



# Full wwPDB NMR Structure Validation Report ⓘ

May 31, 2020 – 10:10 pm BST

PDB ID : 6FDP  
Title : NMR structure of the second TPR domain of the human RPAP3 protein in complex with HSP90 peptide DTSRMEEVD  
Authors : Quinternet, M.; Chagot, M.E.; Manival, X.  
Deposited on : 2017-12-26

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

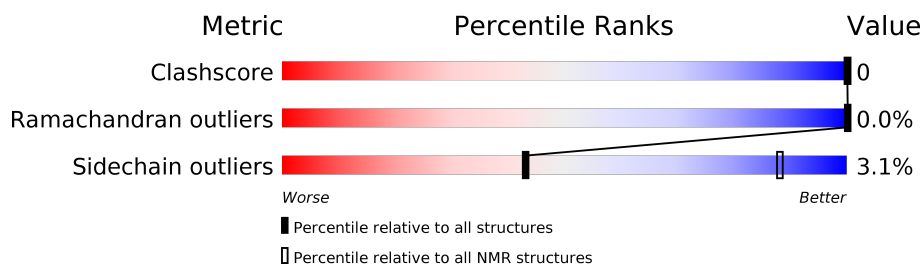
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*SOLUTION NMR*

The overall completeness of chemical shifts assignment is 90%.

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	120	 85% 7% 8%
2	B	9	 78% 11% 11%

## 2 Ensemble composition and analysis

This entry contains 20 models. Model 4 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:282-A:391, B:725-B:732 (118)	0.17	4

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. No single-model clusters were found.

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

### 3 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 2031 atoms, of which 1019 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called RNA polymerase II-associated protein 3.

Mol	Chain	Residues	Atoms						Trace
1	A	120	Total	C	H	N	O	S	0
			1892	589	954	167	178	4	

There are 5 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	277	GLY	-	expression tag	UNP Q9H6T3
A	278	PRO	-	expression tag	UNP Q9H6T3
A	279	HIS	-	expression tag	UNP Q9H6T3
A	280	MET	-	expression tag	UNP Q9H6T3
A	396	LYS	-	expression tag	UNP Q9H6T3

- Molecule 2 is a protein called Heat shock protein HSP 90-alpha.

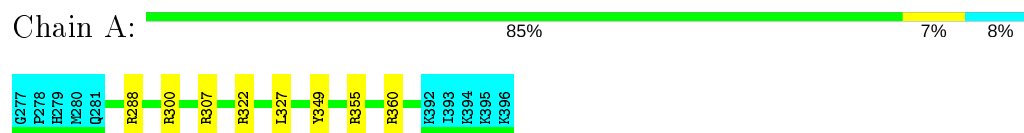
Mol	Chain	Residues	Atoms						Trace
2	B	9	Total	C	H	N	O	S	0
			139	41	65	12	20	1	

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

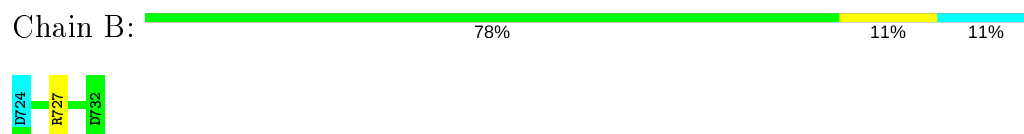
### 4.1 Average score per residue in the NMR ensemble

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: RNA polymerase II-associated protein 3



- Molecule 2: Heat shock protein HSP 90-alpha

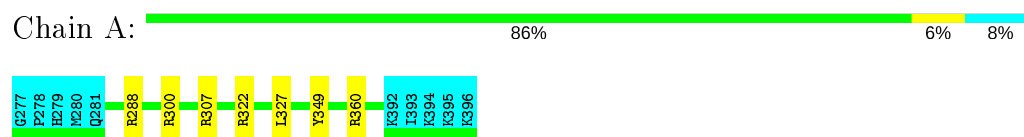


### 4.2 Scores per residue for each member of the ensemble

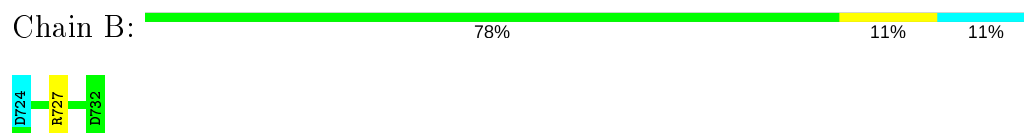
Colouring as in section 4.1 above.

