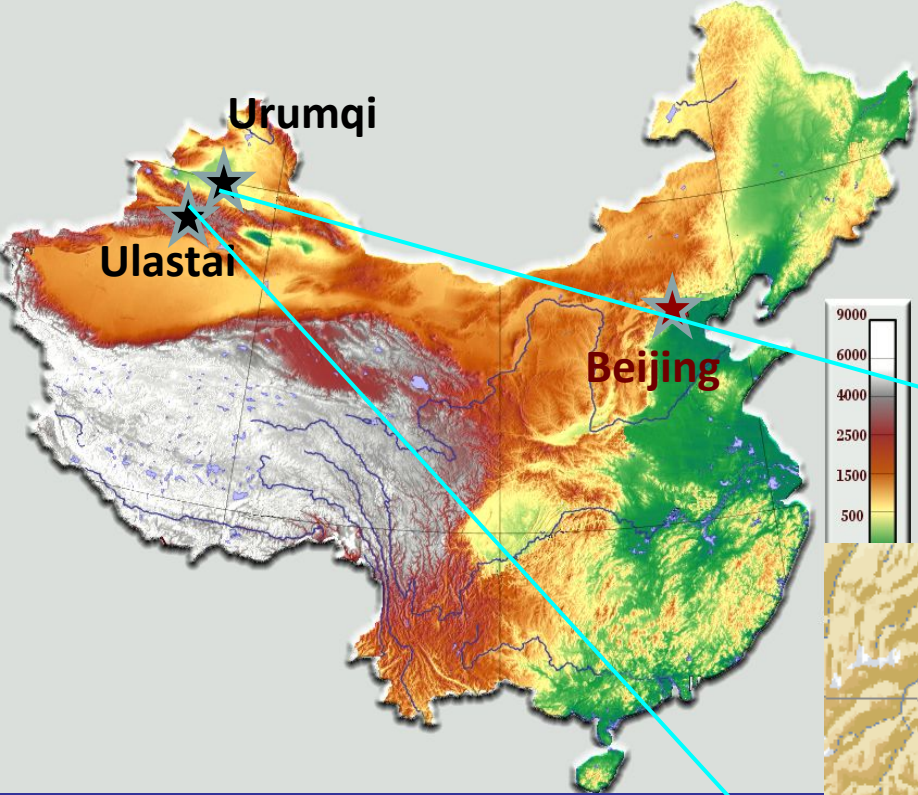


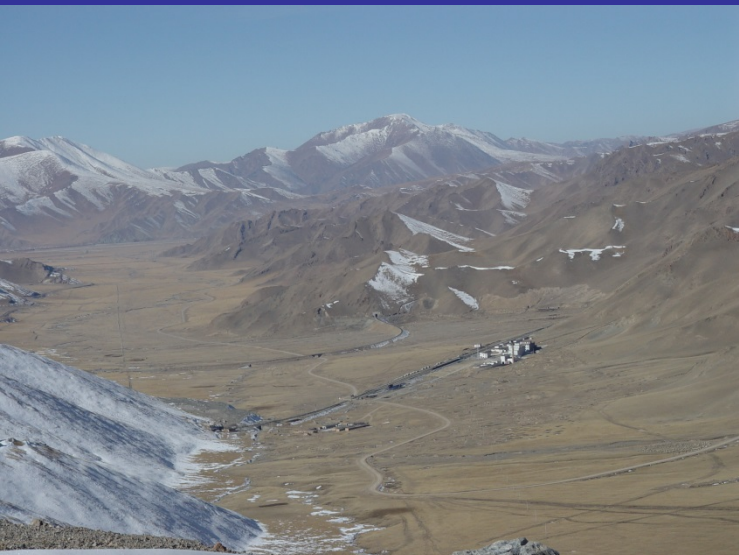
The NCP Region Observed with the 21 CentiMeter Array (21CMA)

Cathie Zheng, Xiang-Ping Wu, Melanie Johnston-Hollitt
(on behalf of the 21CMA Collaborations)





21CMA Site



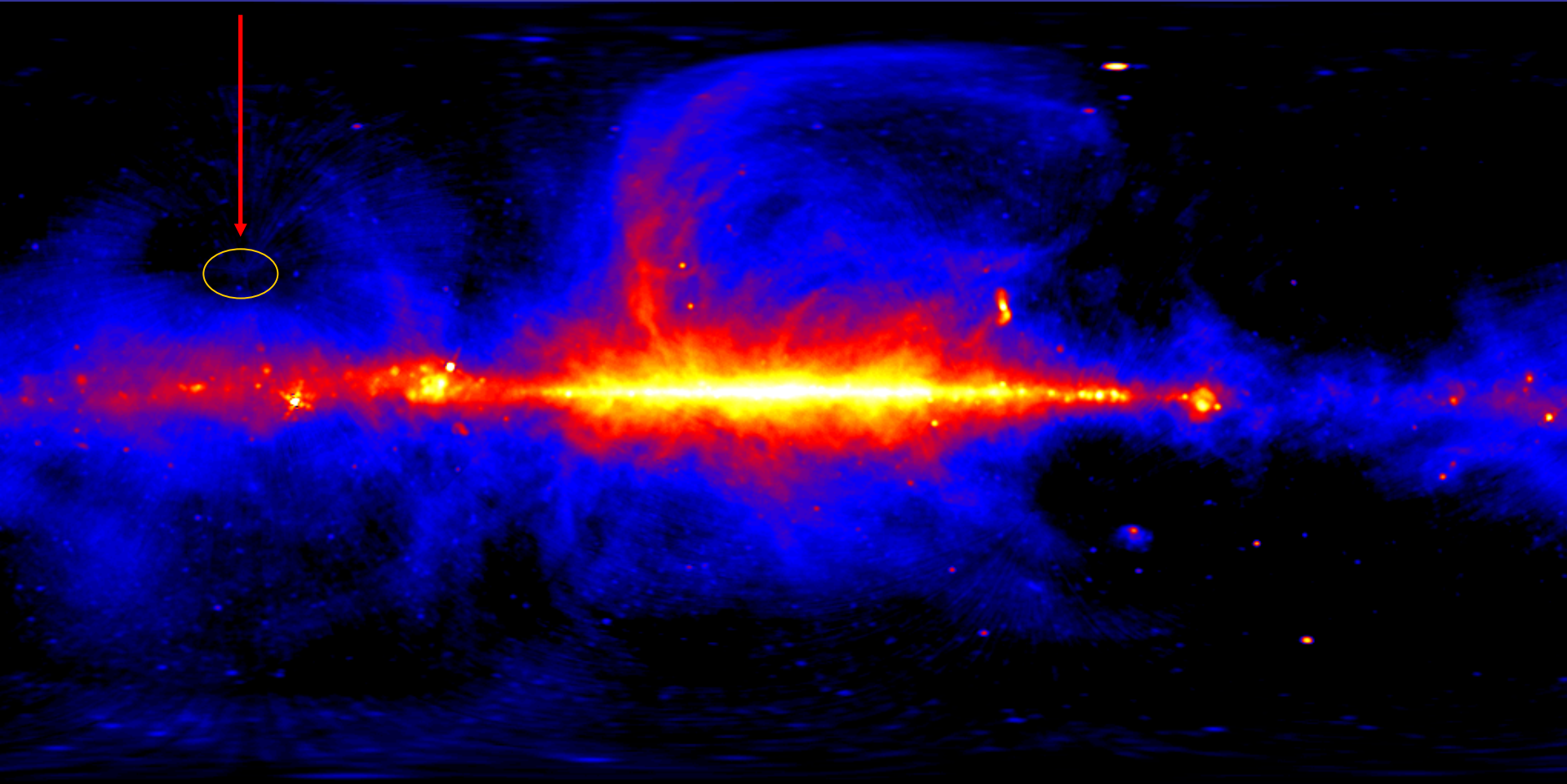
Log Periodic Antenna (16 pairs of wire)



Frequencies: 50 – 200MHz

VHF Sky (408 MHz)

21CMA



Points at NCP only – economical reason and simplicity

21CMA consists of 81 stations or pods



Log-Periodic
Antenna

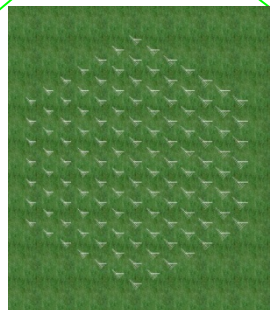


S

N

W

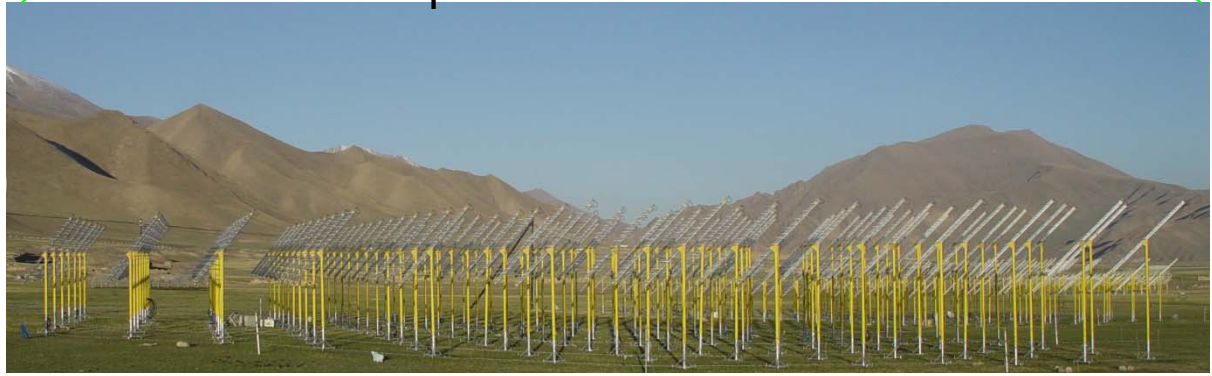
E



1 pod=127 antennas



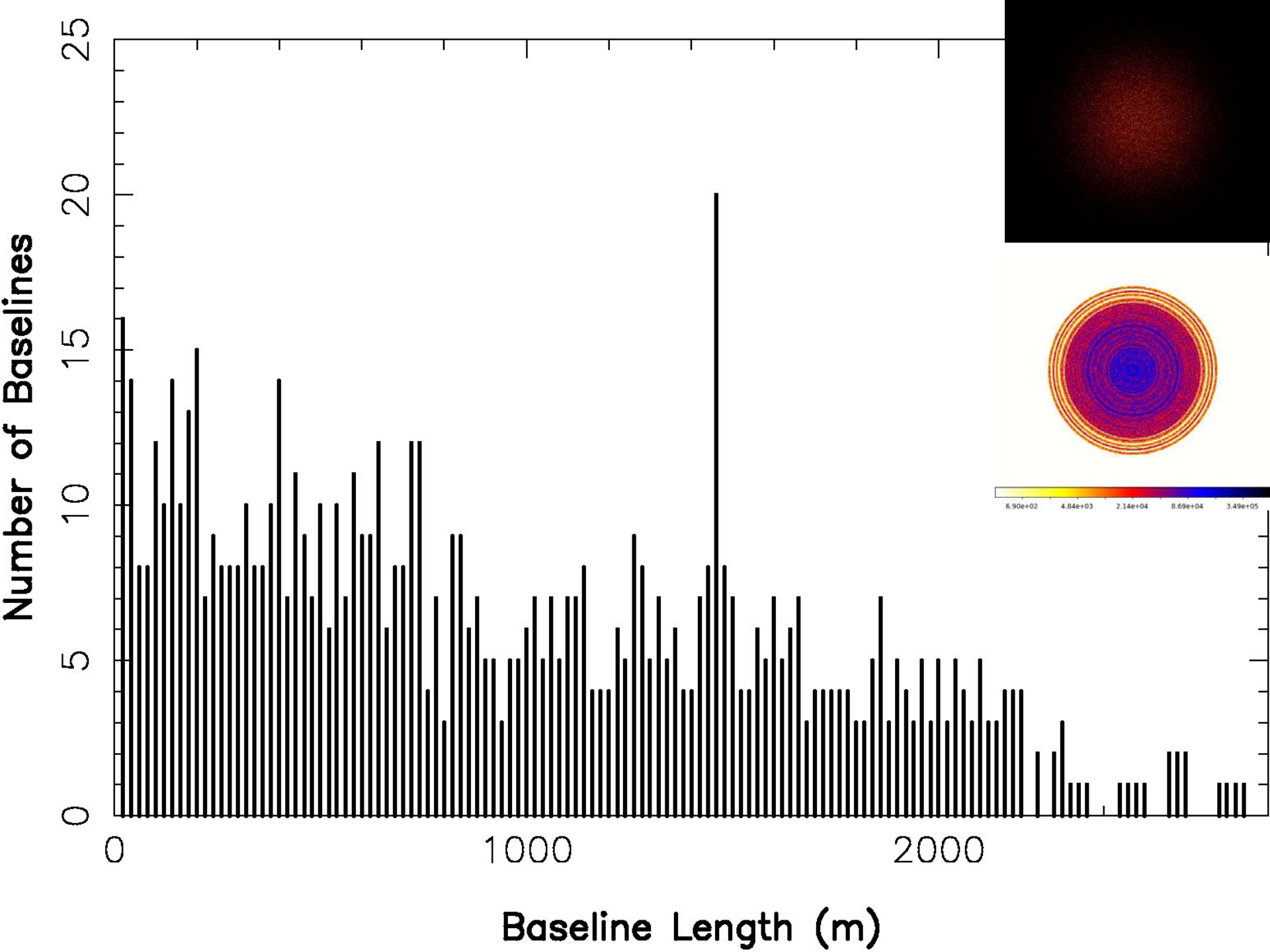
control room



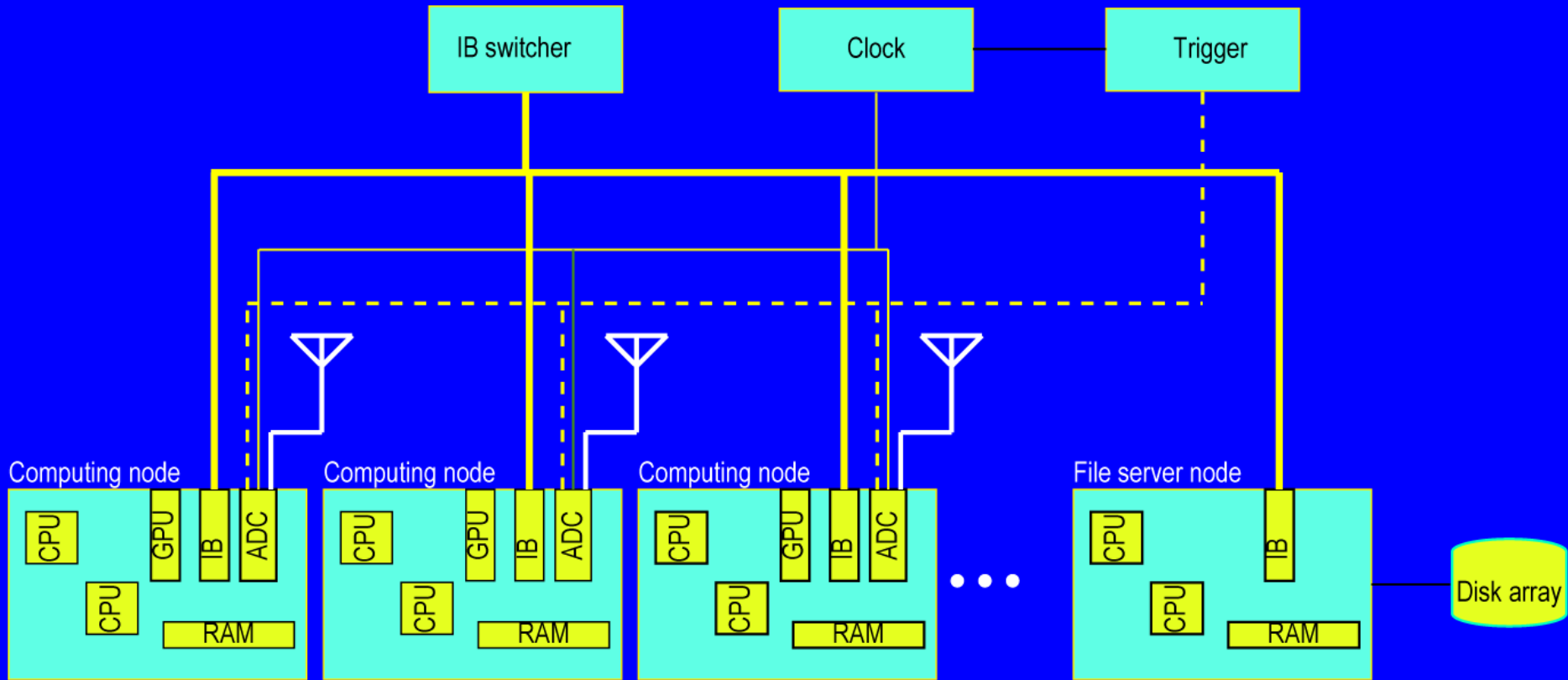
21CMA Layout

81 pods along two perpendicular arms (6km+4km)

Baselines: 3240 Channels: 8192 Correlations: 26,542,080

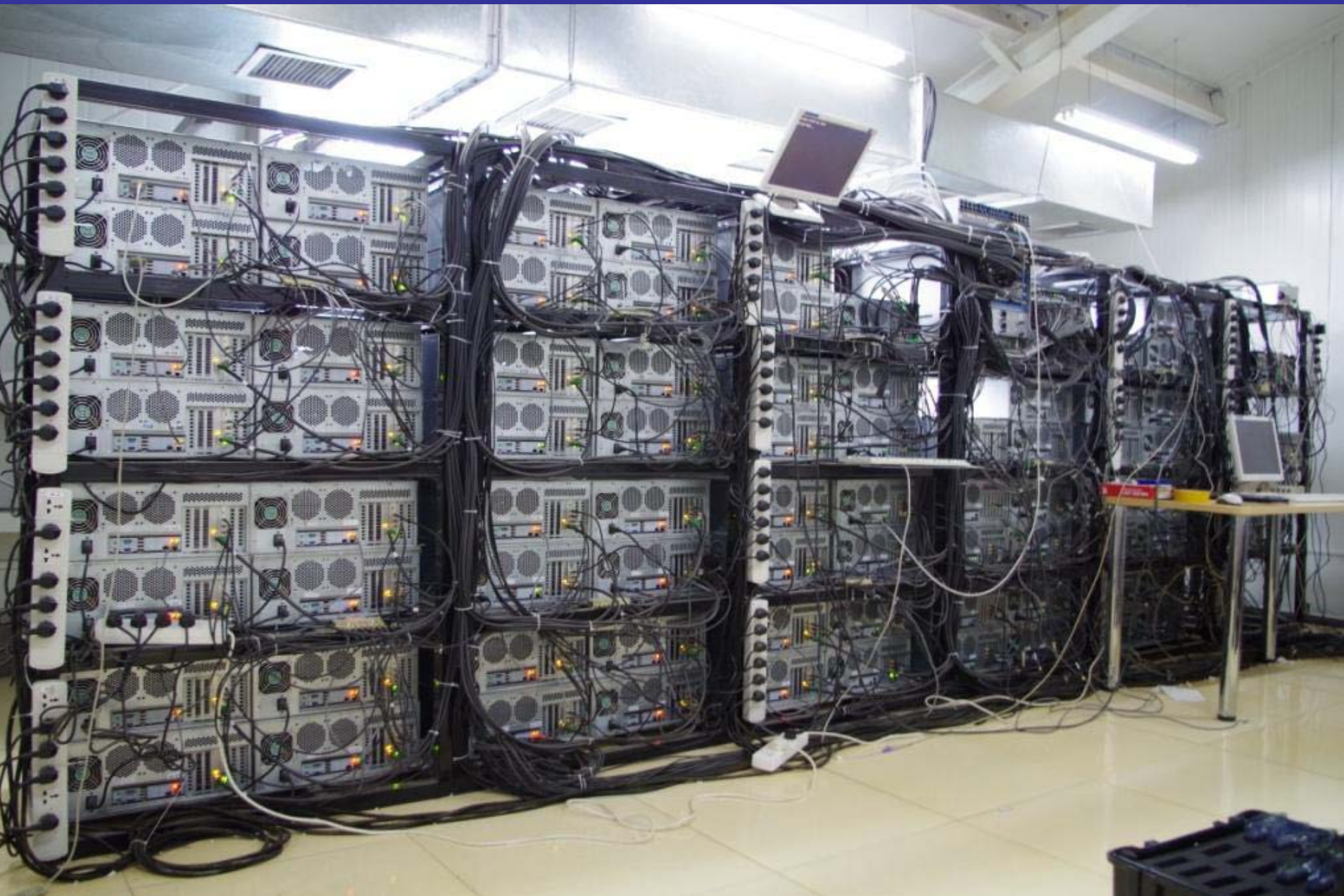


Data Communication

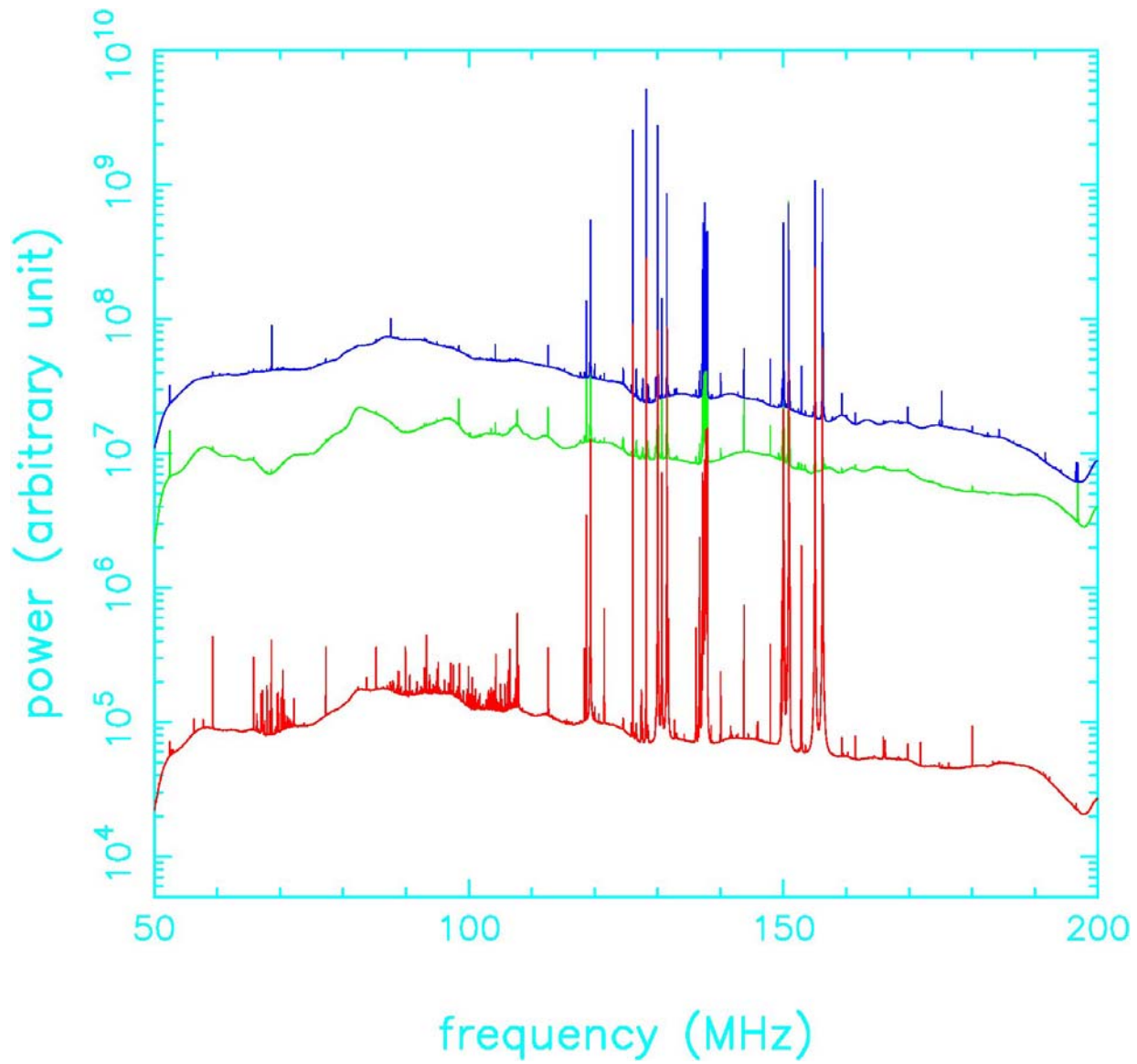


Efficiency:50%

32G/s

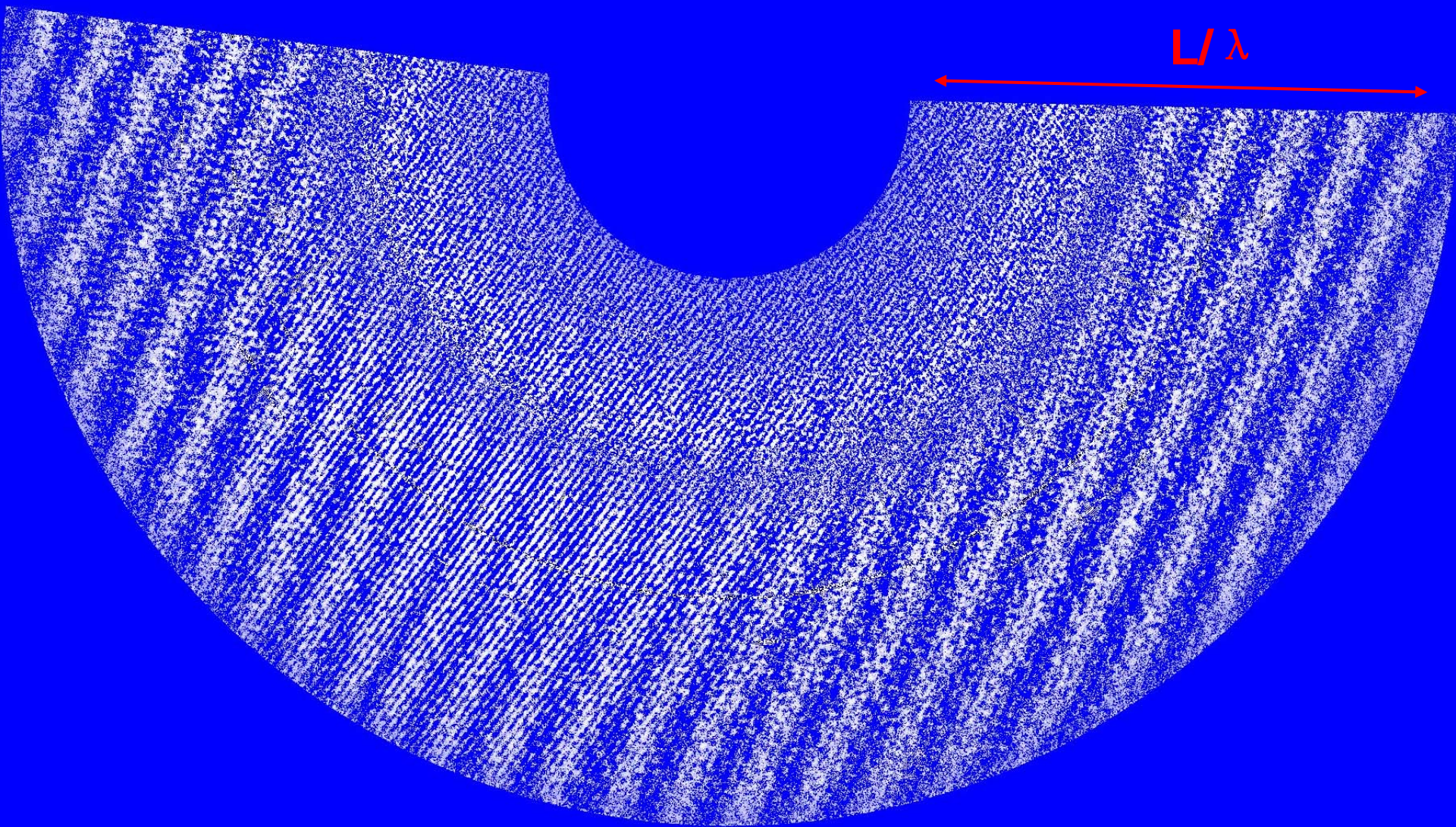


21CMA Data Acquisition System

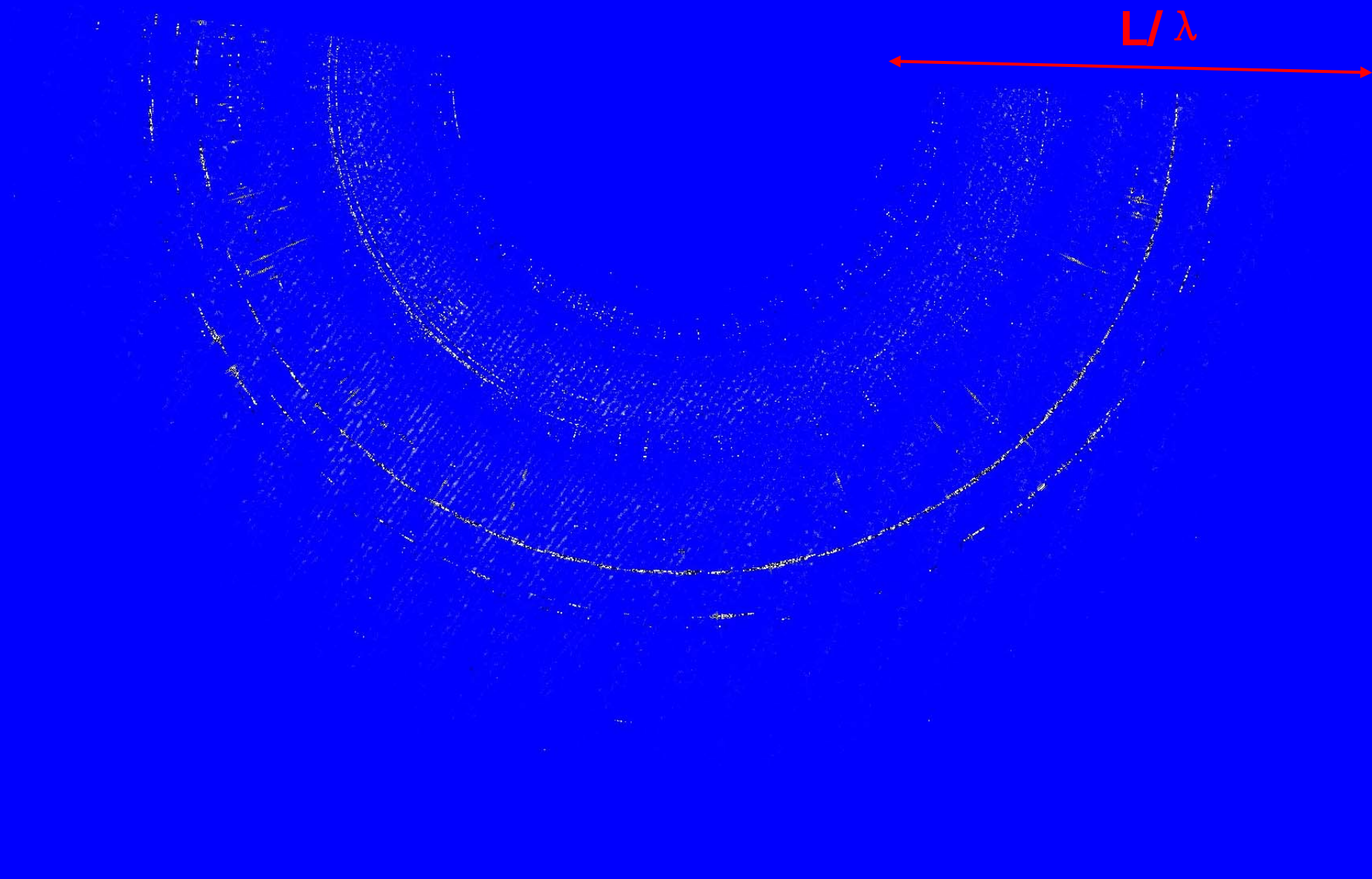


A typical example of the average spectra of auto- and cross-correlations over 24 hours

