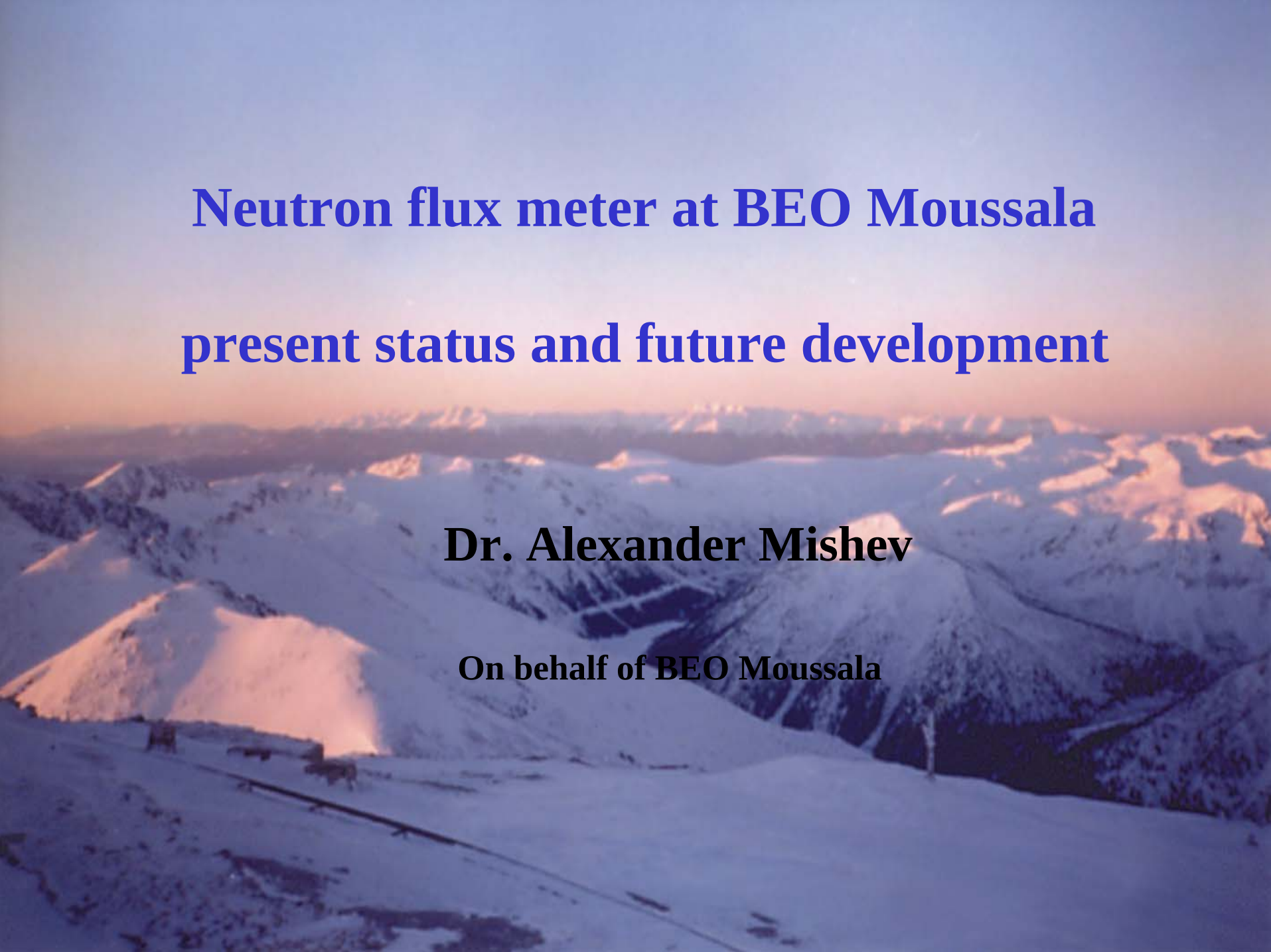


Neutron flux meter at BEO Moussala

present status and future development

Dr. Alexander Mishev

On behalf of BEO Moussala

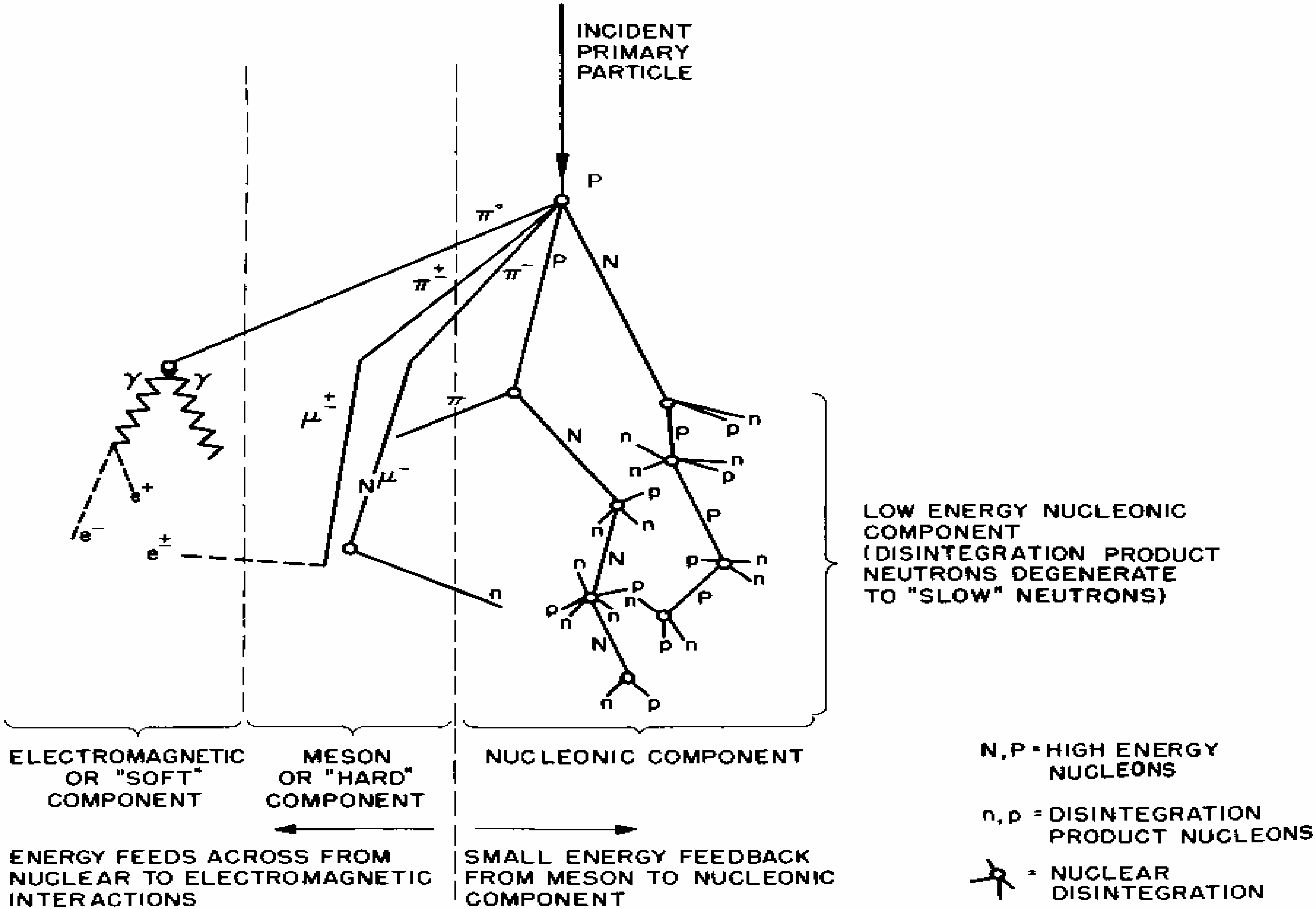
Outlook

Present activities

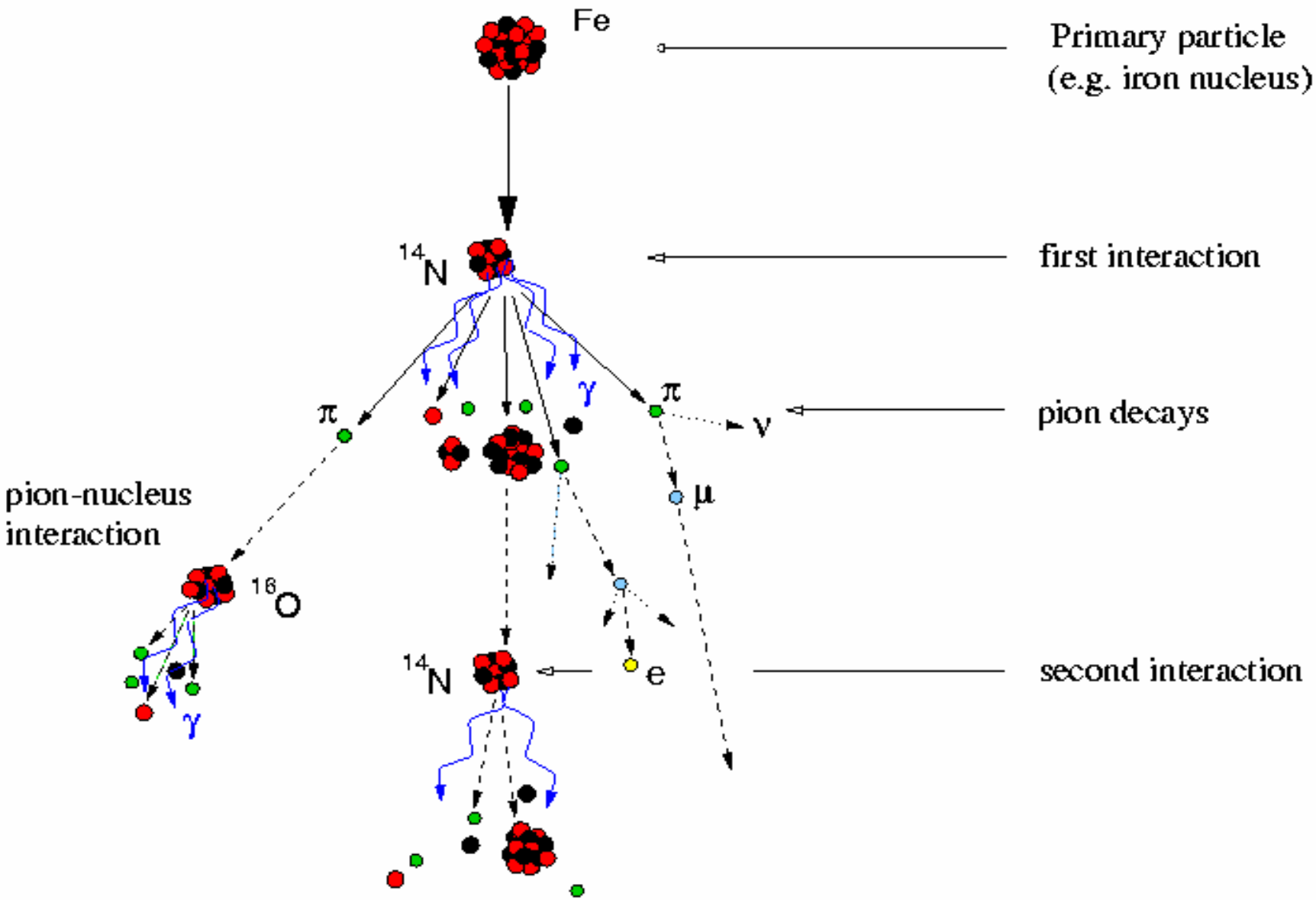
