Follow-up observations of GW170817 with the MAGIC telescopes

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What is this contribution about?

In this contribution we present the follow-up observations of the counterpart of the gravitational wave event GW170817, made by the MAGIC telescopes, and a detailed self-synchrotron Compton model of the late afterglow emission, associated to a short GRB seen off-axis.

Why is it relevant / interesting?

The gravitational wave event GW170817, originated from a binary neutron star merger, was the first GW event associated to the electromagnetic emission from a short GRB and to a kilonova. A radio and X-ray afterglow did emerge few days after the burst, reaching the peak at ~150 days. This could be intringuingly accompanyed by GeV-TeV emission, given the recent discovery of a new energetic component in (long and possibly short) GRBs reaching TeV energies.

What have we done?

We have observed the counterpart of the GW170817 with the MAGIC telescopes, sensitive at energies from ~100 GeV up to 10 TeV, during the peak of the late emission seen in radio and X-rays. Observations were performed at medium/large zenith angles, i.e. with high energy threshold, collecting ~10 hours of data. The multifrequency spectral energy distribution was built with the observations available in literature. The expected TeV emission was computed from a self-synchrotron Compton (SSC) model built on an evolving structured jet, seen off-axis.

What is the result?

Upper limits at energies grater than 400 GeV were derived by the late MAGIC observations, and compared with the expected SSC emission.
The SSC model from a structured jet shows that TeV emission from short-GRBs seen off-axis (with angles >10-20 deg) is challenging for the present generation of Cherenkov telescopes. The detection of an energetic component from GW and BNS counterparts by Cherenkov telescopes is expected with either a smaller off-axis angle <~10 deg and denser interstellar medium density, or an additional emission component.