

# Master thesis project

## Development of an acoustic nano-resonator for molecular sensing

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**Topic:** An acoustic nano-resonator is microdevice composed by a piezoelectric substrate and nanofabricated interdigitated metallic stripes. By applying a specific radiofrequency signal, surface acoustic waves (SAWs) can be excited and confined in a very small area.

Given their very superficial nature, SAWs are highly sensitive to surface perturbations of the substrate along which they propagate. For example, they can interact with liquid droplets or streams inducing macroscopic fluid manipulations

or, in a different configuration, be exploited for sensing applications.

**Objective:** Design, fabrication and characterization of acoustic nano-resonators coupled to microfluidic elements for portable high-performance molecular sensing.

**Methods:** Finite element modelling analysis, nano and microfabrication (optical and electron beam lithography techniques), optical and scanning electron microscopy, laser Doppler vibrometry, radiofrequency testing and characterization.

Further details on this research activity can be found in the website:

<http://web.nano.cnr.it/neurosens>

and in the following publications:

- Agostini M., Greco G., and Cecchini M. "A Rayleigh surface acoustic wave (R-SAW) resonator biosensor based on positive and negative reflectors with sub-nanomolar limit of detection" *Sensors and Actuators B: Chemical* 254 (2018) 1–7 [<http://dx.doi.org/10.1016/j.snb.2017.07.014>]
- Greco G., Agostini M., Shilton R., Travagliati M., Signore G., Cecchini M., "Surface Acoustic Wave (SAW)-Enhanced Chemical Functionalization of Gold Films" *Sensors* (2017), 17, 2452 [<http://www.mdpi.com/1424-8220/17/11/2452>]