wwPDB NMR Structure Validation Summary Report

Jun 6, 2023 – 05:25 pm BST

PDB ID	:	5FRG
BMRB ID	:	25945
Title	:	The NMR Structure of the Cdc42-interacting region of TOCA1
Authors	:	Watson, J.R.; Nietlispach, D.; Owen, D.; Mott, H.R.
Deposited on	:	2015-12-17

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 (1)) were used in the production of this report:

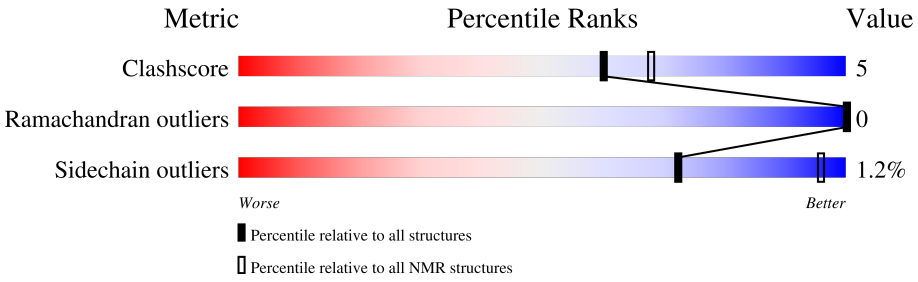
MolProbity	:	4.02b-467
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
wwPDB-RCI	:	v_1n_11_5_13_A (Berjanski et al., 2005)
PANAV	:	Wang et al. (2010)
wwPDB-ShiftChecker	:	v1.2
BMRB Restraints Analysis	:	v1.2
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal 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 91%.

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	104	72% 7% 21%

2 Ensemble composition and analysis

This entry contains 35 models. Model 32 is the overall representative, medoid model (most similar to other models). The authors have identified model 1 as representative.

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:337-A:418 (82)	0.83	32

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 6 clusters. No single-model clusters were found.

Cluster number	Models
1	1, 2, 16, 21, 22, 23, 28, 30, 31, 32, 33
2	8, 10, 17, 19, 20, 26, 34
3	3, 6, 9, 12, 13, 18
4	5, 15, 25, 27, 29
5	4, 11, 14, 35
6	7, 24

3 Entry composition (i)

There is only 1 type of molecule in this entry. The entry contains 1693 atoms, of which 847 are hydrogens and 0 are deuteriums.

- Molecule 1 is a protein called FORMIN-BINDING PROTEIN 1-LIKE.

Mol	Chain	Residues	Atoms						Trace
			Total	C	H	N	O	S	
1	A	104	1693	517	847	158	166	5	0

There are 7 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	323	GLY	-	expression tag	UNP Q6GUF4
A	324	PRO	-	expression tag	UNP Q6GUF4
A	325	LEU	-	expression tag	UNP Q6GUF4
A	326	GLY	-	expression tag	UNP Q6GUF4
A	327	SER	-	expression tag	UNP Q6GUF4
A	328	HIS	-	expression tag	UNP Q6GUF4
A	329	MET	-	expression tag	UNP Q6GUF4

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: FORMIN-BINDING PROTEIN 1-LIKE

Chain A:

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

The representative model is number 32. Colouring as in section 4.1 above.

- Molecule 1: FORMIN-BINDING PROTEIN 1-LIKE

Chain A:

5 Refinement protocol and experimental data overview

The models were refined using the following method: *ARIA2.3; CNS 1.2.*

Of the 100 calculated structures, 35 were deposited, based on the following criterion: *LOWEST ENERGY.*

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

Software name	Classification	Version
ARIA2.3; CNS1.2	refinement	CNS1.2
ARIA	structure solution	2.3
CcpNmr Analysis	structure solution	2.3
Azara	structure solution	
CNS	structure solution	1.2

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	1412
Number of shifts mapped to atoms	1412
Number of unparsed shifts	0
Number of shifts with mapping errors	0
Number of shifts with mapping warnings	0
Assignment completeness (well-defined parts)	91%

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	687	688	685	6±2
All	All	24045	24080	23975	227

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 5.

5 of 54 unique clashes are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Clash(Å)	Distance(Å)	Models	
				Worst	Total
1:A:345:ARG:O	1:A:349:LEU:HG	0.65	1.90	15	6
1:A:413:TRP:O	1:A:416:GLU:HG3	0.57	2.00	14	2
1:A:361:GLN:HA	1:A:364:MET:SD	0.56	2.40	20	1
1:A:349:LEU:O	1:A:353:ILE:HG13	0.56	2.01	16	1
1:A:402:ARG:O	1:A:405:MET:HG2	0.55	2.02	26	18

6.3 Torsion angles

6.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all NMR entries. The Analysed column shows the number of residues for which the backbone conformation was analysed and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	82/104 (79%)	81±1 (99±1%)	1±1 (1±1%)	0±0 (0±0%)	100	100
All	All	2870/3640 (79%)	2828 (99%)	42 (1%)	0 (0%)	100	100

There are no Ramachandran outliers.

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	78/95 (82%)	77±1 (99±1%)	1±1 (1±1%)	72	96
All	All	2730/3325 (82%)	2698 (99%)	32 (1%)	72	96

5 of 18 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	350	GLN	5
1	A	382	GLN	3
1	A	340	LEU	2
1	A	342	PRO	2
1	A	346	ARG	2

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

There are no ligands in this entry.

