



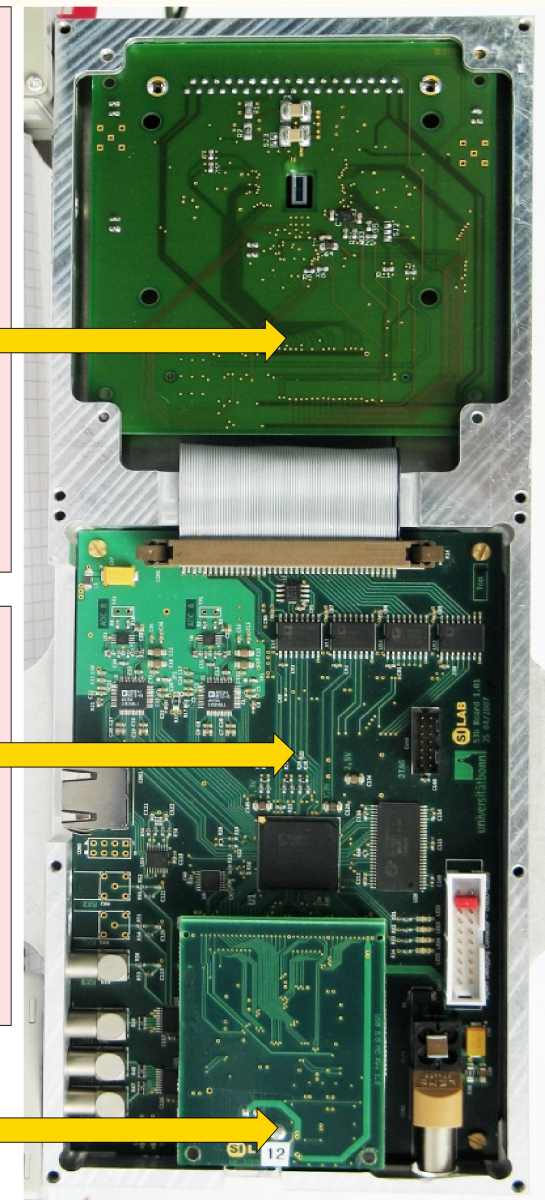
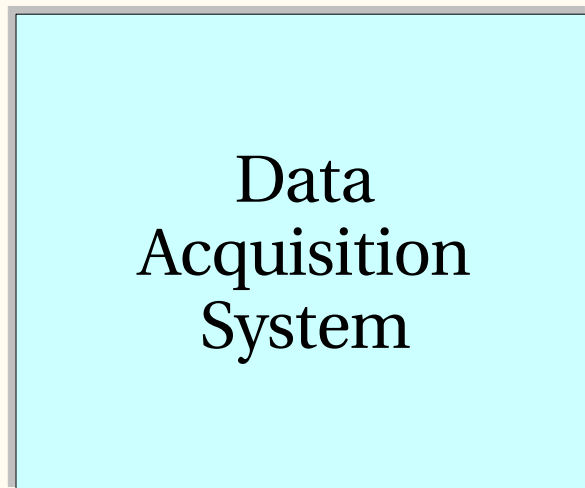
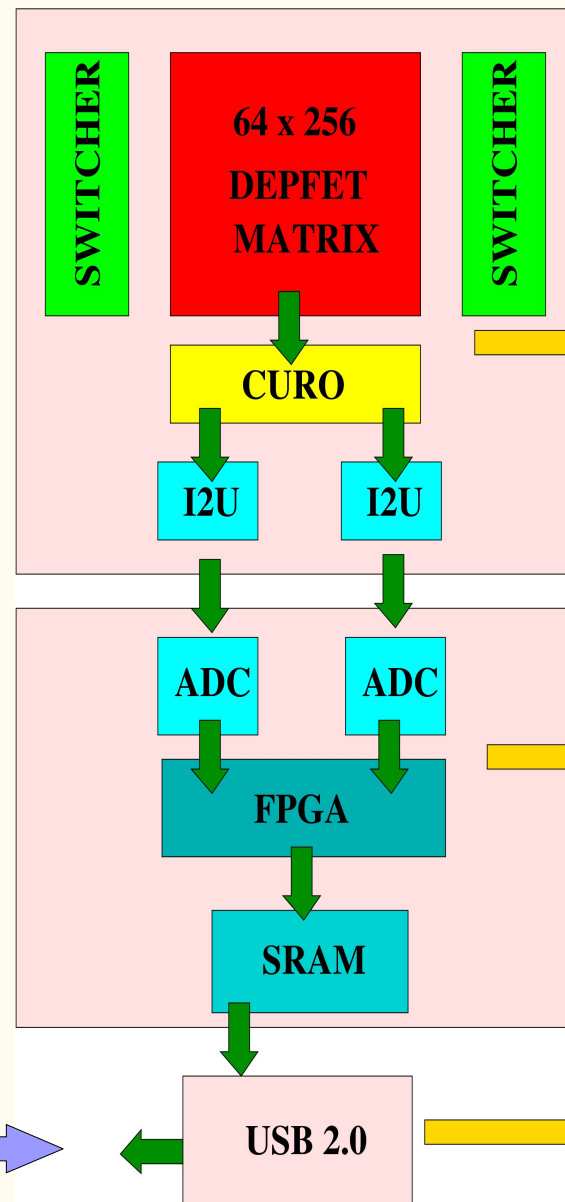
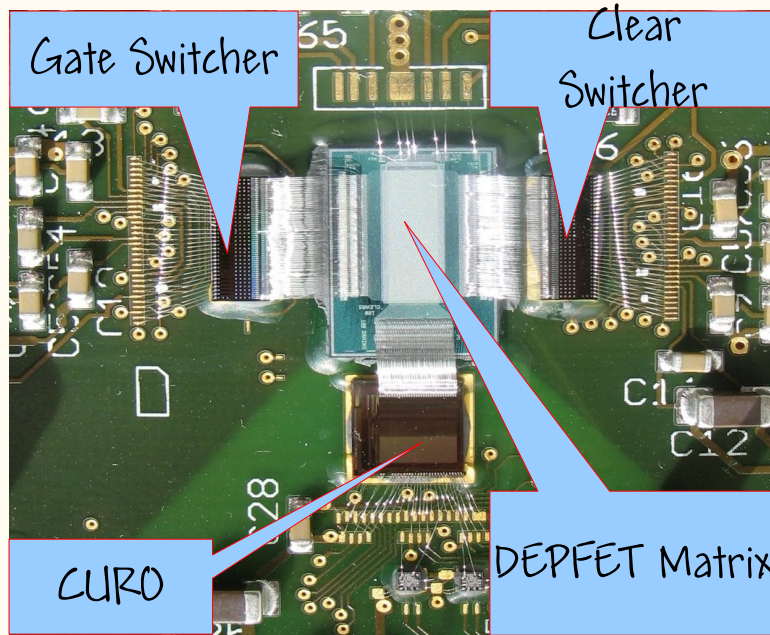
S3B system with PXD5 matrix

