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## The MINOS micromegas-TPC vertex tracker for in-beam spectroscopy of very exotic nuclei

CEA-Irfu developed a new device, called MINOS (MagIc Numbers Off Stability), to improve both the luminosity and the sensitivity of proton-induced knockout reactions experiments performing in-beam spectroscopy of very exotic nuclei produced at fragmentation facilities (such as RIBF at RIKEN in Japan and FAIR in Germany). Its innovative approach is that it uses a compact annular 300 mm long Time Projection Chamber (TPC) surrounding a thick cylindrical liquid hydrogen target. The TPC reconstructs the recoiled proton tracks in order to locate the interaction vertex inside the target, allowing a proper Doppler correction to emitted gamma rays measured in a dedicated detector. A bulk-micromegas, segmented in 4608x2 mm<sup>2</sup> pads, is used to readout the TPC which is filled with an Argon-iC<sub>4</sub>H<sub>10</sub>(3%)-CF<sub>4</sub>(15%) gas mixture. The electronics is composed of 20 analog front-end cards. Each of these is read out by a newly designed digital board, called the Feminos, which is compatible with the AFTER and AGET chips. The internal and external TPC field cages are made of 2 mm thick Rohacell cylinders on which are glued 50 microns thick Kapton foils printed with 381 copper strips. The MINOS device will be described, with a focus on the design choices and performances of the TPC characterized in laboratory with cosmic rays. We will report on the recent full in-beam validation of the TPC at HIMAC (Japan) where a better than 4 mm vertex resolution was obtained with a 180 and 350 Mev/u <sup>20</sup>Ne ion-beam impinging on 0.5 mm thick CH<sub>2</sub> and C targets.

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