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Production of High-Purity Germanium Ingots for Detector-Grade Crystal growth HAO MEI, University of South Dakota, CUBED COL-LABORATION — The growth of high-purity germanium crystals is needed for planned DUSEL experiments. Many steps are required convert bulk germanium into a gamma-ray spectrometer. The electronic-grade polycrystalline germanium starting material is zone refined in a synthetic silica crucible inside a graphite boat enclosed within a quartz tube filled with hydrogen. Ingots of impure germanium approximately 60 cm long are held horizontally in a graphite boat as a radio frequency (RF) coil surrounding the quartz tube melts a small vertical section of the ingot. As the ingot is slowly drawn through the fixed coil, the trailing solid is more pure than the adjacent liquid. Therefore, the last liquid to solidify at the ingot's end contains an increased impurity level. Since the impurities concentrate in the molten section, the repeated and sequential melting from one end towards the final end, sweeps the impurities to the ingot's final end. This sweeping operation is repeated many times until the impurities are concentrated at one end of the ingot. This final end is then removed to leave the desired higher-purity portion. Production rates can be increased by drawing multiple ingots through multiple coils within one hydrogenfilled quartz tube. Purity is then determined by a Hall Effect measurement.During year one, a currently available 30 KVA Induction Generator will be used to develop the zone technique above ground.

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