

Testing Status of P.P. & APD

1

KEN, JERI
FU JEN CATHOLIC UNIVERSITY
2008/DEC./11

Two kinds of Samples

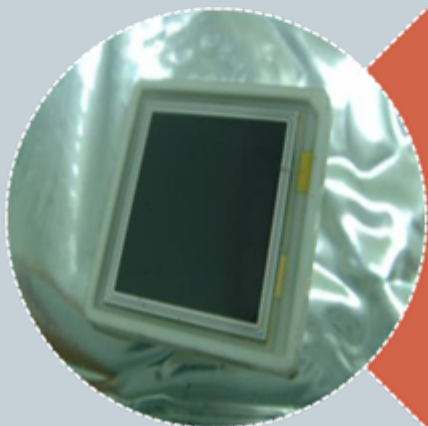
(purpose: enlarge light signals from CsI crystals)

2



P.P. x3

(photo pentode tubes)

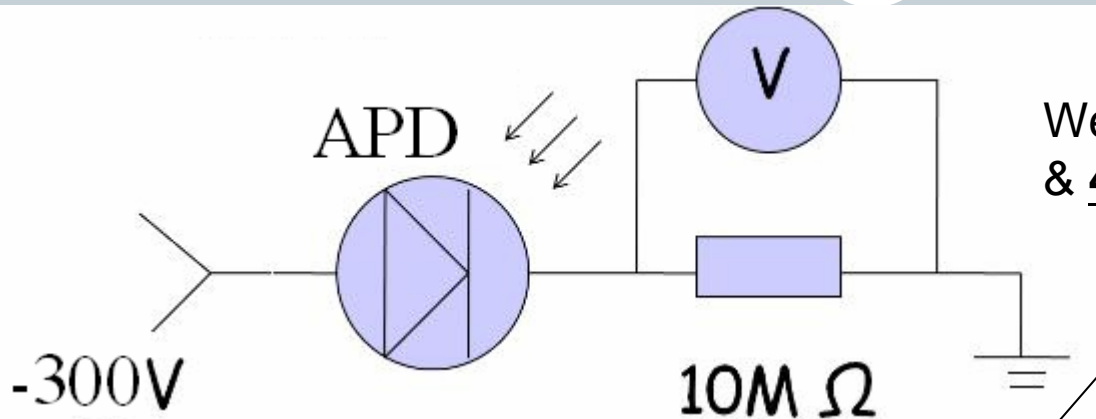


APD x2

(avalanche photodiodes)

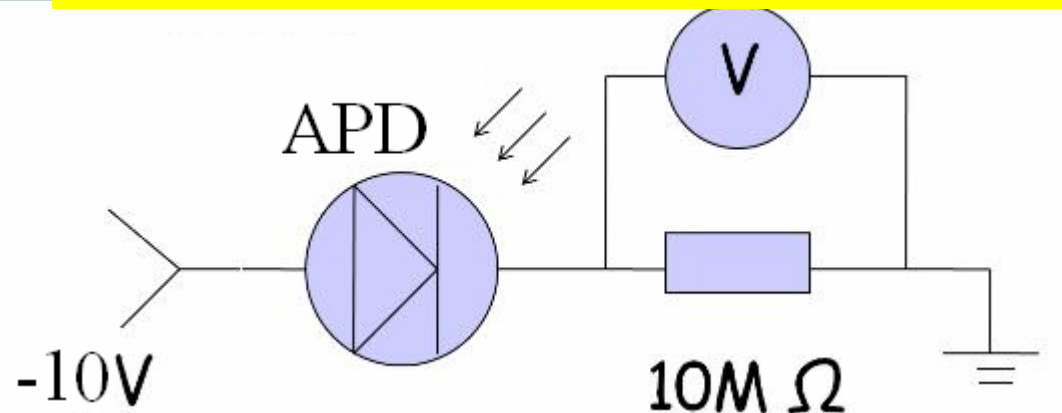
Schematic Diagrams for APD

3



We use 400V for Serial No. AA0705 & 450V for Serial No. AA0724

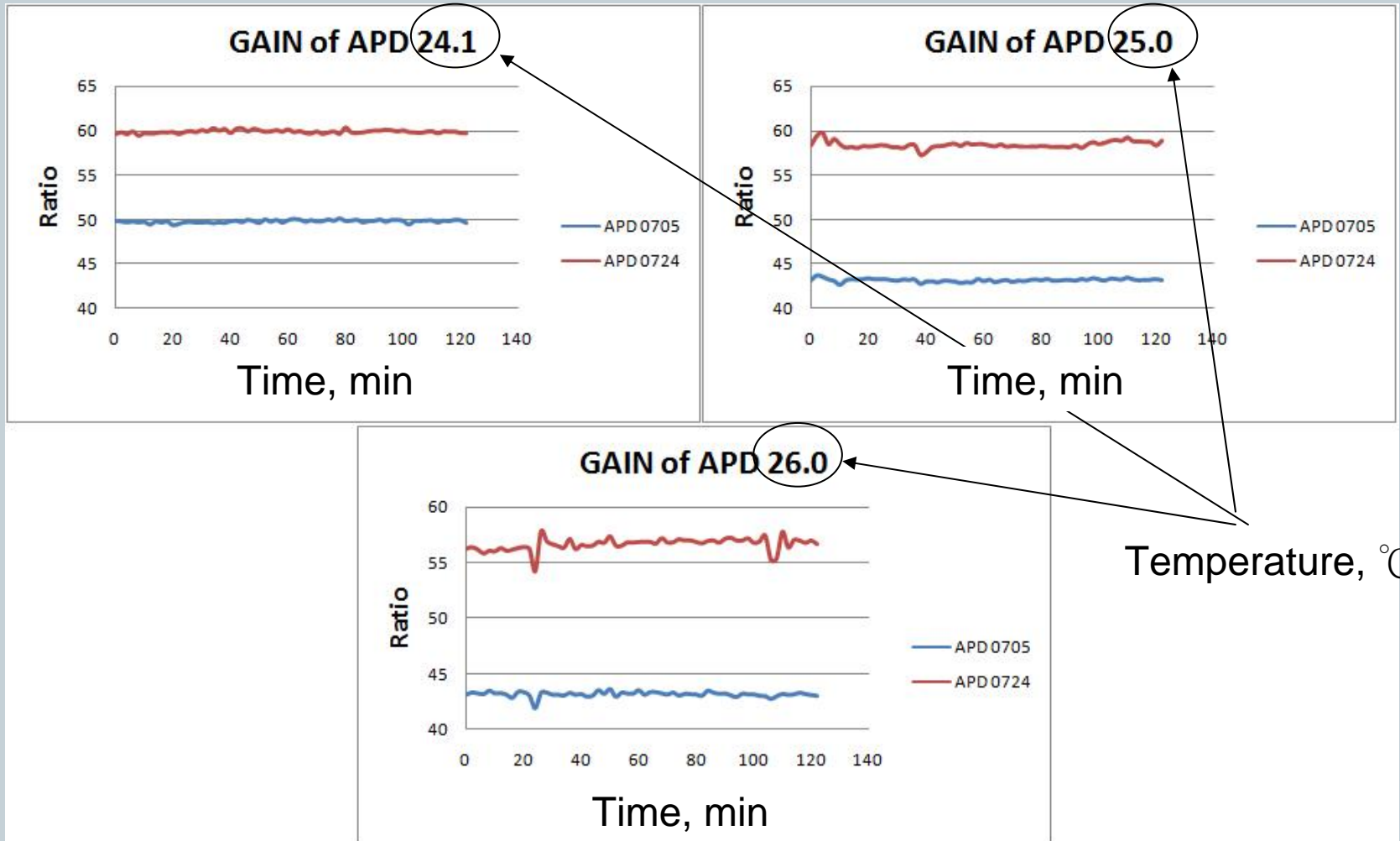
$$Gain_Ratio_{APD} = \frac{V(\text{light \& } 300V) - V(\text{dark \& } 300V)}{V(\text{light \& } 10V) - V(\text{dark \& } 10V)}$$



- Light Source: Blue LED
- Light Intensity: detected by PIN Photodiode
→simulate very weak light (very simple scale)

