



The DSA-2000: Updated status, design and progress

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The Deep Synoptic Array 2000 (DSA-2000) is a 2000-element radio array optimized for wide-band surveys from 700 MHz to 2 GHz. The project has made significant engineering progress on the way to a planned construction start in 2026. The core science goals of the DSA-2000 include multimessenger astronomy, probing our cosmic history, and exploring the time domain sky.

The project has made several key technical decisions and design down-selects, while the site approval process is progressing in parallel.

Recent progress includes:

- The engineering framework has evolved substantially, integrating updated risk mitigation strategies and design optimizations.
- Down-select decisions and additional development work has optimized performance of the antennas and uncooled receivers and improved manufacturability, while ensuring that the system temperature remains below 25K under operational conditions.
- Enhanced Digital Processing and Imaging: The development of the Radio Camera capability has progressed from concept to a demonstrated pipeline that leverages advanced real-time imaging and transient detection algorithms. This improvement eliminates the need for iterative visibility plane processing, streamlining the data flow for full-Stokes imaging.
- Survey Strategy and Scientific Impact: With the array's planned $19 \text{ km} \times 15 \text{ km}$ configuration providing 3.3 arcsecond spatial resolution, the survey strategy outlines a multi-epoch approach that builds on lessons learned during the initial design phase. Anticipated survey products include deep, cadenced all-sky maps with enhanced sensitivity (targeting 500 nJy/beam rms noise) and refined localization capabilities for fast radio transients, pulsars, and slow transients.
- Successful construction and integration of a Test Array at the Owens Valley Radio Observatory, comprising 10 antennas of two designs.
- Software integration via a minimum viable product approach in preparation for full production readiness.
- Initiation of long lead item procurement to ensure a rapid ramp-up to full production.

Ongoing collaborations and funding advances reflect strong support for the project during the final design and preconstruction phases.

The engineering progress puts the DSA-2000 project on track to achieve first light in 2027 and commence survey operations in 2028.

In this presentation, we detail the latest design revisions, the outcomes of recent technical evaluations, and the current roadmap toward construction, commissioning and operation.

References

- [1] G. Hallinan, et al, "The DSA-2000 – a Radio Survey Camera," Astro2020 APC White Papers Bulletin of the AAS Volume 51, Number 7, 17, July 2019, <https://arxiv.org/abs/1907.07648>