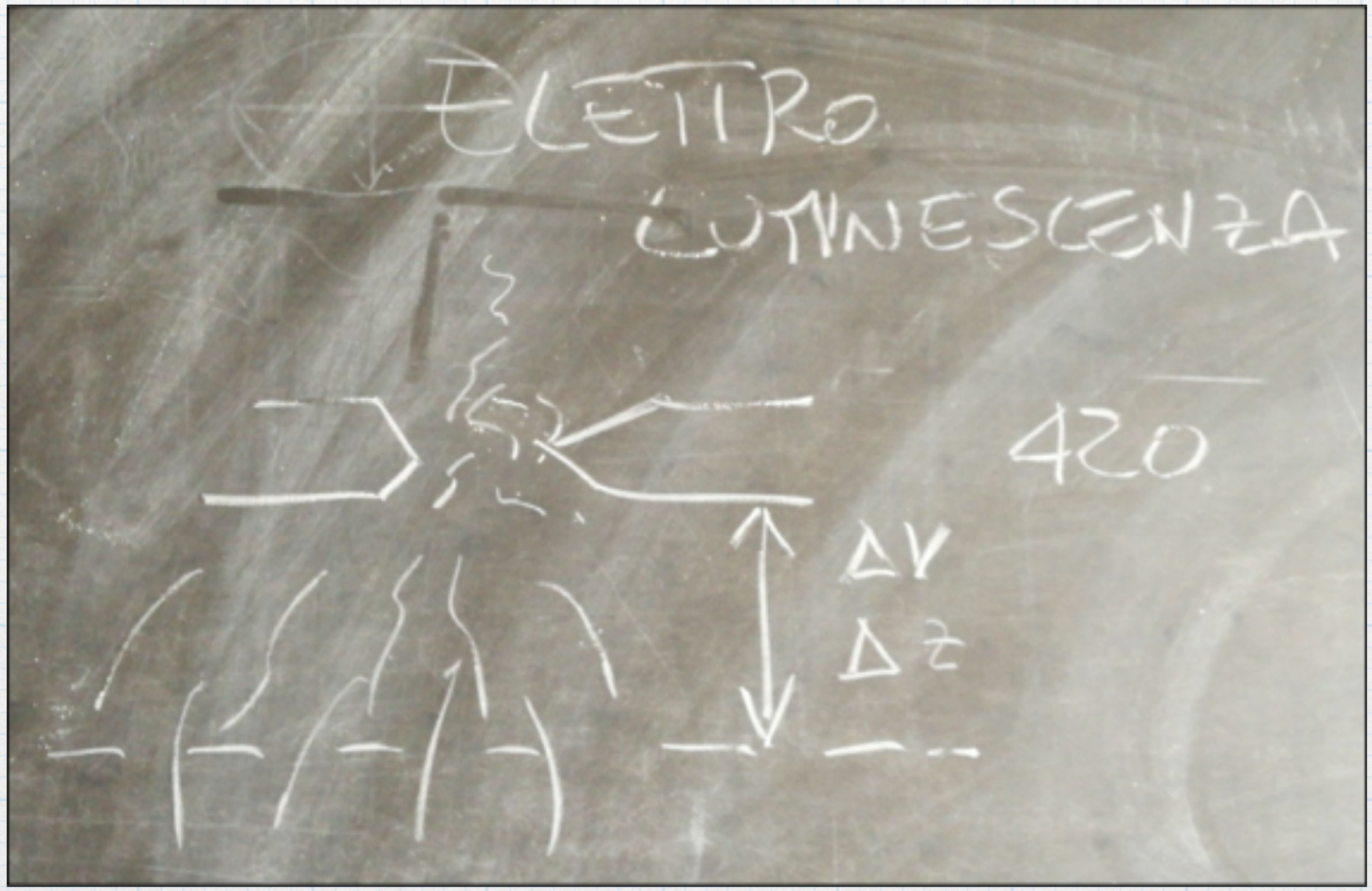
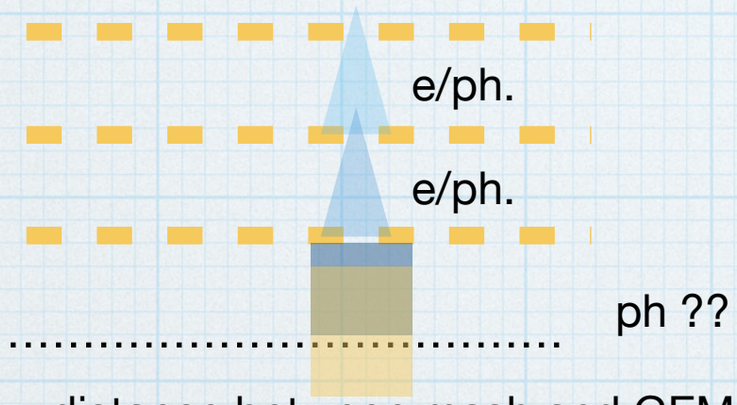
# Electroluminescence



