

New Proof of Concept

ERC Funding to develop Heterogeneous Integrated Short-wave Infrared Colloidal Quantum Dot Lasers

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The European Research Council, in its efforts to help ERC grant-holders to bridge the gap between their research and the earliest stage of a marketable innovation, created the Proof of Concept (PoC) funding scheme for researchers who have already been awarded an ERC grant. Not only does this program help ERC grantees to explore the innovation potential of their research and/or commercialize the results of their ERC-funded research, the program complements the efforts of ICFO's Knowledge and Technology Transfer Unit (KTT), which proactively searches for ways to translate newly generated knowledge into new technologies.

In a press release from the ERC announcing the award of 100 new Proof of Concept Grants, Iliana Ivanova, European Commissioner for Innovation, Research, Culture, Education and Youth, put into context the importance of these grants, stating: i¿½Since 2011 when the scheme started, ERC grantees have received over ?300 million in Proof of Concept grants. Thanks to Horizon Europe funding, they could advance on the path from ground-breaking

research to innovation. These researchers are a great example of how to translate and commercialise the strong research output funded by the EU.i¿
? ICREA professor at ICFO Gerasimos Konstantatos is one of the recipients of the Proof f Concept grant in this, the first round of the 2024 competition. His new project, entitled **IRQUAL,** is his fourth PoC to date, the sixteenth award of this kind for ICFO since the launch of the PoC grant scheme. **The main goal of this project is to explore and develop a new generation of solution-processed, versatile infrared laser technology that can be produced at scale and be compatible with CMOS electronics.**
IRQUAL addresses the critical need for compact, low-cost and integrated lasers operating in the short-wave infrared (SWIR) spectrum (1.3 - 2.5 m) for diverse applications such a consumer electronics, automotive, IoT, and AR/VR. Specifically, lasers in the eye-saf window (around 1.4 m and > 2 m) are crucial for LIDAR systems, 3D face recognition, nd environmental monitoring. Current technologies, including solid-state lasers and II -V semiconductor laser diodes face limitations in size, cost, and scalability, therefore IRQ AL aims to develop a versatile heterogeneous-integrated laser platform that will exploit S IR CQD laser technology pumped by established GaAs-based high-power laser diodes to develop a device that covers the range 1.5 to 2.5 m. The realization of low-cost MOS compatible lasers at eye-safe and telecom wavelengths has the potential to disrupt in any possible ways. To begin, the introduction of this technology in the automotive industry ill render LIDAR technologies a commodity and the use of longer wavelengths (>2 um) curre tly limited by available laser sources can drastically increase the detection range and imp ove the operability of LIDAR technology in all weather conditions with huge benefits to dr ver safety. Moreover, the use of low-cost infrared lasers manufacturable at scale in the mo ile industry and consumer electronics at large will introduce new functionalities for IoT and mobile applications for increased security and data protection. Access to longer wavelen ths (above 2 um) with low cost laser sources will unleash the potential of photonics for environmental monitoring and remote chemical detection that is of paramount import nce for natural gas leak detection, pollution monitoring, hazardous gas inspection etc. Last but not least the possibility of an electrically driven laser integrated on silicon CMOS is the i¿½ Holy Graili¿½ in the field of silicon photonics as it fulfils the last missing component for he realization of all-optical information transfer and processing on silicon with huge implicati ns towards secure, low power consumption and high data rate of transfer and processi g. IRQUAL will further focus on the potential commercialization and exploitation of t is technology by developing a strong intellectual property portfolio as well as engaging w th leading industrial figures that could assist in the development and validation of he technology.

In summary, this project pioneers a new era in SWIR laser technology, featuring compactness, cost-effectiveness, and scalability for a multitude of high-impact applications.