

Analysis meeting 09.02.2016

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Discussion

The distributions of the clustering-1 step and correlation plots (see [Correlations paragraph](#)) were discussed in a context of cuts:

- Weird alternating behavior of the strip signals distr. vs. alibava ch. (see [fig. 1](#), left): the av. signal of a strips group is negative while the following group of strips has positive av. signal (signals dist. was plotted taking to account negative signal polarity from the MCz200P sample). This behavior has to be investigated in details to verify the data. It would make sense to plot the raw charge dist. vs. ch. and compare it to the distr. after the common mode correction (the cross-talk wasn't taken to account yet, its effect is on a few percent lvl., so in the second order correction) noise on fig. 1.



Fig. 1. Signal and noise distr. vs. alibava ch. for 50000 ev. of the run000013.dat, SeedSNRCut = 2.0

(MCz200P(irr. $1.3 \cdot 10^{16} \text{cm}^{-2}$)@-1000V, 0deg. incl., -30deg.C, before annealing).

- Cluster Charge vs. TDC distr. (fig. 2) demonstrates the "Gaussian bell"-like shape as it's expected to be with accordance to the *beetle chip signal's shape*.



Fig. 2. CluCharge vs. TDC for 50000 ev. of the run000013.dat, SeedSNRCut = 2.0.

INB This distr. shouldn't start from 0 along Y axis with a SeedSNRCut being set because the cluster charge averaged upon its strips shouldn't include any noise component since it's being cut by the NeighborSNRCut criterion (positive and negative charge of the same abs. values give zero after summing/averaging). *So the cluster charge calculation should be corrected to cut out the noise charge below the cut lvl.* (see example on [fig. 3](#)).



Fig. 3. CluCharge vs. TDC for 11000 ev. of the run000183.dat (June15 run for FTh200P non-irr. module@-250V, 0deg. incl., -25deg. C), SeedSNRCut = 5.0,

Thomas' code with the old EUTELESCOPE.

- Strips with higher occupancy were observed on the [correlation](#) plots (see [fig. 4](#)). This has to be clarified, not well understood yet; it could be that these patterns somehow related to the influence from the noise neighboring strips, but has to be verified by telescope tracking.



Fig. 4. Cluster correlation plots along Y axis, CMSPixRef vs. DUT; 50000 ev. of the run000013.dat, SeedSNRCut = 2.0

(MCz200P(irr. $1.3 \cdot 10^{16} \text{ cm}^{-2}$)@-1000V, 0deg. incl., -30deg.C, before annealing).

- SNR for this irr. sample is $\sim 5.5-6.8$ (see [fig. 5.44](#) in the [Thomas' thesis](#), the values on the plot were obtained after the tracking procedure), but no peaks at this lvl. were observed in the ClusterSNR distr. ([fig. 5](#)). This doesn't necessarily mean that the data we took are useless, but does require the following checks:
 1. whatever the hist. on [fig. 5](#) was filled right/cluster SNR calculation was correctly done
 2. if it's so, tracking procedure for the telescope has to be performed to find which exactly strips are being fired at a particular event and find the real signal clusters, because it seems like the signal is too low and covered by the noise background. At least the eta distr. gives a hope for signal presence, see [fig. 6](#).



Fig. 5. Cluster SNR dist. for 50000 ev. of the run000013.dat, SeedSNRCut = 2.0

(MCz200P(irr. $1.3 \cdot 10^{16} \text{ cm}^{-2}$)@-1000V, 0deg. incl., -30deg.C, before annealing).

- Right plot on the **fig. 6** shows better peaks separation corresponding to the absence of charge sharing when a sensor oriented perpendicularly to the beam, while the left plot shows higher peaks overlap related to the noise signals which degrade position sensitivity of the detector.



Fig. 6. η dist. for 50000 ev. of the run000013.dat; left - SeedSNRCut = 2.0, right - SeedSNRCut = 5.0.

INB Check the η calculation and exclude clusters which size is greater than 2.

TODO

- Check the charge sign while clustering and correct the cluster charge distr. to omit the signal lower than the cut
 - Clean up the η distr. to take the only clusters which size is 2
 - Compare the raw charge distr. vs. ch. to the charge after the noise subtraction distr. vs. ch.
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- Hitmaker: what does it do, which data collections uses etc. write the details and accomplish this step -> p. 3.4.5 of the [Thomas' thesis](#).
 - Focus on the telescope alignment w/o DUT in order to find the tracks and select the DUT region where strips are being fired and not just accumulate noise BG signal

Miscellaneous

- Next TB analysis meeting will take place on **Mon., 22.02.2016 at 9.00. Place to be defined.**
- Dmitry's presentation at Phil Upgr. meeting should be preliminary scheduled on *04.03.2016*.

Files looked at :

SeedSNRCut/ NeighbourSNRCut	root distr. for run000013.dat (MCz200P(irr. $1.3 \cdot 10^{16} \text{cm}^{-2}$)@-1000V, 0deg. incl., -30deg.C, before annealing)
2.0/1.5	run000013-merger_SNR2.0.root , 000013-alibava-clustering-1_SNR2.0.root
5.0/3.75	run000013-merger_SNR5.0.root , 000013-alibava-clustering-1_SNR5.0.root
0.0/0.0	000013-alibava-clustering-1_SNR0.0.root