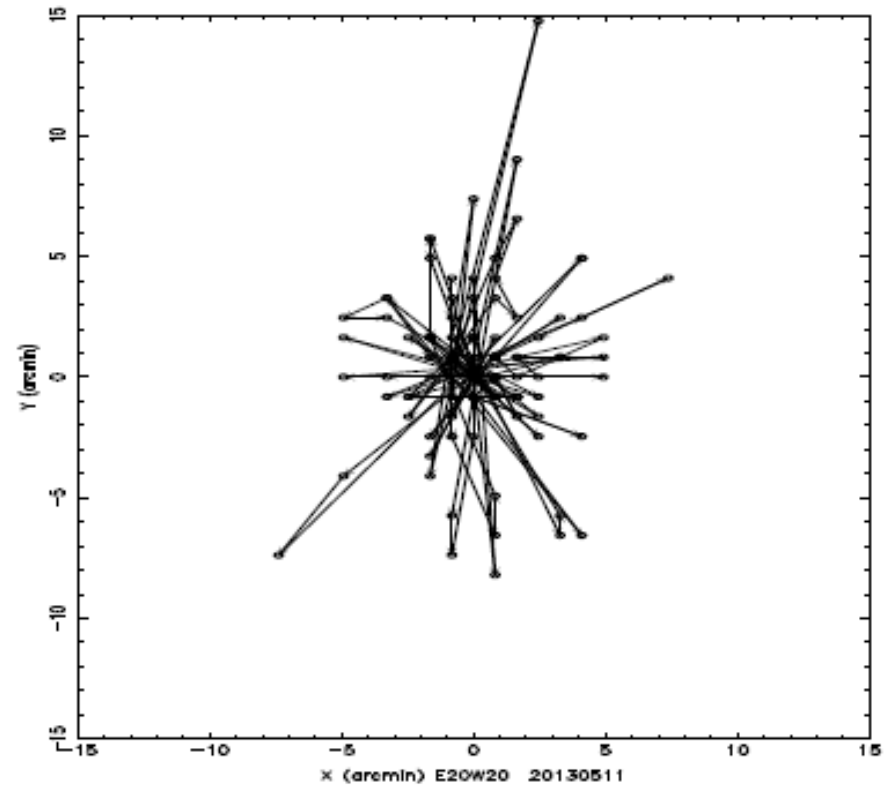
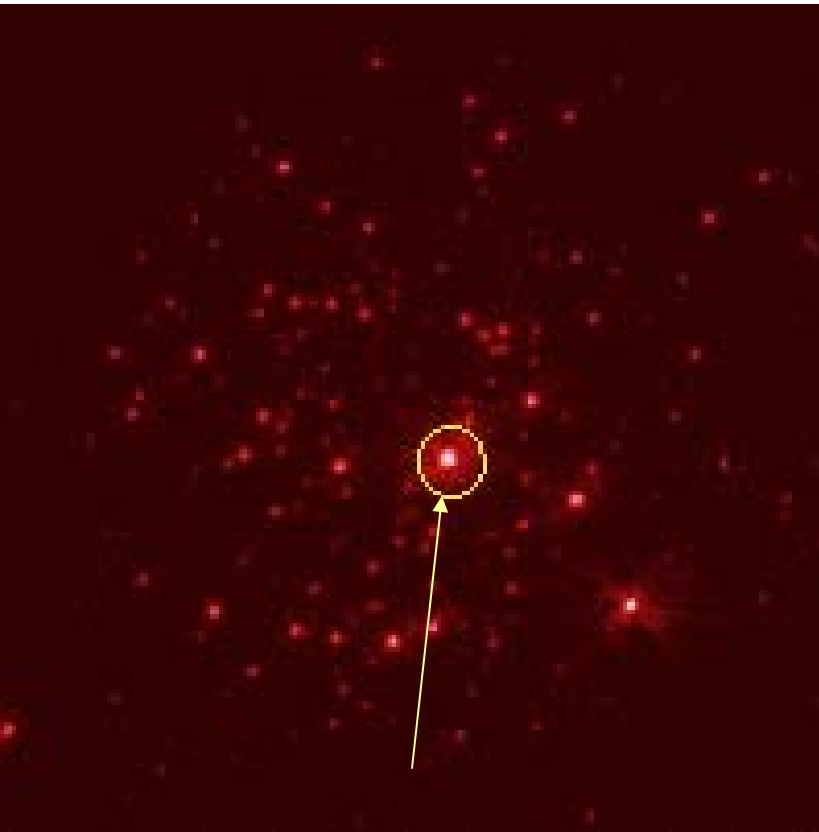
UV Map



