



# Full wwPDB NMR Structure Validation Report ⓘ

Dec 19, 2023 – 02:48 AM EST

PDB ID : 2MV9  
BMRB ID : 25251  
Title : Solution structure of Ovis Aries PrP with mutation delta193-196  
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Deposited on : 2014-09-25

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

<https://www.wwpdb.org/validation/2017/NMRValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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 : 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  
BMRB Restraints Analysis : v1.2  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

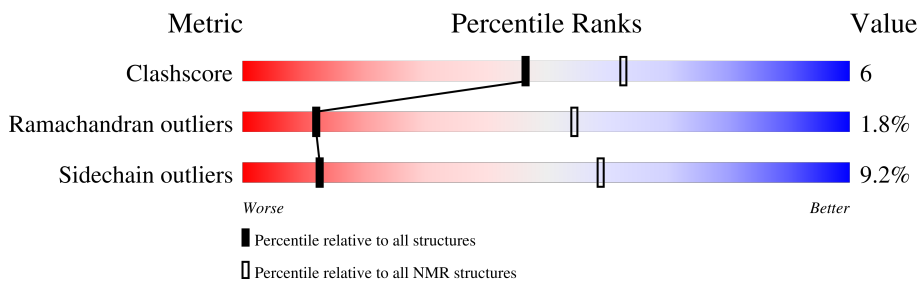
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*SOLUTION NMR*

The overall completeness of chemical shifts assignment is 58%.

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  $\geq 3$ , 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	150	

## 2 Ensemble composition and analysis

This entry contains 20 models. Model 1 is the overall representative, medoid model (most similar to other models).

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:128-A:192, A:197-A:229 (98)	0.92	1

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 5 clusters and 1 single-model cluster was found.

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

### 3 Entry composition [i](#)

There is only 1 type of molecule in this entry. The entry contains 2174 atoms, of which 1064 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Major prion protein.

Mol	Chain	Residues	Atoms					Trace	
			Total	C	H	N	O		S
1	A	139	2174	690	1064	202	209	9	0

There are 26 discrepancies between the modelled and reference sequences:

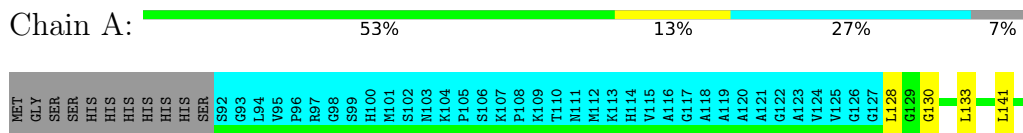
Chain	Residue	Modelled	Actual	Comment	Reference
A	81	MET	-	expression tag	UNP Q712V9
A	82	GLY	-	expression tag	UNP Q712V9
A	83	SER	-	expression tag	UNP Q712V9
A	84	SER	-	expression tag	UNP Q712V9
A	85	HIS	-	expression tag	UNP Q712V9
A	86	HIS	-	expression tag	UNP Q712V9
A	87	HIS	-	expression tag	UNP Q712V9
A	88	HIS	-	expression tag	UNP Q712V9
A	89	HIS	-	expression tag	UNP Q712V9
A	90	HIS	-	expression tag	UNP Q712V9
A	91	SER	-	expression tag	UNP Q712V9
A	92	SER	-	expression tag	UNP Q712V9
A	93	GLY	-	expression tag	UNP Q712V9
A	94	LEU	-	expression tag	UNP Q712V9
A	95	VAL	-	expression tag	UNP Q712V9
A	96	PRO	-	expression tag	UNP Q712V9
A	97	ARG	-	expression tag	UNP Q712V9
A	98	GLY	-	expression tag	UNP Q712V9
A	99	SER	-	expression tag	UNP Q712V9
A	100	HIS	-	expression tag	UNP Q712V9
A	101	MET	-	expression tag	UNP Q712V9
A	102	SER	-	expression tag	UNP Q712V9
A	?	-	THR	deletion	UNP Q712V9
A	?	-	THR	deletion	UNP Q712V9
A	?	-	THR	deletion	UNP Q712V9
A	?	-	THR	deletion	UNP Q712V9

## 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: Major prion protein

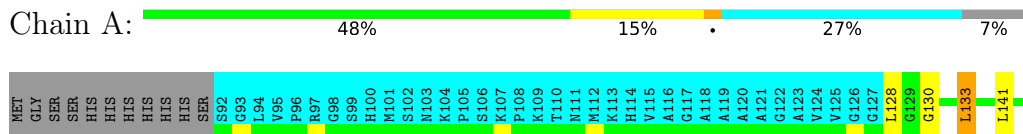


### 4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

#### 4.2.1 Score per residue for model 1 (medoid)

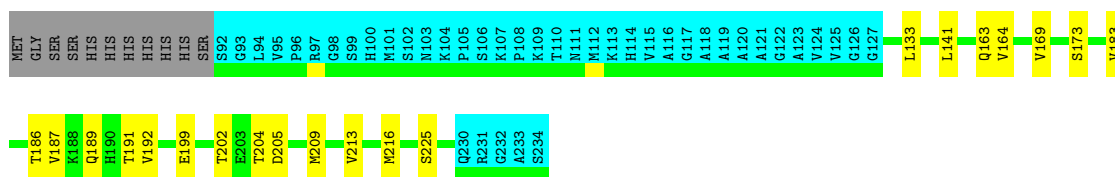
- Molecule 1: Major prion protein



#### 4.2.2 Score per residue for model 2

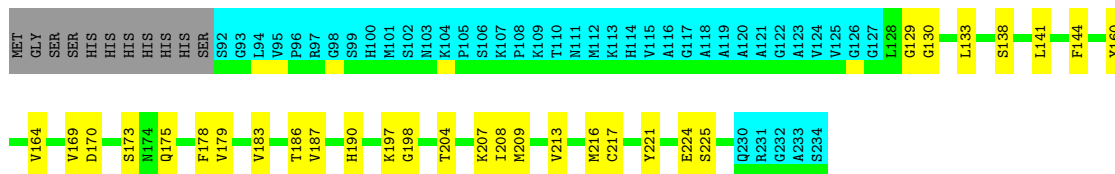
- Molecule 1: Major prion protein





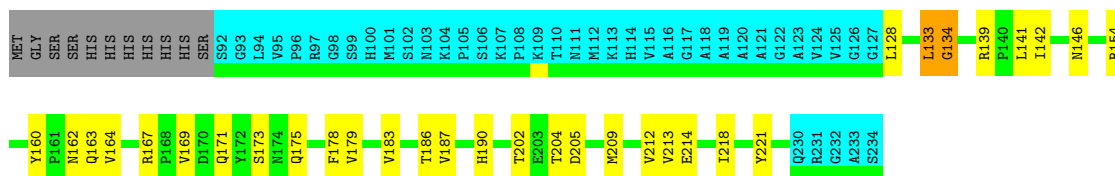
### 4.2.3 Score per residue for model 3

- Molecule 1: Major prion protein



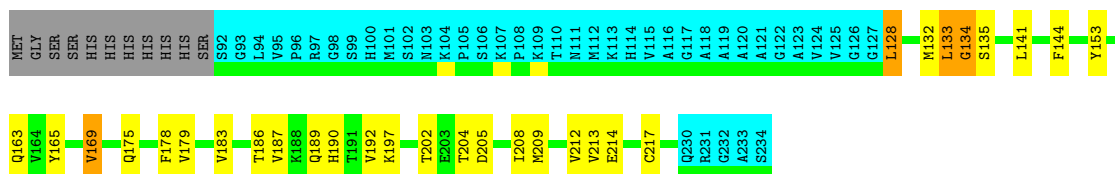
### 4.2.4 Score per residue for model 4

- Molecule 1: Major prion protein



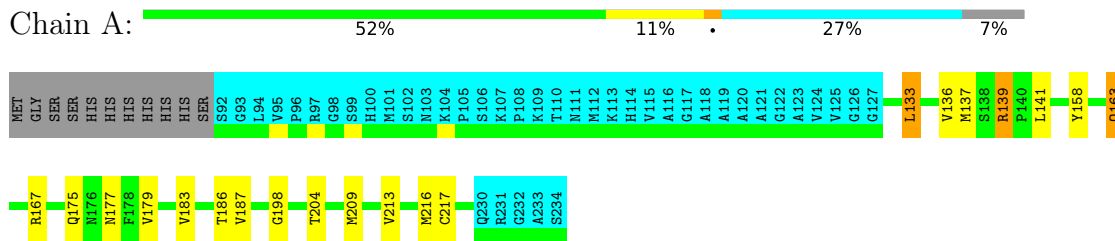
### 4.2.5 Score per residue for model 5

- Molecule 1: Major prion protein



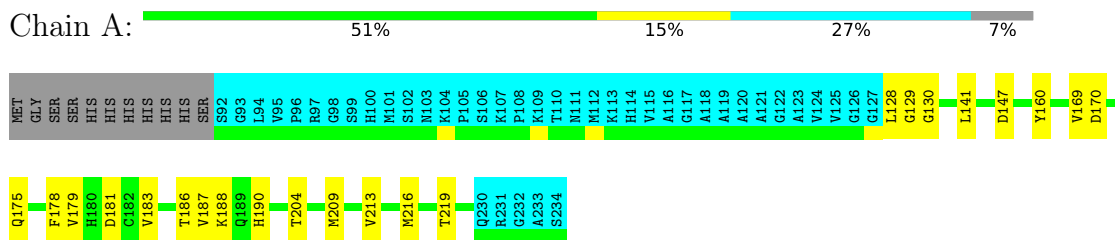
### 4.2.6 Score per residue for model 6

- Molecule 1: Major prion protein



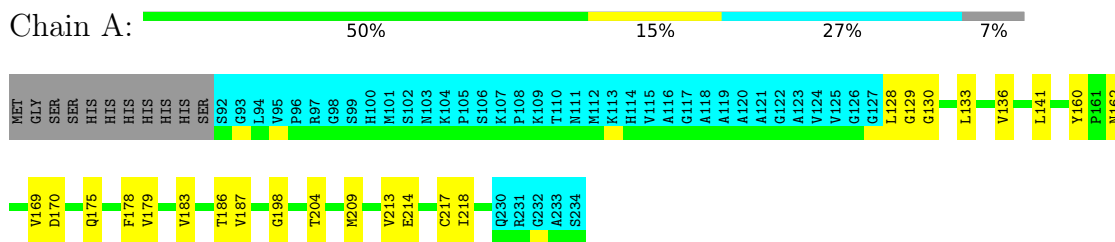
#### 4.2.7 Score per residue for model 7

- Molecule 1: Major prion protein



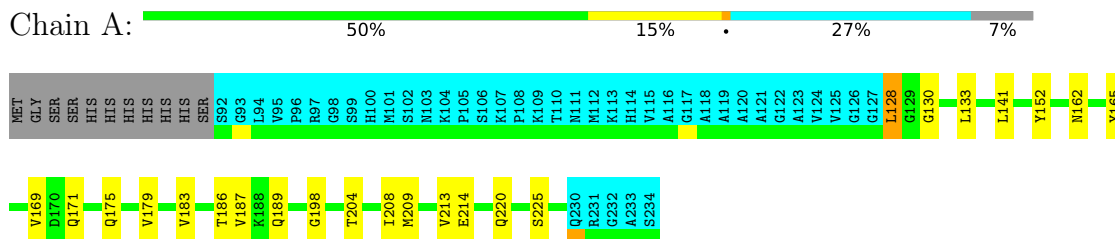
#### 4.2.8 Score per residue for model 8

- Molecule 1: Major prion protein



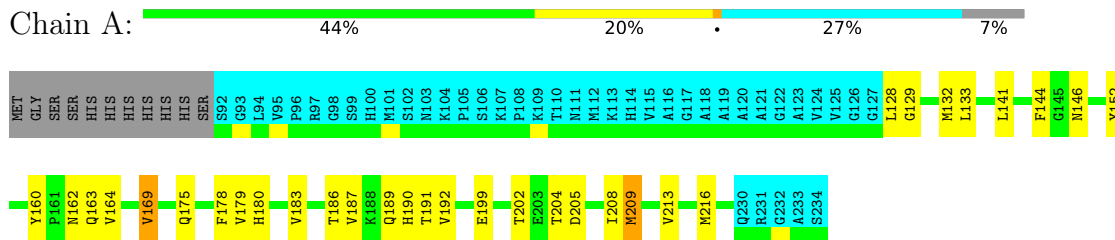
#### 4.2.9 Score per residue for model 9

