Wireless Capsule Endoscope - Antenna and Channel Characterization

Authors : Mona Elhelbawy, Mac Gray

Abstract : Traditional wired endoscopy is an intrusive process that requires a long flexible tube to be inserted through the patient's mouth while intravenously sedated. Only images of the upper 4 feet of stomach, colon, and rectum can be captured, leaving the remaining 20 feet of small intestines. Wireless capsule endoscopy offers a painless, non-intrusive, efficient and effective alternative to traditional endoscopy. In wireless capsule endoscopy (WCE), ingestible vitamin-pill-shaped capsules with imaging capabilities, sensors, batteries, and antennas are designed to send images of the gastrointestinal (GI) tract in real time. In this paper, we investigate the radiation performance and specific absorption rate (SAR) of a miniature conformal capsule antenna operating at the Medical Implant Communication Service (MICS) frequency band in the human body. We perform numerical simulations using the finite element method based commercial software, high-frequency structure simulator (HFSS) and the ANSYS human body model (HBM). We also investigate the in-body channel characteristics between the implantable capsule and an external antenna placed on the surface of the human body.

Keywords : IEEE 802.15.6, MICS, SAR, WCE

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