PMT angular acceptance and muon track reconstruction:
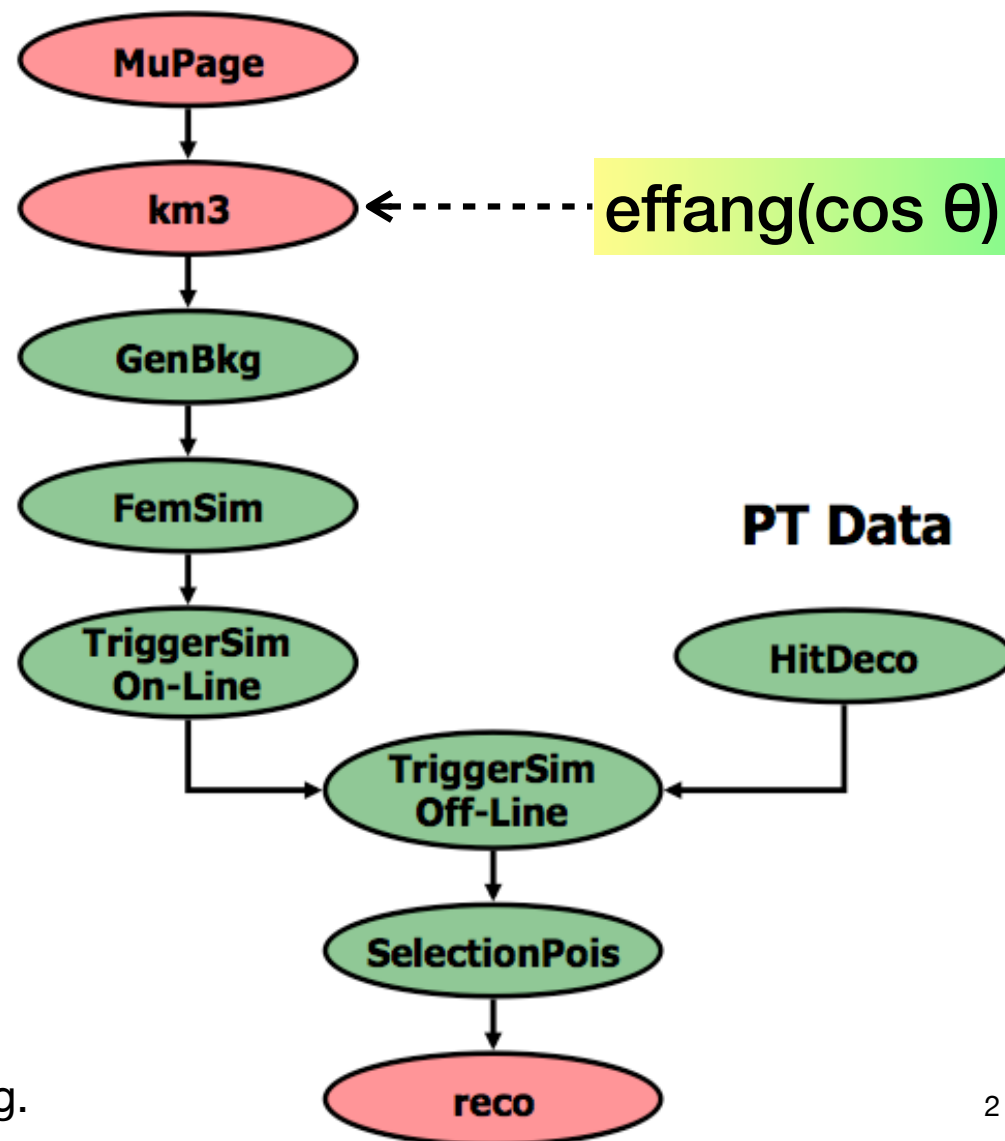# Data/MC comparison with different simulations

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Data vs MC

- KM3 tables have been created for the different OM parameterizations.

- The comparison is done at the level of reconstructed muons[¶].

- Data and MC are normalized to their own live-time.

¶ Thanks to C. Distefano for help in processing.

Simulations

MuPage

km3 ←------- effang(cos θ)

GenBkg

FemSim

TriggerSim On-Line

PT Data

HitDeco

TriggerSim Off-Line

SelectionPois

reco

Slide from ANTARES - take with care the numbers

Effective Area: Comparison KM3 – GEANT4

```
C*/
      real*4 function eff_area_pmt(energy,cos_th)
*  ------------------------------------------------------------
*
* This function computes the "PMT Effective Area" as the product of:
*
*  1.  PM geometrical area        ( 10" )
*  2.  PM collection efficiency   ( 90% )
*  3.  PM quantum efficiency      ( Ham. sheet )
*  4.  PMT transmitivity          ( measured by Herve Lafoux at Saclay )
*  5.  Angular dependence         (      idem                          )
*
```

```
Compute "PMT Effective Area" :
   eff_area_pmt = area *
   &             eff_col *
   &             fqe(xlambda) *
   &             transmit(xlambda) *
   &             effang(cos_th)
```

θ
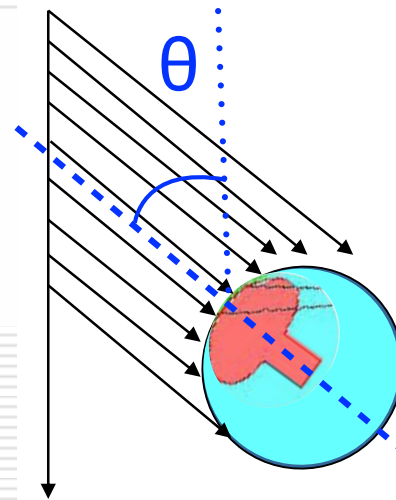
Angular acceptance=1

Coll. efficiency   Trasmissivity (gel+glass)

