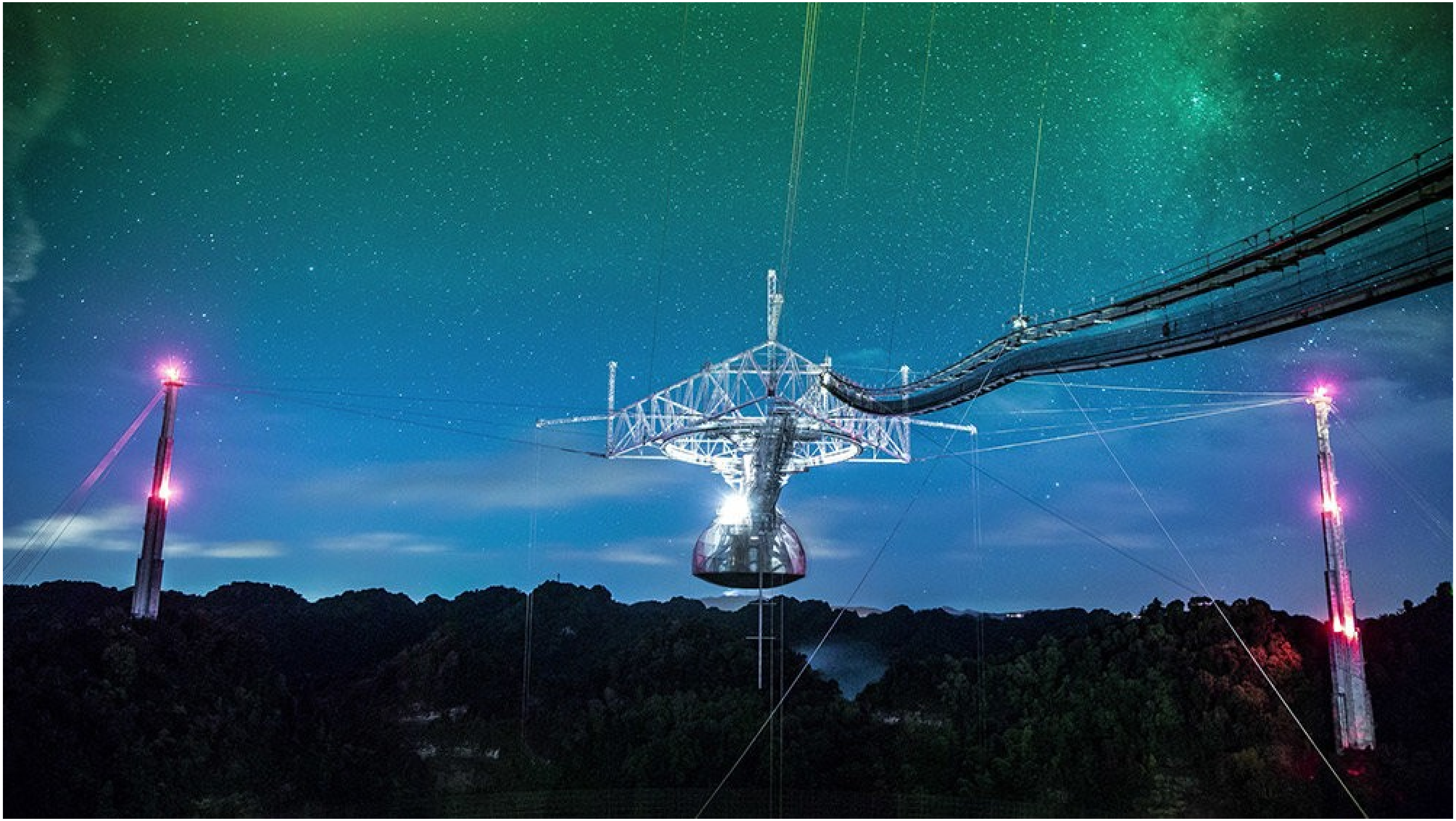
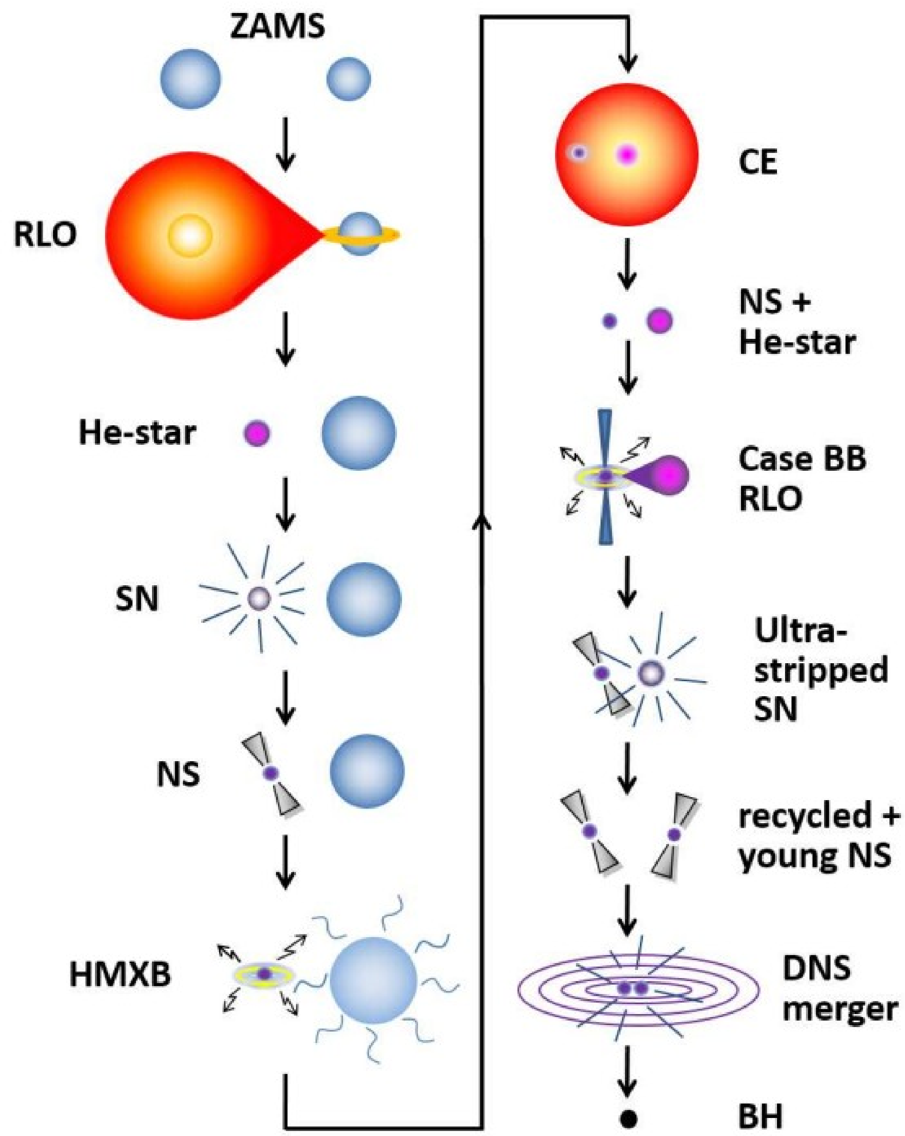
My Pulsars :}

