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IronIC++ NTF

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# *IronIC*++ System: Continuous Monitoring for ICUs

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

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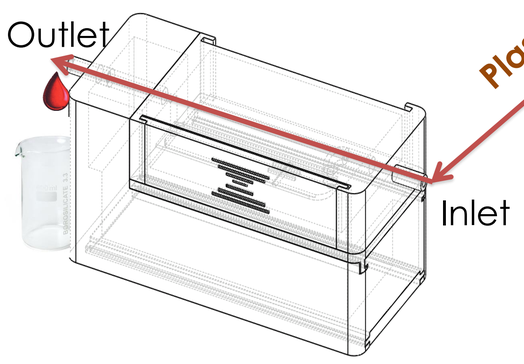
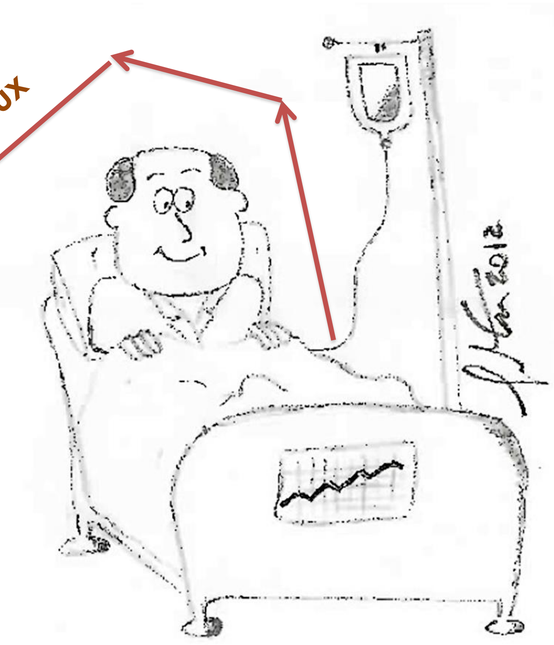
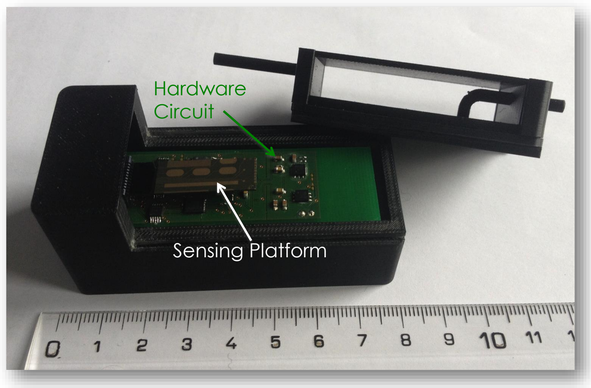
## 1. INTRODUCTION

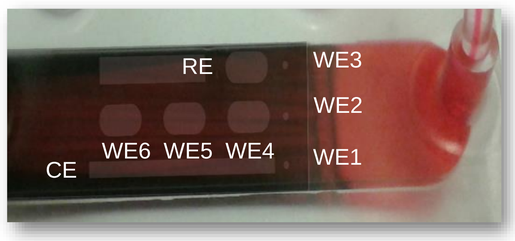
Continuous monitoring for Intensive Care Unit (ICU) patients is a key factor for an appropriate and immediate medical intervention when necessary. Therefore, extremely important for the patient safety. We want to present a smart portable device that can act as a non-invasive fluidic feedback containing biosensors for metabolites and ions detection in flux. It is powered by an embedded rechargeable battery. All the measured data are sent *via* Bluetooth® to a tablet or a smartphone where an user-friendly Android interface offers a clear display and data processing.




Microfluidic System





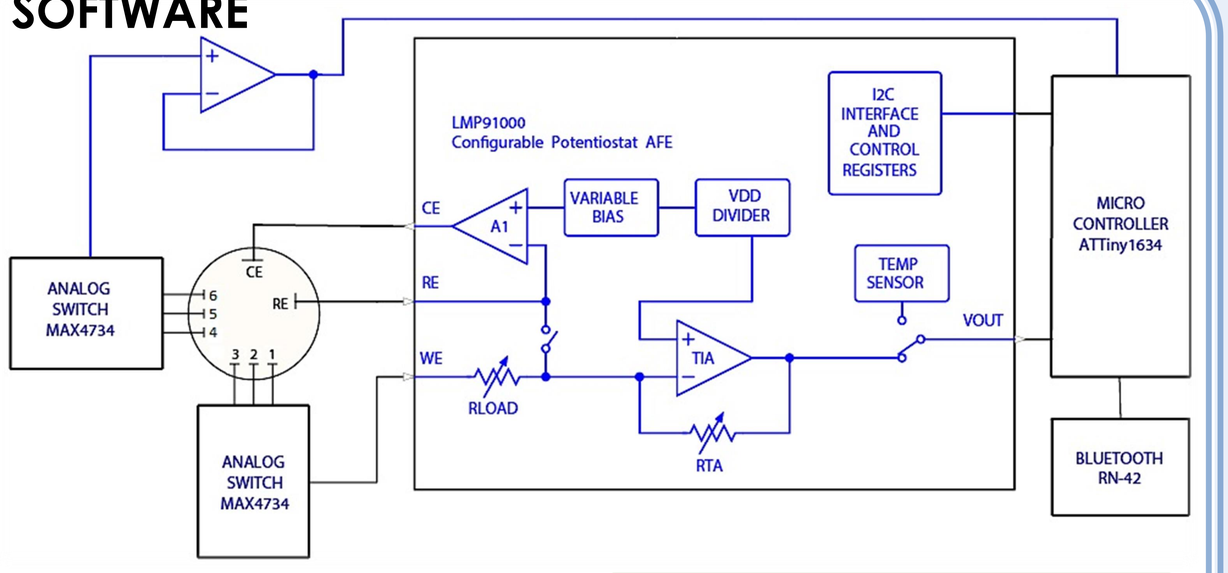



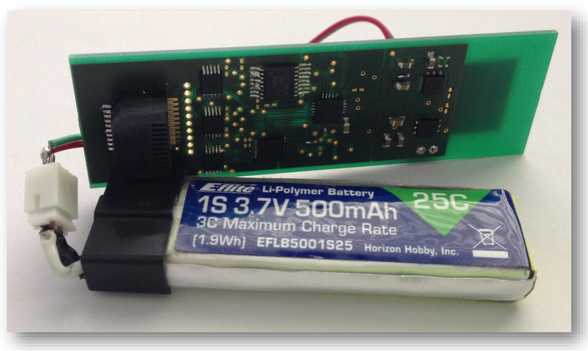

**3D printed case embedding the µ-fluidic chamber** in epoxy matched with the platform and the PCB.
To prevent cross talk phenomenon:
•a laminar flow regime was achieved by studying the chamber design and providing an inlet rate flow of 13 **µl/min**
•two printed walls were introduced between WE1, WE2, and WE3.

## 2. HARDWARE & SOFTWARE

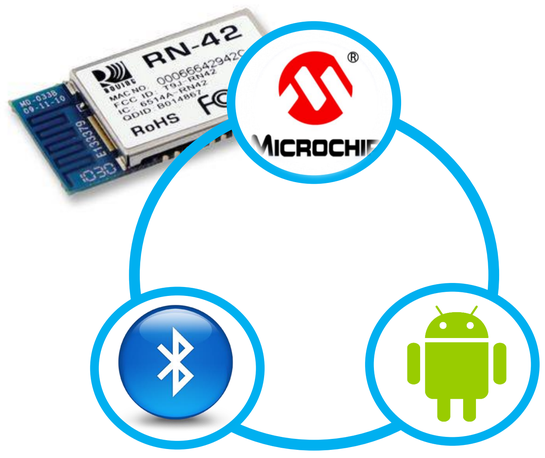
PCB is composed by:
•a **mixed signal integrated circuit *LMP91000*** provided by *Texas Instruments*, which contains three main parts:
1. Potentiostat
2. Transimpedance amplifier
3. Digital I²C (Inter-Integrated Circuit) interface

•a **microcontroller *ATTiny1634*** by *Atmel* which provides all commands and A/D conversion
•*a Roving's* **Bluetooth® module *RN-42*** sends all data to a tablet or smartphone
•an analog **multiplexer *MAX4734*** to select the WEs
•a 3.7V Li-Po **battery** for power supply



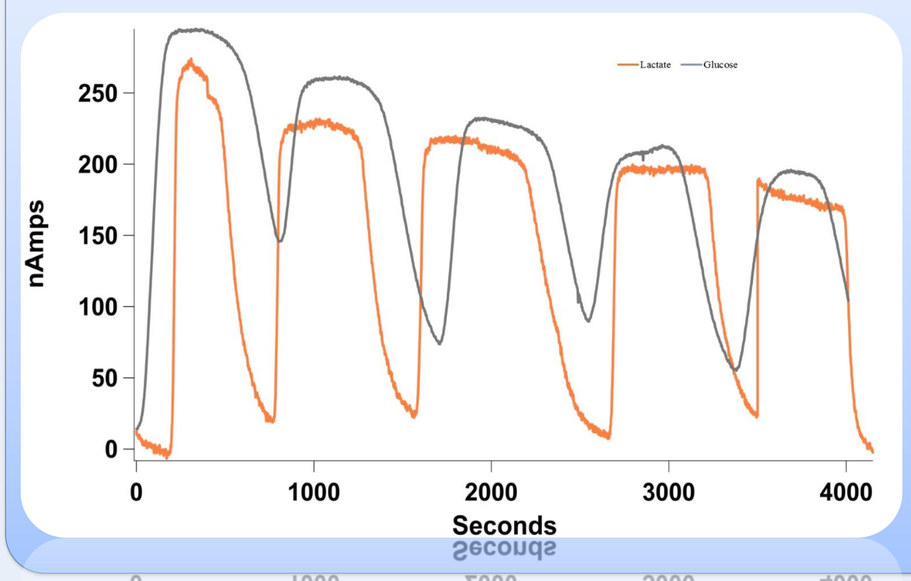








**Android interface** allows the user to:
1. have a continuous display of the measured data
2. set some hardware parameters and WEs
3. calibrate the sensors
4. open previous measurement results stored in the memory of the device

## 3. RESULTS




CAs for glucose (**grey**) and lactate (**orange**) concentration range 9 mM -1 mM with step of 1mM

## 4. ONGOING EXPERIMENTS


Open potential measurement of Sodium concentration range 0.01mM-10mM with step of one decade

***Acknowledgment***
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***Publications***
***F. Stradolini et al.,* Android Interface for Wireless Monitoring of Endogenous and Exogenous Biomolecules, in preparation.**
***F. Basilotta et al.,* Continuous monitoring of metabolites in a 3d printed microfluidic chamber with an Android interface, in preparation.**