



Recent Technology Development at NRAO's Central Development Laboratory

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As part of NRAO's Strategic Plan, its Central Development Laboratory (CDL) has been the focus of renewal and growth over the last five years. Approximately 40% of the Laboratory's current staff was hired in this period, and new technology developments are underway in support of various NRAO initiatives. This includes technology development for the next generation VLA (ngVLA) [1], the next generation Radar program (ngRADAR) [2], the ALMA Band 6 second generation receiver (ALMA Band 6v2) [3], and NSF's National Radio Dynamic Zone initiative (<https://info.nrao.edu/do/spectrum-management/national-radio-dynamic-zone-nrdz>). The Laboratory has also committed resources to improve the performance of Traveling Wave Kinetic Inductance Parametric (TKIP) Amplifiers for use in radio astronomy applications [4].

In addition, as part of a program to develop talent pipelines into the Laboratory to ensure resilience and continuity in the future, NRAO has expanded the Jansky Fellowship program to include post-doctoral fellows at CDL, is participating in co-operative education programs with several universities at the undergraduate and graduate level, and has secured a generous grant from the Heising-Simons Foundation to increase the participation of women in radio astronomy instrumentation development through the hiring of women co-op students and post-docs.

For ngVLA, the CDL is developing the next generation integrated receivers, low noise MMIC amplifiers, performing optics analysis, correlator development, and investigating local oscillator timing and reference schemes. For ngRADAR, CDL staff are working with Raytheon Corporation to, in the short-term, re-deploy a low power prototype radar transmitter for testing on the Robert C. Byrd Green Bank Telescope and, in the long-term, to develop a permanent high-power radar system. CDL staff are upgrading the ALMA Band6 receiver cartridge to conform to new requirements as part of ALMA's Wideband Sensitivity Upgrade (WSU), and in support of the NSF's National Radio Dynamic Zone initiative, the Laboratory is developing an automated, sensitive, wideband spectrum monitor with direction-finding capabilities.

In this talk, we will provide an overview of these technology development efforts and the projects they support. In addition, we will highlight the work of our post-doctoral and co-operative students and how these programs serve to make CDL a more resilient organization in the face of the challenges in recruiting, hiring, and retention of engineering talent in the 21st century.

References

1. ngVLA.nrao.edu
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3. A. Navarrini et al., "ALMA Band 6v2 receiver development status," *2023 XXXVth General Assembly and Scientific Symposium of the International Union of Radio Science (URSI GASS)*, Sapporo, Japan, 2023, pp. 1-4, doi: 10.23919/URSIGASS57860.2023.10265563.
4. J. Carrasco, D. Valenzuela, C. Falcón, R. Finger and F. P. Mena, "The Effect of Complex Dispersion and Characteristic Impedance on the Gain of Superconducting Traveling-Wave Kinetic Inductance Parametric Amplifiers," in *IEEE Transactions on Applied Superconductivity*, vol. 33, no. 3, pp. 1-9, April 2023, Art no. 1500509, doi: 10.1109/TASC.2023.3243464.