



Ruben Verheyden

- 1 some past background
 - 1 Master in Physics (15/09/2006 @ Katholieke Universiteit Leuven)
 - 2 Characterization of MCP Detector for the WITCH experiment
 - 3 Belgium
- 2 present status:
 - 1 ESR @ Jožef Stefan Institute
 - 2 Start date: 09/02/2009
 - 3 WP8: Photodetectors for High-B Fields
 - 4 Samo Korpar @ Univerza v Ljubljani
Supervisor & Mentor

Contents



WP8: Photodetectors for High-B Fields

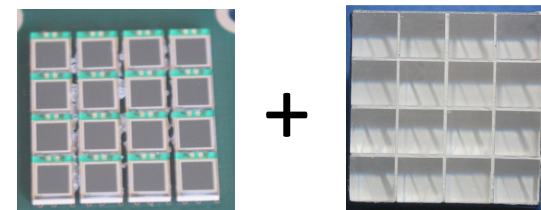
- Main focus → Silicon Photomultipliers:

- B field insensitive
- Very robust & low power
- Can be relatively cheap → fine detector segmentation
- Commercial applications (e.g. MRI+PET scanners)

- Design and Study Time & Spatial Resolution:

- PET Module → LYSO + SiPM ← Results:

- 4x4 SiPM modules available (P8-MS 1 OK)
- First results obtained (Energy & Timing resolution) (P8-D1 OK)



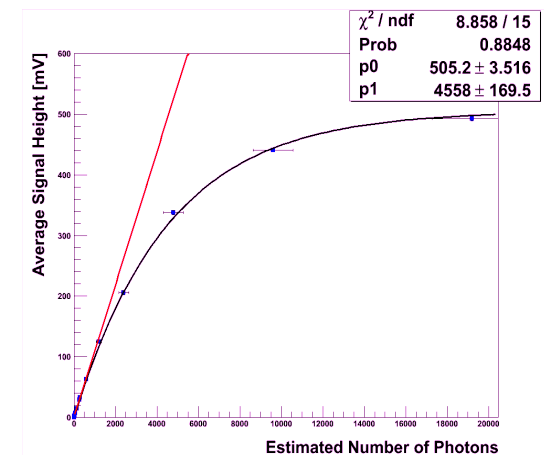
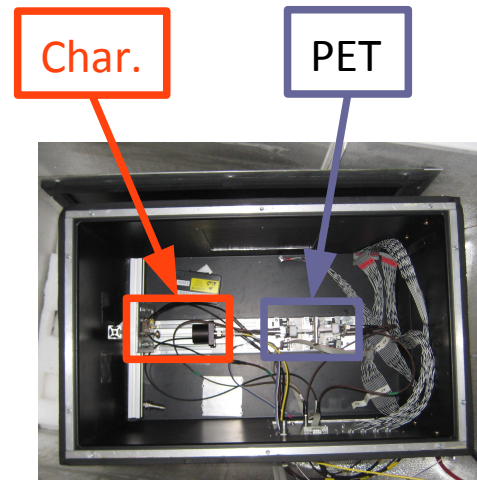
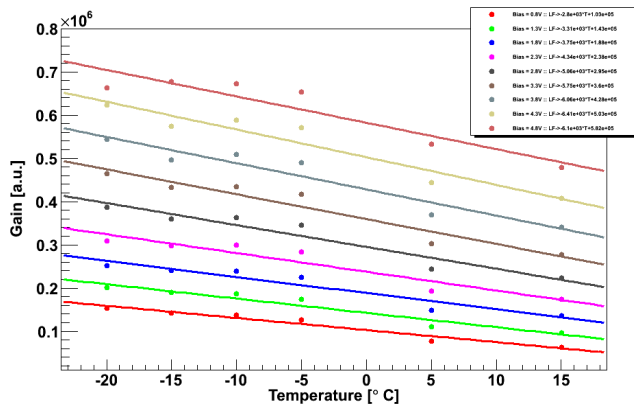
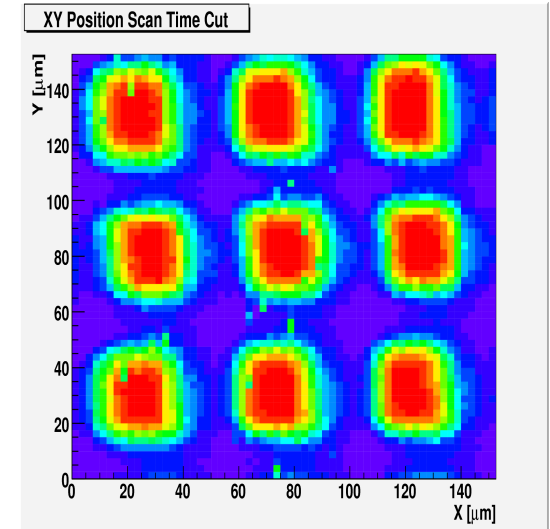
- ARICH Counter → Aerogel + MCP-PMT ← Work in progress:

- Participation to beam test of Photonis MCP-PMTs @ KEK
- Next beam test scheduled for later this year

Progress:

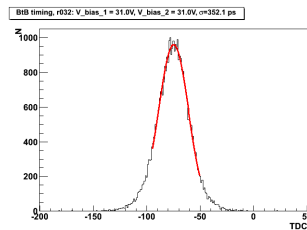
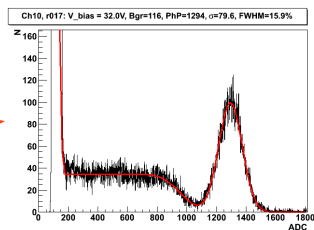
SiPM Properties (laser setup)

- Position Scans \rightarrow active area, uniformity, geometrical efficiency
- Dynamic range \rightarrow linearity
- Intrinsic timing resolution
- Gain vs Temperature (-20 C \rightarrow 15 C)



Progress:

Simple ToF PET Module

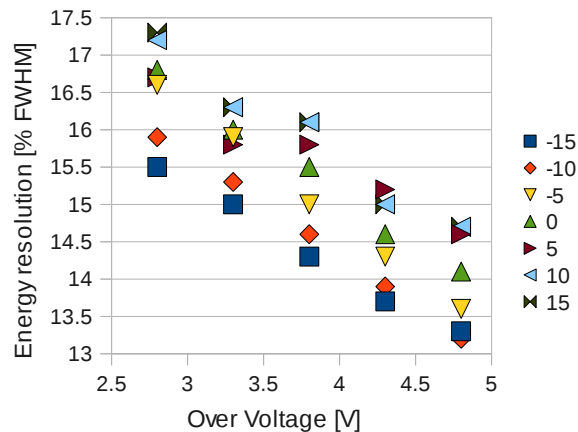


- Temperature dependence:

Energy Resolution

BtB Timing Resolution

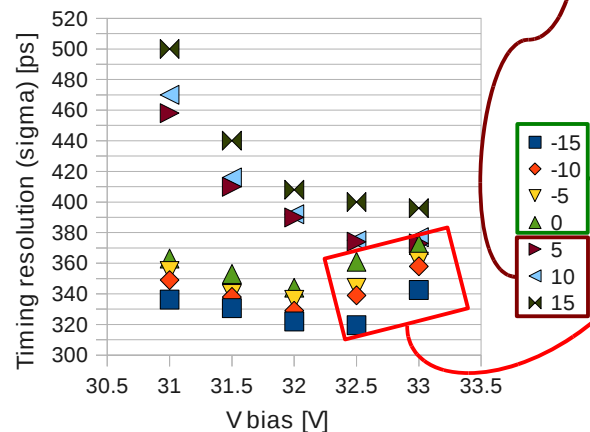
~ 13 - 17%



• Threshold ~ 150mV
 • At higher V_{bias} noise triggers too much and **degrades time res.**

Threshold ~300mV

~ 320 ps



Impact:



- Personal:
 - _ Learning new skills (detectors, electronics, DAQ)
 - _ Project management
 - _ Student supervision
- Science:
 - _ Time-of-Flight PET using Silicon Photomultipliers
 - _ Beam test participation @ KEK (ARICH module with HAPD/MCP-PMT)
 - _ Participation to AXPET testing campaign (**MC-PAD exchange**)
- Institute:
 - _ Student work (thesis, summer job)
 - _ Representation @ conferences
- Collaborations:
 - _ STMicroelectronics (SiPM prototypes)
 - _ Belle 2 detector upgrade: ARICH prototype module
 - _ Future → PET scanner manufacturer?

Overview - Training



- Courses, training events, exchange, ... :
 - _ Euroforum School of Instrumentation @ CERN (May 09)
 - _ Basic Slovene course (May 09 → Jun 09)
 - _ 1st MC-PAD training event @ Krakow (Sep 09)
 - _ Quantum Field Theory course (Sep 09 → Jan 10)
 - _ Experimental Particle Physics course (Sep 09 → Apr 10)
 - _ Beam test @ KEK: ARICH counters using HAPD & MCP-PMT (Nov 09)
 - _ XI ICFA 2010 Summer School @ Bariloche (Jan 10)
 - _ Theory of Particle Physics course (Feb 10 → Jun 10)
 - _ AXPET testing campaign @ CERN (15 Jul → 31 Jul 10) (MC-PAD exchange)
- Student labwork supervision:
 - _ Waveform analysis (Oct 09 → Mar 10)
 - _ SiPM basic properties (Aug 10 → Sep 10)
- Outreach activities:
 - _ 2 Open Days of Jozef Stefan Institute (Mar 09, Mar 10)

Overview - Results



- Publications

- Main author: Article published in NIM A on 6th of July: *Performance study of Silicon Photomultipliers as photon detectors for PET*
- Co-author: Articles on ARICH counter for Belle 2 detector upgrade
- PhD topic proposal: *Development of a PET module using Silicon Photomultipliers as Photon Detectors.*

- Presentations

- Posters:
 - 12th Vienna Conference of Instrumentation
 - Euroforum School of Instrumentation
 - MC-PAD training events
- Monthly overview presentations during the weekly group meetings
- PhD Topic defense