KM3NeT

Neutrino research at intermediate energies with KM3NeT/ORCA

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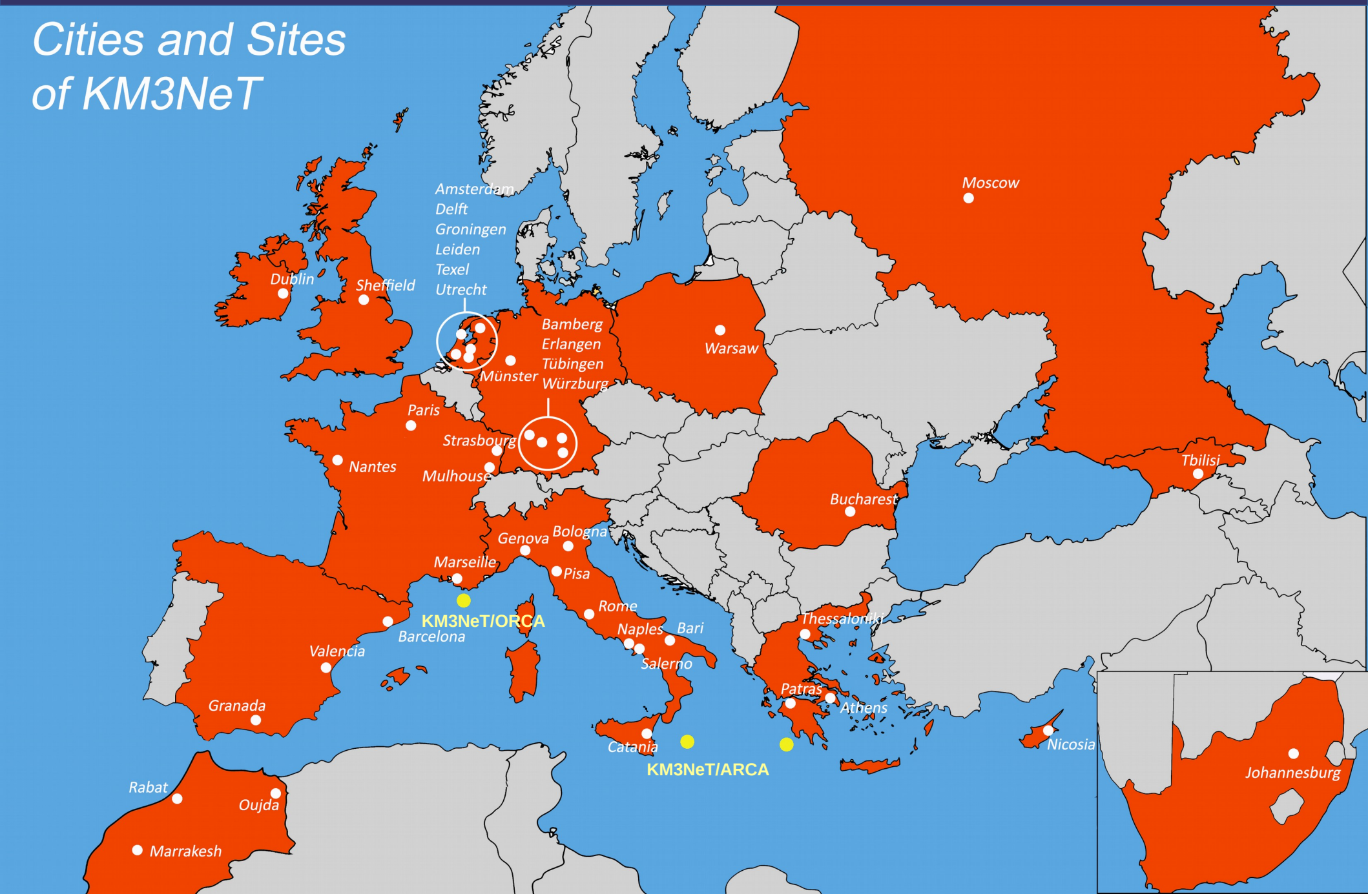
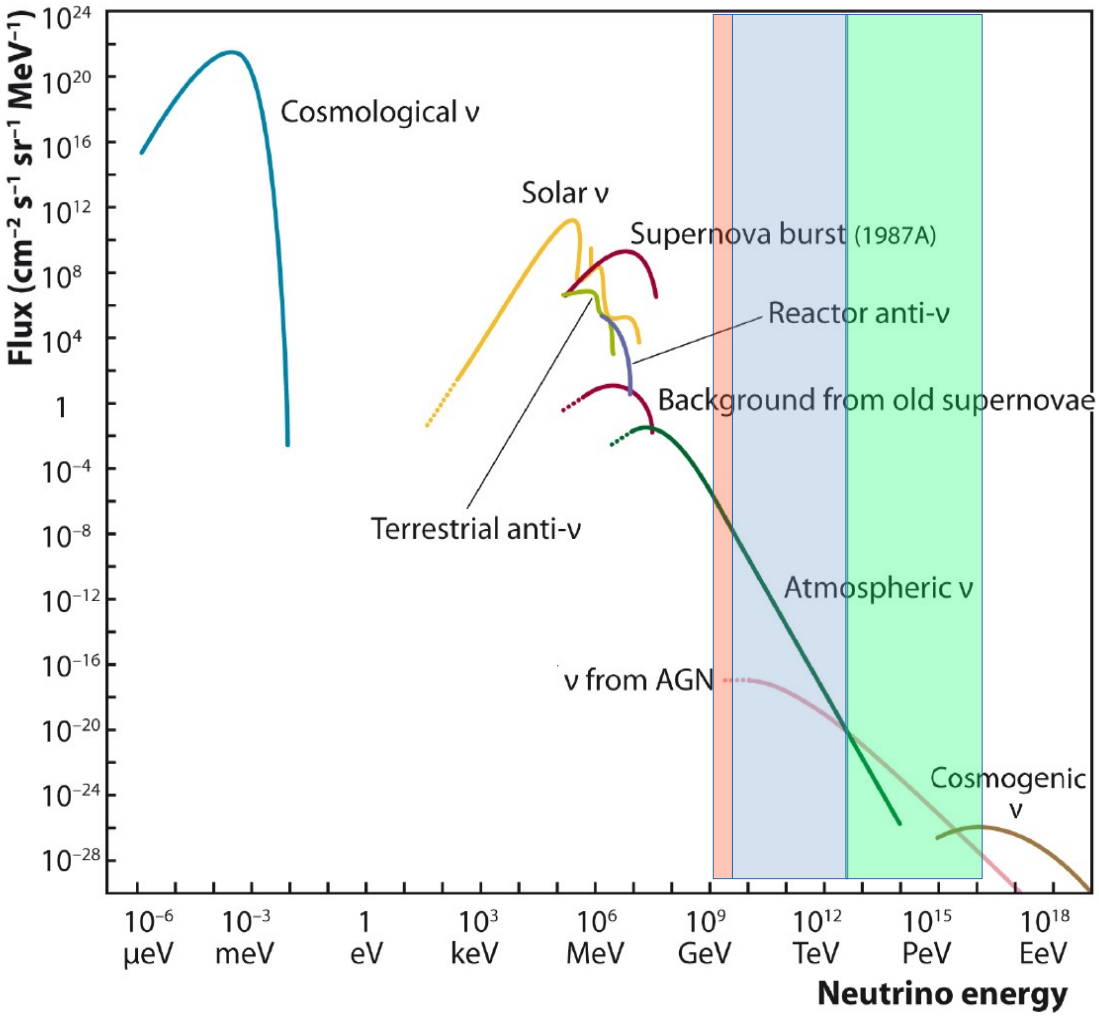
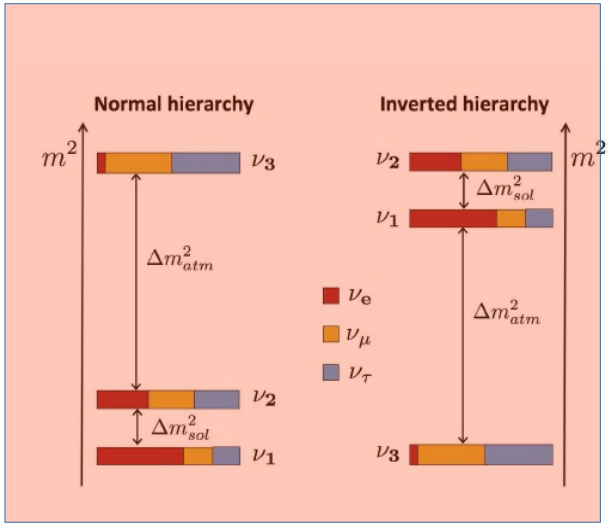
KM3NeT International Collaboration

