Mission Critical Voice Intelligibility Over Long Term Evolution (LTE)

Broadband Voice Intelligibility is Crucial

Voice Intelligibility over Long Term Evolution (LTE) Broadband Network applications are emerging as an important communication tool for first responders, with an increasing number of public safety personnel using LTE in their daily operations. The intelligibility of speech — the ability to be understood — in difficult environments is one of the key requirements established by the National Public Safety Telecommunications Council. First responder voice communications are an important part of FirstNet, the national public safety communications network. Public safety LTE applications should be at least as intelligible as the existing analog Land Mobile Radio (LMR) systems, including in high-noise environments.

Currently, LMR P25 standards set the requirements for voice intelligibility for LMR only. The digital system offered by LTE will differ from LMR, requiring a different type of testing to ensure the same or higher quality of audio in the field. Audio codecs create digital representations of audio signals for transmission over LTE networks, which are capable of transmitting at much higher data rates than LMR. The codecs determine how the audio signals are encoded for transmission and decoded when they are received. LTE offers an opportunity for high quality voice transmissions; however, this necessitates rigorous testing of audio codecs to establish the best possible quality, especially considering the difficult environments responders encounter.

PSCR Testing

The Public Safety Communications Research (PSCR) Program partnered with the Department of Homeland Security Science & Technology Directorate's First Responders Group to conduct Voice Intelligibility Testing. The testing considered acoustic noise at the transmit site and the choice of optimal audio codecs for ensuring reliable audio quality for first responder communications.

- In Phase 1, researchers selected codecs and then generated at least 25,000 audio files of speech under varying conditions echoing real-world challenges for testing.
- Phase 2 included the digital evaluation and statistical testing of the files generated to describe objective intelligibility.

- Finally, Phase 3 used a subset of the files from Phase 2 for testing with live listeners. Reports summarizing test results were published at the end of each phase. At the conclusion of Phase 3, a final report released by National Telecommunications and Information Administration (www.its.bldrdoc.gov/publications/2811.aspx) detailed results of the testing and the intelligibility of the selected codecs.

An example setup used for conducting audio quality testing.

Better LTE Intelligibility

Voice Intelligibility Testing identified noise-robust, high-intelligibility speech codecs for LTE. This ultimately helps place reliable, high-quality audio into the hands of first responders using LTE devices for mission-critical voice applications. With LTE joining LMR as a major carrier of emergency communications, optimal codecs are integral to maintaining reliable audio quality and ensuring responders can effectively communicate in even the most challenging audio environments.

To learn more about Mission Critical Voice Intelligibility Over LTE, contact SandTFRG@hq.dhs.gov.

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