First Epoch Observations of 3-Helium with the Green Bank Telescope

THOMAS M. BANIA

Institute for Astrophysical Research

Boston University

COLLABORATORS

R. T. ROOD
ASTRONOMY DEPARTMENT
UNIVERSITY OF VIRGINIA

D. S. BALSER
NATIONAL RADIO ASTRONOMY OBSERVATORY

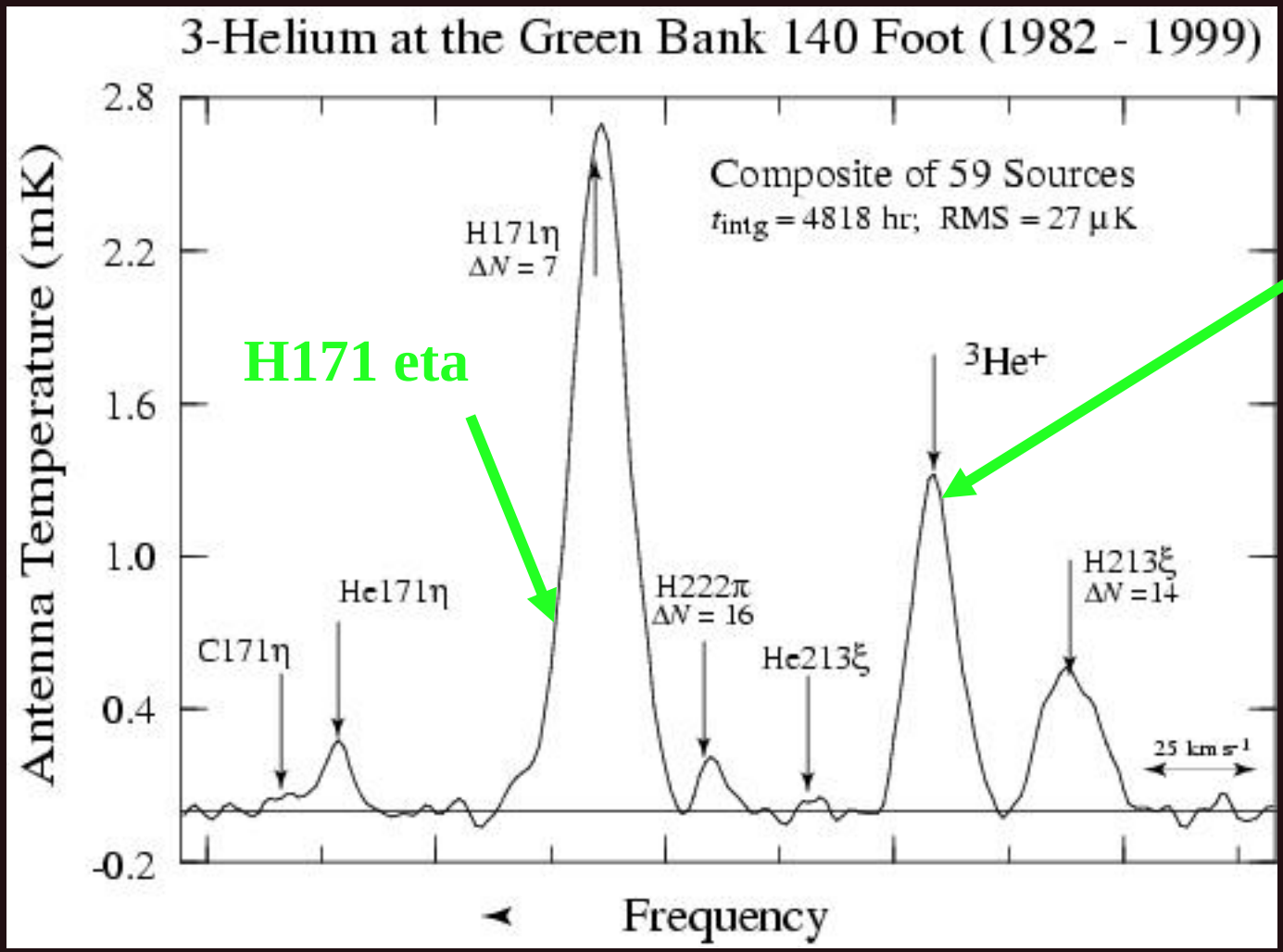
C. QUIREZA CAMPOS
INSTITUTO DE ASTRONOMIA, GEOFISICA E CIENCIAS ATMOSFERICAS
UNIVERSIDADE DE SAO PAULO