6.7 Other polymers

There are no such molecules in this entry.

6.8 Polymer linkage issues

There are no chain breaks in this entry.

7 Chemical shift validation

The completeness of assignment taking into account all chemical shift lists is 91% for the well-defined parts and 90% 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

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	1412
Number of shifts mapped to atoms	1412
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

The following errors were found when reading this chemical shift list.

- Chemical shift has been reported more than once. First 5 (of 0) occurrences are reported below.

List ID	Chain	Res	Type	Atom	Shift Data		
					Value	Uncertainty	Ambiguity
1	A	325	LEU	HD12	0.866	0.002	2
1	A	325	LEU	HD13	0.866	0.002	2
1	A	325	LEU	HD22	0.846	0.021	2
1	A	325	LEU	HD23	0.846	0.021	2
1	A	329	MET	HE2	1.999	0.0	1
1	A	329	MET	HE3	1.999	0.0	1
1	A	333	ALA	HB2	1.142	0.006	1
1	A	333	ALA	HB3	1.142	0.006	1
1	A	334	LEU	HD12	0.756	0.016	2
1	A	334	LEU	HD13	0.756	0.016	2
1	A	334	LEU	HD22	0.791	0.02	2
1	A	334	LEU	HD23	0.791	0.02	2
1	A	340	LEU	HD12	0.696	0.012	2
1	A	340	LEU	HD13	0.696	0.012	2

Continued on next page...

Continued from previous page...

List ID	Chain	Res	Type	Atom	Shift Data		
					Value	Uncertainty	Ambiguity
1	A	340	LEU	HD22	0.697	0.012	2
1	A	340	LEU	HD23	0.697	0.012	2
1	A	349	LEU	HD12	1.430	0.01	2
1	A	349	LEU	HD13	1.430	0.01	2
1	A	349	LEU	HD22	0.807	0.008	2
1	A	349	LEU	HD23	0.807	0.008	2
1	A	353	ILE	HD12	0.751	0.011	1
1	A	353	ILE	HD13	0.751	0.011	1
1	A	353	ILE	HG22	0.909	0.011	1
1	A	353	ILE	HG23	0.909	0.011	1
1	A	356	LEU	HD12	0.747	0.007	2
1	A	356	LEU	HD13	0.747	0.007	2
1	A	356	LEU	HD22	0.874	0.011	2
1	A	356	LEU	HD23	0.874	0.011	2
1	A	360	LEU	HD12	0.856	0.012	2
1	A	360	LEU	HD13	0.856	0.012	2
1	A	360	LEU	HD22	0.999	0.005	2
1	A	360	LEU	HD23	0.999	0.005	2
1	A	364	MET	HE2	2.030	0.017	1
1	A	364	MET	HE3	2.030	0.017	1
1	A	369	ALA	HB2	1.476	0.008	1
1	A	369	ALA	HB3	1.476	0.008	1
1	A	370	LEU	HD12	0.744	0.017	2
1	A	370	LEU	HD13	0.744	0.017	2
1	A	370	LEU	HD22	0.846	0.015	2
1	A	370	LEU	HD23	0.846	0.015	2
1	A	373	MET	HE2	1.945	0.009	1
1	A	373	MET	HE3	1.945	0.009	1
1	A	376	VAL	HG12	0.986	0.013	2
1	A	376	VAL	HG13	0.986	0.013	2
1	A	376	VAL	HG22	1.008	0.013	2
1	A	376	VAL	HG23	1.008	0.013	2
1	A	383	MET	HE2	2.041	0.01	1
1	A	383	MET	HE3	2.041	0.01	1
1	A	389	LEU	HD12	0.737	0.007	2
1	A	389	LEU	HD13	0.737	0.007	2
1	A	389	LEU	HD22	0.830	0.014	2
1	A	389	LEU	HD23	0.830	0.014	2
1	A	393	ILE	HD12	0.741	0.011	1
1	A	393	ILE	HD13	0.741	0.011	1
1	A	393	ILE	HG22	0.852	0.009	1

Continued on next page...

Continued from previous page...

List ID	Chain	Res	Type	Atom	Shift Data		
					Value	Uncertainty	Ambiguity
1	A	393	ILE	HG23	0.852	0.009	1
1	A	394	ALA	HB2	1.411	0.008	1
1	A	394	ALA	HB3	1.411	0.008	1
1	A	396	THR	HG22	1.349	0.01	1
1	A	396	THR	HG23	1.349	0.01	1
1	A	397	THR	HG22	1.197	0.008	1
1	A	397	THR	HG23	1.197	0.008	1
1	A	400	ILE	HD12	0.813	0.017	1
1	A	400	ILE	HD13	0.813	0.017	1
1	A	400	ILE	HG22	0.839	0.009	1
1	A	400	ILE	HG23	0.839	0.009	1
1	A	403	LEU	HD12	0.907	0.006	2
1	A	403	LEU	HD13	0.907	0.006	2
1	A	403	LEU	HD22	0.727	0.012	2
1	A	403	LEU	HD23	0.727	0.012	2
1	A	405	MET	HE2	2.041	0.016	1
1	A	405	MET	HE3	2.041	0.016	1
1	A	407	ILE	HD12	0.733	0.006	1
1	A	407	ILE	HD13	0.733	0.006	1
1	A	407	ILE	HG22	0.818	0.015	1
1	A	407	ILE	HG23	0.818	0.015	1
1	A	412	ALA	HB2	1.217	0.008	1
1	A	412	ALA	HB3	1.217	0.008	1
1	A	414	LEU	HD12	0.981	0.007	2
1	A	414	LEU	HD13	0.981	0.007	2
1	A	414	LEU	HD22	0.869	0.011	2
1	A	414	LEU	HD23	0.869	0.011	2
1	A	417	VAL	HG12	0.975	0.014	2
1	A	417	VAL	HG13	0.975	0.014	2
1	A	417	VAL	HG22	0.999	0.015	2
1	A	417	VAL	HG23	0.999	0.015	2
1	A	421	VAL	HG12	0.891	0.008	2
1	A	421	VAL	HG13	0.891	0.008	2
1	A	421	VAL	HG22	0.891	0.008	2
1	A	421	VAL	HG23	0.891	0.008	2

