



# Full wwPDB NMR Structure Validation Report ⓘ

May 28, 2020 – 11:02 pm BST

PDB ID : 2LDI  
Title : NMR solution structure of ZiaAN sub mutant  
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Deposited on : 2011-05-26

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We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

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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

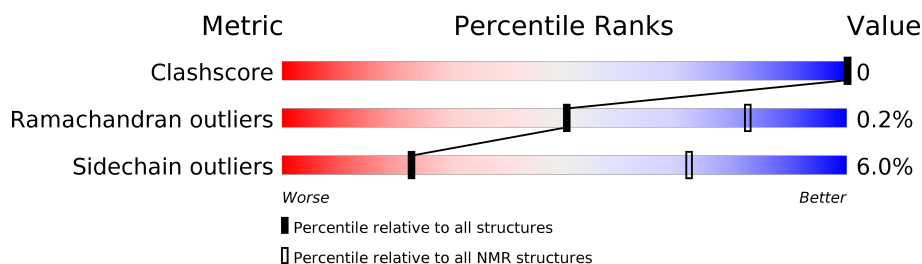
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*SOLUTION NMR*

The overall completeness of chemical shifts assignment is 80%.

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	106	

## 2 Ensemble composition and analysis

This entry contains 30 models. Model 26 is the overall representative, medoid model (most similar to other models). The authors have identified model 1 as representative, based on the following criterion: *fewest violations*.

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:7-A:17, A:22-A:76 (66)	0.45	26

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 7 clusters and 5 single-model clusters were found.

Cluster number	Models
1	1, 4, 5, 15, 19, 25, 26, 28, 30
2	7, 10, 18, 22, 23, 27
3	13, 16
4	2, 29
5	3, 24
6	9, 21
7	14, 20
Single-model clusters	6; 8; 11; 12; 17

### 3 Entry composition

There is only 1 type of molecule in this entry. The entry contains 996 atoms, of which 469 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Zinc-transporting ATPase.

Mol	Chain	Residues	Atoms						Trace
1	A	71	Total	C	H	N	O	S	0
			996	326	469	94	103	4	

There are 8 discrepancies between the modelled and reference sequences:

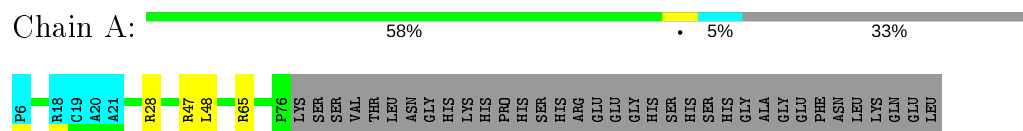
Chain	Residue	Modelled	Actual	Comment	Reference
A	18	ARG	ASP	CONFLICT	UNP Q59998
A	20	ALA	THR	CONFLICT	UNP Q59998
A	21	ALA	SER	CONFLICT	UNP Q59998
A	23	ALA	LYS	CONFLICT	UNP Q59998
A	24	SER	LEU	CONFLICT	UNP Q59998
A	25	SER	LYS	CONFLICT	UNP Q59998
A	28	ARG	GLY	CONFLICT	UNP Q59998
A	29	ALA	SER	CONFLICT	UNP Q59998

## 4 Residue-property plots

### 4.1 Average score per residue in the NMR ensemble

These plots are provided for all protein, RNA and DNA chains in the entry. The first graphic is the same as shown in the summary in section 1 of this report. The second graphic shows the sequence where residues are colour-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 outliers are shown as green connectors. Residues which are classified as ill-defined in the NMR ensemble, are shown in cyan with an underline colour-coded according to the previous scheme. Residues which were present in the experimental sample, but not modelled in the final structure are shown in grey.

