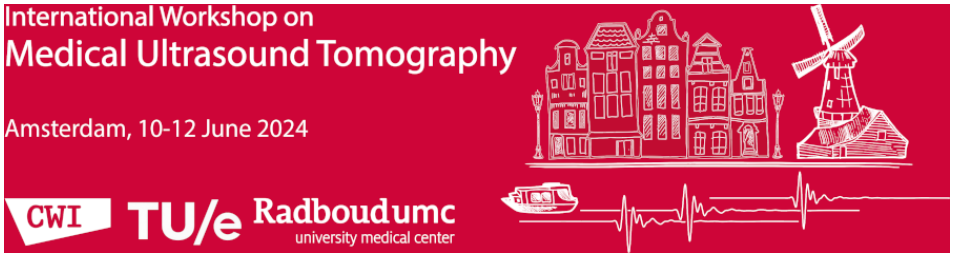

Contribution ID: **21** Type: **not specified**

3D Ultrasound Transmission Tomography with WAPE

At KIT we are developing full 3D ultrasound tomography that uses nearly unfocused spherical wavefronts to emit and receive on a hemispherical aperture. For the reconstruction using the paraxial approximation, we adopted the Wide Angle Paraxial Equation (WAPE).

All 2304 transducers of our measuring device are arranged in 128 transducer arrays (TAS) of 18 transducers as emitters and receivers. To reduce the time and memory required for forward simulation and reconstruction, the system is rotated into a local coordinate system in 3D centered at the TAS for each emitting TAS, and then all the 18 transducers are used as emitters step by step.

We use for the calculations voxel sizes of about lambda/3 leading for 0.5 to 2.5 MHz to $2 * 10^6$ to $2.5 * 10^8$ sound speed and attenuation voxels to be reconstructed for a breast of 100mm radius. To ensure computation times for clinical applicability of the 3D reconstruction with number of A-scans of the order $2.5 * 10^5$, we have implemented parts of the algorithm on GPUs. Additionally, we are now expanding our 2D forward simulation based on neural networks to 3D.

We evaluated the accuracy of the method by comparing results of the forward simulations to a Green's calculation in water, where the attenuation and refraction can be ignored. By limiting the emission angle to 25°, we were able to demonstrate an accuracy of better than 1% for the pressure fields. This evaluation method also allows calibration for the geometry of the system and the reconstruction. The method and first results will be described.

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