UV Map

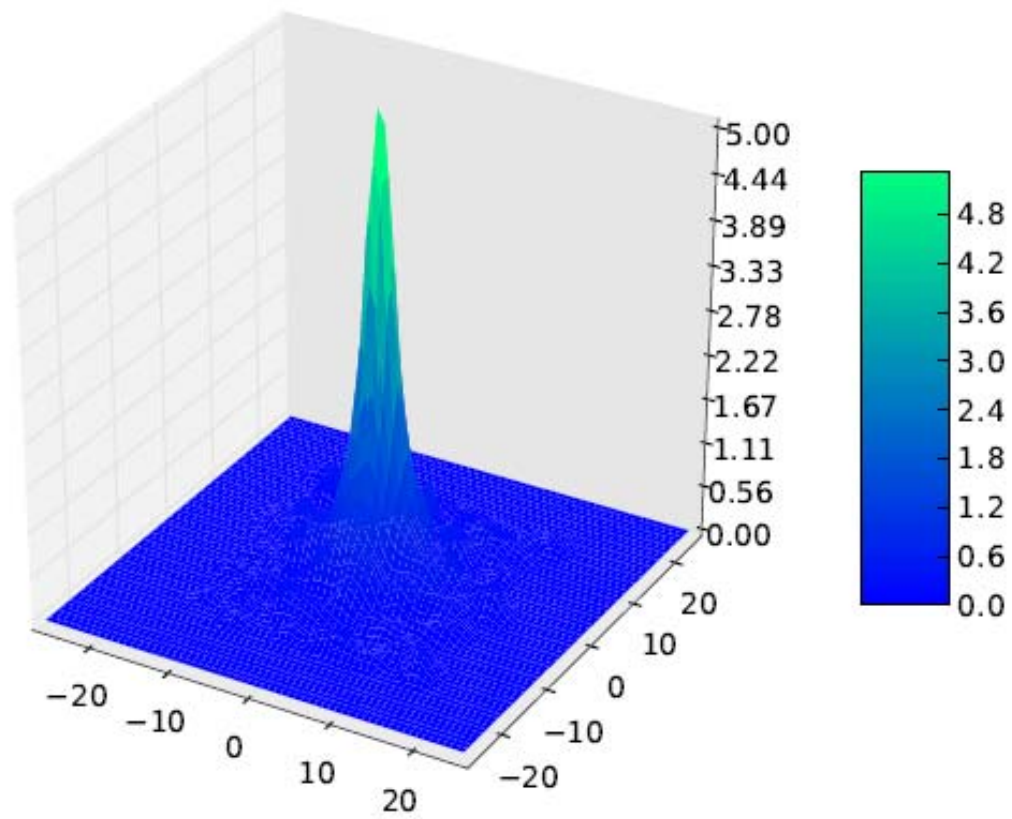


Ionospheric Effect

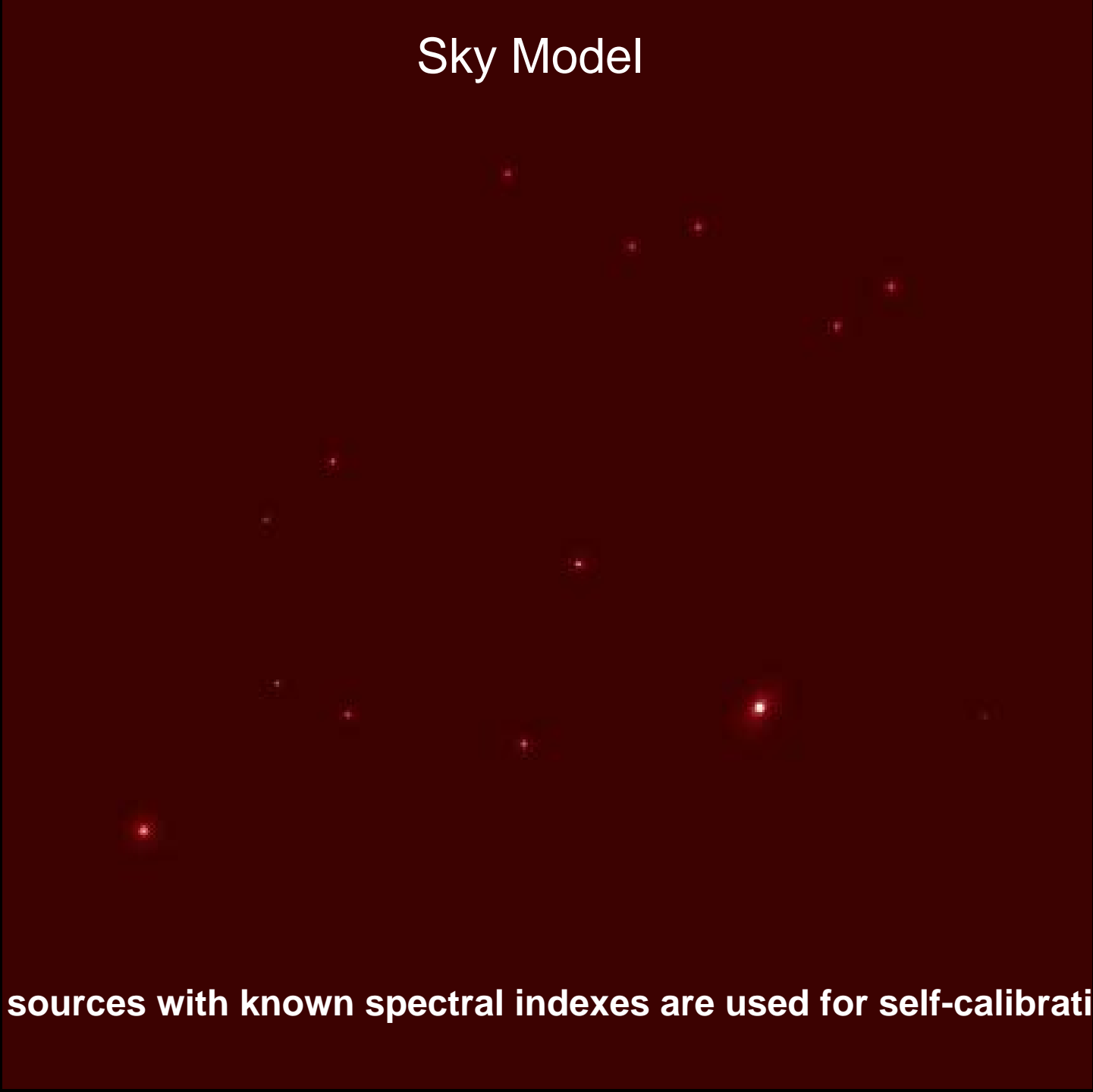


Time resolution: ~3min

Baseline: E20W20

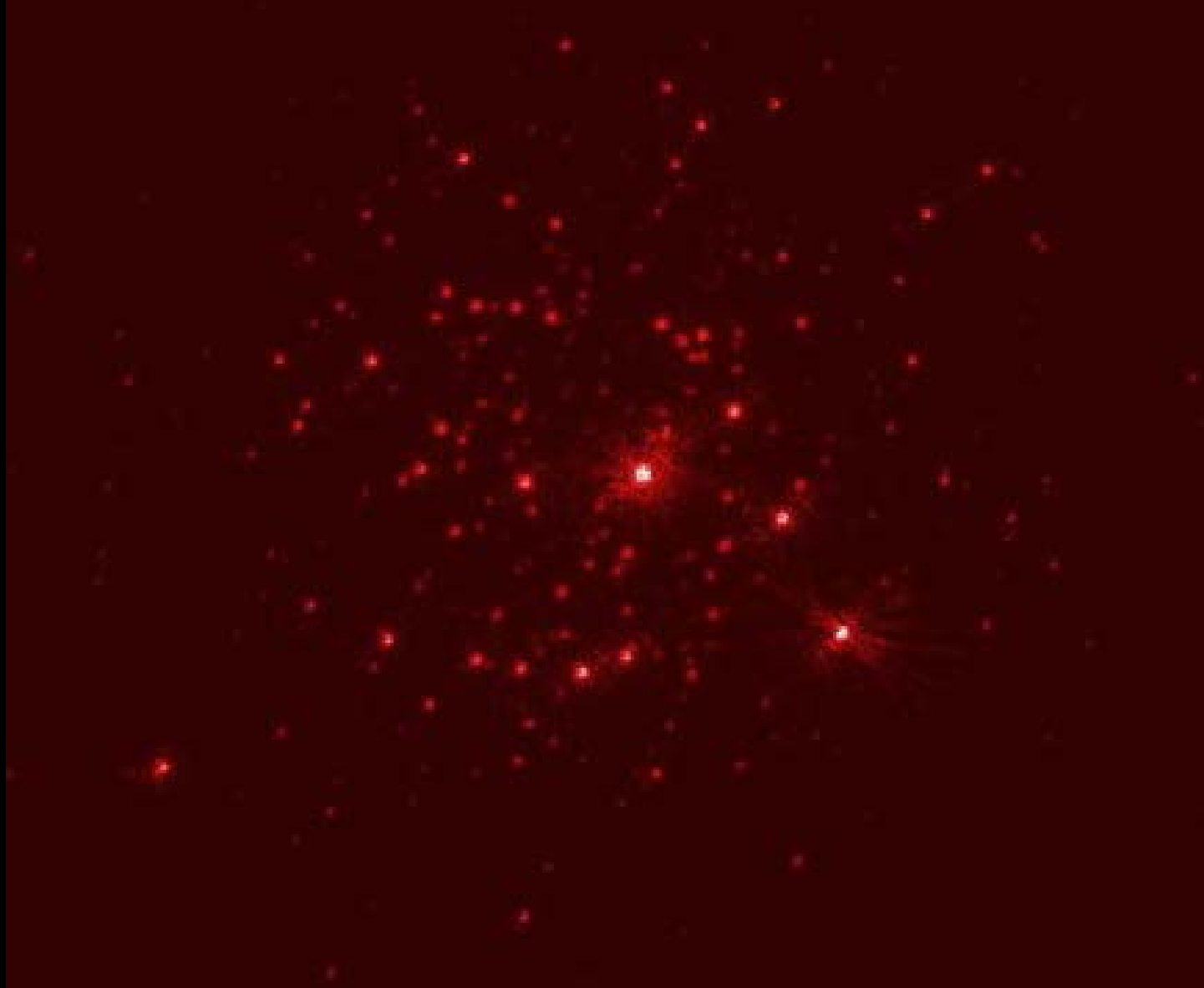


Sky Model

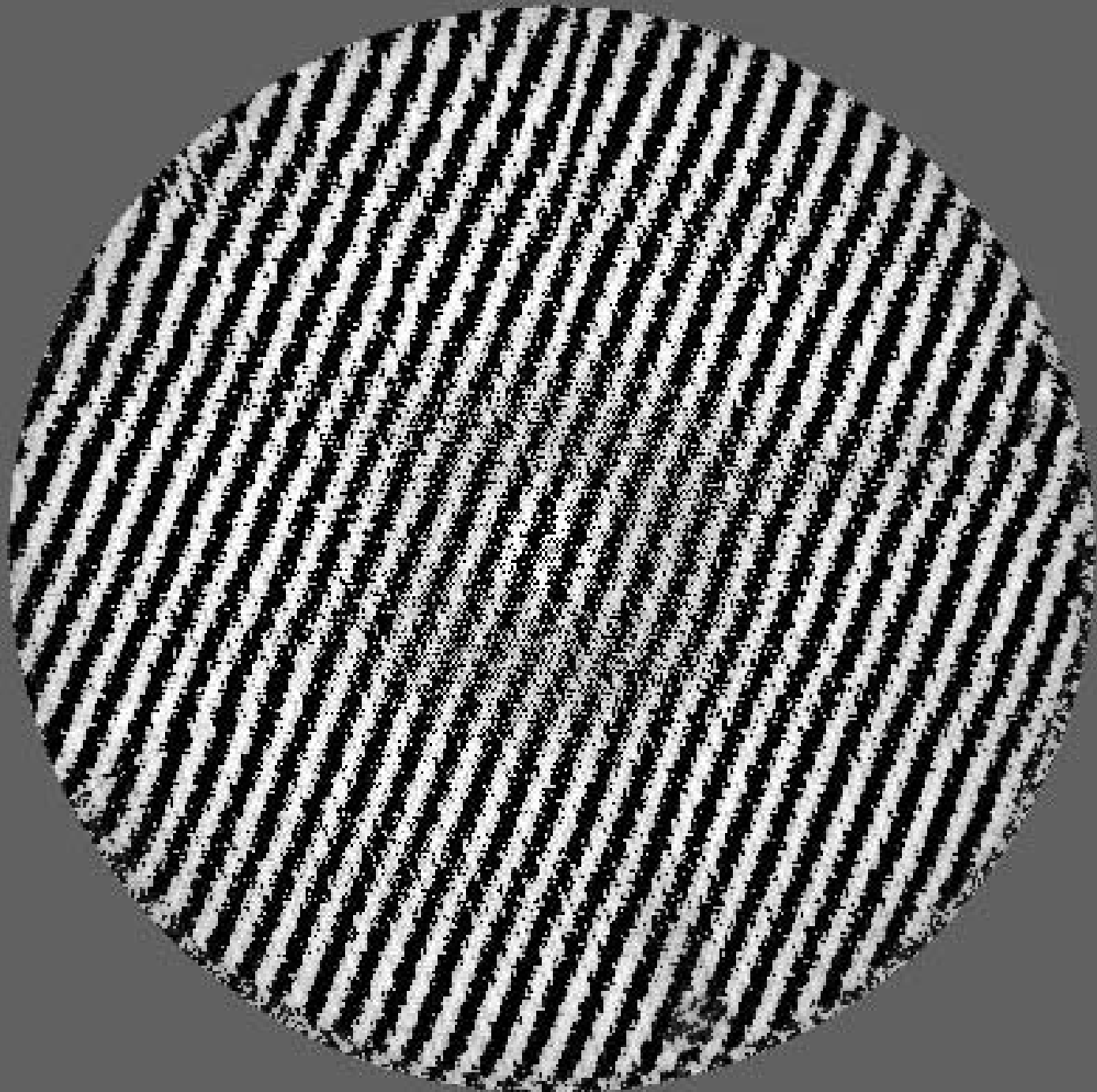


13 sources with known spectral indexes are used for self-calibration

Real Sky



Combined
UV MAP

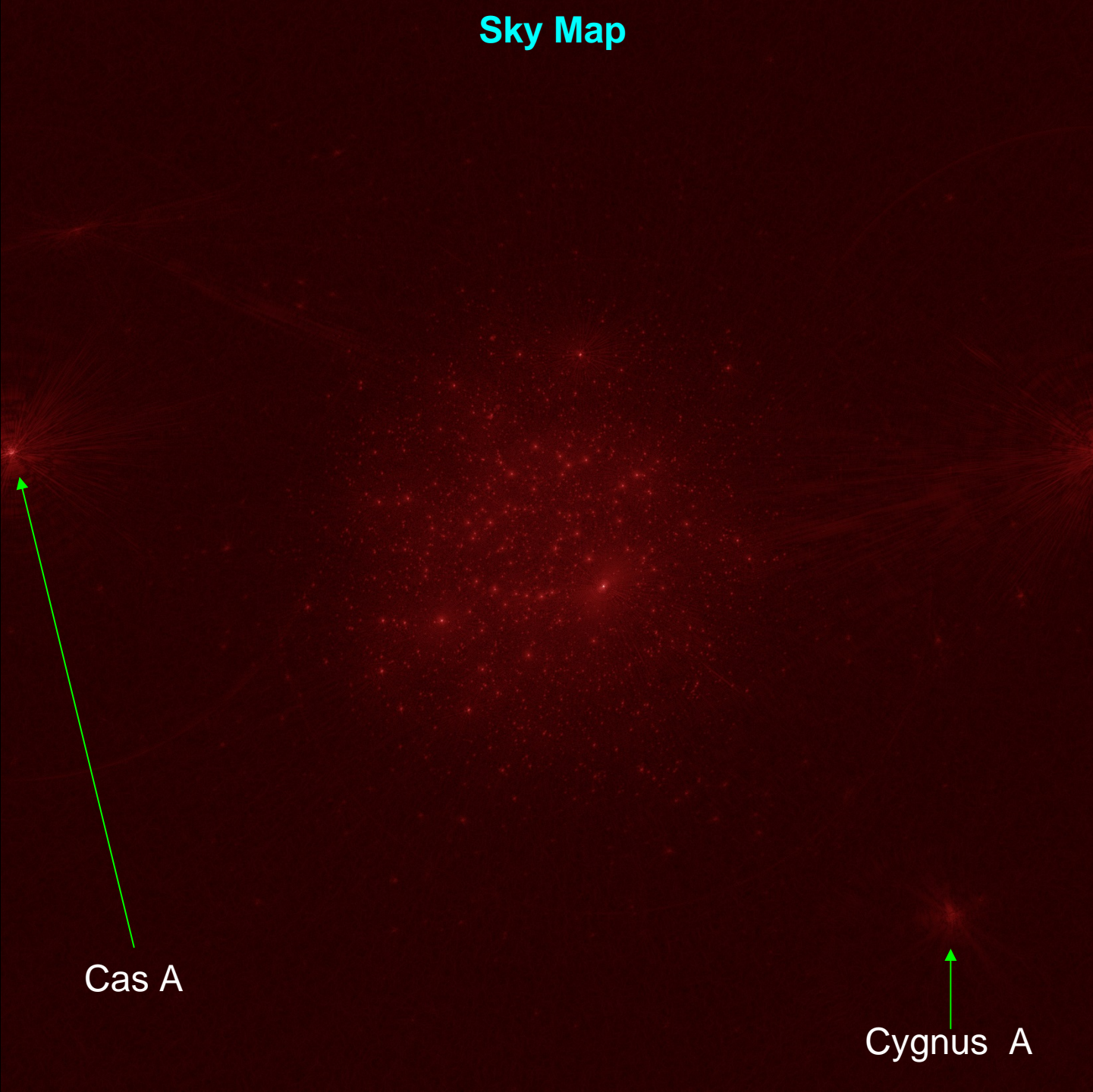


Sky Map

57 deg

Cas A

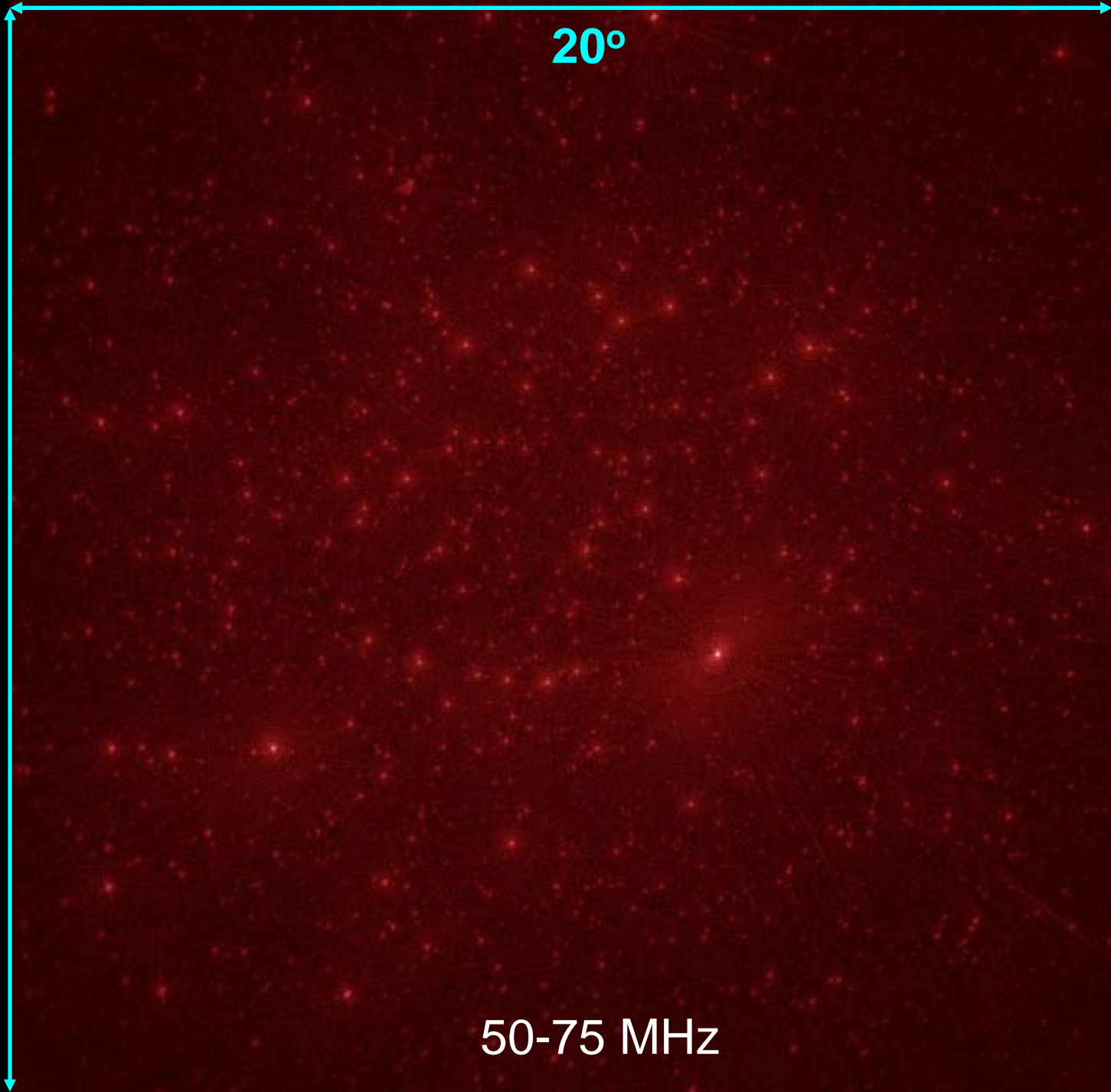
Cygnus A



20°

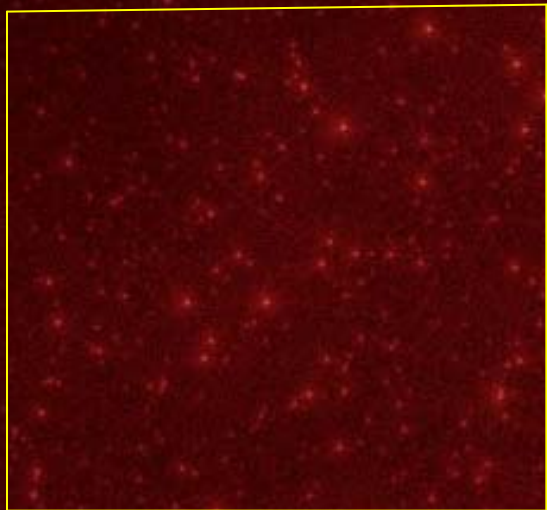
20°

50-75 MHz

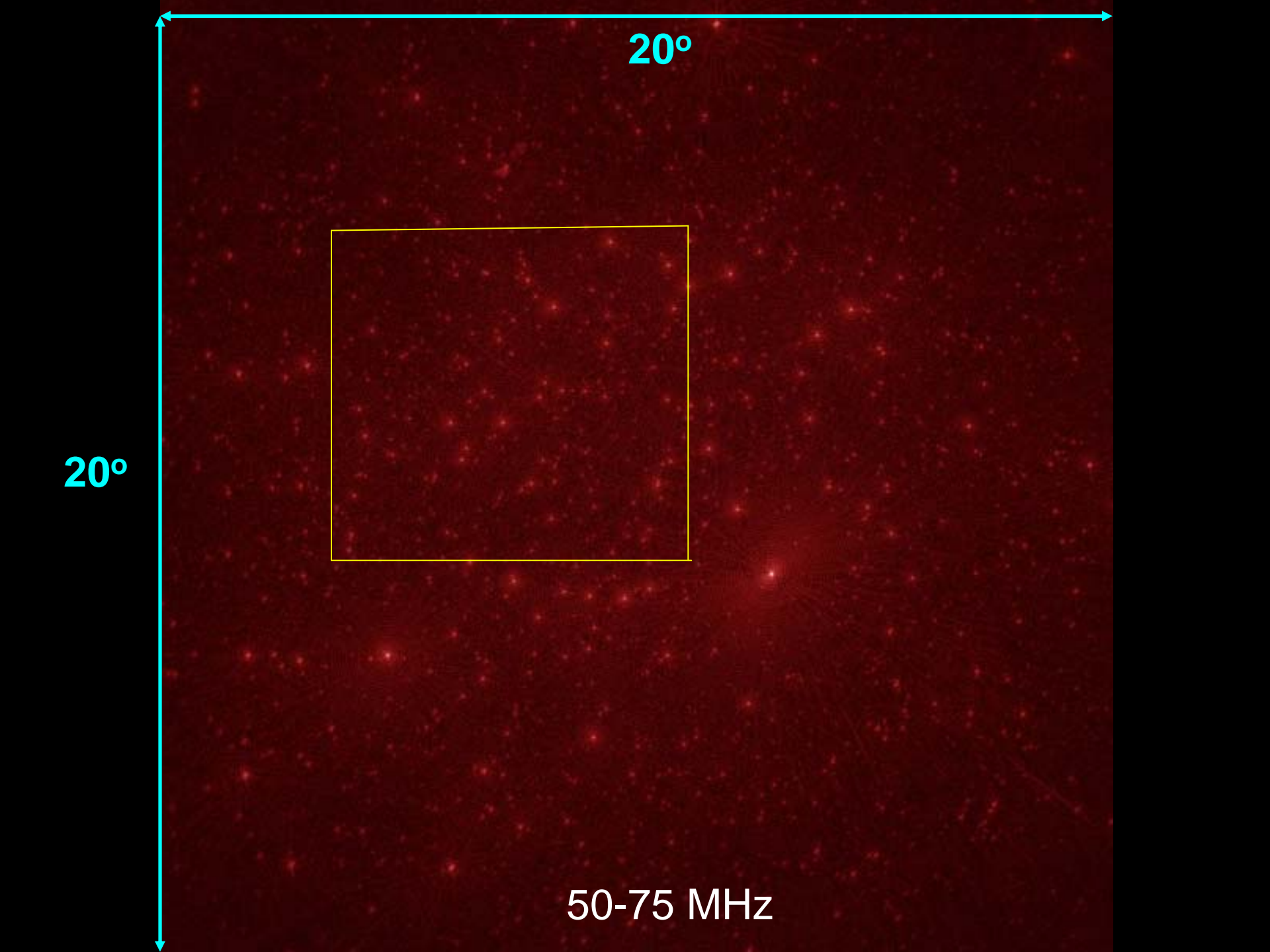


20°

20°

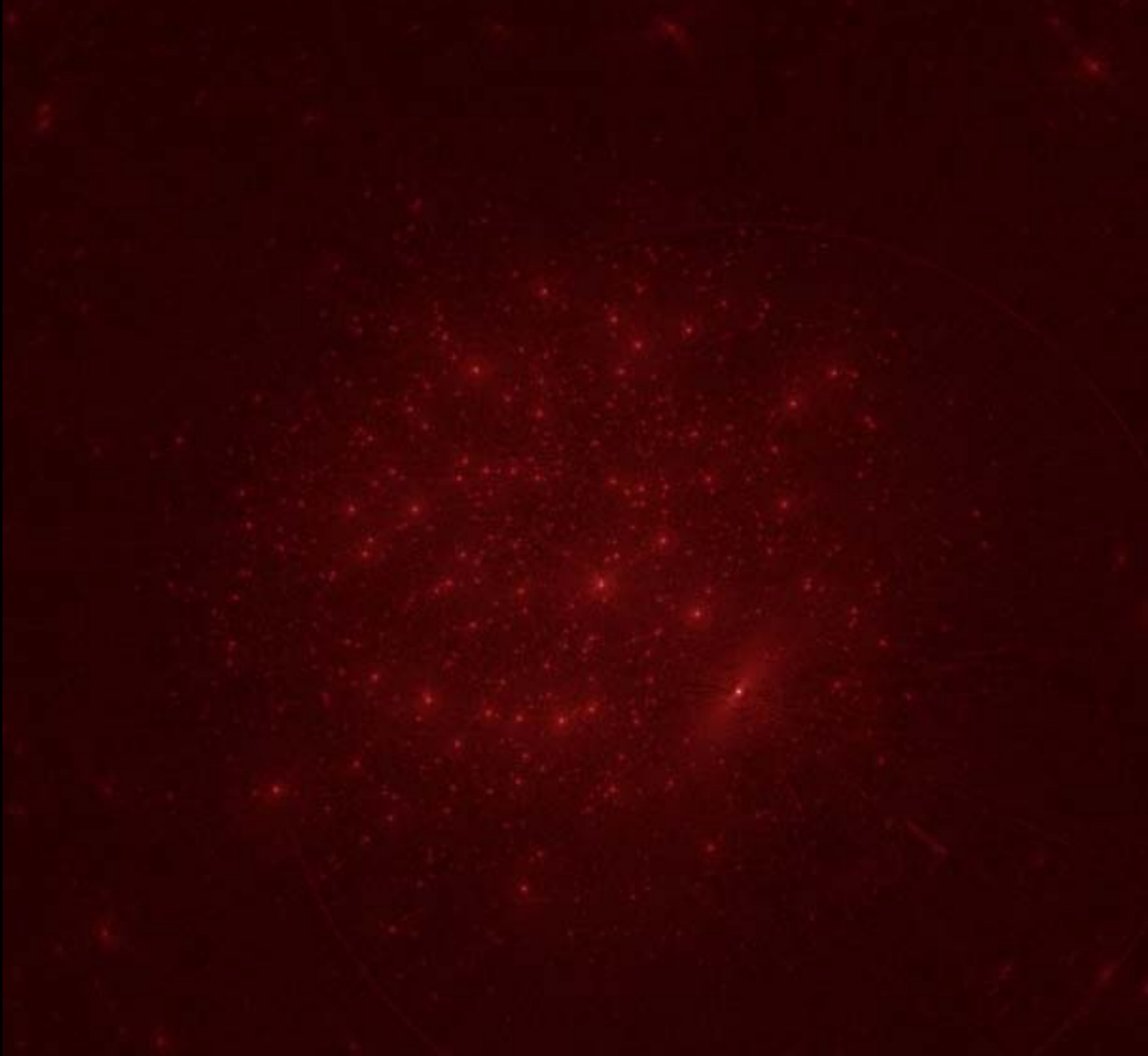


