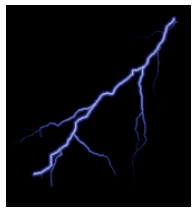


ECLAIRs

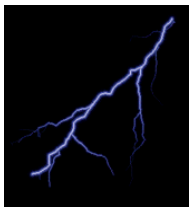
Lab. Activity at CEA Saclay

IDeF-X

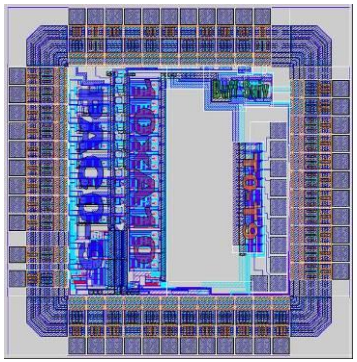
Imaging Detector Front-end

O. Limousin, O. Gevin, F. Lugiez, P. Baron, et al.

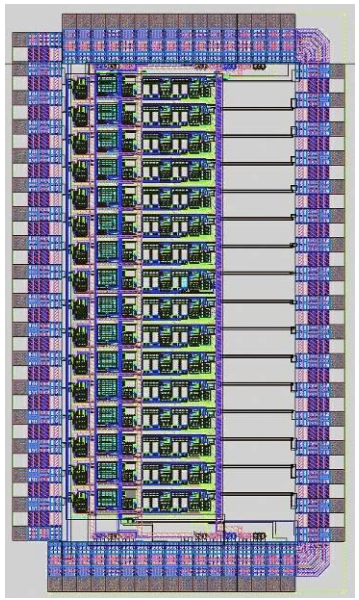
IDeF-X … from R&D CdTe SAp/SEDI - CNES



