

# Full wwPDB NMR Structure Validation Report (i)

### Mar 6, 2022 – 06:51 PM EST

PDB ID : 2RNJ

Title: NMR Structure of The S. Aureus VraR DNA Binding Domain

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Deposited on : 2008-01-09

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 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)

RCI : v 1n 11 5 13 A (Berjanski et al., 2005)

PANAV : Wang et al. (2010)

ShiftChecker : 2.27

Ideal geometry (proteins) : Engh & Huber (2001) Ideal geometry (DNA, RNA) : Parkinson et al. (1996)

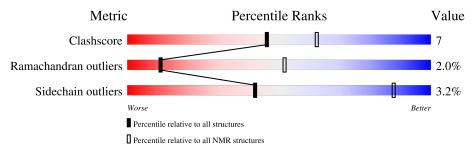
Validation Pipeline (wwPDB-VP) : 2.27

## 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 was not calculated.

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	NMR archive
Metric	$(\# \mathrm{Entries})$	$(\# \mathrm{Entries})$
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	91	64%	8%	•	26%



## 2 Ensemble composition and analysis (i)

This entry contains 10 models. Model 8 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	Well-defined core Residue range (total) Backbone RMSD (Å) Medoid model				
1	A:143-A:207 (65)	0.45	8		

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 1 single-model cluster was found.

Cluster number	Models
1	1, 2, 4, 6, 7, 8, 10
2	3, 5
Single-model clusters	9



## 3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 642 atoms, of which 100 are hydrogens and 0 are deuteriums.

• Molecule 1 is a protein called Response regulator protein vraR.

Mol	Chain	Residues		Atoms					Trace
1	Λ	67	Total	С	Н	N	О	S	0
	A	67	642	344	100	91	105	2	0

There are 19 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	119	GLY	-	expression tag	UNP Q7A2Q1
A	120	SER	-	expression tag	UNP Q7A2Q1
A	121	SER	-	expression tag	UNP Q7A2Q1
A	122	HIS	-	expression tag	UNP Q7A2Q1
A	123	HIS	_	expression tag	UNP Q7A2Q1
A	124	HIS	-	expression tag	UNP Q7A2Q1
A	125	HIS	-	expression tag	UNP Q7A2Q1
A	126	HIS	-	expression tag	UNP Q7A2Q1
A	127	HIS	-	expression tag	UNP Q7A2Q1
A	128	SER	-	expression tag	UNP Q7A2Q1
A	129	SER	-	expression tag	UNP Q7A2Q1
A	130	GLY	-	expression tag	UNP Q7A2Q1
A	131	LEU	_	expression tag	UNP Q7A2Q1
A	132	VAL	-	expression tag	UNP Q7A2Q1
A	133	PRO	-	expression tag	UNP Q7A2Q1
A	134	ARG	-	expression tag	UNP Q7A2Q1
A	135	GLY		expression tag	UNP Q7A2Q1
A	136	SER	-	expression tag	UNP Q7A2Q1
A	137	HIS	-	expression tag	UNP Q7A2Q1

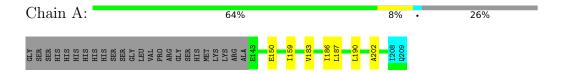


## 4 Residue-property plots (i)

## 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: Response regulator protein vraR

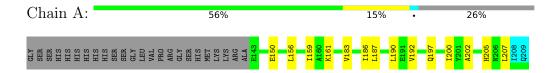


## 4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

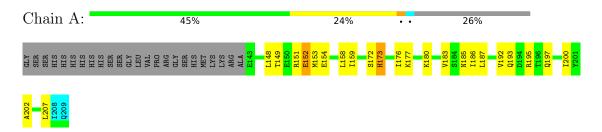
#### 4.2.1 Score per residue for model 1

