

Un esperimento con neutrini del TeV prodotti da LHC

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X Section of Energetic Neutrinos (XSEN) project

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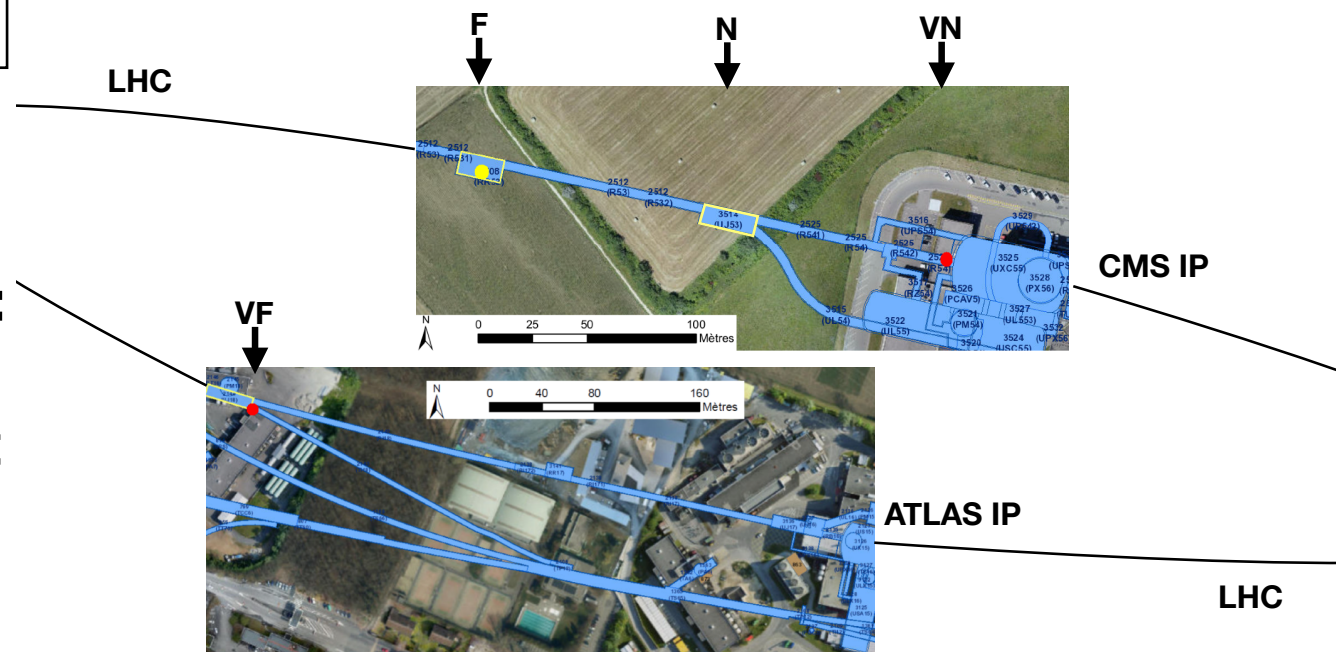
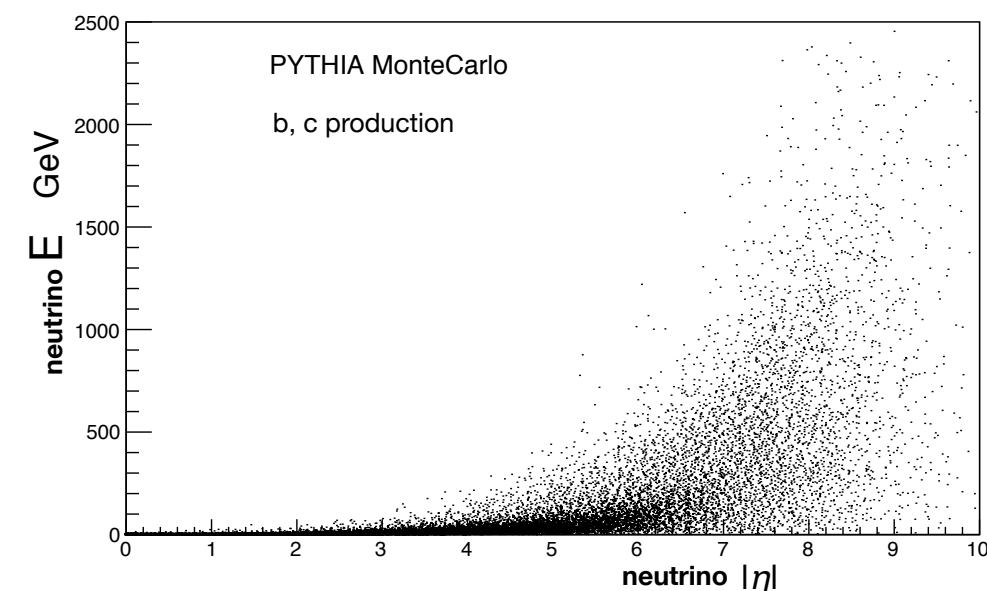
- <http://arxiv.org/abs/1903.06564> “Physics Potential of an Experiment using LHC Neutrinos” March 5, 2019 (subm. to J. of Phys. G)
- <https://edms.cern.ch/ui/file/2022399/1.0/LHC-XSEN-EC-0002-1-0.pdf> September 5, 2018
- <http://arxiv.org/abs/1804.04413> April 12, 2018
- <https://edms.cern.ch/ui/file/1908776/1.0/LHC-XSEN-EC-0001-1-0.pdf> March 19, 2018.

