Full wwPDB NMR Structure Validation Report (i)

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PDB ID	:	7ZJY
BMRB ID	:	34729
Title	:	The NMR structure of the MAX67 effector from Magnaporthe Oryzae
Authors	:	Lahfa, M.; Padilla, A.; de Guillen, K.; Pissarra, J.; Raji, M.; Cesari, S.; Kroj, T.; Gladieux, P.; Roumestand, C.; Barthe, P.
Deposited on	:	2022-04-12

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:

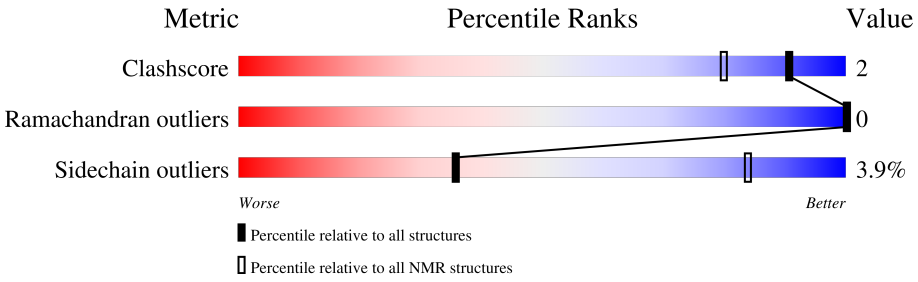
Cyrange	:	Kirchner and Güntert (2011)
NmrClust	:	Kelley et al. (1996)
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
wwPDB-RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
wwPDB-ShiftChecker	:	v1.2
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

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 94%.

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	60	87% 5% 8%

2 Ensemble composition and analysis (i)

This entry contains 20 models. Model 3 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:22-A:76 (55)	0.27	3

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 3 clusters and 2 single-model clusters were found.

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

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 912 atoms, of which 443 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called MAX effector protein.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	60	912	292	443	80	92	5	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	17	GLY	-	expression tag	UNP L7IQQ2
A	18	PRO	-	expression tag	UNP L7IQQ2
A	19	HIS	-	expression tag	UNP L7IQQ2
A	20	MET	-	expression tag	UNP L7IQQ2

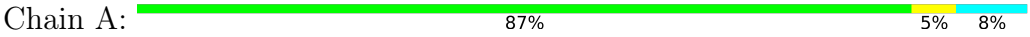
4 Residue-property plots

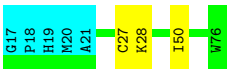
4.1 Average score per residue in the NMR ensemble

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: MAX effector protein

Chain A:





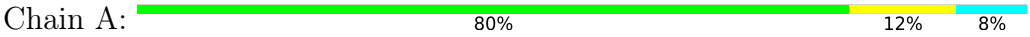
4.2 Scores per residue for each member of the ensemble

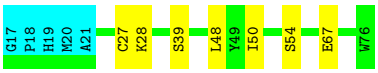
Colouring as in section 4.1 above.

4.2.1 Score per residue for model 1

• Molecule 1: MAX effector protein

Chain A:

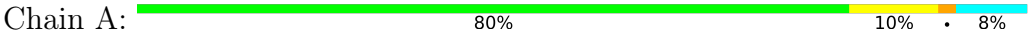


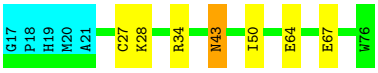


4.2.2 Score per residue for model 2

• Molecule 1: MAX effector protein

Chain A:

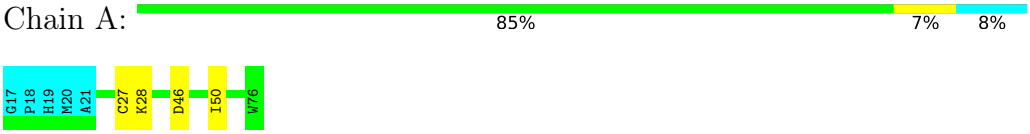




4.2.3 Score per residue for model 3 (medoid)

• Molecule 1: MAX effector protein

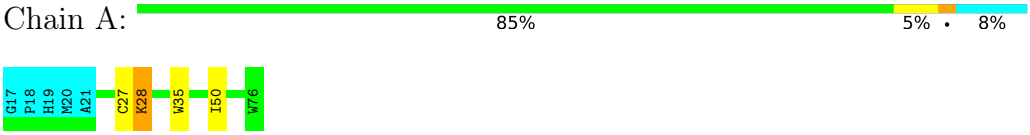
Chain A:



4.2.4 Score per residue for model 4

• Molecule 1: MAX effector protein

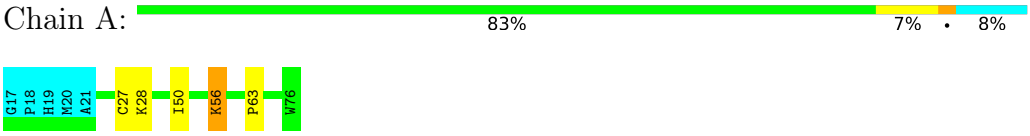
Chain A:



4.2.5 Score per residue for model 5

• Molecule 1: MAX effector protein

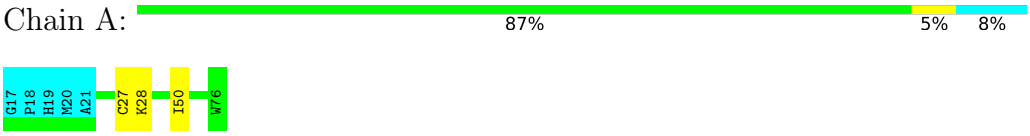
Chain A:



4.2.6 Score per residue for model 6

• Molecule 1: MAX effector protein

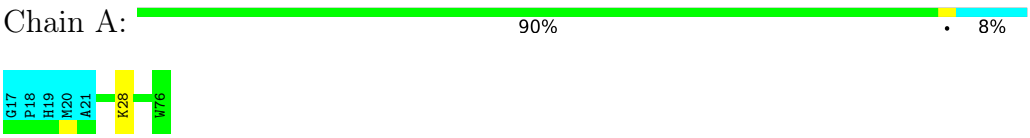
Chain A:



4.2.7 Score per residue for model 7

• Molecule 1: MAX effector protein

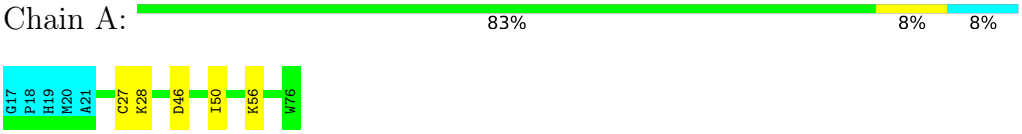
Chain A:



4.2.8 Score per residue for model 8

• Molecule 1: MAX effector protein

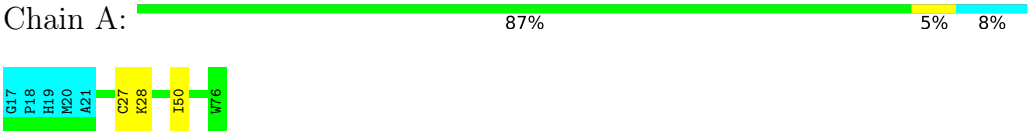
Chain A:



4.2.9 Score per residue for model 9

• Molecule 1: MAX effector protein

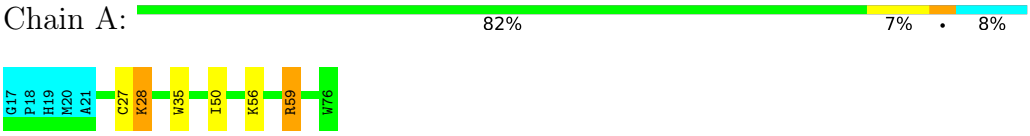
Chain A:



4.2.10 Score per residue for model 10

• Molecule 1: MAX effector protein

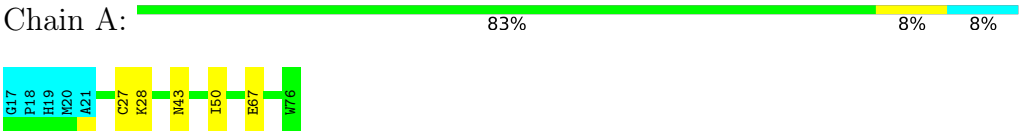
Chain A:



4.2.11 Score per residue for model 11

• Molecule 1: MAX effector protein

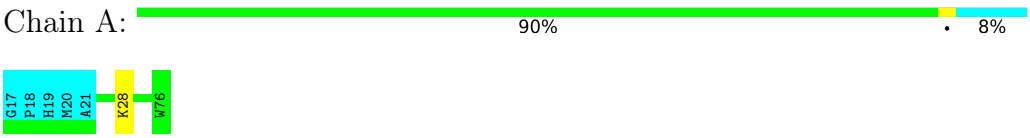
Chain A:



4.2.12 Score per residue for model 12

• Molecule 1: MAX effector protein

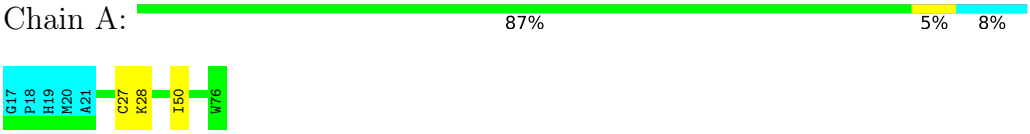
Chain A:



4.2.13 Score per residue for model 13

• Molecule 1: MAX effector protein

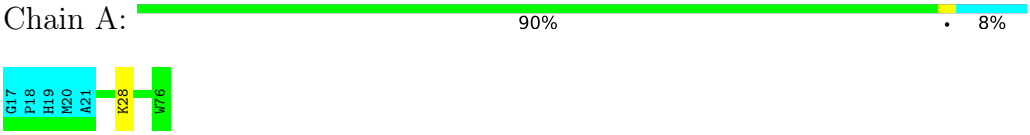
Chain A:



4.2.14 Score per residue for model 14

• Molecule 1: MAX effector protein

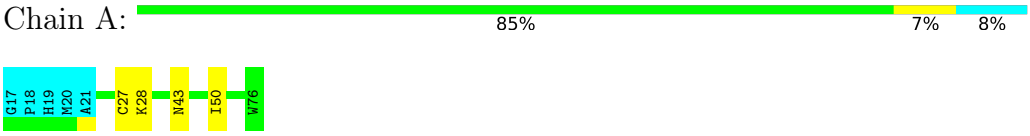
Chain A:



4.2.15 Score per residue for model 15

• Molecule 1: MAX effector protein

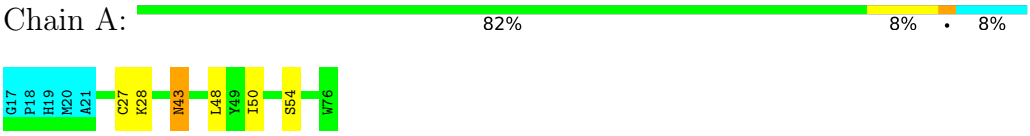
Chain A:



4.2.16 Score per residue for model 16

• Molecule 1: MAX effector protein

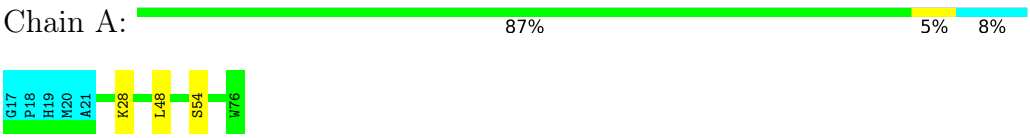
Chain A:



4.2.17 Score per residue for model 17

• Molecule 1: MAX effector protein

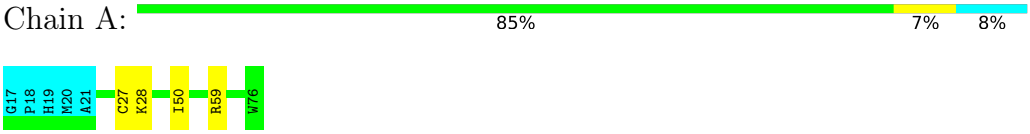
Chain A:



4.2.18 Score per residue for model 18

• Molecule 1: MAX effector protein

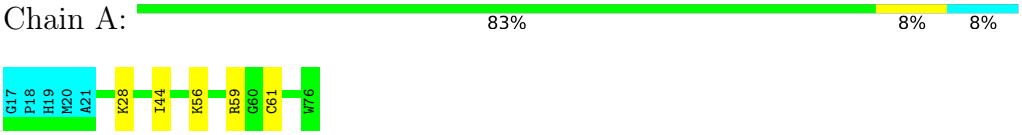
Chain A:



4.2.19 Score per residue for model 19

• Molecule 1: MAX effector protein

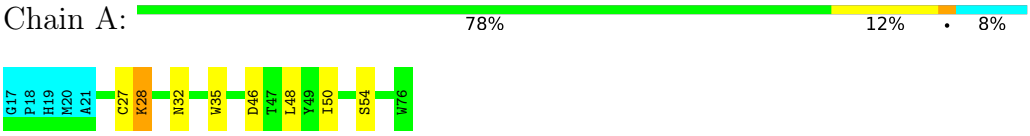
Chain A:



4.2.20 Score per residue for model 20

• Molecule 1: MAX effector protein

Chain A:



5 Refinement protocol and experimental data overview

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

Of the 20 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	refinement	1.2
CYANA	structure calculation	3.98.13

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	723
Number of shifts mapped to atoms	723
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	94%

6 Model quality

6.1 Standard geometry

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

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	0.1±0.3
All	All	0	2

There are no bond-length outliers.

There are no bond-angle outliers.

There are no chirality outliers.

All unique planar outliers are listed below.

Mol	Chain	Res	Type	Group	Models (Total)
1	A	59	ARG	Sidechain	2

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	435	410	410	1±1
All	All	8700	8200	8200	27

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 2.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:27:CYS:SG	1:A:50:ILE:HD11	0.55	2.42	1	15
1:A:28:LYS:HD3	1:A:35:TRP:CE3	0.47	2.44	4	3

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:48:LEU:O	1:A:54:SER:HA	0.44	2.13	1	4
1:A:64:GLU:OE1	1:A:64:GLU:HA	0.43	2.13	2	1
1:A:43:ASN:HD22	1:A:43:ASN:N	0.43	2.12	16	2
1:A:56:LYS:O	1:A:63:PRO:HA	0.43	2.14	5	1
1:A:44:ILE:HD11	1:A:61:CYS:SG	0.40	2.56	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	54/60 (90%)	54±0 (100±1%)	0±0 (0±1%)	0±0 (0±0%)	100	100
All	All	1080/1200 (90%)	1078 (100%)	2 (0%)	0 (0%)	100	100

There are no Ramachandran outliers.

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	48/51 (94%)	46±1 (96±2%)	2±1 (4±2%)	36	84
All	All	960/1020 (94%)	923 (96%)	37 (4%)	36	84

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	28	LYS	20
1	A	56	LYS	4
1	A	67	GLU	3

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Mol	Chain	Res	Type	Models (Total)
1	A	46	ASP	3
1	A	43	ASN	2
1	A	59	ARG	2
1	A	39	SER	1
1	A	34	ARG	1
1	A	32	ASN	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

There are no monosaccharides in this entry.

6.6 Ligand geometry

There are no ligands in this entry.

6.7 Other polymers

There are no such molecules in this entry.

6.8 Polymer linkage issues

There are no chain breaks in this entry.

7 Chemical shift validation

The completeness of assignment taking into account all chemical shift lists is 94% for the well-defined parts and 93% for the entire structure.

