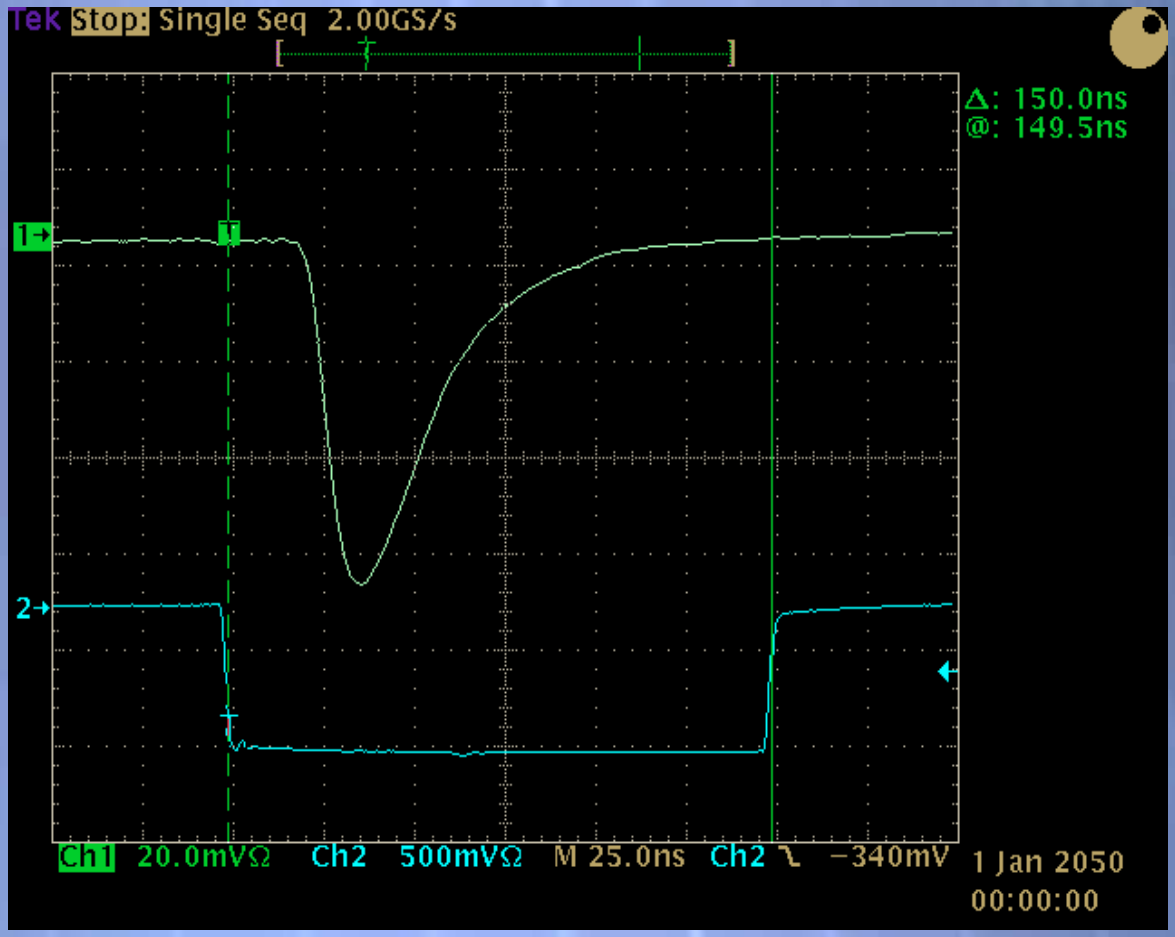
Some Results with new 1 mm^2 SiPM from SensL

