

A large radio telescope dish, the Byrd Green Bank Telescope, is shown against a cloudy sky. The dish is a large, white, parabolic structure with a complex support structure. The text is overlaid on the image.

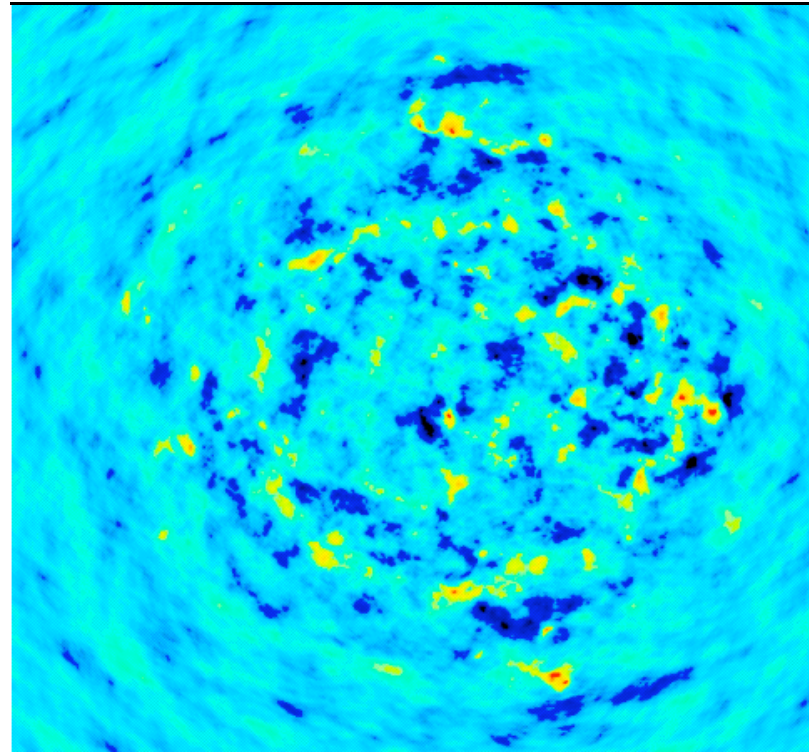
# Missing the Forest for the Trees

Science with the Byrd Green Bank  
Telescope

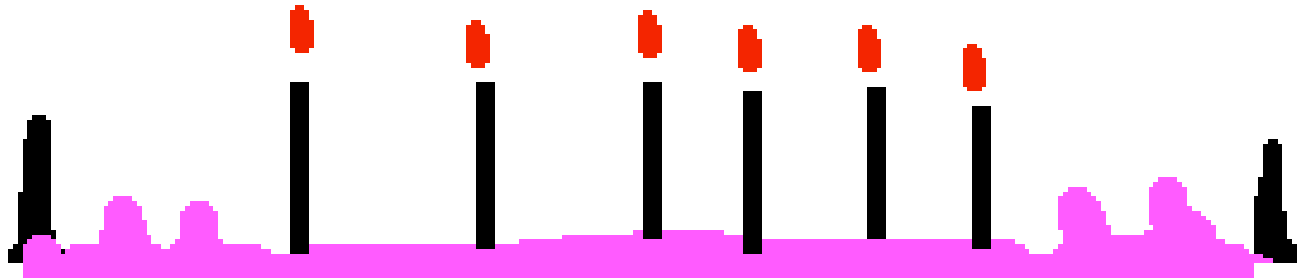
K.K. Dyer - NRAO

# The zero-spacing problem:

- Interferometers work by adding signals between antennas.
- Short baselines measure large scale flux.
- Long baselines provide high resolution -- they sample small scale structure.
- Therefore there is an angular size scale beyond which you cannot observe structure.







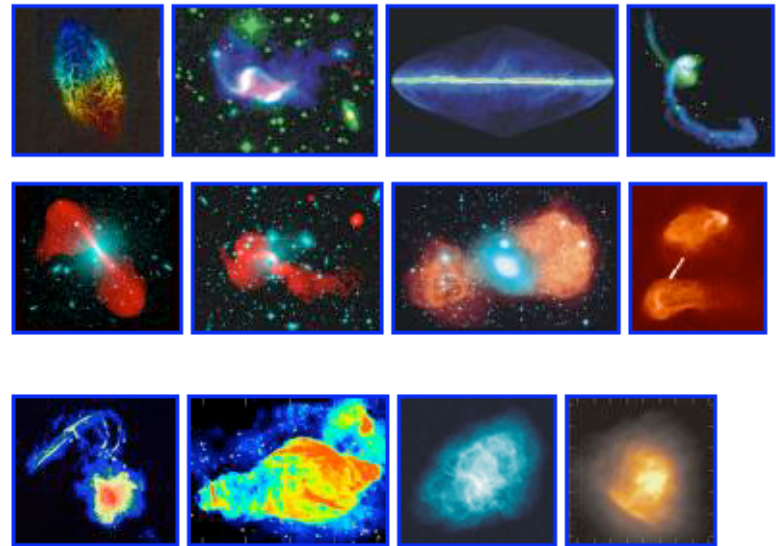
# How much do you lose?

