Development of Low Noise / Low Power Preamplifier for the Readout of Inorganic Scintillators and its Mass Production Test System

Presenting Irakli Keshelashvili\textsuperscript{a}, Fabian Mueller\textsuperscript{a}, Werner Erni\textsuperscript{a}, Michael Steinacher\textsuperscript{a}, Bernd Krusche\textsuperscript{a}

\textsuperscript{a}University of Basel, Klingelbergstrasse 82, Basel, 4056, Switzerland

During past decade, more and more so called “trigger less” experiments are coming/planned. This in fact brings us to face much higher count-rate for each individual detector. Moreover energy frontier is also extended and the energy and time resolution of each system is also increased.

Photomultiplier tubes like vacuum-photo-tetrode (VPTT) and semiconductor sensors like avalanche photo diode (APD) have very big advantage in comparison to multi dynode PMT’s, they can operate in very strong magnetic field, but they also have big disadvantage – very low gain. We have developed, so called Basel-LNP (low noise / low power) preamplifier which is basically a very sensitive charge to voltage converter/amplifier which is discreet element device to use with low amplification photosensors.

The inorganic scintillators (PWO II) which will be used in PANDA (at GSI) detector forward end-cup and CsI crystals of Crystal Barrel (at ELSA) detector will be equipped with Basel-LNP preamplifiers. This extensive modular development allows as to easily modify configurations to meet different needs/requirements of this experiments. In case of PANDA EMC forward end-cup, very high dynamic range (~15'000) and high count-rate (max. 1MHz) is expected. Whereas for Crystal Barrel experiment the main challenge is to compensate gain by changing of APD HV using temperature feed-back information of APD sensor.

Development and all test procedures will be reported done by our group during past several years in the University of Basel. In addition, we report the results from the testing of the first 1500 channels of the preamplifiers for the Crystal Barrel experiment using a specially developed automatized test system.

* corresponding author e-mail: I.keshelashvili@unibas.ch