PAN ARCHIVES OF ACOUSTICS
Vol. **41**, No. 2, pp. 355–373 (2016)

DOI: 10.1515/aoa-2016-0038

The 10th EAA International Symposium on Hydroacoustics Jastrzębia Góra, Poland, May 17 – 20, 2016

The 10th EAA International Symposium on Hydroacoustics, which is also the 33rd Symposium on Hydroacoustics in memory of Prof. Leif Børnø organized in Poland, will take place from May 17 to 20, 2016, in Jastrzębia Góra. It will be a forum for researchers, who are developing hydroacoustics and related issues. The Symposium is organized by the Gdańsk University of Technology and the Polish Naval Academy.

The Scientific Committee comprises of the world – class experts in this field, coming from, among others, Germany, UK, USA, Taiwan, Norway, Greece, Russia, Turkey and Poland. The chairman of Scientific Committee is Prof. Eugeniusz Kozaczka, who is the President of Committee on Acoustics Polish Academy of Sciences and Chairman of Technical Committee Hydroacoustics of European Acoustics Association.

The Symposium will include invited lectures, structured sessions and contributed papers covering almost all major topics of hydroacoustics. Structured session will be devoted to:

- underwater acoustics in security systems,
- seafloor scattering,
- satellite methods in marine ecosystem research,
- underwater communication in confined and shallow waters,
- noise monitoring in European marine waters,
- ultrasonic applications,
- sound propagation in the sea and modelling,
- sonar signal processing,
- sound propagation in the sea and modelling.

More than 90 scientists have already registered to the Symposium representing research centers mainly from Poland but also from other countries including Israel, Canada, USA, with 5 invited papers:

- Prof. Chi Fang Chen: *Review on the Development of Underwater Acoustic Propagation Models*;
- Dr. Ing. Tanja Grießmann *et al.*: *Application of Bubble Curtains to Mitigate Hydro Sound Levels at Offshore Construction Sites*;
- Dr. Christopher Jenkins: *Backscatter from Intensely Biological Seabeds – Benthos Simulation Approaches*;
- Prof. Eugeniusz Kozaczka: *Technical Support for National Border Protection on Vistula Lagoon and Vistula Spit*;
- Prof. Andrzej Nowicki *et al.*: *Estimation of Radial Artery Reactive Response using 20 MHz Ultrasound*;
- Prof. Jerzy Wiciak: *Advances in Structural Noise Reduction in Fluid*.

All accepted papers will be published in the periodical "Hydroacoustics".

Abstracts

Review on the Development of Underwater Acoustic Propagation Models

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Underwater acoustic propagation modeling began with two-dimensional (2D) approach by treating the ocean as range-dependent medium and neglecting the azimuthal variation. Later the azimuthal variation is taken into account by Nx2D approach, i.e. dissect the space into azimuthal sectors and treat each sector with 2D approach. However the ocean is 3-dimensional; we cannot neglect the true ocean physics. This motivated model developers to develop model(s) to treat the 3D ocean physics realistically. This was how the FOR3D (which stands for Finite difference solutions for an Ordinary differential equation using the Rational function approximations for 3Dimensional wave propagations problems) was developed. In 1990s, FOR3D was first introduced to the underwater acoustics community to treat ocean as a three-dimensional medium with variations in range, depth and azimuth. This was the pioneer work in three-dimensional underwater acoustic propagation.

In the last decade, the three-dimensional research attracted more interest as the computational power and speed were greatly improved and advanced. In this paper,

purposes. The aim of the project is the development of a sonar camera system which is able to provide real-time 3D images with a sufficient spatial resolution in a deep sea environment. Within this work we present a first experimental setup of the camera system consisting of a 1024 element matrix array antenna together with a 128 channel beamforming system including an 8:1 multiplexing device. While the basic concept for this camera system was developed in previous stages, this work deals with the construction of the antenna, the description of the electronic beamforming device as well as first measurement results under laboratory conditions.

The measurement results are used to verify the former simulations concerning the antenna's sound opening angle, the attainable spatial resolution and a proof of concept for the entire system. Here, the focus is on the particular transmitting and receiving modalities since the beamforming device allows an adjustable defocused sound field of the antenna. Furthermore, a statistical investigation of the antenna's elements is presented in order to show their electrical and acoustical performances and uniformity. The cross coupling between the single antenna elements as well as their spatial displacement and vibration modes have been investigated using a laser-doppler vibrometer. Finally, the generation and transmission of frequency coded signals for matched filter usage are presented and discussed.

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Acoustical Properties of Tissue Phantoms with Different Stiffness and Water-Like Absorption

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Poly(vinyl alcohol) cryogel, PVA-C, is produced as a soft tissue-mimicking material, suitable for application in ultrasound imaging. A 10% by weight poly(vinyl alcohol) in water solution was used to form PVA-C, which is solidified through a freeze–thaw process. The number of freeze–thaw cycles affects the properties of the material, particularly the mechanical stiffness. The ultrasound characteristics were investigated using 3 different cylindrical samples of PVA-C produced by 1, 2 and 3 cycles of freezing-thawing process. The speed of sound was found to range from 1502 to 1522 $\mathrm{m\,s^{-1}}$, and the attenuation coefficients were in the range of 0.085–0.124 dB/(cm MHz). The structural heterogeneities are visualized by Nakagami maps and it is shown that the range of Nakagami parameter characterize the differences between samples. The samples are structurally different in the regions close to the surface from the internal regions. This is probably caused by the spatial heterogeneity of the solidification process . The thickness of the boundary layer is also measured from Nakagami maps and it is shown that it is also linked to the type of samples. The elastography maps (measured by the commercial quasistatic strain imaging system . . .) are compared with Nakagami maps. The question arises, in what circumstances parametric estimation of spatial structure variations by Nakagami maps are linked to the spatial variations of local stiffness?

Acknowledgments: This work was partially supported by the National Science Centre (grant no. 2011/03/B/ST7/03347).

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Situational Analysis of Underwater Noise Issue in the Area of the Central and South Baltic Sea

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The issue of the noise control in the atmospheric environment has been developed for several decades. As a result, certain legal acts have been constituted, together with a number of quantitative norms regarding both the workplace, and the spatial areas, in particular the urbanized regions. The areas of heavy traffic, such as motorways, highways or thoroughfares, have also been the subject of interest.

In case of the underwater environment the situation is unfortunately heavily underestimated. Human factor is commonly known as highly influencing on the so called marine acoustical climate, as well as, environment.

The main source of the underwater noise is commonly understood maritime transport. There are fairways where shipping traffic is very intense, like on highways. Unlike in gaseous environment, it is hard to imagine constructing acoustic screens in the sea. Thus the noise in the range of small and medium frequency bands propagate in sea over long distances from their sources with far less natural attenuation than in the air. Moreover, the structure of the water environment creates a kind of waveguide with conducing conditions for noise propagation over long distances.

Apart from the maritime transportation noise, new sources of the underwater noise, such as offshore wind farms, occur. The industrial activity in the coastal areas can be also named as additional one.

There have been works in the EU region on the legislation as well as research – measurement activities for several years. Basically, the current situation can be considered as at an early stage, however, there are efforts made in order to reduce the noise level in the sea.

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Acoustic Climate of the Gulf of Gdańsk in Years 2000–2010

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The conditions of the acoustic wave propagation in the southern Baltic are much more complex than in other shallow waters. In the typical shallow water seasonal changes in acoustical conditions in the upper layer of the depth of about 60–70 m are observed. They are caused by variation of the annual meteorological conditions. Most often, in the deep water layer acoustical conditions are stable throughout the year. However, in the Southern Baltic they change