Eddy Current Optimization of Thermal Deposited Silver Film for Nuclear Microprobe Applications

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The purpose of this experiment was to determine which pattern, if any, was the optimal design to minimize eddy current propagation in silver tubing for nuclear microprobes. This experiment has applications in wide range of fields in particle physics and beyond. The silver was thermally deposited on batches of 1" x 3” glass microscope slides. These slides were then etched with various patterns using a diamond scribe. Each silver slide was then placed in a custom built testing rig with 2 small copper inductors, connected to a two channel oscilloscope. The inductors were situated in the center of a 1” electrically isolated area on the slide. A 7kHz triangle signal was generated by a signal generator and then amplified to 1.2 V. The signal was then passed through one inductor. The receiving coil, calibrated to normal background interference, was then used to measure the phase shift due to the silver film. The data was collected from the experiment using an oscilloscope to measure the change in amplitude and phase. As expected, the solid silver surface generated the most current and in turn the generated the highest change in amplitude and frequency. The tube with the most scratches generated the least amount of feedback. However, several patterns with fewer scratches also generated significantly lower amounts of interference. It was found that the hypothesis was supported. When eddy currents were not allowed to propagate on large areas, the interference was reduced. This corresponds to the lower lag during image rastering.