- Molecule 1: Major prion protein



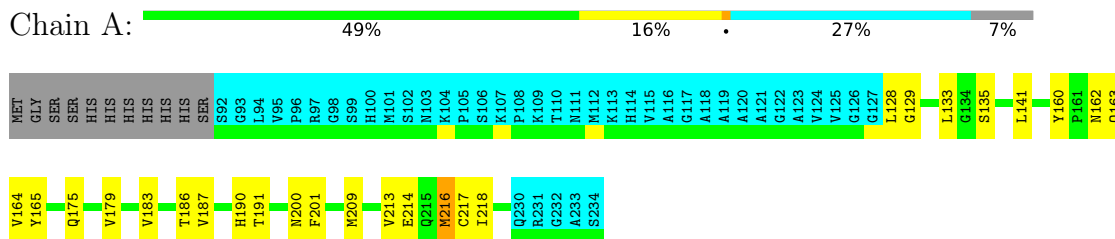
### 4.2.10 Score per residue for model 10

- Molecule 1: Major prion protein



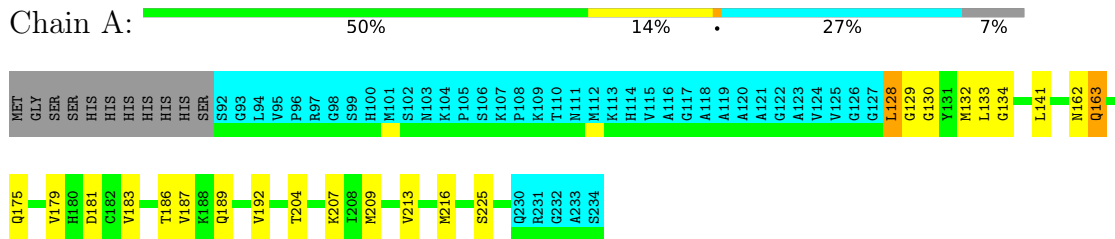
### 4.2.11 Score per residue for model 11

- Molecule 1: Major prion protein



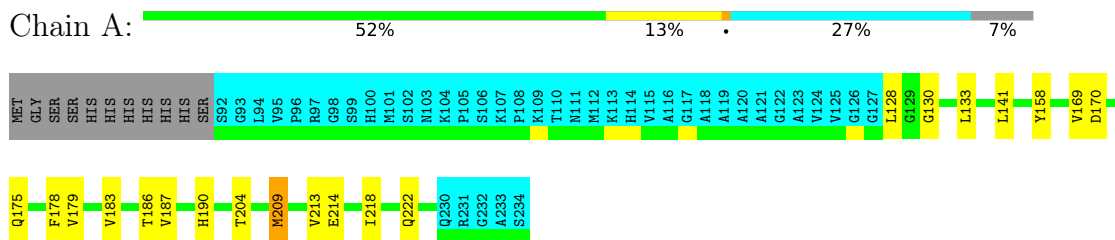
### 4.2.12 Score per residue for model 12

- Molecule 1: Major prion protein



### 4.2.13 Score per residue for model 13

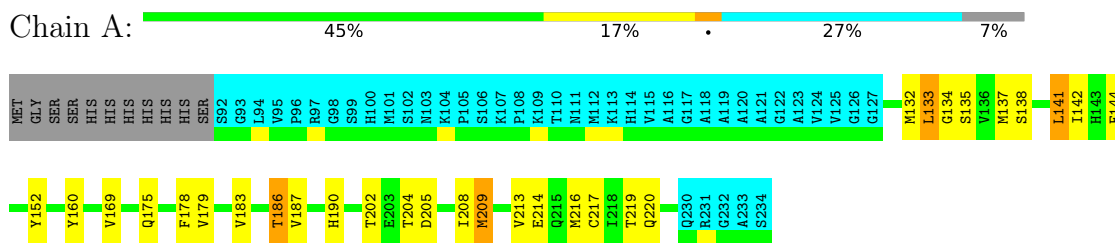
- Molecule 1: Major prion protein





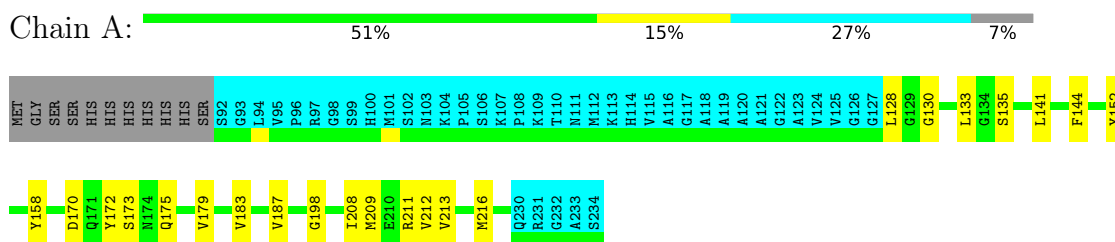
#### 4.2.14 Score per residue for model 14

- Molecule 1: Major prion protein



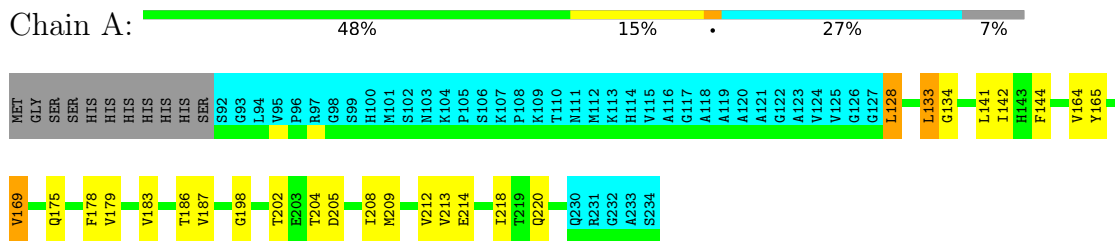
#### 4.2.15 Score per residue for model 15

- Molecule 1: Major prion protein



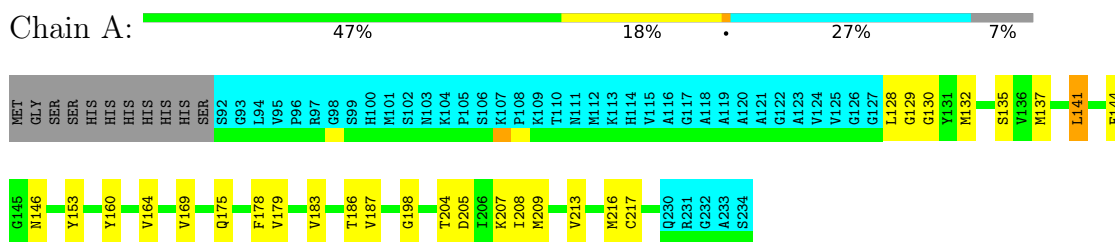
#### 4.2.16 Score per residue for model 16

- Molecule 1: Major prion protein



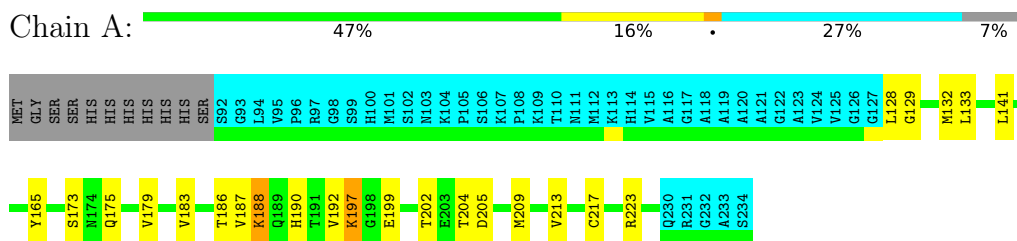
#### 4.2.17 Score per residue for model 17

- Molecule 1: Major prion protein



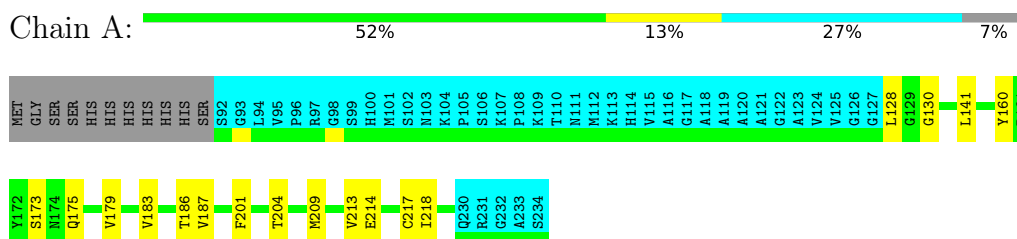
### 4.2.18 Score per residue for model 18

- Molecule 1: Major prion protein



### 4.2.19 Score per residue for model 19

- Molecule 1: Major prion protein



### 4.2.20 Score per residue for model 20

- Molecule 1: Major prion protein



## 5 Refinement protocol and experimental data overview

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

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 calculation	3.0
CYANA	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	1072
Number of shifts mapped to atoms	1067
Number of unparsed shifts	0
Number of shifts with mapping errors	5
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	58%

## 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	834	778	778	10±3
All	All	16680	15560	15560	209

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 6.

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

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:183:VAL:O	1:A:187:VAL:HG23	0.63	1.93	15	16
1:A:209:MET:O	1:A:213:VAL:HG23	0.62	1.94	16	20
1:A:169:VAL:HG12	1:A:178:PHE:CE2	0.62	2.29	13	11
1:A:186:THR:CG2	1:A:213:VAL:HG13	0.60	2.26	19	3
1:A:183:VAL:HG13	1:A:213:VAL:CG1	0.60	2.27	16	2
1:A:183:VAL:HG11	1:A:214:GLU:OE2	0.60	1.95	9	2
1:A:179:VAL:HG13	1:A:217:CYS:HB3	0.60	1.73	17	10
1:A:186:THR:HG21	1:A:213:VAL:HG13	0.59	1.74	10	12
1:A:191:THR:HG22	1:A:199:GLU:O	0.58	1.97	2	2
1:A:188:LYS:O	1:A:192:VAL:HG23	0.58	1.99	18	1
1:A:141:LEU:HD11	1:A:153:TYR:OH	0.58	1.99	17	1
1:A:164:VAL:HG23	1:A:186:THR:OG1	0.57	1.99	16	2
1:A:128:LEU:HD13	1:A:165:TYR:CE2	0.56	2.35	16	2
1:A:202:THR:HG22	1:A:205:ASP:OD2	0.56	2.00	18	1