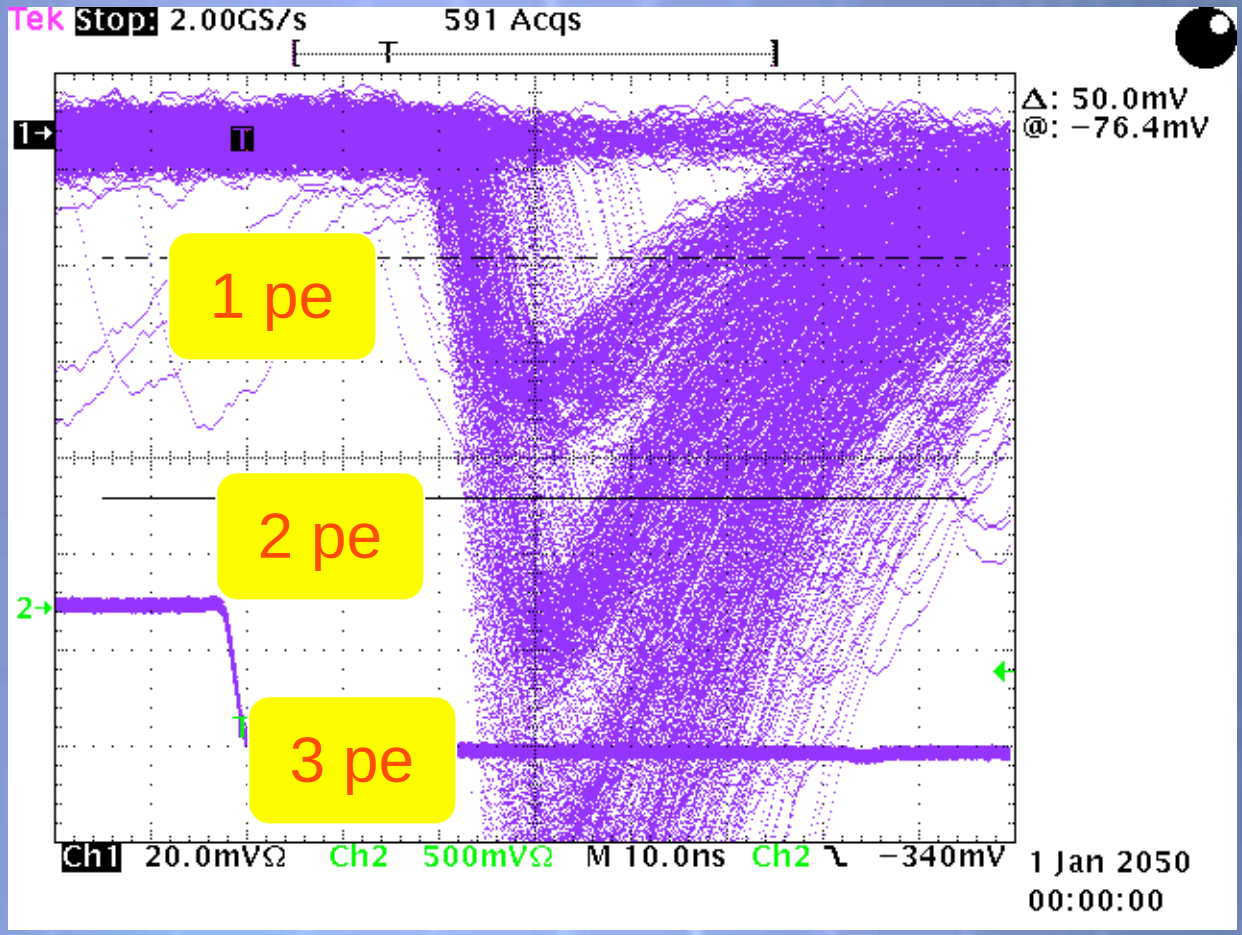
- Type A20H - 20 μm, 43% fill, ~ 1K pixels
- Trenched to decrease crosstalk
- ***This is our first room temperature sample that gives well-resolved photopeaks across a good range of bias voltages***
- Breakdown voltage - 28.1 volts (higher than previous)
- Dark current ~ 10 - 200 nA

