

Updates on HRPPD #25 activities
Amplitude vs. scaled Rate for different ΔV_{MCPs}

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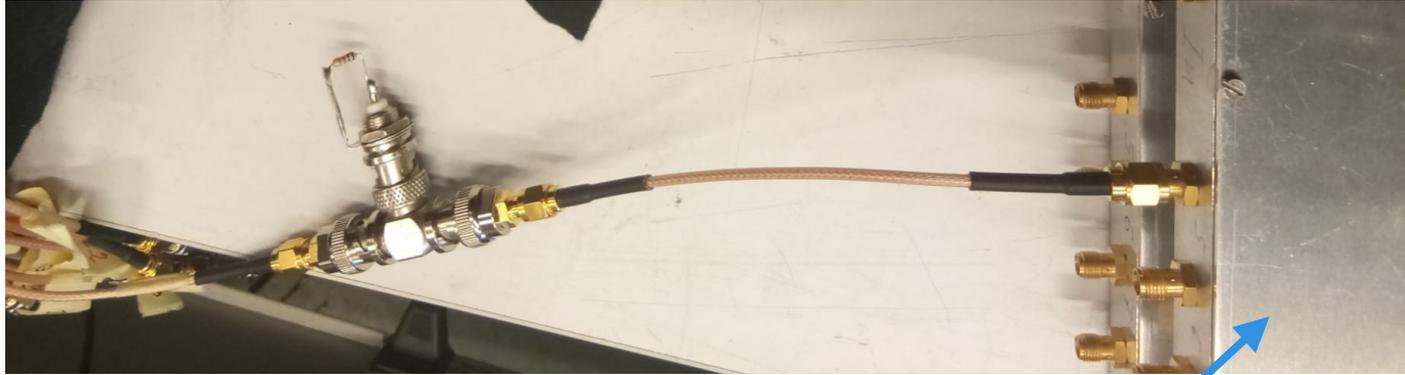
Amplitude vs. scaled Rate for different ΔV_{MCPs} (700 V, 675 V, 650 V) – SPE responses

- measurements are taken using the Oscilloscope
- analysis done using the Oscilloscope (quick, online plotting, single strategy to extract <amplitude>)

repeat the exercise with digitizer (by the end of this week)

