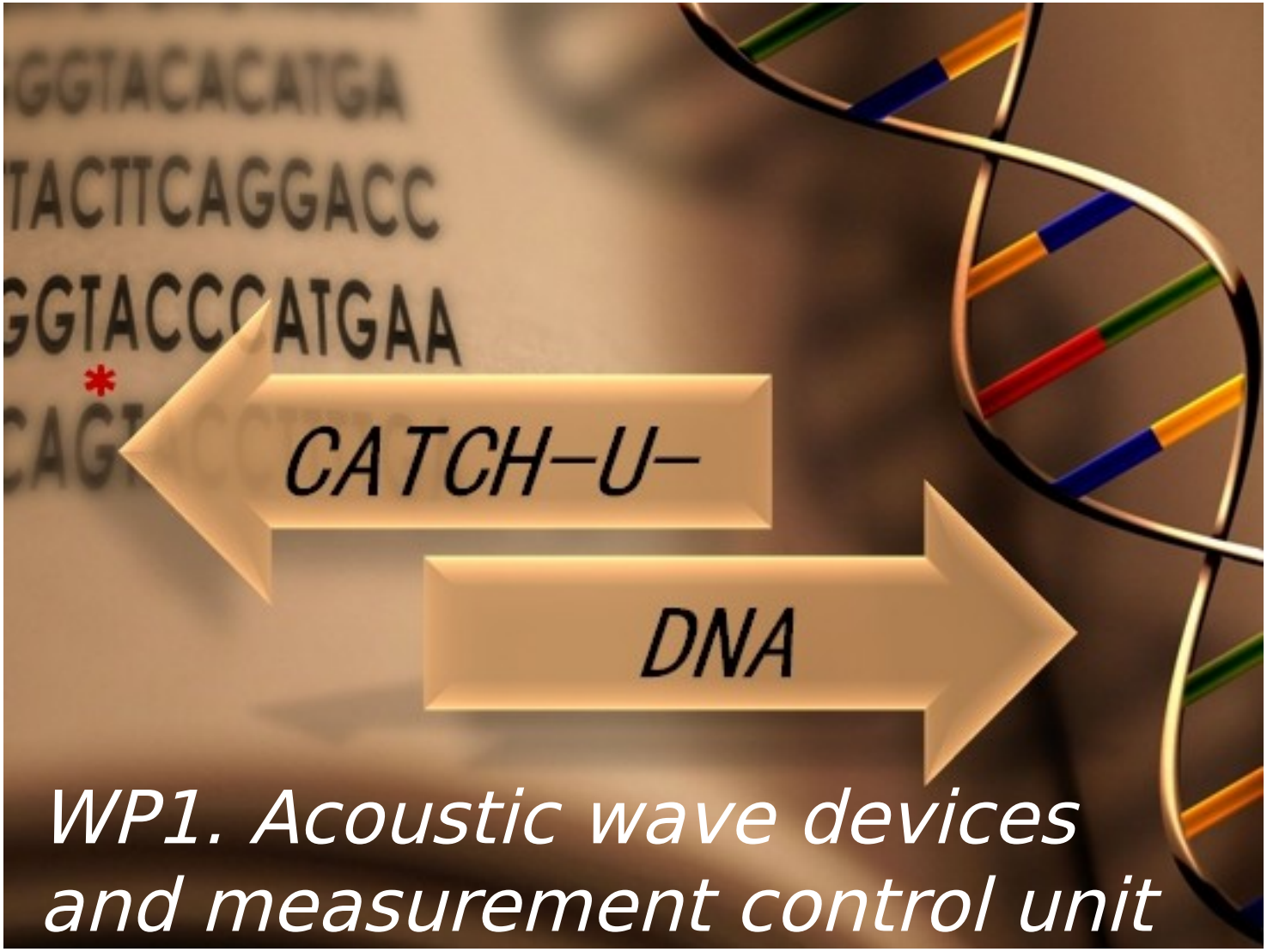


WP1. Acoustic wave devices and measurement control unit

AWSensors
Scientific Technology

Outline

1. Objectives
2. Main achievements
3. Future plans
4. List of deviations, delays or other problems
5. Questions

1. Objectives

- Chip containing an array of acoustic wave resonators

- Measurement system

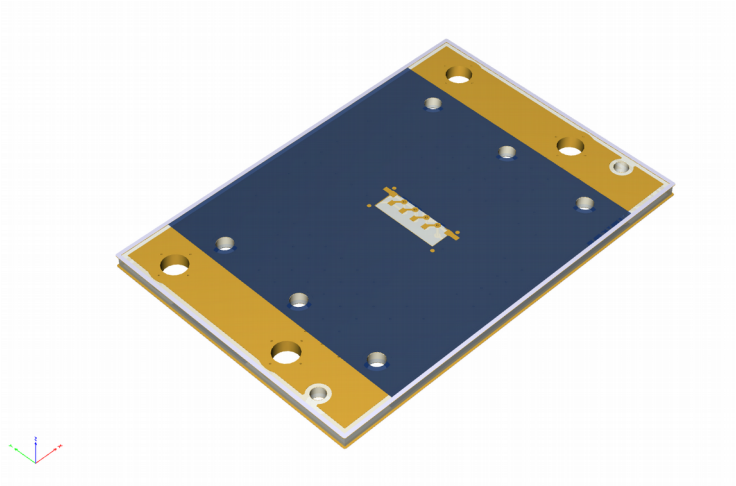
1. Objectives

Workpackage structure

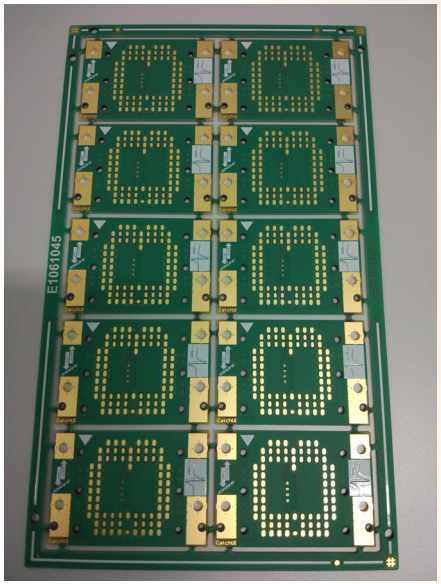
2. Main achievements

SENSOR FABRICATION Task 1.2 (M4-M18)

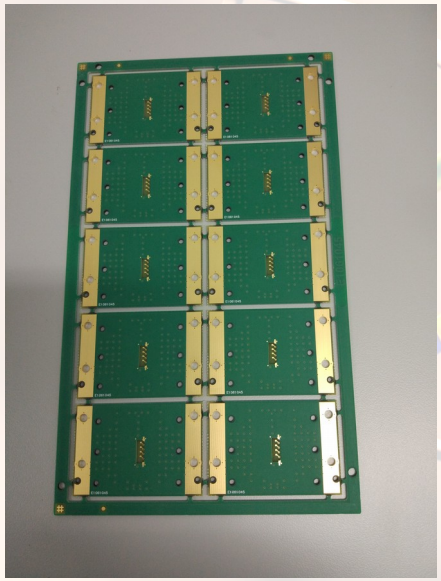
4 sensor HFFQCM array PCB Implemented



Panel Bottom



Panel Top

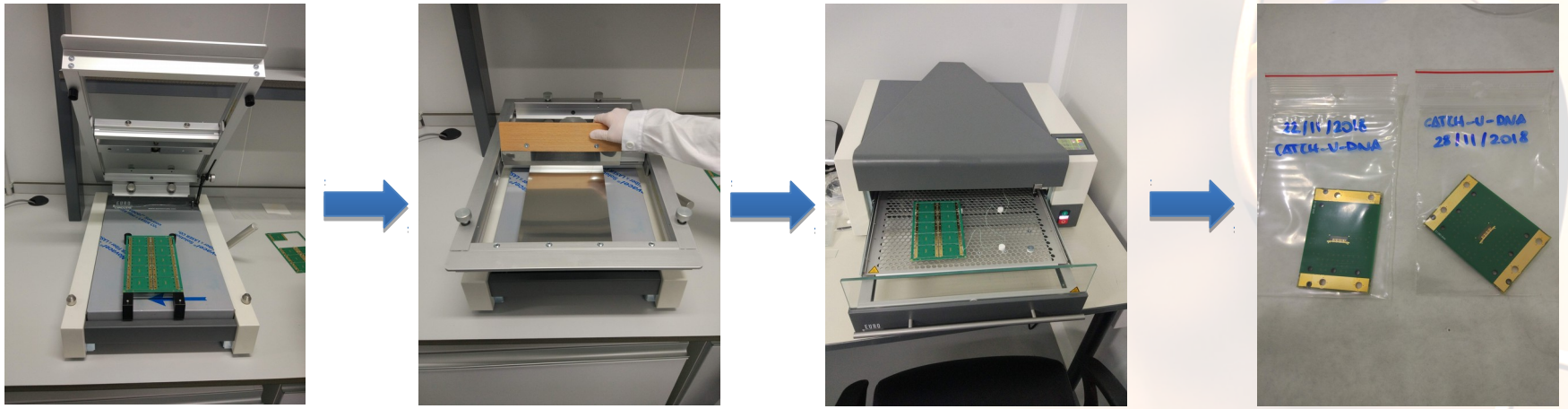


2. Main achievements

SENSOR FABRICATION Task 1.2 (M4-M18)

HFFQCM Array packaging process

Stencil alignment Epoxy deposition Curing step Sensor Assembly



2. Main achievements

HFFQCM Array cleaning process

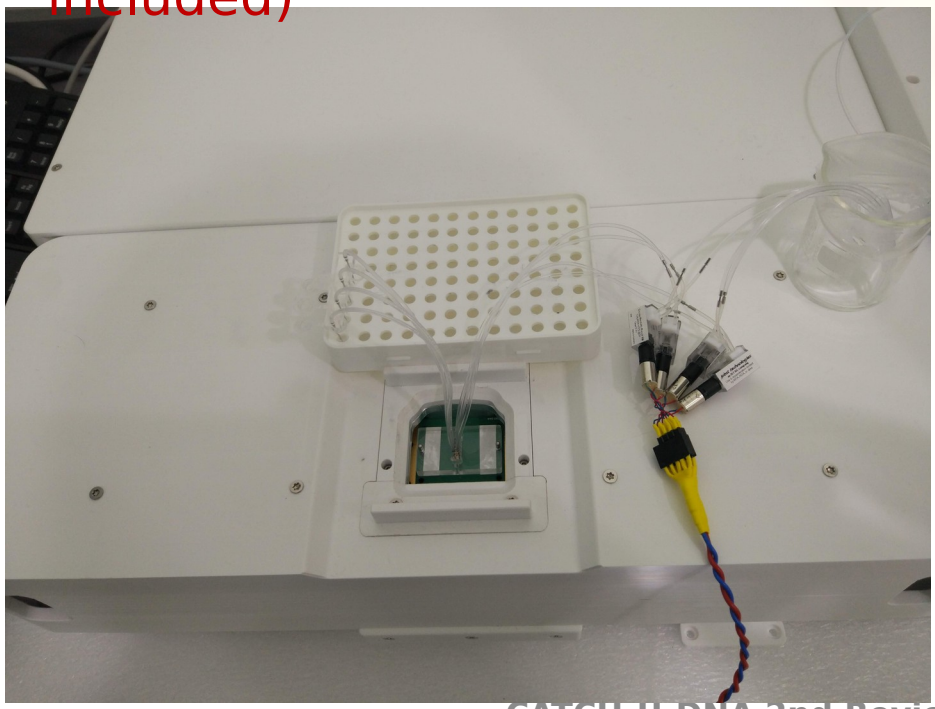
1. Sensor is submerged in SDS (2%) for 30 minutes
2. Sensor is thoroughly rinsed with DI water and dried with nitrogen
3. UV Ozone cleaning (Bioforce) for 30
4. Sensor is submerged in Ethanol (pure) for 30 minutes
5. Sensor is dried with nitrogen

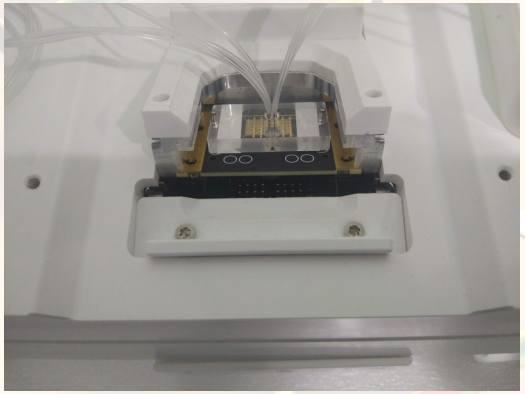
2. Main achievements

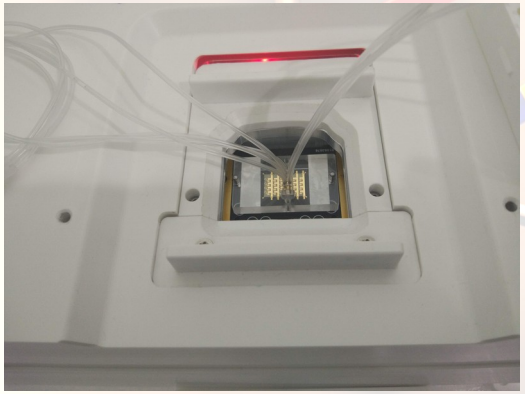
SENSOR FABRICATION Task 1.2 (M4-M18)

Pre-prototype system released

Preliminary setup (New characterization method not included)



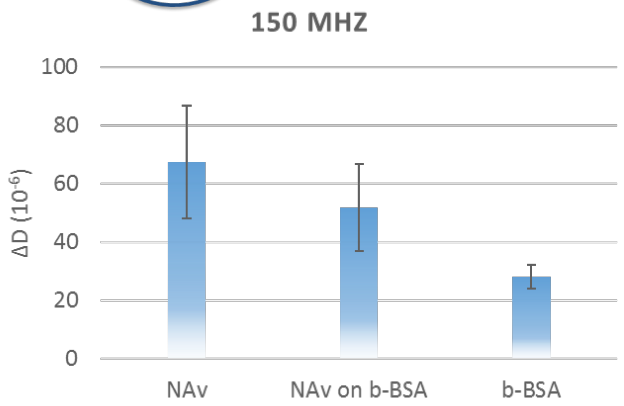


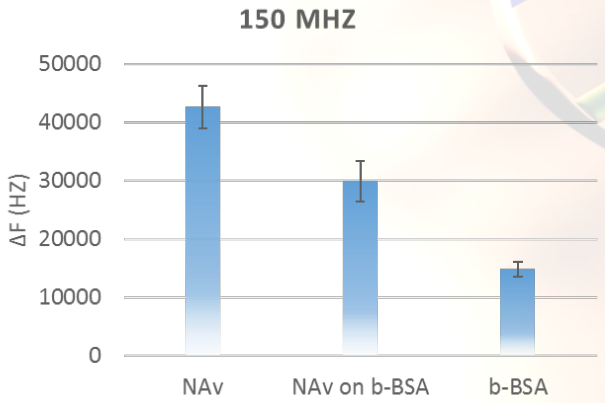


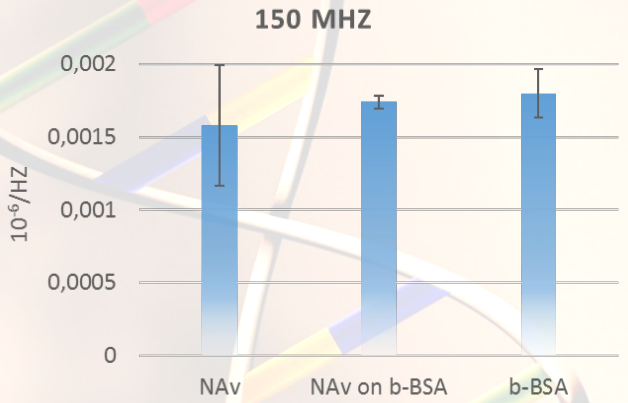
2. Main achievements

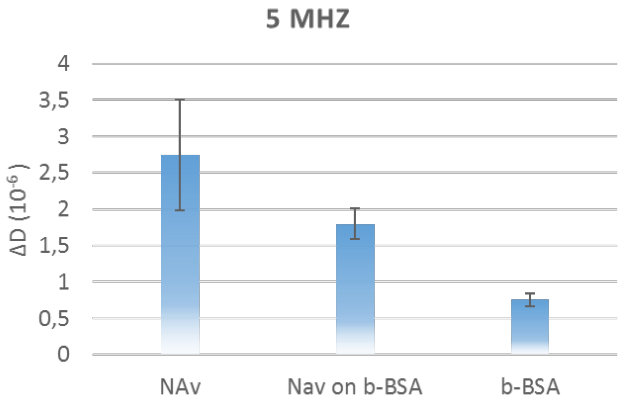
SENSOR FABRICATION Task 1.2 (M4-M18)

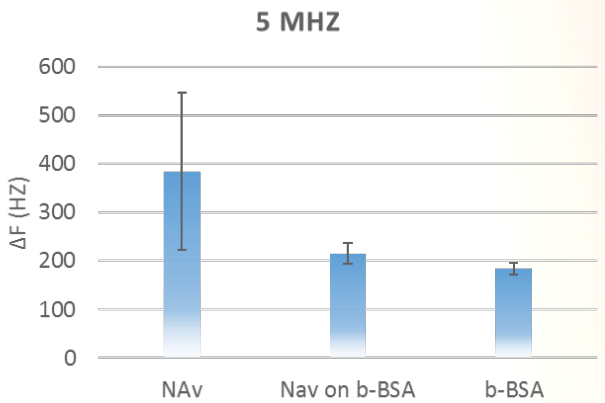
Array testing (Proteins)

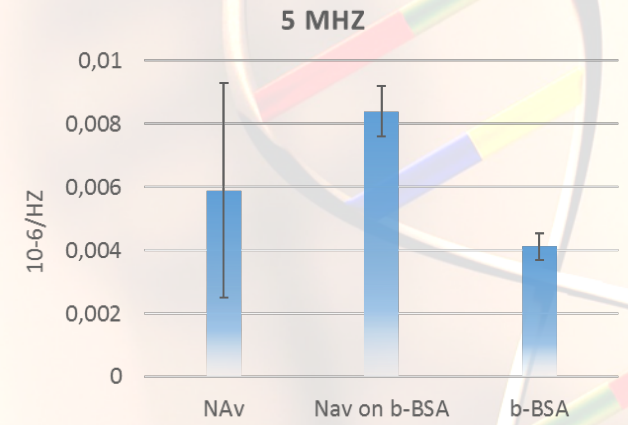










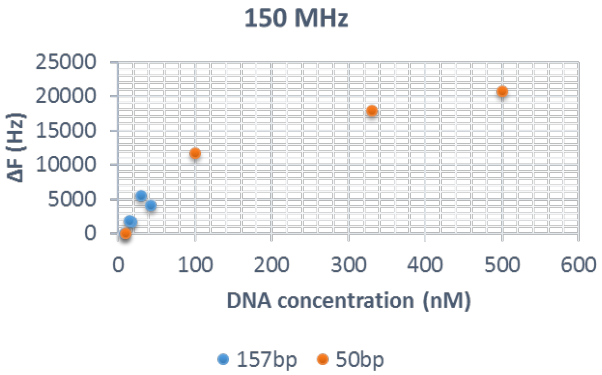


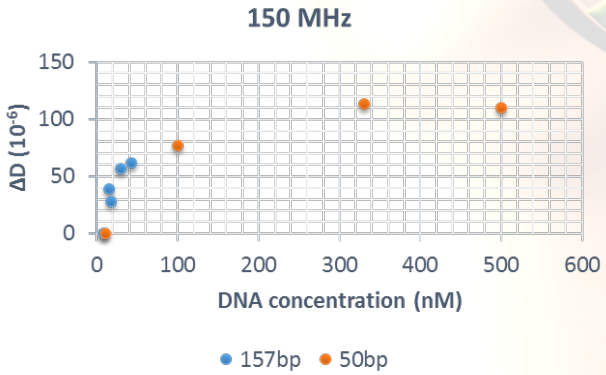
2. Main achievements

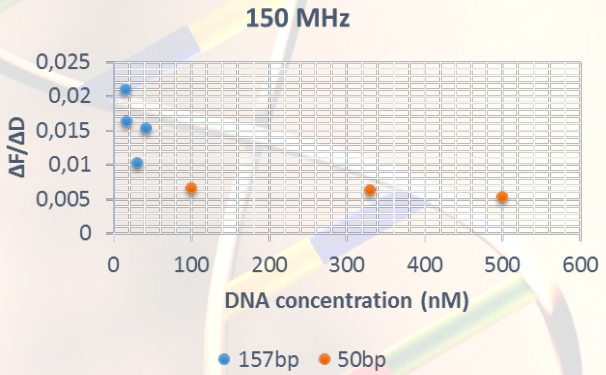
SENSOR FABRICATION Task 1.2 (M4-M18)

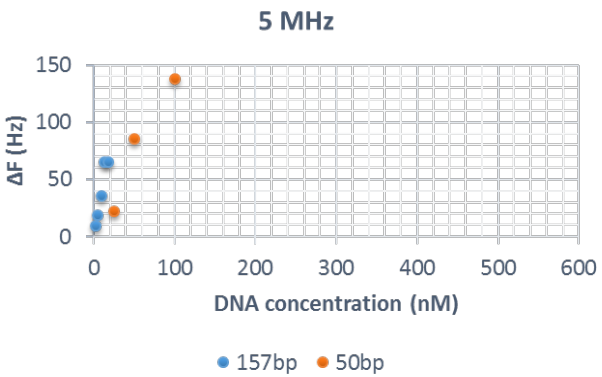
Array testing (DNA)

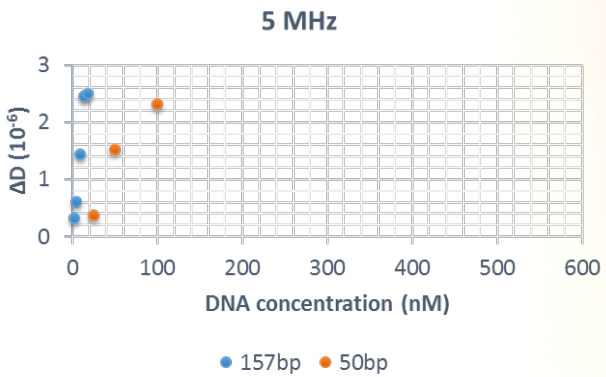
DNA (bp)	5 MHz	150MHZ
50	**5** pmoles/200ul (25nM)	**6** pmoles/60ul (100nM)
157	**0.5** pmoles/200ul (2.25nM)	**0.5** pmoles/30ul (17nM)

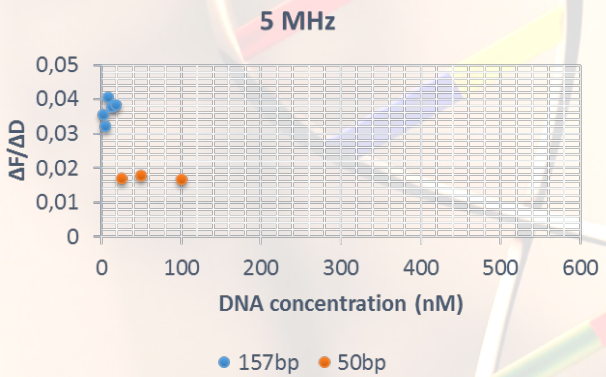








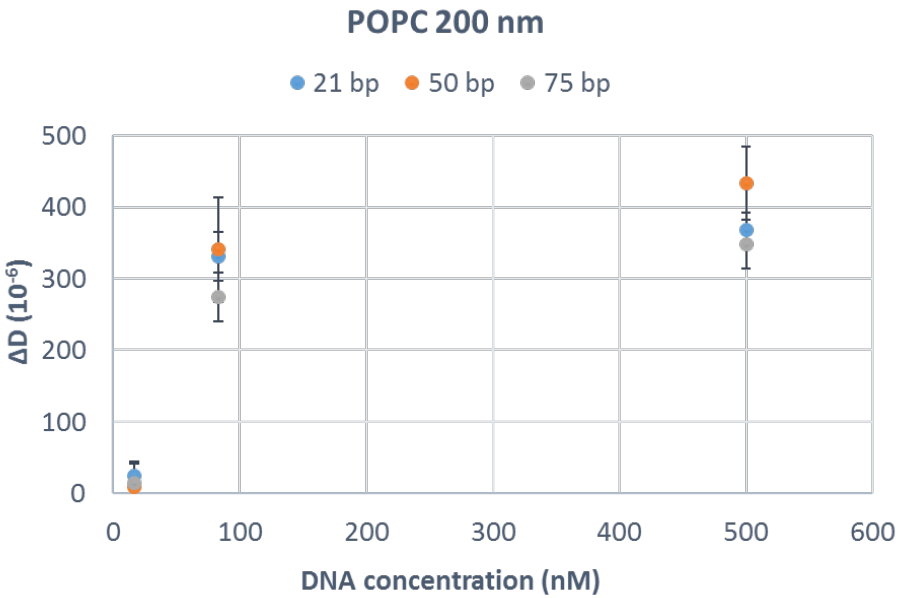


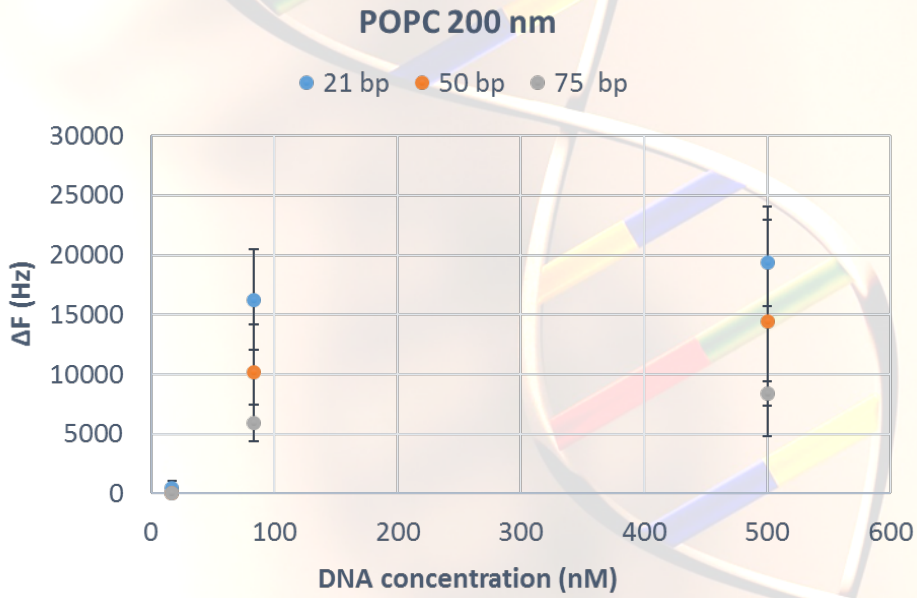


2. Main achievements

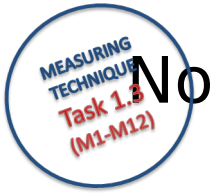
SENSOR FABRICATION Task 1.2 (M4-M18)

Array testing (Liposomes)





2. Main achievements



Novel characterization method

Why?

- Objective: Measure multiple sensor response simultaneously
- Accurate measurement of the acoustic ratio
- Calibration issues (complex electronic interface)
- High stability/Low noise
- Wide operation range (Liposomes)

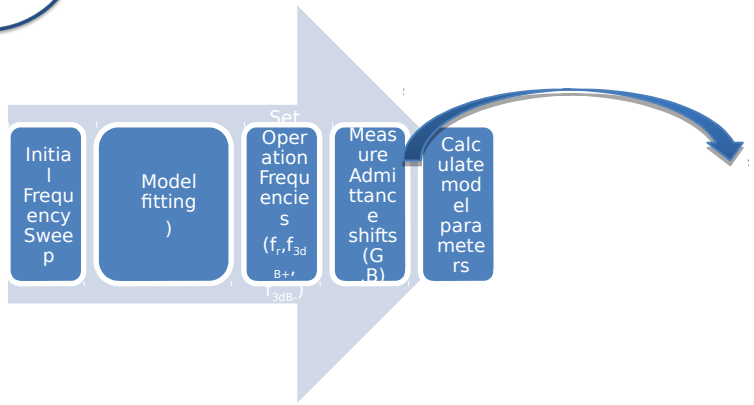
Characteristics & Benefits

- Mixed (Tracking- Fixed frequency) characterization algorithm
- Fast (Multiplexing)
- Accurate
- Wide operation range
- Electrical artifacts considered
- Patent evaluation

2. Main achievements

MEASURING TECHNIQUE Task 1.3 (M1-M12)

Novel characterization method - Definition



Model Parameters:

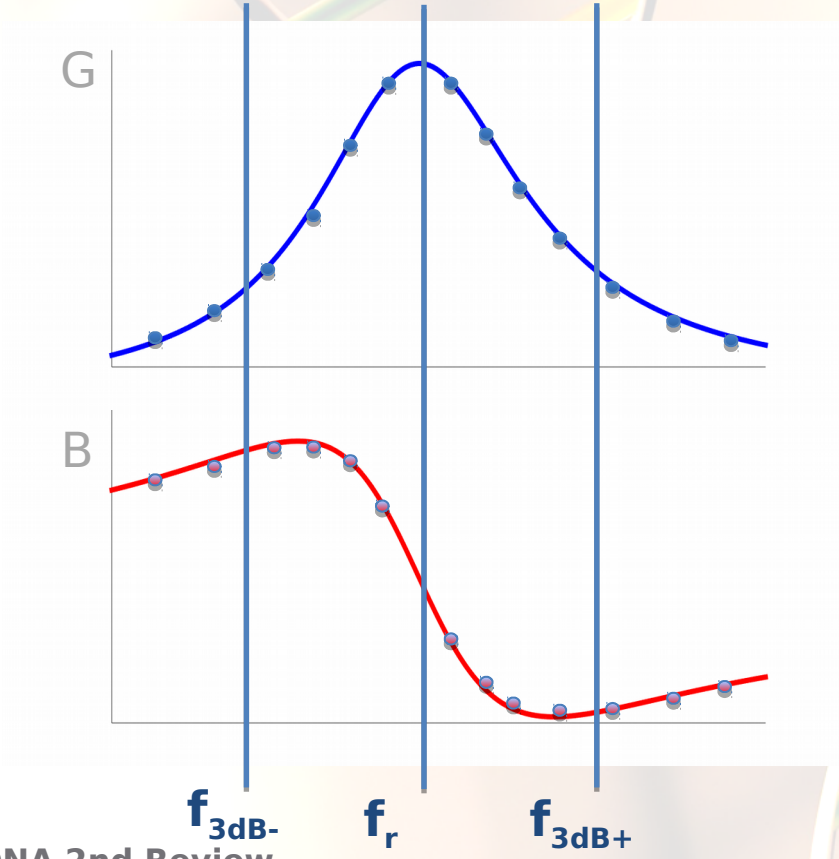
$$f_r, \Gamma, \phi, G_{max}, G_{off}, B_{off}$$

6 unknwons

Approach based on differential calculus:

3 frequency points x 2 magnitudes (G;B) = 6 equations

3 frequency points x 2 magnitudes (G;B) = 6 equations

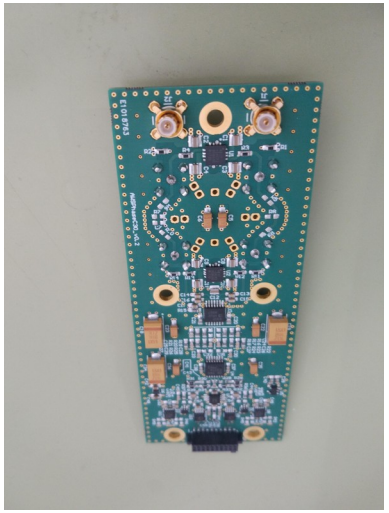


2. Main achievements

Novel characterization method-Implementation

MEASURING TECHNIQUE Task 1.3 (M1-M12)

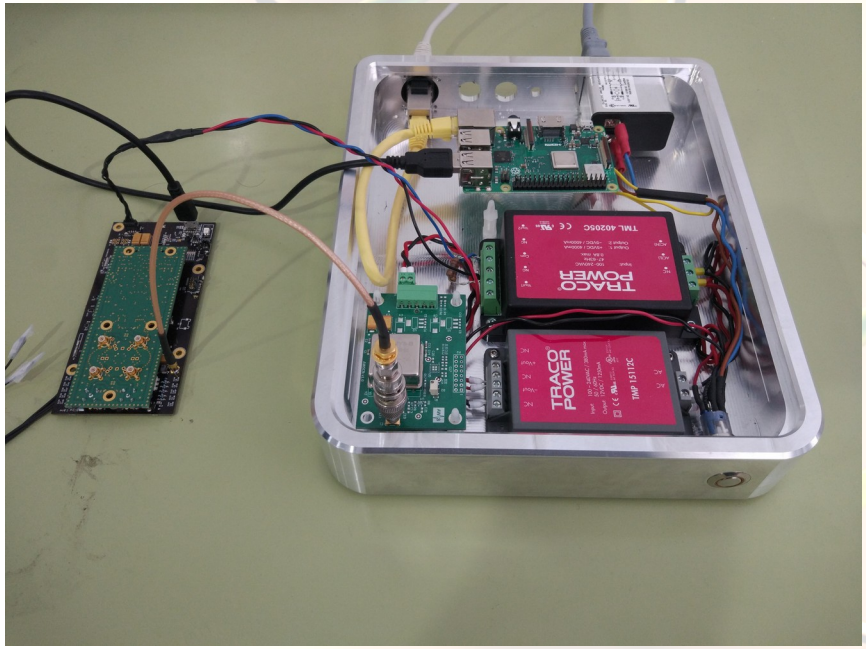
AWSPhase board



- Analog differential measurement interface
- Analog to Digital converters
- Digital acquisition bus

AWSBase board

- DDS Signal generation
- Microcontroller. Real-time operation
- Digital acquisition bus
- USB, Bluetooth, Wifi connectivity



2. Main achievements

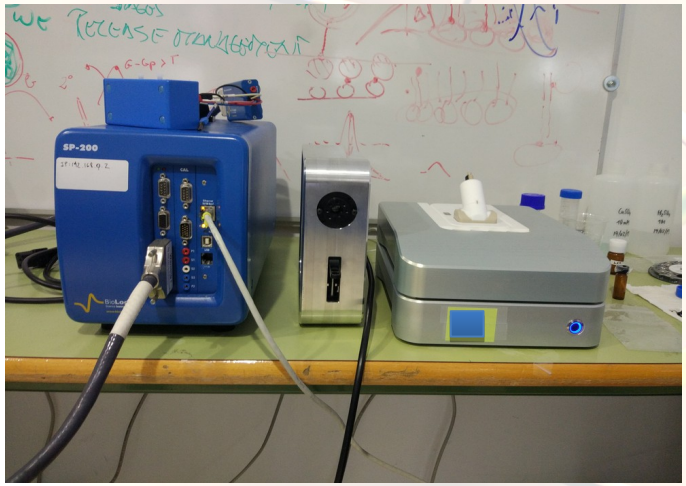
MEASURING TECHNIQUE Task 1.3 (M1-M12)

Novel characterization method-Testing

Multiple sensors

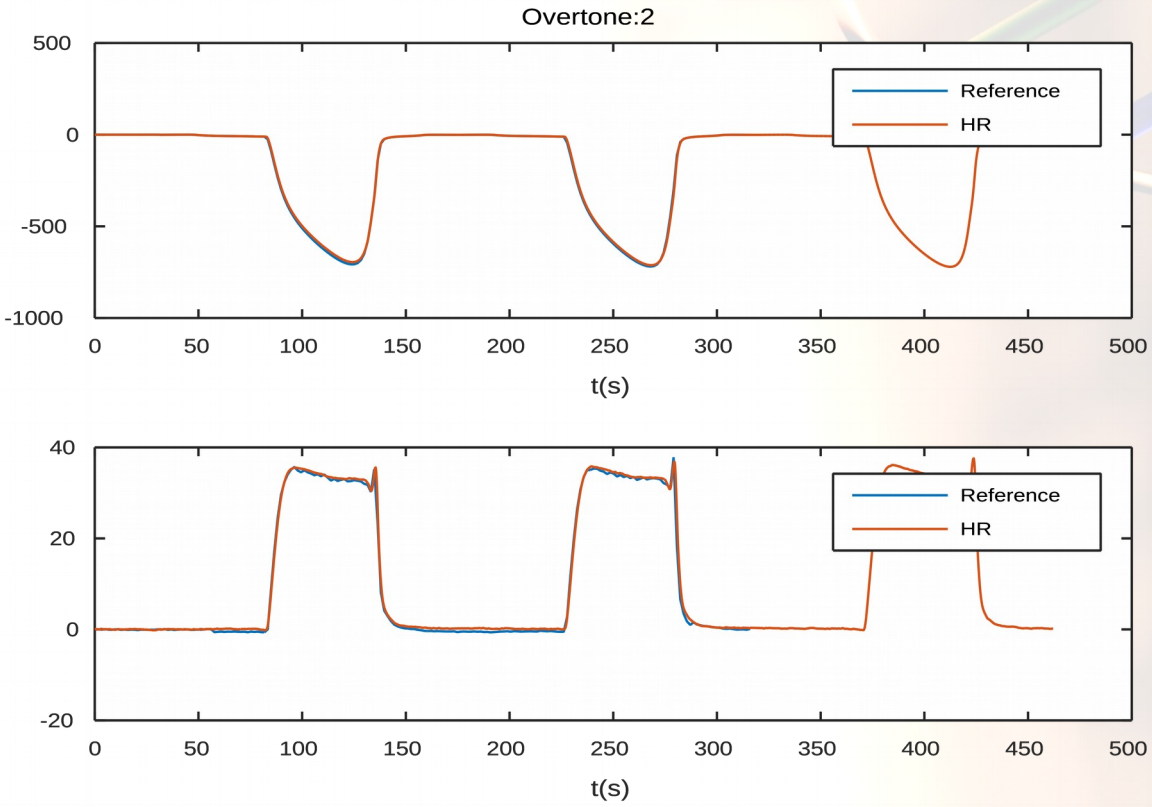
Multiple overtones

Electrochemical/flow Setup



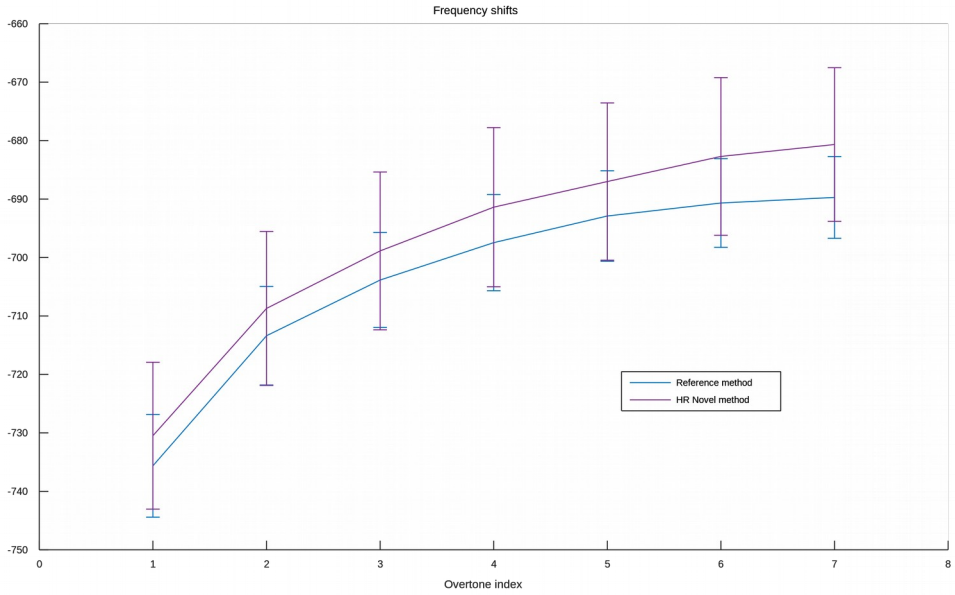
2. Main achievements

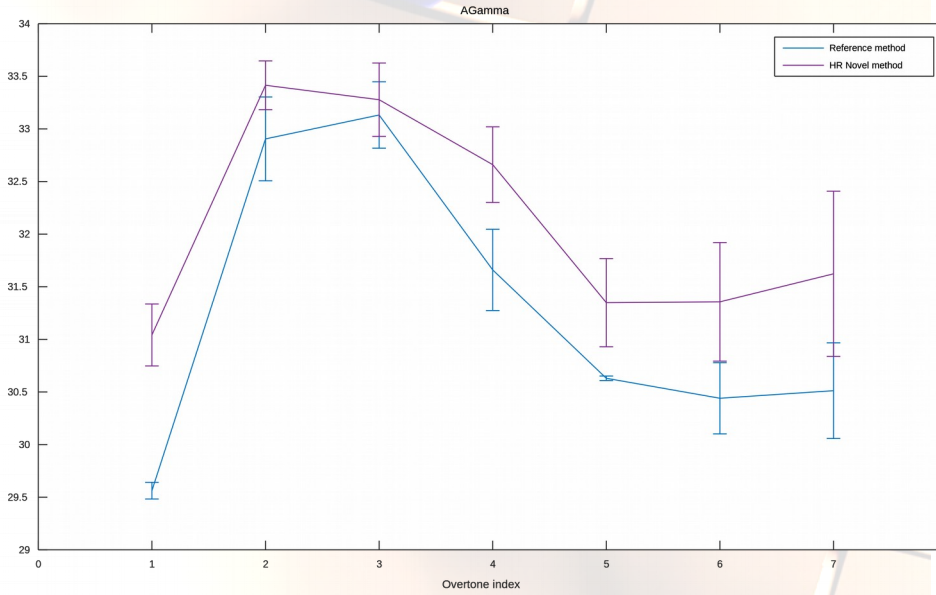
Novel characterization method-Testing results (EQ



2. Main achievements

Novel characterization method-Testing results (EQ

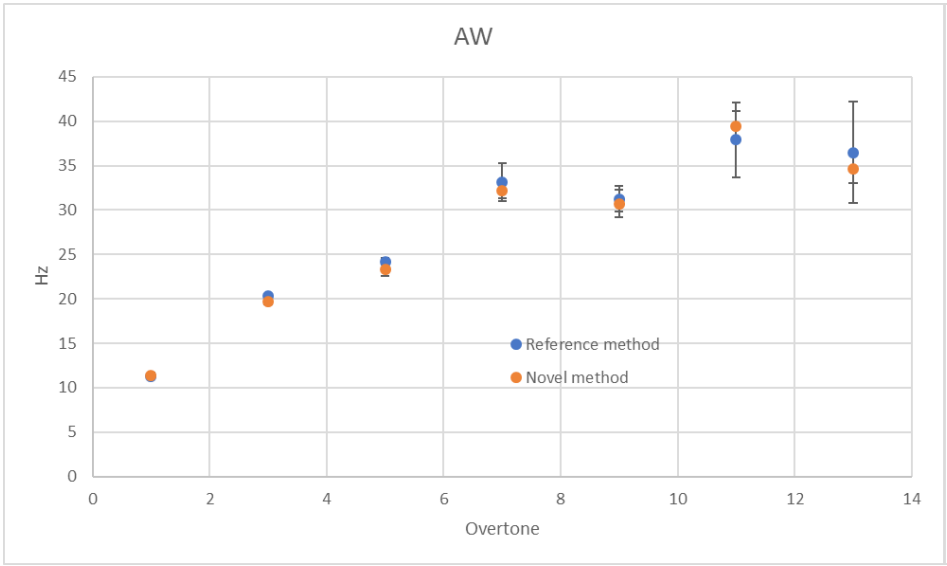


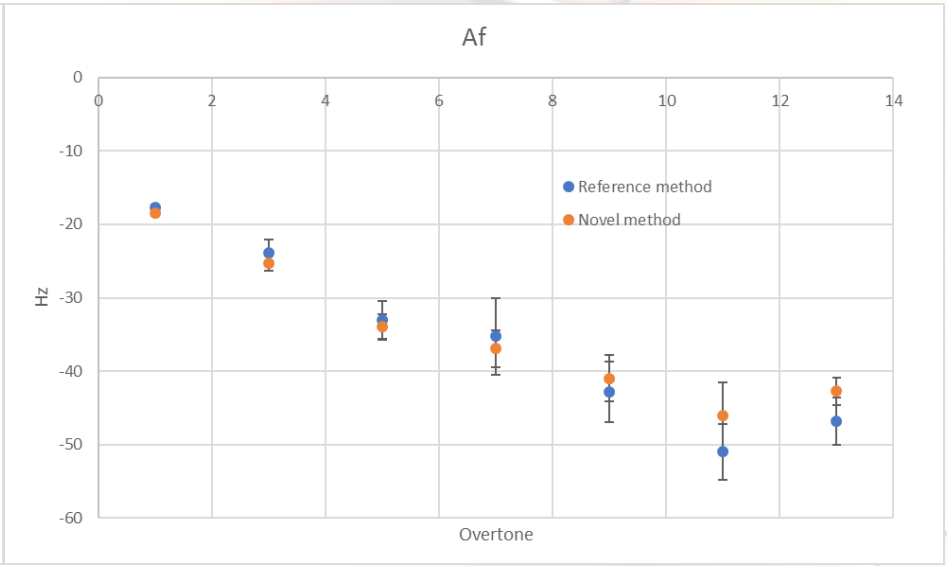


2. Main achievements

MEASURING TECHNIQUE Task 1.3 (M1-M12)

Novel characterization method-Testing results (medium exchange)

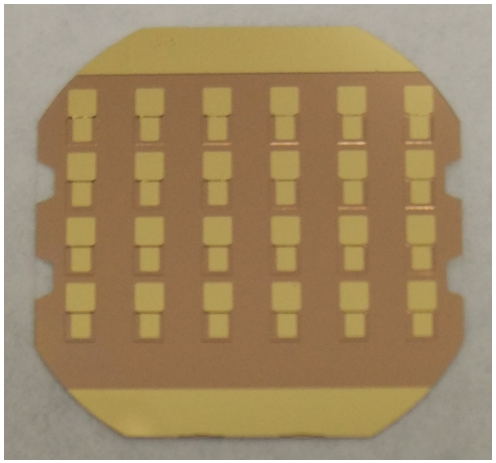




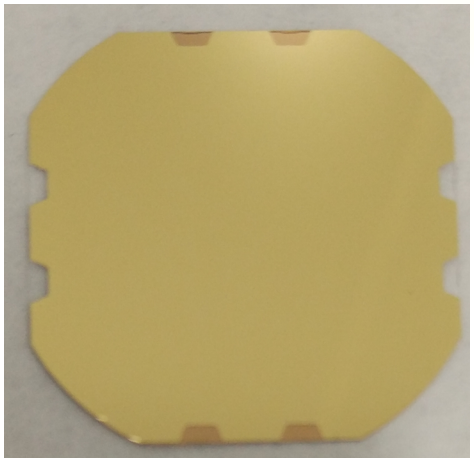
2. Main achievements

SENSOR FABRICATION Task 1.2 (M4-M18)

24 sensor HFFQCM array



Bottom



Top

- @50 MHz
- Two overtone operation (1st and 3rd overtone operation)
- Common top electrode
- AT-cut quartz substrate
- Cr/Au electrodes (5 nm/ 67 nm)

3. Future Plans

- Characterization of the final CUDNA array
- Implementation of final CUDNA assembly
- Optimization of the fluidic setup (WP6)

- Further testing of the novel characterization method
- Instrument prototype implementation (WP6)
- Data post-processing algorithms: Common mode rejection (ICA,CAR, Adaptative filtering…)

4. Deviation, delays and problems

- No significant problems/delays detected
- Deliverable 1.2 delayed (4 weeks)
- Deliverable 1.3 delayed (5 days)

5. Questions

Thank you!