
Grupo Álava
Beyond technology
grupoalava.com

Who we are?

Grupo Álava

Álava Ingenieros GRUPO ÁLAVA | Preditec GRUPO ÁLAVA | MRA GRUPO ÁLAVA | Trazadia GRUPO ÁLAVA

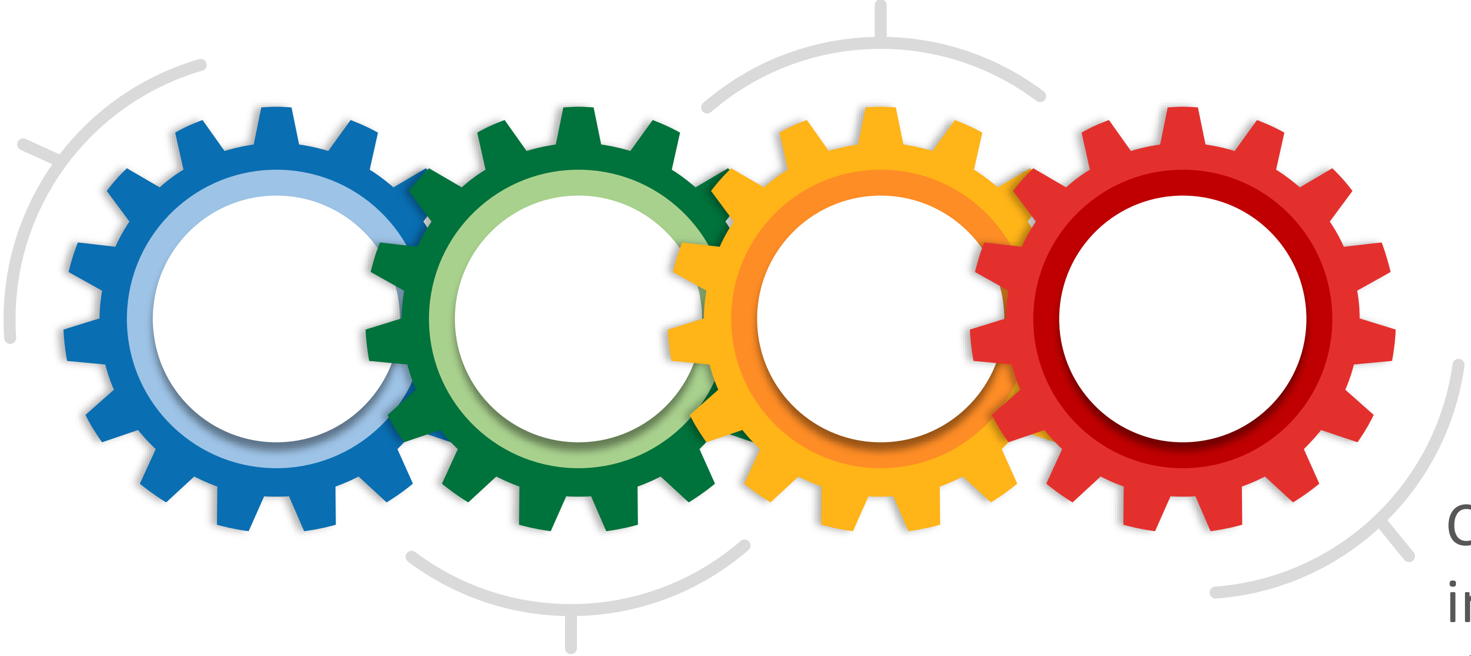
Madrid | Barcelona | Saragossa | Lisbon | Lima | Texas

Our successful business model

Grupo Álava

We seamlessly connect manufacturers, system integrators and end users

We identify needs and develop high-tech solutions.



Innovative technologies…

Auscultation & Civil Engineering

Communications

Environmental technologies

Imaging & Photonics

Instrumentation & Calibration

Nanotechnology

Predictive

Security

Testing

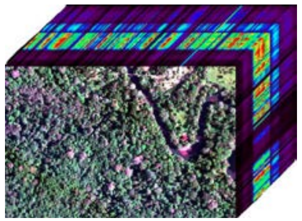
Imaging & Photonics

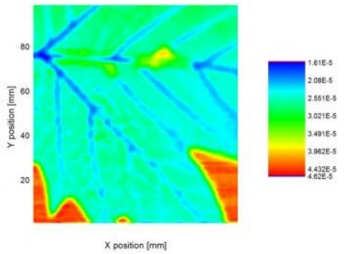
Grupo Álava

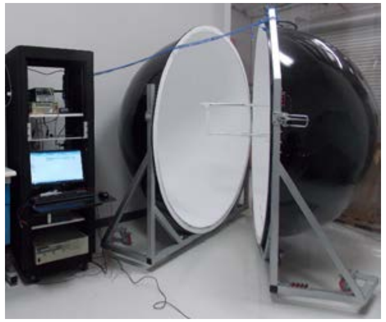
Lasers

Optics and optomechanics

Spectroscopy solutions: hyperespectral cameras, FTIR, portable spectrometers…







Systems for optical character.

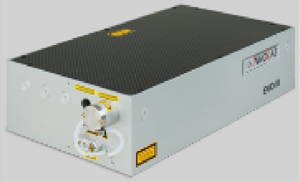
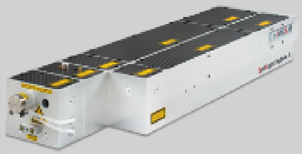
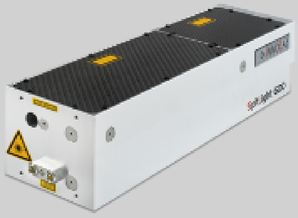
LASER SAFETY OFFICER

Laser protection

Imaging solutions

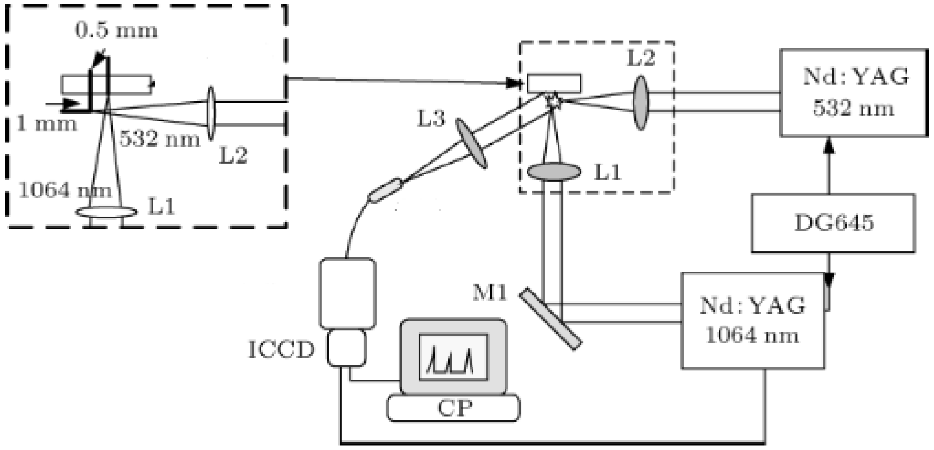
Innolas Laser devices: LIBS applications and developments

INNOLAS LASER portfolio

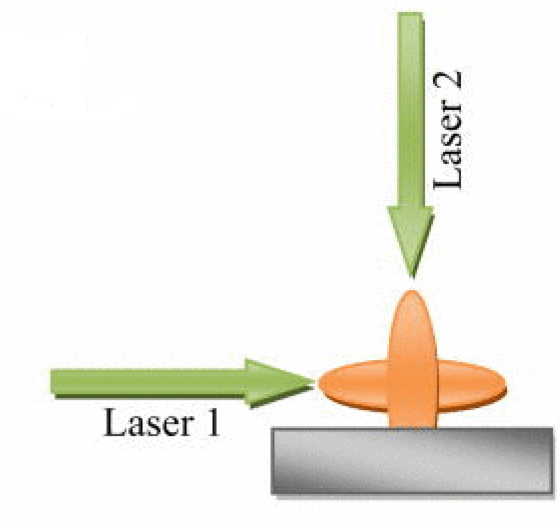
	OPOs	VIS & NIR emitting OPOs from 1mJ to 150mJ
	Sub-ns Lasers	Active Q-Switch sub-nanosecond pulses with up to 1 J pulse energy
	Diode Pumped Lasers	DPSS Lasers with average power of up to 100 W
	Hybrid Lasers	Diode pumped laser with flash lamp amplification - up to 800mJ at 100 Hz
	Lamp Pumped Lasers	Flash lamp-pumped ns Nd:YAG lasers from 100mJ to 2.5J
	Multi-Pulse Lasers	Two laser sources in one housing

DP-LIBS for analysis of heavy metal elements contained in soil samples

- Analysis of heavy metals contained in soil samples: Changchun downtown Changchun Railway Station (dusty), Nanhu Park (less tourists), Jingyuetan Park (large traffic) and the Botanical Garden of Changchun University of Technology.
- They are analyzed by DP-LIBS: dual-pulse pre-ablation LIBS.
- A 1064 nm laser, 100 mJ, is focused on the surface of the soil sample. A pre-ablation 532 nm laser pulse is focused at a distance of 1 mm above the surface of the soil sample and some deviation of the focal point.
- The time delay between two pulses has influence on the enhancement of the spectrum in the process of DP-LIBS.

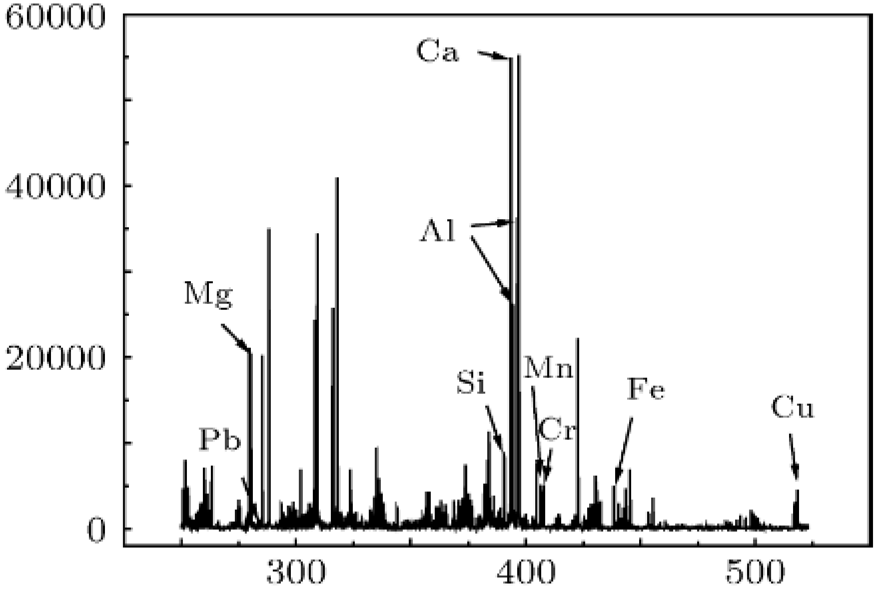


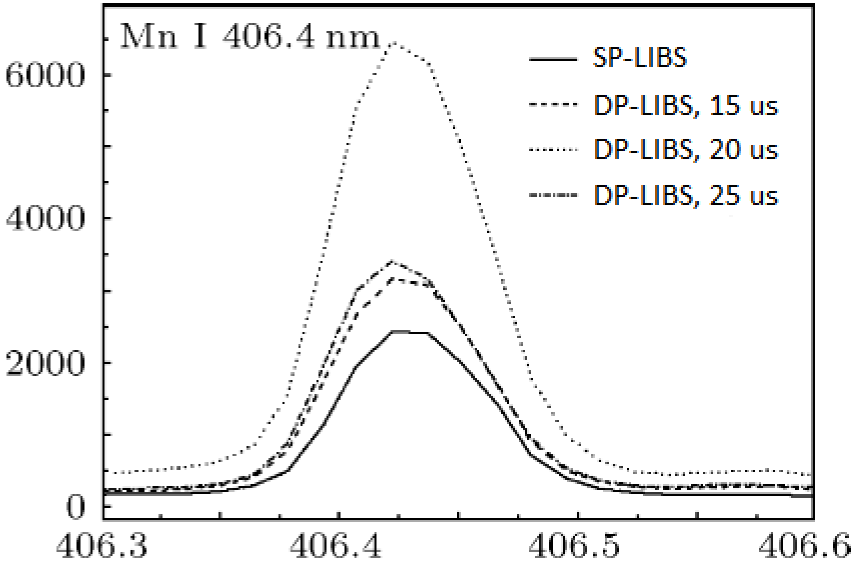
Double Pulse LIBS Experimental System.



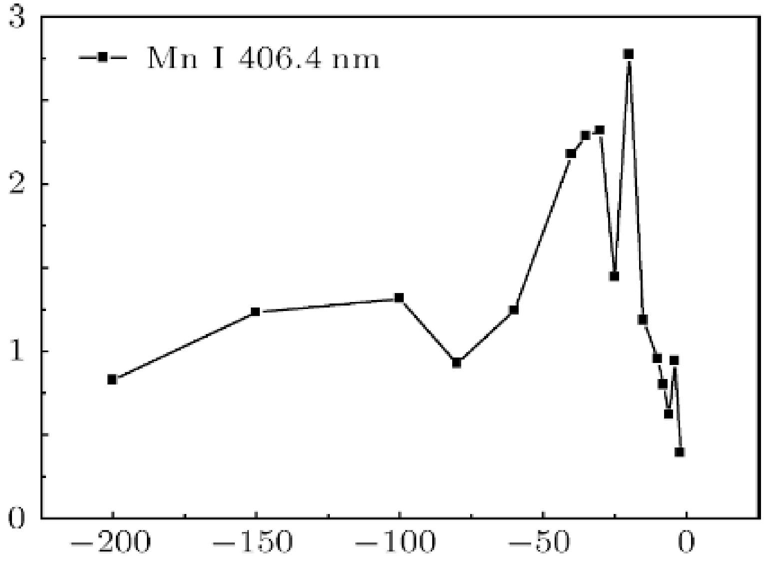
Orthogonal pre-ablation DP LIBS configuration.

DP-LIBS for analysis of heavy metal elements contained in soil samples



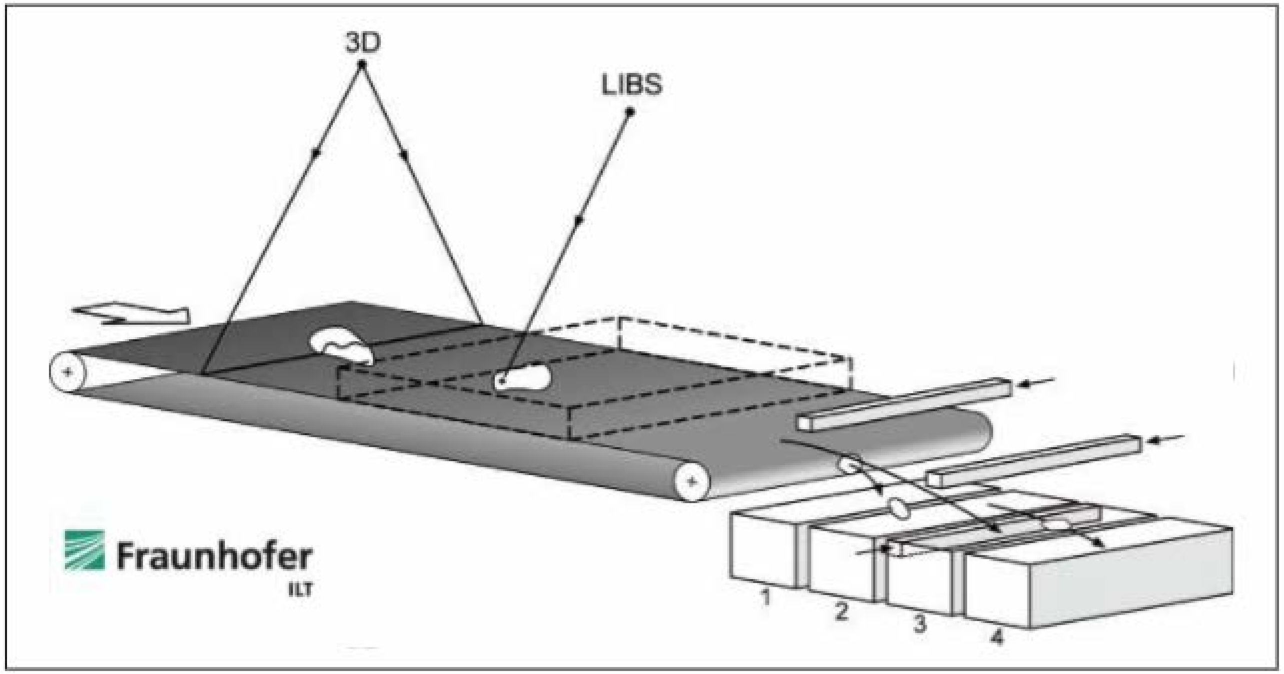


Influence of the pulse delay



Spectral enhacement.

- Device for identification and clasification of light materials in reciclying processes.
- It combines a 3D detection system for the identification of the metallic pieces with the LIBS system for identification of their composition.
- It can support a flow of material of 4 tons/hour, meaning an analysis of ~100 particles per second with the LIBS system.
- A hybrid laser was used to perform this task: DPSS with flashlamp amplification.



Schematic structure consisting in a 3D scanner, the LIBS unit and compressed air nozzle.

by courtesy of C. Fricke-Begemann, Fraunhofer Institute for Laser Technology, Aachen

LASMET Project: identification of metals for reciclying processes

- The integrated laser is responsible of two different tasks: first, there is a cleaning process of the surface; then, the spectrometric analysis is perfomed.

- CuZn-layer on Al 1200 alloy: 68 µm

A: Double pulse only

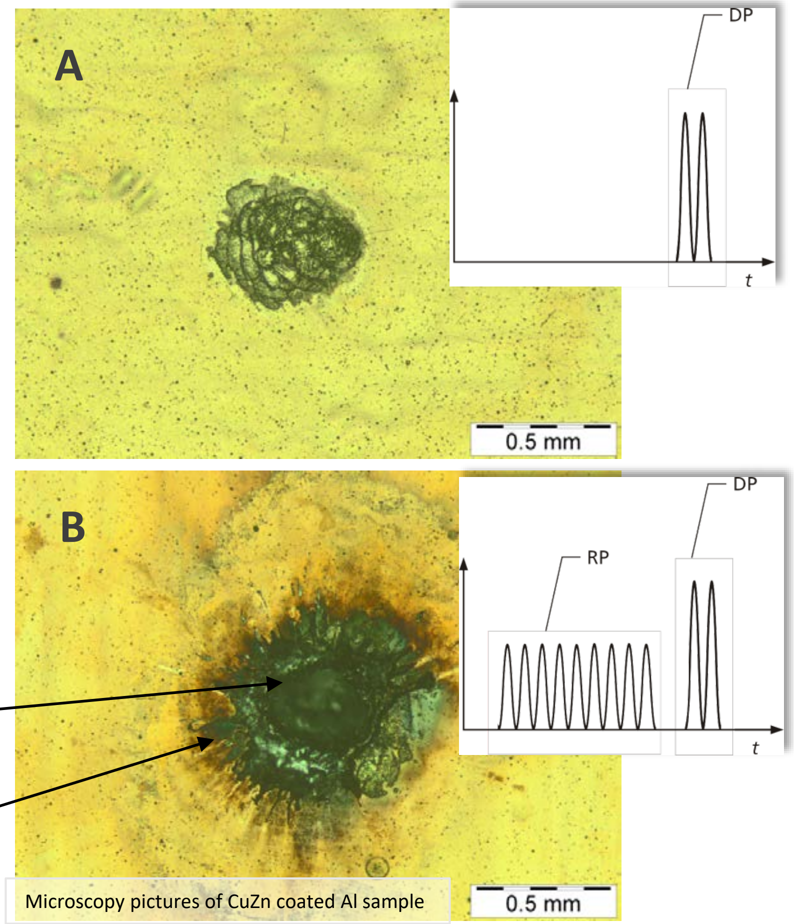
➔ surface layer not penetrated

B: Tailored laser burst

➔ bulk material is exposed by prepulses to double pulse LIBS analysis!

Depth d_c = 140 µm

Diameter D_c = 250 µm



Microscopy pictures of CuZn coated Al sample

by courtesy of C. Fricke-Begemann, Fraunhofer Institute for Laser Technology, Aachen

DPSS with flashlamp amplification:

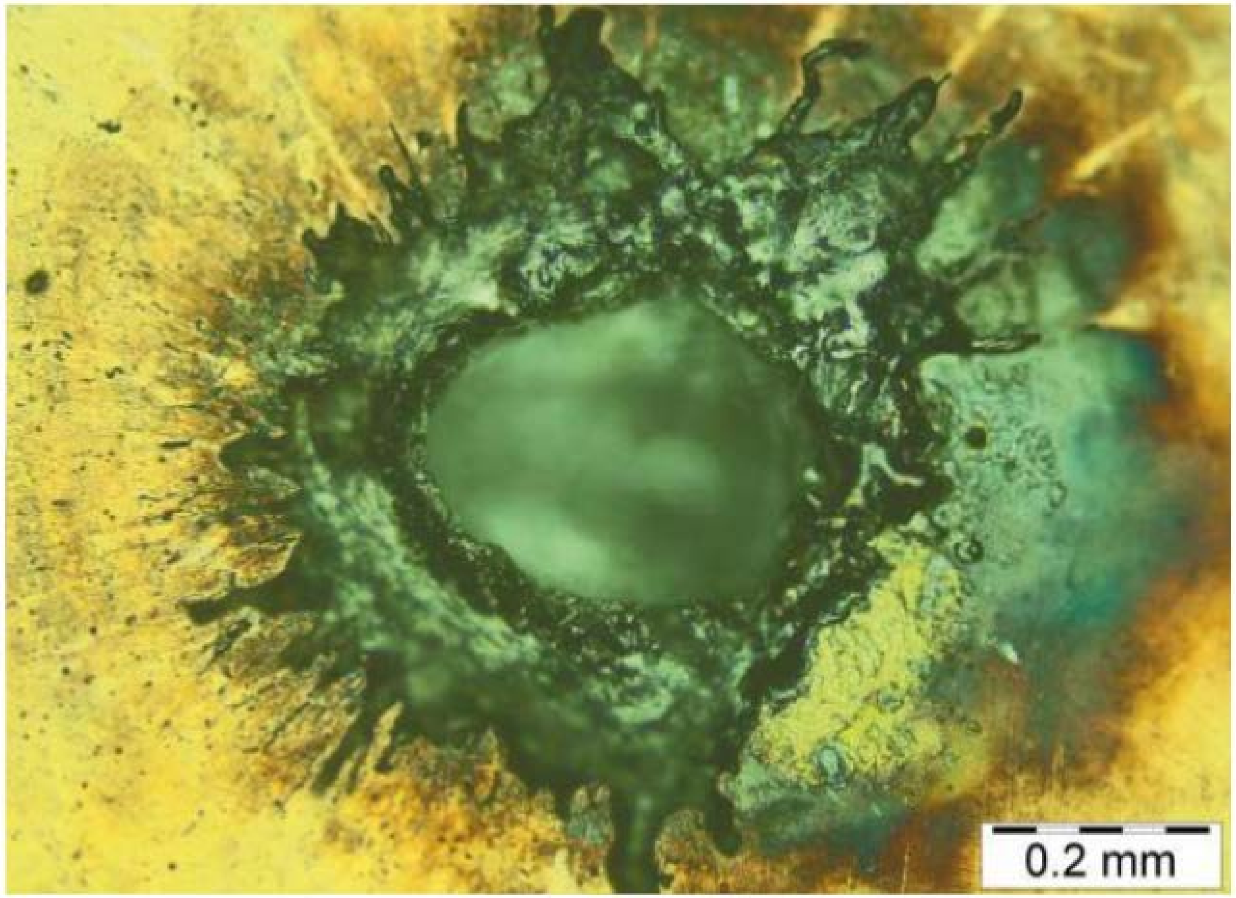
1. Good beam profile, to focus in a small area of the sample material.

2. Double pulse generation, individual pulses well defined in shape and duration.

3. High repetition rate to allow the generation of the double pulse.

4. High energy in order to perform both tasks, cleaning and plasma generation for LIBS analysis.

5. The internal design of the laser must be as robust as possible to withstand the industrial environment (termal and mechanical stresses, dust…).



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LASMET Project: identification of metals for reciclying processes

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- SpitLight 600 Laser with tailored burst.
- Detection and sorting rate 40 Hz
- Up to 600 mJ burst energy
- Moving samples at v= 3 m/s
- Pilot demonstration for Al sorting > 4 t/h
- In cooperation with

Laser Analytical Systems & Automation GmbH

Foto: LIBS-sorting system at TiTech GmbH, Mülheim-Kärlich, Germany

by courtesy of C. Fricke-Begemann, Fraunhofer Institute for Laser Technology, Aachen

LIBS for investigation of surface contaminants at long distances

Grupo Álava

- Set-up installed at the DLR (German Aerospace Center), Institute of Technical Physics Langer Grund in Hardthausen (Germany)
- The DLR laser test range is designed for a wide field of laser application studies under central European atmospheric conditions: detection systems of biological, chemical and explosive hazardous substances.
- LIBS has been introduced for investigation of surface contaminants at distances up to 135 m.
- Micrometeorological measurements were performed simultaneously for a detailed description of the atmospheric properties affecting the propagation of the laser radiation.

Laser test range at DLR with LIBS set-up.

by courtesy of J. Handke, DLR, Institute of Technical Physics Langer Grund, Hardthausen

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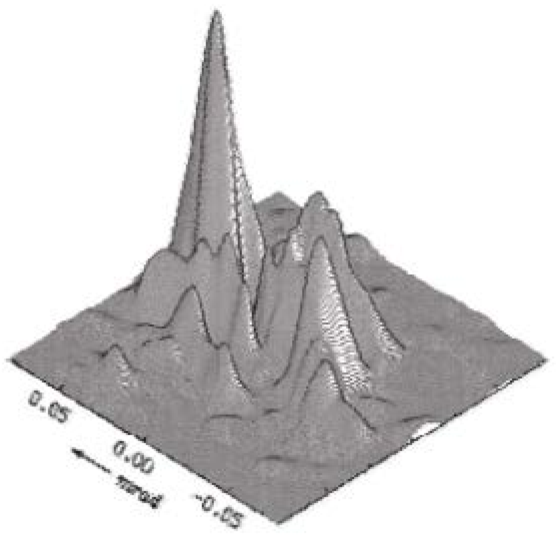
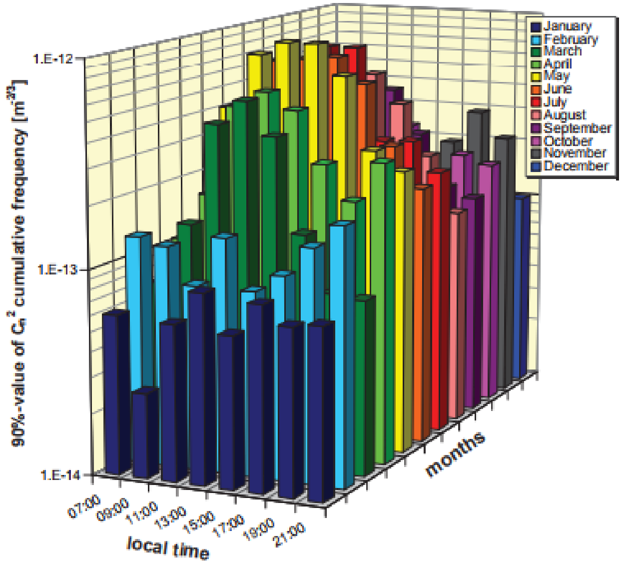


Calculated beam spread due to optical turbulence after 135 m of free propagation.

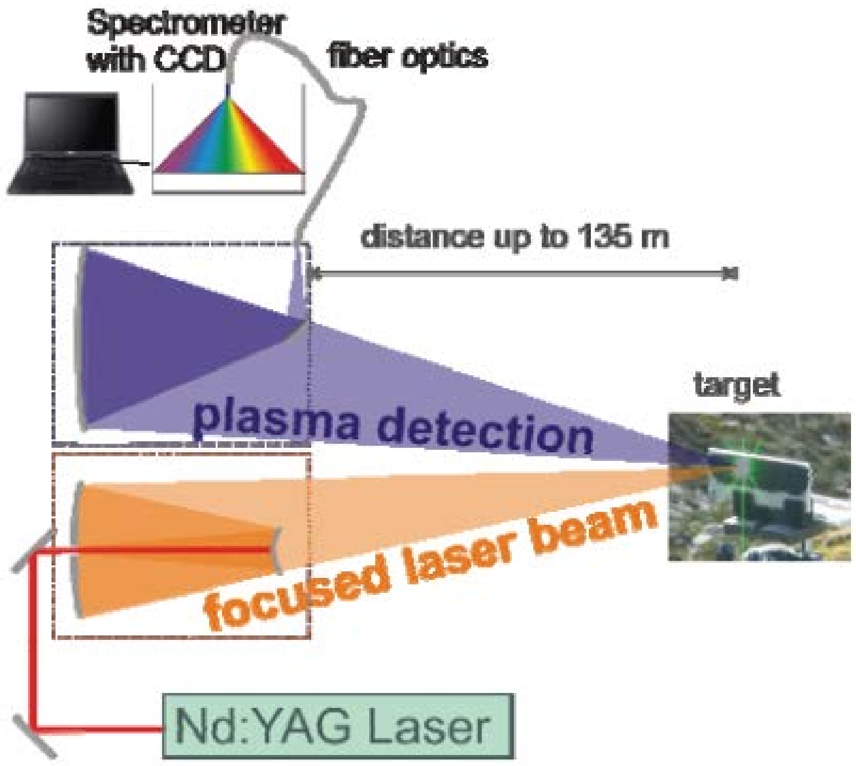


Seasonal and diurnal influence on the optical turbulence.

by courtesy of J. Handke, DLR, Institute of Technical Physics Langer Grund, Hardthausen

LIBS for investigation of surface contaminants at long distances

- For plasma production a Nd:YAG laser is used: repetition rate of 10 Hz, maximum output energy of 800 mJ (@ 1064 nm) and pulse width of 8 ns.
- The first three harmonics of the Nd:YAG laser are used for creating the plasma.
- The laser beam is expanded by a Cassegrain telescope to a diameter of up to 290 mm and is focused to the target which is positioned at distances of 15, 35, 55, or 135 m, respectively.
- The light emitted from the generated plasma is collected by a 400 mm diameter Newton telescope and focused into an optical fiber with a diameter of 200 µm.
- The collecting telescope covers an area with a diameter in the centimeter range.
- The detection is performed with a CCD spectrometer, triggered by the laser to ensure a proper timing (resolution of 0.3 nm and integration times from 1.28 µs to 1.2 ms).



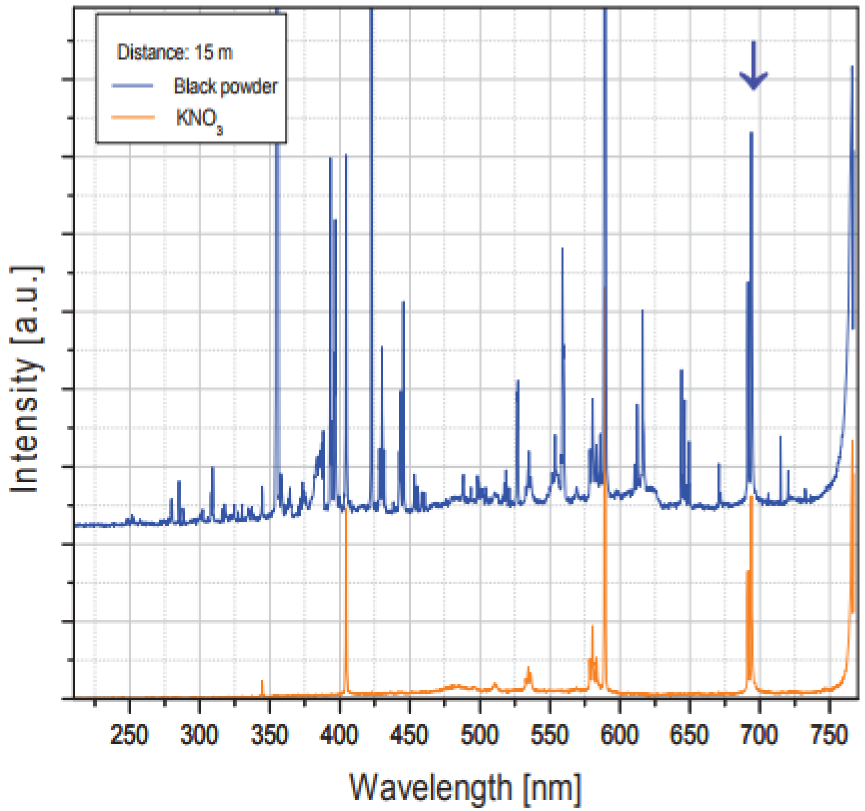
Schematically drawing of the LIBS set-up.

by courtesy of J. Handke, DLR, Institute of Technical Physics Langer Grund, Hardthausen

LIBS for investigation of surface contaminants at long distances

- To demonstrate LIBS capability for detection of explosives, black powder was used as a first representative: a mixture of sulfur, charcoal, and potassium nitrate (KNO3).
- Measurements performed at a bright sunshiny day.
- The characteristic doublet at 692 nm from KNO3 was selected for black powder identification.
- Spectra at short distances ➡ single pulse.

  Distances to more than 100 m ➡ several laser pulses.
- More intense laser pulses compensate the drop of the detection signal with the increasing distance.
- Using adaptive optics increases also the quality of the measurements, as they compensate for atmospheric turbulence.



LIBS spectra of KNO3 and black powder measured at a distance of 15 m.

by courtesy of J. Handke, DLR, Institute of Technical Physics Langer Grund, Hardthausen

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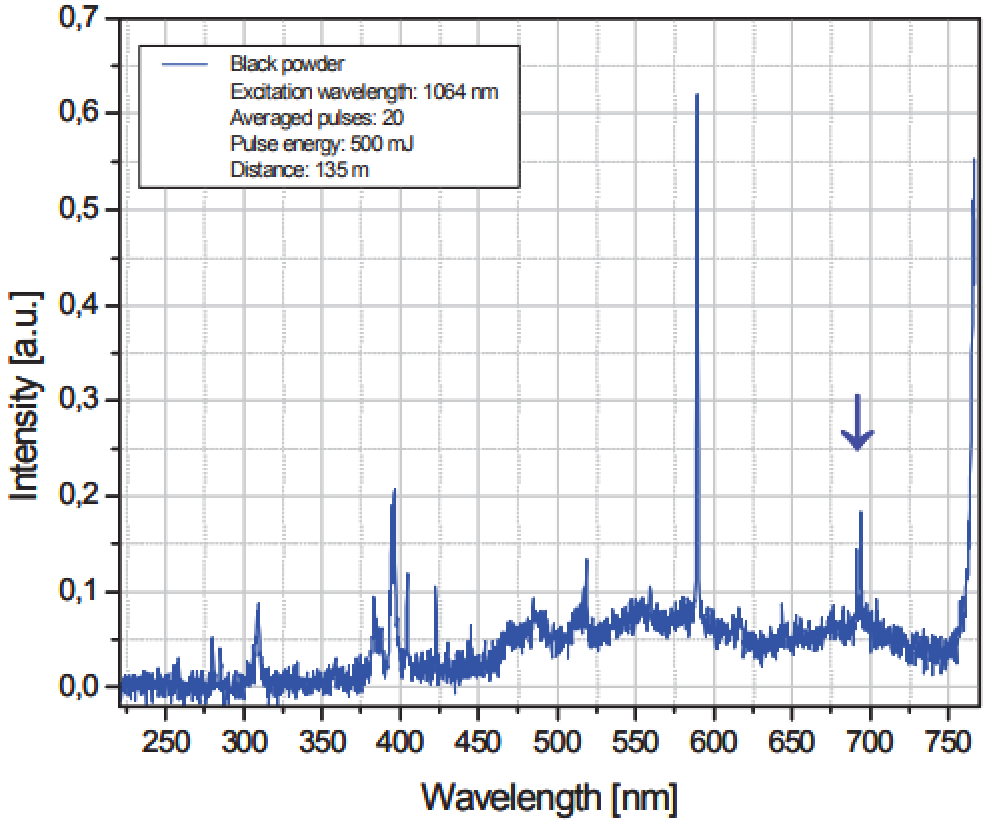

LIBS spectrum of black powder at a distance of 135 m.

by courtesy of J. Handke, DLR, Institute of Technical Physics Langer Grund, Hardthausen

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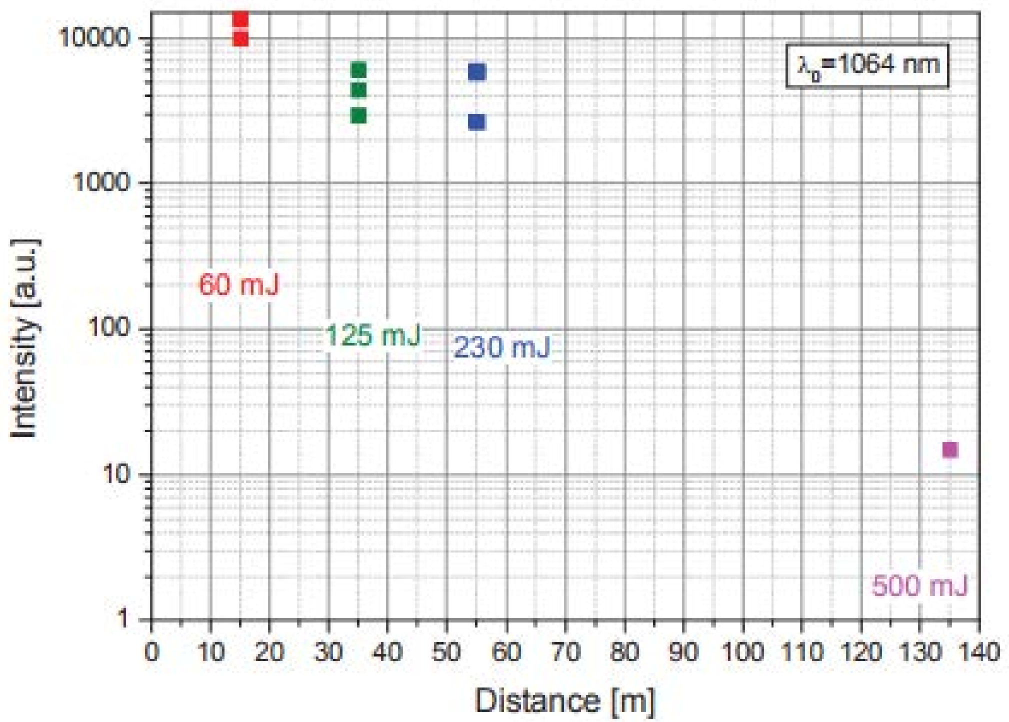
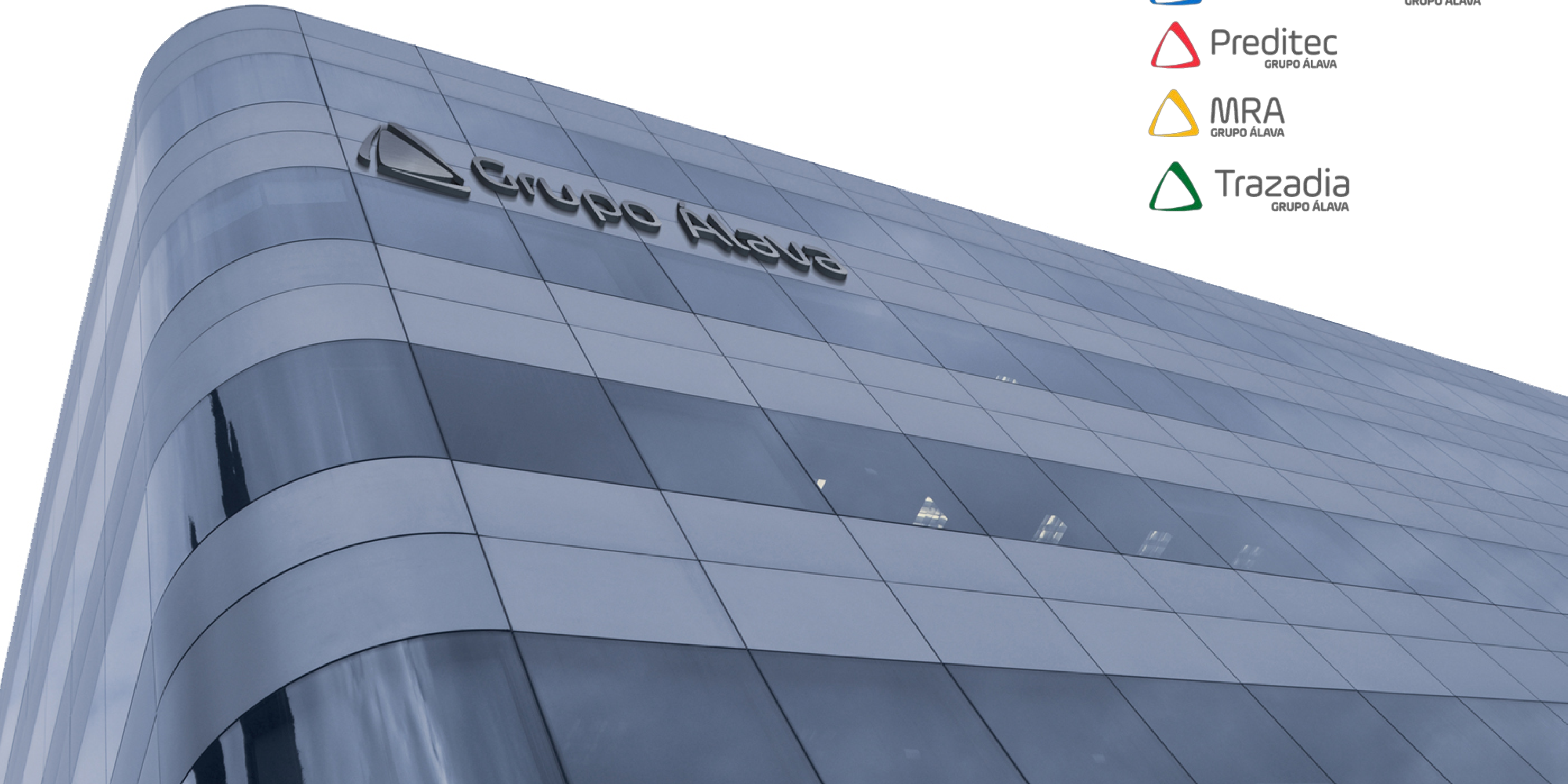


Measured intensities of plasma emission (693.6 nm) at different distances (single pulse).

by courtesy of J. Handke, DLR, Institute of Technical Physics Langer Grund, Hardthausen



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