Jose Guadalupe Martinez

Arecibo Observatory



Double Neutron Star System



see Tauris et al. (2017)

J0453+1559

- First Asymmetric DNS
- \dot{w} = 0.03793(3) deg/yr
- e=0.11
- Shapiro delay detected

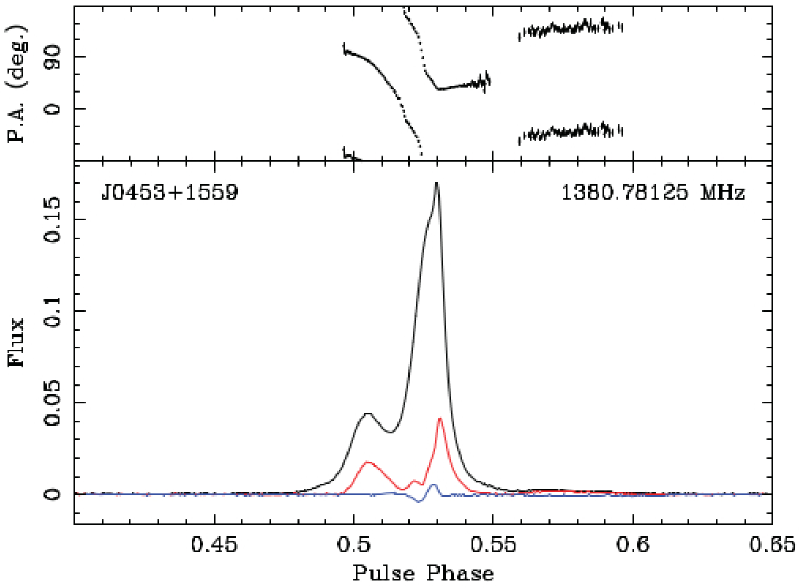
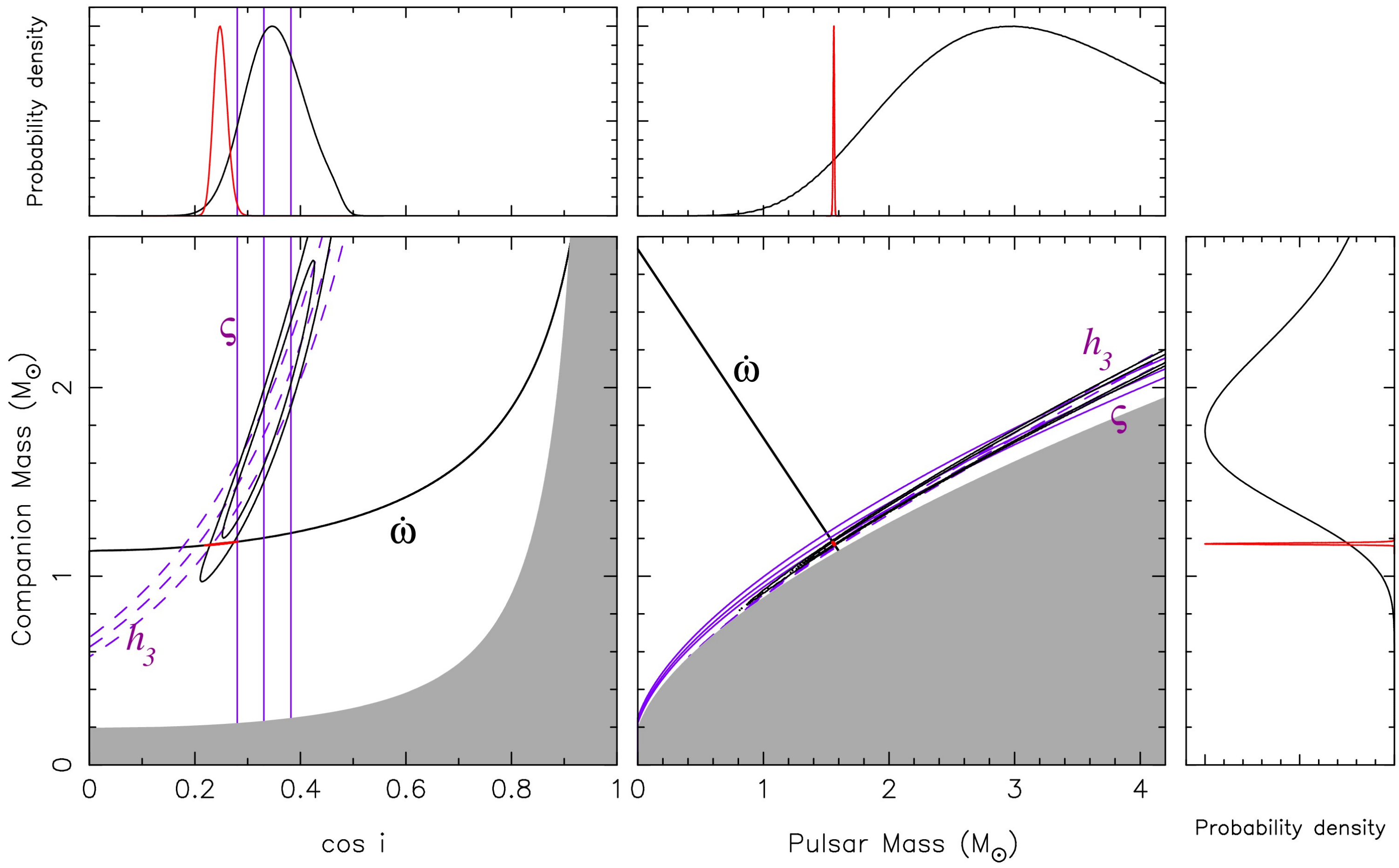


Figure 1. Pulse profile for PSR J0453+1559 in the L band (1170–1730 MHz), obtained by averaging the best detections of the pulsar. The black line indicates the total intensity, the red line is the amplitude of linear polarization, and the blue line is the amplitude of the circular polarization. In the top panel, we depict the position angle of the linear polarization where a clear polarization swing and a sudden jump between orthogonal modes is clearly visible.

J0453+1559



Probability density
Companion Mass ($M_\odot$)
0
1
2
0
0.2
0.4
0.6
0.8
1
cos i
ς
$\dot\omega$
h_3
0
1
2
3
4
Pulsar Mass ($M_\odot$)
$\dot\omega$
h_3
ς
Probability density

J0453+1559

- First Asymmetric DNS
- \dot{w} = 0.03793(3) deg/yr
- e=0.11
- Shapiro delay detected
- M_p = 1.56 M_{\odot}
- M_c = 1.17 M_{\odot}

