



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 13, 2017 – 08:50 pm GMT

PDB ID : 3H3P  
Title : Crystal structure of HIV epitope-scaffold 4E10 Fv complex  
Authors : Holmes, M.A.  
Deposited on : 2009-04-16  
Resolution : 2.70 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

<http://wwpdb.org/validation/2016/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  
Xtriage (Phenix) : 1.9-1692  
EDS : trunk28620  
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)  
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) : recalc28949

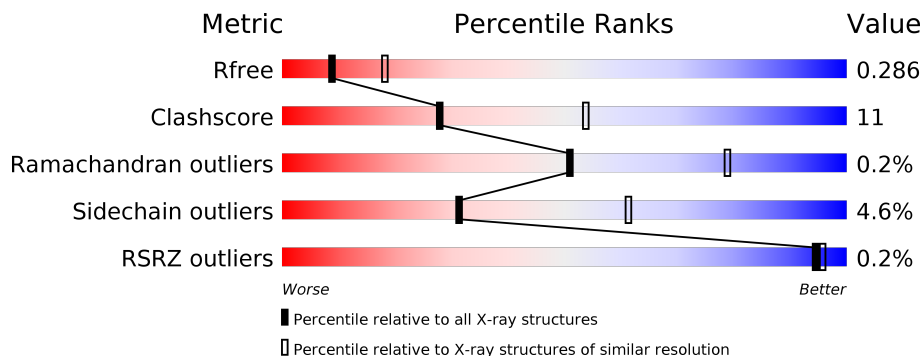
# 1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.70 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))
$R_{free}$	100719	2259 (2.70-2.70)
Clashscore	112137	2590 (2.70-2.70)
Ramachandran outliers	110173	2550 (2.70-2.70)
Sidechain outliers	110143	2550 (2.70-2.70)
RSRZ outliers	101464	2275 (2.70-2.70)

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. 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	137	<div> <div>79%</div> <div>12% • 9%</div> </div>
1	I	137	<div> <div>%</div> <div>71% 19% • 8%</div> </div>
2	L	114	<div> <div>72%</div> <div>22% • •</div> </div>
2	M	114	<div> <div>78%</div> <div>18% • •</div> </div>
3	S	85	<div> <div>19% •</div> <div>79%</div> </div>
3	T	85	<div> <div>19% 6%</div> <div>75%</div> </div>

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 3850 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 Fv 4E10 heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	H	125	Total	C	N	O	S	0	0	0
			920	580	162	175	3			
1	I	126	Total	C	N	O	S	0	0	0
			911	578	156	174	3			

- Molecule 2 is a protein called Fv 4E10 light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	L	109	Total	C	N	O	S	0	0	0
			808	502	141	163	2			
2	M	111	Total	C	N	O	S	0	0	0
			825	518	142	163	2			

- Molecule 3 is a protein called 4E10\_S0\_1TJLC\_004\_N.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	S	18	Total	C	N	O	0	0	0
			150	100	23	27			
3	T	21	Total	C	N	O	0	0	0
			180	117	30	33			

- Molecule 4 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	H	1	Total	Ca	0	0
			1	1		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	H	18	Total	O	0	0
			18	18		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	I	18	Total 18	O 18	0	0
5	L	7	Total 7	O 7	0	0
5	M	10	Total 10	O 10	0	0
5	T	2	Total 2	O 2	0	0

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

These plots are drawn for all protein, RNA and DNA 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.

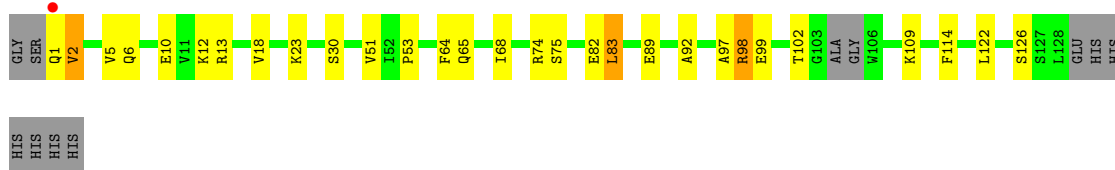
- Molecule 1: Fv 4E10 heavy chain

Chain H: 