7.1.2 Chemical shift referencing (i)

The following table shows the suggested chemical shift referencing corrections.

Nucleus	# values	Correction ± precision, *ppm*	Suggested action
$^{13}C_{\alpha}$	104	-0.56 ± 0.09	Should be checked
$^{13}C_{\beta}$	99	0.06 ± 0.05	None needed (< 0.5 ppm)
$^{13}C'$	93	0.13 ± 0.13	None needed (< 0.5 ppm)
^{15}N	94	0.16 ± 0.32	None needed (< 0.5 ppm)

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 91%, i.e. 1083 atoms were assigned a chemical shift out of a possible 1192. 0 out of 10 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

	Total	^{1}H	^{13}C	^{15}N
Backbone	396/401 (99%)	160/160 (100%)	159/164 (97%)	77/77 (100%)
Sidechain	645/736 (88%)	436/468 (93%)	196/229 (86%)	13/39 (33%)
Aromatic	42/55 (76%)	21/27 (78%)	20/21 (95%)	1/7 (14%)
Overall	1083/1192 (91%)	617/655 (94%)	375/414 (91%)	91/123 (74%)

7.1.4 Statistically unusual chemical shifts

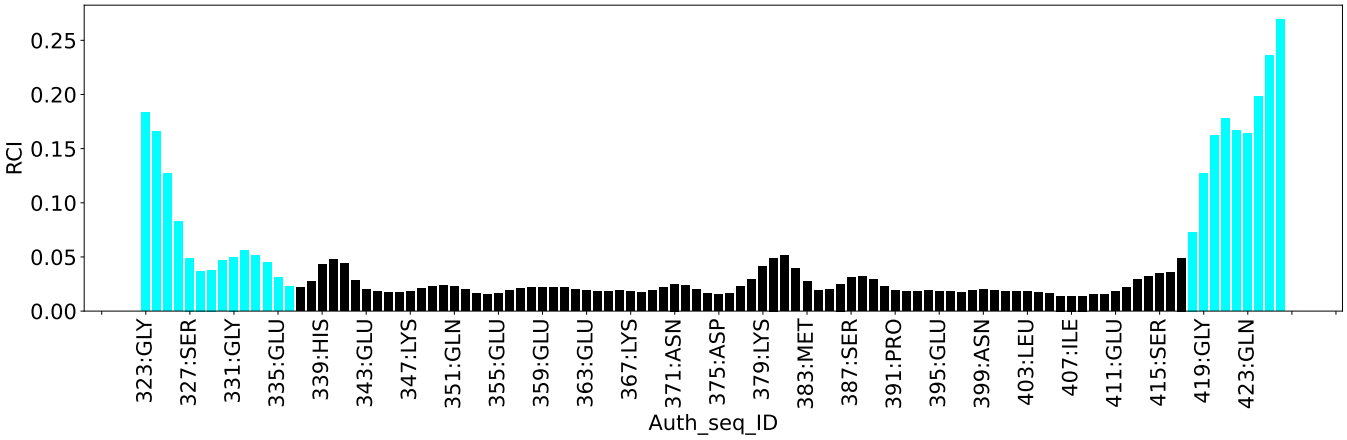
The following table lists the statistically unusual chemical shifts. These are statistical measures, and large deviations from the mean do not necessarily imply incorrect assignments. Molecules containing paramagnetic centres or hemes are expected to give rise to anomalous chemical shifts.

List Id	Chain	Res	Type	Atom	Shift, *ppm*	Expected range, *ppm*	Z-score
1	A	336	ASP	HB2	1.08	1.41 – 4.01	-6.3
1	A	336	ASP	HB3	1.21	1.32 – 4.00	-5.4

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:


RCI
0.25
0.20
0.15
0.10
0.05
0.00
323:GLY
327:SER
331:GLY
335:GLU
339:HIS
343:GLU
347:LYS
351:GLN
355:GLU
359:GLU
363:GLU
367:LYS
371:ASN
375:ASP
379:LYS
383:MET
387:SER
391:PRO
395:GLU
399:ASN
403:LEU
407:ILE
411:GLU
415:SER
419:GLY
423:GLN
Auth_seq_ID

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	3360
Intra-residue (|i-j|=0)	1310
Sequential (|i-j|=1)	772
Medium range (|i-j|>1 and |i-j|<5)	849
Long range (|i-j|≥5)	429
Inter-chain	0
Hydrogen bond restraints	0
Disulfide bond restraints	0
Total dihedral-angle restraints	0
Number of unmapped restraints	0
Number of restraints per residue	32.3
Number of long range restraints per residue[1]	4.1

