



20th ISNA

Lyon, France, 2015

June 29 - July 3

International Symposium on Nonlinear Acoustics

Information about ISNA20

SCOPE OF THE SYMPOSIUM

- **General theory of nonlinear acoustics** : Analytical methods, numerical methods, ray theory, scattering theory, shocks, solitons, chaos, bifurcation, localization, phase conjugation
- **Nonlinear acoustics in fluids** : Sound beams, parametric arrays, resonators, acoustic streaming, radiation pressure, acoustic levitation.
- **Nonlinear acoustics in multiphase and porous media, and cavitation phenomena** : Bubbly liquid, cavitation, sonoluminescence, sonochemistry, etc...
- **Nonlinear acoustics in solids and structures** : Elastic waves, viscoelastic waves, surface waves, nonlinear acousto-electronics, non-destructive evaluation and testing.
- **Nonlinear acoustics of reacting, relaxing media, and physical kinetics** : Nonlinear acoustics in superfluid helium, waves in rarefied gases, micro-acoustics, quantum effects, sonic crystals, metamaterials.
- **Nonlinear acoustics in medicine and biology** : Shock wave therapy, diagnostic ultrasound, ultrasound propagation in bone and biological tissue, nonlinear acoustics in speech.
- **Thermoacoustics** : Energy conversion and devices, aero-thermoacoustics, combustion noise and oscillations.
- **Nonlinear acoustics of atmosphere, ocean, and earth, and nonlinear underwater acoustics** : Shock wave, sonic boom, aircraft noise, intense noise generated by ground transportation, infrasound, acoustic-gravity waves, explosions, earthquakes.
- **Nonlinear aero- and hydroacoustics** : Vortex sound, jets, turbulence, flow-induced sound.
- **Nonlinear acoustics and optics** : Laser generation of acoustic waves, optoacoustical spectroscopy, magneto-acoustics.
- **General experimental methods** : Measurements, instrumentations.
- **Devices and industrial applications of nonlinear acoustics** : Musical acoustics is included here.
- **Other topics in nonlinear acoustics**

Information about ISNA20

INVITED SPEAKERS

- **R. CLEVELAND**
Nonlinear acoustics in biomedical ultrasound
- **V. TOURNAT**
Nonlinear acoustic wave processes in granular media
- **R. METTIN**
Bubble dynamics in high-power ultrasonic fields
- **D. DROB**
Infrasound remote sensing of the atmosphere
- **I. SOLODOV**
Resonant acoustic nonlinearity for sensitive defect-selective imaging and NDT
- **P. COEN**
Breaking the Sound Barrier: Achieving Overland Supersonic Flight without Sonic Boom Disturbance

ORGANIZED SESSIONS

- **“Nonlinear propagation in heterogeneous media”** organized by *R. Marchiano and T. Yano*
- **“Nonlinearity in earth and industrial materials: physics and applications”** organized by *P. Johnson and L. Ostrovsky*
- **“Nonlinear acoustics in medicine and biology”** organized by *V. Khokhlova and C. Lafon*
- **“Computational methods in Nonlinear Acoustics”** organized by *B. Treeby and P. Yuldashev*

History of the Symposium

Although the origin of nonlinear acoustics dates back to the pioneering work by great mathematicians and physicists in 18th and 19th centuries, a new surge emerged in 1960's to research various problems associated with acoustic waves of finite amplitude from a unified point of view as “nonlinear acoustics.” In 1968, the meeting devoted to discuss exclusively nonlinear acoustics was held at the Navy Underwater Sound Laboratory, New London, Connecticut, USA. This meeting has been labeled the first International Symposium on Nonlinear Acoustics (ISNA). Since then, the ISNA was held every year or every two years in Denmark, France, the Soviet Union, the United Kingdom and the United States until 1978. After this year, the ISNA has been held every three years.



Committees

International Organizing Committee:

- **M. F. Hamilton** (USA), General Secretary
- **A. A. Atchley** (USA)
- **Ph. Blanc-Benon** (France)
- **L. A. Crum** (USA)
- **B. O. Enflo** (Sweden)
- **X. F. Gong** (China)
- **P. A. Johnson** (USA)
- **V. K. Kedrinskii** (Russia)
- **W. Lauterborn** (Germany)
- **W. G. Mayer** (USA)
- **K. A. Naugolnykh** (USA/Russia)
- **L. A. Ostrovsky** (USA/Russia)
- **O. A. Sapozhnikov** (Russia)
- **I. Yu. Solodov** (Germany/Russia)
- **T. Yano** (Japan)

International Scientific Committee:

- **A. A. Atchley** (USA)
- **Ph. Blanc-Benon** (France)
- **L. A. Crum** (USA)
- **B. O. Enflo** (Sweden)
- **X. F. Gong** (China)
- **P. A. Johnson** (USA)
- **M. F. Hamilton** (USA)
- **V. K. Kedrinskii** (Russia)
- **V. Khokhlova** (USA/Russia)
- **C. Lafon** (France)
- **W. Lauterborn** (Germany)
- **Y. Makino** (Japan)
- **R. Marchiano** (France)
- **W. G. Mayer** (USA)
- **K. A. Naugolnykh** (USA/Russia)
- **L. A. Ostrovsky** (USA/Russia)
- **O. A. Sapozhnikov** (Russia)
- **I. Yu. Solodov** (Germany/Russia)
- **V.W. Sparrow** (USA)
- **B. Treeby** (England)
- **T. Yano** (Japan)
- **P. Yuldashev** (Russia)

Local Organizing Committee:

- **Ph. Blanc-Benon** (LMFA/Ecole Centrale de Lyon)
- **G. Capiod** (ECL)
- **D. Cassereau** (LIP/UPMC)
- **C. Desjouy** (LMFA/ECL)
- **E. Dewayse** (Société Française d'Acoustique)
- **D. Dagna** (LMFA/ECL)
- **F. El Boukhrissi** (LMFA/ECL)
- **Ph. Eyraud** (LMFA/ECL)
- **Y. Jegou** (ECL)
- **M. Karzova** (LMFA/ECL)
- **Ch. Lance** (LMFA/ECL)
- **A. Pereira** (LMFA/ECL)
- **M.-G. Perriaux** (LMFA/ECL)
- **P. Roland** (LMFA/ECL)
- **E. Salze** (LMFA/ECL)
- **A. Seck** (LMFA/ECL)
- **R. Troian** (LMFA/ECL)
- **C. Zambardi** (CeLyA/UDL)

Program

Monday 29 June			
	Amphi 1 bis	Amphi 2	Amphi 3
14:50 - 15:10		Welcome and opening ceremony	
15:10 - 16:10		Plenary lecture 1: Cleveland	
16:20 - 18:00	General nonlinear acoustics 1	Therapeutic applications 1	Thermo-acoustics 1

Tuesday 30 June			
	Amphi 1 bis	Amphi 2	Amphi 3
09:00 - 10:20	Computational methods 1	Therapeutic applications 2	Thermo-acoustics 2
Coffee break			
11:00 - 12:00		Plenary lecture 2: Tournat	
Lunch			
13:40 - 15:00	General nonlinear acoustics 2	Radiation force in biology and medicine	Thermo-acoustics 3
Coffee break / Poster session			
16:00 - 18:00	General nonlinear acoustics 3	Imaging and tissue characterization 1	Computational methods 2

Wednesday 1 July			
	Amphi 1 bis	Amphi 2	Amphi 3
09:00 - 10:20	Computational methods 3	Imaging and tissue characterization 2	Nonlinear propagation in heterogeneous media 1
Coffee break			
11:00 - 12:00		Plenary lecture 3: Mettin	
Lunch			
13:40 - 15:00	Computational methods 4	Modeling in medicine and biology	Nonlinear propagation in heterogeneous media 1
Coffee break			
15:30 - 16:30		Plenary lecture 4: Solodov	
16:40 - 18:00	General nonlinear acoustics 4	Non-destructive evaluation methods	Nonlinear propagation in heterogeneous media 2

