SF03-S2

10:05-10:50 Room 203

Chairperson(s): **Dong-Guk Paeng** *(Jeju National University, Korea)*
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High Frequency Ultrafast Ultrasound Imaging and Its Biomedical Applications

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The frame rate (the number of images displayed in one second) of current ultrasound imaging machines is about 30-100 fps, which is sufficient for most clinical applications, even echocardiography. However, high frame rate ultrasound imaging, so-called ultrafast ultrasound imaging, has recently been achieved with improvements of ultrasound hardware. One major advantage of ultrafast ultrasound imaging is that it converts the ultrasound image into a “high speed camera”, in which any movement of an object in the view of ultrasound exhibits “slow motion”. Currently, use of plane wave imaging is the standard for ultrafast ultrasound imaging, which the frame rate of ultrafast imaging can be up to >10 kHz. With the emergence of ultrafast ultrasound imaging, several new applications of ultrasound imaging have been proposed such as shear wave elastography, super resolution blood flow imaging, and ultrasound contrast imaging.

To date, the operational frequency of the ultrafast ultrasound imaging is around 2 to 18 MHz, which provides sufficient image resolution with an appropriate imaging depth for clinical applications. However, the spatial resolution of ultrasound imaging can be improved by using high frequency ultrasound imaging (HFUS, >30 MHz), for example, 50 MHz ultrasound imaging provides lateral and axial resolutions of 100 and 20 μm, respectively. Recently, single element and array transducers HFUS imaging systems are commercially available at a center frequency up to 50 MHz. However, the HFUS with an ultrafast imaging ability is still lacking currently.

In this talk, ultrafast HFUS imaging combining a high frequency array transducer (~40 MHz) with a programmable ultrasound imaging has been proposed. Due to the high imaging resolution ability of HFUS, this ultrafast HFUS imaging is suitable for superficial tissue imaging of human and small animal for gene research and cancer studies. Therefore, high-resolution ultrasound elastography and super resolution blood flow imaging without micro-bubble are currently available for biomedical applications, such as high resolution elastography for human cornea, skin, hand tendon, and mouse brain as well as super resolution blood flow imaging for small animal applications in nerve, brain, heart, and kidney.