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## The Cryogenic AntiCoincidence detector for ATHENA X-IFU: the project status.

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The Athena observatory is the 2nd large class ESA mission to be launched on 2031 at L2 orbit. One of the two on board instruments is X-IFU, a TES based kilo-pixels array able to perform simultaneous high grade energy spectroscopy (2.5eV@7keV) and imaging over the 5' FoV.

The X-IFU sensitivity is degraded by primary particles background (bkg) of both solar and Galactic Cosmic Rays origin, and secondary electrons produced by primaries interacting with the materials surrounding the detector. Results from studies regarding the GCR component performed by Geant4 simulations address the necessity to use bkg reduction techniques to enable several key science topics.

This is feasible by combining an active Cryogenic AntiCoincidence detector (CryoAC) and a passive electron shielding to reach the required residual bkg of 5E-3 cts/cm<sup>2</sup>/s/keV.

The CryoAC is a 4 pixels detector made of Silicon suspended absorbers sensed by a network of Ir:Au TESes, and placed at a distance < 1 mm below the TES-array.

On February 2019 the I-PRR for X-IFU and related sub-systems has been held.

Regarding the CryoAC, we reported the instrument definition, its design concept and related trade-off studies between the present baseline (4 pixels) against a monolithic solution (1 pixel).

Further, at the Adoption planned on 2021, it is requested by ESA that critical subsystems must reach TRL5 by Demonstration Model (DM) to enable critical technologies.

The DM CryoAC is made of a 1 cm<sup>2</sup> bridges-suspended absorber, 500 um thick, sensed by 96 Ir:Au TES in parallel connected. On April 2019 the DM has been delivered to the FPA team at SRON (NL) for the "integrated chipset test" whose aim is to understand how one detector affects the other one.

Here we will provide an overview of the CryoAC program, starting with some details on the bkg assessment having impacts on the CryoAC design, then we continue with its design concept including electronics, and the DM results, to conclude with programmatic aspects.

### Less than 5 years of experience since completion of Ph.D

N

### Student (Ph.D., M.Sc. or B.Sc.)

N

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