



# wwPDB/EMDataBank EM Map/Model Validation Summary Report ⓘ

Mar 5, 2018 – 12:16 PM EST

PDB ID : 5XB1  
EMDB ID: : EMD-6714  
Title : human ferritin mutant - E-helix deletion  
Authors : Lee, S.G.; Ahn, B.J.; Jeong, H.; Kim, H.; Hyun, J.; Jung, Y.  
Deposited on : 2017-03-15  
Resolution : 3.00 Å(reported)  
Based on PDB ID : 4Y08

This is a wwPDB/EMDataBank EM Map/Model Validation Summary Report  
for a publicly released PDB/EMDB 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/EMValidationReportHelp>  
with specific help available everywhere you see the ⓘ symbol.

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MolProbity : 4.02b-467  
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)  
Validation Pipeline (wwPDB-VP) : rb-20030736

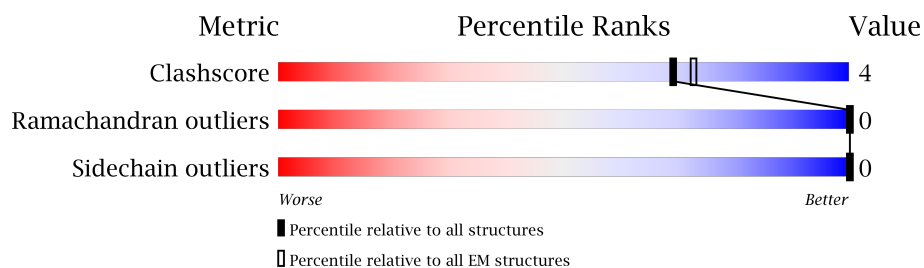
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*ELECTRON MICROSCOPY*

The reported resolution of this entry is 3.00 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)	EM structures (#Entries)
Clashscore	125131	1336
Ramachandran outliers	121729	1120
Sidechain outliers	121581	1026

The table below summarises the geometric issues observed across the polymeric chains. The red, orange, yellow and green segments on the 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  $\leq 5\%$ .

Mol	Chain	Length	Quality of chain
1	A	160	86% 11% .
1	B	160	86% 11% .
1	C	160	88% 9% .
1	D	160	87% 10% .
1	E	160	87% 10% .
1	F	160	87% 10% .
1	G	160	87% 9% . .
1	H	160	86% 11% .
1	I	160	88% 9% .

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Mol	Chain	Length	Quality of chain
1	J	160	 87% 9% ..
1	K	160	 86% 11% .
1	L	160	 88% 9% .
1	M	160	 87% 10% .
1	N	160	 84% 12% ..
1	O	160	 85% 12% .
1	P	160	 88% 9% .
1	Q	160	 86% 11% .
1	R	160	 84% 13% .
1	S	160	 85% 12% .
1	T	160	 89% 8% .
1	U	160	 86% 11% .
1	V	160	 86% 11% .
1	W	160	 86% 11% .
1	X	160	 88% 9% .

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 30847 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 Ferritin heavy chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	B	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	C	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	D	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	E	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	F	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	G	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	H	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	I	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	J	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	K	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	L	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	M	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	N	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	O	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	P	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	Q	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		

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Mol	Chain	Residues	Atoms					AltConf	Trace
1	R	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	S	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	T	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	U	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	V	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	W	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		
1	X	155	Total	C	N	O	S	0	0
			1283	802	228	246	7		

- Molecule 2 is water.

Mol	Chain	Residues	Atoms		AltConf
2	A	2	Total	O	0
			2	2	
2	B	4	Total	O	0
			4	4	
2	C	1	Total	O	0
			1	1	
2	D	2	Total	O	0
			2	2	
2	E	3	Total	O	0
			3	3	
2	F	1	Total	O	0
			1	1	
2	G	2	Total	O	0
			2	2	
2	H	2	Total	O	0
			2	2	
2	I	2	Total	O	0
			2	2	
2	J	2	Total	O	0
			2	2	
2	K	2	Total	O	0
			2	2	
2	L	3	Total	O	0
			3	3	