- wavedump for daq works
- wavedump read crashes

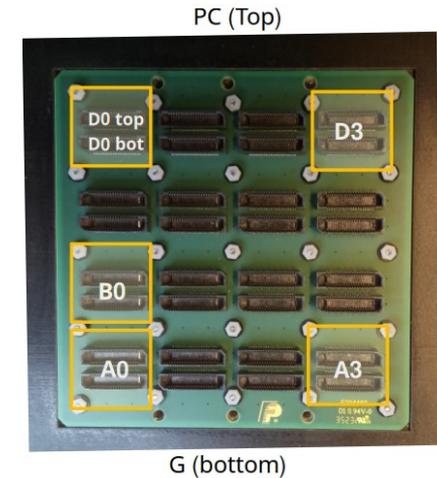
Amplifier with 1 k Ω



- The one used for the LAPPD
- Gain 10
- At present single channel

All measurements

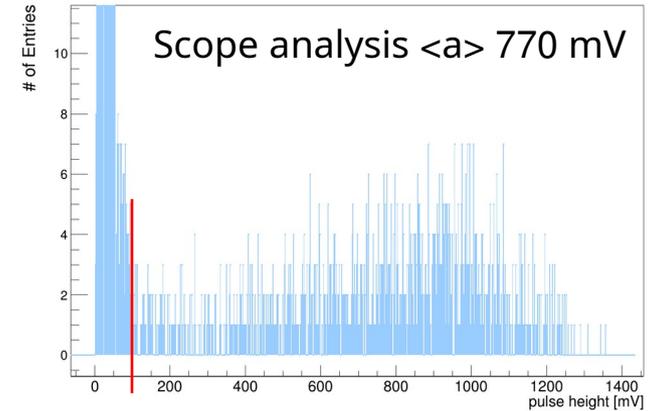
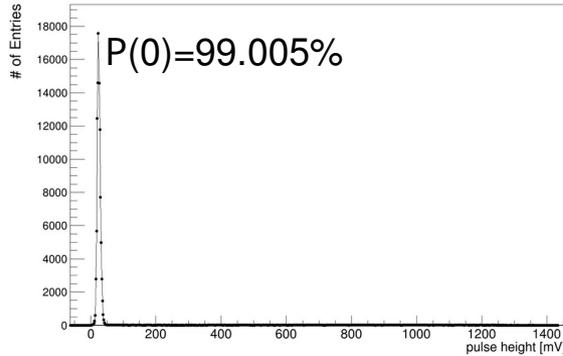
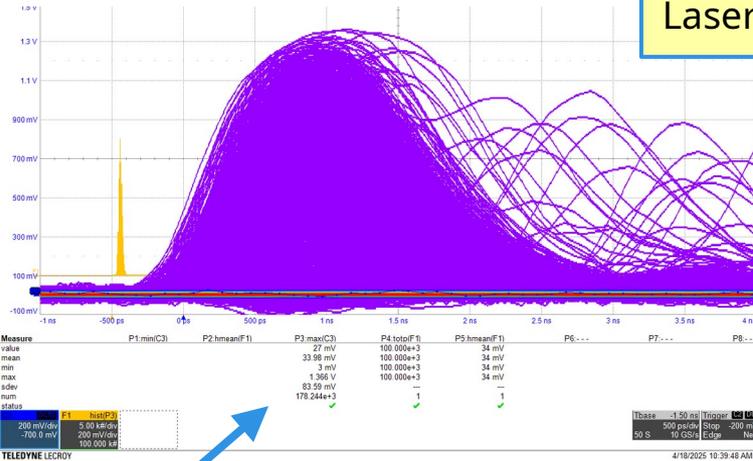
- are with Amplifier and 1k Ω
- for Pin #12 A0Top



Signals with amplifier with 1 kΩ

HV bias: -200_-700_-200_-700_-200 V

Laser intensity 1.55, ~ 1% non empty events (SPE)



P3: max(C3)
 27 mV
 33.98 mV
 3 mV
 1.366 V
 83.59 mV
 178.244e+3
 ✓

- Pin #12 A0Top
- Trigger on laser sync pulse (-200 mV)
- **Intensity 1.55 (1% non-empty) - to have pure s.p.e events ($\lambda=0.01$, contamination of 2 p.e. 5‰)**
- ~ 50k Trigger events

Single strategy to extract $\langle a \rangle$ for different gain/ ΔV

For 10^6 gain (ΔV_{MCPs} 650V/smaller) defining the Th is difficult

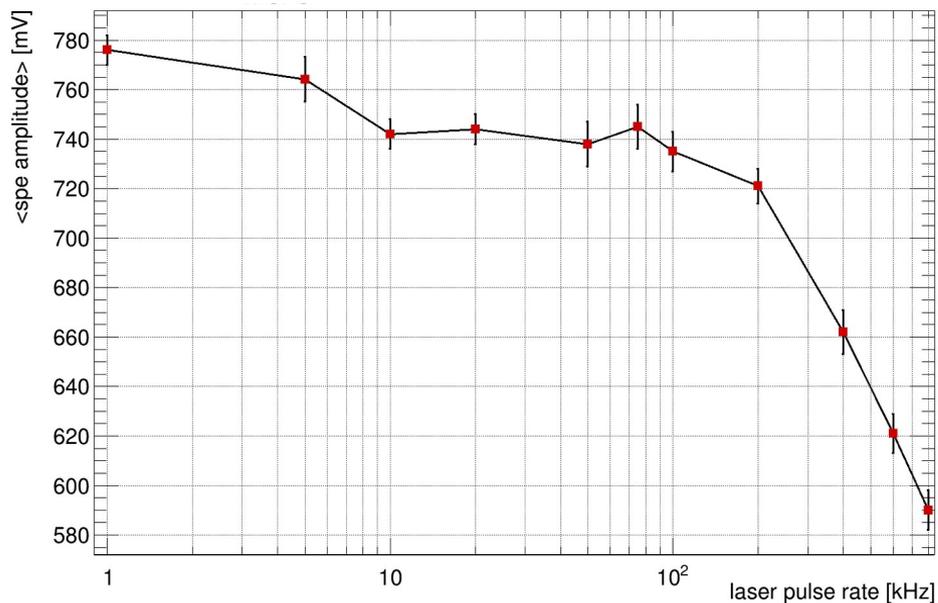
- Amplitude: Parameter (P3) gives the maximum of the waveform
- We record the histogram of P3
- **Apply threshold (1% non-empty)** and get the mean of the histogram that defines the average amplitude

Amplitude vs. Rate

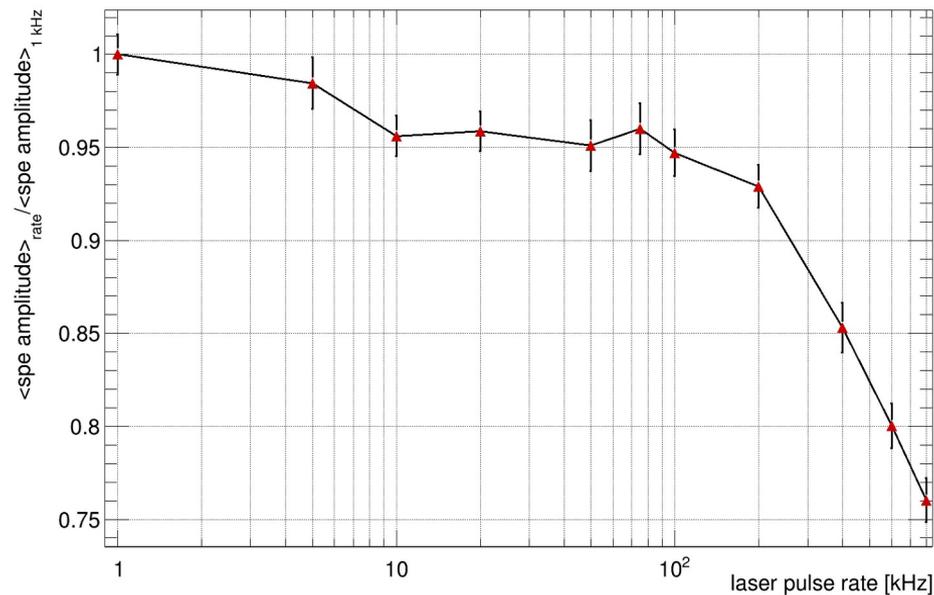
HV bias: -200_ΔV_-200_ΔV_-200 V

Laser intensity 1.55, ~ 1% non empty events (SPE)

$\Delta V_{\text{MCPs}} = 700 \text{ V}$, Threshold @100 mV



~8% saturation at 200 kHz



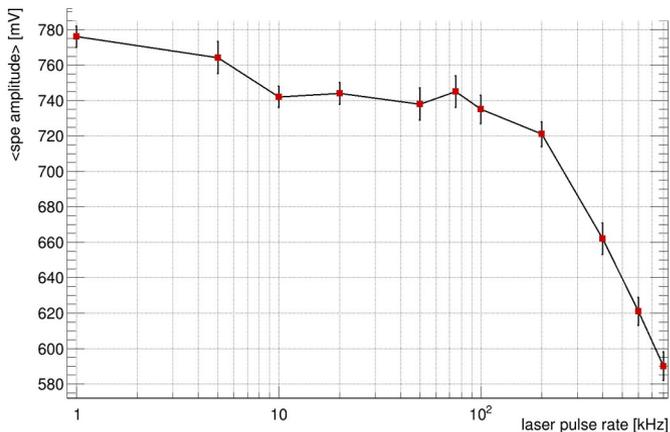
Normalised with respect to amplitude at 1 kHz

