

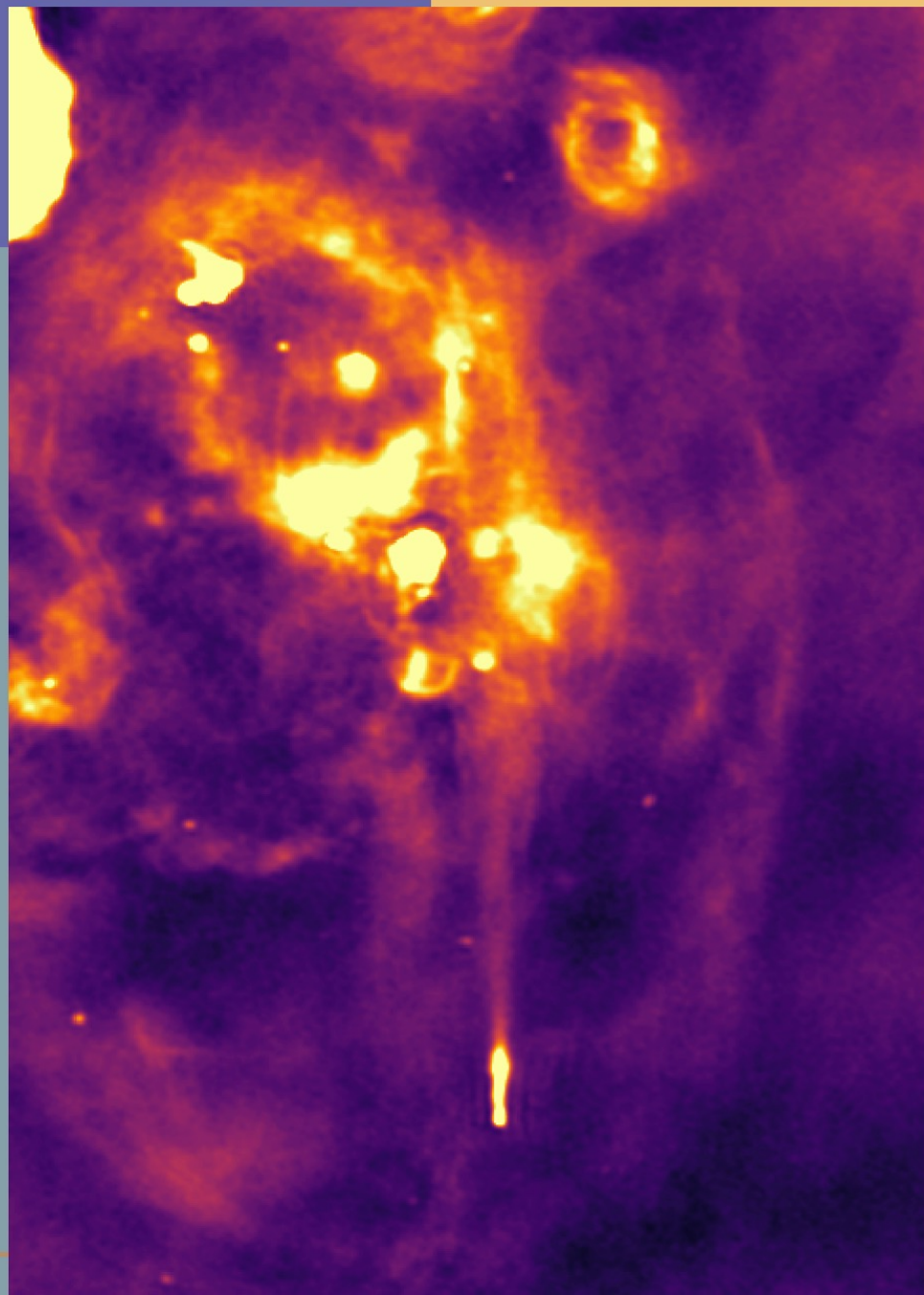
# POTOROO PWN

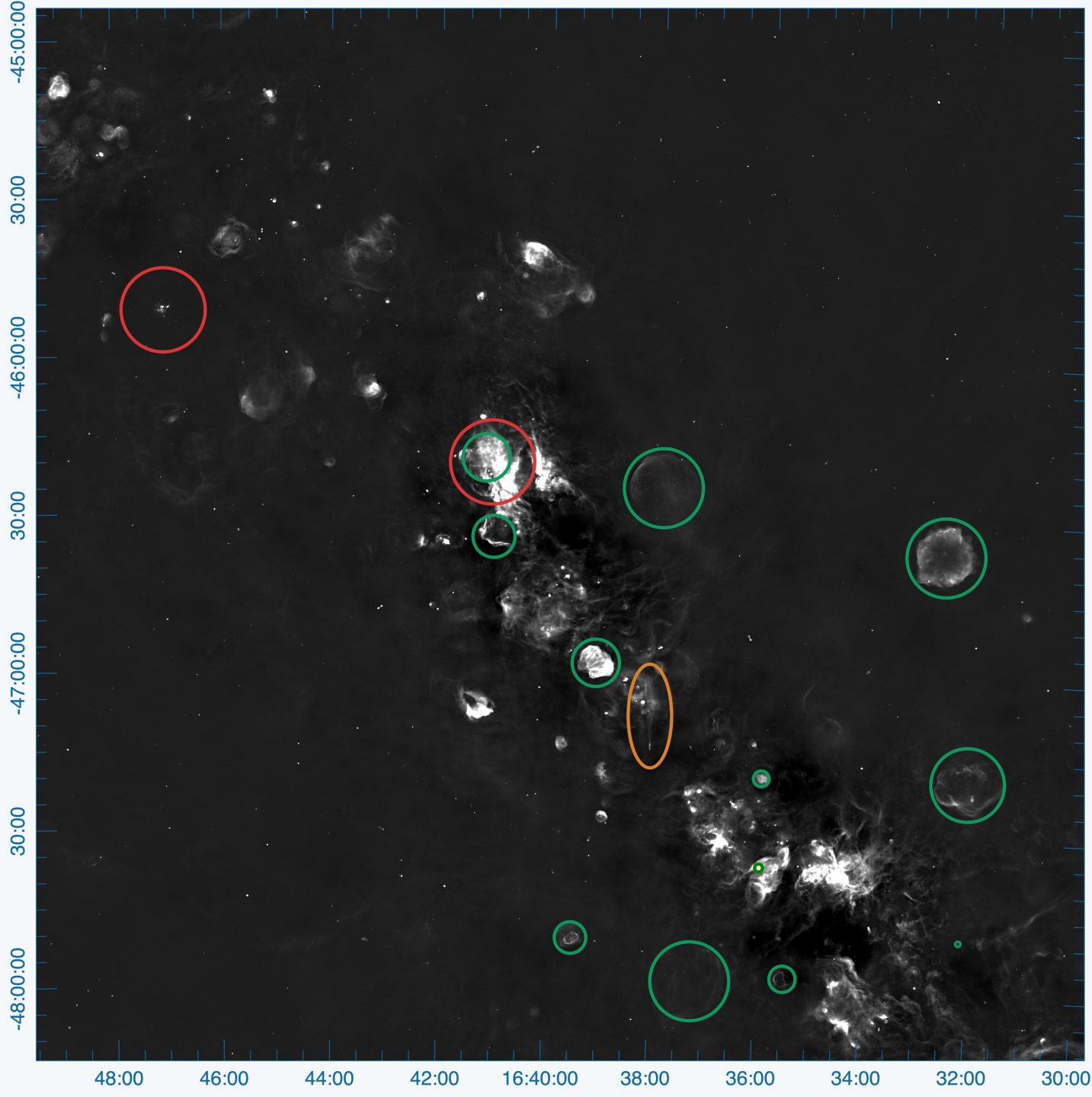
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Supervisors:

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Prof Gavin Rowell  
Dr Sabrina Einecke  
Dr Shi Dai  
Dr Luke Barnes

