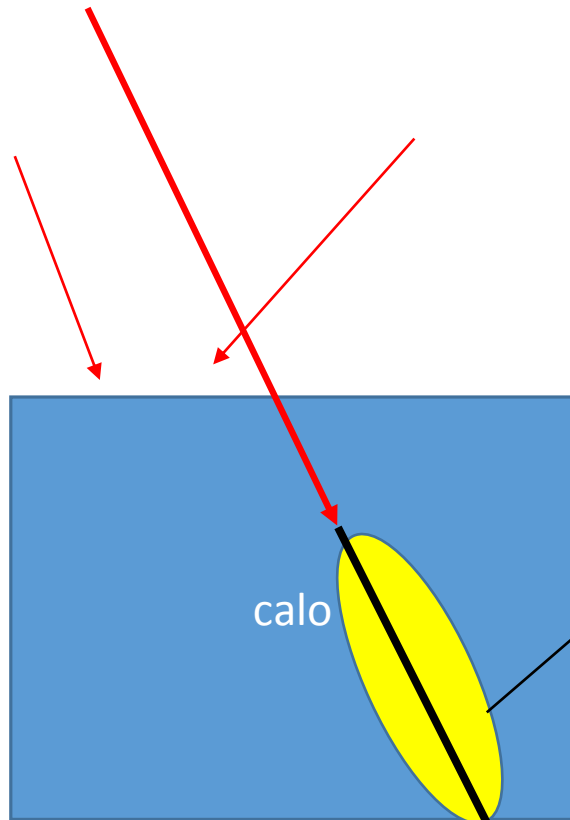


# SATURATION EFFECTS ON ENERGY MEASUREMENTS

Simulation and analysis : HerdSoftware - GEANT4



Procedure :

Selection of golden events :

**ShowerLength > 55cm**

COMPARE TOTAL SIGNAL (SUM ALL THE CUBE) :

WITHOUT SATURATION ↔ WITH SATURATION

**SATURATION : IF ENERGY RELEASED IN ONE CUBE > THRESHOLD      SIGNAL = THRESHOLD**

# problem

**STANDARD GEANT4 STOP AT 100TeV / particle**

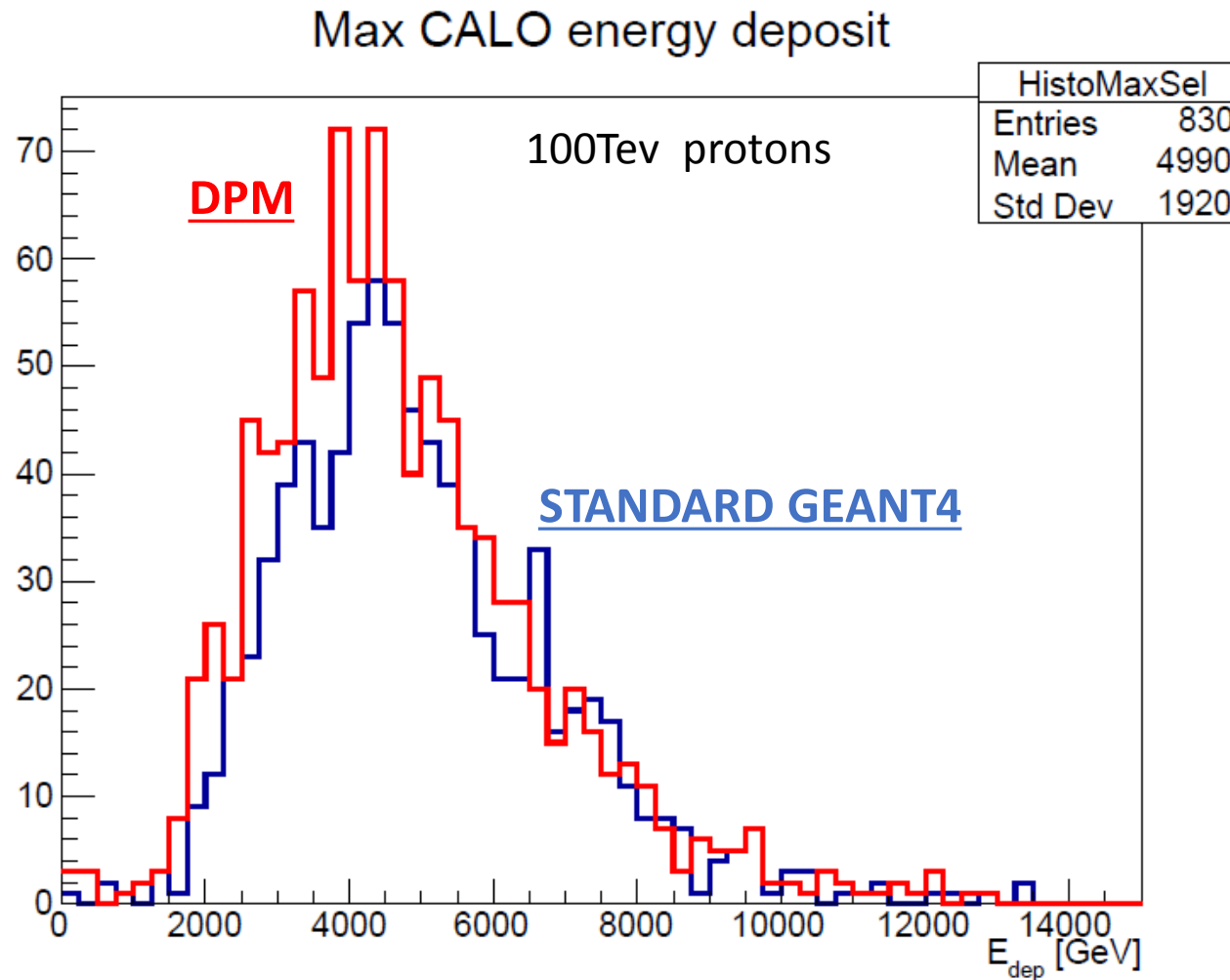
USE 'VERY ' EXPERIMENTAL INTERFACE TO OTHER GENERATORS

