



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 07:20 PM UTC

PDB ID : 4R1D / pdb_00004r1d
Title : The crystal structure of Tle4-Tli4 complex
Authors : Lu, D.
Deposited on : 2014-08-05
Resolution : 1.75 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

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>.

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

MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

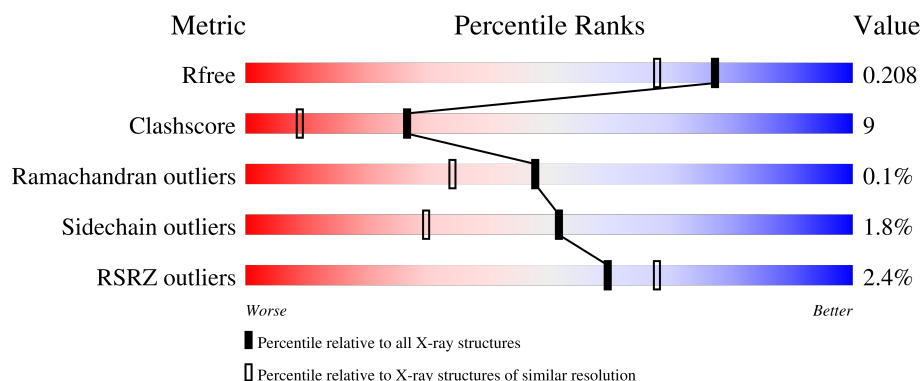
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

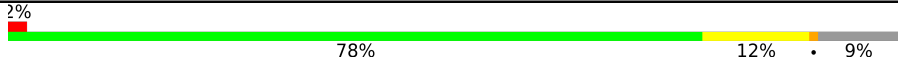
The reported resolution of this entry is 1.75 Å.

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}	180053	1187 (1.74-1.74)
Clashscore	190562	1207 (1.74-1.74)
Ramachandran outliers	187476	1200 (1.74-1.74)
Sidechain outliers	187428	1200 (1.74-1.74)
RSRZ outliers	180081	1188 (1.74-1.74)

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 ≥ 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	A	569	
2	B	348	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 7491 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 Uncharacterized protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	517	Total	C	N	O	S	0	9	0
			4111	2579	731	785	16			

- Molecule 2 is a protein called Uncharacterized protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	301	Total	C	N	O	S	0	3	0
			2419	1537	423	452	7			

- Molecule 3 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Ca	0	0
			1	1		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	597	Total	O	0	0
			597	597		
4	B	363	Total	O	0	0
			363	363		

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	59.68Å 135.18Å 62.61Å 90.00° 113.49° 90.00°	Depositor
Resolution (Å)	20.00 – 1.75 20.00 – 1.75	Depositor EDS
% Data completeness (in resolution range)	94.4 (20.00-1.75) 94.3 (20.00-1.75)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.95 (at 1.74Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.6.4_486)	Depositor
R, R_{free}	0.175 , 0.214 0.170 , 0.208	Depositor DCC
R_{free} test set	4331 reflections (4.74%)	wwPDB-VP
Wilson B-factor (Å ²)	20.5	Xtriage
Anisotropy	0.040	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 41.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.023 for l,-k,h	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	7491	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.22% 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, 0.333 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	A	0.45	0/4241	0.77	4/5761 (0.1%)
2	B	0.40	0/2490	0.74	0/3372
All	All	0.43	0/6731	0.76	4/9133 (0.0%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	73	ARG	CA-C-N	11.23	127.86	119.66
1	A	73	ARG	C-N-CA	11.23	127.86	119.66
1	A	394	GLU	N-CA-C	6.29	117.80	111.07
1	A	192	GLU	CB-CA-C	-5.31	102.31	110.81

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	4111	0	3961	74	0
2	B	2419	0	2376	59	0
3	A	1	0	0	0	0
4	A	597	0	0	7	0
4	B	363	0	0	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	7491	0	6337	119	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 9.

