ABSTRACT

Two different approaches employing the Method of Moments (MoM) and SPICE for field coupling analysis of multiconductor transmission lines in the vicinity of complex structures are proposed. In the first method, Telegrapher's Iterative Coupling Equations (TICE) are derived by modifying Telegrapher's coupling equations with additional distributed voltage and current sources to enforce the tangential electric field boundary condition and continuity equation along the wire bundles in presence of complex structures. The proposed technique is based on a perturbation theory with the quasi-static current distributions on the transmission line still being the dominant term.

The second method addresses the mass wire bundles near complex structures. In this method, the current on each transmission line is decomposed into push-push and push-pull mode currents. The former accounts for the interactions between the surrounding structure and the wire bundle, whereas the latter is responsible for the current perturbation due to interactions among the transmission lines forming the bundle. The push-push mode current is found by solving a test wire located at the center of the transmission line bundle in presence of the surrounding structure. However, the push-pull mode current is computed iteratively (and rather rapidly) by taking the center transmission line as the return conductor/reference.

The surrounding structure is modeled via the Method of Moments and SPICE is used to generate an equivalent circuit model of the multiconductor transmission lines extracted via the PEEC method.