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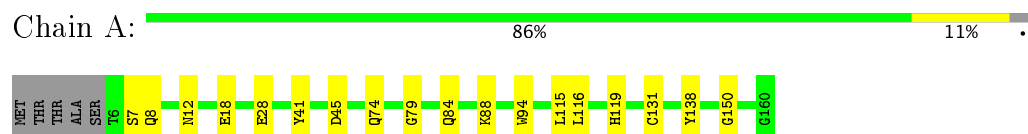
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Mol	Chain	Residues	Atoms		AltConf
2	M	5	Total 5	O 5	0
2	N	2	Total 2	O 2	0
2	O	4	Total 4	O 4	0
2	P	3	Total 3	O 3	0
2	Q	2	Total 2	O 2	0
2	R	2	Total 2	O 2	0
2	S	2	Total 2	O 2	0
2	T	2	Total 2	O 2	0
2	U	2	Total 2	O 2	0
2	V	1	Total 1	O 1	0
2	W	2	Total 2	O 2	0
2	X	2	Total 2	O 2	0

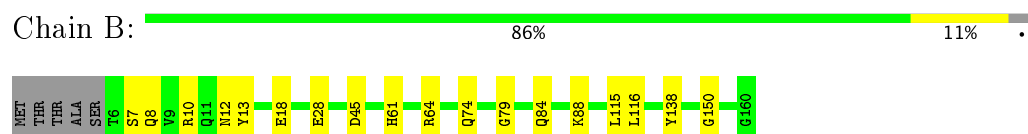
### 3 Residue-property plots [i](#)

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. 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. 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.

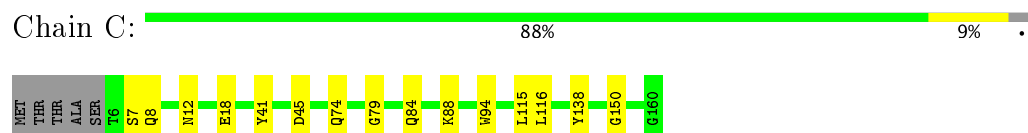
- Molecule 1: Ferritin heavy chain



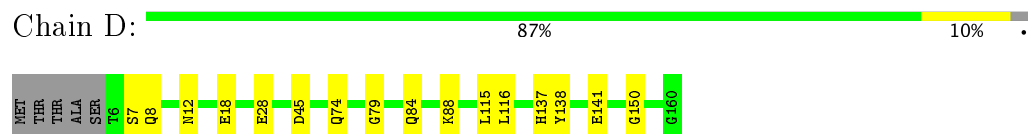
- Molecule 1: Ferritin heavy chain



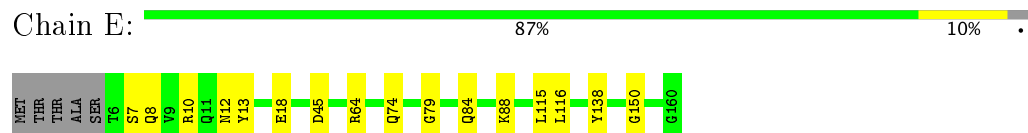
- Molecule 1: Ferritin heavy chain



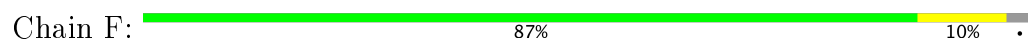
- Molecule 1: Ferritin heavy chain



- Molecule 1: Ferritin heavy chain



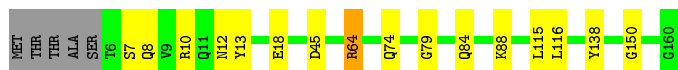
- Molecule 1: Ferritin heavy chain





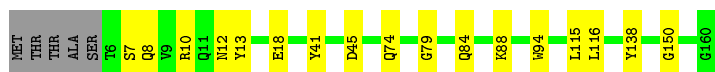
- Molecule 1: Ferritin heavy chain

Chain G: 87% 9% ..



- Molecule 1: Ferritin heavy chain

Chain H: 86% 11% .



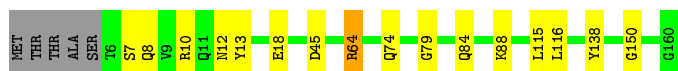
- Molecule 1: Ferritin heavy chain

Chain I: 88% 9% .



