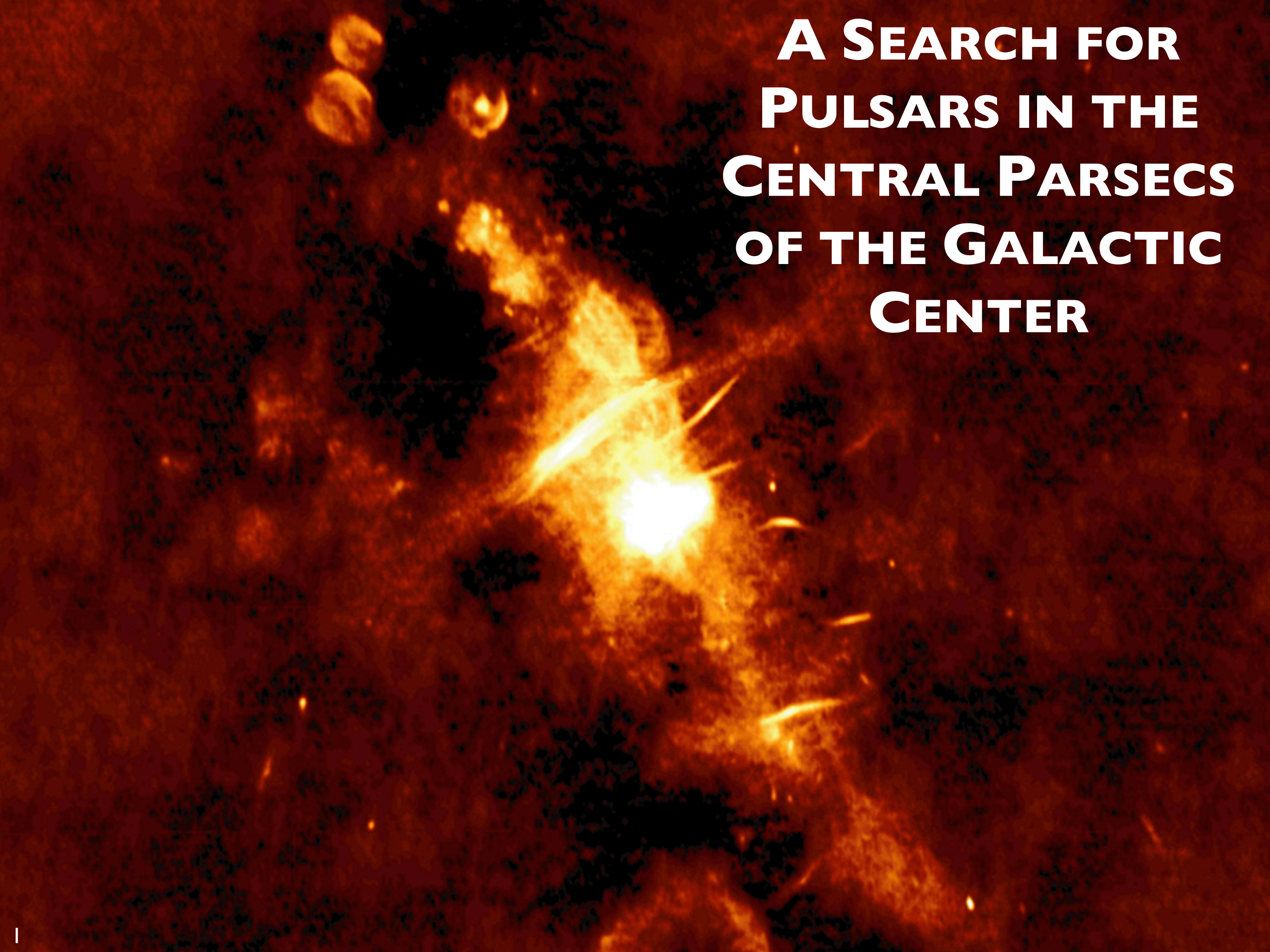


The background of the slide is a deep-field astronomical image of the Galactic Center. It features a dense field of stars, with a prominent bright yellow-white star (likely the supermassive black hole Sgr A*) at the center. Surrounding it are various orange and red nebulae and dust clouds. The text is overlaid in the upper right quadrant.

A SEARCH FOR PULSARS IN THE CENTRAL PARSECS OF THE GALACTIC CENTER

Matthew Bailes - Swinburne University of Technology
Geoff Bower - University of California, Berkeley
Jayanth Chennamangalam - West Virginia University
Jim Cordes - Cornell University
Paul Demorest - National Radio Astronomy Observatory
Gregory Desvignes - University of California, Berkeley
Julia Deneva - Arecibo Observatory
John Ford - National Radio Astronomy Observatory
Dale Frail - National Radio Astronomy Observatory
Abhimat Gautam, University of California, Berkeley
Glenn Jones - California Institute of Technology
Michael Kramer - MPIFR
Joseph Lazio - Jet Propulsion Laboratory
Duncan Lorimer - West Virginia University
Maura McLaughlin - West Virginia University
Scott Ransom - National Radio Astronomy Observatory
Anish Roshi - National Radio Astronomy Observatory
Zac Rzesniowieki - University of California, Berkeley
Simon Scott - University of California, Berkeley
Andrew Siemion - University of California, Berkeley
Mark Wagner - University of California, Berkeley
Dan Werthimer - University of California, Berkeley
Robert Wharton - Cornell University

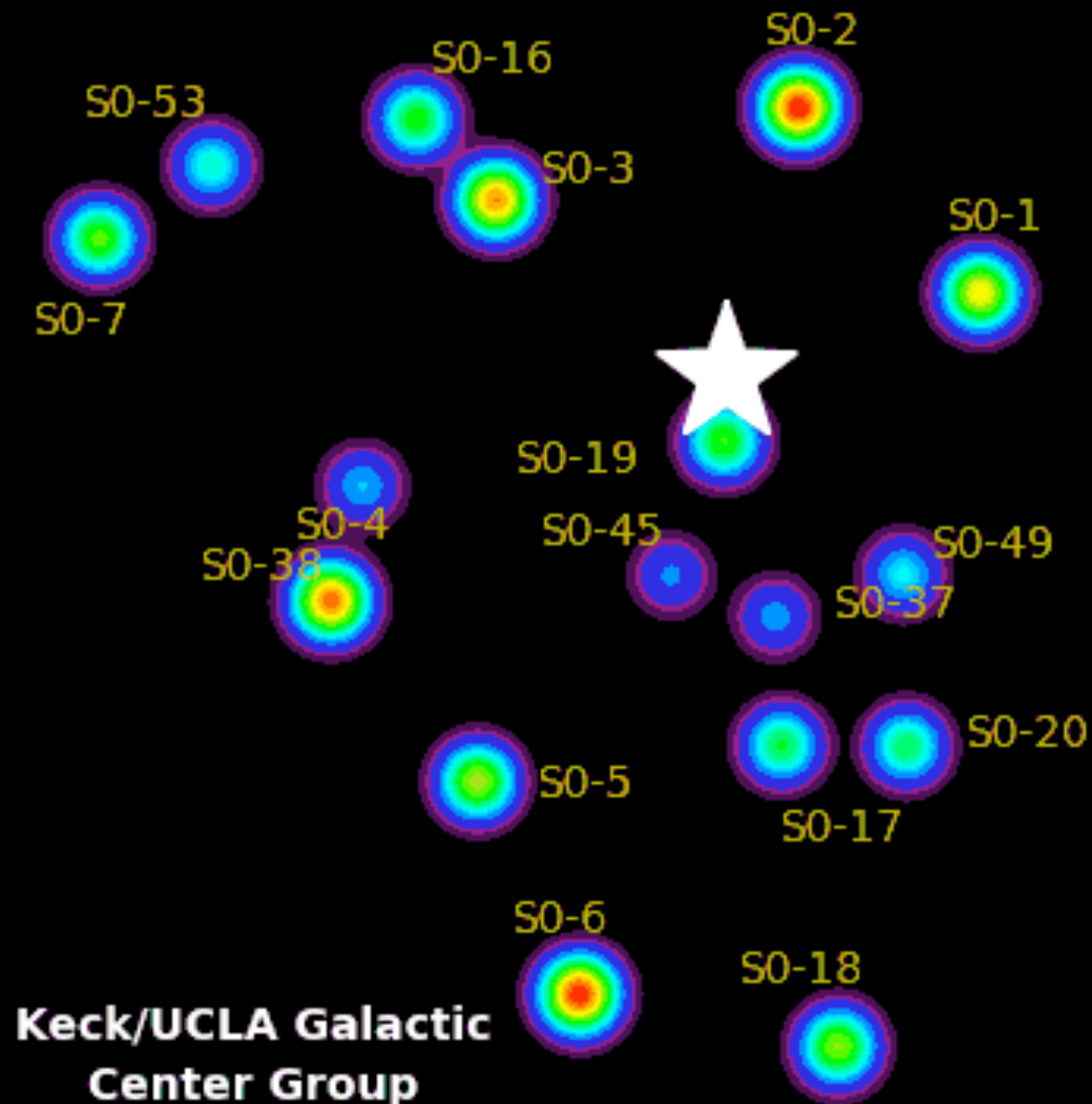


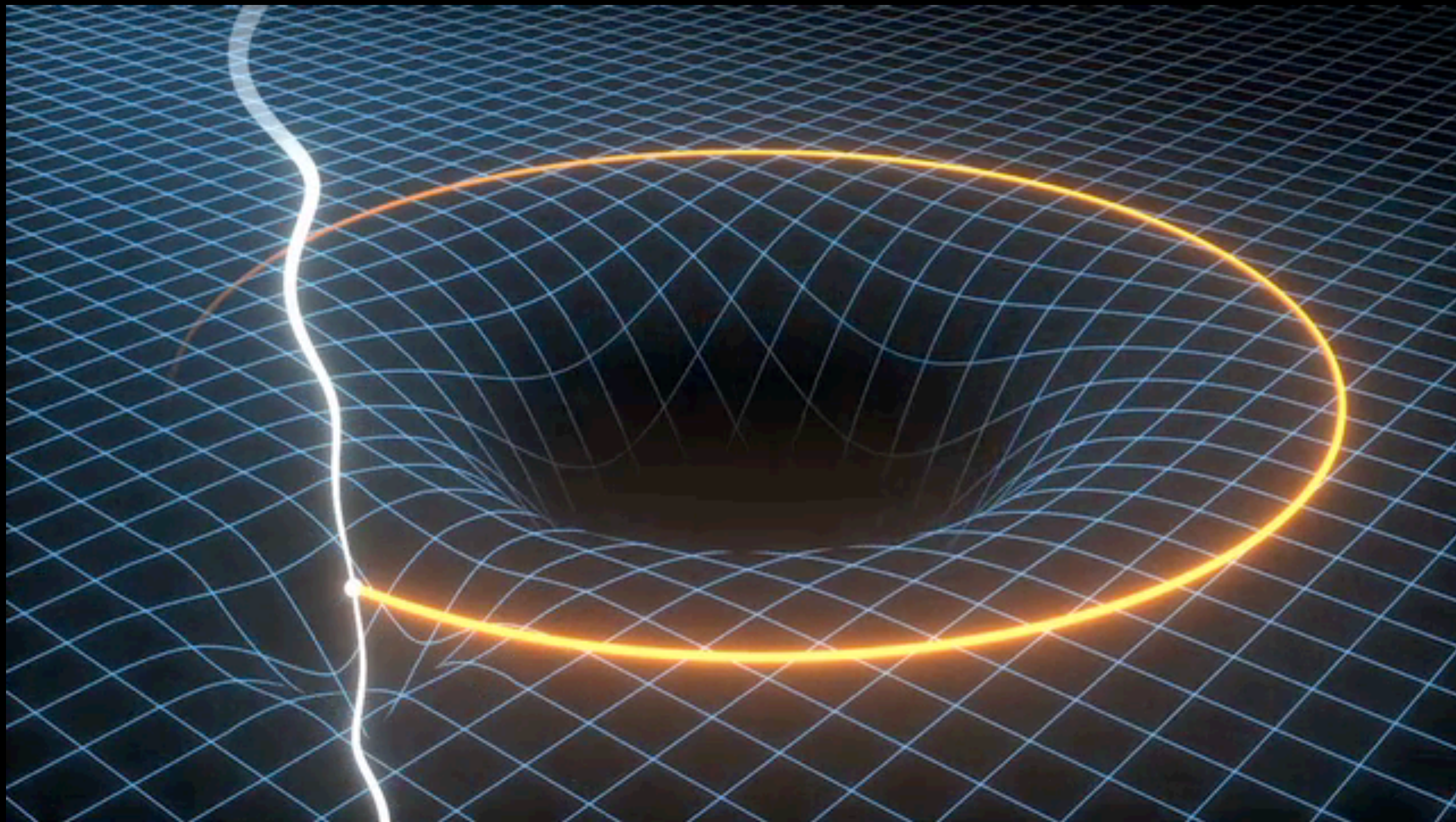
Matthew Bailes - Swinburne University of Technology
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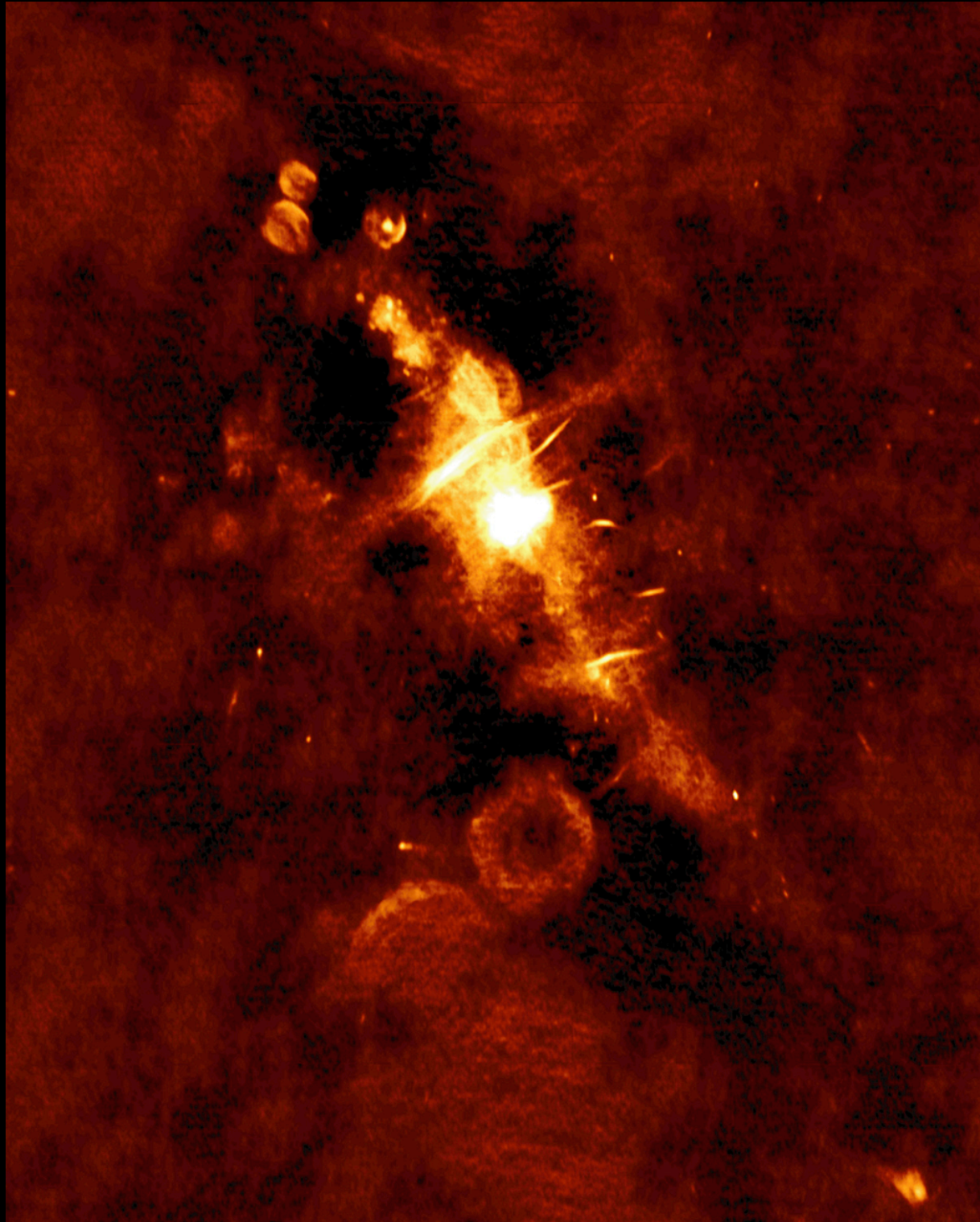
1995.5

The Milky Way's Super Massive Black Hole





Evidence for Pulsars

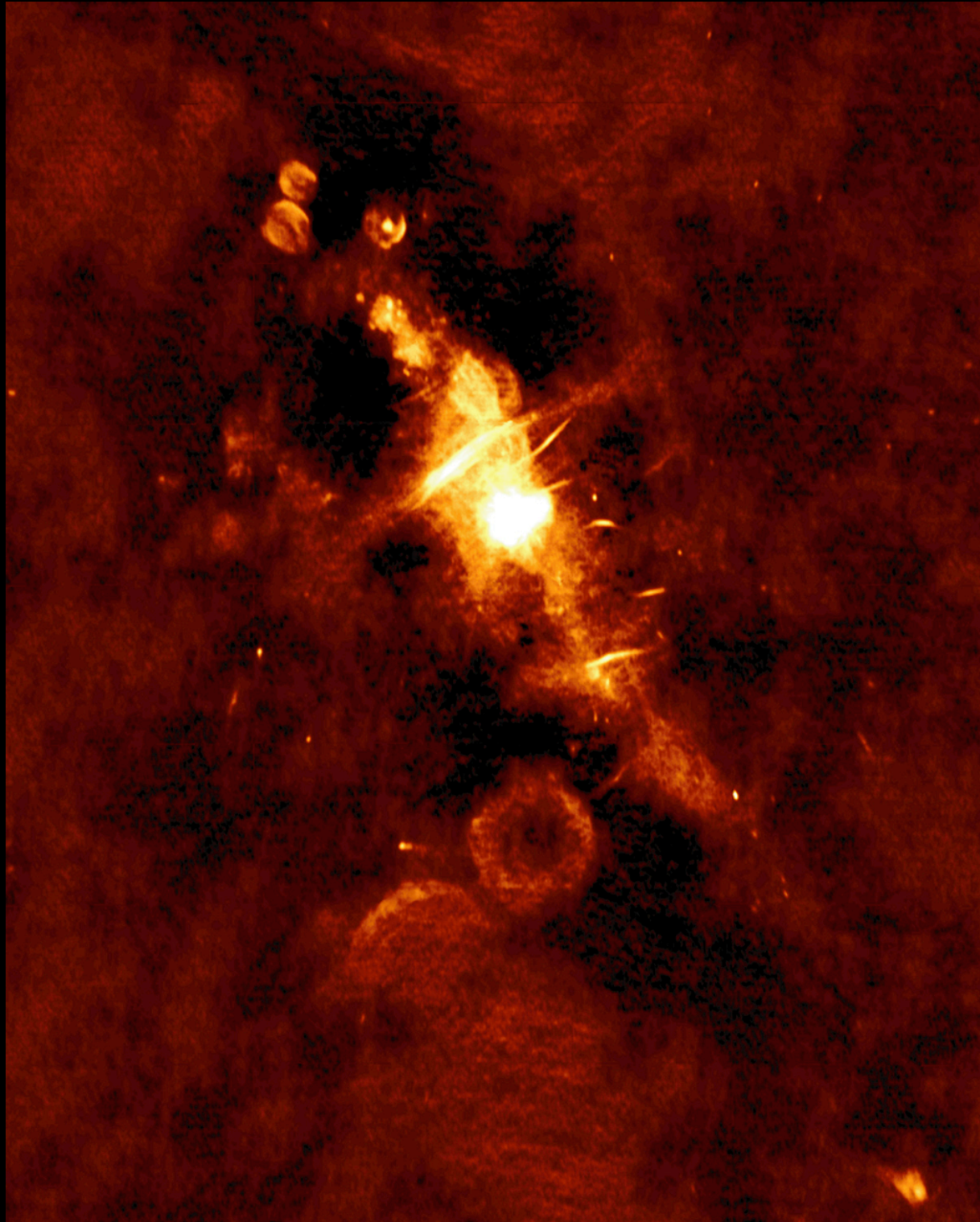


Lazio et al

- * Significant population of NS progenitors
- * Mass segregation
- * High stellar densities increases likelihood of finding interesting binaries, e.g. NS-BH

Faucher-Giguere & Loeb 2011, Merritt et al 2010, Ghez et al 2011, Pfal and Loeb 2004