All (119) 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)
2:B:241:MET:CE	2:B:263:GLY:HA3	1.71	1.20
1:A:196:ARG:HH11	1:A:196:ARG:HG2	1.14	1.11
2:B:241:MET:HE2	2:B:263:GLY:HA3	1.31	1.10
2:B:241:MET:HE1	2:B:263:GLY:HA3	1.50	0.91
1:A:196:ARG:HG2	1:A:196:ARG:NH1	1.82	0.86
2:B:93:HIS:HD2	2:B:95:SER:H	1.23	0.86
2:B:77:LEU:HD22	2:B:139:VAL:CG2	2.07	0.85
1:A:45:GLN:HB2	1:A:46:THR:HA	1.58	0.83
1:A:196:ARG:HH11	1:A:196:ARG:CG	1.92	0.82
1:A:84:LEU:HD11	2:B:241:MET:HE3	1.59	0.81
2:B:70:LEU:HB2	2:B:139:VAL:HG12	1.61	0.81
1:A:74:PRO:HG2	1:A:140[B]:MET:HG2	1.66	0.78
2:B:301:GLU:O	2:B:304:LYS:HG2	1.83	0.78
1:A:325:GLU:HG3	1:A:411[A]:ILE:HD12	1.67	0.77
2:B:77:LEU:HD22	2:B:139:VAL:HG21	1.65	0.76
2:B:108:ASN:O	2:B:109:GLU:HG2	1.89	0.73
1:A:84:LEU:HD21	2:B:241:MET:HE3	1.71	0.72
1:A:84:LEU:CD1	2:B:241:MET:HE3	2.21	0.71
1:A:84:LEU:CG	2:B:241:MET:HE3	2.21	0.70
1:A:393:LYS:HG2	2:B:150:ARG:HH22	1.56	0.69
1:A:392:LYS:HB2	1:A:392:LYS:NZ	2.08	0.69
2:B:70:LEU:HD12	2:B:139:VAL:CG1	2.25	0.67
2:B:93:HIS:CD2	2:B:96:LYS:H	2.14	0.66
2:B:137:TRP:CZ2	2:B:139:VAL:HG23	2.31	0.65
1:A:263:ARG:HH11	1:A:282:GLN:HE22	1.44	0.65
1:A:472:ARG:HB3	1:A:475:LEU:HD11	1.77	0.65
1:A:56:GLY:HA3	1:A:256:SER:HB3	1.79	0.63
1:A:450:THR:HB	1:A:451:PRO:HD3	1.80	0.63
2:B:77:LEU:HD22	2:B:139:VAL:HG22	1.80	0.63
2:B:155:VAL:O	2:B:159:ARG:HG2	1.98	0.63
1:A:100:LYS:HE3	2:B:216:THR:O	1.99	0.63
1:A:144:TYR:OH	1:A:255:HIS:HD2	1.82	0.63
1:A:84:LEU:CD2	2:B:241:MET:HE3	2.30	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:241:MET:HE2	2:B:241:MET:HA	1.82	0.61
1:A:74:PRO:HB2	1:A:140[B]:MET:HE3	1.82	0.61
1:A:199:ARG:HD2	1:A:561:TRP:CZ2	2.36	0.60
2:B:77:LEU:HD13	2:B:139:VAL:HG11	1.84	0.60
2:B:93:HIS:CD2	2:B:95:SER:H	2.11	0.60
2:B:304:LYS:HG3	4:B:733:HOH:O	2.01	0.60
1:A:140[A]:MET:HE2	4:A:1001:HOH:O	2.01	0.59
1:A:84:LEU:HD11	2:B:241:MET:CE	2.32	0.59
1:A:84:LEU:HD21	2:B:241:MET:CE	2.31	0.59
1:A:120:ASP:HB2	1:A:141:ARG:HD2	1.84	0.59
2:B:287:PRO:HG2	2:B:289[B]:LEU:CD1	2.34	0.57
1:A:74:PRO:CG	1:A:140[B]:MET:HG2	2.32	0.57
1:A:437:ARG:HD3	1:A:498:GLU:HG2	1.86	0.57
2:B:137:TRP:CH2	2:B:139:VAL:HG23	2.42	0.55
2:B:241:MET:HE2	2:B:263:GLY:CA	2.21	0.55
1:A:292:HIS:ND1	1:A:293:HIS:HD2	2.05	0.55
1:A:393:LYS:CG	2:B:150:ARG:HH22	2.19	0.55
1:A:144:TYR:OH	1:A:255:HIS:CD2	2.60	0.54
1:A:263:ARG:HH11	1:A:282:GLN:NE2	2.06	0.54
1:A:401:ARG:HD2	4:A:758:HOH:O	2.08	0.54
2:B:241:MET:HE1	2:B:263:GLY:CA	2.32	0.53
1:A:392:LYS:HB2	1:A:392:LYS:HZ3	1.73	0.53
2:B:260:LEU:HD23	2:B:317:LEU:CD2	2.39	0.53
1:A:141:ARG:HH11	1:A:141:ARG:HG2	1.74	0.52
2:B:207:GLY:HA2	2:B:298:ARG:HD3	1.91	0.51
1:A:411[A]:ILE:HG22	1:A:415:HIS:CE1	2.46	0.51
1:A:78:LEU:HG	1:A:308:ARG:NH2	2.26	0.50
2:B:93:HIS:HE1	2:B:121:ALA:O	1.95	0.50
1:A:343:ASP:HB3	1:A:349:LEU:HD21	1.94	0.50
1:A:96:TRP:HA	2:B:227:VAL:CG1	2.41	0.49
1:A:235:GLN:HG2	1:A:245:MET:HE1	1.93	0.49
1:A:438:HIS:CD2	1:A:440:TRP:H	2.29	0.49
2:B:286:GLU:HB3	4:B:707:HOH:O	2.12	0.49
1:A:407[A]:LEU:HD12	4:A:1168:HOH:O	2.12	0.49
1:A:471:PHE:O	1:A:472:ARG:HG2	2.13	0.49
2:B:268:GLN:NE2	2:B:306:PRO:HG3	2.28	0.48
1:A:561:TRP:CD2	1:A:561:TRP:C	2.90	0.48
1:A:359:TYR:HA	1:A:360:PRO:C	2.39	0.48
1:A:141:ARG:NH1	4:A:1045:HOH:O	2.47	0.47
2:B:300:ASN:HA	2:B:304:LYS:O	2.15	0.47
1:A:328:PRO:HB3	1:A:332:TYR:CG	2.50	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:240:LEU:HB2	1:A:245:MET:HE1	1.96	0.47
2:B:287:PRO:HG2	2:B:289[B]:LEU:HD11	1.95	0.47
2:B:301:GLU:O	2:B:304:LYS:CG	2.59	0.47
2:B:191:PHE:CE1	2:B:282:GLU:HA	2.50	0.47
1:A:235:GLN:HB2	1:A:245:MET:SD	2.55	0.47
2:B:46:PHE:CE1	2:B:289[B]:LEU:HD21	2.49	0.47
2:B:298:ARG:C	4:B:506:HOH:O	2.57	0.47
1:A:536:GLN:NE2	4:A:1216:HOH:O	2.47	0.46
1:A:560:ASP:O	1:A:561:TRP:CB	2.64	0.46
2:B:176:GLU:HG3	2:B:177:PRO:HD2	1.98	0.46
1:A:91:LEU:HA	1:A:95:ALA:HB3	1.97	0.46
1:A:73:ARG:HA	1:A:74:PRO:HD2	1.76	0.46
1:A:210:ASN:O	1:A:213:GLN:HG2	2.16	0.45
2:B:133:SER:O	2:B:134[B]:LYS:HD3	2.17	0.45
1:A:324:LEU:HD12	1:A:407[B]:LEU:CD2	2.47	0.45
2:B:137:TRP:CH2	2:B:139:VAL:CG2	3.00	0.44
2:B:222:SER:O	2:B:225:GLU:HG2	2.17	0.44
2:B:301:GLU:O	2:B:302:ASN:C	2.60	0.44
1:A:140[B]:MET:HE2	1:A:140[B]:MET:HB3	1.88	0.44
1:A:96:TRP:HA	2:B:227:VAL:HG12	1.99	0.44
1:A:350:LYS:HE3	4:A:896:HOH:O	2.18	0.44
1:A:45:GLN:HB2	1:A:201:GLN:HE22	1.83	0.44
2:B:299:SER:O	2:B:306:PRO:HB3	2.18	0.44
1:A:263:ARG:HD3	1:A:282:GLN:HE22	1.81	0.43
1:A:393:LYS:HD3	2:B:150:ARG:NH2	2.34	0.43
1:A:46:THR:HG22	1:A:48:PRO:HD3	2.00	0.43
1:A:84:LEU:HD23	1:A:84:LEU:C	2.45	0.42
2:B:207:GLY:CA	2:B:298:ARG:HD3	2.49	0.42
2:B:93:HIS:HD2	2:B:96:LYS:H	1.63	0.42
1:A:452:LEU:O	1:A:457:ALA:HB1	2.19	0.42
1:A:283:PRO:HB3	1:A:500:VAL:HG22	2.01	0.42
1:A:560:ASP:O	1:A:561:TRP:HB3	2.19	0.42
1:A:497:ASP:O	1:A:498:GLU:CB	2.67	0.41
1:A:399:GLY:HA2	1:A:400:PRO:HD3	1.94	0.41
2:B:70:LEU:HB2	2:B:139:VAL:CG1	2.42	0.41
1:A:393:LYS:HD3	2:B:150:ARG:HH22	1.85	0.41
2:B:287:PRO:HG2	2:B:289[B]:LEU:HD12	2.03	0.41
1:A:460:ASN:HB3	4:A:1012:HOH:O	2.20	0.41
2:B:108:ASN:C	2:B:109:GLU:HG2	2.45	0.40
1:A:72:TRP:CD1	1:A:74:PRO:HD3	2.57	0.40
1:A:272[A]:GLU:H	1:A:272[A]:GLU:CD	2.30	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:158:ILE:HA	1:A:168:TRP:CD1	2.57	0.40
2:B:300:ASN:OD1	2:B:306:PRO:HD3	2.21	0.40
1:A:292:HIS:ND1	1:A:293:HIS:CD2	2.89	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	A	524/569 (92%)	508 (97%)	15 (3%)	1 (0%)	43	29
2	B	302/348 (87%)	298 (99%)	4 (1%)	0	100	100
All	All	826/917 (90%)	806 (98%)	19 (2%)	1 (0%)	48	34

