Crystal BGO Simulation 10GeV μ- beam

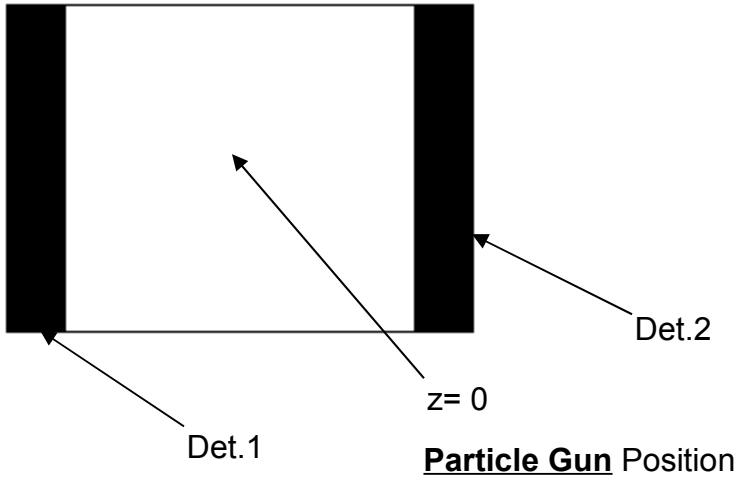
- Energy and Number of photons Distributions compared with deposited energy for specific (z=0) and General Particle Source (GPS) positions.
- Energy resolution for 2x2x2 cm^3 cube with and with out Quantum Efficiency (QE).

Savvas Kyriacou
Yiannis Makris

The Simulation setup

Simulation Setup

Cube: 2x2x2 cm^3
2 Sens. Det. (z=-1,z=1)
Crystal: BGO
Surface: chemically etched surface, with tyvek
Particles: μ^-
Events: 1000
Energy: 10GeV

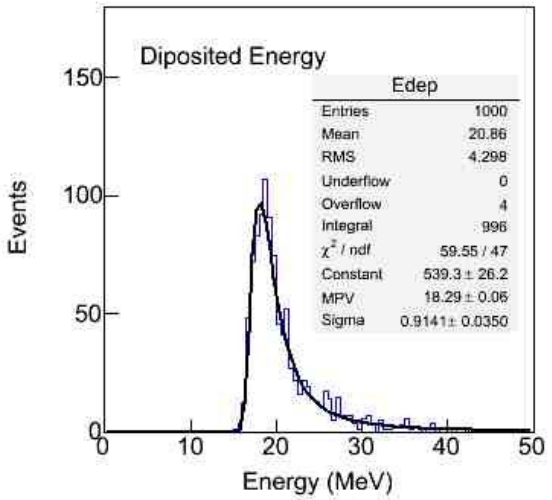


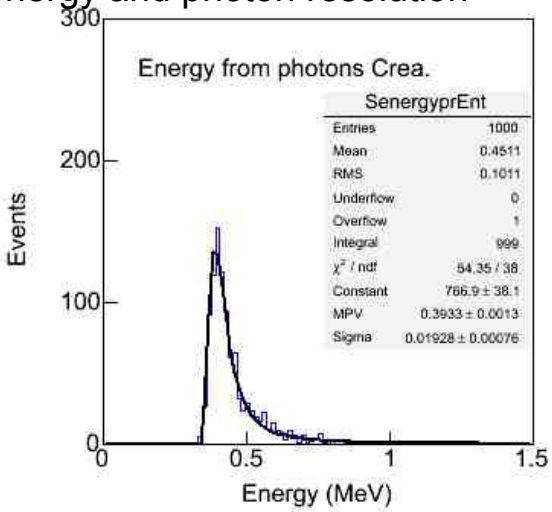
GPS

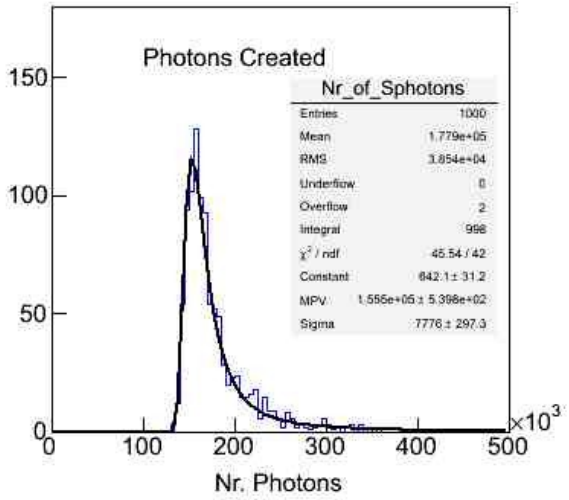
Random Flat Distribution

Energy and Number of photons Distributions compared with deposited energy for specific (z=0) and General Particle Source (GPS) positions.

Scintillation Light for position x=0 mm energy and photon resolution

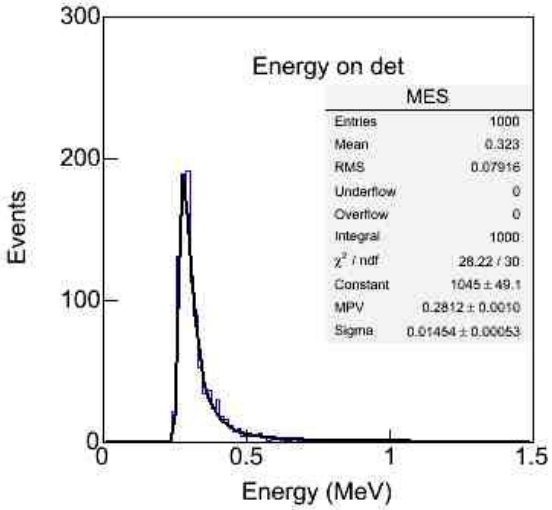


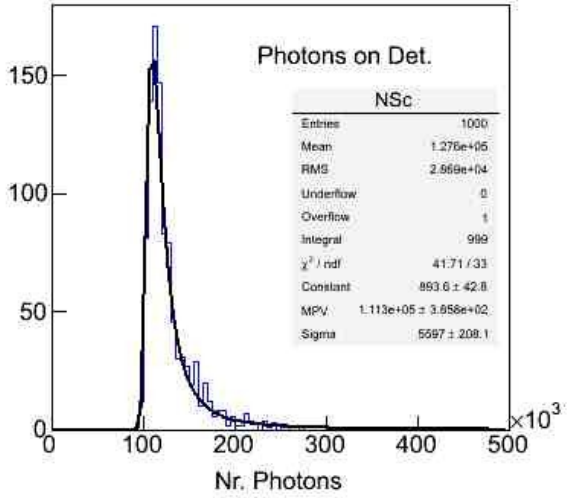




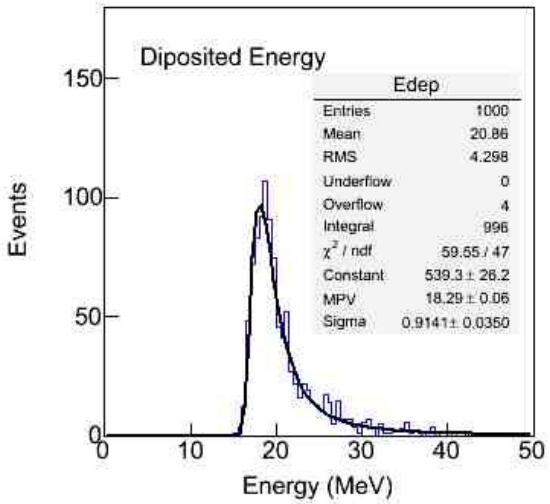
Sigma/MPV

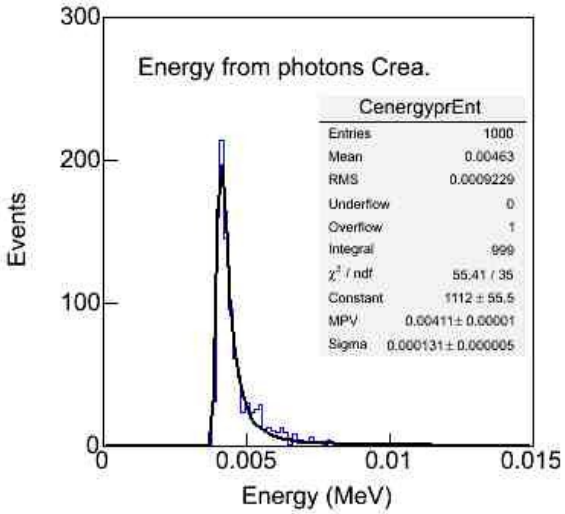
- Deposited Energy : **5.0%**
- Energy from photons Crea.: **4.9%**
- Energy on Det.: **5.1%**
- Photons Created: **4.9%**
- Photons on Det.: **5.0%**

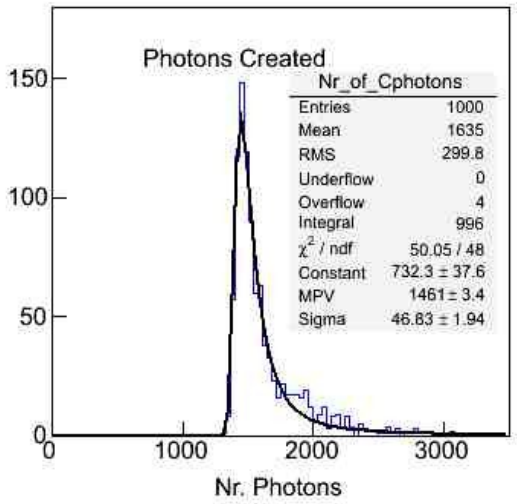




Cerenkov Light for position x=0 mm energy and photon resolution

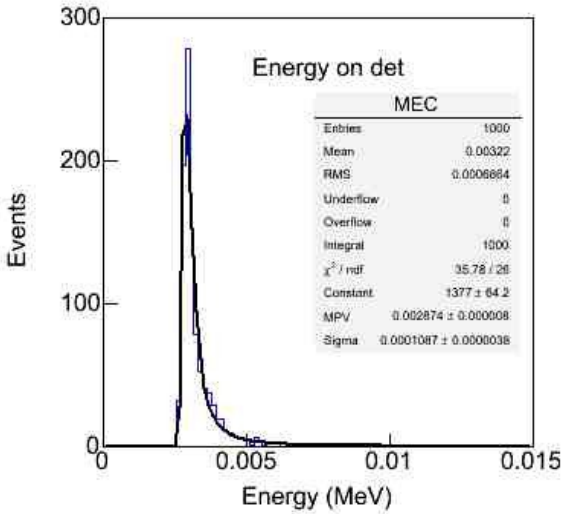


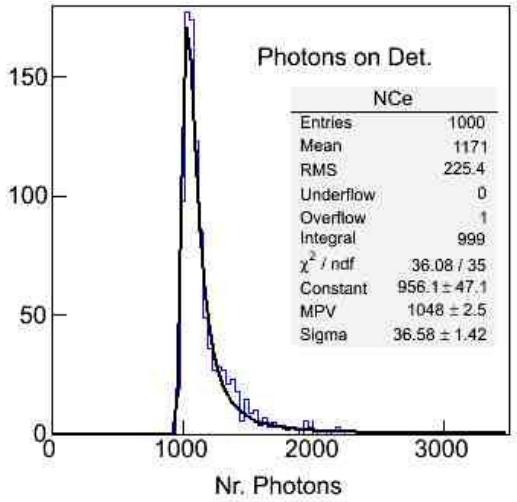




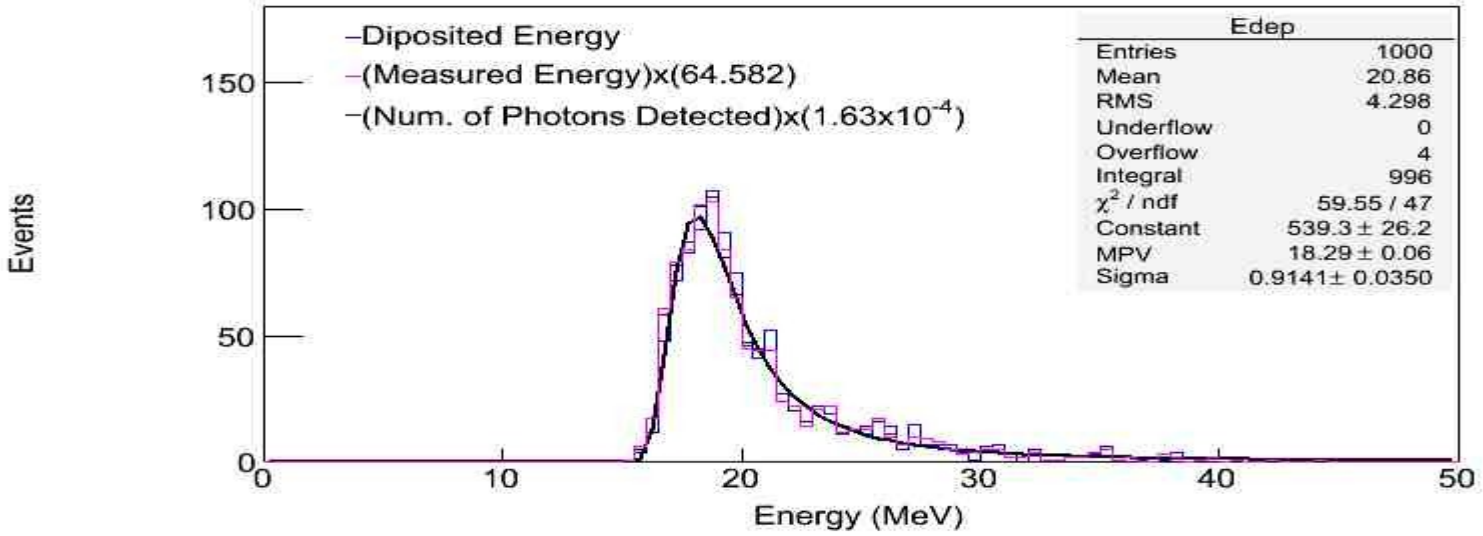
Sigma/PMV

- Deposited Energy : **5.0%**
- Energy from photons Crea.: **3.2%**
- Energy on Det.: **3.8%**
- Photons Created: **3.2%**
- Photons on Det.: **3.2%**