NRAO 140 ft

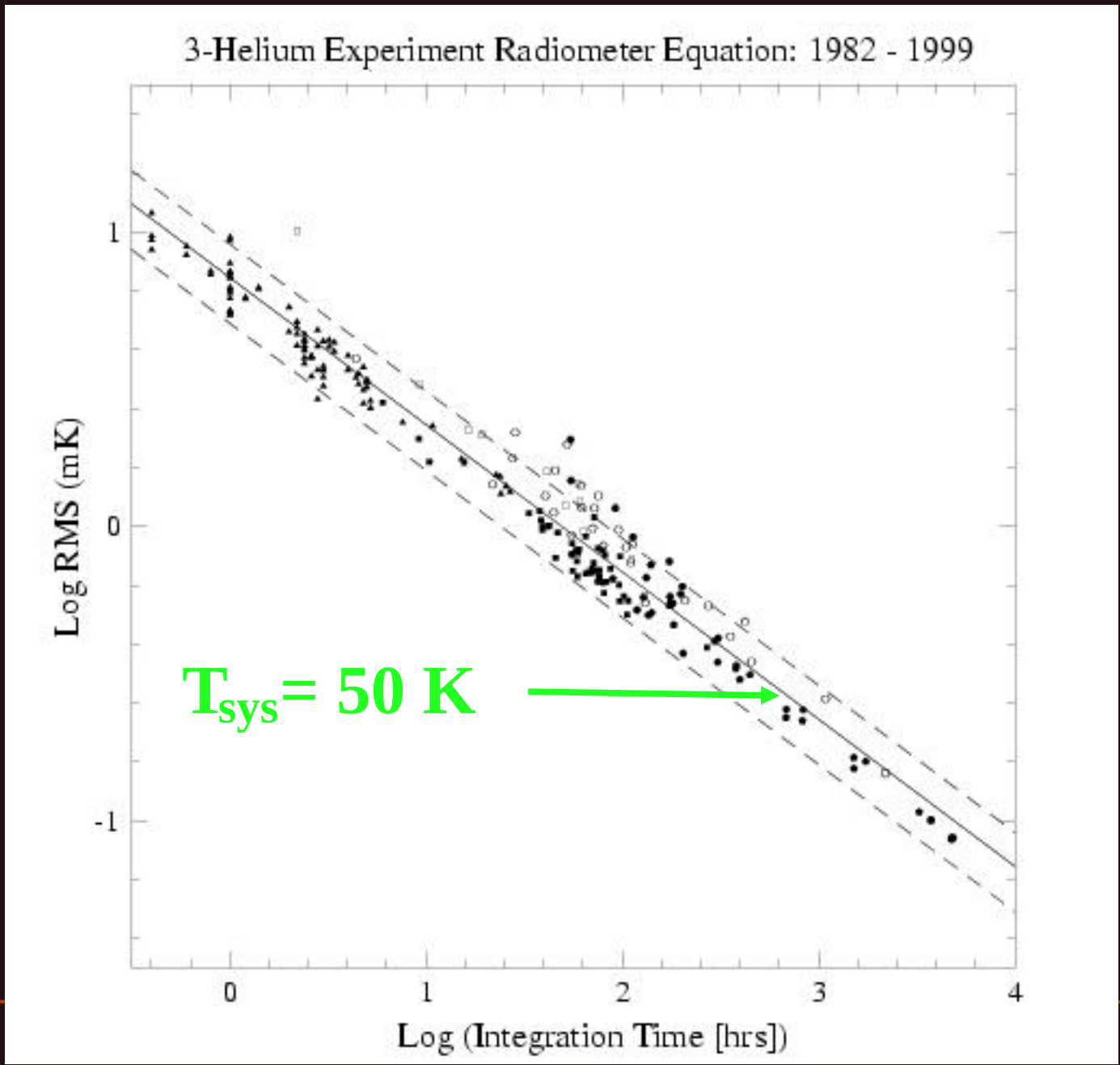
H II Regions

MPIfR 100 m

Planetary Nebulae (PNe)



