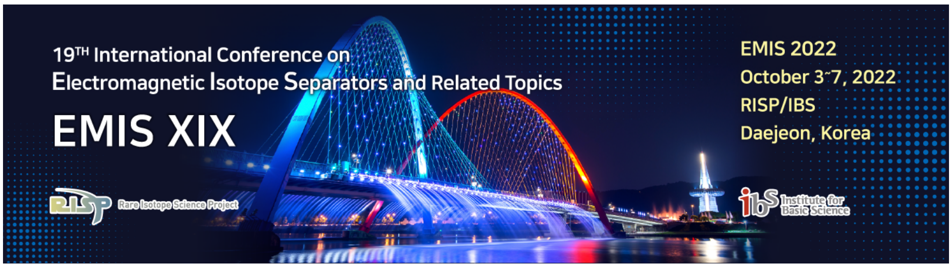


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# New fast-timing $\gamma$-ray detector system in Korea: KHALA

*Friday, 7 October 2022 11:10 (20 minutes)*

The lifetimes of excited nuclear states play an important role in nuclear structure. These many-body quantum dynamic information are crucial particularly for understanding the nuclear shell structure. For instance, the excited states of nuclei near magic numbers provide evidence of the changes in shell structure from a single-particle nature to collective nature. Therefore, the measurement of the lifetimes of the excited state may give a perspective on overall features of nucleon interactions and subsequently the shell and shape structure of nuclei.

Recently, exotic rare-isotope beams far off the $\beta$-stability line were available, and the various state-of-the-art detectors and relevant electronics were developed. With such advances in technology, the fast-timing measurement has attracted much attention. The timing measurement requires more sophisticated and difficult technique compared to the energy measurement. A $LaBr_3$(Ce) inorganic scintillator is one of the optimal materials for this scientific purpose because of its great light yield and very short time response. For this reason, the construction of the $LaBr_3$(Ce) detector system became popular in the field and FATIMA [1] is one of the successful cases.

In Korea, a new fast-timing $\gamma$-ray detector system, Korea High-resolution Array of $LABr_3$(Ce) –KHALA, is being developed to measure such a short lifetime which is typically in a range of a few tens of picoseconds to a few nanoseconds. The KHALA is comprised of 36 $LaBr_3$(Ce) scintillator detectors with a 1.5-inch diameter and 1.5-inch height crystal size, particularly dedicated for the fast-timing response. In this talk, the development of the KHALA and its performances such as the energy resolution, timing response, and detection efficiency will be introduced in detail. Moreover, future experimental plans will be also discussed.

[1] M. Rudigier et al., Nucl. Inst. and Meth. in Phys. Res. A 969, 163967 (2020).

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