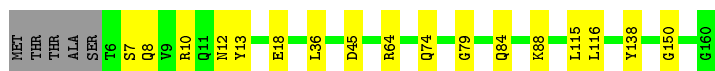
- Molecule 1: Ferritin heavy chain

Chain J: 87% 9% ..



- Molecule 1: Ferritin heavy chain

Chain K: 86% 11% .



- Molecule 1: Ferritin heavy chain

Chain L: 88% 9% .




- Molecule 1: Ferritin heavy chain

Chain M: 87% 10% .






## ● Molecule 1: Ferritin heavy chain

Chain N:  84% 12% ..


## ● Molecule 1: Ferritin heavy chain

Chain O:  85% 12% .


## ● Molecule 1: Ferritin heavy chain

Chain P:  88% 9% .


## ● Molecule 1: Ferritin heavy chain

Chain Q:  86% 11% .

## ● Molecule 1: Ferritin heavy chain

Chain R:  84% 13% .


## ● Molecule 1: Ferritin heavy chain

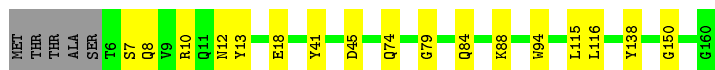
Chain S:  85% 12% .

## ● Molecule 1: Ferritin heavy chain


Chain T:  89% 8% .

## ● Molecule 1: Ferritin heavy chain

Chain U:  86% 11% .




- Molecule 1: Ferritin heavy chain

Chain V:  86% 11% .




- Molecule 1: Ferritin heavy chain

Chain W:  86% 11% .



- Molecule 1: Ferritin heavy chain

Chain X:  88% 9% .



## 4 Experimental information

Property	Value	Source
Reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, O	Depositor
Number of particles used	429135	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	2	Depositor
Minimum defocus (nm)	Not provided	Depositor
Maximum defocus (nm)	Not provided	Depositor
Magnification	47000	Depositor
Image detector	FEI FALCON II (4k x 4k)	Depositor

## 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  >2	RMSZ	# Z  >2
1	A	0.39	0/1308	0.47	0/1760
1	B	0.41	0/1308	0.50	0/1760
1	C	0.39	0/1308	0.47	0/1760
1	D	0.42	0/1308	0.49	0/1760
1	E	0.40	0/1308	0.47	0/1760
1	F	0.40	0/1308	0.48	0/1760
1	G	0.41	0/1308	0.53	2/1760 (0.1%)
1	H	0.40	0/1308	0.48	0/1760
1	I	0.40	0/1308	0.47	0/1760
1	J	0.41	0/1308	0.54	1/1760 (0.1%)
1	K	0.40	0/1308	0.47	0/1760
1	L	0.39	0/1308	0.46	0/1760
1	M	0.40	0/1308	0.47	0/1760
1	N	0.42	0/1308	0.52	1/1760 (0.1%)
1	O	0.40	0/1308	0.48	0/1760
1	P	0.39	0/1308	0.47	0/1760
1	Q	0.39	0/1308	0.46	0/1760
1	R	0.40	0/1308	0.48	0/1760
1	S	0.41	0/1308	0.49	0/1760
1	T	0.39	0/1308	0.46	0/1760
1	U	0.39	0/1308	0.47	0/1760
1	V	0.40	0/1308	0.47	0/1760
1	W	0.40	0/1308	0.48	0/1760
1	X	0.39	0/1308	0.46	0/1760
All	All	0.40	0/31392	0.48	4/42240 (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	J	64	ARG	NE-CZ-NH1	-8.69	115.95	120.30
1	G	64	ARG	NE-CZ-NH1	-8.54	116.03	120.30
1	N	64	ARG	NE-CZ-NH1	-6.69	116.96	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	64	ARG	NE-CZ-NH2	5.03	122.82	120.30

