



wwPDB NMR Structure Validation Summary Report ⓘ

Mar 8, 2026 – 01:18 PM UTC

PDB ID : 2LG1 / pdb_00002lg1
BMRB ID : 16195
Title : Solution structure of the human AKAP13 PH domain and stabilizing DH helix
Authors : Lenoir, M.; Sugawara, M.; Ball, L.; Overduin, M.
Deposited on : 2011-07-19

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 ⓘ 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 ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
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) : 2.49

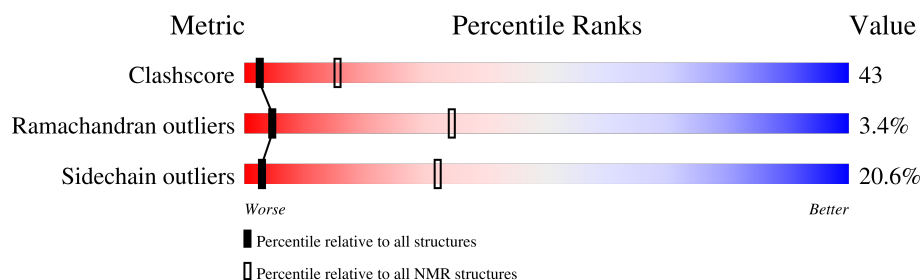
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

SOLUTION NMR

The overall completeness of chemical shifts assignment is 89%.

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	229148	14424
Ramachandran outliers	224038	12848
Sidechain outliers	223484	12823

The table below summarises the geometric issues observed across the polymeric chains and their fit to the experimental data. The red, orange, yellow and green segments indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. A cyan segment indicates the fraction of residues that are not part of the well-defined cores, and a grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	185	

2 Ensemble composition and analysis

This entry contains 20 models. Model 5 is the overall representative, medoid model (most similar to other models). The authors have identified model 1 as representative, based on the following criterion: *lowest energy*.

The following residues are included in the computation of the global validation metrics.

Well-defined (core) protein residues			
Well-defined core	Residue range (total)	Backbone RMSD (Å)	Medoid model
1	A:30-A:185 (156)	0.40	5

Ill-defined regions of proteins are excluded from the global statistics.

Ligands and non-protein polymers are included in the analysis.

The models can be grouped into 3 clusters and 4 single-model clusters were found.

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

3 Entry composition

There is only 1 type of molecule in this entry. The entry contains 2995 atoms, of which 1523 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called A-kinase anchor protein 13.

Mol	Chain	Residues	Atoms						Trace
1	A	185	Total	C	H	N	O	S	0
			2995	922	1523	250	293	7	

There are 2 discrepancies between the modelled and reference sequences:

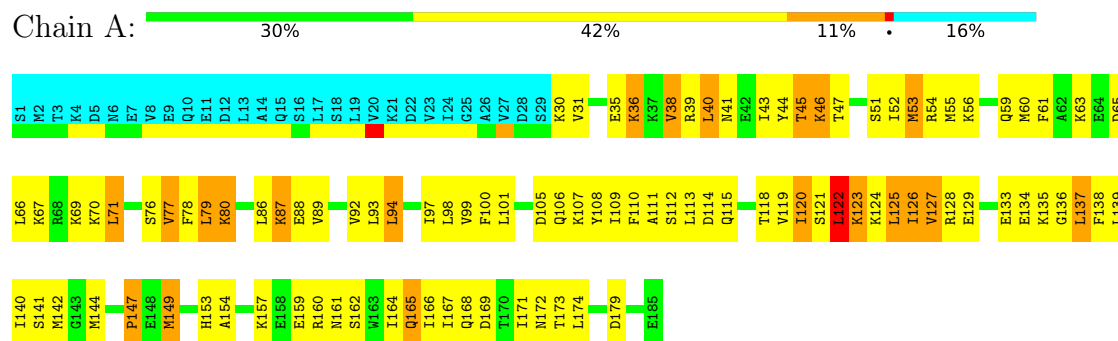
Chain	Residue	Modelled	Actual	Comment	Reference
A	1	SER	-	expression tag	UNP Q12802
A	2	MET	-	expression tag	UNP Q12802

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.

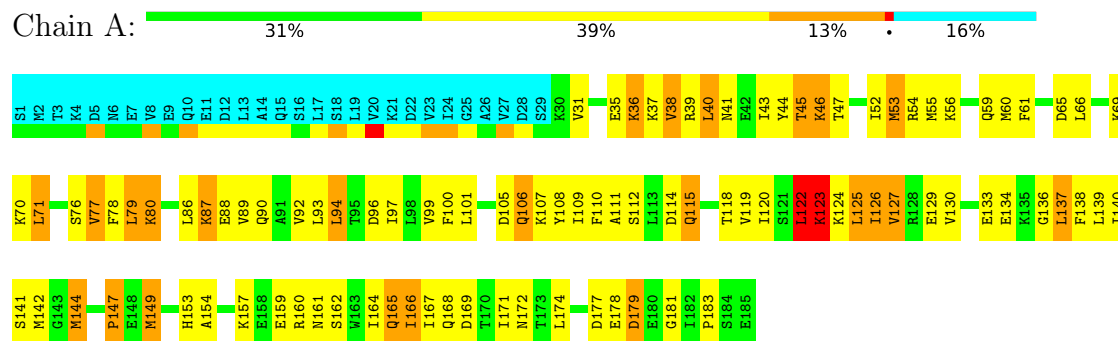
- Molecule 1: A-kinase anchor protein 13



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

The representative model is number 5. Colouring as in section 4.1 above.

- Molecule 1: A-kinase anchor protein 13



5 Refinement protocol and experimental data overview

The models were refined using the following method: *simulated annealing*.

Of the 100 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	refinement	2.1

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	2281
Number of shifts mapped to atoms	2281
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	89%

6 Model quality [i](#)

6.1 Standard geometry [i](#)

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the (average) root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#Z>5	RMSZ	#Z>5
1	A	0.64±0.01	0±0/1269 (0.0± 0.0%)	0.90±0.02	0±0/1695 (0.0± 0.0%)
All	All	0.64	1/25380 (0.0%)	0.90	2/33900 (0.0%)

All unique bond outliers are listed below.

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)	Models	
								Worst	Total
1	A	135	LYS	N-CA	-6.16	1.42	1.46	17	1

All unique angle outliers are listed below.

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)	Models	
								Worst	Total
1	A	161	ASN	CA-CB-CG	5.51	118.11	112.60	19	2

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	1256	1310	1308	110±5
All	All	25120	26200	26160	2196

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 43.

