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Overview of Recent Upgrades to the Madison Dynamo Experiment ELLIOT KAPLAN, CARY FOREST, ROCH KENDRICK, CARLOS PARADA, ZANE TAYLOR, Univ. of Wisc.–Madison, MARK NORNBERG, PPPL, ERIK SPENCE, ETH–Zurich — The Madison Dynamo Experiment is designed to function as a simply-connected, homogeneous dynamo. A turbulent flow of liquid sodium is driven by two counter-rotating impellers in a one-meter-diameter sphere. The experiment is presently undergoing upgrades to it's magnetic diagnostics and seed field coils to better refine the measurement of turbulence driven currents. A high current amplifier, to drive the experiment's seed magnetic field coils, is under development that will be able to generate a >200 gauss sinusoidal magnetic field in the .1-5 Hz frequency band. The current wave form is generated by applying pulse-width-modulated square waves to a set of four IGBT switches in an H Bridge configuration which allows the current to flow in either direction through the external field coils. The duty cycle is determined through one of two methods: An analog circuit generates a reference sine wave and a modulating triangle wave in an intersective PWM circuit; a Labview Realtime control that uses a PID feedback loop to calculate the duty cycle. This is replacing the present system of a single IGBT turning on a DC current through the coils. The primary physics goal for this hardware is to measure the electrical skin depth of large scale magnetic perturbation and unravel the nature of the turbulent resistivity of the experiment.

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