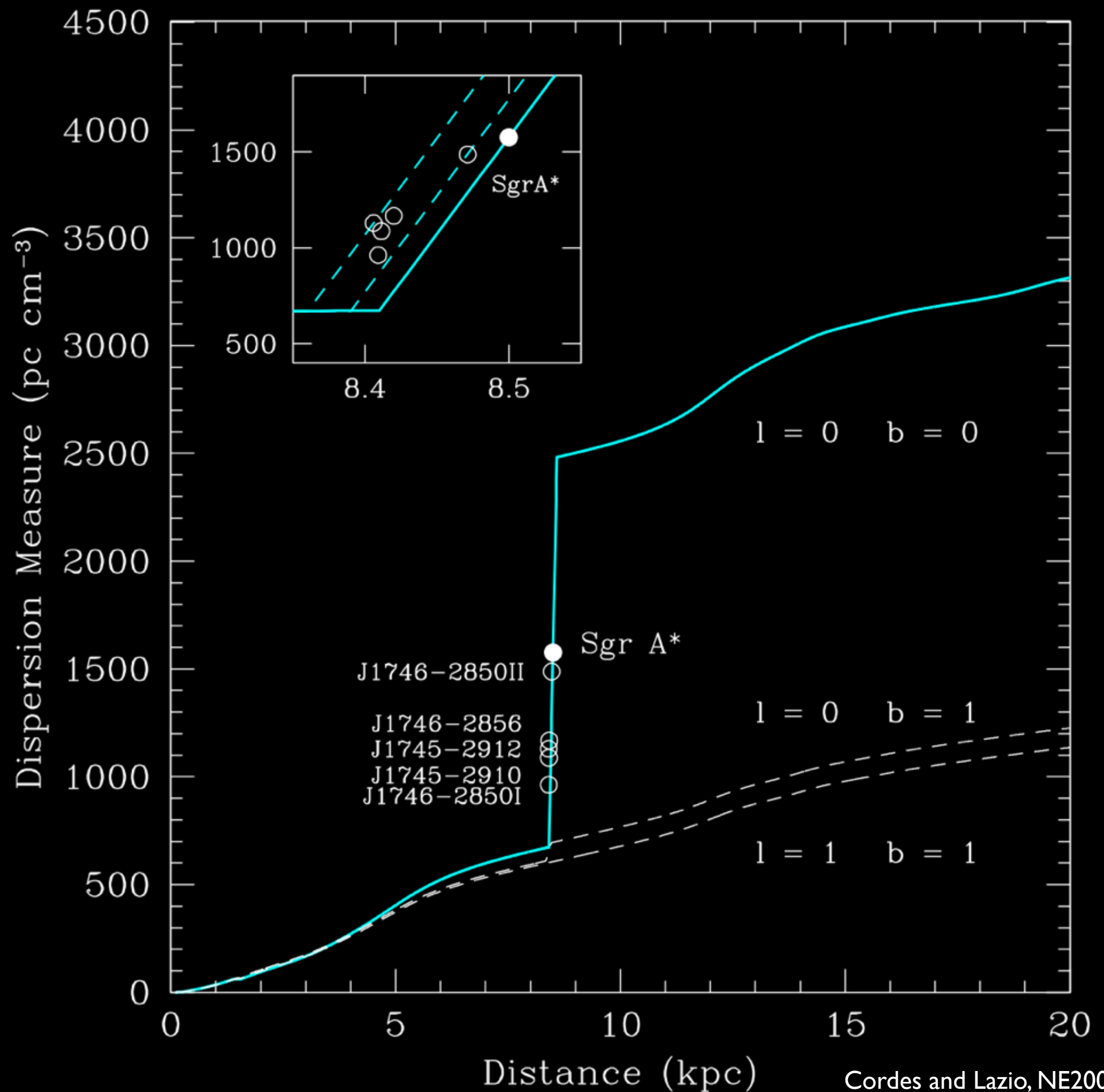
Pulsars at the Galactic Center



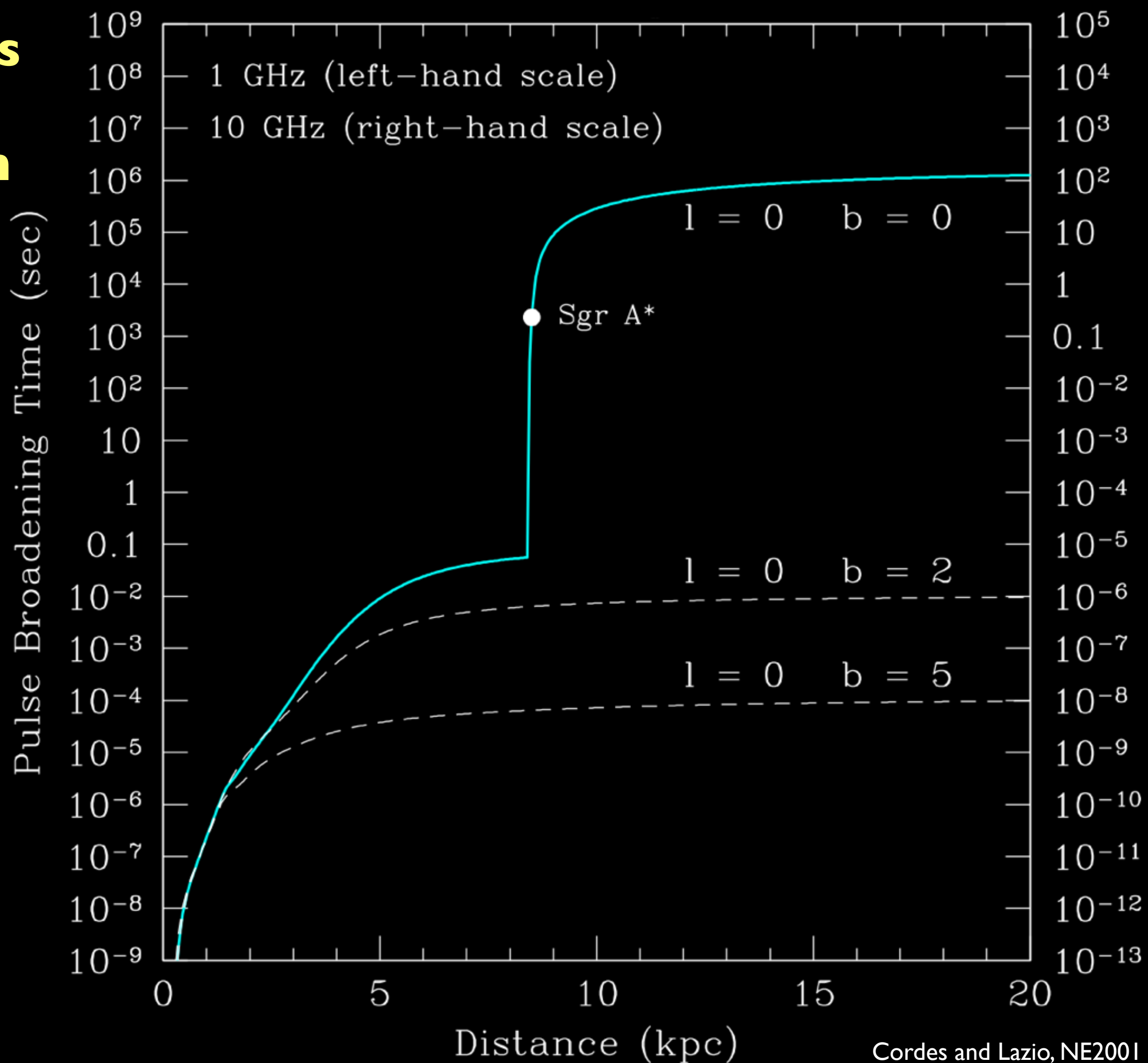
Lazio et al

- * Stellar remnants probe star formation history
- * Detailed picture of the interstellar plasma
- * Determination of the smoothly distributed mass interior to the pulsar's orbit
- * Measurement of GR effects in binaries or Sgr A* itself

