



Plastic Dielectric Constant Measurement using TDR and Copper Foil Tape

Neil (Bing) Hao

03-Dec-2019

<http://uniteng.com>

Part I: Introduction

In my article Time-domain reflectometer (TDR) theory and implementation [1], I illustrated the PCB dielectric constant measurement using TDR. The same measurement procedure can also be used for plastics such as polypropylene (PP), polycarbonate (PC), acrylonitrile butadiene styrene (ABS), etc.

For RF design, the plastic dielectric constant control become crucial when the RF circuit does not have sufficient clearance from plastic structure. Plastic structure near the antenna causes that the resonant frequency shifts to a lower frequency about 100Mhz to 200Mhz in general [2]. This kind of situation become common due to small product dimension and flexible adhesive antenna using wildly. One way to deal with the resonant frequency shifting is wideband antenna. However, the batter solution is measuring plastic dielectric constant and then modeling the antenna with the necessary plastic structure, casing, etc. More accurate resonant frequency always can be calculated using more accurate model and the accurate dielectric constant is always required by accurate model. Therefore, it is meaningful to discuss the plastic dielectric constant measurement using TDR.

Part II: Dielectric Constant of Common Polymers

Typical Dielectric Constants:

Polymer Name	Dielectric Constant [3]
Polycarbonate (PC) High Heat	2.8-3.8
Acrylonitrile Butadiene Styrene(ABS)	2.7- 3.2
ABS/PC Blend - Acrylonitrile Butadiene Styrene/Polycarbonate Blend	2.9-3.2