



## Digital and Multimedia Section – 2012

### B11 Quantifying Phase Changes in Audio Authenticity Examinations

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After attending this presentation, attendees will be presented testing results of automatic methods for detecting phase changes in forensic audio recordings when conducting audio authenticity examinations. Additionally, attendees will learn to compare the results of different automatic phase detection programs used in this series of tests.

This presentation will impact the forensic science community by exploring how phase changes by themselves may not provide insight as to whether an event is an alteration or not, but show promise as a method to correlate multiple events. If the accuracy of detecting phase changes is unreliable, this will also impact the value of it being used as potential method for forensic audio authentication.

**Hypothesis:** To determine whether a phase change in a forensic audio recording can accurately be identified as an alteration or edit and develop criteria or parameters classifying the event as such.

**Synopsis:** A series of test recordings that include various digital formats containing both altered and unaltered recordings will be analyzed by two different automatic phase detection systems. The test recordings will consist of reference tones recorded at various amplitudes as well as background environments consistent with forensic recordings. Testing results will address the question: Is a phase change in an audio file synonymous with alterations; and, can they accurately be detected?

The use of changes in phase is not a new analysis method for forensic audio authenticity examinations. Interest in expanding its role to detecting edits in digital recordings has increased in the last several years. Several concerns accompany this increased interest. Automatic detection of phase shifts can help speed a cumbersome time-consuming process of manually locating events, but the accuracy and thresholds of such detection methods are not widely known. Even if events are detected accurately, there is no specific criteria to determine whether the phase shift is the result of an alteration or naturally occurring event during the time of recording.

Test recordings will be produced to include reference tones at various amplitudes to determine if changing the amplitude of the reference tone will directly impact the accuracy of automatic phase detection systems. The test recordings will also contain a range of naturally occurring events and files with various alterations. The use of several common digital formats that represent the type of audio being received for examination and the method in which they are recorded may show that some formats may or may not maintain phase. An automatic detection system may falsely identify phase changes that may be inherent to the recording process, format, or recording environment and not necessarily the result of an edit or alteration. It may also identify phase changes where they do not exist or not identify them at all. Being able to accurately account for the number of phase changes detected or not detected is important.

The second part of this presentation will attempt to clarify what a phase change means to the authenticity of an audio recording. Even if the detection of phase changes is accurate, what correlation does a phase change have to an alteration or edit? Examination of known events may help correlate phase changes caused by edits or naturally occurring ones. Criteria is lacking for establishing which phase changes are the result of an alteration and which ones are not. This problem is similar to identifying events as pauses or as voice-activated for analog recorders. Both of these events are caused by stopping the transport of the recorder without disengaging the record and erase heads. A pause event is generally associated with a potential alteration, where as a voice-activated event is generally not. Often the events are identified through testing the operation of the analog recorder. This analog analysis method does not translate to digital analysis of record events.

**Digital Audio, Authenticity, Data Analysis**