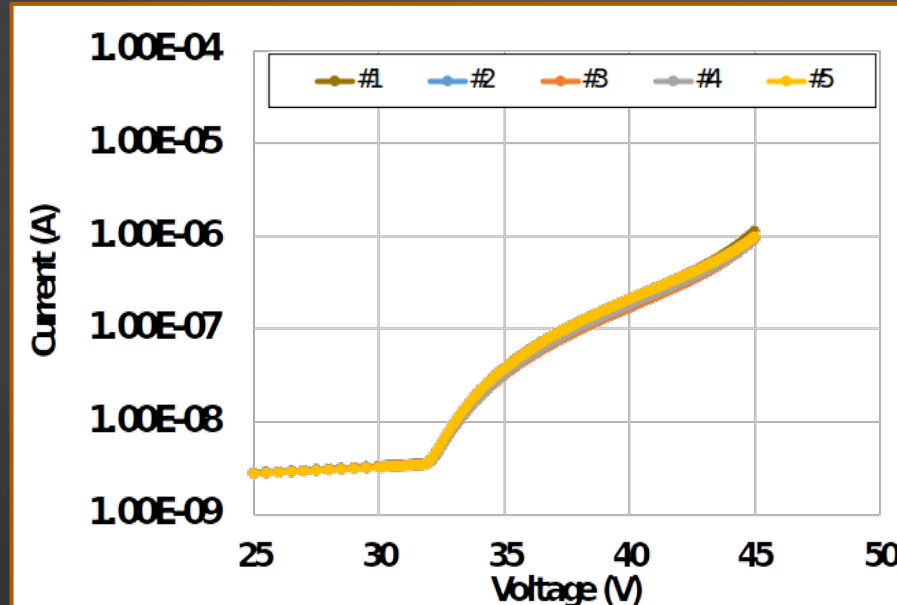
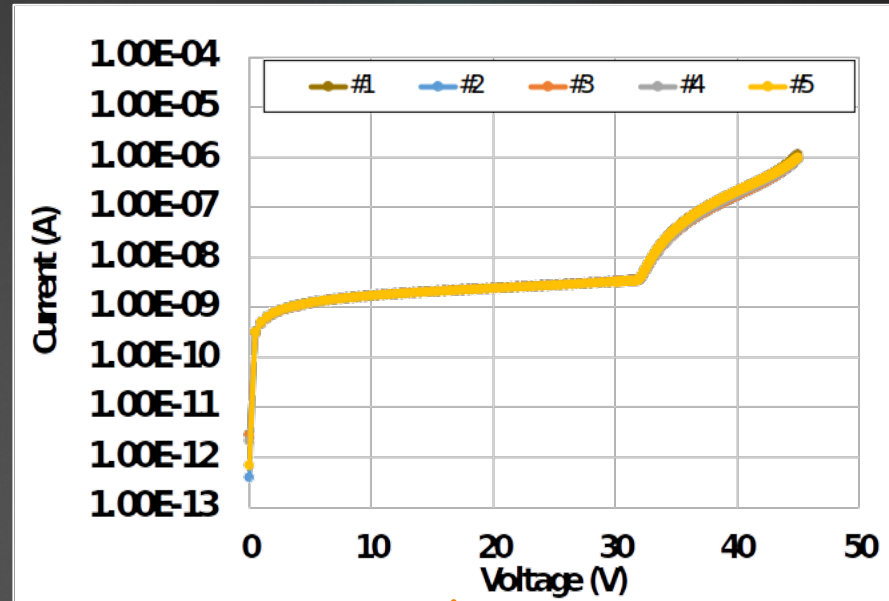


# First test on FBK SiPM NUV-HD-HFF

FABIO GARGANO

## SiPM parameters:

Breakdown Voltage (at RoomT)	~32.6 V	5 samples	3x3 mm <sup>2</sup>
Active Area (nominal)	3.14x3.99 mm <sup>2</sup>	Device Type	NUV-HD-HFF
Cell pitch	15 μm	Junction type	p-on-n



# Set-up

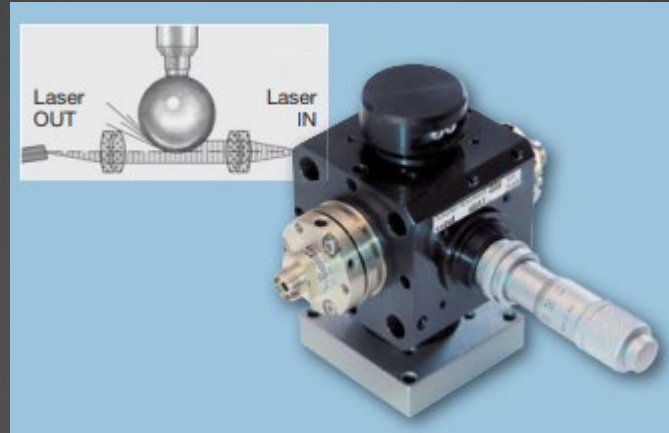
Source: Pilas Laser  
405nm  
1 MHz



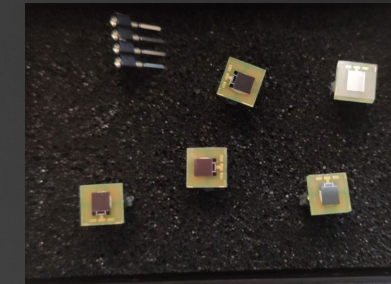
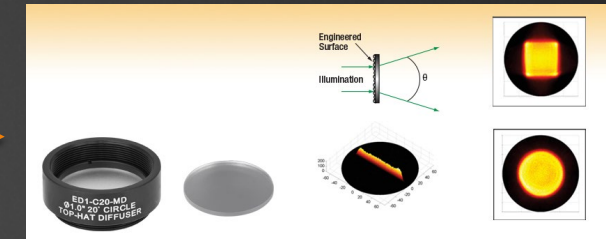
Laser specifications	Pilas
Center wavelength <sup>1</sup>	375 nm - 2 µm
Pulse Duration <sup>2</sup>	20 ps - 150 ps
Pulse peak power <sup>3</sup>	10 mW - 1 W
Pulse energy <sup>4</sup>	1 - 50 pJ
Av. output power at 100 MHz	0.5 - 2 mW
Pulse repetition rate	pulse-on-demand - 120 MHz
Beam quality	M <sup>2</sup> < 1.1, TEM <sub>00</sub>
Polarization Ext. Ratio	> 20 dB
Timing jitter <sup>5</sup>	< 3 ps (rms)
Laser output	free-space or fiber output (PM, SM, MM)
Environmental	
Warm-up time	< 10 minutes
Operation temperature	15°C - 35°C
Storage temperature	-20°C - 65°C
On/Off cycles	> 10000
Mechanical	
Size laser head	97 x 31 x 147 mm <sup>3</sup>
Weight laser head	0.45 kg
Size OEM control unit <sup>6</sup>	168 x 129 x 33 mm <sup>3</sup>
Weight OEM control unit	0.7 kg
Size stand-alone control unit	235 x 88 x 326 mm <sup>3</sup>
Weight stand-alone control unit	2.5 kg
Electrical	
Power supply	12VDC/3A or 100 - 264 VAC, 47 - 63 Hz
Power consumption	< 30 W
Cooling	
Laser system	air cooled

<sup>1</sup> All commercially available laser diode wavelengths in this range  
<sup>2</sup> Depending on laser head model, pulse duration up to 5 ns possible  
<sup>3</sup> Depending on laser head model  
<sup>4</sup> Depending on laser head model and pulse duration  
<sup>5</sup> Not for DFB/DBR lasers  
<sup>6</sup> Other OEM versions available

Fiber-coupled Attenuator 48AT-0



ED1-S50-MD - SM1-Threaded Mount, Ø1" 50°  
Circle Engineered Diffuser

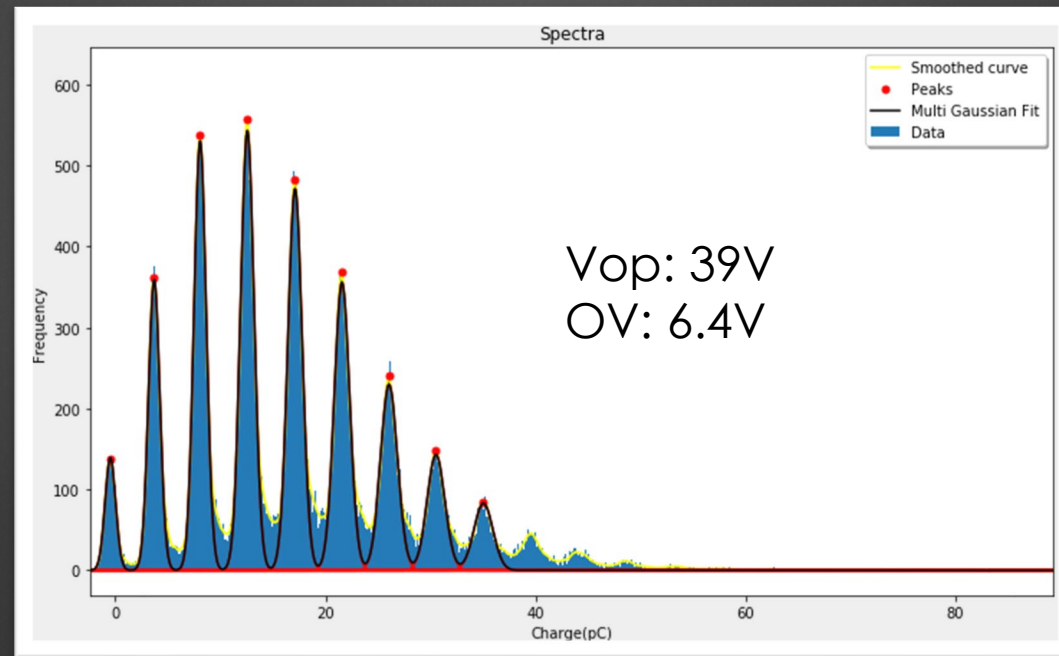
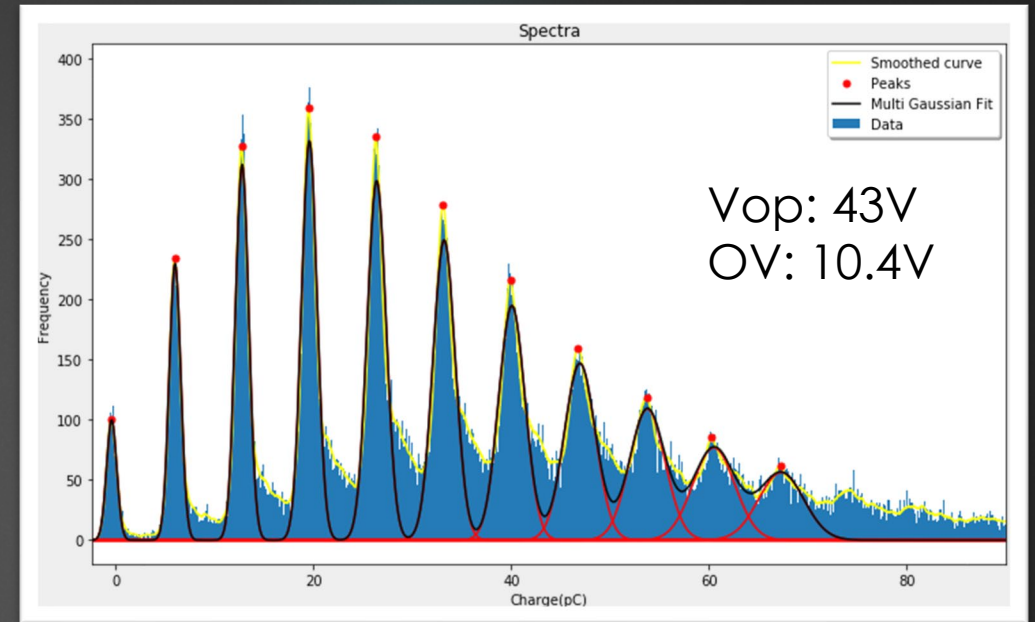
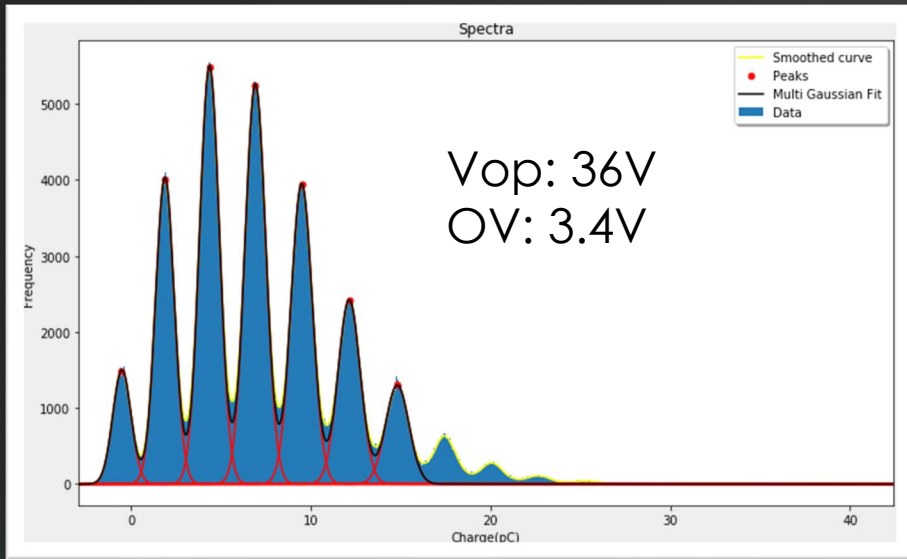


Teledyne LeCroy WR610ZI  
4 Ch 1 GHz Digital Oscilloscope



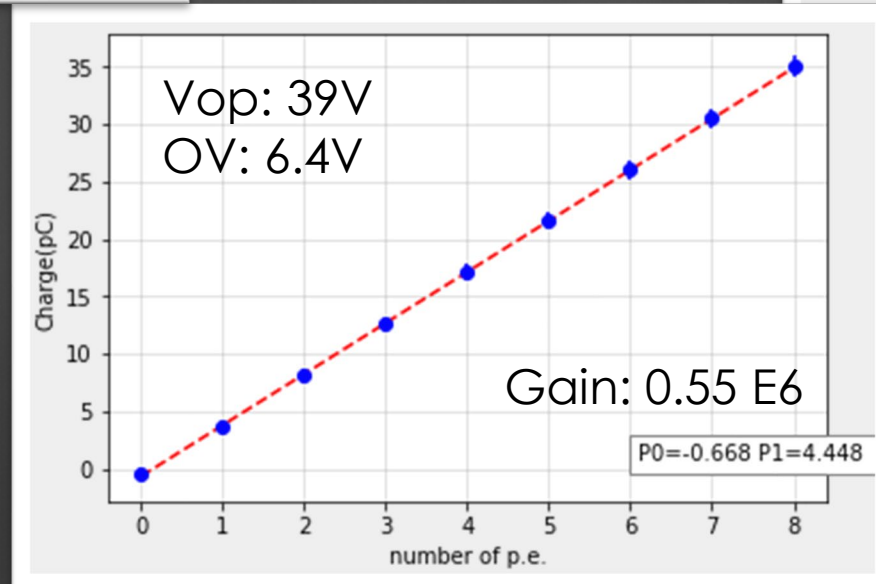
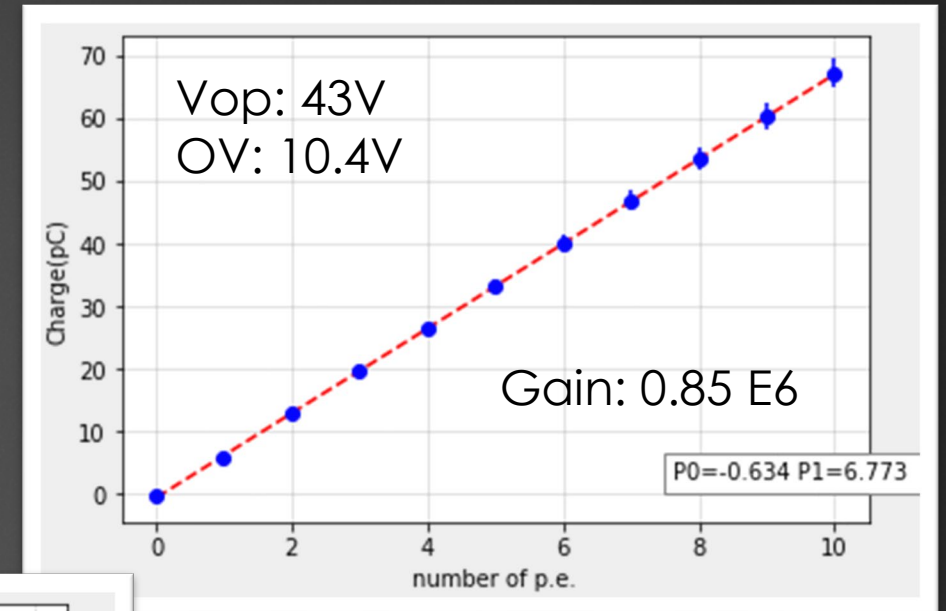
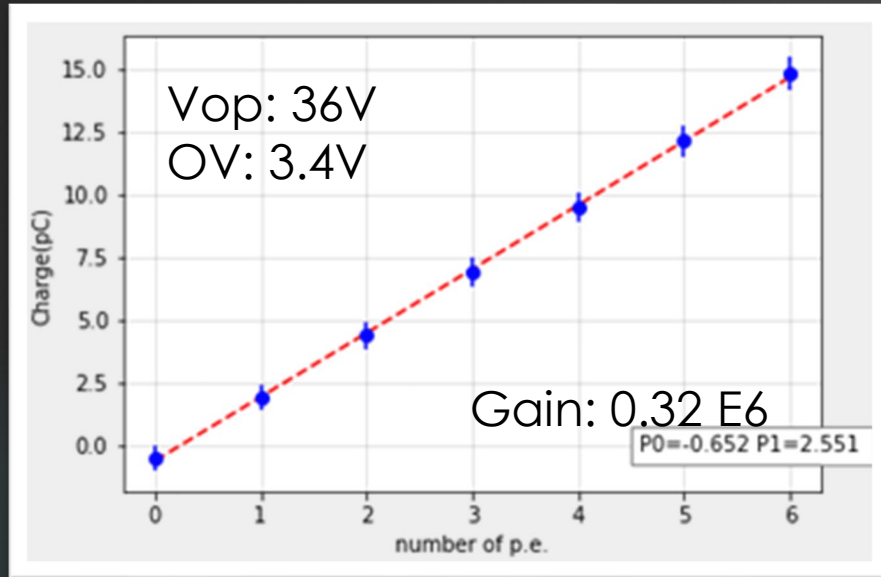
ASD-EP-EB-N - SiPM Evaluation Board





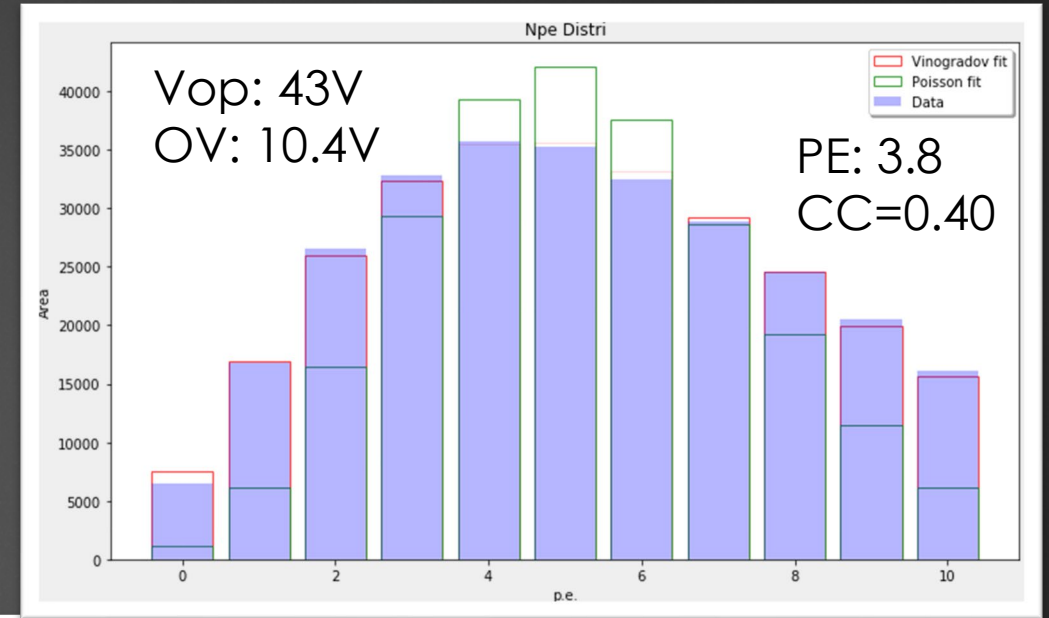
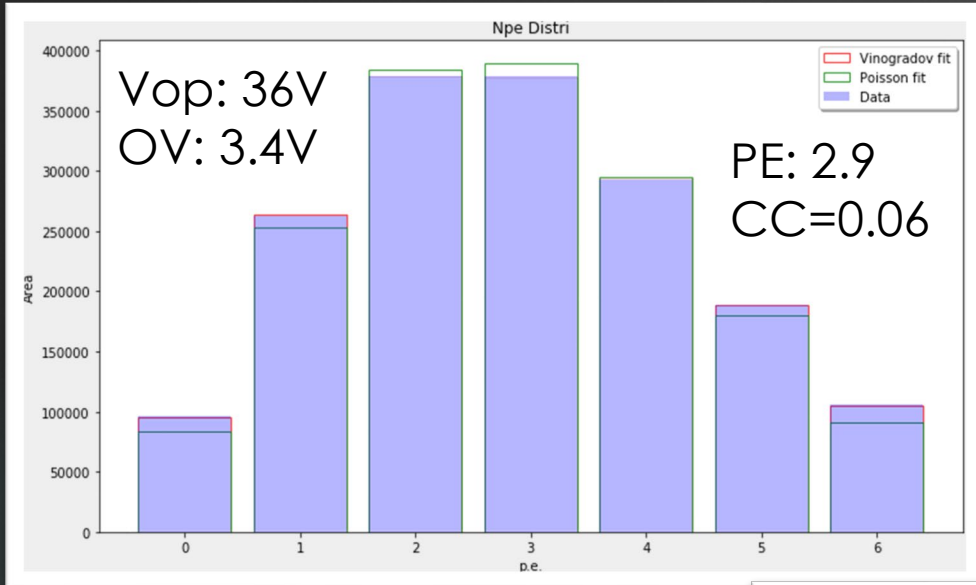
# Gain

From the distances between the peaks is it possible to evaluate the gain taking into account the trans-impedence amplifier gain



# Cross correlation

From the area below each peak is it possible to evaluate the number of p.e. detected and with a Vinogradov fit is it possible to measure the Cross Correlation Factor



$$f_k(p, L) = \frac{\exp(-L) \cdot \sum_{i=0}^k B_{i,k} \cdot [L(1-p)]^i \cdot p^{k-i}}{k!}$$

where

$$B_{i,k} = \begin{cases} 1 & \text{if } i=0 \text{ and } k=0 \\ 0 & \text{if } i=0 \text{ and } k>0 \\ \frac{k! \cdot (k-1)!}{i! \cdot (i-1)! \cdot (k-i)!} & \text{otherwise} \end{cases}$$

