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Preliminary Design of a CsI(Tl) Calorimeter for Muonium-to-Antimuonium Conversion Experiment

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The Muonium-to-Antimuonium Conversion Experiment (MACE) is proposed to search for this charged lepton flavour violating process and obtain a two orders of magnitude higher sensitivity than the MACS experiment at PSI in 1996, taking advantage of recent technique developments.One clear signature of the conversion is given by positron produced by antimuonium decay. This paper introduce a parameterized near-4π-coverage calorimeter for probing e^+e^- annihilation in MACE, the energy resolution of which reaches 8% at 511 keV. Detailed Monte-Carlo simulation with Geant4 toolkit and MACE offline software is presented for geometry optimization, coincidence system design, background estimation, and benchmark detector validation.

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