



# Full wwPDB NMR Structure Validation Report ⓘ

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PDB ID : 2K5C  
BMRB ID : 15828  
Title : NMR Structure for PF0385  
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This is a Full wwPDB NMR 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/NMRValidationReportHelp>

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  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
wwPDB-RCI : v\_1n\_11\_5\_13\_A (Berjanski et al., 2005)  
PANAV : Wang et al. (2010)  
wwPDB-ShiftChecker : v1.2  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36.2

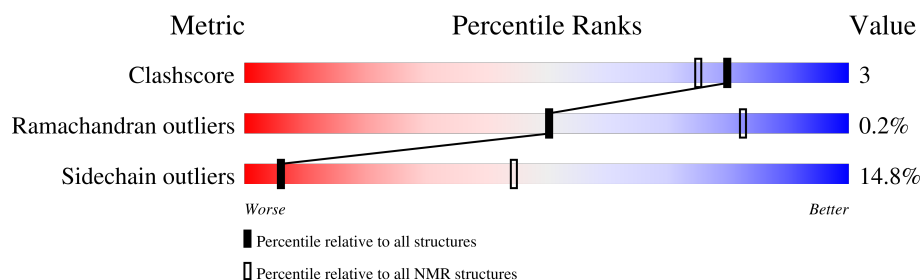
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*SOLUTION NMR*

The overall completeness of chemical shifts assignment is 63%.

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)	NMR archive (#Entries)
Clashscore	158937	12864
Ramachandran outliers	154571	11451
Sidechain outliers	154315	11428

The table below summarises the geometric issues observed across the polymeric chains and their fit to the experimental data. The red, orange, yellow and green segments indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. A cyan segment indicates the fraction of residues that are not part of the well-defined cores, and 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	95	

## 2 Ensemble composition and analysis

This entry contains 10 models. Model 1 is the overall representative, medoid model (most similar to other models).

The following residues are included in the computation of the global validation metrics.

Well-defined (core) protein residues			
Well-defined core	Residue range (total)	Backbone RMSD (Å)	Medoid model
1	A:8-A:95 (88)	0.67	1

Ill-defined regions of proteins are excluded from the global statistics.

Ligands and non-protein polymers are included in the analysis.

The models can be grouped into 2 clusters and 4 single-model clusters were found.

Cluster number	Models
1	1, 7, 8, 10
2	2, 4
Single-model clusters	3; 5; 6; 9

### 3 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 1468 atoms, of which 733 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called uncharacterized protein PF0385.

Mol	Chain	Residues	Atoms						Trace
1	A	88	Total	C	H	N	O	S	0
			1467	475	733	119	134	6	

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	ALA	-	expression tag	UNP Q8U3S0
A	2	HIS	-	expression tag	UNP Q8U3S0
A	3	HIS	-	expression tag	UNP Q8U3S0
A	4	HIS	-	expression tag	UNP Q8U3S0
A	5	HIS	-	expression tag	UNP Q8U3S0
A	6	HIS	-	expression tag	UNP Q8U3S0
A	7	HIS	-	expression tag	UNP Q8U3S0

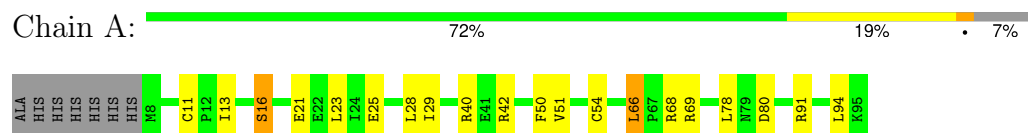
- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms	
2	A	1	Total	Zn
			1	1



