

MPW3 Software Proposal

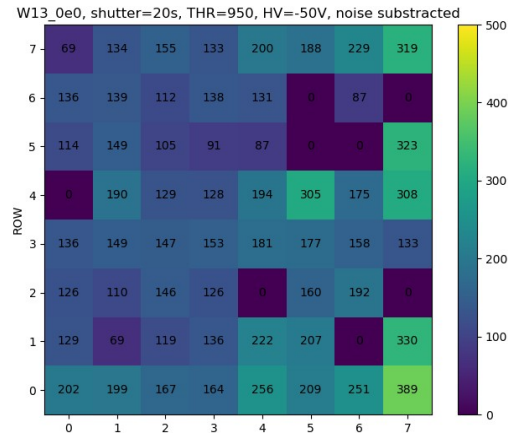
RD50-Cmos Meeting

15.12.21

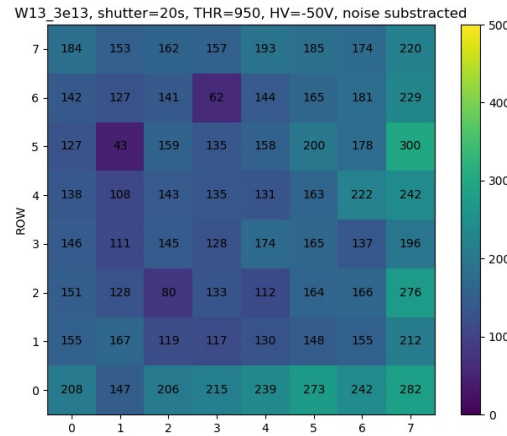
Bernhard Pils

- Motivation
- The Caribou-system
- SW frameworks
- Summary

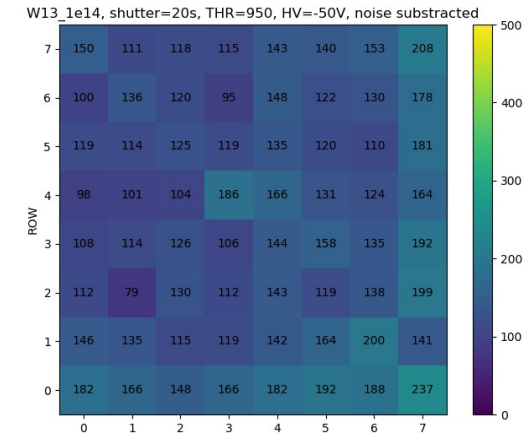
- ^{90}Sr source (10mCi)
- Hitmap at -50V Bias for 3 different fluences



Wafer 13, unirradiated

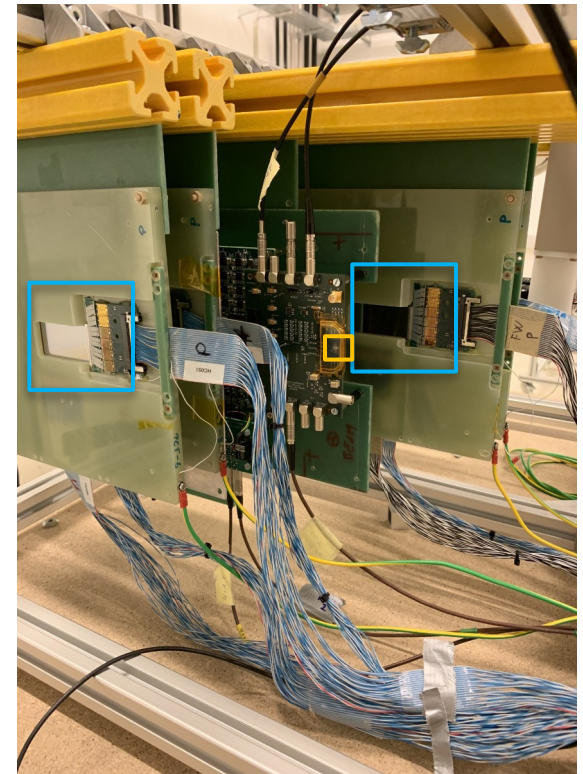


Wafer 13, $3e13N_{eq}$

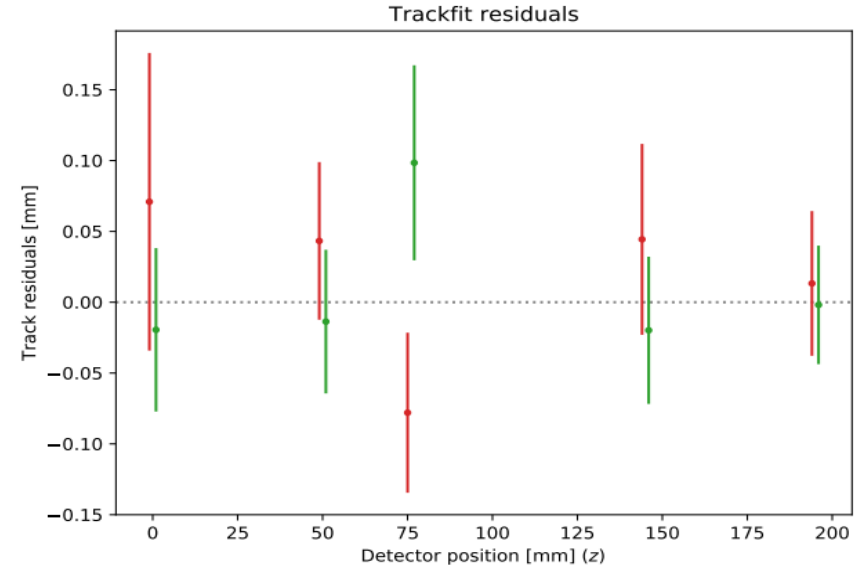


Wafer 13, $1e14N_{eq}$

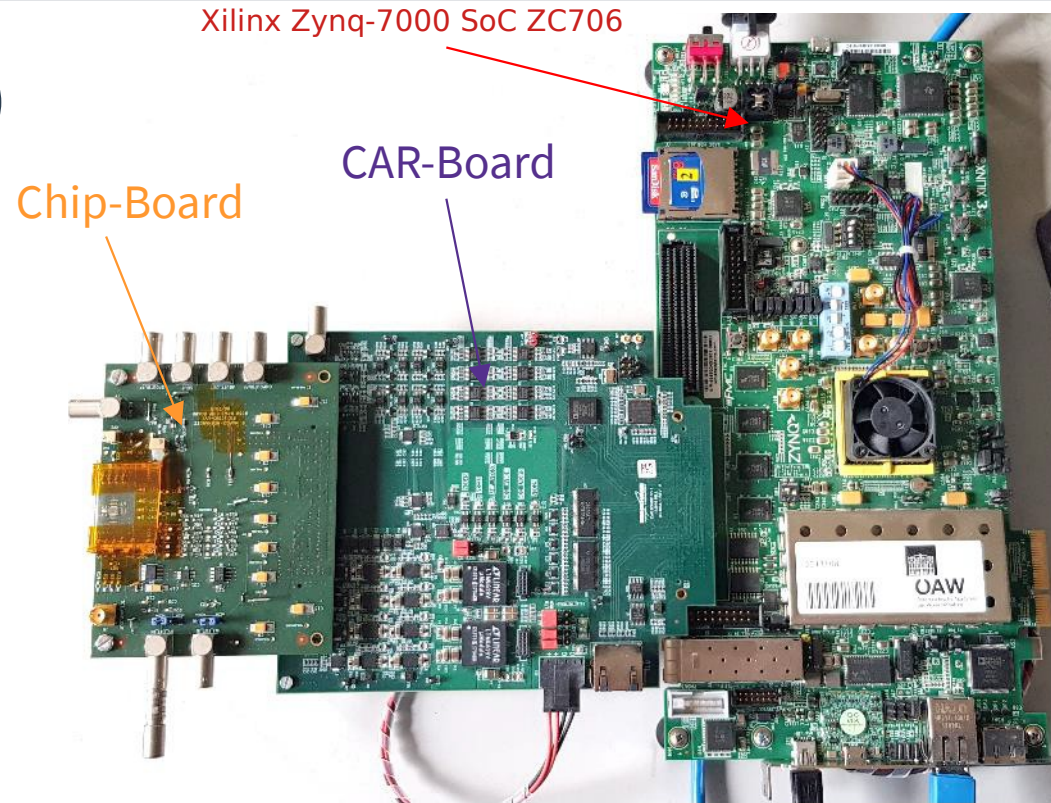
- Testbeam at *MedAustron*
 - 60-800 MeV Protons
 - ~3,5 MHz particle rate
- *Used Detectors:*
 - 4 DSSDs as telescope
 - RD50-MPW2 as DUT
 - Triggered by scintillators with AIDA-TLU



- *Corryvreckan* for track-analysis
- Align MPW2 to telescope
 - Did not work very well
 - No further studies possible

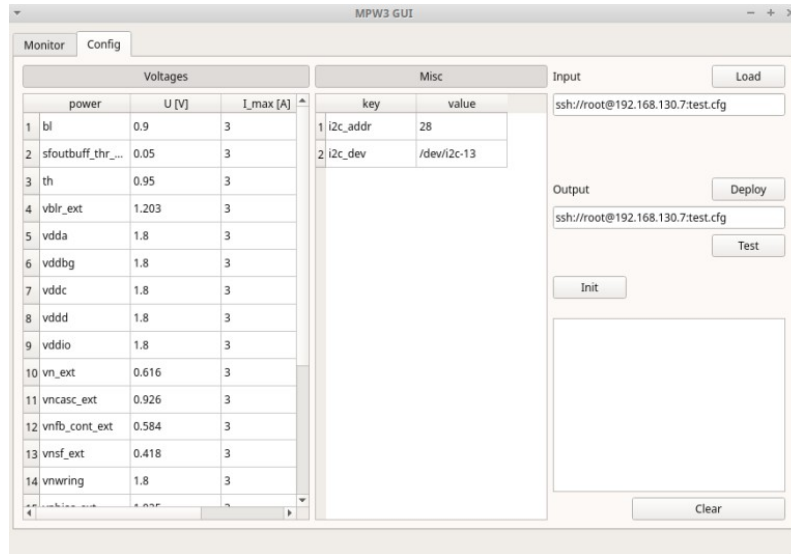


- Modular DAQ System (SW + HW)
- DAQ SW-framework *Peary*



- Modular DAQ framework
- Implementation of „RD50_MPW3“ in progress
- Configures MPW3 via I2C
- Data Readout
 - Reads hits via AXI from FPGA-FIFO
 - For higher particle rates:
UDP data stream via SFP port of Zynq board

- GUI generating config-files (key-value pairs)
- Parsed by *Peary* and applied via I2C

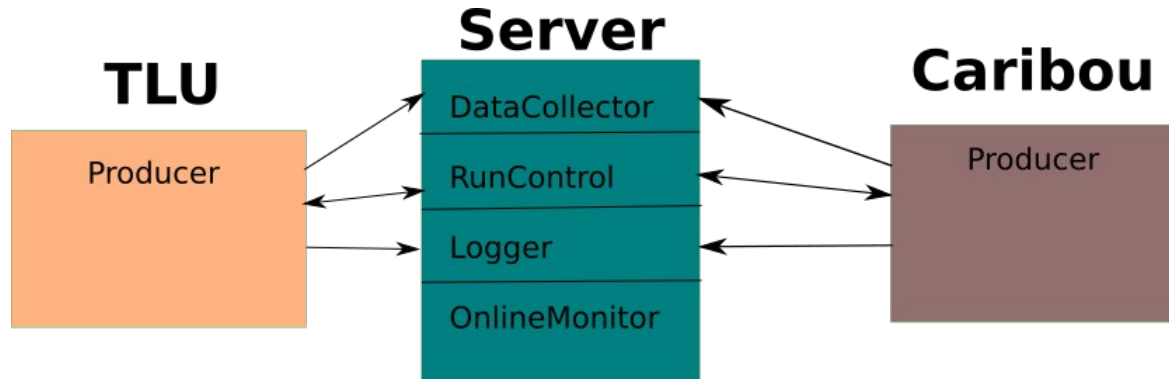


```
[RD50_MPW3]
#SEC::MISC
i2c_addr = 28
i2c_dev = /dev/i2c-13

#SEC::POWER
# voltages with suffix "_u", currents with "_i"
vdda_u = 1.8
vdda_i = 3
vddbg_u = 1.8
vddbg_i = 3
vddc_u = 1.8
vddc_i = 3
vddd_u = 1.8
vddd_i = 3
vddio_u = 1.8
vddio_i = 3
vn_ext_u = 0.616
vn_ext_i = 3
vncasc_ext_u = 0.926
....
```


Data Storing - *Eudaq*

- MPW2: 1 pixel at a time (8 x 8 matrix) → stored on SD-card
- MPW3: 128x32 Pixel „parallel“ → proper disk necessary



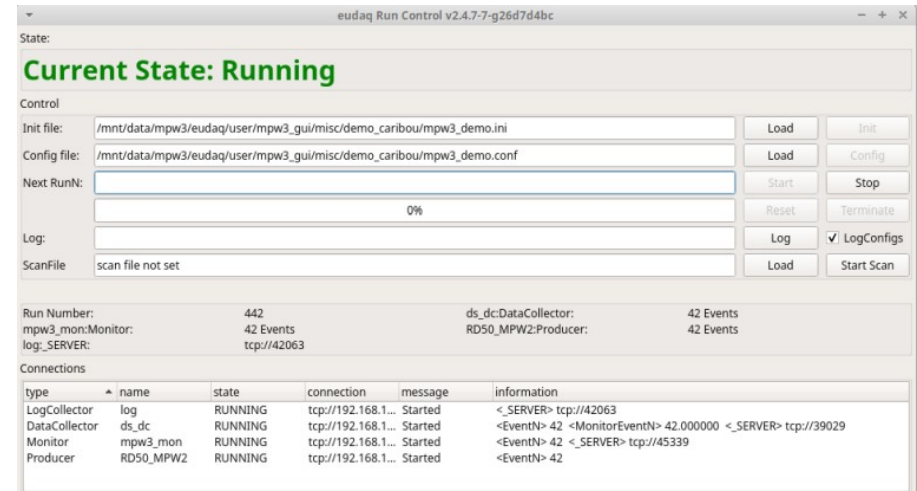
- Event based (tbd)
- EudaqStandardEvent knows:
 - PixelID
 - TriggerN
 - Timestamps (begin / end of event)
 - Chip – ID
 - Custom „tags“

- Implementation of „MPW3-EventConverter“
- Examined with MPW2 measurement

Online-monitor



Run Control



eudaq Run Control v2.4.7-7-g26d7d4bc

State:
Current State: Running

Control

Init file: /mnt/data/mpw3/eudaq/user/mpw3_gui/misc/demo_caribou/mpw3_demo.ini Load Init

Config file: /mnt/data/mpw3/eudaq/user/mpw3_gui/misc/demo_caribou/mpw3_demo.conf Load Config

Next RunN: 0% Start Stop

Log: Log LogConfigs

ScanFile: scan file not set Load Start Scan

Run Number: 442 ds_dc:DataCollector: 42 Events
mpw3_mon:Monitor: 42 Events RD50_MPW2:Producer: 42 Events
log_SERVER: tcp://42063

Connections

type	name	state	connection	message	information
LogCollector	log	RUNNING	tcp://192.168.1...	Started	<_SERVER> tcp://42063
DataCollector	ds_dc	RUNNING	tcp://192.168.1...	Started	<EventN> 42 <MonitorEventN> 42.000000 <_SERVER> tcp://39029
Monitor	mpw3_mon	RUNNING	tcp://192.168.1...	Started	<EventN> 42 <_SERVER> tcp://45339
Producer	RD50_MPW2	RUNNING	tcp://192.168.1...	Started	<EventN> 42

- **Beam telescope analysis framework**
 - Clustering, efficiency, track-reconstruction
- **Aida-TLU for triggering**
- **MPW3 in existing telescope as DUT / MPW3-telescope**

- *Caribou + Peary* for readout
<https://gitlab.cern.ch/Caribou>
- *Eudaq* for data storing
<https://github.com/eudaq>
- *Corryvreckan* for beam analysis
<https://gitlab.cern.ch/corryvreckan>
- Frameworks designed to work with each other

- *Peary*
 - MPW3-device
 - GUI for
 - Generating config-files
 - Control MPW3-Device
- *Eudaq*
 - “MPW3Raw → Standardevnt”-converter
 - Online-monitor
- **Work on each part already started**

Thanks for your attention!