

Follow-up Search for UHE Photons from Gravitational Wave Sources with the Pierre Auger Observatory

Tuesday 20 July 2021 19:18 (12 minutes)

The field of multimessenger astronomy has become increasingly important during the past decade. Some astronomical objects have already been successfully observed in the light of multiple messenger signals, allowing for a much deeper understanding of their physical properties. The Pierre Auger Observatory has taken part in multimessenger astronomy with an exhaustive exploration of the ultra-high-energy (UHE) sky.

In this contribution, for the first time, a search for UHE photons from the sources of gravitational waves (GWs) is presented. This study complements the dedicated search for UHE neutrinos, which has already been established at the Pierre Auger Observatory. While the Observatory has a much larger exposure to primary photons than to neutrinos, interactions with the cosmic background radiation fields are expected to attenuate any possible flux of UHE photons from distant sources. In addition, a non-negligible background of air shower events with hadronic origin makes an unambiguous identification of primary photons a challenging task.

In the analysis presented here, a sophisticated selection strategy is applied to both GW sources and air shower events aiming to provide maximum sensitivity to a possible photon signal. At the same time, a window is kept open for hypothetical processes of new physics, which might allow for much larger interaction lengths of photons in the extragalactic medium. Preliminary results on the UHE photon fluence from a selection of GW sources, including the binary neutron star merger GW170817 are presented.

Keywords

UHE photons; multimessenger; gravitational waves; Pierre Auger Observatory

Collaboration

Auger

other Collaboration

Subcategory

Experimental Results

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Session Classification: Discussion

Track Classification: Scientific Field: MM | Multi-Messenger