wwPDB NMR Structure Validation Summary Report (i)

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PDB ID	:	2LD7
BMRB ID	:	17653
Title	:	Solution structure of the mSin3A PAH3-SAP30 SID complex
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Deposited on	:	2011-05-16

This is a wwPDB NMR Structure Validation Summary Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/NMRValidationReportHelp
with specific help available everywhere you see the (i) symbol.

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

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

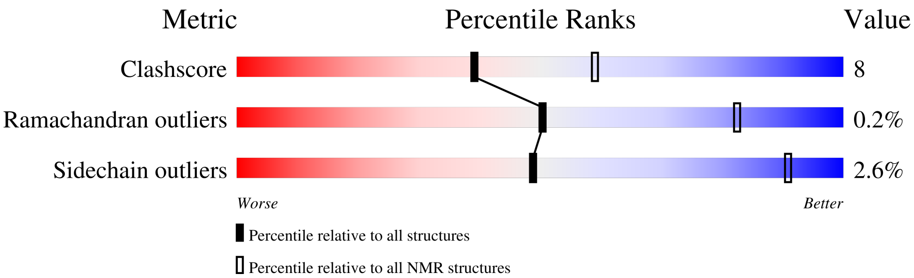
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
wwPDB-RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
wwPDB-ShiftChecker	:	v1.2
BMRB Restraints Analysis	:	v1.2
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.33

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 85%.

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	94	52% 10% 38%
2	B	75	72% 12% 16%

2 Ensemble composition and analysis (i)

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:145-A:169, A:173-A:205, B:463-B:525 (121)	0.55	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 2 clusters and 1 single-model cluster was found.

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

3 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 2701 atoms, of which 1345 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called Histone deacetylase complex subunit SAP30.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	94	1472	458	731	133	148	2	0

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	127	SER	-	expression tag	UNP O88574
A	128	ASN	-	expression tag	UNP O88574
A	129	ALA	-	expression tag	UNP O88574

- Molecule 2 is a protein called Paired amphipathic helix protein Sin3a.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
2	B	75	1229	402	614	103	109	1	0

There are 2 discrepancies between the modelled and reference sequences:

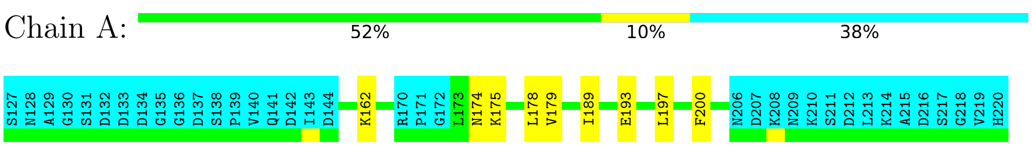
Chain	Residue	Modelled	Actual	Comment	Reference
B	454	SER	-	expression tag	UNP Q60520
B	455	ASN	-	expression tag	UNP Q60520

4 Residue-property plots (i)

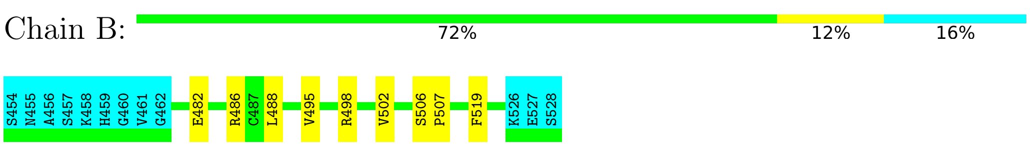
4.1 Average score per residue in the NMR ensemble

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: Histone deacetylase complex subunit SAP30



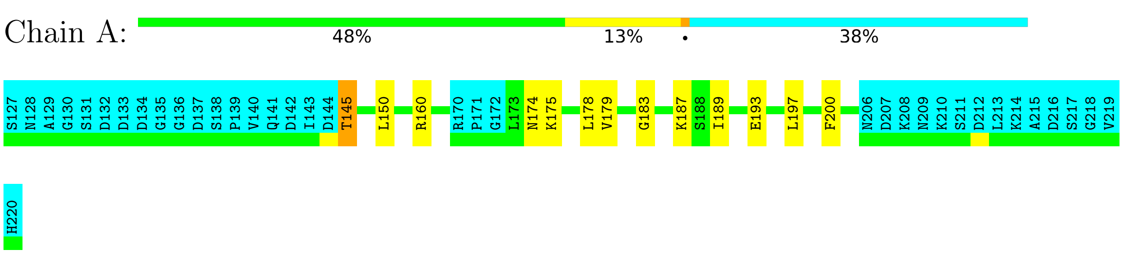
- Molecule 2: Paired amphipathic helix protein Sin3a



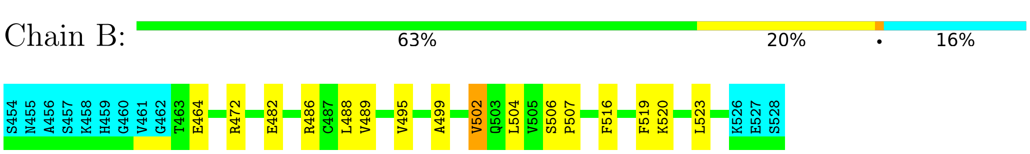
4.2 Residue scores for the representative (medoid) model from the NMR ensemble

The representative model is number 1. Colouring as in section 4.1 above.

- Molecule 1: Histone deacetylase complex subunit SAP30



- Molecule 2: Paired amphipathic helix protein Sin3a



5 Refinement protocol and experimental data overview (i)

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

Of the 80 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
ARIA	structure solution	1.2
CNS	structure solution	
CNS	refinement	

The following table shows chemical shift validation statistics as aggregates over all chemical shift files. Detailed validation can be found in section 7 of this report.

Chemical shift file(s)	working_cs.cif
Number of chemical shift lists	2
Total number of shifts	1959
Number of shifts mapped to atoms	1959
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	85%

6 Model quality (i)

6.1 Standard geometry (i)

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

There are no bond-length outliers.

There are no bond-angle outliers.

There are no chirality outliers.

There are no planarity outliers.

6.2 Too-close contacts (i)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in each chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes averaged over the ensemble.

Mol	Chain	Non-H	H(model)	H(added)	Clashes
1	A	483	503	501	10±2
2	B	531	531	531	11±3
All	All	20280	20680	20640	318

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 8.

5 of 128 unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:189:ILE:HB	2:B:486:ARG:HD3	0.80	1.52	12	11
1:A:174:ASN:HB2	1:A:177:GLN:HG2	0.76	1.56	14	2
2:B:493:GLN:HG3	2:B:495:VAL:HG23	0.64	1.68	19	1
1:A:193:GLU:O	1:A:197:LEU:HG	0.61	1.95	2	13
1:A:189:ILE:HB	2:B:486:ARG:HD2	0.61	1.70	15	3

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	58/94 (62%)	55±1 (95±2%)	3±1 (5±2%)	0±0 (0±1%)	44	80
2	B	63/75 (84%)	61±1 (97±2%)	2±1 (3±2%)	0±0 (0±0%)	100	100
All	All	2420/3380 (72%)	2314 (96%)	102 (4%)	4 (0%)	50	82

All 2 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	145	THR	3
1	A	150	LEU	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	56/85 (66%)	55±1 (98±1%)	1±1 (2±1%)	64	94
2	B	57/66 (86%)	55±1 (96±2%)	2±1 (4±2%)	39	86
All	All	2260/3020 (75%)	2202 (97%)	58 (3%)	49	91

5 of 26 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)
2	B	502	VAL	6
2	B	486	ARG	6
1	A	152	GLN	5
2	B	519	PHE	4
2	B	511	LYS	4

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 85% for the well-defined parts and 84% for the entire structure.

7.1 Chemical shift list 1

File name: working_cs.cif

Chemical shift list name: *assigned_chem_shift_list_1*

7.1.1 Bookkeeping (i)

The following table shows the results of parsing the chemical shift list and reports the number of nuclei with statistically unusual chemical shifts.

