Full wwPDB NMR Structure Validation Report (i)

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PDB ID	:	2LRS
BMRB ID	:	18393
Title	:	The second dsRBD domain from A. thaliana DICER-LIKE 1
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Deposited on	:	2012-04-12

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
https://www.wwpdb.org/validation/2017/NMRValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

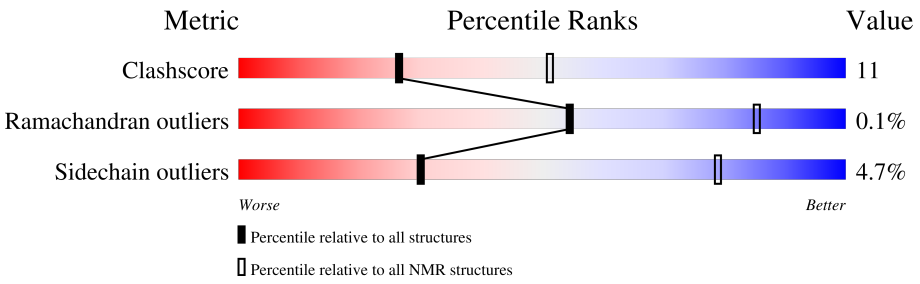
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
wwPDB-RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
wwPDB-ShiftChecker	:	v1.2
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
SOLUTION NMR

The overall completeness of chemical shifts assignment is 88%.

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 >=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 <=5%

Mol	Chain	Length	Quality of chain
1	A	71	65% 15% • 17%

2 Ensemble composition and analysis (i)

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

The following residues are included in the computation of the global validation metrics.

Well-defined (core) protein residues			
Well-defined core	**Residue range (total)**	**Backbone RMSD (Å)**	**Medoid model**
1	A:17-A:32, A:41-A:83 (59)	0.35	20

Ill-defined regions of proteins are excluded from the global statistics.

Ligands and non-protein polymers are included in the analysis.

The models can be grouped into 2 clusters and 5 single-model clusters were found.

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

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 1122 atoms, of which 566 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Endoribonuclease Dicer homolog 1.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	71	1122	349	566	101	101	5	0

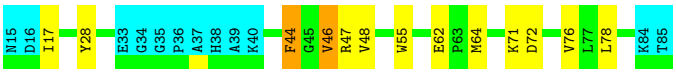
4 Residue-property plots (i)

4.1 Average score per residue in the NMR ensemble

These plots are provided for all protein, RNA, DNA and oligosaccharide 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: Endoribonuclease Dicer homolog 1

Chain A:



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

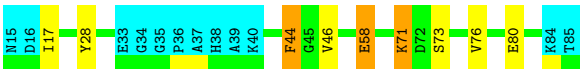
• Molecule 1: Endoribonuclease Dicer homolog 1

Chain A:

4.2.2 Score per residue for model 2

• Molecule 1: Endoribonuclease Dicer homolog 1

Chain A:



4.2.3 Score per residue for model 3

- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A: 68% 13% • 17%

N15 D16 Y28 E33 G34 G35 P36 A37 H38 A39 K40 F44 G45 V46 R47 V48 W55 E58 M64 K69 A70 K71 L78 K84 T85

4.2.4 Score per residue for model 4

- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A: 65% 14% • 17%

N15 D16 I17 Y28 E33 G34 G35 P36 A37 H38 A39 K40 F44 G45 V46 R47 W55 E62 P63 M64 K71 D72 S73 A74 A75 V76 L81 K84 T85

4.2.5 Score per residue for model 5

- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A: 63% 18% • 17%

N15 D16 Y28 E33 G34 G35 P36 A37 H38 A39 K40 F44 G45 V46 R47 V48 N49 T50 G54 E62 P63 M64 K71 D72 S73 A74 A75 V76 L77 L78 L79 E80 K84 T85

