QUANTUM

3D MICROSCOPE™

Powered by **IBIS**® Technology

Take firearm and tool mark identification to the next level

> **Bring objectivity to common source conclusions**

ULTRA | Forensic Technology

QUANTUM
3D MICROSCOPE™

For Firearm and Tool Mark Identification

The Quantum 3D Microscope (Q3M) has capabilities beyond those of conventional comparison microscopes. Technological advancements in 3D topography measurements are unlocking much-needed innovations.

Q3M provides firearm and tool mark examiners with the best 3D visual and quantitative tools for common source determination.

Bullets and Other Small Objects

The Q3M S1 model captures the rifling marks on fired bullets, and tool marks on other small objects, such as press marks on pills and tablets, as well as chamber, extractor, and ejection port marks on cartridge cases.

Support Expert Conclusions Using Objective Methods

Firearm and tool mark identification is evolving and now requires 3D measurements to support expert conclusions using objective methods that provide confidence levels and error rates.

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Q3M capabilities are derived from 3D technology innovations in IBIS Search Networks that were developed over more than a decade.
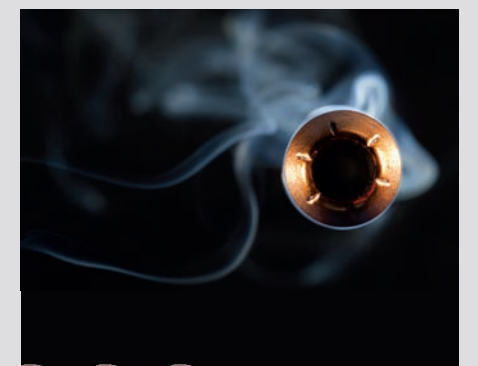
While IBIS focuses on finding the needle-in-the-haystack (previously unrelated firearm crimes), Q3M focuses on specific casework and studies, evaluating and quantifying the strength of agreement in common source determinations.

IBIS®
INTEGRATED BALLISTIC IDENTIFICATION SYSTEM

Crime evidence

Suspect firearm recovered
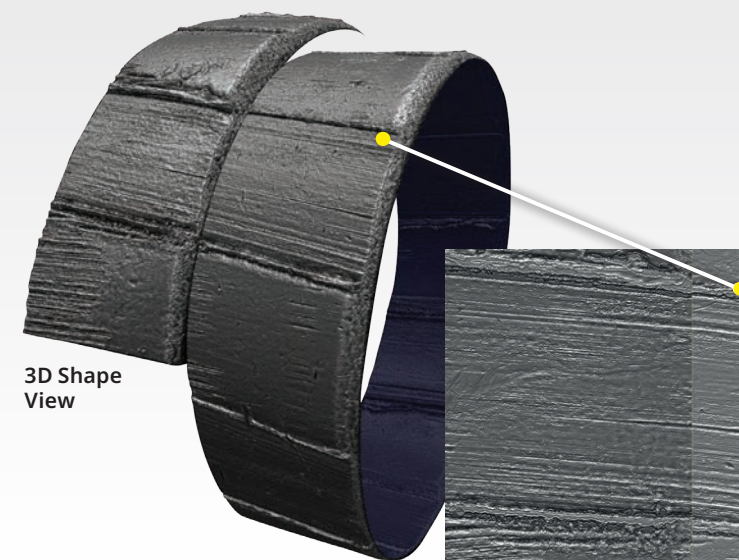
Test-fired bullets

3D Acquisition

Q3M can save hours or days compared to doing the same casework on a comparison microscope.

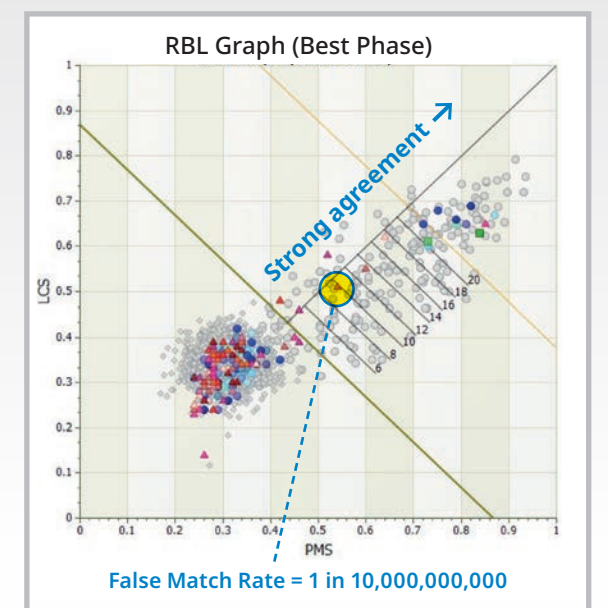Reach more conclusions with high-confidence in a fraction of the time.

3D Comparison Viewing

Quantitative Analysis

3D Shape View

3D Surface View

RBL Graph (Best Phase)

Strong agreement

LCS

PMS

False Match Rate = 1 in 10,000,000,000

3D Comparison Viewing

A whole new level of viewing is made possible with 3D microscopy. More details can be seen with less effort.


Features

- Surface and shape views, always in focus
- Up to 6 objects compared simultaneously side-by-side
- Hairline moveable across overlapped surfaces
- Horizontal and vertical side-by-side views
- Overlap, move, and rotate in locked or free modes
- Sectional line profiles show precise topography
- Visual enhancements emphasize the marks
- Bullet best match assistance aligns the similarities
- Simulated lighting and surface reflectivity options
- Graphically annotate comparisons
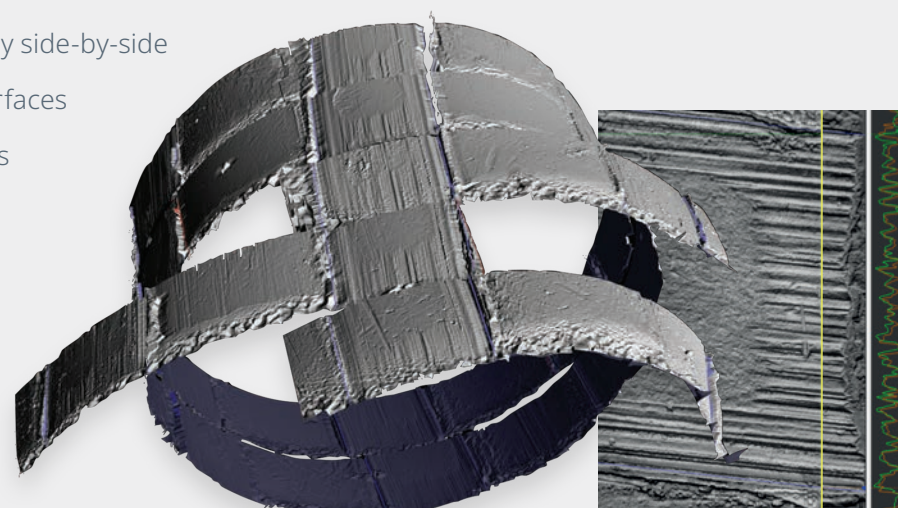
Bullet comparisons
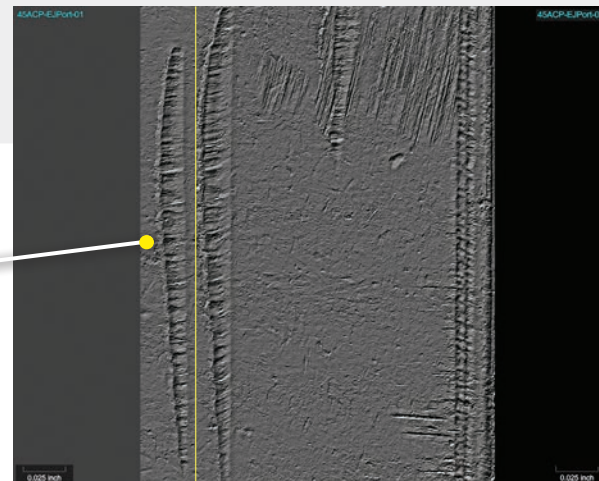
Ejection port mark comparison

Quantitative Analysis

Topography measurements feed algorithms that offer objective results in support of scientific studies and expert conclusions with confidence levels and error rates.

Compare bullets from unknown and known sources, and graphically represent the strength of common source similarity using Q3M's innovative RBL Graph[1].

RBL Graph

- The RBL method visually demonstrates quantifiable differences between matching and non-matching conditions.
- Correlation algorithms provide line counting and pattern matching scores (LCS and PMS).
- Best Phase mode is well-suited for intact bullets. Best LEA mode is well-suited for partial or damaged bullets.
- False Match Rate (FMR) provides a reliable error rate to support expert conclusions. Currently for conventional rifling, with plans to expand.
- Subclass Warning Coefficient indicates the possible influence of subclass characteristics.
- Clustering automatically groups same source items based on FMR as well as phase consistency (patent pending).

RBL Graph (Best Phase)
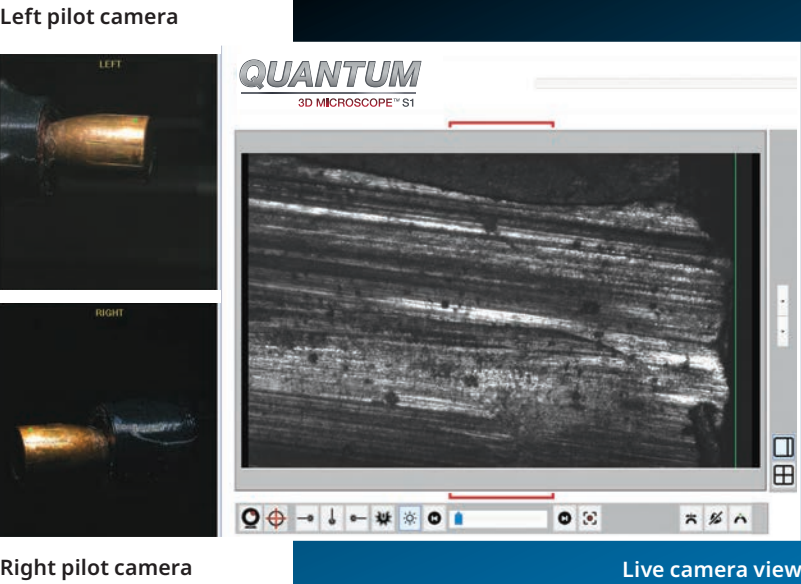
$FMR = 1/10^{18}$

Strong agreement
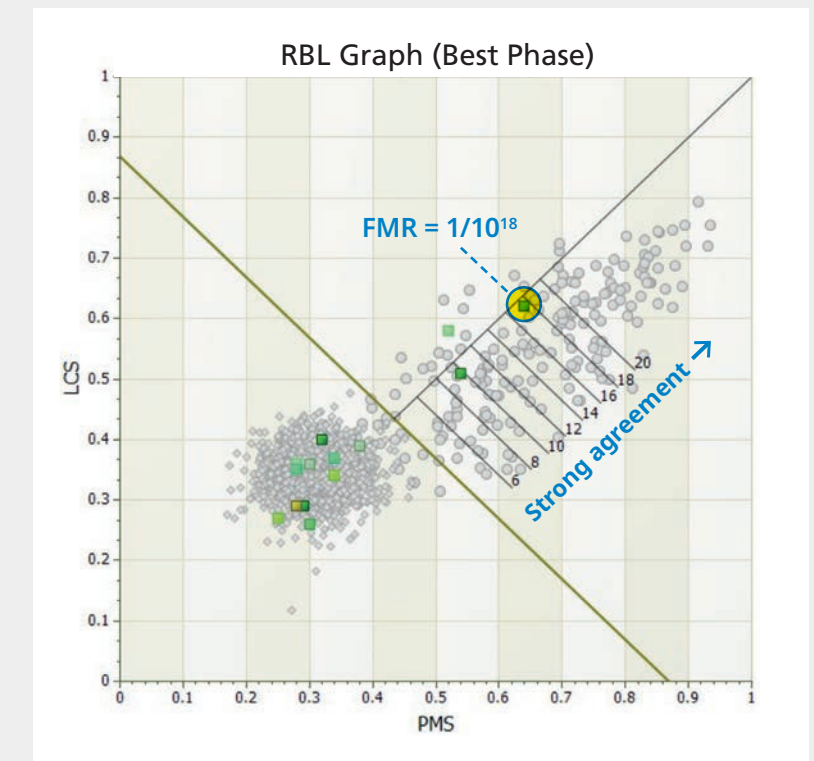
The False Match Rate (FMR) for a given similarity score represents the probability that two bullets that were not fired from the same firearm would generate a greater score.