A_{eff} = Effective area in KM3 MC = 400 cm^2 * 0.9 * 0.95 * QE

Φ = Flux of impinging photons [N_γ/cm^2]

Collection efficiency of photoelectrons (not considered in GEANT4)

-In KM3 MC: $N_{\gamma - detected}(KM3) = \Phi * A_{eff}$

-In GEANT4:   generated flux $\Phi \rightarrow N_{\gamma - detected}(\text{GEANT4-final}) = N_{\gamma - detected}(\text{GEANT4}) * 0.9$
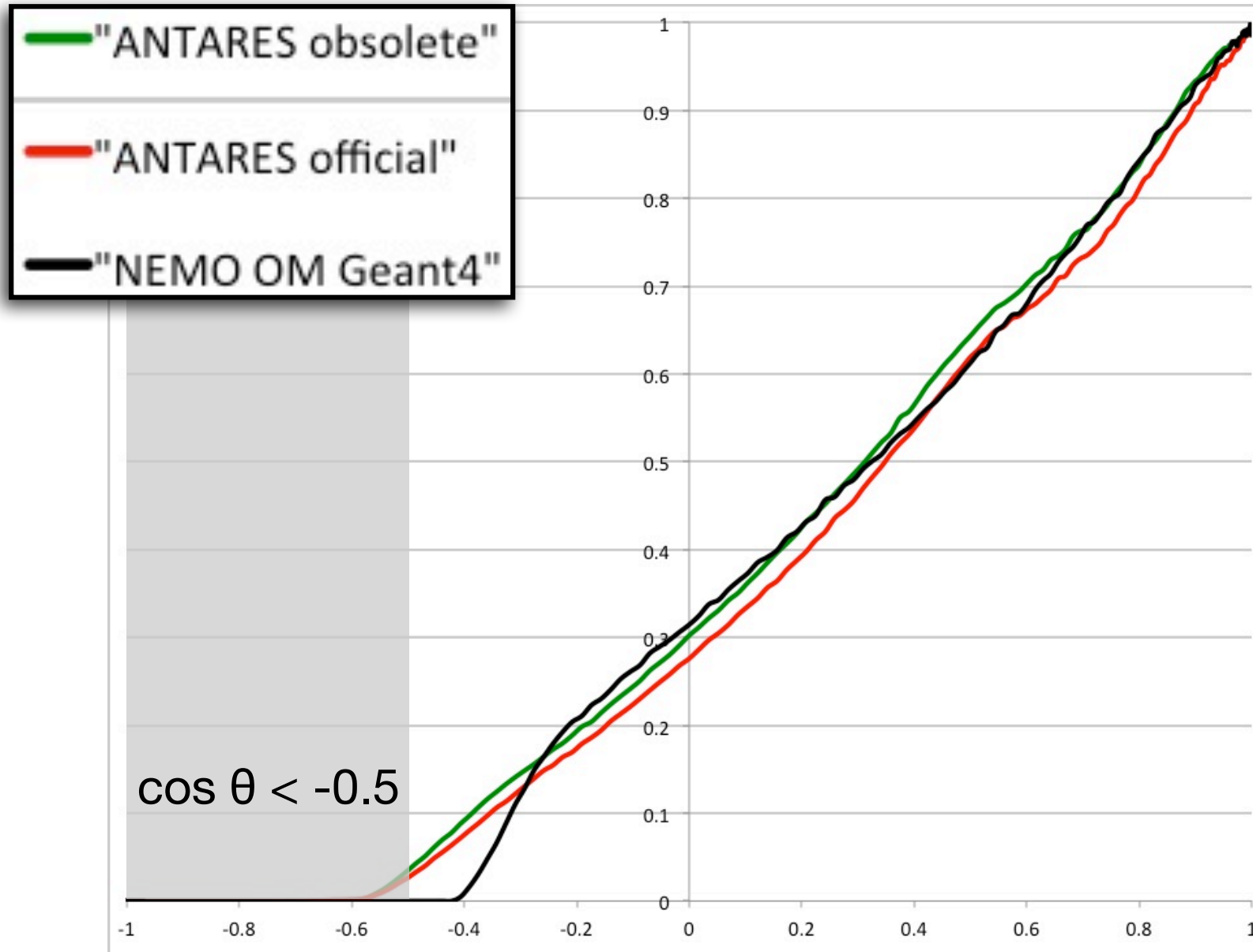
$N_{\gamma - detected}(\text{GEANT4-final}) = \textbf{1.03} * N_{\gamma - detected}(KM3)$
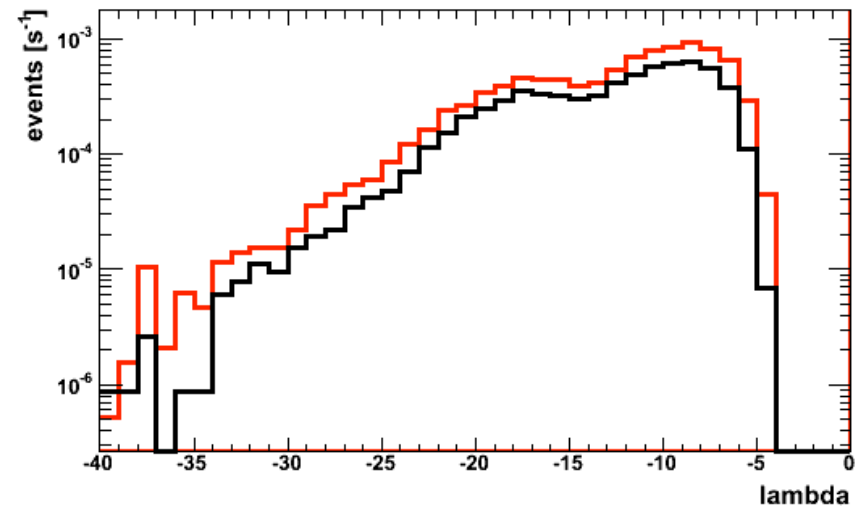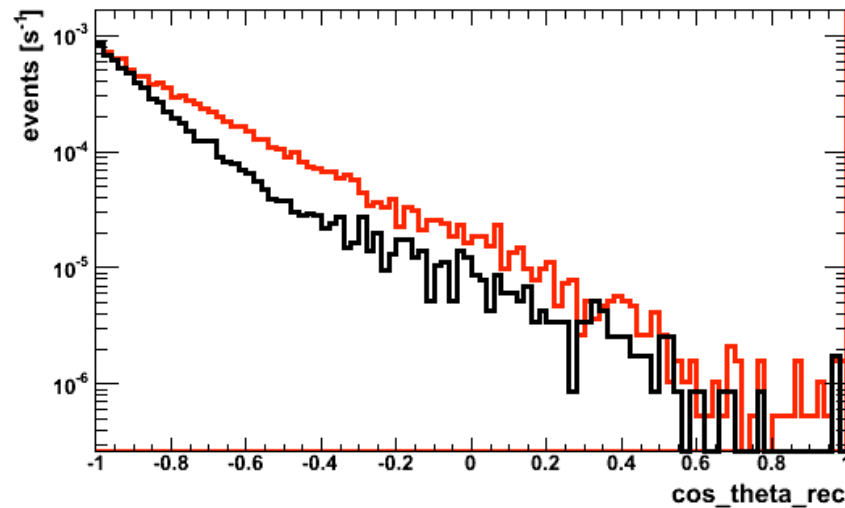
Good agreement between GEANT4 and km3

