

# Skyler-1 X-band Dual-Polarization Phased Array Radar



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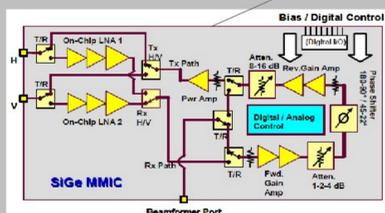
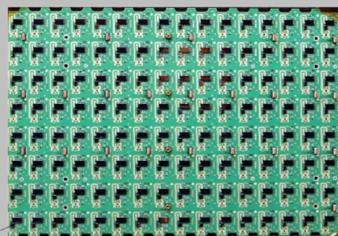
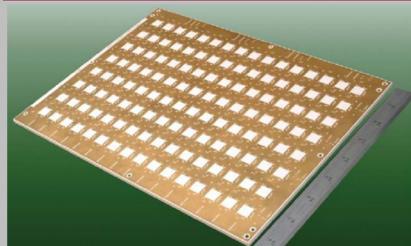
## Mobile Deployment



## Specifications

- Developed by Raytheon Space & Airborne Systems (now Collins Aerospace [1]) during CASA Engineering Research Center.
- 9.6 GHz center frequency
- 2560 element (64 x 40) dual-pol microstrip patch array
- 18 dBm/element or 160 W peak power
- Scan range +/-45 azimuth, +/-15 elevation
- Single or dual PRF/PRT
- Alternating H,V and full polarimetric modes
- Beamwidth 1.9 (az, broadside), 2.1 (el, broadside)
- Pulse compression: LFM, NLFM
- Multi-beam registers (4) for rapid toggling between polarizations, directions, or aperture excitations
- C/C++ driver software API

## Array Architecture

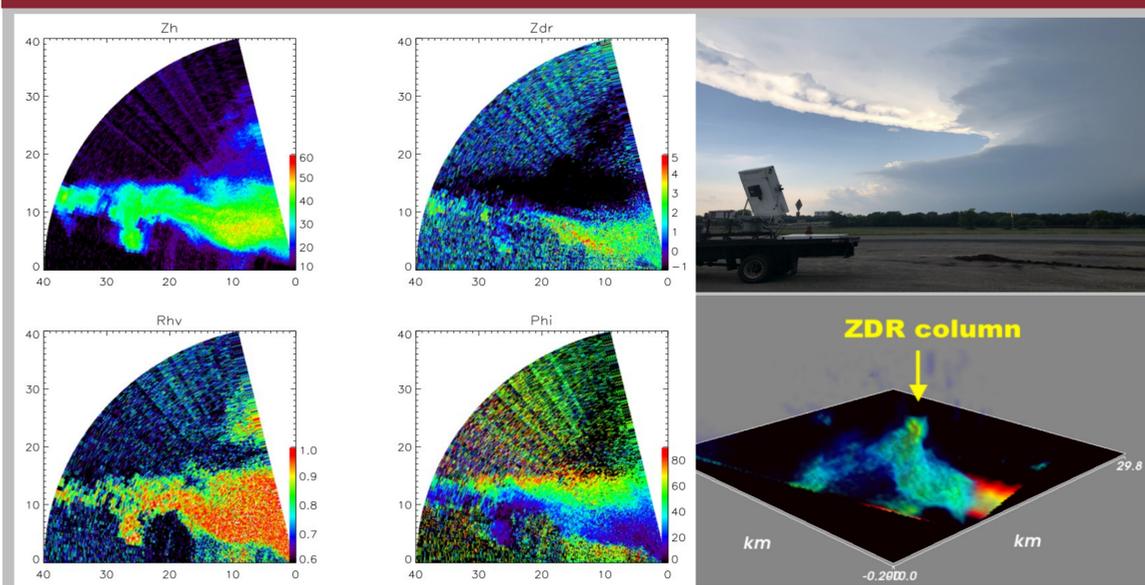


**Above:** radiating and rear sides of a single tile populated with SiGe MMIC T/R chips [2]. Each includes a 5-bit attenuator, 4-bit phase shifter, PA, 2 LNAs, and switching.

