

**Internship in Electrical Engineering**

<b>Supervisor</b>	Prof. Dr. Sandro Binsfeld Ferreira
<b>Project</b>	<b>Radio frequency integrated circuits, electromagnetic compatibility, and IoT</b>
<b>Description</b>	<p>Temperature is one of the most critical factors for the quality and safety of heat-sensitive products, such as food and medicines. Annually, about a third of the global production of fruits and vegetables is discarded due to the loss of quality. Much of this waste is due to improper handling along the production and distribution chain. In the case of biological medicines such as vaccines, the requirements for temperature control and monitoring are even greater since these products can totally lose their effectiveness with small temperature fluctuations.</p> <p>In order to ensure efficacy, quality, safety and waste reduction, it is essential, therefore, to control and monitor the temperature from production, through storage and transportation to the consumer, which is known as “Cold chain”. The monitoring of temperature in products sensitive to heat along the cold chain can be performed by packaging or smart tags containing time and temperature sensors (ITT).</p> <p>The solution proposed in this project is to implement a low consumption sensor network in a star topology using wireless communication protocol. In order to enable the low consumption of the sensors, the sampling rate necessary to monitor the temperature is defined in order to minimize the consumption of the data communications interface, prolonging the life of the battery or energy stored in a super capacitor. The energy required for communication is provided by an energy harvesting sensor and wake up receiver designed in CMOS technology especially for this purpose. Temperature sensors are mounted on labels using SiP (System-in-Package) technology in order to facilitate integration and cost reduction.</p>
<b>Tasks</b>	<ul style="list-style-type: none"> <li>- Learn the basic concepts in RF modeling using the software AWR Microwave Office from Cadence Systems;</li> <li>- Characterize and model energy harvesting and wake up receiver circuits off-the-shelf and developed by the Research Group;</li> <li>- Model system-in-Package systems using AWR;</li> </ul>
<b>Requirements</b>	Basic RF concepts, simulation, and operation of RF measurement equipment
<b>Language Skills</b>	English (Portuguese would be nice, but is not necessary).
<b>Duration</b>	4-6 months
<b>Possible Beginning</b>	February/March or July/August.
<b>Credits</b>	According to agreement
<b>Payment</b>	None