



AGH UNIVERSITY OF SCIENCE
AND TECHNOLOGY

Raport from the Hardware Working Group

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Main Objectives of Hardware Group

- Presently the main Hardware Goal is to build a prototype of Compact Multilayer FCAL Detector
 - Within the AIDA-2020 project it is also our deliverable with the deadline in first part of 2019
- Proceeding with hardware R&Ds: on sensors, ASICs, mechanics, alignment, DAQ, back-end electronics, ...
- Test-beam preparation and data analyses – topic shared with Software&Analyses group

Summary of meetings held

Technical info

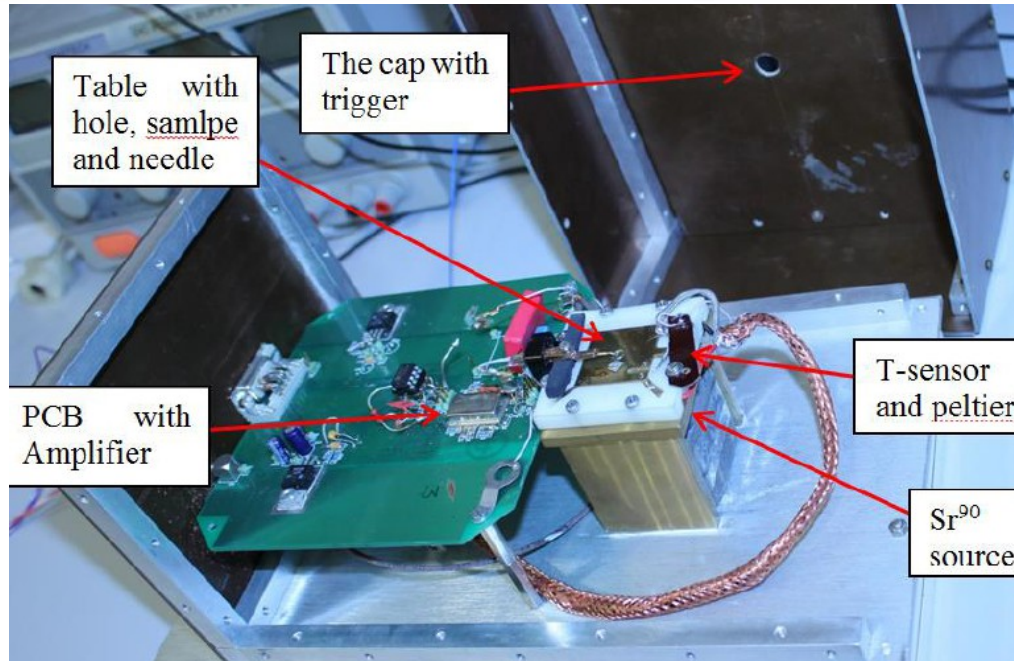
- Frequency: every ~4 weeks (recently less...)
- 3 meetings from the last (September 2016) FCAL Workshop in TelAviv – in total 28 meetings
- Duration: ~1 hour
- Participation – good (> 5 people)

Topics and presentations:

- Report from TB analysis group, Yan Benhammou
- Comparison of DD4Hep to TB data, Itamar Levy
- Recent progress at AGH-UST, Marek Idzik
- Radiation hardness tests at JINR, Alexey Zhemchugov
- Recent report from TB analysis group, Yan Benhammou
- Update on Moliere radius analysis, Itamar Levy

My feeling is that the hardware activities have slowed down...
(at least looking at the HWG meeting presentations)

Summary of "Radiation hardness tests at JINR"



- Two new GaAs sensors ($4 \times 4 \text{ mm}^2$ to $5 \times 5 \text{ mm}^2$, thickness $300 \mu\text{m}$, with/without junction) and two Si n-type (from USCS and Russian) irradiated with 20 MeV electrons at JINR up to 1.5MGy at room temperature
- Leakage current: for GaAs max few μA , for Si increased few orders of magnitude up to few tens of μA
- CCE: for GaAs decreased an order of magnitude, and much less for Si
- Noise: increased very little for GaAs and much more for Si, so that after total irradiation it was still possible to distinguish the MIP peak from the noise for GaAs sensors, while it was not possible for Si sensors
- Performance of Si sensors after irradiation could be improved significantly by cooling
- One should try also p-type Si sensors for which better hardness is expected

Progress&Status with HWG objectives

- The Main Hardware Goal for the next years is to build a prototype of Compact Multilayer FCAL Detector
 - Within the AIDA-2020 project, we have **milestone for ASIC and FPGA-based readout in April-May 2017**, and deliverable of compact calorimeter prototype in 2019
 - Sensors: first thin sensor modules produced by TAU/CERN, and already used at test-beams (2015, 2016)
 - ASICs: new LumiCal readout in progress at AGH-UST (Jakub's talk)
 - Back-end electronics: weakest point ! Recently some work started (see Leszek's talk, starting collaboration with JINR...)
 - Mechanical frame and tungsten plates, in principle ready

Summary

- The works focused on Compact Calorimeter Prototype are proceeding (sensors, ASIC, and recently FPGA back-end)
- My feeling is that other hardware activities have slowed down (at least looking at the HWG meeting presentations)
- Test-beam data analysis are ongoing (although man resources are probably too low...)
- Thanks to everybody who contributed to the HWG meetings/works !

Thank You for Attention

Questions, Comments, Proposals ?



Expressed interests

Reminder – any change/update ?

- PUC (Angel); ASICs for BeamCal; ~1 FTE
- SLAC (Bruce); Sensors, radiation damage; ~1 FTE
- ISS (Titi); Testbeams&Analyses, Sensors; ~1 FTE
- CERN (Konrad); Mechanical structure; ~1 FTE
- IFJPAN (Leszek); LumiCal sensors, Laser alignment; ~2 FTE
- JINR (Georgy); Tungsten, BeamCal sensors; ~2 FTE
- TelAviv (Itamar); LumiCal sensors, Testbeam&Analyses, DAQ; ~2 FTE
- DESY (Wolfgang); BemCal sensors, Testbeam&Analyses, conn., ~2 FTE
- AGH-UST (Marek); ASICs for LumiCal, testbeam&analyses, ~3 FTE