

**Technical Note prepared by the Special Rapporteur on extrajudicial, summary or arbitrary executions, Philip Alston, in relation to the authenticity of the “Channel 4 videotape”**

**Appendix – Opinions provided by each of the independent and impartial experts**

**Expert 1: Jeff S. Spivack**

**Expert 2: Daniel Spitz**

**Expert 3: Peter Diaczuk**

## **Forensic Video Analysis Report**

### **re: Authenticity of Digital Video/Audio Recording of Purported Sri Lanka Executions**

**Jeff S. Spivack, CFC**

#### **Introduction:**

On or about November 3, 2009, Professor Philip Alston, United Nations Special Rapporteur on extrajudicial, summary or arbitrary executions, requested, in his official capacity, that this author, hereinafter alternately referred to as “the analyst”, conduct an analysis of a digital video/audio recording purportedly depicting executions of Tamils by Sri Lanka armed forces personnel. This recording, first broadcast by Channel 4 television in the United Kingdom on August 25, 2009, appears to depict Sri Lanka military members shooting two unidentified bound and blindfolded individuals in the head at close range with an AK-47 variant or similar assault rifle, as well as the presence of several other unidentified deceased or dying individuals. After the Channel 4 broadcast, the Sri Lanka government issued a document reporting the results of forensic examinations undertaken by a panel of experts commissioned by the government regarding the authenticity of the video, concluding that the video and events contained therein were “fake” or fabricated.

The scope of this analysis is limited to an examination of the properties of a recording provided by Ms. Sarah Knuckey, acting on behalf of Prof. Alston, originally provided to her by a group identified as “Journalists for Democracy in Sri Lanka”, as well as a point by point review of the Sri Lanka government's forensic analysis. Generally, this analyst will defer to the expertise of the forensic pathologist and ballistics expert retained concurrently by Prof. Alston with respect to biomechanical and related medico legal conclusions, and terminal ballistics, respectively. However, this report will contain very limited scope observations regarding the presence or absence of visible weapon recoil based on the analyst's experience and general working knowledge of firearm behavior obtained in the course of past military service and police firearm training and qualification.

#### **About the author:**

Jeff Spivack is a Forensic Multimedia Analyst currently in private practice, formerly serving in that capacity with the Las Vegas Metropolitan Police Department. In addition to providing forensic video and audio analysis services, Mr. Spivack provides training upon request to law enforcement agencies, and serves as a beta tester and authorized technical representative for Cognitech, Inc. forensic video analysis software products. Mr. Spivack is a member of the American College of Forensic Examiners Institute, is designated by that organization as a Certified Forensic Consultant, and has been qualified as an expert witness on the subject of forensic video analysis in courts throughout the United States in both civil and criminal proceedings.

#### **Background:**

According to the Scientific Working Group on Imaging Technologies (SWGIT) “*Best Practices for*

*Image Authentication*” Version 1.0 2007.06.04<sup>1</sup>, establishing the authenticity of a disputed multimedia (video and audio) recording to a high degree of scientific certainty is highly problematic, particularly when provenance of the recording cannot be verified, as is the case with the subject of this analysis. However, it is sometimes possible to *exclude* the authenticity of a recording submitted for analysis based on factors including, but not necessarily limited to: metadata inconsistent with purported properties of the recording, evidence of image manipulation, evidence of image creation, evidence of staging, evidence of discontinuity, and/or evidence of image processing. As the authors of this SWGIT publication note, “Image Authentication must not be confused with the requirement to authenticate evidence as a precondition to admissibility in court. Likewise, authenticity differs significantly from integrity. Integrity ensures that the information presented is complete and unaltered from the time of acquisition until its final disposition. For example, the use of a hash function can verify that a copy of a digital image file is identical to the file from which it was copied, but it cannot demonstrate the veracity of the scene depicted in the image”. For the purposes of this analysis, it is also necessary to remember that merely transcoding or converting a multimedia recording from one format to another to facilitate viewing does not in and of itself invalidate the recording's authenticity.

## **Procedures:**

1. MediaInfo Version 0.7.26 was used to obtain metadata contained in the recording provided, identified by file name as “Video DJ.3gp”, to wit:

Complete name: E:\VideoDJ.3gp

Format: MPEG-4

Format profile: 3GPP Media Release 4

Codec ID: 3gp4

File size: 1.61 MiB

Duration: 1mn 17s

Overall bit rate: 175 Kbps

Encoded date: UTC 2009-07-18 09:06:47

Tagged date: UTC 2009-07-18 09:06:47

VideoID: 2

Format: H.263

Format profile: BaseLine@4.5

Codec ID: s263

Duration: 1mn 17s

Bit rate mode: Variable

Bit rate: 160 Kbps

Width: 176 pixels

Height: 144 pixels

Display aspect ratio: 4:3

Frame rate mode: Variable

Frame rate: 7.248 fps

Minimum frame rate: 2.141 fps

Maximum frame rate: 7.576 fps

Bits/(Pixel\*Frame): 0.873

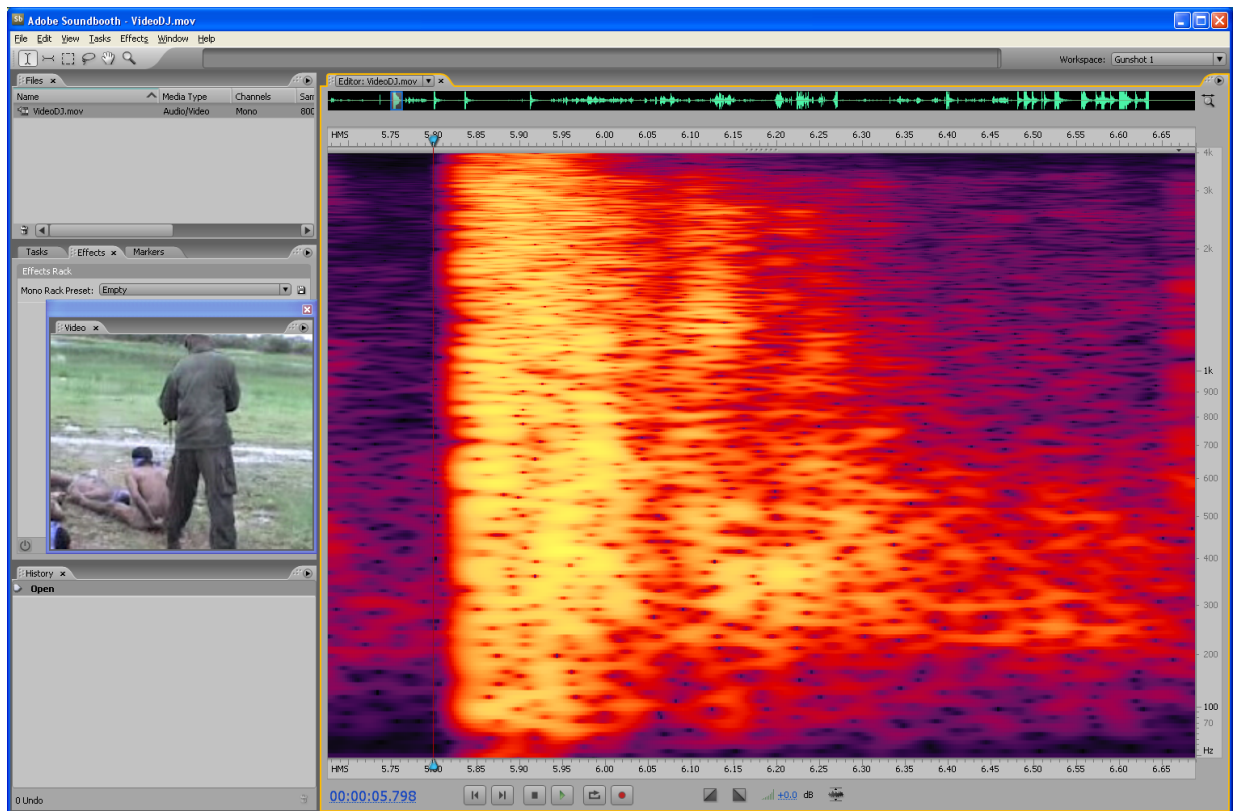
Stream size: 1.47 MiB (91%)