# Principle of operation

We can add a grid below the Triple GEM structure:




$\Delta z$=distance between mash and GEM

$\Delta V$= tension between mash and GEM

We can decrease the gain of GEMs so that e.g. for 1 electron reaching the GEM $10^5$ electron are produced in third GEM (more than half of the will be captured by the GEM electrode, let's say 2/3).

In the very high fields inside the GEM we get 8 x $10^3$ photons;
In the low electric field below the GEM we'll have 3 x $10^4$ electrons.
**If we manage to make each electron creating a 2 or 3 photons we can have the same amount of light.**

To have an idea about the number of photons we can produce, we started from a phenomenological formula (valid for Xe)

Development and Characterization of a Multi-APD Xenon Electroluminescence TPC

$$\eta = 140\left(\frac{\Delta V}{p\Delta z} - 0.83\right)p\Delta z$$

p= gas pressure
$\Delta z$=distance mesh - GEM3
$\Delta V$= tension mesh - GEM3

# Experimental setup

## Effect of the electric field on the primary scintillation from $CF_4$

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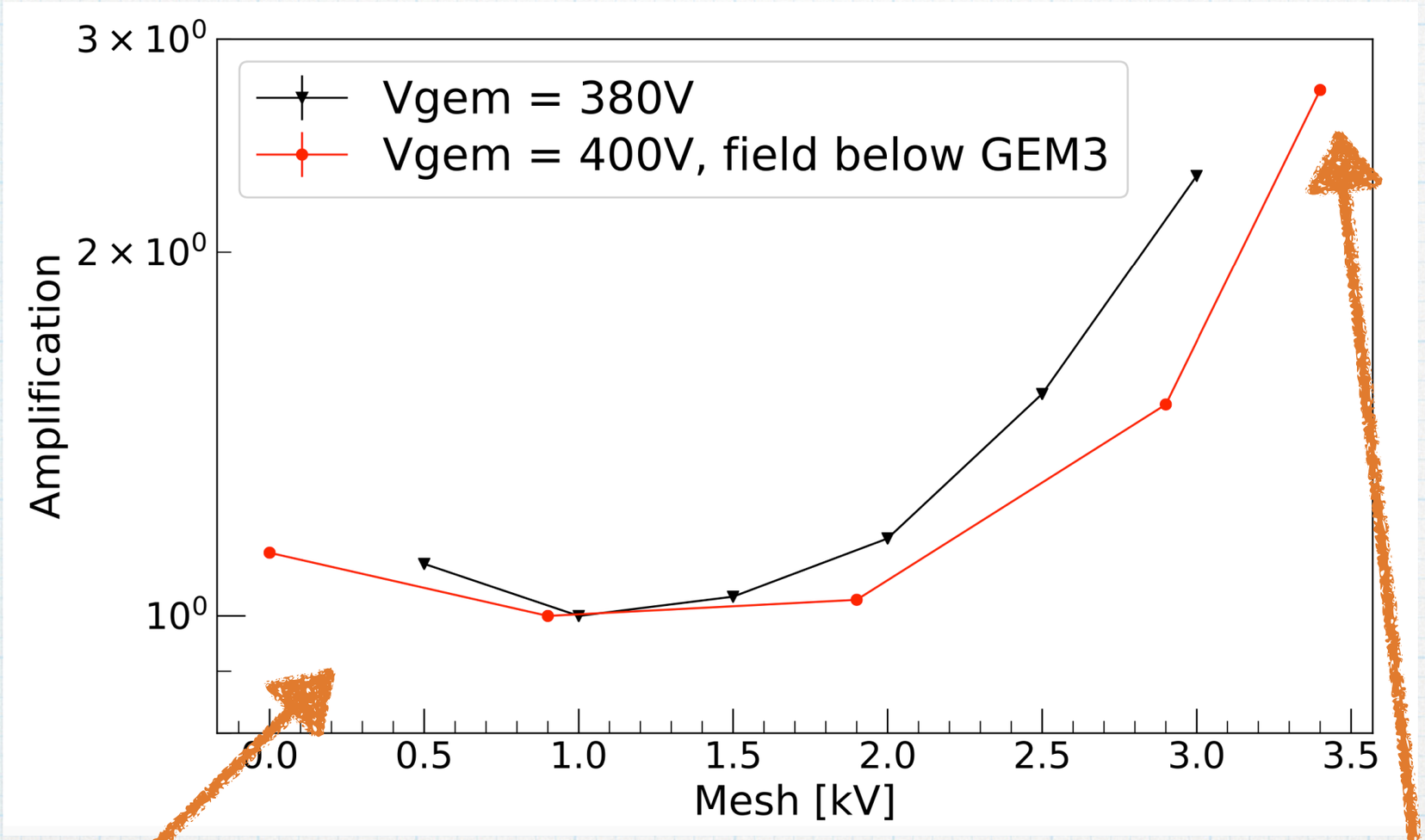
**Abstract**

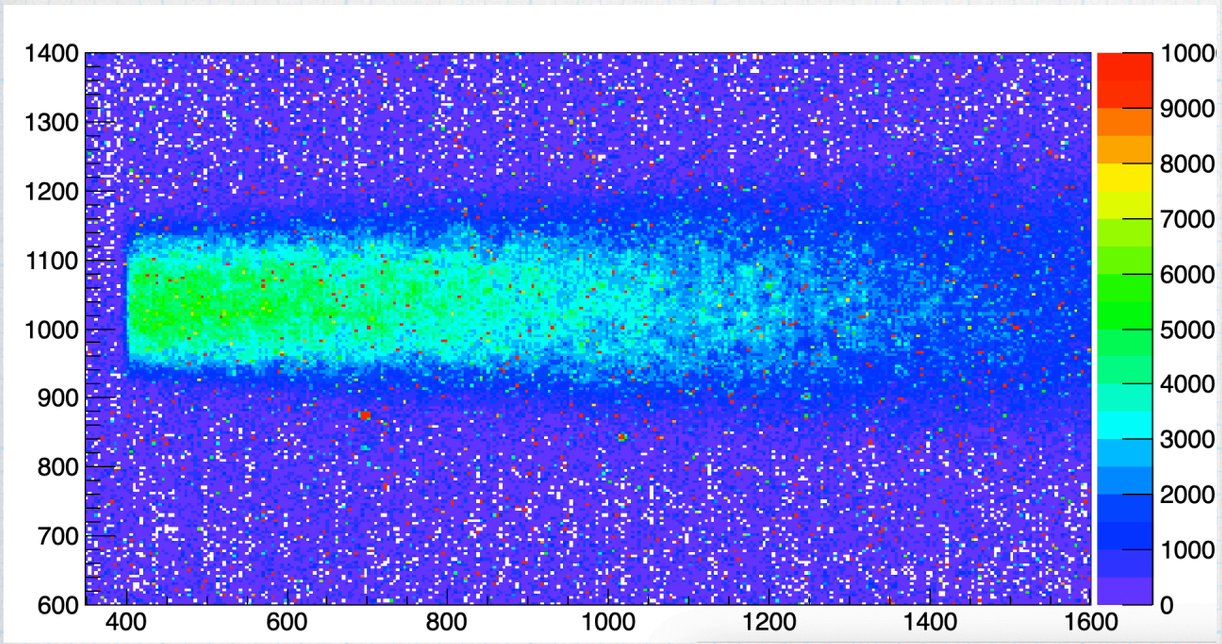
The effect of an electric field on the primary scintillation from $CF_4$ in the ultraviolet and visible wavelength regions (200 - 800 nm) is reported. The study was performed in the pressure range from 1 to 5 bar and at electric fields of up to 2 kV/cm. Photon emission spectra, fully corrected for the detection response, and the absolute photon yields in the ultraviolet and visible regions are reported. The $CF_4$ emission spectra and the photon fluxes show no variations with the field at low pressures (~1 bar), while at higher pressures the effect of the field on the scintillation is strong: the ultraviolet emission intensity increases and the visible intensity decreases with the field strength. Time spectra of the primary scintillation for several applied electric field strengths are also reported for the two wavelength regions of light emission.

*Key words:*
$CF_4$, primary scintillation, emission spectra, photon yield, time spectra

Since it was found that $CF_4$ electroluminescence has a very high energy threshold, we decided to modified MANGO adding a **grid** with **$\Delta z$=2/3 mm** and **$\Delta V$ up to 3 kV** in order to have electric fields up to 10/15 kV/cm

Then, we tested everything with $^{55}Fe$ X rays.


Vgem = 380V
Vgem = 400V, field below GEM3
Amplification
$3 \times 10^0$
$2 \times 10^0$
$10^0$
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Mesh [kV]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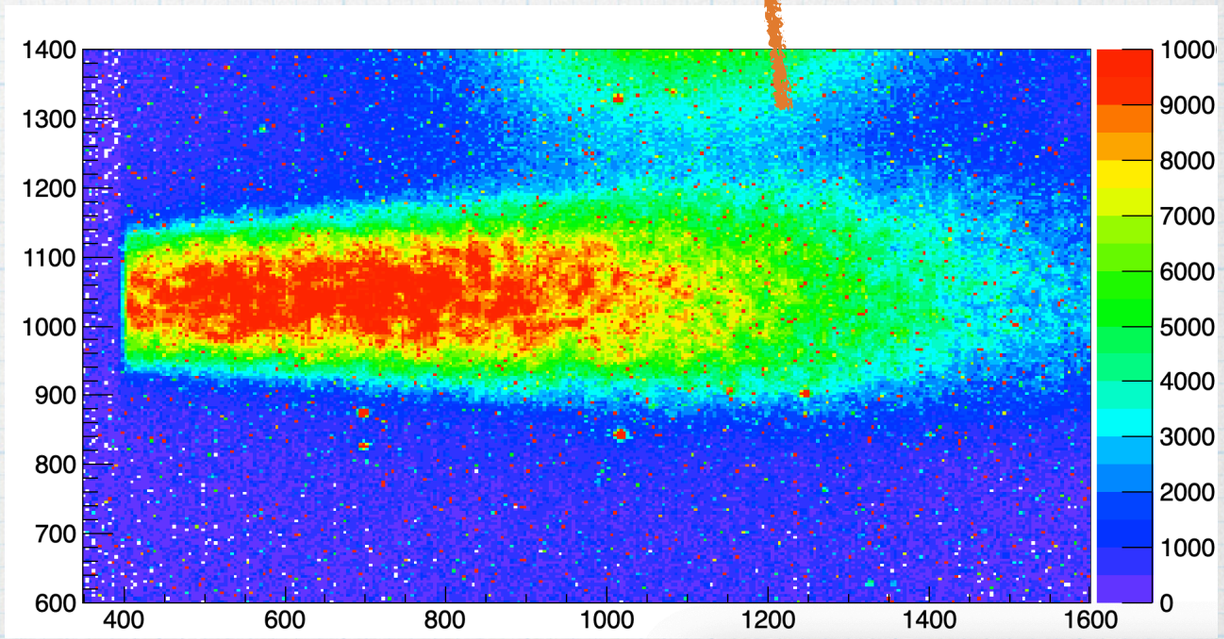
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