



# Full wwPDB NMR Structure Validation Report ⓘ

Feb 12, 2017 – 11:53 pm GMT

PDB ID : 2LBW  
Title : Solution structure of the *S. cerevisiae* H/ACA RNP protein Nhp2p-S82W mutant  
Authors : Koo, B.; Park, C.; Fernandez, C.F.; Chim, N.; Ding, Y.; Chanfreau, G.; Feigon, J.  
Deposited on : 2011-04-07

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

<http://wwpdb.org/validation/2016/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 : 20161228.v01 (using entries in the PDB archive December 28th 2016)  
RCI : v\_1n\_11\_5\_13\_A (Berjanski et al., 2005)  
PANAV : Wang et al. (2010)  
ShiftChecker : trunk28760  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : recalc28949

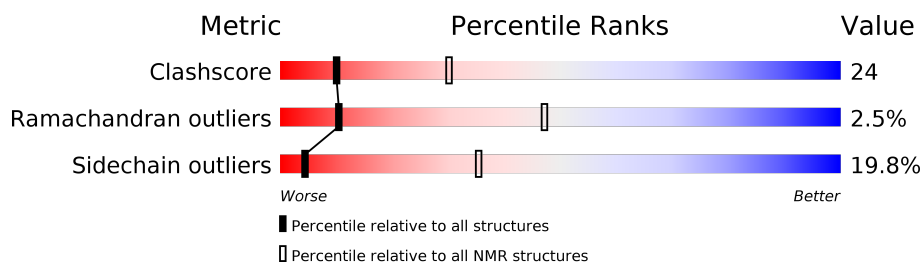
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*SOLUTION NMR*

The overall completeness of chemical shifts assignment is 70%.

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	125131	11601
Ramachandran outliers	121729	10391
Sidechain outliers	121581	10367

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	121	

## 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:37-A:156 (120)	0.53	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 4 clusters and 2 single-model clusters were found.

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

### 3 Entry composition

There is only 1 type of molecule in this entry. The entry contains 1946 atoms, of which 1011 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called H/ACA ribonucleoprotein complex subunit 2.

Mol	Chain	Residues	Atoms						Trace
1	A	121	Total	C	H	N	O	S	0
			1946	600	1011	165	169	1	

There is a discrepancy between the modelled and reference sequences:

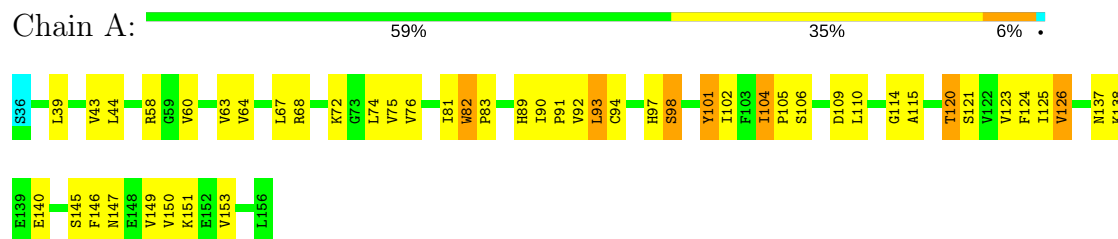
Chain	Residue	Modelled	Actual	Comment	Reference
A	82	TRP	SER	CONFLICT	UNP P32495

## 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: H/ACA ribonucleoprotein complex subunit 2

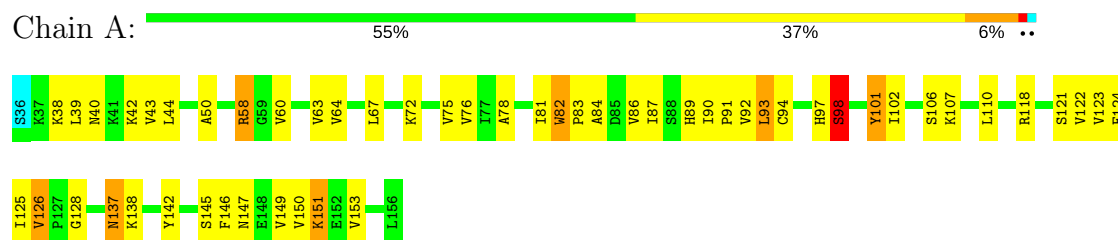


### 4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

#### 4.2.1 Score per residue for model 1

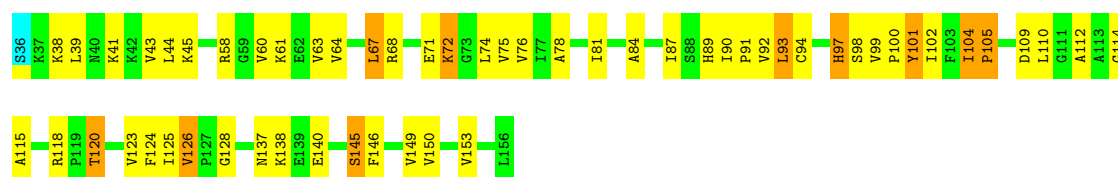
- Molecule 1: H/ACA ribonucleoprotein complex subunit 2



#### 4.2.2 Score per residue for model 2

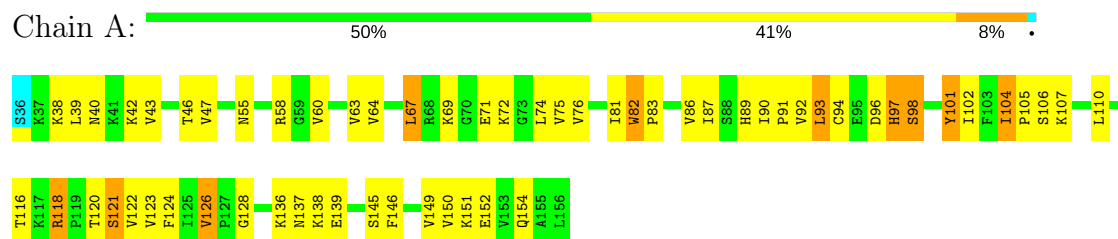
- Molecule 1: H/ACA ribonucleoprotein complex subunit 2





