

## Licensing Opportunity

### Ultra-low power wake-up receiver for location aware objects operating with UWB



#### Application

Mobile devices using ultra-wide band (UWB) technology for communication and localization benefit from an improved energy efficient receiver system. Battery and therefore system lifetime are extended. The novel always-on receiver has microwatt power consumption and microsecond latency in picking up communication.

#### Features & Benefits

- Optimized performance in power demand (low power) and sensitivity (longer range)
- Supporting 802.15.4-2011 UWB standard protocol
- Point-to-Point Two-Way Ranging (TWR)

#### Publications

- Patent pending

#### Background

Radio communication is a power-hungry task as the radio receiver is kept in listening mode, waiting to receive. This is a major drawback for mobile devices, which rely on a limited battery-powered energy supply. A work-around is duty cycled listening, which periodically scans for incoming data packages. For some applications like UWB navigation and localization the duty cycled listening is a poor compromise as it causes unwanted latency in the system response and still wastes energy due to listening for messages.

#### Invention

A microwatt power receiver system has been invented, which combines two subsystems: a fully functional UWB transmitter for the bi-directional data transfer for distance measurements or high data rate message exchange, and a low power wake-up receiver. Both subsystems share a common antenna. When inactive, the UWB transmitter is set to sleep, while the wake-up receiver remains always-on and continuously listens for a trigger signal. The wake-up receiver analyses the content and when the received signal is a wake-up command, the UWB subsystem is powered up with only a negligible delay. Any commercial UWB transceiver can generate such a trigger signal without any hardware modification. Prototypes have been built, both with off the shelf commercial components and as an integrated solution at 65nm CMOS. The wake-up receiver consumes only 2 microwatts for continuous listening at a sensitivity of -45 dBm (discrete prototype), or 56 microwatts at -84 dBm (CMOS prototype) which translates to over 20 meter scanning range. The trigger signal can also be encrypted to improve the security and wake up the main radio with authorized devices only.

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#### Reference 2020-061

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#### Technology Readiness Level