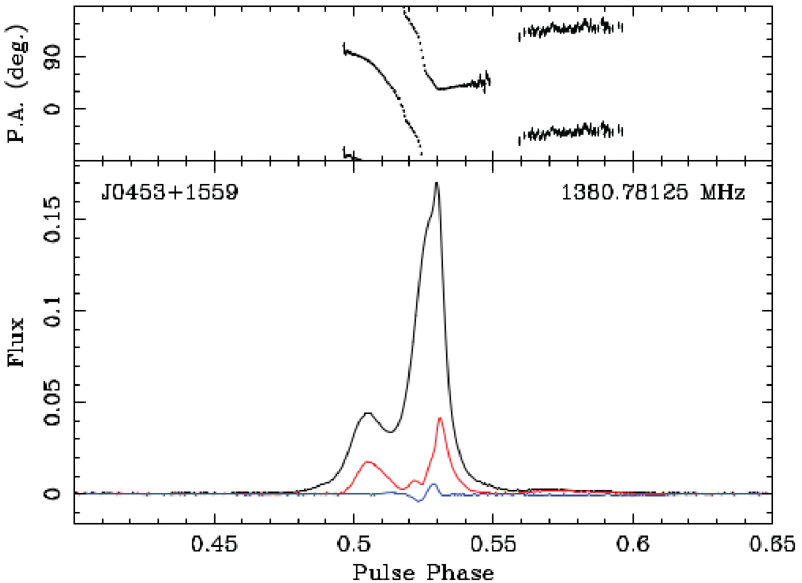


Figure 1. Pulse profile for PSR J0453+1559 in the L band (1170–1730 MHz), obtained by averaging the best detections of the pulsar. The black line indicates the total intensity, the red line is the amplitude of linear polarization, and the blue line is the amplitude of the circular polarization. In the top panel, we depict the position angle of the linear polarization where a clear polarization swing and a sudden jump between orthogonal modes is clearly visible.

J1411+2551

- Among the lowest DNS total mass
- M_{T} = 2.53 M_{\odot}

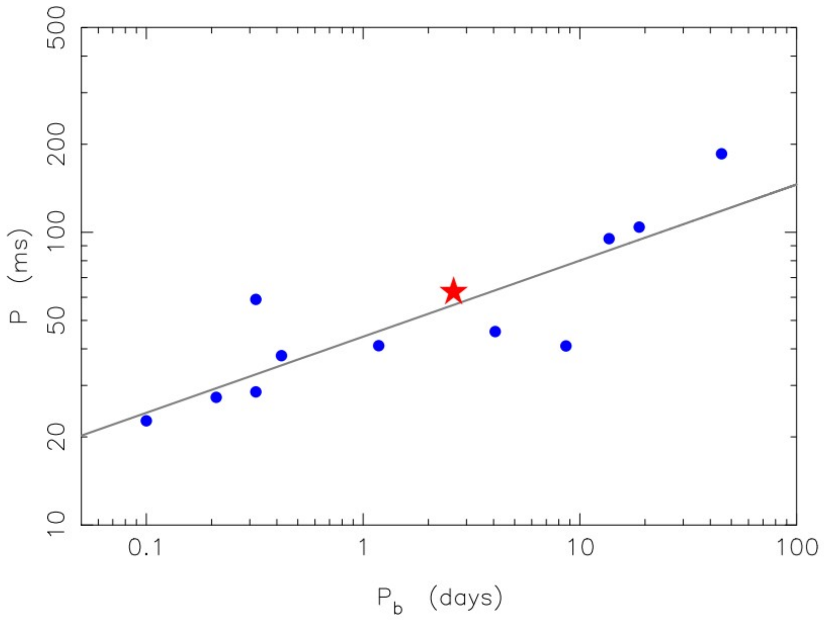


Figure 3. Blue points represent the spin period of the recycled pulsars in DNS systems as a function of their orbital period. PSR J1411+2551 is represented by the red star. The gray line represents Equation (4). For a detailed discussion, see Tauris et al. (2017).

$$P \approx 44 \text{ ms } (P_b/\text{days})^{0.26}.$$

J1411+2551

- Once merged, it could become a massive NS?

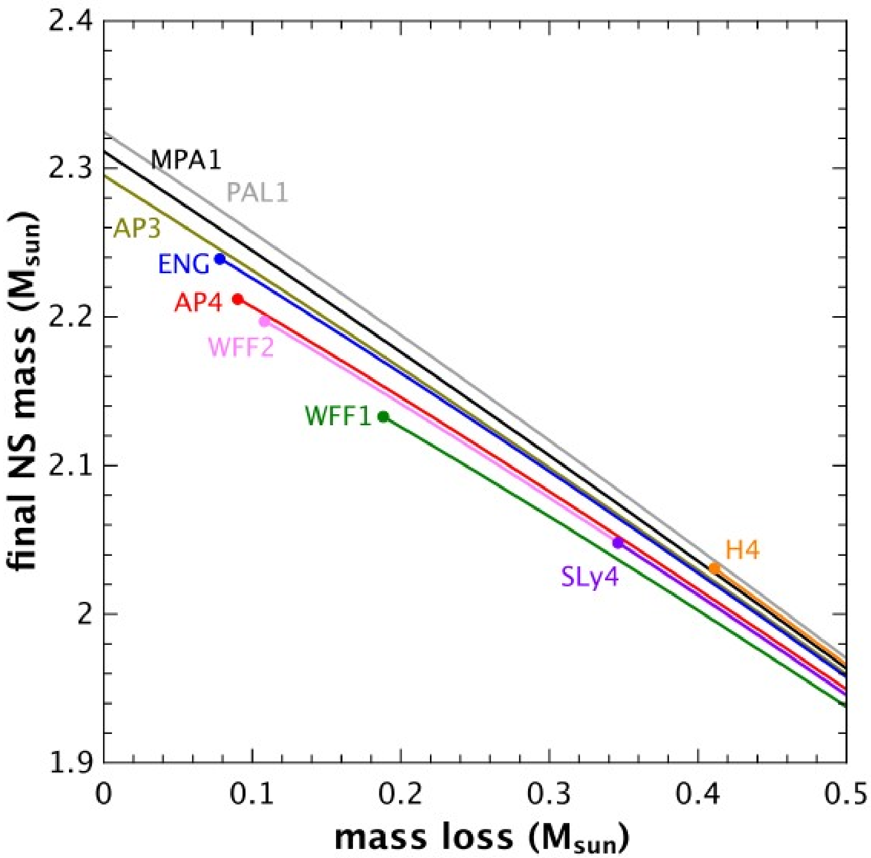
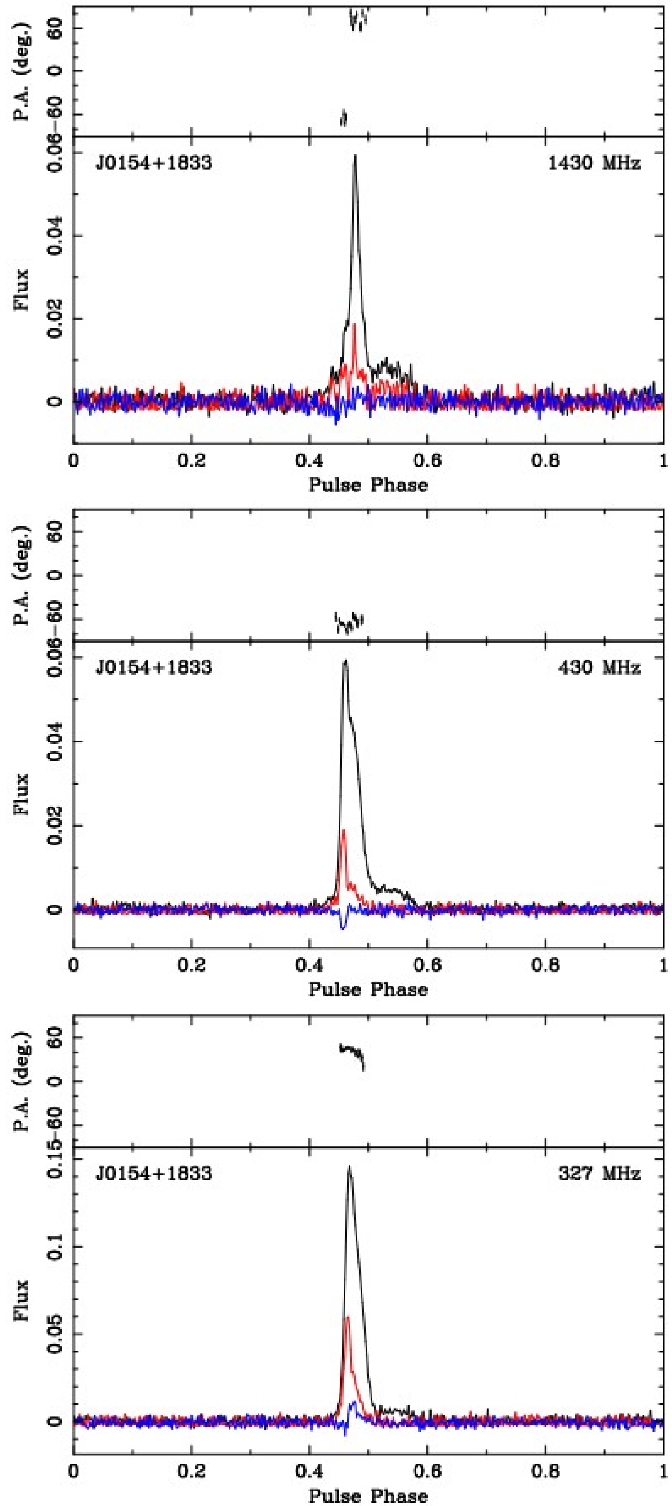