1 Roberge, D., Beauchamp, A., & Lévesque, S. (2019). Objective Identification of Bullets Based on 3D Pattern Matching and Line Counting Scores. International Journal of Pattern Recognition and Artificial Intelligence, 33(11)

3D Microscope Technical Characteristics

- Non-Linear Photometric Stereo 3D sensor capable of measuring purely specular surfaces and diffusive surfaces (patented)

- Pilot cameras with smart positioning function

- Intelligent surface tracking for full object wraparound or across fragments

- Surface width: 2.8 mm

- Lateral resolution: 2.98 µm/pixel
  Depth resolution: Less than 0.3 µm

- Calibration to traceable measurement standards

- Object dimensions: up to 50 mm long and 28 mm diameter, including all bullet calibers (0.17 to 0.50)

Left pilot camera

Right pilot camera

Live camera view

Flexible Data Management

- Organize captured data and results in workspaces

- Easily document the work product in notes

- Output images, screenshots, notes, and results for expert reports and external information management systems

- Import and export 3D acquisition data in native and X3P/OpenFMC formats

Workspace

3D Acquisitions

Comparison Views

Quantitative Analysis

Notes

JP2 PNG — Images and X3P Data

Screenshots

Results

Standalone Workstation and Remote Extensions

Although the standard Q3M is a standalone workstation, acquisitions can be provided to remote workstations via workspace files.

For example, a technician can acquire the physical evidence from multiple cases so that examiners can work in parallel on comparison viewing and quantitative analysis. Examiners can share workspaces for peer reviews.

Remote Extensions

Acquisition

Q3M Examiner

Q3M Examiner

Q3M Examiner

Customized Mounting Stubs

A set of 10 customized stubs is provided for the easy mounting of objects of various shapes and sizes. All calibers of bullets, in various shapes, can be mounted, including test fires, and damaged and fragmented evidence.
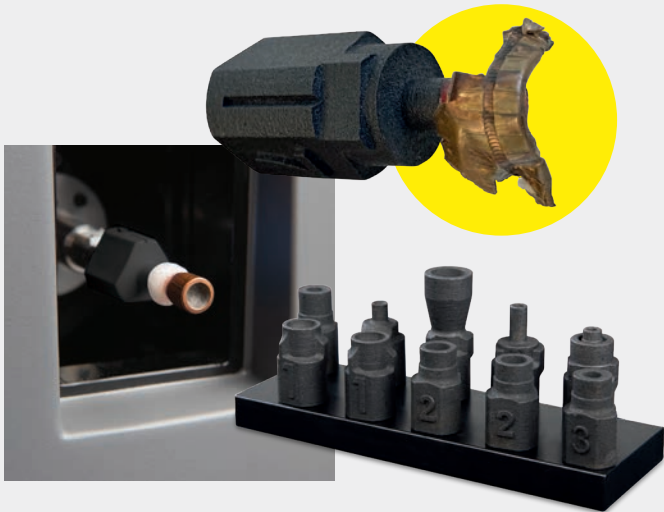
Stub is magnetically secured to shaft and automatically retracts
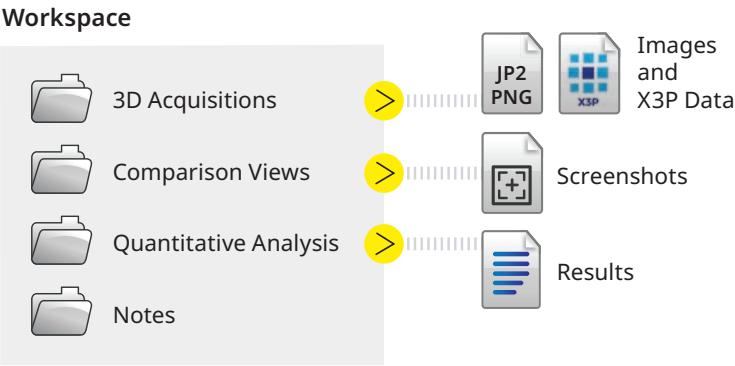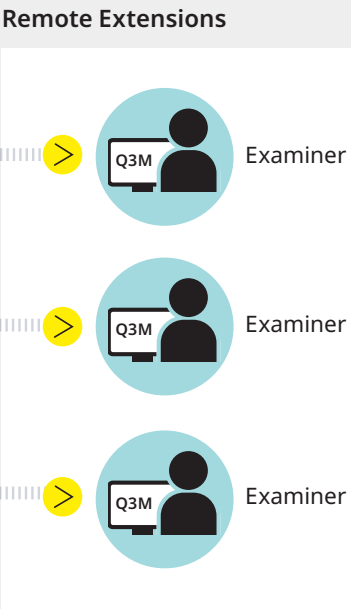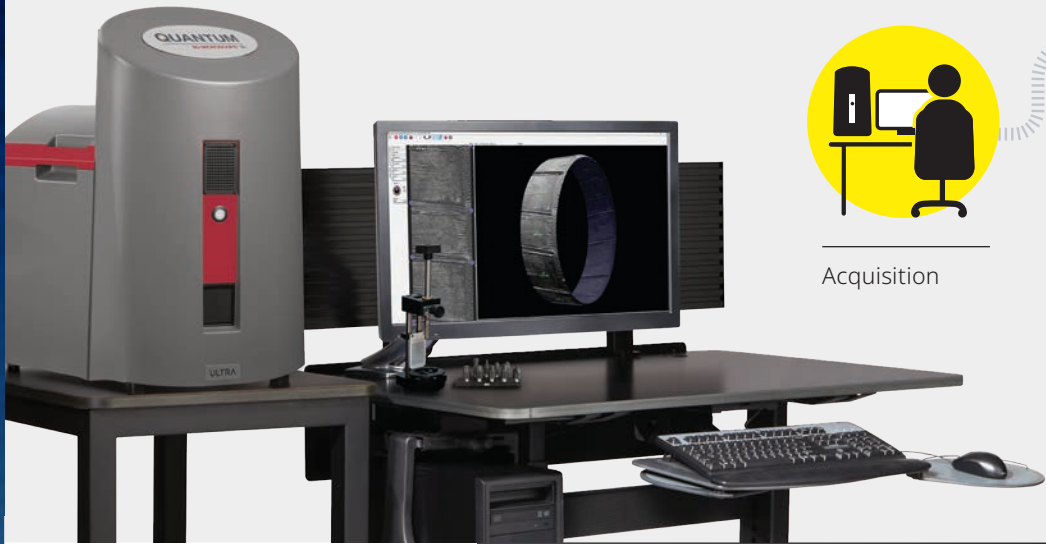
Set of 10 customized stubs

