Aalto University – Where *science* and *art* meet *technology* and *business*

Mikko-Ville Laitinen

2nd SPLab Workshop 2012
24-26 October 2012
Brno, Czech Republic

Three leading universities in their own fields became *Aalto University* in 2010

Helsinki School of Economics (HSE)

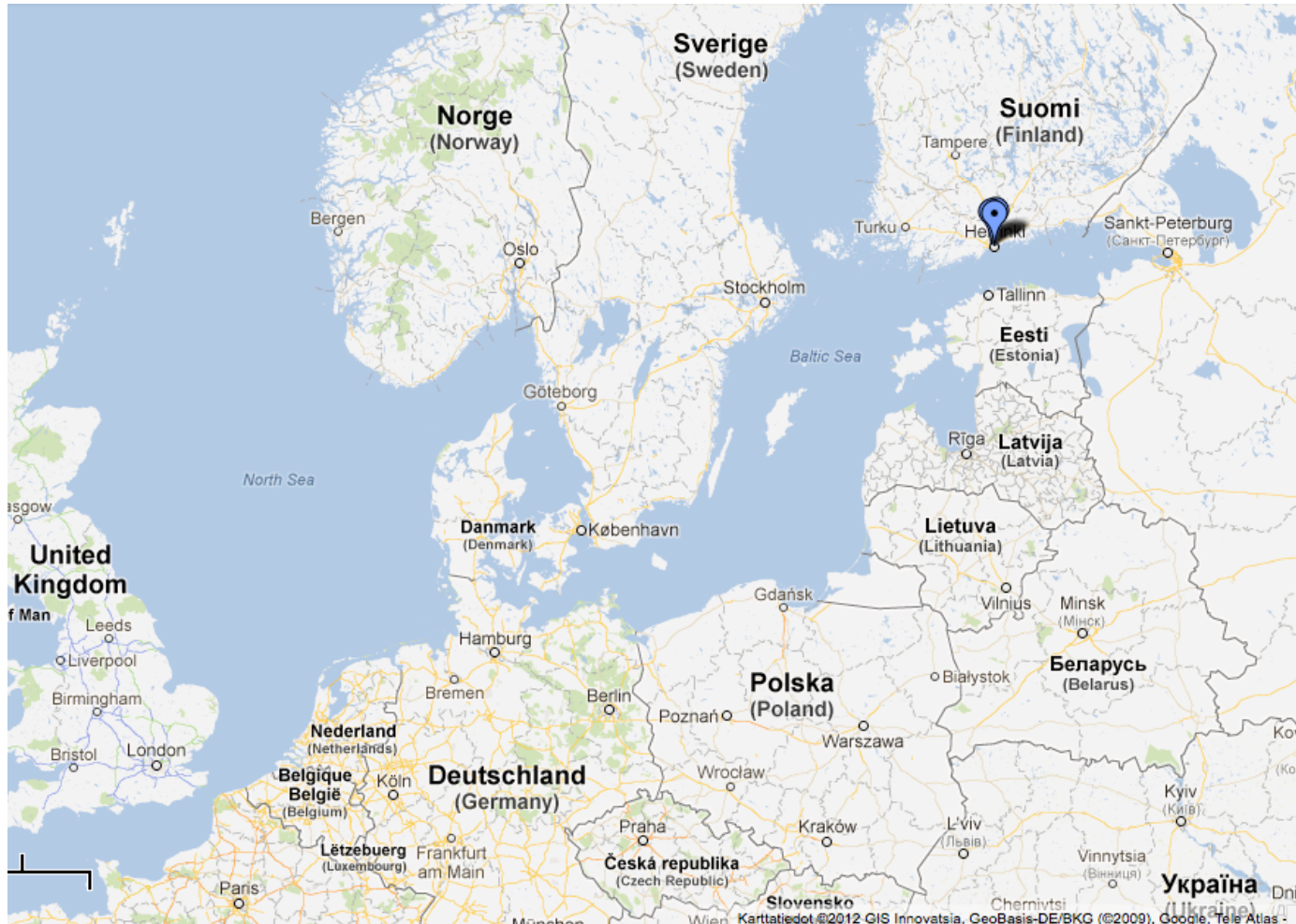University of Art and Design Helsinki (TaiK)

