

# Mobile Phased Array Weather Radars

## Developments from the ARRC at the University of Oklahoma

Advanced Radar Research Center  
University of Oklahoma

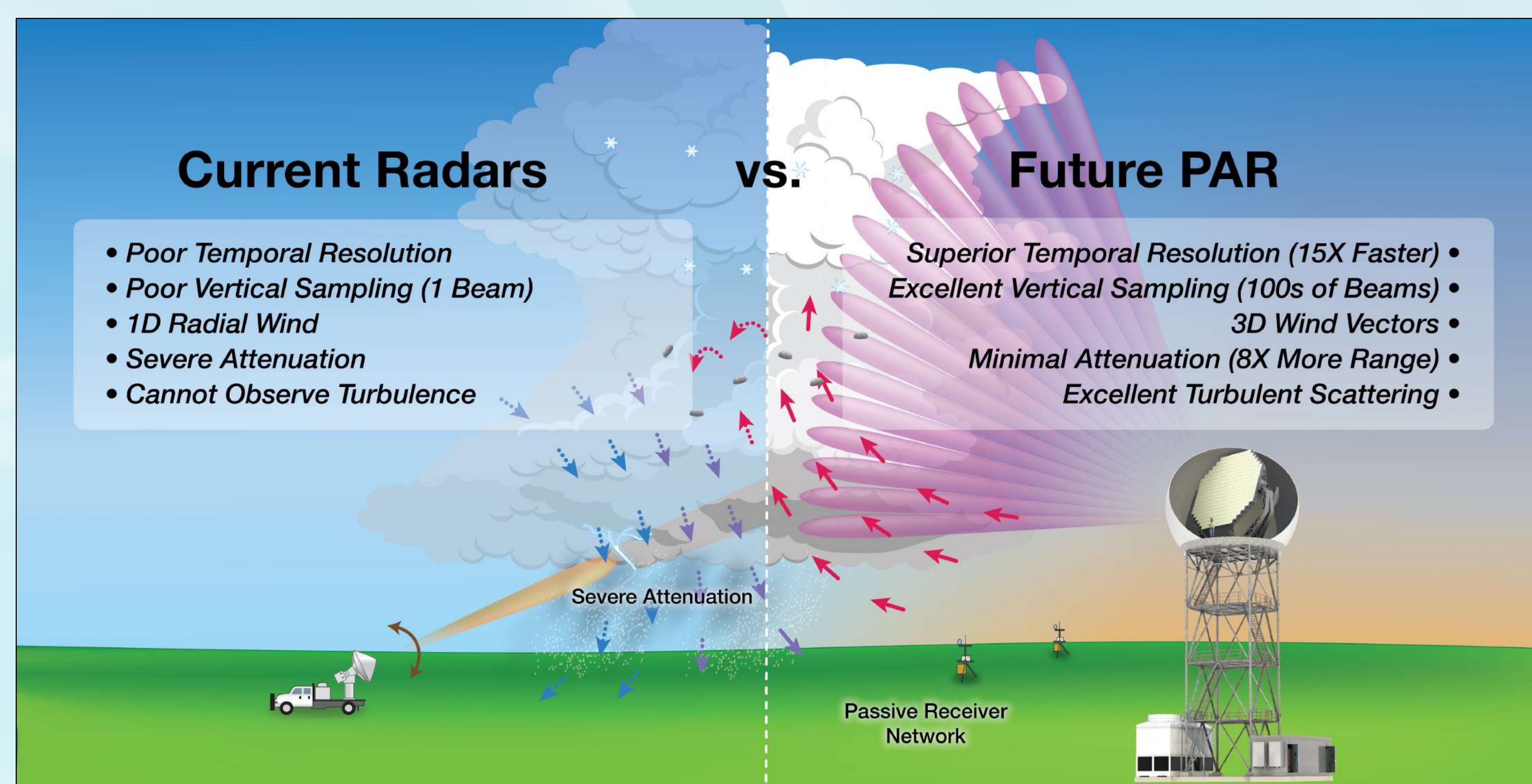
### Phased Array Radars for Atmospheric Observations

*The Future of High-Resolution Observations*



- What is the observable scatterer (e.g., rain, snow, cloud particles, turbulent eddies) and the desired observation range?
  - Scattering, attenuation, sensitivity (wavelength, transmit power, antenna gain)
- Is the observable scatterer geometrically complex?
  - Polarimetry
- Within the observation range, what are the spatial scales of interest?
  - Spatial resolution (bandwidth, antenna size)
  - Fine/adaptive angular sampling (mechanical vs phased array)
- Are the atmospheric processes rapidly evolving?
  - Temporal resolution (mechanical vs phased array)

**Many observational needs naturally lead to a polarimetric phased array radar**

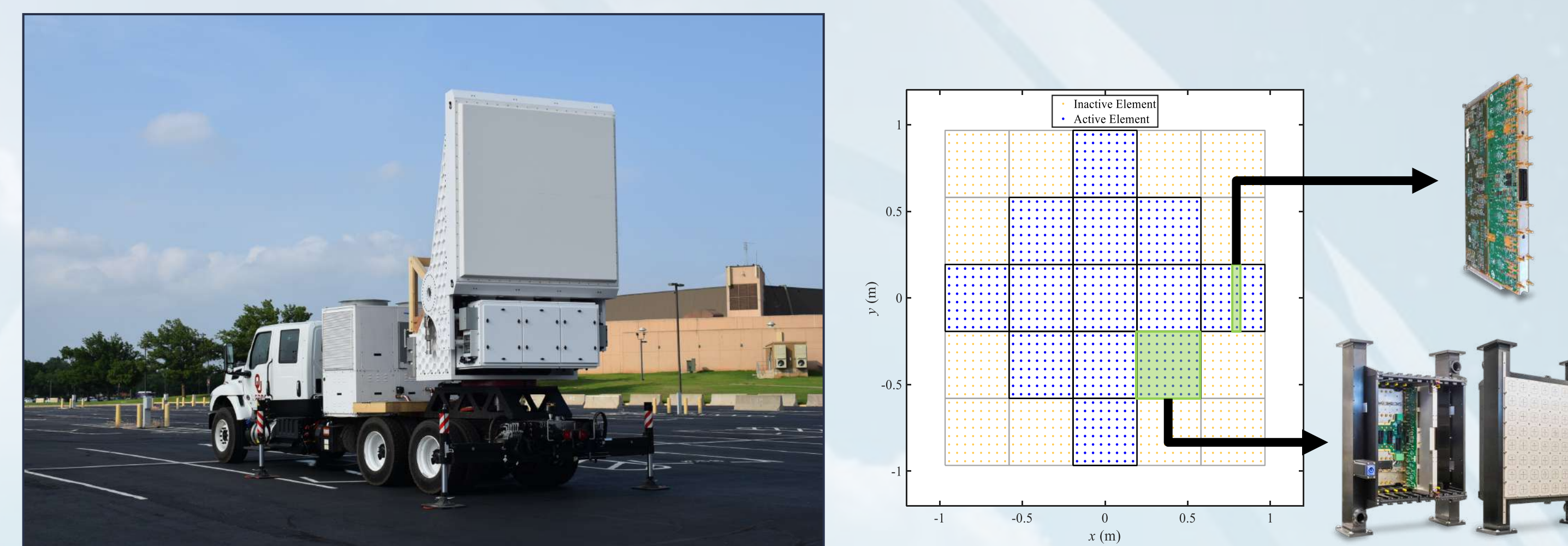


