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A Solution to Inductive Power Coupling in a Time-Cycled Atom Trap for Beta Decay LIAM LAWRENCE, McMaster University, JOHN BEHR, MELISSA ANHOLM, JAMES MCNEIL, TRIUMF — The TRINAT group at TRIUMF uses lasers and magnetic fields to confine, cool, and polarize a cloud of beta-decaying neutral alkali atoms to test weak force asymmetry. To alternate between trapping and polarizing the atoms, the trapping magnetic field must be switched on and off. This time-changing magnetic field, created by a pair of co-axial coils, produces eddy currents—and consequentially resistive heating—in nearby conductors. This heating may cause undesirable effects, including damage to the delicate pellicle mirrors which are to be used in future experiments. Previously, the current waveform in the coils consisted of two periods of a sinusoid during the on time of the trapping field (this reduces leftover field from eddy currents during the polarization time). We have calculated the relative power coupled to the pellicle mirror mount for various waveforms, and determined that using half a period of a lower-frequency sinusoid couples an order of magnitude less power than the original waveform, and approximately 2 times less than a trapezoidal wave. We measured the lifetime of the trap subject to this new waveform and found it is possible to achieve a lifetime comparable to that of a continuous trap, our best result differing by less than 5 percent.

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