

Multi-Messenger astrophysics with Athena

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In this talk we will present the scientific objectives and design status of Athena - the Advanced Telescope for High-ENergy Astrophysics. Athena was selected in June 2014 as the second L-class (flagship) mission in ESA's Cosmic Vision 2015-25 plan, with a launch foreseen in early 2030s. It is an X-ray observatory designed to address the two questions of Cosmic Vision science theme 'The Hot and Energetic Universe': a) How does ordinary matter assemble into the large-scale structures we see today? and; b) How do black holes grow and shape the Universe? It will achieve these goals by studying a wide range of astrophysical phenomena: the formation and evolution of groups and clusters of galaxies; the chemical evolution of hot baryons; feedback effects of active galactic nuclei; missing baryons thought to populate the intergalactic medium; the formation and early growth of black holes; and the accretion by super-massive black holes through cosmic time, among others.

We will particularly discuss the role that Athena will play in the new era of multi-messenger astrophysics, and the natural synergies with ground-based and space-borne Gravitational Wave facilities to study merging super-massive black holes, their environment and afterglows, as well as the X-ray afterglows of NS-NS merging events.

Obvious synergies between Athena and LISA (the 3rd L-class missions of ESA's Cosmic Vision Programme) will come from the fact that both missions will observe the most energetic and extreme objects in the universe, the supermassive black holes theorized to be powering the Active Galactic Nuclei (AGN) and to be, when in a binary system, the loudest sources of low-frequency gravitational waves in the Universe. Athena can detect the emission from hot gas around the massive black holes during a merger, whereas LISA will detect the gravitational waves emitted during the inspiral, merger and ringdown.