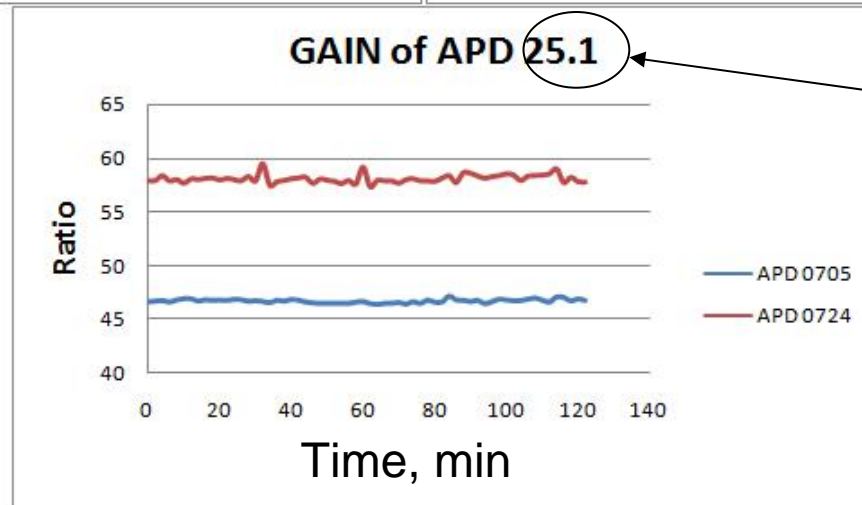
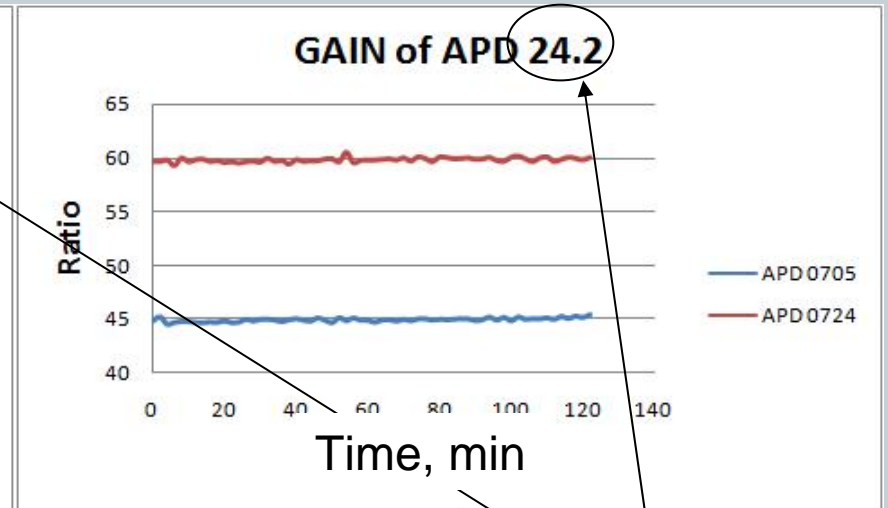
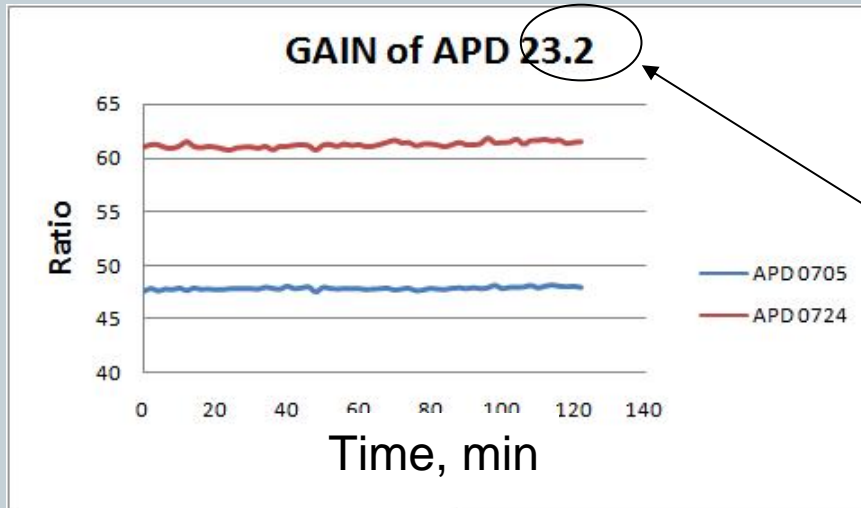
Results: 2008/Nov./25