**S-Band**

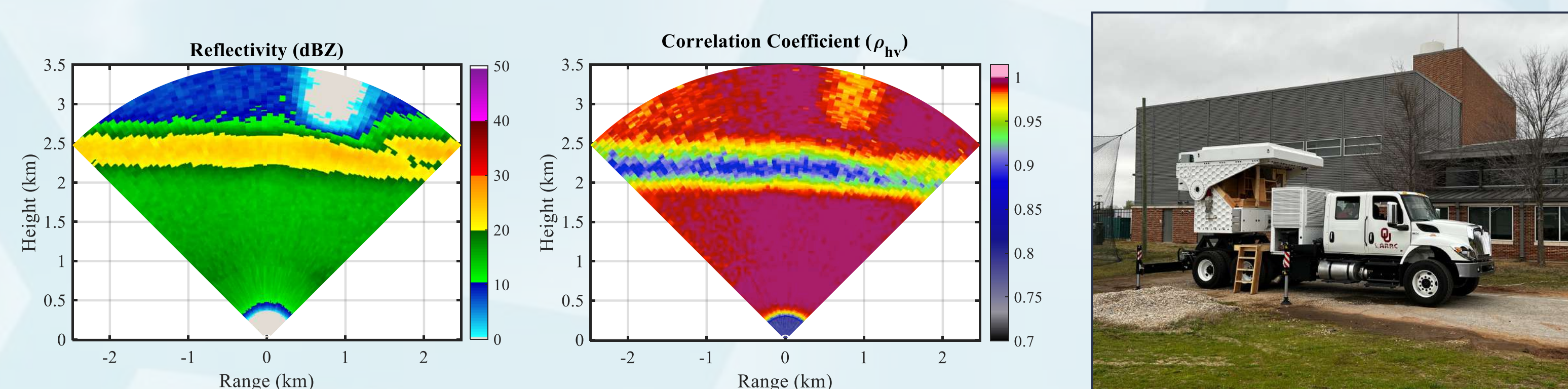
### Horus Fully Digital Phased Array Radar

*Operational Since 2023*

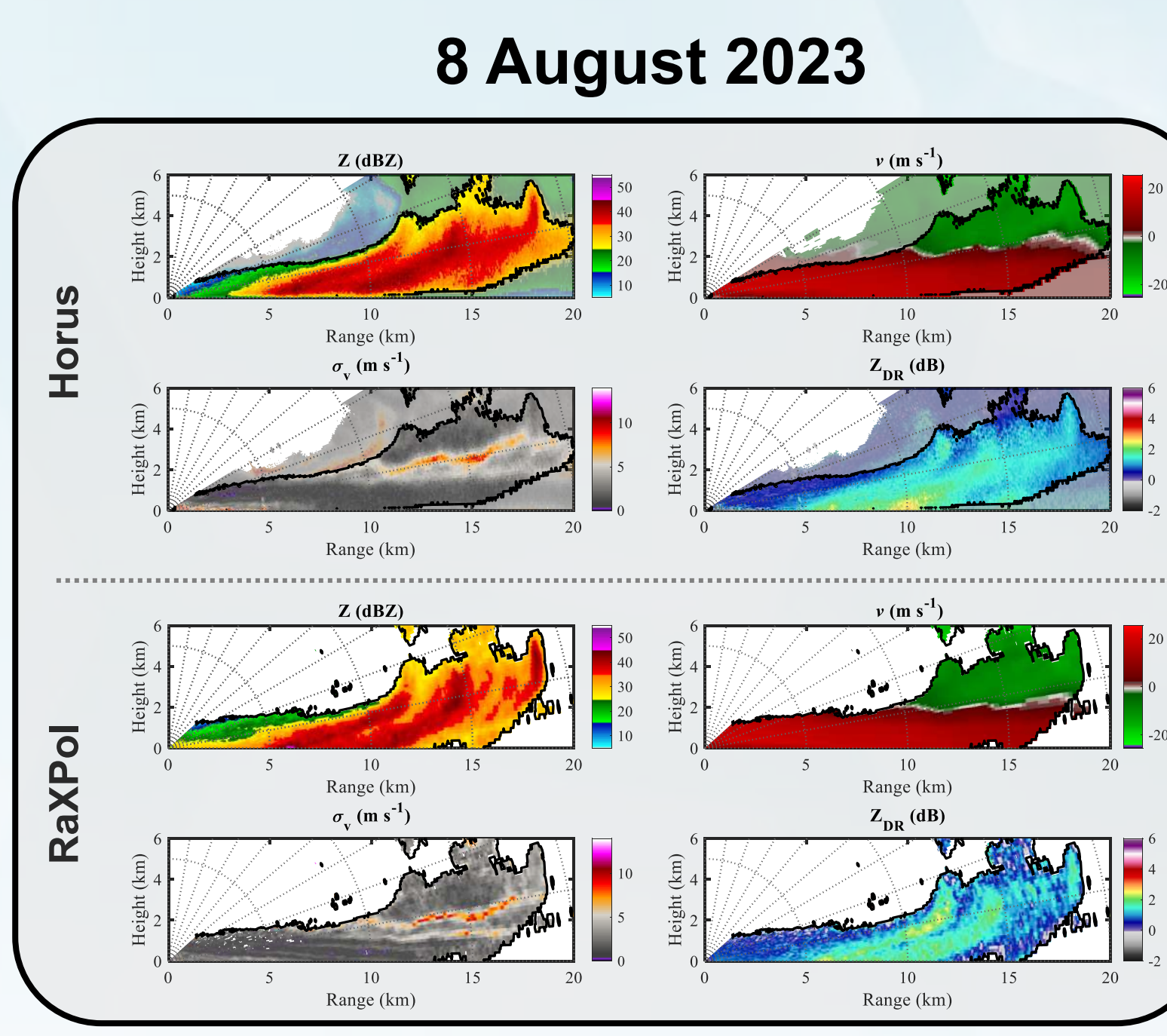
- **Horus** is a **mobile, dual-polarization, S-Band, active PAR** designed to **demonstrate** the benefits of fully digital technology for meteorological observations
- With in-house design and integration, **Horus** was completed at the **ARRC** with support from the **NOAA National Severe Storms Lab**
- This “**future proof**” **fully digital system** can produce time-series IQ signals at each antenna element, which gives **maximum flexibility**



