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Silicon detector for neutron beta decay measurements with PERC

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The PERC facility is currently under construction at the FRM II in Garching, Germany. It will serve as an intense and clean source of electrons and protons from neutron beta decay for precision studies. It aims to improve the measurements of the properties of weak interaction by one order of magnitude and to search for new physics via new effective couplings.

PERC's central component is a 12 m long superconducting magnet system that has been delivered. It hosts an 8 m long decay region in a uniform field. An additional high-field region selects the phase space of electrons and protons, which can reach the downstream detector to minimize systematic uncertainties.

The downstream detector and the two upstream backscattering detectors will initially be scintillation detectors with (silicon) photomultiplier readout. In a later upgrade, the downstream detector will be replaced by a pixelated silicon PIN-detector. This new detector is 2mm thick. The entrance window consists of a 100nm thin p+ doped layer with a 300nm thin aluminium grid on top and the readout side is 500nm of pixelated n+ doping.

The detector is scheduled to be delivered in the fourth quarter of 2023, and we are presenting the first results of its characterization.

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