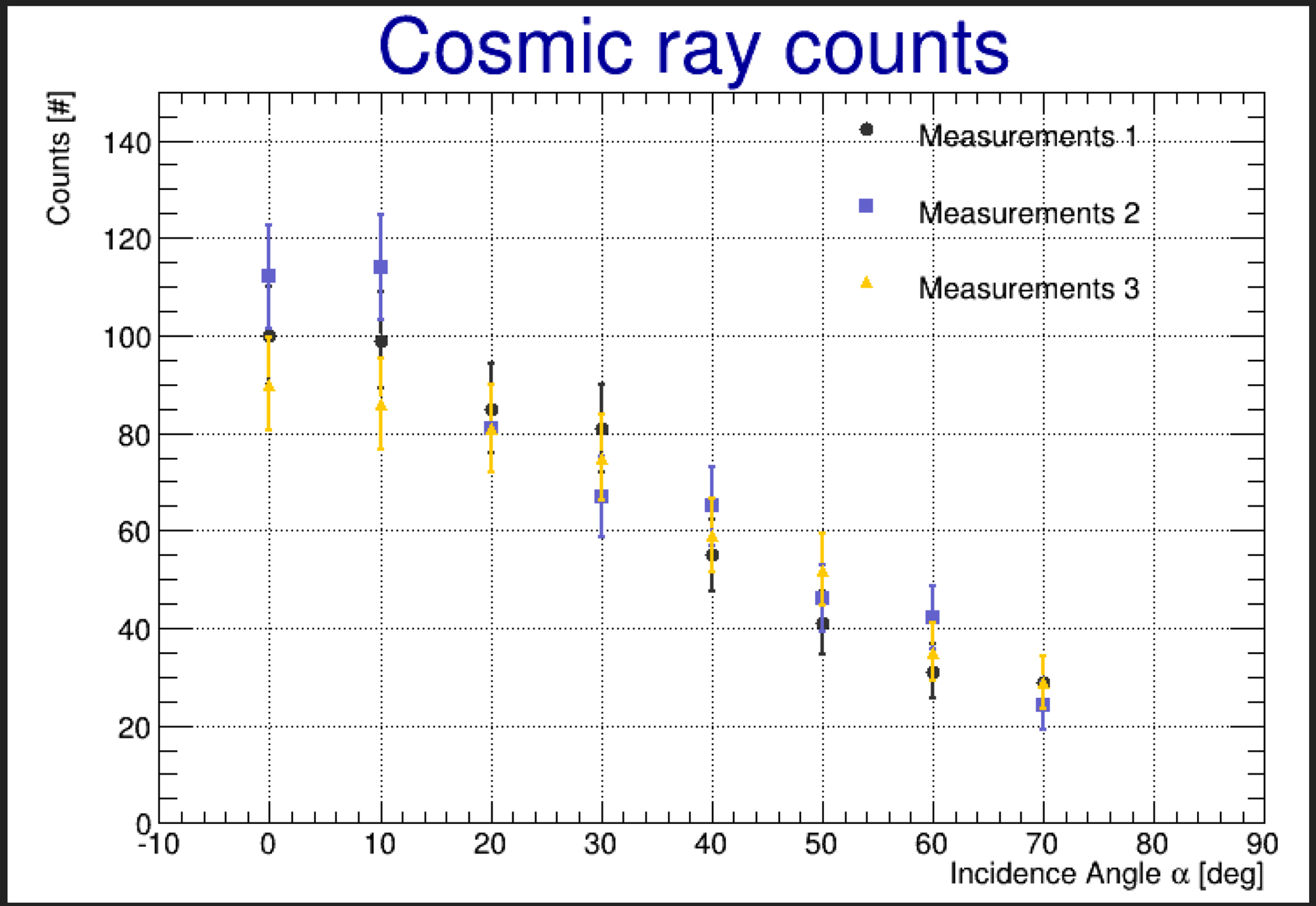
INTERNATIONAL COSMIC DAY 2018 - PADOVA

# RISULTATI DELLE MISURE

# DATI

| | | | | Calcolatelo voi! | | | Misuriamo insieme | | Calcolatelo voi |
|---|---|---|---|---|---|---|---|---|---|
| Angolo [deg] | Misura 1 | Misura 2 | Misura 3 | Media | Errore Media | Precisione della Misura | Misura in "real time" | Errore | Compatibilità tra media e misura real time |
| **0** | 100 | 112 | 90 | **100,7** | **10,0** | **10%** | 114,0 | 10,7 | 0,91 |
| **10** | 99 | 114 | 86 | **99,7** | **10,0** | **10%** | 115,0 | 10,7 | 1,05 |
| **20** | 85 | 81 | 81 | **82,3** | **9,1** | **11%** | 108,0 | 10,4 | 1,86 |
| **30** | 81 | 67 | 75 | **74,3** | **8,6** | **11%** | 95 | 9,7 | 1,59 |
| **40** | 55 | 65 | 59 | **59,7** | **7,7** | **13%** | 75 | 8,7 | 1,32 |
| **50** | 41 | 46 | 52 | **46,3** | **6,8** | **15%** | 68 | 8,2 | 2,03 |
| **60** | 31 | 42 | 35 | **36,0** | **6,0** | **17%** | 39 | 6,2 | 0,35 |
| **70** | 29 | 24 | 29 | **27,3** | **5,2** | **19%** | 32 | 5,7 | 0,61 |

# MISURE NEL NOSTRO UFFICIO (28.11.2018)

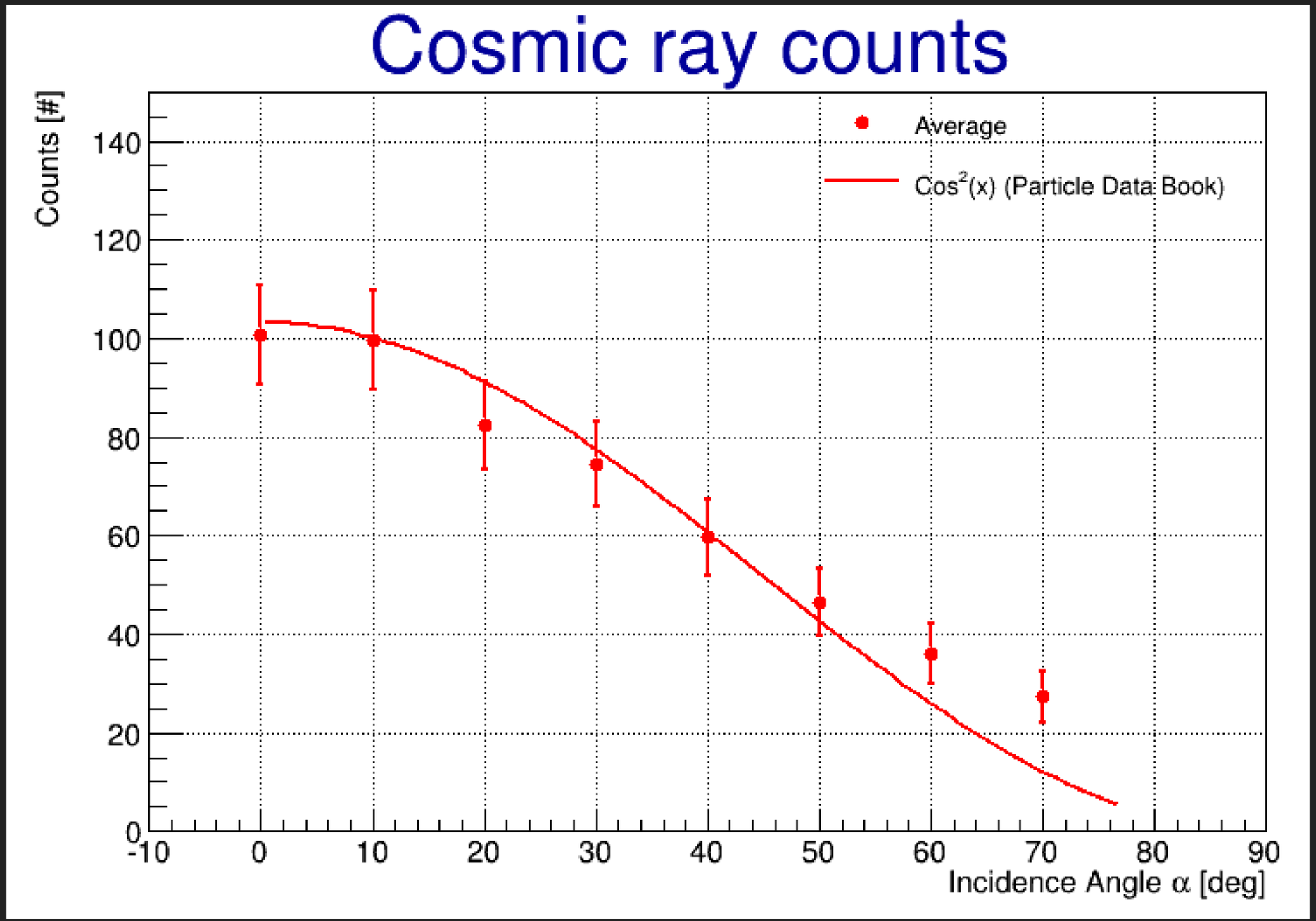


# ANDAMENTO DELLE MISURE: PARTICLE DATA BOOK

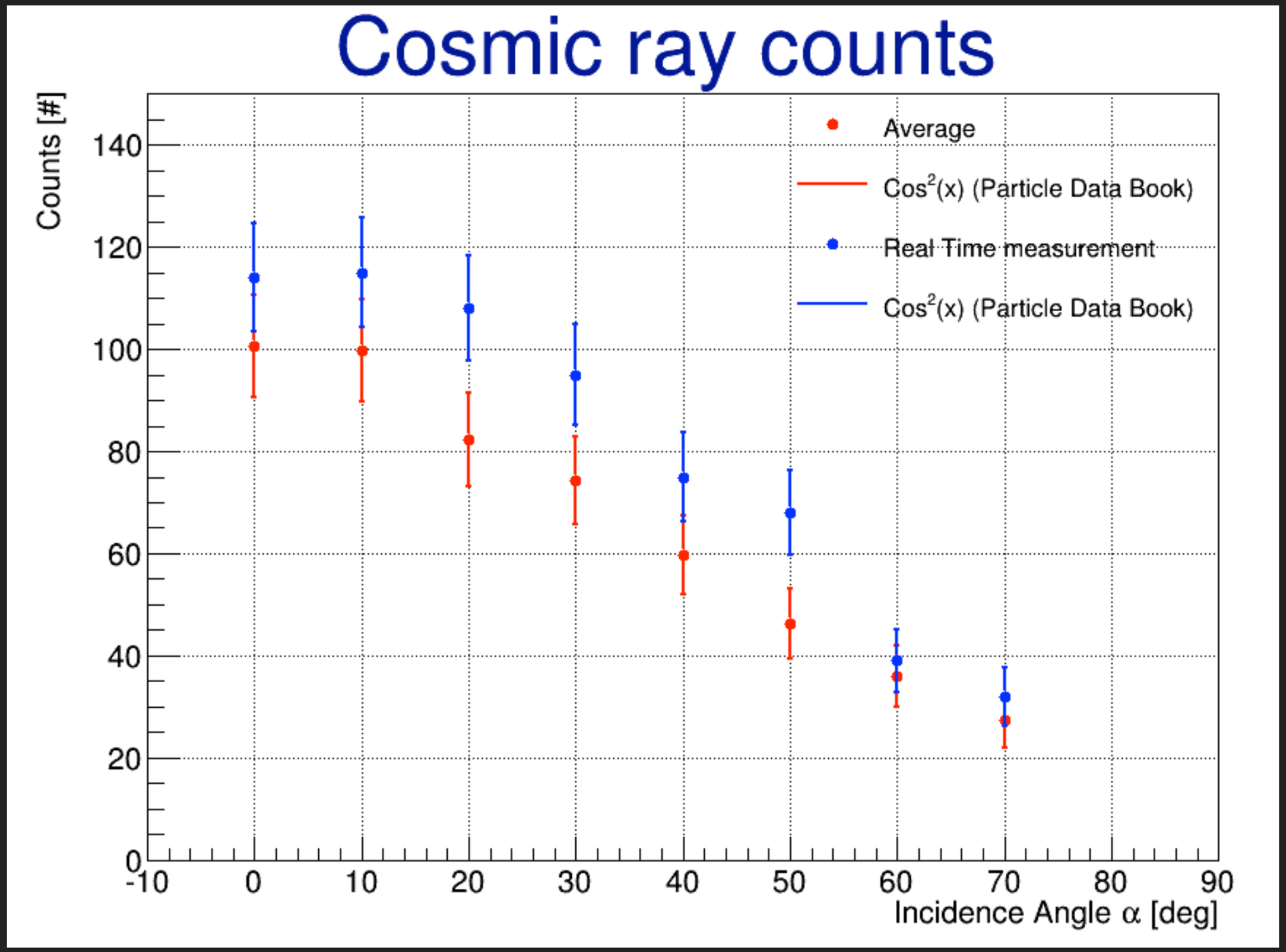

## 29.3. Cosmic rays at the surface

**29.3.1.** ***Muons*** : Muons are the most numerous charged particles at sea level (see Fig. 29.4). Most muons are produced high in the atmosphere (typically 15 km) and lose about 2 GeV to ionization before reaching the ground. Their energy and angular distribution reflect a convolution of the production spectrum, energy loss in the atmosphere, and decay. For example, 2.4 GeV muons have a decay length of 15 km, which is reduced to 8.7 km by energy loss. The mean energy of muons at the ground is $\approx 4$ GeV. The energy spectrum is almost flat below 1 GeV, steepens gradually to reflect the primary spectrum in the 10–100 GeV range, and steepens further at higher energies because pions with $E_\pi > \epsilon_\pi$ tend to interact in the atmosphere before they decay. Asymptotically ($E_\mu \gg 1$ TeV), the energy spectrum of atmospheric muons is one power steeper than the primary spectrum. The integral intensity of vertical muons above 1 GeV/$c$ at sea level is $\approx 70$ m$^{-2}$s$^{-1}$sr$^{-1}$ [50,51], with recent measurements [52–54] favoring a lower normalization by 10-15%. Experimentalists are familiar with this number in the form $I \approx 1$ cm$^{-2}$ min$^{-1}$ for horizontal detectors. The overall angular distribution of muons at the ground as a funxtion of zenith angle $\theta$ is $\propto \cos^2\theta$, which is characteristic of muons with $E_\mu \sim 3$ GeV. At lower energy the angular distribution becomes increasingly steep, while at higher energy it flattens, approaching a $\sec\theta$ distribution for $E_\mu \gg \epsilon_\pi$ and $\theta < 70°$.

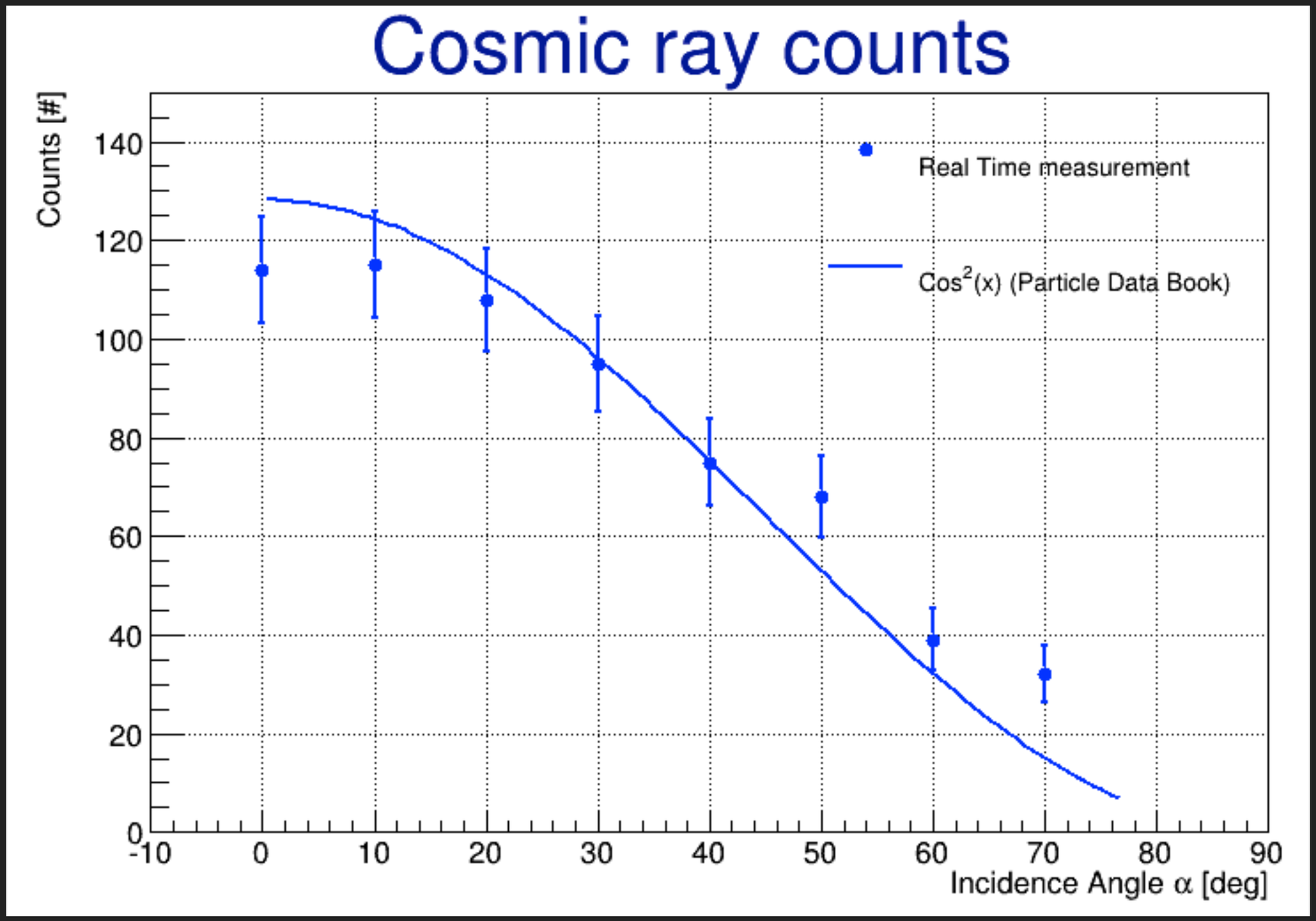
# CONFRONTO MEDIA DATI E MODELLO



# CONFRONTO NUOVI DATI E MEDIA



# CONFRONTO ANDAMENTO NUOVI DATI – MODELLO



# CONCLUSIONI

- Abbiamo misurato la dipendenza dall'angolo del flusso di muoni cosmici
- Abbiamo confrontato con altre misure tramite la compatibilità e statisticamente compatibili
- Abbiamo confrontato visivamente con il modello e i nostri dati verificano le attese
- La misura è migliorabile aumentando il tempo di esposizione, o aumentando le prove.