CTA-OZ Meeting #2  
30/11/2022





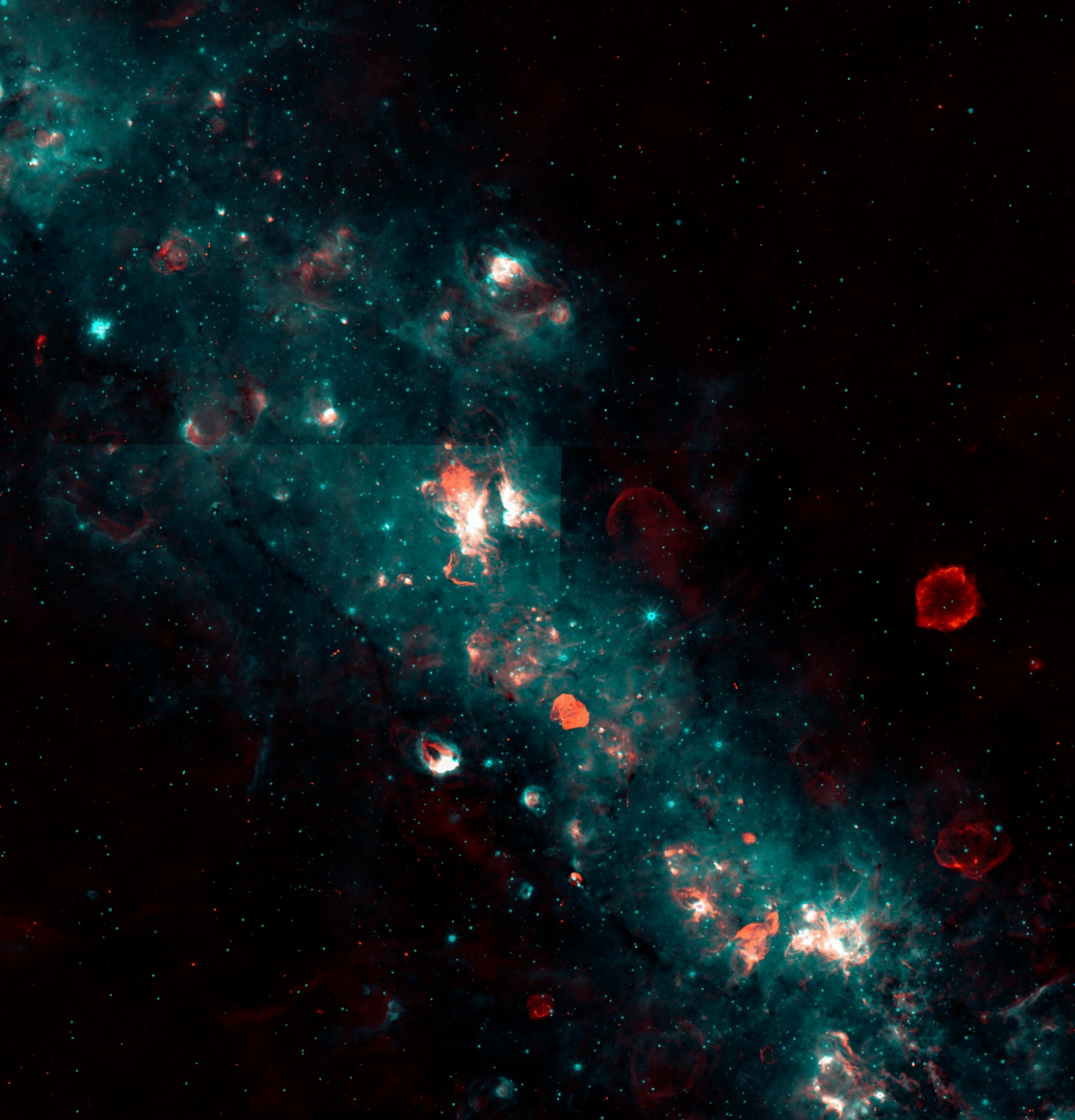
## GALACTIC PLANE REGION:

\* Potoroo PWN

\* SNR

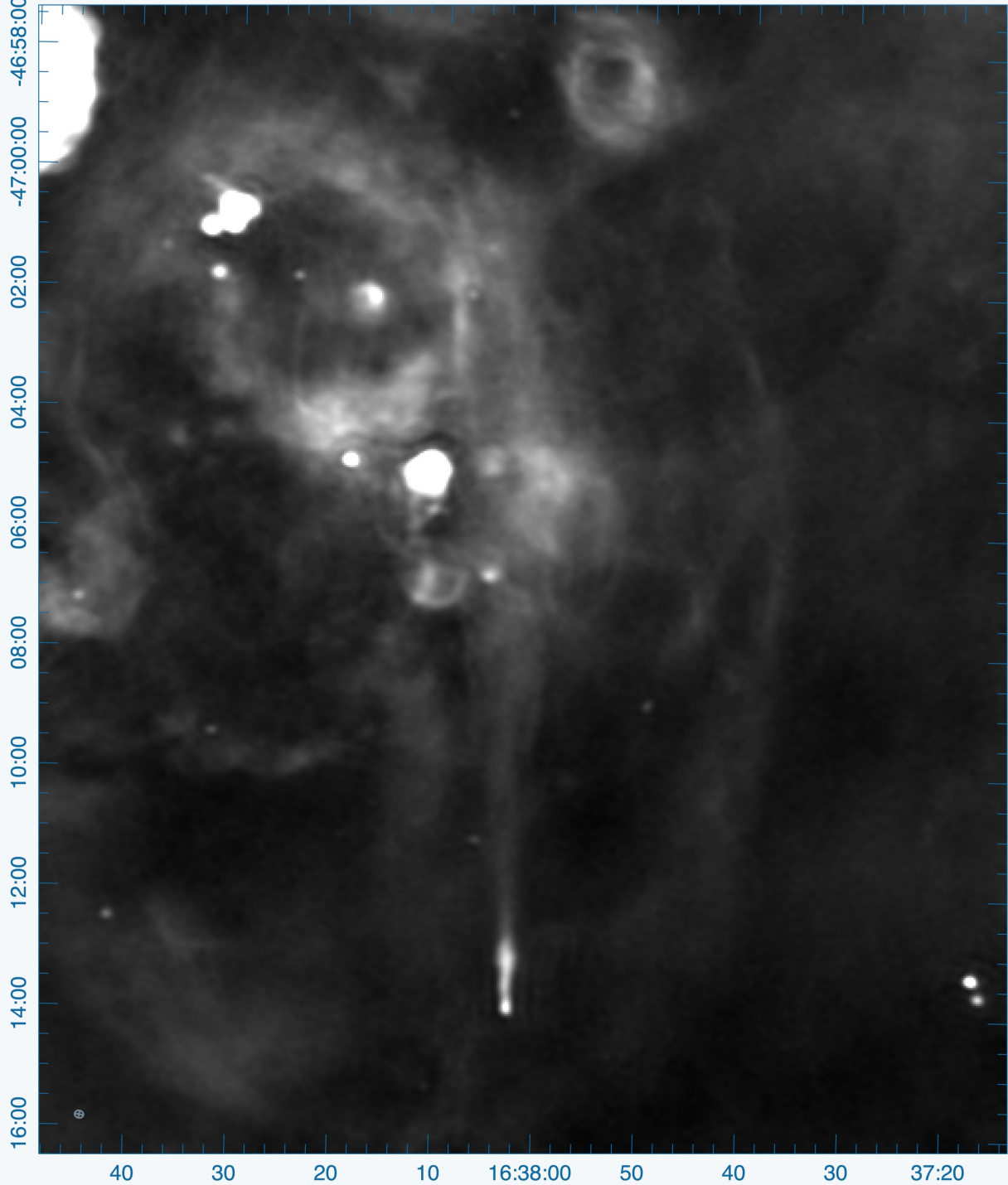
\* PeVatrons

- HESS J1646-558
- HESS J1641-463



▶ red: ASKAP – EMU, 1367 MHz

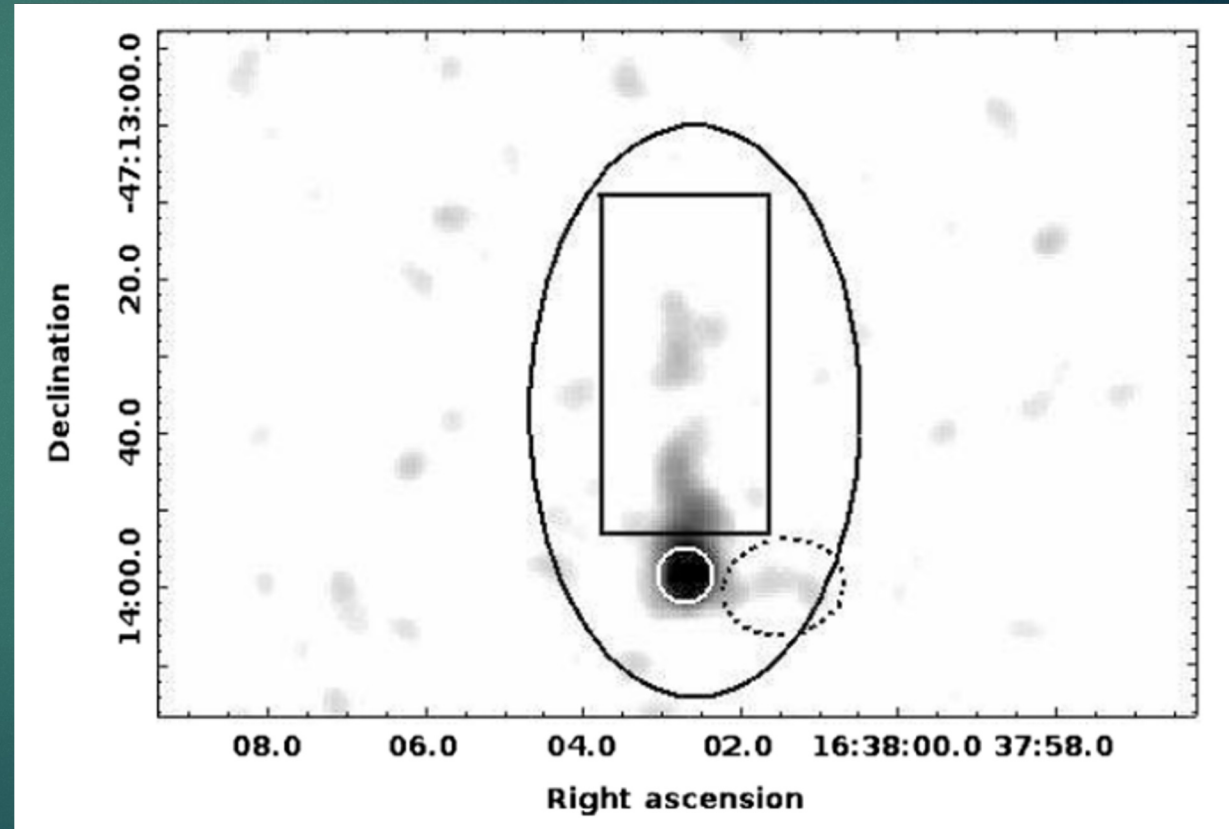
▶ green: WISE, 12  $\mu\text{m}$

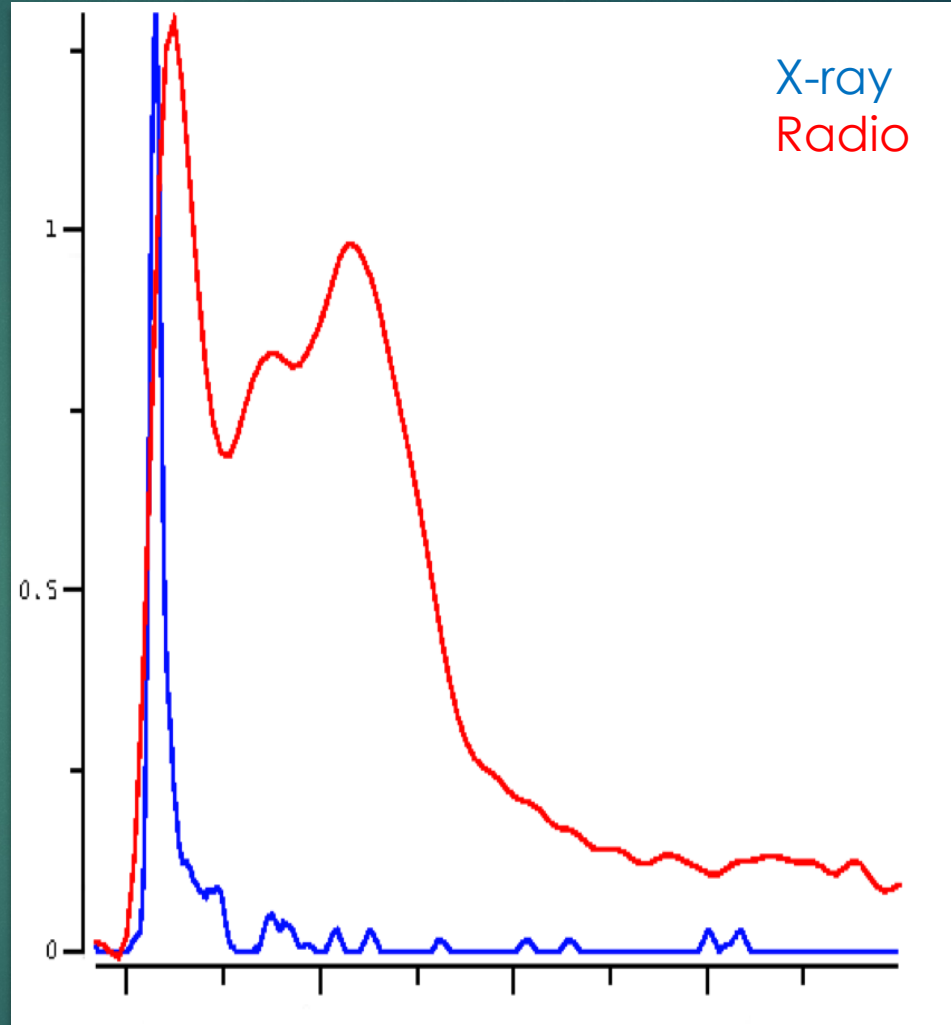
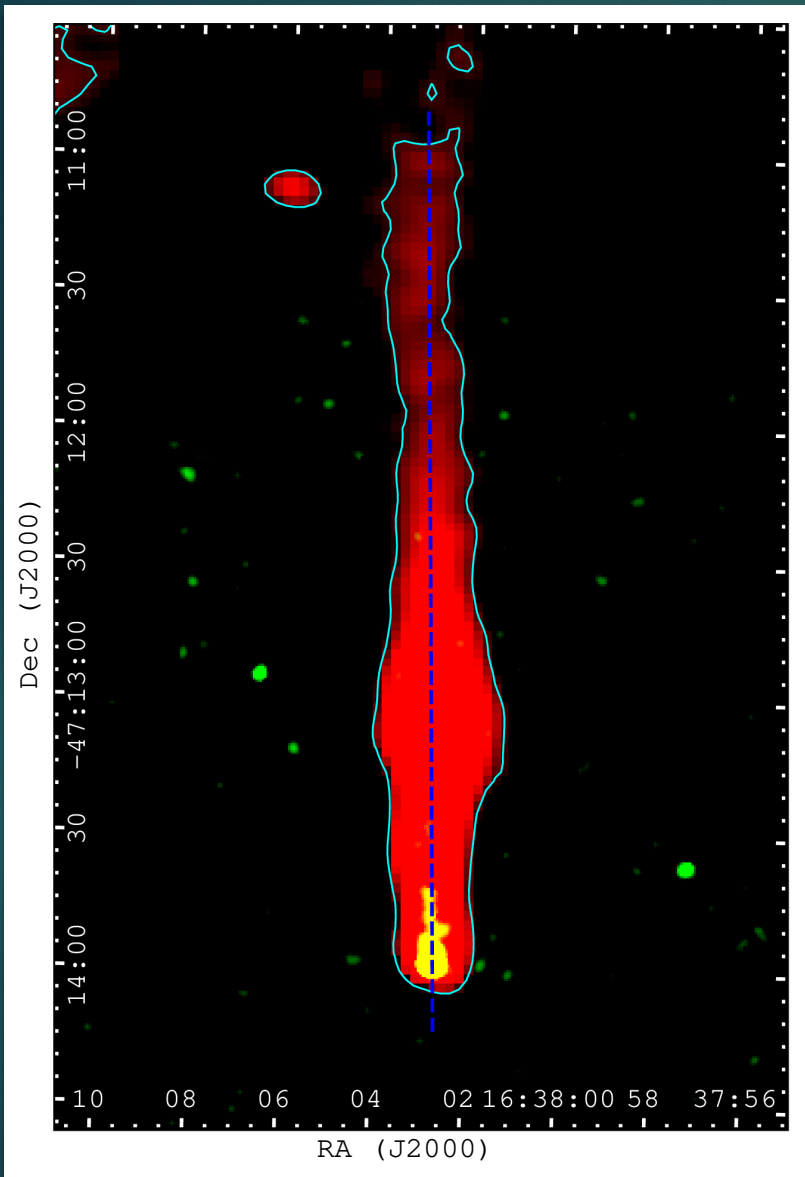


