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Characterisation of material properties for biomedical applications in COST Action MyWAVE

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Accurate knowledge of dielectric properties of materials have been of great research interest with different communities for different applications. In recent years, there have been huge efforts to utilise non-ionizing electromagnetic fields in the treatment of various diseases. In particular it has been shown that devices based on ElectroMagnetic (EM) therapeutic technologies hold great potential for the treatment of different clinical conditions through modification of tissue temperature. Specifically, in HyperThermia (HT) therapy tissue temperature in the body is altered to just above a normal physiological level, making the cancerous tissue more susceptible to chemotherapy and radiotherapy. Whilst, RadioFrequency Ablation (RFA) and MicroWave Ablation (MWA) significantly increase the temperature of the targeted tissue causing total coagulation necrosis in the diseased tissue, while protecting more of the surrounding healthy tissue.
Such treatments still require proper treatment planning procedures such that patients are offered personalized treatment. The design and development of treatment planning requires knowledge of dielectric and thermal tissue properties in order to determine the distribution of absorbed energy and the temperature. Additionally, dielectric and thermal properties are incorporated into computational models to assess the technical risk of a proposed medical device, and to optimise its design, efficacy, and safety. Without adequate dielectric and thermal knowledge, engineers are forced to develop prototype systems and complete costly patient pilot studies in order to gather the same preliminary data, which heavily burdens budgets of small and medium-sized enterprises (SMEs).
COST Action MyWAVE (CA17115) will address these challenges through one of it's working groups with the main objective to further advance EM hyperthermic technologies closer to commercialisation and thus to patient bedside. The associated gaps in knowledge of dielectric properties of biological tissues will be addressed through a holistic approach starting from addressing the large variability in reported data (through the analysis and development of new measurement systems, protocols and method for reporting) to creating a database for such data.