5 of 389 unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:171:ILE:HA	1:A:174:LEU:HD12	0.91	1.42	4	20
1:A:61:PHE:CZ	1:A:97:ILE:HD13	0.90	2.02	15	19
1:A:126:ILE:HG23	1:A:140:ILE:HB	0.89	1.44	11	20
1:A:61:PHE:CE2	1:A:119:VAL:HG21	0.83	2.07	8	1
1:A:52:ILE:HG12	1:A:60:MET:HE3	0.82	1.50	4	20

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	155/185 (84%)	129±3 (83±2%)	21±3 (13±2%)	5±2 (3±1%)	4	34
All	All	3100/3700 (84%)	2580 (83%)	414 (13%)	106 (3%)	4	34

5 of 15 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	122	LEU	15
1	A	147	PRO	15
1	A	71	LEU	15
1	A	115	GLN	14
1	A	123	LYS	13

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	142/168 (85%)	113±3 (79±2%)	29±3 (21±2%)	3	32

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	2840/3360 (85%)	2256 (79%)	584 (21%)	3 32

5 of 62 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	36	LYS	20
1	A	38	VAL	20
1	A	45	THR	20
1	A	46	LYS	20
1	A	47	THR	20

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 oligosaccharides 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

The completeness of assignment taking into account all chemical shift lists is 89% for the well-defined parts and 88% 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

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	2281
Number of shifts mapped to atoms	2281
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Number of shift outliers (ShiftChecker)	11

7.1.2 Chemical shift referencing

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction $\pm$ precision, ppm	Suggested action
$^{13}\text{C}_\alpha$	185	-0.23 ± 0.10	None needed (< 0.5 ppm)
$^{13}\text{C}_\beta$	176	0.13 ± 0.08	None needed (< 0.5 ppm)
$^{13}\text{C}'$	169	-0.09 ± 0.06	None needed (< 0.5 ppm)
^{15}N	175	-0.67 ± 0.20	Should be applied

7.1.3 Completeness of resonance assignments

The following table shows the completeness of the chemical shift assignments for the well-defined regions of the structure. The overall completeness is 89%, i.e. 1978 atoms were assigned a chemical shift out of a possible 2223. 0 out of 27 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^1H	^{13}C	^{15}N
Backbone	754/782 (96%)	308/316 (97%)	298/312 (96%)	148/154 (96%)
Sidechain	1130/1336 (85%)	754/863 (87%)	366/418 (88%)	10/55 (18%)

Continued on next page...

Continued from previous page...

	Total	¹ H	¹³ C	¹⁵ N
Aromatic	94/105 (90%)	47/51 (92%)	46/49 (94%)	1/5 (20%)
Overall	1978/2223 (89%)	1109/1230 (90%)	710/779 (91%)	159/214 (74%)

7.1.4 Statistically unusual chemical shifts ⓘ

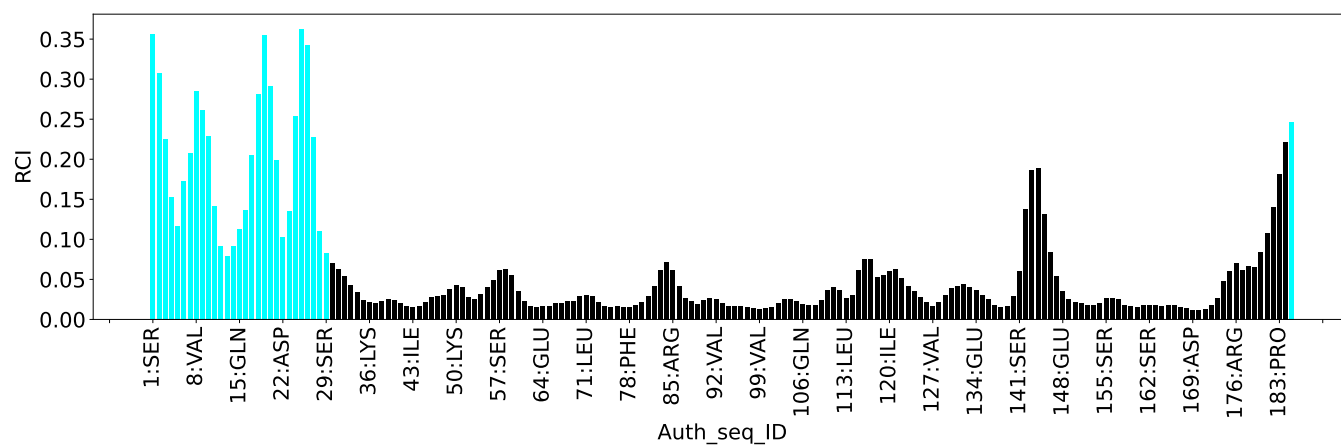
The following table lists the statistically unusual chemical shifts. These are statistical measures, and large deviations from the mean do not necessarily imply incorrect assignments. Molecules containing paramagnetic centres or hemes are expected to give rise to anomalous chemical shifts.

List Id	Chain	Res	Type	Atom	Shift, ppm	Expected range, ppm	Z-score
1	A	108	TYR	CE2	97.44	111.68 – 124.17	-16.4
1	A	108	TYR	CE1	97.44	111.24 – 124.66	-15.3
1	A	34	TYR	CE2	99.75	111.68 – 124.17	-14.6
1	A	44	TYR	CE2	100.43	111.68 – 124.17	-14.0
1	A	34	TYR	CE1	99.75	111.24 – 124.66	-13.6
1	A	44	TYR	CE1	100.43	111.24 – 124.66	-13.1
1	A	153	HIS	CD2	89.40	103.95 – 136.66	-9.4
1	A	163	TRP	CH2	133.48	116.19 – 131.43	6.3
1	A	132	HIS	CE1	150.91	126.08 – 149.12	5.8
1	A	132	HIS	CD2	101.76	103.95 – 136.66	-5.7
1	A	74	ASP	HA	6.21	3.04 – 6.12	5.3

7.1.5 Random Coil Index (RCI) plots ⓘ

The image below reports *random coil index* values for the protein chains in the structure. The height of each bar gives a probability of a given residue to be disordered, as predicted from the available chemical shifts and the amino acid sequence. A value above 0.2 is an indication of significant predicted disorder. The colour of the bar shows whether the residue is in the well-defined core (black) or in the ill-defined residue ranges (cyan), as described in section 2 on ensemble composition. 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	3564
Intra-residue ($ i-j =0$)	1528
Sequential ($ i-j =1$)	589
Medium range ($ i-j >1$ and $ i-j <5$)	424
Long range ($ i-j \geq 5$)	996
Inter-chain	0
Hydrogen bond restraints	27
Disulfide bond restraints	0
Total dihedral-angle restraints	235
Number of unmapped restraints	0
Number of restraints per residue	20.5
Number of long range restraints per residue ¹	5.5

¹Long 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)	173.8	0.2
0.2-0.5 (Medium)	374.9	0.5
>0.5 (Large)	459.5	4.89

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)	17.9	9.3
10.0-20.0 (Medium)	0.1	11.76
>20.0 (Large)	0.1	42.65

9 Distance violation analysis ⓘ

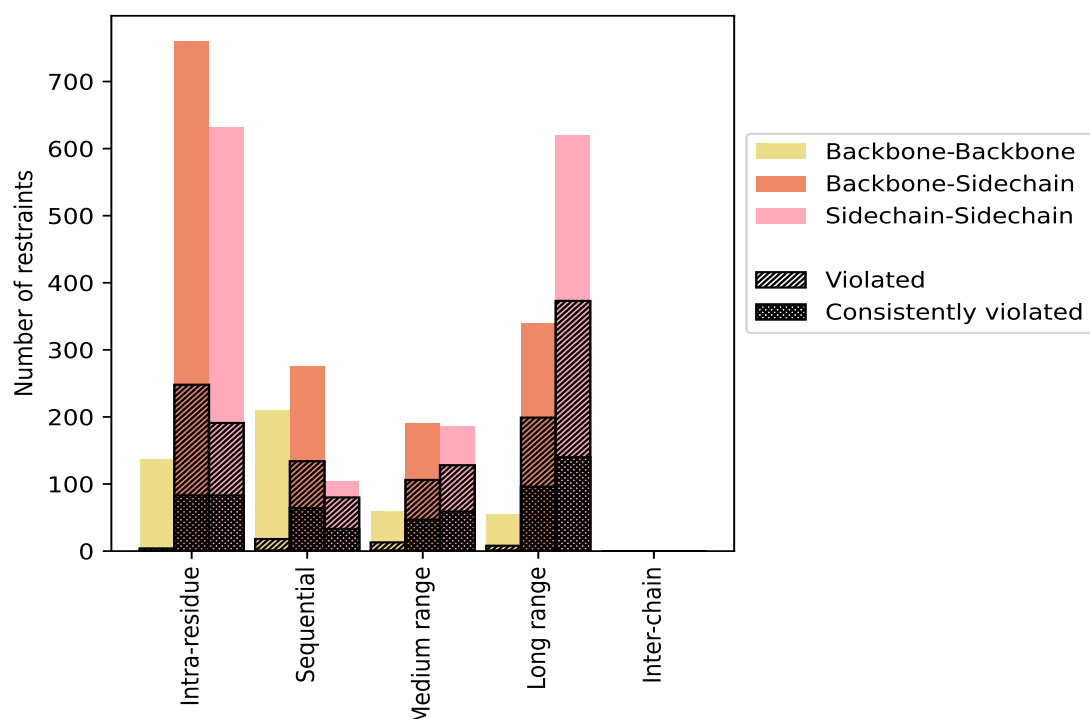
9.1 Summary of distance violations ⓘ

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	% ¹	Violated ³			Consistently Violated ⁴		
			Count	% ²	% ¹	Count	% ²	% ¹
Intra-residue (i-j =0)	1528	42.9	443	29.0	12.4	167	10.9	4.7
Backbone-Backbone	137	3.8	4	2.9	0.1	1	0.7	0.0
Backbone-Sidechain	760	21.3	248	32.6	7.0	83	10.9	2.3
Sidechain-Sidechain	631	17.7	191	30.3	5.4	83	13.2	2.3
Sequential (i-j =1)	589	16.5	232	39.4	6.5	98	16.6	2.7
Backbone-Backbone	210	5.9	18	8.6	0.5	1	0.5	0.0
Backbone-Sidechain	275	7.7	134	48.7	3.8	64	23.3	1.8
Sidechain-Sidechain	104	2.9	80	76.9	2.2	33	31.7	0.9
Medium range (i-j >1 & i-j <5)	424	11.9	236	55.7	6.6	100	23.6	2.8
Backbone-Backbone	59	1.7	13	22.0	0.4	1	1.7	0.0
Backbone-Sidechain	179	5.0	95	53.1	2.7	40	22.3	1.1
Sidechain-Sidechain	186	5.2	128	68.8	3.6	59	31.7	1.7
Long range (i-j ≥5)	996	27.9	564	56.6	15.8	224	22.5	6.3
Backbone-Backbone	54	1.5	8	14.8	0.2	1	1.9	0.0
Backbone-Sidechain	323	9.1	183	56.7	5.1	83	25.7	2.3
Sidechain-Sidechain	619	17.4	373	60.3	10.5	140	22.6	3.9
Inter-chain	0	0.0	0	0.0	0.0	0	0.0	0.0
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
Hydrogen bond	27	0.8	27	100.0	0.8	20	74.1	0.6
Disulfide bond	0	0.0	0	0.0	0.0	0	0.0	0.0
Total	3564	100.0	1502	42.1	42.1	609	17.1	17.1
Backbone-Backbone	460	12.9	43	9.3	1.2	4	0.9	0.1
Backbone-Sidechain	1564	43.9	687	43.9	19.3	290	18.5	8.1
Sidechain-Sidechain	1540	43.2	772	50.1	21.7	315	20.5	8.8

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	305	160	173	409	0	1047	0.68	4.87	0.66	0.46
2	296	162	165	390	0	1013	0.66	4.85	0.65	0.44
3	282	159	170	396	0	1007	0.68	4.8	0.65	0.46
4	295	162	166	389	0	1012	0.68	4.73	0.66	0.47
5	294	156	170	396	0	1016	0.67	4.8	0.65	0.47
6	295	155	168	403	0	1021	0.67	4.89	0.65	0.46
7	295	162	169	397	0	1023	0.67	4.86	0.65	0.45
8	286	156	175	402	0	1019	0.68	4.69	0.66	0.46
9	291	156	167	397	0	1011	0.68	4.86	0.66	0.47
10	298	158	166	404	0	1026	0.67	4.72	0.65	0.44

Continued on next page...

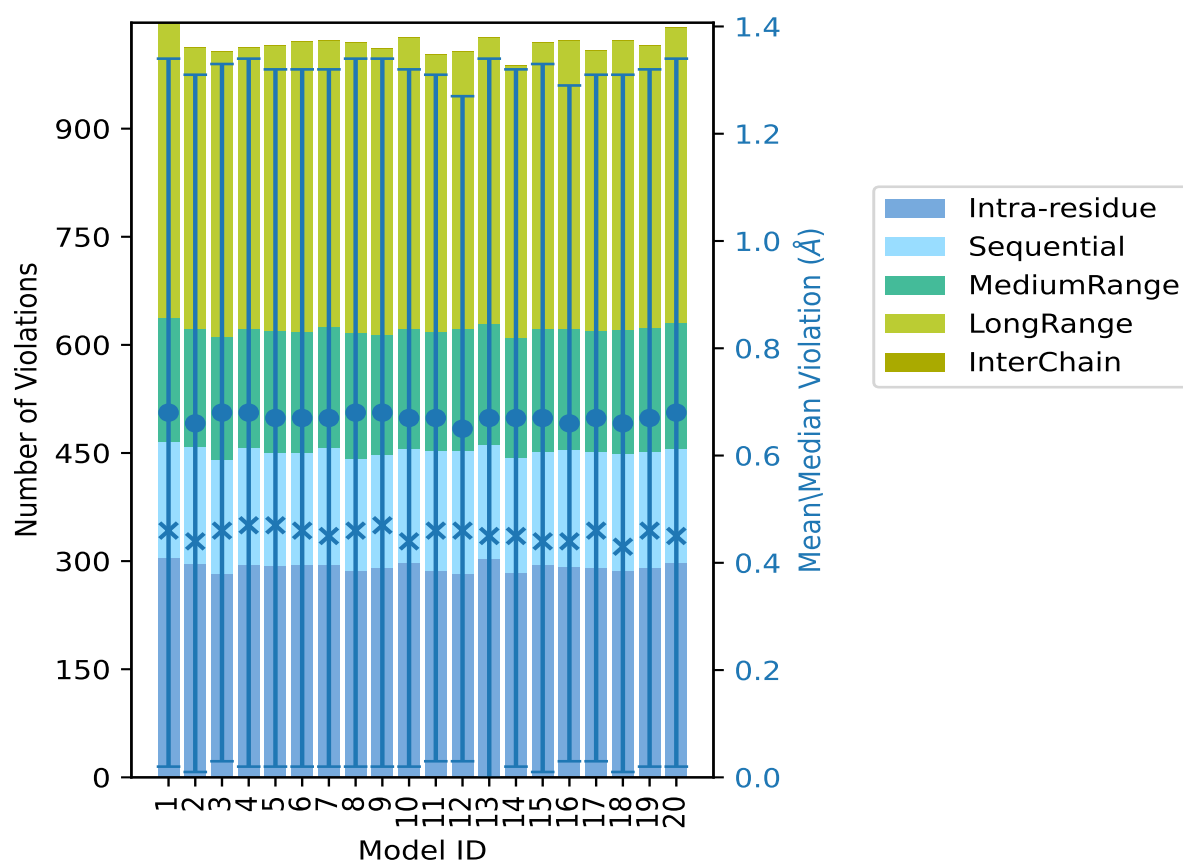
Continued from previous page...

