Conformability of a textile antenna for reception of digital television

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Abstract — The performance of a wide band UHF textile antenna for reception of digital television is enhanced by means of a parametric study using FDTD and robustness to variations in substrate height and permittivity is observed. Despite dimensions that are somewhat large for a human body, measurements of the antenna under curvature and in the presence of the body show that the antenna is robust to deformations, showing little change in input response when crumpled, rolled or worn on the chest and arm.

Motivation
- Textile antennas are widely developed for wearable applications as they are light weight, inherently conformal to the human body and comfortable to wear
- Mostly proposed for RF frequencies from 2.45 GHz to 10 GHz
- Only very few narrow-band textile antennas exist in the UHF band and below
- Digital television (DTV) antennas are emerging for laptops and portable media players but only one prototype proposed to receive television on textiles [1]

Performance of new wideband DTV antenna

Optimised Digital Television antenna (Full thickness: 1.21 mm, dielectric constant: 1.208, loss tangent: 0.008)

Influence of the width of block 1 and 3 had a marked effect on the bandwidth (optimum: 7.5 cm)
- All parts of the ground plane were found to have a major influence on the response

Radiation patterns of new DTV antenna are in good agreement with those from [1]

Measurements of the DTV antenna when bent or rolled showed that the input response was little affected by strong curvature

Measured input response of the DTV antenna remained satisfactory when worn on chest and arm

Acknowledgement: The authors wish to thank Dr. Robert Clarke and Dr. Kevin Lees from the National Physical Laboratory, Teddington, UK for their invaluable contribution in the dielectric measurement of the felt used in this project.

Conclusion
- Textile DTV antenna, using felt and high performance conductive textile, showed a wide bandwidth of 76% (376–843 MHz) as opposed to 470–770 MHz in [1]
- Ground plane dimensions were found to have a large influence on the bandwidth
- Antenna is robust to variations in substrate height and permittivity, hence the same design could potentially be applied to other textiles
- Performance maintained when bent, wrapped, worn on chest or rolled around the arm

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