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Proceedings of the  
INTERNATIONAL SYMPOSIUM ON  
**HYDROACOUSTICS  
AND  
ULTRASONICS**

EAA Symposium (formerly 13<sup>th</sup> FASE Symposium)

Edited by  
A. Stepnowski and E. Kozaczka



Jurata, 12 - 16 May 1997



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# **HYDROACOUSTICS AND ULTRASONICS**

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EDITED BY

**A. STEPNOWSKI**

AND

**E. KOZACZKA**

**TECHNICAL UNIVERSITY OF GDANSK**

**NAVAL ACADEMY IN GDYNIA**

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## *Preface*

The International Symposium on Hydroacoustics and Ultrasonics is organised by the Underwater Acoustics Department of the Naval Academy in Gdynia and the Acoustics Department of the Technical University of Gdańsk under the auspices of the European Acoustics Association (EAA) and the Federation of Acoustical Societies of Europe (FASE).

The Symposium has been organized under the scheme of celebrating the Millennium of the City of Gdańsk (997 - 1997) and it is hoped that the Symposium will be a good reflection of the city's fine history - which has in the past given Europe a gift of constructive and friendly coexistence between nations, and gives the gift of great hope to present Europe - as the city where „Solidarity” was born. Thus the organizers hope that the Symposium may serve as a vehicle integrating both previously mentioned European acoustic organizations which hopefully will take place during the Symposium.

The Symposium has evolved from domestic Symposia on Hydroacoustics (so called SHA's) that have been held annually since 1984 and have been designed to promote research and development in various areas of Underwater Acoustics in Poland and exchange results and ideas on a National level.

The European scene of research and development in underwater acoustics has benefited in the last decade from a valuable and helpful platform with the establishment of the European Community program on Marine Science and Technology (MAST) which unifies research from various EC countries and supports organization of European Conferences on Underwater Acoustics.

However, EC still does not comprise the whole of Europe and the range and quality of research and considerably increased level of activity in hydroacoustics in Central Europe and in the Baltic Sea Region (especially Poland, Denmark, Germany, Norway, Russia and Sweden) call for a forum for presentation of the scientific results for this part of Europe.

The purpose of these proceedings is to make information presented at the symposium readily available, and to present a synthesis of research on ongoing projects in Underwater Acoustics and Ultrasonics in Universities, research institutes and industrial companies in countries participating in the Symposium, thus ensuring fast dissemination of results and exchange of ideas on an international level.

The published proceedings show that the present Symposium has attracted remarkable numbers of scientists and engineers from Europe, the USA and Canada, and China (62 contributions in total), and may become an established forum for the presentation of the latest developments in all major areas of Hydroacoustics.

The Symposium will consist of papers related to all major research fields in Hydroacoustics. The contributions have been distributed to sessions which cover all important topics, namely: fisheries acoustics, nonlinear acoustics, scattering, sea bed surveying, ship noise and cavitation, signal processing and imaging, sonar systems, sound propagation and modeling and underwater communications. In addition, the topics related to ultrasound are presented in two separate sessions, viz.: ultrasonics and biomedical diagnostics.

A conference such as this Symposium can only be organized as the result of team work and its success is only possible through the joint effort of many people. We would like to thank the members of the Honorary Committee and the Scientific Committee, and especially Professor Jens Blauert of EAA, Dr Robert Chivers of FASE and Professor Leif Bjørnø of EAA for their help and sharing their valuable experience with us.

We would like to express our special thanks to Professor Wittbrodt the President of the Programming Council of the Gdańsk Millennium Committee for his efforts towards including the Symposium in the Program of Gdańsk Millennium.

We would also like to give our thanks to all members of the Local Organizing Committee whose commitment and contribution through the last year towards the success of the Symposium is highly acknowledged.

It is our hope, that the Proceedings of the International Symposium on Hydroacoustics and Ultrasonics will be received by the international community of researchers in these fields with interest and that these Proceedings will be a valuable reference to them in the coming years.

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Gdańsk, 1 April 1997



## Plenary Paper

- |    |             |  |   |
|----|-------------|--|---|
| 1. | E. Kozaczka | <u>INVITED PAPER:</u> Fifty years of Polish Hydroacoustics | 3 |
|----|-------------|--|---|

## Fisheries Acoustics

- |    |                               |   |    |
|----|-------------------------------|---|----|
| 2. | A. Stepnowski                 | <u>INVITED PAPER:</u> Analysis of fish target strength estimation methods               | 15 |
| 3. | N. Gorska                     | Some Aspects of krill acoustic sampling   | 27 |
| 4. | M. Moszyński<br>A. Stepnowski | The Beam Pattern PDF in Target Strength Estimation - Theoretical and Practical Approach | 31 |
| 5. | A. Orłowski                   | Acoustic evaluating the Baltic fish behaviour   | 37 |
| 6. | K. Poraziński                 | Concentration of marine organisms on the hydrological background - acoustical surveys   | 43 |

## Nonlinear Acoustics

- |     |   |  |    |
|-----|---|--|----|
| 7.  | M.A. Breazeale                                    | <u>INVITED PAPER:</u> Overview of the development of nonlinear acoustics                                     | 49 |
| 8.  | P.A. Johnson<br>Koen E-A<br>Van Den Abeele        | Earth solids and dynamic nonlinear elasticity  | 53 |
| 9.  | A. Baranowska                                     | Influence of discrete model parameters on the KZK equation solution using the finite difference method       | 59 |
| 10. | P.P. Delsanto<br>M. Scalerandi                    | Discretization schemes for the simulation of nonlinear propagation equations                                 | 65 |
| 11. | S. Dobrociński<br>E. Kozaczka<br>G. Grelowska     | Numerical investigation of the finite amplitude wave pressure distribution radiated by a circular transducer | 71 |
| 12. | B.O. Enflo  | Sound beams with shockwave pulses  | 75 |
| 13. | E. Kozaczka<br>G. Grelowska                       | An experimental investigation of the finite amplitude wave in the nearfield                                  | 79 |
| 14. | S.B. Leble<br>K. Zachariasz<br>I.S. Vereshchagina | The estimation of virial coefficients via the third harmonics measurements                                   | 83 |
| 15. | A.A. Perelomova<br>S.B. Leble                     | Generation conditions and nonlinear sound directed propagation in inhomogeneous medium                       | 89 |

## Scattering

- |     |                         |  |     |
|-----|-------------------------|--|-----|
| 16. | E. Steiger              | Scattering of Focused Strong Pressure Pulses by Spheroids  | 97  |
| 17. | Z. Klusek<br>J. Jakacki | On the concentrations of gas bubbles measured acoustically in the Baltic Sea - wind and time dependences | 103 |
| 18. | J. Szczucka             | Analysis of diurnal variability of the Baltic sound scattering layers                                    | 109 |



## Sea Bed Surveying

19.	B. Woodward	<b>INVITED PAPER:</b> Progress in developing sonar systems for sea bed surveys	117
20.	R. Komendarczyk	Comparison of selected classifiers in a sea-bottom recognition task	125
21.	Z. Łubniewski A. Stepnowski	Sea bottom typing using fractal dimension	131
22.	M. Moszyński A. Partyka A. Stepnowski	System for Bottom Typing with Geographical Context Mapping	135
23.	J. Tęgowski	Spatial distributions of acoustic field scattered at the sea bottom-numerical model	141

## Ship Noise and Cavitation

24.	H. Czyż	On the continuity equation of aerosol particles in a standing wave field	149
25.	Li Huamao	Cavitation concentration	151
26.	P. Bittner	Measurements of sound velocity by means of the cross-spectral method	153
27.	W. Kiciński	Method of shipping noise recognition	157
28.	T. Koronowicz J. Szantyr	A Computer Program for Determination of Acoustic Pressure Field Related to Ship Hull and Propeller Operation	163
29.	E. Kozaczka I. Gloza G. Grelowska	Determination of the ship detection area in the coastal region	169
30.	E. Kozaczka L. Milanowski	Hydrodynamic pressure of a ship	173
31.	J. Leander	Transient Underwater Bubble Sound	179
32.	S. Pogorzelski	The surface film effect on underwater noise of rain	181
33.	L. Wilczyński	On the hydroacoustic method of detection of microbubbles distributed in water	185

## Signal Processing and Imaging

34.	N. Kamel	Estimation of Frequencies of Multiple Sinusoids in Case of Long Data Records	193
35.	K. Kosbi U. Scheer S. Boseck	Direct measurement of surface acoustic wave velocities and accuracy enhancement by wavelet transform	195
36.	J. Litniewski A. Sawicki	Parametric Imaging of a Trabecular Bone by a Scanning Acoustic Microscope	199
37.	A. Milewski I.S. Mitrofanov M. Tupaj S. Gawor	Reflective Array Compressor With Etched Grooves	205

38.	G.R. Minassian	Application of high resolution methods to underwater data processing	209
39.	G.R. Minassian	Sea reverberation rejection via adaptive beamforming	213

## Sonar Systems

40.	K. Kremer	<b>INVITED PAPER:</b> Advanced Underwater Technology with Emphasis on Acoustic Modeling and Systems	221
41.	A. Elminowicz T. Janowski W. Męciński	Sonar with electronically steered transmitted beam	227
42.	L. Kwapisz M. Narewski L.A. Rowiński C. Żrodowski	A Measurement of 3-D Water Velocity Components During ROV Tether Simulations in a Test Tank Using Hydroacoustic Doppler Velocimeter	231
43.	J. Marszał R. Salamon L. Kilian A. Raganowicz T. Szurowski	Signal processing in the hydroacoustic ships berthing aid system	237
44.	M. Narewski L. Kwapisz L.A. Rowiński C. Żrodowski	Application of Underwater Hydroacoustic Navigation System in the Research of Submerged Cables and ROV Umbilicals	243

## Sound Propagation and Modeling

45.	L.M. Lyamshev	<b>INVITED PAPER:</b> Fractals in underwater acoustics	251
46.	P.P. Delsanto E. Ruffino M. Scalerandi N.K. Batra R.B. Mignogna	A spring model for perfect or imperfect contact interfaces	257
47.	Dubrovsky Esipov Naugolnykh Tuzhilkin	Feasibility of the acoustic approach to remote sensing of water current with respect to Fram Strait	263

## Underwater Communication

48.	C. Bjerrum-Niese	<b>INVITED PAPER:</b> Simulated performance of an acoustic modem in a multipath channel	271
49.	Young-hoon Yoon A. Zieliński	Coherent Underwater Acoustic Communications - A Review	279

## Ultrasonics

50.	V. Andreev V. Khokhlova Yu. Pischal'nikov O. Sapozhnikov	Propagation of powerful acoustic pulse with shock front in relaxing liquids	287
-----	---	---	-----



51.	M. Baszun W. Rogulski	Geometrical optimization of multidetector ultrasonic propagation sensor for object recognition in air	293
52.	C. Desmet V. Gusev W. Lauriks J. Thoen	Laser generation and detection of interface waves for the acoustic spectroscopy of liquids	295
53.	T. Gudra K. Opieliński	Computer model of acoustic link in a pipe with a flowing gas medium  Part I: Perturbation of ultrasonic transducer directivity pattern	299
54.	T. Gudra K. Opieliński	Computer model of acoustic link in a pipe with a flowing gas medium  Part II: Accuracy improvement of medium flow velocity determination	303
55.	L. Kelders W. Lauriks J. Thoen	Ultrasonic transmission experiments on porous materials	307
56.	L. Leniowska	Acoustic pressure of circular plate vibrating in a finite baffle with fluid loading	311
57.	J. Rzeszutarska F. Rejmund P. Ranachowski	Acoustic emission probes of foam drainage processes in $H_2O-C_2H_5OH$ -air system with content of detergent triton X-100	317
58.	A. Snakowska P. Witkowski H. Idczak	The saddle point method applied to some problems in acoustics	321

## Biomedical Diagnostic

59.	L. Filipczyński T. Kujawska R. Tymkiewicz J. Wójcik	Possible temperature increases in soft tissues in the case of nonlinear and linear wave propagation	329
60.	K. Kycia G. Łypacewicz A. Nowicki	Comparison of ceramic and composite transducers	333
61.	A. Nowicki W. Secomski J. Wójcik	Acoustic streaming generated by ultrasonic transducers, measurements by means of 32 MHz Doppler	337
62.	T. Powałowski L. Hilgertner Z. Trawiński	Common carotid wall elasticity and intima-media thickness examinations by means of ultrasound	343