

9D LADAR - Next Generation Technology for Reverse Engineering & 3D Scanning

JTEG Technology Forum on Reverse Engineering, 3D Scanning & Prototyping

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API Metrology



A world leader in **Automation, Precision, and Innovation**

- HQ in Rockville MD, USA
- Over 400 employees, and more than 45 resellers
- API is Globally Local

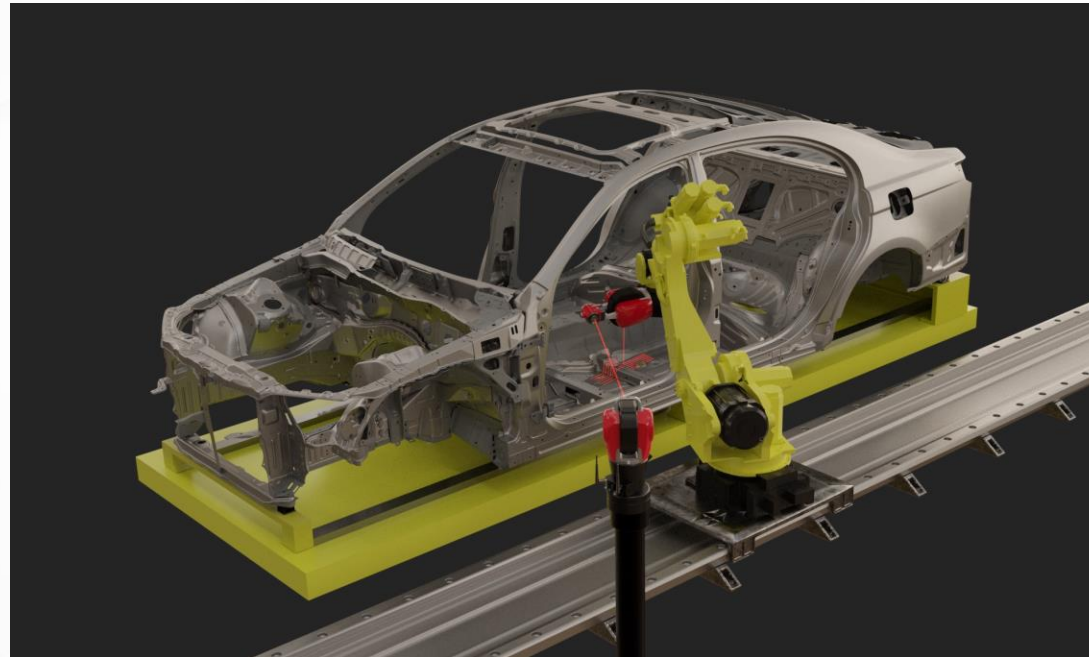
API has pioneered laser-based equipment for dimensional measurement and calibration for 30+ years;

- Founded in 1987 by Dr. Kam Lau, CEO & CTO, Inventor of the Laser Tracker
- Industries Served: Automotive, Aerospace, Energy, Shipbuilding, Robotics, Machine Tool
- Over 100 Worldwide Patents & Collaborations with Industry Partners
- 2022 Introduced the next generation of portable dimensional metrology – Dynamic 9D LADAR



API's Dynamic 9D LADAR (X, Y, Z, i, j, k, R,G,B)

- 3D Dimensional Non-contact Measuring System
- Innovative, patent-pending Optical-Frequency-Chirping-Laser Interferometer (OFCI) technology gives APIs 9D LADAR micron-level resolution and sensitivity of measuring surface up to 85-deg incident
- Built-in state-of-the-art signal processor streaming out the point cloud data at 20,000 pts/sec
- Compact, lightweight, fast warm-up, omni-orientation, readily integrated with other metrology equipment such as Laser Trackers for large-area, fully automated measurements



API

API-DYNAMIC 9D LADAR General Specifications

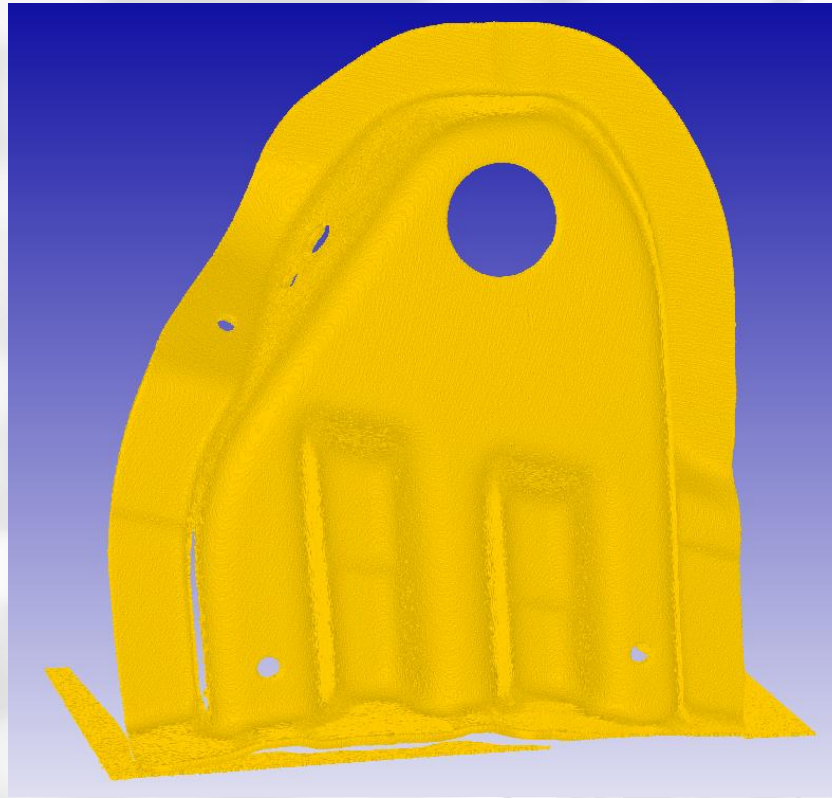
- Small form factor (432mm x 254mm; 10.4kg)
(17" x 10", 22 lbs.)
- Quick warmup (30min from cold)
- Eye Safe (Laser Class I)
- Rapid high-density raster scanning control
(up to 50 lines/sec, 0.1mm horizontal line resolution)
- 3D accuracy (2σ), ($\pm 25 \mu\text{m} + 6\mu\text{m/m}$)
accuracy comparable to laser tracker
 - At a 10' stand-off, the accuracy is $\pm 0.45\mu\text{m}$ or $\pm 0.002''$
- 2 Models (LD-15; LD-25)



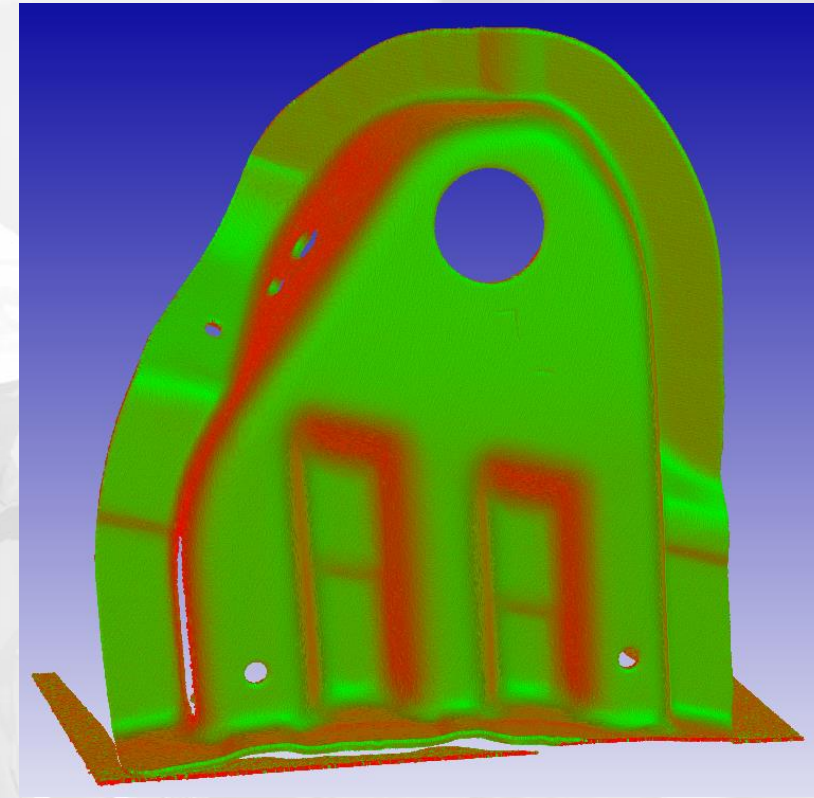
Line resolution = 0.100mm / Scan duration = 46s / Part dimension = 130mm x 130mm



Photo



Mono-color Point Cloud

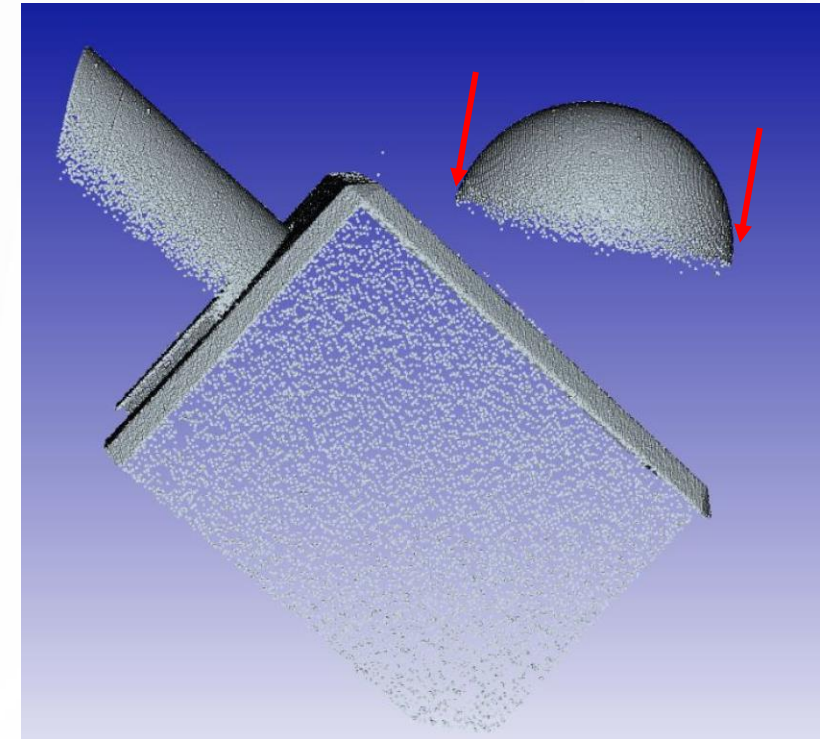
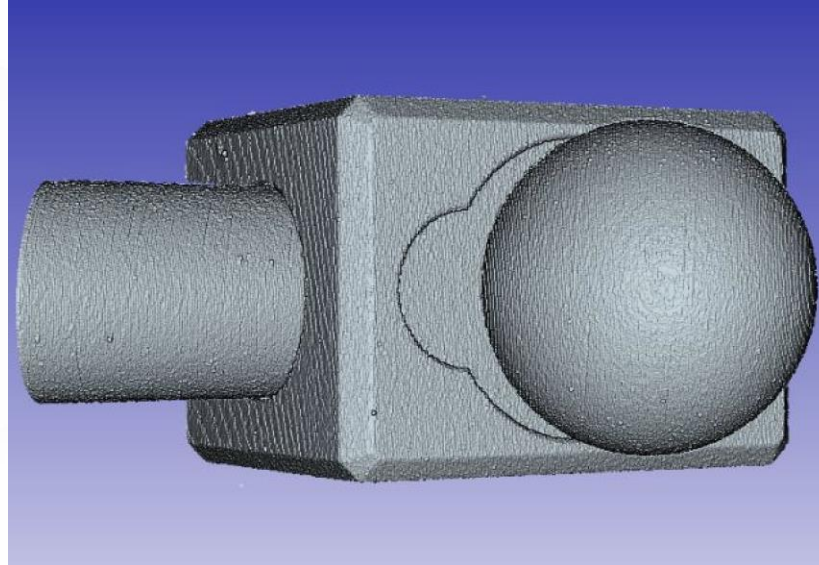
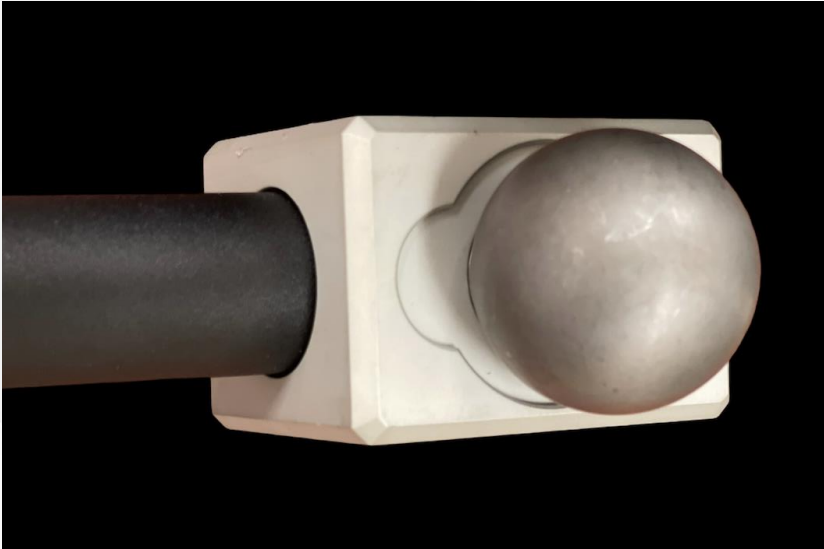


Beam Incidence Angle Color Map (green: norm; red: 90-deg)

Automotive Stamped Sheet Metal Scan with LD-15

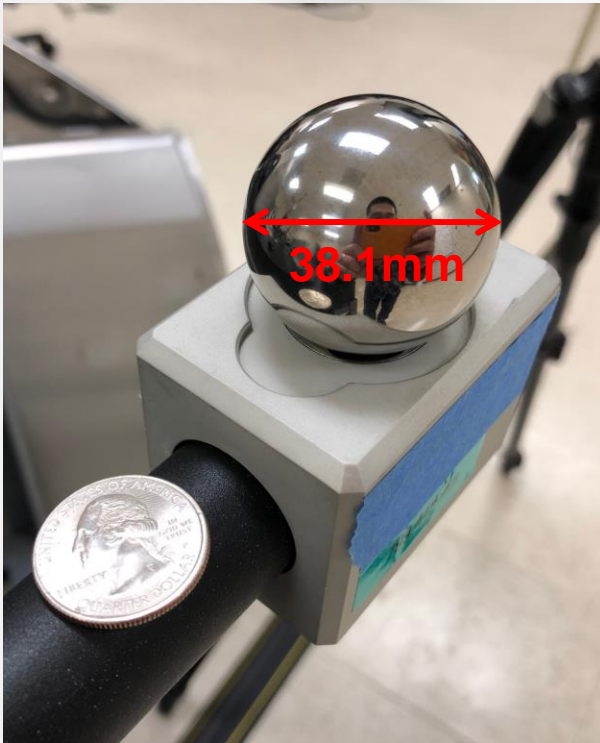


Line resolution = 0.100mm / Scan duration = 30s / Highest angle of incidence = 88°

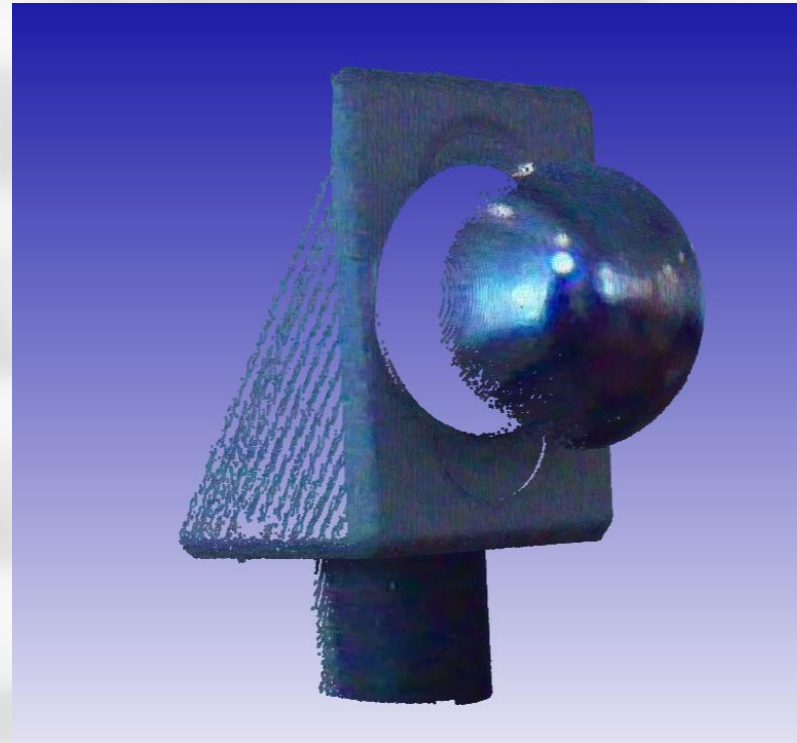


1.5" Sphere Scan with LR-25

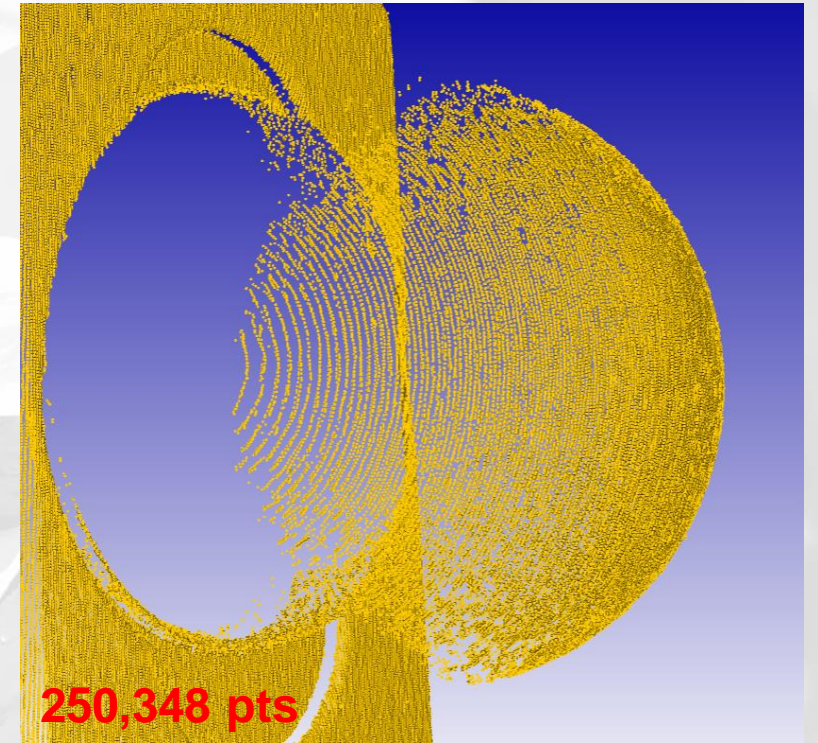
API



Photo



Point Cloud with RGB
Information

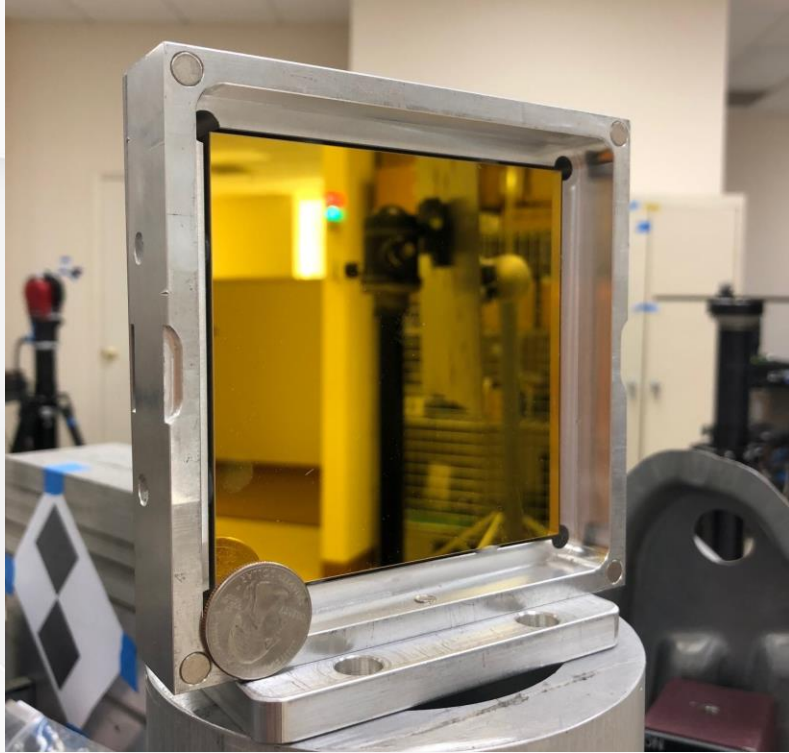


250,348 pts

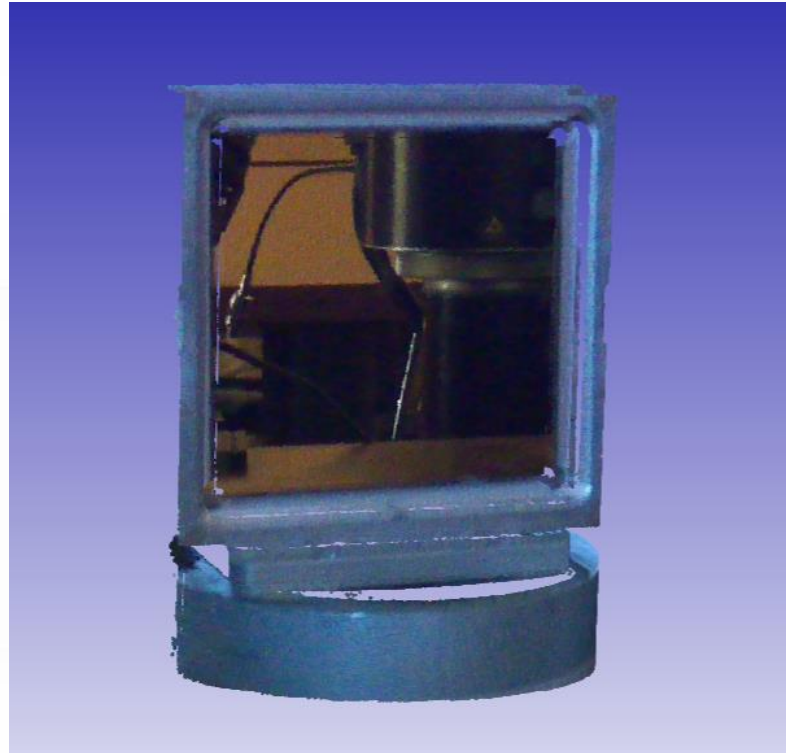
Mono-color Point Cloud

Scanning a highly reflective 1.5" Chrome Steel Ball

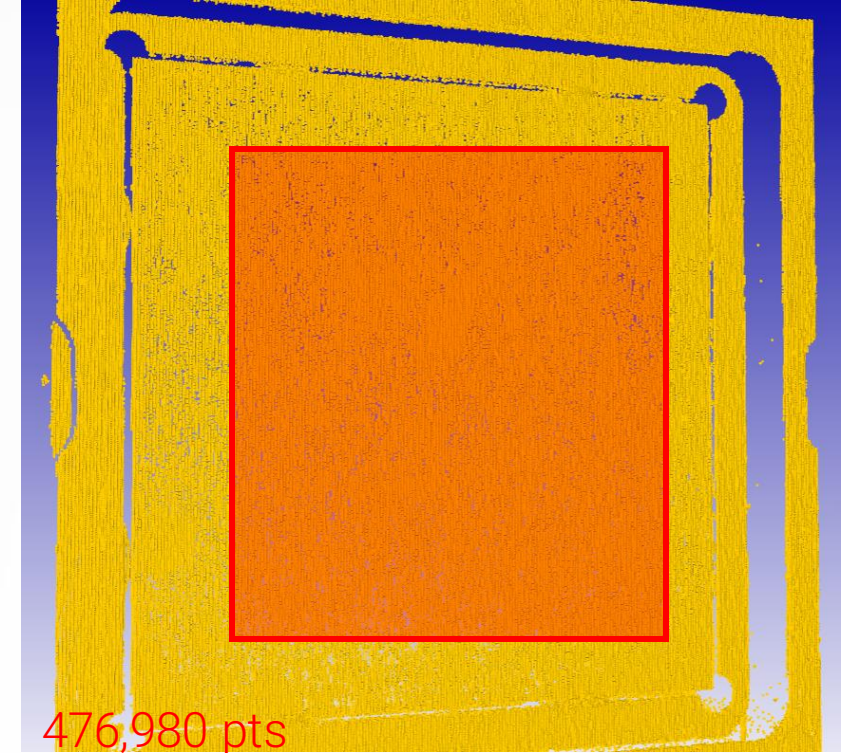




125mm x 125mm
Gold Mirror Target Picture



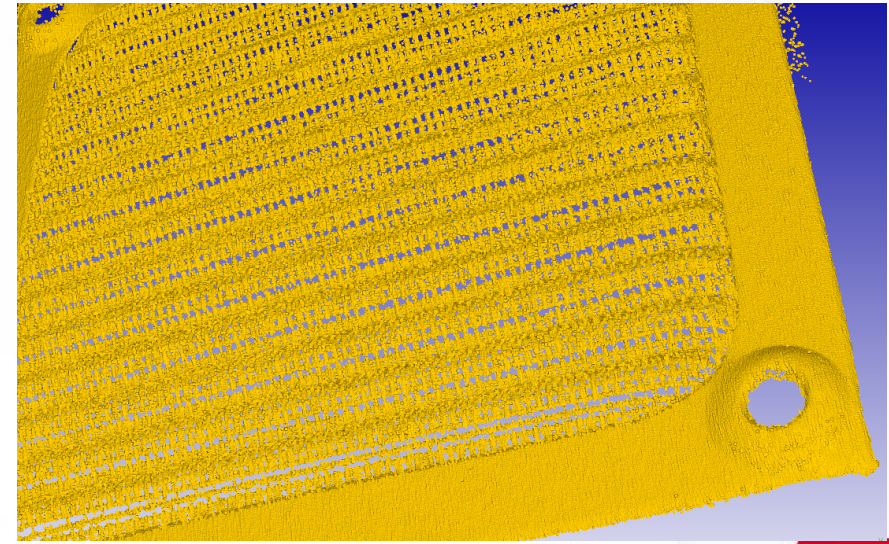
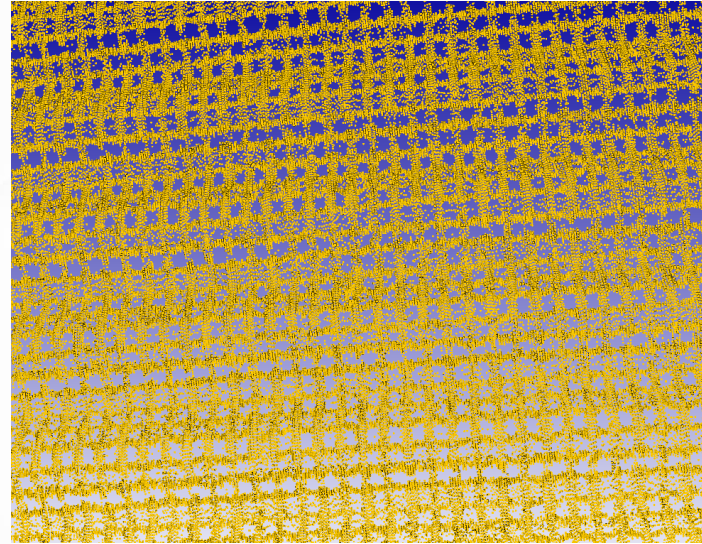
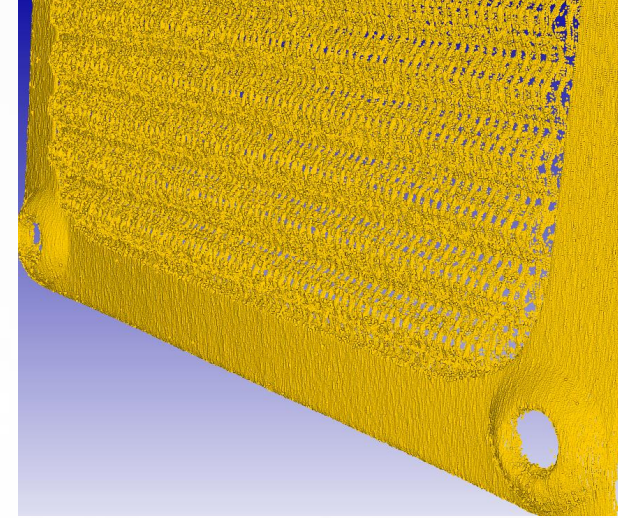
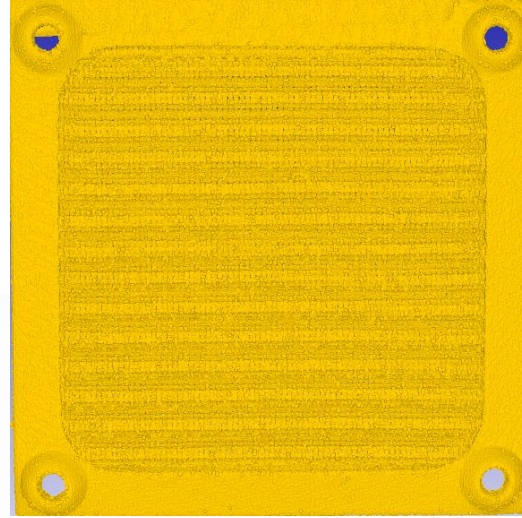
Point Cloud with RGB
Overlay



Raw Point Cloud
Plane Fit RMS = 30 μ m

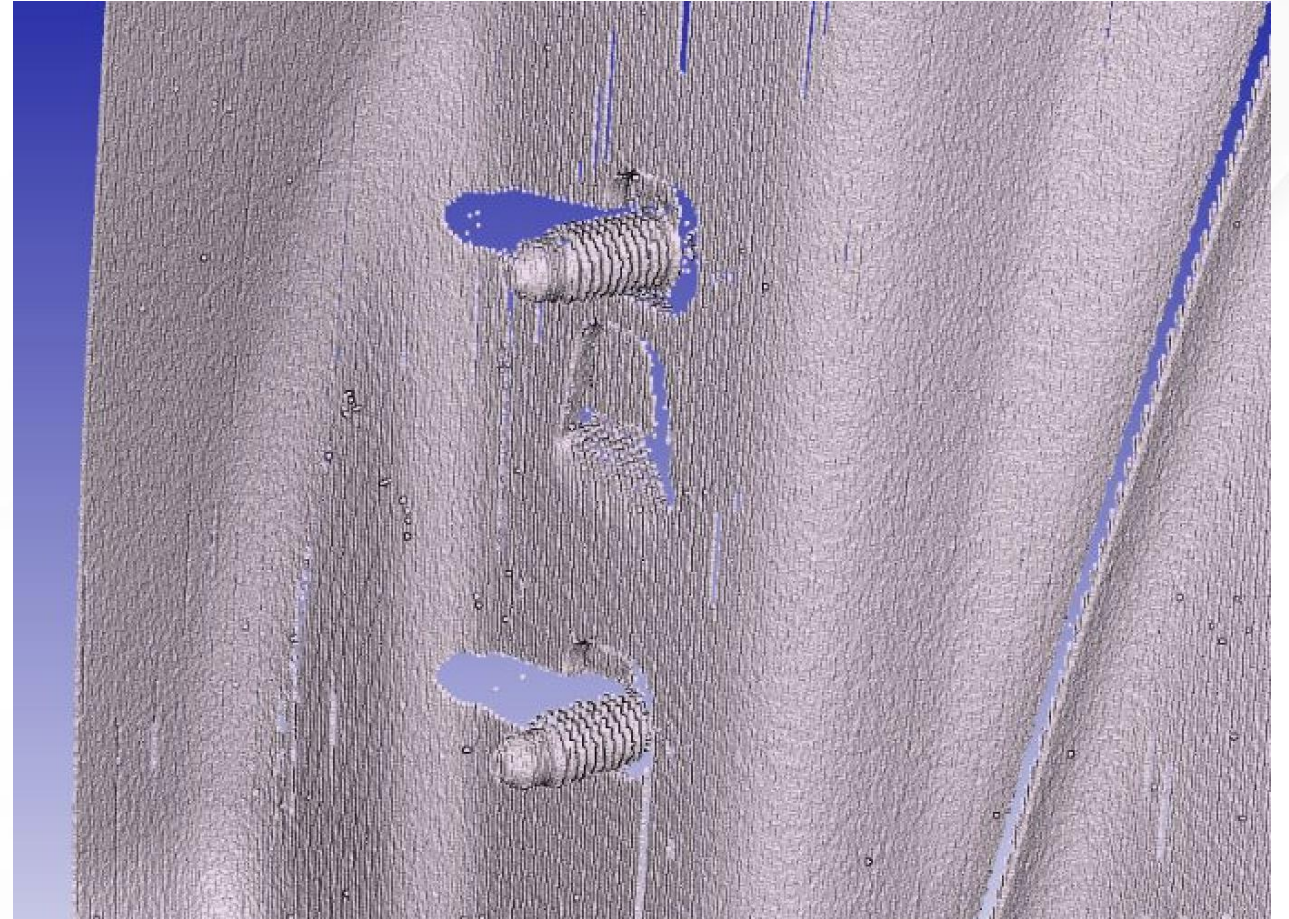
Gold Mirror Scan

Line Spacing = 0.050mm @ 4m from the LADAR

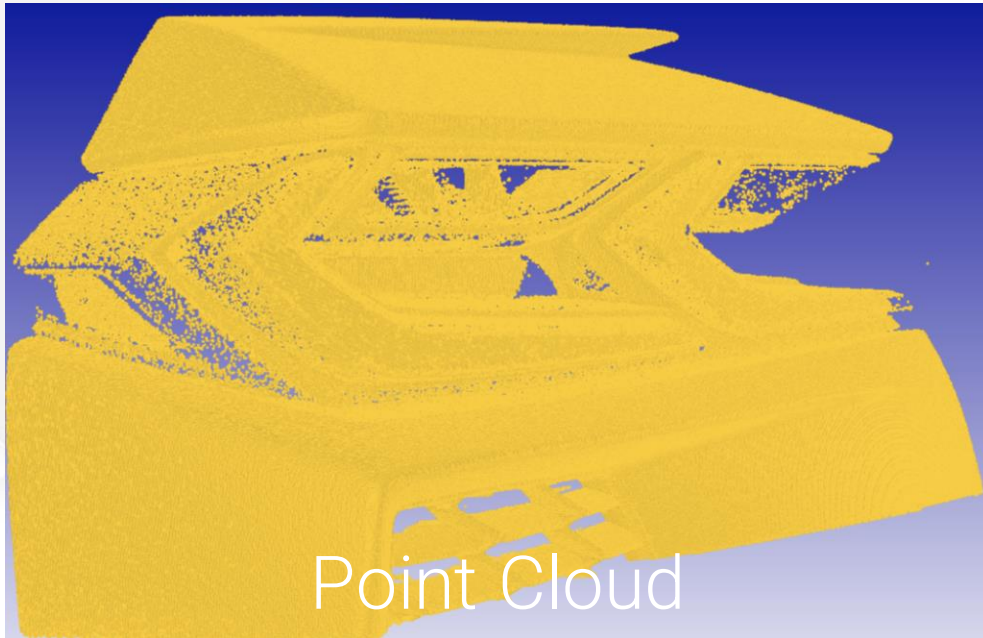
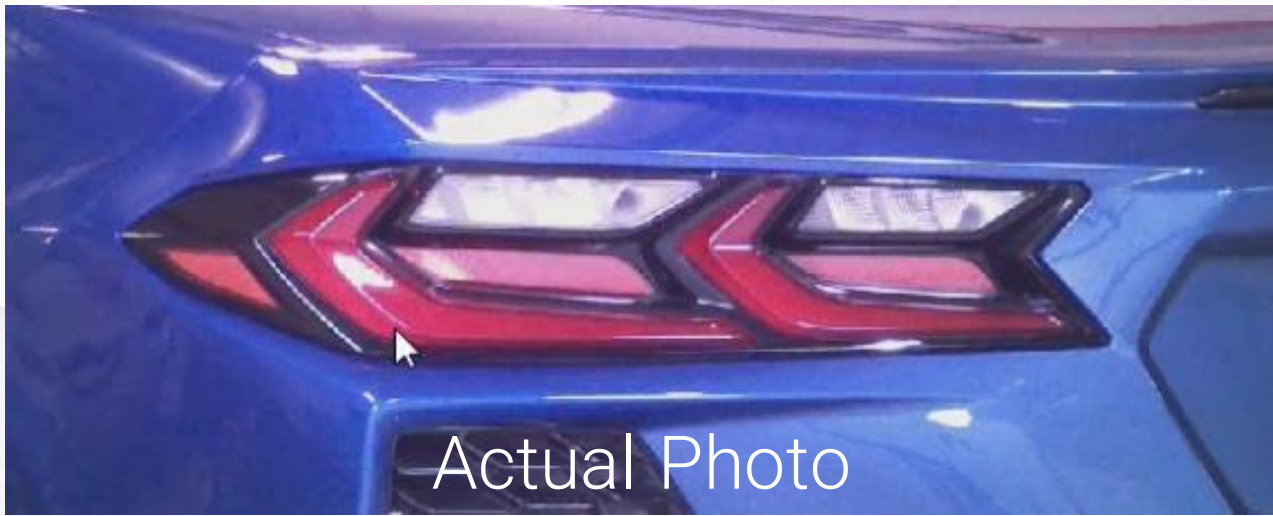


Wire Mesh (70mm x 70mm) Scan





Line resolution = 0.2mm / Scan duration = 55s
Detailed Scan of a Stud



Automotive Tail Light Scan

■ Benefits of API DYNAMIC 9D LADAR

- Innovative, patent-pending, chirping laser-interferometer 100X more sensitive than phase-detection
- Micron accuracy unaffected by surface reflectivity, material and incident angle; ability to “probe” into holes and geometric details
- 20,000 samples/sec (100X faster than competitors)
- Embedded iVision smart camera with digital zoom for ease of set up and part recognition
- Advanced G-Hz controller for signal processing and high-speed computation. No external controller or heavy cables needed
- Full automation and remote operation enabled
- Compact, lightweight, ease to install, omni-orientation

Potential Applications

- Measurement of aircraft for design compliance and damage assessment
- Gun Barrel Characterization
- Propeller Shafts Inspection
- Helicopter Blade Inspection
- Damage Assessment, Corrosion Analysis
- Reverse Engineering
- Automated and Remote Inspection
- Part Templating

Summary

DYNAMIC 9D LADAR 2 Models: LD-15; LD-25 (similar performance specifications)

Software Options: API MeasurePro (iVision off-line programming, runtime control, geometric analysis); MeasurePro + 3rd Party SW

Applications:

- Optical CMM – small to large volume, simple to set up, fast and accurate
- CNC Machine In-situ inspection
- In-line inspection and dimensional control for aircraft, automobile, wind energy or similar industries

DYNAMIC 9D LADAR can integrate with an API 6DoF Radian Laser Tracker for greater flexibility, accuracy, and volume

**API DYNAMIC 9D LADAR:
A New Paradigm in High-Accuracy
Non-Contact Dimensional Metrology**



API

NOTHING BEYOND MEASURE

Questions?