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Wireless sensor node

With some months to go before the InComEss project can be wrapped up, it is gratifying to see that the team of experts has delivered significant results. In the frame of the project, an ultra-low-power Wireless Sensor Node was developed to demonstrate the capabilities of the novel piezoelectric and thermoelectric generator materials. Achieving this objective requires a great deal of effort not only for consumption measurement but also to identify and optimize where energy is being spent.

Consumption measurements were performed using the amperemeter Power Profiler Kit II, as shown in Figure 1, which features a logic analyzer that is used to record traces of the internal program. This makes it possible not only to calculate the overall energy expenditure but also to sort it out into multiple segments that directly correspond to distinct tasks or portions of the source code. Therefore, an energy profile is constructed, allowing developers to practice energy-aware programming and to focus optimization efforts more effectively.

Measurements are automated using the amperemeter software and Python scripts alongside several electronic equipment such as relays and LabJack data acquisition tools to reduce the testing time, allowing many more tests to be performed thus, increasing the statistical significance of the results.
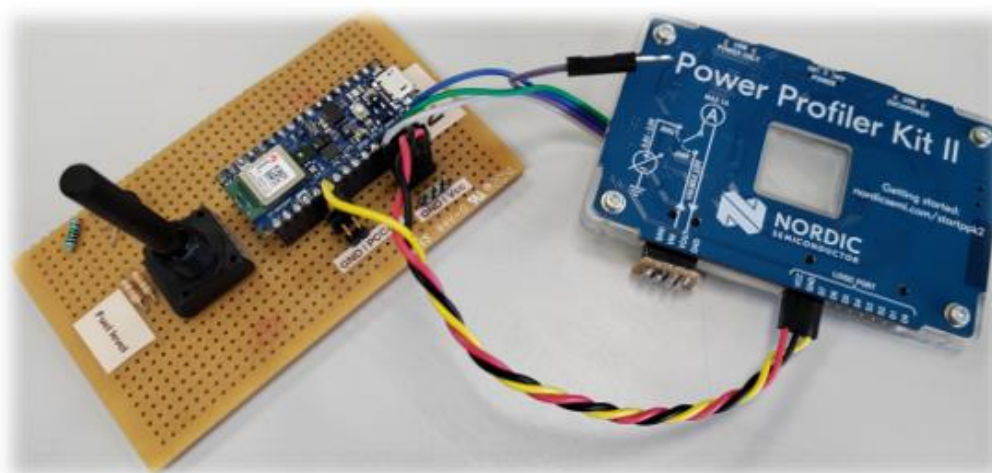

Figure 1: WSN prototype partially attached to the amperemeter.

As an example, one such consumption profile is presented in the next two figures below, with only a few states for simplicity. These states are:

- **SETUP**: Initialization of the base hardware in the WSN.
- **SENSE**: Sensor measurements.
- **SETUP_BLE**: Initialization of the Bluetooth transceiver.
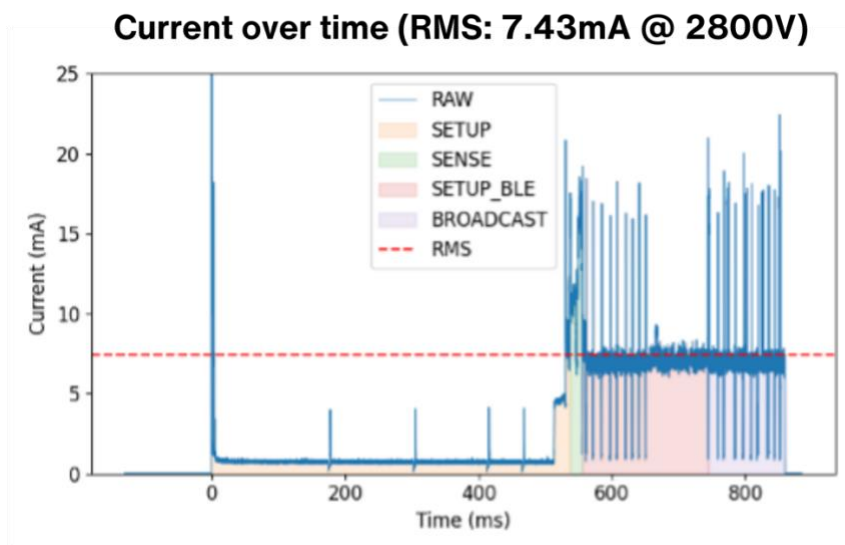- **BROADCAST**: Wireless data transmission.

Current over time (RMS: 7.43mA @ 2800V)

Figure 2: Consumption profile as current over time with color coded states
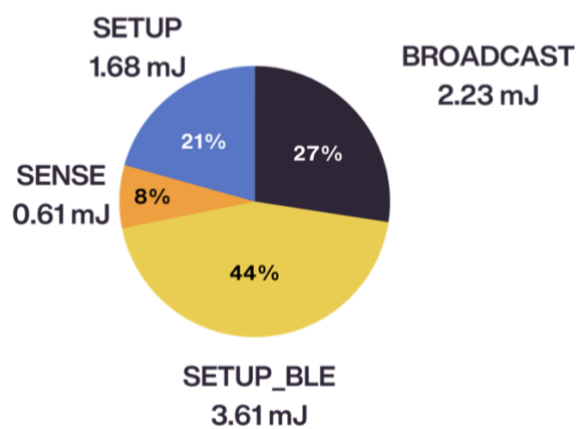
Consumption by states (Total: 8.21mJ)

Figure 3: Relative consumption by states

If you are interested in exploring a more detailed version of this topic, including a thorough analysis of the current state of the art in energy harvesting, please visit the news section of the InComEss official website here.

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Details

Project title: INnovative polymer based COmposite systeMs for high efficient Energy Scavenging and Storage

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For additional information please contact

Project Coordinator: AIMEN
Cintia Mateo | cintia.mateo@aimen.es

Dissemination & Communication Manager: Core Innovation
Ilia Kantartzi | ikantartzi@core-innovation.com