

# Phenomenology 2022 Symposium: From Virtual to Real



Contribution ID: 28

Type: **not specified**

## New developments in the Galactic Center Gamma-Ray Excess

Monday 9 May 2022 17:00 (15 minutes)

The Galactic center gamma-ray excess (GCE) remains one of the most intriguing discoveries from the Fermi Large Area Telescope (Fermi-LAT) observations. Explanations of the GCE include a new population of millisecond pulsars, or annihilating dark matter. The latter explanation could provide us with the first evidence for dark matter interacts with the Standard Model. Debates over the GCE origin have lasted over a decade. I will report new developments toward solving the puzzle. In the first part of my talk, I will describe how we test the sensitivity of GCE with an updated point source catalog, 4FGL, from the Fermi-LAT collaboration. We find that a population of millisecond pulsars with luminosity function that follows a single-power law, once considered the leading interpretation of the GCE, is not a viable candidate to explain the excess. In the second part, I will describe how we revisit the characteristics of the GCE with a set of newly developed galactic diffuse gamma-ray emission templates, which are calibrated with data from multi-messenger observations. We found the broad properties of the GCE are qualitatively unchanged although its quantitative features appear mildly different than those obtained in previous analyses. In particular, we find a high-energy tail with higher significance than previously reported. This also affects the millisecond pulsar interpretation of the GCE: known millisecond pulsars are incapable of producing this high-energy emission and are therefore disfavored as the sole explanation of the GCE. See arXiv:1911.12369 and 2112.09706 for more details.

**Author:** ZHONG, Yiming (University of Chicago)

**Presenter:** ZHONG, Yiming (University of Chicago)

**Session Classification:** Cosmology II