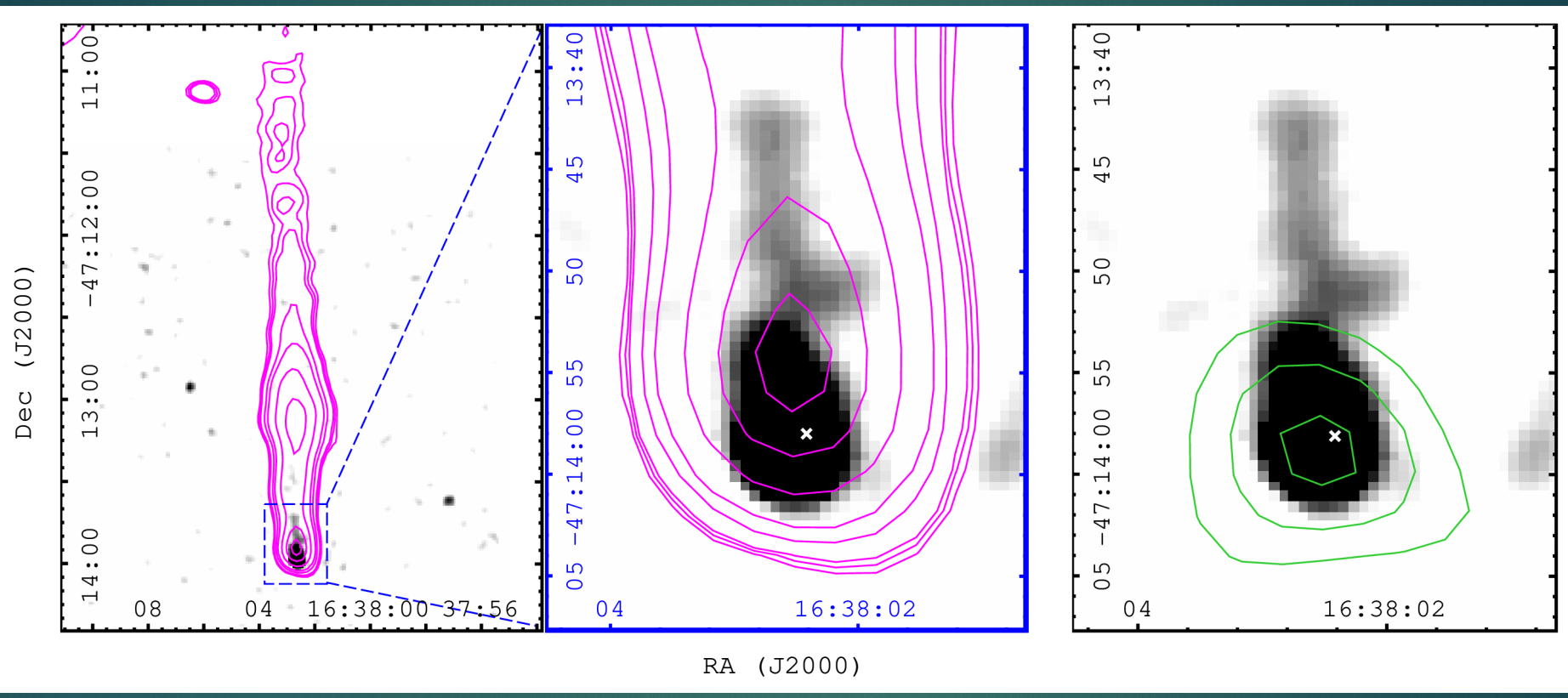
## Potoroo

- bow shock tail PWN:

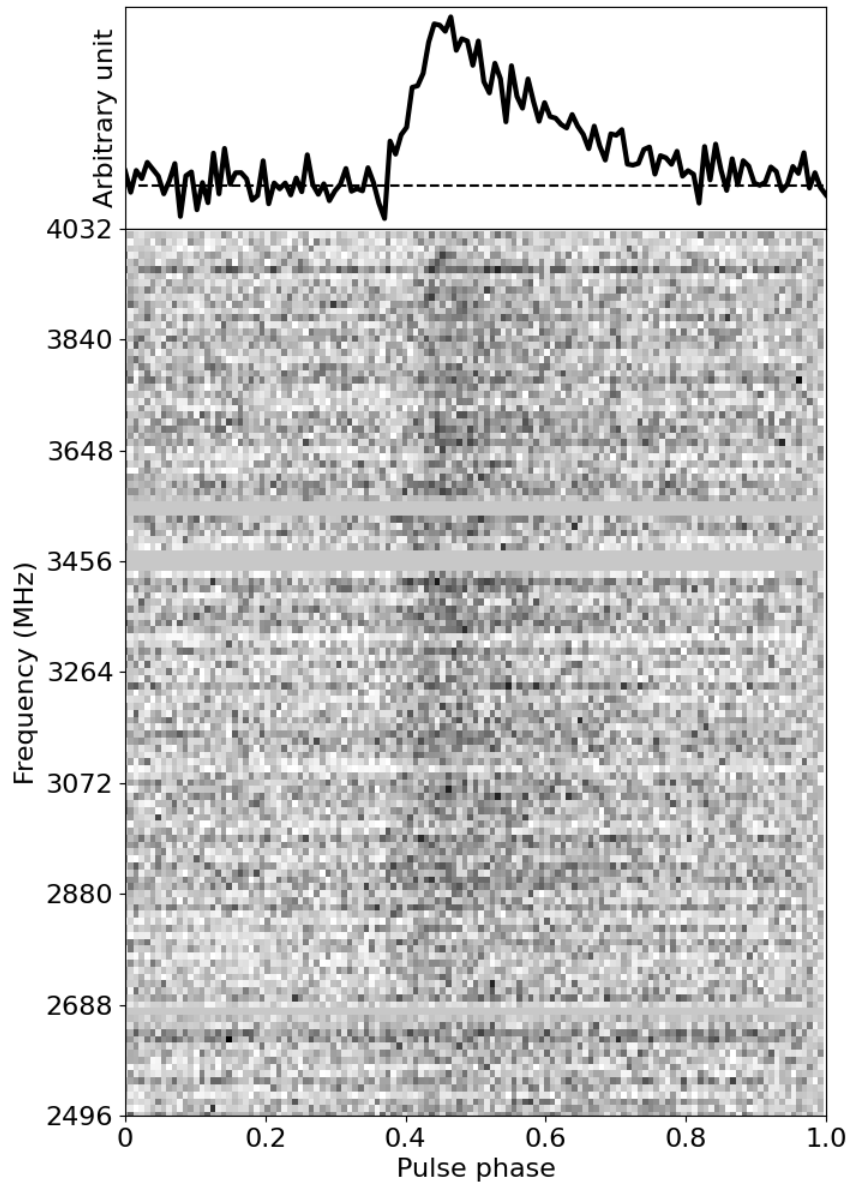
- radio image
- X-ray image (d = 10 Kpc)