Bullet fragment
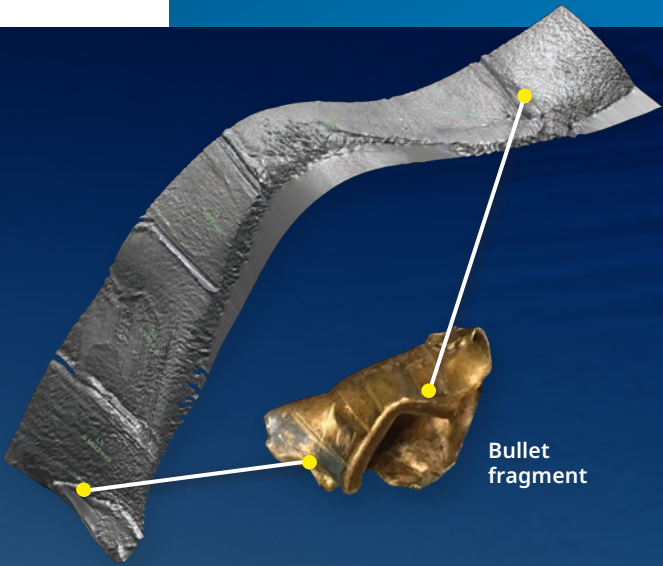
⊕ Add-On to IBIS BULLETTRAX™

The Q3M Acquisition Unit can be shared as part of an IBIS BULLETTRAX Acquisition Station for bullet entries onto an IBIS Search Network.

This can be advantageous if the use of the equipment can accommodate the volume of IBIS bullet entries and 3D microscope casework.

Acquisition Unit Dimensions (W x H x D):
61.7 cm x 37.5 cm x 57.9 cm
(24.3" x 14.8" x 22.8")

Acquisition Unit Weight:
33 kg (72 lb.)

Training, Proficiency Testing, and Research Studies

- Acquire objects once, and freely view and share
- Build training sets and reference sets
- 3D topography data provides reliable measurements
- Perform studies to advance the firearm and tool mark identification discipline
- Collaborate in community research projects based on shared 3D data

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Innovating today for a safer tomorrow

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