Full wwPDB X-ray Structure Validation Report ⓘ

May 25, 2020 – 08:56 am BST

PDB ID	:	5AEM
Title	:	Structure of t131 N-terminal TPR array
Authors	:	Taylor, N.M.I.; Muller, C.W.
Deposited on	:	2015-01-05
Resolution	:	3.40 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 following versions of software and data (see references ①) were used in the production of this report:

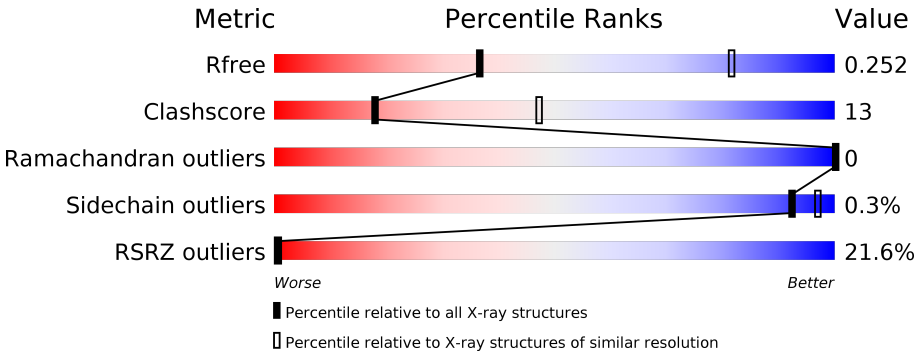
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.11
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.11

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 3.40 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	1026 (3.48-3.32)
Clashscore	141614	1055 (3.48-3.32)
Ramachandran outliers	138981	1038 (3.48-3.32)
Sidechain outliers	138945	1038 (3.48-3.32)
RSRZ outliers	127900	2173 (3.50-3.30)

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 >=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 <=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	447	20% 66% 26% 9%

2 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 6689 atoms, of which 3310 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 TRANSCRIPTION FACTOR TAU 131 KDA SUBUNIT.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	407	6689	2169	3310	563	634	13	0	0	0

There are 3 discrepancies between the modelled and reference sequences:

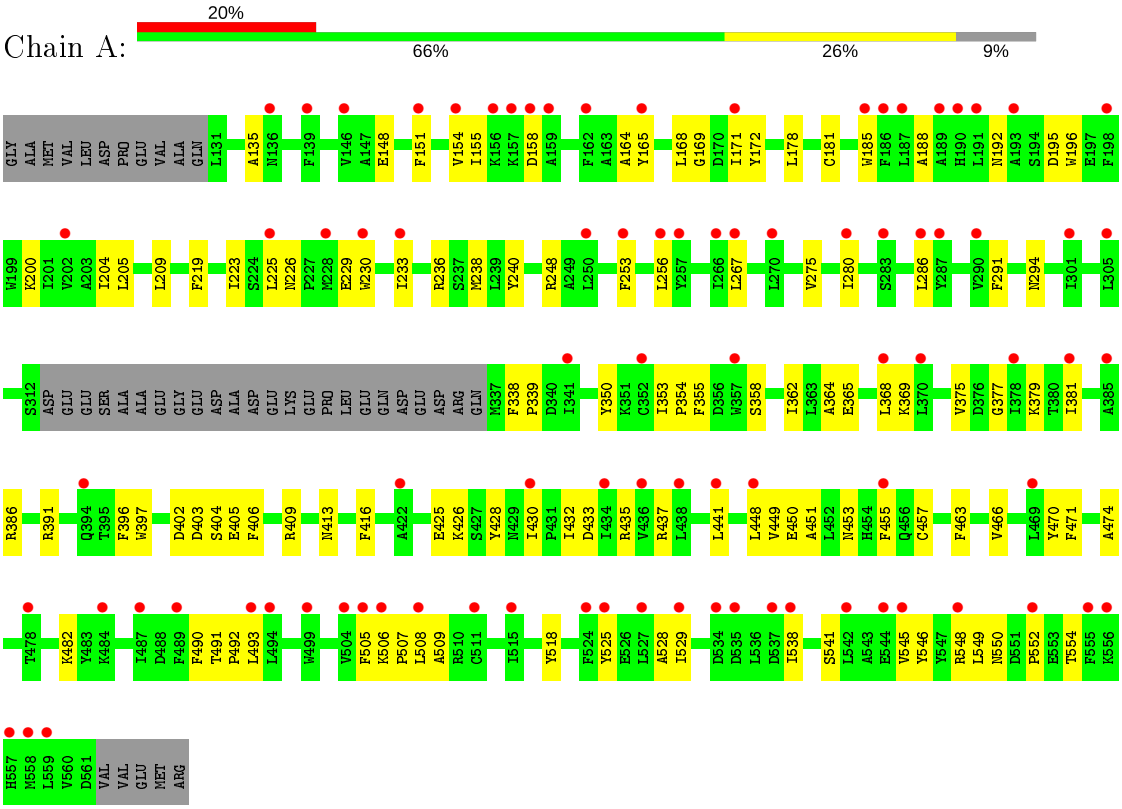
Chain	Residue	Modelled	Actual	Comment	Reference
A	120	GLY	-	expression tag	UNP P33339
A	121	ALA	-	expression tag	UNP P33339
A	122	MET	-	expression tag	UNP P33339

