Joint measurement of the atmospheric muon flux transmitted through the Puy de Dôme volcano with two the MU-RAY and TOMUVOL detectors

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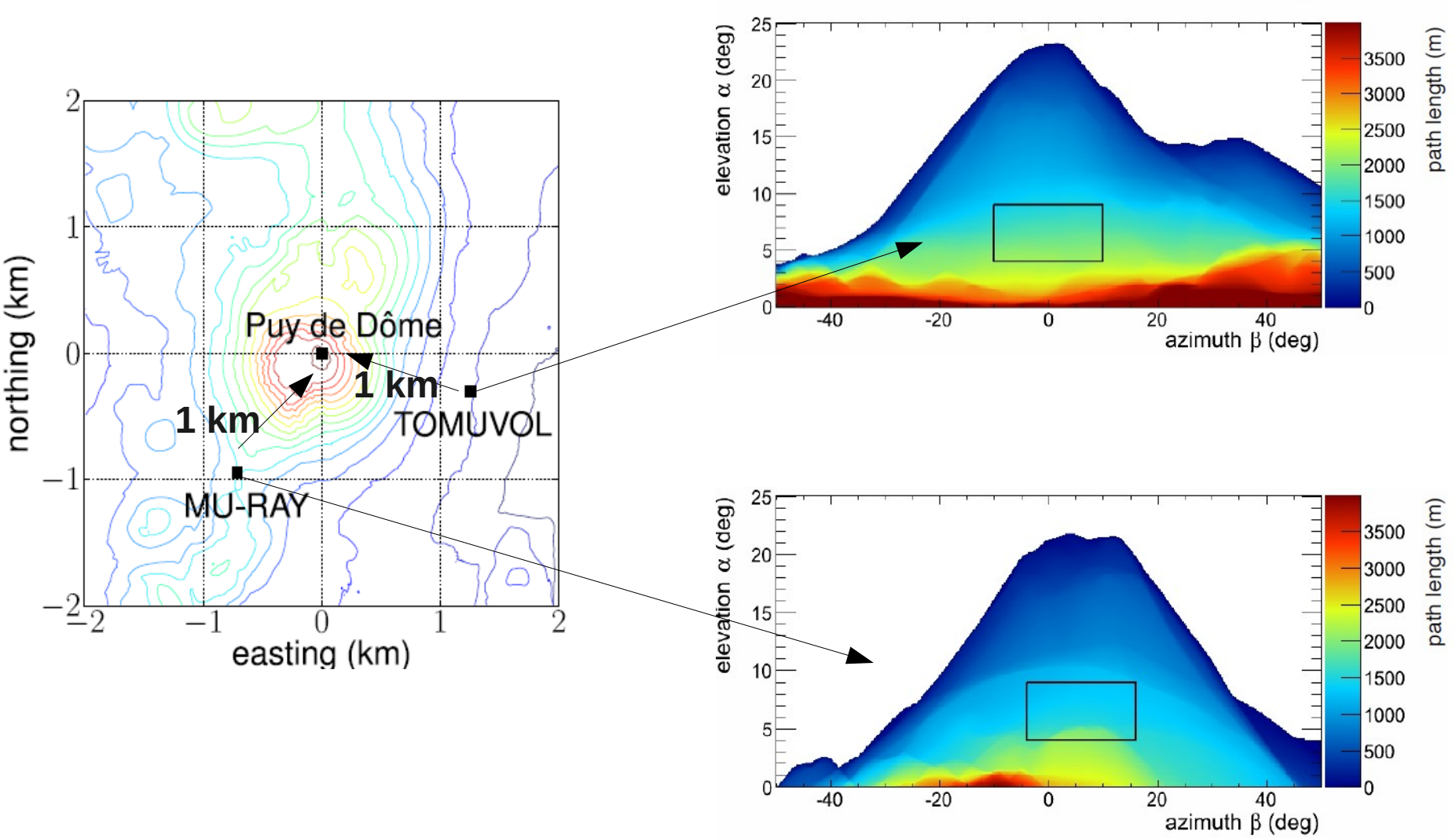
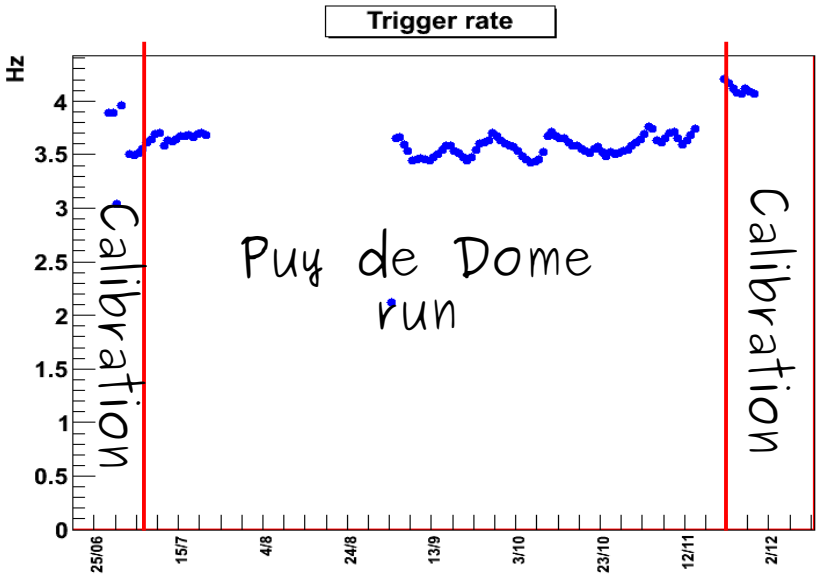
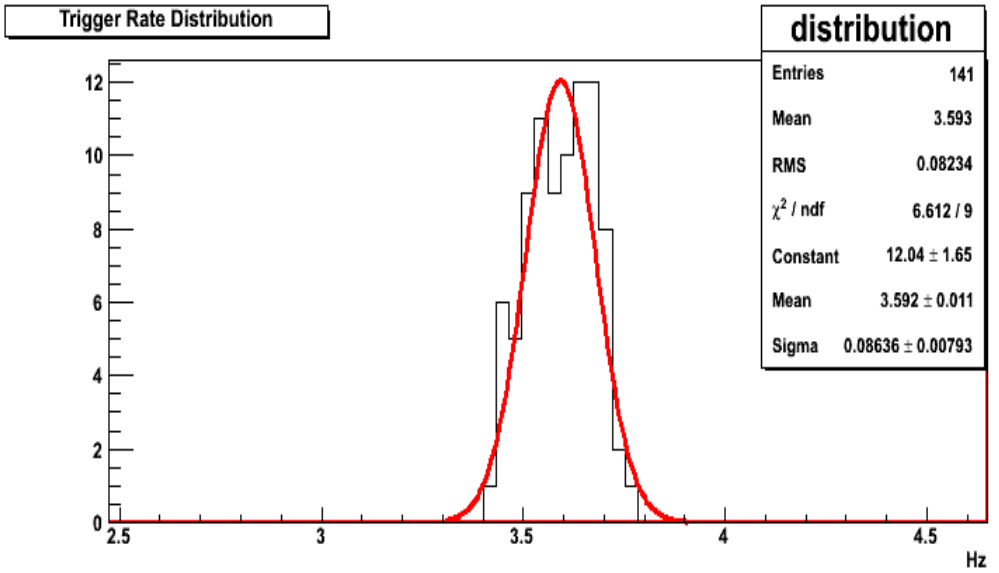
Napoli 22 Gennaio 2015