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				
11	287	166	165	385	0	1003	0.67	4.78	0.64	0.46
12	282	171	169	385	0	1007	0.65	4.83	0.62	0.46
13	304	157	169	397	0	1027	0.67	4.86	0.67	0.45
14	284	159	167	378	0	988	0.67	4.81	0.65	0.45
15	295	157	171	397	0	1020	0.67	4.84	0.66	0.44
16	292	162	169	400	0	1023	0.66	4.82	0.63	0.44
17	291	161	168	388	0	1008	0.67	4.89	0.64	0.46
18	286	163	172	402	0	1023	0.66	4.77	0.65	0.43
19	290	162	172	391	0	1015	0.67	4.77	0.65	0.46
20	298	158	175	410	0	1041	0.68	4.82	0.66	0.45

¹Intra-residue restraints, ²Sequential restraints, ³Medium range restraints, ⁴Long range restraints,

⁵Inter-chain restraints, ⁶Standard 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 ⓘ

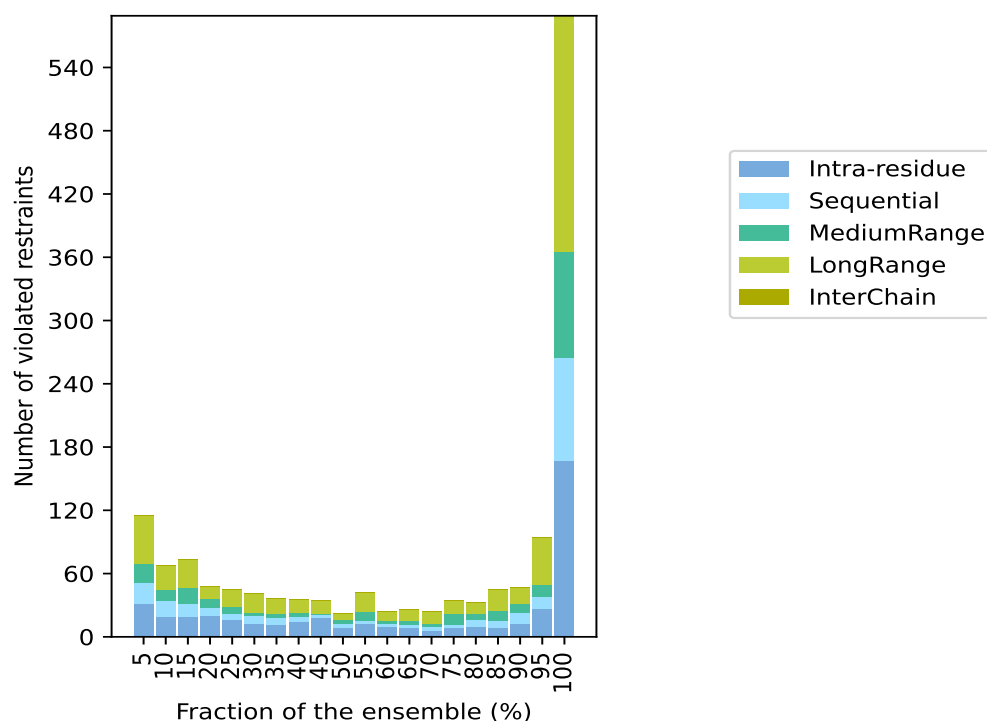
Violation analysis may find that some restraints are violated in few models and some are violated in most of models. The following table provides this information as number of violated restraints for a given fraction of the ensemble. In total, 2062(IR:1085, SQ:357, MR:188, LR:432, IC:0) restraints are 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	%
32	19	18	46	0	115	1	5.0
19	15	11	23	0	68	2	10.0
19	12	16	26	0	73	3	15.0
20	8	8	12	0	48	4	20.0
16	6	6	17	0	45	5	25.0
12	8	3	18	0	41	6	30.0
12	6	4	14	0	36	7	35.0
14	5	4	12	0	35	8	40.0
18	3	1	12	0	34	9	45.0
9	4	3	6	0	22	10	50.0
13	2	9	18	0	42	11	55.0
10	3	2	9	0	24	12	60.0
9	3	3	11	0	26	13	65.0
6	4	2	12	0	24	14	70.0
9	2	11	12	0	34	15	75.0
10	6	6	11	0	33	16	80.0
9	6	10	20	0	45	17	85.0
12	11	8	16	0	47	18	90.0
27	11	11	45	0	94	19	95.0
167	98	100	224	0	589	20	100.0

¹Intra-residue restraints, ²Sequential restraints, ³Medium range restraints, ⁴Long range restraints,

⁵Inter-chain restraints, ⁶ Number of models with violations

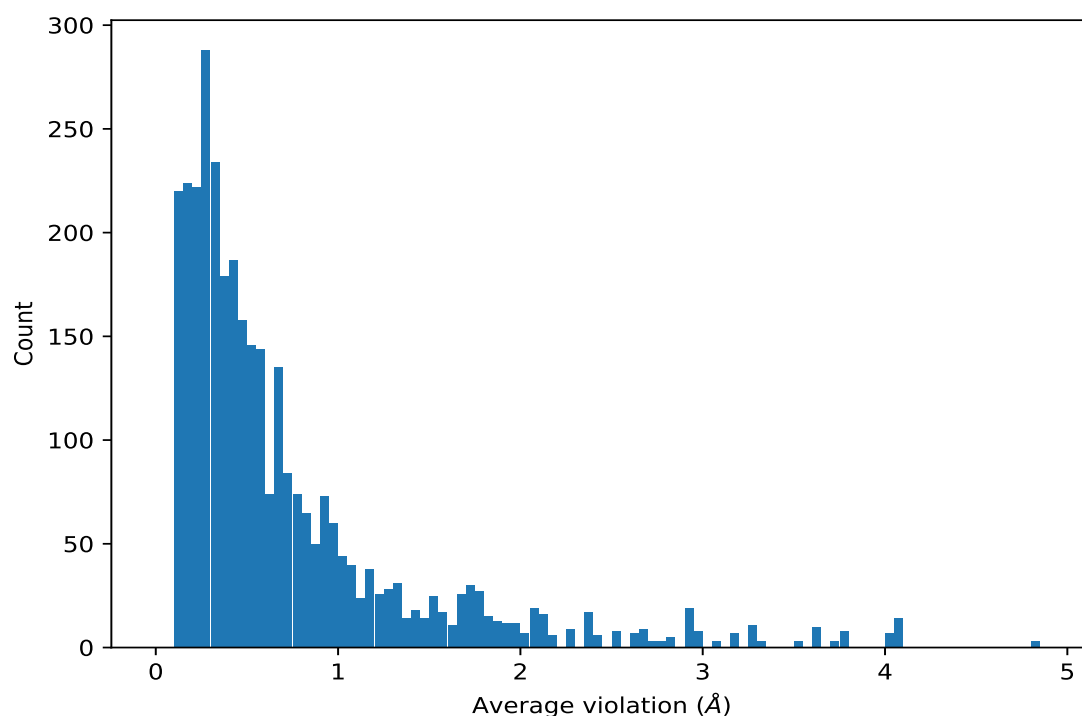
9.3.1 Bar graph : Distance violation statistics for the ensemble [i](#)



