

# Calibration of the gain and measurement of the noise for the aPV25 electronics

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*From INFN Italy: E. Cisbani, P. Musico*

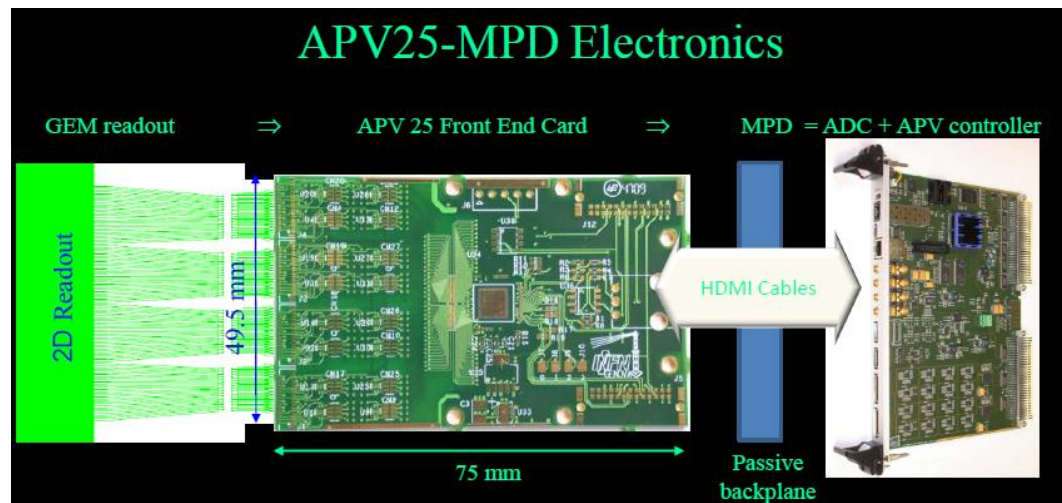
Experimental setup put in place at UVa to

- Measure the gain of two apv25 based readout electronics: Scalable Readout System (CERN, RD51) and MPD (INFN Italy for SBS)
- Measure the apv channels rms noise and estimation of the ENC from the apv gain measurement
- Comparison of the performances of the two systems

# APV25 MPD and SRS system

## Multi Purpose Digitizer (MPD)

- P. Musico, INFN Italy
- More than 2.5K Channels at UVa



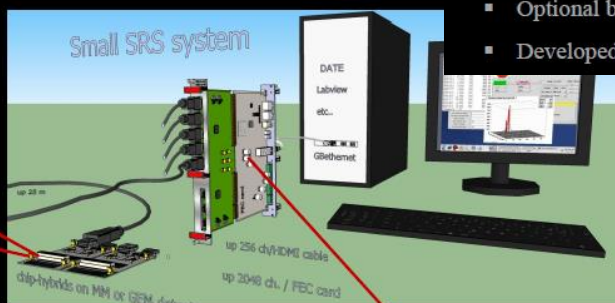
### Main features:

- 2 “active” components: Front-End Card and VME64x custom module (MPD=Multi Purpose Digitizer)
- HDMI Copper cables between front-end and VME
- Optional backplane acting as signal bus, electrical shielding, GND distributor and mechanical support
- Developed by INFN, manufactured by a commercial company

## APV25-SRS Electronics @ UVa



Scalable Readout System (SRS)