Total number of shifts	1053
Number of shifts mapped to atoms	1053
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	0

7.1.2 Chemical shift referencing (i)

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction ± precision, *ppm*	Suggested action
$^{13}C_{\alpha}$	93	-2.37 ± 0.09	Should be checked
$^{13}C_{\beta}$	87	-1.89 ± 0.06	Should be checked
$^{13}C'$	91	-2.18 ± 0.08	Should be applied
^{15}N	85	-1.04 ± 0.29	Should be applied

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 40%, i.e. 723 atoms were assigned a chemical shift out of a possible 1797. 0 out of 27 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^{1}H	^{13}C	^{15}N
Backbone	283/598 (47%)	113/240 (47%)	116/242 (48%)	54/116 (47%)
Sidechain	423/1006 (42%)	279/653 (43%)	139/308 (45%)	5/45 (11%)

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	Total	^{1}H	^{13}C	^{15}N
Aromatic	17/193 (9%)	17/94 (18%)	0/94 (0%)	0/5 (0%)
Overall	723/1797 (40%)	409/987 (41%)	255/644 (40%)	59/166 (36%)

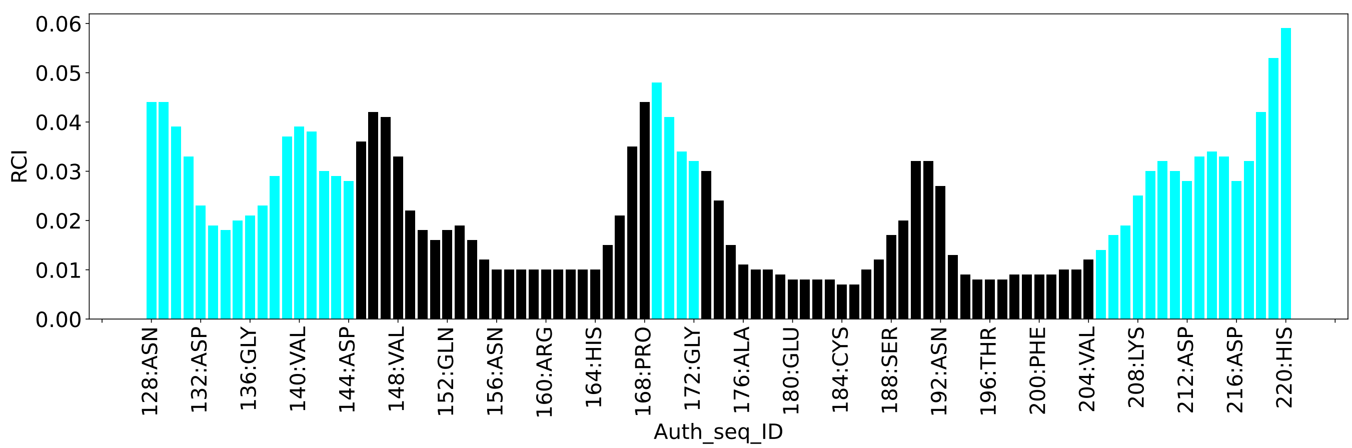
7.1.4 Statistically unusual chemical shifts (i)

There are no statistically unusual chemical shifts.

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:



7.2 Chemical shift list 2

File name: working_cs.cif

Chemical shift list name: *assigned_chem_shift_list_2*

7.2.1 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	906
Number of shifts mapped to atoms	906
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

7.2.2 Chemical shift referencing (i)

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction ± precision, *ppm*	Suggested action
$^{13}C_{\alpha}$	74	-2.90 ± 0.25	Should be checked
$^{13}C_{\beta}$	70	-1.76 ± 0.17	Should be checked
$^{13}C'$	71	-2.43 ± 0.24	Should be applied
^{15}N	71	-0.13 ± 0.38	None needed (< 0.5 ppm)

7.2.3 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 44%, i.e. 796 atoms were assigned a chemical shift out of a possible 1797. 0 out of 27 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^{1}H	^{13}C	^{15}N
Backbone	311/598 (52%)	126/240 (52%)	124/242 (51%)	61/116 (53%)
Sidechain	431/1006 (43%)	288/653 (44%)	136/308 (44%)	7/45 (16%)
Aromatic	54/193 (28%)	34/94 (36%)	19/94 (20%)	1/5 (20%)
Overall	796/1797 (44%)	448/987 (45%)	279/644 (43%)	69/166 (42%)

7.2.4 Statistically unusual chemical shifts (i)

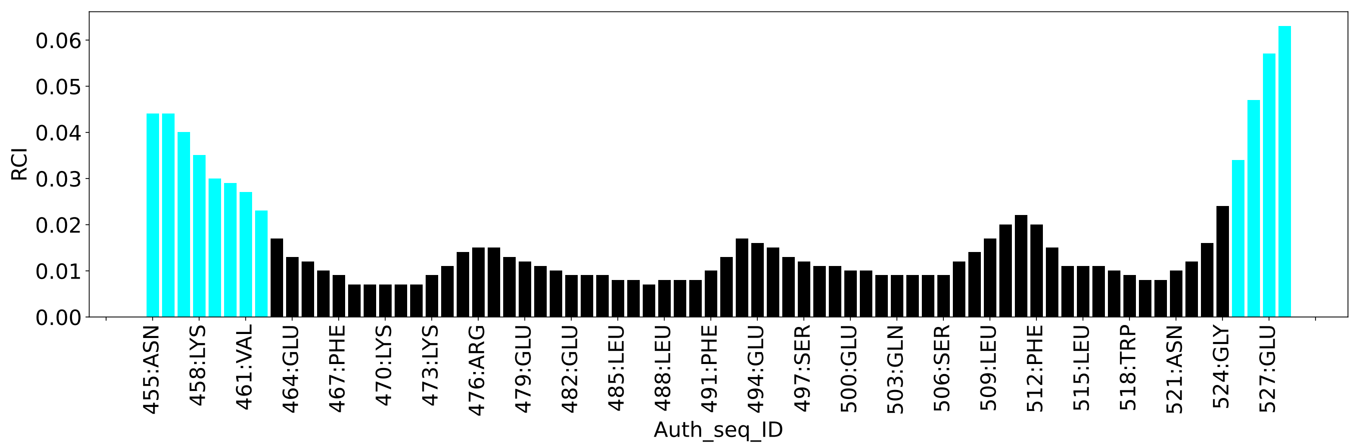
The following table lists the statistically unusual chemical shifts. These are statistical measures, and large deviations from the mean do not necessarily imply incorrect assignments. Molecules containing paramagnetic centres or hemes are expected to give rise to anomalous chemical shifts.

