



Call 2019

# C'MON-QSENS!

**Continuously Monitored Quantum Sensors:**

**Smart Tools and Applications**

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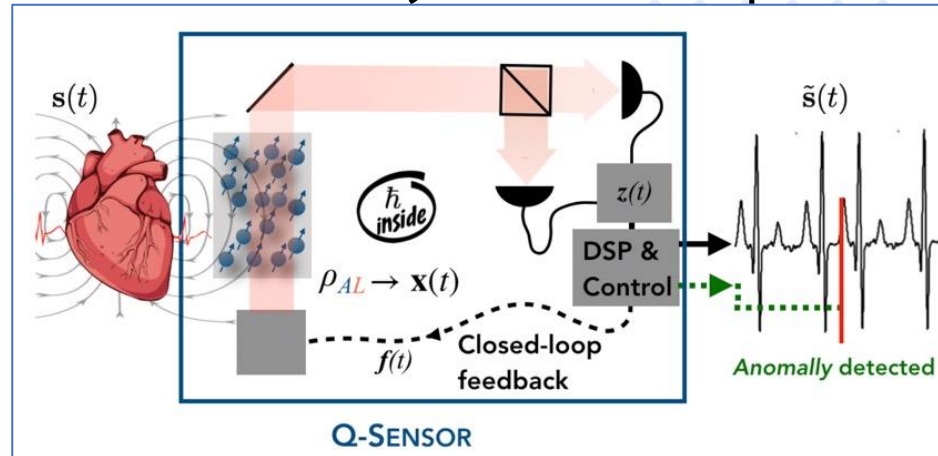
*Theory*


*Experiments*



# PROJECT PROGRESS (highlights)

-  **CHALLENGE** – advance the current frontiers of fundamental and applied knowledge on **continuously monitored quantum sensors**.



-  **SOLUTION** – **Theory**: dynamical models for real-time quantum sensors; develop signal processing and statistical inference techniques for real-time inference. Derive *ultimate quantum bounds*.
- Experiments**: real-time sensors based on *atomic vapours* and *optomechanical systems*.



# PROJECT PROGRESS (highlights)



**IMPLEMENTATION** – \*Stochastic (quadratic) bosonic models that include measurement back-action and various decoherence mechanisms. Kalman filter, smoothers, back-action evading mechanisms+ ultimate bounds for sequential hypothesis testing.

\*Optomechanical displacement sensors to measure accelerations or forces. Novel microcavity reaching **ultra-strong coupling** regime. **First experiments** with **magnetic levitation** platform.

Atomic magnetometers based on Cesium vapour for detection of radio-frequency magnetic fields+ prototype for detection of small metal objects.



**HURDLES-** COVID-19 induced delays (specially in experiments). Prof. Eldar (DSP expert) disengages from project.

# IMPACT (RRI aspects)



**GENDER:** foster gender balance in research teams and activities related to the project.



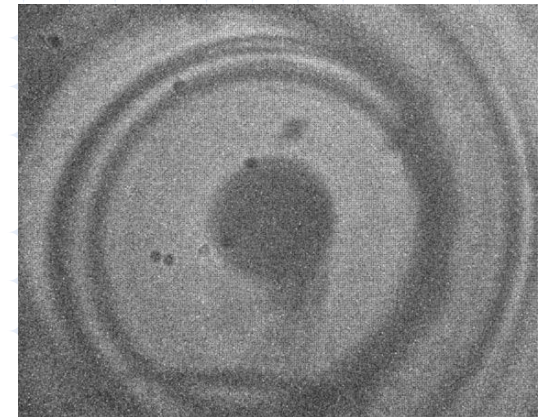
**OPEN SCIENCE:** 43% of publications in open access journals, all available at the quant-ph archive. Codes available at GitHub repositories.



**SCIENCE EDUCATION:** Involvement in several graduate and postgraduate programs on quantum statistical inference subjects.



**PUBLIC ENGAGEMENT:** popular science talk on “Quantum sensing”  
+ Video on magnetic levitation of superconducting particle (Wieczorek)







# QUANTERA

ERA-NET Cofund in Quantum Technologies



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