Earth WIMP search

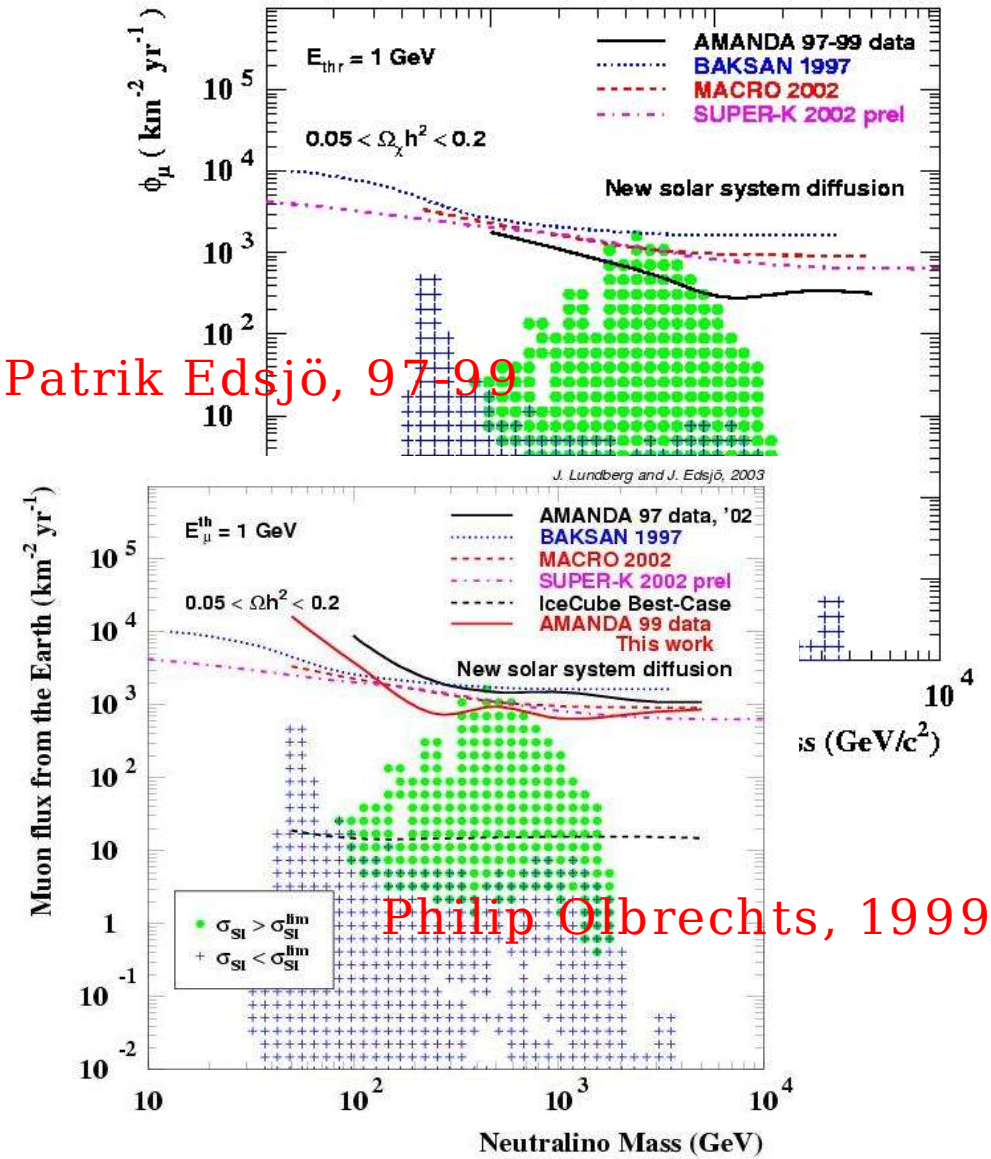
Update on the analysis of data
2001-2003
including string triggered events
with some results from 2002 data

Anna Davour

Collaboration meeting Berkeley 2005

Aim of the analysis

- Use new data, 2001-2003
- Use string trigger
- Improve limits at low energies –compare earlier results



Data and Monte Carlo

Data

Runs are selected after looking at monitoring files.

Select 20% of the "good" runs for blind analysis. From 2002 this is $\sim 3 \cdot 10^8$ events, corresponding to 34 days of live-time

Atm. muons with Corsika

$6 \cdot 10^6$ triggers

Atm. neutrinos with ANIS

200 000 triggered events weighted to the same live-time as the data sample

WIMP signal

1 000 000 annihilations simulated per WIMP mass --> ~20 000 triggers at 100 GeV, soft annihilation channel

Data selection

2001

Not uniform trigger conditions, try to fix with retrigger.
232 runs selected, 45 of these for blind analysis.

2002

Preliminary: take only part of year with uniform trigger.
The string trigger is downscaled with factor 2.
222 runs selected, 40 of these for blind analysis.

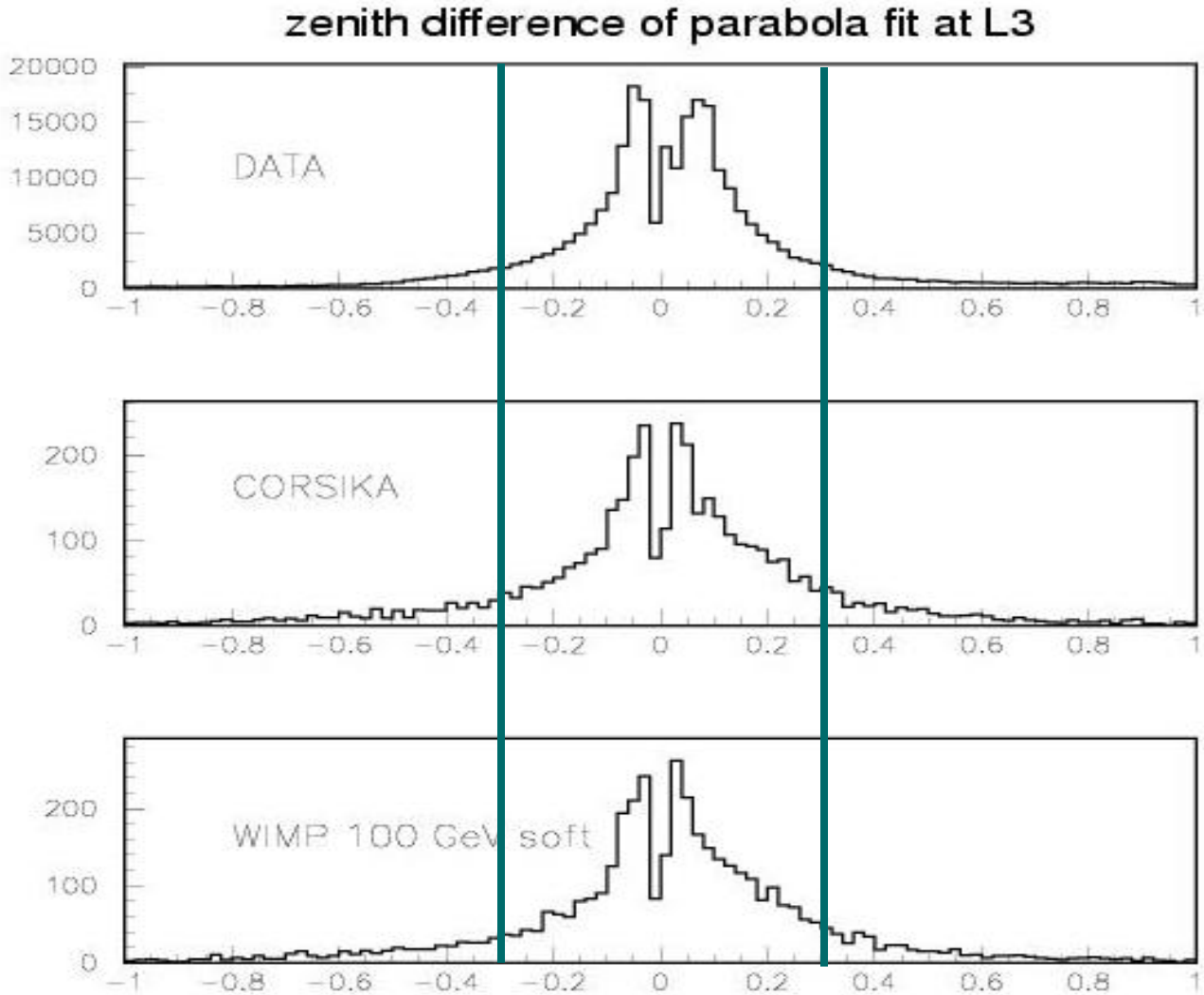
2003

Stable conditions, use large part of the year.
326 runs selected, 64 of these for blind analysis.

Filtering

- L1 done in Zeuthen. Cut: zenith of DirectWIMP first guess > 80°. Reduces data to < 4% and signal to 90%.
- Add reconstructions, simulate trigger after hit cleaning (thanks to P. Steffen!)
- Precut: zenith(32 it)>140°.
- Cut on flare variables, retrigger.

Before optimizing the cuts, make a precut on reconstruction quality (parabola fit made with Siegmund):



Cut optimization

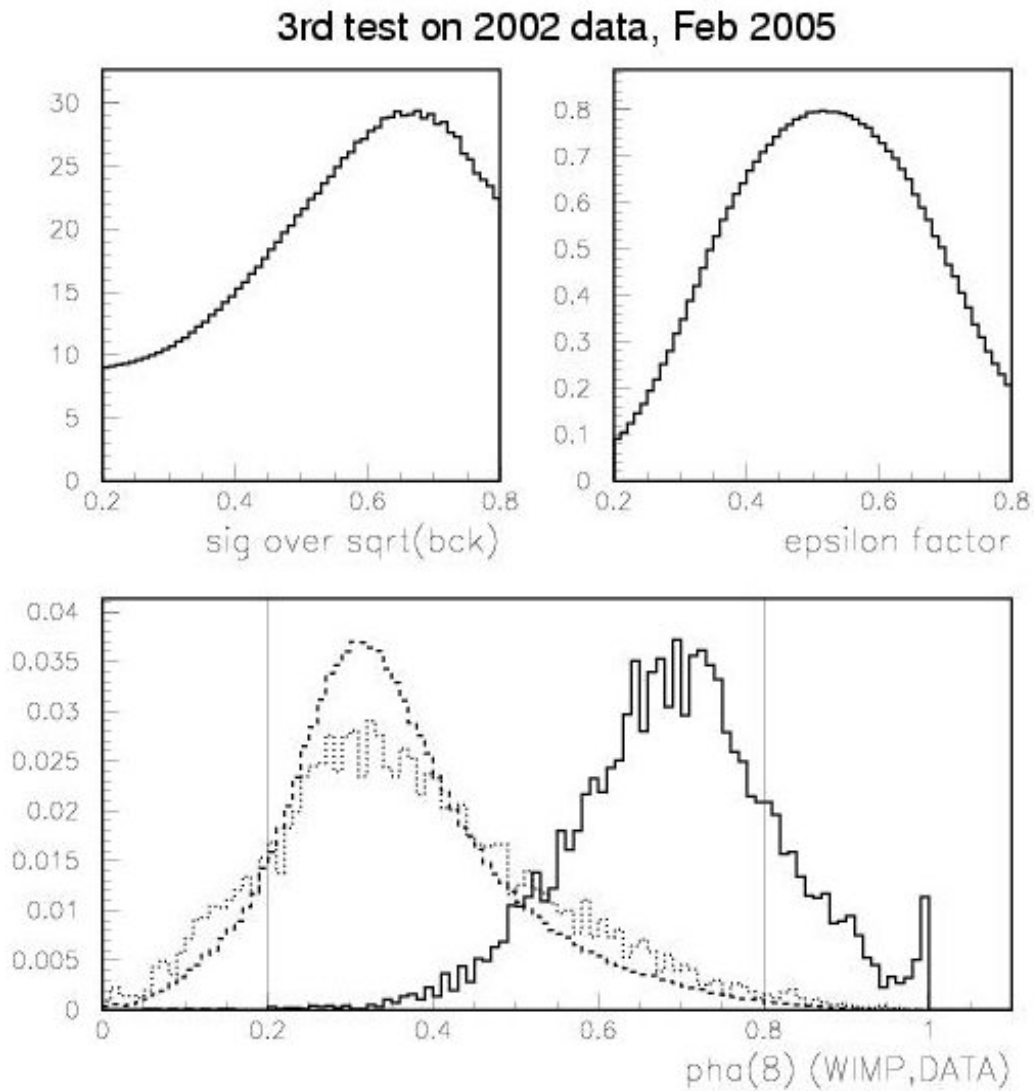
- Use the "epsilon factor", defined as

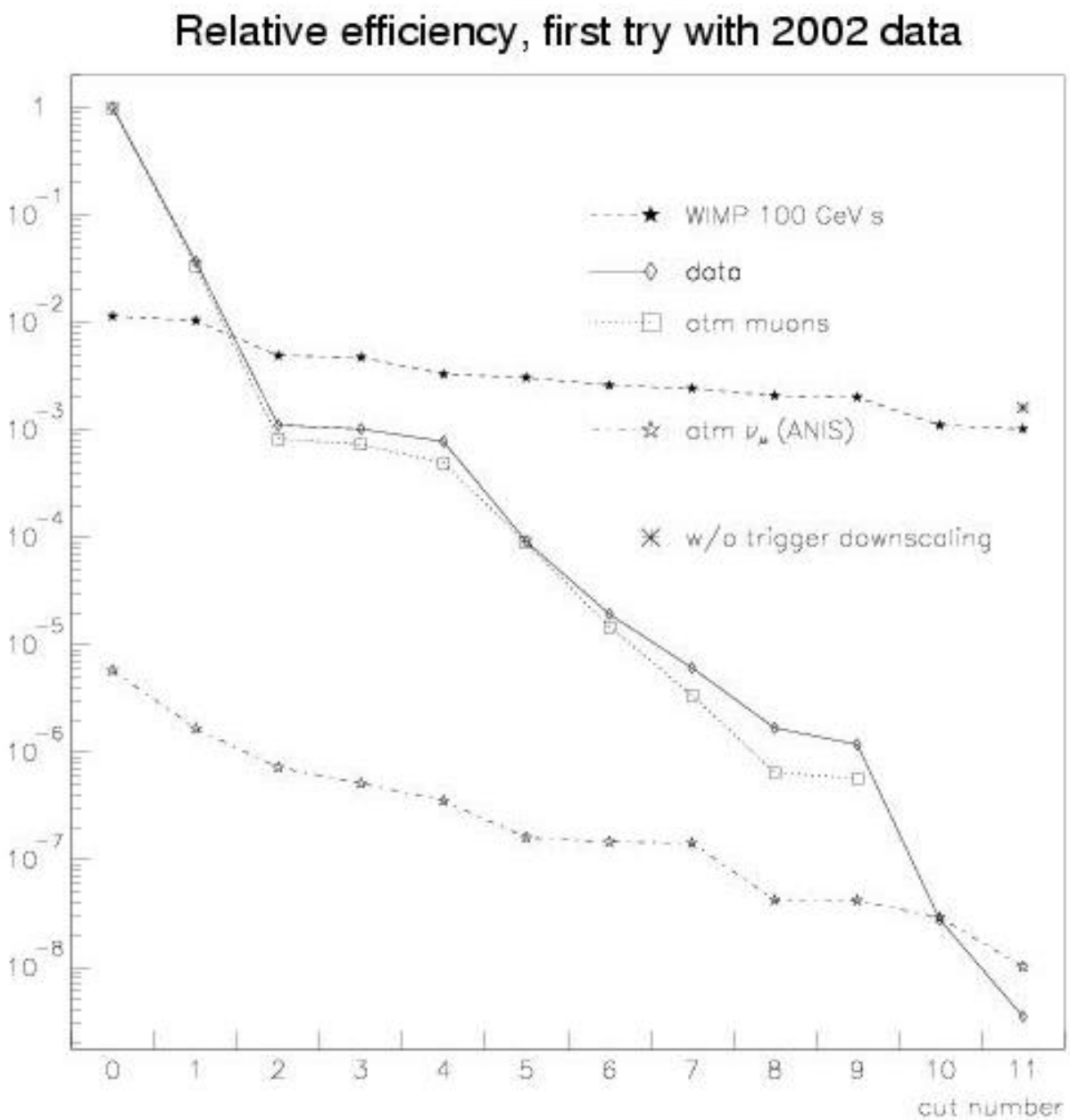
$$\varepsilon_s \cdot (1-\varepsilon_b)$$

where ε is the cut efficiency

- For comparison also compute

$$s \cdot \sqrt{b}$$





2002

Preliminary result of the cut procedure.

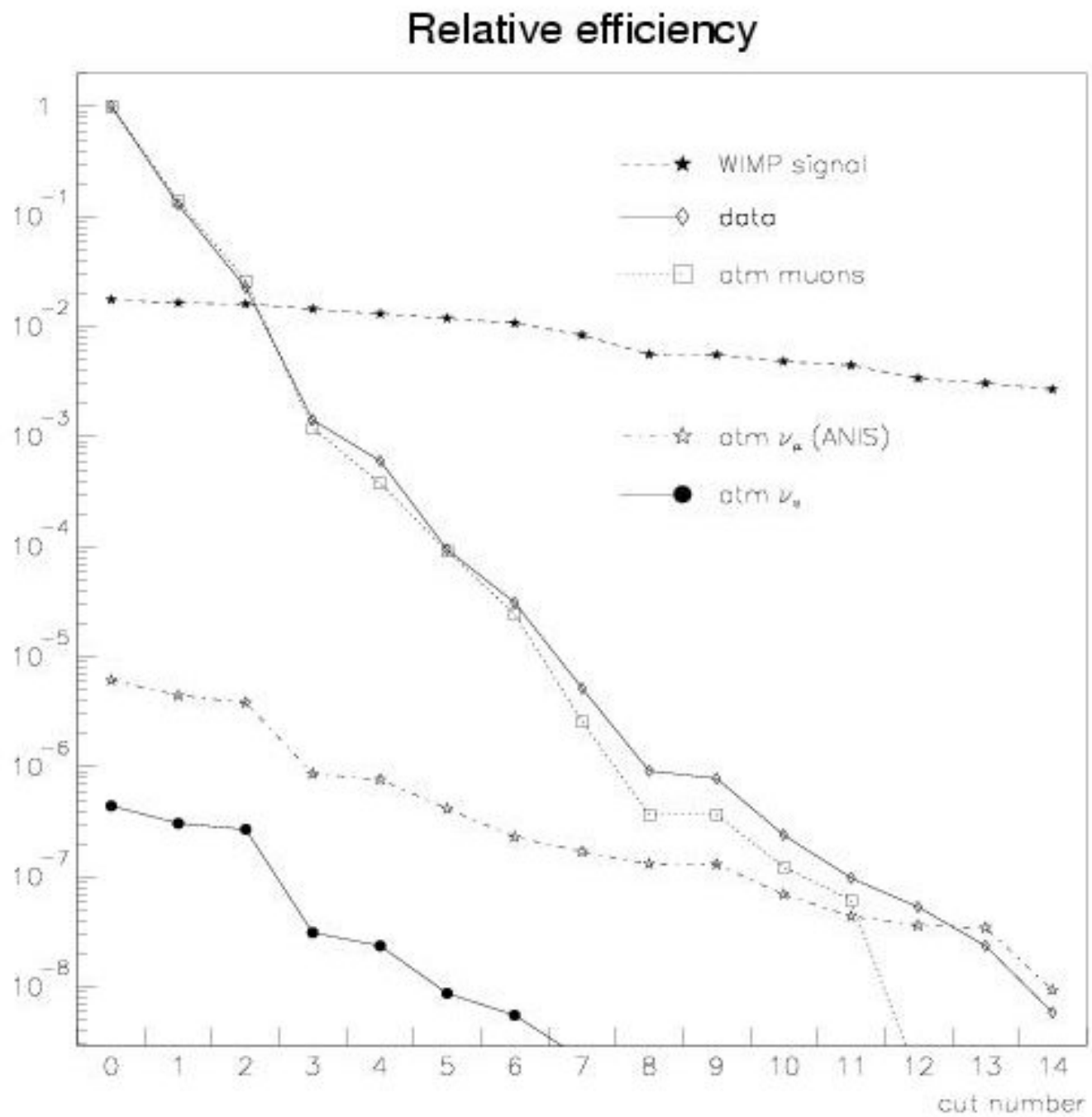
The last cut is optimized for MRF with a flat distribution as background.

10% of signal remains from trigger level.

2001

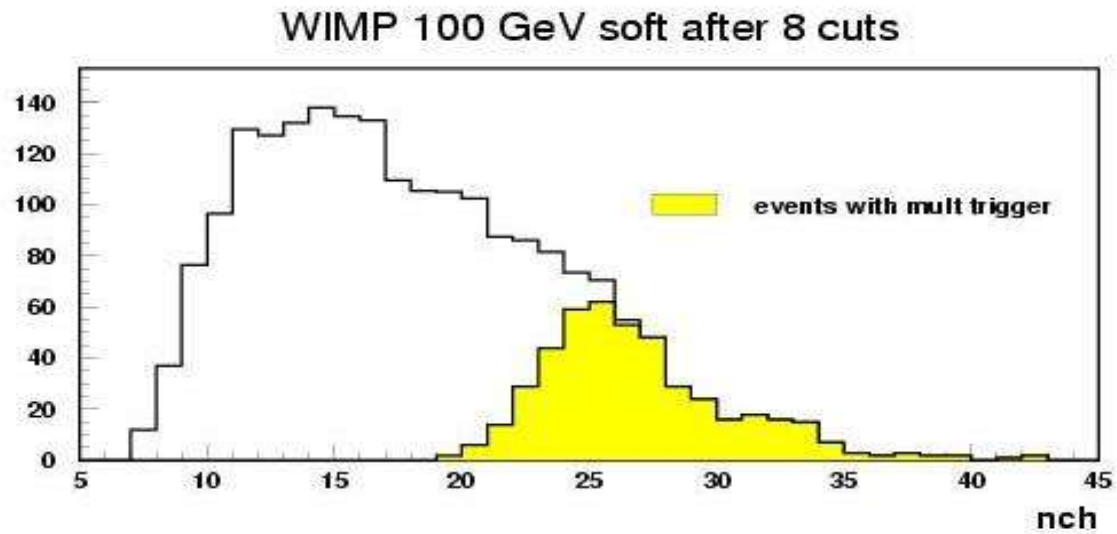
This result is presented for comparison. The analysis was made 2004 with a special filter and recon-structions in the Siegmund framework.

15% of signal remains from trigger level.

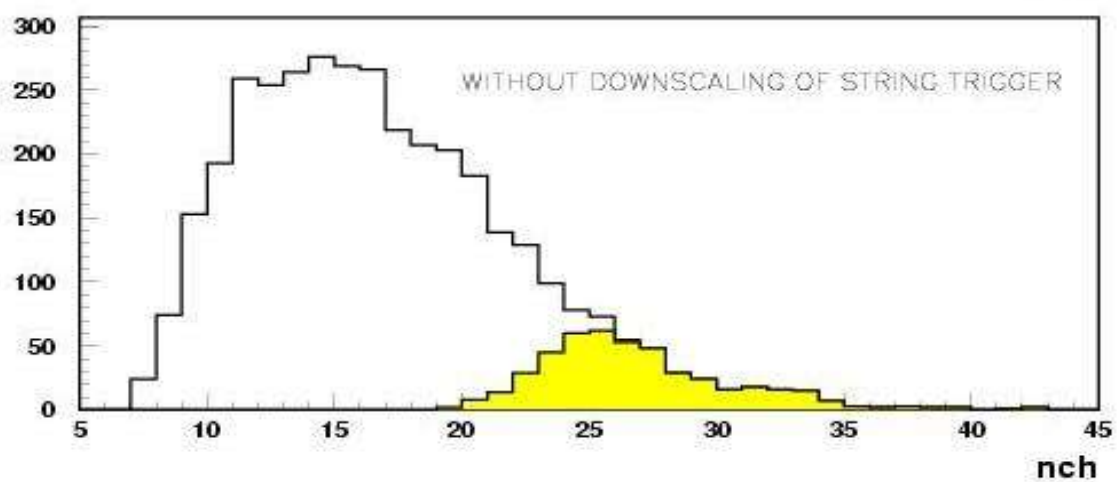


We can clearly see that the string triggered events contribute a lot. At the final cut level ~35% of the remaining events fulfilled multiplicity ≥ 24

Also note that we lose efficiency due to the trigger downscaling.



The yellow area is the same in the both plots.



Outlook, time table

May:	all data processed, $2 \cdot 10^7$ triggered Corsika events produced (~2 days live-time)
August:	combined limit for 2001-2003
January:	thesis defended

Reconstruction 8 is a likelihood fit with 32 iterations.

1 zenith(DirectWIMP) > 80°
2 cut on flarevariables + retrigger
3 zenith(8) > 140°
4 | p08sigze | < 0.3 rad
5 (sqrt(pha(8)**2+phe(8)**2)) > 0.6
6 ndirb(8) > 4
7 -(jkchi(8)-jkchi(9)) > 22
8 ninline.f > 5
9 ldirb(8) > 55
10 ndirb(8) > 7
11 zenith(8) > 166°