

# MACACO II results and further upgrades

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## Abstract

The IRIS group at IFIC (Valencia) is developing a three-layer Compton camera for treatment monitoring in ion beam therapy. The system is composed of three detector planes, each made of a LaBr<sub>3</sub> monolithic crystal coupled to a SiPM array. The first prototype (MACACO), was fully characterised in the laboratory and in beam tests demonstrating the feasibility of the proposed technology. A second prototype (MACACO II), has been developed to improve performance. The SiPM arrays have been replaced by newer models, leading to an improved detector energy resolution which translates into a higher spatial resolution of the telescope. In addition, the image reconstruction code has been improved with an accurate model of the sensitivity matrix. Furthermore, a new spectral reconstruction algorithm for two plane Compton cameras has been developed with good results. Beyond laboratory tests, the device has been assessed in two accelerator facilities: at CNA, Sevilla, and at KVI-CART, Groningen, showing a significant improvement with respect to the first version. In parallel, performance characterization tests have been carried out with different types of components (SiPM arrays from different manufacturers or the readout electronics TOFPET2 from PETSys) in order to improve performance towards a third prototype.

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