

OPTICAL 3D MEASURING SYSTEMS

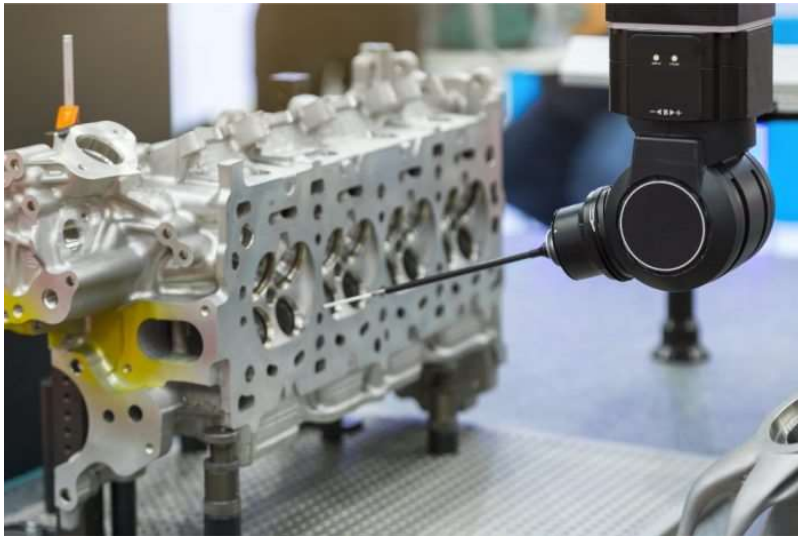
- Dimensional traceability for industrial and medical applications



Bruno Gastaldi
INTI

MOTIVATION OF THE PROJECT

The role of metrology is changing: *final inspection is becoming less important*



MOTIVATION OF THE PROJECT

The change from measurement as a quality control tool to a fully integrated step in the production process



MOTIVATION OF THE PROJECT

The industrial manufacturing processes are changing: 3D printing / adaptive manufacturing technologies



MOTIVATION OF THE PROJECT

Measuring systems are now able to measure and adapt its measurement process in real-time



Note: Images from GOM Web page

MOTIVATION OF THE PROJECT

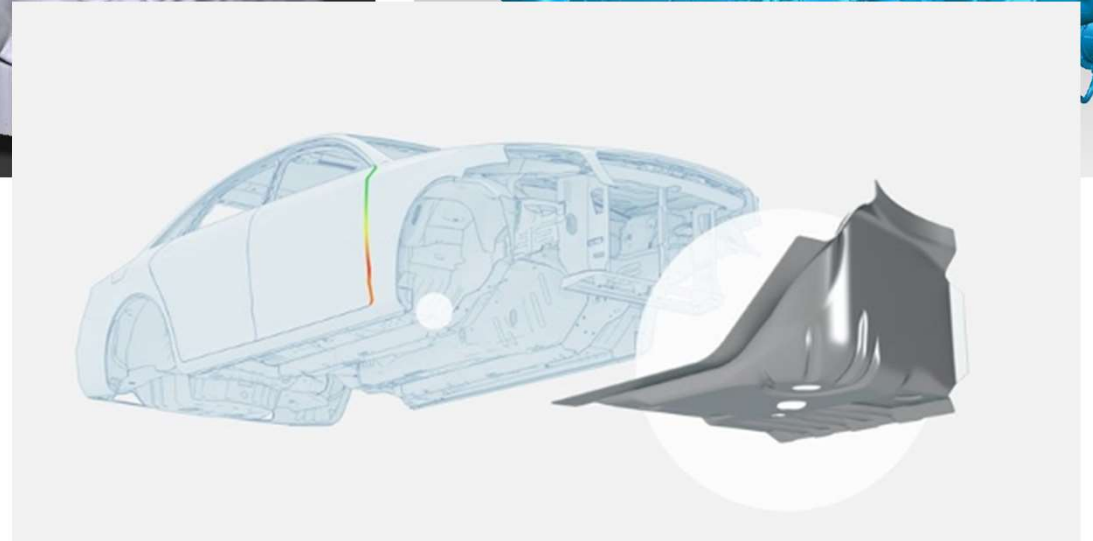
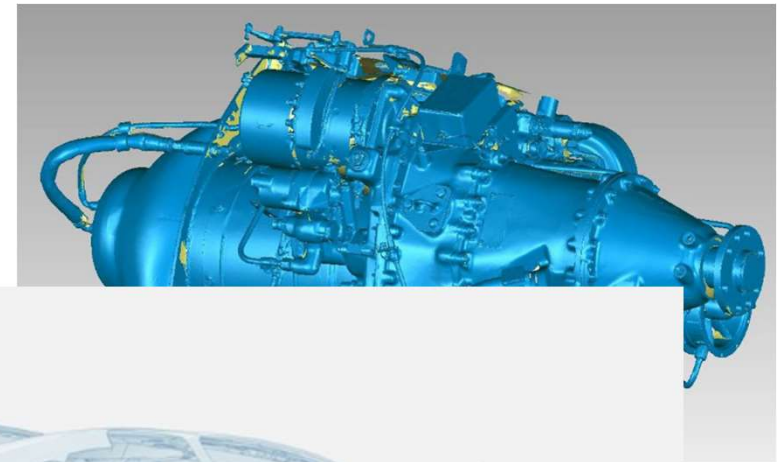
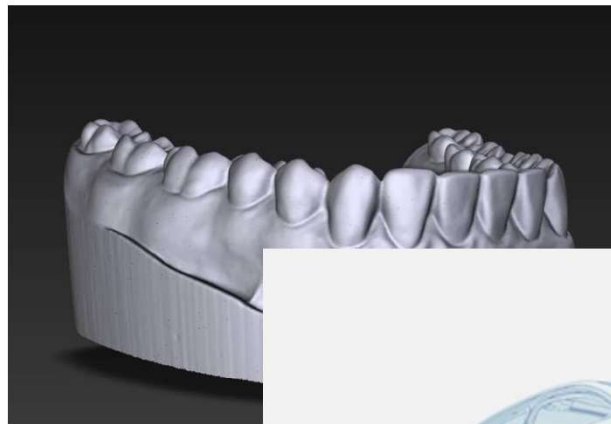
Increasing use of optical 3D metrology in multiple applications:

Automotive industry

Aerospace industry

Medical Research

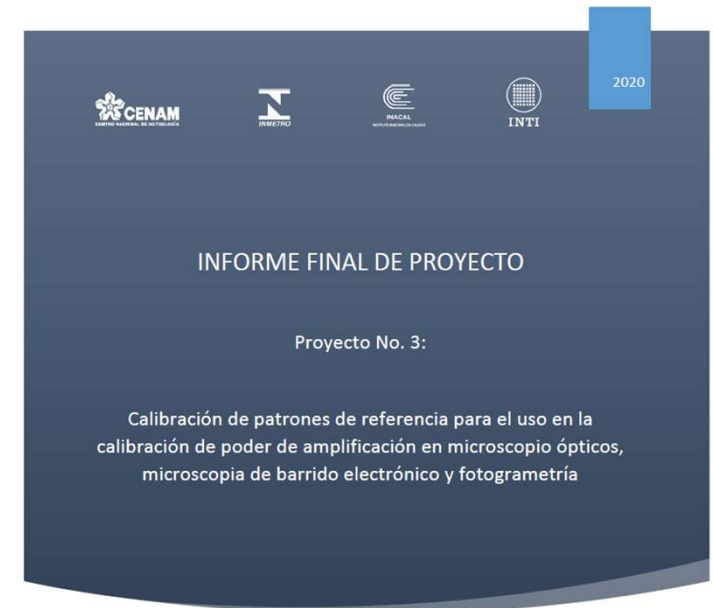
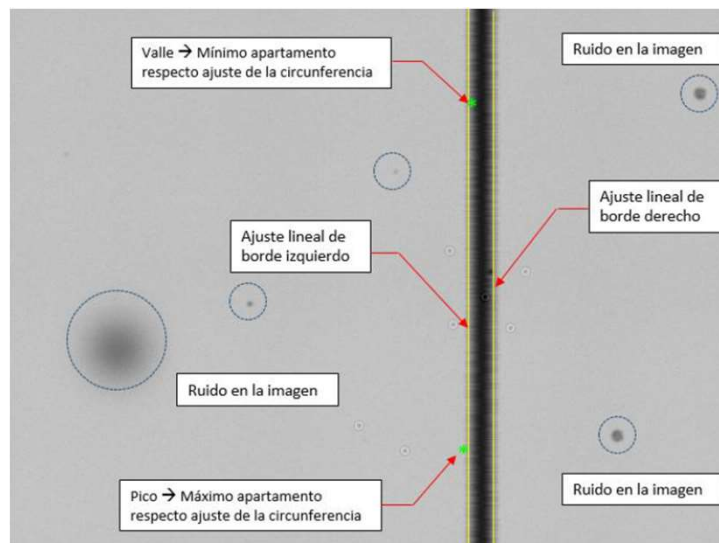
Power Generation



PREVIOUS COLLABORATIONS

Cenam, Inmetro, Inacal and Inti were members of the project “IADB SIM Research Engagement Opportunity”

Project: Calibration of standard reference material for use in calibrating the magnification or scale of optical microscopy and scanning electron microscopy.



OPTICAL 3D MEASURING SYSTEMS PROJECT

NMIs Participants:

Cenam (Mexico)

Inmetro (Brasil)

Ibmetro (Bolivia)

Dictuc (Chile)

Inti (Argentina)



OPTICAL 3D MEASURING SYSTEMS PROJECT

NMIs precondition

Experience in traditional metrology: contact metrology

Relationship with companies that use optical 3D metrology

The NMIs does not have 3D optical measurement equipment



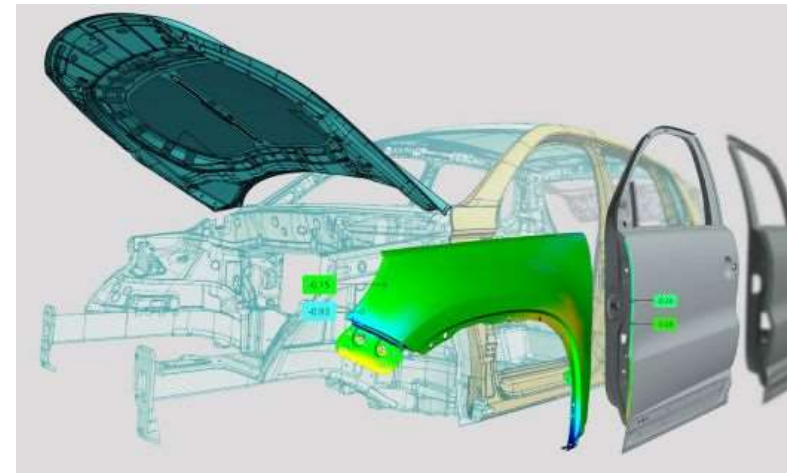
OPTICAL 3D MEASURING SYSTEMS PROJECT

The general objective:

Study of optical 3D measuring systems

Key objectives:

- 1- Study of traceability and the standards or guidelines used
- 2- Patterns required for performance evaluation according to standards or guidelines
- 3- Study of typical sources of errors
- 4- Working groups with companies that use optical 3D metrology
- 5 - Development of special patterns for specific applications



OPTICAL 3D MEASURING SYSTEMS PROJECT

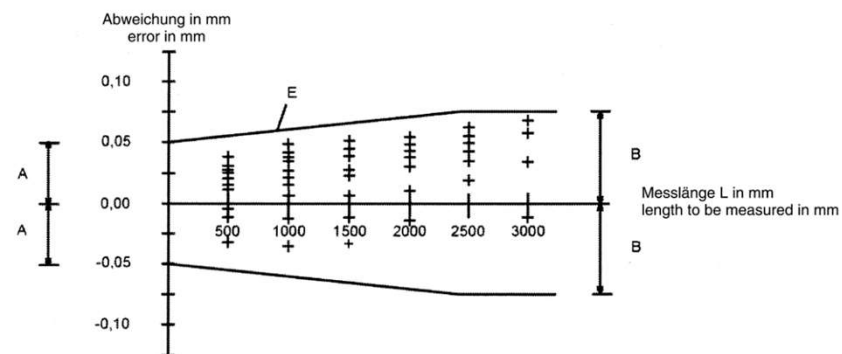
Key objective 1: study of traceability and the standards or guidelines used

Procedures of 3D optical measuring systems according to the existing guidelines:

VDI/VDE 2634: Part 1 for point by point probing / Part 2 for optical systems based on area scanning /
Part 3 for multiple view systems based on area scanning

VDI/VDE 2634

Blatt 1 / Part 1





OPTICAL 3D MEASURING SYSTEMS PROJECT

Key objective 1: study of traceability and the standards or guidelines used

Procedures of 3D optical measuring systems according to the existing guidelines:

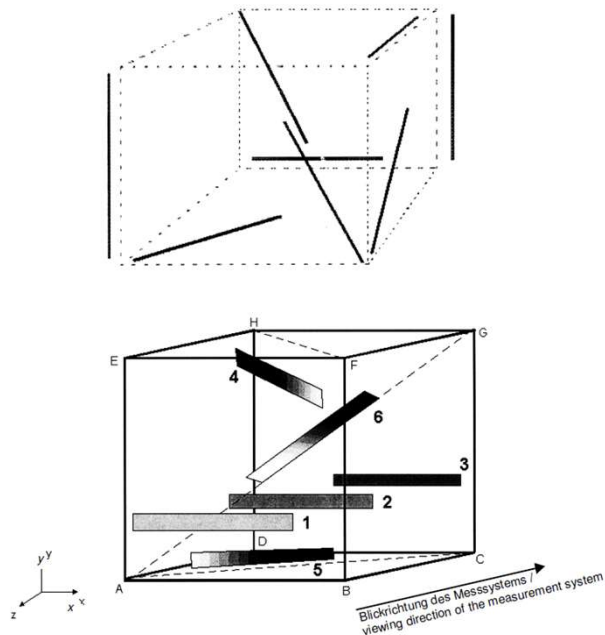
ASTM E2544-11a (2019) “Standard Terminology for Three-Dimensional (3D) Imaging Systems / ASTM E2919-14 / ASTM E2938-15 / ASTM E3064-16 / ASTM E3124-17 / ASTM E3125-17

ASTM E2544-11a(2019)

Standard Terminology for Three-Dimensional
(3D) Imaging Systems

OPTICAL 3D MEASURING SYSTEMS PROJECT

Key objective 2: artifacts required for performance evaluation according to the standards or guidelines



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Key objective 3: study of typical sources of errors

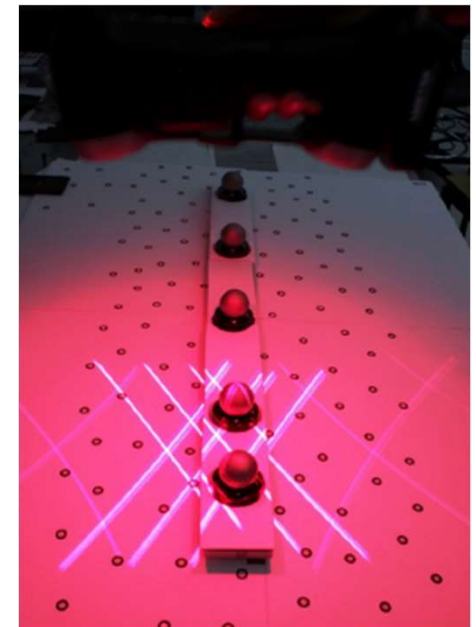
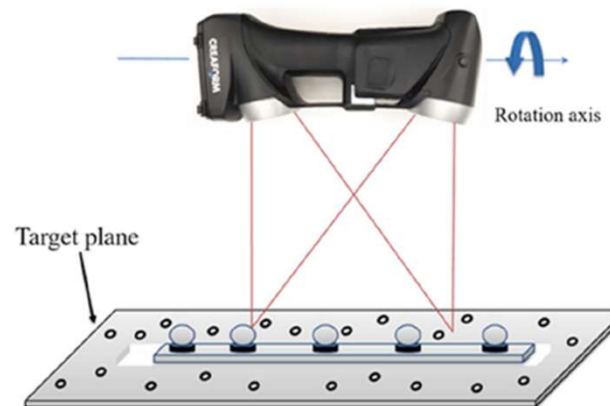
Manufacturer artifact calibration

3D instrument adjustment with the artifact provided by the manufacturer

Ambient light

Target reflectivity

Instrument orientations



Note: Images from Performance evaluation of a portable 3D imaging system publication from NRC

OPTICAL 3D MEASURING SYSTEMS PROJECT

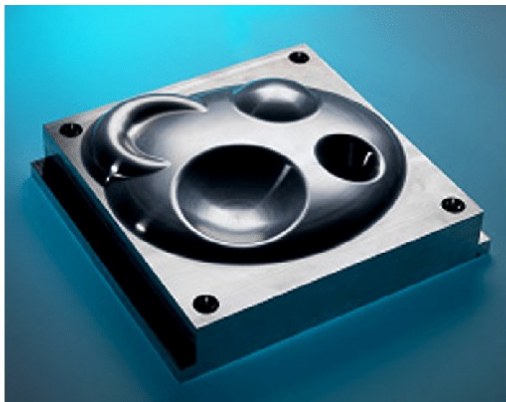
Key objective 4: working groups with companies that use optical 3D metrology



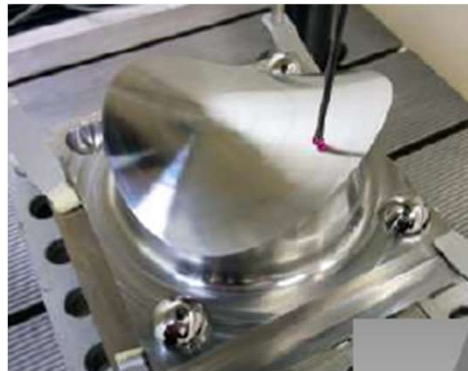
El equipo del LIE en el Laboratorio de Medición de Antenas (LaMA), con la antena radar SAR SAOCOM 1B.

OPTICAL 3D MEASURING SYSTEMS PROJECT

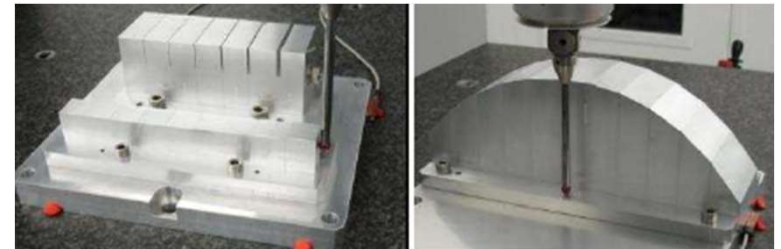
Key objective 5: development of special artifacts for specific applications



(a)



(b)



(c)

Notes:

(a) NPL freeform artifact (b) Image from EMRP JRP IND62 –TIM: Use of on-board metrology systems for area-scanning on machine tools (c) Image from Artefact for optical surface measurement publication from NRC

OPTICAL 3D MEASURING SYSTEMS PROJECT

Time schedule

[illegible]



OPTICAL 3D MEASURING SYSTEMS PROJECT

Questions with the aim to strengthen the R&D project

1- Do you know if the optical 3D technology traceability chain is adequate?

(Manufacturer / NMI / Accredited laboratory)

2- What do you considerer to be more relevant?

- Development of procedures in accordance with existing guidelines
- Development of special patterns for specific applications

¡THANKS!

!MUCHAS GRACIAS!

