# UniGE Minerνa Application

Motivation

UniGE neutrino group

MINERνA @ UniGE

NA61 / SHIνE and hadro-produtcion

MICE Electron Muon Ranger calorimeter

Intendend contribution

MINERνA test beam

27 April '12
MINERνA meeting

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# Motivation

1. $\nu$ cross-section measurements at low and medium energy
   on a variety of nuclear targets (incl. H or D)
   and study of final states

2. MINER$\nu$A detector technology

Our interest can be summarized as follows:

1. interest in neutrino cross sections,
   deep inelastic scattering (ME data)
   $Q^2$ dependence and form factors,
   detailed study of final states

2. cross section measurements in view of future large scale scintillator based neutrino detectors (in particular C and Fe targets) at similar beam energies

# UniGE neutrino group

Members:

1 full professor (A. Blondel, group leader)
1 M.E.R. (= senior lecturer and researcher, A. Bravar, UniGE MINERνA P.I.)
2 M.A. (= senior Postdoc, A. Korzenev and Y. Kharadzov et al.)
3 PostDocs
5 PhD students (C. Maris et al.)
+ electronics and mechanical engineering groups

Current activities :

T2K
- TPC readout based on MicroMegas
- neutrino beam flux
- inclusive cross - sections

NA61 / SHIνE
- hadro-production measurements to characterize the T2K neutrino beam (see later)

MICE
- DAQ
- construction of the Electron Muon Ranger calorimeter (EMR) for e / μ / π P.I.D.

AIDA - Future neutrino detectors / facilities
- prototyping of scintillator based detectors (TASD and MIND) with Si-PM readout
- simulations

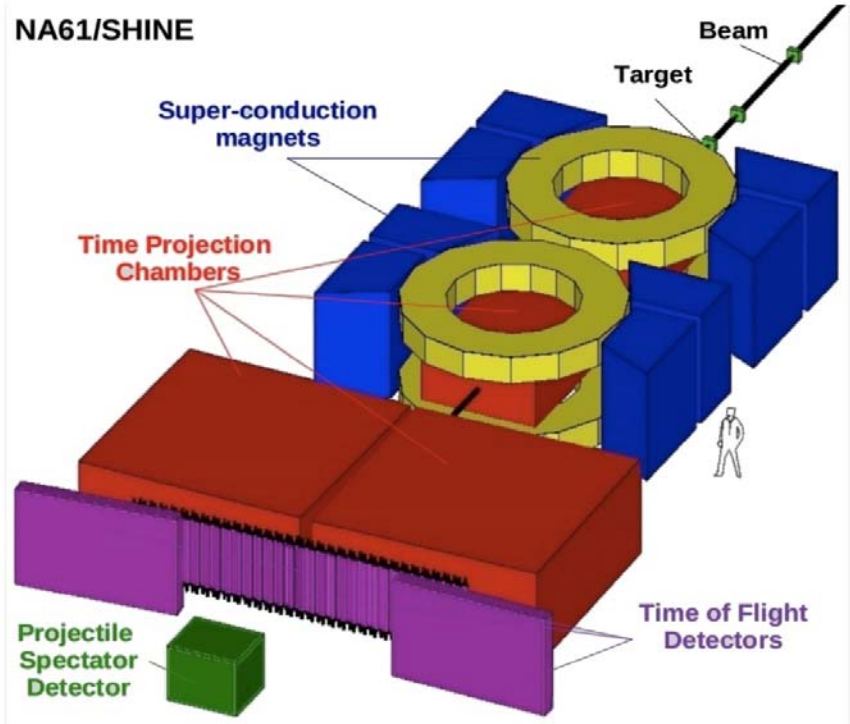
(not everybody is involved all projects!)

# MINERνA@UniGE

Members of the Geneva neutrino group that would like to join MINERνA

| | % MINERνA | other activities |
|---|---|---|
| Alessandro Bravar<br>(M.E.R.)<br>UniGE MINERνA P.I. | 40 %<br>(25 % as soon as acc.,<br>40% from Jan 1st 2013) | T2K, NA61,<br>proposal for LFV at PSI |
| Alain Blondel<br>(P.O.)<br>(Limited Author) | 10 % | MICE, T2K, NA61, AIDA,<br>future ν facilities |
| Yordan Karadzhov<br>(M.A.) | 30 %<br>(as soon as acc.) | MICE, future ν detectors |
| Alexander Korzenev<br>(M.A.) | 50 %<br>(25 % as soon as acc.,<br>50% from Jan 1st 2013) | T2K, NA61 |
| Carlos Mari<br>(Ph.D. student)<br>(will start on May 1st) | 50 %<br>(as soon as acc.) | future ν detectors |
| 2nd Ph.D. student<br>(as soon as FNS grant approved) | 80 %<br>? | NA61 |

# NA61 / SHINE




Physics case

2 PhD. Theses

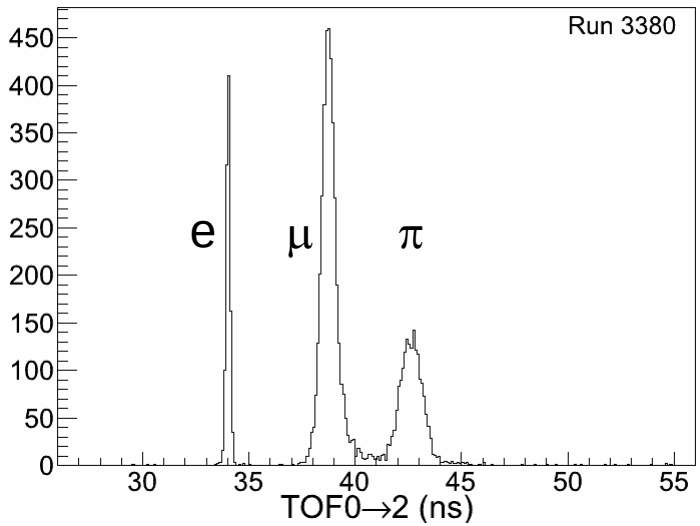
Hardware:

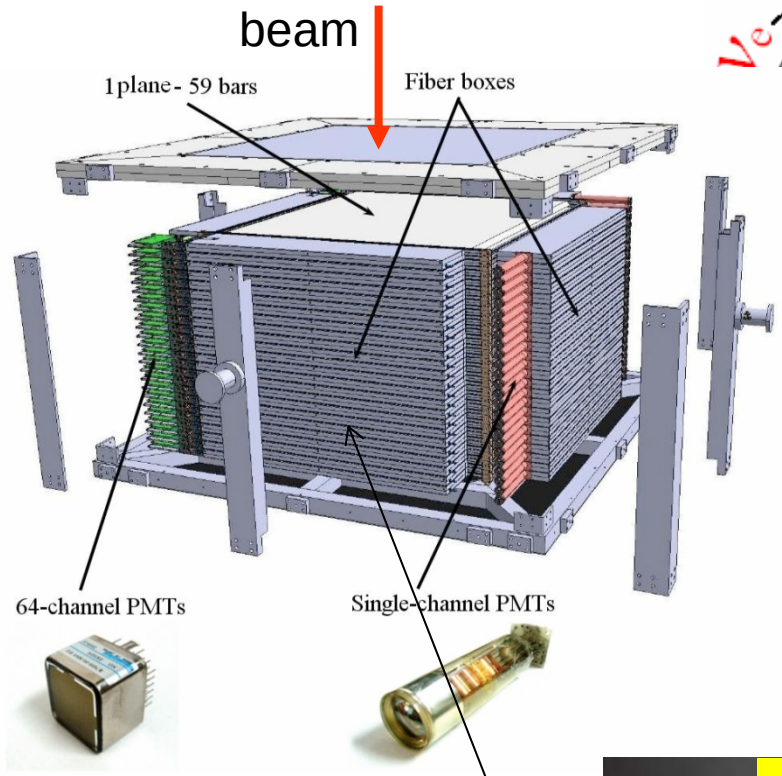
- “Forward” ToF
- Trigger
- T2K replica target

Analysis:

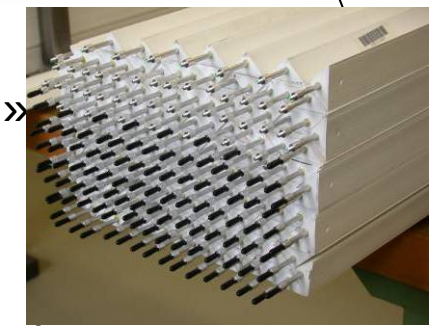
- Simulations
- Calibrations (ToF and TPC)
- combined ToF / dE/dx P.I.D. analysis
- $\pi$+ / $\pi$- , and K+ spectra (published), and K-, p / pbar spectra
- long target analysis
- implementation studies of long target data in T2K

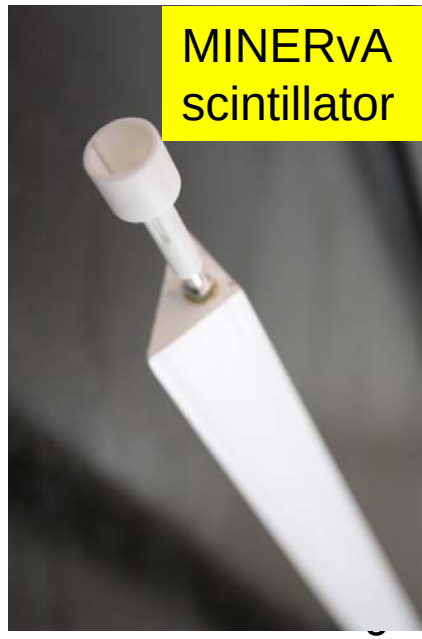
# MICE - EMR




EMR = 1 x 1 x 0.80 $m^3$ plastic scintillator « cube »
beam = 140-400 MeV/c, e, μ, π TOF-tagged






➔Large statistics of stopping e, μ, and π of both signs will give calibration of *range and stopping properties* (decay, nuclear star, absorption…) for μ / π PID
Running starting end 2012 + all of 2013

# Intendend Contribution

We plan to participate actively in the operation, maintenance, and data taking (shifts), and we plan to contribute actively to the analysis and calibration of MINERνA data.

help / support for NA61
NuMI neutrino beam simulations (e.g. implement NA61 data)
evaluation of flux uncertainties

study the stopping properties of μ, π, and p in a MINERνA type detector (MICE EMR)
participate in the test beam activities using the MINERνA prototype in 2013

analysis (tentative)

- too learn about MINERνA contribute to the analysis of some LE channels
- $\nu_\mu$ vs $\nu_e$ cross sections
- DIS and form factors (ME data)

we are also interested to participate to any upgrade plan of the MIENRνA detector (photo-detectors and FE electronics)

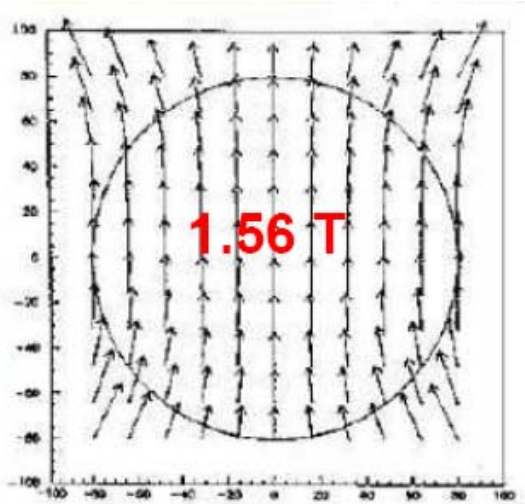
This is a tentative plan:
we need still to learn a lot about MINERνA, understand MINERνA needs, etc.
before presenting a more detailed plan
in particular regarding the analysis of the MINERνA data

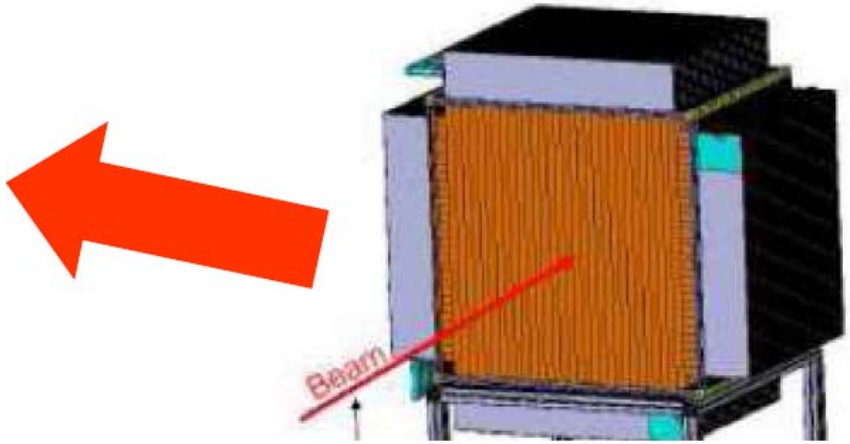
# MINERνA Prototype / Test Beam

explore its tracking performance in a magnetic field
using for instance a large aperture dipole magnet at CERN

if feasible contribute to the replacement
of the MAPMTs with Si-PMs
(incl. mechanics and electronics)

Morpurgo magnet on the H8 beam line at CERN



# Outlook

We have already submitted an application to our funding agency (FNS) on March 31st asking explicitly financial support for MINERνA (travel funds, one student, one postdoc, and Si-PMs to refit the MINERνA test beam prototype)

We expect to obtain sufficient support for our younger colleagues, as well as for equipment contribution to MINERνA.

We will transmit rapidly to SNF any acceptance statement and positive support MINERνA will be able to express in writing.

Depending on our “sponsors” we might increase our participation in MINERνA

We envisage also supporting our students at Fermilab for long stays (6 months / year).