The GEANT based Monte Carlo, and the “Simulations for KM3NeT Technical Design” Report

A progress report

Work at Erlangen, NIKHEF*, “Demokritos”, NESTOR, …

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D. Lenis, C. Markou, K. Tzamarioudaki, A. Psallidas,

P. Koojman, A.C. Assis-Jesus, and others …

Presented by P. Rapidis

Work done by Erlangen, Nikhef, NESTOR, and Demokritos people, already described to a large extent by A. Kappes

Some of it was coordinated during a working meeting held at Erlangen 3 weeks ago

- Use spectra of muons and neutrino-induced muons from various (existing generators) and use (1) GEANT4 for Cherenkov light (and not only) generation, (2) add a flexible XML based adjustable detector geometry, (3) do pattern recognition and event reconstruction.

- GEANT was never meant to be a production tool – a validation check mostly. It just takes too long (timing is a problem - approx 2 hours for 10-100 TeV muon) thus a long run will be prohibitive.

- Work on Sirene (some debugging and comparisons w/ Geant4)

  Sirene is supposed to be a fast muon propagation and Cherenkov light generation software. Work of P. Koojman and others from the Netherlands …

  " There is quite good agreement with the Geant simulations but there are some detailed differences in the timing of the shower hits. We are working on that. It runs up to 10**6 TeV, and takes about 10mins on a single modern CPU (3G), reducing by a factor of 2 for every factor of 10 in energy, per event "

- Porting reconstruction (Chameleon) to KM3Tray (The Fitter was already ported by C. Kopper, the rest - pattern recognition -- is done by D. Lenis, work in progress)

- Effort to install Km3tray on "D"'s cluster (continues to fail, thanks to the Greek Army that has taken our system expert away from us or 45 days) (140 cpus)

- Considering porting KM3NeT tray to the GRID environment.

- Started test runs of g4sim on Lyon cluster w/ JP's files (in progress) (looong)

- Scripts to make plots for the above when it will be ready (in progress, w/ A. Psallidas)

- Submission of minor patches to the km3tray project (reading of .bz2 files)

- Significant amount of time went into learning the tray (we are newcomers)

Objective : contribute to the studies to be presented at the March-April meeting.

A first (?) attempt at a systematic compilation of the various studies and parameters

Simulations for the KM3NeT Technical Design Report

Th. Eberl, ECAP and E. Tzamariudaki, NCSR Demokritos

February 22, 2009

Abstract

This document provides details of the settings and parameters used for the Monte-Carlo simulations (planned and ongoing) as well as a comprehensive description of the analysis goals for the upcoming Technical Design Report of the KM3NeT experiment.

Work by
Th. Eberl and K. Tzamarioudaki
with input/criticism from many and will ask for more input as well

Towards the KM3NeT TDR (Thomas E. & Katerina T.)

An attempt towards standardization/organization …

The capabilities of the detector designs proposed are usually described in terms of some fundamental quantities like:

- effective area
- rate of mis-reconstructed atmospheric muons
- sensitivity

It is mandatory to ensure that the results obtained by the different working groups are easily comparable. Need to provide

- documentation and clarification of parameters used for MC simulations
- comprehensive description of the analysis goals

Towards the KM3NeT TDR

A document containing

- an outline of the software chains used by the different working groups
- a summary of the detector configurations
- definitions of the most important terms commonly used
- a detailed description of the quantities recommended to be used

  for the comparison of the different detector layouts and

  to study the issue of the deployment depth

detailed information to be found in the KM3NeT Wiki:

http://wiki.km3net.physik.uni-erlangen.de/

login: km3net password: pyrosoma

Suggested Strategy for Detector Performance comparisons

A first try - can be refined …

Use one depth: 3500m and compare different 'detectors'

- neutrino effective area at trigger level (at least 6 muon induced hits)
- neutrino (muon) detection efficiency after reconstruction

  $N_{detected} / N_{trig}$ vs logE and θ
- angular resolution vs logE and θ
- if cuts applied: logE and θ spectra of the events surviving and being rejected – cuts to be made on reconstructed quantities only
- neutrino effective area vs logE and θ after applying all cuts to suppress atmospheric muon background
- quote percentage and logE and θ spectra of mis-reconstructed atmospheric muon events $N_{\theta\ upwards} / N$

Suggested Strategy for Detector Performance comparisons

Sensitivity estimation taking into account background from mis-reconstructed atmospheric muon events and atmospheric neutrinos and taking into account the energy resolution

- diffuse neutrino flux:

  muon event rates as function of logE for signal and

  background (atmospheric muon events and atmospheric neutrinos)

  sensitivity as function of logE

- point sources:

  sensitivity as a function of the declination

  using a search window 1.6×angular resolution

Studies of the influence of Depth

Use one detector (Cabled_String) for three depths(2.475km, 3.5km, 4.8km)

- comparison of the ratio $\frac{\text{N(tracks, mis-reconstructed atmospheric muons)}}{\text{N(tracks, correctly reconstructed atmospheric neutrinos)}}$

  vs logE and θ

- neutrino effective area vs logE and θ
- account for the contribution of coincident muons (coming from two different showers
- sensitivity for diffuse flux and for point sources as for the detector layout comparisons

Don't Miss it !
Register NOW !

Couldn't be better !

A great event !

An experience of a lifetime

http://www.inp.demokritos.gr/~km3net/

KM3NeT Design Study & Preparatory Phase Meeting

March 30 to April 3, 2009, Athens, Greece

Home | General Information | Accommodation | Transportation | Registration | Program / Participants

KM3NeT DS and PP Meeting

National Center for Scientific Research "Demokritos"
Athens, Greece
March 30, 2009 to April 3, 2009

At this time the program/schedule is being prepared.

PLEASE USE THE REGISTRATION LINK ABOVE TO LET US KNOW YOU WILL ATTEND !

There will be a conference fee of the order of 120-150 euros (to be determined once we understand our costs better). It will cover costs of lunch, coffee breaks, bus transportation, meeting rooms and secretarial costs.

A conference dinner cost will be additional (and optional).

Please be advised that you will be asked to pay all fees in cash, and a receipt will be provided.

We will be splitting the fee in two i.e. PP and DS, since that may be needed for cost allocation to the two projects