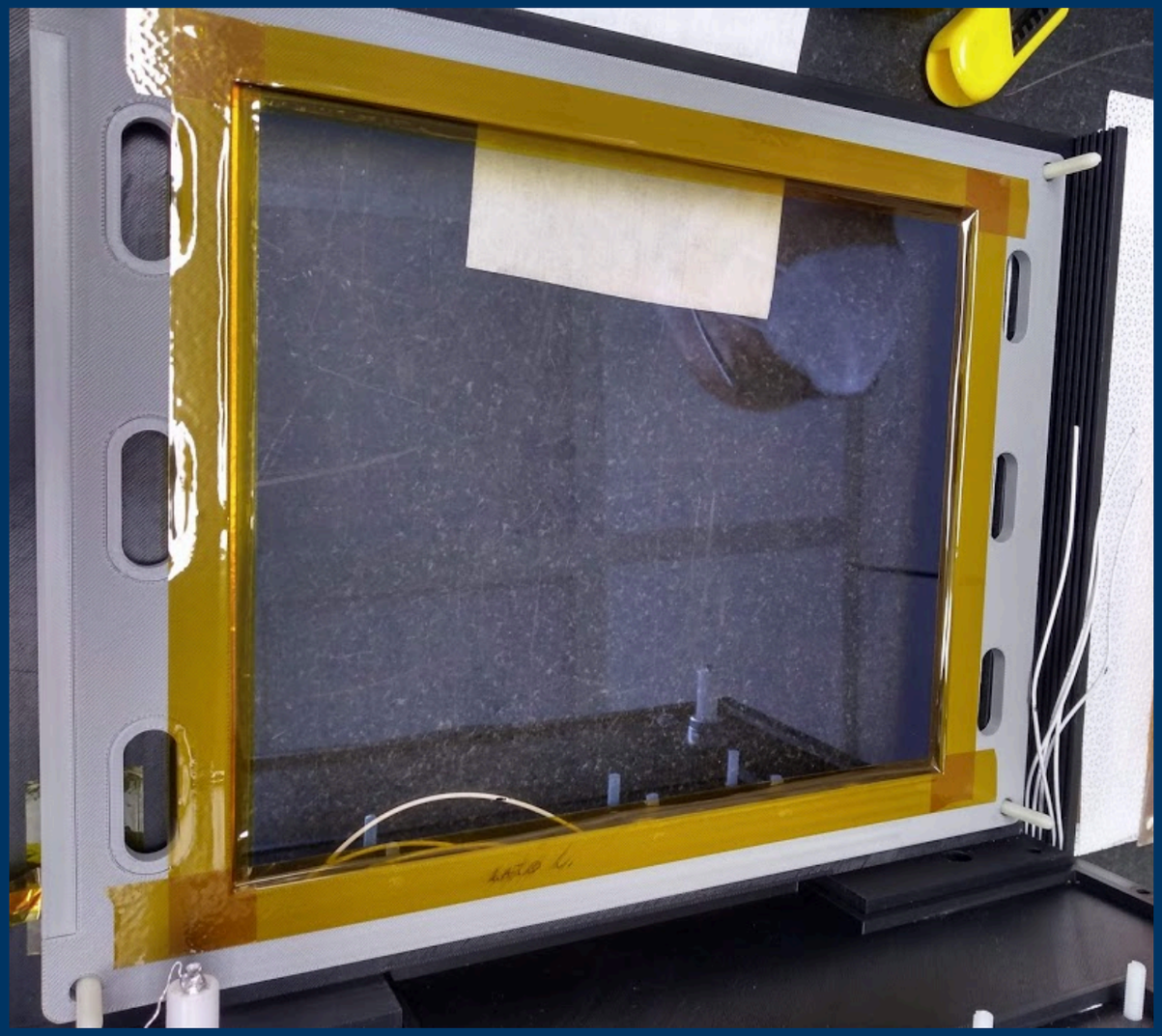
y d pink floyd p

LET THERE BE MORE LIGHT

CYGNO
Collaboration

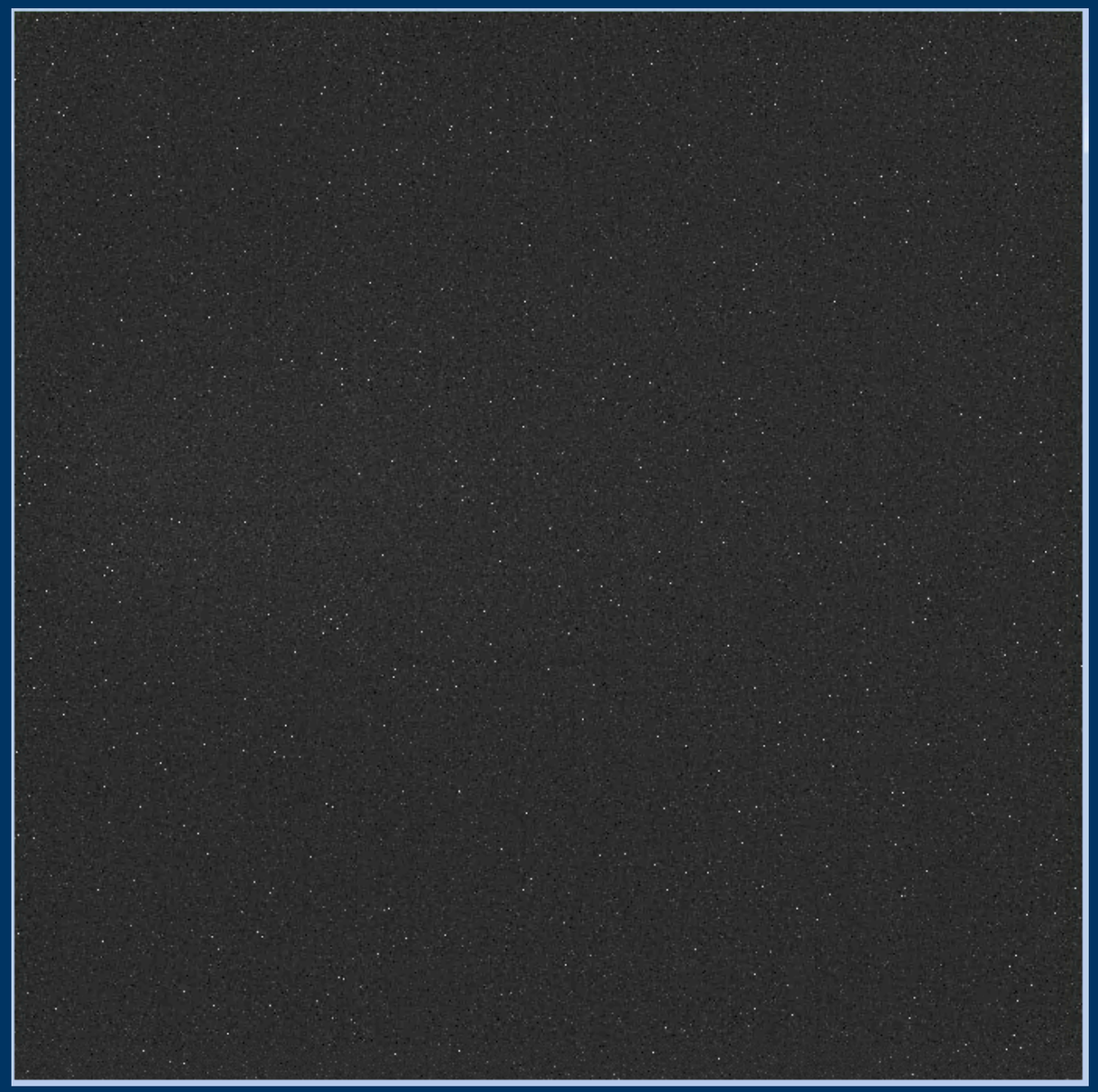
New test at LNF

- In LEMON we are trying to study in more details luminescence phenomena induced by electrons below the last GEM as a part of more general studies about gain saturation and possible solutions;
- A conductive (7Ω/□) glass ITO-coated is used to accelerate them;

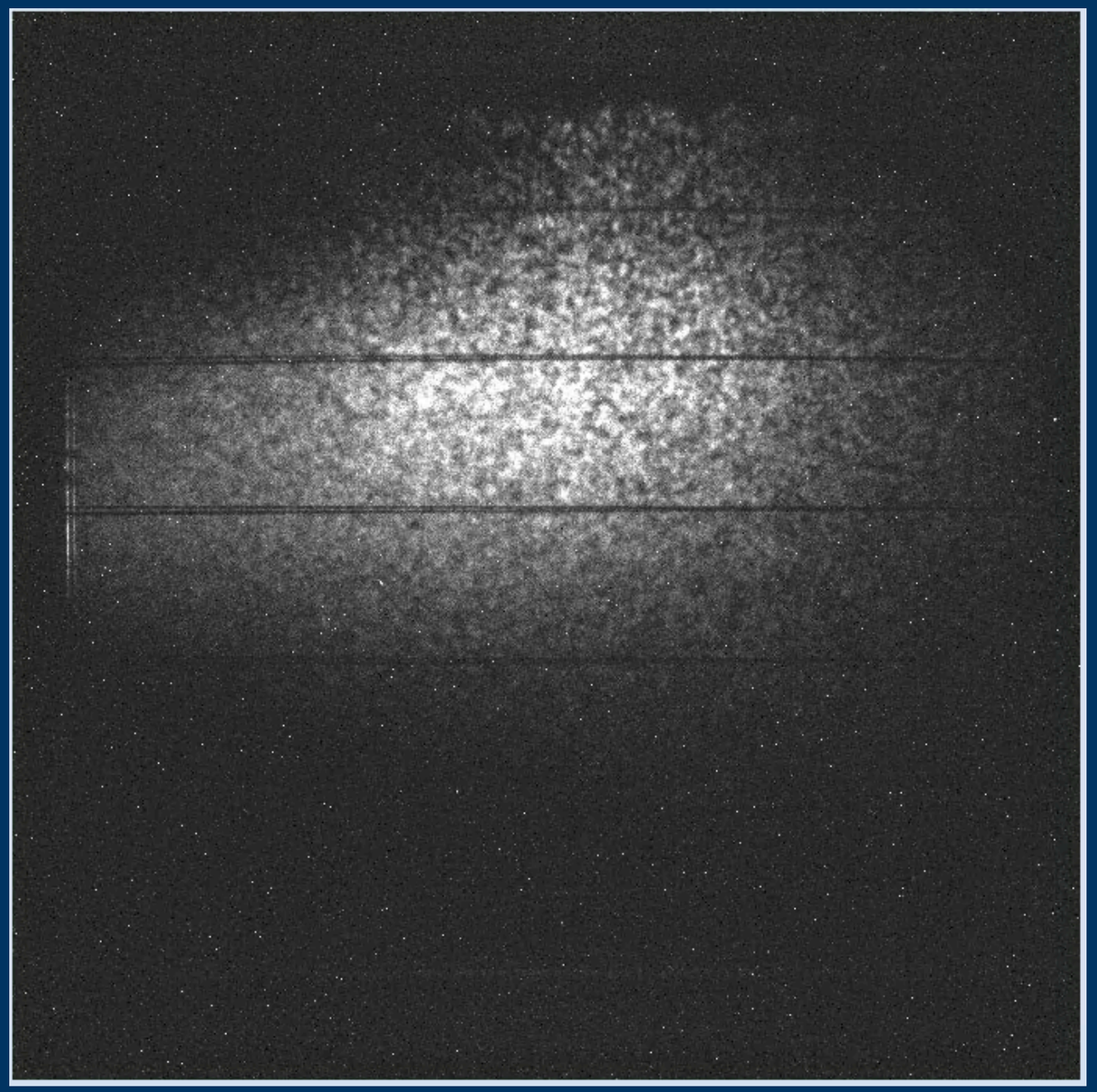


- Thickness 0.7 mm;
- Transmittance at 550 nm: 89%;
- Reflection less than 4%;

New test at LNF

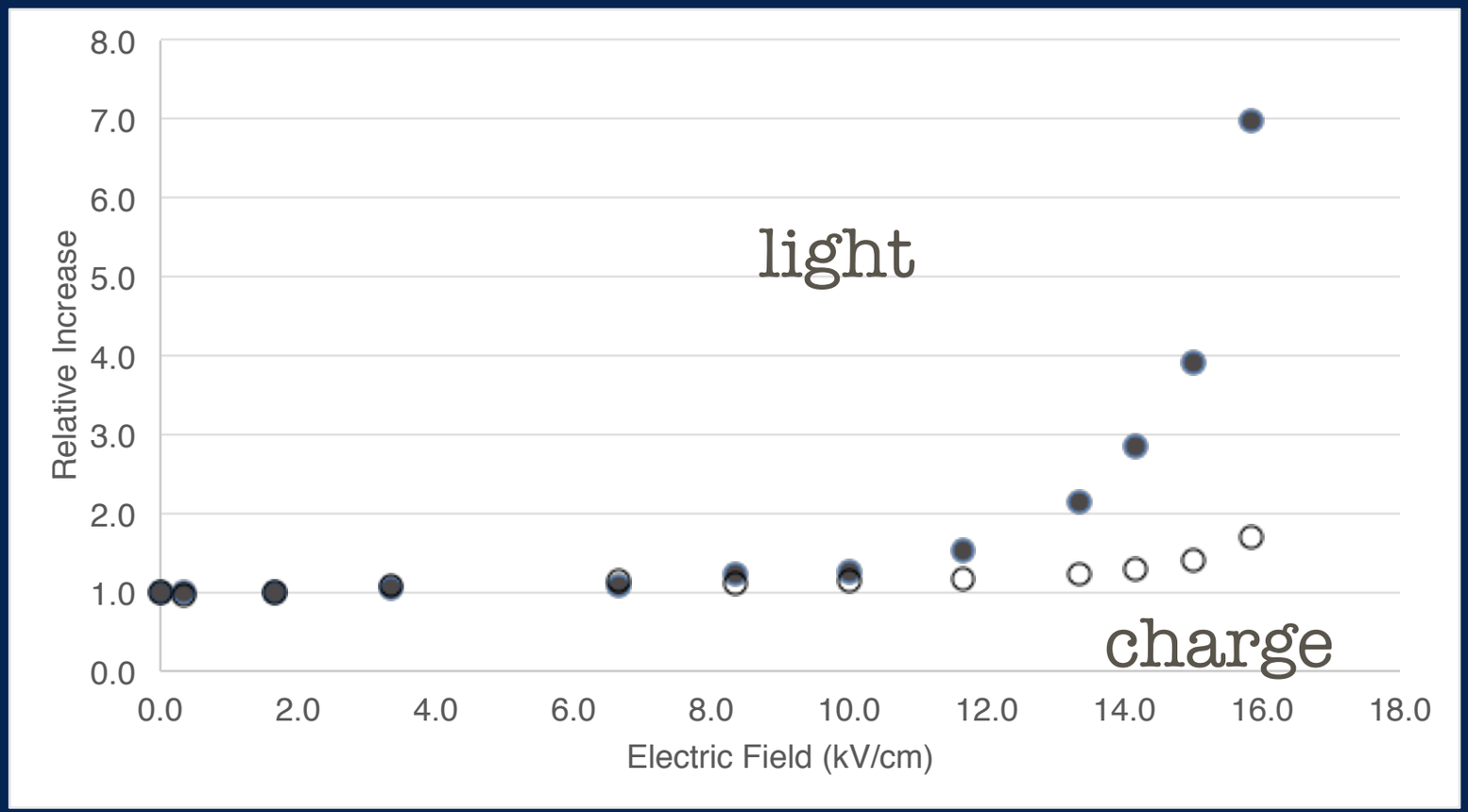


VGEM = 365 V
No field below GEM#3



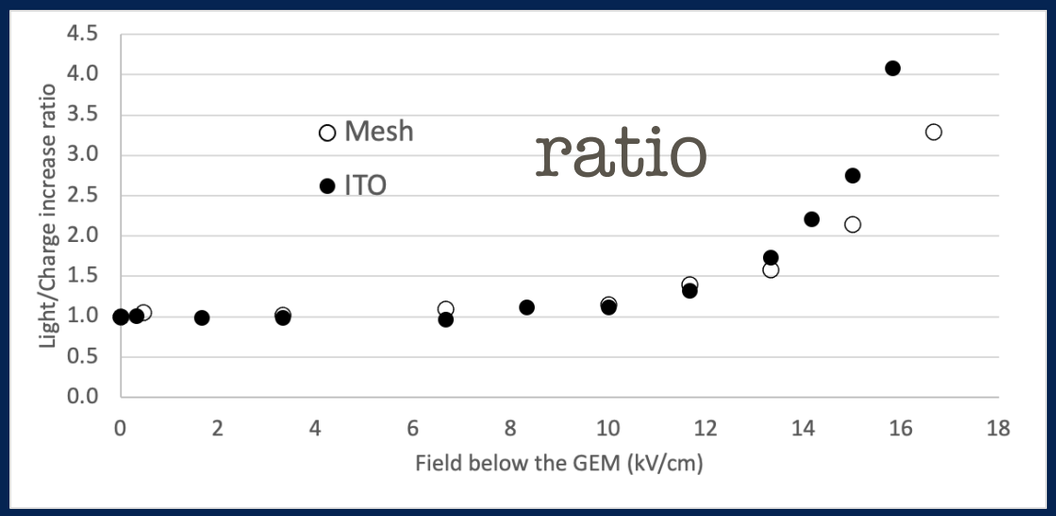
VGEM = 365 V
16.7 kV/cm field below GEM#3

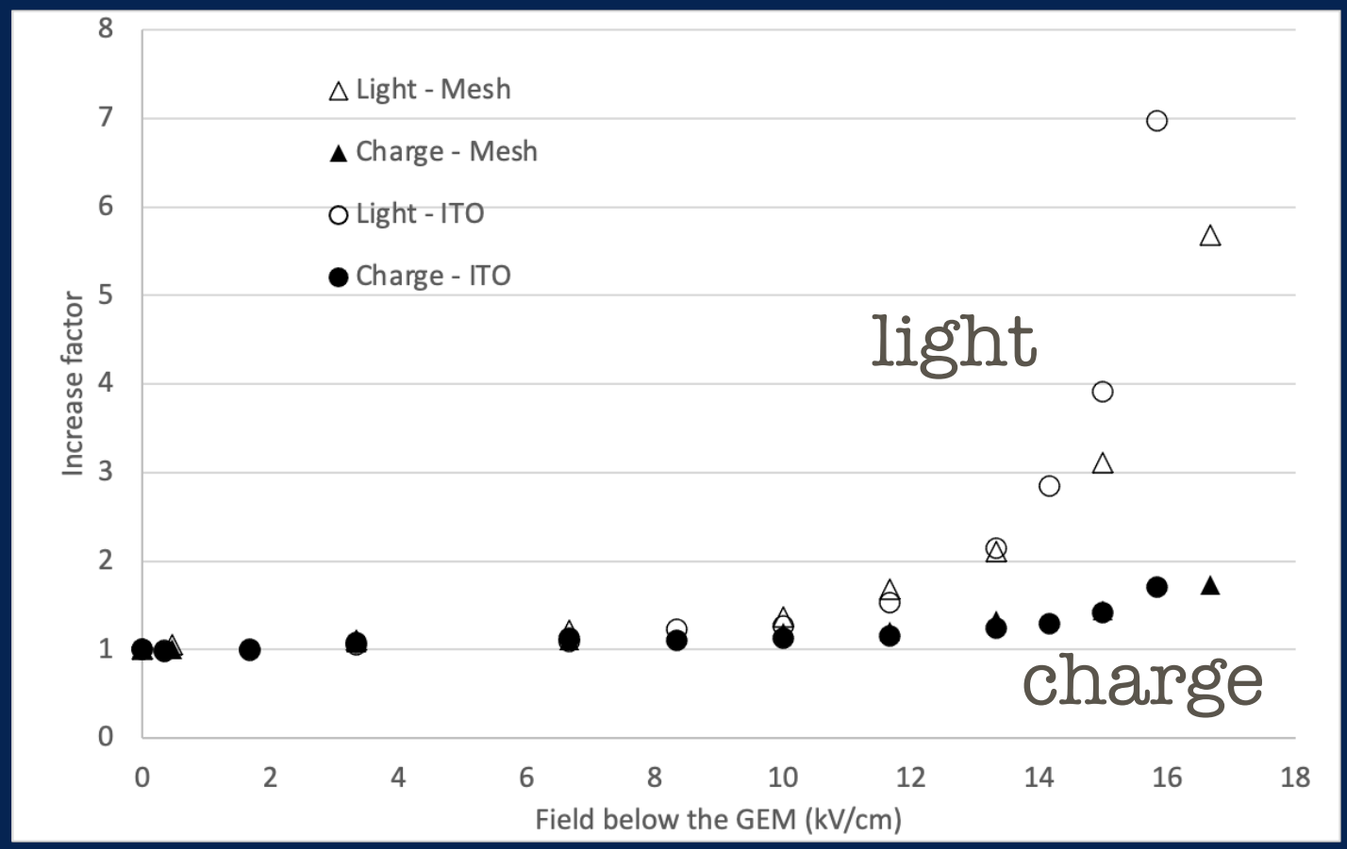
ITO



We did the usual scan on Electric field below the GEM.

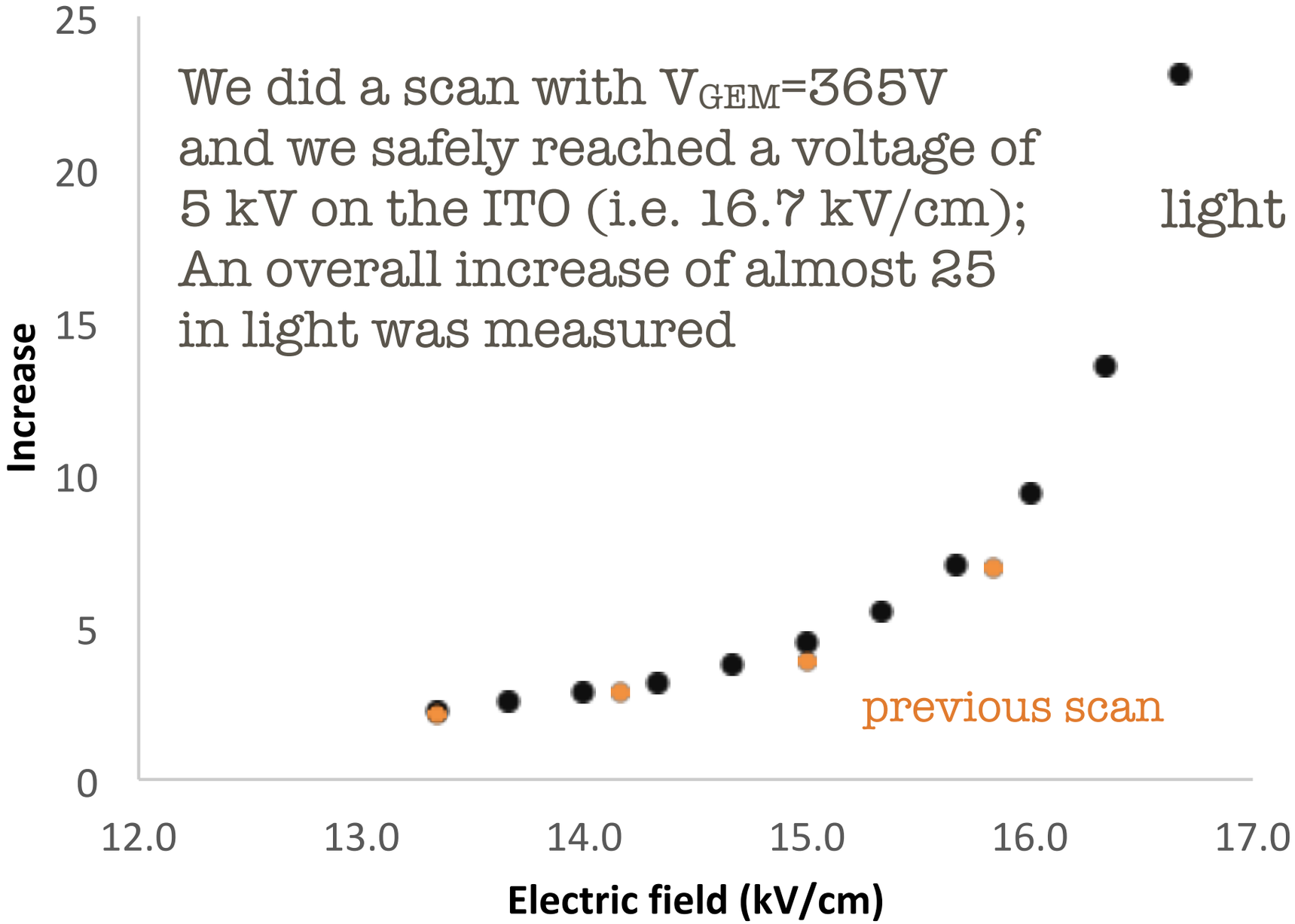
Results obtained are similar (within a 25%) with the ones obtained with the Mesh.



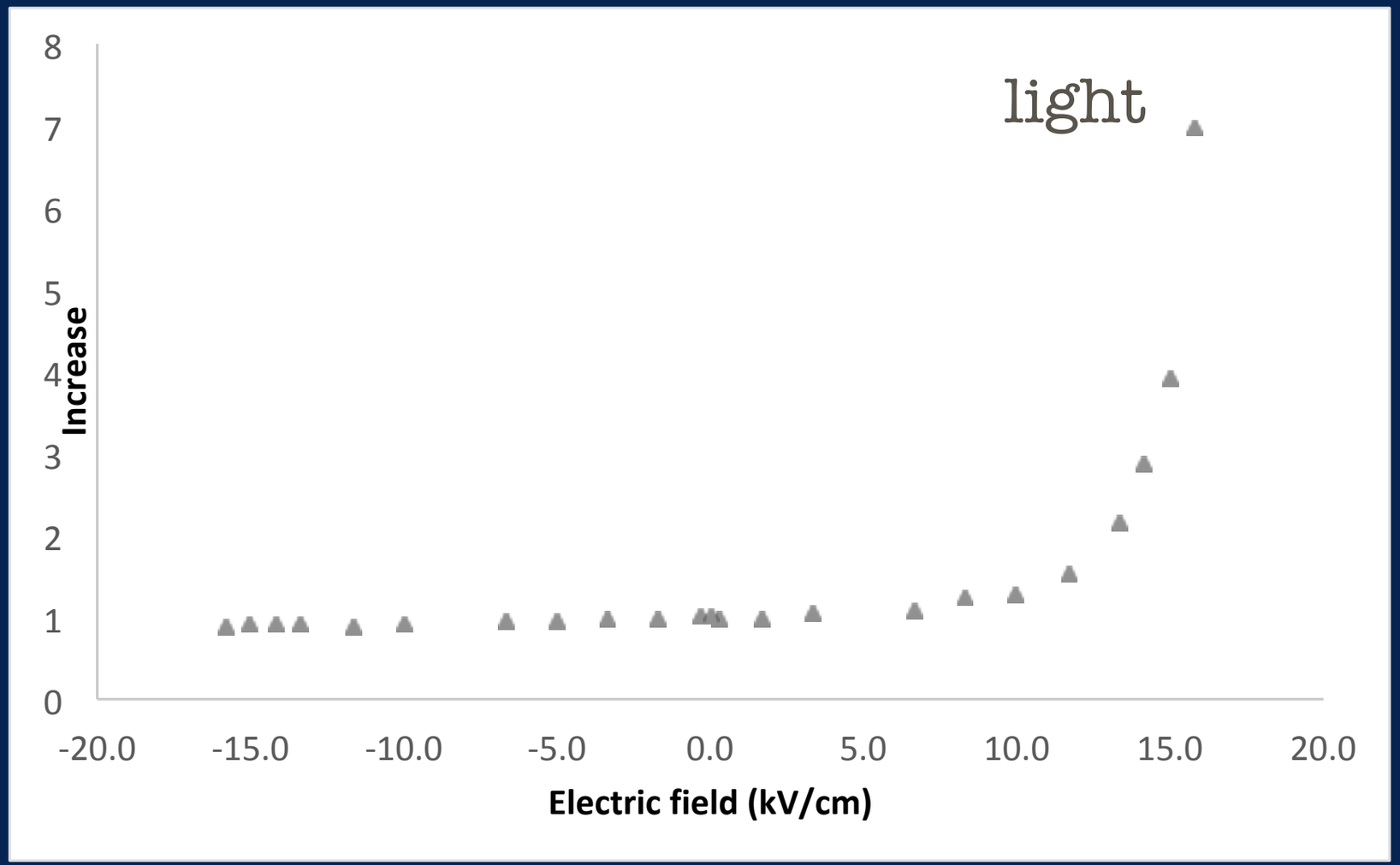


ITO

We did a scan with V_{GEM}=365V and we safely reached a voltage of 5 kV on the ITO (i.e. 16.7 kV/cm); An overall increase of almost 25 in light was measured

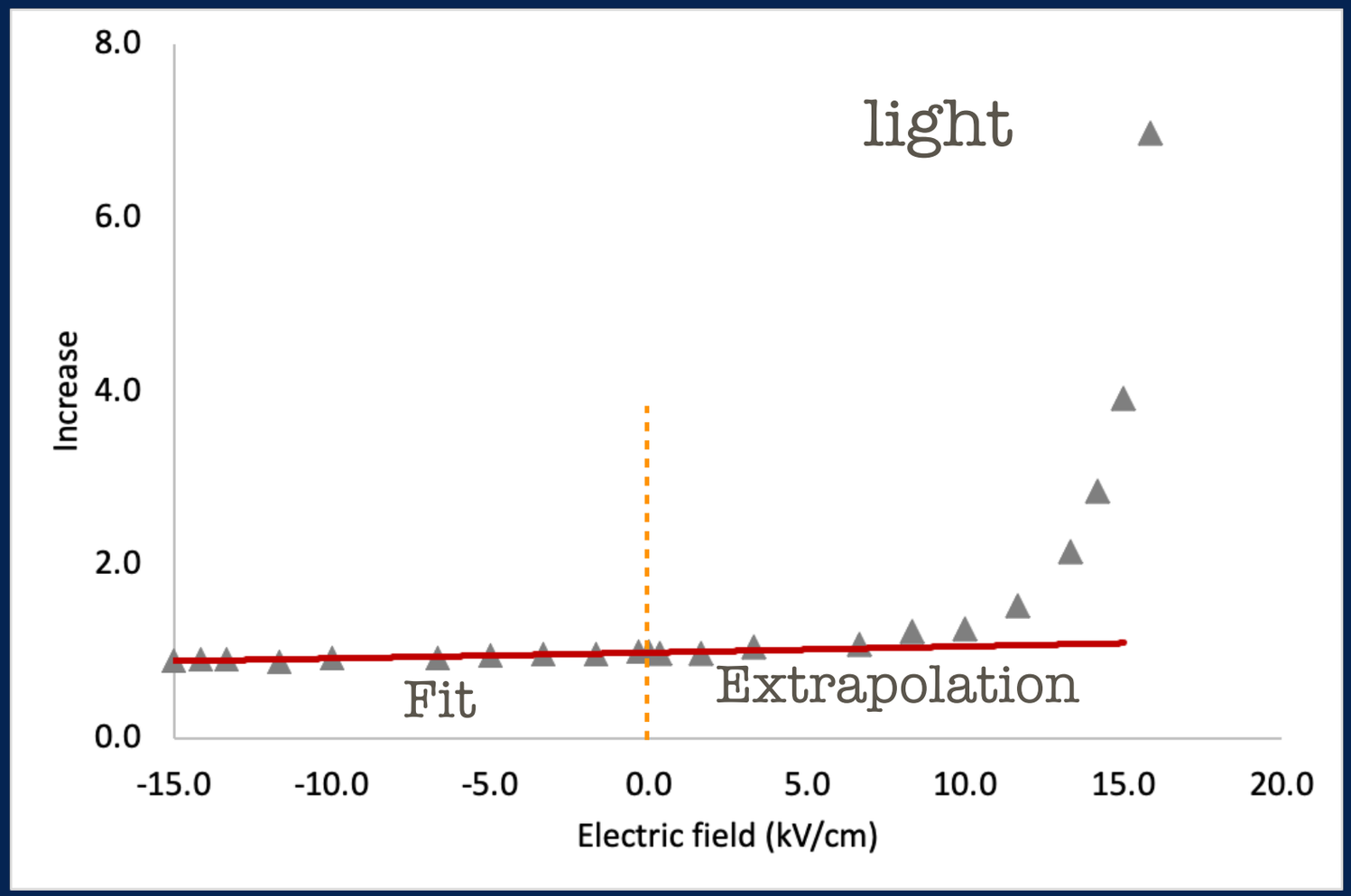


ITO



To check how the external electric field “influences” the field in the GEM, we applied a negative voltage to ITO.
With a field of -15.8 kV/cm a decrease of 10% in light was observed (to be compared with an increase of about 7 for +15.8 kV/cm)

ITO



The exponential extrapolation to negative field data indicates a continuous increase up to about 8-10 kV/cm.
Then another process arises;

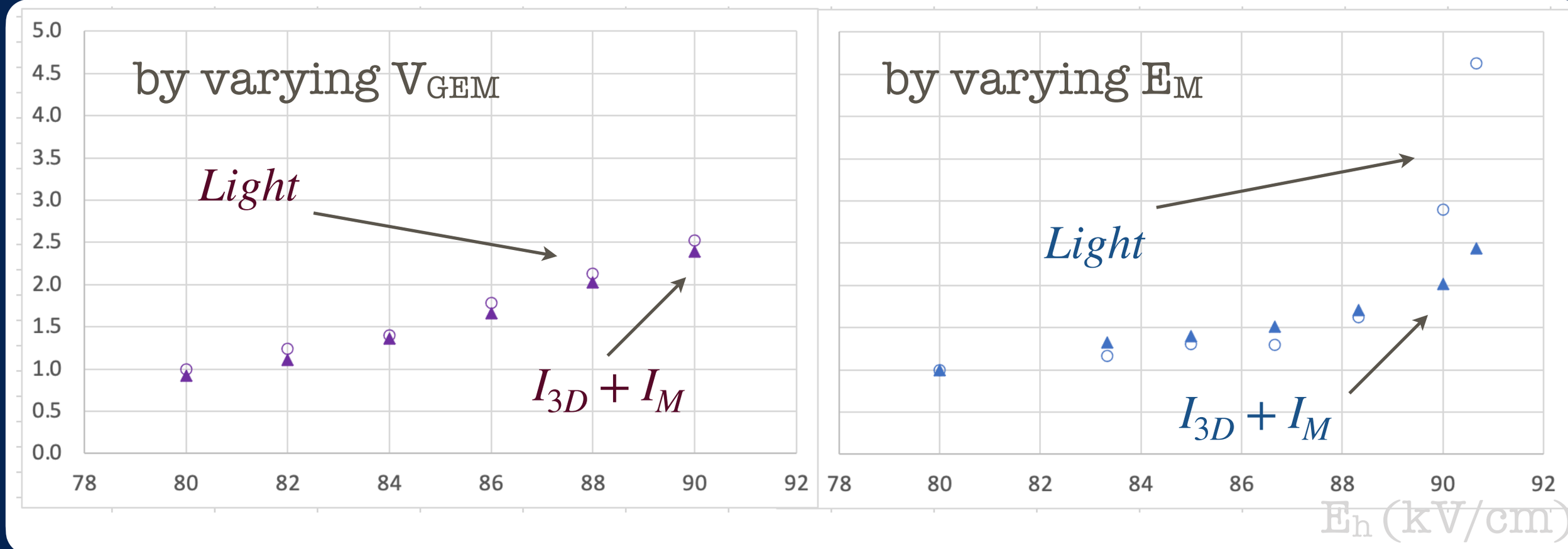
GEM#3

Mesh

Electric field in the holes can be evaluated as

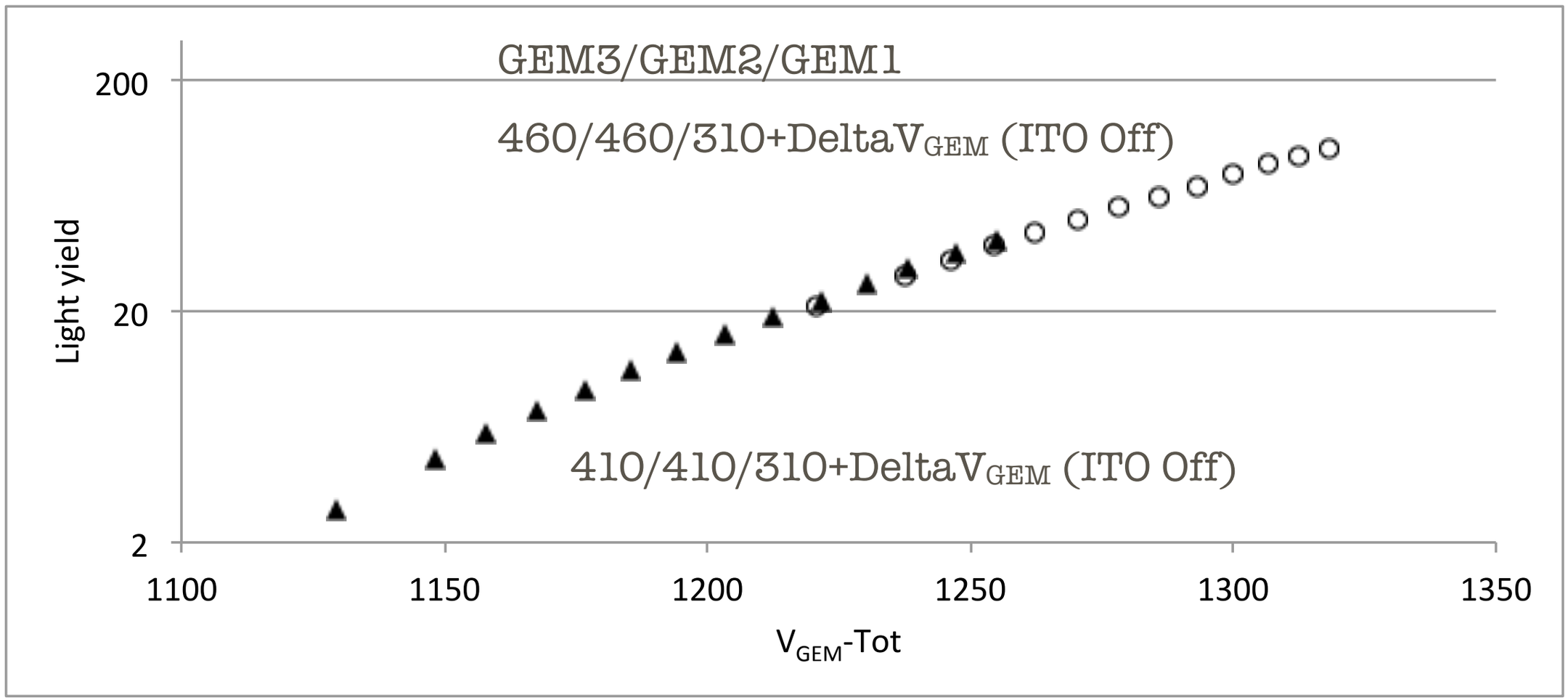
$$E_h = \frac{V_{GEM}}{50\mu m} + E_M$$

We studied the behavior of light and current as a function E_h;



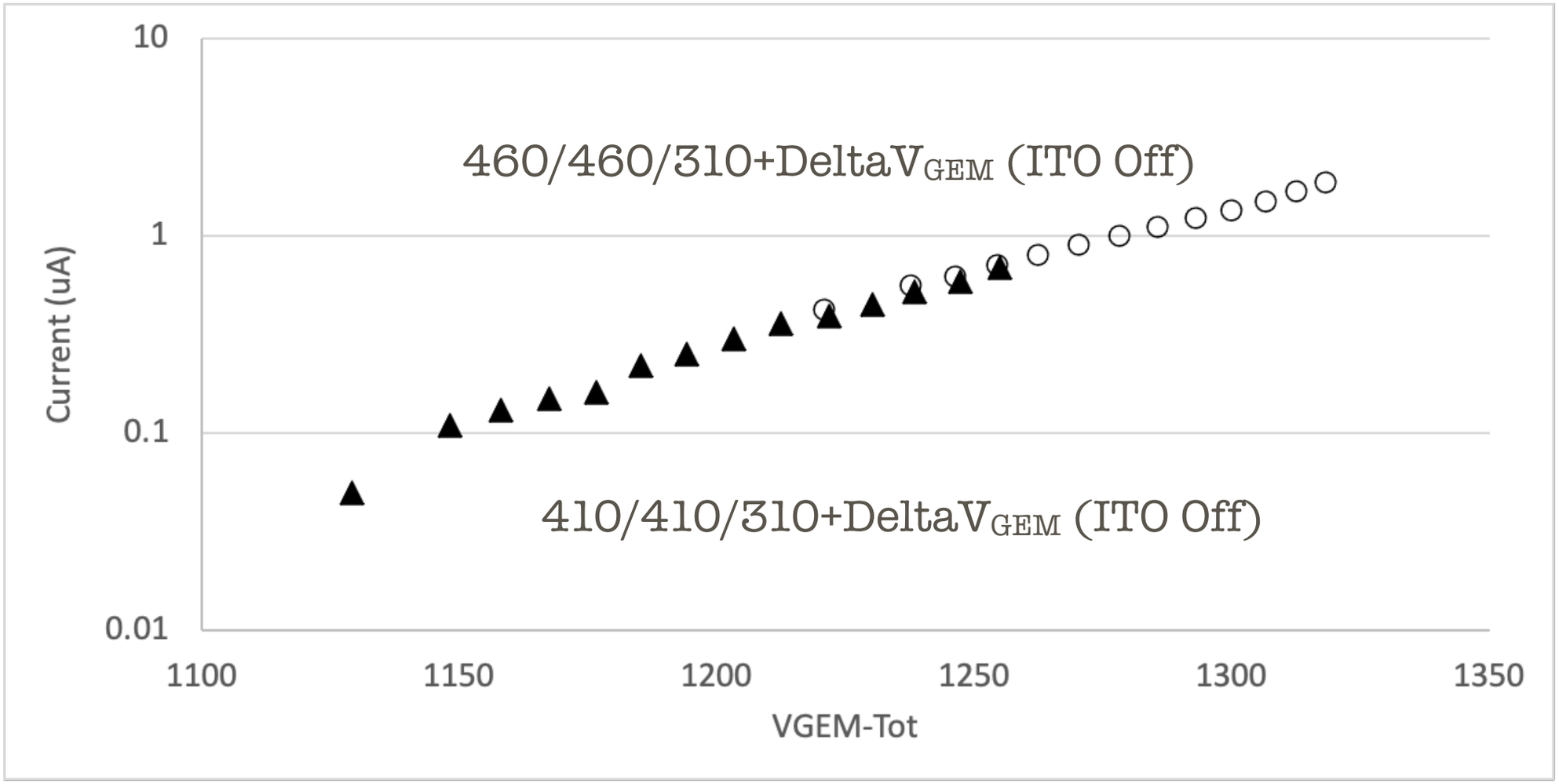
When increasing V_{GEM} light and current have the same behavior;
Effect of the E_M seems completely different;

