



Full wwPDB NMR Structure Validation Report ⓘ

Apr 27, 2016 – 02:21 AM BST

PDB ID : 2M0R
Title : Solution structure and dynamics of human S100A14
Authors : Bertini, I.; Borsi, V.; Cerofolini, L.; Das Gupta, S.; Fragai, M.; Luchinat, C.
Deposited on : 2012-11-05

This is a Full wwPDB NMR Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<http://wwpdb.org/validation/2016/NMRValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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
Mogul	:	unknown
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
ShiftChecker	:	rb-20027457
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	rb-20027457

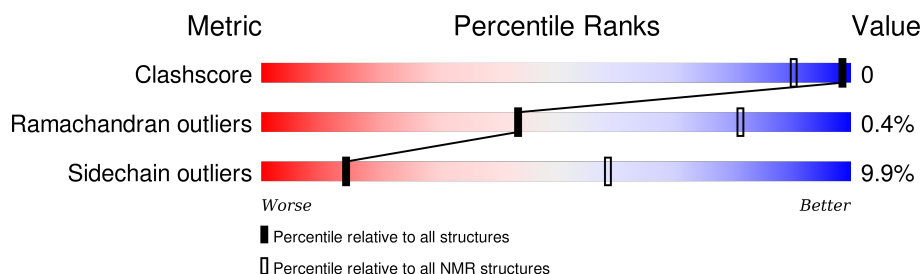
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

SOLUTION NMR

The overall completeness of chemical shifts assignment is 40%.

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	114402	11133
Ramachandran outliers	111179	9975
Sidechain outliers	111093	9958

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 ≥ 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	104	
1	B	104	

2 Ensemble composition and analysis ⓘ

This entry contains 30 models. Model 16 is the overall representative, medoid model (most similar to other models). The authors have identified model 1 as representative, based on the following criterion: *closest to the average*.

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:14-A:60, A:64-A:71, A:79-A:96, B:118-B:163, B:168-B:175, B:183-B:200 (145)	0.58	16

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 5 clusters and 5 single-model clusters were found.

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

3 Entry composition [i](#)

There is only 1 type of molecule in this entry. The entry contains 3230 atoms, of which 1596 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Protein S100-A14.

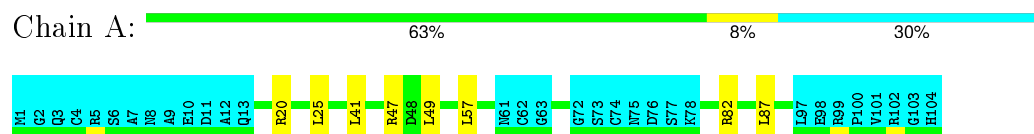
Mol	Chain	Residues	Atoms						Trace
1	A	104	Total	C	H	N	O	S	0
			1615	504	798	145	163	5	
1	B	104	Total	C	H	N	O	S	0
			1615	504	798	145	163	5	

4 Residue-property plots [i](#)

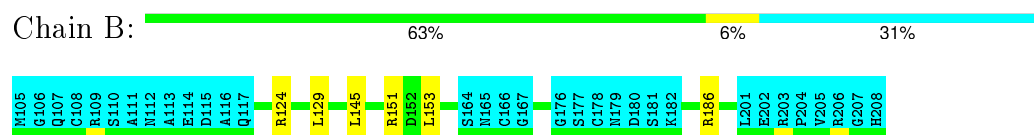
4.1 Average score per residue in the NMR ensemble

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: Protein S100-A14



- Molecule 1: Protein S100-A14

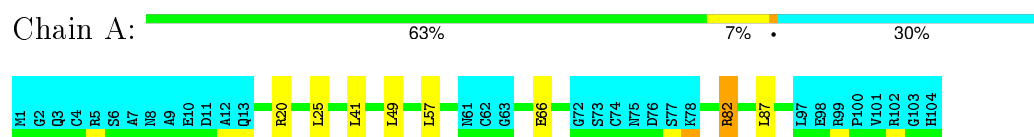


4.2 Scores per residue for each member of the ensemble

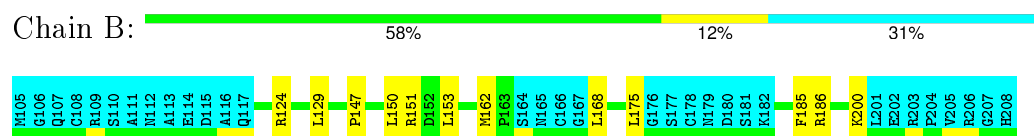
Colouring as in section 4.1 above.