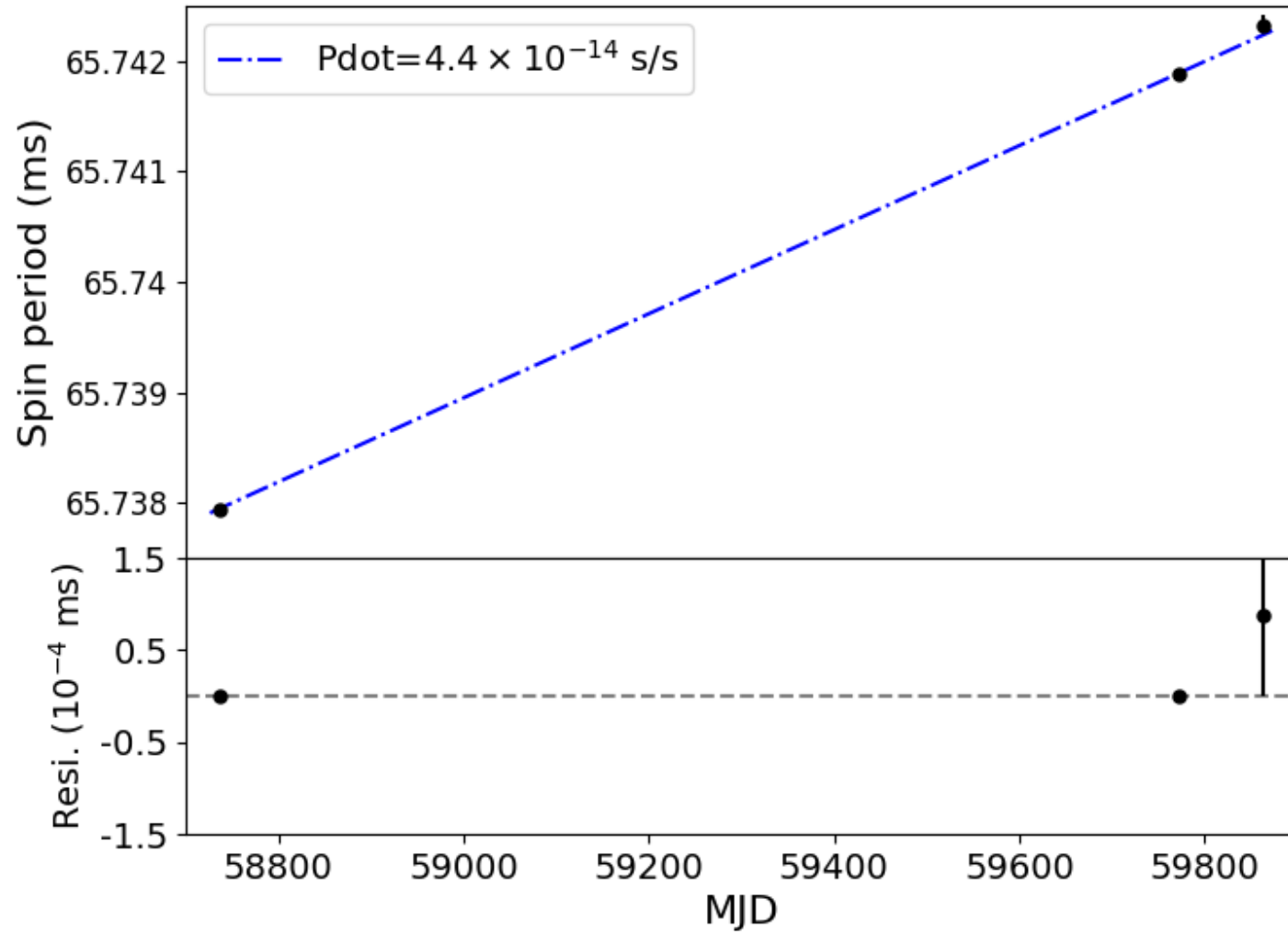




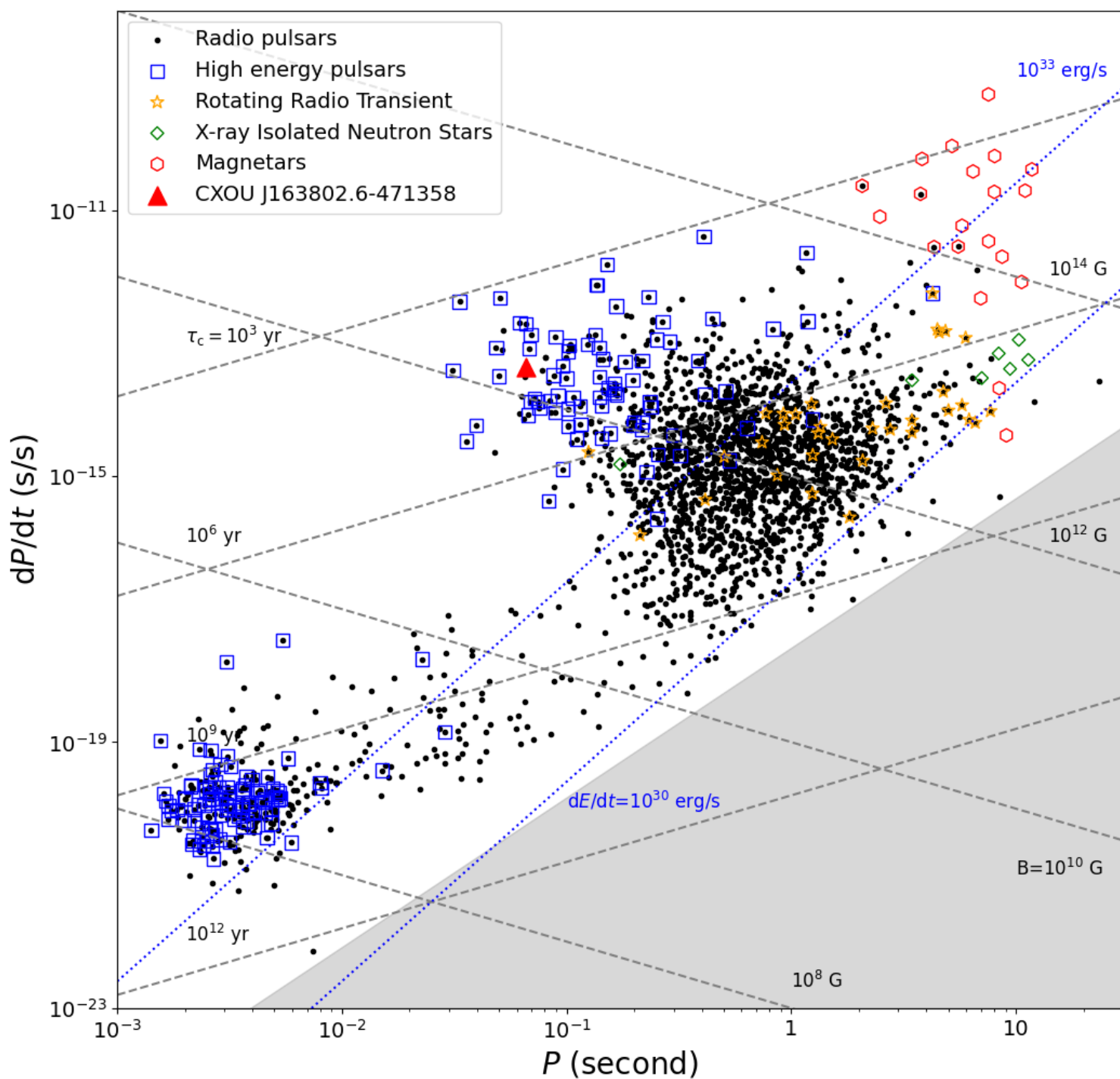
Stokes V / Stokes I > 1 %



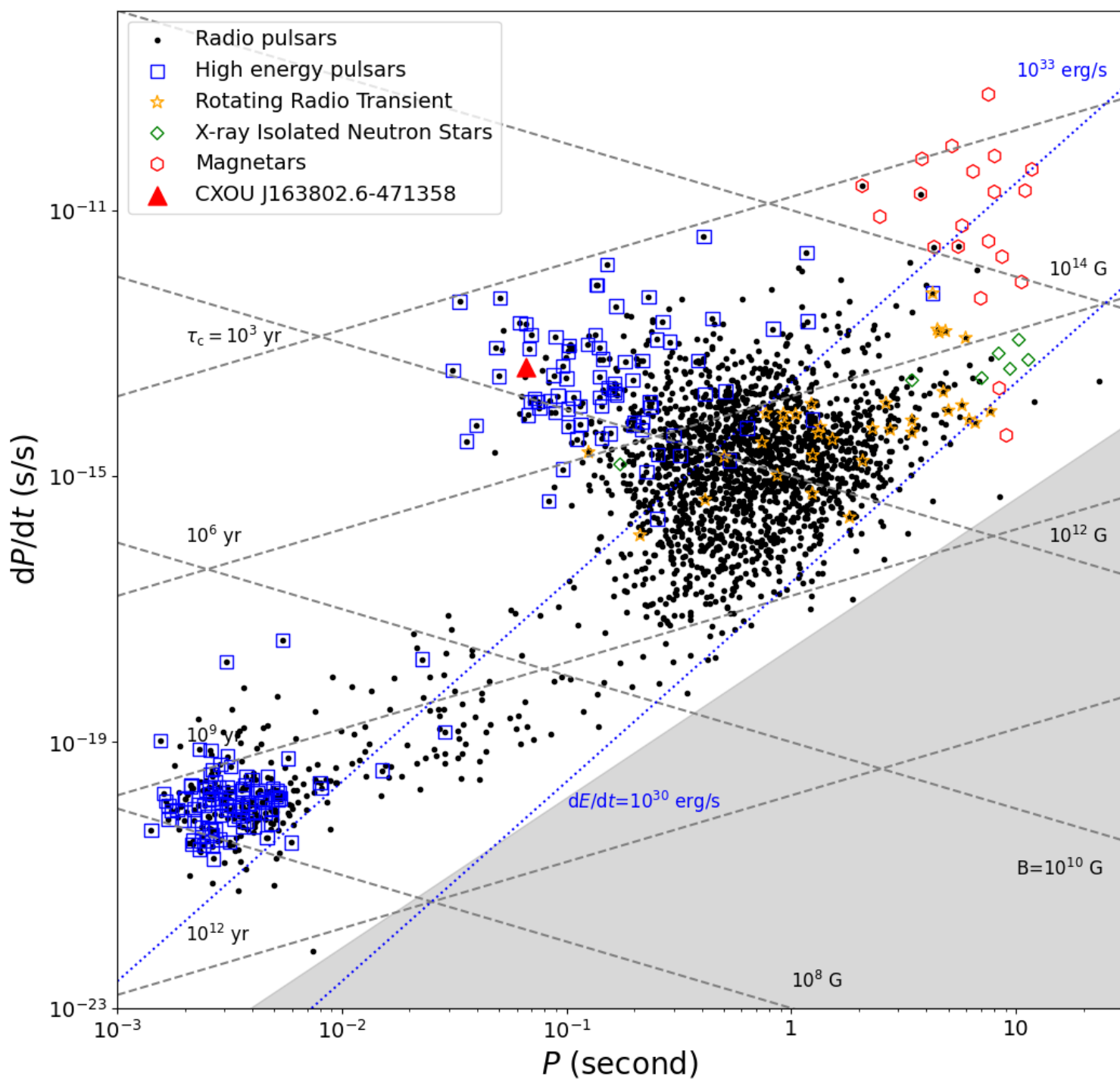
- Potoroo was observed by Parkes using the UWL receiver, but no pulsar was discovered
- We reprocessed the data but focused on the *high frequency band* motivated by its potentially large distance (high dispersion).
