Abstract Submitted
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New Technique of AC drive in Tokamak using Permanent Magnets[1] JACKSON MATTEUCCI, Duke University, ALI ZOLFAGHARI, Princeton Plasma Physics Labs — This study investigates a new technique of capturing the rotational energy of alternating permanent magnets in order to inductively drive an alternating current in tokamak devices. The use of rotational motion bypasses many of the pitfalls seen in typical inductive and non-inductive current drives. Three specific designs are presented and assessed in the following criteria: the profile of the current generated, the RMS loop voltage generated as compared to the RMS power required to maintain it, the system's feasibility from an engineering perspective. All of the analysis has been done under ideal E&M conditions using the Maxwell 3D program. Preliminary results indicate that it is possible to produce an over 99% purely toroidal current with a RMS $d\Phi/dt$ of over 150 Tm^2/s, driven by 20MW or less of rotational power. The proposed mechanism demonstrates several key advantages including an efficient mechanical drive system, the generation of pure toroidal currents, and the potential for a quasi-steady state fusion reactor. The following quantities are presented for various driving frequencies and magnet strengths: plasma current generated, loop voltage, torque and power required.

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