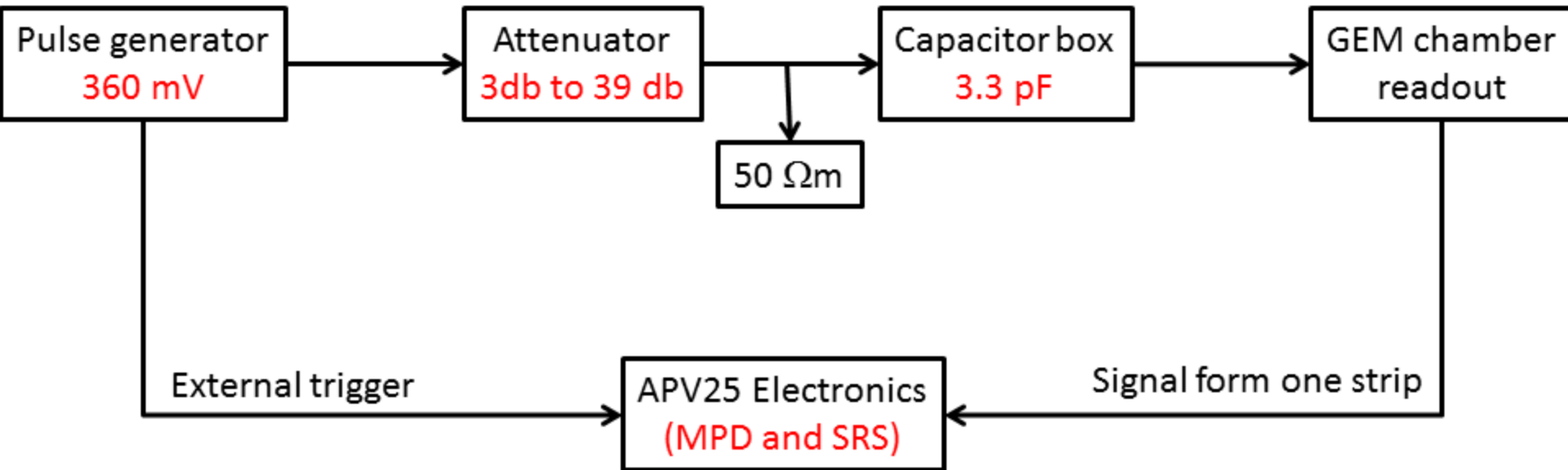


## Scalable Readout System (SRS)

- H. Muller, CERN, RD51
- 2048 channels at Uva

- Portable readout system developed by RD51 Collaboration (CERN)
- Successfully tested with APV25 chip ( many users and experiments)
- APV25 cards, 1 ADC board, 1 Data Concentrator board
- Data transferred to the DAQ Ethernet via UDP (ALICE DAQ)
- Common platform for different chips ( Beetle, VFAT, VMM1)