List Id	Chain	Res	Type	Atom	Shift, *ppm*	Expected range, *ppm*	Z-score
2	B	520	LYS	HE2	1.66	1.95 – 3.88	-6.5
2	B	520	LYS	HE3	1.76	1.92 – 3.89	-5.8

7.2.5 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 B:



8 NMR restraints analysis (i)

8.1 Conformationally restricting restraints (i)

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	4185
Intra-residue (|i-j|=0)	1683
Sequential (|i-j|=1)	750
Medium range (|i-j|>1 and |i-j|<5)	629
Long range (|i-j|≥5)	491
Inter-chain	526
Hydrogen bond restraints	106
Disulfide bond restraints	0
Total dihedral-angle restraints	168
Number of unmapped restraints	0
Number of restraints per residue	25.8
Number of long range restraints per residue[1]	2.9

[1]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 (i)

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 (i)

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)	22.1	0.2
0.2-0.5 (Medium)	20.8	0.5
>0.5 (Large)	25.1	2.9

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)	1.3	3.3
10.0-20.0 (Medium)	None	None
>20.0 (Large)	None	None

9 Distance violation analysis (i)

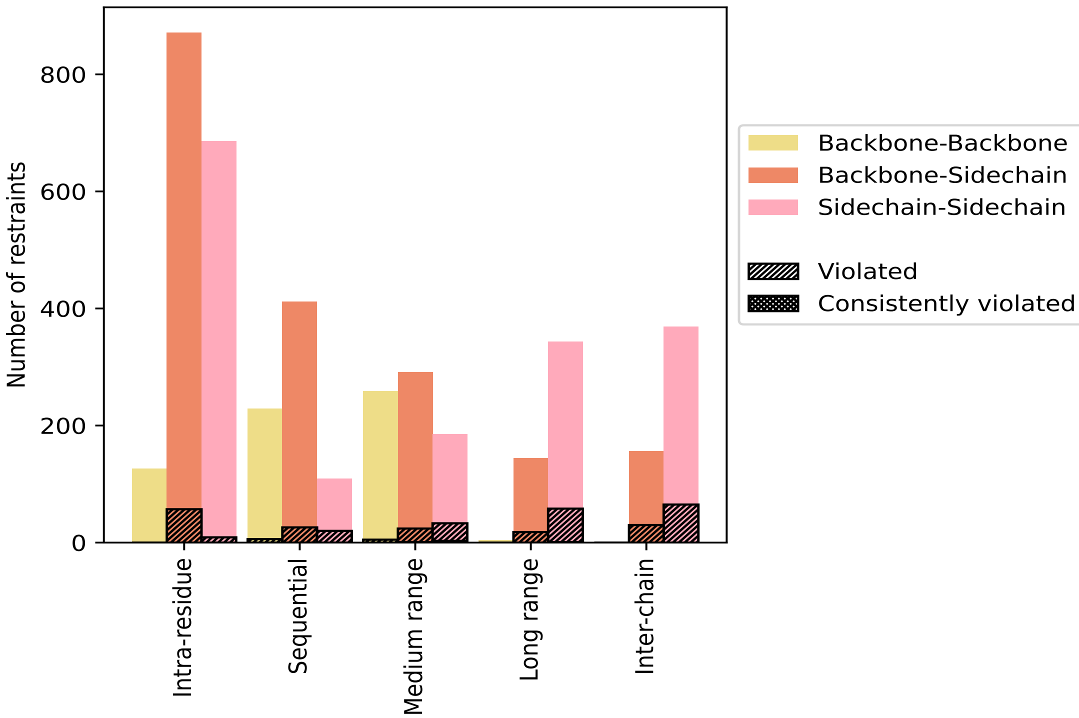
9.1 Summary of distance violations (i)

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.

Restraints type	Count	%[1]	Violated[3]			Consistently Violated[4]		
			Count	%[2]	%[1]	Count	%[2]	%[1]
Intra-residue (|i-j|=0)	1683	40.2	66	3.9	1.6	0	0.0	0.0
Backbone-Backbone	126	3.0	0	0.0	0.0	0	0.0	0.0
Backbone-Sidechain	871	20.8	57	6.5	1.4	0	0.0	0.0
Sidechain-Sidechain	686	16.4	9	1.3	0.2	0	0.0	0.0
Sequential (|i-j|=1)	750	17.9	52	6.9	1.2	0	0.0	0.0
Backbone-Backbone	229	5.5	6	2.6	0.1	0	0.0	0.0
Backbone-Sidechain	412	9.8	26	6.3	0.6	0	0.0	0.0
Sidechain-Sidechain	109	2.6	20	18.3	0.5	0	0.0	0.0
Medium range (|i-j|>1 & |i-j|<5)	629	15.0	58	9.2	1.4	4	0.6	0.1
Backbone-Backbone	153	3.7	1	0.7	0.0	0	0.0	0.0
Backbone-Sidechain	291	7.0	24	8.2	0.6	1	0.3	0.0
Sidechain-Sidechain	185	4.4	33	17.8	0.8	3	1.6	0.1
Long range (|i-j|≥5)	491	11.7	76	15.5	1.8	1	0.2	0.0
Backbone-Backbone	4	0.1	0	0.0	0.0	0	0.0	0.0
Backbone-Sidechain	144	3.4	18	12.5	0.4	0	0.0	0.0
Sidechain-Sidechain	343	8.2	58	16.9	1.4	1	0.3	0.0
Inter-chain	526	12.6	95	18.1	2.3	0	0.0	0.0
Backbone-Backbone	1	0.0	0	0.0	0.0	0	0.0	0.0
Backbone-Sidechain	156	3.7	30	19.2	0.7	0	0.0	0.0
Sidechain-Sidechain	369	8.8	65	17.6	1.6	0	0.0	0.0
Hydrogen bond	106	2.5	4	3.8	0.1	0	0.0	0.0
Disulfide bond	0	0.0	0	0.0	0.0	0	0.0	0.0
Total	4185	100.0	351	8.4	8.4	5	0.1	0.1
Backbone-Backbone	619	14.8	11	1.8	0.3	0	0.0	0.0
Backbone-Sidechain	1874	44.8	155	8.3	3.7	1	0.1	0.0
Sidechain-Sidechain	1692	40.4	185	10.9	4.4	4	0.2	0.1

[1] percentage calculated with respect to the total number of distance restraints, [2] percentage calculated with respect to the number of restraints in a particular restraint category, [3] violated in at least one model, [4] 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 disulfied 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[6] (Å)	Median (Å)
	IR[1]	SQ[2]	MR[3]	LR[4]	IC[5]	Total				
1	15	13	12	23	31	94	0.68	2.8	0.56	0.55
2	9	13	12	19	15	68	0.48	2.3	0.42	0.3
3	15	6	12	15	19	67	0.52	2.87	0.51	0.34
4	13	4	15	22	20	74	0.49	2.72	0.52	0.33
5	16	7	15	19	21	78	0.54	2.28	0.43	0.4
6	18	10	10	12	28	78	0.46	2.63	0.42	0.3
7	11	8	15	14	19	67	0.51	2.28	0.46	0.32
8	11	12	11	20	18	72	0.4	2.86	0.41	0.26
9	10	3	14	15	16	58	0.4	2.14	0.39	0.23
10	9	8	9	15	20	61	0.55	1.99	0.46	0.42
11	16	9	13	19	16	73	0.53	2.02	0.44	0.34

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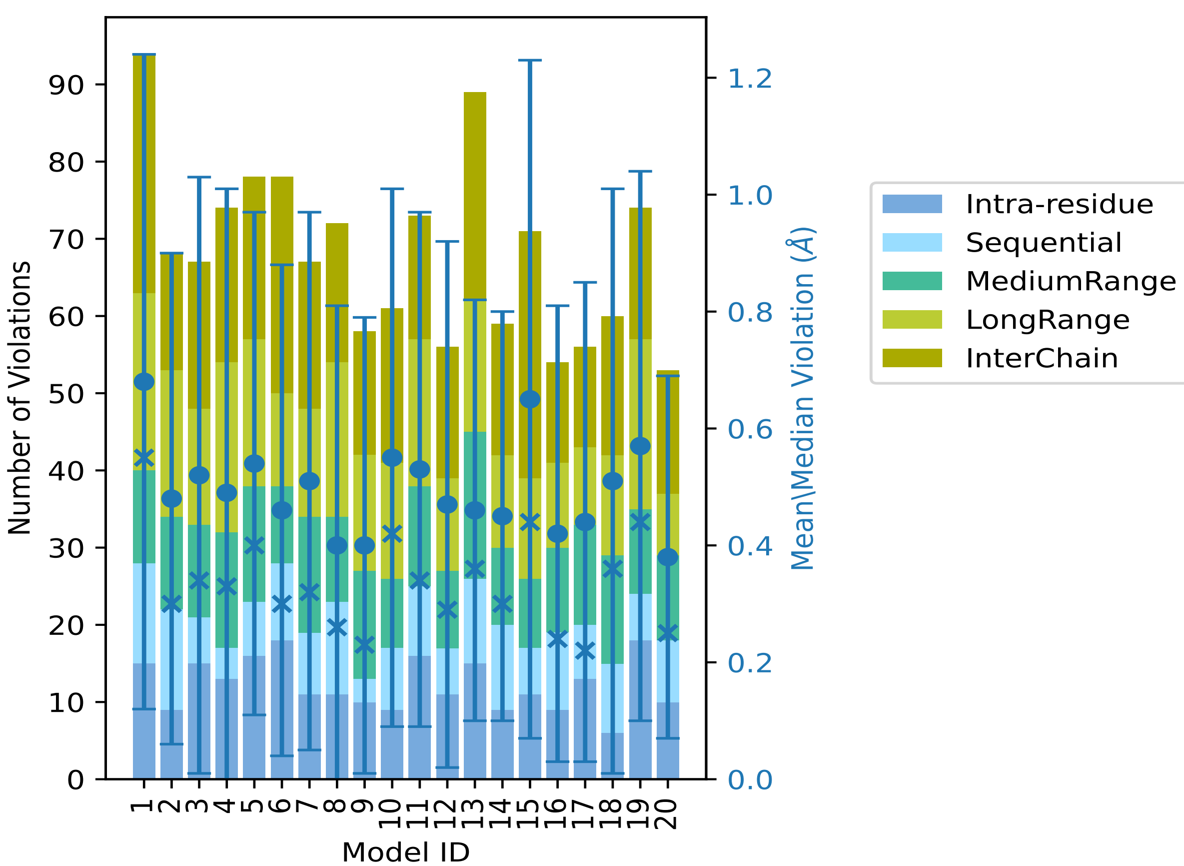
Model ID	Number of violations						Mean (Å)	Max (Å)	SD[6] (Å)	Median (Å)
	IR[1]	SQ[2]	MR[3]	LR[4]	IC[5]	Total				
12	11	6	10	12	17	56	0.47	2.6	0.45	0.29
13	15	11	19	17	27	89	0.46	1.69	0.36	0.36
14	9	11	10	12	17	59	0.45	1.42	0.35	0.3
15	11	6	9	13	32	71	0.65	2.55	0.58	0.44
16	9	10	11	11	13	54	0.42	1.97	0.39	0.24
17	13	7	13	10	13	56	0.44	1.5	0.41	0.22
18	6	9	14	13	18	60	0.51	2.9	0.5	0.36
19	18	6	11	22	17	74	0.57	2.19	0.47	0.44
20	10	8	11	8	16	53	0.38	1.39	0.31	0.25

[1]Intra-residue restraints, [2]Sequential restraints, [3]Medium range restraints, [4]Long range restraints, [5]Inter-chain restraints, [6]Standard deviation

9.2.1 Bar graph : Distance Violation statistics for each model ⓘ



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

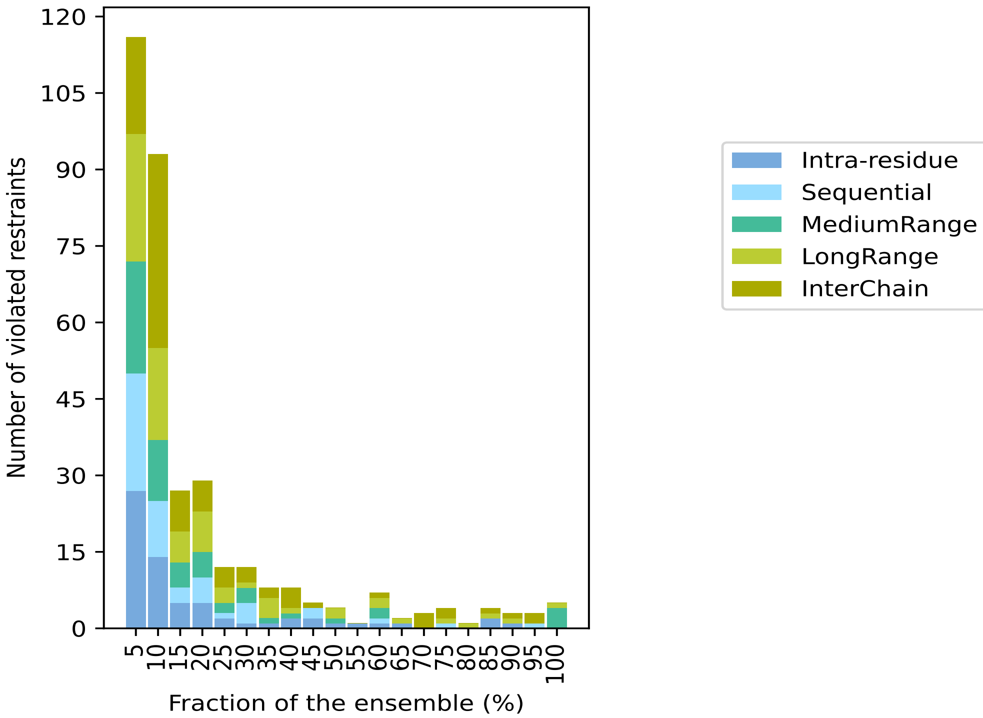
9.3 Distance violation statistics for the ensemble (i)

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, 3732(IR:1617, SQ:698, MR:571, LR:415, IC:431) restraints are not violated in the ensemble.

Number of violated restraints						Fraction of the ensemble	
IR[1]	SQ[2]	MR[3]	LR[4]	IC[5]	Total	Count[6]	%
27	23	22	25	19	116	1	5.0
14	11	12	18	38	93	2	10.0
5	3	5	6	8	27	3	15.0
5	5	5	8	6	29	4	20.0
2	1	2	3	4	12	5	25.0
1	4	3	1	3	12	6	30.0
1	0	1	4	2	8	7	35.0
2	0	1	1	4	8	8	40.0
2	2	0	0	1	5	9	45.0
1	0	1	2	0	4	10	50.0
1	0	0	0	0	1	11	55.0
1	1	2	2	1	7	12	60.0
1	0	0	1	0	2	13	65.0
0	0	0	0	3	3	14	70.0
0	1	0	1	2	4	15	75.0
0	0	0	1	0	1	16	80.0
2	0	0	1	1	4	17	85.0
1	0	0	1	1	3	18	90.0
0	1	0	0	2	3	19	95.0
0	0	4	1	0	5	20	100.0

[1]Intra-residue restraints, [2]Sequential restraints, [3]Medium range restraints, [4]Long range restraints, [5]Inter-chain restraints, [6] Number of models with violations

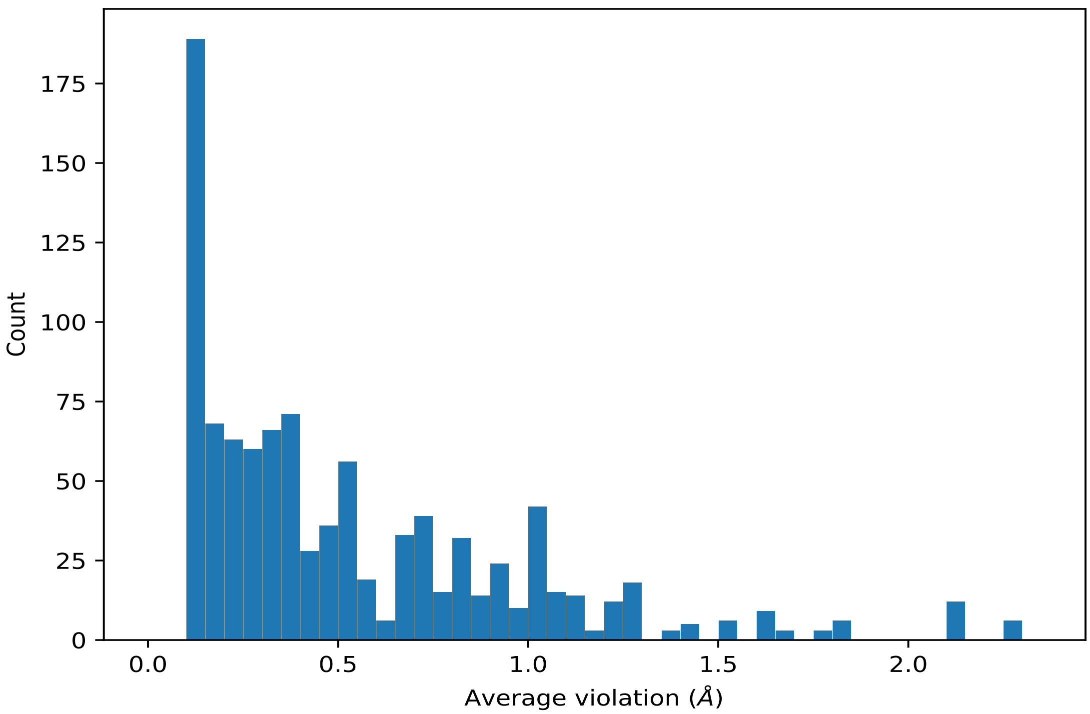
9.3.1 Bar graph : Distance violation statistics for the ensemble (i)



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 violations for the 10 worst performing restraints, sorted by number of violated models and the mean violation 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[1]	Mean (Å)	SD[1] (Å)	Median (Å)
(3,41)	2:B:490:ILE:HD11	2:B:486:ARG:HH12	20	1.35	0.16	1.4
(3,41)	2:B:490:ILE:HD12	2:B:486:ARG:HH12	20	1.35	0.16	1.4
(3,41)	2:B:490:ILE:HD13	2:B:486:ARG:HH12	20	1.35	0.16	1.4
(2,281)	1:A:177:GLN:HB3	1:A:155:VAL:HG11	20	1.05	0.37	0.96
(2,281)	1:A:177:GLN:HB3	1:A:155:VAL:HG12	20	1.05	0.37	0.96
(2,281)	1:A:177:GLN:HB3	1:A:155:VAL:HG13	20	1.05	0.37	0.96
(2,281)	1:A:160:ARG:HB3	1:A:155:VAL:HG11	20	1.05	0.37	0.96
(2,281)	1:A:160:ARG:HB3	1:A:155:VAL:HG12	20	1.05	0.37	0.96
(2,281)	1:A:160:ARG:HB3	1:A:155:VAL:HG13	20	1.05	0.37	0.96
(2,1671)	2:B:513:PRO:HD2	2:B:511:LYS:HA	20	0.86	0.37	0.86
(2,353)	2:B:488:LEU:HD11	2:B:485:LEU:HD11	20	0.73	0.13	0.76
(2,353)	2:B:488:LEU:HD11	2:B:485:LEU:HD12	20	0.73	0.13	0.76
(2,353)	2:B:488:LEU:HD11	2:B:485:LEU:HD13	20	0.73	0.13	0.76
(2,353)	2:B:488:LEU:HD12	2:B:485:LEU:HD11	20	0.73	0.13	0.76
(2,353)	2:B:488:LEU:HD12	2:B:485:LEU:HD12	20	0.73	0.13	0.76
(2,353)	2:B:488:LEU:HD12	2:B:485:LEU:HD13	20	0.73	0.13	0.76

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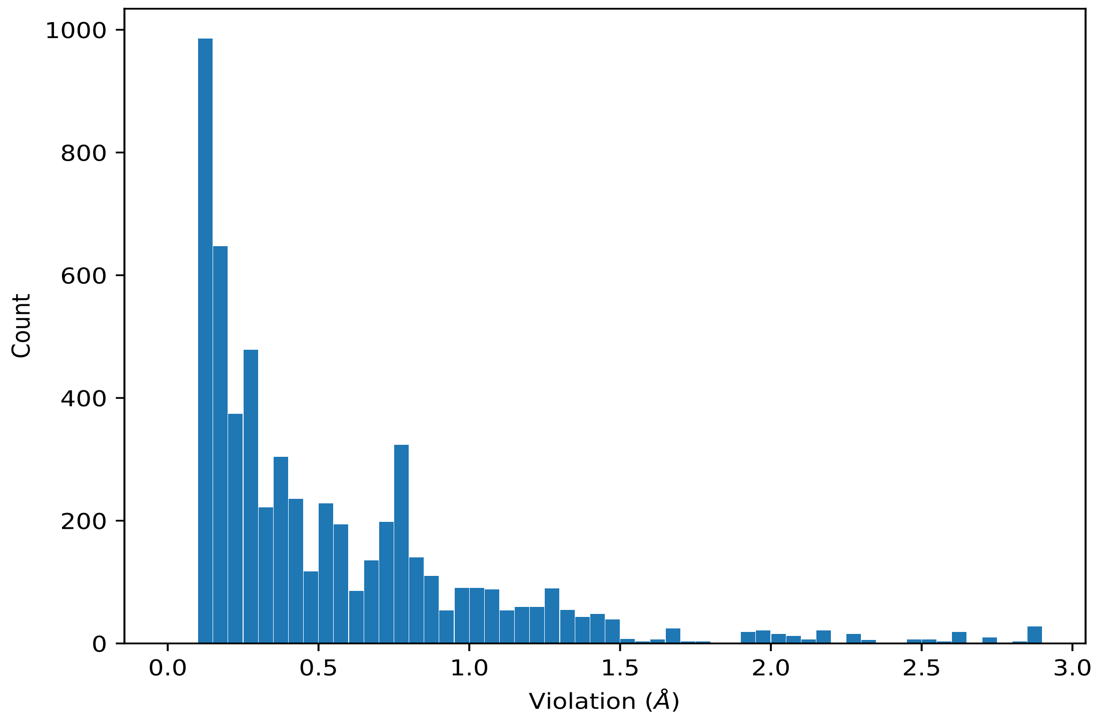
Key	Atom-1	Atom-2	Models[1]	Mean (Å)	SD[1] (Å)	Median (Å)
(2,353)	2:B:488:LEU:HD13	2:B:485:LEU:HD11	20	0.73	0.13	0.76
(2,353)	2:B:488:LEU:HD13	2:B:485:LEU:HD12	20	0.73	0.13	0.76
(2,353)	2:B:488:LEU:HD13	2:B:485:LEU:HD13	20	0.73	0.13	0.76
(2,353)	2:B:471:VAL:HG11	2:B:485:LEU:HD11	20	0.73	0.13	0.76
(2,353)	2:B:471:VAL:HG11	2:B:485:LEU:HD12	20	0.73	0.13	0.76
(2,353)	2:B:471:VAL:HG11	2:B:485:LEU:HD13	20	0.73	0.13	0.76
(2,353)	2:B:471:VAL:HG12	2:B:485:LEU:HD11	20	0.73	0.13	0.76
(2,353)	2:B:471:VAL:HG12	2:B:485:LEU:HD12	20	0.73	0.13	0.76
(2,353)	2:B:471:VAL:HG12	2:B:485:LEU:HD13	20	0.73	0.13	0.76
(2,353)	2:B:471:VAL:HG13	2:B:485:LEU:HD11	20	0.73	0.13	0.76
(2,353)	2:B:471:VAL:HG13	2:B:485:LEU:HD12	20	0.73	0.13	0.76
(2,353)	2:B:471:VAL:HG13	2:B:485:LEU:HD13	20	0.73	0.13	0.76
(2,272)	1:A:175:LYS:HD2	1:A:179:VAL:HG11	20	0.43	0.22	0.29
(2,272)	1:A:175:LYS:HD2	1:A:179:VAL:HG12	20	0.43	0.22	0.29
(2,272)	1:A:175:LYS:HD2	1:A:179:VAL:HG13	20	0.43	0.22	0.29
(2,272)	1:A:178:LEU:HB2	1:A:179:VAL:HG11	20	0.43	0.22	0.29
(2,272)	1:A:178:LEU:HB2	1:A:179:VAL:HG12	20	0.43	0.22	0.29
(2,272)	1:A:178:LEU:HB2	1:A:179:VAL:HG13	20	0.43	0.22	0.29
(2,272)	1:A:158:LEU:HG	1:A:179:VAL:HG11	20	0.43	0.22	0.29
(2,272)	1:A:158:LEU:HG	1:A:179:VAL:HG12	20	0.43	0.22	0.29
(2,272)	1:A:158:LEU:HG	1:A:179:VAL:HG13	20	0.43	0.22	0.29
(2,514)	2:B:485:LEU:HD21	1:A:193:GLU:HB3	19	1.0	0.25	1.02
(2,514)	2:B:485:LEU:HD22	1:A:193:GLU:HB3	19	1.0	0.25	1.02
(2,514)	2:B:485:LEU:HD23	1:A:193:GLU:HB3	19	1.0	0.25	1.02
(2,514)	2:B:485:LEU:HD21	1:A:193:GLU:HB2	19	1.0	0.25	1.02
(2,514)	2:B:485:LEU:HD22	1:A:193:GLU:HB2	19	1.0	0.25	1.02
(2,514)	2:B:485:LEU:HD23	1:A:193:GLU:HB2	19	1.0	0.25	1.02
(2,513)	2:B:485:LEU:HD21	1:A:193:GLU:HG2	19	0.92	0.22	0.87
(2,513)	2:B:485:LEU:HD22	1:A:193:GLU:HG2	19	0.92	0.22	0.87
(2,513)	2:B:485:LEU:HD23	1:A:193:GLU:HG2	19	0.92	0.22	0.87
(2,2262)	2:B:487:CYS:HB3	2:B:488:LEU:HD11	19	0.24	0.04	0.24
(2,2262)	2:B:487:CYS:HB3	2:B:488:LEU:HD12	19	0.24	0.04	0.24
(2,2262)	2:B:487:CYS:HB3	2:B:488:LEU:HD13	19	0.24	0.04	0.24
(2,70)	2:B:488:LEU:HB3	1:A:191:VAL:HG11	18	1.23	0.08	1.25
(2,70)	2:B:488:LEU:HB3	1:A:191:VAL:HG12	18	1.23	0.08	1.25
(2,70)	2:B:488:LEU:HB3	1:A:191:VAL:HG13	18	1.23	0.08	1.25
(2,70)	2:B:475:LEU:HG	1:A:191:VAL:HG11	18	1.23	0.08	1.25
(2,70)	2:B:475:LEU:HG	1:A:191:VAL:HG12	18	1.23	0.08	1.25
(2,70)	2:B:475:LEU:HG	1:A:191:VAL:HG13	18	1.23	0.08	1.25
(2,366)	2:B:516:PHE:HZ	2:B:502:VAL:HG21	18	0.38	0.15	0.38

