Expression of Interest
Euripides Forum Graz
ULP RF SoC
RF Architecture & Design Integration

Eric Mercier (eric.mercier@cea.fr)
Project leader / Deputy Lab. Head
Low-Power Short-Range RF - Vision

- **Standard-based Solutions**
  - Home Automation / Energy Management / Metering
    - IEEE802.15.4 / ZigBee
  - Fitness & Wellness
    - *BlueTooth* low energy
  - Medical Care IEEE802.15.6
    - Implants / Wearable / Equipments

- **Driven by the application**
  - RF viewed as a feature of a more complex SoC
  - More integration / shorter time-to-market
    - Bottom-up approach / Benefit from Léti’s techno developments

.... and still less Power Consumption
Ultra-Low Power RF – flexibility

- Technology push
  - From 130-nm to 65-nm & beyond
  - Benefit from natural down-scaling
    - Better Active Modes consumption
    - Make use of more digital process
  - More active blocks integration – less passives

- Versatility & reconfigurability
  - Adopt a digital-oriented architecture
  - Block performance related to the Overall Front-End context
  - Reduce drastically the average power consumption

System-level study of constraints split over the RX chain
Ultra-Low Power RF – fully digital

- Full-digital front-end
  - Only the LNA as pure analog block
  - ...followed by quantization/sampling process
  - Very efficient in terms of Integration & Portability

- Low-Power consumption
  - Power consumption mainly driven by clocks
    - Quantization process does not use clocks
  - Natural flexibility through digital base band process
    - Easy reconfiguration / power consumption tuning of the process
Ultra-Low Power RF – BandPass Sampling

- Band-Pass Sampling
  - Scalable Filtering strategy for low-power
  - ...but high-end solution can be envisioned
  - Very digital-oriented

Band-Pass Sampling RX architecture

Sampler and its associated FIR/IIR filtering stages

Sampler and filter buffer interface en 65 nm
Low Power RF – a sum-up

- Versatility & easy portability
  - Digital-oriented solutions
    - Continuous-Time process with quantization
    - Discrete-Time process with sampling
    - Digital filtering...
  - Avoid on-chip inductors

- Low Power
  - Benefit from technology down-scaling
  - Balanced split between analog & digital
  - Adaptive front-end and cross-layer interaction

- Partners required to implement the complete RF Front-End
  - Transmitter + Synthesizer + Receiver
  - Applications requiring low power consumption / energy harvesting
  - Implementation of Wake-Up receiver for very low power RF scan