Thursday 2 July			
	Amphi 1 bis	Amphi 2	Amphi 3
09:00 - 10:20	Bubbles and cavitation 1	Nonlinear propagation in fluids 1	Solids and soft matter
Coffee break			
11:00 - 12:00		Plenary lecture 5: Drob	
Lunch			
13:40 - 15:00	Bubbles and cavitation 2	Nonlinear propagation in fluids 2	Granular media 1
Coffee break			
15:40 - 16:40		Sonic boom propagation	Granular media 2
		Closing ceremony	

Friday 3 July	
	Amphi 3
09:00 - 10:00	Plenary lecture 6 : Coen
10:00 - 10:40	Perception of sonic boom
Coffee break	
11:00 - 11:40	Perception of sonic boom
11:40 - 12:30	Sonic Boom Industry Panel
Lunch	
14:00 - 16:00	Q and A with Concorde/Air France Experts
	Concluding remarks

Organized sessions

- "Nonlinear propagation in heterogeneous media" organized by R. Marchiano and T. Yano
- "Nonlinearity in earth and industrial materials: physics and applications" organized by P. Johnson and L. Ostrovsky
- "Nonlinear acoustics in medicine and biology" organized by V. Khokhlova and C. Lafon
- "Computational methods in Nonlinear Acoustics" organized by B. Treeby and P. Yuldashev
- 2nd International Sonic Boom Forum organized by V. W. Sparrow, Y. Makino and Ph. Blanc-Benon

Participants from LIMU



Oral presentations

- [T. Krit](#), I. Golubkova and V. Andreev

«Standing Shear Waves in Anisotropic Viscoelastic Media»

- [V. Khokhlova](#), P. Yuldashev, I. Sinilshchikov, A. Partanen, T. Khokhlova, N. Farr, W. Kreider, A. Maxwell and O. Sapozhnikov

«Use of Shock-Wave Heating for Faster and Safer Ablation of Tissue Volumes in High Intensity Focused Ultrasound Therapy»

- [M. Karzova](#), B. Cunitz, P. Yuldashev, Y. Andriyakhina, W. Kreider, O. Sapozhnikov, M. Bailey and V. Khokhlova

«Nonlinear effects in ultrasound fields of diagnostic-type transducers used for kidney stone propulsion: characterization in water and derating to clinically relevant depth in tissue»

- [P. Yuldashev](#), S. Ilyin, L. Gavrilov, O. Sapozhnikov, W. Kreider and V. Khokhlova

«Enhanced focus steering abilities of multi-element therapeutic arrays operating in nonlinear regimes»

- A. Nikolaeva, M. Kryzhanovskiy, [S. Tsysar](#), W. Kreider and O. Sapozhnikov

«Experimental Study of Acoustic Radiation Force of an Ultrasound Beam on Absorbing and Scattering Objects»

Oral presentations

- [S. Tsysar](#), A. Nikolaeva, V. Svet, V. Khokhlova, P. Yuldashev and O. Sapozhnikov

«Experimental Study of Transmission of a Pulsed Focused Beam through a Skull Phantom in Nonlinear Regime»

- [P. Rosnitskiy](#), P. Yuldashev and V. Khokhlova

«A boundary condition to the Khokhlov-Zabolotskaya equation for modeling strongly focused nonlinear ultrasound fields»

- [E. Annenkova](#), W. Kreider and O. Sapozhnikov

«Nonlinear Dynamics of a Vapor Bubble Expanding in a Superheated Region of a Finite Size»

- P. Blanc-Benon, [M. Karzova](#), S. Ollivier, V. Khokhlova and P. Yuldashev

«Nonlinear reflection of a spherically divergent N-wave from a plane surface: optical interferometry measurements in air»

- [O. Sapozhnikov](#), M. Terzi, A. Nikolaeva, S. Tsysar and A. Maxwell

«Rotating small solid objects in liquids by a focused vortex ultrasound beam»