200 Day Integration: 27 microKelvin RMS

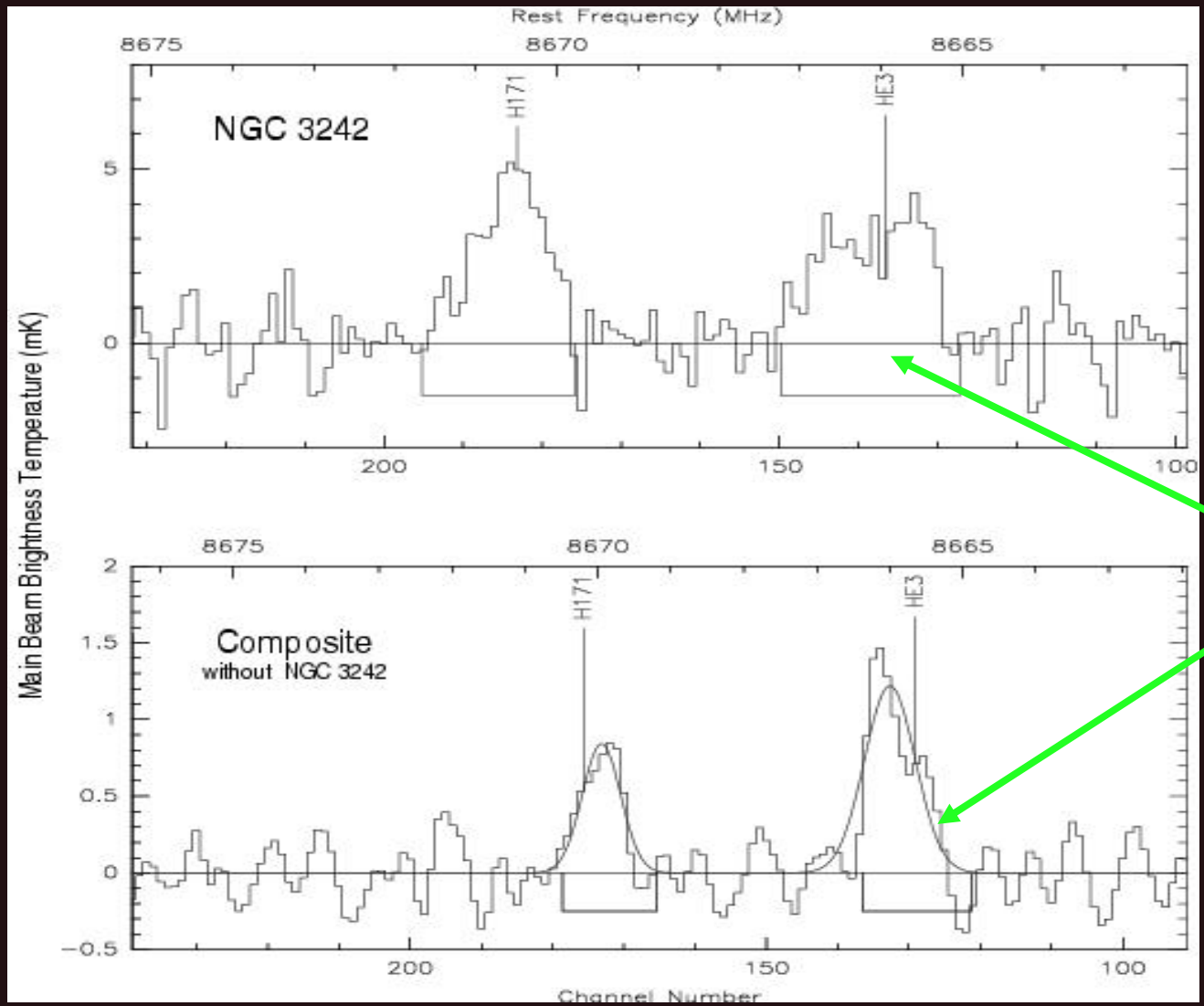

3-Helium Experiment Radiometer Equation: 1982 - 1999
Log RMS (mK)
1
0
-1
0
1
2
3
4
Log (Integration Time [hrs])
T_{sys}= 50 K

MPIfR 100 m PNe Survey

Balser, et al. 1997, ApJ 483, 320

106 hr

1987-1997

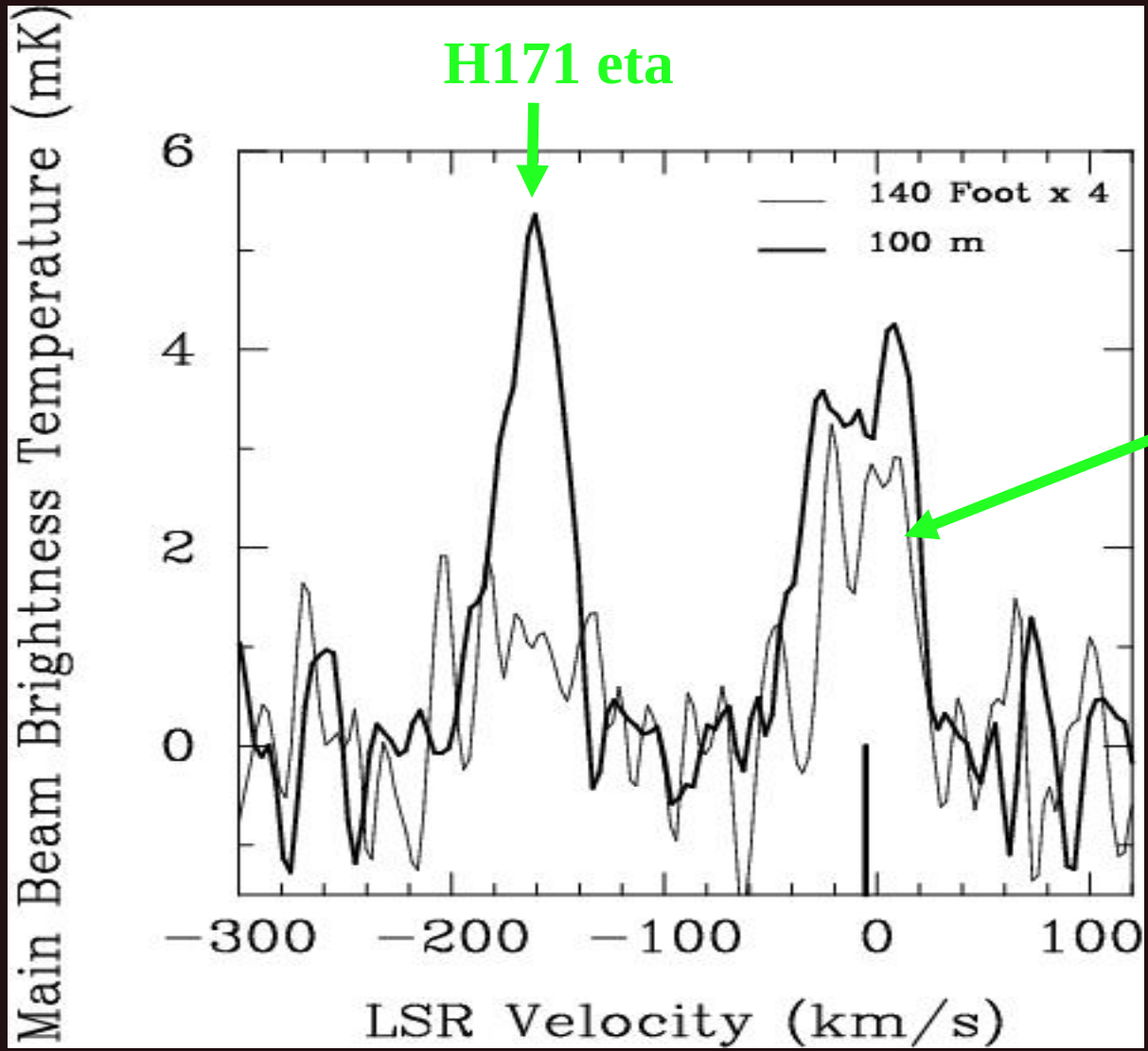


$^3He^+$

443 hr

Composite: NGC 6543 + NGC 6720 + NGC 7009 + NGC 7662 + IC 289

NGC 3242 Confirmation Balser, et al. 1999 ApJ 522, L73



NRAO 140 ft spectrum is a 270 hour integration

