

PHOREVER

PHOtonic integrated OCT-enhanced flow cytometry for cancer and cardiovascular diagnostics enabled by Extracellular VESicles discRimination



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1st NEWSLETTER

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The PHOREVER project is an innovative research initiative aimed at developing a groundbreaking multi-sensing platform to enhance cancer and cardiovascular diagnostics. Utilizing photonic integrated OCT-enhanced flow cytometry, the platform will detect extracellular vesicles (EVs) as small as 80 nm, identify specific biomarkers on their surface, and determine EV concentrations in blood. AI-powered data analysis will provide disease-specific insights.



Concept and objectives

PHOREVER will demonstrate its potential via the development of:

- 1)** a TriPLeX PIC for flow-cytometry (FCM) and fluorescence sensing and use it as a dual sensing tool for detection of EVs in blood samples and detection of biomarkers on the surface of these EVs,
- 2)** a TriPLeX PIC with a dual-channel swept-source optical coherence tomography (SS-OCT) unit on-chip and use it as a coherent gate for the processing of the FCM measurement data,
- 3)** a microfluidic unit for the pre-analytical and analytical handling of blood samples as the disposable part of the multi-sensing PHOREVER platform, and
- 4)** development of a comprehensive data analysis tool empowered by AI algorithms for use in the medical cases of the pancreatic cancer and the stroke.

Exploitation and expected impact

This multi-sensing platform has enormous promise for medical applications, but the actual effects will vary depending on the specifics of each medical use case. The project will look into two particular use cases. The first will be a pancreatic cancer case with a focus on tracking the disease's stage of progression, estimating the risk of metastasis, and assessing



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the effectiveness of treatment. The second example will involve a stroke, with an emphasis hospital. The focus of the project will be on the association between the total EV concentration in the blood samples and the actual medical information of the patient because, in the case of pancreatic cancer, the medical community is still working to find a protein as a vulgate biomarker. The emphasis within the project will be on the detection of the corresponding subclass of EVs and the correlation of their concentration to the stroke incident parameters, however, as the corresponding efforts in the stroke case have already led to the identification of effective biomarkers that can be carried as cargo by EVs. In either scenario, a set of data analysis tools driven by AI algorithms will be employed to process the readings from the multi-sensing platform and to correlate them with the relevant medical data. on quick stroke event diagnosis and quick stroke type identification using the multi-sensing platform of PHOREVER as a POC device before the patient actually arrives at the

Consortium

PHOREVER consortium consists of **8 partners**, among which **4 academic organizations** (ICCS, University of Ioannina, National and Kapodistrian University of Athens, Amsterdam UMC), **1 industry-oriented research institutes** (CSEM), **1 SME** (PHIX) and **2 large companies** (LioniX, LRE Medical) originating from **4 countries** (Greece, Germany, The Netherlands and Switzerland).

