

FE-D front-end modifications

MAIN POINTS:

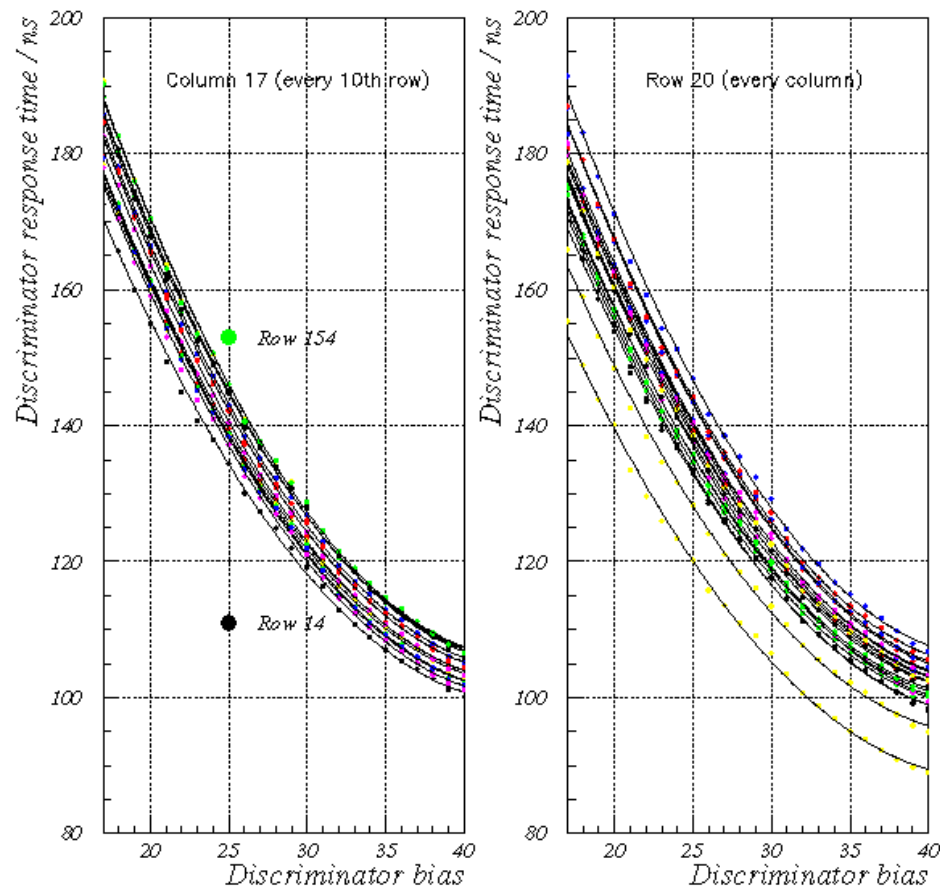
- Discriminator bias dependance on the transit time drastically reduced
- Time walk reduced

FE-C and MAREBO transit time dependance:

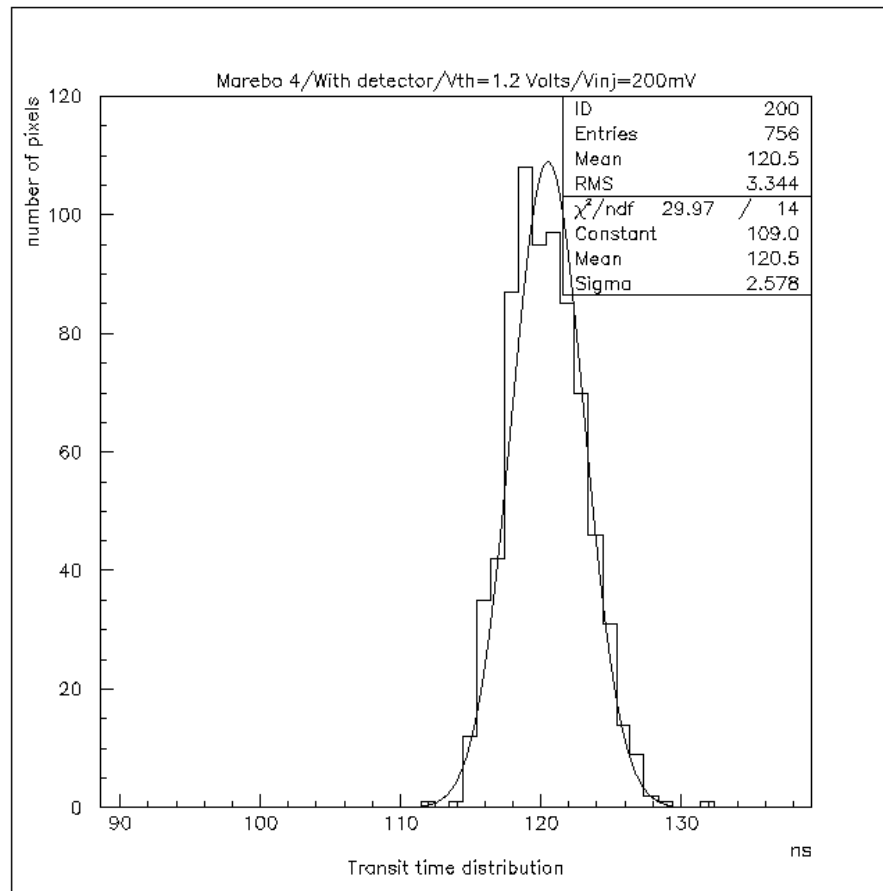
The transit time story:

Kevin found out a large transit time on FE-C during test beam. This transit time has been clearly measured by John to be strongly dependant on the discriminator bias:

FE-C ST2-03 IP=32 IF=15



This dependence has been confirmed by Markus on FE-D but not seen by Jean-Claude on the MAREBO chip leading that the number of rows contained in the MAREBO array is not big enough to generate large ID dispersion through the column.
(the voltage drop of the bias system is a quadratic function of the number of rows!)



This effect has been understood to be the extra time that the "digital" shaping at the output of the discriminator has to load the output parasitic capacitance.

The post-simulation (analog cell + pixel slow control including parasitic capacitances) is in agreement with further measurements carried out on MAREBO cells and on FE-C cells. (credit to Petr SICHO)

The front-end has been modified in order that the discriminator output shaping is no more dependant on the discriminator bias

- The 2 bipolar transistors of the discriminator differentiel pair have been replaced by 2 NMOS transistors
- The "digital" shaping is now working from cut-off to saturated region leading to a large output current capability when discriminator firering.

Moreover, separate power lines for sensitive biasses have been added

Time walk improvement:

The Time Walk has suffered when the NMOS discriminator has replaced the bipolar discriminator (no rebound effect anymore....)

The full CMOS cell Time Walk simulation (with parasitic back annotation) fits with the Time Walk measured on MAREBO full CMOS cell. The sensitive nodes have been determined and several interactions between the layout (thanks to Peter!) and the parasitic simulations give now the minimum charge above threshold seen in a 25 ns window of 1100 electrons.

