



### D83 Considerations for the Forensic Authentication of Digital Audio Recordings

*Douglas S. Lacey, BS\*, and Bruce E. Koenig, MFS, BEK TEK, LLC, 12115 Sangsters Court, Clifton, VA 20124-1947*

After attending this presentation, participants will have learned about the differences in the approaches to the forensic authentication of analog and digital audio recordings. Common analyses and those unique to each will be discussed, and special considerations related to the analysis of digital recordings will be introduced.

This presentation will impact the forensic science community by providing a framework for the formal development of a methodology with regard to the forensic authentication of digital audio recordings. Such a methodology will directly assist examiners in the field.

The methodology for the forensic authentication of analog audio recordings is well-established in the field, most notably through the 1974 report regarding the examination of the Nixon tapes by the Advisory Panel on White House tapes and "Authentication of Forensic Audio Recordings" (Koenig) published in the *Journal of the Audio Engineering Society* in 1990. These documents provide detailed descriptions of the various analyses employed by government and private forensic examiners when authenticating analog recordings. The analyses which form the core of the examination include physical inspection, critical listening, high-resolution waveform, magnetic development, narrow-band spectrum, spectrographic, and other related scientific analyses.

With the proliferation of digital audio recordings in law enforcement investigations and consumer activities, these analog authentication methodologies and analyses need to be revisited, updated, and modified, as appropriate. Digital audio recordings can be stored on a wide variety of media (CD, DVD, fixed memory, memory cards, digital tape, etc.) and can be in a standard or proprietary format, with each combination of media and format bringing with it unique challenges for playback and analysis.

While most of the techniques employed in the authentication of analog recordings are also applicable to digital recordings, magnetic development may negatively impact digital recordings or may provide no meaningful data, depending on the media containing the recording. Magnetic development is crucial to the authentication of analog recordings, as it assists the examiner in visualizing the magnetic patterns of the information recorded on the analog tape. However, with digital recordings, such examinations are meaningless with non-magnetic digital media (CDs, memory cards, etc.); may potentially render some forms of magnetic digital media (DAT, NT-2, etc.) unreadable, in part or in whole; and even when applied in a non-destructive way to magnetic digital media, may provide no useful information to the examiner.

Conversely, some digital recordings offer new forms of analyses which have no direct corollary in analog recordings. Metadata contained within a digital audio file, for example, may provide information above and beyond the audio data itself, which can be useful when determining time/date information, recorder information, and other administrative characteristics related to the recording. Additionally, mathematical algorithms which produce a "unique" value (generally referred to as "checksum" or "hash" values) based on the size and/or contents of the file may also be incorporated into the metadata and may directly determine if changes have been made to the audio data.

Deciphering and/or obtaining information about the structure and encoding of the metadata and audio data itself may be difficult or impossible, especially with the increase in the number of digital audio recorders employing proprietary file formats. In situations where this information (the non-standard structure of a digital audio file) cannot be determined, attempts are made by the examiner to decode the file structure through detailed data analysis techniques and exemplar recordings produced on the original recorder or a similar model recorder, if possible.

Because of the wide variety of physical media/format possibilities and the intricacies of various digital file formats, published research related to the forensic considerations of individual media, file formats (standard and proprietary), the applicability of the various "analog" analyses to digital recordings, and the development of new analysis techniques becomes even more critical for the establishment of a formal methodology.

#### **Digital, Audio, Authenticity**