



New bullet and cartridge case 3D measurements tools

AFTE 2018 - 6th June 2018
Charleston





3-in-1 technologies

CONFOCAL
INTERFEROMETRY
FOCUS VARIATION



- + 17 years
- + 700 systems worldwide



NIST



mossos d'esquadra



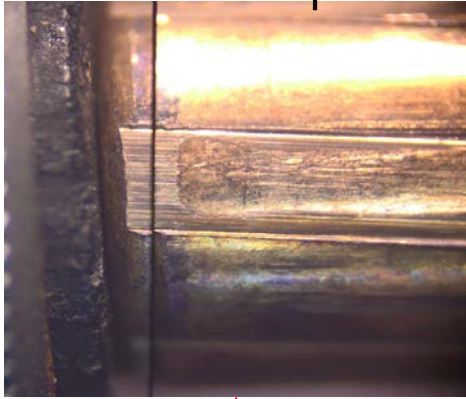
Contents



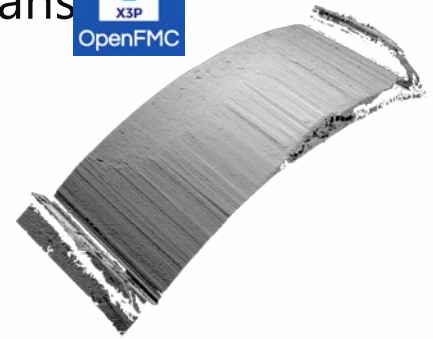
15 min

- ➔ • Revision of 3D scans uses at FM/TM labs
 - Virtual Comparison Microcopy
 - Objective Identification
- New tools to acquire 3D scans
- Summary

Comparison
microscope



3D scans

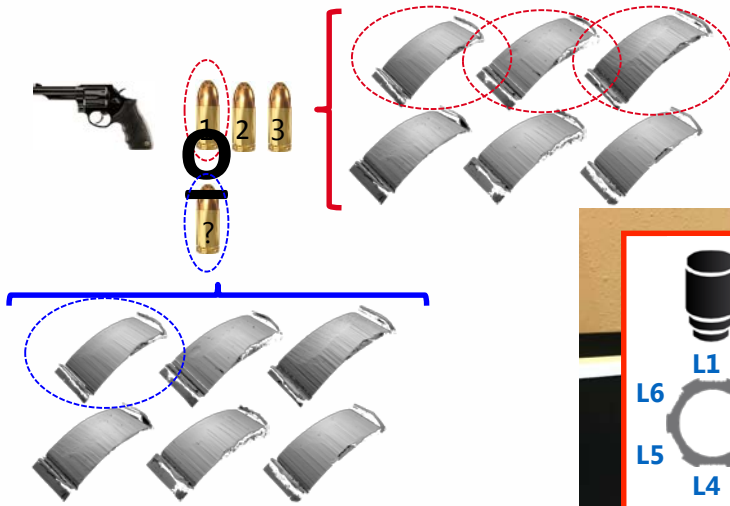


3D virtual
microscopy

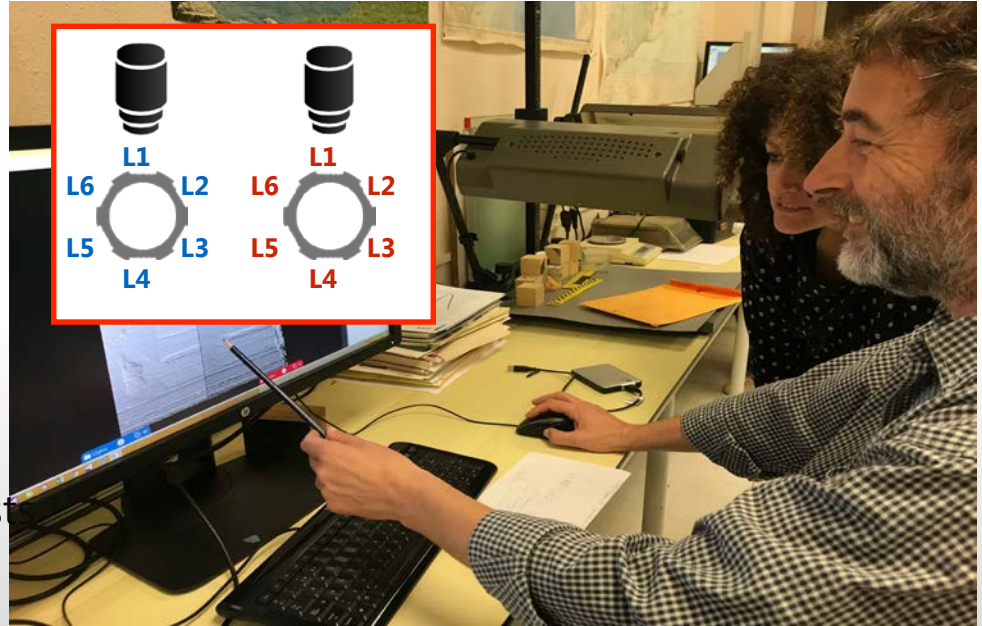


Database search
&
Objective
identification





- Routine casework
- Qualitative information
- Independent review
- Training & proficiency test
- Data exchange (x3p)
- Document a comparison



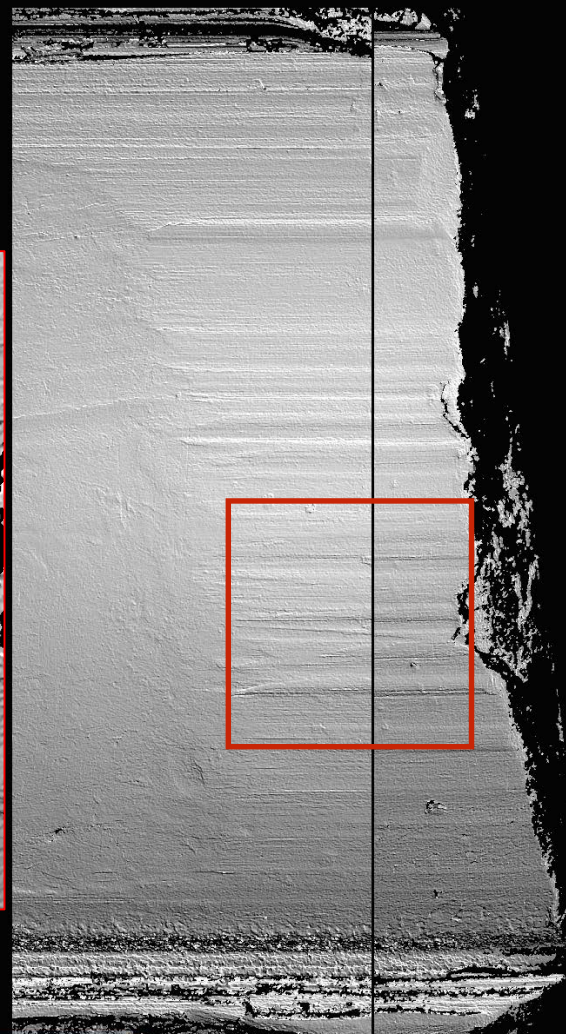
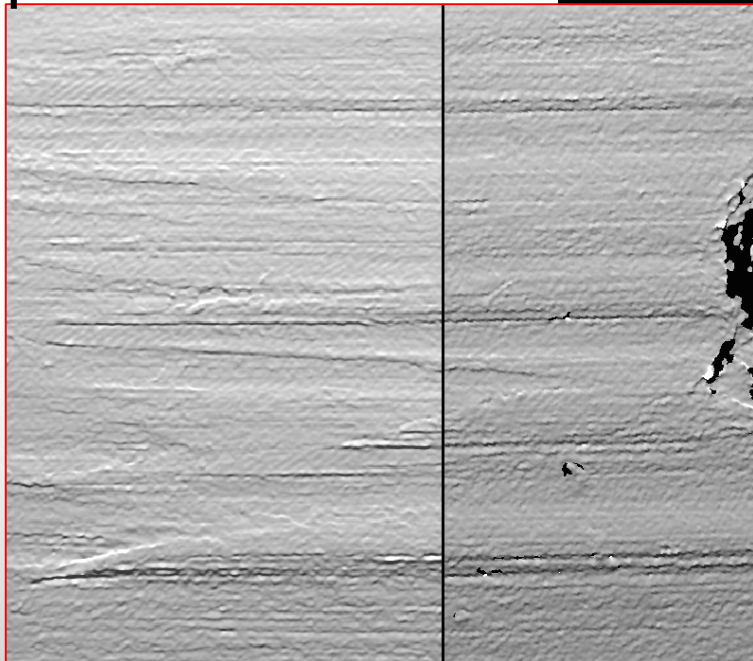
"we can see more details"

