

**Prospect of  
Si Quenching Factor (QF)  
analysis in Antonella**

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*DAMIC Oct10-2014 meeting*

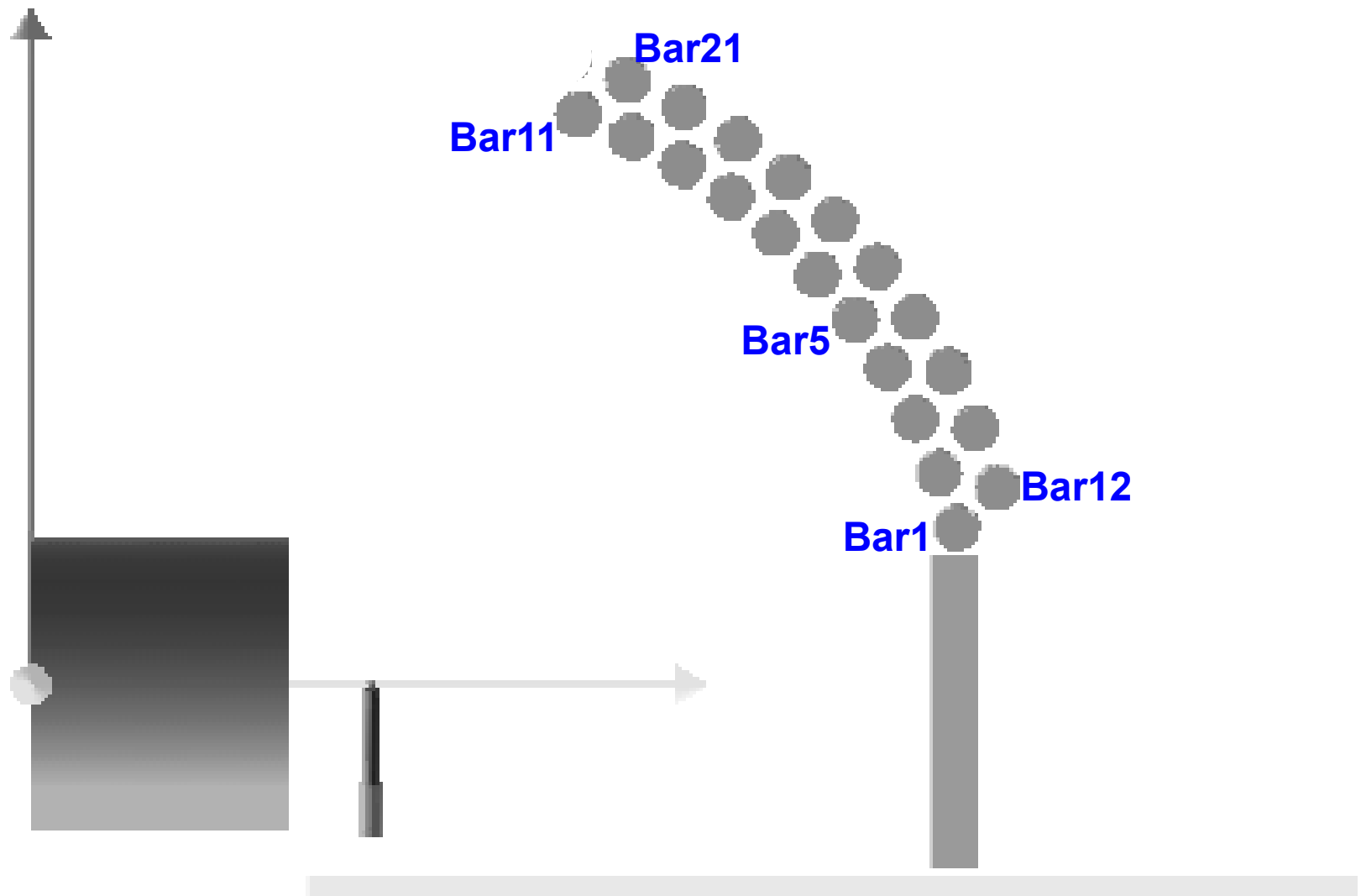
# Objectives

- **Show that the analysis of Antonella data for the Silicon QF measurement may be easily done**

