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Sun-Mo-Or2-01: Electromagnetic Design of Ioffe Magnet for Project 8

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Project 8 aims at measurement of the absolute neutrino mass using tritium, by precisely measuring the energies of the beta-decay electrons in the high-energy tail of the spectrum. A trap for atomic tritium is envisaged using a Ioffe magnet, which is discussed in this paper. The fundamental requirement is to trap atomic tritium within a large microwave cavity for cyclotron radiation emission spectroscopy. The cavity also acts as the bobbin of the Ioffe magnet. The Ioffe magnet is a high-multipolarity magnet constructed with precision to ensure its insignificant contribution to the field inside the cavity except near the walls. The central field is an electron trap produced by a normal conducting solenoid magnet. This paper discusses the electromagnetic design, optimization, and parametric studies of the Ioffe magnet, and it explores the feasibility of constructing and testing this magnet using BNL's direct-wind magnet technology.

Authors: LINDMAN, A (Johannes Gutenberg University, Mainz); REIMANN, R. (Johannes Gutenberg University, Mainz); ROBERTSON, R.G.H. (CENPA and Department of Physics, University of Washington); WEISS, T. (Wright Laboratory and Department of Physics, Yale University); TEOTIA, Vikas (Brookhaven National Laboratory)

Presenter: TEOTIA, Vikas (Brookhaven National Laboratory)

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