Figure 4. Final NS mass for various EoS as a function of baryonic mass loss in a DNS merger event for a system similar to PSR J1411+2551. Only the AP3, MPA1, and PAL1 EoS models are able to leave behind a stable (slowly rotating) NS if the baryonic mass loss is less than about 0.05 $M_{\odot}$. For the different EoSs, see Lattimer & Prakash (2001). Note, the EoS models H4 and PAL1 correspond to rather large neutron stars (typical radii ∼14 km) and are therefore disfavored by the GW170817 merger event (Abbott et al. 2017).

More recycled pulsars...

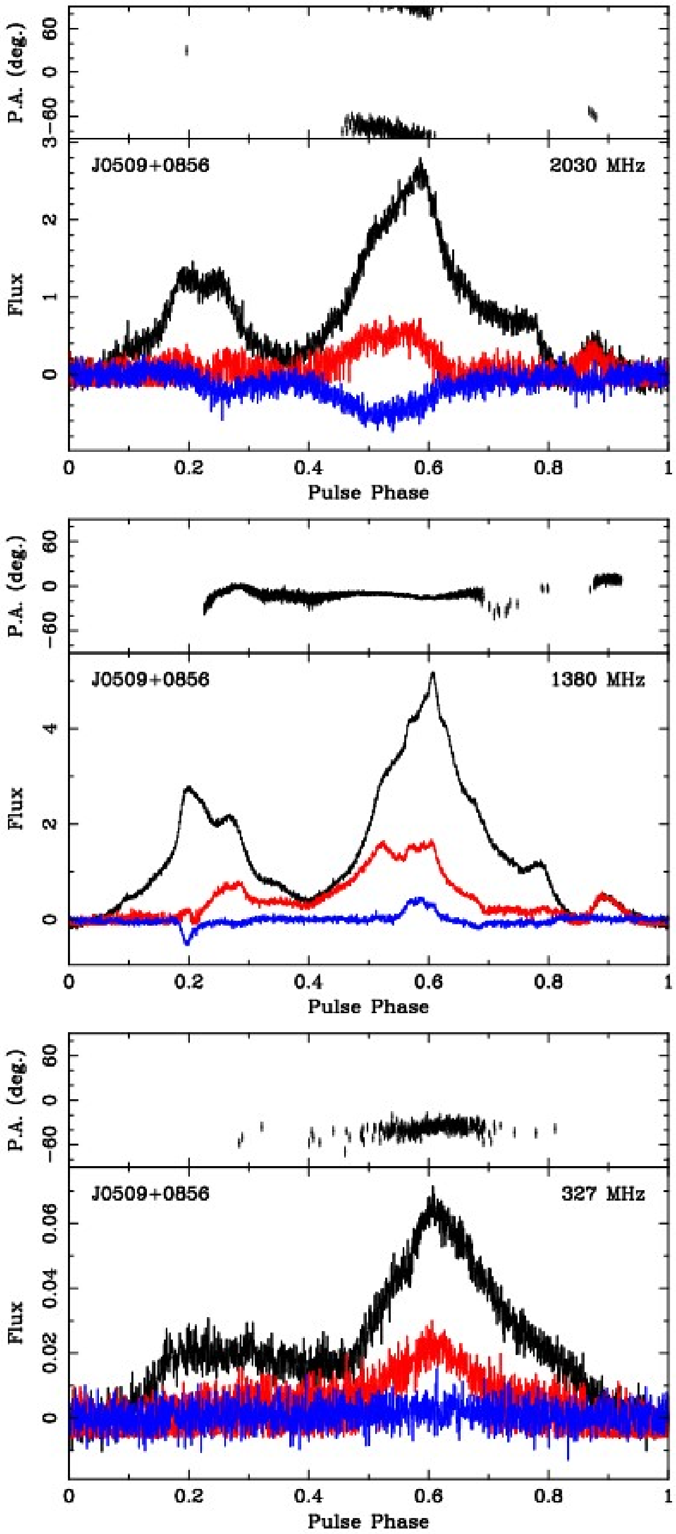
J0154+1833

- Isolated MSP
- 2.36 ms
- DM variations
- Evolution scenario ?



