Motivation

- Growing demand for wearable computers from military, medical and commercial sectors.
- Antennas will play a central role for wearable applications and need to be light and comfortable to wear.
- Some textile antennas have appeared recently in the literature.
- Most prototypes are narrow-band and can easily get detuned by the curvature or the presence of the body when worn.
- An antenna with a good match around the centre frequency and a wide bandwidth is therefore desirable to overcome these drawbacks.

The metallic E-shaped patch antenna

The conventional metallic antenna $C_1$ used for reference consists of a patch in the shape of the letter E made in brass and suspended in air above an aluminium ground plane. Initial design was based on dimensions specified in [1], a substrate thickness of 9 mm being considered so that two layers of fleece would subsequently take the place of the air substrate exactly.

Abstract: A textile E-shaped patch antenna for communications in the ISM band (2.4 GHz - 2.5 GHz) is presented. Design was inspired from literature and further tuned using in-house FDTD software. The textile antenna compares reasonably well with the same antenna in conventional technology offering a wide bandwidth of 17% around 2.4 GHz and good radiation patterns.

The textile E-shaped patch antennas

Various textile E-shaped antennas were fabricated at Bristol:
- $T_1$, the same dimensions as $C_1$.
- $T_2$ and $T_3$ with optimised dimensions.

All prototypes use the same highly conductive fabric for the E patch and for the ground plane with a commonly available fleece fabric in between. Conductive fabric is Nora for $T_1$ and $T_2$ and Nice for $T_3$, both fabricated by Shieldex and offering an average shielding effectiveness of 80 dB in the ISM band.

Conclusions

- Although the fabrication process should be refined for repeatability, all textile prototypes covered the ISM band of interest, the bandwidth is therefore desirable to overcome these drawbacks.
- The radiation patterns for all textile antennas were similarly good and compared well with those for the conventional metallic antenna.

References: