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On the Use of the Lossy Transmission Line Theory for the SRF Characterization

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In this work, an alternative method to compute the effect of losses on superconductors based on the *Lossy Transmission Line Theory* is introduced rigorously. In contrast to the application of the well-known perturbative methods at the dielectric-superconductor interface to obtain the equivalent surface currents, this new approach lies in analyzing the decaying propagative waves along the superconductive media by means of a lossy transmission line equivalent circuit. This kind of analysis becomes crucial when trying to characterize rigorously the EM behavior of *Superconducting RadioFrequency* (SRF) devices, in particular SRF cavities, turning out to be a possible way to generalize SRF studies. Thus, the characteristic effects of both good conductors and superconductors could be described all at once by means of this approach as particular cases. In order to illustrate all these aspects, some basic examples are presented while emphasizing the graphical capabilities of this analysis when representing the underlying theory using resources of Complex Analysis, as well as its usefulness to uncover possible practical uses of SRF.

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