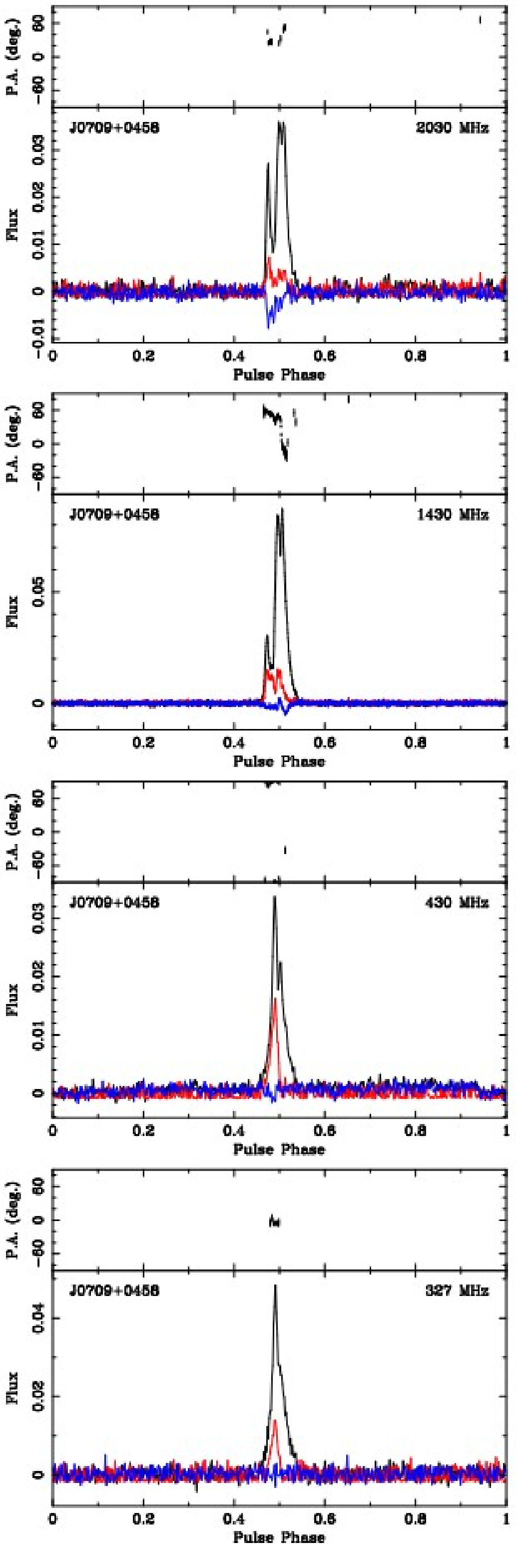
J0509+0856

- Binary MSP
- 4.05ms
- He WD companion
- No Shapiro delay

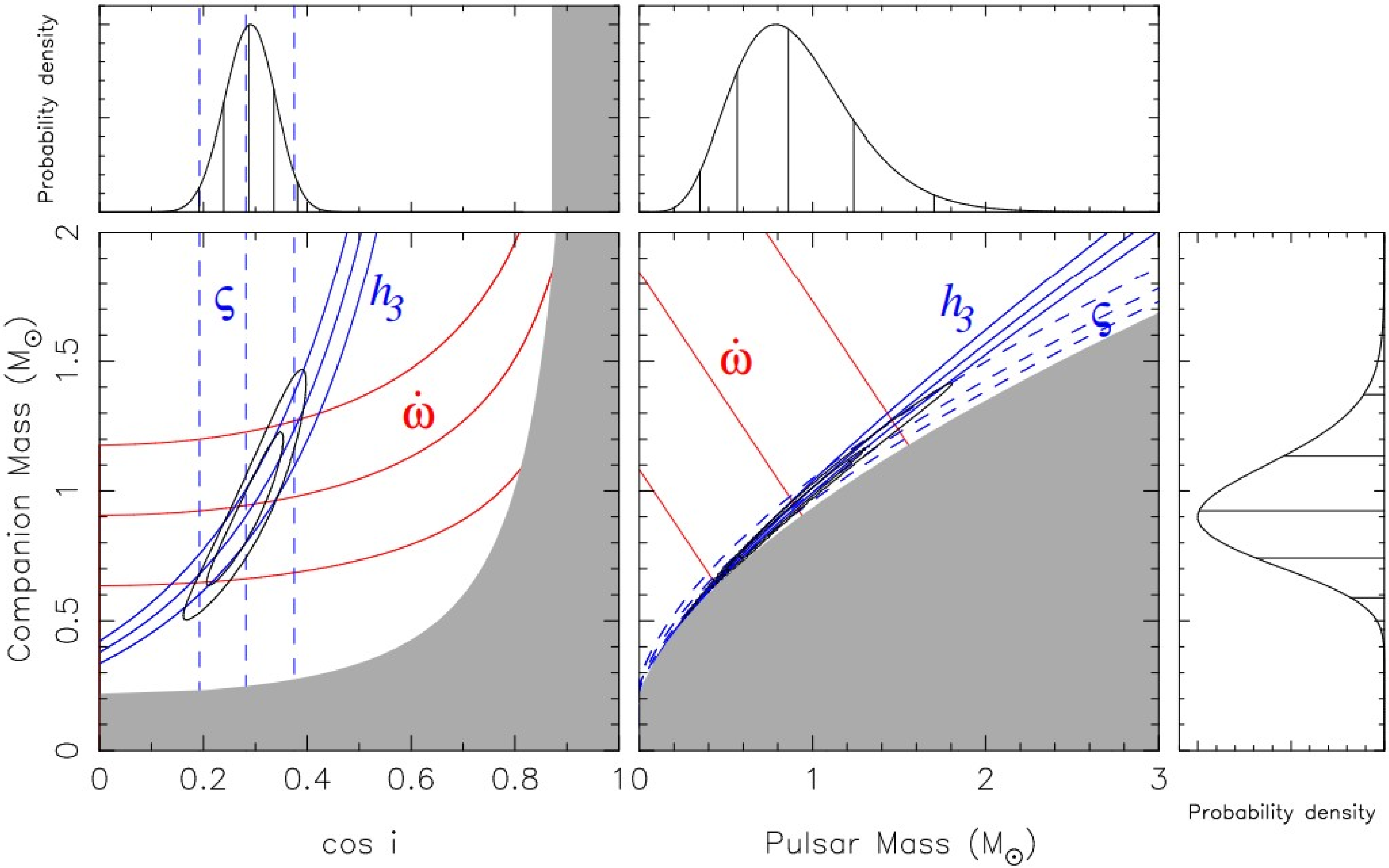


J0709+0458

- Binary MSP
- e=0.000225
- With a rate of advance of periastron!!! Whaaa
- \dot{w} = 0.032(12)
- Shapiro Delay also detected!



