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Physics on the event horizon scale with millimetre and submillimetre interferometry

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Impressive progress has been achieved recently in studies addressing fundamental physical processes near the event horizon scale of putative cosmic black holes. The detection of gravitational waves, the near infrared interferometry measurements of relativistic stellar orbits and accretion disk hot spot motion in the Galactic Centre, and the millimetre interferometry imaging of the strong gravitational lensing on scales down to several Schwarzschild radii are presently the best evidence for the existence of black holes. These areas of study will continue to draw substantial attention in the coming years, as the results obtained until now still admit several alternative explanations featuring, for example, such exotic entities as wormholes and gravastars. In millimetre and submillimetre bands, significant advances in the sensitivity and resolution of interferometric measurements should enable the most stringent tests for discerning between black holes and their alternatives. These tests will include improved direct imaging of the event horizon scale at 86, 230, and 345 GHz, accurate polarimetric and Faraday rotation measurements, precise astrometric observations of the hot spot motion in the Galactic Centre, and detailed studies of the photon rings in a number of AGN. Current status and future prospects of these measurements will be discussed in this presentation.

Primary author: Dr LOBANOV, Andrei (Max-Planck-Institut für Radioastronomie)

Presenter: Dr LOBANOV, Andrei (Max-Planck-Institut für Radioastronomie)

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