#### 4.2.1 Score per residue for model 1

- Molecule 1: RNA polymerase II-associated protein 3

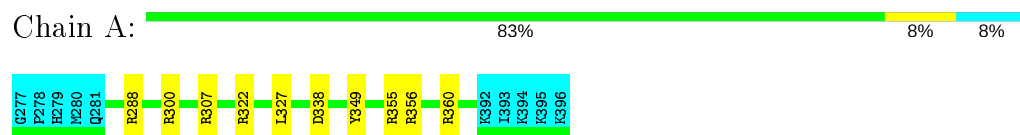


- Molecule 2: Heat shock protein HSP 90-alpha

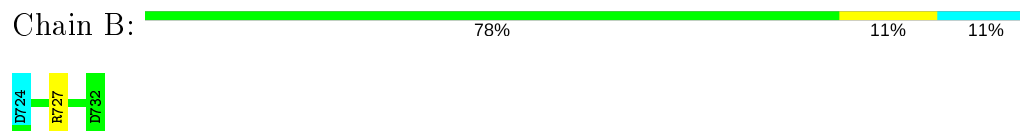


### 4.2.2 Score per residue for model 2

- Molecule 1: RNA polymerase II-associated protein 3

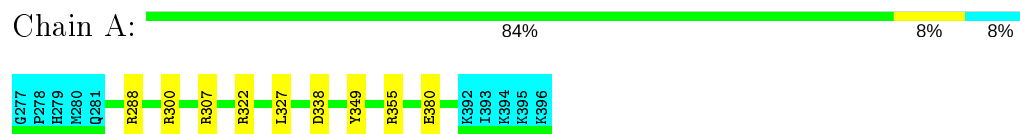


- Molecule 2: Heat shock protein HSP 90-alpha

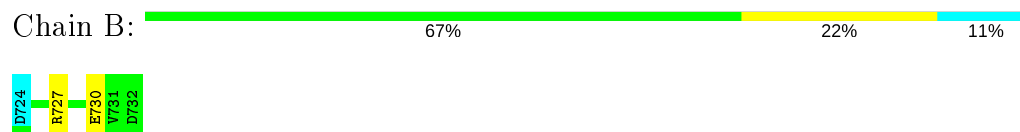


### 4.2.3 Score per residue for model 3

- Molecule 1: RNA polymerase II-associated protein 3

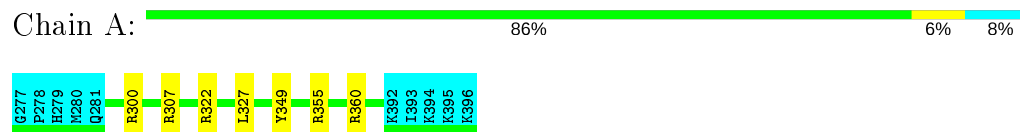


- Molecule 2: Heat shock protein HSP 90-alpha

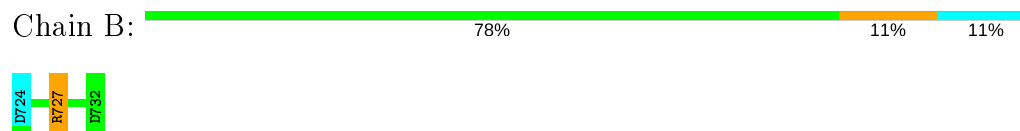


### 4.2.4 Score per residue for model 4 (medoid)

- Molecule 1: RNA polymerase II-associated protein 3

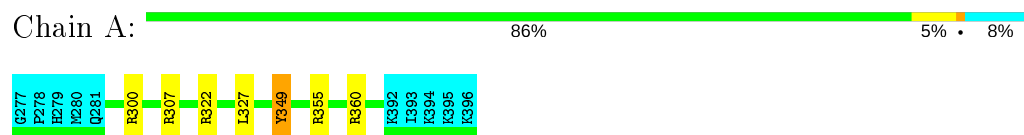


- Molecule 2: Heat shock protein HSP 90-alpha



### 4.2.5 Score per residue for model 5

- Molecule 1: RNA polymerase II-associated protein 3

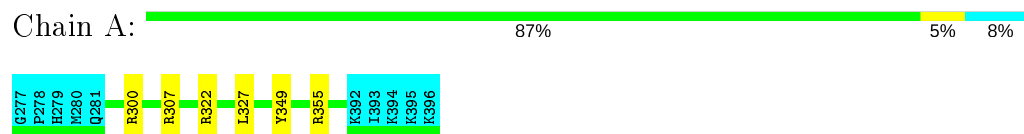


- Molecule 2: Heat shock protein HSP 90-alpha

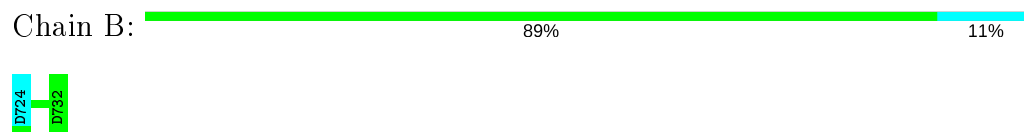


### 4.2.6 Score per residue for model 6

- Molecule 1: RNA polymerase II-associated protein 3

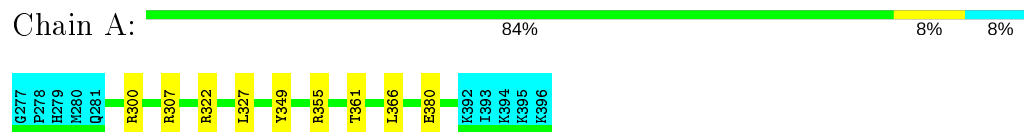


- Molecule 2: Heat shock protein HSP 90-alpha

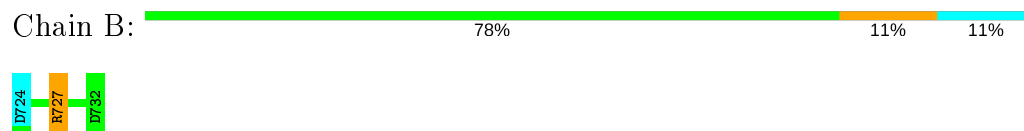