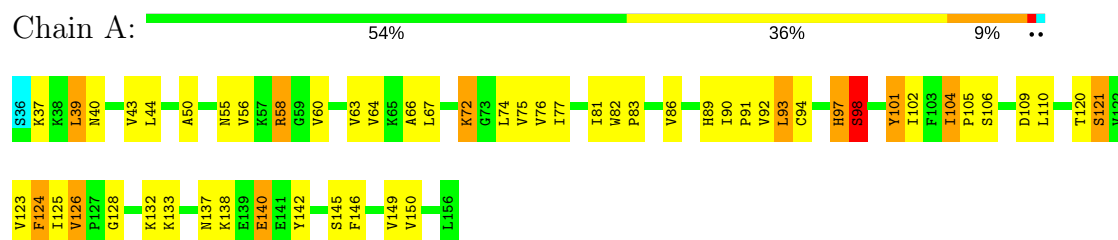
#### 4.2.3 Score per residue for model 3

- Molecule 1: H/ACA ribonucleoprotein complex subunit 2



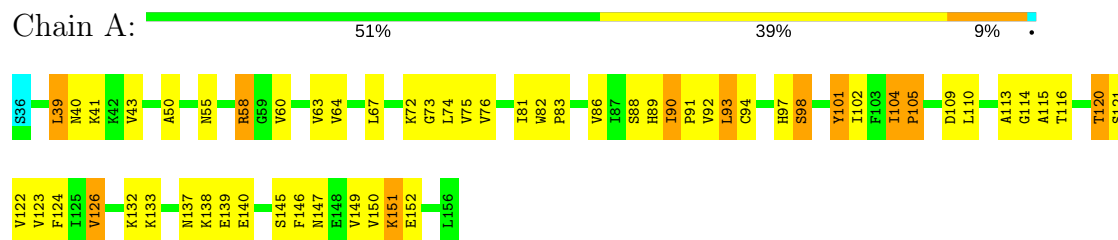
#### 4.2.4 Score per residue for model 4 (medoid)

- Molecule 1: H/ACA ribonucleoprotein complex subunit 2



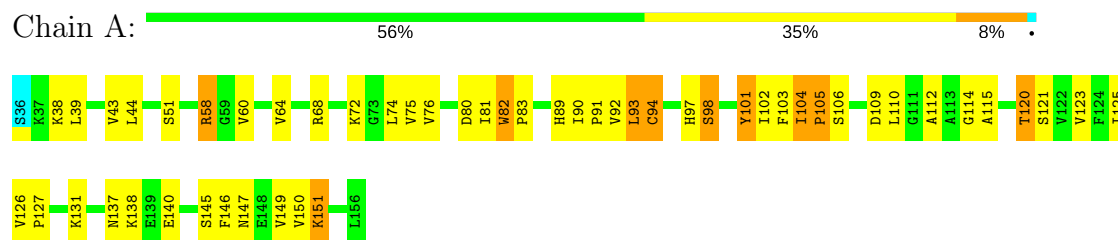
#### 4.2.5 Score per residue for model 5

- Molecule 1: H/ACA ribonucleoprotein complex subunit 2



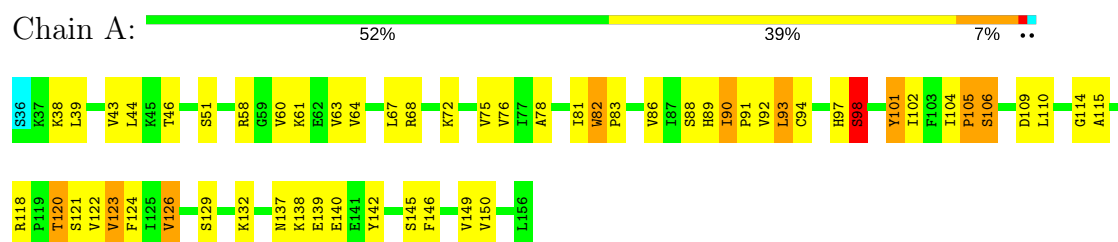
#### 4.2.6 Score per residue for model 6

- Molecule 1: H/ACA ribonucleoprotein complex subunit 2



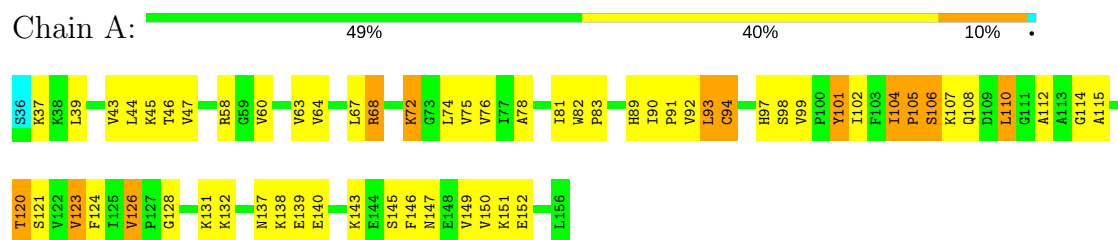
#### 4.2.7 Score per residue for model 7

- Molecule 1: H/ACA ribonucleoprotein complex subunit 2



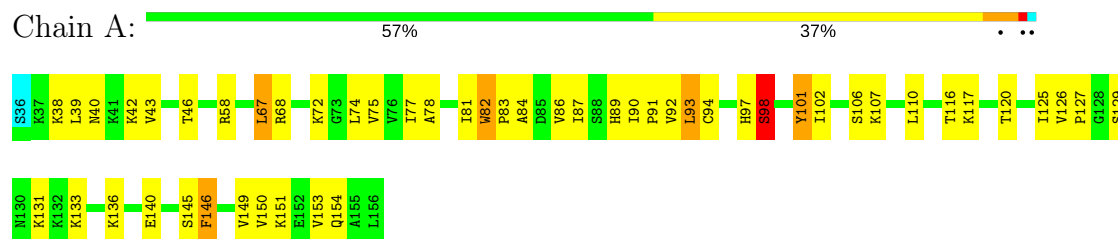
#### 4.2.8 Score per residue for model 8

- Molecule 1: H/ACA ribonucleoprotein complex subunit 2



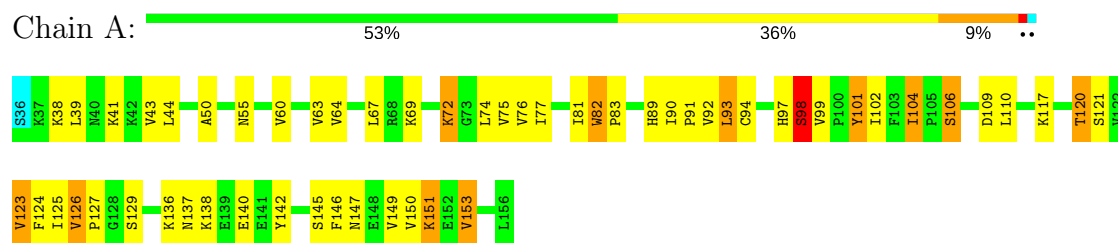
#### 4.2.9 Score per residue for model 9

