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Shadows of the past, shadows of the future

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What do archival observations tell us about the M87 black hole?

With the 2017 observations of the Event Horizon Telescope we observed the M87 supermassive black hole with linear resolution corresponding to about 3 Schwarzschild radii, revealing a bright ring surrounding dark center – a feature dubbed a “black hole shadow”. Several archival observations of M87 with the EHT prototype arrays were obtained in 2009-2013. They are generally of far lower data quantity, quality, and resolution. Nevertheless, they allow to constrain certain geometric parameters of the source, confirming its persistent diameter and presence of the flux depression. I will discuss those observations and findings. Then I will discuss more generally what constitutes a minimal usable observation to meaningfully claim a detection of a black hole shadow, if it can be translated to a mass measurement, and what other assumptions do we need to make. This is relevant in the context of the future space very long baseline interferometry observations that may give us results for a larger set of sources, but likely with data sets resembling sparse 2009-2013 observations more than the 2017 results of the EHT.

Primary author: WIELGUS, Maciek (Black Hole Initiative (Harvard University))

Presenter: WIELGUS, Maciek (Black Hole Initiative (Harvard University))

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