Internal Amplification Ge(GeIA)

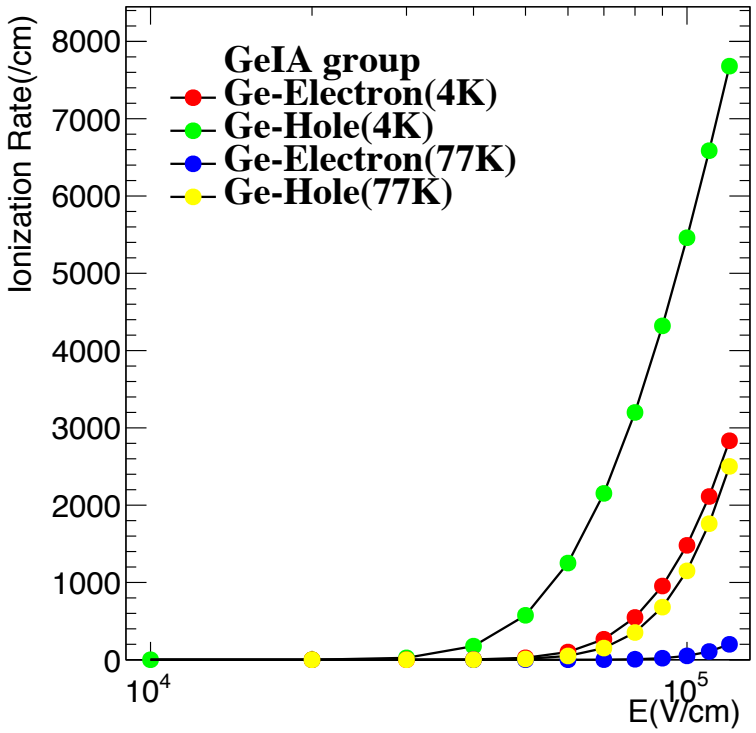
Theory of predicting the necessary gain

*Chih-Hsiang Yeh, Tze-Tzing Henry Wong

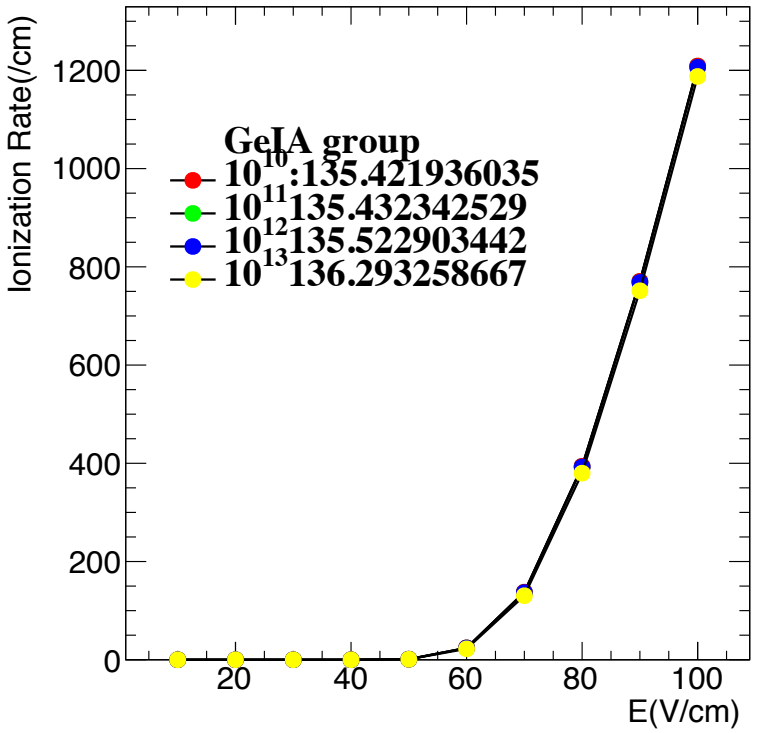
The reminder of the previous results

- At the first place, the ionization rates of electron and hole were predicted by some of the formulae:

Signal(Ge)



Signal(Impurities)



Ionization rate

➔ Give us the “Gain” in the end.

➔ Great! But what‘s the next?

➔ **Debut of our “BKG”!!**

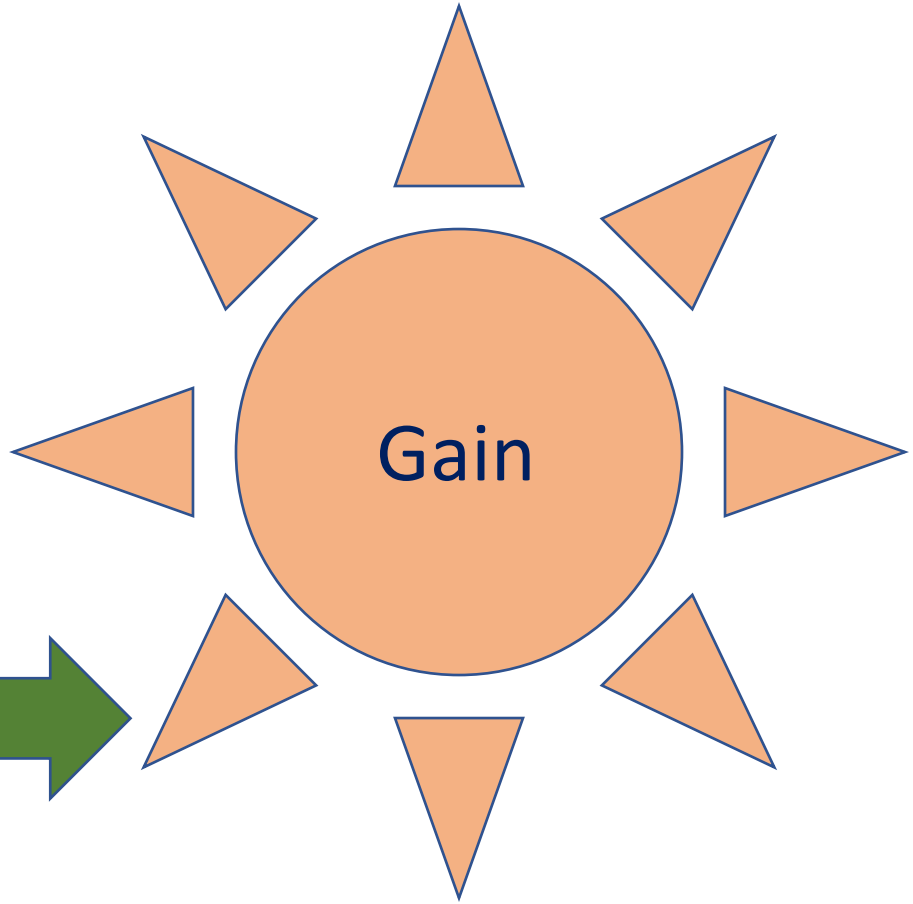
➔ **Umm…It seems complicated!**

➔ **Let me map out the blueprint first!**

Three steps

SIG estimation

BKG estimation



Ionization rate
Gain(E,T)

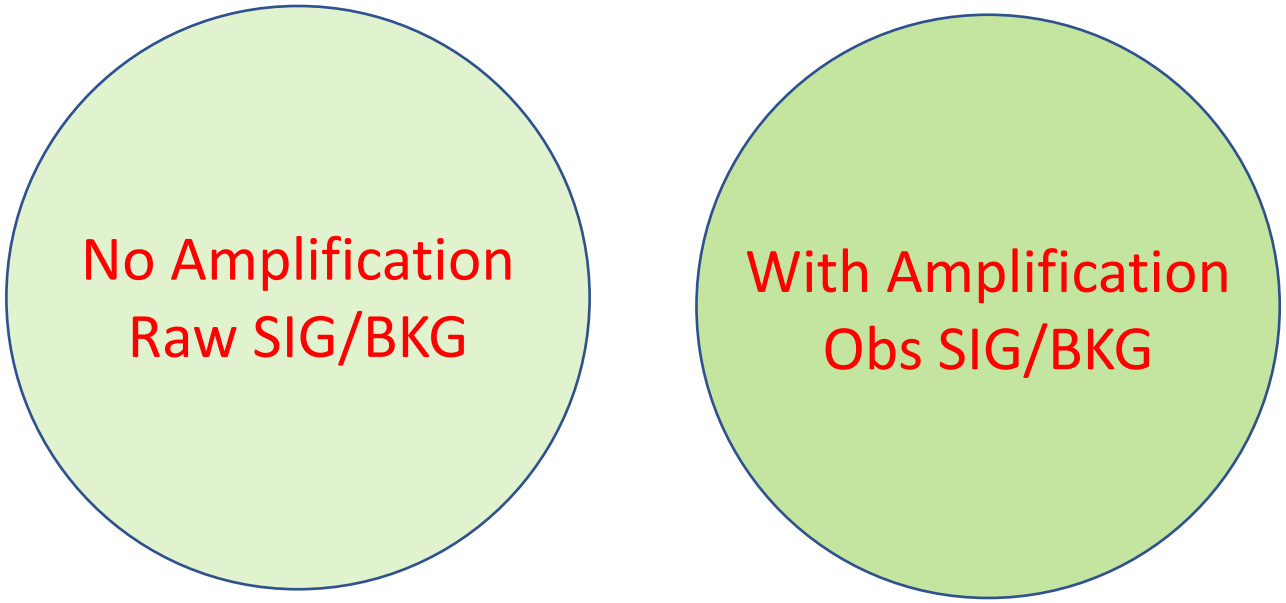
Theory of BKG
Signal threshold

Type of the detector?
Temperature?
Electric field?

Know our predicted gain for signal
Under the certain T and E

Know the threshold of the signal
(Signal ➔ Gain)
Predicted by BKG (Theory)

Raw/Observable



S

B

S*G

B*G

(SIG) > (3 * sigma of BKG)

$$(S * G) > 3 * \sqrt{(B * G)}$$

$$S > \frac{3 * \sqrt{(B * G)}}{G}$$

Various thresholds (Given the dark matter energy) ➔ All can be predicted.

Confirm the circumstance

	G	S(GS)	B(GB)	Threshold
(1)USD	1	1(1)	1(1)	3
(2)China-THU	100	1(100)	100(10000)	3

(SIG) > (3 * sigma of BKG)

$$(S * G) > 3 * \sqrt{(B * G)}$$

$$S > \frac{3 * \sqrt{(B * G)}}{G}$$

Purpose of this study

- *The important issue:
- Can we predict “the necessary gain” by the signal we expect?

- Next step:
- Find out the right BKG and find out the right threshold plots.
- ➔ Then, we can apply it on our detector
- ➔ Even design the different type of the detector compared with other people.