4



Results: 2008/Nov./26

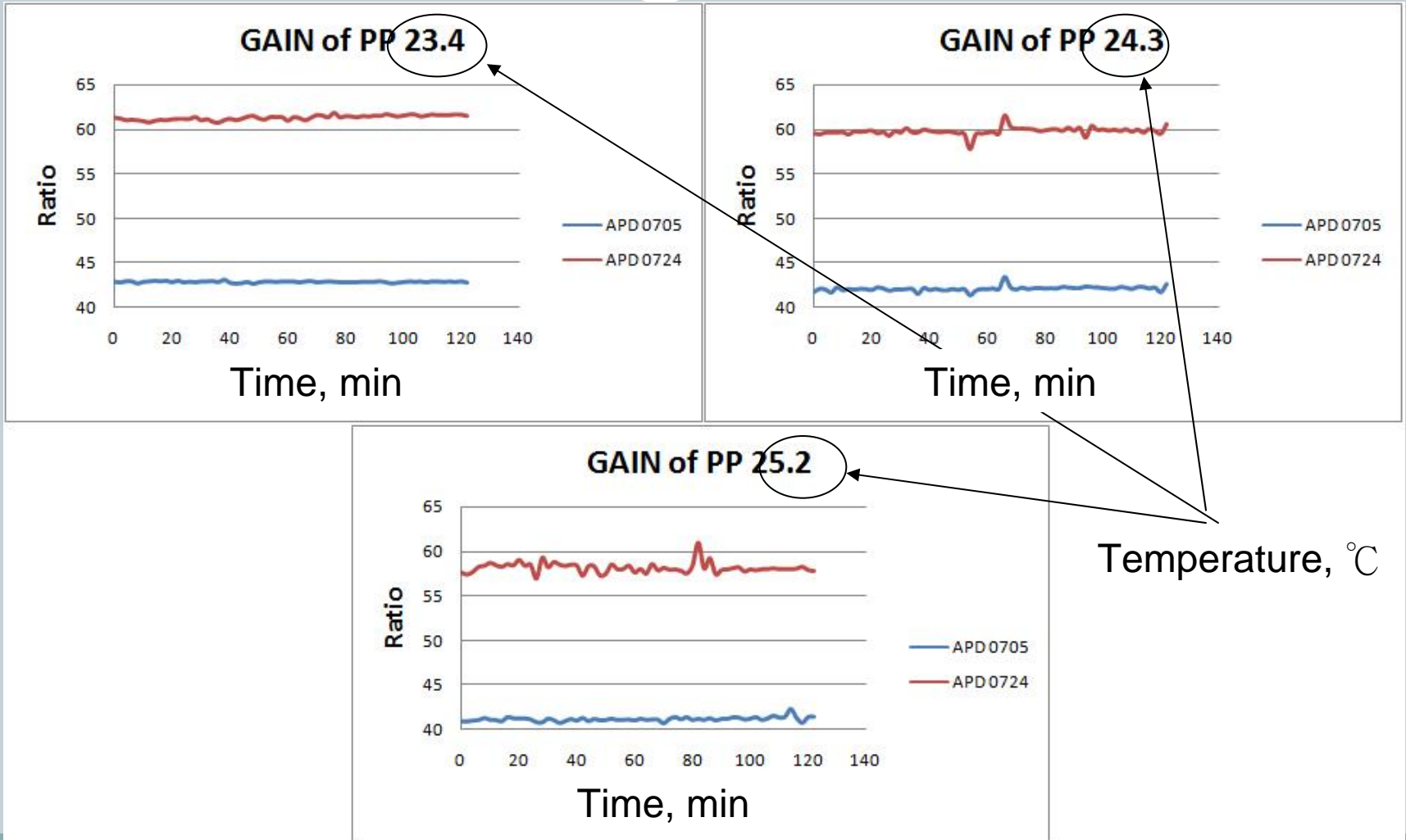
5



Temperature, °C

Results: 2008/Nov./27

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GAIN of PP 23.4

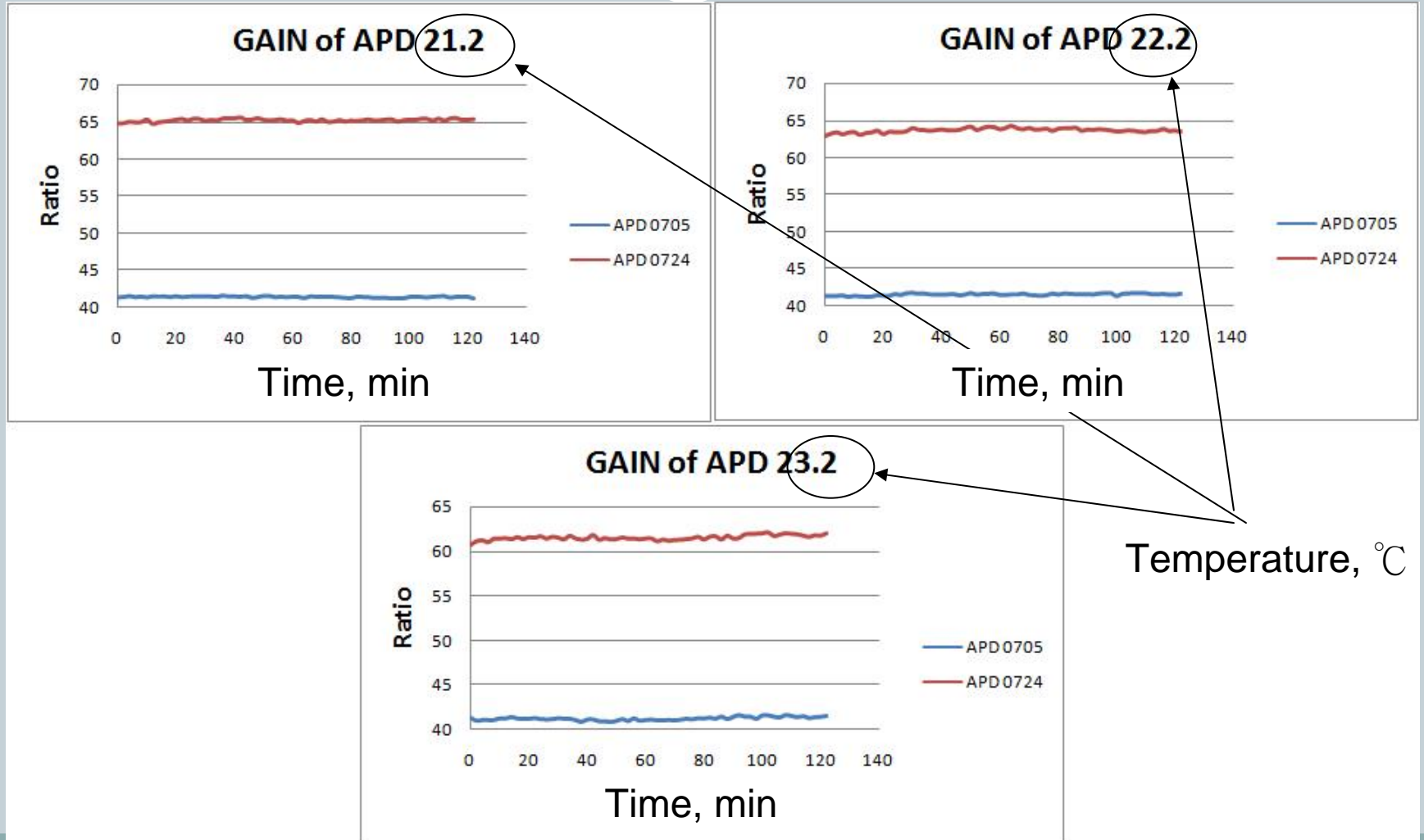
GAIN of PP 24.3

GAIN of PP 25.2

Temperature, °C

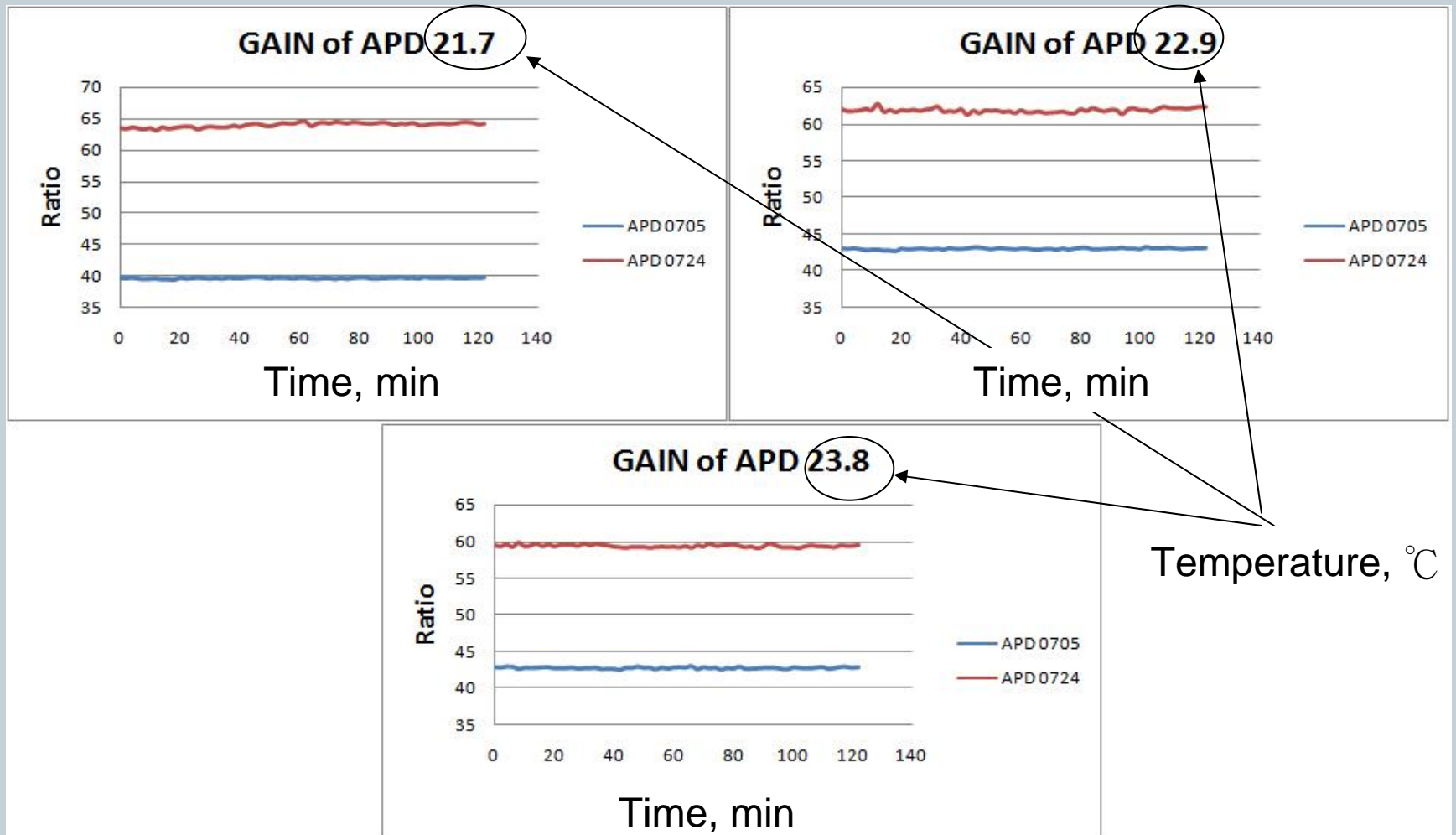
Results: 2008/Dec./1

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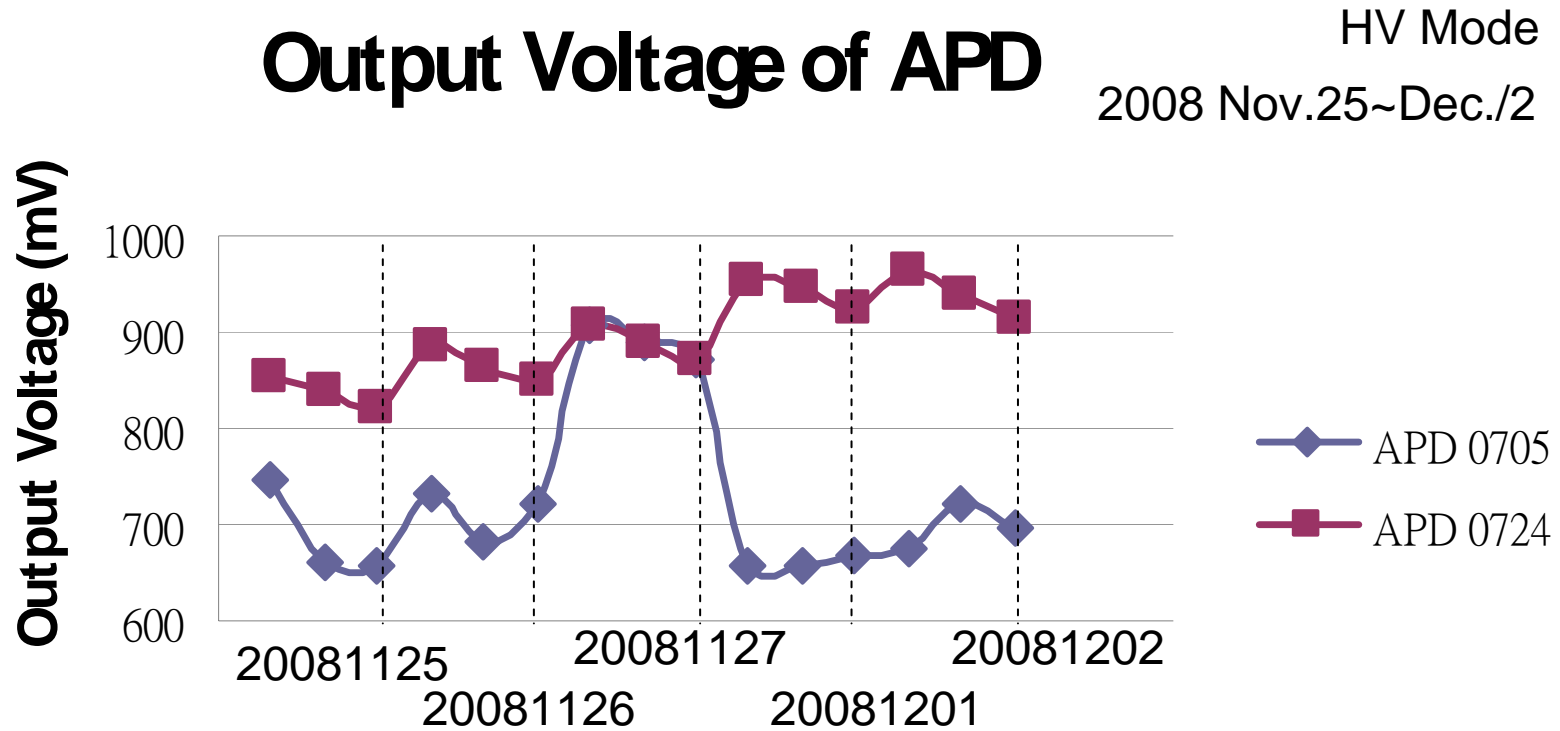
Results: 2008/Dec./2

8



Summary Plots 1

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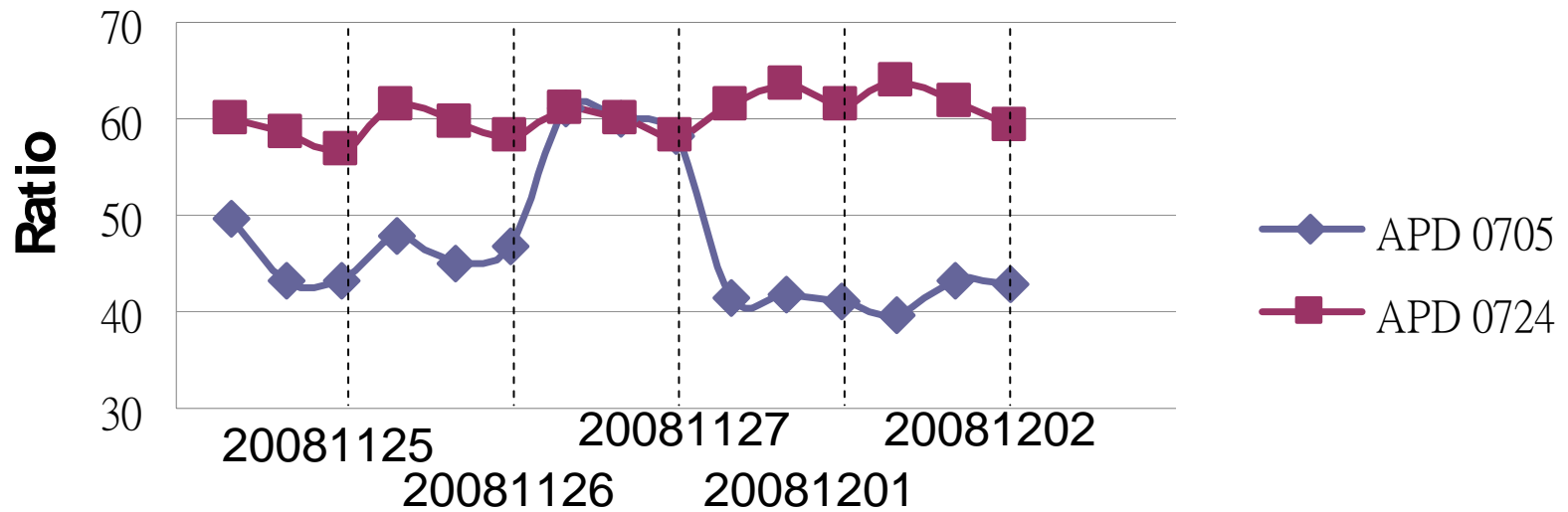


Summary Plots 2

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GAIN of APD

2008 Nov.25~Dec./2



Summary of APD

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- APD Type: 0724 is more stable & Gain ratio is higher. → Better choose!
- When temperature is lower, the output voltage becomes higher. → But, Gain Ratio is stable.

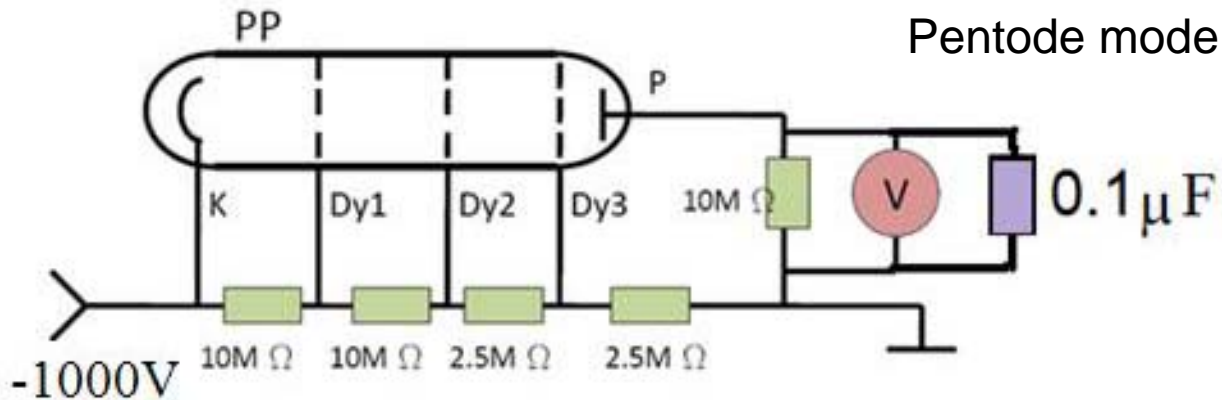
Next Step of APD

12

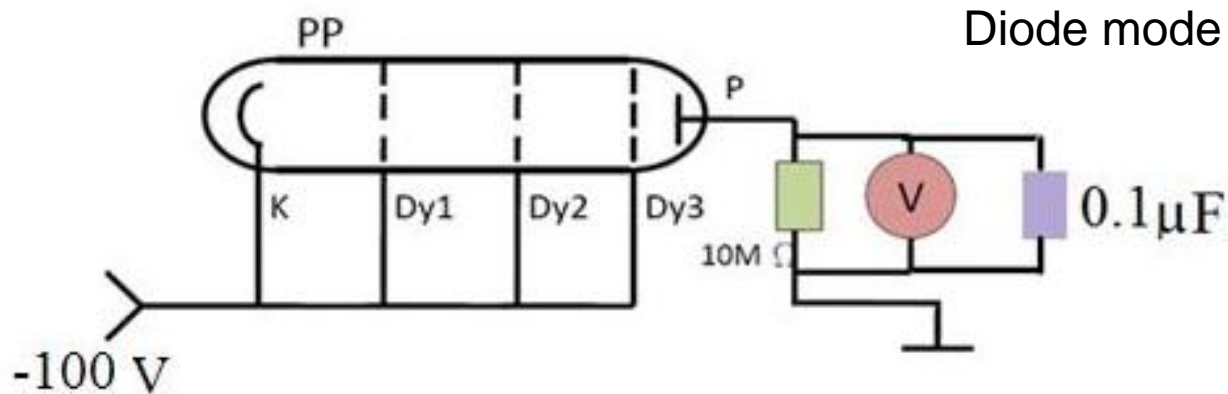
- We will keep measuring these two APDs and will provide their results on the webpage soon.
- Could we have two more APDs? We can tell which type is better.
- We are making a magnetic field now. We hope to know how will it affect the gain ratio of APD.

Schematic Diagrams for P.P.

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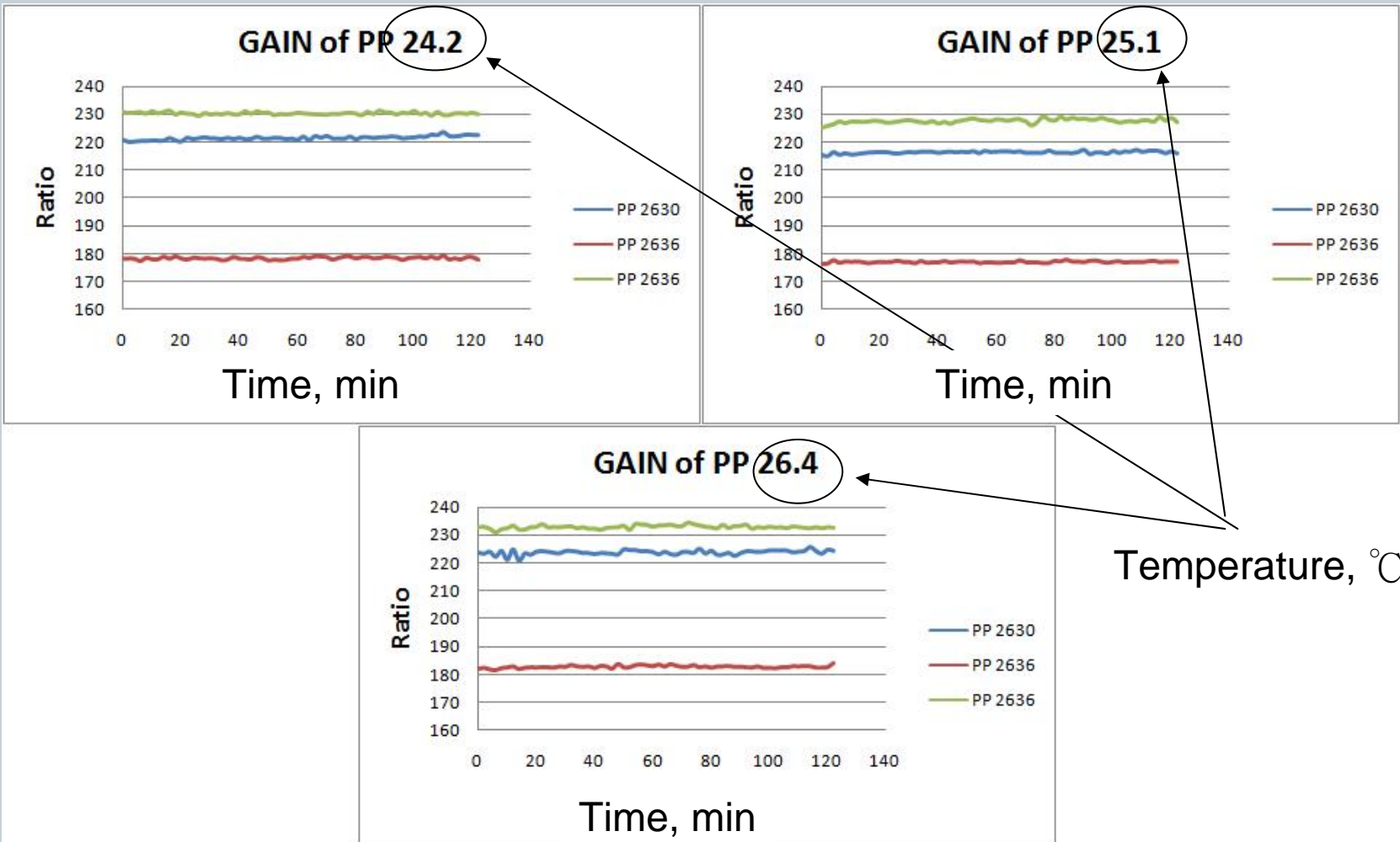


$$Gain_Ratio_{PP} = \frac{V(\text{light \& } 1000V)_{\text{pentode}} - V(\text{dark \& } 1000V)_{\text{pentode}}}{V(\text{light \& } 100V)_{\text{diode}} - V(\text{dark \& } 100V)_{\text{diode}}}$$



Results: 2008/Nov./25

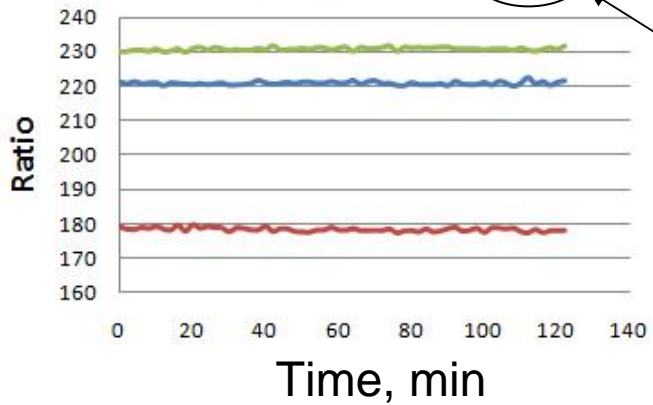
14



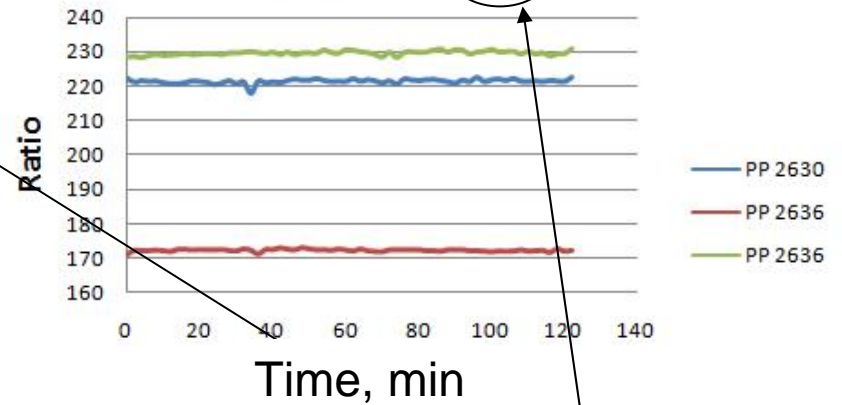
Results: 2008/Nov./26

15

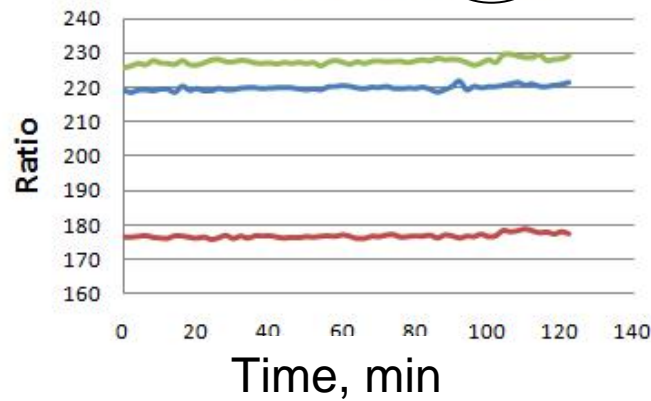
GAIN of PP 23.0



GAIN of PP 24.3



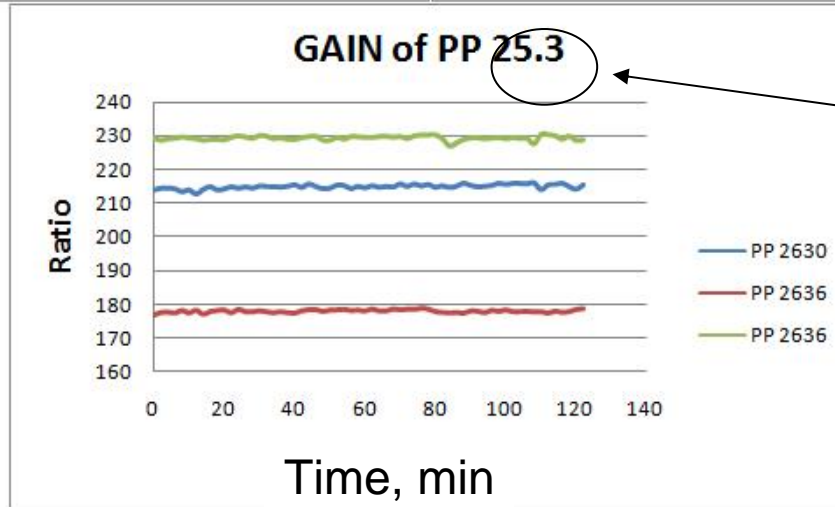
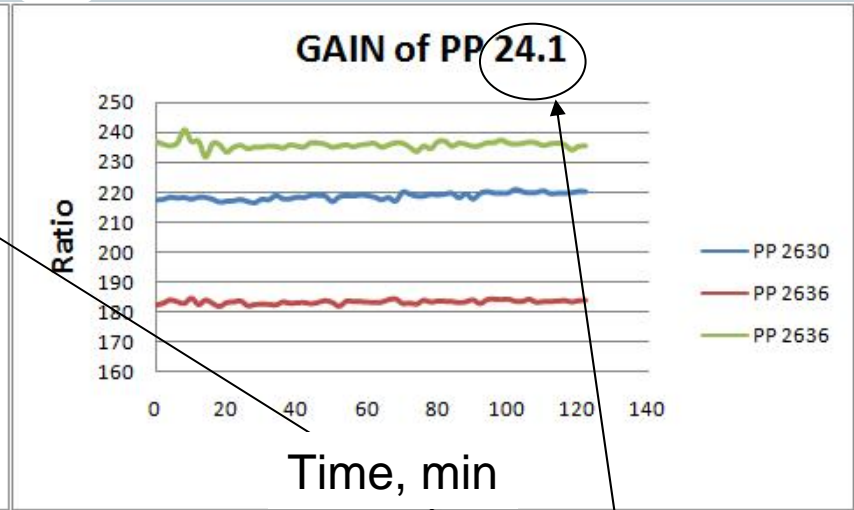
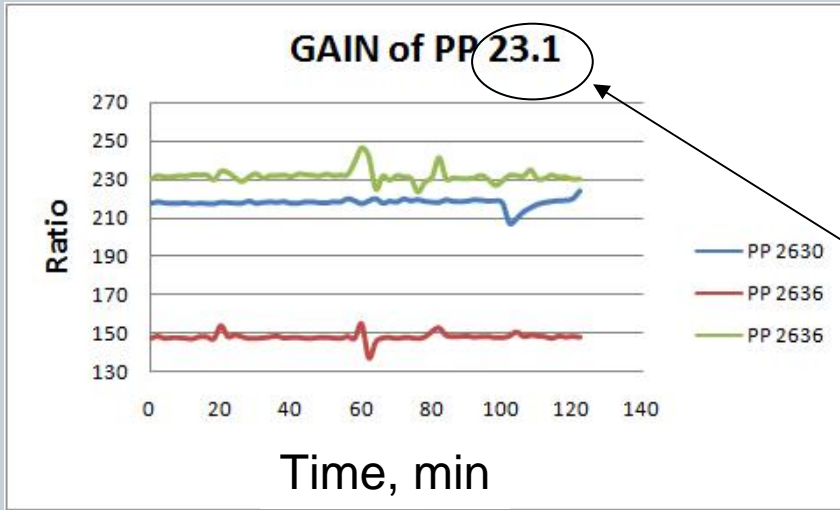
GAIN of PP 25.0



Temperature, °C

Results: 2008/Nov./27

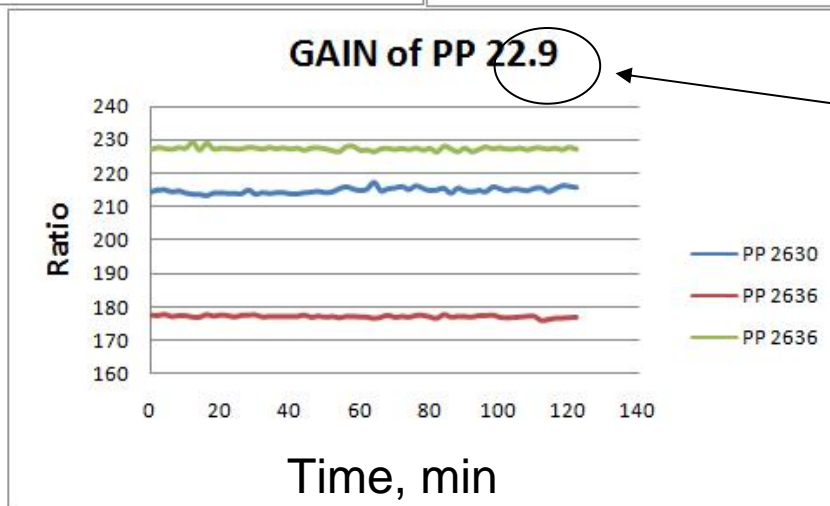
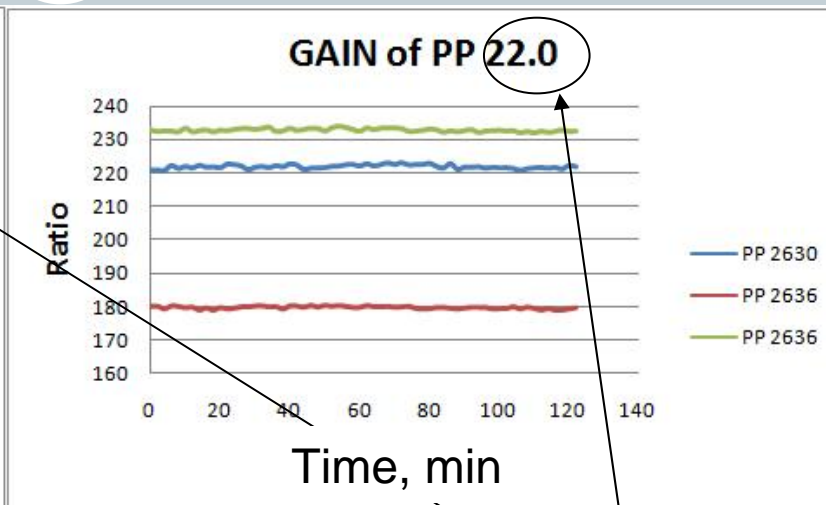
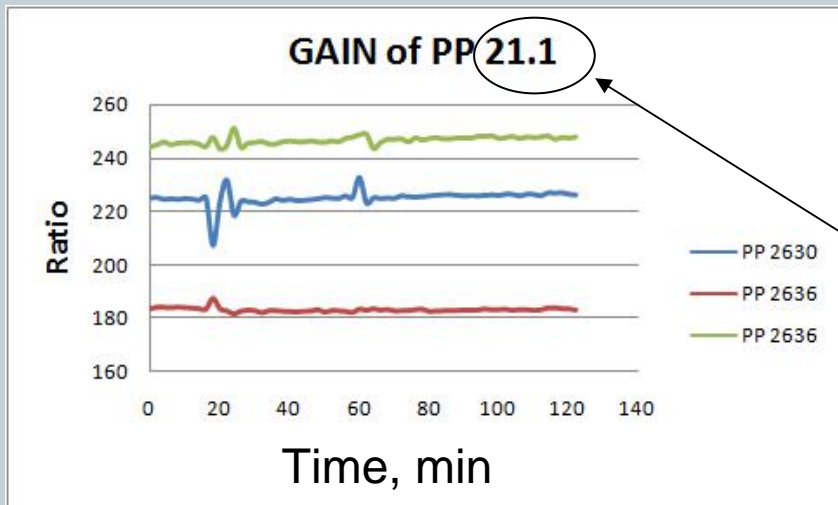
16