### Birdbath Scanning (Vertical Pointing)



### Validation (Coordinated Experiment)

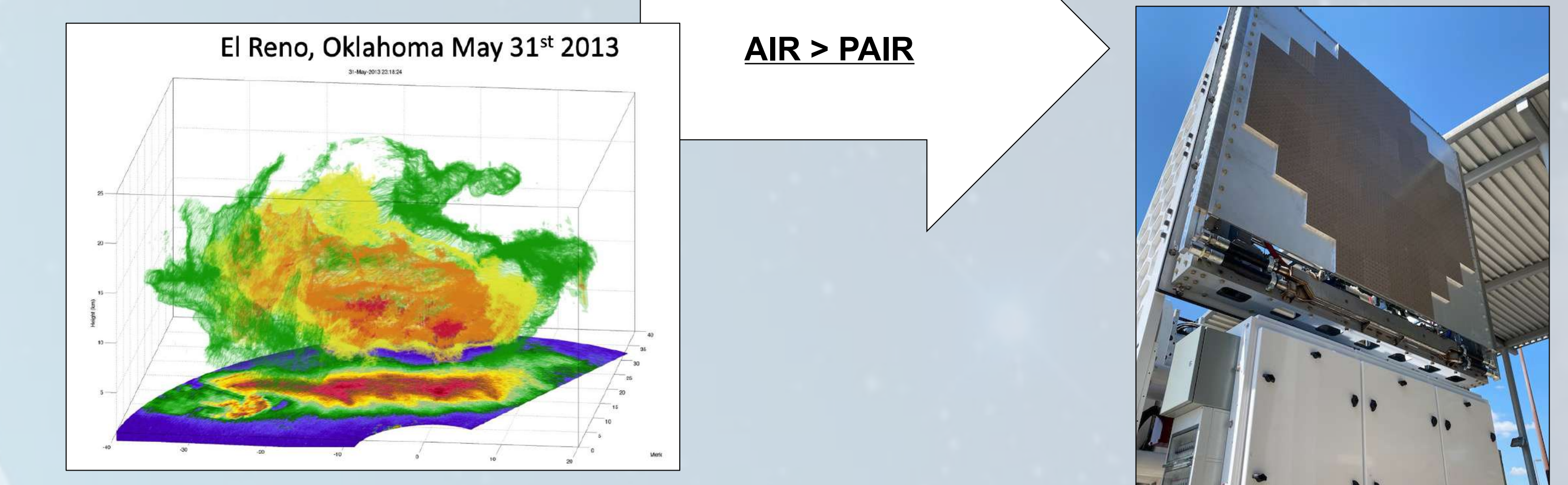


**C-Band**

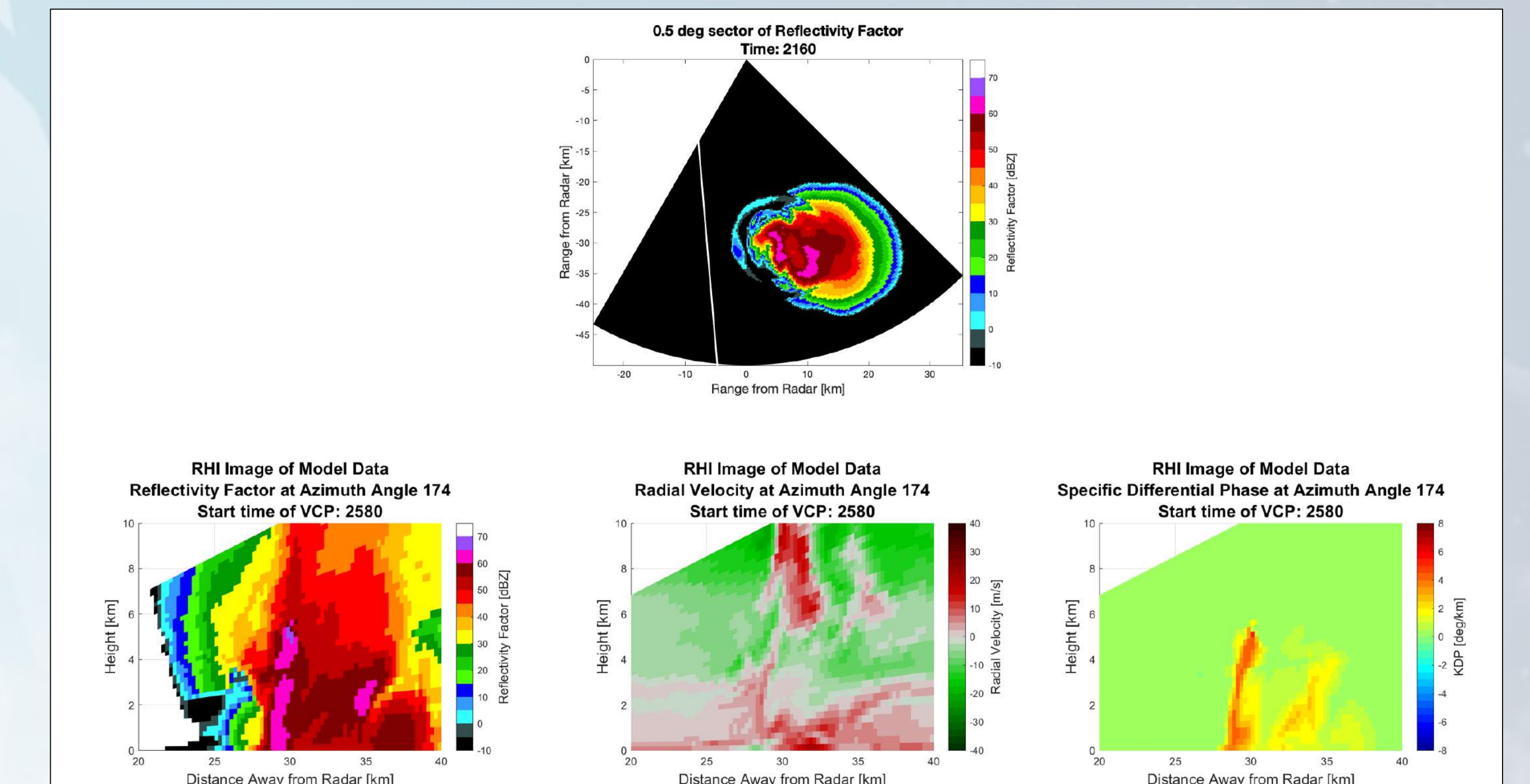
### Polarimetric Atmospheric Imaging Radar (PAIR)

*Coming in 2024*

- **Mobile, C-band, Polarimetric Imaging radar**
- Digital beamforming and e-scan in elevation for ultra-high update time (**360°x20° in 6-10 s**)
- E-scan pencil or spoiled beam in elevation
- **High sensitivity (-2.9 dBZ @ 10 km)**



### CM1 emulated microburst for the C-band PAIR (rotating PAR)



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