Status of the muon veto

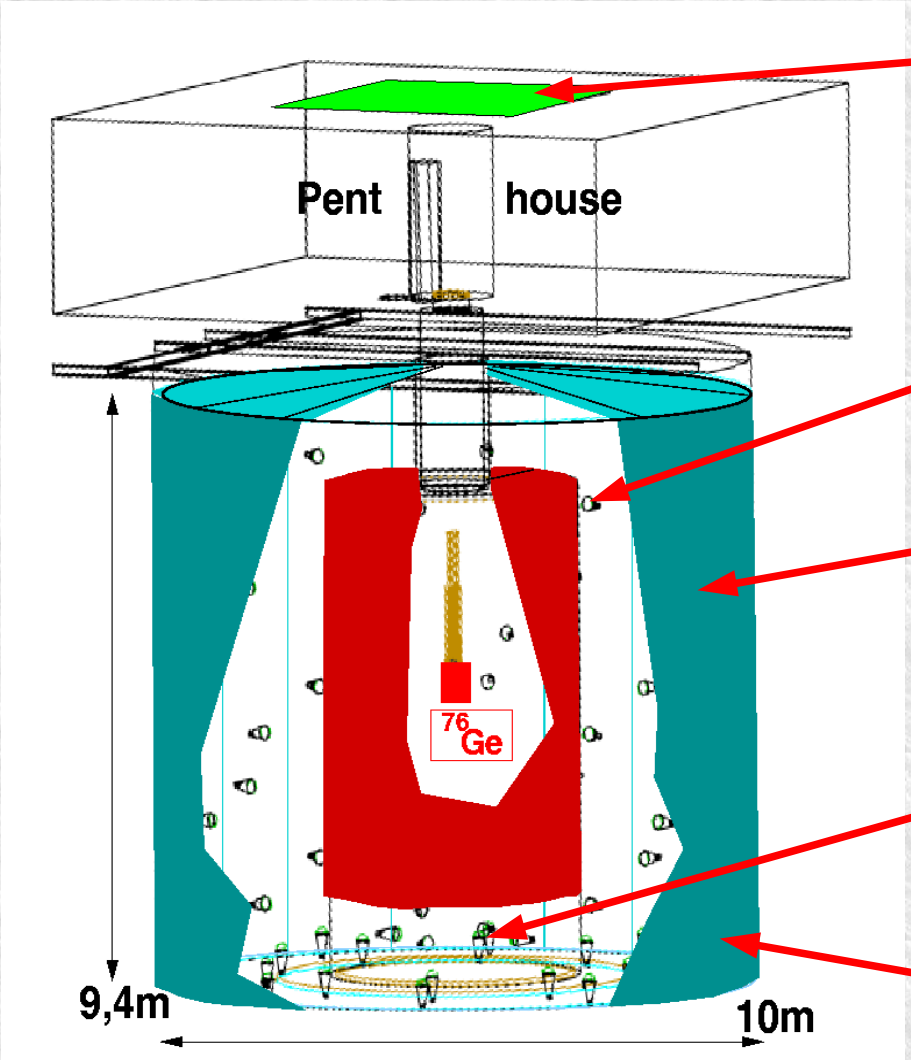
GERDA Collaboration Meeting

LNGS

November, 5th-7th 2007

Markus Knapp

Overview: muon veto



plastic scintillator

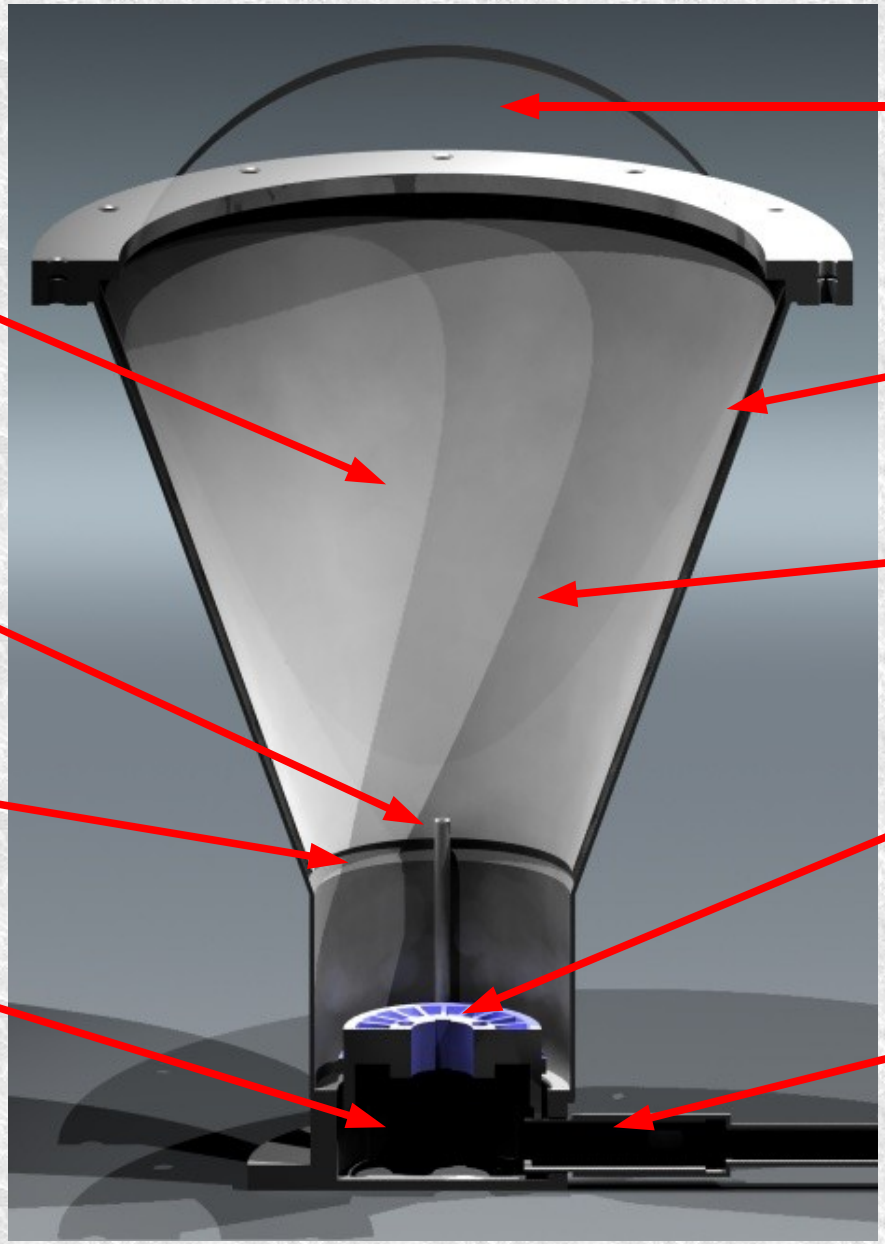
photomultiplier

Cherenkov-Veto

„Pillbox“

VM 2000

Status of encapsulation



PMT 9350KB
(ETL)
delivered

small steel parts
delivered

silicon gel
delivered

polyurethane
delievered

PET-window
delivered

encapuslation
