

Performance of the integrated tracker towers of the GLAST Large Area Telescope (LAT)

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(Bari University & INFN)
for the GLAST Collaboration*

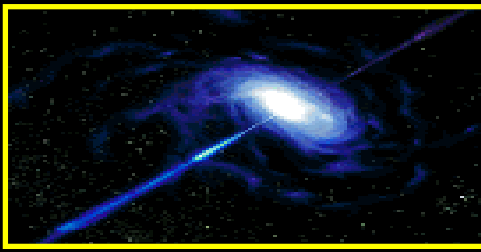
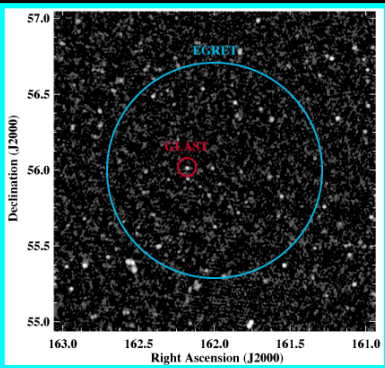


Outline

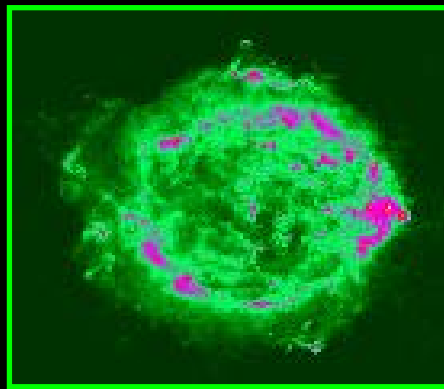
- *The GLAST mission*
- *The GLAST detector*
 - *the Large Area Telescope (LAT)*
 - *the LAT silicon tracker (TKR)*
- *TKR construction and testing*
 - *efficiency of the SSD planes*
- *Integration of the LAT*
- *Cosmic ray data analysis*
 - *study of the ToT distributions*
 - *dependence of the ToT on track parameters*
 - *evaluation of the hit capture efficiency*
- *Conclusions*



The GLAST mission: scientific goals

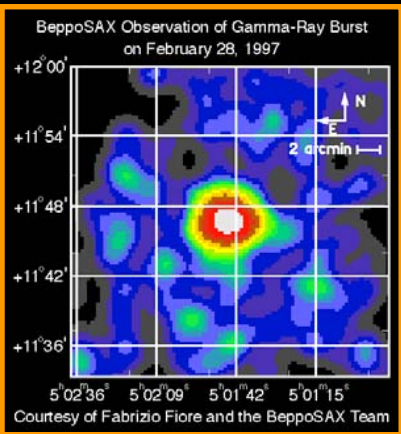
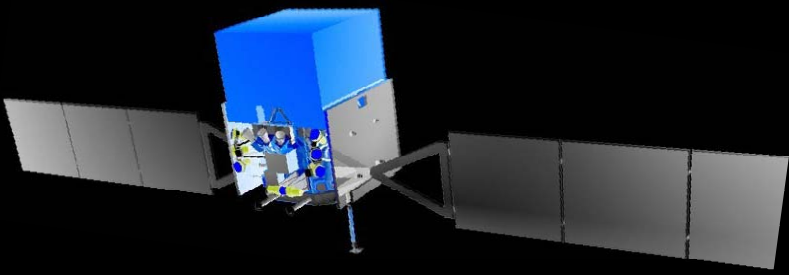


Active Galactic Nuclei

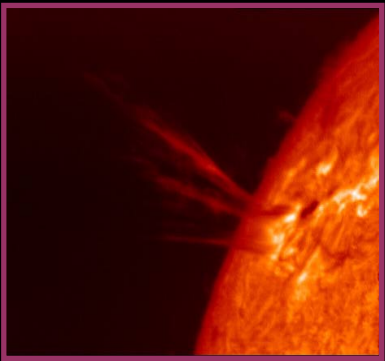


SuperNova Remnants

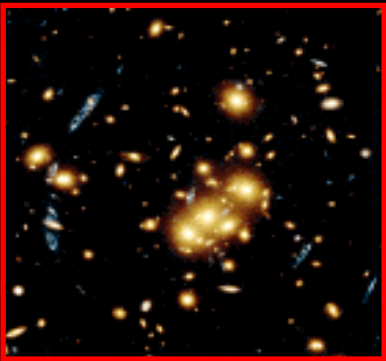
Unidentified sources



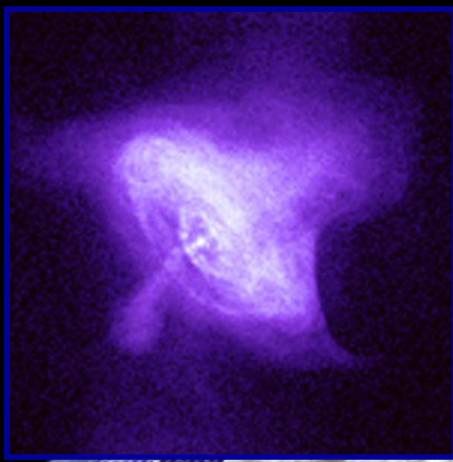
Gamma Ray Bursts



Solar Flares



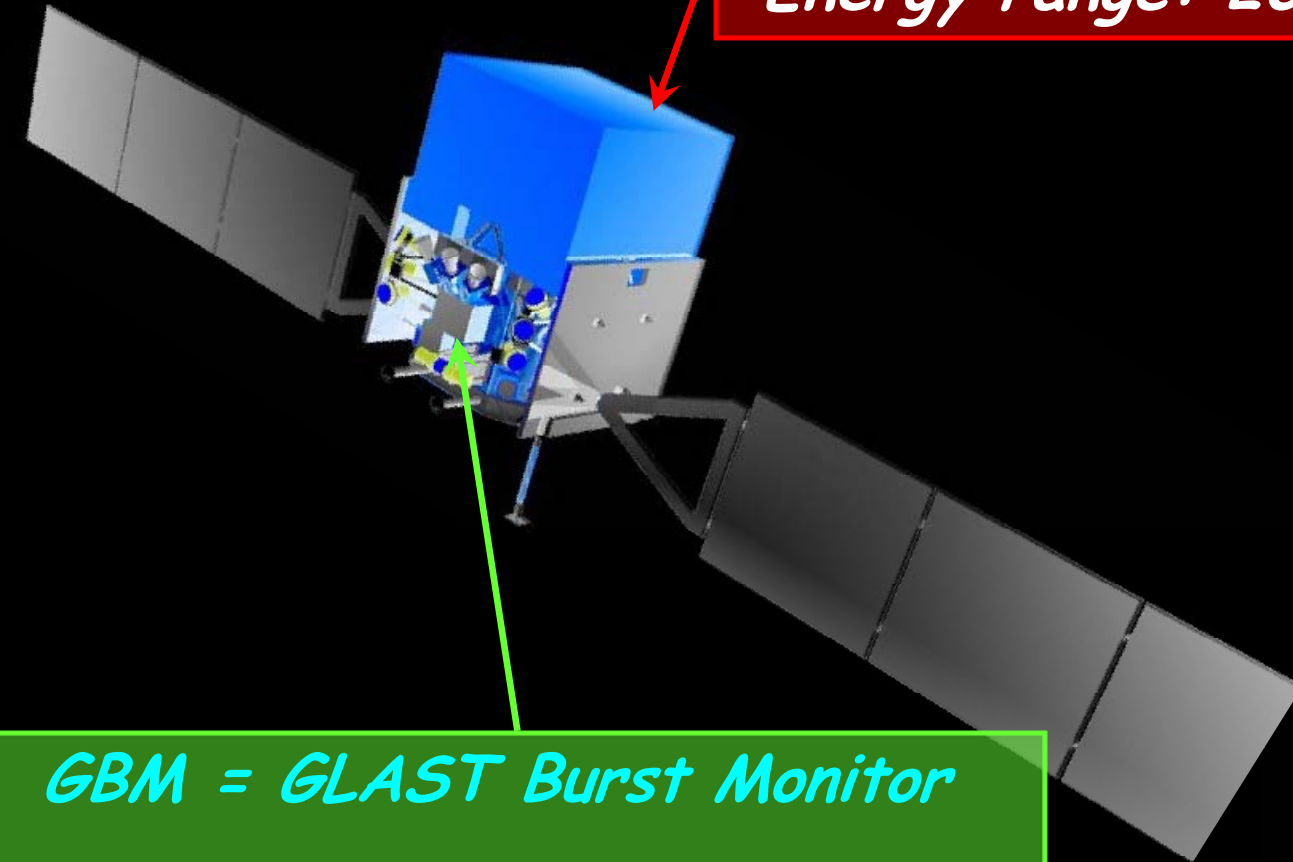
Dark Matter



Pulsars

The *GLAST* detector

LAT = Large Area Telescope
Energy range: 20 MeV-300 GeV



GBM = GLAST Burst Monitor
Energy range: 1 keV - 30 MeV



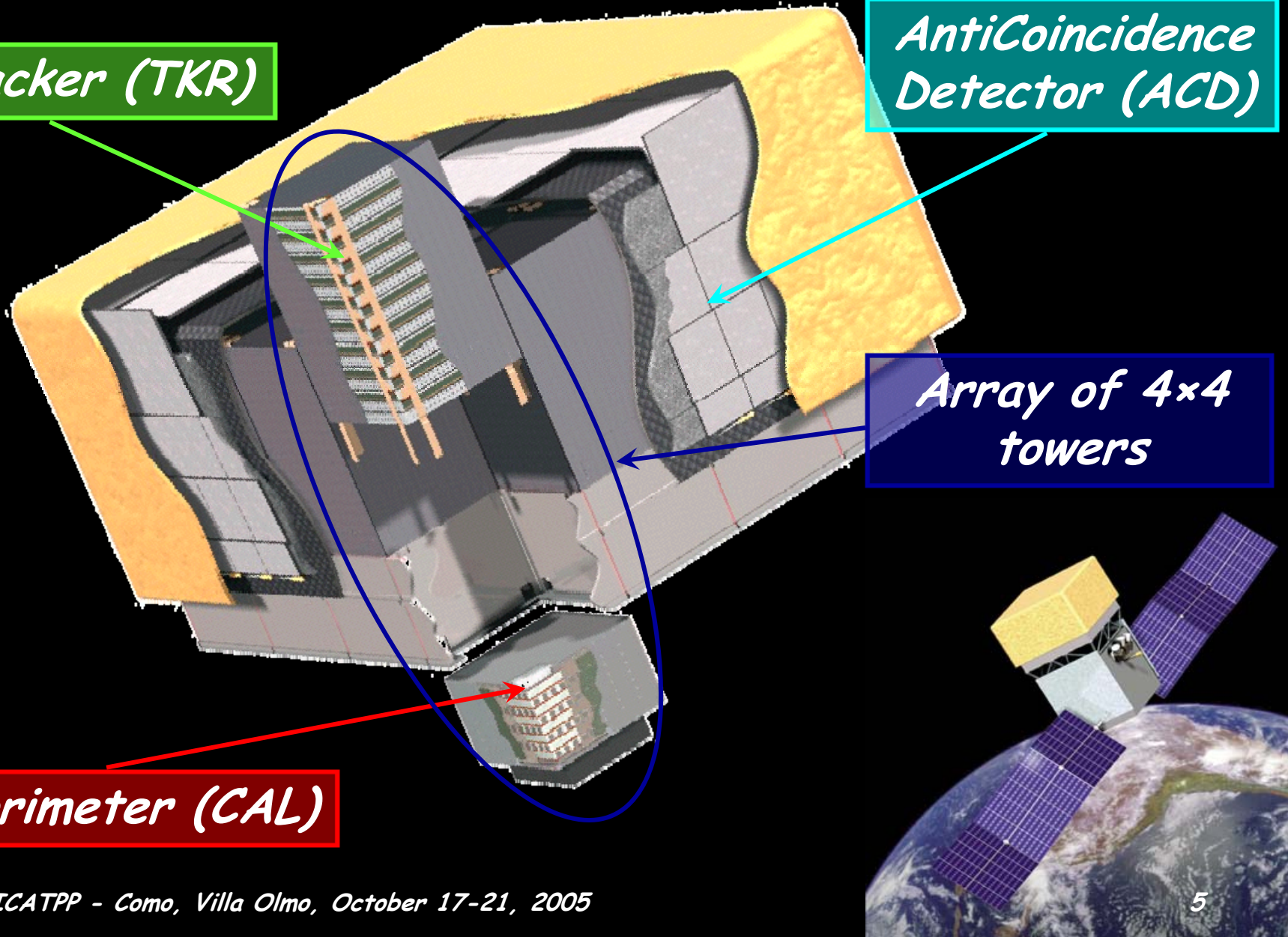
The GLAST LAT

Tracker (TKR)

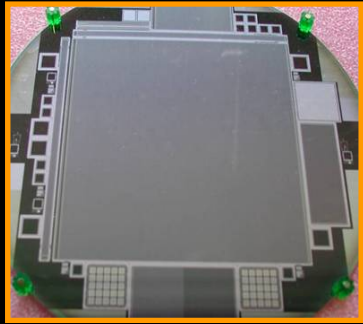
AntiCoincidence Detector (ACD)

Array of 4x4 towers

Calorimeter (CAL)



The LAT tracker (TKR)

