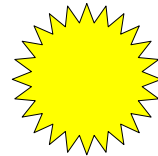
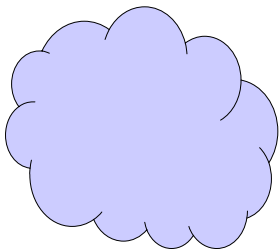


Baikal-Amanda-IceCube

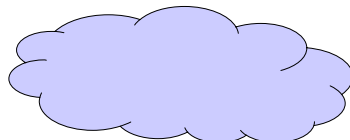
Neutrino-Astronomie in DESY Zeuthen

Christian Spiering, Technisches Seminar, Mai2004

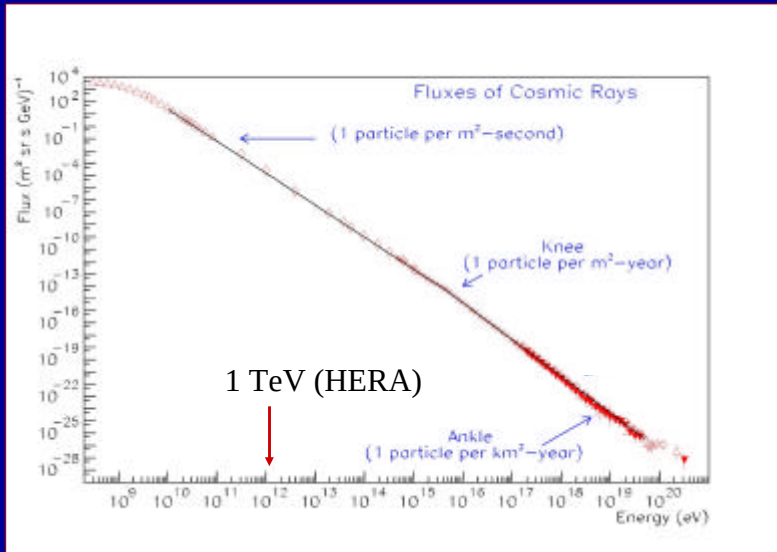
Entdeckung der
Kosmischen Strahlen
1912

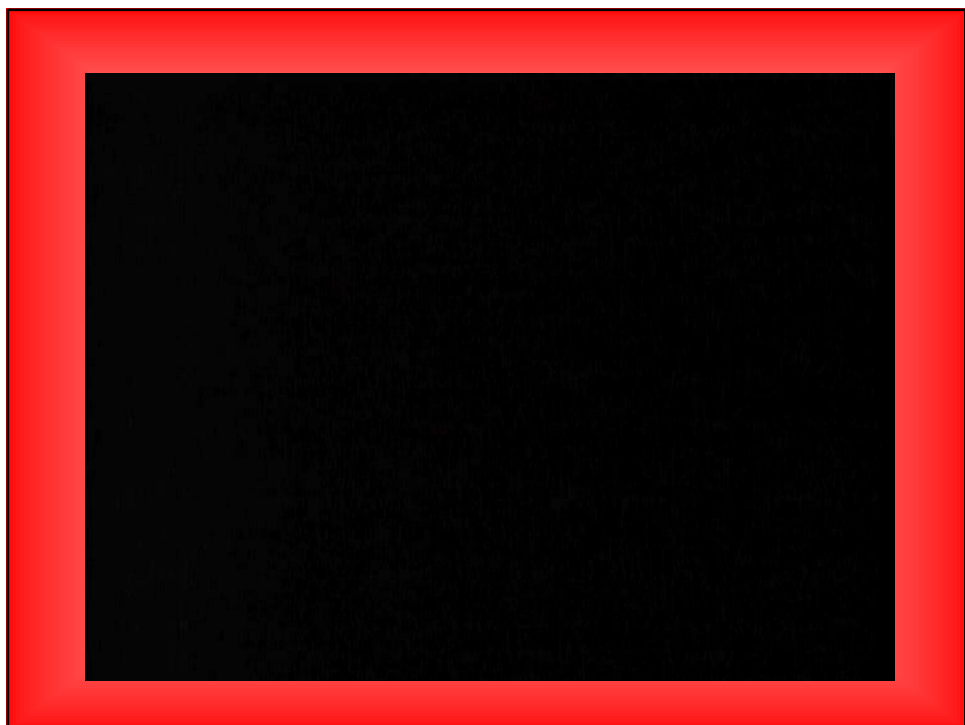
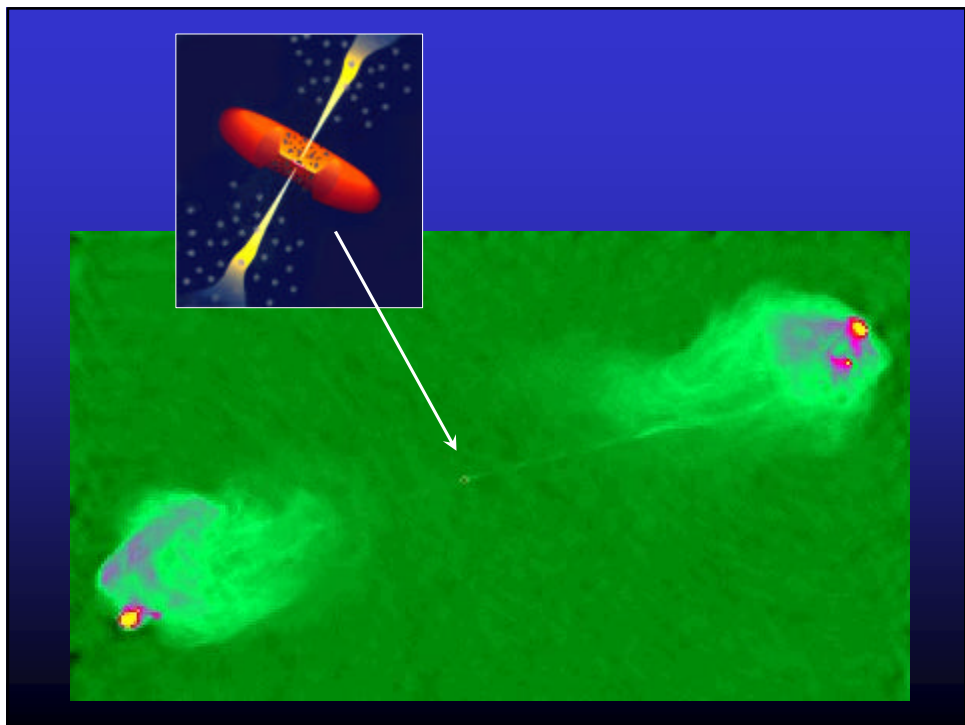


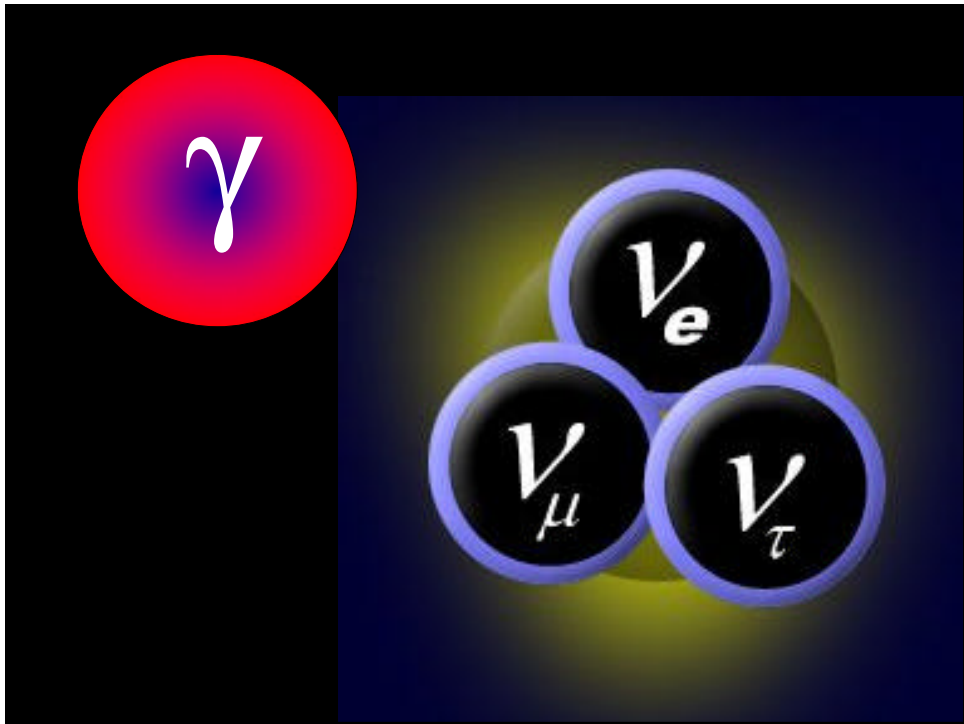
Viktor Hess
(Nobelpreis 1936)



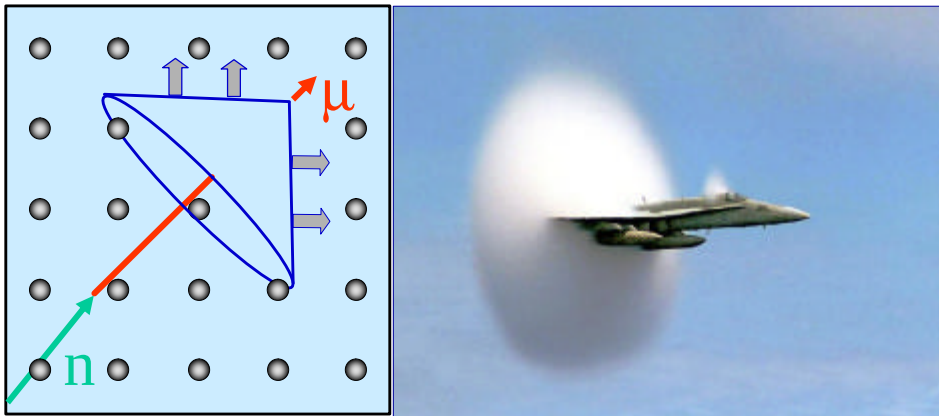
Kosmische Strahlen

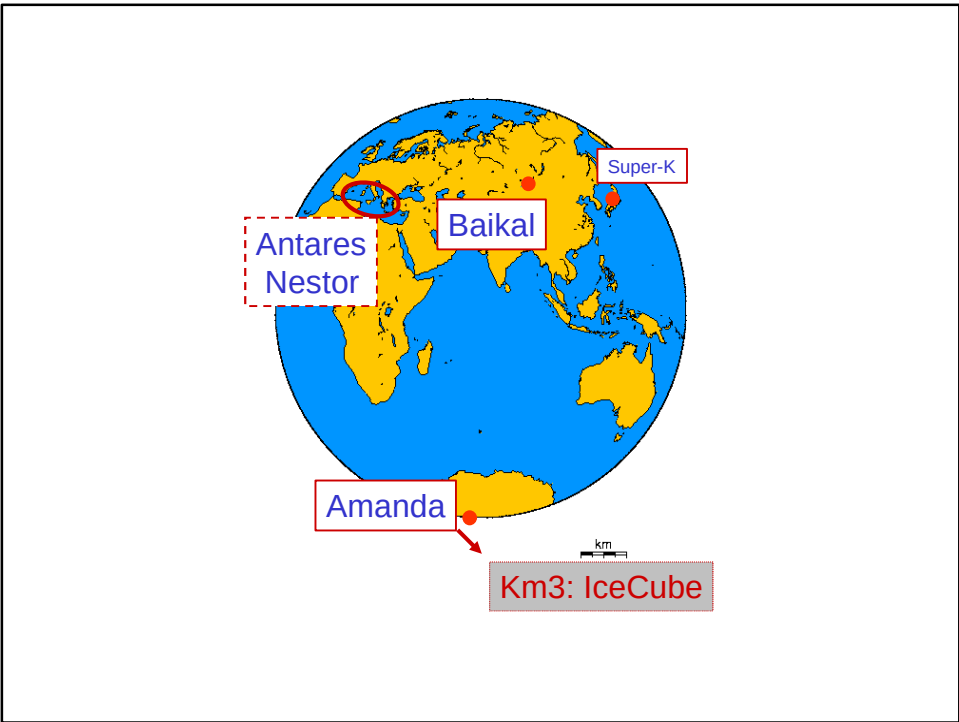
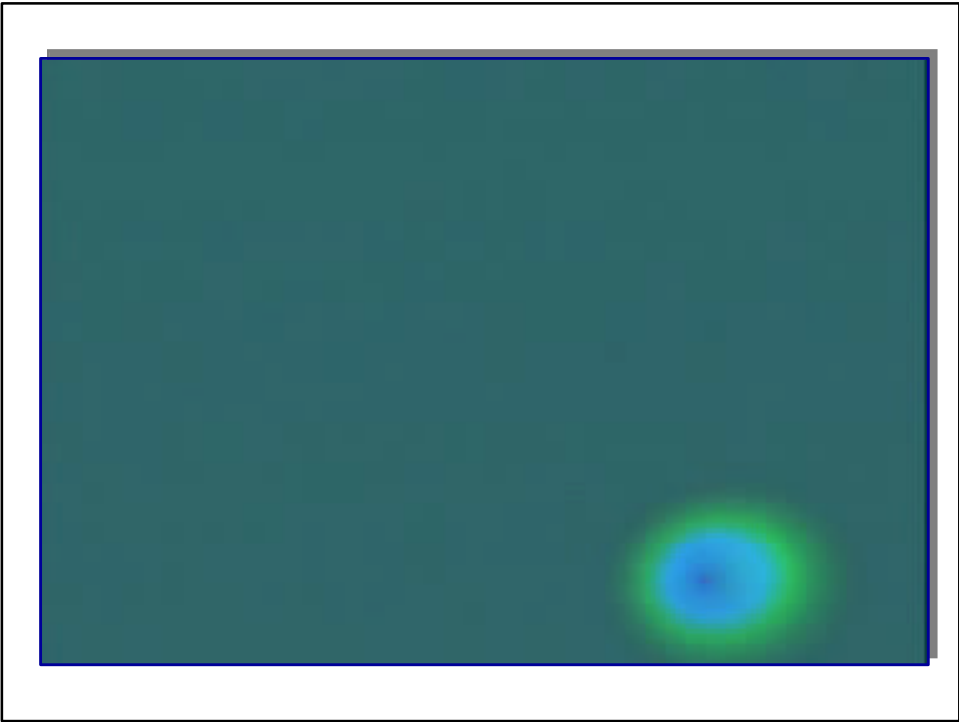




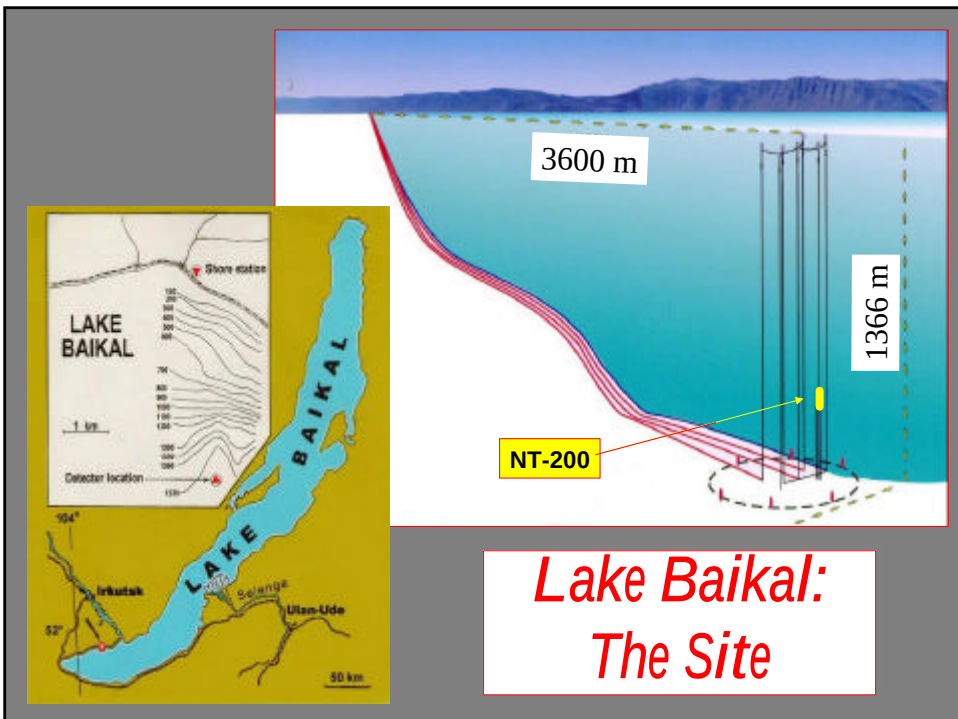


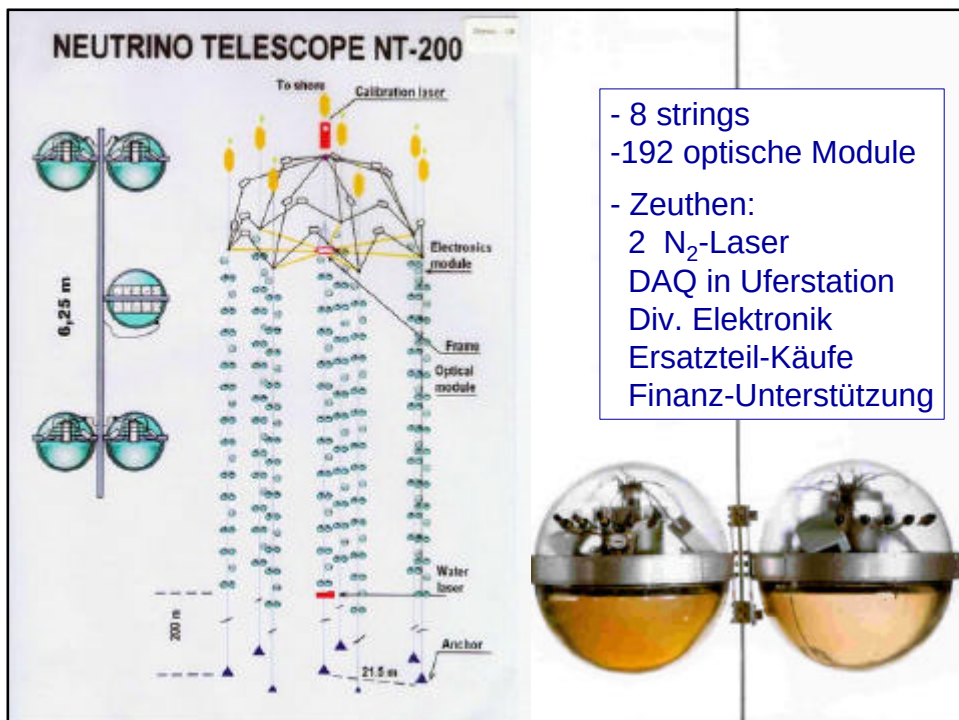
Neutrino-Teleskope in Wasser und Eis





Das Baikal Experiment

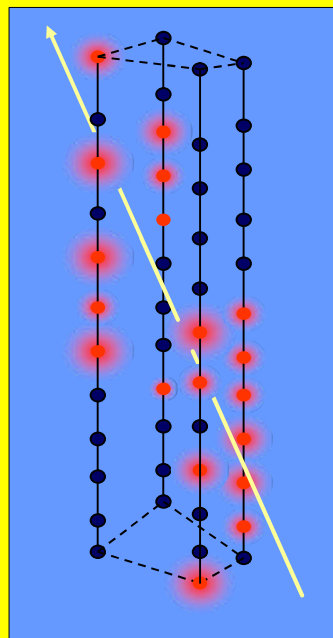


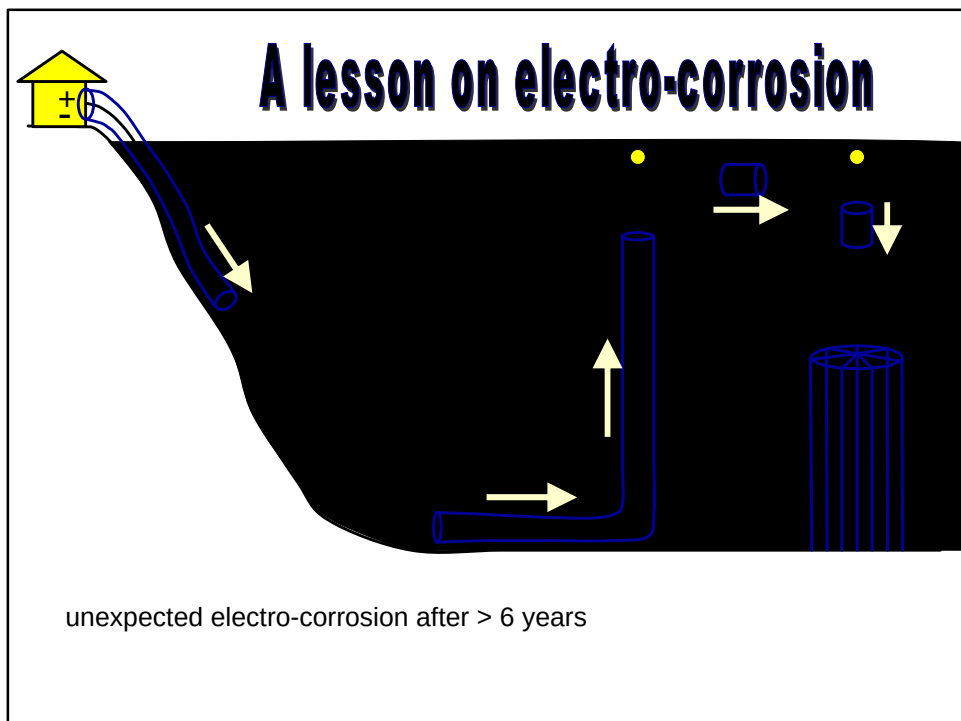
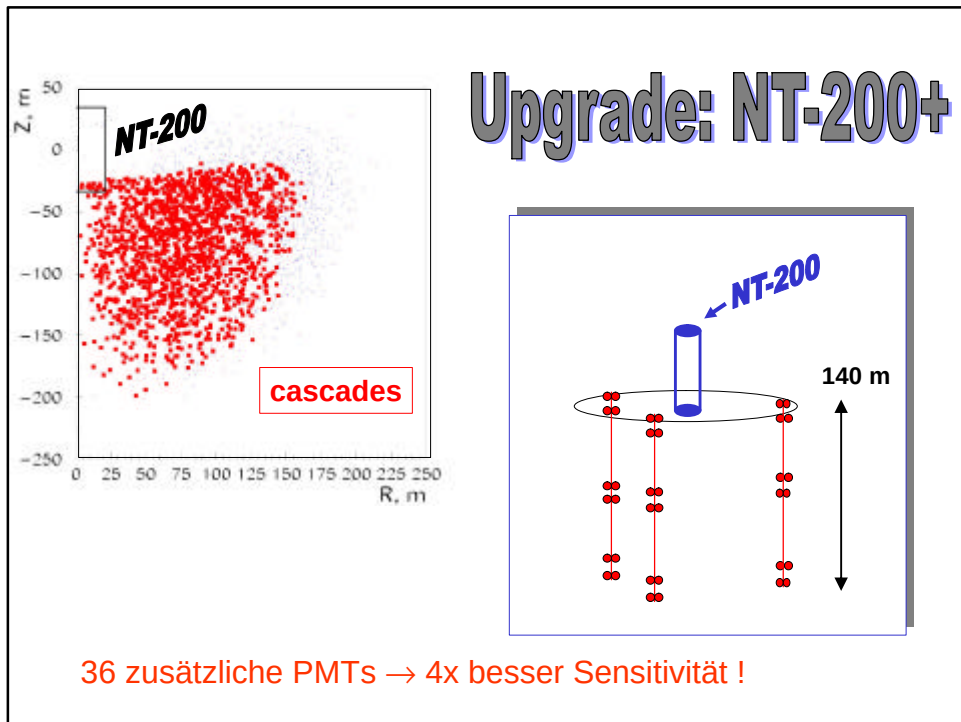


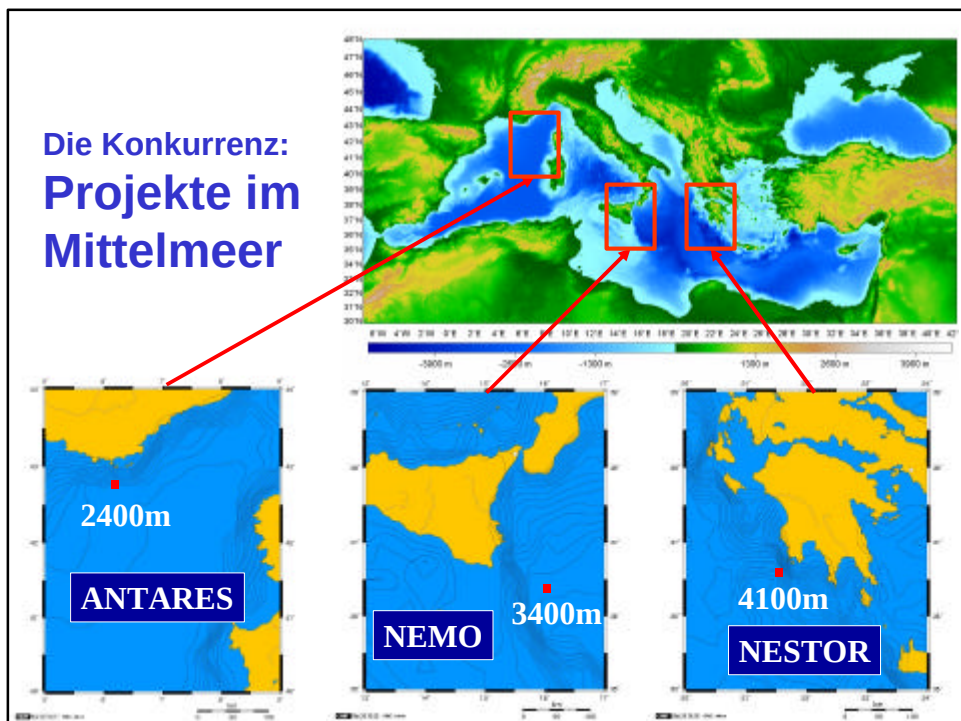
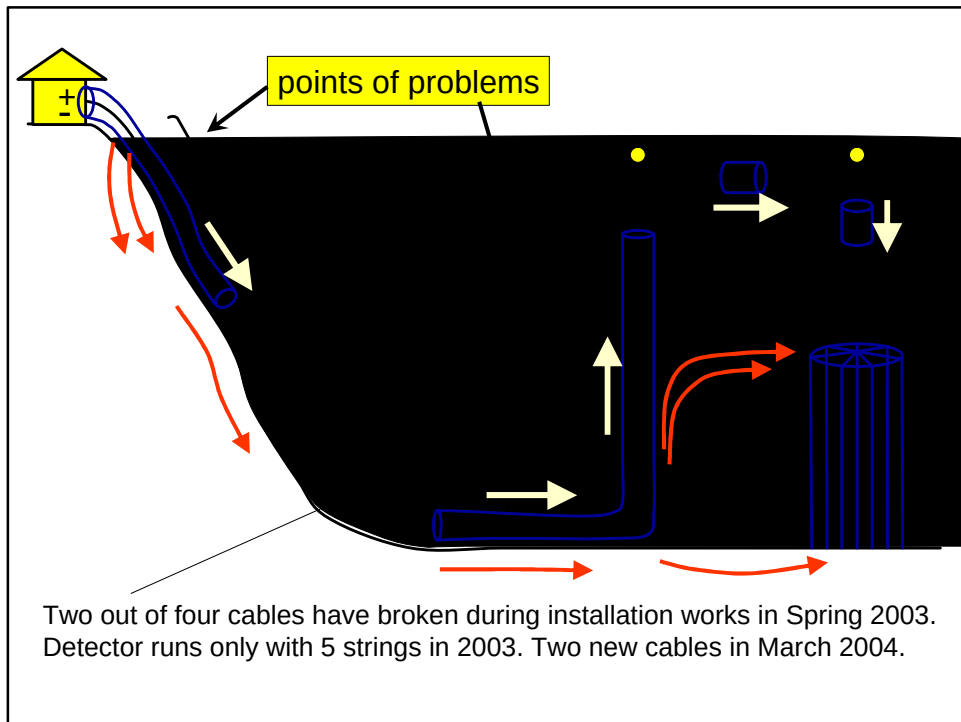


**Wasserdicht:
~ 900 Stecker ohne Leck !!!**

Eines der ersten
Neutrino-Ereignisse,
die mit dem
Baikal-Teleskop
registriert wurden.
(1996)

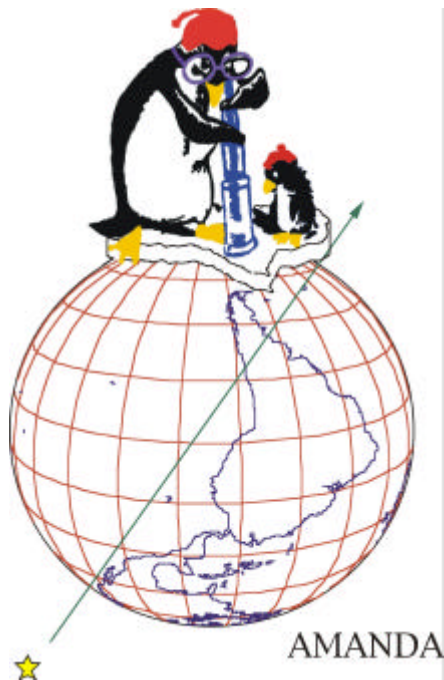
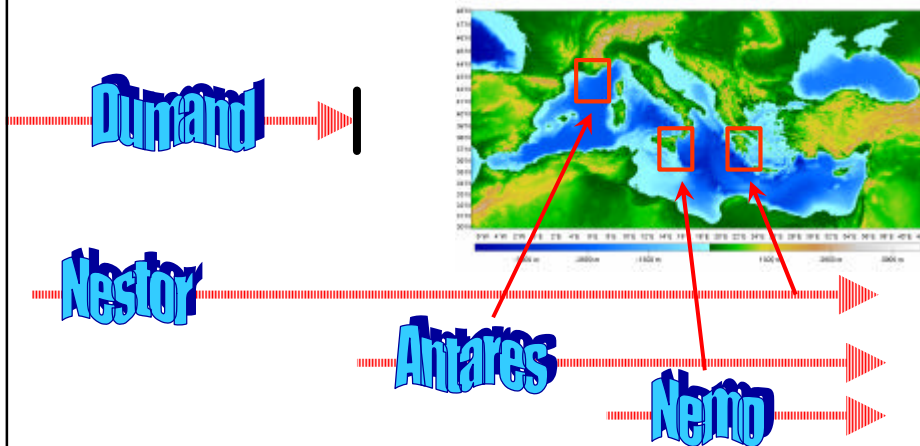


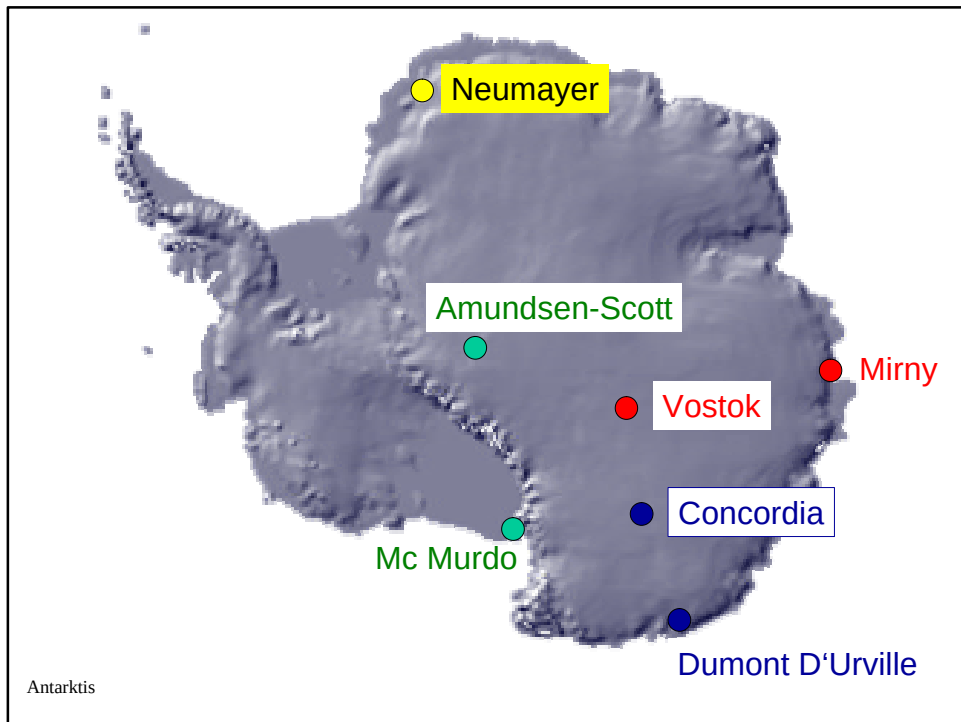


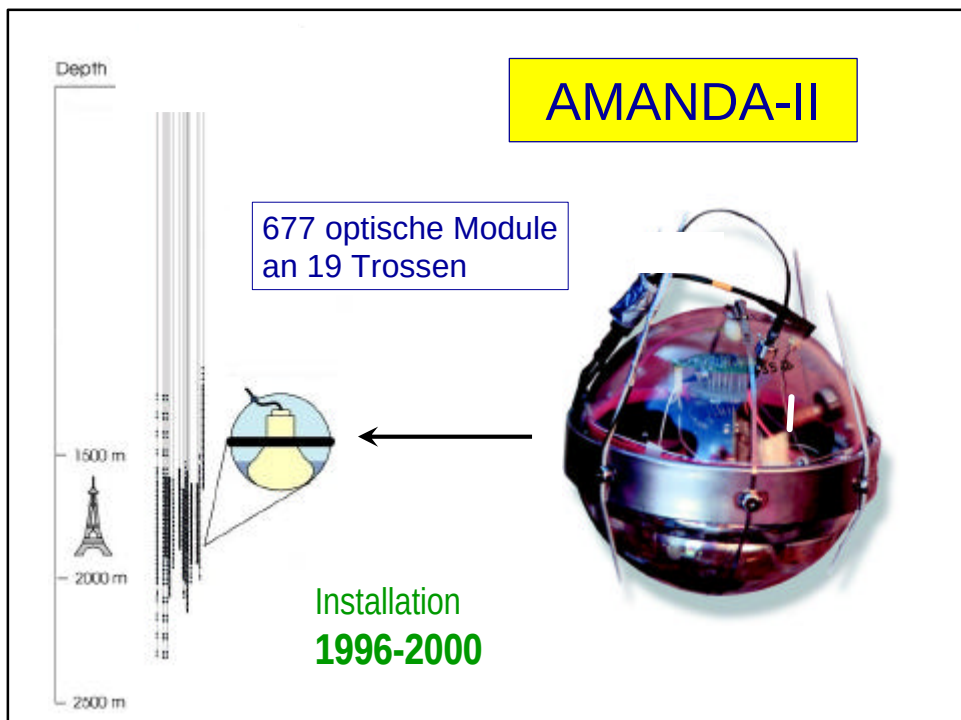


Neutrinoskope im Meer

~~91 92 93 94 95 96 97 98 99 00 01 02 03 04~~





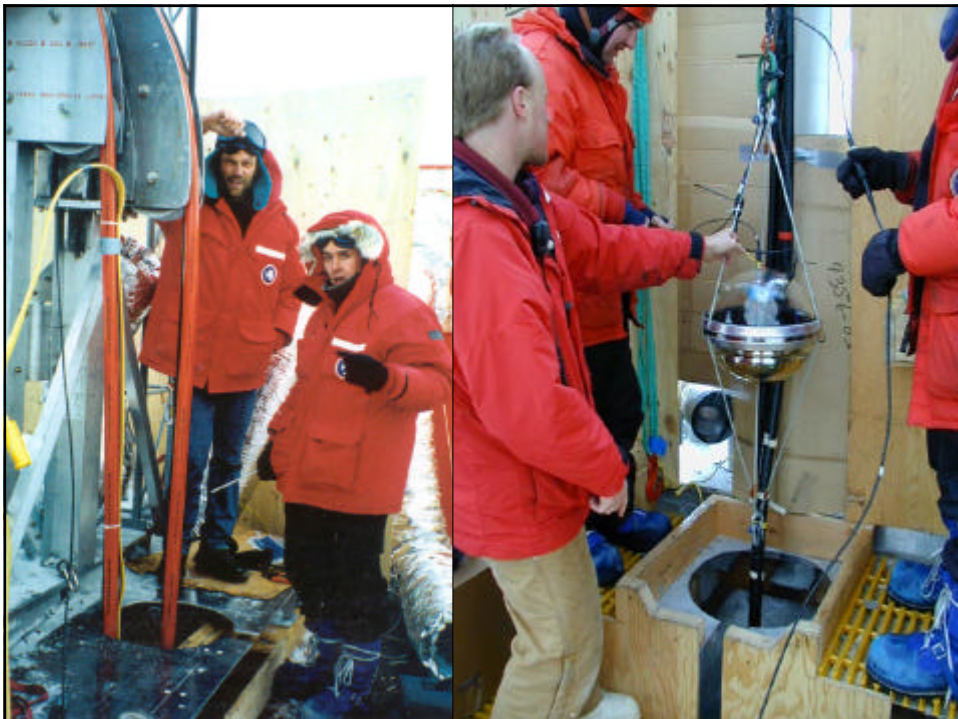
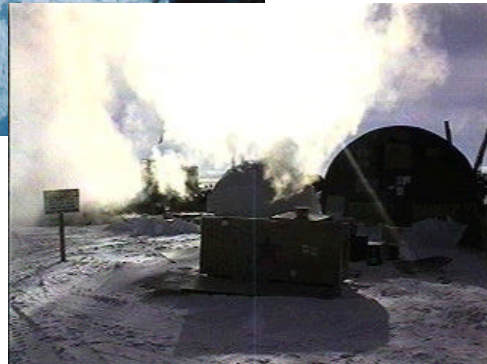




Hot water drilling

2 MW power
3-4 days / 2 km

60 cm hole



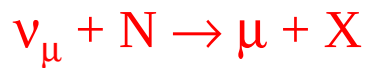
The Counting House



AMANDA Event Signatures: Muons

CC muon neutrino
interaction

→ **track**



Color display: LE Primary Channel



Star display: ADC



Star display: L in



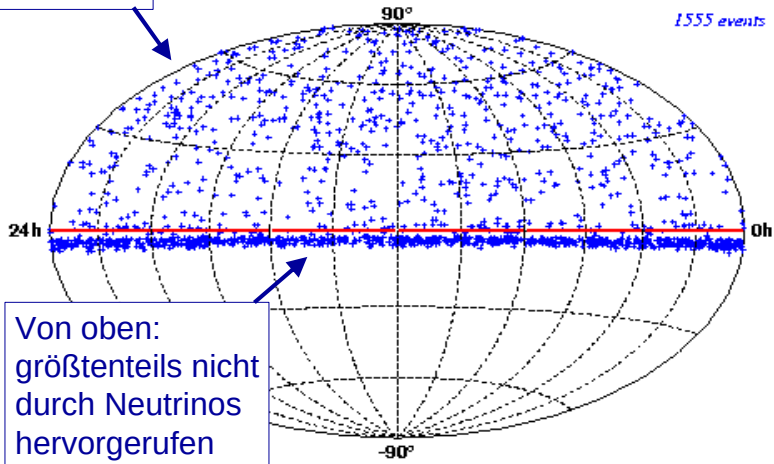
No external geometry file is opened.
Detector: amanda-b-10, 10strings, 303 modules
Data file: /home/tobias/amanda_eventdata/19.01k
File contains 19 events
Displaying data event: 1 197900 time: 19.01k
Recorded yyyy: 1997/285
181320001381 seconds past midnight
Before cut: 44 hits, 44 CMs
After cut: 44 hits, 44 CMs
AS120000

x y z
Vertex pos: 17.4 -16.1 6.8 m
Direction: 0.03970 0.41614 0.90544
Length: 7.7 m
Energy: 7.9 GeV
Time: 3320, 100000 ns
Zenith: 1.55 3°
Azimuth: 264.6°

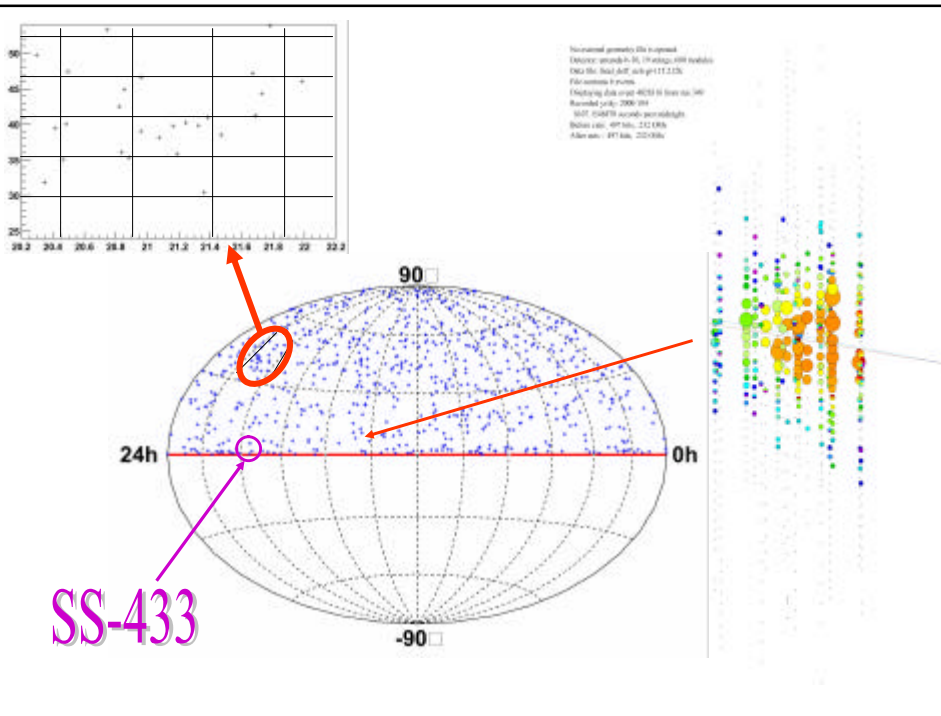


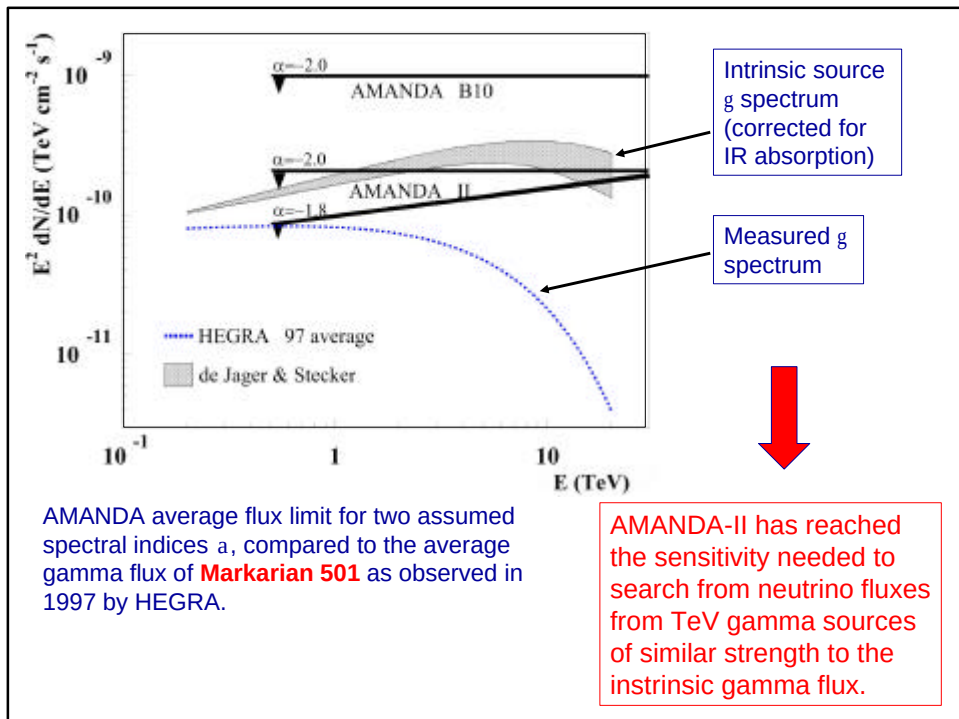
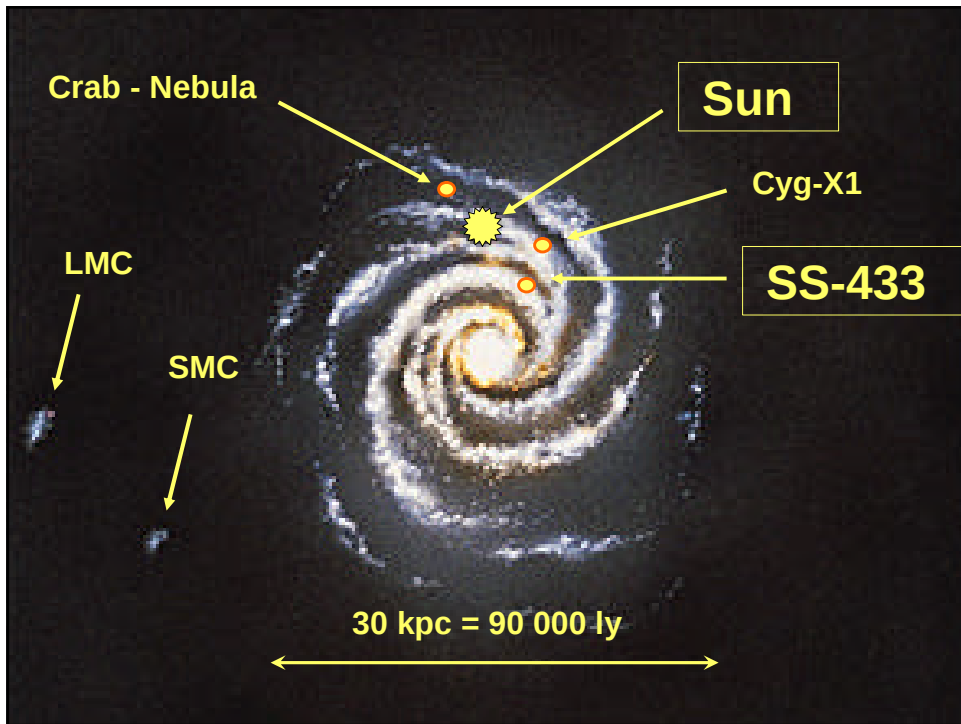
Himmelskarte Amanda-II, 2000

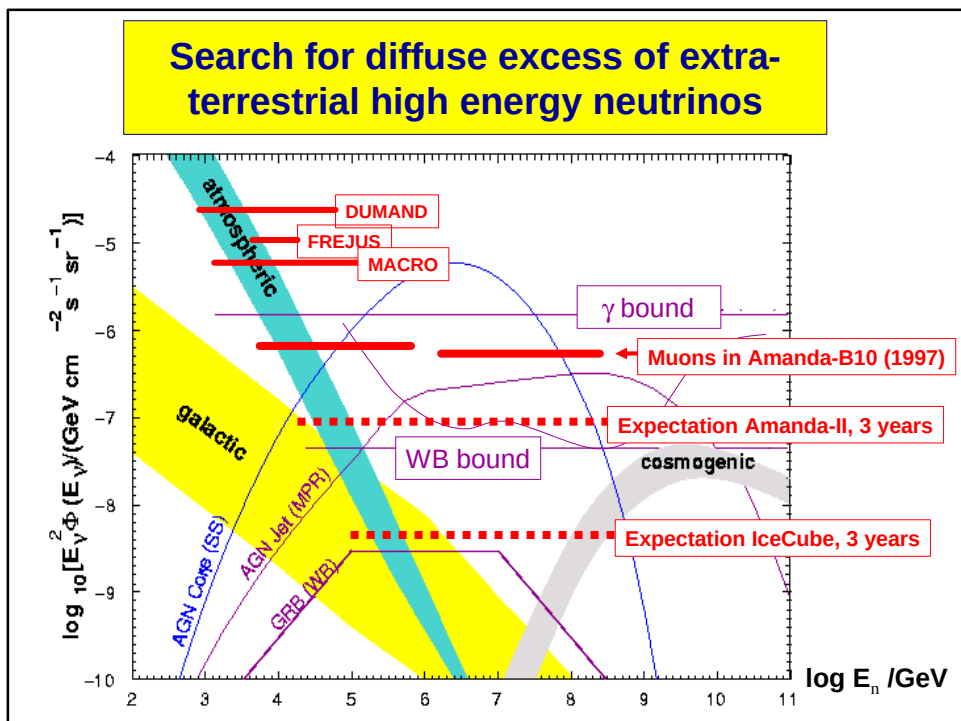
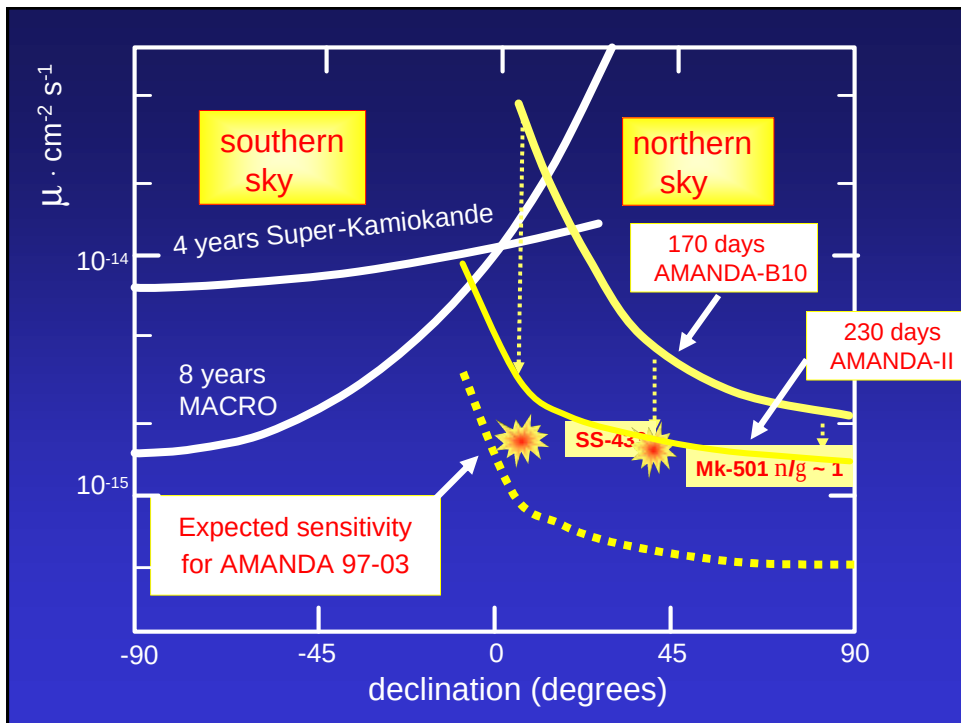
697 Spuren
von unten



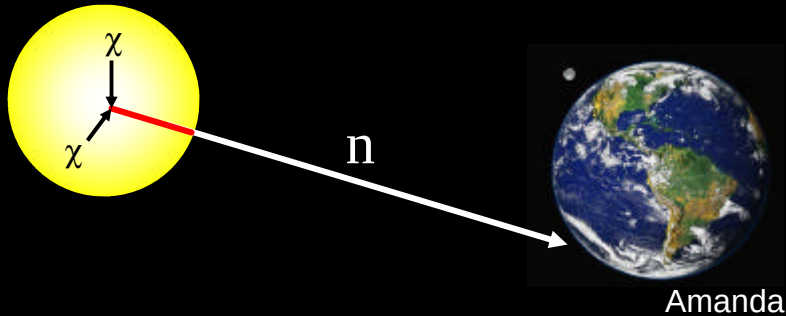
Von oben:
größtenteils nicht
durch Neutrinos
hervorgerufen







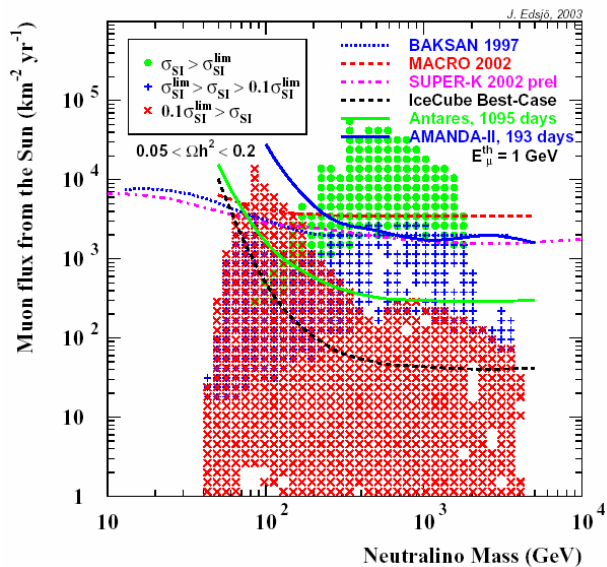
Suche nach dunkler Materie (χ)

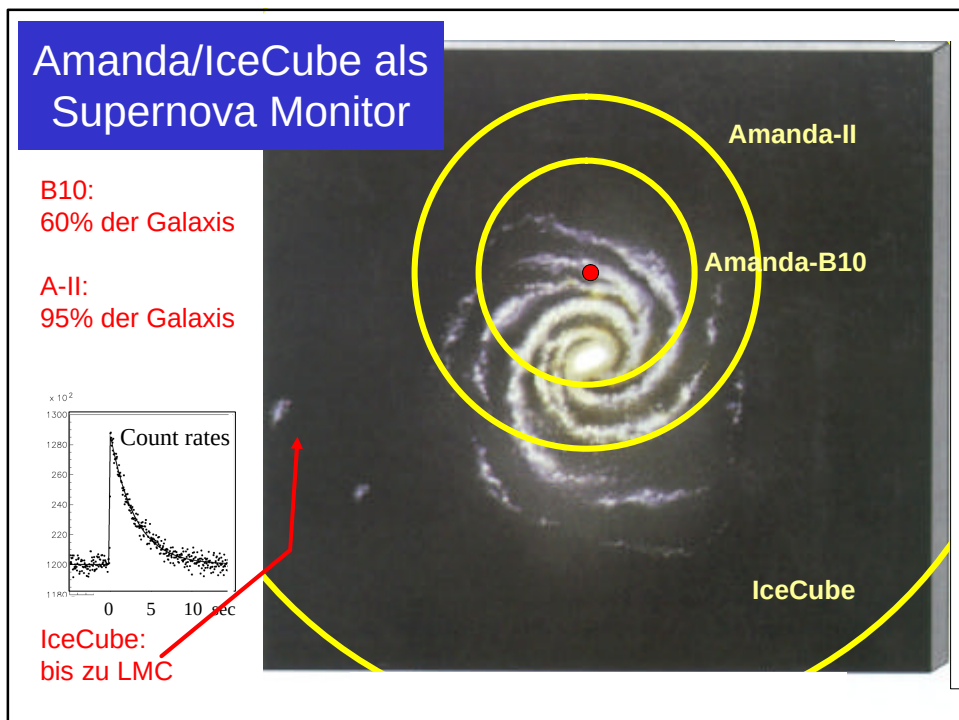
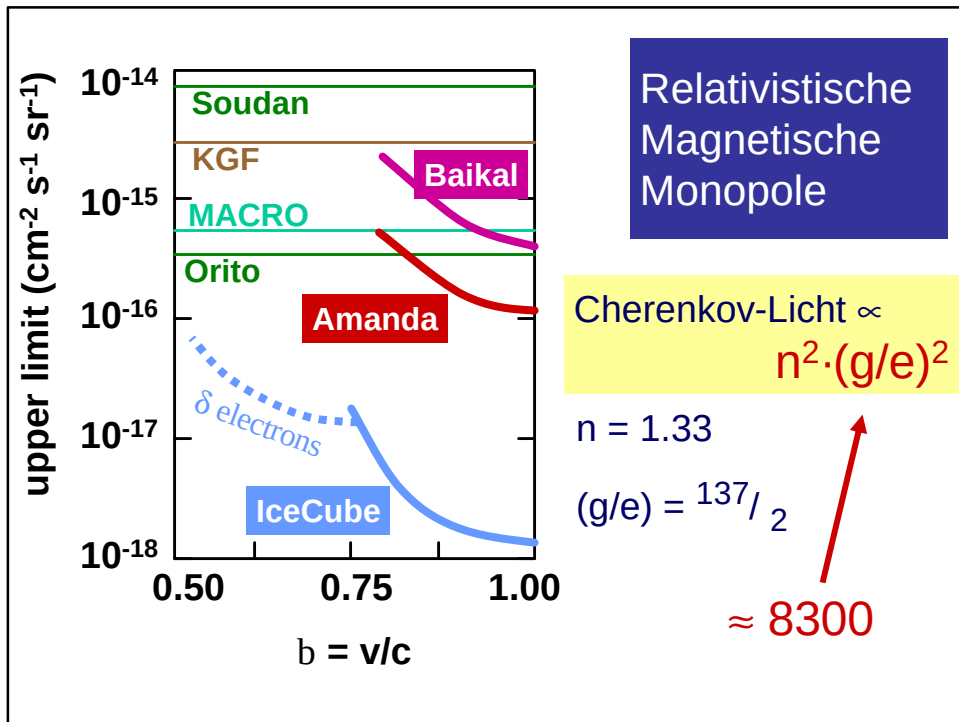


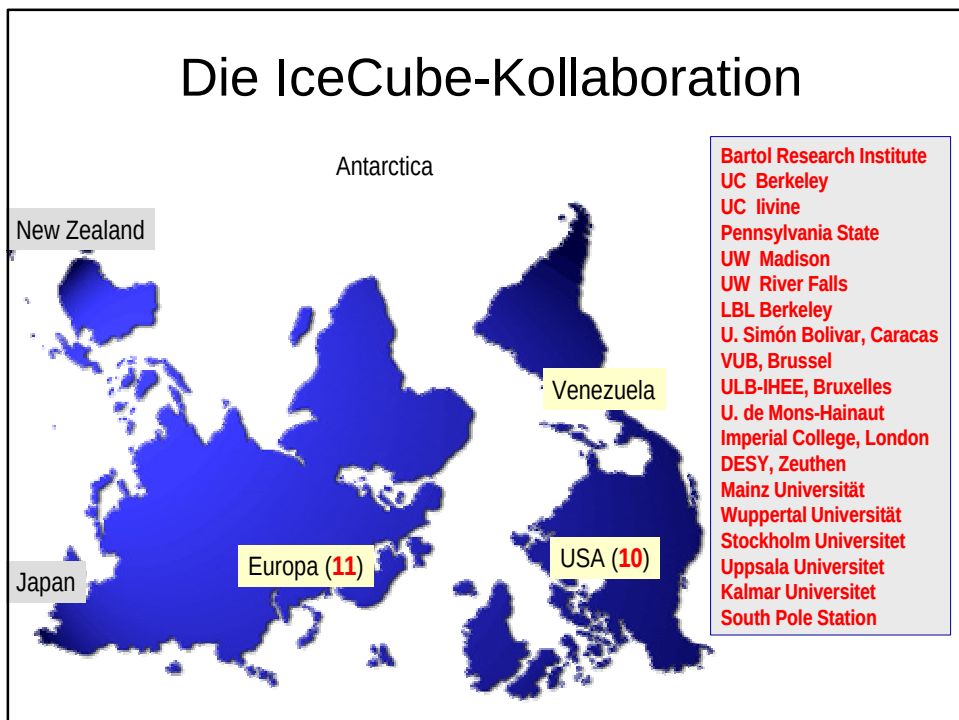
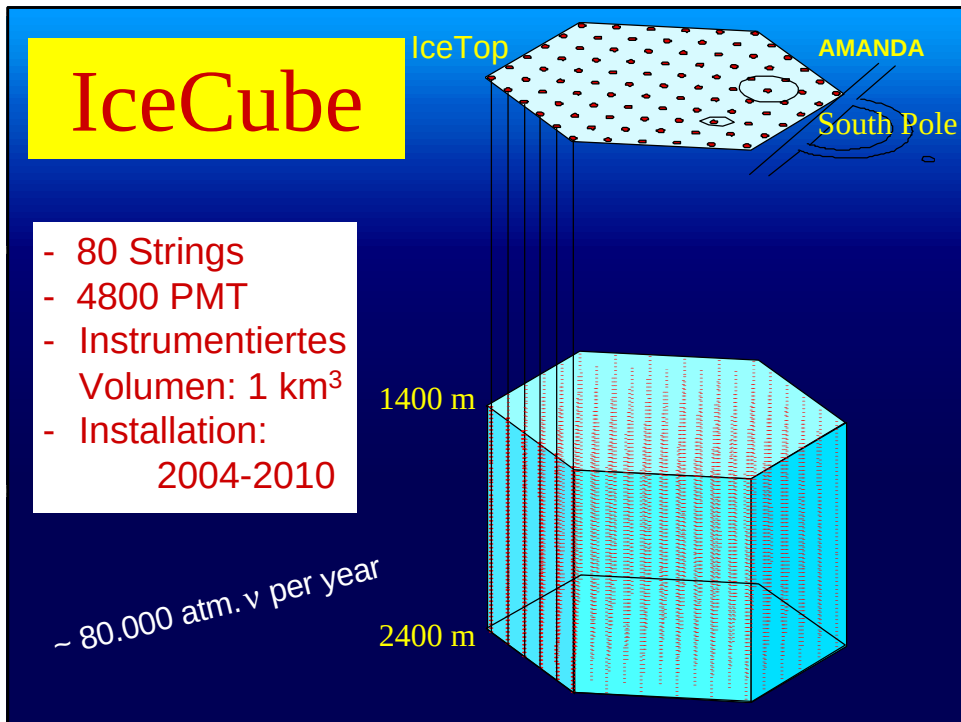
Suche nach einem Überschuss von Neutrinos aus der gegenseitigen Vernichtung von Teilchen der dunklen Materie, die vom Schwerefeld der Sonne eingefangen wurden.

Upper limits on muon flux from neutralino annihilations in center of Sun

ANTARES und
ICECUBE:
Erwartung aus
Monte-Carlo
Simulationen





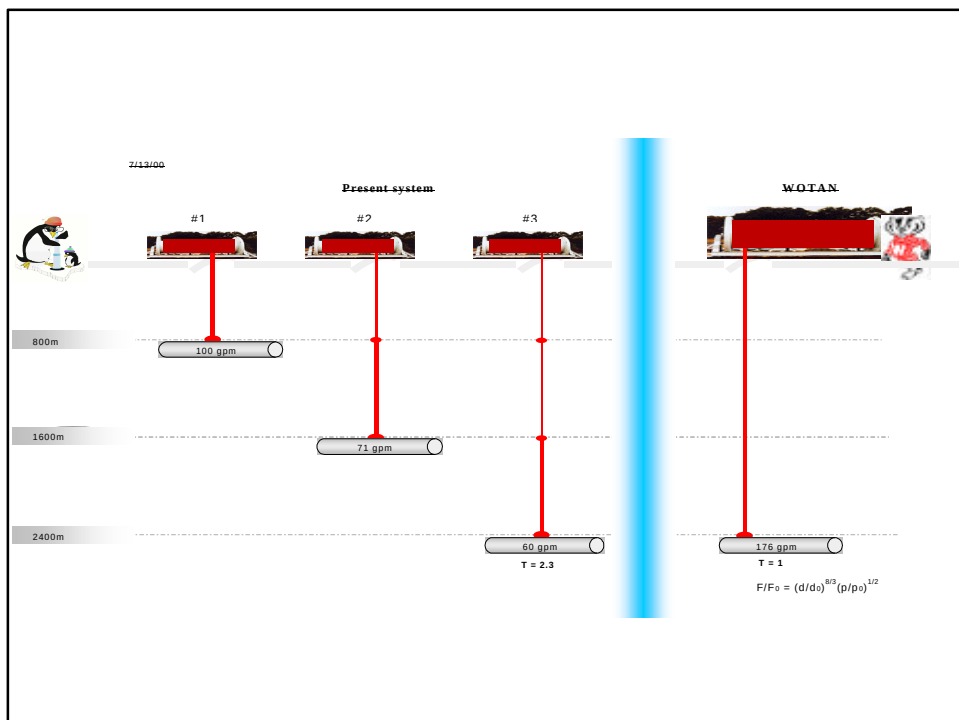


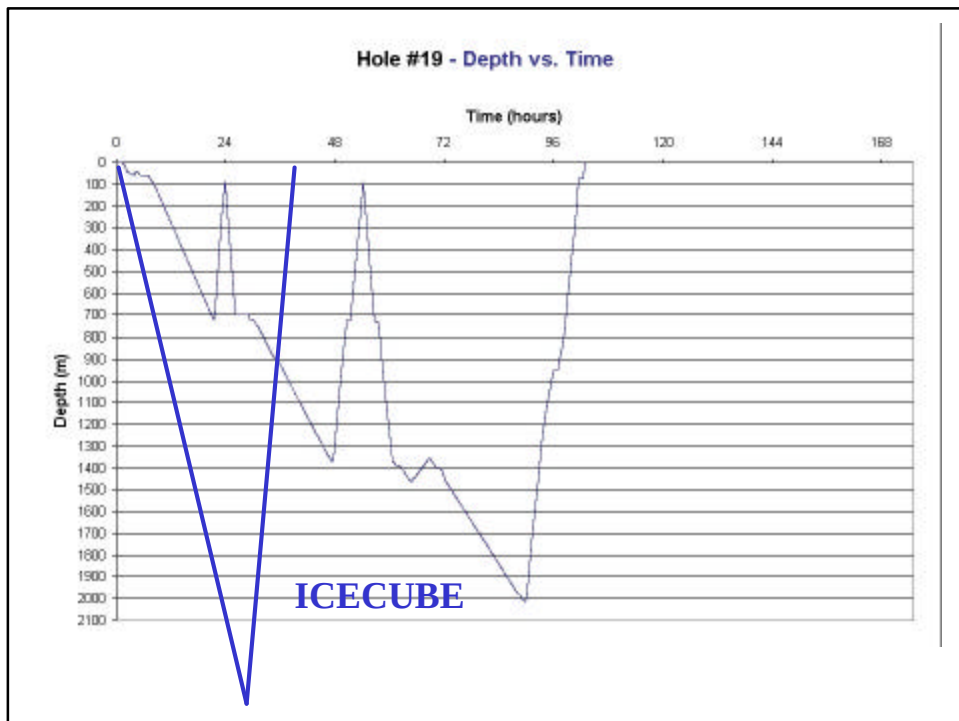
Bohren: von Amanda zu IceCube

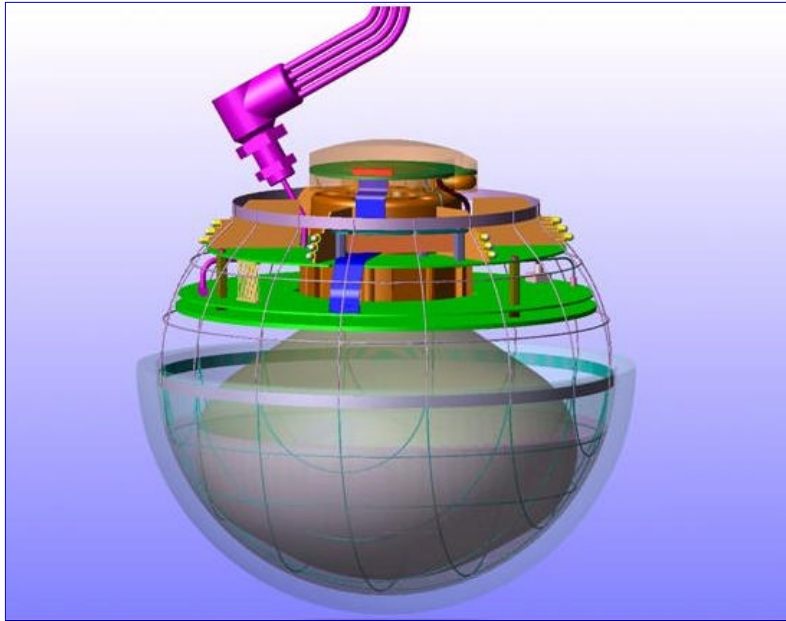
Amanda

IceCube

Heat (surface)	2 MW	5 MW
Time to 2400 m	120-140 hours	35-40 hours
Fuel (gal/hole)	10,000 - 12,000	7,000 - 8,000
Set-up Time	5-6 weeks	18-25 days

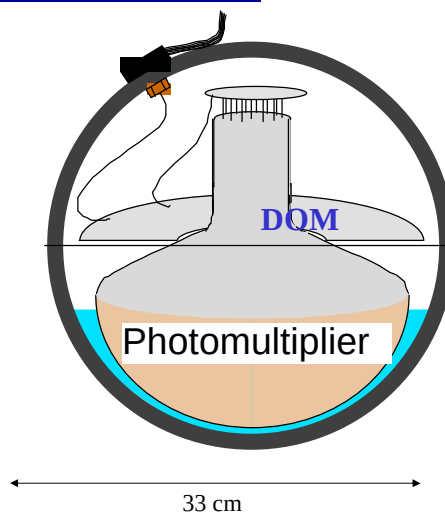


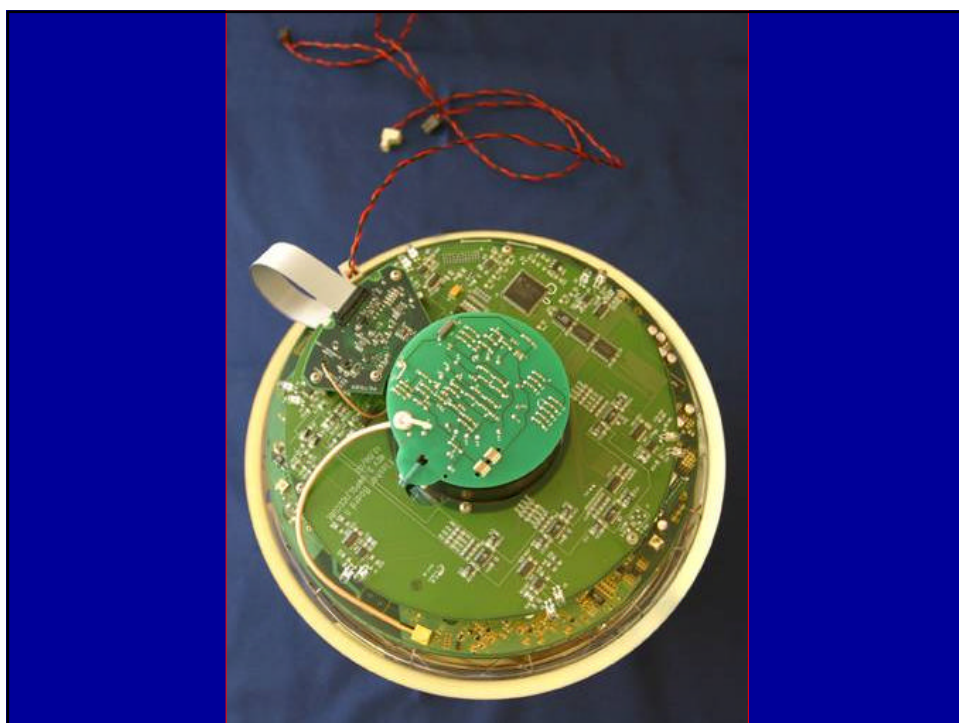
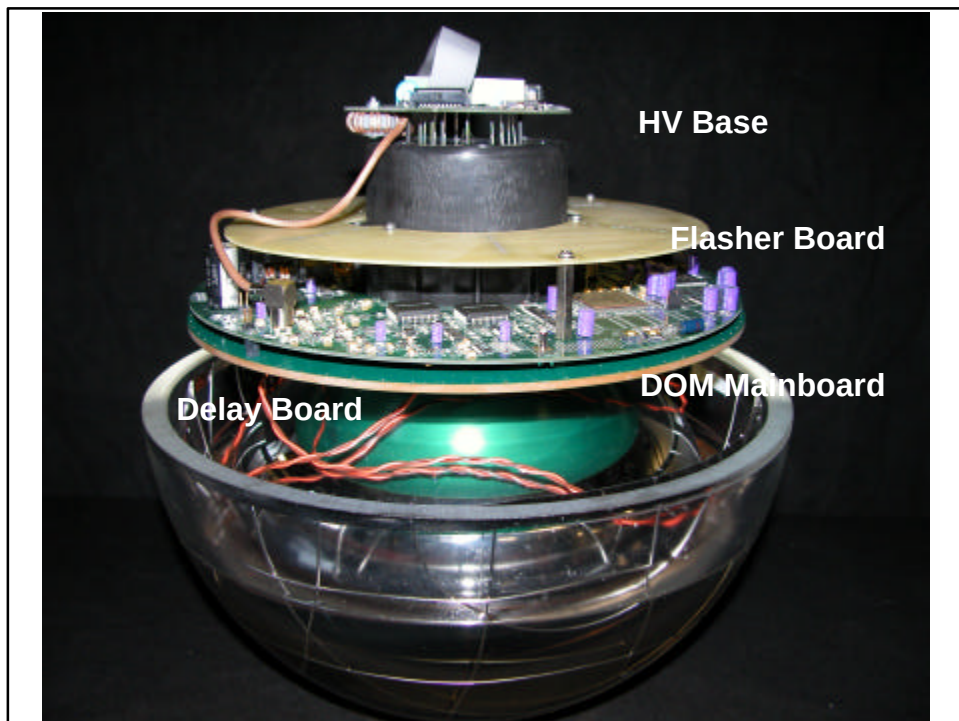


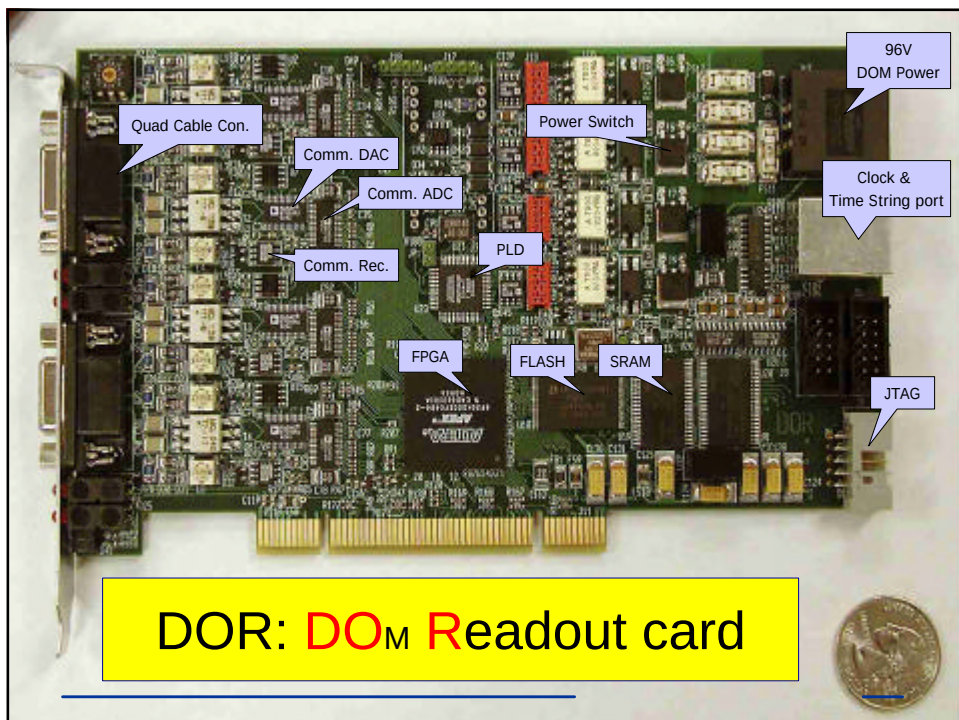


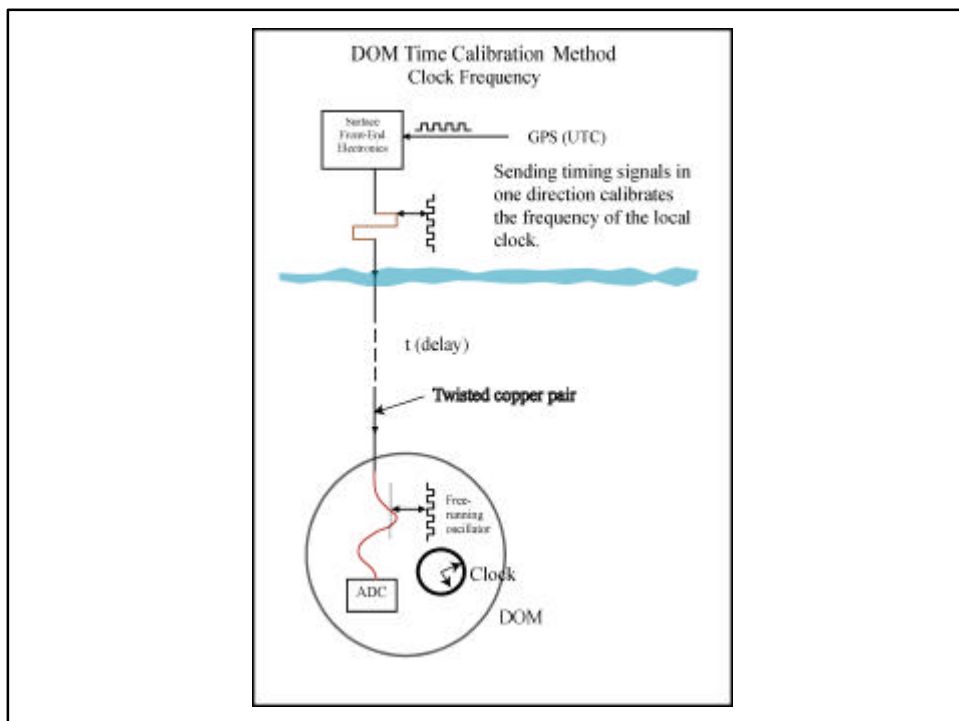
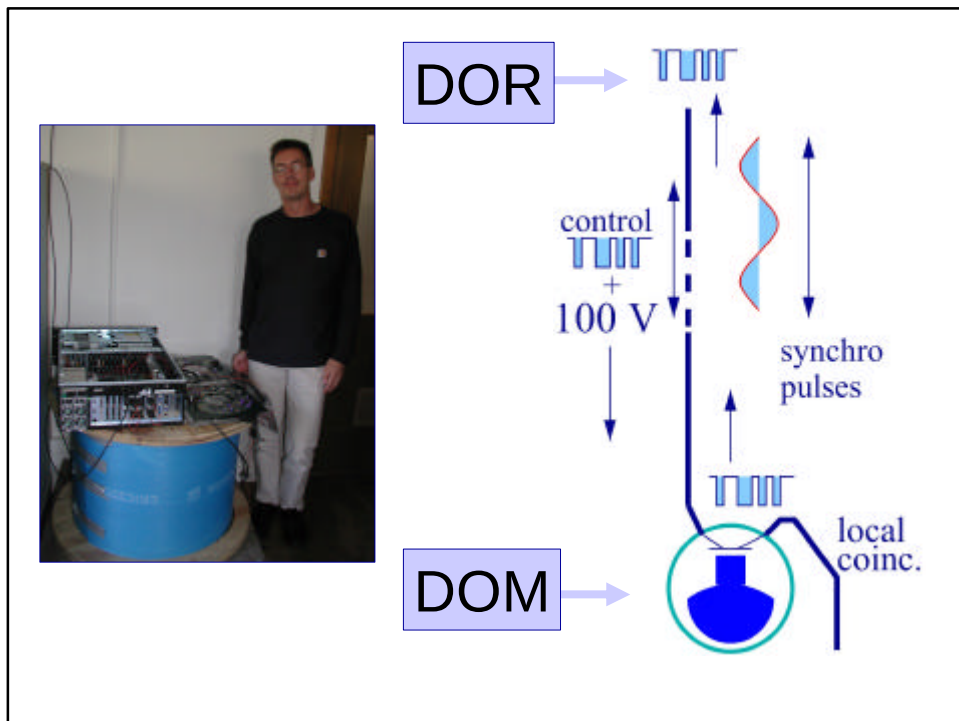
Digital Optical Module - (DOM)

- Captures waveforms with
 - 250 MHz first 500 ns
 - 40 MHz over 5000 ns
- Time-stamps each pulse
 - r.m.s. < 5 nsec
- Dynamic range
 - 200 PE over 15 ns
 - 2000 PE over 5000 ns
- Dead time < 1 %
- Noise rate < 500 Hz







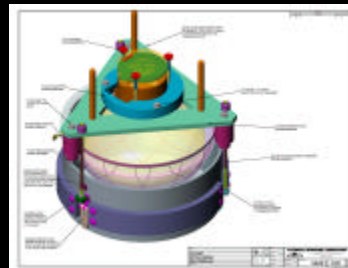


Produktion optischer Module in Zeuthen



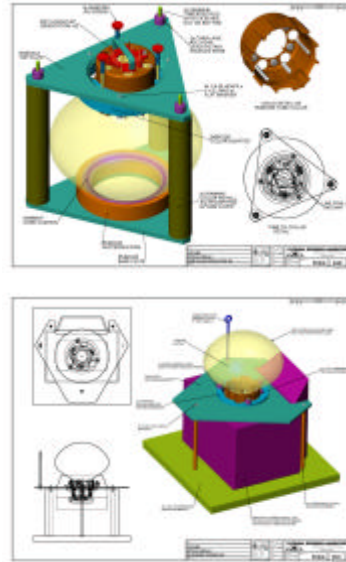
Room 1:

preparation of components
cleaning
pouring



Room 2:

assembly
integration
functionality test



1st Produktion

End of February:

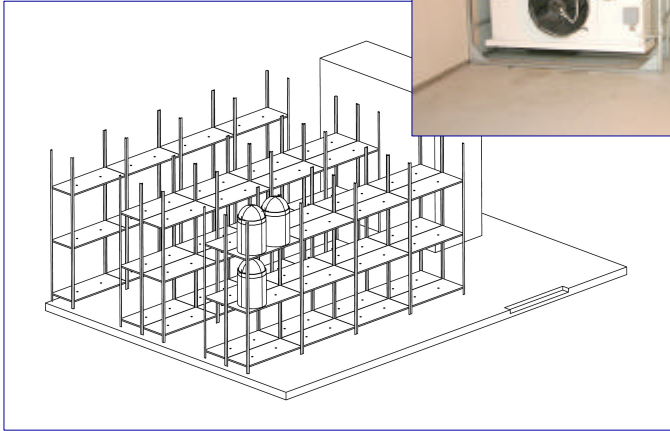
First 2 kits of
electronic boards
arrived at Zeuthen

1.3.2004 :

**First DOM
produced
at DESY**



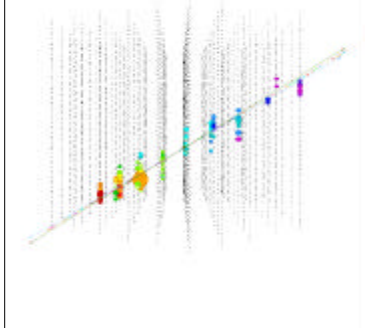
Dark Freezer Lab



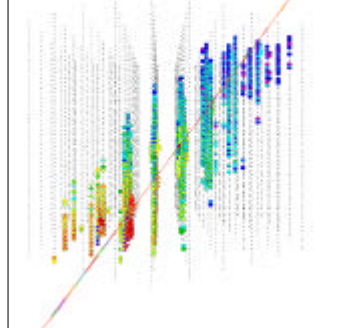
- 45 °C

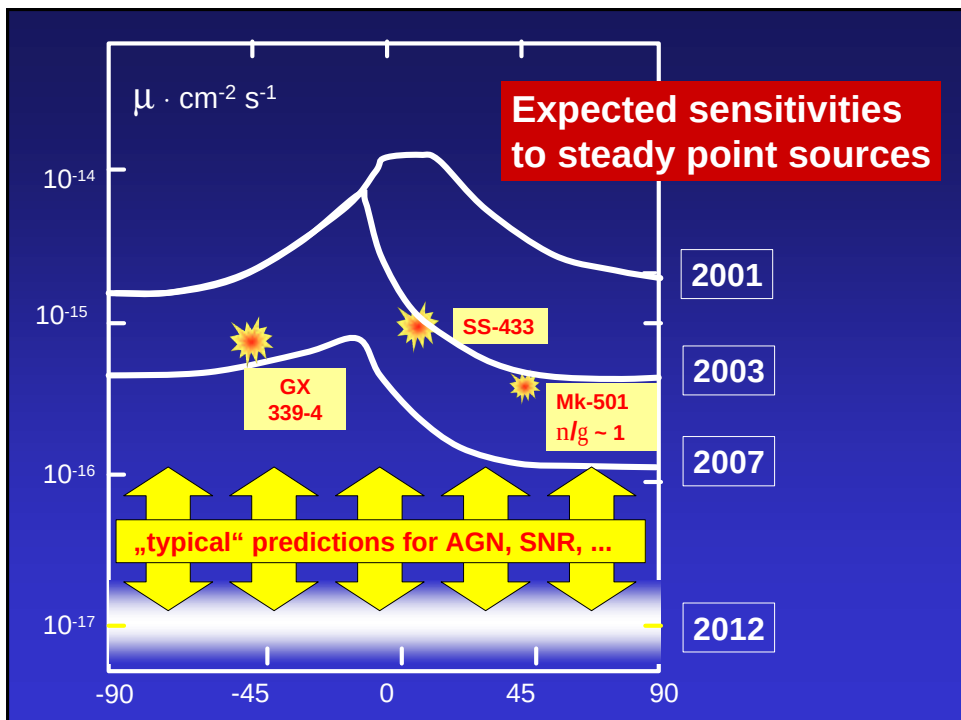
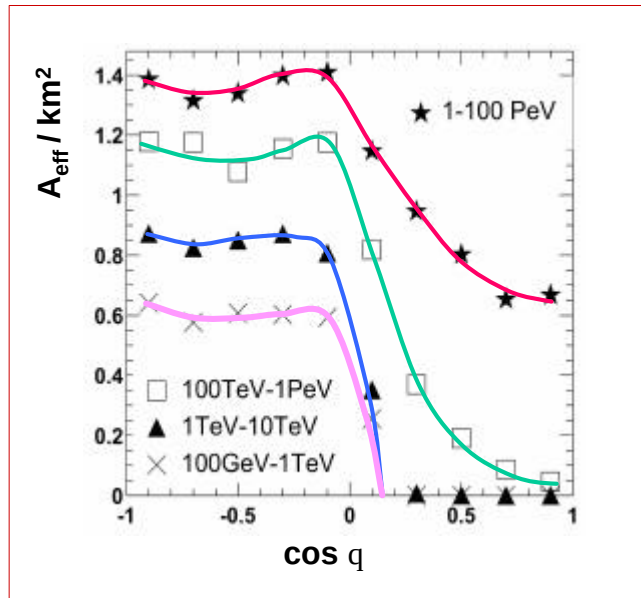
Simulierte IceCube n_m Events

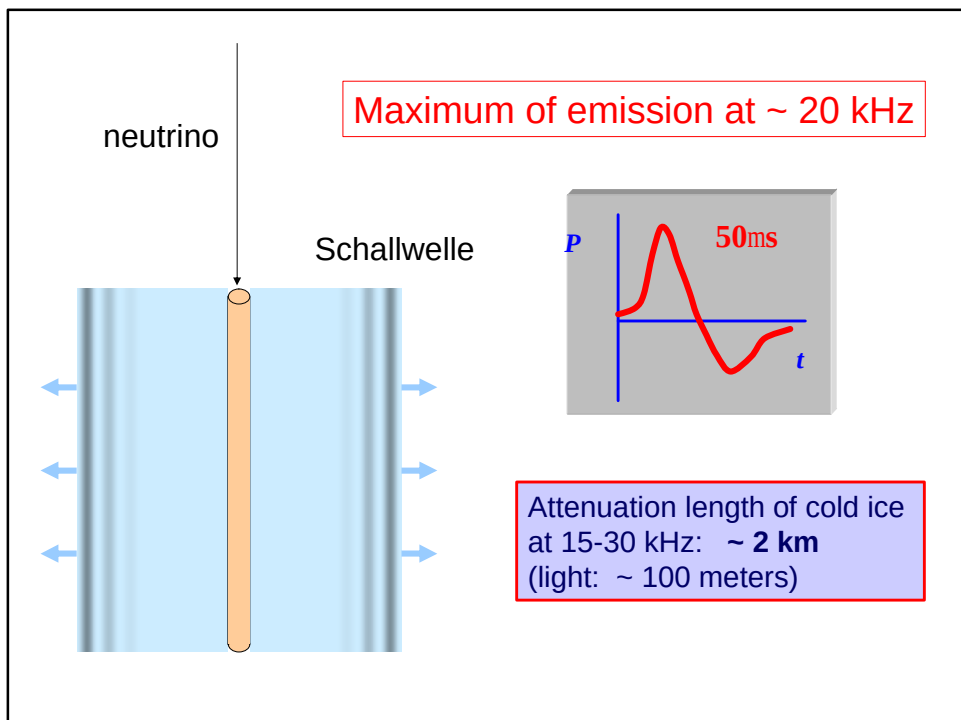
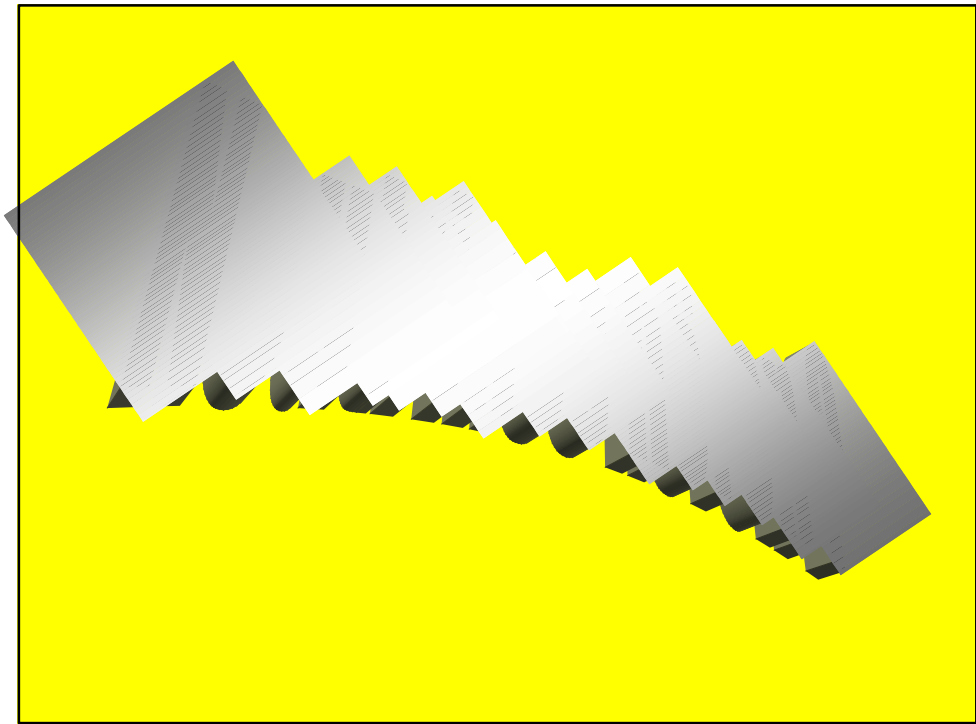
$E_\mu = 10 \text{ TeV}$, 90 hits



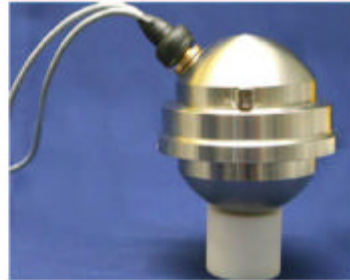
$E_\mu = 6 \text{ PeV}$, 1000 hits





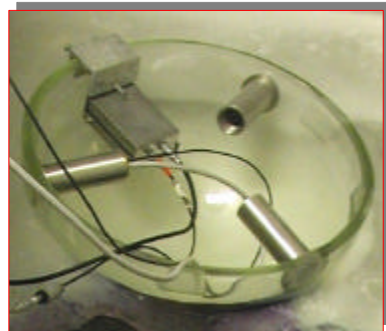
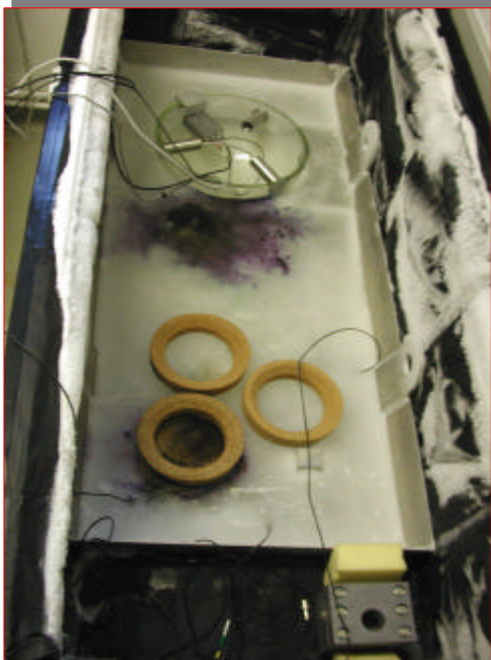


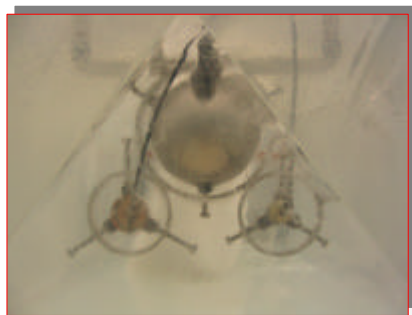
Sensors



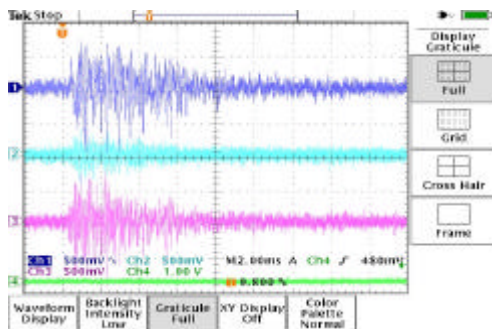
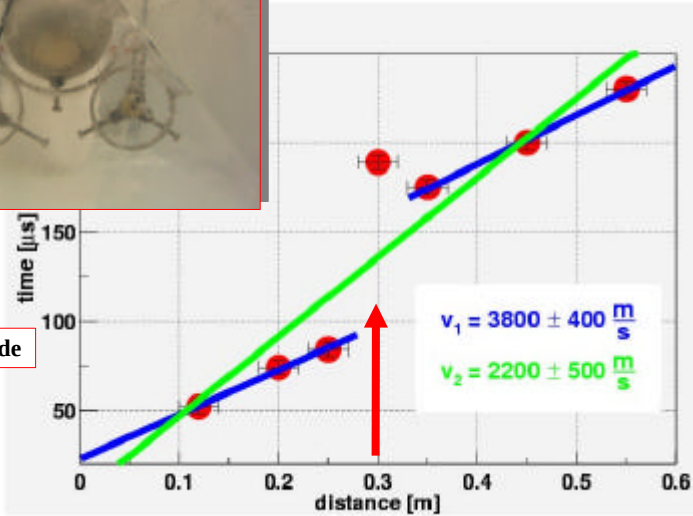
Acoustic detection - Sensor studies 2: Sensors

aboenser@fh.de

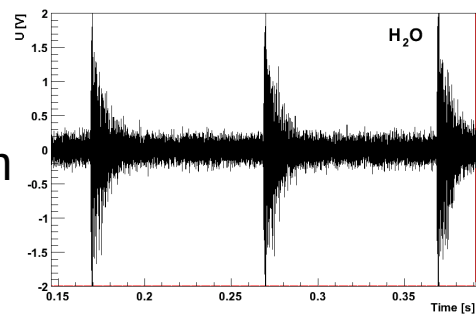


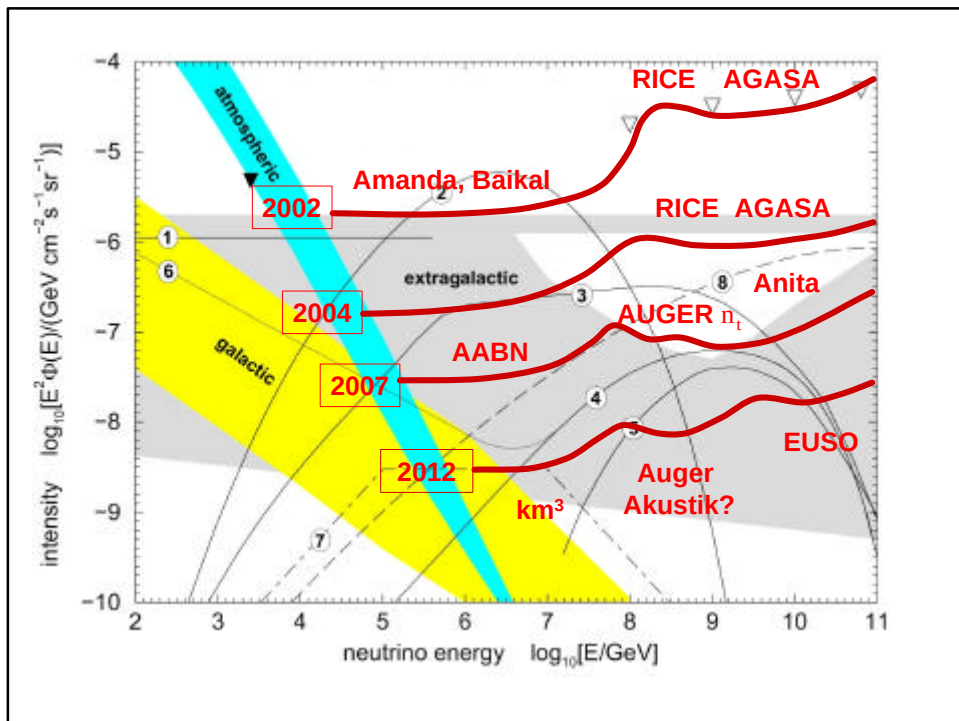


amplitude



180 MeV Protonen
Uppsala Test-Beam





Ende