

**Executive summary:  
H.E.S.S. follow-up of BBH merger events**

The High Energy Stereoscopic System (H.E.S.S.) is an array of four 12-m and one 28-m imaging atmospheric Cherenkov Telescopes located in the Khomas Highland in Namibia. H.E.S.S. dedicates a large portion of its observation program to the follow-up of GW events. In this contribution, the H.E.S.S. follow-up of four Binary Black Holes (BBH) merger events is presented, along with the analysis, the results and their interpretation.

In order to search for very-high-energy (VHE) gamma-ray counterparts to BBH merger events, H.E.S.S. uses observation tiling strategies that consists of covering the regions that have the highest probability to host the GW event first. Each region, represented by the H.E.S.S. field of view is covered during 28-minute observations before moving to the next region if no signal is found, following observation and visibility conditions. An animation illustrating a particular example of the H.E.S.S observations of GW waves taking into consideration observation and visibility constraints is presented in the talk.

H.E.S.S. observed four BBH mergers during the second and third Advanced Ligo and Virgo observing runs (O2 and O3): GW170814, S190512at, S190728q and S200224ca. No significant emission of VHE gamma rays was found. However, the observations are used to constrain the intrinsic luminosity and the observed absorbed flux on Earth assuming a generic  $E^{-2}$  spectrum of the source. For the luminosity, the variation if the estimation of the GW event distance within the H.E.S.S. observed regions is taken into consideration.

Finally, the derived constraints are used to assess the H.E.S.S. GW follow-up strategies and prospects for the next GW observation run are derived.