

Group meeting
22/02/2018

ν cross sections at high energies

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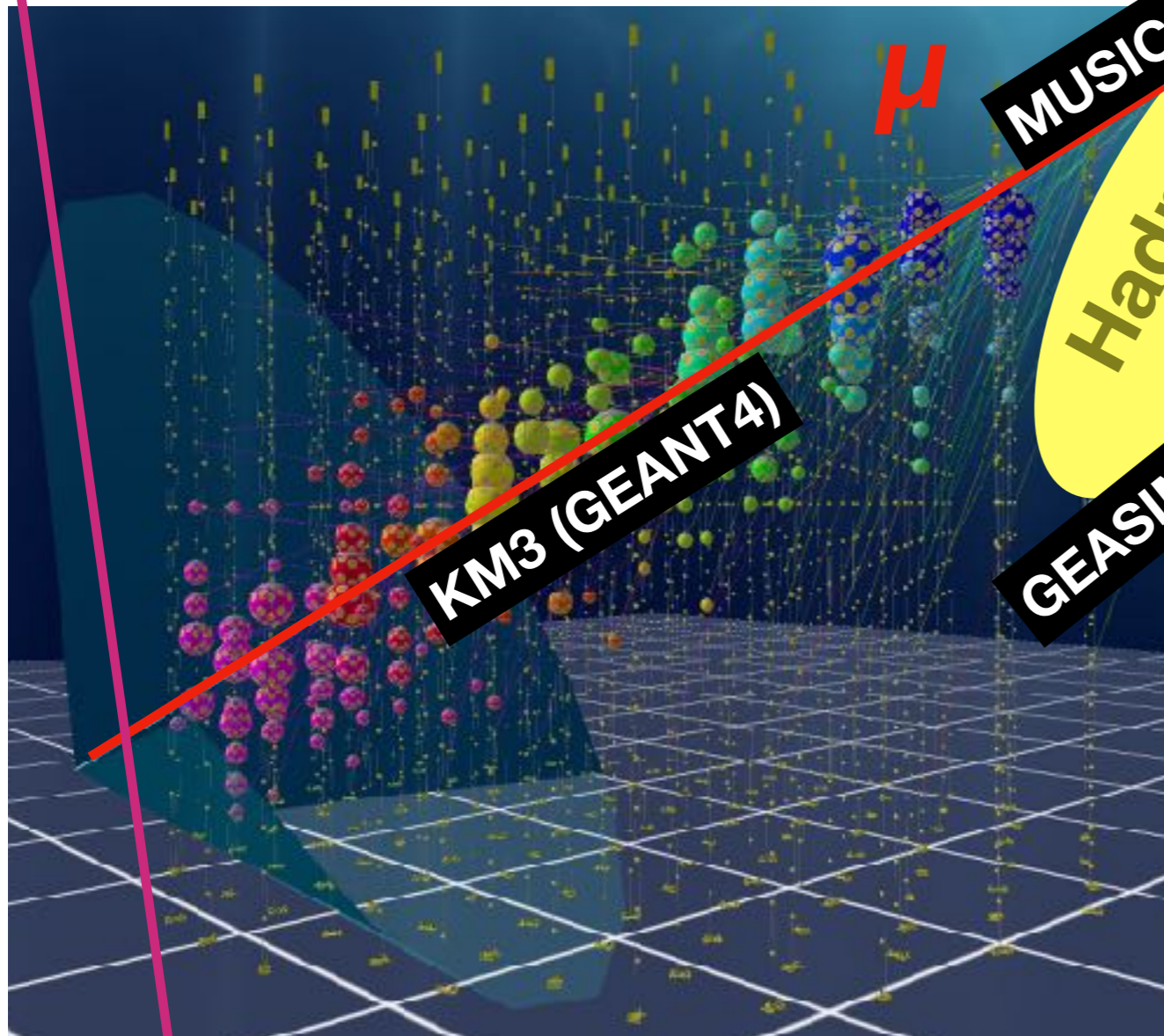
Nikhef

Cross Section in KM₃Net/ARCA:

- Several programs to compute the amount of neutrino that interact in the active volume of the detector.

MUPAGE (HEMES+MUSIC)

μ_{atm}



MUSIC

GEASIM (GEANT3)

KM3 (GEANT4)

Hadronic shower



RSQ (QE,RES)

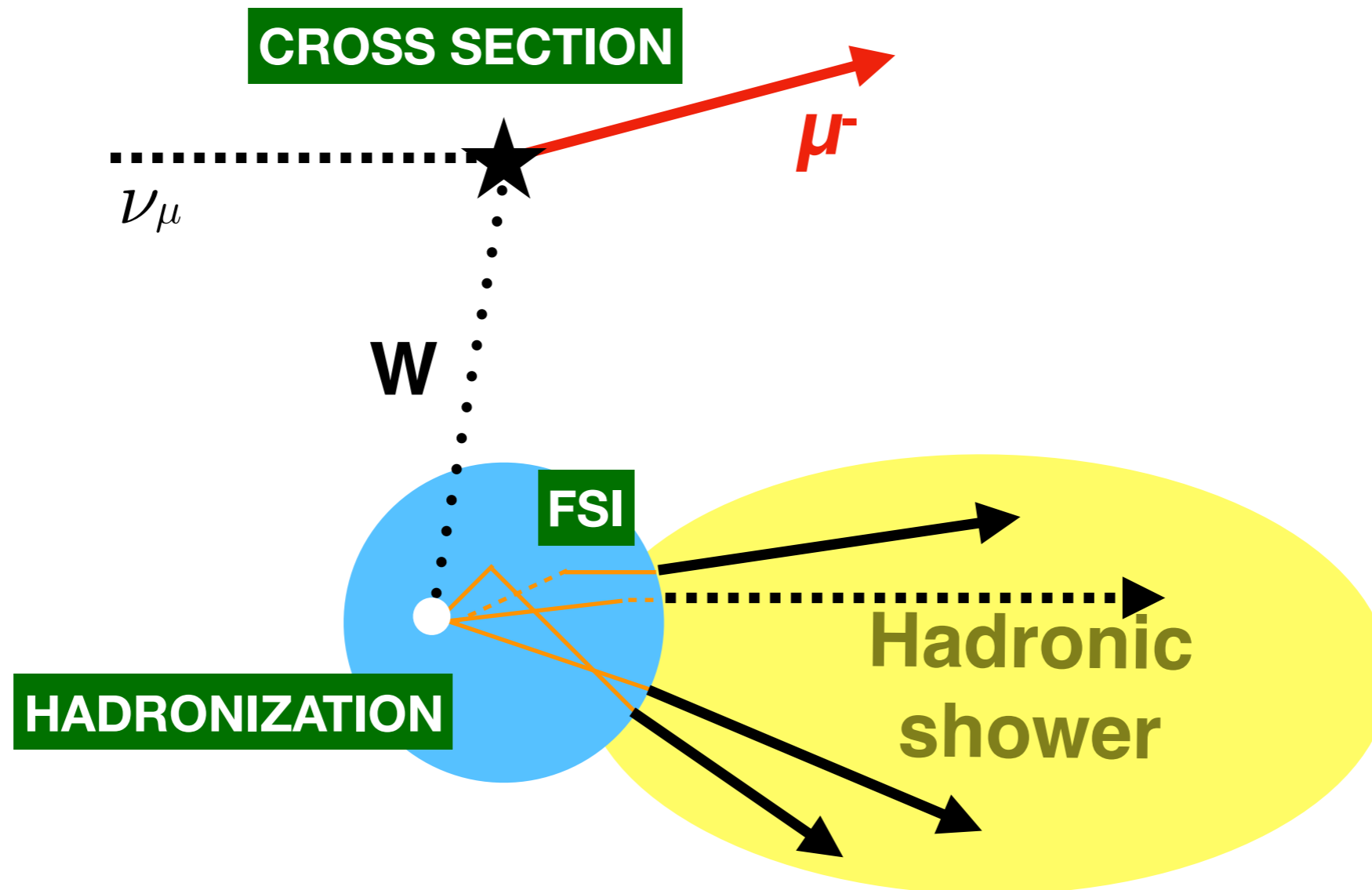
LEPTO (DIS)

ν_{μ} ν_e ν_{τ}
 $\bar{\nu}_{\mu}$ $\bar{\nu}_e$ $\bar{\nu}_{\tau}$

CORSIKA

Cross Section in KM₃Net/ARCA:

- Three main processes have to be taken into account.



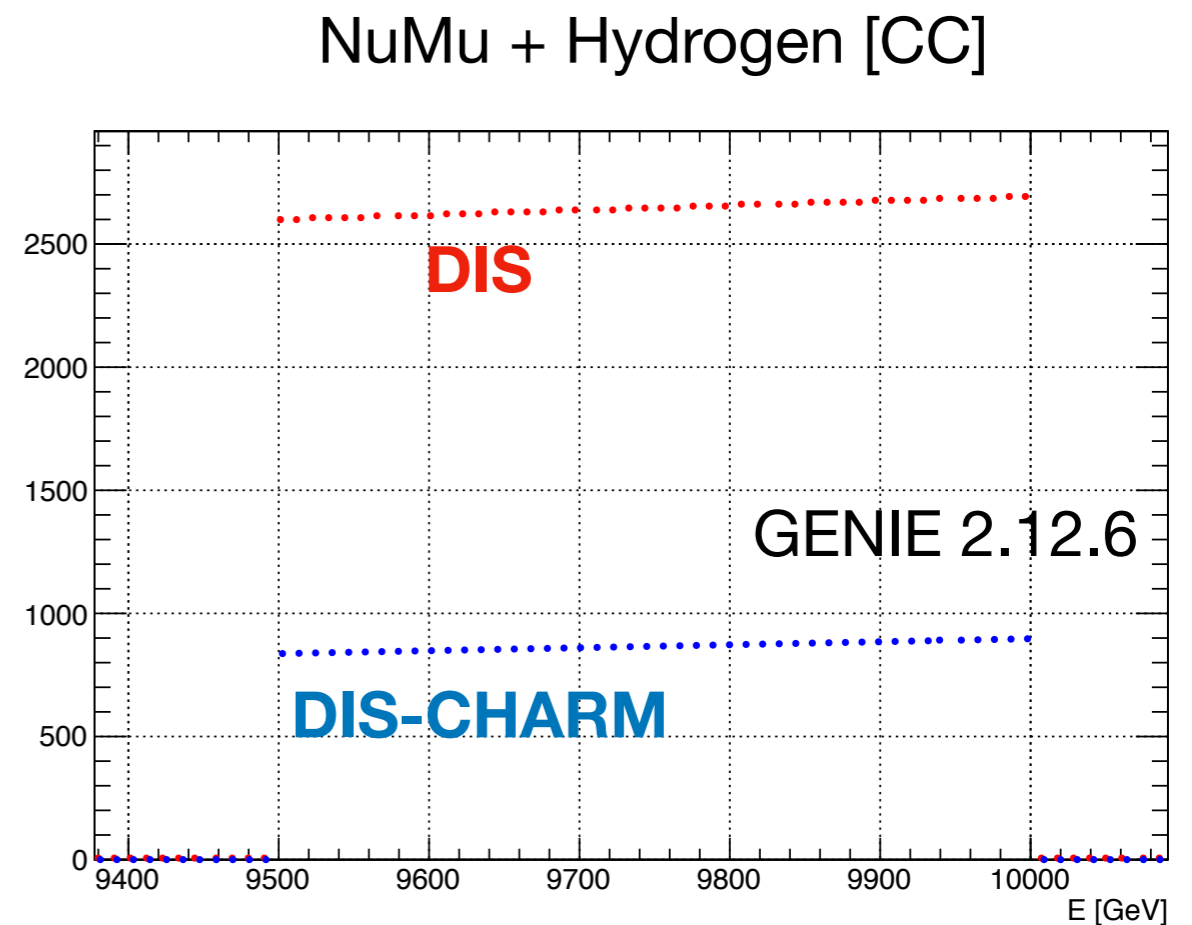
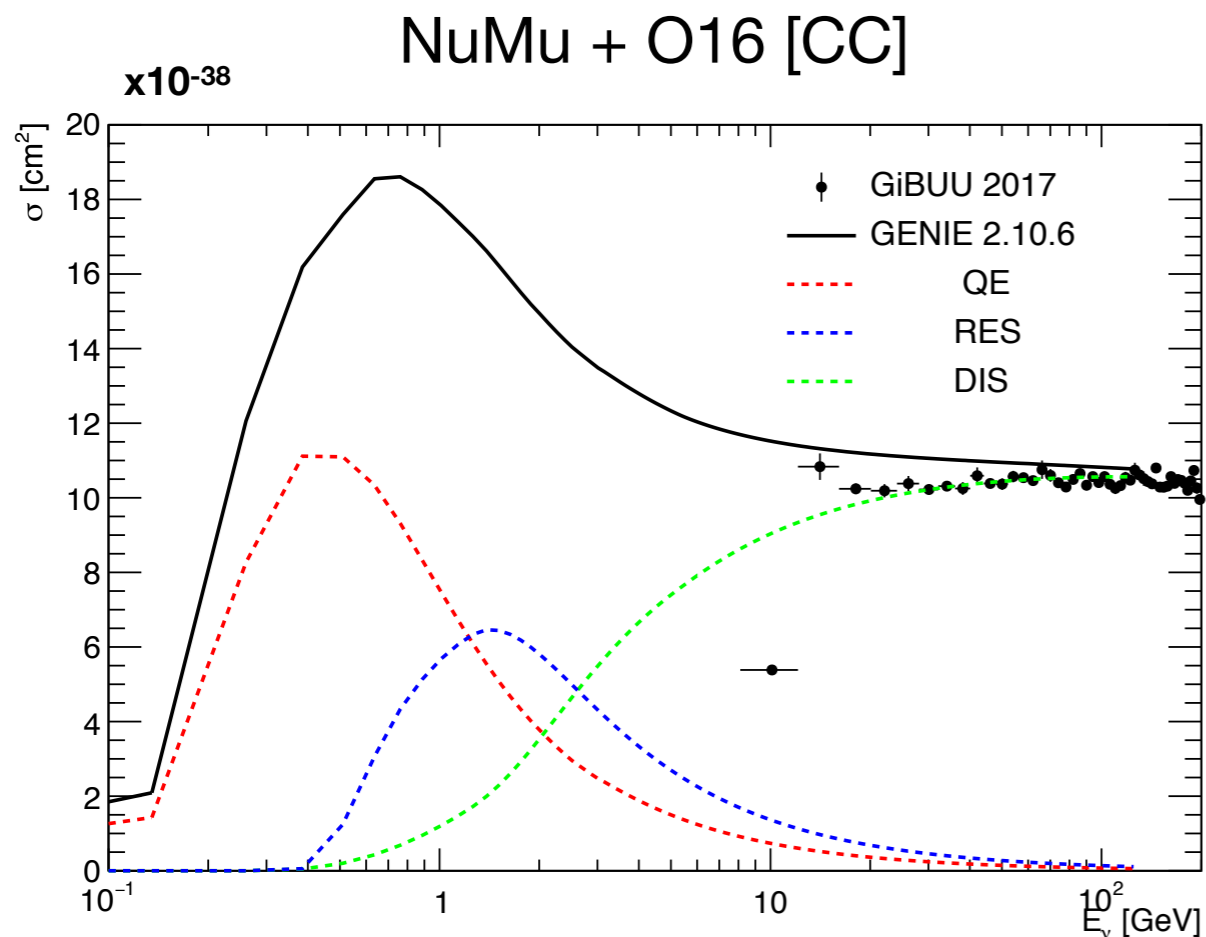
Generators market:

	GENIE	NuWro	GiBUU	ANIS	LEPTO
XSEC	LO PDF: GRV98 LO	LO PDF: GRV98 LO	PYTHIA (LO) PDF: CTEQ4	Cooper-Sakar (NLO) PDF: HERA1.5	LO PDF: CTEQ6
HADRON.	PYTHIA6	PYTHIA6 (tuned)	PYTHIA6	Hadronic energy is written out as pions	PYTHIA6
FSI	CASCADE	CASCADE	Transport model	NO	?
Comments	DIS optimised for low Q^2 Limited up to 5 TeV	DIS optimised for low Q^2	FSI treatment is very consistent (slow) Limited up to 1 TeV	Design for HE neutrinos	Design for HE neutrinos



Generators market:

- I've been able to install and run GiBUU and GENIE.
- Currently try to increase their energy range.
- I want also to include Aart's cross section in the plots.



Theory:

- DIS cross section is “easy” to compute at LO (assuming mass of lepton zero and isoscalar target).

**Spectral
Functions**

$$\frac{d^2\sigma}{dxdy} = \frac{2G_F^2 M E_\nu}{\pi} \left(\frac{M_W^2}{Q^2 + M_W^2} \right)^2 \left[xq(x, Q^2) + x\bar{q}(x, Q^2)(1-y)^2 \right]$$

$$q(x, Q^2) = \frac{u_v(x, Q^2) + d_v(x, Q^2)}{2} + \frac{u_s(x, Q^2) + d_s(x, Q^2)}{2} + s_s(x, Q^2) + b_s(x, Q^2)$$

$$\bar{q}(x, Q^2) = \frac{u_s(x, Q^2) + d_s(x, Q^2)}{2} + c_s(x, Q^2) + t_s(x, Q^2),$$

PDFs

Theory:

- A group of theoreticians from NIKHEF want to provide us “state of the art” cross sections.

