PROCEEDINGS OF SCIENCE

Fermi-LAT Limit on Individual Primordial Black Holes

Christian Johnson
Santa Cruz Institute for Particle Physics, Department of Physics and Department of Astronomy and Astrophysics, University of California at Santa Cruz, Santa Cruz, CA 95064, USA
E-mail: arcjohns@ucsc.edu

Dmitry Malyshev*
Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen Centre for Astroparticle Physics, Erwin-Rommel-Str. 1, 91058 Erlangen, Germany
E-mail: dmitry.malyshev@fau.de

Steven Ritz
Santa Cruz Institute for Particle Physics, Department of Physics and Department of Astronomy and Astrophysics, University of California at Santa Cruz, Santa Cruz, CA 95064, USA
E-mail: sritz@ucsc.edu

Stefan Funk
Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen Centre for Astroparticle Physics, Erwin-Rommel-Str. 1, 91058 Erlangen, Germany
E-mail: s.funk@fau.de

Primordial black holes (PBH) with masses below approximately 10^{15} g are expected to emit gamma rays with energies above a few tens of MeV via Hawking radiation. Previous searches for PBH evaporation signal have focused on either short timescale bursts of TeV photons corresponding to last moments of PBH lifetime or the contribution of PBHs to the isotropic gamma-ray emission. We show that, in case of individual PBHs, the Fermi LAT is most sensitive to PBHs with temperatures near 16 GeV, which can be detected out to a distance of about 0.03 pc. These PBHs have lifetimes of a few years and would appear as potentially moving point sources. We develop a new algorithm to detect the proper motion of a gamma-ray point source (PS) and apply it to unassociated PS in the third Fermi-LAT source catalog (3FGL). None of unassociated PS that have spectra consistent with PBH evaporation show significant proper motion. The derived 99% confidence limit on PBH evaporation rate in the vicinity of the Earth is similar to the limits obtained with ground-based gamma-ray observatories.

7th Fermi Symposium 2017
15-20 October 2017
Garmisch-Partenkirchen, Germany

*Speaker.

PoS(IFS2017)169