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Missing energy analysis of vacuum breakdowns in a high power X-band system

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After fabrication, high-gradient structures need to be conditioned to provide high gradients of 100 MV/m, and sustain even higher gradients at the copper surfaces, while achieving a breakdown rate below $3 * 10^{-7}$ BD/pulse. Estimating the energy unaccounted for during a breakdown may be important in order to avoid damage to the structure as well as to understand the breakdown process itself. We are establishing an energy balance analysis of individual breakdowns and compare it to the overall conditioning process.
After refining the calibrations for the direct RF power measurements, we are performing simulations and calorimetry measurements of the power lost by dissipation in the copper.
Future work will seek to apply CST PIC-Solver analysis to investigate the "Dark Current"and "Breakdown Current".
All these factors affect how well we can measure the missing energy during a breakdown. The first results of this analysis will be shown.

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