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	498	GLU

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	A	428/466 (92%)	419 (98%)	9 (2%)	47	24
2	B	260/295 (88%)	257 (99%)	3 (1%)	63	47

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
All	All	688/761 (90%)	676 (98%)	12 (2%)	51	32

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	45	GLN
1	A	192	GLU
1	A	196	ARG
1	A	341	LEU
1	A	392	LYS
1	A	443	LEU
1	A	458	THR
1	A	472	ARG
1	A	561	TRP
2	B	109	GLU
2	B	139	VAL
2	B	301	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	45	GLN
1	A	215	ASN
1	A	235	GLN
1	A	255	HIS
1	A	267	GLN
1	A	269	HIS
1	A	282	GLN
1	A	293	HIS
1	A	319	ASN
1	A	361	GLN
1	A	460	ASN
1	A	536	GLN
2	B	93	HIS
2	B	108	ASN
2	B	302	ASN

5.3.3 RNA ⓘ

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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

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 [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	517/569 (90%)	-0.20	13 (2%) 58 66	11, 19, 37, 65	9 (1%)
2	B	301/348 (86%)	-0.08	7 (2%) 61 69	10, 23, 41, 78	3 (0%)
All	All	818/917 (89%)	-0.15	20 (2%) 59 68	10, 20, 40, 78	12 (1%)

All (20) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	79	TRP	6.9
1	A	457	ALA	4.6
1	A	561	TRP	4.3
2	B	306	PRO	3.7
2	B	302	ASN	3.6
2	B	139	VAL	3.2
1	A	245	MET	3.0
1	A	78	LEU	3.0
2	B	305	PRO	3.0
1	A	80	PRO	2.8
1	A	393	LYS	2.7
2	B	299	SER	2.7
1	A	46	THR	2.7
1	A	470	TRP	2.6
1	A	471	PHE	2.6
2	B	303	GLY	2.5
2	B	307	PRO	2.4
1	A	458	THR	2.2
1	A	81	MET	2.1
1	A	484	GLU	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 oligosaccharides 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, 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	B-factors($\text{\AA}^2$)	Q<0.9
3	CA	A	601	1/1	0.99	0.08	22,22,22,22	0

6.5 Other polymers [i](#)

There are no such residues in this entry.