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Current Status of The Segmented La-GPS Scintillation Crystal Detector as a New Implant-β Detection Tool at Fragmentation Facilities

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The rapid neutron capture (*r*-) process holds a significant amount of interest as a means for nucleosynthesis of elements in astrophysical environments. From the perspectives of both nuclear physics and astrophysics, ongoing efforts are being carried out to better understand it. Such efforts include the measurements of β-decay and delayed neutron emissions of the *r*-process elements in order to obtain a more accurate input for the calculations in relation to its theoretical modelling [1].
Typically, β-γ spectroscopies are conducted with implantation detectors at fragmentation facilities such as the implementation of the Silicon Strip Detectors (SSDs) at Radioactive Isotope Beam Factory (RIBF). However, SSDs are incapable of fast timing response for the purpose of neutron time-of-flight measurements of the delayed neutron emissions. Therefore, to address this limitation, the Yttrium Orthosilicate (YSO) segmented scintillation crystal detector ($Z \approx 35$, $\rho \approx 4.5$ g/cm³) was developed. The characteristics of the YSO allow for 80% correlation efficiency with 3mm correlation radius between implant events and β-decay events [2].
The success of the YSO prompted the development of the Lanthanum-enriched Gadolinium Pyrosilicate (La-GPS) segmented scintillation crystal detector ($Z \approx 51$, $\rho \approx 5.2$ g/cm³) to achieve better correlation radius and higher energy resolution compared to the YSO, and faster timing response than SSDs [3]. This presentation will then showcase the current status of the La-GPS scintillation crystal detector of (1.5 x 1.5)mm arranged into a 32 x 32 array in the *x*-*y* plane.

References

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Research field of your presentation

Experimental Low-energy nuclear physics

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