## How?

- **Use Junhui's 21 bar array G4 MC (thanks!)**

# 21 Bar MC



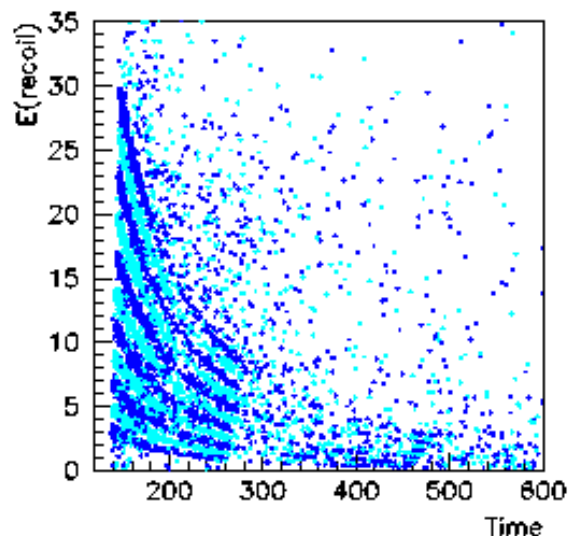
# Data: time distributions

**Time cut:**

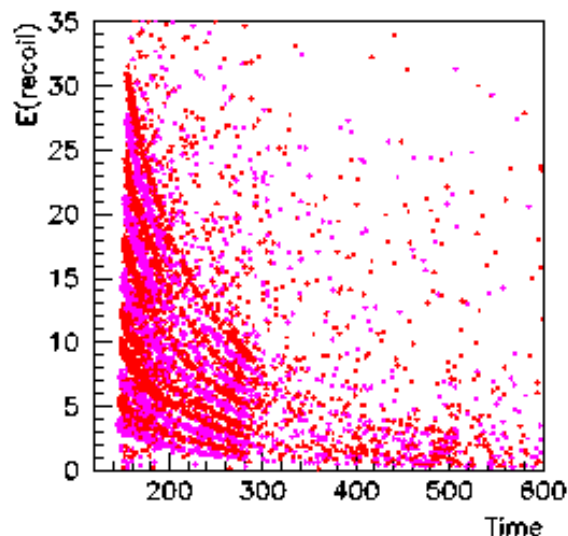
**All one hit events are selected**

**If more than one hit, the selected bar is the one with first hit**

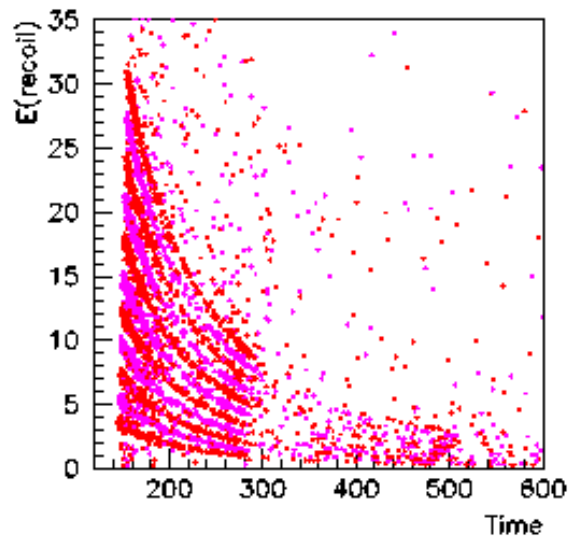
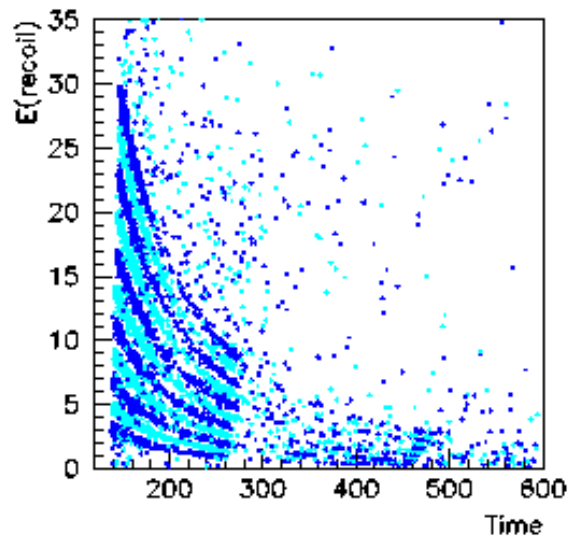
**Front Bars**



**Rear Bars**



**Raw MC events**



**After time cut**

# $E_R$ -Time fits

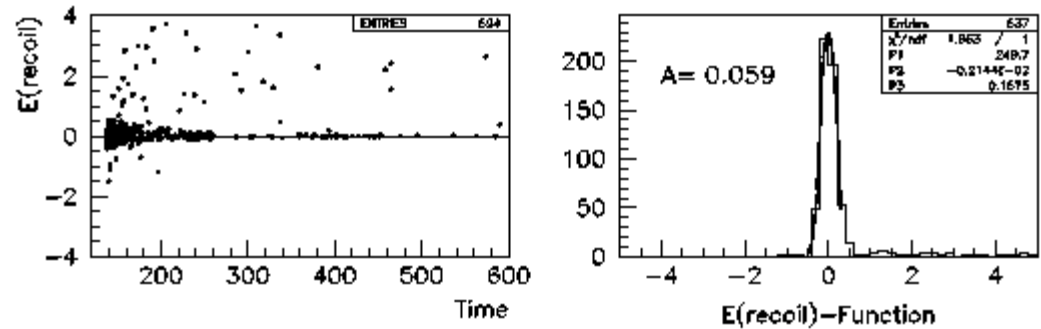
## $A/T^2$ fits

The  $E_R$  vs. Time distributions can be fitted with  $A/T^2$ .

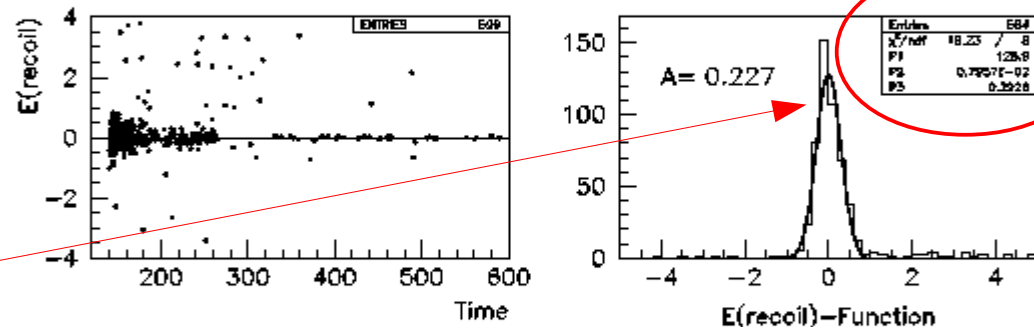
All bars have the same distribution, each one has a different  $A$  value, and a  $\sigma_E$  for the nth-bar.

Here we show  
 $E_R - A/T^2$

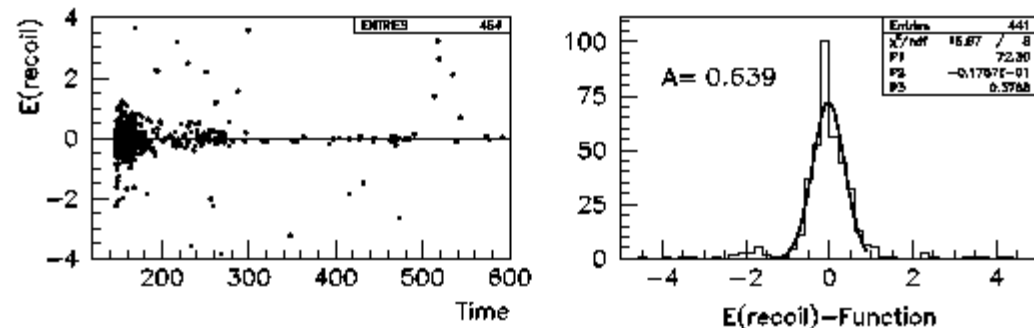
Bar1



Bar5



Bar11



# Shift per Shift analysis

9M events generated

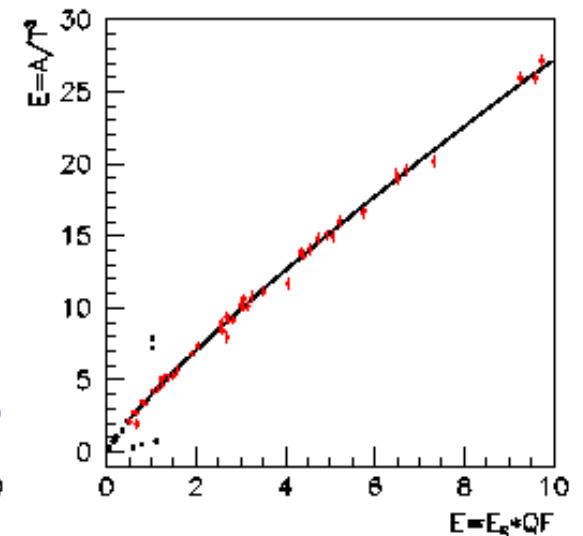
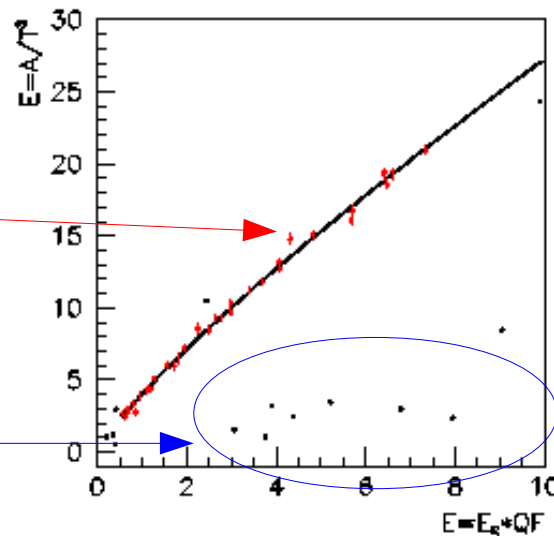
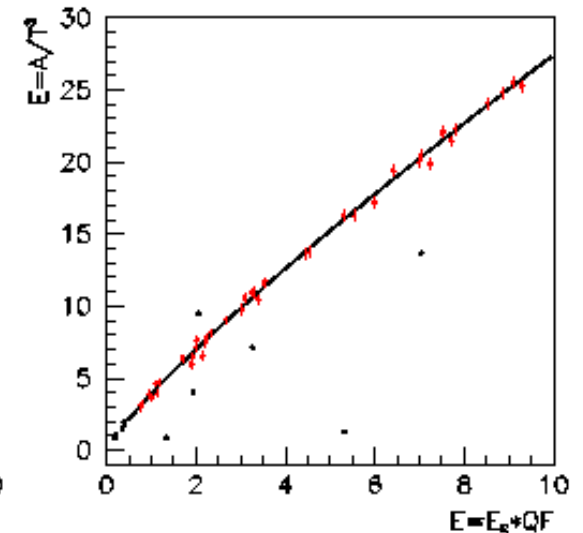
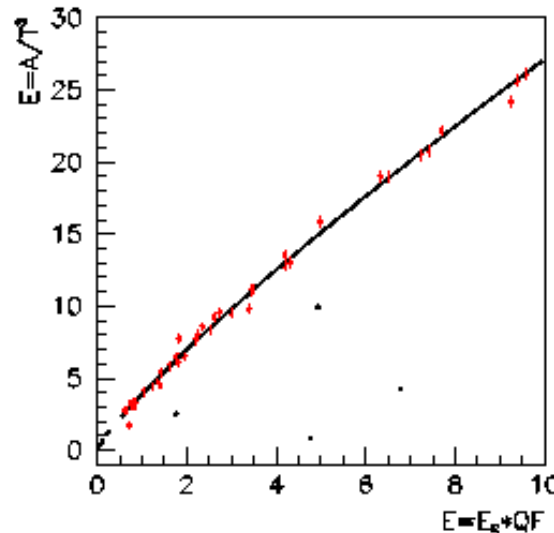
12K events selected

~7K good events

We used 200 sets of 60 events (one shift of the Dec Run!!)

For each set, we selected events with  $E_R$  within  $3\sigma$  of  $A/T^2$

Background events



x-Axis: ADC ( $E_R * QF$ )

y-Axis:  $A/T^2$  ( $E_R$ )

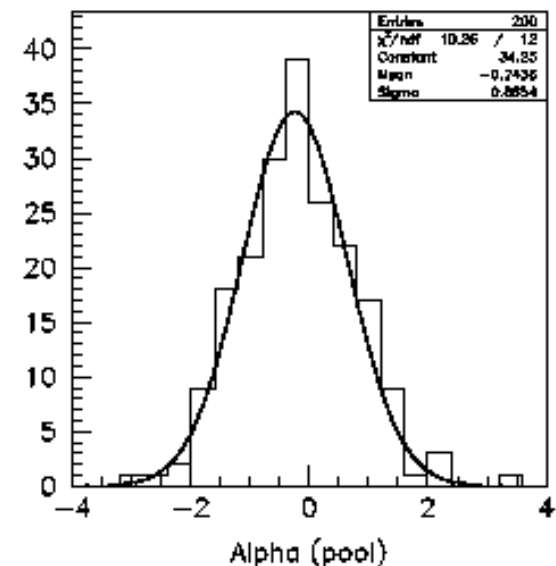
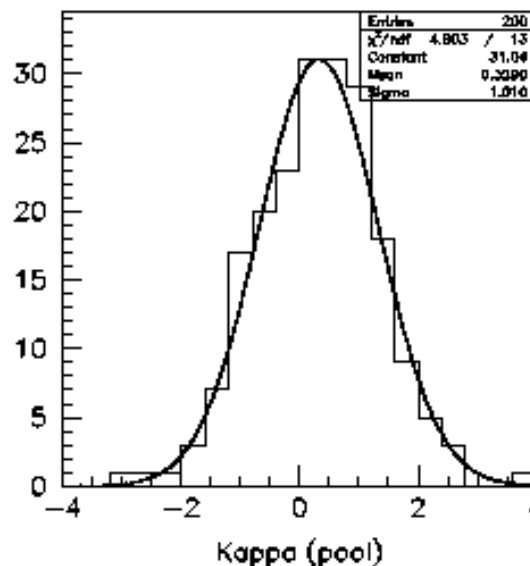
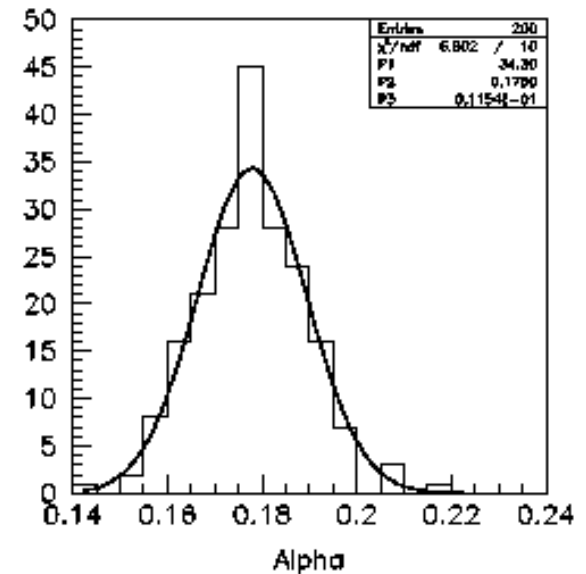
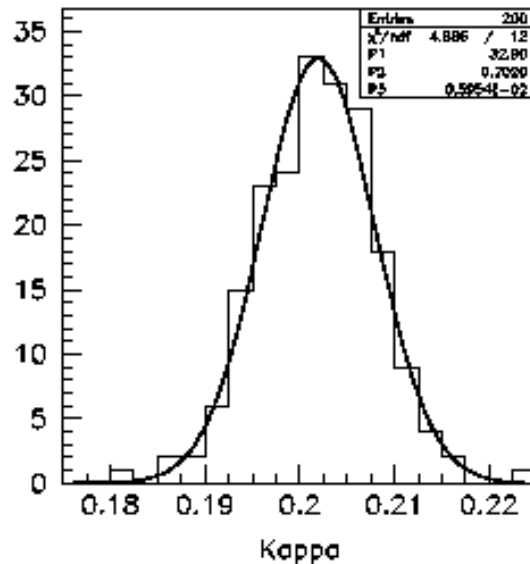
# MC Analysis

For this analysis we used as QF a power law:  $QF = \kappa E_R^\alpha$ , with  $\kappa = 0.2$ ,  $\alpha = 0.18$ .

The reconstructed parameters were found with 1% errors.

The pull was 1.01 for  $\kappa$  and 0.89 for  $\alpha$

Error will reduce more in 25 shifts ...



# Conclusions

- **Need to refine analysis, but .....**
- **We look forward to getting data!!!**



**BACKUP SLIDE**

# Statistics projection for December run

- We have **1400** good events in one of the **Two-bar** 2013 runs, which lasted **1.5hrs**. B2 is **21.4cm** away from B1 (tgt). Antonella bars are **90cm** away from the tgt, and the collimator hole is **0.7cm**. We will have in **1shift** (7hrs), for scintillator QF measurement,

$$(0.7)^2 (21.4/90)^2 (7/1.5) 1400 = \mathbf{181 \text{ events/bar}}$$

To reduce error bars to 1/2, **we need 2-3 shifts (change collimator??)**

- We have **60** good events in the **SD+2Bar** 2013 run, in a **1shift** run, on a bar that was at **16.3cm** from the SiDet. If we dedicate **12 days** to this run we will have

$$(16.3/90)^2 (36/1) 60 = \mathbf{71 \text{ events/bar}}$$

- **Si and C run** to measure resonances: **1-2 shifts (??)**
- **Background estimation: 1 shift**