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:128:LEU:HD12	1:A:129:GLY:N	0.56	2.15	11	7
1:A:212:VAL:HG22	1:A:216:MET:CE	0.56	2.31	15	1
1:A:144:PHE:CE1	1:A:208:ILE:HG23	0.56	2.35	16	3
1:A:152:TYR:CD1	1:A:208:ILE:HD12	0.56	2.35	15	5
1:A:175:GLN:O	1:A:179:VAL:HG23	0.54	2.01	10	19
1:A:186:THR:HG22	1:A:190:HIS:CD2	0.54	2.38	14	1
1:A:164:VAL:HG11	1:A:216:MET:CG	0.54	2.32	2	2
1:A:133:LEU:HD13	1:A:134:GLY:N	0.53	2.18	14	4
1:A:164:VAL:HG21	1:A:216:MET:HG3	0.53	1.81	17	3
1:A:169:VAL:HG12	1:A:178:PHE:CE1	0.53	2.38	14	1
1:A:153:TYR:CE1	1:A:212:VAL:HG21	0.53	2.38	5	1
1:A:189:GLN:O	1:A:192:VAL:HG12	0.53	2.03	12	4
1:A:144:PHE:CZ	1:A:208:ILE:HG23	0.52	2.39	5	5
1:A:146:ASN:ND2	1:A:149:GLU:H	0.51	2.04	1	2
1:A:133:LEU:HD23	1:A:134:GLY:N	0.51	2.20	12	1
1:A:136:VAL:HG23	1:A:139:ARG:HG2	0.50	1.83	6	1
1:A:133:LEU:HD11	1:A:163:GLN:CG	0.50	2.36	6	1
1:A:144:PHE:CE2	1:A:208:ILE:HG23	0.50	2.41	1	2
1:A:133:LEU:HD21	1:A:163:GLN:CD	0.49	2.27	6	1
1:A:202:THR:HG23	1:A:205:ASP:H	0.49	1.67	10	7
1:A:169:VAL:HG21	1:A:225:SER:HA	0.49	1.85	9	1
1:A:133:LEU:HD12	1:A:163:GLN:HG2	0.48	1.84	2	1
1:A:183:VAL:O	1:A:187:VAL:HG13	0.48	2.08	17	3
1:A:186:THR:HG21	1:A:216:MET:CE	0.48	2.38	12	1
1:A:169:VAL:HG11	1:A:221:TYR:CD1	0.48	2.43	3	2
1:A:212:VAL:HG22	1:A:216:MET:HE2	0.48	1.84	15	1
1:A:164:VAL:HG11	1:A:216:MET:HG3	0.48	1.86	3	3
1:A:179:VAL:HG13	1:A:217:CYS:CB	0.47	2.40	5	3
1:A:128:LEU:HD13	1:A:165:TYR:CD2	0.47	2.45	5	1
1:A:133:LEU:HD11	1:A:163:GLN:NE2	0.46	2.25	12	1
1:A:133:LEU:HD11	1:A:163:GLN:HG3	0.46	1.87	6	1
1:A:142:ILE:HD13	1:A:144:PHE:CZ	0.46	2.46	14	1
1:A:183:VAL:HG13	1:A:213:VAL:HG12	0.46	1.88	4	2
1:A:133:LEU:HD11	1:A:165:TYR:CE1	0.45	2.46	11	1
1:A:133:LEU:HD12	1:A:163:GLN:CG	0.45	2.41	2	1
1:A:186:THR:HG21	1:A:216:MET:HE1	0.45	1.89	12	1
1:A:141:LEU:HA	1:A:219:THR:HG21	0.45	1.87	14	1
1:A:142:ILE:HD12	1:A:212:VAL:HA	0.44	1.89	4	3
1:A:183:VAL:HG13	1:A:213:VAL:HG11	0.44	1.89	16	1
1:A:164:VAL:HG11	1:A:216:MET:CE	0.44	2.42	10	1
1:A:183:VAL:O	1:A:187:VAL:HG22	0.44	2.13	5	2

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Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:133:LEU:HD21	1:A:163:GLN:NE2	0.43	2.28	6	1
1:A:144:PHE:HE1	1:A:208:ILE:HG23	0.43	1.74	16	1
1:A:133:LEU:HD21	1:A:163:GLN:OE1	0.42	2.14	10	1
1:A:133:LEU:HD12	1:A:163:GLN:NE2	0.42	2.29	11	1
1:A:214:GLU:O	1:A:218:ILE:HD12	0.42	2.15	16	6
1:A:183:VAL:O	1:A:187:VAL:HG12	0.41	2.15	19	1
1:A:169:VAL:HG13	1:A:224:GLU:HB3	0.41	1.92	20	2
1:A:133:LEU:HD13	1:A:165:TYR:CD2	0.41	2.49	18	1
1:A:133:LEU:HD11	1:A:163:GLN:CD	0.41	2.36	4	1
1:A:136:VAL:HG23	1:A:139:ARG:HD3	0.41	1.91	6	1
1:A:190:HIS:CE1	1:A:213:VAL:HG22	0.40	2.51	20	1
1:A:164:VAL:HG11	1:A:216:MET:HG2	0.40	1.93	1	1
1:A:187:VAL:O	1:A:191:THR:HG23	0.40	2.17	11	1
1:A:164:VAL:HG21	1:A:216:MET:CG	0.40	2.46	17	1
1:A:133:LEU:HD21	1:A:163:GLN:HE21	0.40	1.76	1	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	98/150 (65%)	88±2 (90±2%)	8±2 (8±2%)	2±1 (2±1%)	12	54
All	All	1960/3000 (65%)	1760 (90%)	165 (8%)	35 (2%)	12	54

All 10 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	130	GLY	11
1	A	198	GLY	8
1	A	169	VAL	6
1	A	173	SER	3
1	A	134	GLY	2
1	A	129	GLY	1
1	A	136	VAL	1

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Mol	Chain	Res	Type	Models (Total)
1	A	132	MET	1
1	A	135	SER	1
1	A	197	LYS	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	92/129 (71%)	84±3 (91±3%)	8±3 (9±3%)	13 59
All	All	1840/2580 (71%)	1671 (91%)	169 (9%)	13 59

All 44 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	141	LEU	20
1	A	204	THR	17
1	A	133	LEU	12
1	A	160	TYR	11
1	A	128	LEU	9
1	A	190	HIS	9
1	A	162	ASN	7
1	A	170	ASP	5
1	A	132	MET	5
1	A	163	GLN	4
1	A	135	SER	4
1	A	216	MET	4
1	A	225	SER	3
1	A	173	SER	3
1	A	197	LYS	3
1	A	207	LYS	3
1	A	146	ASN	3
1	A	167	ARG	3
1	A	171	GLN	3
1	A	137	MET	3
1	A	158	TYR	3
1	A	220	GLN	3

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Mol	Chain	Res	Type	Models (Total)
1	A	209	MET	3
1	A	138	SER	2
1	A	139	ARG	2
1	A	214	GLU	2
1	A	181	ASP	2
1	A	186	THR	2
1	A	188	LYS	2
1	A	201	PHE	2
1	A	205	ASP	2
1	A	154	ARG	1
1	A	177	ASN	1
1	A	147	ASP	1
1	A	219	THR	1
1	A	189	GLN	1
1	A	180	HIS	1
1	A	200	ASN	1
1	A	222	GLN	1
1	A	172	TYR	1
1	A	211	ARG	1
1	A	149	GLU	1
1	A	199	GLU	1
1	A	223	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 58% for the well-defined parts and 57% for the entire structure.

### 7.1 Chemical shift list 1

File name: working\_cs.cif

Chemical shift list name: *assigned\_chem\_shift\_list*

#### 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	1072
Number of shifts mapped to atoms	1067
Number of unparsed shifts	0
Number of shifts with mapping errors	5
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	1

The following assigned chemical shifts were not mapped to the molecules present in the coordinate file.

- No matching atom found in the structure. All 5 occurrences are reported below.

List ID	Chain	Res	Type	Atom	Shift Data		
					Value	Uncertainty	Ambiguity
1	A	82	GLY	CA	45.09	0.25	1
1	A	83	SER	H	8.33	0.02	1
1	A	83	SER	N	115.75	0.15	1
1	A	83	SER	CA	58.24	0.25	1
1	A	91	SER	CA	58.16	0.25	1

#### 7.1.2 Chemical shift referencing [i](#)

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction $\pm$ precision, ppm	Suggested action
$^{13}\text{C}_\alpha$	138	$-0.21 \pm 0.13$	None needed ( $< 0.5$ ppm)
$^{13}\text{C}_\beta$	0	—	None (insufficient data)
$^{13}\text{C}'$	0	—	None (insufficient data)

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Nucleus	# values	Correction $\pm$ precision, ppm	Suggested action
<sup>15</sup> N	130	0.03 $\pm$ 0.22	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 58%, i.e. 808 atoms were assigned a chemical shift out of a possible 1395. 0 out of 12 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	<sup>1</sup> H	<sup>13</sup> C	<sup>15</sup> N
Backbone	373/489 (76%)	188/198 (95%)	94/196 (48%)	91/95 (96%)
Sidechain	378/747 (51%)	363/478 (76%)	0/229 (0%)	15/40 (38%)
Aromatic	57/159 (36%)	57/75 (76%)	0/81 (0%)	0/3 (0%)
Overall	808/1395 (58%)	608/751 (81%)	94/506 (19%)	106/138 (77%)

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 57%, i.e. 1066 atoms were assigned a chemical shift out of a possible 1882. 0 out of 17 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	<sup>1</sup> H	<sup>13</sup> C	<sup>15</sup> N
Backbone	538/695 (77%)	274/284 (96%)	135/278 (49%)	129/133 (97%)
Sidechain	471/1014 (46%)	455/654 (70%)	0/307 (0%)	16/53 (30%)
Aromatic	57/173 (33%)	57/83 (69%)	0/85 (0%)	0/5 (0%)
Overall	1066/1882 (57%)	786/1021 (77%)	135/670 (20%)	145/191 (76%)

### 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.

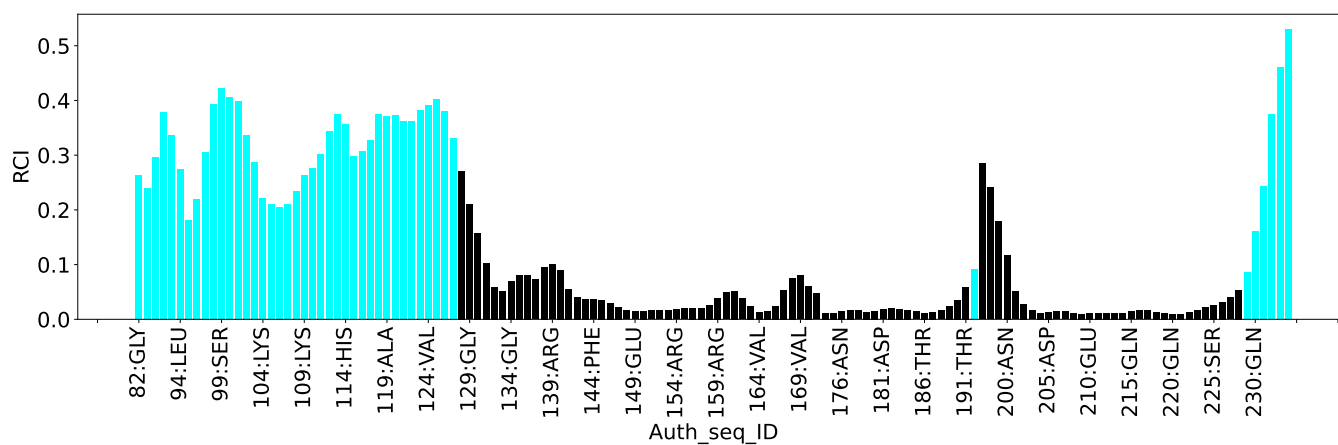
List Id	Chain	Res	Type	Atom	Shift, ppm	Expected range, ppm	Z-score
1	A	186	THR	HG1	6.29	0.08 – 2.19	24.4

### 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:



## 8 NMR restraints analysis

### 8.1 Conformationally restricting restraints

The following table provides the summary of experimentally observed NMR restraints in different categories. Restraints are classified into different categories based on the sequence separation of the atoms involved.

Description	Value
Total distance restraints	1589
Intra-residue ( $ i-j =0$ )	430
Sequential ( $ i-j =1$ )	483
Medium range ( $ i-j >1$ and $ i-j <5$ )	319
Long range ( $ i-j \geq 5$ )	356
Inter-chain	0
Hydrogen bond restraints	0
Disulfide bond restraints	1
Total dihedral-angle restraints	142
Number of unmapped restraints	0
Number of restraints per residue	11.5
Number of long range restraints per residue <sup>1</sup>	2.4

<sup>1</sup>Long range hydrogen bonds and disulfide bonds are counted as long range restraints while calculating the number of long range restraints per residue

### 8.2 Residual restraint violations

This section provides the overview of the restraint violations analysis. The violations are binned as small, medium and large violations based on its absolute value. Average number of violations per model is calculated by dividing the total number of violations in each bin by the size of the ensemble.

#### 8.2.1 Average number of distance violations per model

Distance violations less than 0.1 Å are not included in the calculation.

Bins (Å)	Average number of violations per model	Max (Å)
0.1-0.2 (Small)	1.8	0.2
0.2-0.5 (Medium)	0.5	0.44
>0.5 (Large)	None	None

### 8.2.2 Average number of dihedral-angle violations per model [i](#)

Dihedral-angle violations less than 1° are not included in the calculation.

