



Full wwPDB NMR Structure Validation Report ⓘ

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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 : 4.02b-467
Mogul : 2022.3.0, CSD as543be (2022)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
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) : 2.40

2 Ensemble composition and analysis

This entry contains 20 models. This entry does not contain polypeptide chains, therefore identification of well-defined residues and clustering analysis are not possible. All residues are included in the validation scores.

3 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 659 atoms, of which 232 are hydrogens and 0 are deuteriums.

- Molecule 1 is a DNA chain called DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3').

| Mol | Chain | Residues | Atoms | | | | | Trace | |
|-----|-------|----------|-------|----|----|----|----|-------|---|
| | | | Total | C | H | N | O | | P |
| 1 | A | 5 | 164 | 54 | 58 | 22 | 26 | 4 | 0 |
| 1 | B | 5 | 164 | 54 | 58 | 22 | 26 | 4 | 0 |
| 1 | C | 5 | 164 | 54 | 58 | 22 | 26 | 4 | 0 |
| 1 | D | 5 | 164 | 54 | 58 | 22 | 26 | 4 | 0 |

- Molecule 2 is POTASSIUM ION (three-letter code: K) (formula: K).

| Mol | Chain | Residues | Atoms | |
|-----|-------|----------|-------|---|
| | | | Total | K |
| 2 | A | 2 | 2 | 2 |
| 2 | C | 1 | 1 | 1 |

4 Residue-property plots

4.1 Average score per residue in the NMR ensemble

These plots are provided for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic is the same as shown in the summary in section 1 of this report. The second graphic shows the sequence where residues are colour-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. Stretches of 2 or more consecutive residues without any outliers are shown as green connectors. Residues which are classified as ill-defined in the NMR ensemble, are shown in cyan with an underline colour-coded according to the previous scheme. Residues which were present in the experimental sample, but not modelled in the final structure are shown in grey.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.

4.2 Scores per residue for each member of the ensemble

Colouring as in section 4.1 above.

4.2.1 Score per residue for model 1

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.


4.2.2 Score per residue for model 2

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  80% 20%



- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.

4.2.3 Score per residue for model 3

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.

4.2.4 Score per residue for model 4

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.

4.2.5 Score per residue for model 5

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%


There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  80% 20%



4.2.6 Score per residue for model 6

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.

4.2.7 Score per residue for model 7

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.

4.2.8 Score per residue for model 8

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.

4.2.9 Score per residue for model 9

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.

4.2.10 Score per residue for model 10

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.

4.2.11 Score per residue for model 11

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.

4.2.12 Score per residue for model 12

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.

4.2.13 Score per residue for model 13

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%


There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  80% 20%



4.2.14 Score per residue for model 14

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.

4.2.15 Score per residue for model 15

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%


There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  80% 20%



- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.

4.2.16 Score per residue for model 16

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.

4.2.17 Score per residue for model 17

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.

4.2.18 Score per residue for model 18

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.

4.2.19 Score per residue for model 19

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:  100%

There are no outlier residues in this chain.

4.2.20 Score per residue for model 20

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain A:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain B:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain C:  100%

There are no outlier residues in this chain.

- Molecule 1: DNA (5'-D(*GP*GP*(AZW)P*GP*G)-3')

Chain D:

100%

There are no outlier residues in this chain.

5 Refinement protocol and experimental data overview

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

Of the 200 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 |
|---------------|--------------------|---------|
| CNS | structure solution | 1.1 |
| ARIA | structure solution | 1.2 |
| ARIA | refinement | 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 | 82 |
| Number of shifts mapped to atoms | 82 |
| Number of unparsed shifts | 0 |
| Number of shifts with mapping errors | 0 |
| Number of shifts with mapping warnings | 0 |
| Assignment completeness (well-defined parts) | 18% |

6 Model quality [i](#)

6.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: AZW, K

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 | 0.31±0.03 | 0±0/95 (0.0± 0.0%) | 0.96±0.08 | 0±0/144 (0.0± 0.0%) |
| 1 | B | 0.30±0.02 | 0±0/95 (0.0± 0.0%) | 0.94±0.05 | 0±0/144 (0.0± 0.2%) |
| 1 | C | 0.31±0.02 | 0±0/95 (0.0± 0.0%) | 0.94±0.05 | 0±0/144 (0.0± 0.2%) |
| 1 | D | 0.30±0.02 | 0±0/95 (0.0± 0.0%) | 0.94±0.07 | 0±0/144 (0.1± 0.2%) |
| All | All | 0.30 | 0/7600 (0.0%) | 0.94 | 4/11520 (0.0%) |

There are no bond-length outliers.

All unique angle outliers are listed below. They are sorted according to the Z-score of the worst occurrence in the ensemble.

| Mol | Chain | Res | Type | Atoms | Z | Observed(°) | Ideal(°) | Models | |
|-----|-------|-----|------|-------------|-------|-------------|----------|--------|-------|
| | | | | | | | | Worst | Total |
| 1 | D | 5 | DG | O4'-C4'-C3' | -5.58 | 102.27 | 104.50 | 13 | 2 |
| 1 | C | 5 | DG | O4'-C4'-C3' | -5.32 | 102.37 | 104.50 | 15 | 1 |
| 1 | B | 5 | DG | O4'-C4'-C3' | -5.29 | 102.38 | 104.50 | 2 | 1 |

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 |
|-----|-------|-------|----------|----------|---------|
| All | All | 8540 | 4640 | 4720 | - |

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 -.

There are no clashes.

6.3 Torsion angles [i](#)

6.3.1 Protein backbone [i](#)

There are no protein molecules in this entry.

6.3.2 Protein sidechains [i](#)

There are no protein molecules in this entry.

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](#)

Of 3 ligands modelled in this entry, 3 are monoatomic - leaving 0 for Mogul analysis.

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 18% for the well-defined parts and 18% for the entire structure.

7.1 Chemical shift list 1

File name: working_cs.cif

Chemical shift list name: *assigned_chem_shift_list*

7.1.1 Bookkeeping [i](#)

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

| | |
|---|----|
| Total number of shifts | 82 |
| Number of shifts mapped to atoms | 82 |
| Number of unparsed shifts | 0 |
| Number of shifts with mapping errors | 0 |
| Number of shifts with mapping warnings | 0 |
| Number of shift outliers (ShiftChecker) | 1 |

7.1.2 Chemical shift referencing [i](#)

No chemical shift referencing corrections were calculated (not enough data).

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 18%, i.e. 60 atoms were assigned a chemical shift out of a possible 336. 0 out of 0 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

| | Total | ¹ H | ¹³ C | ¹⁵ N |
|---------|--------------|----------------|-----------------|-----------------|
| Sugar | 48/192 (25%) | 28/112 (25%) | 20/80 (25%) | 0/0 (—%) |
| Base | 12/144 (8%) | 8/96 (8%) | 4/16 (25%) | 0/32 (0%) |
| Overall | 60/336 (18%) | 36/208 (17%) | 24/96 (25%) | 0/32 (0%) |

The following table shows the completeness of the chemical shift assignments for the full structure. The overall completeness is 18%, i.e. 60 atoms were assigned a chemical shift out of a possible 336. 0 out of 0 assigned methyl groups (LEU and VAL) were assigned stereospecifically.

| | Total | ¹H | ¹³C | ¹⁵N |
|---------|--------------|----------------------|-----------------------|-----------------------|
| Sugar | 48/192 (25%) | 28/112 (25%) | 20/80 (25%) | 0/0 (—%) |
| Base | 12/144 (8%) | 8/96 (8%) | 4/16 (25%) | 0/32 (0%) |
| Overall | 60/336 (18%) | 36/208 (17%) | 24/96 (25%) | 0/32 (0%) |

7.1.4 Statistically unusual chemical shifts [i](#)

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

| List Id | Chain | Res | Type | Atom | Shift, ppm | Expected range, ppm | Z-score |
|---------|-------|-----|------|------|------------|---------------------|---------|
| 1 | B | 4 | DG | C2' | 32.64 | 32.65 – 47.92 | -5.0 |

7.1.5 Random Coil Index (RCI) plots [i](#)

No *random coil index*(RCI) plot could be generated from the current chemical shift list. RCI is only applicable to proteins

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 | 273 |
| Intra-residue ($ i-j =0$) | 106 |
| Sequential ($ i-j =1$) | 56 |
| Medium range ($ i-j >1$ and $ i-j <5$) | 7 |
| Long range ($ i-j \geq 5$) | 0 |
| Inter-chain | 24 |
| Hydrogen bond restraints | 64 |
| Disulfide bond restraints | 0 |
| Total dihedral-angle restraints | 33 |
| Number of unmapped restraints | 0 |
| Number of restraints per residue | 13.3 |
| Number of long range restraints per residue ¹ | 0.0 |

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) | 1.8 | 0.2 |
| 0.2-0.5 (Medium) | 4.5 | 0.5 |
| >0.5 (Large) | 10.8 | 3.82 |

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) | 0.1 | 1.64 |
| 10.0-20.0 (Medium) | None | None |
| >20.0 (Large) | None | None |

9 Distance violation analysis i

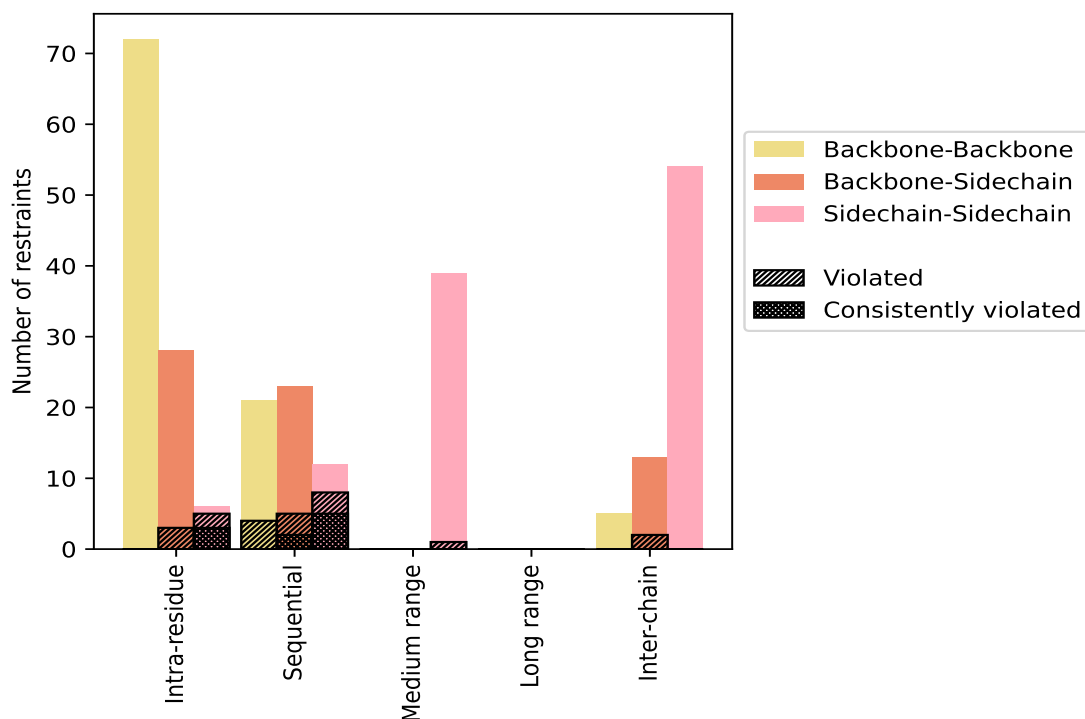
9.1 Summary of distance violations i

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.

| Restrains type | Count | % ¹ | Violated ³ | | | Consistently Violated ⁴ | | |
|---|------------|----------------|-----------------------|----------------|----------------|------------------------------------|----------------|----------------|
| | | | Count | % ² | % ¹ | Count | % ² | % ¹ |
| Intra-residue (i-j =0) | 106 | 38.8 | 8 | 7.5 | 2.9 | 3 | 2.8 | 1.1 |
| Backbone-Backbone | 72 | 26.4 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| Backbone-Sidechain | 28 | 10.3 | 3 | 10.7 | 1.1 | 0 | 0.0 | 0.0 |
| Sidechain-Sidechain | 6 | 2.2 | 5 | 83.3 | 1.8 | 3 | 50.0 | 1.1 |
| Sequential (i-j =1) | 56 | 20.5 | 17 | 30.4 | 6.2 | 7 | 12.5 | 2.6 |
| Backbone-Backbone | 21 | 7.7 | 4 | 19.0 | 1.5 | 0 | 0.0 | 0.0 |
| Backbone-Sidechain | 23 | 8.4 | 5 | 21.7 | 1.8 | 2 | 8.7 | 0.7 |
| Sidechain-Sidechain | 12 | 4.4 | 8 | 66.7 | 2.9 | 5 | 41.7 | 1.8 |
| Medium range (i-j >1 & i-j <5) | 7 | 2.6 | 1 | 14.3 | 0.4 | 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 | 7 | 2.6 | 1 | 14.3 | 0.4 | 0 | 0.0 | 0.0 |
| Long range (i-j ≥5) | 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 |
| Inter-chain | 24 | 8.8 | 2 | 8.3 | 0.7 | 0 | 0.0 | 0.0 |
| Backbone-Backbone | 5 | 1.8 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| Backbone-Sidechain | 13 | 4.8 | 2 | 15.4 | 0.7 | 0 | 0.0 | 0.0 |
| Sidechain-Sidechain | 6 | 2.2 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| Hydrogen bond | 64 | 23.4 | 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 | 273 | 100.0 | 28 | 10.3 | 10.3 | 10 | 3.7 | 3.7 |
| Backbone-Backbone | 98 | 35.9 | 4 | 4.1 | 1.5 | 0 | 0.0 | 0.0 |
| Backbone-Sidechain | 64 | 23.4 | 10 | 15.6 | 3.7 | 2 | 3.1 | 0.7 |
| Sidechain-Sidechain | 111 | 40.7 | 14 | 12.6 | 5.1 | 8 | 7.2 | 2.9 |

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 disulfid bonds are counted in their appropriate category on the x-axis

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

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

| Model ID | Number of violations | | | | | | Mean (Å) | Max (Å) | SD ⁶ (Å) | Median (Å) |
|----------|----------------------|-----------------|-----------------|-----------------|-----------------|-------|----------|---------|---------------------|------------|
| | IR ¹ | SQ ² | MR ³ | LR ⁴ | IC ⁵ | Total | | | | |
| 1 | 4 | 10 | 0 | 0 | 2 | 16 | 0.85 | 2.66 | 0.74 | 0.58 |
| 2 | 3 | 9 | 0 | 0 | 3 | 15 | 1.17 | 2.88 | 0.92 | 0.68 |
| 3 | 5 | 12 | 0 | 0 | 3 | 20 | 0.89 | 2.61 | 0.72 | 0.62 |
| 4 | 6 | 12 | 0 | 0 | 3 | 21 | 0.84 | 2.55 | 0.73 | 0.62 |
| 5 | 5 | 11 | 0 | 0 | 3 | 19 | 0.86 | 3.01 | 0.78 | 0.62 |
| 6 | 3 | 12 | 0 | 0 | 3 | 18 | 0.92 | 2.57 | 0.72 | 0.64 |
| 7 | 3 | 9 | 0 | 0 | 3 | 15 | 1.14 | 2.67 | 0.84 | 0.72 |
| 8 | 3 | 10 | 0 | 0 | 4 | 17 | 0.91 | 2.89 | 0.82 | 0.61 |
| 9 | 5 | 10 | 0 | 0 | 2 | 17 | 0.93 | 2.41 | 0.69 | 0.76 |
| 10 | 5 | 9 | 0 | 0 | 3 | 17 | 0.93 | 2.45 | 0.8 | 0.42 |

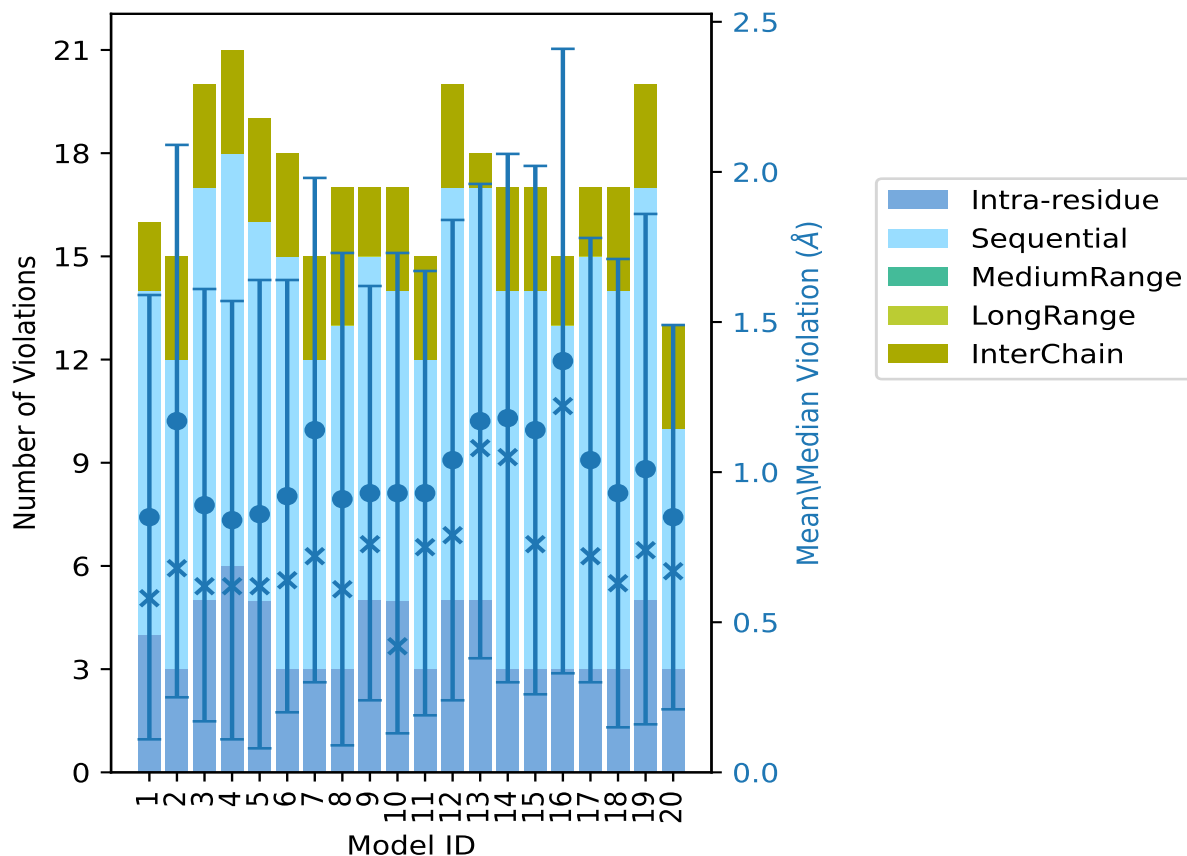
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| Model ID | Number of violations | | | | | Total | Mean (Å) | Max (Å) | SD ⁶ (Å) | Median (Å) |
|----------|----------------------|-----------------|-----------------|-----------------|-----------------|-------|----------|---------|---------------------|------------|
| | IR ¹ | SQ ² | MR ³ | LR ⁴ | IC ⁵ | | | | | |
| 11 | 3 | 9 | 0 | 0 | 3 | 15 | 0.93 | 2.45 | 0.74 | 0.75 |
| 12 | 5 | 12 | 0 | 0 | 3 | 20 | 1.04 | 3.08 | 0.8 | 0.79 |
| 13 | 5 | 12 | 0 | 0 | 1 | 18 | 1.17 | 2.93 | 0.79 | 1.08 |
| 14 | 3 | 11 | 0 | 0 | 3 | 17 | 1.18 | 3.08 | 0.88 | 1.05 |
| 15 | 3 | 11 | 0 | 0 | 3 | 17 | 1.14 | 2.81 | 0.88 | 0.76 |
| 16 | 3 | 10 | 0 | 0 | 2 | 15 | 1.37 | 3.82 | 1.04 | 1.22 |
| 17 | 3 | 12 | 0 | 0 | 2 | 17 | 1.04 | 2.61 | 0.74 | 0.72 |
| 18 | 3 | 11 | 0 | 0 | 3 | 17 | 0.93 | 2.7 | 0.78 | 0.63 |
| 19 | 5 | 12 | 0 | 0 | 3 | 20 | 1.01 | 3.43 | 0.85 | 0.74 |
| 20 | 3 | 7 | 0 | 0 | 3 | 13 | 0.85 | 2.25 | 0.64 | 0.67 |

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 [\(i\)](#)



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

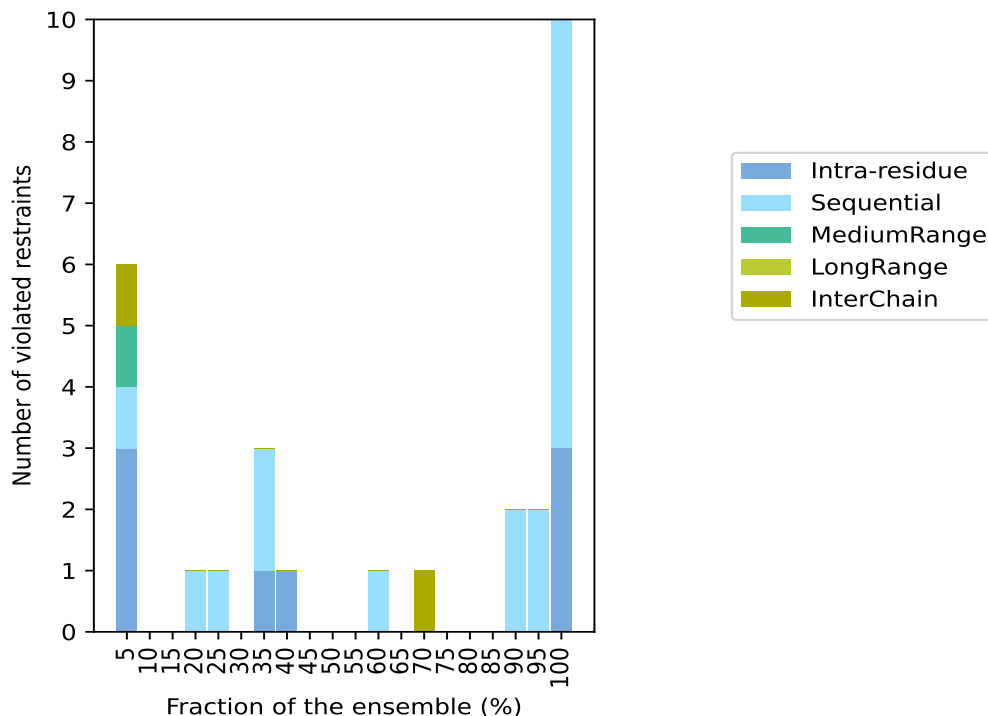
9.3 Distance violation statistics for the ensemble

Violation analysis may find that some restraints are violated in few models and some are violated in most of models. The following table provides this information as number of violated restraints for a given fraction of the ensemble. In total, 165(IR:98, SQ:39, MR:6, LR:0, IC:22) 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 | % |
| 3 | 1 | 1 | 0 | 1 | 6 | 1 | 5.0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 2 | 10.0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 3 | 15.0 |
| 0 | 1 | 0 | 0 | 0 | 1 | 4 | 20.0 |
| 0 | 1 | 0 | 0 | 0 | 1 | 5 | 25.0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 6 | 30.0 |
| 1 | 2 | 0 | 0 | 0 | 3 | 7 | 35.0 |
| 1 | 0 | 0 | 0 | 0 | 1 | 8 | 40.0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 9 | 45.0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 10 | 50.0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 11 | 55.0 |
| 0 | 1 | 0 | 0 | 0 | 1 | 12 | 60.0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 13 | 65.0 |
| 0 | 0 | 0 | 0 | 1 | 1 | 14 | 70.0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 15 | 75.0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 16 | 80.0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 17 | 85.0 |
| 0 | 2 | 0 | 0 | 0 | 2 | 18 | 90.0 |
| 0 | 2 | 0 | 0 | 0 | 2 | 19 | 95.0 |
| 3 | 7 | 0 | 0 | 0 | 10 | 20 | 100.0 |

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

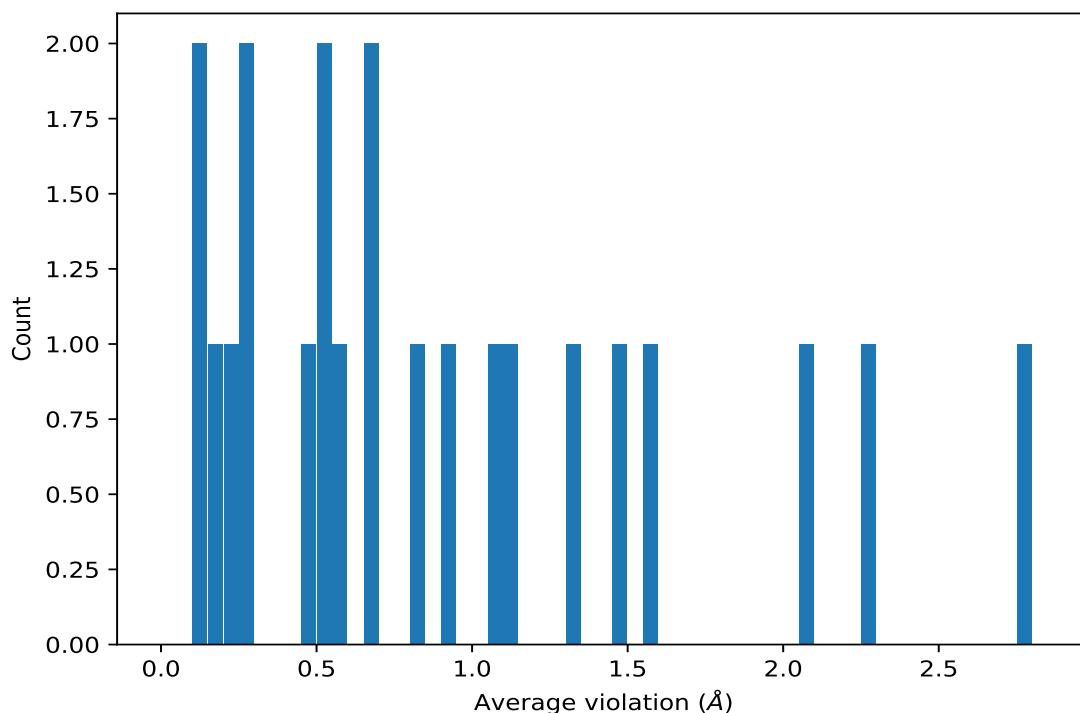
9.3.1 Bar graph : Distance violation statistics for the ensemble [i](#)



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

| Key | Atom-1 | Atom-2 | Models ¹ | Mean (Å) | SD ¹ (Å) | Median (Å) |
|---------|----------------|---------------|---------------------|----------|---------------------|------------|
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 20 | 2.78 | 0.37 | 2.68 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 20 | 2.26 | 0.36 | 2.35 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 20 | 2.09 | 0.35 | 2.13 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 20 | 1.55 | 0.3 | 1.61 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 20 | 1.47 | 0.4 | 1.42 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 20 | 1.14 | 0.35 | 1.18 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 20 | 0.7 | 0.08 | 0.73 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 20 | 0.46 | 0.09 | 0.47 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 20 | 0.29 | 0.01 | 0.29 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 20 | 0.28 | 0.0 | 0.28 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 19 | 0.8 | 0.4 | 0.79 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 19 | 0.23 | 0.08 | 0.23 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 18 | 0.95 | 0.49 | 1.01 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 18 | 0.66 | 0.28 | 0.67 |
| (1,189) | 1:1:A:DG:H5'' | 1:5:C:DG:H8 | 14 | 0.15 | 0.08 | 0.13 |
| (1,105) | 1:2:A:DG:H1 | 1:3:A:AZW:H3A | 12 | 0.52 | 0.29 | 0.5 |

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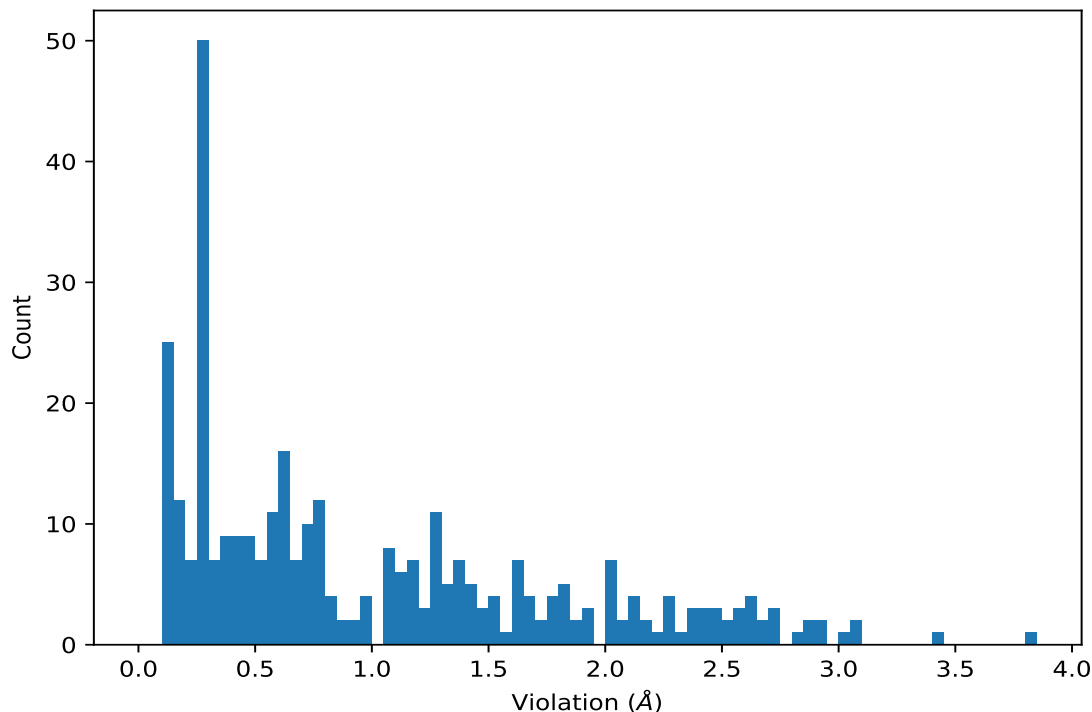
| Key | Atom-1 | Atom-2 | Models ¹ | Mean (Å) | SD ¹ (Å) | Median (Å) |
|---------|----------------|----------------|---------------------|----------|---------------------|------------|
| (1,53) | 1:3:A:AZW:H3A | 1:3:A:AZW:H5'' | 8 | 0.58 | 0.08 | 0.62 |
| (1,108) | 1:2:A:DG:H1' | 1:3:A:AZW:H5' | 7 | 1.31 | 0.09 | 1.35 |
| (1,113) | 1:2:A:DG:H4' | 1:3:A:AZW:H5' | 7 | 1.09 | 0.17 | 1.12 |
| (1,56) | 1:3:A:AZW:H5'' | 1:3:A:AZW:H2A | 7 | 0.18 | 0.01 | 0.19 |
| (1,107) | 1:2:A:DG:H1' | 1:3:A:AZW:H3A | 5 | 0.5 | 0.17 | 0.59 |
| (1,99) | 1:1:A:DG:H3' | 1:2:A:DG:H2' | 4 | 0.11 | 0.01 | 0.11 |

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 lists the absolute value of the violation for each restraint in the ensemble sorted by its value. The Key (restraint list ID, restraint ID) is the unique identifier for a given restraint. Rows with same key represent combinatorial or ambiguous restraints and are counted as a single restraint.

| Key | Atom-1 | Atom-2 | Model ID | Violation (Å) |
|---------|---------------|---------------|----------|---------------|
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 16 | 3.82 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 19 | 3.43 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 12 | 3.08 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 14 | 3.08 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 5 | 3.01 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 13 | 2.93 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 14 | 2.92 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 8 | 2.89 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 2 | 2.88 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 15 | 2.81 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 13 | 2.74 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 2 | 2.73 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 18 | 2.7 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 7 | 2.67 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 1 | 2.66 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 12 | 2.65 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 15 | 2.61 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 3 | 2.61 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 17 | 2.61 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 16 | 2.59 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 16 | 2.58 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 6 | 2.57 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 4 | 2.55 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 19 | 2.51 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 15 | 2.48 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 10 | 2.45 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 11 | 2.45 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 5 | 2.43 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 8 | 2.41 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 9 | 2.41 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 7 | 2.39 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 17 | 2.39 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 2 | 2.36 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 6 | 2.34 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 4 | 2.29 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 9 | 2.27 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 10 | 2.26 |
| (1,110) | 1:2:A:DG:H2'' | 1:3:A:AZW:H2A | 20 | 2.25 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 3 | 2.22 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 13 | 2.18 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 11 | 2.15 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 3 | 2.14 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 19 | 2.12 |

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| Key | Atom-1 | Atom-2 | Model ID | Violation (Å) |
|---------|---------------|---------------|----------|---------------|
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 10 | 2.12 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 16 | 2.12 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 12 | 2.07 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 1 | 2.06 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 14 | 2.04 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 14 | 2.04 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 7 | 2.03 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 18 | 2.03 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 16 | 2.02 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 4 | 2.01 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 7 | 2.0 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 8 | 1.93 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 10 | 1.91 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 15 | 1.91 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 19 | 1.88 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 17 | 1.85 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 11 | 1.84 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 2 | 1.82 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 18 | 1.82 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 20 | 1.81 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 13 | 1.81 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 12 | 1.79 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 2 | 1.78 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 9 | 1.78 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 15 | 1.78 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 7 | 1.73 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 1 | 1.72 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 5 | 1.69 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 18 | 1.67 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 18 | 1.67 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 8 | 1.67 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 6 | 1.65 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 16 | 1.64 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 17 | 1.63 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 20 | 1.62 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 17 | 1.62 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 2 | 1.62 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 6 | 1.6 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 14 | 1.57 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 15 | 1.53 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 14 | 1.52 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 18 | 1.51 |

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| Key | Atom-1 | Atom-2 | Model ID | Violation (Å) |
|---------|---------------|---------------|----------|---------------|
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 10 | 1.5 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 7 | 1.49 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 1 | 1.48 |
| (1,114) | 1:2:A:DG:H8 | 1:3:A:AZW:H2A | 10 | 1.47 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 11 | 1.45 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 7 | 1.44 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 6 | 1.42 |
| (1,108) | 1:2:A:DG:H1' | 1:3:A:AZW:H5' | 13 | 1.42 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 4 | 1.41 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 16 | 1.38 |
| (1,180) | 1:4:A:DG:H1 | 1:3:A:AZW:H3B | 5 | 1.37 |
| (1,108) | 1:2:A:DG:H1' | 1:3:A:AZW:H5' | 12 | 1.37 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 13 | 1.37 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 17 | 1.36 |
| (1,108) | 1:2:A:DG:H1' | 1:3:A:AZW:H5' | 3 | 1.36 |
| (1,108) | 1:2:A:DG:H1' | 1:3:A:AZW:H5' | 4 | 1.35 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 4 | 1.34 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 6 | 1.34 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 9 | 1.32 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 3 | 1.31 |
| (1,113) | 1:2:A:DG:H4' | 1:3:A:AZW:H5' | 13 | 1.3 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 13 | 1.29 |
| (1,108) | 1:2:A:DG:H1' | 1:3:A:AZW:H5' | 5 | 1.29 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 19 | 1.27 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 15 | 1.27 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 17 | 1.27 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 15 | 1.26 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 8 | 1.26 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 9 | 1.26 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 12 | 1.26 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 11 | 1.26 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 1 | 1.25 |
| (1,108) | 1:2:A:DG:H1' | 1:3:A:AZW:H5' | 19 | 1.24 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 13 | 1.23 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 16 | 1.22 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 11 | 1.2 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 3 | 1.2 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 3 | 1.19 |
| (1,113) | 1:2:A:DG:H4' | 1:3:A:AZW:H5' | 3 | 1.19 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 4 | 1.18 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 19 | 1.17 |
| (1,113) | 1:2:A:DG:H4' | 1:3:A:AZW:H5' | 4 | 1.17 |

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| Key | Atom-1 | Atom-2 | Model ID | Violation (Å) |
|---------|----------------|---------------|----------|---------------|
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 14 | 1.13 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 12 | 1.12 |
| (1,113) | 1:2:A:DG:H4' | 1:3:A:AZW:H5' | 5 | 1.12 |
| (1,113) | 1:2:A:DG:H4' | 1:3:A:AZW:H5' | 12 | 1.12 |
| (1,108) | 1:2:A:DG:H1' | 1:3:A:AZW:H5' | 9 | 1.12 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 20 | 1.1 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 14 | 1.09 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 9 | 1.09 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 19 | 1.08 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 2 | 1.06 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 6 | 1.06 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 12 | 1.06 |
| (1,113) | 1:2:A:DG:H4' | 1:3:A:AZW:H5' | 9 | 1.05 |
| (1,105) | 1:2:A:DG:H1 | 1:3:A:AZW:H3A | 14 | 1.05 |
| (1,109) | 1:2:A:DG:H2' | 1:3:A:AZW:H2A | 10 | 0.99 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 8 | 0.98 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 11 | 0.96 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 20 | 0.96 |
| (1,105) | 1:2:A:DG:H1 | 1:3:A:AZW:H3A | 13 | 0.93 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 17 | 0.9 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 14 | 0.88 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 16 | 0.88 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 12 | 0.81 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 19 | 0.81 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 5 | 0.81 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 5 | 0.8 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 8 | 0.79 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 3 | 0.79 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 1 | 0.77 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 18 | 0.77 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 12 | 0.77 |
| (1,105) | 1:2:A:DG:H1 | 1:3:A:AZW:H3A | 15 | 0.76 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 9 | 0.76 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 13 | 0.76 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 19 | 0.76 |
| (1,105) | 1:2:A:DG:H1 | 1:3:A:AZW:H3A | 12 | 0.75 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 11 | 0.75 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 20 | 0.75 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 8 | 0.74 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 1 | 0.73 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 4 | 0.73 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 18 | 0.72 |

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| Key | Atom-1 | Atom-2 | Model ID | Violation (Å) |
|---------|----------------|----------------|----------|---------------|
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 7 | 0.72 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 17 | 0.72 |
| (1,113) | 1:2:A:DG:H4' | 1:3:A:AZW:H5' | 19 | 0.71 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 5 | 0.71 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 13 | 0.71 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 14 | 0.71 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 6 | 0.7 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 2 | 0.68 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 2 | 0.68 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 20 | 0.67 |
| (1,107) | 1:2:A:DG:H1' | 1:3:A:AZW:H3A | 17 | 0.67 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 15 | 0.66 |
| (1,107) | 1:2:A:DG:H1' | 1:3:A:AZW:H3A | 6 | 0.65 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 7 | 0.64 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 17 | 0.64 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 4 | 0.63 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 16 | 0.63 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 15 | 0.63 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 18 | 0.63 |
| (1,53) | 1:3:A:AZW:H3A | 1:3:A:AZW:H5'' | 3 | 0.63 |
| (1,53) | 1:3:A:AZW:H3A | 1:3:A:AZW:H5'' | 9 | 0.63 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 1 | 0.62 |
| (1,53) | 1:3:A:AZW:H3A | 1:3:A:AZW:H5'' | 4 | 0.62 |
| (1,53) | 1:3:A:AZW:H3A | 1:3:A:AZW:H5'' | 5 | 0.62 |
| (1,53) | 1:3:A:AZW:H3A | 1:3:A:AZW:H5'' | 12 | 0.62 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 6 | 0.62 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 16 | 0.62 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 6 | 0.61 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 8 | 0.61 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 3 | 0.6 |
| (1,53) | 1:3:A:AZW:H3A | 1:3:A:AZW:H5'' | 13 | 0.6 |
| (1,107) | 1:2:A:DG:H1' | 1:3:A:AZW:H3A | 14 | 0.59 |
| (1,53) | 1:3:A:AZW:H3A | 1:3:A:AZW:H5'' | 19 | 0.59 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 14 | 0.58 |
| (1,105) | 1:2:A:DG:H1 | 1:3:A:AZW:H3A | 6 | 0.58 |
| (1,105) | 1:2:A:DG:H1 | 1:3:A:AZW:H3A | 17 | 0.58 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 7 | 0.57 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 13 | 0.55 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 18 | 0.55 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 1 | 0.55 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 12 | 0.54 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 2 | 0.53 |

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| Key | Atom-1 | Atom-2 | Model ID | Violation (Å) |
|---------|----------------|----------------|----------|---------------|
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 10 | 0.53 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 15 | 0.52 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 4 | 0.51 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 19 | 0.51 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 3 | 0.5 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 19 | 0.49 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 12 | 0.49 |
| (1,49) | 1:3:A:AZW:H3'' | 1:3:A:AZW:H2B | 18 | 0.49 |
| (1,115) | 1:3:A:AZW:H2B | 1:4:A:DG:H1 | 5 | 0.48 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 1 | 0.47 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 8 | 0.46 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 13 | 0.45 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 7 | 0.45 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 2 | 0.45 |
| (1,188) | 1:1:A:DG:H5' | 1:5:C:DG:H8 | 20 | 0.44 |
| (1,189) | 1:1:A:DG:H5'' | 1:5:C:DG:H8 | 19 | 0.43 |
| (1,178) | 1:3:A:AZW:H3B | 1:4:A:DG:H1 | 5 | 0.42 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 10 | 0.42 |
| (1,105) | 1:2:A:DG:H1 | 1:3:A:AZW:H3A | 3 | 0.42 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 9 | 0.41 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 8 | 0.41 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 17 | 0.41 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 9 | 0.4 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 5 | 0.39 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 9 | 0.38 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 6 | 0.38 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 11 | 0.38 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 1 | 0.37 |
| (1,53) | 1:3:A:AZW:H3A | 1:3:A:AZW:H5'' | 10 | 0.37 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 10 | 0.36 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 4 | 0.36 |
| (1,105) | 1:2:A:DG:H1 | 1:3:A:AZW:H3A | 8 | 0.36 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 11 | 0.34 |
| (1,177) | 1:3:A:AZW:H2B | 1:2:A:DG:H1 | 3 | 0.33 |
| (1,107) | 1:2:A:DG:H1' | 1:3:A:AZW:H3A | 18 | 0.33 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 17 | 0.31 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 20 | 0.31 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 6 | 0.31 |
| (1,57) | 1:3:A:AZW:H3B | 1:3:A:AZW:H3A | 10 | 0.31 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 12 | 0.3 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 11 | 0.3 |
| (1,105) | 1:2:A:DG:H1 | 1:3:A:AZW:H3A | 16 | 0.3 |

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| Key | Atom-1 | Atom-2 | Model ID | Violation (Å) |
|---------|---------------|---------------|----------|---------------|
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 3 | 0.3 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 13 | 0.3 |
| (1,174) | 1:1:A:DG:H1 | 1:2:B:DG:H1 | 20 | 0.29 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 1 | 0.29 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 4 | 0.29 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 5 | 0.29 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 6 | 0.29 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 8 | 0.29 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 9 | 0.29 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 10 | 0.29 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 11 | 0.29 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 12 | 0.29 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 14 | 0.29 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 15 | 0.29 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 17 | 0.29 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 19 | 0.29 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 20 | 0.29 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 2 | 0.29 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 3 | 0.29 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 4 | 0.29 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 12 | 0.29 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 13 | 0.29 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 16 | 0.29 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 19 | 0.29 |
| (1,107) | 1:2:A:DG:H1' | 1:3:A:AZW:H3A | 15 | 0.28 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 2 | 0.28 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 7 | 0.28 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 16 | 0.28 |
| (1,52) | 1:3:A:AZW:H3A | 1:3:A:AZW:H2A | 18 | 0.28 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 1 | 0.28 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 5 | 0.28 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 6 | 0.28 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 7 | 0.28 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 8 | 0.28 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 9 | 0.28 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 10 | 0.28 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 11 | 0.28 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 14 | 0.28 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 15 | 0.28 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 17 | 0.28 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 18 | 0.28 |
| (1,46) | 1:3:A:AZW:H2B | 1:3:A:AZW:H3B | 20 | 0.28 |

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| Key | Atom-1 | Atom-2 | Model ID | Violation (Å) |
|---------|----------------|---------------|----------|---------------|
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 10 | 0.27 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 3 | 0.27 |
| (1,111) | 1:2:A:DG:H2'' | 1:3:A:AZW:H3A | 4 | 0.26 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 20 | 0.26 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 16 | 0.25 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 5 | 0.23 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 7 | 0.23 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 11 | 0.23 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 2 | 0.21 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 19 | 0.21 |
| (1,189) | 1:1:A:DG:H5'' | 1:5:C:DG:H8 | 10 | 0.2 |
| (1,56) | 1:3:A:AZW:H5'' | 1:3:A:AZW:H2A | 3 | 0.2 |
| (1,105) | 1:2:A:DG:H1 | 1:3:A:AZW:H3A | 19 | 0.19 |
| (1,56) | 1:3:A:AZW:H5'' | 1:3:A:AZW:H2A | 5 | 0.19 |
| (1,56) | 1:3:A:AZW:H5'' | 1:3:A:AZW:H2A | 9 | 0.19 |
| (1,56) | 1:3:A:AZW:H5'' | 1:3:A:AZW:H2A | 12 | 0.19 |
| (1,189) | 1:1:A:DG:H5'' | 1:5:C:DG:H8 | 15 | 0.18 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 3 | 0.18 |
| (1,56) | 1:3:A:AZW:H5'' | 1:3:A:AZW:H2A | 4 | 0.18 |
| (1,105) | 1:2:A:DG:H1 | 1:3:A:AZW:H3A | 5 | 0.17 |
| (1,56) | 1:3:A:AZW:H5'' | 1:3:A:AZW:H2A | 13 | 0.17 |
| (1,56) | 1:3:A:AZW:H5'' | 1:3:A:AZW:H2A | 19 | 0.17 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 4 | 0.16 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 15 | 0.16 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 1 | 0.15 |
| (1,189) | 1:1:A:DG:H5'' | 1:5:C:DG:H8 | 11 | 0.14 |
| (1,189) | 1:1:A:DG:H5'' | 1:5:C:DG:H8 | 12 | 0.14 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 14 | 0.14 |
| (1,105) | 1:2:A:DG:H1 | 1:3:A:AZW:H3A | 4 | 0.14 |
| (1,189) | 1:1:A:DG:H5'' | 1:5:C:DG:H8 | 2 | 0.13 |
| (1,189) | 1:1:A:DG:H5'' | 1:5:C:DG:H8 | 14 | 0.13 |
| (1,189) | 1:1:A:DG:H5'' | 1:5:C:DG:H8 | 18 | 0.13 |
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 8 | 0.13 |
| (1,82) | 1:5:A:DG:H2' | 1:5:A:DG:H8 | 1 | 0.13 |
| (1,189) | 1:1:A:DG:H5'' | 1:5:C:DG:H8 | 3 | 0.12 |
| (1,189) | 1:1:A:DG:H5'' | 1:5:C:DG:H8 | 6 | 0.12 |
| (1,156) | 1:3:A:AZW:H3A | 1:3:A:AZW:H3B | 4 | 0.12 |
| (1,124) | 1:5:A:DG:H5'' | 1:4:A:DG:H1' | 17 | 0.12 |
| (1,99) | 1:1:A:DG:H3' | 1:2:A:DG:H2' | 18 | 0.12 |
| (1,189) | 1:1:A:DG:H5'' | 1:5:C:DG:H8 | 4 | 0.11 |
| (1,189) | 1:1:A:DG:H5'' | 1:5:C:DG:H8 | 5 | 0.11 |
| (1,189) | 1:1:A:DG:H5'' | 1:5:C:DG:H8 | 7 | 0.11 |

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| Key | Atom-1 | Atom-2 | Model ID | Violation (Å) |
|---------|---------------|---------------|----------|---------------|
| (1,175) | 1:2:A:DG:H1 | 1:1:B:DG:H1 | 18 | 0.11 |
| (1,106) | 1:2:A:DG:H1' | 1:3:A:AZW:H2A | 9 | 0.11 |
| (1,99) | 1:1:A:DG:H3' | 1:2:A:DG:H2' | 6 | 0.11 |
| (1,189) | 1:1:A:DG:H5'' | 1:5:C:DG:H8 | 8 | 0.1 |
| (1,185) | 1:5:A:DG:H1 | 1:1:B:DG:H1 | 8 | 0.1 |
| (1,99) | 1:1:A:DG:H3' | 1:2:A:DG:H2' | 1 | 0.1 |
| (1,99) | 1:1:A:DG:H3' | 1:2:A:DG:H2' | 10 | 0.1 |

10 Dihedral-angle violation analysis

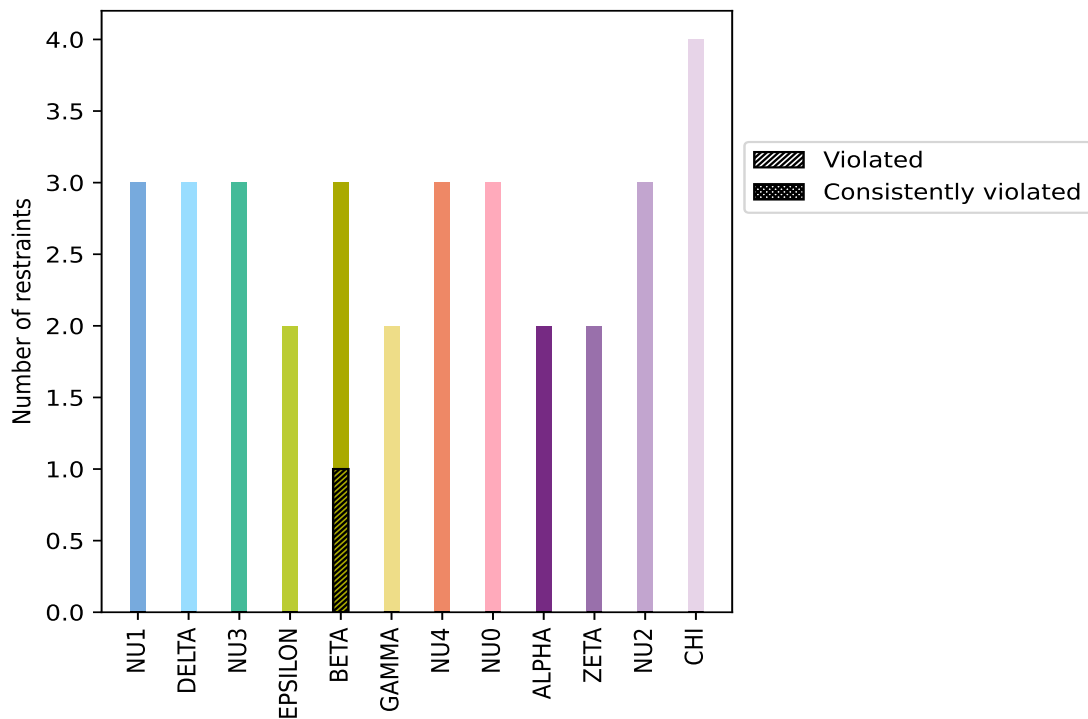
10.1 Summary of dihedral-angle violations

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 |
| NU1 | 3 | 9.1 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| DELTA | 3 | 9.1 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| NU3 | 3 | 9.1 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| EPSILON | 2 | 6.1 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| BETA | 3 | 9.1 | 1 | 33.3 | 3.0 | 0 | 0.0 | 0.0 |
| GAMMA | 2 | 6.1 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| NU4 | 3 | 9.1 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| NU0 | 3 | 9.1 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| ALPHA | 2 | 6.1 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| ZETA | 2 | 6.1 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| NU2 | 3 | 9.1 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| CHI | 4 | 12.1 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| Total | 33 | 100.0 | 1 | 3.0 | 3.0 | 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 [i](#)



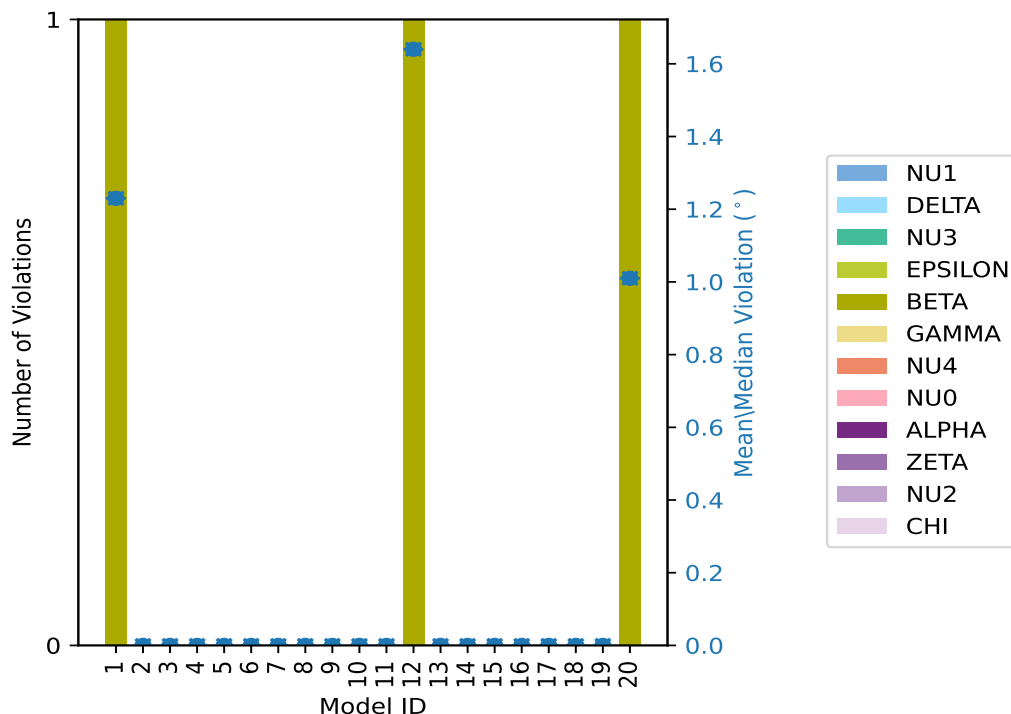
Violated and consistently violated restraints are shown using different hatch patterns in their respective categories

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

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

| Model ID | Number of violations | | | | | | | | | | | | Total | Mean (°) | Max (°) |
|----------|----------------------|-------|-----|---------|------|-------|-----|-----|-------|------|-----|-----|-------|----------|---------|
| | NU1 | DELTA | NU3 | EPSILON | BETA | GAMMA | NU4 | NU0 | ALPHA | ZETA | NU2 | CHI | | | |
| 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1.23 | 1.23 |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| 12 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1.64 | 1.64 |
| 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0.0 |
| 20 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1.01 | 1.01 |

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 |
|-------------------------------|-------|-----|---------|------|-------|-----|-----|-------|------|-----|-----|-------|--------------------|
| NU1 | DELTA | NU3 | EPSILON | BETA | GAMMA | NU4 | NU0 | ALPHA | ZETA | NU2 | CHI | Total | Count ¹ |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 |

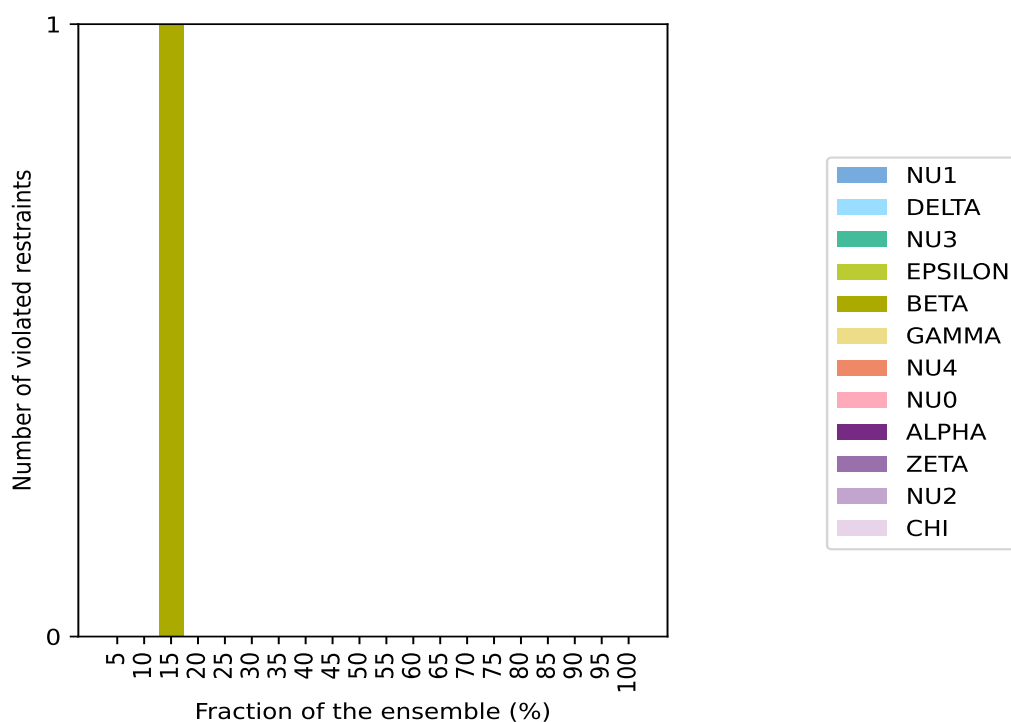
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| Number of violated restraints | | | | | | | | | | | | | Fraction Count ¹ |
|-------------------------------|-------|-----|---------|------|-------|-----|-----|-------|------|-----|-----|-------|--------------------------------|
| NU1 | DELTA | NU3 | EPSILON | BETA | GAMMA | NU4 | NU0 | ALPHA | ZETA | NU2 | CHI | Total | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 |

¹ Number of models with violations

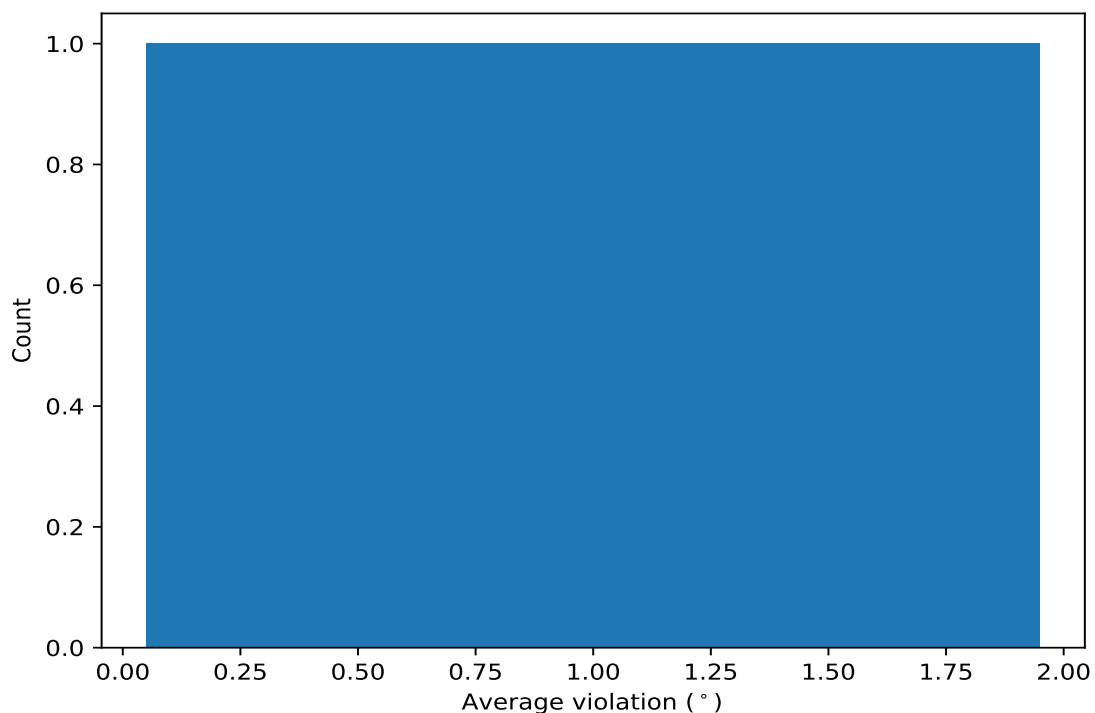
10.3.1 Bar graph : Dihedral-angle Violation statistics for the ensemble [i](#)



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 |
|-------|------------|--------------|--------------|--------------|---------------------|------|-----------------|--------|
| (1,2) | 1:4:A:DG:P | 1:4:A:DG:O5' | 1:4:A:DG:C5' | 1:4:A:DG:C4' | 3 | 1.29 | 0.26 | 1.23 |

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.

Data insufficient to plot histogram

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

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

| Key | Atom-1 | Atom-2 | Atom-3 | Atom-4 | Model ID | Violation (°) |
|-------|------------|--------------|--------------|--------------|----------|---------------|
| (1,2) | 1:4:A:DG:P | 1:4:A:DG:O5' | 1:4:A:DG:C5' | 1:4:A:DG:C4' | 12 | 1.64 |
| (1,2) | 1:4:A:DG:P | 1:4:A:DG:O5' | 1:4:A:DG:C5' | 1:4:A:DG:C4' | 1 | 1.23 |
| (1,2) | 1:4:A:DG:P | 1:4:A:DG:O5' | 1:4:A:DG:C5' | 1:4:A:DG:C4' | 20 | 1.01 |