Update on SciTil hardware development

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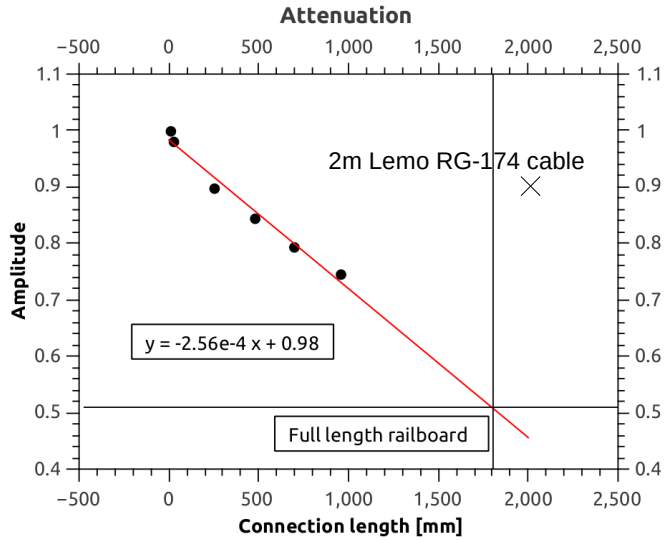
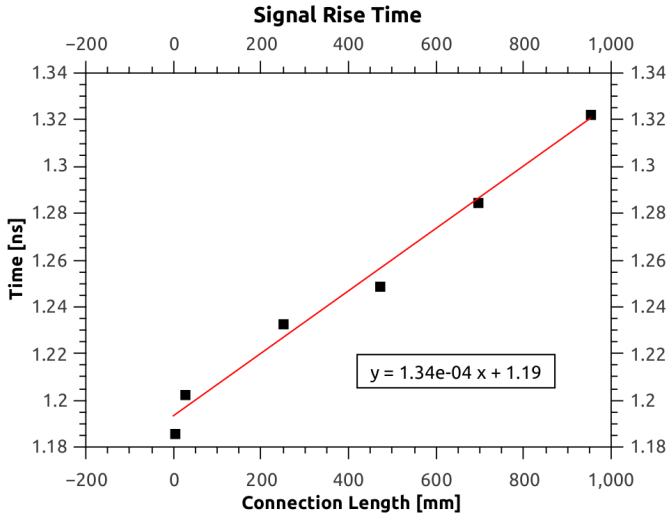
JUSTUS-LIEBIG-UNIVERSITÄT GIESSEN

Attenuation

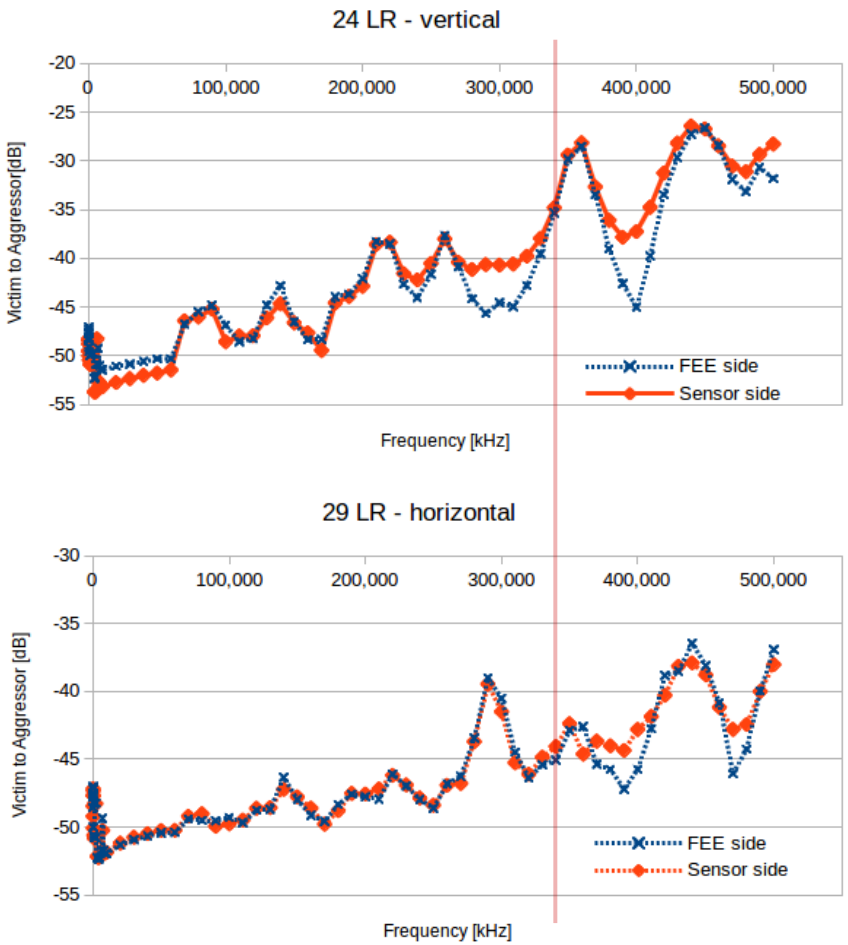
- **Attenuation measured with SiPM pulses**
  - **Extrapolated to full length board**
- **Linear loss of 26% of maximum amplitude per meter**
- **Rise time increases by 0.13 ns per meter**





Crosstalk

- **Using sinusoidal signal**
- **SiPM Signal risetime in order of 1 ns**
  - **> corresponds to 350 MHz**
  - **Approx. 2.5% crosstalk level**
- **Crosstalk level higher for vertical neighbours**
- **With a real signal crosstalk only appears with >1V amplitudes (above expectation)**
  - **At a approx. -53 dB (0.2 %) level for 1.5 V**



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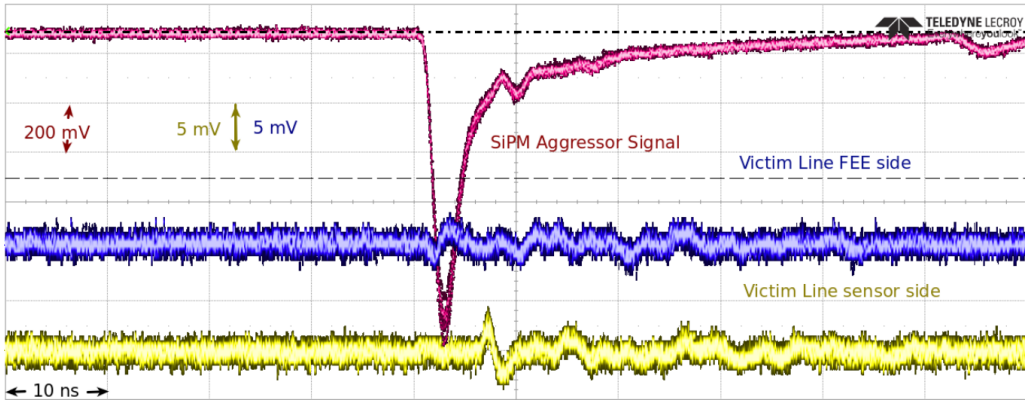
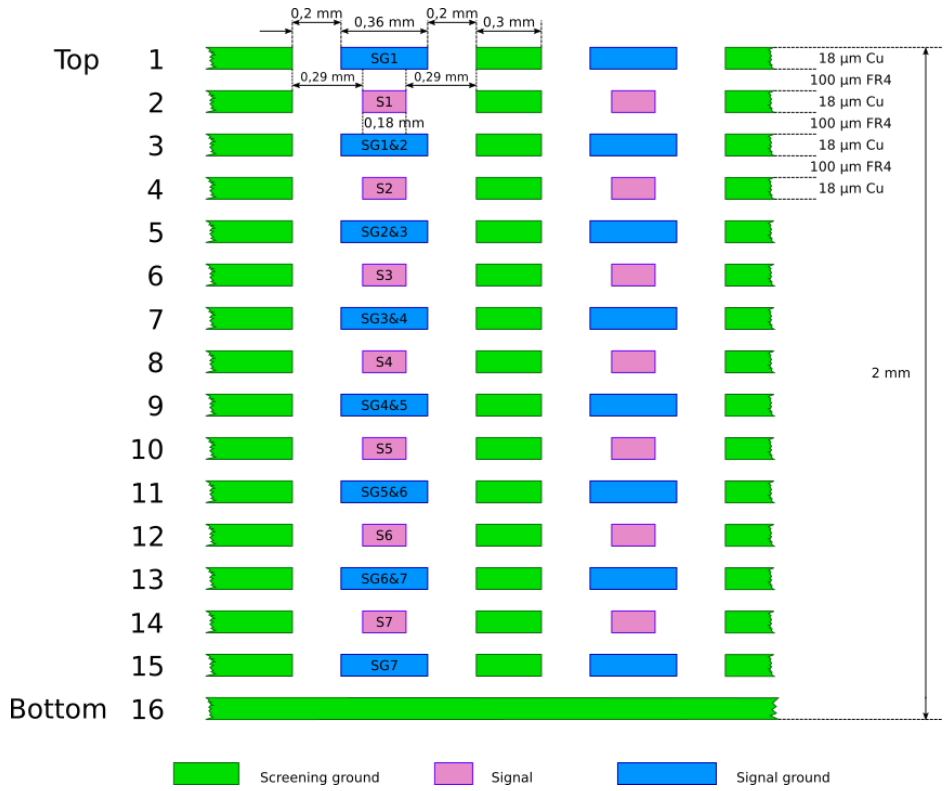
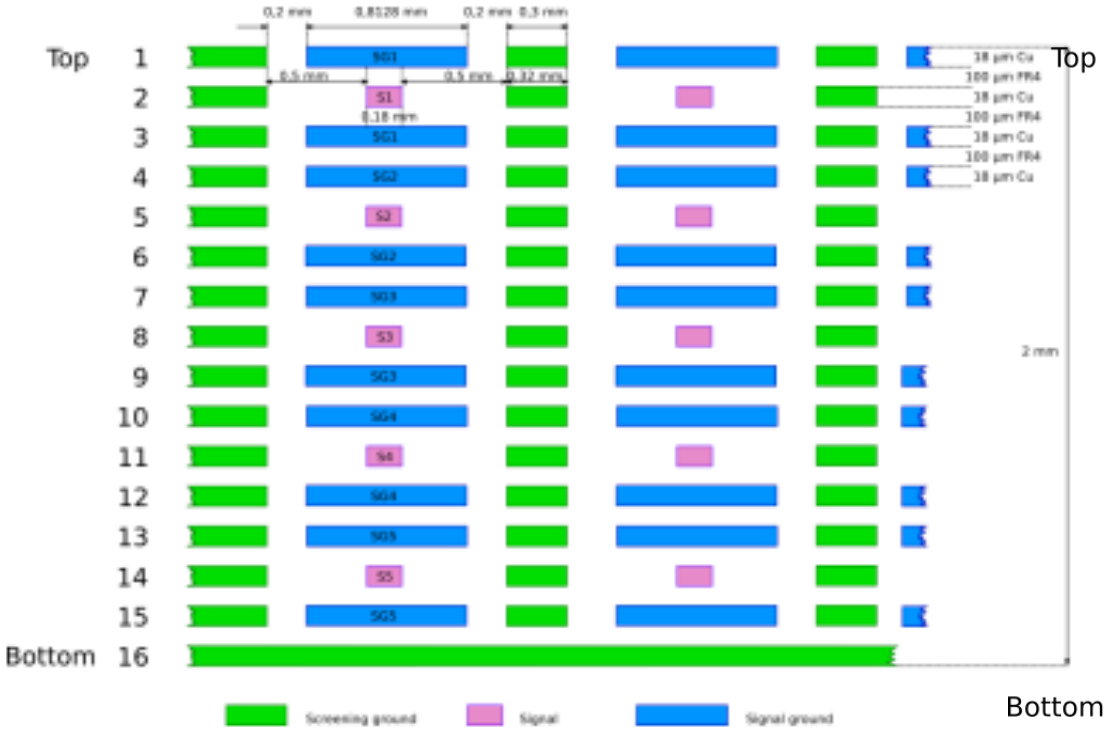


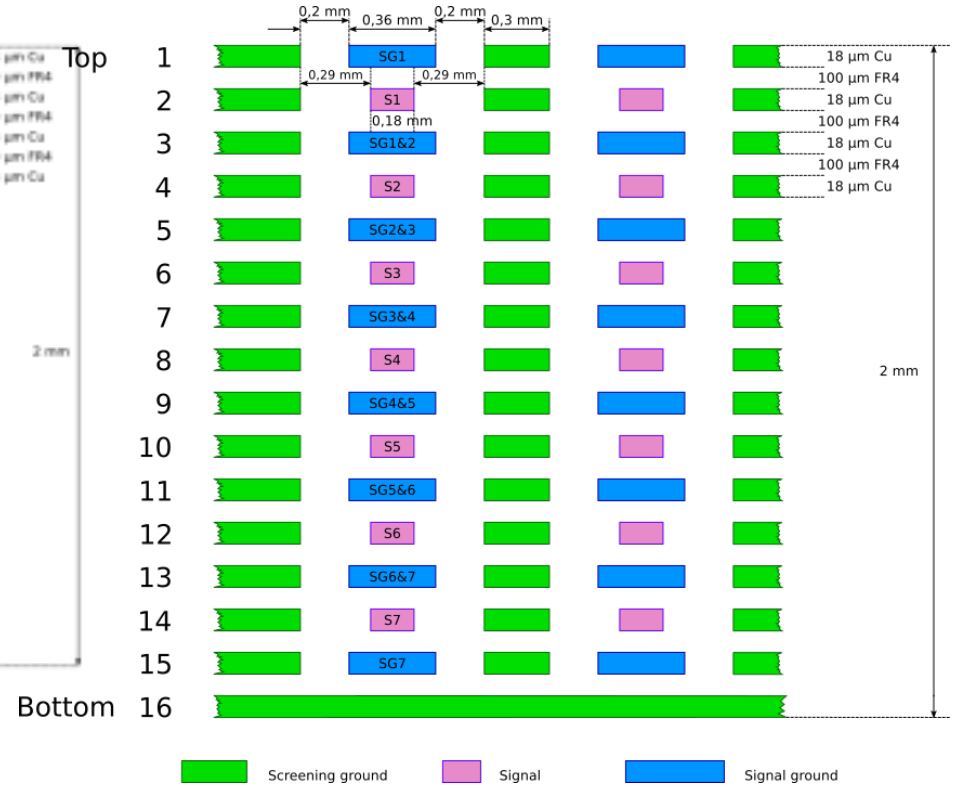
Railboard Design Update

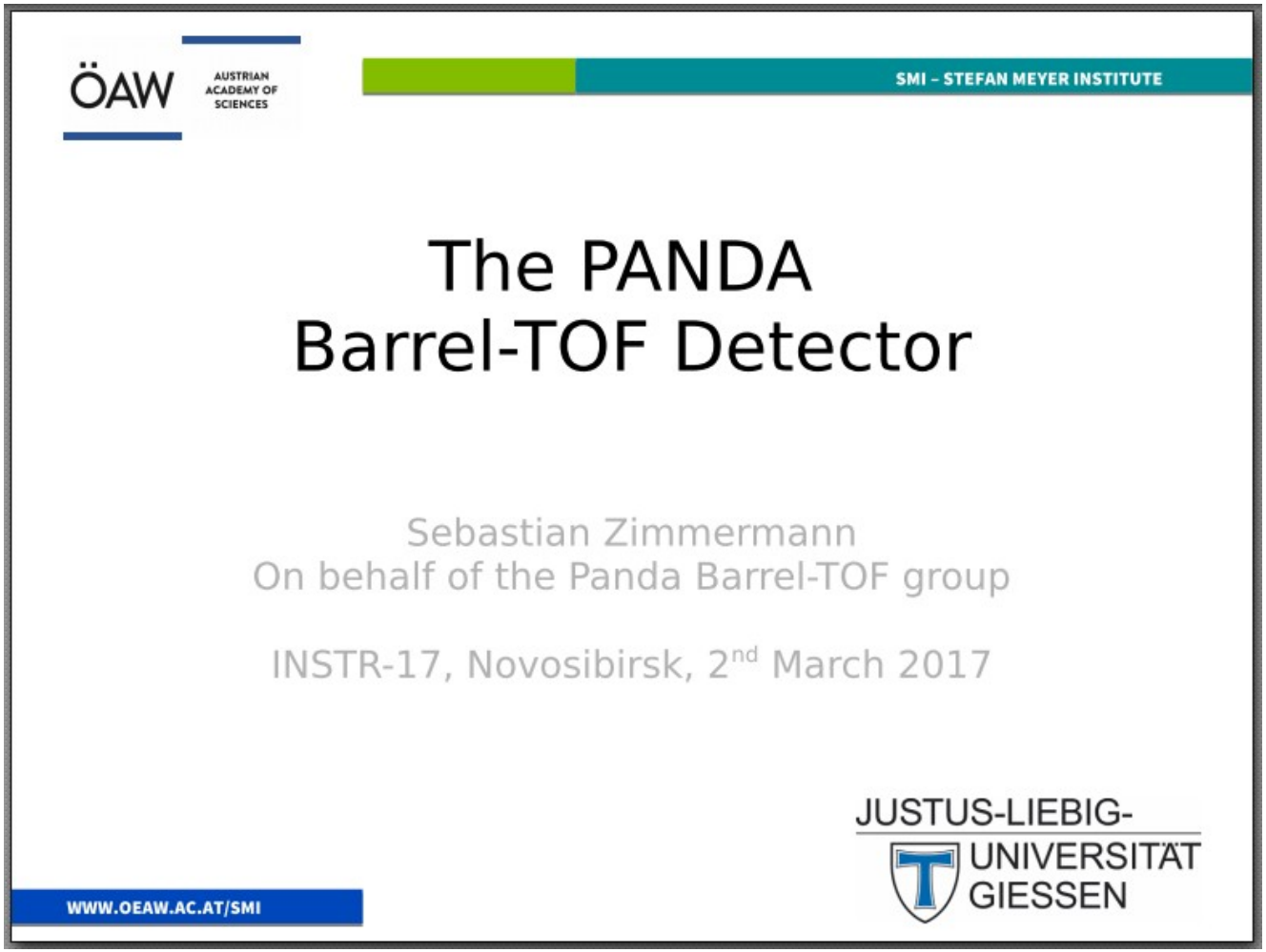
- **Signal shields merged and width reduced**
- **Potential thickness increase to 35 µm**
- **Width of area occupied by connections reduced**
  → material budget reduced
  - **Previously approx. 2.4% X_0**



Railboard Design Update






ÖAW AUSTRIAN ACADEMY OF SCIENCES
SMI – STEFAN MEYER INSTITUTE
The PANDA
Barrel-TOF Detector
Sebastian Zimmermann
On behalf of the Panda Barrel-TOF group
INSTR-17, Novosibirsk, 2nd March 2017
JUSTUS-LIEBIG-
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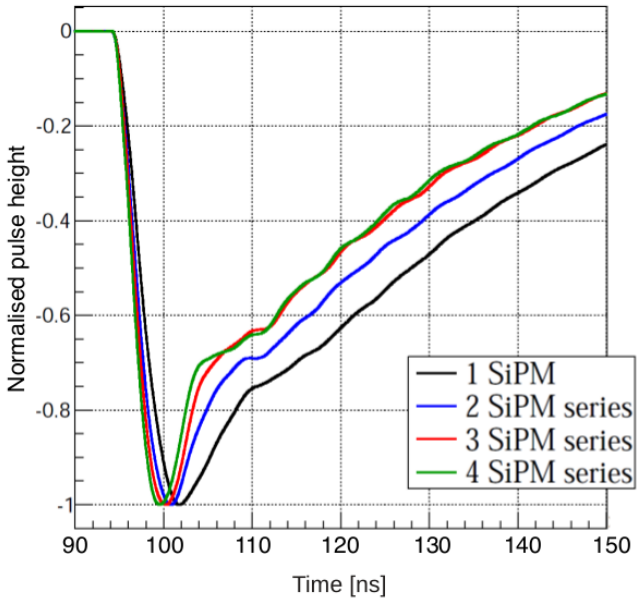
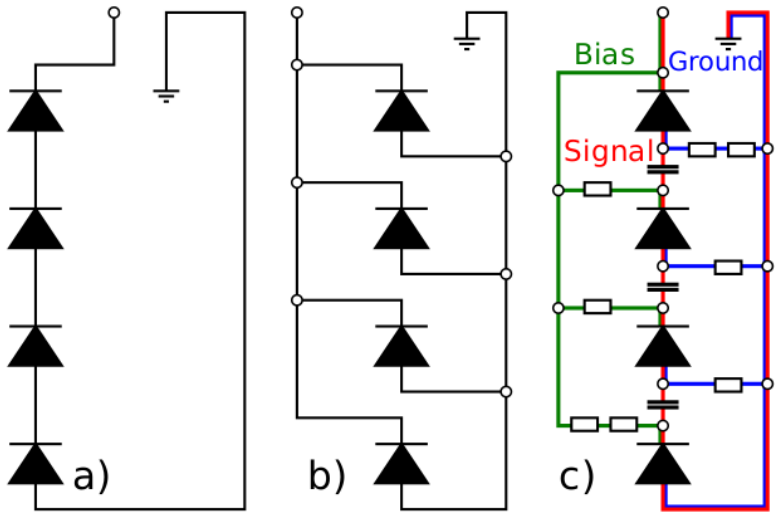
SiPM Configuration

- **SiPMs will be connected in series or in hybrid[1] configuration (insert image right)**
- **Simplifies readout (1 channel for 4 SiPMs)**
- **Serial connection improves signal rise time**
- **Hybrid connection can only provide one voltage value to all 4 SiPMs**

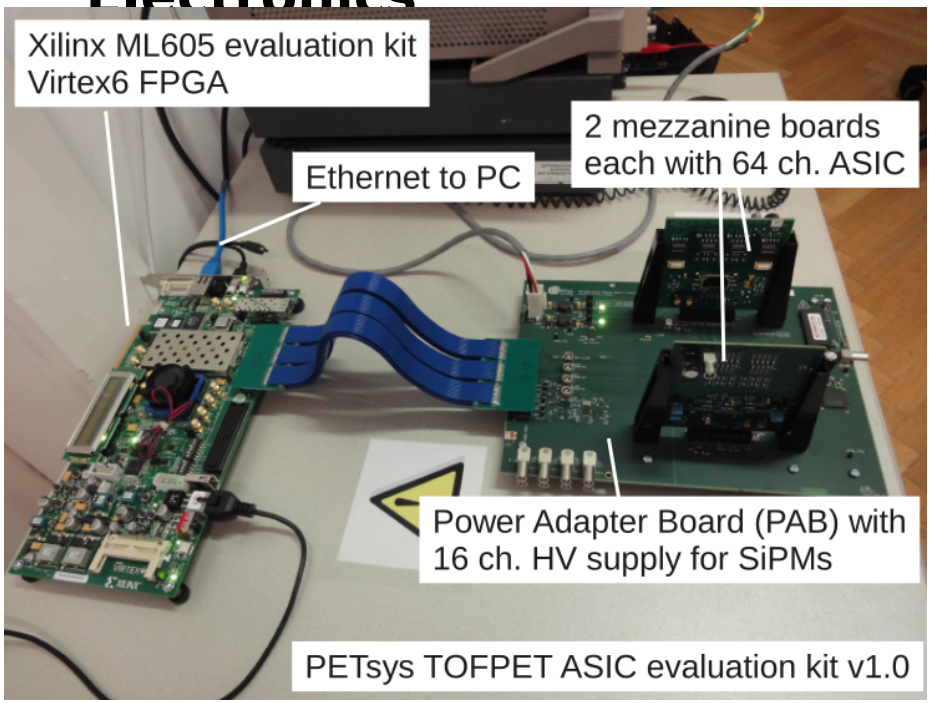


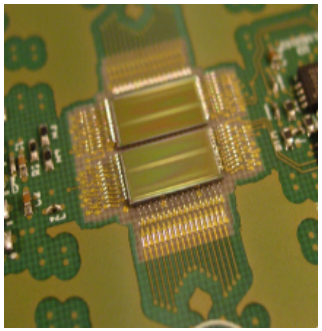


[1] Inspired by MEGII: arXiv:1301.7225

Front End Electronics (FEE)

- **Data will be processed by the TOF PET ASIC produced by the company PETsys Electronics**





TOFPET ASIC by PETsys Electronics	
number of channels	64
TDC time binning	50 ps (25 ps optional)
intrinsic time resolution	21 ps r.m.s.
charge measurement	time over threshold (ToT)
dynamic range	300 pC
SNR (Qin = 200 pF)	25 dB
coarse gain	G0, G0/2, G0/4
SiPM familiy support	positive or negative signal polarity
on-chip calibration circuit	internal pulse generator, programmable 6-bit amplitude
max channel hit rate	160 kHz
max output data rate	320 Mb/s (640 Mb/s with double data rate)
Fully digital output	2 data LVDS links, DDR compatible
operation frequency	80-160 MHz
power per channel	8-11 mW
SiPM HV fine biasing	range 500 mV

Outlook

- Get the evaluation kit up and running again
- Do first timing measurements to familiarize myself with the ASIC
- Talk to PETsys about custom FEE development
  - We might reuse some commercial components