AbstractID: 7615 Title: Multiple Overlapping Low Intensity Focused Ultrasound Fields for Localized Tissue Ablation

Abstract: Ultrasound has long been known to cause tissue heating when applied in high intensities. More recently, interest has arisen in the area of High Intensity Focused Ultrasound (HIFU) for localized tissue heating effects, specifically thermal ablation. HIFU is being introduced into clinical settings for localized tissue ablation guided by MRI. All present techniques employ focused traveling high intensity acoustic waves to create a region of elevated temperature, which causes cell death. Such high intensity traveling waves can be damaging to normal tissue in the vicinity of the focal region, and have demonstrated surface burns and caused patient discomfort in certain clinical trials. The focal region is also difficult to determine due to divergence of the beam and elongation of the focus along the direction of propagation. Use of lower intensity ultrasound can minimize the side-effects presented by HIFU. This paper demonstrates the use of multiple low intensity focused ultrasound beams resulting in stationary acoustic fields which are capable of heating a very small and more precisely located region of tissue. The intensity of the individual ultrasound beams is within FDA diagnostic ultrasound limits (0.720 W/cm^2). Temperature elevation that would cause cell death was achieved in tissue-mimicking phantoms after short exposures to the acoustic field in the region of beam overlap. The technique was tested with excised turkey breast samples. Temperature increases of 30 C above ambient (37 C) were observed after sonication times of 30 seconds. The size of the tissue ablation was a quasi-sphere of diameter = 1 cm.