

On the distribution of cosmic rays in the Galactic Center region: new insights from H.E.S.S.

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The Galactic center region is one of the richest in the Milky Way, hosting a large variety of sources such as supernova remnants, pulsar wind nebulae and stellar clusters. The supermassive black hole Sgr A* is surrounded by dense molecular cloud complexes that shape the so-called central molecular zone (CMZ). Very-high-energy gamma-ray emission has been reported towards this inner 200 pc region of the Galaxy, resulting from the interaction of accelerated protons which propagate through the CMZ. Analyses of this emission revealed a $1/r$ cosmic-ray density profile, typical of continuous injection near the Galactic center. With almost thrice more observation time, we revisit the very-high-energy gamma-ray emission coming from the CMZ region with the H.E.S.S. telescopes using a spectro-morphological analysis. We investigate the gamma-ray morphology of the diffuse emission, in particular testing for a possible deviation from a $1/r$ cosmic-ray density profile. Taking into account the foreground large-scale emission, we derive the first intrinsic gamma-ray spectrum of the Galactic center diffuse emission as well as the spectrum of the parent cosmic rays pervading the CMZ. We also present the four H.E.S.S. sources in the region (HESS J1745-290, G0.9+0.1, HESS J1746-285, HESS J1741-302). We finally discuss physical interpretation of these new results.

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