4.2.1 Score per residue for model 1

- Molecule 1: Protein S100-A14

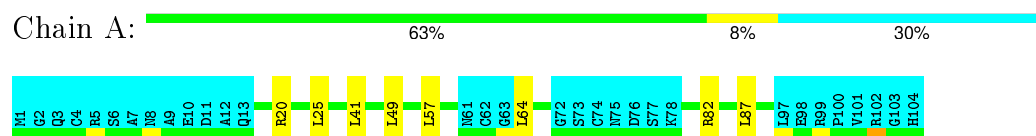


- Molecule 1: Protein S100-A14

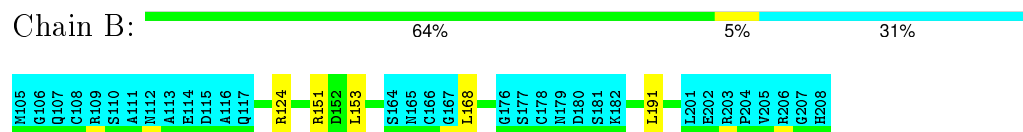


4.2.2 Score per residue for model 2

- Molecule 1: Protein S100-A14

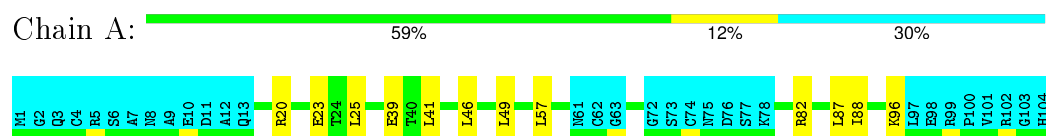


- Molecule 1: Protein S100-A14

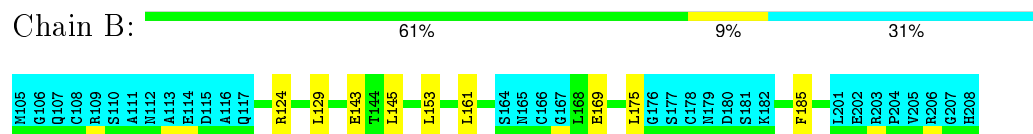


4.2.3 Score per residue for model 3

- Molecule 1: Protein S100-A14

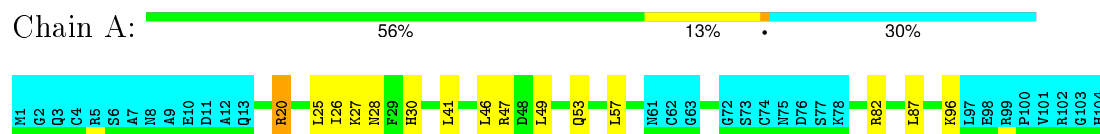


- Molecule 1: Protein S100-A14

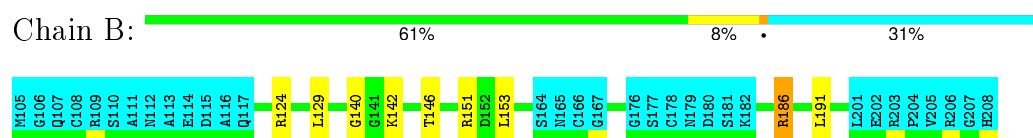


4.2.4 Score per residue for model 4

- Molecule 1: Protein S100-A14

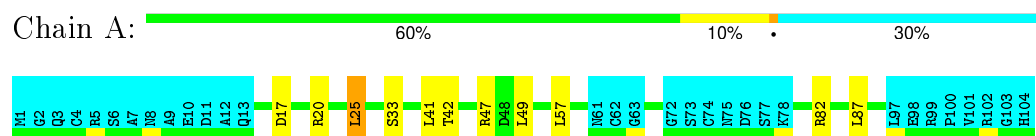


- Molecule 1: Protein S100-A14

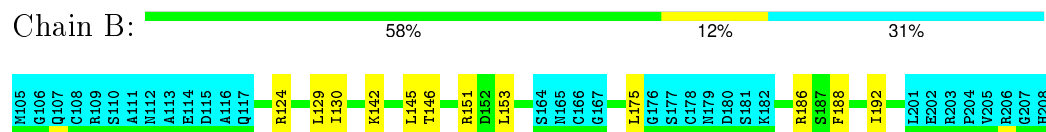


4.2.5 Score per residue for model 5

- Molecule 1: Protein S100-A14

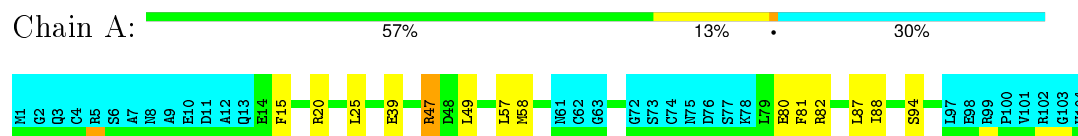


- Molecule 1: Protein S100-A14

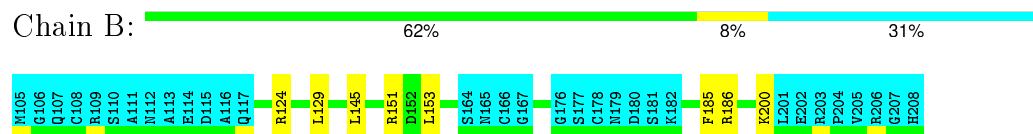


4.2.6 Score per residue for model 6

- Molecule 1: Protein S100-A14

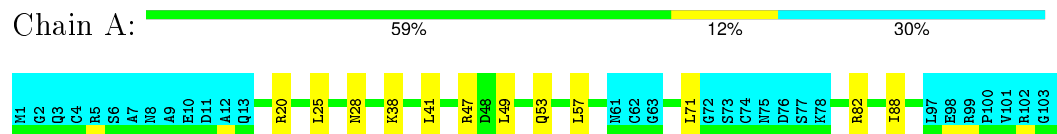


- Molecule 1: Protein S100-A14

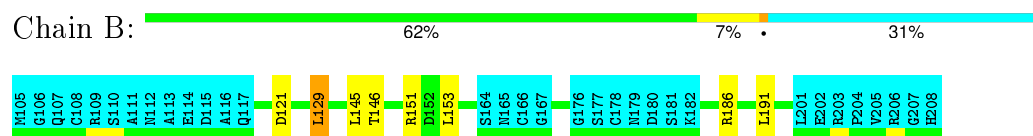


4.2.7 Score per residue for model 7

- Molecule 1: Protein S100-A14

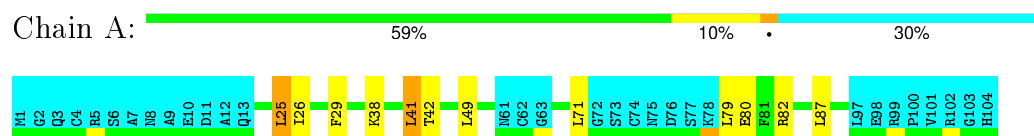


- Molecule 1: Protein S100-A14

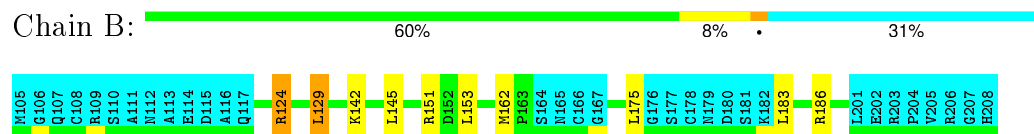


4.2.8 Score per residue for model 8