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)
(1,3382)	1:127:A:VAL:HG12	1:125:A:LEU:HB3	20	4.81	0.05	4.82
(1,3382)	1:127:A:VAL:HG13	1:125:A:LEU:HB3	20	4.81	0.05	4.82
(1,3382)	1:127:A:VAL:HG11	1:125:A:LEU:HB3	20	4.81	0.05	4.82
(1,3469)	1:138:A:PHE:HD2	1:137:A:LEU:HD22	20	4.09	0.07	4.12
(1,3469)	1:138:A:PHE:HD1	1:137:A:LEU:HD23	20	4.09	0.07	4.12
(1,3469)	1:138:A:PHE:HD1	1:137:A:LEU:HD22	20	4.09	0.07	4.12
(1,3469)	1:138:A:PHE:HD2	1:137:A:LEU:HD21	20	4.09	0.07	4.12
(1,3469)	1:138:A:PHE:HD1	1:137:A:LEU:HD21	20	4.09	0.07	4.12
(1,3469)	1:138:A:PHE:HD2	1:137:A:LEU:HD23	20	4.09	0.07	4.12
(1,490)	1:130:A:VAL:HG22	1:129:A:GLU:HG3	20	4.06	0.2	4.11
(1,490)	1:130:A:VAL:HG21	1:129:A:GLU:HG2	20	4.06	0.2	4.11
(1,490)	1:130:A:VAL:HG23	1:129:A:GLU:HG2	20	4.06	0.2	4.11
(1,490)	1:130:A:VAL:HG23	1:129:A:GLU:HG3	20	4.06	0.2	4.11
(1,490)	1:130:A:VAL:HG21	1:129:A:GLU:HG3	20	4.06	0.2	4.11
(1,490)	1:130:A:VAL:HG22	1:129:A:GLU:HG2	20	4.06	0.2	4.11
(1,490)	1:130:A:VAL:HG23	1:135:A:LYS:HB3	20	4.06	0.2	4.11

Continued on next page...

Continued from previous page...

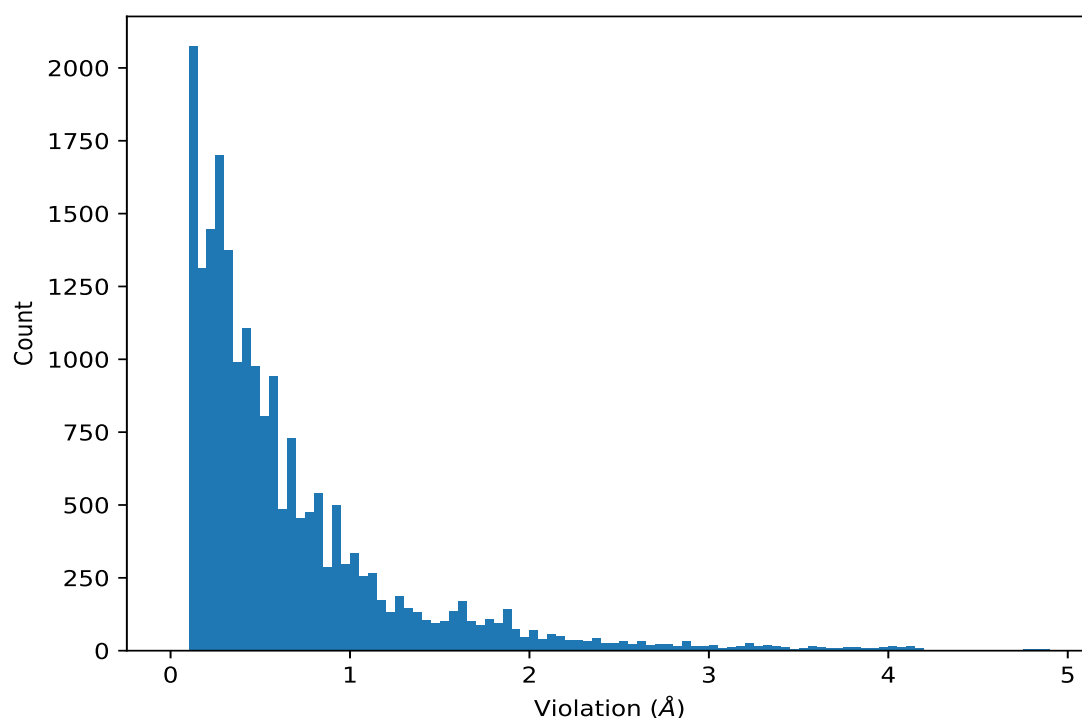
Key	Atom-1	Atom-2	Models ¹	Mean (Å)	SD ¹ (Å)	Median (Å)
(1,490)	1:130:A:VAL:HG22	1:135:A:LYS:HB3	20	4.06	0.2	4.11
(1,1754)	1:99:A:VAL:HG22	1:92:A:VAL:HG13	20	4.02	0.1	4.02
(1,1754)	1:99:A:VAL:HG21	1:92:A:VAL:HG11	20	4.02	0.1	4.02
(1,1754)	1:99:A:VAL:HG21	1:92:A:VAL:HG12	20	4.02	0.1	4.02
(1,1754)	1:99:A:VAL:HG23	1:92:A:VAL:HG13	20	4.02	0.1	4.02
(1,1754)	1:99:A:VAL:HG21	1:92:A:VAL:HG13	20	4.02	0.1	4.02
(1,1754)	1:99:A:VAL:HG23	1:92:A:VAL:HG12	20	4.02	0.1	4.02
(1,1754)	1:99:A:VAL:HG22	1:92:A:VAL:HG12	20	4.02	0.1	4.02
(1,1951)	1:66:A:LEU:HD12	1:92:A:VAL:HG13	20	3.79	0.06	3.8
(1,1951)	1:66:A:LEU:HD11	1:92:A:VAL:HG11	20	3.79	0.06	3.8
(1,1951)	1:66:A:LEU:HD12	1:92:A:VAL:HG12	20	3.79	0.06	3.8
(1,1951)	1:66:A:LEU:HD13	1:92:A:VAL:HG12	20	3.79	0.06	3.8
(1,1951)	1:66:A:LEU:HD13	1:92:A:VAL:HG13	20	3.79	0.06	3.8
(1,1951)	1:66:A:LEU:HD13	1:92:A:VAL:HG11	20	3.79	0.06	3.8
(1,1951)	1:66:A:LEU:HD12	1:92:A:VAL:HG11	20	3.79	0.06	3.8
(1,1951)	1:66:A:LEU:HD11	1:92:A:VAL:HG13	20	3.79	0.06	3.8
(1,2623)	1:113:A:LEU:HA	1:79:A:LEU:HD13	20	3.74	0.73	3.9
(1,2623)	1:113:A:LEU:HA	1:79:A:LEU:HD11	20	3.74	0.73	3.9
(1,2623)	1:113:A:LEU:HA	1:79:A:LEU:HD12	20	3.74	0.73	3.9
(1,2059)	1:125:A:LEU:HD12	1:127:A:VAL:HG12	20	3.61	0.15	3.66
(1,2059)	1:125:A:LEU:HD13	1:127:A:VAL:HG13	20	3.61	0.15	3.66
(1,2059)	1:125:A:LEU:HD13	1:127:A:VAL:HG12	20	3.61	0.15	3.66
(1,2059)	1:125:A:LEU:HD11	1:127:A:VAL:HG11	20	3.61	0.15	3.66
(1,2059)	1:125:A:LEU:HD12	1:127:A:VAL:HG13	20	3.61	0.15	3.66
(1,2059)	1:125:A:LEU:HD12	1:127:A:VAL:HG11	20	3.61	0.15	3.66
(1,2059)	1:125:A:LEU:HD13	1:127:A:VAL:HG11	20	3.61	0.15	3.66
(1,3234)	1:125:A:LEU:HD22	1:98:A:LEU:H	20	3.61	0.1	3.63
(1,3234)	1:125:A:LEU:HD23	1:98:A:LEU:H	20	3.61	0.1	3.63
(1,3234)	1:125:A:LEU:HD21	1:98:A:LEU:H	20	3.61	0.1	3.63
(1,2606)	1:28:A:ASP:HA	1:31:A:VAL:HG23	20	3.51	0.1	3.54
(1,2606)	1:28:A:ASP:HA	1:31:A:VAL:HG22	20	3.51	0.1	3.54
(1,2606)	1:28:A:ASP:HA	1:31:A:VAL:HG21	20	3.51	0.1	3.54
(1,3460)	1:130:A:VAL:HG11	1:132:A:HIS:HE1	20	3.32	0.17	3.31