Bins (°)	Average number of violations per model	Max (°)
1.0-10.0 (Small)	4.5	5.76
10.0-20.0 (Medium)	None	None
>20.0 (Large)	None	None

## 9 Distance violation analysis

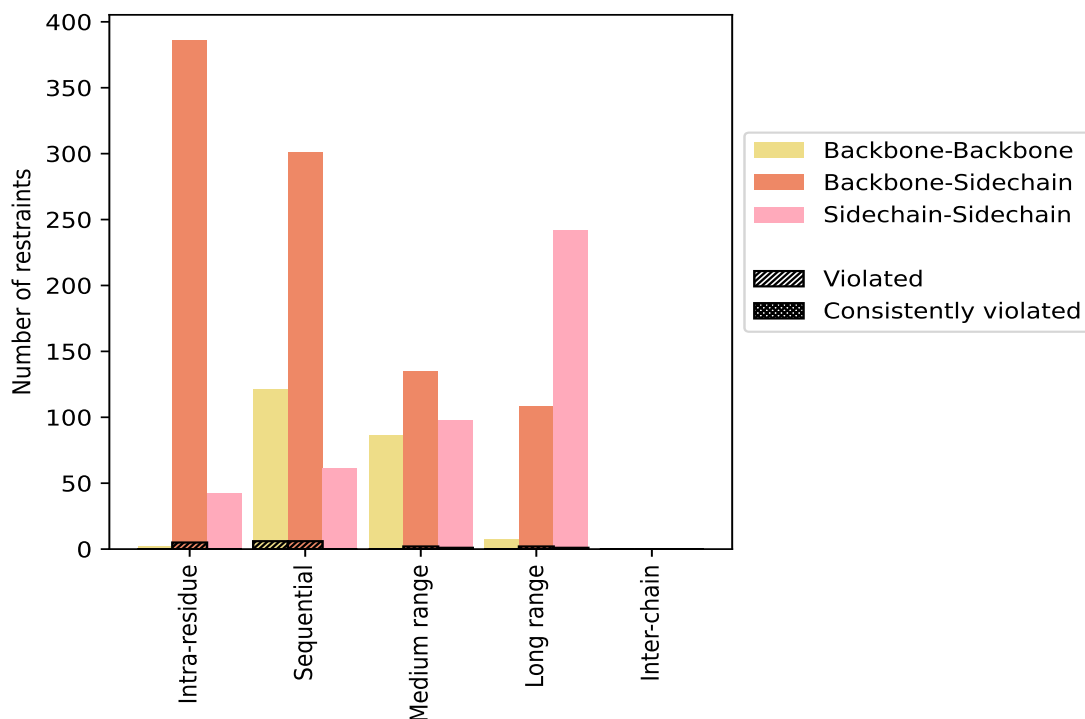
### 9.1 Summary of distance violations

The following table shows the summary of distance violations in different restraint categories based on the sequence separation of the atoms involved. Each category is further sub-divided into three sub-categories based on the atoms involved. Violations less than 0.1 Å are not included in the statistics.

Restrains type	Count	% <sup>1</sup>	Violated <sup>3</sup>			Consistently Violated <sup>4</sup>		
			Count	% <sup>2</sup>	% <sup>1</sup>	Count	% <sup>2</sup>	% <sup>1</sup>
<b>Intra-residue (<math> i-j =0</math>)</b>	<b>430</b>	<b>27.1</b>	<b>5</b>	<b>1.2</b>	<b>0.3</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>
Backbone-Backbone	2	0.1	0	0.0	0.0	0	0.0	0.0
Backbone-Sidechain	386	24.3	5	1.3	0.3	0	0.0	0.0
Sidechain-Sidechain	42	2.6	0	0.0	0.0	0	0.0	0.0
<b>Sequential (<math> i-j =1</math>)</b>	<b>483</b>	<b>30.4</b>	<b>12</b>	<b>2.5</b>	<b>0.8</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>
Backbone-Backbone	121	7.6	6	5.0	0.4	0	0.0	0.0
Backbone-Sidechain	301	18.9	6	2.0	0.4	0	0.0	0.0
Sidechain-Sidechain	61	3.8	0	0.0	0.0	0	0.0	0.0
<b>Medium range (<math> i-j &gt;1</math> &amp; <math> i-j &lt;5</math>)</b>	<b>319</b>	<b>20.1</b>	<b>3</b>	<b>0.9</b>	<b>0.2</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>
Backbone-Backbone	86	5.4	0	0.0	0.0	0	0.0	0.0
Backbone-Sidechain	135	8.5	2	1.5	0.1	0	0.0	0.0
Sidechain-Sidechain	98	6.2	1	1.0	0.1	0	0.0	0.0
<b>Long range (<math> i-j \geq 5</math>)</b>	<b>356</b>	<b>22.4</b>	<b>3</b>	<b>0.8</b>	<b>0.2</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>
Backbone-Backbone	7	0.4	0	0.0	0.0	0	0.0	0.0
Backbone-Sidechain	108	6.8	2	1.9	0.1	0	0.0	0.0
Sidechain-Sidechain	241	15.2	1	0.4	0.1	0	0.0	0.0
<b>Inter-chain</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>
Backbone-Backbone	0	0.0	0	0.0	0.0	0	0.0	0.0
Backbone-Sidechain	0	0.0	0	0.0	0.0	0	0.0	0.0
Sidechain-Sidechain	0	0.0	0	0.0	0.0	0	0.0	0.0
<b>Hydrogen bond</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>
<b>Disulfide bond</b>	<b>1</b>	<b>0.1</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>
<b>Total</b>	<b>1589</b>	<b>100.0</b>	<b>23</b>	<b>1.4</b>	<b>1.4</b>	<b>0</b>	<b>0.0</b>	<b>0.0</b>
Backbone-Backbone	216	13.6	6	2.8	0.4	0	0.0	0.0
Backbone-Sidechain	930	58.5	15	1.6	0.9	0	0.0	0.0
Sidechain-Sidechain	443	27.9	2	0.5	0.1	0	0.0	0.0

<sup>1</sup> percentage calculated with respect to the total number of distance restraints, <sup>2</sup> percentage calculated with respect to the number of restraints in a particular restraint category, <sup>3</sup> violated in at least one model, <sup>4</sup> violated in all the models

### 9.1.1 Bar chart : Distribution of distance restraints and violations [i](#)



Violated and consistently violated restraints are shown using different hatch patterns in their respective categories. The hydrogen bonds and disulfid bonds are counted in their appropriate category on the x-axis

## 9.2 Distance violation statistics for each model [i](#)

The following table provides the distance violation statistics for each model in the ensemble. Violations less than 0.1 Å are not included in the statistics.

Model ID	Number of violations						Mean (Å)	Max (Å)	SD <sup>6</sup> (Å)	Median (Å)
	IR <sup>1</sup>	SQ <sup>2</sup>	MR <sup>3</sup>	LR <sup>4</sup>	IC <sup>5</sup>	Total				
1	2	0	1	1	0	4	0.17	0.27	0.07	0.16
2	1	0	0	0	0	1	0.11	0.11	0.0	0.11
3	1	1	0	1	0	3	0.14	0.17	0.02	0.14
4	0	0	0	1	0	1	0.1	0.1	0.0	0.1
5	0	0	0	1	0	1	0.19	0.19	0.0	0.19
6	2	0	0	1	0	3	0.14	0.18	0.03	0.13
7	0	0	0	0	0	0	0.0	0.0	0.0	0.0
8	1	2	0	0	0	3	0.18	0.22	0.03	0.18
9	0	2	0	1	0	3	0.15	0.19	0.03	0.15
10	0	0	0	1	0	1	0.11	0.11	0.0	0.11
11	0	5	0	3	0	8	0.16	0.22	0.04	0.16

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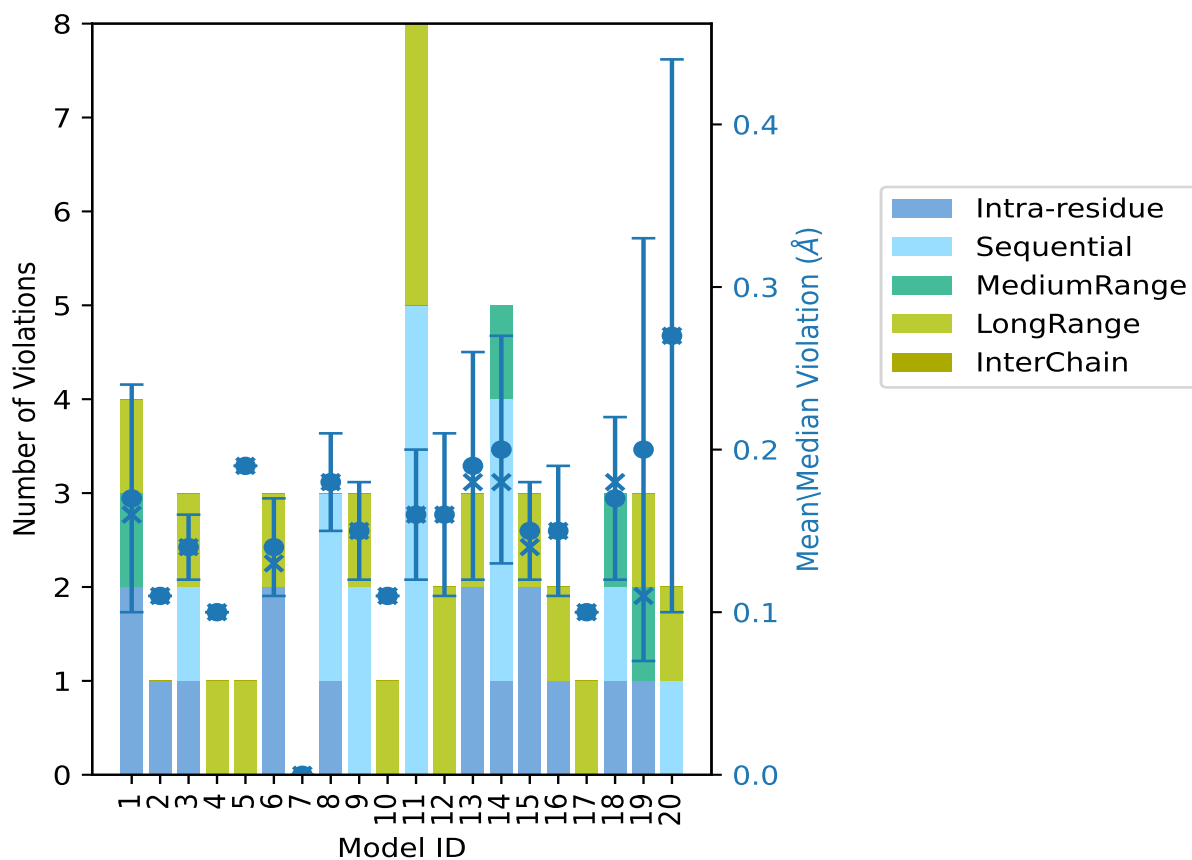


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Model ID	Number of violations						Mean (Å)	Max (Å)	SD <sup>6</sup> (Å)	Median (Å)
	IR <sup>1</sup>	SQ <sup>2</sup>	MR <sup>3</sup>	LR <sup>4</sup>	IC <sup>5</sup>	Total				
12	0	0	0	2	0	2	0.16	0.2	0.05	0.16
13	2	0	0	1	0	3	0.19	0.28	0.07	0.18
14	1	3	1	0	0	5	0.2	0.29	0.07	0.18
15	2	0	0	1	0	3	0.15	0.19	0.03	0.14
16	1	0	0	1	0	2	0.15	0.19	0.04	0.15
17	0	0	0	1	0	1	0.1	0.1	0.0	0.1
18	1	1	1	0	0	3	0.17	0.22	0.05	0.18
19	1	0	1	1	0	3	0.2	0.38	0.13	0.11
20	0	1	0	1	0	2	0.27	0.44	0.17	0.27

<sup>1</sup>Intra-residue restraints, <sup>2</sup>Sequential restraints, <sup>3</sup>Medium range restraints, <sup>4</sup>Long range restraints, <sup>5</sup>Inter-chain restraints, <sup>6</sup>Standard deviation

### 9.2.1 Bar graph : Distance Violation statistics for each model [\(i\)](#)



The mean(dot),median(x) and the standard deviation are shown in blue with respect to the y axis on the right

