MERAKEB Abder
2013-07-17

LXe TPC
Report 1: Test of ASIC TPCFE test board, version 1

I- Aim of the test

The purpose of this test was to see the response of the ASIC after a pulse input.

To have a precise count of the number of electrons drifted to the cathode, the signal detected by the cathode has to be shaped. Indeed, the input signal is a pulse with a width representing the time between the moment the electrons passed the grill and its contact to the cathode. Or it is more convenient to work with peaks signals. To do this, the ASIC differentiate the input signal.

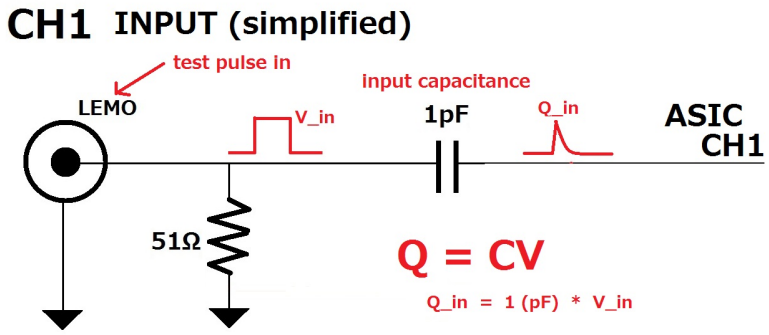


Fig. 1 : Simplified scheme of the ASIC and its role

So, the measure will consist to see the peaks out of the different channels. For these, we need:

- A Power Supplier: giving a voltage of +1,25V and -1,25V to the board
- A function generator: producing the pulses (120mV of amplitude and 100Hz frequency)
- An attenuator: placed before the input of the board
- An oscilloscope: to see the response of the board to pulses

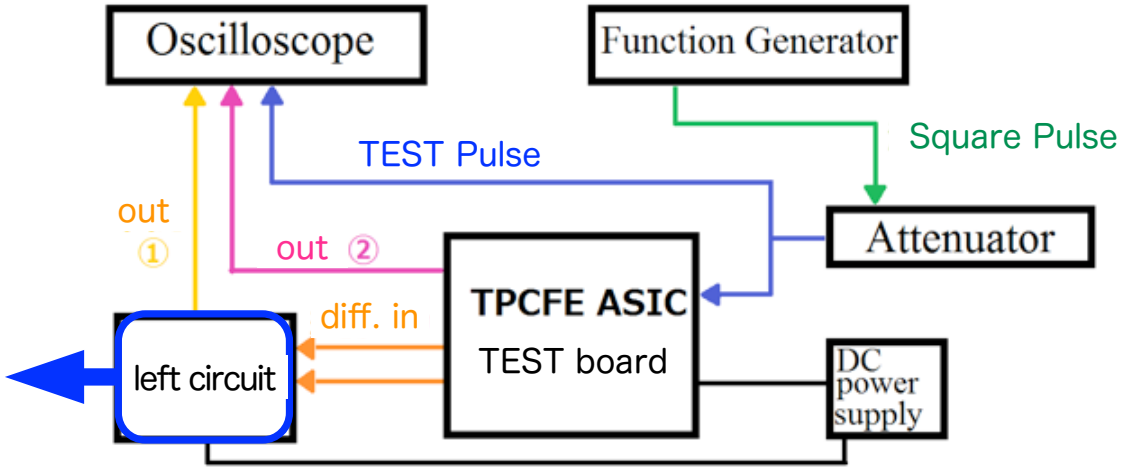


Fig. 2: Scheme of the principle of the measure (from Test board of TPCFE, Yokohama National University)

II- Measures

I obtained the result of the channel and it fits to the shape finded by the student Yuya Iwazaki (AC couple) of the Yokohama University. These results are below.

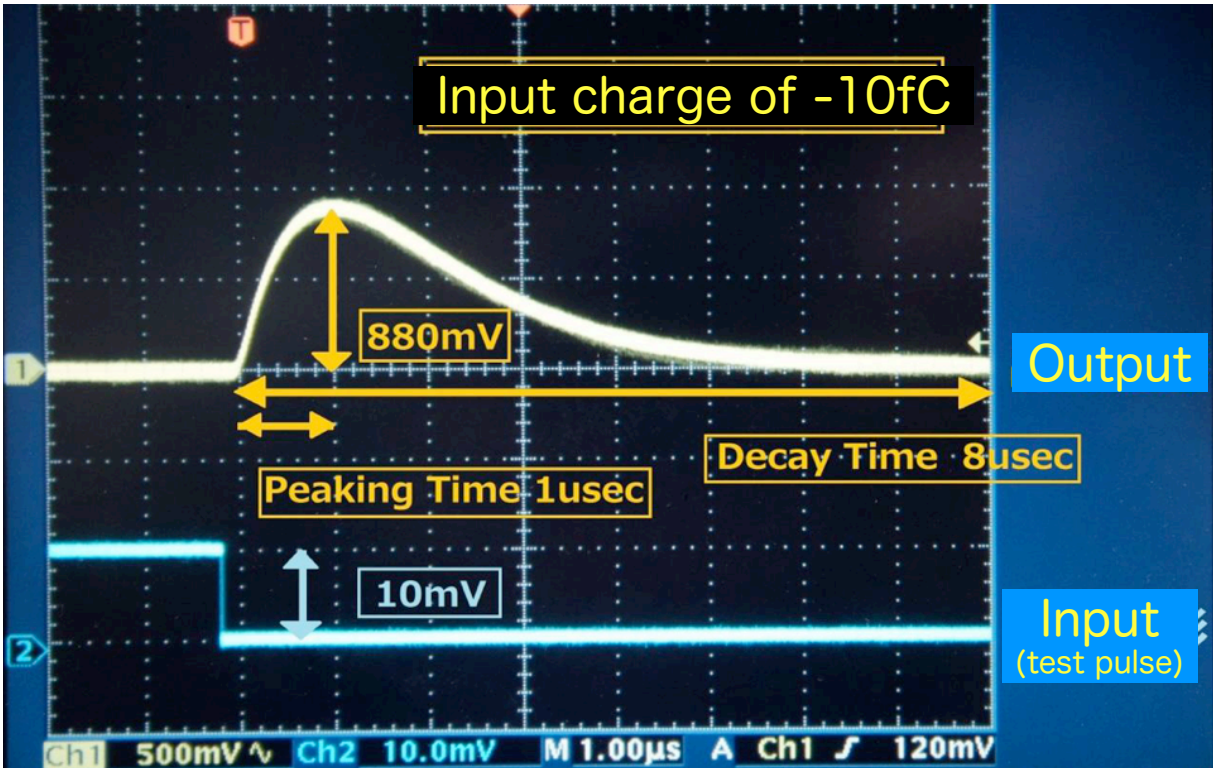
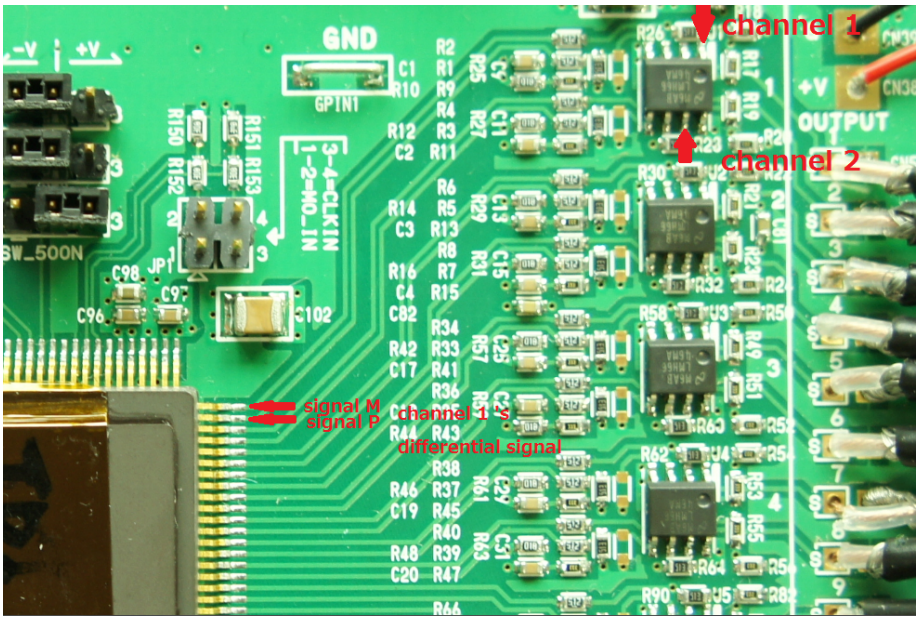


Fig. 3: Input test pulse and peak response (from Test board of TPCFE, Yokohama National University)

However, the next day, no signal appears. It seems that a dysfunction has appeared between 2 measures.

But what has to be noticed in the only graphs observed is the link between the input charge (find by using the formula Q = C*Uint) and the amplitude of the peak response. Unfortunately, we need to have more measures for different input voltage to find a relation between them, as did the student Yuya Iwazaki. However, for now, the only measure fits with the trend of the ones effected by Yuya Iwazaki. We can then approve the measures done previously.



Because of the dysfunction, my main work consisted after that to find where it was located. I then carried out a series of measures.

-Alimentation voltage:
V+ = +1227 mV V- = -1250 mV Groud

- Input of the TPC-FE: Good signal appears

Baseline voltage of outputs at the DC-couple :

Output (ch)	Baseline vol. (mV)	Output (ch)	Baseline vol. (mV)
1	+680	9	+541
2	+480	10	+764
3	+1220	11	+504
4	+647	12	+665
5	+627	13	+534
6	+528	14	+572
7	+644	15	+387
8	+614	16	+362

Baseline voltage of diff. output

Channel	OUTM (mV)	OUTP (mV)	Channel	OUTM (mV)	OUTP (mV)
1	-12,5	-2,7	9	-12,0	-13,5
2	-16,2	-26,2	10	-23,2	-6,5
3	-9,5	-21,8	11	-10,9	-18,0
4	-18,4	-10,7	12	-23,0	-14,7
5	-18,7	-15,4	13	-20,5	-23,8
6	-12,4	-16,2	14	-12,1	-13,1
7	-17,0	-12,5	15	-6,6	-27,2
8	-16,8	-12,0	16	+1,4	-20,7

Conclusion: These outputs are not what should be expected, and they are all wrong. So, there is probably a dysfunction in a previous common component.

III- Analysis

After the results of the baseline voltage of the final DC outputs and of the differential output, and after checking the resistances and connections of the board, it seems that the dysfunction comes from a component previous the differential channel (M0, P0, M1…).

One main hypothesis appear now:

➔ There is a dysfunction on the TPC-FE

Conclusion:

Unfortunately, because of the dysfunction, which suddenly happened Friday morning, I could not do all the measures I expected to do. And I could not also see the link between the input voltage (or charge) and the amplitude of the peak response.

Moreover, I also f the problem has appeared in the TPC-FE, that means that I did a wrong manipulation. In that case, the most probable reason comes from a discharge during the manipulation. It could be also a too strong voltage input, but this hypothesis can be excepted as I took care to put the good input voltage. In the future, for the manipulation of the new board, I will be more careful about the discharges and I will discharge my hand before manipulation.

Nonetheless, this dysfunction forced me to understand more precisely the ASIC and to be more familiar with all the electronics. And that could be useful for the test of the next new board.