3

OM angular acceptance

- An obsolete version provided by G. De Bonis used in ANTARES + a cut at cos θ < -0.5

- Angular acceptance "à la ANTARES" + a cut at cos θ < -0.5

- Angular acceptance calculated by C. Hugon with GeaSim considering the real NEMO OM

- Compared with Reco data sample equivalent to 321 hours of live-time. [Run 847-953]

OM angular acceptance

Legend: "ANTARES obsolete" (green), "ANTARES official" (red), "NEMO OM Geant4" (black)

cos θ < -0.5

Angular acceptance - preliminary version (De Bonis)

Reconstructed tracks

MC
Data

Ratio MC/Data = 1.45

Angular acceptance - preliminary version (De Bonis)

Raw hits and selected by fit

MC
Data
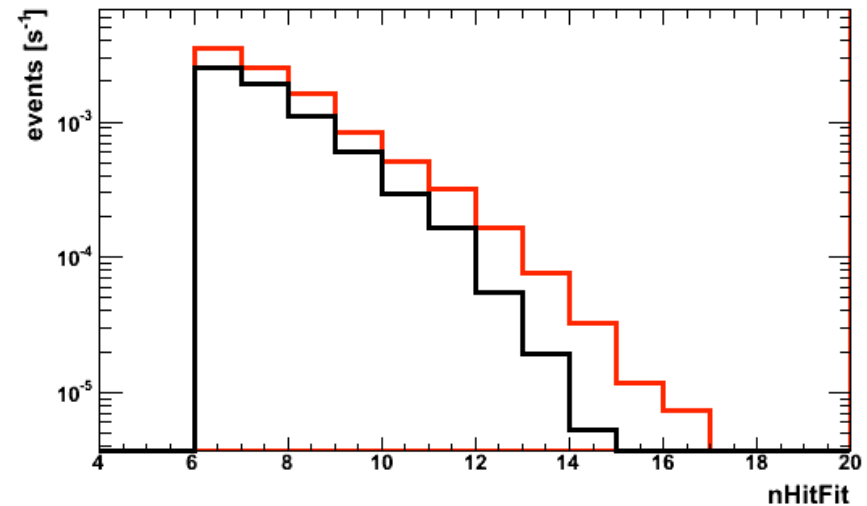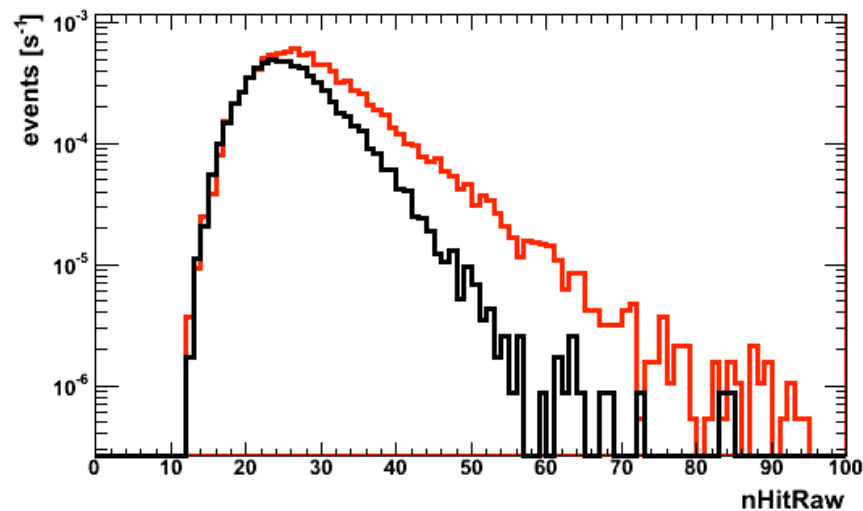
Ratio MC/Data = 1.45

Angular acceptance - preliminary version (De Bonis)

