

Gamma ray signals from primordial black hole evaporation

Thursday 12 January 2023 16:20 (20 minutes)

In this work, we study the photon spectrum produced by the Hawking radiation from a primordial black hole (PBH). We focus on the last stages before full evaporation. The spectrum is estimated using the black body approach and Hawking's emission formula. The connection between both descriptions is discussed. Furthermore, through analytical approximations for the greybody factors at the high and low energy limits, we time-integrate the primary spectrum along the PBH lifetime. As a result, we obtain a correction to the primary photon time-integrated spectrum commonly used in the literature. In addition, due to the BH emission of free quarks, we estimate, under rough approximations, the pion production from quark hadronization. As a consequence, a secondary photon spectrum is obtained through $\pi^0 \rightarrow \gamma\gamma$ decay. These calculations for the spectral emission are compared with spectra obtained with simulations using `BlackHawk`. Based on the previous analysis, we estimate the number of photons per km^2 , within a certain detection energy interval, and during a fixed observation time, that eventually reach the Earth's atmosphere. Finally, with the help of `Corsika`, we run simulations of very high energy gamma rays to study the basic features of the electromagnetic showers that are produced in the atmosphere.

Author: RECABARREN, Luis (Universidad Técnica Federico Santa María)

Co-author: DIB, Claudio (Federico Santa Maria Technical University (CL))

Presenter: RECABARREN, Luis (Universidad Técnica Federico Santa María)

Session Classification: poster Session