Helsinki University of Technology (TKK)

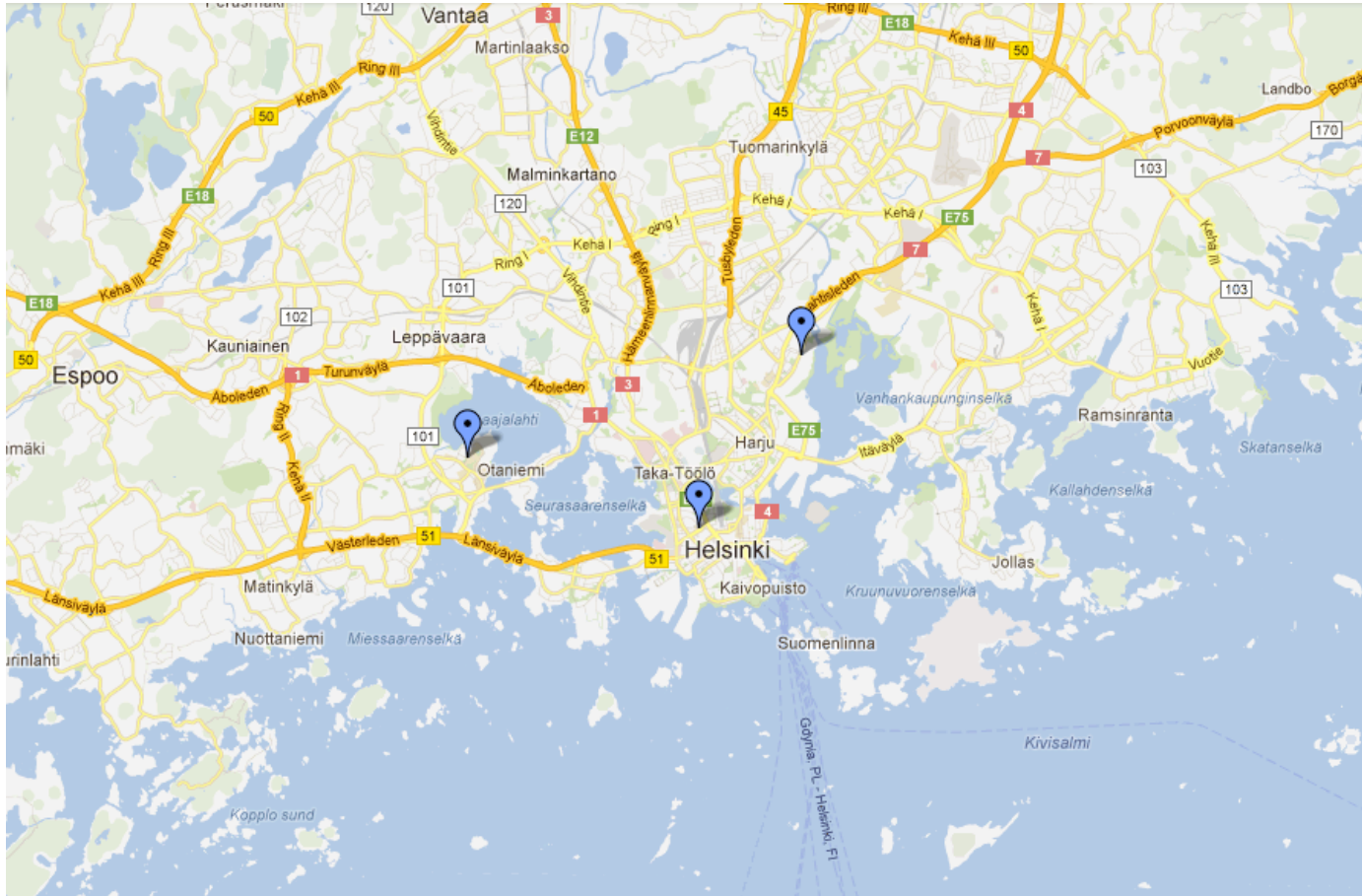*The Aalto University community: 75,000 alumni, 20,000 students, 5,000 staff members, 350 professors*

A? Aalto University

Aalto University
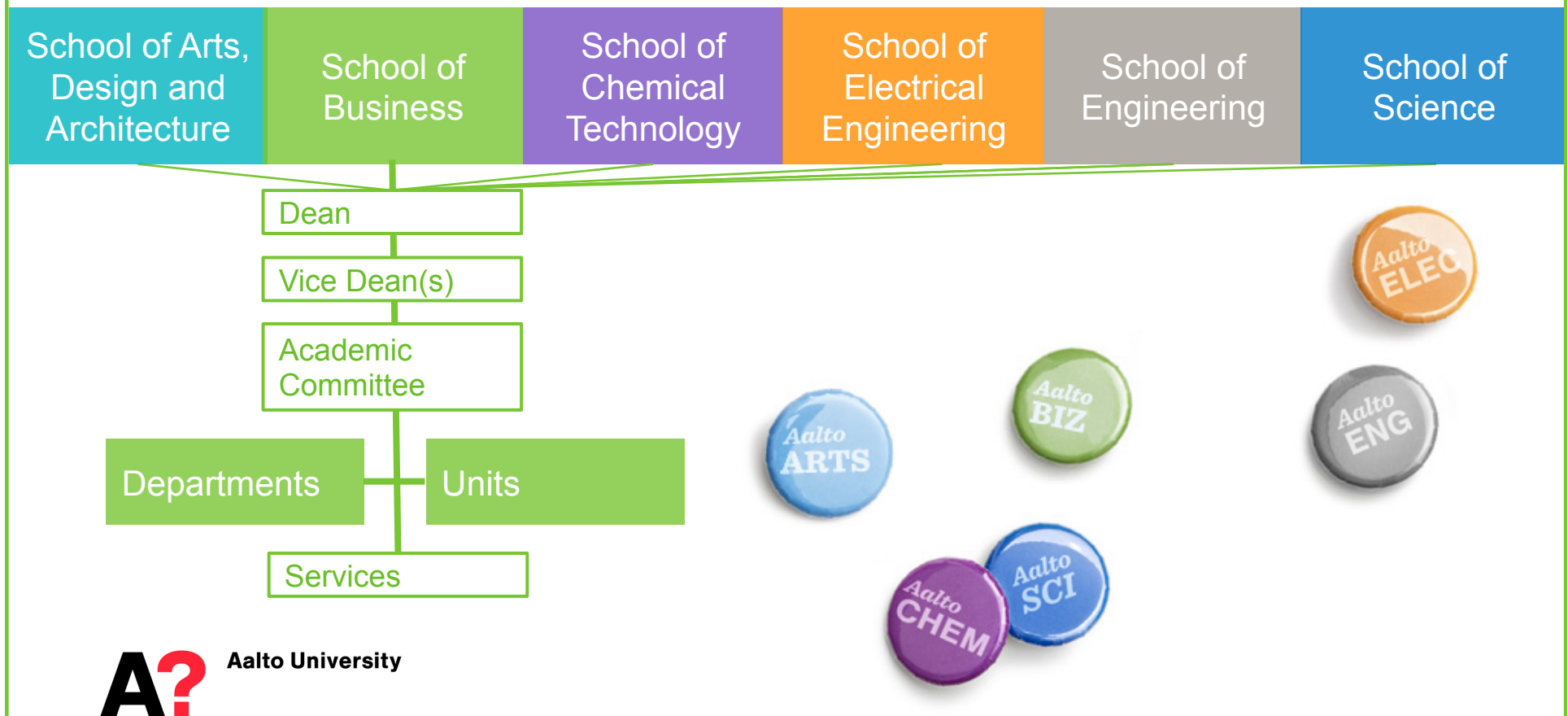# *location*

Aalto University *location*

Aalto University

Aalto University *location*

Aalto University *location*

Aalto University
schools

A? Aalto University

Science, art, business and *technology*

School of Arts, Design and Architecture	School of Business	School of Chemical Technology	School of Electrical Engineering	School of Engineering	School of Science

Dean

Vice Dean(s)

Academic Committee

Departments

Units

Services

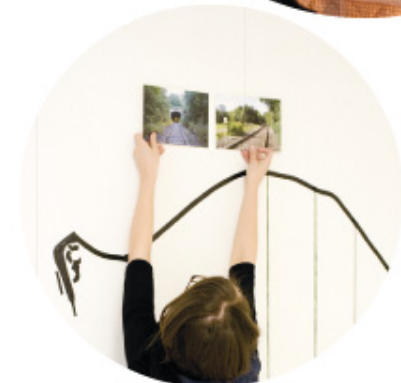**A?** Aalto University

School of Arts, Design and Architecture

For useful art

Staff members: 360
Professors: 60
Undergraduate and doctoral students: 2,140

Departments

Architecture | Art | Design | Film, Television and Scenography | Media

Other units

Media Centre Lume | Western Finland Design Centre Muova

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School of Business

Leading the way

Staff members: 470
Professors: 70
Unergraduate and doctoral students: 3,860

Departments

Management and International Business | Accounting | Marketing | Finance | Economics | Information and Service Economy | Communication

Other units

Center for Markets in Transition (CEMAT) | Center for Knowledge and Innovation Research (CKIR) | The International Business Programme, Mikkeli | Small Business Center
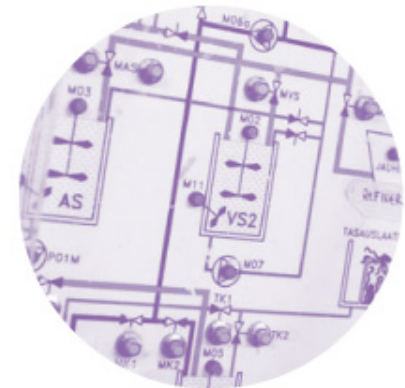
A? Aalto University

The only "Triple crown" of the Nordic countries: AACSB, AMBA and EQUIS.

School of Chemical Technology

At the forefront of sustainable development

Staff members: 480
Professors: 40
Undergraduate and doctoral students: 1,820

Departments

Biotechnology and Chemical Technology | Chemistry | Materials Science and Engineering | Forest Products Technology

Aalto University

School of Electrical Engineering

Expertise in science and engineering

Staff members: 650
Professors: 50
Undergraduate and doctoral students: 3,430

Departments

Automation and Systems Technology | Electronics | Micro- and Nanosciences | Radio Science and Engineering | **Signal Processing and Acoustics** | Electrical Engineering | Communications and Networking

Other units

Metsähovi Radio Observatory | Micronova Centre for Micro- and Nanotechnology

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School of Engineering

Expertise in technology and the built environment

Staff members: 760
Professors: 60
Undergraduate and doctoral students: 4,650

Departments
Energy Technology | Engineering Design and Production | Real Estate, Planning and Geoinformatics | Civil and Structural Engineering | Applied Mechanics | Civil and Environmental Engineering

Other units
Center for Energy Technology | Institute of Building Services Technology

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School of Science

Research creates future

Staff members: 1,260
Professors: 80
Undergraduate and doctoral students: 3,670
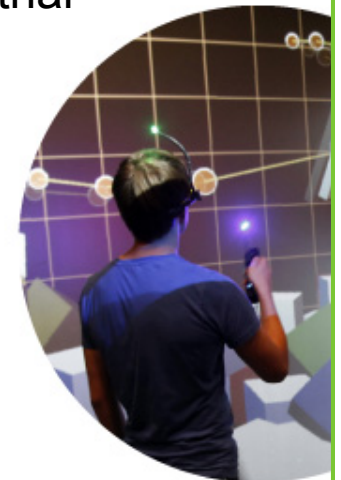
Departments
Biomedical Engineering and Computational Science | Mathematics and Systems Analysis | Media Technology | Applied Physics | Information and Computer Science | Computer Science and Engineering | Industrial Engineering and Management

Other units
O.V. Lounasmaa Laboratory | Helsinki Institute for Information Technology HIIT | Language Centre

Partnerships
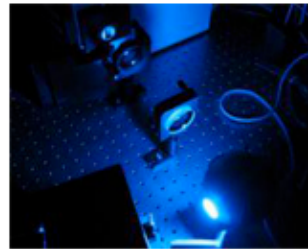EIT ICT Labs Helsinki | Helsinki Institute of Physics HIP

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Five Centres of Excellence of the Academy of Finland

Aalto University
department of signal processing and acoustics

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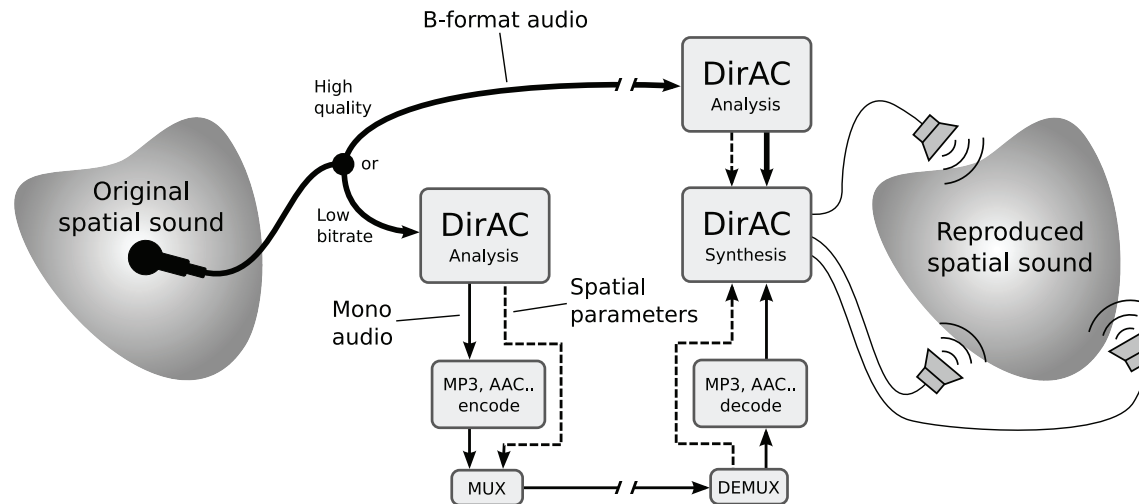# Aalto University *department of signal processing and acoustics*

- Acoustics and audio signal processing group
  - Spatial Sound
  - Audio Signal Processing
  - Speech Communication
  - Speech Technology
- Metrology group
- Signal processing group

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Spatial Sound Team

- Ville Pulkki, Professor
- 10 PhD students
- 3 MSc students

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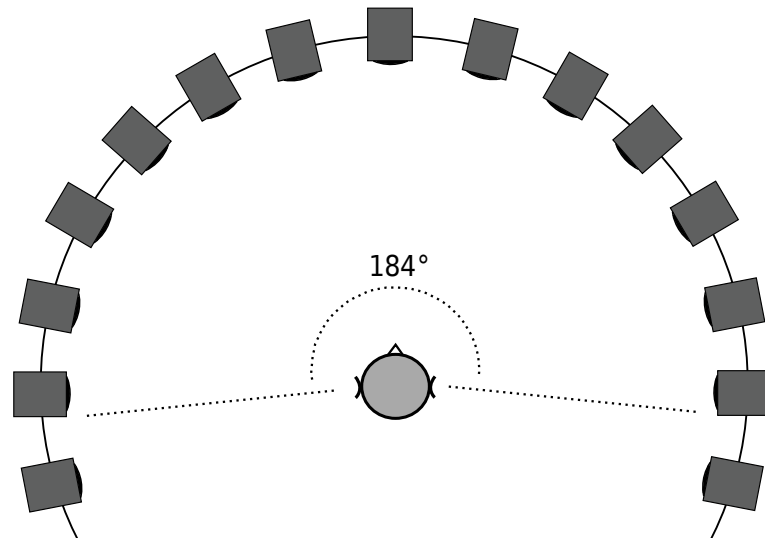
Spatial Sound Team
Directional audio coding

- Teleconferencing
- Sound recording / reproduction
- Virtual worlds / game audio
- Microphone techniques for parametric spatial audio

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Spatial Sound Team
Psychoacoustic research

184°

- Basic scientific tests on the resolution of humans in perception of spatial sound

- How does binaural listening affect perceived sound color?
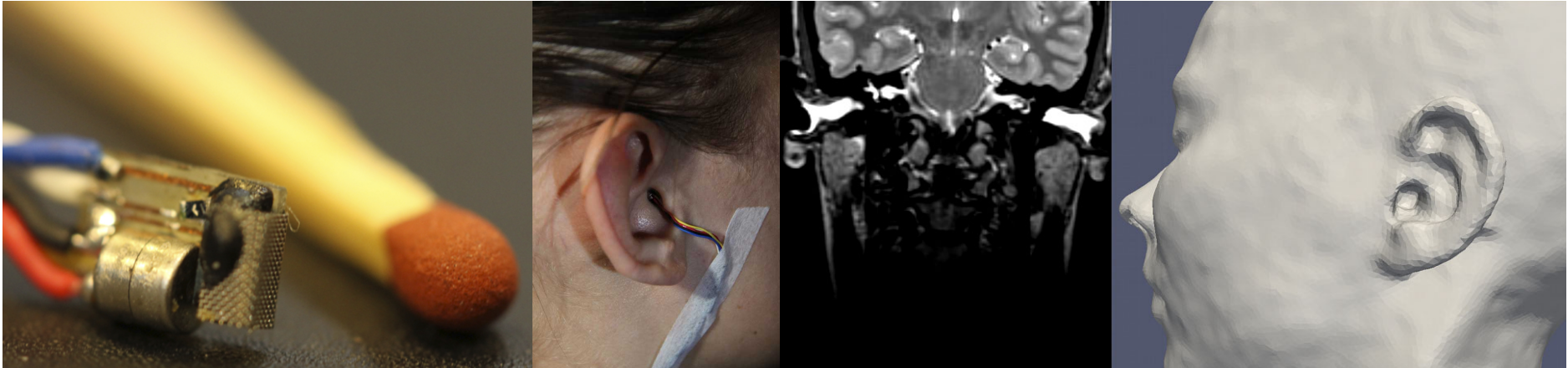
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Spatial Sound Team
Crossmodal research

- Influence of audio and vision to perceived overall quality of reproduction

- Crossmodal effects between head movements and hearing, specifically in headphone listening

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Spatial Sound Team
Head-related acoustics

- Utilizing miniature pressure-velocity sensors
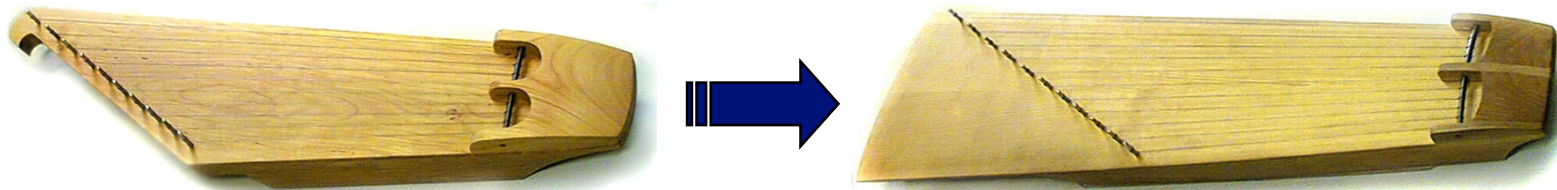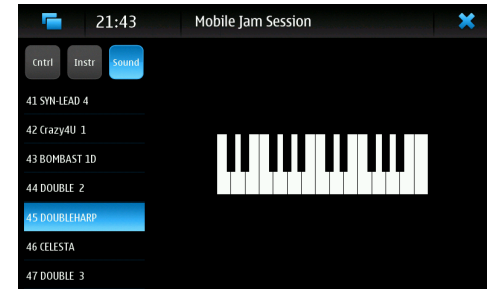- Numerical modeling of head-related acoustics with MRI-scanned heads

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Audio Signal Processing Team

- Vesa Välimäki, Professor
- 4 postdoc researchers
- 6 PhD students

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Audio Signal Processing Team
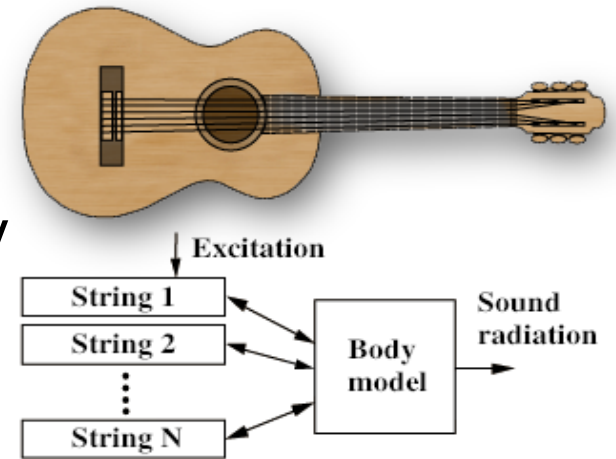## *Research*

- Wideband sound technology
  - Music technology
  - Mobile phones
  - Noise control

- Main tool: digital signal processing

- Sound synthesis, musical effects processing, sound analysis, filter design, musical instrument design, listening tests

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Audio Signal Processing Team
Current topics

- Physical modeling of sound sources
  - Musical instruments and noise sources
- Modeling of analog music technology
  - "Virtual analog" models
- Sound synthesis algorithms
- Digital filters for audio processing
- Headphone audio

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Speech Communication Team

- Paavo Alku, Professor
- Staff : ca. 10

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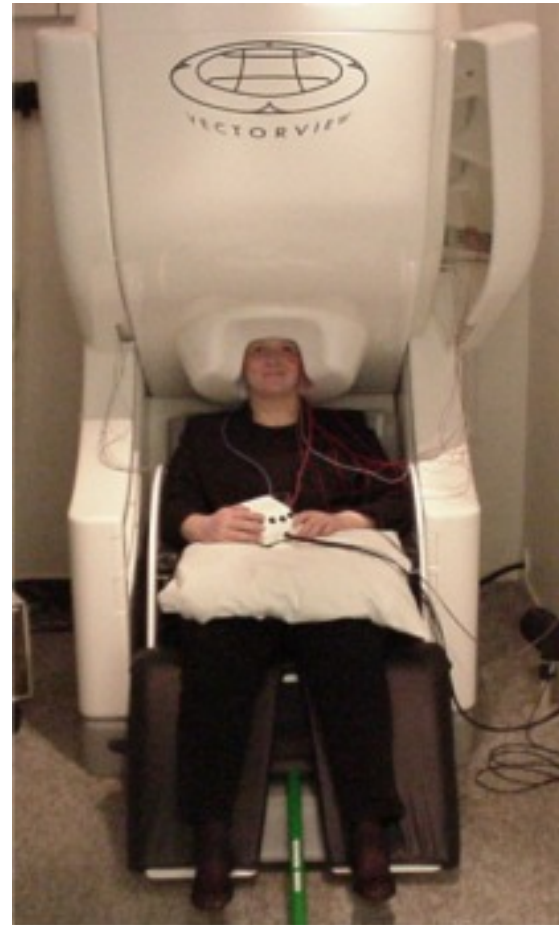
Speech Communication Team
Research topics

- Analysis of voice production

- Brain functions in speech perception

- Occupational voice care

- Quality and intelligibility improvement of speech in mobile phones

- Robust speech features

- Statistical parametric speech synthesis

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Speech Communication Team
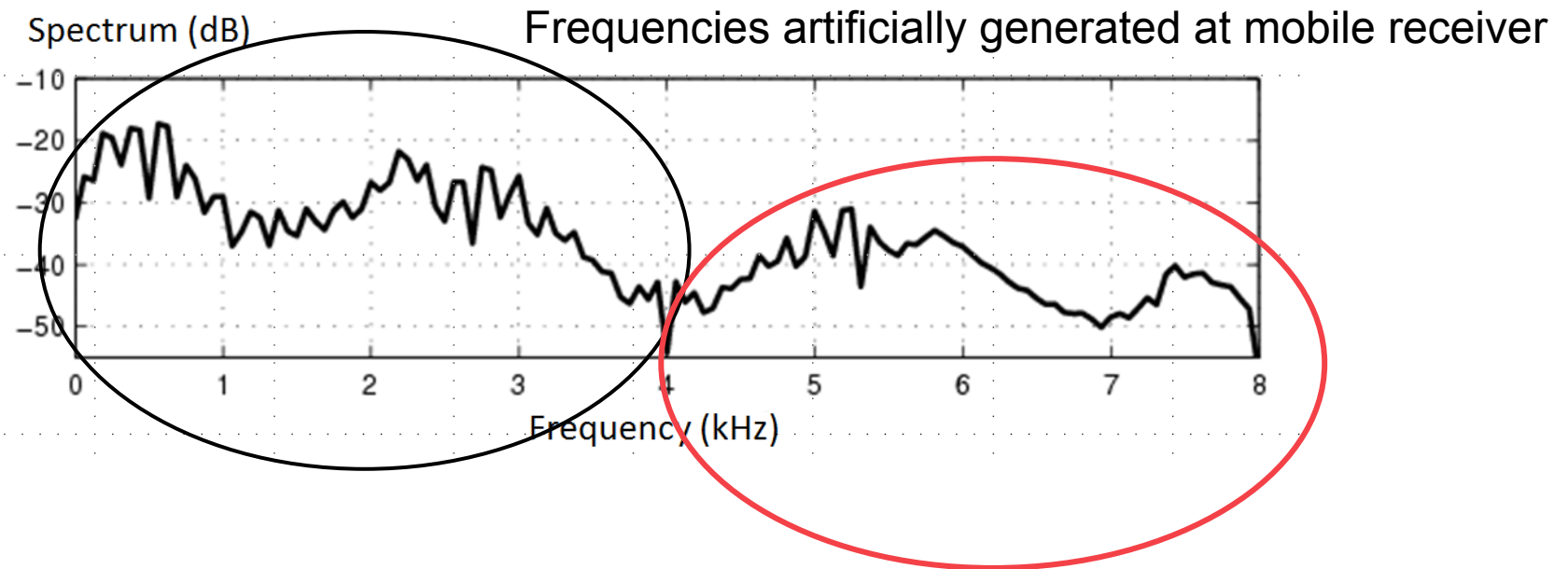## *Brain functions in speech perception*

- Goal:
  - To combine modelling of speech production with modern brain imaging methods, particularly magnetoencephalography (MEG)

Speech Communication Team
Artificial bandwidth extension of speech

Frequencies transmitted through network

Frequencies artificially generated at mobile receiver

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Speech Technology Team

- Unto Laine, Professor
- Staff : ca. 6

Speech Technology Team
Research topics

- Speech analysis
- Speech segmentation
- Speech corpora access
- Pattern discovery
- Classification of bird sounds
- Modeling of language acquisition
- Multimodal information processing

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Infrastructure for acoustical research

- 3 anechoic chambers (LF cutoffs: 65, 100, 100)
  - One with multichannel loudspeaker and microphone setups, and head tracking capability
- ITU-R BS.1116 multichannel listening room
- Multipurpose room
  - E.g. cave environment
- Three listening booths

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Thank you!

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