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: TRANSCRIPTION FACTOR TAU 131 KDA SUBUNIT

Chain A:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 43	Depositor
Cell constants a, b, c, α, β, γ	105.13Å 105.13Å 98.74Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	74.34 – 3.40 74.34 – 3.40	Depositor EDS
% Data completeness (in resolution range)	99.6 (74.34-3.40) 99.8 (74.34-3.40)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.84 (at 3.41Å)	Xtriage
Refinement program	PHENIX (PHENIX.REFINE)	Depositor
R, R_{free}	0.209 , 0.244 0.216 , 0.252	Depositor DCC
R_{free} test set	754 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å^2)	135.5	Xtriage
Anisotropy	0.020	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.39 , 106.7	EDS
L-test for twinning[2]	$< \|L\| > = 0.47$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	0.057 for h,-k,-l	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	6689	wwPDB-VP
Average B, all atoms (Å^2)	158.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.85% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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

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	0.33	0/3454	0.54	0/4676

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	A	3379	3310	3304	90	0
All	All	3379	3310	3304	90	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 13.

All (90) 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:A:168:LEU:O	1:A:171:ILE:HG13	1.83	0.79
1:A:448:LEU:HD22	1:A:482:LYS:HD2	1.68	0.76
1:A:406:PHE:HA	1:A:428:TYR:O	1.88	0.73
1:A:196:TRP:HB3	1:A:225:LEU:HD12	1.72	0.70
1:A:466:VAL:O	1:A:466:VAL:HG23	1.92	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:506:LYS:HB2	1:A:507:PRO:HD3	1.77	0.67
1:A:402:ASP:HB3	1:A:404:SER:HB2	1.77	0.66
1:A:509:ALA:HB1	1:A:525:TYR:CD2	2.31	0.65
1:A:409:ARG:NH2	1:A:450:GLU:OE2	2.31	0.64
1:A:358:SER:O	1:A:362:ILE:HG12	1.99	0.63
1:A:240:TYR:CE2	1:A:248:ARG:HB3	2.33	0.63
1:A:233:ILE:HG22	1:A:256:LEU:HD11	1.80	0.62
1:A:491:THR:HG22	1:A:492:PRO:HD3	1.81	0.62
1:A:365:GLU:OE1	1:A:437:ARG:NH1	2.35	0.60
1:A:240:TYR:CD2	1:A:248:ARG:CB	2.86	0.58
1:A:169:GLY:HA3	1:A:185:TRP:NE1	2.18	0.58
1:A:402:ASP:CB	1:A:404:SER:HB2	2.33	0.58
1:A:425:GLU:O	1:A:426:LYS:HG3	2.04	0.58
1:A:402:ASP:O	1:A:403:ASP:CB	2.52	0.58
1:A:491:THR:CG2	1:A:492:PRO:HD3	2.35	0.56
1:A:240:TYR:CD2	1:A:248:ARG:HB2	2.41	0.56
1:A:200:LYS:NZ	1:A:229:GLU:CD	2.59	0.56
1:A:196:TRP:HB3	1:A:225:LEU:CD1	2.35	0.56
1:A:435:ARG:HD3	1:A:457:CYS:SG	2.46	0.56
1:A:509:ALA:HB1	1:A:525:TYR:CE2	2.41	0.55
1:A:226:ASN:OD1	1:A:229:GLU:N	2.40	0.55
1:A:402:ASP:O	1:A:403:ASP:HB3	2.07	0.55
1:A:240:TYR:CE2	1:A:248:ARG:CB	2.90	0.54
1:A:200:LYS:NZ	1:A:229:GLU:OE2	2.38	0.53
