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# Standard Guide for Examination of Documents Produced with Toner Technology<sup>1</sup>

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## 1. Scope

1.1 This guide provides procedures that should be used by forensic document examiners (Guide E444) for examinations of documents produced with toner technology, and related procedures.

1.2 These procedures are applicable whether the examination is of questioned and known item(s) or of exclusively questioned item(s).

1.3 These procedures include evaluation of the sufficiency of the material available for examination.

1.4 The particular methods used in a given case will depend upon the nature and sufficiency of the material available for examination.

1.5 This guide may not cover all aspects of unusual or uncommon examinations.

1.6 These methods are applicable to examinations involving photocopiers, printers, facsimile devices, and multifunction devices using toner technology.

1.7 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

E444 Guide for Scope of Work of Forensic Document Examiners

E1658 Terminology for Expressing Conclusions of Forensic Document Examiners

E1732 Terminology Relating to Forensic Science

E2195 Terminology Relating to the Examination of Questioned Documents

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee E30 on Forensic Sciences and is the direct responsibility of Subcommittee E30.90 on Executive.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

E2291 Guide for Indentation Examinations (Withdrawn 2012)<sup>3</sup>

F221 Terminology Relating to Carbon Paper and Inked Ribbon Products and Images Made Therefrom

F909 Terminology Relating to Printers

F1125 Terminology of Image Quality in Impact Printing Systems

F1156 Terminology Relating to Product Counterfeit Protection Systems (Withdrawn 2001)<sup>3</sup>

F1424 Test Method for Estimating Toner Usage in Full-Color Copiers Utilizing Dry Mono- or Dual-Component Toners

F1434 Practice for Estimating the Performance of a Fuser Oil in an Electrostatic Copier or Printer

F1457 Terminology Relating to Laser Printers

## 3. Terminology

3.1 For definitions of terms in this guide, refer to Terminologies E1658, E1732, and E2195.

3.2 *Definitions:*

3.2.1 *aliasing, n*—see *pixilation*.

3.2.2 *black write, n*—process in electrostatic printing in which the photoconductive element is charged with a charge of the same sign as that of the toner. A light beam, used like a “stylus” is used to discharge only those areas that are to receive toner to form the image. In the development process, the charged background areas repel the like charged toner to the discharged areas on the photoconductor. **F909**

3.2.3 *bridging, v*—clumping of toner that causes a hollow area in the toner supply that prevents the free flow of toner to the dispenser auger. **F1457**

3.2.4 *corona, n*—device used to place a uniform electrical charge on the surface of a xerographic photoreceptor. **F1457**

3.2.5 *dielectric printing process, n*—nonimpact printing technique in which specially treated paper consisting of a conductive base layer coated with a nonconductive thermoplastic material is used to hold an electric charge usually applied

<sup>3</sup> The last approved version of this historical standard is referenced on www.astm.org.

directly by a set of electrode styli. The electric charge corresponds to the latent image of the original. Following the charging step, the paper is imaged by a toner system similar to that of electrostatic copying devices. This technique is sometimes called electrographic, and is currently used on general purpose non impact printers, plotting and facsimile devices.

**F909**

3.2.5.1 *Discussion*—Bridging is a different phenomenon from the image quality bridging as defined in Terminology **F1125**.

3.2.6 *dry toner*, *n*—material in a dry developer system which when deposited on a substrate by the field of an electrostatic charge pattern, becomes the visible record. **F1457**

3.2.7 *dual-component development*, *n*—mixture of dry toner and iron oxide developer that is used for developing electrostatic images in copiers. **F1424**

3.2.8 *electrophotographic printer*, *n*—nonimpact printing technique that is similar to the technology used in a typical office copier, which forms a copy by attracting toner particles to a static charge on the surface of a photoconductor, then transferring the toner image to the surface of a sheet of paper. In the normal office copier, the charged image (latent image) of the original document is formed on the photoconductor simply through exposure of the photoconductor to reflected light from the document. In an electrophotographic printer, the image is formed by a light source (laser, LED, LCS, laser diode, or other controlled light source) that erases or discharges a static image charge on the photoconductor according to information being supplied through the input data stream. Each bit of data can be related to a character shape in the memory of the printing system, and in most cases characters are formed by a dot matrix method similar in concept to that of the matrix printer. Paper can be sheet or roll—fed or continuous form. **F909**

3.2.9 *full-color copiers*, *n*—copiers that can reproduce color originals containing gradations of color. Full-color copiers may have up to four individual color developing units containing four different color toners. These colors are frequently cyan, magenta, yellow, and black. The original is scanned by means of an analog system using a series of color filters or by means of a digital scanning process. The full-color copier may require up to four scans to read the original. The copier individually applies one or more color toners to a transfer drum/belt or photoconductor, or both, which is in turn deposited on the paper. **F1424**

3.2.10 *fuser roll*, *n*—heated roller that contacts the paper and toner directly and is part of the fuser unit. **F1434**

3.2.11 *glitch*, *n*—print defect that displaces the laser scan line so that it appears to start and stop late. **F1457**

3.2.12 *grripper bar*, *n*—metal bars used in delivery systems to grasp individual sheets, directing them through the system in a toner device.

3.2.13 *image area*, *n*—that portion of the page that is printed, including the space between letters and lines. (See *percent coverage* and *maximum image area*.) **F1457**

3.2.14 *image density*, *n*—contrast between image and background as measured by densitometer. **F221**

3.2.15 *image*, *n*—optical counterpart of an object produced by means of an image producing device. **F221**

3.2.16 *imaging drum*, *n*—photoreceptive drum coated with a charge-sensitive material used in the image transfer systems of toner devices.

3.2.17 *landscape mode*, *adj*—printer output orientation in which printed lines run parallel to the direction of movement of the paper. **F1457**

3.2.18 *laser printer*, *n*—nonimpact printer that uses a laser light source driven by digital signals to create images on a photoconductor. (See *electrophotographic printer*.) **F909**

3.2.19 *liquid toner*, *n*—toner material composed of carbon particles or colorants suspended in a liquid carrier.

3.2.20 *maximum image area*, *n*—portion on a page that can be printed. (See *percentage coverage* and *image area*.) **F1457**

3.2.21 *maximum print position*, *n*—rightmost point at which the printer can mark the paper. **F1457**

3.2.22 *monocomponent development*, *n*—single component dry toner used for developing electrostatic images in copiers. **F1424**

3.2.23 *nonimpact printer*, *n*—printer in which image formation is not the result of mechanical impacts.

3.2.23.1 *Discussion*—Examples are thermal printers, electrostatic printers, electrophotographic printers, and ink jet printers. **F909**

3.2.24 *nonrecirculating system*, *n*—fuser oil application system in which none of the fuser oil that has been removed from the reservoir is returned. **F1434**

3.2.25 *overtoneing*, *n*—any of the conditions occurring in the developing unit when the toner concentration is too high. **F1457**

3.2.26 *percent coverage*, *n*—ratio of the area actually covered by the ink (or print material) to the area of the page times one hundred. (See *image area* and *maximum image area*.) **F1457**

3.2.27 *picker bar*, *n*—metal bars used in the delivery system to remove individual sheets of paper from the photoconductive drum in a toner device.

3.2.28 *pitting*, *n*—small defects in the surface of the photo-receptor that produce spots or voids on the printout. **F1457**

3.2.29 *pixelation*, *n*—stair stepped or jagged effect resulting from analog to digital conversion.

3.2.30 *platen*, *n*—flat plate or roller used as a support for printing or copying a document. **F1156**

3.2.31 *portrait mode*, *adj*—printer output orientation in which print lines run perpendicular to the direction of movement of the paper. **F1457**

3.2.32 *printer output area*, *n*—maximum area on the page to which the printer will print. **F1457**

3.2.33 *printer*, *n*—output unit that produces durable hard-copy record of data in the form of a sequence of discrete graphic characters belonging to a predetermined character set. **F909**