Neutron measurements

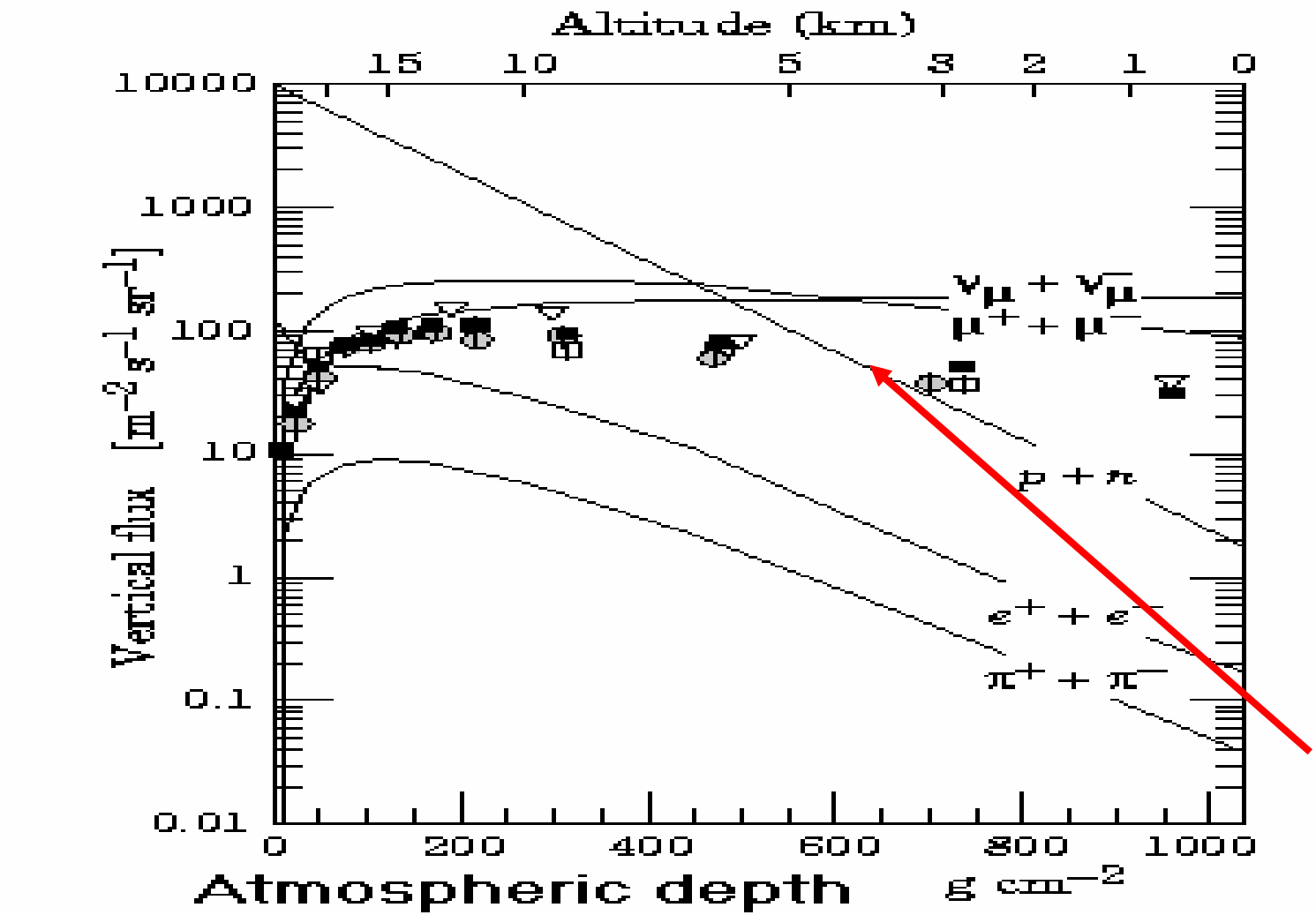
Future plans

Discussion


INCIDENT PRIMARY PARTICLE
P
π°
π±
π⁻
P
N
γ γ
μ±
π
N
Nμ⁻
e⁺
e⁻
e±
n
LOW ENERGY NUCLEONIC COMPONENT (DISINTEGRATION PRODUCT NEUTRONS DEGENERATE TO "SLOW" NEUTRONS)
ELECTROMAGNETIC OR "SOFT" COMPONENT
MESON OR "HARD" COMPONENT
NUCLEONIC COMPONENT
N,P = HIGH ENERGY NUCLEONS
n, p = DISINTEGRATION PRODUCT NUCLEONS
= NUCLEAR DISINTEGRATION
ENERGY FEEDS ACROSS FROM NUCLEAR TO ELECTROMAGNETIC INTERACTIONS
SMALL ENERGY FEEDBACK FROM MESON TO NUCLEONIC COMPONENT

