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This is a preparatory research problem into the possibility of utilizing Faraday's law of induction, similar to the Biot Savart law, to generate a pickup coil current from the current drive and plasma particle current in the stellarator tokamak. The question was phrased: what current will be introduced from Faraday's law of induction from a 15 mega-amperes (MA) ten meter loop, in a secondary coaxial loop of 1,000,000 turns with a diameter of ten meters. The current is ramped to maximum value every ten seconds. The pickup loop is five meters away.

The answer is phrased: based on Faraday's law of induction, the induced electromotive force (or EMF) in the secondary loop is approximately 5.23 mega-volts (MV). The specific current induced depends on the total resistance. (A niobium tin or YBCO superconducting wire is proposed with resistance of zero. $Z = 0$)

The underlying physics requires knowing the induced EMF, which is determined by the mutual inductance between the loops. The magnetic field B along the axis of the primary loop at a distance z is:

$$B = \frac{\mu_0 I r^2}{2(r^2 + z^2)^{\frac{3}{2}}} \quad (0.1)$$

The magnetic flux Φ through the secondary loop is $B \times Area$. Mutual inductance M is defined as the flux linkage per unit current.

$$M = \frac{N\Phi}{I} = \frac{N\mu_0 r^2 (\pi r_x^2)}{2(r^2 + z^2)^{\frac{3}{2}}} \quad (0.2)$$

The induced EMF is found from the rate of change of the current (a changing or non-static current is necessary which means the plasma must be ignited in a pulsed fashion).

$$\frac{\partial I}{\partial t} = \frac{15,000,000A}{10s} = 1.5 \times 10^6 \frac{A}{s} \quad (0.3)$$

$$EMF = -M \frac{\partial I}{\partial t} \quad (0.4)$$

This generates a solution of 5,234,148V or 5.23MV. When combined with a zero resistance current carrying wire with negligible Andreev transmission points of contact at the N-S boundary, the result is a massive power calculation.

General Physics is interested in presenting a novel electrical current generation paradigm beyond steam cycle generation in the electrical fusion device. It is our hope to provide a MHD pickup coil of HTS to provide non-negligible power.