

Gamma-ray PSR J2333-5526

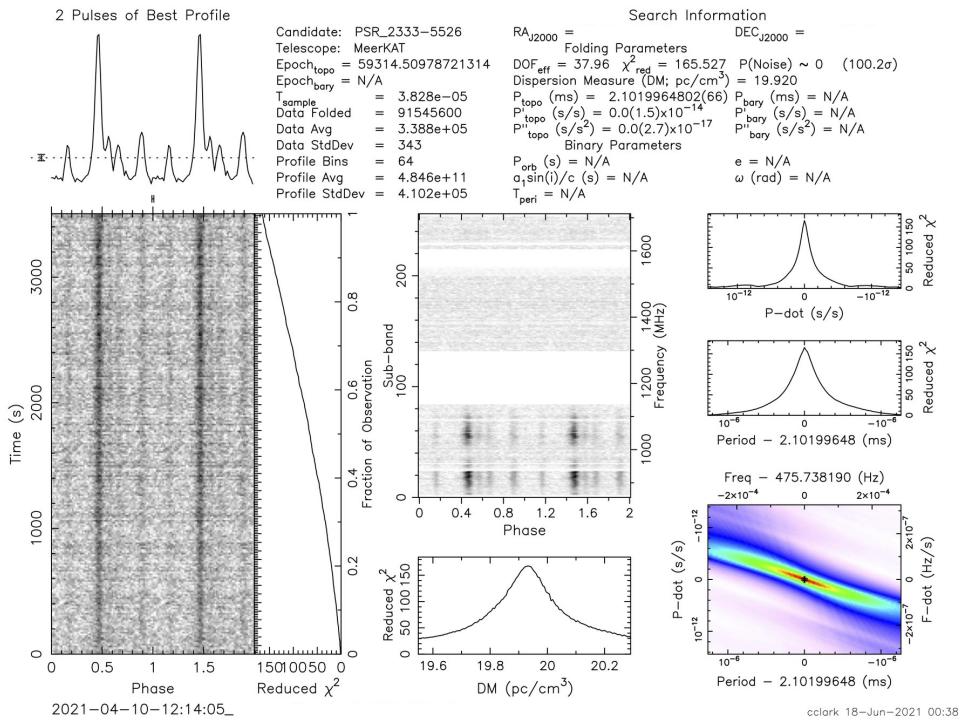
General Information

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

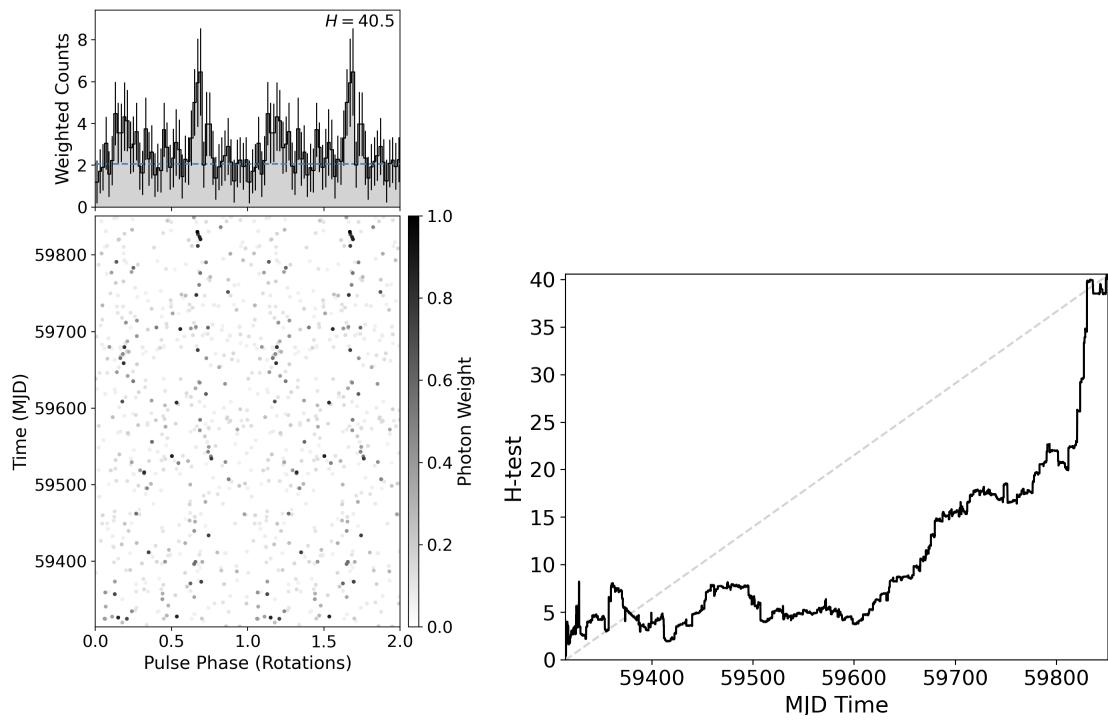
This pulsar was discovered by TRAPUM's Fermi Sources working group using MeerKAT, targeting the optical redback candidate identified by Swihart et al.