Lecture room



Oral presentations



T. Krit



M. Karzova



V. Khokhlova

Oral presentations



P. Yuldashev



E. Annenkova



S. Tsysar



Oral presentations

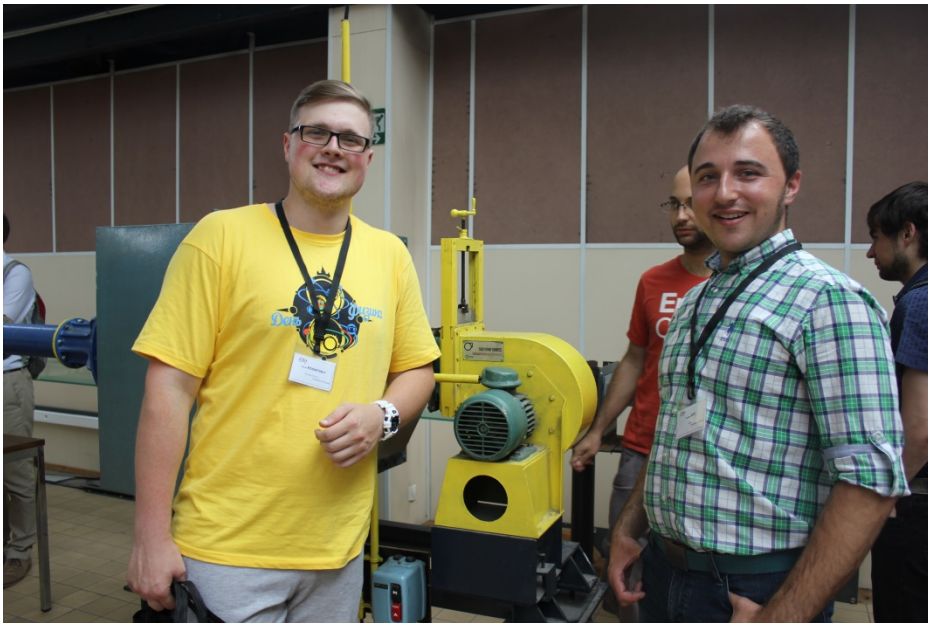


P. Rosnitskiy



O. Sapozhnikov

Laboratories



Coffee breaks

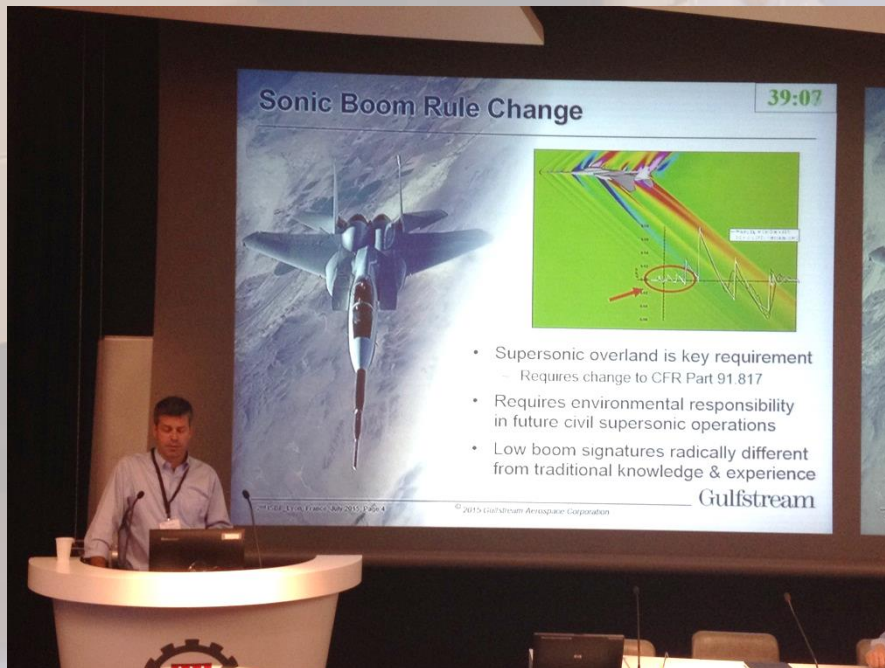


Gala dinner



Sonic Boom Forum

- The purpose of holding this Second International Sonic Boom Forum (Lyon, France, July 2-3, 2015) is to foster technical communication and exchange between university, industry, and government scientists, engineers and executives interested in sonic booms
- Contributions are desired for recent research findings related to sonic booms: aerodynamic design for sonic boom mitigation, propagation modeling, meteorological variability, and human, animal, and structural responses to booms



Little journey

