

The images of the plasma jet have been taken by the pinhole camera system with the diameter of the pinhole is 500 μm



8/12

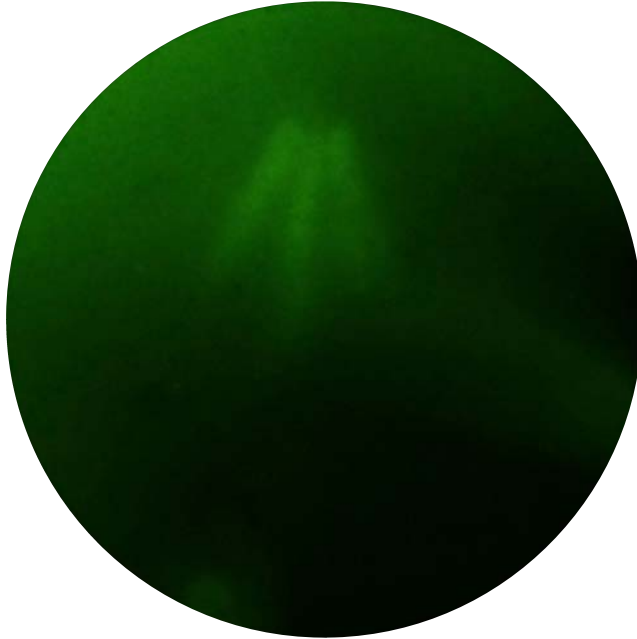
F#4

ISO100

5 kV, -1 kV

0.5mm hole

• 亮度+40%



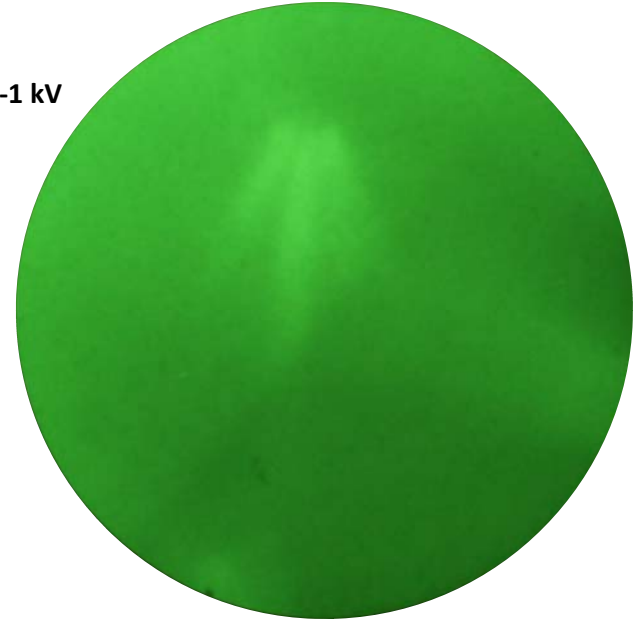
8/17

F#16

ISO100

5.6 kV, 2.1 kV, -1 kV

0.5mm hole



The images of the plasma jet have been taken by the pinhole camera system with the diameter of the pinhole is 500 μm



- **The OE receiver box needs to be placed around the laser cooler near the optical table to avoid the EMP.**
- **The suggested pinhole camera setting is ISO-100 and the f-number is 16.**
- **The suggested high voltage supply on the screen is 5 kV and 2 kV for MCP2.**
- **The diameter of the pinhole has been changed to 500 μm .**

Outline



- **Pinhole camera testing**

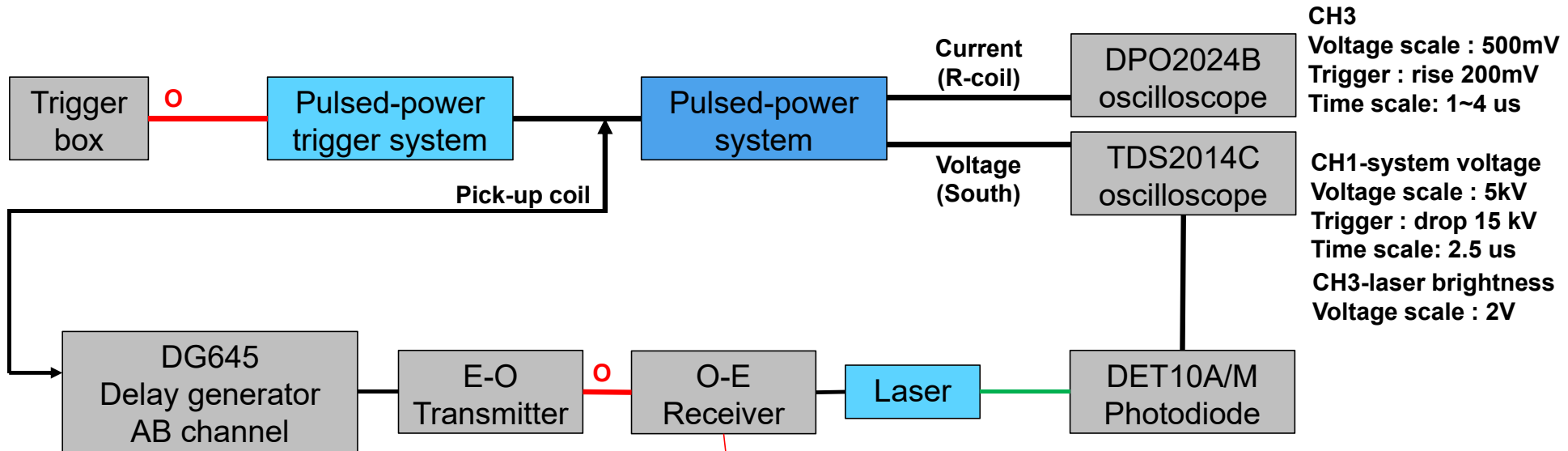
- **Pinhole camera control box**

Outline



- **Pinhole camera testing**
- Pinhole camera control box

Experiment setup



CH3
Voltage scale : 500mV
Trigger : rise 200mV
Time scale: 1~4 us

CH1-system voltage
Voltage scale : 5kV
Trigger : drop 15 kV
Time scale: 2.5 us
CH3-laser brightness
Voltage scale : 2V

The OE receiver box needs to be placed around the laser cooler near the optical table to avoid the EMP.

Experiment setup



- Trigger :
EXT+Single mode
- Threshold : 0.2 V



- Trigger signal :
Pick-up coil

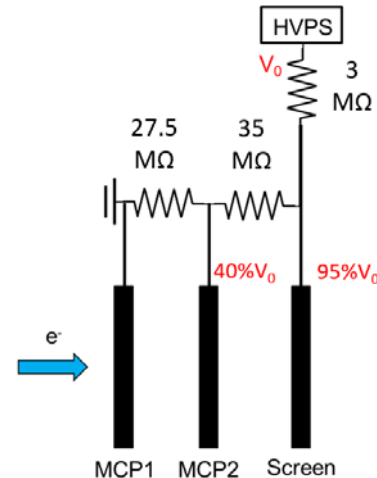
- A : $T_0 + (\text{experiment needed delay time})$
- B : $A + 35\mu\text{s}$
(This channel for trigger laser)

- G : $T_0 + 1306.6\mu\text{s}$
- H : $G + 35\mu\text{s}$
(This channel for testing the laser system)

Experiment setup



- Side view camera :
 - ND filter – ND16+ND4=ND64
 - ISO-1
- DC power supply:
 - ES-1R6 (for –HV, connect with photocathode, supply -1 kV)
 - ES-5R1.2 (for +HV, connect with voltage divided box, supply 5kV)
- Voltage divided box:
 - Screen – $95\%V_0 \sim 4.75 \text{ kV}$
 - MCP2 – $40\%V_0 \sim 2 \text{ kV}$



The parameter setting of the pinhole camera



日期	f#	ISO	+HV_Screen(kV)	+HV_MCP2(kV)	-HV_Photocathode(kV)	pinhole size	備註
7月14日	*	*	*	*	*	*	沒拍到
7月16日	2.2	1	4.75	2	-1	50 um	
7月20日	8	100	4.75	2	-1	50 um	
7月22日	16	100	4.75	2	-1	50 um	建議參數
7月24日	16	100	4.75	2	-1	50 um	建議參數
7月26日	16	100	4.75	2	-1	50 um	建議參數
7月27日	*	*	*	*	*	*	沒拍到
7月28日	*	*	*	*	*	*	沒拍
7月29日	16	100	4.75	2	-1	50 um	建議參數
7月30日	16	100	4.75	2	-1	50 um	建議參數
8月2日	16	100	4.75	2	-1	50 um	建議參數
8月3日	16	1	4.75	2	-1	50 um	
8月4日	*	*	*	*	*	*	沒拍到
8月5日	16	500	4.75	2	0	50 um	沒拍到
8月6日	2.2	100	4.75	2	0	50 um	photocathode沒通電還是會發亮
8月9日	2.2	500	4.75	2	-1	0(1mm鋁板)	針孔改1mm鋁板
8月10日	2.2	100	4.75	2	-1	0(1mm鋁板)	針孔改1mm鋁板
8月11日	16	100	4.75	2	-1	1000 um	1mm鋁板鑽1mm的洞，有拍到東西
8月12日	4	100	4.75	2	-1	500 um	1mm鋁板鑽0.5mm的洞，有拍到東西，建議參數
8月13日	4	100	4.75	2	-1	500 um	1mm鋁板鑽0.5mm的洞，有拍到東西，建議參數
8月17日	16	100	5.6	2.1	-1	500 um	1mm鋁板鑽0.5mm的洞，有拍到東西
8月18日	16	100	5.6	2.1	-1	500 um	1mm鋁板鑽0.5mm的洞，有拍到東西
8月19日	16	100	5.6	2.1	-1	500 um	沒拍到東西，MCP燒掉
8月20日	16	100	4.75	2	-1	500 um	沒拍到東西，MCP燒掉

7/16



F#	2.2
ISO	1

+HV	5 kV
-HV	1 kV

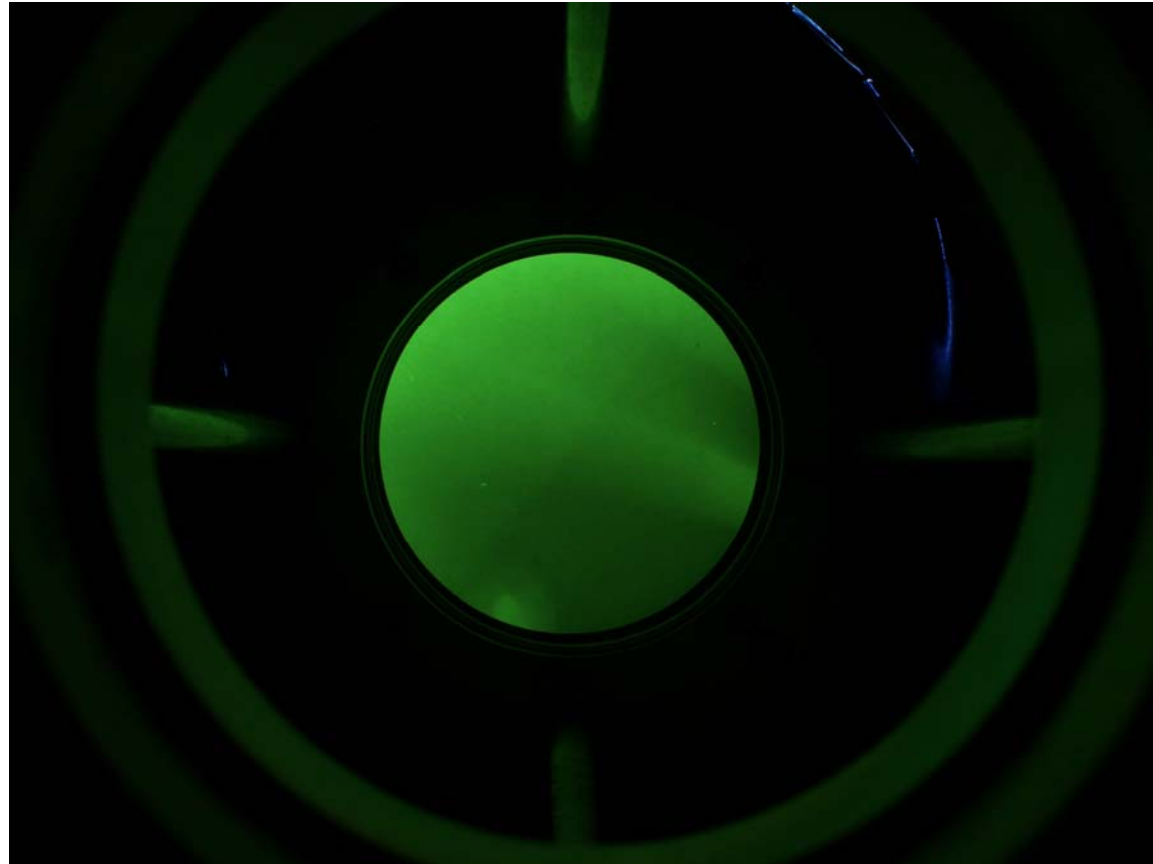


7/20



F#	8
ISO	100

+HV	5 kV
-HV	1 kV

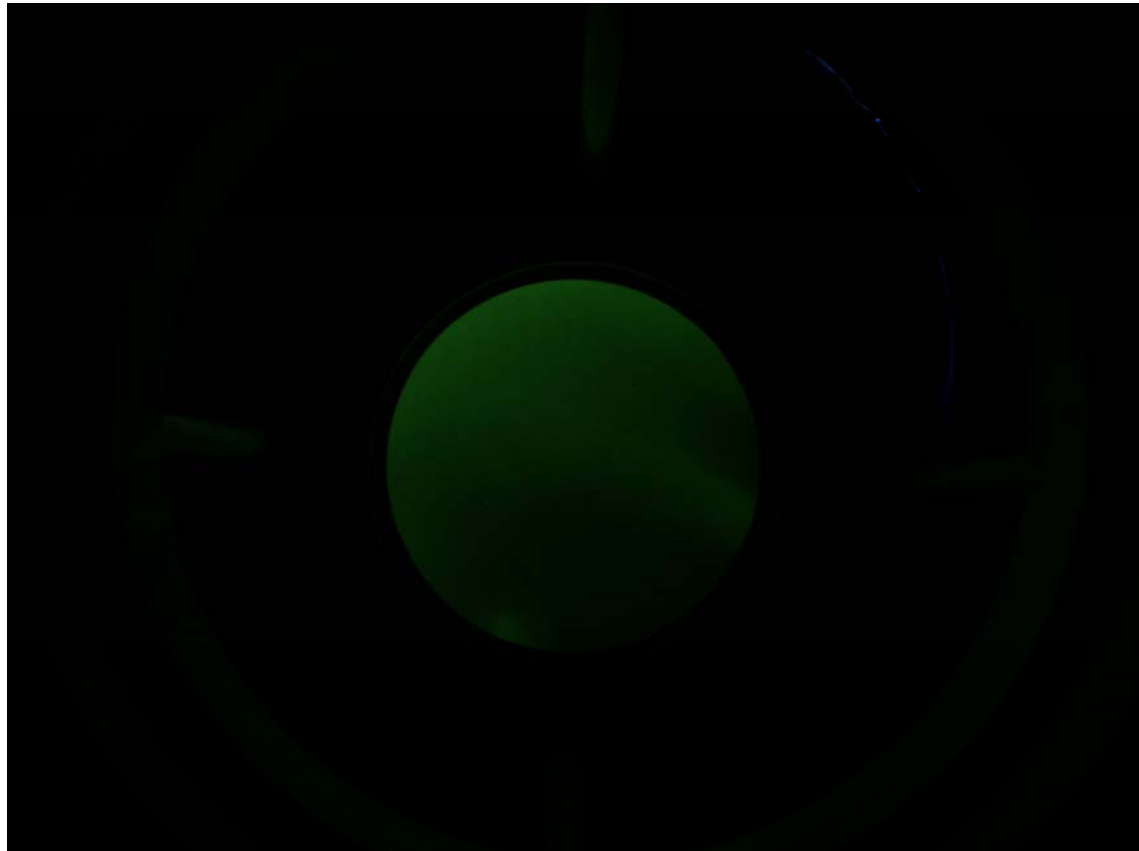


7/22



F#	16
ISO	100

+HV	5 kV
-HV	1 kV

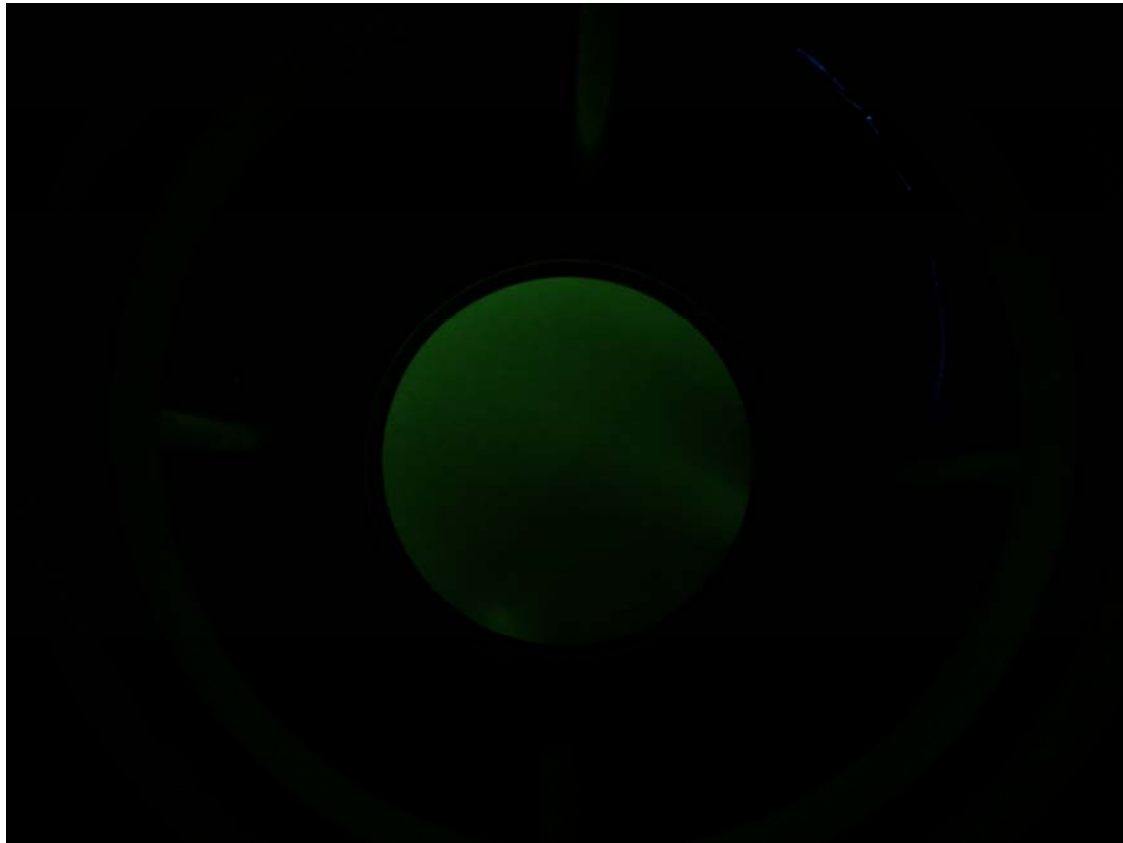


7/24



F#	16
ISO	100

+HV	5 kV
-HV	1 kV

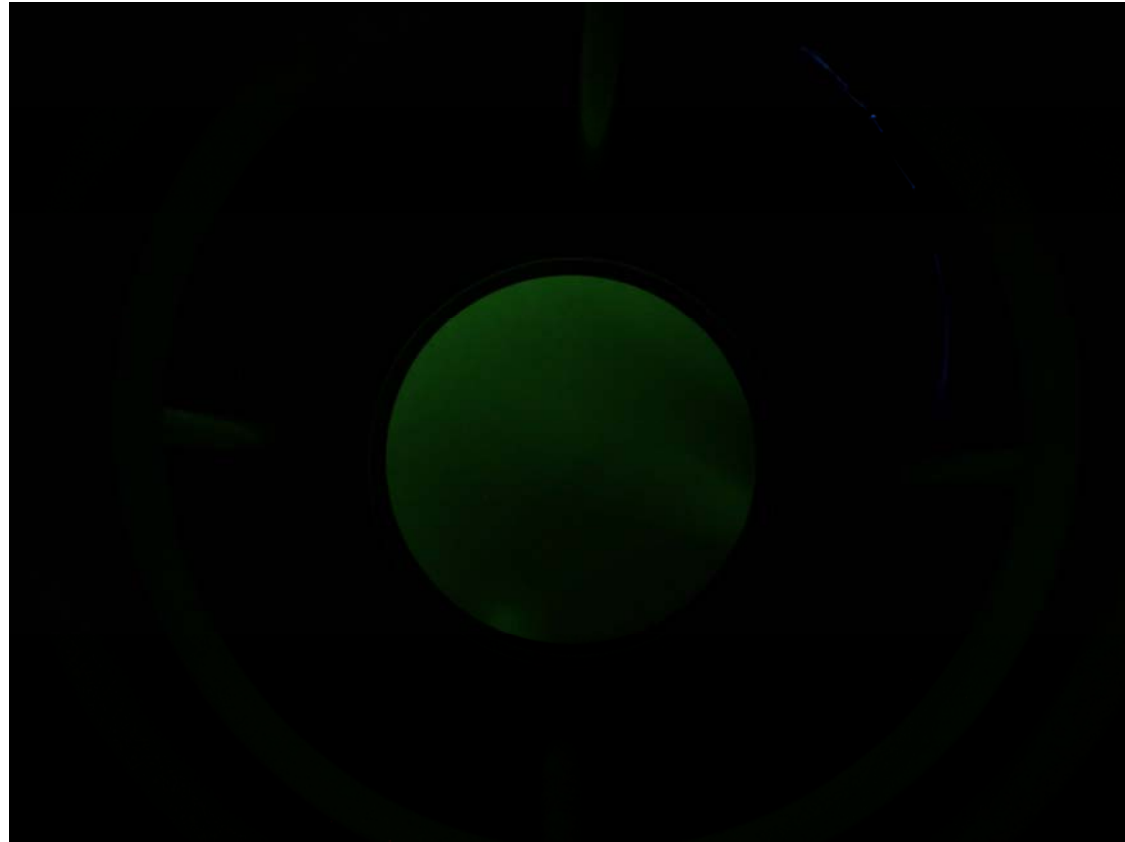


7/26



F#	16
ISO	100

+HV	5 kV
-HV	1 kV

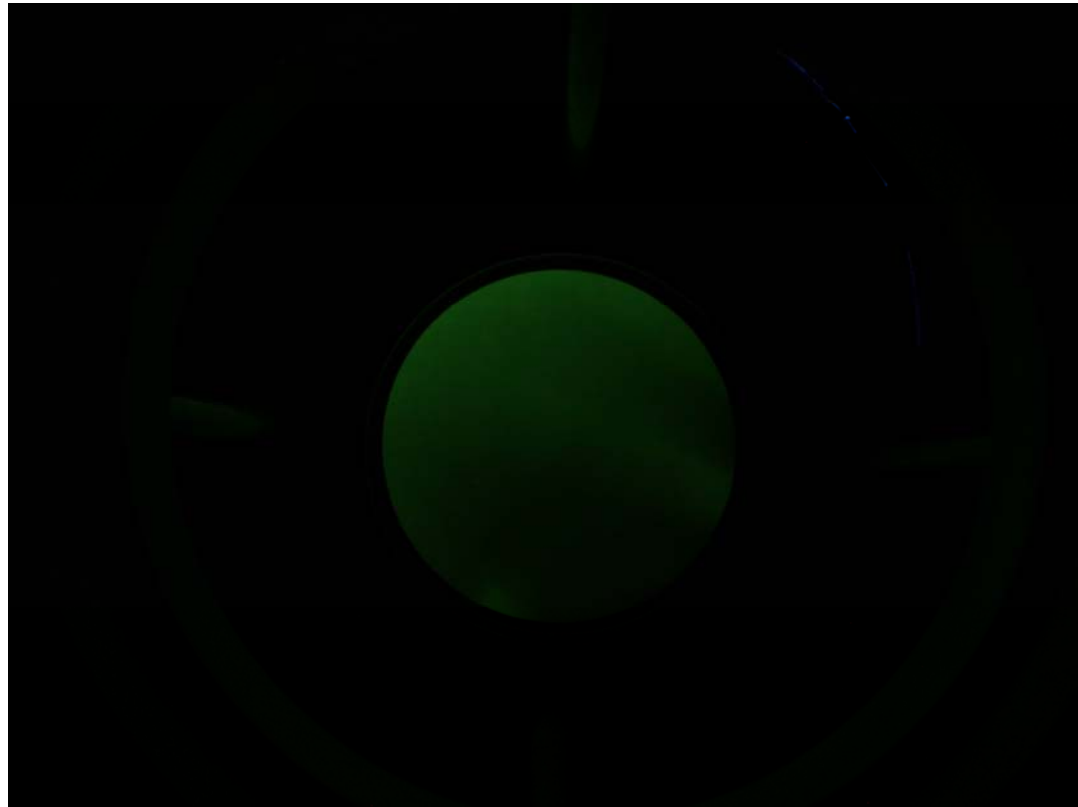


7/29



F#	16
ISO	100

+HV	5 kV
-HV	1 kV

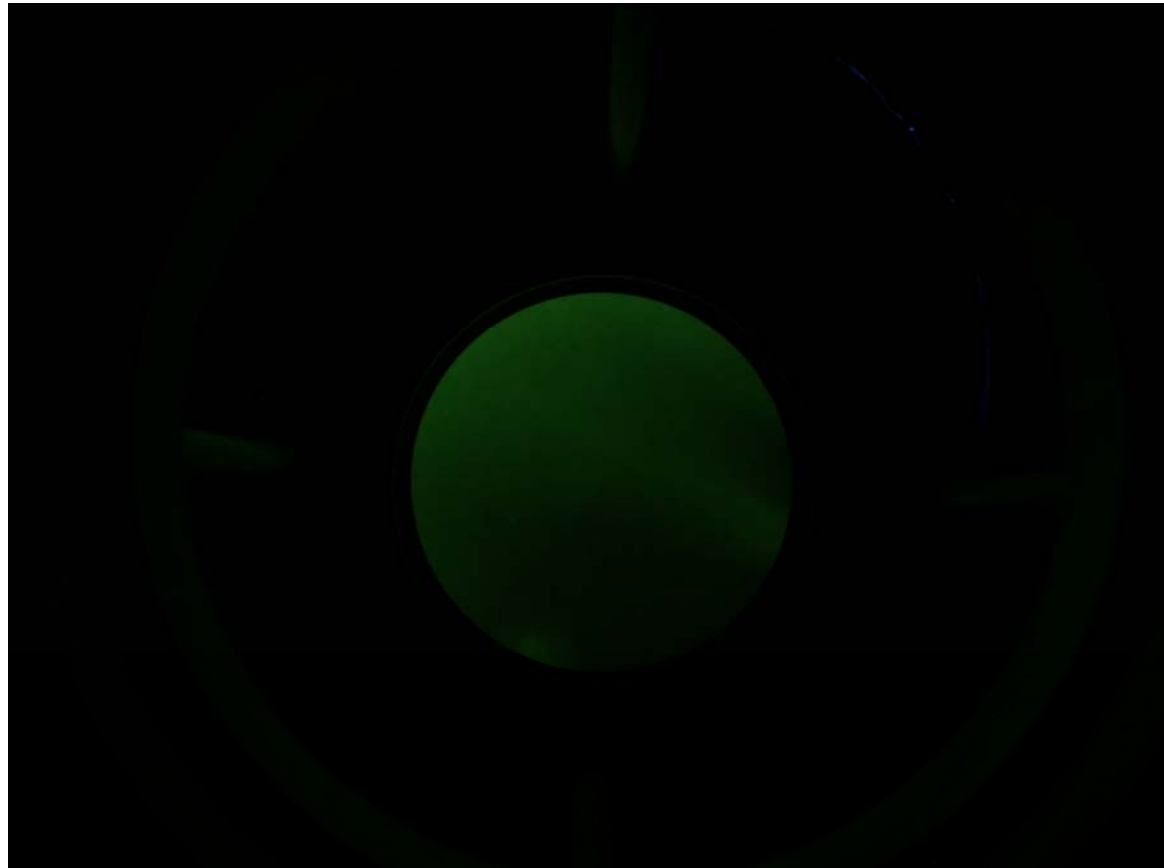


7/30



F#	16
ISO	100

+HV	5 kV
-HV	1 kV

