

# FBI

## Latent Fingerprint Services Universal Latent Workstation

### “Tips, Tricks, and Best Kept Secrets”

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# IAFIS Repositories

**FBI Laboratory Division**

**CMF**

**Civil File**

**ULF**

**Special Latent Cognizant Files**

**Local, State, Federal, International**

**CMF Only**





# Search Penetration

- Search penetration cannot exceed 30%
- If finger position is known, the search will be under 30%
- Each finger position searched equals 10%
- If finger position is unknown use combination of pattern type and descriptors to lower penetration level



# Search Penetration

- If there are no descriptors, the easiest way to stay below the penetration cap is to search three fingers at a time using multiple searches
- When using pattern type keep in mind the pattern type in the ten-print files was determined by AFIS with no human intervention therefore image searches are very good on a good quality latent
- Next Generation Identification (NGI) will increase the penetration to at least a 50% average and try to achieve as close to 100% as possible while still maintaining accuracy and reliability requirements
- **NO RIDGE COUNTS!**





# Tolerances

- The AFIS matcher has...
  - approximately a ridge and a furrow tolerance for matching minutiae
  - a 17 degree tolerance for matching the angle of the minutiae tails
  - a one ridge count tolerance for matching ridge counts
- Although minutia type is not used in the matcher, it does determine where the minutia mark should be placed



# False and Missed Minutiae

- **Missed Minutiae**
  - FBI IAFIS encoder missed consistently in the high curve area (cores)
    - innermost recurve
    - spikes
  - The AFE marks minutiae more accurately as you move away from the innermost recurving ridge





# High Curve Area Core

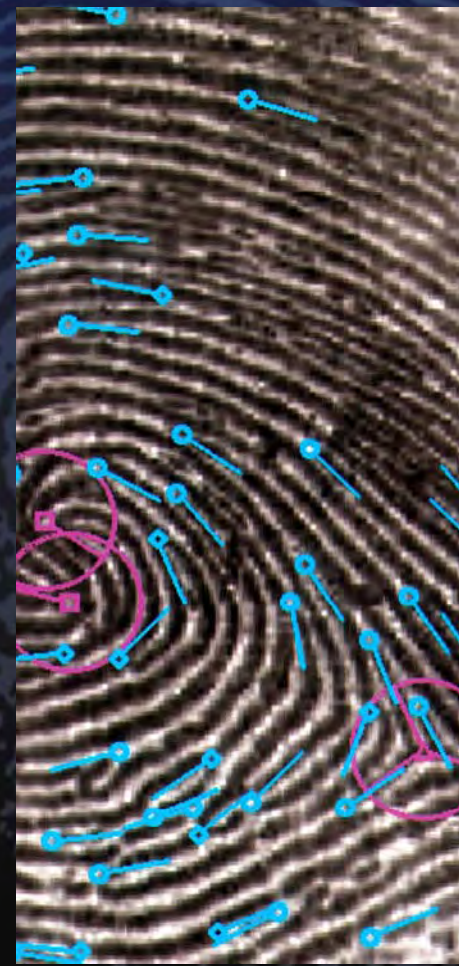
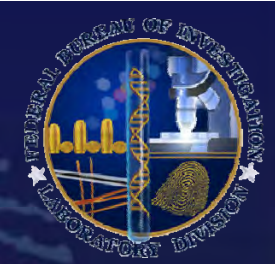


**Do not mark points on the innermost recurving ridge or any spike inside the innermost recurve**





# 112 Minutiae Limit







# Observations



- IAFIS does not handle multiple clusters well
- Matcher can match minutiae from different areas of prints
- Quality of ten-print is extremely important
- If a tip or side area is captured on the ten- print AFIS can find it



# **Recommendations**

- **Do not mark minutiae on the innermost recurving ridge or any spike inside the innermost recurving ridge**
- **Avoid questionable minutiae**
  - minutiae caused by the edge of a latent
  - minutiae in smudged areas
  - minutiae caused by distortion or brushstrokes
- **If a minutia position is unclear it can be marked if it is within the ridge-furrow tolerance**





# Recommendations

- **Avoid lone outlying minutiae**
- **If a latent is scarred mark either side of the scar and then mark both sides**
  - launch each one
- **If a latent is twisted, mark one side of twist and launch, then mark the other side and launch**



# **Recommendations**

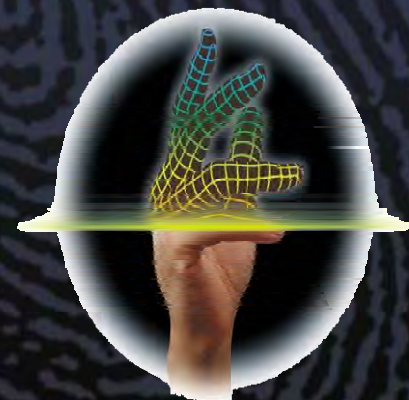
- **If you are unsure of the orientation launch the search unoriented**
- **Do not hesitate to search low minutiae count latents**
  - **A latent with four minutiae hit against a database of 800,000 fingers**
  - **Latents with eight minutiae have hit against a database of 108,000,000 fingers**





# NGI Palm Print Service

- FBI Palm Service will serve as the National Palm Repository (Currently 2.5 Million)
- Fully Integrated within IAFIS
- Primary customers include FBI Laboratory Division and other federal, state and local law enforcement agencies
- Functionality
  - Receive, Store, & Search Palm Prints
    - Including Supplemental Fingers and Palms (Major Case Prints Collection)
  - Allow Bulk Submissions
  - Search Unsolved Latent File
  - Multi-modal Benefits
  - Additional Biometric
  - Solve More Crimes





# ULW

Has always operated as a single application for editing and submitting latent searches in an EBTS format with the following abilities:

- is capable of registering latent fingerprints to the ULF
- can retrieve ten-print images from file using FBI #
- can import images from multi-media devices
- can be installed onto vendor hardware if compatible
- can conduct search of other AFIS vendors
- accepts tracings





# ULW 2011

- ULW 2011 is somewhat like Microsoft Office
  - ULW 2011 is a suite of applications for latent encoding, search, and comparison
    - **ULW Transaction Manager (TM)** – acts as a submission log for managing casework for any designated system
    - **ULW Comparison Tool (CT)** – is a more streamlined comparison tool liken to modern vendor comparison applications
    - **ULW Latent Editor (LE)** – is a more traditional ULW application for markup and submission of latents for agencies utilizing stand alone systems with minimal staffing.



# ULW Pre-NGI

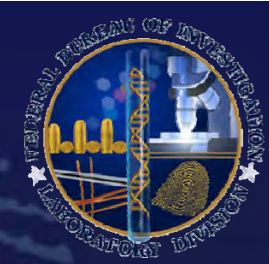
- The ULW version deployed prior to NGI Increment 3 will have palm print capabilities with the introduction of the NGI National Palm Print System in 2013.
- Additional repository search designation and NGI functionality will also be implemented in ULW before the 2013 deployment of latent and palm print capabilities





# Shortcuts

- Drag/Move Toolbars for examiner's preference
- Control +/- will zoom and roller on mouse
- Control up/down arrow will scroll candidates
- Keyboard is a faster way to do ridge counts
- New Feature: Pin/UnPin
- Levels for more broad range of grays
  - Screen, Multiply, Overlay like Photoshop
- Colorize available for variations
- Tailor language in TM by changing config files
- Can View TP Cards in TM and CT and Print



# Latent Editor (ULW)

Universal Latent Workstation

File Window Help Task List

Task List

Open Image Open/Import EBTS File Scan Image Image Search Image Request Refresh Delete Task

Drag a column header here to group by that column

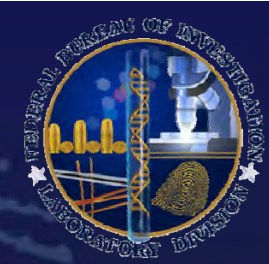
Transaction File	Progress	Application
▼		
▶ MA_11-5105_0_MA-11-5105-00_0.SRL	Needs Comparison	Comparison Tool
MA_11-5105_0_MA-11-5105-00_0_1.rsp	Needs Comparison	Comparison Tool
MA_11-5105_0_MA-11-5105-00_0_1.SRL	Needs Comparison	Comparison Tool
SAMPLE_1008_0_SAMPLE_1008_1_Sample_008_G_1_1...	Needs Comparison	Comparison Tool
MA_201104772bb_0_MA-201104772bb-00_0.SRL	Needs Comparison	Comparison Tool
119322_alexandria_0_119322-alexandria-04_6.SRL	Needs Comparison	Comparison Tool
119322_alexandria_0_11-119322-alexandria-08_4.SRL	Needs Comparison	Comparison Tool
Coral-Gables_FLAPD_2_coral-gables_12.LFIS	Needs Markup	Latent Editor
Coral-Gables_FLAPD_2_coral-gables_12.rsp	Needs Comparison	Comparison Tool
Coral-Gables_FLAPD_0_CORAL-GABLES-FLAPD-11_11_...	Needs Comparison	Comparison Tool

Switch to Comparison Tool Switch to Transaction Manager

☒ Open this form automatically (Can be modified via Program Settings)

start ULW2011-NGI Presen... Latent Services Over... Universal Latent Wor... 4:10 PM





# Text Fields

Universal Latent Workstation - [LFFS: (\_DSC5087 processed b..tif) 140% (500 ppi)]

File Edit Image View Training Window Help To Do Task List

**Text Fields**

**Feature Markup**

Name	Abbr	#	Field	EBTSValue
<b>▼ Rec 01, 1: Transaction Data</b>				
Type of Transaction	TOT		1.04	LFFS
Date	DAT		1.05	Aug 11, 2011
Destination Agency ID	DAI		1.07	WVIAFIS0Z
Originating Agency ID	ORI		1.08	WVFBIO13Z
Transaction Control Num	TCN		1.09	20110811020205
<b>▼ Rec 02, 1: Case Information</b>				
Contributor Case ID Number	CIN		2.010	
• Prefix	CIN		2.010	jpc
• Identifier	CIN		2.010	1234567
Contributor Case ID Extension	CIX		2.011	00
Controlling Agency Identifier	CRI	1 (2...	2.073	WVFBIO13Z
Priority	PRI		2.076	1 {Homicide, rape, and special circumstances}
Number of Images Returned	NCR		2.079	20
Add to Unsolved Latent File	ULF		2.083	<input type="checkbox"/> Check
Note Field	NOTE		2.088	
<b>▼ Rec 02, 1: Subject Description</b>				
Place of Birth	POB		2.020	
Age Range	AGR		2.023	
Gender	SEX		2.024	
Race	RAC		2.025	
Scars Marks & Tattoos	SMT	1 (2...	2.026	

**FieldInfo**

Place of Birth

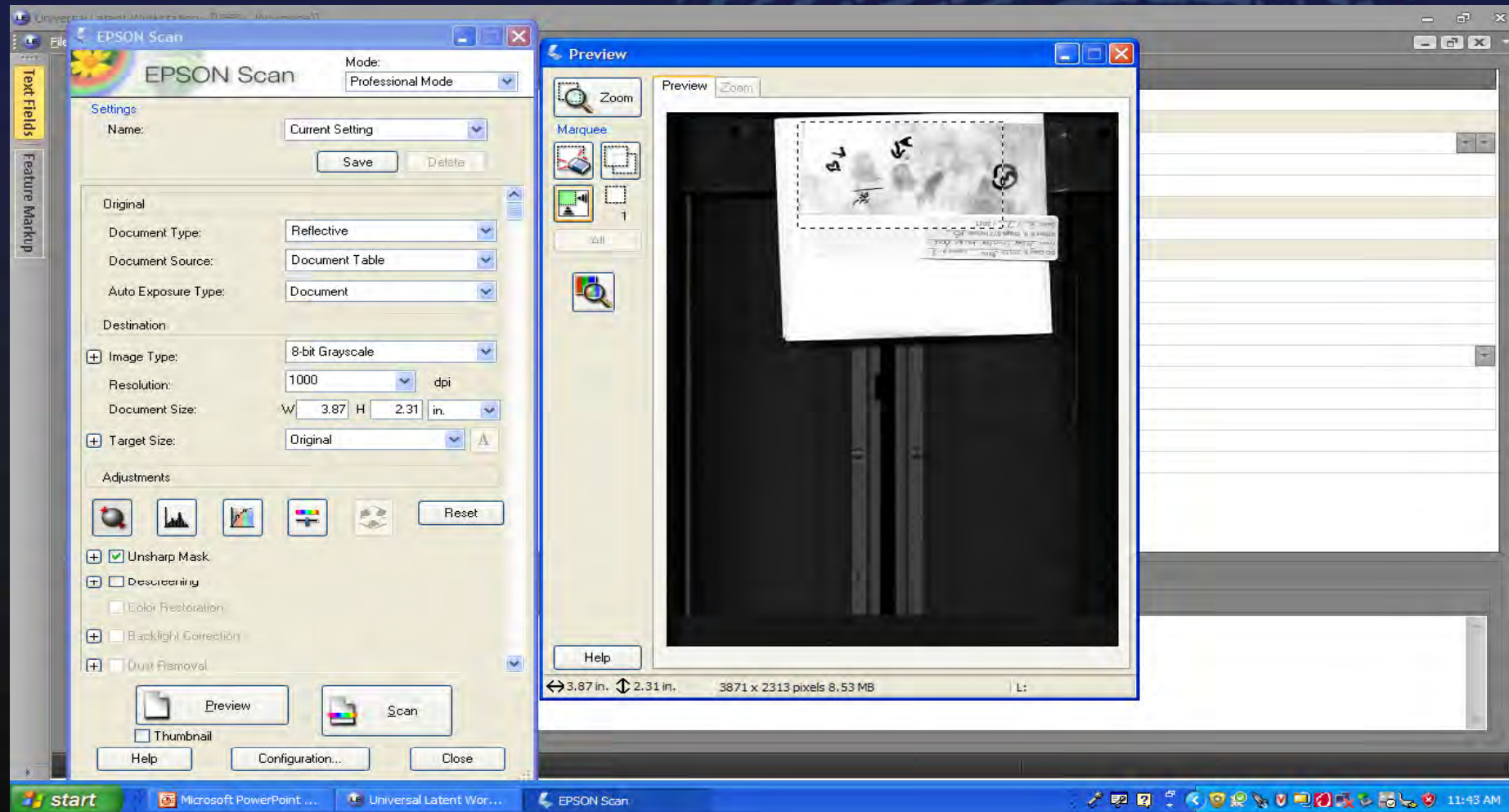
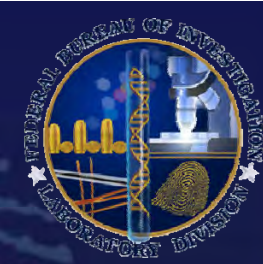
Abbrev.	POB
ANSI/NIST #	2.020
List Selection	
Max length	2
Min length	2

Click and drag to mark features. Position: 3,321 pixels @ 500 ppi File Penetration: 100%

start Microsoft PowerPoint ... Universal Latent Wor... 2:26 PM



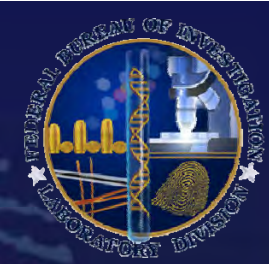
# SCANNING







# Importing image



Universal Latent Workstation - [LFFS: (P 1 enhanced w dots for iafis.tif) 50% (500 ppi)]

File Edit Image View Training Window Help To Do Task List

Text Fields  
Feature Markup

Features Toolbar

Image Tools

- Crop
- Invert (Off)
- Rotate

Latent Info

Finger Position: Unknown finger  
Pattern Class: Unable to Class  
Orientation: Fingertip up  
Impression Type: 6 (Latent photo)

Features

Feature Set: FBI IAFIS

Region of Interest

Minutiae

Find Minutiae

Reject: 10 | Accept: 0

Options

Ridge Count

Show Features

- Show All
- Show Current
- Show None
- Show Specific

Show Specific Options

Image Viewer

Select Image: #01

Zoom 50% | Fit to Page | Fit to ROI

Image Processing Features

- ☒ GrayScale
- ☐ Colorize

Original Image

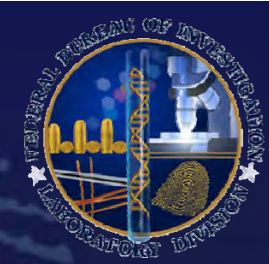
- ☐ Binarize/Trace
- ☐ Blur
- ☐ Bas Relief
- ☐ Difference of Gaussians
- ☐ Unsharp Mask
- ☐ Local Histogram EQ
- ☐ Laplacian Sharpen

File Contents

Click and drag to mark features. Position: 4,614 pixels @ 500 ppi File Penetration: 100%

start Microsoft PowerPoint ... Universal Latent Wor...