• Molecule 1: Response regulator protein vraR



#### 4.2.2 Score per residue for model 2

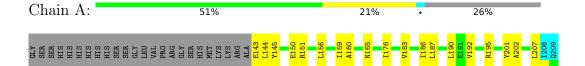
• Molecule 1: Response regulator protein vraR





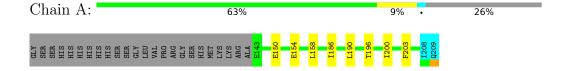
#### 4.2.3 Score per residue for model 3

• Molecule 1: Response regulator protein vraR



#### 4.2.4 Score per residue for model 4

• Molecule 1: Response regulator protein vraR



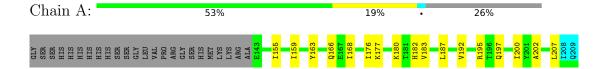
#### 4.2.5 Score per residue for model 5

• Molecule 1: Response regulator protein vraR



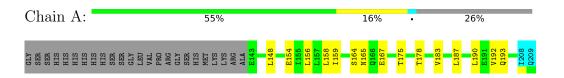
#### 4.2.6 Score per residue for model 6

• Molecule 1: Response regulator protein vraR



#### 4.2.7 Score per residue for model 7

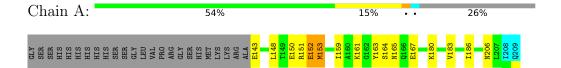
• Molecule 1: Response regulator protein vraR





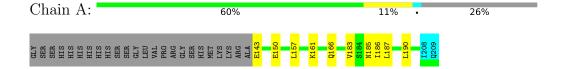
## 4.2.8 Score per residue for model 8 (medoid)

• Molecule 1: Response regulator protein vraR



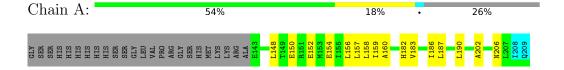
## 4.2.9 Score per residue for model 9

• Molecule 1: Response regulator protein vraR



#### 4.2.10 Score per residue for model 10

• Molecule 1: Response regulator protein vraR





#### Refinement protocol and experimental data overview (i) 5



The models were refined using the following method: simulated annealing, additional refinement.

Of the 25 calculated structures, 10 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
CYANA	structure solution	2.1
X-PLOR NIH	refinement	

No chemical shift data was provided.



## 6 Model quality (i)

## 6.1 Standard geometry (i)

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	$0.0\pm0.0$	$0.2 \pm 0.4$
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	151	ARG	Sidechain	2

## 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	524	97	537	7±3
All	All	5240	970	5370	70

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 7.

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

Atom-1	Atom 2	Clash(Å)	Distance(Å)	Models	
Atom-1	Atom-2	Clash(A)	Distance(A)	Worst	Total
1:A:202:ALA:HB1	1:A:207:LEU:HD22	0.70	1.63	2	3
1:A:192:VAL:HG13	1:A:197:GLN:HB2	0.59	1.74	6	1

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A La casa 1		C11-(%)	D:-4(%)	Models	
Atom-1	Atom-2	$\operatorname{Clash}( ext{\AA})$	$\operatorname{Distance}(\mathrm{\AA})$	Worst	Total
1:A:183:VAL:O	1:A:187:LEU:HG	0.58	1.97	9	7
1:A:154:GLU:O	1:A:158:LEU:HG	0.57	1.99	7	5
1:A:152:GLU:HB2	1:A:186:ILE:HG22	0.57	1.75	8	2
1:A:156:LEU:O	1:A:159:ILE:HB	0.54	2.01	7	2
1:A:202:ALA:HA	1:A:207:LEU:HD13	0.52	1.81	2	1
1:A:156:LEU:O	1:A:159:ILE:HG22	0.50	2.06	3	2
1:A:149:THR:HA	1:A:153:MET:SD	0.49	2.47	2	1
1:A:148:LEU:HD11	1:A:190:LEU:HD21	0.49	1.83	7	2
1:A:172:SER:O	1:A:173:HIS:HB2	0.48	2.08	2	1
1:A:151:ARG:O	1:A:154:GLU:HG2	0.47	2.10	2	1
1:A:186:ILE:O	1:A:190:LEU:HG	0.47	2.10	9	4
1:A:182:HIS:O	1:A:186:ILE:HG13	0.46	2.09	10	1
1:A:145:TYR:CD1	1:A:207:LEU:HD21	0.46	2.46	5	2
1:A:160:ALA:HB2	1:A:202:ALA:CB	0.46	2.40	10	1
1:A:148:LEU:HD22	1:A:152:GLU:HG2	0.46	1.88	2	2
1:A:176:ILE:HD12	1:A:177:LYS:N	0.46	2.26	2	1
1:A:197:GLN:HA	1:A:200:ILE:CG2	0.45	2.42	1	2
1:A:155:ILE:HG23	1:A:168:ILE:HG21	0.44	1.89	6	1
1:A:143:GLU:HB3	1:A:201:TYR:OH	0.44	2.13	3	1
1:A:144:LEU:HD13	1:A:190:LEU:O	0.44	2.12	3	2
1:A:159:ILE:HD12	1:A:186:ILE:HD11	0.44	1.90	2	1
1:A:159:ILE:HA	1:A:163:TYR:CD1	0.43	2.48	8	2
1:A:187:LEU:HB3	1:A:192:VAL:O	0.43	2.13	7	4
1:A:187:LEU:HD11	1:A:195:ARG:HG2	0.43	1.90	3	1
1:A:164:SER:O	1:A:167:GLU:HG2	0.42	2.14	7	2
1:A:160:ALA:HB2	1:A:202:ALA:HB3	0.42	1.90	5	2
1:A:157:LEU:HG	1:A:161:LYS:NZ	0.42	2.29	9	1
1:A:166:GLN:OE1	1:A:176:ILE:HB	0.41	2.15	6	1
1:A:175:THR:O	1:A:178:THR:HG22	0.41	2.16	7	1
1:A:197:GLN:HA	1:A:200:ILE:HG22	0.41	1.92	6	1
1:A:183:VAL:O	1:A:186:ILE:HG12	0.41	2.16	8	2
1:A:202:ALA:HB1	1:A:207:LEU:HB2	0.41	1.92	5	1
1:A:159:ILE:HG22	1:A:199:VAL:HG22	0.41	1.93	5	1
1:A:155:ILE:HD12	1:A:182:HIS:CE1	0.41	2.51	6	1
1:A:150:GLU:HB2	1:A:152:GLU:OE1	0.40	2.16	10	1
1:A:196:THR:O	1:A:200:ILE:HG12	0.40	2.16	4	1
1:A:150:GLU:O	1:A:153:MET:HG3	0.40	2.17	8	1
1:A:148:LEU:HD22	1:A:152:GLU:CG	0.40	2.46	10	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	Allowed Outliers	
1	A	64/91 (70%)	58±1 (91±1%)	5±1 (7±2%)	1±0 (2±1%)	11 52
All	All	640/910 (70%)	581 (91%)	46 (7%)	13 (2%)	11 52

All 7 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	150	GLU	3
1	A	165	ASN	3
1	A	205	HIS	2
1	A	206	ASN	2
1	A	173	HIS	1
1	A	195	ARG	1
1	A	166	GLN	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	Perce	ntiles
1	A	59/81 (73%)	57±2 (97±3%)	2±2 (3±3%)	42	88
All	All	590/810 (73%)	571 (97%)	19 (3%)	42	88

All 12 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	180	LYS	3
1	A	143	GLU	3
1	A	152	GLU	2

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Mol	Chain	Res	Type	Models (Total)
1	A	185	ASN	2
1	A	193	GLN	2
1	A	161	LYS	1
1	A	195	ARG	1
1	A	176	ILE	1
1	A	177	LYS	1
1	A	153	MET	1
1	A	150	GLU	1
1	A	157	LEU	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)

No chemical shift data were provided

