Application of the Discrete Hankel Transform to Cylindrical Waveguides Structures (EGSR_45)

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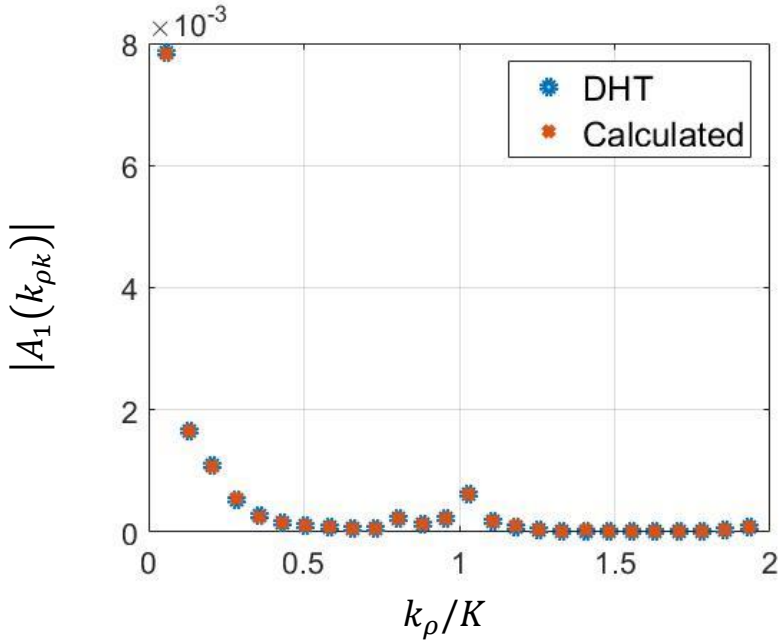
In this work, we apply the Discrete Hankel Transform (DHT) to solve electromagnetic problems that involve cylindrical waveguide structures. We demonstrate the DHT's use by deriving the modal wave matrix for inhomogeneous isotropic electrical sheet impedance inside cylindrical waveguide. The modal wave matrix is written in terms of the DHT transformation matrices which are known in closed-form. The modal wave matrix relates the forward and the backward modal coefficients below the sheet impedance to the forward and the backward modal coefficients above the sheet impedance. Having such matrix can be very helpful to realize certain bianisotropic boundary conditions, by simply three cascaded isotropic electrical sheets.

In the figure below, the modal wave matrix has been verified by comparing the magnitude of the forward modal coefficients evaluated by two methods: Modal wave matrix (labeled DHT), and the standard method which is the modes orthogonality (labeled: calculated).



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