Challenges to Detection



Challenges to Detection

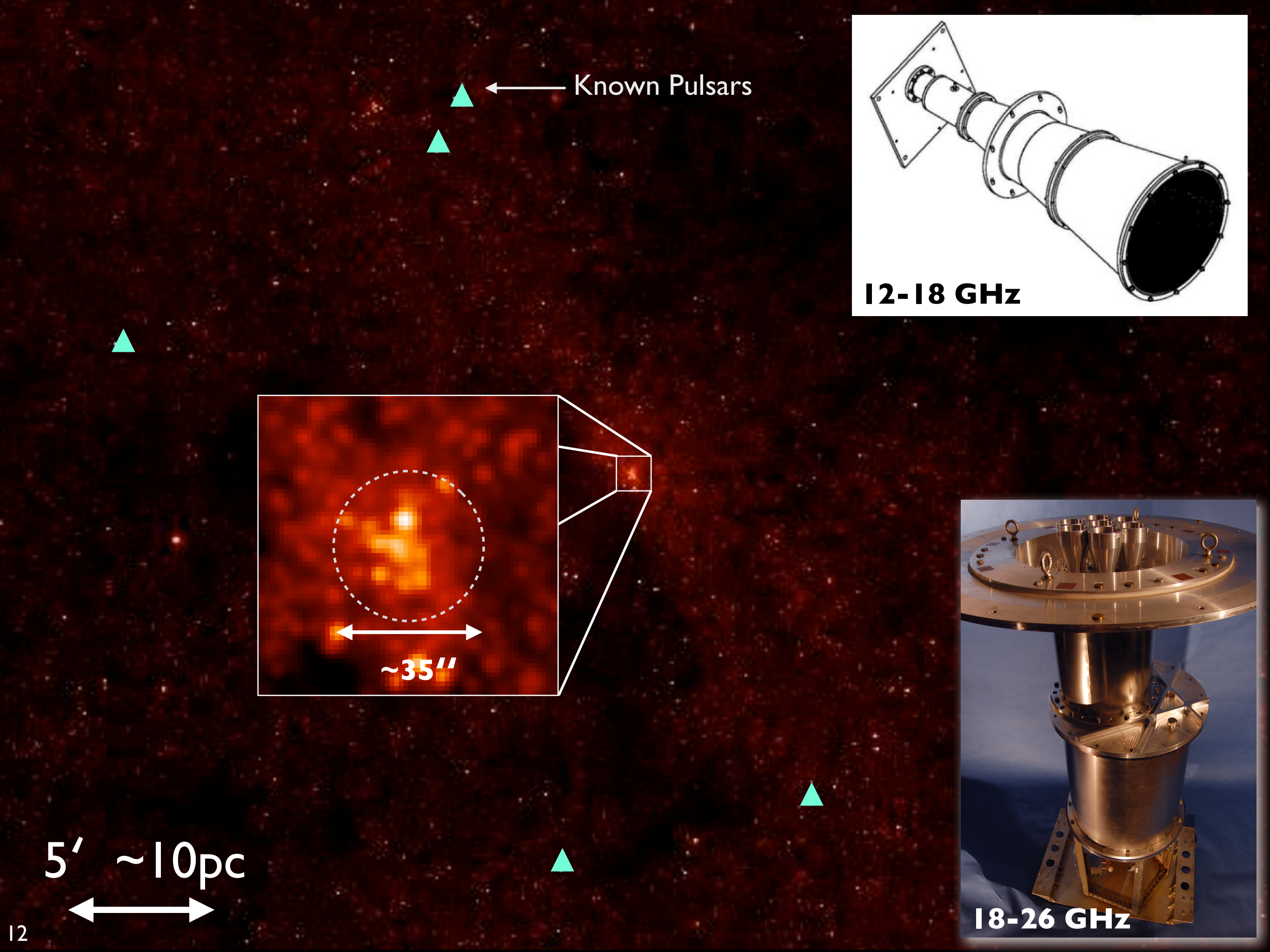


The Green Bank Telescope

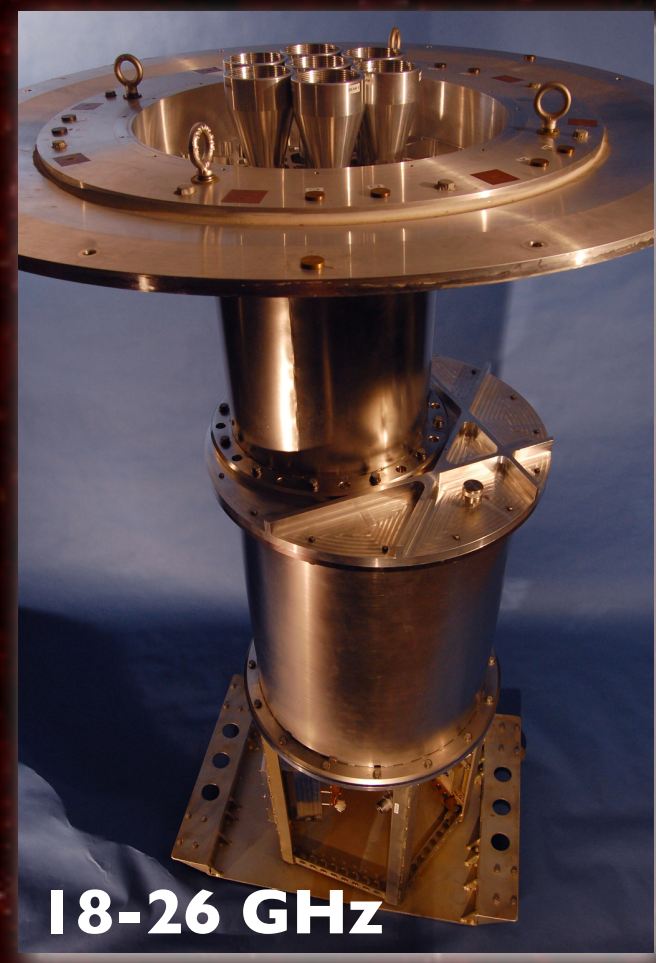
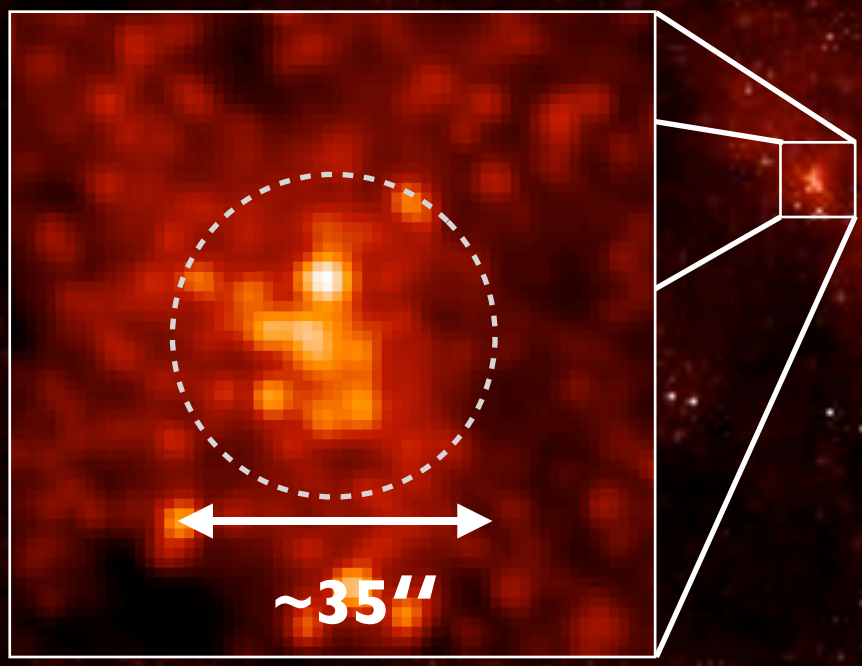
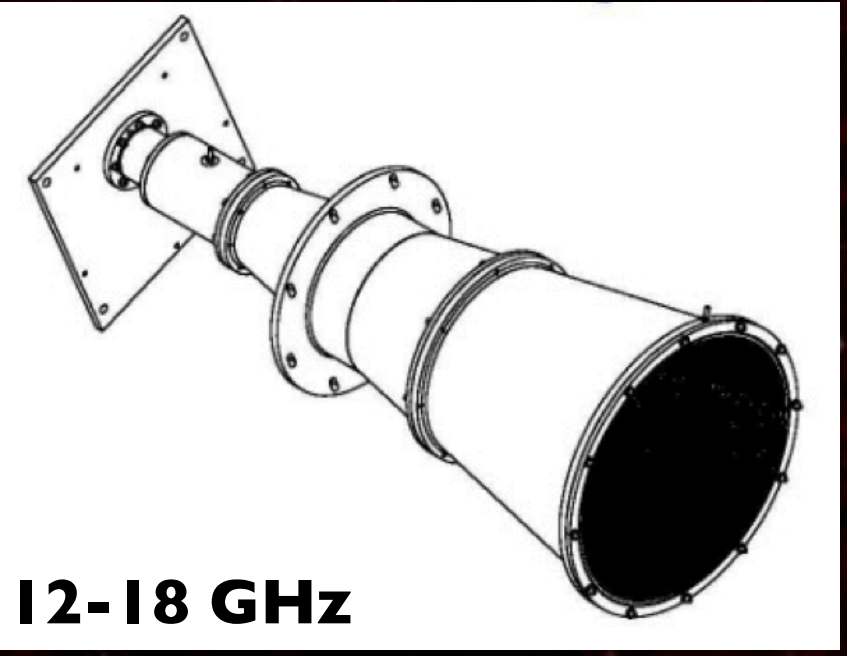