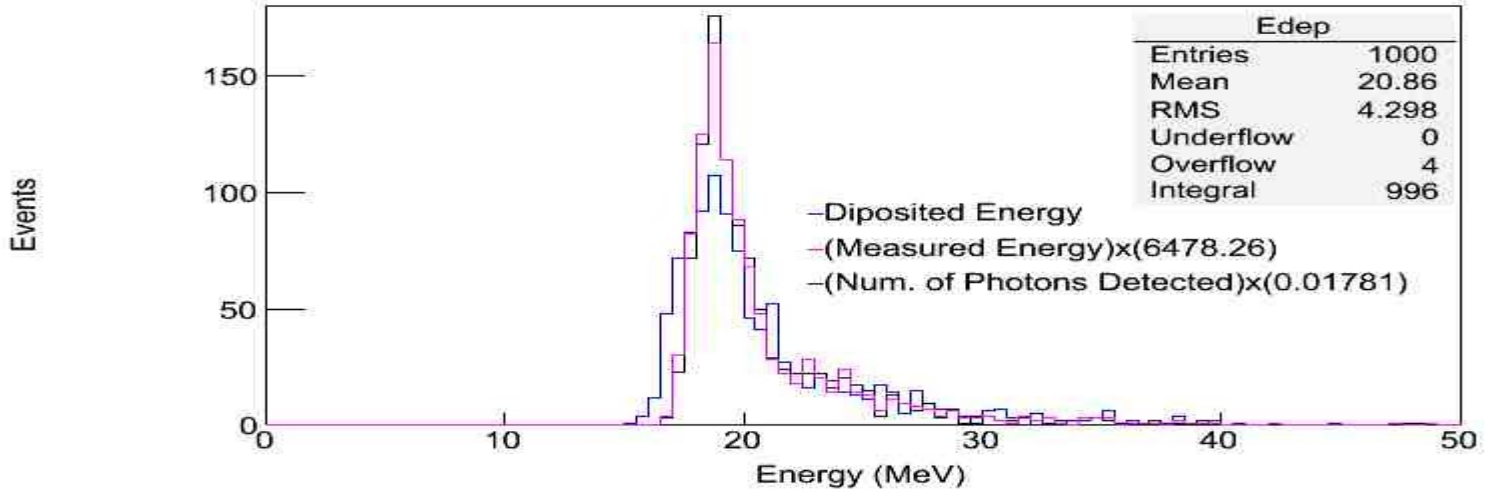




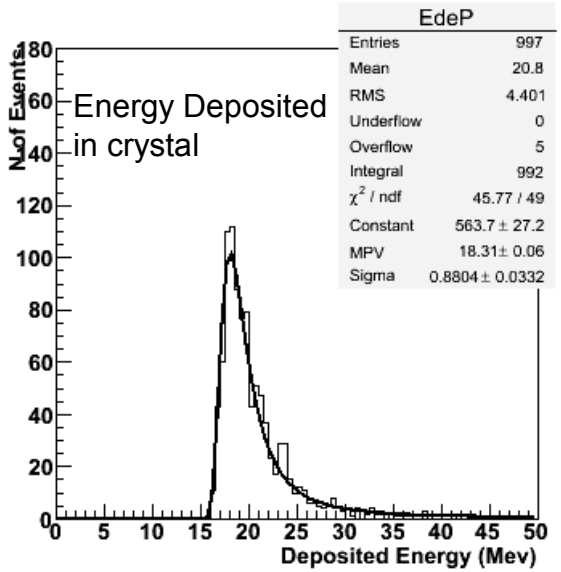
Comparing the resolutions of **Scintillation** light for
Deposited, measured energy and photons at **x=0 mm**

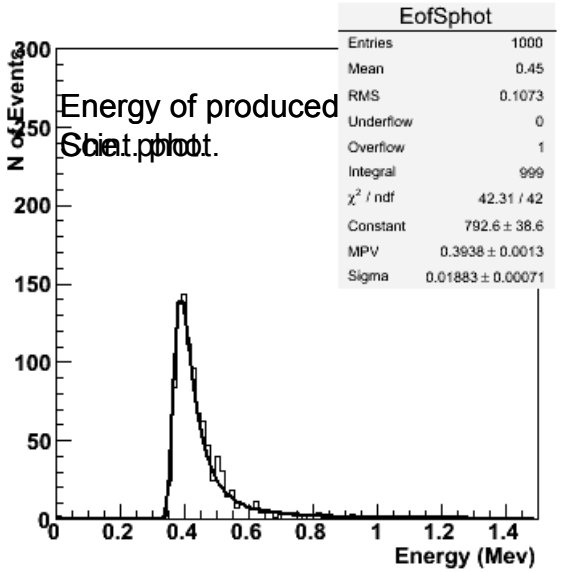


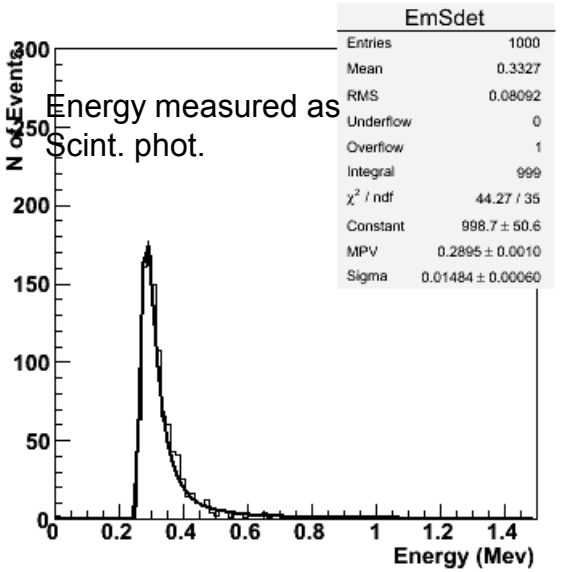
Comparing the resolutions of **Cerenkov** light for
Deposited, measured energy and photons at **x=0 mm**



