

# Radiodetection of extensive air showers at the South Pole

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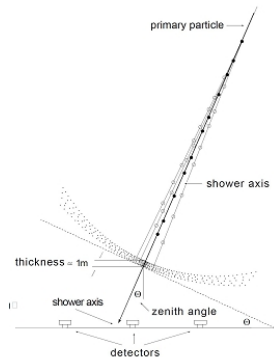
RFWU Bonn

Astroteilchenschule Obertrubach-Bärnfels, 09.10.2010

# Radiosignals of extensive air showers

## Radio signal of EAS

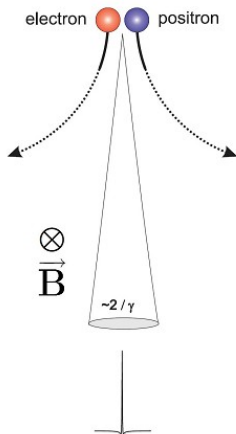
- Mainly synchrotron radiation of electrons and positrons
- Emitted into a narrow cone into particle's direction of travel
- Short bipolar radio pulse  
10 - 100 MHz range  
Duration shorter than 10 ns
- Proof of detection principle by LOPES



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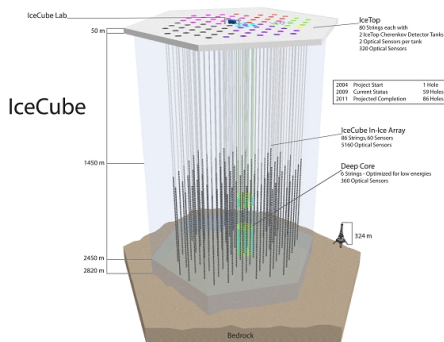
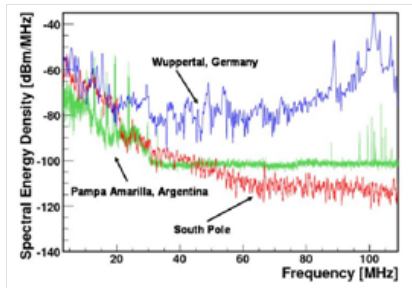
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# Advantages of the South Pole

## Local advantages

- Low radio noise level
- Good weather conditions
- Existing experiments: IceCube, IceTop



# Synergy effects

## Neutrino search

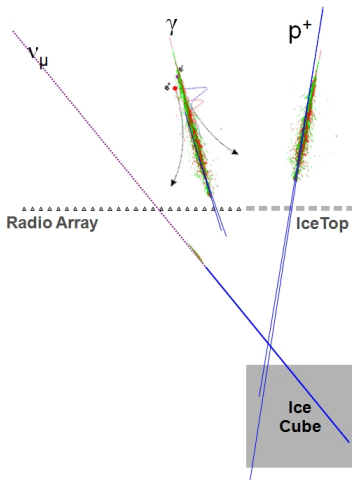
Increase surface veto area for atmospheric neutrinos (main background)

## Primary particle composition

Use different handles from three different detectors (muons, electrons, shower maximum)

## PeV Gamma Ray Search

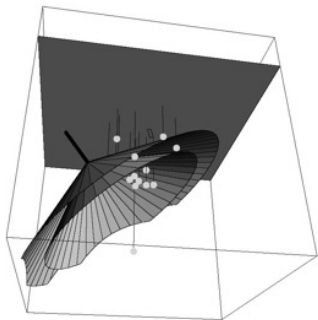
Search for showers with low muon numbers (inverted veto)



# RICE

## RICE

- Radio Ice Cherenkov Experiment
- 18 radio antennas in a depth between 100 and 300m
- Neutrino detection using the Askaryan effect



## RICE Trigger

- InIce
- External
- Veto
- Surface

# RICE Surface Configuration 2009

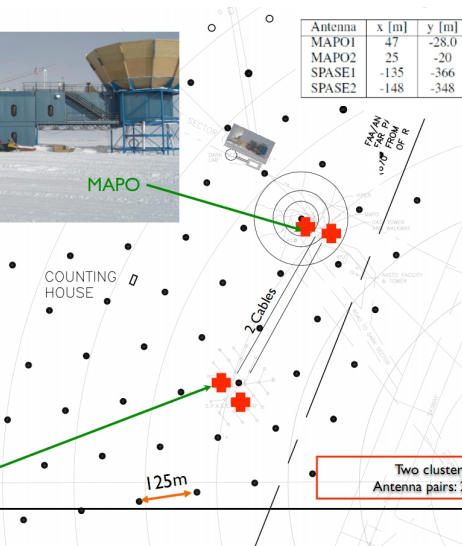


MAPO



SPASE Building

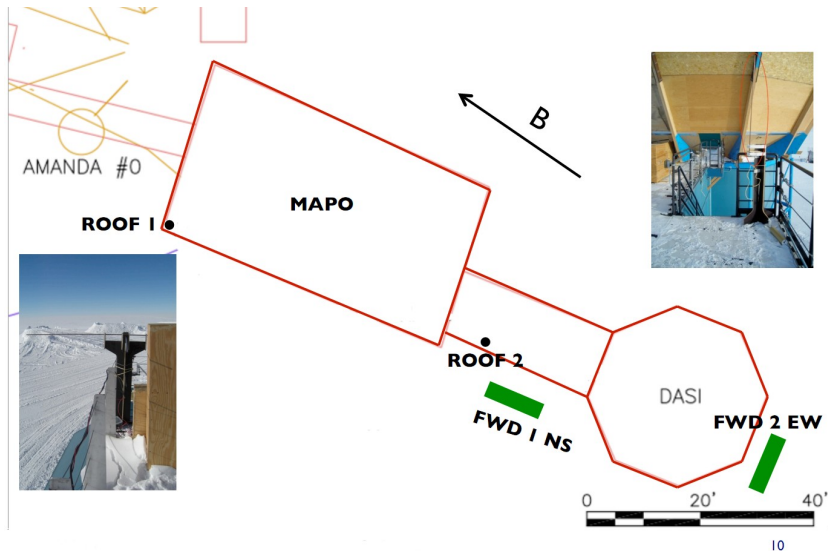
Antenna	x [m]	y [m]	z [m]	cable delay [ns]
MAPO1	47	-28.0	18	144
MAPO2	25	-20	18	129
SPASE1	-135	-366	1	2126
SPASE2	-148	-348	1	2729



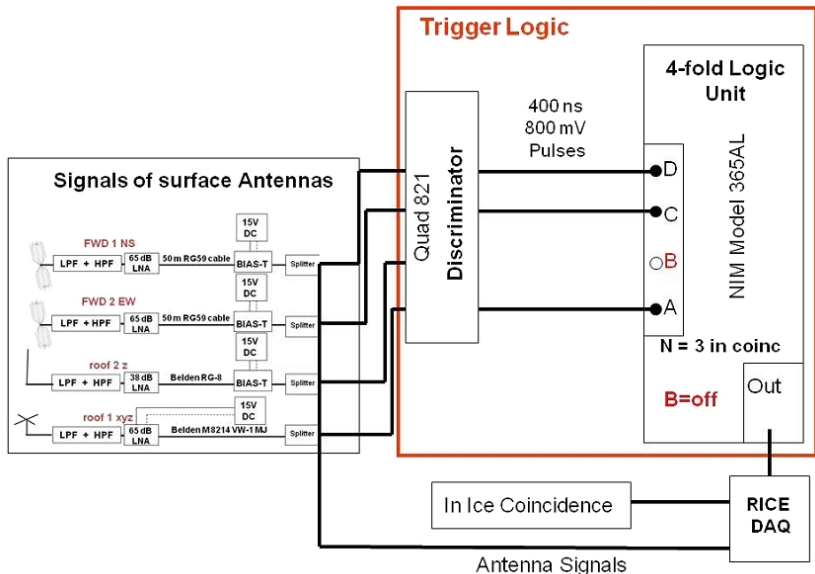
Two clusters: 350 m distance  
Antenna pairs: 20 m mutual distance



# RICE Surface Configuration 2010



# RICE Surface Trigger

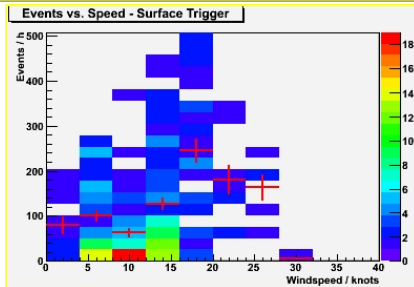
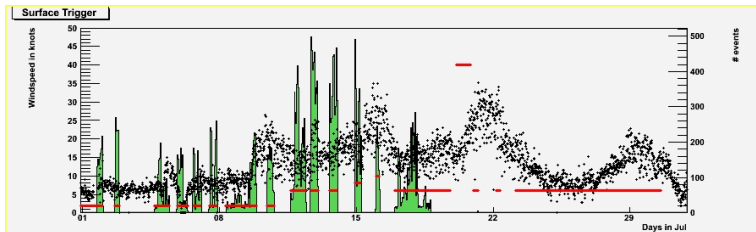


# Diploma thesis plans

## Search for coincidences in IceTop and RICE Surface Antennas

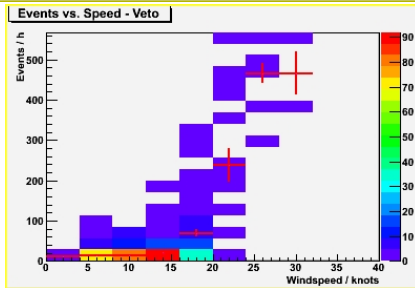
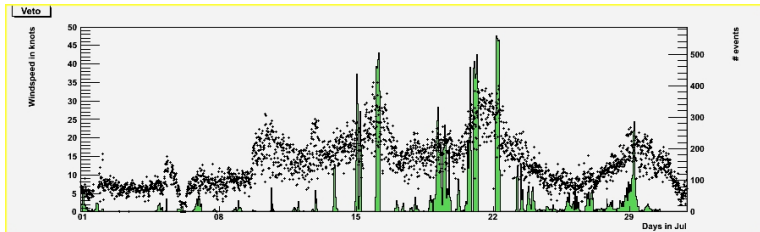
- Data quality
  - Wind dependence
  - Pressure dependence
  - Daytime dependence
  - Periodic events
- Analysis of signal waveforms and spectra
- Search for coincident events

# Windspeed Analysis



First analysis: Surface trigger not correlated to wind

# Windspeed Analysis



First analysis: Veto Trigger clearly correlated, mechanism unknown