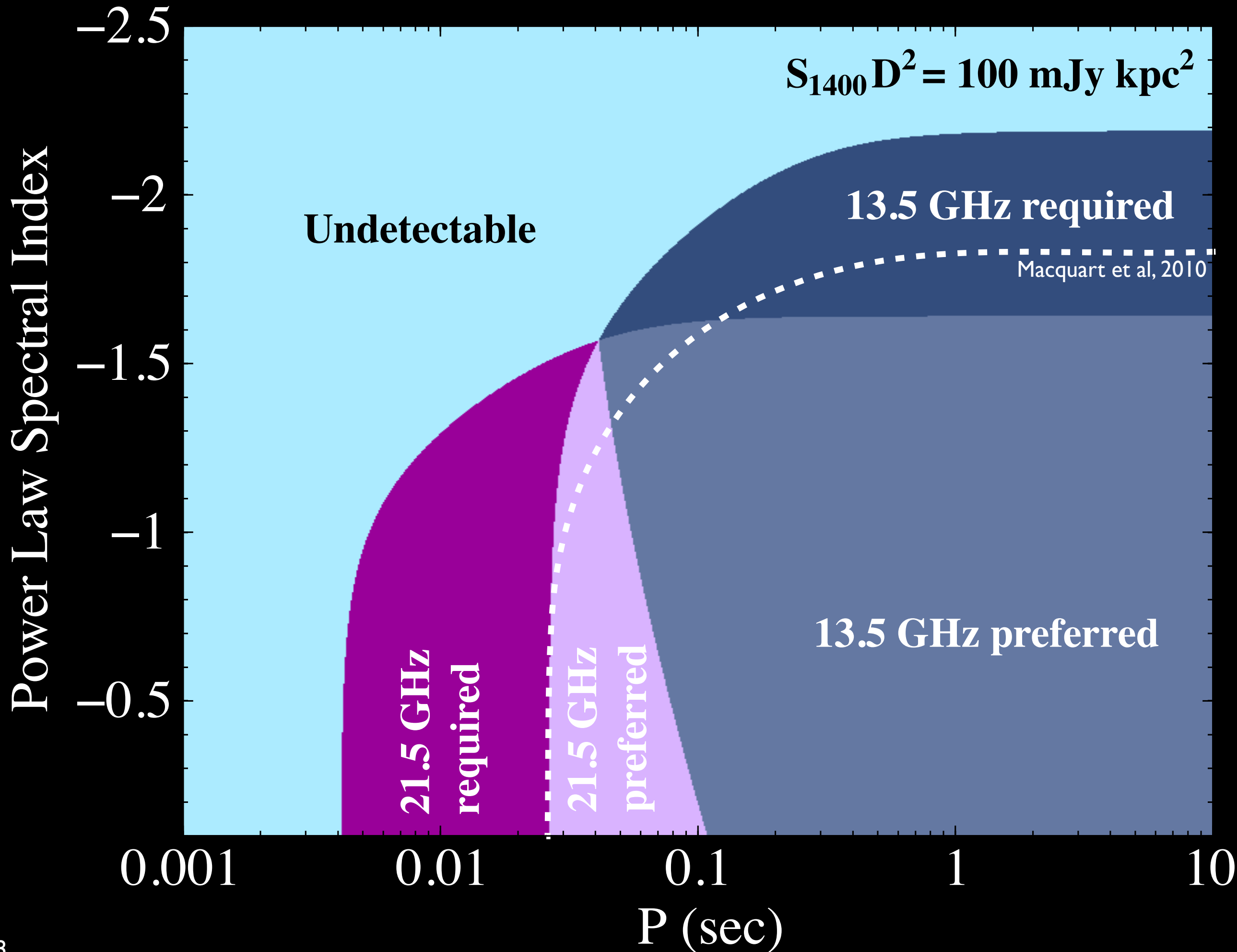
The Green Bank Telescope





Known Pulsars





VEGAS: VErsatile GBT Astronomical Spectrometer

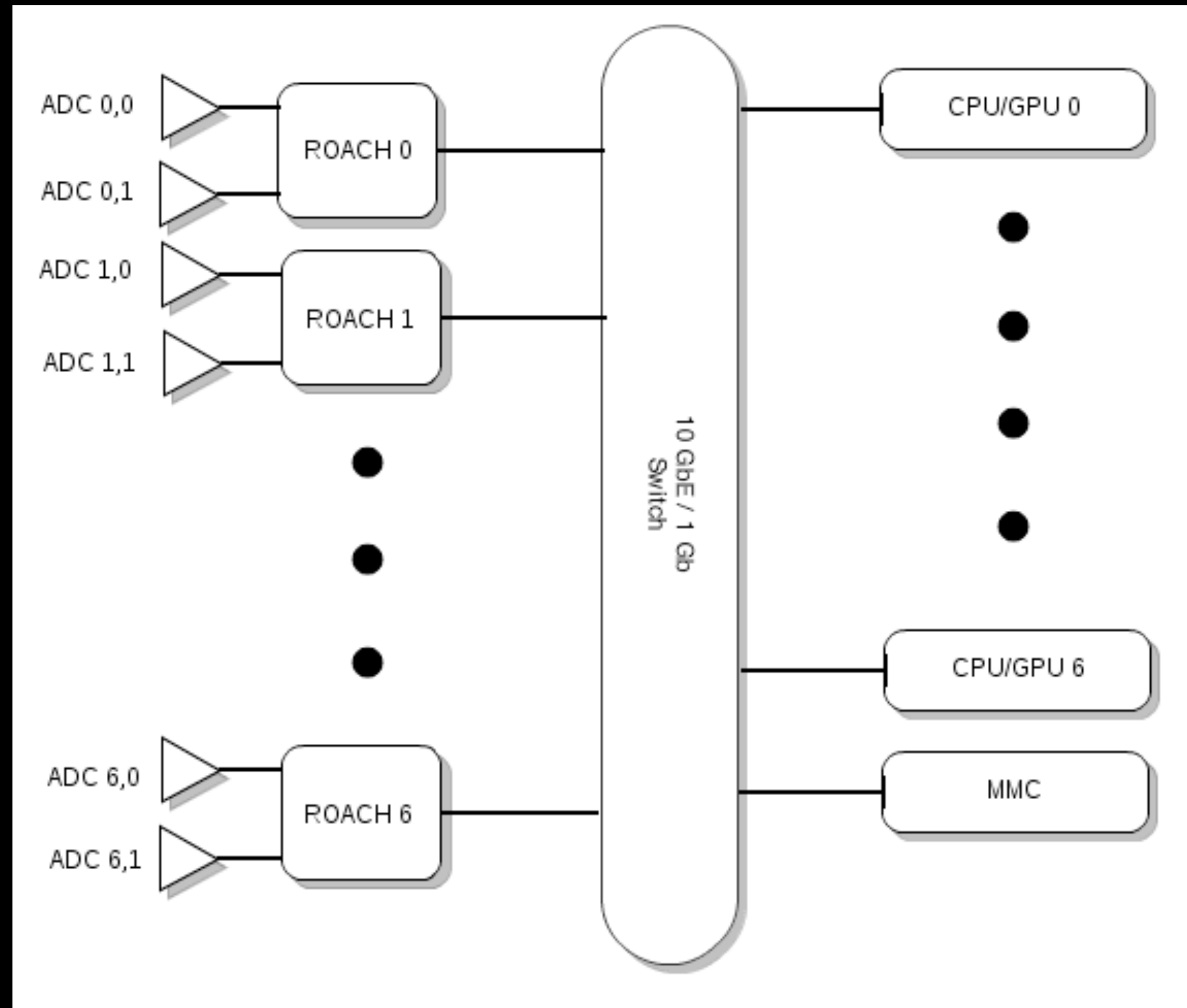
Roshi et al, arXiv:1202.0938

8 x 1.4 GHz BW

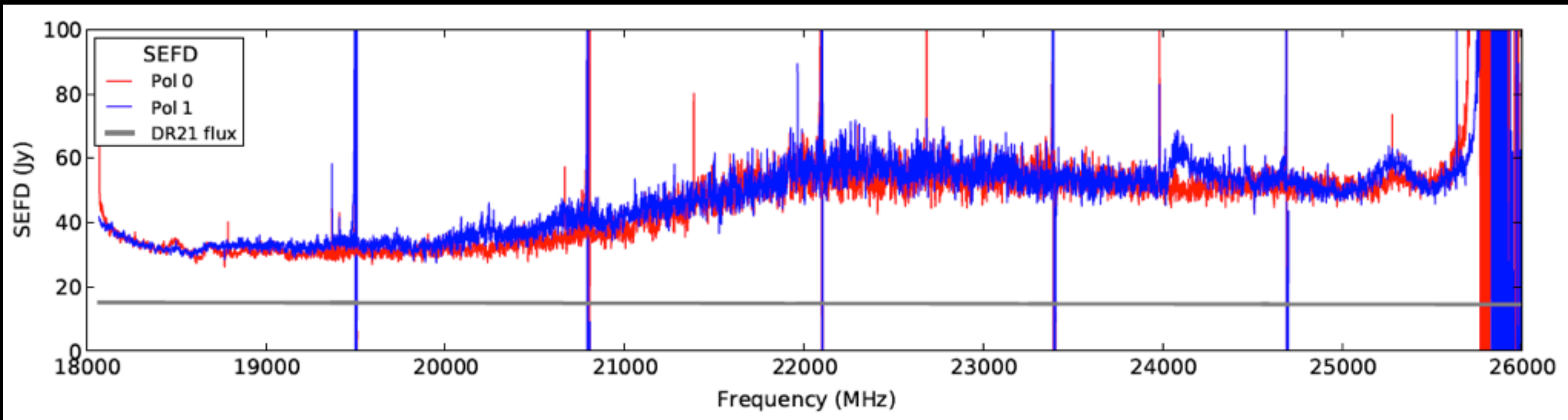
Flexible Design

~1 MHz polyphase
channelization in
wideband modes

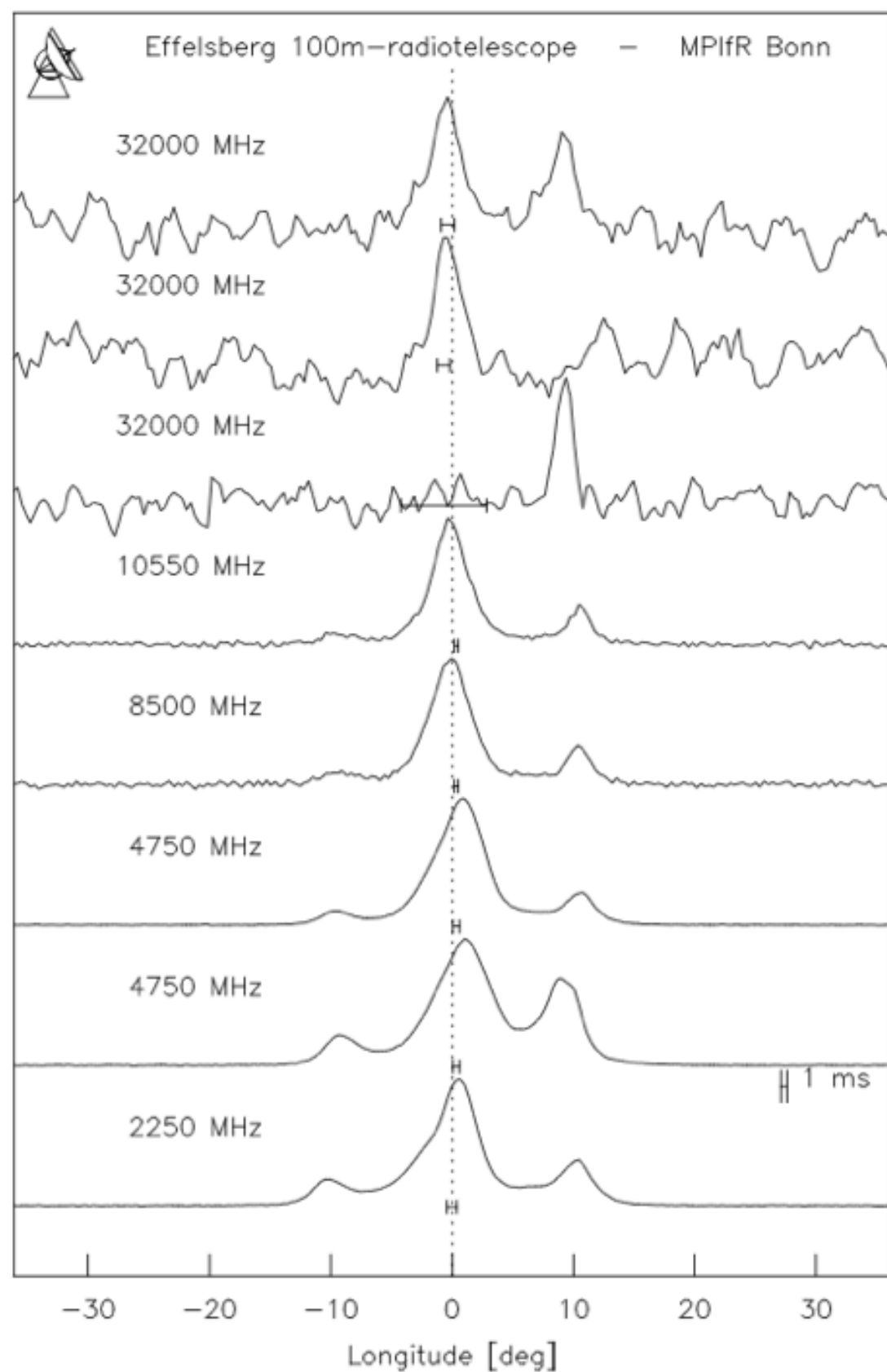
~ Hz polyphase
channelization in
narrowband modes



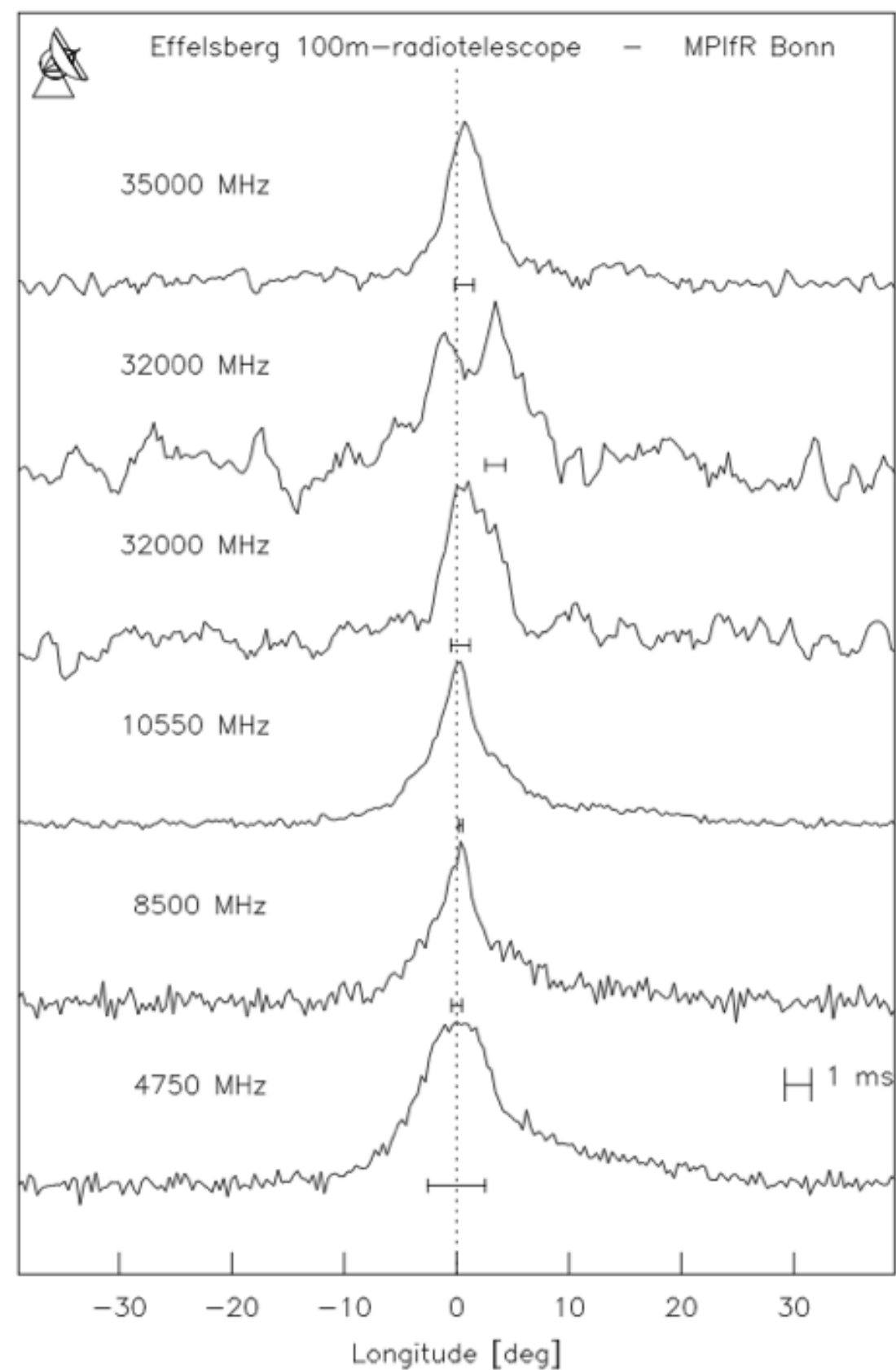
K-band (18-26 GHz) First Light - March 2012