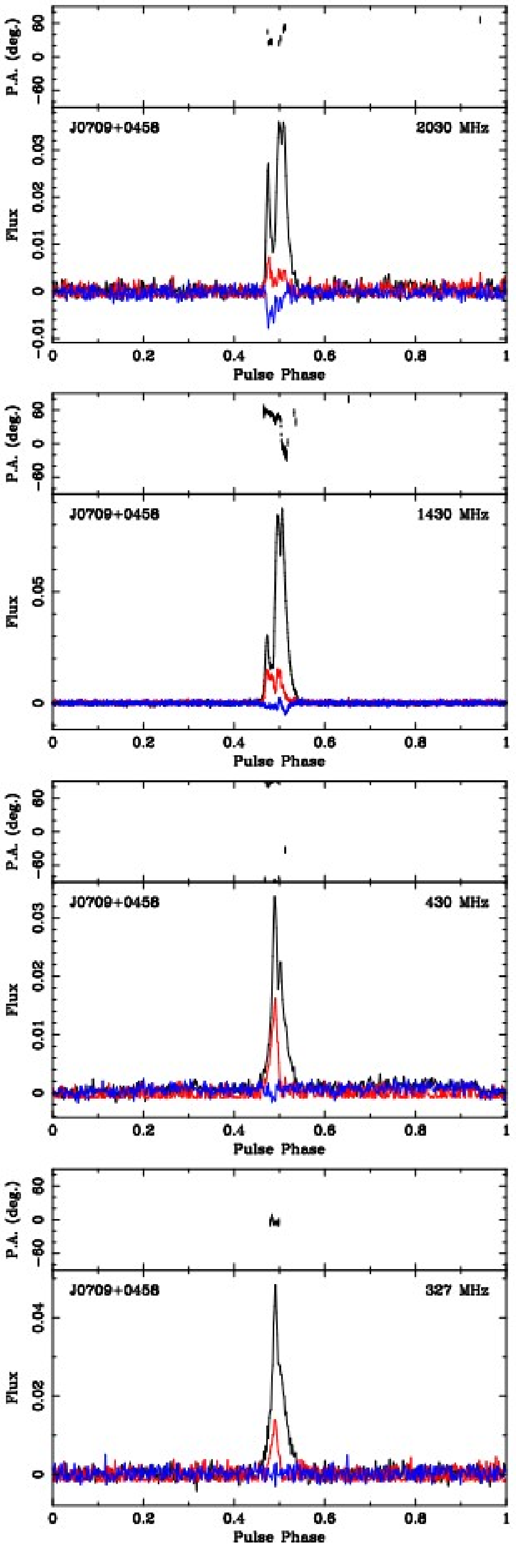
J0709+0458



Probability density
Companion Mass ($M_\odot$)
cos i
Pulsar Mass ($M_\odot$)
Probability density
ς
h_3
$\dot{\omega}$
0
0.2
0.4
0.6
0.8
1
0
1
2
3
0.5
1.5
2

J0709+0458

- Binary MSP
- e=0.000225
- With a rate of advance of periastron!!! Whaaa
- \dot{w} = 0.032(12)
- Shapiro Delay also detected!
- ONeMg WD companion !



J0732+2314

- Binary almost circular MSP
- 30 day orbit
- He WD
- Follows Phinney 1992 relation

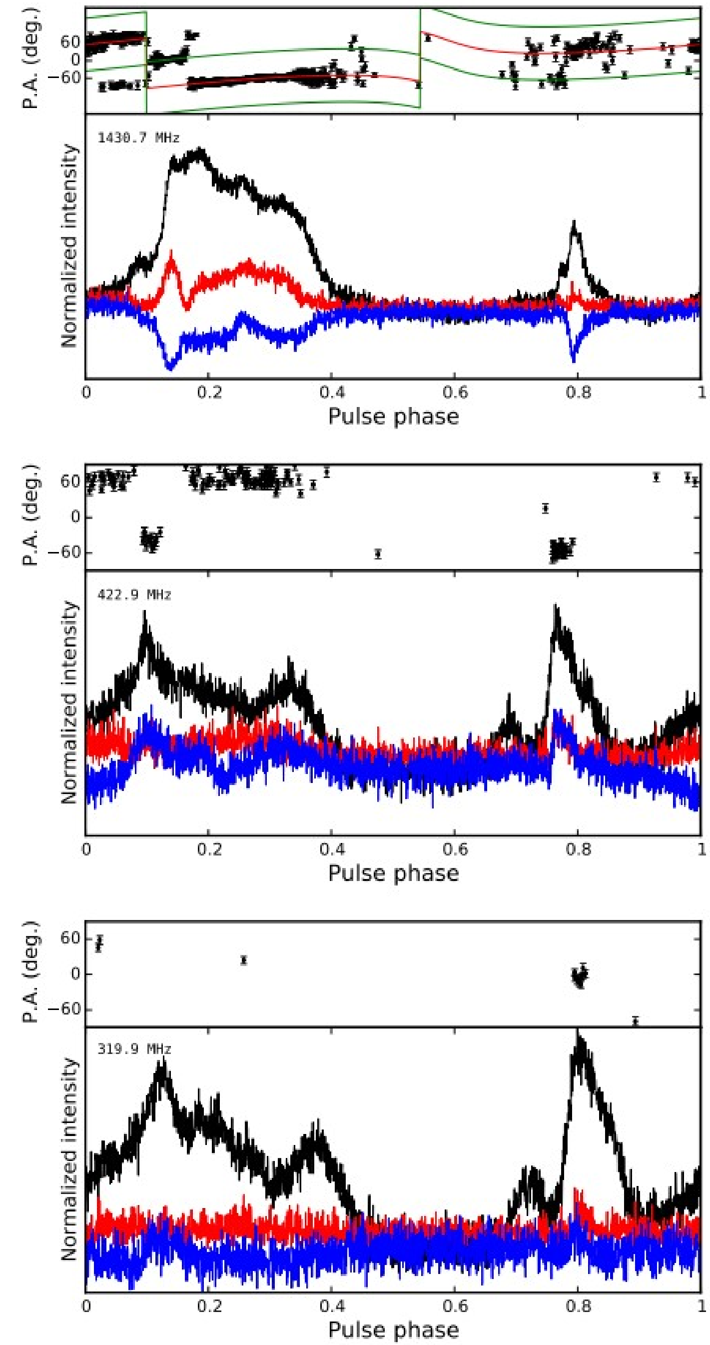
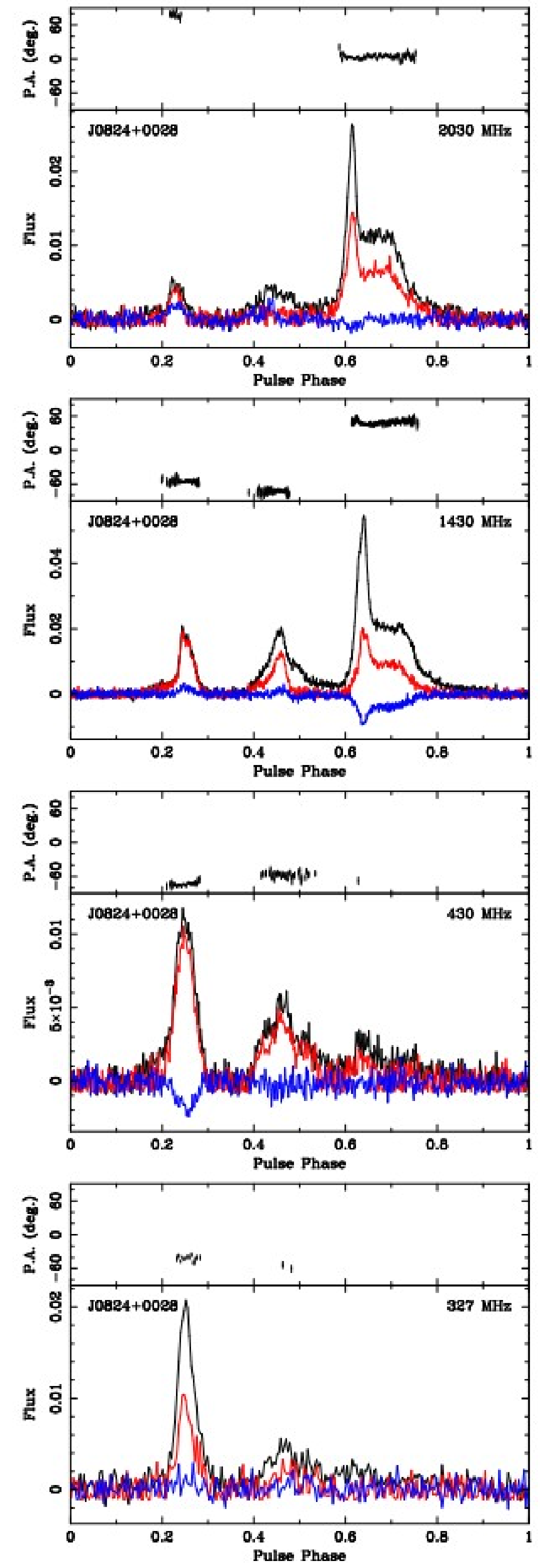


