EFFECTS OF SHIELD SLOTS ON INPUT IMPEDANCE OF SHIELDED COIL

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The inductance of a coil in the close proximity of a conducting surface is reduced from its inductance remote from the conductor due to the reduction in the rate of change of flux linkage caused by the current in the conductor. This effect causes the inductance of a shielded coil to be reduced when the shield is present. To lessen the reduction in inductance of a shielded coil, thin slots are cut in the shield to interrupt the induced shield current. On this basis, the effects of slots in the outer conductor of a shielded coil are investigated. A portion of the center conductor of a shorted coaxial cavity is removed and replaced with a ferrite-cored coil. The input impedance of the shielded load as "seen" from one end of the cavity is measured. Longitudinal slots are cut in the shield and the input impedance measurement is repeated. The experiment is repeated for various loads that differ in numbers of turns, core materials, and core radii. Several shields are constructed and the effects of the number of slots on the input impedance of the load structure are investigated.

A method is presented for accurate measurement of the input impedance of the shielded loads. The impedance of the shielded coil is measured by a network analyzer through an adapter. The input impedances of three different lengths of shorted coaxial cavities are measured through the adapter and these data are used to de-embed the impedance of the shielded coil from that of the adapter-shielded-coil structure.

The utility of slotted-shield coils in a loaded dipole over an infinite conducting plane is assessed. The shielded coils are deployed in a dipole antenna that has the same radius as the outer shield of the load. A circumferential slit is cut in the outer shield of the load to allow coupling between the current in the coil and the current on the surface of the dipole. The slit is placed far from the coil so that only the TEM component of the coupling field is relevant. The measured input impedance of the shielded coil is used in a hybrid integral equation/measurement method to determine the input impedance of the loaded dipole. It is assumed that the narrow slots do not significantly alter the current on the exterior surface of the dipole. The presence of the slots are accounted for in the physical measurements of the load and the input impedance of the dipole but are not represented in the model for the exterior region of the loaded dipole. Data for the input impedance of dipoles loaded with various shielded loads are presented and compared.

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2. B - Fields and Waves

3. (a)

4. C - Contributed Paper

5. No special instructions