HERE dpmjets is used for all interactions above 600 GeV

- COMPARISON WITH STANDARD GEANT AT 100 TEV
- COMPARISON WITH FLUKA

# COMPARISON WITH STANDARD GEANT4

DISTRIBUTION OF MAXIMUM SIGNAL AMONG THE CUBES WITHOUT SATURATION



# COMPARISON WITH STANDARD GEANT4

COMPARE DIRECTLY THE EFFECT OF SATURATION 100TeV protons

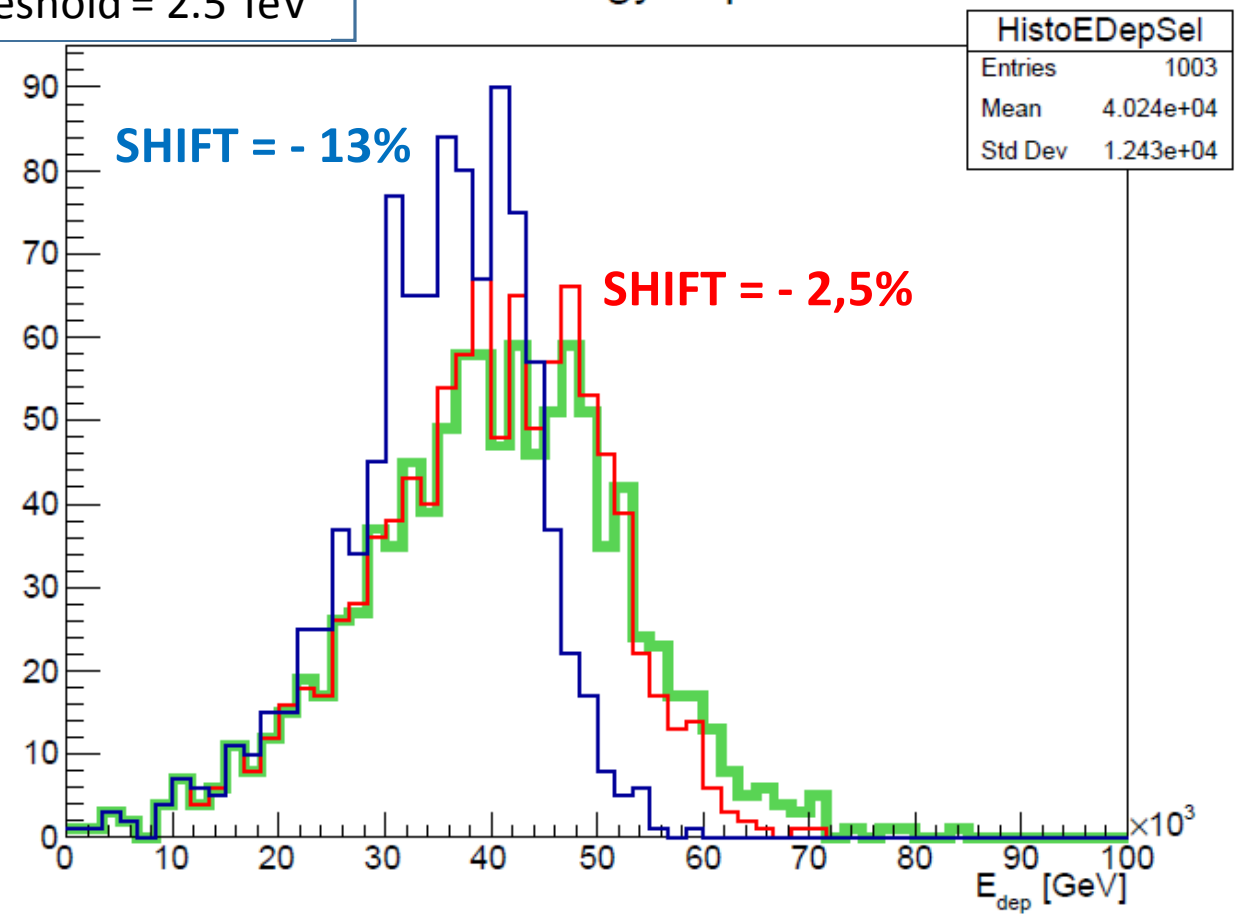
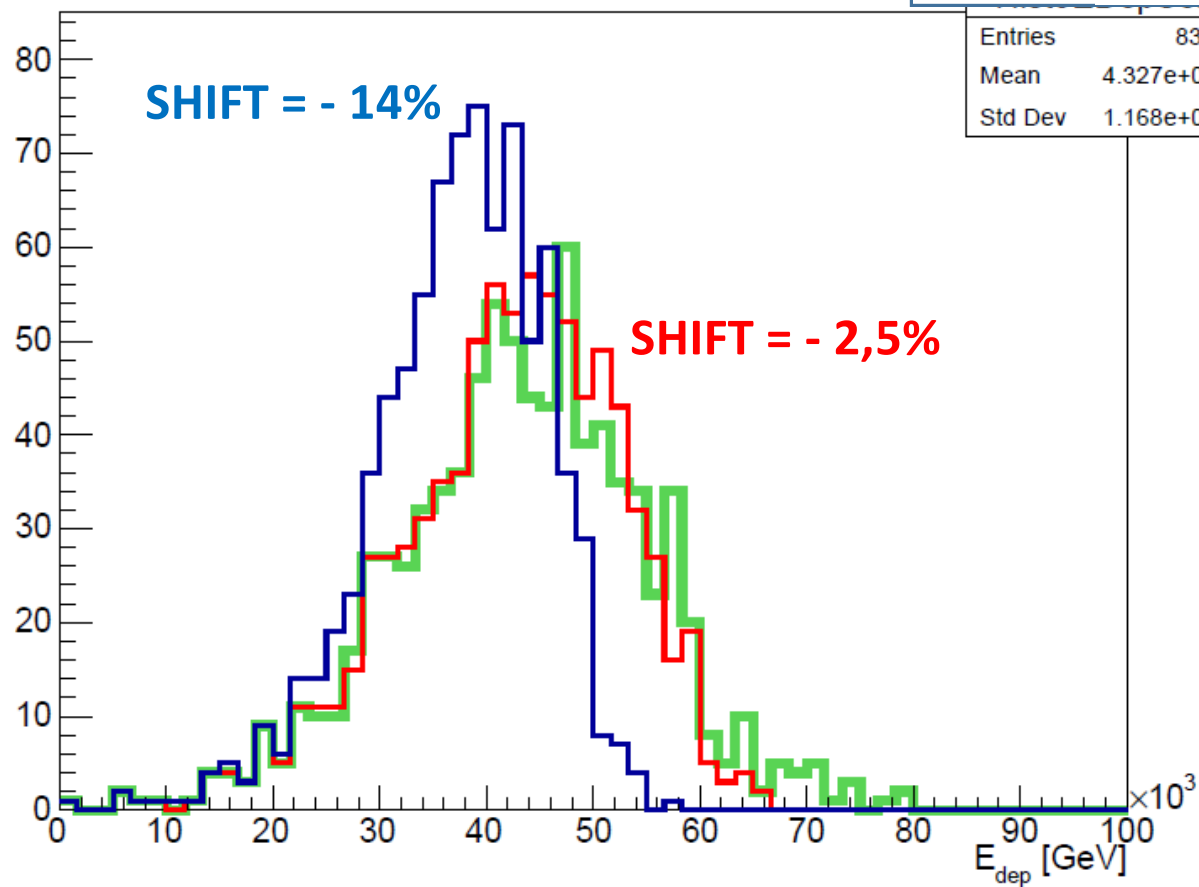
DPM

CALO energy deposit

Standard geant

CALO energy deposit

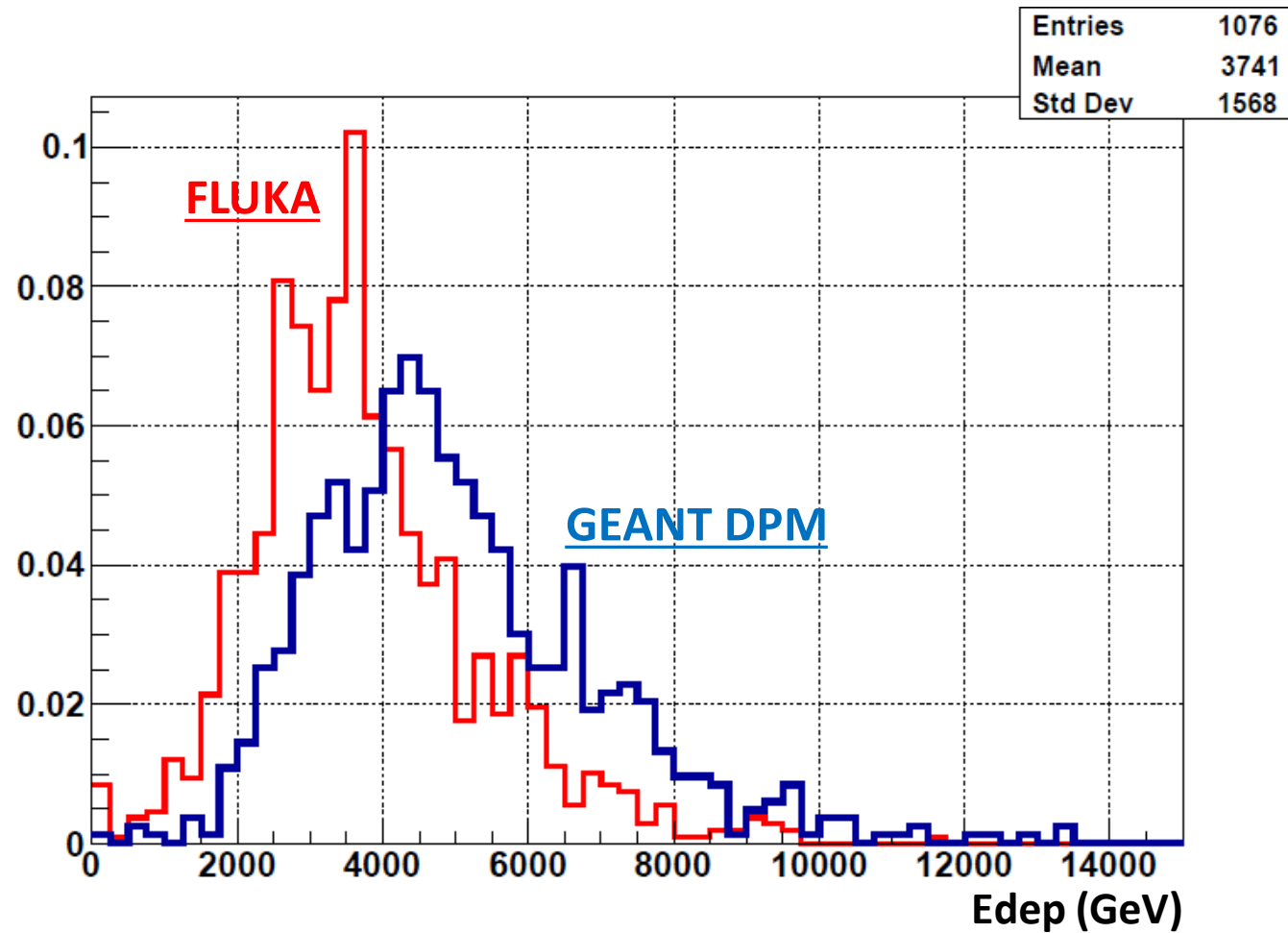
- No Sat
- Sat Threshold = 5 TeV
- Sat Threshold = 2.5 TeV



# COMPARISON WITH FLUKA

## DISTRIBUTION OF MAXIMUM SIGNAL AMONG THE CUBES WITHOUT SATURATION

100TeV protons



# COMPARISON WITH FLUKA

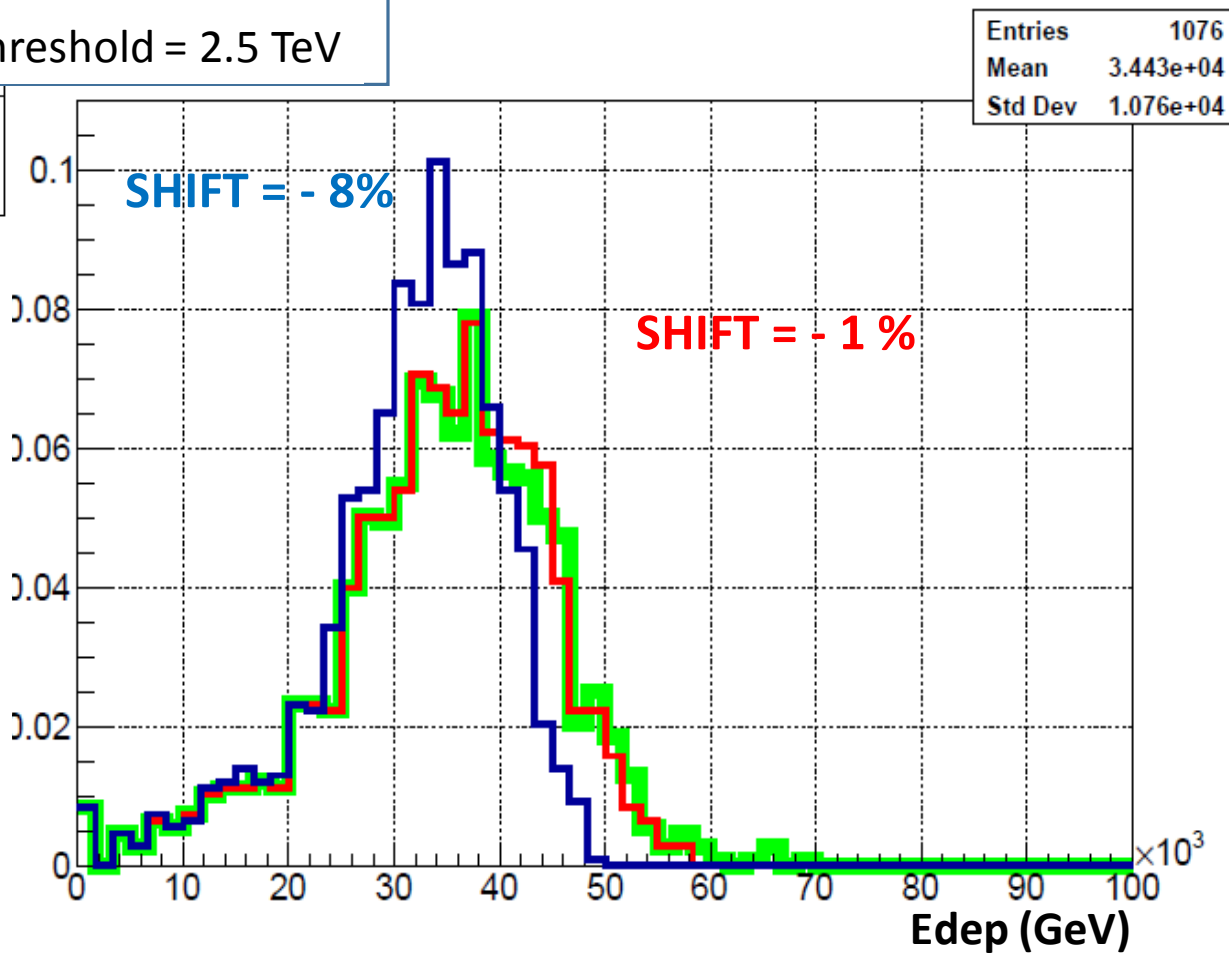
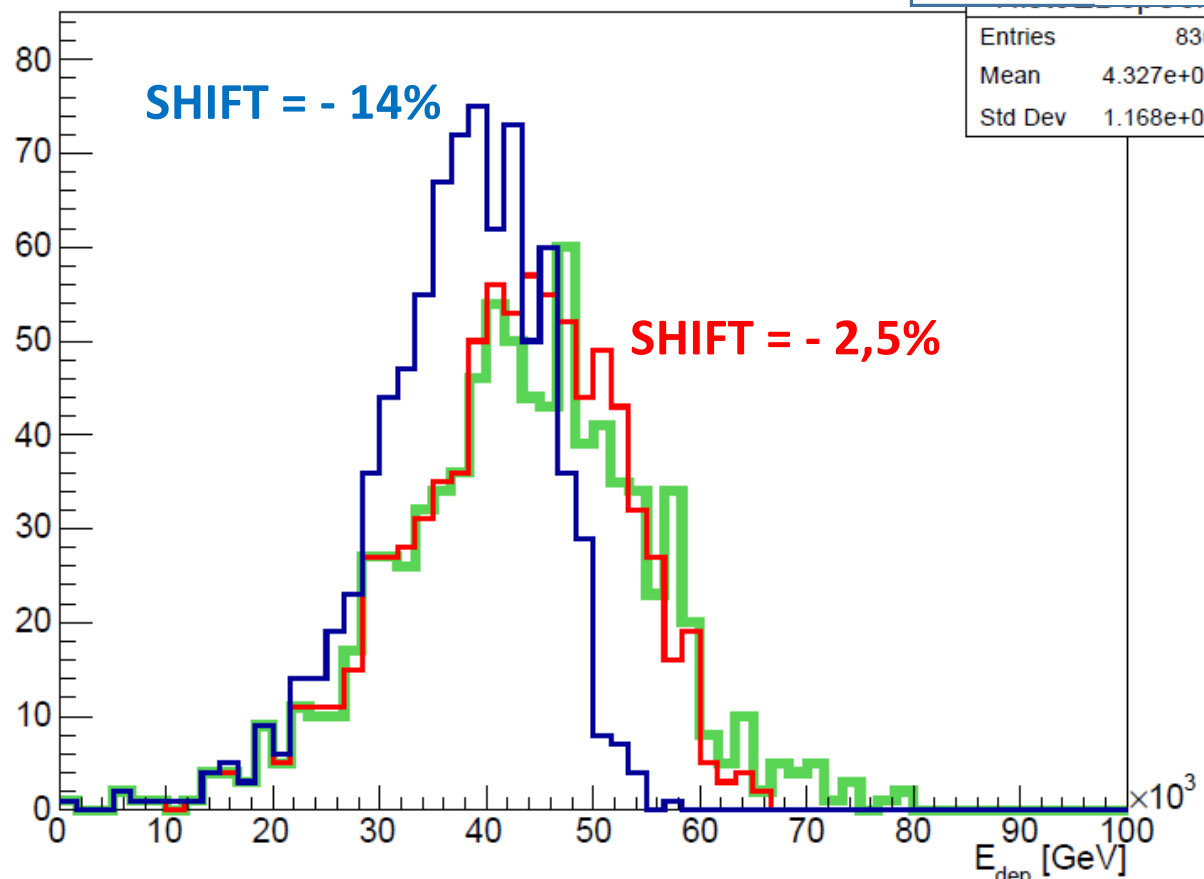
COMPARE DIRECTLY THE EFFECT OF SATURATION 100TeV protons

Geant DPM

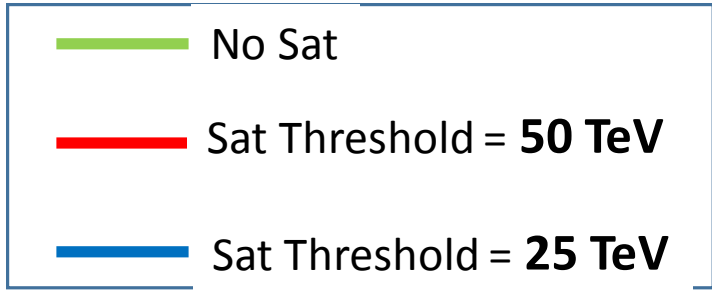
CALO energy deposit

FLUKA

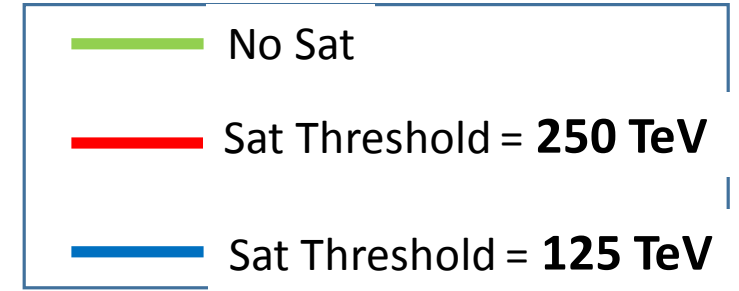
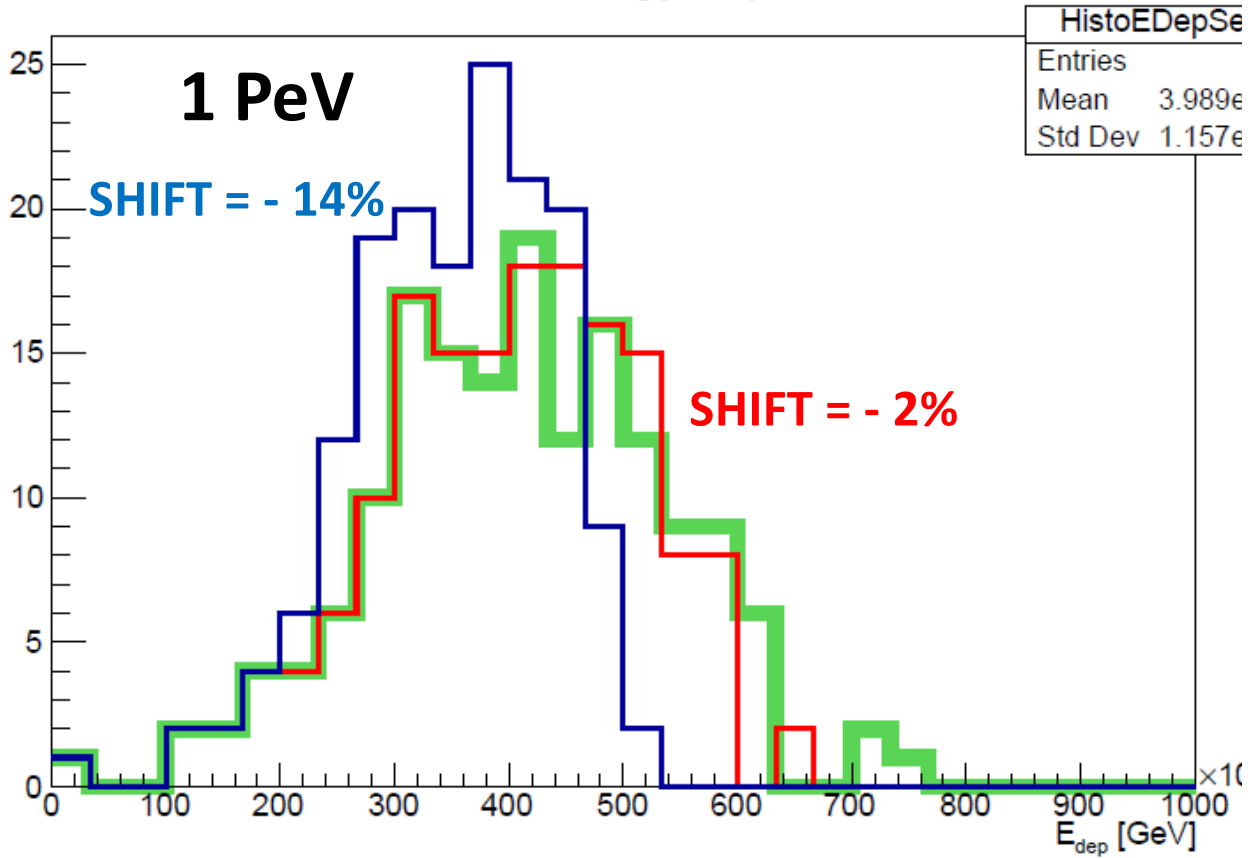
- No Sat
- Sat Threshold = 5 TeV
- Sat Threshold = 2.5 TeV



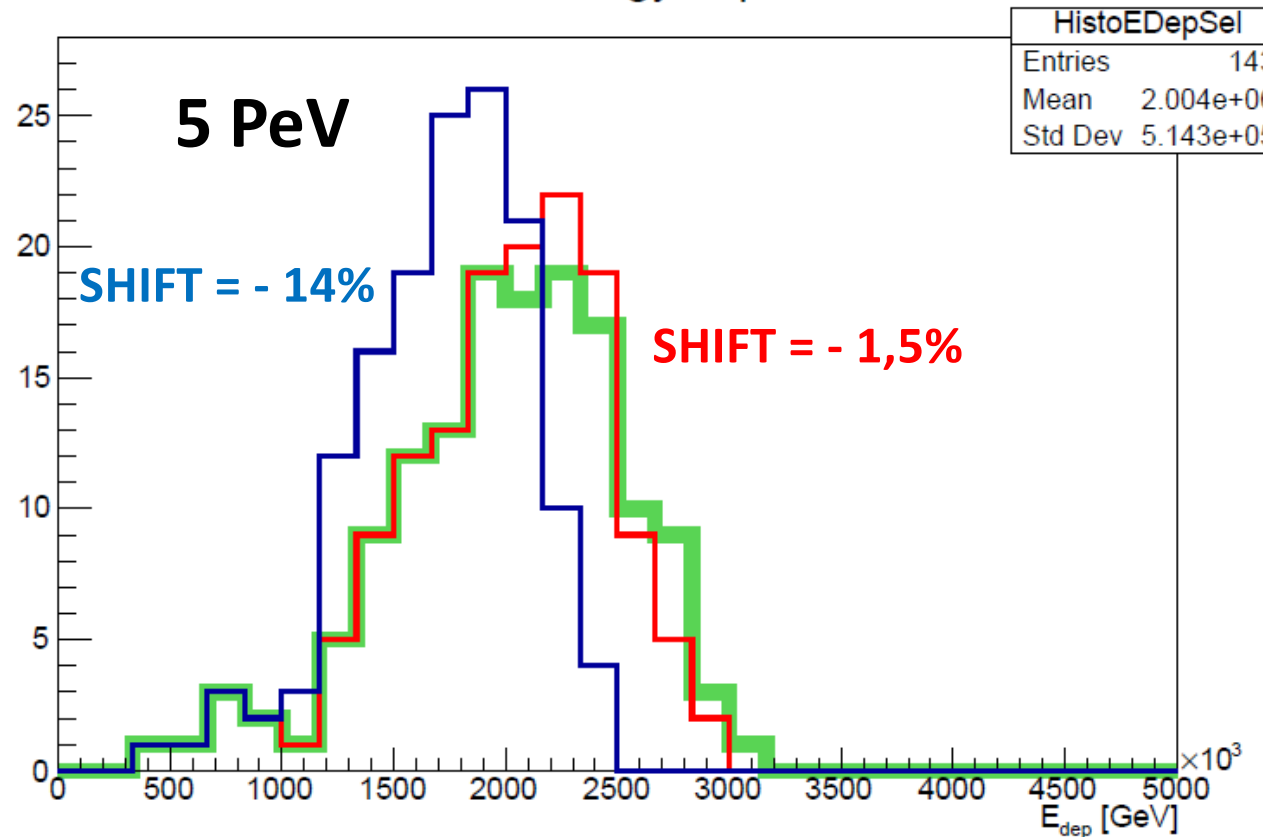
# RESULTS



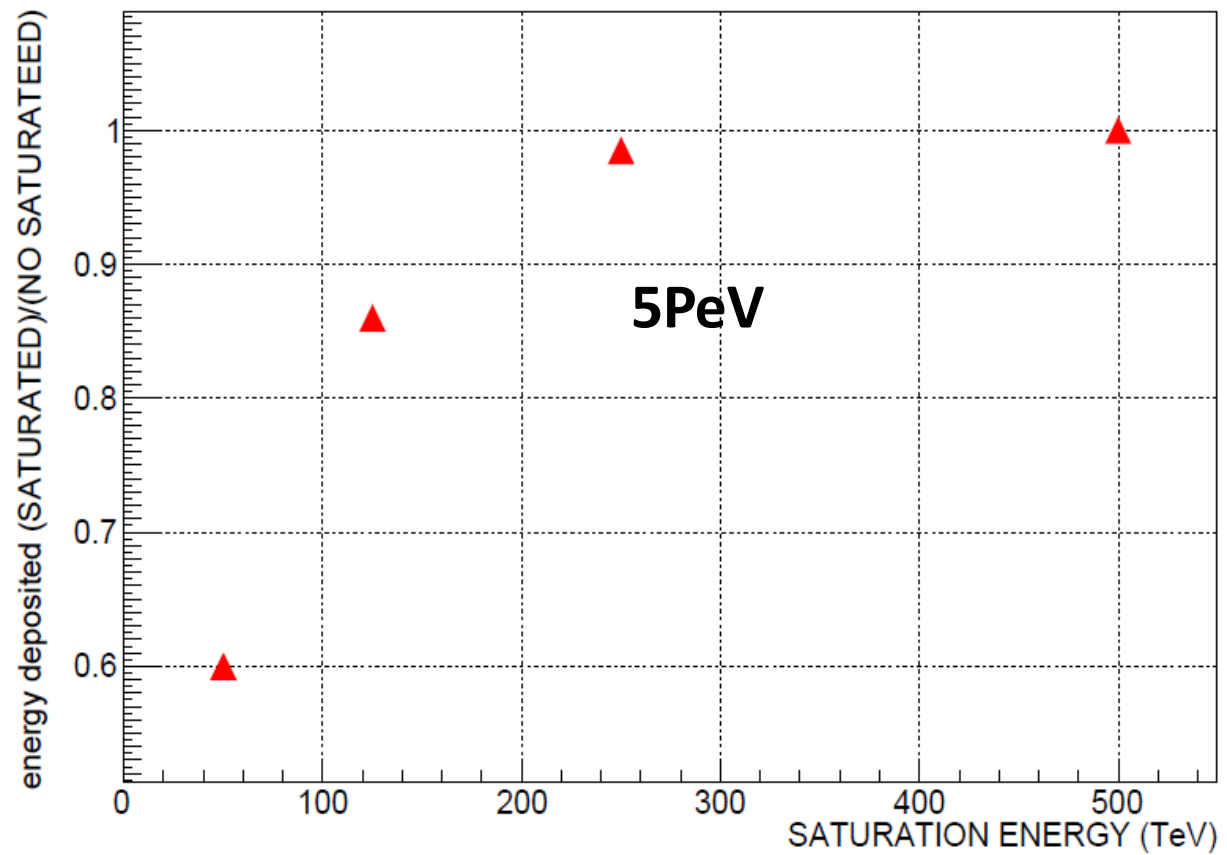
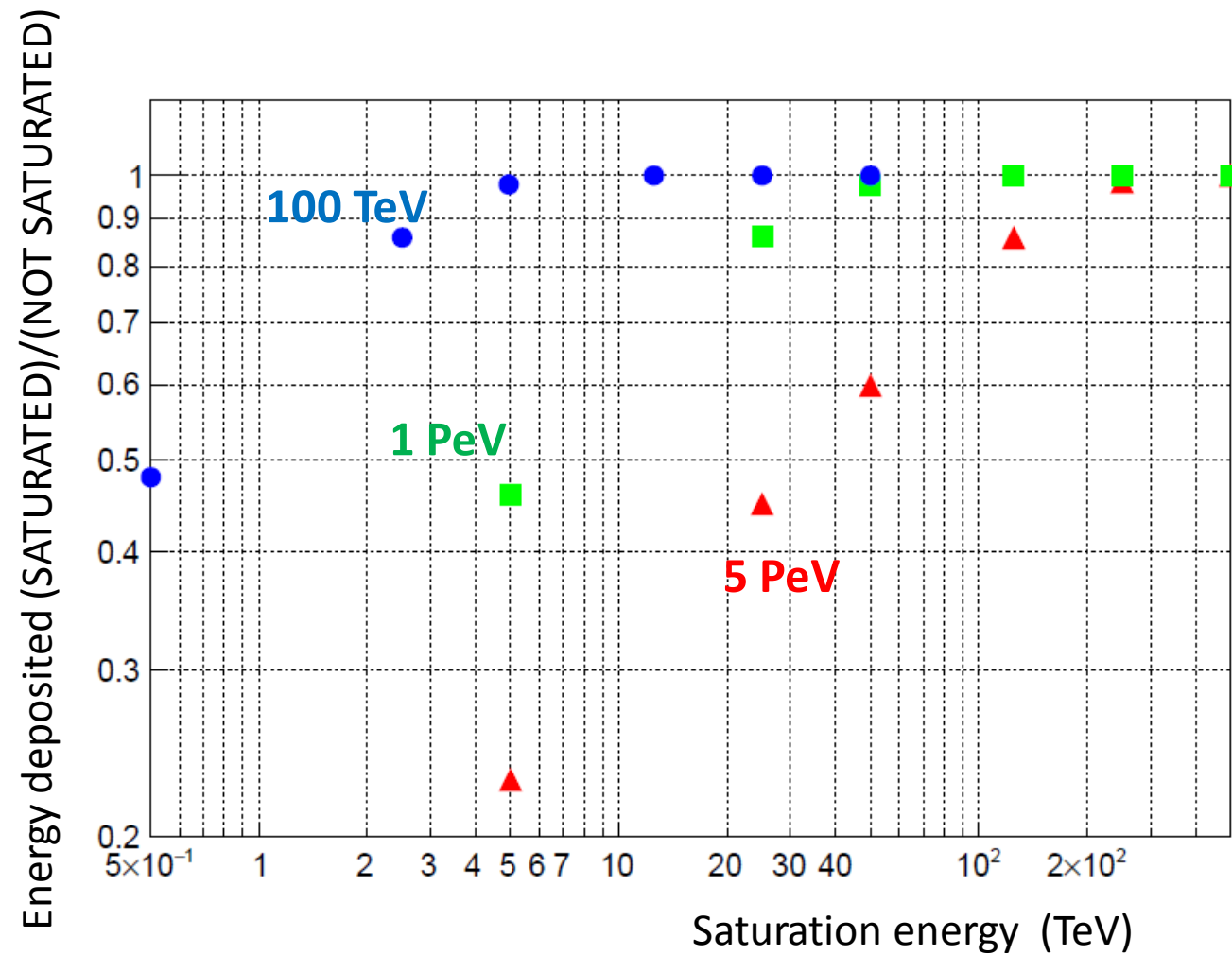
CALO energy deposit



CALO energy deposit



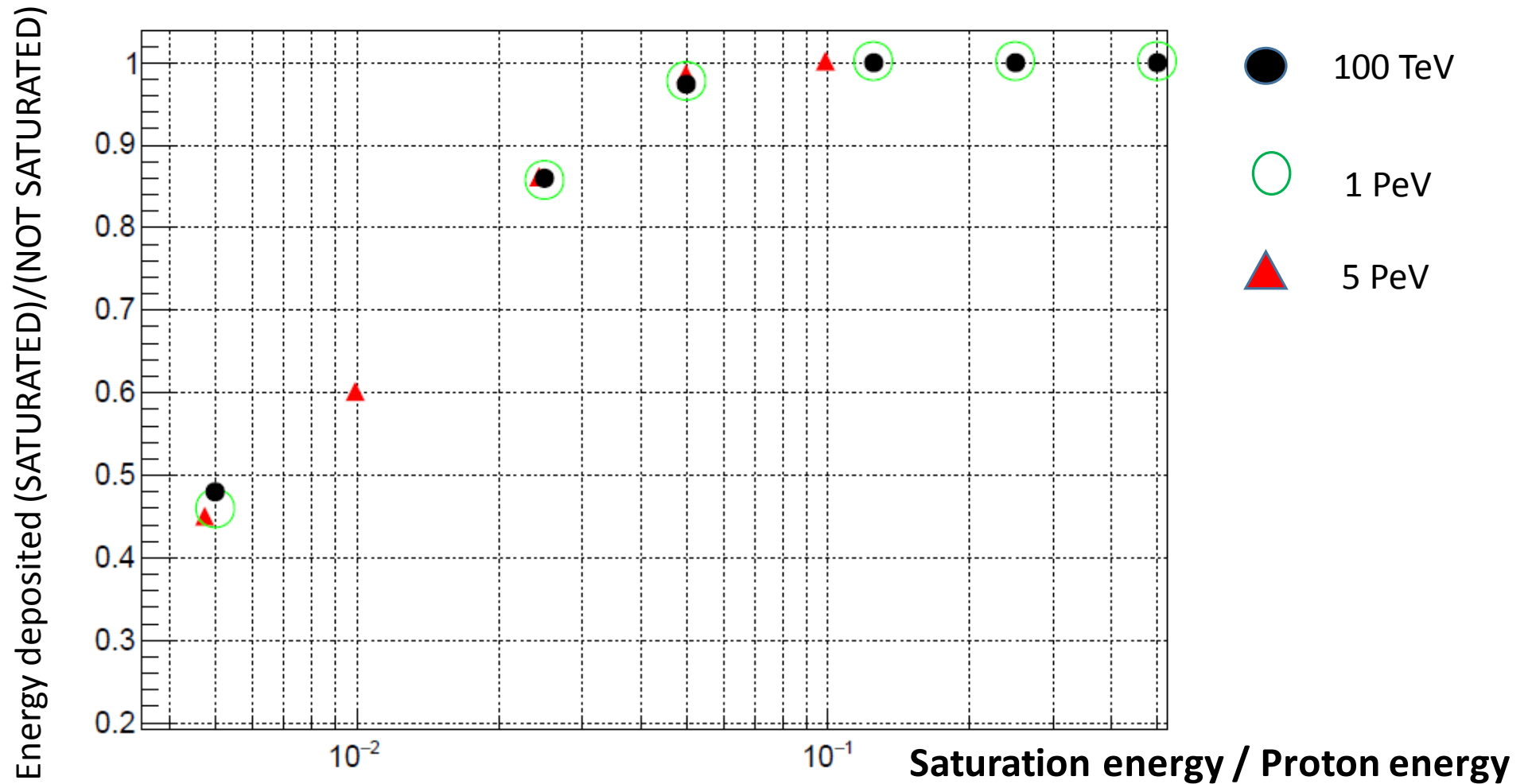
# RESULTS





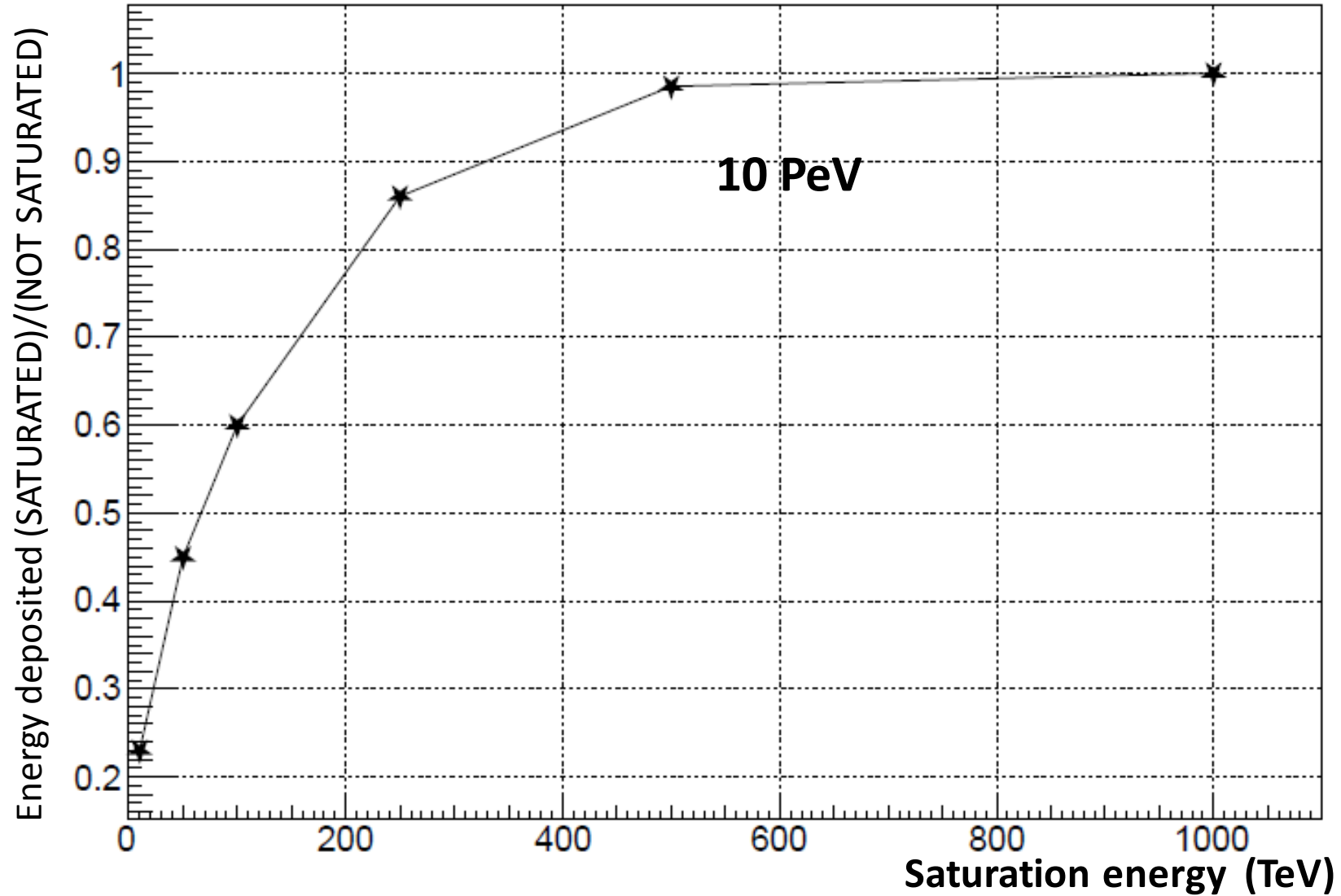
# RESULTS

«The threshold Energy which produce a constant shift at different proton energies scale linearly with energy «



# RESULTS

Extrapolate from 5 PeV to 10 PeV



# RESULTS

**1 MIP = 0.0343 GeV**

