Switching Experiments on a Current-Biased MgB$_2$ Josephson Junction$^1$ ROBERTO RAMOS, JEROME MLACK, JOSEPH LAMBERT, STEVEN CARABELLO, Department of Physics, Drexel University — As the current through a Josephson junction is increased, the voltage across the junction switches from zero to a finite voltage. This is analogous to the escape of a phase particle originally oscillating with a plasma frequency $\omega$ in a washboard potential well, to the running state. We report results of our switching experiments on current-biased MgB$_2$/I/Pb thin film junctions through a broad range of sub-Kelvin temperatures. Our results exhibit features in the escape rate $\Gamma$ suggestive of substructure within the pi gap of MgB$_2$, which is consistent with our recent work demonstrating substructure within the pi and sigma superconducting energy gaps of MgB$_2$. Upon irradiation of microwaves with frequencies resonant with the plasma frequency, we observe enhancement of escape rates, which is a clear demonstration of microwave resonant activation in these devices. By manipulating frequency and power, we demonstrate good control over the escape of the phase particle.

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