- Molecule 1: Protein S100-A14

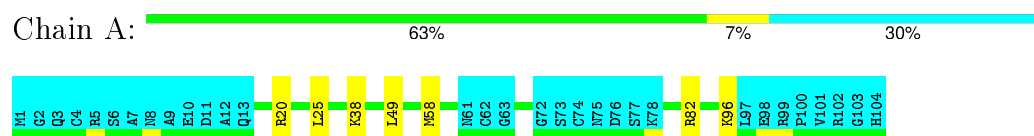


- Molecule 1: Protein S100-A14

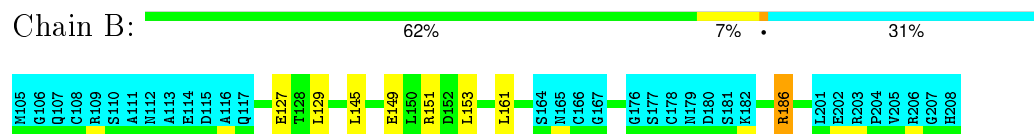


4.2.9 Score per residue for model 9

- Molecule 1: Protein S100-A14

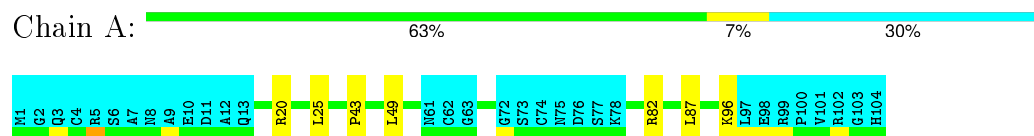


- Molecule 1: Protein S100-A14

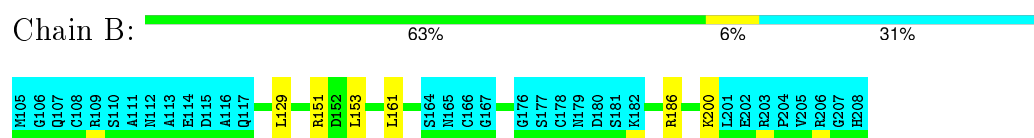


4.2.10 Score per residue for model 10

- Molecule 1: Protein S100-A14

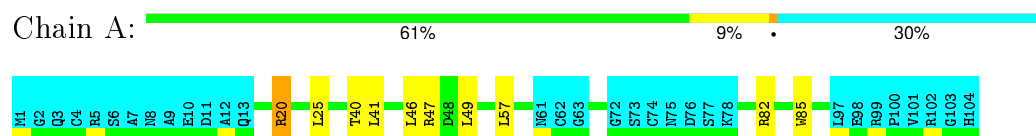


- Molecule 1: Protein S100-A14

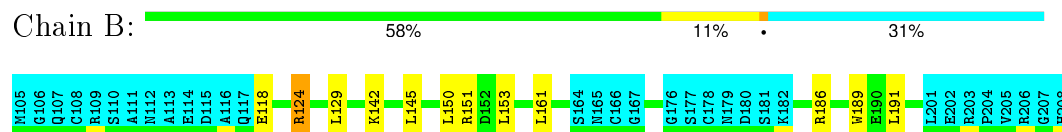


4.2.11 Score per residue for model 11

- Molecule 1: Protein S100-A14

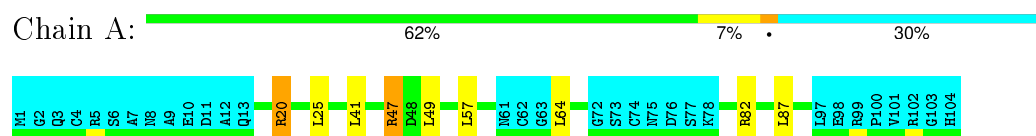


- Molecule 1: Protein S100-A14

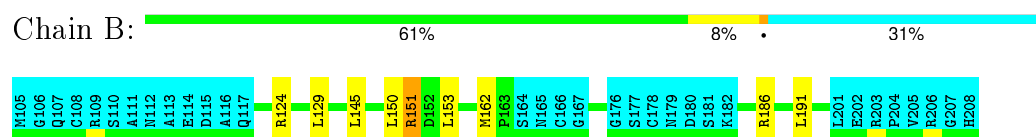


4.2.12 Score per residue for model 12

- Molecule 1: Protein S100-A14

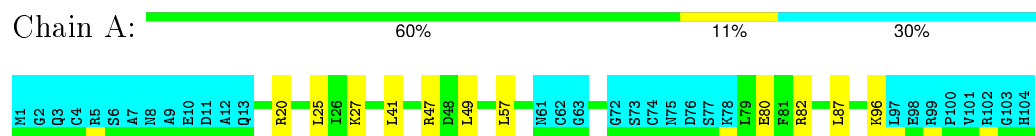


- Molecule 1: Protein S100-A14

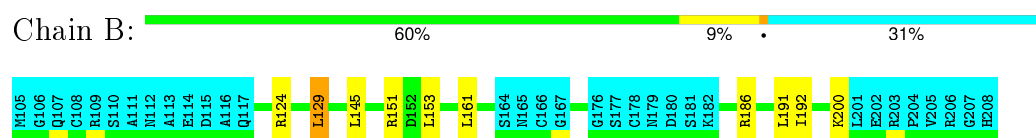


4.2.13 Score per residue for model 13

- Molecule 1: Protein S100-A14

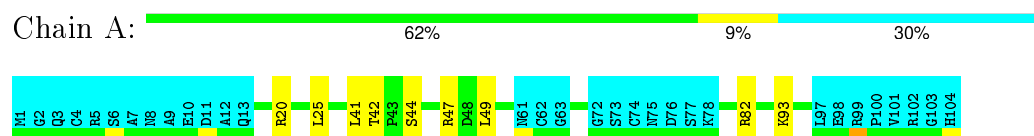


- Molecule 1: Protein S100-A14

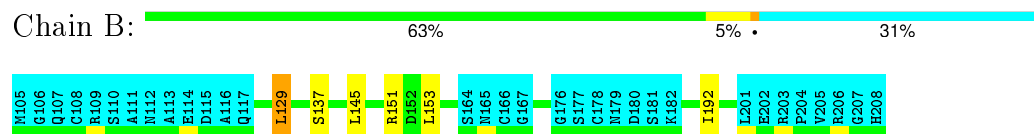


4.2.14 Score per residue for model 14

- Molecule 1: Protein S100-A14

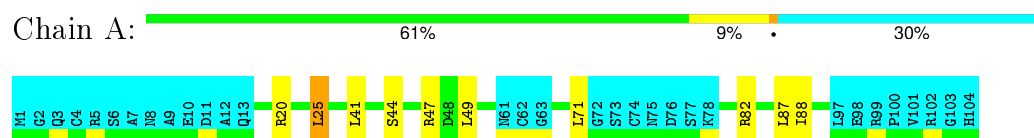


- Molecule 1: Protein S100-A14

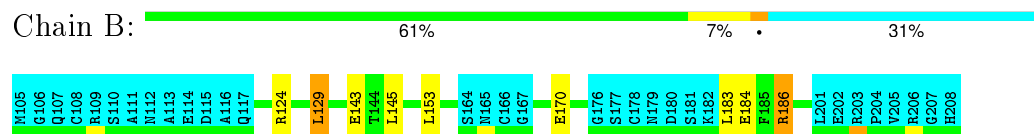


4.2.15 Score per residue for model 15

- Molecule 1: Protein S100-A14

