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A Search for the ^{12}Be Isomeric State

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Spectroscopy of neutron unbound ^{13}Be can provide insights into the unexpected structural changes of neutron-rich nuclei around $N=8$. Invariant mass spectra from past experiments do not agree on the location of the $1/2^-$ p-wave that is expected to strongly decay to a long-lived 0_2^+ state in ^{12}Be with a mean lifetime of 331(12) ns. Its decay scheme has a 20% branch through the $^{12}\text{Be}(2^+)$ to the ground state, giving a 2.1 MeV gamma ray, and 80% for an E0 transition giving two 511 keV gamma rays from positron annihilation. An experiment was performed by the MoNA Collaboration at the National Superconducting Cyclotron Laboratory of Michigan State University to study the one neutron decay of ^{13}Be to this isomeric state in ^{12}Be . The experiment featured a new telescope to identify the ^{12}Be fragment, and utilizes 96 modules of the MoNA-LISA neutron array as well as the gamma ray detector CAESAR. The latter was placed around the telescope due to the long lifetime of the expected isomer. An overview and preliminary results of the experiment will be presented and discussed.

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