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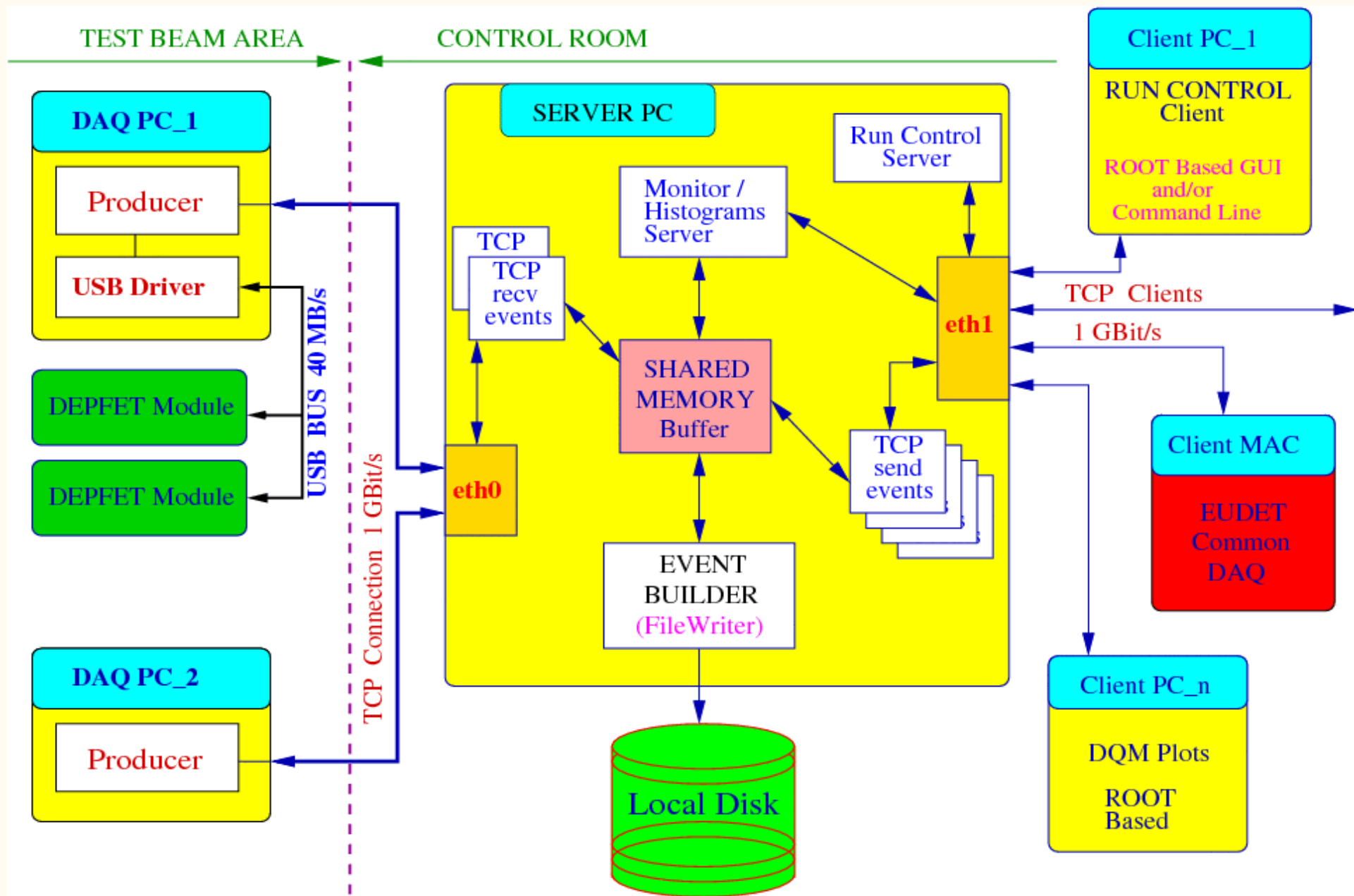
2nd International Workshop on DEPFET Detectors and Applications

Ringberg Castle, 3-6 May 2009

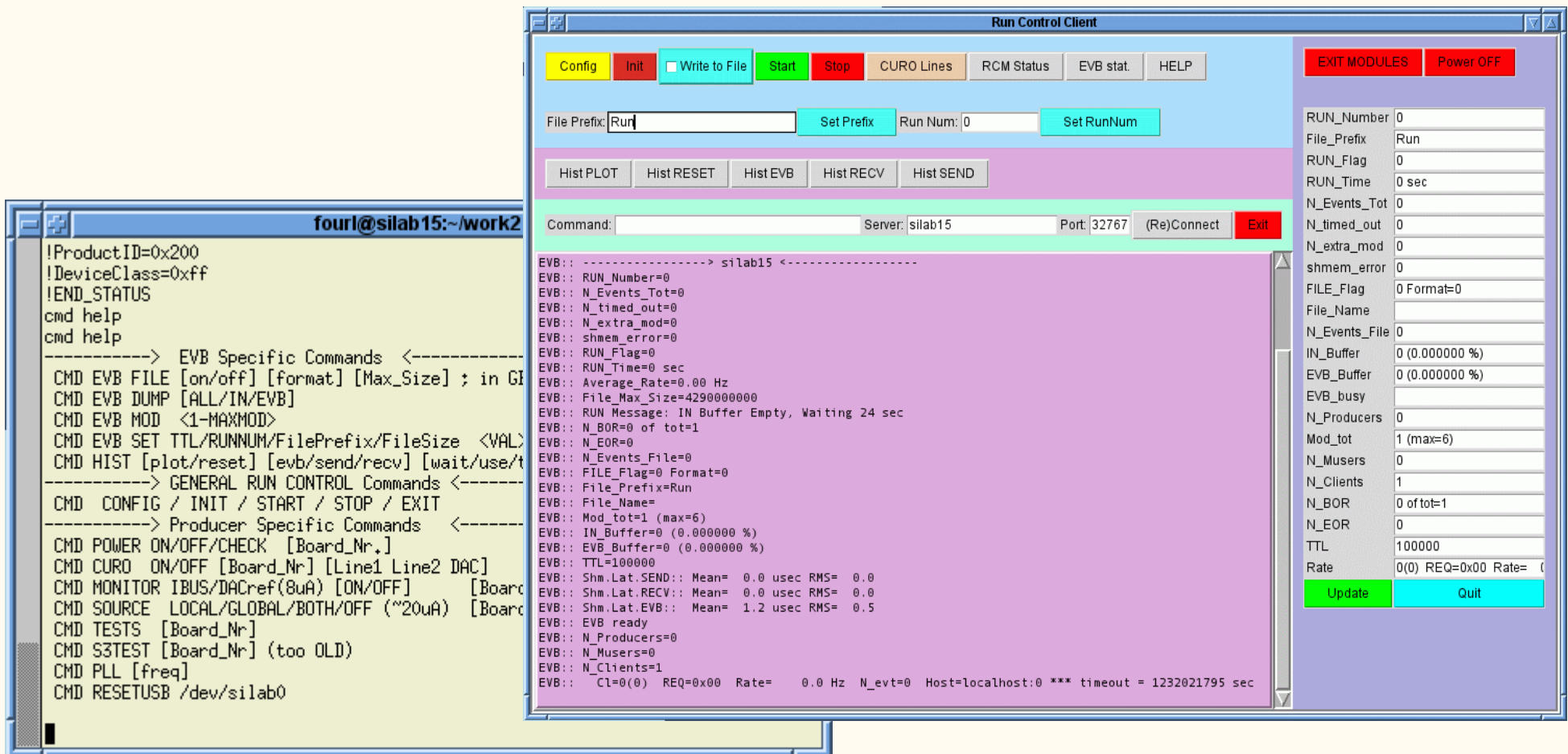
- *S3B system is developed to fully utilize the new DEPFET matrix and Switcher:*
 - ✓ *new generation of DEPFET sensors (PXD5) with bigger matrices and improved layout has been produced.*
 - ✓ *new Switcher3 is designed in a small chip technology and can also drive higher matrix capacitance.*
- *The S3B module comprises of 2 PCB boards:*
 - 1) *HYBRID 3.0 with :*
 - *the DEPFET matrix itself*
 - *two steering chips SWITCHER 3 on each side, to select a matrix row for readout*
 - *the current based readout chip (CURO II).*
 - 2) *FPGA board contains :*
 - *an FPGA itself, ADCs, buffer RAM, and a USB2.0-PC interface.*
- *S3B system also includes Readout, DAQ and DQM software*



- *Originally DAQ was developed for S3A system and now is upgraded to work with S3B system.*
- *DAQ is based on Linux network distributed client/server architecture which allows :*
 - ✓ *share resources and tasks*
 - ✓ *easy scale the system*
 - ✓ *remote control and monitoring*
 - ✓ *easy integration of other detectors*
- *DAQ uses **USB 2.0** for data transfer from DEPFET R/O board to PC and **TCP/IP** to send data to **Event Builder** .*
- *The DAQ components are:*
 - ✓ *a LINUX based USB driver for S3B module*
 - ✓ *a USB readout client transferring data to an Event Builder via network;*
 - ✓ *an Event Builder assembling complete events and storing in a shared memory buffer;*
 - ✓ *an event server send complete event to consumers (file writer, DQM, upper level DAQ, histogram server);*
 - ✓ *online Data Quality Monitoring (DQM) package based on ROOT.*
- *DAQ and DQM also allows to run the S3A and S3B modules together.*



- *Run Control server can accept commands from different clients:*
 - ✓ *Command line interface via Telnet*
 - ✓ *TCL/TK or Root GUI*
 - ✓ *Another program with TCP connection to Run Control server*



The image shows a terminal window on the left and a 'Run Control Client' GUI on the right.

Terminal Window (four1@silab15:~/work2):

```

!ProductID=0x200
!DeviceClass=0xff
!END_STATUS
cmd help
cmd help

-----> EVB Specific Commands <-----
CMD EVB FILE [on/off] [format] [Max_Size] ; in GI
CMD EVB DUMP [ALL/IN/EVB]
CMD EVB MOD <1-MAXMOD>
CMD EVB SET TTL/RUNNUM/FilePrefix/FileSize <VAL>
CMD HIST [plot/reset] [evb/send/recv] [wait/use/t

-----> GENERAL RUN CONTROL Commands <-----
CMD CONFIG / INIT / START / STOP / EXIT

-----> Producer Specific Commands <-----
CMD POWER ON/OFF/CHECK [Board_Nr.]
CMD CURO ON/OFF [Board_Nr] [Line1 Line2 DAC]
CMD MONITOR IBUS/DACref(8uA) [ON/OFF] [Board
CMD SOURCE LOCAL/GLOBAL/BOTH/OFF ("20uA) [Board
CMD TESTS [Board_Nr]
CMD S3TEST [Board_Nr] (too OLD)
CMD PLL [freq]
CMD RESETUSB /dev/silab0
  
```

Run Control Client GUI:

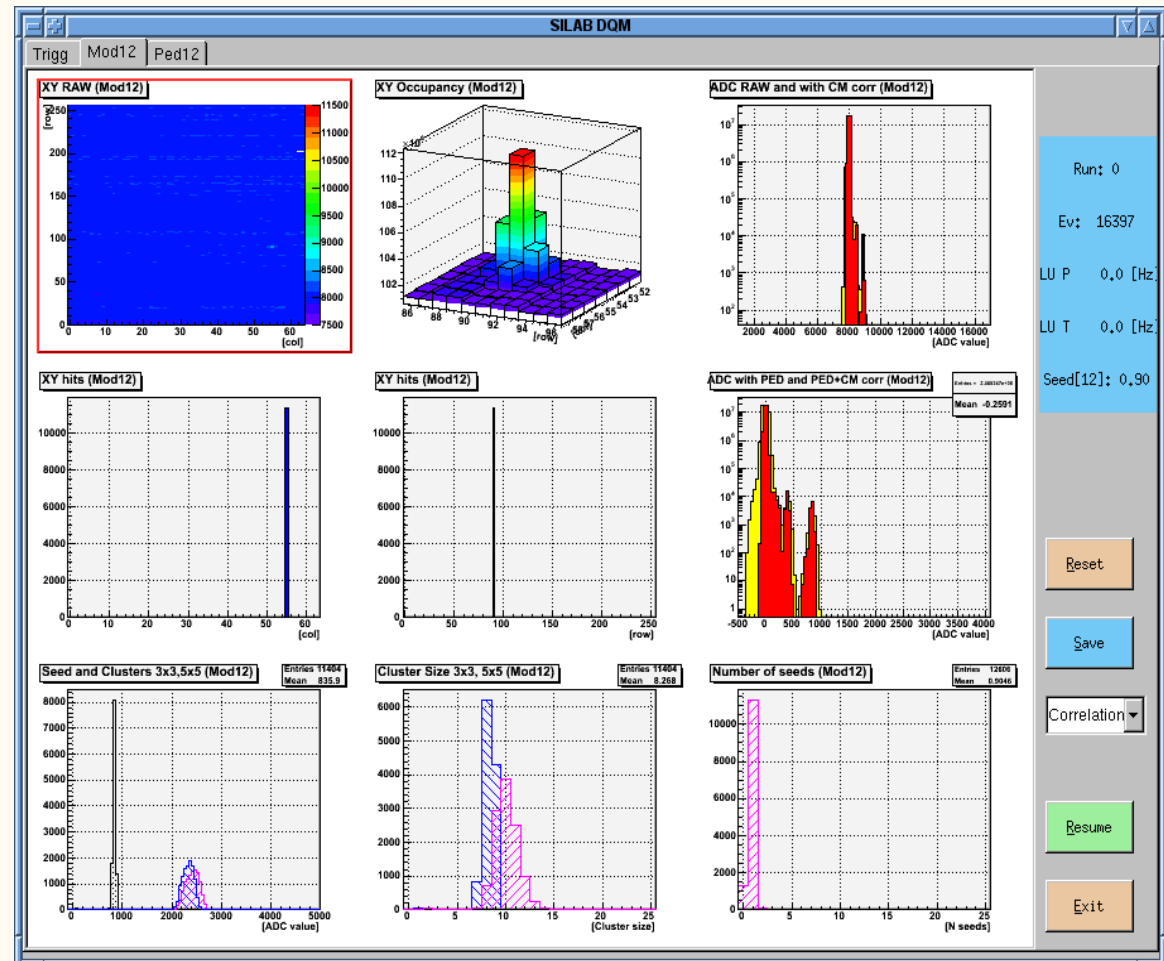
The GUI has a top toolbar with buttons: Config, Init, Write to File, Start, Stop, CURO Lines, RCM Status, EVB stat, HELP. Below the toolbar are input fields for File Prefix (Run) and Run Num (0), with Set Prefix and Set RunNum buttons. A Command field is empty, and the Server is silab15, Port is 32767. There are (Re)Connect and Exit buttons. A status area shows EVB:: output: EVB:: RUN_Number=0, EVB:: N_Events_Tot=0, EVB:: N_timed_out=0, EVB:: N_extra_mod=0, EVB:: shmем_error=0, EVB:: RUN_Flag=0, EVB:: RUN_Time=0 sec, EVB:: Average_Rate=0.00 Hz, EVB:: File_Max_Size=4290000000, EVB:: RUN Message: IN Buffer Empty, Waiting 24 sec, EVB:: N BOR=0 of tot=1, EVB:: N EOR=0, EVB:: N_Events_File=0, EVB:: FILE_Flag=0 Format=0, EVB:: File_Prefix=Run, EVB:: File_Name=, EVB:: Mod_tot=1 (max=6), EVB:: IN_Buffer=0 (0.000000 %), EVB:: EVB_Buffer=0 (0.000000 %), EVB:: TTL=100000, EVB:: Shm.Lat.SEND:: Mean= 0.0 usec RMS= 0.0, EVB:: Shm.Lat.RECV:: Mean= 0.0 usec RMS= 0.0, EVB:: Shm.Lat.EVB:: Mean= 1.2 usec RMS= 0.5, EVB:: EVB ready, EVB:: N_Producers=0, EVB:: N_Musers=0, EVB:: N_Clients=1, EVB:: Cl=0(0) REQ=0x00 Rate= 0.0 Hz N_evt=0 Host=localhost:0 *** timeout = 1232021795 sec.

On the right side of the GUI, there are EXIT MODULES and Power OFF buttons, and a table of status variables:

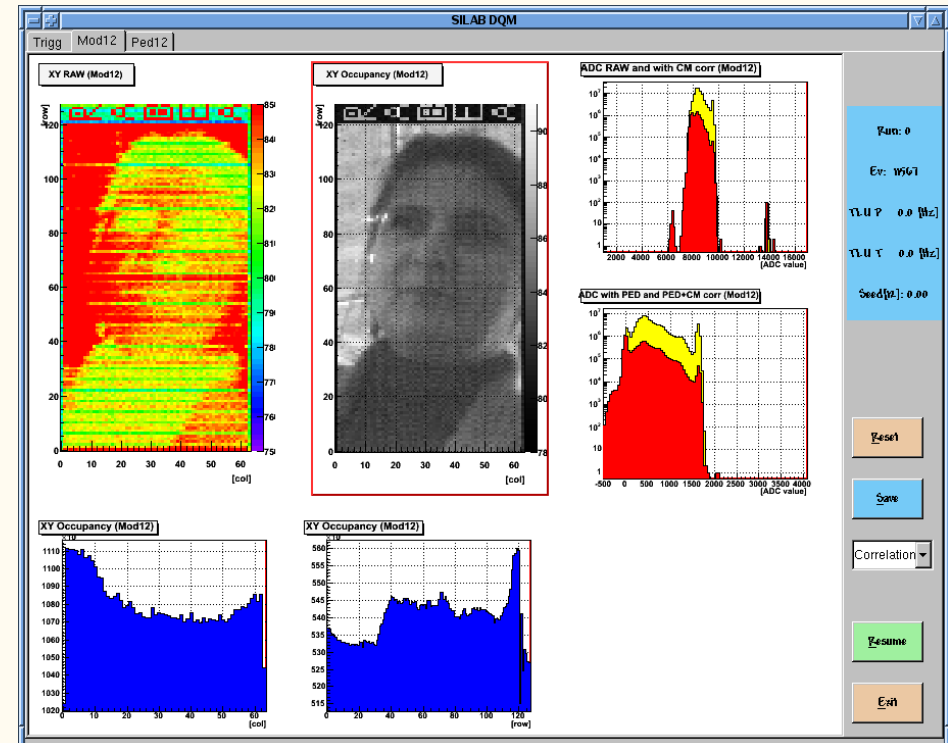
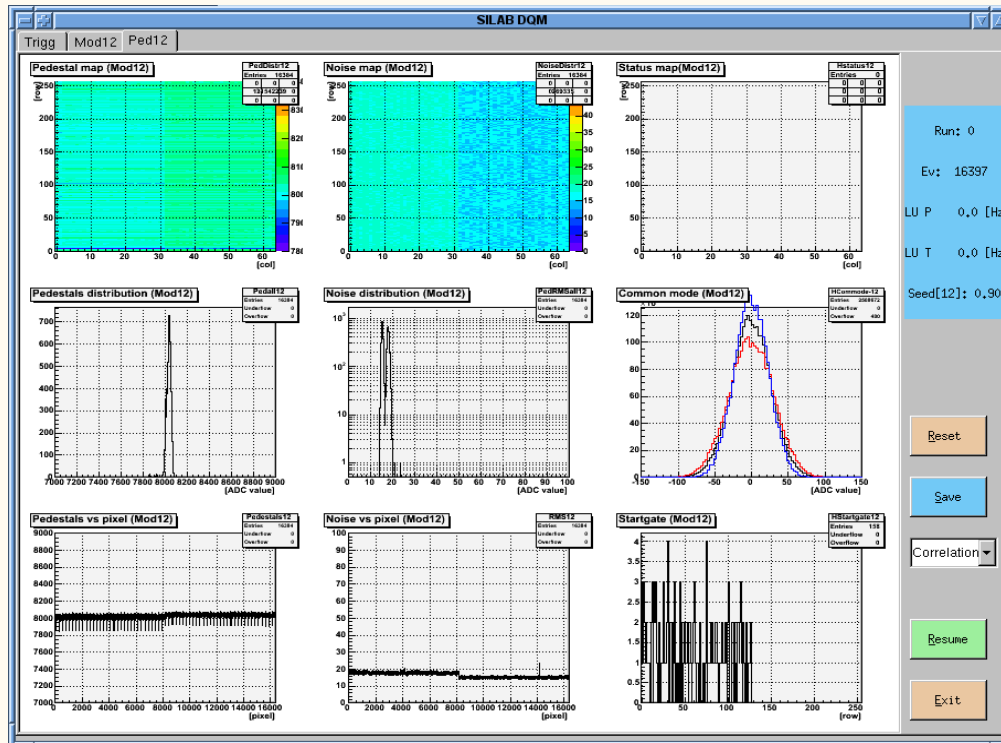
RUN_Number	0
File_Prefix	Run
RUN_Flag	0
RUN_Time	0 sec
N_Events_Tot	0
N_timed_out	0
N_extra_mod	0
shmем_error	0
FILE_Flag	0 Format=0
File_Name	
N_Events_File	0
IN_Buffer	0 (0.000000 %)
EVB_Buffer	0 (0.000000 %)
EVB_busy	
N_Producers	0
Mod_tot	1 (max=6)
N_Musers	0
N_Clients	1
N BOR	0 of tot=1
N EOR	0
TTL	100000
Rate	0(0) REQ=0x00 Rate= (

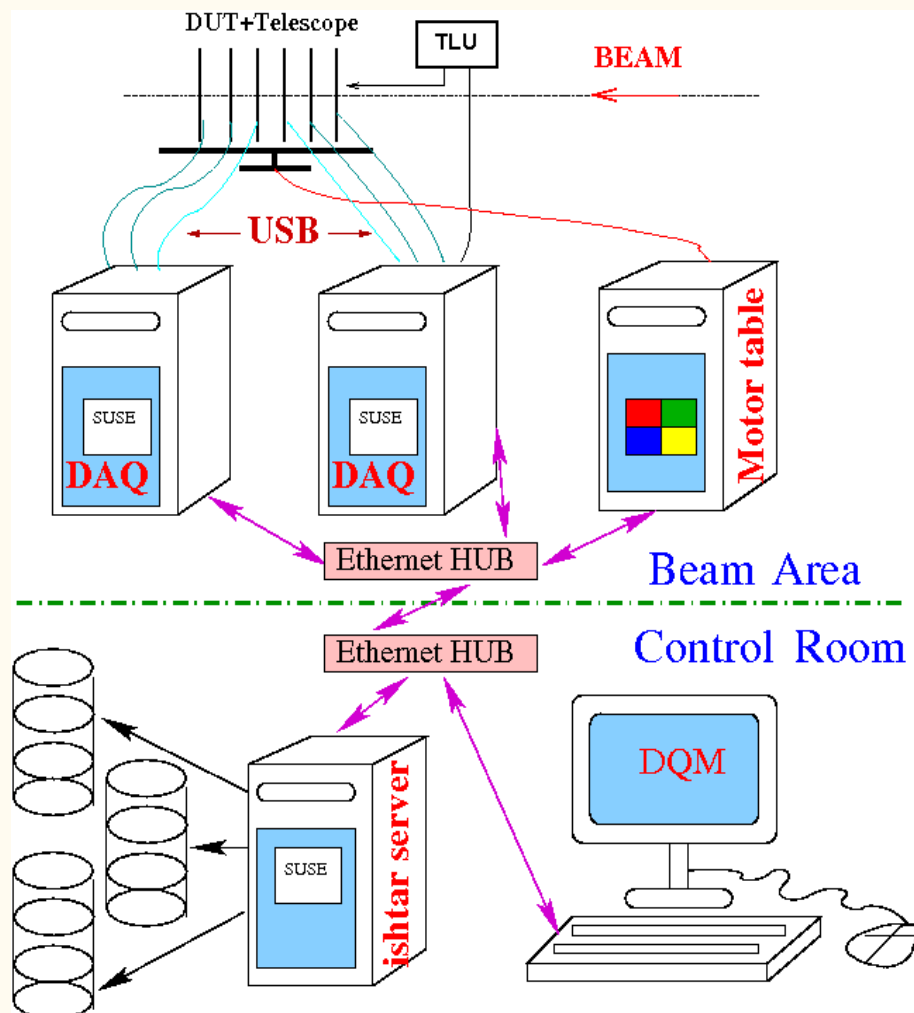
At the bottom right of the GUI are Update and Quit buttons.

- *network Data Acquisition system allows to run powerful Data Quality Monitor on dedicated PC in real time*
- *DQM is based on ROOT:*
 - ✓ *includes various data access methods : file, shared memory, network*
 - ✓ *online data processing – pedestal and common mode calculation, cluster reconstruction and simple tracking.*
 - ✓ *can also act as network histogram server*
- *advanced DQM functionality allows to find most of DAQ and DEPFET matrix problems during the run*



- Pedestals and noise distributions for module 12:
- Picture from CMOS matrix





- **Test Beam Area :**
 - ✓ table with DEPFET telescope consisting of 5-6 modules, mounted on X-Y motor stages
 - ✓ 2 readout PC with 3 DEPFET modules per PC, connected via USB2.0 in the test beam area in distance of max. 4 meters from the modules.
 - ✓ Windows PC to control 6 X-Y motor stages, with USB2.0 connection to controller.
 - ✓ Trigger Logic Unit (TLU) connected to one of readout PC via USB2.0
 - ✓ all PC are connected to 1GB ethernet HUB
- **Control Room :**
 - ✓ one DAQ server – rack mounted server PC : Intel S5000, 8 CPU, 4GB memory, hot swap SATA RAID with 3 TByte disk space – total 6 disks.
 - ✓ working PC : Run Control, DQM, etc....
 - ✓ all PC also connected to local ethernet HUB
 - ✓ both HUBs are connected by ethernet cable, from test beam area to control room

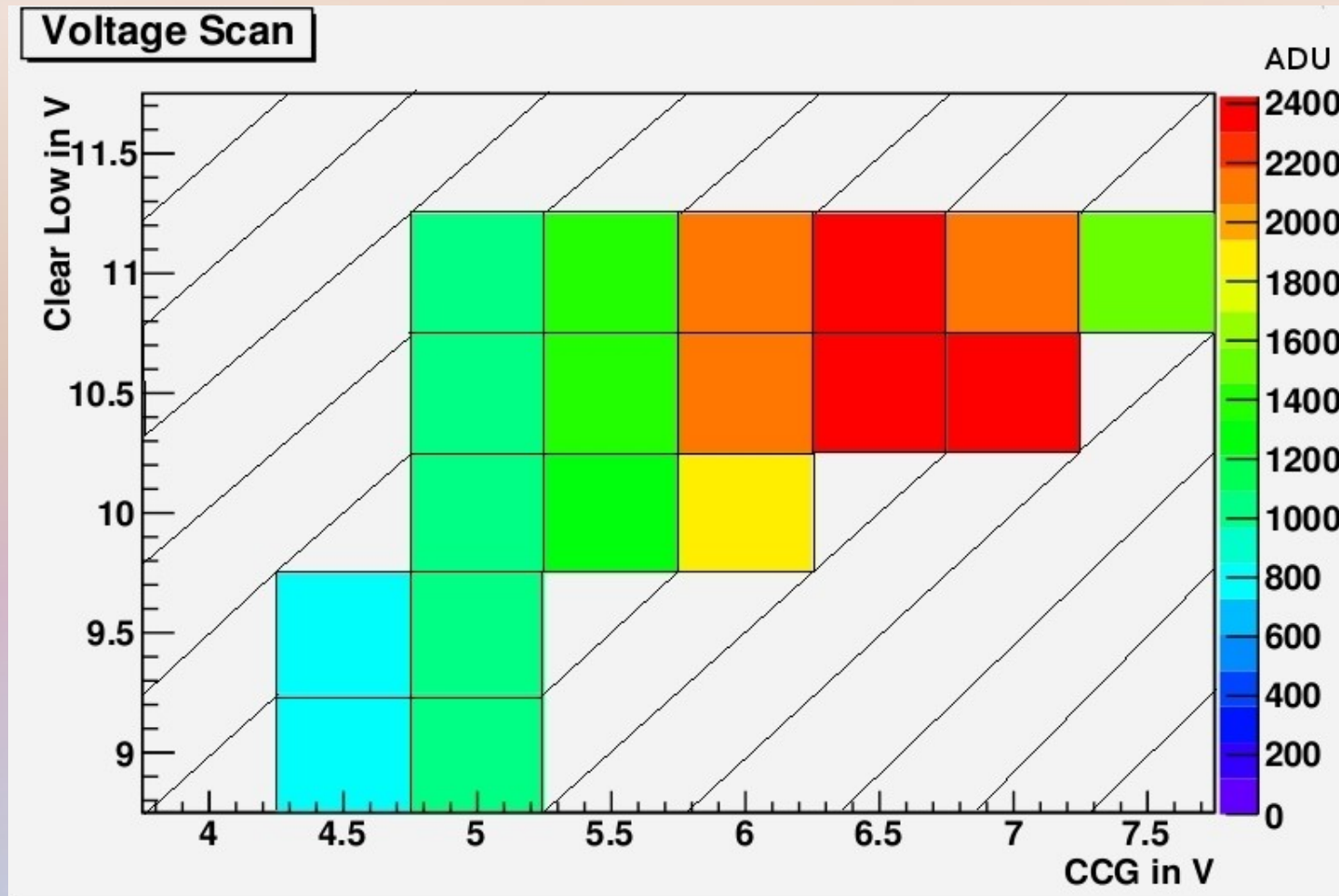
- *New S3B readout system is developed and tested on Laser Setup.*
- *S3B module provides the readout rate up to 130 Hz*
 - ✓ **Data rate about 4.2 MB/s per module (32 kB / frame)**
- *Carried out first scans of new matrices on Laser Setup.*
- *A series of 10 S3B boards is ordered .*

Laser Setup in Bonn

Simone Esch

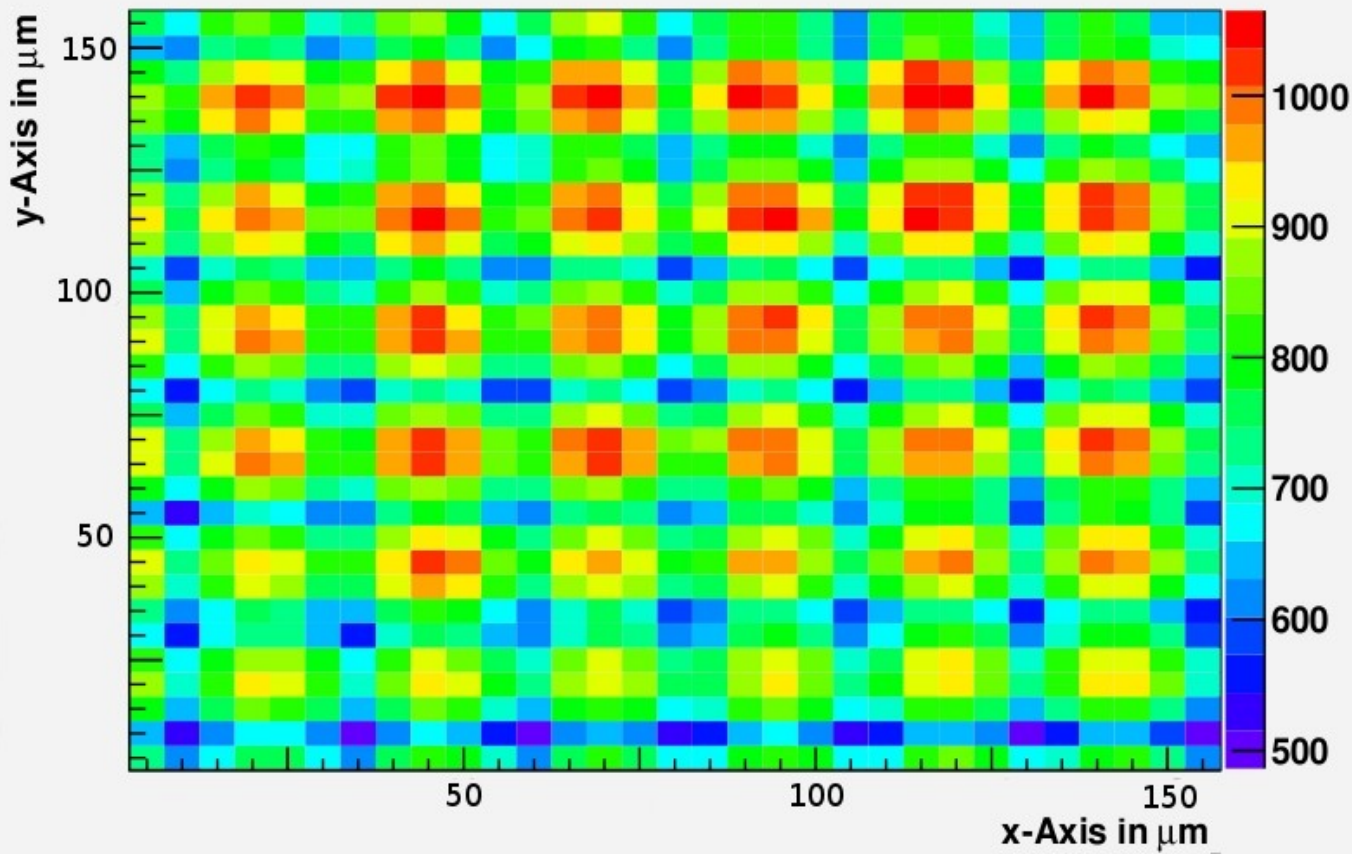
University of Bonn

Voltage Scan PXD5 (64x256) Matrix



Laser scan 64x256 matrix

Seed Signal



S3B System
Hybrid 3.0 PXD5

Voltages:
CCG=6,5 V
Clear Low=10,5 V
(wrt GND)

Step Size: 5 μm

Summary

- Just started with Diploma-Thesis
- Laser Setup works
- All software runs on Linux