[1]Number of violated models, [2]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 provides the 10 worst performing restraints, sorted by the violation 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)
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG11	18	2.9
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG12	18	2.9
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG13	18	2.9
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG11	18	2.9
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG12	18	2.9
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG13	18	2.9
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG11	18	2.9
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG12	18	2.9
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG13	18	2.9
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG11	3	2.87
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG12	3	2.87

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Key	Atom-1	Atom-2	Model ID	Violation (Å)
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG13	3	2.87
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG11	3	2.87
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG12	3	2.87
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG13	3	2.87
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG11	3	2.87
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG12	3	2.87
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG13	3	2.87
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG11	8	2.86
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG12	8	2.86
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG13	8	2.86
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG11	8	2.86
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG12	8	2.86
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG13	8	2.86
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG11	8	2.86
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG12	8	2.86
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG13	8	2.86
(2,590)	2:B:504:LEU:HD21	1:A:152:GLN:HB3	1	2.8
(2,590)	2:B:504:LEU:HD22	1:A:152:GLN:HB3	1	2.8
(2,590)	2:B:504:LEU:HD23	1:A:152:GLN:HB3	1	2.8
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG11	4	2.72
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG12	4	2.72
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG13	4	2.72
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG11	4	2.72
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG12	4	2.72
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG13	4	2.72
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG11	4	2.72
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG12	4	2.72
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG13	4	2.72
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG11	6	2.63
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG12	6	2.63
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG13	6	2.63
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG11	6	2.63
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG12	6	2.63
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG13	6	2.63
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG11	6	2.63
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG12	6	2.63
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG13	6	2.63
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG11	12	2.6
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG12	12	2.6
(2,1900)	2:B:523:LEU:HD21	2:B:502:VAL:HG13	12	2.6
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG11	12	2.6
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG12	12	2.6

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Key	Atom-1	Atom-2	Model ID	Violation (Å)
(2,1900)	2:B:523:LEU:HD22	2:B:502:VAL:HG13	12	2.6
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG11	12	2.6
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG12	12	2.6
(2,1900)	2:B:523:LEU:HD23	2:B:502:VAL:HG13	12	2.6
(2,590)	2:B:504:LEU:HD21	1:A:152:GLN:HB3	15	2.55
(2,590)	2:B:504:LEU:HD22	1:A:152:GLN:HB3	15	2.55
(2,590)	2:B:504:LEU:HD23	1:A:152:GLN:HB3	15	2.55
(2,1962)	2:B:512:PHE:HE1	2:B:475:LEU:HD11	1	2.53
(2,1962)	2:B:512:PHE:HE1	2:B:475:LEU:HD12	1	2.53
(2,1962)	2:B:512:PHE:HE1	2:B:475:LEU:HD13	1	2.53
(2,1962)	2:B:512:PHE:HE2	2:B:475:LEU:HD11	1	2.53
(2,1962)	2:B:512:PHE:HE2	2:B:475:LEU:HD12	1	2.53
(2,1962)	2:B:512:PHE:HE2	2:B:475:LEU:HD13	1	2.53
(2,1962)	2:B:512:PHE:HE1	2:B:475:LEU:HD11	4	2.47

10 Dihedral-angle violation analysis

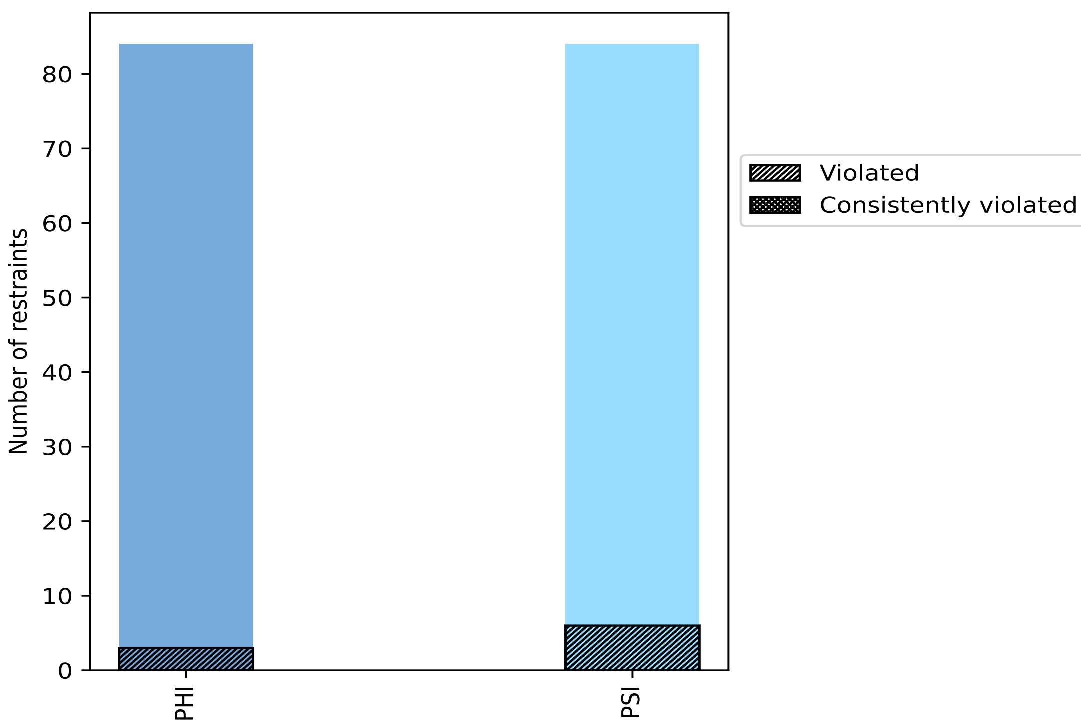
10.1 Summary of dihedral-angle violations

