



FIBER OPTIC  
**SENSING**  
EQUIPMENT

# SENSING FIBER OPTIC EQUIPMENT

Distributed fiber optic sensing (DFOS) is a disruptive technology set to change the way infrastructures are managed. DFOS can turn any optical fiber into thousands of sensors and monitor tens of kilometers of assets with a single interrogator, making it a very cost effective and non-intrusive solution that is being adopted by more industries every year.

With a patent portfolio and our in-house expertise, Aragon Photonics is able to provide unique DFOS equipment that allows customers to perform measurements of continuous acoustic, strain and temperature, during long periods of time and for large distances.

Apart from creating high-end DFOS equipment, Aragon Photonics can help customers to develop custom tailored solutions. Also, we participate in R&D projects mostly focused in seismic activity monitoring and Third-party intrusion.



## CONVENTIONAL USERS & APPLICATIONS



THE CUSTOMER



THE APPS



OUR SOLUTION

1

Universities & Research centers

Seismic activity  
DFOS investigation

DAS technology is spread around the world for earthquake detection and seismic monitoring, urban subsurface monitoring and seismic noise analysis. Our products provide superb pure RAW data ready for being processed by geologists and geophysicists.

2

Application developers

Pipeline leakage  
Third party intrusion  
Infrastructure health

Aragon Photonics products are perfect devices for application developers who want to add value to their current solutions. Our open platform helps to reduce time and efforts on data handling and postprocessing for live and predictive analysis.

3

System integrators

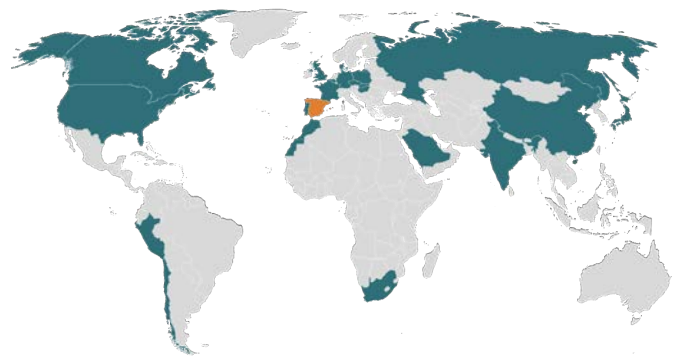
Assets monitoring  
Energy & Transport  
Border and security

Today, security of assets includes fiber optic based systems, punctual and distributed. System integrators can use our DAS and DTSS to provide precise monitoring of electrical power cables, railways, traffic or borders. Contact us for more info!

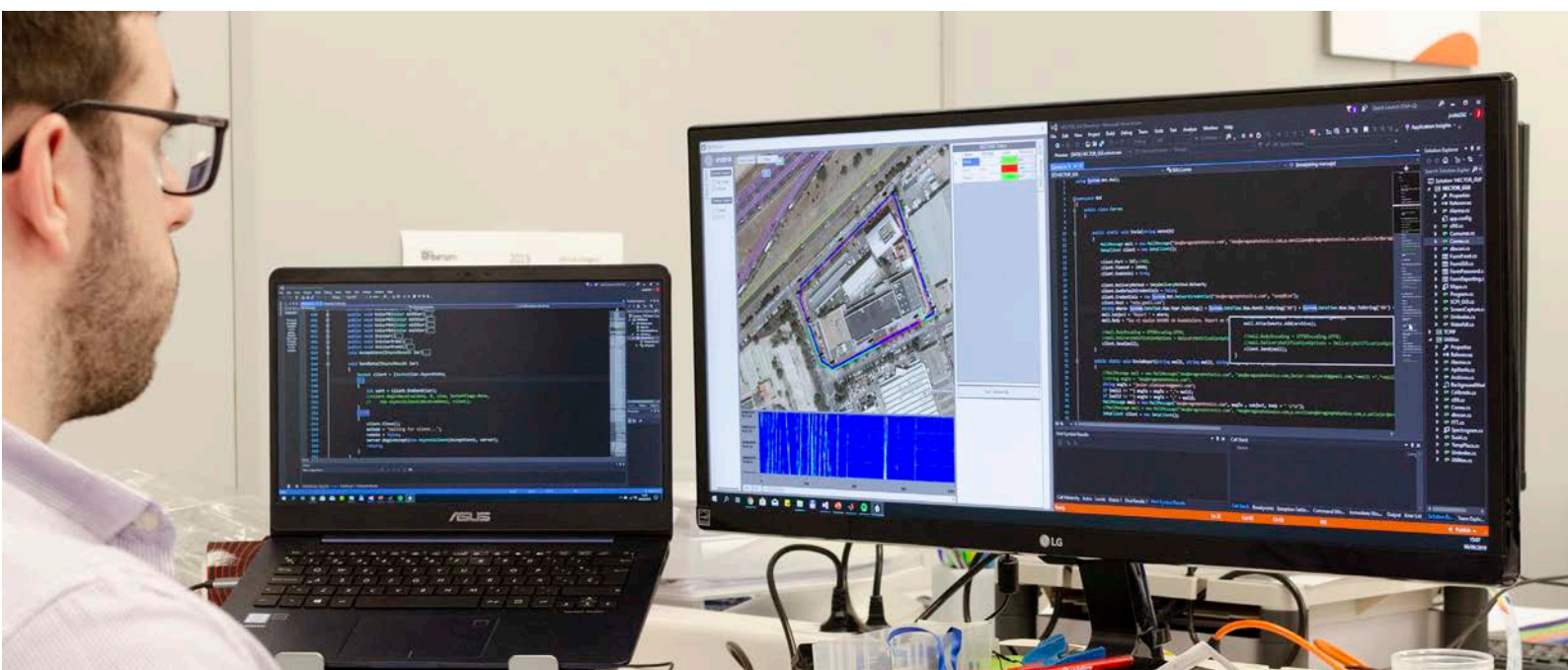
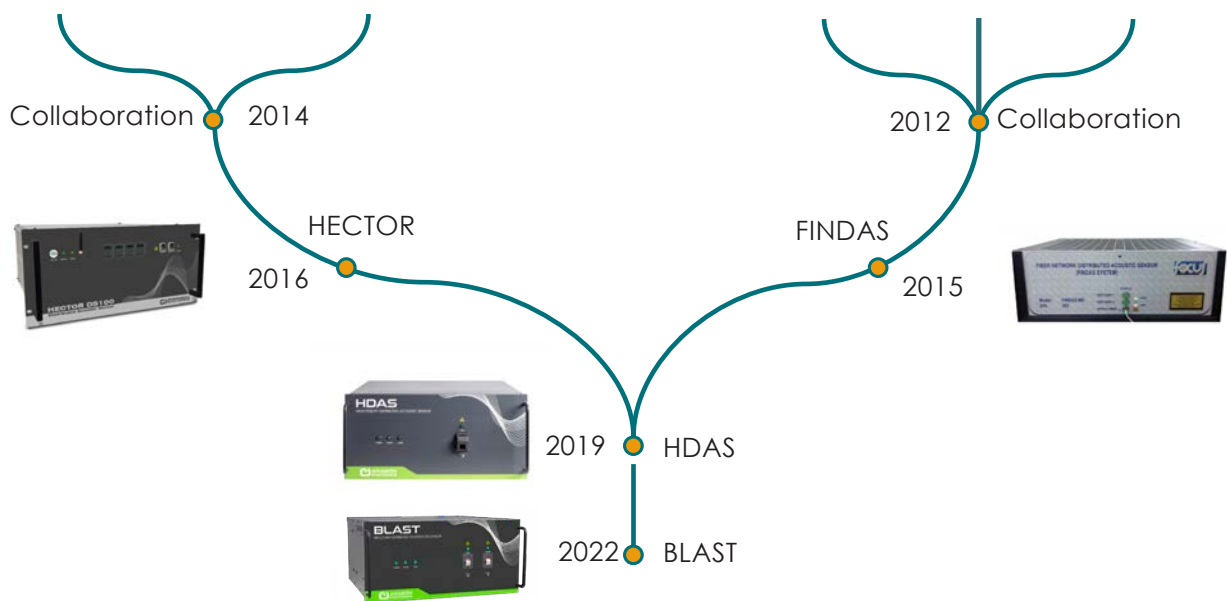
## OUR JOURNEY IN FIBER OPTIC SENSING

Aragon Photonics started its activities on Fiber Optic Sensing in 2014 collaborating with the University of Zaragoza to develop DFOS equipment based in **Direct Detection C-OTDR**.

Later, in 2018, Aragon Photonics acquires FOCUS SL and its **Chirped-pulse Phase OTDR technology** developed by the University of Alcalá de Henares and CSIC. The first official launch of the DFOS Business Line happens in 2019.



Since then, we have been evolving our products to adapt them to the needs of the market, specially to our partners: application developers and integrators.



# HDAS

Among DFOS, Distributed Acoustic Sensing (DAS), which allows for the **detection of vibrations along the fiber**, is the one with a wider range of potential applications, both industrial and scientific.

At Aragon Photonics we are set to provide scientists and engineers with the **most advanced and configurable DAS system**, the HDAS, so that they can use it as a tool to unlock new applications and knowledge.

## TECHNOLOGY

HDAS is a revolutionary DAS-system based Chirped-pulse Phase OTDR technology. Thanks to this pulse nature, the variations sensed along the fiber are therefore transformed into time delays which, through the use of proprietary processing, are then converted into high-fidelity strain variations.

HDAS stands out among competing DAS products thanks to its **linearity, high performance and its unique capability to maintain a very homogeneous performance along all the fiber**. It can be used in standard single mode fiber.

## KEY FEATURES

- 1 nstrain sensitivity
- Down to 6 m resolution
- **Linear & Quantitative measurement**
- Unmatched low-frequency performance
- **High SNR & No fading**
- Up to 90 km reach
- Optical Unit & Processing Unit

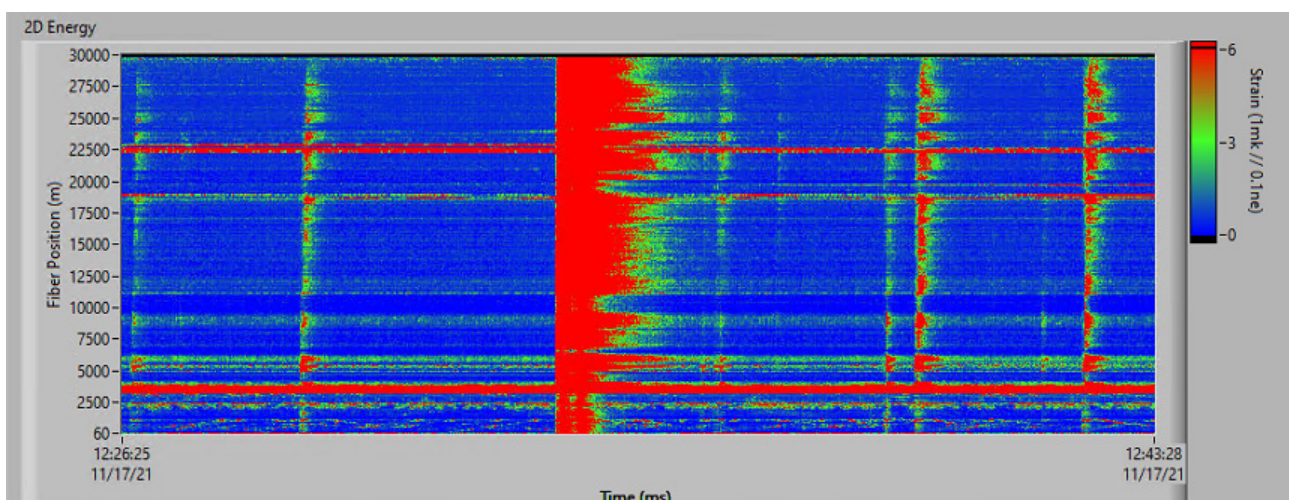


## APPLICATIONS

At Aragon Photonics we have conceived the HDAS as an **open platform to enable the development of applications** for end-users in multiple sectors:

- Perimeter intrusion detection
- Third-party interference (TPI) detection
- Power cable monitoring
- Traffic monitoring (roads, railway...)
- Seismic activity monitoring
- Subsea cable monitoring
- Asset integrity
- Oil, gas & water pipelines

*RAW Seismic activity in Cumbre Vieja volcano (La Palma)  
Nov. 17th 2021*



# High Fidelity Distributed Acoustic Sensor

## TECHNICAL SPECIFICATIONS

| Measurement                    |  |  |
|--------------------------------|--|--|
| Wavelength                     |  | 1550 nm  |
| Strain resolution (noise rms)  |  | < 1 nε   |
| Spatial resolution             |  | 10 m (typ.)<br>6 m, 20 m (available)               |
| Sampling resolution            |  | 1 to 10 m  |
| Sampling rate                  |  | 200 – 4000 Hz                                      |
| GPS sync                       |  | Yes (option)<br>2 μHz (between traces)             |
| Reach                          | Basic configuration  | >30 km   |
|                                | + Forward extension module (FEM)   | >50 km   |
|                                | + High capacity acquisition module <sup>1</sup> (HCAM)                             | >70 km   |
|                                | + Backward extender configuration <sup>2</sup> , requires range extender unit (RE) | >90 km   |
| System interfaces              |  |  |
| Optical connector <sup>3</sup> |  | SC/APC   |
| Internal memory                |  | 8 Tb   |
| Data                           |  | Ethernet 1 Gb, Ethernet 10 Gb,<br>USB 3.0, USB 2.0 |
| Video                          |  | HDMI, DP   |

1. maximum reach for 20 m pulse  
2. >90 km with FEM+HCAM; >70 km with FEM  
3. others on demand

## OTHER SPECIFICATIONS

| Physical & electrical |                                       |
|-----------------------|---------------------------------------|
| HDAS Optical Unit     | 19" rackable, 5U, 40 cm Depth, <15 kg |
| HDAS Processing Unit  | 19" rackable, 4U, 50 cm Depth, <23 kg |
| Range Extender Unit   | 19" rackable, 5U, 40 cm Depth, <15 kg |
| Power                 | 110/220 V , 50/60 Hz, <800 W          |
| Temperature range     | +15 to +35 °C                         |



Range Extender Unit  
(mandatory to reach >90 km)



GPS option for HDAS

# BLAST

Distributed Temperature Sensing (DTS), that allows for the **precise measurement of temperature values along a conventional fibre**, is one of the most common DFOS techniques, with a wide range of uses and already established applications in different environments. Different methods and technologies can be employed to obtain DTS measurements.

Aragon Photonics presents a **Brillouin Optical Time Domain Analyser (BOTDA) technology** based DTSS capable of reliable and precise temperature measurements along a conventional fiber. Presented in a simple to use and highly configurable interrogator that can provide to both scientific and industrial groups an invaluable tool to develop new research and applications.

## KEY FEATURES

- **Up to 0.1 degrees sensitivity**
- **Down to 1 m spatial resolution**
- Direct temperature readings (reference required)
- Easy to use configuration and straightforward measurement
- Up to 50 km loop reach without amplification
- Complete configurable acquisition time capable of fast (<30 sec) measurement times
- Two boxes: Optical Unit & Processing Unit

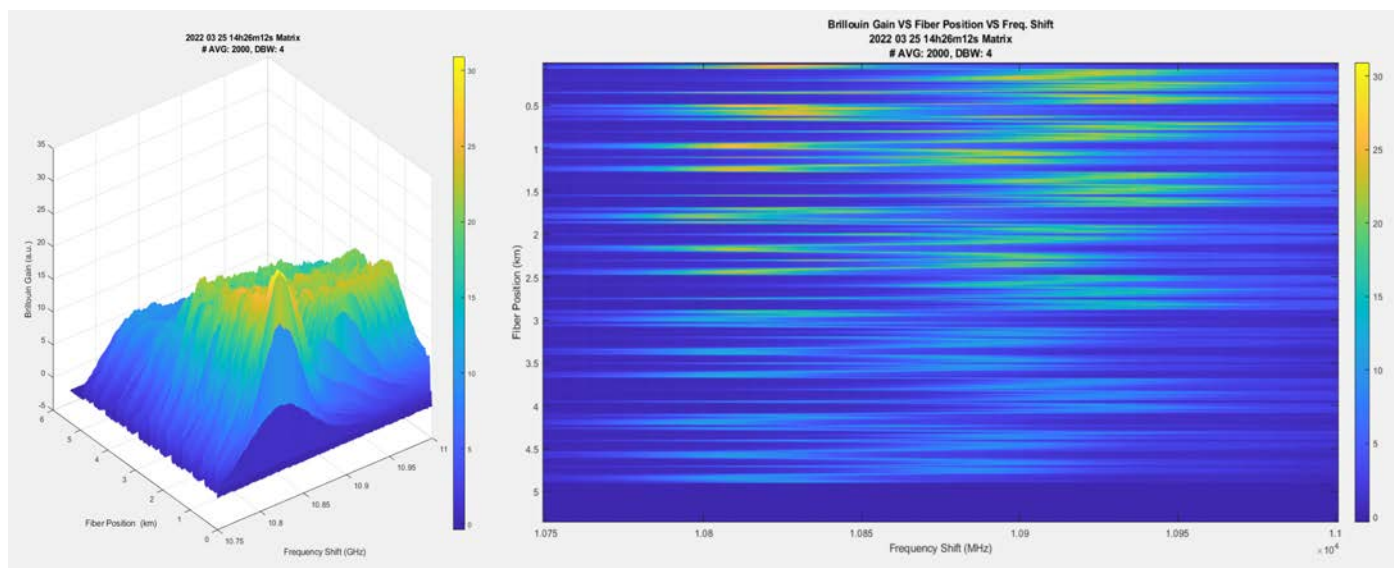


## TECHNOLOGY

BLAST is a DTSS-system based on BOTDA technology that implements **novel techniques and methods that improve the quality and reduce the noise in the final measurements**. The interrogator measures thousands of points along a continuous loop of fibre obtaining values of Brillouin Frequency Shift (BFS) that can be converted to direct temperature readings over the fiber.

BLAST offers a simple and direct DTSS measurement taking advantage of an improved Brillouin detection technique to improve the quality of the BFS measurements and thus improve the temperature values acquired, providing a **consistent and low noise performance along all the fiber loop**.

*BLAST DTSS measurement of terrain deformation caused by sinkholes near Ebro river in Alcala de Ebro (Aragon, SPAIN, 2020-2022)*



# Brillouin Loop Analyzer of Strain and Temperature

## TECHNICAL SPECIFICATIONS

| Measurement                        |   |
|------------------------------------|---|
| Wavelength                         | 1550 ± 0.5 nm   |
| Measurement channels               | 1 channel (loop)  |
| Distance range                     | 50 km in loop<br>85 Km with amplification (preliminary) |
| Spatial resolution (gauge length)  | 1 to 25 m   |
| Spatial sampling                   | 1 m   |
| Accuracy ( $\sigma$ ) <sup>1</sup> | <0.1 °C   |
| Dynamic range                      | Brillouin shift: ± 2 GHz<br>T°: up to 600 °C            |
| Measurement time                   | Mín: 30 sec for 10 Km<br>Typ: 5 min for 50 Km           |
| System interfaces                  |   |
| Optical connector                  | SC/APC  |
| Data                               | Ethernet 1 Gb, USB 3.0                                  |
| Video                              | HDMI, DP  |

1. Over last 4 km, 3 m spatial resolution, 150 MHz (2 MHz step) frequency scan, 50 km G.652D fiber.

## OTHER SPECIFICATIONS

| Physical & electrical |  |
|-----------------------|--|
| Optical Unit          | 19" rackable,, 5U, 40 cm depth, <15 Kg             |
| Processing Unit       | 19" rackable, 4U, 50 cm depth, <23 Kg <sup>2</sup> |
| Temperature range     | +15 to +35 °C                                      |
| Power                 | 110/220 V, 50/60 Hz, < 500 W                       |

2. Without added storage drives

## APPLICATIONS

BLAST has been built and designed with a **simple configuration approach that allows to easily modify the key parameters of measurement to adapt it to the end-user demands**. The versatility of the interrogator allows for its use in multiple applications:

- **Infrastructure health monitoring**
- Power cable monitoring
- Oil & gas monitoring (pipeline leak)
- Renewable **energy control and prospection (geothermal)**
- Fire hazard detection
- Thermal energy generation
- Ice formation monitoring in cables and structures

# INDUSTRIES & PRODUCTS



## HDAS

High Fidelity Distributed Acoustic Sensor

## BLAST

Brillouin Loop Analyzer of Strain & Temperature



## BOSA

High Resolution Optical Spectrum Analyzer

## HDCA

High Definition Component Analyzer



## CONDOR

Portable solar reflectometer

## INCUS

Receiver tube spectrophotometer



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