- Molecule 1: H/ACA ribonucleoprotein complex subunit 2



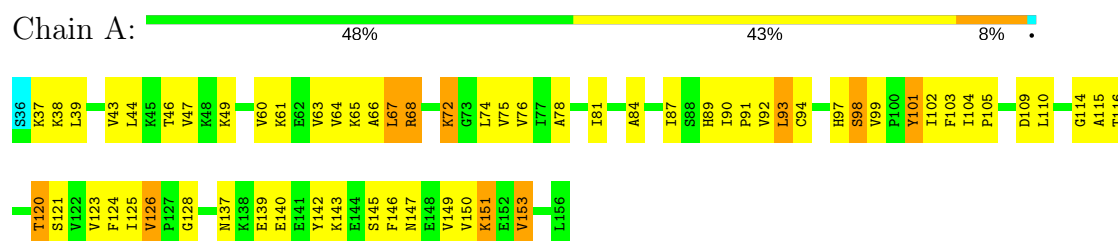
### 4.2.10 Score per residue for model 10

- Molecule 1: H/ACA ribonucleoprotein complex subunit 2



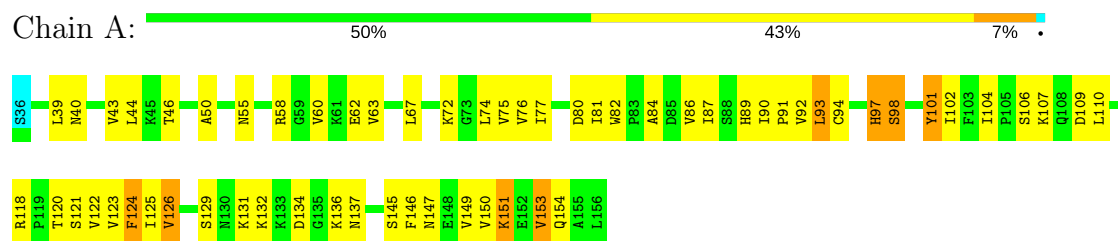
### 4.2.11 Score per residue for model 11

- Molecule 1: H/ACA ribonucleoprotein complex subunit 2



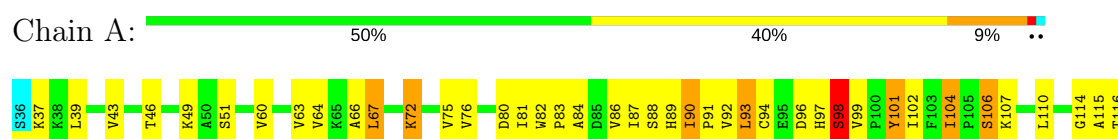
### 4.2.12 Score per residue for model 12

- Molecule 1: H/ACA ribonucleoprotein complex subunit 2

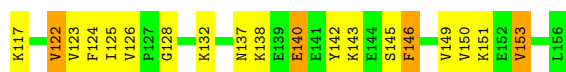


### 4.2.13 Score per residue for model 13

- Molecule 1: H/ACA ribonucleoprotein complex subunit 2







#### 4.2.14 Score per residue for model 14

- Molecule 1: H/ACA ribonucleoprotein complex subunit 2

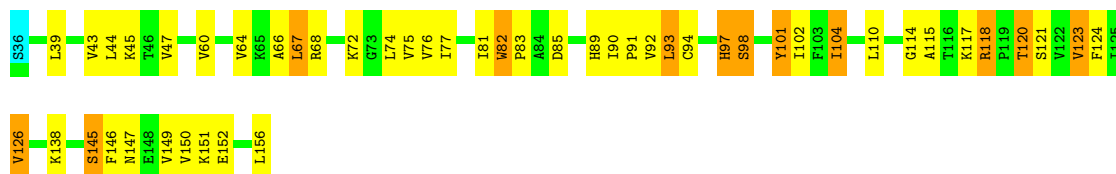
Chain A: 54% 38% 7% ..



#### 4.2.15 Score per residue for model 15

- Molecule 1: H/ACA ribonucleoprotein complex subunit 2

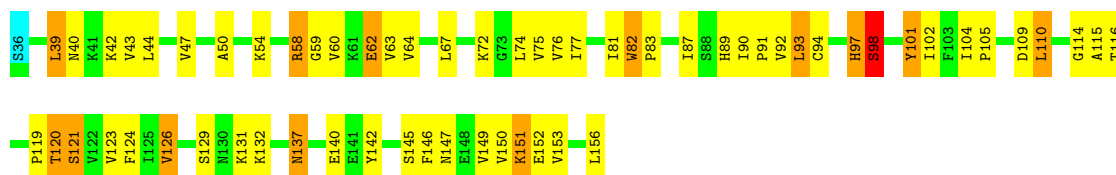
Chain A: 59% 31% 10% .



#### 4.2.16 Score per residue for model 16

- Molecule 1: H/ACA ribonucleoprotein complex subunit 2

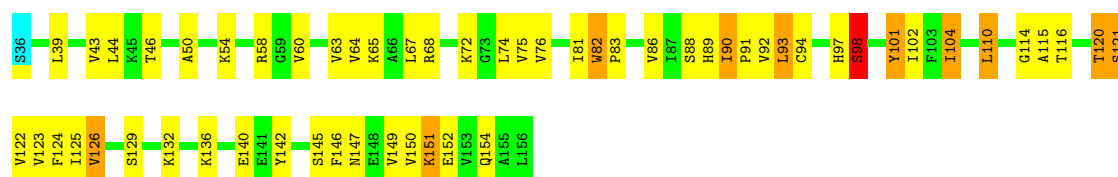
Chain A: 48% 40% 11% ..



#### 4.2.17 Score per residue for model 17

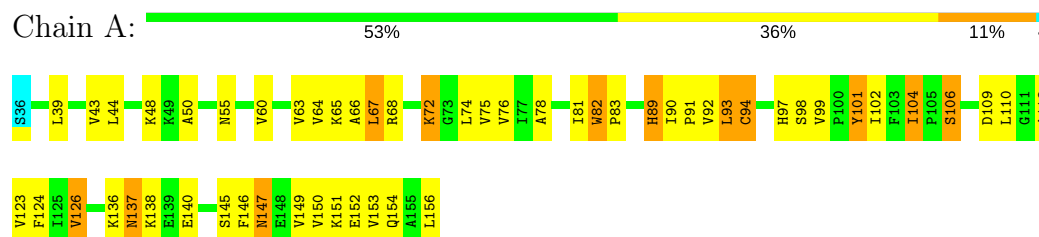
- Molecule 1: H/ACA ribonucleoprotein complex subunit 2

Chain A: 52% 38% 8% ..



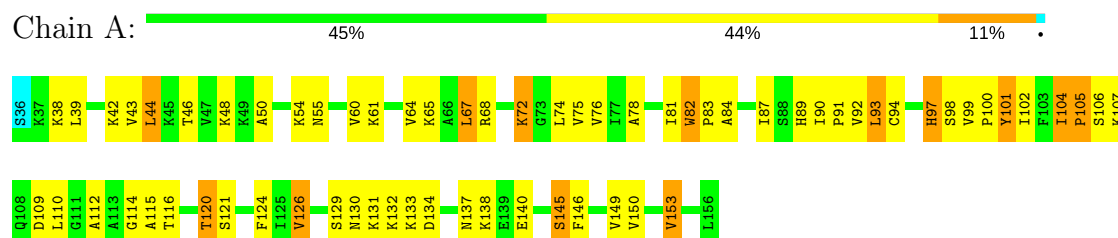
#### 4.2.18 Score per residue for model 18

- Molecule 1: H/ACA ribonucleoprotein complex subunit 2



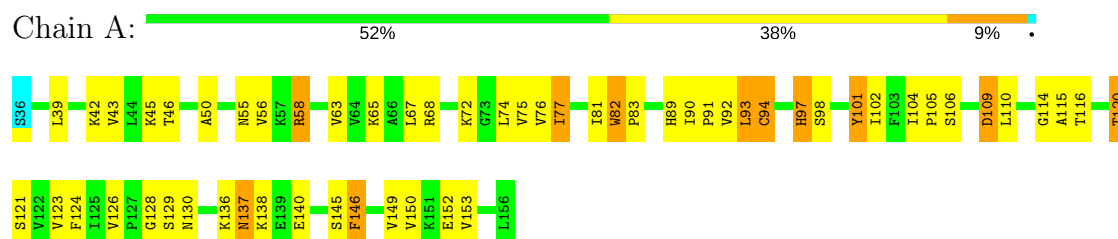
#### 4.2.19 Score per residue for model 19

- Molecule 1: H/ACA ribonucleoprotein complex subunit 2



#### 4.2.20 Score per residue for model 20

- Molecule 1: H/ACA ribonucleoprotein complex subunit 2



## 5 Refinement protocol and experimental data overview

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

Of the 100 calculated structures, 20 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
TALOS	geometry optimization	
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)	2lbw_cs.str
Number of chemical shift lists	1
Total number of shifts	1108
Number of shifts mapped to atoms	1108
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	70%

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

## 6 Model quality ⓘ

### 6.1 Standard geometry ⓘ

There are no covalent bond-length or bond-angle outliers.

There are no bond-length outliers.

There are no bond-angle outliers.

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	929	1006	1006	47±5
All	All	18580	20120	20120	941

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 24.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:102:ILE:HD11	1:A:150:VAL:HG12	1.06	1.20	16	18
1:A:110:LEU:HD11	1:A:123:VAL:HG11	0.94	1.37	15	4
1:A:74:LEU:HD12	1:A:150:VAL:HG11	0.82	1.51	19	9
1:A:110:LEU:HD22	1:A:123:VAL:HG11	0.80	1.51	1	2
1:A:76:VAL:HG13	1:A:104:ILE:HD11	0.78	1.53	4	15
1:A:86:VAL:HG22	1:A:122:VAL:HG13	0.76	1.57	12	1
1:A:78:ALA:HB2	1:A:110:LEU:HD11	0.76	1.58	1	2
1:A:86:VAL:HG12	1:A:122:VAL:HG13	0.75	1.58	14	7
1:A:125:ILE:HG21	1:A:146:PHE:CE2	0.75	2.17	17	1
1:A:76:VAL:CG1	1:A:104:ILE:HD11	0.74	2.12	19	7
1:A:77:ILE:HG23	1:A:86:VAL:HG11	0.73	1.58	12	1
1:A:43:VAL:HG21	1:A:149:VAL:HG11	0.72	1.60	2	7
1:A:43:VAL:CG2	1:A:149:VAL:HG11	0.70	2.16	17	14
1:A:67:LEU:HD13	1:A:68:ARG:N	0.70	2.01	19	3

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:77:ILE:HG23	1:A:86:VAL:HG21	0.69	1.63	9	1
1:A:78:ALA:HB3	1:A:81:ILE:HD11	0.69	1.62	8	1
1:A:125:ILE:HG22	1:A:127:PRO:HD3	0.69	1.65	14	4
1:A:76:VAL:HB	1:A:123:VAL:HG13	0.68	1.66	5	15
1:A:93:LEU:HD21	1:A:101:TYR:CE2	0.67	2.24	18	1
1:A:90:ILE:HG22	1:A:101:TYR:CZ	0.66	2.26	13	4
1:A:39:LEU:O	1:A:43:VAL:HG23	0.65	1.91	3	19
1:A:74:LEU:HG	1:A:150:VAL:HG11	0.65	1.68	16	9
1:A:107:LYS:HA	1:A:110:LEU:HD12	0.65	1.69	13	2
1:A:106:SER:HB2	1:A:110:LEU:HD12	0.64	1.70	14	5
1:A:63:VAL:HG12	1:A:124:PHE:HB3	0.63	1.70	4	12
1:A:74:LEU:CD1	1:A:150:VAL:HG11	0.63	2.22	17	14
1:A:104:ILE:HD12	1:A:109:ASP:OD1	0.63	1.93	16	7
1:A:78:ALA:HB3	1:A:81:ILE:CD1	0.63	2.23	8	1
1:A:39:LEU:HD22	1:A:149:VAL:HG22	0.62	1.70	7	2
1:A:58:ARG:HB3	1:A:120:THR:HG21	0.62	1.71	2	7
1:A:50:ALA:HB1	1:A:55:ASN:OD1	0.61	1.94	10	4
1:A:110:LEU:HD11	1:A:123:VAL:CG1	0.61	2.22	15	4
1:A:76:VAL:HG13	1:A:104:ILE:CD1	0.61	2.24	5	2
1:A:60:VAL:HG23	1:A:89:HIS:CE1	0.61	2.30	12	2
1:A:48:LYS:HD3	1:A:112:ALA:HB1	0.61	1.73	18	1
1:A:78:ALA:HB2	1:A:110:LEU:CD1	0.61	2.26	9	2
1:A:149:VAL:O	1:A:153:VAL:HG12	0.61	1.96	13	8
1:A:146:PHE:O	1:A:150:VAL:HG13	0.60	1.95	16	19
1:A:110:LEU:HD23	1:A:120:THR:N	0.60	2.11	10	2
1:A:50:ALA:HB2	1:A:142:TYR:CE1	0.60	2.31	17	3
1:A:58:ARG:CB	1:A:120:THR:HG21	0.60	2.27	16	5
1:A:67:LEU:HD21	1:A:96:ASP:OD2	0.60	1.97	3	2
1:A:106:SER:HB3	1:A:110:LEU:HD22	0.60	1.73	10	1
1:A:78:ALA:HB3	1:A:81:ILE:CG1	0.59	2.27	2	4
1:A:145:SER:O	1:A:149:VAL:HG23	0.59	1.97	12	20
1:A:110:LEU:HD22	1:A:123:VAL:CG1	0.59	2.23	1	1
1:A:106:SER:HA	1:A:110:LEU:HD22	0.59	1.74	8	1
1:A:81:ILE:HG21	1:A:121:SER:HA	0.59	1.74	3	10
1:A:102:ILE:CD1	1:A:150:VAL:HG12	0.59	2.20	6	13
1:A:75:VAL:HG21	1:A:93:LEU:HD21	0.59	1.74	5	4
1:A:44:LEU:HD13	1:A:109:ASP:HB3	0.59	1.73	12	1
1:A:124:PHE:CE2	1:A:126:VAL:HG22	0.59	2.33	3	6
1:A:62:GLU:OE2	1:A:63:VAL:HG13	0.59	1.98	16	1
1:A:43:VAL:O	1:A:47:VAL:HG12	0.58	1.99	14	6
1:A:72:LYS:NZ	1:A:93:LEU:HD13	0.58	2.14	14	3

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:93:LEU:HD21	1:A:101:TYR:CE1	0.57	2.34	11	3
1:A:110:LEU:HD23	1:A:120:THR:H	0.57	1.58	15	3
1:A:102:ILE:HG13	1:A:153:VAL:HG11	0.57	1.75	9	2
1:A:81:ILE:HD11	1:A:107:LYS:CB	0.57	2.29	9	2
1:A:149:VAL:O	1:A:153:VAL:HG23	0.57	1.99	18	2
1:A:102:ILE:HD11	1:A:150:VAL:CG1	0.57	2.21	6	10
1:A:81:ILE:HD11	1:A:106:SER:CB	0.57	2.29	6	3
1:A:81:ILE:HD13	1:A:121:SER:O	0.57	1.99	8	1
1:A:90:ILE:N	1:A:91:PRO:HD2	0.57	2.15	19	20
1:A:75:VAL:O	1:A:101:TYR:HA	0.56	2.01	20	16
1:A:84:ALA:HB1	1:A:87:ILE:CD1	0.56	2.30	1	6
1:A:104:ILE:HD12	1:A:106:SER:OG	0.56	2.01	12	1
1:A:39:LEU:HD23	1:A:40:ASN:N	0.56	2.16	4	5
1:A:44:LEU:HD21	1:A:108:GLN:HG3	0.56	1.76	8	1
1:A:104:ILE:HD12	1:A:109:ASP:CG	0.56	2.21	20	5
1:A:39:LEU:CD1	1:A:149:VAL:HG13	0.55	2.31	4	3
1:A:44:LEU:CD2	1:A:112:ALA:HB3	0.55	2.30	19	1
1:A:124:PHE:CE2	1:A:126:VAL:HG13	0.55	2.37	11	11
1:A:149:VAL:O	1:A:153:VAL:HG22	0.55	2.01	10	2
1:A:46:THR:HG22	1:A:146:PHE:CZ	0.55	2.36	19	4
1:A:43:VAL:CG2	1:A:149:VAL:HG21	0.55	2.31	18	3
1:A:106:SER:CB	1:A:110:LEU:HD12	0.55	2.31	14	5
1:A:124:PHE:CZ	1:A:126:VAL:HG22	0.55	2.37	12	4
1:A:86:VAL:HG12	1:A:122:VAL:CG1	0.55	2.31	3	4
1:A:101:TYR:C	1:A:102:ILE:HD12	0.55	2.22	1	7
1:A:110:LEU:CD2	1:A:123:VAL:HG11	0.55	2.31	6	3
1:A:56:VAL:HG12	1:A:125:ILE:HG23	0.55	1.79	4	1
1:A:110:LEU:HD22	1:A:120:THR:CG2	0.54	2.32	14	1
1:A:39:LEU:CG	1:A:149:VAL:HG13	0.54	2.32	8	2
1:A:39:LEU:HD12	1:A:149:VAL:HG13	0.54	1.79	16	3
1:A:39:LEU:HG	1:A:149:VAL:HG13	0.54	1.79	20	3
1:A:67:LEU:C	1:A:67:LEU:HD13	0.54	2.23	19	2
1:A:74:LEU:CG	1:A:150:VAL:HG11	0.53	2.32	16	7
1:A:67:LEU:HD23	1:A:68:ARG:N	0.53	2.19	9	4
1:A:44:LEU:HD11	1:A:112:ALA:HB3	0.53	1.79	6	3
1:A:97:HIS:O	1:A:98:SER:CB	0.53	2.56	17	19
1:A:77:ILE:HG13	1:A:90:ILE:HD11	0.53	1.81	16	3
1:A:43:VAL:HG22	1:A:149:VAL:HG21	0.53	1.78	18	1
1:A:60:VAL:O	1:A:64:VAL:HG23	0.52	2.05	19	16
1:A:89:HIS:O	1:A:93:LEU:HD23	0.52	2.05	2	4
1:A:78:ALA:HB3	1:A:81:ILE:HG12	0.52	1.81	2	2

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:77:ILE:HD12	1:A:86:VAL:CG2	0.52	2.34	9	2
1:A:39:LEU:HD21	1:A:152:GLU:HB2	0.52	1.82	20	2
1:A:110:LEU:HD21	1:A:120:THR:O	0.51	2.05	12	1
1:A:75:VAL:HB	1:A:101:TYR:HB3	0.51	1.82	13	4
1:A:114:GLY:O	1:A:115:ALA:HB2	0.51	2.05	14	8
1:A:99:VAL:O	1:A:101:TYR:CE2	0.51	2.64	19	3
1:A:106:SER:O	1:A:107:LYS:C	0.51	2.48	12	4
1:A:72:LYS:HD3	1:A:99:VAL:HG22	0.51	1.83	18	1
1:A:104:ILE:HB	1:A:105:PRO:HD2	0.51	1.83	20	4
1:A:125:ILE:HD12	1:A:125:ILE:N	0.50	2.22	14	4
1:A:126:VAL:O	1:A:126:VAL:HG13	0.50	2.06	6	1
1:A:110:LEU:C	1:A:115:ALA:HB3	0.50	2.27	7	4
1:A:50:ALA:HB1	1:A:55:ASN:ND2	0.50	2.21	5	3
1:A:74:LEU:CD1	1:A:150:VAL:HG21	0.50	2.35	12	1
1:A:92:VAL:HG13	1:A:93:LEU:N	0.50	2.21	11	20
1:A:92:VAL:CG1	1:A:93:LEU:N	0.50	2.75	10	20
1:A:106:SER:HB2	1:A:110:LEU:HD22	0.50	1.83	20	1
1:A:46:THR:HG21	1:A:146:PHE:CD1	0.50	2.42	13	4
1:A:126:VAL:CG1	1:A:126:VAL:O	0.50	2.59	20	1
1:A:106:SER:CB	1:A:110:LEU:HD22	0.50	2.37	10	1
1:A:39:LEU:CD2	1:A:149:VAL:HG22	0.50	2.36	10	2
1:A:94:CYS:O	1:A:98:SER:CA	0.50	2.60	18	20
1:A:67:LEU:O	1:A:67:LEU:HD22	0.50	2.05	18	1
1:A:102:ILE:HG22	1:A:104:ILE:HG22	0.50	1.84	13	1
1:A:67:LEU:C	1:A:67:LEU:HD22	0.49	2.28	18	1
1:A:110:LEU:HD21	1:A:123:VAL:HG11	0.49	1.84	6	1
1:A:89:HIS:HA	1:A:92:VAL:HG12	0.49	1.85	2	20
1:A:75:VAL:O	1:A:102:ILE:HD12	0.49	2.08	2	2
1:A:124:PHE:HE2	1:A:126:VAL:HG13	0.49	1.68	1	10
1:A:78:ALA:HB3	1:A:81:ILE:HG13	0.49	1.84	11	3
1:A:125:ILE:HG21	1:A:142:TYR:OH	0.49	2.07	11	3
1:A:39:LEU:HD21	1:A:102:ILE:HG21	0.49	1.84	9	1
1:A:110:LEU:CD2	1:A:123:VAL:HG21	0.49	2.37	4	1
1:A:102:ILE:HD12	1:A:102:ILE:N	0.49	2.23	13	7
1:A:94:CYS:O	1:A:98:SER:HA	0.49	2.08	6	3
1:A:66:ALA:HB2	1:A:124:PHE:CZ	0.49	2.43	18	2
1:A:39:LEU:HD21	1:A:152:GLU:CB	0.49	2.37	20	3
1:A:58:ARG:CB	1:A:123:VAL:HG22	0.49	2.37	4	1
1:A:152:GLU:O	1:A:156:LEU:HD23	0.48	2.07	16	3
1:A:39:LEU:CB	1:A:149:VAL:HG13	0.48	2.38	20	2
1:A:39:LEU:HG	1:A:149:VAL:HG22	0.48	1.85	11	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:110:LEU:CD1	1:A:123:VAL:HG11	0.48	2.27	15	4
1:A:81:ILE:HG21	1:A:121:SER:CA	0.48	2.38	14	5
1:A:102:ILE:CG1	1:A:150:VAL:HG12	0.48	2.38	2	3
1:A:44:LEU:HD13	1:A:109:ASP:HA	0.48	1.85	10	4
1:A:84:ALA:HB1	1:A:87:ILE:HD12	0.48	1.83	13	4
1:A:126:VAL:HG13	1:A:126:VAL:O	0.48	2.08	20	1
1:A:78:ALA:HA	1:A:104:ILE:O	0.48	2.08	11	3
1:A:60:VAL:HG12	1:A:122:VAL:HG21	0.48	1.86	17	1
1:A:44:LEU:HD21	1:A:109:ASP:HA	0.48	1.86	2	1
1:A:58:ARG:HB3	1:A:123:VAL:HG12	0.48	1.86	2	2
1:A:90:ILE:HG22	1:A:101:TYR:CE1	0.48	2.44	7	3
1:A:72:LYS:HG2	1:A:99:VAL:HG11	0.47	1.85	8	2
1:A:39:LEU:HD21	1:A:152:GLU:HB3	0.47	1.86	17	1
1:A:44:LEU:HD21	1:A:112:ALA:HB3	0.47	1.87	19	1
1:A:90:ILE:N	1:A:91:PRO:CD	0.47	2.77	5	20
1:A:72:LYS:CE	1:A:99:VAL:HG22	0.47	2.39	2	3
1:A:48:LYS:CD	1:A:112:ALA:HB1	0.47	2.39	18	1
1:A:39:LEU:HD21	1:A:102:ILE:CG2	0.47	2.39	9	1
1:A:60:VAL:O	1:A:64:VAL:HG12	0.47	2.10	1	1
1:A:120:THR:HG21	1:A:123:VAL:HG11	0.47	1.85	14	1
1:A:67:LEU:HD13	1:A:67:LEU:C	0.47	2.29	15	1
1:A:50:ALA:HB2	1:A:142:TYR:CD2	0.47	2.45	1	1
1:A:46:THR:HG22	1:A:142:TYR:CD1	0.46	2.45	17	1
1:A:77:ILE:HG12	1:A:90:ILE:HD11	0.46	1.87	20	1
1:A:99:VAL:O	1:A:101:TYR:CZ	0.46	2.69	19	4
1:A:80:ASP:O	1:A:81:ILE:HD13	0.46	2.10	13	2
1:A:125:ILE:HG21	1:A:146:PHE:CZ	0.46	2.44	17	1
1:A:58:ARG:HB3	1:A:123:VAL:HG22	0.46	1.87	4	1
1:A:75:VAL:HG23	1:A:99:VAL:CG1	0.46	2.40	19	4
1:A:50:ALA:HB1	1:A:55:ASN:CG	0.46	2.30	20	4
1:A:59:GLY:O	1:A:63:VAL:HG22	0.46	2.10	16	1
1:A:67:LEU:HD21	1:A:97:HIS:HB3	0.46	1.88	19	1
1:A:150:VAL:HG23	1:A:151:LYS:HD3	0.45	1.89	5	2
1:A:86:VAL:CG1	1:A:122:VAL:HG13	0.45	2.40	13	1
1:A:81:ILE:HD11	1:A:107:LYS:HB3	0.45	1.87	1	2
1:A:56:VAL:HG13	1:A:58:ARG:NH2	0.45	2.26	20	1
1:A:81:ILE:HD11	1:A:106:SER:OG	0.45	2.12	20	1
1:A:76:VAL:N	1:A:123:VAL:O	0.45	2.50	4	5
1:A:77:ILE:CG1	1:A:90:ILE:HD11	0.45	2.41	16	1
1:A:44:LEU:HD22	1:A:109:ASP:CG	0.45	2.32	12	1
1:A:110:LEU:HD13	1:A:120:THR:H	0.45	1.71	4	2

