

IMEC's offer

IMEC invites industry to join its millimeter-wave research program to benefit from its knowledge and expertise, enabling high-performance millimeter-wave radio solutions.

IMEC offers a variety of business solutions and dynamic interaction models ranging from research collaborations at different levels of engagement (scope and depth) to IP and solution/building block transfer and license agreements. The flavour of deliverables include design databases for IP components, design flows and approaches, models and simulators, case studies, system exploration and consultancy.

IMEC's Industrial affiliation Program (IIAP) is IMEC's premium cooperation formula for joint R&D between industrial research partners and IMEC research teams. The concept is recognized worldwide as one of the most successful international R&D partnership models.

Contact us

IMEC Belgium

E-mail: Bart.VanPoucke@imec.be

Phone: +32 16 28 83 51

Fax: +32 16 28 15 15

IMEC, Inc., US

E-mail: Raffaella.Borzi@imec.be

Phone: +1 408 551 4502

Fax: +1 408 551 4505

IMEC Shanghai Office - P.R. China

E-mail: Gao.Teng@imec.be

Phone: +86 21 6236 0700 ext. 18

Fax: +86 21 6236 0706

IMEC Taiwan

E-mail: Tien-Fu.Lei@imec-tw.tw

Phone: +886 3 578 1115

IMEC representative Japan

E-mail: Akihiko.Ishitani@imec.be

Phone: +81 3 5210 5882

Fax: +81 3 5210 5883

E-mail: Mitsugu.Yoneyama@imec.be

Phone: +81 80 5180 1081

Fax: +81 3 5210 5883

IMEC Stichting Nederland (IMEC-NL)

E-mail: Philippe.Mattelaer@imec-nl.nl

Phone: +31 40 277 4005

www.imec.be



MILLIMETER-WAVE WIRELESS COMMUNICATION



GREEN RADIOS
BOOSTING HIGH-DATA-RATE COMMUNICATION AT SHORT DISTANCES

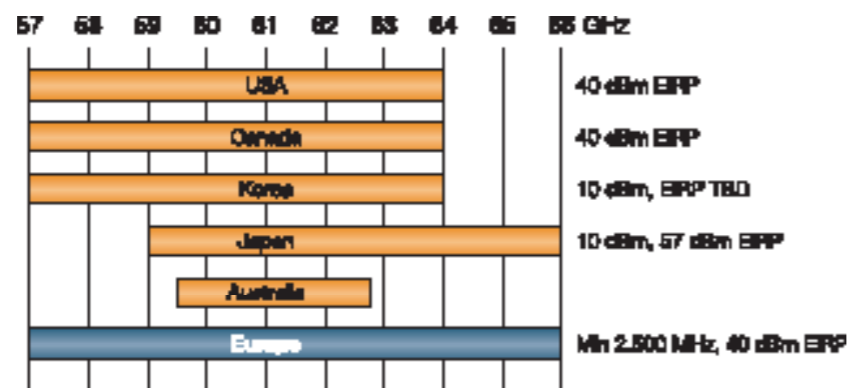


Research platform for millimeter-wave solutions

TOWARDS HIGHLY INTEGRATED LOW-COST LOW-POWER SINGLE-CHIP RADIOS

The quest for higher data rates and spectrum scarcity requires wireless system designers to explore higher frequency bands. The recently allocated 57-64GHz unlicensed band is available throughout the world and enables **multi-Gbit/s wireless** communication. A disadvantage of high-frequency communication – its high propagation attenuation – turns into an advantage for the **short-range** (3 to 10 m) applications: immunity to interference, high security characteristics and frequency reuse. A whole range of new applications, from uncompressed video distribution in-house, downloads at video kiosks to connections between laptop and printers, comes into sight.

Traditionally, millimeter-wave radios rely on the characteristics of the expensive SiGe material. Today, the advances in Si processing technology enable smaller transistors with higher switching speed, making them more realistic candidates for the analog circuits in millimeter-wave radios. An analog radio front-end in CMOS technology will enable seamless integration with the digital radio baseband on one chip, resulting in a smaller one-chip, 'cheap' radio. The demand for **low-cost**, small-sized millimeter-wave modules requires integration of the antenna with the CMOS chip. When **high-performance** solutions are targeted, a large number (16 or more) of antenna elements, yet small in size at these high frequencies, are to be considered.



Worldwide spectrum allocation in the 60GHz band

Building on IMEC's expertise

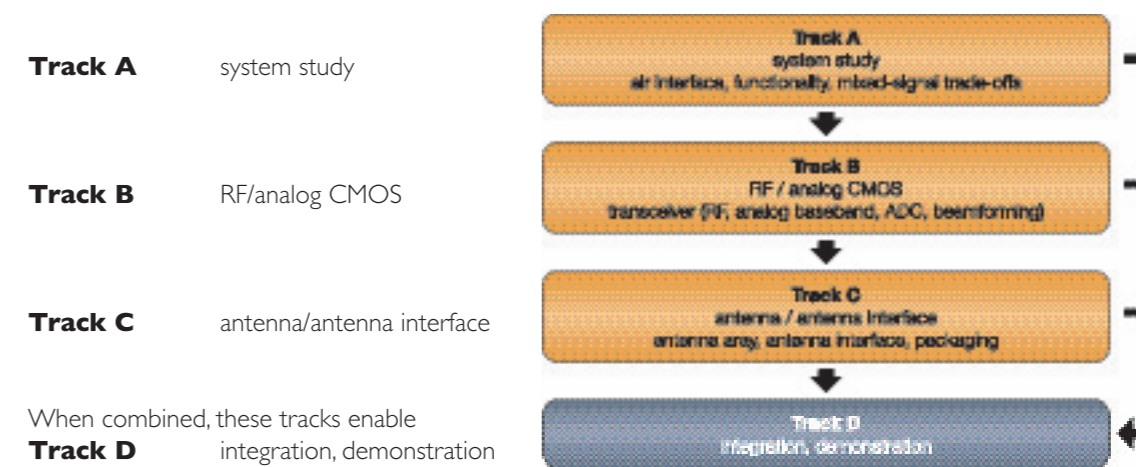
IMEC aims at developing single-chip millimeter-wave radios using deep sub-micron digital CMOS technology. For this research, IMEC can rely on its longstanding expertise in **RF-CMOS design**, on its millimeter-wave circuits design methodology and on the availability of advanced IMEC **heterogeneous integration** technologies (including RF-through-Si-vias and integrated passive devices). The latter are needed to integrate on one module other subsystems such as the antenna and antenna interface.

Key challenges for a millimeter-wave communication

- radio architectures that allow for CMOS integration while satisfying the specifications imposed by the different standards; this challenge requires the use of **beamforming** and the capability of bonding together several channels;
- **calibration and compensation** techniques that make efficient use of the power of digital processing;
- new architectures and circuit concepts that focus on low area to reduce the excessive cost of **deeply scaled digital CMOS**;
- overcoming the variability coming with the **deeply scaled CMOS**;
- **low power** consumption;
- **antenna arrays** integrated with the active CMOS front-end;
- suitable **packaging** strategies for module integration.

IMEC's millimeter-wave program tackles the challenges

In order to enable high-performance, small-sized and low-cost millimeter-wave solutions, IMEC's millimeter-wave program is built around 3 tracks:



IMEC's millimeter-wave program structure