- *Highly scattered* periodic signal (65ms) was detected at a DM of  $1553 \text{ pc/cm}^3$





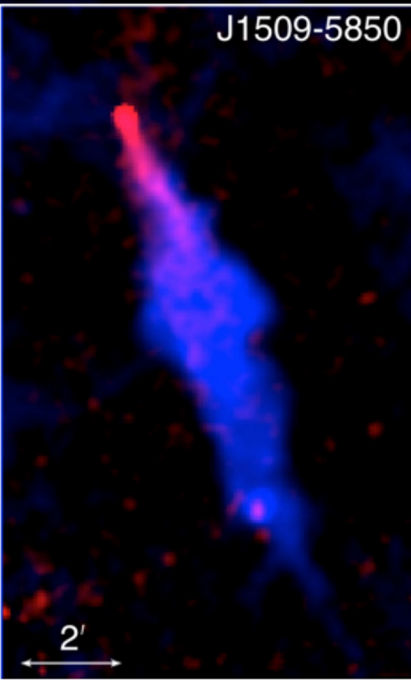
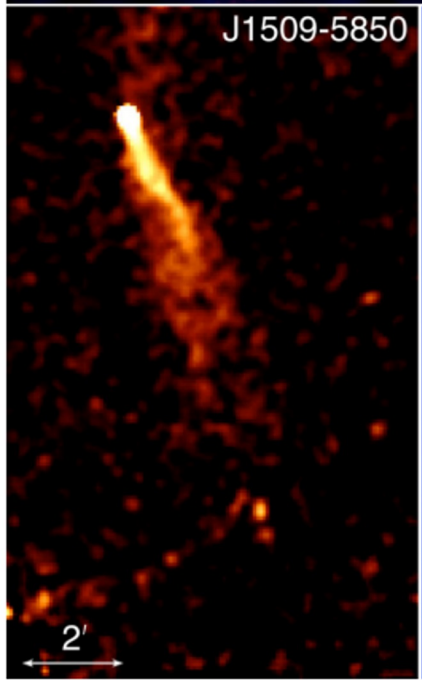
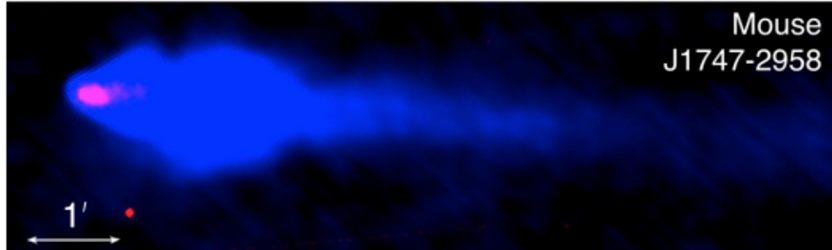
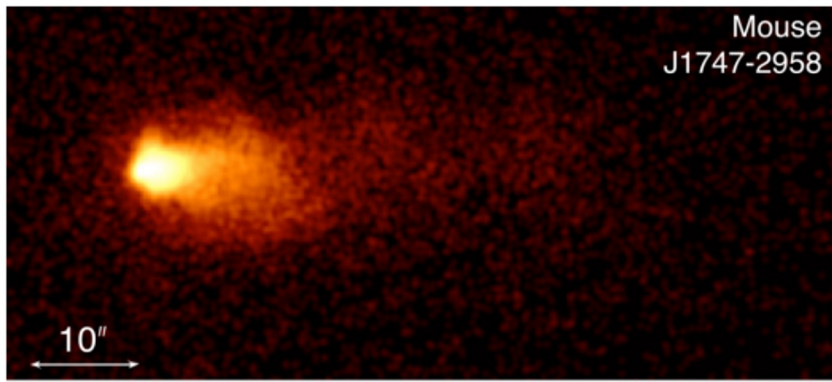


- Characteristic age –  $10^4 \text{ yr}$
- Surface magnetic field –  $10^{12} \text{ G}$
- Typical parameters for a young pulsar with high energy emission



