

# Status of the muon veto

**GERDA Collaboration Meeting**

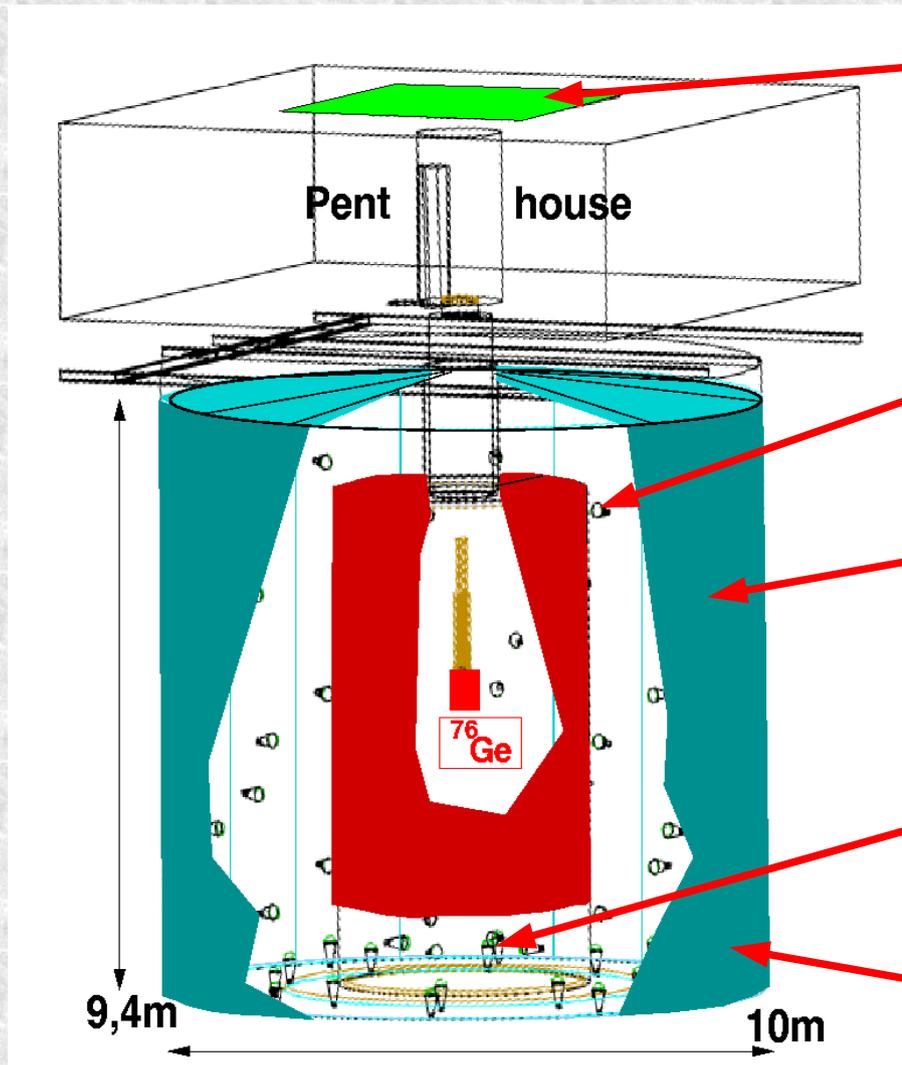
**IRRM Geel**

**June, 11<sup>th</sup> 2007**

**Markus Knapp**



# Overview: muon veto



plastic scintillator

photomultiplier

Cherenkov-Veto

„Pillbox“

VM 2000

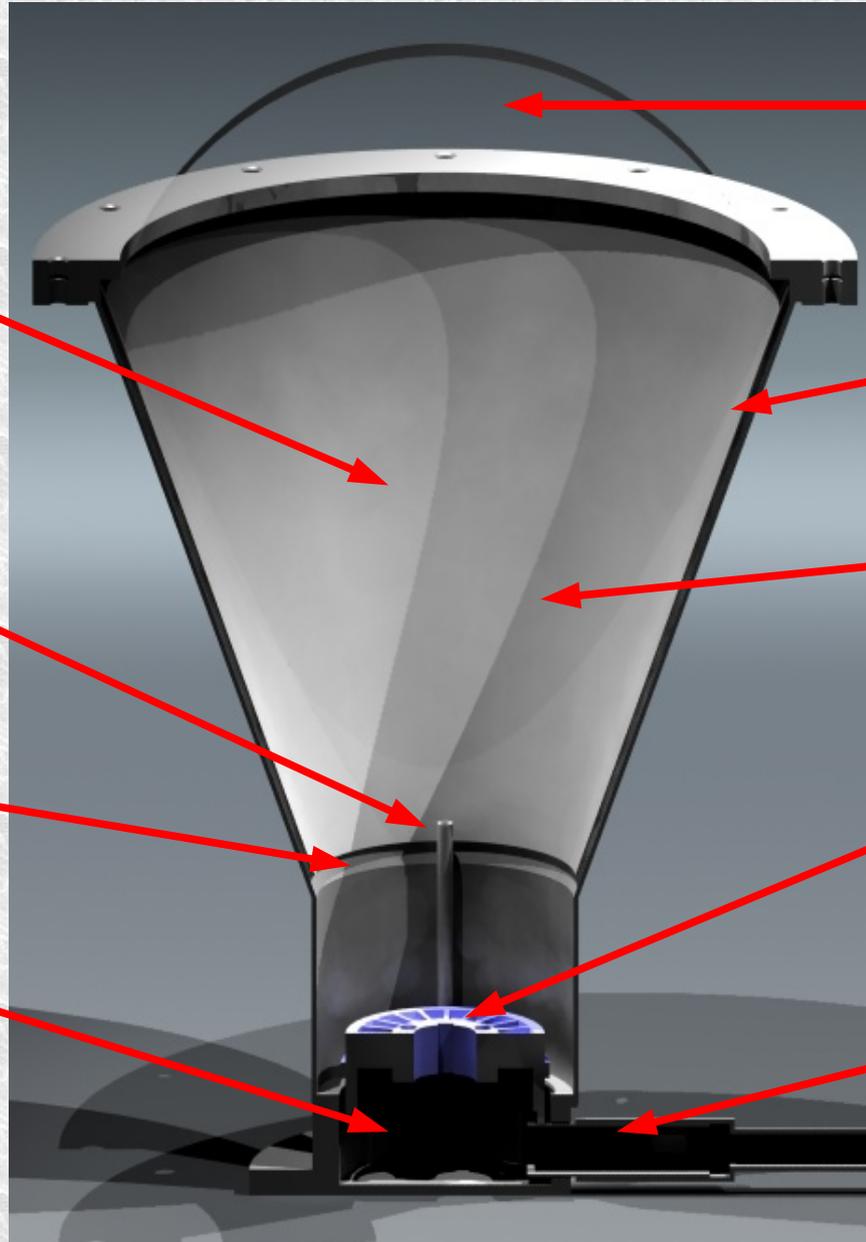
# Status of encapsulation

PMT 9350KB  
(ETL)  
delivered

small steel parts  
in production /  
delivered

silicon gel  
delivered

polyurethane  
available



PET-window  
delivered

encapsulation  
delivered

mineral oil /  $\mu$ -metal  
delivered

B20 socket and  
voltage divider  
in production

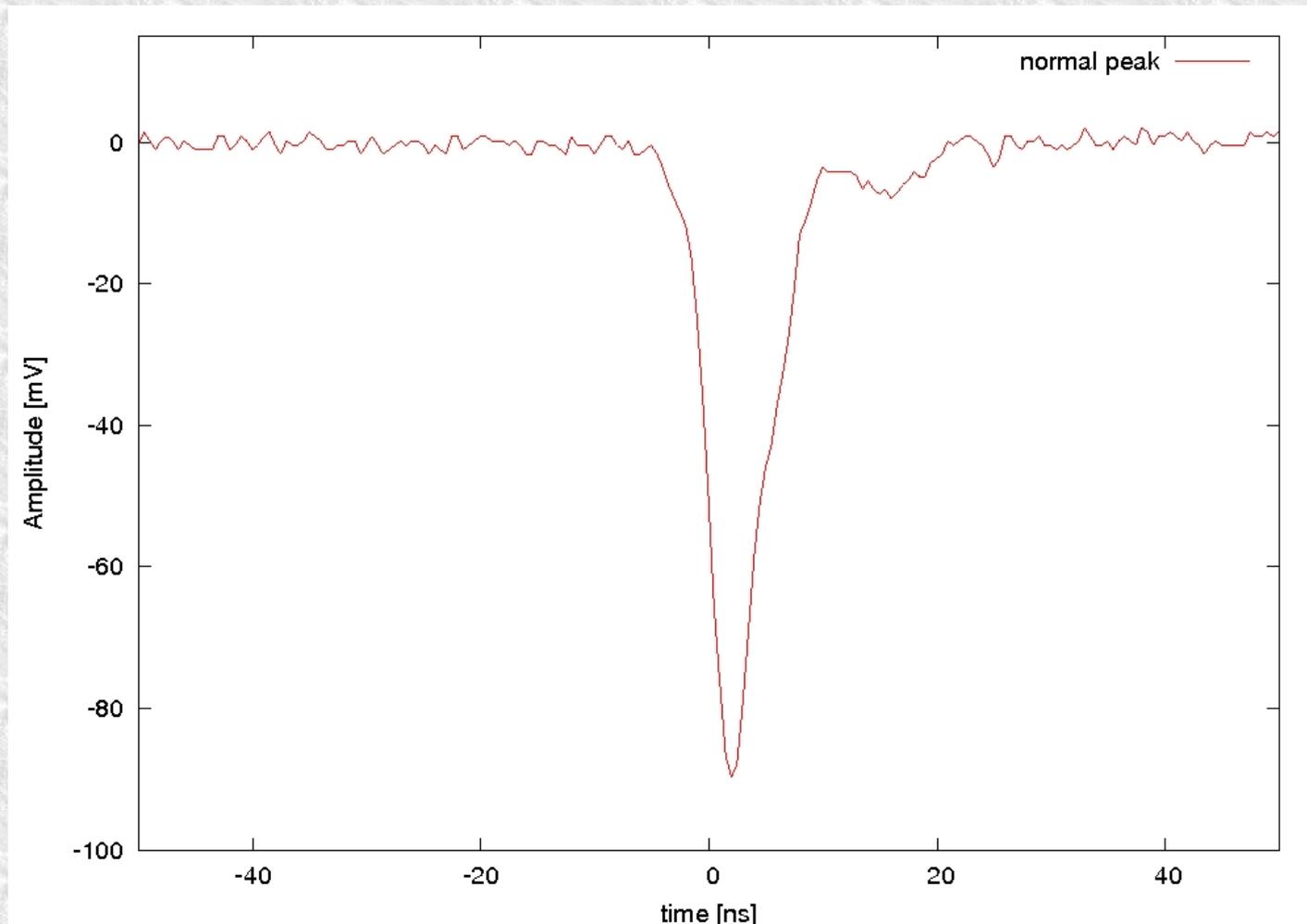
cable / cable  
feedthrough  
delivered / in  
production