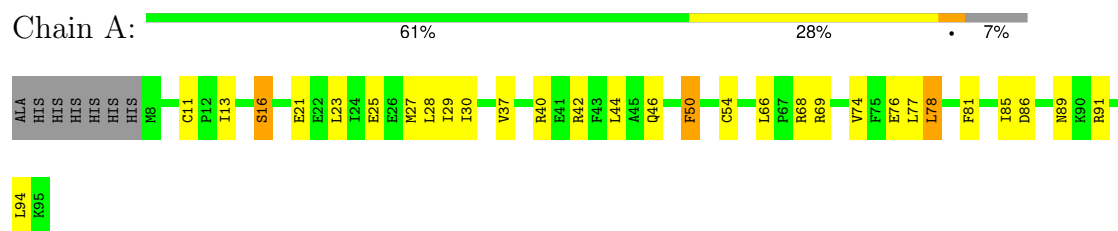
### 4.2.3 Score per residue for model 3

- Molecule 1: uncharacterized protein PF0385



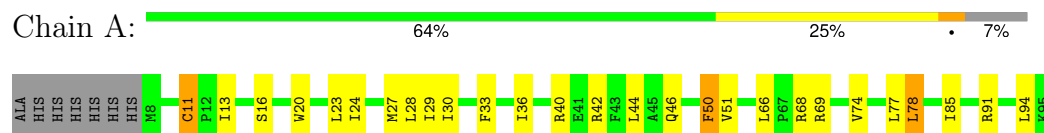
#### 4.2.4 Score per residue for model 4

- Molecule 1: uncharacterized protein PF0385



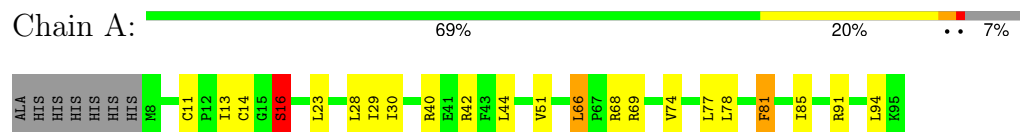
#### 4.2.5 Score per residue for model 5

- Molecule 1: uncharacterized protein PF0385



#### 4.2.6 Score per residue for model 6

- Molecule 1: uncharacterized protein PF0385



#### 4.2.7 Score per residue for model 7

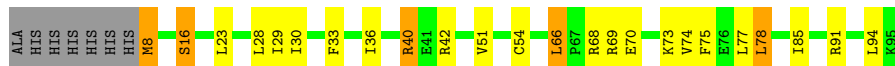
- Molecule 1: uncharacterized protein PF0385





#### 4.2.8 Score per residue for model 8

- Molecule 1: uncharacterized protein PF0385



#### 4.2.9 Score per residue for model 9

- Molecule 1: uncharacterized protein PF0385



#### 4.2.10 Score per residue for model 10

- Molecule 1: uncharacterized protein PF0385



## 5 Refinement protocol and experimental data overview

The models were refined using the following method: *simulated annealing*.

Of the 50 calculated structures, 10 were deposited, based on the following criterion: *structures with the lowest energy*.

The following table shows the software used for structure solution, optimisation and refinement.

Software name	Classification	Version
X-PLOR NIH	refinement	
CYANA	structure solution	

The following table shows chemical shift validation statistics as aggregates over all chemical shift files. Detailed validation can be found in section 7 of this report.

Chemical shift file(s)	working_cs.cif
Number of chemical shift lists	1
Total number of shifts	799
Number of shifts mapped to atoms	799
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	63%



## 6 Model quality

### 6.1 Standard geometry

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

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 (average) 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	1.31±0.03	3±1/749 ( 0.4± 0.1%)	1.00±0.02	5±0/1001 ( 0.5± 0.0%)
All	All	1.31	32/7490 ( 0.4%)	1.00	50/10010 ( 0.5%)

All unique bond outliers are listed below. They are sorted according to the Z-score of the worst occurrence in the ensemble.

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)	Models	
								Worst	Total
1	A	16	SER	C-N	5.96	1.45	1.34	7	10
1	A	66	LEU	C-N	5.76	1.45	1.34	6	10
1	A	11	CYS	C-N	5.40	1.44	1.34	2	5
1	A	54	CYS	C-N	5.36	1.44	1.34	10	7

All unique angle outliers are listed below. They are sorted according to the Z-score of the worst occurrence in the ensemble.

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)	Models	
								Worst	Total
1	A	40	ARG	NE-CZ-NH1	7.34	123.97	120.30	5	10
1	A	42	ARG	NE-CZ-NH1	7.22	123.91	120.30	5	10
1	A	91	ARG	NE-CZ-NH1	7.17	123.89	120.30	2	10
1	A	68	ARG	NE-CZ-NH1	7.06	123.83	120.30	1	10
1	A	69	ARG	NE-CZ-NH1	6.93	123.76	120.30	5	10

There are no chirality outliers.

There are no planarity outliers.

## 6.2 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 each 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 averaged over the ensemble.

Mol	Chain	Non-H	H(model)	H(added)	Clashes
1	A	734	733	732	4±2
All	All	7350	7330	7320	39

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 3.

All unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:8:MET:N	1:A:73:LYS:HZ3	0.48	2.07	10	1
1:A:74:VAL:O	1:A:77:LEU:HG	0.48	2.09	4	8
1:A:11:CYS:SG	1:A:13:ILE:HD12	0.46	2.50	7	7
1:A:14:CYS:SG	1:A:16:SER:HB2	0.45	2.52	6	2
1:A:33:PHE:HA	1:A:36:ILE:HD12	0.43	1.91	8	3
1:A:8:MET:N	1:A:73:LYS:HZ2	0.43	2.12	8	1
1:A:74:VAL:O	1:A:78:LEU:HD12	0.42	2.14	10	6
1:A:21:GLU:O	1:A:25:GLU:HB2	0.42	2.15	4	2
1:A:37:VAL:O	1:A:78:LEU:HD23	0.42	2.15	7	2
1:A:46:GLN:O	1:A:50:PHE:HB2	0.41	2.15	7	3
1:A:43:PHE:O	1:A:47:VAL:HG23	0.41	2.15	10	2
1:A:44:LEU:HD21	1:A:71:ALA:O	0.40	2.17	2	1
1:A:20:TRP:O	1:A:24:ILE:HG12	0.40	2.16	5	1

## 6.3 Torsion angles ⓘ

### 6.3.1 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 NMR 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	86/95 (91%)	83±0 (97±0%)	3±1 (3±1%)	0±0 (0±0%)	50	82
All	All	860/950 (91%)	831 (97%)	27 (3%)	2 (0%)	50	82

All 1 unique Ramachandran outliers are listed below.

Mol	Chain	Res	Type	Models (Total)
1	A	81	PHE	2

### 6.3.2 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 PDB entries followed by that with respect to all NMR 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	80/86 (93%)	68±2 (85±2%)	12±2 (15±2%)	6	44
All	All	800/860 (93%)	682 (85%)	118 (15%)	6	44

All 24 unique residues with a non-rotameric sidechain are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type	Models (Total)
1	A	28	LEU	10
1	A	29	ILE	10
1	A	78	LEU	10
1	A	23	LEU	9
1	A	50	PHE	8
1	A	85	ILE	8
1	A	94	LEU	8
1	A	66	LEU	7
1	A	30	ILE	7
1	A	44	LEU	6
1	A	16	SER	6
1	A	51	VAL	6
1	A	40	ARG	4
1	A	75	PHE	3
1	A	27	MET	3
1	A	76	GLU	3
1	A	81	PHE	2
1	A	86	ASP	2
1	A	33	PHE	1
1	A	80	ASP	1
1	A	89	ASN	1
1	A	46	GLN	1
1	A	8	MET	1
1	A	70	GLU	1

### 6.3.3 RNA [i](#)

There are no RNA molecules in this entry.

## 6.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

## 6.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 6.6 Ligand geometry [i](#)

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

## 6.7 Other polymers [i](#)

There are no such molecules in this entry.

## 6.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 7 Chemical shift validation

The completeness of assignment taking into account all chemical shift lists is 63% for the well-defined parts and 63% for the entire structure.