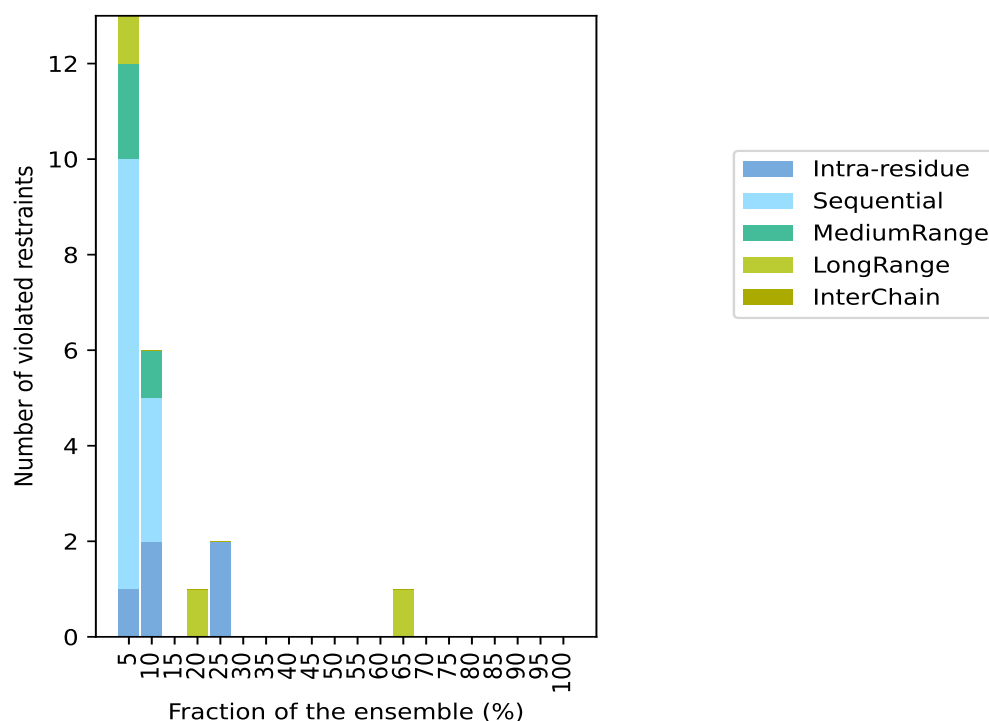
### 9.3 Distance violation statistics for the ensemble

Violation analysis may find that some restraints are violated in few models and some are violated in most of models. The following table provides this information as number of violated restraints for a given fraction of the ensemble. In total, 1565(IR:425, SQ:471, MR:316, LR:353, IC:0) restraints are not violated in the ensemble.

Number of violated restraints						Fraction of the ensemble	
IR <sup>1</sup>	SQ <sup>2</sup>	MR <sup>3</sup>	LR <sup>4</sup>	IC <sup>5</sup>	Total	Count <sup>6</sup>	%
1	9	2	1	0	13	1	5.0
2	3	1	0	0	6	2	10.0
0	0	0	0	0	0	3	15.0
0	0	0	1	0	1	4	20.0
2	0	0	0	0	2	5	25.0
0	0	0	0	0	0	6	30.0
0	0	0	0	0	0	7	35.0
0	0	0	0	0	0	8	40.0
0	0	0	0	0	0	9	45.0
0	0	0	0	0	0	10	50.0
0	0	0	0	0	0	11	55.0
0	0	0	0	0	0	12	60.0
0	0	0	1	0	1	13	65.0
0	0	0	0	0	0	14	70.0
0	0	0	0	0	0	15	75.0
0	0	0	0	0	0	16	80.0
0	0	0	0	0	0	17	85.0
0	0	0	0	0	0	18	90.0
0	0	0	0	0	0	19	95.0
0	0	0	0	0	0	20	100.0

<sup>1</sup>Intra-residue restraints, <sup>2</sup>Sequential restraints, <sup>3</sup>Medium range restraints, <sup>4</sup>Long range restraints, <sup>5</sup>Inter-chain restraints, <sup>6</sup> Number of models with violations

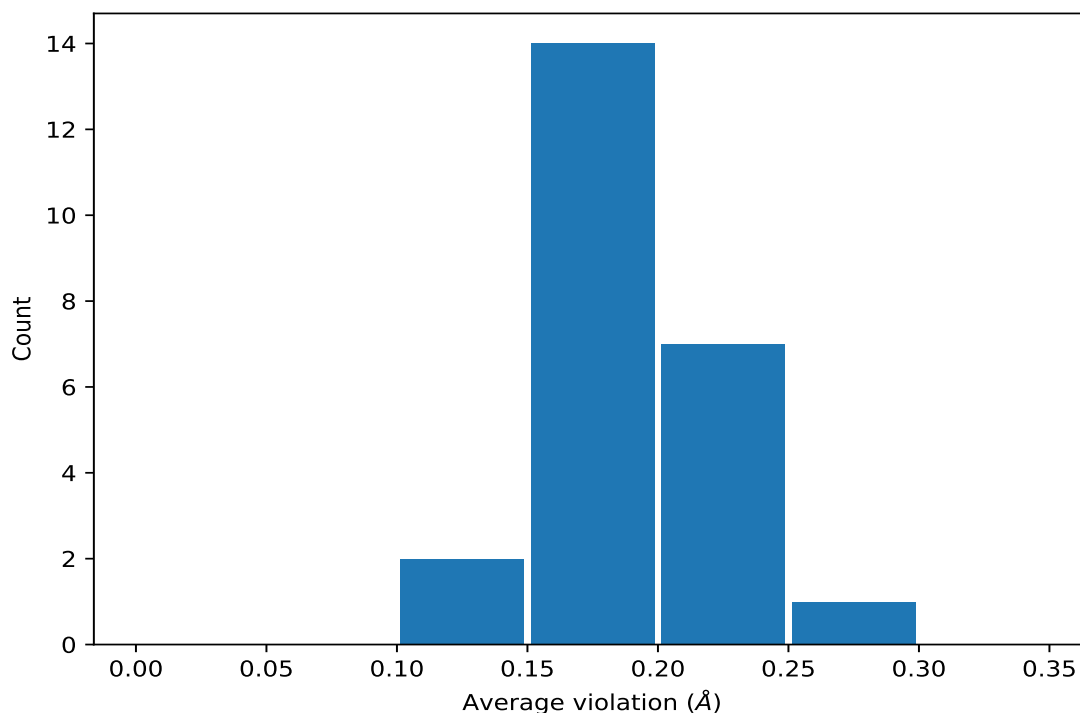
### 9.3.1 Bar graph : Distance violation statistics for the ensemble [i](#)



## 9.4 Most violated distance restraints in the ensemble [i](#)

### 9.4.1 Histogram : Distribution of mean distance violations [i](#)

The following histogram shows the distribution of the average value of the violation. The average is calculated for each restraint that is violated in more than one model over all the violated models in the ensemble



#### 9.4.2 Table: Most violated distance restraints [i](#)

The following table provides the mean and the standard deviation of the violation for each restraint sorted by number of violated models and the mean value. The Key (restraint list ID, restraint ID) is the unique identifier for a given restraint. Rows with same key represent combinatorial or ambiguous restraints and are counted as a single restraint.

Key	Atom-1	Atom-2	Models <sup>1</sup>	Mean (Å)	SD <sup>1</sup> (Å)	Median (Å)
(1,1586)	1:182:A:CYS:SG	1:217:A:CYS:CB	13	0.11	0.01	0.11
(1,1267)	1:139:A:ARG:HA	1:139:A:ARG:HG2	5	0.18	0.0	0.18
(1,1267)	1:139:A:ARG:HA	1:139:A:ARG:HG3	5	0.18	0.0	0.18
(1,111)	1:133:A:LEU:H	1:133:A:LEU:HB2	5	0.13	0.01	0.14
(1,847)	1:192:A:VAL:HG11	1:199:A:GLU:H	4	0.16	0.04	0.16
(1,847)	1:192:A:VAL:HG12	1:199:A:GLU:H	4	0.16	0.04	0.16
(1,847)	1:192:A:VAL:HG13	1:199:A:GLU:H	4	0.16	0.04	0.16
(1,847)	1:192:A:VAL:HG21	1:199:A:GLU:H	4	0.16	0.04	0.16
(1,847)	1:192:A:VAL:HG22	1:199:A:GLU:H	4	0.16	0.04	0.16
(1,847)	1:192:A:VAL:HG23	1:199:A:GLU:H	4	0.16	0.04	0.16
(1,476)	1:125:A:VAL:H	1:125:A:VAL:HB	2	0.28	0.01	0.28
(1,515)	1:146:A:ASN:H	1:146:A:ASN:HD21	2	0.21	0.01	0.21
(1,1258)	1:136:A:VAL:HG11	1:137:A:MET:H	2	0.2	0.02	0.2
(1,1258)	1:136:A:VAL:HG12	1:137:A:MET:H	2	0.2	0.02	0.2
(1,1258)	1:136:A:VAL:HG13	1:137:A:MET:H	2	0.2	0.02	0.2
(1,1258)	1:136:A:VAL:HG21	1:137:A:MET:H	2	0.2	0.02	0.2

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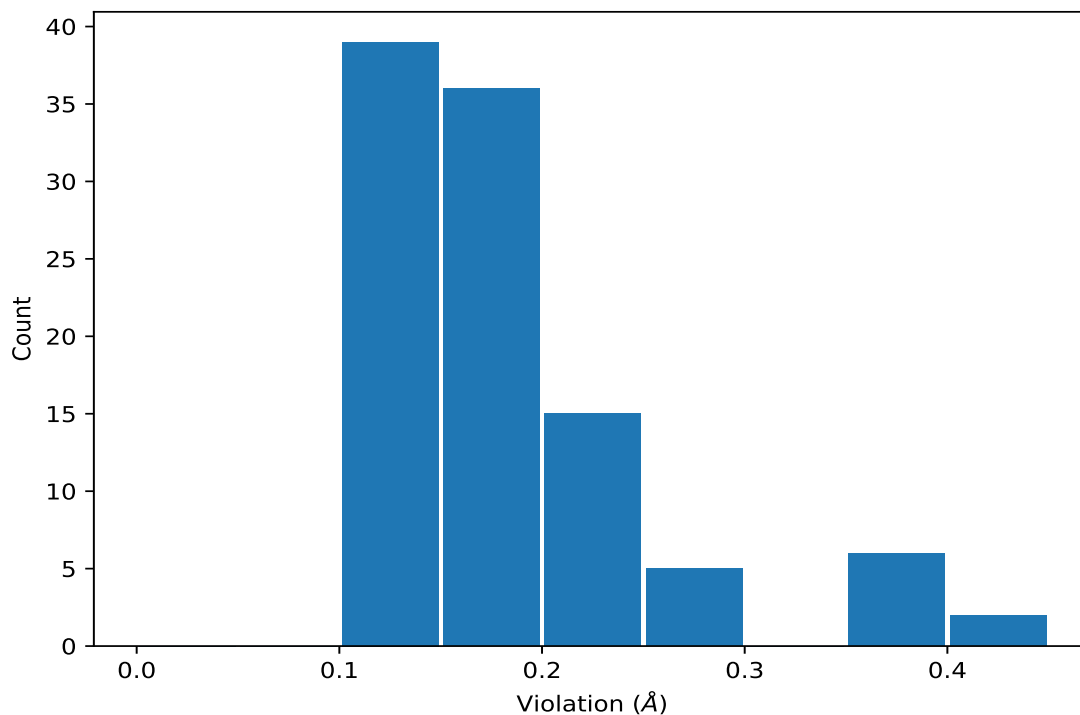
Key	Atom-1	Atom-2	Models <sup>1</sup>	Mean (Å)	SD <sup>1</sup> (Å)	Median (Å)
(1,1258)	1:136:A:VAL:HG22	1:137:A:MET:H	2	0.2	0.02	0.2
(1,1258)	1:136:A:VAL:HG23	1:137:A:MET:H	2	0.2	0.02	0.2
(1,867)	1:136:A:VAL:HG11	1:137:A:MET:H	2	0.18	0.0	0.18
(1,867)	1:136:A:VAL:HG12	1:137:A:MET:H	2	0.18	0.0	0.18
(1,867)	1:136:A:VAL:HG13	1:137:A:MET:H	2	0.18	0.0	0.18
(1,1256)	1:135:A:SER:HB2	1:136:A:VAL:H	2	0.17	0.01	0.17
(1,1256)	1:135:A:SER:HB3	1:136:A:VAL:H	2	0.17	0.01	0.17
(1,588)	1:146:A:ASN:HD22	1:149:A:GLU:HB3	2	0.15	0.03	0.15

<sup>1</sup>Number of violated models, <sup>2</sup>Standard deviation

## 9.5 All violated distance restraints [i](#)

### 9.5.1 Histogram : Distribution of distance violations [i](#)

The following histogram shows the distribution of the absolute value of the violation for all violated restraints in the ensemble.



### 9.5.2 Table : All distance violations [i](#)

The following table lists the absolute value of the violation for each restraint in the ensemble sorted by its value. The Key (restraint list ID, restraint ID) is the unique identifier for a given restraint.