4.2.6 Score per residue for model 6

- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A: 63% 17% • 17%

N15 D16 I17 Y28 E33 G34 G35 P36 A37 H38 A39 K40 F44 G45 V46 R47 V48 N49 T50 G54 W55 T56 E62 P63 M64 K69 A70 K71 L78 K84 T85

4.2.7 Score per residue for model 7

- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A: 62% 18% • 17%

N15 D16 I17 Y28 R29 C30 E33 G34 G35 P36 A37 H38 A39 K40 R41 F42 T43 F44 G45 V46 R47 W55 E62 P63 M64 K71 D72 V76 L77 L78 K84 T85

4.2.8 Score per residue for model 8

- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A: 66% 14% • 17%

N15 D16 I17 Y28 R29 C30 E33 G34 G35 P36 A37 H38 A39 K40 F44 G45 V46 R47 V48 W55 K71 D72 V76 L77 L78 K84 T85

4.2.9 Score per residue for model 9

- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A: 63% 18% • 17%

N15 D16 I17 C18 P26 E33 G34 G35 P36 A37 H38 A39 K40 R41 F44 G45 V46 R47 V48 W55 M64 K69 A70 K71 D72 V76 L82 N83 K84 T85

4.2.10 Score per residue for model 10

- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A: 61% 21% • 17%

N15 D16 I17 Y28 E33 G34 G35 P36 A37 H38 A39 K40 F44 G45 V46 R47 V48 R53 G54 W55 C59 E62 P63 M64 K71 D72 V76 L77 L78 L81 K84 T85

4.2.11 Score per residue for model 11

- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A: 66% 13% • 17%

N15 D16 I17 C18 L19 Y28 E33 G34 G35 P36 A37 H38 A39 K40 F44 G45 V46 R47 T50 R53 G54 W55 M64 K69 A70 K71 K84 T85

4.2.12 Score per residue for model 12

- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A: 61% 20% • 17%

N15 D16 I17 Y28 E33 G34 G35 P36 A37 H38 A39 K40 R41 F44 G45 V46 R47 V48 N49 T50 R53 G54 W55 E62 P63 M64 K71 D72 V76 L77 L78 K84 T85

4.2.13 Score per residue for model 13

- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A: 58% 23% • 17%

N15 D16 W23 S27 Y28 R29 E33 G34 G35 P36 A37 H38 A39 K40 F44 G45 V46 R47 V48 N49 T50 G54 W55 E62 P63 M64 K71 D72 V76 L77 L78 K84 T85

4.2.14 Score per residue for model 14

- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A: 61% 18% • 17%

N15 D16 Y28 E33 G34 G35 P36 A37 H38 A39 K40 F44 G45 V46 R47 V48 N49 T50 G54 W55 M64 K69 A70 K71 D72 V76 L77 L78 L81 L82 N83 K84 T85

4.2.15 Score per residue for model 15

- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A: 59% 21% • 17%

N15 D16 I17 C18 W23 P26 S27 Y28 E33 G34 G35 P36 A37 H38 A39 K40 R41 F42 T43 F44 G45 V46 R47 V48 W55 E62 P63 M64 V67 K71 D72 V76 L77 L78 K84 T85

4.2.16 Score per residue for model 16

- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A: 66% 14% • 17%

N15 D16 I17 Y28 E33 G34 G35 P36 A37 H38 A39 K40 F44 G45 V46 R47 W55 E62 P63 M64 K71 A75 L79 L82 N83 K84 T85

4.2.17 Score per residue for model 17

- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A: 65% 15% • 17%

N15 D16 I17 S27 Y28 E33 G34 G35 P36 A37 H38 A39 K40 F44 G45 V46 R47 V48 N49 T50 G54 W55 K71 A74 L78 K84 T85

4.2.18 Score per residue for model 18

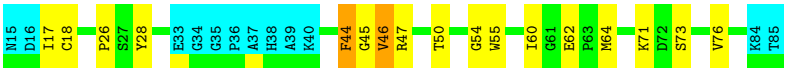
- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A:

4.2.19 Score per residue for model 19

- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A:



4.2.20 Score per residue for model 20 (medoid)

- Molecule 1: Endoribonuclease Dicer homolog 1

Chain A:

5 Refinement protocol and experimental data overview (i)

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

Of the 1000 calculated structures, 20 were deposited, based on the following criterion: *structures with the lowest energy*.