- Smallest scale information =  $\lambda/D$
- $D$  = distance between antennas
- For the VLA in D array at 20 cm  $\sim 17$  arcminutes



# What kind of observations does this affect?

- Nearby galaxies
- Galaxy clusters:  
Coma, Virgo
- Supernova remnants
- Planetary nebulae
- Galactic plane
- HI



# CARMA and ALMA



- 12 meters, 90 GHz = 1 arcminute
- 15.4 meters, 490 GHz = 10 arcsecond

**So this will be a problem EVERYWHERE**

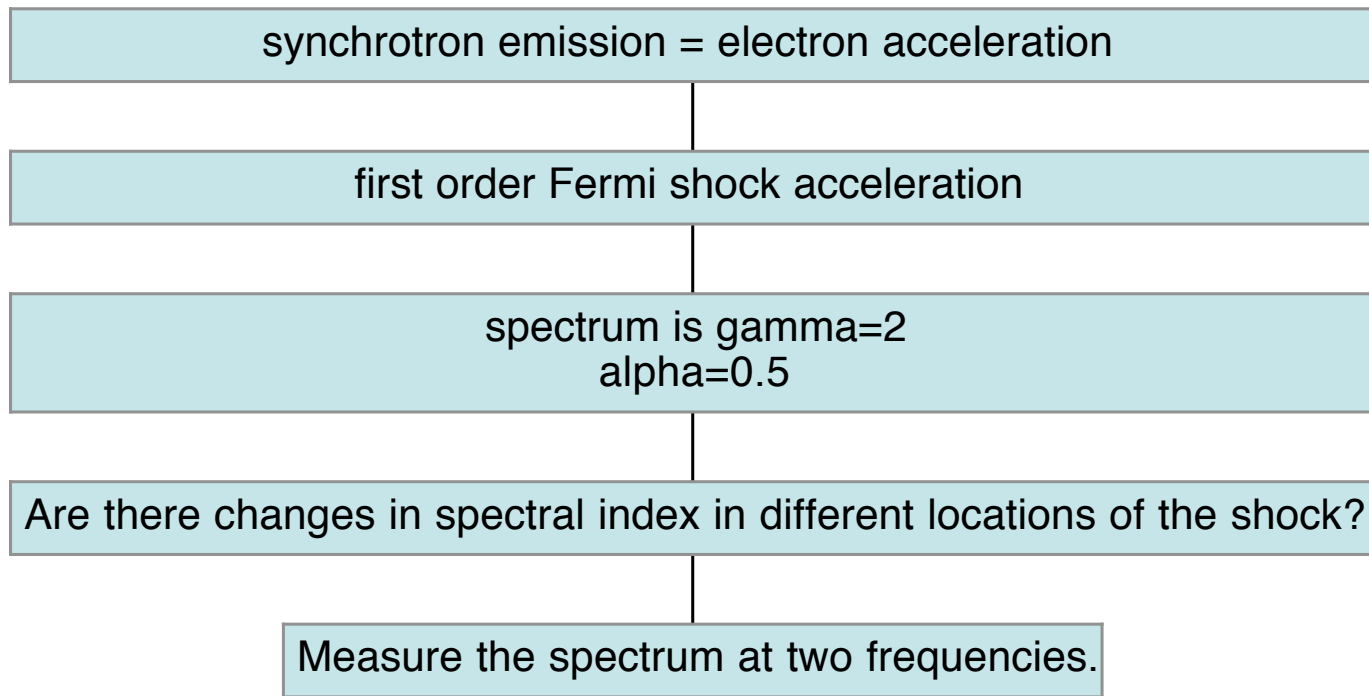
# Science issues affected by zero spacing problem

Supernova remnants:

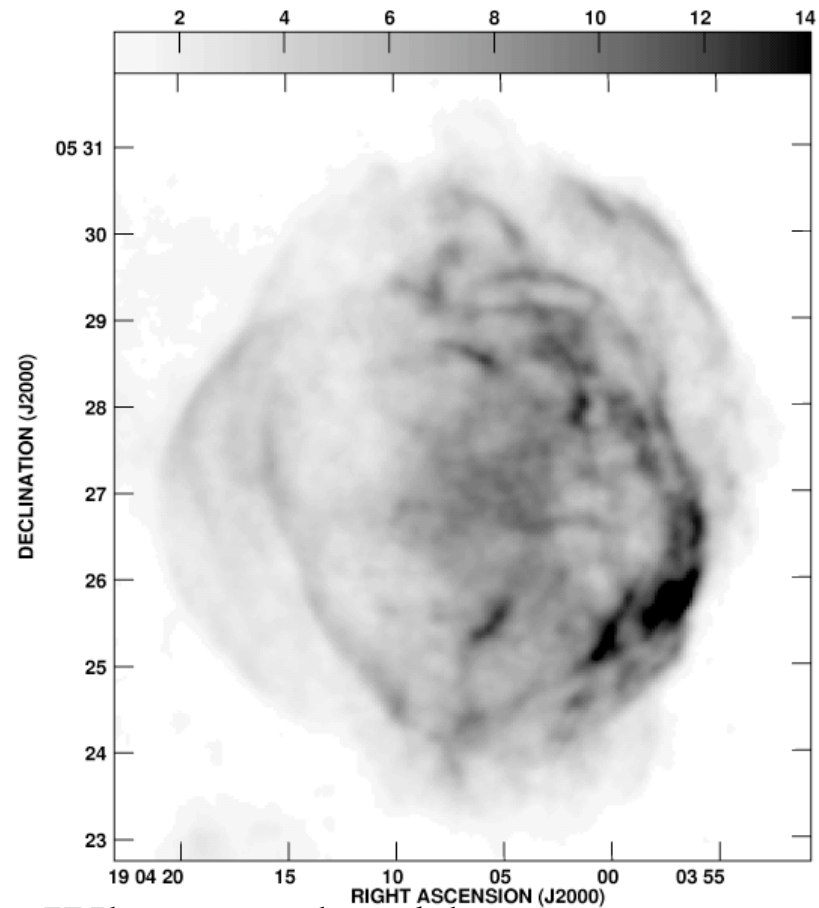
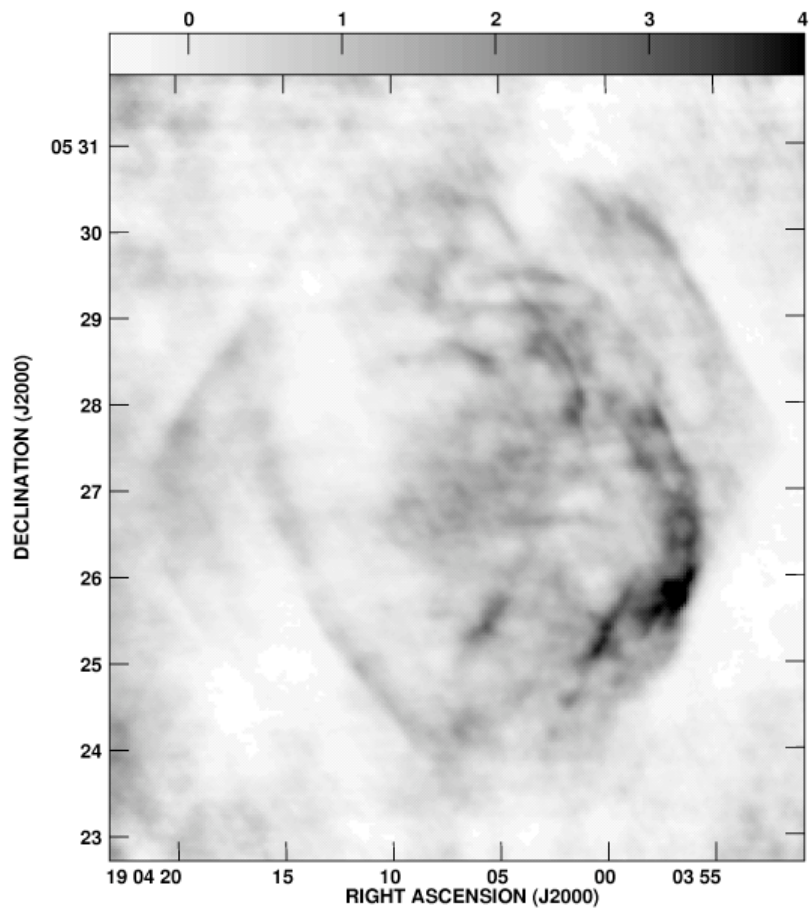
- Testing particle acceleration
- Determining magnetic field



*Example 1:*  
Cosmic rays, Particle acceleration



Smallest scale measured is different at each frequency!