1:A:148:GLU:O	1:A:151:PHE:HB3	2.09	0.53
1:A:294:ASN:OD1	1:A:355:PHE:HB2	2.09	0.53
1:A:554:THR:O	1:A:554:THR:HG22	2.09	0.53
1:A:155:ILE:C	1:A:155:ILE:HD12	2.29	0.52
1:A:550:ASN:C	1:A:552:PRO:HD2	2.30	0.52
1:A:365:GLU:OE2	1:A:369:LYS:HE3	2.10	0.52
1:A:471:PHE:HB2	1:A:493:LEU:HD21	1.93	0.51
1:A:267:LEU:HD11	1:A:286:LEU:HG	1.93	0.51
1:A:151:PHE:CE2	1:A:164:ALA:HA	2.47	0.50
1:A:406:PHE:CD1	1:A:430:ILE:HG23	2.47	0.50
1:A:375:VAL:O	1:A:379:LYS:HG2	2.12	0.50
1:A:192:ASN:O	1:A:192:ASN:OD1	2.30	0.50
1:A:240:TYR:CD2	1:A:248:ARG:HB3	2.46	0.50
1:A:240:TYR:HD2	1:A:248:ARG:HB2	1.78	0.49
1:A:353:ILE:HG23	1:A:354:PRO:HD2	1.95	0.49
1:A:386:ARG:HG3	1:A:391:ARG:NH1	2.28	0.49
1:A:413:ASN:HB3	1:A:416:PHE:HB3	1.95	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:165:TYR:CB	1:A:188:ALA:HB2	2.44	0.48
1:A:155:ILE:O	1:A:158:ASP:O	2.32	0.48
1:A:432:ILE:HG23	1:A:433:ASP:N	2.28	0.48
1:A:377:GLY:O	1:A:381:ILE:HG12	2.14	0.47
1:A:396:PHE:CE1	1:A:397:TRP:CE2	3.02	0.47
1:A:275:VAL:HG22	1:A:280:ILE:HD13	1.97	0.47
1:A:238:MET:HG3	1:A:253:PHE:HZ	1.80	0.47
1:A:463:PHE:CD1	1:A:470:TYR:CE2	3.03	0.46
1:A:226:ASN:C	1:A:226:ASN:OD1	2.54	0.46
1:A:368:LEU:HD12	1:A:441:LEU:HD13	1.96	0.46
1:A:178:LEU:O	1:A:181:CYS:HB3	2.15	0.46
1:A:451:ALA:O	1:A:455:PHE:CD2	2.69	0.46
1:A:219:PHE:HB3	1:A:236:ARG:HB2	1.99	0.45
1:A:490:PHE:HB3	1:A:508:LEU:HG	1.99	0.44
1:A:554:THR:CG2	1:A:554:THR:O	2.65	0.44
1:A:364:ALA:HA	1:A:381:ILE:HD11	1.98	0.44
1:A:425:GLU:O	1:A:426:LYS:CG	2.65	0.44
1:A:538:ILE:O	1:A:541:SER:HB3	2.18	0.44
1:A:405:GLU:HG3	1:A:406:PHE:CD2	2.53	0.44
1:A:466:VAL:O	1:A:466:VAL:CG2	2.62	0.44
1:A:205:LEU:O	1:A:209:LEU:HG	2.17	0.44
1:A:135:ALA:HB1	1:A:154:VAL:HG21	1.99	0.44
1:A:238:MET:HG3	1:A:253:PHE:CZ	2.52	0.43
1:A:525:TYR:O	1:A:529:ILE:HG13	2.19	0.43
1:A:169:GLY:HA3	1:A:185:TRP:CE2	2.52	0.43
1:A:416:PHE:CD1	1:A:416:PHE:C	2.90	0.43
1:A:164:ALA:O	1:A:168:LEU:HD13	2.18	0.43
1:A:192:ASN:ND2	1:A:195:ASP:HB2	2.33	0.43
1:A:238:MET:CG	1:A:253:PHE:HZ	2.31	0.42
1:A:545:VAL:HG12	1:A:554:THR:HG23	2.02	0.42
1:A:449:VAL:O	1:A:453:ASN:ND2	2.47	0.42
1:A:518:TYR:HB2	1:A:548:ARG:HB2	2.00	0.42
1:A:223:ILE:HA	1:A:226:ASN:O	2.19	0.42
1:A:291:PHE:HB2	1:A:355:PHE:CE2	2.55	0.42
1:A:505:PHE:HB3	1:A:528:ALA:HB2	2.02	0.42
1:A:168:LEU:O	1:A:172:TYR:CD2	2.73	0.42
1:A:230:TRP:CE2	1:A:256:LEU:HD23	2.54	0.42
1:A:432:ILE:CG2	1:A:433:ASP:N	2.83	0.42
1:A:546:TYR:C	1:A:546:TYR:CD1	2.93	0.42
1:A:474:ALA:HB1	1:A:490:PHE:CD2	2.55	0.41
1:A:546:TYR:O	1:A:549:LEU:O	2.38	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:338:PHE:HB3	1:A:339:PRO:CD	2.50	0.41
1:A:192:ASN:O	1:A:192:ASN:CG	2.60	0.40
1:A:200:LYS:O	1:A:204:ILE:HG23	2.21	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	403/447 (90%)	397 (98%)	6 (2%)	0	100 100