delivered
further treatment

mineral oil / µ-metal
delivered

B20 socket and
voltage divider
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cable / cable
feedthrough
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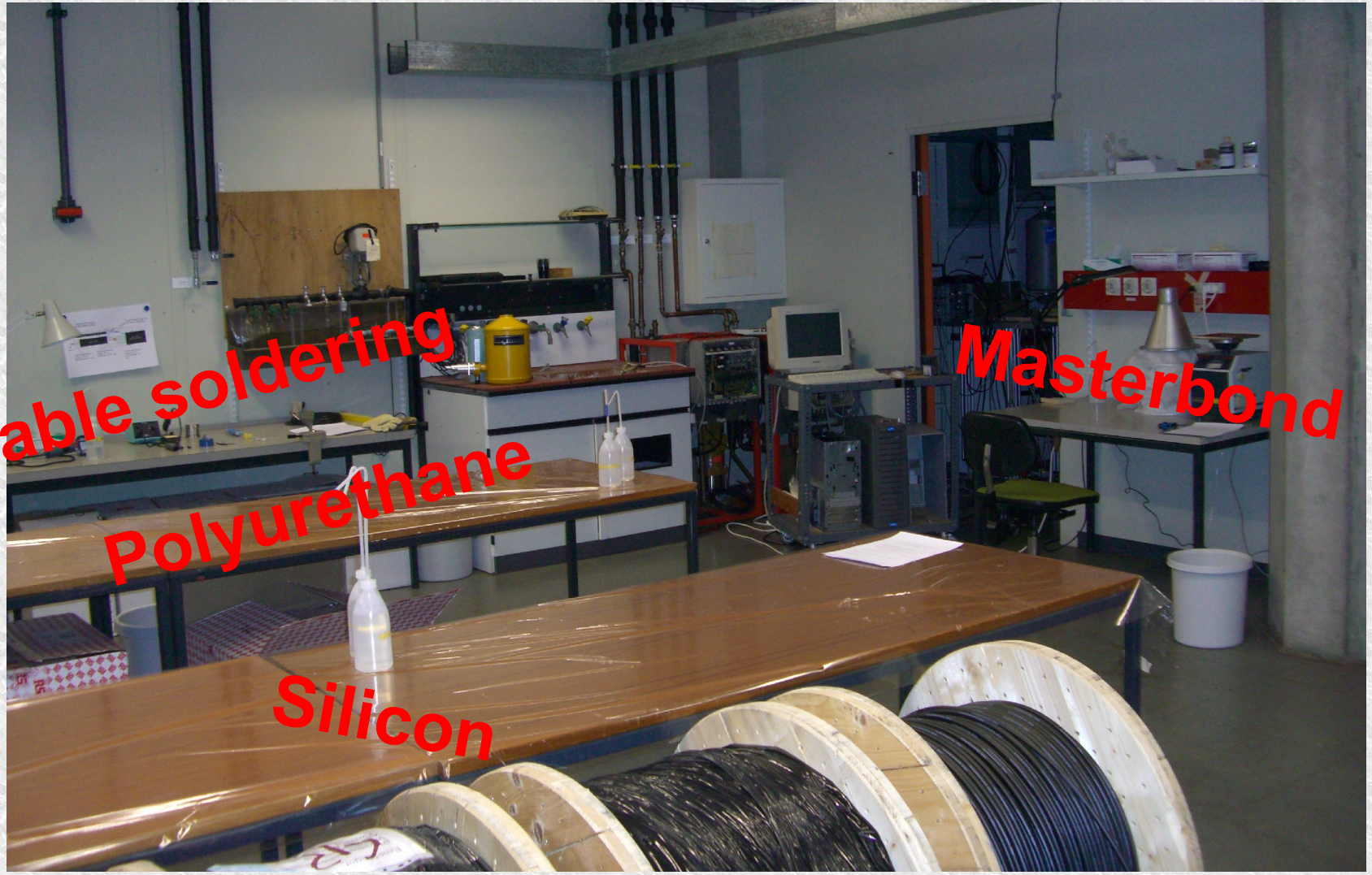
PMT Assembly Line
5 Steps

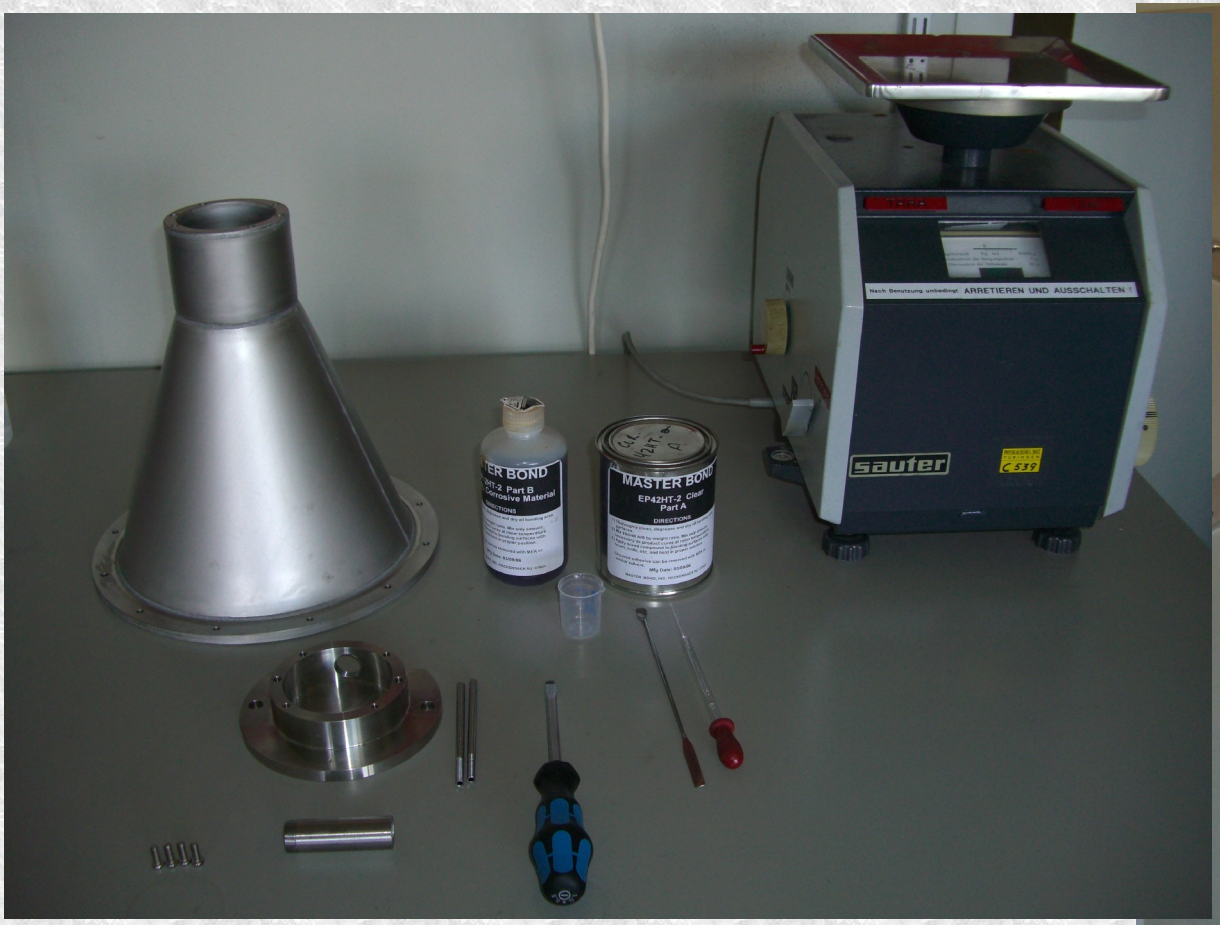
1. Masterbond glueing
2. Cable soldering
3. Pouring of polyurethane
4. Pouring of silicon gel
5. Oil filling

PMT Assembly Line
5 Steps

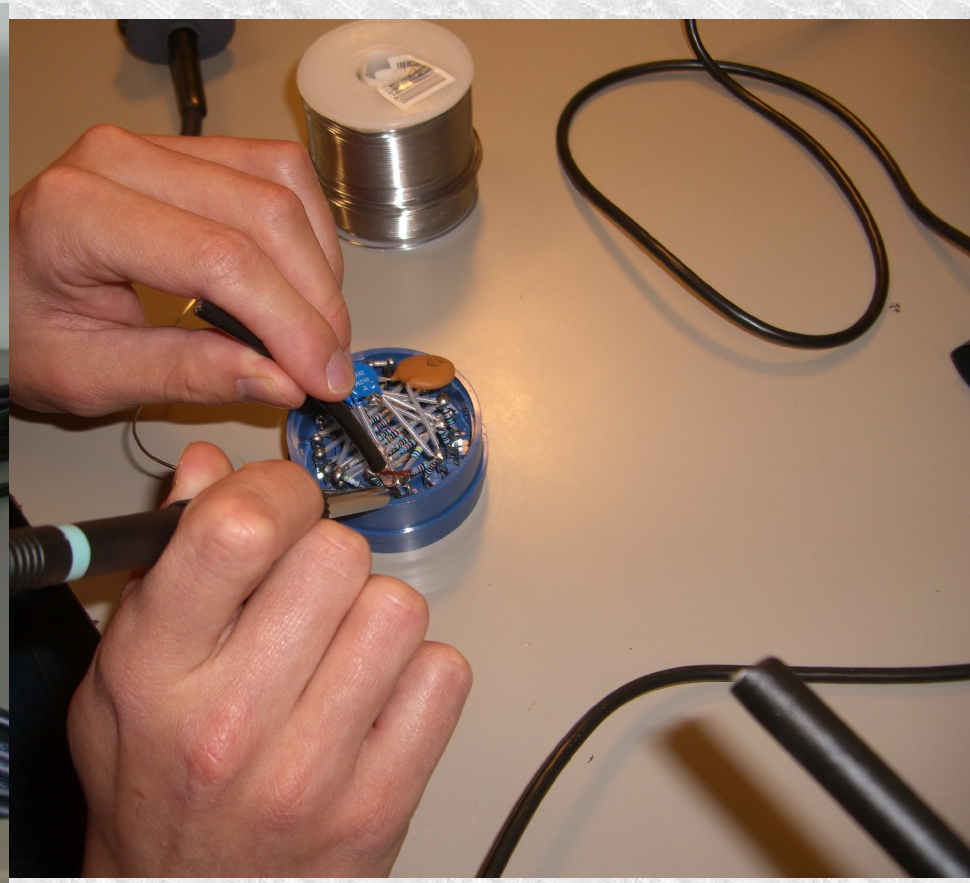


PMT Assembly Line
5 Steps

PMT Assembly Line
1. Masterbond glueing



PMT Assembly Line
2. Cable soldering



PMT Assembly Line
3. Pouring of polyurethane

PMT Assembly Line
4. Pouring of silicon gel

PMT Assembly Line
5. Oil filling

PMT Assembly Line Finished

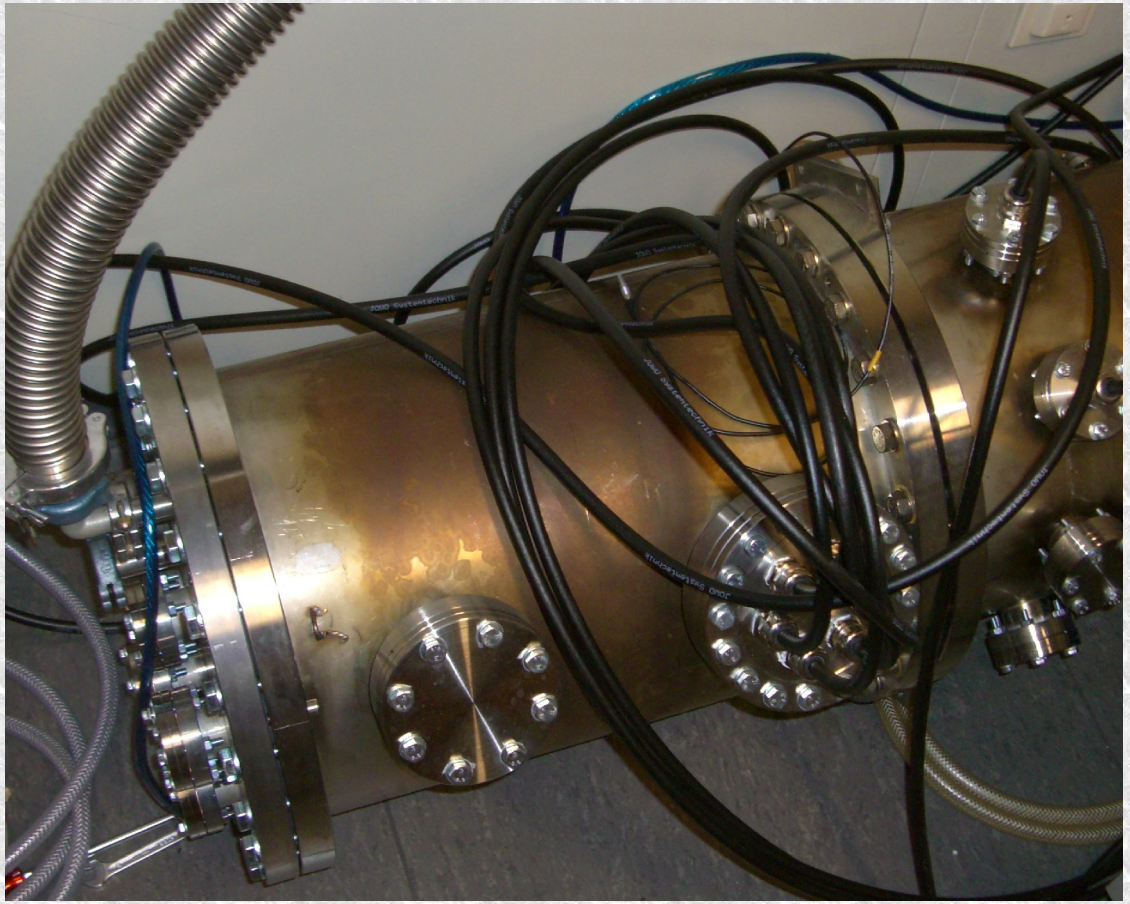
PMT Assembly Line Finished

Status of encapsulation

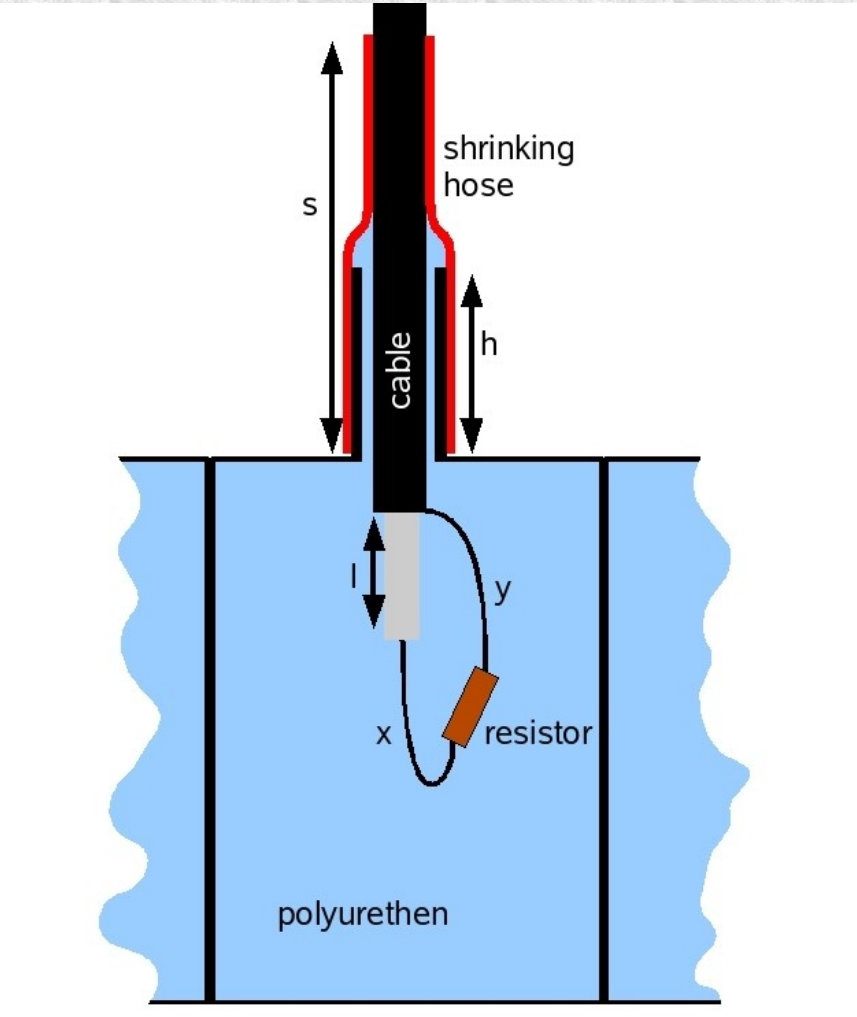
- prototypes under water
- two prototypes running since 7 months

Status of encapsulation

- pressure test running since 3 months
- two prototypes
- no problems encountered



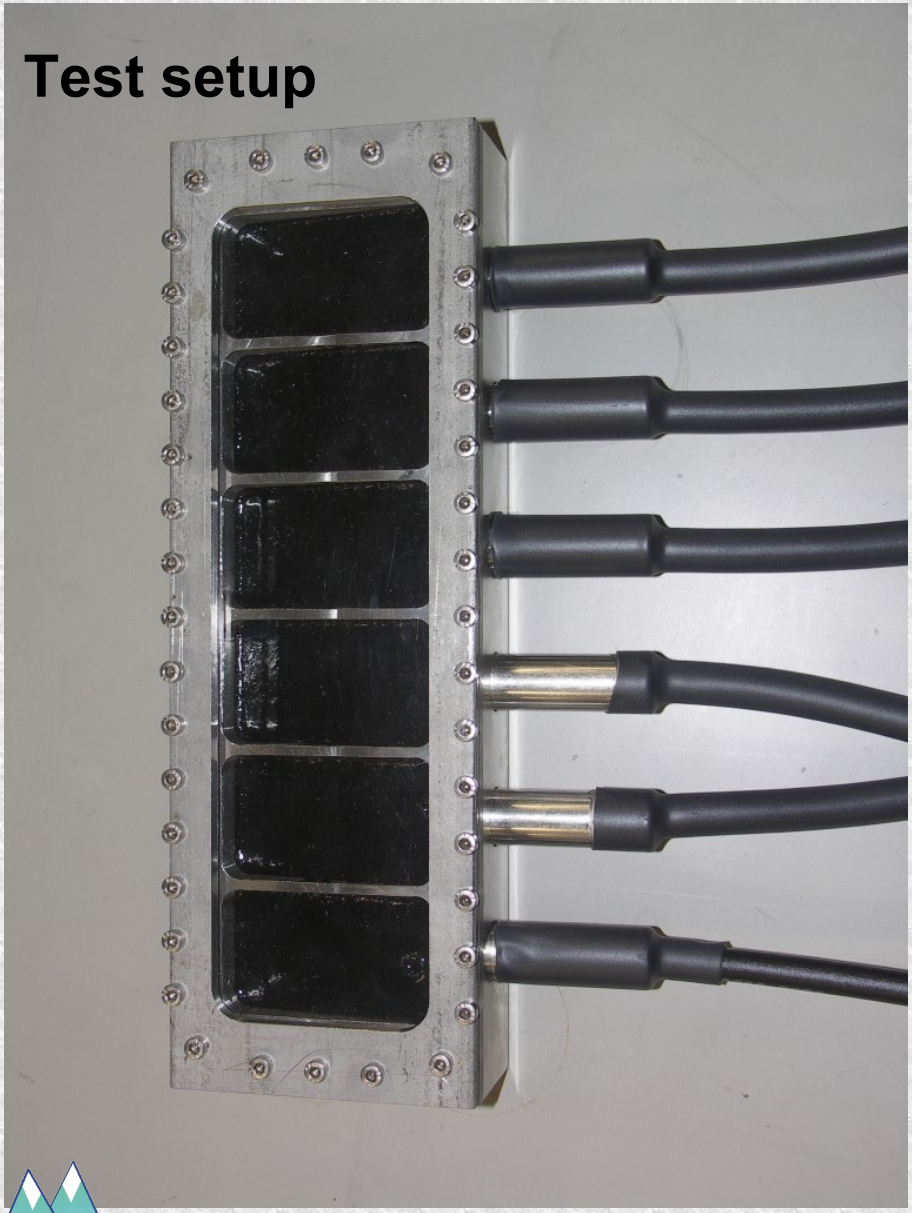
Cable feedthrough tests



- vary lengths: x,y,l,h,s
- worst case scenario (cut, minimal lengths)
- running since 7months
- running since 3 months under 2bar pressure
- no problems encountered

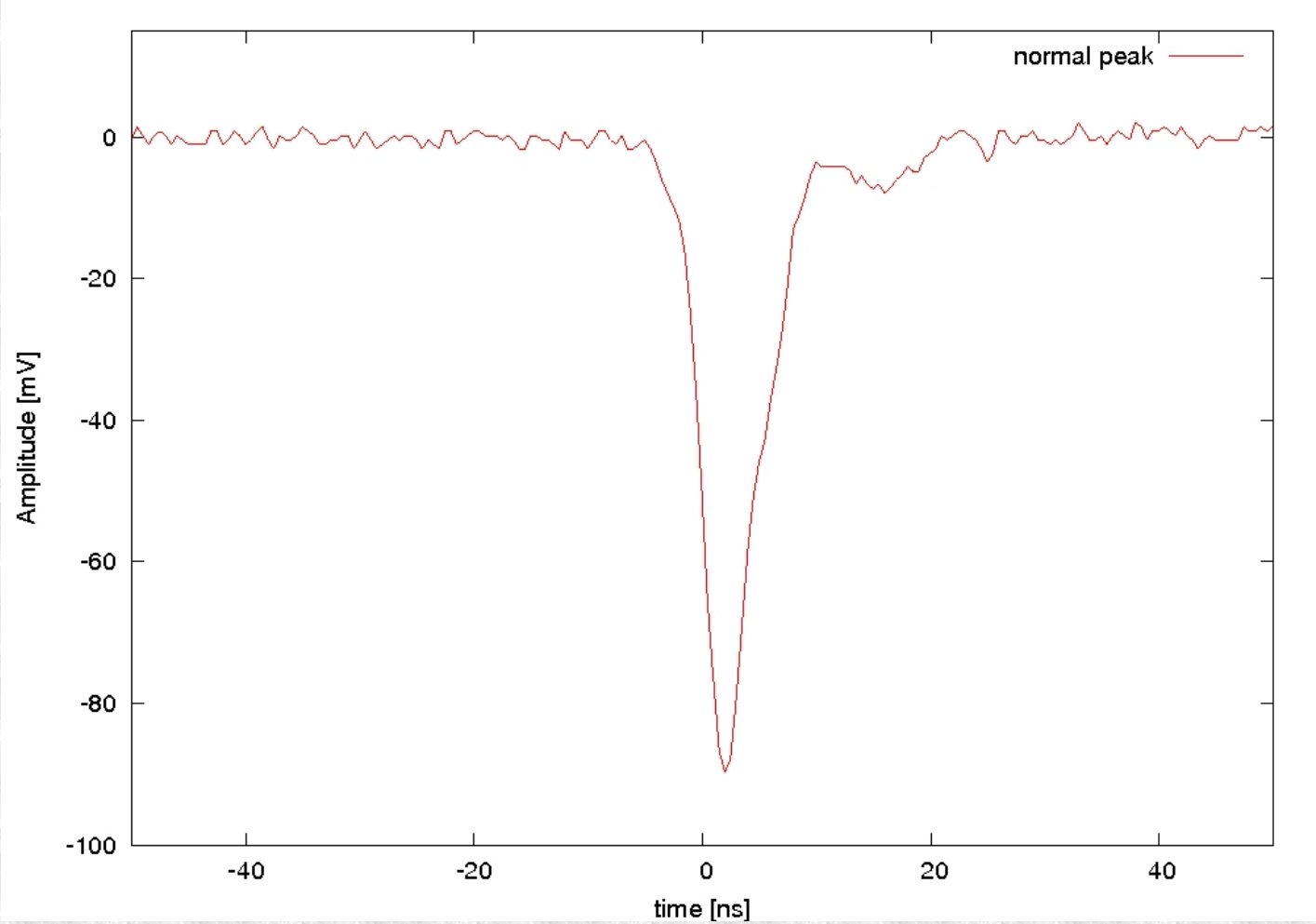
Cable feedthrough tests

Test setup



Tests under water

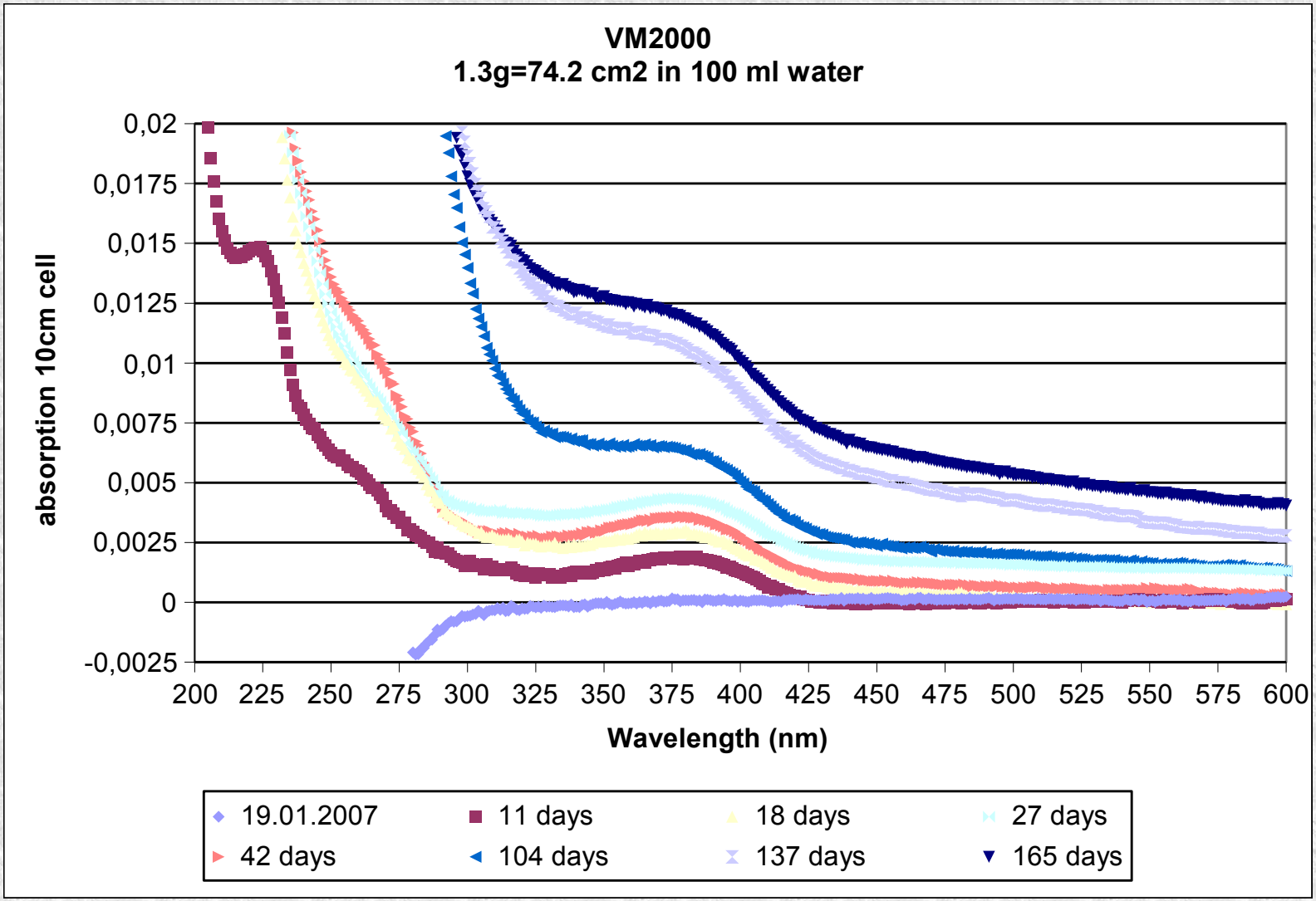
Status of encapsulation



VM2000 - Status

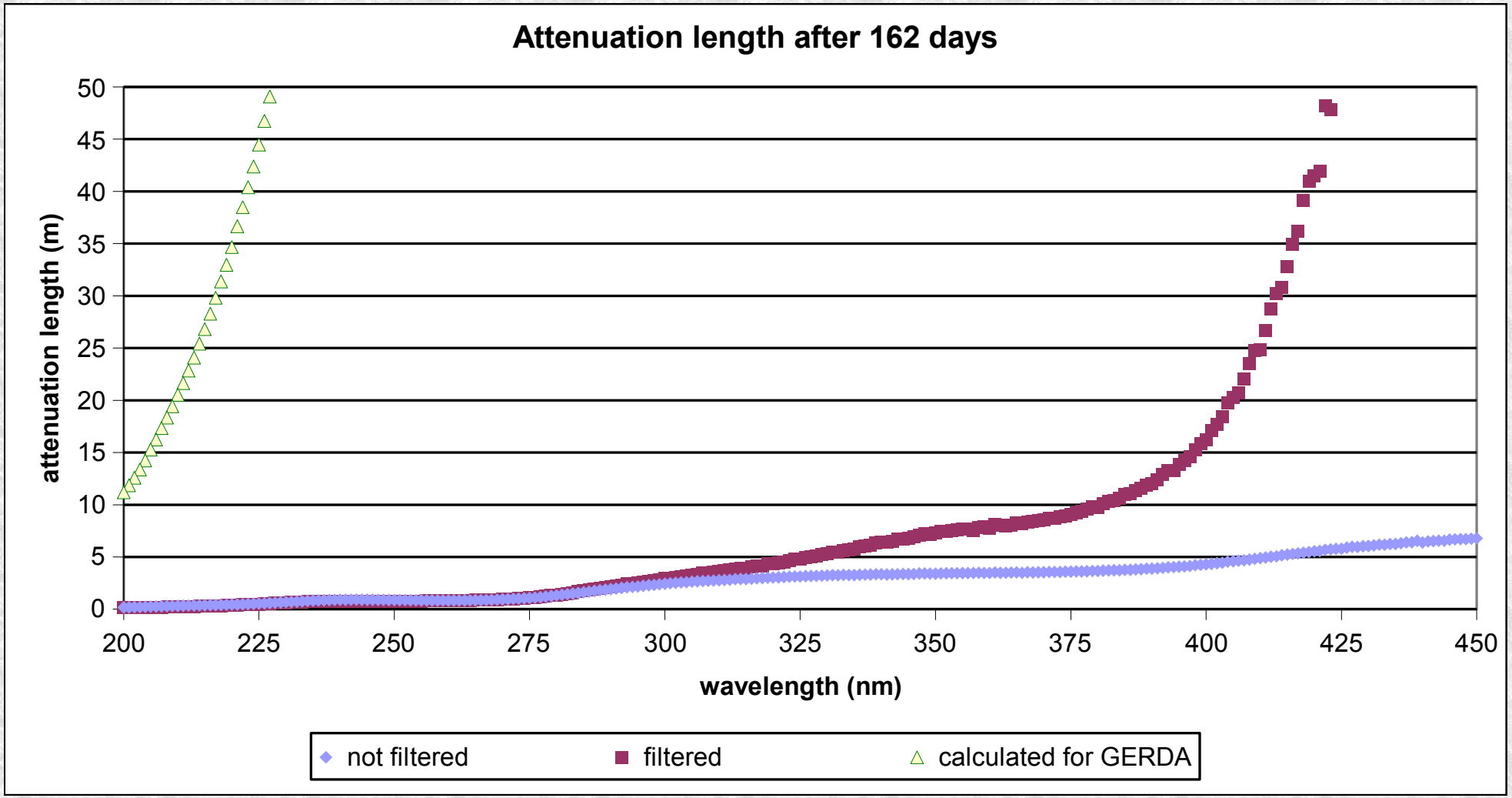
- Not ordered
- Problem: Adhesive on backside of foil
- Tests of solubility in water
  - CHNS analysis from *Euro***EA** at Tübingen:
    - Two samples, one in water, the other continuously heated in water
    - no impurities (carbon, nitrogen, sulphur) in water were detected
    - not enough glue was solved in water to be detected

VM2000 – Absorption



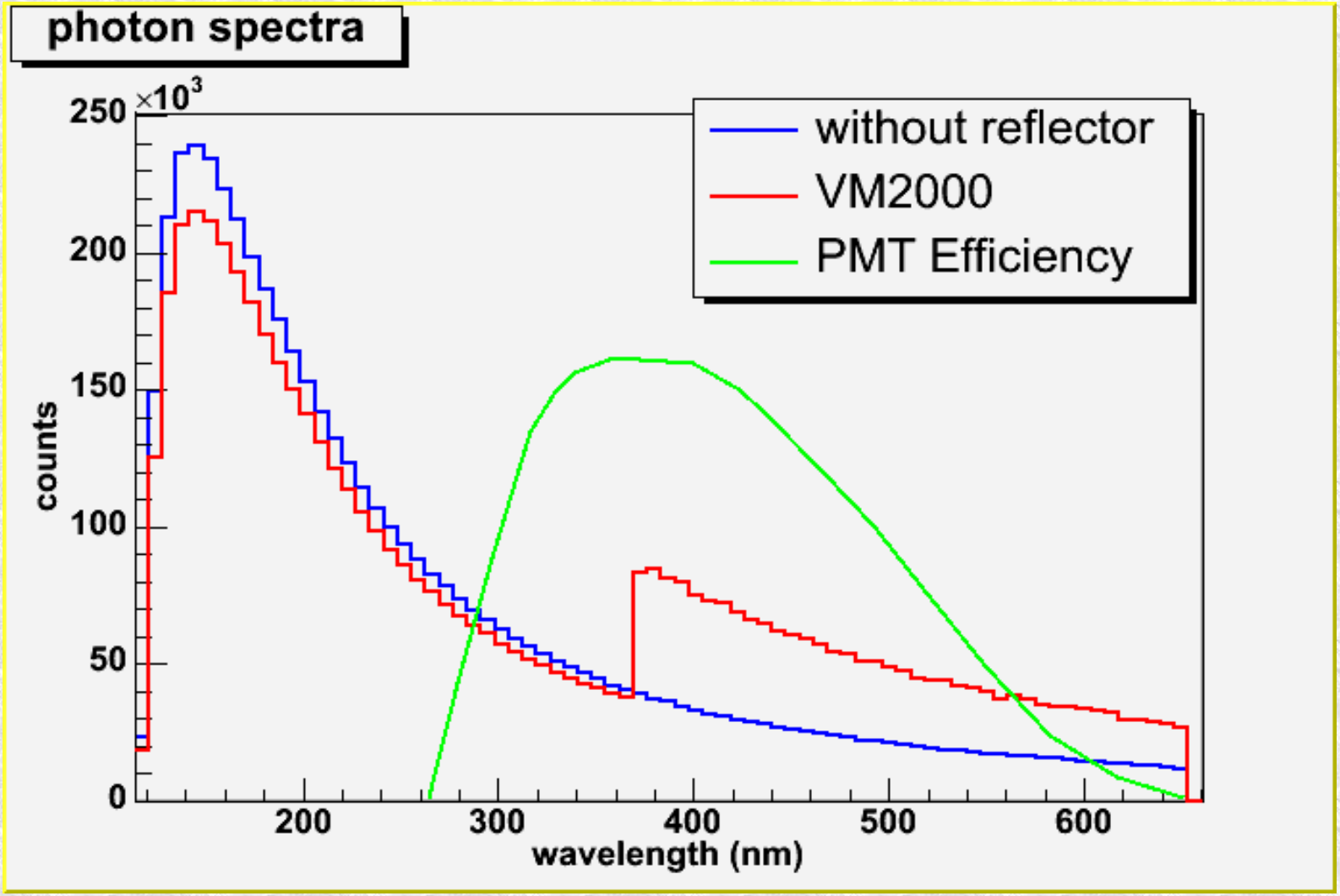
- Measurement from MPIK – Heidelberg -

VM2000 – Attenuation length



- Measurement from MPIK – Heidelberg -

VM2000 - Photon spectra

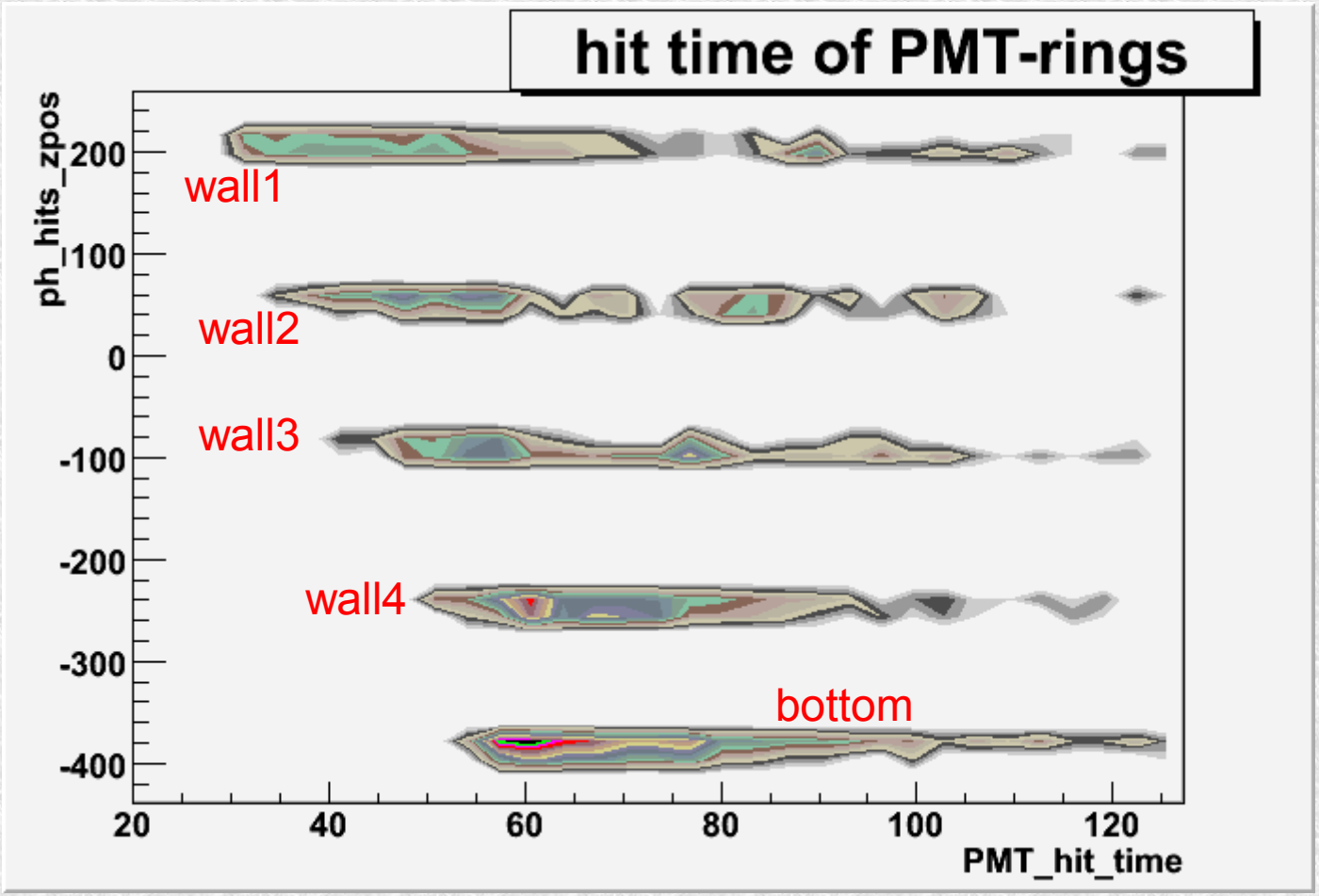


- MaGe Simulation results – Photon Spectra

VM2000

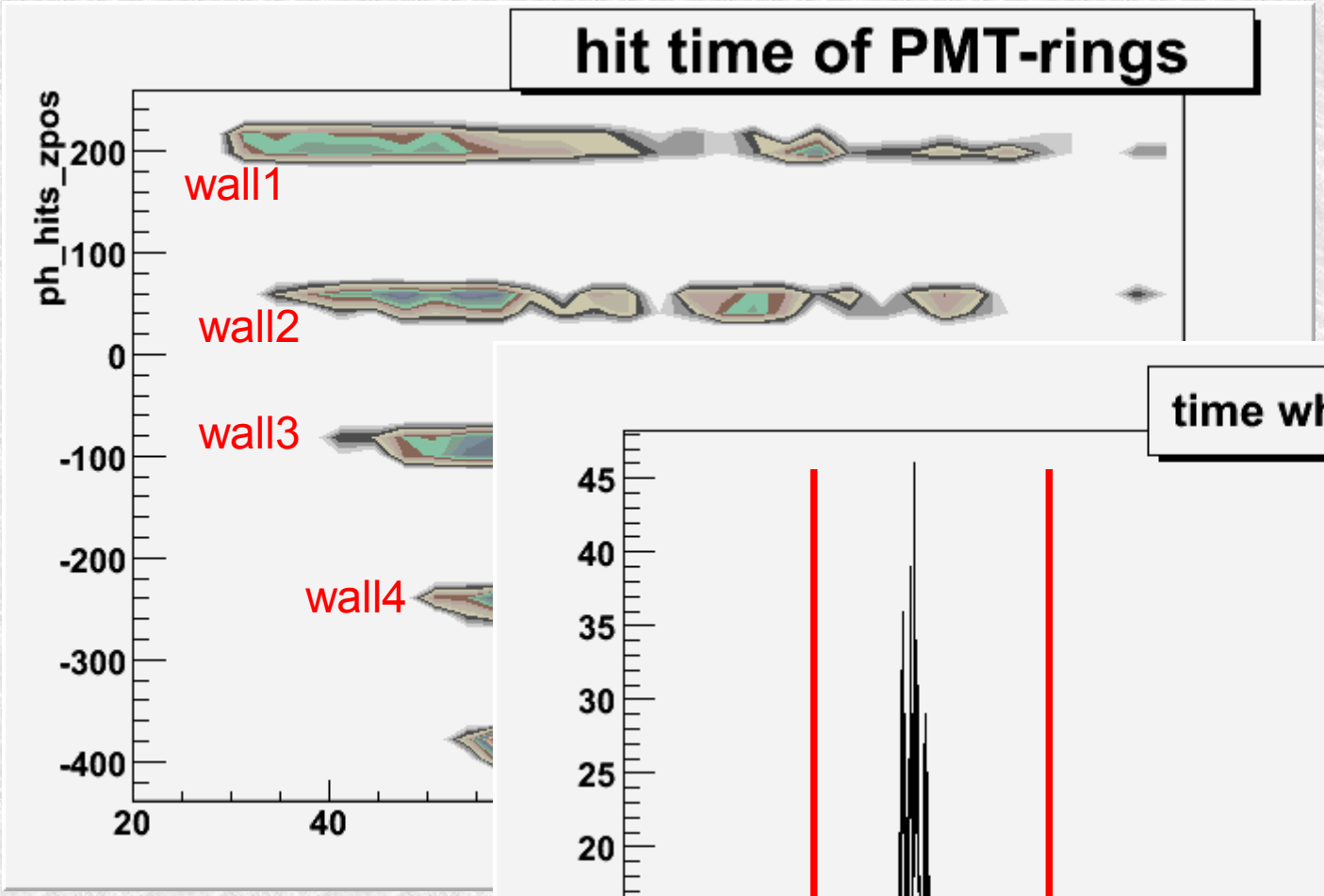
If there are no objections, we will order the reflector foil VM2000 as soon as possible.

Time information



Bottom PMTs register more photons, but later

Time information



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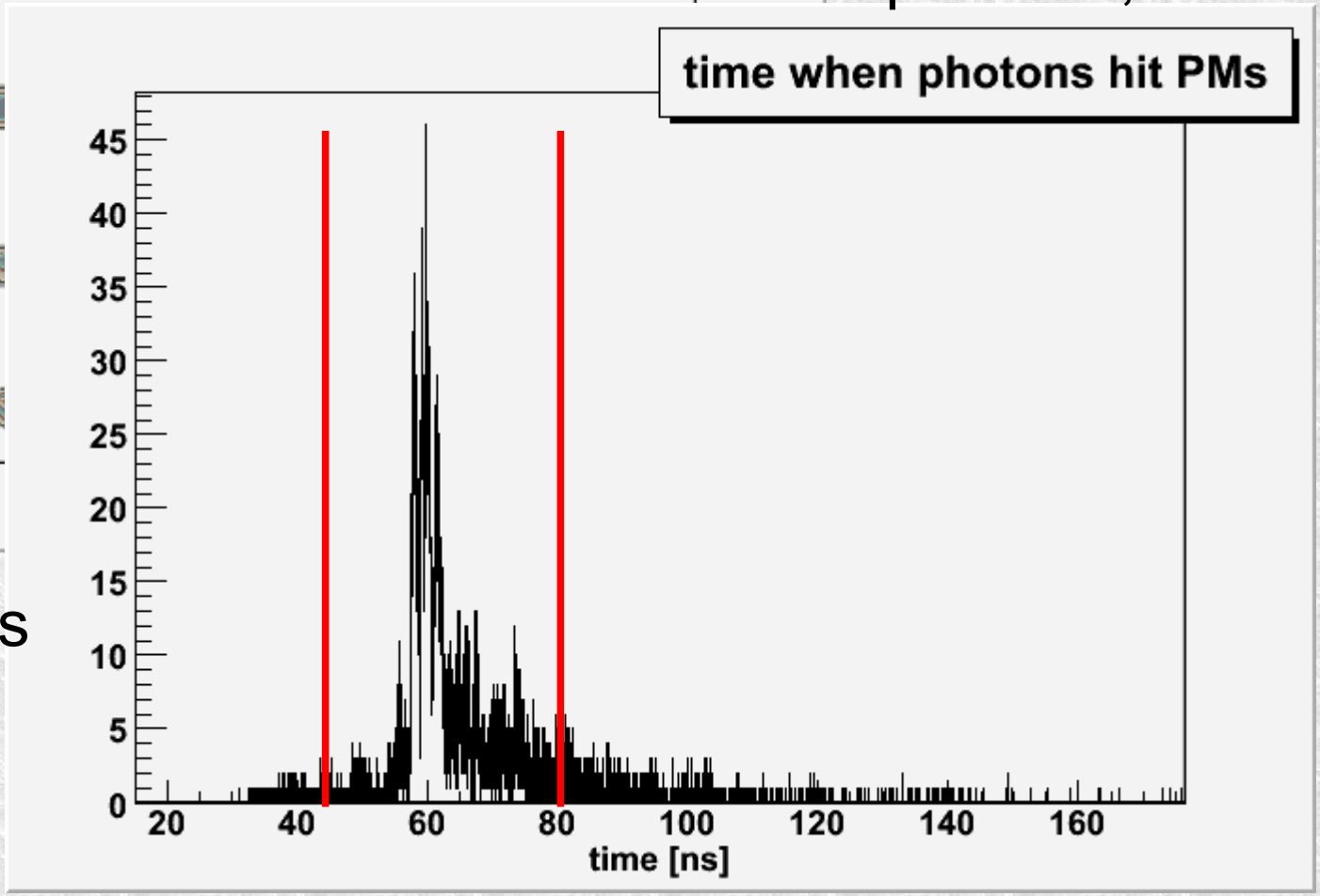

~80 % of photons registered within 40 ns

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%

Cherenkov veto schedule

- Friday: Beginning of mass production
  Tests at Tübingen
- November: Tests of DAQ with panels at Heidelberg.
- February: Production of 80 PMTs finished
- March-September: Tests at Tübingen
- End of September: Delivery to LNGS
- October: Mounting at LNGS

Reports under preparation

- Time structure and randoms of the Cherenkov light (P. Grabmayr, M. Knapp)
- Photomultiplier encapsulation and mounting (P. Grabmayr, J. Jochum, M. Knapp, L. Niedermeier, F. Ritter, B. Lubsandorzhiev)
- VM2000
  (P. Grabmayr, J. Jochum, M. Knapp, L. Niedermeier, F. Ritter, +Heidelberg?)

Thank you