Implantable Antennas Using Biocompatible Tinite (TiN)

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The growing elderly population in the US is expected to steadily double from 46 million (age 65+) to 98 million by 2060. The percentage of the US population accounted for by the elderly is projected to grow from 15% to 24% by 2060 (Population Reference Bureau Vol. 70, No. 2). As the elderly population grows, life expectancies lengthen and government subsidized health care budgets become increasingly scrutinized there is a steadily growing demand for medical devices and home health care.

Implantable medical devices represent a part of the third largest subsector (NAICS 334510) of the steadily growing $140 Billion USD Medical Device market. Globally the market value of medical devices is expected to experience double digit growth in developing countries (2016 ITA Medical Devices Top Market Report). These metrics represent a growing demand for medical devices as well as implantable patient monitoring devices. The demand for patient metrics and implantable devices exposes a need for long term solutions to communicate data from inside the body to external devices; a demand for biologically compatible antenna.

When designing an antenna to be implanted inside the human body there must be considerations made to the biocompatibility of the materials being used as well as the communication frequencies to be used. Biocompatibility ensures that the device, once implanted, will stay in the body without harm and without rapid degradation.

In this study, a new material, Titanium Nitride, is explored as a conductor for an implantable antenna. This paper explores the use of TiN on a sapphire substrate and its results when designing an antenna for WMTS, and ISM bands. We will present *in vitro*, *ex vivo* and *in vivo* results.