Amplitude vs. Rate

HV bias: -200_ΔV_-200_ΔV_-200 V

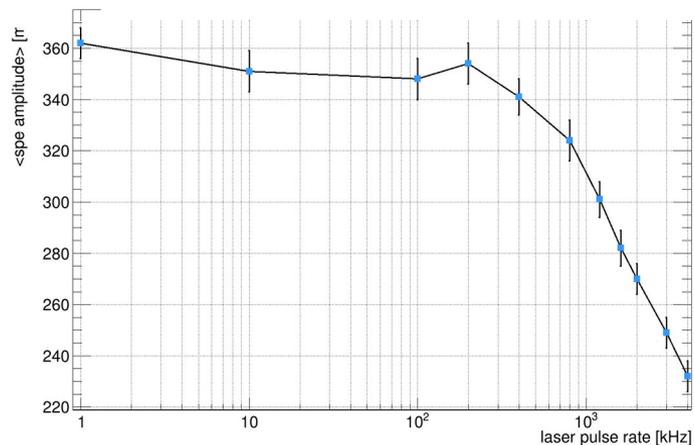
Laser intensity 1.55, ~ 1% non empty events (SPE)

$\Delta V_{\text{MCPs}} = 700 \text{ V, Th @ } 100 \text{ mV}$



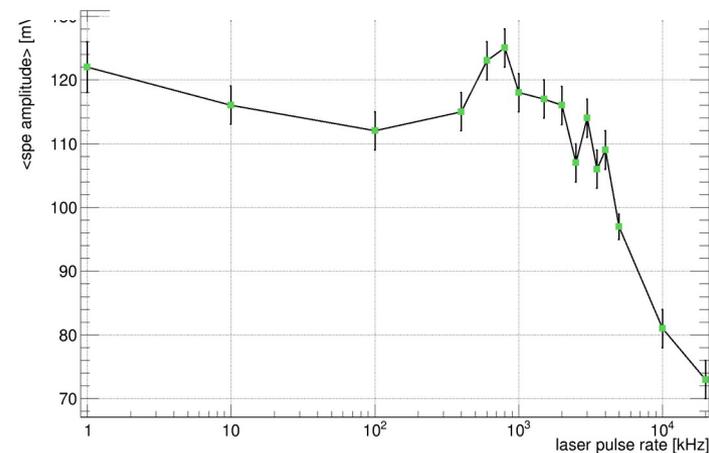
- 8% saturation at 200 kHz
- 50k, 100k, 1000k

$\Delta V_{\text{MCPs}} = 675 \text{ V, Th @ } 50 \text{ mV}$



- Amplitude reduces by a factor ~2
- 10% saturation at 400 kHz

$\Delta V_{\text{MCPs}} = 650 \text{ V, Th @ } 25 \text{ mV}$



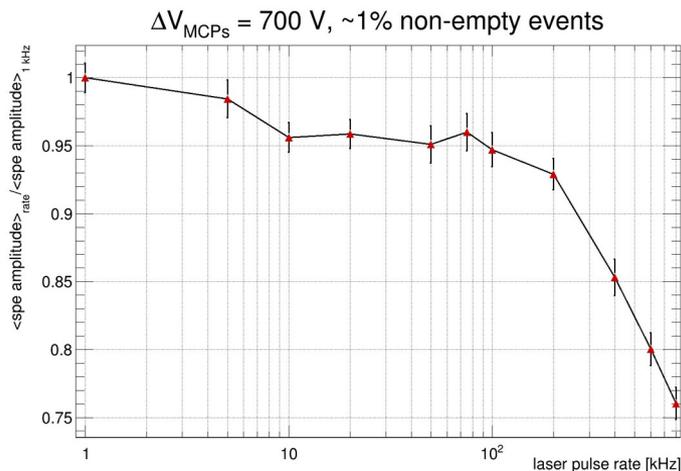
- Further amplitude reduces by a factor ~3
- 10% saturation at 2.5 MHz

Amplitude vs. Rate

HV bias: -200_ΔV_-200_ΔV_-200 V

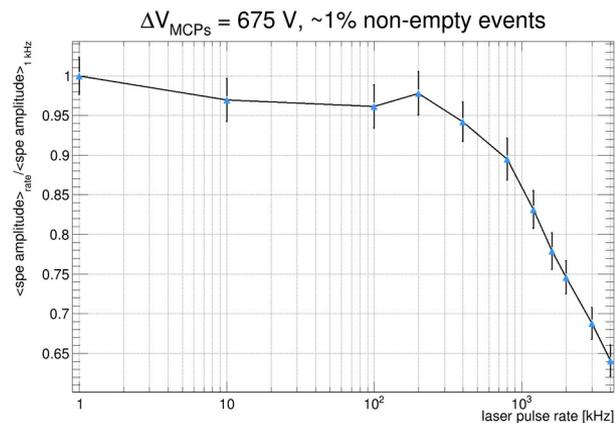
Laser intensity 1.55, ~ 1% non empty events (SPE)

$\Delta V_{\text{MCPs}} = 700 \text{ V}$, Th @ 100 mV



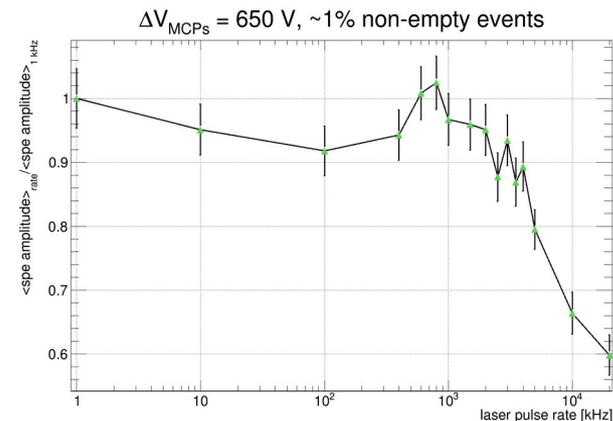
- Clear saturation effect at 200 kHz
- ~ 20% drop at 400 kHz

$\Delta V_{\text{MCPs}} = 675 \text{ V}$, Th @ 50 mV



- Clear saturation effects from 800 kHz
- ~ 20% drop at 1.2 MHz

$\Delta V_{\text{MCPs}} = 650 \text{ V}$, Th @ 25 mV



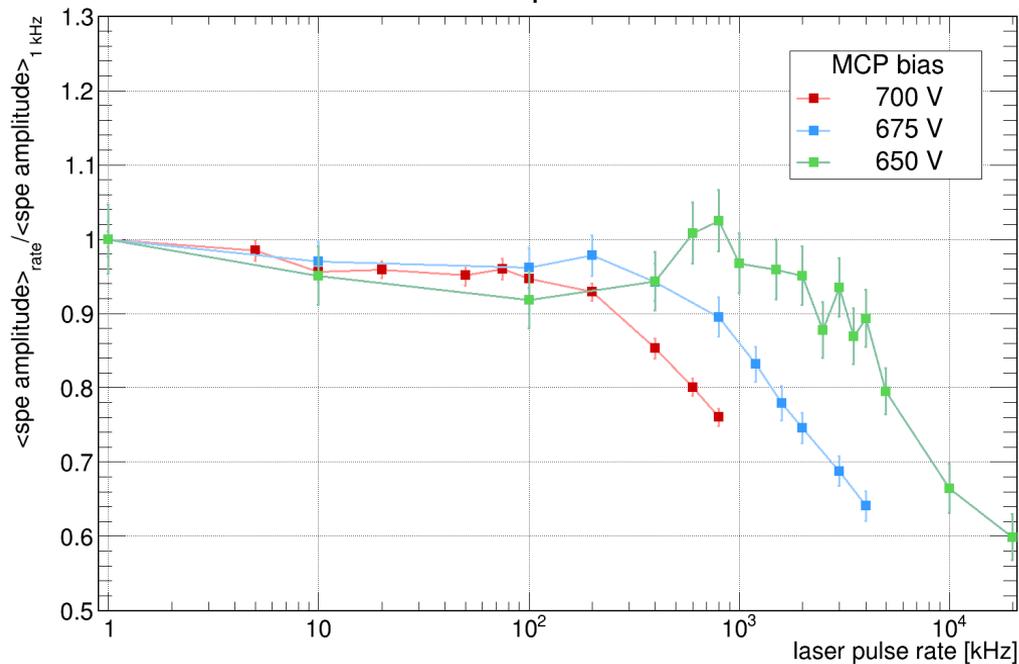
- Clear saturation effects from 2 MHz
- ~ 20% drop at 5 MHz

Amplitude vs. Rate

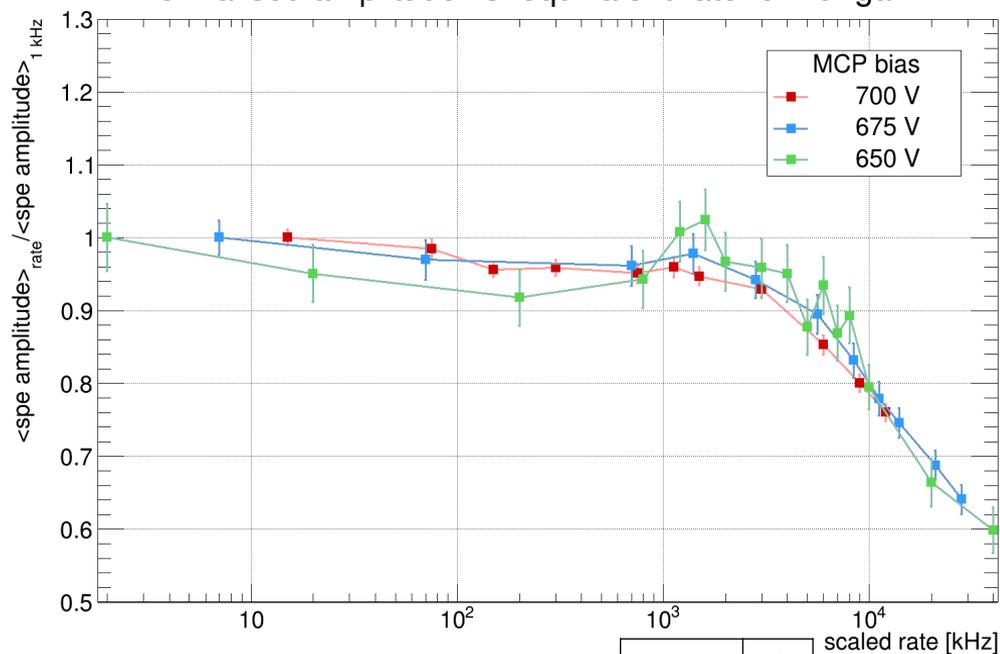
HV bias: -200_ΔV_-200_ΔV_-200 V

Laser intensity 1.55, ~ 1% non empty events (SPE)

normalised amplitude vs. rate



normalised amplitude vs. equivalent rate for 10^6 gain



$$\text{Scaled rate} = \frac{\text{Rate} \times G \text{ (datasheet)}}{10^6}$$

ΔV [V]	f
700	15
675	7
650	2

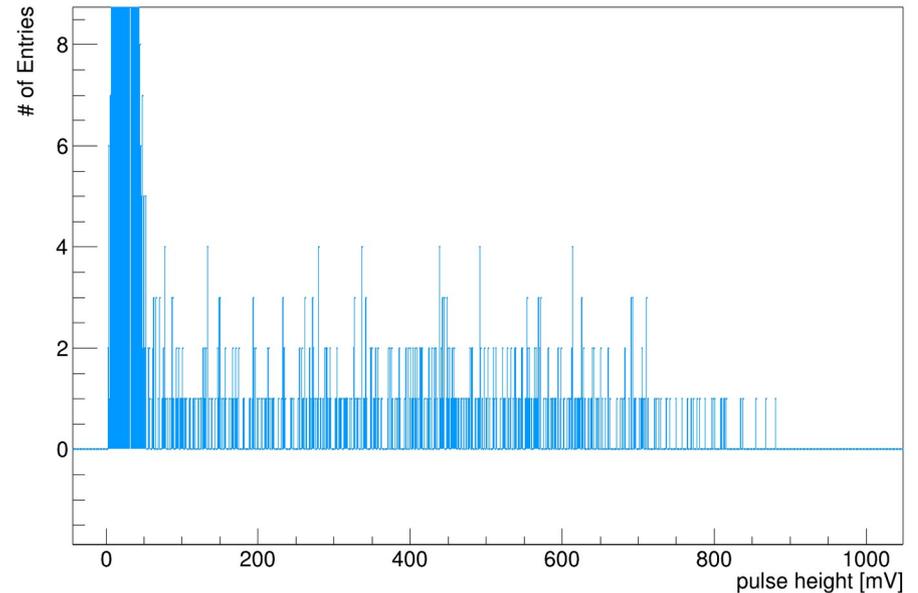
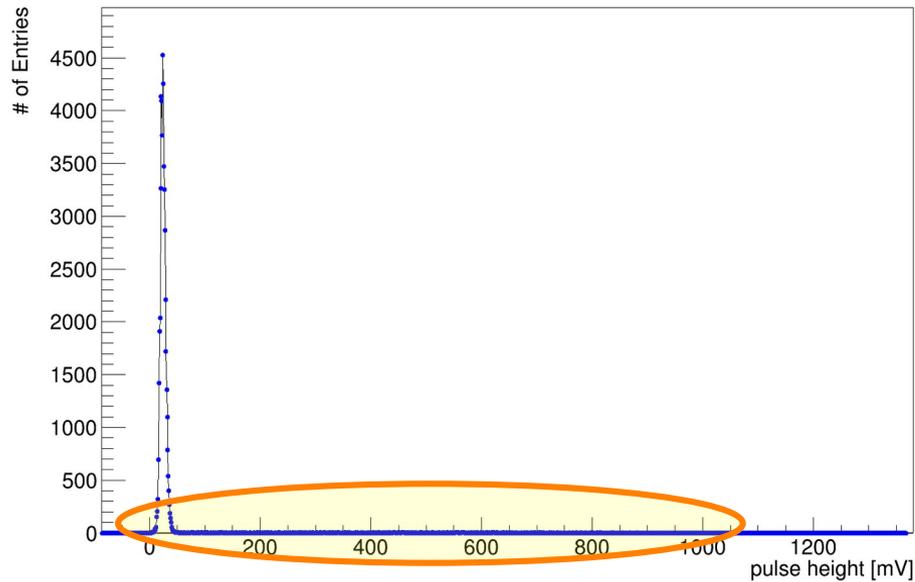
Amplitude vs. Rate

HV bias: -200_-675_-200_-675_-200 V

Laser intensity **2.35**,

$\lambda = 2$, $P(0) = \sim 14\%$, $P(1) = \sim 27\%$, $P(2) = \sim 27\%$, $P(>2) = \sim 32\%$

Extract $\langle a \rangle$ without applying a cut, removes the issue of selecting Threshold for 10^6 gain