[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

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)	34.1	0.2
0.2-0.5 (Medium)	58.2	0.5
>0.5 (Large)	137.7	4.3

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

Dihedral-angle violations less than 1° are not included in the calculation.There are no dihedral-angle violations

9 Distance violation analysis (i)

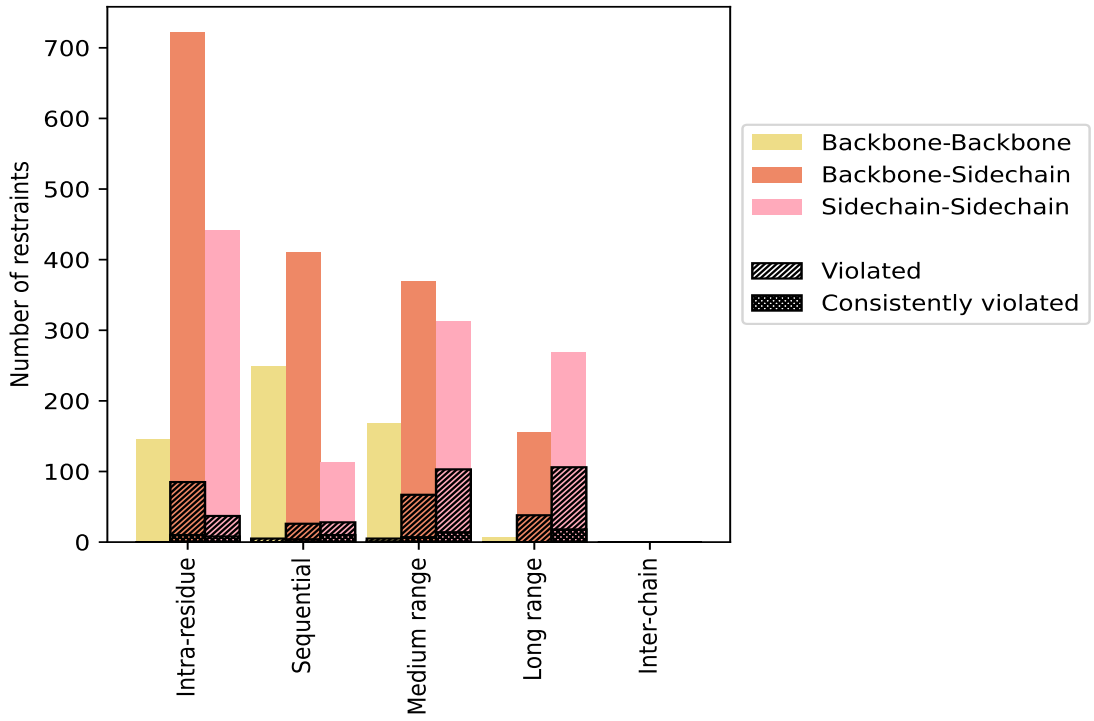
9.1 Summary of distance violations (i)

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)	1310	39.0	122	9.3	3.6	18	1.4	0.5
Backbone-Backbone	146	4.3	0	0.0	0.0	0	0.0	0.0
Backbone-Sidechain	722	21.5	85	11.8	2.5	10	1.4	0.3
Sidechain-Sidechain	442	13.2	37	8.4	1.1	8	1.8	0.2
Sequential (|i-j|=1)	772	23.0	59	7.6	1.8	14	1.8	0.4
Backbone-Backbone	249	7.4	5	2.0	0.1	0	0.0	0.0
Backbone-Sidechain	410	12.2	26	6.3	0.8	4	1.0	0.1
Sidechain-Sidechain	113	3.4	28	24.8	0.8	10	8.8	0.3
Medium range (|i-j|>1 & |i-j|<5)	849	25.3	175	20.6	5.2	22	2.6	0.7
Backbone-Backbone	168	5.0	5	3.0	0.1	1	0.6	0.0
Backbone-Sidechain	369	11.0	67	18.2	2.0	7	1.9	0.2
Sidechain-Sidechain	312	9.3	103	33.0	3.1	14	4.5	0.4
Long range (|i-j|≥5)	429	12.8	144	33.6	4.3	18	4.2	0.5
Backbone-Backbone	6	0.2	0	0.0	0.0	0	0.0	0.0
Backbone-Sidechain	155	4.6	38	24.5	1.1	0	0.0	0.0
Sidechain-Sidechain	268	8.0	106	39.6	3.2	18	6.7	0.5
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	0	0.0	0	0.0	0.0	0	0.0	0.0
Disulfide bond	0	0.0	0	0.0	0.0	0	0.0	0.0
Total	3360	100.0	500	14.9	14.9	72	2.1	2.1
Backbone-Backbone	569	16.9	10	1.8	0.3	1	0.2	0.0
Backbone-Sidechain	1656	49.3	216	13.0	6.4	21	1.3	0.6
Sidechain-Sidechain	1135	33.8	274	24.1	8.2	50	4.4	1.5

[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



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

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	53	34	75	78	0	240	0.86	4.3	0.74	0.64
2	60	28	77	75	0	240	0.82	3.01	0.67	0.62
3	54	31	81	70	0	236	0.84	3.31	0.69	0.64
4	54	29	78	63	0	224	0.84	3.92	0.67	0.64
5	58	27	72	68	0	225	0.82	3.78	0.72	0.54
6	52	32	71	81	0	236	0.89	3.89	0.75	0.66
7	55	30	68	76	0	229	0.84	3.28	0.65	0.65
8	51	32	65	67	0	215	0.84	3.23	0.68	0.61
9	56	31	66	70	0	223	0.84	2.96	0.64	0.69
10	58	31	87	68	0	244	0.81	3.3	0.67	0.62
11	50	32	79	71	0	232	0.83	3.9	0.68	0.64