Temperature, °C

Results: 2008/Dec./1

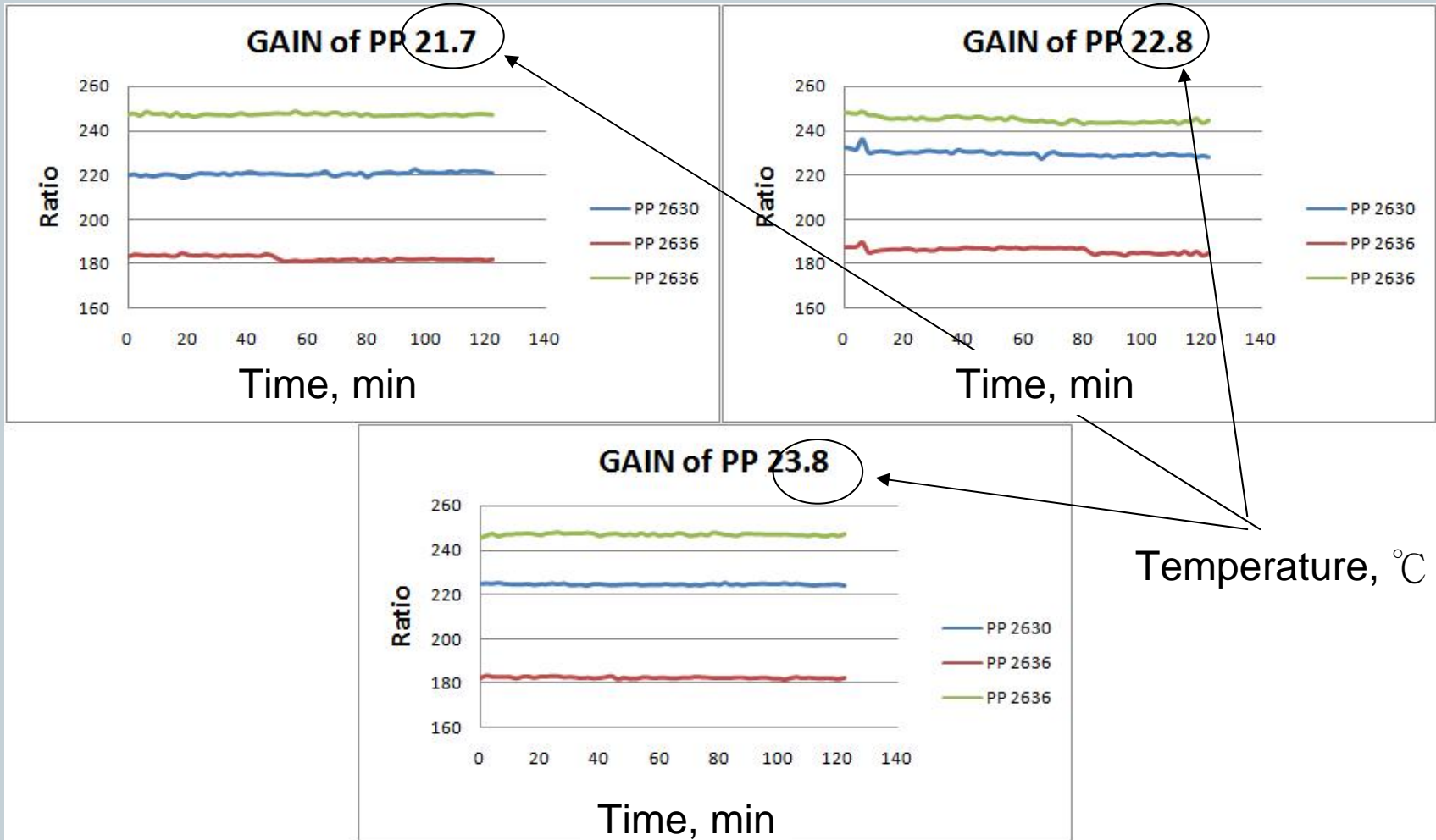
17



Temperature, °C

Results: 2008/Dec./2

18

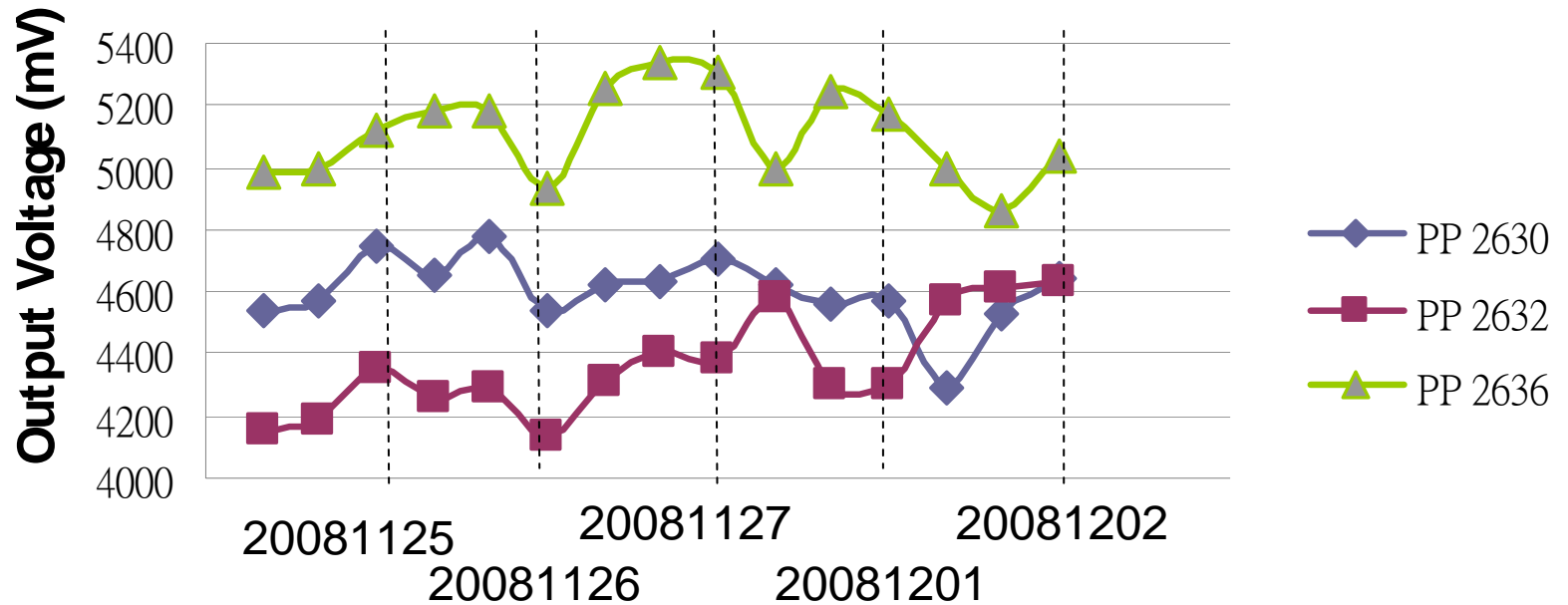


Summary Plots 1

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Output Voltage of PP

HV Mode
2008 Nov.25~Dec./2

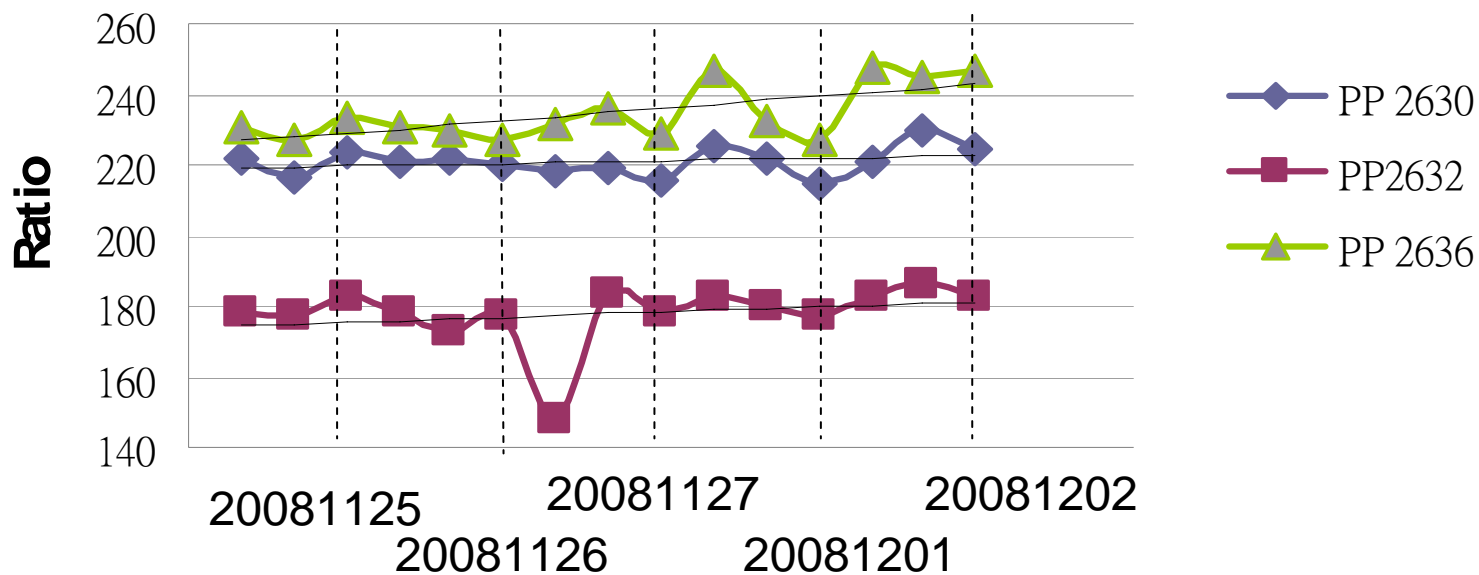


Summary Plots 2

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GAIN of PP

2008 Nov.25~Dec./2



Summary of P.P.

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- Gain-ratio of the three P.P.s are stable. Type **2636** shows highest gain-ratio.
- **Temperature** doesn't show direct effect on the P.P. output voltage.

Next Step of P.P.

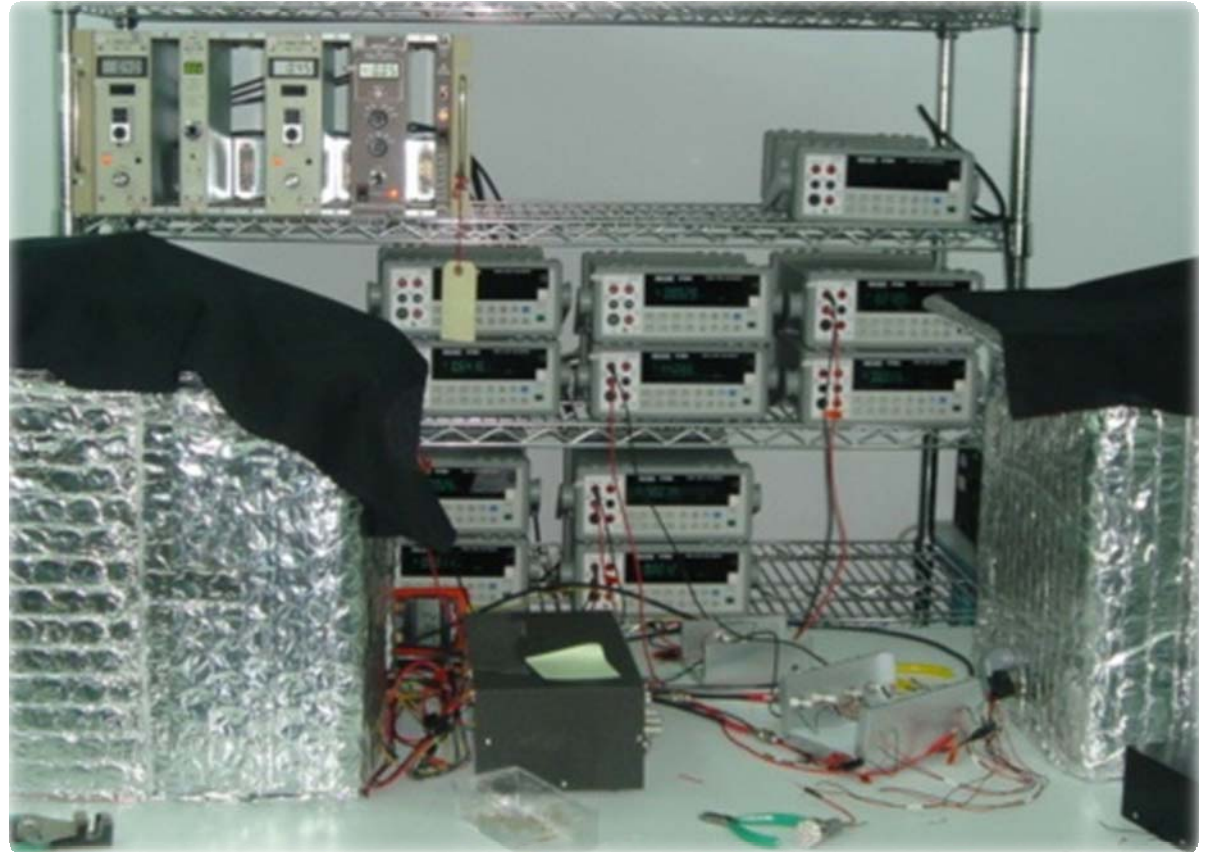
22

- We will keep measuring these three P.P.s and will provide their results on the webpage soon.
- We are making a magnetic field now. We hope to know how will it affect the gain ratio of P.P.

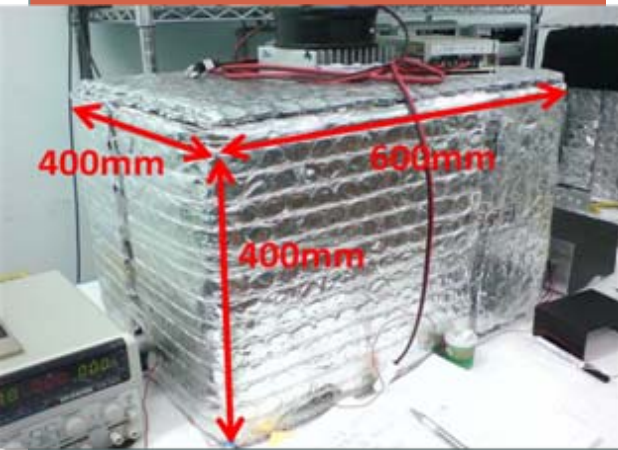
Left Box: P.P.

Right Box: APD

Bottom: Box
Size

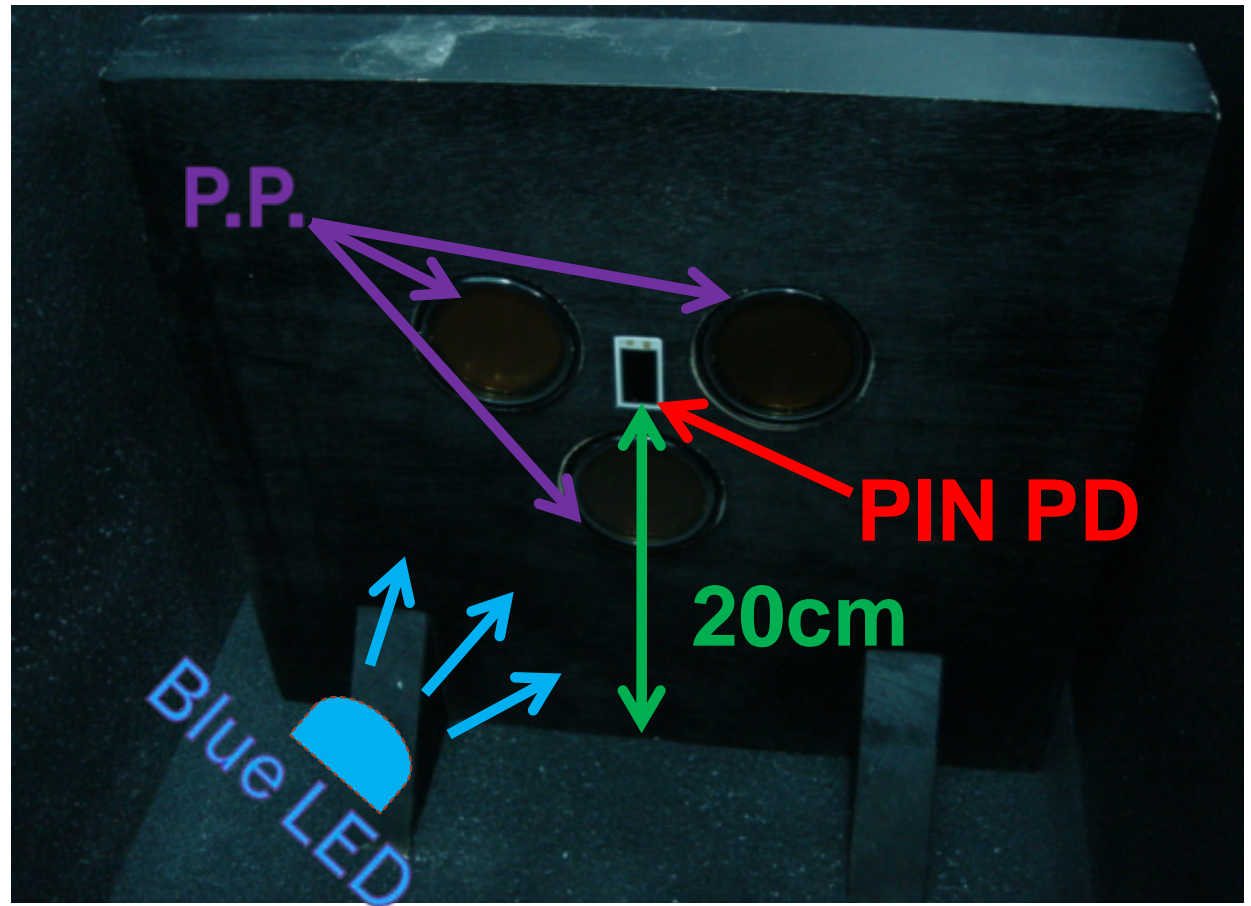


Setup: Outside View



The distance between LED and PP samples is 34cm.

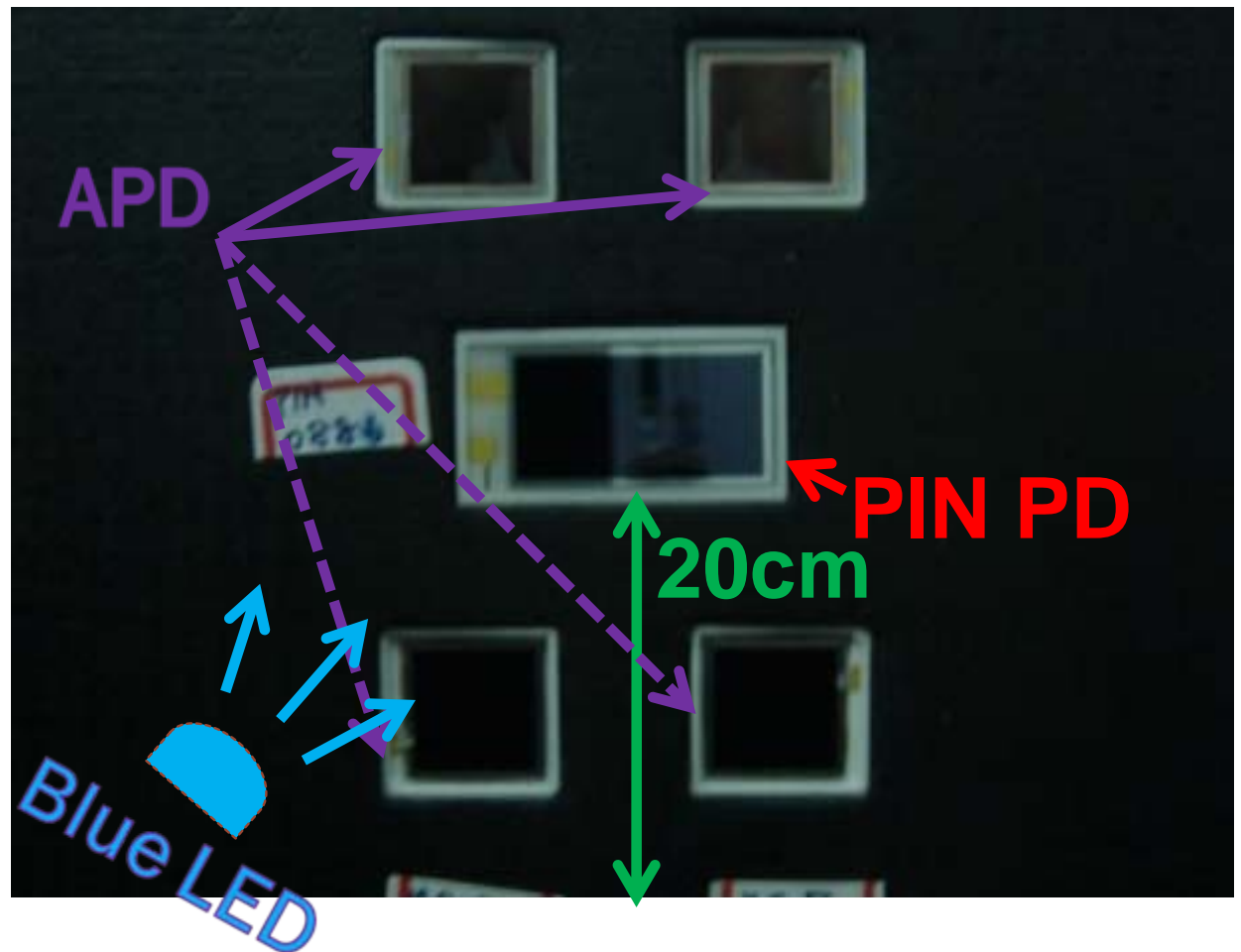
The wave length of blue LED is about 450 nm.



Inside the Box: P.P.

The distance between LED and APD samples is 34cm.

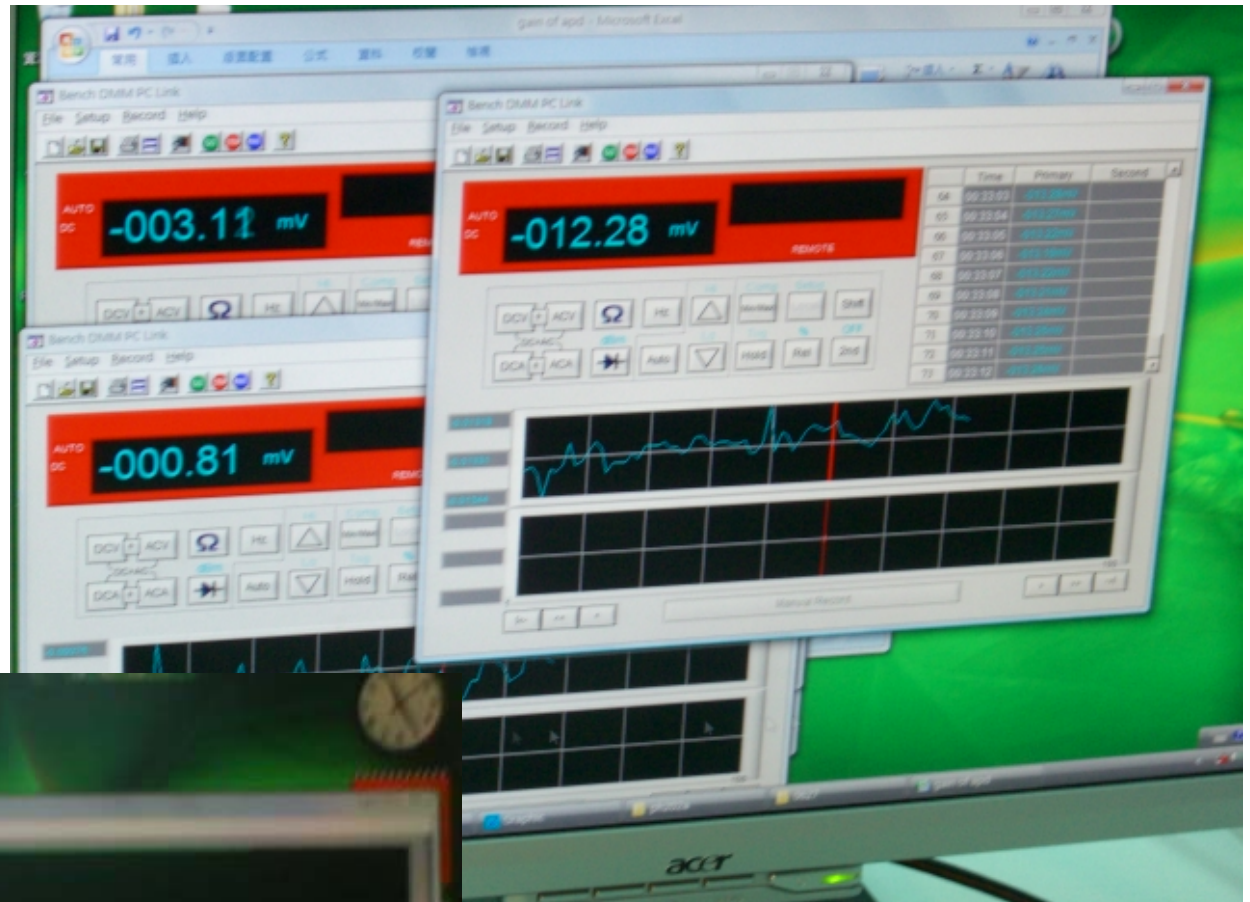
The wave length of blue LED is about 450 nm.



Inside the Box: APD

Right: voltage

Bottom:
temperature



Output Monitoring

Conclusion

- Comparing the gain-ratio between APD and P.P., we think P.P. is better to enlarge the light from pure CsI crystal.