### 7.1 Chemical shift list 1

File name: working\_cs.cif

Chemical shift list name: *assigned\_chem\_shift\_list\_1*

#### 7.1.1 Bookkeeping

The following table shows the results of parsing the chemical shift list and reports the number of nuclei with statistically unusual chemical shifts.

Total number of shifts	799
Number of shifts mapped to atoms	799
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	7

#### 7.1.2 Chemical shift referencing

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction $\pm$ precision, ppm	Suggested action
$^{13}\text{C}_\alpha$	87	$-0.36 \pm 0.12$	None needed ( $< 0.5$ ppm)
$^{13}\text{C}_\beta$	82	$0.46 \pm 0.12$	None needed ( $< 0.5$ ppm)
$^{13}\text{C}'$	0	—	None (insufficient data)
$^{15}\text{N}$	83	$0.54 \pm 0.40$	None needed (imprecise)

#### 7.1.3 Completeness of resonance assignments

The following table shows the completeness of the chemical shift assignments for the well-defined regions of the structure. The overall completeness is 63%, i.e. 799 atoms were assigned a chemical shift out of a possible 1276. 0 out of 14 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	$^1\text{H}$	$^{13}\text{C}$	$^{15}\text{N}$
Backbone	342/437 (78%)	172/177 (97%)	87/176 (49%)	83/84 (99%)
Sidechain	414/736 (56%)	273/472 (58%)	141/235 (60%)	0/29 (0%)

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	Total	<sup>1</sup> H	<sup>13</sup> C	<sup>15</sup> N
Aromatic	43/103 (42%)	21/51 (41%)	20/50 (40%)	2/2 (100%)
Overall	799/1276 (63%)	466/700 (67%)	248/461 (54%)	85/115 (74%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 63%, i.e. 799 atoms were assigned a chemical shift out of a possible 1276. 0 out of 14 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	<sup>1</sup> H	<sup>13</sup> C	<sup>15</sup> N
Backbone	342/437 (78%)	172/177 (97%)	87/176 (49%)	83/84 (99%)
Sidechain	414/736 (56%)	273/472 (58%)	141/235 (60%)	0/29 (0%)
Aromatic	43/103 (42%)	21/51 (41%)	20/50 (40%)	2/2 (100%)
Overall	799/1276 (63%)	466/700 (67%)	248/461 (54%)	85/115 (74%)

#### 7.1.4 Statistically unusual chemical shifts ⓘ

The following table lists the statistically unusual chemical shifts. These are statistical measures, and large deviations from the mean do not necessarily imply incorrect assignments. Molecules containing paramagnetic centres or hemes are expected to give rise to anomalous chemical shifts.

List Id	Chain	Res	Type	Atom	Shift, ppm	Expected range, ppm	Z-score
1	A	24	ILE	CD1	79.34	5.18 – 21.60	40.2
1	A	36	ILE	CG1	17.52	19.24 – 36.26	-6.0
1	A	85	ILE	HG21	-0.75	-0.56 – 2.11	-5.7
1	A	85	ILE	HG22	-0.75	-0.56 – 2.11	-5.7
1	A	85	ILE	HG23	-0.75	-0.56 – 2.11	-5.7
1	A	52	PHE	HB2	1.12	1.20 – 4.80	-5.2
1	A	34	GLU	HB2	0.99	1.00 – 3.05	-5.0

#### 7.1.5 Random Coil Index (RCI) plots ⓘ

The image below reports *random coil index* values for the protein chains in the structure. The height of each bar gives a probability of a given residue to be disordered, as predicted from the available chemical shifts and the amino acid sequence. A value above 0.2 is an indication of significant predicted disorder. The colour of the bar shows whether the residue is in the well-defined core (black) or in the ill-defined residue ranges (cyan), as described in section 2 on ensemble composition. If well-defined core and ill-defined regions are not identified then it is shown as gray bars.

Random coil index (RCI) for chain A:

