

# Highlights of XMM-Newton Observations of Black Holes

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**Abstract.** With the detection of relativistic broad emission lines in MCG 6-30-15 (Tanaka 1995) X-ray observations have become an important tool to test the direct environment of black holes.

XMM-Newton observations were the basis of remarkable progress in different directions in recent years. On the one side the birth and the growth of black holes could be addressed in detail. On the other side several observations allowed the study of the strong gravitational field in the vicinity of black holes.

The talk provides an overview of XMM-Newton observations of black holes: starting from the creation of stellar-mass black holes, through mass growth via accretion disks and occasional tidal disruption events, up to intermediate and supermassive black holes in the centre of active and non-active galaxies. Special attention will be given to the achieved status in the determination of the measurable quantities of black holes, i.e. mass and spin.

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## Discussion

MÜLLER: There exist other black hole solutions like Gravastar with dark energy core and Holostar with stringy core. There is currently no possibility to distinguish Schwarzschild BH, Gravastar, Holostar.

SCHARTEL: The observers point of view: It ends if the event horizon can be proven.

BOSCH-RAMON: Are there evidences or hints of black hole spin energy extraction?

SCHARTEL: XMM-Newton has made several observations, which require spin energy extraction to explain the profile of the broad iron emission line. Examples are: the observation of MCG-6-30-15 in July 2000 published by J. Wilms *et al.* (2001, MNRAS 328, L27) or the observation of XTE J1650-500 (in outburst) in September 2001, which was published by Miller *et al.* (2002, ApJ 570, L69).

LIPUNOV: (Comment:) In my opinion, the most strong arguments for BH existence will be after discovery binary BH with radiopulsar and detection of gravitational waves from merging BH in experiments like LIGO, LISA.

MCBREEN: (Comment:) I would like to point out that there is good evidence for spin-up and spin-down of Kerr Black Holes in the time profiles of some Gamma-Ray Bursts.