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:81:ILE:HG21	1:A:121:SER:CB	0.44	2.43	7	2
1:A:67:LEU:HD22	1:A:67:LEU:C	0.44	2.33	15	1
1:A:67:LEU:HD22	1:A:67:LEU:O	0.44	2.11	15	1
1:A:63:VAL:HG12	1:A:124:PHE:CD1	0.44	2.47	17	2
1:A:82:TRP:HA	1:A:83:PRO:C	0.44	2.32	8	16
1:A:46:THR:HG22	1:A:146:PHE:CE2	0.44	2.47	20	2
1:A:128:GLY:O	1:A:129:SER:C	0.44	2.56	14	1
1:A:39:LEU:HB3	1:A:149:VAL:HG13	0.44	1.90	20	2
1:A:102:ILE:N	1:A:102:ILE:HD12	0.44	2.28	10	6
1:A:104:ILE:CB	1:A:105:PRO:HD2	0.44	2.43	19	6
1:A:81:ILE:HD11	1:A:120:THR:O	0.44	2.13	18	2
1:A:110:LEU:HD22	1:A:120:THR:OG1	0.44	2.11	3	1
1:A:81:ILE:HD11	1:A:107:LYS:HB2	0.44	1.89	9	1
1:A:110:LEU:HD22	1:A:123:VAL:HG21	0.43	1.89	4	1
1:A:147:ASN:O	1:A:151:LYS:HB2	0.43	2.13	17	10
1:A:93:LEU:HG	1:A:101:TYR:OH	0.43	2.14	19	3
1:A:125:ILE:N	1:A:125:ILE:CD1	0.43	2.81	14	1
1:A:81:ILE:HG21	1:A:121:SER:HB3	0.43	1.89	7	1
1:A:94:CYS:O	1:A:98:SER:N	0.43	2.51	10	10
1:A:67:LEU:HD12	1:A:93:LEU:CD1	0.43	2.43	11	1
1:A:89:HIS:HA	1:A:92:VAL:CG1	0.43	2.43	2	16
1:A:44:LEU:O	1:A:44:LEU:HD12	0.43	2.13	12	1
1:A:81:ILE:HD11	1:A:106:SER:HB3	0.43	1.91	6	1
1:A:110:LEU:HD22	1:A:120:THR:HG23	0.43	1.89	14	1
1:A:44:LEU:HD21	1:A:108:GLN:CG	0.43	2.42	8	1
1:A:81:ILE:HD11	1:A:119:PRO:HB2	0.43	1.90	16	1
1:A:75:VAL:CB	1:A:101:TYR:HB3	0.43	2.44	13	1
1:A:67:LEU:HD12	1:A:93:LEU:HD13	0.43	1.90	11	1
1:A:66:ALA:HB1	1:A:72:LYS:HA	0.42	1.91	11	1
1:A:44:LEU:HD22	1:A:112:ALA:HB3	0.42	1.90	2	1
1:A:72:LYS:HE2	1:A:99:VAL:HG22	0.42	1.91	11	1
1:A:46:THR:HB	1:A:146:PHE:CE1	0.42	2.50	12	1
1:A:109:ASP:O	1:A:113:ALA:HB3	0.42	2.14	5	1
1:A:82:TRP:HA	1:A:83:PRO:O	0.42	2.15	8	1
1:A:88:SER:C	1:A:91:PRO:HD2	0.42	2.35	5	4
1:A:76:VAL:HG11	1:A:104:ILE:HD11	0.42	1.91	20	1
1:A:81:ILE:HD11	1:A:106:SER:HB2	0.42	1.89	6	2
1:A:66:ALA:HB1	1:A:72:LYS:CA	0.41	2.44	13	3
1:A:93:LEU:HG	1:A:94:CYS:N	0.41	2.29	20	4
1:A:75:VAL:O	1:A:101:TYR:CA	0.41	2.67	14	3
1:A:55:ASN:OD1	1:A:56:VAL:HG13	0.41	2.15	4	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:94:CYS:HB2	1:A:101:TYR:OH	0.41	2.15	18	1
1:A:125:ILE:HG21	1:A:146:PHE:HE2	0.41	1.74	4	1
1:A:76:VAL:HG13	1:A:104:ILE:CG1	0.41	2.45	14	1
1:A:67:LEU:HG	1:A:97:HIS:CG	0.41	2.51	18	1
1:A:93:LEU:HD11	1:A:99:VAL:HB	0.41	1.92	13	1
1:A:73:GLY:C	1:A:74:LEU:HD22	0.41	2.36	5	1
1:A:58:ARG:HG3	1:A:123:VAL:HG23	0.41	1.92	1	1
1:A:116:THR:HG23	1:A:118:ARG:O	0.41	2.15	3	1
1:A:147:ASN:O	1:A:150:VAL:HG22	0.41	2.15	8	1
1:A:43:VAL:HG22	1:A:149:VAL:HG11	0.41	1.92	3	1
1:A:110:LEU:HD13	1:A:120:THR:HG23	0.41	1.91	14	1
1:A:90:ILE:HG22	1:A:91:PRO:N	0.41	2.30	15	1
1:A:125:ILE:N	1:A:125:ILE:HD12	0.40	2.30	17	1
1:A:87:ILE:O	1:A:91:PRO:CD	0.40	2.70	3	3
1:A:59:GLY:O	1:A:62:GLU:HG3	0.40	2.15	16	1
1:A:74:LEU:HD11	1:A:150:VAL:HG21	0.40	1.91	12	1
1:A:75:VAL:HG23	1:A:99:VAL:HG11	0.40	1.93	18	1
1:A:74:LEU:HD22	1:A:74:LEU:N	0.40	2.31	20	1
1:A:74:LEU:HD13	1:A:100:PRO:HG2	0.40	1.92	2	2
1:A:82:TRP:CB	1:A:83:PRO:HA	0.40	2.45	20	1
1:A:90:ILE:HD12	1:A:101:TYR:CD1	0.40	2.52	15	1
1:A:74:LEU:O	1:A:125:ILE:N	0.40	2.53	12	2
1:A:77:ILE:HD12	1:A:86:VAL:HG21	0.40	1.93	9	1
1:A:46:THR:HG23	1:A:142:TYR:HA	0.40	1.93	7	1
1:A:103:PHE:O	1:A:104:ILE:HG23	0.40	2.16	11	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	119/121 (98%)	101±3 (85±3%)	15±3 (13±3%)	3±1 (3±1%)	10	47
All	All	2380/2420 (98%)	2015 (85%)	305 (13%)	60 (3%)	10	47

