NEXT GENERATION RADAR

The Next Generation Planetary Radar on the Green Bank Telescope

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The Role of the GBT in Planetary Radar

- 20+ years as a radar receiver
  - Two of the first science observations by GBT were radar of Venus and a near-Earth asteroid
  - Recently used to confirm the NASA DART kinetic impactor technology demonstration

- Why transmit from GBT?
  - Large 100-m aperture (antenna gain)
  - Surface accuracy
  - Higher frequency
  - Maneuverability

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Image Credit: Raytheon

Pilot Observations

- Transmitter built by Raytheon
- Transmit from NSF's GBT
- Receive with NSF's VLBA
- Low output Power: < 700 W
- Finest Resolution Possible: ~1 meter
- Observations completed in 2020/2021
  - Moon, space debris, NEO
- Left: "Spotlight" radar images of Apollo 15 landing-site region

Apollo 15 Landing Site

Resolution: ~1.25 meters

Highest resolution image of the Moon taken from Earth

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Image Credit: Raytheon

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Tycho crater:
~85 km diameter

Resolution:
~5 meters

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Tycho crater: ~85 km

Resolution: ~5 meters

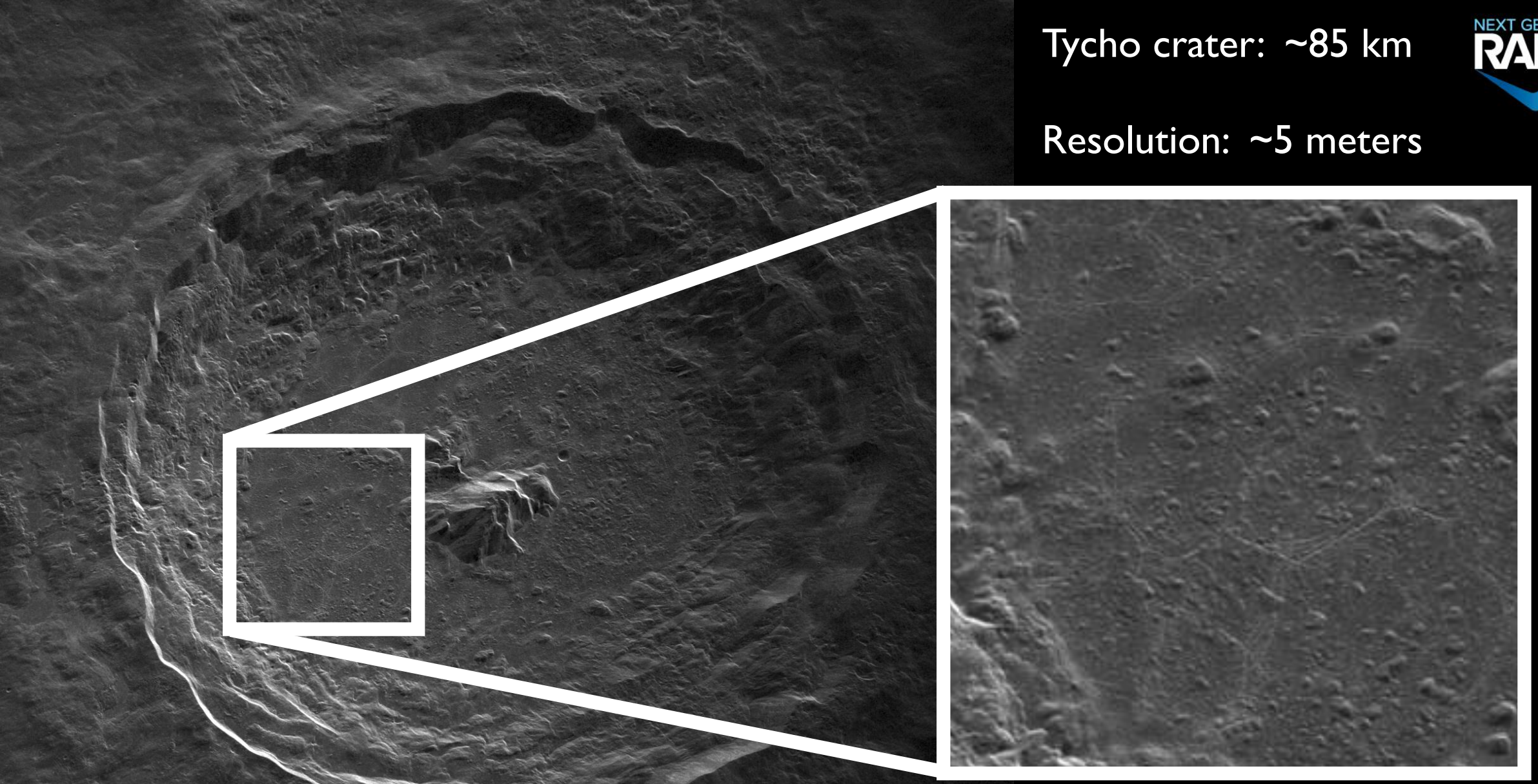
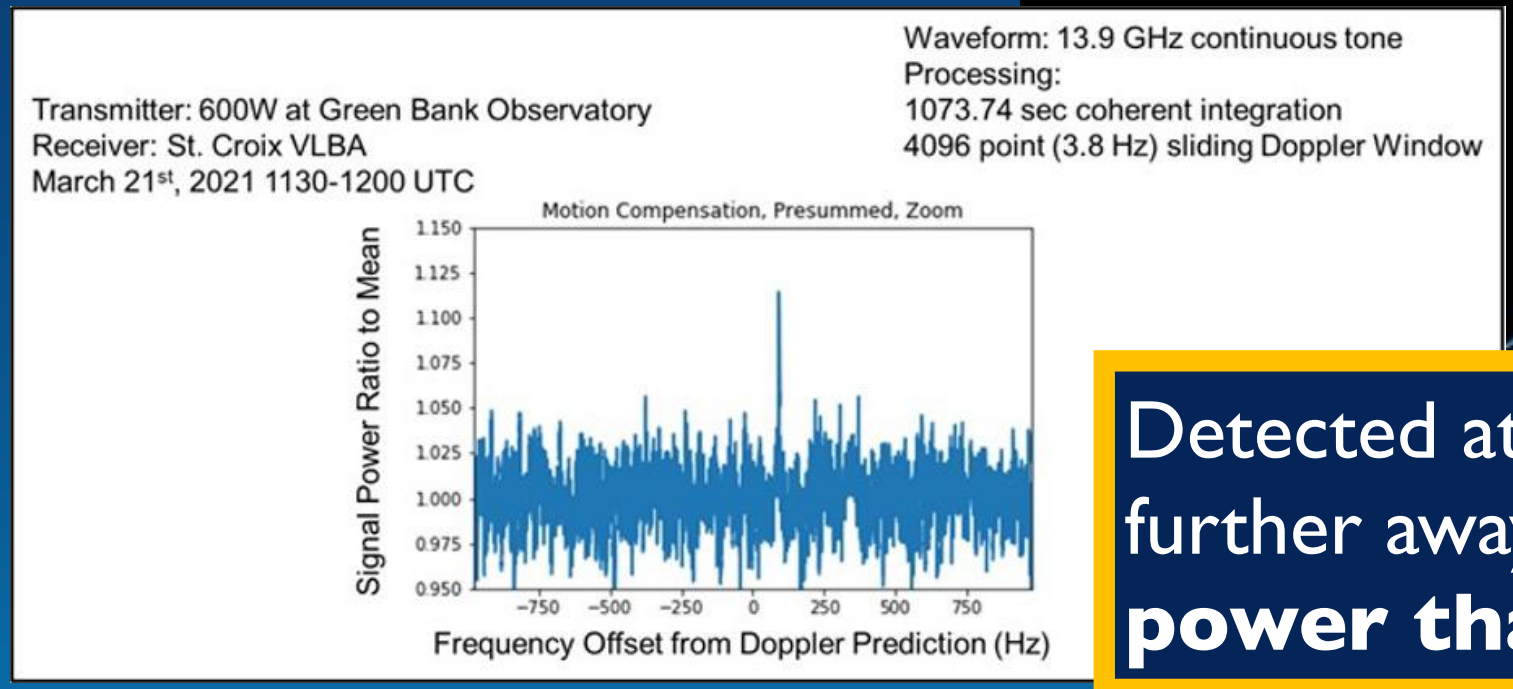
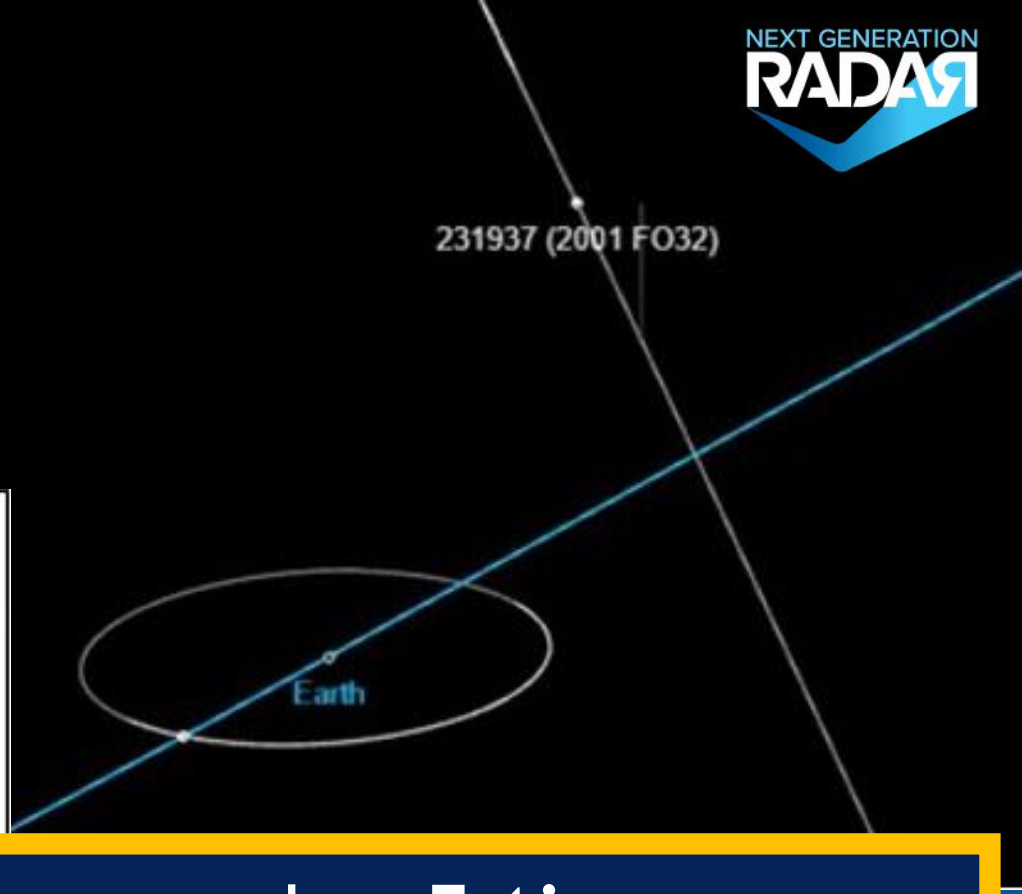