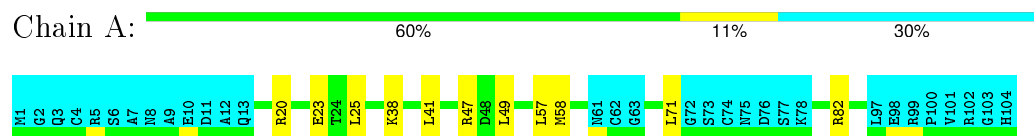


- Molecule 1: Protein S100-A14

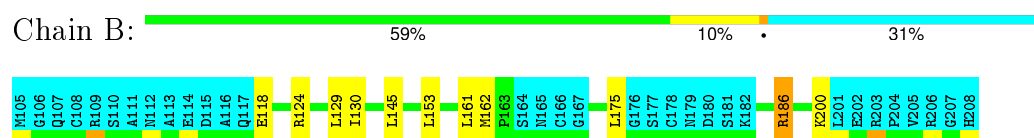


4.2.16 Score per residue for model 16 (medoid)

- Molecule 1: Protein S100-A14

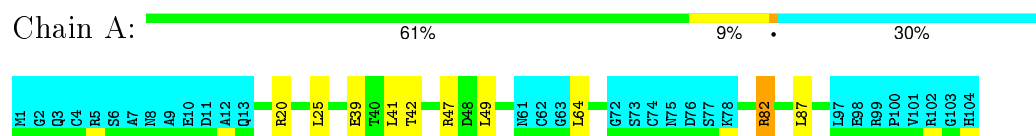


- Molecule 1: Protein S100-A14

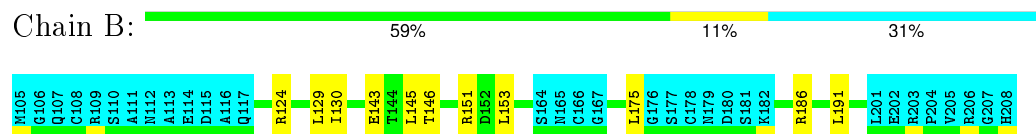


4.2.17 Score per residue for model 17

- Molecule 1: Protein S100-A14

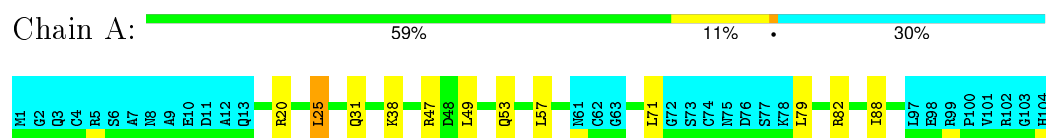


- Molecule 1: Protein S100-A14

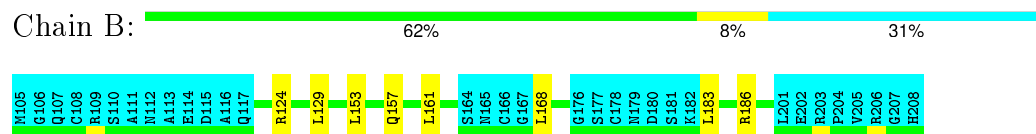


4.2.18 Score per residue for model 18

- Molecule 1: Protein S100-A14

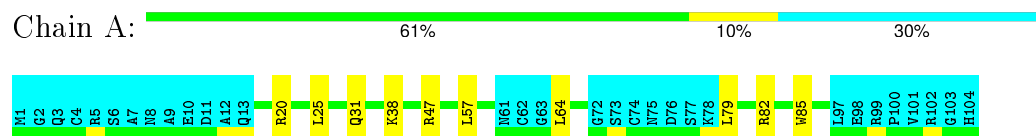


- Molecule 1: Protein S100-A14

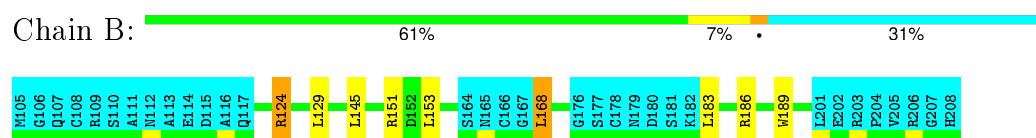


4.2.19 Score per residue for model 19

- Molecule 1: Protein S100-A14

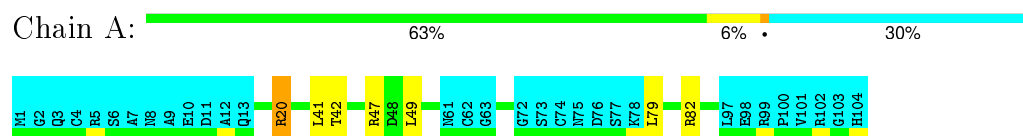


- Molecule 1: Protein S100-A14

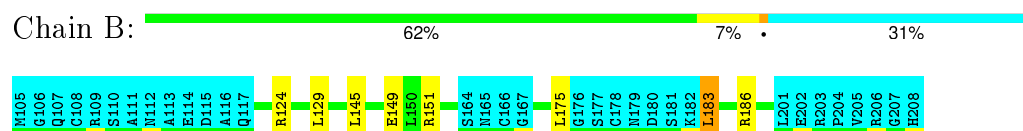


4.2.20 Score per residue for model 20

- Molecule 1: Protein S100-A14

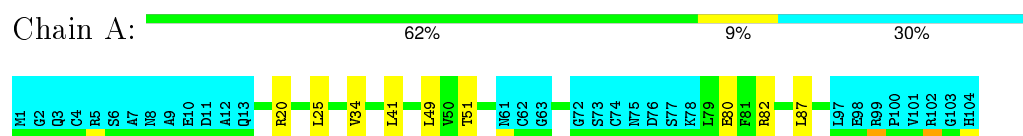


- Molecule 1: Protein S100-A14

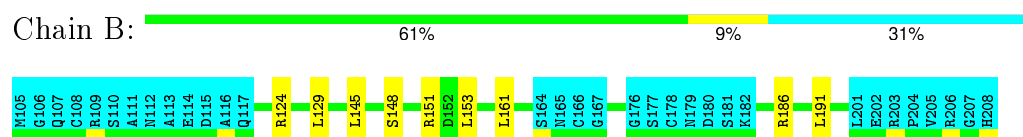


4.2.21 Score per residue for model 21

- Molecule 1: Protein S100-A14

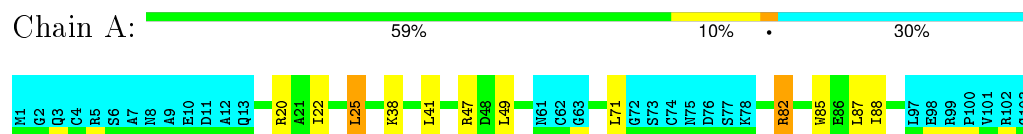


- Molecule 1: Protein S100-A14

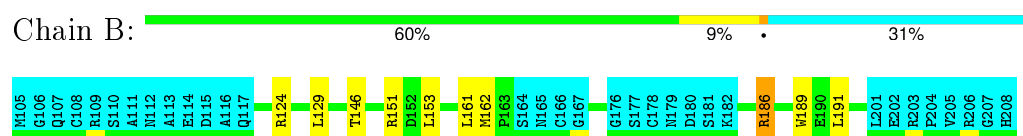


4.2.22 Score per residue for model 22

- Molecule 1: Protein S100-A14

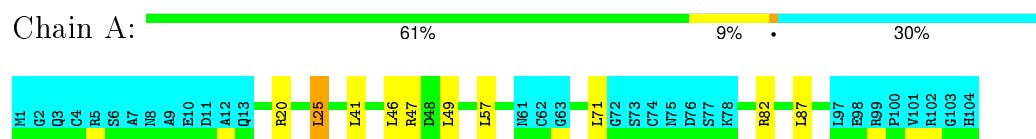