All 9 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	140	GLU	16
1	A	98	SER	9
1	A	105	PRO	9
1	A	128	GLY	8
1	A	137	ASN	8
1	A	114	GLY	5
1	A	115	ALA	2
1	A	117	LYS	2
1	A	118	ARG	1

### 6.3.2 Protein sidechains ⓘ

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	103/104 (99%)	83±3 (80±3%)	20±3 (20±3%)	4	35
All	All	2060/2080 (99%)	1653 (80%)	407 (20%)	4	35

All 67 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	93	LEU	20
1	A	101	TYR	20
1	A	72	LYS	19
1	A	126	VAL	18
1	A	67	LEU	18
1	A	98	SER	15
1	A	82	TRP	14
1	A	138	LYS	14
1	A	120	THR	14
1	A	104	ILE	13
1	A	137	ASN	13
1	A	151	LYS	13
1	A	116	THR	9
1	A	121	SER	9
1	A	132	LYS	9
1	A	58	ARG	9
1	A	38	LYS	9

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Mol	Chain	Res	Type	Models (Total)
1	A	136	LYS	8
1	A	129	SER	8
1	A	97	HIS	8
1	A	42	LYS	6
1	A	44	LEU	6
1	A	68	ARG	6
1	A	154	GLN	6
1	A	118	ARG	6
1	A	131	LYS	6
1	A	153	VAL	5
1	A	139	GLU	5
1	A	106	SER	5
1	A	65	LYS	5
1	A	123	VAL	4
1	A	61	LYS	4
1	A	94	CYS	4
1	A	37	LYS	4
1	A	143	LYS	4
1	A	133	LYS	4
1	A	110	LEU	4
1	A	107	LYS	4
1	A	45	LYS	4
1	A	146	PHE	4
1	A	90	ILE	4
1	A	39	LEU	3
1	A	41	LYS	3
1	A	145	SER	3
1	A	51	SER	3
1	A	54	LYS	3
1	A	49	LYS	2
1	A	40	ASN	2
1	A	122	VAL	2
1	A	62	GLU	2
1	A	134	ASP	2
1	A	130	ASN	2
1	A	69	LYS	2
1	A	124	PHE	2
1	A	140	GLU	2
1	A	71	GLU	2
1	A	117	LYS	2
1	A	103	PHE	1
1	A	77	ILE	1

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Mol	Chain	Res	Type	Models (Total)
1	A	152	GLU	1
1	A	85	ASP	1
1	A	55	ASN	1
1	A	80	ASP	1
1	A	147	ASN	1
1	A	48	LYS	1
1	A	109	ASP	1
1	A	89	HIS	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 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 70% for the well-defined parts and 70% for the entire structure.

### 7.1 Chemical shift list 1

File name: 2lbw\_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	1108
Number of shifts mapped to atoms	1108
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
$^{13}\text{C}_\alpha$	109	$-0.36 \pm 0.15$	None needed ( $< 0.5$ ppm)
$^{13}\text{C}_\beta$	102	$0.18 \pm 0.11$	None needed ( $< 0.5$ ppm)
$^{13}\text{C}'$	52	$0.06 \pm 0.20$	None needed ( $< 0.5$ ppm)
$^{15}\text{N}$	109	$0.63 \pm 0.28$	Should be applied

#### 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 70%, i.e. 1060 atoms were assigned a chemical shift out of a possible 1508. 0 out of 24 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	$^1\text{H}$	$^{13}\text{C}$	$^{15}\text{N}$
Backbone	480/588 (82%)	213/234 (91%)	159/240 (66%)	108/114 (95%)
Sidechain	563/851 (66%)	359/499 (72%)	200/313 (64%)	4/39 (10%)

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	Total	<sup>1</sup> H	<sup>13</sup> C	<sup>15</sup> N
Aromatic	17/69 (25%)	16/37 (43%)	0/29 (0%)	1/3 (33%)
Overall	1060/1508 (70%)	588/770 (76%)	359/582 (62%)	113/156 (72%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 70%, i.e. 1066 atoms were assigned a chemical shift out of a possible 1516. 0 out of 24 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	<sup>1</sup> H	<sup>13</sup> C	<sup>15</sup> N
Backbone	484/593 (82%)	214/236 (91%)	161/242 (67%)	109/115 (95%)
Sidechain	565/854 (66%)	361/501 (72%)	200/314 (64%)	4/39 (10%)
Aromatic	17/69 (25%)	16/37 (43%)	0/29 (0%)	1/3 (33%)
Overall	1066/1516 (70%)	591/774 (76%)	361/585 (62%)	114/157 (73%)

#### 7.1.4 Statistically unusual chemical shifts ⓘ

There are no statistically unusual chemical shifts.

#### 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.

Random coil index (RCI) for chain A:

