

TIEMF in unirradiated Cu cored MI cables

Rafael Vila, Eric Richard Hodgson

CIEMAT- Fusion Nat. Lab Avda Complutense 22 28040 MADRID SPAIN

Radiation and temperature induced currents and voltages in MI cables, (generally termed RIEMF and TIEMF respectively) have recently been the object of discussion and study. The present problem is due to the observed generation of a voltage along the centre conductor of MI cables due to temperature gradients, particularly large for Cu cored cables. This will make it difficult, if not impossible, to separate radiation and temperature effects from the required signal for the ITER magnetic diagnostic coils in a radiation field. It has been confirmed that these voltages are generated in well localized regions of the cable, suggesting that some inhomogeneity is present, however no geometric variations have been observed by X-ray imaging of the cable core and sheath. Furthermore no annealing or modification of the sensitive regions has been observed for heating up to 550 C, indicating that the problem was not related to work hardening effects in the copper.

Work has now been started to examine in detail the sensitive regions of the Cu cored MI cables. As a first step single strand bare Cu wire of comparable diameter was examined, and found to produce no such voltages. In addition it had been observed that cables with stainless steel core material also produced no TIEMF. Sections of the Cu core were extracted from the MI cable, and lengths from the bare Cu wire, have been prepared and examined by optical and scanning electron microscopy. An important result is the observation of severe surface damage for the Cu wire extracted from the MI cable, compared with the highly polished surface of the bare Cu wire. These observations, together with the impurity analysis, and comparison with the stainless steel cable will be presented.