ITO



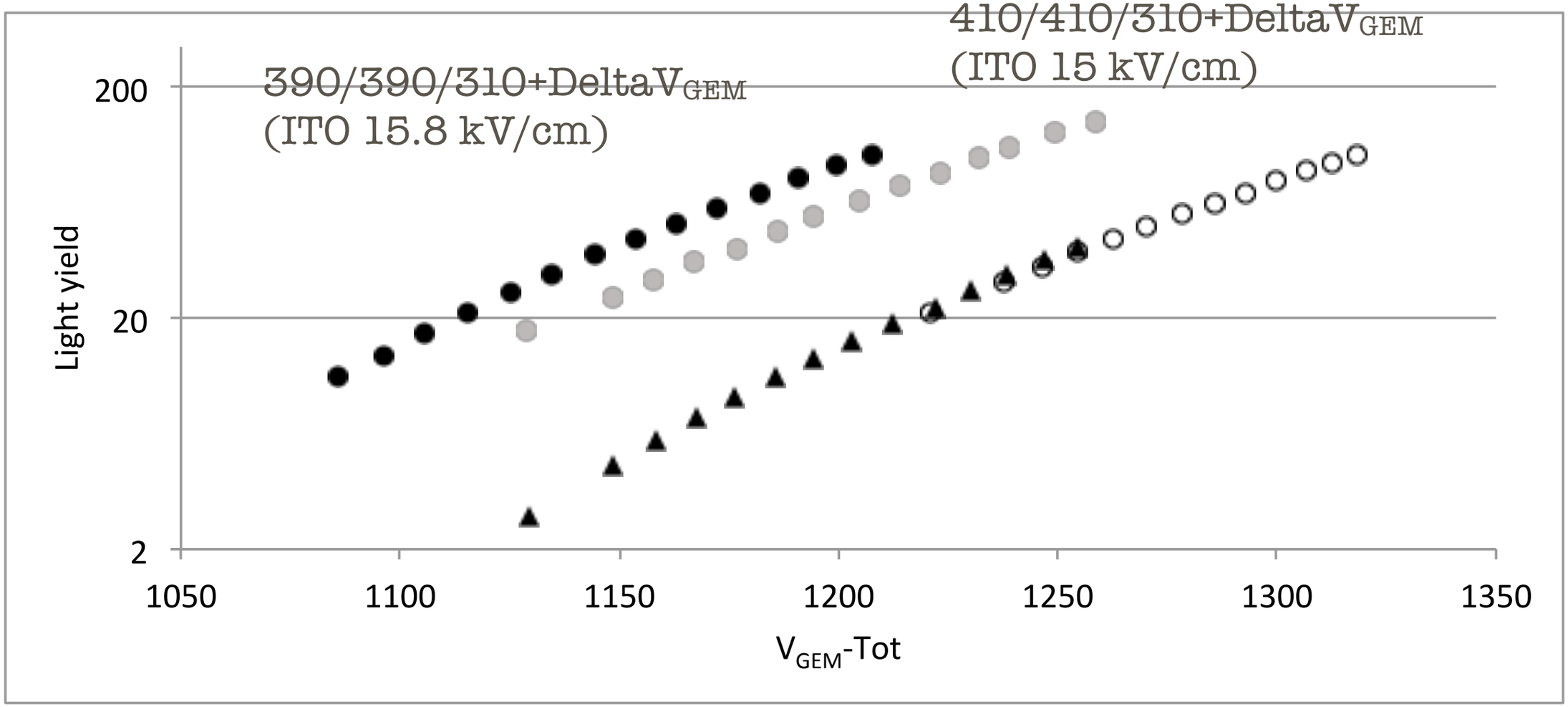
The light yield depends almost only on the sum of V_{GEM}

ITO



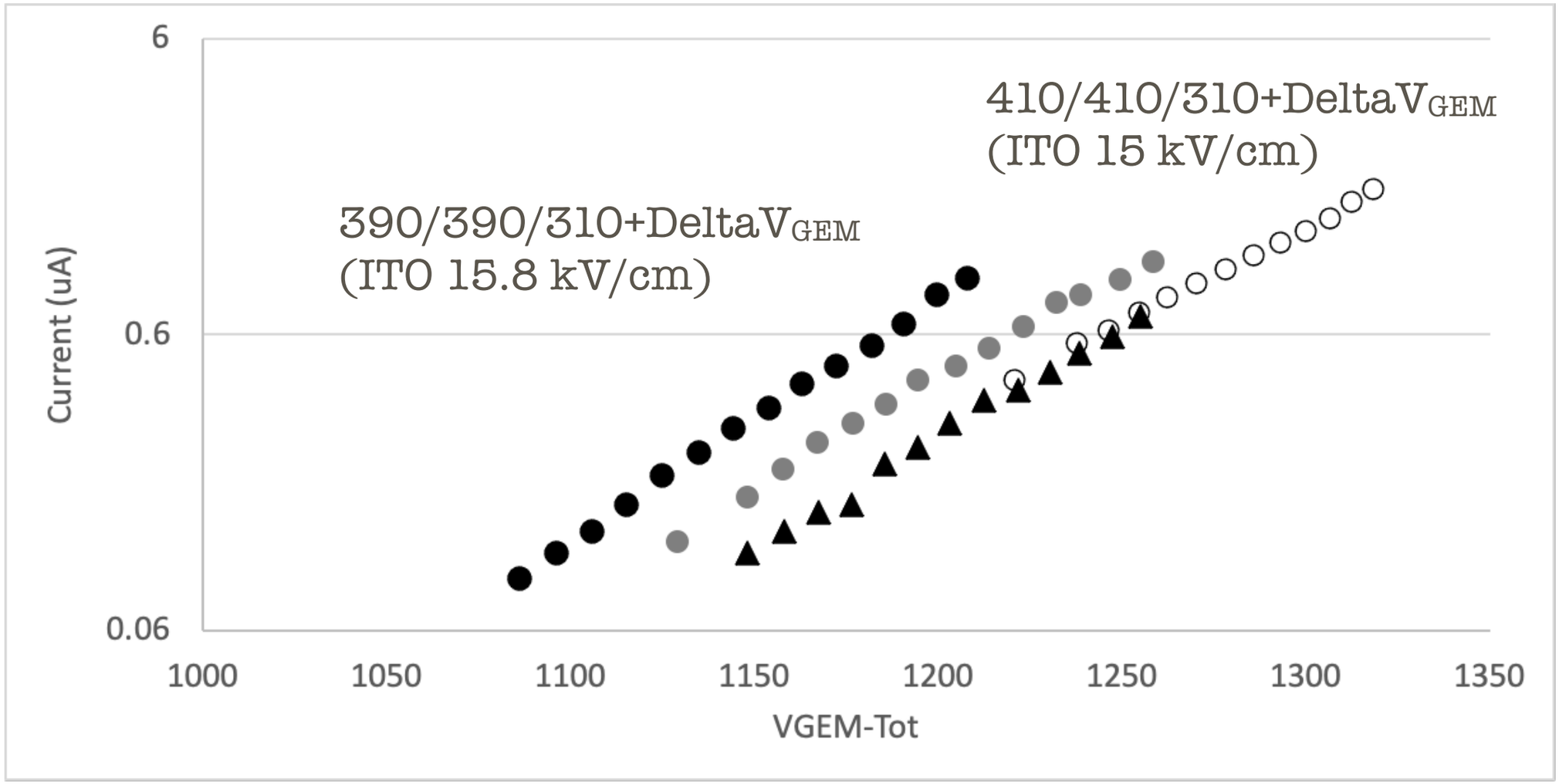
Same behavior for the current too: it depends almost only on the sum of V_{GEM}

ITO



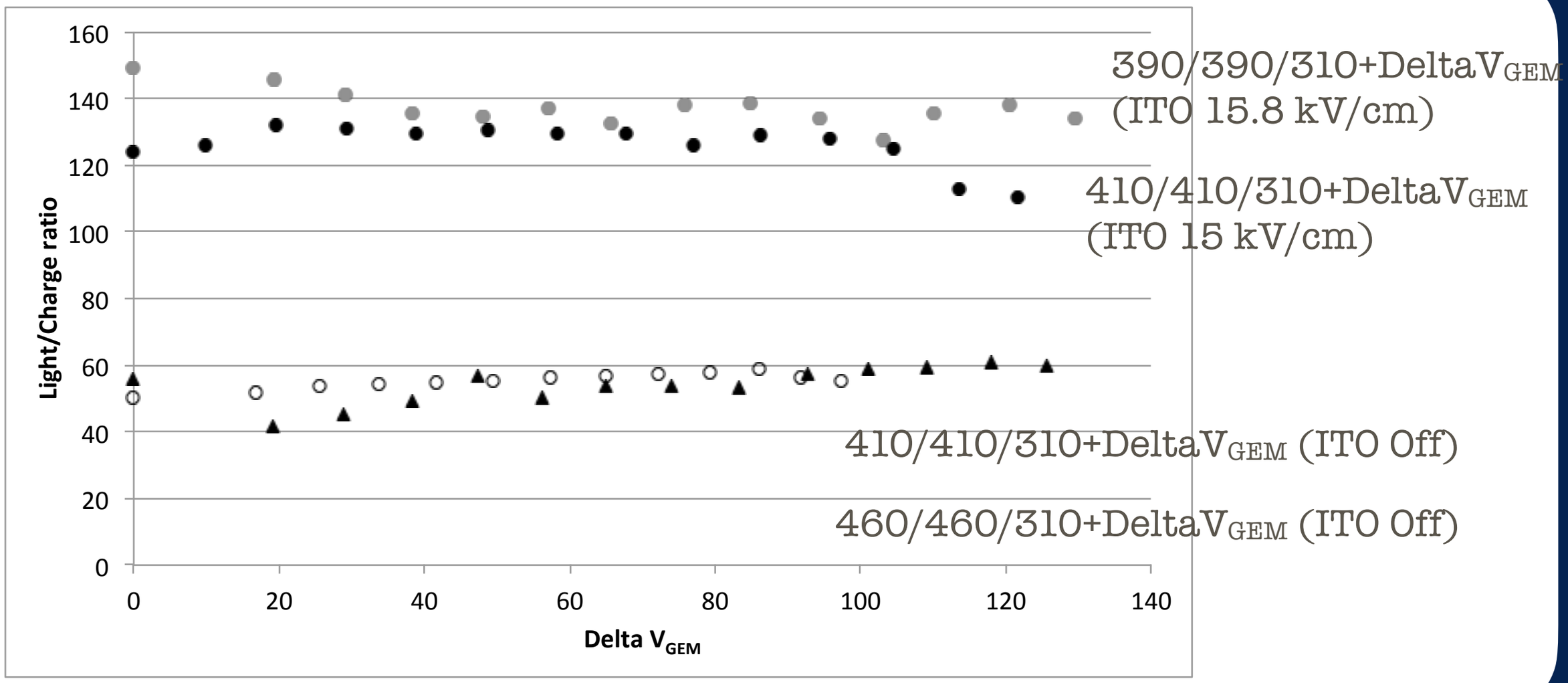
The light yield depends almost only on the sum of V_{GEM} and on the Field below the third GEM;

ITO



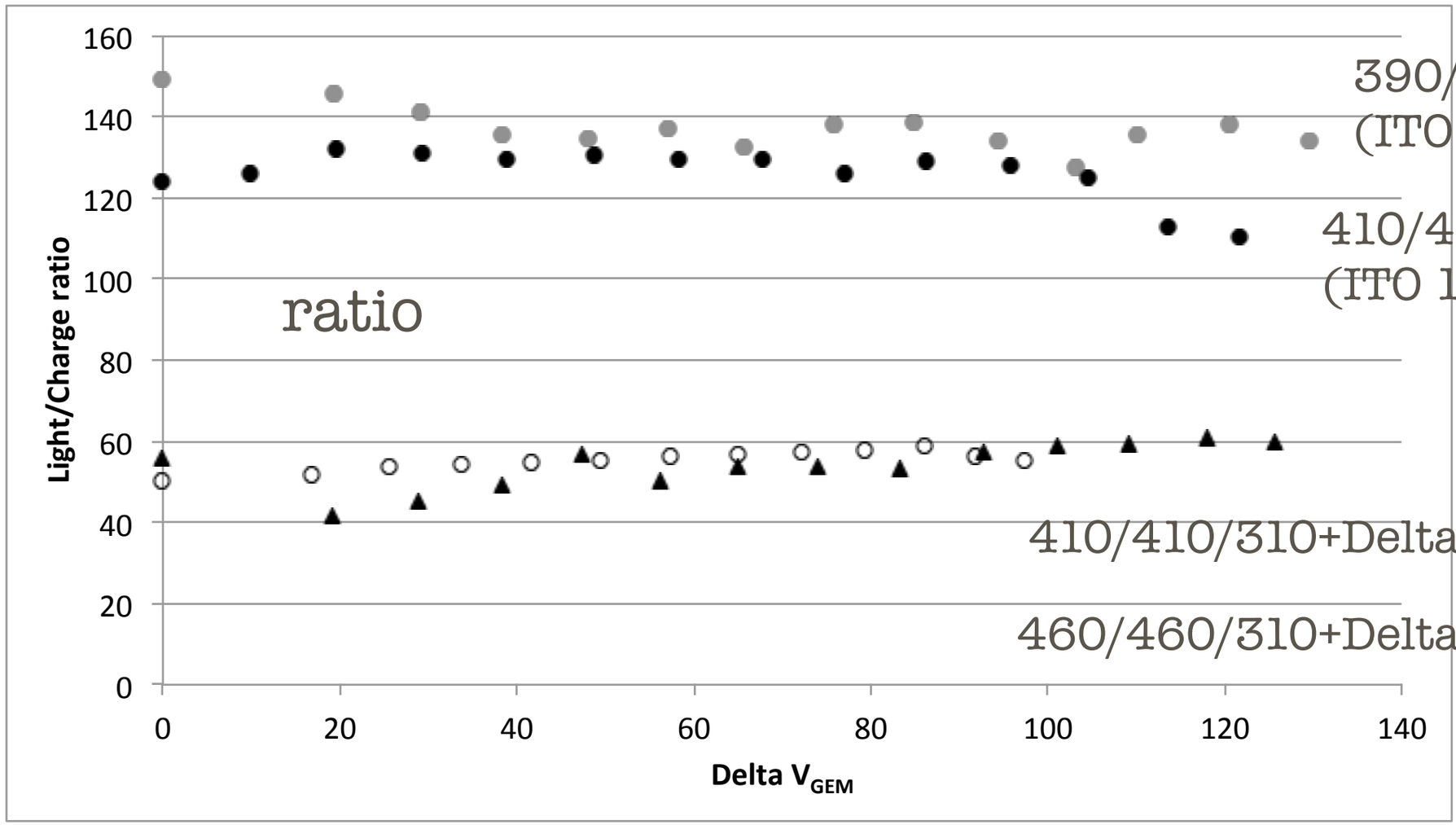
Same behavior for the current too: it depends almost only on the sum of V_{GEM+} on the ITO voltage.

