# Dielectric Characterization of Porcine Model for Subcutaneous Wireless Telemetry

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According to the National Health Council, 157 million Americans will be living with one or more chronic diseases by the year 2020. In many cases, these diseases are preventable with continuous monitoring of physiological factors such as glucose and cholesterol. Subsequently, continuous health monitoring technology has been on the rise through the realization of fully implantable biosensor-telemetry systems. In order to incorporate these systems in the daily lives of patients, they must test effectively in the challenges of a biological environment. One challenge is impedance-matching to the lossy tissue surrounding the antenna. Biological tissue produces large variability as permittivity and conductivity are frequency dependent—according to the different cellular dispersions caused by the electric field—as well as temperature and age. It is imperative that these dielectric properties be known and tested before the design. Understanding the tissue properties in a microwave frequency range is essential to the design and testing of implantable antennas.

In this study, we measured the dielectric properties of porcine skin tissue from 200 MHz to 50 GHz utilizing a network analyzer and two probe techniques. *Ex-vivo* samples were collected from multiple porcine subjects and measured in a way to reduce the influence of water loss. Results were compared to findings in the literature. Differences as a result of age, breed, temperature, and size are discussed. Influences on the dielectric properties of the tissue and biocompatibility of the system are considered in the analysis for future antenna design and development.