"Tape Enhancement"

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This is the second of two articles on the voice as a forensic tool by prosecutors. This article deals with the enhancement and authentication of tape-recorded voices and is adapted from two articles on the subject by forensics specialist Steve Cain, president of Applied Forensic Technologies, Intl., plus discussions with Cain.

You're a prosecutor preparing a major drug or conspiracy case and one of your principal pieces of evidence is the tape-recorded conversations of the alleged conspirators.

The problem is that the quality of the tape — as the result of background noises and other factors
— is so marginal that you run the risk of the jury discounting it.

What do you-do?

According to Steve Cain, president of Applied Forensic Technologies, Intl., and one of the nation's leading experts on voiceprint (or spectrograph) technology, you have tape quality enhanced and authenticated by qualified specialists.

"An integral part of any voice identification task," says Cain, "is to attempt to ensure that the most intelligible speech samples are available for comparison purposes.

All too often, however, the limitations of surveillance, recorder, microphone, and adverse room and reverberation effects severely degrade the audio signal. Through the proper selection of a variety of analog and digital tape filtering devices, unwanted sounds often can be attenuated."

The output signals of tape recorders can be damaged by three general factors — noise, interference and distortion — each of which is caused by a specific condition. In addition, there are what Cain calls "adverse forensic influences" that include the bandwidth equaliza tion of telephone lines that limit voice frequencies to between 300 to 3500 hertz.

To reduce or eliminate various noise and distortion sounds from an audio tape, forensic audio specialists use a variety of filters. For example, when a tape hiss occurs within the speech frequency range, a so-called low-pass filter is used to eliminate it. When what is called a "low-end rumble" occurs, an appropriate high-

pass filter is used. "Comb filters" are used to reduce harmonically related noise such as a power supply hum.

"Because of inadequate equipment and poor operator technique," Cain says, "a host of...factors besides noise can reduce speech intelligibility. Improper recorder speed or transient mechanical problems, along with poor quality tape or unstable AC power, all can contribute to a poor quality recording."

The tape enhancement process, therefore, must start with examination of the equipment used and the recording tape speed. Once a tape is "cleansed" of interfering noises to make the recorded voices or other pertinent sounds as clear as possible, it usually must be authenticated before it can be introduced as evidence in court, to avoid any charges of illegal tampering.

Probably the most famous tape authentication examination was the one conducted in 1974 by a group of forensic experts appointed by then U.S. District Judge John Siica in the Watergate case to examine the disputed 18-minute gap in a White House recording.

With the increasing number of drug-related and money laundering cases being prosecuted by federal, state and local prosecutors, the use of tape-recorded conversations and related sounds is increasing correspondingly, calling— Cain says — for professional examination of tapes requiring enhancement and authentication.

As might be expected, the tape authentication procedures developed and suggested by the FBI Technical Services Division's Signal Analysis Branch are detailed and voluminous.

The requirements include sworn testimony on the circumstances of the recording and equipment used, the original tape and recording device, written records of any damage, maintenance and repairs; detailed statements by the operator on the technical conditions existing at the time of the recording, including such factors as the power source, background environment, condition of the tape, etc.

The FBI suggests that forensic experts carefully examine the recorder right down to the marks left by ferrofluids that adhere to magnetic poles. Each recorder leaves a distinctive "fingerprint" in the form of electronic imprints along the tape surface. These imprints — unless physically altered — are identifiable among different records.

Finally, the FBI suggests a physical as well as spectrographic (wave form) examination of the tape to make a subjective determination. The physical examination involves a trained examiner listening to perceived pitch, quality, rate of speech, mannerisms, amplitude, breathing patterns, syllable couplings,

background sound variation, hum and other acoustic effects, such as room reverberation. That done, you and your tape are ready for the trial.

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