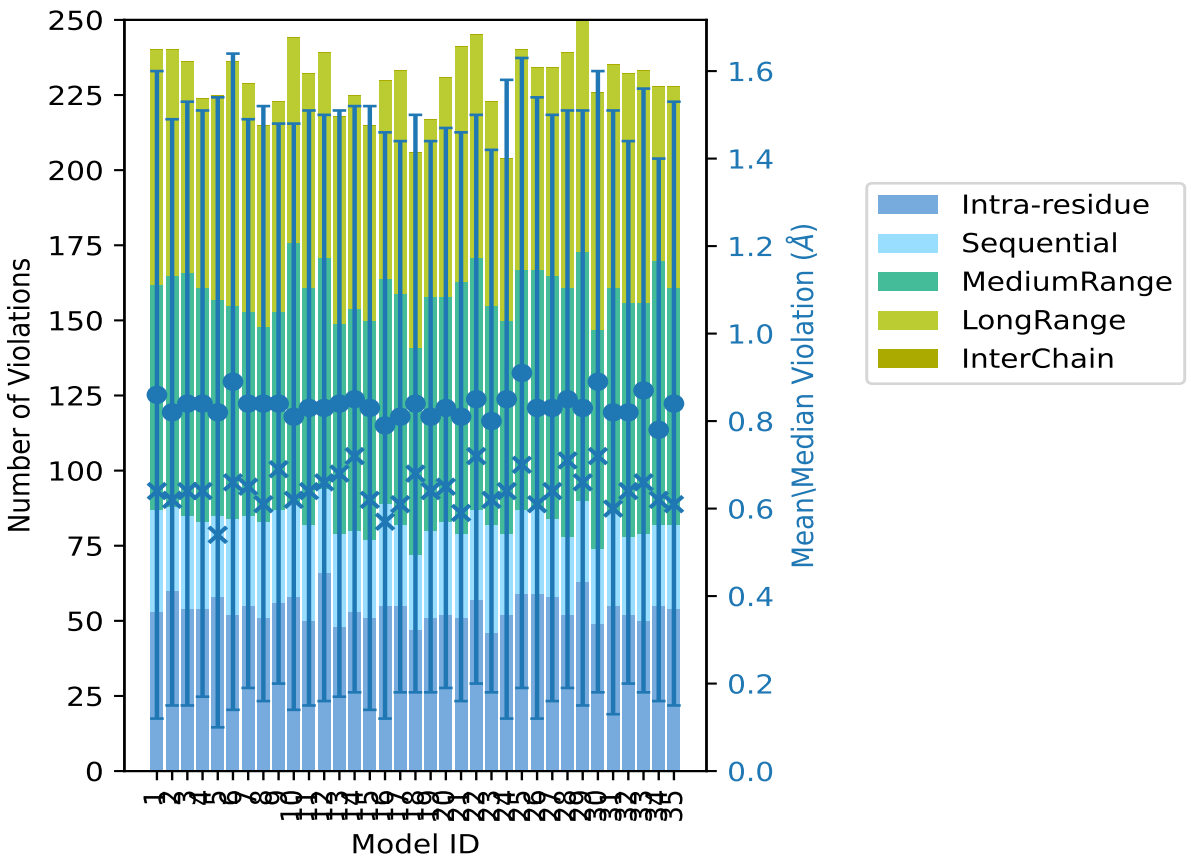
Continued on next page...

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				
12	66	28	77	68	0	239	0.83	3.26	0.67	0.66
13	48	31	70	69	0	218	0.84	3.86	0.67	0.68
14	53	27	74	71	0	225	0.85	3.34	0.67	0.72
15	51	26	73	65	0	215	0.83	3.83	0.69	0.62
16	55	34	75	66	0	230	0.79	3.33	0.67	0.57
17	55	27	77	74	0	233	0.81	3.86	0.63	0.61
18	47	25	69	65	0	206	0.84	3.82	0.66	0.68
19	51	29	78	59	0	217	0.81	2.83	0.63	0.64
20	52	31	75	73	0	231	0.83	3.28	0.64	0.65
21	51	28	84	78	0	241	0.81	3.93	0.65	0.59
22	57	30	84	74	0	245	0.85	3.18	0.65	0.72
23	46	36	73	68	0	223	0.8	3.11	0.62	0.62
24	52	27	71	54	0	204	0.85	3.95	0.73	0.64
25	59	28	80	73	0	240	0.91	3.18	0.72	0.7
26	59	29	79	67	0	234	0.83	4.0	0.71	0.61
27	58	26	81	69	0	234	0.83	3.3	0.67	0.64
28	52	26	83	78	0	239	0.85	3.13	0.66	0.71
29	63	27	83	77	0	250	0.83	3.39	0.68	0.66
30	49	25	73	79	0	226	0.89	3.91	0.71	0.72
31	55	31	75	74	0	235	0.82	3.9	0.69	0.6
32	52	26	78	76	0	232	0.82	3.32	0.62	0.64
33	50	29	77	77	0	233	0.87	4.05	0.69	0.66
34	55	27	88	58	0	228	0.78	2.96	0.62	0.62
35	54	28	79	67	0	228	0.84	3.85	0.69	0.61

[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 (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 (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, 2860(IR:1188, SQ:713, MR:674, LR:285, 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]	%
12	10	21	19	0	62	1	2.9
7	4	18	13	0	42	2	5.7
10	3	8	5	0	26	3	8.6
2	3	8	5	0	18	4	11.4
6	1	10	6	0	23	5	14.3
2	1	7	1	0	11	6	17.1

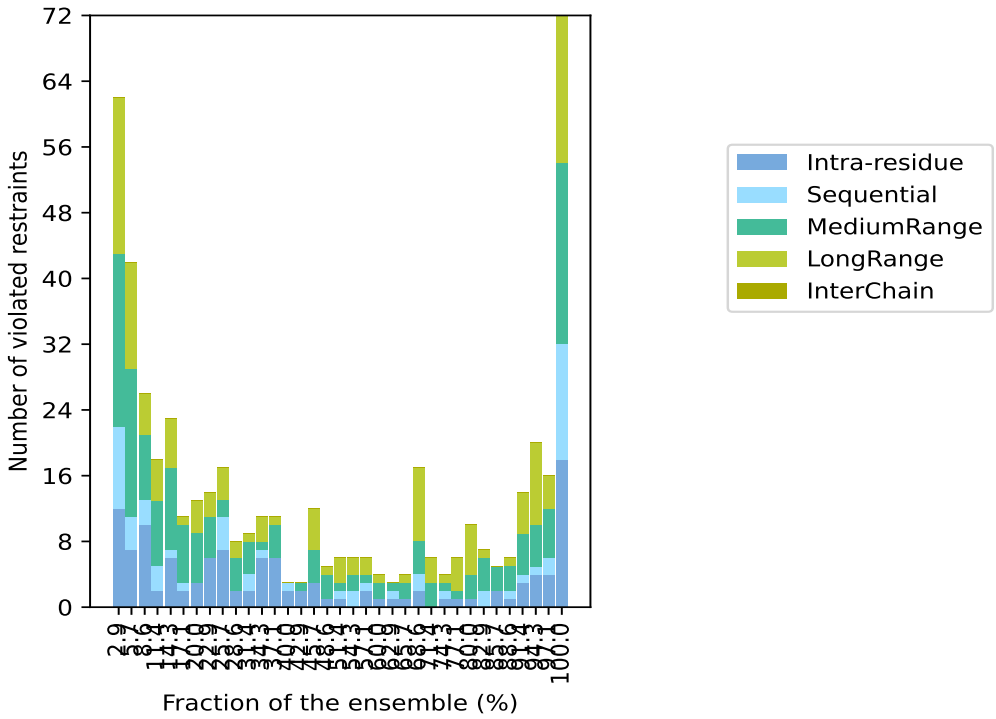
Continued on next page...

Continued from previous page...

Number of violated restraints						Fraction of the ensemble	
IR[1]	SQ[2]	MR[3]	LR[4]	IC[5]	Total	Count[6]	%
3	0	6	4	0	13	7	20.0
6	0	5	3	0	14	8	22.9
7	4	2	4	0	17	9	25.7
2	0	4	2	0	8	10	28.6
2	2	4	1	0	9	11	31.4
6	1	1	3	0	11	12	34.3
6	0	4	1	0	11	13	37.1
2	1	0	0	0	3	14	40.0
2	0	1	0	0	3	15	42.9
3	0	4	5	0	12	16	45.7
1	0	3	1	0	5	17	48.6
1	1	1	3	0	6	18	51.4
0	2	2	2	0	6	19	54.3
2	1	1	2	0	6	20	57.1
1	0	2	1	0	4	21	60.0
1	1	1	0	0	3	22	62.9
1	0	2	1	0	4	23	65.7
2	2	4	9	0	17	24	68.6
0	0	3	3	0	6	25	71.4
1	1	1	1	0	4	26	74.3
1	0	1	4	0	6	27	77.1
1	0	3	6	0	10	28	80.0
0	2	4	1	0	7	29	82.9
2	0	3	0	0	5	30	85.7
1	1	3	1	0	6	31	88.6
3	1	5	5	0	14	32	91.4
4	1	5	10	0	20	33	94.3
4	2	6	4	0	16	34	97.1
18	14	22	18	0	72	35	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

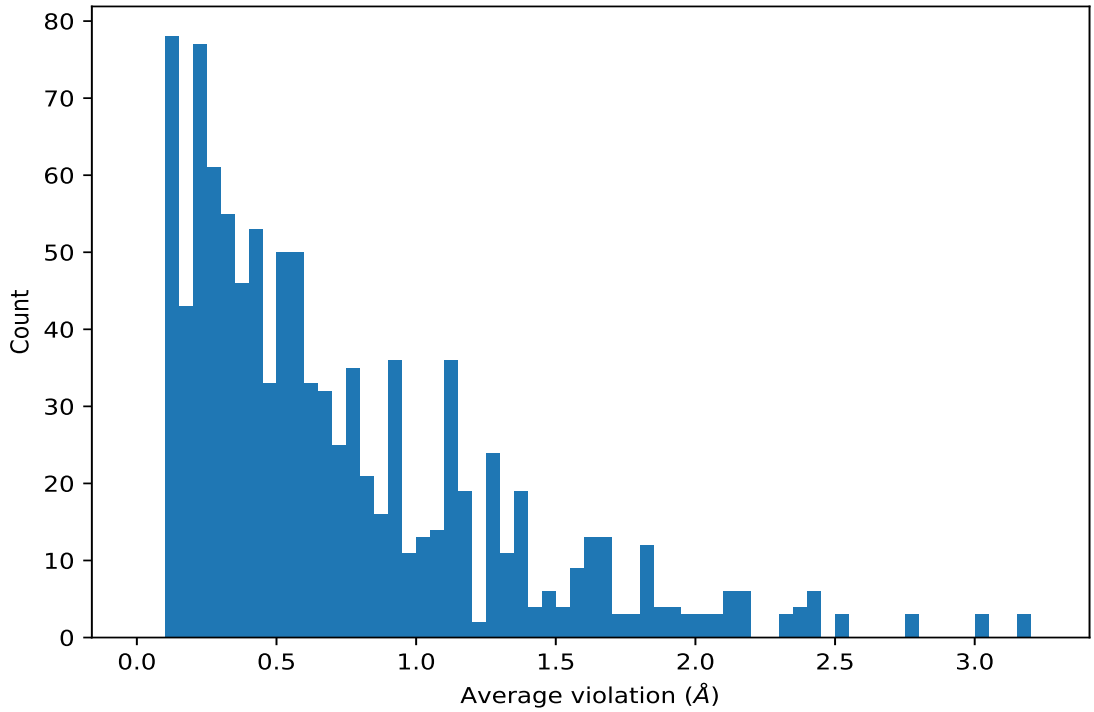
9.3.1 Bar graph : Distance violation statistics for the ensemble



9.4 Most violated distance restraints in the ensemble

9.4.1 Histogram : Distribution of mean distance 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



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)
(1,1022)	1:A:376:VAL:HG11	1:A:372:LYS:HD3	35	3.18	0.6	2.91
(1,1022)	1:A:376:VAL:HG12	1:A:372:LYS:HD3	35	3.18	0.6	2.91
(1,1022)	1:A:376:VAL:HG13	1:A:372:LYS:HD3	35	3.18	0.6	2.91
(1,1024)	1:A:376:VAL:HG11	1:A:372:LYS:HD2	35	3.0	0.24	2.98
(1,1024)	1:A:376:VAL:HG12	1:A:372:LYS:HD2	35	3.0	0.24	2.98
(1,1024)	1:A:376:VAL:HG13	1:A:372:LYS:HD2	35	3.0	0.24	2.98
(1,1018)	1:A:376:VAL:HG21	1:A:383:MET:HB3	35	2.8	0.42	2.72
(1,1018)	1:A:376:VAL:HG22	1:A:383:MET:HB3	35	2.8	0.42	2.72
(1,1018)	1:A:376:VAL:HG23	1:A:383:MET:HB3	35	2.8	0.42	2.72
(1,1025)	1:A:376:VAL:HG11	1:A:372:LYS:HG2	35	2.54	0.1	2.55
(1,1025)	1:A:376:VAL:HG12	1:A:372:LYS:HG2	35	2.54	0.1	2.55
(1,1025)	1:A:376:VAL:HG13	1:A:372:LYS:HG2	35	2.54	0.1	2.55
(1,1207)	1:A:376:VAL:HG21	1:A:382:GLN:HB3	35	2.44	0.05	2.44
(1,1207)	1:A:376:VAL:HG22	1:A:382:GLN:HB3	35	2.44	0.05	2.44
(1,1207)	1:A:376:VAL:HG23	1:A:382:GLN:HB3	35	2.44	0.05	2.44
(1,1207)	1:A:376:VAL:HG21	1:A:382:GLN:HB2	35	2.44	0.05	2.44

Continued on next page...

Continued from previous page...

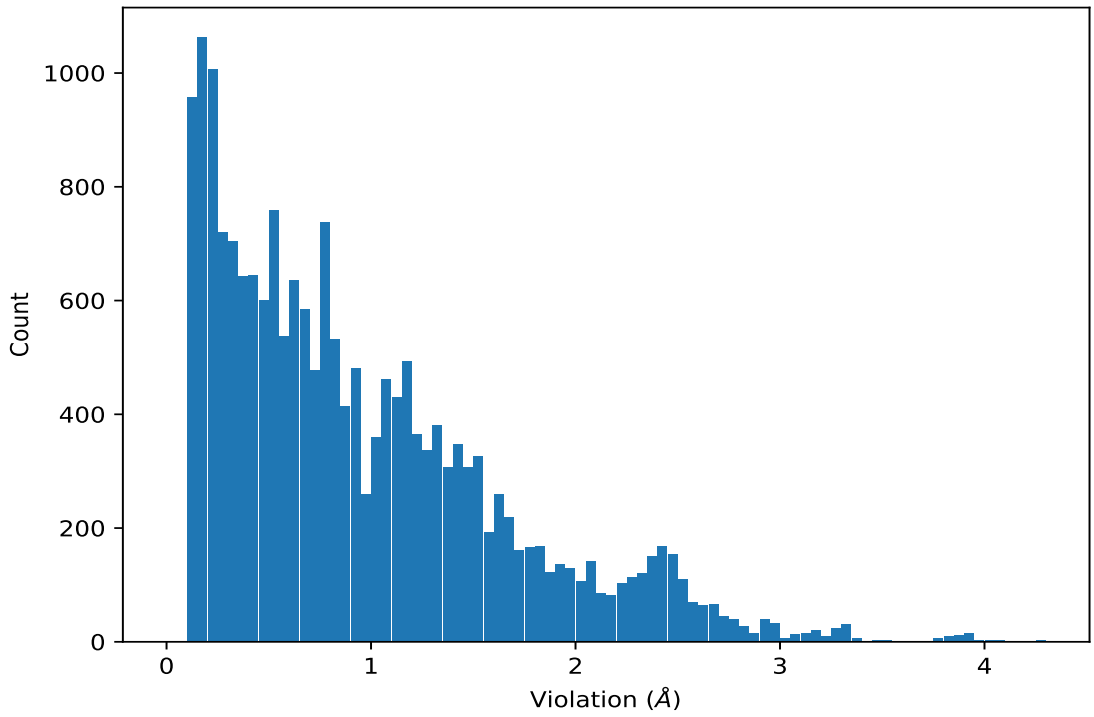
Key	Atom-1	Atom-2	Models[1]	Mean (Å)	SD[1] (Å)	Median (Å)
(1,1207)	1:A:376:VAL:HG22	1:A:382:GLN:HB2	35	2.44	0.05	2.44
(1,1207)	1:A:376:VAL:HG23	1:A:382:GLN:HB2	35	2.44	0.05	2.44
(1,2246)	1:A:344:GLN:HB2	1:A:341:PRO:HD3	35	2.37	0.47	2.43
(1,1013)	1:A:376:VAL:HG11	1:A:375:ASP:HB2	35	2.35	0.05	2.35
(1,1013)	1:A:376:VAL:HG12	1:A:375:ASP:HB2	35	2.35	0.05	2.35
(1,1013)	1:A:376:VAL:HG13	1:A:375:ASP:HB2	35	2.35	0.05	2.35
(1,1936)	1:A:417:VAL:HG21	1:A:346:ARG:HG3	35	2.32	0.47	2.4
(1,1936)	1:A:417:VAL:HG22	1:A:346:ARG:HG3	35	2.32	0.47	2.4
(1,1936)	1:A:417:VAL:HG23	1:A:346:ARG:HG3	35	2.32	0.47	2.4
(1,3313)	1:A:362:LYS:HG2	1:A:361:GLN:HB2	35	1.91	0.3	1.97
(1,2427)	1:A:417:VAL:HG21	1:A:342:PRO:HB2	35	1.88	0.5	1.9

[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)
(1,3327)	1:A:409:LYS:HA	1:A:334:LEU:HD21	1	4.3
(1,3327)	1:A:409:LYS:HA	1:A:334:LEU:HD22	1	4.3
(1,3327)	1:A:409:LYS:HA	1:A:334:LEU:HD23	1	4.3
(1,1022)	1:A:376:VAL:HG11	1:A:372:LYS:HD3	33	4.05
(1,1022)	1:A:376:VAL:HG12	1:A:372:LYS:HD3	33	4.05
(1,1022)	1:A:376:VAL:HG13	1:A:372:LYS:HD3	33	4.05
(1,1022)	1:A:376:VAL:HG11	1:A:372:LYS:HD3	26	4.0
(1,1022)	1:A:376:VAL:HG12	1:A:372:LYS:HD3	26	4.0
(1,1022)	1:A:376:VAL:HG13	1:A:372:LYS:HD3	26	4.0
(1,1022)	1:A:376:VAL:HG11	1:A:372:LYS:HD3	24	3.95
(1,1022)	1:A:376:VAL:HG12	1:A:372:LYS:HD3	24	3.95
(1,1022)	1:A:376:VAL:HG13	1:A:372:LYS:HD3	24	3.95
(1,1022)	1:A:376:VAL:HG11	1:A:372:LYS:HD3	21	3.93
(1,1022)	1:A:376:VAL:HG12	1:A:372:LYS:HD3	21	3.93
(1,1022)	1:A:376:VAL:HG13	1:A:372:LYS:HD3	21	3.93
(1,1022)	1:A:376:VAL:HG11	1:A:372:LYS:HD3	4	3.92
(1,1022)	1:A:376:VAL:HG12	1:A:372:LYS:HD3	4	3.92
(1,1022)	1:A:376:VAL:HG13	1:A:372:LYS:HD3	4	3.92
(1,1022)	1:A:376:VAL:HG11	1:A:372:LYS:HD3	30	3.91
(1,1022)	1:A:376:VAL:HG12	1:A:372:LYS:HD3	30	3.91
(1,1022)	1:A:376:VAL:HG13	1:A:372:LYS:HD3	30	3.91
(1,1022)	1:A:376:VAL:HG11	1:A:372:LYS:HD3	31	3.9
(1,1022)	1:A:376:VAL:HG12	1:A:372:LYS:HD3	31	3.9
(1,1022)	1:A:376:VAL:HG13	1:A:372:LYS:HD3	31	3.9
(1,1018)	1:A:376:VAL:HG21	1:A:383:MET:HB3	11	3.9
(1,1018)	1:A:376:VAL:HG22	1:A:383:MET:HB3	11	3.9
(1,1018)	1:A:376:VAL:HG23	1:A:383:MET:HB3	11	3.9
(1,1018)	1:A:376:VAL:HG21	1:A:383:MET:HB3	6	3.89

10 Dihedral-angle violation analysis (i)

No dihedral-angle restraints found