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Abstract Subject Area(s)
["in vivo","Human studies","RF/Microwave","Biological and medical applications"]
Summary
Introduction: We investigated the effects of antenna-to-tissue spacing on port reflection characteristics for a 6 GHz open-ended waveguide and horn antenna. Experimentally derived responses from a human forearm were compared with simulated responses from a three-layer tissue model. **Methods:** Written and informed consent was obtained prior to participation (Health Canada REB 2021-012H). One healthy male completed testing (age = 24 years, height = 186 cm, mass = 99 kg). The participant rested supine for 30 min with the right arm extended on a table next to the bed (air temperature = 20°C, relative humidity = 27%). The medial half of the volar forearm was exposed to the antenna. Effects of separation distance between the antenna aperture and skin surface on the reflection coefficient were evaluated for an open-ended waveguide and horn antenna. Measured distances ranged from 25-100 mm (7 equal increments) spanning one-half to two wavelengths at 6 GHz. Skin and subcutaneous adipose tissue (SAT) layer thicknesses were measured with B-mode ultrasound with a 20 MHz probe. Simulated responses were evaluated for a 3-layer tissue model in Sim4Life with skin (1.5 mm), SAT (2.3 mm), and muscle (60 mm), thickness values derived from ultrasound measurements. **Results and conclusion:** Examination of the measured responses from the human forearm indicates that the horn showed lower reflection coefficients across the range of antenna-tissue separation distances we evaluated compared to the open-ended waveguide. However, across this range the uncertainty (root mean squared error) associated with each separation distance was generally greater for the horn.
Is the work in progress?
Yes

063A
Heath surveillance of workers with active implanted or wearable medical devices exposed to electromagnetic fields
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Abstract Subject Area(s)
["Epidemiology","ELF/LF","RF/Microwave","Occupational exposure","Risk assessment","Standards and public health policy"]
Summary
Occupational exposure to electromagnetic fields (EMF) is nowadays almost ubiquitous: the problem of electromagnetic interference with the functioning of Active Implanted Medical Devices (AIMD) and with Active Wearable Medical Devices (AWMD) can be relevant for an appropriate Health Surveilance(HS) of workers.
A questionnaire-based investigation has been performed in a group of Occupational Physicians (OPs) in the framework of the Italian project BRIC 22 ID 36 project, supported by INAIL. The survey has 15 items, of which nine specifically investigating different

groups of AIMD or AWMD and asking to the OP show many workers with these devices they examined in the past year.
The preliminary results of our questionnaire-based investigation include answers from OPs based on data from a population of about 30-thousands workers. Considering AIMD and EMF health risk at the workplaces, the most relevant situations seem those related to subjects with pacemakers or implanted cardioverter defibrillators, representing the 0.3% of the total number of workers followed by the OPs. Regarding wearable devices, both hormone/drugs pumps and hearing aids are frequent, involving about the 0.5% of the total number of workers visited.
The occupational HS of EMF-exposed workers needs to include a full examination of all the possible conditions resulting in an increased susceptibility to the risk for the workers, in partiular the use of AIMD and AWMD. Our survey among a group of Italian OPs highlights the most common implanted and wearable devices in workers, giving a relevant indication for the prevention of the EMF-related risk.

Is the work in progress?

Yes

065A

Study of the effects of human exposure to 5G millimeter-wave electromagnetic fields: development of an exposure system.

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Abstract Subject Area(s)

["Human studies","MM Waves"]

Summary

A double-blind exposure system is being developed in order to take part to two separate but complementary research projects on the possible health effects of 5G exposure. The first study is a part of NextGEM project which focuses on studying possible effects of 5G exposure on human red blood cells in the mm-wave band; the second is a work package of the 5GINC project which aims at improving knowledge on EMF hypersensitivity in the same range.
Exposure sessions, skin characterization measurements as well as any collection of biological samples will take place in a dedicated room in a controlled environment (temperature, humidity and low EMF levels). The system is designed for a double-blind 5G-like exposure in the millimeter-wave range (FR2). The exposure is localized on the forearm, in an area close to the wrist.
The system is configured to generate a modulated OFDM 5G signal at 26,5 GHz. The modulated signal is realized using a software defined radio (SDR) unit or employing a vector signal generator at an intermediate frequency (IF). The IF signal is moved to the FR2 band, employing a custom designed up-converter and filtered for out of band unwanted signals. The upconverted signal will be amplified using a linear amplification stage. A controllable switch will be placed to allow selection between the two transmitting antennas located just a few centimeters from the exposed area.