平成２１年度共同利用研究・研究成果報告書

研究課題名　和文：ステレオ観測法による銀河内TeVガンマ線のスペクトル観測
英文：Observation of TeV gamma-ray spectra from galactic objects

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研究成果概要

We observed HESS J1614-518 from 2008 May to August using two telescopes. We detected diffuse gamma-ray emission above 760GeV at the 8.9 sigma level during an effective exposure of 54 hr. TeV gamma-rays from this object was detected with a

Significance of 8.9σ. Obtained spectrum is represented with a power-law: $(8.2\pm2.2_{stat}\pm0.6_{sys})\times10^{-12}\times(E/1\ TeV)^{-\alpha}$ photons cm^{-2} s^{-1} TeV^{-1} with a photon index α of $2.4\pm0.3_{stat}\pm0.2_{sys}$, which is consistent with that of the H.E.S.S. result. The morphology shows extended emission compared to our Point Spread Function (Fig. 1).

We consider the plausible origin of the high energy emission based on a multi-wavelength spectral analysis and energetics arguments. For the pulsar wind nebula scenario, none of known pulsars in this region can be responsible for the observed X-ray and very high energy gamma-ray spectra because the total energy of accelerated electrons is larger than the total energy emitted by the pulsar through its life. For the supernova remnant (SNR) scenario, one-zone leptonic models could not account for the observed spectral energy distribution (SED). However, hadronic models could give a good reproduction of the SED and a typical SNR explosion energy of 10^{51} ergs could supply the total energy of protons (Fig. 2). For the stellar wind scenario, the young open cluster Pismis22 would have to contain at least two O-type stars from energetics considerations.

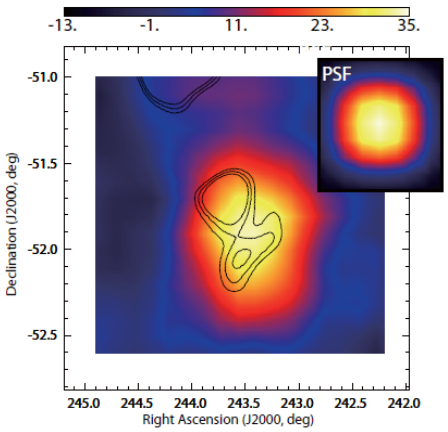

Fig. 1. Morphology of gamma-ray—like events with CANGAROO-III. The black solid contours show the VHE gamma-ray emission seen by H.E.S.S.

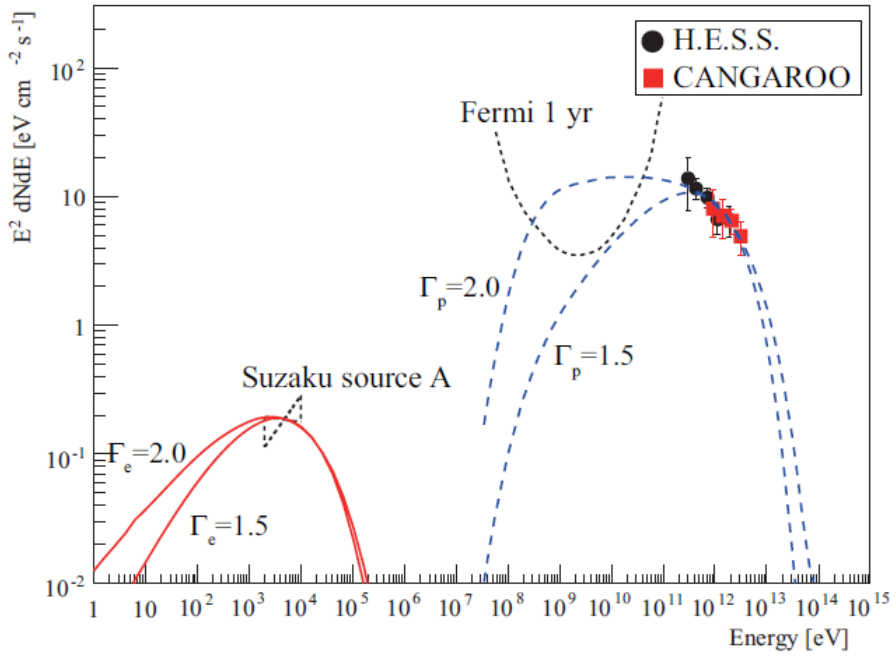

Fig. 2. SED and the model curve of neutral pion decay (dashed line). Solid line shows synchrotron model curve. The dotted curve shows the 1-year sensitivity of the Fermi LAT.

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