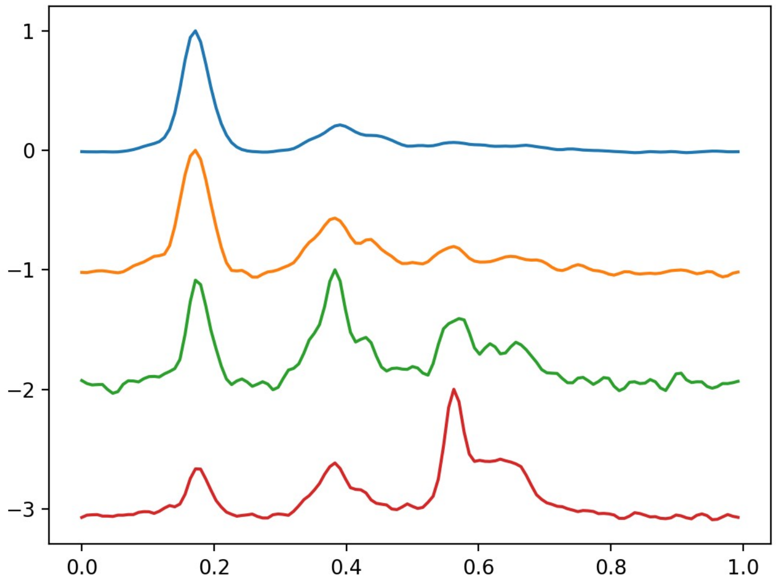
Figure 2. Same as Figure 1, this time for PSR J0732+2314. For this pulsar, we also display a rotating vector model at the top panel, which is based on the L-band data (more details are in Section 4.4). The red line is the rotating vector model fit to the position angle measurements of this pulsar, while the green lines are a 90° orthogonal mode transitions.

J0824+0028

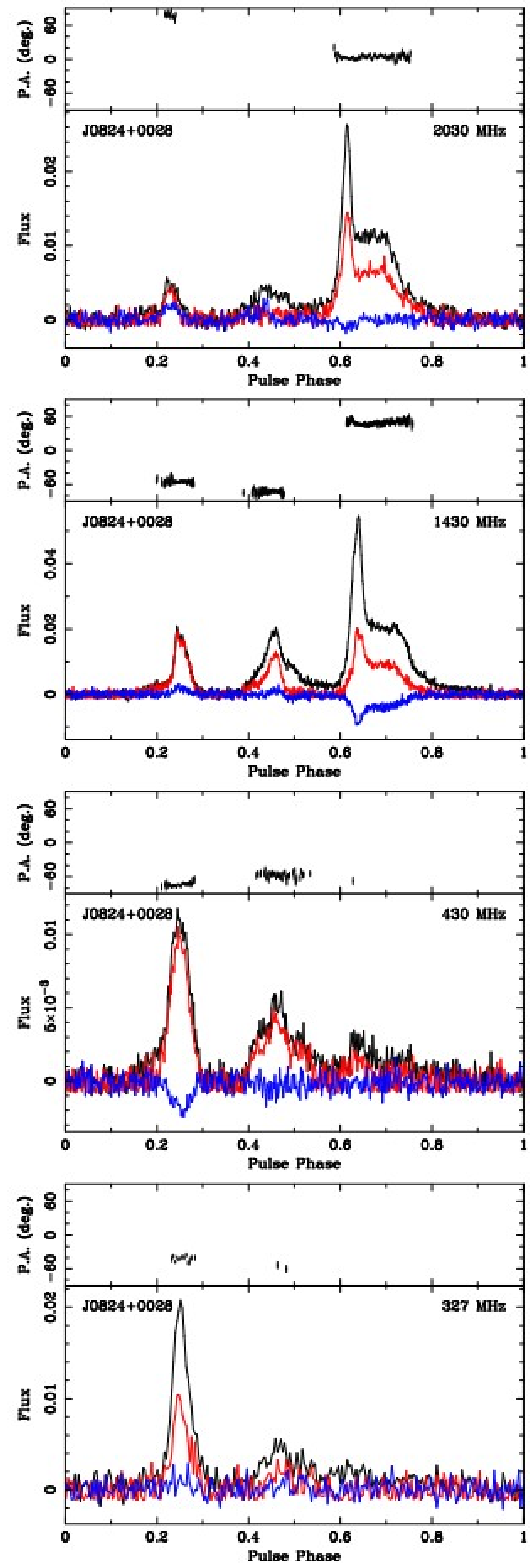
- Binary almost circular MSP
- 23 day orbit
- CO WD companion
- Follows Phinney 1992 relation