### 4.2.7 Score per residue for model 7

- Molecule 1: RNA polymerase II-associated protein 3




- Molecule 2: Heat shock protein HSP 90-alpha




### 4.2.8 Score per residue for model 8

- Molecule 1: RNA polymerase II-associated protein 3

Chain A:  85% 7% 8%



- Molecule 2: Heat shock protein HSP 90-alpha

Chain B:  78% 11% 11%




### 4.2.9 Score per residue for model 9

- Molecule 1: RNA polymerase II-associated protein 3

Chain A:  87% 5% 8%



- Molecule 2: Heat shock protein HSP 90-alpha

Chain B:  78% 11% 11%



### 4.2.10 Score per residue for model 10

- Molecule 1: RNA polymerase II-associated protein 3

Chain A:  86% 6% 8%



- Molecule 2: Heat shock protein HSP 90-alpha


Chain B:  67% 22% 11%





#### 4.2.11 Score per residue for model 11

- Molecule 1: RNA polymerase II-associated protein 3

Chain A:  85% 7% 8%




- Molecule 2: Heat shock protein HSP 90-alpha

Chain B:  56% 33% 11%




#### 4.2.12 Score per residue for model 12

- Molecule 1: RNA polymerase II-associated protein 3

Chain A:  83% 8% 8%




- Molecule 2: Heat shock protein HSP 90-alpha

Chain B:  78% 11% 11%




#### 4.2.13 Score per residue for model 13

- Molecule 1: RNA polymerase II-associated protein 3

Chain A:  83% 8% 8%



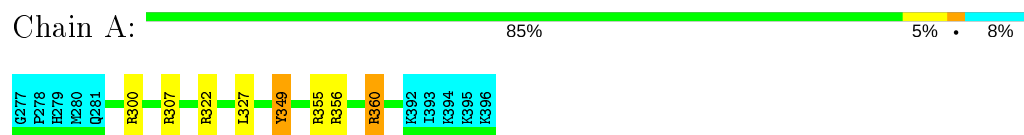
- Molecule 2: Heat shock protein HSP 90-alpha