- Molecule 1: Fv 4E10 heavy chain

Chain I: 




- Molecule 2: Fv 4E10 light chain

Chain L: 



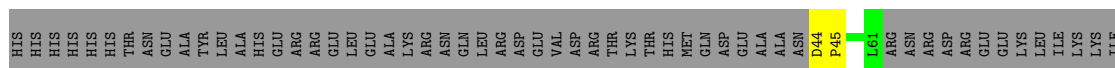
- Molecule 2: Fv 4E10 light chain

Chain M: 



- Molecule 3: 4E10\_S0\_1TJLC\_004\_N

Chain S: 



GLU

GLN

THR

LEU

LYS

LYS

VAL

GLU

ASN

GLU

ASP

● Molecule 3: 4E10\_S0\_1TJLC\_004\_N



HIS

HIS

HIS

HIS

HIS

HIS

HIS

THR

ASN

GLU

ALA

TYR

LEU

ALA

HIS

GLU

ARG

ARG

GLU

LEU

LEU

GLU

ALA

LYS

ARG

ASN

GLN

LEU

ARG

ASP

GLU

VAL

ASP

ARG

THR

LYS

THR

HIS

MET

GLN

ASP

GLU

ALA

ALA

ASN

D44

P45

R46

W47

I50

W55

R64

ASP

ARG

GLU

GLU

LYS

LEU

ILE

LYS

LYS

ILE

GLU

GLN

THR

LEU

LYS

LYS

VAL

GLU

ASN

GLU

ASP

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 65 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	92.40Å 92.40Å 272.79Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	60.08 – 2.70 60.07 – 2.70	Depositor EDS
% Data completeness (in resolution range)	97.3 (60.08-2.70) 97.3 (60.07-2.70)	Depositor EDS
$R_{merge}$	0.10	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.48 (at 2.69Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.229 , 0.287 0.232 , 0.286	Depositor DCC
$R_{free}$ test set	953 reflections (5.19%)	DCC
Wilson B-factor (Å <sup>2</sup> )	61.5	Xtriage
Anisotropy	0.049	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 33.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.53$ , $\langle L^2 \rangle = 0.37$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	3850	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.24% 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: CA

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	0.46	0/939	0.65	0/1278
1	I	0.48	0/930	0.59	0/1267
2	L	0.40	0/824	0.53	0/1120
2	M	0.42	0/842	0.57	0/1143
3	S	0.41	0/156	0.41	0/214
3	T	0.45	0/186	0.50	0/254
All	All	0.44	0/3877	0.58	0/5276

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	H	920	0	900	17	0
1	I	911	0	877	32	0
2	L	808	0	769	20	0
2	M	825	0	802	15	0
3	S	150	0	123	4	0
3	T	180	0	155	3	0
4	H	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	H	18	0	0	2	0
5	I	18	0	0	0	0
5	L	7	0	0	1	0
5	M	10	0	0	0	0
5	T	2	0	0	0	0
All	All	3850	0	3626	83	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 11.