- Molecule 1: Protein S100-A14

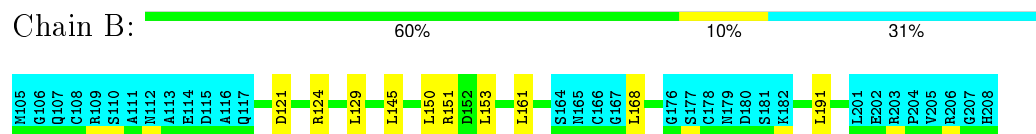


4.2.23 Score per residue for model 23

- Molecule 1: Protein S100-A14

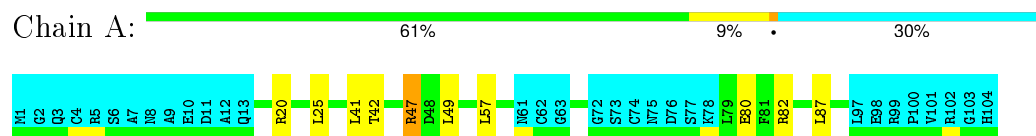


- Molecule 1: Protein S100-A14

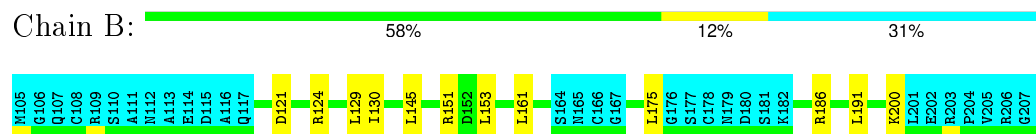


4.2.24 Score per residue for model 24

- Molecule 1: Protein S100-A14

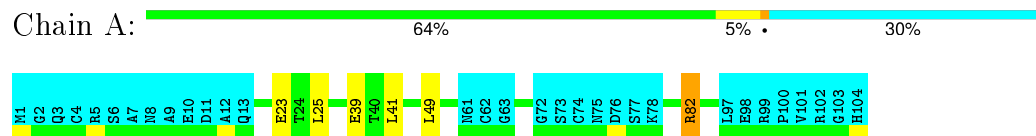


- Molecule 1: Protein S100-A14

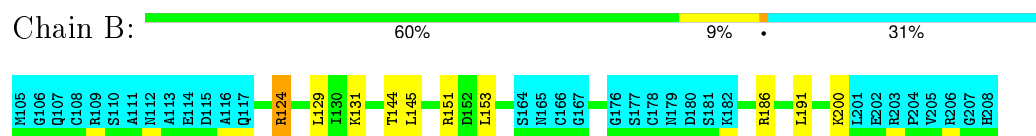


4.2.25 Score per residue for model 25

- Molecule 1: Protein S100-A14

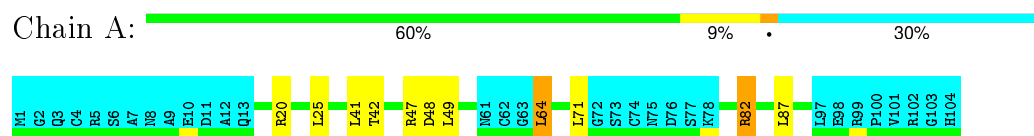


- Molecule 1: Protein S100-A14

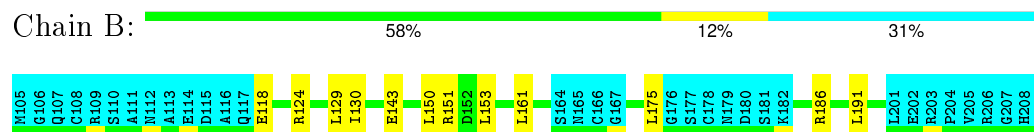


4.2.26 Score per residue for model 26

- Molecule 1: Protein S100-A14

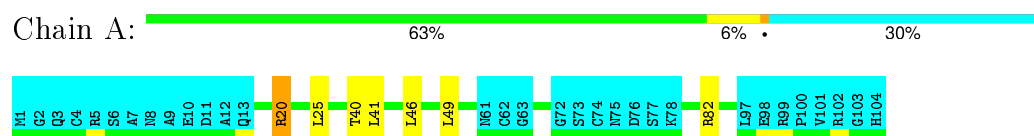


- Molecule 1: Protein S100-A14

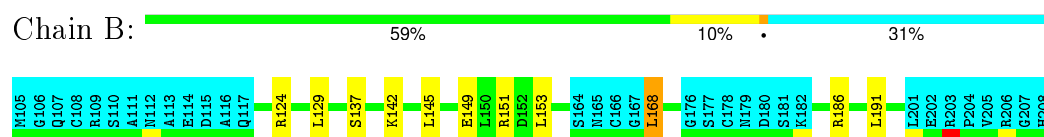


4.2.27 Score per residue for model 27

- Molecule 1: Protein S100-A14

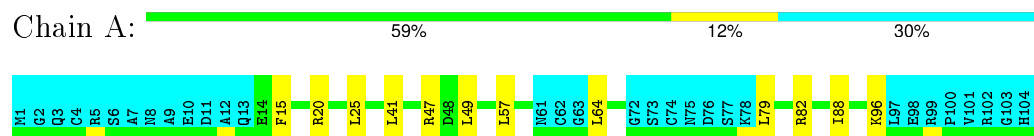


- Molecule 1: Protein S100-A14

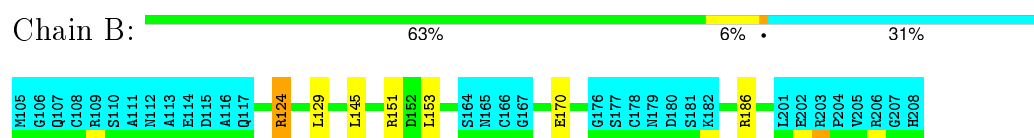


4.2.28 Score per residue for model 28

- Molecule 1: Protein S100-A14

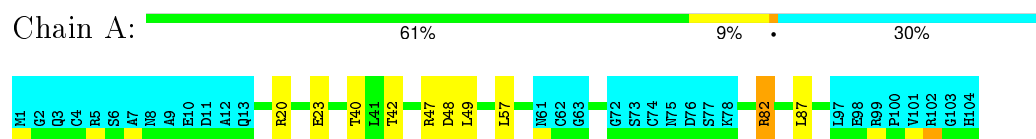


- Molecule 1: Protein S100-A14

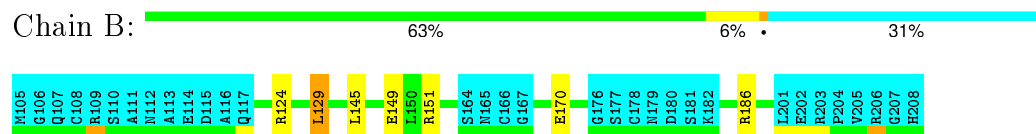


4.2.29 Score per residue for model 29

- Molecule 1: Protein S100-A14

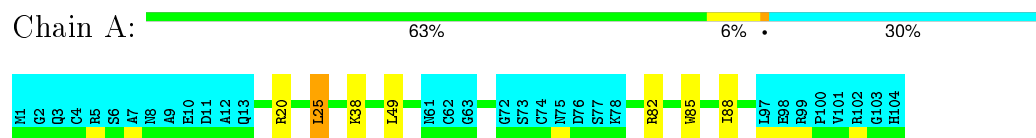