The Robert C. Byrd

GREEN BANK TELESCOPE

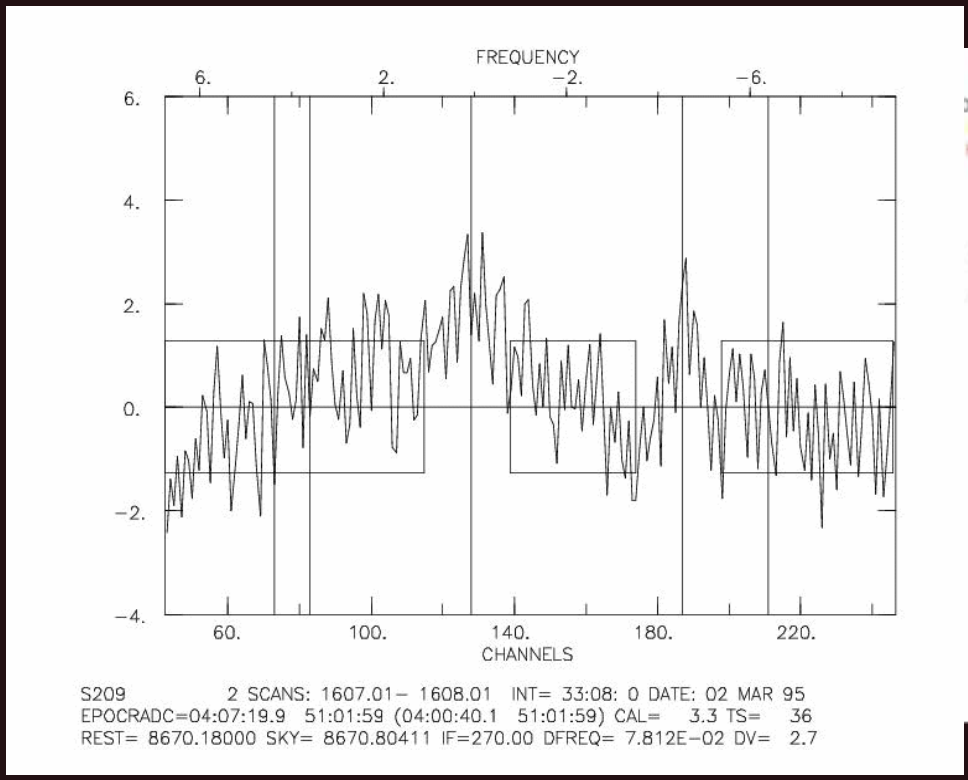
GBT: Surface Area is 8,000 m^2

GBT: Mass is 7,300,000 kg

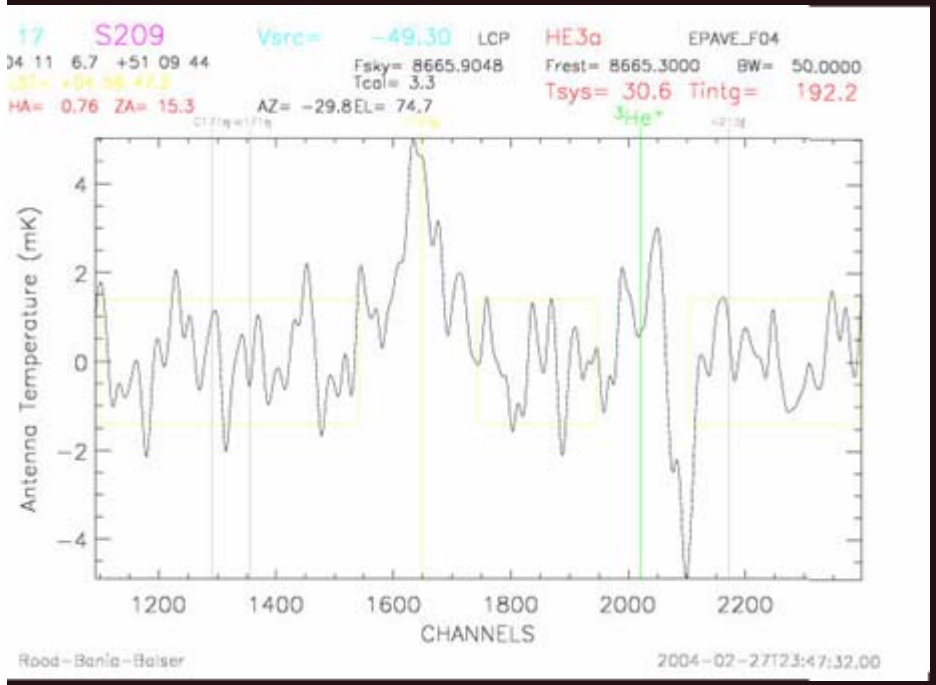
GBT: Clear Aperture Optics

S 209 H II Region

140 ft March 1995