- Molecule 1: Zinc-transporting ATPase

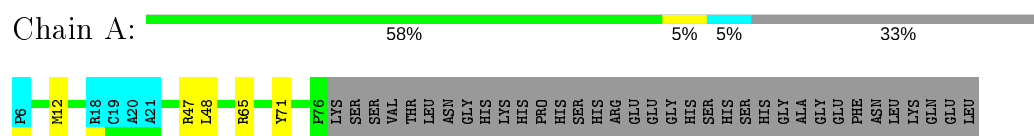


### 4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

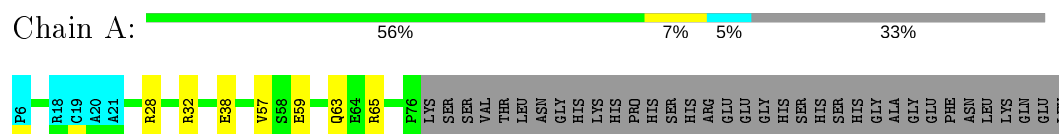
#### 4.2.1 Score per residue for model 1

- Molecule 1: Zinc-transporting ATPase



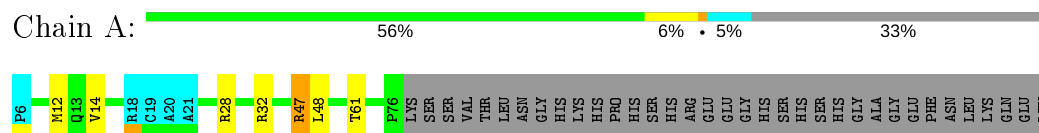
#### 4.2.2 Score per residue for model 2