There are no Ramachandran outliers to report.

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	363/396 (92%)	362 (100%)	1 (0%)	92 97

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	350	TYR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such

sidechains are listed below:

Mol	Chain	Res	Type
1	A	211	HIS

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

There are no ligands in this entry.

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^{th} 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	407/447 (91%)	1.26	88 (21%) 0 1	94, 134, 222, 247	0

All (88) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	537	ASP	7.6
1	A	548	ARG	6.7
1	A	558	MET	6.0
1	A	146	VAL	5.6
1	A	534	ASP	5.3
1	A	159	ALA	5.3
1	A	544	GLU	5.1
1	A	555	PHE	4.6
1	A	508	LEU	4.5
1	A	270	LEU	4.4
1	A	154	VAL	4.1
1	A	165	TYR	4.0
1	A	230	TRP	3.8
1	A	542	LEU	3.7
1	A	283	SER	3.7
1	A	301	ILE	3.7
1	A	162	PHE	3.7
1	A	559	LEU	3.6
1	A	556	LYS	3.6
1	A	286	LEU	3.5
1	A	499	TRP	3.5
1	A	190	HIS	3.5
1	A	381	ILE	3.4
1	A	511	CYS	3.4
1	A	441	LEU	3.3
1	A	253	PHE	3.3
1	A	185	TRP	3.3

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Mol	Chain	Res	Type	RSRZ
1	A	436	VAL	3.3
1	A	430	ILE	3.2
1	A	504	VAL	3.2
1	A	535	ASP	3.2
1	A	352	CYS	3.1
1	A	557	HIS	3.1
1	A	136	ASN	3.1
1	A	233	ILE	3.0
1	A	552	PRO	3.0
1	A	266	ILE	2.9
1	A	186	PHE	2.9
1	A	394	GLN	2.8
1	A	157	LYS	2.8
1	A	191	LEU	2.8
1	A	494	LEU	2.8
1	A	484	LYS	2.8
1	A	505	PHE	2.7
1	A	487	ILE	2.7
1	A	156	LYS	2.7
1	A	529	ILE	2.7
1	A	202	VAL	2.6
1	A	287	TYR	2.6
1	A	171	ILE	2.6
1	A	225	LEU	2.6
1	A	378	ILE	2.6
1	A	493	LEU	2.5
1	A	385	ALA	2.5
1	A	525	TYR	2.5
1	A	187	LEU	2.5
1	A	158	ASP	2.5
1	A	489	PHE	2.5
1	A	538	ILE	2.4
1	A	305	LEU	2.4
1	A	250	LEU	2.4
1	A	545	VAL	2.4
1	A	524	PHE	2.4
1	A	438	LEU	2.4
1	A	139	PHE	2.3
1	A	193	ALA	2.3
1	A	506	LYS	2.3
1	A	280	ILE	2.3
1	A	357	TRP	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	151	PHE	2.3
1	A	422	ALA	2.3
1	A	228	MET	2.3
1	A	189	ALA	2.2
1	A	368	LEU	2.2
1	A	448	LEU	2.2
1	A	469	LEU	2.2
1	A	198	PHE	2.2
1	A	478	THR	2.2
1	A	290	VAL	2.2
1	A	257	TYR	2.2
1	A	515	ILE	2.2
1	A	527	LEU	2.1
1	A	256	LEU	2.1
1	A	455	PHE	2.1
1	A	341	ILE	2.1
1	A	434	ILE	2.1
1	A	267	LEU	2.1
1	A	370	LEU	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 carbohydrates in this entry.

6.4 Ligands (i)

There are no ligands in this entry.

6.5 Other polymers (i)

There are no such residues in this entry.