LHC IP1 and IP5 are intense sources of neutrinos (all flavours, tau included)

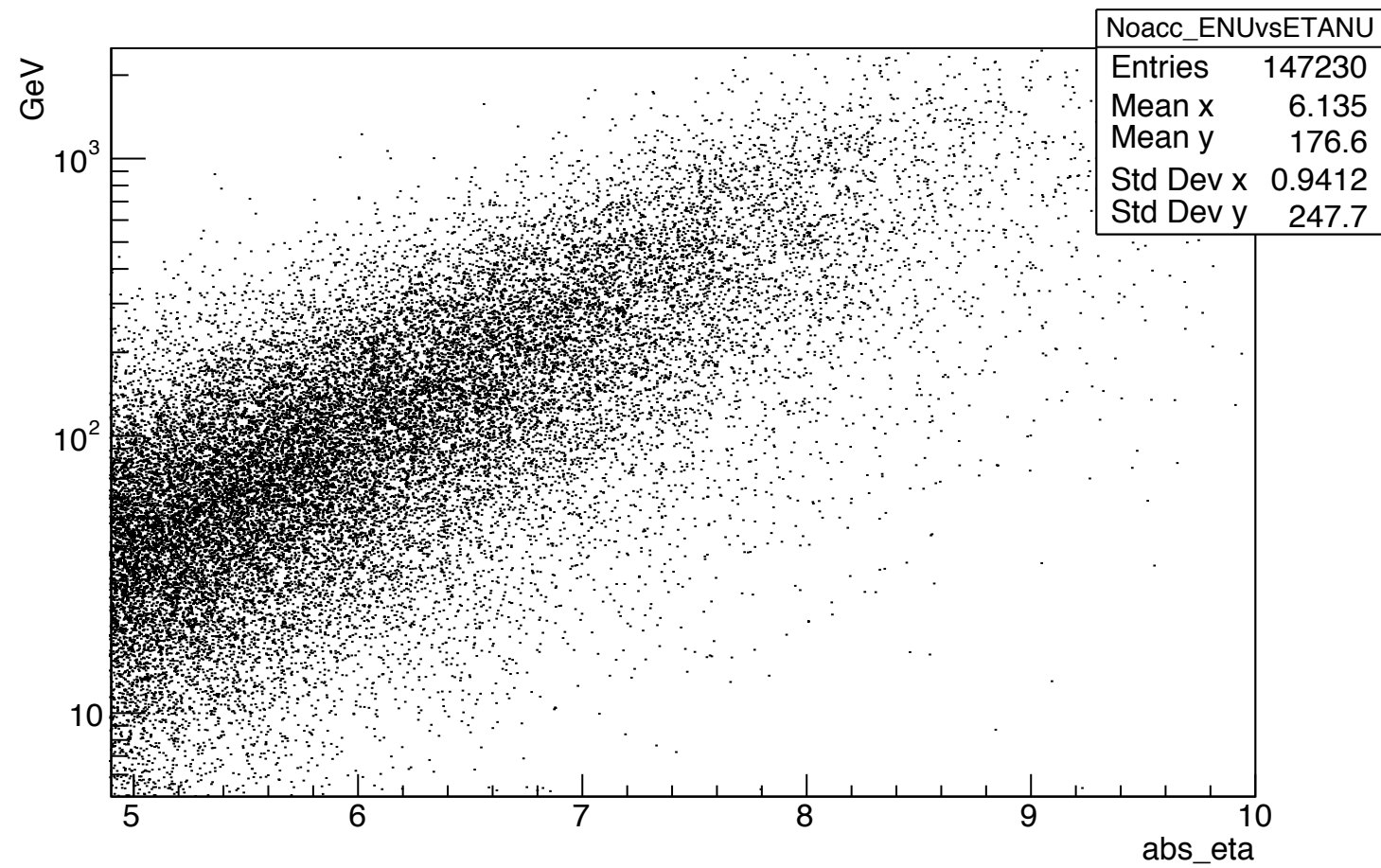
- > neutrinos reach TeV energies at large η
- > LHC is a unique laboratory for measuring for the first time the νN Xsections in the 500 GeV - 2 TeV range

Favorable site exists with low machine backgrounds

- > studied sites Very Near, Near, Far, Very Far from IP5, IP1
- > VF qualifies as host for a neutrino detector: at junction of the T118 unused tunnel with LHC
- > T118 has similar features to T112 (FASER) at opposite end of IP1: advantage of LHC magnetic bend and of a 30 m layer of rock



dN/dE_nu vs eta Noacc



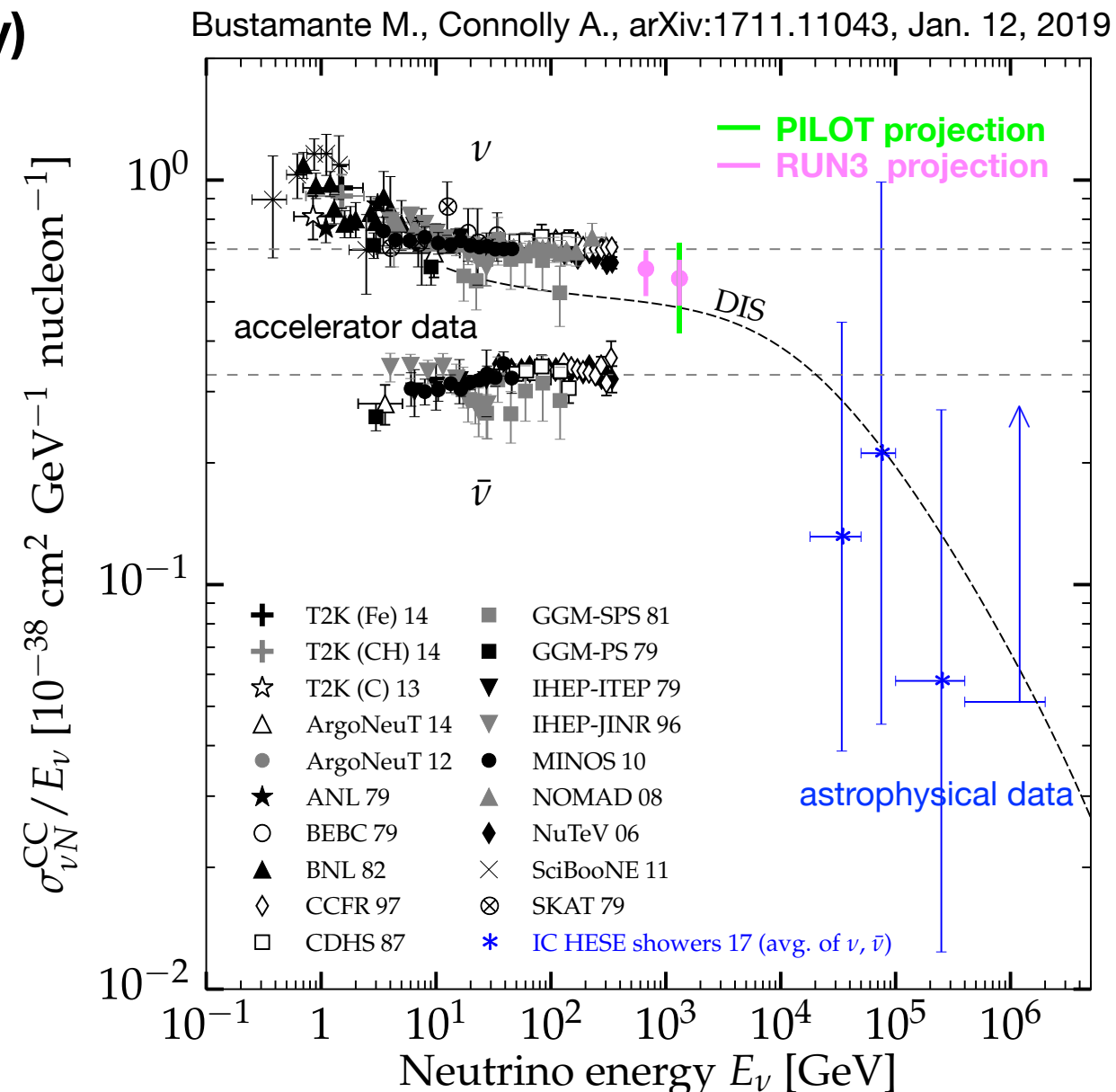
XSEN project

Detector:

- > low mass (3 tons max): high energy neutrinos favoured since νN Xsection grows proportionally to E
- > 2 sections covering η ranges with different average energy (0.7, 1.2 TeV)
- > slightly off the beam axis prolongation from IP1 : to favour neutrinos from b,c (5% tau neutrinos)
 - NO modifications to T118 (checked with CERN civil engineering)
- > nuclear emulsions:
 - efficient for vertex reconstruction (tau decay)
 - exposure and analysis proved to stand 10^5 tracks/cm² (i.e. ~30 /fb in T118)
 - modular blocks, easy to install

Experiment:

- > measurement in LHC RUN3
 - machine backgrounds likely to increase with HL-LHC
 - with 150 /fb, 1.5 tons, can record up to 2000 HE neutrino interactions, up to 100 ν_{τ}
- > PILOT RUN in 2021
 - 0.4 tons, 25 /fb, 1.2 TeV $\langle E_{\nu} \rangle$, ~ 100 HE ν
 - characterisation of the background
 - set-up and tune emulsion handling infrastructure and analysis



PROSSIMI PASSI: PERCORSI IN PARALLELO

Percorso 1

- Eol sottoposta a LHCC Chair
- in discussione nella sessione chiusa di Giugno
- assegnazione dei referees
- Lol da sottoporre entro metà Luglio (allargare collaborazione, garantire le risorse)
- discussione coi referee, presentazione e decisione nella sessione di Settembre
- se progetto approvato, TP per la sessione di Novembre e decisione
- decisione finale del Research Board a inizio 2020

Percorso 2 (solo PILOT)

- Eol sottoposta a LHCC Chair e a LMC Chair
- presentazione nella sessione di Giugno del TREX e discussione
- se green light, discussione nella sessione di Giugno di LMC e decisione

Percorso 3 INFN

- Eol da sottoporre a Presidente CSN1
- presentazione? richieste per PILOT in DOT1
- se PILOT approvato, apertura sigla? Oppure dopo approvazione LHCC? a Settembre?

Percorso 4

- Fondi europei?

le ISSUES

XSEN WBS 2019-2021

XSEN WBS		2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4
OK by cern civil engineering												
Experiment design												
LOI submission (early,final) to LHCC/LMC												
Collaboration setting-up												
fund raising												
investigate EU funds												
Technical Proposal submission (early,final)												
CERN green light by ResearchBoard												
find emulsion producer												
order emulsions for 2021 run												
emulsion production												
R&D analysis tools												
set-up development infrastructure												
produce detector support mechanics												
install detector												
LHC recommissioning and Run3 start												
2021 emulsion development (first, second batch)												

brick layout
detector depth

emulsion procurement
emulsion development
analysis

Collaborazione in via di formazione

XSEN è un micro-OPERA; la sezione aveva il Know-how, e le attrezzature