

Construction and commissioning of the AstroBox2 detector

A. Saastamoinen, B.T. Roeder, A. Spiridon, R.E. Tribble, E. Pollaco,¹ L. Trache,² and G. Pascovici²

¹IRFU, CEA Saclay, Gif-sur-Yvette, France

²National Institute of Physics and Nuclear Engineering, Bucharest-Magurele, Romania

In past years we have done several studies of beta-delayed proton emitters of astrophysical interest by implantation technique [1-5]. It was realized rather soon that shrinking the physical detection volume of elements in Si detector did not reduce the beta-background enough to create background free spectrum in the typical energy range of astrophysically interesting decays

($E_p \sim$ few hundred keV). To further reduce the beta-background a novel detector, AstroBox, based on Micro Pattern Gas Amplifier Detector (MPGAD) was developed [6].

We have built an upgraded version, AstroBox2, described in the previous annual report [7]. The design of the detector field cage and other related components, as well as the custom vacuum chamber was completed and the chamber was built at the Cyclotron Institute in spring/summer 2014. The detector chamber includes many novel features, including possibility to scan all the detector pads with an X-ray source while keeping the system under clean conditions.

In October we received three detector elements, two 256 μm thick and one 128 μm thick. The first 256 μm element, shown in Fig. 1., has been thoroughly characterized with ^{55}Fe X-ray

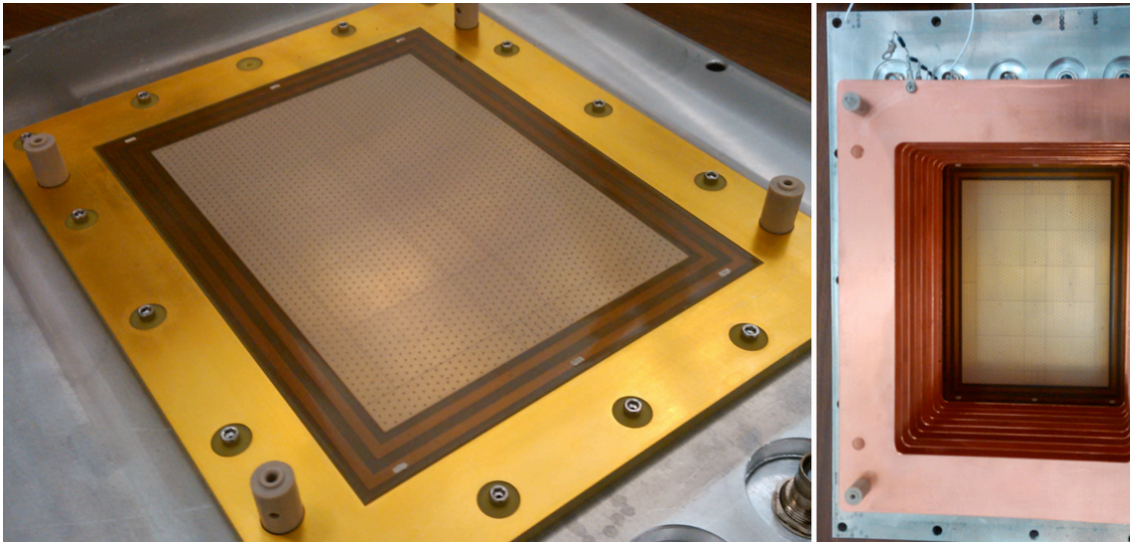


FIG. 1. Left: The first AstroBox2 MicroMEGAS detector element mounted into the detector flange. Right: The detector and the field cage from top (cathode removed for visibility)

source, a

mixed alpha source (^{148}Gd , ^{239}Pu , ^{241}Am , ^{244}Cm), and a pulser. Typical resolution of 13% is achieved for the 6 keV X-ray from ^{55}Fe (Fig. 2.), and about 3% for the 5.5 MeV alphas from ^{241}Am (Fig. 3). The detector will be tested online in April 2015.

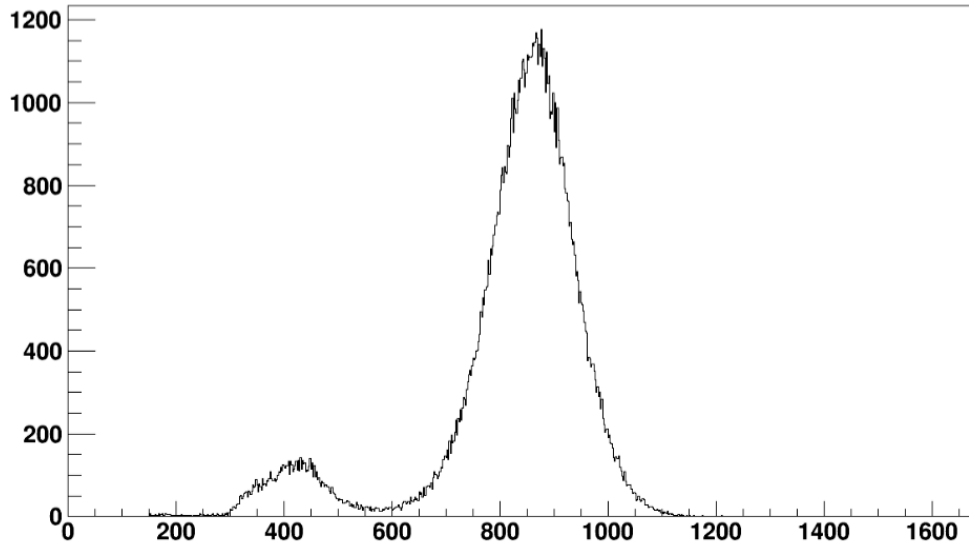


FIG. 2. An X-ray spectrum from ^{55}Fe source.

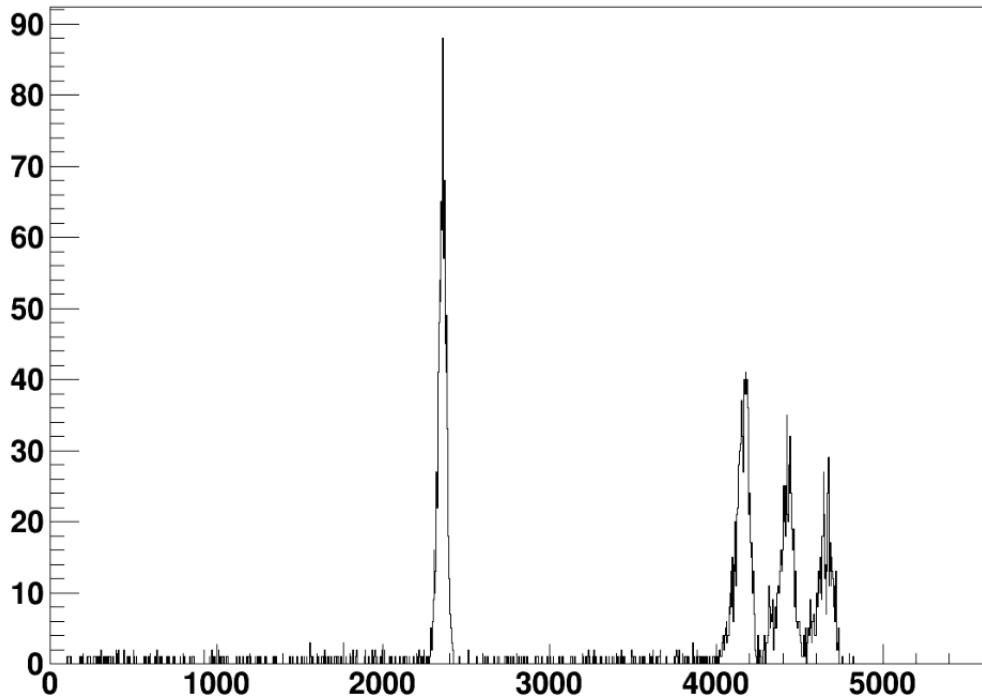


FIG. 3. Spectrum from a tightly collimated, mixed (^{148}Gd , ^{239}Pu , ^{241}Am , ^{244}Cm) alpha source.

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