- Molecule 1: Protein S100-A14

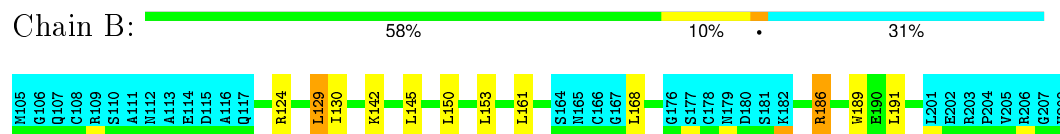


4.2.30 Score per residue for model 30

- Molecule 1: Protein S100-A14



- Molecule 1: Protein S100-A14



5 Refinement protocol and experimental data overview

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

Of the 500 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
CYANA	structure solution	2.1
AMBER	refinement	11
CYANA	refinement	2.1

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)	2m0r_cs.str
Number of chemical shift lists	1
Total number of shifts	1077
Number of shifts mapped to atoms	1077
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	40%

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

6 Model quality

6.1 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 (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	0.69±0.01	0±0/603 (0.0±0.0%)	1.11±0.03	3±1/815 (0.3±0.1%)
1	B	0.69±0.01	0±0/597 (0.0±0.0%)	1.12±0.03	3±1/807 (0.4±0.1%)
All	All	0.69	0/36000 (0.0%)	1.12	172/48660 (0.4%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	Chirality	Planarity
1	A	0.0±0.0	0.2±0.4
1	B	0.0±0.0	0.2±0.5
All	All	0	13

There are no bond-length outliers.

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	B	124	ARG	NE-CZ-NH1	9.23	124.92	120.30	29	26
1	A	82	ARG	NE-CZ-NH1	9.17	124.89	120.30	21	28
1	A	20	ARG	NE-CZ-NH1	8.75	124.67	120.30	26	27