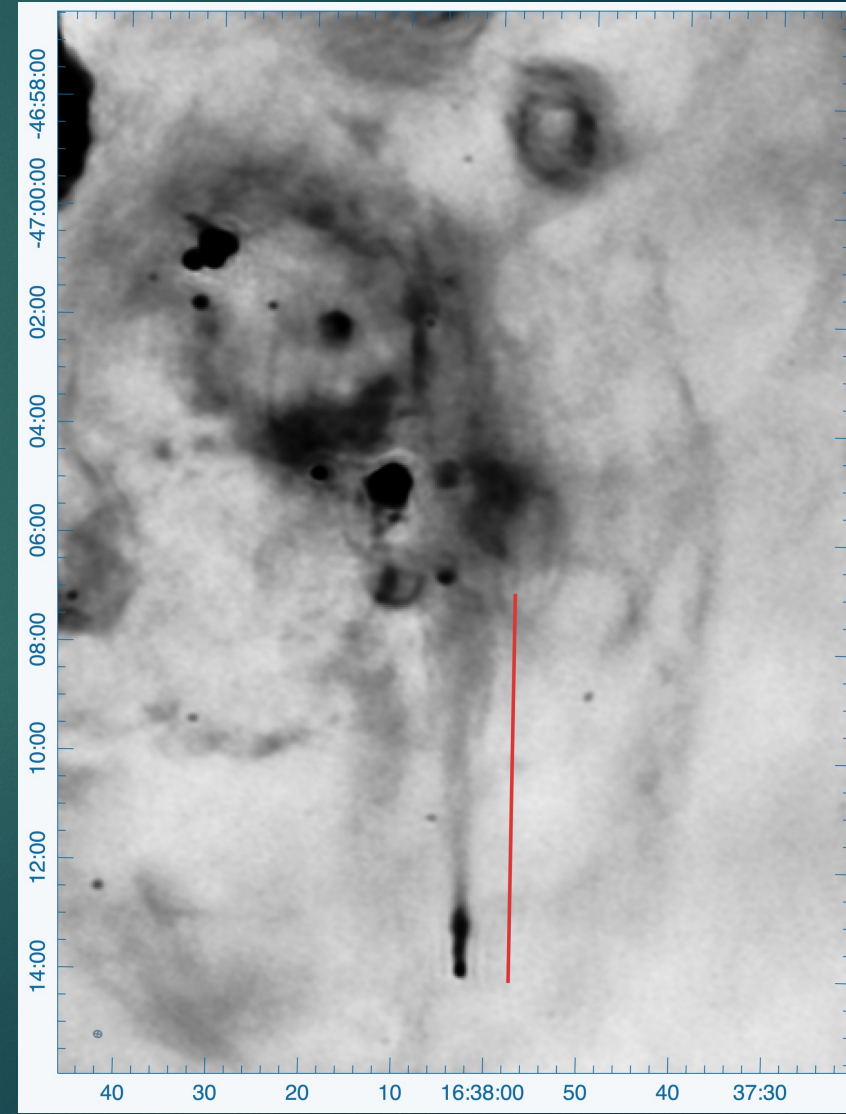
## Timing of the Potoroo pulsar

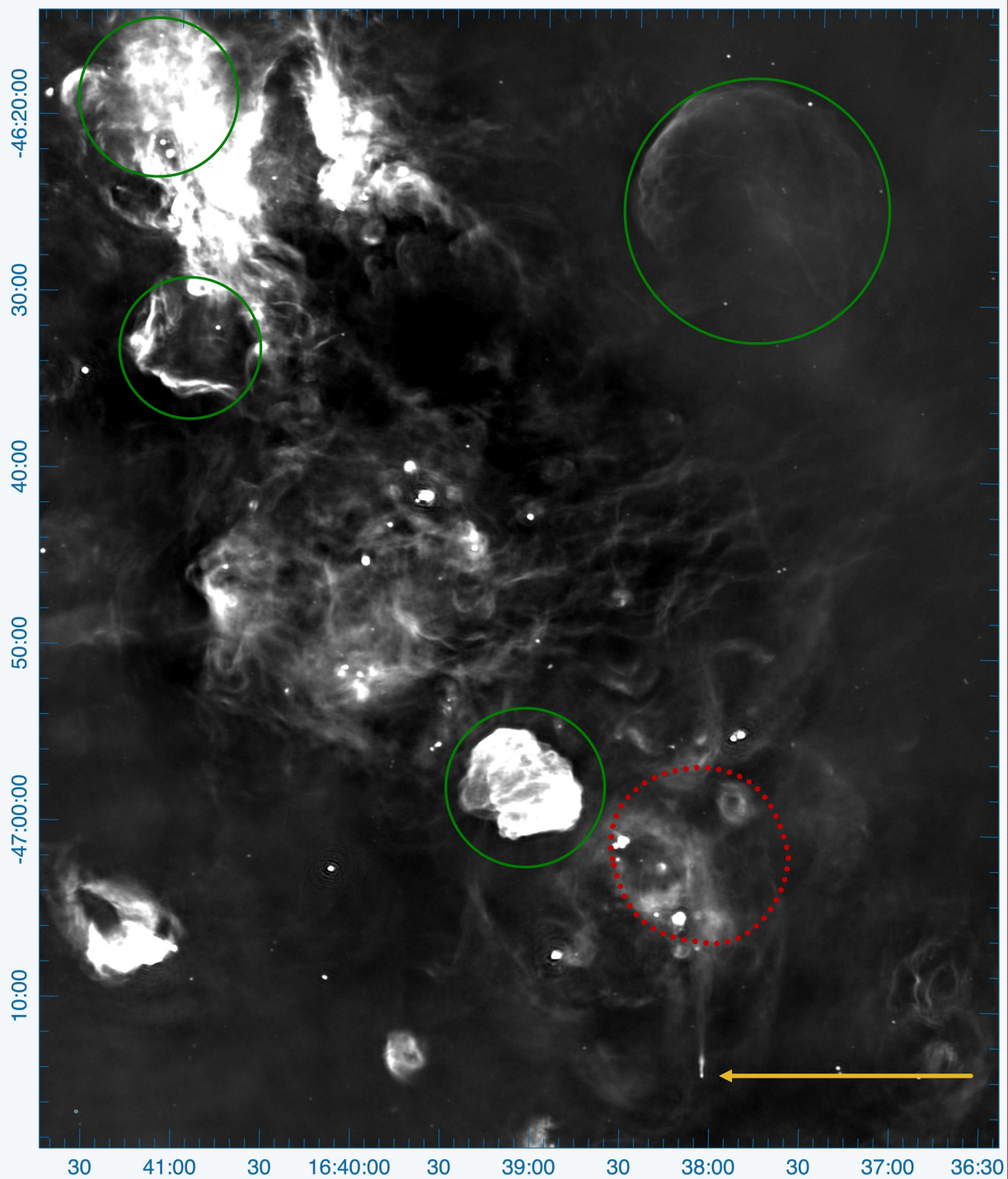
- Proper motion and parallax
- Pulsar velocity
- Scintillation/scattering and bow shock properties



# The Longest Radio Tail?

- ▶ Mouse PWN  
\* 17 pc
- ▶ PSR J1509-5850  
\* 10 pc
- ▶ Potoroo
  - ▶ 21 pc
  - 7.2' and  $d = 10$  kpc