Image Credit: Raytheon

"Potentially Hazardous" Asteroid

- No impact threat to Earth
- Flew by Earth at >2 million km
- (231937) 2001 FO32





Detected at more than 5 times further away than the Moon with less power than a microwave oven!

A Next Generation Planetary Radar on the GBT

- *Goal*: High-power radar (500 kW at 13.7 GHz) for planetary science, planetary defense, and space situational awareness
- Demonstrated compelling radar results:
  - Meter-scale imaging of the Moon (and closer)
    - *Geology and dynamics*
  - Detecting, tracking, and characterizing space debris in cislunar space
    - *Safety and security*
  - Detecting, tracking, and characterizing NEOs for planetary defense
    - *Impact hazard assessment and mitigation planning*
  - Studying solid bodies across the Solar System for planetary science
    - *Physical and dynamical characterization*

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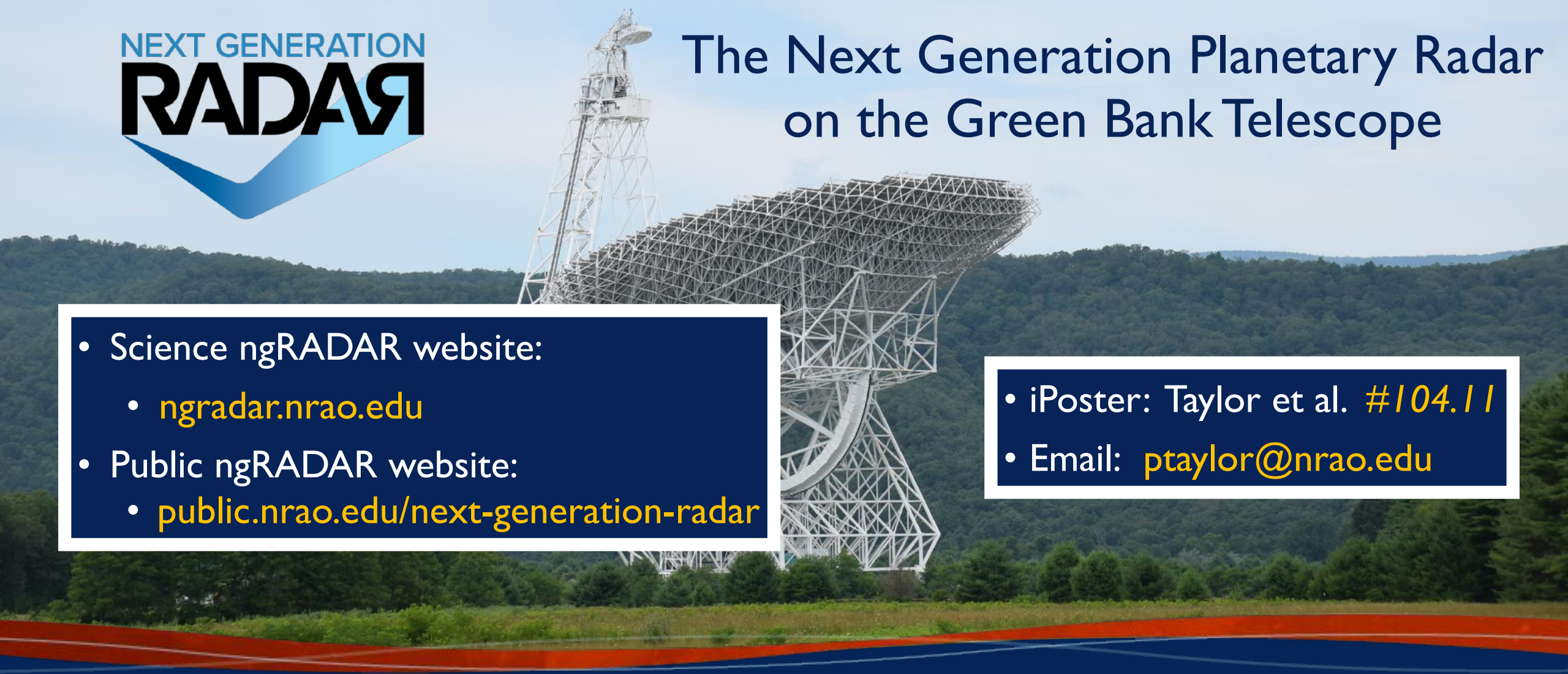

- Science ngRADAR website:
  - ngradar.nrao.edu
- Public ngRADAR website:
  - public.nrao.edu/next-generation-radar

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