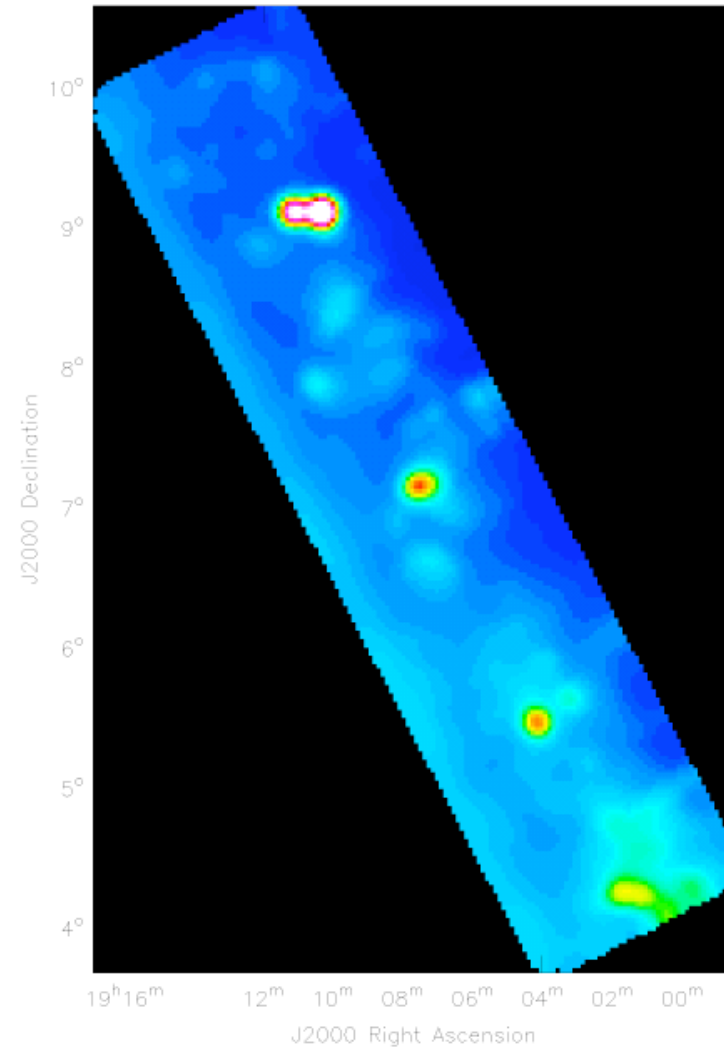


- 6 cm: 2.7 Jy
- 20 cm: 18.5 Jy

What we should get:

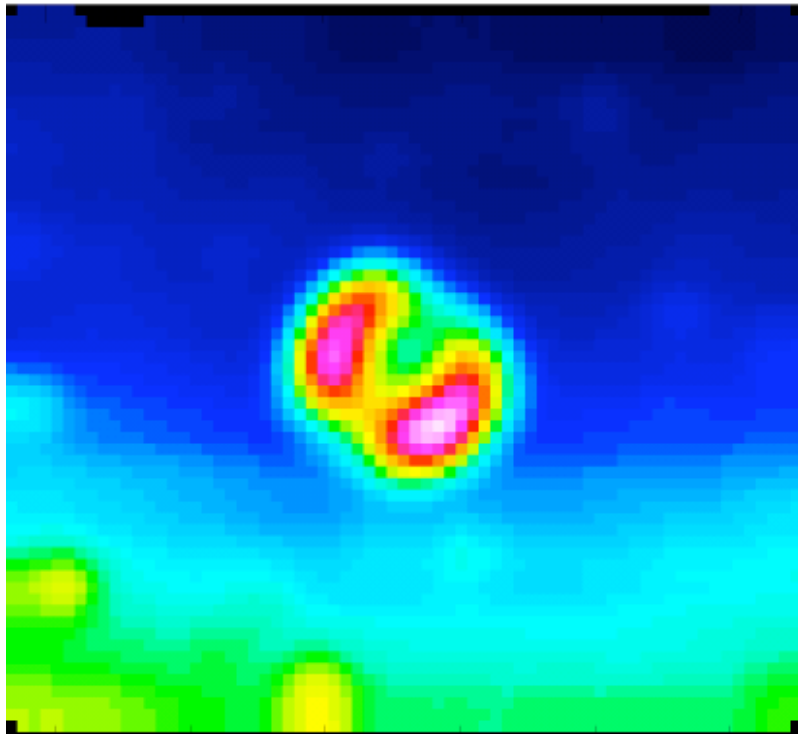
- 7 Jy
- 15 Jy

# Single dish measurements



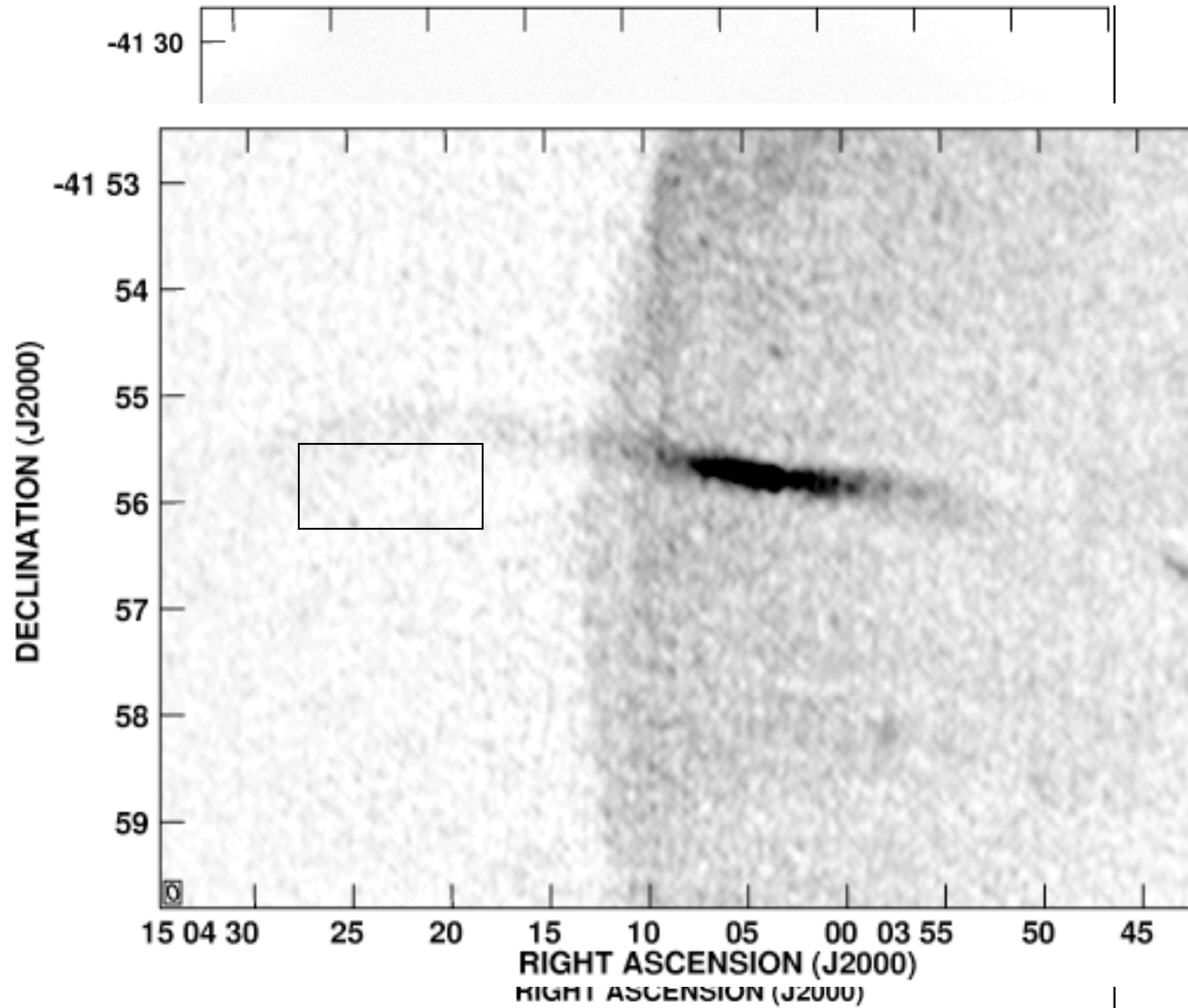
*Example 2:*

The magnetic field across the shock in SN1006



GBT 20 cm observation of SN1006

- Critical example of shock acceleration
- Disagreement over nonthermal x-ray emission
- Confirm the magnetic field



GBT+ VLA BCD 20 cm, Cornwell, Holdaway, Dyer

# Conclusions:

- Interferometers do high resolution well, total flux poorly
- Worry about small spacing scale
- Apply for time at the Green Bank Telescope
- Technical issues can hang up very important science questions