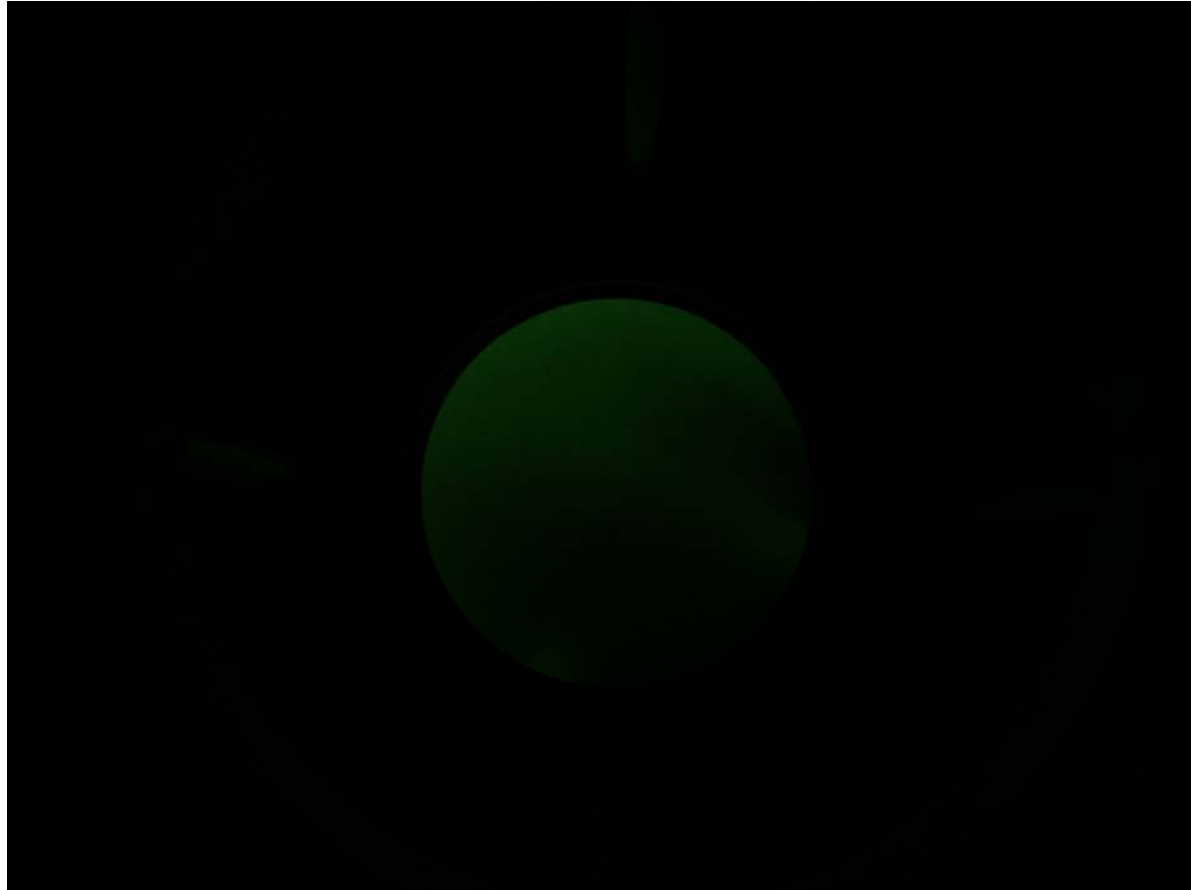


8/2



F#	16
ISO	100

+HV	5 kV
-HV	1 kV

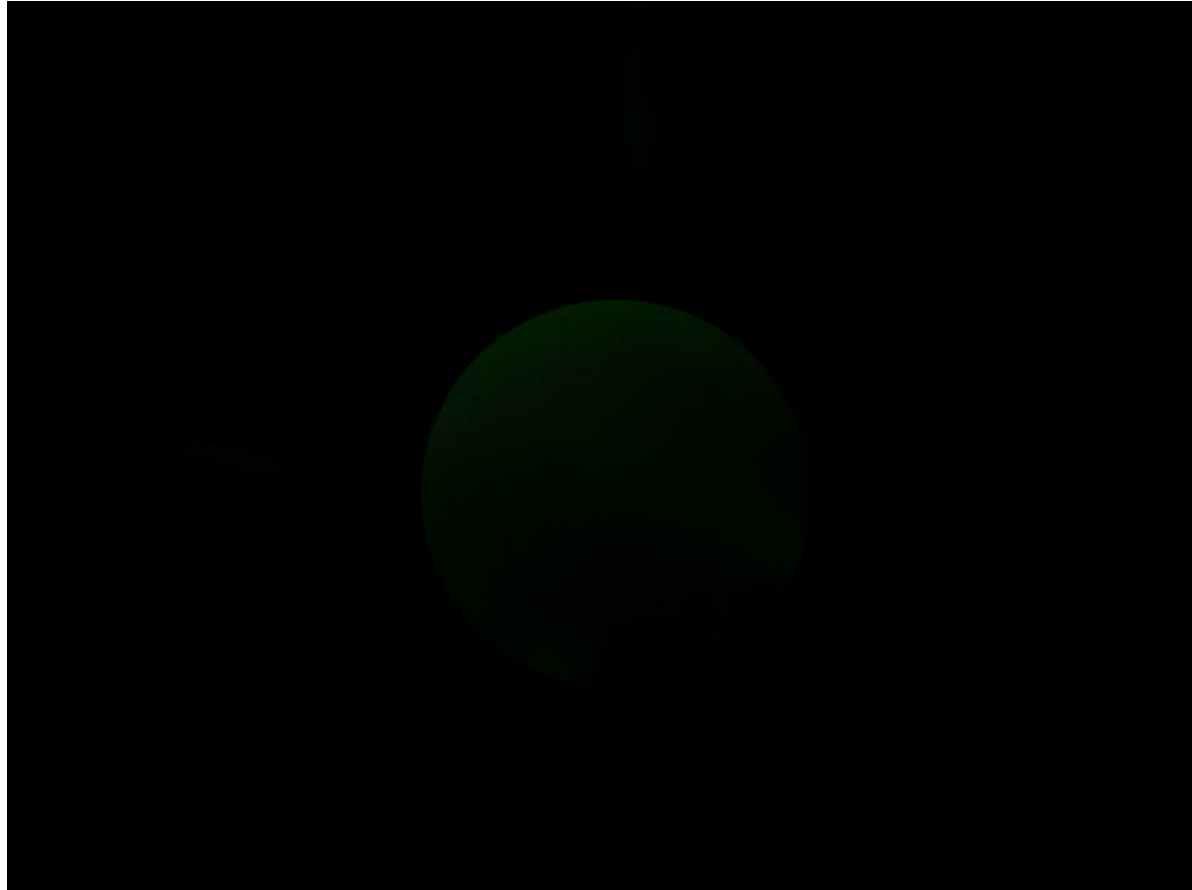


8/3



F#	16
ISO	1

+HV	5 kV
-HV	1 kV



8/4

8/4沒拍到
相機掛掉



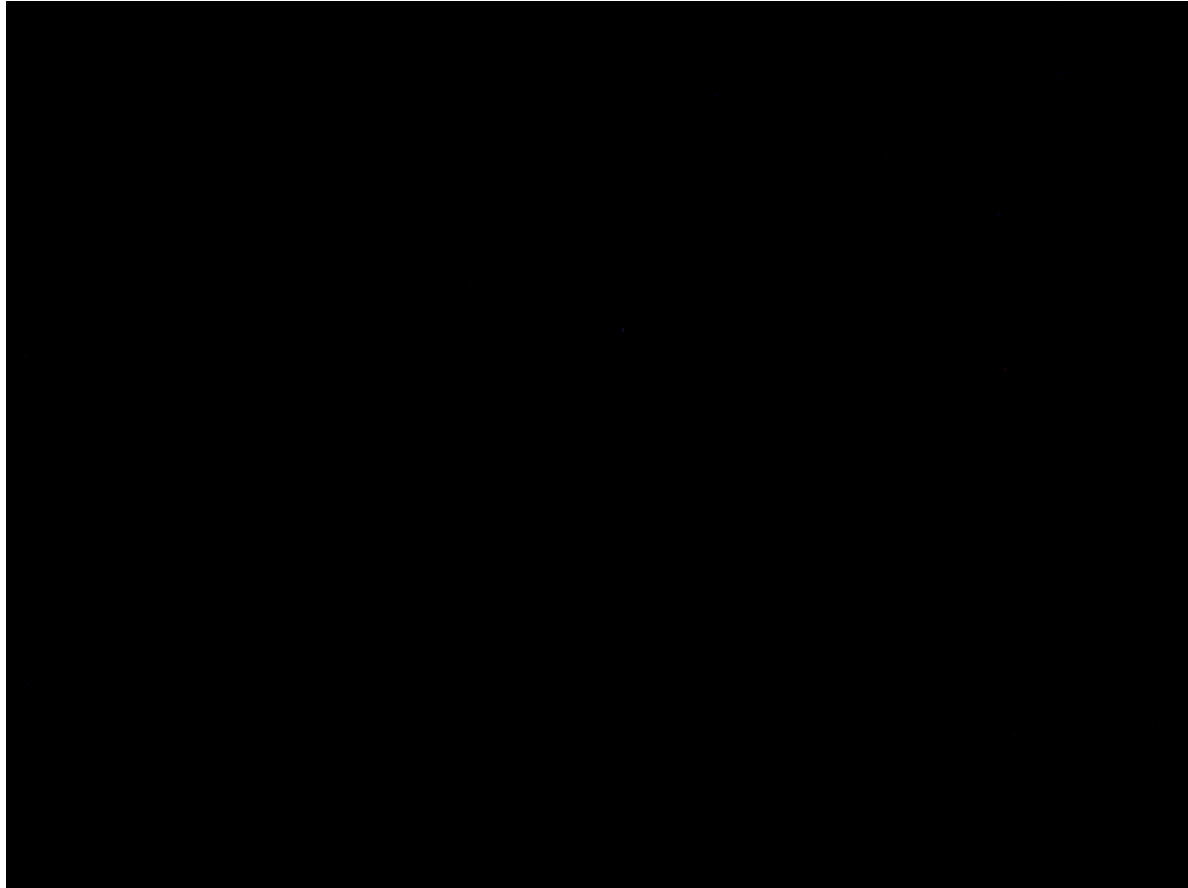
8/5



F#	16
ISO	500

+HV	5 kV
-HV	0kV

8/5(應該是相機問題)



8/6



F#	2.2
ISO	100

+HV	5 kV
-HV	0kV



8/9



F#	2.2
ISO	500

+HV	5 kV
-HV	1 kV

1mm Al plate



8/10



F#	2.2
ISO	100

+HV	5 kV
-HV	1 kV

1mm Al plate



8/11



F#	16
ISO	100

+HV	5 kV
-HV	1 kV

1mm Al plate
1mm pin



8/11



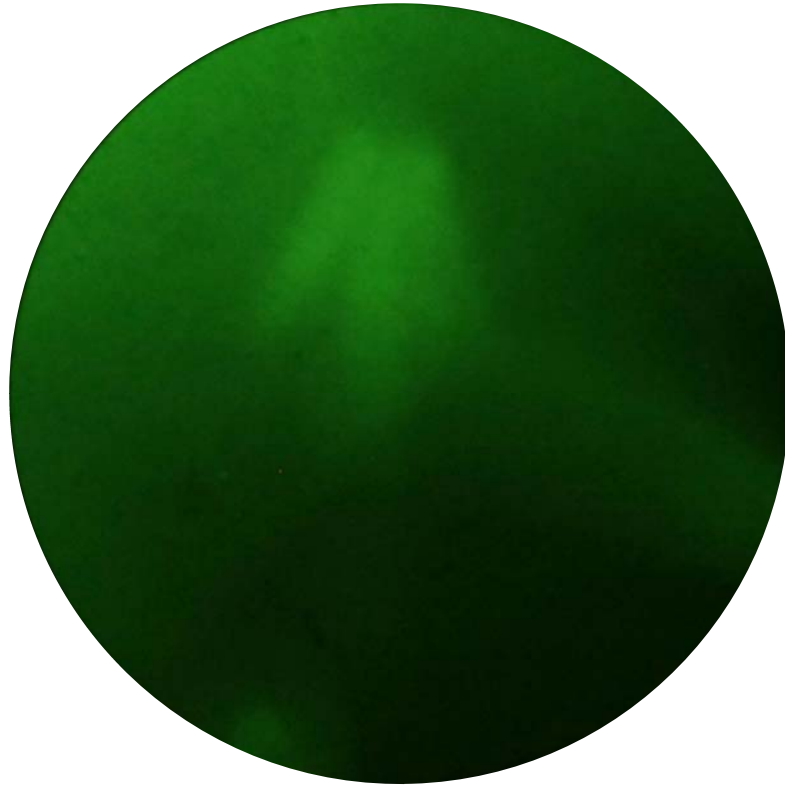
F#16

ISO100

5 kV, -1 kV

1mm pinhole

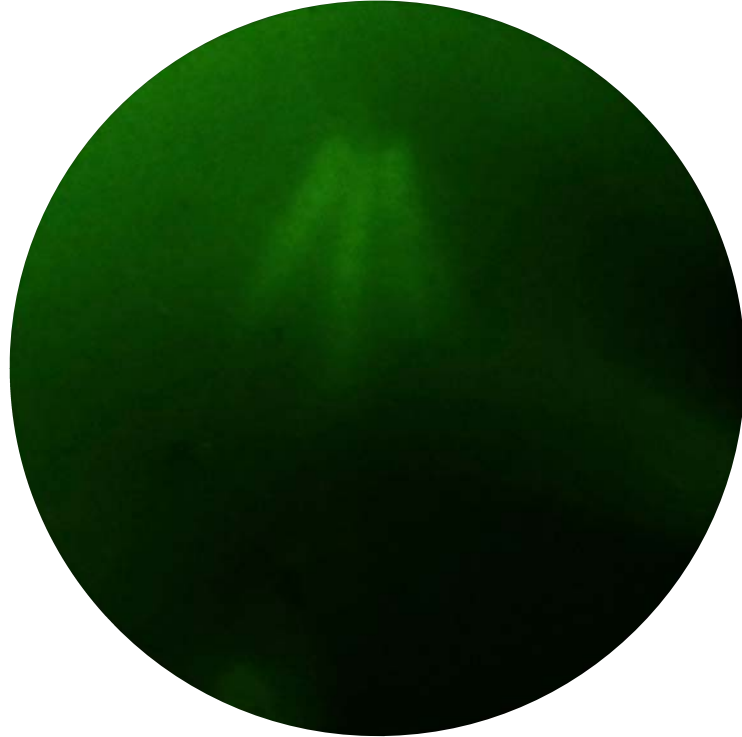
• 亮度+40%



8/12



F#4
ISO100
5 kV, -1 kV
0.5mm pinhole
• 亮度+40%



8/13



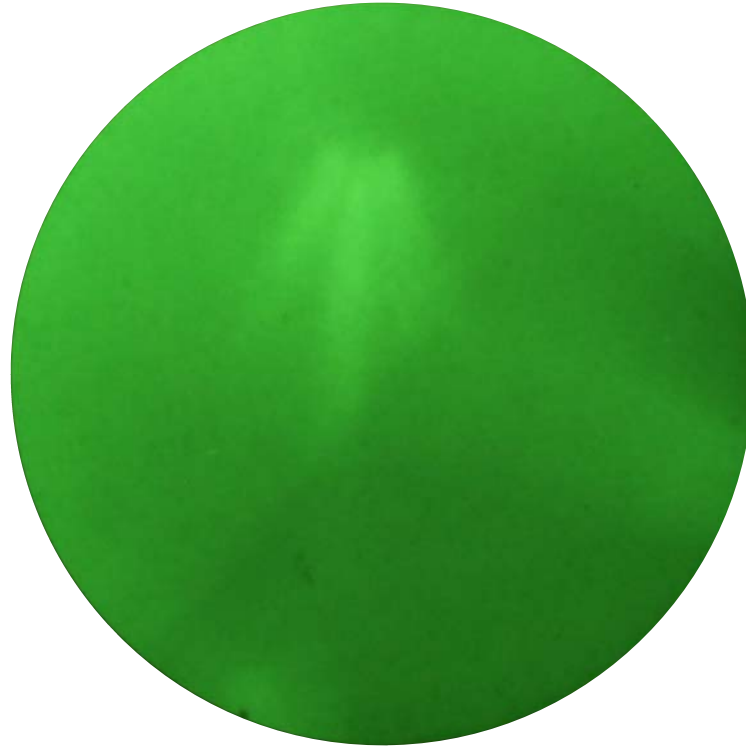
F#4
ISO100
5 kV, -1 kV
0.5mm pinhole



8/17



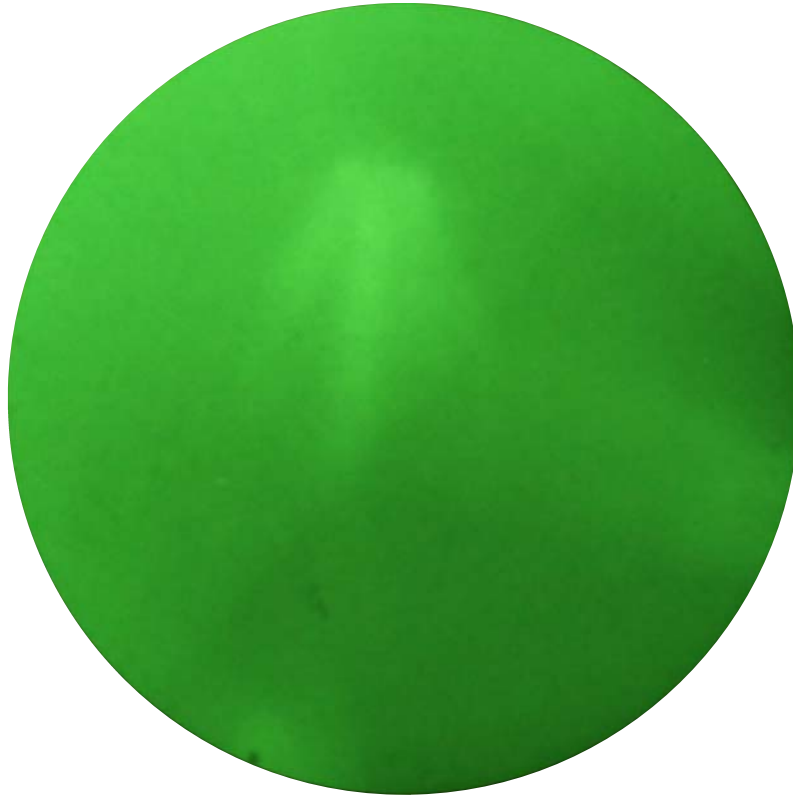
F#16
ISO100
5.6 kV, 2.1 kV, -1 kV
0.5mm hole



8/18



F#16
ISO100
5.6 kV, 2.1 kV, -1 kV
0.5mm pinhole



8/11

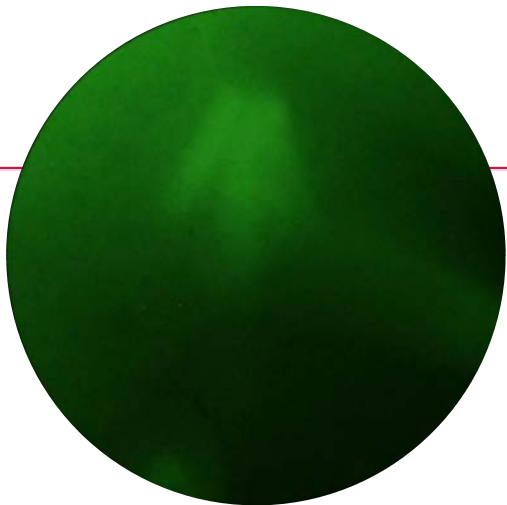
F#16

ISO100

5 kV, -1 kV

1mm hole

• 亮度+40%



8/12

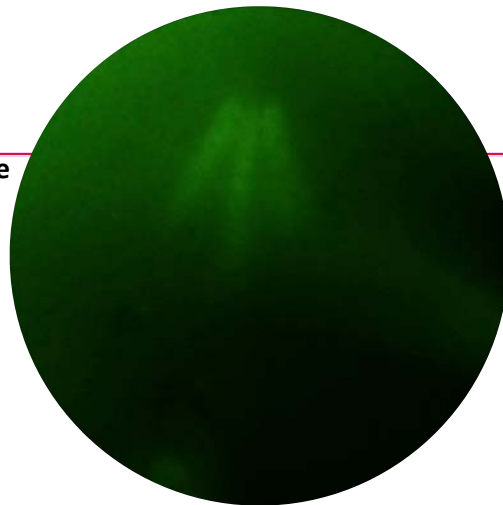
F#4

ISO100

5 kV, -1 kV

0.5mm hole

• 亮度+40%



8/13

F#4

ISO100

5 kV, -1 kV

0.5mm hole



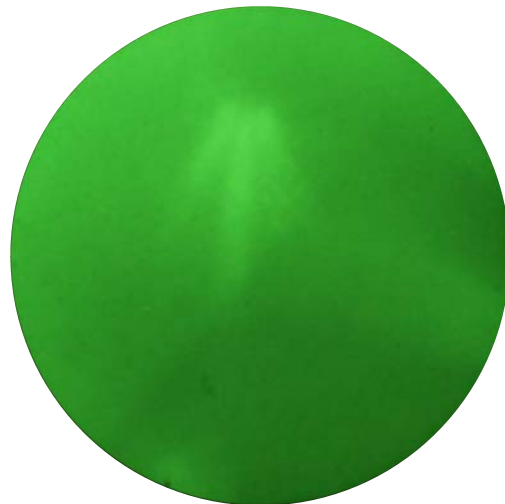
8/17

F#16

ISO100

5.6 kV, 2.1 kV, -1 kV

0.5mm hole



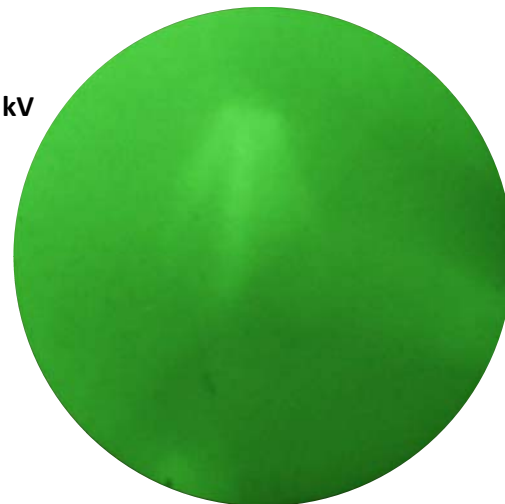
8/18

F#16

ISO100

5.6 kV, 2.1 kV, -1 kV

0.5mm hole



The MCP was burned due to the higher DC voltage supply



8/20

F#	16
ISO	100

+HV	5.6 kV/2.1 kV
-HV	1 kV

0.5mm
pinhole



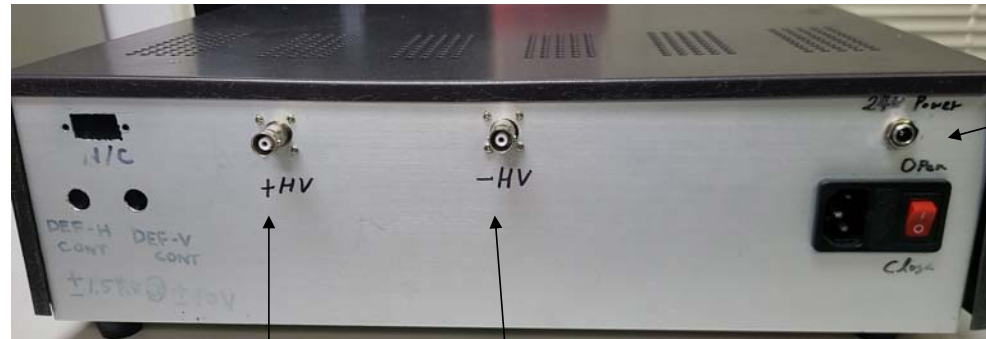
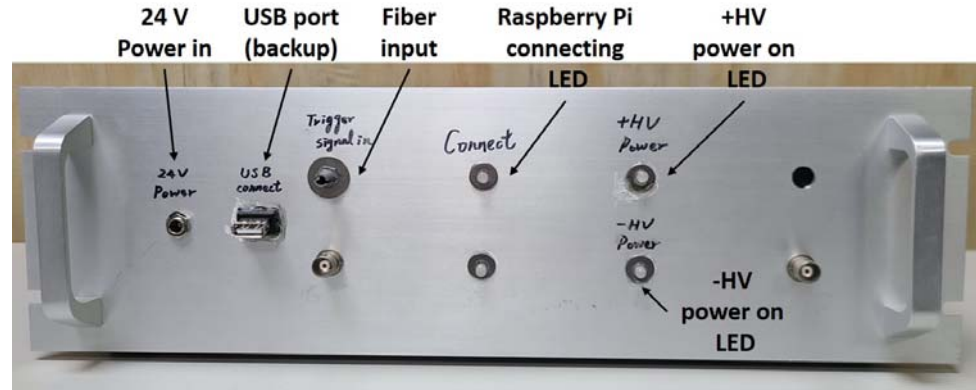
The suggested high voltage supply on the screen is 5 kV and 2 kV for MCP2.

Outline



- Pinhole camera testing
- **Pinhole camera control box**

How to use the pinhole camera control box



Part I - Hardware



1. **Insert fiber into the fiber input channel. The fiber must be lighted up.**
2. **Connect the pinhole camera control box with the 24V battery from the 24V power-in channel at the back of the control box .**
3. **Turn on the switch at the back of the control box .**

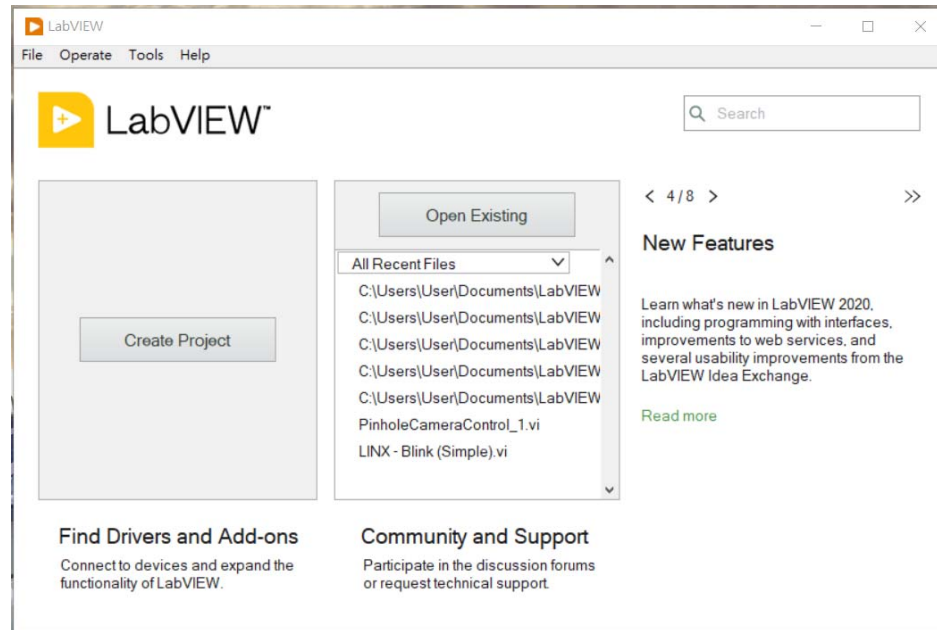
Part II - Software



1. Install the LabVIEW Community Edition.

<https://www.ni.com/zh-tw/shop/labview/select-edition/labview-community-edition.html>

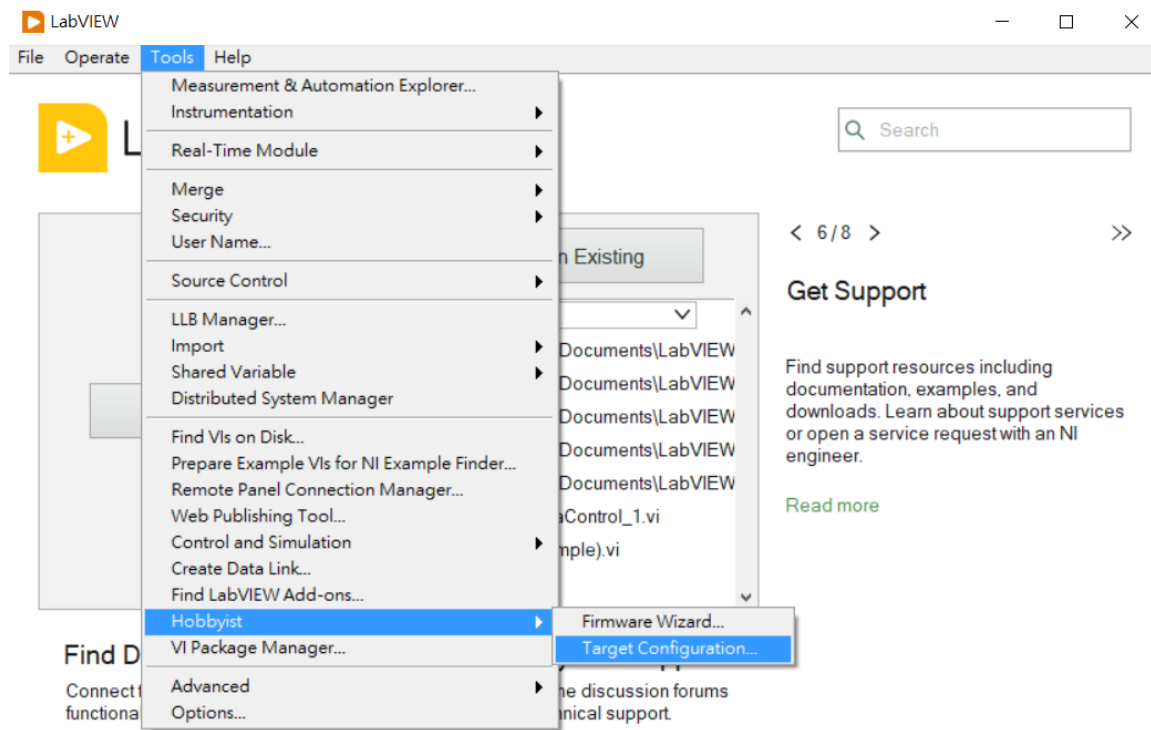
2. Open the LabVIEW Community Edition



Part II - Software



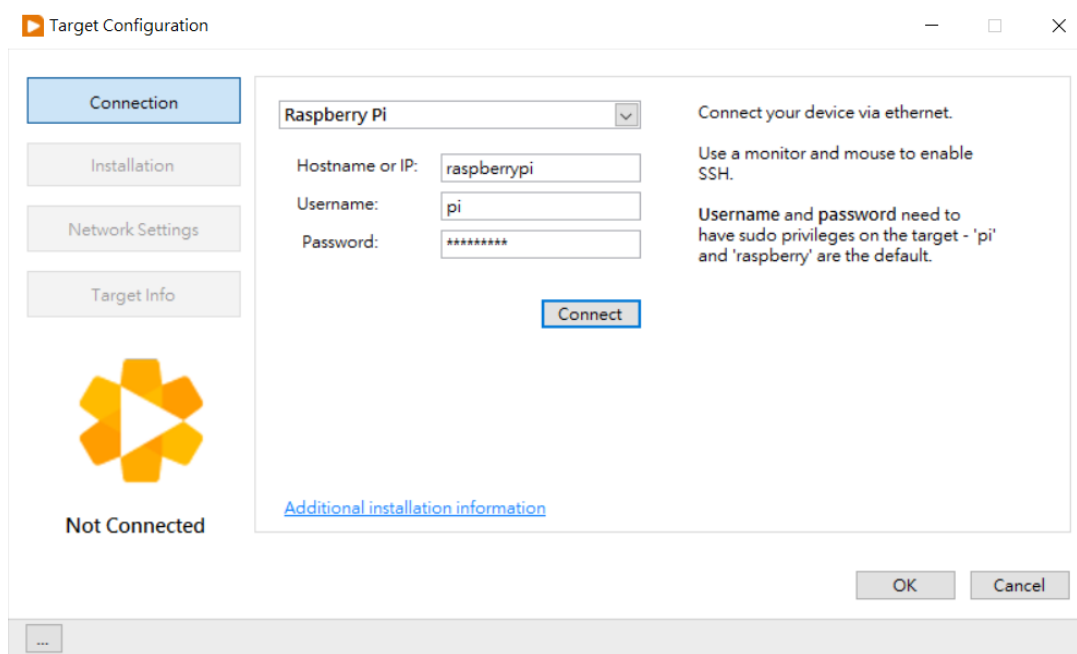
3. Choose the Tools>>Hobbyist>>Target Configuration



Part II - Software



4. Type the IP of the Raspberry Pi: 192.168.0.8 (The IP of the Raspberry Pi use in the control box now)
5. Type the username: pi; Type the password: 65916
6. Connect

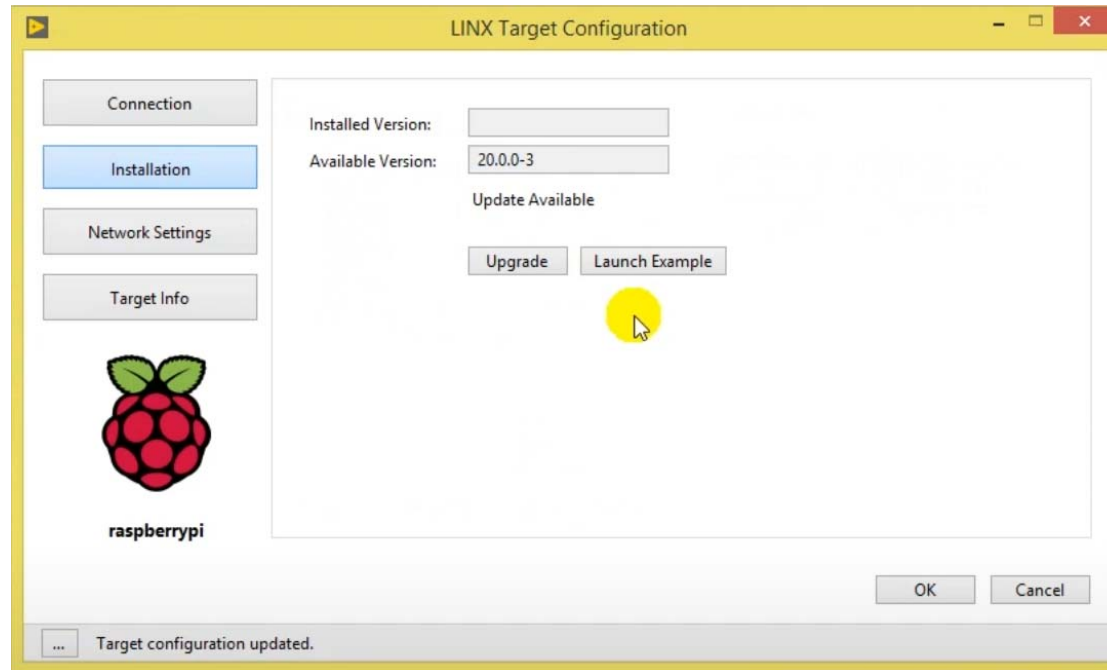


Part II - Software



7. Choose : Installation>>Upgrade

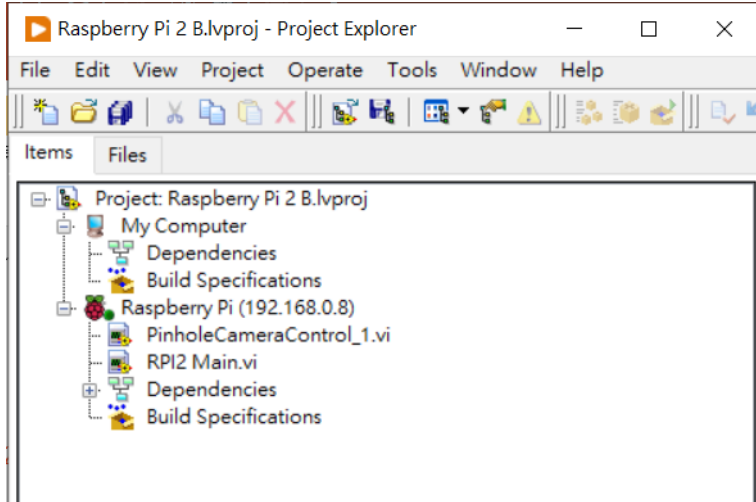
8. After the install progress finished, click the Launch Example



