

Next-gen High-Precision Low Power Ultra-Wideband

Imec pioneers ultra-wideband (UWB) impulse radio (IR) technology for IEEE 802.15.4a/z compatible products including new features defined in the next-gen IEEE802.15.4ab std, which require enhanced high-precision and secure distance bounding, and agile spatial awareness capabilities based on 2D/3D precise wireless distance measurement and advanced radar sensing.. Imec's ultra-low power (ULP) circuit solutions offer 10x lower power consumption (<15mW Tx, <25mW Rx) than state-of-the-art products. Advanced localization algorithms to achieve 5x improved accuracy in challenging environments (one-cm level). Based on imec's >15-year R&D track record on UWB technology, imec offers partners a wide portfolio of hardware, algorithmic, and software IP

Applications

- Secure Access for Digital Car Key
- Radar sensing (in-cabin child presence detection, CPD)
- Indoor Location and Asset Tracking
- VR/AR Gaming
- Hospital 5.0
- Industrial Micro-location - Robotics, drones
- Secure Mobile Payment



Imec UWB offering

Imec's **UWB technology offering** comprises a wide range of available **whitebox hardware and software IP**, as well as expertise in hardware (integrated circuit, PCB demonstrators, antenna) and software (system to physical-layer algorithm) design.

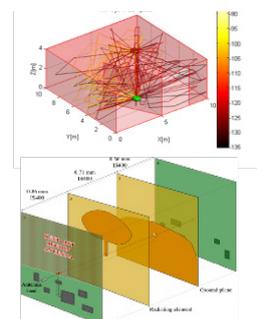
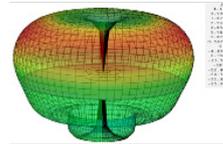
- **Whitebox system and application IP and demonstrators**, e.g., multi-anchor UWB localization demo, in-warehouse drone-based inventory inspection demo, in-cabin radar sensing for live-objects detection, using IMEC prototypes as well as commercially available UWB chips.
- **Ranging (distance measurement) and direction finding (DF) algorithms for improved multi-path resilience** and to achieve **best-in-class performance**
- **Advanced localization algorithms including neural networks for smart anchor selection**, particle filtering and sensor fusion techniques to achieve cm-level accuracy in challenging environments (2x improved in warehouse scenario). **Secure Distance Bounding (SDB)** for prevention of relay attacks
- **Advanced radar sensing algorithms including, robust vital sign detection with body movement reduction, and target classification.**
- Secure Distance Bounding (SDB) for prevention of relay attacks
- **Whitebox silicon IP offering** – analog and digital integrated circuit (IC) designs, layout databases and testbenches (28nm and smaller nodes) - of wireless transceivers and building blocks in both TSMC and GF-FDX
- **Next-gen UWB transceiver** – cm-accurate, **ultra-low power** (<5mW Tx, <25mW Rx) and small area (<1mm² for complete transceiver front-end including three Rx)
- **Supporting IEEE 802.15.4z UWB**, basis for high-impact industry consortia such as the **Car Connectivity Consortium (CCC)** and **Fine Ranging (FIRA) Consortium**
- Supporting next-gen **IEEE 802.15.4ab UWB** features including advanced **sensing** and narrowband assist (**NBA-**) multi-millisecond (**MMS**) channel sounding
- Building blocks for UWB systems, e.g. RF front-end,

all-digital **phase-locked-loops (ADPLL)**, wakeup timers, timing references, **analog-digital-converters (ADCs)**, complete digital baseband (modem)

- Access to **proof-of-concept integrated circuit (IC) implementations** and **ranging/direction finding & localization** (e.g., TWR and radar sensing) **demonstrators** including imec algorithms and 3rd-party MAC / SW stack (3rd party)
- **Expertise** in RF/analog, digital design, system and algorithm, protocol design, security & distance bounding against relay attacks, embedded software design for partner's custom UWB designs
- Expertise in **antenna design** – General purpose or custom UWB antenna designs. Antenna array design for direction finding / angle-of-arrival (AoA). for both ranging and radar sensing
- Imec participates in **standardization** bodies and industry consortia, e.g., IEEE, CCC, FiR ETSI/FCC and others

Work with imec

- **'White box' IP** licensing and technology transfer, including product design support, of silicon IP (e.g., analog/RFIC circuit design schematics and layout, digital RTL design and testbenches), algorithms and system models as well as demonstrators, HW/SW prototypes and measurement results.
- **Insight partnerships** – Gain early stage insights on latest technology developments via technology concept and prototype evaluation briefs.
- **Development on Demand (DoD)** – Custom R&D for your future product.



FLTR: 1 Circuits, 2 Algorithms, 3 Application demos (i.e., the drone) and 4 custom antenna designs.

CONTACT US
WWW.CONTACTIMEC.COM

This leaflet is carbon neutral printed.

DISCLAIMER - This information is provided 'AS IS', without any representation or warranty. Imec is a registered trademark for the activities of imec International (IMEC International, a legal entity set up under Belgian law as a "stichting van openbaar nut"), imec Belgium (IMEC vzw supported by the Flemish Government), imec the Netherlands (Stichting IMEC Nederland), imec China (IMEC Microelectronics (Shanghai) Co. Ltd.), imec India (IMEC India Private Limited), imec San Francisco (IMEC Inc.) and imec Florida (IMEC USA Nanoelectronics Design Center Inc.).