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Lifetime Measurement of the 0_3^+ State in ^{120}Sn

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The semi-magic $^{120}_{50}\mathrm{Sn}_{70}$ lies in the neutron mid-shell among the other stable Sn isotopes, where $2p-2h$ intruder configurations built on excited 0^+ states have been recently observed. However, the transition rates from the 0_3^+ state in ^{120}Sn are not well-known because its lifetime only has a lower limit of 6 ps, which prevents a firm assignment or exclusion of the 0_3^+ state into the intruder band.

The first thermal neutron capture experiment, ^{119}Sn(n,γ^{many})^{120}Sn, was performed at the Institut Laue-Langevin, where the world's highest-flux thermal neutron beam was delivered at 10^8 n/cm^2/s at the target position on an isotopically enriched ^{119}Sn target. Low-spin states in ^{120}Sn were populated up to $S_n = 9.1$ MeV, and the decaying gamma-ray cascades were detected with the Fission Product Prompt Gamma-ray Spectrometer (FIPPS) comprised of eight Compton-suppressed HPGe clovers coupled to an array of 15 $\mathrm{LaBr_3}$(Ce) scintillation detectors. The $\mathrm{LaBr_3}$(Ce) scintillators, which were used for gamma-ray detection and lifetime measurement using the Mirror Symmetric Centroid Difference (MSCD) method, have fast timing responses and are ideal for extracting lifetimes between 10 and a few hundred ps.

In total, there are 4×10^9 counts in the $\gamma\gamma\gamma$ cube where two $\mathrm{LaBr_3}$(Ce) events were in coincidence with one HPGe. Preliminary lifetimes in ^{120}Sn using the MSCD technique will be reported.

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