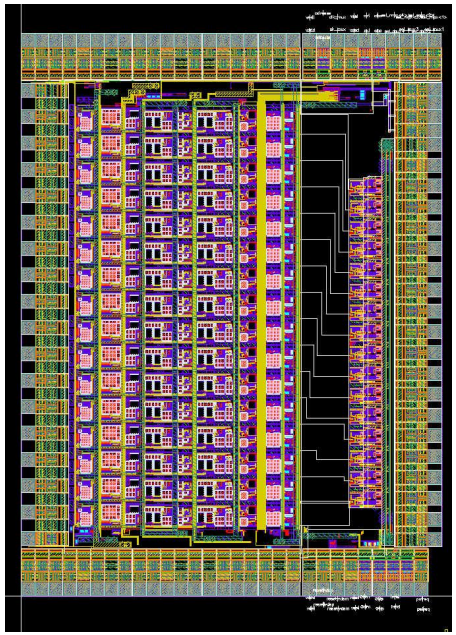
ECLAIRs



IDeF-X V0

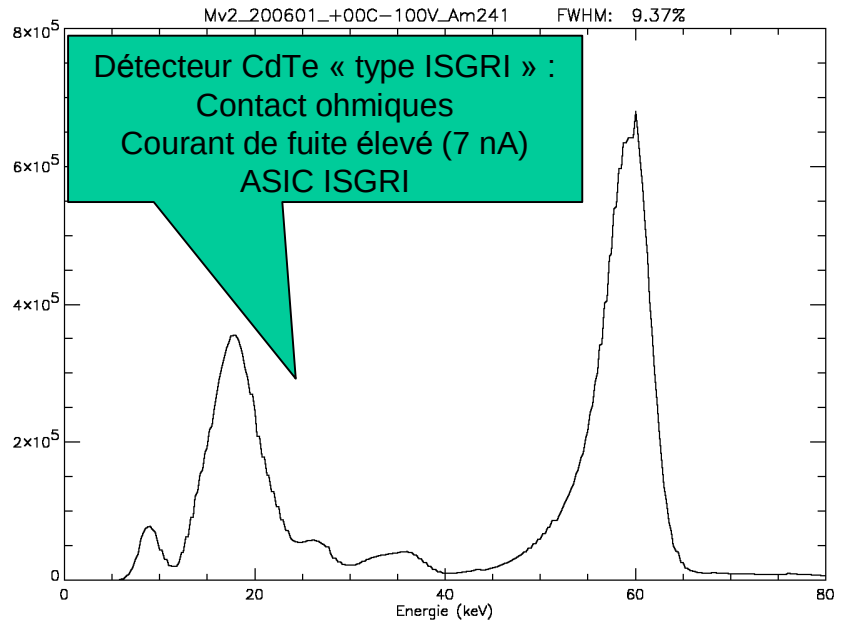


IDeF-X V1.0



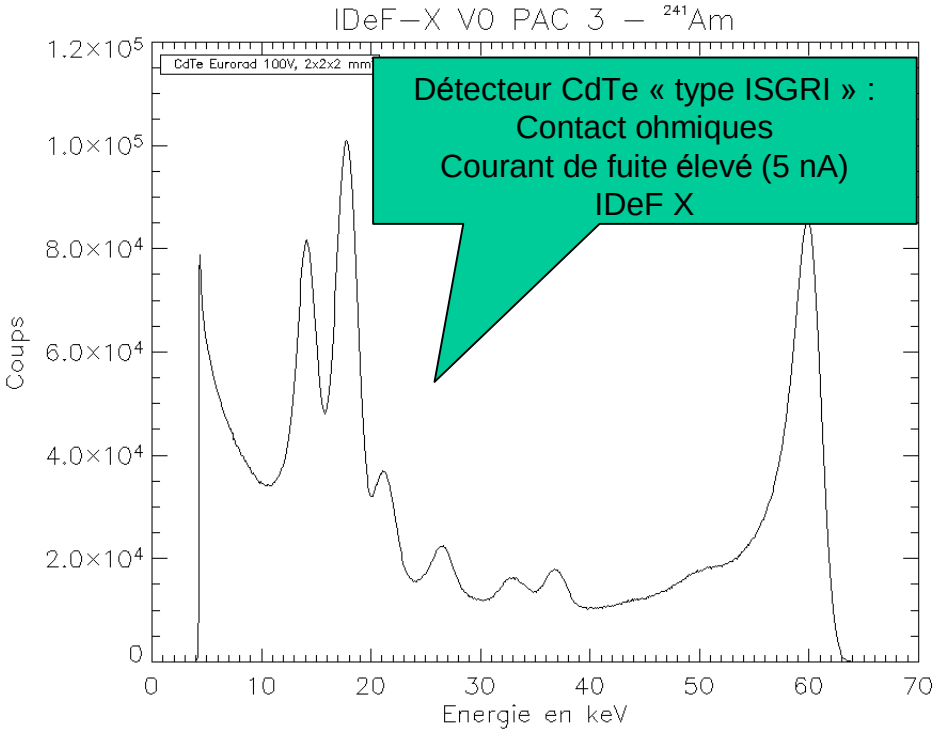
IDeF-X V1.1

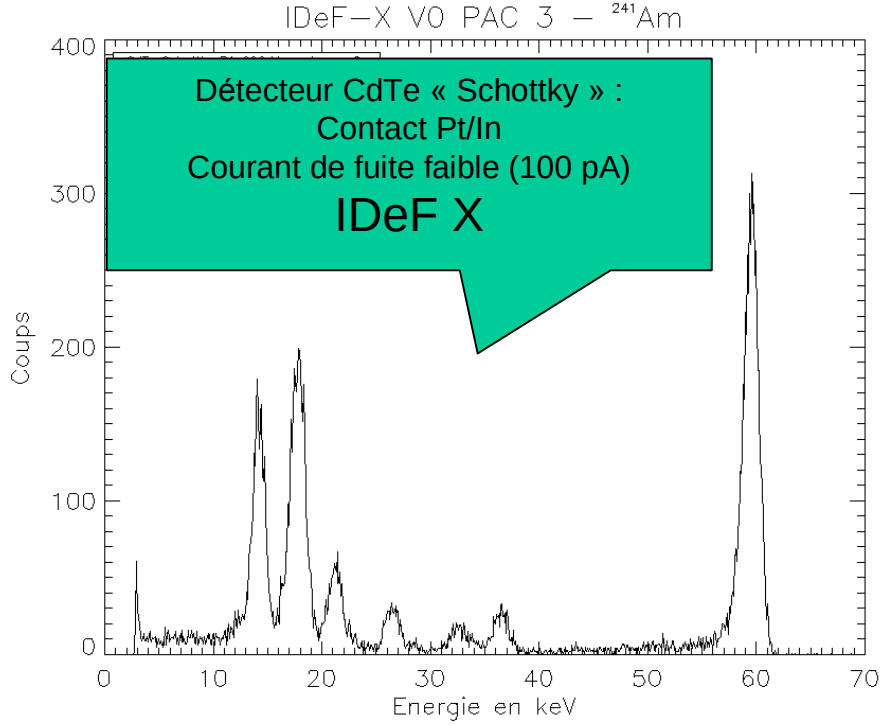
IDeF-X V2.X

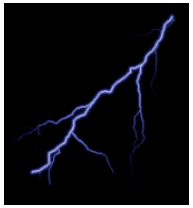


ASIC ISGRI + CdTe ISGRI : 5.6 keV à 60 keV
IDeF-X V0 + CdTe ISGRI : 3.5 keV à 60 keV
IDeF-X V0 + CdTe Schottky : 1.4 keV à 60 keV

IDeF-X V2 + Schottky/matrice : <1 keV à 60 keV
IDeF-X V2 + Schottky/matrice : 0.6 keV à 60 keV



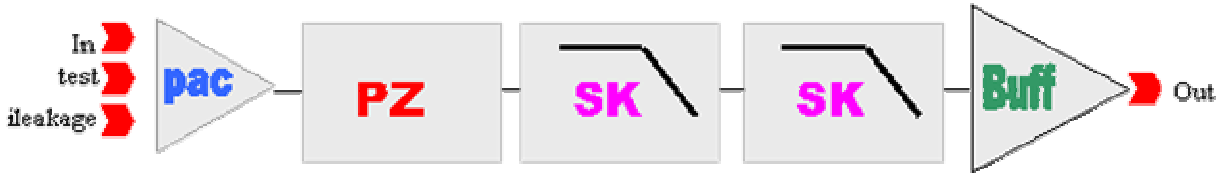


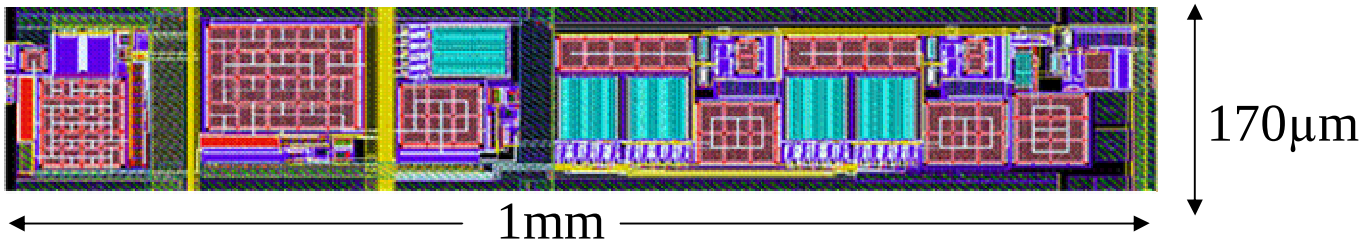


- IDeF-X V1.0 ASIC :16 complete spectrometry channels

  Each channel is made of :

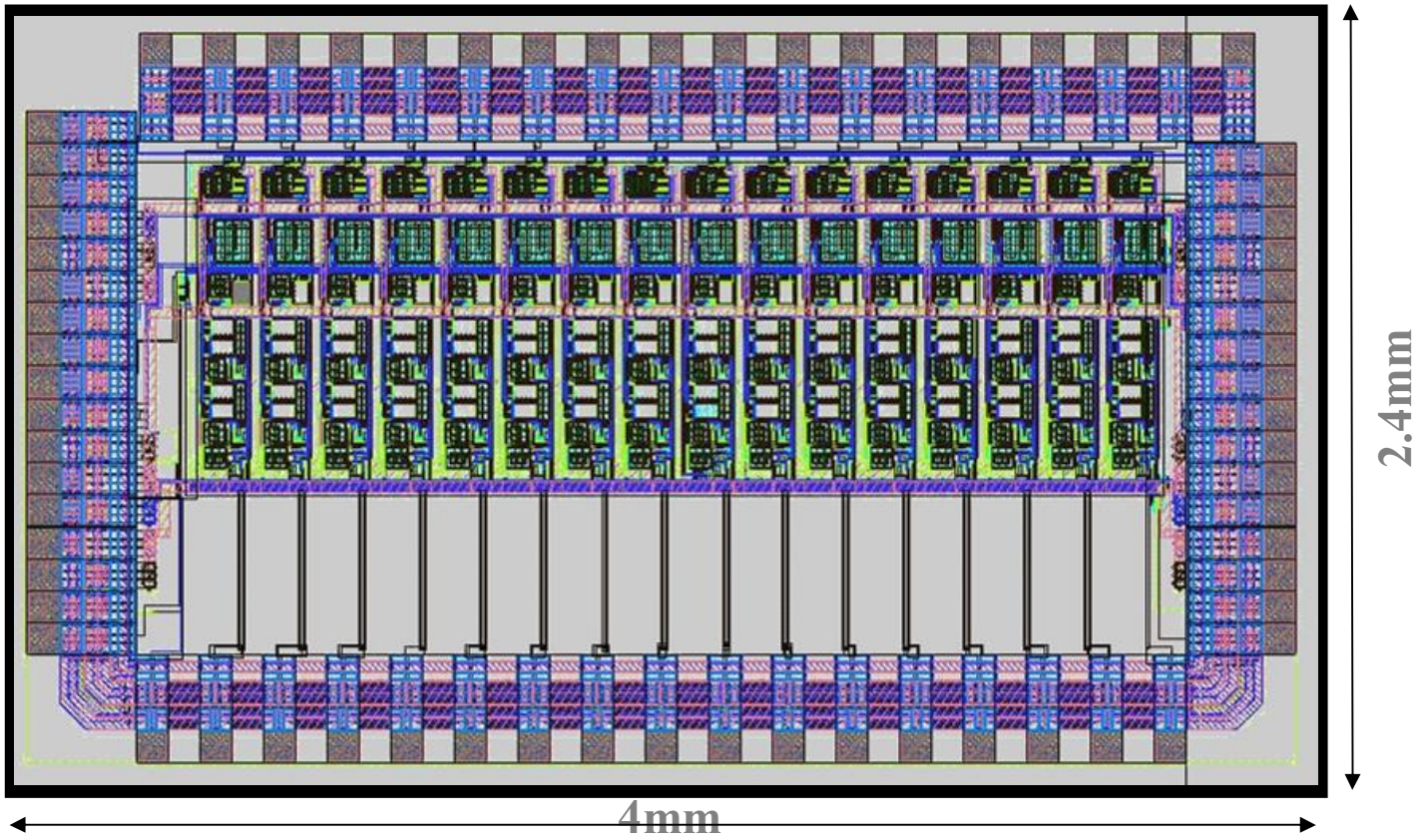
  - **A charge sensitive preamplifier**
  - **A pole-zero cancelation stage**
  - **Filtering stages (tunable peaking time Sallen & Key)**
  - **An Output buffer**





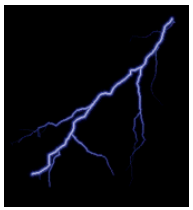
ECLAIRs

- IDeF-X V1.0 ASIC layout :



***IDeF-X V1.1* : april 2004**

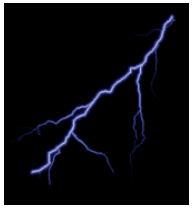
IDeF-X V1.0



ECLAIRs

- Optimised for Cdet=2-5pF
- DC coupling (working up to 1nA detector current)
- Two polarity signals (best when connected to the anode)
- 16 input pads + 1 multiplexed test input (4 config)
- 16 outputs
- CSA current, peaking time, test configurations are tunable
- Fixed Gain

IDeF-X V1.0

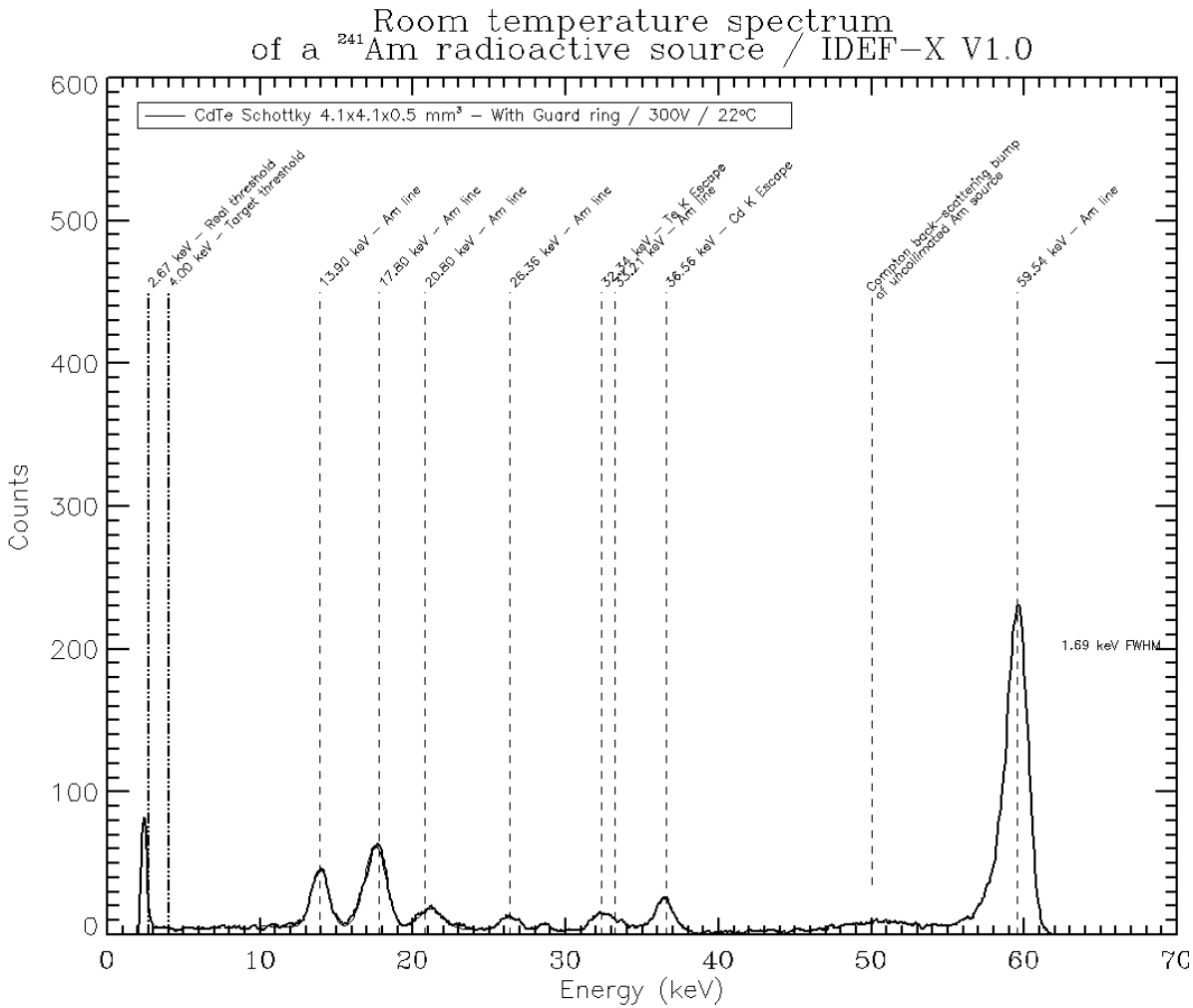


ECLAIRs

Chip size	4040µm x 2355µm
Packaging	JLCC68
Packaging size	2.5cm x 2.5cm
Number of channels	16
Power supply	3.3V
Typical power consumption	2,26mW/channel 36,16mW/chip
Gain	210mV/fC (33mV/ke$^-$) at 9,6µs
Dynamic	-40ke$^-$ → 40ke$^-$
Peaking time (µs)	0,3 0,6 1,2 2,4 3,6 4,8 6 7,2 9,6
ENC (9.6µs $i_{leakage}$=10pA)	20e$^-$ + 3.25e$^-$/pF (floor at 35 e$^-$)

IDeF-X V1.0

Spectrum with CdTe Schottky ^{241}Am (line at 59.5keV) at 24°C



RESOLUTION à 13.9000 = 1.30 keV

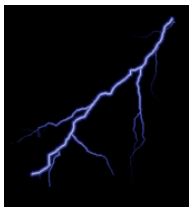
RESOLUTION à 17.8000 = 1.63 keV

RESOLUTION à 20.8000 = 1.76 keV

RESOLUTION à 59.5400 1.69 keV

IDeF-X V1.1

16 channels circuit, multiplexed output, peak detector, discriminator



ECLAIRs

IDeF-X V1.1

IDeF-X V1.0

IDeF-X V0

Charge sensitive amplifiers

PZC

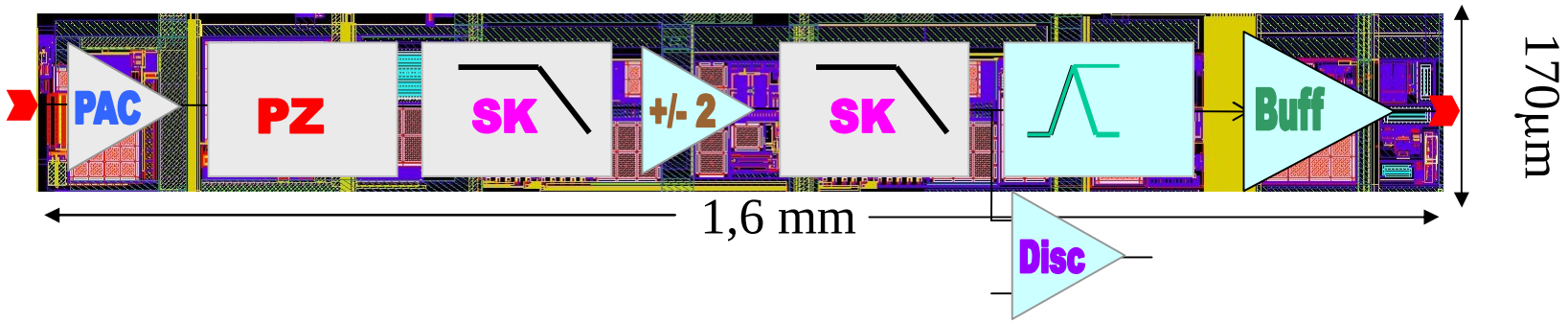
Filtering stages

Offset removal and inverting stage

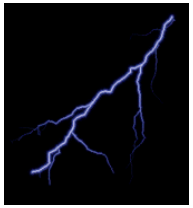
Peak detector

Discriminator

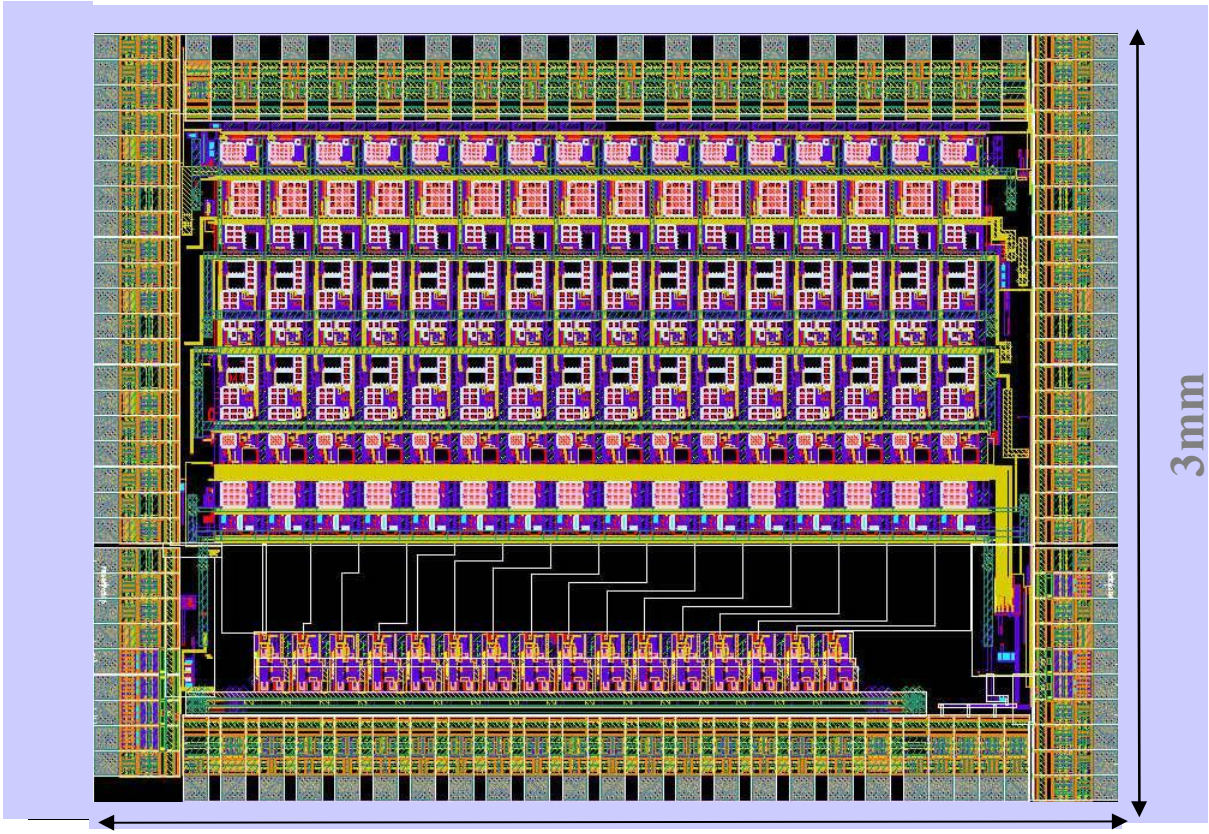
Buffer



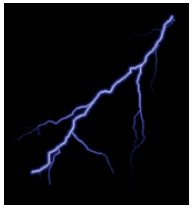
IDeF-X V1.1



ECLAIRs

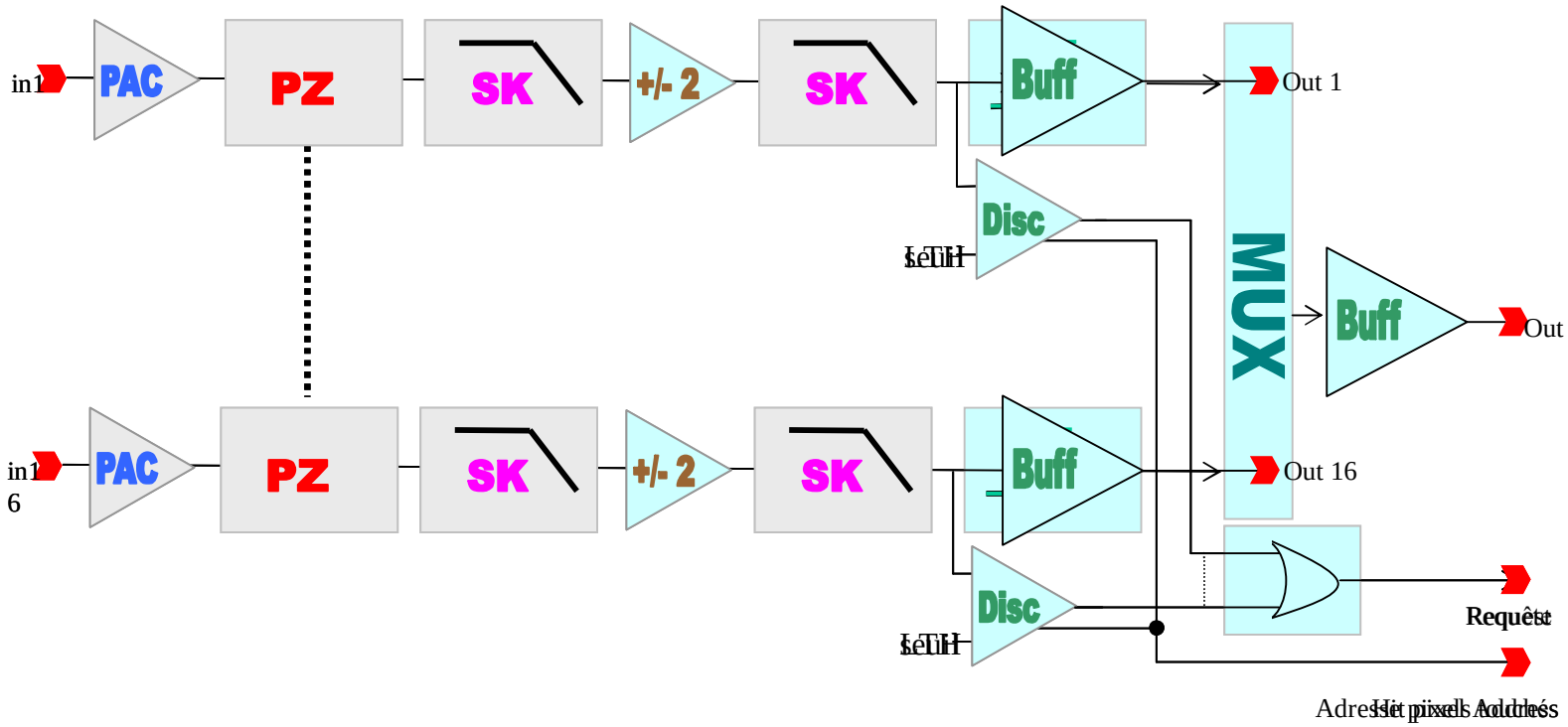


***IDeF-X V1.1* : layout march 2005**

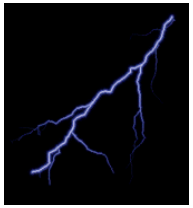


Two operating modes :

Multiplexed outputs (IDeF-X V1.0) :



IDeF-X V1.1



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Dynamic range	-50ke$^-$ → 50ke$^-$
Peaking time (µs)	0,3 0,6 1,2 2,4 3,6 4,8 6 7,2 9,6

Tests will begin this summer