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	1283	0	1235	16	0
1	B	1283	0	1235	22	0
1	C	1283	0	1235	13	0
1	D	1283	0	1235	15	0
1	E	1283	0	1235	15	0
1	F	1283	0	1235	15	0
1	G	1283	0	1235	16	0
1	H	1283	0	1235	14	0
1	I	1283	0	1235	13	0
1	J	1283	0	1235	16	0
1	K	1283	0	1235	16	0
1	L	1283	0	1235	13	0
1	M	1283	0	1235	14	0
1	N	1283	0	1235	21	0
1	O	1283	0	1235	16	0
1	P	1283	0	1235	13	0
1	Q	1283	0	1235	15	0
1	R	1283	0	1235	17	0
1	S	1283	0	1235	20	0
1	T	1283	0	1235	12	0
1	U	1283	0	1235	14	0
1	V	1283	0	1235	18	0
1	W	1283	0	1235	17	0
1	X	1283	0	1235	13	0
2	A	2	0	0	1	0
2	B	4	0	0	1	0
2	C	1	0	0	0	0
2	D	2	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	E	3	0	0	0	0
2	F	1	0	0	0	0
2	G	2	0	0	1	0
2	H	2	0	0	0	0
2	I	2	0	0	0	0
2	J	2	0	0	0	0
2	K	2	0	0	0	0
2	L	3	0	0	0	0
2	M	5	0	0	1	0
2	N	2	0	0	0	0
2	O	4	0	0	0	0
2	P	3	0	0	0	0
2	Q	2	0	0	0	0
2	R	2	0	0	0	0
2	S	2	0	0	0	0
2	T	2	0	0	0	0
2	U	2	0	0	0	0
2	V	1	0	0	0	0
2	W	2	0	0	0	0
2	X	2	0	0	0	0
All	All	30847	0	29640	260	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 4.

The worst 5 of 260 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:J:64:ARG:HH12	1:V:64:ARG:CZ	1.91	0.83
1:G:64:ARG:HH12	1:S:64:ARG:CZ	1.96	0.77
1:J:64:ARG:HH12	1:V:64:ARG:NH1	1.83	0.76
1:H:12:ASN:HD22	1:J:116:LEU:HD13	1.51	0.75
1:I:116:LEU:HD13	1:K:12:ASN:HD22	1.52	0.74

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 PDB entries followed by that with respect to all EM entries.

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	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	B	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	C	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	D	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	E	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	F	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	G	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	H	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	I	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	J	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	K	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	L	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	M	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	N	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	O	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	P	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	Q	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	R	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	S	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	T	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	U	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	V	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	W	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
1	X	153/160 (96%)	150 (98%)	3 (2%)	0	100	100
All	All	3672/3840 (96%)	3600 (98%)	72 (2%)	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 PDB entries followed by that with respect to all EM entries.

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	140/144 (97%)	140 (100%)	0	100	100
1	B	140/144 (97%)	140 (100%)	0	100	100
1	C	140/144 (97%)	140 (100%)	0	100	100
1	D	140/144 (97%)	140 (100%)	0	100	100
1	E	140/144 (97%)	140 (100%)	0	100	100
1	F	140/144 (97%)	140 (100%)	0	100	100
1	G	140/144 (97%)	140 (100%)	0	100	100
1	H	140/144 (97%)	140 (100%)	0	100	100
1	I	140/144 (97%)	140 (100%)	0	100	100
1	J	140/144 (97%)	140 (100%)	0	100	100
1	K	140/144 (97%)	140 (100%)	0	100	100
1	L	140/144 (97%)	140 (100%)	0	100	100
1	M	140/144 (97%)	140 (100%)	0	100	100
1	N	140/144 (97%)	140 (100%)	0	100	100
1	O	140/144 (97%)	140 (100%)	0	100	100
1	P	140/144 (97%)	140 (100%)	0	100	100
1	Q	140/144 (97%)	140 (100%)	0	100	100
1	R	140/144 (97%)	140 (100%)	0	100	100
1	S	140/144 (97%)	140 (100%)	0	100	100
1	T	140/144 (97%)	140 (100%)	0	100	100
1	U	140/144 (97%)	140 (100%)	0	100	100
1	V	140/144 (97%)	140 (100%)	0	100	100
1	W	140/144 (97%)	140 (100%)	0	100	100
1	X	140/144 (97%)	140 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
All	All	3360/3456 (97%)	3360 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 53 such sidechains are listed below:

Mol	Chain	Res	Type
1	K	74	GLN
1	N	74	GLN
1	W	12	ASN
1	L	12	ASN
1	M	12	ASN

### 5.3.3 RNA [i](#)

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 carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

## 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.