Contribution ID: **120** Type: **Oral presentation**

Discovery of gamma-ray orbital modulation in three spider pulsars

Tuesday 17 June 2025 14:15 (15 minutes)

Compact binary millisecond pulsars (spiders) are short-period binary systems consisting of a millisecond pulsar and a low-mass companion. These systems emit across the entire electromagnetic spectrum and are particularly bright in gamma-rays. Pulsed gamma-ray emission has been observed in many of these systems and is believed to originate from the neutron star's current sheet. Some spiders also exhibit orbital modulation of the gamma-ray and X-ray luminosities.

The X-ray modulation can be explained by an intrabinary shock emission model, where pulsar wind particles are re-accelerated and Doppler boosted along the shock tangent, producing orbitally modulated photons via synchrotron radiation. This shock typically wraps around the pulsar, causing modulation to peak at the pulsar's inferior conjunction.

If similar processes were responsible for the gamma-ray modulation, its peak should align with X-ray modulation. However, in three previously studied systems, the X-ray and gamma-ray modulation peaks occur at opposite orbital phases, suggesting different underlying mechanisms, such as inverse Compton scattering of companion star photons by pulsar wind particles or synchrotron emission from wind particles interacting with the companion's magnetosphere.

Using data from the recently published Third Fermi Large Area Telescope Catalog of Gamma-Ray Pulsars (3PC), we searched for gamma-ray orbital modulation in 40 redback and black widow pulsars. We detected significant modulation in seven systems, including three newly identified ones. In this presentation, I will discuss these findings, focusing on the measured modulated fractions and their relation to system properties such as gamma-ray flux, luminosity, binary inclination and X-ray light curves.

Author: Mr SATYBALDIEV, Maksat (Norwegian University of Science and Technology)

Co-authors: Prof. LINARES ALEGRET, Manuel (Norwegian University of Science and Technology); Dr VECCHIOTTI, Vittoria (Norwegian University of Science and Technology)

Presenter: Mr SATYBALDIEV, Maksat (Norwegian University of Science and Technology)

Session Classification: Parallell A3