



# EPIC Online Technology Meeting on 3D Printing

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**NIT**  
New Infrared  
Technologies

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# New Infrared Technologies: A vertically integrated company supplying innovative mid-IR detectors, cameras and industrial solutions

**New Infrared Technologies (NIT)** is a company located in Madrid (Spain), which develops and commercializes industrial solutions for real-time process monitoring and smart control of industrial processes.

These solutions are based in **self-produced infrared cameras**, manufactured with a unique technology, sensitive in the **medium wavelength infrared (MWIR, 1-5 microns)**, high-speed capabilities and **uncooled operation at room temperature**.

Proud member of:



# New Infrared Technologies: High-speed Infrared Cameras and Solutions for 3D printing process monitoring, control and QA

Our Cameras and Solutions are targeted to Integrators, Solution developers and End-users involved in 3D printing:

- **CLAMIR**: Real-time, closed-loop control of the laser power during L-DED (LMD and cladding) processes
- **I3MS** Industrial process quality monitoring system
- **TACHYON 16k CAMERA PLUS**: Uncooled high-speed MWIR camera, up to 4,000 fps @full frame, snapshot acquisition with industrial MV interface

Strong collaboration with the industry in the 3D printing field through H2020 projects:



## CLAMIR

Real-time  
LMD/cladding  
process control

## I3MS

Industrial process  
quality monitoring  
system

## TACHYON 16k CAMERA PLUS

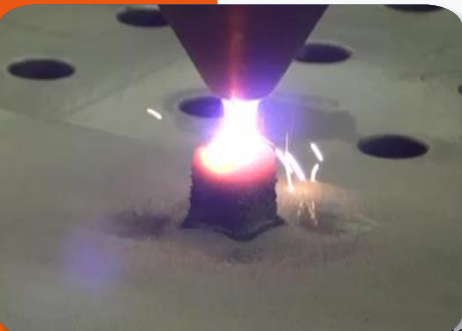
High-speed MWIR  
camera, up to  
4,000 fps





## CLAMIR for L-DED LMD process control

- Continuous monitoring and measurement of the melt pool geometry using a MWIR infrared camera (1.1  $\mu\text{m}$  – 5.0  $\mu\text{m}$ )
- Closed-loop control of the laser power during the complete process, ensuring quality and repeatability
- Consistent operation, no need of reconfiguration during the process
- Compatible with most of laser optics and powders
- Easy mechanical integration and quick configuration
- Main applications: LMD and cladding
- More info: [www.clamir.com](http://www.clamir.com)



Winner of the Innovation Radar Prize 2018, category 'Industrial & Enabling Tech', awarded by the European Commission

# CLAMIR for L-DED LMD process control

## Mechanical integration

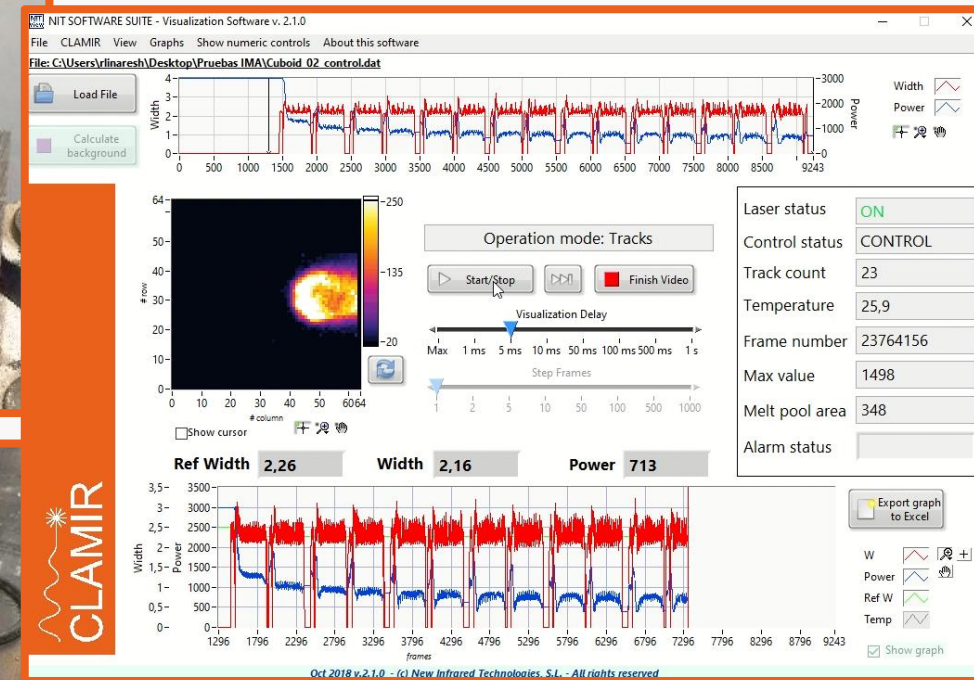
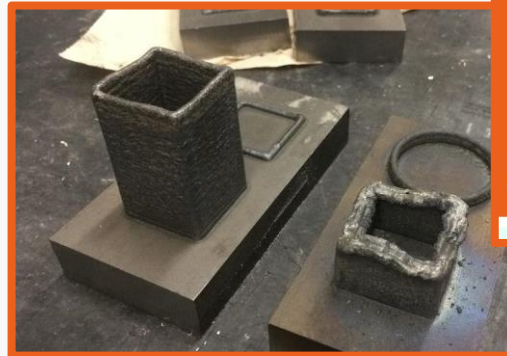
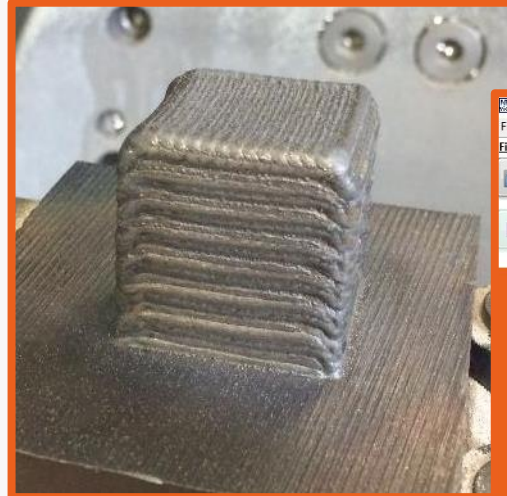


Photo courtesy by Apollo Laser-Clad



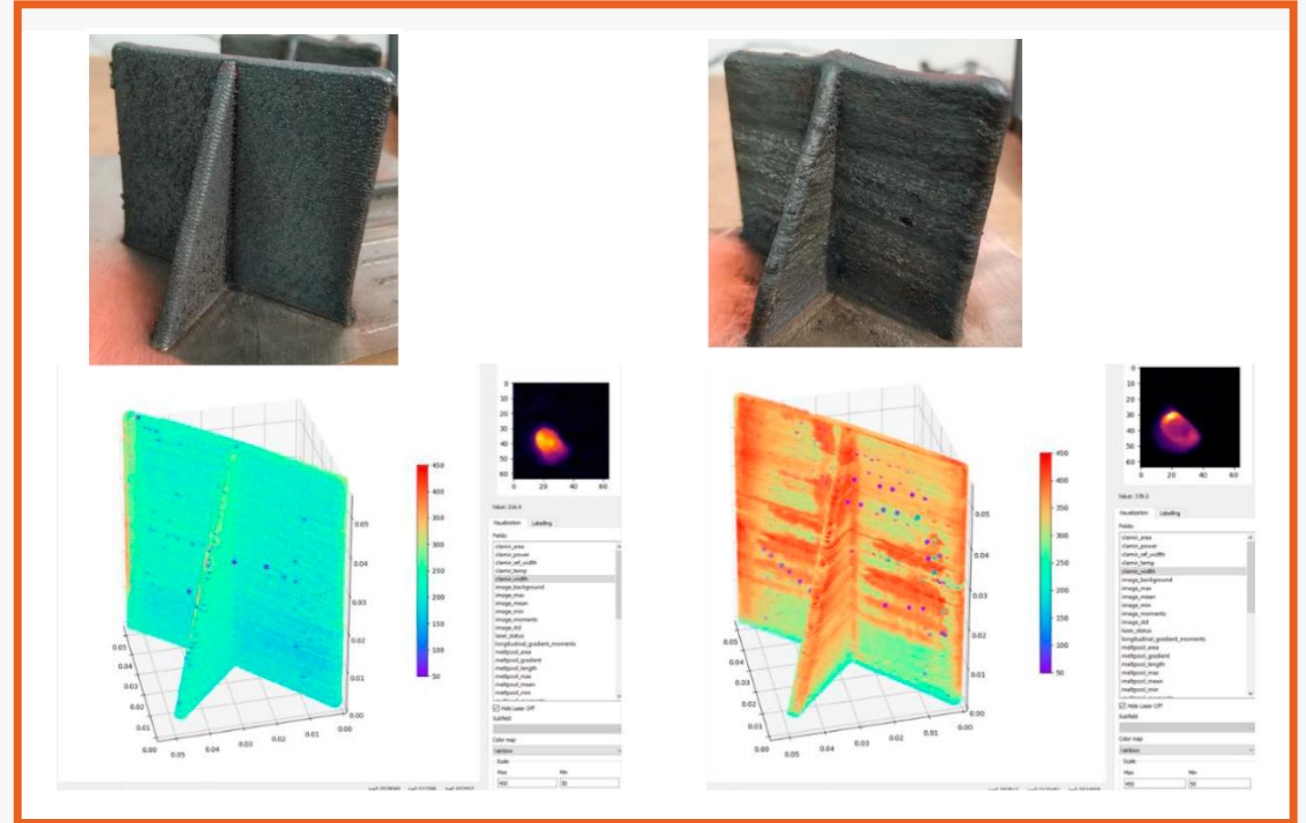
# CLAMIR for L-DED LMD process control

- Continuous control of the laser avoids overheating of the part under process and allows a continuous and high quality manufacturing process
- Use of CLAMIR reduces rates of defective parts, material use and energy than uncontrolled processes. It can also help to optimize the process and improve the productivity.



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3D part thermal gradient reconstruction using information provided by CLAMIR\*

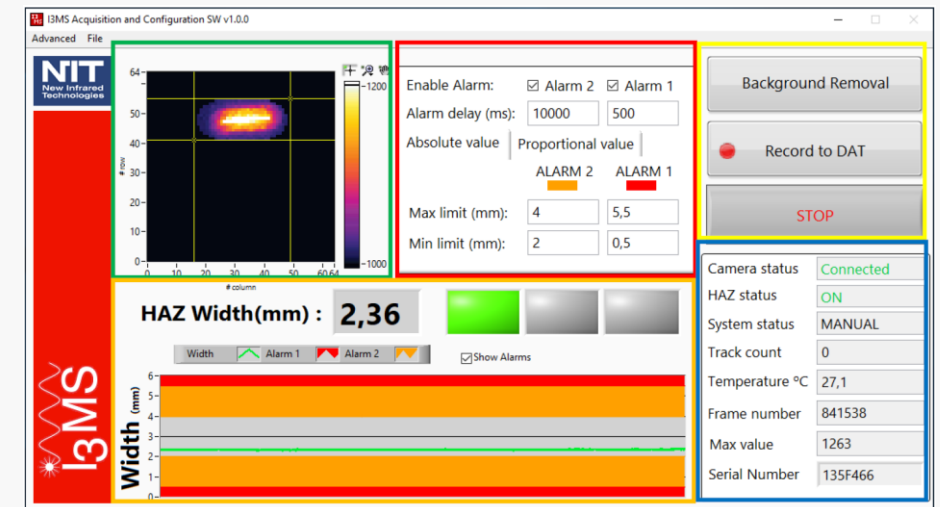
Left: the part is built using CLAMIR laser power control

Right: the part is built with constant laser power and NO control

\* '3D thermal mapping during AM by LMD towards better part quality', C. Prieto et al, presented at LIM / LWofPh 2019  
Work completed under INTEGRADDE project, EC grant agreement No 820776

# I3MS: Process monitoring in metal 3D printing

- Inline Infrared Imaging Monitoring System (I3MS) for industrial process monitoring
- Continuous monitoring and measurement of the melt pool and HAZ width
- Ensures monitoring of the process quality
- Allows coaxial integration and off-axis operation
- Standalone operation
- Melt pool width is available as an analog signal
- 2-alarm levels configuration, PC datalogging
- Main application in 3D printing processes: L-DED (powder & wire), WAAM
- More info: [www.i3ms.eu](http://www.i3ms.eu)



I3MS Acquisition and Configuration SW



## High-speed MWIR infrared camera for 3D printing process monitoring

- Resolution: 128x128 px, pixel size: 50  $\mu\text{m}$ , uncooled operation
- Max. frame rate: 4,000 fps @full frame
- Windowing mode that allows faster frame rates
- Machine Vision interfaces: GigE VISION & GenICam
- Power-over-Ethernet
- Snapshot acquisition

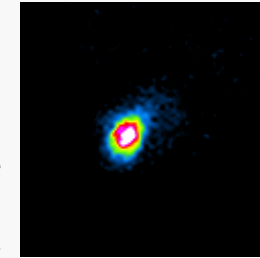


**GigE**  
VISION

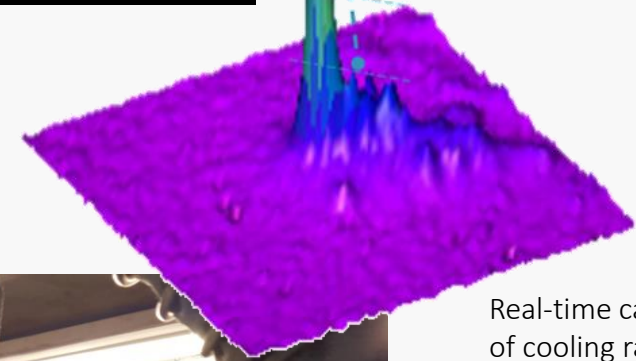
GEN*i*CAM

**PoE**  
POWER OVER ETHERNET

Image of the melt pool in a PBF process



Cooling rate (K/sec)



Real-time calculation of cooling rates based in the IR image





TACHYON 16k CAMERA PLUS coaxially integrated in a PBF machine

# NIT

## New Infrared Technologies

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