# Status of encapsulation

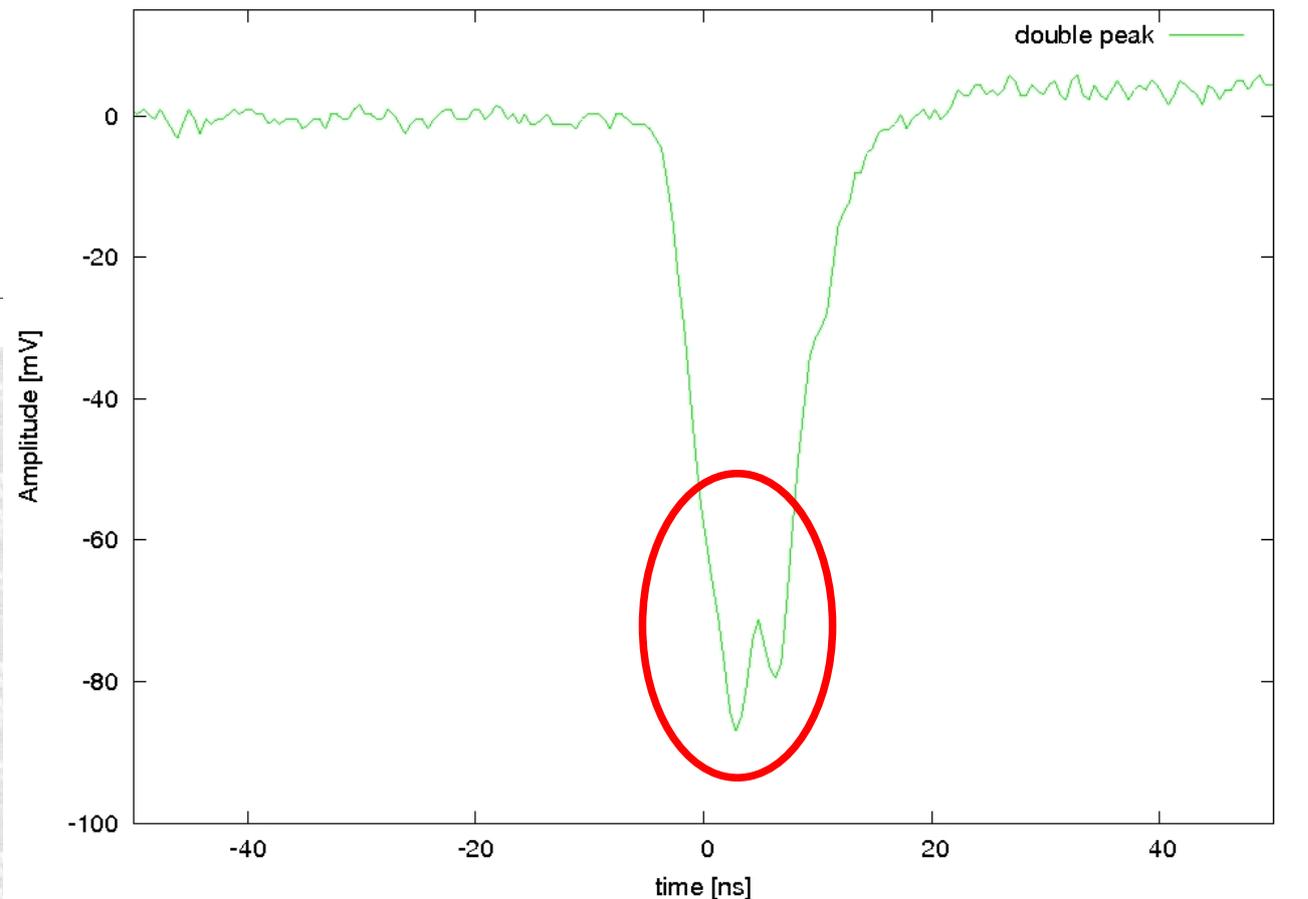
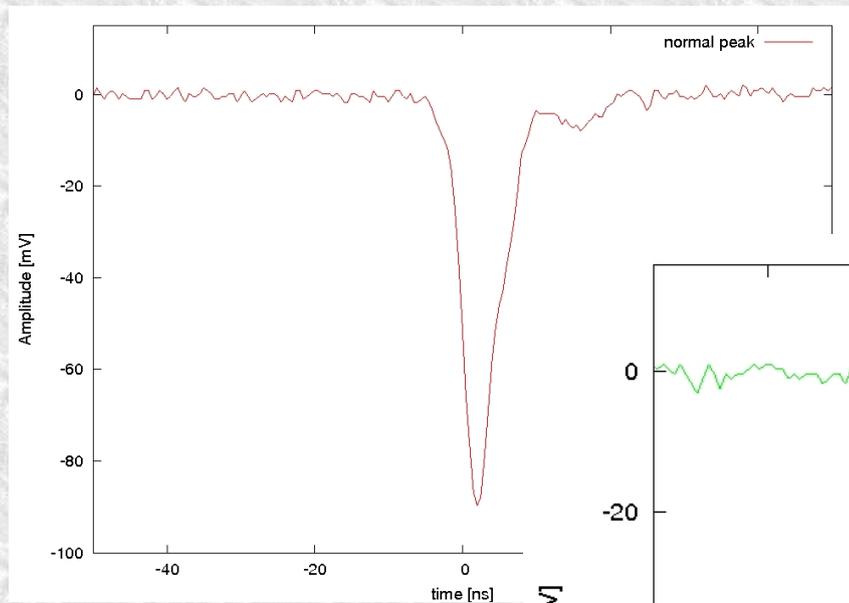


- prototypes under water
- two prototypes running since 4 months
- one more prototype now running at 0 bar
- start testing at 2 bar after conference

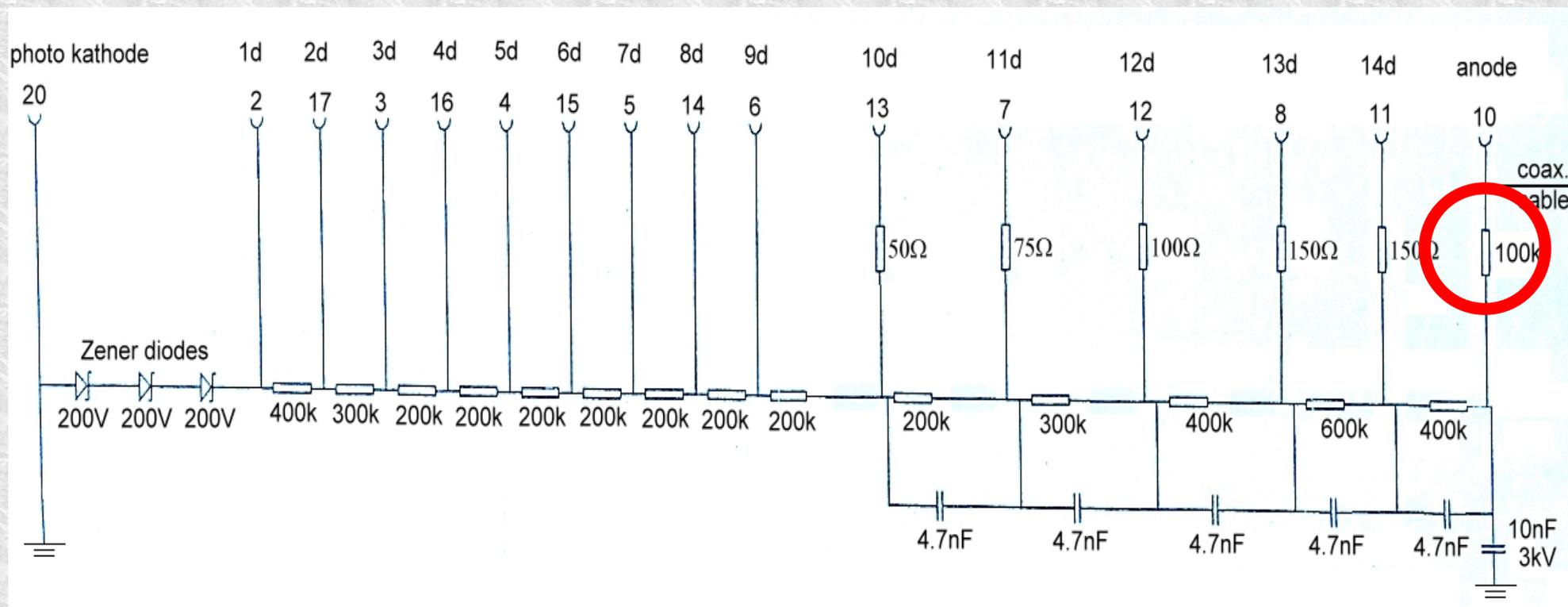
# Status of encapsulation



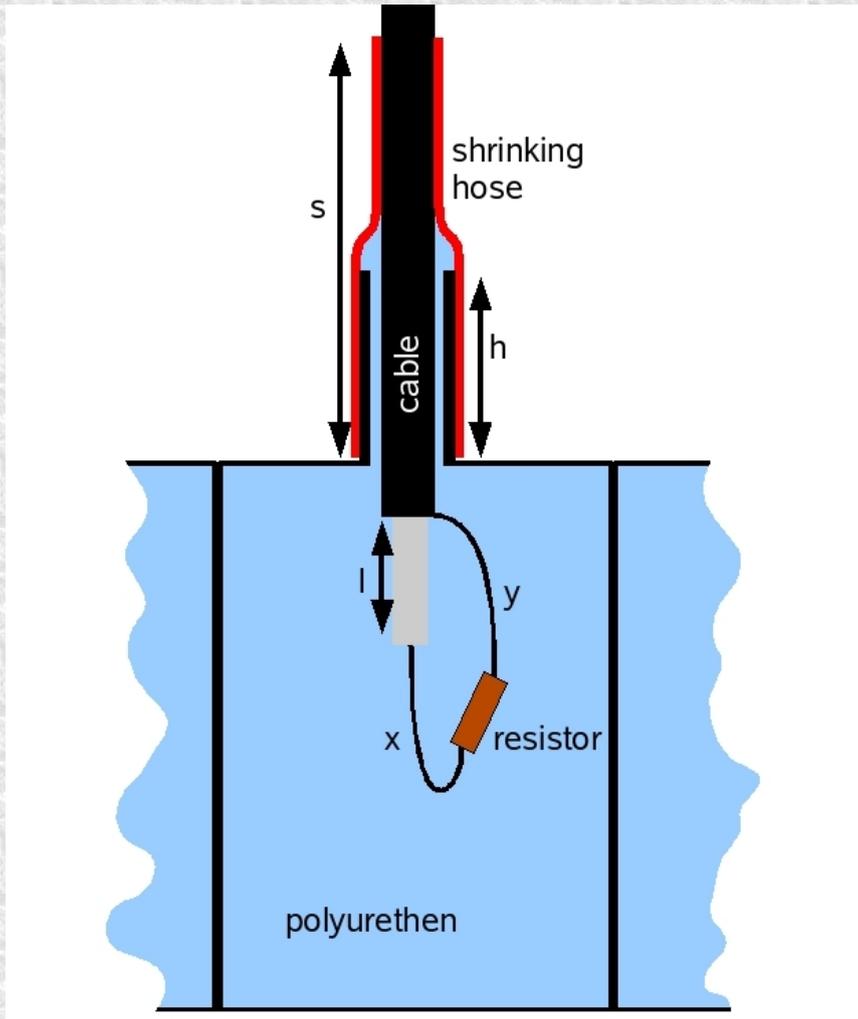
# Status of encapsulation



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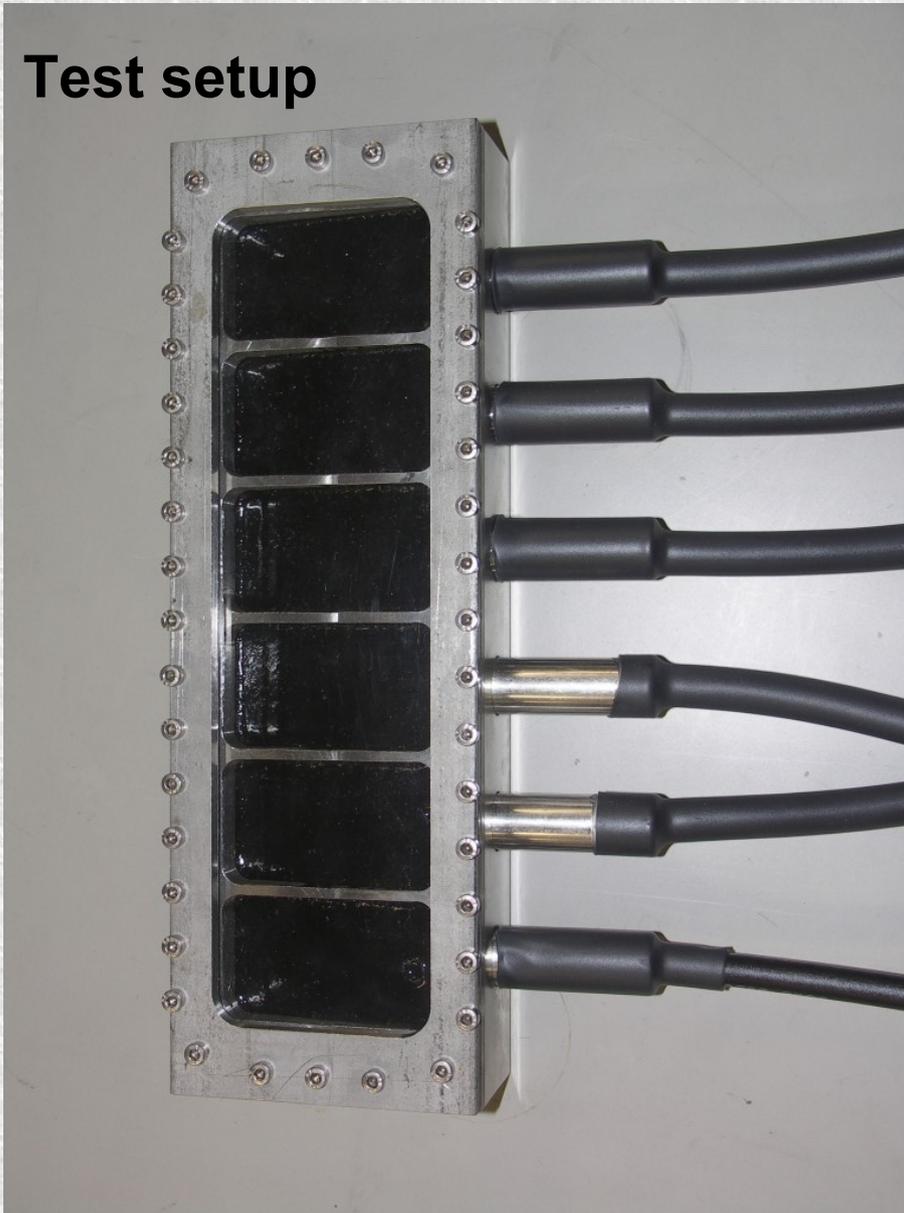
# Cable feedthrough tests



- vary lengths:  $x, y, l, h, s$
- worst case scenario (cut, minimal lengths)
- running since 4 months
- no problems encountered