SC and FC triggers

MC
Data
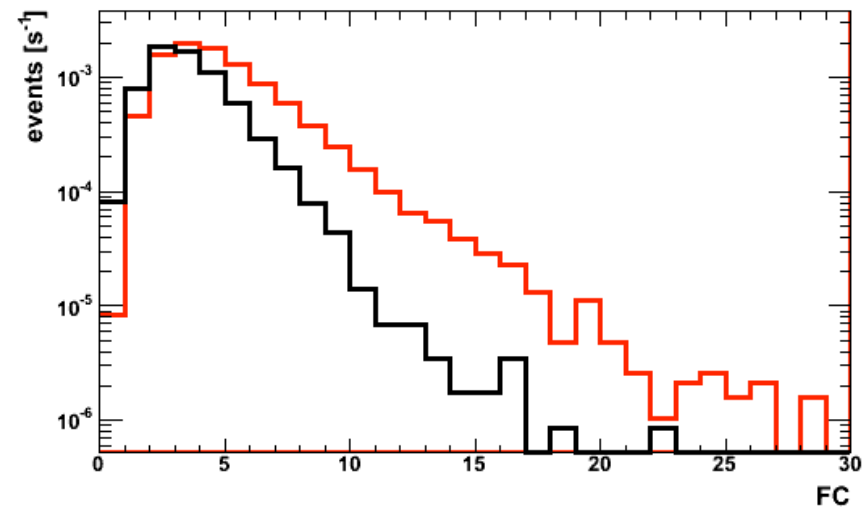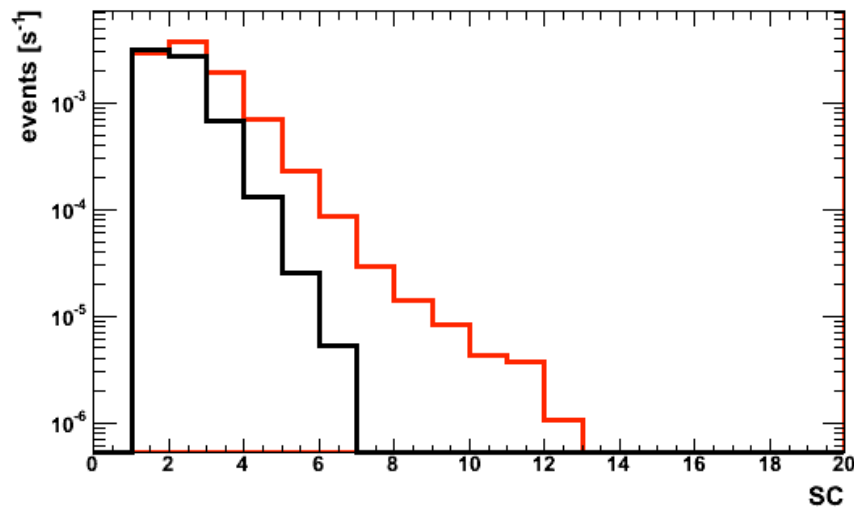
Ratio MC/Data = 1.45

Angular acceptance - modified ANTARES

Reconstructed tracks

MC
Data
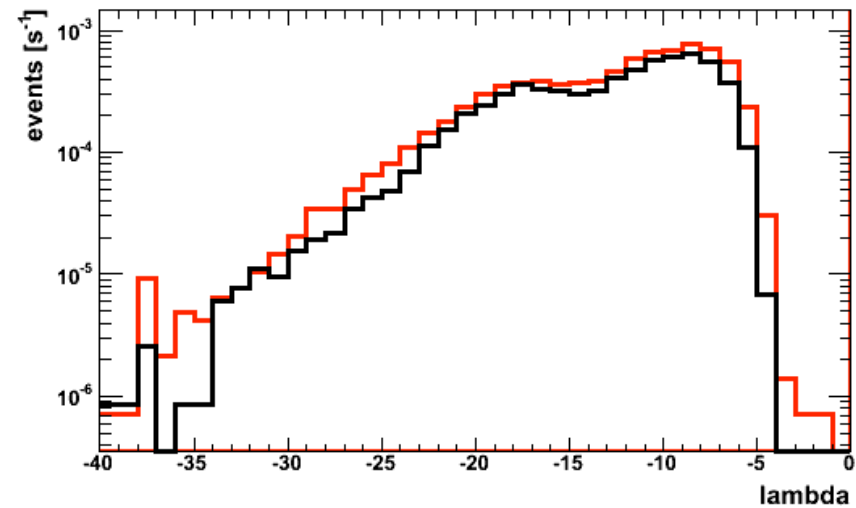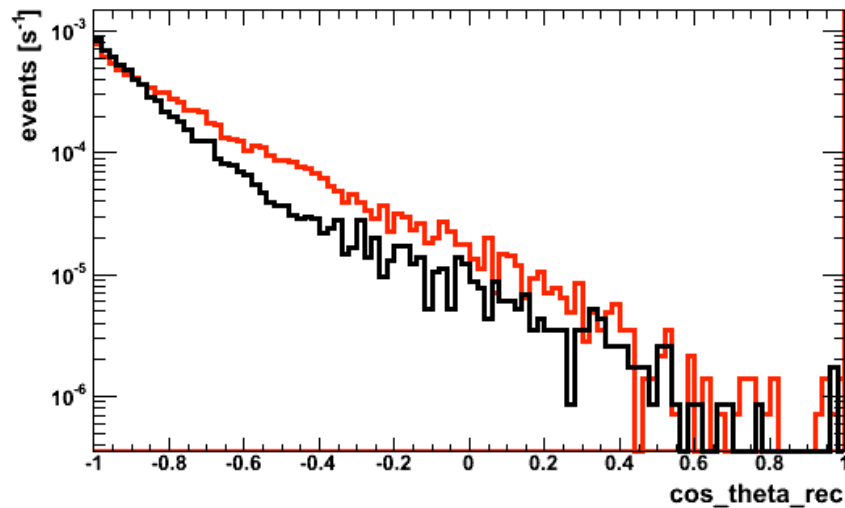
Ratio MC/Data = 1.23

