# Readout ASIC for SiPM detector of the CTA new generation camera (ALPS)

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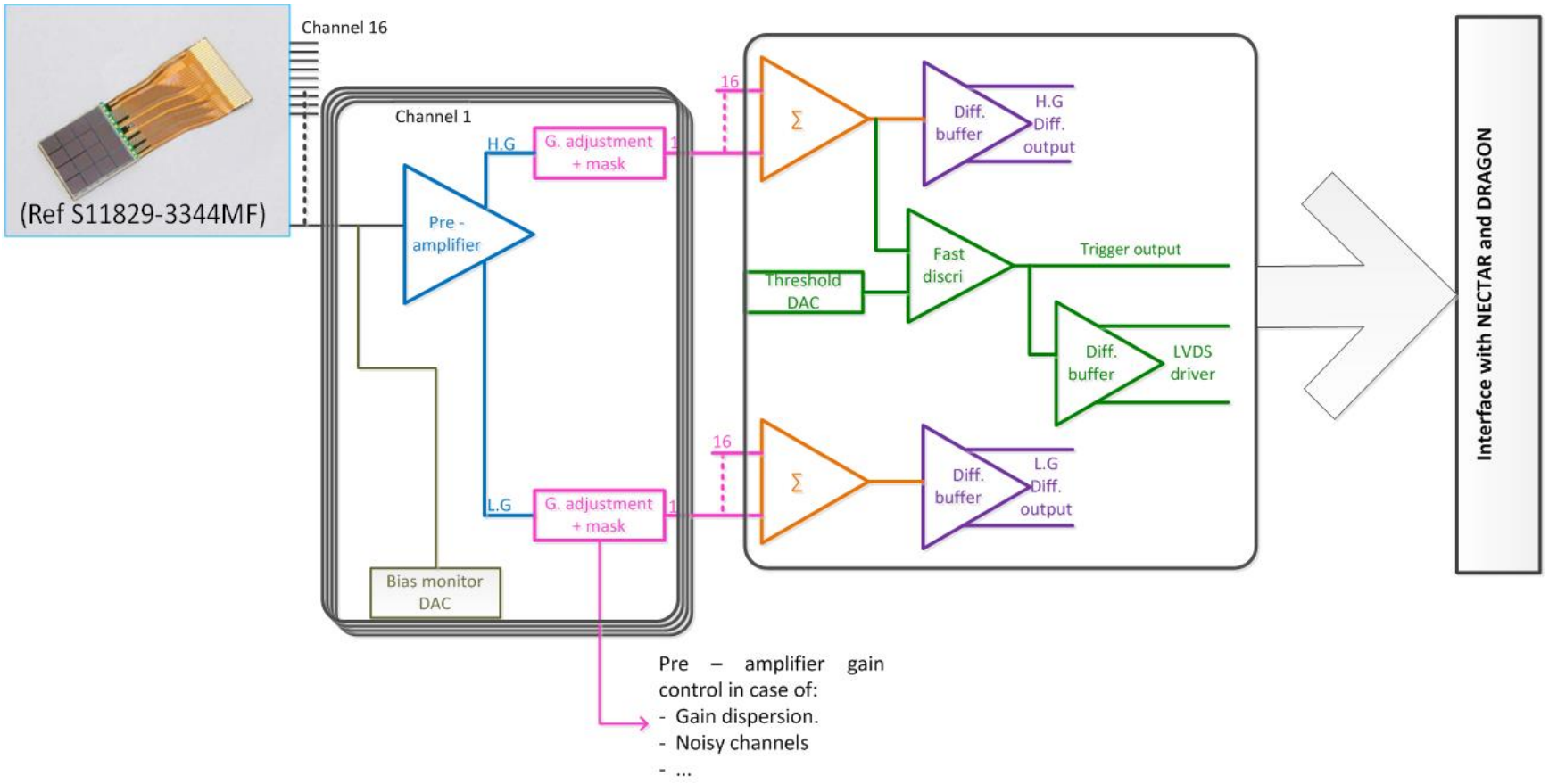
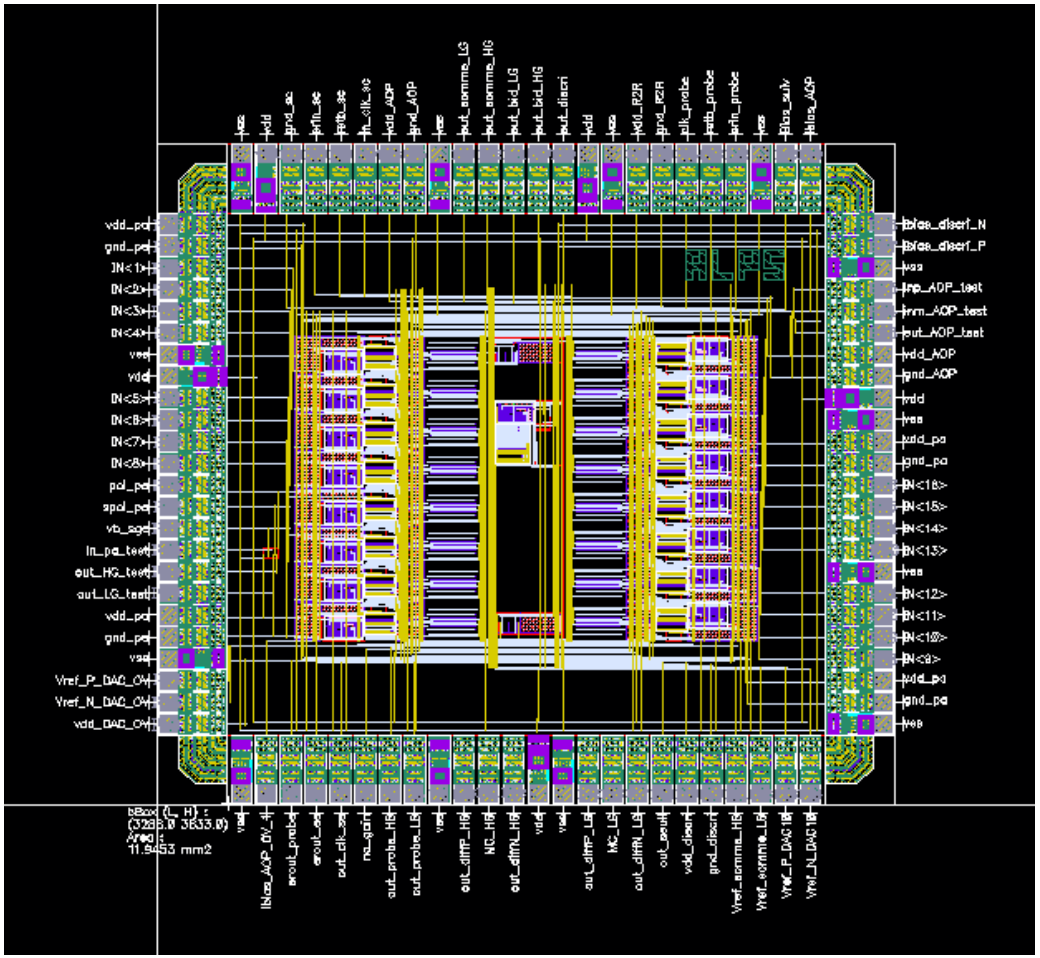
# ALPS chip – bloc scheme



# ALPS chip– Layout

## sent to fabrication 03/03/2014



- **AMS BiCMOS 0.35µm**
- **96 pin out**
- **Die size:**

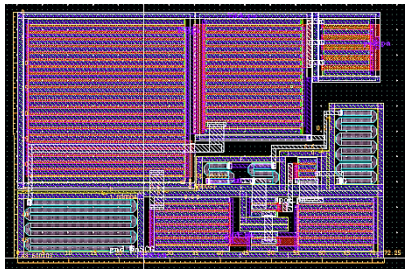
**about 3.673 X 3.298 mm²**

We haven't received it yet!

**To be tested at the beginning of June**

Pre - amplifier

# Pre-amplifier



- 16 channels: adapted to 4x4 SiPM matrix
- Principle:
  - Low input Impedance about 20 ohm.
  - Fast response < 5ns

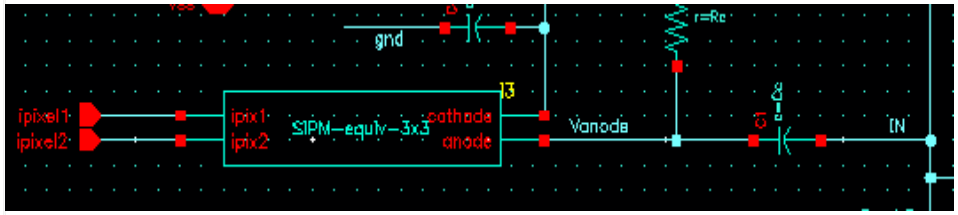
  => **Current mode**
- Dynamic range:
  - From 1 up to about 2000 photoelectron (pe)
  - Signal to noise ratio (SNR) > 5

  => **2 Gains**
  - HG covers from 1 to about 125 pe
  - LG covers from 11 to about 2000 pe

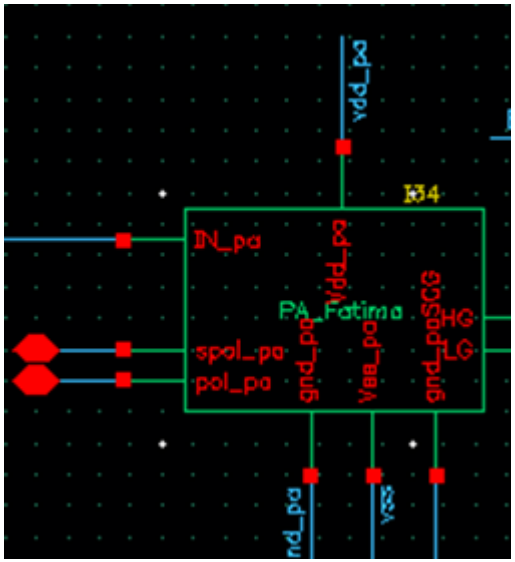
  Gain ratio about 92, gain overlap 1 decade
- Voltage output
- Low power consumption < **30mW** at this stage (from simulation)

# Pre-amplifier simulation (1)

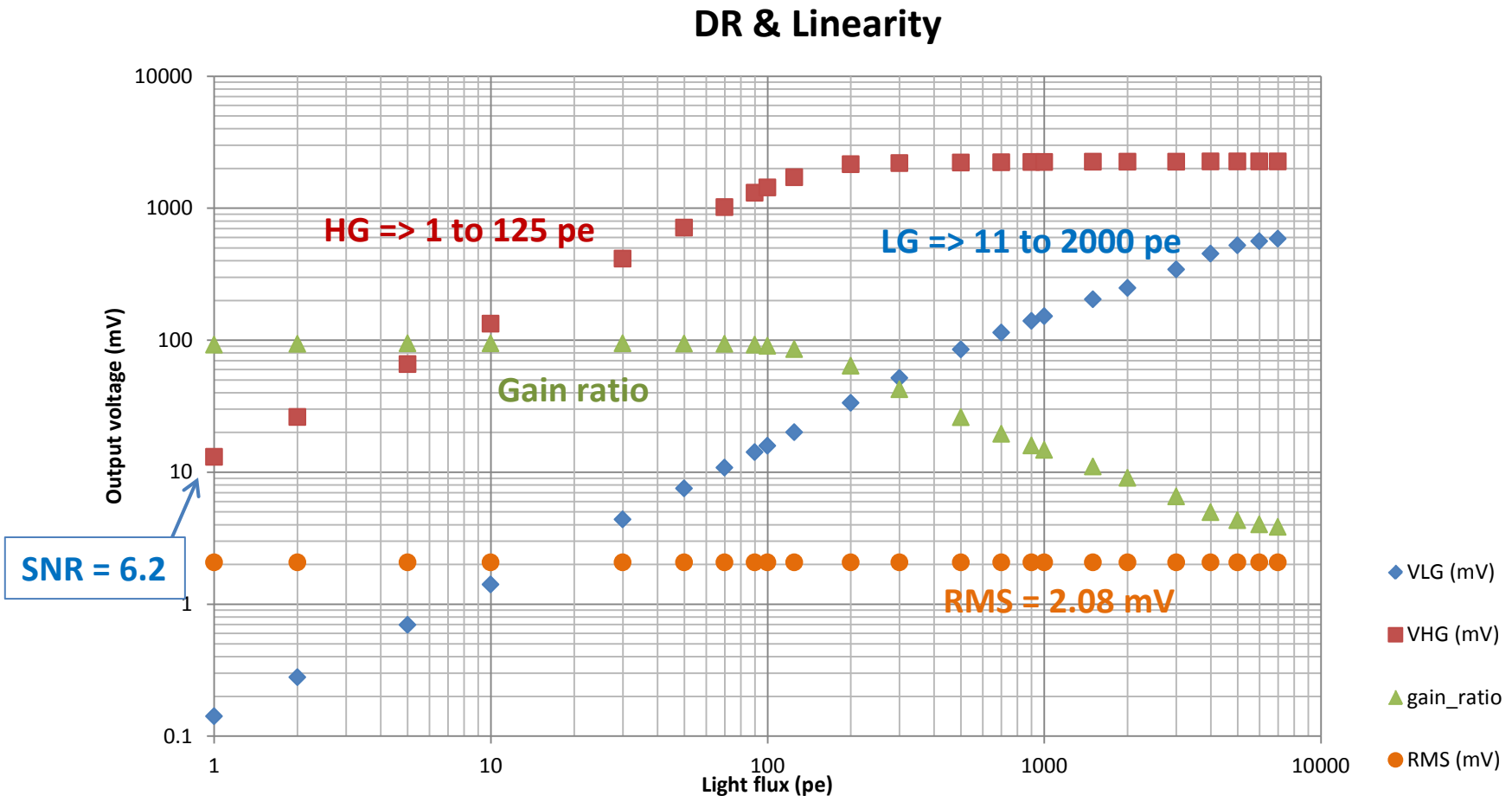

Simulated SiPM signal 1pe



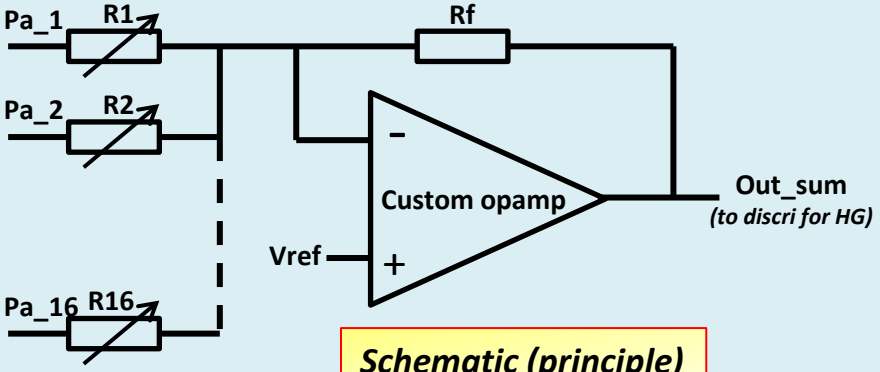

High gain response



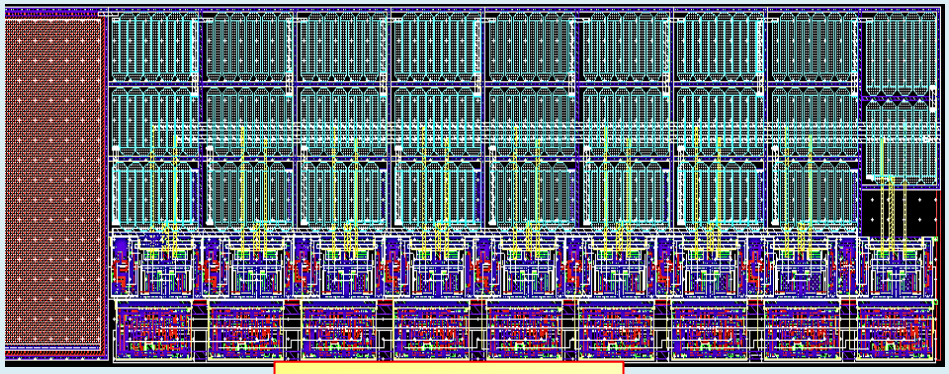
# Pre-amplifier – simulation (2)



# Analog sums and gain control



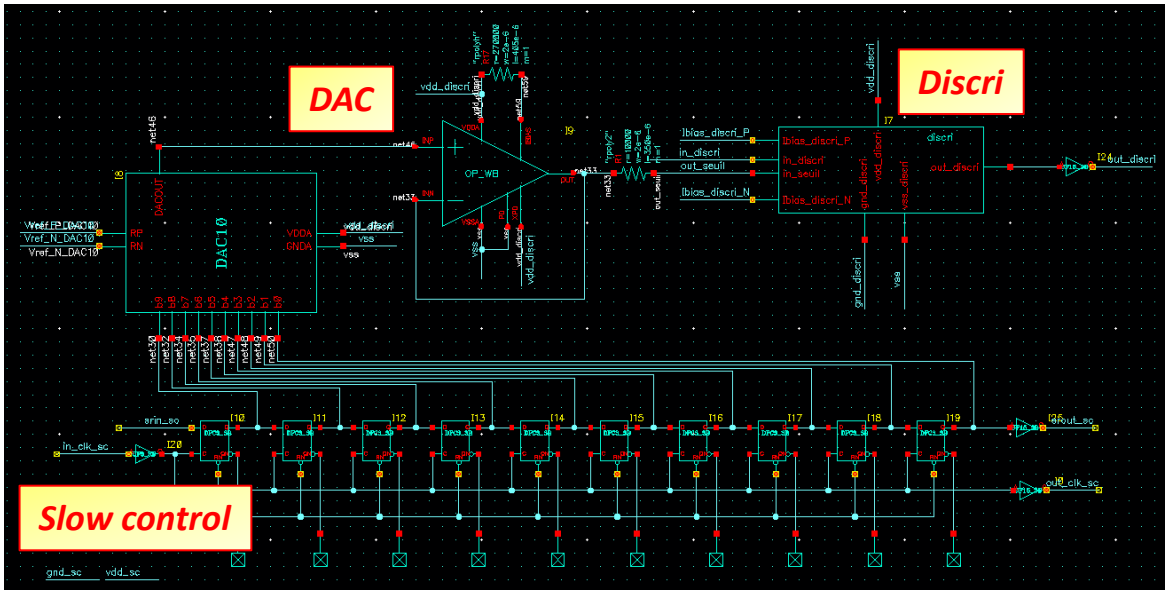

*Schematic (principle)*

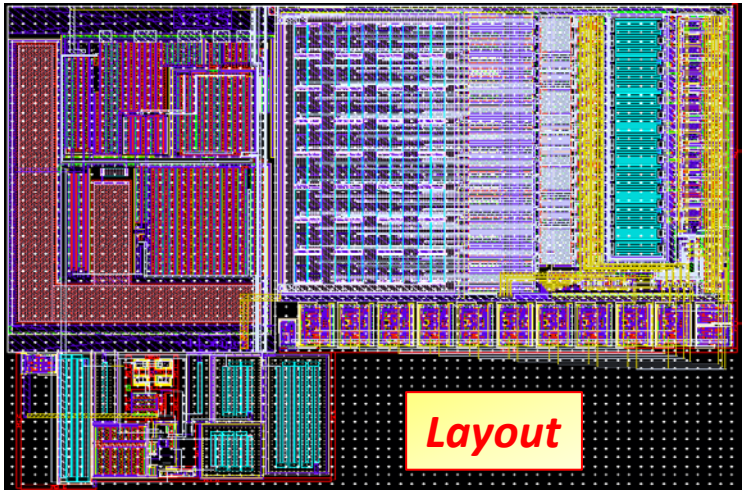


*Layout of 1 resistor*

- Weighted sum of the 16 preamp outputs by digitally controlled resistors
- Each resistor has a R-2R like architecture :
  - Preamp always sees the same load (better for linearity)
  - 8 bits resolution for gain adjustment
  - Noisy channels can be digitally removed
- CR shaping included in each channel
- Adjustable Vref to match the discriminator threshold

# Trigger (DAC + discri)




- Discriminator (full custom) :
  - Dual bipolar input stage to minimize offset
  - Self-biased
  - Buffered digital output for trigger
- 10 bits DAC for threshold
  - AMS standard cell
  - Digitally controlled threshold

# Perspective:

- Test board (to measure the performance of the ALPS chip) has been designed and submitted.
- Collaboration?