<u>D2.6/ Summary of the deliverable:</u> Test rig for TMM: Characterization of tissue mimicking materials, measurement of mechanical properties and derivation and calibration of material strength models, based on their composition. Extrapolation of the models for the prediction of tissue properties.

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Ultrasound (US), with its thermal and mechanical effects on tissue, especially US cavitation induction, can be harnessed for a variety of therapeutic ultrasound applications. Tissue mimicking materials (TMM) are required for experiments and simulations which investigate these effects. These TMM should be easily adjustable to resemble different tissues in their acoustic, mechanical and thermal properties, as well as their cavitation thresholds. As soft tissue has a high water content, water based gels (hydrogels) appear to be promising candidates for TMM.
Poly(vinyl alcohol) (PVA) hydrogels of different composition were produced, and acoustically and thermally characterized. The acoustic properties measured were sound speed, acoustic attenuation and acoustic impedance, using the finite amplitude insertion substitution method (FAIS), depicted in fig. 1, in a frequency range of 1.5-3.5 MHz at temperatures of 20-45 °C (PVA) and 20 °C (tissue). Thermal characterisation (specific heat capacity, thermal conductivity) was achieved using the Transient Plane Source Method and gathere thermal properties gathered are specific heat capacity and thermal conductivity.
Values of acoustic and thermal parameters for PVA hydrogels were found to be comparable to those of soft tissue.

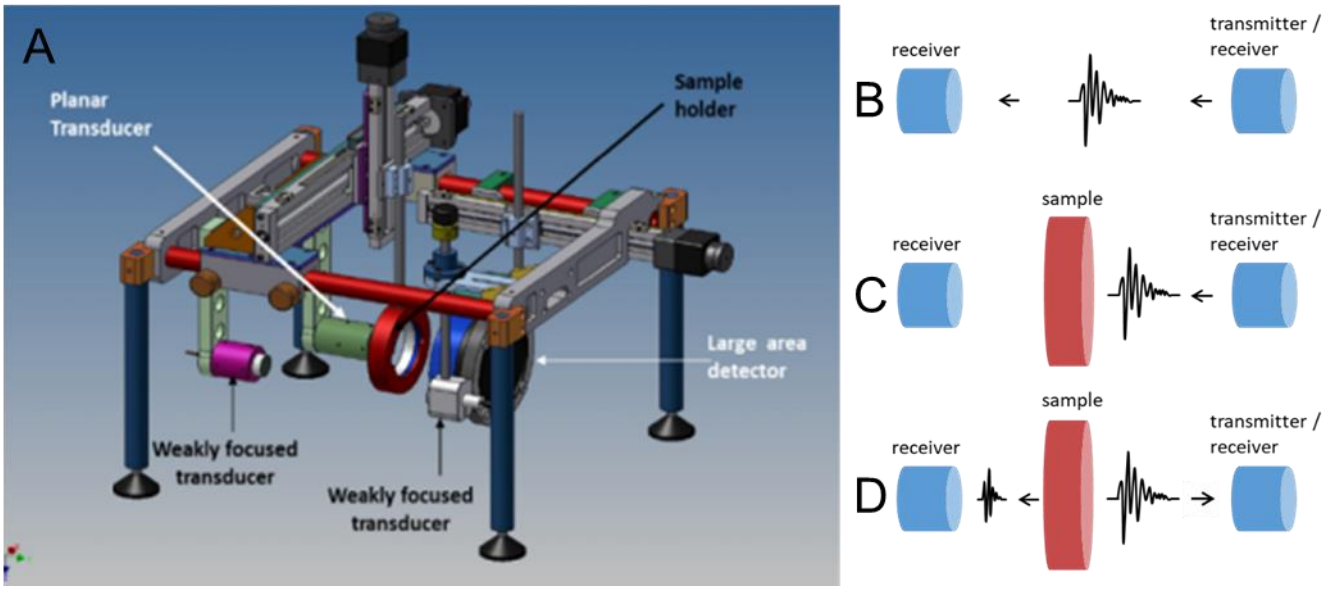

Figure 1: (A): schematic diagram of the measurement system showing the pair of weakly focused 2.5 MHz transducers used for measurements and the automated gantry used to hold the sample holder During measurements, the transducers and samples are submerged in degassed water which can be cooled or heated and then held at a constant temperature to ensure the sample is at that temperature. Image provided by ICR workshop (B):An ultrasonic pulse is sent from transmitter through the reference medium to the receiver (C): an ultrasonic pulse is sent from transmitter to receiver with a sample in the signal path (D): part of the signal is reflected back to the transmitter from each face (front and back) of the sample, the rest is attenuated in the sample en-route to the receiver.