Bound and unbound states of ^{115}Xe

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Introduction

In this article the study of exotic decay mode of the neutron deficient nucleus A$\sim$115 close to the proton drip-line will be presented. Many interesting properties are observed in the nuclei close to drip line. These properties are the disappearance of magic numbers[1], appearence of PIGMY resonance[2], exotic decay[3], exotic cluster structure [4] etc. ^{115}Cs is located close to the proton drip line with a half-life of 1.03(10)sec [4]. Due to large Q value for beta-decay of this drip-line nucleus, the daughter nucleus may populate above particle(s) thresold. For ^{115}Cs: Q_{EC} is 8.96(10) MeV. In case of ^{115}Xe: S_p, S_{2p}, S_α are 3.15(15)MeV, -4.89(3)MeV and 2.506(14)MeV respectively. So many decay

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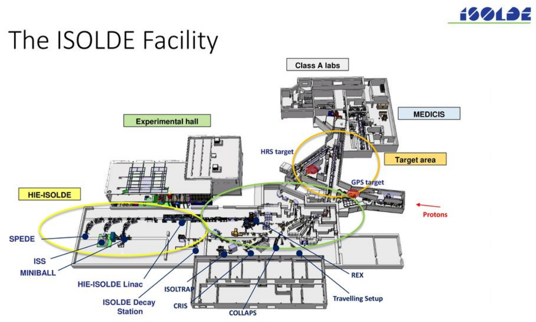

FIG. 1: ISOLDE facility at Cern.

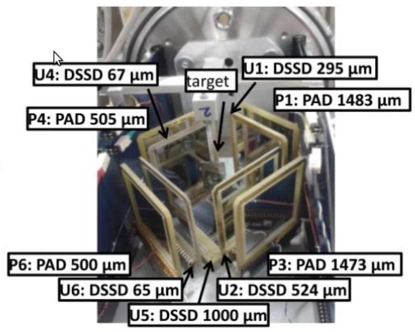

FIG. 2: Arrangement of DSSD and PAD detectors set-up during experiment (IS545)

channels open:$\beta-\gamma$, $\beta-p$, $\beta-p-\gamma$, $\beta-2p$, $\beta-2p-\gamma$.Therefore beta-delayed particle emission take place.We have calculated the delayed proton branch and delayed alpha branch for this isotope are 0.64% and 0.23% resspectively[5].

Experimental Setup

This experiment was performed at ISOLDE, CERN. The pulses of 1 GeV protons from PS Booster were impacted on a Lanthanum Carbaide target and after fragmentation/spallation reaction radioactive beams were produced and from there ^{115}Cs was separated and by mass spectrometer (GPS) which is shown in figure 1. This secondary with energy upto 60 keV /nucleon beam was transferred to the experimental area and implanted projected on a carbon target. In experimental room there are 5 DSSD (Double Sided Silicon Strip Detectors), 4 PAD detectors behind the DSSD(behind the lower DSSD there is no PAD) as shown in figure 2. Four High-Purity Germanium(HPGe) clover detectors surround the chamber to provide high Gamma-Ray detection efficiency.

Data analysis and Spectrum

For the calibration of silicon detectors some standard Alpha sources were used which were ^{148}Gd$_{64}$, ^{241}Am$_{95}$, ^{239}Pu$_{94}$, ^{249}Cf$_{98}$. And for the calibration of HPGe a standard gamma source ^{152}Eu was used. After the calibration of the detectors, we have produced the beta gated gamma spectrum and pure backgroud spectrum. Figure 3 shows the the overlay of these two gamma spectra and which shows gamma-lines of daughter nucleus(^{115}Xe). In this presentation, we shall report also unbound states of ^{115}Xe from measurement of delayed particles decay [5,6].

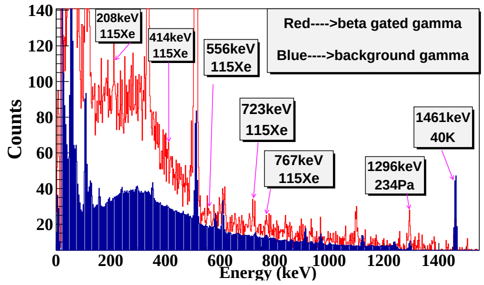

FIG. 3: Overlayed beta gated gamma spectrum with background gamma spectrum.

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