The technology is suitable for mobile handsets and all kind of battery-powered wireless connectivity devices, as well as for base stations for small cells, and can be programmed to meet the requirements of many standards and dedicated needs.

**NEXT-GENERATION WIRELESS ACCESS ASKS FOR RECONFIGURABLE RADIOS**

The trend in wireless communication where terminals give their users ubiquitous access to a multitude of services drives the development of reconfigurable radios in deep-submicron CMOS. This is enhanced with the advent of 3GPP-LTE, a standard that is inherently so flexible that a reconfigurable radio is its most economical implementation. Imec’s single-chip reconfigurable transceiver technology provides an answer to this need.

**TECHNOLOGY DESCRIPTION**

Imec’s reconfigurable radio front-end, named SCALDIO (scalable radio), is programmable to operate with all current and future cellular, wireless local area network (WLAN), wireless personal area network (WPAN), broadcast and positioning standards in the frequency range between 174MHz and 6GHz. The unique architecture of the flexible RF front-end achieves a power consumption, performance and CMOS chip area competitive with current state-of-the-art single mode radio front-ends. The average power consumption can be reduced even further, by using the flexibility to exploit real-time power/performance trade-off opportunities, when allowed by the environmental conditions, e.g., by reducing the filtering level when there is less/no interference. Imec has 2 generations of SCALDIO radio transceivers with proven silicon performance: SCALDIO-1 and SCALDIO-2. SCALDIO-2 has been realized in a digital system-on-chip (SoC) 40nm CMOS technology. It fits the cost requirements for integration into next-generation mass volume devices. SCALDIO-1 has been realized in a 130nm CMOS technology thereby offering cost advantages for niche applications.

**SCALDIO-2**

- **SAW-Less reconfigurable radio transceiver**

SCALDIO-2 is a highly-linear and low-noise reconfigurable radio transceiver eliminating the need of surface acoustic wave (SAW) filters. The unique approach is a major breakthrough towards fully reconfigurable radios, because the requirements of antenna filters are relaxed. As a result, the bill of materials and board space, and thus the cost of mobile devices can be significantly reduced.

- **Highly linear receiver**

The highly linear receiver tolerates 0dBm blockers with acceptable noise figure, avoiding the need of SAW filters and consequently enabling a simplified antenna interface. It achieves high sensitivities and low phase noise for cellular standards. It also includes flexible analog-to-digital converter technology supporting sampling frequencies from 0-80MS/s and up to 10-bit resolution.
R&D FACT SHEET
IMEC gREEn RADIoS

Low-noise transmitter
The flexible transmitter reaches very low out-of-band noise, making it also compatible with SAW-less operation. SAW-less transmitters become more and more important with the evolution towards future standards such as 3GPP-LTE where transmitters will need to operate in multiple FDD (frequency division duplex) bands.

Reconfigurable radio transceiver competitive with state-of-the-art single mode radios
SCALDIO-2 consists of a single-chip reconfigurable receiver, transmitter and 2 frequency synthesizers in 40nm digital CMOS technology. It is fully software configurable across all channels in the frequency bands between 100MHz and 6GHz. Its properties (such as the RF carrier frequency, channel bandwidth, noise figure, linearity, filter characteristic) can be adapted to the requirements of the standards that are used. The transceiver is further characterized by a very low power consumption and an extremely small chip area of only 5mm². All these targets are achieved by innovative architecture and circuit techniques, exploiting the speed capabilities of the scaled digital technology while minimizing the total area occupied by passive devices. Therefore, it is competitive to state-of-the-art single mode radios in mobile devices – handsets, smart phones, PDAs, PC cards, USB dongles –. Moreover, its high-performance, ultra-low power and low-cost features make the transceiver suited for next generation of mass volume mobile devices.

AVAILABLE FOR TRANSFER, PARTNERING FOR NEXT GENERATION SCALDIO
Imec licenses the mature SCALDIO IP to industry in a package including:
- design database
- evaluation board
- documentation (design reports, measurement reports,...)
- training and support (including tutorial & hands-on workshop, follow-up via remote Q&A)

In its green radio program, imec partners with industrial players to design low-power and compact high-performance reconfigurable RF transceivers leveraging on state-of-the-art CMOS technology and targeting all key broadband communication standards including next generation cellular and connectivity standards such as LTE advanced and next-generation WiFi (802.11ac).

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