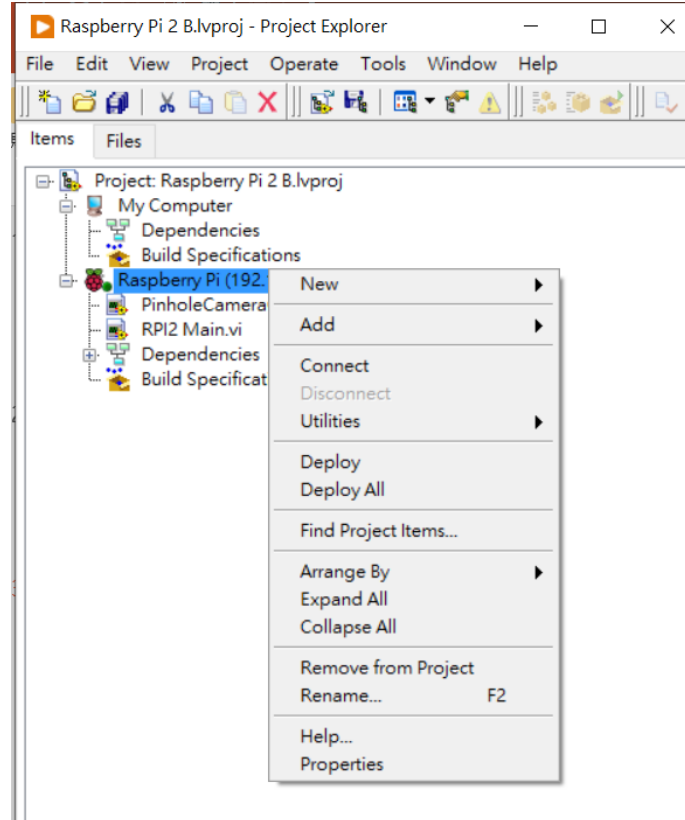
Part II - Software



9. Project menu



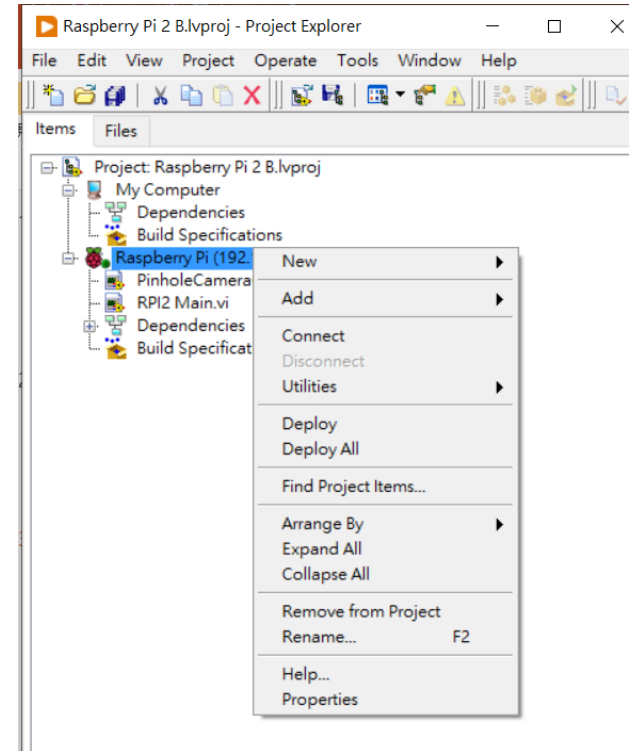
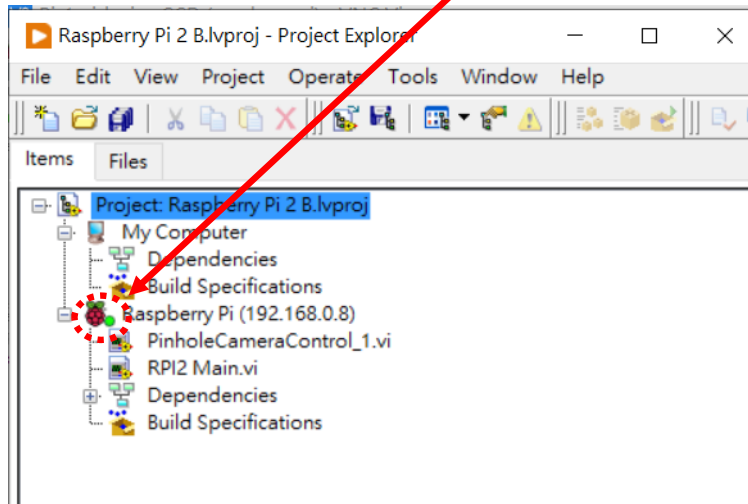
10. Right-clicked the raspberry pi(192.168.0.8)>Connect



Part II - Software



11. After connecting, the green light will turn on.

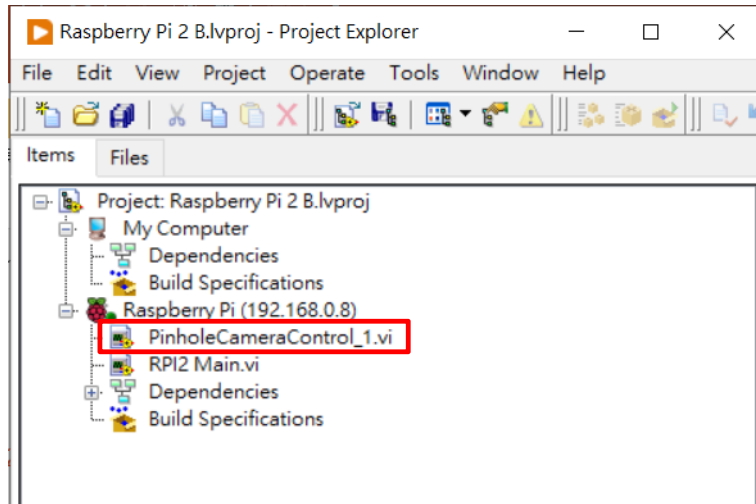


12. Right-clicked the raspberry pi(192.168.0.8)>Add, to add the LabVIEW program:PinholeCameraControl_1

Part II - Software



13. After add the program, the program will show at the list. Double click the program to open the program.



Part II - Software



The pins used in the raspberry pi

Start the program

PinholeCameraControl_1.vi Front Panel *

File Edit View Project Operate Tools Window Help

15pt Application Font

Start the program

Connect

stop STOP

LINUX Resource

IO

Remote

Interface

Serial

Device Name

Error Out

status code

107367629

source

VISA Read in LVH-LINX.Mlib.Device.Mlib-Serial Read.vi->LVH-LINX.Mlib.Device.Mlib-Wait For Packet.vi->LVH-LINX.Mlib.Device.Mlib-Send Command.vi->LVH-LINX.Mlib.Device.Mlib-Get DIO Channels.vi->LVH-LINX.Mlib.Device.Mlib-Load Device Config.vi->LVH-

Marx

Marx HV (Max: 1000)

0

Out of range (Marx)

Boolean array (Marx)

0

Expected Voltage (Marx)

0

Resolution (Marx)

0

Power (Marx)

Change (Marx)

MCP

MCP HV (Max: 5000)

0

Out of range (MCP)

Boolean array (MCP)

0

Step(V)

100

Time(s)

10

Expected Voltage (MCP)

0

Change (MCP)

Pin layout

Marx:

big(Marx) 11

push(Marx) 13

data pin(Marx) 15

MCP:

big(MCP) 36

push(MCP) 38

data pin(MCP) 40

Power pin (Marx)

16

Power pin (MCP)

18

Connect pin

7

Pin list on 74HC595

Big pin : 12

push pin : 11

data pin : 14

3V3 pin

GPIO 2 (:

GPIO 3 (:

GPIO 4 (GPC

Gr

GPI

GPI

GPI

3V3 pin

GPIO 10 (M

GPIO 9 (M

GPIO 11 (Si

Gr

GPIO 0 (ID

GF

GF

GPIO 13 (PW

GPIO 19 (PCM

GPI

Gr

Control the voltage of the -HV

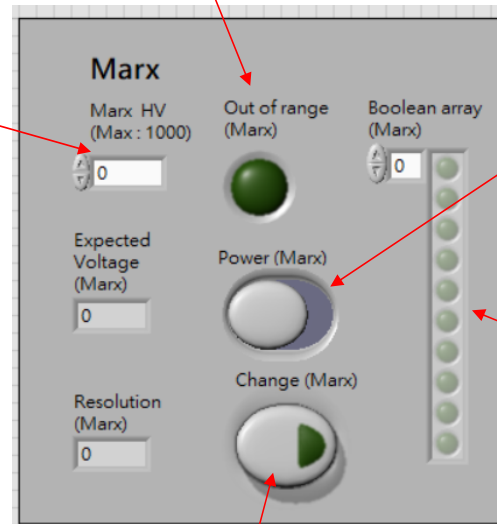
Control the voltage of the +HV

Part II - Software



If the setting voltage is large than the maxima voltage, this light will turn on.

1.Type the setting voltage want to supply for -HV



3. Turn ON/OFF the power of the power supply

2. Change the setting voltage

Shows the Boolean array send to the AD7533

Part II - Software



If the setting voltage is large than the maxima voltage, this light will turn on.

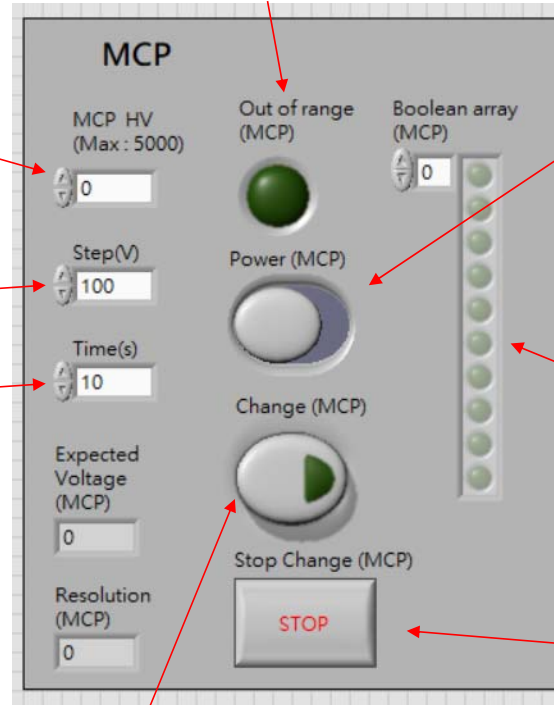
4. Turn ON/OFF the power of the power supply

1.Type the setting voltage want to supply for -HV

2. The step size(voltage) of changing the setting voltage

3. The step size(time) of changing the setting voltage

Rise the voltage 100V/10s
Don't faster than this speed



Shows the Boolean array send to the AD7533

Stop to change the setting voltage

5. Change the setting voltage

The ppt about the pinhole camera



- 2021.05.05
- 2021.05.26

Problem



- **The output voltage of the HVPS for negative high voltage generator(1-stage Marx) has some noise.**
- **The output voltage of the HVPS for negative high voltage generator(1-stage Marx) will decay to half after some times.**

File storage – procedure, guide book, escape routes



- **Dust free cabinet : /Shares/Document; or /Shares/ylin/Document.**
- **Pulsed-power system : /Shares/Document; or /Shares/ylin/Document.**
- **Guide book(UPS, Dryer, Optical table, Lens, High voltage power supply) : /Shares/Document; or /Shares/ylin/Document.**
- **Escape routes : /Shares/Document; or /Shares/ylin/Document.**
- **Laser: /Shares/Document**

File storage – Arduino, LabVIEW, Raspberry Pi



- **Arduino-DS1023: /Shares/ylin/Arduino.**
- **Arduino-trigger box: /Shares/ylin/Arduino.**
- **LabVIEW-pinhole camera: /Shares/ylin/PinholeCamera.**
- **Raspberry Pi: /Shares/presentation/2019_ylin/How to start the raspberry pi**

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- **The diameter of the pinhole has been changed to 500 μm .**