

Desarrollo tecnológico y preparación para la explotación científica de Athena X-IFU

The project ‘Technological development and preparation for the scientific exploitation of Athena X-IFU’ was created with the aim of contributing to the development of the X-IFU instrument, an X-ray calorimeter spectrograph integrated into the European Space Agency’s NewAthena space telescope, through the development of the scientific simulator and advanced spectral and temporal analysis tools.

Our science focuses on high-mass X-ray binary systems. The study of these systems, consisting of a star much more massive than the Sun and a compact object (white dwarf, neutron star or black hole), allows us to deepen our understanding of stellar winds, matter accretion processes under extreme conditions and stellar evolution. Characterising these systems is essential, as they are the progenitors of the gravitational waves predicted by General Relativity more than a hundred years ago and recently detected.

Over the years, we have worked on developing the X-IFU detector simulator in collaboration with IFCA (Santander) and the University of Erlangen-Nuremberg FAU (Germany), as well as useful tools for high-resolution spectral analysis in X-rays. Thanks to these efforts, we have implemented an elliptical response model that accurately reproduces the response of the superconducting sensors that will capture X-ray photons in the NewAthena telescope. We have developed advanced algorithms for the automatic detection of emission lines, identification of high or low emission states, and detection of orbital modulations, which have been successfully applied to sources such as Centaurus X-3 and 4U0114+65, with the results published in high-impact scientific journals.

The project ‘Technological development and preparation for the scientific exploitation of Athena X-IFU’ has contributed to developing and improving the capabilities of the X-IFU instrument simulator and to developing advanced tools for high-resolution spectral analysis in X-rays. With this work, it is hoped that the research group will be in the best possible position for the future exploitation of observations from the NewAthena telescope.

Authors: Prof. RODES ROCA, Jose Joaquín (University of Alicante); Prof. TORREJÓN VÁZQUEZ, Jose Miguel (University of Alicante); PLANELLES VILLALVA, Jessica (PDI); Dr SANJURJO FERRÍN, Graciela (University of Alicante)

Presenters: PLANELLES VILLALVA, Jessica (PDI); Dr SANJURJO FERRÍN, Graciela (University of Alicante)

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