PSR B 0329+54

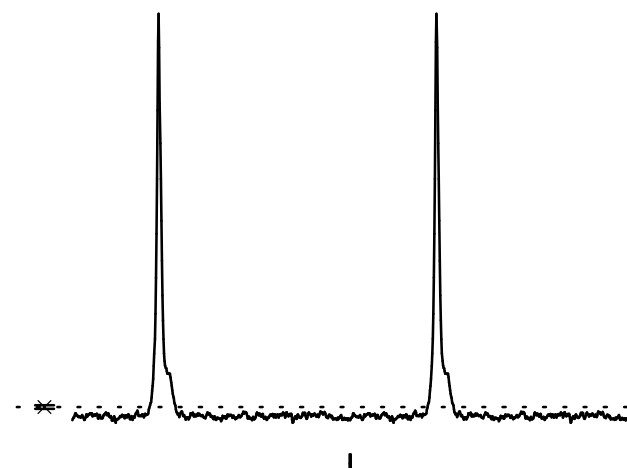


PSR B 0355+54



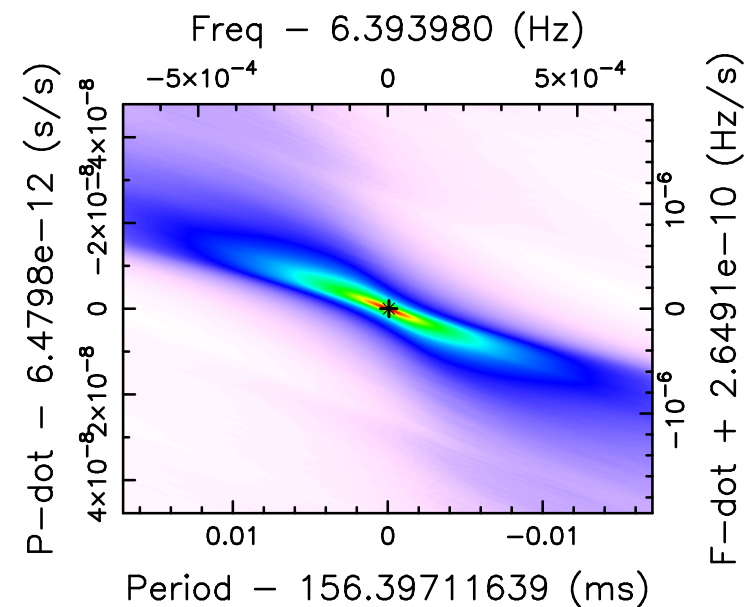
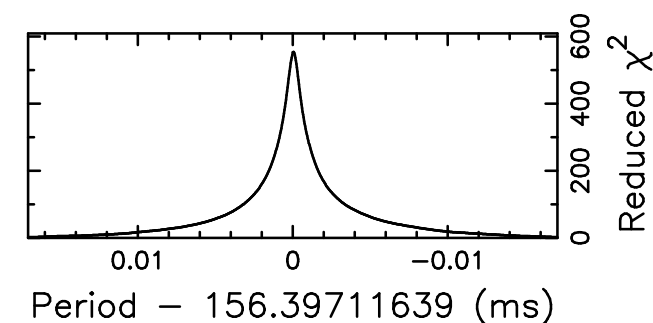
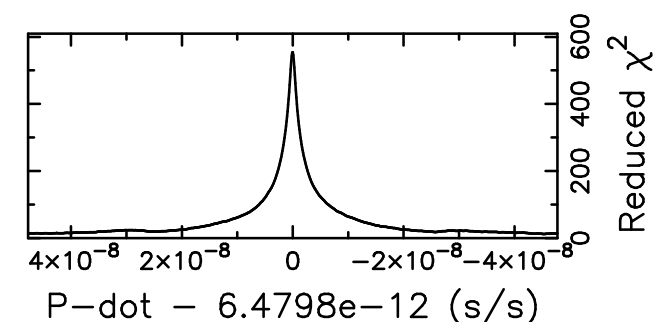
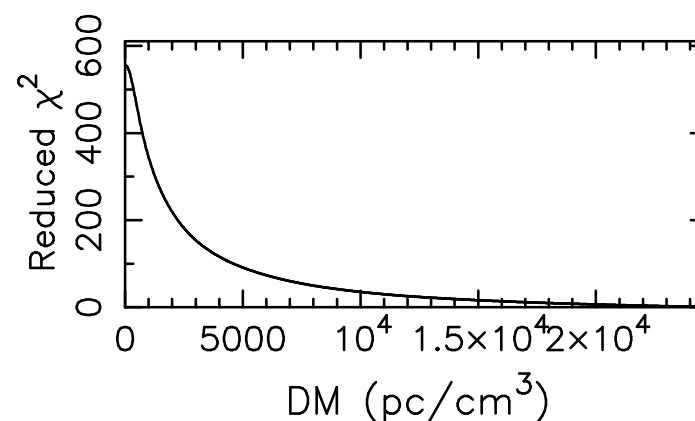
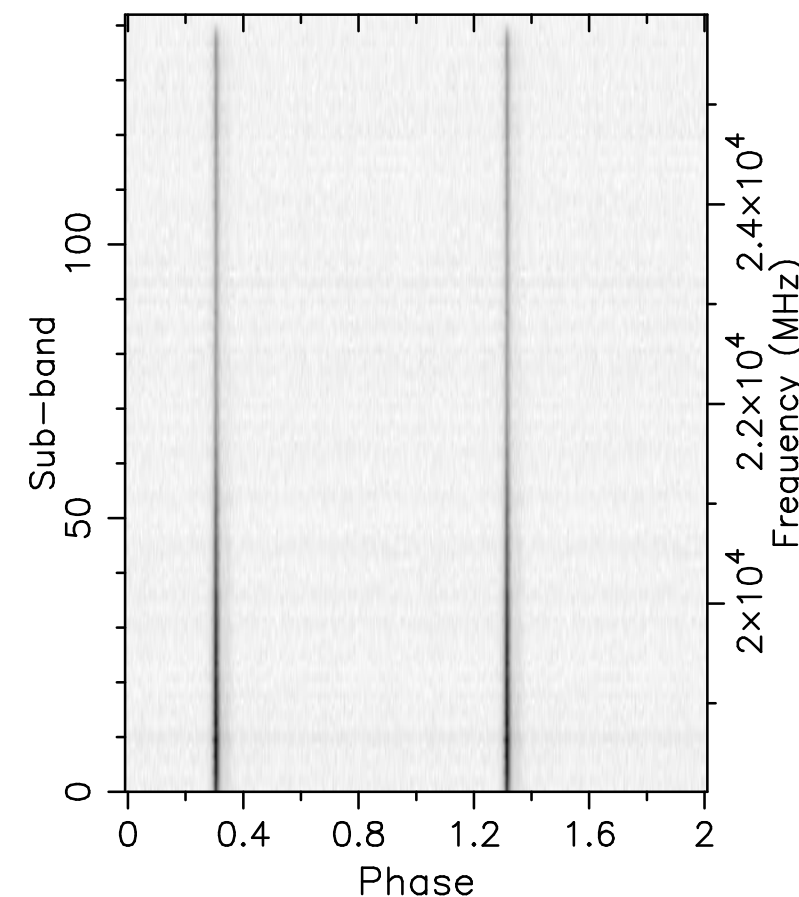
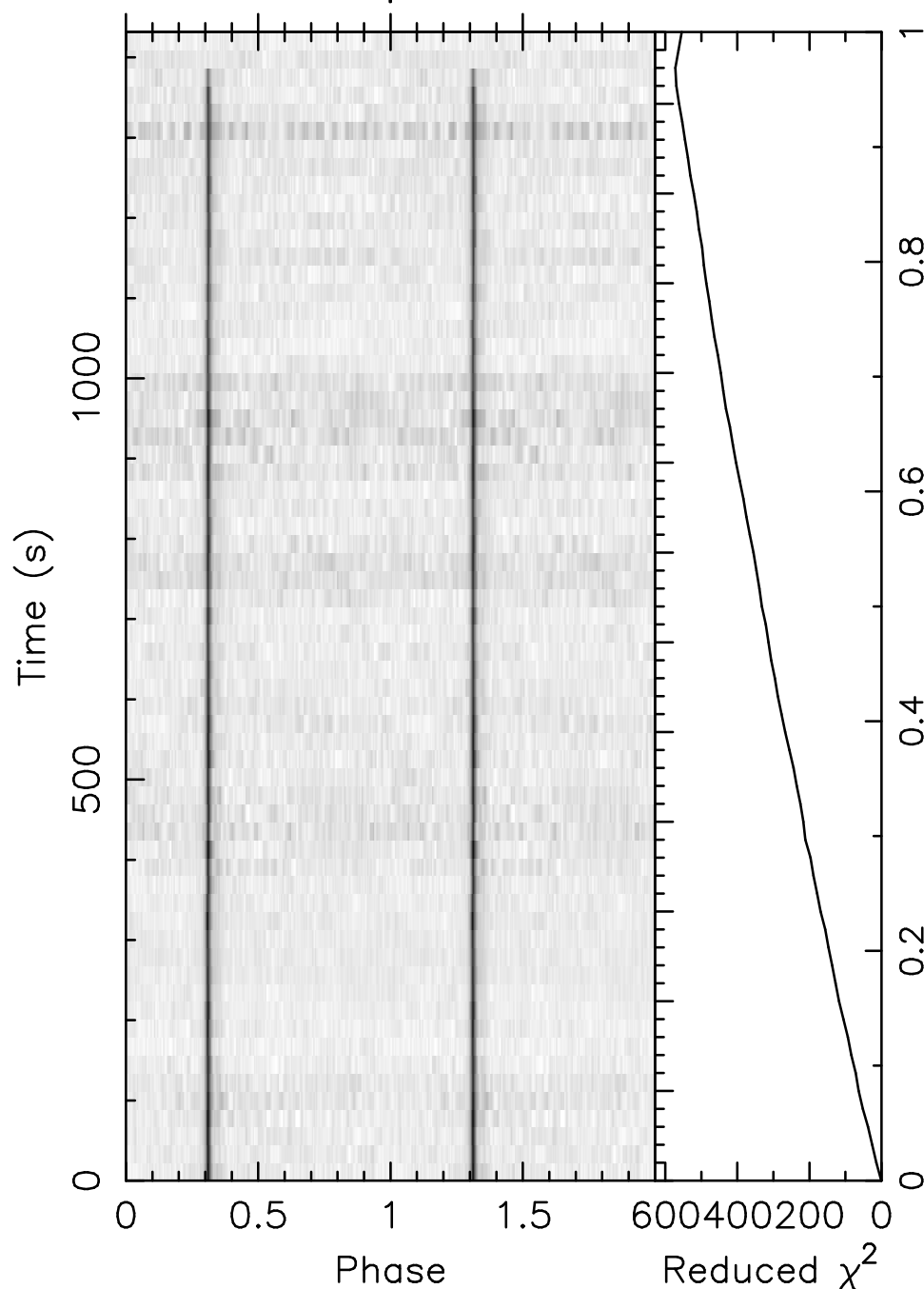
PSR B0355+54

