# Very Preliminary Simulation of the Properties Cerenkov Counter for the Moller Experiment

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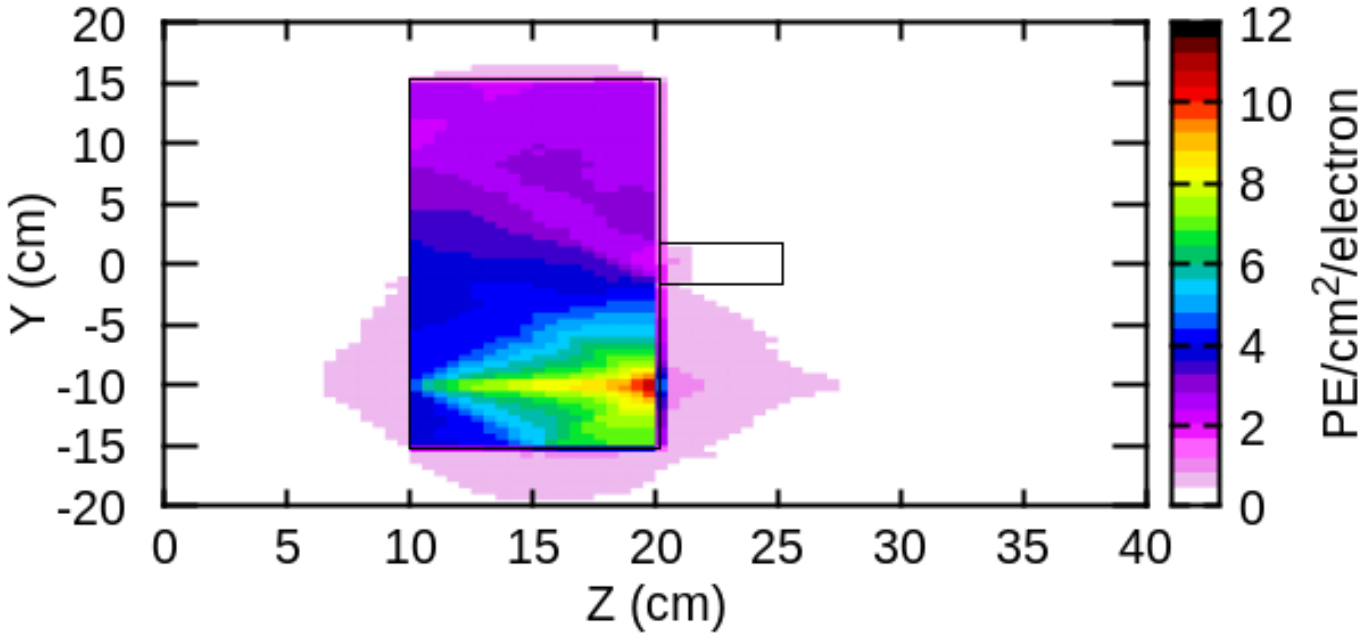
# Input:

1. **Geometry and material**
2. **Quantum efficiency**
3. **Electron beam energy**
4. **Index of refraction**
5. **Absorption coefficient**
6. **Diffusion coefficient**

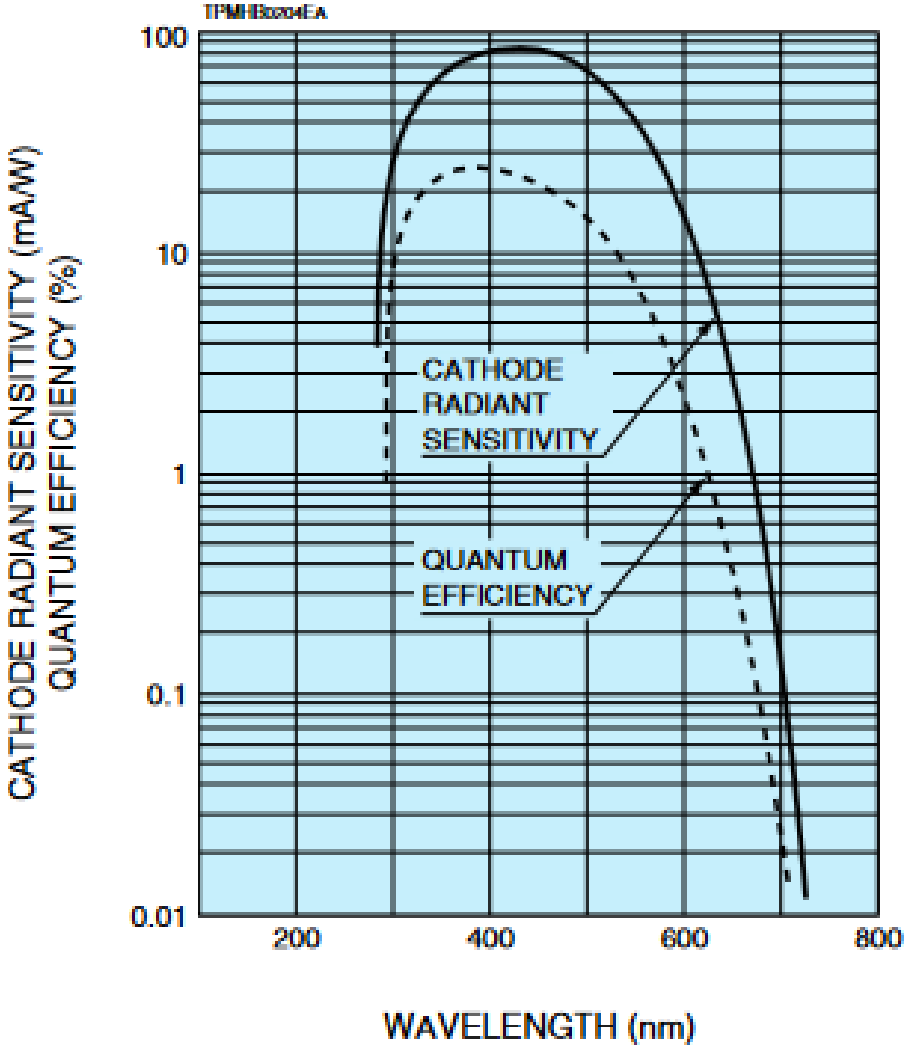
# Geometry

1. **Lucite Cerenkov bar: 1.5 inch thick, 12 inch long, and 4 inch wide**
2. **Hamamatsu R580 photomultiplier tube**

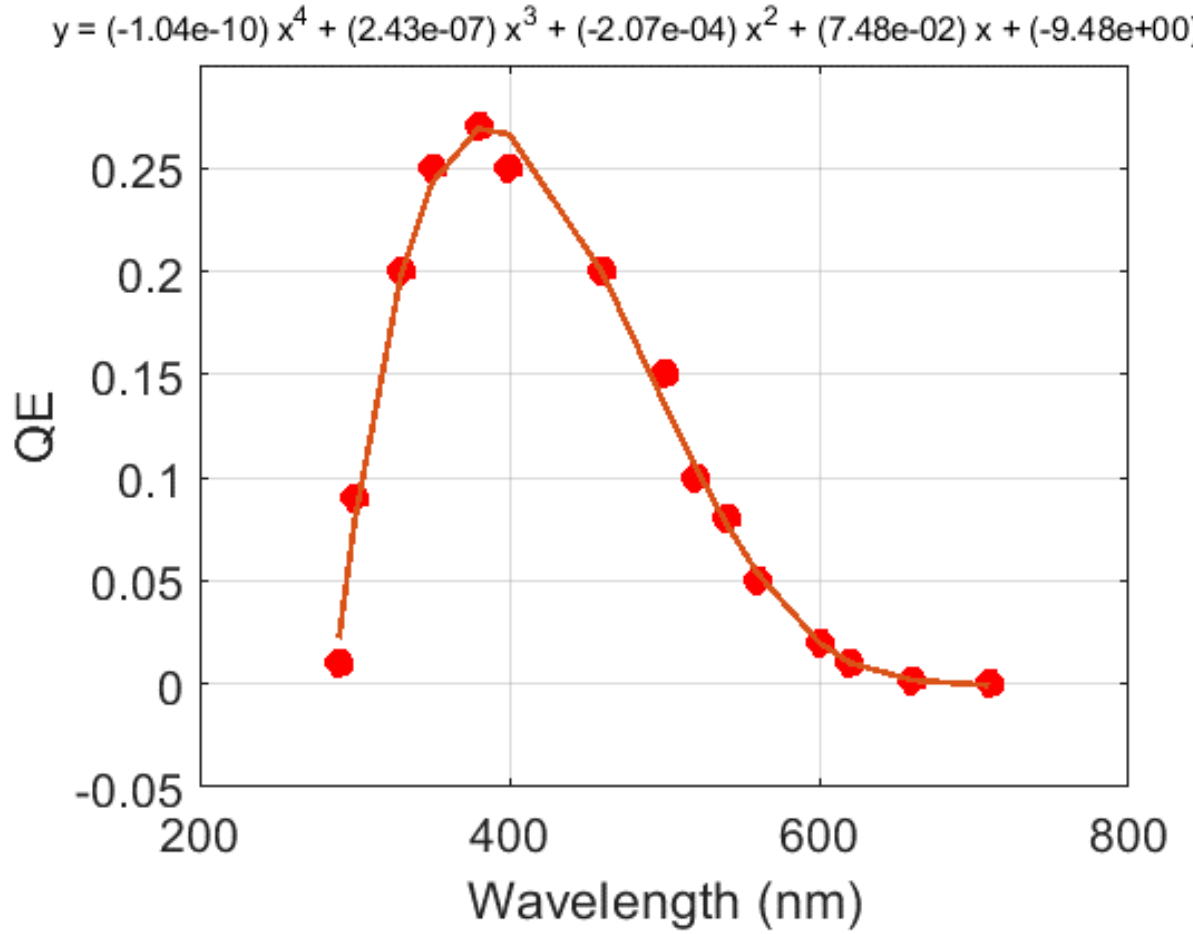
**Example:**



# Quantum Efficiency for Hamamatsu R580



# Parameterization of Quantum Efficiency for Hamamatsu R580



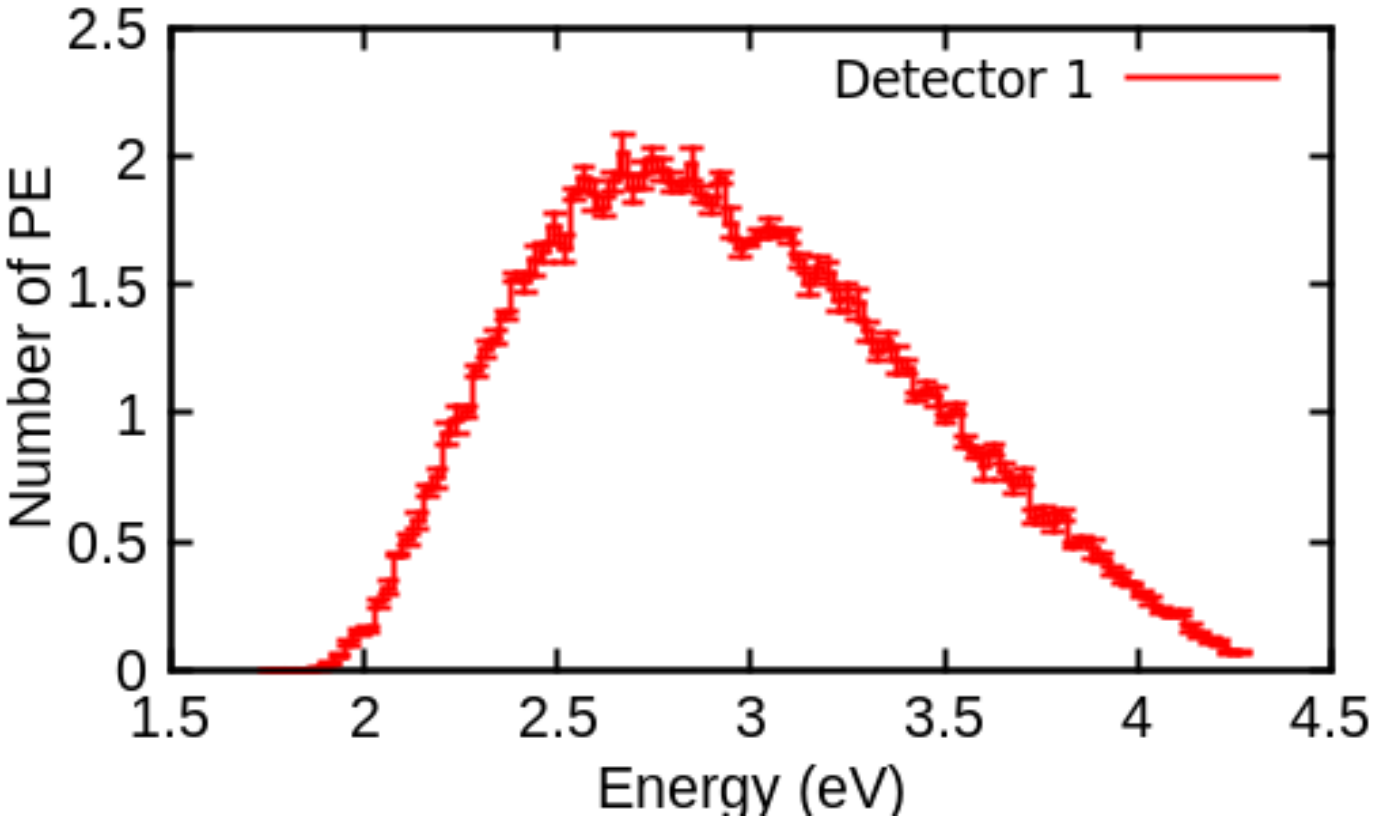
# Parameters

1. **Electron beam energy: 855 MeV**
2. **Index of refraction: 1.49 lucite, 1.52 borosilicate glass**
3. **Absorption coefficient: 1000 cm the mean free path**
4. **Diffusion coefficient: 90 cm the mean free path**

