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Searching for Gamma-Ray Bursts with the High-Altitude Water Cherenkov (HAWC) Observatory

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Satellites and imaging atmospheric Cherenkov telescopes (IACTs) have shown that gamma-ray bursts (GRBs) are capable of producing very-high-energy photons— most notably GRB 190114C, observed up to 1 TeV by the MAGIC telescopes approximately one minute after triggering the Fermi GBM and Swift BAT satellites. Particularly suited to such searches and follow-up studies is the High-Altitude Water Cherenkov (HAWC) Observatory, which monitors 1/6th of the sky at any one time, complementing the pointed observations of TeV telescopes. It covers 2/3 of the sky every day, with near continuous uptime. The HAWC GRB program comprises two dedicated analyses: a self-triggered all-sky search and a rapid response follow-up of GRBs reported by satellites. Both methods are performed in real time at the HAWC site and additionally repeated on archival data with improved calibration and reconstruction algorithms. Recent upgrades have HAWC poised for detection of the highest-energy gamma rays associated with GRBs, which are key to developing GRB emission models as well as constraining possible beyond-the-Standard-Model physics.

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