



# Full wwPDB NMR Structure Validation Report ⓘ

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PDB ID : 6NU0  
Title : Solution NMR structure of 1918 NS1 effector domain  
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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.

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

Cyrange : Kirchner and Güntert (2011)  
NmrClust : Kelley et al. (1996)  
MolProbity : 4.02b-467  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
RCI : v\_1n\_11\_5\_13\_A (Berjanski et al., 2005)  
PANAV : Wang et al. (2010)  
ShiftChecker : 2.11  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.11

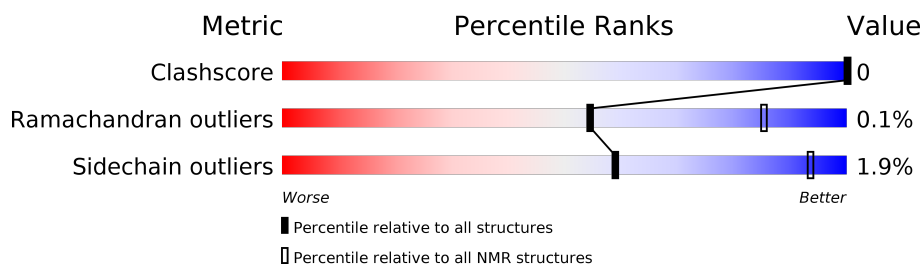
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*SOLUTION NMR*

The overall completeness of chemical shifts assignment is 84%.

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	230	

## 2 Ensemble composition and analysis

This entry contains 20 models. Model 20 is the overall representative, medoid model (most similar to other models). The authors have identified model 1 as representative, based on the following criterion: *lowest energy*.

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:90-A:136, A:144-A:163, A:170-A:202 (100)	0.33	20

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 4 clusters and 3 single-model clusters were found.

Cluster number	Models
1	1, 3, 5, 8, 10, 20
2	7, 9, 11, 15, 16, 18
3	13, 14, 17
4	4, 19
Single-model clusters	2; 6; 12

### 3 Entry composition

There is only 1 type of molecule in this entry. The entry contains 1903 atoms, of which 960 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Non-structural protein 1.

Mol	Chain	Residues	Atoms						Trace
1	A	119	Total	C	H	N	O	S	0
			1903	596	960	163	177	7	

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	70	LYS	GLU	conflict	UNP A0A2Z5CYV0
A	178	VAL	ILE	conflict	UNP A0A2Z5CYV0
A	187	ARG	TRP	engineered mutation	UNP A0A2Z5CYV0
A	227	LYS	GLU	conflict	UNP A0A2Z5CYV0

SEQUENCE-PLOTS INFOmissingINFO

## 4 Refinement protocol and experimental data overview

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

Of the 40 calculated structures, 20 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 calculation	

The following table shows chemical shift validation statistics as aggregates over all chemical shift files. Detailed validation can be found in section 5 of this report.

Chemical shift file(s)	input_cs.cif
Number of chemical shift lists	1
Total number of shifts	1336
Number of shifts mapped to atoms	1336
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	84%

No validations of the models with respect to experimental NMR restraints is performed at this time.

COVALENT-GEOMETRY INFOmissingINFO

### 4.1 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	779	804	804	0±0
All	All	15580	16080	16080	1

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 0.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:196:GLU:H	1:A:196:GLU:CD	0.47	2.12	17	1

## 4.2 Torsion angles [i](#)

### 4.2.1 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 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	100/230 (43%)	99±1 (99±1%)	1±1 (1±1%)	0±0 (0±0%)	54	85
All	All	2000/4600 (43%)	1981 (99%)	18 (1%)	1 (0%)	54	85

All 1 unique Ramachandran outliers are listed below.

Mol	Chain	Res	Type	Models (Total)
1	A	144	LEU	1

### 4.2.2 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	87/202 (43%)	85±1 (98±1%)	2±1 (2±1%)	59	93
All	All	1740/4040 (43%)	1707 (98%)	33 (2%)	59	93

All 15 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	115	LEU	6
1	A	191	THR	4
1	A	195	SER	4
1	A	136	VAL	3
1	A	151	THR	3

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Mol	Chain	Res	Type	Models (Total)
1	A	146	LEU	2
1	A	197	THR	2
1	A	134	PHE	2
1	A	91	THR	1
1	A	90	LEU	1
1	A	121	GLN	1
1	A	178	VAL	1
1	A	188	ASN	1
1	A	196	GLU	1
1	A	198	LEU	1

#### 4.2.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

#### 4.4 Carbohydrates [i](#)

There are no carbohydrates in this entry.

#### 4.5 Ligand geometry [i](#)

There are no ligands in this entry.

#### 4.6 Other polymers [i](#)

There are no such molecules in this entry.

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

There are no chain breaks in this entry.

## 5 Chemical shift validation

The completeness of assignment taking into account all chemical shift lists is 84% for the well-defined parts and 80% for the entire structure.

### 5.1 Chemical shift list 1

File name: input\_cs.cif

Chemical shift list name: *NS1\_ED\_187R\_tr\_CS\_pdb\_20190104.str*

#### 5.1.1 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	1336
Number of shifts mapped to atoms	1336
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	3

#### 5.1.2 Chemical shift referencing

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction $\pm$ precision, ppm	Suggested action
$^{13}\text{C}_\alpha$	109	$-0.39 \pm 0.14$	None needed ( $< 0.5$ ppm)
$^{13}\text{C}_\beta$	103	$-0.04 \pm 0.10$	None needed ( $< 0.5$ ppm)
$^{13}\text{C}'$	105	$0.10 \pm 0.16$	None needed ( $< 0.5$ ppm)
$^{15}\text{N}$	109	$0.40 \pm 0.50$	None needed ( $< 0.5$ ppm)

#### 5.1.3 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 84%, i.e. 1036 atoms were assigned a chemical shift out of a possible 1231. 0 out of 20 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	$^1\text{H}$	$^{13}\text{C}$	$^{15}\text{N}$
Backbone	479/496 (97%)	192/198 (97%)	191/200 (96%)	96/98 (98%)
Sidechain	522/687 (76%)	313/397 (79%)	201/259 (78%)	8/31 (26%)

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	<b>Total</b>	<b><sup>1</sup>H</b>	<b><sup>13</sup>C</b>	<b><sup>15</sup>N</b>
Aromatic	35/48 (73%)	20/26 (77%)	14/21 (67%)	1/1 (100%)
Overall	1036/1231 (84%)	525/621 (85%)	406/480 (85%)	105/130 (81%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 80%, i.e. 1194 atoms were assigned a chemical shift out of a possible 1493. 0 out of 22 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	<b>Total</b>	<b><sup>1</sup>H</b>	<b><sup>13</sup>C</b>	<b><sup>15</sup>N</b>
Backbone	544/587 (93%)	221/234 (94%)	214/238 (90%)	109/115 (95%)
Sidechain	586/822 (71%)	355/479 (74%)	222/303 (73%)	9/40 (22%)
Aromatic	64/84 (76%)	36/45 (80%)	26/36 (72%)	2/3 (67%)
Overall	1194/1493 (80%)	612/758 (81%)	462/577 (80%)	120/158 (76%)

#### 5.1.4 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.

Mol	Chain	Res	Type	Atom	Shift, ppm	Expected range, ppm	Z-score
1	A	156	ILE	HG22	-0.72	2.13 – -0.57	-5.6
1	A	156	ILE	HG23	-0.72	2.13 – -0.57	-5.6
1	A	156	ILE	HG21	-0.72	2.13 – -0.57	-5.6

#### 5.1.5 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.

Random coil index (RCI) for chain A:

