

Nanocrystalline Alloy Toroidal Core used for Current Transformer and Electric Current Sensing in the Electromagnetic Energy Harvesting Context

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ABSTRACT

Current Transformers (CT) with toroidal core are widely used as instrument transformers or current sensing devices in electrical power systems. In these applications the ferromagnetic core holds and concentrates a small sample of the leakage flux from the primary line, because unlike all the others transformers, the mutual flux in the CT is smaller than the leakage flux due to the demagnetizing effect of its secondary winding current. In practice, commercial clamp ammeters are used for measuring currents at 60 Hz or 50 Hz frequency. But when a good power quality measurement is required, the accuracy of CT and current sensing devices depends strongly on the magnetic permeability of the material used for magnetic cores. Nowadays nanocrystalline alloys for CT are the best magnetic materials to provide accurate measurements. In this work an analytic approach and a computational analysis of CT with soft magnetic material toroidal core used for current sensing and energy harvesting are presented. The analytical approach is based on the magnetic circuit theory and the computational analysis uses software based on finite element method.