H2020 project AMPLITUDE prototypes new multi-modal imaging technology optimised to work in the third biological window

EDINBURGH, UNITED KINGDOM, January 14, 2025 /EINPresswire.com/ -- In 2020 AMPLITUDE set out with the ambition of developing and testing new technologies that advance bladder cancer diagnosis and treatment by utilizing the third biological window for deeper, high-resolution tissue imaging.

With funding from the Horizon 2020, research and innovation program, the AMPLITUDE team designed and manufactured prototype devices including:

• A compact and cost effective ultrashort pulsed laser with tunable operation between 1650 and 1700nm and integrated frequency mixing for second harmonic generation at 837nm.
• An upright multi-photon microscope unifying metabolic, morphological and molecular imaging capabilities in one device and support image acquisition at 1675nm and 837nm.
• A multimodal endoscopic probe optimised to operate in the third biological window and capture high resolution non-linear images in thick tissues.

In late 2024, the laser was integrated in multi-modal microscopy set up at the ICFO - Institut de Ciencies Fotoniques, so that the capabilities of the system could be explored. This testing demonstrated the potential of using the third biological window to image deeper into tissue, with a recorded penetration depths of >1mm. This performance represents a significant improvement compared to shorter wavelengths.

Proof-of-concept testing on clinical samples is ongoing at the University of Florence, Italy. This work is assessing the use of the integrated microscope for the detection and discrimination of different grades and stages of bladder cancer in excised bladder cancer biopsies. With the aim of demonstrating the Amplitude imaging technology can be used to improve the diagnosis and monitoring of bladder cancer.

In addition, the AMPLITUDE team also explored new methods to improve the identification and

diagnosis of tumour tissues through fast, label-free optical methods. To achieve this, pre-clinical in vitro 3D models from bladder cancer cell lines with various grade of aggressiveness/invasiveness were generated by the University of Milano-Bicocca to investigate bladder cancer biology and behaviour. These models were then examined using two label-free optical techniques: Raman spectroscopy and autofluorescence imaging and were found to be capable of discriminating between different grades and stages of bladder cancer.

"'The achievements realised by AMPLITUDE were only possible thanks to the support of the European Commission. The technical and financial support provided by HaDEA enabled the consortium to develop new European technologies with potential to improve biological imaging in the future" – Regina Gumenyuk, Tampere University, AMPLITUDE Project Coordinator.

For more detail on the specific achievements of the AMPLITUDE project, please visit the project website at: https://www.amplitude-imaging.com/

ABOUT THE PROJECT:
AMPLITUDE, which stands for 'Advanced Multi-modal Photonics Laser Imaging Tool for Urothelial Diagnosis in Endoscopy' started on 1st January 2020 and ran until 31st December 2024.

The AMPLITUDE project was delivered by 11 partners from 7 countries
- Tampere University, Finland
- Aston University, UK
- Consiglio Nazionale Delle Ricerche, Italy
- Ampliconyx OY, Finland
- ICFO - Institut de Ciencies Fotoniques
- Femtonics, Hungary
- Universita Degli Studi di Milano-Bicocca, Italy
- Universita Degli Studi di Firenze, Italy
- HC Photonics Corporation Limited, Taiwan
- WEINERT Fibre Optics GmbH, Germany
- Modus Research and Innovation Limited, UK

To develop the technology that was demonstrated, AMPLITUDE was granted 4.48M€ from the European Union's H2020-ICT-05-2019 Research and Innovation Action Framework Programme under Grant Agreement no 871277.

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