

Gamma-ray PSR J2333-5526

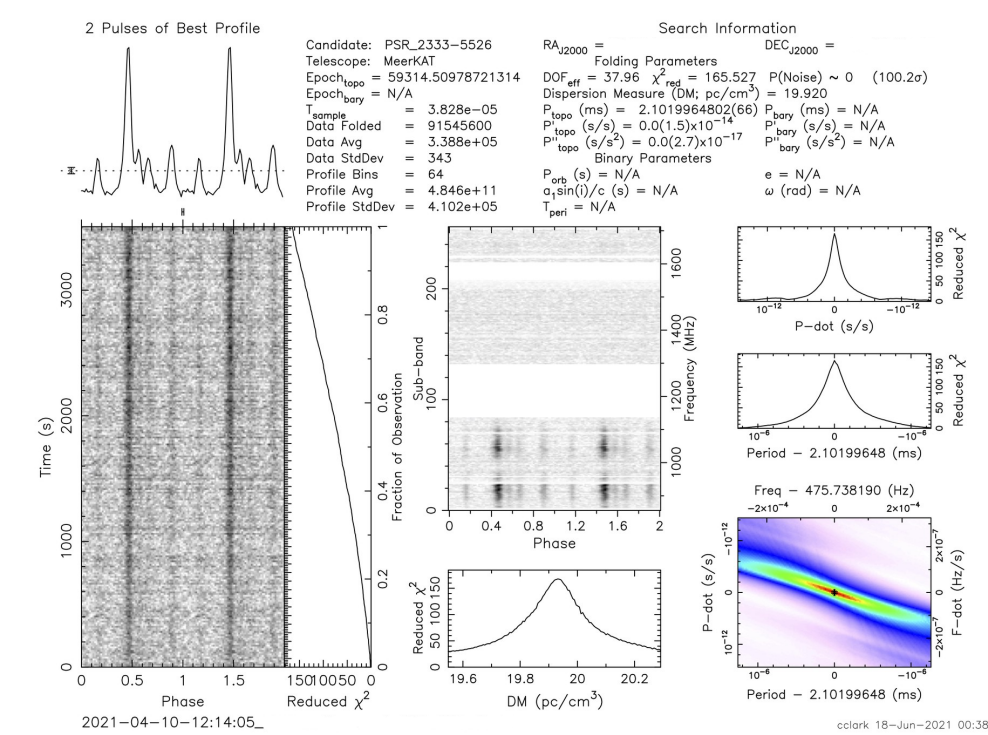
General Information

PSR	RA	DEC		P0	P1	F0	F1	Age
Dist	Edot	CODES (see below)						
J2333-5526	353.32	-55.44	0.0021	7.7e-21	475.6	-1.74e-15	4.4e9	3.3e34
RUP mbrk								

Quick Info

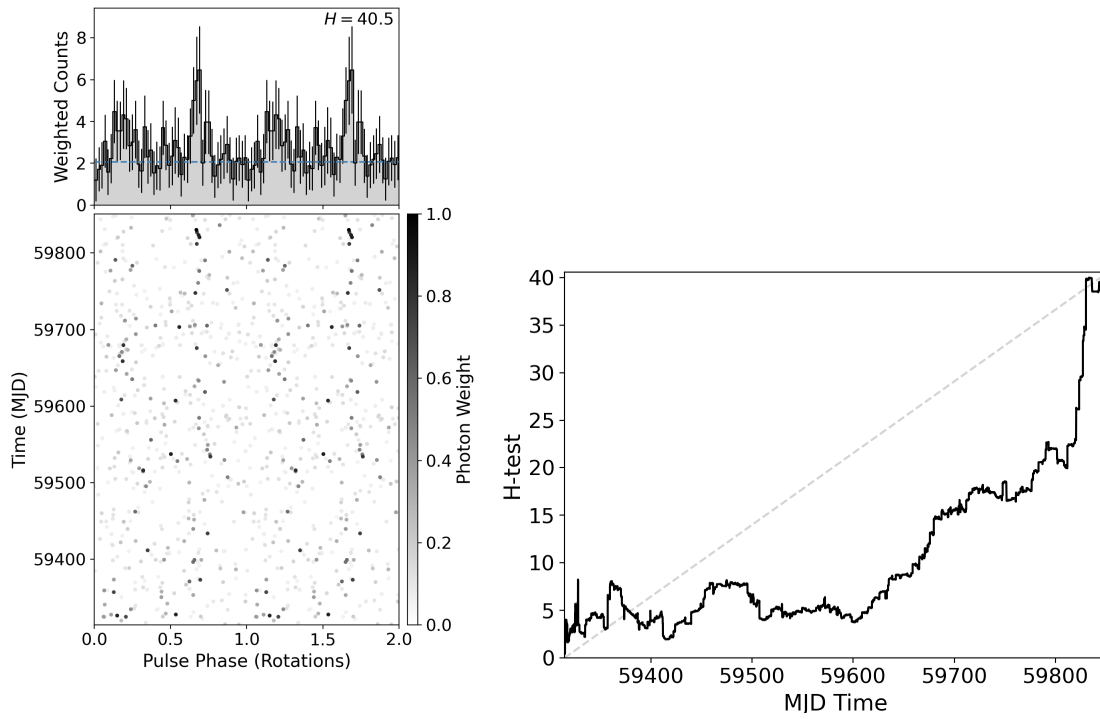
This pulsar was discovered by TRAPUM's Fermi Sources working group using MeerKAT, targeting the optical redback candidate identified by [Swihart et al.](#)

