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Improving Efficiency of Diamond Thin Film Deposition In an ECR Sputter Source MICHAEL NEWBY, JERRY ROSS, Princeton Plasma Physics Laboratory, ANDREW ZWICKER, PRINCETON PLASMA PHYSICS LABORATORY COLLABORATION — Having some of the most extreme physical properties of any material, diamond thin films are used to reinforce vacuum windows, as a semiconductor in electronic devices and to coat knives among other things. In our experiment, a 5 KW microwave ignites Argon or Hydrogen-Methane gas to create plasma at a low pressure which sputters a graphite target to create a diamond thin film on silicon substrates. The microwave matching system used to do this has an output frequency of 2.45GHz which is sent through a SmartMatch AX3060 impedance matching tuner. The SmartMatch uses three tuning stubs to match the load impedance and optimize the microwave power into the plasma. Problems arise when the SmartMatch tunes to something other than the plasma, such as the o-rings at the quartz window vacuum interface. This project focused on troubleshooting these issues by enabling the control of and communication with the microwave matching system.

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