# Cable feedthrough tests

Test setup



Tests under water

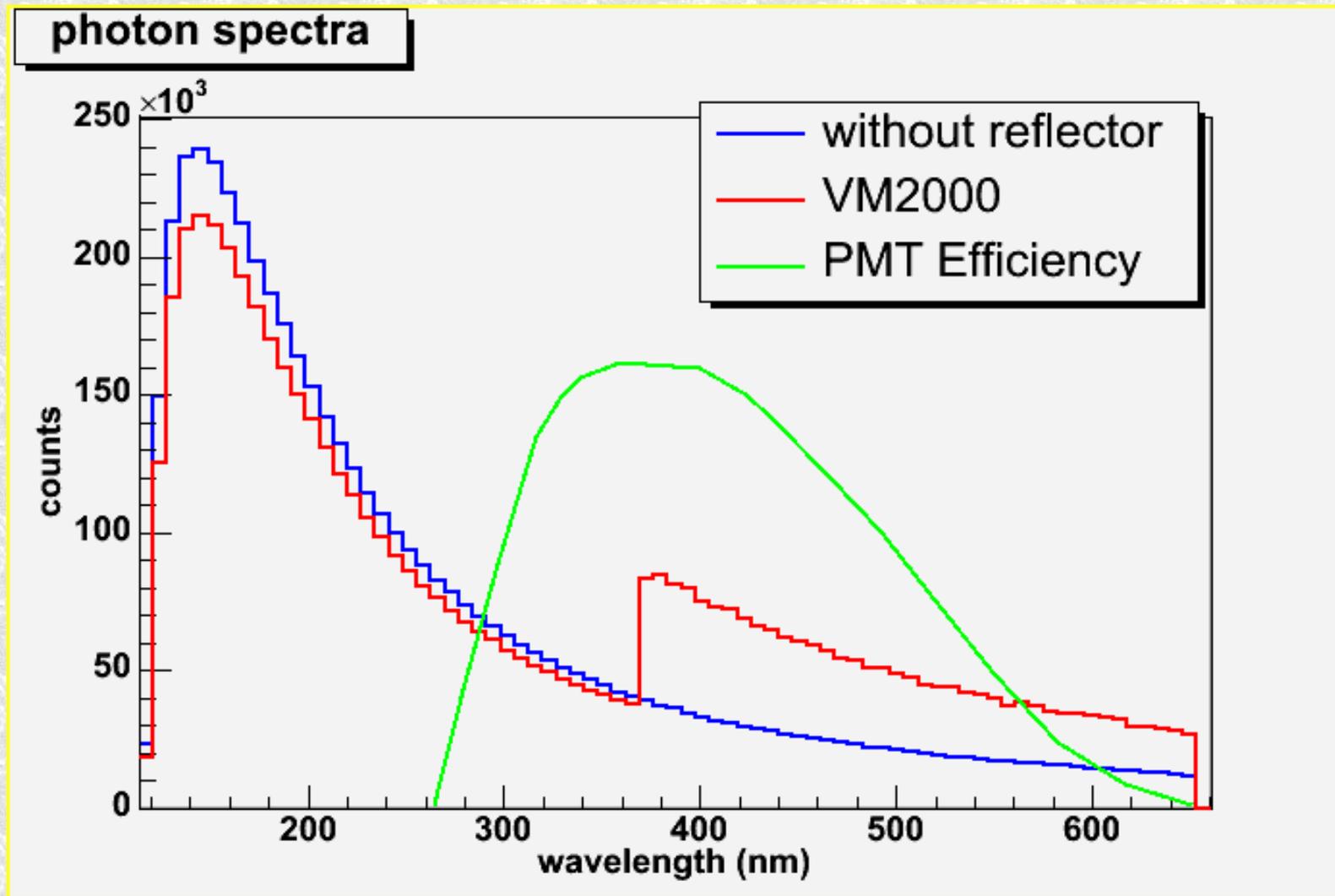


# Status: VM2000

- Not ordered
- Problem: Adhesive on backside of foil
- Solution: i) Cleaning procedure  
ii) order small sheets without glue  
iii) leave it
- Tests of solubility in water
  - CHNS analysis:
    - > no impurities (carbon, ...) in water



# Photon spectra

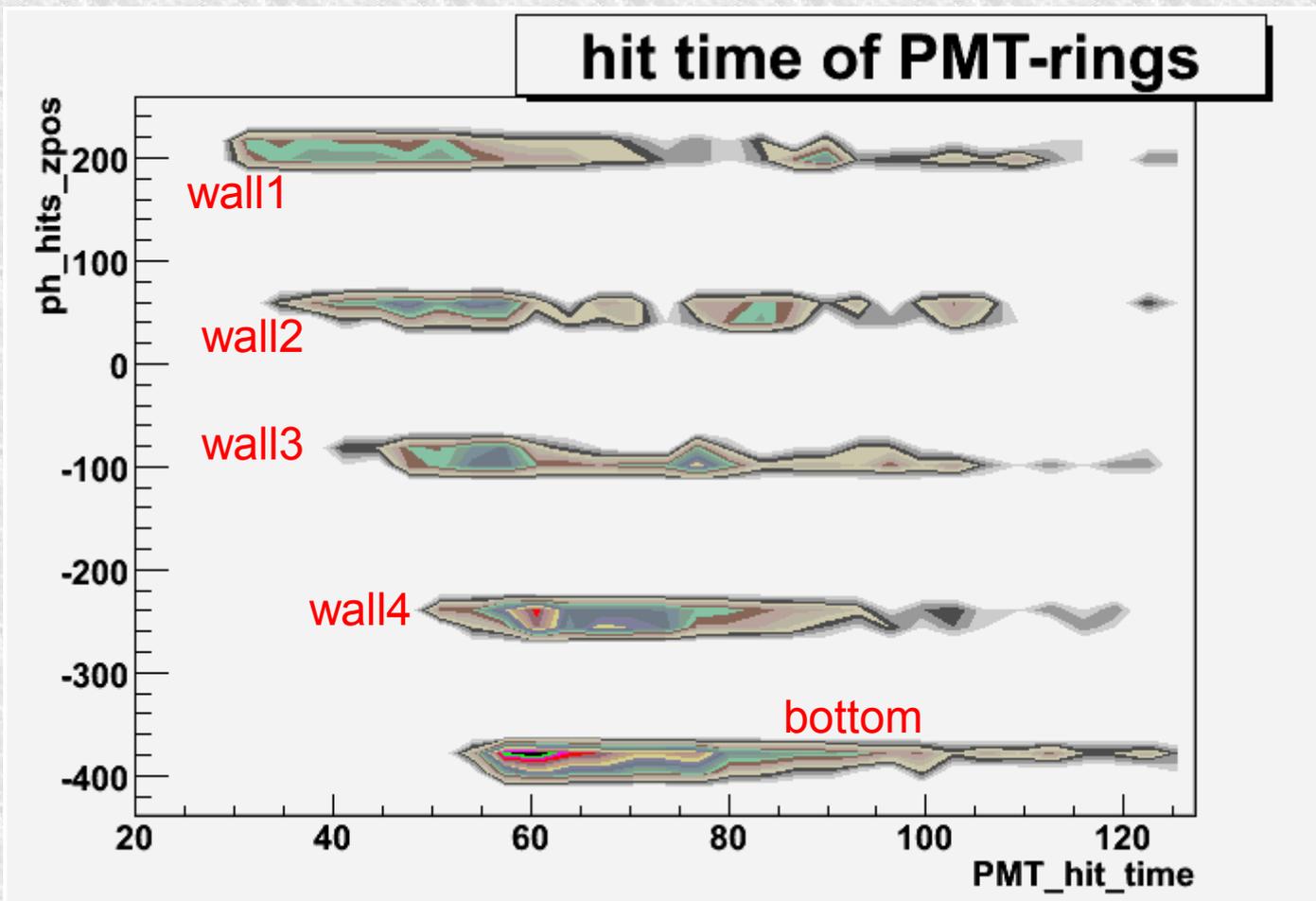


# Status: DAQ

- FADC still under investigation
- testing of the stretcher
  
- various VME-modules delivered (LED, CFD, Scaler...)
- VME-Crates delivered (Wiener)
- HV Crate and modules delivered (CAEN)
  
- Test of DAQ at GDL with plastic panels



# Time information

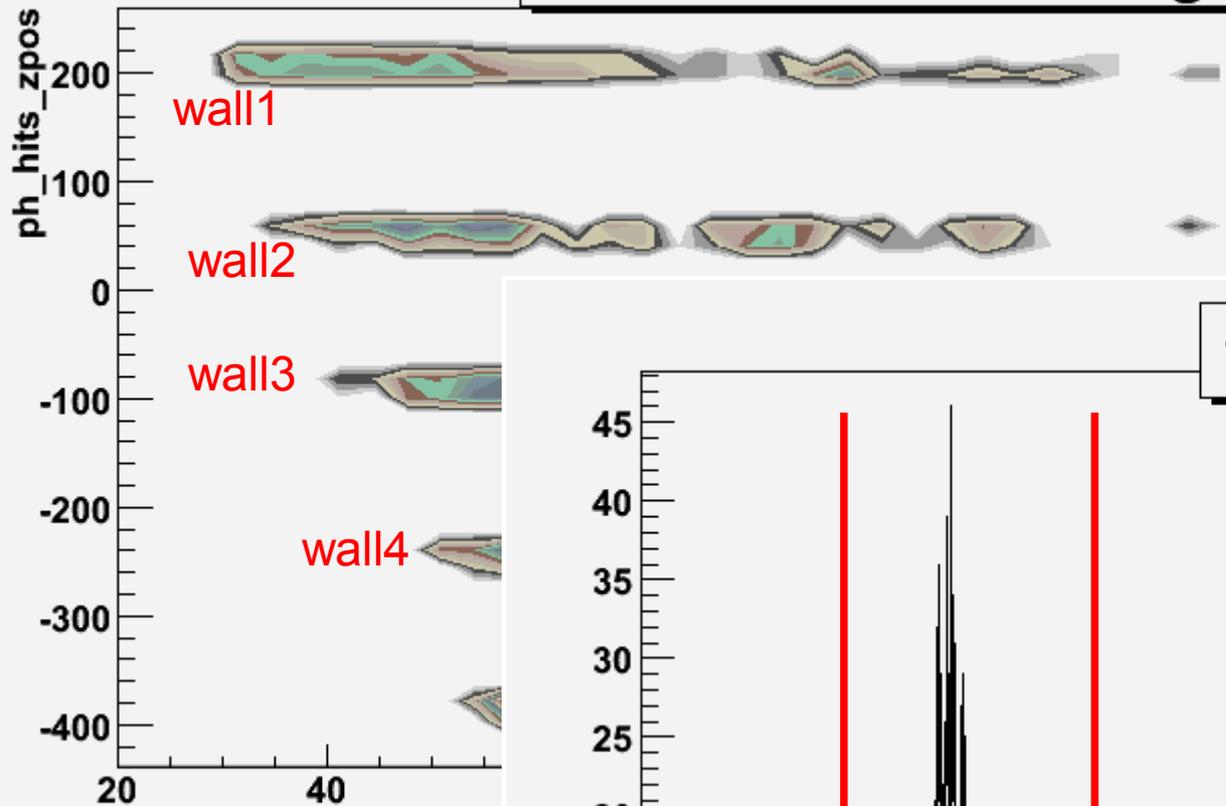


Bottom PMTs  
register more  
photons, but later



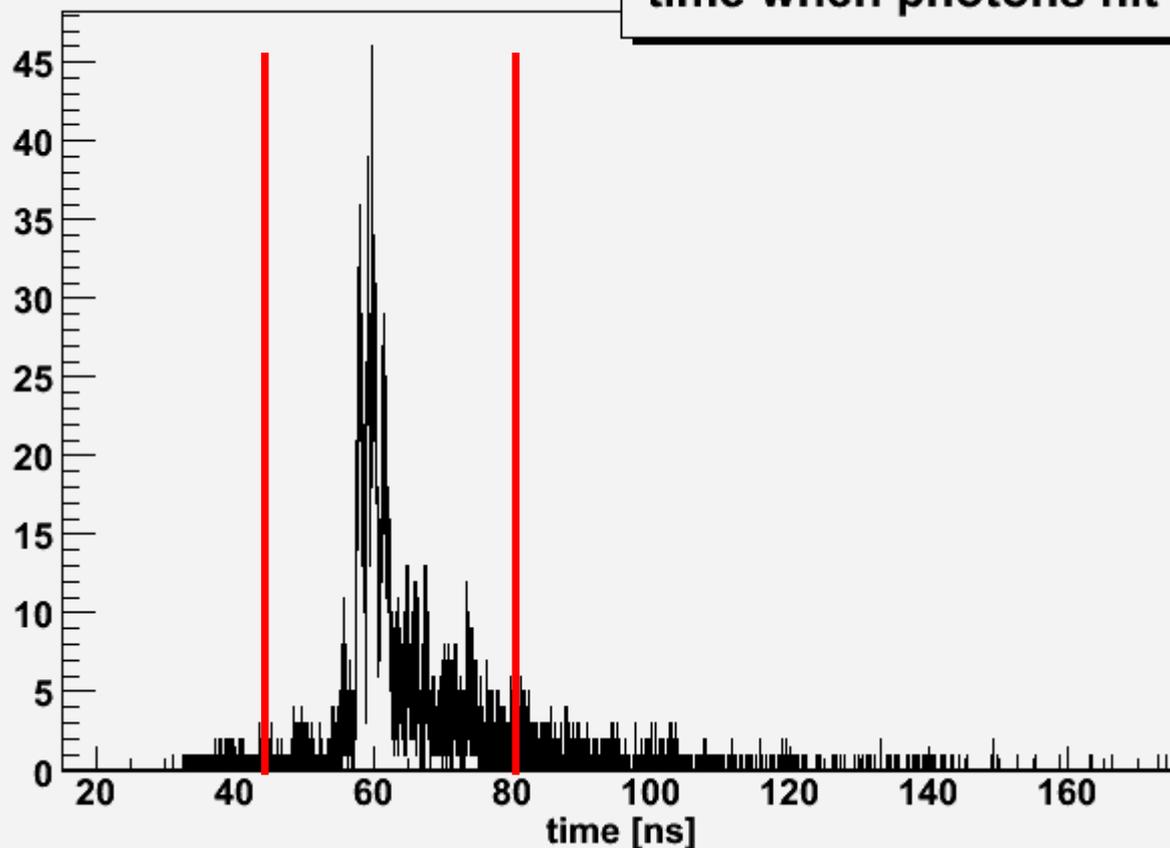
# Time information

hit time of PMT-rings



Bottom PMTs register more photons, but later

time when photons hit PMs



~80 % of photons registered within 40 ns



# Grouping of Photomultipliers

- different FADC channel combinations will be tested
- a simple combination is one PM of the pillbox and one of each ring per FADC
- first results show, high efficiency of more than **98 %** possible
- other combinations will be tested soon

time window	# of fired FADCs	efficiency
10 ns	4 FADC	96.4%
10 ns	3 FADC	99.0%
30 ns	4 FADC	98.5%
30 ns	3 FADC	99.5%
50 ns	4 FADC	98.9%
50 ns	3 FADC	99.5%

# Muon veto schedule

- next week: - pressure tests of encapsulations  
- measurement of neutron capture on Ge76 in Munich for background determination
- July: (Pre-)production of 5–10 encapsulated PMTs + tests in water (2bar) at Tübingen/LNGS
- September: Mass production (70 PMTs)  
First plastic panels at LNGS
- November: Delivery of PMs to LNGS and pressure test.



# Reports under preparation

- Time structure and randomness of the Cherenkov light (P. Grabmayr, M. Knapp)
- Photomultiplier encapsulation and mounting (P. Grabmayr, J. Jochum, M. Knapp, L. Niedermeier, F. Ritter)
- VM2000 (P. Grabmayr, J. Jochum, M. Knapp, L. Niedermeier, F. Ritter)

