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Digital coincidence spectrometer with two HPGe detectors constructed at IFJ PAN –design, construction and early results

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The use of digital coincidence opens new perspectives for low background gamma rays measurements. The basic idea is that two detectors are collecting independently gamma spectra, but spectrum is not stored as one dimensioned array of counts but two-dimensional array where data on each registered photon energy is registered together with information on its arrival with several nanoseconds precision. During off-line analyses of such spectrum different numeric filters can be applied to search for coincidences between different parts of each spectra, for example annihilation line at one spectrometer with certain gamma line of a beta plus emitter registered on another detector. The coincidences between any gamma ray line of certain radionuclide and X-ray line of daughter are also possible. The constructed by us system uses two HPGe detectors: coaxial in vertical cryostat and planar in L shape cryostat. They are shielded by one 5 cm thick standard lead shield. Spectra are collected using CAEN digitizer and they are registered using build-in software. The off-line analyses are made by means of purposely written our own code. At moment of writing abstract the system is not operating yet. First it will be applied for attempt of ^{85}Kr determination on environmental levels (collected in a cryogenic charcoal trap) using gamma-X ray coincidences and ^{22}Na in air using 511 keV/1275 keV coincidences. The first results will be presented during Conference.

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Primary authors: Mr JANOWSKI, Janowski (The Henryk Niewodniczanski Institute of Nuclear Physics, Polish Academy of Sciences (IFJ PAN), AGH Technical University Krakow); Prof. MIETELSKI, Jerzy-Wojciech (The Henryk Niewodniczanski Institute of Nuclear Physics, Polish Academy of Sciences (IFJ PAN))

Co-author: Dr KIEREPKO, Renata (The Henryk Niewodniczanski Institute of Nuclear Physics, Polish Academy of Sciences (IFJ PAN))

Presenter: Prof. MIETELSKI, Jerzy-Wojciech (The Henryk Niewodniczanski Institute of Nuclear Physics, Polish Academy of Sciences (IFJ PAN))

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