VCM
x3p

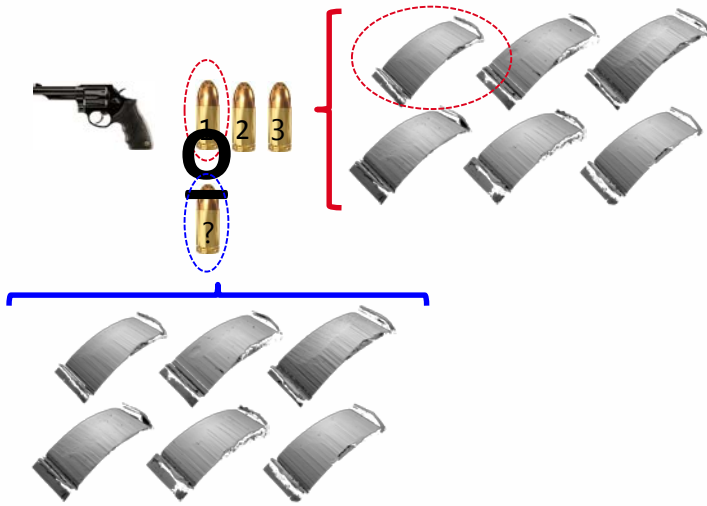


SensoCOM 

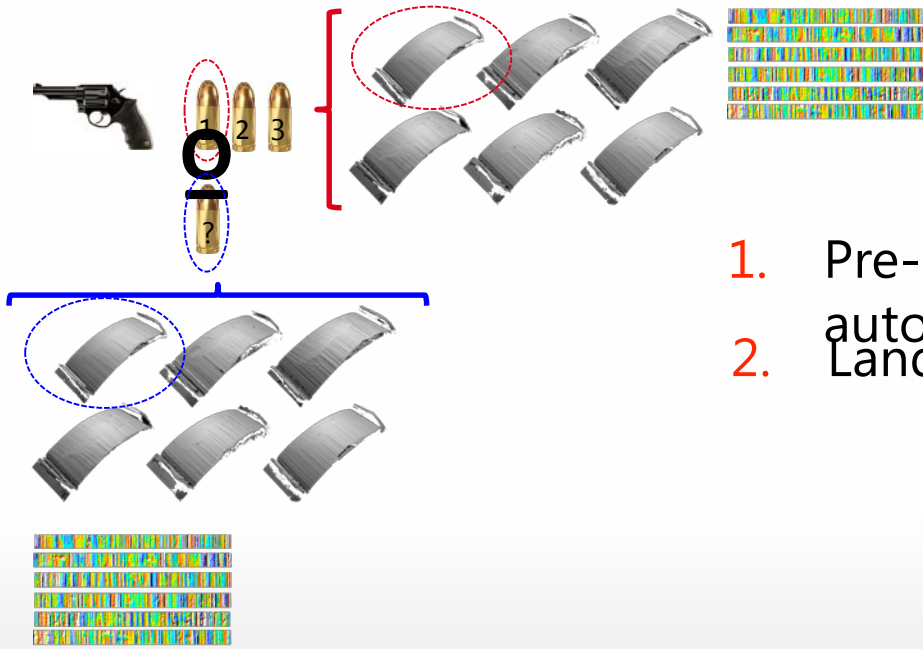
P



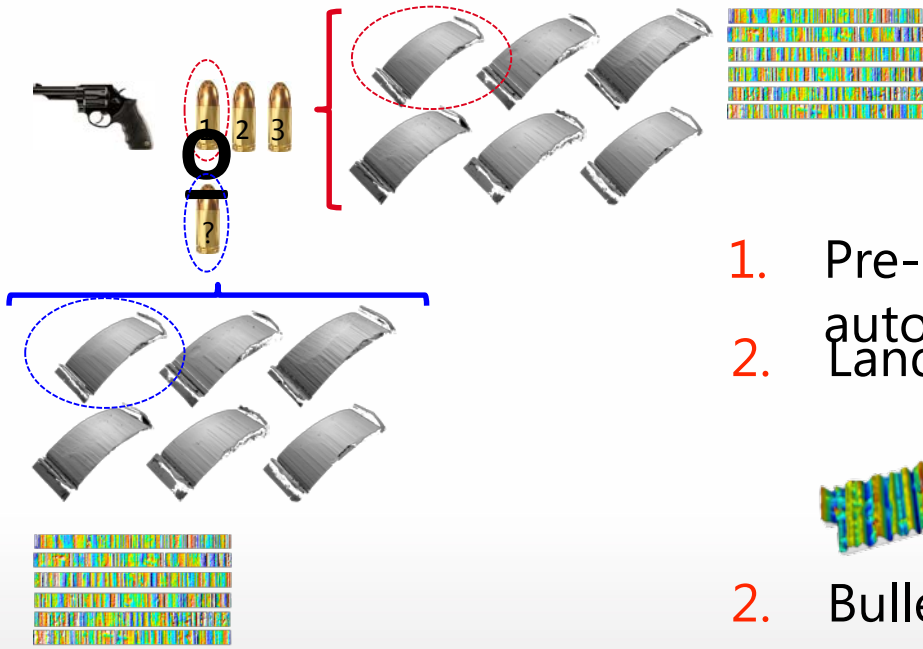
SENSOFAR
METROLOGY



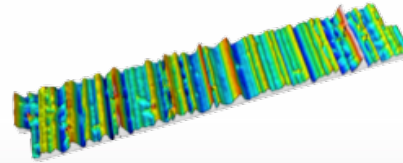
1. Pre-processing: manual / automatic



1. Pre-processing: manual / automatic
2. Land comparisons



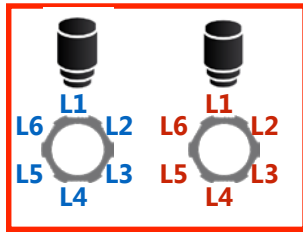
1. Pre-processing: manual / automatic
2. Land comparisons



