

Time-Varying Electromagnetic Systems

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Traditional electromagnetic devices such as antennas or microwave filters are mostly linear and time-invariant systems. The time-domain response of such a device can be obtained through Fourier transform of its frequency-domain response. The so-called time-varying electromagnetic system is formed when part of the boundary condition becomes time-varying. The time-domain response of such a system is now dependent on the variation of the boundary condition in time and can no longer be obtained by performing Fourier transforms. An antenna or a filter connected to a source/load impedance that varies in time is a typical example of time-varying electromagnetic systems. In this talk, we will discuss about this new perspective of time-varying electromagnetic systems and how to analyze and understand the behaviors of such systems. Several examples are used to demonstrate that this new concept can indeed lead to new applications with “out of box” performance compared to classical, time-invariant electromagnetic devices.