Will Whittow

Title: 3D printed antennas, metamaterials, and metasurfaces for microwave applications

Abstract:

My research relates to radiofrequency materials which encapsulates altering the dielectric properties and internal / external shape to design novel antennas, filters, and metamaterials. I have been working in this area for more than a decade and recently led a large multi-institution project on this topic. 3D printing not only allows control of the external shape, the local relative permittivity can be tailored to precise specifications by controlling the internal geometry and hence varying the ratio of air and filament. The local relative permittivity can then be graded in all three axes for extra degrees of freedom. This can be exploited to create flat grade index lenses as well as hybrid lenses. By using specialist printers and careful control of the settings, filaments with relative permittivities up to 15 can be printed. Ceramics can be used for ultra-low loss materials. The talk will demonstrate how these RF materials can be used to create artificial dielectrics, filters, metamaterials, and bespoke antennas. The talk will also cover the challenges of measuring dielectric properties. We have recently developed a bespoke system to measure the properties of anisotropic and (dia)magnetic materials. In addition, we will discuss inkjet printing including on curved surfaces; RFID tags; metasurfaces, intelligent reconfigurable surfaces; and sensing for Bioelectromagnetics in Healthcare.