

Powering Sound Ideas

UIA47: Atlanta GA, USA 30 April - 2 May 2018

UIA47 returns to the United States in 2018. Atlanta, Georgia was picked for its proximity to Georgia Institute of Technology.

"We already have a very strong line-up of invited speakers and workshops in place," noted Tony Crandall, UIA47 Chair. "UIA continues its global focus by welcoming Dr. Marc Lethiecq from the University of Tours as our Keynote Speaker for the medical session on Wednesday, 2 May."



The symposium will open on Monday, 30 April with the industrial session, featuring keynote speaker Shashank Priya, Associate Director, Research and Scholarship, Institute for Critical Technology and Applied Science (ICTAS),

Robert E Hord Professor, Mechanical Engineering, Virginia Tech.

Our Tuesday workshop will feature Dr. Alfredo Vazquez Carazo presenting a 2.5 hour workshop on the ATILA piezoelectric-based

Continued on next page

Special Points of Interest

- A Chip That Saves Optic Data As Sound Waves - Page 6
- Registration and Atlanta Info - Page 9

Ultrasonic Acoustic Deterrents (UADs)

There's some evidence to suggest that bats, at least some species, are attracted to wind turbines, but what that is, if anything beyond sheer curiosity, remains unknown.

One promising solution : Bat Conservation International's wind program team, under the auspices of the BWEC, is investigating the effectiveness of Ultrasonic Acoustic Deterrents, or UAD devices, mounted on the wind turbines themselves.

The idea is that these devices will "jam" bats' echolocation or make the airspace around the turbine aurally uncomfortable, thereby keeping bats away from potential dangerous rotating turbine blades. Researchers got the idea from some species of moth's ability to "jam" bat calls in order to avoid predation.

Ultrasonic Acoustic Deterrents (UADs) are devices that emit a loud, high frequency noise (sound humans can't hear) - and that bats will avoid. It is hypothesized that placing

UADs on wind turbines may allow wind energy facilities to operate normally while dramatically decreasing bat fatalities.

The tricky thing is to produce a robust device that can withstand being exposed to the environmental conditions experienced 80 to 100 m above ground level, and be effective at deterring bats away from large rotor-swept areas of current and future turbines. Field trials have shown promise but testing on operating turbines provide technological and logistical

Inside this issue:

ATILA Workshop	3
Industrial Keynote	4
Medical Keynote	5
Hotel Reservations	5
UIA47 Presentation Instructions	8
Important Dates	12

UIA47 Preview, continued

FEA software.(see page 3 for description). You may register for this workshop and receive the book, *FEM and Micromechatronics with ATILA software* by Kenji Uchino, a \$125 value.

Exhibit and Sponsorship Opportunities

Once again, UIA is offering a range of exhibit and sponsorship opportunities to companies who want to target their marketing to key

ultrasonic manufacturers and researchers. See page 10 for more information.

Papers and Posters

There is still time to submit your abstract for presentation for the medical or industrial sessions. There will also be a poster session on Tuesday after the ATILA workshop - research projects either in process or included are welcome. Please see page 8 for more information.

Hotel Reservation Information is on page 5.

100% of UIA46 participants said exhibits met or exceeded their expectations.

Ultrasonic Acoustic Deterrents, continued

challenges that are currently being refined. If proven, UADs could provide an alternative impact reduction strategy that is more cost effective than operational minimization allowing wind turbine operators more options to reduce impacts to bats.

Field tests are still under way to determine how well the devices perform under various environmental conditions, how effective they are compared to operational minimization and which species can be deterred by the devices mounted on to of operating wind turbines.

Using thermal cameras (foreground) to monitor bat activity during preliminary deterrent (background) tests BCI is planning three studies in 2017 to investigate the effectiveness of a UAD-designed and manufactured by Renewable NRG Systems (RNRG). One of these, funded by the U.S. Department of Energy, will compare the reduction levels of the deterrents with operational minimization, specifically feathering

blades to 5.0 m/s (or 2.0 m/s above the preset operating conditions). Moreover, we will combine both impact reduction strategies to determine whether there is an additive effect, furthering the reduction in bat fatalities.

Preliminary functionality tests of the RNRG deterrent, conducted in 2016, showed significant improvements over previous generations of the technology. The devices passed all reliability tests, both in the lab and when installed on wind turbines, and showed no water entry or overheating (both issues commonly experienced in the previous design). During ground-based tests of the device, we documented a significant reduction in bat activity in areas of high bat concentrations (e.g., ponds where bats drink and forage for insects).

DONATE TO HELP PROTECT BATS AND DEVELOP WIND-ENERGY RESPONSIBLY.

<https://supportbats.org/wishlist-wind>



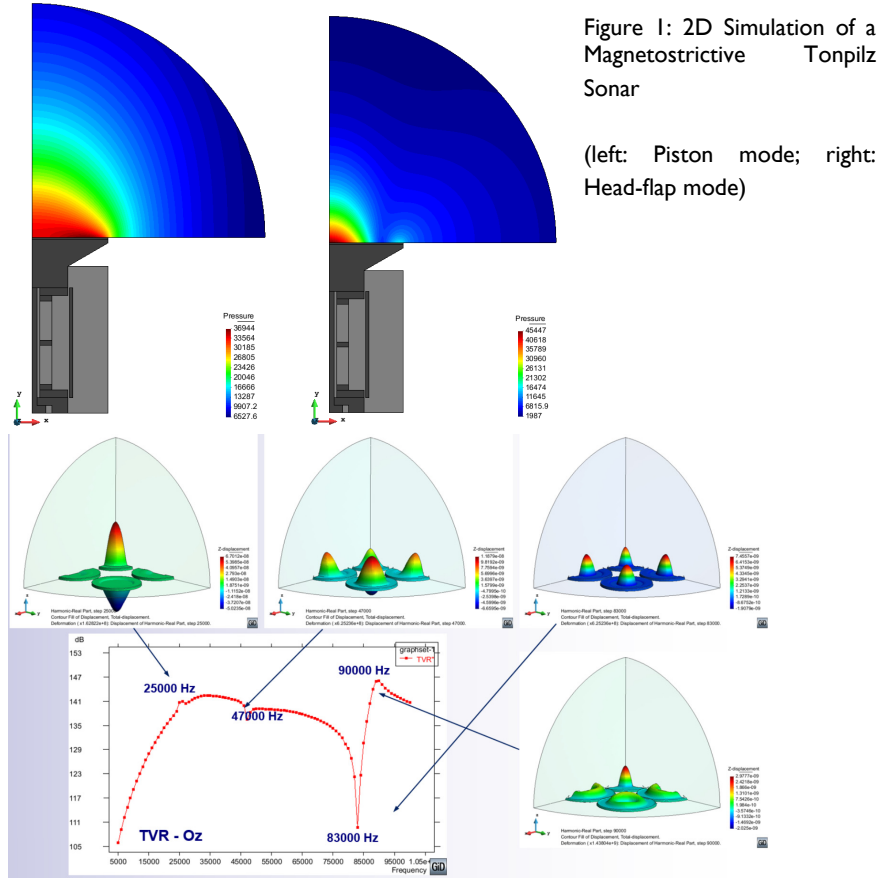
Michael Schirmacher installing equipment on a turbine
Photo Courtesy of Michael Schirmacher

Ultrasonic Acoustic Deterrents (UADs) are devices that emit a loud, high frequency noise (sound human can't hear) - and that bats will avoid. It is hypothesized that placing UADs on wind turbines may allow wind energy facilities to operate normally while dramatically decreasing bat fatalities.

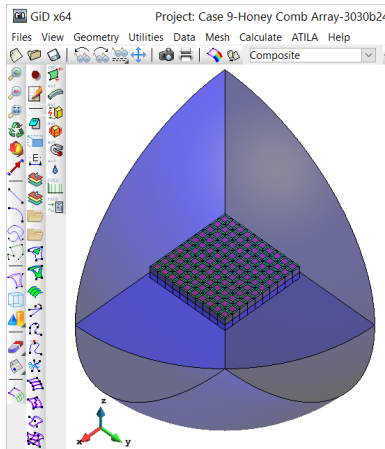
UIA47 Preview: ATILA Workshop Tuesday 1 May

Ultrasonic Transducer Modeling in ATILA FEA software - Dr. Alfredo Vazquez Carazo

ATILA is a finite element software package specifically developed for the analysis of two or three dimensional structures that contain piezoelectric and magnetostrictive materials. Its FEM solver is organized around strong electrical-to-mechanical coupling and fluid-to-structure coupling formulations. As a result, this software has been extensively used in a variety of ultrasonic power transducers and ultrasonic underwater sonars. During this workshop, a typical analysis of various piezoelectric and magnetostrictive devices will be shown. A typical analysis of an ultrasonic transducer will be implemented with special focus to modal, harmonic and transient response.



TVR and deformed shape of an underwater Cymbal Array.



Underwater Simulation of a honeycomb Composite ultrasonic Transducer

FEM and Micromechatronics with ATILA software by Kenji Uchino, a \$125 value, is being offered to conference attendees at the subsidized cost of only \$50 (must register for this workshop to receive discount). As a special bonus, the full-featured ATILA light version of the latest ATILA++ software will also be offered to all participants for free when it is published in 2018; the only thing "light" about this software compared to ATILA++ is the limit in model size.

Dr. Alfredo Vazquez Carazo is the CEO and CTO of Micromechatronics, Inc, State College, Pennsylvania, USA. Dr. Vazquez Carazo received his Ph.D. in Electrical Engineering (2000) and MS in Industrial Engineering (1996) degrees from Polytechnic University of Catalonia, Barcelona, Spain. Before joining Micromechatronics Inc., he worked in several world-leading institutions in the fields of smart-material and nano-engineering, including the University of Southampton, England (1997), the Ecole Polytechnique Federale de Lausanne, Switzerland (1998), Murata Manufacturing Co. Ltd., Japan (1999), and the International Center for Actuators and Transducers (ICAT) of the Penn State University (2000). He has been the Principal Investigator of several Phase I and II SBIR projects for NASA, Darpa, Army and NIH developing multiple innovative piezoelectric-devices for space, military and medical applications. He is the inventor of several commercialized patents, author or co-author of more than 50 papers and 2 books, and has participated in more than 30 international conferences.

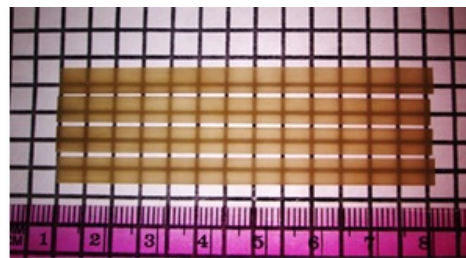
Priya Shashank: Industrial Keynote Monday 30 April



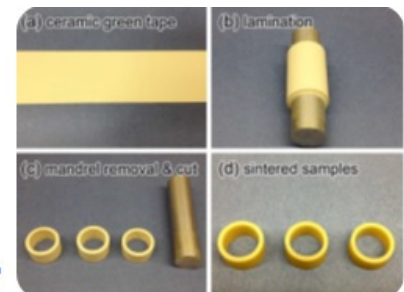
Shashank Priya is currently Robert E Hord Jr. Professor in department of mechanical engineering and Associate Director of Research and Scholarship at Institute for Critical Technology and Applied Science (ICTAS). In past he has served as program director at National Science Foundation, and Director of Center for Energy Harvesting Materials and Systems (CEHMS). His research is focused in the areas related to multifunctional materials and sensors, energy harvesting and bio-inspired systems. He has published over 350 peer-reviewed journal papers and more than 60 conference proceedings covering these topics. Additionally, he has published more than five US patents, and five edited books. He has worked on research projects related to ceramics, magnetic nanomaterials, and smart material systems with various federal agencies including NSF, ARO, AFOSR, DARPA and ONR. He has expertise in designing high performance ceramic materials as bulk, thin films and nanostructures. His laboratory has developed new processing techniques and material compositions in order to provide functional characteristics relevant for specific applications.

Textured Piezoelectric Ceramics

This presentation will provide review of the textured piezoelectric ceramics, both lead-based and lead-free, covering various methodologies such as templated grain growth and reactive templated grain growth techniques. Pb(Zr,Ti)O₃ (PZT) based compositions have been challenging to texture or grow in a single crystal form due to the incongruent melting point of ZrO₂. We have been successful in achieving >95% textured PZT-based ceramics and further show that it can provide highest known energy density in piezoelectric materials through enhancement of piezoelectric charge and voltage coefficients (d and g). Our method provides ~3 – 5 times increase in the ratio $d(\text{textured})/d(\text{random})$. The electromechanical properties of textured 0.4Pb(Mg_{1/3}Nb_{2/3})O₃–0.25PbZrO₃–0.35PbTiO₃ (PMN-PZT) composition which has relatively high rhombohedral to tetragonal (R-T) transition temperature (TR-T of 160° C) and Curie temperature (TC of 234° C) were doped with Mn to improve mechanical quality factor. MnO₂ doped PMN-PZT ceramics textured with 3 vol% BT and subsequently poled at 140° C (T-3BT140) exhibited very stable and high k_{31} (> 0.53) in a wide temperature range from room temperature to 130° C through reduction in the interface region volume. Further, the T-3BT140 ceramic exhibited excellent hard and soft combinatory piezoelectric properties of $d_{33} = 720$ pC/N, $k_{31} = 0.53$, $Q_m = 403$, $\tan \delta = 0.3\%$ which are very promising for high power and magnetoelectric applications. In lead-free materials, the presentation will cover the texturing of sodium bismuth titanate – barium titanate and sodium potassium niobate systems. Combined, the results will demonstrate that texturing process is cost-effective and reliable way to improve the performance of existing compositions. Texturing process is fully compatible with current industrial manufacturing of polycrystalline ceramics.



[001]-Textured PMN-PZT



Marc Lethiecq: Medical Keynote 2 May



Marc Lethiecq is Professor at the University of Tours, France, where he has been working on ultrasonic transducers & piezoelectric material characterisation and modelling since 1990. He is head of GREMAN, a laboratory of 120+ persons on materials, microelectronics, acoustics and nanotechnology. From 1987 to 1989 he had worked as a research engineer on ultrasonic devices for Vermon and CNTS companies and between 1984 and 1987 he had been assistant professor at Institut National des Sciences Appliquées (INSA) in Lyon, France, from which he had graduated (M. Eng. in Electronics & Electrical Engineering 1984, MSc 1984 and PhD 1988 in Acoustics). He has been teaching electronics, feedback control and courses related to his research activities since 1984 in several universities and engineering schools, currently at INSA Centre Val de Loire, Blois, France.

Ultrasonic Transducers for High Frequency Biomedical Imaging: Materials, Technologies and Applications

Marc Lethiecq, Franck Levassort, Jean-Marc Gregoire, Frédéric Ossant and Dominique Certon

The need for very high-resolution biomedical imaging systems has been increasing during the past 20 years in application fields such as dermatology, ophthalmology, intravascular examinations and small animal exploration, among others. This requires transducers that operate typically in the 20 to 100 MHz frequency range for which classical technologies (bulk piezoelectric materials) are not adapted. After an introduction on pioneering work on high-frequency transducers, the talk will review recent work on technologies compatible with large-scale industrial production. Transducer performance as well as images obtained for several applications will be presented; finally the pros and cons of the different technologies will be highlighted.



Make Your Hotel Reservations Now

Our hotel, **Atlanta Marriott Suites Midtown**, offers a central location and the appropriate size for our meeting and exhibition space that encourages in-depth discussions about all things ultrasonic.

Room rates are just \$169 single/double, with this rate available from Friday, 27 April through Friday, 4 May for those who wish to spend longer time in Atlanta. **Reservations must be made by 1 April to ensure you receive this special UIA rate.**



UIA has negotiated a flat rate of \$15 for overnight self-parking during the Symposium..

Make your hotel online reservation now: [UIA47 Hotel Reservations](https://tinyurl.com/UIA47Hotel) or <https://tinyurl.com/UIA47Hotel>

A Chip That Saves Optic Data As Sound Waves

As the processing power of computers continues to increase, there are laws of physics that start to create practical problems. For instance, using electrons to transfer data is limited by the speed of electrons, and electronic resistance generates heat, a fact most of us who use laptops and smartphones are well aware of.

A new microchip developed by researchers from the University of Sydney could change that. This chip, fabricated at the Australian Research Council's Centre of Excellence for Ultrahigh bandwidth Devices for Optical Systems (CUDOS), takes data stored in photons and converts them to sound waves, and then back to the optical domain.

Photons — the particles that make up light — are very good carriers of information, and since they do not have any charge — unlike electrons — they do not cause any heating even as they travel over very long distances through fiber-optic cables. Also, they travel much faster than electrons, meaning computer networks that use photons would be much faster than traditional digital networks relying on electrons. Photons are also impervious to disturbances caused by electromagnetic radiation.

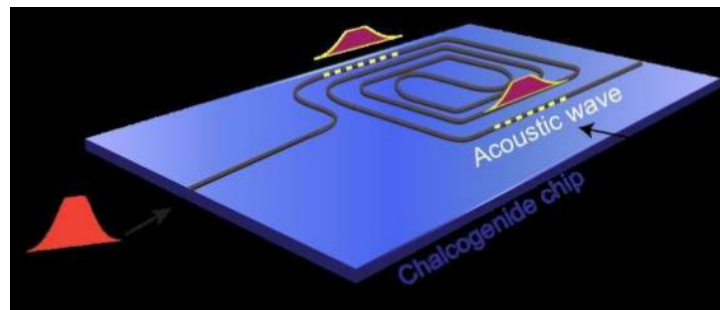
This makes photons an ideal candidate to use in computing, and a lot of research is being done in the field of optophotonics. However, the speed of photons also creates an inherent problem: they travel too fast for computers to actually process the data being carried by them, therefore making them potentially useless. This prob-

lem could be overcome if the photons could somehow be slowed down for processing, before being sent on their way again at their usual speed. And this is where the new microchip comes in.

"The information in our chip in acoustic form travels at a velocity five orders of magnitude slower than in the optical domain," Birgit Stiller, research fellow at the University of Syd-

nothing is close to being produced at a commercially viable scale yet.

Moritz Merklin of CUDOS, who was co-lead author of the research paper on the topic along with Stiller, said in the statement: "For this to become a commercial reality, photonic data on the chip needs to be slowed down so that they can be processed, routed, stored and accessed."



© Provided by IBT US Stylized image of the chalcogenide glass microchip. Information enters in the form of light waves and is converted and stored in the chip as acoustic waves

ney and supervisor of the project, said in a statement Monday. "It is like the difference between thunder and lightning."

The thunder and lightning analogy is fitting. Just as there is a delay between the flash of lightning and the roll of thunder that accompanies it, the delay between the light and sound in the chip "allows for the data to be briefly stored and managed inside the chip for processing, retrieval and further transmission as light waves," according to the statement.

While various research institutions and even well-known companies like IBM and Intel are working on developing functional computer microchips that use photons instead of electrons,

Using acoustics is not the only possible solution to the problem, but it could be one of the breakthroughs in technology.

Calling their device a world first, Stiller said: "Our system is not limited to a narrow bandwidth. So unlike previous systems this allows us to store and retrieve information at multiple wavelengths simultaneously, vastly increasing the efficiency of the device."

The research was published in the journal *Nature Communications*.

From the President...



Tony Crandall, UIA President

The UIA is an international trade association, network and technical society that brings manufacturers, users and academics together from around the world who work in the field of ultrasonics on a diverse range of medical and industrial applications. We welcome large and small industries, consultants, large academic groups and individual researchers, and government technical organizations. At our core is innovation in ultrasonic devices and products. Our international symposia and workshops attract an even wider audience and range of topics, including the advances in measurement instrumentation and techniques, characterization methods and fundamental research that underpin product innovation.

So if you've read the articles describing UIA47 in Atlanta, you know we've got a great symposium planned. Come join us and find out who we are. Even better, present a poster, a paper or become a sponsor.

We look forward to seeing you there!

Who or What is the UIA?

*Our core is
innovation
in
ultrasonic
devices
and
products*

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UIA47: Call for Papers

Submission of abstracts for consideration for UIA47 presentations or posters is now electronic.

Use the link below to go to the UIA47Symposium Abstract Submission site. Please follow the instructions to complete your submission(s). Should you have any questions, please email uia@ultrasonics.org or call +1.937+586.3725.

The UIA invites abstract submissions for posters for the 47th Annual UIA Symposium, 30 April - 2 May 2018, in Atlanta, GA, USA. This is an opportunity to showcase your research results to academic and industry delegates in any area of medical or industrial ultrasonics. We would be delighted to receive poster abstracts from graduate students to bring a strong 'local research' flavour to the UIA Symposium. You can submit your abstract here. We look forward to seeing you in Atlanta.

Go to <http://tinyurl.com/UIA47Paper> to submit your abstract.

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Forgot Password • New User? Click Here

Step 1

You must create a new profile, even if you submitted an abstract last year. Click on **New User?** to enter your email and password.

On the next screen, you will be asked to enter your contact information and your chosen password. On the next screen, select **Submissions** from the top menu, then click **Add New**.

Homepage My Profile Submissions

Your Submissions + add new

There are no Submissions. Click [add new](#) above to create one.

You may upload your abstract if you wish. After you have completed the submission, you may choose one of the following actions:

save & continue later save & submit cancel

**Deadline for
Presentation
Abstracts is
15 January 2018**

Register Before 15 January to \$ave

Registration is now open! Go to <https://tinyurl.com/UIA47Reg> to complete your registration prior to 15 January.

The registration fee for members is \$790 prior to 15 January, after it is \$950 USD

The registration fee for non-members is \$910 prior to 15 January, after it is \$1,050

A few hints:

- ◇ Our Tuesday evening event is **included** in full member and non-member registration. You may purchase a ticket for your companion
- ◇ You may purchase the ATILA book (\$125 value) for just \$50 when you register. This includes free ATILA light software available after the symposium.
- ◇ If you plan to attend the Tuesday evening event, **please be sure to check this box on the registration form.**
- ◇ You may register for one or two days if you do not want to stay the entire 3 days. To do this, select the daily registration for the days you wish to attend
- ◇ The daily registration for Tuesday **does** include the ATILA workshop and book, but **does not** include the Tuesday evening event. You may purchase a ticket to join us at this event.
- ◇ Questions? Feel free to call the UIA office at +1.937.586.3725

Important Links:

Registration:

<https://tinyurl.com/UIA47Reg>

Hotel Reservations:

<https://tinyurl.com/UIA47Hotel>

Paper/Poster Abstract:

<http://tinyurl.com/UIA47Paper>



Centennial Park courtesy of <http://travelinnate.com>

Atlanta, Georgia

Recently, Atlanta Georgia is becoming the new 'it' place and attracting more and more visitors. It is becoming the next international destination that you must put on your list to visit.

Take your taste buds on a fiery adventure with authentic world-class cuisines at fancy restaurants. Take yourself to hip nightclubs and make memories of a lifetime.

Modernism hasn't taken over the city though because the city has carefully preserved its' history. Atlanta Georgia History Center and Martin Luther King Jr. Historical Site are all part of the main tourist attractions in this upcoming city.



Here's how YOUR company can reach key ultrasonics users



UIA offers companies access to key influencers in the international ultrasonic community through four key avenues: new website, *Vibrations* newsletter, Sound Solutions one-day meeting and UIA47 International Symposium.

UIA47 Annual Symposium

The three day annual symposium will be held in Atlanta, Georgia, USA 30 April - 2 May 2018. Sponsorships include table top exhibits.

Website Banners

There are two positions available that will appear on every page of the site that will click through to the URL of your choice. See page two for more information about sizes, location, and costs.

Vibrations Newsletter

Display ads are available in this newsletter that is distributed electronically every quarter. Ads include a link to the URL of your choice.

Sponsorship Packages

Each package is for 12 months from date of payment. Go to page 11 to see details and pricing.

Titanium Includes two ad positions on website, full page ad in *Vibrations* newsletter and sponsor recognition/tabletop exhibit at Sound Solutions midyear meeting and Annual Symposium and more.

Gold Includes masthead banner ad position on ultrasonics.org, half page ad in *Vibrations* newsletter and sponsor recognition/exhibit at Sound Solutions and Symposium.

Silver Includes vertical ad position on ultrasonics.org, 1/3 page ad in quarterly *Vibrations* newsletter and tabletop exhibit at Sound Solutions and Annual Symposium.

Bronze Includes 1/2 column page ad in quarterly *Vibrations* newsletter and tabletop exhibit at Symposium.

Select the level of exposure best for your company. Go to www.Ultrasonics.org/UIA47Reg



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	Titanium	Gold	Silver	Bronze
	\$5,000	\$4,000	\$3,000	\$1,500

Website

Masthead banner with URL link	X	X		
Vertical banner with URL link	X		X	
Career Center Ad	unlimited	4 per year	3 per year	1 per year

Vibrations

Ad in 4 quarterly issues with URL Link	Full	1/2 page	1/3 page	1/2 column
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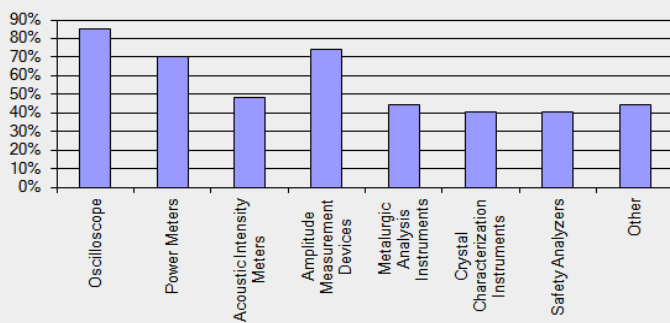
Sound Solutions

Sponsor Recognition	X	X		
Tabletop exhibit	X	X	X	X
Complimentary Registration	2	2	1	1

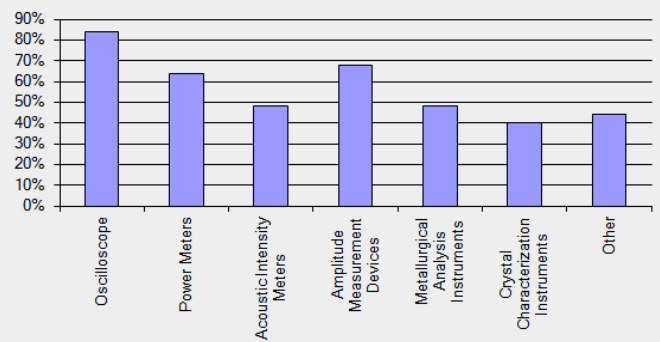
UIA46 Symposium

Sponsor Recognition	X	X		
Tabletop exhibit	X	X	X	X
Complimentary Registration	3	2	1	
Proceedings Sponsorship	X	X		
Sponsor Badge Ribbon Recognition	X			
Onsite Program Recognition	X	X	X	X
Exhibitor Badge Ribbon Recognition	X	X	X	X

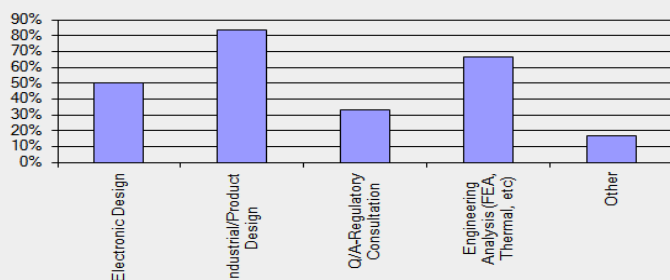
Instruments used in R&D and Production



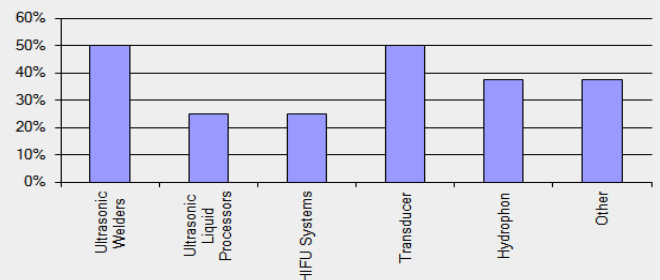
Instruments used for products and services



Types of Design Service Companies used by UIA members



Types of Ultrasound Companies used by UIA members



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How can ultrasonics enhance the value of your business?

UIA is the international business forum for users, manufacturers, and researchers of ultrasonics. Our members use acoustic vibrations to improve materials, industrial processes, and medical technology. We call this *powering sound ideas*.

Let's work together to power your sound ideas. Contact a member consultant or company through our online Referral Network, learn about ultrasonics with our online primer, or meet industry leaders at our next symposium.

Important Dates

14 January 2018: Last day to register for **UIA47** at earlybird rates <https://tinyurl.com/UIA47Reg>

28 February 2018: Deadline for Poster abstracts <https://tinyurl.com/UIA47Paper>

1 April 2018: Last day to make your reservations at the **Marriott Suites Hotel Midtown** [UIA47 Hotel Reservations](#)

30 April - 2 May 2018: **UIA47** in Atlanta, GA, USA

