Abstract Submitted
for the DNP17 Meeting of
The American Physical Society

**Investigating the Inversion of $^{9}$He**[1] GERARD OWENS-FRYAR, Rensselaer Polytechnic Institute/MSU, DANIEL VOTAW, DAYAH CHRISMAN, MSU/NSCL, PAUL GUEYE, Hampton University/MSU, MONA COLLABORATION — The one-neutron unbound $^{9}$He nucleus is in a region of the nuclear chart, the light island of inversion, where the ground-state structure is expected to be inverted relative to the typical shell model structure: the inverted ground state is expected to be a $1/2^{+}$ state indicating that the valence neutron is in the $s_{1/2}$ orbital, in comparison to the standard shell model structure which would suggest a $1/2^{-}$ state due to the valence $p_{1/2}$ neutron. Past experiments have struggled to provide a consistent and accurate picture of the (energy) level structure of $^{9}$He. One of the difficulties of previous experiments is that the reactions have populated mainly one state and therefore were unable to simultaneously constraint both states. Experiment e15091 was conducted in the summer 2017 to measure the invariant mass spectrum of $^{9}$He from two different reactions: $^{11}$Be(-2p) and $^{12}$B(-3p). The $^{11}$Be reaction strongly populates the $1/2^{+}$ state while the $^{12}$B reaction strongly populates the $1/2^{-}$ state. The experiment used the MoNA-LISA-Sweeper setup of the National Superconducting Cyclotron Laboratory (NSCL) in Lansing, Michigan. Preliminary analysis of the data, including detector calibration and particle identification, will be presented.

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Date submitted: 28 Jul 2017 Electronic form version 1.4