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Production and Application of Magnetized Plasmas Generated by Rotating Magnetic Fields JOHN SLOUGH, MSNW LLC — The use of rotating magnetic fields (RMF), where ω lies between the ion and electron gyro frequency in the RMF field, readily generates both a high density plasma (n $\sim 10^{19}$ – 10^{20} m^{-3}), and large plasma currents (10-50 kA). These large currents in turn produce a significant confining magnetic field. Previously RMF current drive has been studied using dielectric vacuum chambers with the RMF coils located outside the chamber. Methods for studying RMF current drive in conducting metal vacuum chambers have been developed by moving the RMF coils inside the vacuum chamber. The experiments to be described employed three distinct RMF coil geometries with each demonstrating a potential application. The first coil set was successfully deployed in a plasma thruster configuration. The second coil set demonstrated the ability to couple energy to plasma tied to a static dipole magnet suspended inside the RMF coils in a manner suitable for plasma processing applications. The third coil set demonstrated that RMF current drive can be achieved outside the RMF coils with the coils fully immersed in the center of the RMF driven plasma. This coil geometry is relevant to the Plasma Magnet propulsion concept, where RMF currents would be driven at large distances from a central spacecraft creating a mini-magnetosphere. For all three RMF coil sets, plasma diagnostics reveal the formation of a stable, high β plasma.

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