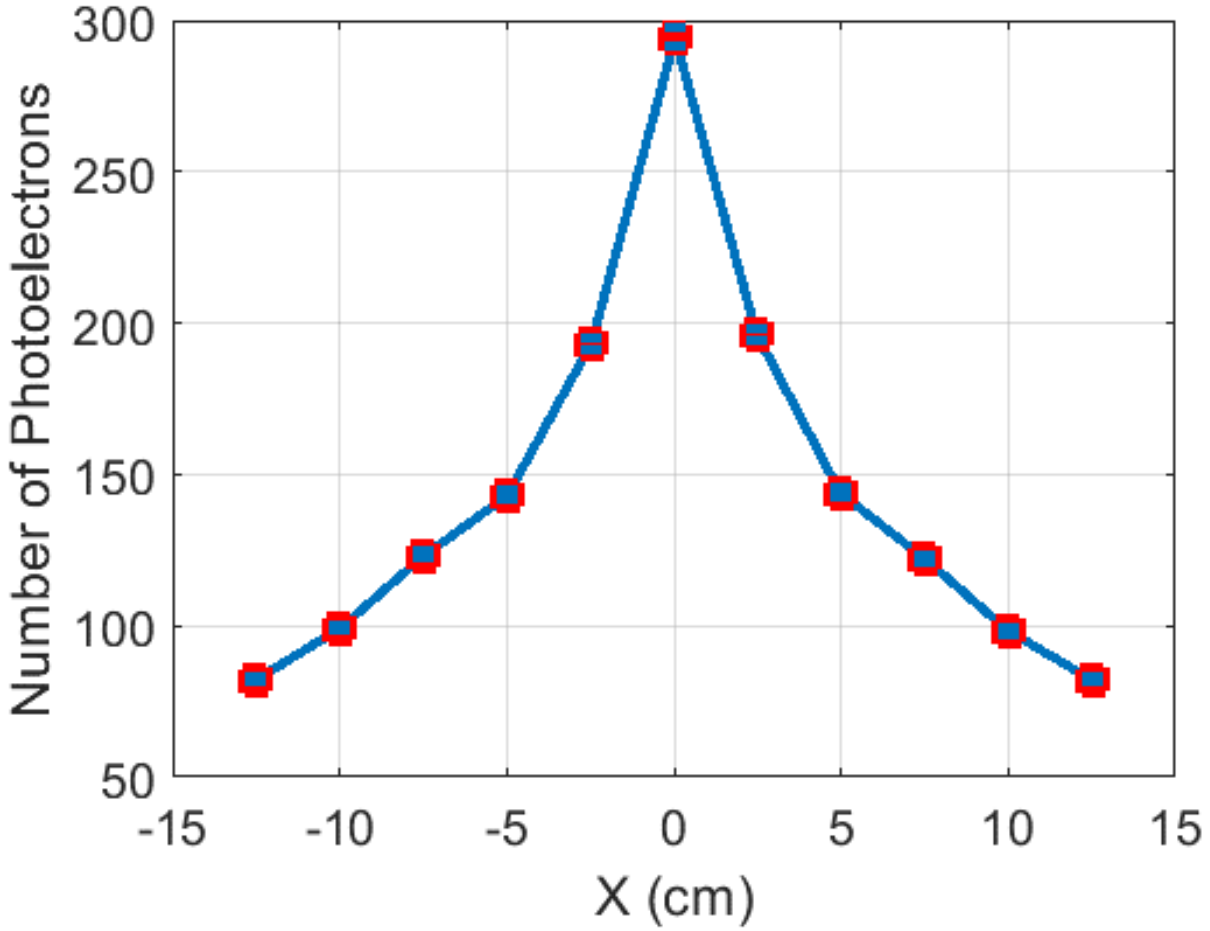
**Absorption coefficient and diffusion coefficient are just educated guesses.**

# Results

**Example of the energy spectrum of the active photons:**



# Results


Number of Photoelectrons
300
250
200
150
100
50
-15
-10
-5
0
5
10
15
X (cm)

# Conclusion

- **Simulated properties of a Moller experiment Lucite Pion Detector were presented.**

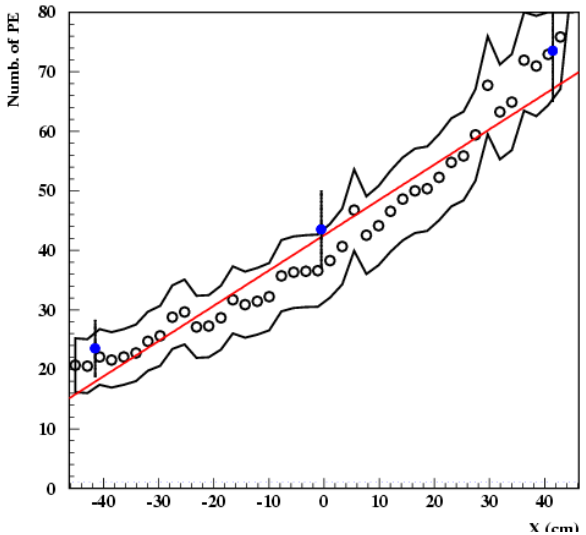
- **The results depend of several parameters from which Quantum Efficiency is well known. Indexes of refraction for both lucite and borosilicate glass were assumed constant while they are wavelength dependent (small contribution to the error). Absorption coefficient and diffusion coefficient are also wavelength depended and were just educated guesses (somewhat larger contribution to the error).**

- **Reflectivity was not taken into account since is dependent on quality of polishing and is a small effect for such a small detector.**

- **The combination of the simulation and the testing of the prototype in the forthcoming period will contribute to a possibility for an improvement in the detector design.**

# *Historical Data for the Qweak experiment: Comparing Simulation and Measurement*

- **Comparison with Los Alamos data with bialkali photo-cathode :**




- **Comparison with Los Alamos data if S20 photo-cathode:**