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$2\nu\beta\beta$ of ^{96}Zr to the First Excited 0^+ State SEAN FINCH, WERNER TORNOW, Duke University and TUNL — A progress report is presented on our work to measure the double-beta decay of ^{96}Zr to the first excited 0^+ state of ^{96}Mo. Such measurements provide valuable test cases for $2\nu\beta\beta$ nuclear matrix element calculations, which in turn are used to tune $0\nu\beta\beta$ nuclear matrix element calculations. After undergoing double-beta decay, the excited 0^+ state decays via the $0^+ \rightarrow 2^+ \rightarrow 0^+$ decay sequence in the daughter nucleus, emitting two coincident γ rays. These two γ rays are detected in coincidence by two HPGe detectors sandwiching the ^{96}Zr sample, with a NaI veto in anti-coincidence. This experimental apparatus, located at the Kimballton Underground Research Facility (KURF), has previously been used to measure the $T_{1/2}$ of ^{100}Mo and ^{150}Nd to the first excited 0^+ states. The present experiment is an attempt to detect this decay mode in a third nuclide. The experiment is hindered by our small sample mass of 17.9 grams of enriched ^{96}Zr, which has a natural abundance 2.8%. Preliminary results will be shown.

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