50-75 MHz

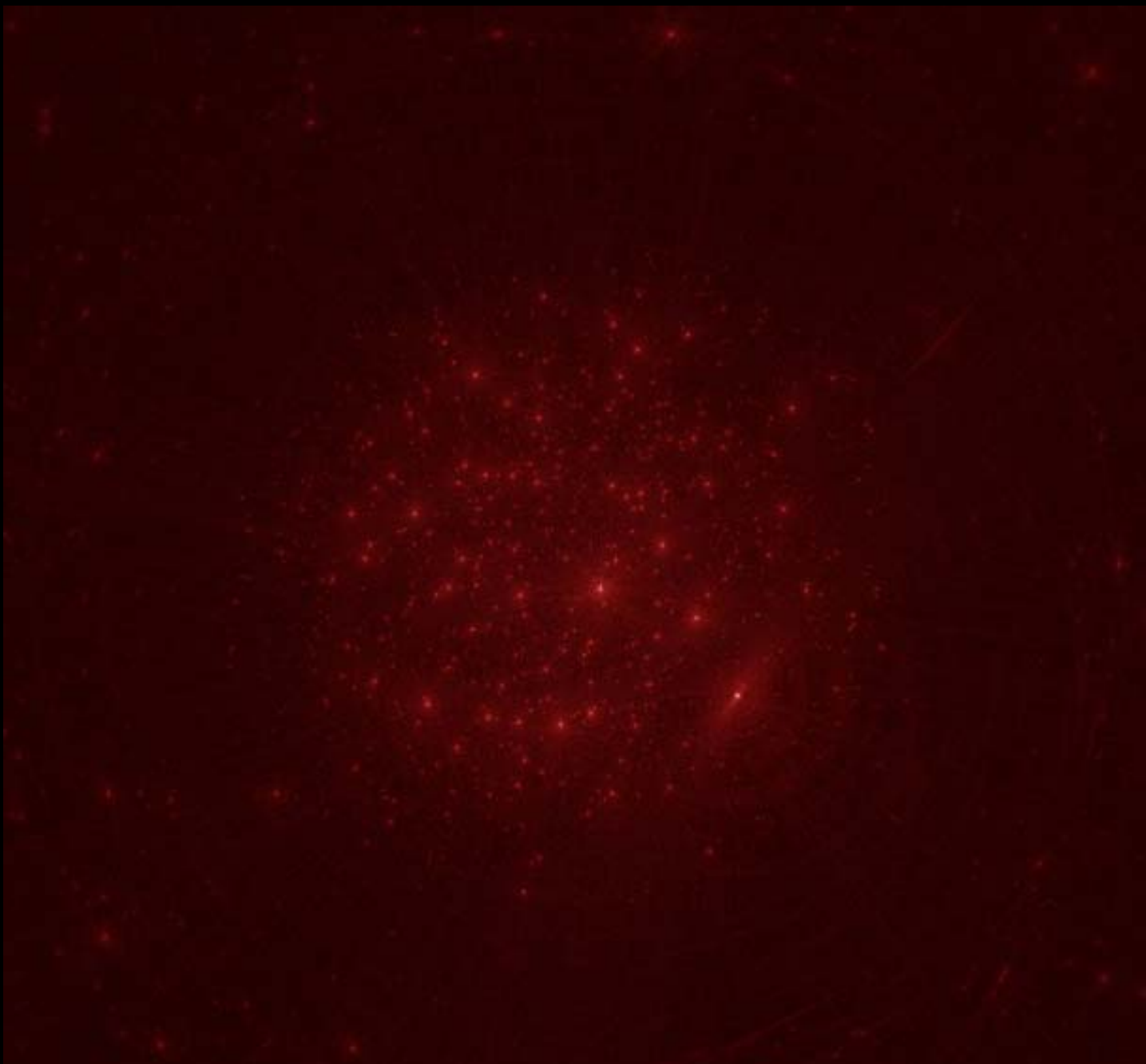




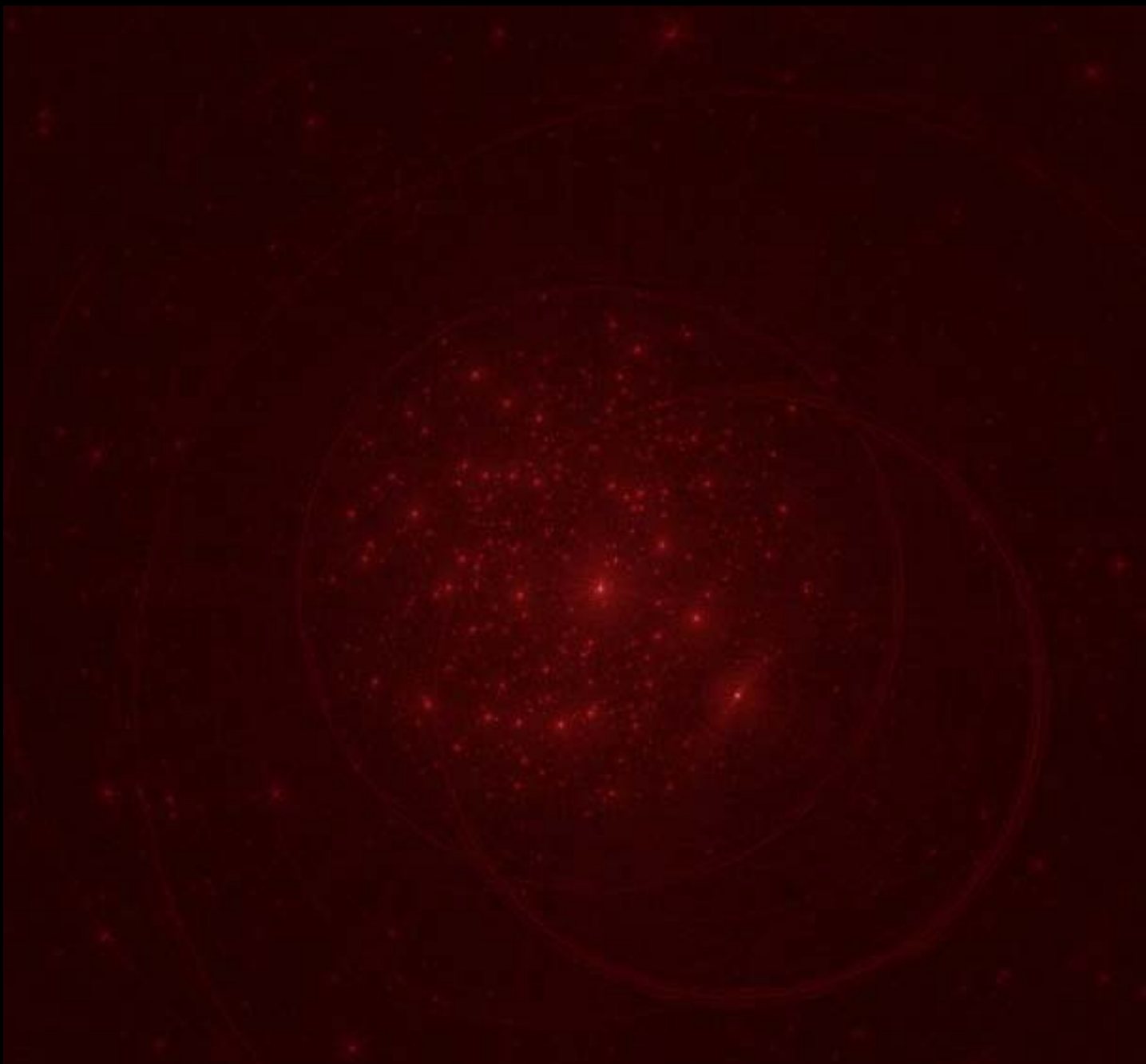
75-100 MHz



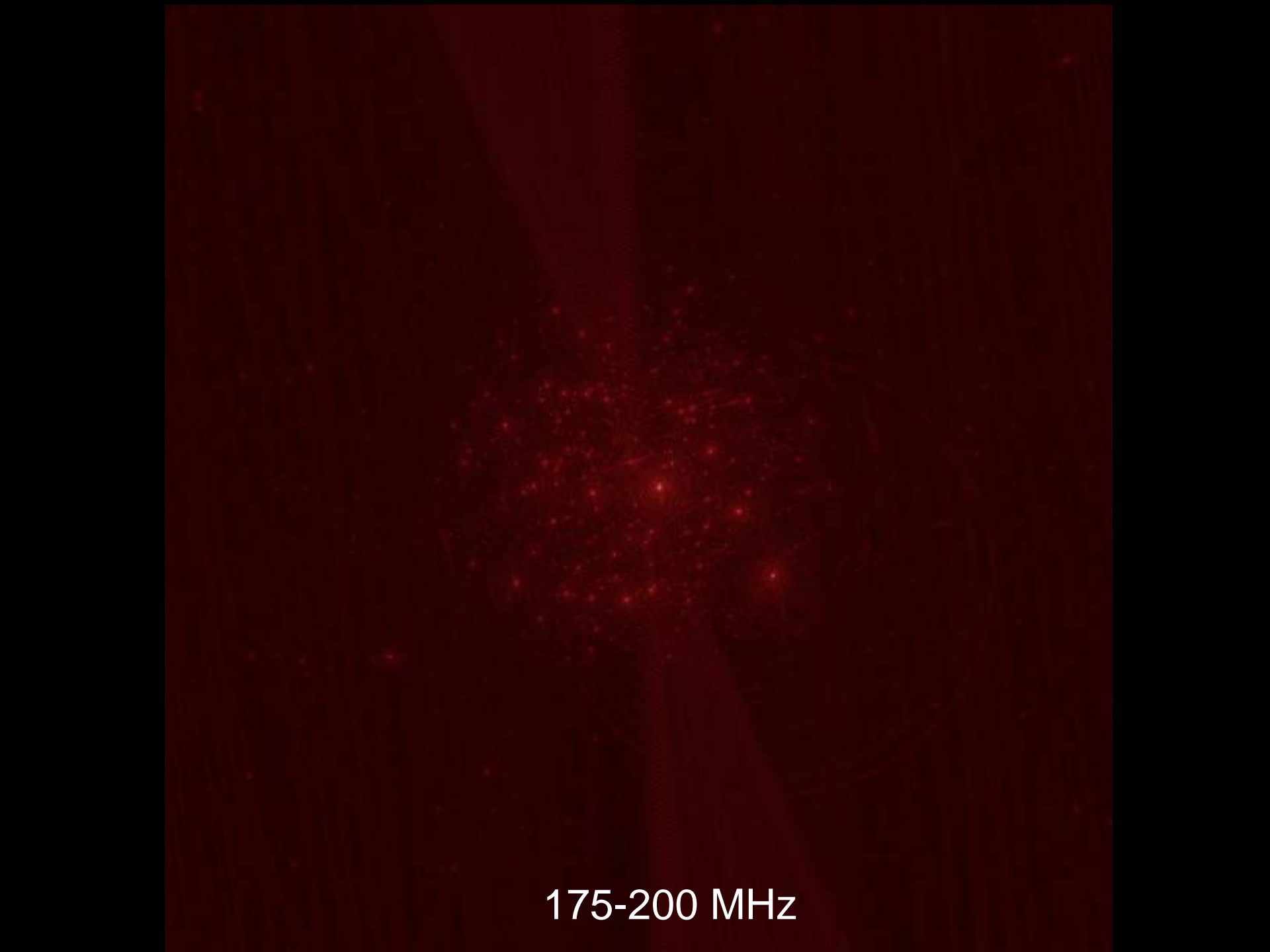
100-125 MHz



125-150 MHz

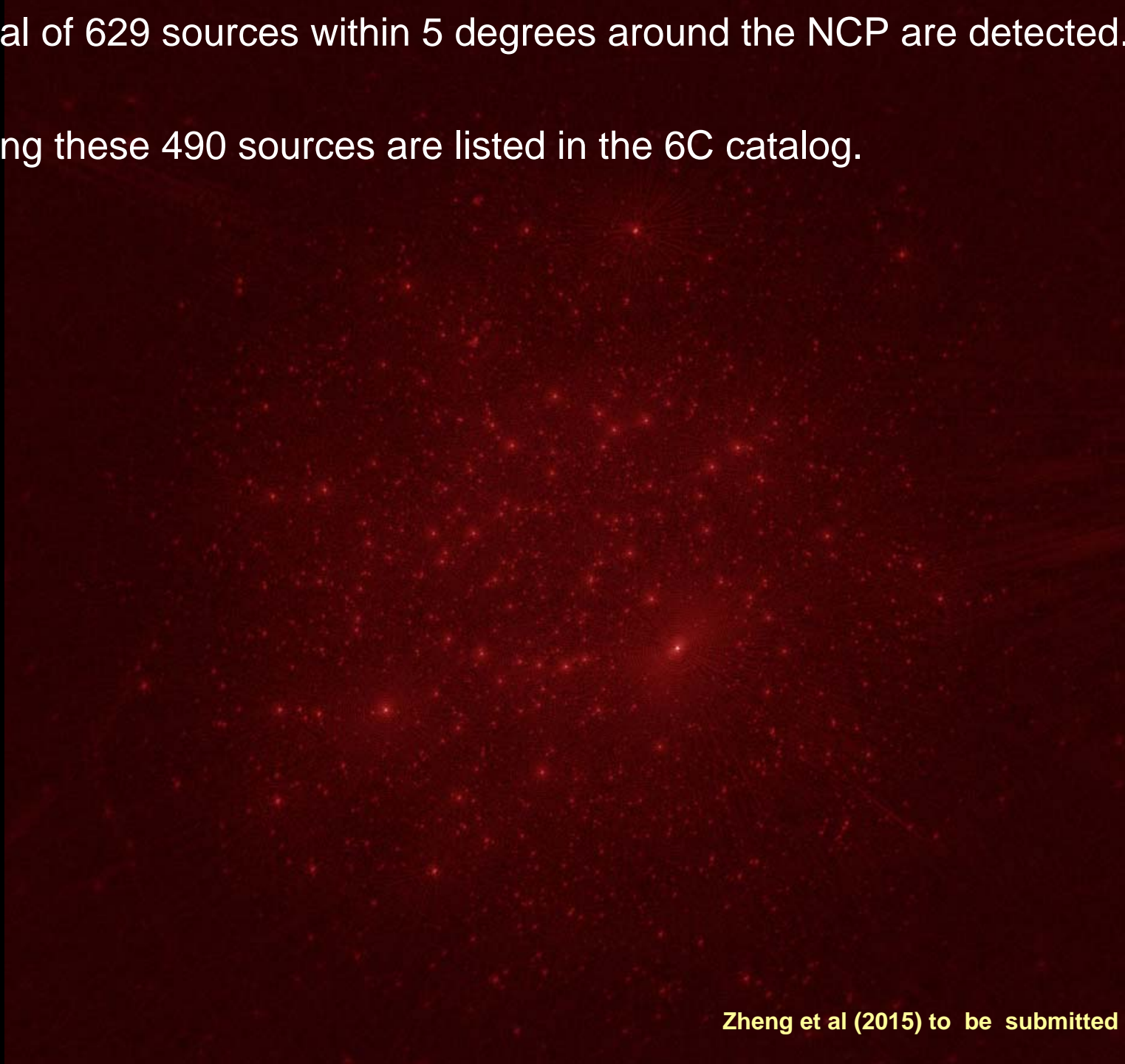


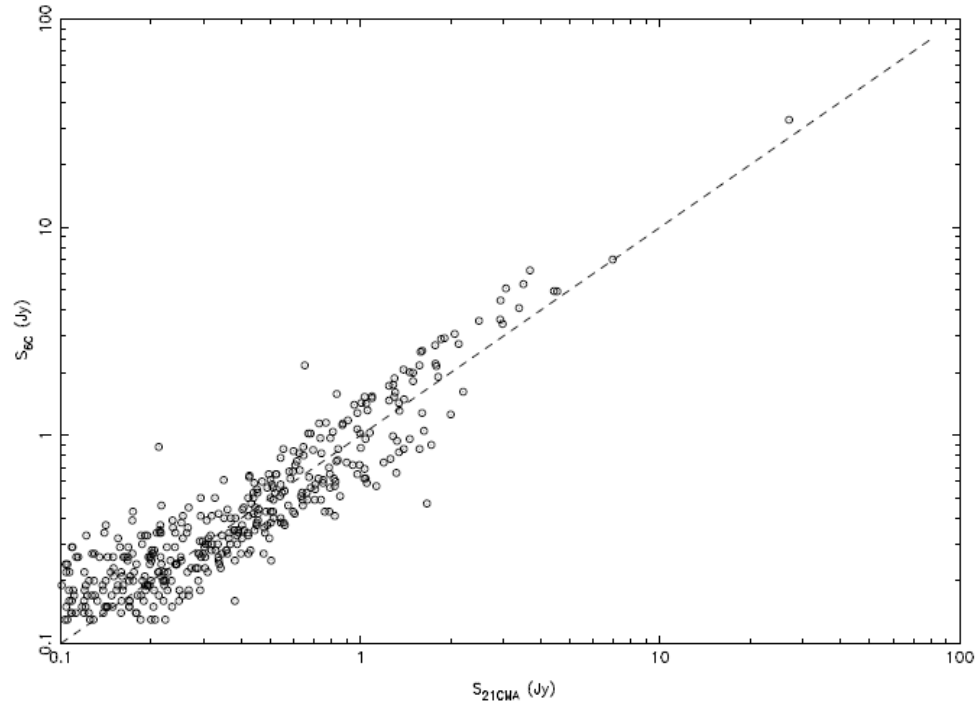
150-175 MHz

This image displays a dense field of stars, likely a star cluster or galaxy core, captured in the 175-200 MHz frequency range. The stars appear as numerous small, bright red points of light, concentrated in a central region and becoming sparser towards the edges. The overall background is a dark, mottled red color, suggesting a high level of sensitivity