Search for dark matter in the Galactic Centre region with the H.E.S.S. Inner Galaxy Survey

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The presence of dark matter (DM) in the universe is indicated by copious astrophysical and cosmological measurements, however, its underlying nature is still under debate. Among the most promising candidates to explain dark matter are weakly interacting massive particles (WIMPs), that have mass and coupling strength at the electroweak scale. If thermally produced in the early universe, WIMPs have a present relic density consistent with that observed today. The self-annihilation of WIMPs would produce Standard Model particles, including gamma-rays in the final state. For a long-time, dark matter annihilation signals have been searched indirectly through gamma-rays. The inner part of the Milky Way is predicted as the brightest source of DM annihilation. A region of several degrees around the Galactic Centre has been observed in the last years by the H.E.S.S. collaboration with the Inner Galaxy Survey (IGS), with the aim to achieve the best sensitivity to faint and diffuse emissions. To search for DM annihilation signal, we analyzed observations taken between 2014 and 2020 with the five-telescope array and consisting of about 550 hours. No significant excess was found, therefore we derived strong constraints on the velocity-weighted annihilation cross-section of dark matter particles. Different annihilation channels can be inspected to probe thermal WIMPs in the TeV mass range.

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