Pasquale Noli


Puy de Dôme
1 km
1 km
TOMUVOL
MU-RAY
northing (km)
easting (km)
elevation α (deg)
azimuth β (deg)
path length (m)
elevation α (deg)
azimuth β (deg)
path length (m)

Trigger





MURAY:

Trigger: AND of 6 planes:
Forward XY-Middle XY-Backward XY.

Trigger rate average:
3.6 Hz pointing to Puy de Dome.
4.0 Hz pointing to the free sky.

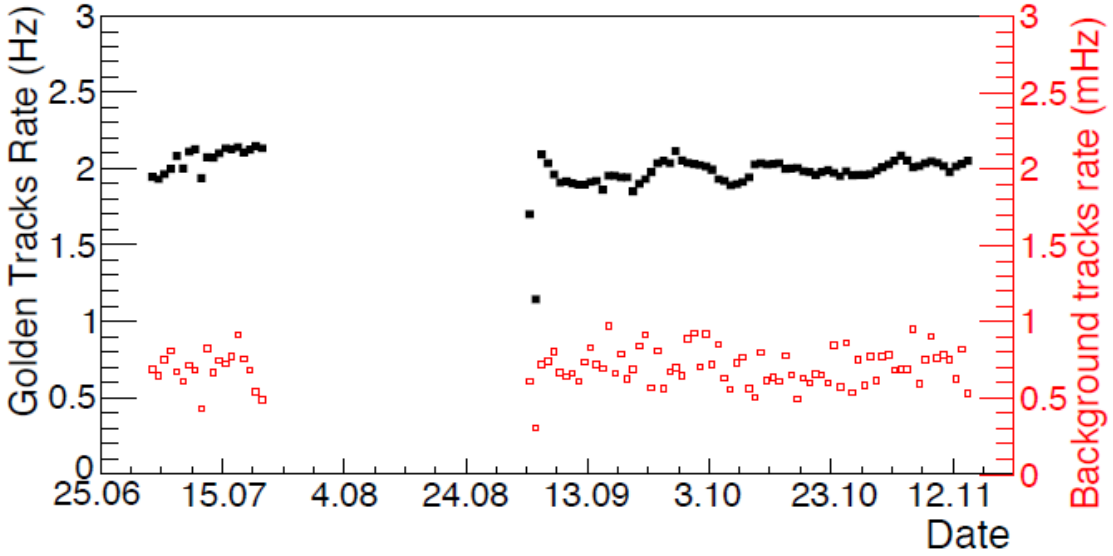
13 days pointing to the free sky (3.5 M triggers)

92 days pointing to Puy de Dome(24 M triggers)

TOMUVOL:

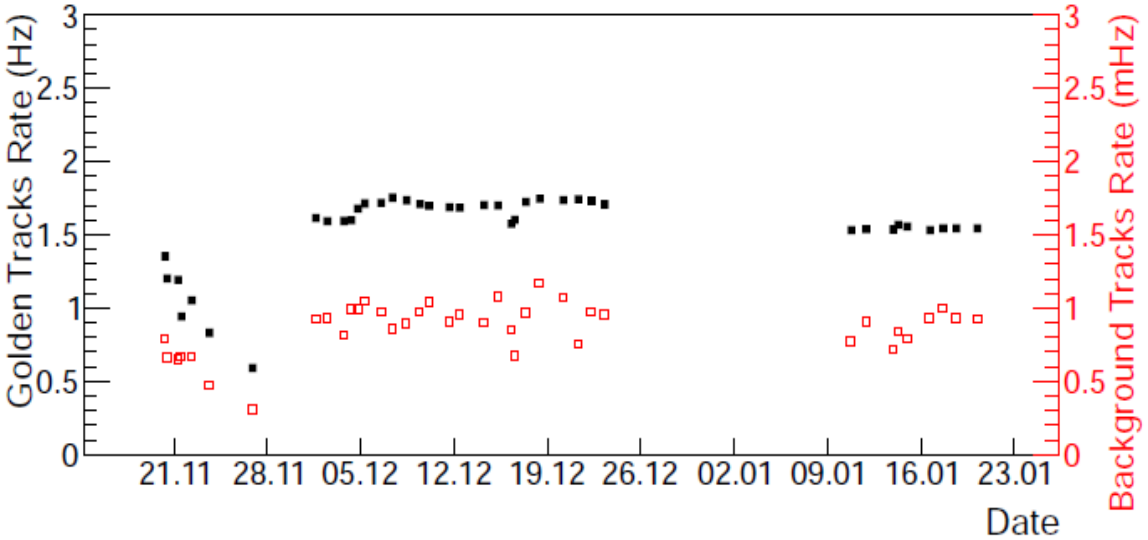
Trigger: AND of 4 planes: 3.5 Hz

34 days pointing to PdD
7 days Calibration



Mean value of Golden Track rate =1.99+- 0.12 Hz
In control region = 0.7 +- 0.1 mHz

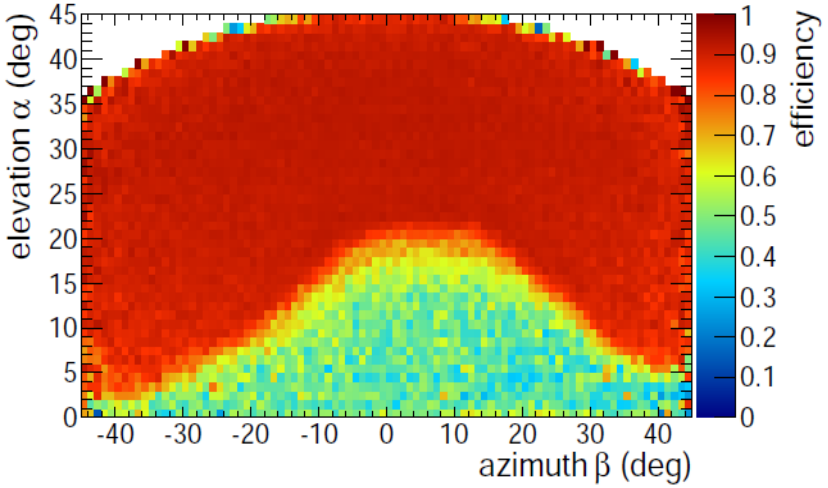
Golden track: Emin >20, χ^2<5, **Isolated**

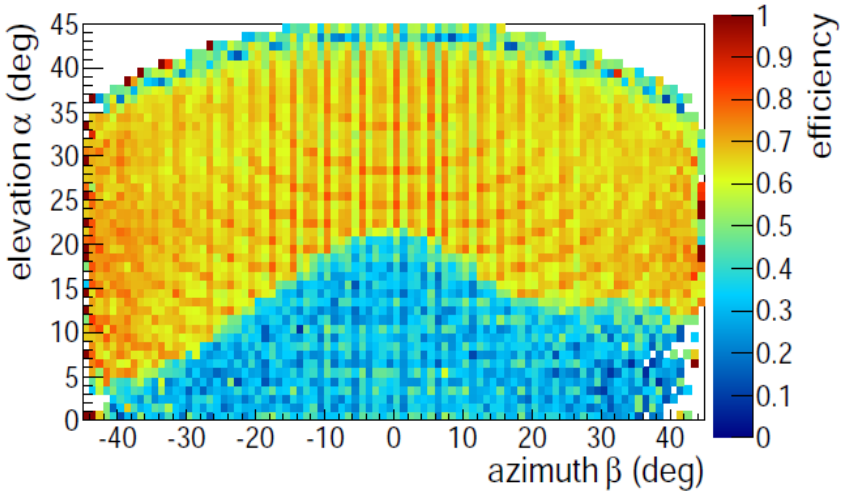


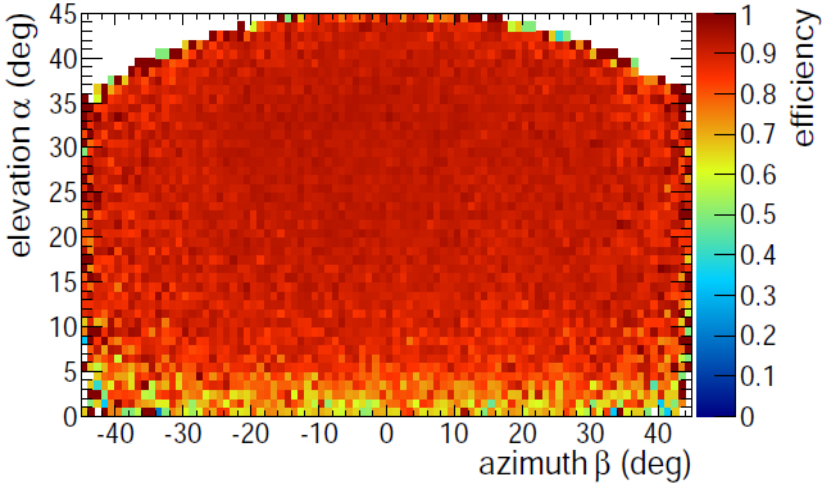
Mean value of Golden Track rate = 1.64+- 0.08 Hz
In control region = 0.93 +- 0.11 mHz

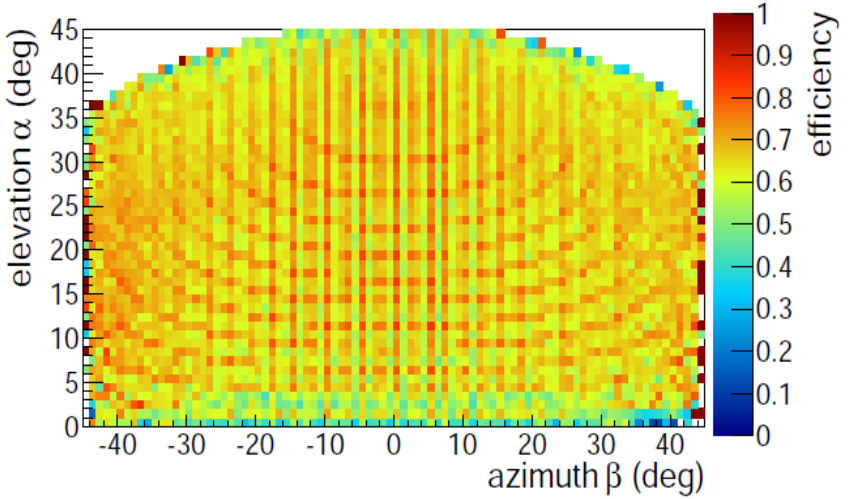
Golden track: 4 layers, χ^2<0.8, **Isolated**