7.1 Chemical shift list 1

File name: working_cs.cif

Chemical shift list name: *starch_output*

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	723
Number of shifts mapped to atoms	723
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	2

7.1.2 Chemical shift referencing

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction ± precision, *ppm*	Suggested action
$^{13}C_{\alpha}$	60	0.00 ± 0.14	None needed (< 0.5 ppm)
$^{13}C_{\beta}$	54	-0.05 ± 0.17	None needed (< 0.5 ppm)
$^{13}C'$	59	0.48 ± 0.09	None needed (< 0.5 ppm)
^{15}N	57	0.04 ± 0.76	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 94%, i.e. 667 atoms were assigned a chemical shift out of a possible 713. 0 out of 5 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^{1}H	^{13}C	^{15}N
Backbone	278/278 (100%)	114/114 (100%)	110/110 (100%)	54/54 (100%)
Sidechain	325/365 (89%)	228/236 (97%)	92/116 (79%)	5/13 (38%)

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	Total	^{1}H	^{13}C	^{15}N
Aromatic	64/70 (91%)	32/34 (94%)	29/32 (91%)	3/4 (75%)
Overall	667/713 (94%)	374/384 (97%)	231/258 (90%)	62/71 (87%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 93%, i.e. 718 atoms were assigned a chemical shift out of a possible 770. 0 out of 5 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^{1}H	^{13}C	^{15}N
Backbone	299/302 (99%)	123/124 (99%)	119/120 (99%)	57/58 (98%)
Sidechain	351/391 (90%)	246/254 (97%)	100/124 (81%)	5/13 (38%)
Aromatic	68/77 (88%)	34/38 (89%)	31/34 (91%)	3/5 (60%)
Overall	718/770 (93%)	403/416 (97%)	250/278 (90%)	65/76 (86%)

7.1.4 Statistically unusual chemical shifts (i)

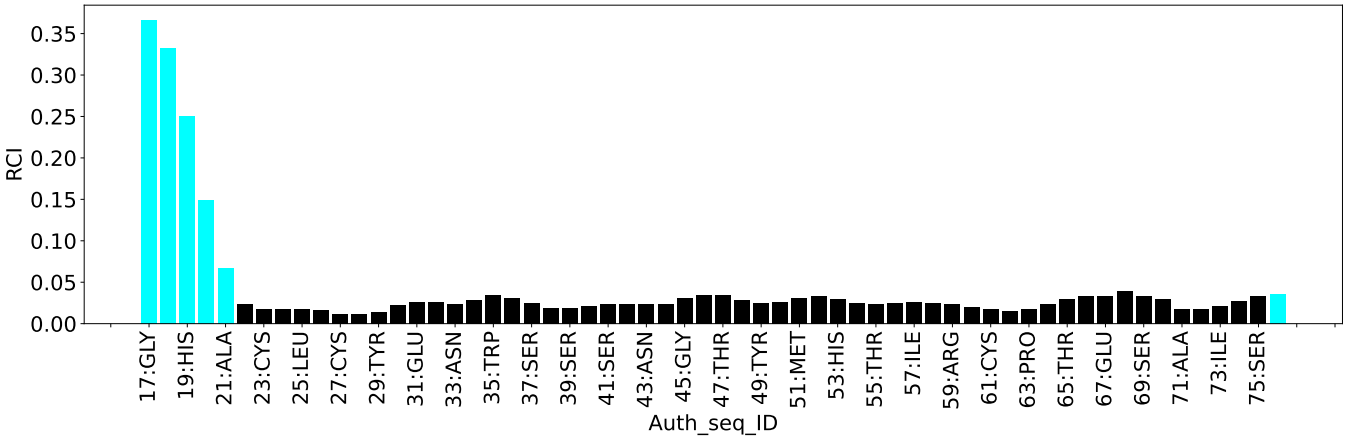
The following table lists the statistically unusual chemical shifts. These are statistical measures, and large deviations from the mean do not necessarily imply incorrect assignments. Molecules containing paramagnetic centres or hemes are expected to give rise to anomalous chemical shifts.

List Id	Chain	Res	Type	Atom	Shift, *ppm*	Expected range, *ppm*	Z-score
1	A	55	THR	HG1	5.14	0.08 – 2.19	19.0
1	A	63	PRO	HD3	1.68	1.76 – 5.48	-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
0.35
0.30
0.25
0.20
0.15
0.10
0.05
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45:GLY
47:THR
49:TYR
51:MET
53:HIS
55:THR
57:ILE
59:ARG
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63:PRO
65:THR
67:GLU
69:SER
71:ALA
73:ILE
75:SER
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