- Molecule 1: Zinc-transporting ATPase



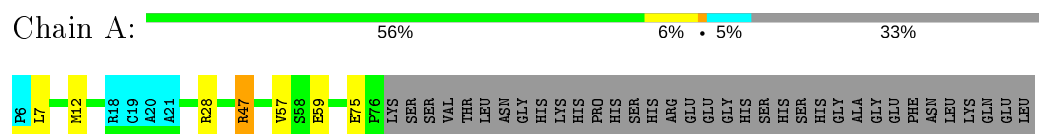
### 4.2.3 Score per residue for model 3

- Molecule 1: Zinc-transporting ATPase



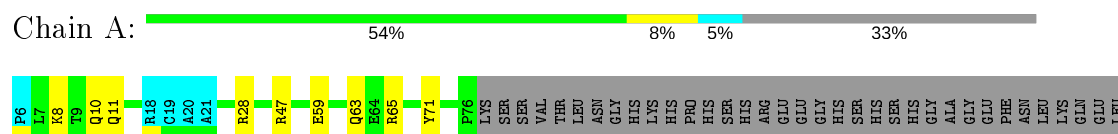
### 4.2.4 Score per residue for model 4

- Molecule 1: Zinc-transporting ATPase



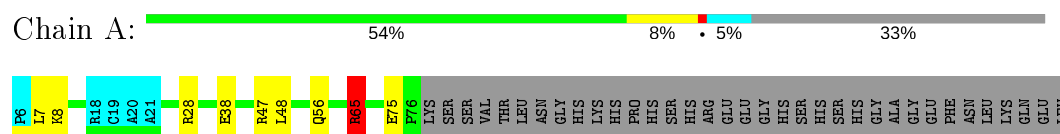
### 4.2.5 Score per residue for model 5

- Molecule 1: Zinc-transporting ATPase



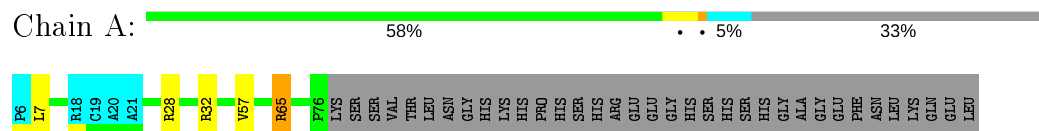
### 4.2.6 Score per residue for model 6

- Molecule 1: Zinc-transporting ATPase



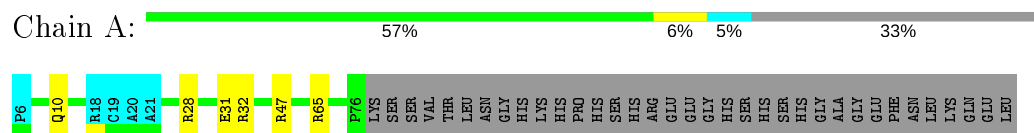
### 4.2.7 Score per residue for model 7

- Molecule 1: Zinc-transporting ATPase



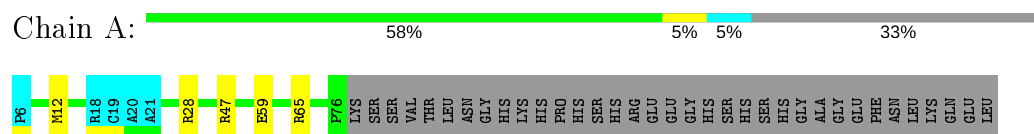
### 4.2.8 Score per residue for model 8

- Molecule 1: Zinc-transporting ATPase



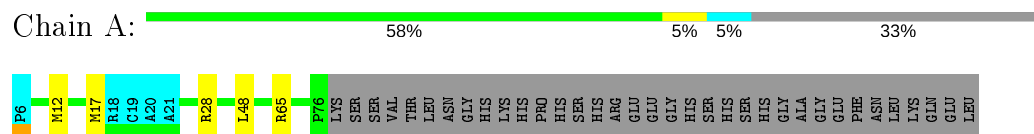
### 4.2.9 Score per residue for model 9

- Molecule 1: Zinc-transporting ATPase



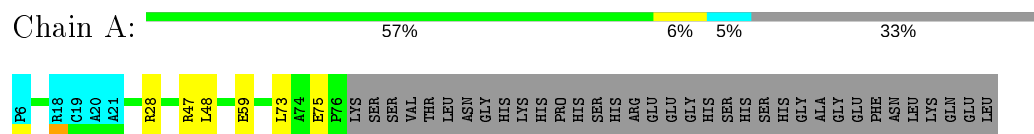
### 4.2.10 Score per residue for model 10

- Molecule 1: Zinc-transporting ATPase



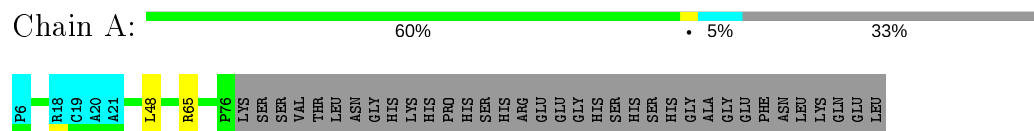
### 4.2.11 Score per residue for model 11

- Molecule 1: Zinc-transporting ATPase



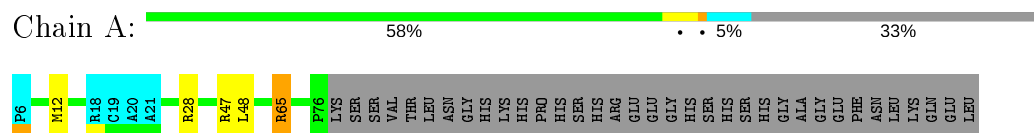
### 4.2.12 Score per residue for model 12

- Molecule 1: Zinc-transporting ATPase



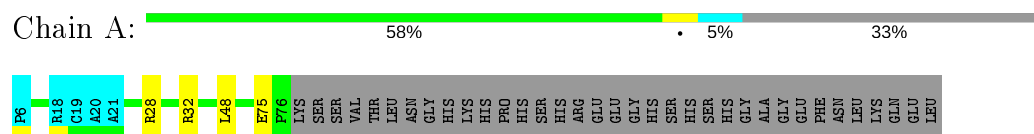
### 4.2.13 Score per residue for model 13

- Molecule 1: Zinc-transporting ATPase



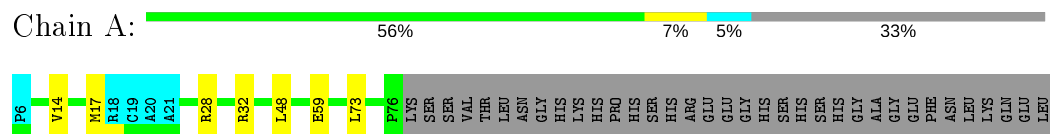
### 4.2.14 Score per residue for model 14

- Molecule 1: Zinc-transporting ATPase



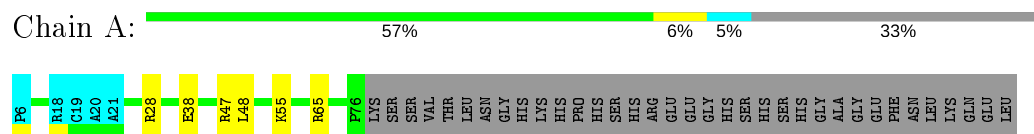
### 4.2.15 Score per residue for model 15

