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INTERNATIONAL PHD PROJECTS IN APPLIED NUCLEAR PHYSICS AND INNOVATIVE TECHNOLOGIES

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Data Acquisition System for Straw Tube Detector in Cracow

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Plan

1. Test setup
2. Hardware
   1. CARIOCA
   2. TRBv2
   3. HUBv2
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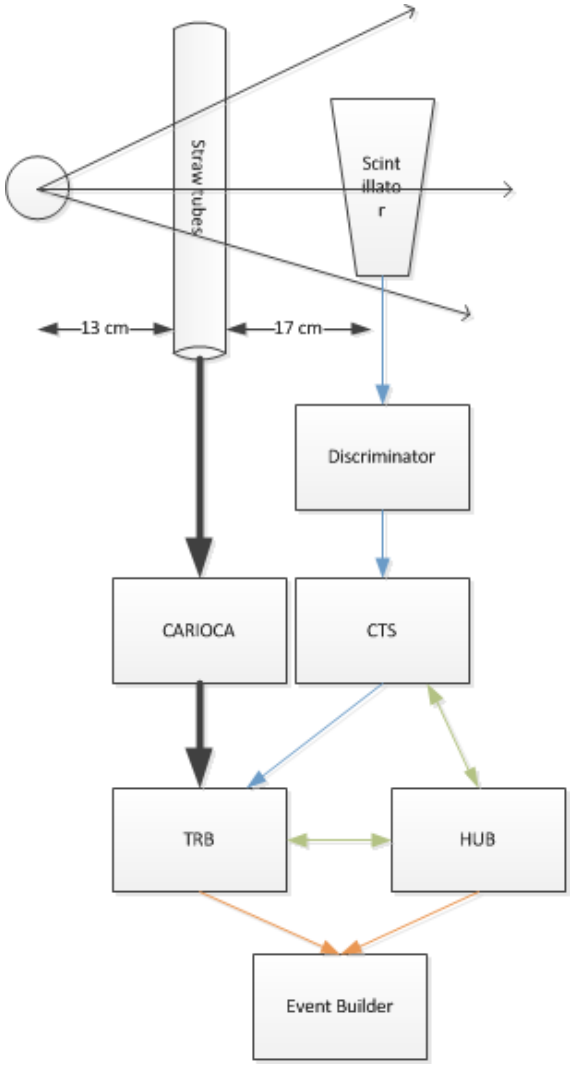
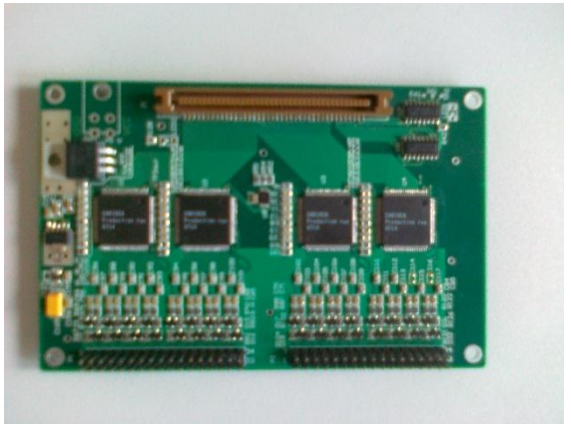
Test Setup

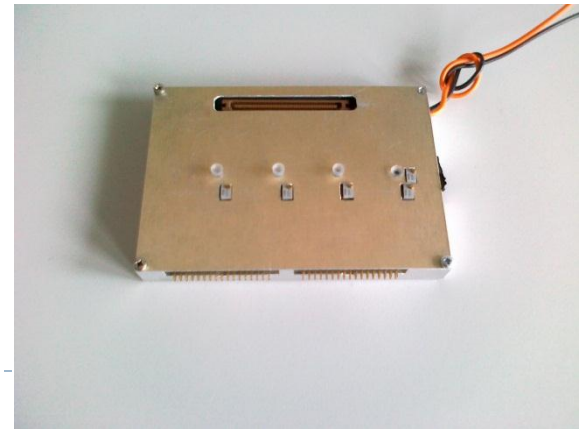
- Triggering done by scintillator
- NIM modules as discriminator
- Trigger control by CTS
- CARIOCA as Straws Front-End
- Time measurement by HPTDC on TRB
- Trigger rate 145kHz
- Uplink bandwidth 50 MBps
- Reference time, TrbNet, Gigabit Ethernet
- Lightweight unpacker



Hardware - CARIOCA

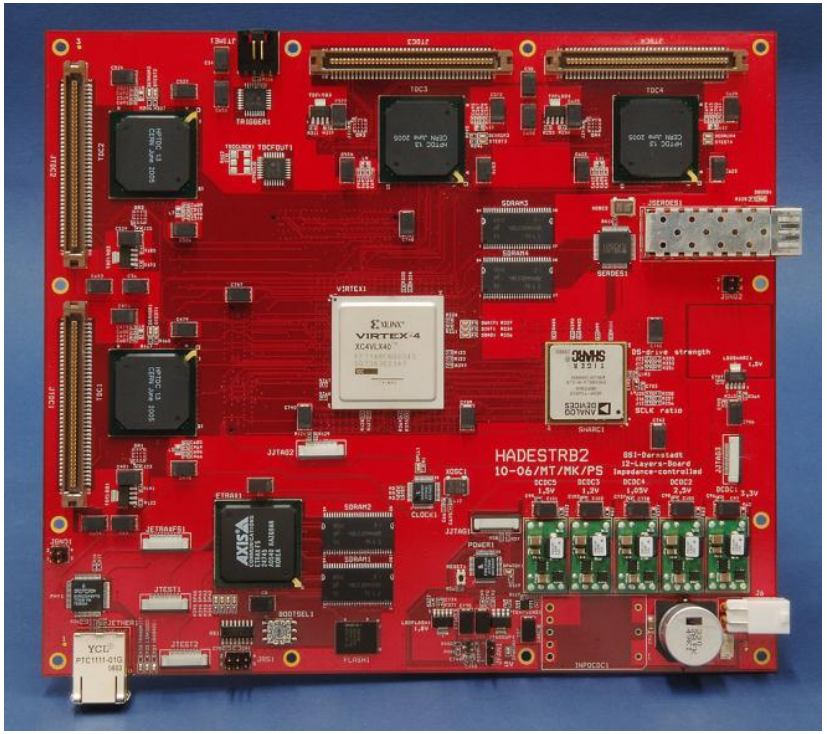
- CARIOCA
  - Amplifier, shaper, baseline restorer, discriminator
  - LVDS outputs
- CARIOCA Board 1
  - 4x 8 channel CARIOCA
  - Manually adjustable thresholds per device
- CARIOCA Board 2
  - 4x 8 channel CARIOCA
  - Remote thresholds adjustment per device
  - Different input plugs to reduce crosstalk





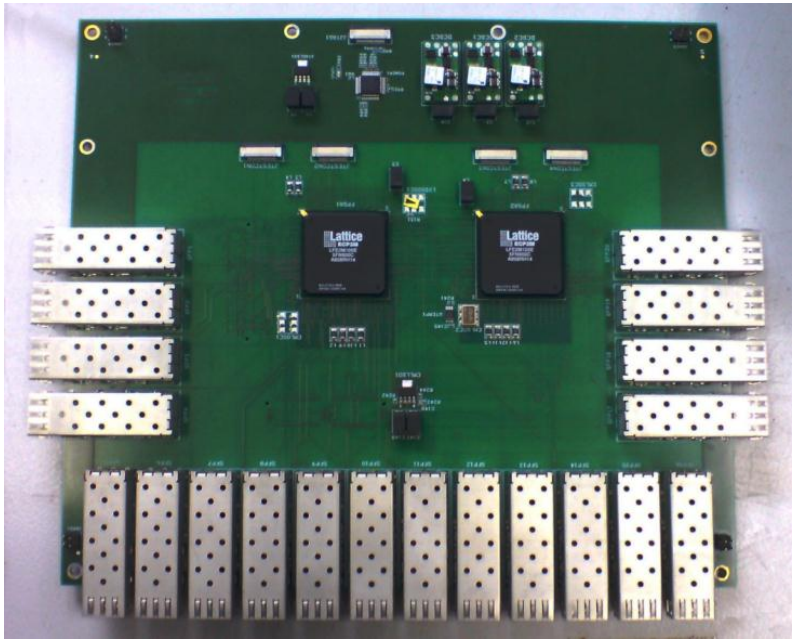
Hardware – TRBv2

- 4x HPTDC
  - 32 channels each
  - Up to 17ps resolution
- 1x Xilinx Virtex4 FPGA
- 1x ETRAX
- 1x 2Gbps Optical link
- 1x RJ45
- 1x Addon connector
- 1x Reference time input



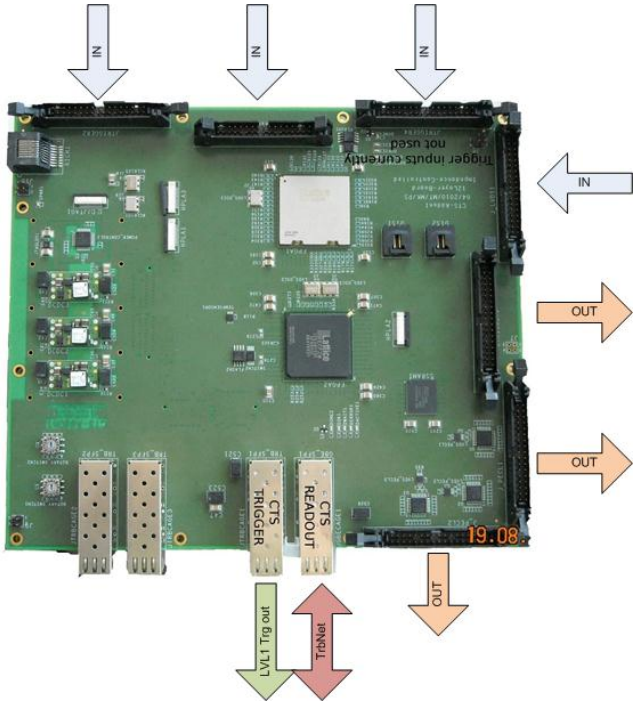
Hardware – HUBv2

- 2x Lattice ECP2M100 FPGA
- 20x 2Gbps optical links
  - Multiprotocol
  - Current setup:
    - 1 Gigabit Ethernet
    - 1 TrbNet – Trigger channel
    - 1 TrbNet – Slow Control channel
    - 16 TrbNet - General



Hardware - CTS

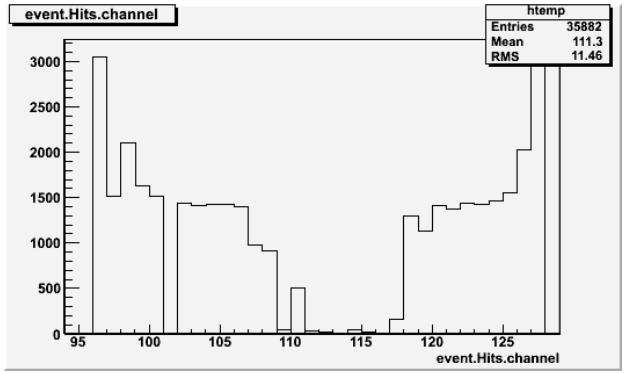
- 68 x LVDS trigger inputs
- 51 x LVDS trigger outputs
- 1 x RJ45 trigger output
- 1 x TrbNet Trigger output
- 1 x TrbNet general connection



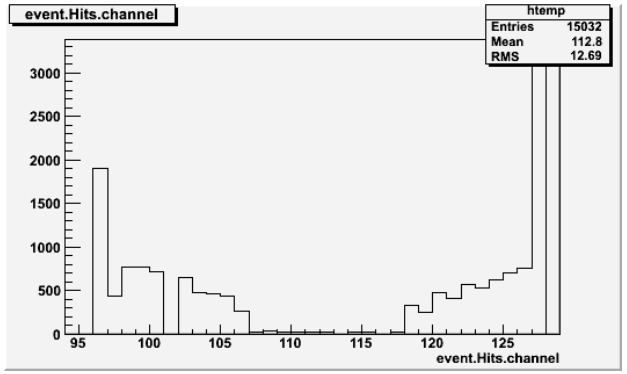
- 1x Lattice SCM – trigger logic
- 1x Lattice ECP2M50 – optical links control

Measurements - noise

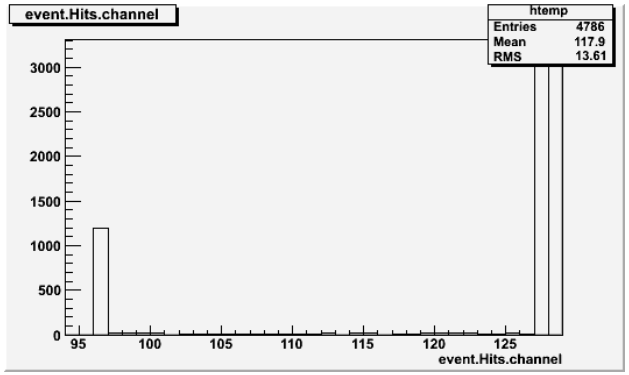
- Noise and thresholds adjustment - CARIOCA1



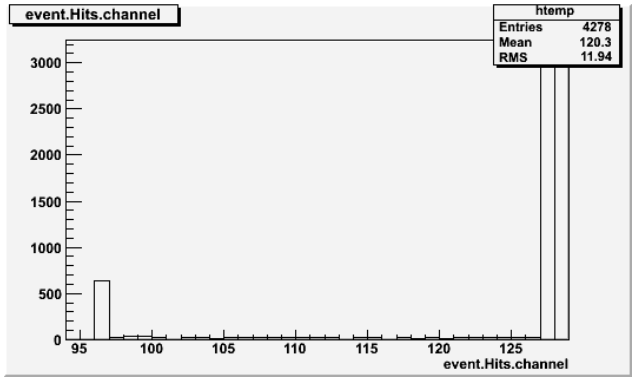
Threshold 1000



Threshold 1100



Threshold 1150

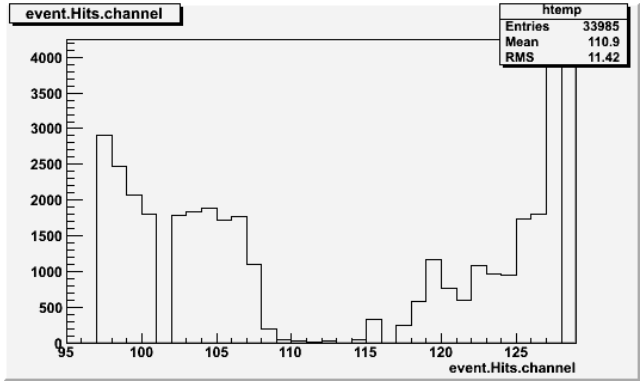


Threshold 1200

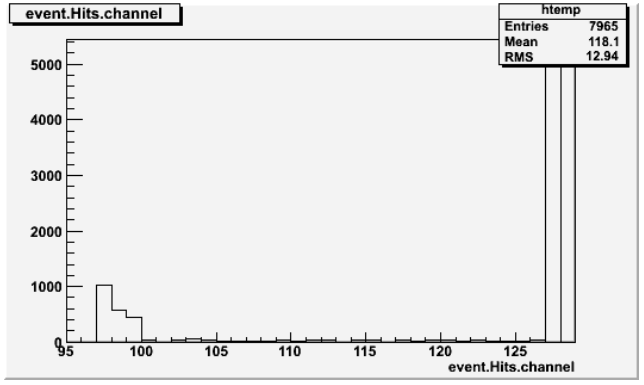
- CARIOCA devices on borders generate more noise
- CARIOCA board has to shielded
- Long cable between CARIOCA board and TRB has to be shielded
- Common grounding doesn't help

Measurements – noise

- Noise and threshold adjustment – CARIOCA 2

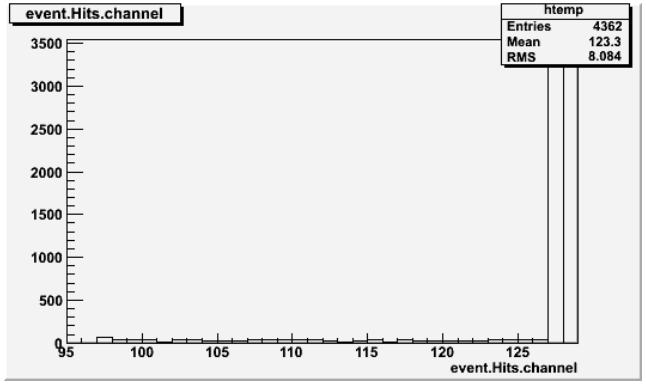


Threshold 900

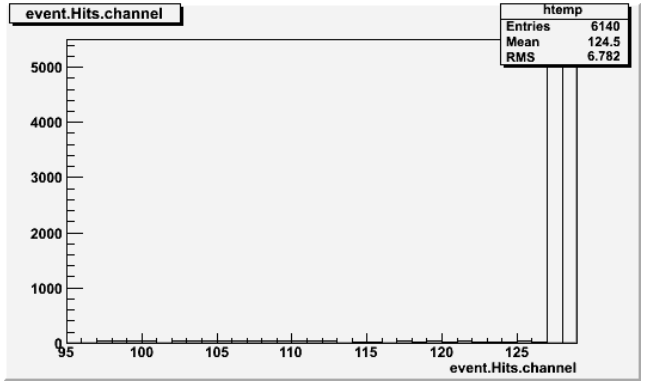


Threshold 1000

- Almost the same behaviour as for CARIOCA1



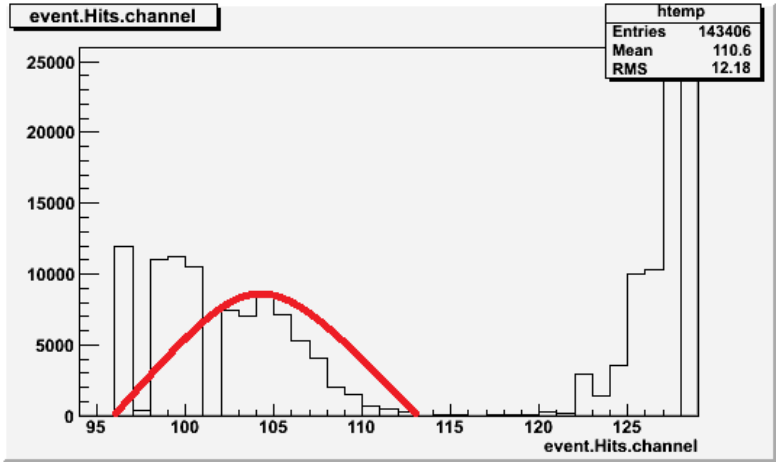
Threshold 1050



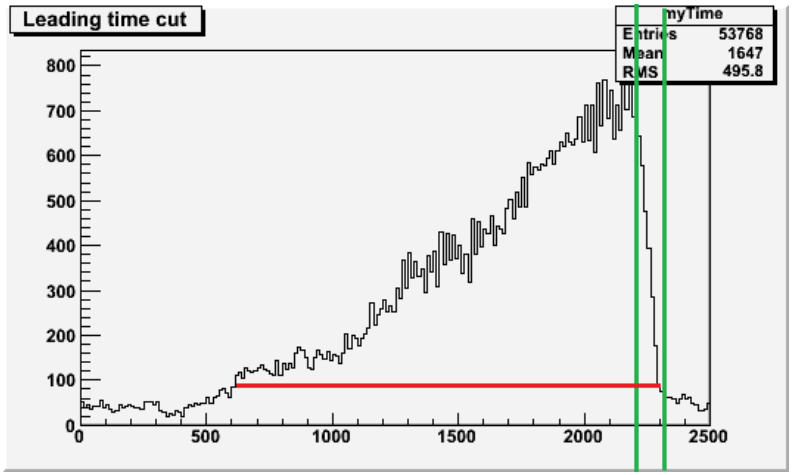
Threshold 1200

Measurements – channels and timing

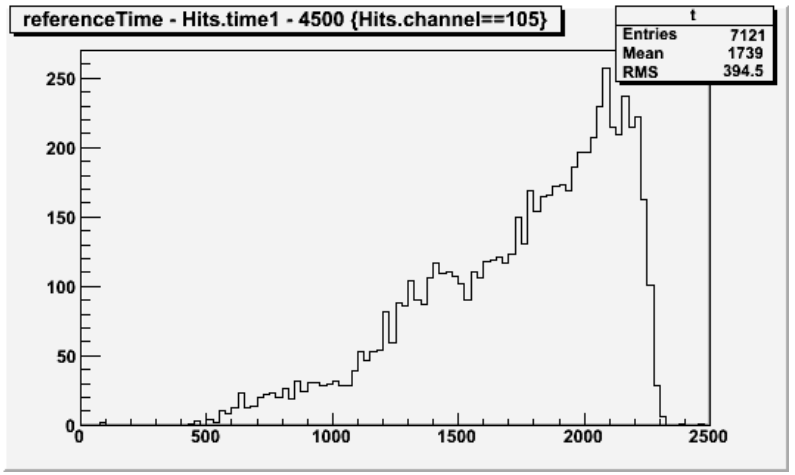
- Risetime: ~10ns
- Maximum drift time: 180ns



Hits on channels



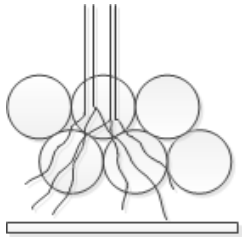
Leading time for all channels

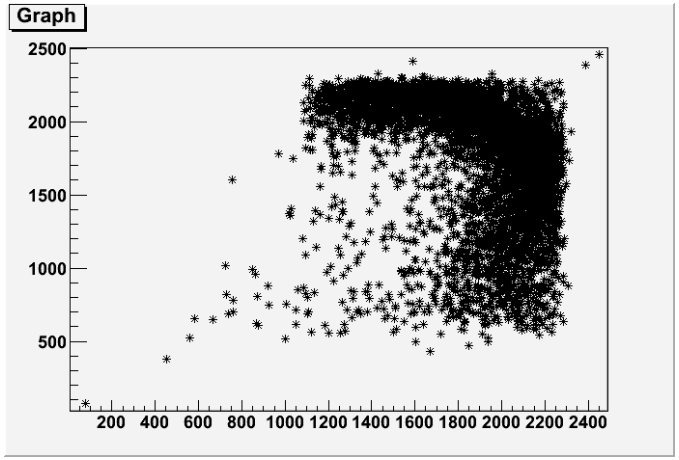


Leading time for channel 105

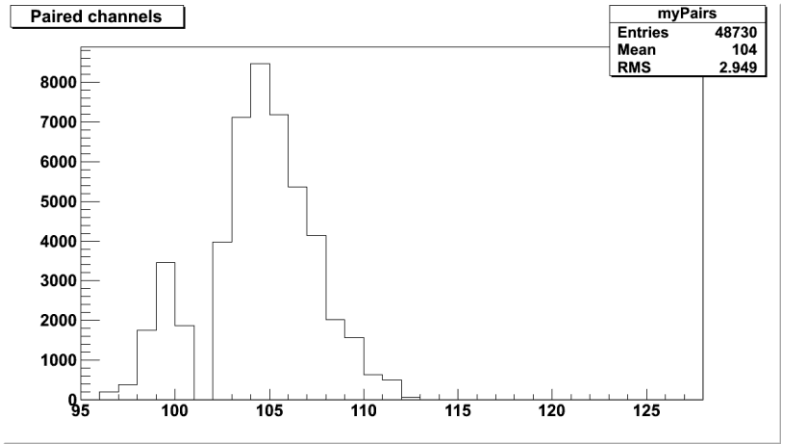
Measurements - tracks

- Selection of channels with hits on neighbours
- Low-energetic electrons disperse in gas

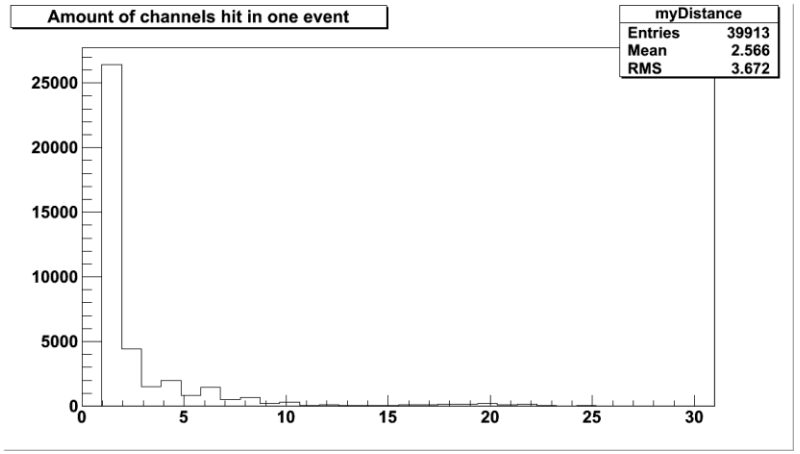




T1 and T2 for channel 105



Channels with neighbours hits



Common hits on all channels (distance between channels)

Summary and plans

- Very sensitive setup – a lot of effort on shielding needed
- Correct CARIOCA 2 problems
- Migrate to Marek Idziks' ASIC chip

Backup