Selection efficiency

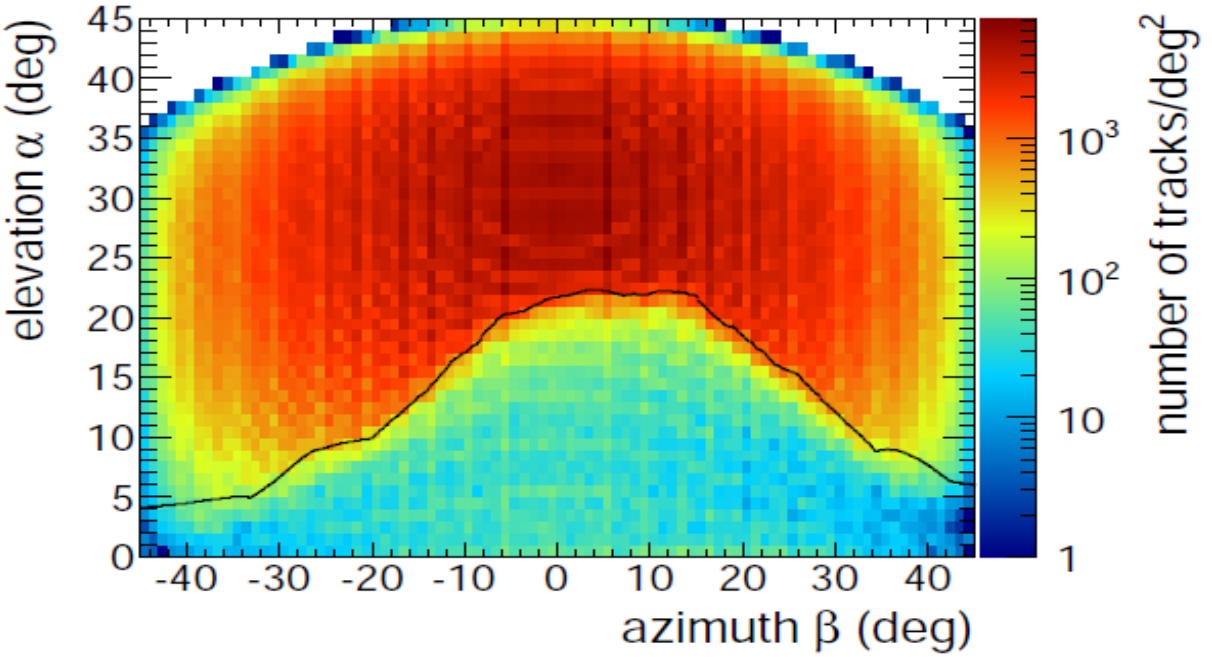


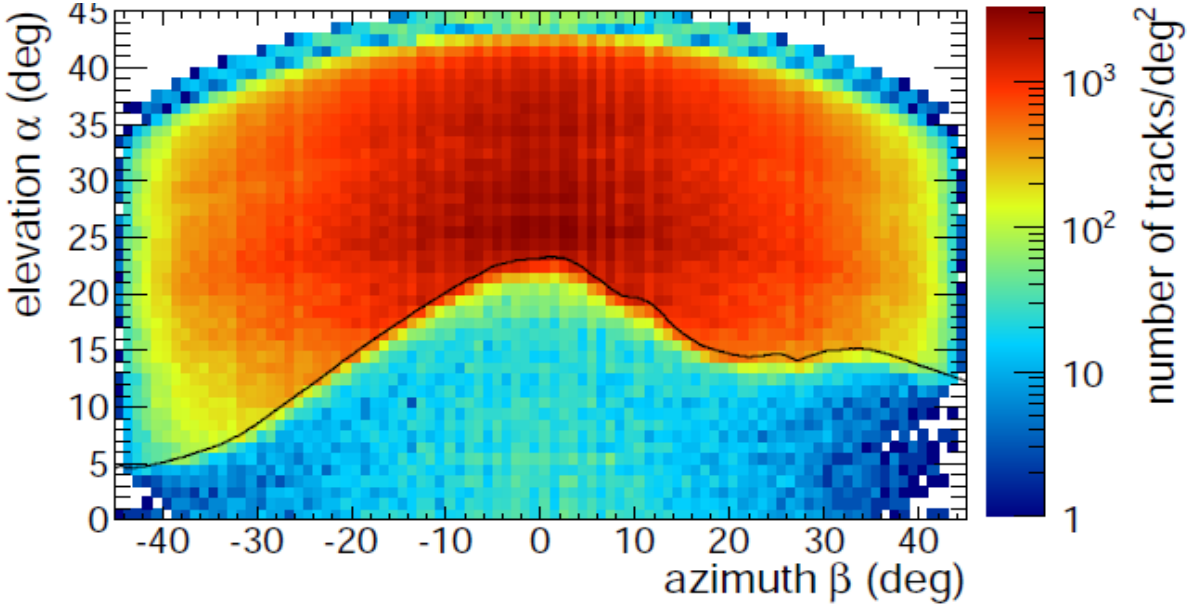


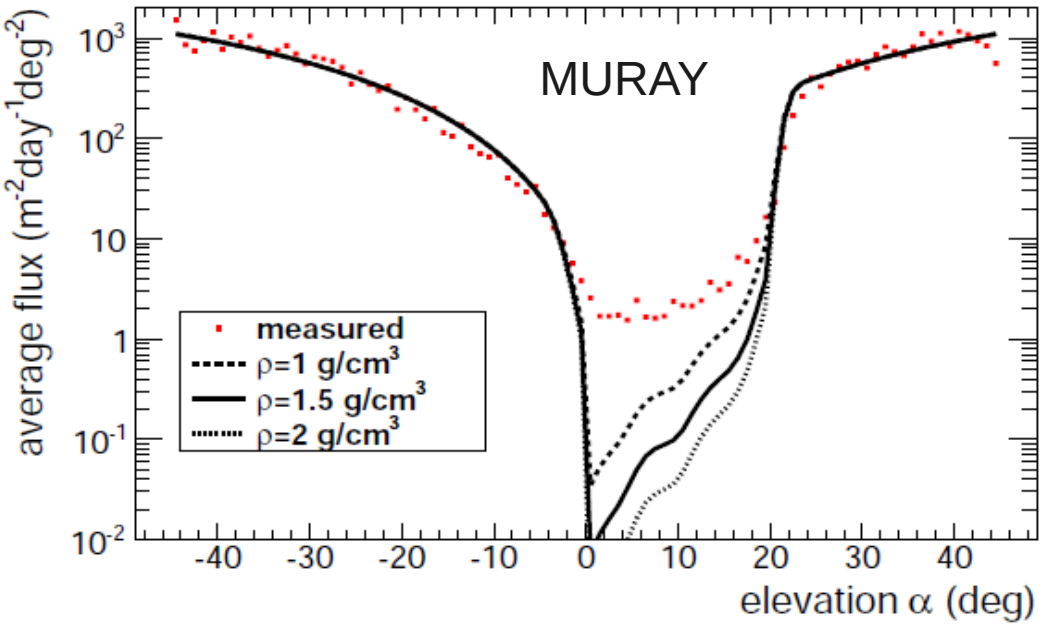




Golden Track

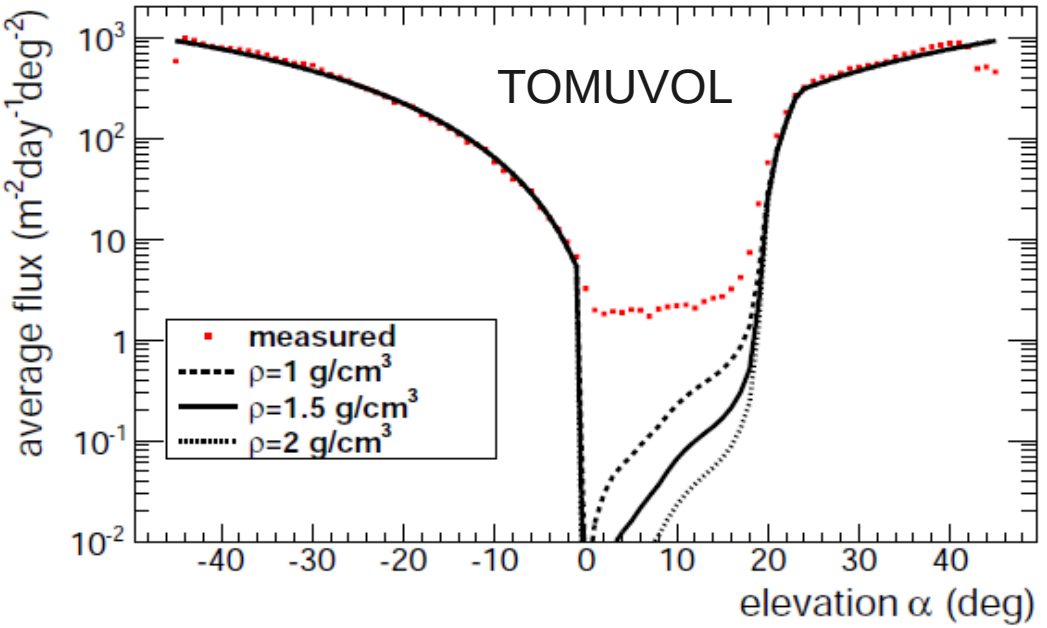






Fit result:
Muray: Norm = 1.270 +- 0.228
TMV: Norm = 1.084 +- 0.055

Mean noise in the CTRL region
TMV: 1.95 +- 0.05 m^-2 day^-1 deg^-2
MURAY: 1.78 +- 0.06 m^-2 day^-1 deg^-2



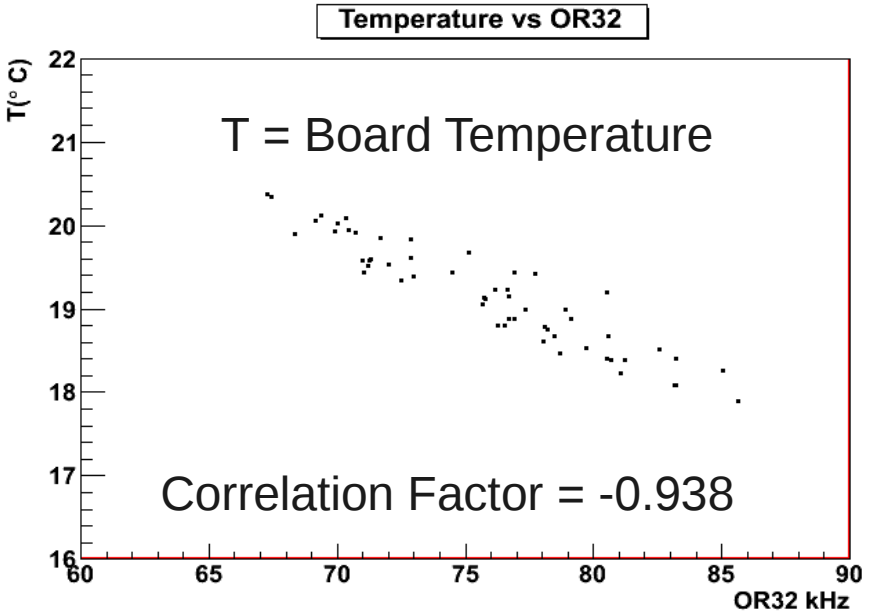
TMV

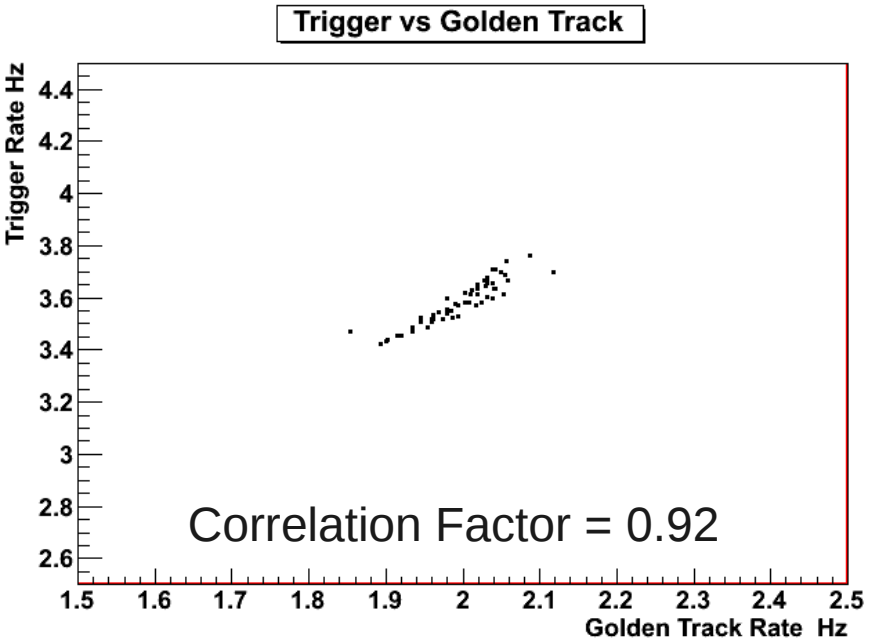
$$1.95 \pm 0.16(\text{syst}) \pm 0.05(\text{stat}) \ \text{m}^{-2}\text{day}^{-1}\text{deg}^{-2}$$

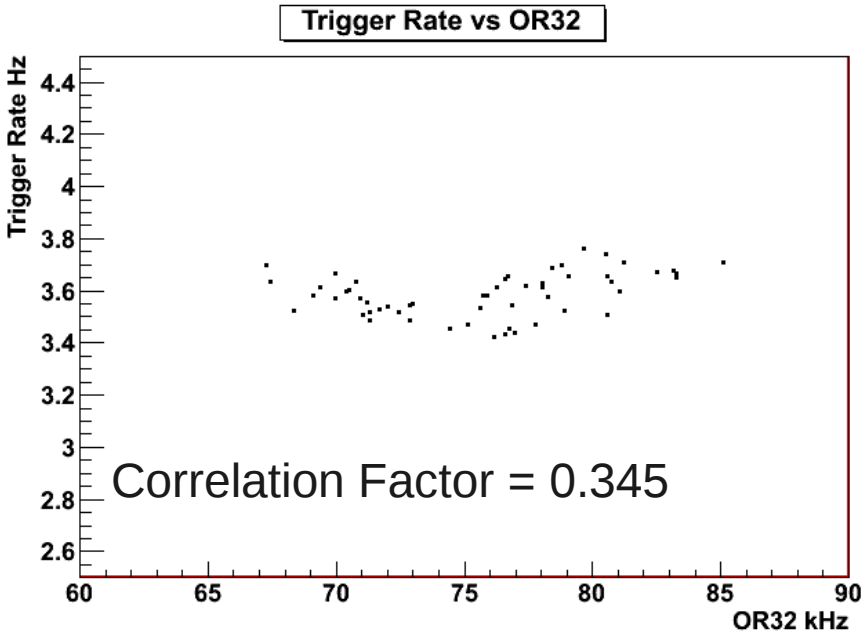
Muray

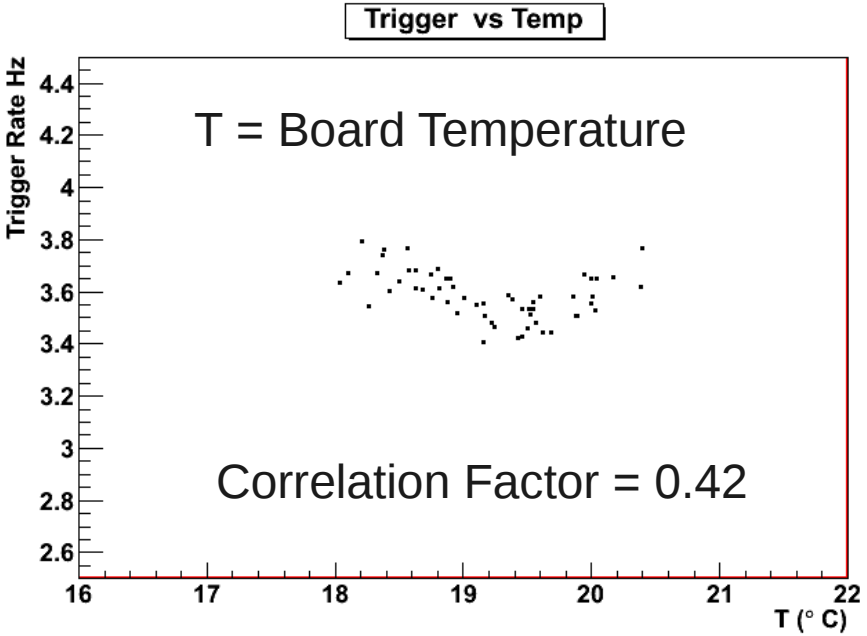
$$1.78 \pm 0.48(\text{syst}) \pm 0.06(\text{stat}) \text{m}^{-2}\text{day}^{-1}\text{deg}^{-2}$$

SPARE


Temperature vs OR32
T(° C)
T = Board Temperature
Correlation Factor = -0.938
OR32 kHz


Trigger vs Golden Track
Trigger Rate Hz
Correlation Factor = 0.92
Golden Track Rate Hz


Trigger Rate vs OR32
Trigger Rate Hz
Correlation Factor = 0.345
OR32 kHz


Trigger vs Temp
Trigger Rate Hz
T = Board Temperature
Correlation Factor = 0.42
T (° C)

Efficiencies

Triggers	All tracks (Emin >20, χ^2<5)	Golden Tracks
3.65 x 10^6	1.85 x 10^6	1.68 10^6

$$\varepsilon_{analysis} = \frac{GoldenTracks}{Triggers} = \frac{1.68 \cdot 10^6}{3.65 \cdot 10^6} = 0.46$$

$$\varepsilon_{selection} = \frac{GoldenTracks}{AllTracks} = \frac{1.68 \cdot 10^6}{1.85 \cdot 10^6} = 0.90$$