

# SiECAL Technological Prototype TB

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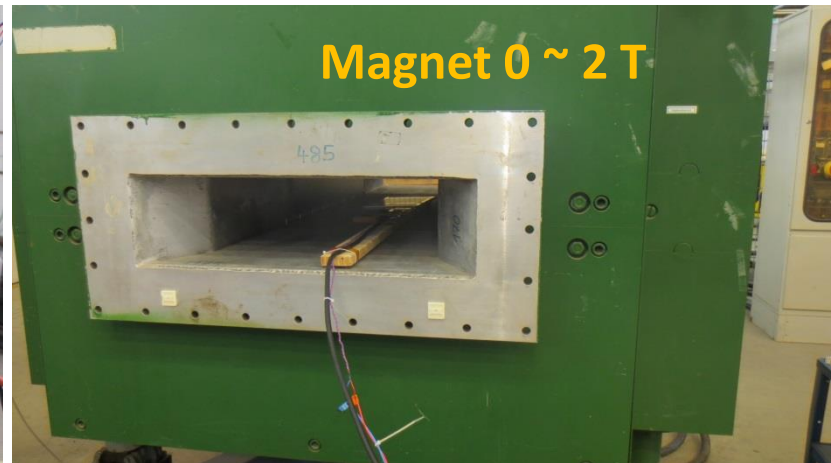
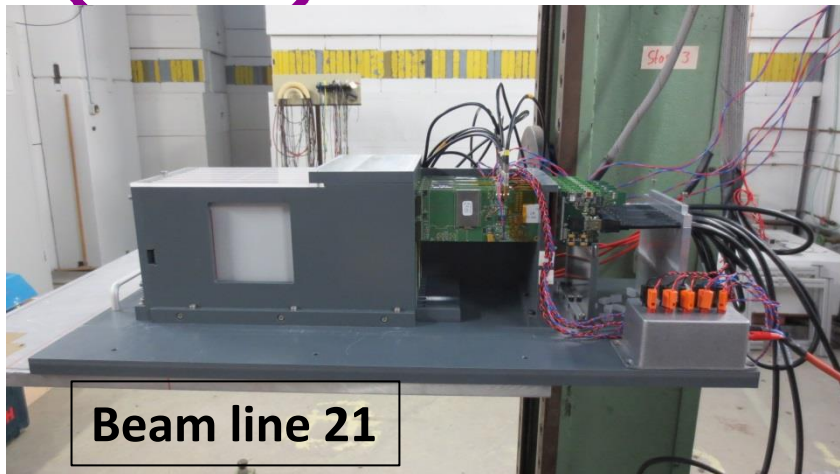
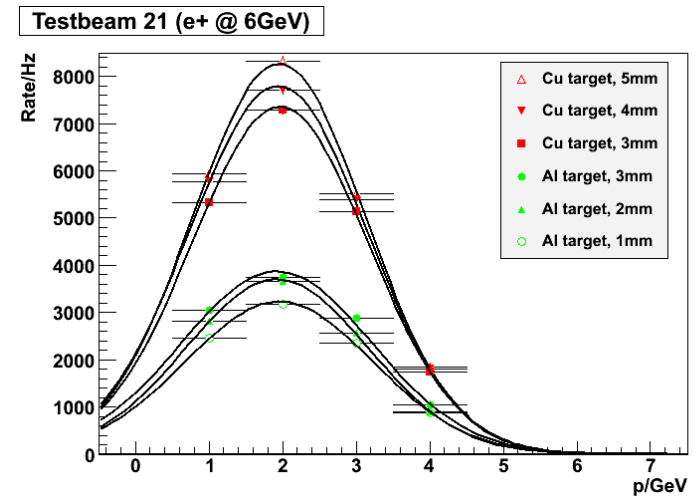
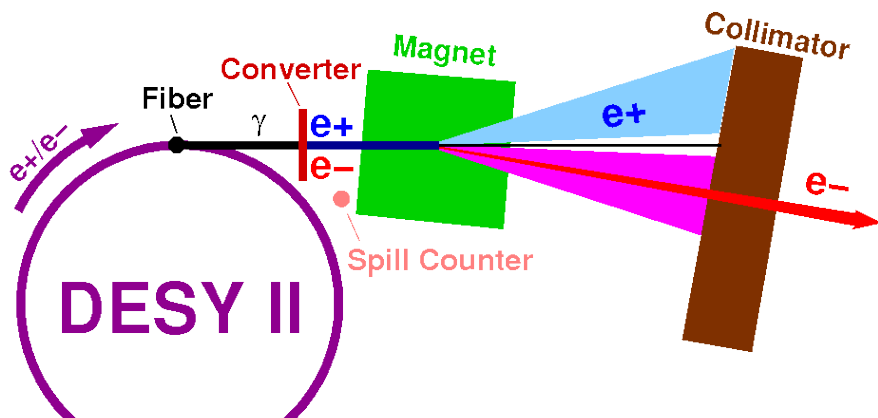
On behalf of SiWECAL Group.

# SiECAL Test Beam @



Test Beam for The SiECAL technological prototype at beam line 21.

Main goal = **Power Pulsing**



# Slabs

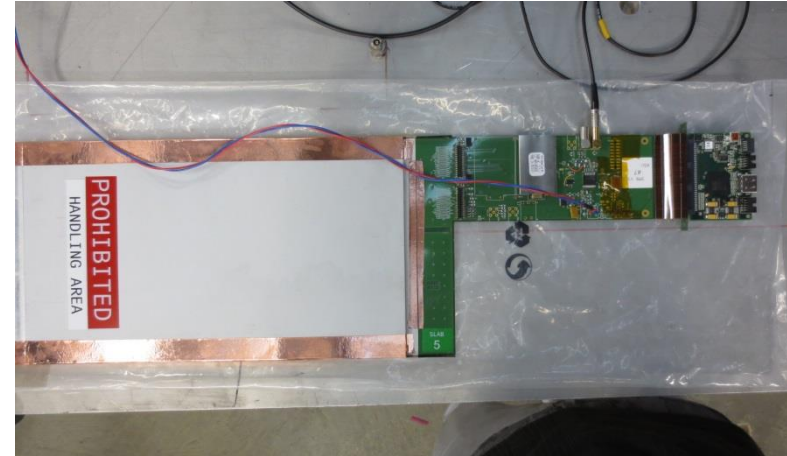
Si sensor has 324 pixels

Pixel size =  $5 \times 5 \text{ mm}^2$

4 SKIROC2b ASICs in a slab = 256 ch/slab

We tested 10 slabs with  $e^+$  beam.

- 4 slabs in Power Pulsing (PP) mode
- 4 slabs in no-PP mode
- 2 slabs have interconnection problem.



four no-PP slabs are same setting as last summer TB.

PP slabs are modified for PP mode.

- all PP slabs have no decoupling capacitance for  $V_{ref}$  (dif 1,2,3,8)
- bigger decoupling capacitance in power supply lines (dif8)
- pin clipping (dif2)

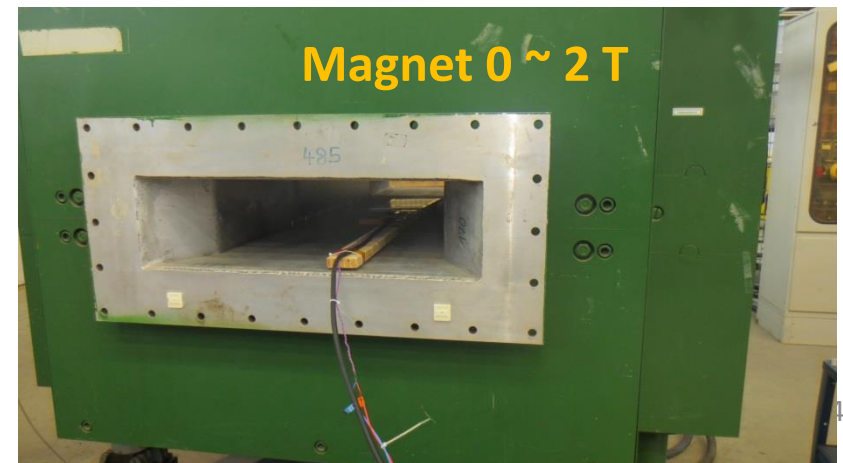
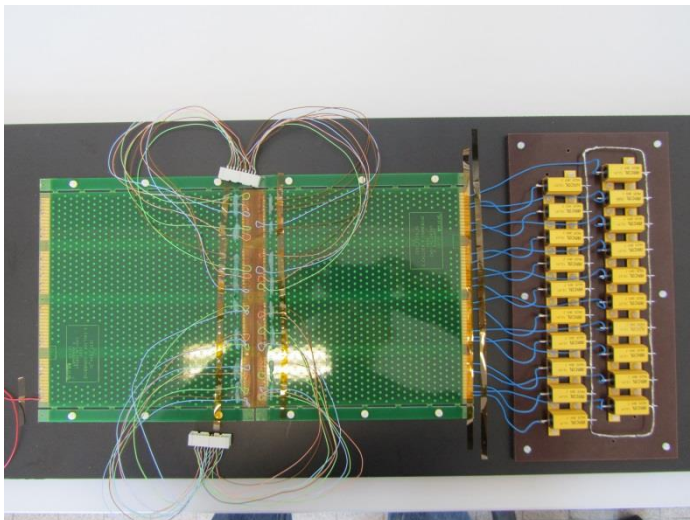
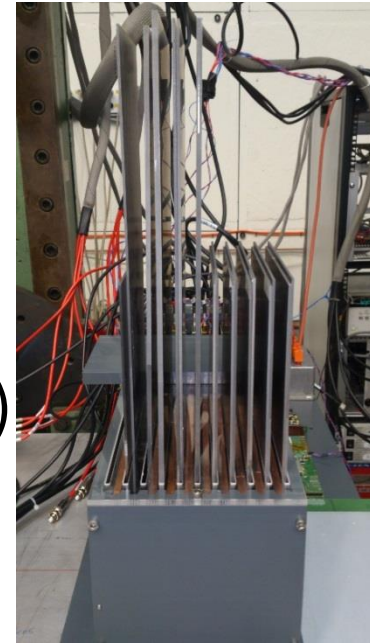
# Program of the TB

Power pulsing studies

comparison full PP/noPP/only PA in PP/LL  
MIP/showers

Magnetic field

- Test of pulsed current in B field (see Nathalie's talk)  
Measurement of interconnection resistance
- Test of one slab in B field (in PP config)  
Measurement of pedestal



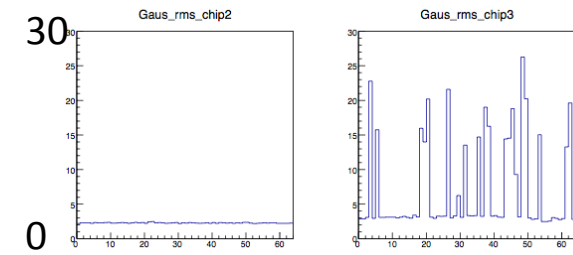
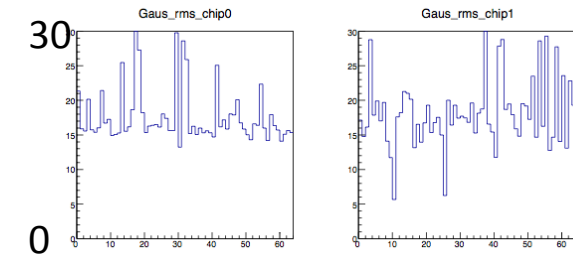
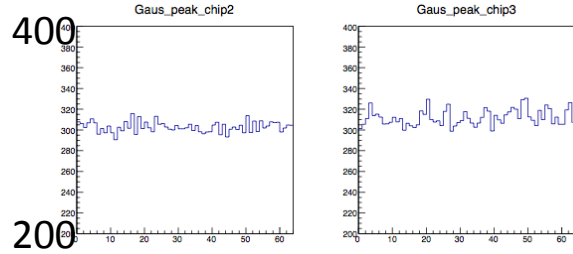
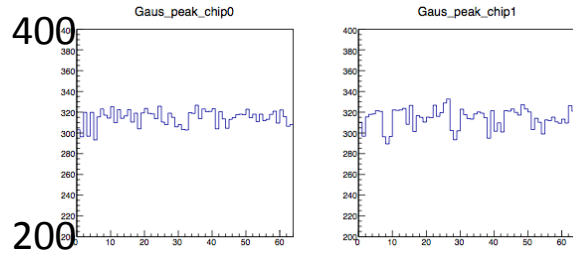
# Analysis

- Pedestal Study
- MIP calibration
- de-synchronization
- Pedestal Study in magnetic field

# Pedestal

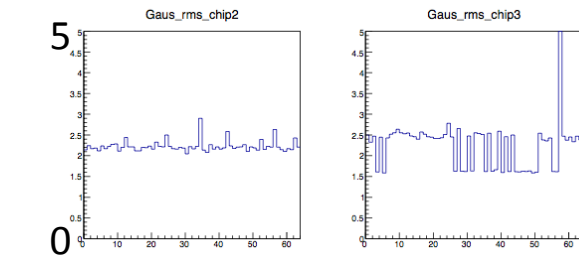
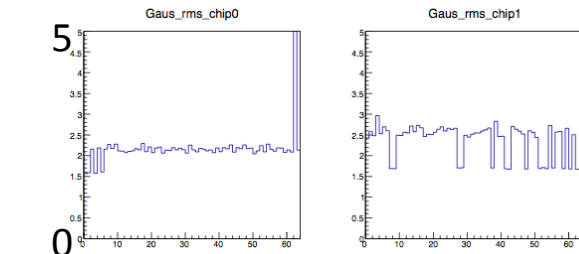
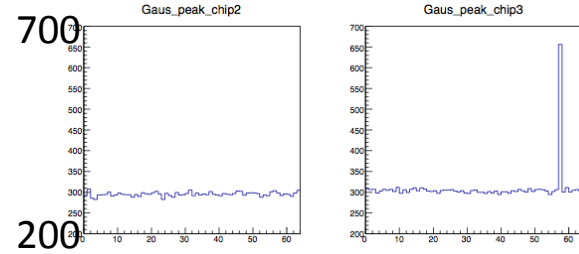
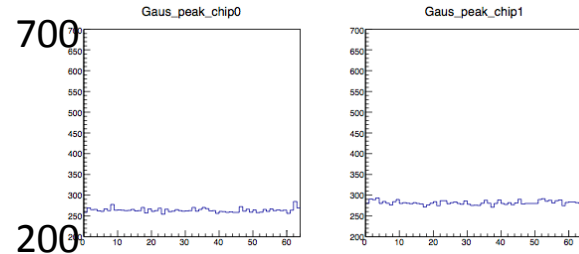
dif1(PP)

dif8(noPP)



Pedestal Position  
(ADC count)

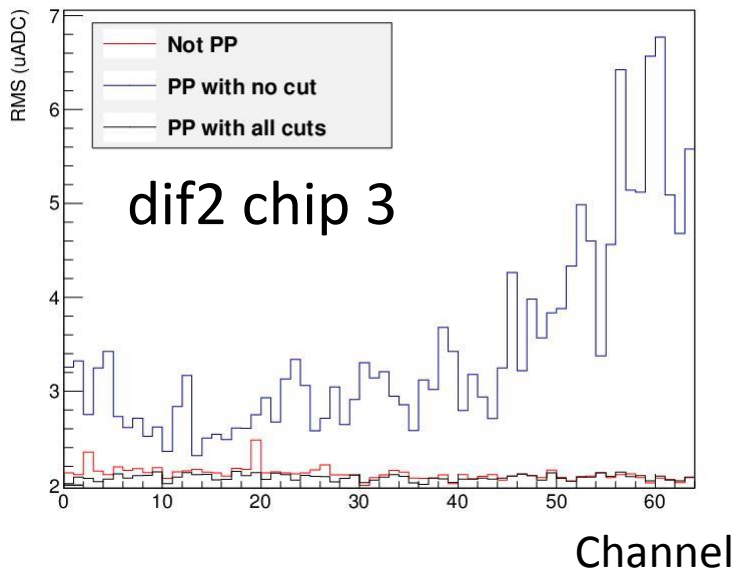
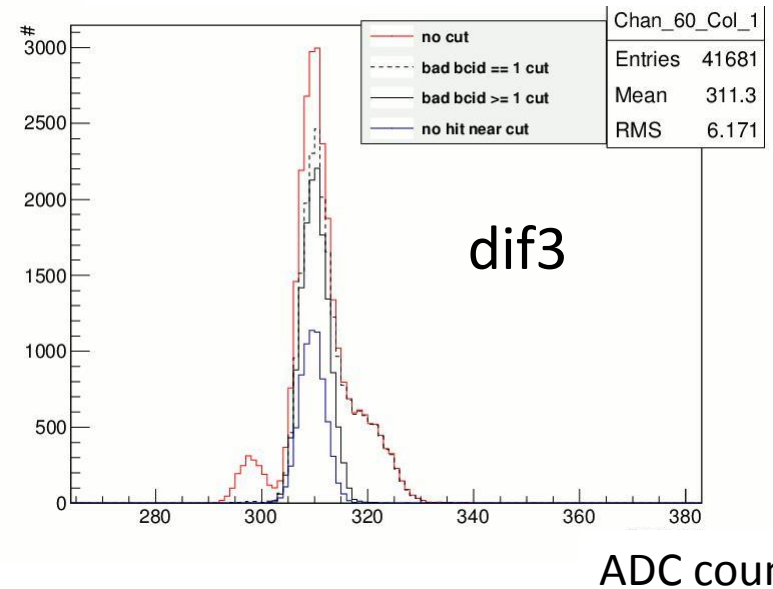
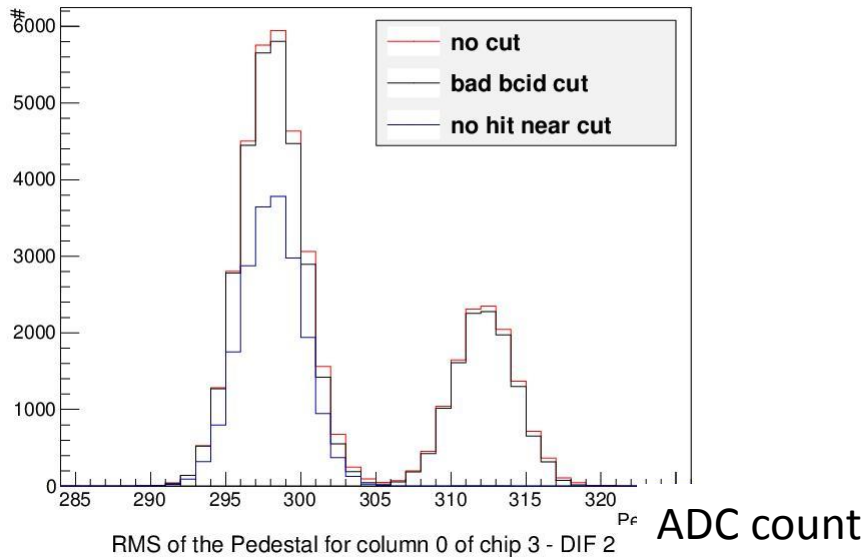
Pedestal Width  
(ADC count)



# First Pedestal Result

Already seen in previous Test beam but not so clear

dif2 Chan\_60\_Col\_0 - DIF 2



Badbcid==1 cut → remove BCID+1 event

Badbcid==2 cut → remove plane event

Nohit near cut = We cut the events with a hit  
In a channel geometrically close to the  
studied channel

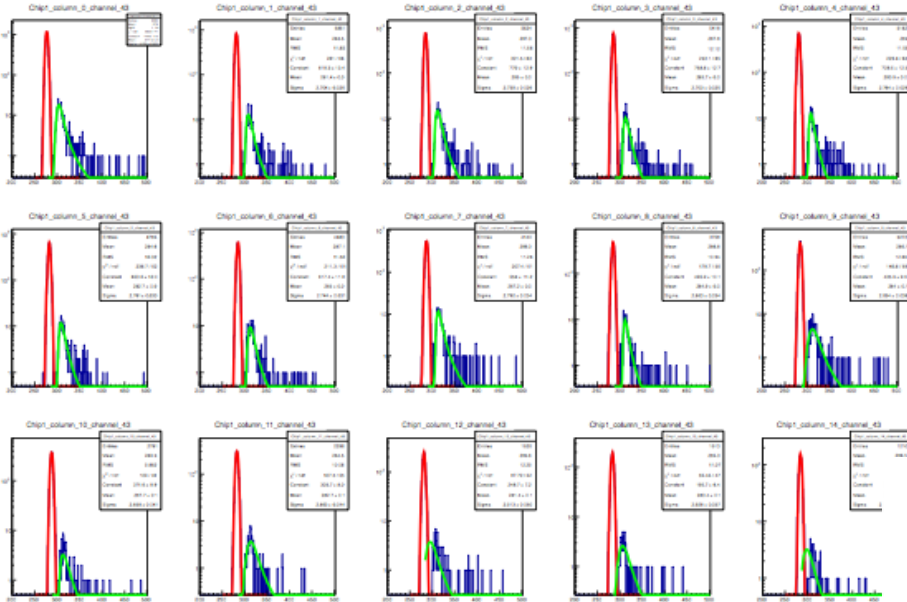
# Analysis

- Pedestal Study
- **MIP calibration**
- de-synchronization
- Pedestal Study in magnetic field

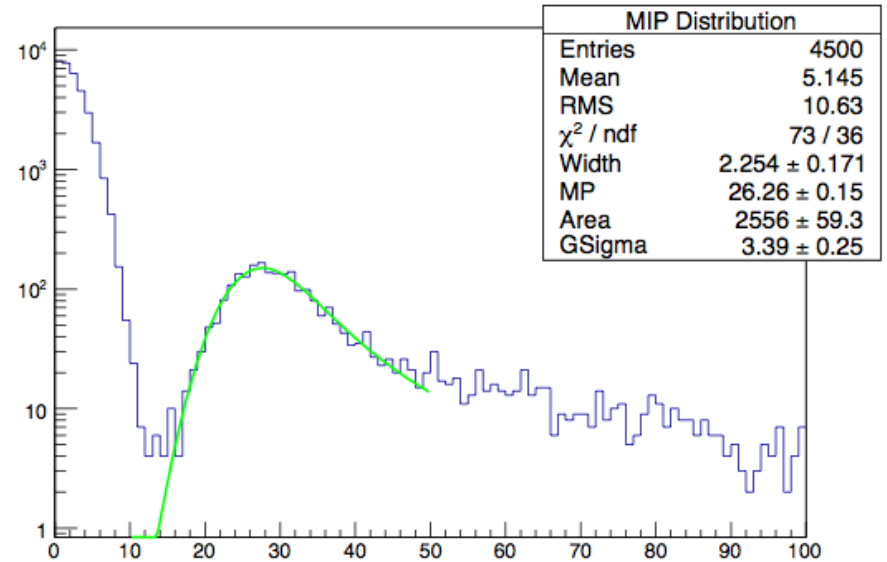


# MIP

Dif8 all columns of a channel

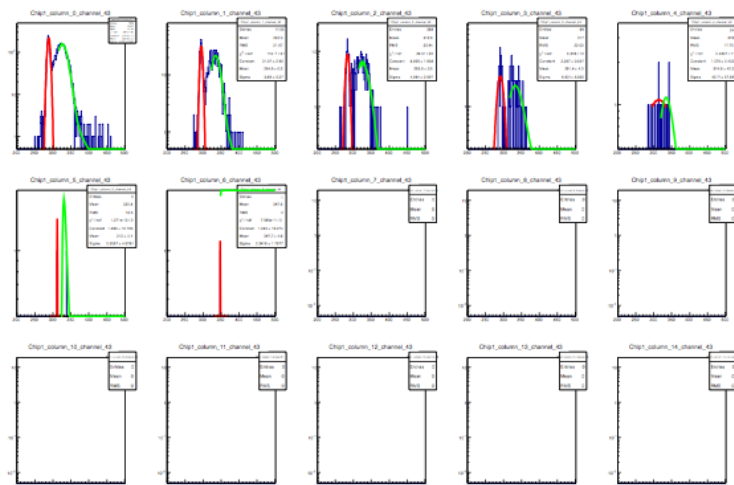


Sum of all columns  
After subtracted pedestal  
MIP Distribution

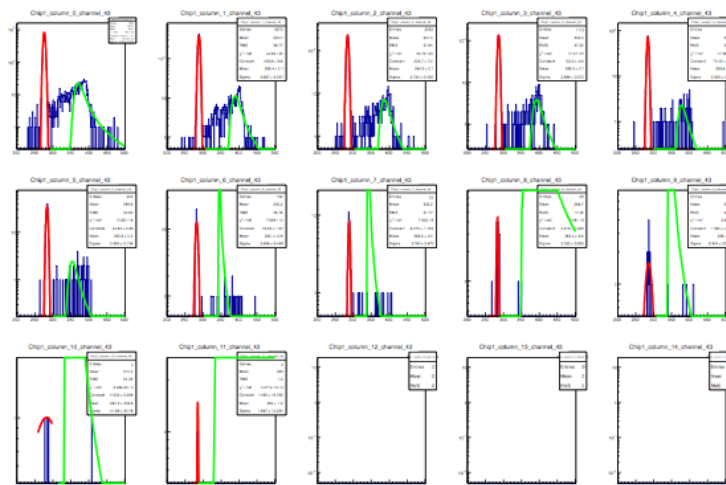


# strange behaviors

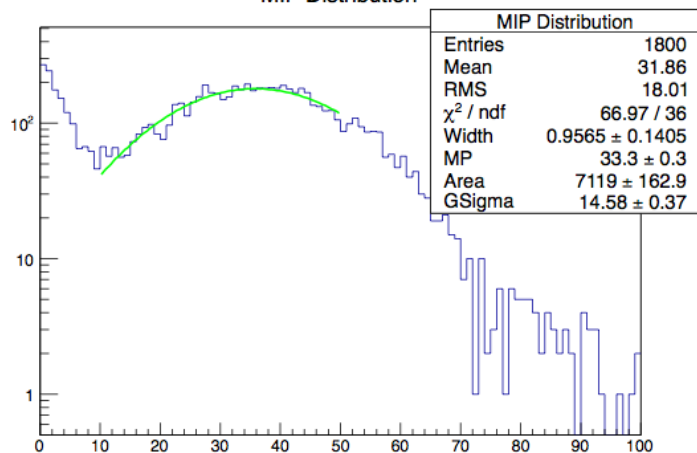
## DIF1 Ch43(PP)



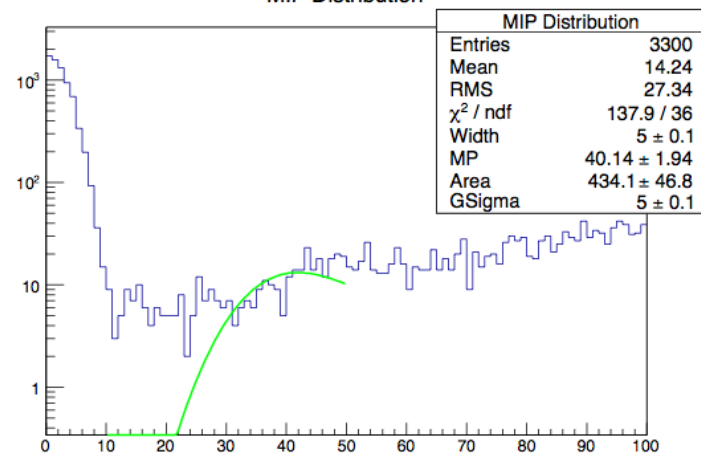
## DIF5 CH43(noPP)



### MIP Distribution



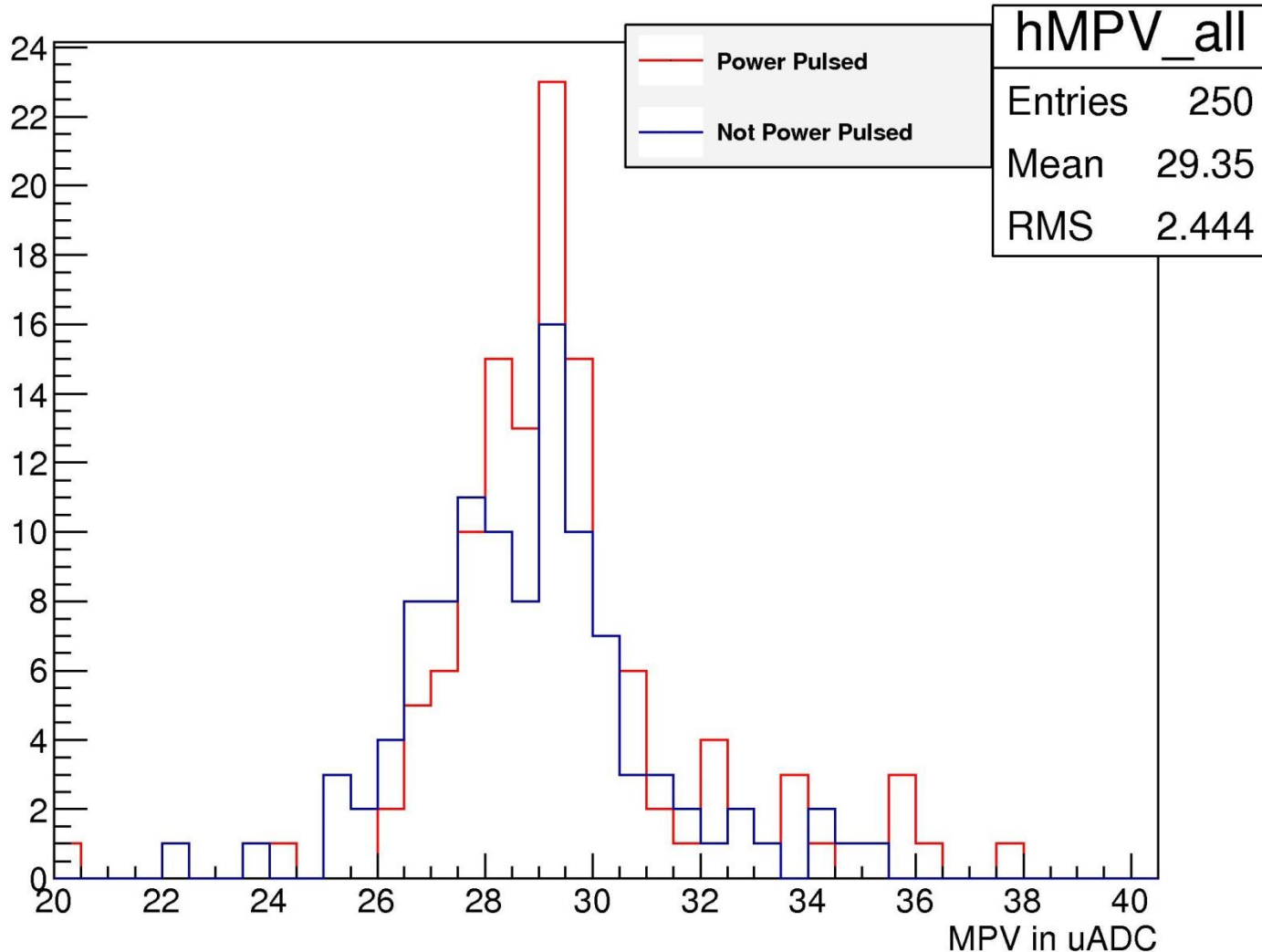
### MIP Distribution



# MPV of MIP in PP/noPP

Beam is in the center of the detector

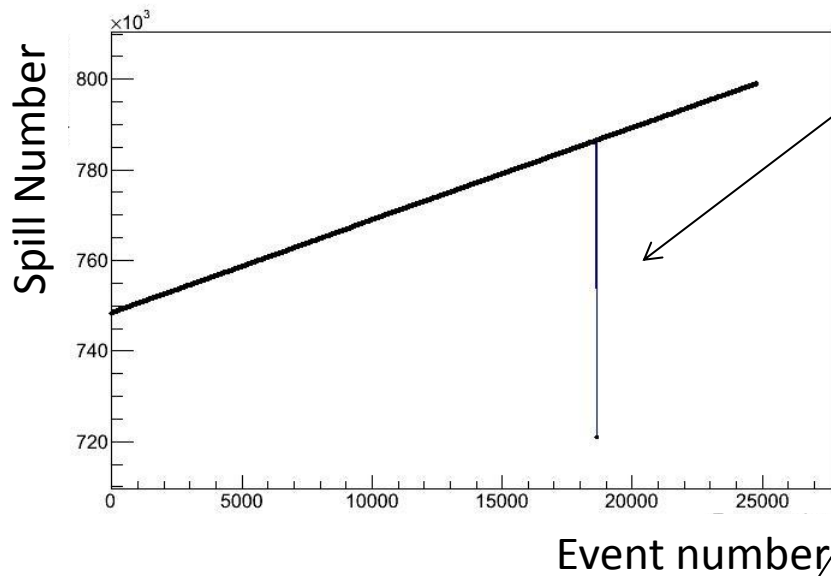
Distribution of all the MPV of the dif 2



# Analysis

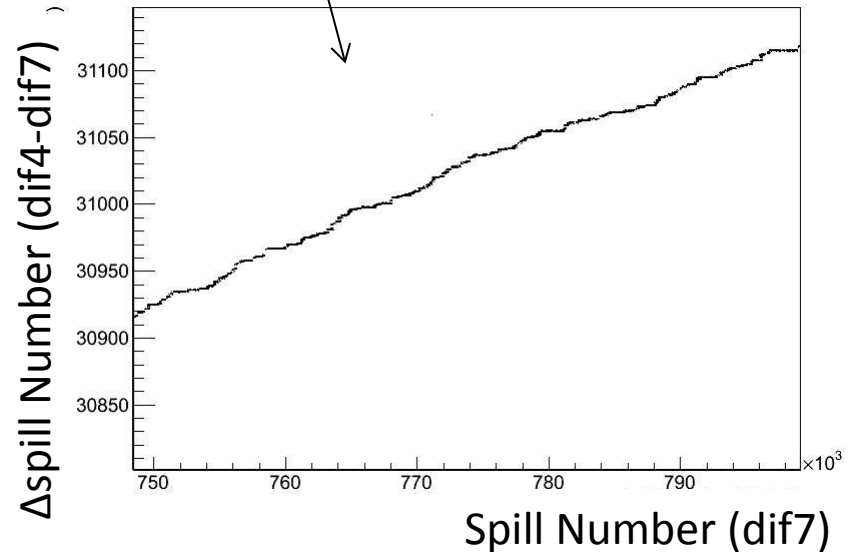
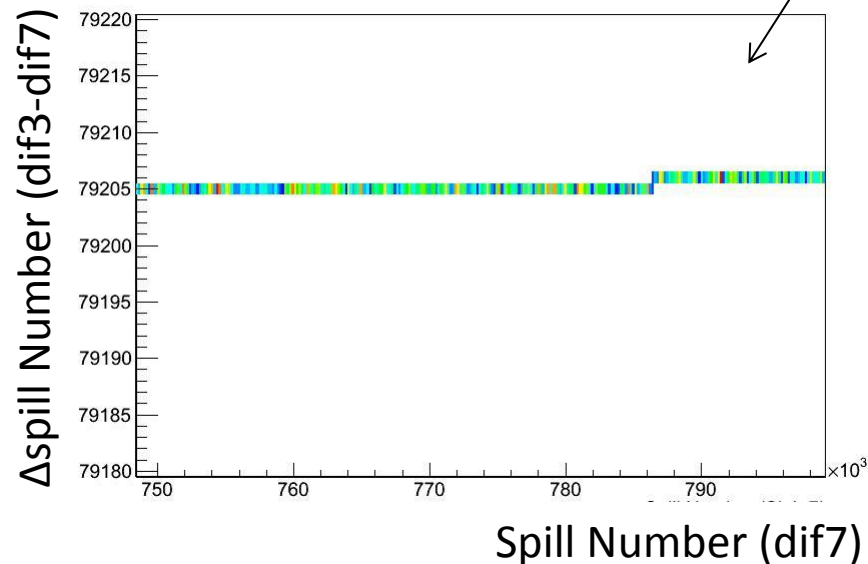
- Pedestal Study
- MIP calibration
- **de-synchronization**
- Pedestal Study in magnetic field

# De-synchronization between slabs



Spill number as a function of the event number for 1 run : we see one event with a crazy value (to be studied)

Difference between spill number of dif3 and 4 as a function of the spill number of dif7 for 1 run : we see that the de-synchronization change during the run. (mainly like dif3 = few change during run). Not seen in previous test beam.



# Detection efficiency

In MIP reconstruction, we compensate the synchronization problem event by event to take into account the de-synchronization during run.

We can calculate detection efficiency from MIP reconstruction.