2:06 PM



# Encoding

Universal Latent Workstation - [LFFS: (\_DSC5087 processed b..tif) 113% (500 ppi)]

File Edit Image View Training Window Help To Do Task List

Text Fields Feature Markup

Features Toolbar

Image Tools

Crop

Invert (Off)

Rotate

Latent Info

Finger Position: Unknown finger

Pattern Class: Unable to Class

Orientation: Fingertip up

Impression Type: 6 (Latent photo)

Features

Feature Set: FBI IAFIS

Region of Interest

Minutiae

Find Minutiae

Reject: 0

Accept: 49

Options

Ridge Count

Show Features

Show All Show Current Show None Show Specific

Show Specific Options

Image Viewer

Select Image: #01

Zoom: 113%

Fit to Page Fit to ROI

Image Processing Features

GrayScale Colorize

Original Image

Binarize/Trace

Blur

Bas Relief

Difference of Gaussians

Unsharp Mask

Local Histogram EQ

Laplacian Sharpen

File Contents

Click and drag to mark features.

Position: 75,355 pixels @ 500 ppi

File Penetration: 100%

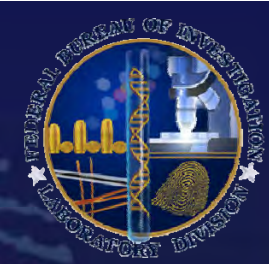
start Microsoft PowerPoint ... Universal Latent Wor...

2:16 PM





# Minutia Marks



Universal Latent Workstation - [LFFS: (\_DSC5087 processed b...tif) 140% (500 ppi)]

File Edit Image View Training Window Help To Do Task List

**Text Fields**  
**Feature Markup**

**Features Toolbar**

**Image Tools**

Crop  
Invert (Off)  
Rotate

**Latent Info**

Finger Position: Unknown finger  
Pattern Class: Unable to Class  
Orientation: Fingertip up  
Impression Type: 6 (Latent photo)

**Features**

Feature Set: FBI IAFIS  
Region of Interest: Minutiae  
Find Minutiae  
Reject: 40  
Accept: 10  
16%  
Options  
Ridge Count

**Show Features**

Show All Show Current  
Show None Show Specific  
Show Specific Options

**Image Viewer**

Select Image: #01  
Zoom 140% Fit to Page Fit to ROI

**Image Processing Features**

☒ GrayScale ☐ Colorize Options

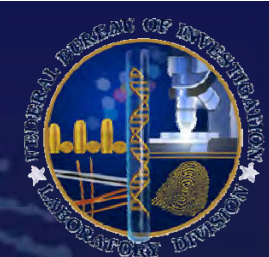
Original Image  
☐ Binarize/Trace  
☐ Blur  
☐ Bas Relief  
☐ Difference of Gaussians  
☐ Unsharp Mask  
☐ Local Histogram EQ  
☐ Laplacian Sharpen

**File Contents**

Click and drag to mark features. 19.18 degrees File Penetration: 100%

start Microsoft PowerPoint ... Universal Latent Wor... 2:23 PM





# Ridge Counting

Universal Latent Workstation - [LFFS: (DSC5087) processed b.i. bf) 140% (500 ppi)]

File Edit Image View Training Window Help To Do Task List

**Features Toolbar**

Image Tools

- Crop
- Invert (Off)
- Rotate

Latent Info

Finger Position: Unknown finger  
Pattern Class: Unable to Class  
Orientation: Fingertip up  
Impression Type: 6 (Latent photo)

Features

Feature Set: FBI IAFIS

Region of Interest

Minutiae

Find Minutiae

Reject: 30 15% Accept: 6

Options

Ridge Count

Show Features

- Show All
- Show Current
- Show None
- Show Specific

Show Specific Options

**Ridge Count (EDITING)**

View All Edit

Ridge Count: 2 ☐ Uncountable

Reliability: 15

Edit Next

**Image Toolbar**

Image Viewer

Select Image: #01

Zoom: 140%

**Image Processing Features**

☒ GrayScale ☐ Colorize

Original Image

- ☐ Binarize/Trace
- ☐ Blur
- ☐ Bas Relief
- ☐ Difference of Gaussians
- ☐ Unsharp Mask
- ☐ Local Histogram EQ
- ☐ Laplacian Sharpen

File Contents

Click EDIT NEXT (or press ENTER) to step through ridge counts Position: 233,388 pixels @ 500 ppi File Penetration: 100%

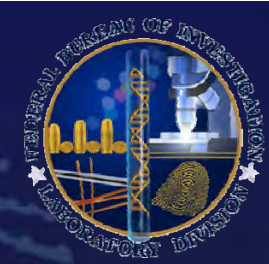
start Microsoft PowerPoint ... Universal Latent Wor...

2:21 PM





# Transaction Manager



Transaction Manager

Getting Started | Home | Preferences | Admin

Logged In As: JPCARLYLE ? Help Log Out Exit

User Data Grid

Create Case \* Import Image \* Open/Import EBTS File \* Create Image Request (IRQ) Check Response Task History Print View Refresh

Drag a column header here to group by that column

Archived	Prefix	Case	Ex	Sear	Edited	Submitted	ULF	SR	IR	IR	UL	ER	Notes	TCN	Date Modifie	Date Createx	Date Submit	Date Respon	Date Compa
<input type="checkbox"/>	ma	201...	0	LFFS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	0	0	0	0		2011080905...	8/10/2011 1...	8/9/2011 5:5...	8/10/2011 1...	8/10/2011 1...	8/10/2011 2:...
<input type="checkbox"/>	ma	201...	1	LFFS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	0	0	0	0	0			8/10/2011 1...	8/9/2011 5:5...			
<input type="checkbox"/>	MA	201...	0	LFFS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2	0	0	0	0		2011080904...	8/10/2011 1...	8/9/2011 5:5...		8/10/2011 1...	8/10/2011 1...
<input type="checkbox"/>	MA	11-5...	0	LFFS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4	0	0	0	0		2011080912...	8/9/2011 5:1...	8/9/2011 3:3...		8/9/2011 5:1...	8/9/2011 6:2...
<input type="checkbox"/>	MA	201...	0	LFFS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	0	0	0	0		2011080909...	8/9/2011 4:0...	8/9/2011 10:...		8/9/2011 4:0...	8/9/2011 6:3...
<input type="checkbox"/>	MA	201...	1	LFFS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	0	0	0	0		2011080910...	8/9/2011 4:0...	8/9/2011 10:...	8/9/2011 10:...	8/9/2011 4:0...	8/9/2011 6:3...
<input checked="" type="checkbox"/>	SAMPLE	1008	1	LFFS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1	2	1	1	0		2010041905...	8/10/2011 1:...	8/10/2011 1:...	8/10/2011 1:...	8/10/2011 1:...	8/10/2011 1:...
<input type="checkbox"/>	TED	1	1	LFFS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0	0	0	0	0		2011081001...	8/10/2011 1:...	8/10/2011 1:...	8/10/2011 1:...		

Case Preview

Search File: SAMPLE\_1008\_0\_SAMPLE\_1008\_1\_Sample...  
Image: SAMPLE\_1008\_1\_LWB49EC2.bmp  
Latent:

Transaction Information

Case Prefix: SAMPLE  
Case ID: 1008  
Case Extension: 1

Actions to Current Case

Edit Search in ULW-LE  
Submit Search  
Add to Unsolved Latent File (ULF)  
Delete from Unsolved Latent File (ULF)  
Create Latent Feature Search(s) (LFFS) from Image File  
Create Latent Feature Search(s) (LFFS) from Image Folder

Transaction File Content

Transaction Control Number: 20100419054330 (TCN value is updated after transaction is submitted, or file was import)

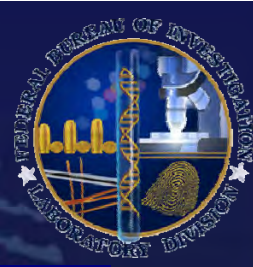
Add to ULF Requested: ☐  
Add to ULF Confirmed: ☐  
Delete from ULF Requested: ☐  
Delete from ULF Confirmed: ☐  
Transaction Summary: v

Case Preview | SRL Preview | IRQ Preview | IRR Preview | ULM Preview | ERRL Preview

start | Microsoft PowerPoint ... | Transaction Manager | 2:44 PM



# ULW Comparison



Universal Latent Workstation

File Edit Image View Training Window Help To Do

Zoom (1:1) (Full page)

SRL:

- Rec 1: Transaction Information
  - Transaction Data
- Rec 2: Descriptive Text
  - Candidate List
- Rec 4: Fingerprint Image
  - #01: Score 2693
  - #02: Score 1628
  - #03: Score 1543
  - #04: Score 1538
  - #05: Score 1532
  - #06: Score 1527
  - #07: Score 1513
  - #08: Score 1474
  - #09: Score 1445
  - #10: Score 1431

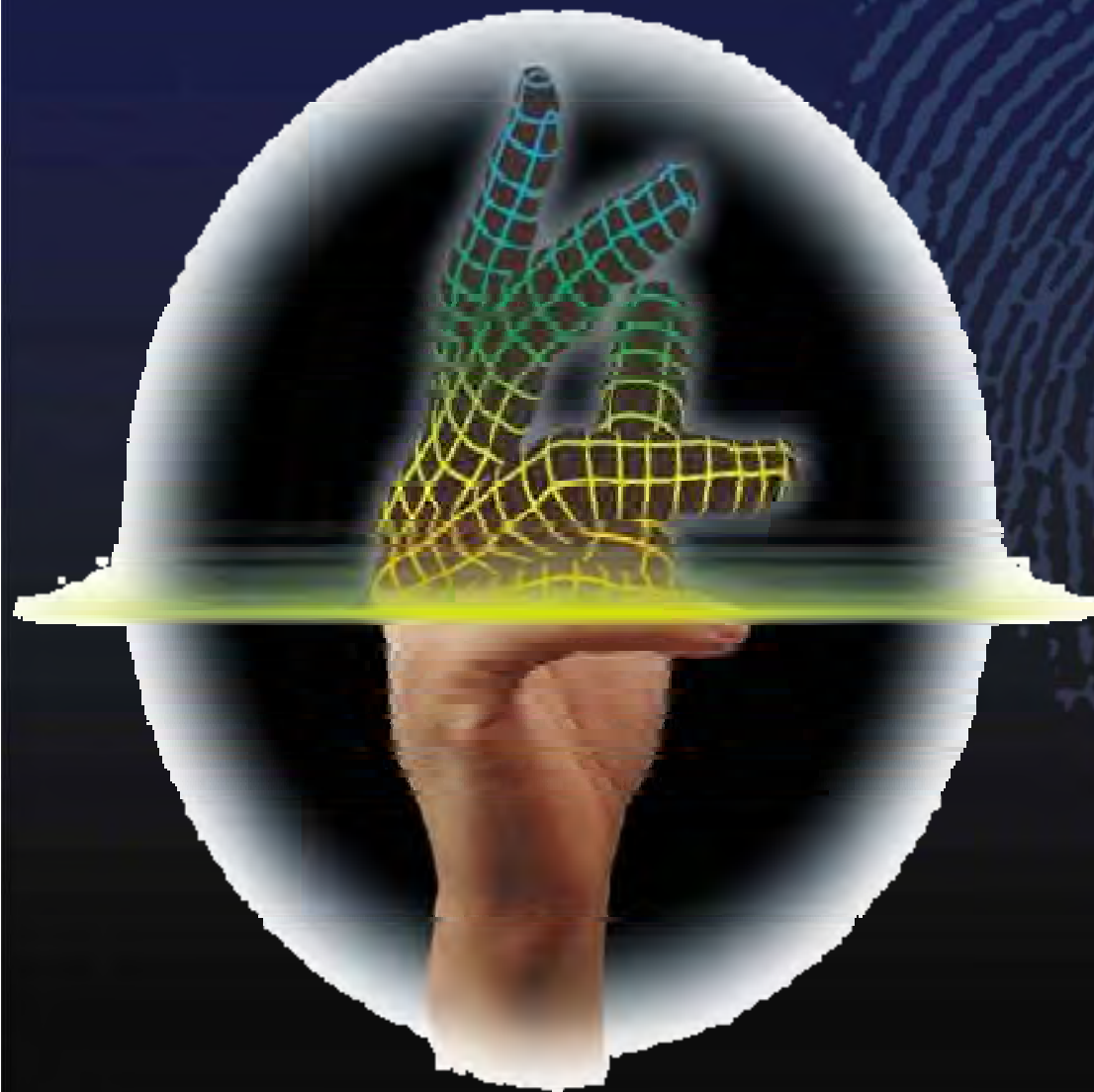
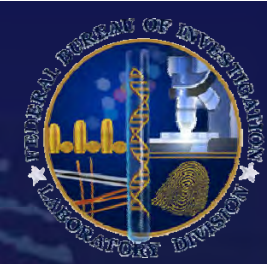
LFES: Rfes7g021Rfes7g02102000100\_lffs.eft (RFES7gRFES725010300\_enh2.bmp) (. . .)

SRL: RFES7g-RFES725010300-0100.srl (1.1)





# Glance at ULW 2011





# Contact Information

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