Angular acceptance - modified ANTARES

Raw hits and selected by fit

MC
Data
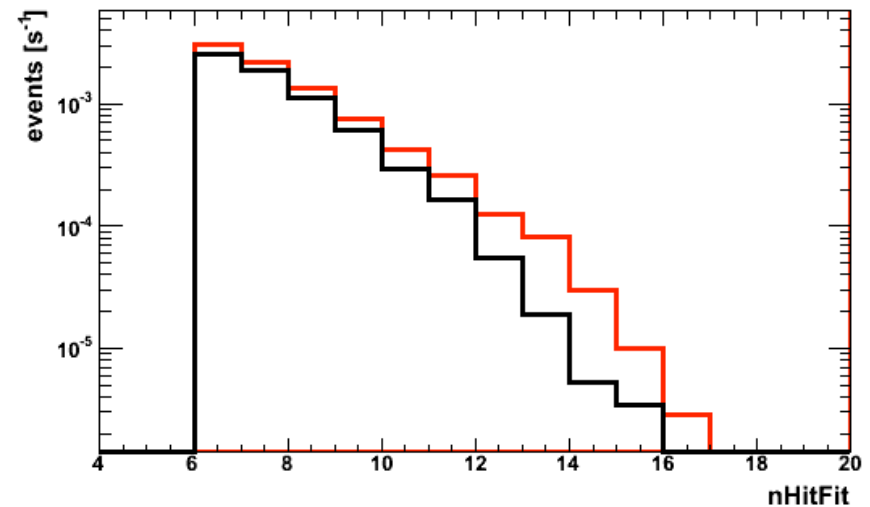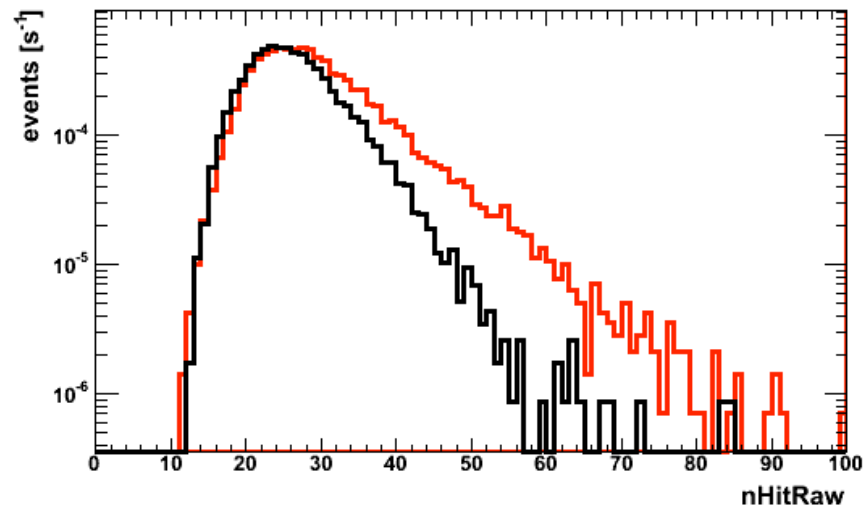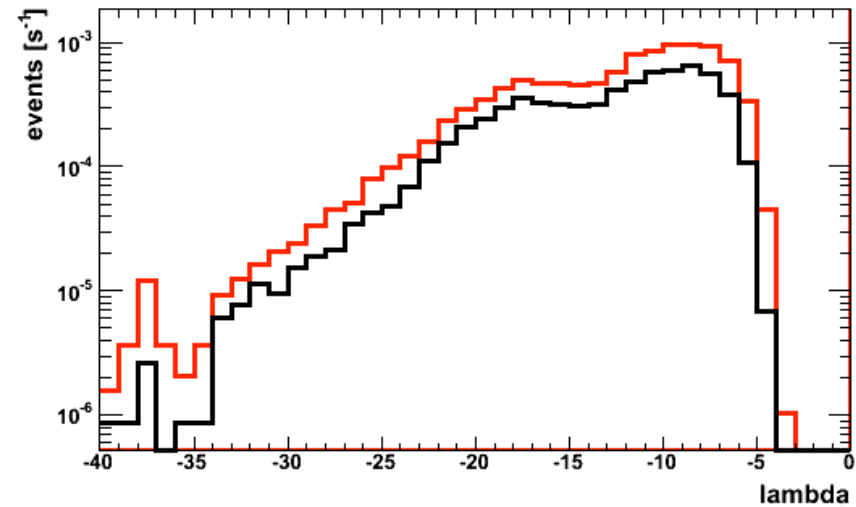
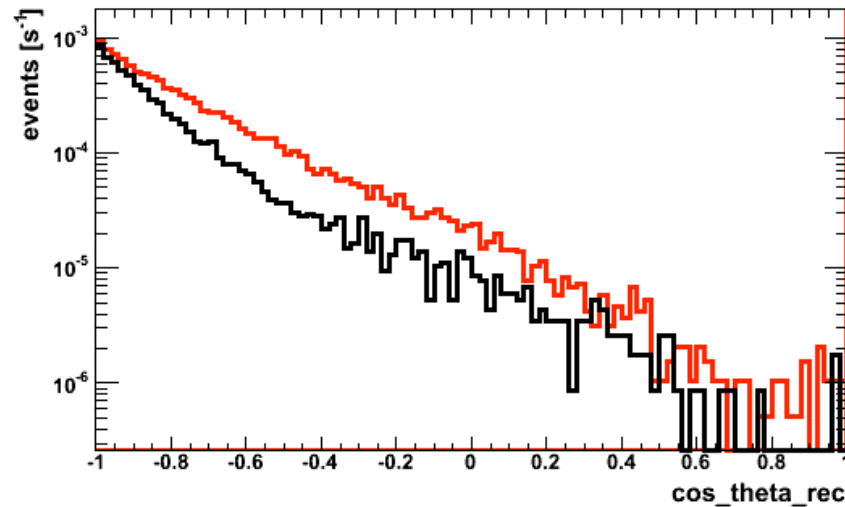Ratio MC/Data = 1.23

Angular acceptance - modified ANTARES

SC and FC triggers

MC
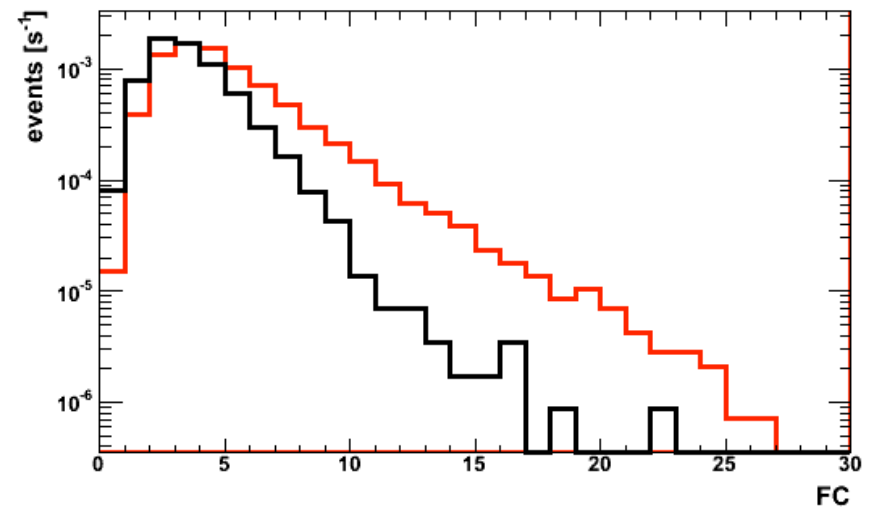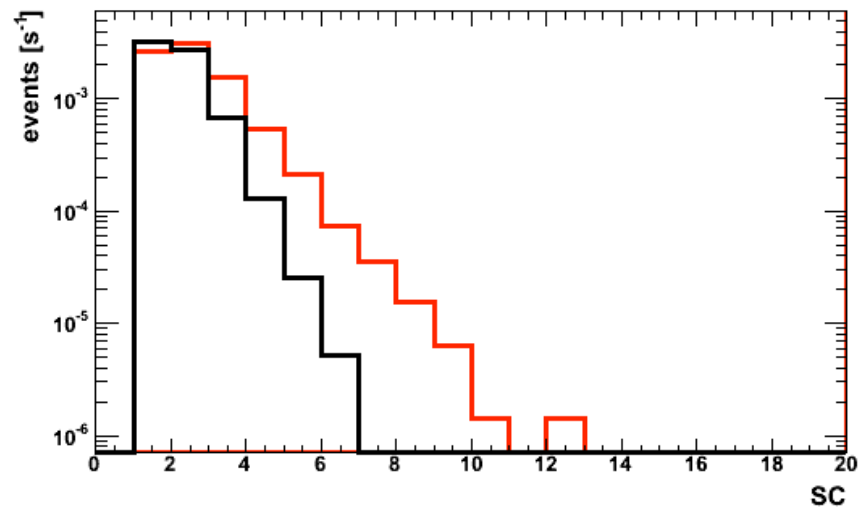
Data

Ratio MC/Data = 1.23
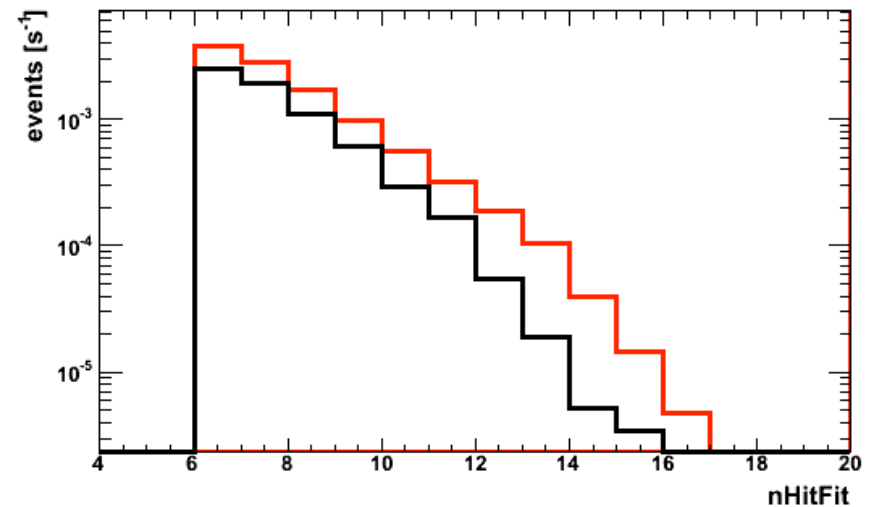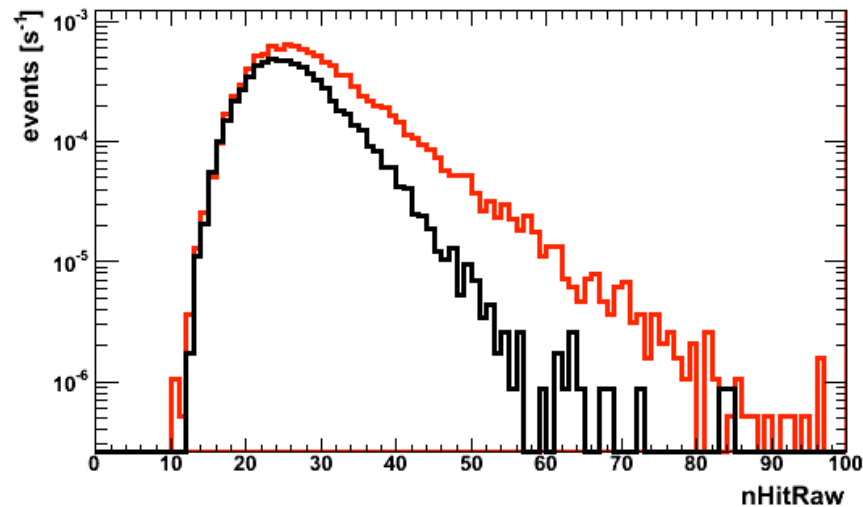
Angular acceptance by C. Hugon (NEMO OM)

Reconstructed tracks

MC
Data

Ratio MC/Data = 1.57

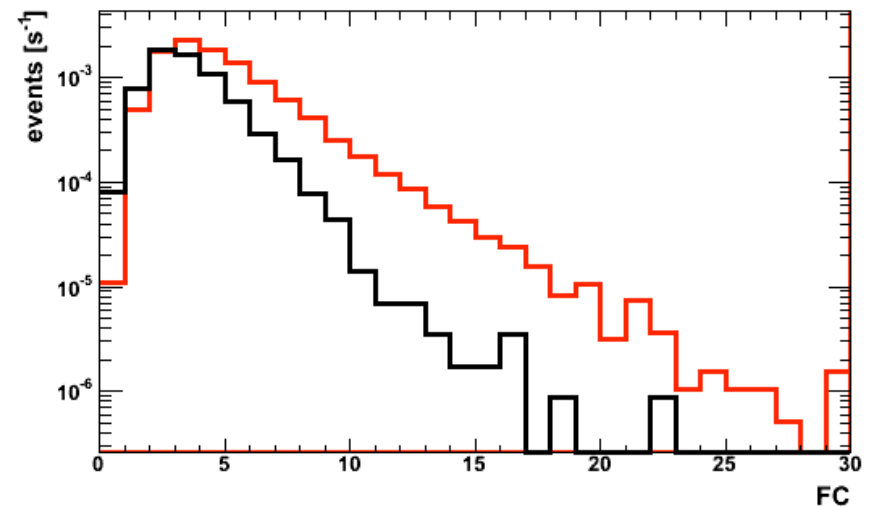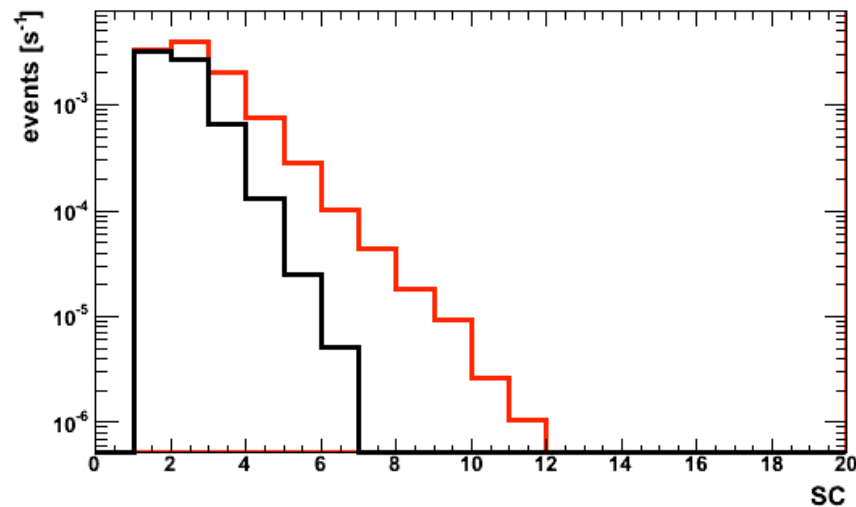# Angular acceptance by C. Hugon (NEMO OM)

Raw hits and selected by fit

MC
Data

Ratio MC/Data = 1.57
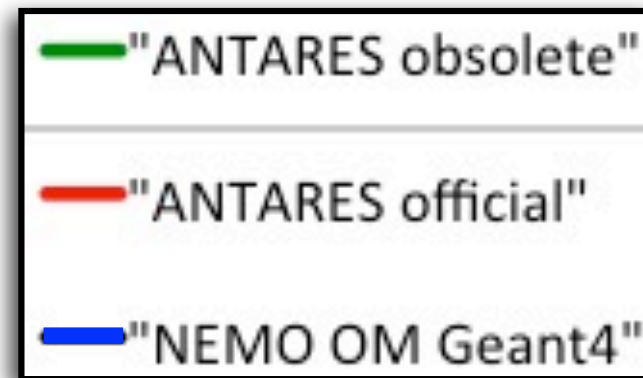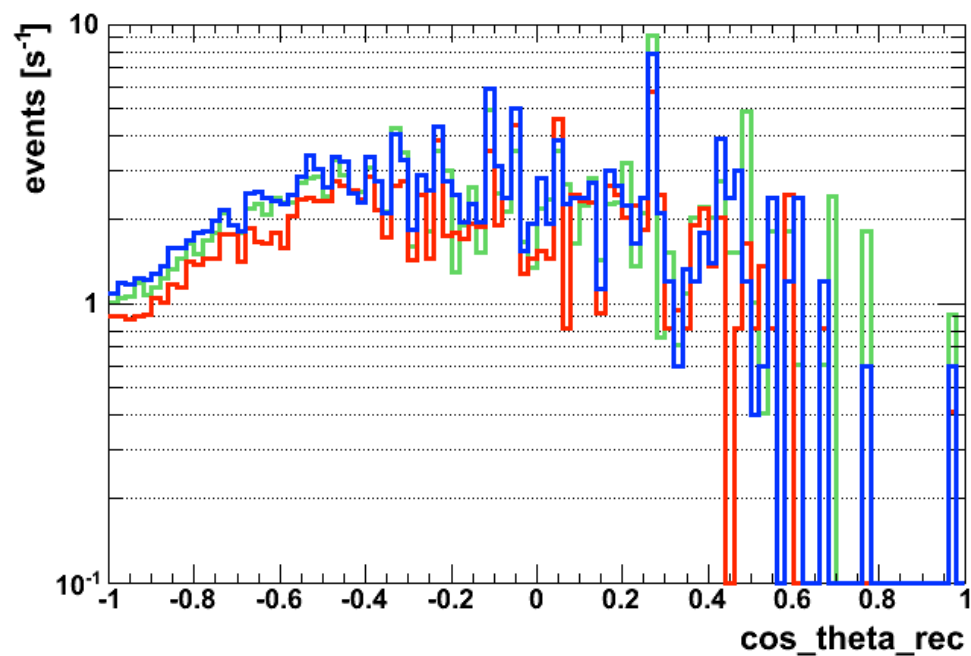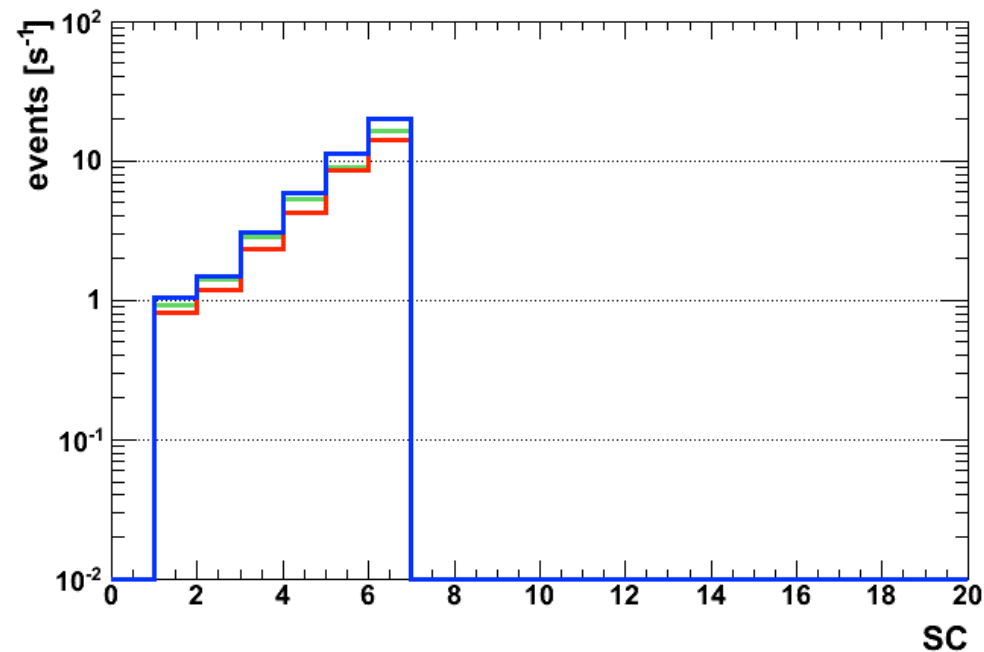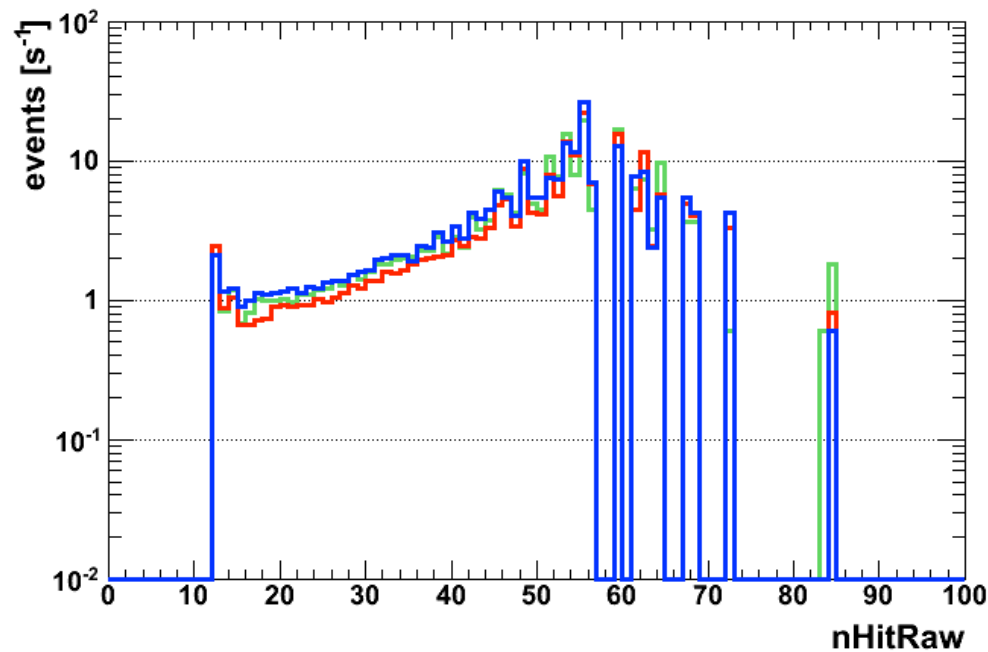
Angular acceptance by C. Hugon (NEMO OM)

SC and FC triggers

MC
Data

Ratio MC/Data = 1.57

MC/data ratios

Summary

- Studies and checks on the MC parameters have been started.

- No clear indication about the origin of the discrepancy.