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	%[1]	Violated[3]			Consistently Violated[4]		
			Count	%[2]	%[1]	Count	%[2]	%[1]
PHI	84	50.0	3	3.6	1.8	0	0.0	0.0
PSI	84	50.0	6	7.1	3.6	0	0.0	0.0
Total	168	100.0	9	5.4	5.4	0	0.0	0.0

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

10.1.1 Bar chart : Distribution of dihedral-angles and violations



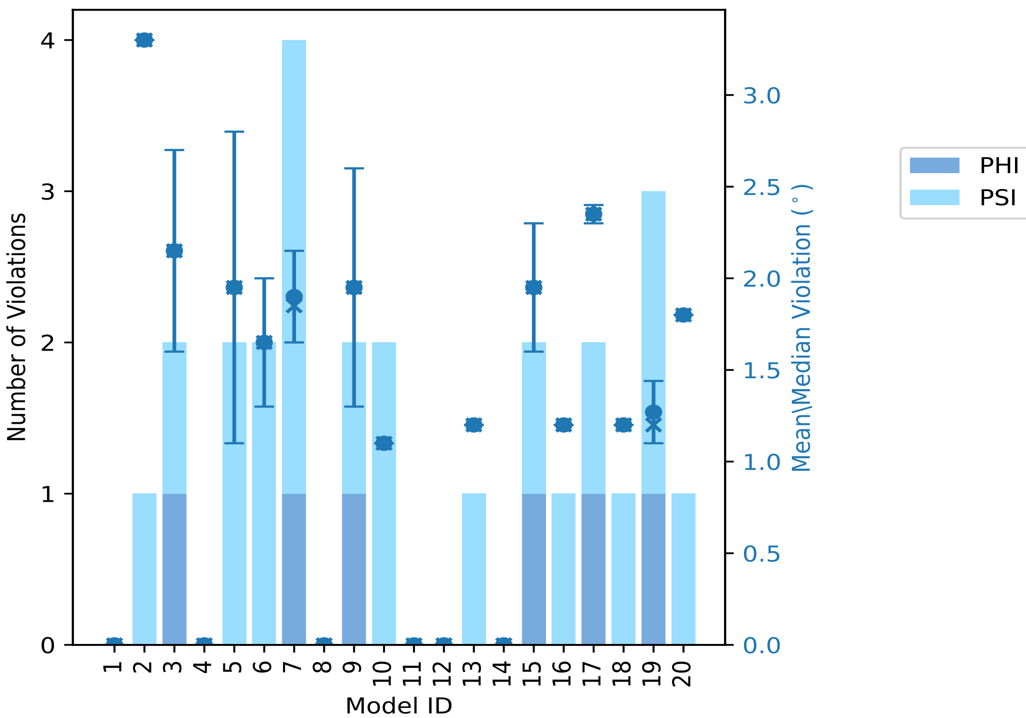
Violated and consistently violated restraints are shown using different hatch patterns in their respective categories

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 (°)
	PHI	PSI	Total				
1	0	0	0	0.0	0.0	0.0	0.0
2	0	1	1	3.3	3.3	0.0	3.3
3	1	1	2	2.15	2.7	0.55	2.15
4	0	0	0	0.0	0.0	0.0	0.0
5	0	2	2	1.95	2.8	0.85	1.95
6	0	2	2	1.65	2.0	0.35	1.65
7	1	3	4	1.9	2.3	0.25	1.85
8	0	0	0	0.0	0.0	0.0	0.0
9	1	1	2	1.95	2.6	0.65	1.95
10	0	2	2	1.1	1.1	0.0	1.1
11	0	0	0	0.0	0.0	0.0	0.0
12	0	0	0	0.0	0.0	0.0	0.0
13	0	1	1	1.2	1.2	0.0	1.2
14	0	0	0	0.0	0.0	0.0	0.0
15	1	1	2	1.95	2.3	0.35	1.95
16	0	1	1	1.2	1.2	0.0	1.2
17	1	1	2	2.35	2.4	0.05	2.35
18	0	1	1	1.2	1.2	0.0	1.2
19	1	2	3	1.27	1.5	0.17	1.2
20	0	1	1	1.8	1.8	0.0	1.8

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	
PHI	PSI	Total	Count[1]	%
1	3	4	1	5.0
1	0	1	2	10.0
1	0	1	3	15.0
0	0	0	4	20.0
0	1	1	5	25.0
0	2	2	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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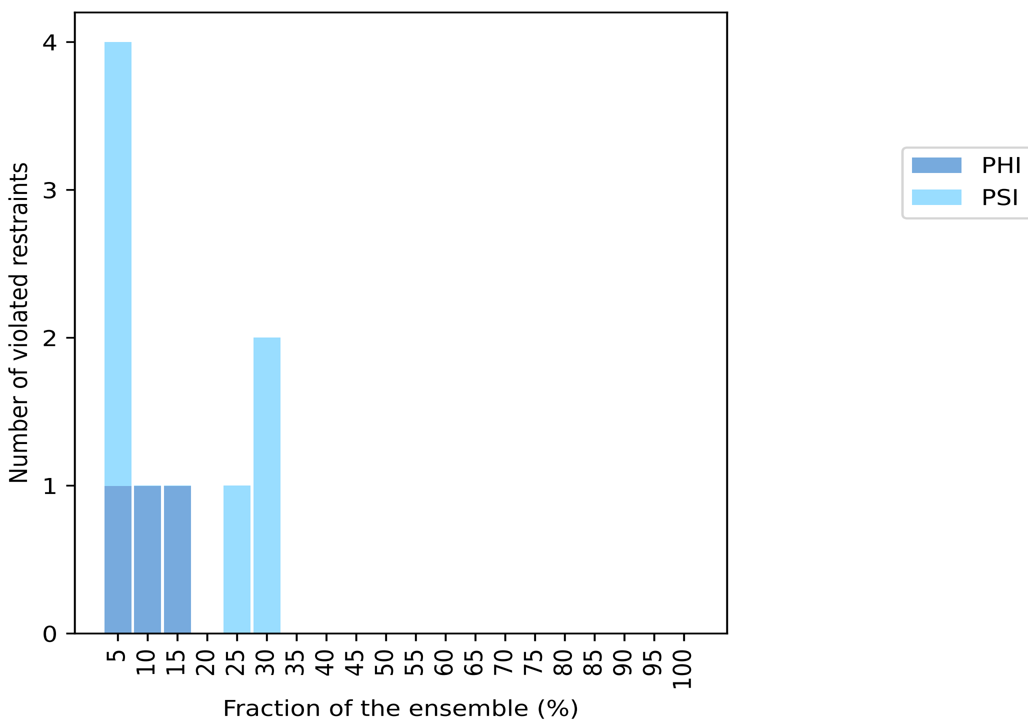
Number of violated restraints			Fraction of the ensemble	
PHI	PSI	Total	Count[1]	%
0	0	0	12	60.0
0	0	0	13	65.0
0	0	0	14	70.0
0	0	0	15	75.0
0	0	0	16	80.0
0	0	0	17	85.0
0	0	0	18	90.0
0	0	0	19	95.0
0	0	0	20	100.0

