Textile-Integrated Transmitting Unit

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ABSTRACT

In order to reduce weight of small airplanes and consequently decrease their fuel consumption, there is strong motivation to develop and use multifunctional structures. E.g. if textile materials are used, they can fulfil different functions. Apart from their conventional roles of seat or upholstery covers, they can be considered for thermal insulation or mechanical attenuation. In addition, textile materials are nowadays very popular for development of electronic components where they usually play the role of a substrate [1], [2].

In our previous work [2], the attention was focused on the integration of wireless sensor network components into 3 dimensional (3D) knitted fabrics (produced by SINTEX) exploited on a board of a small airplane EV-55 (developed by EVEKTOR) with particular attention on optimized 3D knitted fabric and textile-integrated receiver. In the prepared conference paper, we will describe in detail our textile-integrated transmitting unit, operating in 5.8 GHz ISM band, composed of two main parts: an antenna and a transmitter.

The proposed textile antenna of the unit is based on a substrate integrated waveguide ring-slot antenna concept [3] which provides monopole-like radiation pattern. However, in comparison to that antenna, the proposed antenna is simpler since the shorting vias were removed. So it is also easier for manufacturing. The monopole-like radiation pattern is generated by the excitation of higher order modes in the ring-slot. The antenna was fabricated on 3D knitted fabric.

The transmitter is based on IEEE 802.11a standard. The WLAN UART Serial Port Module OWS451 has UART interface and fully embedded TCP/IP stack and driver. For real-time data acquisition, due to the dimensions and the selected frequency band, it seems to be the best choice. The module itself is controlled via the UART interface by microprocessor ATmega328. The microprocessor is as well connected through A/D converters to a sensor matrix for mechanical pressure sensing. The pressure sensors are piezoresistive fabrics that are made by coating regular fabrics in a conductive polymer.

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