Short Range Titanium Nitrite Antenna for Subcutaneous Implant

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Chronic diseases (e.g. heart disease, cancer, and diabetes) account for 70% of all deaths per year in the United States. In particular, one in eleven adults in the United States have diabetes and current methods to monitor diabetes include painful finger pricking to get a snapshot of the glucose concentration. Due to the painful finger prick and limited data acquisition timing, there is demand for continuous glucose monitoring which will offer a better insight to glucose trends over months, days, and even minutes. Implantable sensors offer this capability for continuous monitoring via wireless telemetry which can then be viewed and analyzed by both patients and practitioners. The antennas used in these monitors' telemetry systems are made of bio-incompatible materials which must be sealed from the human body, leading to several challenges including antenna miniaturization. There is a need for antennas made of highly conductive, biocompatible materials to utilize the high permittivity tissues to help with antenna miniaturization. The material also needs to the highly durable and slow to degrade. Titanium nitrite (TiN) is a highly conductive, biocompatible, and durable material that is promising to fabricate implantable antennas for subcutaneous applications.

This paper presents the design, simulation, and fabrication of an implantable antenna using TiN as the radiating conductor. The return loss and link budget analysis are presented in this study. The antenna designed operates in the 2.4 GHz ISM Band (2.4 GHz to 2.5 GHz). The antenna performance is validated via *in vitro* (tissue mimicking gels) and *in vivo* (porcine animal model) tests.