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Search for anisotropies in the arrival directions of cosmic rays above 32 EeV from Phase One of the Pierre Auger Observatory

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The toe of the spectrum of ultra-high energy cosmic rays (UHECRs), above ˜50 EeV, is an extremely interesting region for studying the origins of CRs. The potentially small magnetic deflections at these energies are coupled with the presence of the flux suppression, which could be a signature of the maximum acceleration potential of the sources, or could find its explanation in the interactions of cosmic rays with background photons, effectively limiting the region of interest in the search for UHECR sources to a relatively small bubble around us. In this talk we present the latest anisotropy searches carried out by the Pierre Auger Collaboration in the energy range above 32 EeV. The dataset used is the last collected in the "Phase One" of the Observatory between 2004 and 2020, before the AugerPrime upgrade, for a cumulative exposure of ˜120000 km2 sr yr. We have conducted both blind, model-independent searches for overdensities, correlation analyses with astrophysical structures, and cross-correlation studies with catalogs of candidate sources. We have found evidence for a deviation from isotropy at angular scale of ˜25 degrees at the 4sigma level for UHECRs with energy above 38 EeV.

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