



# NEXT-GEN HIGH-PRECISION LOW-POWER ULTRA-WIDEBAND

Imec pioneers ultra-wideband (UWB) impulse radio (IR) technology for next-generation products which require secure distance bounding and high-precision, agile spatial awareness capabilities that are based on secure and precise wireless distance measurement or 2D/3D localization. Based on its extensive (>15-year) R&D track record on UWB technology, imec offers partners a wide portfolio of UWB hardware and software IP.

## APPLICATIONS

- Secure access
- High-precision distance measurement
- Indoor localization and asset tracking
- VR/AR gaming
- Mobile payments



| Contactless payment

## 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
  - Ranging (distance measurement) and direction finding (DF) algorithms for improved multi-path resilience and non-line-of-sight (NLOS) versus line-of-sight (LOS) detection to achieve best-in-class localization.
  - Advanced localization algorithms for smart anchor selection, particle filtering and sensor fusion techniques to achieve cm-accuracy in challenging environments, using imec prototypes as well as commercially available UWB chips.
- Whitebox silicon IP offering – analog and digital integrated circuit (IC) designs, layout databases and testbenches (90nm, 40nm, 28nm) – of wireless transceivers and building blocks
  - Next-gen UWB 802.15.4z & 802.15.4a (legacy) transceiver – cm-accurate, ultra-secure & ultra-low power (ULP)
  - Building blocks for UWB systems, e.g. phase-locked-loops (PLL), wakeup timers, timing references, analog-digital-converters (ADCs), power management (PMU), digital baseband (DBB)
- Access to proof-of-concept integrated circuit (IC) implementations and demonstrators including demo protocol / MAC / SW stack of state-of-the-art wireless IP
- Expertise in RF/analog, digital design, system and algorithm, protocol design, embedded software design for partner's custom UWB designs
- Benchmarking – Evaluation of feasibility and performance of UWB, 802.11 WiFi fine time measurement (FTM) and Bluetooth high accuracy (phase-based) ranging in certain scenarios and use cases, for helping imec partners to derive specifications and product prototypes for next-gen UWB products.

- Expertise in antenna design – General purpose or custom UWB antenna designs. Antenna array design for direction finding / angle-of-arrival (AoA).
- Imec participates in standardization bodies and industry consortia, e.g., IEEE, CCC, 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.



Imec IDLAB demo of high-accuracy UWB localization of drones in a warehouse

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