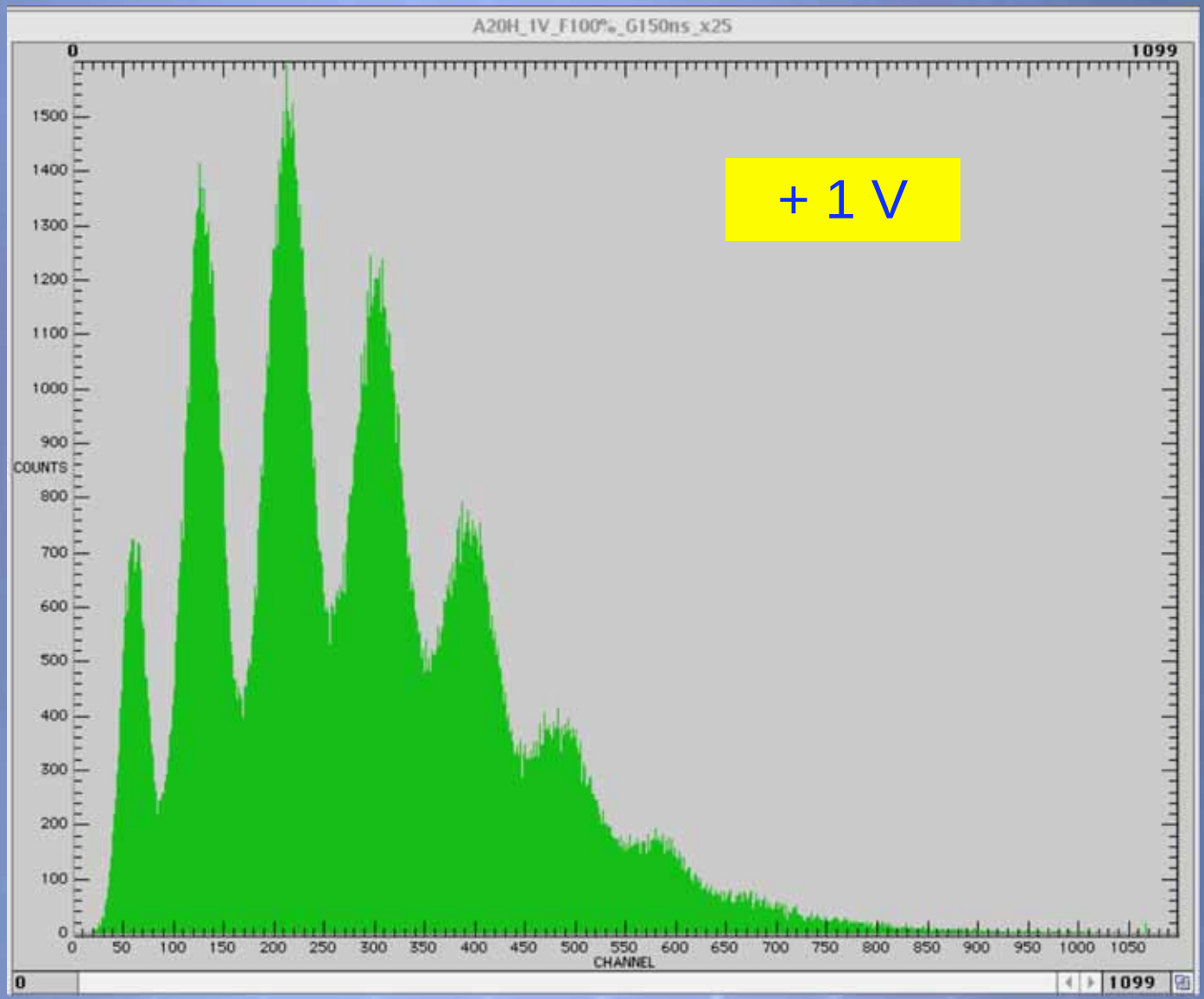
Example pulse with x21 amplifier included

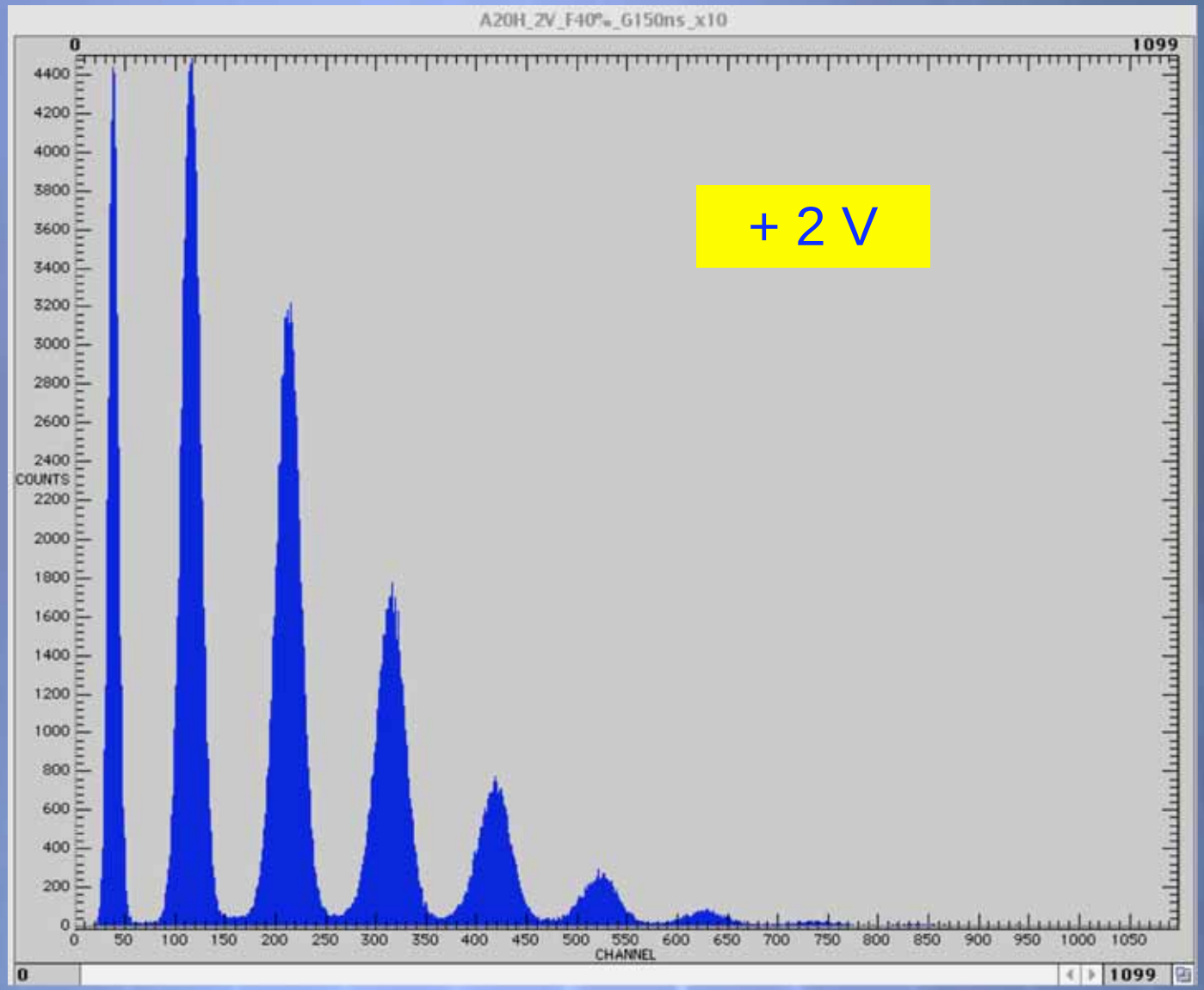
Average of 16 pulses

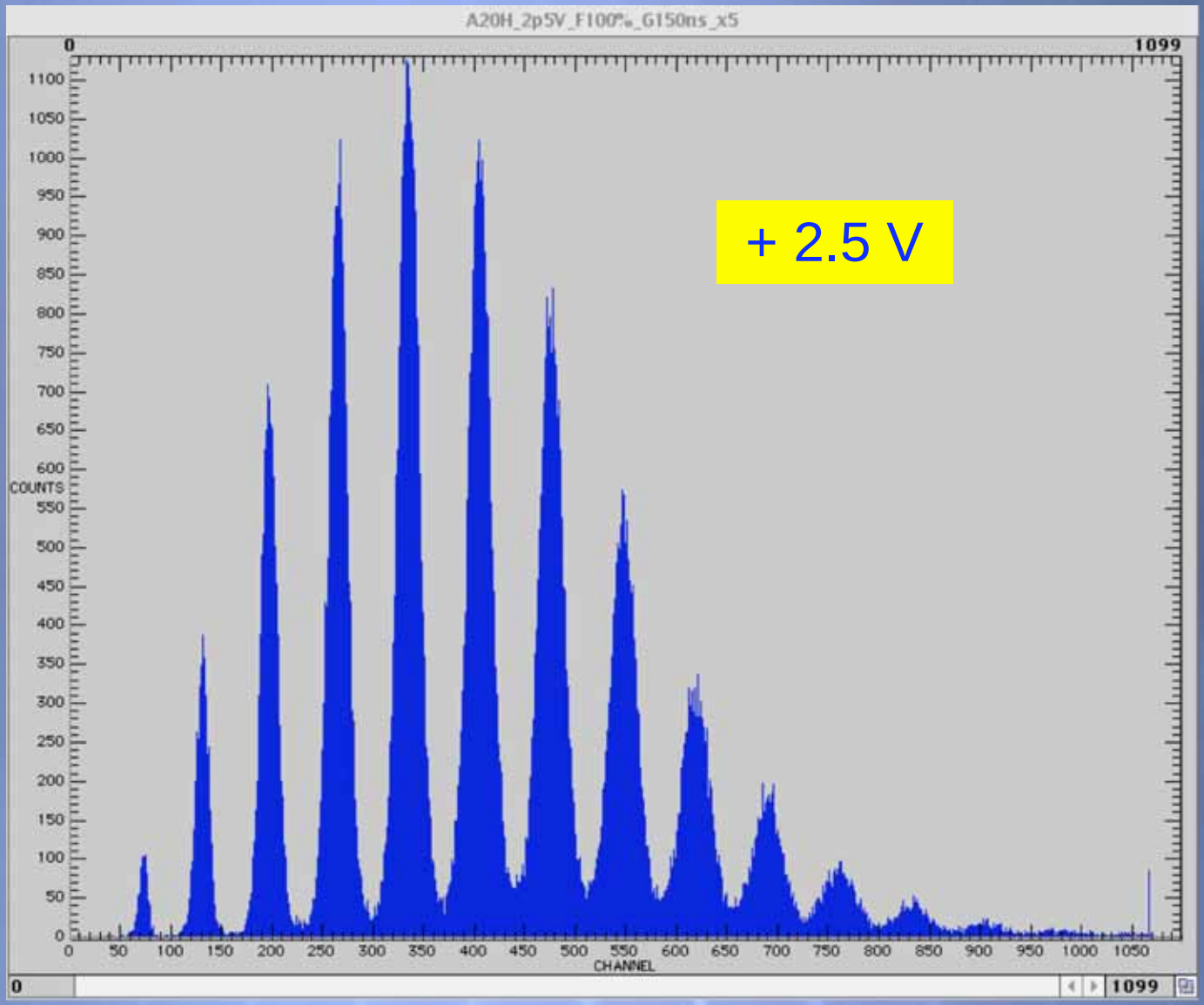


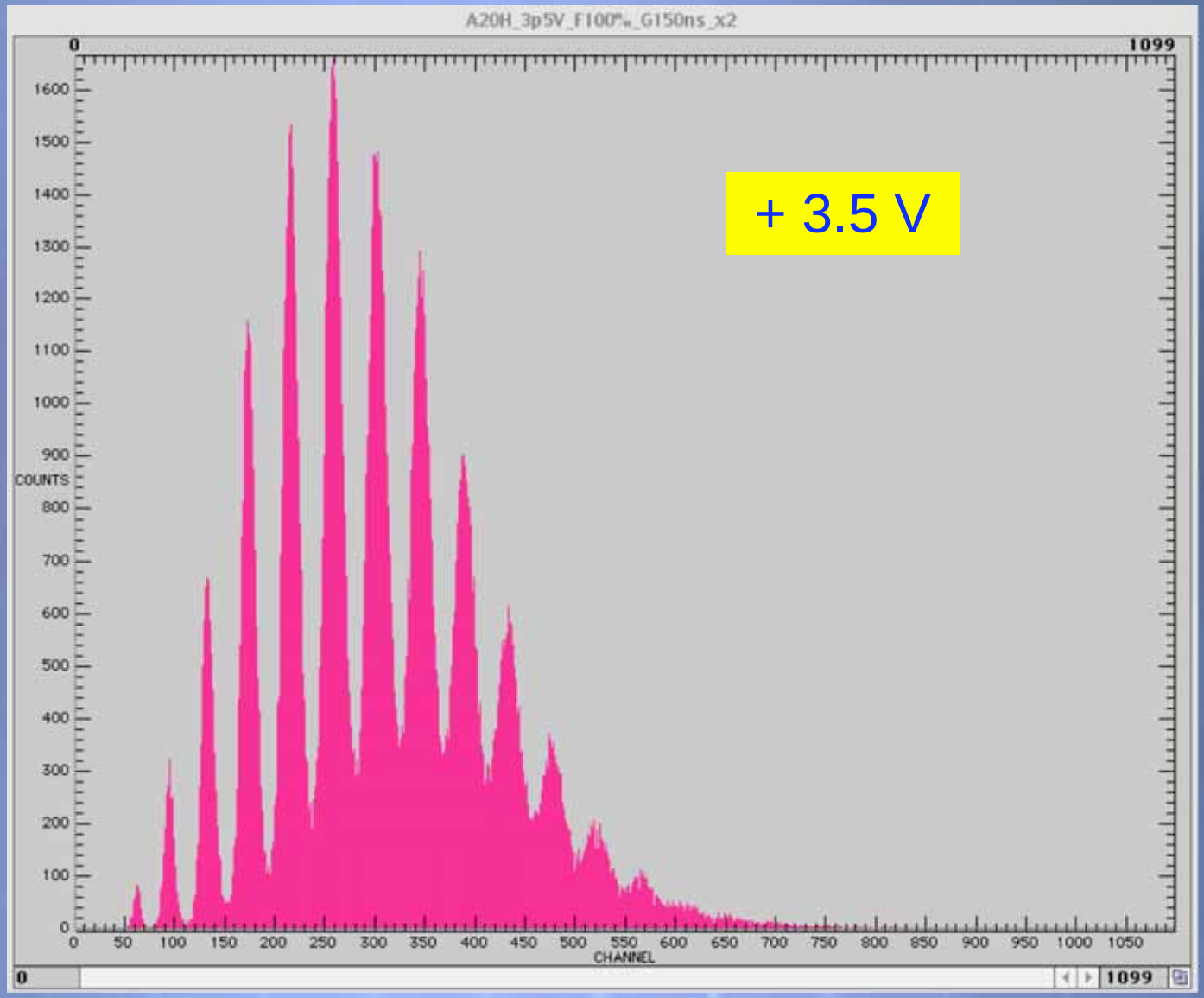
Pulses accumulated - note the resolved photopeaks

