



Integrated Biometrics'  
LES Optical Direct Imaging Sensors:  
A Smarter Alternative to Prism-Based Scanners

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## A Better Approach

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Not all optical biometric fingerprint scanners are created equal. The type of sensor used has a powerful impact on speed, accuracy, reliability and portability. Most scanners rely on fragile, heavy prism assemblies to generate high-quality images. This whitepaper introduces Integrated Biometrics' Light Emitting Sensor (LES) optical technology and demonstrates how it creates faster, more reliable results than any other fingerprint scanning system currently available.

## The LES Optical Scanning Advantage

Integrated Biometrics sensors use LES film – a patented electroluminescent polymer – rather than prisms to generate exceptionally high-resolution scans when touched by one

or more fingers. The conductive properties of a finger energize particles of dielectric phosphor suspended in the thin film substrate. The luminescent glow of the phosphors produces an exact image of the fingerprint.

### **FBI Standards for Biometric Fingerprint Identity Validation**

There are two standards currently in use for fingerprints: Appendix F and PIV-071006.

- Appendix F has stringent image quality conditions, focusing on the human fingerprint comparison and facilitating large scale machine many-to-many matching operation.
- PIV-071006 is a lower-level standard designed to support one-to-one fingerprint verification. Certification is available for devices intended for use in the FIPS 201 PIV program.

Integrated Biometrics' LES optical scanners meet both standards, using LES sensors to deliver a lighter, more robust scanner that requires far less power than traditional prism-based systems.

*Source: FBI Biometric Center for Excellence*

LES sensors are optical devices that fully meet the standards for electro-luminescent (EL) optical imaging, as determined by the United States National Institute of Standards and Technology (NIST). Page 14 of NIST Special Publication 500-280v2 defines the EL optical direct imaging used in LES as:

*A contact technology in which the ridges and an Alternating Current (AC) signal cause an EL panel to emit light which is captured by an imaging system.*

The LES sensor generates the light needed for the scan, rather than a complicated assembly of platen, light source, and prism. The resulting image is captured using digital camera optics.

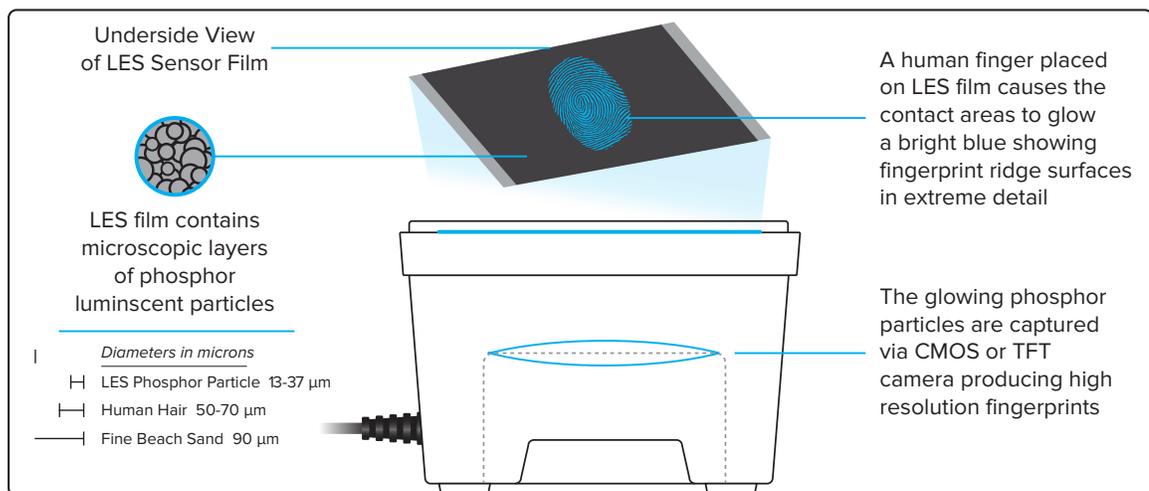
LES sensors require far less power than prism-based systems. They are thinner and lighter, making LES the ideal medium for portable scanning systems. LES is unaffected by oils from previous fingerprints, dirt, heat,

or cold. Operators can use LES sensors in a wider range of operating conditions, without having to clean the sensor between scans.

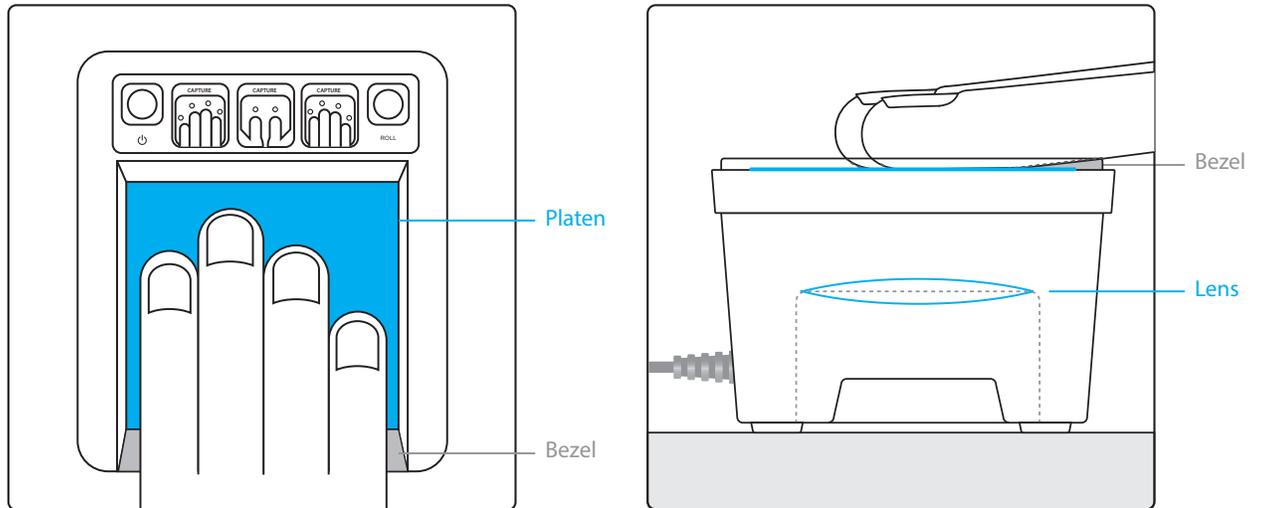
This superior performance generates high-resolution optical scans that are FBI-certified (Appendix F and PIV), ensuring products that meet or exceed this “gold standard” for biometric fingerprint validation. LES delivers these scans extremely rapidly, with built-in testing to eliminate spoofing and other attempts at fraudulent validation.

## How LES Technology Works

Integrated Biometrics' LES-based sensors generate high-resolution fingerprint scans by using energy to excite phosphorus particles suspended across a thin film substrate. The electroluminescent particles' light emission varies, based on a finger's ridges and valleys. Contact with the sensor therefore produces an accurate, high-resolution image of the fingerprint.



Unlike glass-based sensor systems that require significant amounts of light to create a scan, LES sensors need only a small amount of energy, plus the conductive properties of a human finger placed on the sensor's bezel and platen, to excite the phosphor particles in the film. The result is an image so detailed that even sweat pores are evident within a fingertip's ridges and valleys. High-speed digital cameras capture these high-resolution images. Either a CMOS camera with a traditional glass lens or thin film transistor (TFT) camera, depending on the intended use of the scanner.



Since LES sensors rely upon conductivity from the bezel across the finger to the platen to generate an image, LES scanners automatically position fingers for optimal scanning and maximum surface area. Any attempt at spoofing using non-conductive materials is automatically rejected, since no image can result.



Image files transfer to host PCs, tablets or smartphones using an ordinary USB interface. This connection also acts as the sensor's power source, removing the need for a separate wired connection or battery pack. LES scanners can operate for hours using a cell phone battery without additional auxiliary power, making this technology ideal for field operations using smartphones and tablets.

