changes. Some recommendations for the further study of the mechanism were done.

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The Properties of Silent Sonar with MLS+HFM Sounding Signal

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An FM-CW type sounding signal is used in the classical solution of silent sonar. The such a signal provides a relatively simple implementation of digital signal processing, ensures good detection conditions, but unfortunately, in the presence of Doppler effect, distance measurement result is burdened with a very big error. This is due to the fact that the received signal momentary frequency value is dependent both on the distance to the object and its speed. Sounding signal, patented by the authors, is a combination of pseudo-random sequences MLS type and elementary signals HFM type. The structure of this signal is aimed at minimizing the above-mentioned measurement error. The article presents the idea of a sounding signal MLS + HFM type and the results of computer simulations.

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Harmonic Antibubbles

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We study the sonication of stable particles that encapsulate a liquid core, so-called antibubbles. Acoustically active antibubbles can potentially be used for ultrasound-guided drug delivery. In this presentation, we derive the oscillating behaviour of acoustic antibubbles with a negligible outer shell, resulting in a Rayleigh-Plesset equation of antibubble dynamics. Furthermore, we compare the theoretical behaviour of antibubbles to that of regular gas bubbles. We conclude that antibubbles and regular bubbles are acoustically active in a very similar way, if the liquid core is less than half the antibubble radius. For larger cores, antibubbles demonstrate highly harmonic behaviour, which would make them suitable vehicles in ultrasonic imaging and ultrasound-guided drug delivery.

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New Type of High Power Ultrasonic Generator for Welding and Cutting Processes

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The paper presents a new type of high power ultrasonic generator for welding and cutting processes developed by Tele & Radio Research Institute. The new generator cna provide up to 5 kW of electrical power to ultrasonic transducer in frequency range from 16 kHz up to 40 kHz with regulation step down to 0.1 Hz. The device utilizes innovative microcontroller with built-in high resolution timing blocks that enable direct synthesis of control signals for generator's resonant converter without the need of external DDS unit or programmable device. This new approach to designing ultrasonic generators can benefit in greater flexibility and reliability of the device. New algorithms with cycle by cycle parameter control and precise regulation of output frequency and power delivery have been developed. Various parameters of ultrasonic stack such as impedance and resonant frequency are measured by the generator in real time and can be used to diagnose the stack and detect its damages.

In addition, the newly designed generator is equipped with 7 inch, high resolution color display with touch panel which allows for clear presentation of data gathered by the device including impedance curves of ultrasonic stack, output power curves and easy setup of desired parameters. Gathered data can also be transferred to computer via USB Device interface, over local LAN network using built-in Ethernet or WiFi module or stored to Flash Drive via USB Host interface. The generator can also be connected to PLC controller via RS485 interface, digital or analog in/out control signals and can also measure external parameters such as temperature or horn vibration amplitude by built-in analog inputs.

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Application of Ultrasound to Noninvasive Imaging of Temperature Distribution Induced in Tissue

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Therapeutic and surgical applications of High Intensity Focused Ultrasound (HIFU) require monitoring of local temperature rises induced inside tissues. Guidance of the HIFU beam is of crucial importance. It is needed to appropriately target the focal plane and hence the whole focal volume inside the tumor tissue prior to thermo-ablative treatment and beginning of tissue necrosis. Currently, the Magnetic Resonance Imaging technique, relatively expensive and rather inconvenient in practice is used. In this study we present an ultrasound method, which calculates the variations of speed of sound in the locally heated tissue. Changes in velocity correspond to temperature change. The method calculates 2D distribution of changes in the sound velocity by estimation of the local phase shifts of RF echo-signals backscattered from the heated tissue volume (the focal volume of the HIFU beam) and received by an ultrasound scanner. Further, the method combines the advantages of Synthetic Transmit Aperture and phase shift detection techniques to improve the spatial resolution and minimize the overall uncertainty in temperature estimation. The technique enabled temperature imaging of the heated tissue volume from the very inception of heating. The results indicated that the contrast sensitivity for