

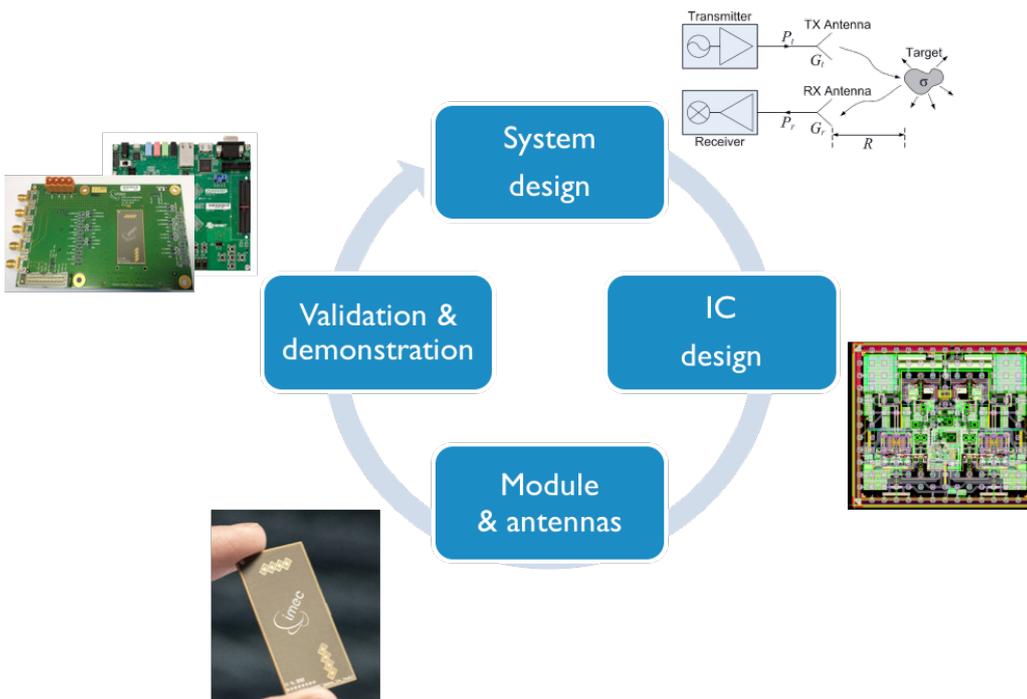
# SINGLE CHIP 79GHz RADAR

## FULLY-INTEGRATED MILLIMETER-WAVE SENSORS FOR HIGH-DEFINITION REMOTE SENSING

Imec's millimeter-wave radar operates in the 4GHz wide 79GHz band. This band enables unprecedented ranging capabilities with a resolution finer than 10cm. It is available today in Europe, with worldwide harmonization ongoing.

## ALL DESIGN CAPABILITIES UNDER ONE ROOF

Having all key design skills under one roof (system, algorithm, analog, millimeter-wave, digital, antenna and packaging), Imec's multi-disciplinary team develops globally-optimized solutions for automotive ADAS systems, autonomous drones, conscious infrastructure and consumer electronics.



## ENABLING NEXT-GENERATION RADAR SYSTEMS

Imec's hardware covers both 77GHz and 79GHz bands, targets phase modulation but can be redesigned for other waveforms, and enables multiple-input, multiple output (MIMO) radar in the code domain. Combined with virtually unlimited digital integration capabilities thanks to the advanced CMOS node, this results in ultimate versatility and configurability.

## COLLABORATION MODES

Joining imec's research program gives you full access to all generated white-box IP, allows you to participate in steering the R&D roadmap, and enables optimum knowledge transfer by making your experts part of the imec team for the duration of the program.

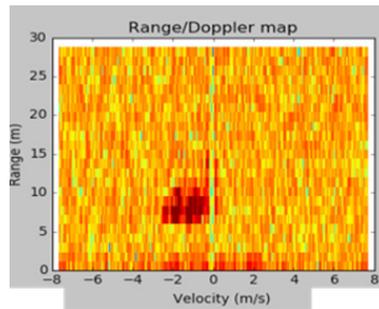
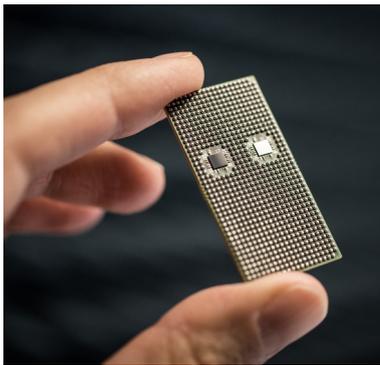
Alternatively, selected IP blocks (TX, RX, PA, LNA, PLL) are available for licensing, giving you a head start on your competitors.

Finally our team is ready to discuss your specific design requirements, allowing you to leverage our expertise to enable your specifications.

## RELATED R&D WORK

Besides the automotive 77-79 GHz CMOS radar, imec is also working towards an even more compact 140GHz radar for short-range consumer applications. This may become a cheap radar with antenna-on-package for IoT applications, easy to mount, e.g. for smart homes, elderly assisted living, detection of people in smart meeting rooms, smart cities, vital signs detection, etc. Similarly to the automotive radar, this compact IoT radar is made in 28nm CMOS.

In addition to the radar hardware R&D, imec is also researching multi-sensor data fusion architectures and algorithms, for detection, tracking and classification of moving targets. Starting from radar-based micro-doppler solution, we are now working towards deep learning algorithms for multi radar & camera data fusion. Automotive, smart home, smart city are examples of such application.



Range / Doppler map

## TYPICAL PERSON DETECTION SPECIFICATIONS

Maximum range	30m
Minimum range	0m
Range resolution	7.5cm
Maximum velocity	50km/h
Velocity resolution	1km/h
Field of view	+/- 60°
Angular resolution	10°
Refresh rate	>100Hz
Latency	10ms

## KEY TECHNICAL PARAMETERS

Technology	28nm CMOS
Chip size	<9 sqmm
Power consumption (full chip)	~ 1W
Modulation	PMCW
Main blocks on chip	2TX, 2RX TX Pout (per antenna path): >10dBm 1 ADC per channel, 7bits/2GSps PLL: 15.8 GHz (LO), 1.975 GHz (CK) Range Processing: digital, 128 correlators & accumulators per channel

## APPLICATIONS

- Automotive
- Autonomous Robots
- Drone Collision Avoidance
- Smart Infrastructure

### AMERICAS

raffaella.borzi@imec.be  
T +1 408 386 8357

### JAPAN

isao.kawata@imec.be  
T +81 90 9367 8463

### CHINA

timo.dong@imec-cn.cn  
+86 13564515130

### TAIWAN & SE-ASIA

mavis.ho@imec.be  
T +886 989 837 678

### EUROPE & ISRAEL

michel.windal@imec.be  
+32 478 96 67 29

### VIETNAM, BRAZIL, RUSSIA, MID EAST, INDIA

max.mirgoli@imec.be  
T +1 415 480 4519

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