## A Smarter Approach for Biometric Fingerprint Scanning

Integrated Biometrics' LES sensors deliver reliable, 500ppi FBI-certified optical fingerprint scans in compact devices that are more portable than any other scanners currently available. Integrated Biometrics' sensors automatically enforce proper scanning

### **The FBI Chooses Integrated Biometrics**

The United States Federal Bureau of Investigation (FBI) is one of many law enforcement agencies that recognize the advantages that come from LES-based fingerprint scanners. The FBI recently selected Integrated Biometrics' Kojak scanner as the sole source for a major purchase. The reason, according to the FBI, was that:

*No other fingerprint scanners were found capable of meeting the weight, size, and power requirements, as well as meet the requirement of being FBI certified.*

When performance and portability are critical, LES optical fingerprint sensors are clearly the superior choice.

*Source: Federal Bureau of Investigation  
Requisition Number DJF-16-0100-PR-0002913,  
December 2015*

position for the maximum surface area across one or more fingerprints. They enroll or scan multiple fingers quickly (2fp and 442fp), without requiring the surface to be cleaned between scans.

LES sensors recognize the topography of a finger using the conductivity properties of human skin, rather than the surface image generated by backlit glass platens and prisms. This difference in functionality helps detect and reject spoofing and other attempts at evasion.

Since LES sensors use a thin polymer film rather than heavy, fragile glass surfaces and complicated prism assemblies and light sources, fingerprint scanners using LES work in extremes of temperature, dirt, glare, and humidity where other technologies cannot. The scanning surface itself is resistant to minor abrasions, and there are no light sources to burn out and replace. Low energy consumption makes LES sensors ideal for portable applications, drawing power through the USB connection of a typical smartphone or tablet.

Integrated Biometrics is the first, and the only provider of FBI-certified optical fingerprint sensors using LES

technology. Its superior performance, durability, light weight and low power requirements have made it the obvious choice for federal, state and local law enforcement and border control agencies, as well as handheld device manufacturers seeking a better solution for biometric identity validation. Today's heightened security concerns and performance requirements demand a smarter approach to optical fingerprint scanning. Integrated Biometrics' LES-based sensors meet that requirement.

## LES vs Traditional Biometric Fingerprint Sensors – At-a-Glance

	LES Optical Scanners	Prism-and-Glass Sensors
Speed and Accuracy	<ul style="list-style-type: none"> <li>• Instant scan of one or multiple fingers</li> <li>• Low incidence of false accept or false reject</li> <li>• Automatic rejection of common spoofing techniques</li> </ul>	<ul style="list-style-type: none"> <li>• Often requires multiple scans for accurate read</li> <li>• Higher rates of false accept and false reject</li> <li>• Subject to spoofing from copies of fingerprints imaged on non-conductive material</li> </ul>
Reliability	<ul style="list-style-type: none"> <li>• Unaffected by fingerprint oils, dirt, or moisture on scanner</li> <li>• Works under extreme heat, cold, or direct sunlight</li> <li>• Captures hard-to-scan prints, including cold, elderly, or juvenile fingers</li> <li>• No light source or silicon membranes to burn out or replace</li> </ul>	<ul style="list-style-type: none"> <li>• Needs clean surface – requires wiping between scans to remove oils and dirt</li> <li>• Operates under narrow range of environmental conditions and ideal lighting</li> <li>• Works best with warm adult fingers</li> <li>• Easily damaged and susceptible to light source failure</li> </ul>
Portability	<ul style="list-style-type: none"> <li>• Lightweight, durable material</li> <li>• Requires little power and can operate for hours using a smartphone as a power source</li> </ul>	<ul style="list-style-type: none"> <li>• Heavy, bulky, hard to handle</li> <li>• May require separate battery-based power pack for field operations</li> </ul>

## About Integrated Biometrics

Integrated Biometrics, LLC designs and manufactures FBI-certified fingerprint sensors for identity solutions serving government agencies, commercial organizations, and consumer markets worldwide. Our technology utilizes a durable, patented, light emitting sensor (LES) film which outperforms traditional prism-based devices in accuracy, power consumption, and usability, while being up to 90% smaller. These innovative sensors enable organizations to enroll and verify individuals within large populations for use in national ID programs, elections, social services, homeland security, law enforcement and military operations. Integrated Biometrics offers the only Appendix F FBI-certified sensors that meet the mobility requirements demanded by end users.

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