Abstract of thesis entitled

GAMMA-RAY SPECTRAL ANALYSIS OF THREE ENERGETIC MILLISECOND PULSARS

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A millisecond pulsar (MSP) is a fast-spinning pulsar whose rotational period is a few milliseconds. MSPs are believed to be old pulsars spun up by their companion stars. PSRs J0218+4232, B1821−24 and B1937+21 are among the most energetic and fastest-spinning MSPs. They have been studied in radio, X-ray and gamma-ray bands, and show aligned pulse profile in different energy bands. However, all previous gamma-ray studies were done with previous Fermi LAT Pass 7 data or earlier. The Fermi LAT Pass 8 data was published in 2015 and has substantial improvements, such as increased effective area and

wider energy range. Since the recent gamma-ray spectral analyses of the three MSPs are relatively old, I re-analyzed the gamma-ray spectra of the three MSPs with four-year more Fermi LAT observational data and newly published Pass 8 data. Additionally, new X-ray studies of the three MSPs using NuSTAR had been published. I obtained better fit results for gamma-ray spectra of the three MSPs with smaller error bars and larger test statistic values. I built a numerical model to explain the high-energy emission from X-rays to gamma-rays based on a two-layer outer gap model. By minimizing the differences between the predictions of the two-layer model and the real data, I fitted three independent parameters of the model. It is found that the simplified two-layer model can predict broadband spectra of the three MSPs which are very close to the observational data from in both X-rays and gamma-rays.

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