Writing library: PHLP

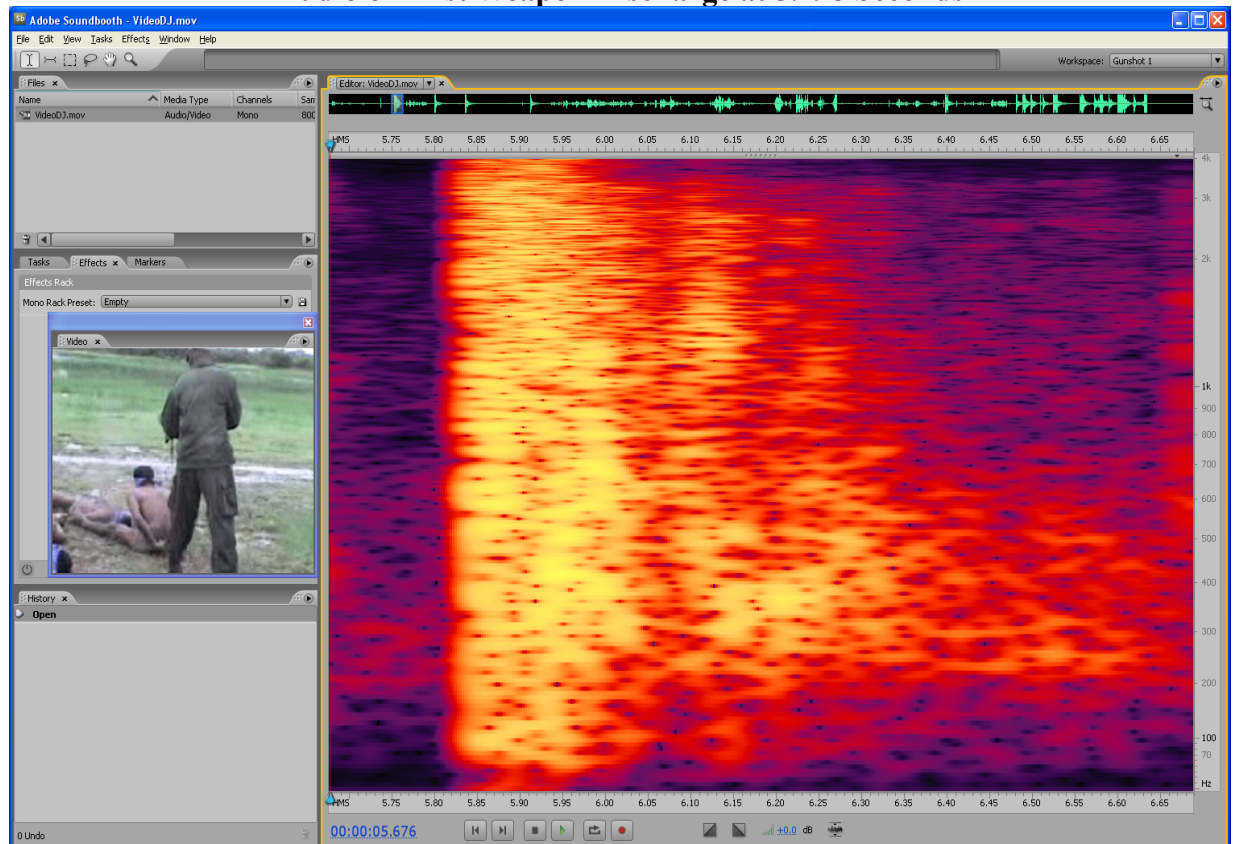
Encoded date: UTC 2009-07-18 09:06:47  
Tagged date: UTC 2009-07-18 09:06:47

Audio ID: 1  
Format: AMR  
Format/Info: Adaptive Multi-Rate  
Format profile: Narrow band  
Codec ID: samr  
Duration: 1mn 17s  
Bit rate mode: Variable  
Bit rate: 12.4 Kbps  
Channel(s): 1 channel  
Sampling rate: 8 000 Hz  
Resolution: 13 bits  
Stream size: 117 KiB (7%)  
Writing library: Philips  
Encoded date: UTC 2009-07-18 09:06:47  
Tagged date: UTC 2009-07-18 09:06:47

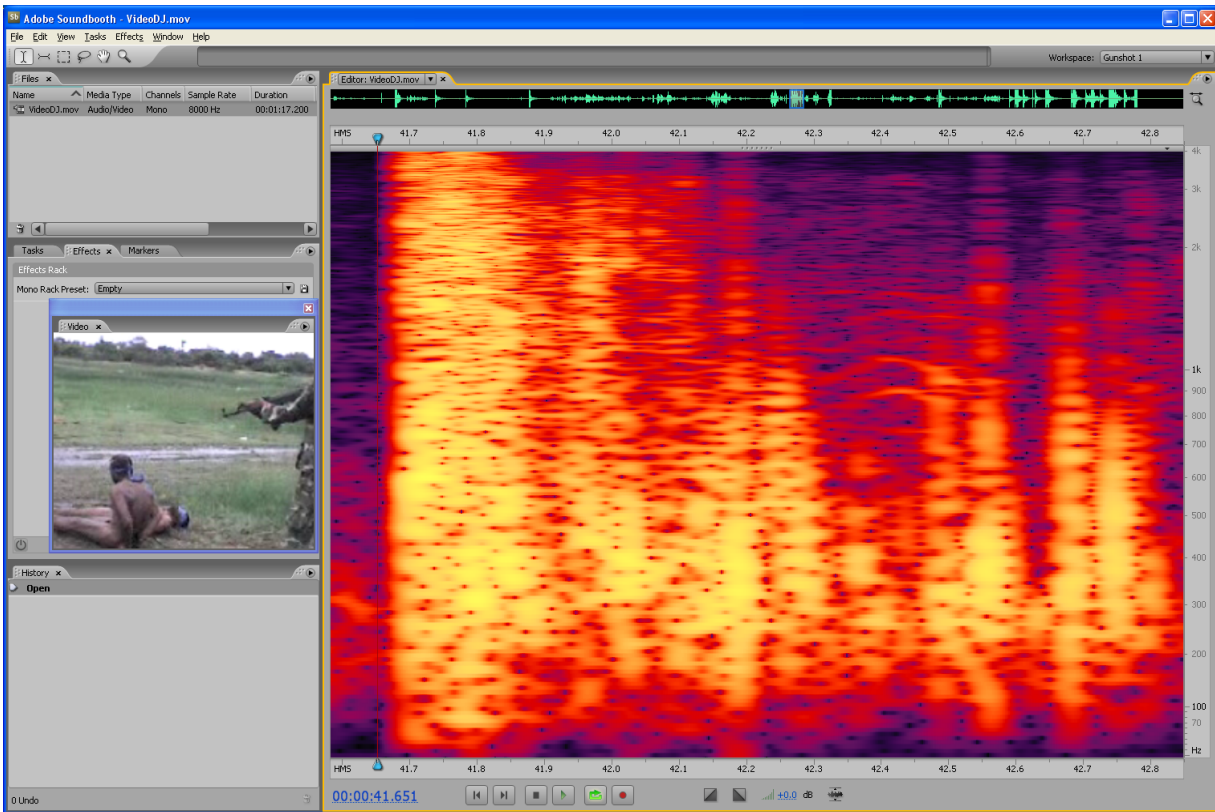
2. Mindego Analyzer 4600 version 2.2.2 software was used to conduct a detailed analysis of the multimedia file's stream statistics, first Group of Pictures (GoP) header, errors (none indicated), and individual I-frame and P-frame picture header data. The detailed analysis report is attached as a PDF.
3. To facilitate further analysis and processing with Cognitech Video Investigator and Adobe Soundbooth, QuickTime Professional was used to save a duplicate of the file, changing the file wrapper from .3gp to .mov. This change of file wrapper/file extension does not alter the media contained in the wrapper in any way. Similarly, the file was exported to .avi format for further processing and analysis with VirtualDub.
4. Cognitech Video Investigator software was used to process the first and second instances of visible weapon discharge, as well as the apparent drainage of blood and/or other fluid from the second potential victim's head in the video by using a correlation velocity estimation filter and the corresponding video stabilization filter, enlarging the regions of interest and cropping to 640 X 480 during the stabilization output process. Because the Cognitech software does not process audio, VirtualDub version 1.8.6 was used to add the corresponding frames' audio track previously exported to .avi format. Stabilized/enlarged versions of these segments were provided to Ms. Knuckey for further distribution to the forensic pathologist and terminal ballistics expert.
5. Adobe Soundbooth CS3 software was used to open the .mov file extension duplicate of the recording to determine the extent of video/audio synchronization difference between the first frame in which visual evidence of weapon discharge is present and the corresponding audio for each discharge by simultaneously displaying the video window and audio spectrograph display. For the purpose of this analysis, visual evidence of weapon discharge is defined as visible recoil, expanding gases from the rifle's barrel, and what appears to be aerosolized biological material from the potential victims' heads.



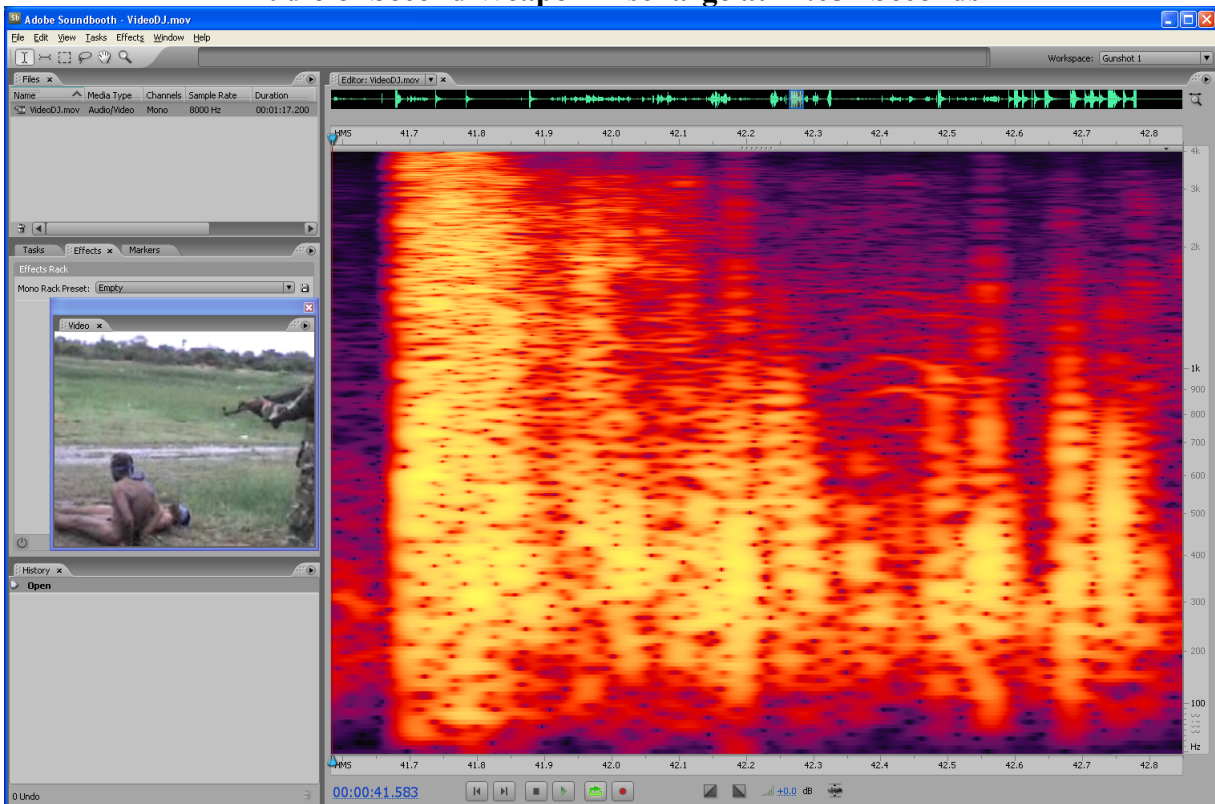
**Audio of First Weapon Discharge at 5.798 Seconds**