## Parentless Potoroo

$d = 10$  kpc

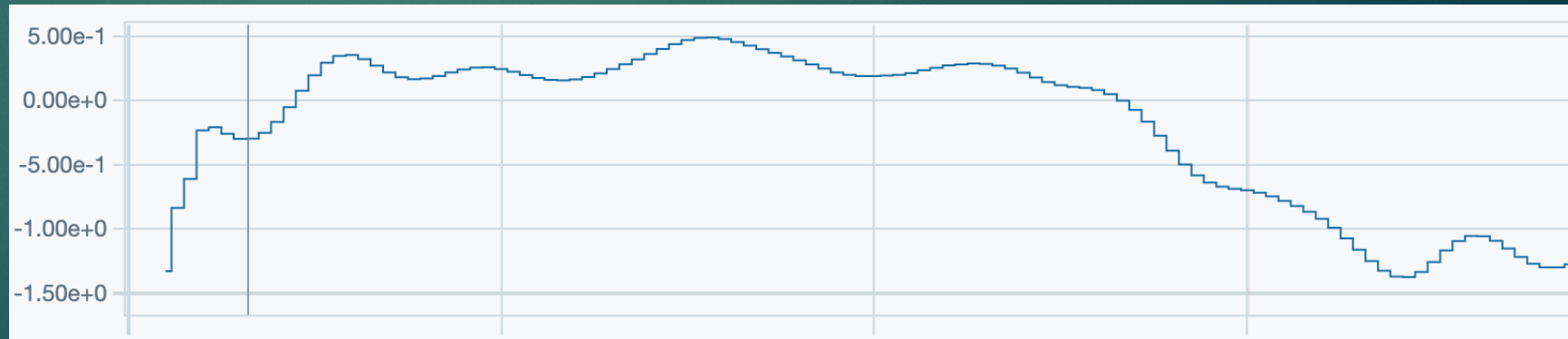
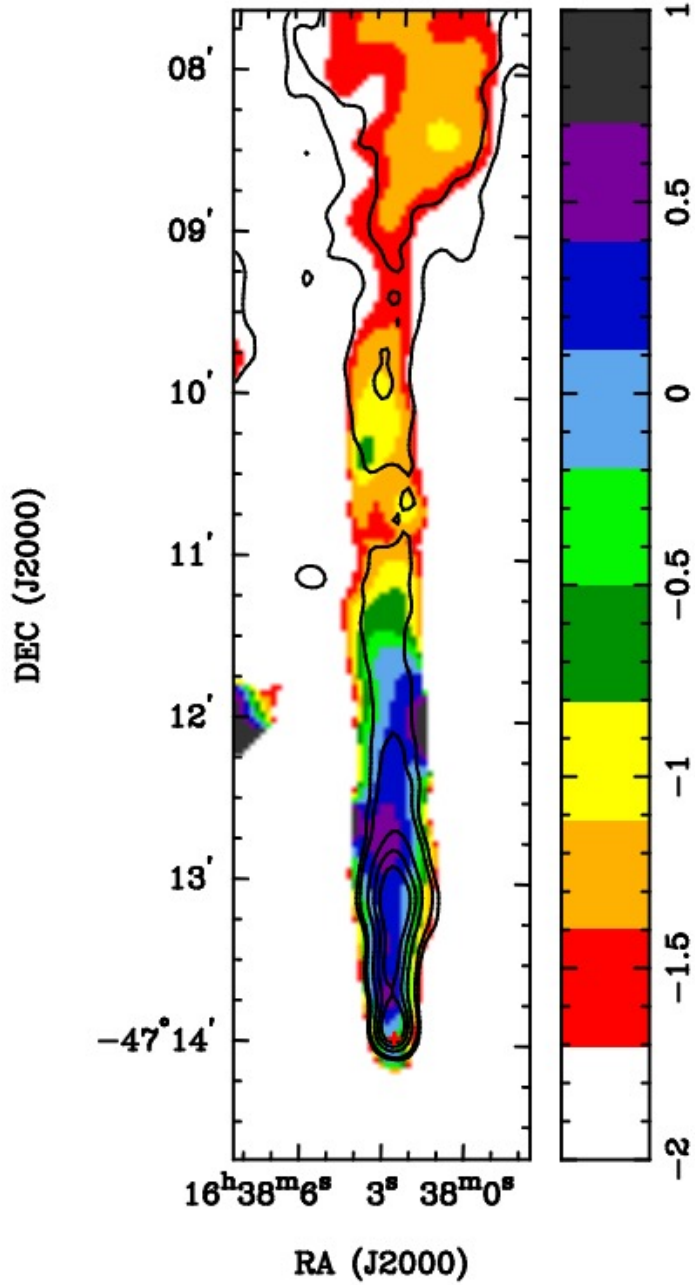
$L = 12'$

age = 20 kyears

$V > 1500$  km/s

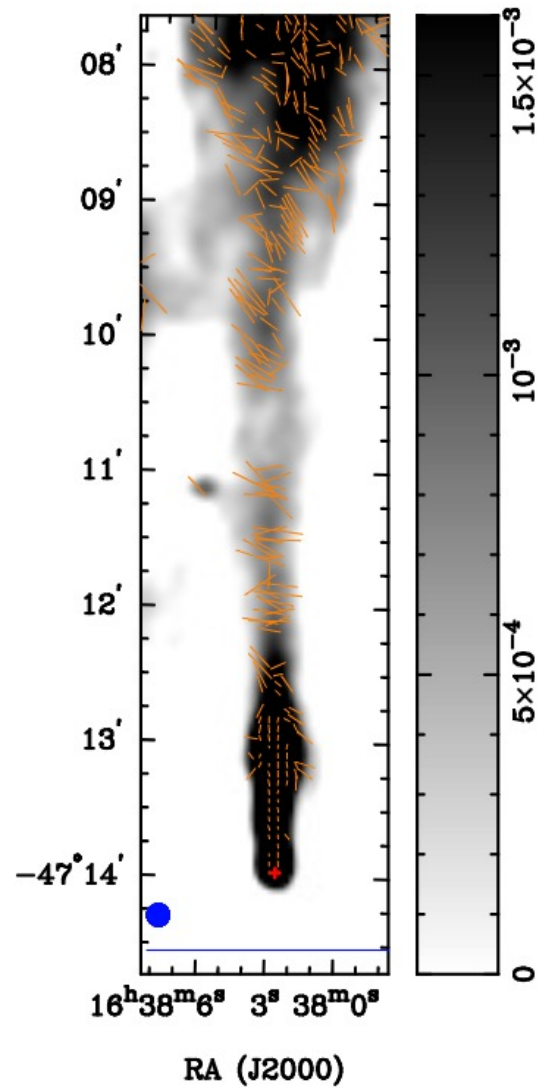
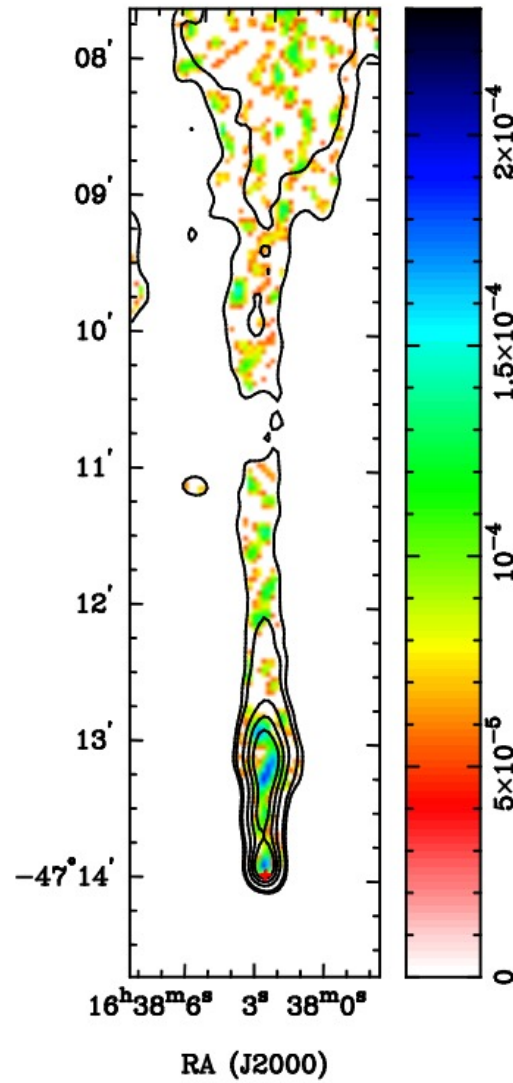
# SPECTRAL INDEX

- ▶ AKSAP – EMU, 944.5 MHz
- ▶ MeerKAT – 1283 MHz
- ▶ AKSAP – TEST, 1367.5 MHz



↑ pulsar position

Polarization Intensity Map



Fractional Polarization Map

$P = 20 \pm 5\%$   
average  $\sim 5\%$ .

# POTOROO PWN

Thank you for your  
attention!

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