2 Pulses of Best Profile



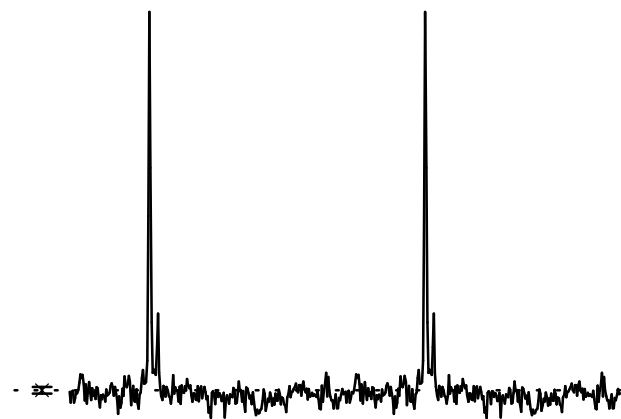
Candidate: PSR_B0355+54
 Telescope: GBT
 Epoch_{topo} = 56007.98008101850
 Epoch_{bary} = 56007.97901420428
 T_{sample} = 0.00054613
 Data Folded = 2621440
 Data Avg = 7.038e+05
 Data StdDev = 1339
 Profile Bins = 512
 Profile Avg = 3.603e+09
 Profile StdDev = 9.583e+04

Search Information
 RA_{J2000} = 03:58:53.7360 DEC_{J2000} = 54:13:13.4400
 Best Fit Parameters
 Reduced χ^2 = 554.178 P(Noise) $\sim$ 0
 Dispersion Measure (DM; pc/cm³) = 48.308
 P_{topo} (ms) = 156.3970496(97) P_{bary} (ms) = 156.3847793(97)
 P'_{topo} (s/s) = 0.6(5.3)x10⁻¹¹ P'_{bary} (s/s) = 0.0(5.3)x10⁻¹¹
 P''_{topo} (s/s²) = 0.0(2.4)x10⁻¹³ P''_{bary} (s/s²) = 0.0(2.4)x10⁻¹³
 Binary Parameters
 P_{orb} (s) = N/A e = N/A
 a₁sin(i)/c (s) = N/A ω (rad) = N/A
 T_{peri} = N/A



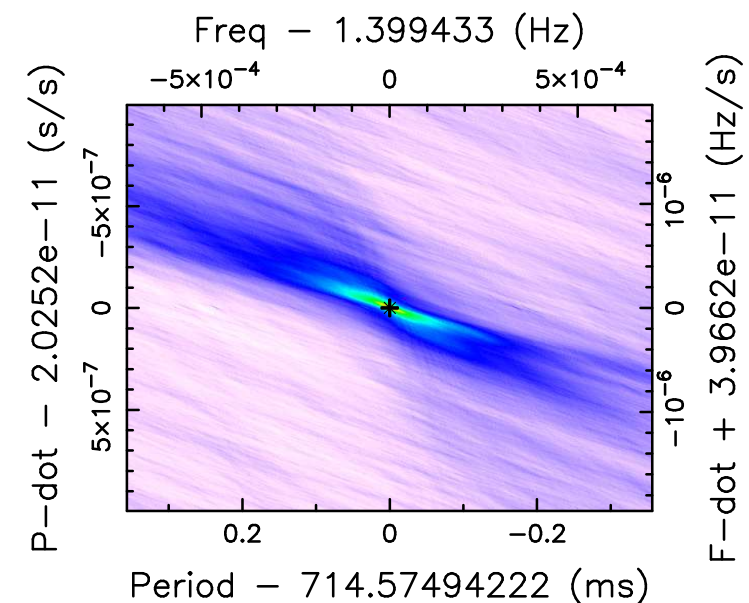
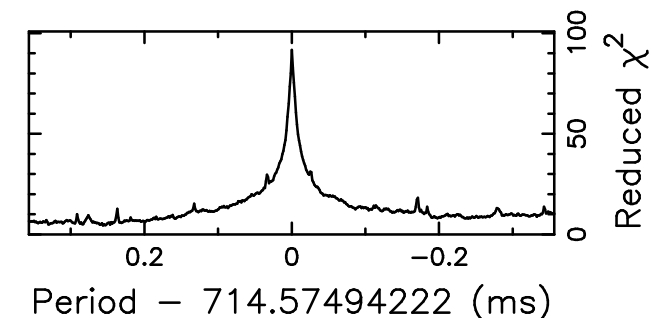
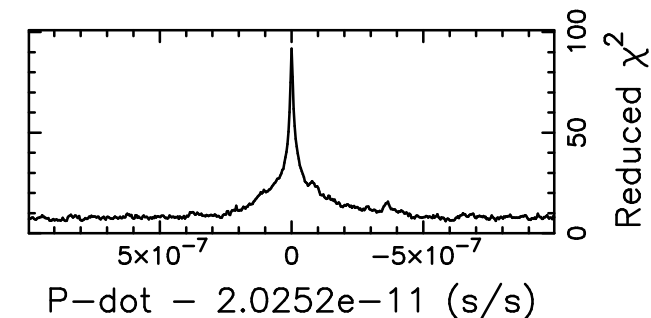
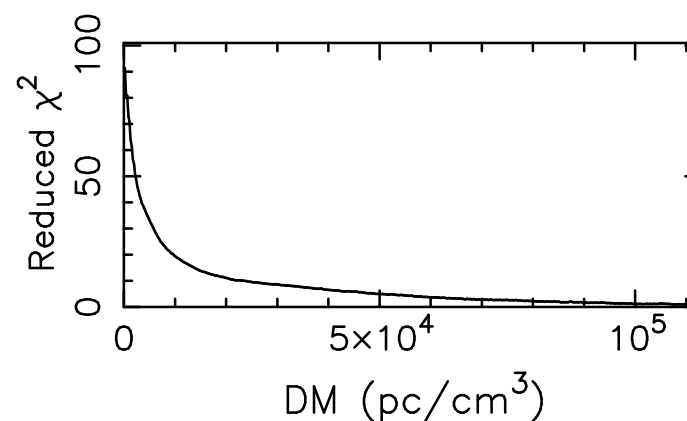
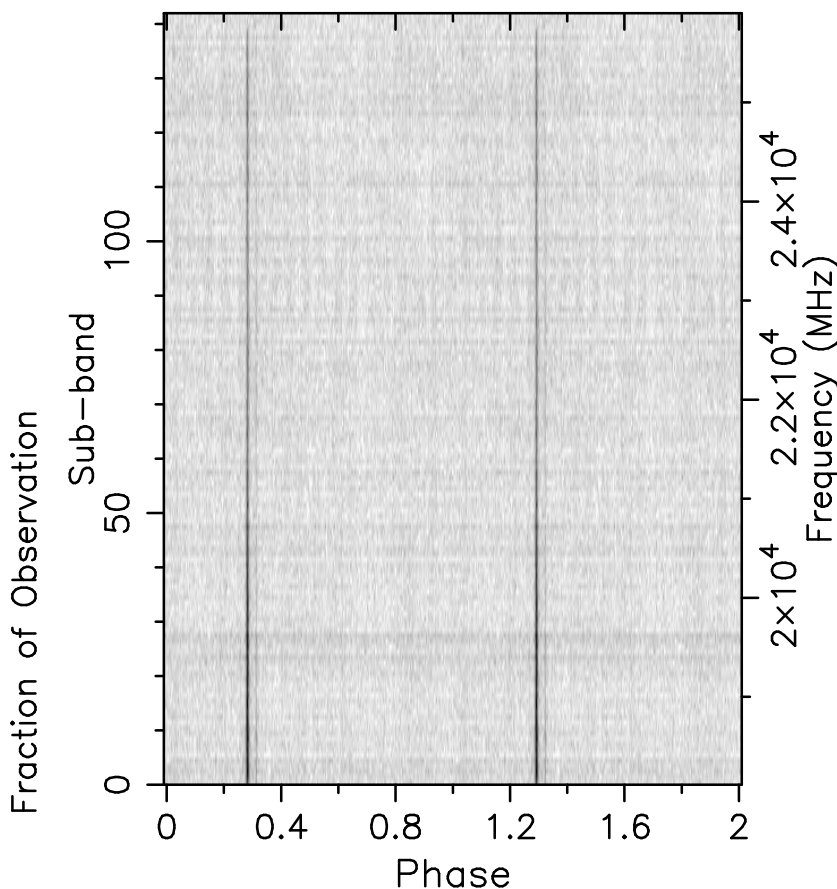
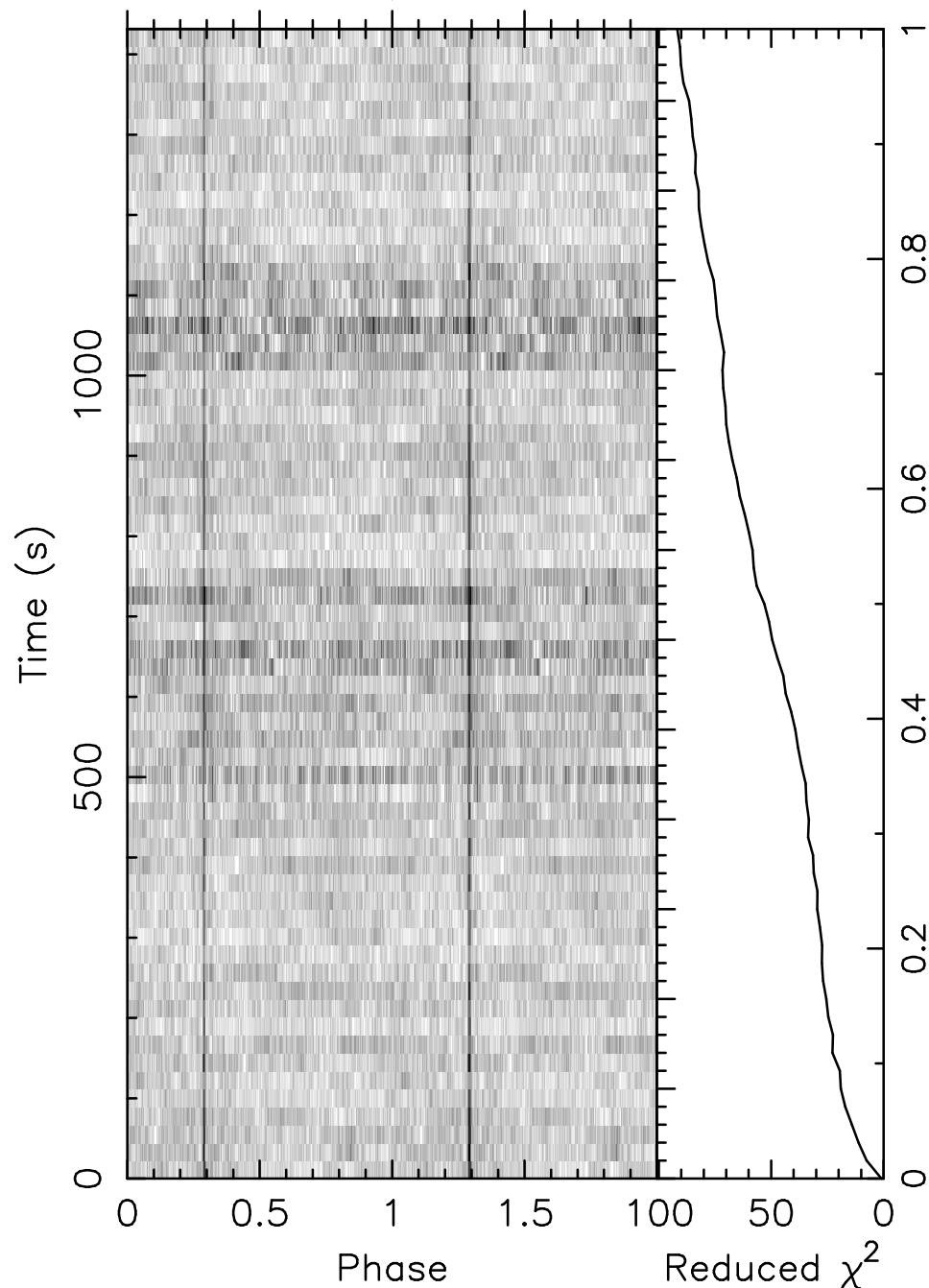
PSR B0329+54

