24.40 – 1.95	Depositor EDS
% Data completeness (in resolution range)	99.8 (24.40-1.95) 99.9 (24.40-1.95)	Depositor EDS
$R_{merge}$	0.10	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.34 (at 1.95Å)	Xtriage
Refinement program	PHENIX (PHENIX.REFINE: 1.8.1_1168)	Depositor
R, $R_{free}$	0.205 , 0.255 0.206 , 0.257	Depositor DCC
$R_{free}$ test set	1975 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	27.1	Xtriage
Anisotropy	0.704	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 43.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	3648	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.40% 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

### 5.1 Standard geometry

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

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	H	0.36	0/1778	0.54	0/2429
2	L	0.36	0/1631	0.56	0/2230
All	All	0.36	0/3409	0.55	0/4659

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

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	H	1734	0	1690	18	0
2	L	1592	0	1542	16	0
3	L	12	0	12	9	0
4	H	173	0	0	1	0
4	L	137	0	0	1	0
All	All	3648	0	3244	36	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 5.

All (36) 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:H:105:ASN:HD22	3:L:1217:MES:H61	1.34	0.90
2:L:92:TRP:CD2	3:L:1217:MES:H22	2.14	0.83
1:H:216:LYS:HE3	1:H:216:LYS:H	1.46	0.80
2:L:141:ASP:HA	2:L:174:LYS:HB3	1.64	0.80
1:H:13:LYS:HB2	1:H:16:GLU:HG3	1.71	0.71
2:L:81:THR:O	2:L:173:ASN:ND2	2.26	0.69
2:L:17:LYS:HD3	2:L:77:THR:HG22	1.75	0.68
1:H:157:THR:HG22	1:H:205:ASN:HB3	1.74	0.68
1:H:125:PRO:HD2	1:H:211:THR:HG21	1.74	0.68
4:H:2127:HOH:O	3:L:1217:MES:H51	1.96	0.65
2:L:10:VAL:HG13	2:L:106:LEU:HD13	1.84	0.59
2:L:91:THR:C	3:L:1217:MES:H21	2.24	0.58
1:H:105:ASN:ND2	3:L:1217:MES:H61	2.14	0.57
2:L:92:TRP:CG	3:L:1217:MES:H22	2.40	0.57
2:L:169:LYS:HD2	2:L:175:TYR:CZ	2.40	0.57
1:H:39:ARG:HB3	1:H:49:ILE:HD11	1.87	0.57
1:H:201:ILE:HG12	1:H:216:LYS:HA	1.88	0.55
1:H:11:LEU:HD23	1:H:122[B]:THR:HG22	1.92	0.51
2:L:27:SER:HB3	2:L:94:SER:HB3	1.92	0.51
1:H:165:LEU:HD13	1:H:188:VAL:HG21	1.93	0.50
2:L:26:SER:HA	2:L:30:GLY:HA3	1.92	0.49
1:H:125:PRO:HB3	1:H:151:TYR:HB3	1.93	0.49
1:H:157:THR:CG2	1:H:205:ASN:HB3	2.43	0.48
2:L:4:LEU:HD11	2:L:91:THR:HG22	1.97	0.47
1:H:214:ASP:OD1	1:H:214:ASP:N	2.48	0.47
2:L:92:TRP:CE2	3:L:1217:MES:H22	2.51	0.46
1:H:41:PRO:HB2	1:H:44:LYS:HD3	1.98	0.44
1:H:105:ASN:HB2	3:L:1217:MES:C5	2.48	0.44
1:H:61:ASN:HA	1:H:62:PRO:HD2	1.87	0.43
2:L:11:SER:HB3	2:L:107:THR:HB	2.03	0.41
2:L:126:GLU:HB2	4:L:2086:HOH:O	2.19	0.41
3:L:1217:MES:H31	3:L:1217:MES:H82	1.52	0.41
1:H:194:SER:O	1:H:198:GLN:HB2	2.21	0.40
2:L:5:THR:O	2:L:22:CYS:HA	2.21	0.40
2:L:172:ASN:C	2:L:174:LYS:H	2.25	0.40
1:H:152:PHE:HA	1:H:153:PRO:HA	1.85	0.40

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	H	231/255 (91%)	225 (97%)	6 (3%)	0	100	100
2	L	214/247 (87%)	206 (96%)	8 (4%)	0	100	100
All	All	445/502 (89%)	431 (97%)	14 (3%)	0	100	100

There are no Ramachandran outliers to report.