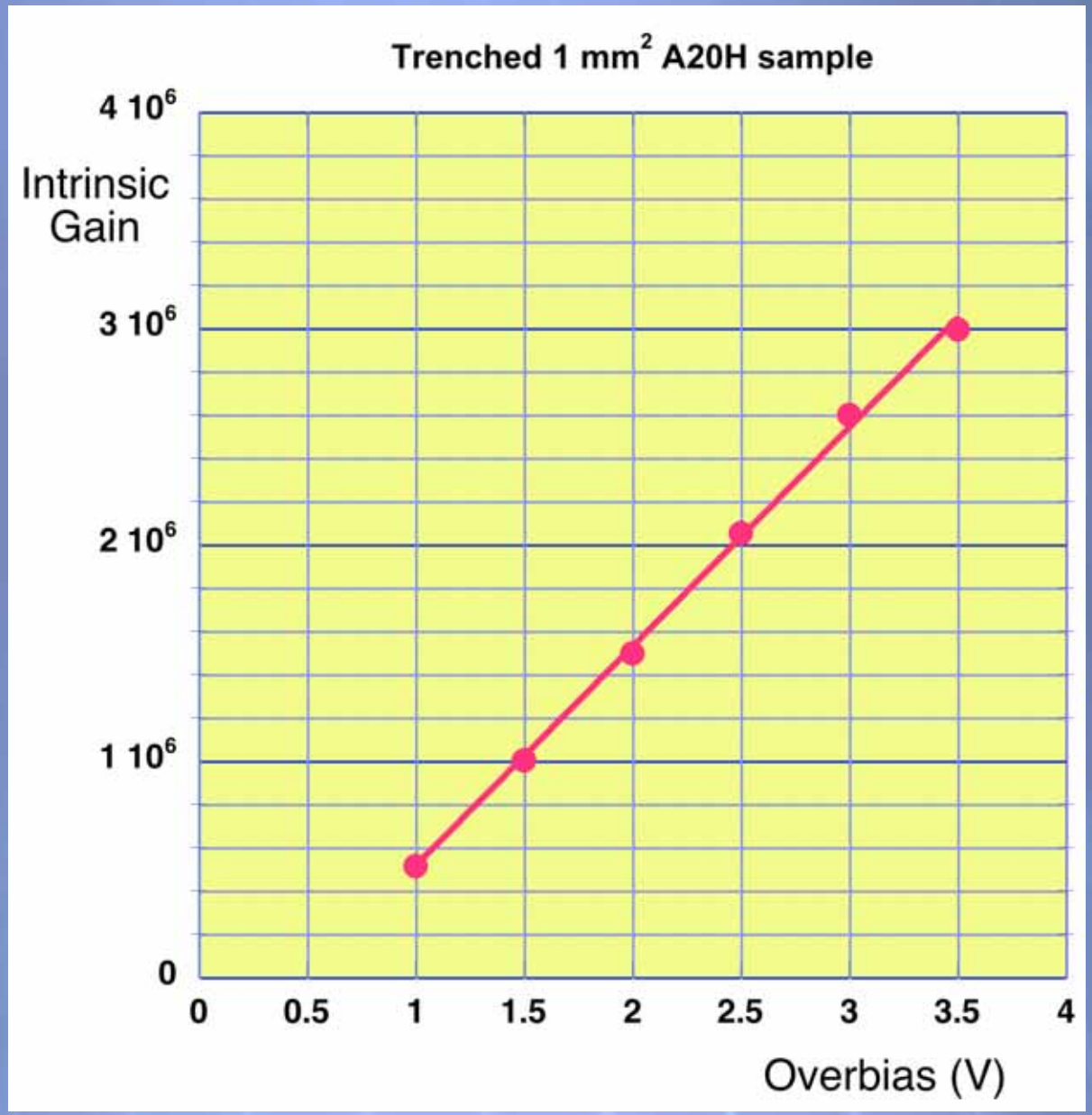



A20H_1V_F100%_G150ns_x25
0
1099
+ 1 V
COUNTS
CHANNEL
0
1099

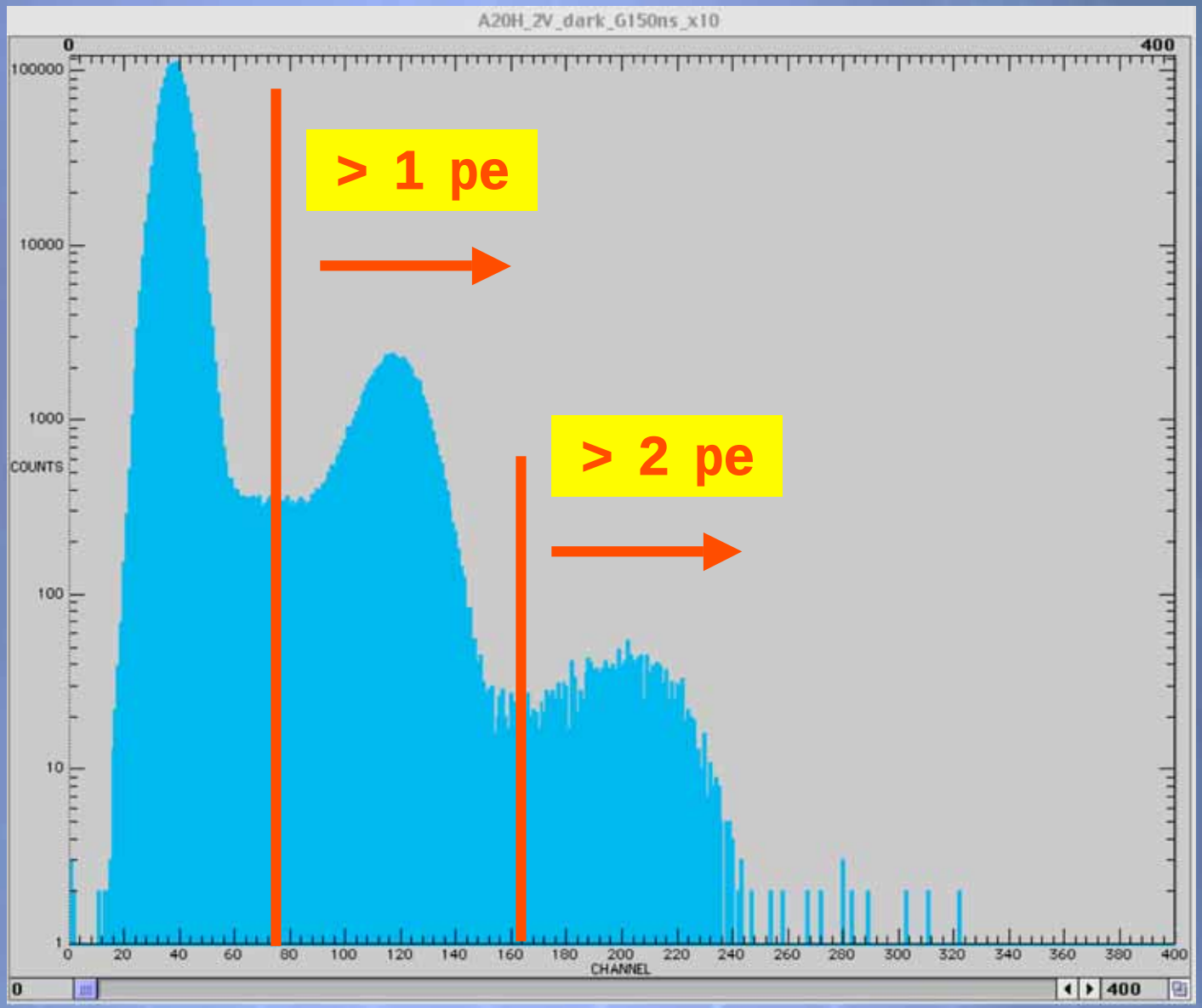

A20H_2V_F40%_G150ns_x10
0
1099
+ 2 V
COUNTS
CHANNEL
4400
4200
4000
3800
3600
3400
3200
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950 1000 1050
0
1099


A20H_2p5V_F100%_G150ns_x5
0
1099
+ 2.5 V
COUNTS
CHANNEL
0
1099


A20H_3p5V_F100ns_G150ns_x2
0
1099
1600
1500
1400
1300
1200
1100
1000
900
COUNTS
800
700
600
500
400
300
200
100
0
0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950 1000 1050
CHANNEL
0
1099
+ 3.5 V


Trenched 1 mm^2 A20H sample
Intrinsic Gain
4 10^6
3 10^6
2 10^6
1 10^6
0
0
0.5
1
1.5
2
2.5
3
3.5
4
Overbias (V)

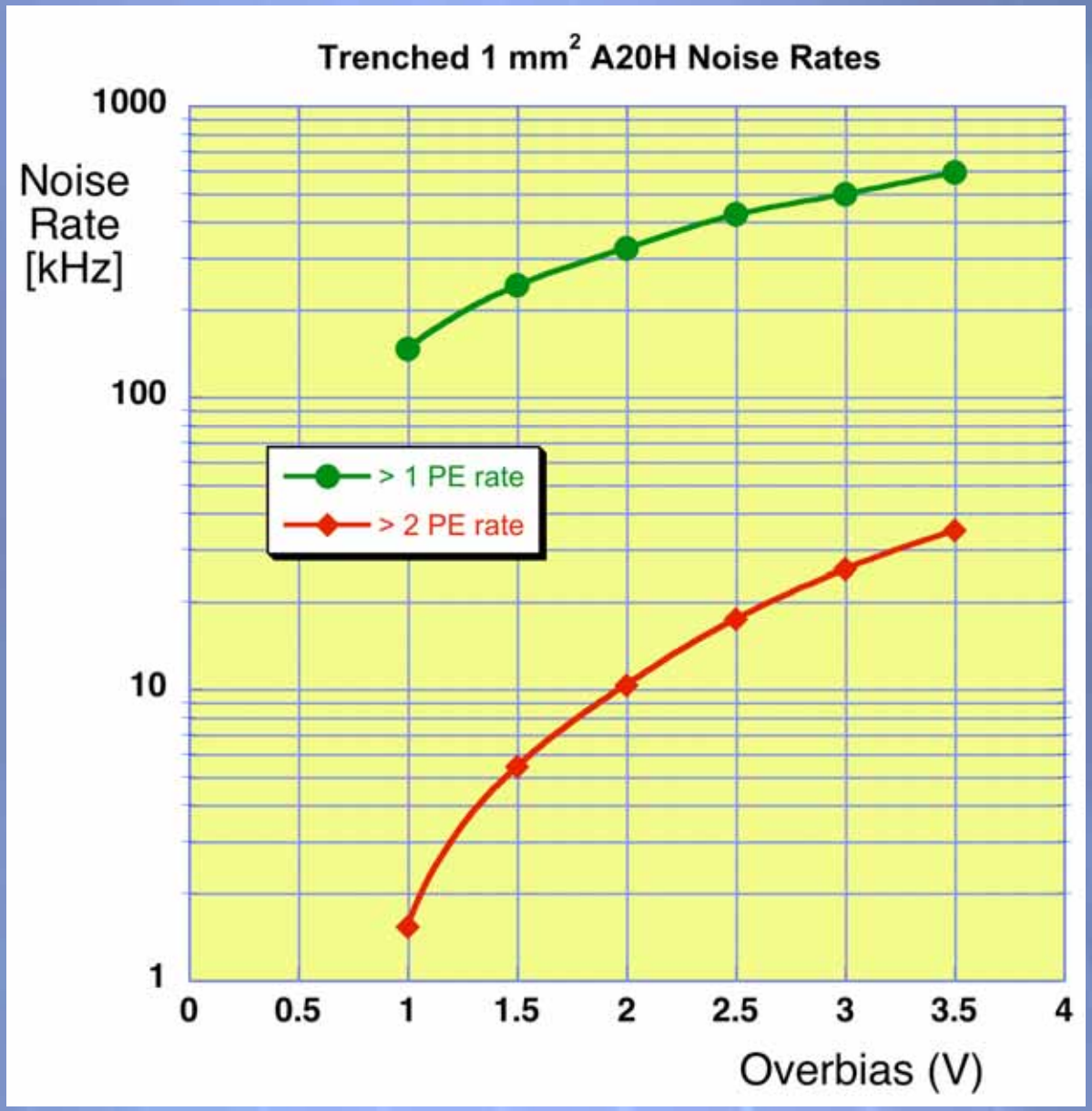
Dark Noise


A20H_2V_dark_G150ns_x10
> 1 pe
> 2 pe
COUNTS
CHANNEL
100000
10000
1000
100
10
1
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400

Noise Rates:

$$R(>1)\ [kHz] = \frac{N(>1) / N_T}{\text{Gate (150 ns)}}$$

$$R(>2)\ [kHz] = \frac{N(>2)}{N(>1)} \times R(>1)$$


Trenched 1 mm^2 A20H Noise Rates
1000
100
10
1
Noise Rate [kHz]
> 1 PE rate
> 2 PE rate
0
0.5
1
1.5
2
2.5
3
3.5
4
Overbias (V)

Still to Come:

- PDE measurements
- Linearity Tests
- Long-term torture tests of 3x3 mm^2 A30H samples