Scintilation Light for GPS mm energy and photon resolution

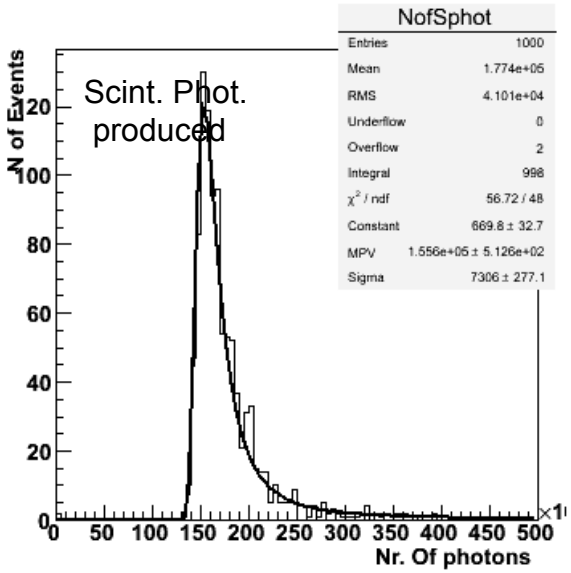


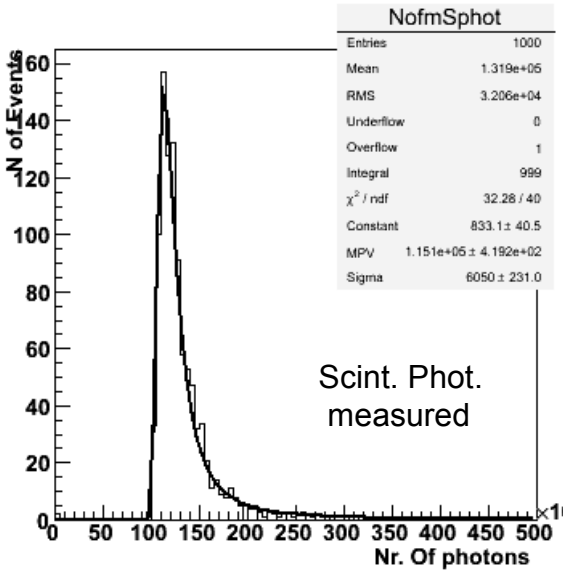




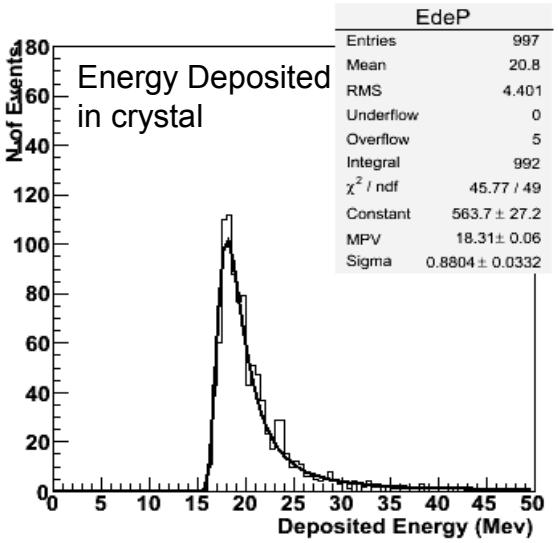
Sigma/MPV

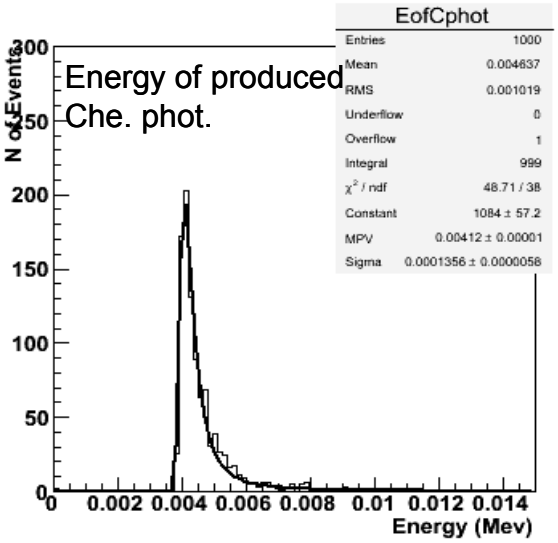
- Deposited Energy : **4.8%**
- Energy from photons Crea.: **4.8%**
- Energy on Det.: **5.4%**
- Photons Created: **4.6%**
- Photons on Det.: **5.2%**

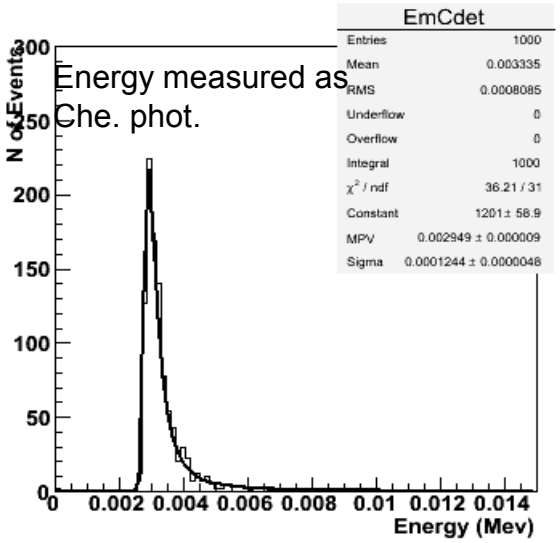




Cerenkov Light for GPS energy and photon resolution

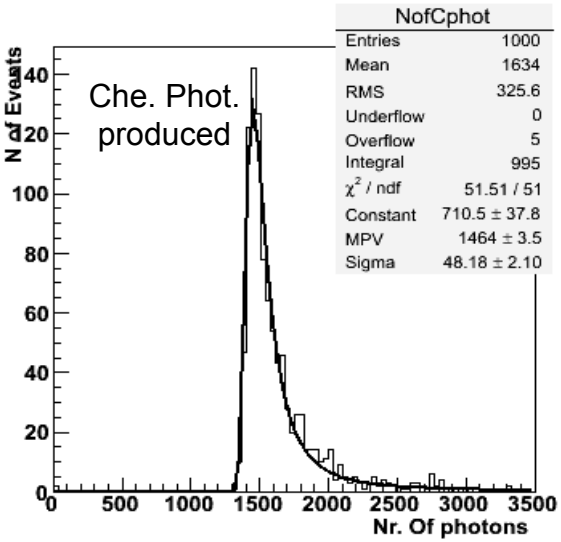


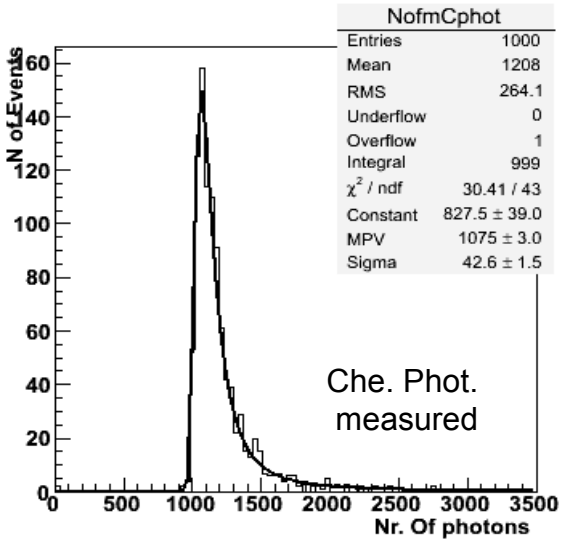




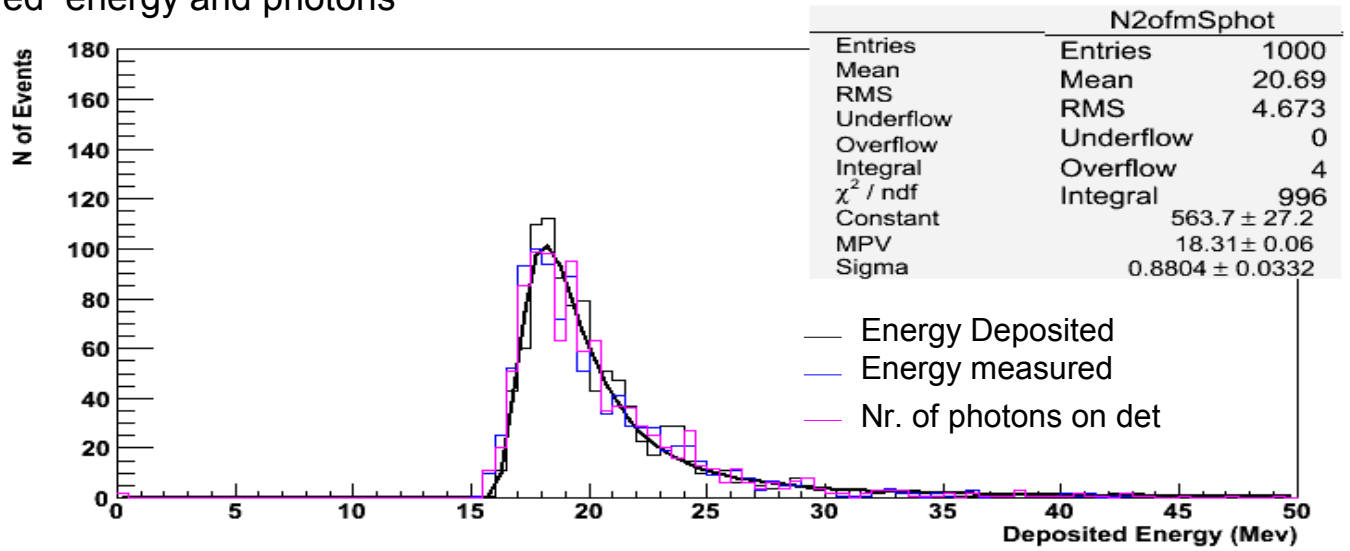
Sigma/MPV

- Deposited Energy : **4.8%**
- Energy from photons Crea.: **3.3%**
- Energy on Det.: **4.2%**
- Photons Created: **3.3%**
- Photons on Det.: **4.0%**

