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On behalf of the ARGO-YBJ Collaboration



The Detector



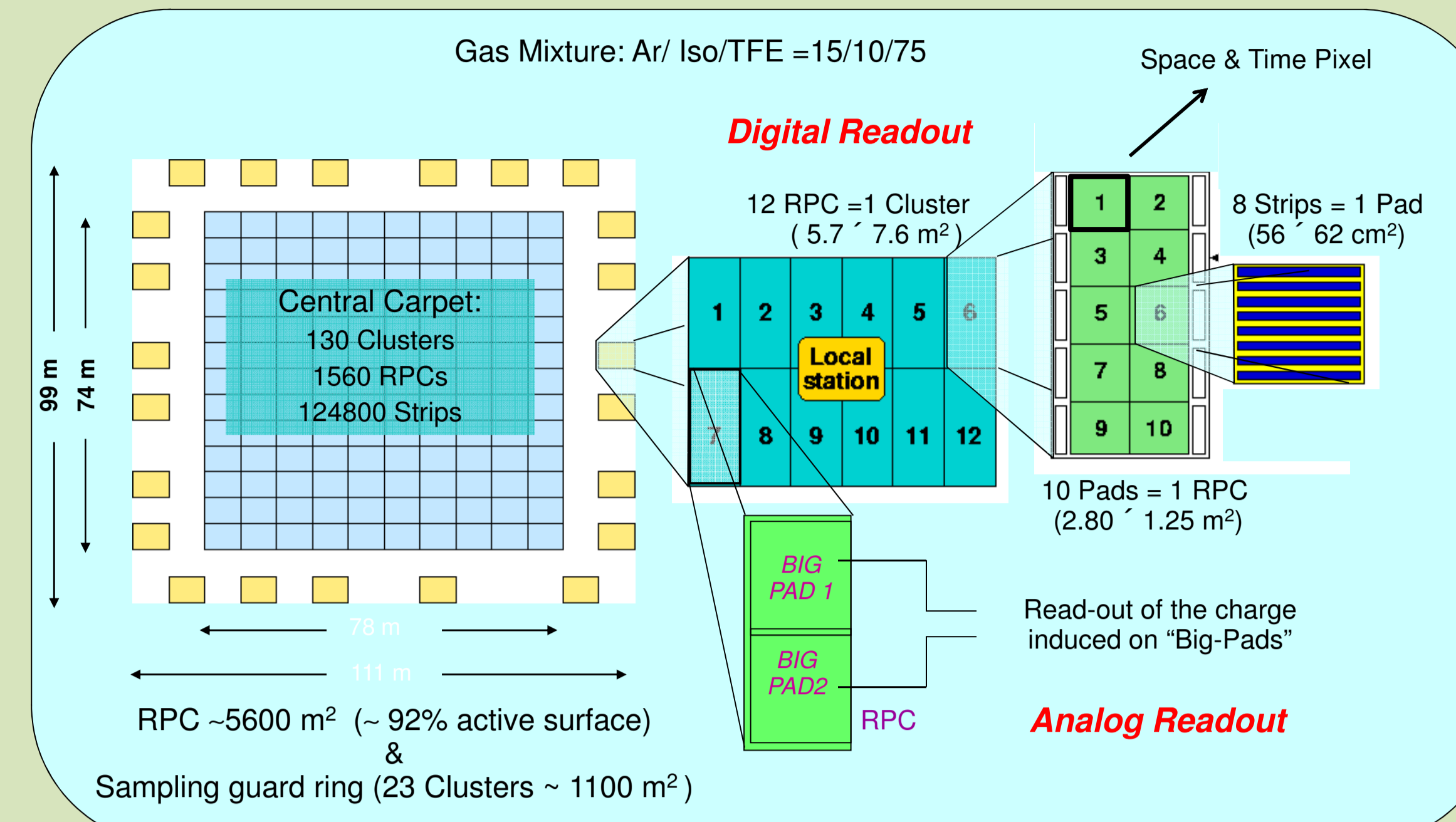
ARGO-YBJ is a "full coverage" EAS array consisting of a 6700 m² carpet of Resistive Plate Chambers, located at the YangBaJing Cosmic Ray Laboratory (Tibet, P.R. of China). The large field of view (~2 sr) makes ARGO-YBJ particularly suitable to detect unpredictable and short duration events such as Gamma Ray Bursts (GRBs).

High duty-cycle (> 90%) and FOV ~ 2 sr

ARGO-YBJ can search for GRBs in coincidence with satellite triggers using two detection techniques, corresponding to two independent DAQs: the "Scaler Mode", working in the GeV energy range, and the "Shower Mode", at energies above a few hundred GeV.

The updated scaler mode results are presented here.

The ARGO-YBJ experiment @ <http://argo.na.infn.it/>



GRB Monitoring at the GeV-TeV Scale

Why:

- > Satellite detectors (EGRET, LAT-FERMI) confirmed emission @ E > 1 GeV.
- > Ground experiments (MILAGRO, HEGRA, AIROBICC, Tibet AS-γ) reported marginal detections on VHE tail.
- > Many models predict the energy cut-off.

The GeV-TeV energy sensitivity of ARGO-YBJ may:

> Reveal the spectral cutoff

&

> Put constraints on the emission model

Scaler mode (E > 1 GeV)

&

Shower Mode (E > 10 GeV)

G. Aielli et al. - Search for GRBs with the ARGO-YBJ detector in scaler mode
The Astrophysical Journal 699 (2009) 1281-1287

G. Aielli et al. - ARGO-YBJ constraints on very high energy emission From GRBs
Astroparticle Physics 32 (2009) 47-52

Data & Results

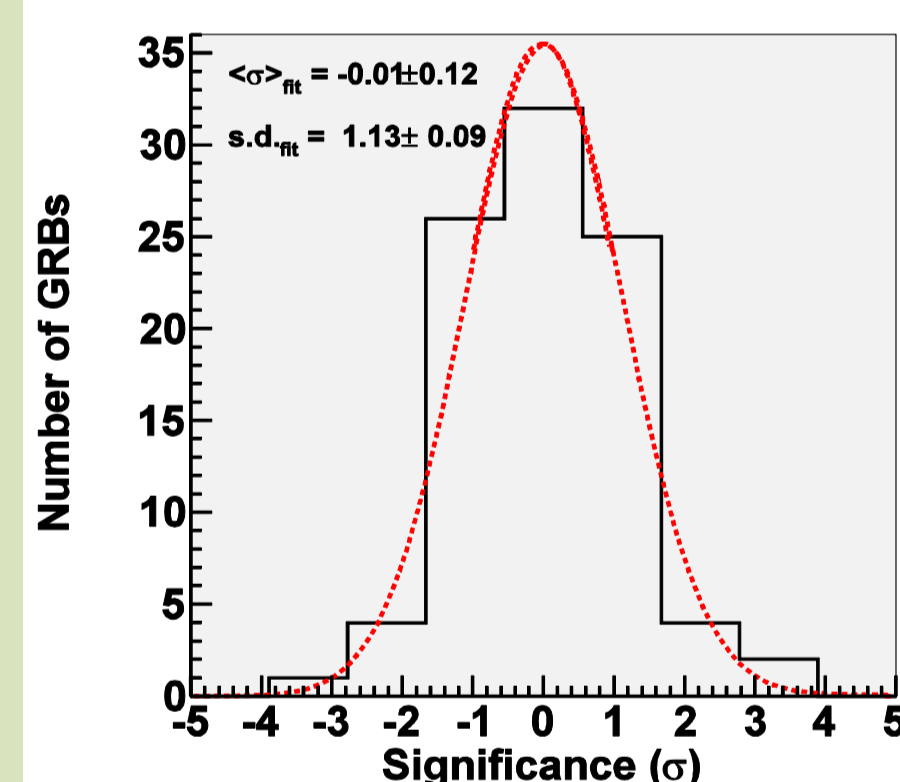
We look for excess in the total single counting rate ($N_{hit}=1$) in coincidence with satellite detections (T0 and T90 duration are considered).

DATA SET

Detected GRBs in the ARGO FOV since December 2004 (Swift launch) to May 2010 (last update).

Number of GRBs analysed ($\theta < 45^\circ$): 94
With known redshift: 16
Long duration GRBs ($> 2s$): 83
Short duration GRBs ($\leq 2s$): 11

Distribution of the Significances in T₉₀



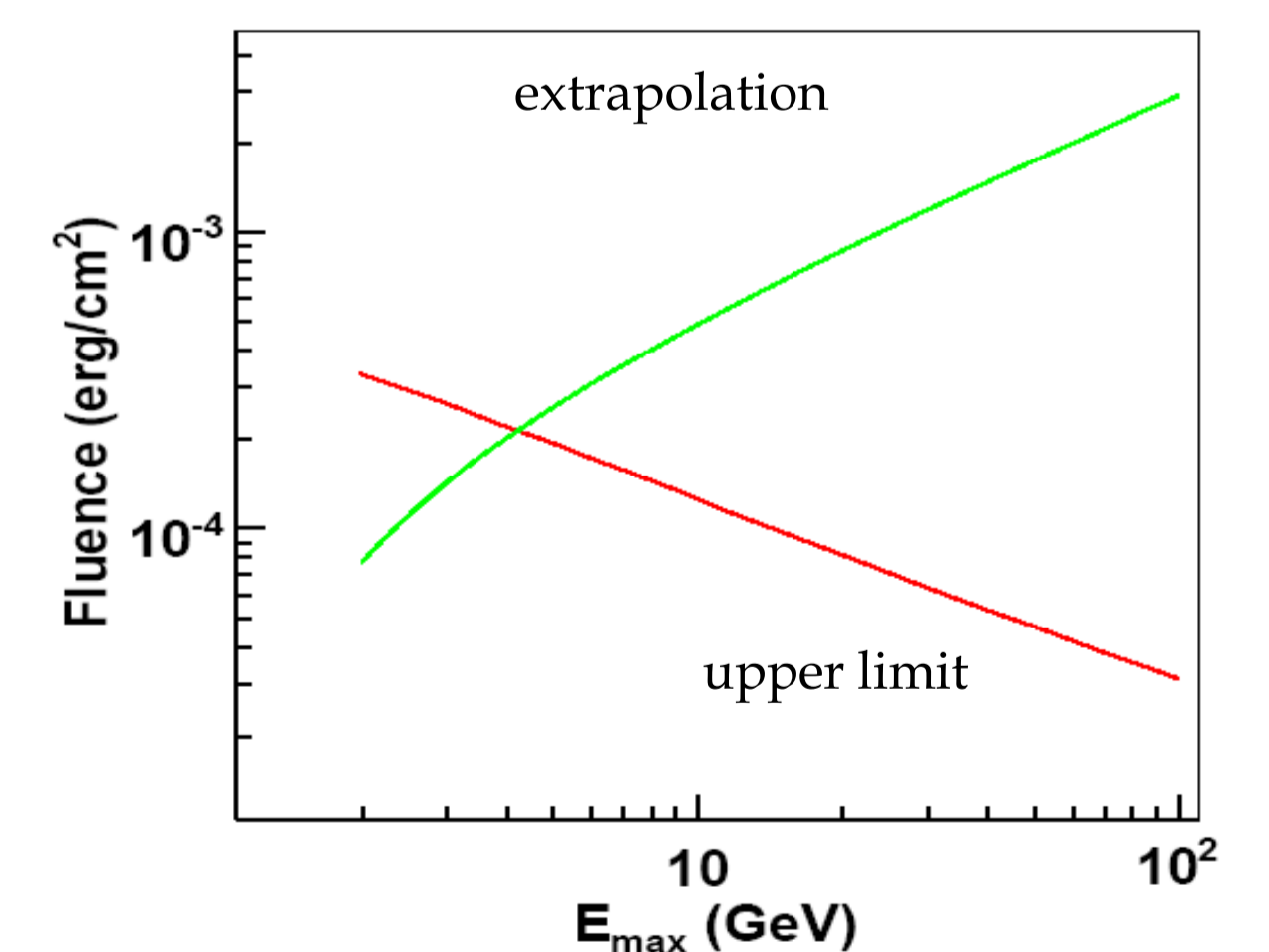
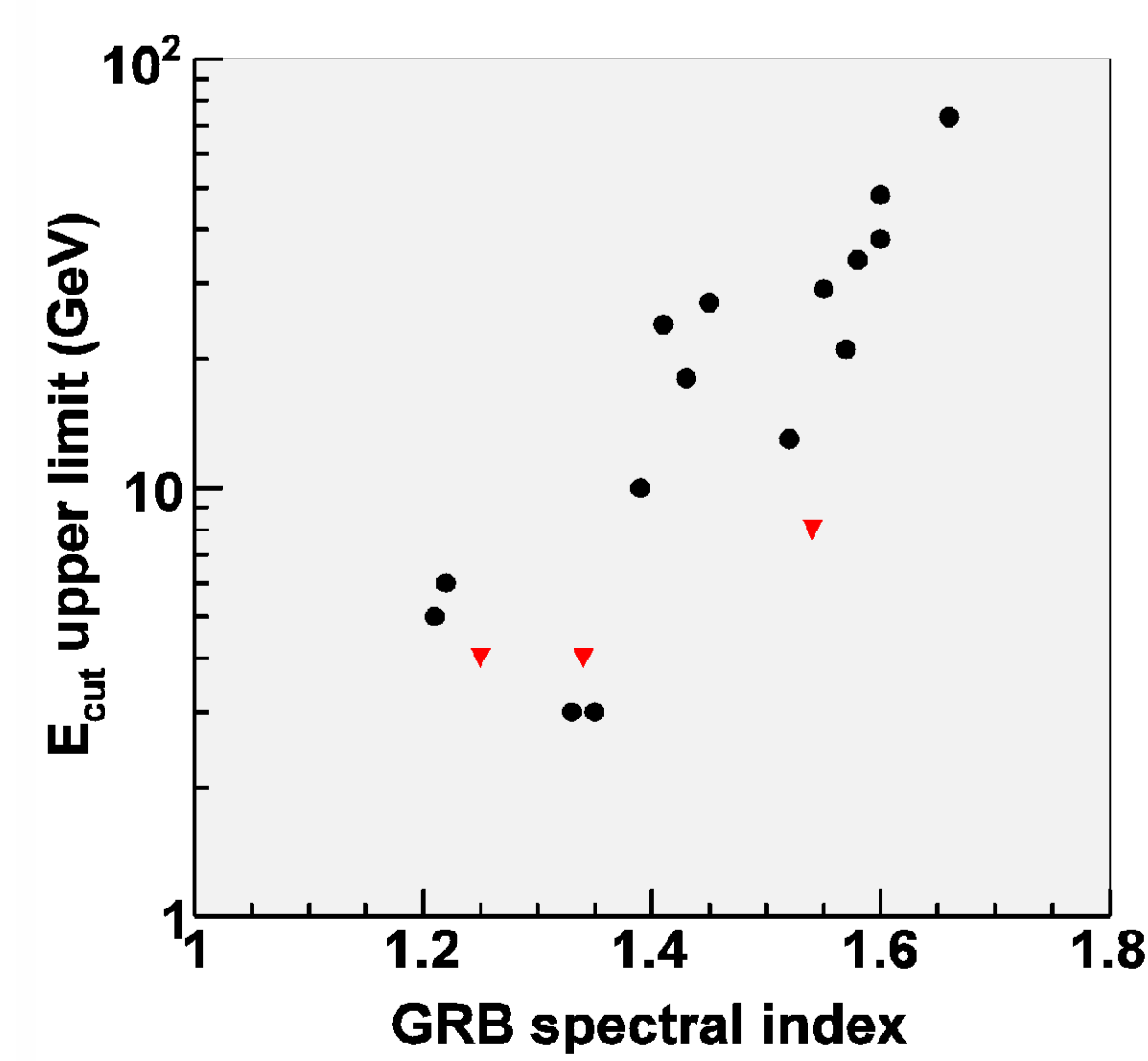
No evidence of coincident signal over the GRB duration T₉₀.

Also stacked analysis (overlapping all GRBs in phase or time) shows no evidence for any integral effect.

Energy cutoff upper limits @ 99% c.l. are calculated including the redshift and the EBL absorption.

Upper limits to the Energy Cutoff

The upper limit on the GRB cutoff energy is given by the intersection of the fluence upper limit, as a function of the cutoff energy, with the extrapolation of the fluence measured by satellites.

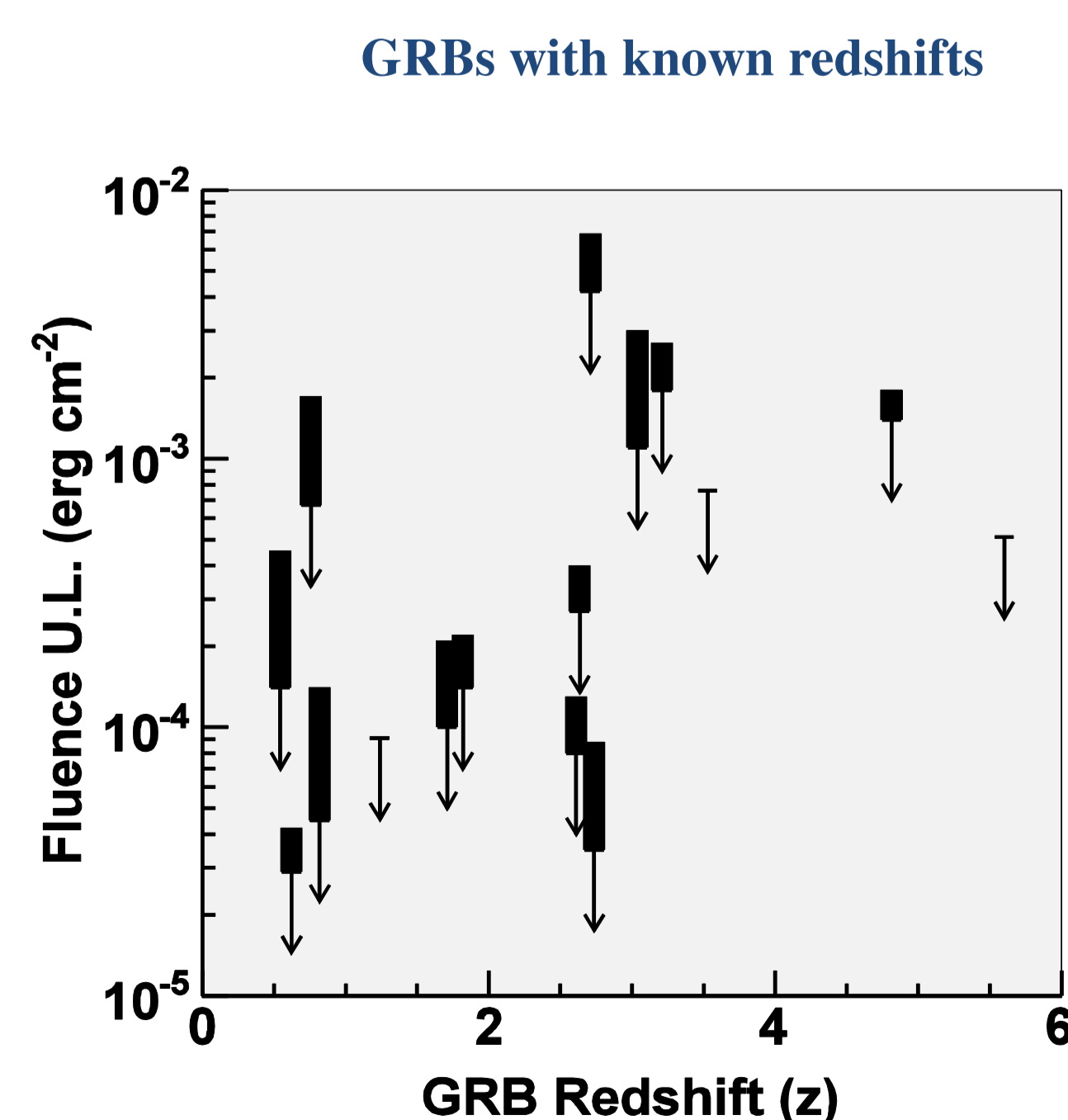
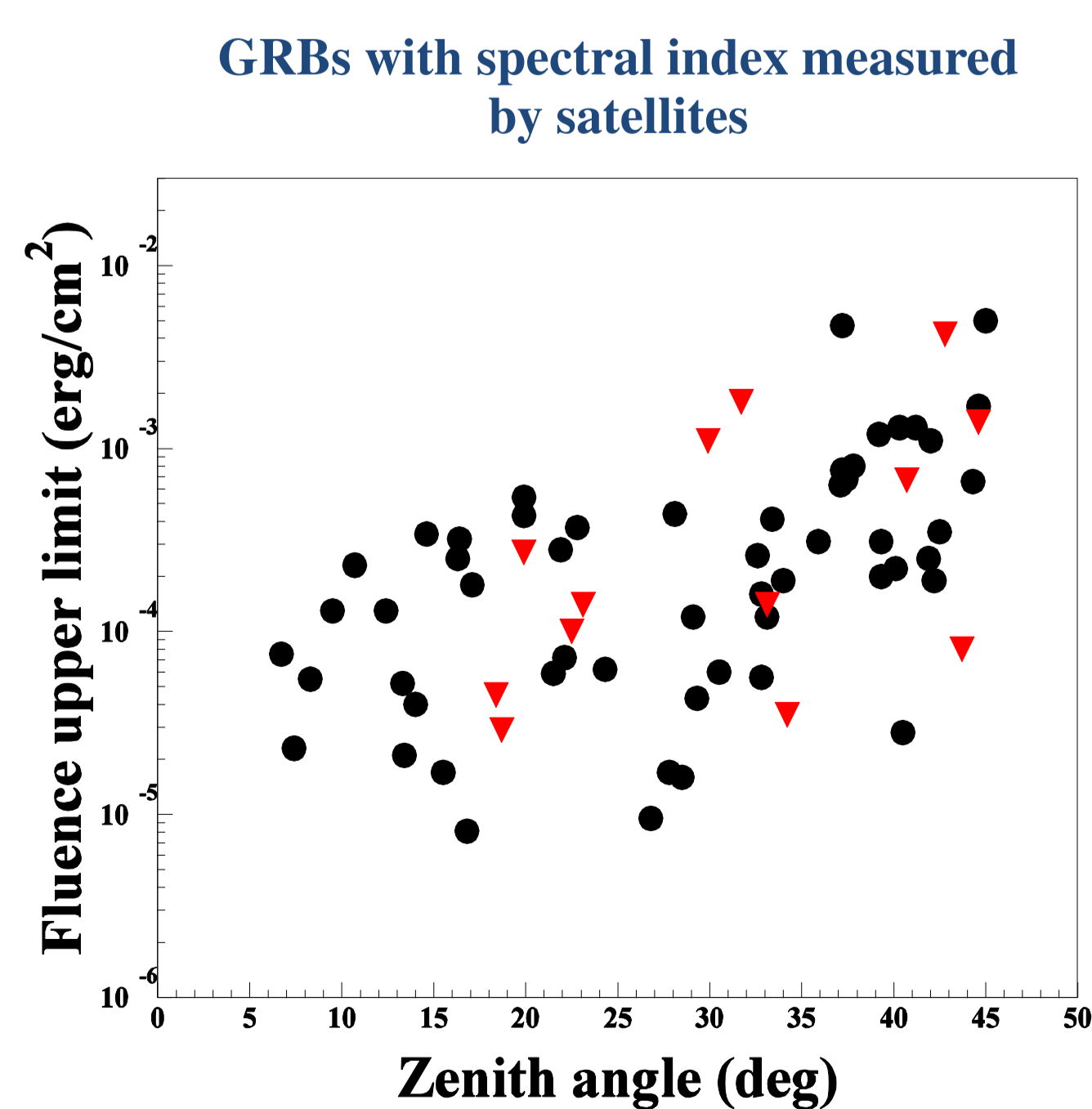


If E_{cut} is in the the sensitivity region of ARGO-YBJ operated in scaler mode (1-100 GeV) we can stat @ 99% c.l. that the GRB spectra do not extend beyond the obtained E_{cut} upper limit.

Conclusions

- Until now, the search for emission from GRBs with the ARGO-YBJ detector has given no positive result.
- Fluence upper limits have been set, taking into account the EBL absorption when redshift is known.
- The simple scaler mode has shown a good sensitivity with fluence upper limits down to $\approx 10^{-5}$ erg/cm² in the 1-100 GeV energy range.

Fluence Upper limits



Red triangles: GRBs with known z, or z=1 assumed.

Black box: spectral index ranging from the value measured by satellites up to 2.5.
Arrow: spectral index fixed @ 2.5.