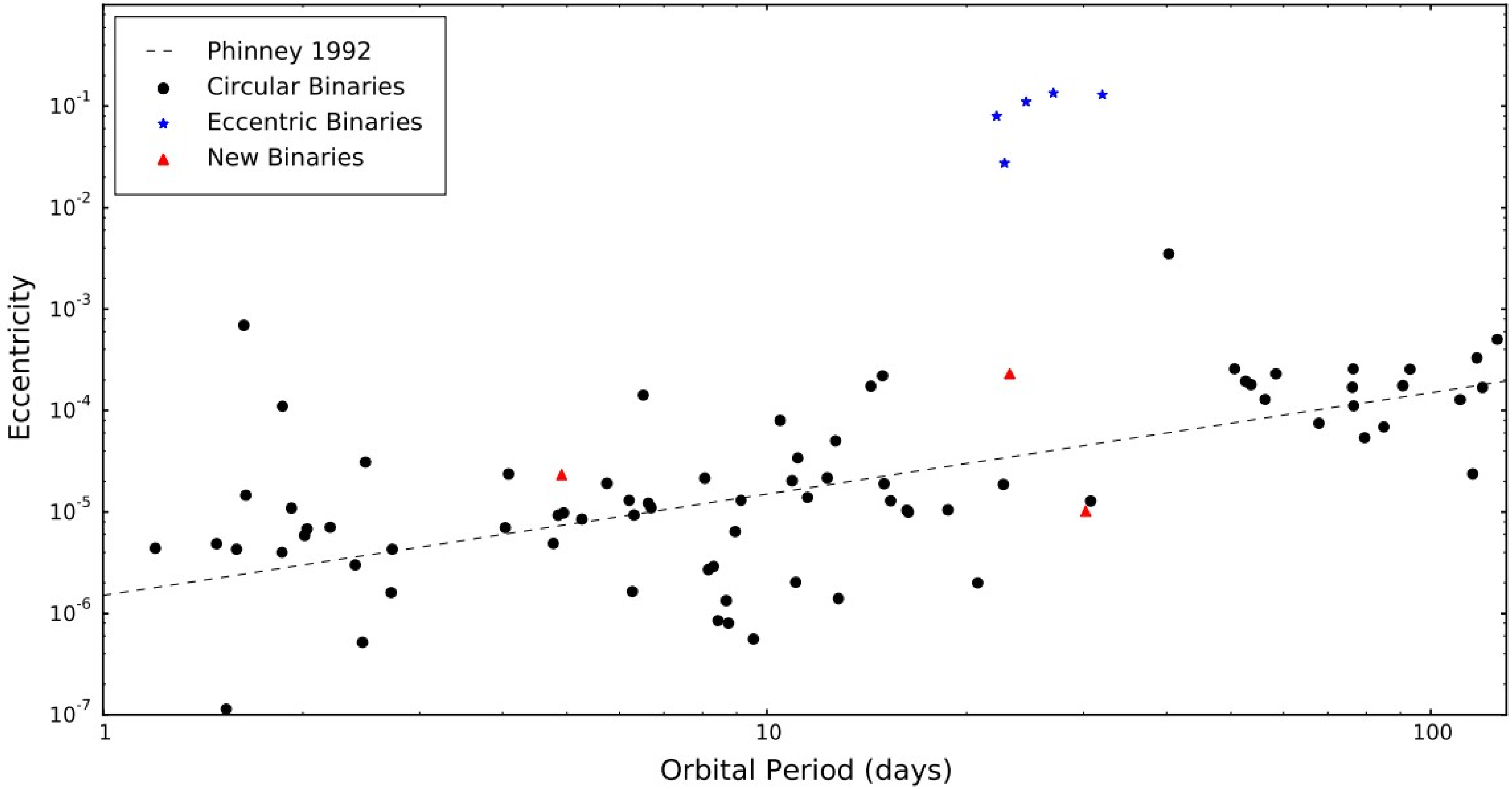
J0824+0028



1
0
−1
−2
−3
0.0
0.2
0.4
0.6
0.8
1.0



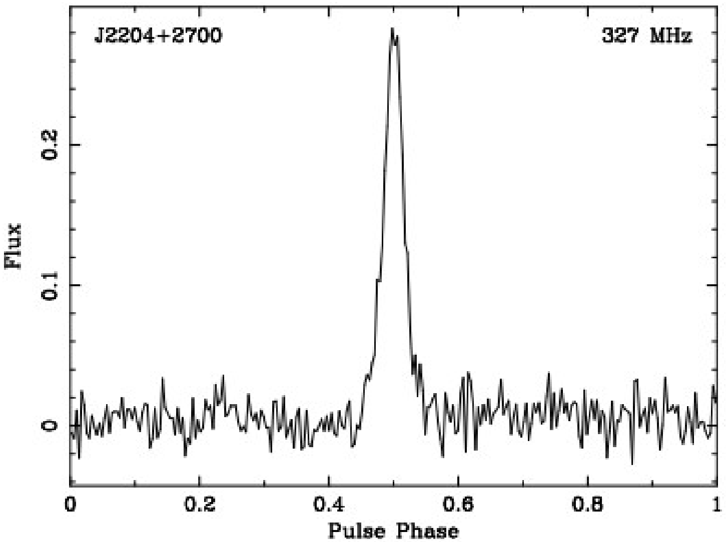
P.A. (deg.)
J0824+0028
2030 MHz
1430 MHz
430 MHz
327 MHz
Flux
Pulse Phase



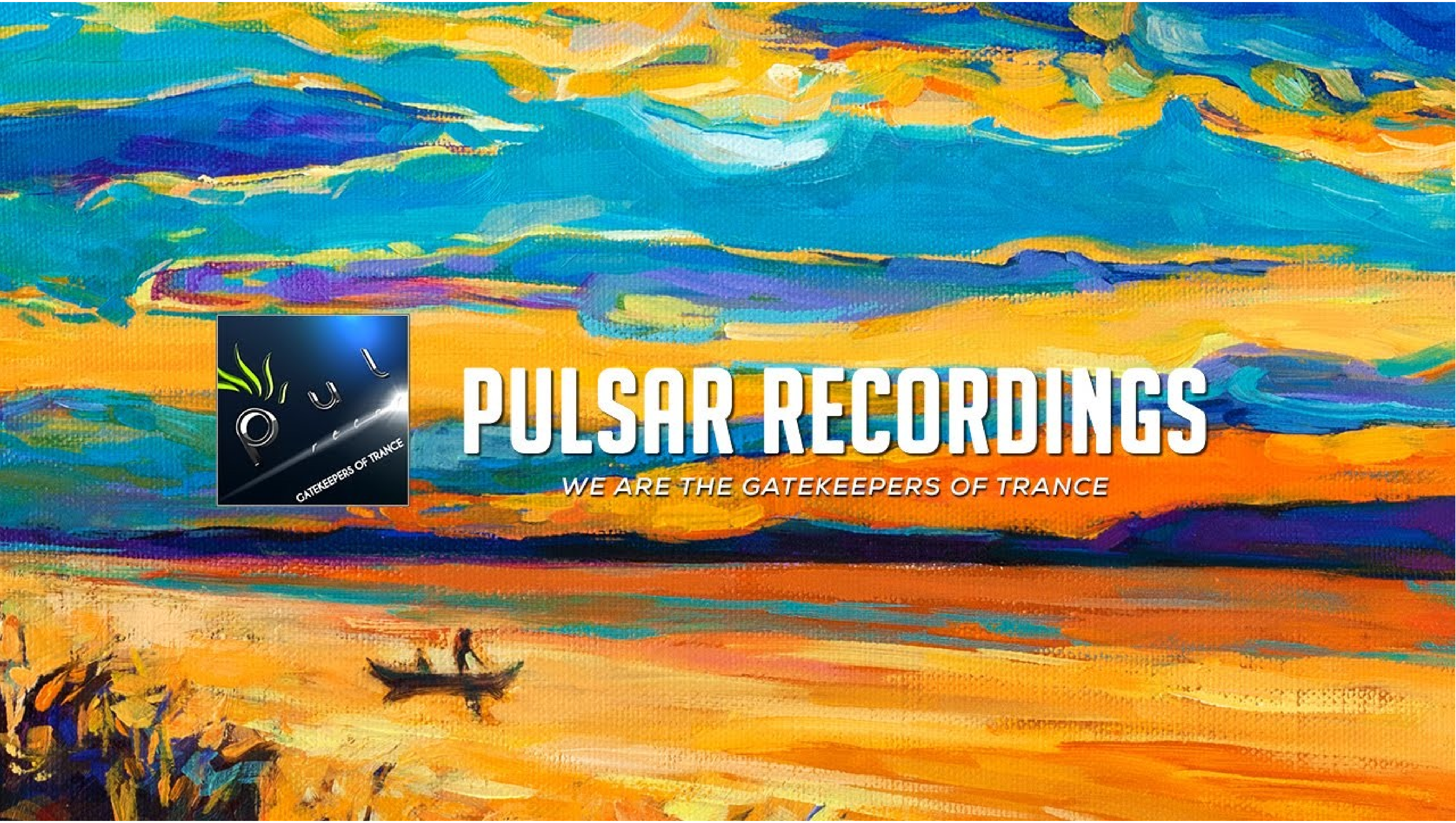
Phinney 1992
Circular Binaries
Eccentric Binaries
New Binaries
Eccentricity
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
1
10
100
Orbital Period (days)

J2204+2700

- MRP
- 815 day orbit
- Candidate for SEP tests
  - All test masses fall with the same acceleration in an external gravitation fields, the gravitational and inertial masses of self-gravitating bodies are identical.
- Gonzalez el al. 2011



c) J2204+2700


PULSAR RECORDINGS
WE ARE THE GATEKEEPERS OF TRANCE
GATEKEEPERS OF TRANCE