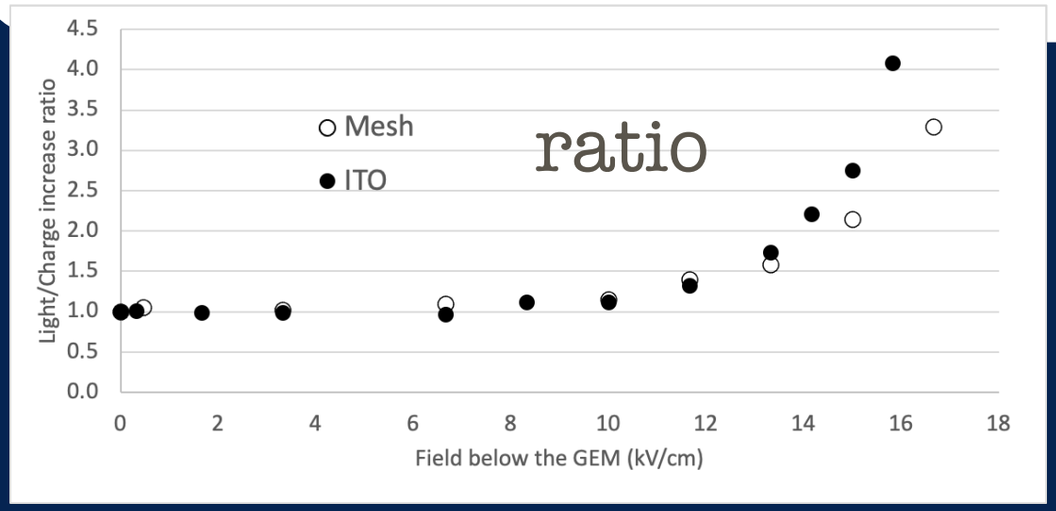
ITO



The ratio between light and charge seems to depend only on the ITO voltage

ITO

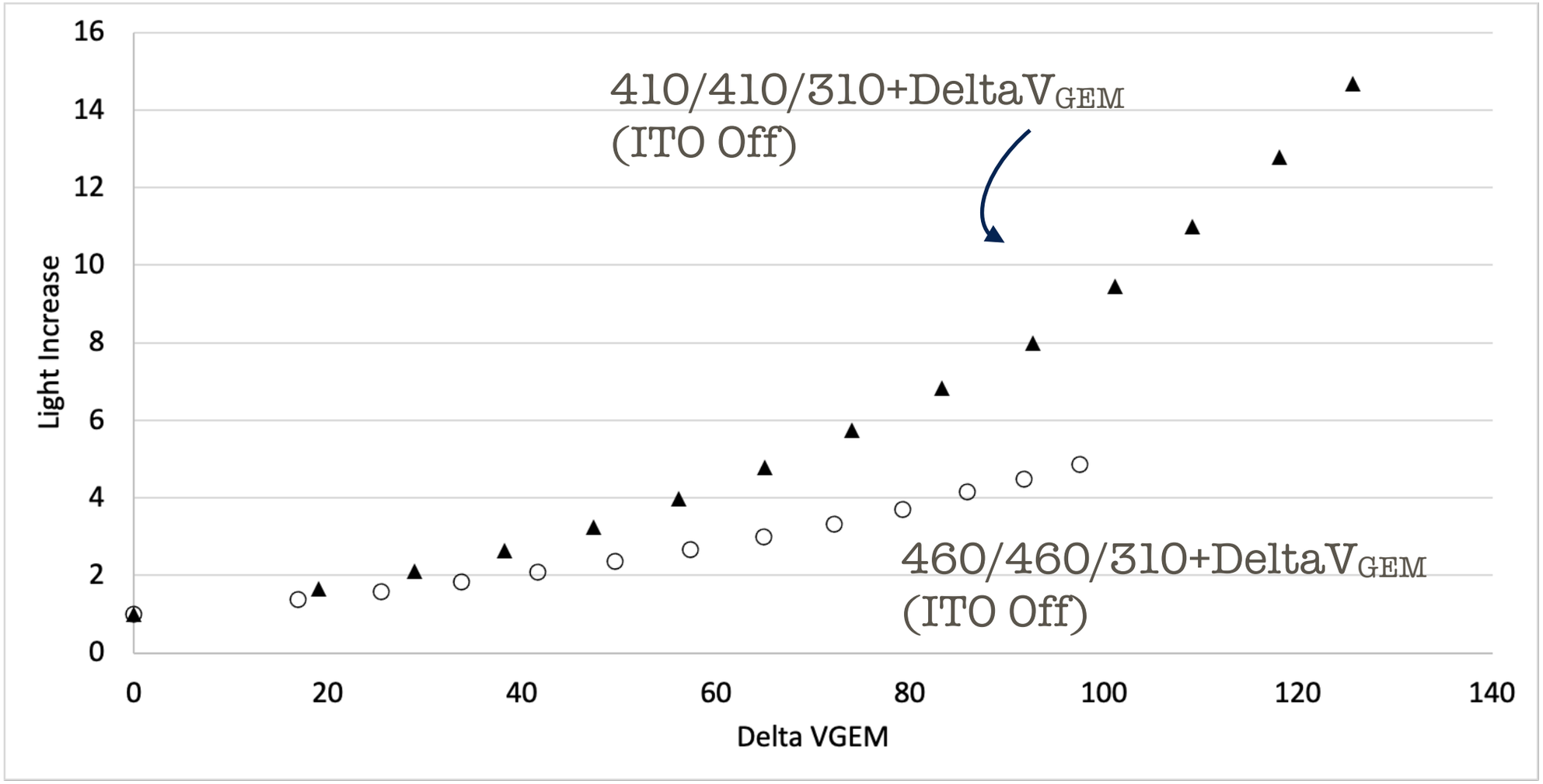




Different behavior when changing V_{GEM}

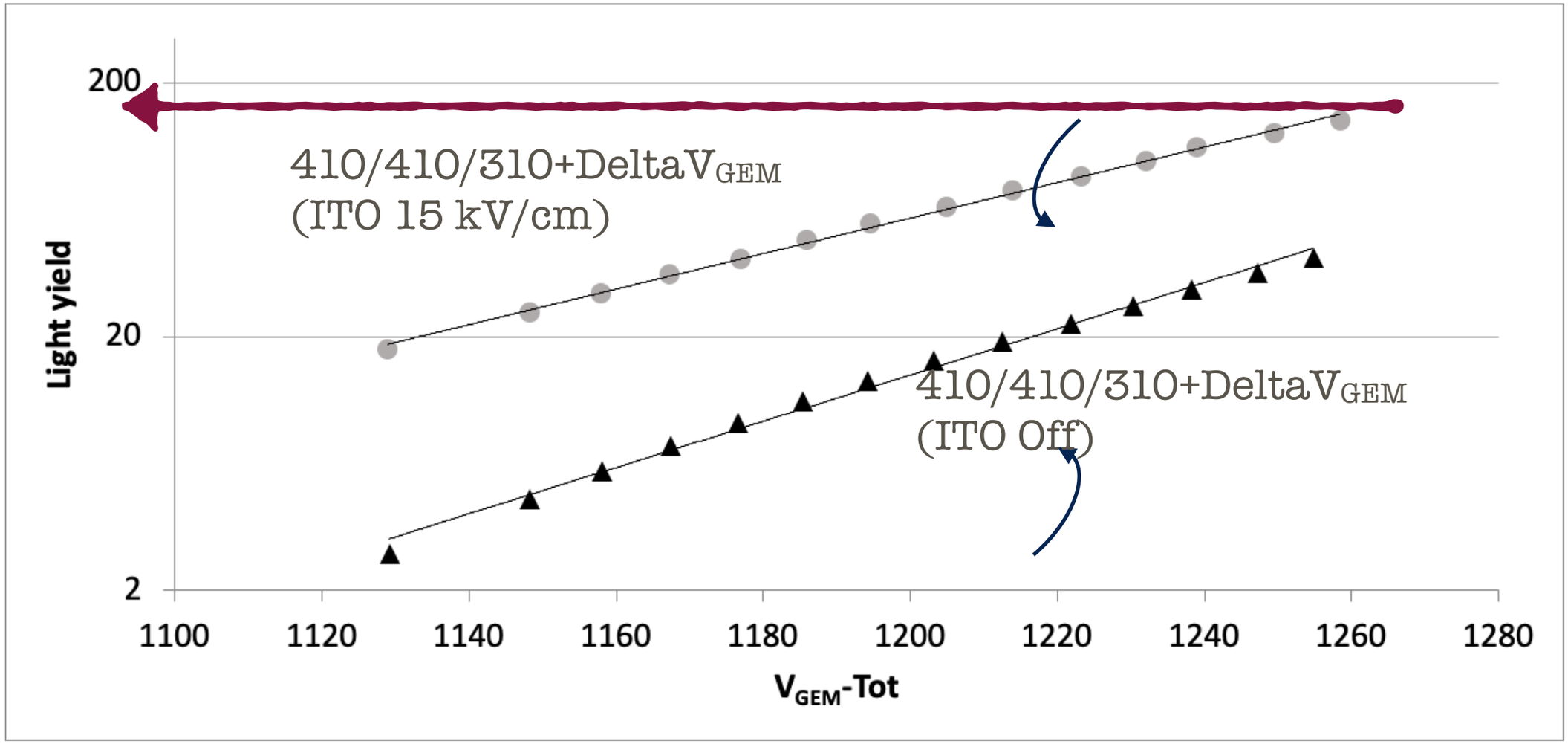
Saturation?

Because of the saturation, we expect that increasing the voltage on GEM1 with GEM2/GEM3 at high voltages (460V) provides lower gain increases w.r.t. GEM2/GEM3 at lower voltages (410V)



Saturation?

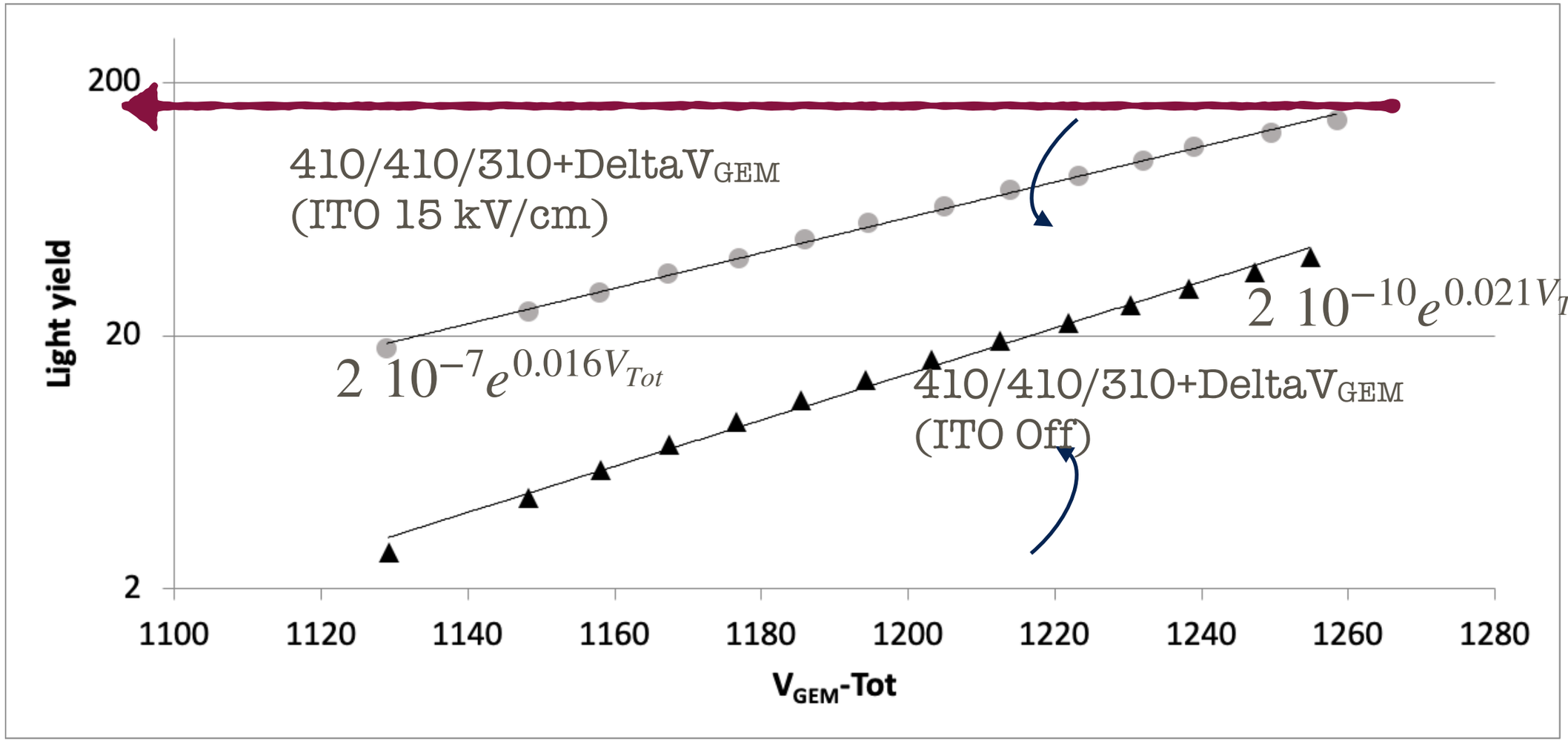
What happens if we turn On the ITO field in the configuration with low GEM2/GEM3 gain?



Light yield can be completely recovered

Saturation?

But the curves are not “parallel”!



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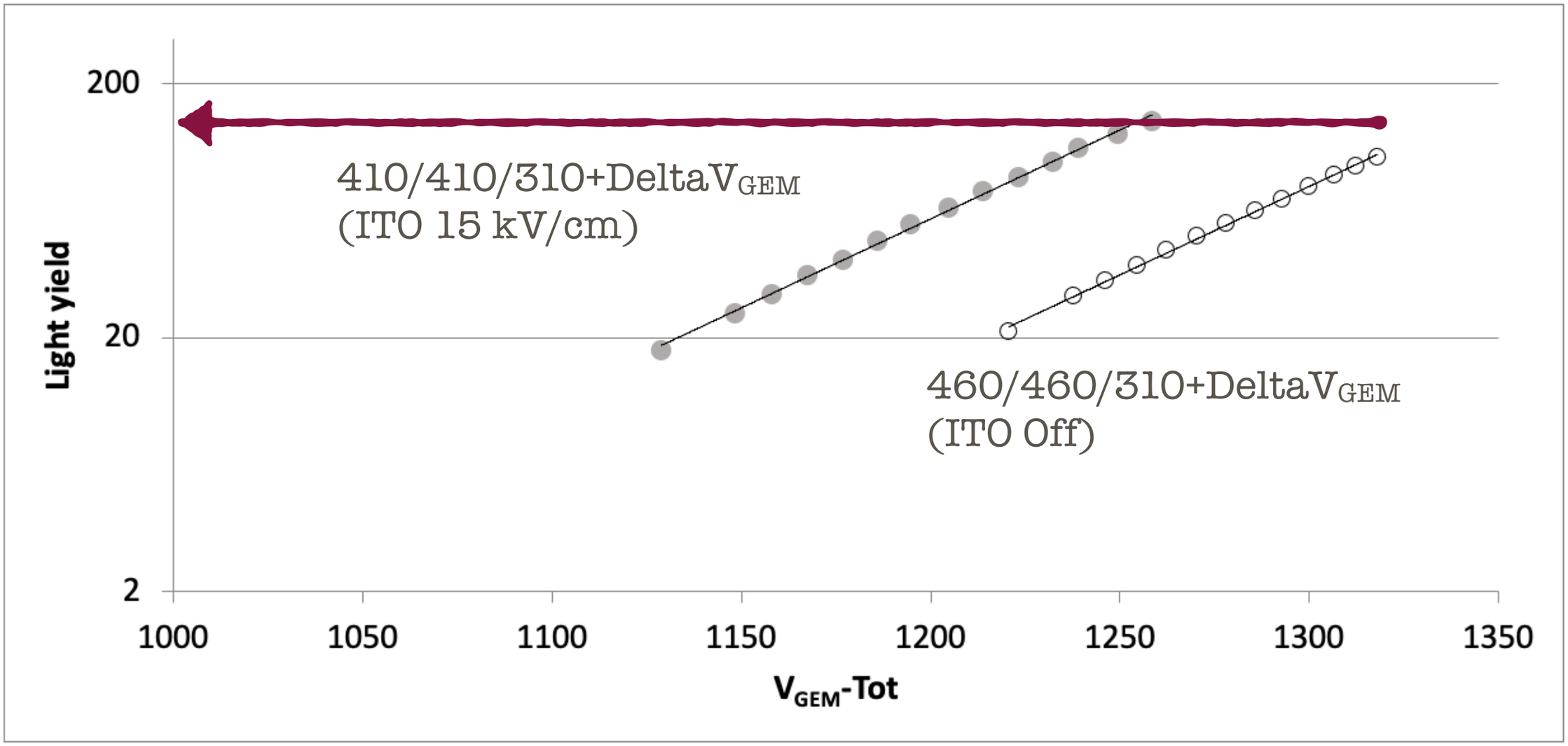