¹Number of violated models, ²Standard 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)
(1,3382)	1:127:A:VAL:HG11	1:125:A:LEU:HB3	6	4.89
(1,3382)	1:127:A:VAL:HG13	1:125:A:LEU:HB3	17	4.89
(1,3382)	1:127:A:VAL:HG12	1:125:A:LEU:HB3	1	4.87
(1,3382)	1:127:A:VAL:HG11	1:125:A:LEU:HB3	7	4.86
(1,3382)	1:127:A:VAL:HG11	1:125:A:LEU:HB3	9	4.86
(1,3382)	1:127:A:VAL:HG11	1:125:A:LEU:HB3	13	4.86
(1,3382)	1:127:A:VAL:HG13	1:125:A:LEU:HB3	2	4.85
(1,3382)	1:127:A:VAL:HG13	1:125:A:LEU:HB3	15	4.84
(1,3382)	1:127:A:VAL:HG12	1:125:A:LEU:HB3	12	4.83
(1,3382)	1:127:A:VAL:HG13	1:125:A:LEU:HB3	16	4.82

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

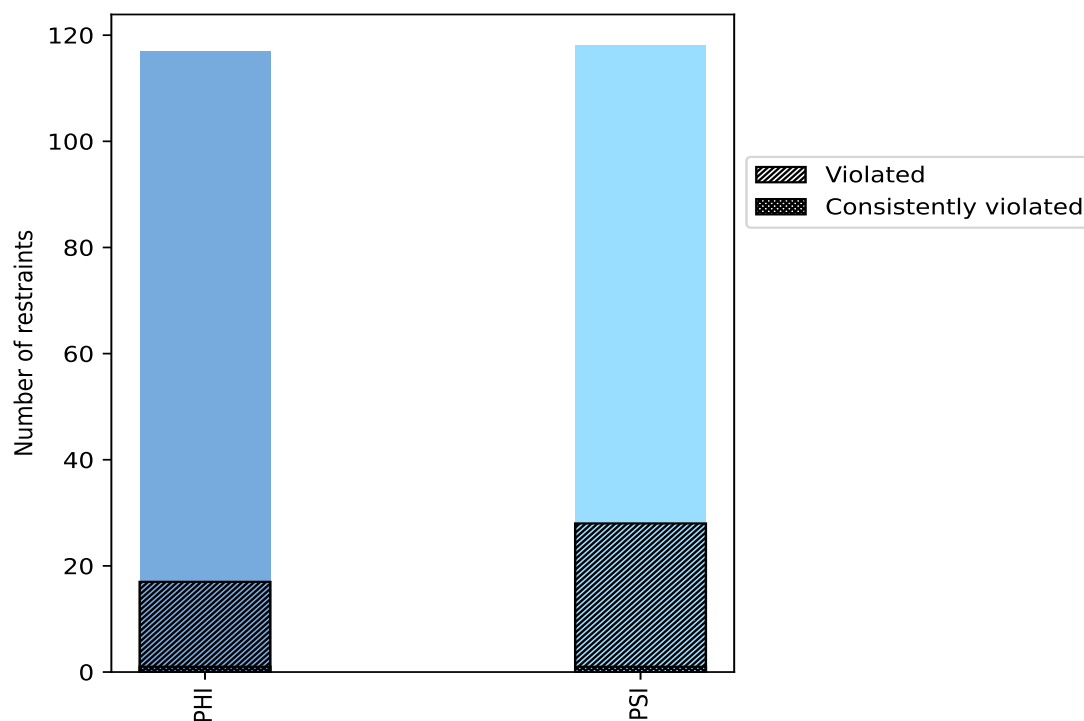
10.1 Summary of dihedral-angle violations [i](#)

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	% ¹	Violated ³			Consistently Violated ⁴		
			Count	% ²	% ¹	Count	% ²	% ¹
PHI	117	49.8	17	14.5	7.2	1	0.9	0.4
PSI	118	50.2	28	23.7	11.9	1	0.8	0.4
Total	235	100.0	45	19.1	19.1	2	0.9	0.9

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 [i](#)



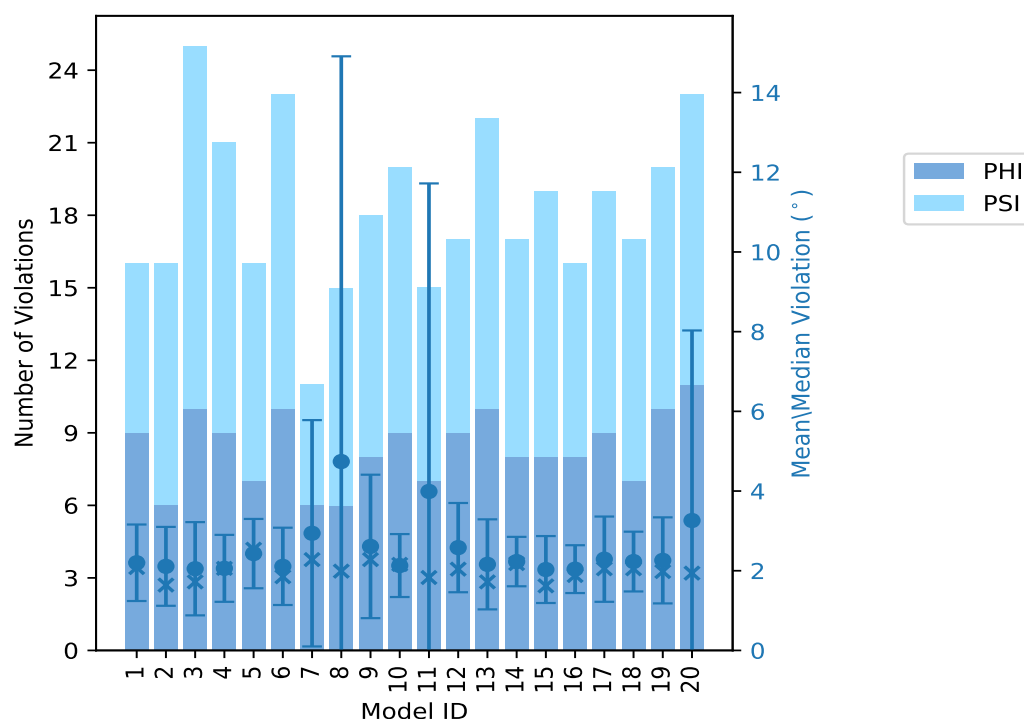
Violated and consistently violated restraints are shown using different hatch patterns in their respective categories

10.2 Dihedral-angle violation statistics for each model

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	9	7	16	2.2	4.41	0.96	2.08
2	6	10	16	2.11	4.9	0.99	1.64
3	10	15	25	2.05	6.9	1.17	1.72
4	9	12	21	2.06	4.08	0.84	2.06
5	7	9	16	2.43	4.08	0.87	2.54
6	10	13	23	2.11	4.4	0.97	1.85
7	6	5	11	2.94	11.76	2.84	2.28
8	6	9	15	4.74	42.65	10.17	1.99
9	8	10	18	2.61	9.3	1.8	2.28
10	9	11	20	2.13	3.45	0.79	2.16
11	7	8	15	3.99	32.77	7.73	1.83
12	9	8	17	2.58	4.88	1.12	2.04
13	10	12	22	2.16	5.61	1.13	1.72
14	8	9	17	2.23	3.64	0.62	2.18
15	8	11	19	2.03	3.88	0.84	1.62
16	8	8	16	2.04	3.4	0.6	1.88
17	9	10	19	2.29	5.57	1.07	2.05
18	7	10	17	2.23	4.02	0.75	2.05
19	10	10	20	2.26	5.47	1.08	1.98
20	11	12	23	3.26	25.31	4.77	1.94

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	%
5	5	10	1	5.0
0	3	3	2	10.0
0	1	1	3	15.0
0	4	4	4	20.0
0	2	2	5	25.0
2	2	4	6	30.0
1	0	1	7	35.0
0	2	2	8	40.0
0	2	2	9	45.0
0	0	0	10	50.0
0	0	0	11	55.0

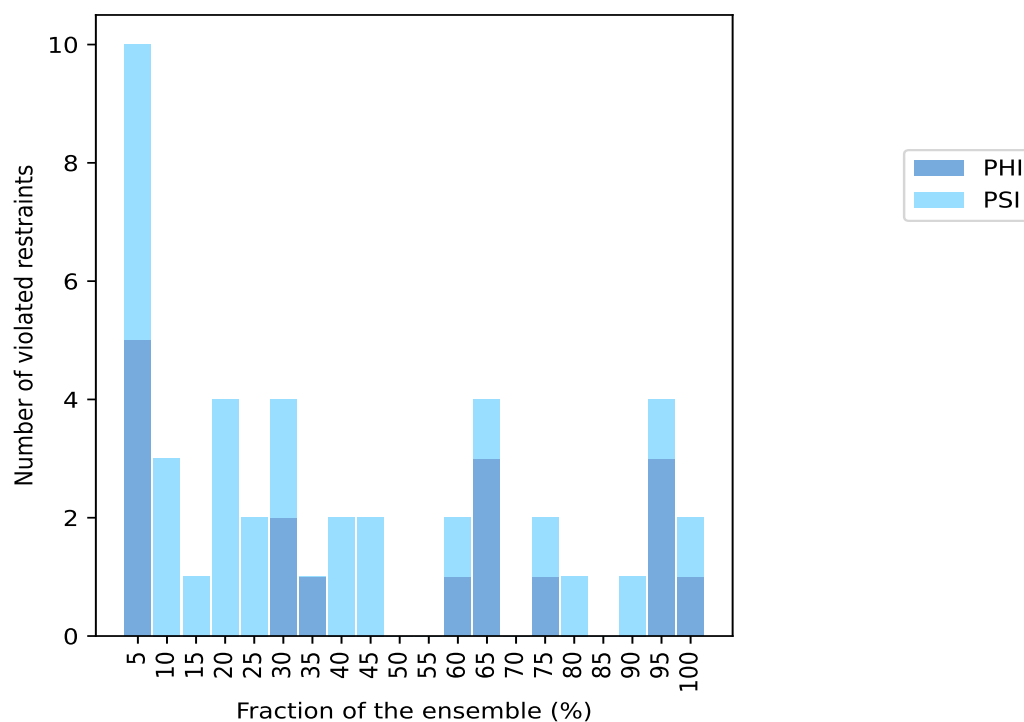
Continued on next page...

Continued from previous page...

