

SOUND INNOVATION™



Welcome to *Sound Innovation*™, the quarterly newsletter created by Akustica to keep you abreast of technology advancements that can help you deliver the voice improvements demanded by your customers. Each quarter, we explore topics affecting voice communications and provide you with leading-edge information that will help you understand emerging trends and evaluate new offerings.

DESIGNING A HIGH QUALITY MICROPHONE SYSTEM FOR A LAPTOP



End-user perception of a VVoIP (Video and Voice over Internet Protocol) call will be impacted by both the audio and video quality. Studies have shown that given the same video performance but two different audio systems, customers will perceive higher quality video when paired with a higher quality audio system. This means equal time and effort should be given to designing a high quality audio and video system, particularly in next generation laptops that are being developed specifically to support RTC (Real Time Communication) applications.

This issue of *Sound Innovation* outlines three important considerations for designing a high performance integrated microphone solution in a laptop – placing the microphone in the best location, selecting the right microphone, and using a microphone array. For example, the picture below shows some of the common mechanical and electrical noise sources that are encountered when laptop manufacturers try to integrate microphones into a laptop. By following the recommendations discussed in this newsletter, the highest quality solution will be achieved in laptop platforms, leading to a superior user experience.



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AKUSTICA NEWS and ARTICLES

- Akustica to Enhance Voice Communications on Fujitsu LifeBook Q2010 High-End Executive Notebook
- Akustica Collaborates with Ricoh on the Promotion of Voice and Video over Internet Applications
- Akustica and SigmaTel Develop New Digital Microphone Array Solution for Microsoft Vista-ready Notebook PCs
- Akustica Readies CMOS MEMS Platform for New Application Areas
- *Sound Innovation* Vol. 2, No.1 - Akustica Announces World's First Single-Chip Microphone

WHAT OTHERS ARE SAYING

- *Electronic Design*: Breaking A New Sound Barrier: It's A Mic-On-A-Chip
- *EDN-Brian's Brain*: The Sounds of Silence
- *CNET*: Skype software to ship on Dell laptops
- *PC Mag.com*: The Best Stuff for Video Chatting

INDUSTRY EVENTS

- **MIPI Alliance**
September 19-21
- **Interspeech**
September 18-22
- **Intel Developer Forum**
September 26-28
- **117th AES Convention**
October 6-9

➔ [Click here to meet with Akustica at any of these events](#)

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DESIGNING A HIGH QUALITY INTEGRATED MICROPHONE SYSTEM

By Dr. Marcie Weinstein, Director of Strategic Marketing

One of the main challenges faced by laptop PC audio system designers is achieving a high quality and robust microphone design. Without a low noise design, high quality voice input for real time communication applications such as Video and Voice-over Internet Protocol (VVoIP) will not be realized. The good news is that there are steps that can be taken to quickly and easily achieve a high quality audio input system to support next generation RTC (Real Time Communication) platforms.

I. REDUCE ACOUSTIC AND MECHANICAL NOISE BY MOVING MICROPHONES FAR AWAY FROM THE NOISE SOURCES IN THE BASE OF THE LAPTOP

Most mechanical noises will be heard most loudly when the microphone is located in the laptop base near the sources that are shown in the picture below. A better, more isolated location for the microphone is the laptop display bezel. In the Fujitsu LifeBook Q2010 notebook shown in the picture, there are two Akustica digital microphones that have been located in the display bezel. Their locations are indicated by the green circles. In this location, the distance between the microphone and the mechanical noise sources is substantially increased, reducing the noise at the microphone to a barely audible level.



II. REDUCE RF NOISE FROM WLAN, PAN, WAN, CELLULAR, AND EM NOISE FROM BACKLIGHT INVERTER

With the widespread adoption of wireless, the display bezel has become an antenna rich environment which includes antennas for WLAN, WAN, GSM, PAN, and other wireless standards. These antennas interfere with analog microphones when they are placed in the bezel.

RF and EM interference on the audio path can be difficult to combat in the bezel with an analog microphone. In addition to the BOM cost increase and physical space limitations that result from using shielded cables, pre-amplifiers, and voltage regulators to overcome the interference, significant design time is also required to accomplish a satisfactory solution.

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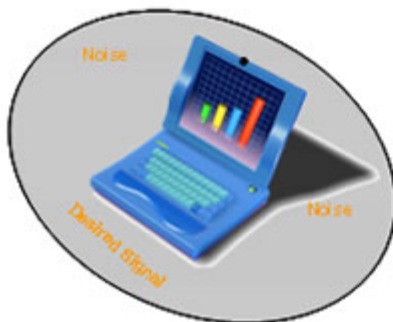


Fortunately, single-chip CMOS MEMS microphones like the AKU2000, 2001, and 2004 from Akustica have been designed with a digital output that is immune to RF and EM interference, providing a straightforward way of integrating a microphone into the bezel.

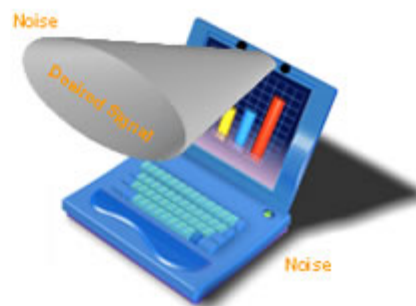
III. REDUCE AMBIENT AND BACKGROUND NOISE BY USING A MICROPHONE ARRAY

Ambient noise can also degrade a VVoIP experience. In order to achieve suppression of background noise, two or more digital microphones can be integrated into the bezel to form a microphone array. A microphone array can be used in conjunction with software that processes the sound and forms a “spotlight” that focuses the microphones on your voice and not on the surrounding sounds. This type of signal processing can only be performed if more than one microphone is present in the system.

A single microphone picks up the desired signal AND background noise



A microphone array uses beamforming software to pick up only the desired signal and suppress the background noise



Some more advanced types of beamforming software can even have the “spotlight” follow your voice as you move around a room. In general, if you increase the number of microphones in the array from 2 to 4 or more, the “spotlight” will sharpen and the ambient noise will be suppressed even further.

**SOUND INNOVATION™****RECOMMENDATIONS FOR DESIGNING A HIGH QUALITY INTEGRATED MICROPHONE SYSTEM**

I.	Mount the microphones away from mechanical and acoustic noise sources
II.	Use single-chip digital microphones such as the AKU2000, 2001, or 2004 to eliminate RF and EM interference on the audio path
III.	Use multiple microphones and beamforming algorithms such as those in Windows Vista™ to suppress ambient noise.

Shielded cables and lengthy simulations are no longer necessary when using a digital microphone. Instead, the integration of a digital microphone into the bezel is an uncomplicated and more cost-effective way to enable RTC platforms with high quality voice input solutions. [Click here](#) for more information from Akustica.