[1] Number of models with violations

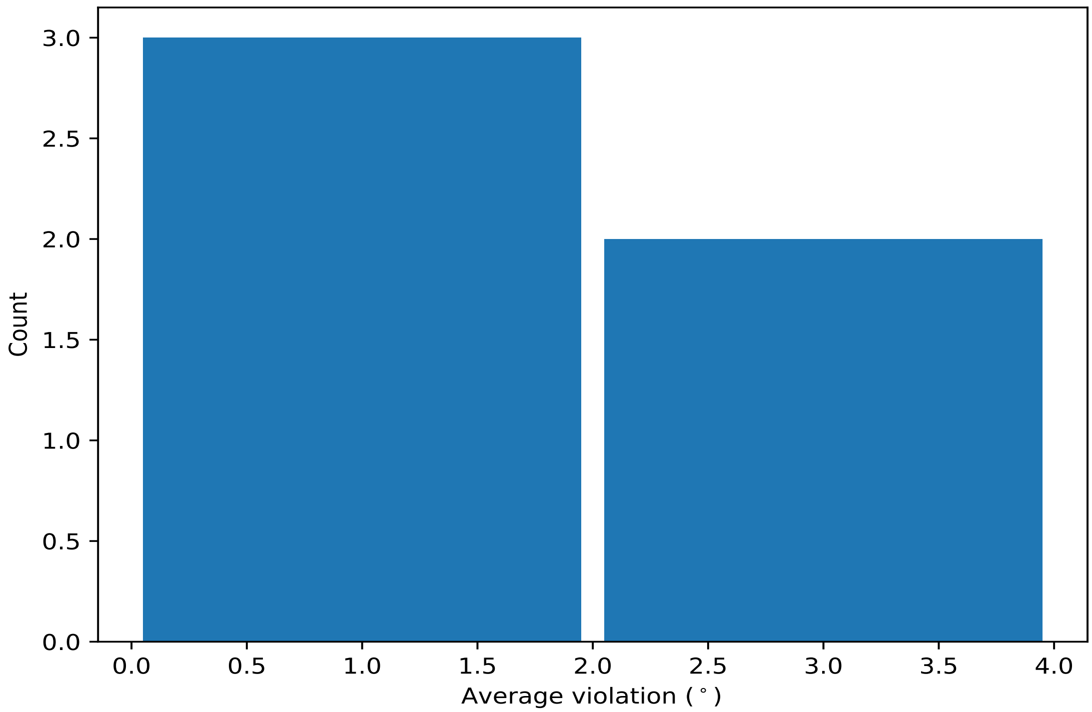
10.3.1 Bar graph : Dihedral-angle Violation statistics for the ensemble (i)



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.

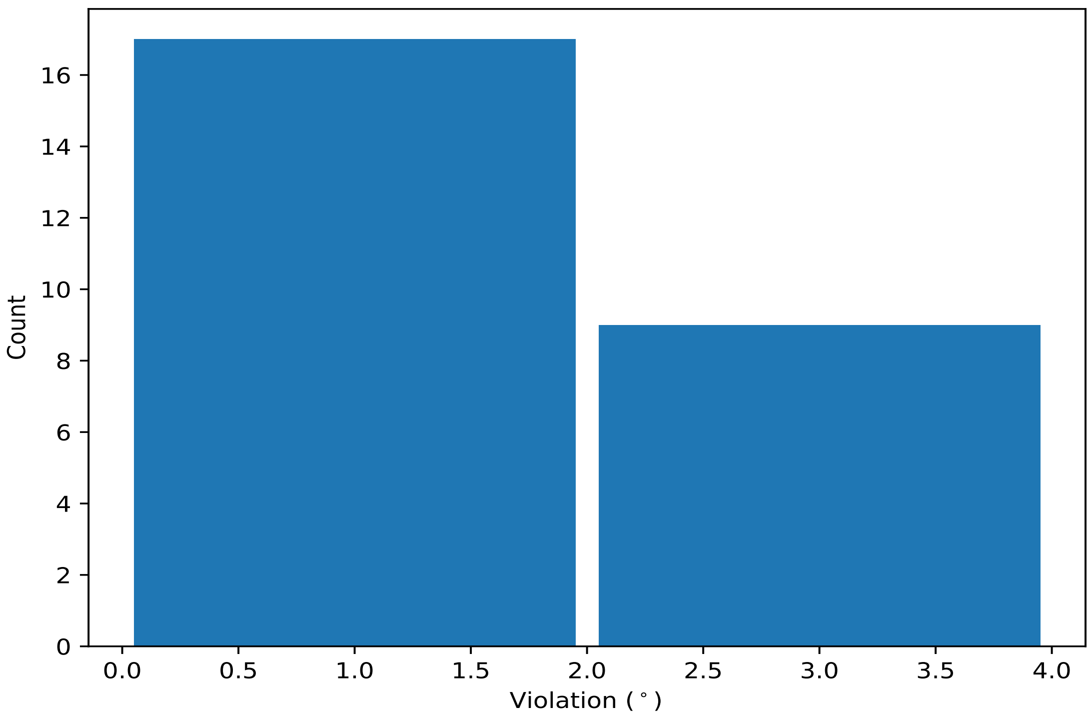
Key	Atom-1	Atom-2	Atom-3	Atom-4	Models[1]	Mean	SD[2]	Median
(1,142)	1:A:168:PRO:N	1:A:168:PRO:CA	1:A:168:PRO:C	1:A:169:THR:N	6	2.3	0.34	2.3
(1,88)	2:B:518:TRP:N	2:B:518:TRP:CA	2:B:518:TRP:C	2:B:519:PHE:N	6	1.28	0.24	1.2
(1,156)	1:A:193:GLU:N	1:A:193:GLU:CA	1:A:193:GLU:C	1:A:194:LYS:N	5	2.14	0.86	2.4
(1,26)	2:B:489:VAL:C	2:B:490:ILE:N	2:B:490:ILE:CA	2:B:490:ILE:C	3	1.47	0.12	1.5
(1,118)	1:A:192:ASN:C	1:A:193:GLU:N	1:A:193:GLU:CA	1:A:193:GLU:C	2	1.95	0.35	1.95

[1] Number of violated models, [2]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 provides the list of violationsfor the 10 worst performing restraints, sorted by the violation 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 (°)
(1,156)	1:A:193:GLU:N	1:A:193:GLU:CA	1:A:193:GLU:C	1:A:194:LYS:N	2	3.3
(1,142)	1:A:168:PRO:N	1:A:168:PRO:CA	1:A:168:PRO:C	1:A:169:THR:N	5	2.8
(1,156)	1:A:193:GLU:N	1:A:193:GLU:CA	1:A:193:GLU:C	1:A:194:LYS:N	3	2.7
(1,142)	1:A:168:PRO:N	1:A:168:PRO:CA	1:A:168:PRO:C	1:A:169:THR:N	9	2.6
(1,156)	1:A:193:GLU:N	1:A:193:GLU:CA	1:A:193:GLU:C	1:A:194:LYS:N	17	2.4
(1,142)	1:A:168:PRO:N	1:A:168:PRO:CA	1:A:168:PRO:C	1:A:169:THR:N	7	2.3
(1,142)	1:A:168:PRO:N	1:A:168:PRO:CA	1:A:168:PRO:C	1:A:169:THR:N	15	2.3
(1,118)	1:A:192:ASN:C	1:A:193:GLU:N	1:A:193:GLU:CA	1:A:193:GLU:C	17	2.3
(1,142)	1:A:168:PRO:N	1:A:168:PRO:CA	1:A:168:PRO:C	1:A:169:THR:N	6	2.0
(1,93)	1:A:154:GLN:C	1:A:155:VAL:N	1:A:155:VAL:CA	1:A:155:VAL:C	7	1.9