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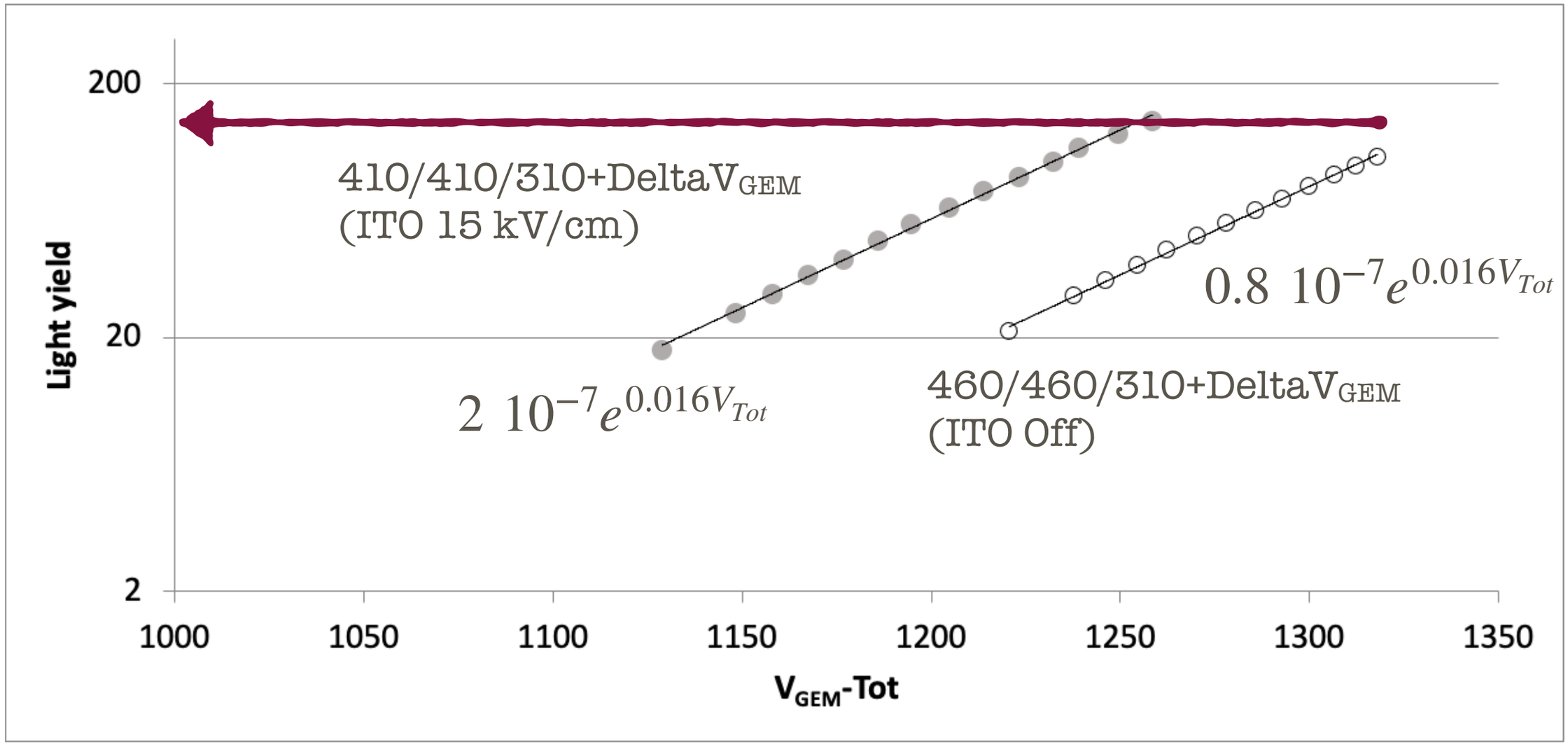
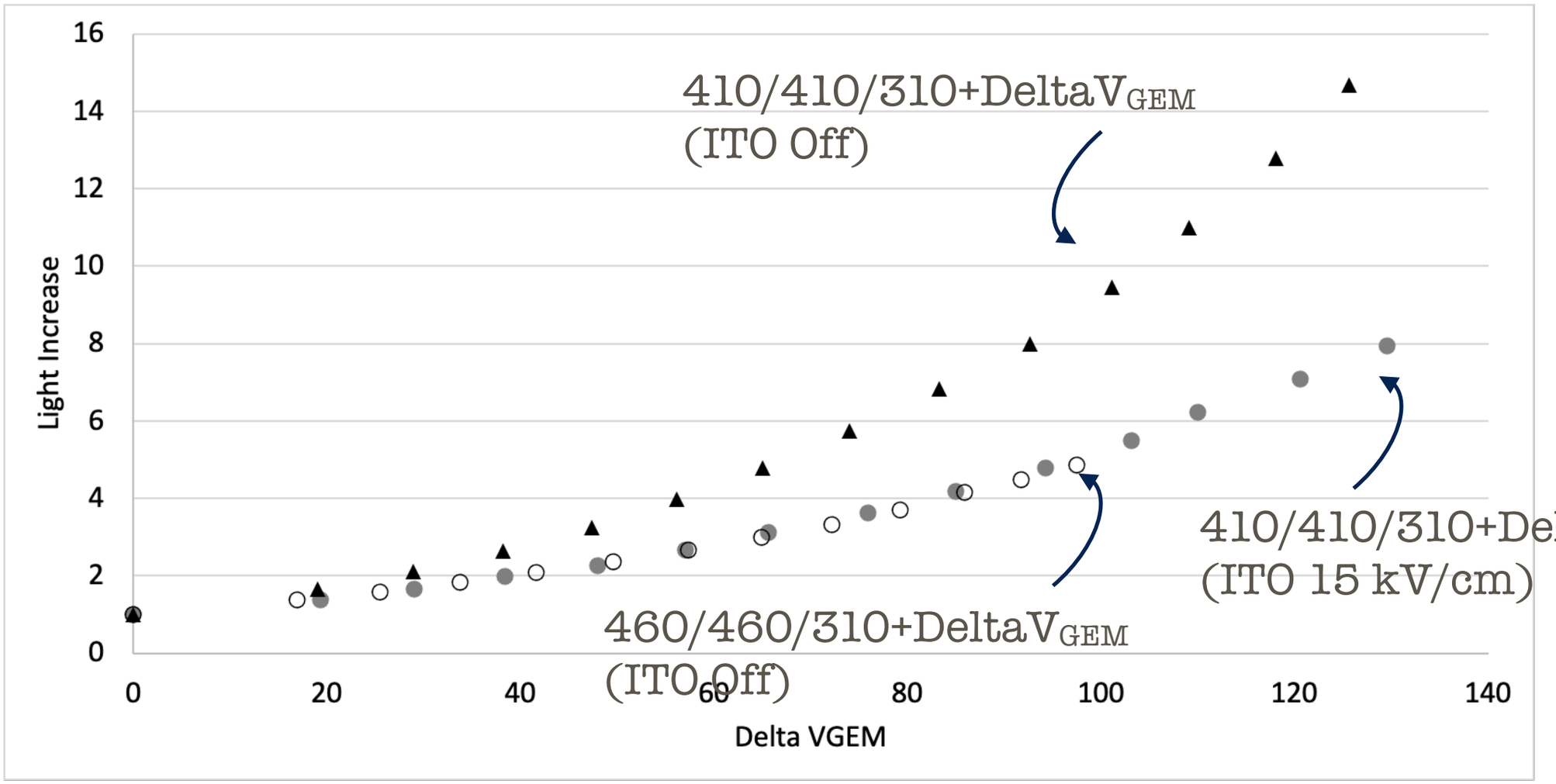
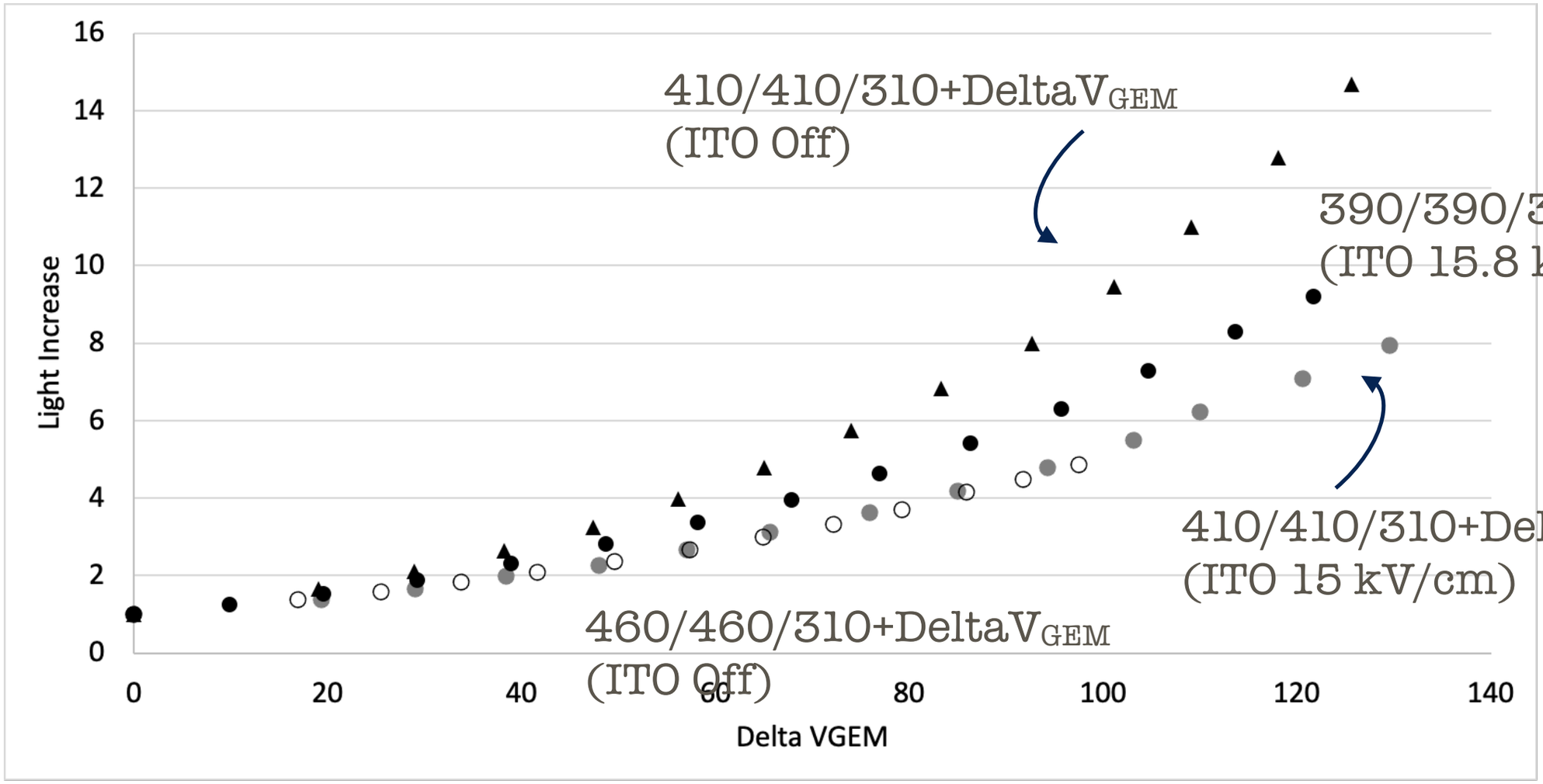


Saturation?



Gain increases with the same behavior if ITO is On, with low GEM voltage or ITO is OFF with high GEM voltage;
And the increase is lower w.r.t. the case of low GEM voltage and ITO Off.
Probably the ITO process have same saturation behavior.

Saturation?



Slightly better behavior with even lower GEM voltage