$CCF_{\max}=0.91$

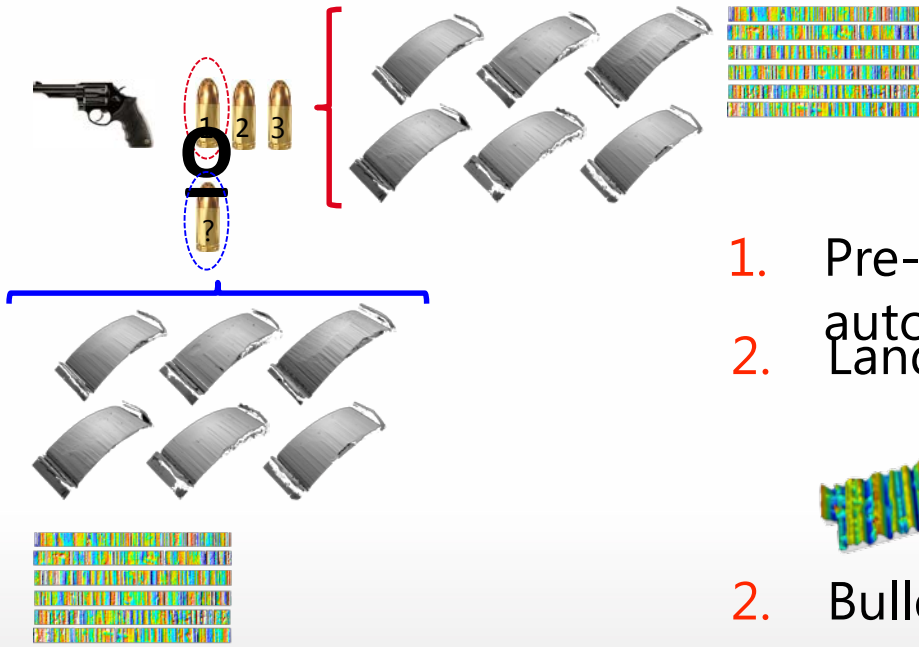
2. Bullet comparisons

Bullet comparisons

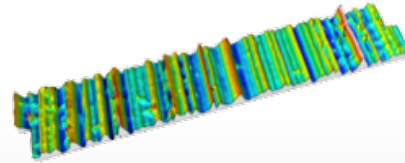


IC	L1	L2	L3	L4	L5	L6
L1	0.25	0.29	0.20	0.21	0.25	0.91
L2	0.83	0.33	0.23	0.19	0.27	0.17
L3	0.16	0.84	0.14	0.23	0.19	0.24
L4	0.23	0.12	0.89	0.30	0.23	0.28
L5	0.25	0.29	0.26	0.87	0.28	0.24
L6	0.28	0.22	0.26	0.31	0.39	0.18





