



VERSATILE INTEGRATED SPECTRUM SENSING SOLUTIONS

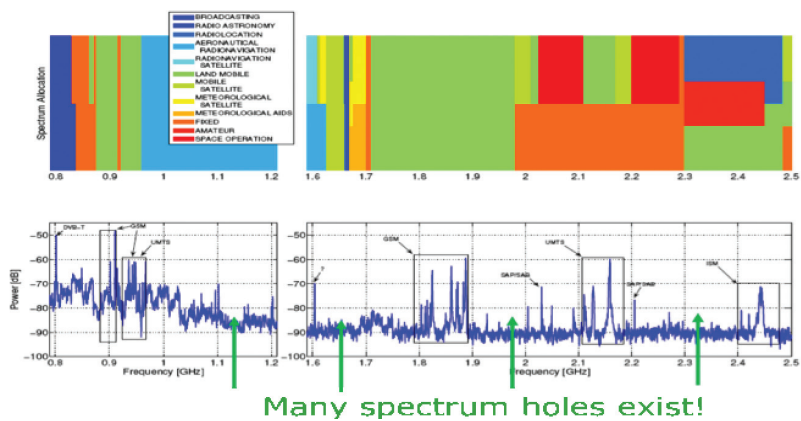
Imec offers both a reconfigurable radio front-end and an ASIP-based digital front-end that together enable versatile and low-power spectrum sensing. These technologies pave the way towards green cognitive radios.

HEADING TOWARDS A SPECTRAL CONFLICT

The accelerated deployment of broadband personal communication coupled with the continuously increasing demand for large data rates reveals an increasing spectrum scarcity. Indeed, the transmitted data volume increases approximately by a factor of 10 every 5 years, which would lead us to a spectral conflict. While the spectrum in general is completely allocated, instantaneously and local many channels remain unused (see figure 01). A more dynamic use of the spectrum is a promising solution to sustain the growth of wireless communication.

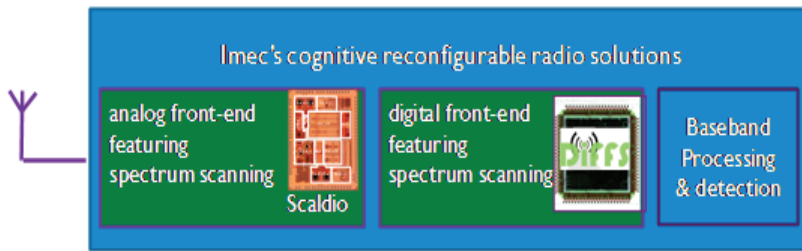
COGNITIVE RADIOS BUILDING ON SPECTRUM SENSING SOLUTIONS

A cognitive radio, in its most general definition, aims at 'sensing' and 'learning' the environment to autonomously adapt its transmission parameters. This requires the receiver to be able to 'scan' the whole band, searching for optimal transmit opportunities. It is expected that this will become crucial in order to maintain the current user experience, and improve it further.

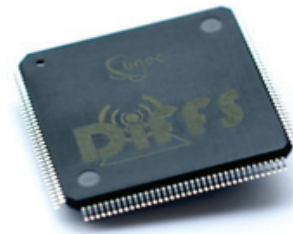


Many spectrum holes exist!

01 Spectrum allocation and typical instantaneous use.



02 Imec's reconfigurable radio solution features fast, flexible and efficient spectrum sensing.



03 The 'digital front-end for spectrum sensing' (DIFFs) chip features flexible synchronization and spectrum sensing capabilities.

IMEC'S RECONFIGURABLE RADIO SOLUTIONS ENABLE FAST, FLEXIBLE, AND EFFICIENT SPECTRUM SENSING

Current radio architectures, which are focused on the reception of a predefined channel, are not able to proceed to a frequency scan operation in a timely, cost and energy efficient way.

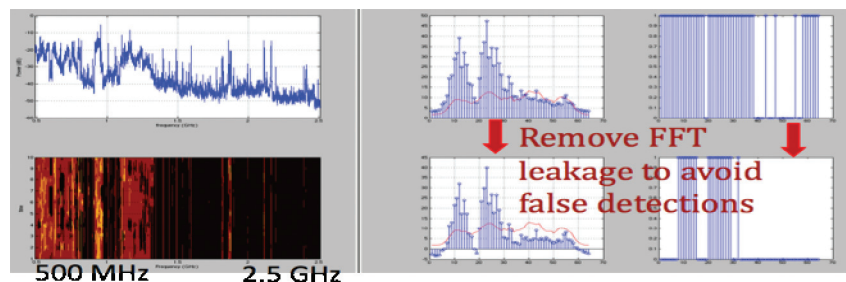
Imec's cognitive reconfigurable radio solutions (see figure 02) enable multi-mode communication, and spectrum sensing.

For the analog front-end, the 'SCALDIO' (scalable radio) transceiver IC implemented in digital CMOS, can do the job. At the digital baseband side, the COBRA (COgnitive Baseband Radio Architecture) platform is conceived for 4G seamless connectivity. The 'digital front-end for spectrum sensing' component of this platform was designed as a versatile digital engine to meet a wide variety of use cases, at low cost and low power overhead. The chip (see figure 03) which hosts a dedicated ASIP can perform both flexible synchronization and spectrum sensing for WLAN (802.11a-n), cellular standards (including the recent 3GPP-LTE), and digital broadcasting.

SPECTRUM SENSING EXPERIMENTS RUN ON IMEC'S SET-UP

Imec is conducting experiments for spectrum sensing. For the experiments imec's radio and digital chips are used, including the SCALDIO flexible front-end to scan the spectrum and the digital front-end hosting an ASIP for performing the signal processing. Figure 04 shows the results of a typical experiment.

The set-up allows investigating different spectrum sensing strategies, and proves the suitability of the SCALDIO and the DIFFs to perform flexible spectrum sensing. The experiments show we can retrieve spectrum occupancy information in specific bands, giving information on frequency, bandwidth, and power and noise estimates.



04 Spectrum sensing experimental result.

MORE INFORMATION

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