Rows with same key represent combinatorial or ambiguous restraints and are counted as a single restraint.

Key	Atom-1	Atom-2	Model ID	Violation (Å)
(1,1261)	1:137:A:MET:H	1:138:A:SER:HB2	20	0.44
(1,1261)	1:137:A:MET:H	1:138:A:SER:HB3	20	0.44
(1,1425)	1:183:A:VAL:HA	1:187:A:VAL:HG11	19	0.38
(1,1425)	1:183:A:VAL:HA	1:187:A:VAL:HG12	19	0.38
(1,1425)	1:183:A:VAL:HA	1:187:A:VAL:HG13	19	0.38
(1,1425)	1:183:A:VAL:HA	1:187:A:VAL:HG21	19	0.38
(1,1425)	1:183:A:VAL:HA	1:187:A:VAL:HG22	19	0.38
(1,1425)	1:183:A:VAL:HA	1:187:A:VAL:HG23	19	0.38
(1,1542)	1:216:A:MET:HG2	1:217:A:CYS:H	14	0.29
(1,1542)	1:216:A:MET:HG3	1:217:A:CYS:H	14	0.29
(1,459)	1:138:A:SER:H	1:139:A:ARG:H	14	0.29
(1,476)	1:125:A:VAL:H	1:125:A:VAL:HB	13	0.28
(1,476)	1:125:A:VAL:H	1:125:A:VAL:HB	1	0.27
(1,1258)	1:136:A:VAL:HG11	1:137:A:MET:H	8	0.22
(1,1258)	1:136:A:VAL:HG12	1:137:A:MET:H	8	0.22
(1,1258)	1:136:A:VAL:HG13	1:137:A:MET:H	8	0.22
(1,1258)	1:136:A:VAL:HG21	1:137:A:MET:H	8	0.22
(1,1258)	1:136:A:VAL:HG22	1:137:A:MET:H	8	0.22
(1,1258)	1:136:A:VAL:HG23	1:137:A:MET:H	8	0.22
(1,515)	1:146:A:ASN:H	1:146:A:ASN:HD21	18	0.22
(1,33)	1:199:A:GLU:H	1:200:A:ASN:H	11	0.22
(1,847)	1:192:A:VAL:HG11	1:199:A:GLU:H	12	0.2
(1,847)	1:192:A:VAL:HG12	1:199:A:GLU:H	12	0.2
(1,847)	1:192:A:VAL:HG13	1:199:A:GLU:H	12	0.2
(1,847)	1:192:A:VAL:HG21	1:199:A:GLU:H	12	0.2
(1,847)	1:192:A:VAL:HG22	1:199:A:GLU:H	12	0.2
(1,847)	1:192:A:VAL:HG23	1:199:A:GLU:H	12	0.2
(1,515)	1:146:A:ASN:H	1:146:A:ASN:HD21	1	0.2
(1,1267)	1:139:A:ARG:HA	1:139:A:ARG:HG2	15	0.19
(1,1267)	1:139:A:ARG:HA	1:139:A:ARG:HG3	15	0.19
(1,1267)	1:139:A:ARG:HA	1:139:A:ARG:HG2	16	0.19
(1,1267)	1:139:A:ARG:HA	1:139:A:ARG:HG3	16	0.19
(1,1258)	1:136:A:VAL:HG11	1:137:A:MET:H	11	0.19
(1,1258)	1:136:A:VAL:HG12	1:137:A:MET:H	11	0.19
(1,1258)	1:136:A:VAL:HG13	1:137:A:MET:H	11	0.19
(1,1258)	1:136:A:VAL:HG21	1:137:A:MET:H	11	0.19
(1,1258)	1:136:A:VAL:HG22	1:137:A:MET:H	11	0.19
(1,1258)	1:136:A:VAL:HG23	1:137:A:MET:H	11	0.19
(1,847)	1:192:A:VAL:HG11	1:199:A:GLU:H	5	0.19
(1,847)	1:192:A:VAL:HG12	1:199:A:GLU:H	5	0.19
(1,847)	1:192:A:VAL:HG13	1:199:A:GLU:H	5	0.19

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Key	Atom-1	Atom-2	Model ID	Violation (Å)
(1,847)	1:192:A:VAL:HG21	1:199:A:GLU:H	5	0.19
(1,847)	1:192:A:VAL:HG22	1:199:A:GLU:H	5	0.19
(1,847)	1:192:A:VAL:HG23	1:199:A:GLU:H	5	0.19
(1,94)	1:231:A:ARG:HA	1:232:A:GLY:H	9	0.19
(1,1267)	1:139:A:ARG:HA	1:139:A:ARG:HG2	6	0.18
(1,1267)	1:139:A:ARG:HA	1:139:A:ARG:HG3	6	0.18
(1,1267)	1:139:A:ARG:HA	1:139:A:ARG:HG2	13	0.18
(1,1267)	1:139:A:ARG:HA	1:139:A:ARG:HG3	13	0.18
(1,1267)	1:139:A:ARG:HA	1:139:A:ARG:HG2	14	0.18
(1,1267)	1:139:A:ARG:HA	1:139:A:ARG:HG3	14	0.18
(1,1256)	1:135:A:SER:HB2	1:136:A:VAL:H	11	0.18
(1,1256)	1:135:A:SER:HB3	1:136:A:VAL:H	11	0.18
(1,867)	1:136:A:VAL:HG11	1:137:A:MET:H	8	0.18
(1,867)	1:136:A:VAL:HG12	1:137:A:MET:H	8	0.18
(1,867)	1:136:A:VAL:HG13	1:137:A:MET:H	8	0.18
(1,588)	1:146:A:ASN:HD22	1:149:A:GLU:HB3	18	0.18
(1,867)	1:136:A:VAL:HG11	1:137:A:MET:H	11	0.17
(1,867)	1:136:A:VAL:HG12	1:137:A:MET:H	11	0.17
(1,867)	1:136:A:VAL:HG13	1:137:A:MET:H	11	0.17
(1,87)	1:101:A:MET:HA	1:102:A:SER:H	3	0.17
(1,1256)	1:135:A:SER:HB2	1:136:A:VAL:H	14	0.16
(1,1256)	1:135:A:SER:HB3	1:136:A:VAL:H	14	0.16
(1,638)	1:192:A:VAL:HB	1:198:A:GLY:H	11	0.16
(1,706)	1:228:A:TYR:HD1	1:229:A:TYR:HA	9	0.15
(1,706)	1:228:A:TYR:HD2	1:229:A:TYR:HA	9	0.15
(1,847)	1:192:A:VAL:HG11	1:199:A:GLU:H	11	0.14
(1,847)	1:192:A:VAL:HG12	1:199:A:GLU:H	11	0.14
(1,847)	1:192:A:VAL:HG13	1:199:A:GLU:H	11	0.14
(1,847)	1:192:A:VAL:HG21	1:199:A:GLU:H	11	0.14
(1,847)	1:192:A:VAL:HG22	1:199:A:GLU:H	11	0.14
(1,847)	1:192:A:VAL:HG23	1:199:A:GLU:H	11	0.14
(1,111)	1:133:A:LEU:H	1:133:A:LEU:HB2	3	0.14
(1,111)	1:133:A:LEU:H	1:133:A:LEU:HB2	8	0.14
(1,111)	1:133:A:LEU:H	1:133:A:LEU:HB2	15	0.14
(1,1156)	1:138:A:SER:H	1:138:A:SER:HB3	6	0.13
(1,1586)	1:182:A:CYS:SG	1:217:A:CYS:CB	9	0.12
(1,1586)	1:182:A:CYS:SG	1:217:A:CYS:CB	13	0.12
(1,1586)	1:182:A:CYS:SG	1:217:A:CYS:CB	15	0.12
(1,588)	1:146:A:ASN:HD22	1:149:A:GLU:HB3	1	0.12
(1,1586)	1:182:A:CYS:SG	1:217:A:CYS:CB	3	0.11
(1,1586)	1:182:A:CYS:SG	1:217:A:CYS:CB	11	0.11
(1,1586)	1:182:A:CYS:SG	1:217:A:CYS:CB	12	0.11

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Key	Atom-1	Atom-2	Model ID	Violation (Å)
(1,1586)	1:182:A:CYS:SG	1:217:A:CYS:CB	16	0.11
(1,1586)	1:182:A:CYS:SG	1:217:A:CYS:CB	19	0.11
(1,847)	1:192:A:VAL:HG11	1:199:A:GLU:H	10	0.11
(1,847)	1:192:A:VAL:HG12	1:199:A:GLU:H	10	0.11
(1,847)	1:192:A:VAL:HG13	1:199:A:GLU:H	10	0.11
(1,847)	1:192:A:VAL:HG21	1:199:A:GLU:H	10	0.11
(1,847)	1:192:A:VAL:HG22	1:199:A:GLU:H	10	0.11
(1,847)	1:192:A:VAL:HG23	1:199:A:GLU:H	10	0.11
(1,111)	1:133:A:LEU:H	1:133:A:LEU:HB2	2	0.11
(1,111)	1:133:A:LEU:H	1:133:A:LEU:HB2	19	0.11
(1,31)	1:197:A:LYS:H	1:198:A:GLY:H	18	0.11
(1,1586)	1:182:A:CYS:SG	1:217:A:CYS:CB	1	0.1
(1,1586)	1:182:A:CYS:SG	1:217:A:CYS:CB	4	0.1
(1,1586)	1:182:A:CYS:SG	1:217:A:CYS:CB	6	0.1
(1,1586)	1:182:A:CYS:SG	1:217:A:CYS:CB	17	0.1
(1,1586)	1:182:A:CYS:SG	1:217:A:CYS:CB	20	0.1
(1,1166)	1:218:A:ILE:HG21	1:221:A:TYR:HA	14	0.1
(1,1166)	1:218:A:ILE:HG22	1:221:A:TYR:HA	14	0.1
(1,1166)	1:218:A:ILE:HG23	1:221:A:TYR:HA	14	0.1
(1,441)	1:136:A:VAL:HA	1:137:A:MET:H	11	0.1



## 10 Dihedral-angle violation analysis [i](#)

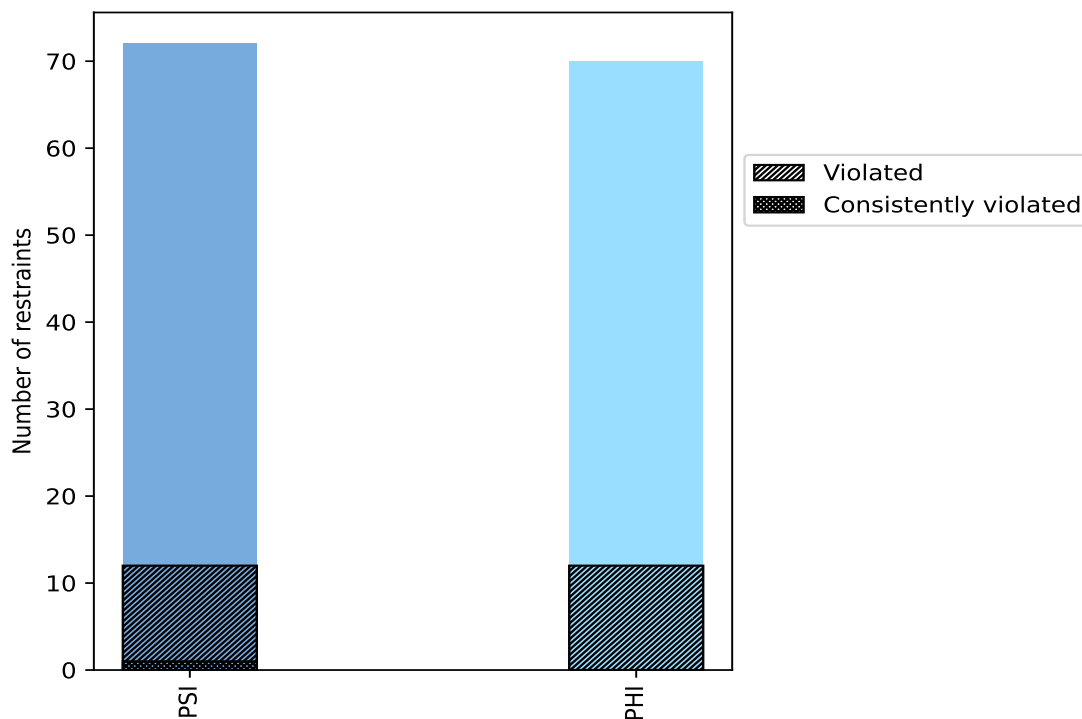
### 10.1 Summary of dihedral-angle violations [i](#)

The following table provides the summary of dihedral-angle violations in different dihedral-angle types. Violations less than 1° are not included in the calculation.

Angle type	Count	% <sup>1</sup>	Violated <sup>3</sup>			Consistently Violated <sup>4</sup>		
			Count	% <sup>2</sup>	% <sup>1</sup>	Count	% <sup>2</sup>	% <sup>1</sup>
PSI	72	50.7	12	16.7	8.5	1	1.4	0.7
PHI	70	49.3	12	17.1	8.5	0	0.0	0.0
Total	142	100.0	24	16.9	16.9	1	0.7	0.7

<sup>1</sup> percentage calculated with respect to total number of dihedral-angle restraints, <sup>2</sup> percentage calculated with respect to number of restraints in a particular dihedral-angle type, <sup>3</sup> violated in at least one model, <sup>4</sup> violated in all the models

#### 10.1.1 Bar chart : Distribution of dihedral-angles and violations [i](#)



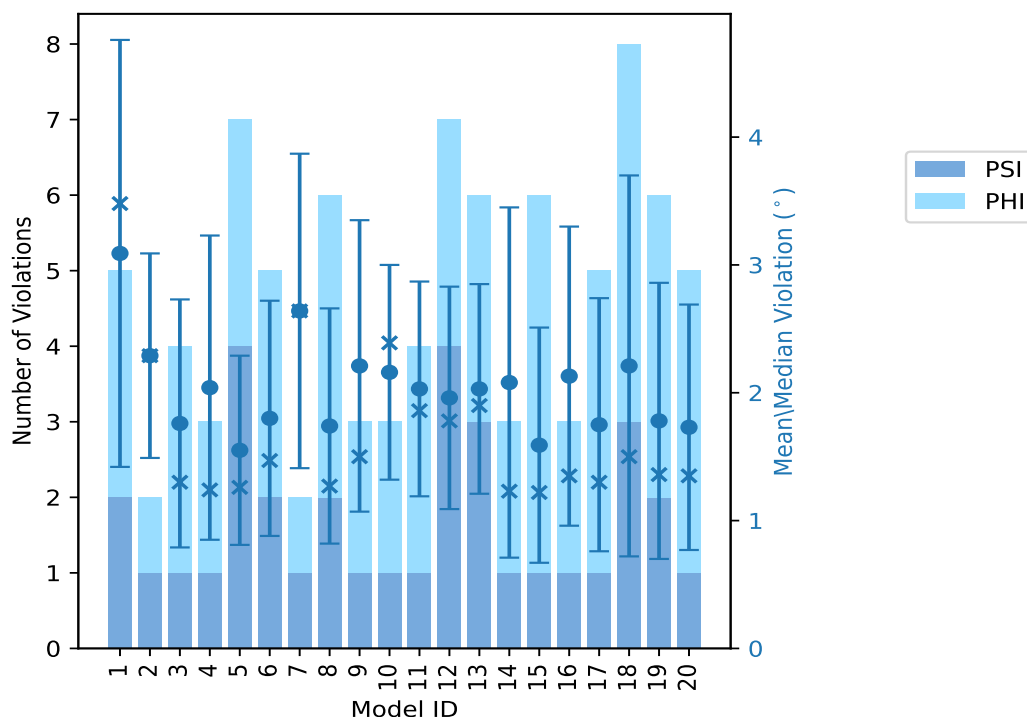
Violated and consistently violated restraints are shown using different hatch patterns in their respective categories

## 10.2 Dihedral-angle violation statistics for each model [i](#)

The following table provides the dihedral-angle violation statistics for each model in the ensemble. Violations less than 1° are not included in the statistics.

Model ID	Number of violations			Mean (°)	Max (°)	SD (°)	Median (°)
	PSI	PHI	Total				
1	2	3	5	3.09	5.76	1.67	3.48
2	1	1	2	2.29	3.09	0.8	2.29
3	1	3	4	1.76	3.42	0.97	1.3
4	1	2	3	2.04	3.72	1.19	1.24
5	4	3	7	1.55	3.28	0.74	1.26
6	2	3	5	1.8	3.58	0.92	1.47
7	1	1	2	2.64	3.87	1.23	2.64
8	2	4	6	1.74	3.67	0.92	1.27
9	1	2	3	2.21	3.82	1.14	1.5
10	1	2	3	2.16	3.05	0.84	2.39
11	1	3	4	2.03	3.33	0.84	1.86
12	4	3	7	1.96	3.82	0.87	1.78
13	3	3	6	2.03	3.67	0.82	1.9
14	1	2	3	2.08	4.01	1.37	1.23
15	1	5	6	1.59	3.62	0.92	1.22
16	1	2	3	2.13	3.78	1.17	1.35
17	1	4	5	1.75	3.72	0.99	1.3
18	3	5	8	2.21	5.44	1.49	1.5
19	2	4	6	1.78	4.17	1.08	1.36
20	1	4	5	1.73	3.63	0.96	1.35

### 10.2.1 Bar graph : Dihedral violation statistics for each model [i](#)



The mean(dot),median(x) and the standard deviation are shown in blue with respect to the y axis on the right

### 10.3 Dihedral-angle violation statistics for the ensemble [i](#)

Violation analysis may find that some restraints are violated in very few models and some are violated in most of models. The following table provides this information as number of violated restraints for a given fraction of ensemble.

Number of violated restraints			Fraction of the ensemble	
PSI	PHI	Total	Count <sup>1</sup>	%
8	6	14	1	5.0
3	2	5	2	10.0
0	0	0	3	15.0
0	1	1	4	20.0
0	0	0	5	25.0
0	0	0	6	30.0
0	0	0	7	35.0
0	0	0	8	40.0
0	0	0	9	45.0
0	0	0	10	50.0
0	0	0	11	55.0

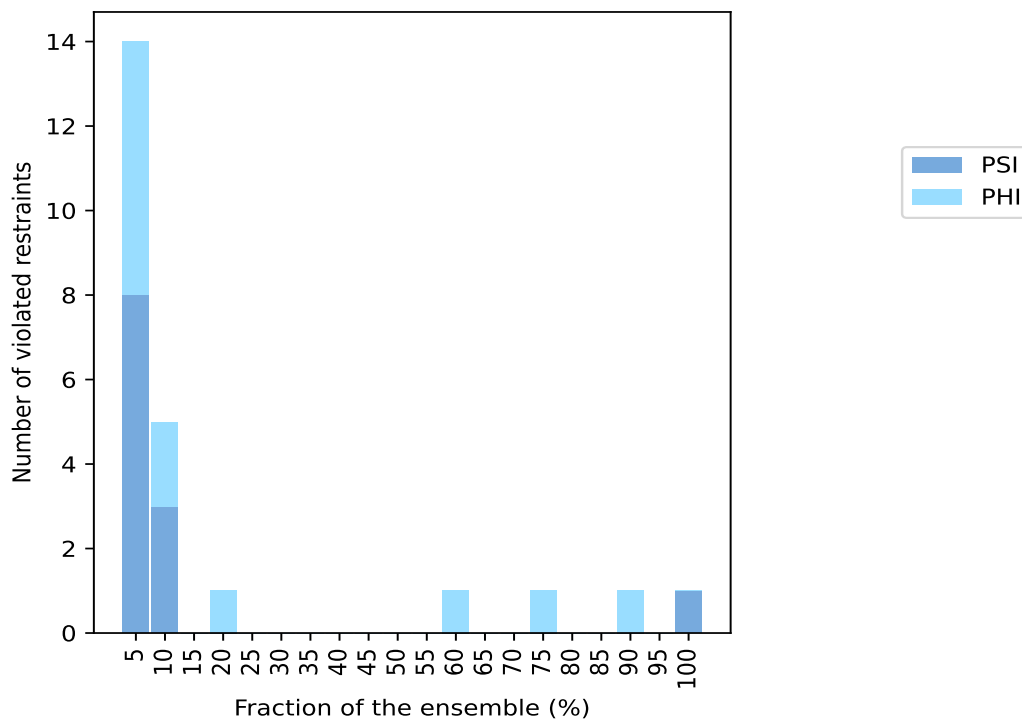
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Number of violated restraints			Fraction of the ensemble	
PSI	PHI	Total	Count <sup>1</sup>	%
0	1	1	12	60.0
0	0	0	13	65.0
0	0	0	14	70.0
0	1	1	15	75.0
0	0	0	16	80.0
0	0	0	17	85.0
0	1	1	18	90.0
0	0	0	19	95.0
1	0	1	20	100.0

<sup>1</sup> Number of models with violations

### 10.3.1 Bar graph : Dihedral-angle Violation statistics for the ensemble [i](#)

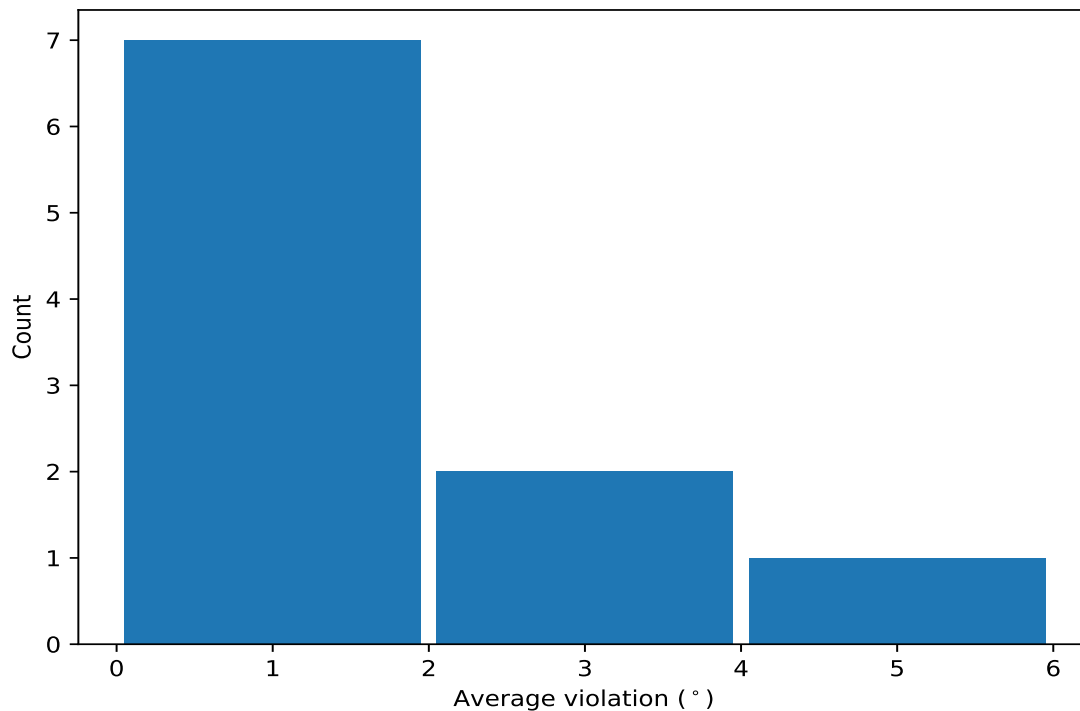


## 10.4 Most violated dihedral-angle restraints in the ensemble [i](#)

### 10.4.1 Histogram : Distribution of mean dihedral-angle violations [i](#)

The following histogram shows the distribution of the average value of the violation. The average is calculated for each restraint that is violated in more than one model over all the violated models

in the ensemble



#### 10.4.2 Table: Most violated dihedral-angle restraints [i](#)

The following table provides the mean and the standard deviation of the violation for each restraint sorted by number of violated models and the mean value. The Key (restraint list ID, restraint ID) is the unique identifier for a given restraint.

