The CSU-CHILL National Weather Radar Facility, located in Greeley, CO, is an advanced, transportable dual-polarized dual-wavelength weather radar system. The facility is funded by the National Science Foundation and Colorado State University, and is hosted by the Departments of Atmospheric Science and Electrical and Computer Engineering.

**Features**
- Dual offset, dual-wavelength low sidelobe Gregorian antenna system
- Easy-to-use, remotely accessible radar control interface
- Polarization-agile dual-Klystron 1 MW transmitter at S-band
- Simultaneous-transmit 25 kW Magnetron transmitter at X-band
- Dual-channel software-defined digital-IF receiver
- Simultaneous-transmit 25 kW Magnetron transmitter at X-band
- Flexible signal processor, customizable to project needs
- Comprehensive calibration subsystem
- YCHILL Real-time control and distribution of radar data
- Dual-doppler capability with CSU-Pawnee S-band radar

**User Access**
- NSF-funded projects reviewed by Observing Facilities Allocation Panel (OFAP)
- Cost-recovery non-NSF projects, also reviewed by OFAP
- Small scale "20-hour" projects, conducted at Greeley
- Live virtual tours of the radar facility

**Educational Activities**
- REU Sphere CAL
- Virtual Radar Tours
- Classroom Activities
  - A rich collection of radar data in support of classroom activities
  - Tutorials with guided interpretations of polarimetric radar cases
  - Short courses which integrate the CSU-CHILL Facility
- Research Experience for Undergraduates
  - Hands-on experience with radar hardware and operations
  - Individual mentoring by facility staff
  - Majors in Physics, Engineering, Computer Science and Atmospheric Science
- Educational Field Trips
  - Tours conducted for small groups of visitors
  - Includes introduction to radar, visits to radar hardware and a live demo

**Research Activities**
- Advanced signal processing techniques
- Radar hardware research and design
- Advanced polarimetric rainfall analysis
- Automated hydrometeor identification algorithms

**Virtual Radar Tours**
- Internet streaming video from multiple on-site cameras
- Close-up views of the antenna structure
- Walk-around of the transmitter/receiver subsystems
- Remote presentation via video by CSU-CHILL staff

**Dual-Wavelength Antenna**
- The CSU-CHILL radar features a unique dual-offset-fed antenna with dual-wavelength capability
- Three feed horn options available (Dual wavelength, 10 cm and 1 cm)
- Beam width of 1.0 degree at 10 cm (S-band), 0.1 degree at 3 cm (X-band)
- Symmetric OMT design, with LDR limit exceeds -40 dB
- Low sidelobe levels improve clutter rejection at low elevation sweeps
- Flexible antenna controller supports sector scans and RHIs

**Example Measurements with the CSU-CHILL Radar**

**S-band Hail Observations**
Severe thunderstorm observed during the DC3 project on the evening of June 7, 2012. This storm produced widespread damaging hail. Near 0 dB differential reflectivity values were observed in the reflectivity core, coincident with observations of large hail shown below. The hail area also displayed enhanced linear depolarization levels. At a slightly higher elevation angle, a mesocyclone circulation was present.

Halitones observed from this storm

**THUNDERSTORM OBSERVATIONS**
Comparative measurements at S- and X-band. X-band data is attenuation corrected.

a) Differential propagation phase is inversely proportional to wavelength, the accumulated phase shift is significantly larger in the X-band data vs. the S-band data
b) The increased $\psi_{dp}$ measurement sensitivity also makes the vertically-aligned ice crystal electrification signature more evident in the X-band data

The CSU-CHILL radar’s dual-wavelength capabilities will support a wide variety of cloud microphysics and electrification research.