

NGAT: The Next Generation Arecibo Telescope

The Arecibo Observatory (AO) scientific and engineering staff and several members of the AO user community have proposed a new telescope concept, referred to as the 'Next Generation Arecibo Telescope' (NGAT) [1]. The proposal is for an array of dishes to be 'tightly' packed on a tiltable planar platform. This configuration was envisaged to obtain maximum surface brightness sensitivity. The design satisfies the following key science requirements: (a) 5 MW of continuous-wave transmitting power at 2 - 6 GHz, 1-2 arcmin beamwidth at these frequencies, and increased sky coverage for planetary defense; (b) 0° to 45° or more sky coverage from zenith to observe both parallel and perpendicular directions to the geomagnetic field, 10 MW peak transmitting power at 430 MHz (also at 220 MHz under consideration) and very high surface brightness sensitivity for incoherent scattering experiments and (c) excellent sensitivity over 200 MHz to 30 GHz frequency range and increased sky coverage and telescope pointing up to 48° from zenith to observe the Galactic Center for astronomical research.

The total collecting area of the NGAT will be equivalent to that of a 300 m diameter dish. The telescope will have 4 receivers covering a frequency range between 0.2 to 30 GHz. The individual dish's diameter can be between 9 and 18m and will be finalized based on the frequency coverage and science requirements. The telescope will operate either as an interferometer or as a phased array. The plane of the dish array will be tiltable to achieve zenith angle coverage between 0° and 48°. Besides, the NGAT will have transmitters with phased peak power of 10 MW operating at 0.2 to 0.5 GHz and at 2 - 6 GHz with a phased continuous wave power of 5 MW. The array will likely need to be segmented to make it mechanically feasible to tilt the structure and achieve sky coverage. The segments would be as large as possible, as fewer segments would reduce shadowing effects. Compared to the 305m telescope, the NGAT will have a field of view at least two orders of magnitude larger, work over a frequency range 3 times larger, have 5 times more sky coverage, more than 4 times the transmitting power, and nearly double the sensitivity to receive radio signals.

In this talk, I will outline the case for the NGAT and briefly discuss some of the novel science applications that would be possible with the NGAT. I will also talk about synergy with other upcoming projects and discuss the technical challenges to be overcome in building the NGAT

1. D. Anish Roshi, N. Aponte, E. Araya, et al. "The future of the Arecibo Observatory: The Next Generation Arecibo Telescope", arXiv:2103.01367, 2021, 1-82.