Chain B:  78% 11% 11%

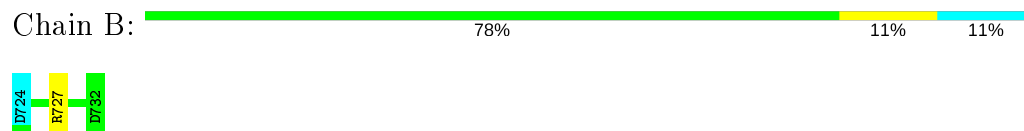


#### 4.2.14 Score per residue for model 14

- Molecule 1: RNA polymerase II-associated protein 3

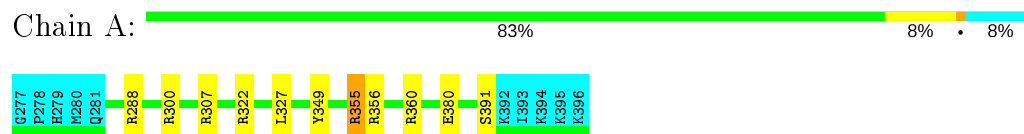


- Molecule 2: Heat shock protein HSP 90-alpha

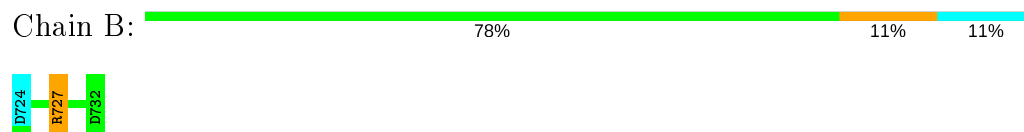


#### 4.2.15 Score per residue for model 15

- Molecule 1: RNA polymerase II-associated protein 3

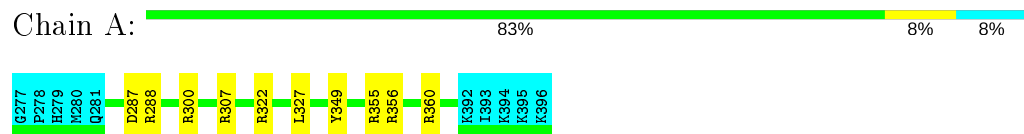


- Molecule 2: Heat shock protein HSP 90-alpha

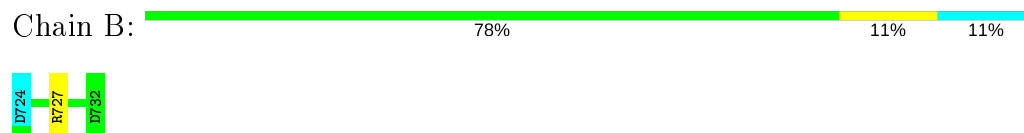


#### 4.2.16 Score per residue for model 16

- Molecule 1: RNA polymerase II-associated protein 3



- Molecule 2: Heat shock protein HSP 90-alpha



#### 4.2.17 Score per residue for model 17

- Molecule 1: RNA polymerase II-associated protein 3

Chain A:  88% 8%



- Molecule 2: Heat shock protein HSP 90-alpha

Chain B:  67% 22% 11%




#### 4.2.18 Score per residue for model 18

- Molecule 1: RNA polymerase II-associated protein 3

Chain A:  85% 7% 8%



- Molecule 2: Heat shock protein HSP 90-alpha

Chain B:  78% 11% 11%




#### 4.2.19 Score per residue for model 19

- Molecule 1: RNA polymerase II-associated protein 3

Chain A:  85% 6% 8%




- Molecule 2: Heat shock protein HSP 90-alpha

Chain B:  78% 11% 11%



#### 4.2.20 Score per residue for model 20

- Molecule 1: RNA polymerase II-associated protein 3

Chain A:  86% 5% • 8%



- Molecule 2: Heat shock protein HSP 90-alpha

Chain B:  67% 11% 11% 11%



## 5 Refinement protocol and experimental data overview

The models were refined using the following method: *molecular dynamics*.

Of the 200 calculated structures, 20 were deposited, based on the following criterion: *structures with the restraint lowest energy*.

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

Software name	Classification	Version
CYANA	structure calculation	
TALOS	structure calculation	
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	1588
Number of shifts mapped to atoms	1588
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	90%

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
1	A	855	855	855	0±0
All	All	18420	18280	18280	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:361:THR:HG23	1:A:366:LEU:CD1	0.42	2.44	7	1

## 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	110/120 (92%)	107±1 (98±1%)	3±1 (2±1%)	0±0 (0±0%)	100	100
2	B	7/9 (78%)	6±1 (86±9%)	1±1 (14±8%)	0±0 (1±3%)	26	73
All	All	2340/2580 (91%)	2268 (97%)	71 (3%)	1 (0%)	100	100

All 1 unique Ramachandran outliers are listed below.

Mol	Chain	Res	Type	Models (Total)
2	B	729	GLU	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	85/94 (90%)	83±1 (97±1%)	2±1 (3±1%)	49	91
2	B	8/9 (89%)	7±1 (92±10%)	1±1 (8±10%)	15	63
All	All	1860/2060 (90%)	1802 (97%)	58 (3%)	43	88

All 9 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	327	LEU	20
1	A	349	TYR	14

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Mol	Chain	Res	Type	Models (Total)
2	B	727	ARG	9
1	A	380	GLU	5
1	A	338	ASP	4
2	B	732	ASP	3
2	B	730	GLU	1
1	A	391	SER	1
1	A	287	ASP	1

### 5.2.3 RNA ⓘ

There are no RNA molecules in this entry.