- Molecule 1: Zinc-transporting ATPase



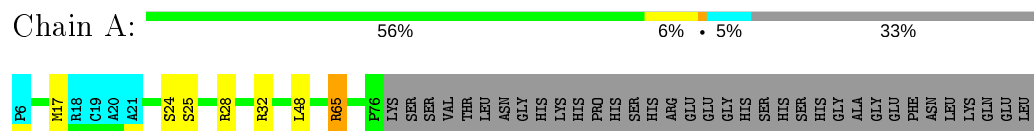
### 4.2.16 Score per residue for model 16

- Molecule 1: Zinc-transporting ATPase



### 4.2.17 Score per residue for model 17

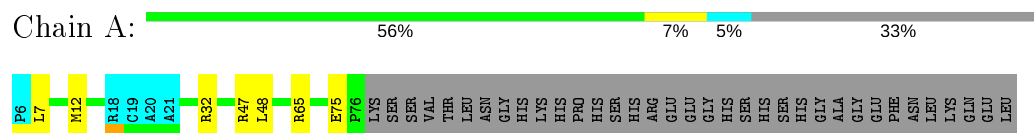
- Molecule 1: Zinc-transporting ATPase





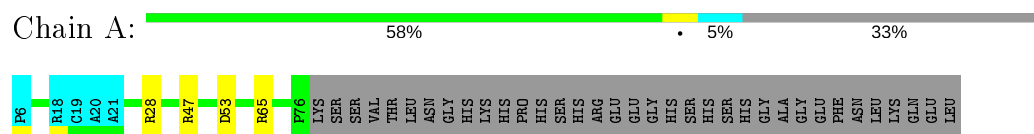
### 4.2.18 Score per residue for model 18

- Molecule 1: Zinc-transporting ATPase



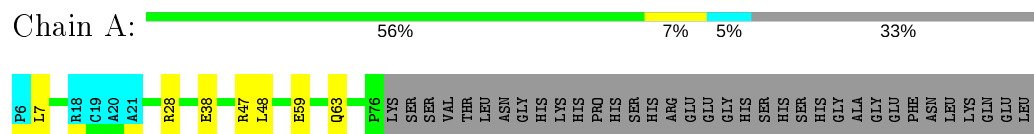
### 4.2.19 Score per residue for model 19

- Molecule 1: Zinc-transporting ATPase



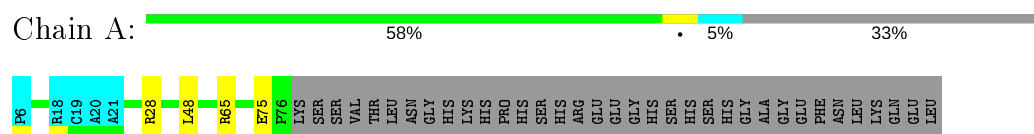
### 4.2.20 Score per residue for model 20

- Molecule 1: Zinc-transporting ATPase



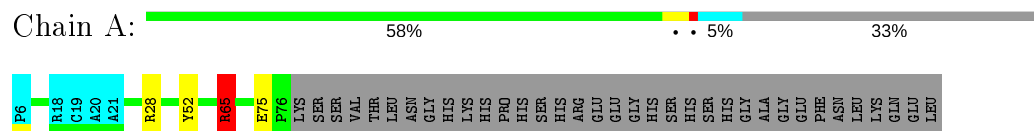
### 4.2.21 Score per residue for model 21

- Molecule 1: Zinc-transporting ATPase



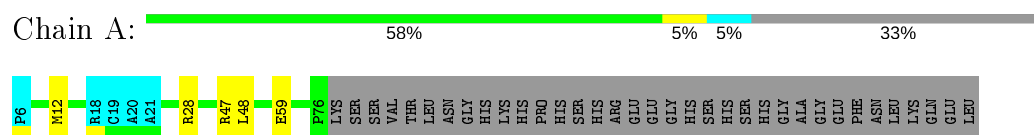
### 4.2.22 Score per residue for model 22

- Molecule 1: Zinc-transporting ATPase



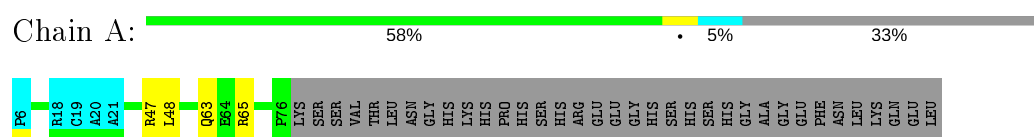
### 4.2.23 Score per residue for model 23

- Molecule 1: Zinc-transporting ATPase



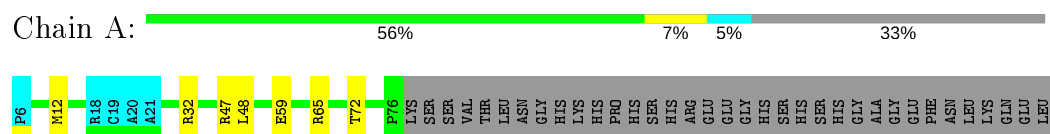
### 4.2.24 Score per residue for model 24

- Molecule 1: Zinc-transporting ATPase



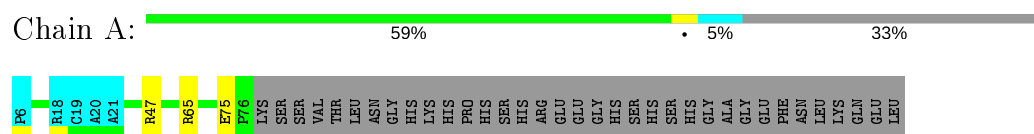
### 4.2.25 Score per residue for model 25

- Molecule 1: Zinc-transporting ATPase



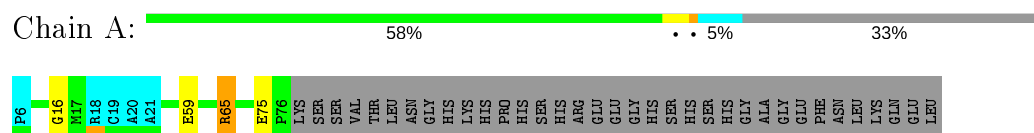
### 4.2.26 Score per residue for model 26 (medoid)

- Molecule 1: Zinc-transporting ATPase



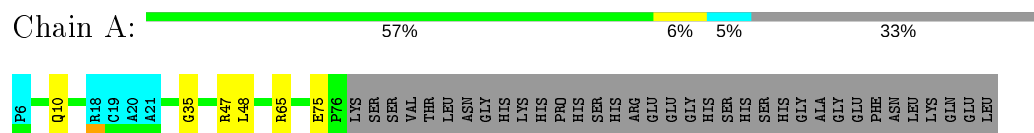
### 4.2.27 Score per residue for model 27

- Molecule 1: Zinc-transporting ATPase



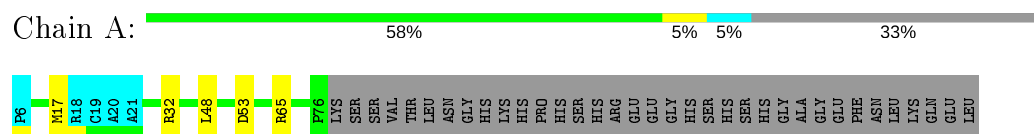
### 4.2.28 Score per residue for model 28

- Molecule 1: Zinc-transporting ATPase



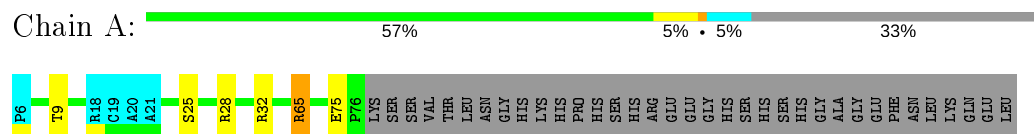
### 4.2.29 Score per residue for model 29

- Molecule 1: Zinc-transporting ATPase



### 4.2.30 Score per residue for model 30

- Molecule 1: Zinc-transporting ATPase



## 5 Refinement protocol and experimental data overview

The models were refined using the following method: *restrained energy minimization*.

Of the 300 calculated structures, 30 were deposited, based on the following criterion: *target function*.

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

Software name	Classification	Version
AMBER	refinement	

The following table shows chemical shift validation statistics as aggregates over all chemical shift files. Detailed validation can be found in section 6 of this report.

Chemical shift file(s)	input_cs.cif
Number of chemical shift lists	1
Total number of shifts	1014
Number of shifts mapped to atoms	1014
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	80%

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

COVALENT-GEOMETRY INFOmissingINFO

### 5.1 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
All	All	14790	13200	15420	-

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 -.

There are no clashes.

## 5.2 Torsion angles [i](#)

### 5.2.1 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	65/106 (61%)	59±2 (90±3%)	6±2 (10±3%)	0±0 (0±1%)	50	82
All	All	1950/3180 (61%)	1759 (90%)	187 (10%)	4 (0%)	50	82

All 2 unique Ramachandran outliers are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type	Models (Total)
1	A	57	VAL	3
1	A	16	GLY	1

### 5.2.2 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	53/86 (62%)	50±1 (94±3%)	3±1 (6±3%)	23	72
All	All	1590/2580 (62%)	1495 (94%)	95 (6%)	23	72

All 25 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	48	LEU	19
1	A	59	GLU	10
1	A	75	GLU	10
1	A	12	MET	9
1	A	65	ARG	7
1	A	7	LEU	5
1	A	38	GLU	4
1	A	17	MET	4

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Mol	Chain	Res	Type	Models (Total)
1	A	63	GLN	4
1	A	10	GLN	3
1	A	8	LYS	2
1	A	53	ASP	2
1	A	25	SER	2
1	A	73	LEU	2
1	A	14	VAL	2
1	A	72	THR	1
1	A	31	GLU	1
1	A	61	THR	1
1	A	24	SER	1
1	A	11	GLN	1
1	A	9	THR	1
1	A	55	LYS	1
1	A	47	ARG	1
1	A	52	TYR	1
1	A	56	GLN	1

### 5.2.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

## 5.4 Carbohydrates [i](#)

There are no carbohydrates in this entry.

## 5.5 Ligand geometry [i](#)

There are no ligands in this entry.

## 5.6 Other polymers [i](#)

There are no such molecules in this entry.

## 5.7 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

## 6 Chemical shift validation

The completeness of assignment taking into account all chemical shift lists is 80% for the well-defined parts and 79% for the entire structure.

### 6.1 Chemical shift list 1

File name: input\_cs.cif

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

#### 6.1.1 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	1014
Number of shifts mapped to atoms	1014
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	0

#### 6.1.2 Chemical shift referencing

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction $\pm$ precision, ppm	Suggested action
$^{13}\text{C}_\alpha$	103	$-0.05 \pm 0.11$	None needed ( $< 0.5$ ppm)
$^{13}\text{C}_\beta$	94	$-0.00 \pm 0.27$	None needed ( $< 0.5$ ppm)
$^{13}\text{C}'$	93	$-0.18 \pm 0.19$	None needed ( $< 0.5$ ppm)
$^{15}\text{N}$	99	$0.31 \pm 0.65$	None needed ( $< 0.5$ ppm)

#### 6.1.3 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 80%, i.e. 617 atoms were assigned a chemical shift out of a possible 774. 12 out of 12 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	$^1\text{H}$	$^{13}\text{C}$	$^{15}\text{N}$
Backbone	311/326 (95%)	118/130 (91%)	129/132 (98%)	64/64 (100%)
Sidechain	306/432 (71%)	169/250 (68%)	137/162 (85%)	0/20 (0%)

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	Total	<sup>1</sup> H	<sup>13</sup> C	<sup>15</sup> N
Aromatic	0/16 (0%)	0/8 (0%)	0/8 (0%)	0/0 (—%)
Overall	617/774 (80%)	287/388 (74%)	266/302 (88%)	64/84 (76%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 79%, i.e. 653 atoms were assigned a chemical shift out of a possible 831. 12 out of 12 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	<sup>1</sup> H	<sup>13</sup> C	<sup>15</sup> N
Backbone	326/349 (93%)	122/139 (88%)	137/142 (96%)	67/68 (99%)
Sidechain	327/466 (70%)	181/271 (67%)	146/172 (85%)	0/23 (0%)
Aromatic	0/16 (0%)	0/8 (0%)	0/8 (0%)	0/0 (—%)
Overall	653/831 (79%)	303/418 (72%)	283/322 (88%)	67/91 (74%)

#### 6.1.4 Statistically unusual chemical shifts [i](#)

There are no statistically unusual chemical shifts.

#### 6.1.5 Random Coil Index (RCI) plots [i](#)

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:

