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Finding the valid gravity theory from observations of black hole silhouettes

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Nowadays the major problem in cosmology is in the choice of the valid gravity theory for interpretation of the observational data. Usually in cosmology it is used the Einstein general theory of relativity and the corresponding Friedman-Robertson-Walker equations in the strong field limit (when gravitational potential is of the order of square of the light velocity). Meanwhile, the general theory of relativity is verified and confirmed only in the weak field limit in the nearest cosmological environments. Observations of black hole images (silhouettes) opens a unique possibility for the verification (or falsification) of modified gravity theories in the strong field limit when gravitation dominates over astrophysical or cosmological factors. This is especially crucial for physical interpretation of astrophysical and cosmological observations of the far regions of the Universe and for understanding the physical origin of enigmatic dark matter and dark energy. The first visual images of supermassive black holes *M87* and *SgrA* have been observed recently by the Event Horizon Telescope. These images demonstrate a qualitative agreement with the general theory of relativity. In the nearest future it would be possible to quantitatively scrutinize the known modified gravity theories after construction of the Space Millimetron Observatory with nano-arcsecond angular resolution.

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