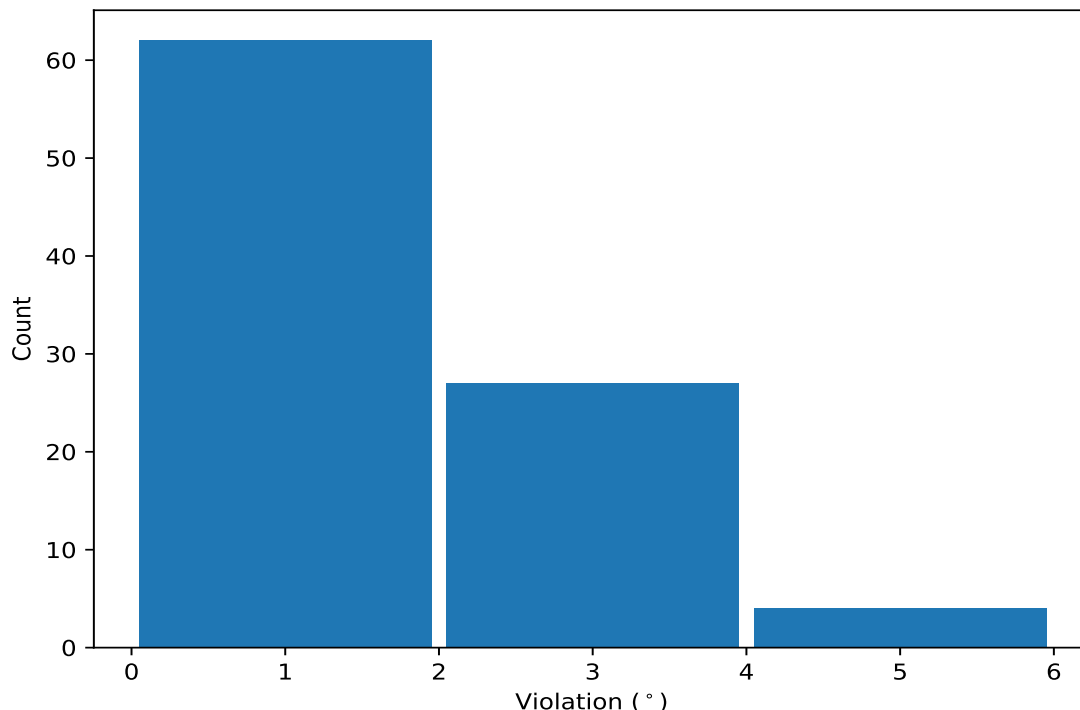
Key	Atom-1	Atom-2	Atom-3	Atom-4	Models <sup>1</sup>	Mean	SD <sup>2</sup>	Median
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	20	3.63	0.28	3.67
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	18	1.59	0.39	1.48
(1,57)	1:176:A:ASN:C	1:177:A:ASN:N	1:177:A:ASN:CA	1:177:A:ASN:C	15	1.34	0.13	1.32
(1,55)	1:175:A:GLN:C	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	12	1.14	0.19	1.1
(1,111)	1:213:A:VAL:C	1:214:A:GLU:N	1:214:A:GLU:CA	1:214:A:GLU:C	4	1.46	0.34	1.31
(1,16)	1:147:A:ASP:C	1:148:A:TYR:N	1:148:A:TYR:CA	1:148:A:TYR:C	2	5.6	0.16	5.6
(1,17)	1:148:A:TYR:N	1:148:A:TYR:CA	1:148:A:TYR:C	1:149:A:GLU:N	2	2.85	0.63	2.85
(1,86)	1:191:A:THR:N	1:191:A:THR:CA	1:191:A:THR:C	1:192:A:VAL:N	2	1.52	0.26	1.52
(1,26)	1:152:A:TYR:C	1:153:A:TYR:N	1:153:A:TYR:CA	1:153:A:TYR:C	2	1.4	0.05	1.4
(1,102)	1:209:A:MET:N	1:209:A:MET:CA	1:209:A:MET:C	1:210:A:GLU:N	2	1.1	0.03	1.1

<sup>1</sup> Number of violated models, <sup>2</sup>Standard deviation, All angle values are in degree (°)

## 10.5 All violated dihedral-angle restraints [i](#)

### 10.5.1 Histogram : Distribution of violations [i](#)

The following histogram shows the distribution of the absolute value of the violation for all violated restraints in the ensemble.



### 10.5.2 Table: All violated dihedral-angle restraints [i](#)

The following table lists the absolute value of the violation for each restraint in the ensemble sorted by its value. The Key (restraint list ID, restraint ID) is the unique identifier for a given restraint.

Key	Atom-1	Atom-2	Atom-3	Atom-4	Model ID	Violation (°)
(1,16)	1:147:A:ASP:C	1:148:A:TYR:N	1:148:A:TYR:CA	1:148:A:TYR:C	1	5.76
(1,16)	1:147:A:ASP:C	1:148:A:TYR:N	1:148:A:TYR:CA	1:148:A:TYR:C	18	5.44
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	19	4.17
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	14	4.01
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	7	3.87
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	9	3.82
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	12	3.82
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	16	3.78
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	18	3.78
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	4	3.72
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	17	3.72
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	8	3.67
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	13	3.67
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	20	3.63

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Key	Atom-1	Atom-2	Atom-3	Atom-4	Model ID	Violation (°)
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	15	3.62
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	1	3.6
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	6	3.58
(1,17)	1:148:A:TYR:N	1:148:A:TYR:CA	1:148:A:TYR:C	1:149:A:GLU:N	1	3.48
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	3	3.42
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	11	3.33
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	5	3.28
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	2	3.09
(1,56)	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	1:177:A:ASN:N	10	3.05
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	10	2.39
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	12	2.39
(1,17)	1:148:A:TYR:N	1:148:A:TYR:CA	1:148:A:TYR:C	1:149:A:GLU:N	18	2.22
(1,33)	1:156:A:ASN:N	1:156:A:ASN:CA	1:156:A:ASN:C	1:157:A:MET:N	13	2.19
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	11	2.15
(1,111)	1:213:A:VAL:C	1:214:A:GLU:N	1:214:A:GLU:CA	1:214:A:GLU:C	12	2.04
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	8	2.03
(1,35)	1:157:A:MET:N	1:157:A:MET:CA	1:157:A:MET:C	1:158:A:TYR:N	13	2.03
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	13	1.78
(1,86)	1:191:A:THR:N	1:191:A:THR:CA	1:191:A:THR:C	1:192:A:VAL:N	12	1.78
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	5	1.77
(1,55)	1:175:A:GLN:C	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	6	1.74
(1,57)	1:176:A:ASN:C	1:177:A:ASN:N	1:177:A:ASN:CA	1:177:A:ASN:C	11	1.56
(1,57)	1:176:A:ASN:C	1:177:A:ASN:N	1:177:A:ASN:CA	1:177:A:ASN:C	19	1.54
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	18	1.52
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	9	1.5
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	2	1.49
(1,73)	1:184:A:ASN:C	1:185:A:ILE:N	1:185:A:ILE:CA	1:185:A:ILE:C	19	1.48
(1,57)	1:176:A:ASN:C	1:177:A:ASN:N	1:177:A:ASN:CA	1:177:A:ASN:C	3	1.48
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	6	1.47
(1,21)	1:150:A:ASP:N	1:150:A:ASP:CA	1:150:A:ASP:C	1:151:A:ARG:N	18	1.47
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	20	1.45
(1,57)	1:176:A:ASN:C	1:177:A:ASN:N	1:177:A:ASN:CA	1:177:A:ASN:C	13	1.45
(1,26)	1:152:A:TYR:C	1:153:A:TYR:N	1:153:A:TYR:CA	1:153:A:TYR:C	15	1.45
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	1	1.43
(1,57)	1:176:A:ASN:C	1:177:A:ASN:N	1:177:A:ASN:CA	1:177:A:ASN:C	7	1.42
(1,57)	1:176:A:ASN:C	1:177:A:ASN:N	1:177:A:ASN:CA	1:177:A:ASN:C	12	1.38
(1,111)	1:213:A:VAL:C	1:214:A:GLU:N	1:214:A:GLU:CA	1:214:A:GLU:C	20	1.35
(1,57)	1:176:A:ASN:C	1:177:A:ASN:N	1:177:A:ASN:CA	1:177:A:ASN:C	16	1.35
(1,26)	1:152:A:TYR:C	1:153:A:TYR:N	1:153:A:TYR:CA	1:153:A:TYR:C	17	1.35
(1,57)	1:176:A:ASN:C	1:177:A:ASN:N	1:177:A:ASN:CA	1:177:A:ASN:C	5	1.32
(1,57)	1:176:A:ASN:C	1:177:A:ASN:N	1:177:A:ASN:CA	1:177:A:ASN:C	9	1.32
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	17	1.3
(1,111)	1:213:A:VAL:C	1:214:A:GLU:N	1:214:A:GLU:CA	1:214:A:GLU:C	8	1.27
(1,57)	1:176:A:ASN:C	1:177:A:ASN:N	1:177:A:ASN:CA	1:177:A:ASN:C	8	1.27
(1,57)	1:176:A:ASN:C	1:177:A:ASN:N	1:177:A:ASN:CA	1:177:A:ASN:C	17	1.27
(1,86)	1:191:A:THR:N	1:191:A:THR:CA	1:191:A:THR:C	1:192:A:VAL:N	5	1.26
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	15	1.25
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	16	1.25
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	4	1.24
(1,57)	1:176:A:ASN:C	1:177:A:ASN:N	1:177:A:ASN:CA	1:177:A:ASN:C	20	1.24
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	19	1.23

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Key	Atom-1	Atom-2	Atom-3	Atom-4	Model ID	Violation (°)
(1,55)	1:175:A:GLN:C	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	14	1.23
(1,54)	1:175:A:GLN:N	1:175:A:GLN:CA	1:175:A:GLN:C	1:176:A:ASN:N	6	1.23
(1,68)	1:182:A:CYS:N	1:182:A:CYS:CA	1:182:A:CYS:C	1:183:A:VAL:N	19	1.22
(1,114)	1:215:A:GLN:N	1:215:A:GLN:CA	1:215:A:GLN:C	1:216:A:MET:N	12	1.19
(1,111)	1:213:A:VAL:C	1:214:A:GLU:N	1:214:A:GLU:CA	1:214:A:GLU:C	15	1.19
(1,57)	1:176:A:ASN:C	1:177:A:ASN:N	1:177:A:ASN:CA	1:177:A:ASN:C	1	1.18
(1,57)	1:176:A:ASN:C	1:177:A:ASN:N	1:177:A:ASN:CA	1:177:A:ASN:C	4	1.17
(1,55)	1:175:A:GLN:C	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	5	1.16
(1,57)	1:176:A:ASN:C	1:177:A:ASN:N	1:177:A:ASN:CA	1:177:A:ASN:C	18	1.14
(1,55)	1:175:A:GLN:C	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	8	1.13
(1,102)	1:209:A:MET:N	1:209:A:MET:CA	1:209:A:MET:C	1:210:A:GLU:N	12	1.12
(1,55)	1:175:A:GLN:C	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	3	1.11
(1,55)	1:175:A:GLN:C	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	17	1.11
(1,20)	1:149:A:GLU:C	1:150:A:ASP:N	1:150:A:ASP:CA	1:150:A:ASP:C	18	1.11
(1,55)	1:175:A:GLN:C	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	11	1.08
(1,55)	1:175:A:GLN:C	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	13	1.08
(1,102)	1:209:A:MET:N	1:209:A:MET:CA	1:209:A:MET:C	1:210:A:GLU:N	8	1.07
(1,98)	1:207:A:LYS:N	1:207:A:LYS:CA	1:207:A:LYS:C	1:208:A:ILE:N	5	1.05
(1,32)	1:155:A:GLU:C	1:156:A:ASN:N	1:156:A:ASN:CA	1:156:A:ASN:C	15	1.05
(1,117)	1:216:A:MET:C	1:217:A:CYS:N	1:217:A:CYS:CA	1:217:A:CYS:C	3	1.04
(1,104)	1:210:A:GLU:N	1:210:A:GLU:CA	1:210:A:GLU:C	1:211:A:ARG:N	5	1.04
(1,65)	1:180:A:HIS:C	1:181:A:ASP:N	1:181:A:ASP:CA	1:181:A:ASP:C	10	1.04
(1,55)	1:175:A:GLN:C	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	18	1.02
(1,55)	1:175:A:GLN:C	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	19	1.02
(1,5)	1:138:A:SER:C	1:139:A:ARG:N	1:139:A:ARG:CA	1:139:A:ARG:C	14	1.01
(1,55)	1:175:A:GLN:C	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	15	1.0
(1,55)	1:175:A:GLN:C	1:176:A:ASN:N	1:176:A:ASN:CA	1:176:A:ASN:C	20	1.0
(1,53)	1:174:A:ASN:C	1:175:A:GLN:N	1:175:A:GLN:CA	1:175:A:GLN:C	6	1.0