### 5.3 Non-standard residues in protein, DNA, RNA chains ⓘ

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

### 5.4 Carbohydrates ⓘ

There are no carbohydrates in this entry.

### 5.5 Ligand geometry ⓘ

There are no ligands in this entry.

### 5.6 Other polymers ⓘ

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 90% for the well-defined parts and 90% for the entire structure.

### 6.1 Chemical shift list 1

File name: input\_cs.cif

Chemical shift list name: *test.str*

#### 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	1588
Number of shifts mapped to atoms	1588
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	4

#### 6.1.2 Chemical shift referencing

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction $\pm$ precision, ppm	Suggested action
$^{13}\text{C}_\alpha$	124	$-0.88 \pm 0.09$	Should be applied
$^{13}\text{C}_\beta$	119	$0.47 \pm 0.15$	None needed ( $< 0.5$ ppm)
$^{13}\text{C}'$	116	$-0.63 \pm 0.11$	Should be applied
$^{15}\text{N}$	123	$-0.35 \pm 0.25$	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 90%, i.e. 1297 atoms were assigned a chemical shift out of a possible 1442. 14 out of 14 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	$^1\text{H}$	$^{13}\text{C}$	$^{15}\text{N}$
Backbone	572/586 (98%)	234/234 (100%)	223/236 (94%)	115/116 (99%)
Sidechain	672/771 (87%)	421/451 (93%)	234/277 (84%)	17/43 (40%)

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	Total	<sup>1</sup> H	<sup>13</sup> C	<sup>15</sup> N
Aromatic	53/85 (62%)	38/45 (84%)	15/40 (38%)	0/0 (—%)
Overall	1297/1442 (90%)	693/730 (95%)	472/553 (85%)	132/159 (83%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 90%, i.e. 1431 atoms were assigned a chemical shift out of a possible 1597. 14 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	615/639 (96%)	252/255 (99%)	240/258 (93%)	123/126 (98%)
Sidechain	759/866 (88%)	478/509 (94%)	263/309 (85%)	18/48 (38%)
Aromatic	57/92 (62%)	40/49 (82%)	17/42 (40%)	0/1 (0%)
Overall	1431/1597 (90%)	770/813 (95%)	520/609 (85%)	141/175 (81%)

#### 6.1.4 Statistically unusual chemical shifts ⓘ

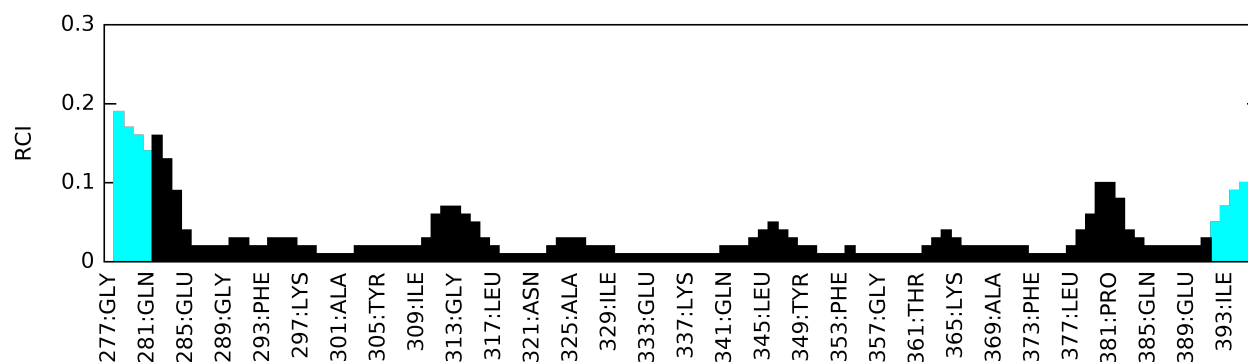
The following table lists the statistically unusual chemical shifts. These are statistical measures, and large deviations from the mean do not necessarily imply incorrect assignments. Molecules containing paramagnetic centres or hemes are expected to give rise to anomalous chemical shifts.

Mol	Chain	Res	Type	Atom	Shift, ppm	Expected range, ppm	Z-score
1	A	334	GLU	HB2	0.61	3.08 – 0.98	-6.8
1	A	389	GLU	HB2	0.73	3.08 – 0.98	-6.2
1	A	322	ARG	HE	10.90	10.48 – 4.28	5.7
1	A	300	ARG	HB2	0.37	3.15 – 0.45	-5.3

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

The images below report *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:



Random coil index (RCI) for chain B:

