Test of Different Light Sources for SiPM Dynamic Range Research

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2023.02.22

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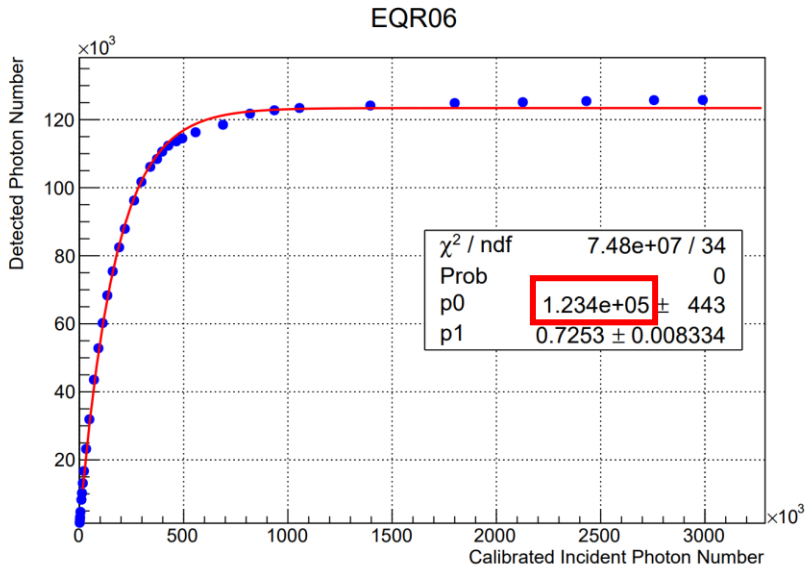
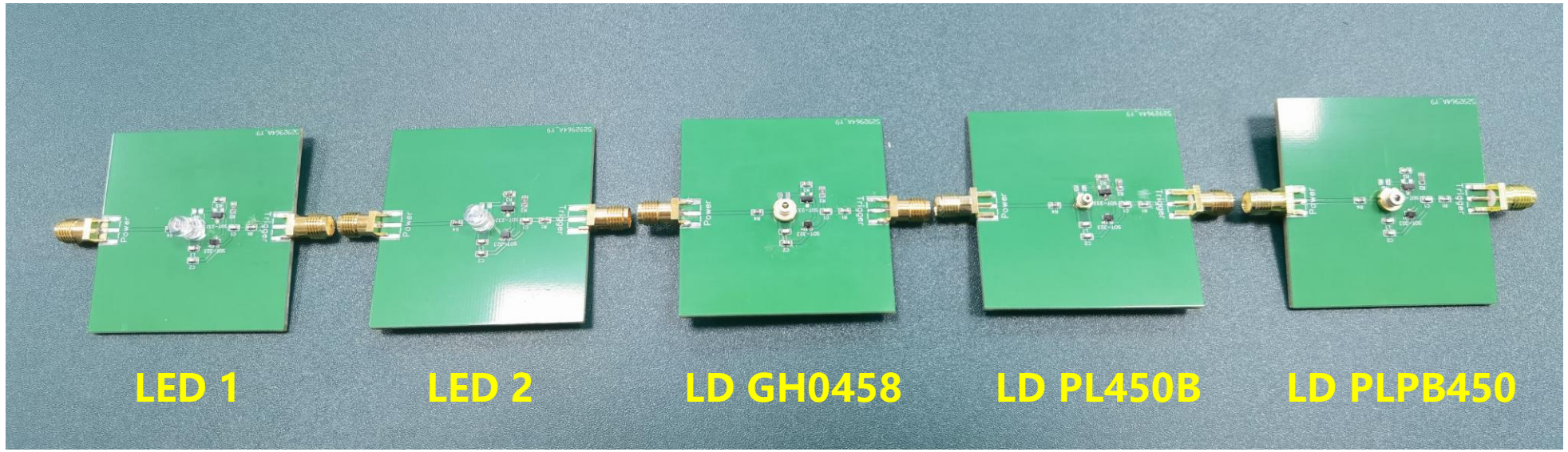
Motivation

- Some SiPMs have extremely large pixels number, which can be used in the experiment with high dynamic range requirement.
- The response curve of NDL-EQR06 was measured with pico-second laser as a light source. But the maximum detected photon number is only about half of the total pixels number. One possible reason is that the result was limited by the output power of pico-second laser.
- Requirements on the source: high intensity, narrow pulse width



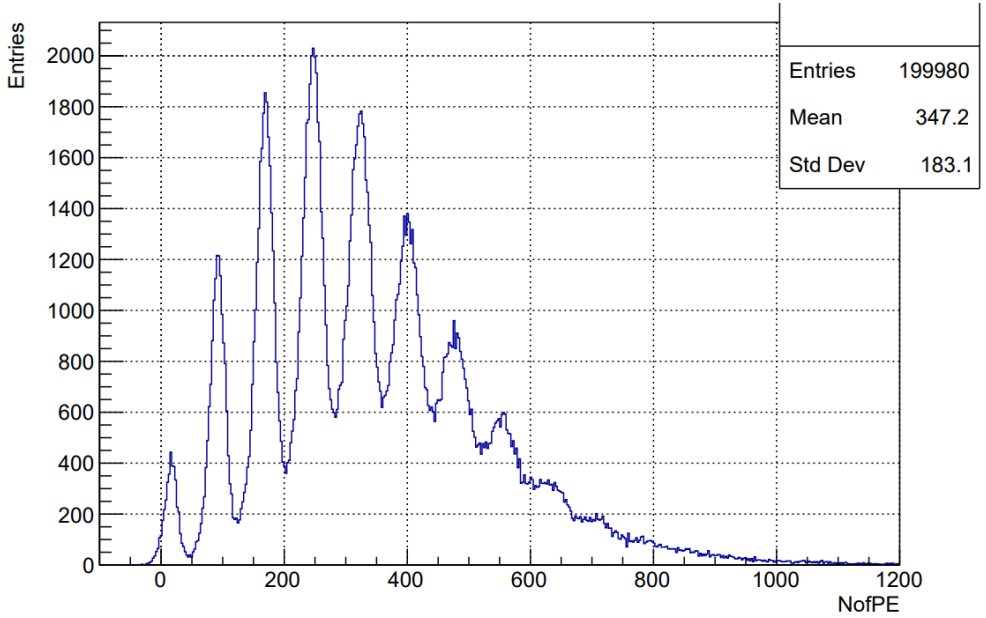
Light Sources

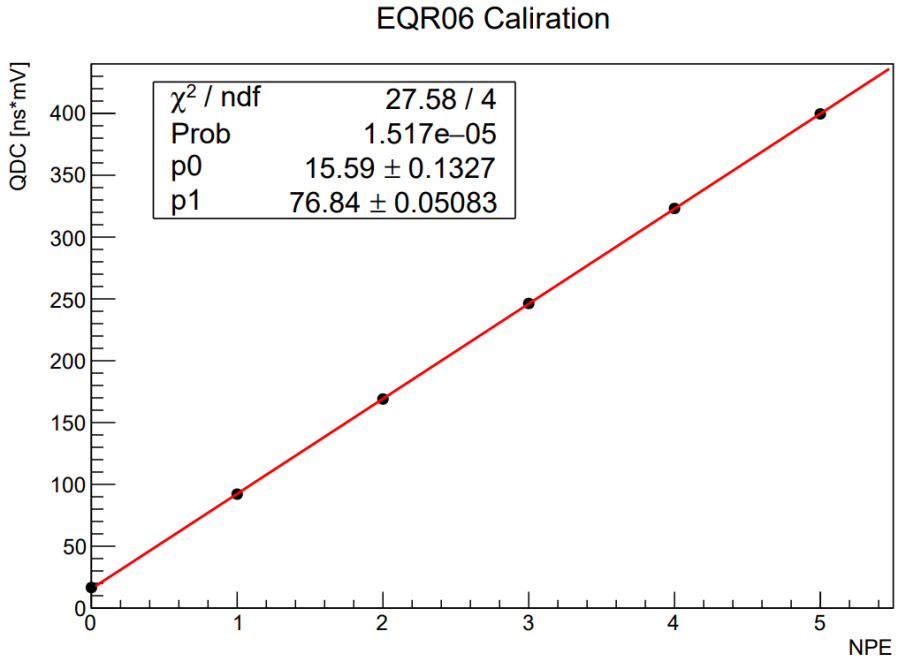


	LED 1	LED 2	LD GH0458	LD PL450B	LD PLPB450
Wavelength	460-465nm	470nm	450nm	450nm	450nm
Brightness	5000-7000mcd	23500mcd	-	-	-
Current	20mA	30mA	84mA	100mA	1.2A
Power	60mW	120mW	85mW(optical)	80mW(optical)	1.6W(optical)

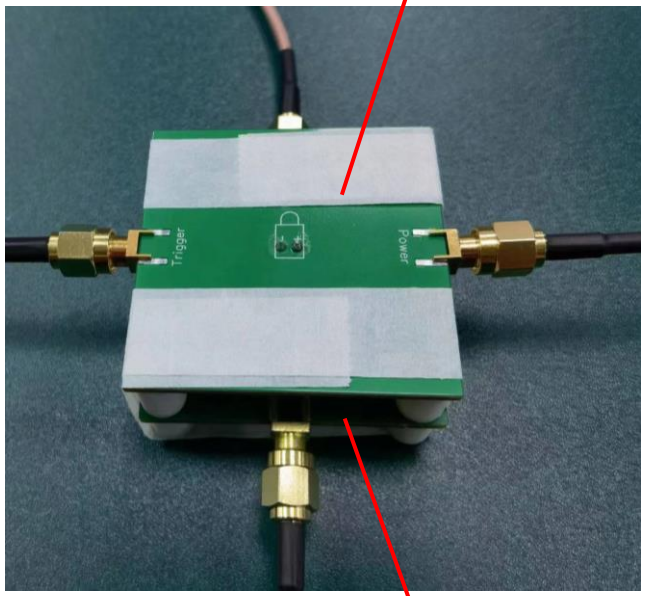
SiPM Calibration

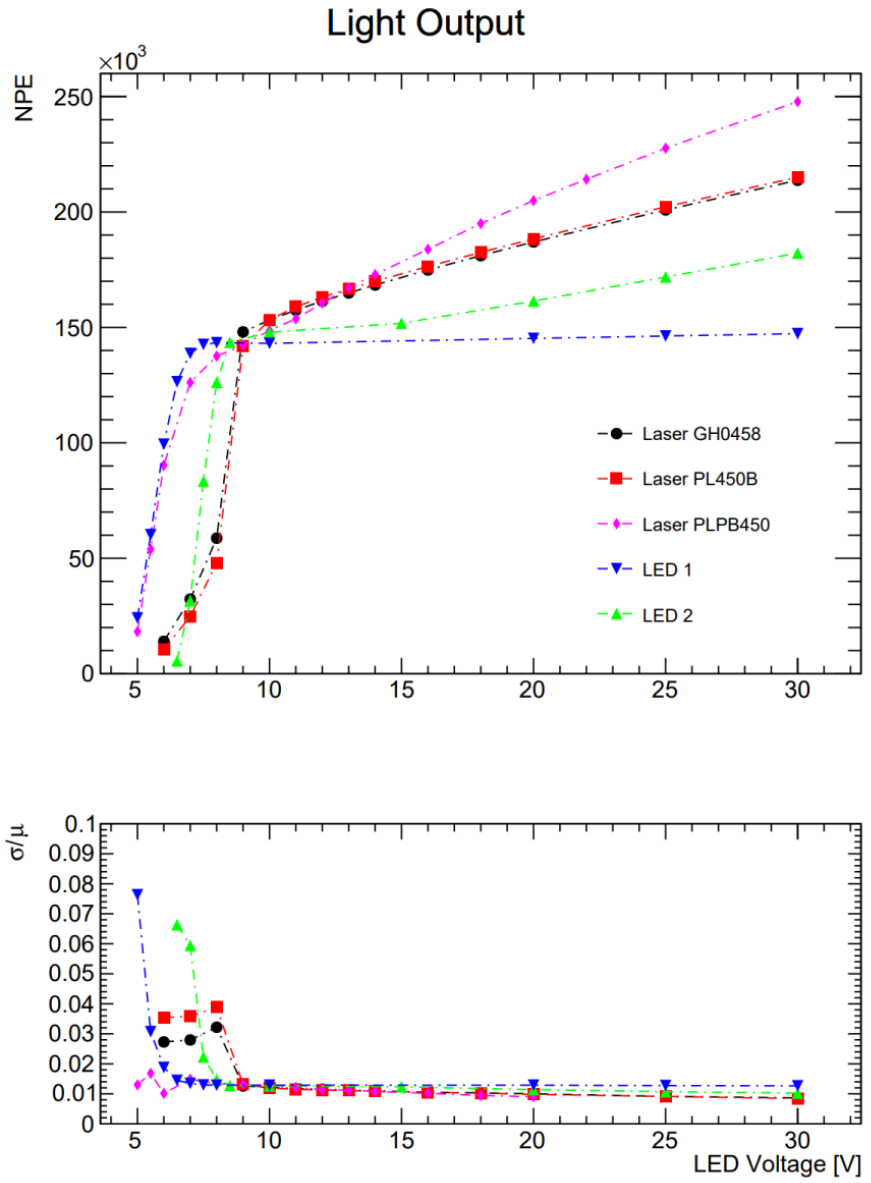
- NDL SiPM EQR06, $3 \times 3mm^2$, 244720 pixels
- LED as a light source
- NDL 40dB pre-amplifier





Measurement Results of Different Sources





- The number of photon detected by SiPM is close to 250k, which is beyond its pixels number.

Summary & Next

- We can use laser diode as light source to measure the response curve of SiPMs with large pixels number.
- We also need to measure the response time of laser diode and driver circuit. Because if the pulse width is longer than the recovery time of SiPM, its pixels could be fired more than one time. Then we will not sure if the SiPM is saturated.

Backup

Light Output Change with L-C Values

LD GH0458

- The light emission of diode is controlled by a LC oscillation circuit. If we change the values of L and C, the light output will be changed accordingly.