

Publication

A multi-band body-worn distributed radio-frequency exposure meter: design, on-body calibration and study of body morphology

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A multi-band Body-Worn Distributed exposure Meter (BWDM) calibrated for simultaneous measurement of the incident power density in 11 telecommunication frequency bands, is proposed. The BWDM consists of 22 textile antennas integrated in a garment and is calibrated on six human subjects in an anechoic chamber to assess its measurement uncertainty in terms of 68% confidence interval of the on-body antenna aperture. It is shown that by using multiple antennas in each frequency band, the uncertainty of the BWDM is 22 dB improved with respect to single nodes on the front and back of the torso and variations are decreased to maximum 8.8 dB. Moreover, deploying single antennas for different body morphologies results in a variation up to 9.3 dB, which is reduced to 3.6 dB using multiple antennas for six subjects with various body mass index values. The designed BWDM, has an improved uncertainty of up to 9.6 dB in comparison to commercially available personal exposure meters calibrated on body. As an application, an average incident power density in the range of $26.7\text{--}90.8 \mu\text{W}/\text{m}^2$ is measured in Ghent, Belgium. The measurements show that commercial personal exposure meters underestimate the actual exposure by a factor of up to 20.6.

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