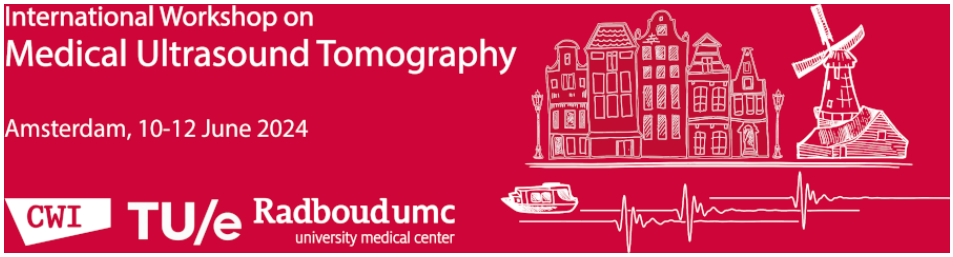

Contribution ID: **6** Type: **not specified**

Tissue-mimicking phantom for reflection image performance testing of the ultrasound computed tomography instrument

Tuesday, June 11, 2024 10:20 AM (20 minutes)

Ultrasound Computed Tomography (USCT) is a radiation free imaging technique that provides acoustic properties information of the human tissue. It commonly provides three image modalities: reflection image, sound speed image and attenuation image. As a newly developed medical instrument, the imaging performance of the USCT should be tested following standard method and provided to the users for product registration and clinical diagnostic reference. Tissue-mimicking phantom is recognized as a standard test tool for quality assurance of medical imaging equipment. We designed and built a universal tissue-mimicking ultrasound phantom for USCT instruments to test their imaging performance in reflection modality. Involved test parameters include spatial resolution (axial and lateral resolution at different radius distance), perimeter and area imaging accuracy, lesion detection capabilities (cyst target, calcific nodules target, tumor target). This phantom contains standard background ultrasound tissue-mimicking hydrogel material with embedded nylon monofilament and lesion-mimicking targets within an enclosed circular truncated cone housing. The housing of the phantom is constructed of upper and lower PMMA plates and plastic acoustic window surrounding at the cuved side face of the truncated cone. The slant angle of the truncated cone side of the housing was designed to simulate real breast shape in water medium and to prevent the primary ultrasound echo transmitted from the circular concave array element. The embedded nylon monofilament and lesion-mimicking targets are designed to be throughout the upper and lower PMMA plates. To keep the structural intensity of the phantom construction, we built three supporting pillar with sound absorption material surroundings between the plates. For the validation of the tissue-mimicking phantom, a 2048-element circular ring array USCT system was used to obtain the tomography image in relection modality. The results demonstrated the imaging performance testing capability of the phantom to USCT system.

Authors: ZHANG, Di (Institute of Acoustics, Chinese Academy of Sciences); Mr ZHOU, Liang (Department of Biomedical Engineering, School of Life Science and Technology, Huazhong University of Science and Technology); Prof. NIU, Fengqi (Institute of Acoustics, Chinese Academy of Sciences); Prof. ZHU, Chenggang (Institute of Acoustics, Chinese Academy of Sciences); Prof. DING, Mingyue (Department of Biomedical Engineering, School of Life Science and Technology, Huazhong University of Science and Technology); Mr CHENG, Yang (Institute of Acoustics, Chinese Academy of Sciences)

Presenter: ZHANG, Di (Institute of Acoustics, Chinese Academy of Sciences)

Session Classification: Hardware Development, System Calibration & Phantom Validation

Track Classification: oral presentations