ICRC2015

ICRC
The Astroparticle Physics Conference
34th International Cosmic Ray Conference
July 30 - August 6, 2015
The Hague, The Netherlands

Contribution ID: **768** Type: **Poster contribution**

Searching for primordial black hole evaporation signal with AMON

Saturday, August 1, 2015 3:30 PM (1 hour)

Primordial black holes (PBHs) are expected to explode violently during the last few seconds of their lives, producing jets of high energy particles. These particles could be detected in coincidence by several observatories with large fields of view, such as IceCube and ANTARES (neutrinos), HAWC and Fermi LAT (gamma rays) and Pierre Auger (neutrons). The short temporal structure of the anticipated PBH evaporation signal provides a very low false positive rate for any possible detection. We will present the discovery potential of the Astrophysical Multimessenger Observatory Network (AMON) for PBH evaporation events. AMON aims to discover multimessenger transient sources by performing real-time and archival coincidence searches from multiple observatory subthreshold data streams. In this approach, a distinctive PBH evaporation signature may be probed by conducting coincidence analysis from a few years of subthreshold neutrino, gamma-ray and neutron data. Detection of PBHs would be a scientific breakthrough confirming Hawking's hypothesis of black hole radiation and cosmological models of phase transitions, and would allow us to probe physics at the highest energy scale as well as quantum gravity. The fraction of the mass of dark matter that may have initially existed in the form of PBHs could be measured as well.

Collaboration

– not specified –

Registration number following "ICRC2015-I/"

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Session Classification: Poster 2 CR

Track Classification: CR-EX