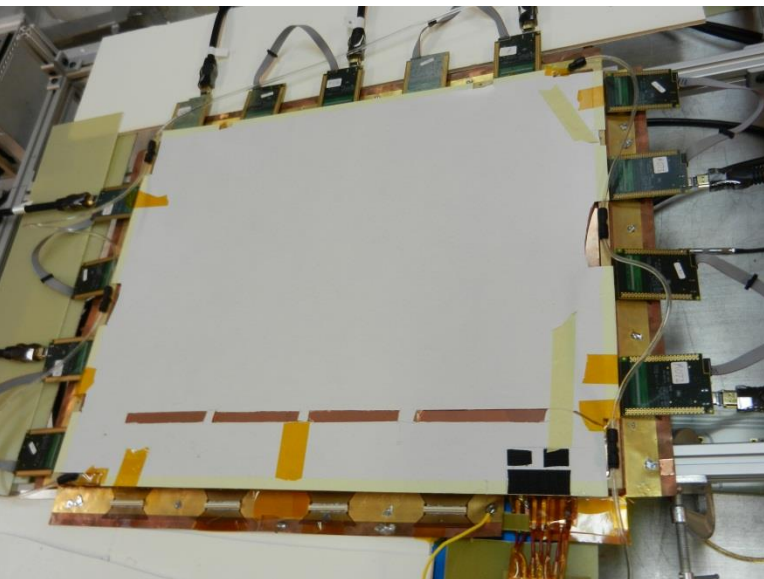
# APV25 Gain calibration setup



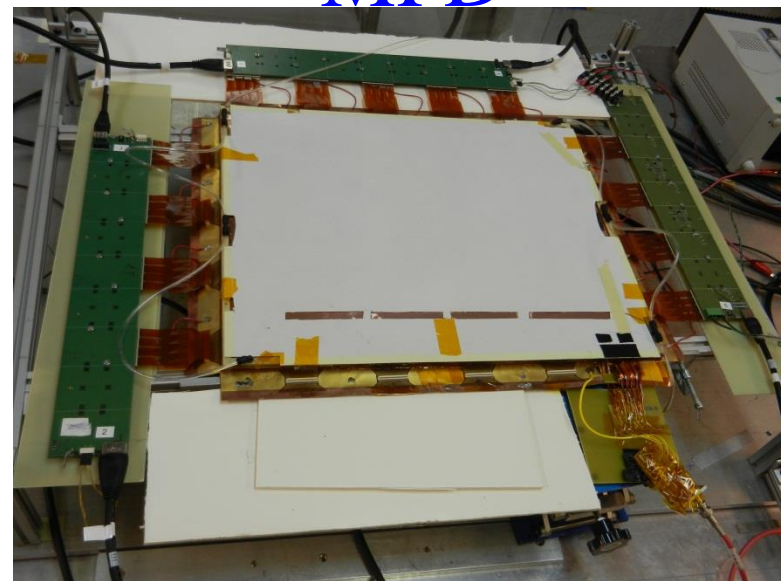
- Test pulse = 360 mV, Capacitor = 3.3 pF → Equivalent charges = 7.2 Million e<sup>-</sup>
- Injected charges = Equivalent charges / Attenuator → attenuation 3dB to 39 db

# APV2 on SBS GEM prototype

## SRS



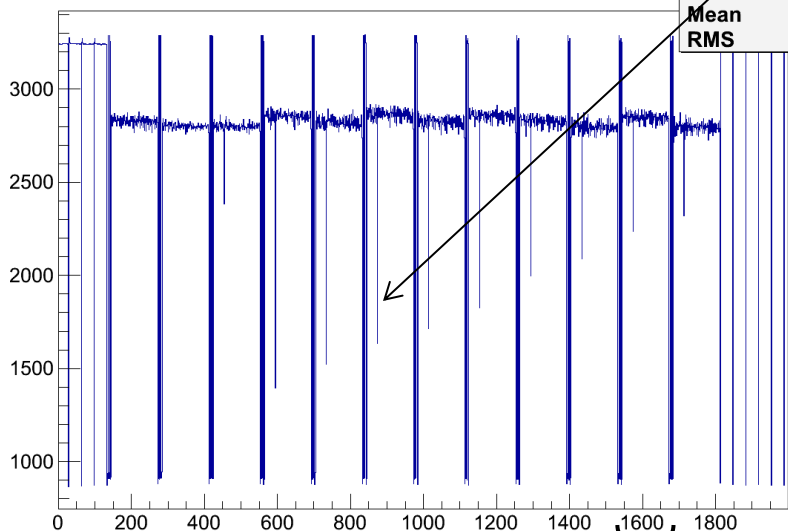
## MPD



Analog signal

Fec1 ch1 APVn1 eventNo 2524

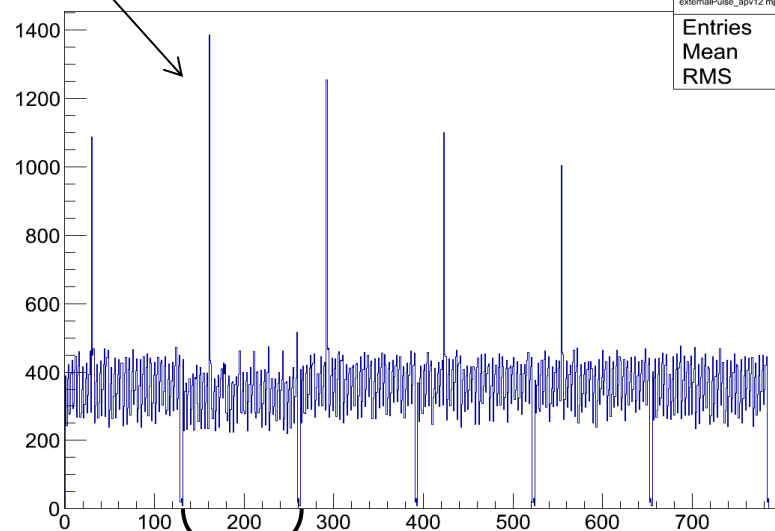
apvNo1RawData	
Entries	2524
Mean	1006
RMS	587.5



11/07/2012

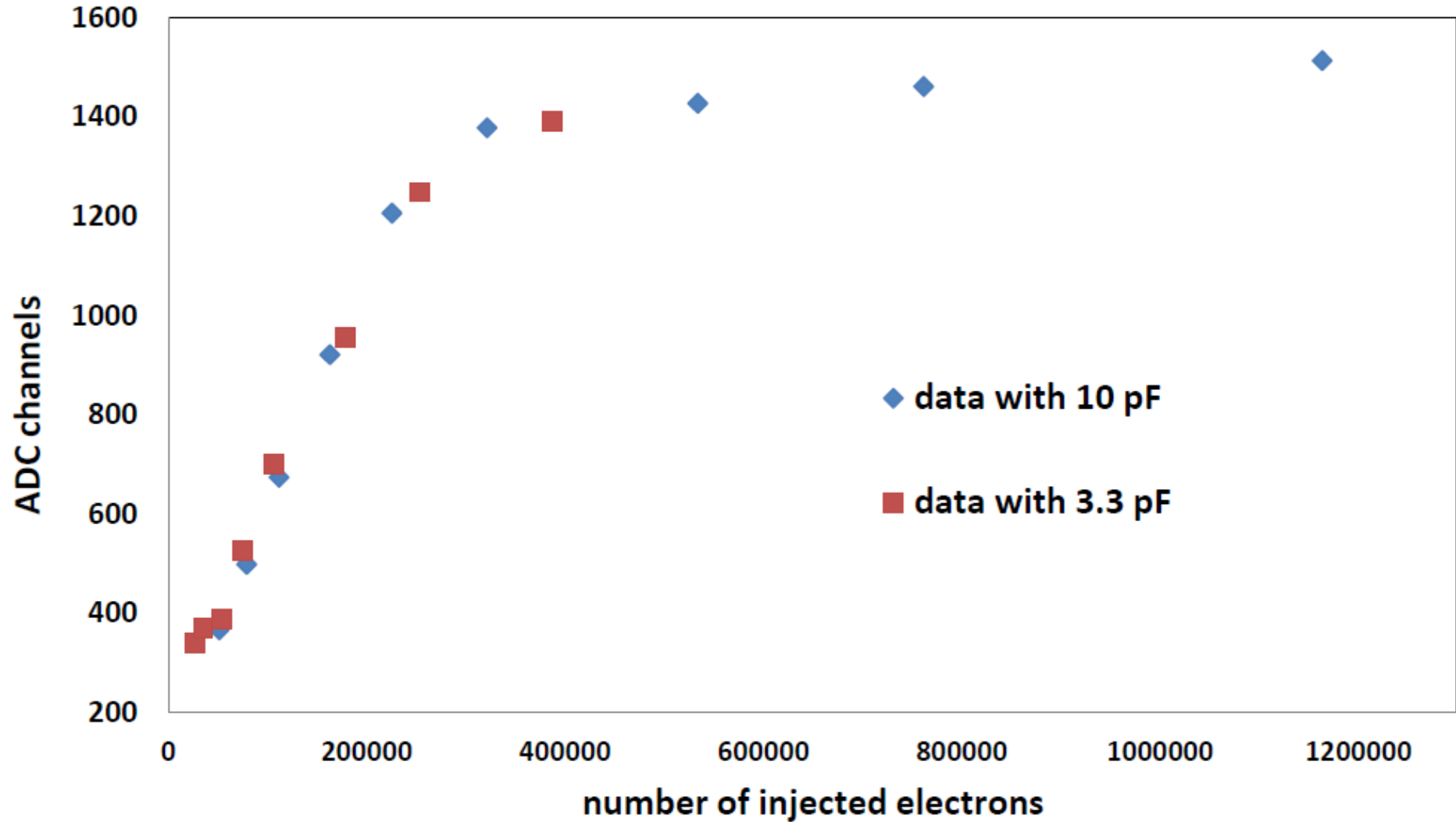
externalPulse\_apv12 mpd9 adc3 adc12C3

externalPulse_apv12 mpd9 adc3 adc12C3	
Entries	786
Mean	393.6
RMS	225.8



SBS Weekly meeting  
25 ns time frame

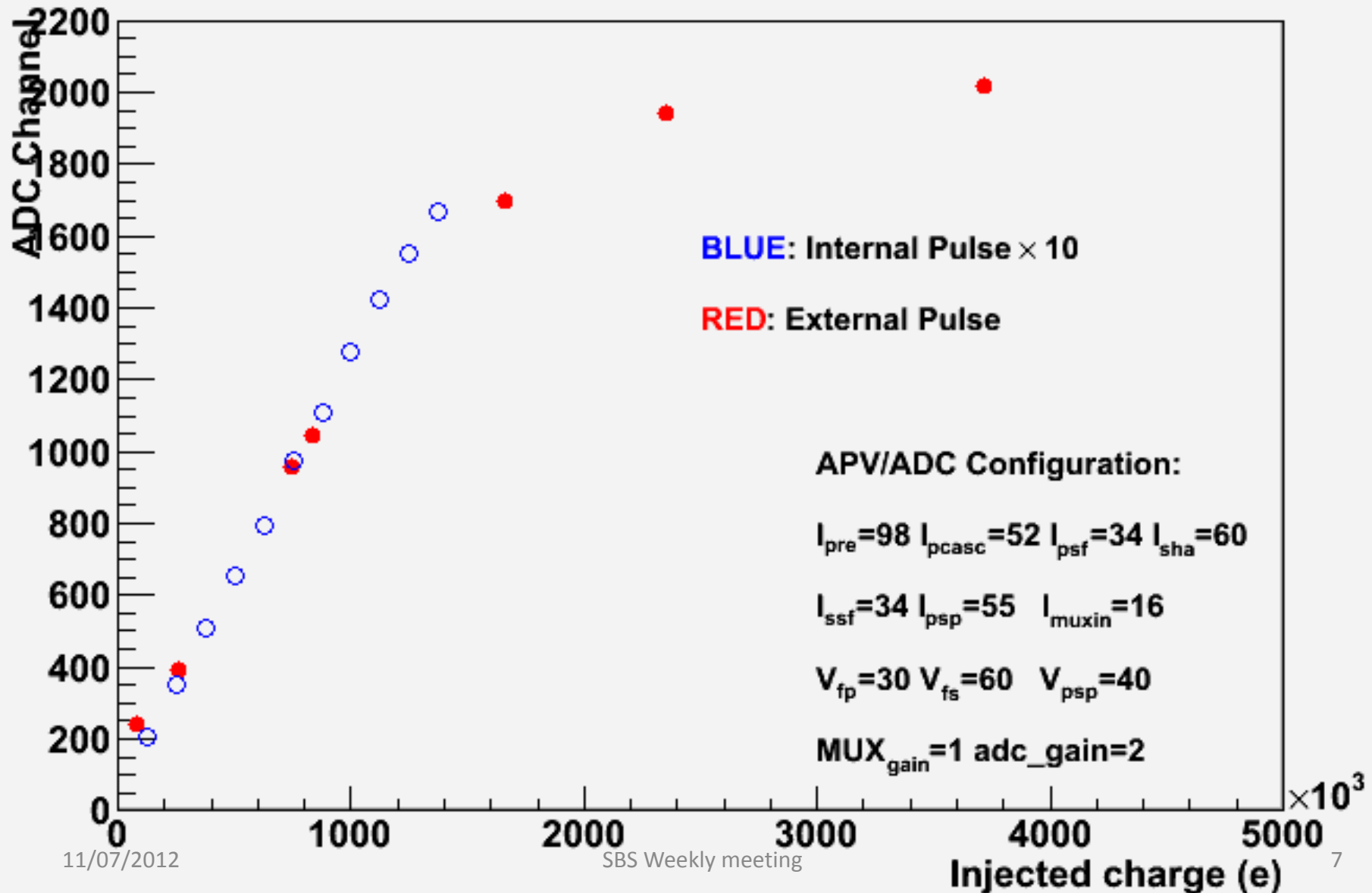
# APV25-SRS with external pulse



# APV25-MPD with Internal & external pulse

## INFN/APV - ADC Calibration

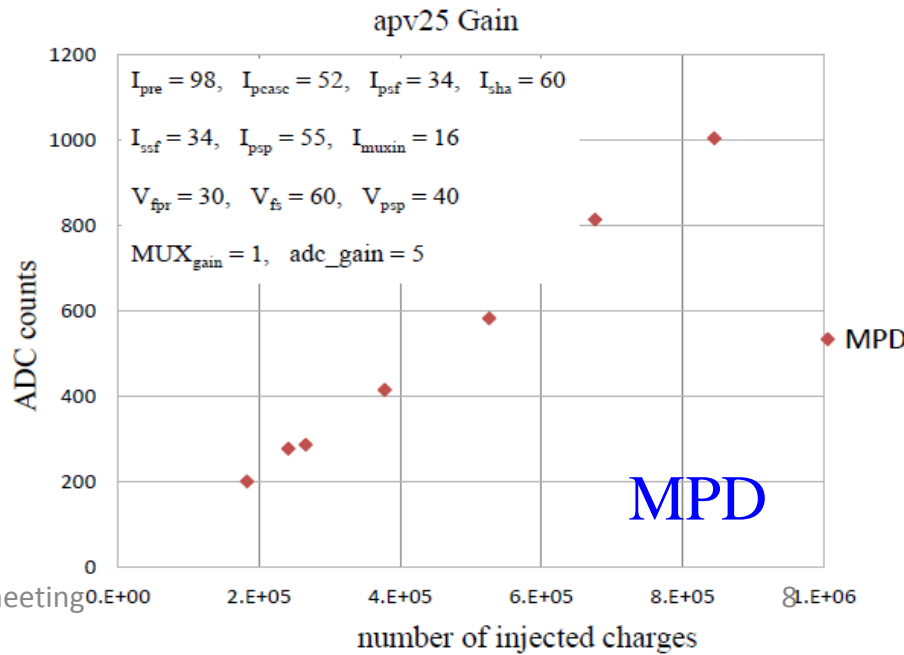
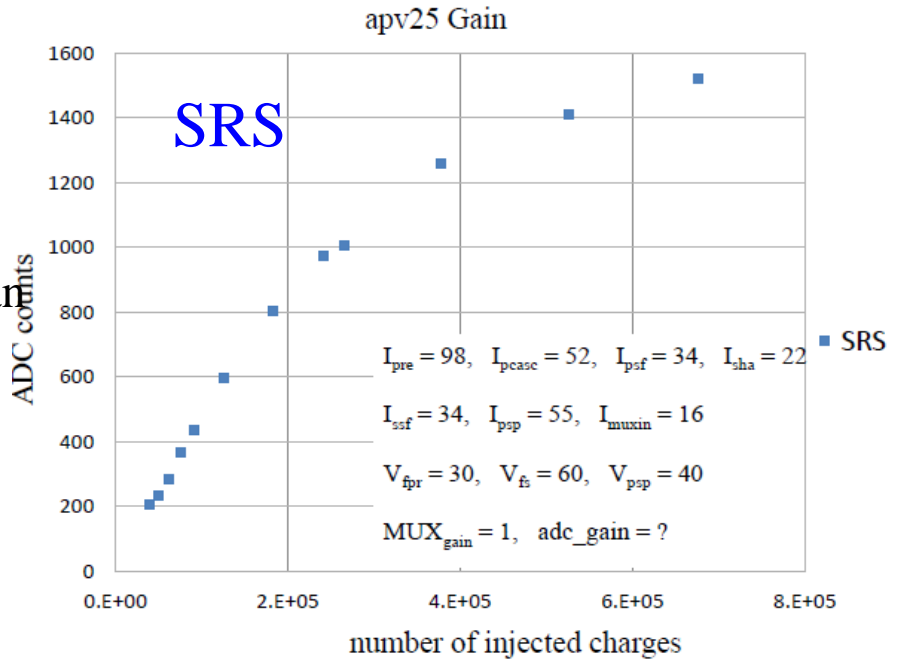
Courtesy E. Cisbani



# APV25 and ADC configuration for MPD and SRS systems

- We have almost the same configuration parameters for the two systems
- Different performances of the two electronics can be related to some differences in hardware that Paolo has identified:

- protecting diode in the VCC line of the INFN card
- input capacitance 47 pF vs. 1 pF in SRS
- 1 M $\Omega$  resistor to ground in the SRS input lines
- external biasing in INFN card vs. internal biasing in SRS (this affect the values of the APV parameters for the optimal working point)

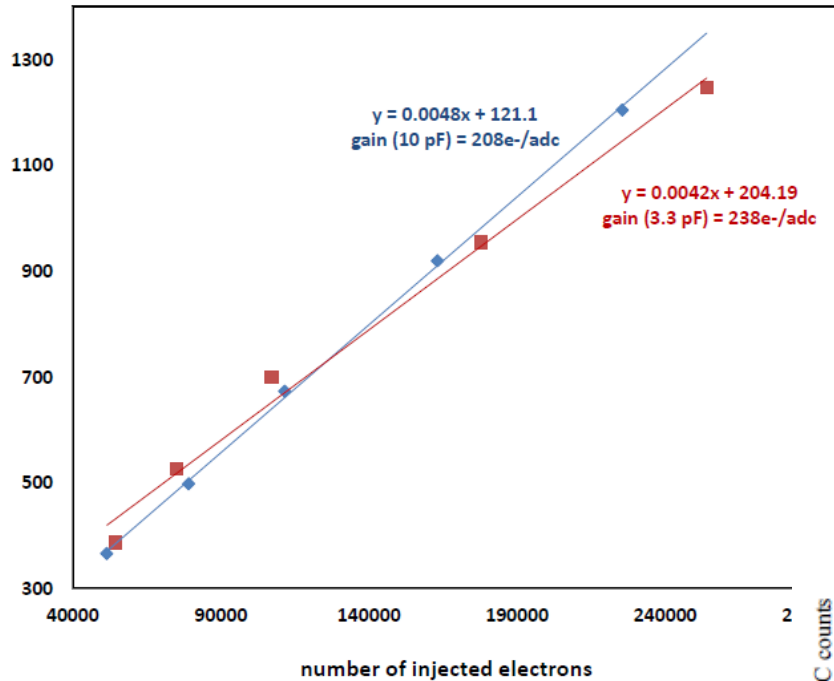




# Apv25 Gain: MPD vs SRS

## Gain calibration with 3.3pF and 10pF

apv gain with SRS electronics



## Gain calibration for SRS and MPD

apv25 Gain

