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Mu2e upgrade physics reach optimization studies for the PIP-II era (15' + 5')

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The Mu2e experiment at Fermilab is being designed to study the coherent neutrino-less conversion of a negative muon into an electron in the field of a nucleus. This process has an extremely low probability in the Standard Model, and its observation would provide unambiguous evidence for BSM physics. The current Mu2e design aims to reach a single-event-sensitivity of about $2.5 \cdot 10^{-17}$ and will probe effective new physics mass scales in the $10^3 - 10^4$ TeV range, well beyond the reach of the LHC. This work studies how the sensitivity might be further improved with a second generation experiment using an upgraded proton beam from the PIP-II project, which will be capable of providing MW beams to Fermilab experiments later in the next decade. We will examine the maximum beam power that can be tolerated for beam energies in the 0.5 – 8 GeV range. We will also explore variations in the geometry in the region of the production target using the MARS15 code.

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