or a specific spectral filter. The text '175-200 MHz' is positioned at the bottom center of the image in a white, sans-serif font.

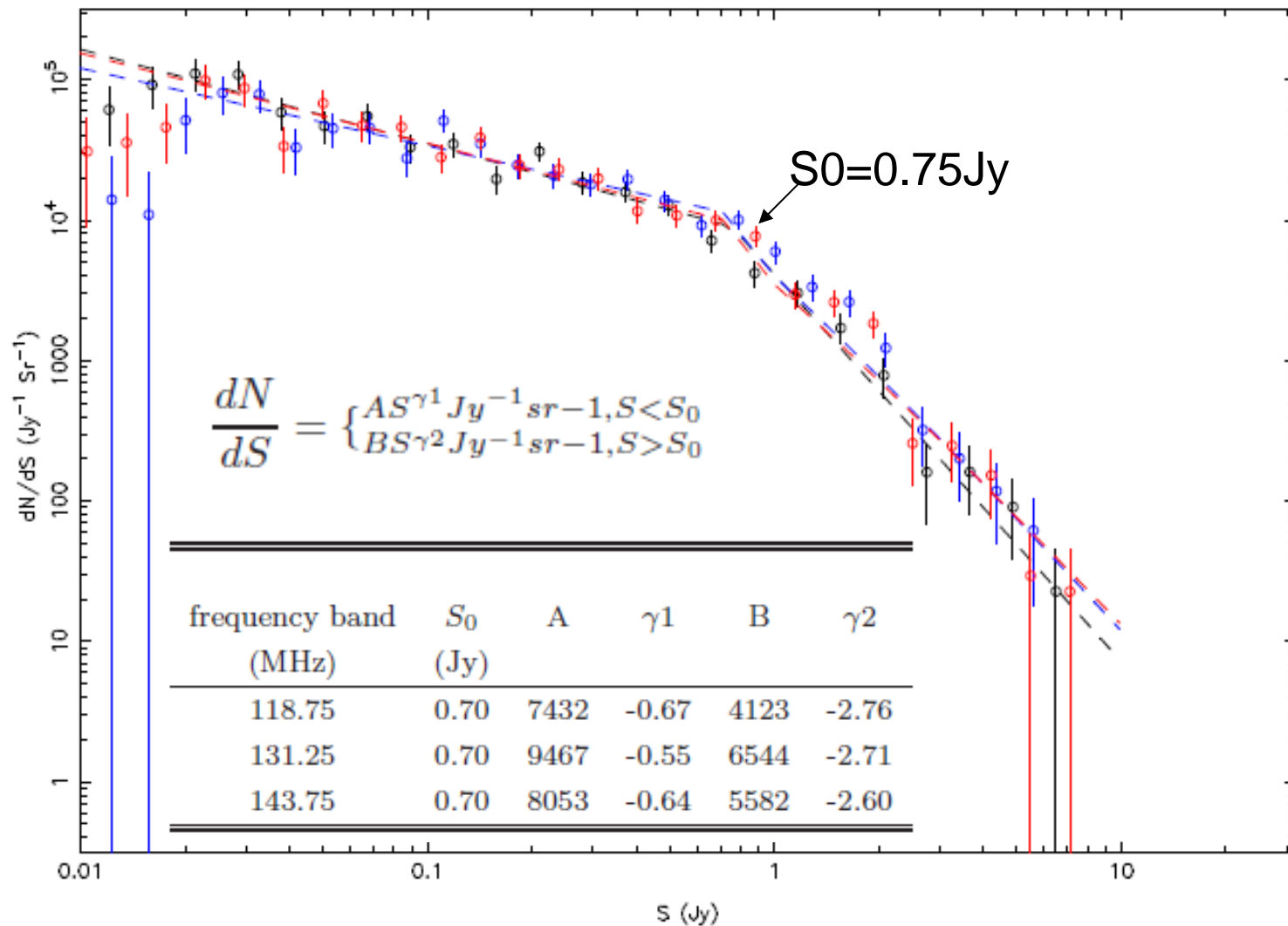
175-200 MHz

- A total of 629 sources within 5 degrees around the NCP are detected.
- Among these 490 sources are listed in the 6C catalog.



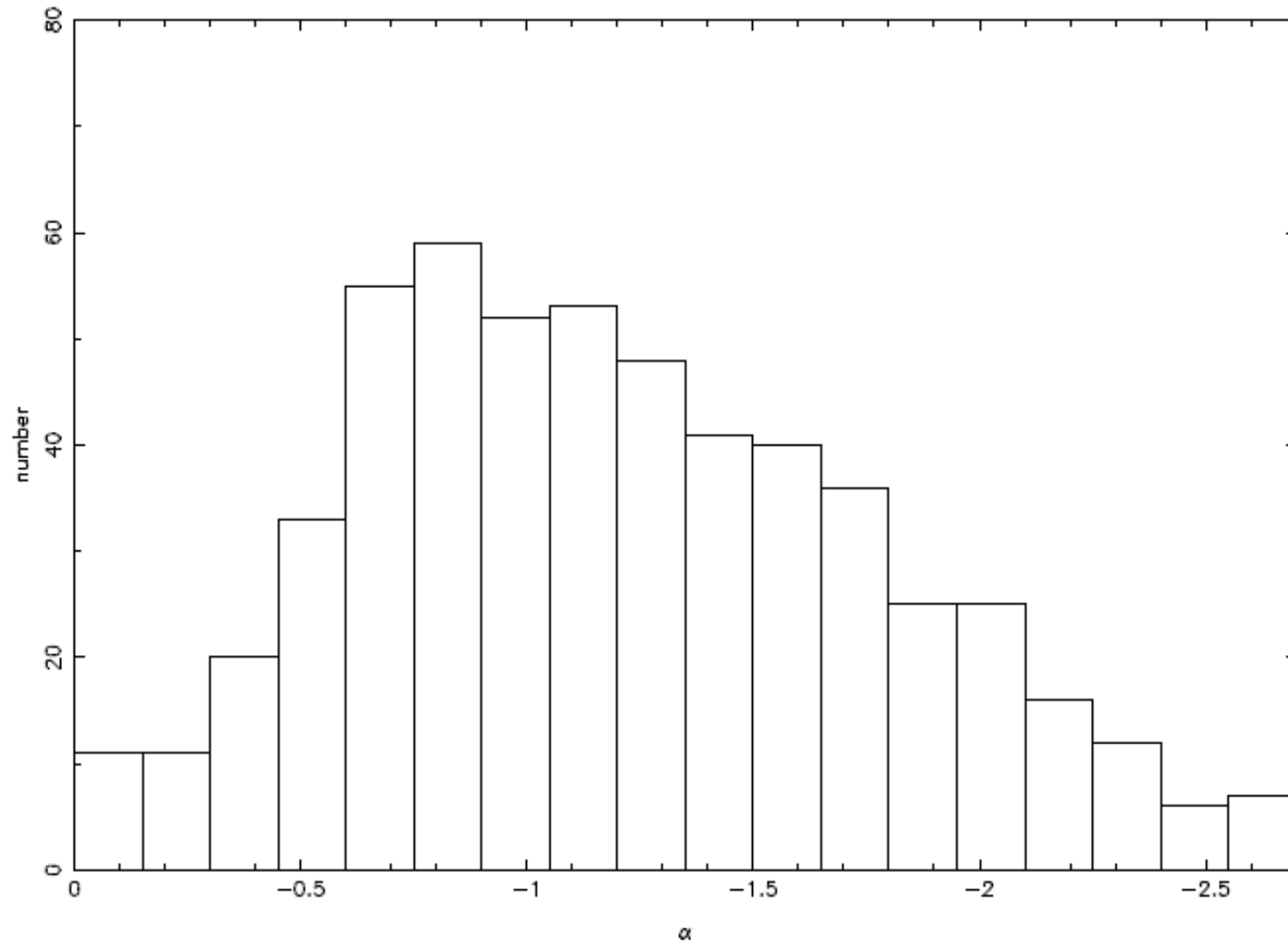


Comparisons of measured flux densities for the sources at 151MHz in the 6C survey and the 21CMA observation



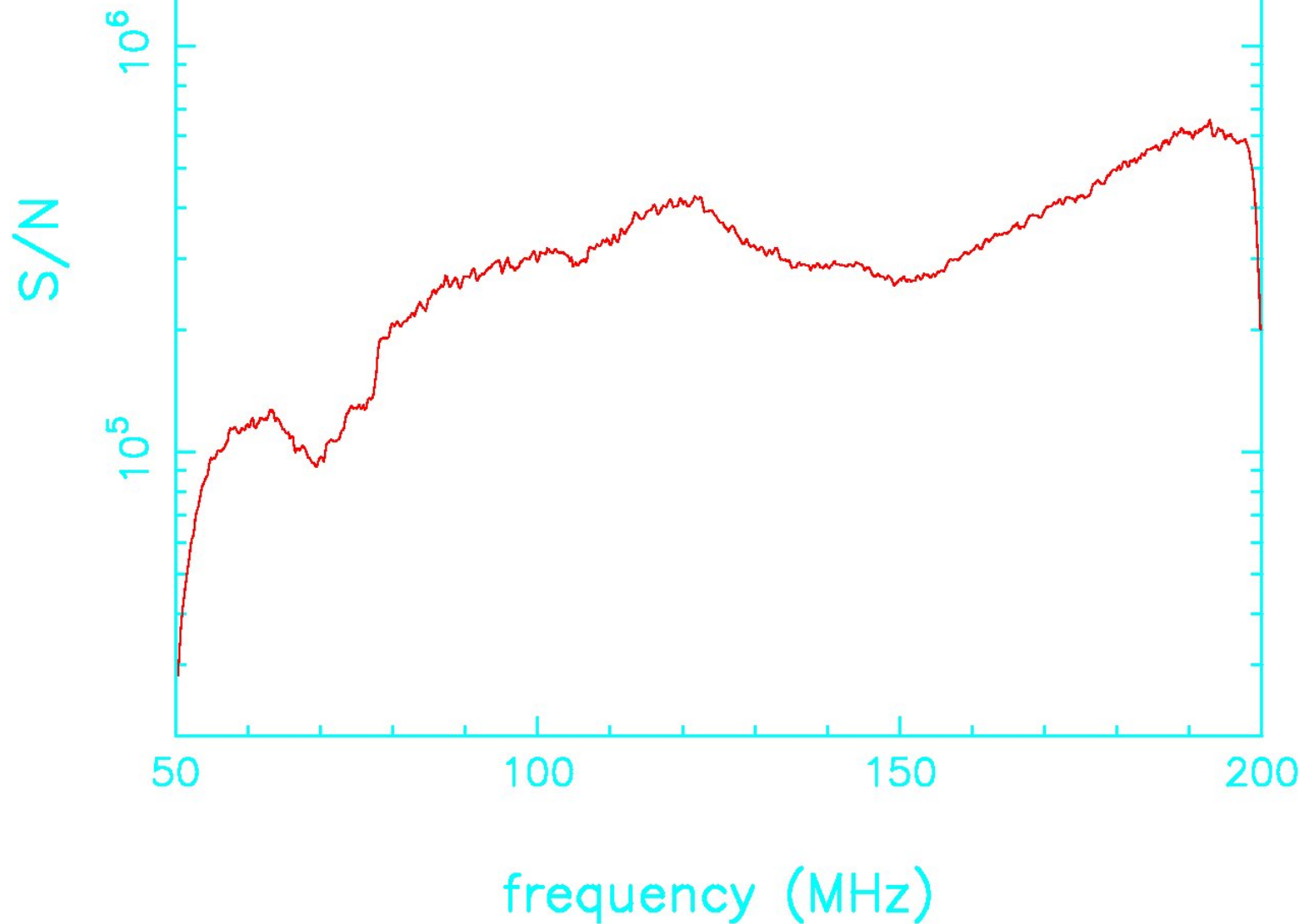
Differential number counts (dN/dS) of three frequency bands:
 118.75MHz(blue), 131.25MHz(red), 143.75MHz(black)