Development of cosmic-ray air showers

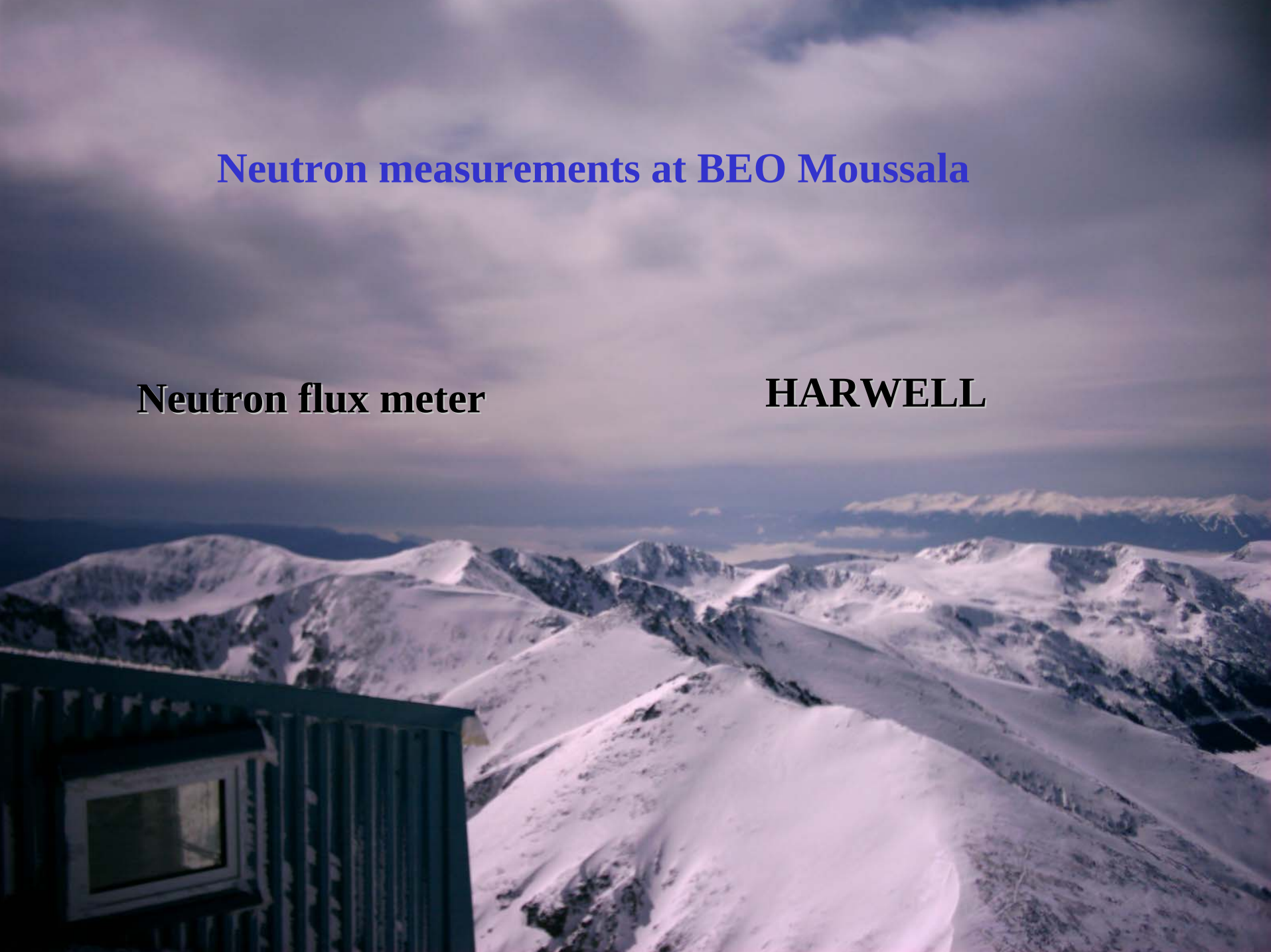



Altitude (km)
15
10
5
3
2
1
0
10000
1000
100
10
1
0.1
0.01
Vertical flux [m^{-2} s^{-1} sr^{-1}]
$\nu_\mu + \bar{\nu}_\mu$
$\mu^+ + \mu^-$
$p + n$
$e^+ + e^-$
$\pi^+ + \pi^-$
0
200
400
600
800
1000
Atmospheric depth g cm^{-2}

Neutron measurements at BEO Moussala

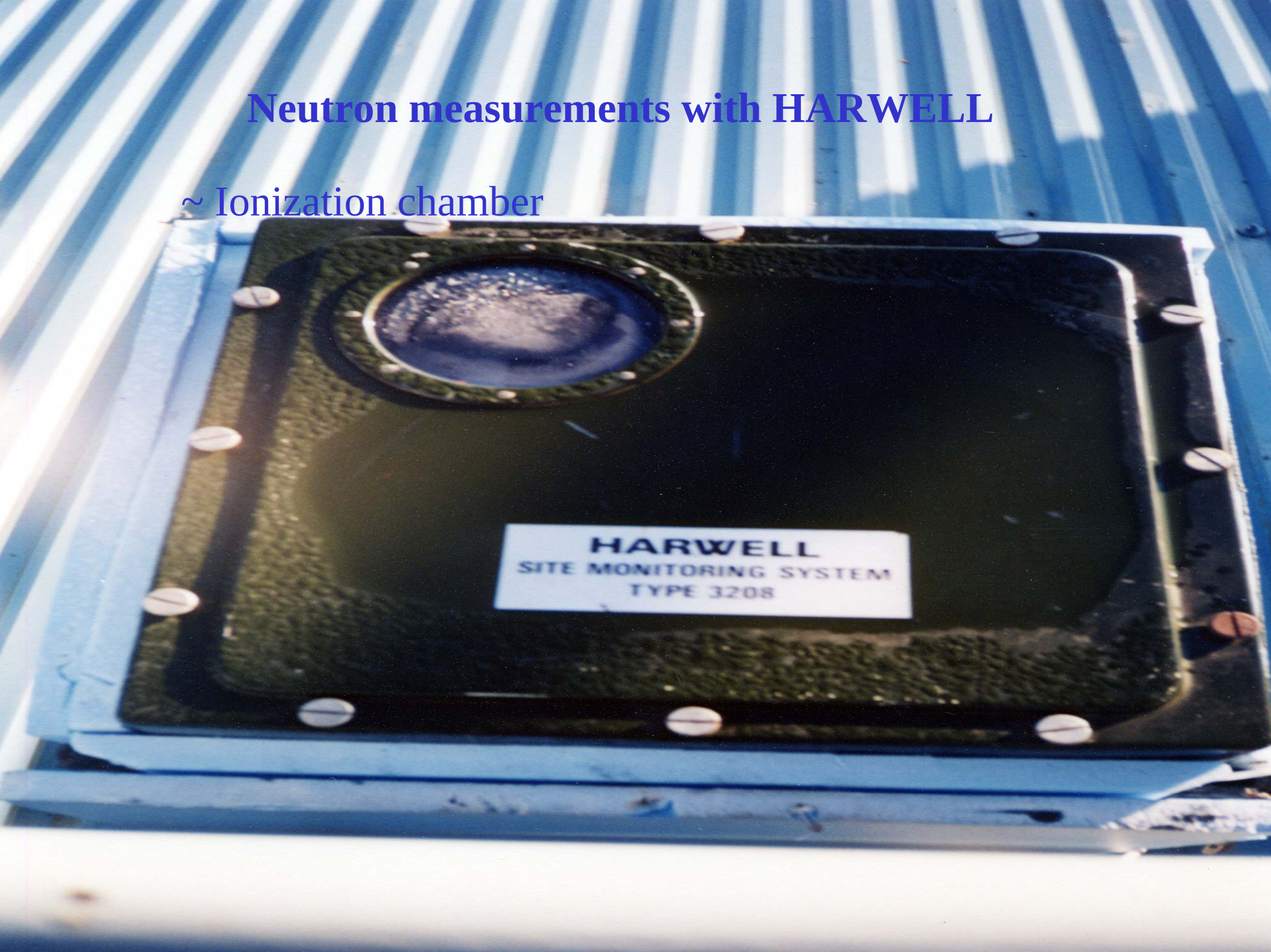
Neutron flux meter

HARWELL



Neutron measurements with HARWELL

~ Ionization chamber

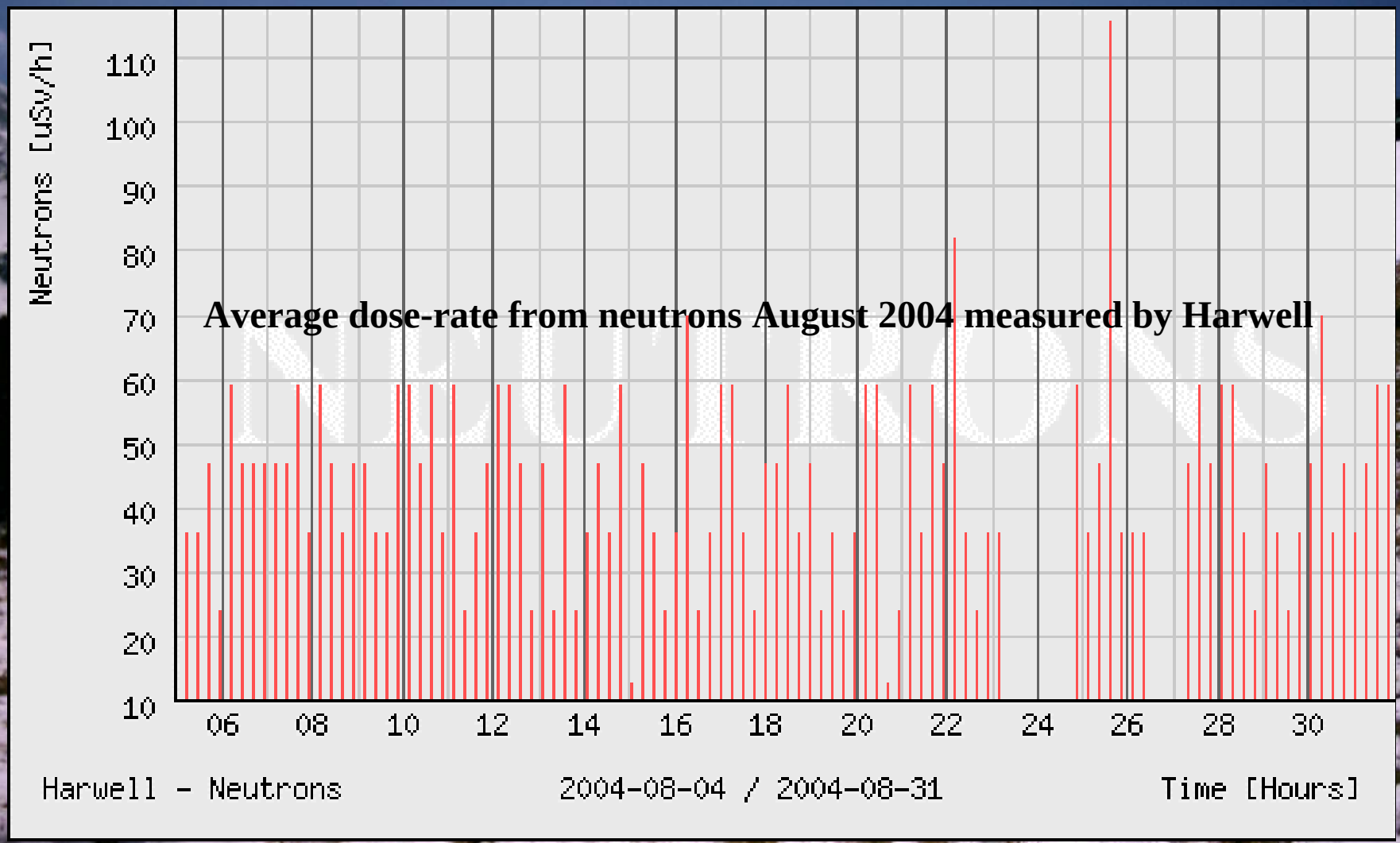


Neutron measurements with HARWELL

~ proportional counter and Anderson-Braun moderator

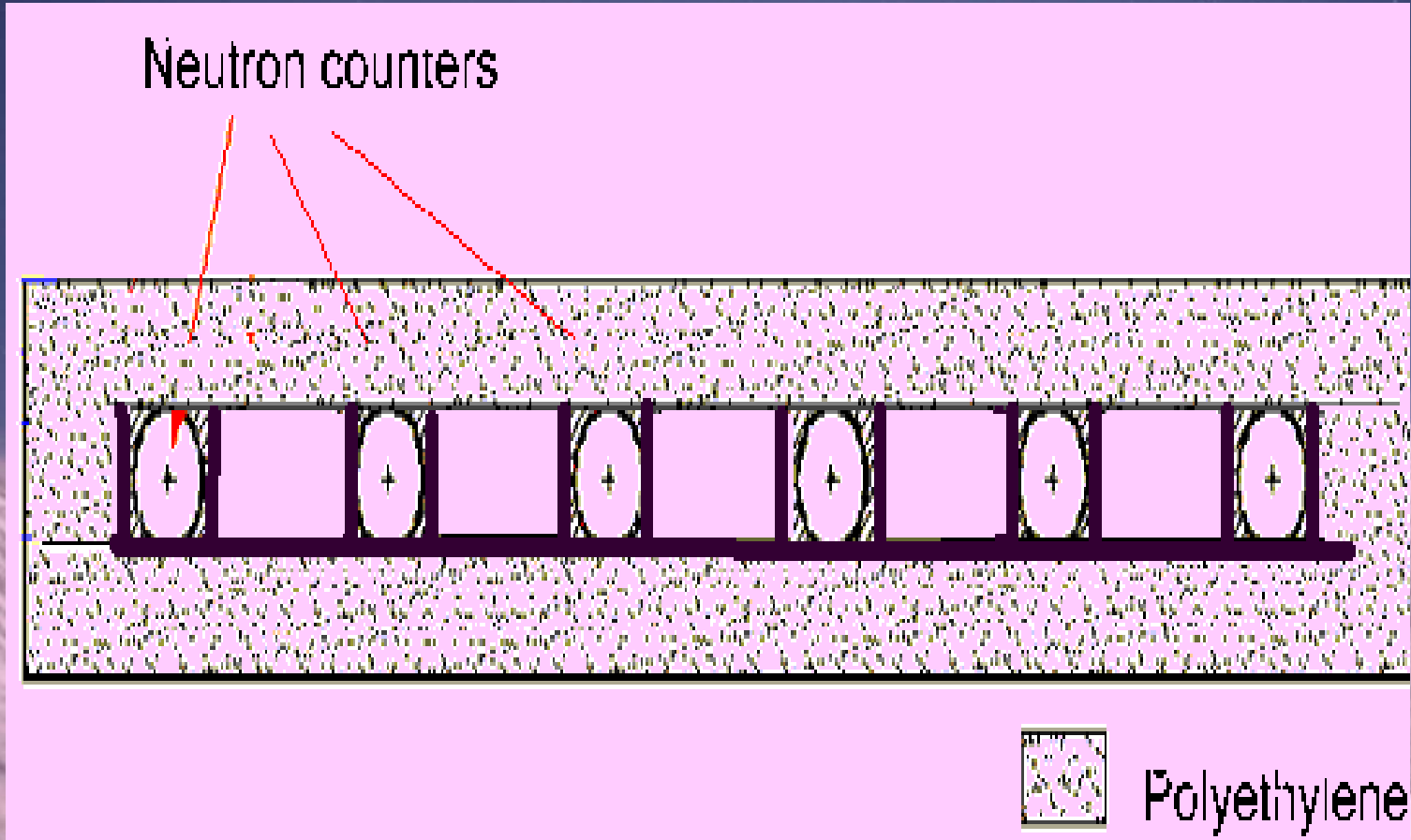
Average month values for neutrons