Efficiency depends on the trigger threshold :

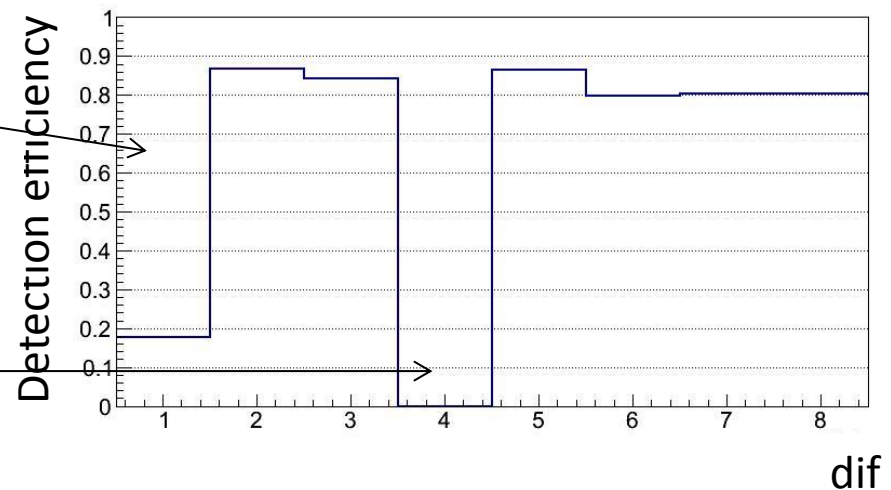
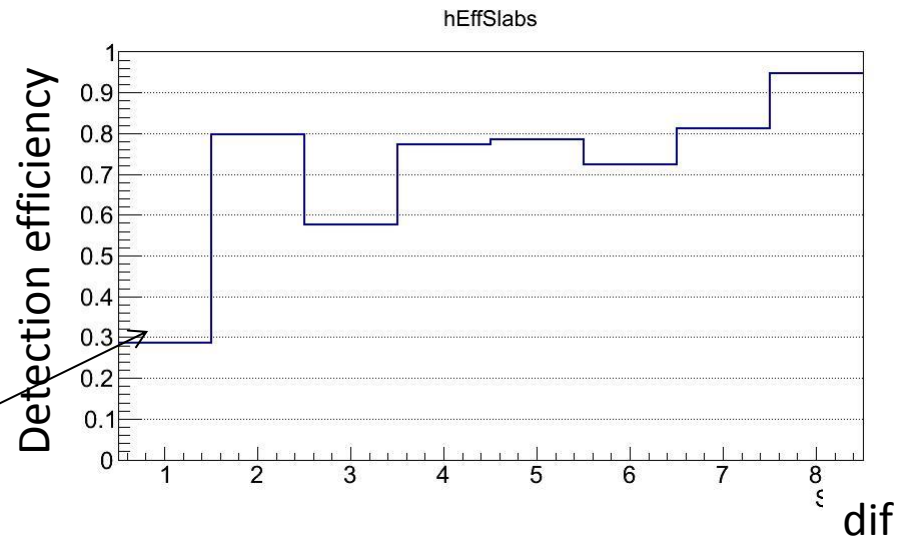
Example 2 runs with 2 trigger sets

Why this inefficiency?

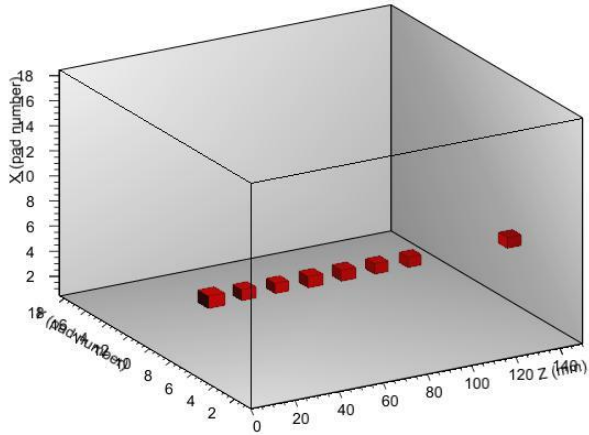
In other runs, we can reach better efficiency . Still synchronization problem?

Trigger threshold effect?

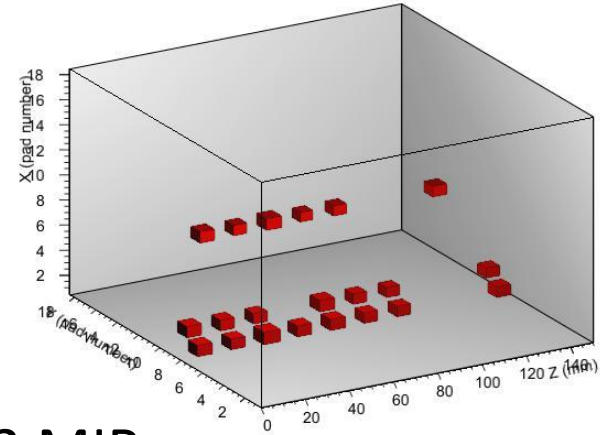
Very high threshold for dif4



# Event Displays

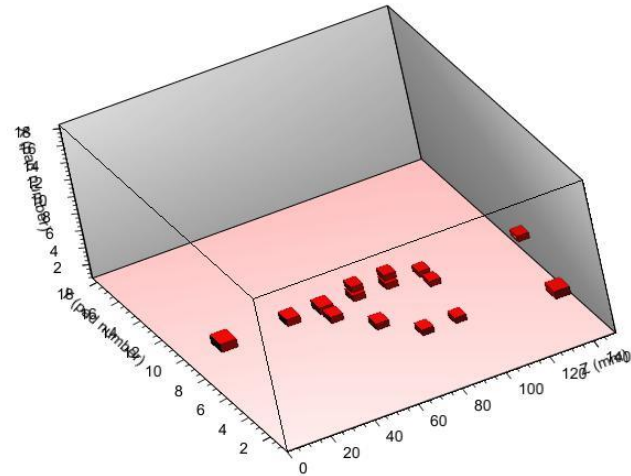


1 MIP



3 MIPs

The hole just before the last layer is  
Due to 2 removed slabs



Start of shower

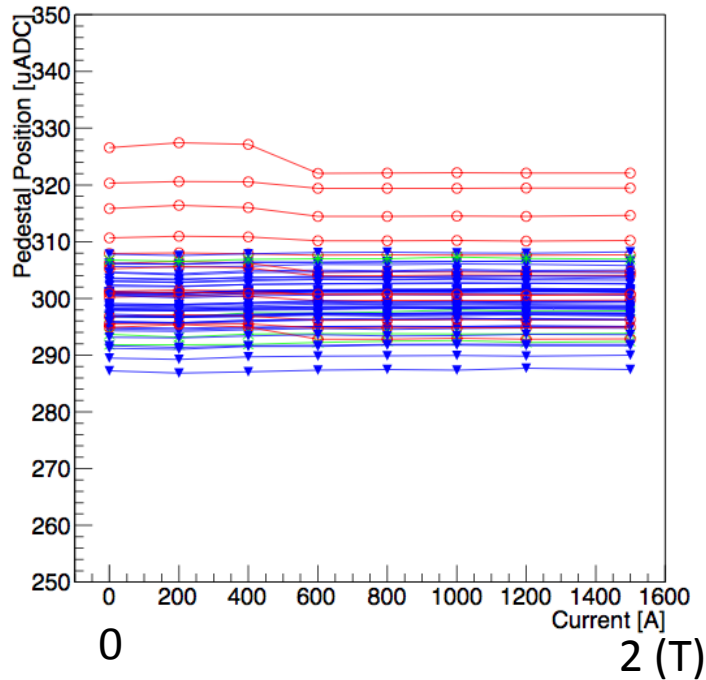
# Analysis

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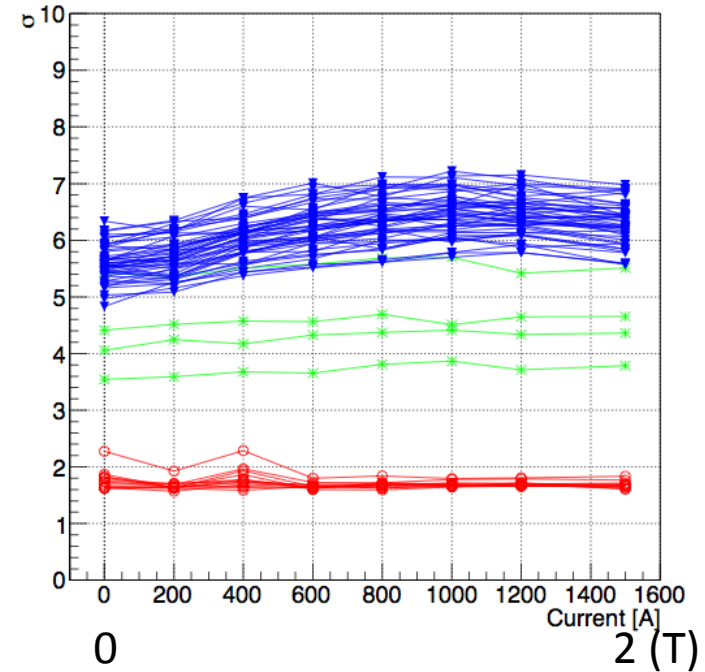


# Pedestal of Chip1 in 0 ~ 2 T magnetic field

## Pedestal Position



## Pedestal Width



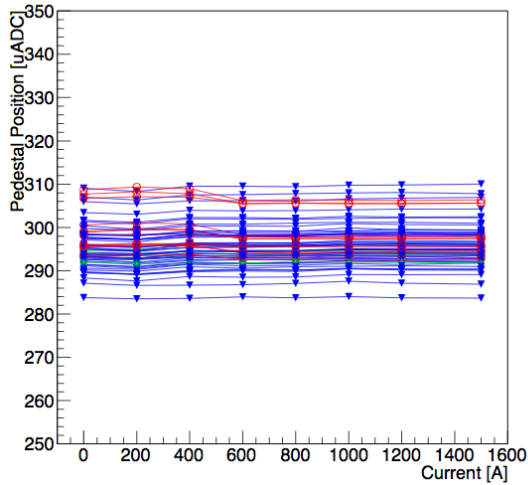
- ▼: Masked, Preamp. enable
- : Masked, Preamp. disable
- \*: Not masked, Preamp. enable

# Other Chips

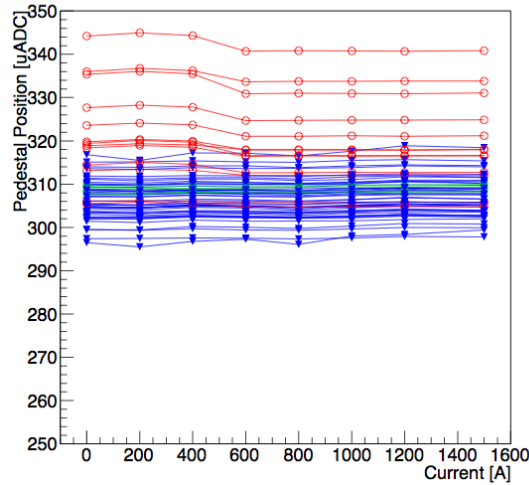
- ▼: Masked, Preamp. enable
- : Masked, Preamp. disable
- \*: Not masked, Preamp. enable

Pedestal Position

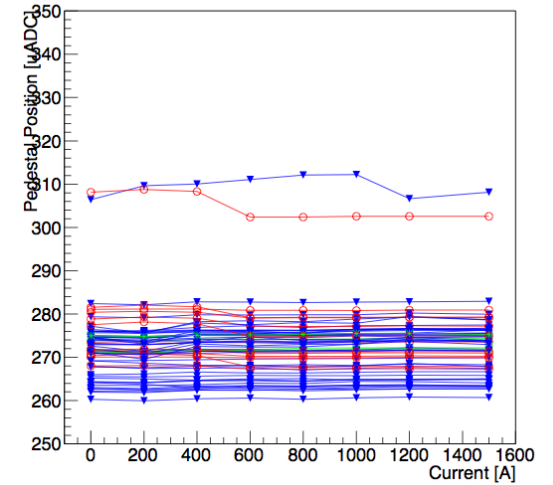
Chip2



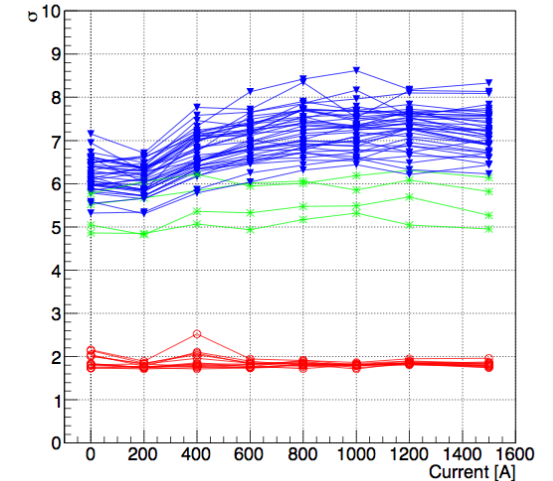
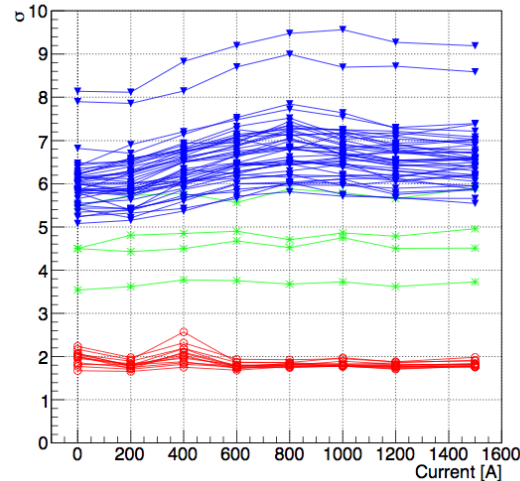
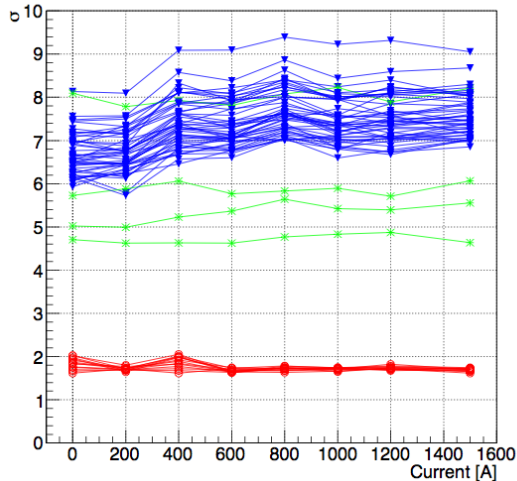
Chip3



Chip4



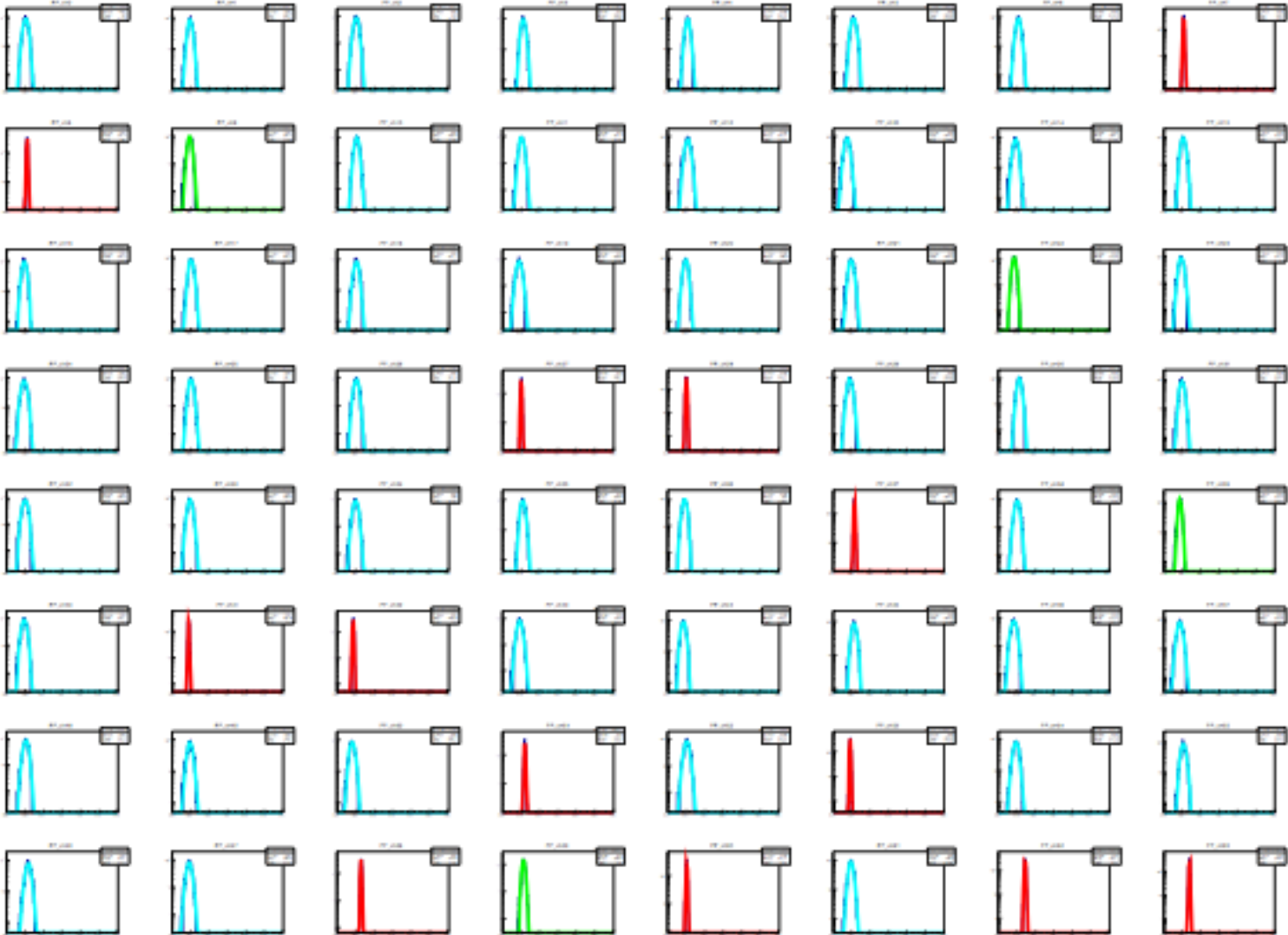
Pedestal Width



# Short run 100V

2 T (1500A)

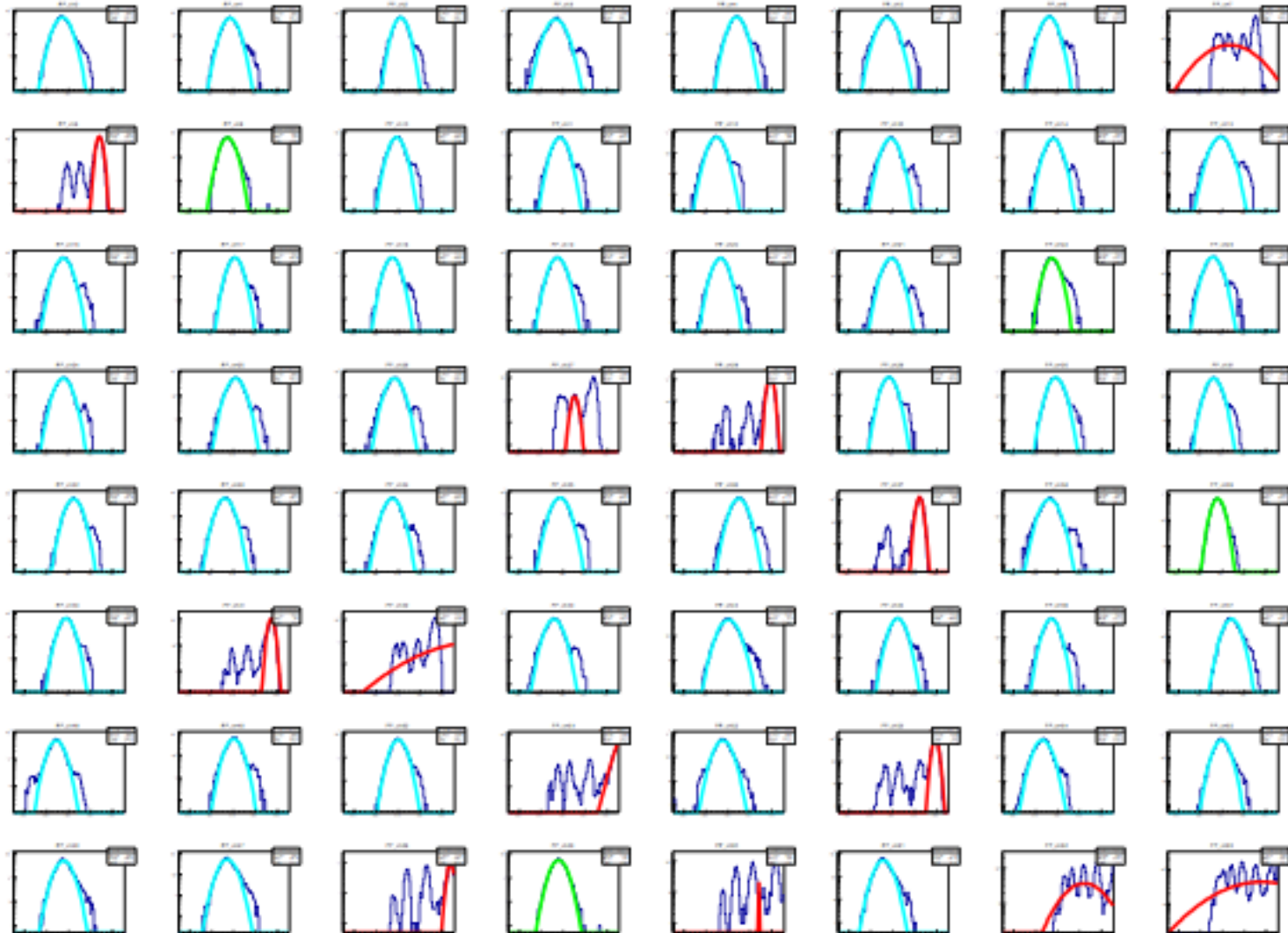
- : Masked, Preamp. enable
- : Masked, Preamp. disable
- : Not masked, Preamp. enable



# Long Run 100V

2 T (1500A)

- : Masked, Preamp. enable
- : Masked, Preamp. disable
- : Not masked, Preamp. enable



# Conclusion

For magnetic field

We study pedestal in function of time to check pedestal stability.

We plan to test in magnetic field with injected signal.

with beam

Power pulsing measurements seem promising

We have to understand

-- noise behavior, pedestal distribution

-- synchronization

Thanks to our experts: Mickael, Remi

And in particular Frederic for the DAQ software

... and all participants to the test beam

Backup

with beam :

- all PP slabs in PP mode
  - with all channels
    - without W plate
    - with a 2.1 mm W plate
    - with 4.2 mm W plates
  - with 6ch/chip (PP slab)
  - with one or two chip/slab (PP slab)
  - several PA gain settings
- only preamp in PP mode
  - normal mode
  - low leakage current mode

- all modules in no-PP mode

without beam :

- in magnetic field

# Long Run 8V

2 T (1500A)

- : Masked, Preamp. enable
- : Masked, Preamp. disable
- : Not masked, Preamp. enable