Histogram of the Spectral Indices



$$S \propto \nu^\alpha$$

Dynamical Range vs Frequency
(integration of 13 days freq width=0.192MHz)

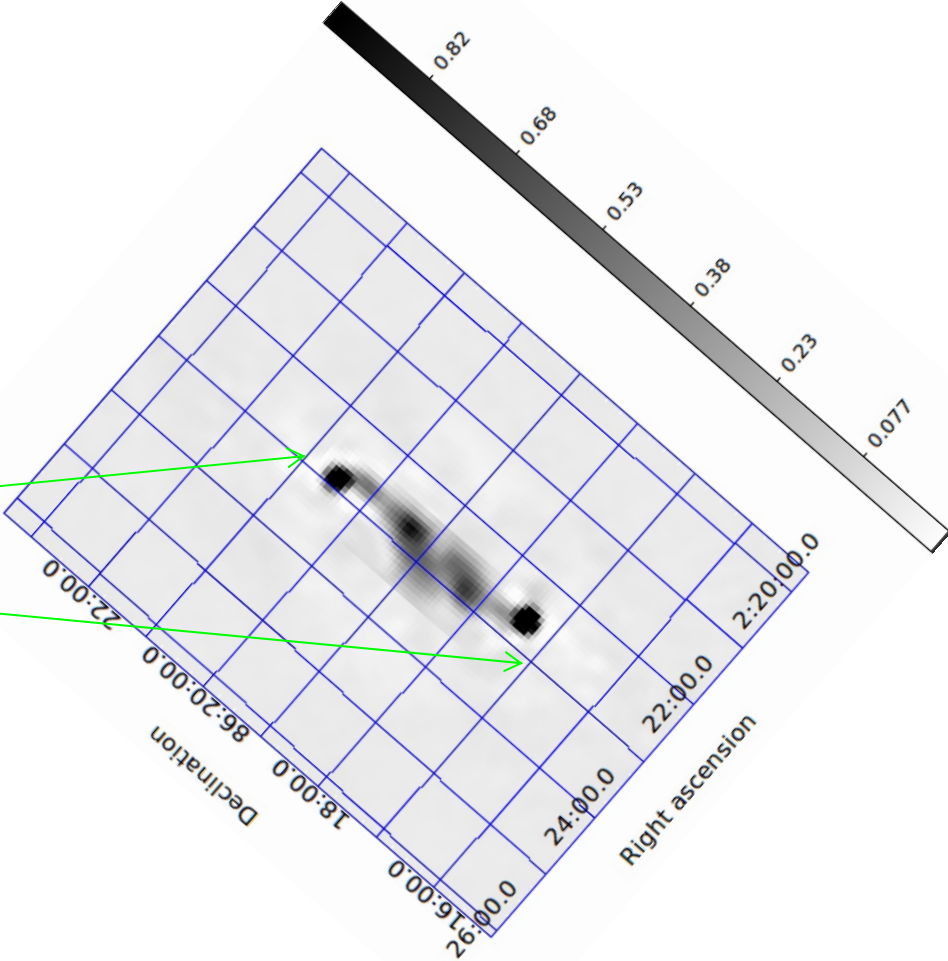
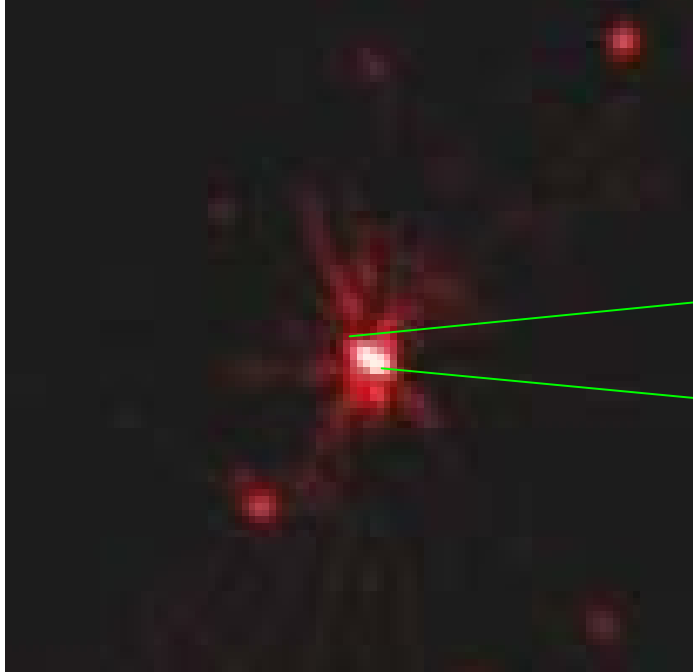


Brightest Sources @ 21CMA Field



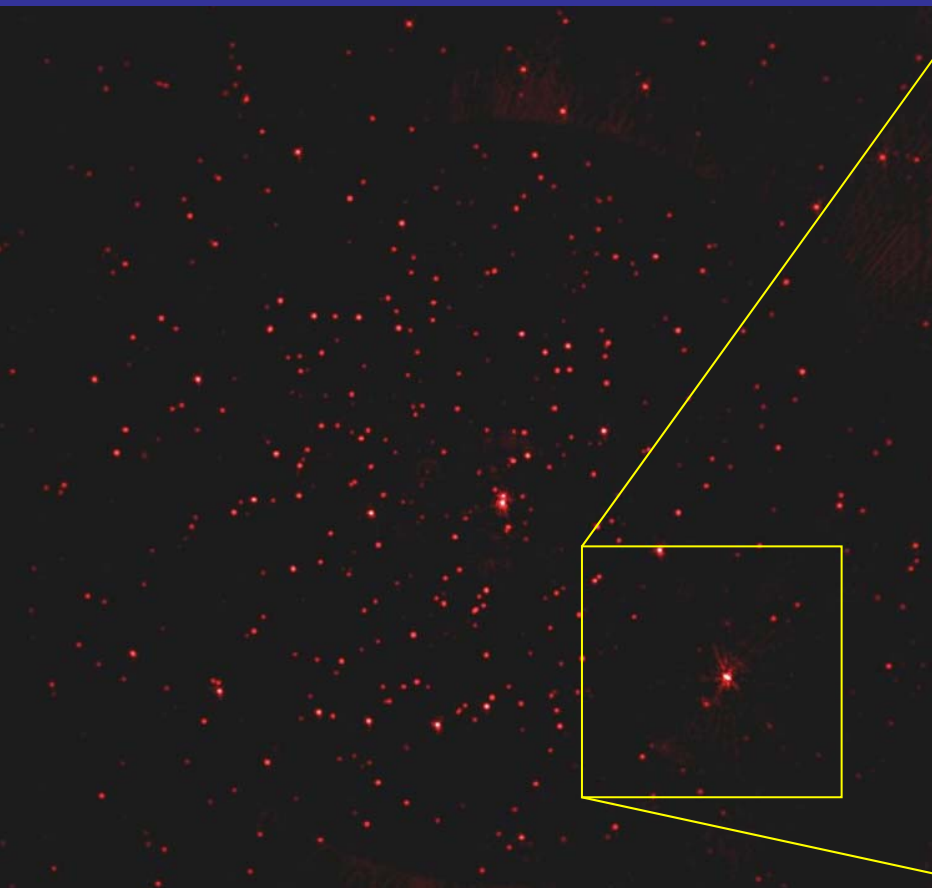
3C061.1

3C61.1

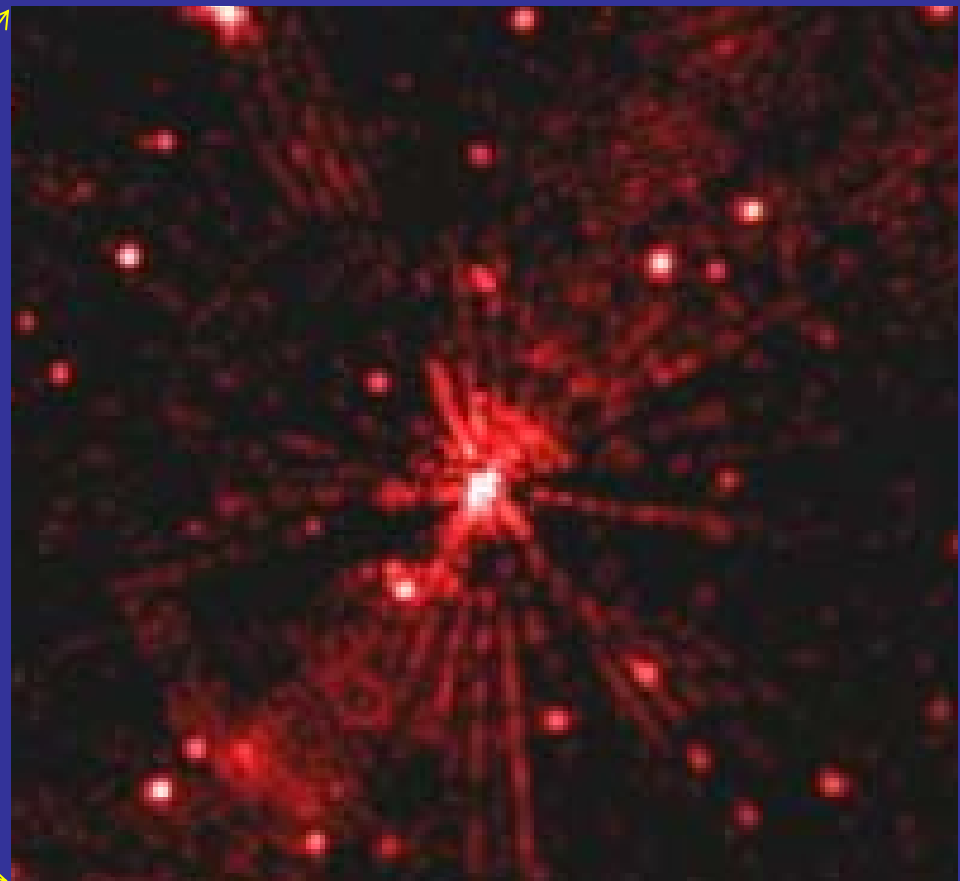


NCP field observed with 21CMA

image



residual



3C61.1

residual = image / 10^5

Tianshan Radio Experiment for Neutrino Detection (TREND)

Cosmic air showers can also be be detected through radio emission around 100MHz

particles

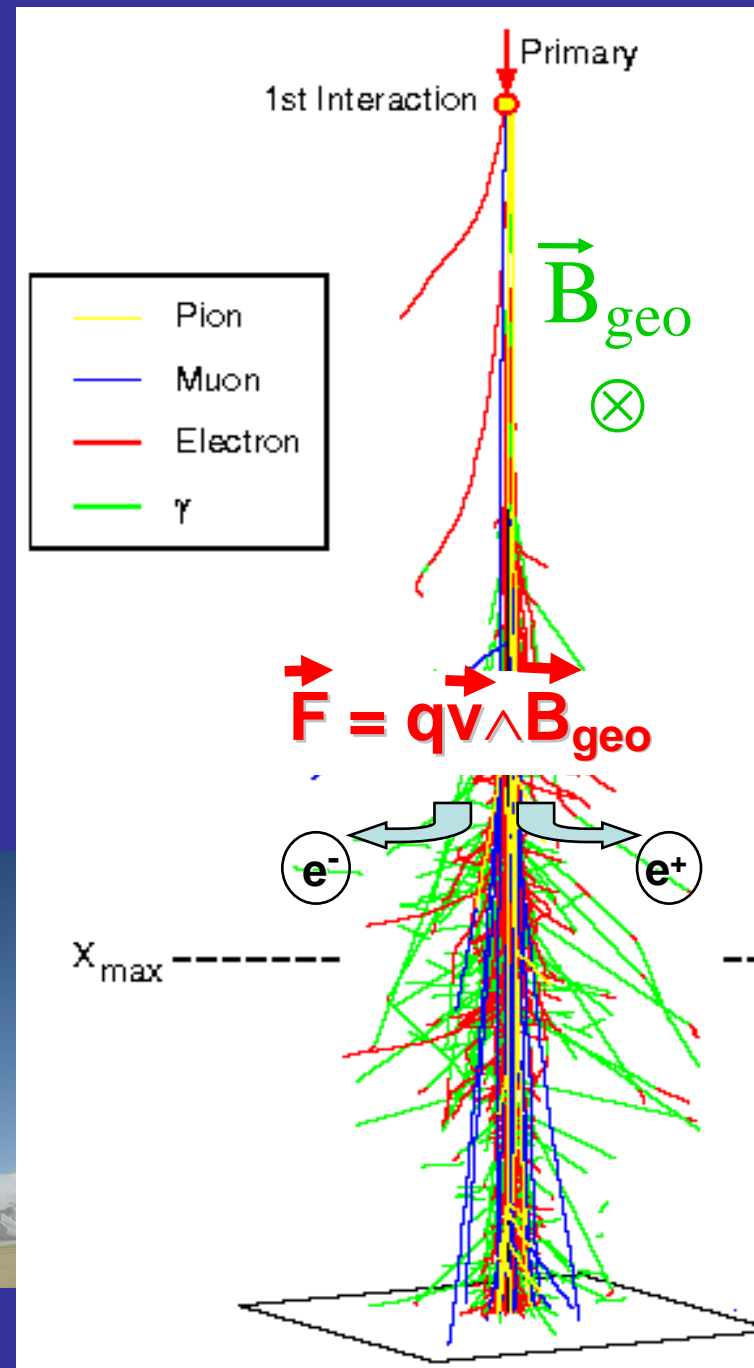
radiation



Scintillator



Antenna



First detection of Extensive Air Showers by the TREND self-triggering radio experiment

D. Ardouin^a, C. Cârloganu^b, D. Charrier^a, Q. Gou^c, H. Hu^c, L. Kai^d, P. Lautridou^a, O. Martineau-Huynh^{c,e,f,*}, V. Niess^{b,*}, O. Ravel^a, T. Saugrin^{e,*}, X. Wu^e, J. Zhang^c, Y. Zhang^c, M. Zhao^e, Y. Zheng^d