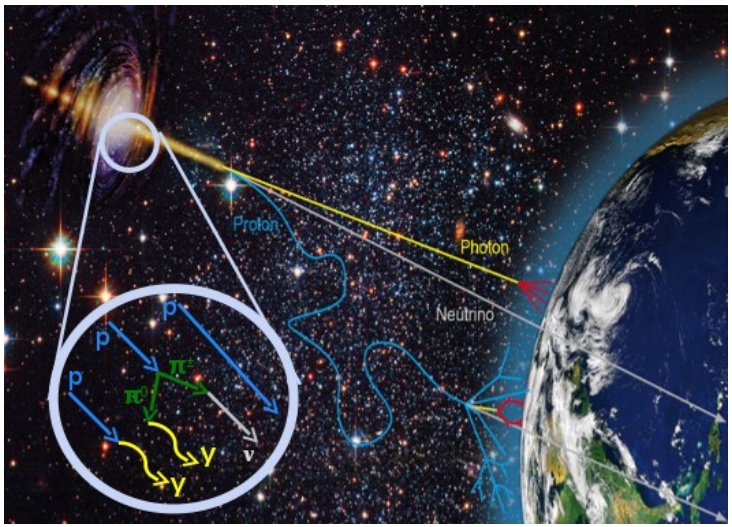


Neutrino Energy Spectrum

Neutrino energy spectrum and their corresponding sources

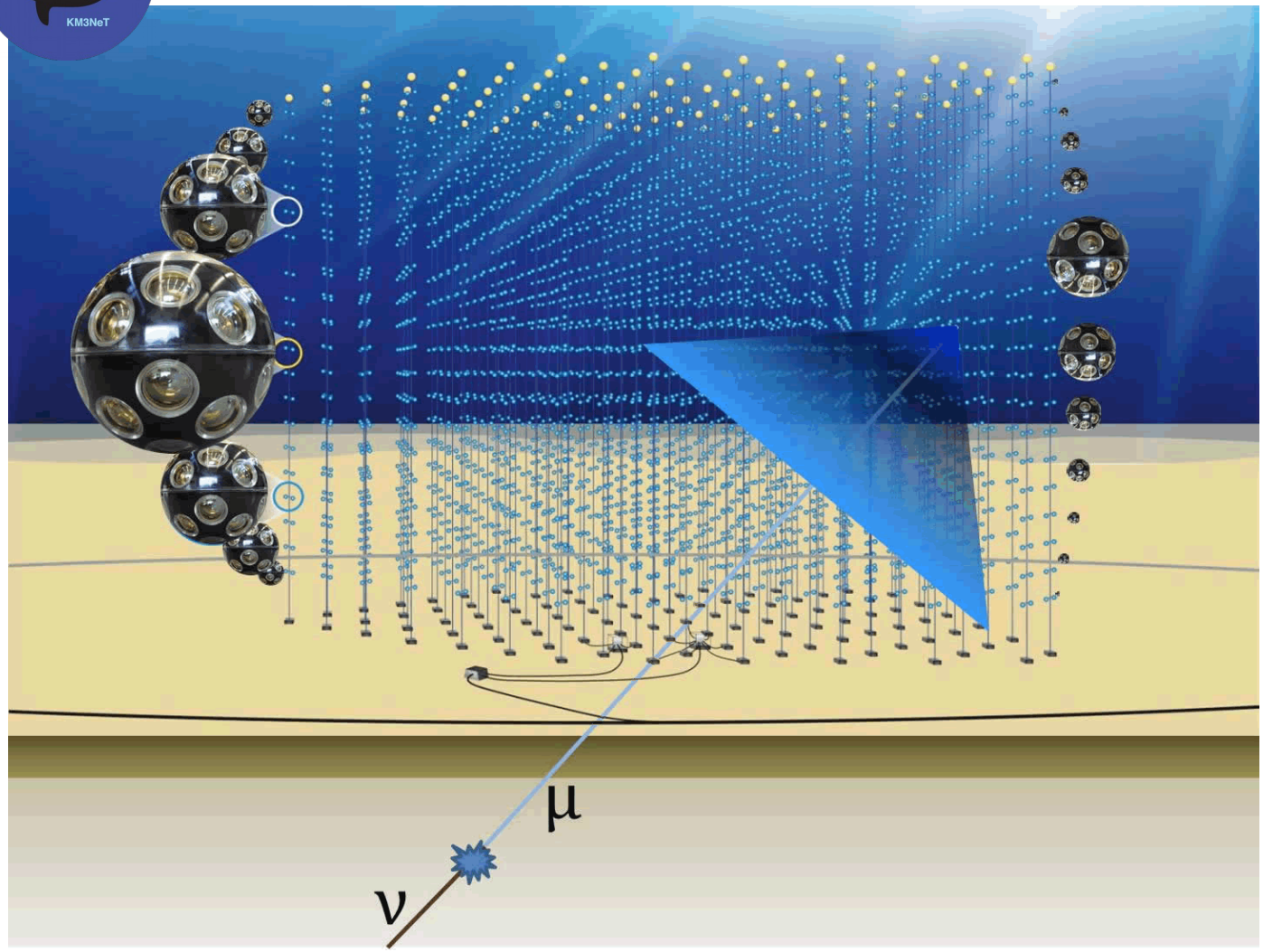