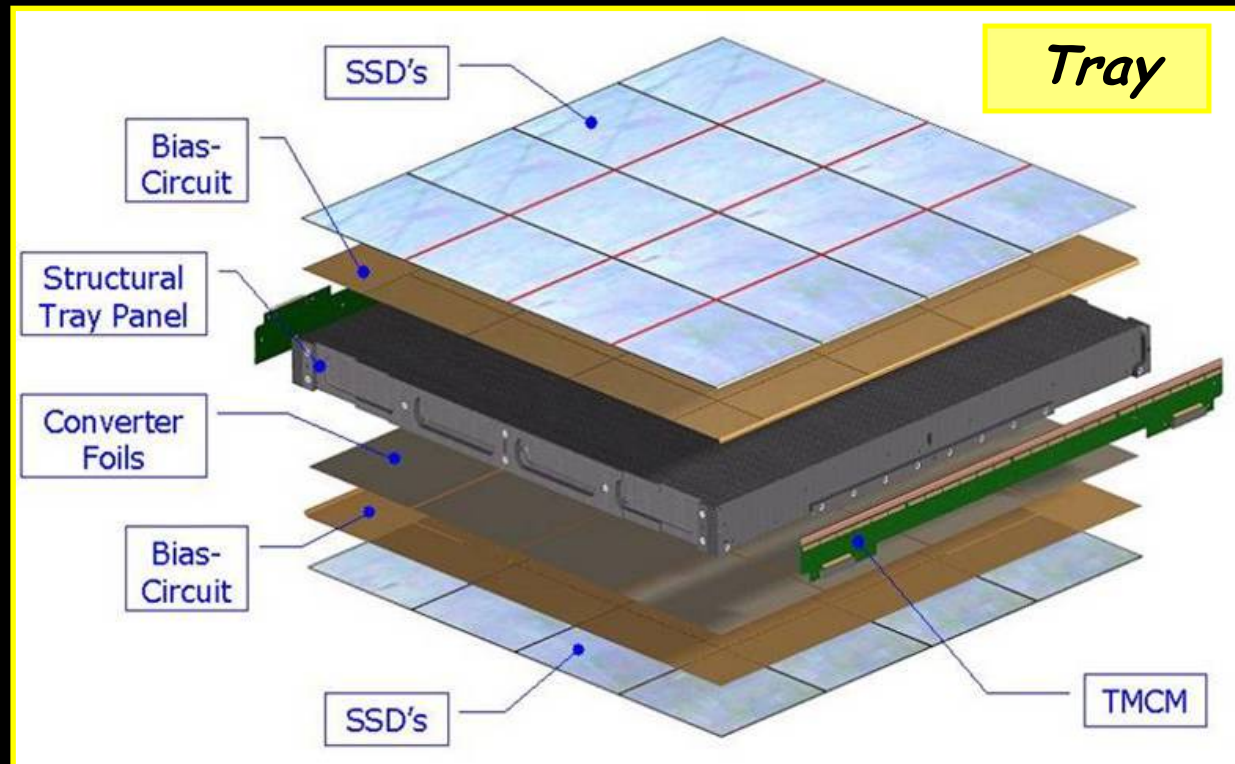


Wafer

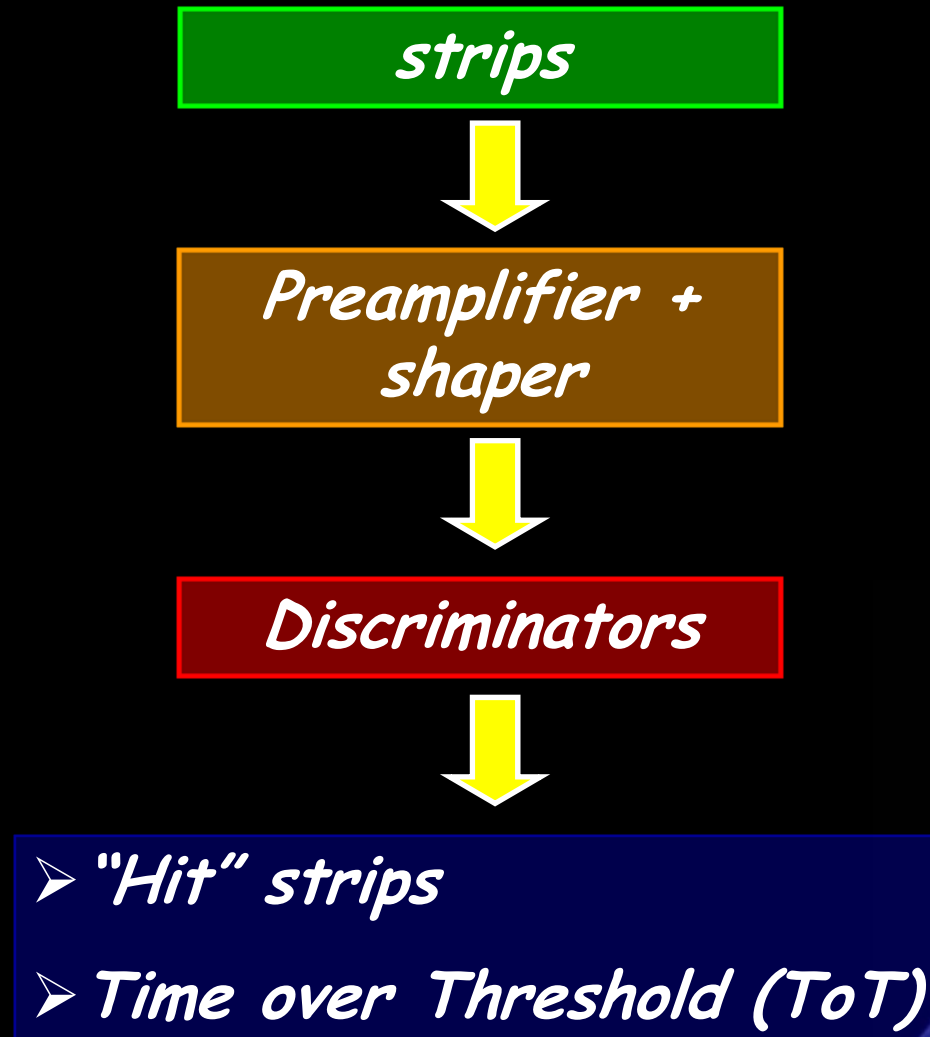
The GLAST SSDs	
Cross section	8.95 x 8.95 cm ²
Thickness	400 μm
Strips	384
Pitch	228 μm



Ladder



The TKR front-end electronics

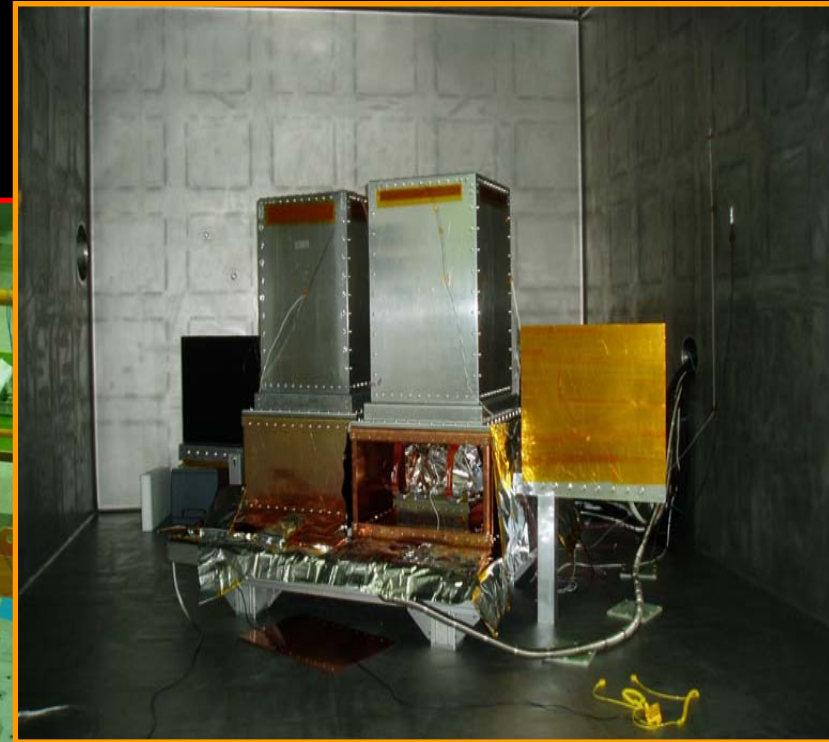
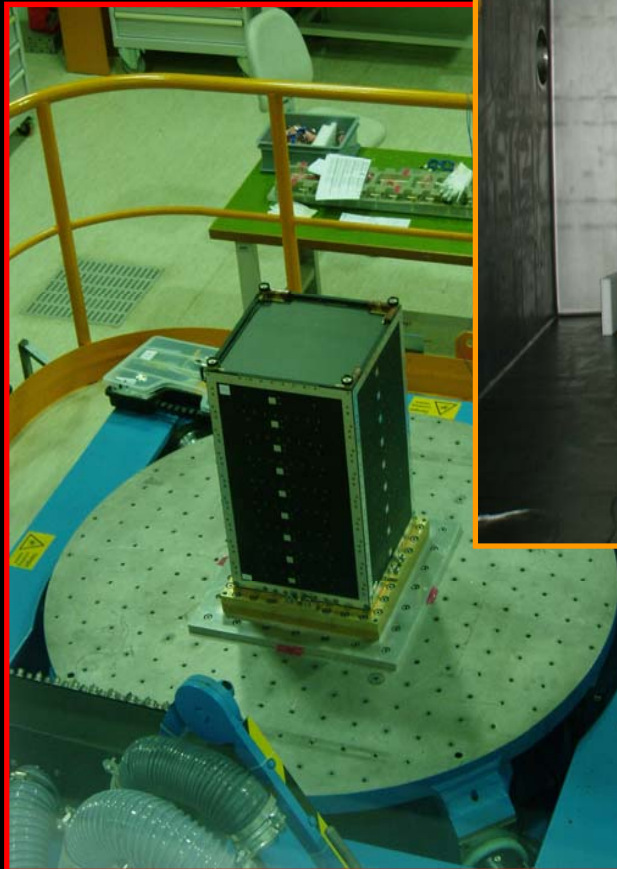


TKR towers: construction & environmental tests



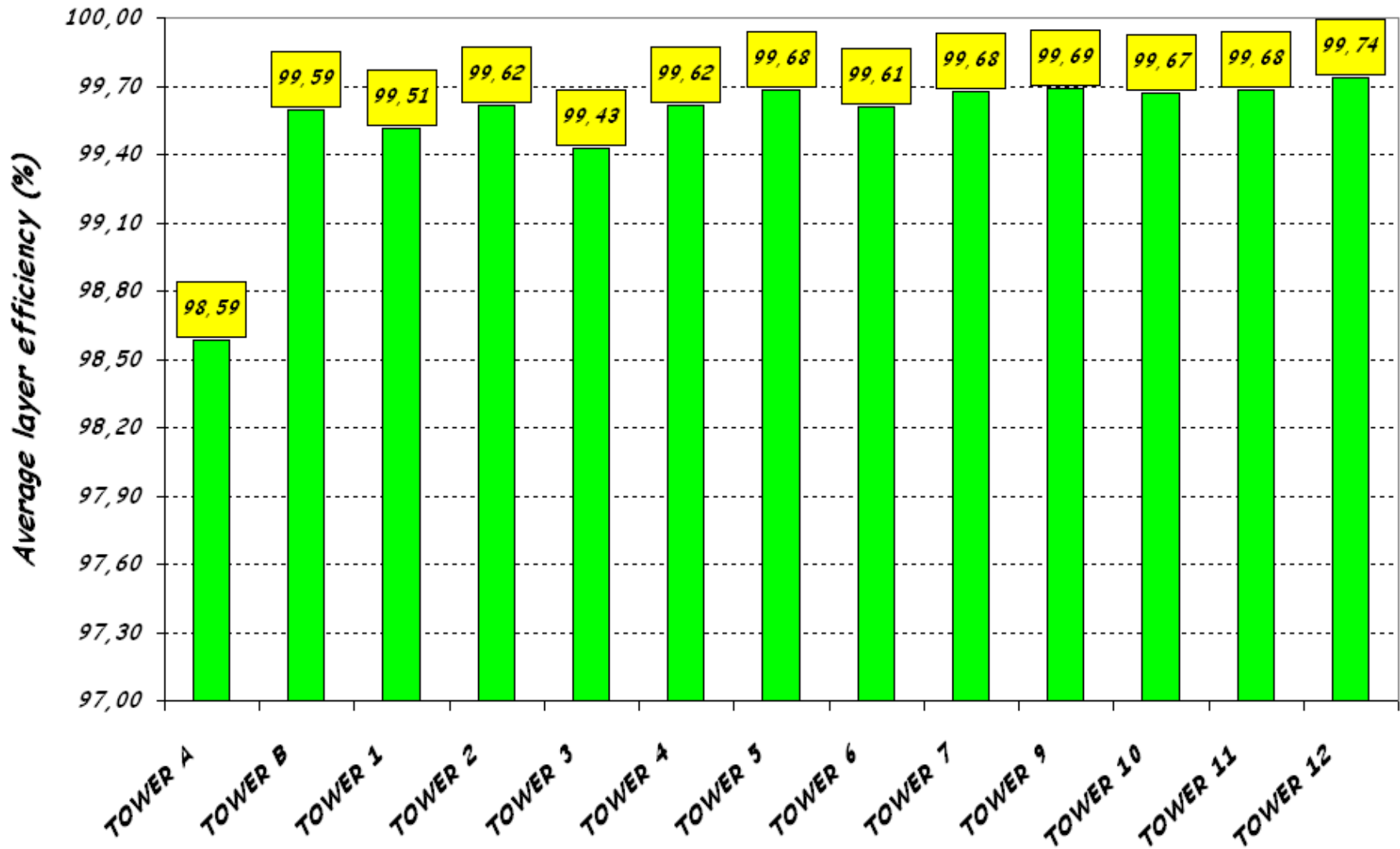
*Assembly
(INFN Pisa)*

*Vib tests
(Alenia, Roma)*

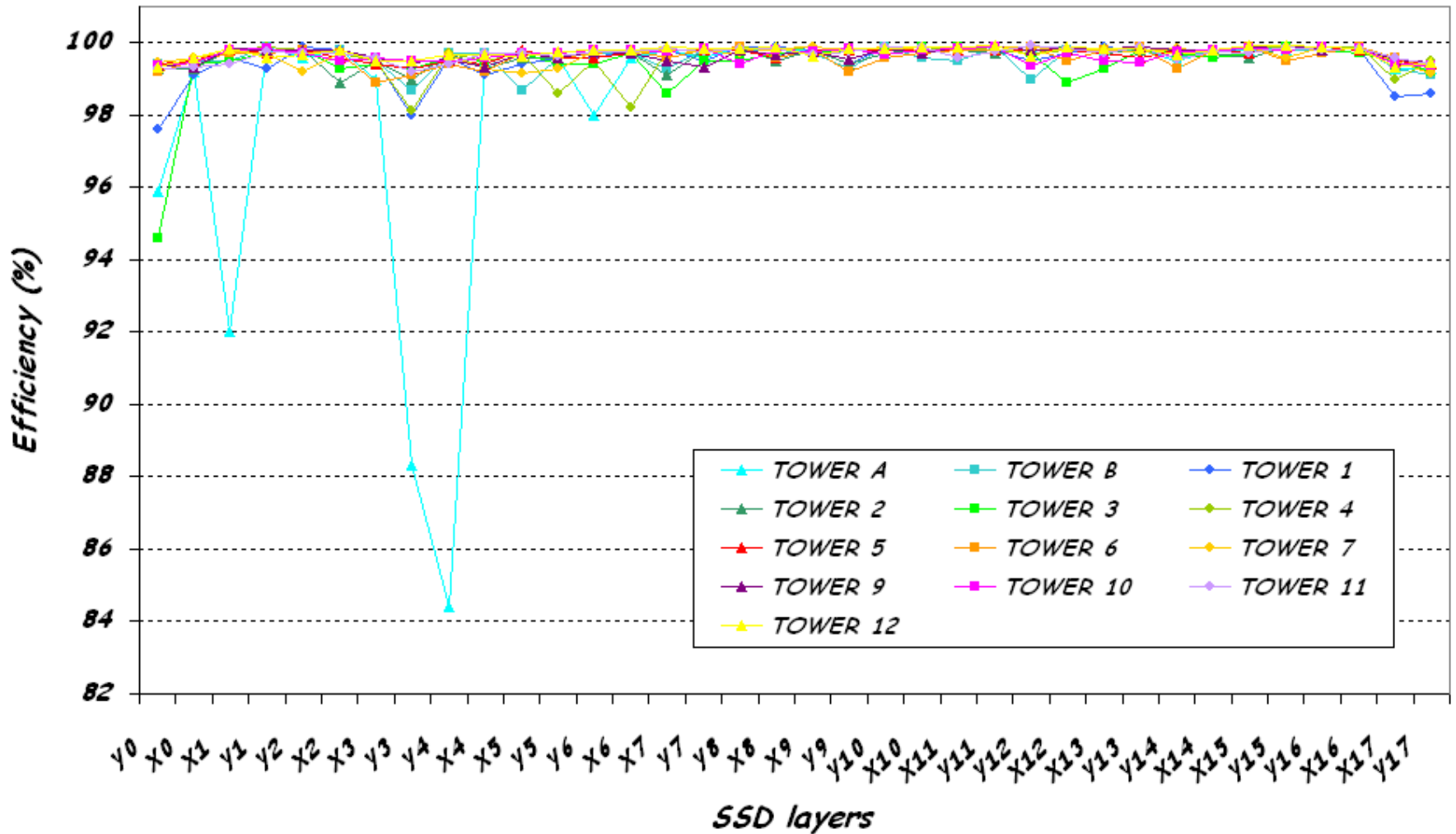


*TV tests
(Alenia, Roma)*

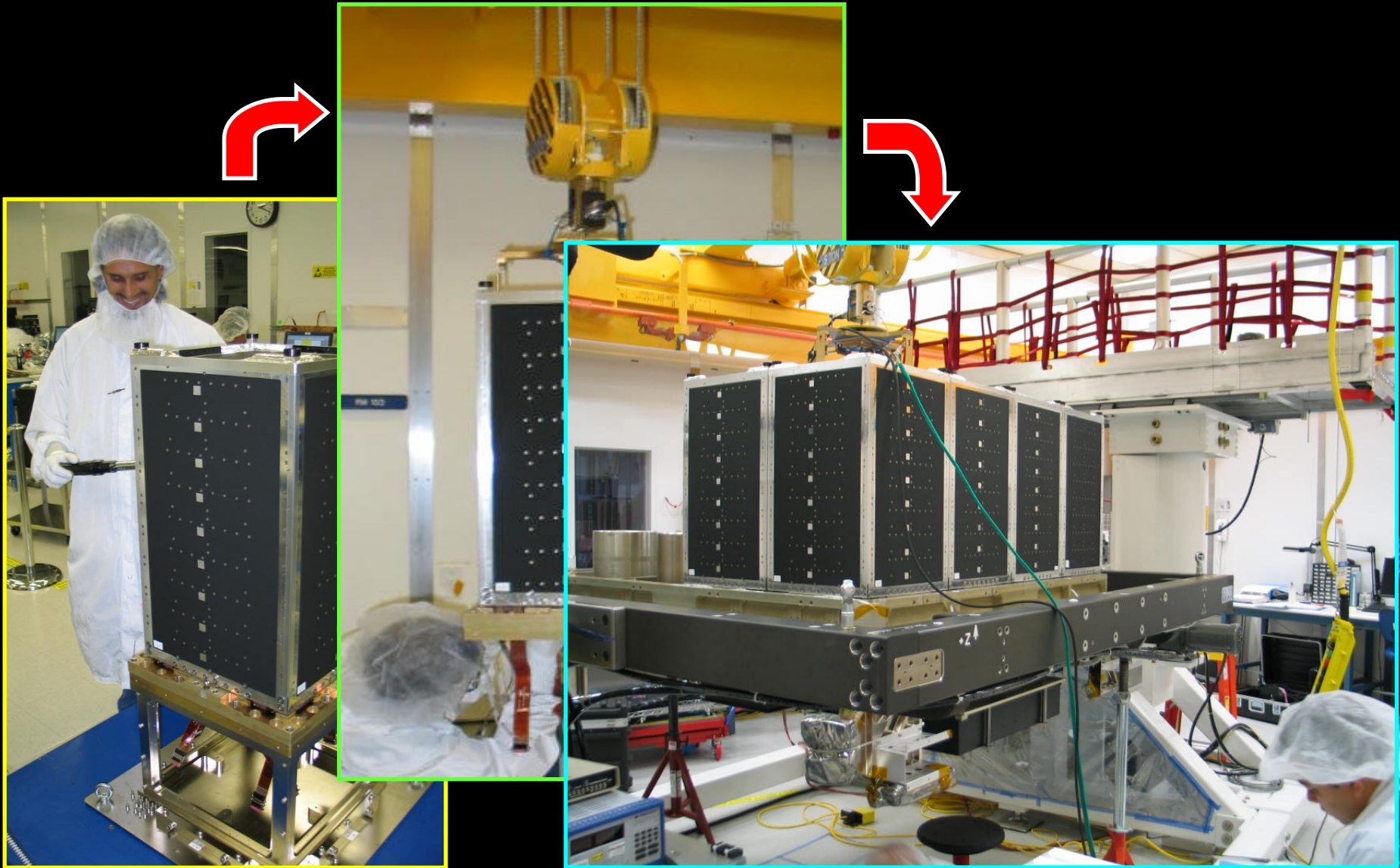
Study of the TKR efficiency



Efficiency of the TKR layers

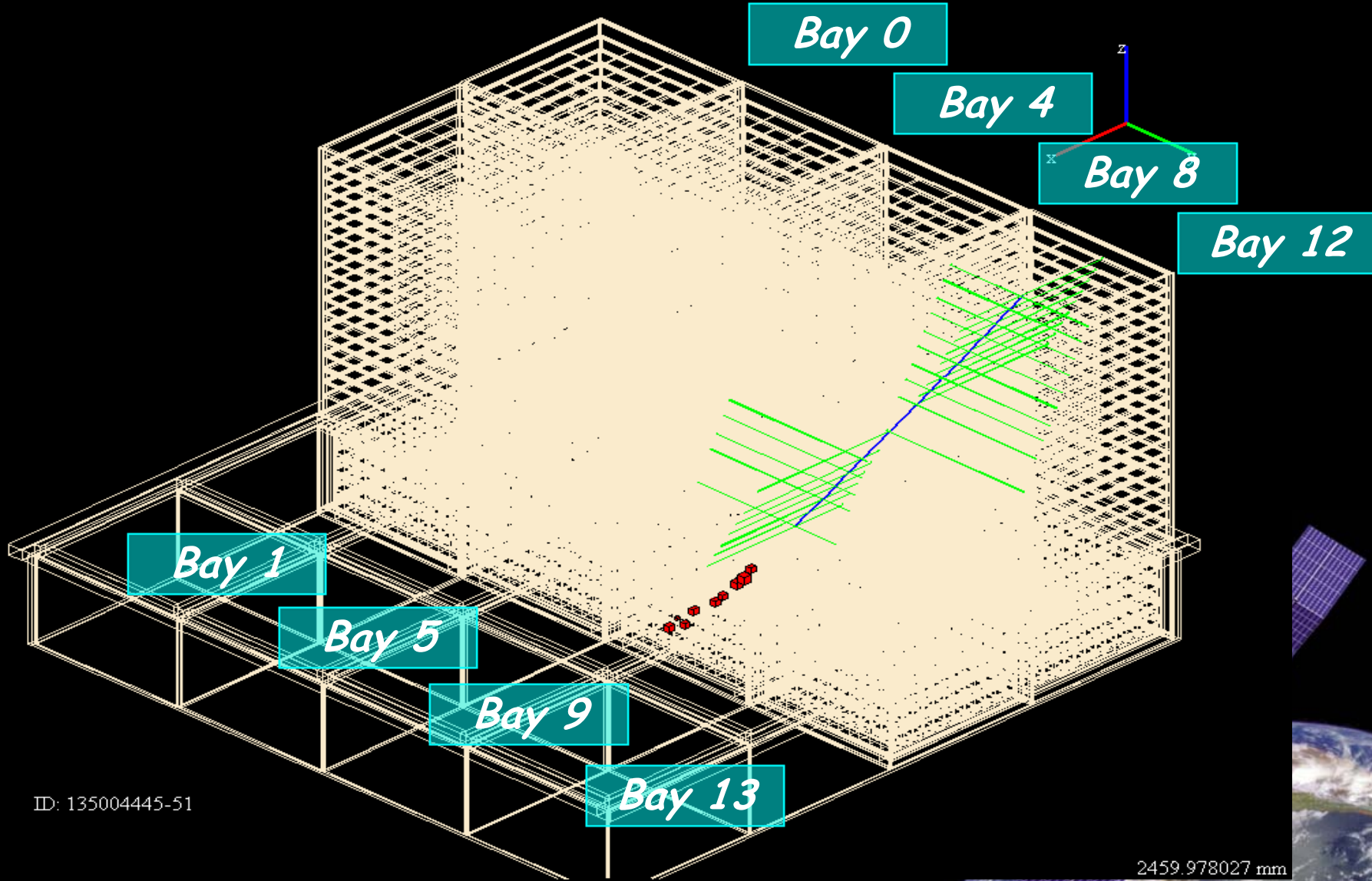


