Wearable AMC Backed Dipole Antenna for WBAN Applications on PDMS Substrate at 2.45 GHz

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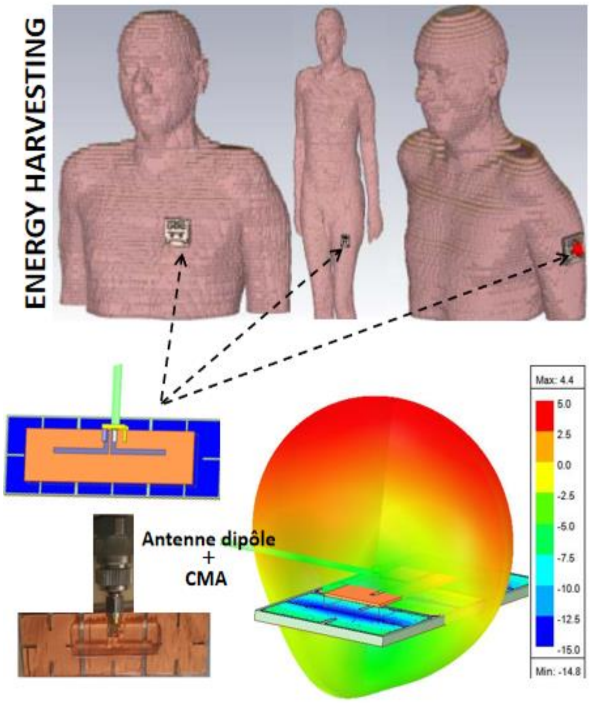

Our preliminary studies on flexible dielectric materials as substrates for GSM and Wi-Fi band antennas, such as kapton and polydimethylsiloxane (PDMS) have received our attention. Therefore, wireless body area network (WBAN) applications rely on the material's elasticity, flexibility, water resistance, and ability to withstand harsh environments. Furthermore, most of flexible substrate are susceptible to environmental influence, particularly when operating in severe environments or inclement weather. Polymer like PDMS is therefore suggested in my thesis as an alternative material that could be compliant with the aforementioned working environment. In this part, a 2.45 GHz dipole antenna upon a high impedance surface (HIS) specifically the artificial magnetic conductor reflector (AMC), due to their capability in suppressing the surface waves, improving the antenna's performances and to prevent the absorption of electromagnetic waves by the human body, is given and investigated for WBAN application using PDMS as substrate. The presented design has a maximum dimension of 90 x 30 mm^2. This latter performs satisfactorily in terms of gain (5.04 dBi), efficiency (around 82.6%), satisfied front to back ratio (FBR) and reflection coefficient (S11 = -30.66 dB) at 2.45 GHz comparing to the dipole without AMC.
In order to guarantee user safety, the design, specifically the AMC, has also decreased radiation coming from the body (seen and proved through radiation pattern, front to back ratio (FBR) and specific absorption rate (SAR)). This figure above depicts the simulated antenna and its fabrication design.
On the basis of the findings and compliance with safety requirements, the proposed antenna design can be considered a future excellent alternative for WBAN devices. In foreseeable future, the antenna system will be coupled to a single-band rectifier circuit (see the second figure), to convert differential RF input to DC output, designed and fabricated by us in order to study and analyse the amount of recuperated voltage that the rectifier can afford in function of the variation of the distance and the power.