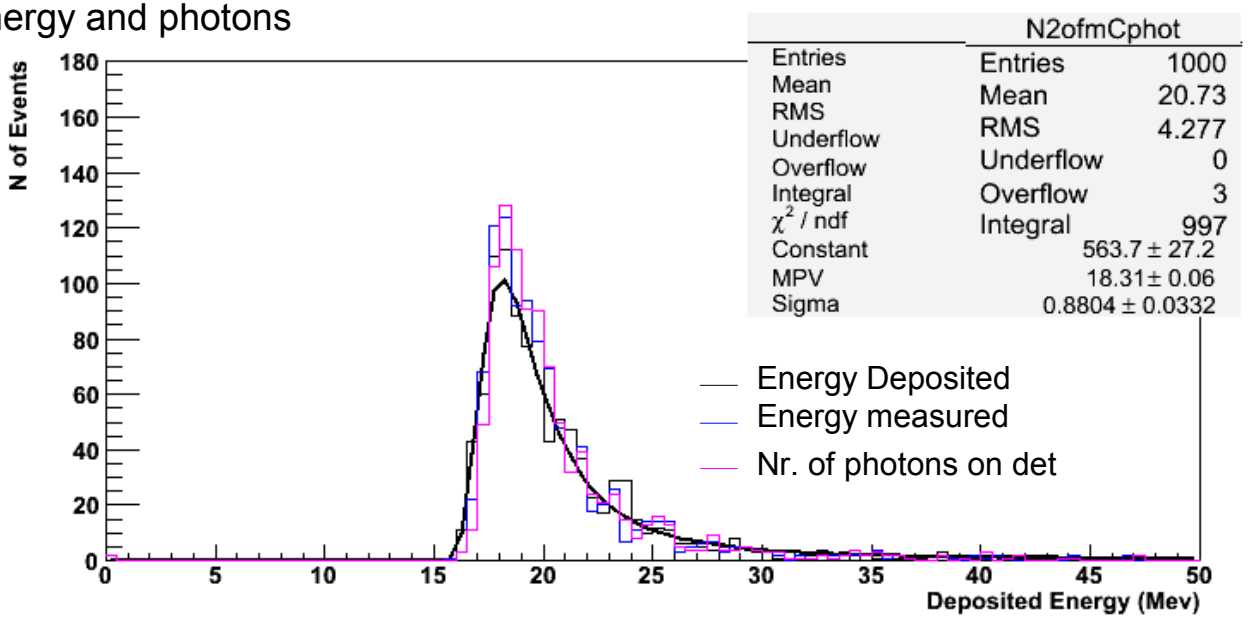




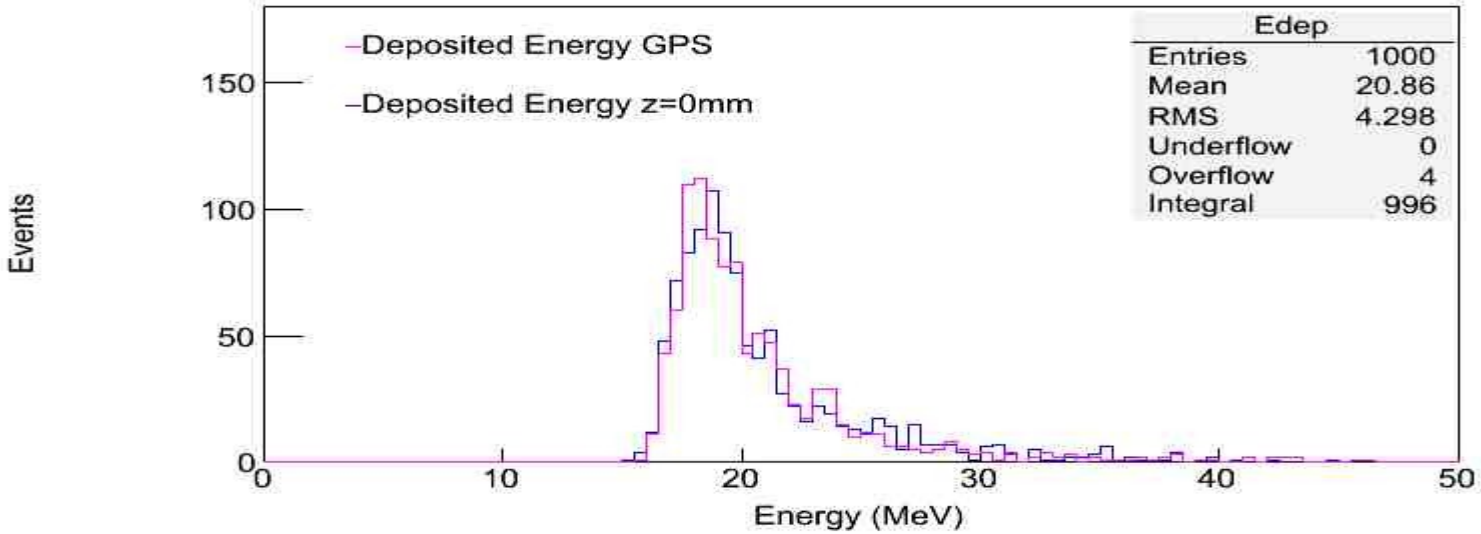
Comparing the resolutions of **Scintillation** light for GPS
Deposited, measured energy and photons

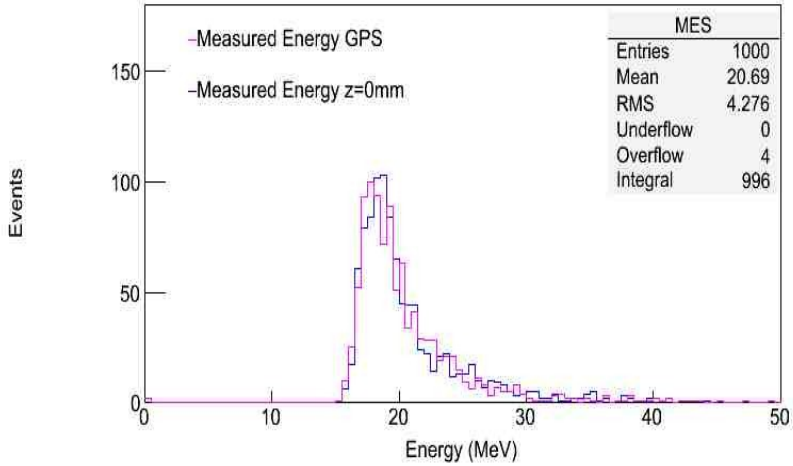


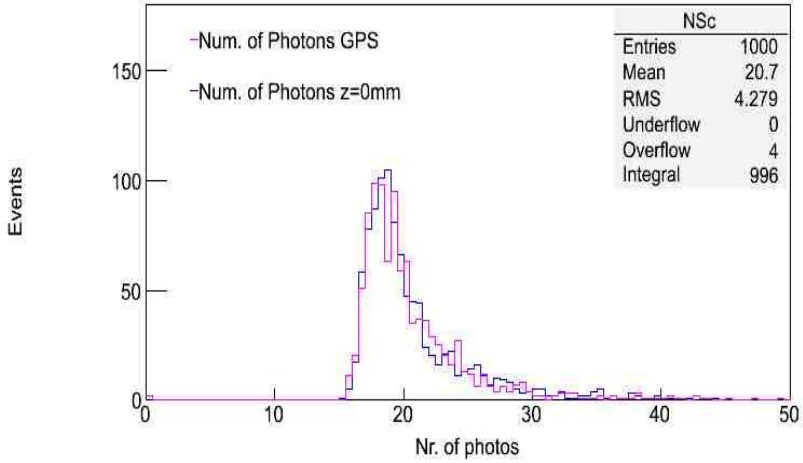
Comparing the resolutions of **Cerenkov** light for
Deposited, measured energy and photons



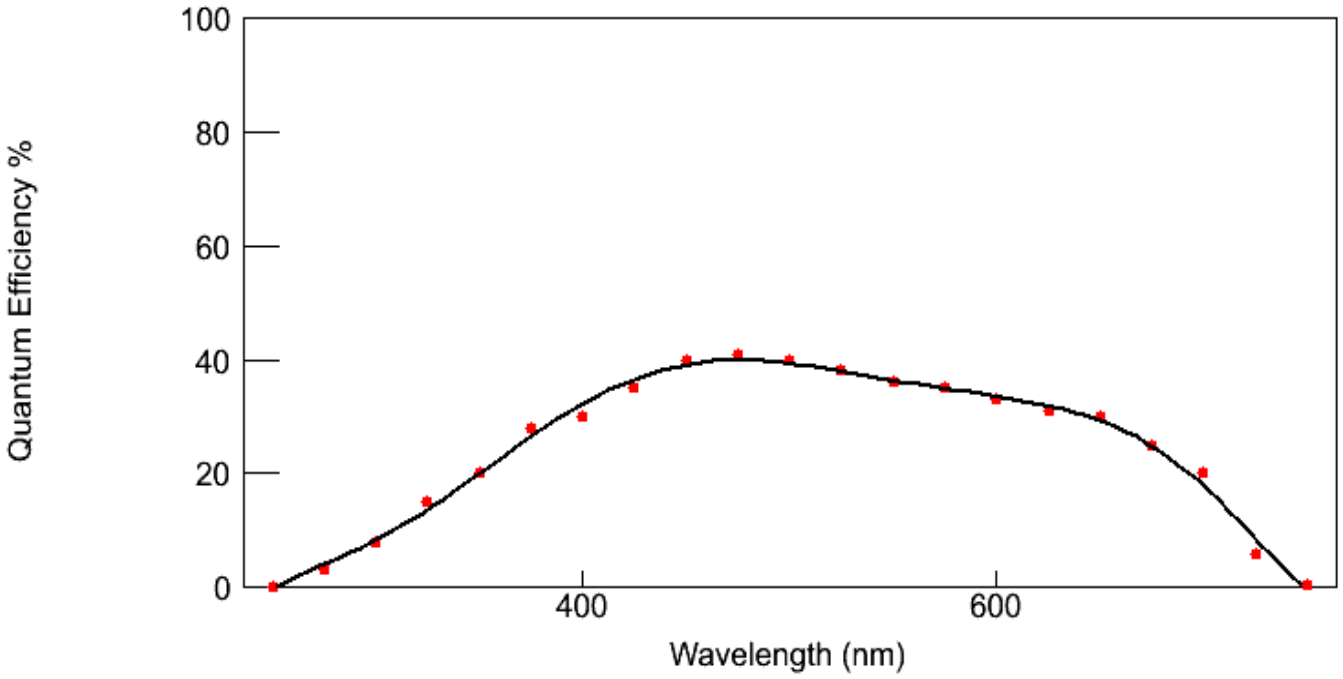
Comparing GPS and specific positions for **Scintillation** light







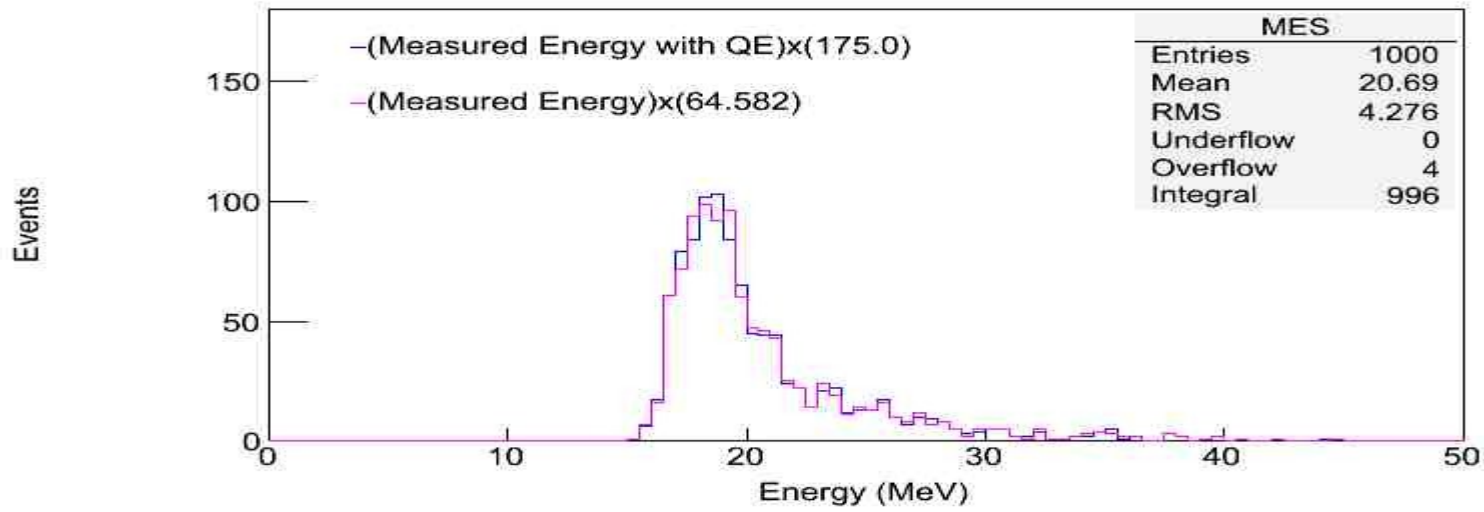
The Quantum Efficiency



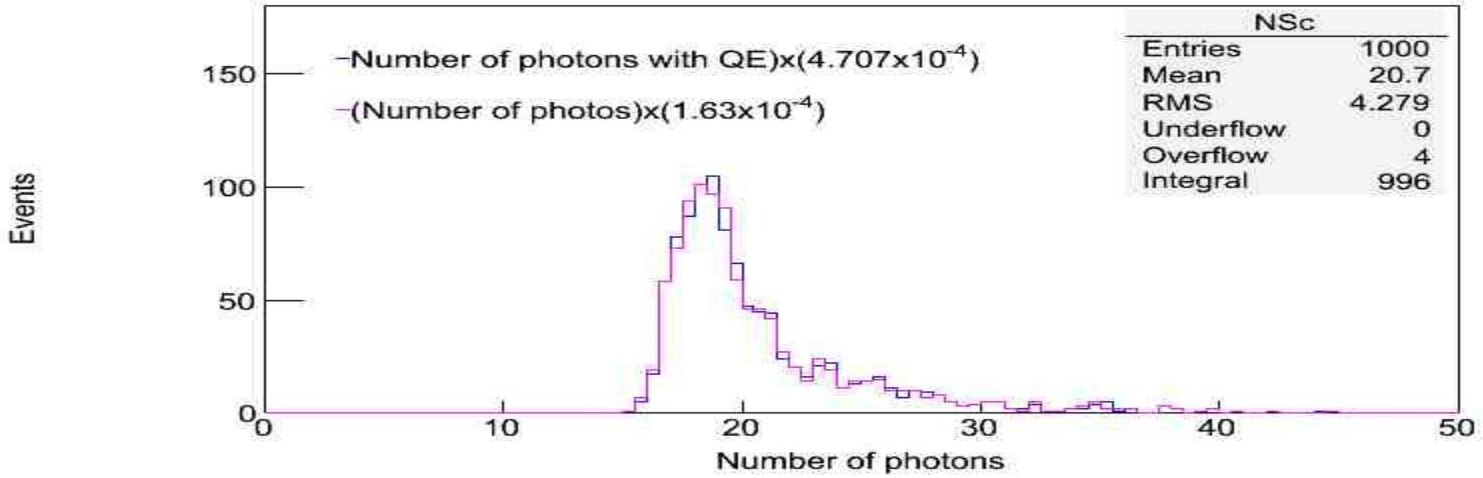
How QE reflects on Energy Resolution

Scintillation

Energy

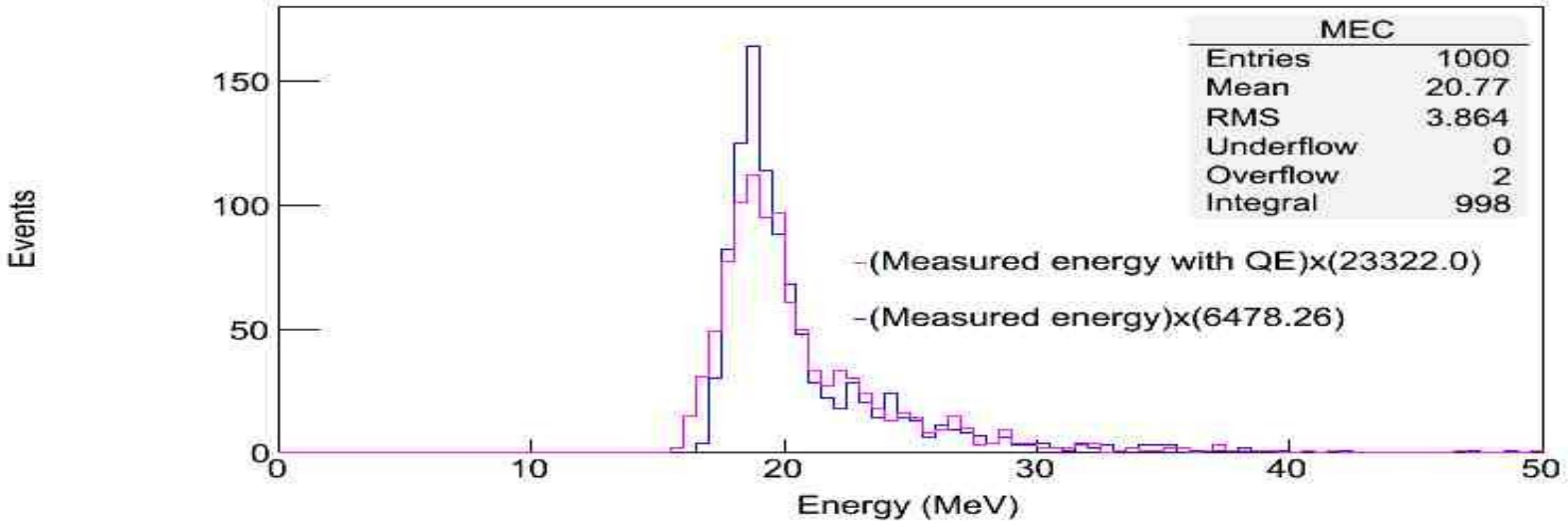


Num. of Photons

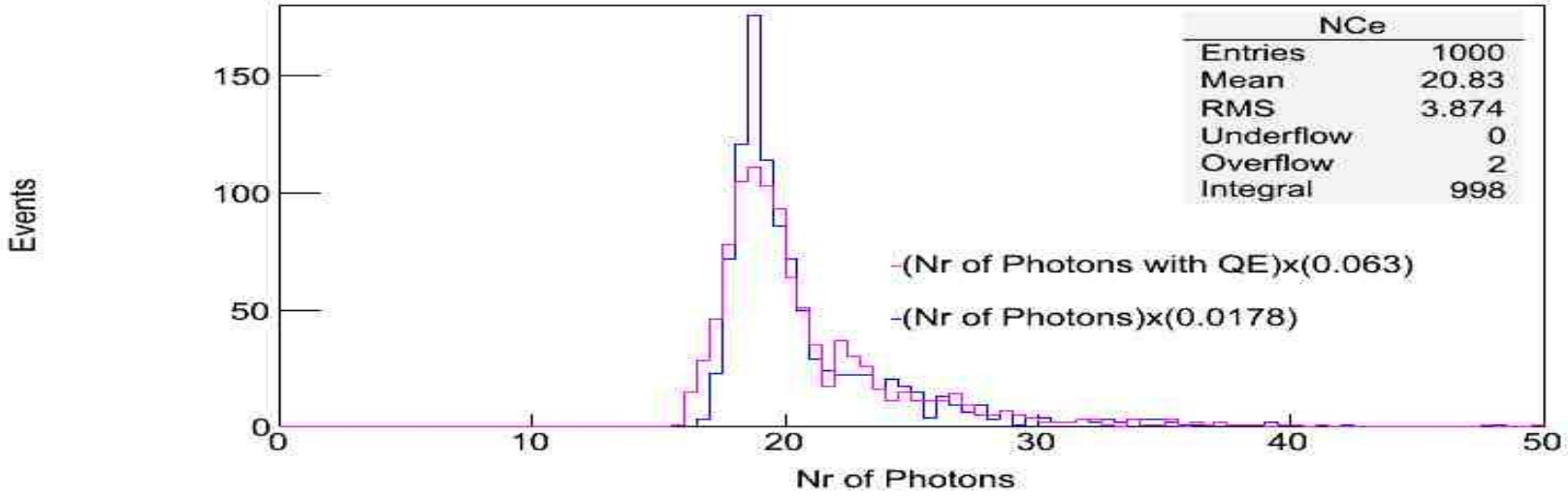


Cerenkov

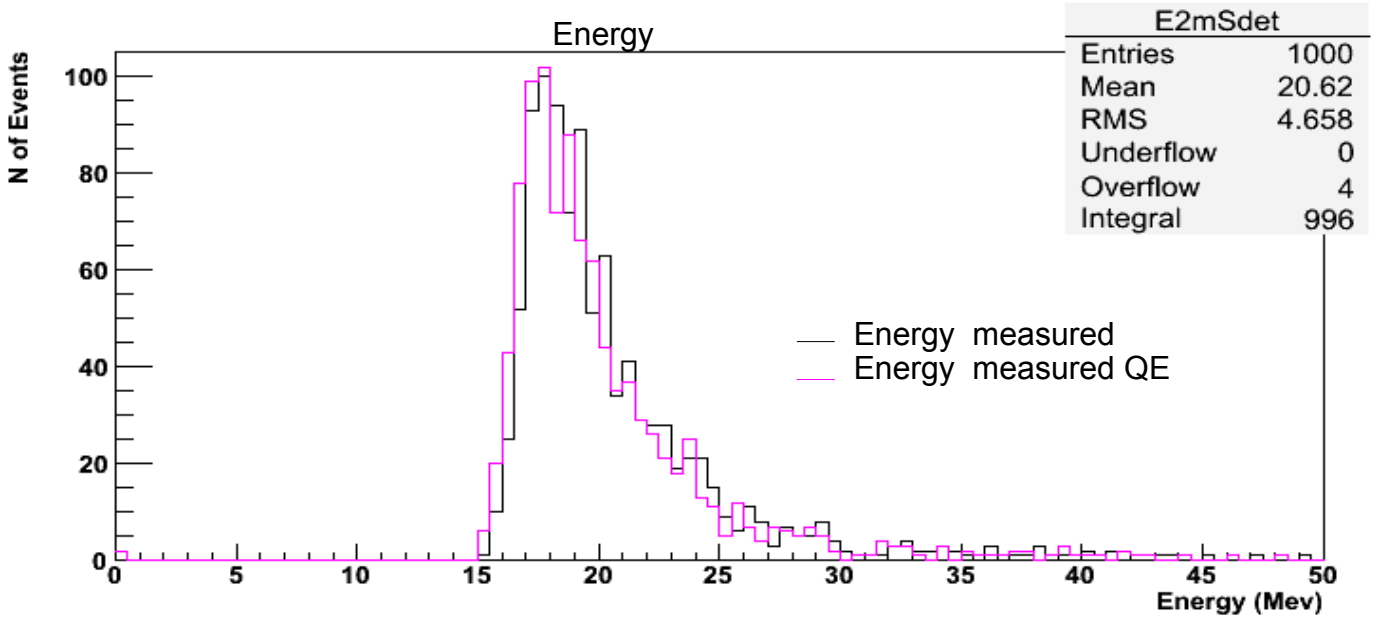
Energy

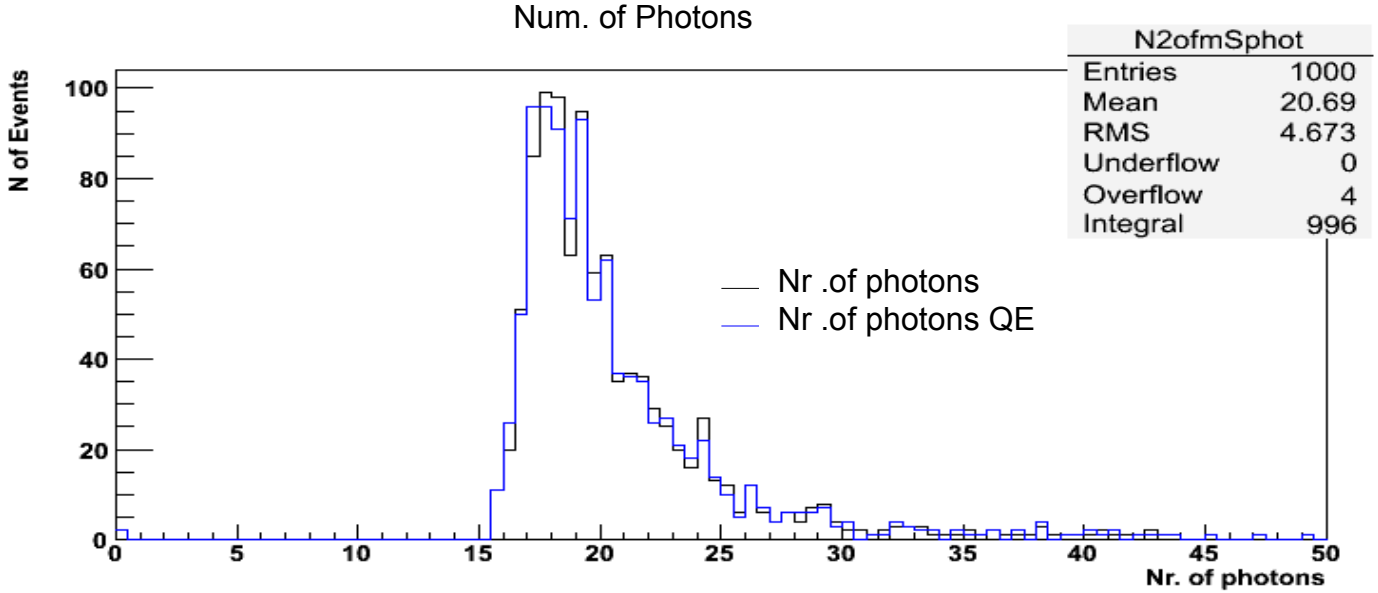


Num. of Photons

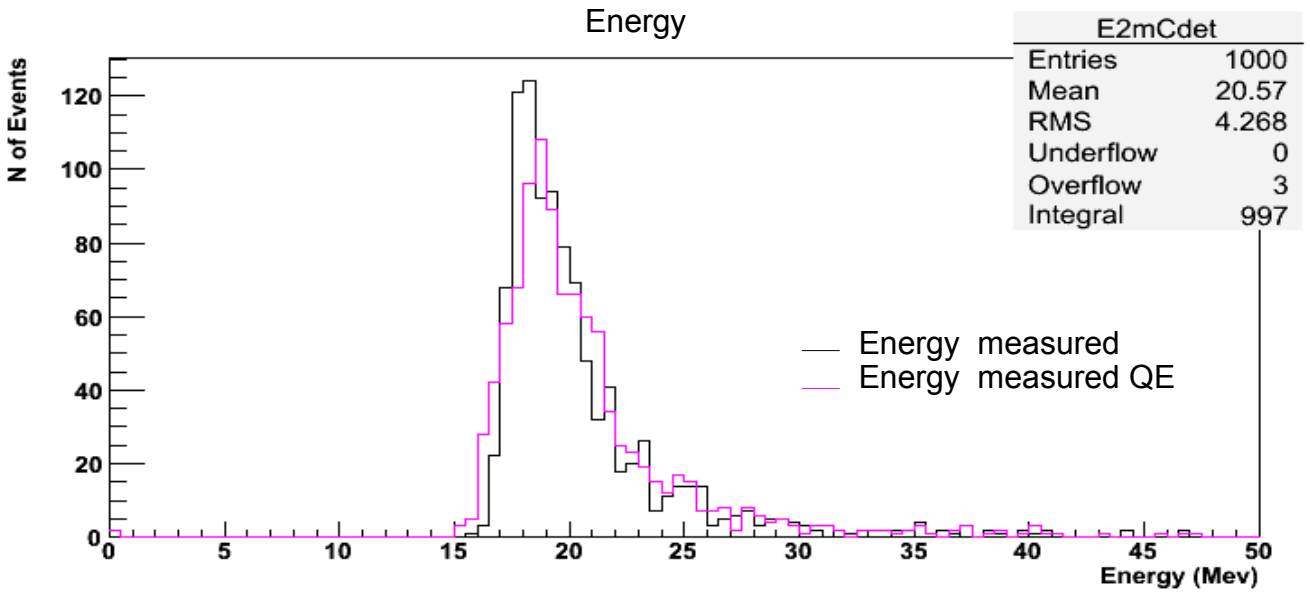


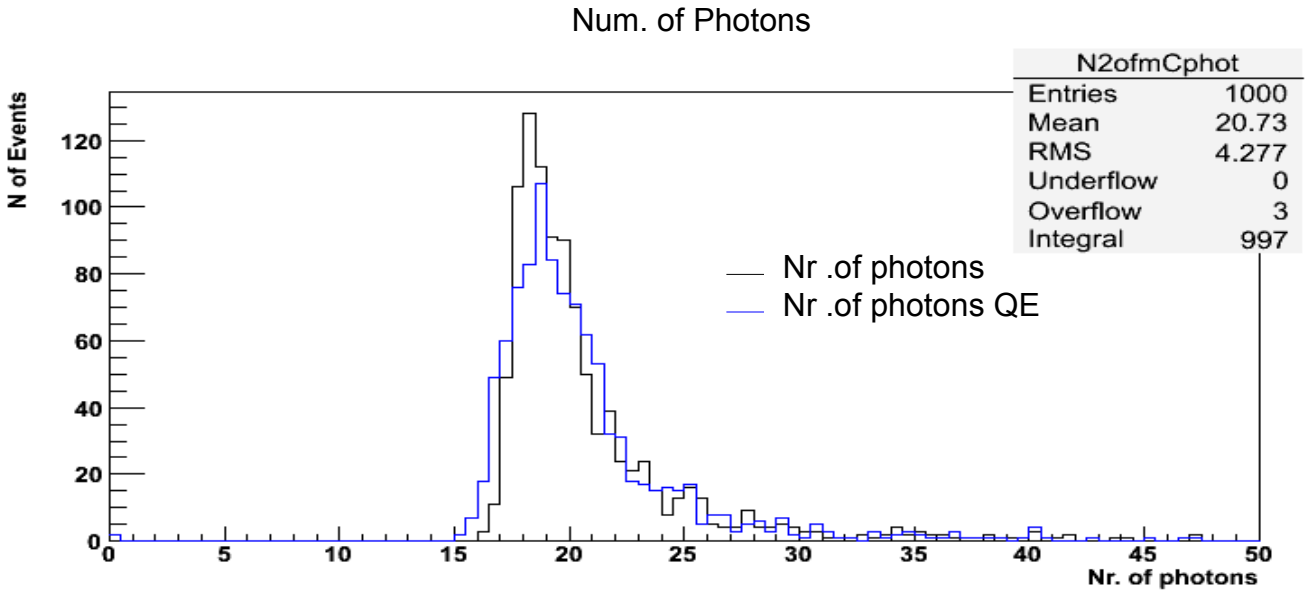
Scintillation





Cerenkov


Energy
E2mCdet
Entries 1000
Mean 20.57
RMS 4.268
Underflow 0
Overflow 3
Integral 997
N of Events
Energy (Mev)
Energy measured
Energy measured QE


Num. of Photons
N2ofmCphot
Entries 1000
Mean 20.73
RMS 4.277
Underflow 0
Overflow 3
Integral 997
N of Events
Nr. of photons
Nr .of photons
Nr .of photons QE