### 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	H	200/221 (90%)	195 (98%)	5 (2%)	47	38
2	L	181/206 (88%)	176 (97%)	5 (3%)	43	33
All	All	381/427 (89%)	371 (97%)	10 (3%)	44	36

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

Mol	Chain	Res	Type
1	H	156	VAL
1	H	167	SER
1	H	212	LYS
1	H	214	ASP
1	H	216	LYS
2	L	6	GLN
2	L	31	ASN
2	L	57	SER

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Mol	Chain	Res	Type
2	L	117	SER
2	L	170	GLN

Sometimes 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 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 monosaccharides in this entry.

## 5.6 Ligand geometry ⓘ

1 ligand is 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	MES	L	1217	-	12,12,12	2.57	2 (16%)	15,16,16	3.10	9 (60%)

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	MES	L	1217	-	-	2/6/14/14	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	L	1217	MES	C8-S	-8.34	1.65	1.77
3	L	1217	MES	O1S-S	2.01	1.50	1.45

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	L	1217	MES	C6-C5-N4	-6.76	99.84	110.12
3	L	1217	MES	C2-C3-N4	-4.29	103.60	110.12
3	L	1217	MES	C5-N4-C3	4.28	118.06	108.84
3	L	1217	MES	C7-N4-C3	3.61	120.86	111.24
3	L	1217	MES	C7-N4-C5	3.51	120.58	111.24
3	L	1217	MES	O1-C6-C5	-3.16	104.97	111.77
3	L	1217	MES	O3S-S-C8	3.04	111.96	106.00
3	L	1217	MES	O1-C2-C3	2.65	117.48	111.77
3	L	1217	MES	C8-C7-N4	-2.40	103.28	112.36

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	L	1217	MES	C8-C7-N4-C3
3	L	1217	MES	N4-C7-C8-S

There are no ring outliers.

1 monomer is involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	L	1217	MES	9	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

### 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	H	231/255 (90%)	0.69	30 (12%) <b>3</b> <b>5</b>	9, 22, 52, 63	0
2	L	214/247 (86%)	0.35	13 (6%) <b>21</b> <b>29</b>	11, 22, 37, 54	0
All	All	445/502 (88%)	0.52	43 (9%) <b>7</b> <b>12</b>	9, 22, 49, 63	0

All (43) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	L	173	ASN	6.7
1	H	212	LYS	5.4
1	H	164	ALA	4.3
1	H	210	ASN	4.3
1	H	190	VAL	4.1
1	H	213	VAL	4.1
1	H	191	PRO	4.0
1	H	168	GLY	3.7
2	L	136	VAL	3.7
1	H	139	GLY	3.7
1	H	201	ILE	3.5
1	H	211	THR	3.5
1	H	166	THR	3.5
1	H	138	SER	3.5
1	H	167	SER	3.5
2	L	170	GLN	3.4
1	H	137	THR	3.2
1	H	197	THR	3.2
1	H	163	GLY	3.2
1	H	207	LYS	3.2
1	H	136	SER	3.1
1	H	141	THR	3.0
1	H	140	GLY	2.9
1	H	214	ASP	2.9

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Mol	Chain	Res	Type	RSRZ
1	H	160	TRP	2.9
2	L	74	LEU	2.8
2	L	36	TRP	2.7
1	H	37	TRP	2.7
1	H	65	LYS	2.7
1	H	1	GLN	2.6
1	H	205	ASN	2.5
2	L	174	LYS	2.5
2	L	172	ASN	2.5
2	L	49	ILE	2.4
2	L	204	THR	2.3
1	H	146	CYS	2.3
2	L	48	LEU	2.2
1	H	161	ASN	2.2
2	L	175	TYR	2.2
2	L	120	LEU	2.1
1	H	165	LEU	2.1
2	L	68	SER	2.1
1	H	231	ASP	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](#)

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(Å <sup>2</sup> )	Q<0.9
3	MES	L	1217	12/12	0.90	0.20	9,18,25,34	12

## 6.5 Other polymers [i](#)

There are no such residues in this entry.