Development and tests of a Smart-Pixel-Camera in the context of the H.E.S.S.-Project

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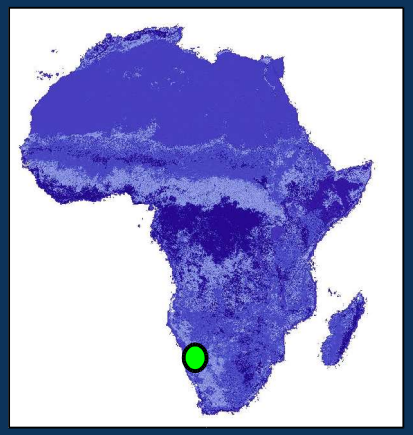
The H.E.S.S.-Project

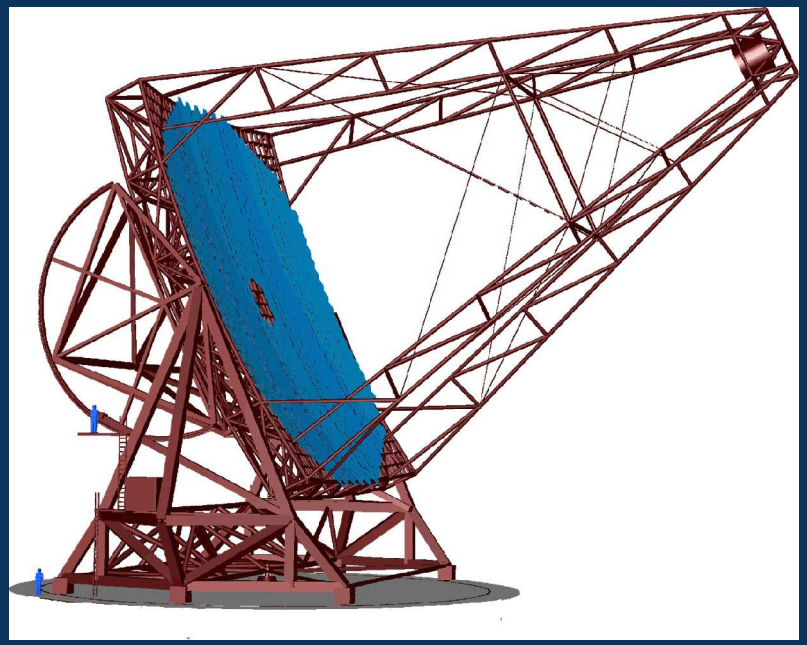


- H.E.S.S.: **H**igh **E**nergy **S**tereoscopic **S**ystem
- **Location**: Khomas Highlands, Namibia, at 1800m asl
- **Status**: since Dec 2003: 4 telescopes operational
  each with a mirror surface of 107m²
  arranged in a square with 120m side length
  Cameras: 960 pixel, field of view: 5°
- **Stereoscopy**: good angular resolution
  efficient background suppression
  energy resolution 10-20%
- **sensitivity** ~ 10mcrab, **energy threshold** ~ 100GeV

• **Future Plans**: buildup of another telescope in the centre of the system
with a mirror surface of 600m²
=> **threshold** ~ 50-70GeV (coincidence mode)

HESS 2004
960 Pixel
event rate: 500 Hz

=>



3000-4000 Pixel
event rate: 5 - 10kHz

www.mpi-hd.mpg.de/hfm/HESS/

Specifications for the Smart-Pixel-Camera

To ensure a high **readout rate**:

- Very short signals => trigger timing < 1 ns
- Short dead time
- Pixels should be linear within the range of 1 - 1600 photoelectrons
- Single photoelectrons should be resolvable

Layout:

- High number of pixels: modular design
- Monitoring functions
- Costs per pixel should be low
- Photodetectors should be exchangeable

Camera Layout

Data aquisition: **Smart Pixel**

→ **16** Smart Pixel form a Segment

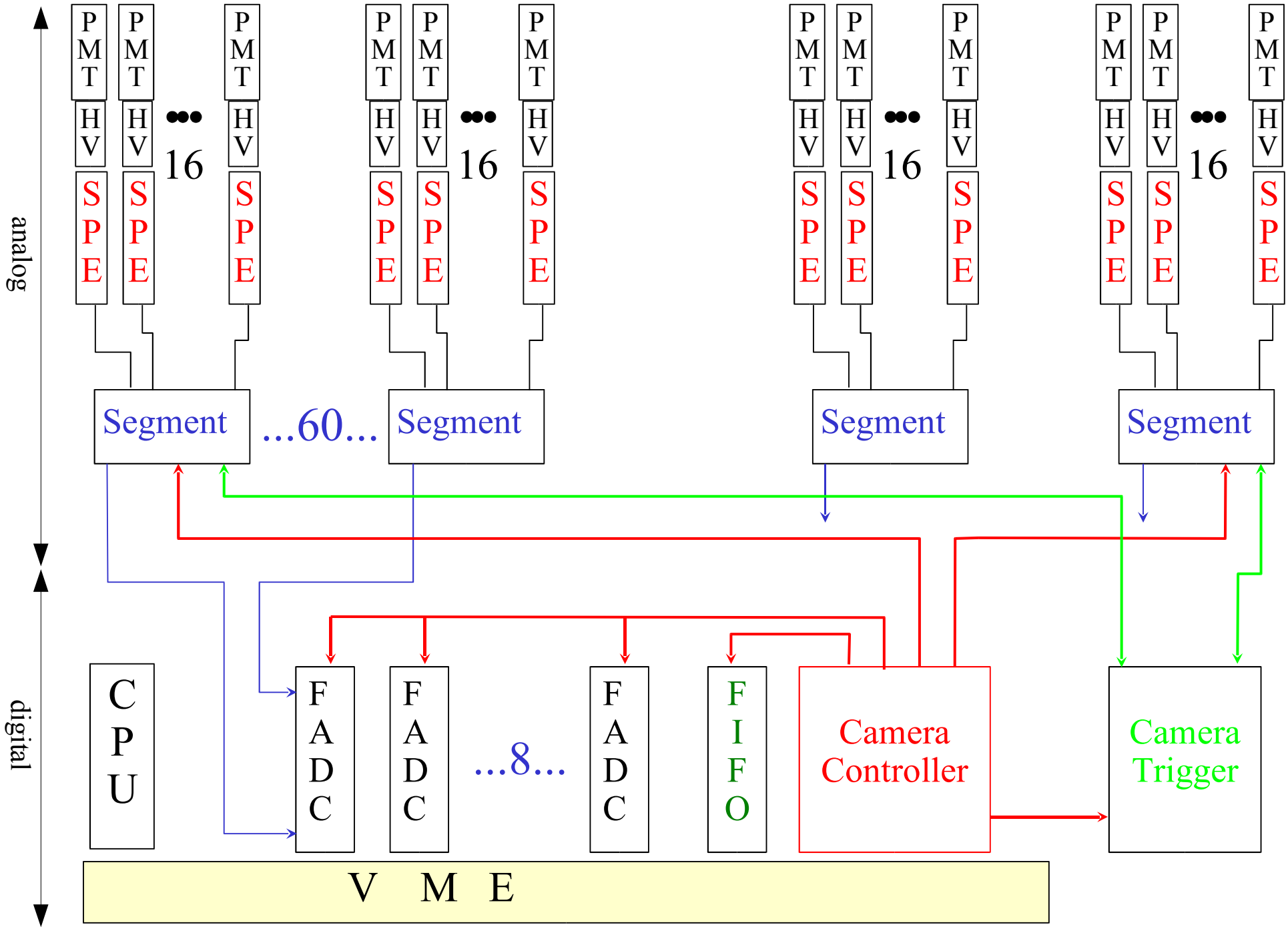
→ **60** Segments { **960** Pixel

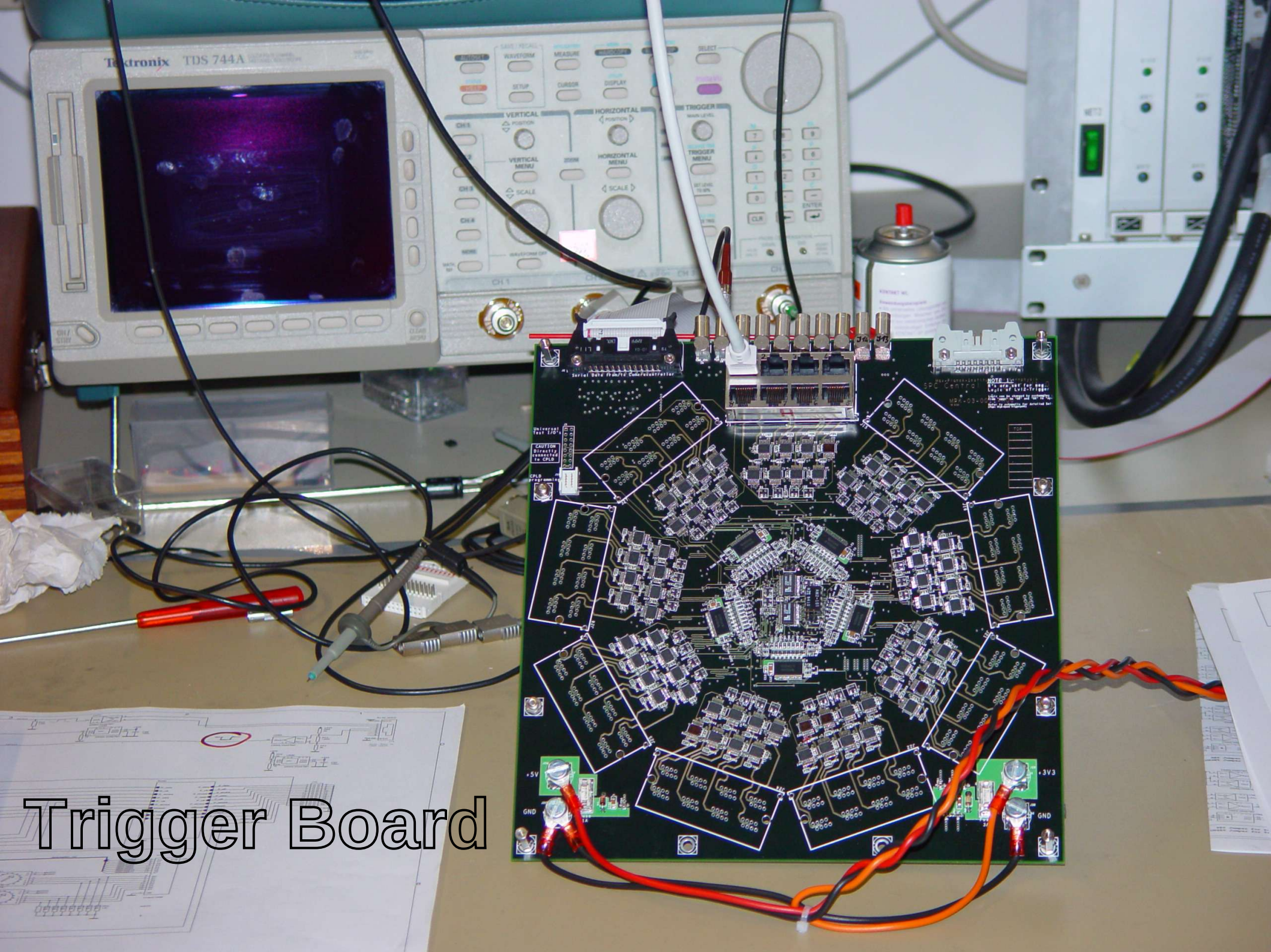
Smart Pixel consists of:

- **P**hoto**M**ultiplier
- **H**igh **V**oltage Supply
- **S**mart **P**ixel **E**lectronic

Smart **P**ixel **E**lectronic:

- Signal Integration
- Trigger
- Monitoring


analog
digital
PMT
HV
SPE
16
Segment
...60...
CPU
FADC
...8...
FIFO
Camera Controller
Camera Trigger
VME


Tektronix TDS 744A
Trigger Board

Conclusions and Outlook

Status: electronics operational, first tests successful

Further Aims:

- buildup of a new camera prototype
  - specification of the prototype
    - development of an analysis method for the new camera system

Tests for further specifications:

- runtime on the trigger board
- temperature dependance
- run the whole setup