# An Optimized Configuration for the Brazilian Decimetric Array

Show affiliations

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The Brazilian Decimetric Array (BDA) is a radio interferometer designed to operate in the frequency range of 1.2-1.7, 2.8 and 5.6 GHz and to obtain images of radio sources with high dynamic range. A 5-antenna configuration is already operational being implemented in BDA phase I. Phase II will provide a 26-antenna configuration forming a compact T-array, whereas phase III will include further 12 antennas. However, the BDA site has topographic constraints that preclude the placement of these antennas along the lines defined by the 3 arms of the T-array. Therefore, some antennas must be displaced in a direction that is slightly transverse to these lines. This work presents the investigation of possible optimized configurations for all 38 antennas spread over the distances of 2.5 x 1.25 km. It was required to determine the optimal position of the last 12 antennas. A new optimization strategy was then proposed in order to obtain the optimal array configuration. It is based on the entropy of the distribution of the sampled points in the Fourier plane. A stochastic model, Ant Colony Optimization, uses the entropy of the such distribution to iteratively refine the candidate solutions. The proposed strategy can be used to determine antenna locations for free-shape arrays in order to provide uniform u-v coverage with minimum redundancy of sampled points in u-v plane that are less susceptible to errors due to unmeasured Fourier components. A different distribution could be chosen for the coverage. It also allows to consider the topographical constraints of the available site. Furthermore, it provides an optimal configuration even considering the predetermined placement of the 26 antennas that compose the central T-array. In this case, the optimal location of the last 12 antennas was determined. Performance results corresponding to the Fourier plane coverage, synthesized beam and sidelobes levels are shown for this optimized BDA configuration and are compared to the results of the standard T-array configuration that cannot be implemented due to site constraints.

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