Projects of the Electronics Division

Project Review 2006

Outlook

- Projects in 2006
- Status of Selected Projects
  - H1 Jet-Trigger
  - MAGIC-I Multiplexer / FADC
  - MAGIC-II Camera
  - MDT
  - HEC-II

Projects in 2006

- Main Projects
  - H1 Jet-Trigger at DESY (EE)
  - HEC Hadronic Endcap Calorimeter (EA, EE)
  - MAGIC-I Air Cherenkov Telescope Camera (EP)
  - MAGIC-II Air Cherenkov Telescope Camera (EA, EE, EP)
  - MDT Muon Drift Tube Chambers (EA)

- Additional Projects
  - Cresst (EP)
  - Gerda (EE, EP)
  - Muon Cooling (EP)
  - SCT (EA)
  - Support for the Semiconductor Laboratory (EP)

- New Projects (started in late 2006)
  - HEC-II HEC Electronics Upgrade for the SLHC (EE)
  - MDT-II MDT Electronics Upgrade for the SLHC (EE)

Group Naming

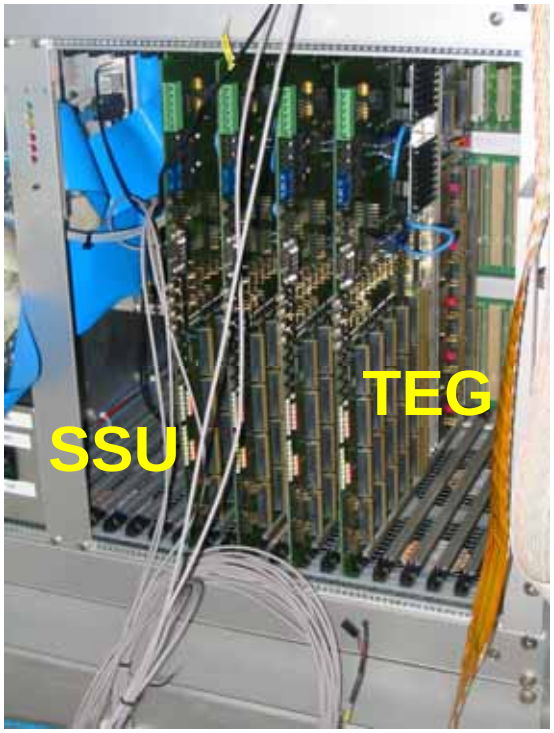
EA: Elektroanlagen

EE: Elektronik Entwicklung

EP: Elektronikproduktion

Work on the H1 Jet-Trigger has finished!

• First L3 test triggers using Jet-Trigger	June 06
• ACS installation completed, covers full θ	July 06
• TEG debugged	Oct 06
• H1 green light - activation JET-Trigger at L1/L3	Dec 06



MAGIC-I Multiplexer/ FADC

- Test of the whole System in the Lab (January - March)

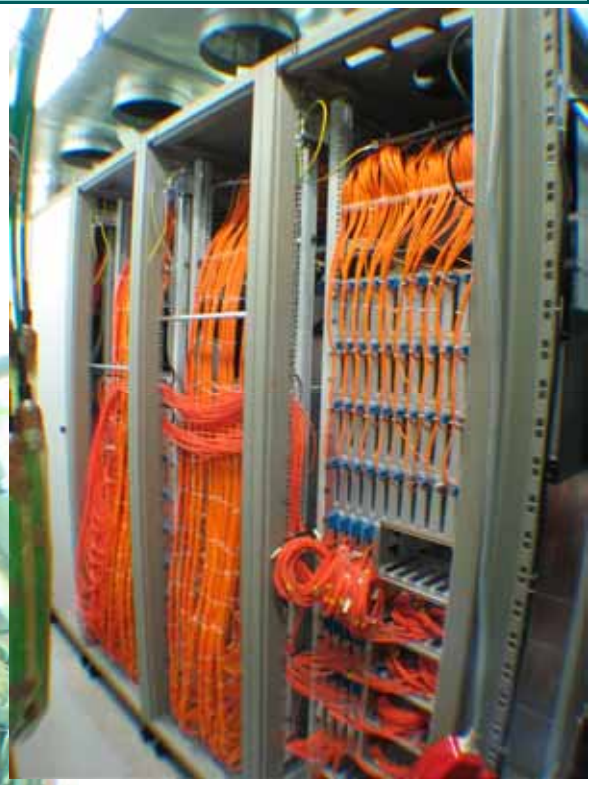
- Installation in La Palma in April 2006
  - all optical components & all multiplexer electronics and all internal cabelings
  - 325 trigger pixels connected to both (Siegen & MUX) FADCs
  - 4 (of 5) crates & 2 (of 10) Acqiris FADC boards

MAGIC-I Multiplexer/ FADC

Some Technical Data:

- 2 GHz sampling (0.5 ns per sample)
- 40 ns (80 samples) per pixel per sample
- 10-bit digit hardware sample converted to 16-bit value (2 bytes - linearization)
- 16 channels (pixels) per FADC
- 8 FADC channels (4+4) per crate

Front:

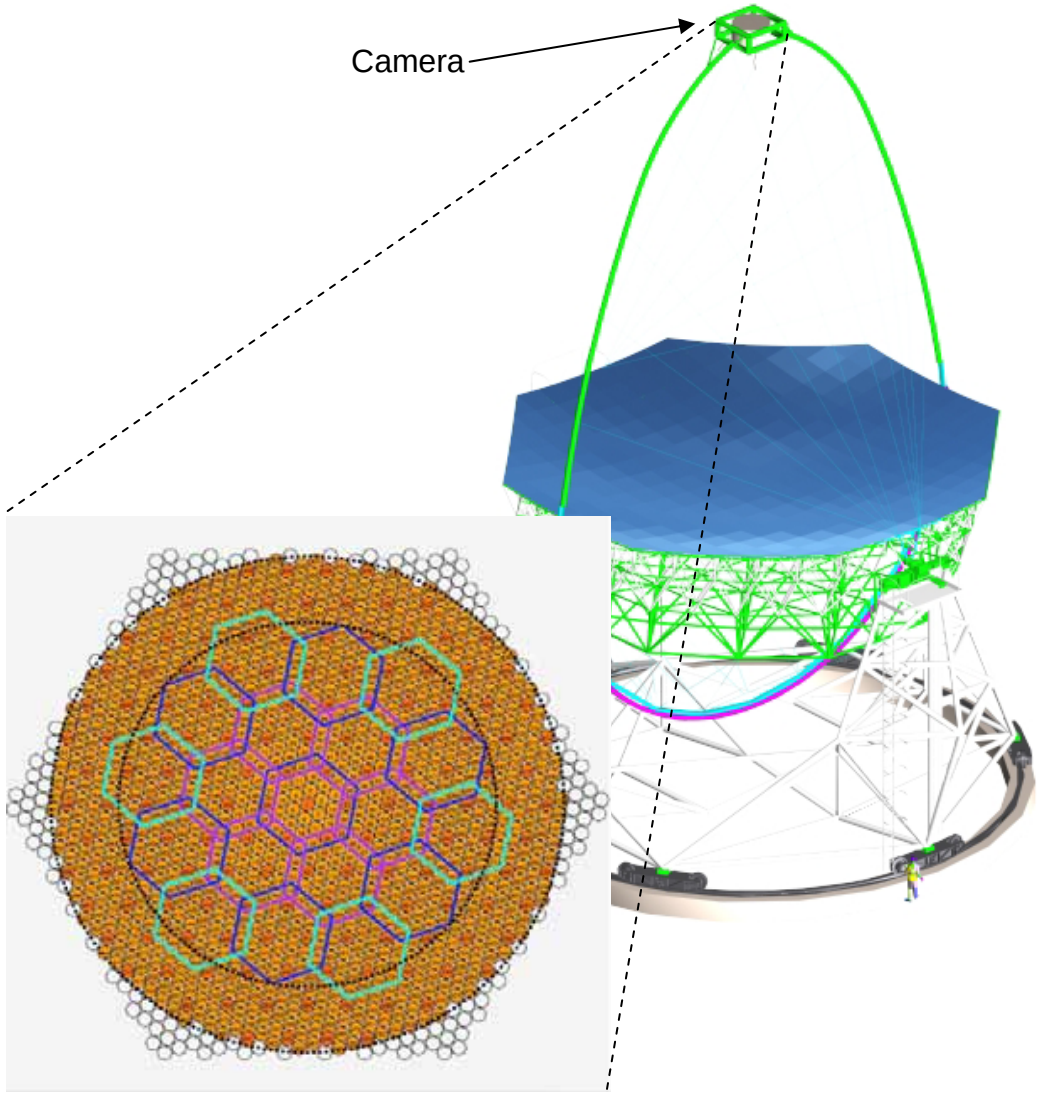


Backside

MAGIC-II Overview

Main Task:

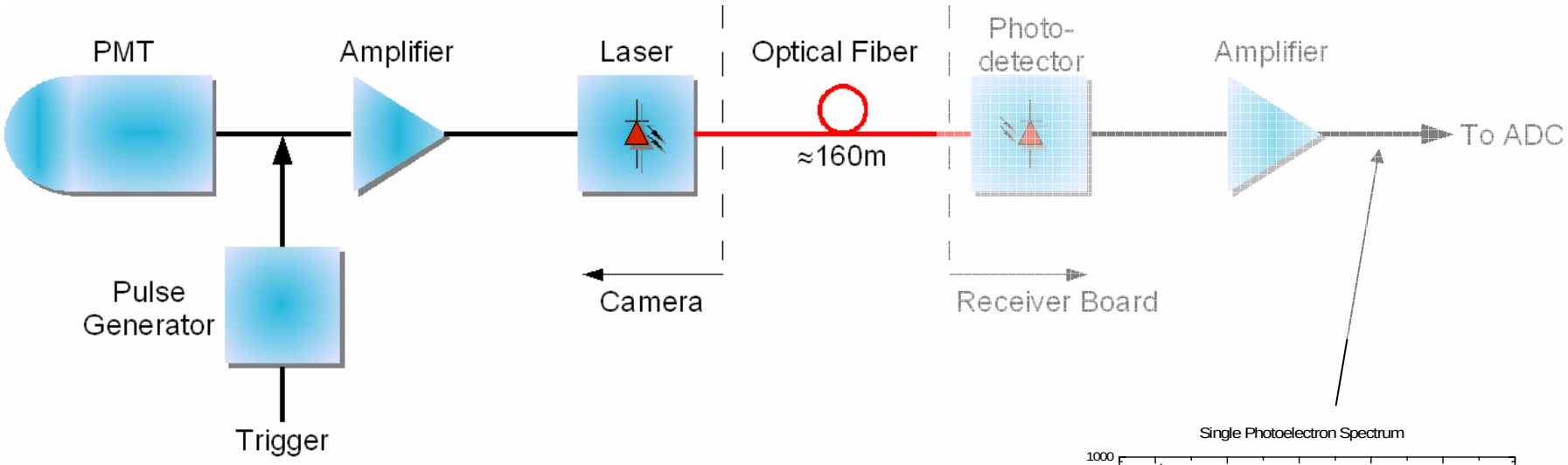
- Development of Camera Electronics
  - Signal Transmission System
  - Camera Control System
  - Test Signal Generation
  - Power Distribution

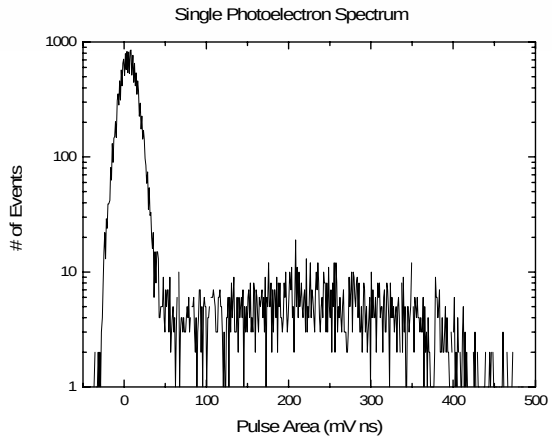


Camera:

- 1039 Pixels
  (Photomultipiers + Signal Transm.)
- 7 Pixels are grouped into a Cluster
- Each Cluster has its own Test Pulse Generation and Control System

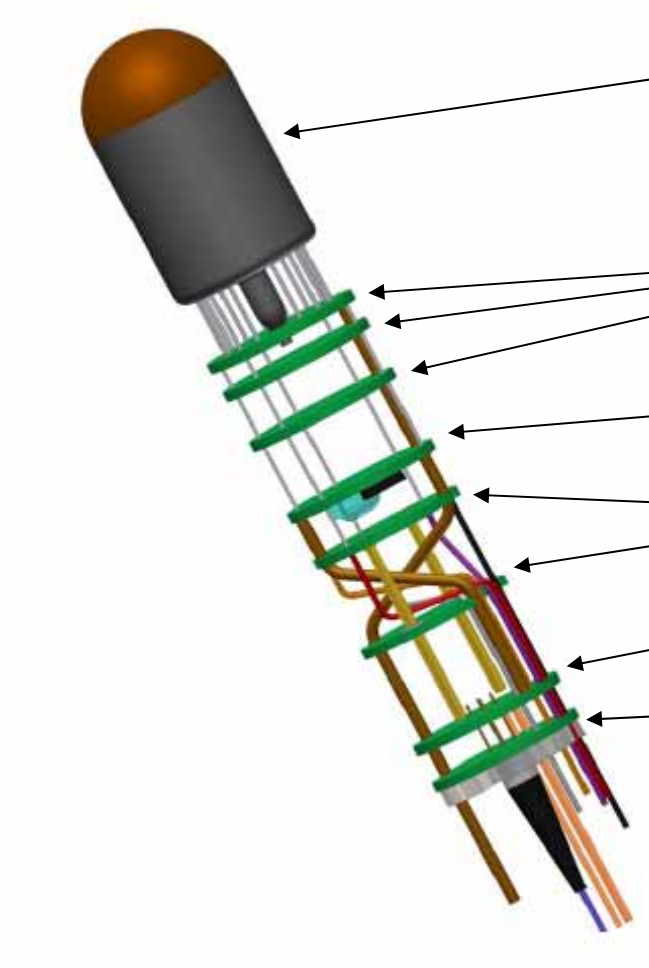
MAGIC-II Signal Transmission



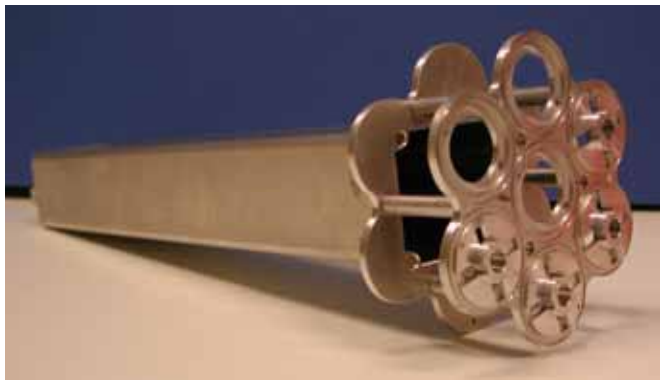


- High Dynamic Range: 60dB
- Low Noise for Single Photoelectron Resolution
- High Bandwidth for good Pulse Reconstruction
  (Possible better Hadron/Gamma Separation)
  Actual Bandwidth is approx. 2GHz

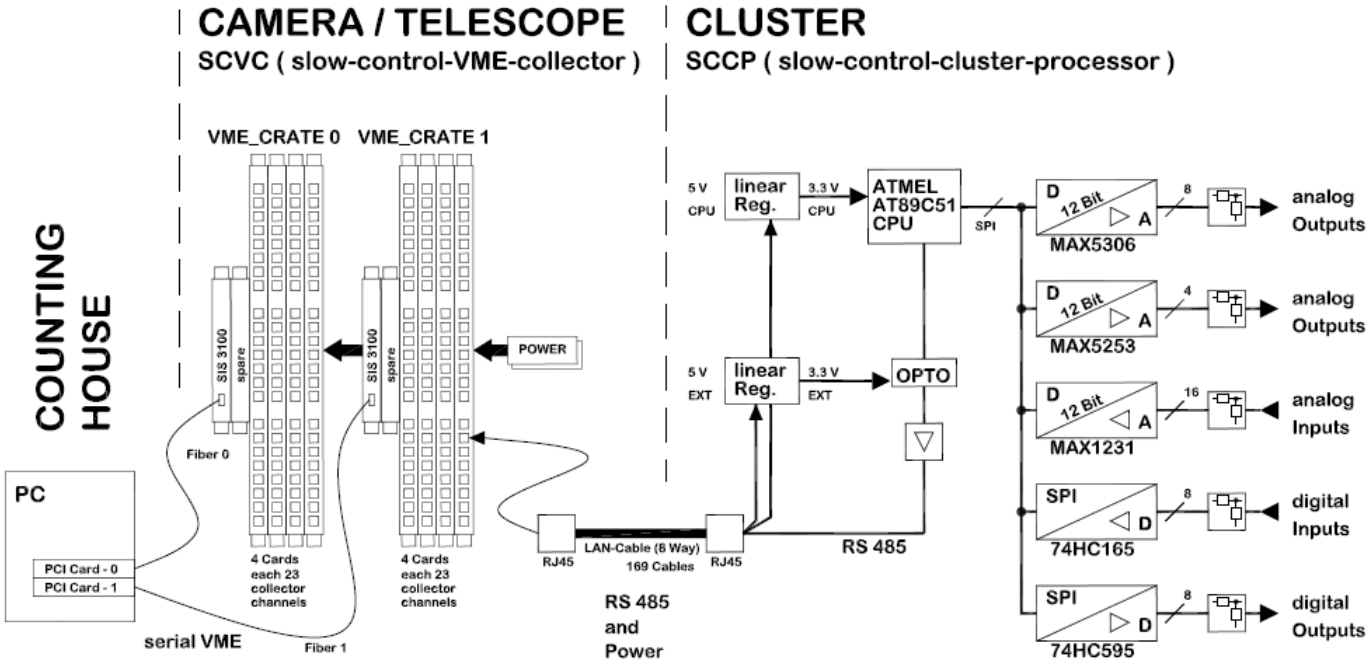
MAGIC-II Pixel Design



Cluster Dummy:



MAGIC-II Slow Control



Each Cluster has its own Microcontroller for

- High Voltage Setting
- Laser Bias Setting
- PMT Anode Current Measurement
- Temperature Measurement
- Test Pulse Control (Level Setting)

Muon Drift Tube Chambers (MDT)

- Electrical Installation of 88 Chambers
- 15 High Voltage Splitters and Cabeling
- 7 CanBus Power Supplies

This is not the Training for the next Mount Everest Expedition.

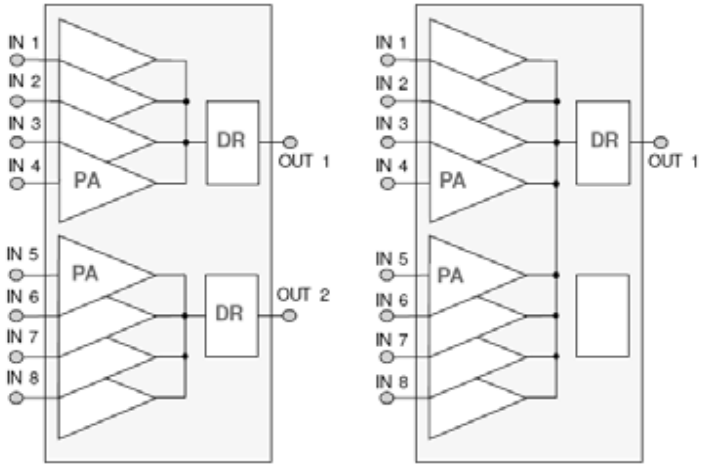
Upgrade of the Hadronic Endcap Calorimeter (HEC-II)

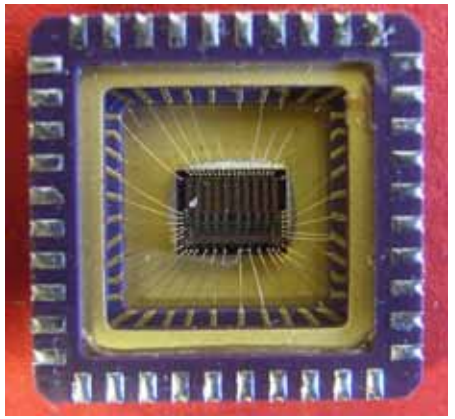
<u>New R&D-Project for 2007-2009</u>:

- SLHC luminosity upgrade leads to increased particle rates
  - -> Improved Amplifiers for the ATLAS-HEC (Factor 10 higher Radiation Hardness)
    - -> Reduced Structure Size in Amplifier Chips (e.g. 250nm or less)
    - -> Possible use of a different Technology (SiGe instead of GaAs)

Project has started with contact to three possible Technologie Partners:
Institute for Semiconductor Physics (Frankfurt/Oder), Triquint, Ommic

Block Scheme and Chip of the current HEC-Amplifier:



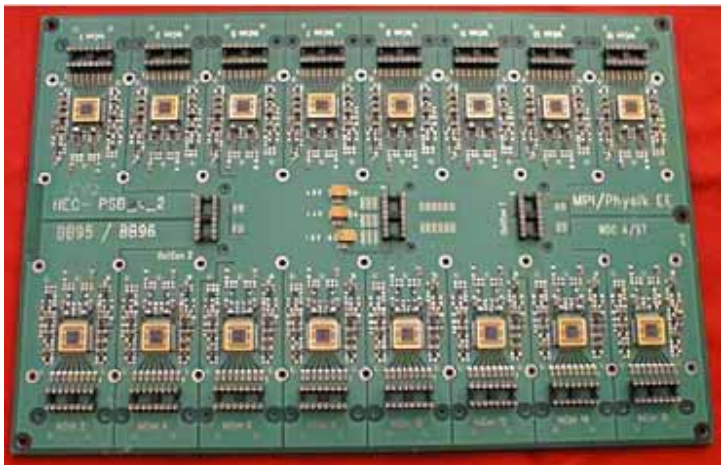


Upgrade of the Hadronic Endcap Calorimeter (HEC-II)

Some Specifications for the new Amplifier:

• Radiation Hardness	Neutrons $1.5 \cdot 10^{15}$
	Protons $2 \cdot 10^{12}$
	Gammas 50 kGy
• Power Consumption	<250mW/Chip
• Dynamic Range	10^4
• Input Impedance	$50 \pm 2\ \Omega$
• Gain Variation	< 2%
• Xtalk	< 2%

Currently used Board with 16 Amplifiers:



MAX-PLANCK-GESELLSCHAFT

Apprentices Project

20 Apprentices

- 12 in Electronics
- 8 in Mechanics

Common Project: Racing Car

Technical Data

- Mechanics are fabricated by automatic CNC-Machining
- Controlled by Microcontroller
- Way Recognition by Optical Sensors
- 7 Different Velocities
- Reverse and Forward Speed
- Flashing Signal for Left and Right Turns
- Operating Time about 2 Hours