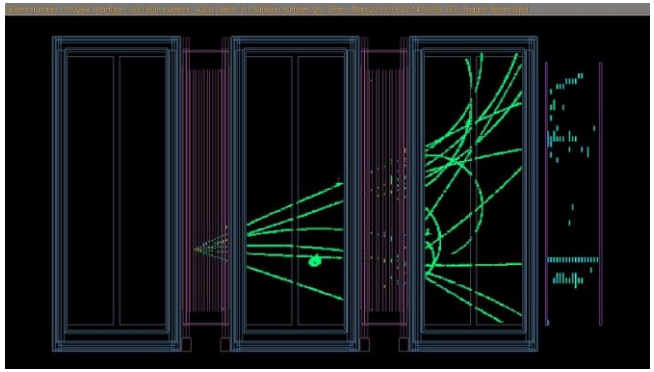
Warsaw University of Technology



WUT contribution to T2K upgrade

Andrzej Rychter

Warsaw University of Technology

2nd Workshop on Neutrino Near Detectors based on gas TPCs

Work packages and schedule

Updated WP

- WP1 Mechanical design and integration (Marcela, Davide)
- WP2 TPC field cage and gas vessel (Gabriella, Emilio)
- WP3 TPC Readout technology (Saclay, CERN?)
- WP4 TPC electronics and DAQ (D. Calvet, Andrej Richter)
- WP5 Scintillator-based trackers (Japan+LLR)
- WP6 TOF system (Yury)
- WP7 Gas system and calibration (Blair)
- WP8 Test beam measurements (Federico, Stefania)
- WP9 High Pressure TPC (Asher, Morgan ...)
- WP9 Simulation and optimization studies (Davide)
- WP10 Physics studies (Sara, Claudio, Kevin)
- WP11 DAQ (G. Barr)
- WP12 Software(Y. Uchida)

Project schedule

The overall schedule that we are considering is the following:

1. 2017 Finalization of the design, followed by a Technical Design Report. In 2017, we also plan to form the collaboration for the ND280 upgraded construction and to submit the proposal to SPSC and funding agencies.
2. 2018-2019 Construction of the new TPCs and active targets.
3. 2020 Shipment of the detectors to Japan, installation and commissioning.

WUT responsibilities in ND280 upgrade:

New HTPC detectors

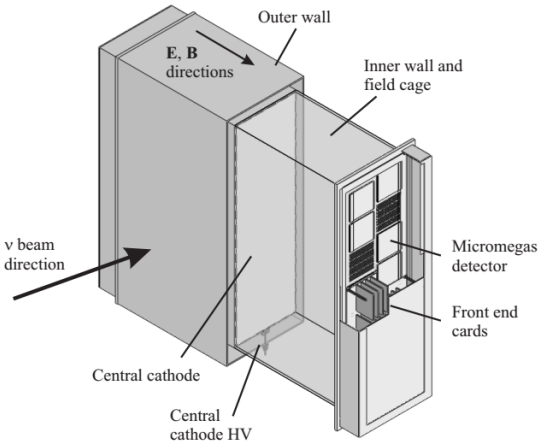
Tests and QA of Micromegas Modules

Tests of FrontEnd electronics

TPC detectors and MicroMegas Modules

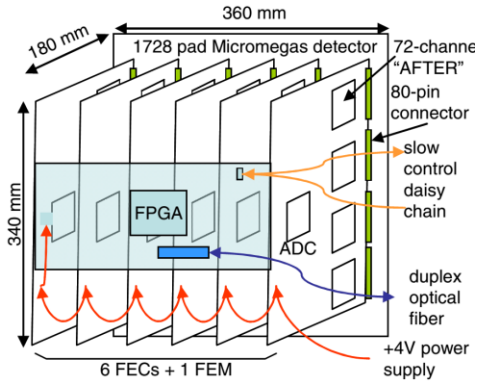
Current ND280

- 3 TPC chambers × 24 MicroMegas modules
- 72 modules × 1726 pads = 124 416 channels
- 50 MHz SCA (AFTER) + 20 MHz/12 bits ADC
- Total data bandwidth 144 Gbps (FEM->DCC)



Upgraded detector:

- 2 or 4 new horizontal TPC detectors
- Approx. 50-100 new MicroMegas modules
- FEC and FEM cards



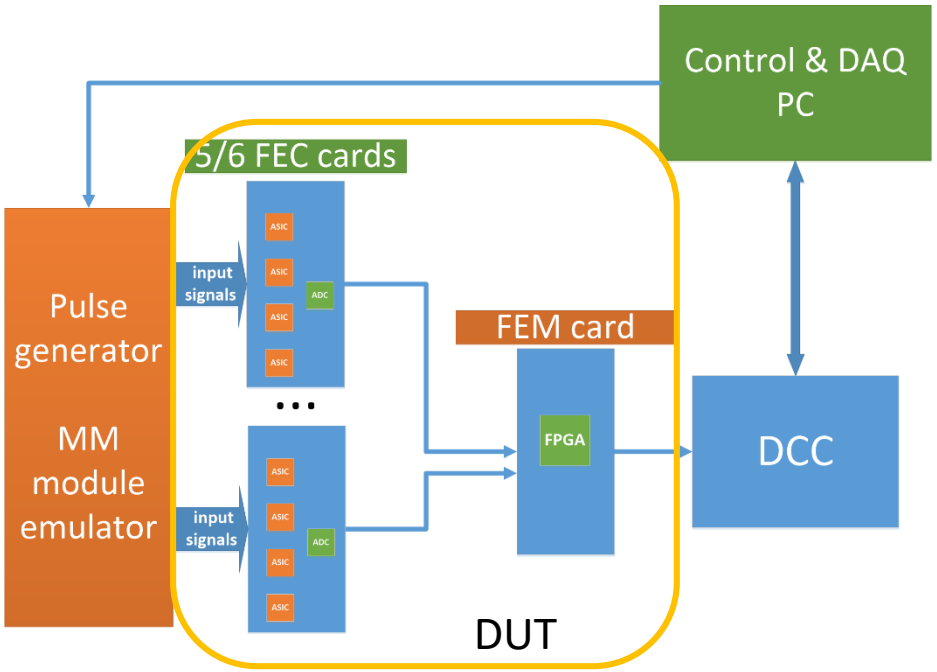
MM modules and FrontEnd electronics have to be tested!

Tests of FrontEnd electronics

What should be tested?

- FrontEnd electronics:
  - All channels working OK?
  - Noise amplitude (ENC),
  - Shaping and ADC check with a test signal,
  - Gain and peaking time maps.
- FrontEnd card + FEM:
  - Summing of events from 5-6 FEC,
  - Pedestal subtraction and zero suppression,
  - Throughput test.

Proposed test system



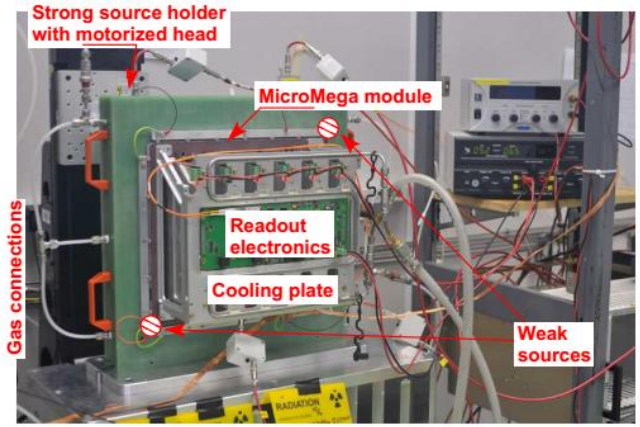
TestBench for MicroMegas

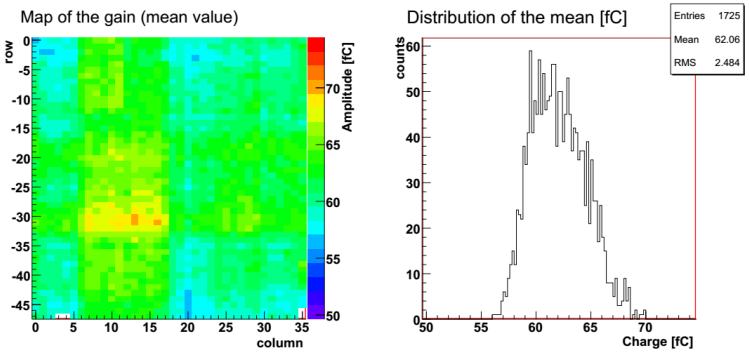
Main goal of the tests is to measure and verify:

- quality (find dead pads),
- mapping for all resistive MicroMegas modules of:
  - signal amplitude/gain
  - energy resolution.
- Assess spread of the signal – verify spatial resolution.

Need to scan the active surface with a strong radioactive source.

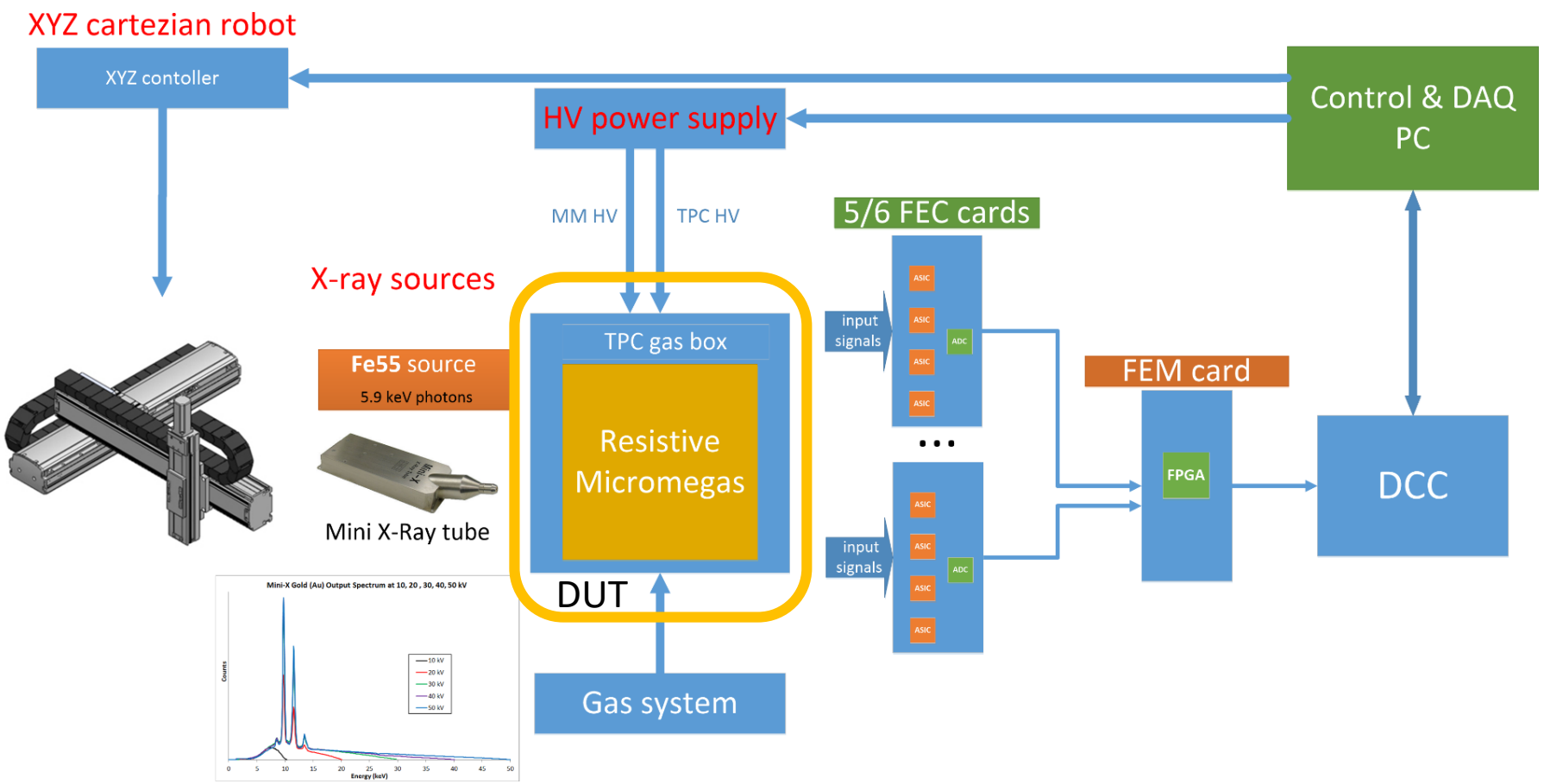
TestBench from 2008





A. Ferrero T2K Test Bench results on uniformity and reproducibility of Micromegas production

MicroMegas Test Bench



MicroMegas Test Bench

Measurement plan:

- Build fully automatic test bench with motorized XYZ robot for scanning of MM modules,
- Initial tests in Warsaw,
- Transport of test bench to CERN,
- Perform two independent scans of every MM module
  - with Fe55 source for energy resolution,
  - with mini X-ray tube for gain distribution (possible higher spatial resolution scan ~10mm),
- Measurements of a charge distribution with resolution of ~100µm in desired regions.

Schedule

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WUT schedule:

Tests of Front-end electronics:

2017 - 2018 - design of FrontEnd test bench

2018 – tests of all PCBs in Warsaw

QA of MicroMegas Modules

2017 - 2018 - design of MicroMegas test bench.

2019 - 2020 – transport of MM test bench and tests in CERN.