# Imaging the Cosmic Microwave Background With DASI

Clem Pryke Astrophysics in Antarctica May 2000 I will not be showing a DASI power spectrum this afternoon.

# Outline

- Current CMB situation
- Why use an interferometer?
- Why do it at the south pole?
- DASI design
- DASI deployment
- Analysis in progress...

### **Current Situation**



#### Where does DASI fit?



#### Why an Interferometer?

- Directly measures power spectrum of the sky.
- Intrinsically stable only correlated signals are detected.
- Designer can control angular range covered.

### How DASI Works



























#### Why at the South Pole?

- Low atmospheric moisture
- Atmosphere highly stable
- No Sun for 6 months of the year
- Fields remain at constant elevation angle
- Existing infrastructure and logistics







#### **DASI/CBI** Collaboration

- CBI at CalTech / Chile
- Steve Padin / Tony Readhead
- Tim Pearson, Martin Shepherd
- John Cartwright

- DASI UofC / South Pole (CARA)
- John Carlstrom / Mark Dragovan
- Bill Holzapfel, Erik Leitch, Clem Pryke
- Nils Halverson, John Kovac
- Ethan Schartman
- John Yamasaki / Gene Davidson

### **DASI** Design

- Corrugated microwave feedhorns
- 26-36 GHz HEMT amplifiers cooled to 20K, downconvert to 2-12 GHz
- Passive filter splits into 10 x 1GHz bands
- Each band correlated to form 156 visibilities

# Feedhorns





# Receivers



# **Atmospheric Emission**



# **HEMT Amplifiers**



# First stage FET



# **Receiver Control Card**



#### **DASI** Mount



SIDE VIEW - EL =  $45^{\circ}$ 

### DASI Deployment

- Mount completed April 99 by Vertex Inc.
- Initial assembly and integration in EFI high bay.
- Moved out to parking lot July
- Disassembled for shipping August
- Arrived in Antarctica October
- Arrived at South Pole November

## DASI at Vertex



# DASI Leaves High Bay



# Summer Testing



# Arrival in Antarctica



# Arrival at South Pole



# Re-assembly



# Lifting to Tower



# Cover for Working



# DASI at Sunset



# Analysis in Progress

- System works well and is very stable
- Imaged astronomical object quickly
- For CMB ground signal is an issue

## First Image



### Ground signal is stable

















$$\chi^{2} = \sum_{i=1}^{12} \frac{(x_{i} - \overline{x})^{2}}{\frac{7}{8}\sigma^{2}(x_{i})}$$







# Synchrotron Map



#### Dust Map



#### Conclusion

- DASI is running, data is flowing
- Ground signals are an issue
- Things are looking up...

