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Section 1

Overview of SWGIT and the Use of Imaging Technology in the Criminal Justice System

*** Released previously as "Guidelines for the Use of Imaging Technologies in the Criminal Justice System" and "Definitions and Guidelines for the Use of Imaging Technologies in the Criminal Justice System" ***

1. Introduction

Although digital imaging technologies have been used in a variety of scientific fields for decades, their application in the criminal justice system is more recent. Consequently, there has been a need to gather and disseminate accurate information regarding the proper application of this and other imaging technologies (including silver-based film and video) in the criminal justice system.

1.1 Mission Statement

The mission of the Scientific Working Group on Imaging Technology (SWGIT) is to facilitate the integration of imaging technologies and systems within the criminal justice system (CJS) by providing definitions and recommendations for the capture, storage, processing, analysis, transmission, and output of images.

1.2 SWGIT Membership

The Technical Working Group on Imaging Technology was formed by the Federal Bureau of Investigation in December of 1997. In 1999, the name of the group was changed to the Scientific Working Group on Imaging Technology (SWGIT). From the beginning the group has been comprised of individuals from federal, state, and local law enforcement agencies, the American military, academia, foreign law enforcement agencies, and other researchers. Those selected for membership in the group are experienced professionals working in the field of imaging technology or a related field and demonstrate the willingness to participate by consulting on the release of best practices and guidelines for the use of imaging technology in the Criminal Justice System. All SWGIT documents represent the consensus opinion of this membership and should not be construed as the official policy of any of the represented agencies.

1.3 Purpose of this Document

This document will familiarize the reader with important considerations in the capture, preservation, processing, and handling of images, whether the images are in digital, analog, or film format. This document will also refer the reader to other SWGIT documents for more complete details and guidelines.

1.4 Admissibility of Digital Images

Digital imaging is an accepted practice in forensic science, law enforcement, and the courts. Relevant, properly authenticated digital images that accurately portray a scene or object are admissible in court. Digital images that have been enhanced are admissible when the enhancement can be explained by qualified personnel.

1.5 Other SWGIT Documents

A complete list of documents that have been published by the SWGIT is attached.

2. Image Capture

“Capture” is the process of recording data such as an image or video sequence. The taking of photographs with a digital, film, or video camera is an example of capture. Digitizing images, documents, or objects with a scanner is another example of capture. When images are captured by those law enforcement or forensic laboratory personnel who are charged with the responsibility for processing or analyzing images, it is possible to control the equipment, methods, and techniques used. This may not be possible when images are captured by others and are submitted for processing or analysis. The handling of this evidence differs dependent on the source.

2.1 Image Capture Equipment

Image capture devices should be capable of rendering an accurate representation of the item or items of interest. Different applications will dictate different standards of accuracy. At a minimum, the following should be considered when selecting appropriate devices:

- Resolution requirements which are in turn driven by the intended use of the image (first responder, crime scene work, preserve impressions, etc.)
- Characteristics (size, movement, location, etc.) of the scene, item, or items of interest
- Lighting of the items of interest
- Dynamic range of the scene
- Time constraints
- Required end product(s)

Specific information and additional SWGIT recommendations relating to different law enforcement field applications may be found in the SWGIT document “*Field Photography Equipment and Supporting Infrastructure.*”

2.2 Image Compression

Compression is the process of reducing a digital file’s size. Compression may be lossy or lossless. The decision to use lossy or lossless compression will be dictated by the intended use of the image. When lossy compression is used, critical image information can be lost and unwanted artifacts introduced as a result. Repeatedly saving a file using lossy compression may exacerbate the loss of image information. Therefore, if an image is to be subjected to scientific analysis and compression is necessary, lossless compression is strongly recommended. Likewise, due to the fact that the end use of an image cannot always be predicted, it is recommended that original images be recorded using no compression or lossless compression. If lossy compression must be used,

then the lowest level of compression should be used.

Specific information and additional SWGIT recommendations relating to image compression may be found in the following SWGIT documents: *"Issues Relating to Digital Image Compression and File Formats"*, *"Guidelines for Image Processing"*, *"General Guidelines for Capturing Latent Impressions Using a Digital Camera"*, *"General Guidelines for Photographing Tire Impressions"*, and *"General Guidelines for Photographing Footwear Impressions"*.

3. Image Integrity

A legal prerequisite to the admissibility of any evidence is that the evidence being offered in court can be authenticated. An exhibit is authenticated when there is sufficient evidence that the exhibit is what the proponent claims it to be. In the case of images the authentication requirement is usually satisfied when a witness can testify that the image accurately portrays the scene or objects that were captured. If authenticity is challenged, the proponent must be prepared to show that the image (or data) has not been altered.

In the case of images processed using advanced enhancement techniques, qualified witnesses must be able to testify concerning the process used.

3.1 Identifying and Handling the Original Image

A primary image refers to the first instance in which an image is recorded onto any media that is a separate identifiable object. An original image is an accurate and complete replica of the primary image, irrespective of media. See the SWGDE/SWGIT document *"SWGDE and SWGIT Digital & Multimedia Evidence Glossary"*.

3.2 Preserving Original Images

The original image should be stored and maintained in an unaltered state. This includes maintaining original digital images in their native file format. To preserve the original image when processing is required SWGIT recommends:

- Film-based media originals may be processed if the processing is non-destructive.
- With analog video, minimal playback of the original is recommended to avoid degradation of signal.
- Original digital images should not be altered. Processing should be performed on working images only.

3.3 Archiving

Care must be taken to ensure that archival media is maintained in such a manner that the information contained thereon may be retrieved in the future (within statutory and agency guidelines).

Specific information and additional SWGIT recommendations relating to archiving may be found in the SWGIT document *"Best Practices for Archiving Digital and Multimedia Evidence (DME) in the Criminal Justice System"*.

4. Image Processing and Analysis

Image processing is any activity that transforms an input image to an output image. Image analysis, on the other hand, involves the application of image science and domain expertise to examine and interpret the content of an image and/or the image itself in legal matters.

Specific information and additional SWGIT recommendations relating to image processing and analysis may be found in the SWGIT documents "Guidelines for Image Processing" and "*Best Practices for Forensic Image Analysis*".

4.1 Documenting Image Enhancement

The intended use of the image dictates the level to which the enhancements are documented. Any processed image subjected to image analysis should be documented with an image processing log. An image not subjected to image analysis does not need an image processing log.

Specific information and additional SWGIT recommendations relating to image enhancement may be found in the SWGIT document "*Best Practices for Documenting Image Enhancement*".

4.2 Software

Software used in processing and analyzing digital images should produce consistent results, permitting comparably trained personnel to achieve comparable analytical results.

LEGAL NOTE: Manufacturers of software used for image processing may be required to make the software source code available to litigants, subject to an appropriate protective order designed to protect the manufacturer's proprietary interests. Failure on the part of the manufacturer to provide this information to litigants could result in the exclusion of imaging evidence in court proceedings. This should be considered when selecting software.

5. Outputting Images

An output device should be capable of producing an accurate representation of the input image. The following should be considered in the selection of output devices:

- Final use of image
- Time constraints
- Longevity/permanence of output image
- Spatial resolution required
- Range of colors and brightness to be produced

6. Distributing Images

Received images should accurately reflect the distributed images. The following should be considered in the selection of distribution methods and transmission devices:

- Final use of image
- Time constraints
- File size
- Security of transmission
- Integrity of transmission
- Hardware and software compatibility of transmitters and receivers
- File format compatibility

7. Quality Assurance

Personnel utilizing images and imaging technology in the criminal justice system should implement quality assurance programs to ensure that results achieved are repeatable and valid. As part of these programs, performance checks and corrective actions should be documented.

7.1 Equipment

Where applicable, equipment utilized in imaging should be checked regularly for proper performance and calibration, and findings documented. Where applicable, an end-to-end system check for consistency within specified system parameters should be performed on a regular basis and whenever modifications are made to the system. All equipment should be maintained according to the manufacturers' specifications and recommendations as contained in the operating manuals.

When a piece of equipment or a system falls outside the specifications and recommendations, the equipment or system should be taken out of service until it has been corrected. Evaluation of equipment and system checks should be documented to include corrective actions.

7.2 Software

If software errors that significantly affect the results of a processing step are detected, then corrective actions should be taken. If the manufacturer identifies software errors and provides corrective remedies for them, the remedies should be implemented before the software is used again. Once corrective actions have been taken, an end-to-end system check should be performed prior to putting the system back into operation.

7.3 Personnel and Training

All personnel utilizing imaging technologies shall be trained and competent in the operation of the relevant imaging technologies.

Issues relating to personnel and training in imaging technology are addressed in the SWGIT documents, "*Guidelines and Recommendations for Training in Imaging Technology in the Criminal Justice System*", "*SWGDE/SWGIT Guidelines and Recommendations for Training in Digital and Multimedia Evidence*" and "*SWGDE/SWGIT Proficiency Test Program Guidelines*".

7.4 Standard Operation Procedures (SOPs)

Personnel engaged in the capture, storage, processing, analysis, transmission, or output of imagery in the criminal justice system should ensure that their use of images and imaging technology are governed by documented policies and procedures.

For issues relating to SOPs see SWGDE/SWGIT "*Recommended Guidelines for Developing Standard Operating Procedures*".

REFERENCE LIST
SWGIT and SWGIT/SWGDE documents can be found at :
www.swgit.org

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