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Research Group Plans New Digital Audio Tests for Early 2010

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By [Sandra Wendelken](#), Editor

New tests addressing the digital audio quality in noisy public-safety environments will be conducted in January or February at the Department of Commerce (DOC) Public Safety Communications Research (PSCR) labs in Boulder, Colo. The [first PSCR tests](#) were conducted in 2008.

D.J. Atkinson, PSCR standards expert, said the 2010 tests will differ in four ways from the original research.

1. The tests will use reference implementations of the radio systems rather than any specific manufacturers' radios. This will enable a baseline minimum of performance to be established that can be applied across manufacturers.
2. The 2010 test will incorporate updated best practices provided by the International Association of Fire Chiefs (IAFC). This will enable the improvements in the changes to be quantified.
3. PSCR will use an updated Project 25 (P25) vocoder software release provided by Digital Voice Systems Inc. (DVS). This update is specifically designed to help with loud noise environments, and this experiment will enable some of those comparisons.
4. The test will incorporate impaired radio channel conditions in addition to the background noise. This

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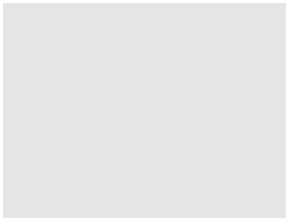
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will help researchers understand the compounding effect that multiple degradation sources have on audio quality.

Atkinson heads the P25 Audio Performance Working Group (APWG) to investigate fireground noise issues and was the lead researcher in the PSCR digital noise tests conducted in 2008 for the IAFC. "A lot of people, organizations and companies have stepped up to the plate to try to improve the situation since the first round of testing," Atkinson said. "It is being addressed as a system issue, where improvements in each individual element contributes to an overall improvement in performance."

The Department of Homeland Security (DHS) has used Small Business Innovation Research (SBIR) grants to fund microphone design. The Audio Engineering Society (AES) also has committed resources to microphone design, and DVSI has improved its vocoder software. At the Association of Public-Safety Communications Officials (APCO) International conference in August, two radio manufacturers demonstrated radios with built-in noise-canceling microphones, Atkinson said. "There's a lot of promising stuff going on. We just need to understand how much of an improvement has been made thus far," he said.

The APWG has contributed to the progress as well. "Some of the biggest progress was in the definition of the reference systems to be used for the test," he said. "Also, the group has made a lot of progress in increasing the awareness that the audio performance issue is a systems issue, and not just a vocoder issue."

At the latest P25 meetings in October, DVSI President John Hardwick offered a presentation that outlined the benefits of firefighters using SCBA masks with internal microphones. "DVSI added an internal microphone to an SCBA mask and found it increased input signal noise reception (SNR) and achieved better voice quality," the presentation said.

DVSI made a series of recordings and conducted tests using the SCBA mask with internal microphone. "If you use an internal microphone, the mask filters out the noise," Hardwick said. "The mic picks up speech and not a lot of noise. You could use this internal mic with any radio that has the right connector."

DVSI purchased an off-the-shelf MSA SCBA mask that fits a radio interface unit that features an internally mounted microphone for the tests. "We don't sell microphones or masks so all of this is relative to the starting point. How do you get the signal into the radio itself?" Hardwick said.

Atkinson said that in concept putting a mic inside the mask makes sense for noisy situations. However, several implementation considerations need to go into the design to make it viable. Atkinson said that based on firefighter feedback, the considerations include the following:

- Additional wires to the head represent a snare hazard. Any wires should have a breakaway in case of snare;
- If there is a breakaway, there needs to be a fallback communications mechanism such as re-enabling a lapel mic. It should be reconnectable

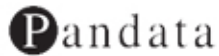
while wearing gloves;

- Firefighter gear is scalable depending on the incident. Firefighter radio communications gear should easily scale up and back to include or exclude any special microphones; and
- Any special mics should not increase the dress time of a firefighter.

“Early on, many of us thought the vocoder only played a minor part,” said Craig Jorgensen, co-chair of the P25 steering committee. “There are other issues outside the vocoder and outside the standard that need to be addressed to solve the problem.”

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