INTRODUCTION

The GALILEO project at the Legnaro National Laboratory (LNL) consists currently of 25 hyper-pure high-efficiency n-type germanium detectors (HPGe) coupled to the EUCLIDES charged particle array and the Neutron Wall array [1,2]. The performances of the multi-detector arrays are usually given in terms of the so-called detection limit, which is a function of the photopeak detection efficiency and of the resolving power of the array. In order to maximize the resolving power of a detector it is necessary to increase the peak-to-total ratio P/T [3].

NEW READOUT SYSTEM

BGO detectors are mainly made up of two parts, marked in the Fig.1:
- Crystal scintillators;
- Photomultiplier tubes;

The crystal scintillators are 8 in each anti-Compton shield and convert high-energy photons into the near-visible light range thanks to their physical properties [6]. The light produced via the interaction of the gamma-ray will be converted into an electronic signal via the photomultiplier tubes (PMT).

The HPGe detectors, inherited by the experimental apparatus GASP [4], are surrounded by anti-Compton shields to improve the P/T [5]. These anti-Compton shields are scintillators and are made of crystals of Bismuth Germanium Oxide, commonly abbreviated as BGOs. The role of anti-Compton shields is operatively that if the BGOs detect events in temporal proximity of a collected datum by the HPGe detector, the latter will be discarded and not used in the subsequent analysis data, because it is part of a Compton scattered event.

In this way, the efficiency of the array decreases but leading an optimal P/T coefficient of about 50%.
TEST OF THE BGO SHIELDS

A gamma-ray source of $^{137}$Cs was used to align the various thresholds of the crystals. This was made tuning each spectrum acquired from the PMTs.

Figure 3 shows a spectrum of one BGO detector in the last commissioning test. The first peak on the left is the noise, the rest correspond to Compton-scattered events.

In summary, to improve the performance of the HPGe detectors were used the anti-Compton shields. The newly built readout system permits to align the thresholds of each BGO crystal, and to obtain the P/T coefficient of array near the 50%. Currently 25 BGO detectors fully operational with the buffer readout system are placed in the GALILEO array.

Fig. 3. Spectrum of an anti-Compton shield BGO of GALILEO.