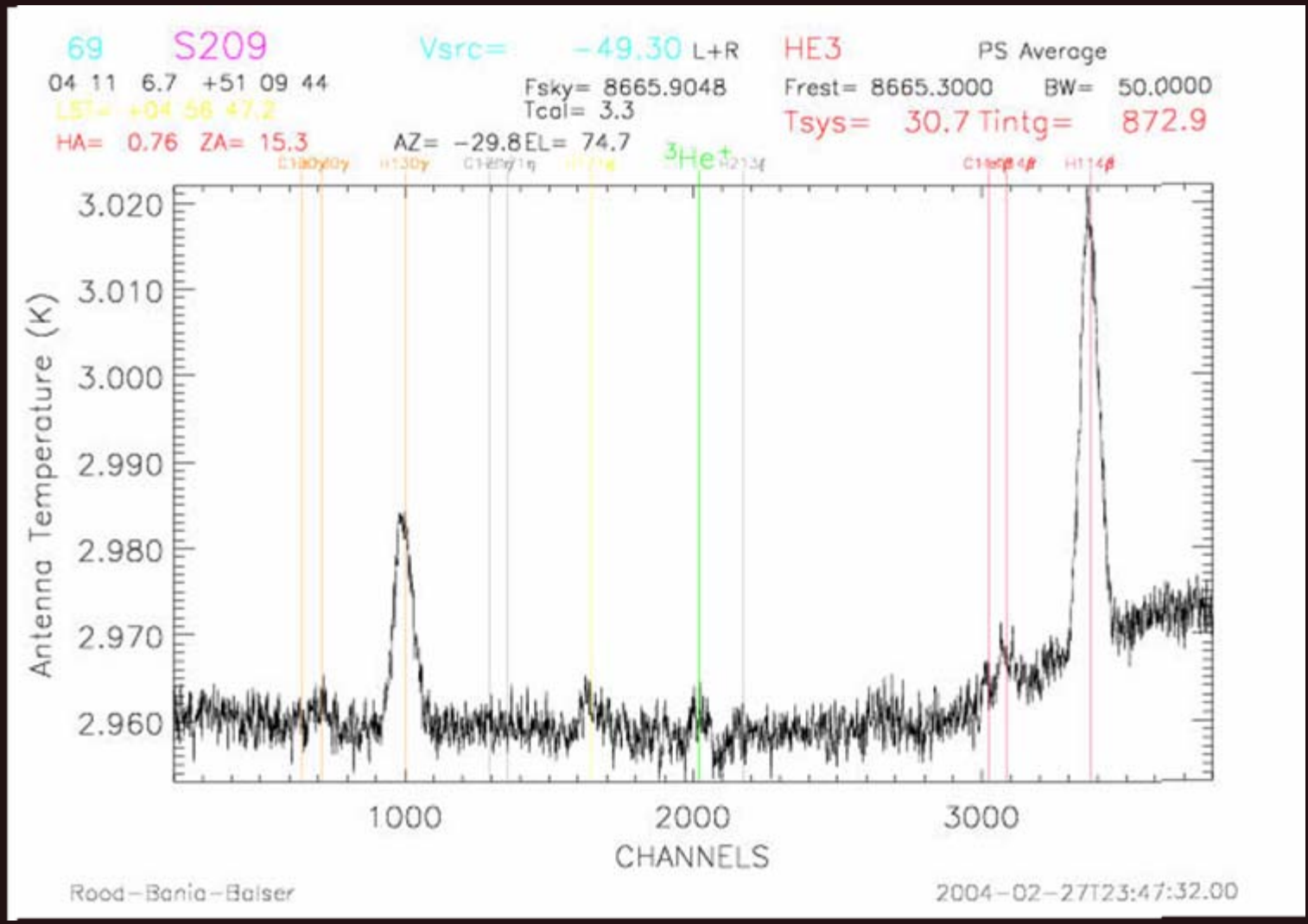
GBT June 2004



33.1 hr

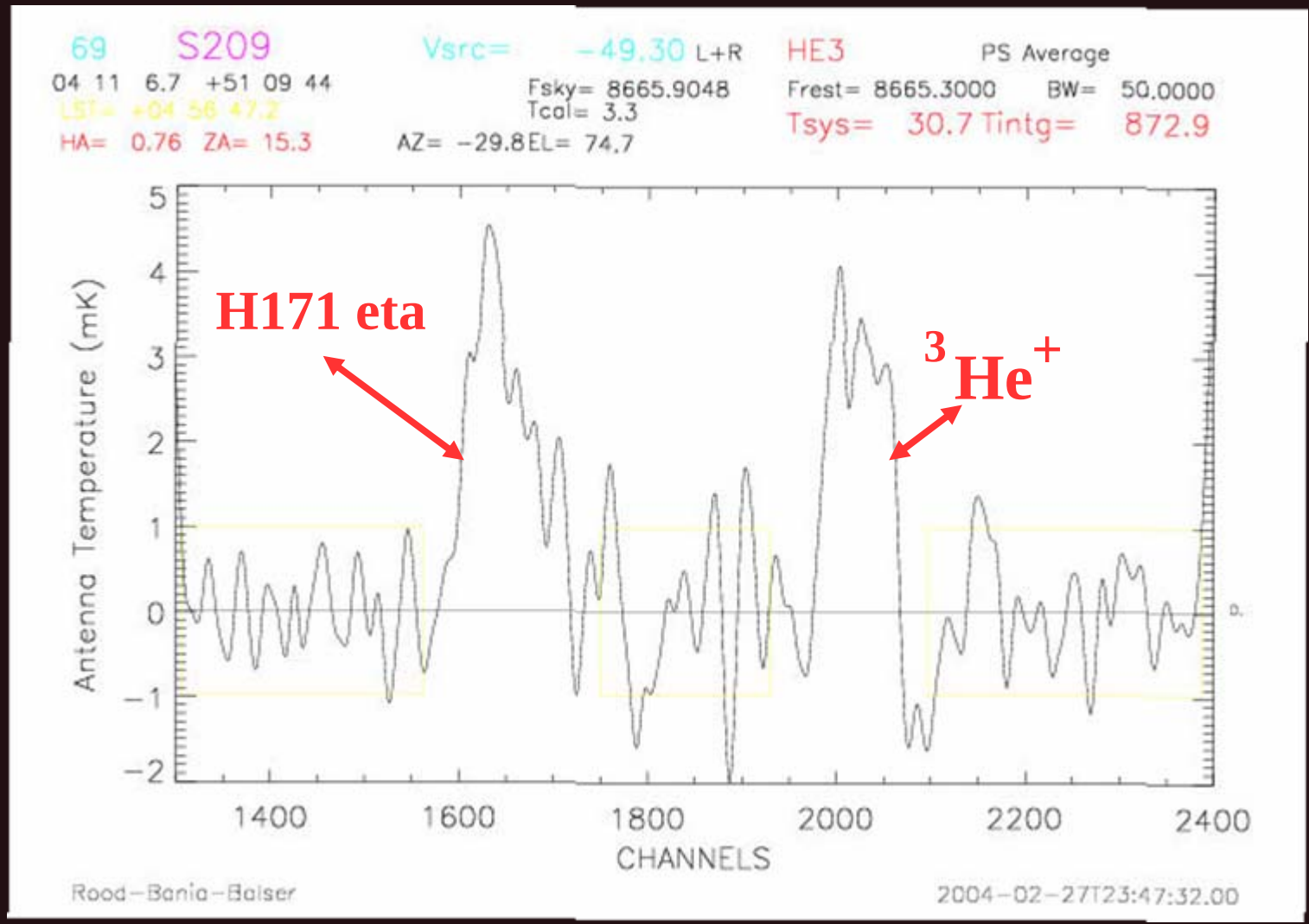
3.2 hr

GBT S 209 H II Region



14.5 hour integration

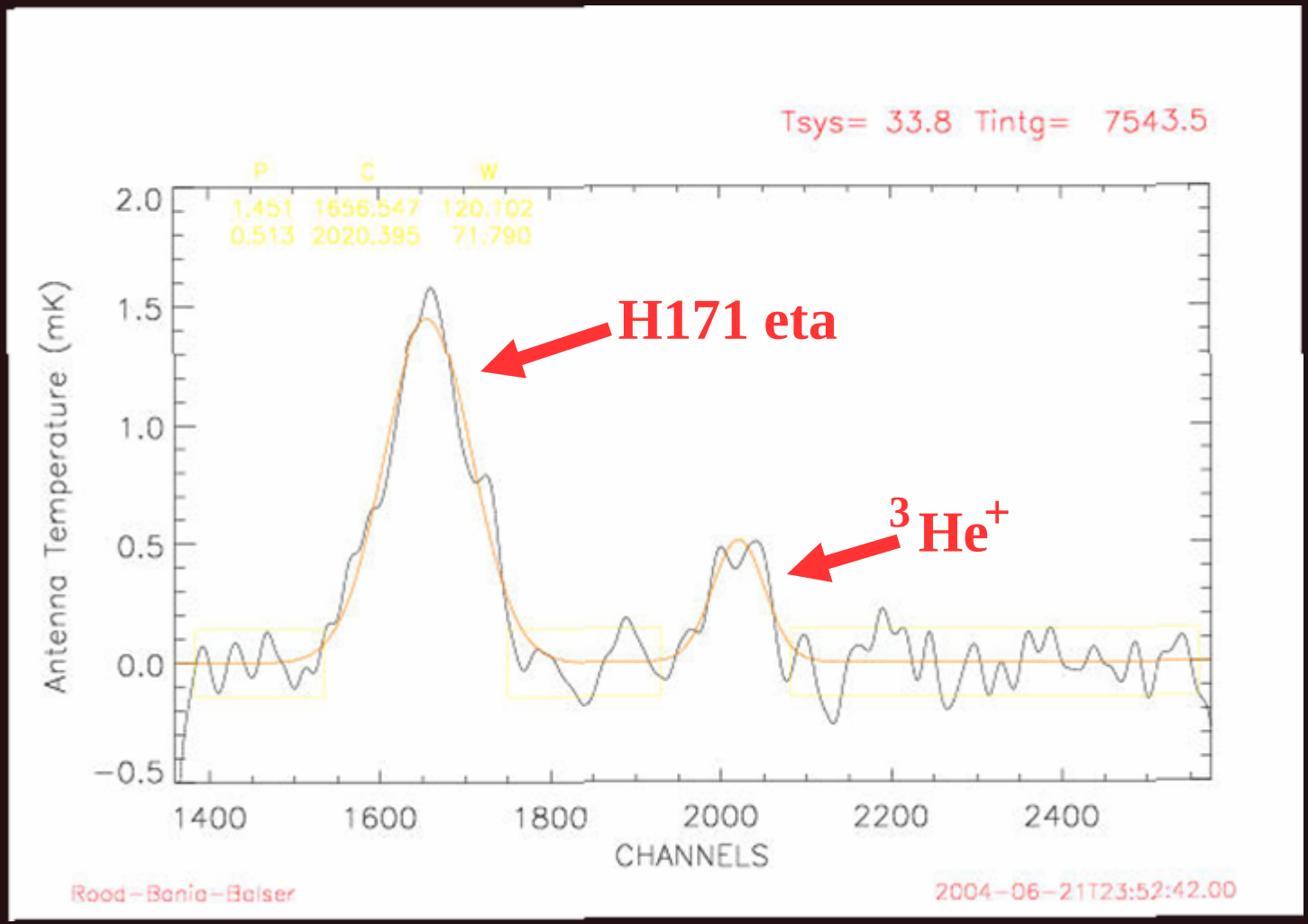
S 209 H II Region



14.5 hour integration **5 km/sec resolution**

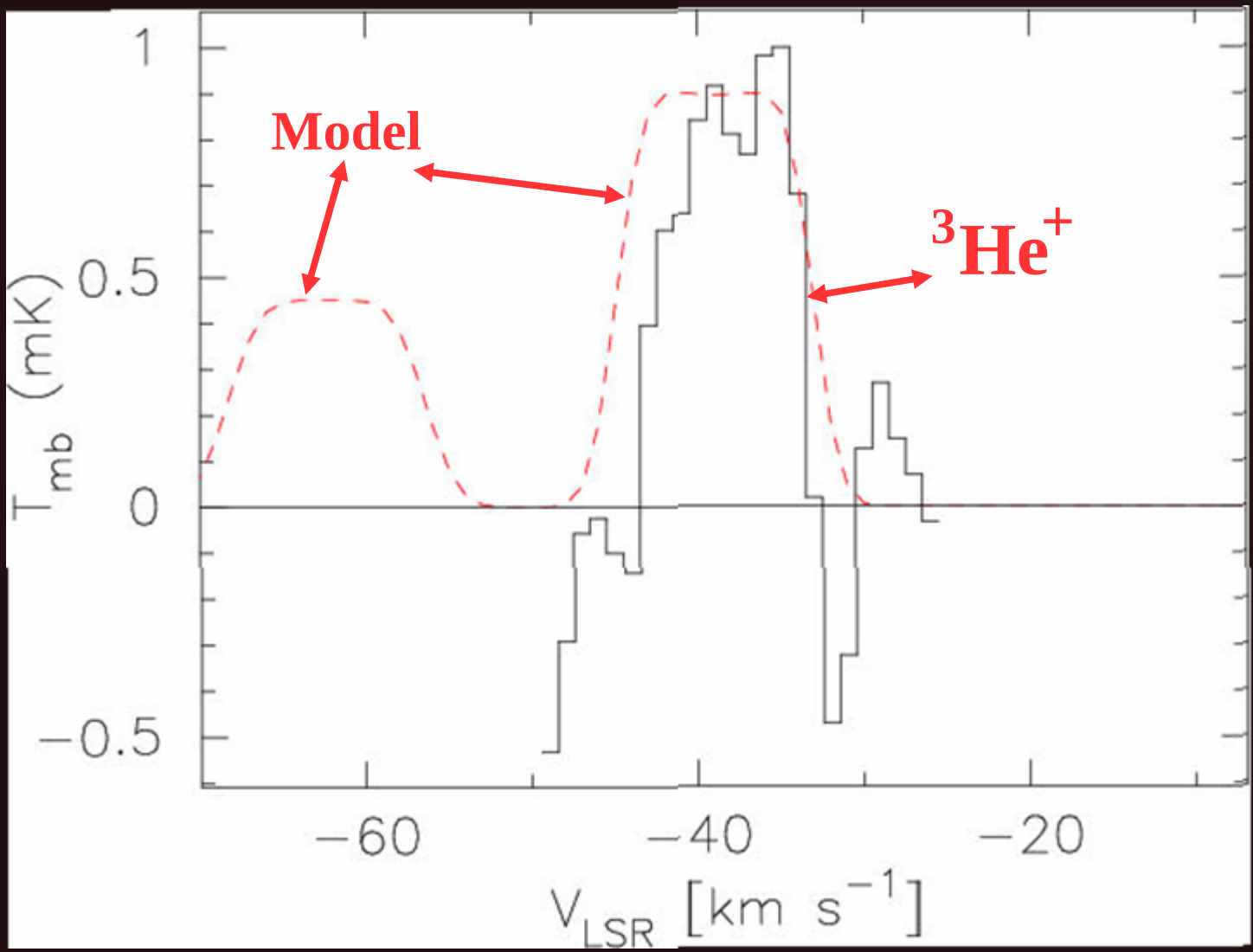
GBT PNe Composite Spectrum

NGC 3242 + NGC 6543 + NGC 6826 + NGC 7009



125.7 hour integration

VLA Planetary Nebula J320



See poster by Balser, Bania, Rood, and Goss

NAIC Arecibo Observatory 305 m

3-Helium Experiment Status

- **GBT now fully operational for 3-He**
- **First GBT 3-He epoch complete**
- **Spectral baselines of excellent quality**
- **Composite PNe spectrum consistent with MPIfR survey results**
- **VLA 3-He detection for the PN J320 (see Balser et al. poster)**
- **NAIC Arecibo Observatory 305 m observations in Winter 2004-2005**