

## UWB THROUGH-THE-WALL PROPAGATION

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### ABSTRACT

The propagation of ultrawideband (UWB) signals in indoor environments is an important issue with significant impacts on the future direction and scope of UWB technology. The propagation of UWB signals is governed, among other things, by the properties of materials in the propagation medium. The information on electromagnetic properties of construction materials in the UWB frequency range would provide valuable insights into the appreciation of the capabilities and limitations of UWB technology. Although electromagnetic properties of certain construction materials over relatively narrow bandwidths in GHz frequency ranges are available, ultrawideband characterisation of most typical construction materials for UWB communication purposes has not been reported. In narrowband wireless communications, only the magnitude of insertion loss has been the quantity of interest. But for UWB signals, in addition to the magnitude, the phase information is an equally important factor that needs to be accounted for. In fact, UWB signals not only suffer attenuation when propagating through walls, but also suffer distortion due to the dispersive properties of the walls. This research examines propagation through typical construction materials and their ultrawideband characterisation. Ten commonly used construction materials are chosen for this investigation. Results for the dielectric constant and loss tangent of the materials over the UWB frequency range are presented. Accuracy of the measured results is discussed and distortions of UWB signals due to the dispersive properties of wall materials are addressed.