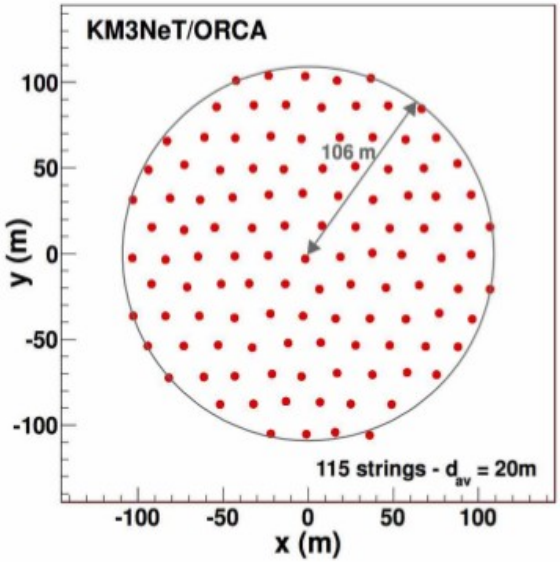




KM3NeT/ORCA Neutrino Telescope

Oscillation **R**esearch with **C**osmics in the **A**byss



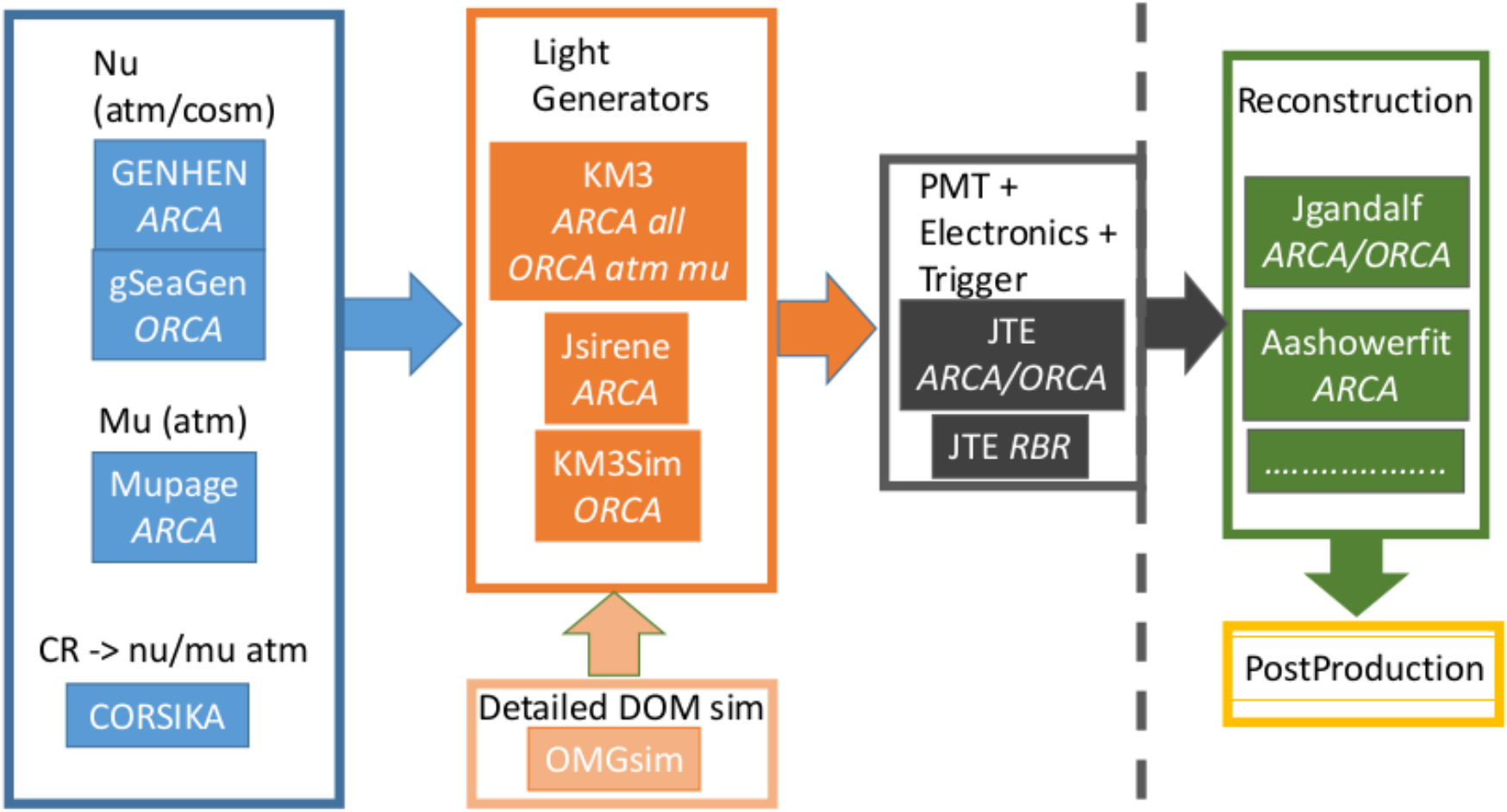


115 Strings, 18 Floors, 2070 DOMs,
64170 Photomultipliers

Horizontal Distance : 20 m
Vertical Distance: 9 m

KM3NeT Simulation Chain

Software packages



Simulation is *almost* identical to the real data at this step.

KM3NeT/ORCA Simulations for Intermediate Energies

- Software used: gSeaGen (neutrino generation);
  KM3Sim (Cherenkov light and detector respons)
  JTE (trigger simulation)
  Jgandalf (event reconstruction)

- $5x10^8$ n_m (CC interaction) events were simulated with KM3NeT Simulation Chain

- Simulations were performed at Lyon Computing Center

- Simulated data is available for the KM3NeT collaboration

Neutrino Generator gSeaGen

gSeaGen (Based on GENIE and Pythia)

The GENIE Collaboration: a state-of-the-art neutrino MC generator for the world experimental neutrino community. Includes all processes for all neutrino species and nuclear targets,
from MeV to PeV energy scales. (KM3NeT/ORCA: $1<E_n<100$ GeV)

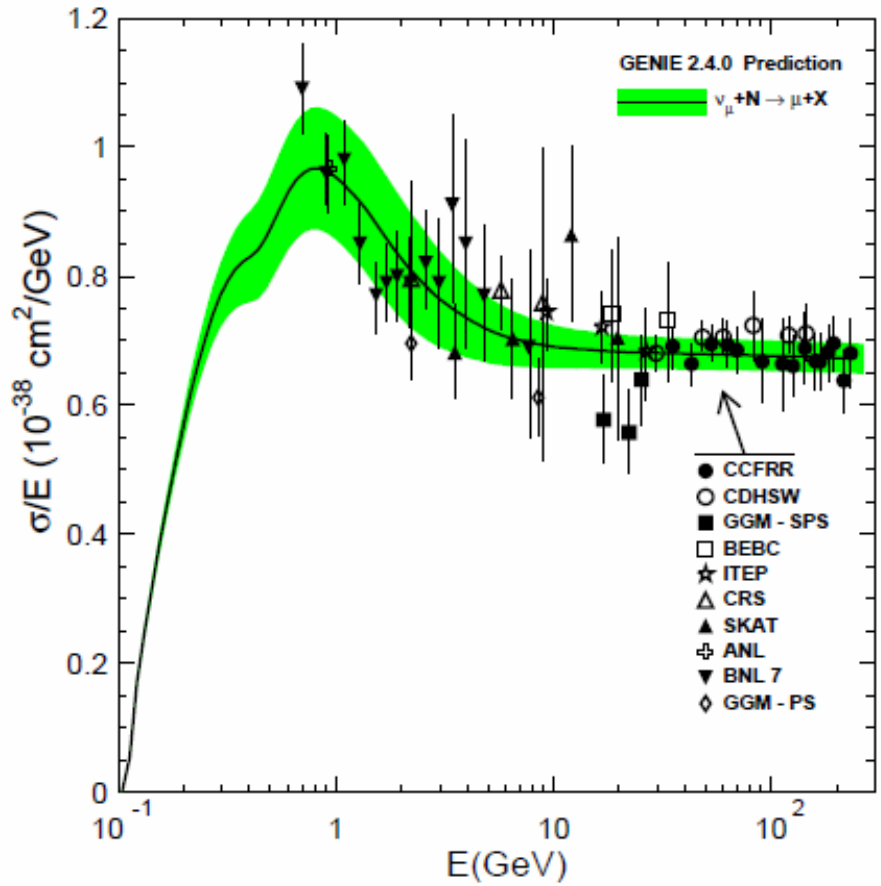
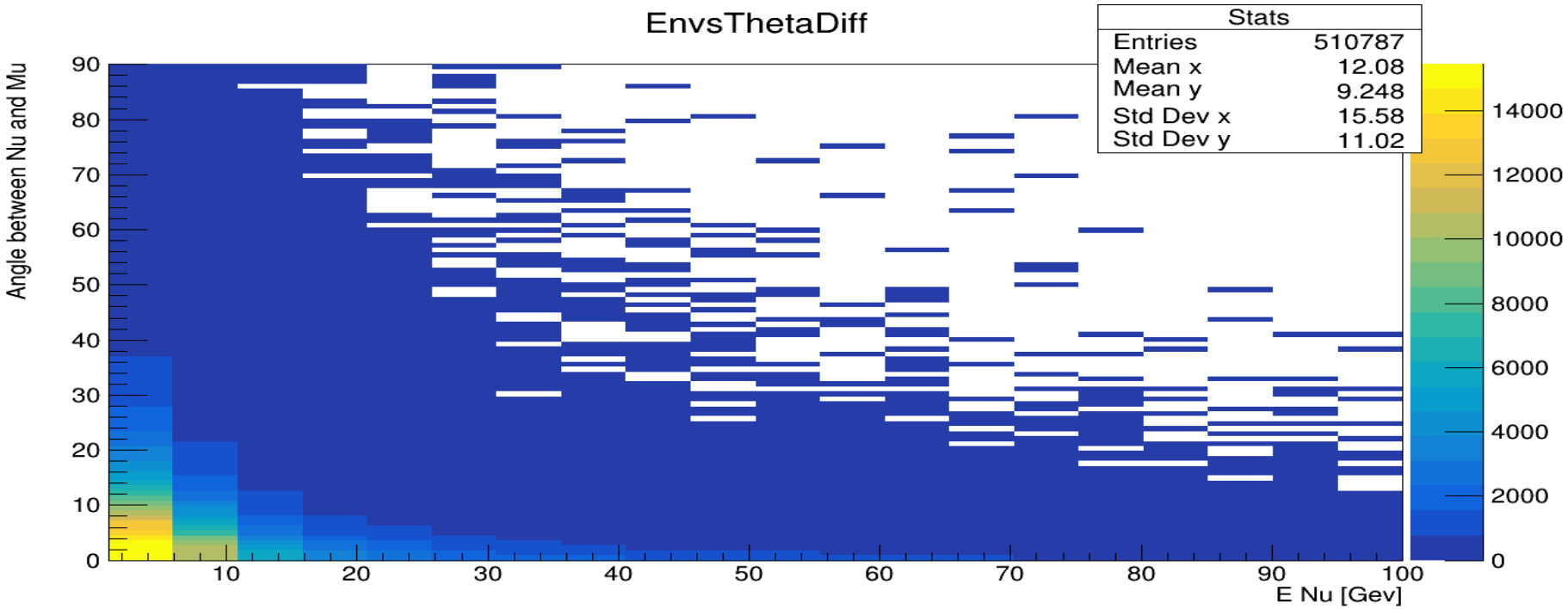