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

¹ Number of models with violations

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

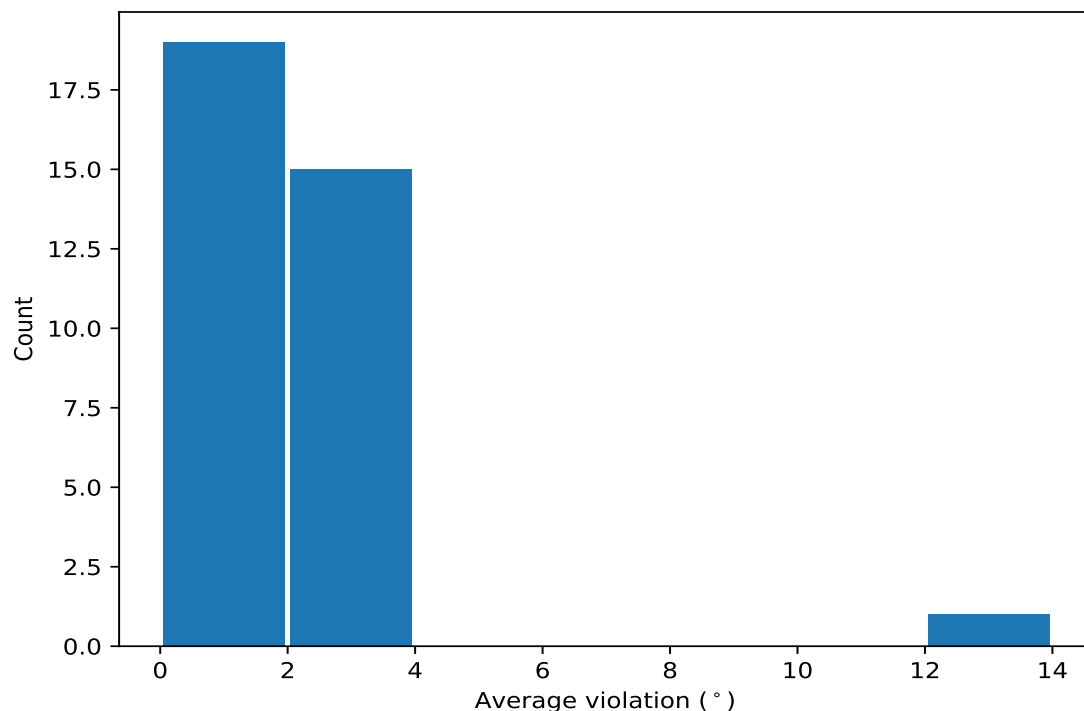


10.4 Most violated dihedral-angle restraints in the ensemble ⓘ

10.4.1 Histogram : Distribution of mean dihedral-angle violations ⓘ

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 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.

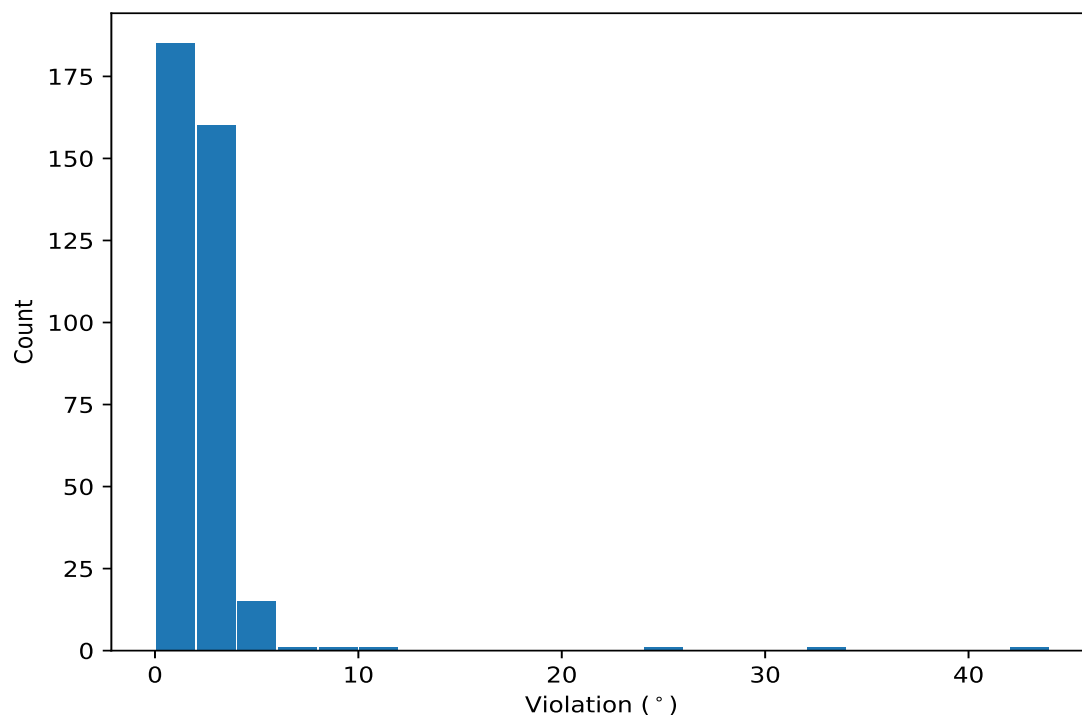
Key	Atom-1	Atom-2	Atom-3	Atom-4	Models ¹	Mean	SD ²	Median
(1,38)	1:43:A:ILE:N	1:43:A:ILE:CA	1:43:A:ILE:C	1:44:A:TYR:N	20	3.25	0.59	3.22
(1,172)	1:137:A:LEU:C	1:138:A:PHE:N	1:138:A:PHE:CA	1:138:A:PHE:C	20	2.24	0.47	2.21
(1,156)	1:124:A:LYS:C	1:125:A:LEU:N	1:125:A:LEU:CA	1:125:A:LEU:C	19	2.61	0.68	2.85
(1,113)	1:90:A:GLN:N	1:90:A:GLN:CA	1:90:A:GLN:C	1:91:A:ALA:N	19	2.52	0.64	2.58
(1,61)	1:59:A:GLN:C	1:60:A:MET:N	1:60:A:MET:CA	1:60:A:MET:C	19	2.26	0.47	2.21
(1,134)	1:101:A:LEU:C	1:102:A:GLN:N	1:102:A:GLN:CA	1:102:A:GLN:C	19	1.92	0.52	1.91
(1,177)	1:140:A:ILE:N	1:140:A:ILE:CA	1:140:A:ILE:C	1:141:A:SER:N	18	1.97	0.44	1.92
(1,143)	1:107:A:LYS:N	1:107:A:LYS:CA	1:107:A:LYS:C	1:108:A:TYR:N	16	1.7	0.4	1.68
(1,26)	1:37:A:LYS:N	1:37:A:LYS:CA	1:37:A:LYS:C	1:38:A:VAL:N	15	3.35	1.1	3.38
(1,186)	1:151:A:GLU:C	1:152:A:VAL:N	1:152:A:VAL:CA	1:152:A:VAL:C	15	2.03	0.88	1.89

¹ Number of violated models, ²Standard 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 violations for 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 (°)
(1,8)	1:22:A:ASP:N	1:22:A:ASP:CA	1:22:A:ASP:C	1:23:A:VAL:N	8	42.65
(1,8)	1:22:A:ASP:N	1:22:A:ASP:CA	1:22:A:ASP:C	1:23:A:VAL:N	11	32.77
(1,8)	1:22:A:ASP:N	1:22:A:ASP:CA	1:22:A:ASP:C	1:23:A:VAL:N	20	25.31
(1,8)	1:22:A:ASP:N	1:22:A:ASP:CA	1:22:A:ASP:C	1:23:A:VAL:N	7	11.76
(1,8)	1:22:A:ASP:N	1:22:A:ASP:CA	1:22:A:ASP:C	1:23:A:VAL:N	9	9.3
(1,8)	1:22:A:ASP:N	1:22:A:ASP:CA	1:22:A:ASP:C	1:23:A:VAL:N	3	6.9
(1,26)	1:37:A:LYS:N	1:37:A:LYS:CA	1:37:A:LYS:C	1:38:A:VAL:N	13	5.61
(1,53)	1:55:A:MET:C	1:56:A:LYS:N	1:56:A:LYS:CA	1:56:A:LYS:C	17	5.57
(1,139)	1:105:A:ASP:N	1:105:A:ASP:CA	1:105:A:ASP:C	1:106:A:GLN:N	19	5.47
(1,26)	1:37:A:LYS:N	1:37:A:LYS:CA	1:37:A:LYS:C	1:38:A:VAL:N	2	4.9