Integration of the TKR towers



Some cosmic ray muon events

1777.777832 mm



ID: 135004445-51

2459.978027 mm

An analysis of Cosmic Ray data

Event Selection:

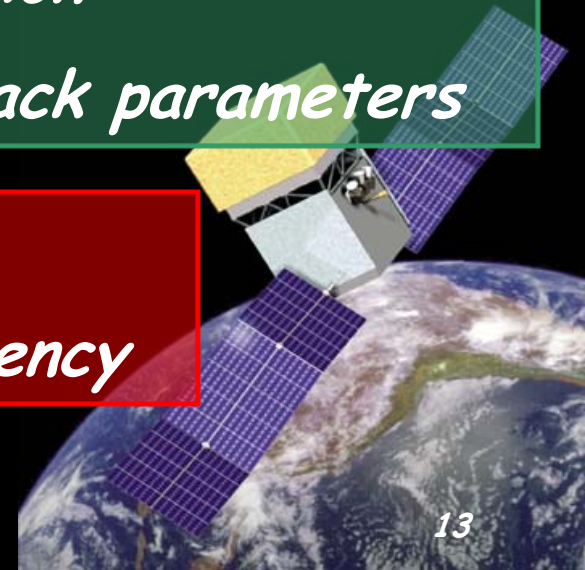
- *TKR trigger from $3x+3y$ in a row layers*
- *Single tower events*
- *Single muon tracks in the TKR*

Study of the ToT in track layers:

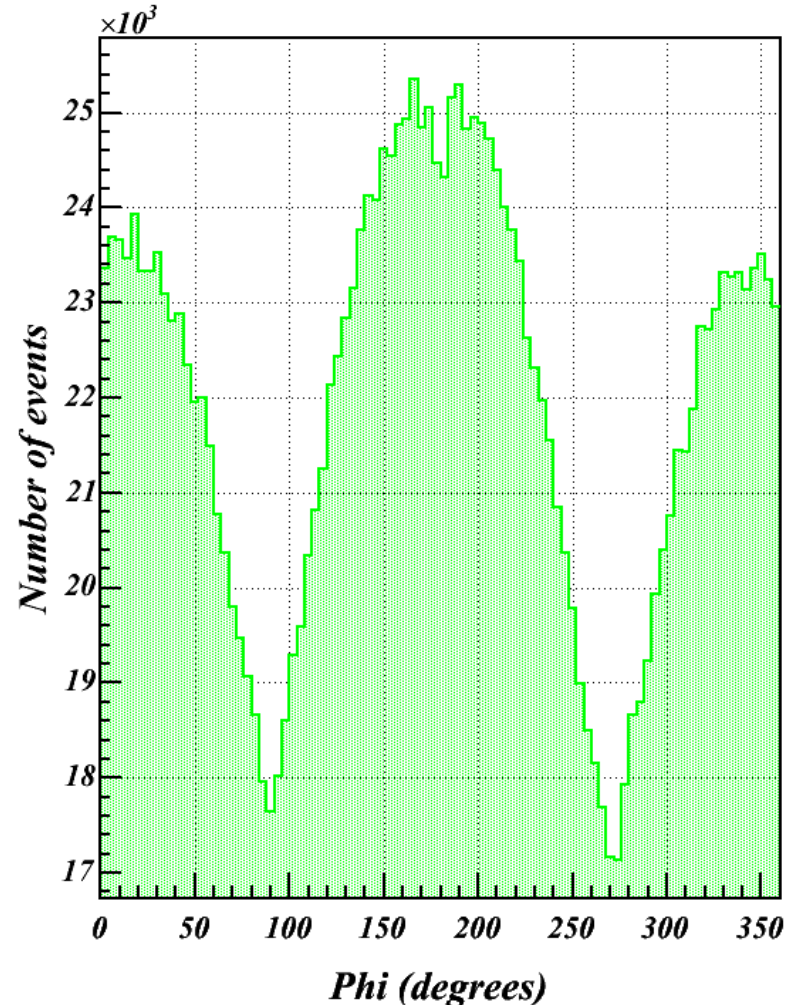
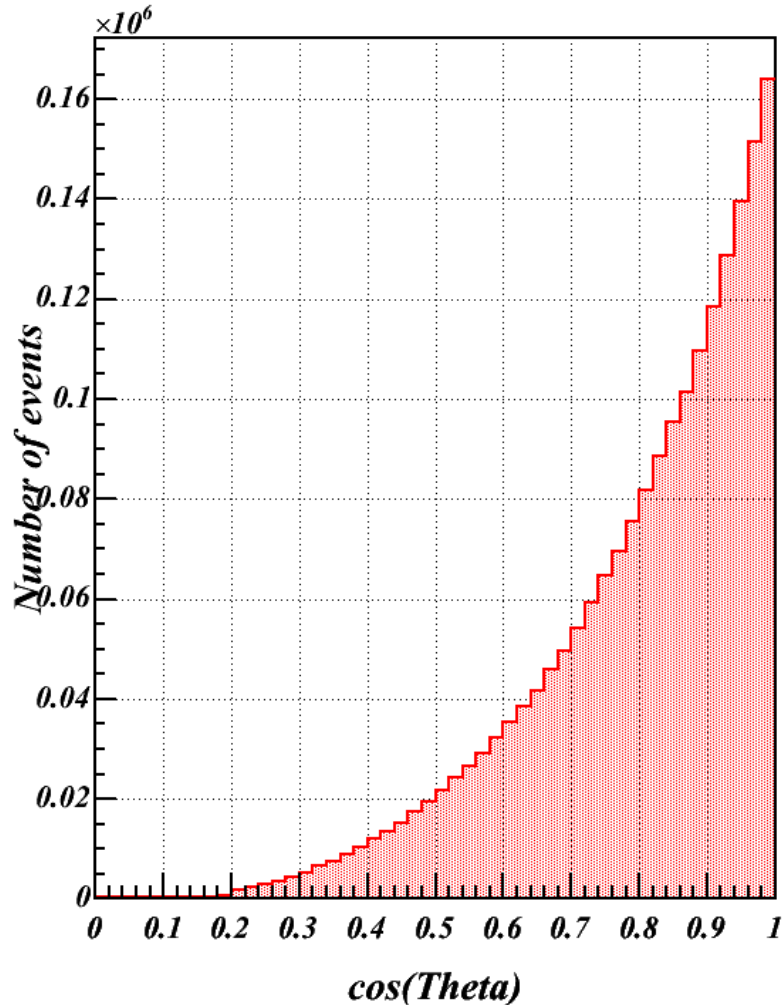
- *Investigation of the ToT distribution*
- *Dependence of the ToT on the track parameters*

Study of the ToT in triggering layers:

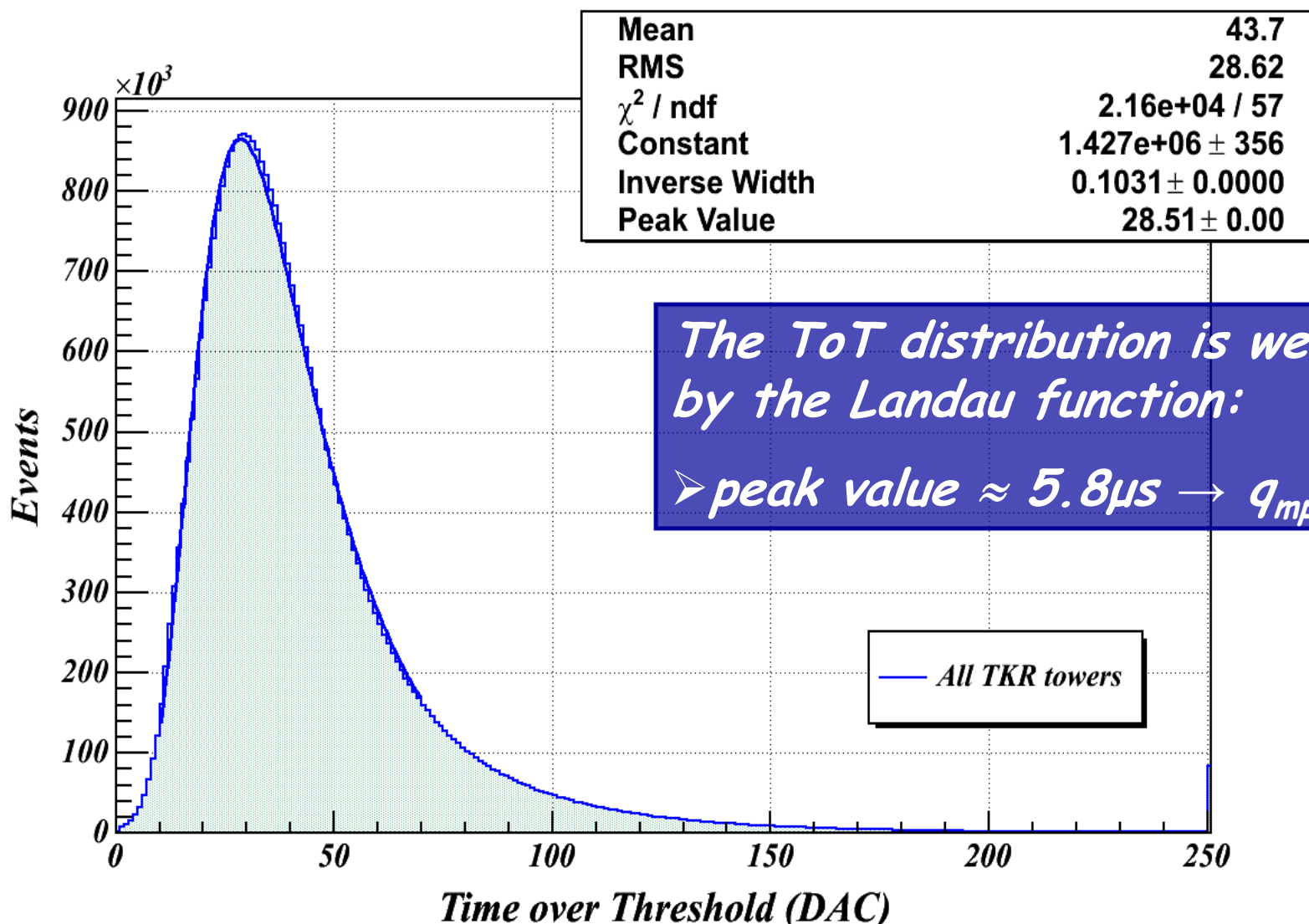
- *Evaluation of the hit capture efficiency*



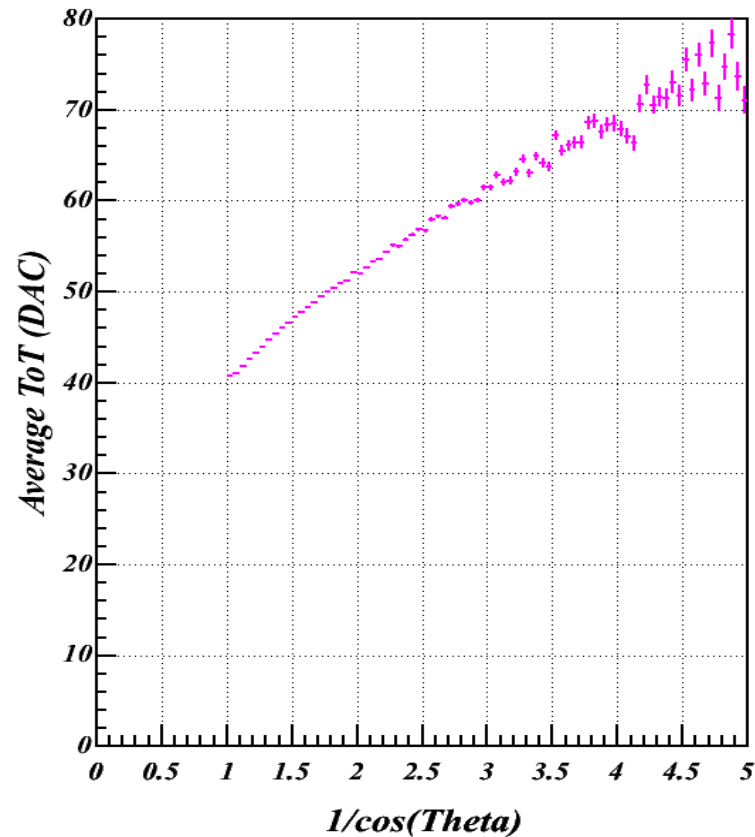
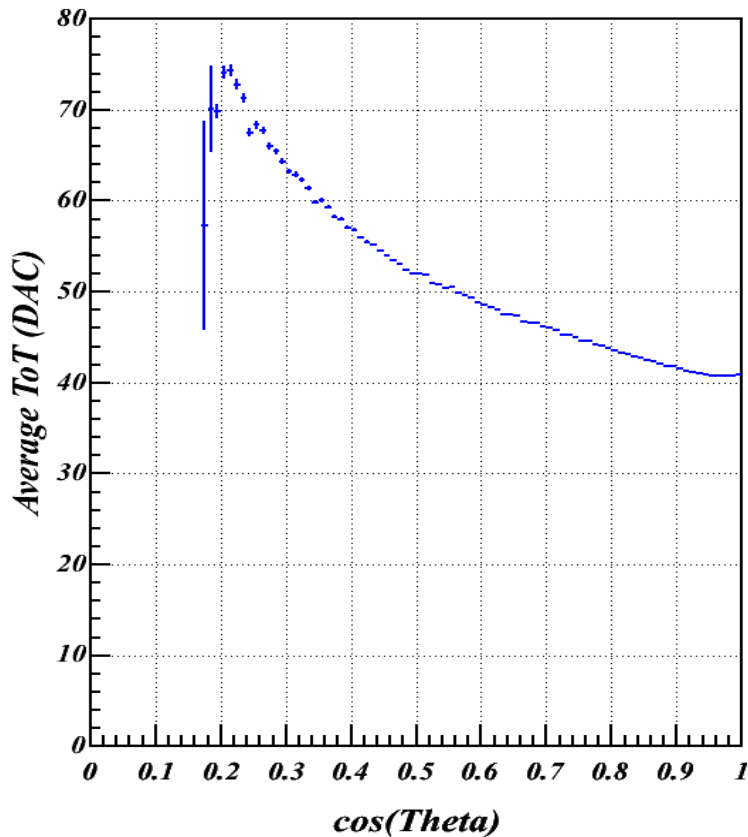
CR Muon angular distributions



ToT distribution

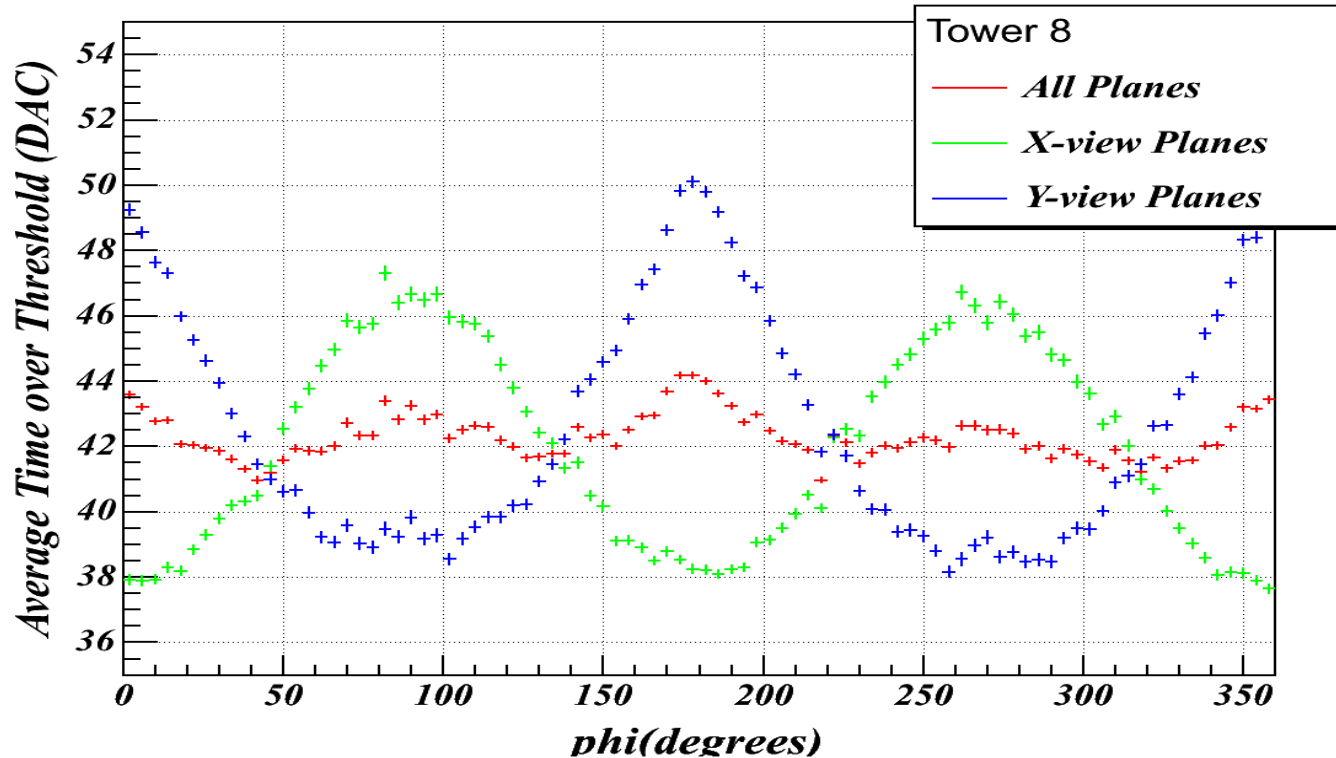


ToT vs zenith angle



The ToT is minimum for vertical tracks and increases with $1/\cos\theta$ (track length)

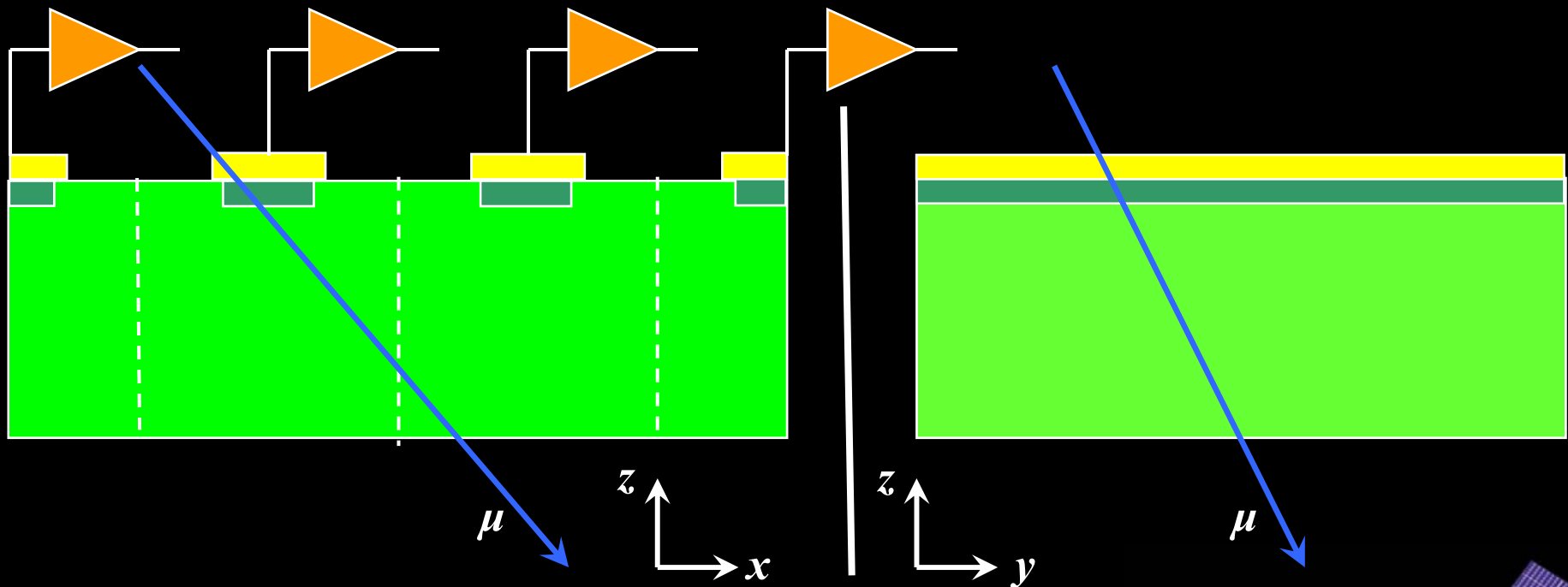
ToT vs azimuth angle



ToT exhibits a periodic dependence on φ :

- *X-view layers: maxima at 90° and 270°*
- *Y-view layers: maxima at 0° and 180°*

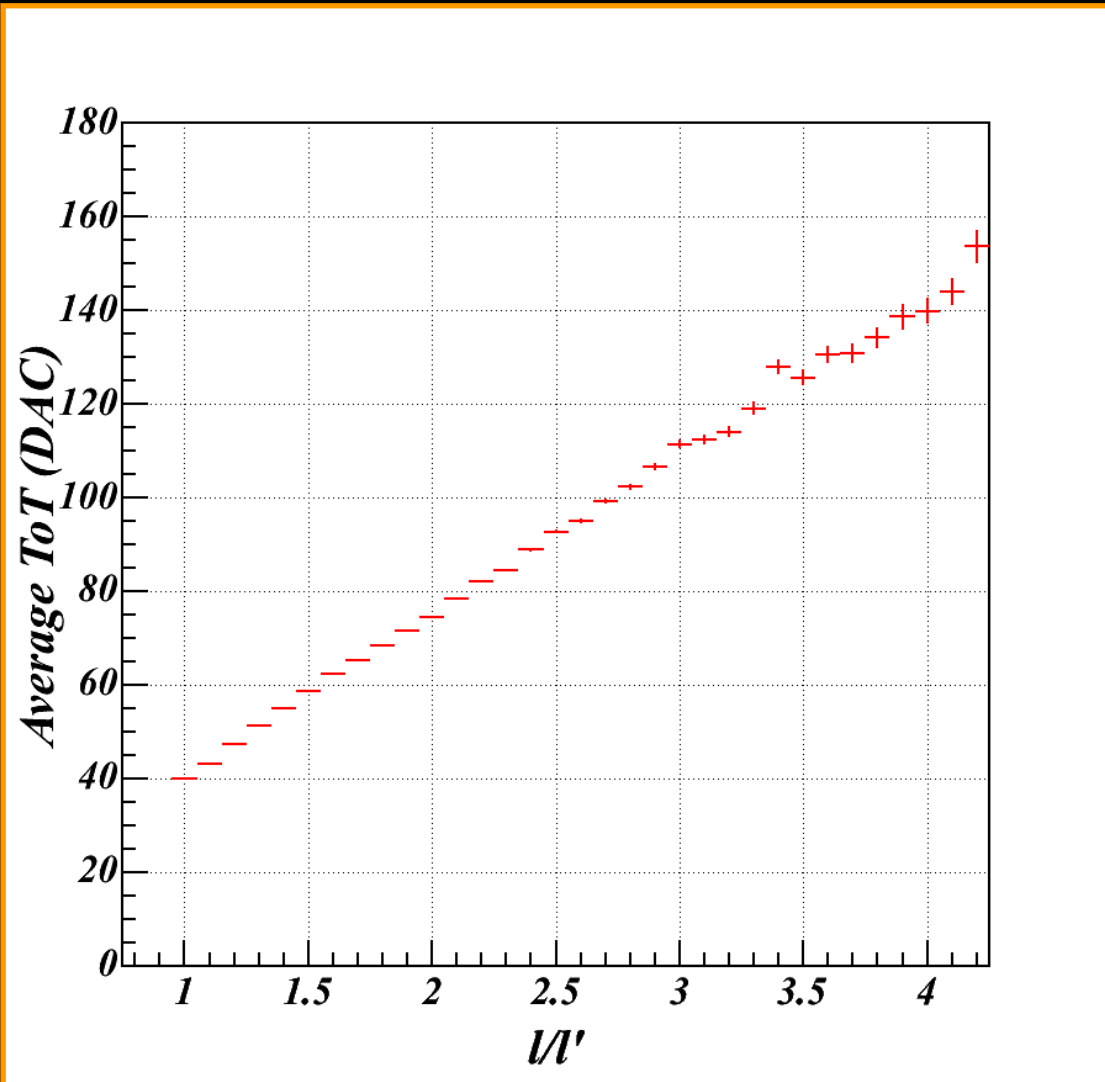
ToT and projected track length



- *The ToT is proportional to maximum strip pulse amplitude*
- *Pulse amplitudes on strips are proportional to the fraction of track length belonging to their sensitive volume*

The ToT depends on the track length projected along the strip view

ToT vs track length/projected track length

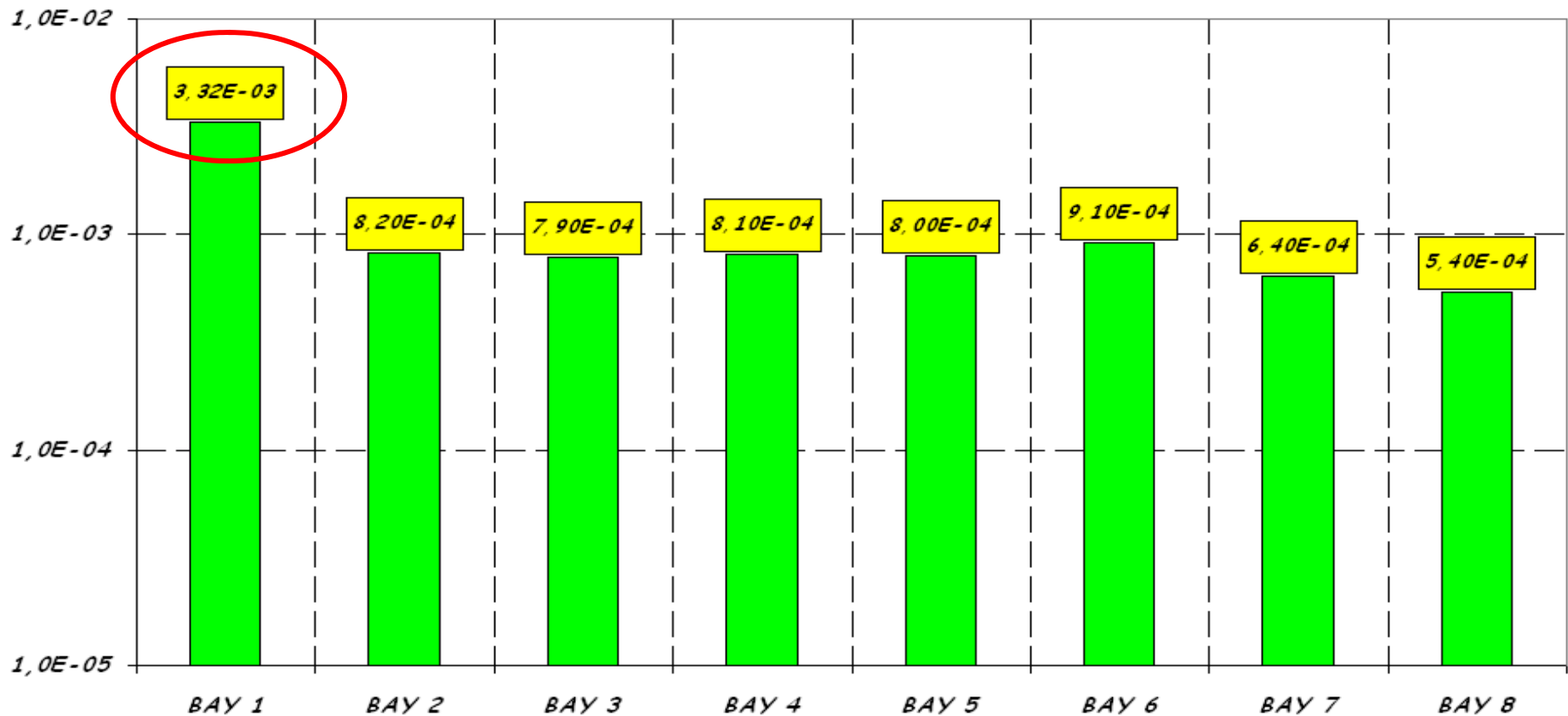


The ToT depends linearly on the ratio l/l' (track length/projected track length)



Evaluation of the hit capture efficiency

Hit Capture Inefficiency



Conclusions

- *The construction and testing of the LAT TKR towers has been completed*
- *The average efficiency of the TKR towers is greater than 99%*
- *The first 14 TKR towers have been integrated and are taking data*
- *A study of the TKR performance is actually in progress*
- *The behaviour of the LAT TKR is consistent with expectations*