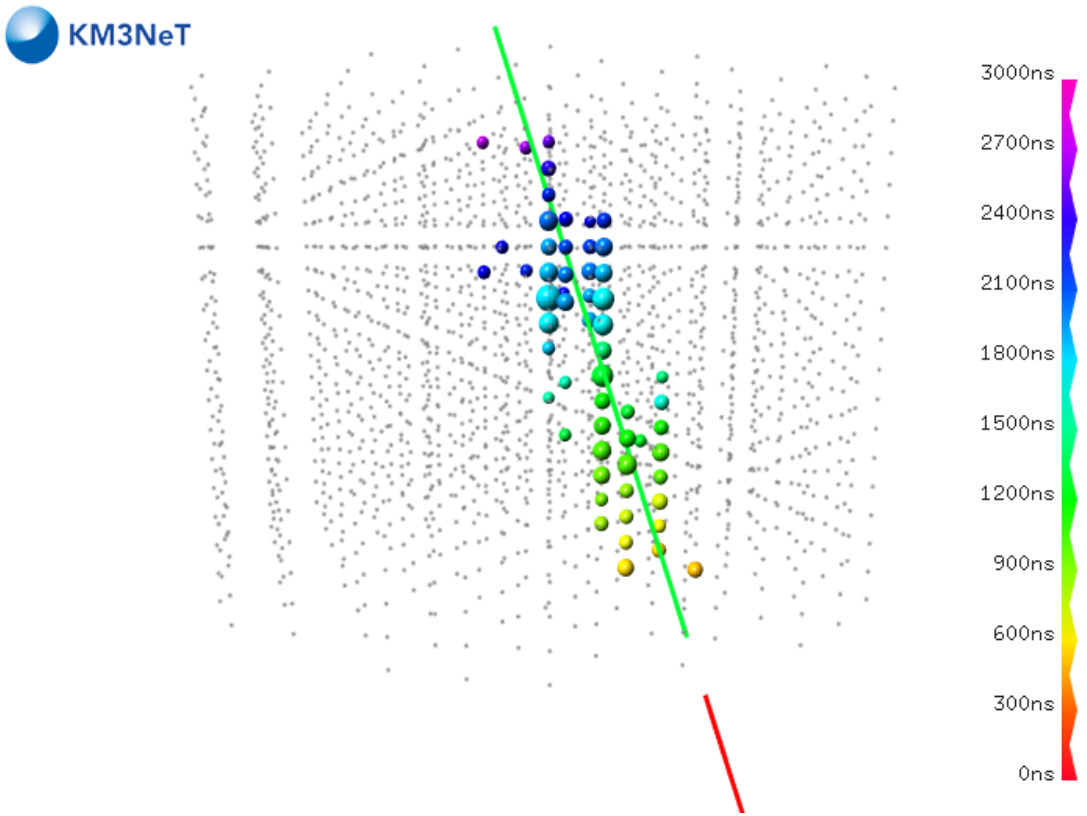
Figure 2.1: νμ charged current scattering from an isoscalar target. The shaded band indicates the estimated uncertainty on the free nucleon cross section. Data are from [53] (CCFRR), [54] (CDHSW), [55] (GGM-SPS), [56, 57] (BEBC), [58] (ITEP), [59] (CRS, SKAT), [60] (ANL), [61] (BNL) and [62] (GGM-PS).

https://genie.hepforge.org/

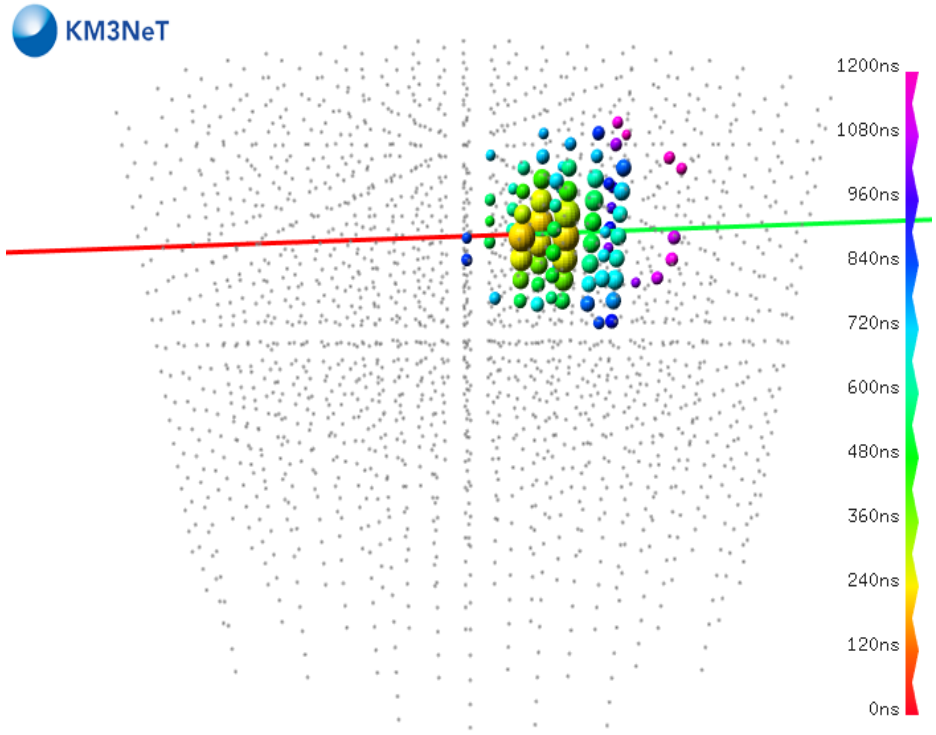
gSeaGen simulations example



Simulated Tracks



Simulated ν_μ event



Simulated ν_e event

Summary

- KM3NeT is a large international project in the high energy neutrino astronomy and neutrino physics.
- KM3NeT-Tbilisi group is involved in the simulations and analysis for the KM3NeT/ORCA project.
- Currently Tbilisi group is focusing on researching KM3NeT/ORCA performance at intermediate energies.

Thanks for Your Attention!