Mean dose-rate ~ 40-50 nSv/h

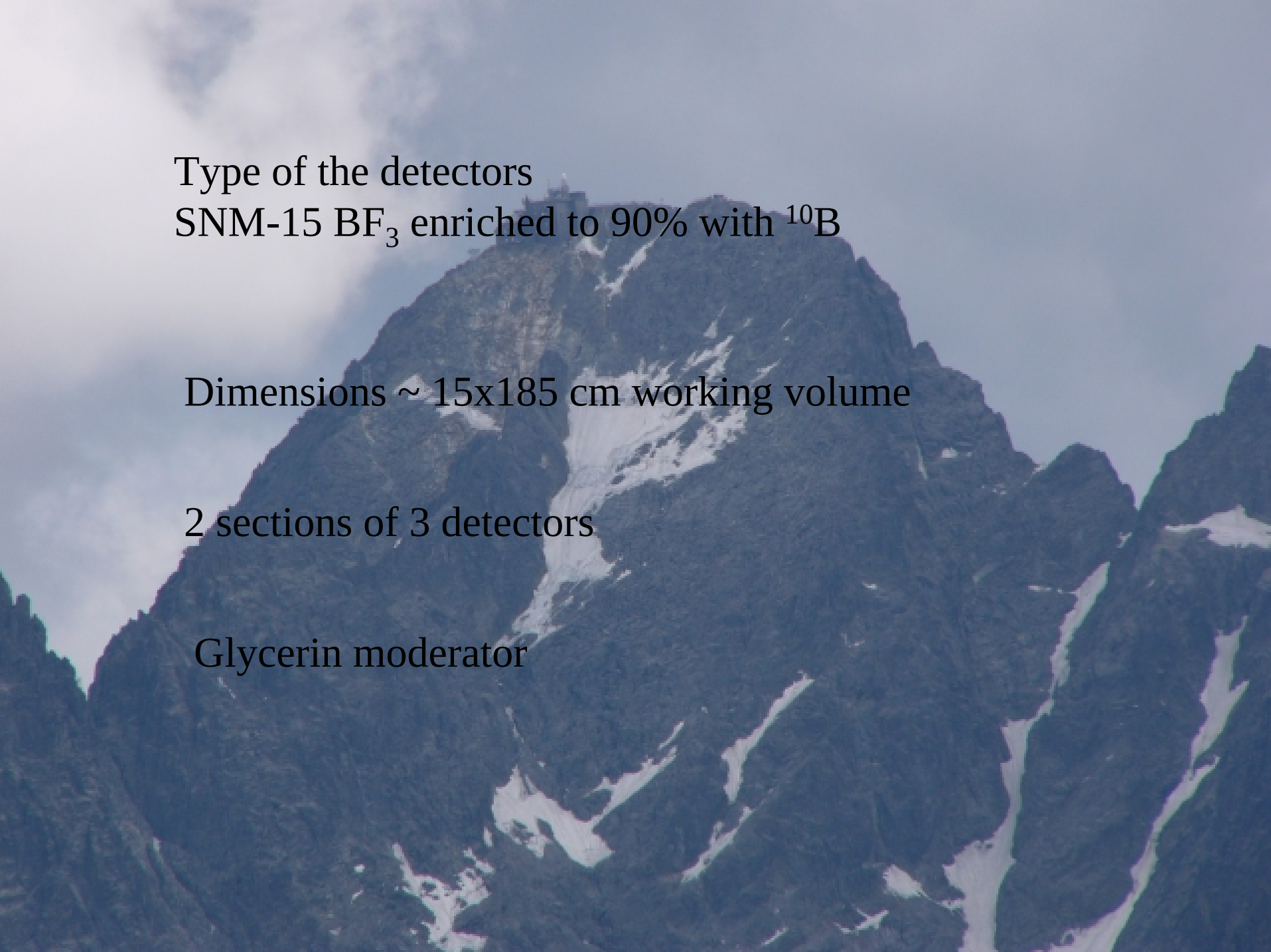


Average dose-rate from neutrons August 2004 measured by Harwell


Neutron flux meter



Configuration of detectors of monitor for absolute neutron flux



Type of the detectors
SNM-15 BF_3 enriched to 90% with ^{10}B

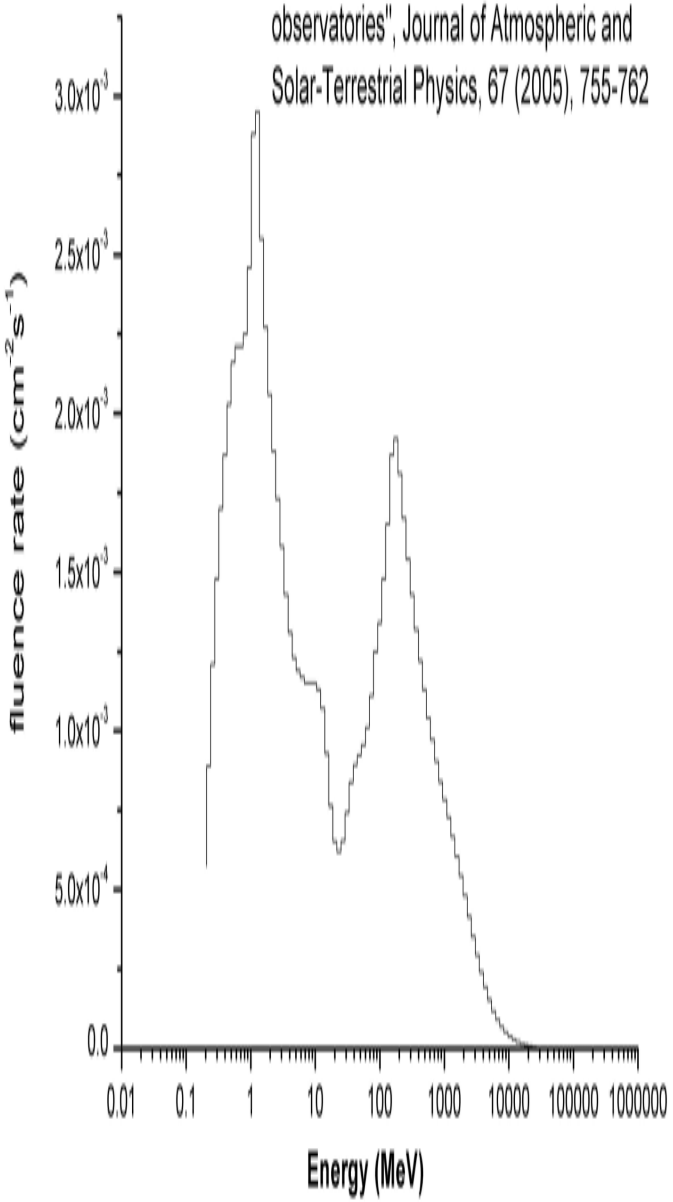
Dimensions ~ 15x185 cm working volume

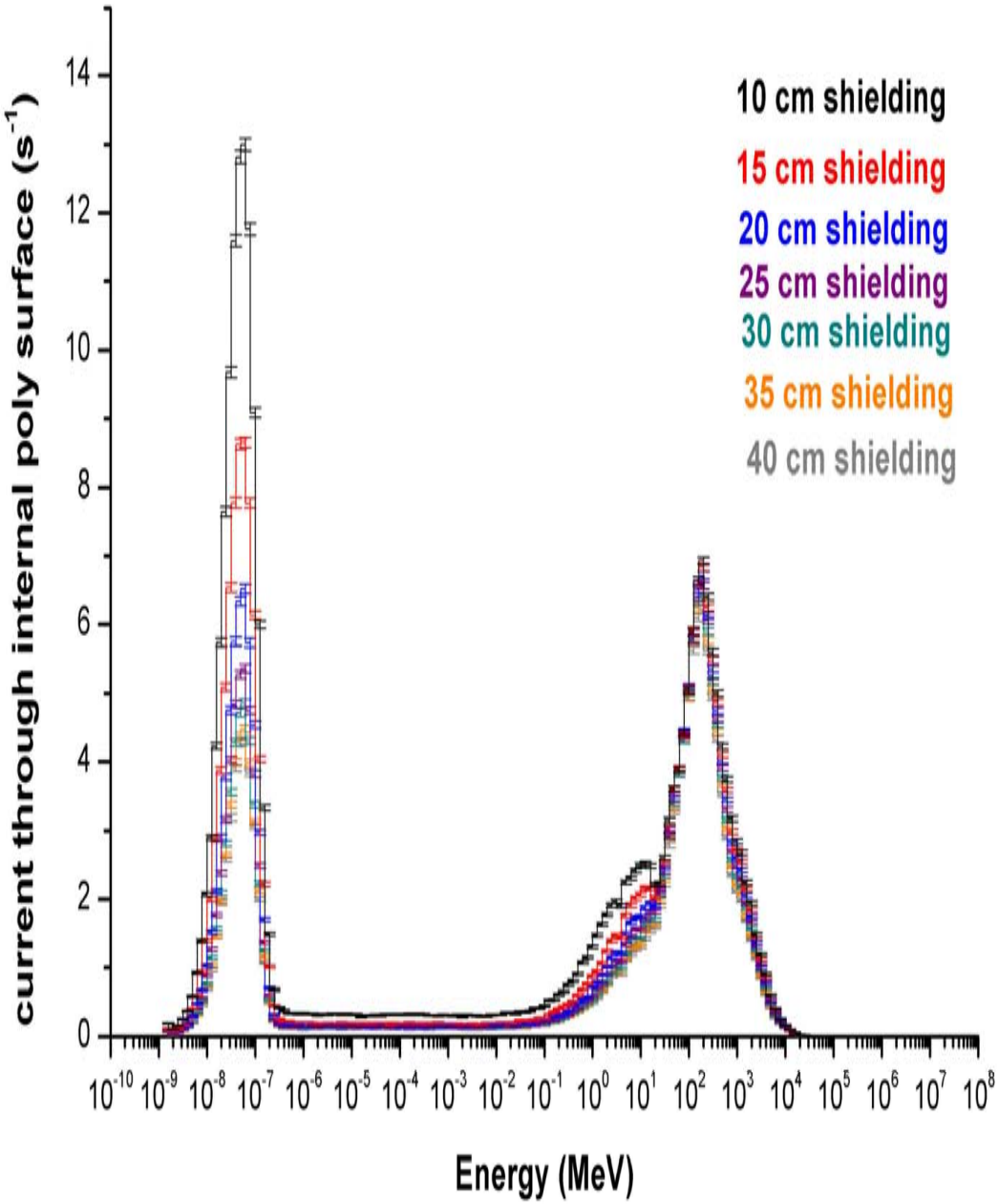
2 sections of 3 detectors

Glycerin moderator

Testa Grigia neutron spectrum:

A. Zanini et al. "Neutron spectrometry at high mountain observatories", Journal of Atmospheric and Solar-Terrestrial Physics, 67 (2005), 755-762

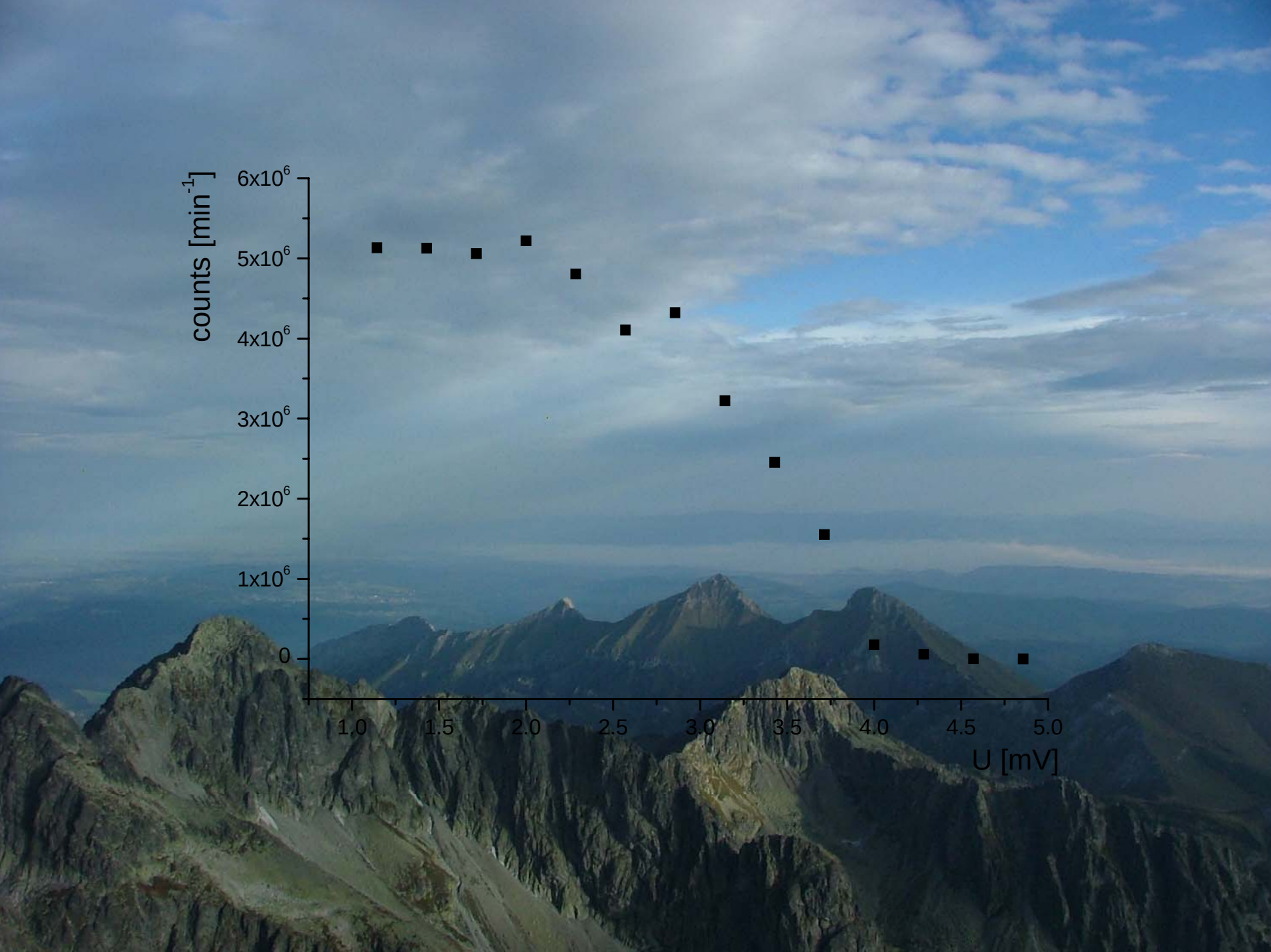




Lomnicki stit

Methodological measurements


Electronics characteristics
Detectors working regime


counts [min-1]
6x10^6
5x10^6
4x10^6
3x10^6
2x10^6
1x10^6
0
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
U [mV]

Future work

Detailed Monte Carlo simulations ~ INFN Torino

Estimation of the ambient dose rate

SUMMARY

Presently environmental measurements

New devices in development

Future projects

We acknowledge

The BEO Moussala staff