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A novel multimessenger study of Starburst galaxies: implications for neutrino astronomy

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Starburst galaxies (SBGs) and more in general starforming galaxies represent a class of galaxies with a high star formation rate (up to 100 Mo/year). Despite their low luminosity, they can be considered as guaranteed "factories" of high energy neutrinos, being "reservoirs" of accelerated cosmic rays and hosting a high density target gas in the central region. The estimation of their point-like and diffuse contributions to the neutrino astrophysical flux measured by IceCube can be crucial to describe the diffuse neutrino spectral features as well as the peculiar point-like excess like NGC1068. To this aim we use the most update gamma-ray catalog of this class of objects to perform a multimessenger study and describe their gamma-ray emission through a calorimetric scenario.

For the diffuse analysis we perform a blending of the measured spectral indexes and obtain a multi-component description of extragalactic background light (EGB), high energy starting events (HESE) and high-energy cascade IceCube data. Remarkably, we find that, differently from recent prototype scenarios, the spectral index blending allows starburst galaxies to account for up to 40% of the HESE events at 95.4% CL and favors a maximal energy of the accelerated cosmic rays at teens of PeV.

For the point like analysis we apply the calorimetric approach to the known SBGs within 100 Mpc, considering, were possible, a source-by-source description of the star formation rate. These results are then compared with what IceCube and ANTARES have seen at TeV energies as well as with what can be expected from the incoming KM3NeT.

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