Characterization of small Scalable Readout System

OUTLINE

- Introduction and Motivation
- Small Scalable Readout System
- Installation, Configuration and First Tests
- TODO List

INTRODUCTION

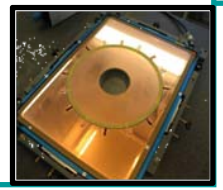
The Helsinki Institute of Physics is currently trying to develop a methodology for characterization of the GEM foils. This will includes: hole uniformity studies, classification of defects and long term stability. This is a common effort together with CERN.

Super FRS
Specifications:
Area: ≈ 200 cm²

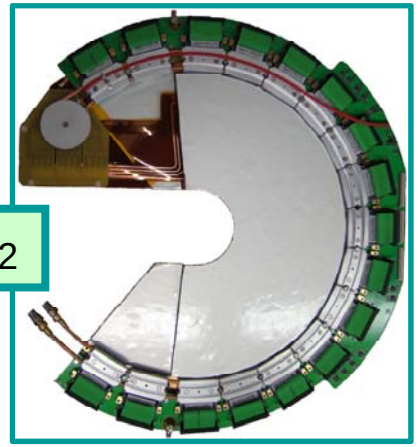
TOTEM
Specifications:
Area: 706 cm²

JEM-X
Specifications:
Area: 707 cm²

PANDA
Specifications:
Area: ≈ 2500 cm²



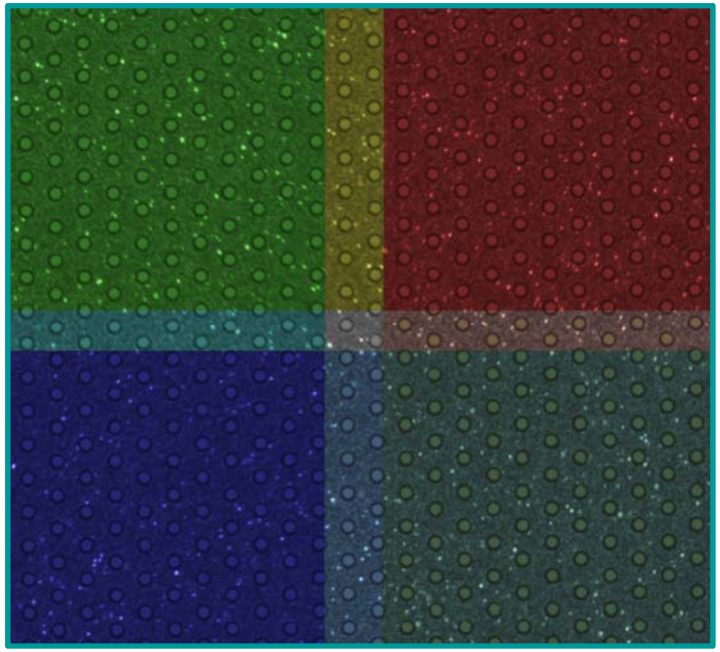
Joint GEM

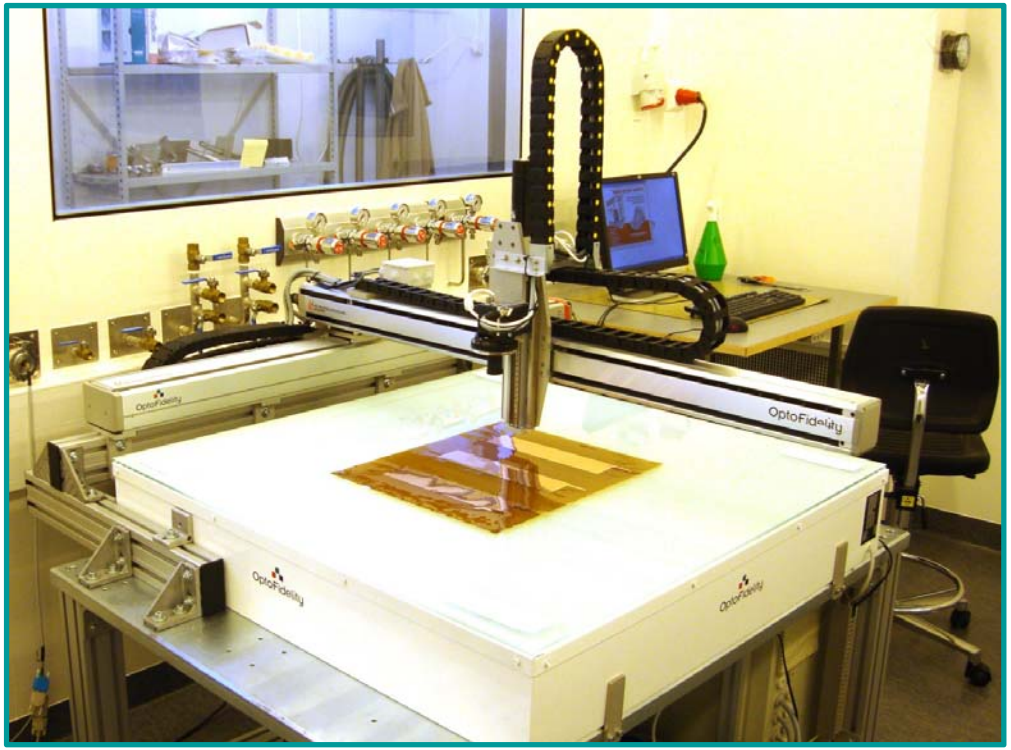


TOTEM -T2

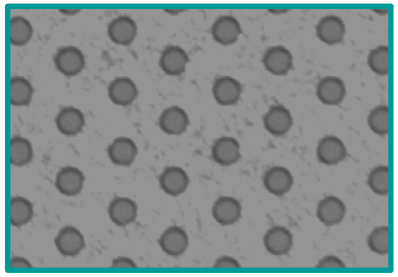
MOTIVATION

FOUR images Stitched
The overlapping on these images is of 245 μm and 140 μm

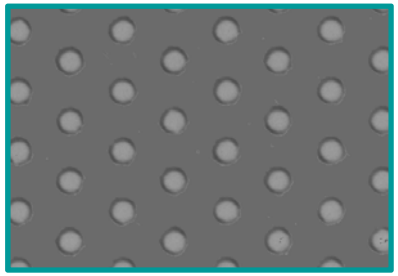




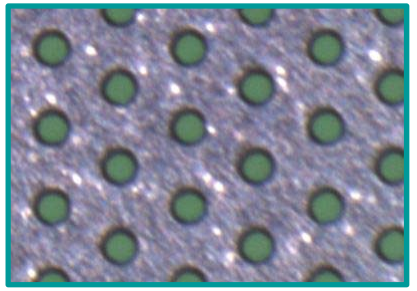
After Apply Red Filter
This procedure is used to find defects and to find the outer diameter of the holes



After Apply Green Filter
This procedure is used to find blind holes and to measure the inner diameter of the holes



New System
Based on 9 Mpix camera with integrated telecentric optics for this setup one pixel corresponds to 1.7 x 1.7 microns



Small Scalable Readout System

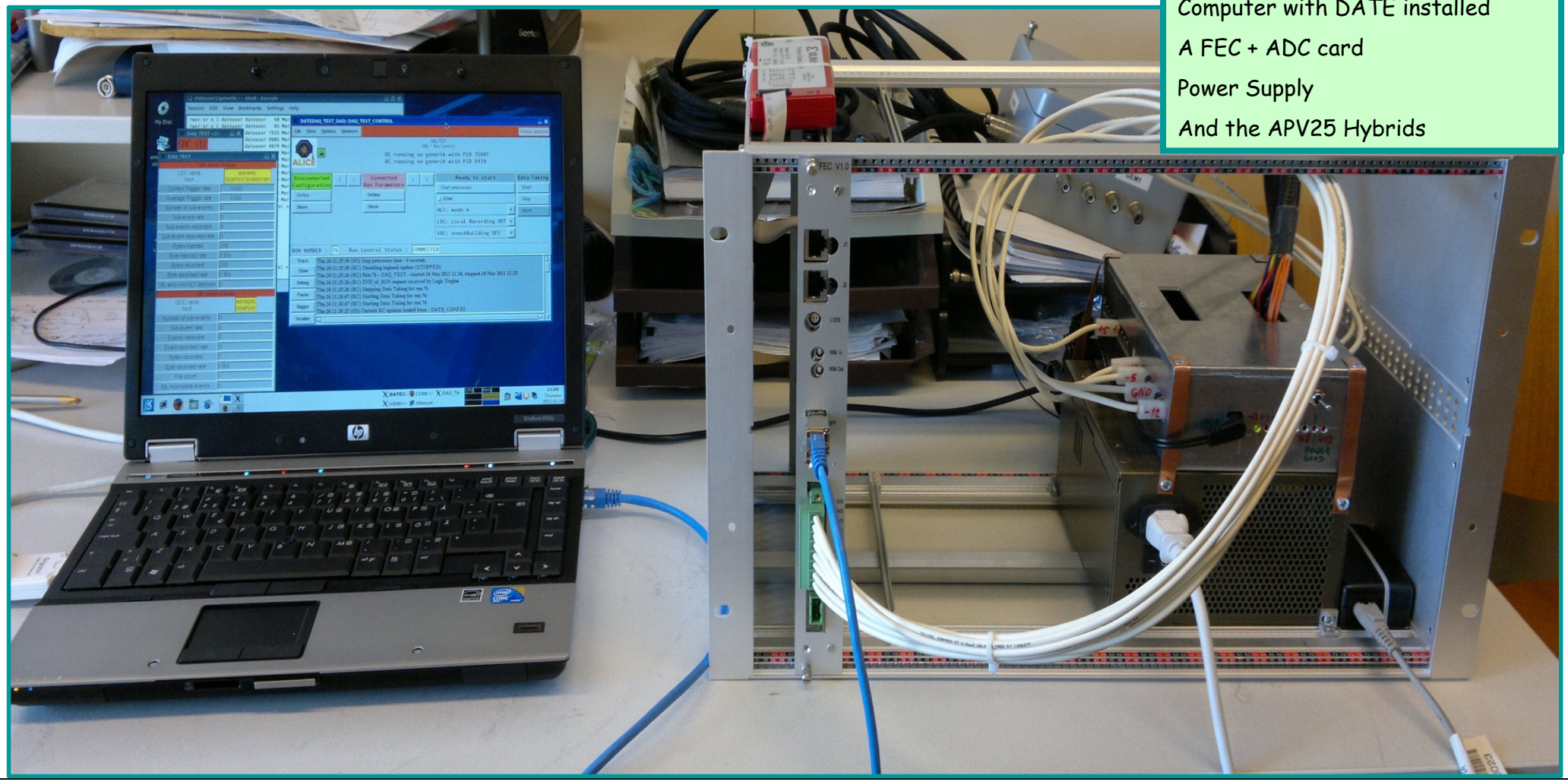
The system consists of:

Computer with DATE installed

A FEC + ADC card

Power Supply

And the APV25 Hybrids

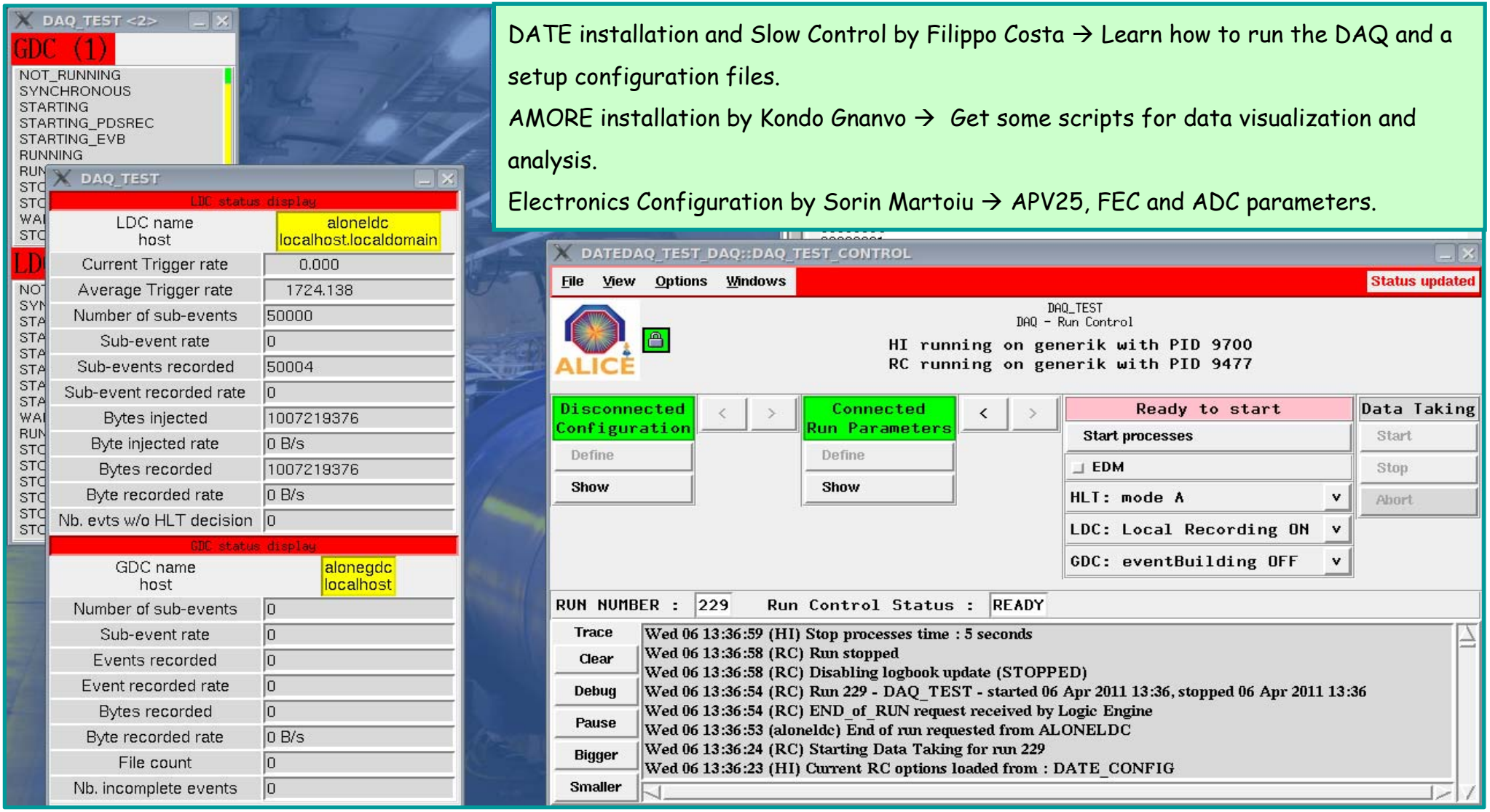


Installation, Configuration and First Tests

DATE installation and Slow Control by Filippo Costa → Learn how to run the DAQ and a setup configuration files.

AMORE installation by Kondo Gnanvo → Get some scripts for data visualization and analysis.

Electronics Configuration by Sorin Martoiu → APV25, FEC and ADC parameters.



Installation, Configuration and First Tests (cont.)

Tests were done without detector connected to the APV25s, the trigger scheme is internal and Data was not visualized.

DAQ_TEST

LDC status display

LDC name / host	aloneldc / localhost.localdomain
Current Trigger rate	0.000
Average Trigger rate	1724.138
Number of sub-events	50000
Sub-event rate	0
Sub-events recorded	50004
Sub-event recorded rate	0
Bytes injected	1007219376
Byte injected rate	0 B/s
Bytes recorded	1007219376
Byte recorded rate	0 B/s
Nb. evts w/o HLT decision	0

fec.txt - emacs@generik.hip.helsinki.fi

File Edit Options Buffers Tools Help

```
10.0.0.2
6039
80000000
00000000
aaaaffff
00000000
00000000
# BCLK_MODE
00000004
00000001
# BCLK_TRGBURST
00000003
00000002
# BCLK_FREQ
00000100
00000003
# BCLK_TRGDELAY
00000100
00000004
# BCLK_TPDELAY
00000080
00000005
# BCLK_ROSYNC
0000012c
00000008
# EVBLD_CHMASK
0000000f
00000009
# EVBLD_DATALENGTH
000009c4
0000000a
00000000
0000000b
00000000
0000000c
# EVBLD_EVENTINFODATA = 0xAABB | Copy of EVBLD_DATALENGTH [15:0]
aabb09c4
```

--:-- fec.txt (Text)--L4--All

Installation, Configuration and First Tests (cont.)

In both cases the file size increases linearly with the increasing of amount of triggers.

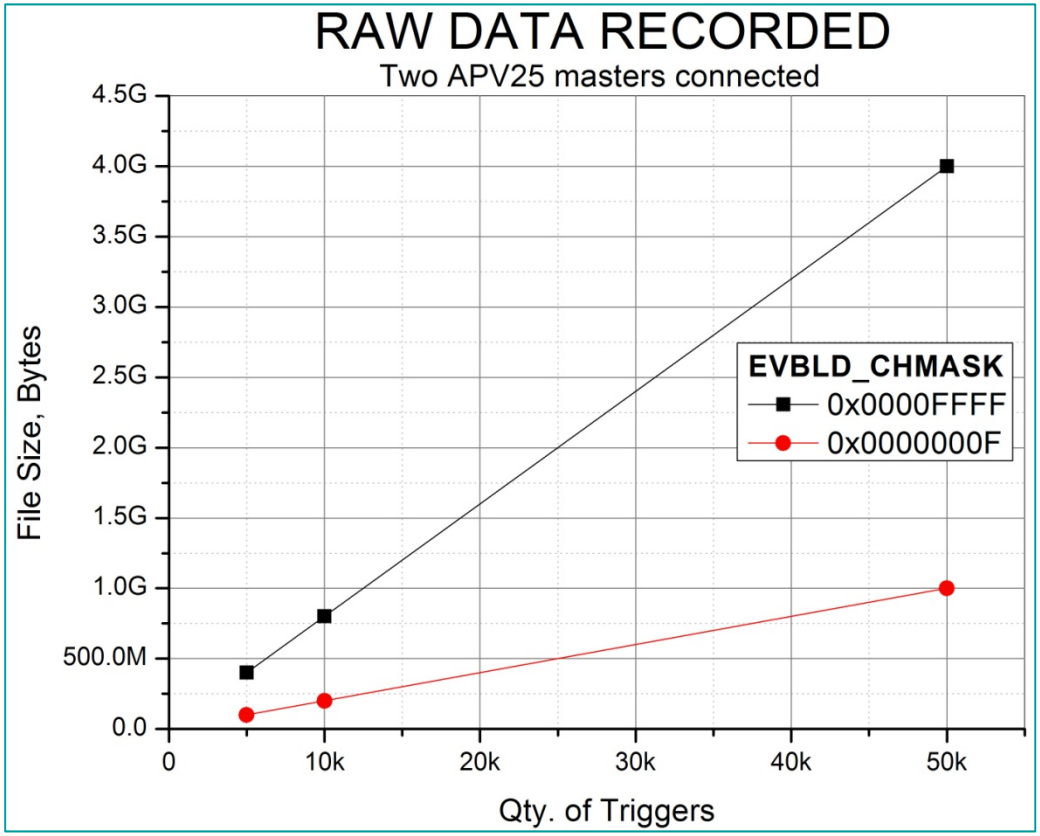
EVBL_CHMASK:

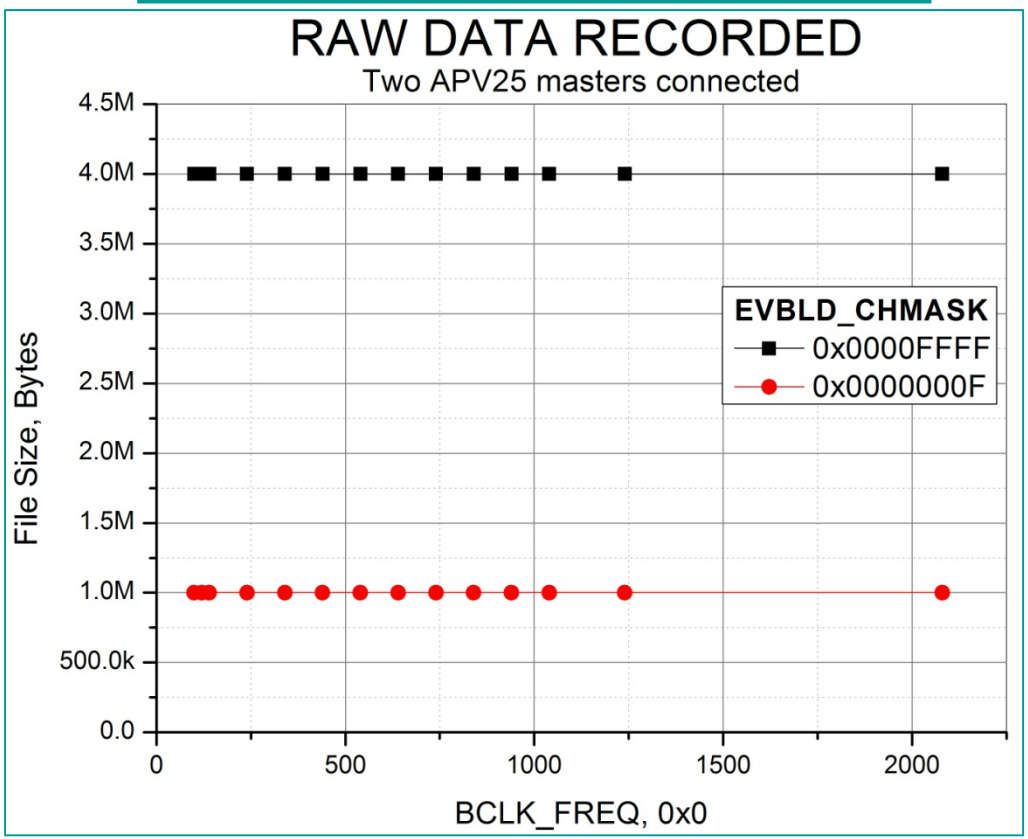
0000FFFF = … 1111 1111 1111 1111 → All 16 APVs data

0000000F = … 0000 0000 000 1111 → 4 APVs data

The File size remains the same, even when the triggers generated by the FEC increase

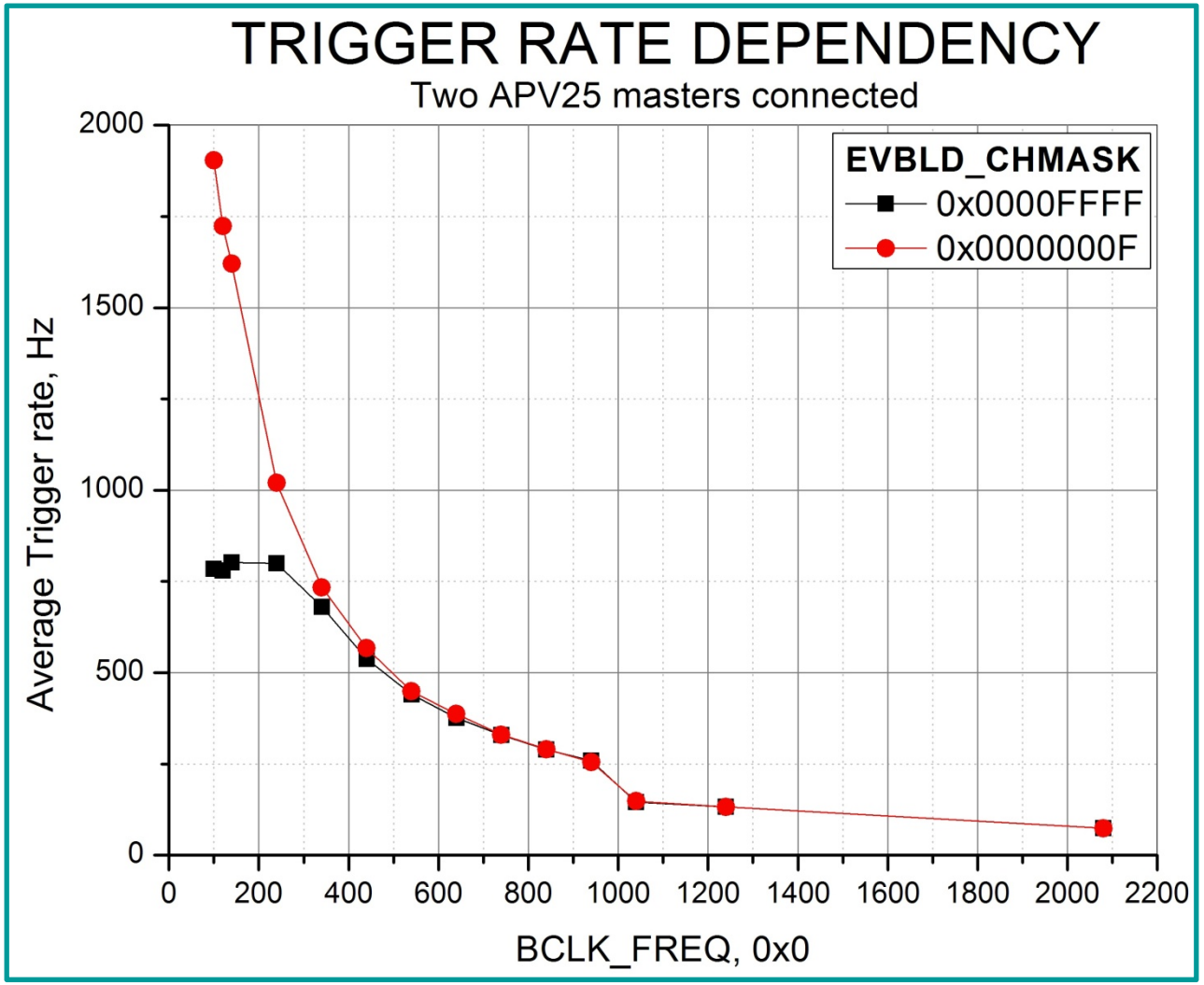
$$Tr = \frac{1}{(BCLK\_FREQ * 64 * 25)}$$





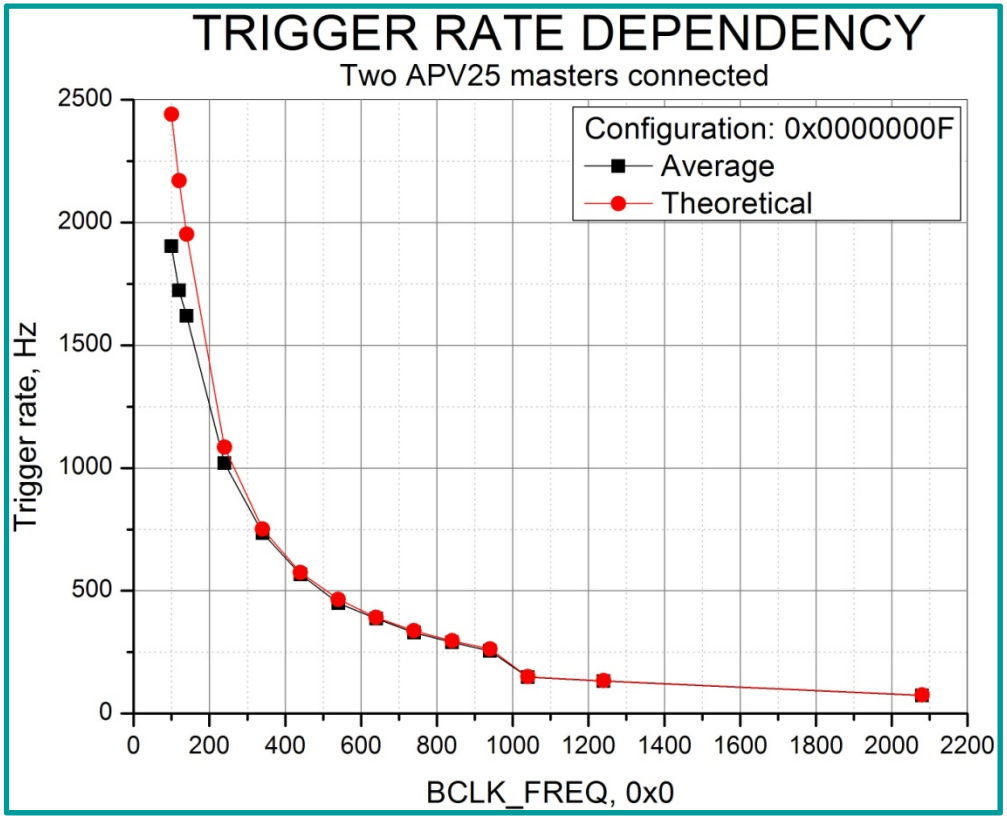
Installation, Configuration and First Tests (cont.)

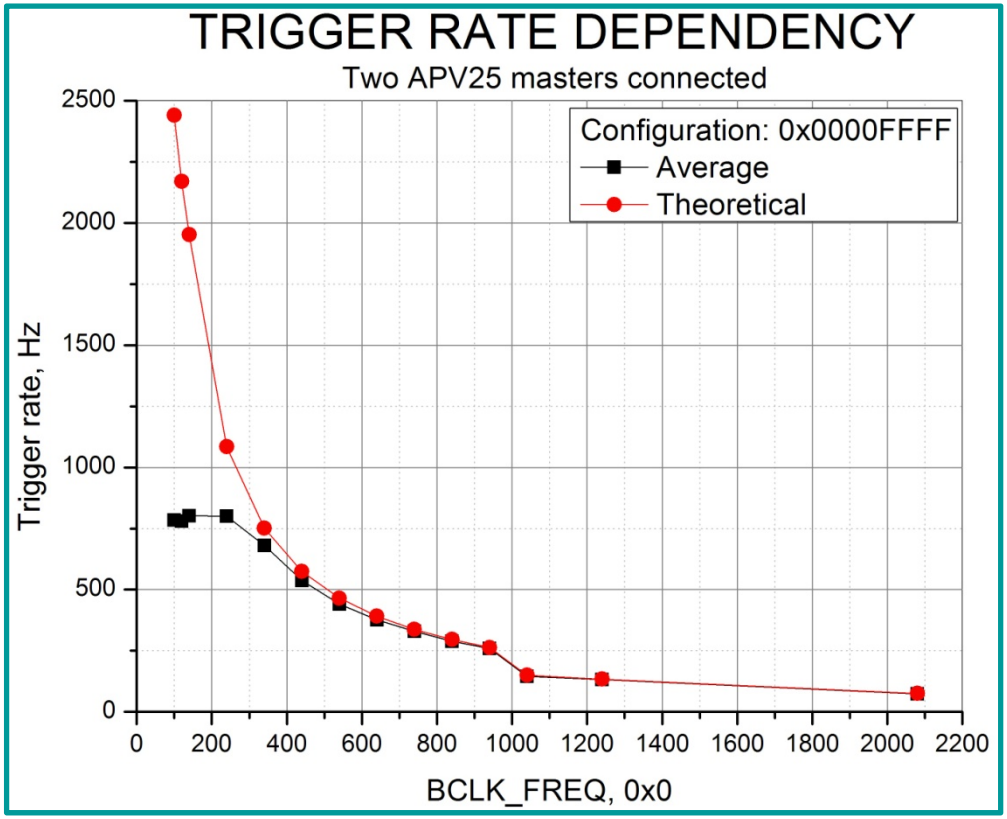
This is the comparison of the average trigger rate for the two cases in study.
In black the configuration on the FEC was to read the data from 16 APV25 chips and in red was for only 4 APV25s.
The maximum average trigger for the configuration of 4 APV25s was very close to 2 kHz in contrast for the case of 16 APV25s the maximum was reached at 784 Hz



Installation, Configuration and First Tests (cont.)

For the case of small quantity of APV25 chips connected to a FEC, the mean trigger rate is almost in complete agreement with the theoretical one. For the case of 16 APV25 chips, which is the maximum number of chips that one FEC can served, there is a saturation around 800 Hz, nevertheless in all cases no data losses were observed.





TODO

- Run Amore with the scripts provided by Kondo
- Compare file size and consistency of the data
- Customize all the parameters for my setup
- Investigate Common mode and pedestal corrections
- Work in the latency scan