



Full wwPDB NMR Structure Validation Report ⓘ

Apr 26, 2016 – 07:15 PM BST

PDB ID : 2D82
Title : Target Structure-Based Discovery of Small Molecules that Block Human p53 and CREB Binding Protein (CBP) Association
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Deposited on : 2005-12-01

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 : 1.7.1 (RC1), CSD as537be (2016)
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

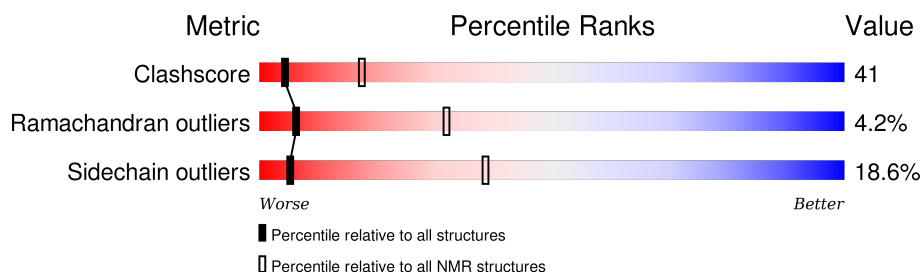
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

SOLUTION NMR

The overall completeness of chemical shifts assignment is 78%.

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	121	

2 Ensemble composition and analysis ⓘ

This entry contains 1 models. Identification of well-defined residues and clustering analysis are not possible.

3 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 2051 atoms, of which 1019 are hydrogens and 0 are deuteriums.

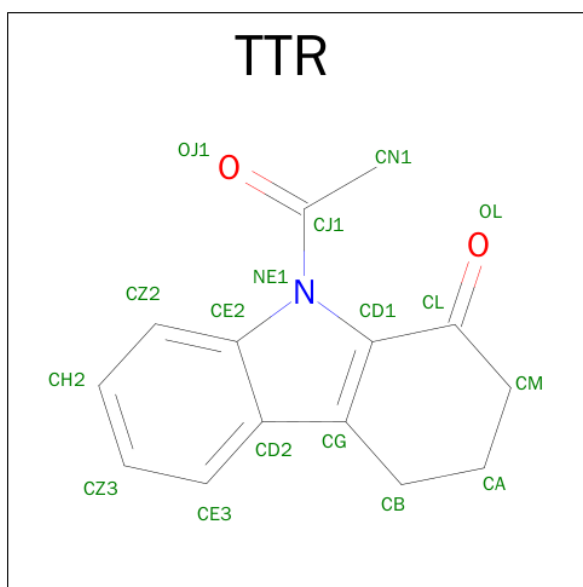
- Molecule 1 is a protein called CREB-binding protein.

Mol	Chain	Residues	Atoms						Trace
1	A	121	Total	C	H	N	O	S	0
			2021	655	1006	169	185	6	

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1077	GLY	-	CLONING ARTIFACT	UNP Q92793
A	1078	SER	-	CLONING ARTIFACT	UNP Q92793
A	1079	HIS	-	CLONING ARTIFACT	UNP Q92793
A	1080	MET	-	CLONING ARTIFACT	UNP Q92793

- Molecule 2 is 9-ACETYL-2,3,4,9-TETRAHYDRO-1H-CARBAZOL-1-ONE (three-letter code: TTR) (formula: $C_{14}H_{13}NO_2$).

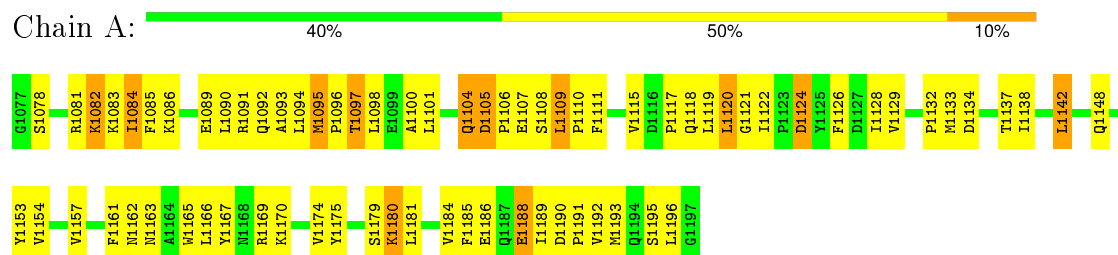


Mol	Chain	Residues	Atoms					
2	A	1	Total	C	H	N	O	
			30	14	13	1	2	

4 Residue-property plots [i](#)

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: CREB-binding protein



5 Refinement protocol and experimental data overview

The models were refined using the following method: *Distance Geometry, Simulated Annealing*.