1	B	186	ARG	NE-CZ-NH1	8.72	124.66	120.30	8	25
1	B	151	ARG	NE-CZ-NH1	8.33	124.46	120.30	5	25
1	A	47	ARG	NE-CZ-NH1	7.69	124.15	120.30	19	20
1	B	186	ARG	NE-CZ-NH2	-7.68	116.46	120.30	11	5
1	A	82	ARG	NE-CZ-NH2	-6.36	117.12	120.30	1	3
1	A	20	ARG	NE-CZ-NH2	-5.93	117.33	120.30	1	2
1	B	151	ARG	NE-CZ-NH2	-5.49	117.55	120.30	24	1
1	B	129	LEU	CB-CG-CD2	5.29	119.99	111.00	8	5
1	A	23	GLU	N-CA-CB	-5.27	101.11	110.60	16	1
1	A	25	LEU	CB-CG-CD2	5.17	119.79	111.00	5	3

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)	Models	
								Worst	Total
1	A	15	PHE	CB-CG-CD2	-5.08	117.24	120.80	6	1

There are no chirality outliers.

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

Mol	Chain	Res	Type	Group	Models (Total)
1	A	47	ARG	Sidechain	2
1	A	20	ARG	Sidechain	2
1	B	200	LYS	Peptide	2
1	A	82	ARG	Sidechain	2
1	B	183	LEU	Peptide	1
1	A	40	THR	Peptide	1
1	B	145	LEU	Peptide	1
1	B	186	ARG	Sidechain	1
1	B	151	ARG	Sidechain	1

6.2 Too-close contacts [i](#)

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	591	590	590	1±1
1	B	585	585	585	0±1
All	All	35280	35250	35250	23

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:B:168:LEU:H	1:B:168:LEU:HD12	0.52	1.63	27	2
1:B:183:LEU:H	1:B:183:LEU:HD13	0.47	1.70	20	1
1:A:25:LEU:CD1	1:A:88:ILE:HD13	0.45	2.41	7	7
1:B:129:LEU:CD1	1:B:192:ILE:HD13	0.45	2.42	13	2
1:A:85:TRP:CZ2	1:B:189:TRP:CZ2	0.44	3.05	22	4

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:81:PHE:CZ	1:B:200:LYS:HE2	0.44	2.48	6	1
1:B:188:PHE:CE2	1:B:192:ILE:HD11	0.43	2.48	5	1
1:A:29:PHE:CE2	1:A:41:LEU:HB2	0.43	2.49	8	1
1:A:96:LYS:HE2	1:B:185:PHE:CE1	0.43	2.48	3	1
1:A:27:LYS:HE2	1:A:30:HIS:CE1	0.42	2.49	4	1
1:A:25:LEU:HD12	1:A:88:ILE:HD13	0.41	1.91	22	1
1:A:64:LEU:HD12	1:A:64:LEU:H	0.41	1.76	26	1

6.3 Torsion angles [i](#)

6.3.1 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	73/104 (70%)	69±2 (95±2%)	4±2 (5±2%)	0±0 (0±1%)	43	81
1	B	72/104 (69%)	69±1 (95±2%)	3±1 (4±2%)	0±1 (0±1%)	43	81
All	All	4350/6240 (70%)	4132 (95%)	200 (5%)	18 (0%)	43	81

All 6 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	38	LYS	8
1	B	142	LYS	6
1	A	33	SER	1
1	B	140	GLY	1
1	B	118	GLU	1
1	B	137	SER	1

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	66/90 (73%)	59±2 (90±2%)	7±2 (10±2%)	14	58
1	B	65/90 (72%)	59±2 (90±3%)	6±2 (10±3%)	14	59
All	All	3930/5400 (73%)	3541 (90%)	389 (10%)	14	59

All 65 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	49	LEU	29
1	B	129	LEU	29
1	B	153	LEU	28
1	A	25	LEU	24
1	A	41	LEU	23
1	B	145	LEU	22
1	A	87	LEU	18
1	A	57	LEU	17
1	B	191	LEU	15
1	B	161	LEU	13
1	B	175	LEU	9
1	A	71	LEU	8
1	A	42	THR	8
1	B	168	LEU	7
1	B	130	ILE	6
1	A	64	LEU	6
1	B	150	LEU	6
1	B	186	ARG	6
1	A	79	LEU	5
1	B	124	ARG	5
1	A	96	LYS	5
1	A	80	GLU	5
1	A	82	ARG	5
1	A	46	LEU	5
1	B	146	THR	5
1	B	162	MET	5
1	B	149	GLU	4
1	A	20	ARG	4
1	A	39	GLU	4
1	B	183	LEU	4
1	B	200	LYS	4
1	B	143	GLU	4
1	B	170	GLU	3
1	A	23	GLU	3

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Mol	Chain	Res	Type	Models (Total)
1	B	121	ASP	3
1	A	53	GLN	3
1	A	58	MET	3
1	A	48	ASP	2
1	A	31	GLN	2
1	A	28	ASN	2
1	B	118	GLU	2
1	A	40	THR	2
1	B	185	PHE	2
1	A	44	SER	2
1	A	26	ILE	2
1	B	131	LYS	1
1	A	15	PHE	1
1	B	127	GLU	1
1	A	27	LYS	1
1	A	94	SER	1
1	B	157	GLN	1
1	A	47	ARG	1
1	A	93	LYS	1
1	A	51	THR	1
1	B	137	SER	1
1	B	169	GLU	1
1	B	147	PRO	1
1	B	184	GLU	1
1	A	17	ASP	1
1	B	148	SER	1
1	A	43	PRO	1
1	A	66	GLU	1
1	B	144	THR	1
1	A	34	VAL	1
1	A	22	ILE	1

6.3.3 RNA ⓘ

There are no RNA molecules in this entry.

6.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

6.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

6.6 Ligand geometry [i](#)

There are no ligands in this entry.

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 40% for the well-defined parts and 38% for the entire structure.

7.1 Chemical shift list 1

File name: 2m0r_cs.str

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	1077
Number of shifts mapped to atoms	1077
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

7.1.2 Chemical shift referencing

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction \pm precision, ppm	Suggested action
$^{13}\text{C}_\alpha$	100	-0.29 ± 0.17	None needed (< 0.5 ppm)
$^{13}\text{C}_\beta$	94	0.57 ± 0.06	Should be applied
$^{13}\text{C}'$	99	-0.17 ± 0.14	None needed (< 0.5 ppm)
^{15}N	96	0.41 ± 0.25	None needed (< 0.5 ppm)

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 40%, i.e. 742 atoms were assigned a chemical shift out of a possible 1848. 12 out of 28 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^1H	^{13}C	^{15}N
Backbone	356/713 (50%)	141/284 (50%)	145/290 (50%)	70/139 (50%)
Sidechain	372/995 (37%)	202/582 (35%)	166/375 (44%)	4/38 (11%)

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	Total	^1H	^{13}C	^{15}N
Aromatic	14/140 (10%)	14/76 (18%)	0/58 (0%)	0/6 (0%)
Overall	742/1848 (40%)	357/942 (38%)	311/723 (43%)	74/183 (40%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 38%, i.e. 969 atoms were assigned a chemical shift out of a possible 2554. 13 out of 32 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^1H	^{13}C	^{15}N
Backbone	486/1024 (47%)	191/408 (47%)	199/416 (48%)	96/200 (48%)
Sidechain	467/1376 (34%)	247/810 (30%)	214/498 (43%)	6/68 (9%)
Aromatic	16/154 (10%)	16/84 (19%)	0/62 (0%)	0/8 (0%)
Overall	969/2554 (38%)	454/1302 (35%)	413/976 (42%)	102/276 (37%)

7.1.4 Statistically unusual chemical shifts [i](#)

There are no statistically unusual chemical shifts.

7.1.5 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:

