



E-NEWSLETTER

Nov 2016 issue

THE SOCIETY OF ACOUSTICS SINGAPORE

Official Address: 5 Derbyshire Road, #04-05, Singapore 309461

Tel: 67913242 and Mobile No. 90932730 Fax: 62990485

E-mail: wsgan@metaultrasound.com

Website: www.acousticssingapore.com

Registration No: 0331/1989

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President: Dr Gan Woon Siong

Secretary: Prof Y F Zhou

Treasurer: Dr Antonio Alvarez

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I CONFERENCE NEWS

The 24th International Congress on Sound and Vibration(ICSV24) will be held in London, UK from 23 to 27 July 2017.

Woon Siong Gan will be organising three structured sessions on:

1. Nonlinear acoustics and vibration
2. Acoustical metamaterials:theory and applications
3. Sound propagation in curvilinear spacetime

Please visit www.icsv24.org for more informations.

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II. ANNOUNCEMENTS

The Society of Acoustics will be sending out invoices to members with outstanding membership subscriptions. Members are encouraged to make payment in support of the Society.

The E-Newsletters will be made available to industrial contacts in an effort to promote the activities of the Society.

The Society is also exploring the possibility of organising talks and other professional events in collaboration with acoustic societies of other countries.

Membership Certificates will soon be made available to all members who had made full payments of membership dues

The Society aims to increase membership by inviting all persons, including those from the institution of higher learning and other related societies such as the Institute of Architects, Singapore and the members of the mechanical engineering division of the Institution of Engineers, Singapore who are qualified in the various field of Acoustics to join our Society.

We are especially keen to invite students to join our society and we are establishing the Youth Chapter soon.

III. MEMBERSHIP SUBSCRIPTION

Fellow	S\$70
Member	S\$50
Associate	S\$30
Student	S\$15
Corporate	S\$200

FEE BASED ON ANNUAL RATE

FOR MORE INFORMATION PLEASE CONTACT: Dr.Gan at
email: wsgan5@gmail.com

Membership application forms can be downloaded from the society website:
www.acousticssingapore.com. Please complete and email to
wsgan5@gmail.com

IV.ARTICLES

Quantum Phononic Crystal and the Control and Manipulation of Phase Transition

Woon Siong Gan

The concept of artificial high temperature superconductor based on metamaterials was proposed in 2014.[1] Artificial metamaterial can be used to raise critical temperature of high temperature superconductor based on the theory of Kirzhnits et al[2] which introduced effective dielectric response function to enhance attractive electron-electron interaction and hence the critical temperature of superconductor.The theory of the artificial high temperature superconductivity is different from that of the natural high temperature superconductivity. It is based on the effective dielectric response

function which controls the critical temperature rather than the critical energy gap of the natural high temperature superconductor. The artificial superconductivity shows the power of the metamaterial in control and manipulation of phase transition. The enhancement of the effective dielectric response will take place at the resonance near zero dielectric constant.. There is a type of phononic crystals based on the idea of localized resonant structures that exhibit spectral gaps with a lattice constant two orders of magnitude smaller than the relevant wavelength. Disordered composition made from such localized resonant structures behave as a material with effective negative elastic constants and a total wave reflector within certain tunable sonic frequency ranges. [3] In this paper, we would like to introduce the concept of quantum phononic crystal which is to shrink this type of phononic crystal to having unit cell the size of ten nanometres. Since artificial quantum metamaterial has been successfully fabricated, the 3D printing method can be investigated for the fabrication of the quantum phononic crystal. The concept of quantum phononic crystal can be applied to artificial high temperature superconductor and to artificial topological superconductor as the metamaterial is able to control and manipulate the geometric structure and topology of the unit cell.

This year's Nobel physics award to topological phase transition enhanced the status of phase transition in condensed matter physics. The topological phase transition covers the field of topological superconductor. This is natural topological superconductor. Topological superconductor is a type of superconductor based on the topology or the geometric structure of the electronic structure. Also topological superconductor is related to high temperature superconductor. This opens up the possibility of designing the unit cell of the quantum phononic crystal for the artificial topological superconductor.

The theory of Kirzhnits et al [2] is a phenomenology.

References

1. D A Kirzhnits, E G. Maksimov, and D I Khomskii, The description of superconductivity in terms of dielectric response function, *J of Low T Phy.*, 10, 79, 1973.
2. Igor Smolyaninov and Vera Smolyaninova, Is there a metamaterial route to high temperature superconductivity, *Advance in Condensed Matter Physics*, 479635, 2014.

3.Z.Liu,X.Zhang, Y.Mao,Y.Y.Zhu,Z.Yang,C.T.Chan,P.Sheng,Locally sonic materials,
Science, 289,1734-1736,2000.

V.REPORT ON CONFERENCES

**Western Pacific Acoustics Conference(WESPAC)- Dec 6 to
10 2015, Grand Copthorne Waterfront Hotel, Singapore**

Singapore has the second highest number of 35 participants after the first place Japan with 95 registrations and the third was China with 32 participants.

The breakdown in field categories was as follows

1. Architectural acoustics	132
2. Noise	119
3. Underwater acoustics	99
4. Signal processing in acoustics	80
5. Acoustical imaging	51
6. Railway acoustics	37
7. Engineering in acoustics	35
8. Structural vibration & acoustics	31
9. Acoustical metamaterials	26
10. Psychological acoustics	24
11. Musical acoustics	19
12. Ultrasonics	18
13. Speech communication	18
14. Physical & biomedical acoustics	11

VI. BID FOR FUTURE INTERNATIONAL CONFERENCES

Riding on the success of Wespac 2015, the society is bidding to host the International Congress on Acoustics(ICA) in Singapore in 2025 and to host the International Congress on Sound and Vibration(ICSV) in Singapore in 2021

Government Bodies

www.mom.gov.sg

www.nea.gov.sg

www.lta.gov.sg

Technical and Research Sites

Corporate Sites

www.metaultrasound.com

www.noisecontrols.com

(The Society welcomes interested parties to contribute relevant websites to the above e useful links. For more information, please contact us. Thank you.)

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President: Woon Siong Gan
E-Newsletter compiled by: Woon Siong Gan