
MEASUREMENT OF THE PHOSWICH CLUSTER PROPERTIES BASED ON THE TEST AT THE γ ELBE FACILITY

Barbara Wasilewska, Institute of Nuclear Physics, Polish Academy of Sciences, Kraków, Poland

B. Wasilewska¹, A. Mentana², P. Bednarczyk¹, C. Boiano², S. Brambilla², F. Camera^{2,3}, M. Ciemała¹, O. Dorvaux⁵, A. Giaz²,
M. Jastrzab¹, S. Kihel⁵, M. Kmiecik¹, A. Maj¹, R. Massarczyk⁶, I. Matea⁷, I. Mazumdar⁸, P. Napiorkowski⁹, S. Riboldi³,
B. Sowicki¹, R. Schwengner⁶, M. Ziębliński¹

1 IFJ PAN Cracow, Poland

2 INFN Milano, Italy

3 University of Milano, Italy

4 GANIL Caen, France

5 IPHC Strasbourg, France

6 HZDR Dresden, Germany

7 IPN Orsay, France

8 TIFR Mumbai, India

9 SLCJ Warsaw, Poland

Photon Array for studies with Radioactive Ion and Stable beams (PARIS) is a calorimeter which will be employed in measurements of high energy gamma-rays. The array will consist of up to more than 200 detectors in phoswich configuration, where two scintillators are optically connected and have a common PMT. In this case 2" x 2" x 2" crystals of novel material of LaBr₃(Ce) are backed by 2" x 2" x 6" standard NaI(Tl) scintillator and are arranged in clusters of nine.

In December 2013 the first cluster of PARIS was assembled and tested at the γ ELBE facility at HZDR, Dresden, Germany, where experiments of a Nuclear Resonance Fluorescence (NRF) can be carried out. In this case the target of choice was ¹¹B + C (natural) which was irradiated with Bremsstrahlung of energies up to 16 MeV from the converted electron beam. The reaction should have made possible detecting discrete gammas of energies 2125, 4444, 5020, 7285, 8917 and 15100 keV. During the experiment the performances of each detector separately, as well as, the whole cluster were evaluated. Data were taken using BaFPro collecting the information about amplitude, charge and time for each event. Notably, the matrices of amplitude vs charge make separating signals of LaBr₃ (Ce) from NaI(Tl) possible.

Recently, new developments have been made enabling precise evaluation of the detectors properties. The scheme of the setup will be presented along with the results showing detectors' energy and time resolution, linearities and efficiency.