PROJECT QUANDO SC3

QUANtum technologies for Defence with application to Optronics

Quantum sensors harness fundamental quantum principles like superposition and entanglement to approach the inherent measurement limits set by physics. They promise significantly enhanced precision and accuracy, revolutionizing scientific, industrial, and commercial applications. These sensors excel in measuring various physical quantities-magnetic, electric, and gravitational fields, times, frequencies, temperatures, and pressures-with unparalleled accuracy.

Typically, a quantum sensor employs discrete quantum states (qubits) dependent on the parameter being measured. A protocol initializes the system in a known quantum state, interacts it with the measured system, and measures the qubits. This iterative process significantly improves accuracy compared to traditional sensors by utilizing entanglement techniques, quantum control, or squeezing protocols that surpass the Heisenberg limit.

Quantum sensor advancements are poised to transform defence domains like C4ISR and navigation, with the potential to disrupt defense operations. The QUANDO Consortium, under EDA's directive, investigates quantum technologies for defense, focusing on quantum sensing. Collaborators across research organizations, large industrial partners, and SMEs are involved in this initiative, investigating quantum technologies' potential in optronics and radio frequency domains.

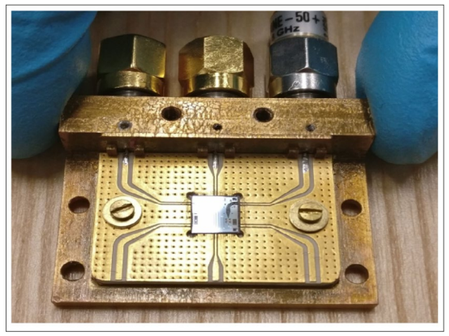
The current phase aims to synthesize an Electro Optical/Radio Frequency (EO/RF) quantum technology to solidify earlier studies and outline a potential EU defense quantum sensing roadmap. The project's objectives encompass technology identification, demonstrator design, realization, experimental testing, and result analysis, aligning with EDA's directive for an EO/RF quantum sensing proof-of-concept demonstrator.

The project evaluates EO and RF quantum sensing technologies, exploring non-classical light sources, Optical Parametric Oscillators for mid-IR radiation, cryogenic Josephson Parametric Amplifiers, and Nitrogen-Vacancy centers in diamond for compact antenna receivers. Quantum Radar, utilizing quantum properties to enhance signal processing and counteract stealth properties, stands as a promising technology offering superior target detection capabilities and resilience against electronic countermeasures.

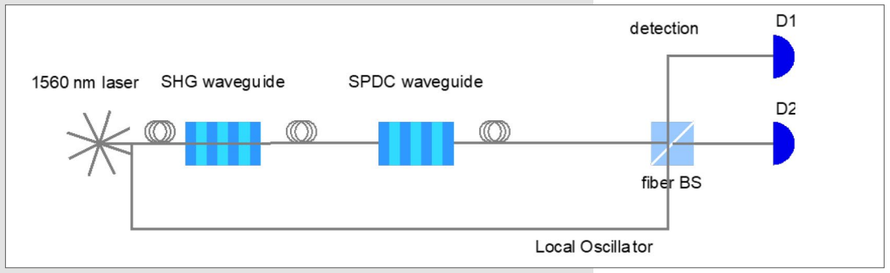
Keywords: Quantum Radar, Quantum Sensing

[1] D. Luong, C. W. S. Chang, A. M. Vadiraj, A. Damini, C. M. Wilson and B. Balaji, "Receiver Operating Characteristics for a Prototype Quantum Two-Mode Squeezing Radar," in IEEE Transactions on Aerospace and Electronic Systems, vol. 56, no. 3, pp. 2041-2060, June 2020

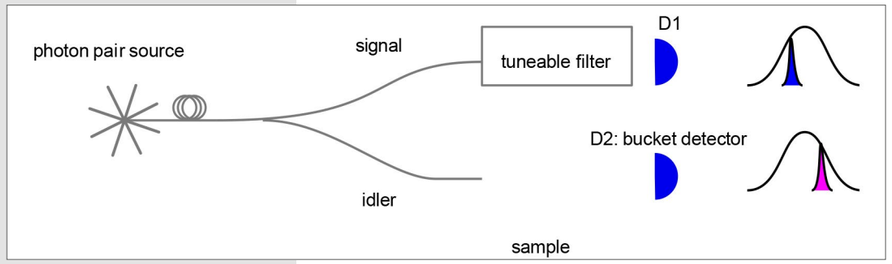
Technical Sheet
Funding institution:
EDA
Project partners
CNR, FLYBY S.R.L., LEONARDO S.P.A., TECNOBIT, THALES R&T, DLR
Project duration
December 2022 - December 2023
Involved countries
Italy, France, Germany, Spain



(a) Josephson Parametric Amplifier [1]



(b) Demonstrator components



(c) Demonstrator high-level scheme

PROJECT REACT II

Responsive Electronic Attack for Cooperation Tasks II

In the context of the fast-changing electromagnetic warfare environment and given the rapid advance in sensors and long-range weapons to counter air threats, it arises the urgent need to address the current military capabilities shortcomings of the EU MS in the area of Airborne Electronic Attack (AEA).

In order to deal with current and future contested EW environments, where the use of air power may be seriously compromised, it is required to boost a joint effort of the EU industry in the defence sector to fill in the gaps in the existing EU AEA capabilities.

REACT II (awarded proposal for EDF-2022-DA-AIR-AEW) will bring all the progress made and the lessons learned from REACT I (awarded proposal for EDIDP-ACC-AEAC-2019). All this experience gathered is an invaluable asset to build on for the new project to be undertaken.

The REACT II consortium consists of 21 partners from 10 Countries, covering the whole value chain from applied research to high technology product development and supply.

The REACT II solution to cover the future challenges for AEA capability will be comprised by a modular architecture based system whose core building blocks will allow to reconfigure the system to better adapt to the needs of the mission to be performed. From a strategic point of view, REACT II will encourage the cooperation among European Union member states, stimulating the production of doctrine and CONOPS at EU level, strengthening the EU defence own capabilities, promoting EU technologies and improving the competitiveness of EU defence industrial base to develop new EW systems to be offered as in-kind contribution to NATO defence.

Keywords: AESA, ECM, AI, Cognitive Radar.

Technical Sheet
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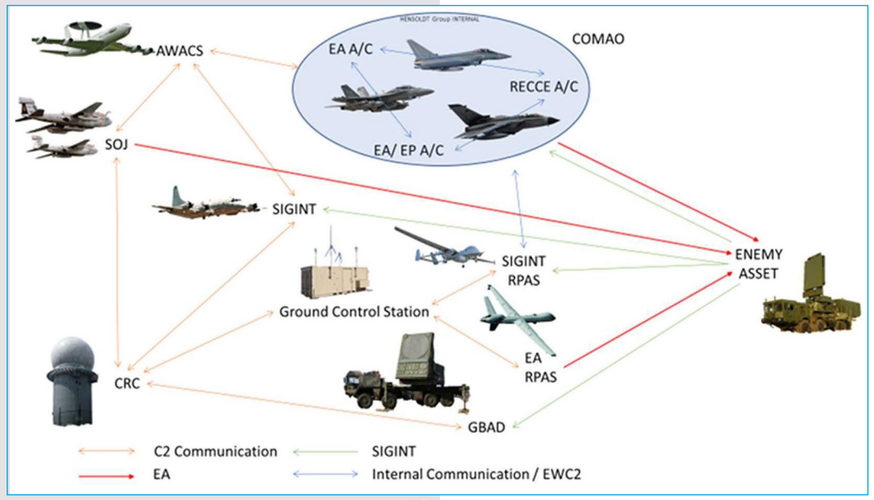
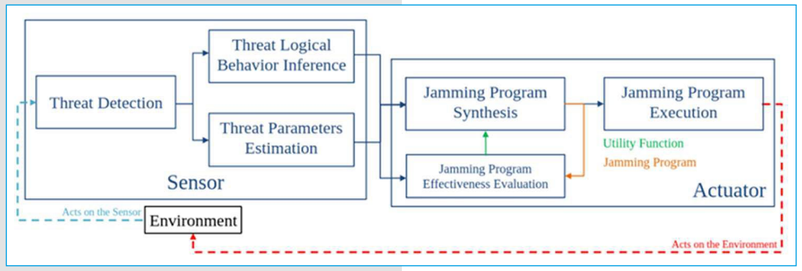
Co-funded by the European Union
Project partners
Indra (Coordinator, Spain), Elettronica (ELT, Italy), Hensoldt (HEN, Germany), Saab (SAAB, Sweden), Thales (TSA, France), CAFA Tech (CAFA, Estonia), BPTI (Lithuania), Rantelon (RAN, Estonia), Bianor Services (BIA, Bulgaria), XY Sensing (XYS, Poland), Axter Aerospace (AXT, Spain), Spikatech (SPT, Spain), Sentech (SEN, Italy), D&P Development (D&P, Italy), Warsaw University of Technology (WUT, Poland), Universidad Politécnica de Madrid (UPM, Spain), Royal Netherland Aerospace Center (NLR, Netherlands), Royal Institute of Technology in Stockholm (KTH, Sweden).
Project duration
December 2023 - November 2027
Involved countries
Spain, Italy, Germany, Sweden, France, Lithuania, Netherlands, Poland, Estonia, Bulgaria



(a) AEA network



(b) Cognitive EW system, block scheme.