ESA-ESTEC GSTP project

Analog Silicon Compiler for Mixed-Signal ASICs

Final Presentation - Introduction

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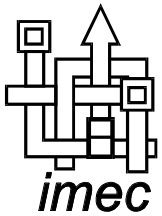
Katholieke Universiteit Leuven



Outline

- **Context**
- Project objectives
- Project partners
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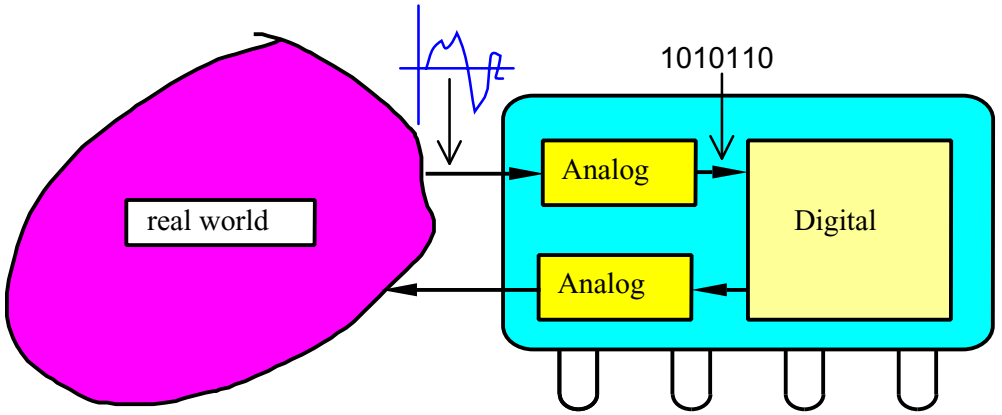
Need for mixed-signal ICs

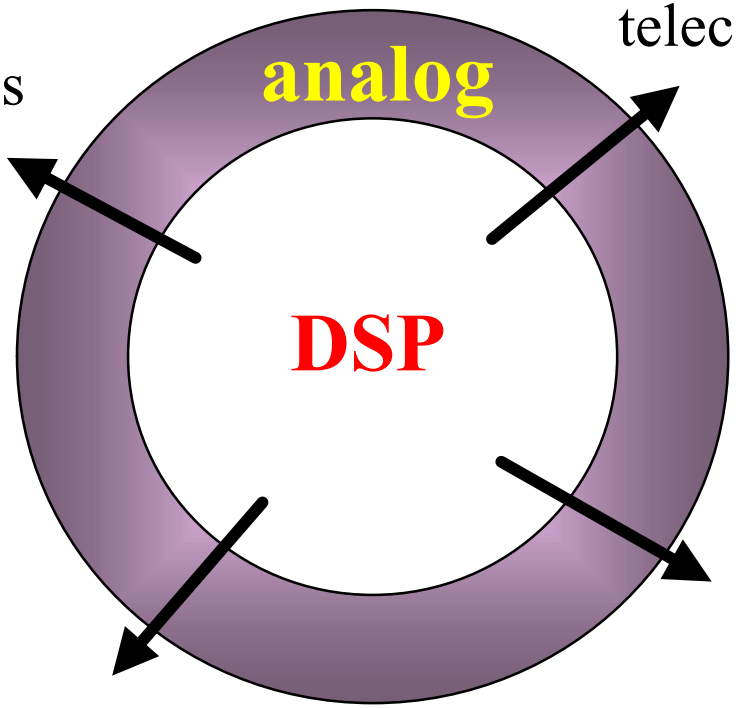
- analog is interface between DSP electronics and analog outer world
  - voice, audio, images…
  - measuring and driving “signals”
  - transmitting “signals”



- high-performance applications
  - high speeds, low power...

The egg model

[Paul Gray - UC Berkeley]



consumer electronics

multimedia

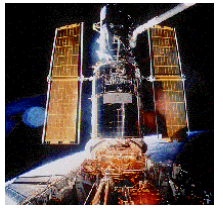
telecommunications

automotive

industrial applications

medical

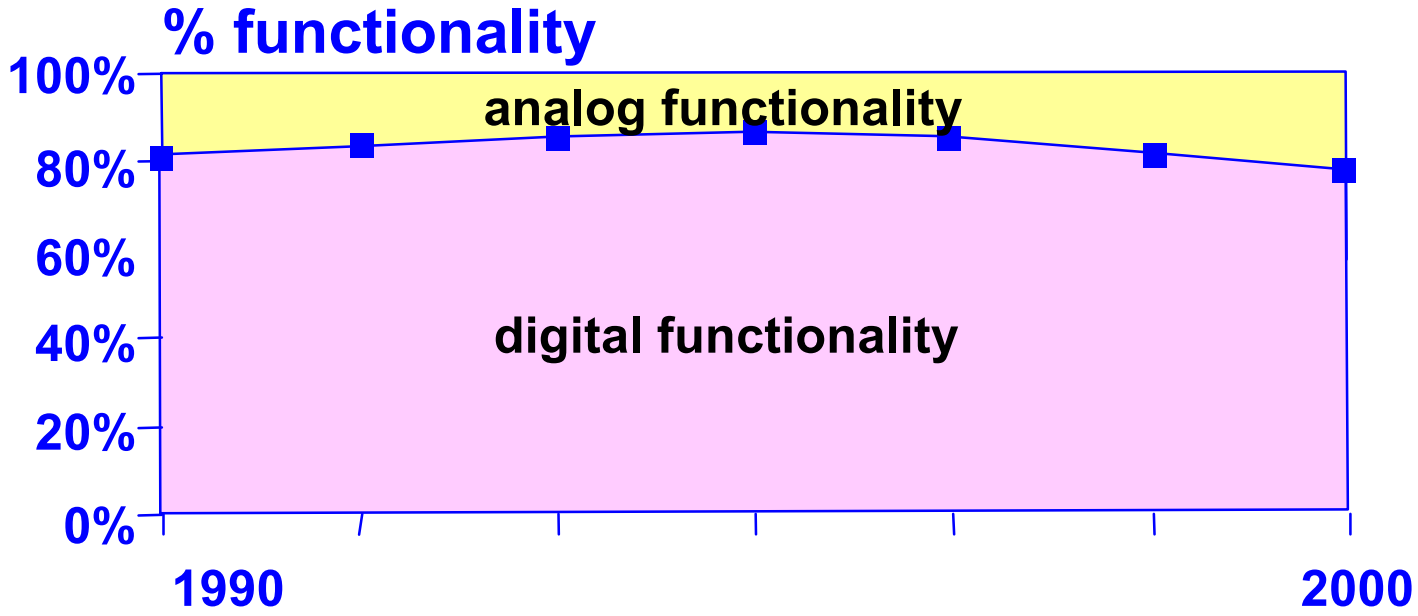
military/space



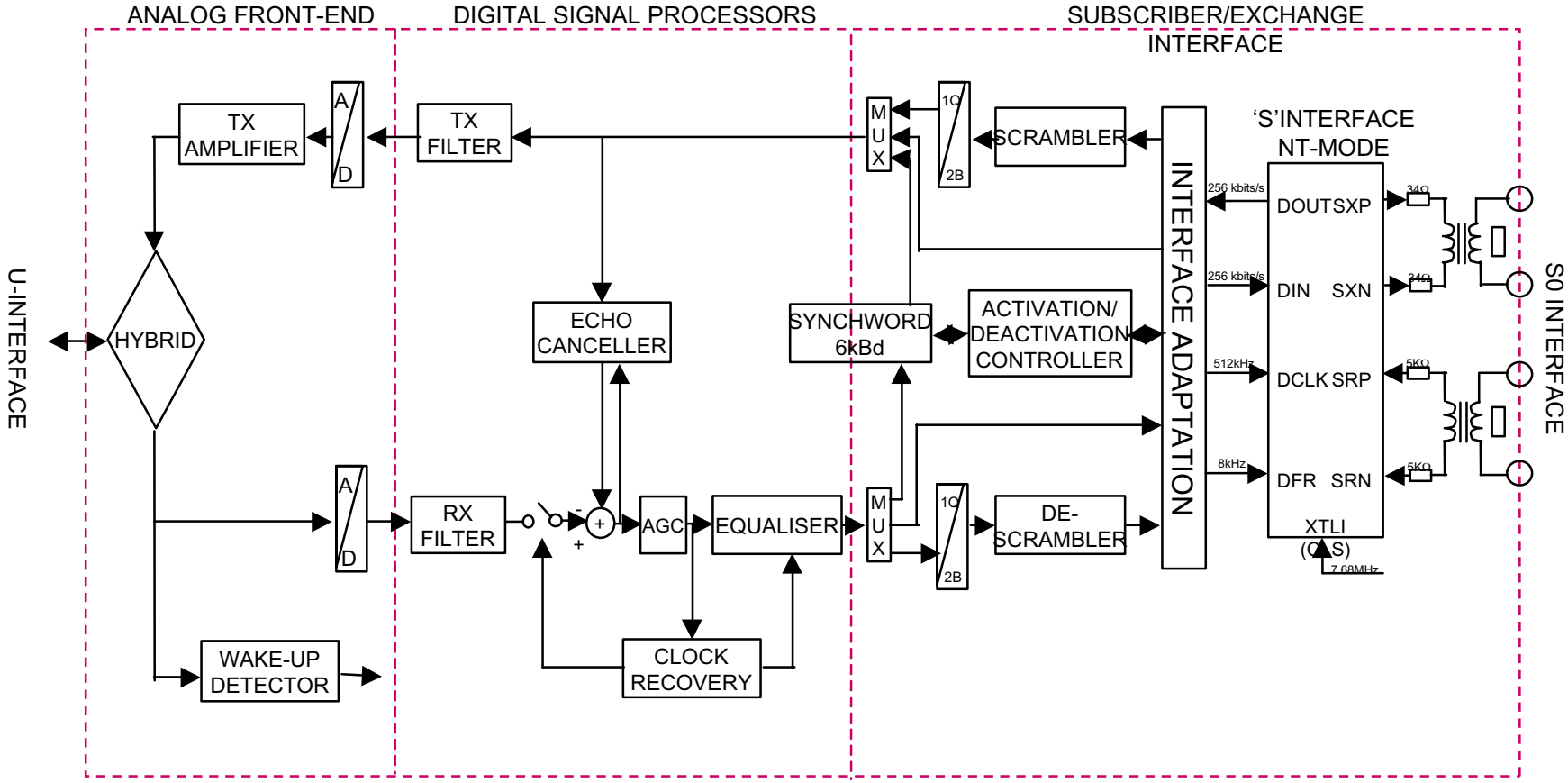
The more digital, the more analog and mixed-signal !

Is analog still important ?

- non-negligible % of system functionality is still analog
- mixed analog-digital ICs is a multi-billion-$ industry

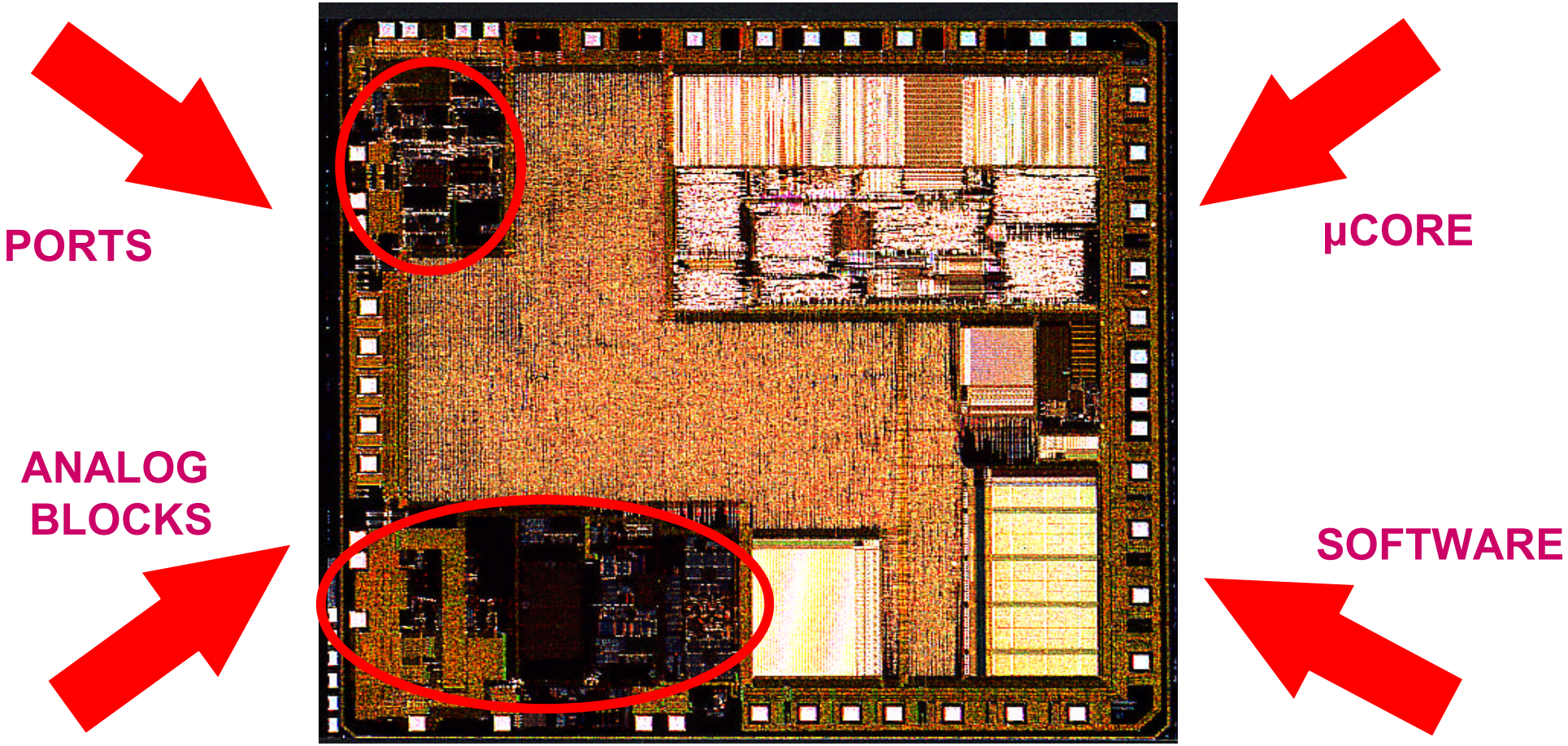


Example : ISDN interface



Source : Alcatel Microelectronics

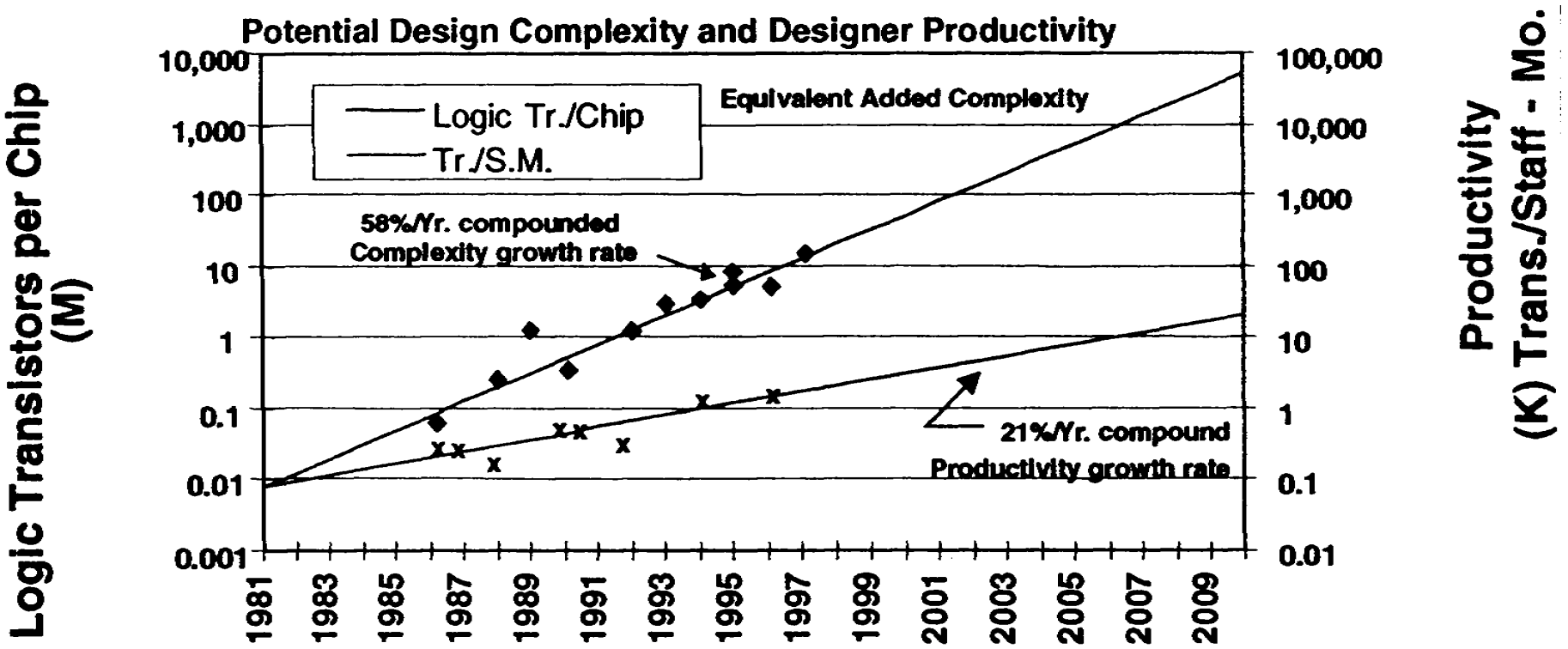
Example : ISDN interface



Source : Alcatel Microelectronics

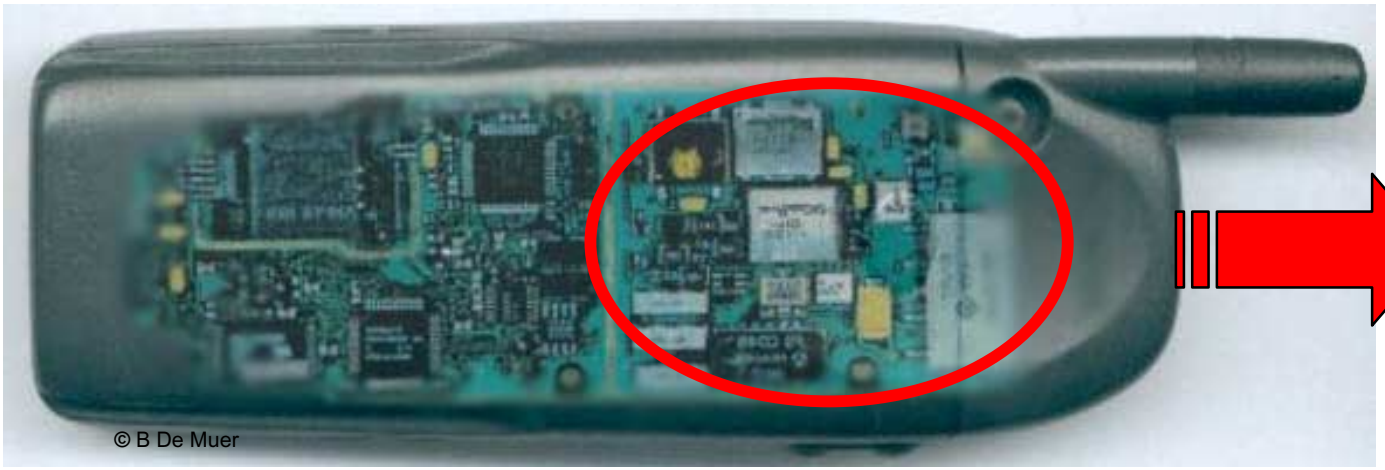
SIA technology roadmap

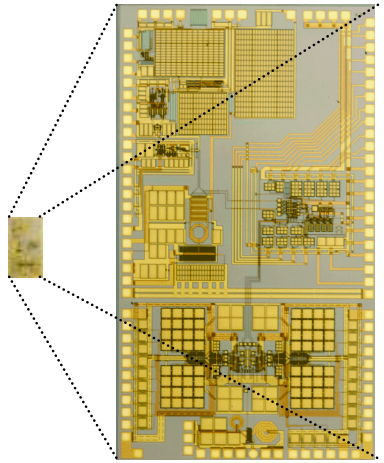
prediction of Gordon Moore:
chip compute power *2 per 1,5 year



What is driving integration ?

- reduction of cost :
  - technology used
  - number of components and passives
- higher performance, lower power

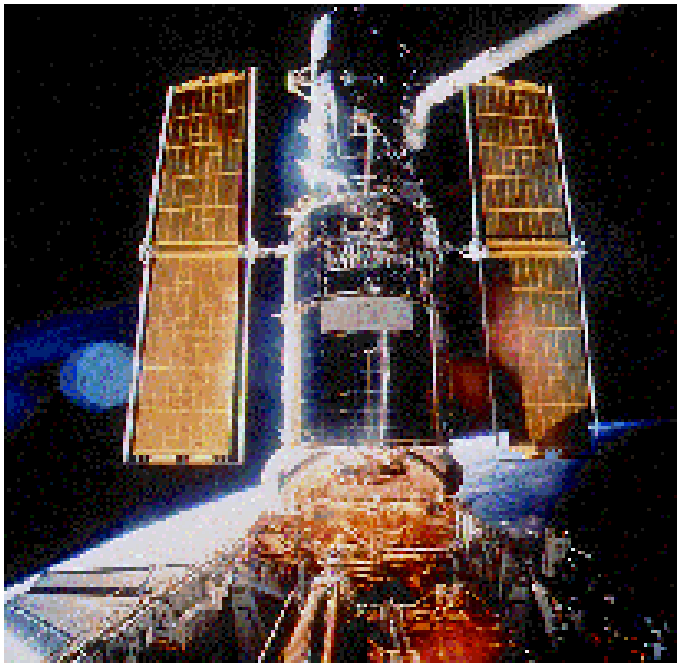




~ cm^2 → ~ mm^2

What about space ?

- integration reduces 3-D volume, weight
- increased performance and lower power consumption
- cheaper standard technologies

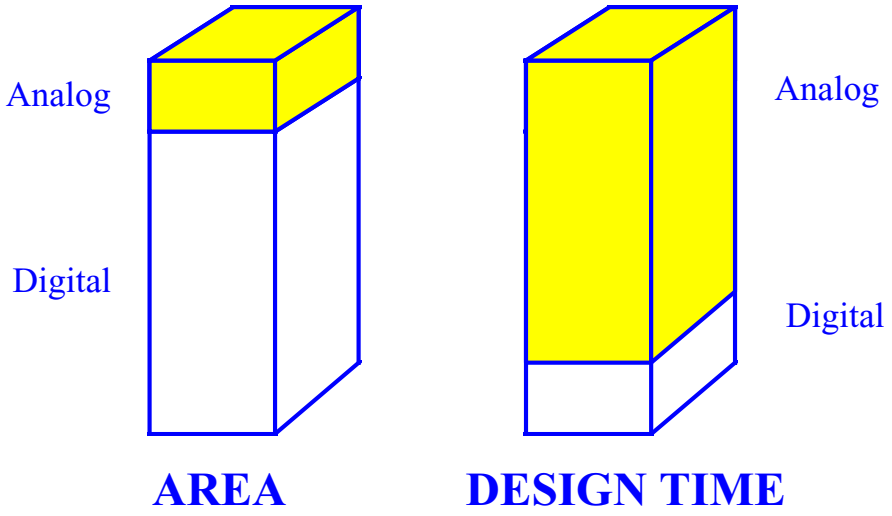


Need for analog CAD tools

- **analog is typically small fraction of chip area**
- **but requires disproportionally large part of design effort and is often responsible for design errors !**

☞ analog is big problem for mixed-signal systems !

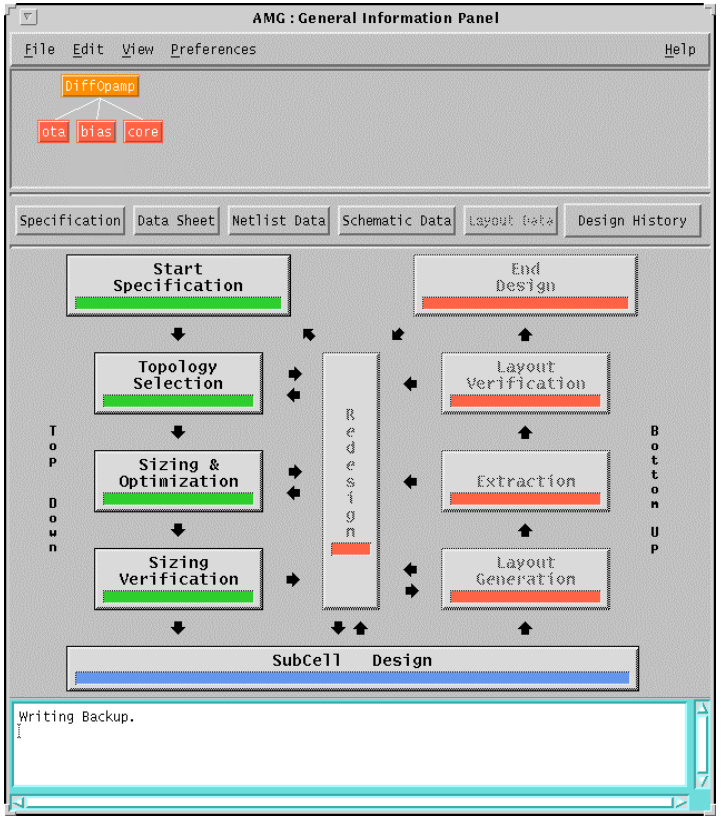
☞ need analog CAD tools to solve this problem !



Analog module generator

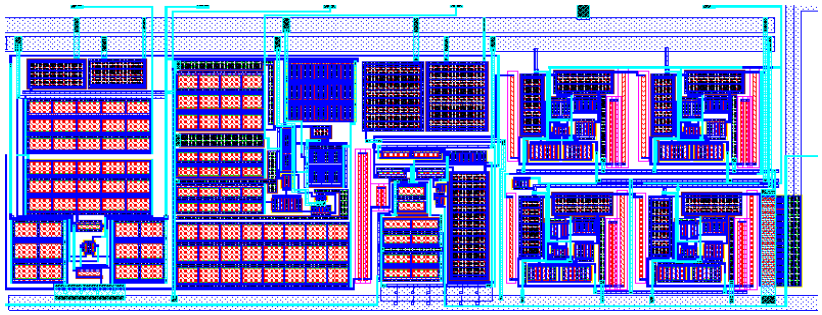
[Gielen JCTheory 1995]

AMGIE



- covers complete design flow from spec to layout :
  - optimally tailors circuit to each application and process
  - increases analog design productivity
  - for frequently used cells e.g. opamps, filters...

LAYLA



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Project objectives

- extend Analog Module Generator (resulting from ASTP4 project) to meet the requirements for on-board space applications
  - mismatch/yield
  - better layout
- develop, manufacture and test two ADC cells
  - high-speed ADC
  - low-power ADC for on-board PDFE
- design, manufacture and demonstrate microcamera for on-board space applications
  - CMOS imager chips

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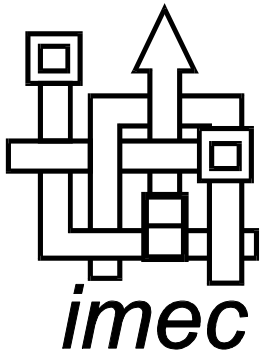
Project partners

- prime contractor : Katholieke Universiteit Leuven

- subcontractor : IMEC
  - subcontractor : FillFactory



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Project overview

- duration : October 1996 - March 2001
- phase I and II - 1.2 MAU
- **project activities :**
  - WP1100-1500 : consolidation and extension of the AMG (K.U.Leuven)
  - WP2100-2500 : development of high-speed ADC (K.U.Leuven)
  - WP2600, 3100-3600 : development of PDFE, including low-power ADC (IMEC)
  - WP4100-4900 : development of microcamera (IMEC - FillFactory)
  - WP5100-5200 : project management (K.U.Leuven)

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Final Presentation Overview

- Geert Van der Plas (K.U.Leuven) :
  "Analog module generator software (AMGIE/Mondriaan)"
- Jan Vandenbussche (K.U.Leuven) :
  "Irradiation of CSA-PSA"
  "High-speed analog-to-digital converter"
- Jan Wouters (IMEC) :
  "Particle detector front-end (PDFE)"
- lunch
- Werner Ogiers (FillFactory) :
  "Integrated radiation-tolerant imaging systems (IRIS1, IRIS2)"