1. Pre-processing: manual / automatic
2. Land comparisons



$CCF_{\max} = 0.91$

2. Bullet comparisons
 $MAX = 0.91 / SAM = 0.75$

Objective
identification



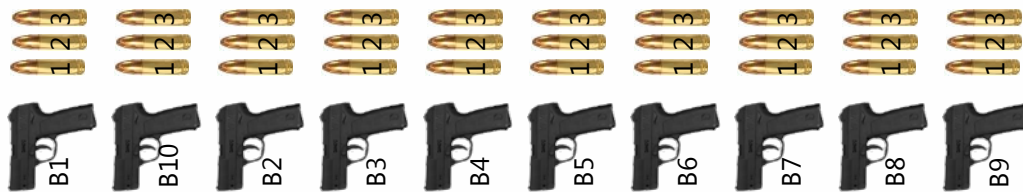
SensoMAT

NIST Interlab study

SAM 30 vs 30

Time <13 sec

- Database search
- Routine casework
- Quantitative information
- Verifications



Bullet	B1_1	B1_2	B1_3	B10_1	B10_2	B10_3	B2_1	B2_2	B2_3	B3_1	B3_2	B3_3	B4_1	B4_2	B4_3	B5_1	B5_2	B5_3	B6_1	B6_2	B6_3	B7_1	B7_2	B7_3	B8_1	B8_2	B8_3	B9_1	B9_2			
B1_1																																
B1_2	0.78																															
B1_3	0.76	0.81																														
B10_1	0.24	0.24	0.27																													
B10_2	0.24	0.23	0.24	0.77																												
B10_3	0.25	0.27	0.25	0.84	0.80																											
B2_1	0.24	0.24	0.28	0.22	0.21	0.24																										
B2_2	0.25	0.23	0.26	0.21	0.24	0.24	0.83																									
B2_3	0.24	0.25	0.25	0.23	0.23	0.24	0.73	0.81																								
B3_1	0.24	0.23	0.22	0.29	0.24	0.29	0.23	0.25	0.24																							
B3_2	0.23	0.25	0.23	0.24	0.22	0.24	0.35	0.23	0.24	0.69																						
B3_3	0.24	0.26	0.23	0.25	0.23	0.23	0.22	0.24	0.27	0.68	0.81																					
B4_1	0.23	0.24	0.25	0.24	0.23	0.22	0.23	0.24	0.24	0.25	0.24	0.22																				
B4_2	0.23	0.24	0.25	0.27	0.24	0.24	0.25	0.23	0.24	0.21	0.23	0.25	0.66																			
B4_3	0.24	0.24	0.24	0.26	0.26	0.28	0.24	0.25	0.23	0.22	0.25	0.23	0.84	0.72																		
B5_1	0.24	0.21	0.22	0.26	0.26	0.29	0.26	0.27	0.26	0.24	0.25	0.25	0.25	0.25	0.25	0.24																
B5_2	0.21	0.24	0.23	0.23	0.25	0.24	0.28	0.25	0.24	0.25	0.28	0.25	0.28	0.25	0.22	0.45																
B5_3	0.24	0.25	0.24	0.24	0.28	0.25	0.27	0.27	0.25	0.24	0.27	0.25	0.24	0.24	0.25	0.73	0.51															
B6_1	0.22	0.22	0.22	0.27	0.25	0.28	0.24	0.27	0.24	0.24	0.24	0.22	0.24	0.24	0.25	0.24	0.25	0.27														
B6_2	0.23	0.22	0.24	0.27	0.25	0.27	0.29	0.30	0.25	0.23	0.22	0.25	0.24	0.26	0.24	0.28	0.26	0.25	0.81													
B6_3	0.23	0.22	0.25	0.26	0.24	0.25	0.25	0.29	0.25	0.23	0.22	0.26	0.28	0.25	0.23	0.25	0.25	0.74	0.86													
B7_1	0.23	0.26	0.26	0.27	0.26	0.23	0.27	0.27	0.30	0.23	0.23	0.26	0.24	0.23	0.24	0.22	0.27	0.32	0.24	0.23	0.24											
B7_2	0.23	0.26	0.23	0.24	0.26	0.24	0.30	0.30	0.30	0.21	0.26	0.24	0.24	0.23	0.26	0.26	0.24	0.26	0.26	0.26	0.23	0.72										
B7_3	0.21	0.23	0.25	0.26	0.24	0.26	0.28	0.28	0.26	0.24	0.28	0.29	0.24	0.24	0.24	0.24	0.23	0.23	0.26	0.28	0.21	0.69	0.79									
B8_1	0.21	0.23	0.25	0.25	0.26	0.24	0.25	0.24	0.24	0.22	0.24	0.23	0.25	0.25	0.27	0.25	0.25	0.24	0.23	0.26	0.23	0.23	0.24	0.21								
B8_2	0.21	0.22	0.24	0.26	0.27	0.27	0.25	0.24	0.23	0.25	0.22	0.25	0.24	0.25	0.24	0.25	0.24	0.25	0.24	0.23	0.23	0.22	0.22	0.24	0.78							
B8_3	0.25	0.26	0.29	0.27	0.26	0.26	0.24	0.25	0.23	0.23	0.23	0.24	0.25	0.25	0.25	0.26	0.25	0.25	0.24	0.25	0.27	0.22	0.22	0.21	0.77	0.84						
B9_1	0.21	0.24	0.23	0.23	0.23	0.23	0.27	0.26	0.25	0.22	0.25	0.25	0.24	0.23	0.23	0.27	0.25	0.25	0.27	0.24	0.25	0.23	0.25	0.25	0.22	0.21	0.24					
B9_2	0.28	0.26	0.28	0.26	0.24	0.25	0.28	0.26	0.24	0.22	0.26	0.26	0.24	0.26	0.26	0.29	0.28	0.25	0.27	0.26	0.28	0.29	0.30	0.25	0.26	0.26	0.23	0.73				
B9_3	0.28	0.24	0.27	0.24	0.22	0.27	0.27	0.24	0.23	0.24	0.25	0.25	0.24	0.24	0.24	0.26	0.28	0.27	0.27	0.24	0.26	0.23	0.23	0.23	0.24	0.22	0.25	0.73	0.78			

Contents



15 min

- Revision of 3D scans uses at FM/TM labs
 - Virtual Comparison Microcopy
 - Objective Identification
- ➔ • New tools to acquire 3D scans
 - Summary

3D scans
x3p



3-in-1
technologies

CONFOCAL
INTERFEROMETRY
FOCUS VARIATION



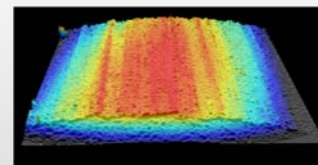
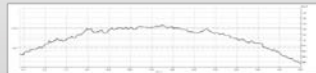
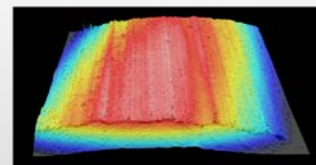
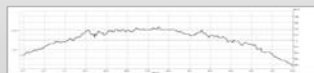
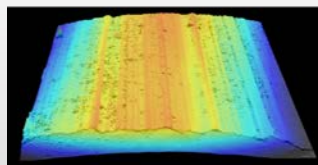
CSI
Interferometry



Confocal



Focus Variation



SENSOFAR
METROLOGY

3D scans
x3p



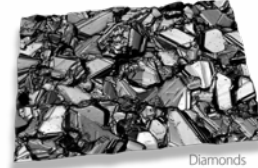
Automotive



Energy



LASER Processing



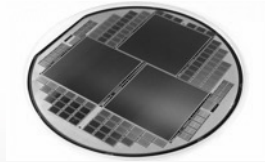
Diamonds



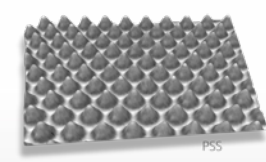
Leather



Microelectronics



Semiconductors



PSS



Micro manufacturing



Medical & Pharma



Tool Industry



Aerospace



Injection molding



Forensics

3D scans
x3p



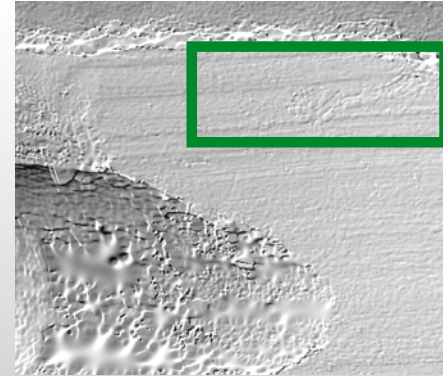
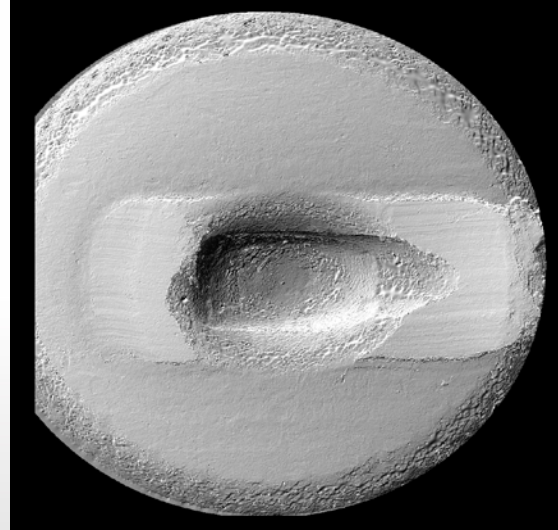
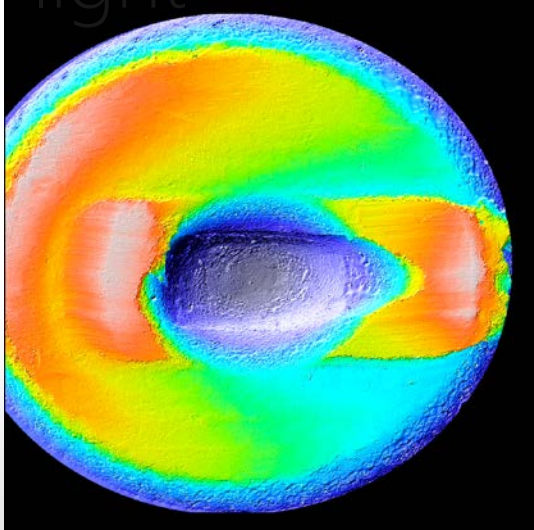
Cartridge cases firing pin -> High local slopes

Bullets & cartridge cases-> Automation & full
3D

3D scans
x3p



Confocal Fusion + ring light



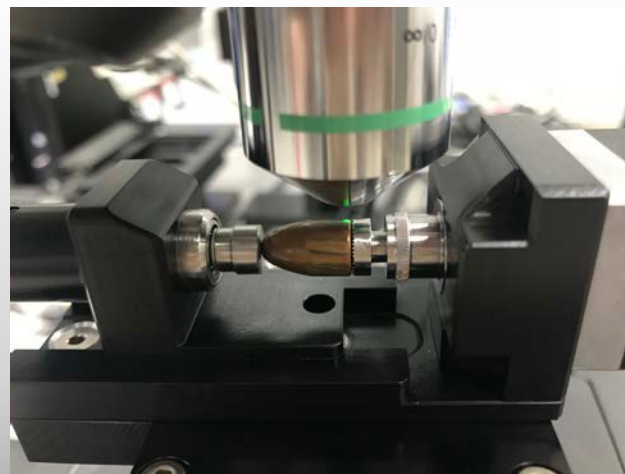
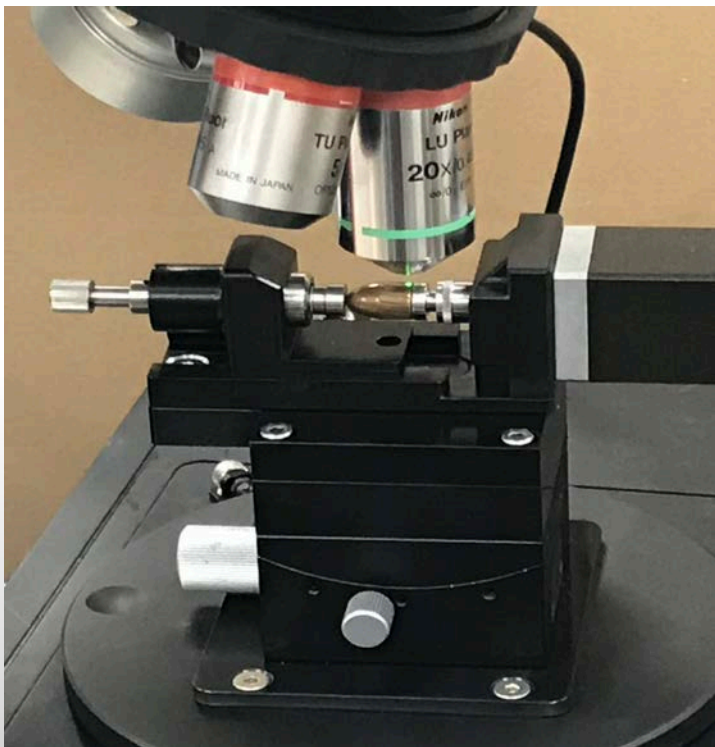
Glock cartridge cases

- S neox 10X EPI
- Time < 6 min

3D scans
x3p



4-axis



NEW

SENSOFAR
METROLOGY

3D scans
x3p



4-axis



1 bullet 9 mm
6 LEA
S neox 20X
Time <10 min



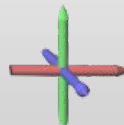
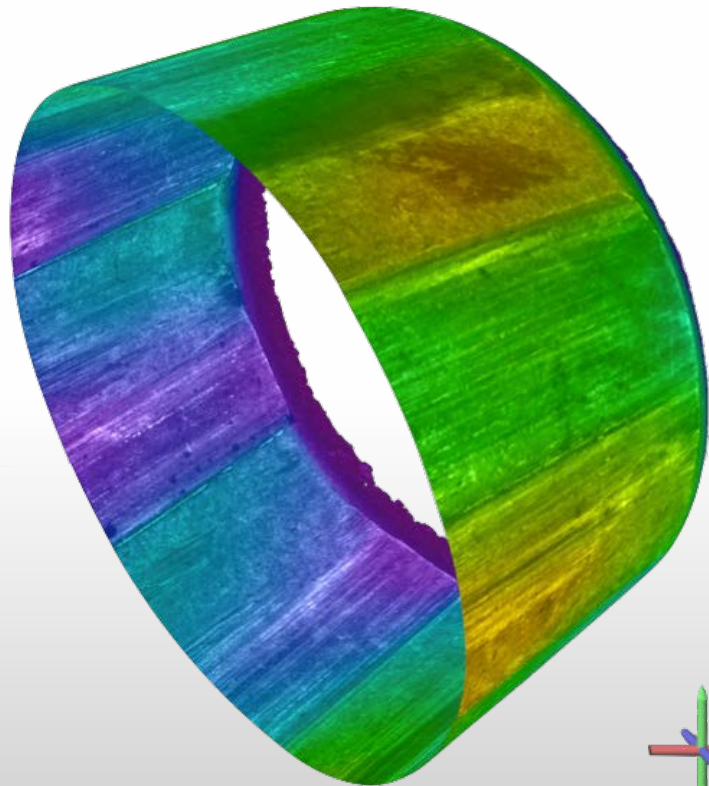
NEW

SENSOFAR
METROLOGY

3D scans
x3p



4-axis



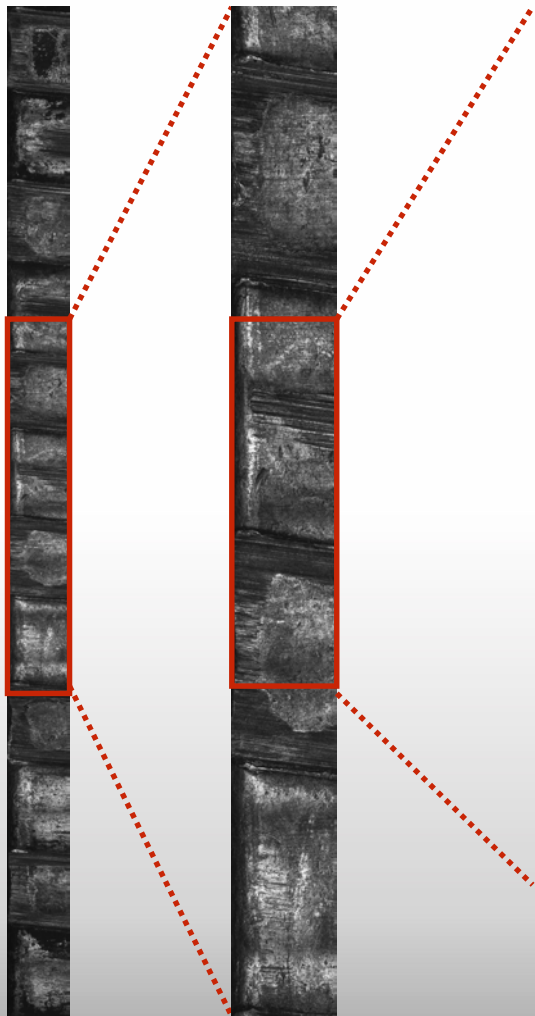
NEW

SENSOFAR
METROLOGY

3D scans
x3p



4-axis



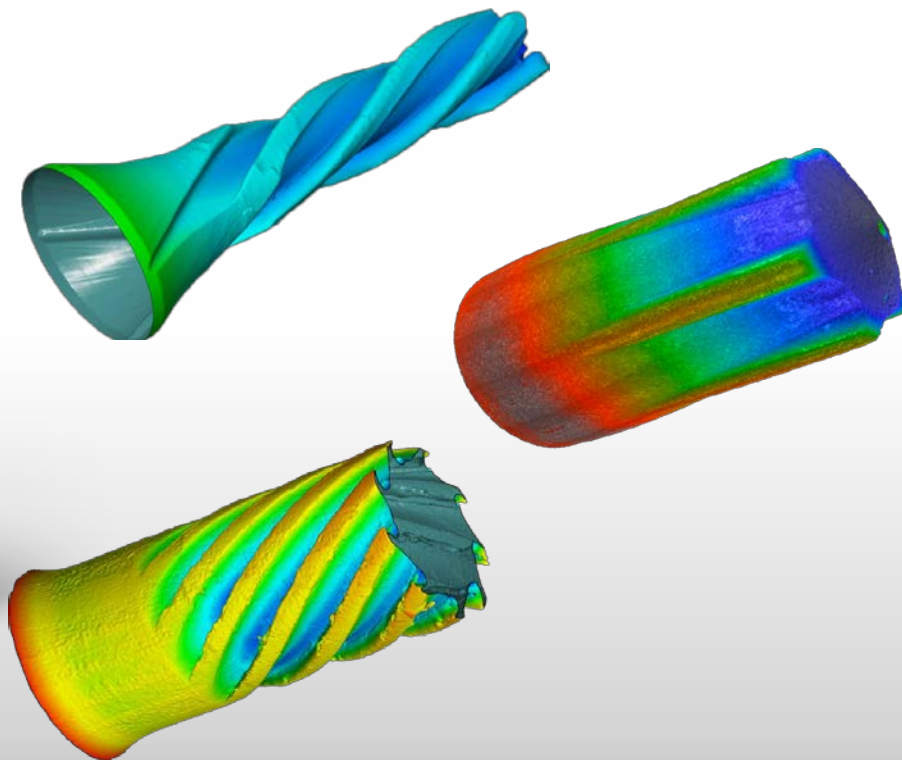
NEW

SENSOFAR
METROLOGY

3D scans
x3p



5-axis



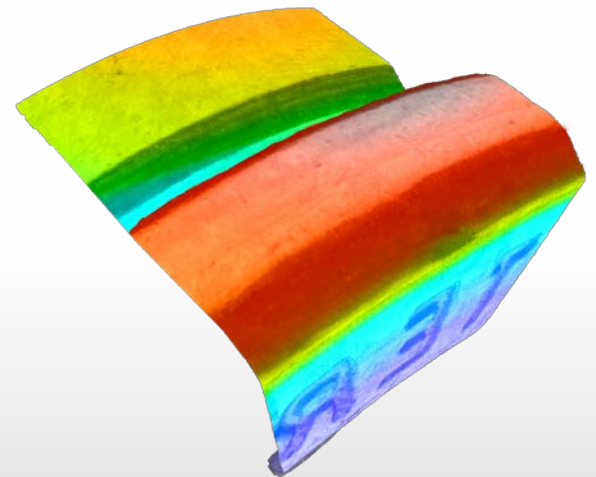
NEW

SENSOFAR
METROLOGY

3D scans
x3p



5-axis



Contents



15 min

- Revision of 3D scans uses at FM/TM labs
 - Virtual Comparison Microcopy
 - Objective Identification
- New tools to acquire 3D scans
- ➔ • Summary

Summary

- ✓ SensoCOMP freeware VCM
- ✓ SensoMATCH category 1 Objective Identification SW (OSAC SOP)
- ✓ Confocal Fusion for 3D scans of **cartridge case** including the **firing pin** impression
- ✓ 4-axis Forensics module for 3D scans around a cylindrical sample
- ✓ 5-axis +full 3D scans

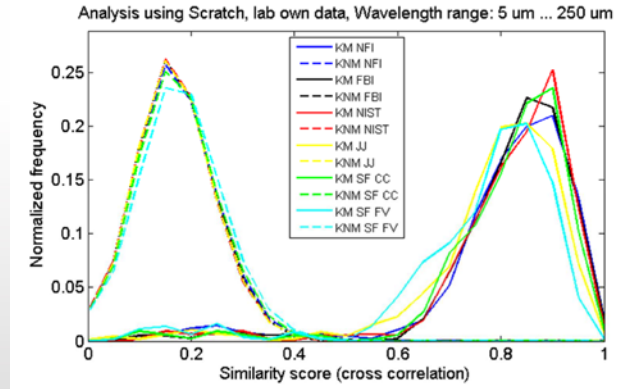
Summary

✓ x3p -> Open System

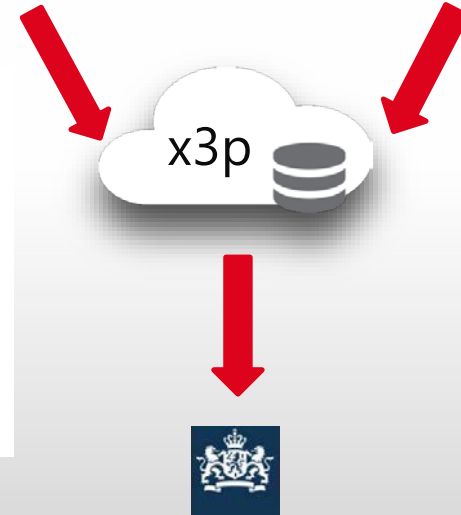
NIST



SENSOFAR
METROLOGY



Ready for routine casework
FA/TM & scientific research



Thank you!

Dr. Cristina Cadevall Artigues

VP Software

cadevall@sensofar.com

SENSOFAR METROLOGY

Parc Audiovisual de Catalunya - Ctra. BV1274, km 1

08225 Terrassa (Catalonia) - SPAIN

T (+34) 93 7001492

www.sensofar.com

SENSOFAR
METROLOGY