FE meeting

Gandalf Readout of SciFi02 and Startcounter – Problems and Solutions

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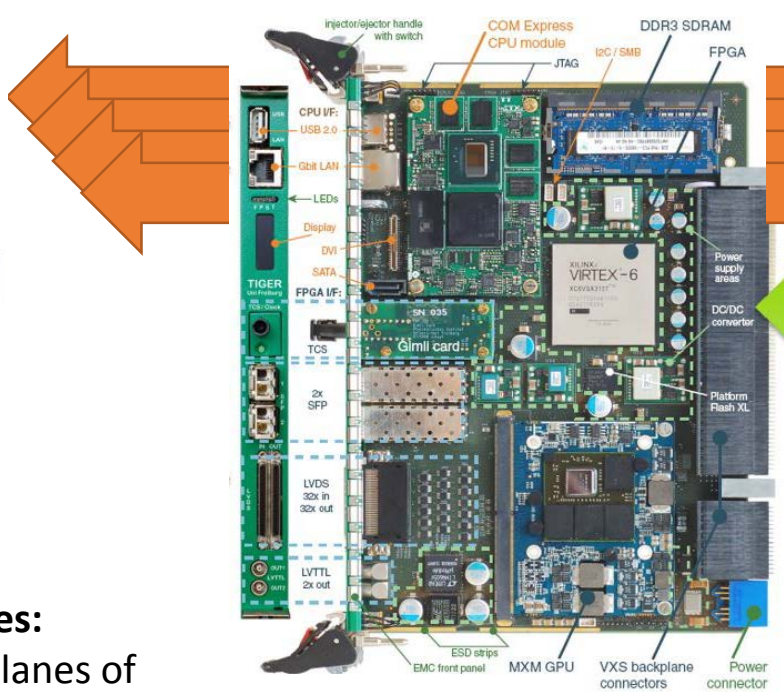
Setup in 2016

4 GANDALF modules:

- 850, 851 for 4 planes of Startcounter
  FW: M1-TDC
- 860, 861 for 2 planes of SciFi02 (96 channels each)
  FW: M1-TDC + Scalers (Beam Monitoring)



TIGER:

- TCS forwarding to GANDALFs
- Data concentration from GANDALFs and transfer to DAQ (SLINK)
- False behaviour on receiving corrupted events

VME backplane + CPU:

- Spy-fifo readout of random-trigger data (spyread-process)
- LOAD and configuration of GANDALFs

Description of Readout Error

On **GANDALF** level:

- Error in data stream on several triggers in short time interval
- Error appearance correlated to occupancy and trigger rate
- Corrupted data stream potentially occures for both, M1-TDC as well as BeamMon Firmware

On **TIGER** level:

- False behaviour on receiving corrupted events
- Module "getting stuck"
  -> keeps on streaming same event to DAQ
  -> Only reload helps to recover the module
- Diagnostic of origin of the error difficult/impossible
- Debug mode not applicable since much less stable

On **DAQ** level

Either:

- No timeout message on MUX level since TIGER keeps on sending data
- Timeout error on SWITCH level since one MUX does not send next event →Loss of synchronization and automatic safe stop of the DAQ after 4 spills

Or:

- "Event type mismatch" detected by MUX →Timeout error in next spill and no further effects on data taking

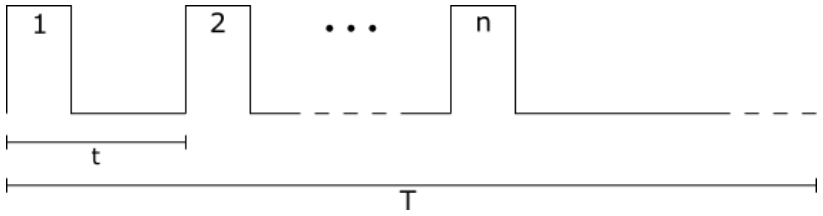
Summary of Last Run

Issues:		Behavior or Readout:
• Frequent beam spikes at beginning of spill during certain periods (e.g. LHC filling)	→	• Readout with BeamMon FW got stuck and a stop of the run + reload of the TIGER module was required
• Noise on some channels of SciFi02 (occurred 5 to 10 times last year)	→	• Readout was stuck with both FWs (M1-TDC + BeamMon). Hardly any possibilities to react since increasing the thresholds sometimes doesn't help. Requires access to the hall and thus great loss of beam time.
• Threshold scan of Startcounter and SciFi02	→	• Readout gets stuck when approaching the noise level

Test during Winter Shutdown

Testing procedure:

- Triggers generated by the pattern generator in TCS controller
- Three parameters:
  1. Pattern length ***T*** (set to 412µs)
  2. Number of triggers ***n***
  3. Time between consecutive triggers ***t***
- Tests performed without any occupancy (minimum event size) and tests performed with lowered threshold to generate noise hits



Most important results:

Loaded FW	n	t [ns]	result
M1-TDC	2	500	stable
	12	500	immediate crash
	12	4000	stable
BeamMon	2	500	stable
	12	500	immediate crash
	12	4000	stable
M1-TDC low thr	10	4000	crash
BeamMon low thr	10	4000	crash

Test under beam conditions

Loaded FW	Detector conditions	Max trigger rate	result	Run #
M1-TDC	No noise on any plane	> 34 kHz	stable	
BeamMon		> 34 kHz	stable	
M1-TDC	High noise on two channels of one plane	ca. 5.5 kHz	stable	
BeamMon		ca. 4 kHz	stable	
M1-TDC	Low noise	27kHz – 31 kHz	Stable at 27kHz Crash at 31kHz after 30 spills	277699
BeamMon		ca. 24kHz	stable	

Planned Fixes

Idea:

- Running with M1-TDC FW during whole run 2017
- Readout via HOLA card to avoid readout via TIGER module

Status:

- Enough HOLA cards and DAQ slots available
- Optical fibres ordered (should arrive today or tmw)
- Work on M1-TDC FW for readout via SLINK ongoing
- Waiting for next longer access to install fibres and HOLA card