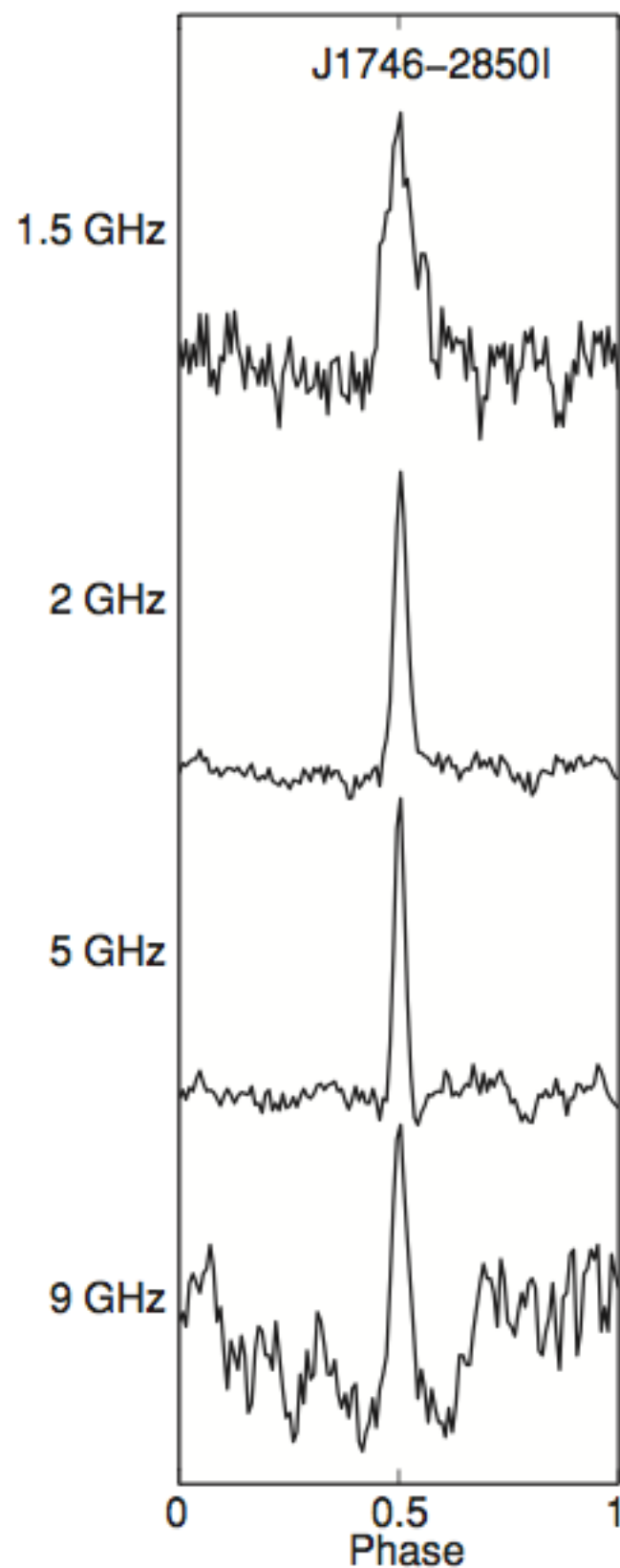
2 Pulses of Best Profile



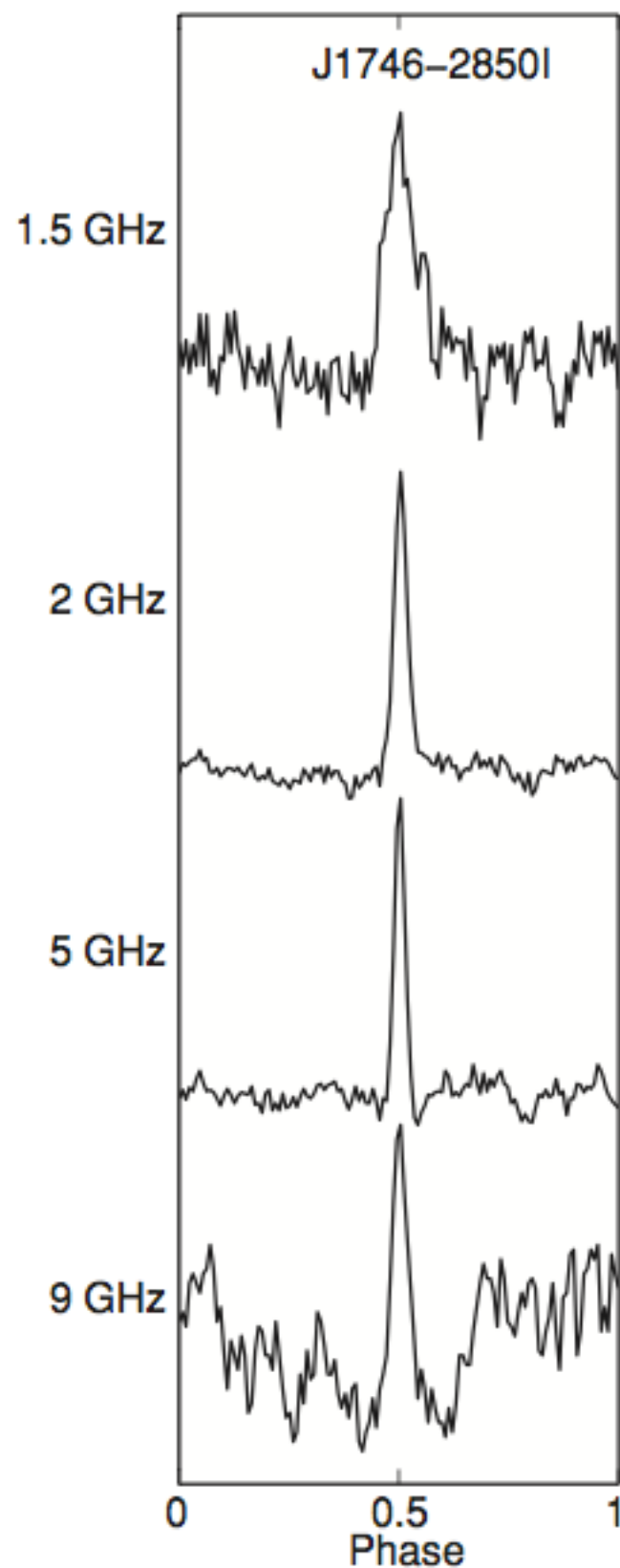
Candidate: PSR_B0329+54
 Telescope: GBT
 Epoch_{topo} = 56008.00135416670
 Epoch_{bary} = 56007.99999157846
 T_{sample} = 0.00054613
 Data Folded = 2621440
 Data Avg = 7.038e+05
 Data StdDev = 1329
 Profile Bins = 256
 Profile Avg = 7.205e+09
 Profile StdDev = 1.345e+05

Search Information
 RA_{J2000} = 03:32:59.3040 DEC_{J2000} = 54:34:43.6800
 Best Fit Parameters
 Reduced χ^2 = 91.732 P(Noise) $\sim$ 0
 Dispersion Measure (DM; pc/cm³) = 0.000
 P_{topo} (ms) = 714.57494(39) P_{bary} (ms) = 714.52139(39)
 P'_{topo} (s/s) = 0.0(2.1)x10⁻⁹ P'_{bary} (s/s) = 0.0(2.1)x10⁻⁹
 P''_{topo} (s/s²) = 0.0(9.5)x10⁻¹² P''_{bary} (s/s²) = 0.0(9.5)x10⁻¹²
 Binary Parameters
 P_{orb} (s) = N/A e = N/A
 a₁sin(i)/c (s) = N/A ω (rad) = N/A
 T_{peri} = N/A





$S_{8.9\text{GHz}} \sim 0.5 \text{ mJy}$
Spectral Index ~ -0.3
Expected SNR ~ 150 in 1 hr



Deneva et al 2009

$S_{8.9\text{GHz}} \sim 0.5 \text{ mJy}$
Spectral Index ~ -0.3
Expected SNR ~ 150 in 1 hr

;(

Status: August 2012

- * ~4 hours on source at K-band in March 2012. System functioning well, but no convincing candidates in hour-long integrations (analysis ongoing)
- * First Ku-band observations September-October 2012