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Evidence for the Sombrero Galaxy as an Accelerator of the Highest-Energy Cosmic Rays

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Ultrahigh-energy cosmic rays (UHECRs) are the highest-energy messenger from space, with energies exceeding 1 EeV. Although UHECRs were discovered more than 60 years ago, their origin remains a mystery. Pinpointing sources of UHECRs is crucial for understanding the extreme astrophysical processes that accelerate particles to such extraordinary energies. We searched for UHECR multiplets by analyzing 17 years of data with energies greater than 40 EeV from the Pierre Auger Observatory. A spatial association is found between a multiplet of 25.7+6.2-7.0 cosmic rays and the Sombrero galaxy with a local (global) significance of $4.5 \boxtimes (3.3 \boxtimes)$. The Sombrero Galaxy hosts a one-billion-solar-mass supermassive black hole and exhibits large-scale radio lobes and jets. Our finding provides critical evidence on active supermassive black holes as the source of the highest-energy cosmic rays.

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