



WP3-3 IP blocks

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Work-package title: Shareable IP blocks for HEP

- •Goal: provide a 2nd lot of IP blocks for analog needs in HEP with full documentation and laboratory tests.
- •1^{srt} set organized by CERN in 65nm (see next talk).
- •A 2nd set will be organized by OMEGA for needs in calorimetry, TPC,...
- •OMEGA/LAL → OMEGA/IN2P3





Electronics needs in calorimeters and TPCs :

- large dynamic range,
- high speed ,
- low noise,
- low offset,
- need of precise capacitors and resistors, ...

Blocks:

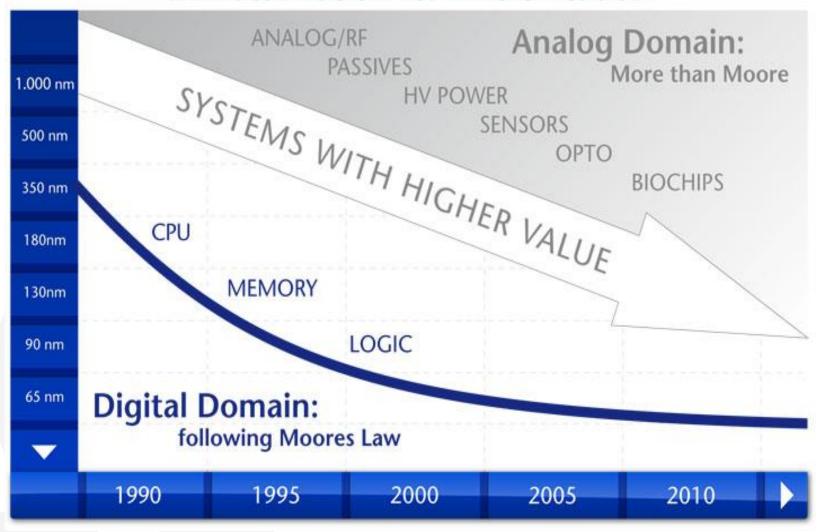
ADC, TDC, DAC, Bandgap, OTA, Rad-tol memory, SEU resistant flipflop ...

- Technology :
- SiGe or CMOS SOI, HV
- 130 nm or 180 nm
- IBM, ST micro, AMS ...





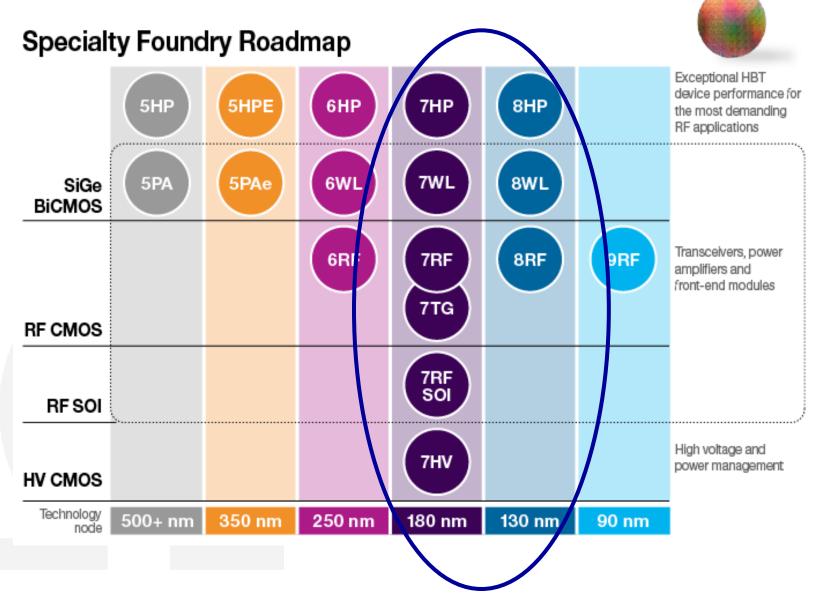
Miniaturization vs. Diversification





AIDA IBM technologies (I)





AIDA IBM technologies (II) () mega



- IBM SiGe 130 nm:
 - 6 MPW runs / year by MOSIS
 - 5 Metal (1thick) 1 poly Cmim
 - ft = 200GHz
 - power supply: 1.2V 2.5V (I/O)
- IBM SiGe 180 nm:
 - 6 MPW runs / year by MOSIS
 - 5/7 Metal (1 thick) 1 poly Cmim
 - ft: 60GHz
 - power supply : 1.8V 3.3V (I/O)
 - Also available in IBM CMOS 180 nm :
 - HV (20V)
 - SOI

Price? Minimal size? Which technology will be perennial?



AIDA Commercial use of technology



Main advantage for IBM 180nm process: Large commercial market in telecom and mobile devices



Cellular power amps RF SOI, SiGe, RF CMOS

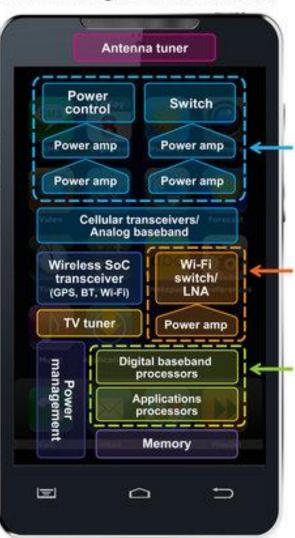
Cellular transceivers RF CMOS, SiGe

Wireless SoC transceiver (GPS, Bluetooth, Wi-Fi) RF CMOS, CMOS

> TV tuner SiGe, RF CMOS

> > Power management HV CMOS

IBM technologies for mobile devices



Antenna tuners RF SOI, RF MEMS

Single-pole/ multi-throw switch RF SOL

Cellular front-end module integration opportunities RF SOI

Wi-Fi RF switch, LNA RF SOI

Wi-Fi front-end module integration opportunities SiGe

Wi-Fi power amps SiGe

Processor integration opportunities

Applications processors Technology Development Alliance/

Common Platform technology



- ST micro SiGe 130 nm:
 - Price: 3500€/mm2 (min. 1mm2)
 - 4 MPW runs / year by CMP
 - 6 Metal 1 poly Cmim
 - Triple well
 - power supply: 1.2V or 2.5V (option)
 - Bipolar: Ft=150 GHz, Beta=1000 MOS: low VT
 - digital cells (VHDL)
- Also available in CMOS 130nm
 - HV: 4.9V for analog blocs -2200€/mm2
 - SOI: 4000€+3000€/mm2
- Time of life, duration: has been available for 4 years
 - → Access for prototyping : for how long ?





- AMS CMOS 180 nm :
 - Price: 1200€/mm2 (min. 5mm2)
 - 4 MPW runs / year by CMP
 - 6 Metal (one thick) 2 poly Cmim High Res
 - power supply: 1.8V or 5V
 - MOS: 4 GHz
 - I/O cells, digital cells, RAM ..
 - Time of life, duration: 10 years
- Also available :
 - HV: 20V or 50V
- Main advantage :
 - Time of life, duration: 10 years
 - Automotive market

Not expensive but no SiGe





Milestones and deliverables for 2nd set of IPs:

- blocks (SiGe) due for month 44 (September) 2014)
- Characterization of these blocks before month 48 (January 2015)

→ All people interested in these blocks are welcomed





Thank you for your attention