

## **Illuminating M87\* inner shadow with dark matter annihilation**

The Event Horizon Telescope (EHT) has revolutionized our ability to study black holes by providing unprecedented spatial resolution and unveiling horizon-scale details. With advancements leading to the next-generation EHT, there is potential to probe even deeper into the black hole's dark region, especially the inner shadow characterized by low-intensity foreground emissions from the jet, thanks to a significant enhancement in dynamic range by two orders of magnitude. We demonstrate how such enhanced observations could transform supermassive black holes into powerful probes for detecting annihilating dark matter, which can form a dense profile in the vicinity of supermassive black holes, by examining the morphology of the black hole image.

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