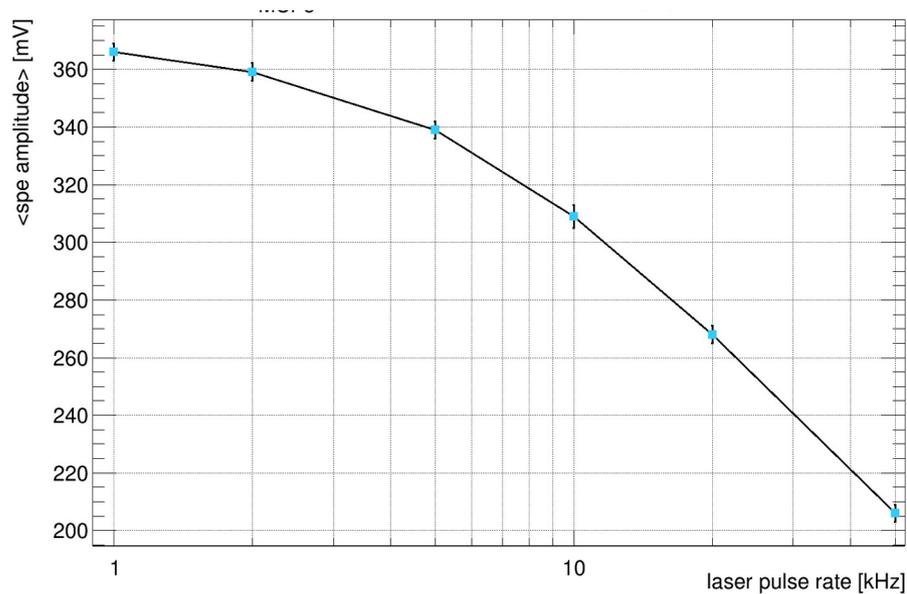
Amplitude vs. Rate

HV bias: -200_-675_-200_-675_-200 V

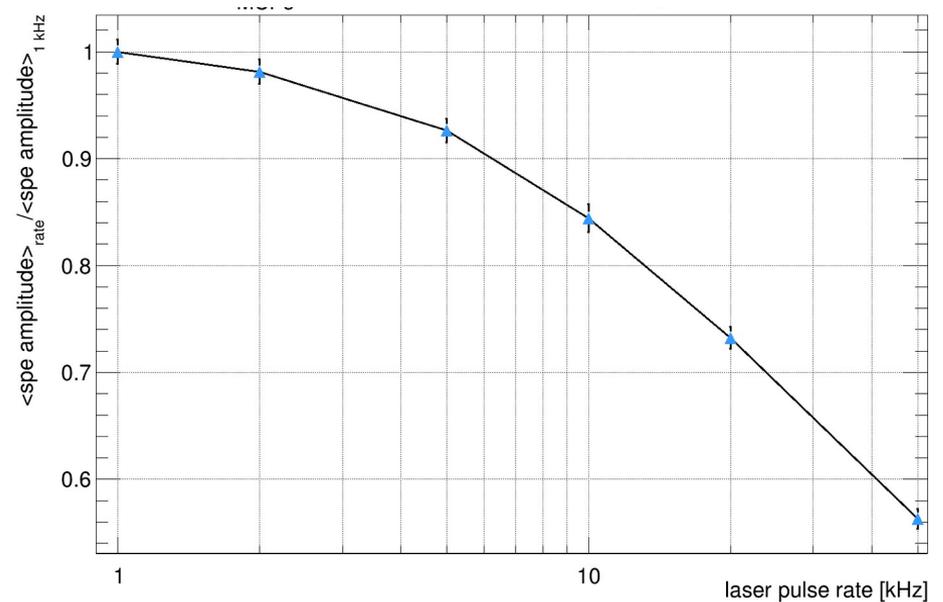
Laser intensity **2.35**,

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Extract $\langle a \rangle$ without applying a cut, removes the issue of selecting Threshold for 10^6 gain



Saturation already at 5 kHz



Amplitude vs. Rate

HV bias: -200_-675_-200_-675_-200 V

Laser intensity **2.35**,

$\lambda = 2$, $P(0) = \sim 14\%$, $P(1) = \sim 27\%$, $P(2) = \sim 27\%$, $P(>2) = \sim 32\%$

$\Delta V_{\text{MCPs}} = 675$ V, normalised amplitude vs. equivalent rate for 10^6 gain