All (83) 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:S:44:ASP:HB3	3:S:45:PRO:HD3	1.17	1.09
1:H:5:VAL:HG11	1:I:5:VAL:HG23	1.41	1.02
1:H:5:VAL:CG1	1:I:5:VAL:HG23	1.90	1.01
3:S:44:ASP:HB3	3:S:45:PRO:CD	1.95	0.96
1:I:13:ARG:H	1:I:13:ARG:HD3	1.32	0.95
2:L:108:LYS:O	2:L:109:LEU:HB2	1.84	0.78
2:L:8:PRO:O	2:L:103:THR:HG23	1.87	0.75
2:L:34:LEU:HD22	2:L:72:PHE:CG	2.26	0.71
1:H:19:THR:HG22	1:H:82:GLU:HG3	1.74	0.70
1:I:1:GLN:O	1:I:2:VAL:CG2	2.43	0.66
3:S:44:ASP:CB	3:S:45:PRO:HD3	2.10	0.66
1:H:5:VAL:CG1	1:I:5:VAL:CG2	2.72	0.65
1:I:13:ARG:H	1:I:13:ARG:CD	2.07	0.65
1:I:83:LEU:N	1:I:83:LEU:HD12	2.13	0.64
2:L:108:LYS:O	2:L:109:LEU:CB	2.45	0.64
2:M:10:THR:HG22	2:M:11:GLN:N	2.13	0.62
1:I:1:GLN:O	1:I:2:VAL:HG22	2.02	0.60
1:I:83:LEU:H	1:I:83:LEU:HD12	1.66	0.60
2:M:12:SER:O	2:M:13:LEU:HD23	2.02	0.60
2:M:21:LEU:HD22	2:M:74:LEU:HD23	1.85	0.59
1:I:98:ARG:NH2	1:I:99:GLU:O	2.36	0.59
2:L:80:GLU:HG3	2:L:81:PRO:CD	2.35	0.56
1:H:19:THR:HG23	5:H:152:HOH:O	2.06	0.54
1:I:13:ARG:HD3	1:I:13:ARG:N	2.12	0.53
1:I:1:GLN:C	1:I:2:VAL:HG23	2.29	0.53
2:L:51:GLY:O	2:L:52:ALA:HB3	2.08	0.53
1:H:12:LYS:HE2	1:H:17:SER:O	2.09	0.53
2:L:80:GLU:HG3	2:L:81:PRO:HD2	1.90	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:M:34:LEU:HD13	2:M:72:PHE:CD1	2.44	0.53
1:I:75:SER:O	2:L:43:GLN:HG2	2.09	0.52
2:L:1:GLU:N	5:L:115:HOH:O	2.35	0.52
1:H:89:GLU:O	1:H:89:GLU:HG3	2.09	0.51
2:M:110:VAL:HG13	2:M:111:PRO:HD2	1.93	0.50
1:H:5:VAL:O	1:H:5:VAL:HG23	2.10	0.50
2:M:48:LEU:O	2:M:56:PRO:HD2	2.11	0.50
1:I:109:LYS:HG3	3:T:55:TRP:CE3	2.47	0.50
1:I:10:GLU:HG2	1:I:18:VAL:HG21	1.94	0.50
1:H:5:VAL:HG11	1:I:5:VAL:O	2.13	0.49
2:L:34:LEU:HD22	2:L:72:PHE:CD2	2.47	0.49
1:I:1:GLN:C	1:I:2:VAL:CG2	2.82	0.48
2:M:21:LEU:N	2:M:21:LEU:CD1	2.77	0.48
2:M:34:LEU:HD22	2:M:72:PHE:CD2	2.48	0.48
1:I:13:ARG:N	1:I:13:ARG:CD	2.75	0.47
2:M:51:GLY:O	2:M:52:ALA:HB3	2.15	0.47
3:T:47:TRP:HA	3:T:50:ILE:HD12	1.97	0.47
1:I:12:LYS:HD2	1:I:18:VAL:HB	1.96	0.46
1:I:92:ALA:O	1:I:122:LEU:HD12	2.15	0.46
2:L:8:PRO:HG3	2:L:11:GLN:HE21	1.81	0.46
2:M:10:THR:CG2	2:M:11:GLN:N	2.76	0.46
1:I:1:GLN:O	1:I:2:VAL:HG23	2.16	0.46
1:I:51:VAL:O	1:I:51:VAL:HG13	2.16	0.45
2:L:60:ALA:HB3	2:L:63:PHE:CE1	2.51	0.45
2:L:107:VAL:O	2:L:107:VAL:HG13	2.16	0.45
1:H:5:VAL:HG21	1:I:6:GLN:C	2.37	0.45
2:L:21:LEU:HD12	2:L:21:LEU:N	2.32	0.45
1:H:17:SER:OG	1:H:84:ASN:HB3	2.17	0.45
1:I:64:PHE:O	1:I:65:GLN:C	2.55	0.44
2:L:21:LEU:CD1	2:L:21:LEU:N	2.81	0.44
1:H:19:THR:CG2	5:H:152:HOH:O	2.64	0.44
1:H:64:PHE:O	1:H:68:ILE:HG22	2.18	0.43
1:I:30:SER:OG	1:I:74:ARG:NH1	2.48	0.43
1:H:19:THR:HA	1:H:81:LEU:O	2.19	0.43
2:M:38:GLN:HB2	2:M:48:LEU:HD11	2.00	0.43
1:I:30:SER:HA	1:I:53:PRO:HB2	2.00	0.43
2:L:3:VAL:H	2:L:26:SER:HG	1.67	0.43
2:M:13:LEU:HD12	2:M:79:LEU:HD11	2.00	0.43
1:H:51:VAL:HG22	1:H:52:ILE:N	2.33	0.43
1:I:97:ALA:HB1	1:I:114:PHE:HB3	1.99	0.43
1:I:68:ILE:HA	1:I:82:GLU:O	2.19	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:I:102:THR:OG1	1:I:109:LYS:HB3	2.18	0.42
2:L:20:THR:C	2:L:21:LEU:HD12	2.39	0.42
2:M:110:VAL:HG13	2:M:111:PRO:CD	2.49	0.42
2:L:38:GLN:HB2	2:L:48:LEU:HD11	2.01	0.42
1:I:5:VAL:HG23	1:I:5:VAL:O	2.19	0.42
1:H:5:VAL:HG12	1:I:23:LYS:HB3	2.02	0.42
2:L:36:TRP:CE2	2:L:74:LEU:HB2	2.55	0.42
3:T:44:ASP:N	3:T:45:PRO:CD	2.83	0.42
1:I:89:GLU:HG3	1:I:89:GLU:H	1.64	0.42
2:M:110:VAL:CG1	2:M:111:PRO:HD2	2.51	0.41
1:H:54:LEU:O	1:H:55:LEU:HB2	2.21	0.41
2:M:4:LEU:HD13	2:M:23:CYS:SG	2.61	0.41
2:L:60:ALA:HB3	2:L:63:PHE:CD1	2.56	0.40
3:S:44:ASP:CB	3:S:45:PRO:CD	2.74	0.40

