

New Developments in BSM Particle Searches at MicroBooNE

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The MicroBooNE Liquid Argon Time Projection Chamber (LArTPC) was situated along two neutrino beam lines, making it a powerful tool for Beyond the Standard Model analyses. Located 8° off-axis from the 120 GeV Neutrinos from the Main Injector (NuMI) beam, MicroBooNE benefited from a reduced neutrino background, enabling sensitive searches for rare meson decays into BSM particles.

The MicroBooNE BSM program continues to set world-leading limits across a broad spectrum of BSM models with e^+e^- , $+^-$, and 0 final states. By expanding the signal simulation to consider mesons decaying in flight rather than only at rest, the latest Higgs Portal Scalar e^+e^- result doubles the expected scalar flux at the MicroBooNE detector and sets the world's strongest limit on the model for scalar masses between 110 and 155 MeV. Heavy Neutral Lepton (HNL) limits set by MicroBooNE are the most stringent for HNL masses between 35 and 175 MeV, and include the first direct constraint of the 0 decay channel. The use of timing to select a sample rich in long-lived BSM particles was first demonstrated in by MicroBooNE in a search for HNLs decaying to . Recent advancements in timing resolution, down to the nanosecond scale, enables future analyses to select between beam bunches, significantly reducing background rates and increasing sensitivity. MeV scale reconstruction allows MicroBooNE to set blip-based millicharged particle limits, and will assist in rejecting neutral pions, a dominant background process for many BSM searches.

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