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

Software name	Classification	Version
CNS	structure solution	
CNS	refinement	

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)	working_cs.cif
Number of chemical shift lists	1
Total number of shifts	850
Number of shifts mapped to atoms	850
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	88%

6 Model quality (i)

6.1 Standard geometry (i)

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 (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	470	484	484	11±2
All	All	9400	9680	9680	211

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 11.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:44:PHE:CZ	1:A:46:VAL:HG22	0.65	2.27	13	18
1:A:47:ARG:HD2	1:A:56:THR:O	0.61	1.94	6	1
1:A:44:PHE:CD2	1:A:71:LYS:HA	0.60	2.32	10	18
1:A:44:PHE:CE2	1:A:71:LYS:HA	0.60	2.31	6	19
1:A:44:PHE:CZ	1:A:46:VAL:HB	0.58	2.33	3	2
1:A:64:MET:SD	1:A:69:LYS:HE3	0.56	2.41	3	3
1:A:75:ALA:O	1:A:79:LEU:HG	0.55	2.02	1	2
1:A:48:VAL:HG23	1:A:78:LEU:HD11	0.54	1.80	5	12
1:A:44:PHE:CE2	1:A:46:VAL:HG22	0.54	2.38	1	10
1:A:62:GLU:O	1:A:64:MET:HG2	0.54	2.02	6	13
1:A:28:TYR:CD2	1:A:44:PHE:CZ	0.54	2.96	19	11
1:A:46:VAL:HG11	1:A:78:LEU:HD22	0.54	1.79	6	7
1:A:64:MET:SD	1:A:69:LYS:HE2	0.54	2.43	9	1
1:A:73:SER:O	1:A:76:VAL:HG12	0.53	2.03	2	4

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:47:ARG:HG3	1:A:55:TRP:CZ3	0.53	2.39	3	16
1:A:28:TYR:CD1	1:A:44:PHE:CZ	0.52	2.97	18	7
1:A:46:VAL:HB	1:A:78:LEU:HD13	0.52	1.82	13	1
1:A:42:PHE:CZ	1:A:67:VAL:HG22	0.51	2.40	15	1
1:A:18:CYS:SG	1:A:26:PRO:HG3	0.51	2.45	9	1
1:A:72:ASP:O	1:A:76:VAL:HG23	0.49	2.08	5	11
1:A:18:CYS:SG	1:A:26:PRO:HD3	0.48	2.49	19	1
1:A:18:CYS:SG	1:A:23:TRP:HB2	0.47	2.49	15	1
1:A:23:TRP:CH2	1:A:50:THR:HG22	0.46	2.44	13	1
1:A:71:LYS:HG3	1:A:72:ASP:N	0.46	2.25	15	1
1:A:50:THR:OG1	1:A:53:ARG:HB3	0.46	2.10	12	1
1:A:67:VAL:O	1:A:71:LYS:HD3	0.46	2.11	18	1
1:A:44:PHE:CE2	1:A:74:ALA:HB3	0.45	2.46	5	3
1:A:59:CYS:SG	1:A:81:LEU:HD12	0.45	2.52	10	2
1:A:50:THR:O	1:A:54:GLY:N	0.44	2.50	5	8
1:A:17:ILE:HD12	1:A:17:ILE:N	0.44	2.28	11	13
1:A:29:ARG:O	1:A:44:PHE:HD1	0.44	1.96	7	2
1:A:50:THR:OG1	1:A:53:ARG:HB2	0.43	2.13	11	1
1:A:28:TYR:HD1	1:A:44:PHE:CZ	0.43	2.30	18	2
1:A:28:TYR:HD2	1:A:44:PHE:CZ	0.43	2.32	19	3
1:A:27:SER:HB3	1:A:47:ARG:CG	0.43	2.44	13	3
1:A:46:VAL:O	1:A:58:GLU:HA	0.43	2.13	2	2
1:A:26:PRO:HB3	1:A:48:VAL:HG22	0.42	1.91	1	2
1:A:47:ARG:HG3	1:A:55:TRP:CE3	0.42	2.50	3	1
1:A:26:PRO:HB2	1:A:28:TYR:CE1	0.42	2.50	15	1
1:A:47:ARG:HB3	1:A:55:TRP:CZ3	0.41	2.50	7	1
1:A:18:CYS:SG	1:A:48:VAL:HG13	0.41	2.54	9	1
1:A:78:LEU:HG	1:A:82:LEU:CD2	0.40	2.46	14	1
1:A:45:GLY:HA3	1:A:60:ILE:HD13	0.40	1.92	19	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	59/71 (83%)	56±1 (95±1%)	3±1 (5±1%)	0±0 (0±0%)	54 85

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	1180/1420 (83%)	1119 (95%)	60 (5%)	1 (0%)	54 85

All 1 unique Ramachandran outliers are listed below.

Mol	Chain	Res	Type	Models (Total)
1	A	63	PRO	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	53/61 (87%)	50±1 (95±1%)	2±1 (5±1%)	30 79
All	All	1060/1220 (87%)	1010 (95%)	50 (5%)	30 79

All 11 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	44	PHE	20
1	A	46	VAL	12
1	A	69	LYS	4
1	A	81	LEU	3
1	A	71	LYS	2
1	A	47	ARG	2
1	A	41	ARG	2
1	A	82	LEU	2
1	A	58	GLU	1
1	A	30	CYS	1
1	A	53	ARG	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 monosaccharides 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 (i)

The completeness of assignment taking into account all chemical shift lists is 88% for the well-defined parts and 88% for the entire structure.

7.1 Chemical shift list 1

File name: working_cs.cif

Chemical shift list name: *assigned_chem_shift_list_1*

7.1.1 Bookkeeping (i)

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	850
Number of shifts mapped to atoms	850
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	7

7.1.2 Chemical shift referencing (i)

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction ± precision, *ppm*	Suggested action
$^{13}C_{\alpha}$	71	-0.09 ± 0.20	None needed (< 0.5 ppm)
$^{13}C_{\beta}$	66	-0.08 ± 0.16	None needed (< 0.5 ppm)
$^{13}C'$	71	0.23 ± 0.22	None needed (< 0.5 ppm)
^{15}N	64	0.26 ± 0.40	None needed (< 0.5 ppm)

7.1.3 Completeness of resonance assignments (i)

The following table shows the completeness of the chemical shift assignments for the well-defined regions of the structure. The overall completeness is 88%, i.e. 728 atoms were assigned a chemical shift out of a possible 828. 0 out of 11 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^{1}H	^{13}C	^{15}N
Backbone	288/290 (99%)	116/117 (99%)	118/118 (100%)	54/55 (98%)
Sidechain	400/485 (82%)	268/315 (85%)	131/147 (89%)	1/23 (4%)

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	Total	^{1}H	^{13}C	^{15}N
Aromatic	40/53 (75%)	24/26 (92%)	14/25 (56%)	2/2 (100%)
Overall	728/828 (88%)	408/458 (89%)	263/290 (91%)	57/80 (71%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 88%, i.e. 849 atoms were assigned a chemical shift out of a possible 966. 0 out of 11 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^{1}H	^{13}C	^{15}N
Backbone	345/350 (99%)	139/142 (98%)	142/142 (100%)	64/66 (97%)
Sidechain	460/555 (83%)	308/359 (86%)	151/170 (89%)	1/26 (4%)
Aromatic	44/61 (72%)	26/30 (87%)	16/27 (59%)	2/4 (50%)
Overall	849/966 (88%)	473/531 (89%)	309/339 (91%)	67/96 (70%)

7.1.4 Statistically unusual chemical shifts (i)

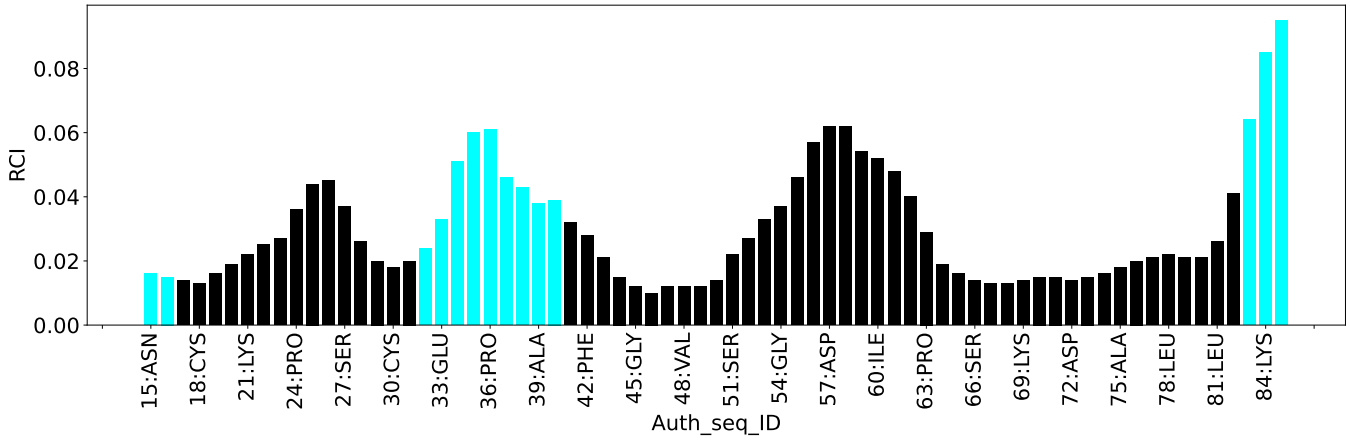
The following table lists the statistically unusual chemical shifts. These are statistical measures, and large deviations from the mean do not necessarily imply incorrect assignments. Molecules containing paramagnetic centres or hemes are expected to give rise to anomalous chemical shifts.

List Id	Chain	Res	Type	Atom	Shift, *ppm*	Expected range, *ppm*	Z-score
1	A	49	ASN	HB3	-0.32	1.12 – 4.38	-9.4
1	A	21	LYS	HB2	0.23	0.58 – 2.97	-6.5
1	A	21	LYS	HB3	0.19	0.46 – 3.04	-6.0
1	A	71	LYS	HG3	-0.04	0.04 – 2.67	-5.3
1	A	50	THR	HG21	0.04	0.08 – 2.19	-5.2
1	A	50	THR	HG22	0.04	0.08 – 2.19	-5.2
1	A	50	THR	HG23	0.04	0.08 – 2.19	-5.2

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.If well-defined core and ill-defined regions are not identified then it is shown as gray bars.

Random coil index (RCI) for chain A:


RCI
0.00
0.02
0.04
0.06
0.08
15:ASN
18:CYS
21:LYS
24:PRO
27:SER
30:CYS
33:GLU
36:PRO
39:ALA
42:PHE
45:GLY
48:VAL
51:SER
54:GLY
57:ASP
60:ILE
63:PRO
66:SER
69:LYS
72:ASP
75:ALA
78:LEU
81:LEU
84:LYS
Auth_seq_ID