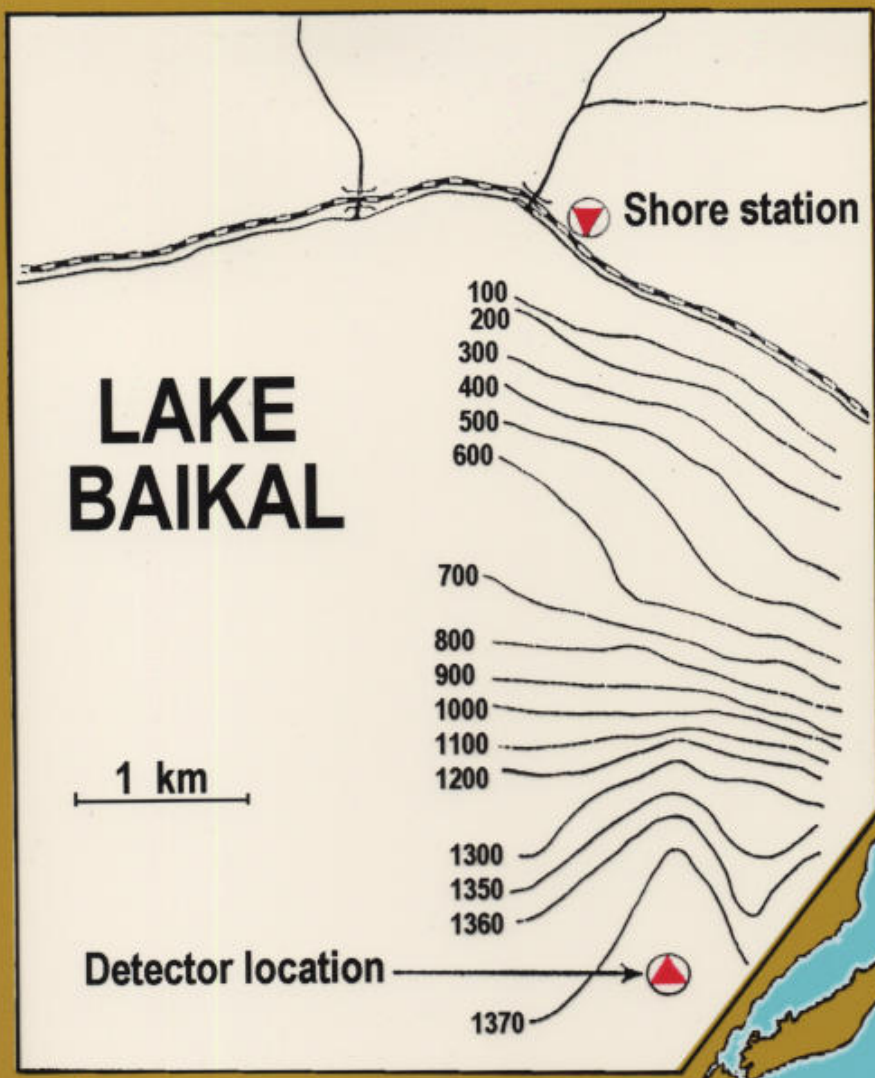


# THE BAIKAL NEUTRINO PROJECT: STATUS REPORT

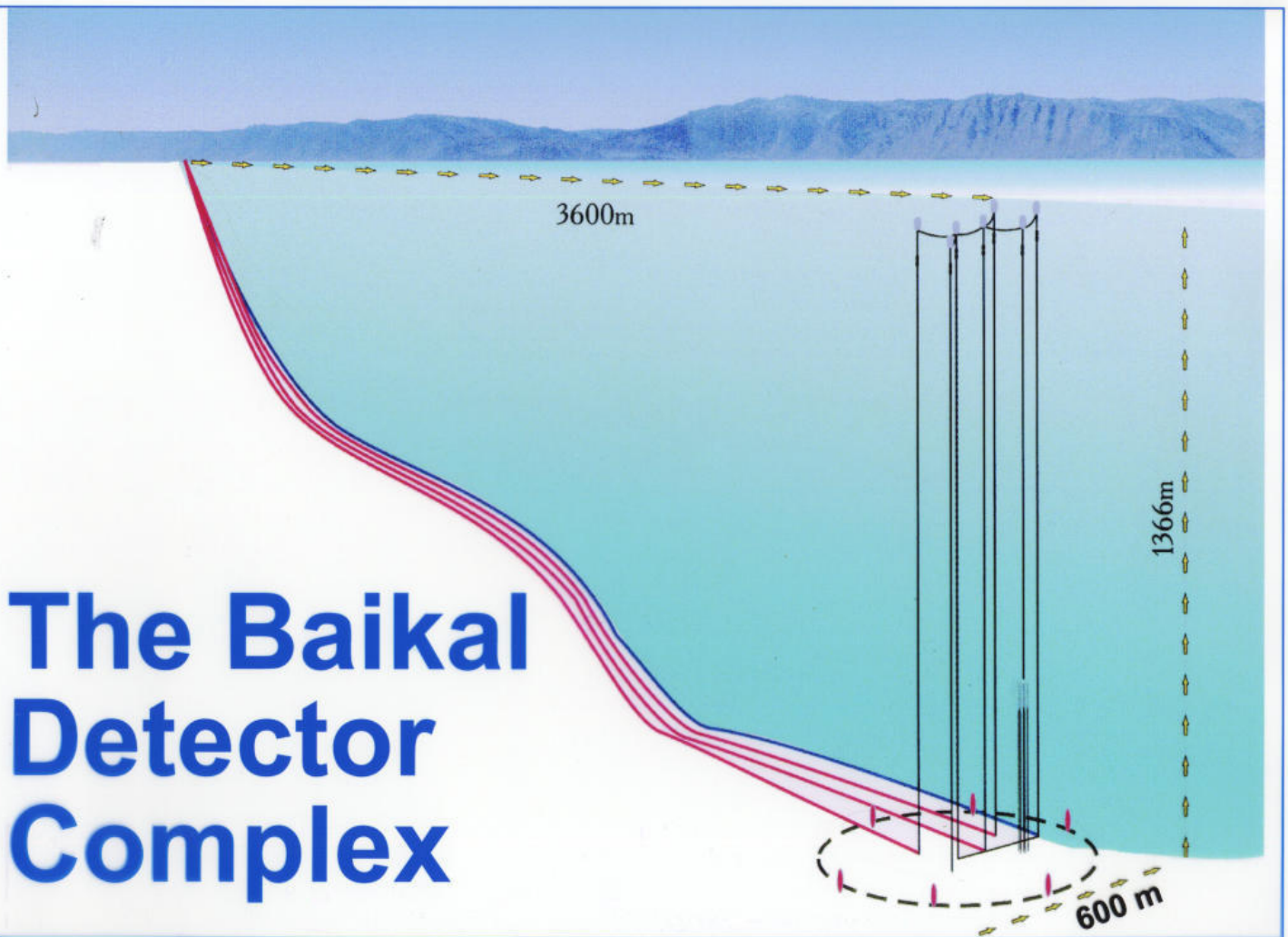
## BAIKAL COLLABORATION

- Institute for Nuclear Research (Moscow, Russia)
- Irkutsk State University (Irkutsk, Russia)
- DESY Institute for High Energy Physics (Zeuthen, Germany)
- Moscow State University (Moscow, Russia)
- N.Novgorod State Technical University (N.Novgorod, Russia)
- State Marine Technical University (St.Petersburg, Russia)
- Kurchatov Institute (Moscow, Russia)
- Joint Institute for Nuclear Research (Dubna, Russia)

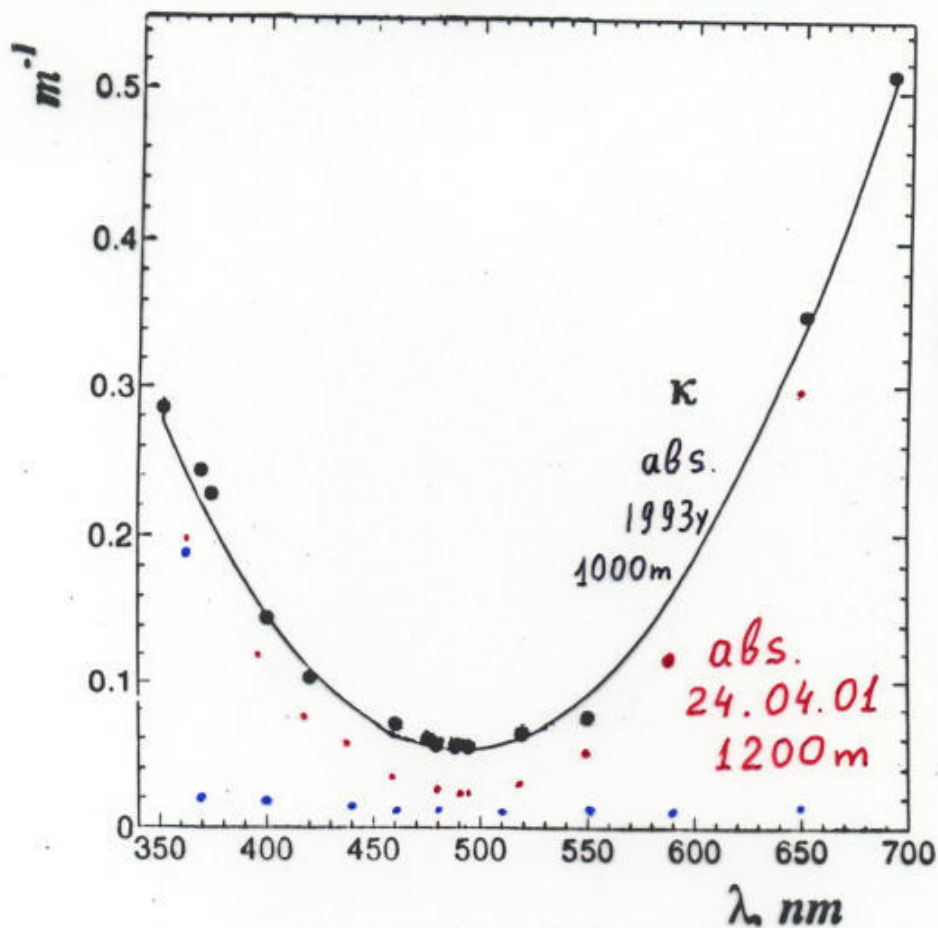
*G.V. DOMOGATSKY*



# The Baikal Detector Complex



# THE OPTICAL PARAMETERS OF THE BAIKAL WATER

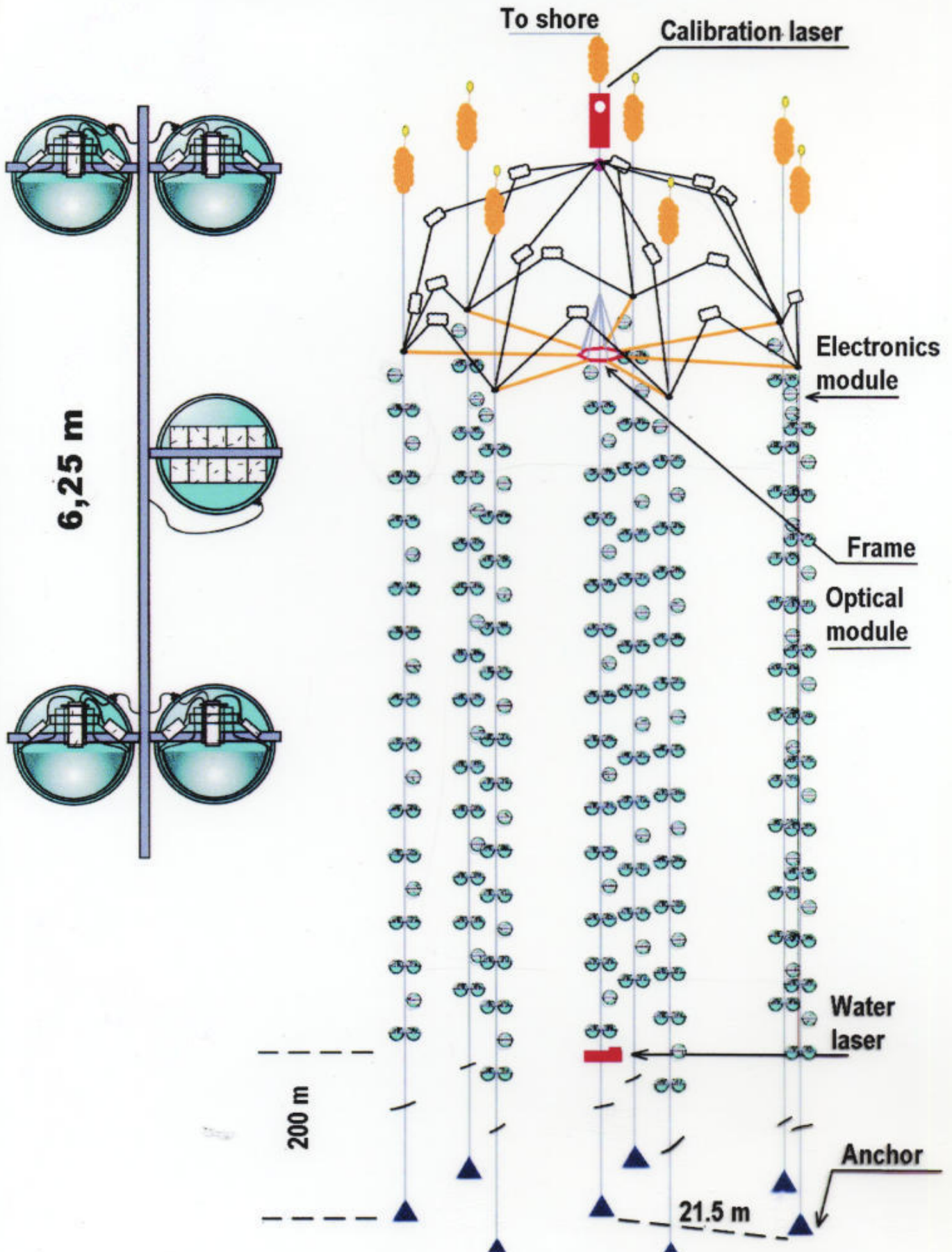


$$L_{abs} \sim 22 \pm 2 \text{ m}$$

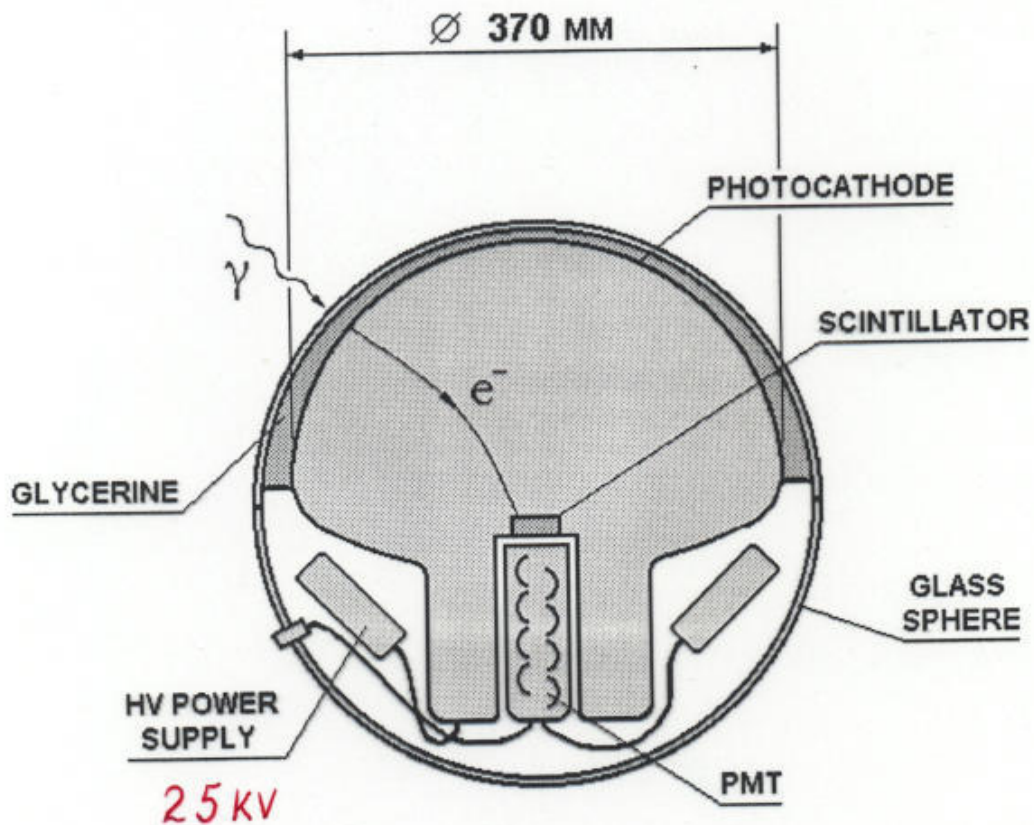
$$L_{scat} \sim (20 - 70) \text{ m}$$

$$L_{scat}^{eff} = L_{scat} / (1 - \langle \cos \theta \rangle) = 200 \text{ m}$$

# NEUTRINO TELESCOPE NT-200



## OPTICAL MODULE OF THE LAKE BAIKAL EXPERIMENT



- SINGLE PHOTOELECTRON RESOLUTION - 70-80%  
FOR THE BEST TUBES - 40%
- TRANSIT TIME SPREAD (FWHM) - 2 NS  
FOR THE BEST TUBES (FWHM) - 1 NS
- PEAK / VALLEY RATIO - 2,5  
FOR THE BEST TUBES - 3,5 - 4,5

## NT-200 STAGES

Years →	98-99	99-00	00-01	01-02	02
$T_{\text{data}}(\text{days})$	234.6	236	245	48	■ 74
$T_{\text{data}}/T_{\text{tot}}$	73%	75%	79%	-	91%
$N_{\text{ev}}(4/1)/10^6$	167	191	233	45	64
$N_{\text{ev}}(6/3)/10^6$	57	65	82	15	22
$\bar{N}_{\text{op}}/N_{\text{tot}}$	71%	76%	81%	-	78%

**(4/1)** -  $\geq 4$  hit channels on  $\geq 1$  strings (*muon trigger*)

**(6/3)** -  $\geq 6$  hit channels on  $\geq 3$  strings (*off-line trigger allowing track reconstruction*)

$\bar{N}_{\text{op}}$  - mean number of operating channels

$N_{\text{tot}} = 96$

# NEUTRINO INDUCED EVENTS

234 DAYS, 1998

DATA

- NUMBER OF OFF-LINE TRIGGERS 6/3  $5.3 \cdot 10^7$
- RECONSTRUCTED AS TRACK WITH  $\cos\theta < 0$   $2.5 \cdot 10^6$
- ALL CUTS 35

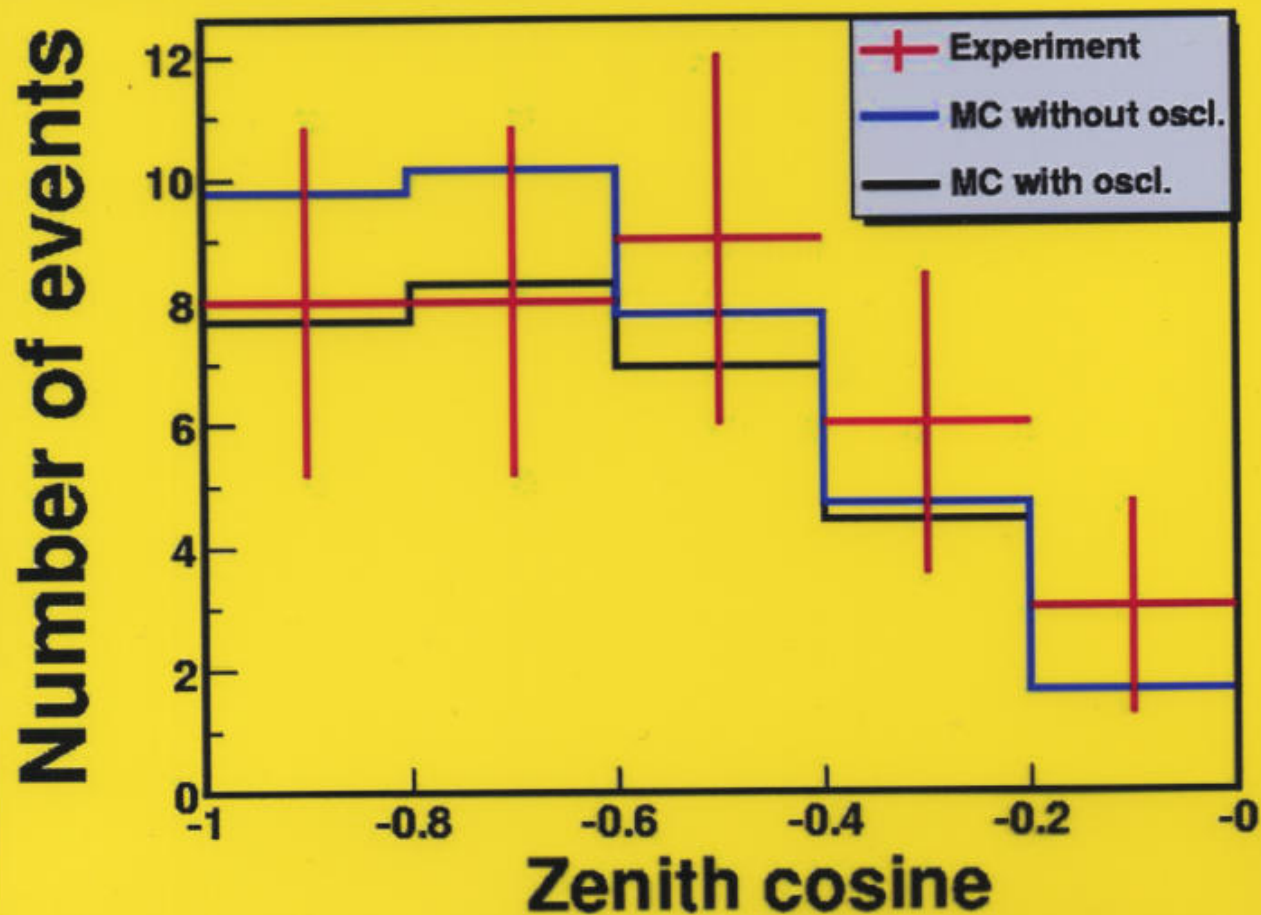
BACKGROUND (MC)

- DETAILED MC FOR BACKGROUND  
INDUCED BY ATMOSPHERIC MUONS  $1.1 \cdot 10^8$
- RECONSTRUCTED AS TRACK WITH  $\cos\theta < 0$   $5.3 \cdot 10^6$
- ALL CUTS 3

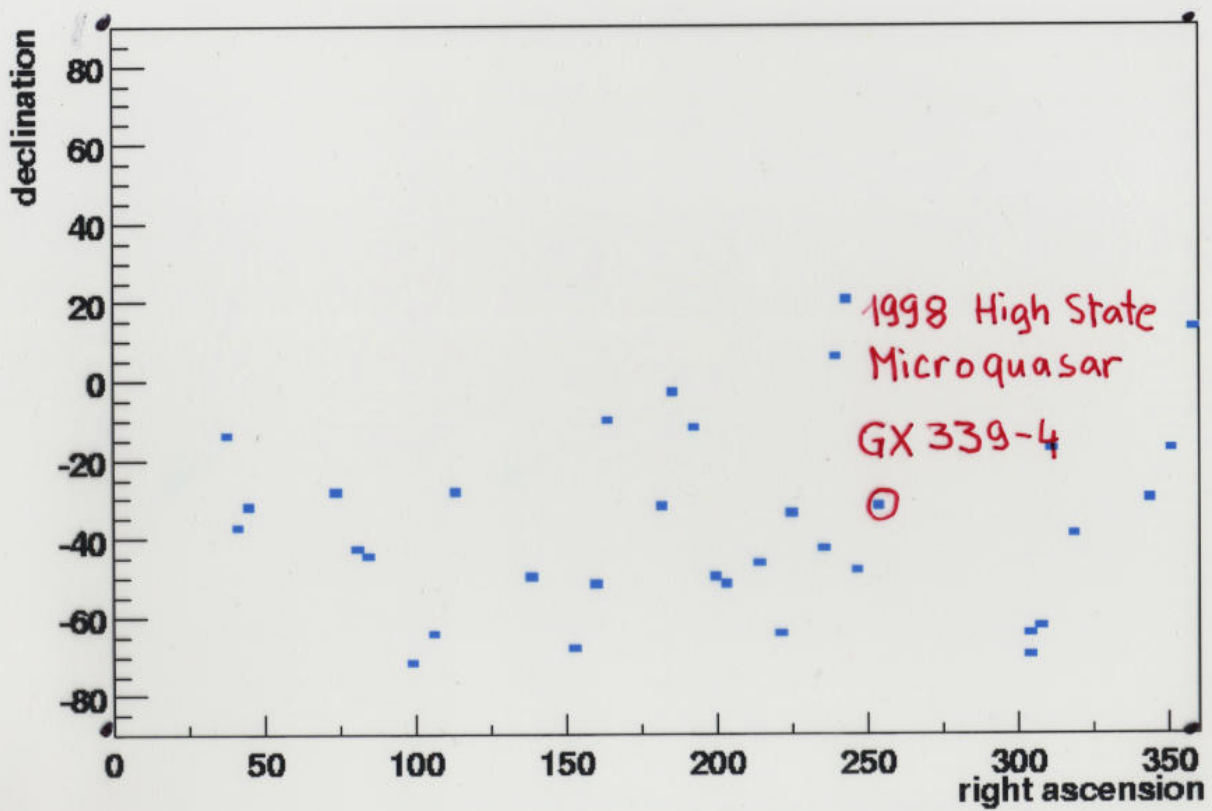


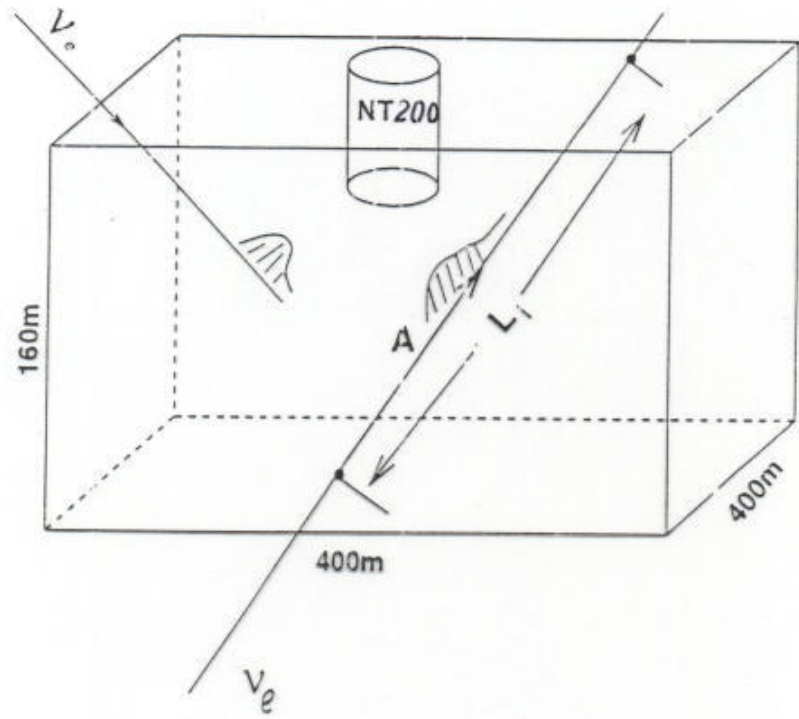
Upward – going muons  
234 days (1998)  
35 events

## Angular distribution

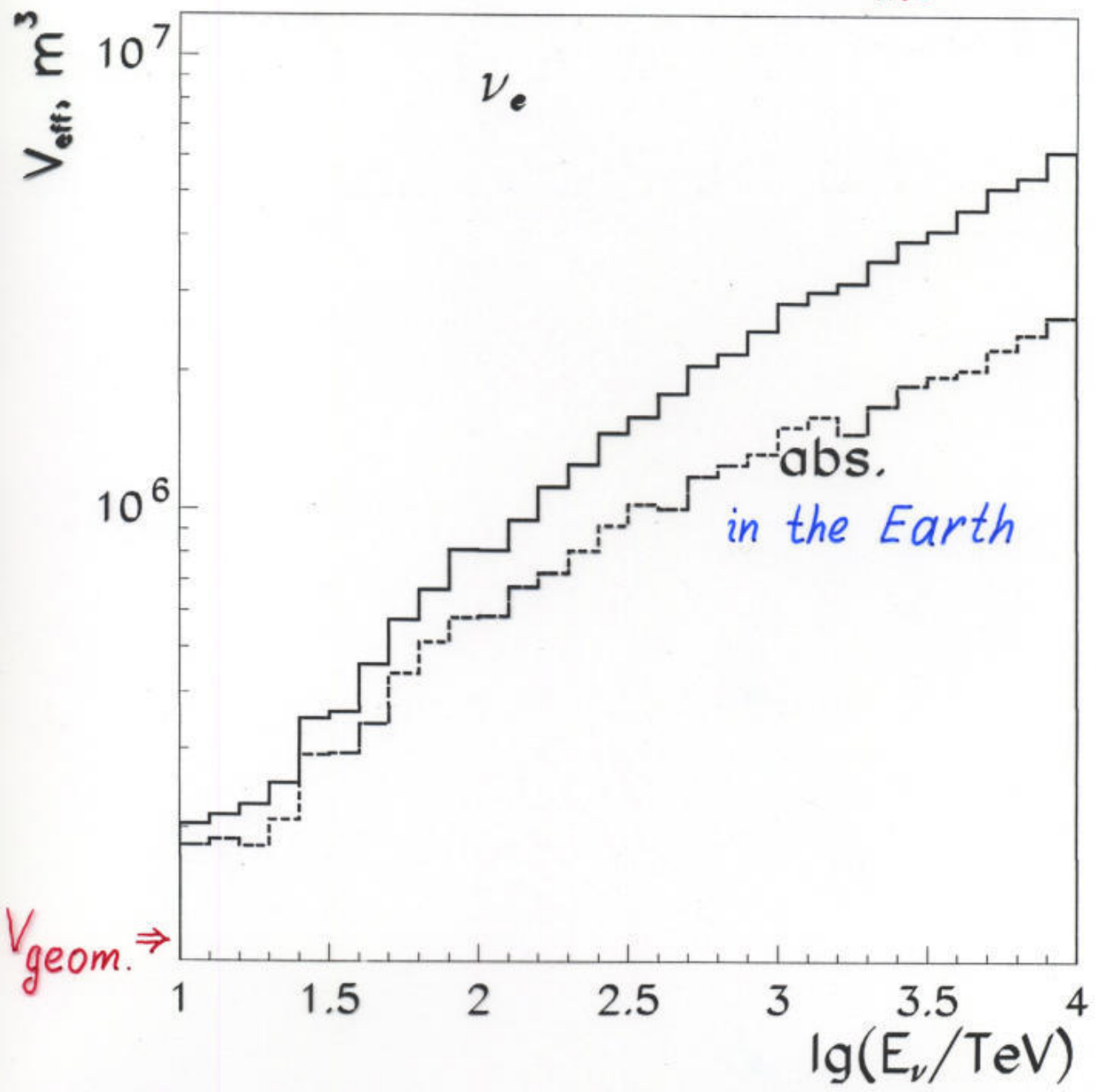


## Celestial coordinates of neutrino events



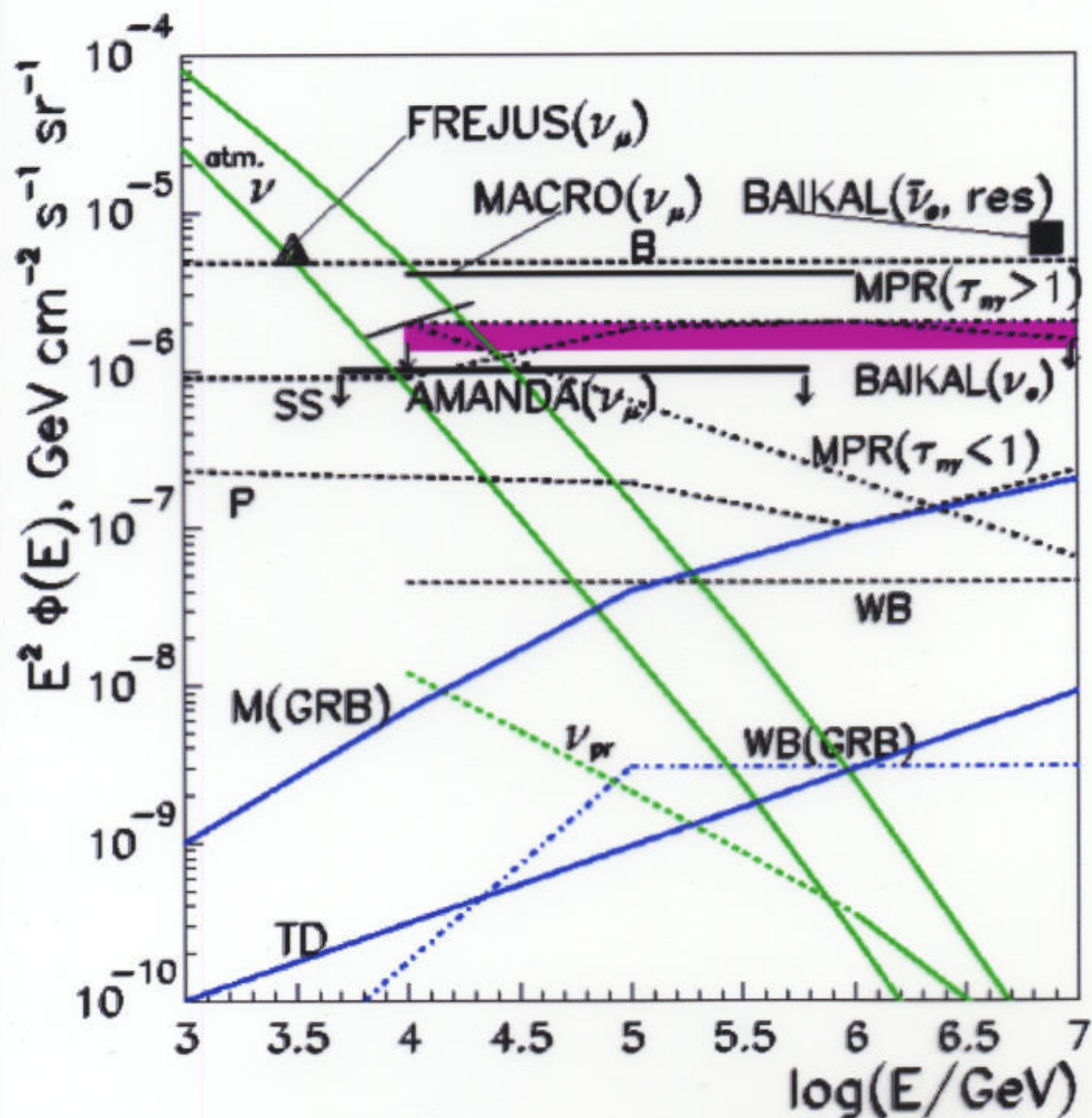


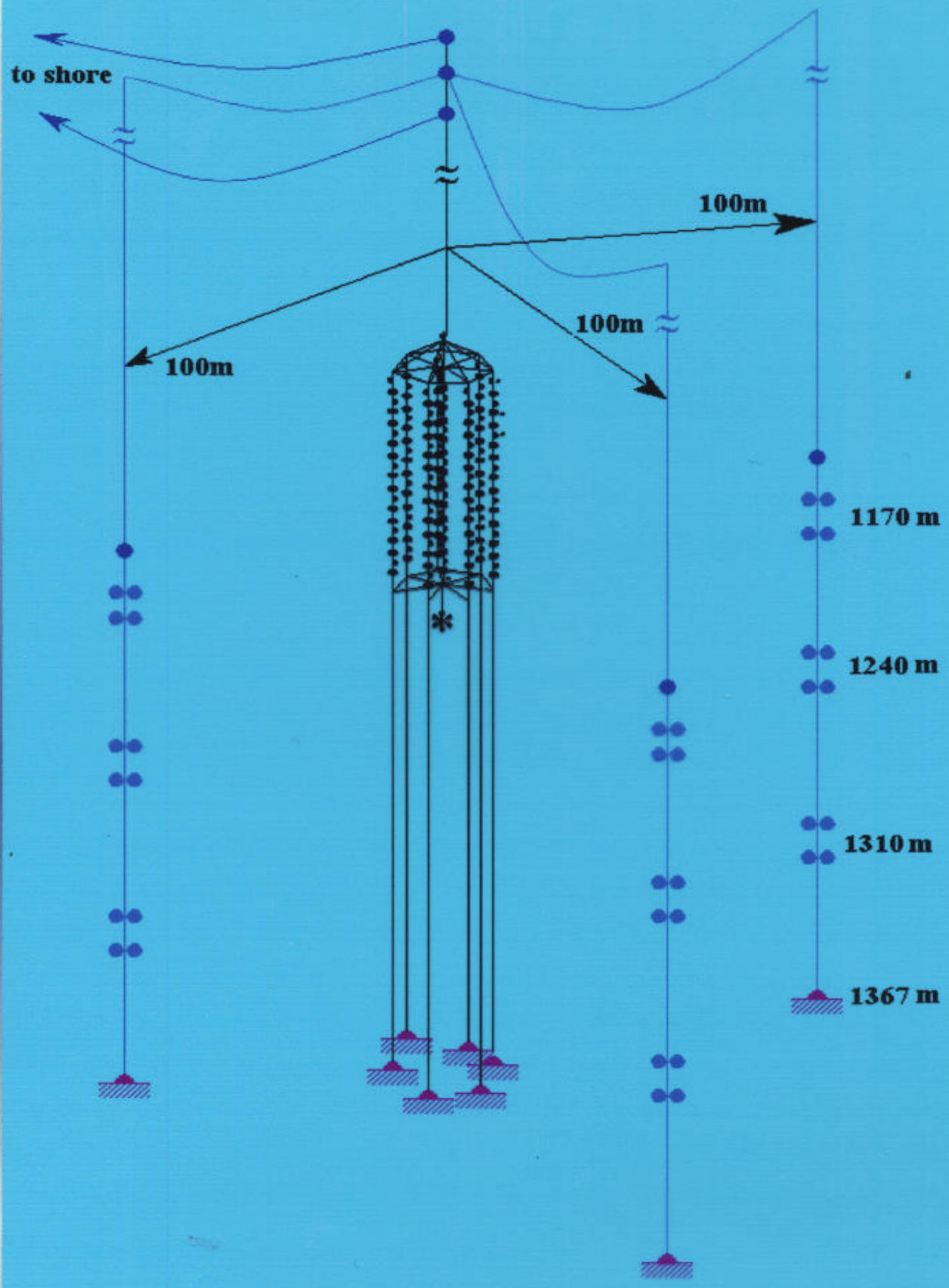
$N_{hit} > 50$



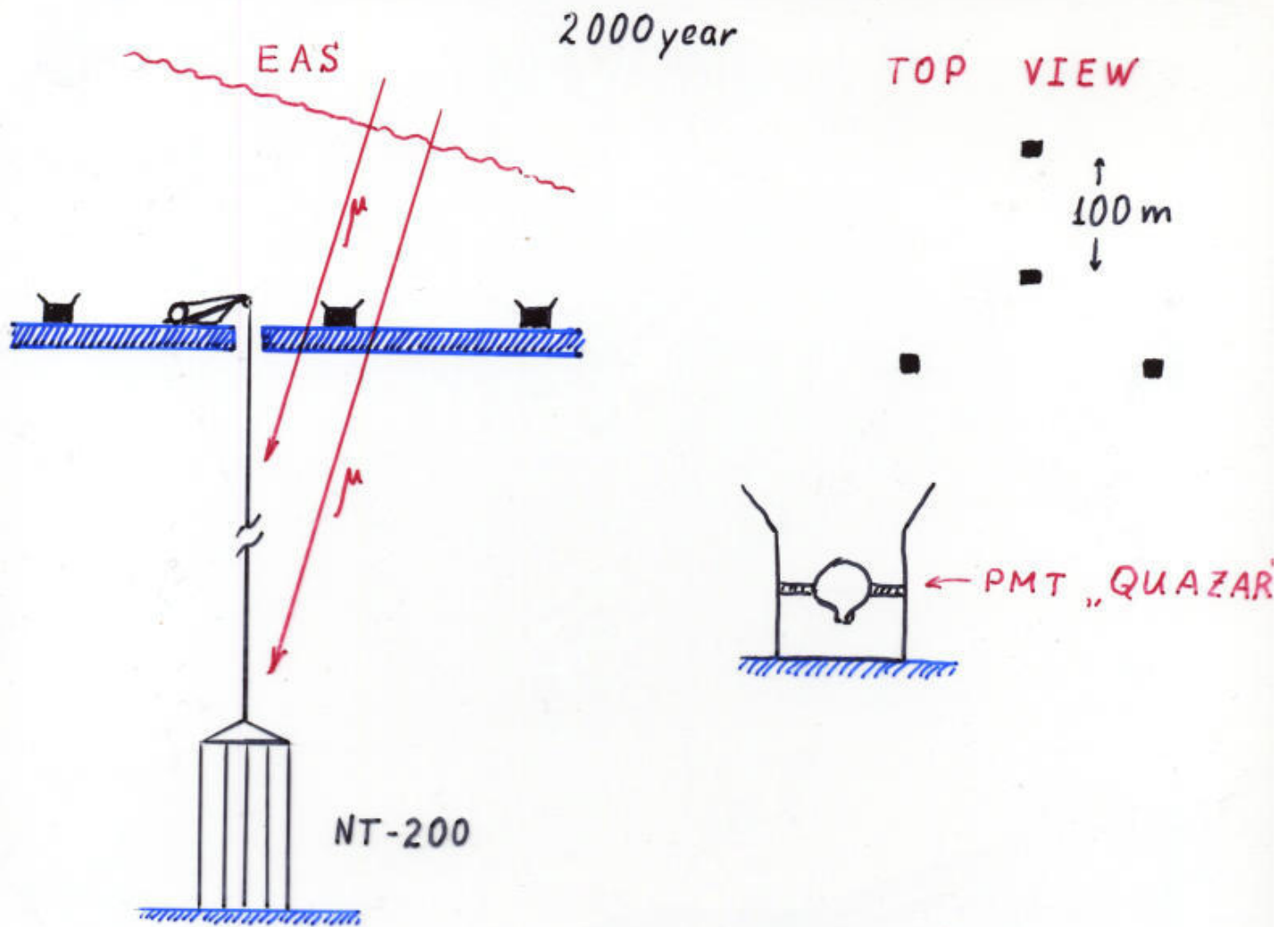
# Limits on diffuse neutrino flux

Baikal data 234 days (1998)

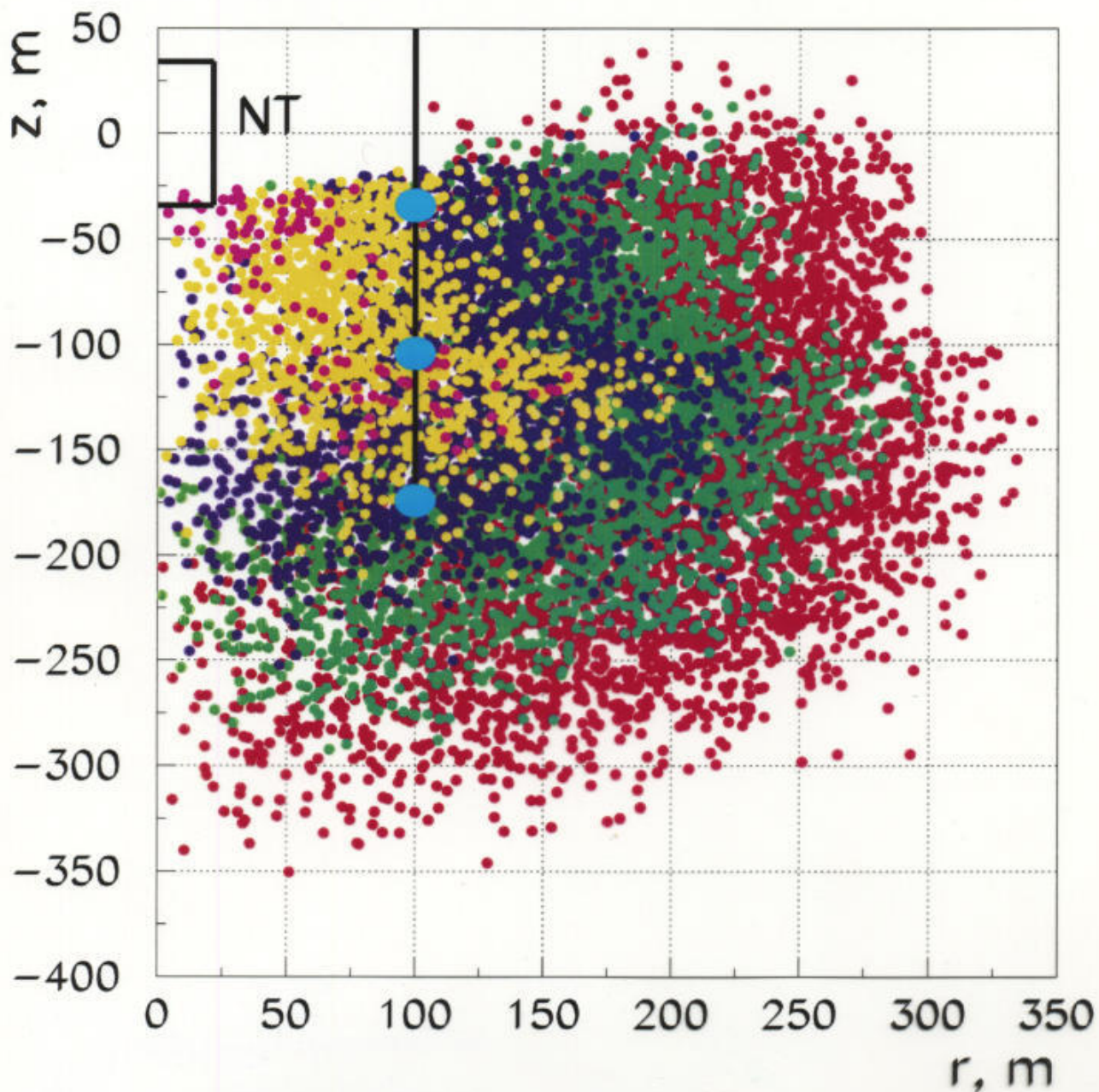




# CHERENKOV EAS ARRAY ON THE ICE

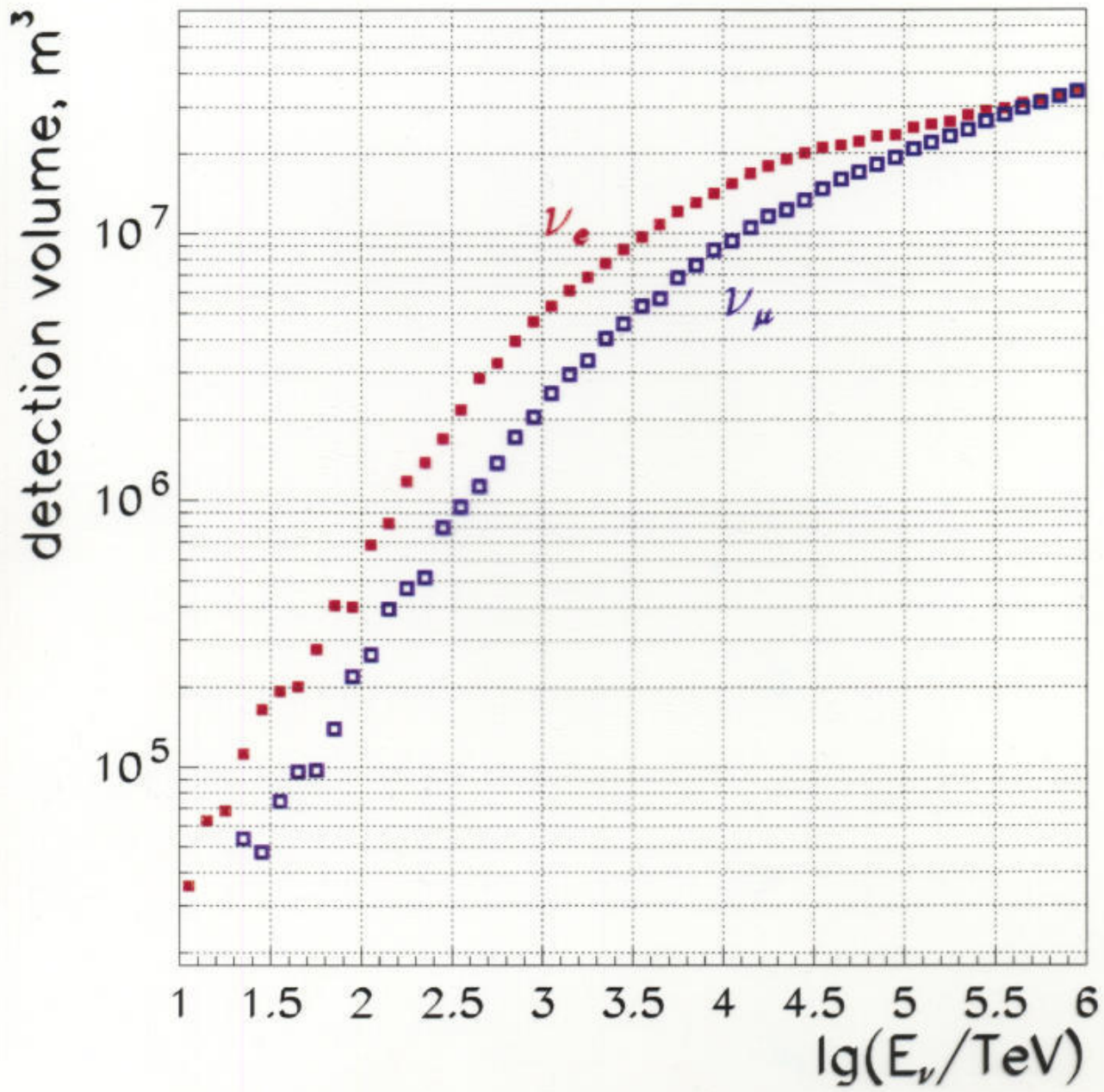


- ANGULAR RESOLUTION OF EAS ARRAY  $\sim 0.5^\circ$
- ENERGY THRESHOLD  $\sim 200 \text{ TeV}$
- NEAR VERTICAL MUONS ( $\theta < 20^\circ$ ) - mean  $\theta = 0.8^\circ$   
(one string)  $\sigma = 4.3$



• -  $10^6$  TeV      • -  $10^5$  TeV      • -  $10^4$  TeV  
 yellow -  $10^3$  TeV      crimson -  $10^2$  TeV

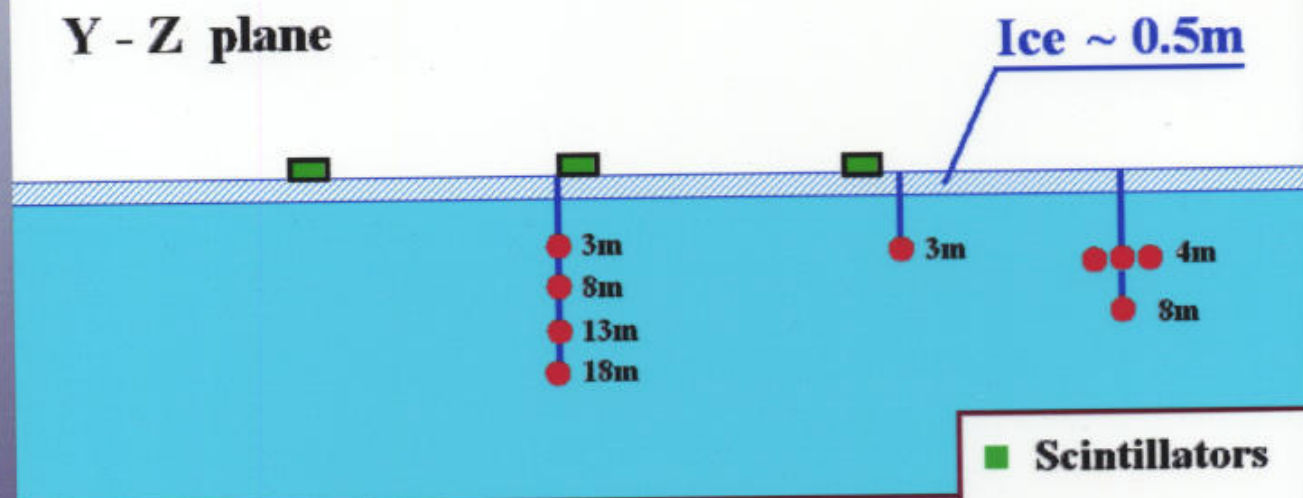




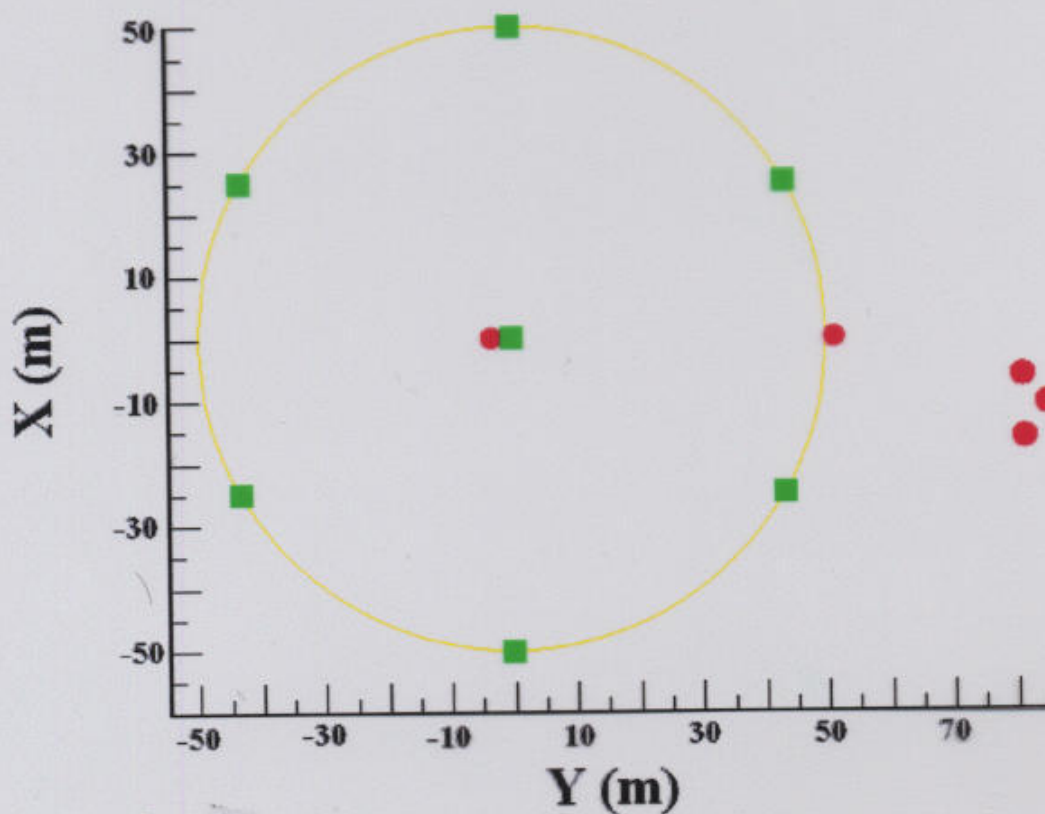
# EAS array + Hydrophones

March - April 2002

Y - Z plane



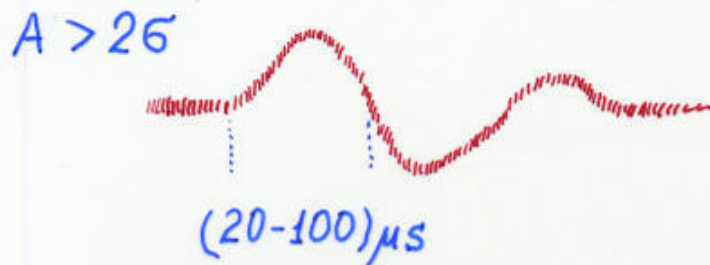
Y - X plane



# ACOUSTIC DETECTION

2001y

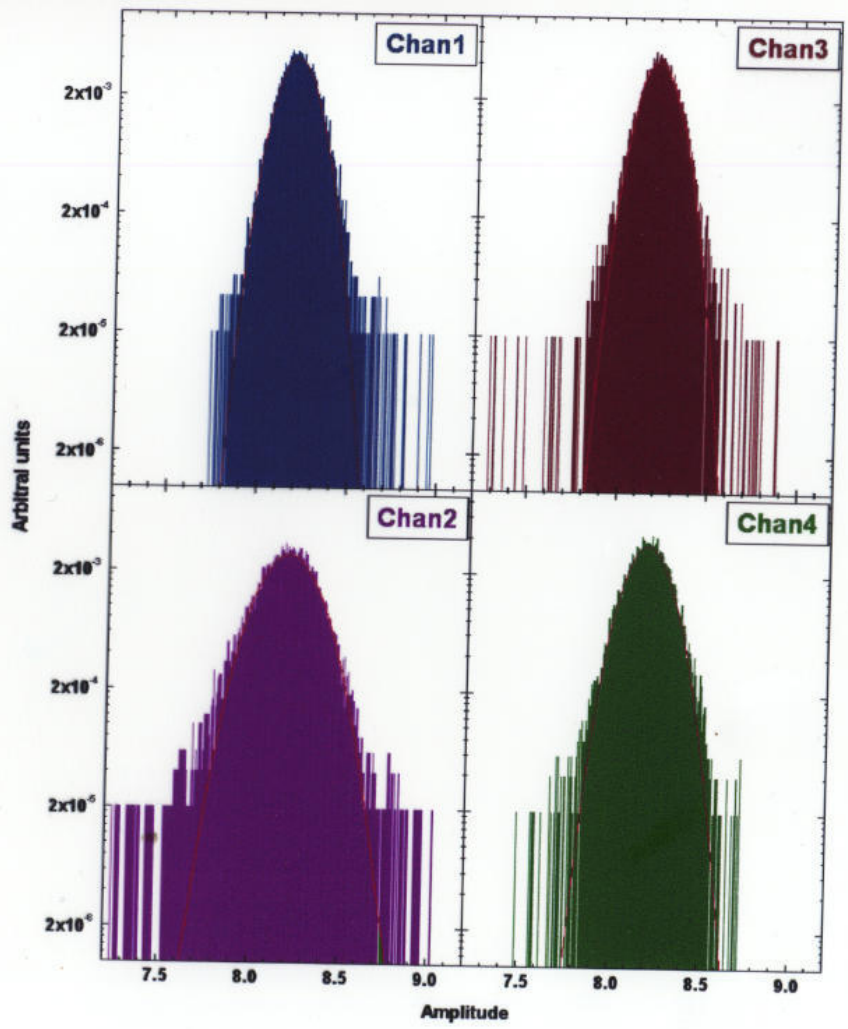
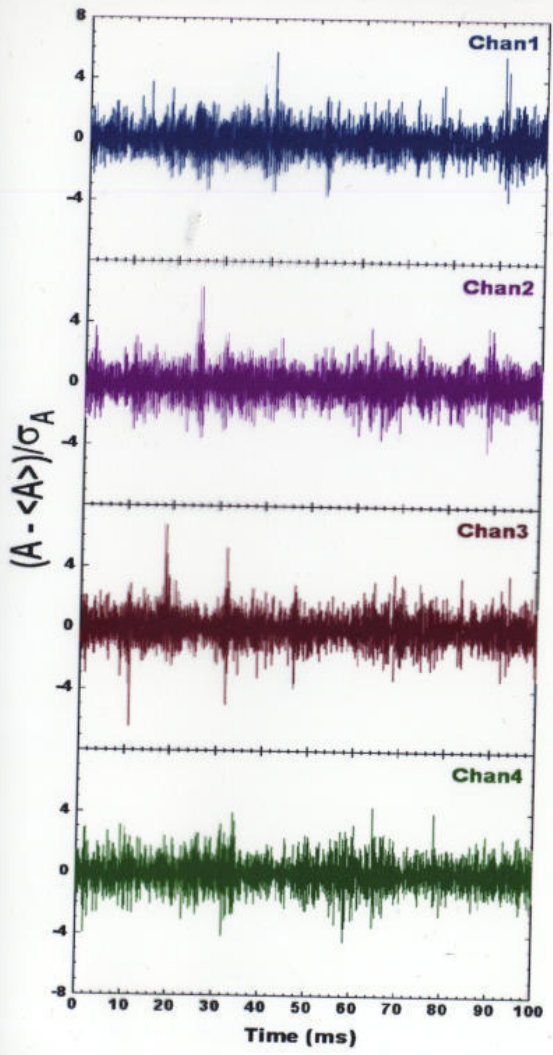
- "ZOOM"

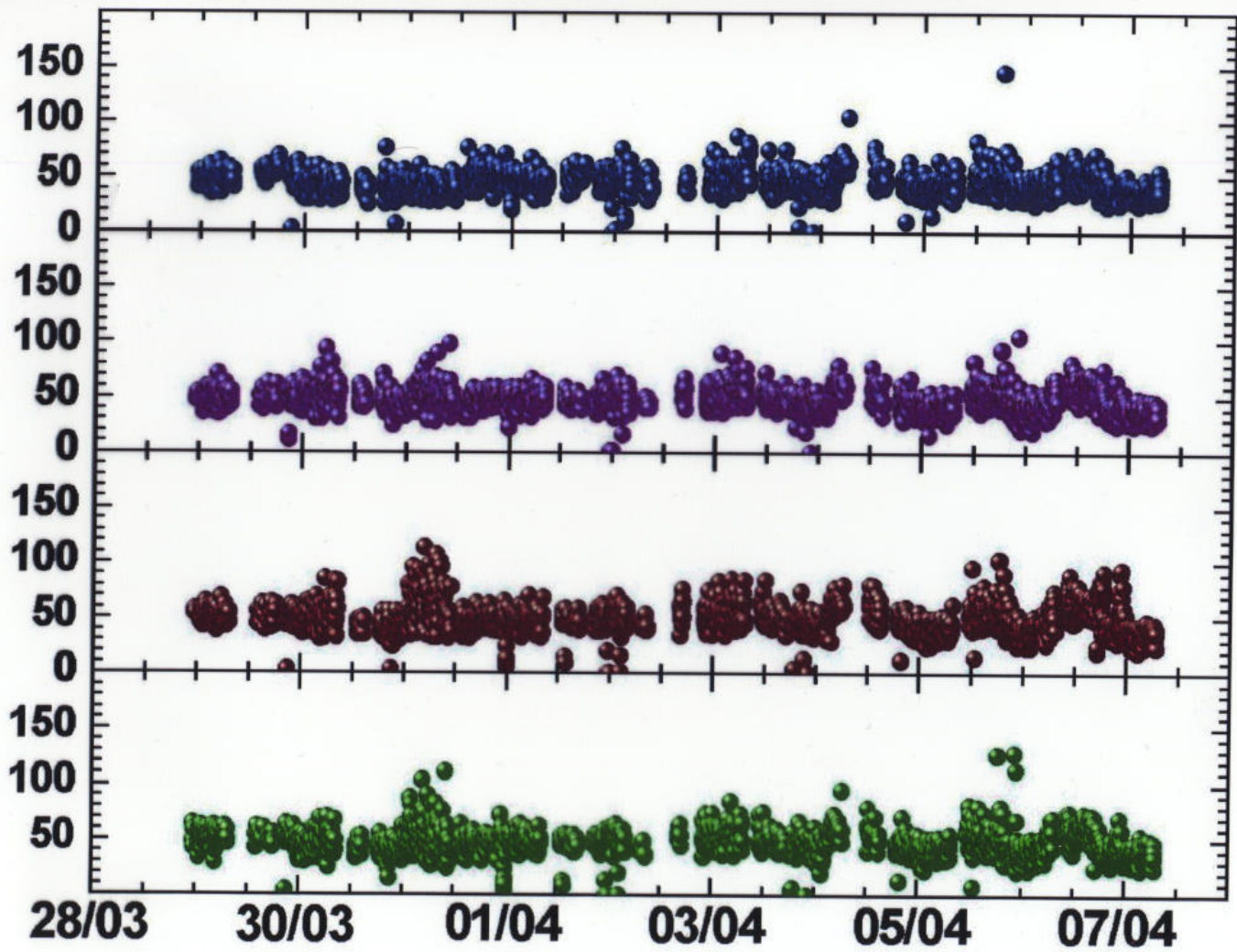


- ABOUT 50 PERTURBATIONS PER CHANNEL
- COINCIDENCE WITH SHOWERS IN TIME WINDOW  $\pm 0.5ms$

	WATER	AIR
BACKGROUND (MC)	26	12
DATA	41	13

"SIGNAL"  $\sim 2\sigma$





## C O N C L U S I O N

- BAIKAL DETECTOR HT-200 IS TAKING DATA
- DATA ANALYSIS IS IN PROGRESS
- WE PLAN:
  - TO CONTINUE STUDIES OF ACOUSTIC DETECTION
  - TO DEPLOY (2003-2004) THREE ADDITIONAL STRINGS
- NEXT STEP (AFTER 2004) - TO BUILD  $1\text{KM}^3$  DETECTOR IN THE LAKE BAIKAL