

IMEC GREEN RADIOS - OPENING NEW HORIZONS IN WIRELESS COMMUNICATIONS



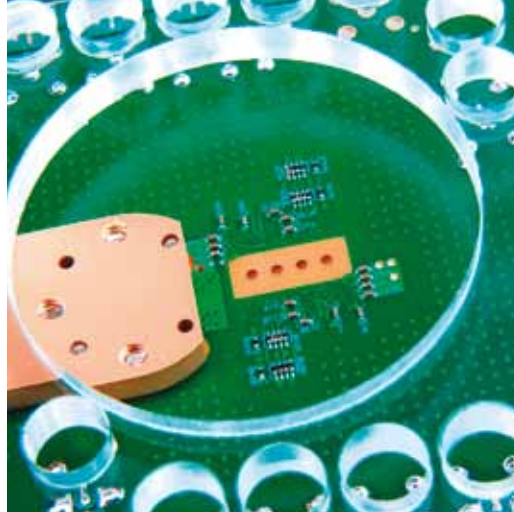
**IMEC
SMART
SYSTEMS**

Building a flexible interactive world





04 imec's 60GHz receive module



05 Detail of imec's 45nm 60GHz RF front-end



06 60GHz wireless demo setup

MILLIMETER-WAVE WIRELESS COMMUNICATION

The quest for higher data rates and the spectrum scarcity makes designers of wireless systems explore higher frequency bands, such as the recently allocated 57-66GHz unlicensed band. This band is available throughout the world and allows multi-Gbit/s wireless communication. A disadvantage of such high-frequency communication, namely its high propagation attenuation, turns into an advantage for short-range applications (up to 10m): immunity to interference, high security characteristics

and frequency reuse. A whole range of new applications comes into sight, from uncompressed video distribution in the home, fast downloads of Gbytes of data at video kiosks, to Gbit/s wireless connections between laptop and printers.

Traditionally, millimeter-wave radios rely on III-V technology and, more recently, on BiCMOS. Today, the advances in CMOS technology enable smaller transistors with a higher switching speed, making them suitable candidates for the

analog circuits in millimeter-wave radios. This technology allows combining the analog radio with the digital radio baseband on one chip, resulting in a smaller, cheaper, single-chip radio. The demand for such low-cost, small-sized millimeter-wave modules also requires integrating the antenna with the CMOS chip. When high-performance solutions are targeted, this may involve a large number (16 or more) of very small (due to the high frequencies) antenna elements.

01

Building on imec's expertise

Imec has a longstanding expertise in broadband and MIMO systems, RF and millimeter-wave CMOS circuit design, and millimeter-wave integration (for antenna and antenna interface) SiP (systems-in-package) technologies.

02

Addressing the design challenges for the next generation

The key design challenges for millimeter-wave communication are low area, low power, CMOS integration, system-level modeling, development of beamforming techniques, calibration and compensation, coping with variability in deep-submicron CMOS, integrated antenna arrays, and advanced packaging strategies.