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	H	121/137 (88%)	118 (98%)	3 (2%)	0	100	100
1	I	122/137 (89%)	120 (98%)	1 (1%)	1 (1%)	22	49
2	L	107/114 (94%)	102 (95%)	5 (5%)	0	100	100
2	M	109/114 (96%)	106 (97%)	3 (3%)	0	100	100
3	S	16/85 (19%)	16 (100%)	0	0	100	100
3	T	19/85 (22%)	18 (95%)	1 (5%)	0	100	100
All	All	494/672 (74%)	480 (97%)	13 (3%)	1 (0%)	51	79

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	I	2	VAL

### 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	94/108 (87%)	90 (96%)	4 (4%)	33	64
1	I	89/108 (82%)	86 (97%)	3 (3%)	42	73
2	L	86/94 (92%)	81 (94%)	5 (6%)	23	50
2	M	88/94 (94%)	82 (93%)	6 (7%)	18	41
3	S	14/79 (18%)	14 (100%)	0	100	100
3	T	18/79 (23%)	18 (100%)	0	100	100
All	All	389/562 (69%)	371 (95%)	18 (5%)	31	61

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	H	1	GLN
1	H	17	SER
1	H	25	SER
1	H	98	ARG
1	I	83	LEU
1	I	98	ARG
1	I	126	SER
2	L	7	SER
2	L	21	LEU
2	L	64	SER
2	L	75	THR
2	L	80	GLU
2	M	18	ARG
2	M	21	LEU
2	M	34	LEU
2	M	54	SER
2	M	61	ASP
2	M	104	LYS

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 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 carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

Of 1 ligands modelled in this entry, 1 is monoatomic - leaving 0 for Mogul analysis.

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.

No monomer is involved in short contacts.

## 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	H	125/137 (91%)	-0.05	0 100 100	19, 28, 37, 43	0
1	I	126/137 (91%)	0.01	1 (0%) 86 86	20, 28, 38, 43	0
2	L	109/114 (95%)	0.05	0 100 100	26, 36, 42, 45	0
2	M	111/114 (97%)	0.00	0 100 100	25, 33, 39, 44	0
3	S	18/85 (21%)	0.01	0 100 100	33, 38, 53, 55	0
3	T	21/85 (24%)	0.10	0 100 100	32, 38, 49, 52	0
All	All	510/672 (75%)	0.01	1 (0%) 94 96	19, 31, 42, 55	0

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	I	1	GLN	2.1

### 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 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, 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	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
4	CA	H	136	1/1	0.90	0.11	-	57,57,57,57	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.