Of the 200 calculated structures, 1 were deposited, based on the following criterion: *structures with the least restraint violations*.

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

Software name	Classification	Version
X-PLOR	structure solution	3.851
ARIA	refinement	2.0

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)	BMRB entry 6960
Number of chemical shift lists	1
Total number of shifts	1402
Number of shifts mapped to atoms	1402
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	78%

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

6 Model quality ⓘ

6.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: TTR

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	1015	1006	1003	83
2	A	17	13	13	8
All	All	1032	1019	1016	83

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 41.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)
1:A:1094:LEU:HD22	1:A:1153:TYR:CD1	0.95	1.97
1:A:1120:LEU:HD21	2:A:201:TTR:CE2	0.87	2.00
1:A:1185:PHE:O	1:A:1189:ILE:HG22	0.80	1.77
1:A:1129:VAL:HG21	1:A:1163:ASN:OD1	0.77	1.78
1:A:1115:VAL:O	1:A:1120:LEU:HD13	0.77	1.80
1:A:1166:LEU:O	1:A:1166:LEU:HD13	0.75	1.81
1:A:1093:ALA:HB1	1:A:1192:VAL:HG13	0.75	1.59
1:A:1180:LYS:O	1:A:1184:VAL:HG23	0.67	1.89
1:A:1142:LEU:HD11	1:A:1153:TYR:CD2	0.67	2.25
1:A:1128:ILE:HD12	1:A:1167:TYR:CE1	0.65	2.26
1:A:1120:LEU:HD21	2:A:201:TTR:CZ2	0.65	2.22
1:A:1107:GLU:O	1:A:1181:LEU:HD11	0.62	1.94

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Atom-1	Atom-2	Clash(Å)	Distance(Å)
1:A:1129:VAL:HG22	1:A:1166:LEU:HD12	0.60	1.74
1:A:1100:ALA:HB1	1:A:1188:GLU:HG2	0.59	1.75
1:A:1166:LEU:C	1:A:1166:LEU:HD13	0.59	2.18
1:A:1094:LEU:HD13	1:A:1153:TYR:CG	0.58	2.34
1:A:1122:ILE:HG23	1:A:1122:ILE:O	0.58	1.97
1:A:1129:VAL:HG11	1:A:1163:ASN:CG	0.58	2.18
1:A:1097:THR:HG21	1:A:1189:ILE:HB	0.56	1.76
1:A:1094:LEU:HD13	1:A:1153:TYR:CB	0.53	2.34
1:A:1128:ILE:HD12	1:A:1167:TYR:HE1	0.53	1.63
1:A:1090:LEU:HD11	1:A:1148:GLN:O	0.53	2.04
1:A:1120:LEU:HD11	2:A:201:TTR:CJ1	0.53	2.34
1:A:1109:LEU:CB	1:A:1110:PRO:CD	0.52	2.87
1:A:1154:VAL:HG21	1:A:1193:MET:SD	0.51	2.44
1:A:1094:LEU:HD22	1:A:1153:TYR:CG	0.51	2.38
1:A:1153:TYR:CE1	1:A:1157:VAL:HG21	0.51	2.40
1:A:1105:ASP:CB	1:A:1106:PRO:CD	0.51	2.88
1:A:1120:LEU:CD2	2:A:201:TTR:CZ2	0.51	2.89
1:A:1085:PHE:CE1	1:A:1196:LEU:HD12	0.51	2.41
1:A:1138:ILE:CG2	1:A:1153:TYR:CE2	0.50	2.93
1:A:1105:ASP:O	1:A:1109:LEU:HD12	0.50	2.07
1:A:1120:LEU:HB3	1:A:1122:ILE:HG22	0.50	1.82
1:A:1085:PHE:N	1:A:1085:PHE:CD1	0.50	2.78
1:A:1184:VAL:HG13	1:A:1188:GLU:OE2	0.49	2.07
1:A:1094:LEU:HD22	1:A:1153:TYR:CE1	0.49	2.43
1:A:1091:ARG:HG3	1:A:1142:LEU:HD23	0.48	1.85
1:A:1153:TYR:O	1:A:1157:VAL:HG23	0.47	2.09
1:A:1120:LEU:CG	2:A:201:TTR:CZ2	0.47	2.92
1:A:1093:ALA:HB1	1:A:1192:VAL:CG1	0.47	2.38
1:A:1174:VAL:HG23	1:A:1175:TYR:N	0.47	2.24
1:A:1190:ASP:N	1:A:1191:PRO:CD	0.47	2.78
1:A:1084:ILE:HG22	1:A:1085:PHE:N	0.46	2.26
1:A:1157:VAL:HG11	1:A:1185:PHE:CZ	0.44	2.47
1:A:1120:LEU:HD11	2:A:201:TTR:OJ1	0.44	2.11
1:A:1109:LEU:CB	1:A:1110:PRO:HD3	0.44	2.42
1:A:1142:LEU:HD11	1:A:1153:TYR:HD2	0.44	1.67
1:A:1169:ARG:O	1:A:1175:TYR:CD2	0.44	2.71
1:A:1105:ASP:O	1:A:1109:LEU:CD1	0.44	2.66
1:A:1179:SER:OG	1:A:1180:LYS:N	0.44	2.51
1:A:1097:THR:O	1:A:1100:ALA:HB3	0.44	2.13
1:A:1101:LEU:HD11	1:A:1185:PHE:CD1	0.43	2.48
1:A:1157:VAL:HG12	1:A:1161:PHE:CE2	0.43	2.49
1:A:1085:PHE:HB3	1:A:1089:GLU:CB	0.43	2.43

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Atom-1	Atom-2	Clash(Å)	Distance(Å)
1:A:1106:PRO:HA	1:A:1109:LEU:HD12	0.43	1.89
1:A:1188:GLU:OE1	1:A:1188:GLU:N	0.43	2.52
1:A:1190:ASP:CB	1:A:1191:PRO:HD3	0.43	2.42
1:A:1091:ARG:CZ	1:A:1142:LEU:O	0.43	2.67
1:A:1091:ARG:NE	1:A:1142:LEU:O	0.43	2.52
1:A:1107:GLU:O	1:A:1181:LEU:CD1	0.43	2.67
1:A:1095:MET:CB	1:A:1096:PRO:CD	0.42	2.97
1:A:1104:GLN:OE1	1:A:1180:LYS:CE	0.42	2.67
1:A:1138:ILE:HG21	1:A:1153:TYR:CE2	0.42	2.49
1:A:1134:ASP:OD1	1:A:1137:THR:N	0.42	2.52
1:A:1111:PHE:CE2	1:A:1181:LEU:HD12	0.42	2.50
1:A:1120:LEU:HD23	1:A:1122:ILE:HG21	0.42	1.92
1:A:1117:PRO:CG	1:A:1126:PHE:CD1	0.42	3.03
1:A:1120:LEU:HD21	2:A:201:TTR:CD2	0.42	2.43
1:A:1105:ASP:HB2	1:A:1106:PRO:CD	0.42	2.45
1:A:1126:PHE:CZ	1:A:1132:PRO:HG2	0.42	2.50
1:A:1119:LEU:HD23	1:A:1119:LEU:C	0.42	2.35
1:A:1184:VAL:CG1	1:A:1188:GLU:OE2	0.41	2.68
1:A:1165:TRP:CD1	1:A:1175:TYR:CD2	0.41	3.08
1:A:1084:ILE:CG2	1:A:1085:PHE:N	0.41	2.83
1:A:1122:ILE:CG2	1:A:1122:ILE:O	0.41	2.68
1:A:1120:LEU:HG	2:A:201:TTR:CZ2	0.41	2.46
1:A:1105:ASP:CB	1:A:1106:PRO:HD3	0.41	2.45
1:A:1175:TYR:C	1:A:1175:TYR:CD1	0.41	2.94
1:A:1117:PRO:O	1:A:1121:GLY:N	0.41	2.51
1:A:1126:PHE:CE2	1:A:1132:PRO:HG2	0.41	2.51
1:A:1085:PHE:O	1:A:1086:LYS:CB	0.41	2.68
1:A:1174:VAL:CG2	1:A:1175:TYR:N	0.40	2.84
1:A:1095:MET:CB	1:A:1096:PRO:HD3	0.40	2.46

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 (85%)	13 (11%)	5 (4%)	6	32

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	119/121 (98%)	101 (85%)	13 (11%)	5 (4%)	6	32

All 5 Ramachandran outliers are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type
1	A	1082	LYS
1	A	1109	LEU
1	A	1124	ASP
1	A	1084	ILE
1	A	1133	MET

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	113/113 (100%)	92 (81%)	21 (19%)	5	38
All	All	113/113 (100%)	92 (81%)	21 (19%)	5	38

All 21 residues with a non-rotameric sidechain are listed below. They are sorted by the frequency of occurrence in the ensemble.

Mol	Chain	Res	Type
1	A	1104	GLN
1	A	1108	SER
1	A	1097	THR
1	A	1180	LYS
1	A	1195	SER
1	A	1118	GLN
1	A	1095	MET
1	A	1142	LEU
1	A	1082	LYS
1	A	1124	ASP
1	A	1092	GLN
1	A	1105	ASP
1	A	1162	ASN
1	A	1188	GLU

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Mol	Chain	Res	Type
1	A	1098	LEU
1	A	1120	LEU
1	A	1078	SER
1	A	1186	GLU
1	A	1081	ARG
1	A	1170	LYS
1	A	1083	LYS

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 carbohydrates in this entry.

6.6 Ligand geometry ⓘ

1 ligand is modelled in this entry.

In the following table, the Counts columns list the number of bonds for which Mogul statistics could be retrieved, the number of bonds that are observed in the model and the number of bonds that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length is the number of standard deviations the observed value is removed from the expected value. A bond length with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the average root-mean-square of all Z scores of the bond lengths.

Mol	Type	Chain	Res	Link	Bond lengths		
					Counts	RMSZ	#Z>2
2	TTR	A	201	-	15,19,19	2.21	1 (6%)

In the following table, the Counts columns list the number of angles for which Mogul statistics could be retrieved, the number of angles that are observed in the model and the number of angles that are defined in the chemical component dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond angle is the number of standard deviations the observed value is removed from the expected value. A bond angle with $|Z| > 2$ is

considered an outlier worth inspection. RMSZ is the average root-mean-square of all Z scores of the bond angles.

Mol	Type	Chain	Res	Link	Bond angles		
					Counts	RMSZ	#Z>2
2	TTR	A	201	-	15,28,28	1.18	0 (0%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the chemical component dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	TTR	A	201	-	-	0,0,14,14	0,3,3,3

All bond outliers are listed below.

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	201	TTR	CD1-CL	6.62	1.38	1.50

There are no bond-angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

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 78% for the well-defined parts and 78% for the entire structure.

7.1 Chemical shift list 1

File name: BMRB entry 6960

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	1402
Number of shifts mapped to atoms	1402
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	5

7.1.2 Chemical shift referencing

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction \pm precision, ppm	Suggested action
$^{13}\text{C}_\alpha$	119	-0.46 ± 0.15	None needed (< 0.5 ppm)
$^{13}\text{C}_\beta$	117	0.37 ± 0.08	None needed (< 0.5 ppm)
$^{13}\text{C}'$	0	—	—
^{15}N	107	0.55 ± 0.49	None needed (imprecise)

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 78%, i.e. 1255 atoms were assigned a chemical shift out of a possible 1610. 20 out of 20 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^1H	^{13}C	^{15}N
Backbone	452/585 (77%)	226/232 (97%)	119/242 (49%)	107/111 (96%)
Sidechain	714/880 (81%)	433/523 (83%)	272/314 (87%)	9/43 (21%)

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	Total	¹H	¹³C	¹⁵N
Aromatic	89/145 (61%)	49/76 (64%)	40/65 (62%)	0/4 (0%)
Overall	1255/1610 (78%)	708/831 (85%)	431/621 (69%)	116/158 (73%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 78%, i.e. 1255 atoms were assigned a chemical shift out of a possible 1610. 20 out of 20 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	¹H	¹³C	¹⁵N
Backbone	452/585 (77%)	226/232 (97%)	119/242 (49%)	107/111 (96%)
Sidechain	714/880 (81%)	433/523 (83%)	272/314 (87%)	9/43 (21%)
Aromatic	89/145 (61%)	49/76 (64%)	40/65 (62%)	0/4 (0%)
Overall	1255/1610 (78%)	708/831 (85%)	431/621 (69%)	116/158 (73%)

7.1.4 Statistically unusual chemical shifts ⓘ

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

Mol	Chain	Res	Type	Atom	Shift, ppm	Expected range, ppm	Z-score
1	A	1157	VAL	HG21	-1.50	2.20 – -0.60	-8.2
1	A	1157	VAL	HG22	-1.50	2.20 – -0.60	-8.2
1	A	1157	VAL	HG23	-1.50	2.20 – -0.60	-8.2
1	A	1165	TRP	HD1	4.99	8.95 – 5.35	-6.0
1	A	1125	TYR	HD1	5.42	8.44 – 5.44	-5.1

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:

