

## DEVICE FEATURES



Non-invasive

Safe to use

Portable

Low cost

Probes deep into the tissue  
(>1cm deep)

Provides real-time hemodynamic  
monitoring of the thyroid together  
with ultrasound imaging

## PROJECT FACTS

Coordinator:  
**Prof. Turgut Durduran**  
ICFO – The Institute of Photonic Sciences

Duration:  
**64 months**

Duration:  
**February 1, 2016 - May 31, 2021**

Total EU Funding:  
**€3,628,845.75**

## CONSORTIUM

ICFO - Institute of Photonic Sciences (ES)  
Politecnico di Milano (IT)  
Institut d'Investigacions Biomèdiques August  
Pi i Sunyer (ES)  
Hemophotonics (ES)  
VERMON (FR)  
IMV Imaging (FR)  
University of Birmingham (UK)  
European Institute for Biomedical Imaging  
Research (AT)

## FUNDED BY



@LUCA\_H2020  
<http://www.luca-project.eu/>



## LASER AND ULTRASOUND CO-ANALYZER FOR THYROID NODULES



@LUCA\_H2020  
<http://www.luca-project.eu/>

## EXPECTED IMPACT OF LUCA

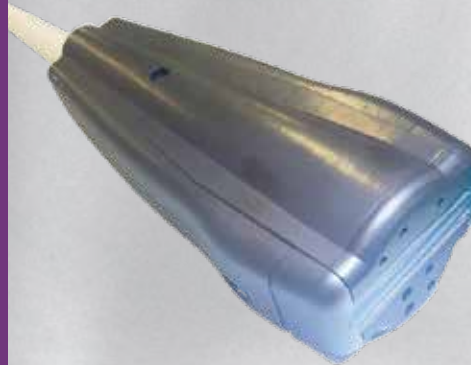
- Improved specificity of the thyroid screening process and corresponding earlier and faster diagnosis for effective treatment.
- Reduction of the number of unnecessary surgeries and associated co-morbidities, thus improving patients' quality of life.
- Reduction of the socio-economic cost related to thyroid cancer and saving of hundreds of millions euro every year.
- Potential use in the diagnosis of other cancers e.g. in the breasthead and neck cancer, abdominal cancer screening and therapy monitoring, cerebrovascular accidents (ictus) or even for COVID19.



## CLINICAL VALIDATION

The LUCA device incorporates two different diffuse optical spectroscopy technologies in parallel to ultrasound:

Time Resolved Spectroscopy (TRS)  
Diffuse Correlation Spectroscopy (DCS)



TRS+DCS



ULTRASOUND

## PHANTOMS

The LUCA device has been validated by using tissue simulating phantoms:

**Solid phantoms:** to simulate tissues with different light absorption and scattering

**Liquid phantoms:** to simulate tissues with different blood flow

**Tests - successful**

## IN VIVO CHARACTERIZATION

The LUCA device has been tested on healthy subjects. Measurements obtained several times a day, several days a week during several weeks

**Tests - successful - Evaluation of the precision in determining the hemodynamic parameters of the thyroid**

## PRECLINICAL TESTS

Preclinical testing on **18 healthy volunteers & 47 patients**, diagnosed with thyroid nodules - The combination of ultrasound and hemodynamic related parameters improves nodule diagnosis.

**Tests: 13 benign & 4 malignant nodules identified with a sensitivity of 100% and specificity of 77%, only those with uncertain ultrasound result.**

## FIRST IN VIVO TESTINGS

