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MATERIAL AND ELECTROMAGNETIC PROPERTIES OF FARADAY SHIELDS FOR ION CYCLOTRON HEATING ANTENNAS*

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ABSTRACT

The Faraday shields for ion cyclotron antennas must transmit magnetic waves and adsorb little rf power. To investigate these properties, we have constructed 27 Faraday shields in many configurations, including chevrons, tubes, straps, concentric rings, various layered shields, conventionally leafed straps, and replicas of the Faraday shields for ASDEX, the Joint European Torus (JET), TEXTOR, and Alcator-C. We have measured the magnetic flux and observed loading at various operating resistances by using dielectric sheets or magnetic-coupled loads. Each Faraday shield effects a net change in the characteristic inductance of the antenna, resulting in a reduction of wave coupling. However, the load experienced by the antenna is not always reduced because the Faraday shield itself acts as a load. We differentiate between these effects experimentally. The net result of the study is that the Faraday shields now in use cost up to a factor of 50% of coupling. This, of course, reduces the power handling capability by 50% as well. However, configurations exist that are easily cooled and result in a reduction of less than 5% in loading.

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