Radio Discovery



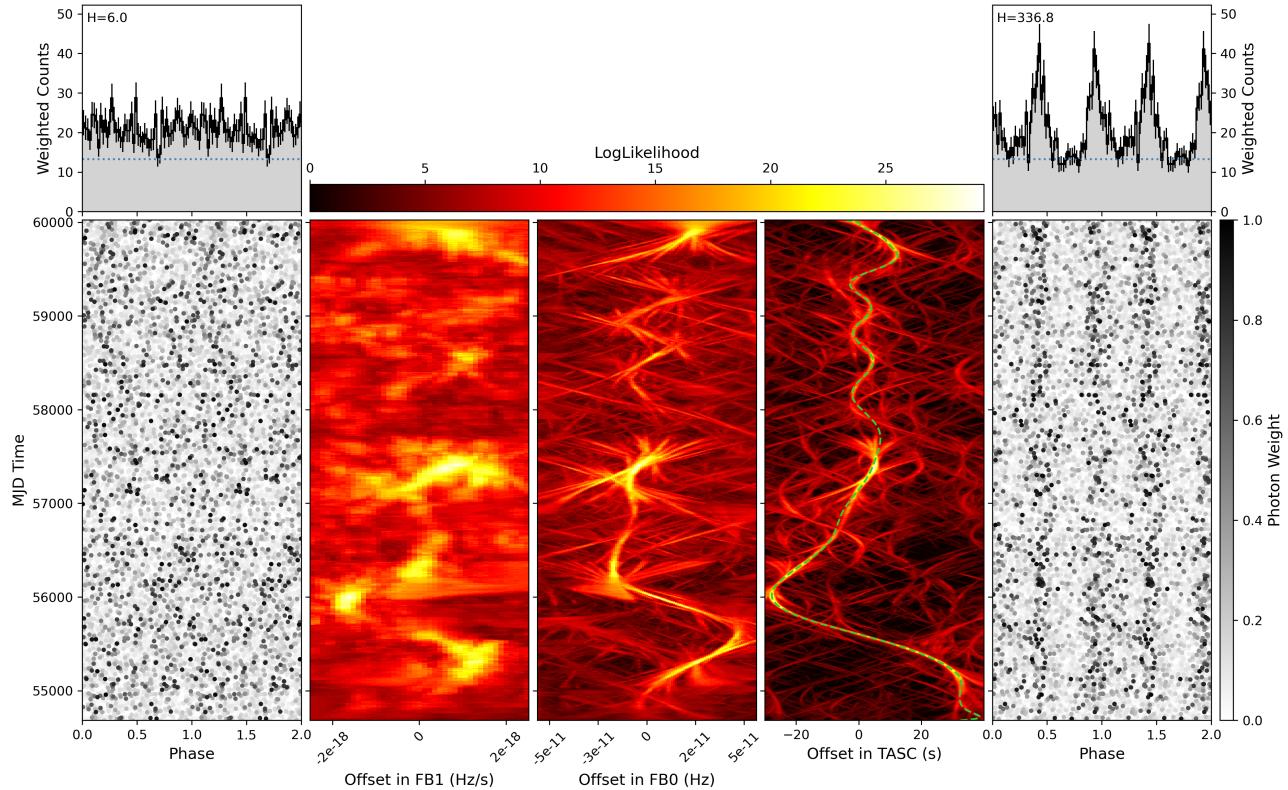
Gamma-ray follow-up Discovery

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



Gamma-ray timing

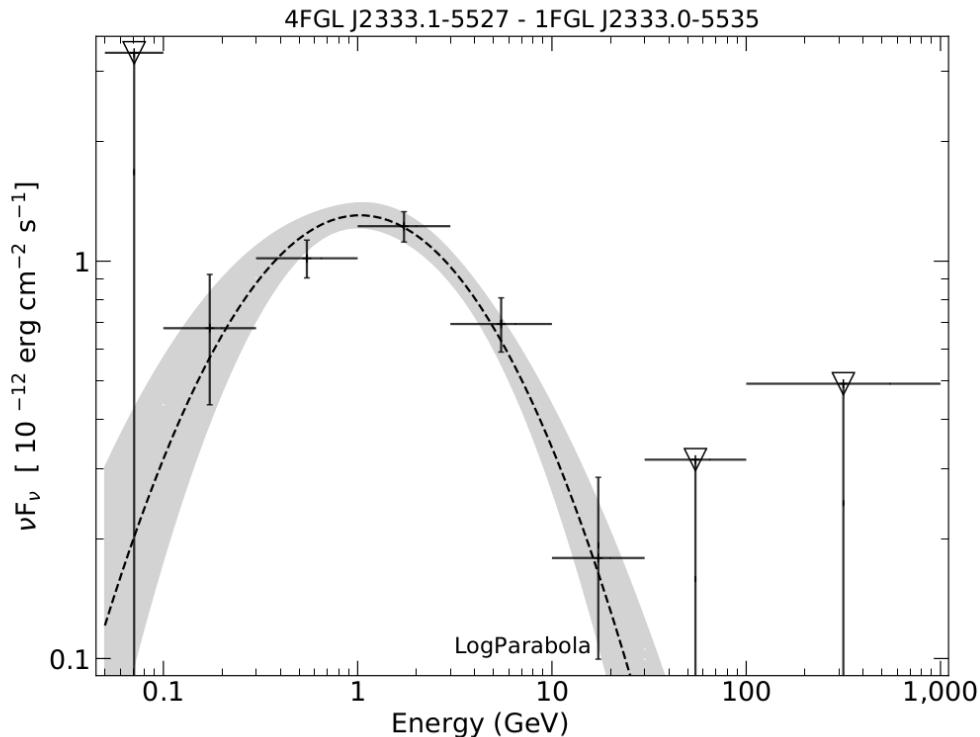
Like most redbacks, J2333-5526 exhibits significant orbital period variability that is making it very hard to time! After some tweaking to F0/F1 from the radio ephemeris, a sliding-window search over TASC/PB/FB1 gives us a timing solution requiring 25 orbital frequency derivatives, more than tempo2 can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