^a*SUBATECH, Ecole des Mines, CNRS/IN2P3 and Université de Nantes, 44307 Nantes, France*

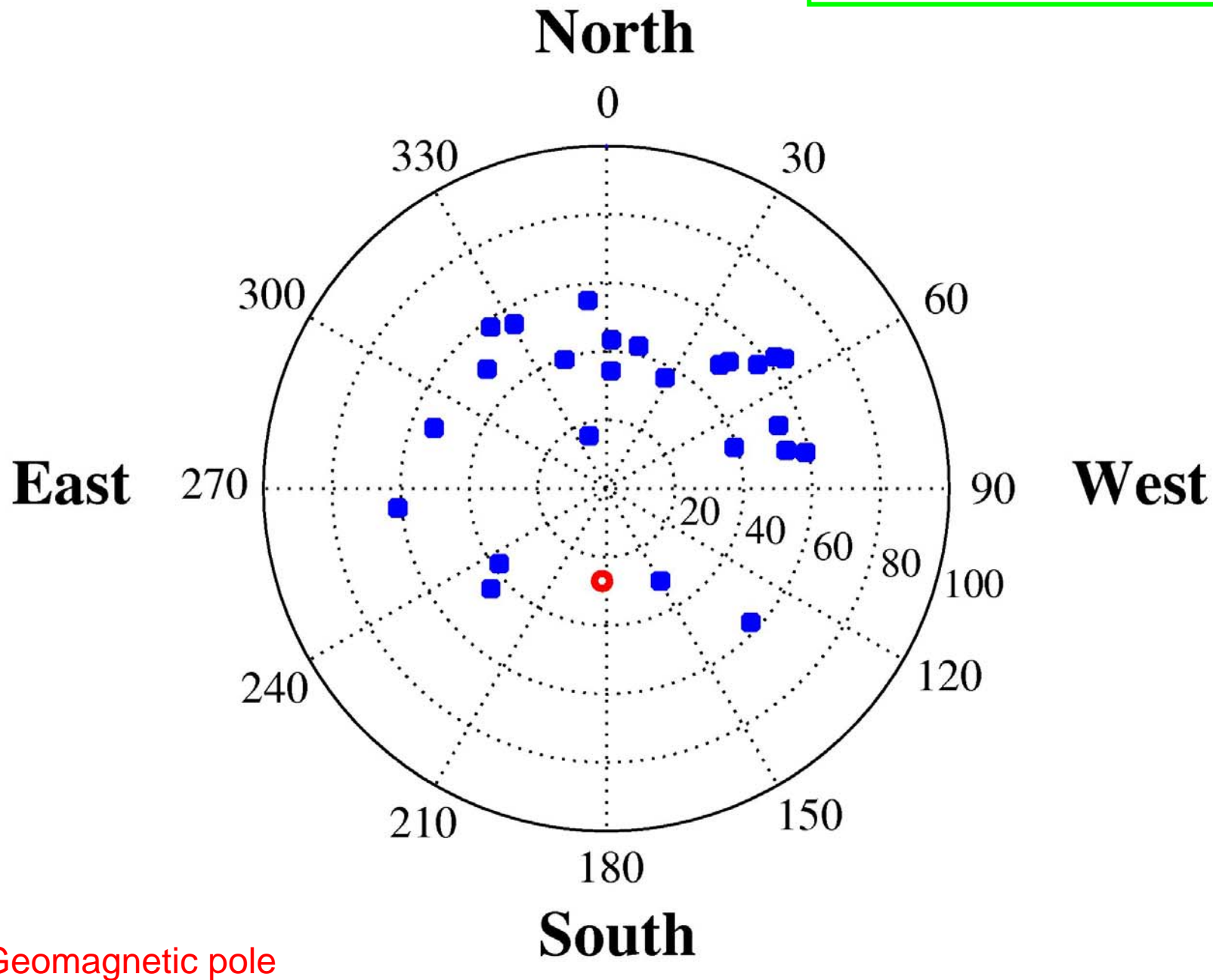
^b*Clermont Université, Université Blaise Pascal, CNRS/IN2P3, Laboratoire de Physique Corpusculaire, BP 10448, F-63000 Clermond-Ferrand, France*

^c*Key Laboratory of Particle Astrophysics, Institute of High Energy Physics, Chinese Academy of Sciences, Beijing 100049, P.R. China*

^d*Graduate University of Chinese Academy of Science, Beijing 100049, P.R. China*

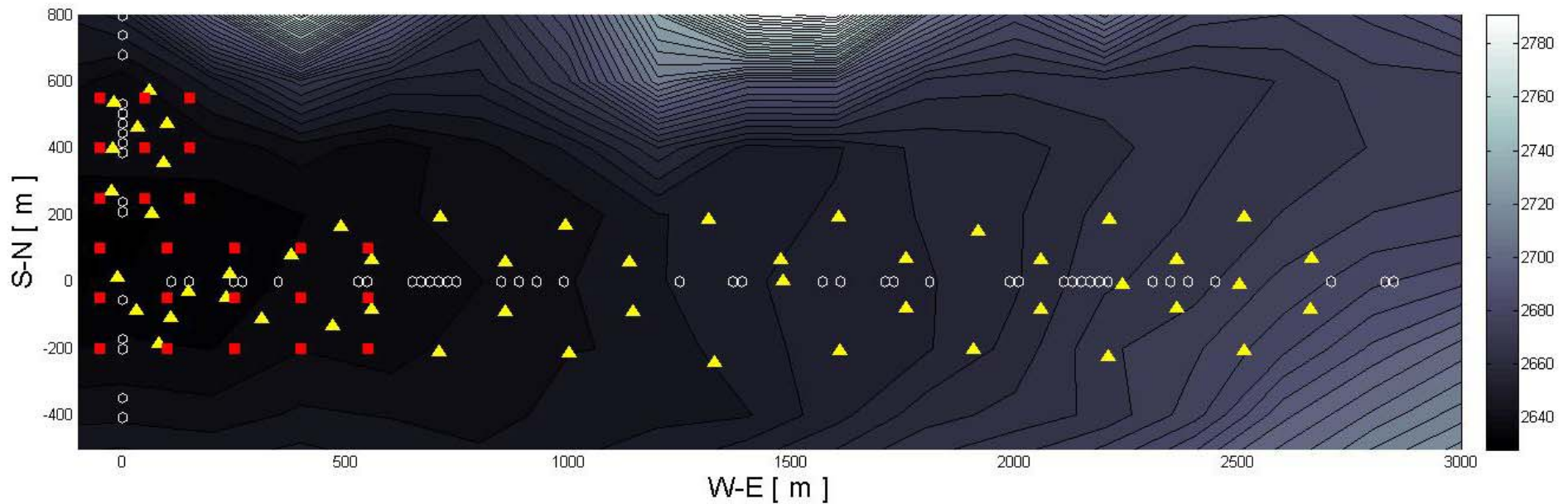
^e*National Astronomical Observatories of China, Chinese Academy of Science, Beijing 100012, P.R. China*

^f*Laboratoire de Physique Nucléaire et des Hautes Energies, CNRS/IN2P3 and Université Pierre et Marie Curie, 75252 Paris Cedex, France*



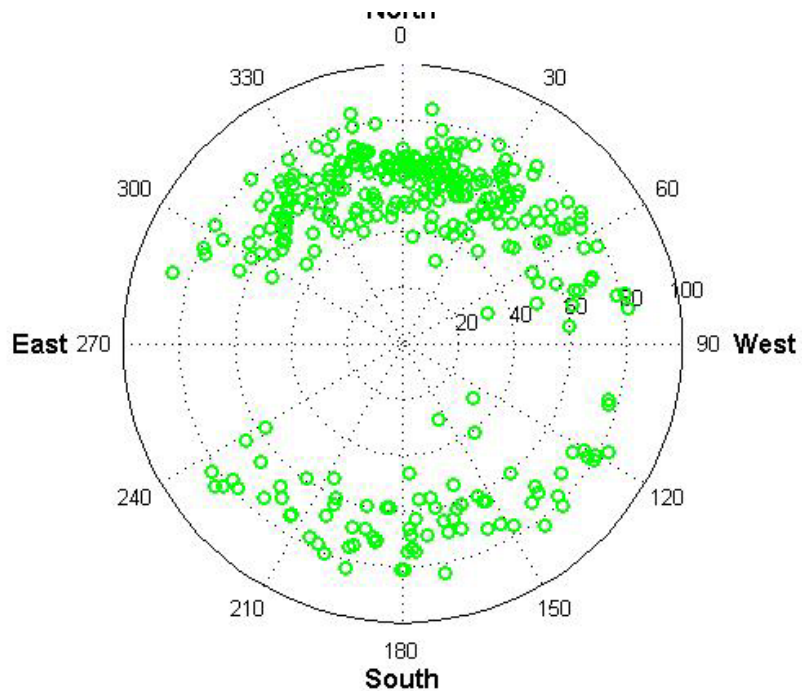
TREND

Phase II: 50 Butterfly Antennas

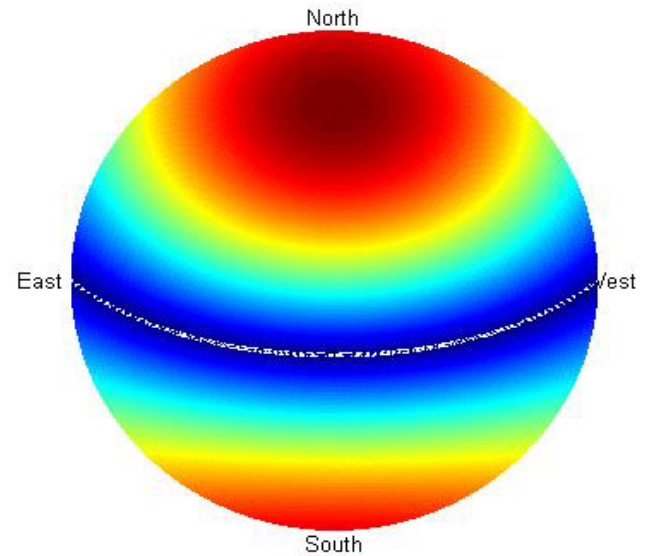


TREND-50 (2012)

Sky distribution of
340 Events



Theoretical prediction



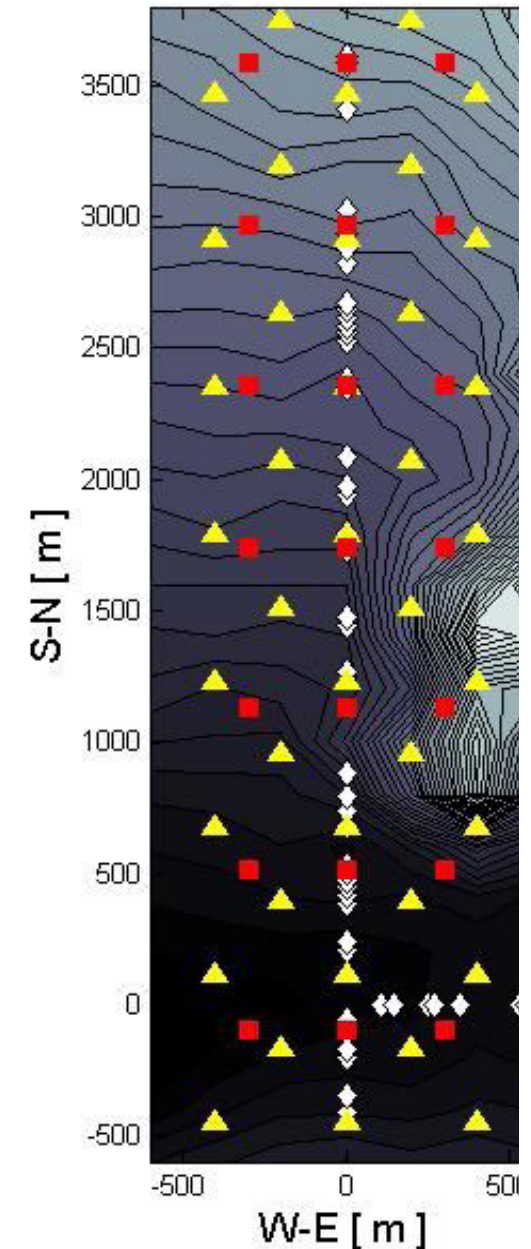
Phase III: Work in progress

- 35 antennas (▲) + 21 scintillators (■)



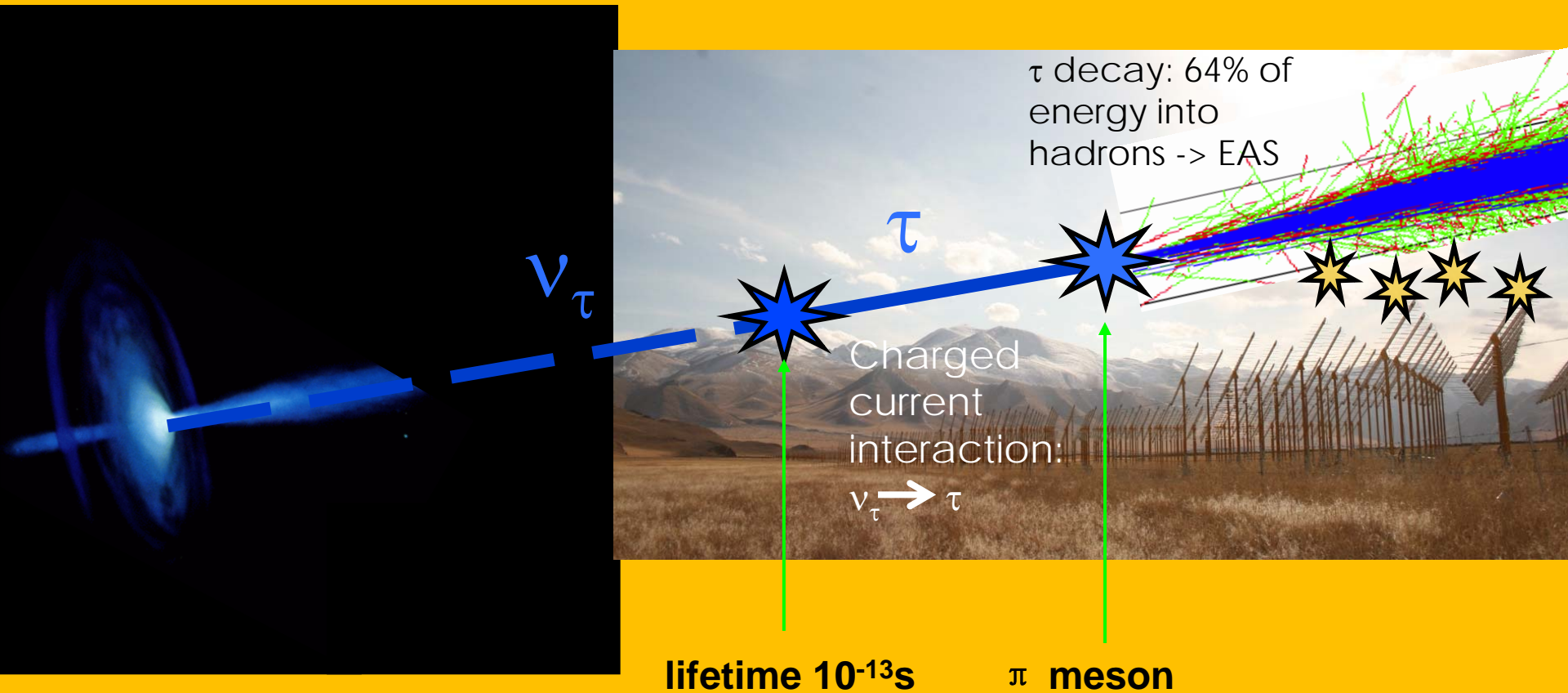
Prototype for a
Giant Radio Array for Neutrino Detection

GRAND



TREND/GRAND

High energy neutrinos detection through tau production in rock and decay in atmosphere



Welcome to Visit 21CMA Site

Thanks