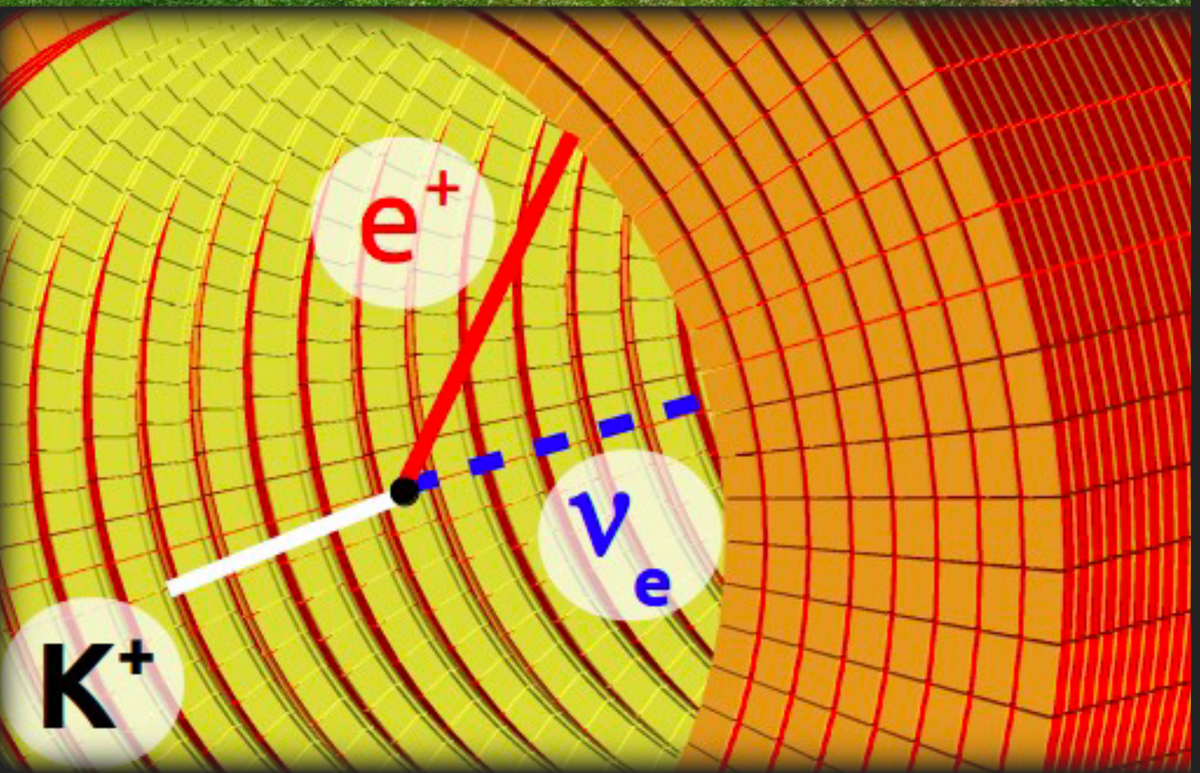
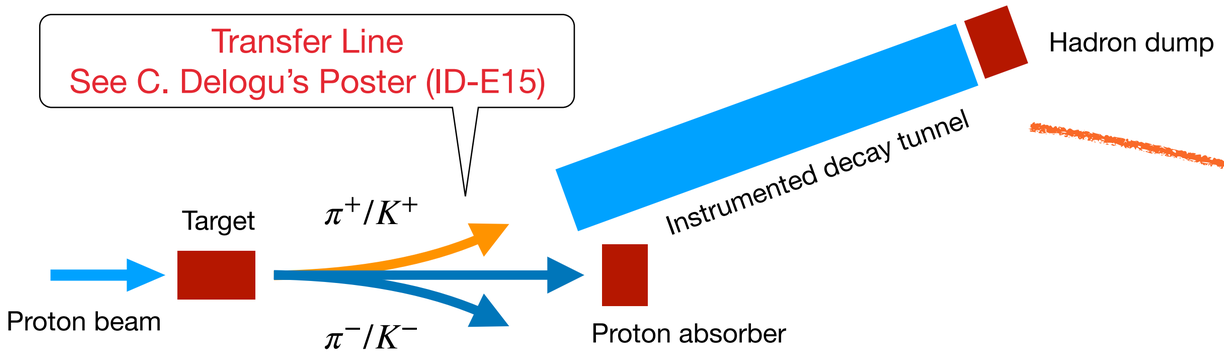


THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN RESEARCH COUNCIL (ERC) UNDER THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME (GRANT AGREEMENT NO 681647).

NuPhys2019 - A. Branca on behalf of the ENUBET Collaboration

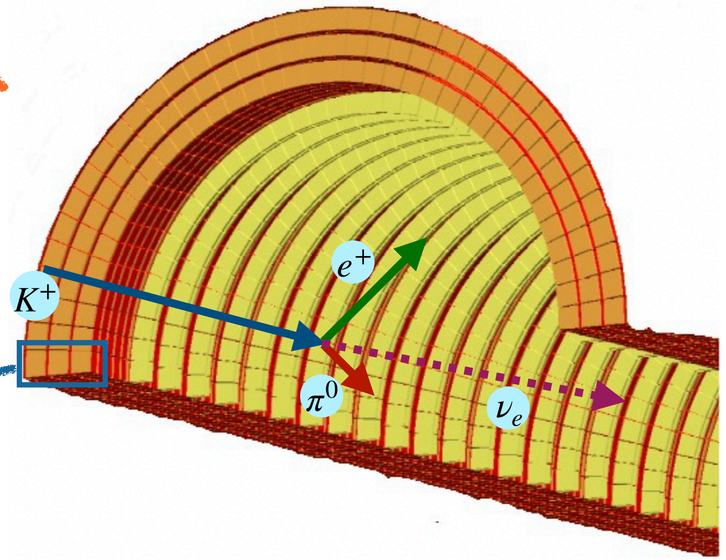
The instrumented decay tunnel of the ENUBET neutrino beam

ENUBET = Enhanced NeUtrino Beams from kaon Tagging



Calorimeter

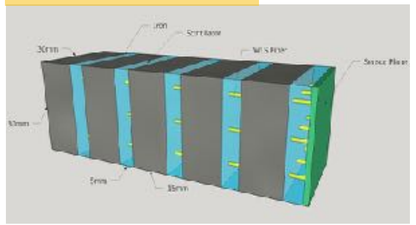
- Monitor positrons from K_{e3} decays from e^+ counting; ⟷ ν_e flux



A narrow-band beam for the precision era of ν physics:

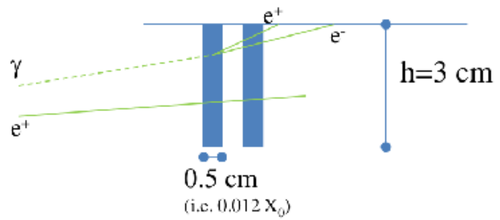
- Knowledge ν_e/ν_μ flux at $O(1\%)$ ⟷ Leptonic CP violation

UCM: schematics



- **U**ltra **C**ompact **M**odules (**UCM**);

Photon Veto: Working principle



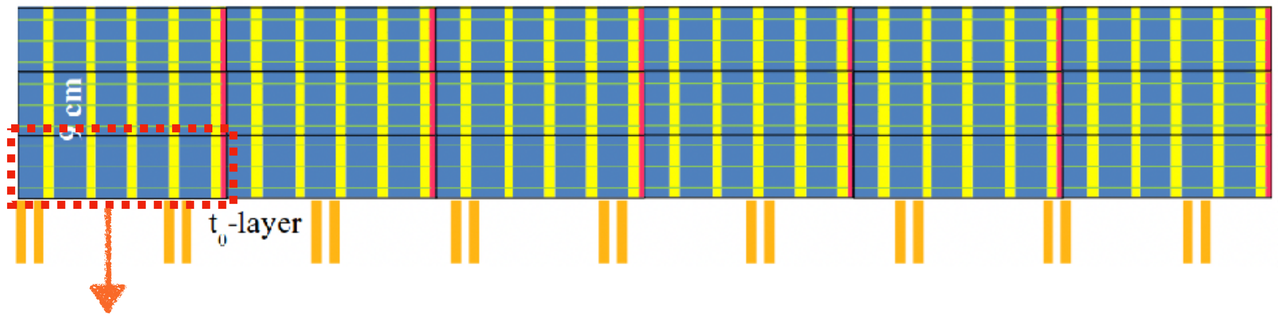
- Plastic scintillator tiles arranged in doublets forming inner rings;

Allows π^0 rejection

- Sampling calorimeter;
- Three radial layers;
- Longitudinal segmentation;

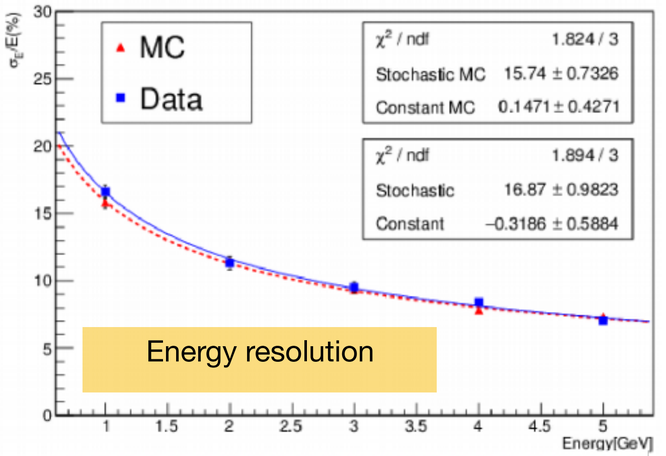
Allows $e^+/\pi^+/\mu$ separation

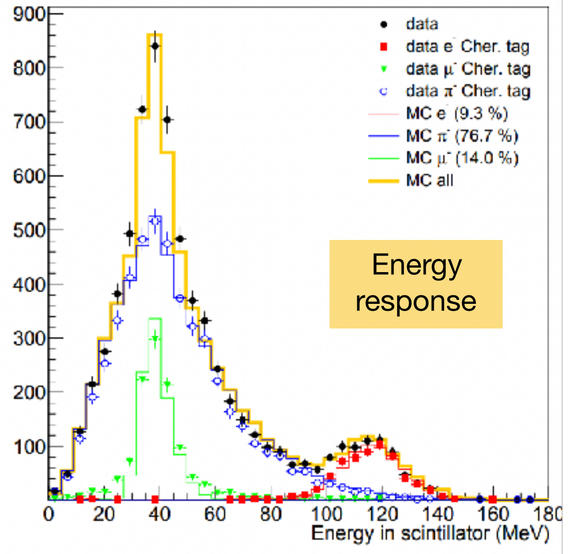
Baseline for the calorimeter: shashlick technique



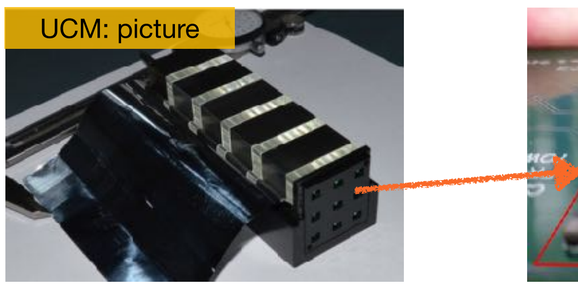
Shashlik: WLS fibers perpendicularly crossing the absorber/ scintillator tiles

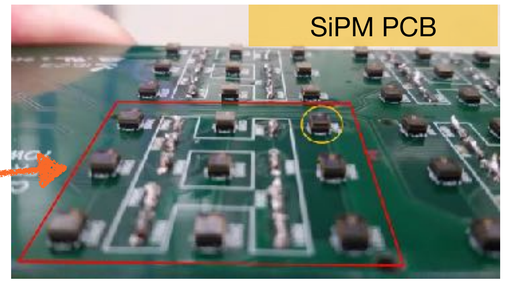
Shashlik prototypes tested @ CERN: response to e^+, π^+ and MIP





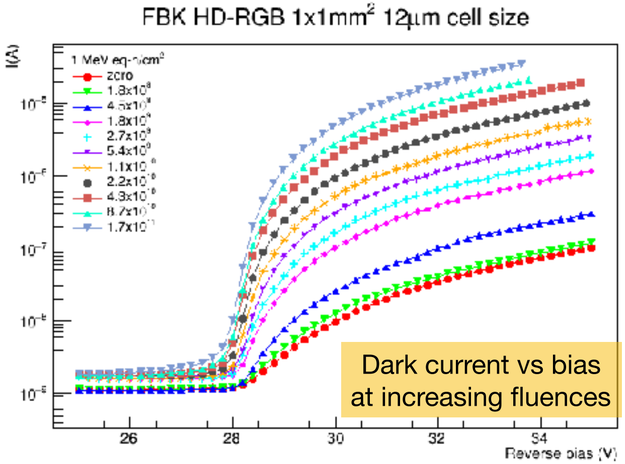
- Energy resolution: $\sim 17\,\%/\sqrt{E}\ (GeV)$;
- Good agreement with MC simulation;

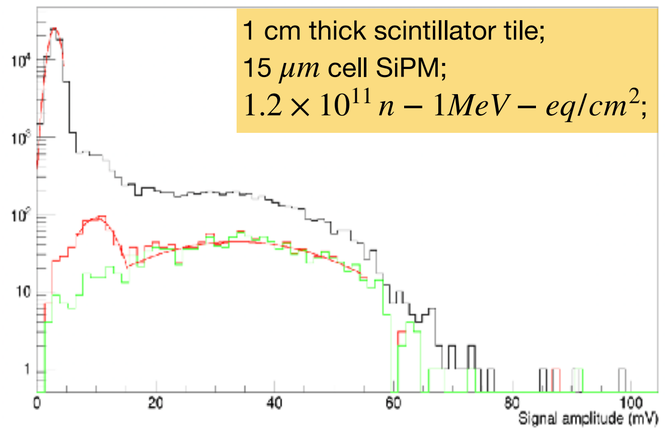




The use of SiPMs embedded in the calorimeter allows a very compact configuration with minimal dead volumes

SiPM irradiation tests @ LNL and beam tests @ CERN:

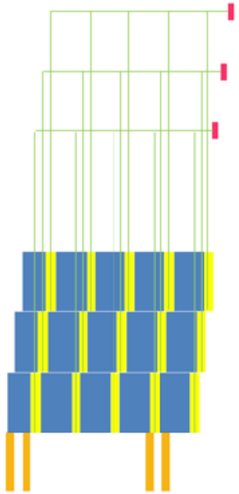




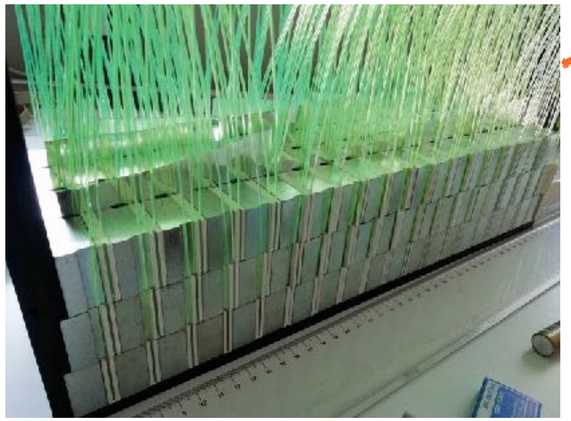
- Dark current after breakdown increases by more than two order of magnitudes @ $\sim 10^{11}\ n/cm^2$;
- MIP signals remain well separated from dark noise peak if SiPM cell size and scintillator thickness are properly chosen;

Overcome SiPM irradiation ageing: lateral readout option

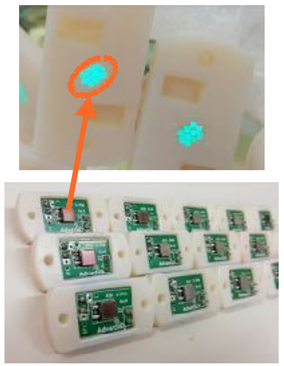
Lateral readout schematic



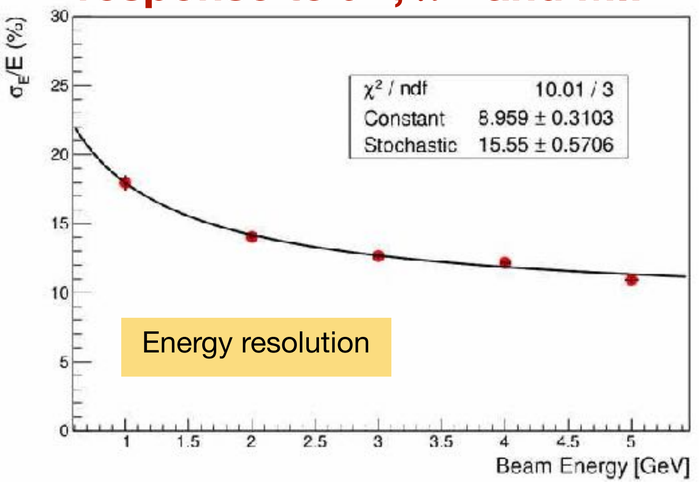
Sampling calorimeter with lateral WLS fibers for light collection



Large SiPM area ($4 \times 4\ cm^2$) for the readout of 10 WLS



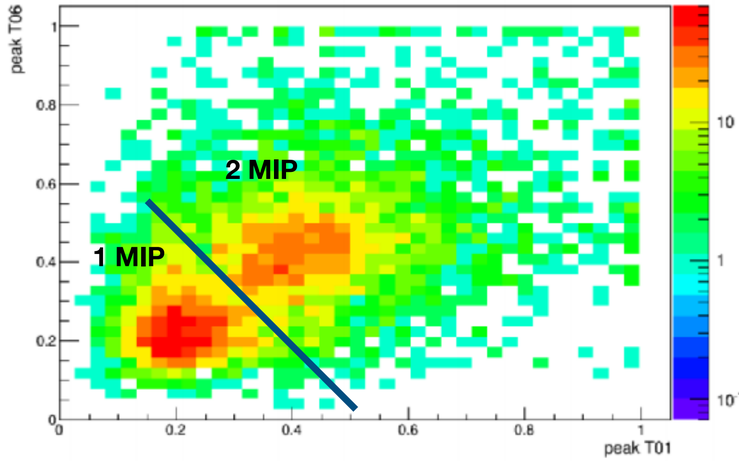
Preliminary results from tests @ CERN: response to e^+, π^+ and MIP



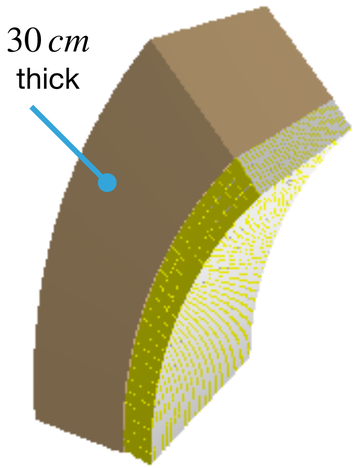
SiPM are not immersed in the hadronic shower: **reduced neutron damage**, **better accessibility**, **possibility of replacement**, **better reproducibility of WLS-SiPM optical coupling**;

Integrated t0-layer in lateral readout prototype

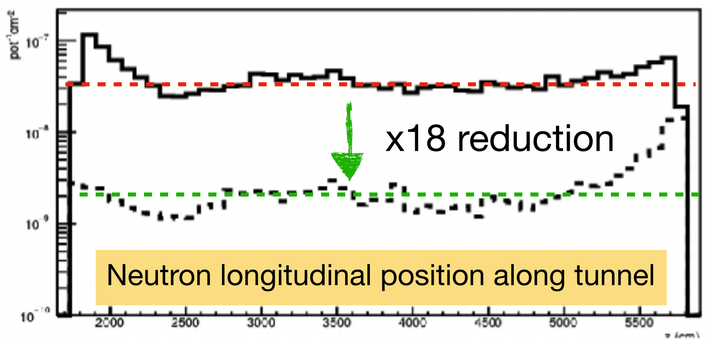
Test 1 MIP/2 MIP separation



Shielding at the back of calorimetric layers:



FLUKA Preliminary



Recognition of ENUBET in the Neutrino Platform as ENUBET/NP06: renovated East Area for the final validation of the demonstrator

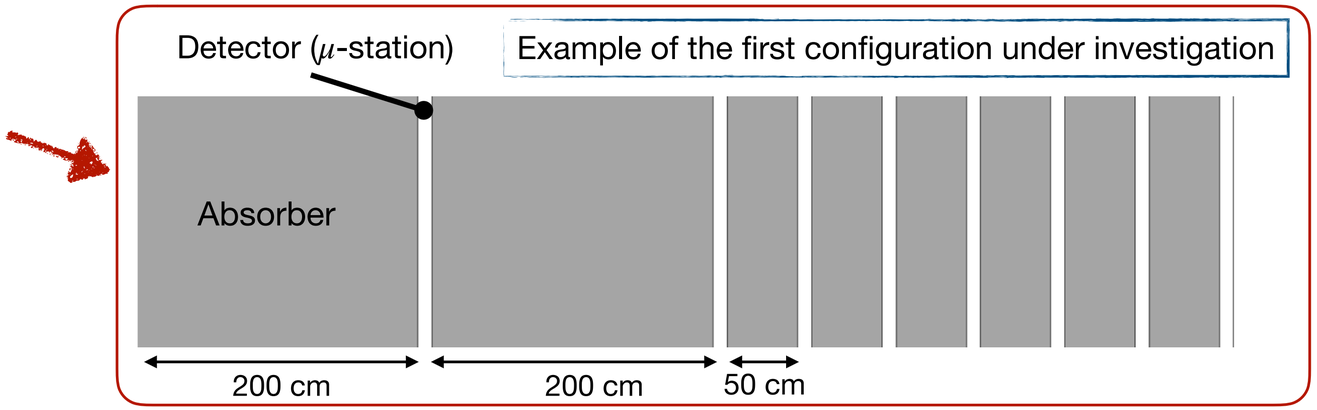
First studies for the development of a muon monitoring system

Use the tagger to constrain the high energy ν_μ spectrum from K^+ decays (in progress), and detectors (μ-stations) following the hadron dump to constrain the low energy ν_μ spectrum from π^+ decays

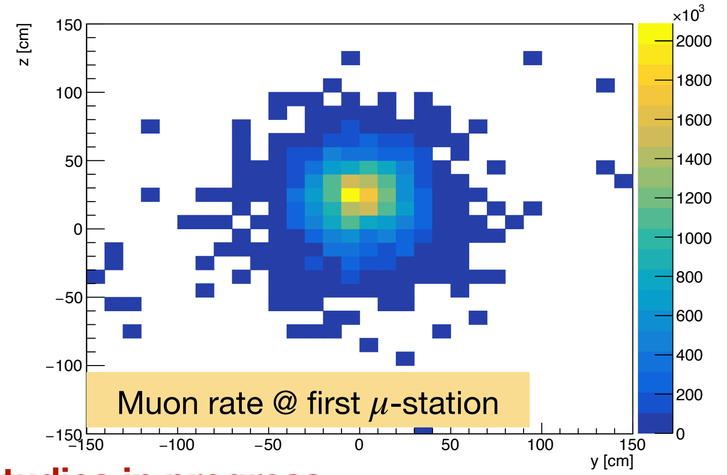
Alternate absorbers (iron/rock) with muon detector planes (technology under investigation)

Instrumentred decay tunnel

Hadron dump



First preliminary simulation tests



Studies in progress:

- Determination of the μ detector technology;
- Studies of the systematics;

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