**Time line Indicator of First Weapon Discharge Frame 41 at 5.676 Seconds**

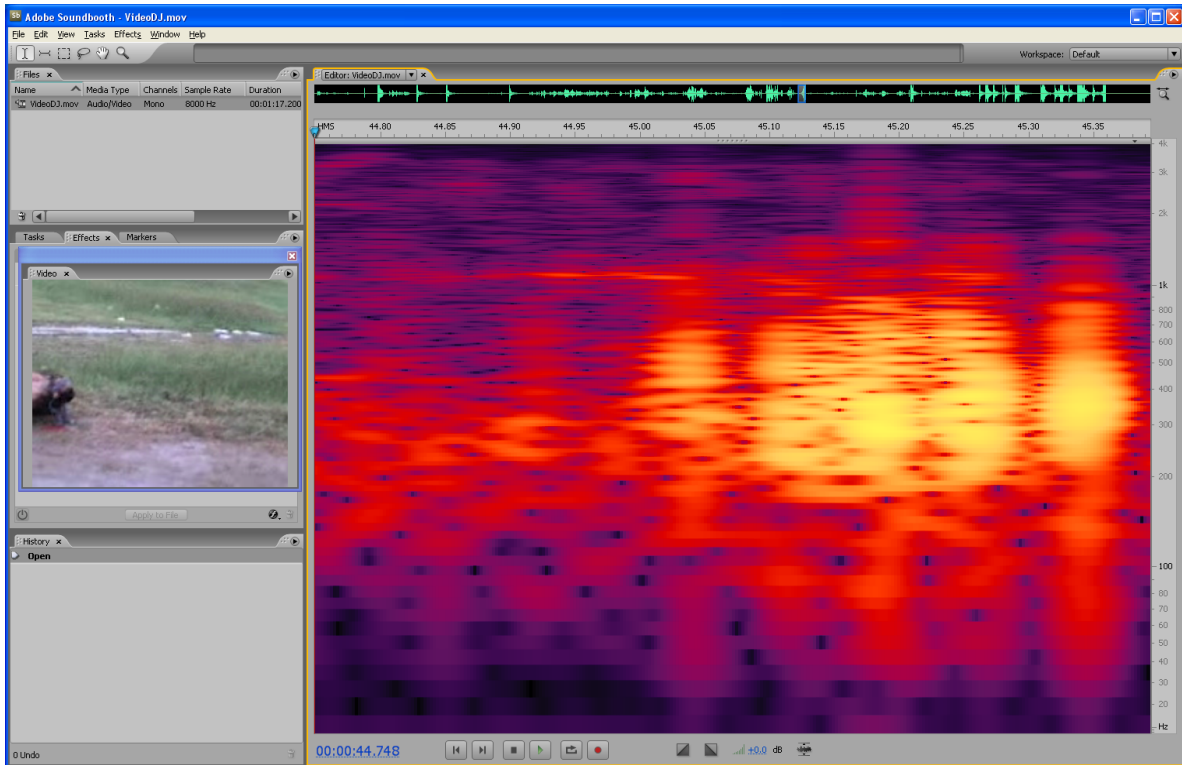


**Audio of Second Weapon Discharge at 41.651 Seconds**

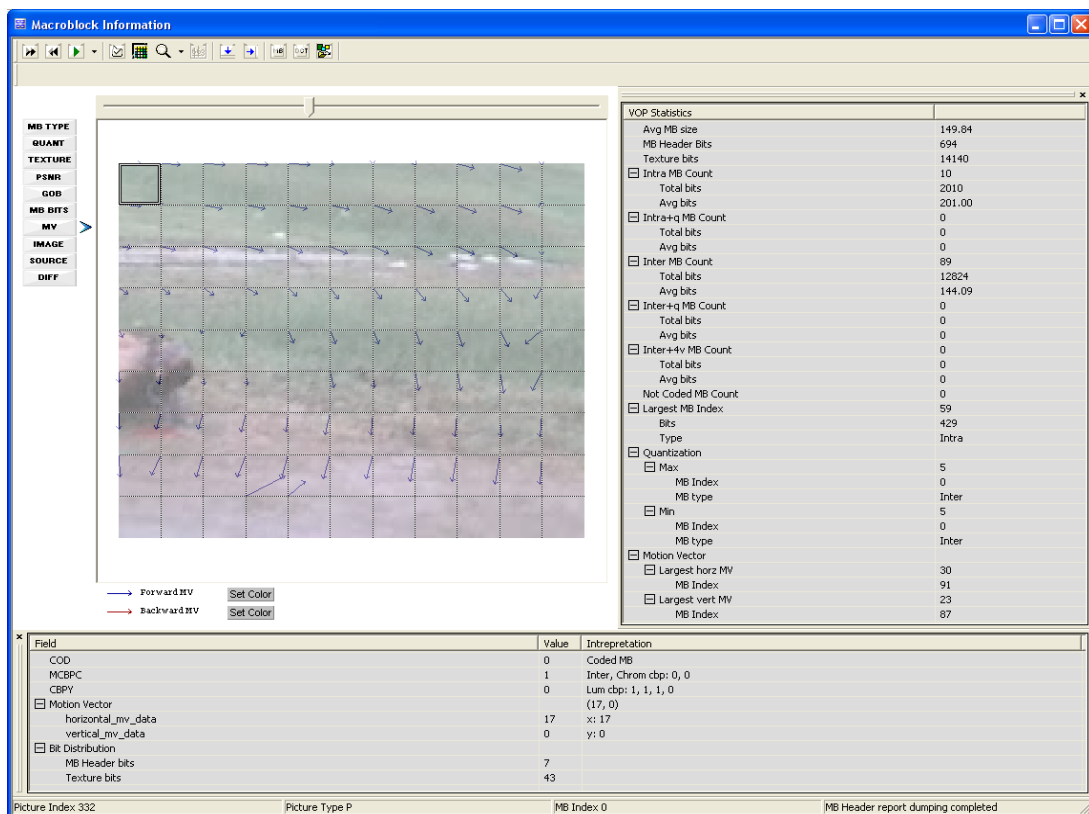


**Time line Indicator of Second Weapon Discharge Frame 309 at 41.583 Seconds**

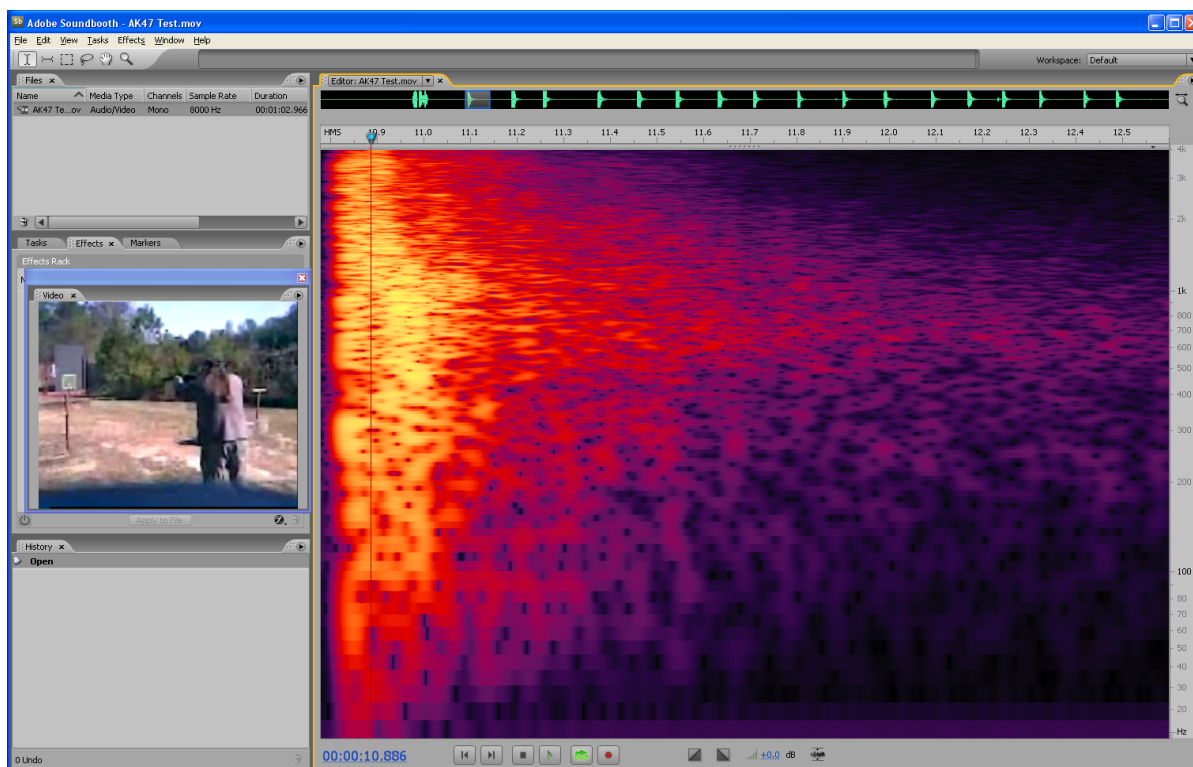




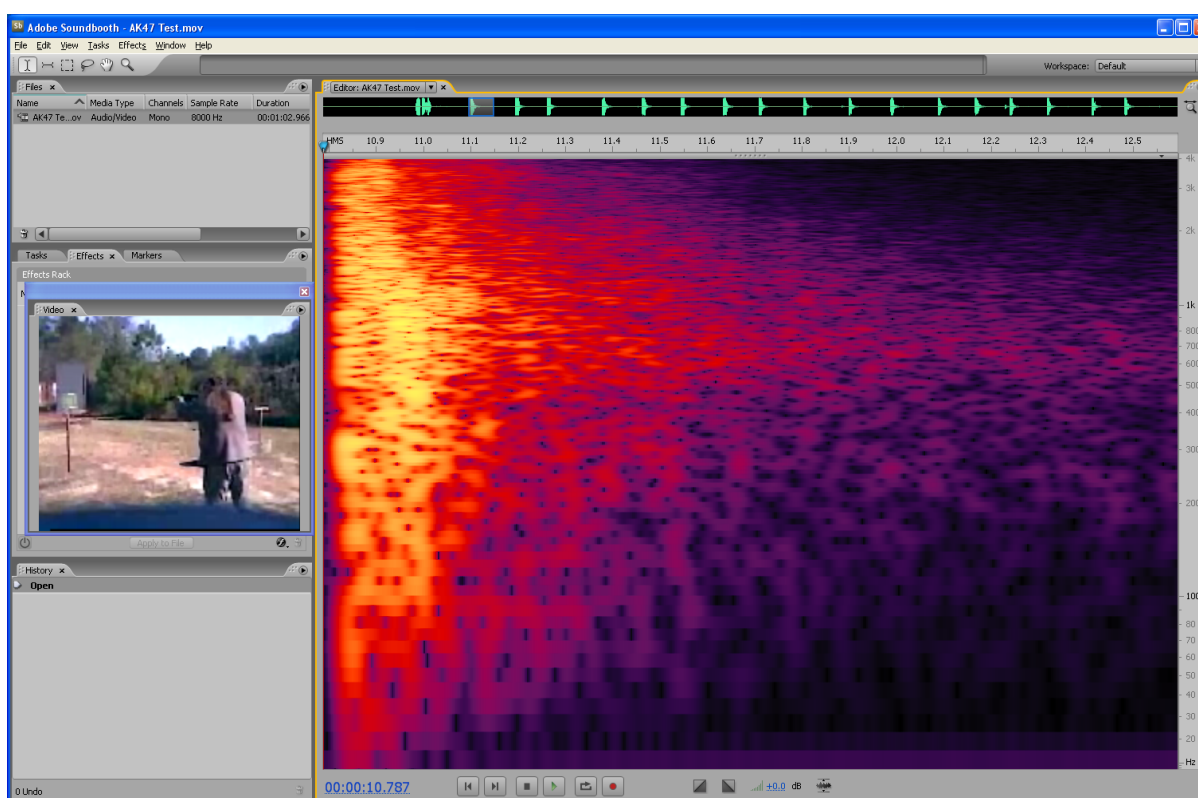
**Frame 333 with Corresponding Wind Noise Spectrograph**



**Frame 333 (Picture Index 332) Motion Vectors and Macro Blocks**



**Time line Indicator of Nokia 3110 Sample Recording/AK-47 Test Firing at 10.886 Seconds**



**Audio of Weapon Discharge Nokia 3110 Sample Recording at 10.787 Seconds**



6. Frame by frame analysis of the 559 video frames for content was conducted using Cognitech Video Investigator to detect any possible breaks in continuity, anachronisms, or visual anomalies that could indicate image tampering.

7. On December 20, 2009 the analyst made simultaneous test recordings with a commonly available (in Europe and Asia, including Sri Lanka) video camera mobile phone, Nokia Model 3110c and a Sony HDR-HC7 3.2 megapixel HDV format camcorder, operating in DV25 (5:1 intraframe compression) mode to obtain 4:3 aspect ratio video. The subject matter of these recordings was a shooter firing an AK-47 semiautomatic rifle with a folding stock and 16" barrel. The target in this test was a Birchwood Casey brand "Shoot\*N\*C" self adhesive target designed to produce a high visibility fluorescent yellow ring around each bullet hole affixed to a black foam board, mounted in a standard target stand. Both the Sony and Nokia recording devices were mounted on a single hand held platform. Subsequent to making the recordings, the analyst transferred the .3gp file from the Nokia device using a USB cable and Nokia PC Suite software, and captured the video from the Sony device as a DV25 .avi file using DVMP Pro 4. Next, the analyst converted the high quality DV25 .avi file to .3gp using the following representative sampling of commercially available conversion software: AVS Video Converter, dvdXsoft 3GP Video Converter, Pavtube Video Converter, ImTOO 3GP Converter, NCH Toolbox, Prism Video Converter, and QuickTime Professional. Metadata for each resulting converted .3gp file was obtained from MediaInfo Version 0.7.26, and details of the original Nokia recording and Sony recording converted to .3gp with QuickTime Pro are attached as PDF files.

### **Findings:**

According to the metadata retrieved from the file submitted for analysis, encoded dates and tagged dates for both video and audio components indicate the recording was made on July 17, 2009 at 09:06:47 UTC (Universal Time Coordinated), also known as GMT (Greenwich Mean Time) or Zulu Time. This time, if correct, would be 14:36:47 local time in Sri Lanka based on the standard offset of GMT + 5.5 hours (Daylight Saving Time is not observed in Sri Lanka). The encoded date is well after the alleged date of the incident and, if accurate, would tend to discredit the recording's authenticity at first glance. However, the encoded date is not conclusive evidence of the actual recording date and time, because it is derived from the device's time and date setting, which, according to documentation obtained for representative Philips mobile phone devices sold and/or operable in Sri Lanka (see attached Philips Xenium X710 Manual, Pg. 8), can be set by the user to any desired date and time, irrespective of time and date references that may or may not be transmitted by the mobile phone network. Indeed, it is possible that the individual who used the device to record these events may have deliberately altered the time and date settings to provide plausible deniability of his/her participation in and/or knowledge of the incident.

The video and audio formats, codecs, bit rates, and video width, height, aspect ratio, and format profile (motion vector) properties are entirely consistent with multimedia files produced by a wide variety of mobile phones with video recording capability. The video and audio writing library data returned as "PHLP" and "Philips", respectively, which provides presumptive evidence that the source of the recording was a Philips mobile phone or camera. The recording may or may not have been transferred to a computer with Philips Media Management software. Particularly noteworthy is the fact that the video frame rate mode of this file is variable, which is commonly the case with video produced by GSM mobile phone devices. By contrast, multimedia files in .3gp format generated as a result of the

representative sample of commercially available video/audio conversion software programs tested for this analysis use constant frame rates rather than variable frame rates. These software converted files also leave evidence of the specific software used to edit/convert the file in the writing libraries, and fail to automatically compensate for aspect ratio discrepancies, although two of the conversion software utilities tested allow for manual definition of cropping parameters to obtain correct width and height.

Of all software conversion utilities tested, QuickTime Pro allowed the most control with respect to converted file attributes, including bit rate, custom frame rate, and cropping to compensate for aspect ratio differences. However, even QuickTime Pro could not produce a .3gp file with a variable frame rate. It is theoretically possible to alter or delete metadata in a multimedia file, so the metadata contained in the file submitted for analysis cannot be considered absolutely conclusive with respect to accuracy or containing all possible file attributes. Notwithstanding this theoretical possibility, the analyst was unable to locate any commercially available software capable of deleting or altering meaningful file attributes; available software was capable only of deleting or altering file tags such as music artist, album name, or similar data. Tampering with metadata relevant to a forensic analysis apparently requires a hex editor and detailed knowledge of the multimedia file structure. In other words, altering the class of metadata recovered in this analysis is no trivial matter; it requires a high degree of technical proficiency.

Based on spectrographic analysis and comparison with the corresponding visual evidence of weapon discharges, the following determinations and conclusions were made: In the first weapon discharge, audio is present 0.122 seconds after the first video frame containing visual evidence of the discharge. In the second weapon discharge, audio is present 0.068 seconds after the first video frame containing visual evidence of the discharge. Comparison of the audio spectrographs from the two weapon discharges reveals a slight variation between the two, indicating that these are two separate and distinct audio events. This slight disparity between the two audio events would preclude the possibility that a single gunshot sound effect was added in an editing process. Frame 333 displays a radical shift in position, apparently caused by the camera operator's response to a gust of wind, demonstrated by the images extracted from Adobe Soundbooth CS3 of the video frame and corresponding spectrograph, and the image extracted from Mindego Analyzer 4600 of the motion vectors and macro blocks for this frame. With respect to test firing of an AK-47 recorded on a Nokia 3110 mobile phone video camera, audio occurred at 10.787 seconds, followed by visual evidence of the discharge at 10.886 seconds. In that test recording, the weapon discharge analyzed exhibited audio preceding the visual indication by 0.099 seconds. It is important to note that the frame rate of both the file submitted for analysis (7.248 frames per second) and the Nokia test recording (15 frames per second) are insufficient to determine the precise instant of weapon discharge based on visual evidence. For this reason, video audio synchronization is approximate at best, and does not provide a reliable reference for establishing distance from the point of weapon discharge to the recording device.

Content analysis revealed no breaks in continuity, no additional video layers, and no evidence of image manipulation. During the first weapon discharge, lateral recoil was evident, and "muzzle rise" recoil was visible at the time of the second weapon discharge. As previously noted, there is compelling visible evidence of wind activity corresponding to wind noise in the audio track, particularly at frame 333 as the individual operating the camera changed the position of the camera radically as a gust of wind was audible. Further, a cloud of what appears to be aerosolized biological material is visible drifting back toward the second shooter as wind gusts are also audible. At the conclusion of the recording submitted for analysis, 17 frames (frames 543 to 559) from approximately 01:13 to 01:17 are present consisting

of a red background with a white uppercase “A” text character in the center of the background. Without access to the specific device that generated this recording, it is not possible to determine if this text or title feature is consistent with the normal operation of the device using default settings, user defined settings, as a consequence of device malfunction, or as a characteristic of proprietary transfer and/or conversion software.

### **Review of Sri Lanka Government Employed Forensic Analyst Conclusions:**

Unfortunately, the four experts employed by the Sri Lanka government did not provide any details with respect to their methodology, or even which multimedia file their conclusions were based upon. There are several discrepancies and factual errors, as well as assertions made with no articulated scientific basis. Statements/assertions made by these experts are discussed in the order presented in the “Consolidated Response of the Government of Sri Lanka to the Telecast by Channel 4 News of the United Kingdom on 25 August 2009 of Supposed Extra-Judicial Executions in Sri Lanka”<sup>2</sup>

#### **Expert statement one, submitted by Dr. De Silva, Senior Lecturer in Computer Science and Engineering and director of the Centre for Instructional Technology at the University of Moratuwa (Sri Lanka):**

**Assertion 1)** “The granularity of motion vectors and other inter-frame features indicate that the footage had been originally captured using a high-end camera (at least a digital camcorder) and not by an average mobile phone.”

**Response:** Dr. De Silva does not specify a basis for this assertion, or elaborate on “other inter-frame features”. During the course of this analysis, the analyst transcoded video from a high end camera to H.263 .3gp format using bit rate and frame rate parameters that closely approximated the multimedia file submitted for analysis, with one exception: the variable frame rate property could not be replicated with transcoding software. Nevertheless, experimental results produced, as expected, a pronounced degradation in quality in the transcoded file. Finally, even if the original source of the video was a high end camera, simply transcoding from one format to another does not automatically invalidate the authenticity of the contents.

**Assertion 2)** “An analysis of the colour levels and saturation shows that the bloodstains in the film are unusually strong in colour and have texture mismatches – this is usually the result of post-recording modifications and the use of digital effects.”

**Response:** Without a standard color reference in a representative image, color reproduction accuracy is inherently unreliable for any photographic or video recording, regardless of domain or medium. Color levels, saturation, and related properties do not provide conclusive evidence of image manipulation.

**Assertion 3)** “There is no recoil or movement of the weapon discharged.”

**Response:** This assertion is demonstrably false. As previously described, lateral recoil is clearly visible corresponding to the first discharge, and “muzzle rise” recoil is clearly visible corresponding to the second discharge.

**Assertion 4)** “Texture analysis of image and possible over-lays shows evidence of tampering / digital effects in relation to enhanced bloodstains and one blindfold.”

**Response:** Dr. De Silva does not provide a methodology or reproducible image analysis basis for this assertion.

**Assertion 5)** “Evidence of audio dubbing

- a) Lack of audio synchronization – audio is delayed for more than 1.5 seconds – this is not due to video compression or processing.
- b) Audio indicates presence of strong wind-noise. However, this is not evident in the video footage.”

**Response:** a) It is unknown what specific multimedia file Dr. De Silva based this assertion on, but the stated delay is inconsistent with the results of the repeatable analysis previously described with respect to the multimedia file submitted for analysis. Specifically, the delay between the first frame in which visual evidence of the first weapon discharge and the corresponding audio event is 0.122 seconds, and the delay between the first frame in which visual evidence of the second weapon discharge exists and the corresponding audio event is 0.068 seconds. As articulated by Cugnini in “*Managing lip sync*”<sup>3</sup>, “Anywhere video is processed, there will be a delay in the signal. Processing filters, format conversion, compression — all of these will add delay to the signal, perhaps as little as a few pixels or one line of video, or perhaps as long as many frames of video. Although faster processors and clever algorithms can minimize these delays, they can never completely eliminate them”.

- b) As previously described, the effects of wind are clearly evident in the video, as radical camera movement at frame 333 and a cloud of apparent aerosolized biological material blowing back toward the second shooter, each event corresponds to audio events consistent with and presumed to be wind noise.

**Assertion 6)** “Transcript of the Sinhala dialogue has no relation to the images in the footage. There is no audio of victims screaming or any other related noise.”

**Response:** This author is conversant in neither Sinhala nor Tamil, and cannot therefore comment on the transcription of any dialog in either language. With respect to the absence of screaming, and whether or not this is to be expected, the analyst defers to the expertise of a forensic pathologist.

**Assertion 7)** “There was no indication that a zoomed view was used.”

**Response:** This assertion is correct, but hardly surprising. In fact, the absence of zooming during the video sequence tends suggest that the video recording device was indeed a mobile phone. Mobile phones with optical zoom lens systems exist, but are the exception rather than the rule. Mobile phone cameras with zoom (either digital or optical) often require the use of controls that are difficult to find or operate, particularly while actively recording video.

**Expert statement two, submitted by Mr. Siri Hewawitharana:**

**Assertion 1)** “There are indications that the original video is edited since original layer stopped at 1:02.781, video editing stopped at 01:02.312 and audio dub stopped at 1:02.152. If it is the original audio, it should have played all the way to 1:02.781 and should not have 2 video layers indicating an original and an edited version.”

**Response:** This assertion is inconsistent with the multimedia file submitted for analysis to this author. The file analyzed, VideoDJ.3gp, contains only one video track, 1 minute, 17.13 seconds in length and one audio track, 1 minute, 17.28 seconds in length. The slight disparity between video and audio track lengths is attributable to the video track's variable frame rate. There is no second layer indicating an edited version.

**Assertion 2)** “It is said that the video came from a mobile phone video source, but there are only two formats in mobile video formats (the old 3GPP format and the new MP4 format). However, the Channel 4 video is much higher in quality than either format can create today.”

**Response:** Mr. Hewawitharana does not provide a basis for this blanket statement, nor does he furnish comparisons of samples from representative commercially available video-capable mobile phone devices. The fact is that a wide variety of mobile phones are equipped with imaging sensors with 5 megapixels or greater, far higher than most standard definition digital video camcorders, and are capable of recording video at 30 frames per second at 640 X 480 (VGA) or even higher resolutions. Furthermore, limitations with respect to the recording's quality are primarily a function of quantization and compression of the video and audio, not necessarily the source camera's imaging circuitry and microphone/audio preamplifier. Thus, video originally captured with a “high quality digital video camera” would be significantly degraded after computer software conversion to .3gp format (as was the case with test video converted for the purpose of this analysis), and difficult to distinguish from mobile phone video simply on the basis of subjective perceived quality. Quality varies widely among video mobile phones, and the multimedia file submitted for analysis cannot be excluded as authentic on the basis of its relative quality.

**Assertion 3)** “Within H-264 coding (used for MP4 format) there is also an extra component called Motion Vectors (VMC) which are used to predict motion on the temporal and spatial domain. Channel 4's video has quite high quality VMC and it appears that this VMC came from a video camera and not from a mobile phone source.”

**Response:** H.264 does indeed make use of motion vectors. However, H.263 (the codec actually present in the recording submitted for testing) also makes use of motion vectors, as does every MPEG implementation of interframe compression, so the use of motion vectors is not unique, nor is it an “extra component”. See *“ITU-T H.263 Appendix III Series H: AUDIOVISUAL AND MULTIMEDIA SYSTEM”*<sup>4</sup> for a detailed description of quantization, spatial compression, and temporal compression. Mr. Hewawitharana does not specify what metric he employed for determining “quite high quality VMC” allegedly found that leads him to conclude that the motion vectors are consistent with a video camera rather than a mobile phone source. In point of fact, many high quality standard definition video cameras record in DV25 format, which is an intraframe compression scheme that employs spatial compression only, not temporal compression, and therefore contains no motion vectors.

**Assertion 4)** “Since the original video was originally in AVI and QuickTime format, this indicates that the original video is of high quality that originated from a video camera source, as mobile formats

does not use AVI or QuickTime. If a change of mobile format to AVI or QT format is attempted, then the resulting video is likely to be of very bad quality. However, in this case the video is of very high quality.”

**Response:** Mr. Hewawitharana provides absolutely no basis for his purported determination of the video recording's original file format. Furthermore, video transcoding software varies in quality, and utilities are widely available that are capable of enlarging the video using resizing algorithms that do not result in any more than negligible further degradation.

**Assertion 5)** “The gun shot was not in synchronization with the video. Normally audio is always ahead of the video since video processing takes more time. In this case, the audio is very late indicating video and audio editing.”

**Response:** First, there are two presumed gunshot audio events captured on video as well as the audio track, not one. As previously described, video/audio synchronization for both events ranges from an audio delay of 0.068 to 0.122 seconds, well within acceptable limits. Again, as previously noted, audio and video quantization processes occur independently and the two tracks are synchronized and multiplexed in a separate process. Audio may be “ahead” of the video or it may be delayed, subject to a number of variables.

**Expert statement three, submitted by Major A. P. Bandara:**

**Assertion 1)** “The leg of a dead person lying prone on the ground rises in the air when the first victim is shot. Thereafter the leg slowly drops to its former position.”

**Response:** It should be noted that the analyst's response to this assertion is not intended as an expert medical opinion. On the contrary, while the words “supine” and “prone” are often used as medical terms of art, their meanings, essentially “face up” and “face down”, respectively, are well known in the English language in other contexts. Further, this author's observation noting the lack of conclusive evidence regarding the status of a person lying on the ground does not require any medical expertise; rather, it is simply an exercise in logic. Notwithstanding the preceding disclaimer, the person to whom Maj. Bandara is referring is actually lying in the supine position, not prone. Additionally, it has not been definitively established whether this person was already deceased, or merely wounded, intoxicated, sleeping, or possibly even uninjured and feigning death after being shot at and missed in order to evade actual injury or death at the hands of a more competent marksman.

**Assertion 2)** “The second victim, though shot in the head, continues to have stiff leg muscles and reclines on his arms bound behind his back. Then he gradually leans back until he lies flat on the ground.”

**Response:** This author defers to the expertise of a qualified forensic pathologist/medical examiner with respect to the possibility or likelihood of this phenomenon.

**Assertion 3)** “One of the other victims who appears to lie dead in muddy ground wears a clean white shirt.”

**Response:** The garment or fabric to which Maj. Bandara refers is visible only with respect to the



front, which is not in contact with the muddy ground. The portion of the garment or fabric making contact with the muddy ground could reasonably be expected to be muddy, but in this video is obviously not visible. The presence or absence of mud on a garment that is not directly in contact with a muddy surface is not a sufficient criteria for determining authenticity.

**Assertion 4)** “The soldier who is shown killing the first victim is wearing a white T-shirt but the standard issue for Sri Lankan Army is of a different colour altogether. The second soldier has a very unmilitary growth of hair.”

**Response:** The analyst does not have any information with respect to Sri Lanka military standards of appearance, grooming, uniform insignia/device placement, or the rigidity with which regulations regarding these standards are enforced.

**Assertion 5)** “Even though the bodies are lying in waterlogged or muddy ground, not all the bloodstains from the fatal injuries have spread in a manner consistent with one another.”

**Response:** Both the surface topography and level of water saturation appear to be highly variable in the area where bodies are present. It is quite true that the bloodstains in this video have individual characteristics and are therefore inconsistent with one another. This is to be expected; in fact, it would be far more suspect if all the bloodstains appeared to be identical. Such a condition would be suggestive of effects inserted in a “copy and paste” manner.

**Expert statement four, submitted by Brigadier Prasad Samarasinghe:**

**Assertion 1)** “30 frames at the end of the video stream only contained a letter “A” against a blank background. This is not consistent with an original video from a mobile telephone source.”

**Response:** The multimedia file submitted for analysis actually contains 17 frames of the uppercase letter “A” in white against a red background. The presence of this character is suspect, though not conclusive; however, Brigadier Samarasinghe does not provide a basis for his assertion that this phenomenon is inconsistent with video from a mobile telephone source.

**Assertion 2)** “The video and audio streams were analyzed concurrently for consistency and several discrepancies were noticed which leads to the conclusion that the distance of the mobile telephone’s microphone from the weapon was 102 metres in respect of the first shot and 38 metres from the second.”

**Response:** As previously noted, the frame rate of the recording submitted for analysis is inadequate to reliably and accurately establish time difference of arrival measurements for the purpose of calculating distance from the audio source (discharging weapon) to the camera microphone.

**Assertion 3)** “A field simulation test using several mobile telephone brands revealed that, in order to maintain the size of image in the Channel 4 video, the mobile telephone camera should have been at a distance of approximately 3 to 5 metres from the discharged weapon.”

**Response:** Based on the analyst's own field test with a similar weapon, Brigadier Samarasinghe's conclusion with respect to approximate distance of the camera to the shooter is quite plausible. In fact,

the analyst maintained the cameras approximately 3 meters from the shooter during test firing. Of course, this determination is meaningless in the absence of reliable calculations concerning time difference of arrival.

### **Conclusions:**

The multimedia file submitted for analysis, VideoDJ.3gp, cannot be authenticated to an absolute certainty without access to the device purportedly used to make the recording for further testing and comparison. A more definitive finding may be possible if said device is tendered for analysis, particularly with respect to a comparison of imaging sensor noise profiles. However, the recording cannot be excluded as authentic, particularly based upon the flawed criteria and factual errors pervasive throughout the Sri Lanka government's published analysis. Of course, there is no way to confirm solely from this recording the identity of the potential victims or the shooters. Neither whether the shooters were actually Sri Lanka military members as opposed to Tamils dressed in Sri Lanka military uniforms, nor whether the potential victims were Tamils or instead innocent victims of another ethnic group can be determined from this recording. There are unexplained characteristics of this file, the most troubling of which from a file integrity standpoint is the text which appears in the final 17 frames of video. Notwithstanding this potentially suspicious feature, there may be a legitimate explanation, and as stated previously, file integrity must not be confused with authenticity. Even if the video was transcoded from another format to .3gp, the conversion does not by itself invalidate the events recorded. Furthermore, there are characteristics of the recording that are highly suggestive of authenticity, particularly the metadata relating to the recording's structural composition, which would require a high level of sophistication to successfully alter, and ultimately the content itself, which contains no breaks in continuity or other detectable indications of tampering.

### **Acknowledgments:**

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1. Detective L.D. Frost of the Athens-Clarke County, GA Police for his invaluable assistance in conducting live fire testing of an AK-47 for comparison recordings.
2. John Brunetti, Forensic Science Examiner with the Connecticut State Forensic Lab, for generously conducting a peer review of this report and making insightful suggestions, which were incorporated in the final report.

In the interest of full disclosure and disclaimer, Detective Frost's and Mr. Brunetti's participation were voluntary, using their own personal time and resources, and no official endorsement by the Athens-Clark County Police Department or Connecticut State Forensic Lab should be inferred.

### **Attachments:**

1. VideoDJ\_Vid\_Stream\_Report.htm
2. QT Conversion Vid\_Stream\_Report.htm
3. Philips Xenium X710 Manual.pdf
4. Nokia 3110 Test Video Details.txt

- 1 [http://www.theiai.org/guidelines/swgit/guidelines/section\\_14\\_v1-0.pdf](http://www.theiai.org/guidelines/swgit/guidelines/section_14_v1-0.pdf)
- 2 [http://www.slembassyusa.org/archives/main\\_index\\_pages/2009/min\\_dmhr\\_pr\\_09sep09.pdf](http://www.slembassyusa.org/archives/main_index_pages/2009/min_dmhr_pr_09sep09.pdf)
- 3 [http://broadcastengineering.com/audio/broadcasting\\_managing\\_lip\\_sync/index.html](http://broadcastengineering.com/audio/broadcasting_managing_lip_sync/index.html)
- 4 <http://www.itu.int/rec/T-REC-H.263-200106-I!App3/en>

**DANIEL J. SPITZ, M.D.**  
**FORENSIC PATHOLOGY AND TOXICOLOGY**

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December 18, 2009

Professor Philip Alston  
UN Special Rapporteur on extrajudicial executions  
110 West Third Street, #204  
New York, New York 10012

**Re: *Sri Lanka Video***

Dear Professor Alston,

Pursuant to your request, I have reviewed the original video and the enhanced video depicting alleged executions in Sri Lanka by Sri Lankan soldiers.

Subsequent to my review of these materials, it is my opinion that the executions shown in this video most likely represent real executions of two individuals with what appear to be 8 other deceased victims, most of whom show signs that their death was secondary to homicidal violence.

The video footage begins with a naked, bound and blindfolded man being shot in the back of the head at close range by an individual firing an assault rifle. As the gun is fired, you can see the discharge of gases and smoke from the muzzle of the gun. As the victim is shot, he immediately collapses to his right and blood begins to pool on the ground under and around his head. Several seconds later, the victim's body rotates back to the left secondary to the effects of gravity.

Following the first shooting, the video continues as it pans out to show eight apparently deceased victims, most of whom have blood evidence around their bodies. The one victim who is clothed, has gross deformity of his face, consistent with being caused by being shot in the head with an assault rifle. The blood evidence under and around his head and upper torso is also what you would expect with a gunshot wound of the head.

As the video continues, the footage is that of a second naked, bound and blindfolded man being shot in the back of the head at close range with an assault rifle. As the victim is shot, he immediately collapses backwards, but appears to tense his body with contraction of his torso and lower extremity musculature. A large gush of blood pours from the back of his head and onto the ground behind his body. Over the next several seconds, his muscles

relax and his back and head then come in complete contact with the ground. Blood continues to saturate the area under and around his head. This reaction is quite typical of an individual who sustains a gunshot wound to the head. The initial response to such trauma is often intense contraction of the skeletal muscles followed by relaxation over the next several seconds.

Questions that remain following my review of this material are the following:

- (1) The left lower extremity of an apparent victim who is on the ground in front of the first victim shown being shot in this video is flexed and rotated outward with his left knee near the ground (expected position) prior to the gunshot. At the time the victim is shot, the other individual's left lower extremity is seen to rapidly rotate upward such that his knee is vertical. It remains in this position after the shooting for a few seconds before rotating back to the original position. Based on my review of the video, it remains uncertain as to what accounts for the movement of this individual's left leg.
- (2) An apparent victim shown in the footage as the video pans to show the multiple other victims has his left lower extremity in an upright position with his knee flexed approximately 90% and his left foot flat on the ground. Under normal circumstances and without something maintaining his leg in this position, I would not expect his leg to remain in this position if he were deceased.

In summary, the footage shown in this video appears authentic, especially with respect to the two individuals who are shown being shot in the head at close range by assailants using high powered assault rifles. The body reaction, movement and blood evidence of both victims are entirely consistent with what you would expect with execution type shootings. Furthermore, it appears that the other 8 apparently deceased individuals are also victims of homicidal violence, however, answers/explanations to the above questions would allow for a more definitive opinion with respect to the other apparent victims.

Should you have additional questions, please do not hesitate to contact me.

Very truly yours,

/Sgd/

Daniel J. Spitz, M.D.

**Peter Diaczuk**  
**Video analysis - Sri Lanka incident**  
**Dec 27th, 2009**

In response to a request from Professor Philip Alston, United Nations Special Rapporteur on Extrajudicial Executions, to prepare a firearms and ballistics report on the videotape that is alleged to show the execution of Tamil prisoners by members of the Sri Lankan armed forces, I have prepared the following document. The views and opinions expressed herein are my own and do not reflect those of the College.

The video in question was initially forwarded to me on 23-September-2009 and bears the title "VideoDJ.3gp"

My expertise within the broad field of forensic science includes more specifically the scientific examination of firearm evidence and crime scene reconstruction. In addition to my education and training in forensic science, I have worked as a Range Officer and am a Certified Firearms Instructor. I am neither a medical examiner nor a video / digital imaging analyst and thus, for interpretations and conclusions as to those aspects of the submitted video recording, I defer to the experts in the respective disciplines.

Prior to the preparation of this document, I performed experiments to aid in my interpretations and conclusions. Those experiments included live firing and high-speed video recording of a firearm of potentially the same caliber as those depicted in the submitted video, which were then reviewed frame-by-frame.

Overall conclusions: from the videos that I took of an AK-47<sup>1</sup> class rifle being fired from both hip and shoulder, I am convinced that the minimal recoil seen in the video submitted was accurate for an adult male holding and firing a Kalashnikov class firearm. No one will dispute that the quality of the recording is poor, so I am trying to interpret minute details from a piece of evidence that is marginal at best. Some questions may simply not be definitively answerable, but between the two discharges, I perceive recoil that is commensurate with that class of firearm.

My use of the term "victim" to refer to those depicted as being shot is not intended to prejudge the outcome of the overall inquiry.



### Parts of the video that appear authentic:

#### First victim-

The firearm used appears to be a Kalashnikov class. This implies that the ammunition would be 7.62 x 39 mm or 5.45 x 39 mm.

At the moment of discharge of the firearm, at frame #41, it moves rearward, as do the shooter's arms, as seen clearly by both of the elbows suddenly jerking rearward and then forward again in the next frame, #42. When the firearm moves rearward as a result of the recoil from discharge, it appears to move in-line with how it was held, and then forward again in the same linear fashion. This is consistent with how a shooter experiences recoil and recovers after firing the shot <sup>2</sup>. Accompanying the discharge is the plume of high-pressure gases that is expelled from the muzzle, visible to the left and lower left of frame #41. Both the recoil <sup>3</sup> described above and the high-pressure gasses (commonly referred to as *muzzle blast*) generated at discharge are indicative of firing live ammunition. Although the use of blank ammunition <sup>4</sup> will produce gasses and slight recoil, neither is as forceful as the use of live (containing a bullet) ammunition.

The victim's head lurches forward (away from the muzzle) at that same moment, in frame #41. This lurching forward is so sudden that the excess cloth used to tie the blindfold is seen to move from what was merely gravity-positioned, to an airborne position. Coinciding with the firearm discharge and forward head movement of the person seated in the foreground is the sudden body movement by the person lying directly in front of him. The energy and ability of the bullet <sup>5</sup> from the Kalashnikov class of firearms to pass through considerable obstacles is well known. Although not fully within my area of expertise, it is quite reasonable that a bullet could pass completely through one person and hit another. I can state from experience that bullets fired from an AK-47 firearm, using 7.62 x 39 mm full metal jacket ammunition, have gone through 6 inches of wood consistently.

The low resolution does not allow me to observe a bullet impact on the victim(s). The direction of ejection of the spent cartridge case is not visible because of the relative positions of the camera to the shooter, which effectively blocks the field of view of that direction.

#### Second victim-

The firearm used also appears to be a Kalashnikov class.

At the moment of discharge of the firearm, both excess cloth “tails” of the blindfold on the victim move suddenly to the side. In the prior frames it is relatively static. The sudden movement of the blindfold is consistent with the turbulence generated from high-pressure gasses that are expelled from the muzzle at discharge. The firearm (and the sling attached to its fore end) clearly moves rearward and slightly upward in the same frame that shows the blindfold movement (i.e. when the shot was fired). In this shooting, the shooter is apparently holding the firearm to his shoulder, which provides the pivot point causing the muzzle to rise slightly in addition to its rearward movement. This is fully consistent with the discharge of a live cartridge and not a blank cartridge. An experiment was conducted pursuant to writing this report about this shooting, which confirmed that the discharge of a blank cartridge (no projectile, just the primer and full powder charge) produced no discernible recoil of the firearm. Also visible in the six frames after the discharge is the plume of high-pressure gases that accompany the discharge, as it moves from the left of the frame to the right of the frame, probably a result of ambient air movement in that direction. The plume is subtle and somewhat difficult to distinguish from the background “noise” due to the sporadic nature of the video. In spite of the low resolution, there is a visible defect that develops in the victim’s head on the left side above his ear. This occurs in the same frame as the firearm is discharged, and appears to worsen in the following frame. An expert in wound ballistics should perform further interpretation of this possible bullet wound.

Unfortunately, the relative positions of the camera and the shooter again prevent observation of the general direction of where a spent cartridge case would be ejected.

I cannot opine on either the proper military uniforms or grooming of the soldiers seen in the video examined.

The conclusions reached are based upon the information available at this time, and are subject to modification if additional information is presented.

Respectfully submitted,

Peter J. Diaczuk

Center for Modern Forensic Practice, John Jay College of Criminal Justice, CUNY

Footnotes:

1. The AK-47 (Avtomat Kalashnikova 1947) rifle was designed by Russian soldier / military firearm designer Mikhail Kalashnikov and adopted in 1947. Since its adoption by the Soviet military, it has undergone several modifications and variations. Estimates of up to 100 million manufactured to date exist, along with its appearance in dozens of countries around the world (Kahaner, 2007, "AK-47"). See appendix for photograph of an AK-47.
2. (Whelen, 1946, "Small Arms Design and Ballistics", vol. 2 ch. 3).
3. The recoil calculation includes the weight of the bullet as a significant factor contributing to the rearward movement of the firearm at discharge (also included is the weight of the powder charge, but the powder weight is considerably less than the bullet weight and thus contributes less to the final figure). Furthermore, the presence of the bullet being pushed through the barrel creates internal pressures not attainable with a blank cartridge.
4. Blank ammunition should not be regarded as "safe" or "harmless" to use at human targets, especially at close range and where unprotected by clothing. There are several types of "blank" cartridges, depending upon how the powder is kept in the case. Some cases are crimped closed by squeezing the brass together at the top (W.D de Hek, 1995, "Military Cartridges Part 1") while others use different types of plugs, such as wax, cotton, paper, cardboard, plastic etc.

In the latter, the plugs become projectiles capable of causing injury as well. Each will allow a different amount of pressure to develop inside the barrel; the more pressure, the greater potential for injury. Injury and even death have been documented from the close range discharge of blanks from military rifles (Di Maio, 1985, "Gunshot Wounds").

5. 7.62 millimeter, 122-grain full metal jacket bullet traveling at a muzzle velocity of 2330 feet per second, 1470 foot-pounds muzzle energy (Barnes, 2000, "Cartridges of the World"). See appendix for photograph of 7.62 x 39 mm ammunition.

*Appendix*