Radio Discovery



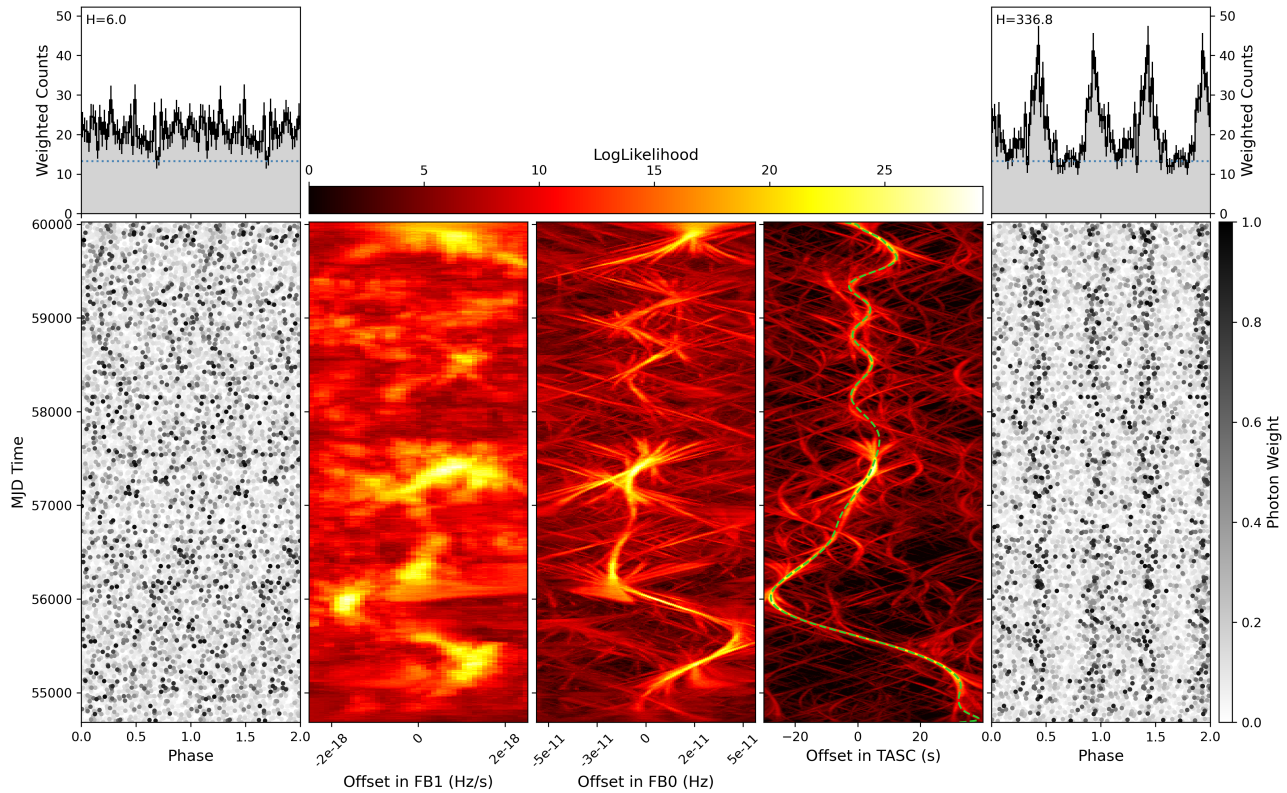
Gamma-ray follow-up Discovery

A radio timing solution from PKS + MeerKAT timing + Gaia astrometry results in H=40 gamma-ray detection with a single fold:



Gamma-ray timing

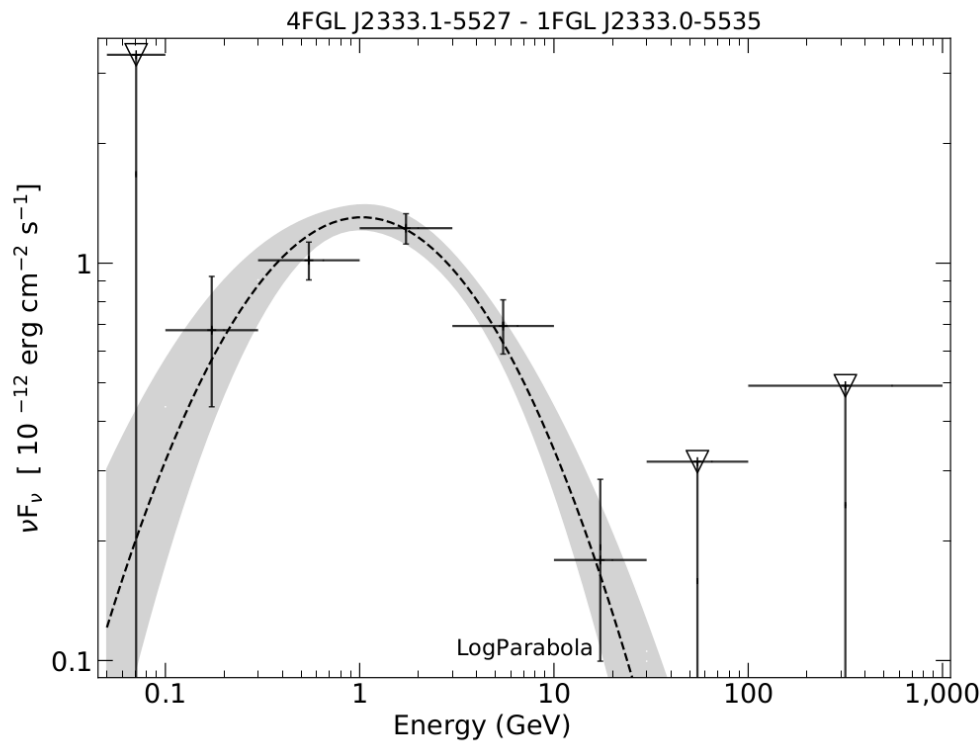
Like most redbacks, J2333-5526 exhibits significant orbital period variability that is making it very hard to time! After some tweaking to F0/F1 from the radio ephemeris, a sliding-window search over TASC/PB/FB1 gives us a timing solution requiring 25 orbital frequency derivatives, more than tempo2 can cope with. The ephemeris expresses the orbital phase evolution as an "ORBIFUNC" interpolation.



Left and right plots: Gamma-ray pulse profile and photon phases versus time. Right plot shows orbital timing solution from light-blue curve in TASC-panel.

Middle plots: Sliding window plots.

SED (Spectral Energy Distribution) from the 4FGL-DR3 catalog:



Derived Parameters

Spin period	2.10 ms
Observed spin period derivative	7.8e-21 s/s
Characteristic age	4.3e9 yr
Spin-down luminosity	3.3e+34 erg/s
Surface magnetic field	1.3e+08 G
DM distance (YMW16)	0.9 kpc
DM distance (NE2001)	2.5 kpc
Gamma-ray efficiency (YMW16)	0.01
Gamma-ray efficiency (NE2001)	0.08

"4FGL" is the **Incremental Fermi Large Area Telescope Fourth Source Catalog** Abdollahi, S. et al. 2022, ApJS, 260, 53 doi: [10.3847/1538-4365/ac6751](https://doi.org/10.3847/1538-4365/ac6751) arXiv: [2201.11184](https://arxiv.org/abs/2201.11184) ADS: [2022ApJS..260...53A](https://ui.adsabs.org/2022ApJS..260...53A)

Link to [ATNF psrcat](#)

Pulsar History and Characteristics codes:

- 'G' 'Discovered in Fermi-LAT gamma-ray data.'
- 'R' 'Discovered in the radio and/or gamma-ray pulsations detected using the radio ephemeris.'
- 'X' 'Discovered in the X-ray and/or gamma-ray pulsations detected using the X-ray ephemeris.'
- 'E' 'Pulsar was detected in gamma rays by EGRET/COMPTEL.'
- 'P' 'Pulsar was discovered by the Pulsar Search Consortium.'
- 'U' 'Discovered using a Fermi-LAT seed position.'

'r' 'Pulsations detected in the radio band.'

'x' 'Pulsations detected in the X-ray band.'

'm' 'Millisecond pulsar.'

'b' 'Pulsar is in a binary system.'

'w' 'Pulsar is in a black-widow system.'

'k' 'Pulsar is in a redback system.'

'q' 'Gamma pulsar with no radio detection'