**Right:** Array on pedestal in the laboratory with the radome removed

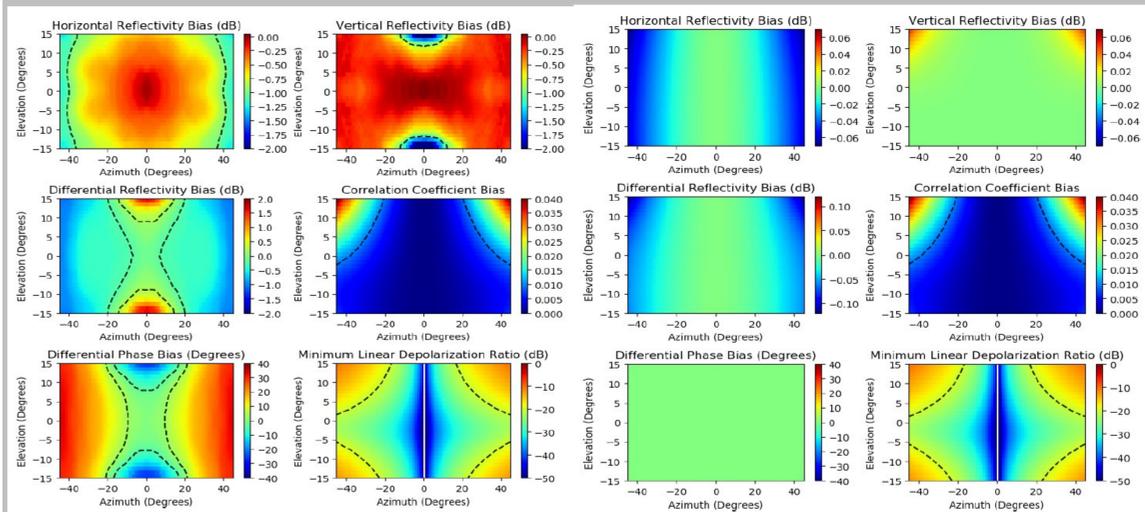


## Field Measurements



Azimuth scans of a hook echo observed by Skyler on 19 June 2019 at 22:25:50 UTC near Greenville, TX during field campaign with Purdue University [3]. Clockwise from top left: Reflectivity factor (attenuated), differential reflectivity, differential phase, and co-polar correlation. At right, a volume rendering of the Zdr column associated with the hook echo.

## Polarimetric Calibration Experiments



Biases of polarimetric variables with scan angle derived from observations of light rain without correction (left) and with correction (right) [4] assuming reflectivity factor of 30 dBZ, and Zdr of 1 dB.

## Evolution of Skyler

- Skyler-1:** microstrip patch array, ATAR, aka LPR (low power radar)  
 2 units: 9.6 GHz (at UMass - shown here)  
 9.2 GHz (at Stony Brook U.)  
 dev. ~2009-2014, to UMass 2017
- Skyler-2:** dipole array panels by FirstRF, ATAR  
 4 units: 9.3-9.5 GHz  
 dev. ~2017-2021
- Skyler-3:** dipole array, digitization at panel level, STSR  
 anticipated summer 2026



## References

- [1] Collins Aerospace, 2025. Skyler. <https://www.collinsaerospace.com/what-we-do/air-traffic-management/surveillance/skyler>.
- [2] Puzella, A., and R. Alm, 2008. Air cooled active transmit/receive panel array, in IEEE Radar Conference, 26-30 May, Rome, IT
- [3] Tanamachi, R., et al. 2020. Observations of Zdr columns in supercells in 2019 by a mobile dual-polarized phased array radar, in *Severe Local Storms Symp.*, AMS Annual Meeting, p. #926, 12-16 Jan, Boston, MA.
- [4] Heberling, W., and S. J. Frasier, 2021. On the projection of polarimetric variables by a planar phased array at X-band, *IEEE Trans. Geosci. Remote Sensing*, 59, doi: 10.1109/TGRS.2020.302640.

## Acknowledgements

This work was supported by the National Science Foundation under grants AGS-1655693, AGS-1741088, by UCAR subaward 004598, and Brookhaven National Laboratory 440011, 417694.