

## ProEM CCD camera operating manual

This manual provides a general guidance of operating ProEM CCD camera and data acquisition using WinView software.

### Initial process - turn on the system

Making sure the CCD power supply and the acquisition computer are switched off.

Connecting power cable between the CCD camera and the power supply.

Connecting ethernet cable between the CCD camera and the acquisition computer.

Connecting power supply cable from the power supply to power source.

1. Turn on the power supply of the CCD camera.
2. Turn on the acquisition computer, then running WinView software.

The program should appear on the screen when the camera is detected, and you can hear a sound of “click” from the CCD camera.

3. Setting up CCD temperature at -55 °C from the program menu.

When the camera reaches the designated temperature, it will show “Locked”. According to the guidance of Princeton Instruments, please be still waiting for further 20 minutes before starting to take data.

-55 °C is recommended by Princeton Instruments because the dark current at this temperature is well documented (0.0087 e-/pixel/second). Although you can set different temperature as you wish, please considering the benefits to justify the change.

## Observation configuration

In “Hardware...” menu

1. Select vertical shift (us/row).

Always selecting “0” for 0.9 us/row. Remember to check it every time you re-start the software.

In “Experiment...” menu

2. Select readout mode (in “ADC” tag).

For typical MEFOS observation, always select “Multiplication Gain” with “10 MHz” Readout Rate.

<b>Multiplication Gain</b>	<b>10 MHz</b>	5 MHz	
<b>Low Noise</b>	5 MHz	1 MHz	100 KHz

Please DO NOT modify “Controller Gain”, the default value is “3”.

3. Select exposure conditions (in “Main” tag).

In this tag, you can configure “Exposure Time”, “Number of Images”, “CCD Readout”, and “Avalanche Gain”.

### Exposure Time

This is “Programmed Exposure Time (PET)”. If CCD camera is operated in “Frame Transfer” mode (this is the default mode), the “Effective Exposure Time (EET)” depends on “Readout Time (RT)”.

If  $PET < RT$ , the CCD will continue to exposure, until the readout process (RT) is completed. Therefore EET is equal to RT.

If  $PET > RT$ , the EET is equal to PET.

For typical MEFOS observation (which uses 30 fibre images),  $RT \sim 89$  msec.

For other observation, it is important to check the “Readout Time”, which can be found in “Experiment”.

### Number of Images

Due to the restriction of current hardware and software, we are suggested to take images which are less than 700 MB (MO) totally. Therefore, number of frame depends on the regions of interest and binning.

binning	image size (pixel)	file size (KB/frame)	readout time (ms)*
1	480X480	450	55.8
2	240X240	112	30.2
4	120X120	28	17.5

\* at readout rate 10 MHz

Taking a too large image will crash the software. We hope the problems will be solved in next major upgrade of WinView software.

### CCD Readout

“Use Full Chip” is mostly useful to define the regions of interest. For most of observations, you need to select “Use Region of Interest”. Three pre-defined region (and binning) files are located in E:\mefos\.

No binning: mefos\_022010.EXS

binning 2X2: mefos\_022010\_bin2.EXS

binning 4X4: mefos\_022010\_bin4.EXS

### Avalanche Gain

This is only enabled when using “Multiplication Gain”.

You should adjust the level of “Avalanche Gain” according to the magnitude of targets. Princeton Instruments suggests that level of 50-100 is enough. We have shown that 100 is good enough to improve the S/N. **Once turned on the gain, please wait for 5 minutes to stabilise the EM gain. Also avoiding quickly switch between different EM gain level, as this will cause the strange behaviour in the lightcurves.**

We have created a VB script containing all the necessary configuration described above for this MEFOS observations. A template file is printed in next page. You can copy and paste the text, and modifying the parameters (marked in **red**) to suit your observation.

```
Sub Main()
```

!

```
' Stat the observqtion loop
,
    Dim ObsIndex
    ObsIndex = 0
    Dim Doc(30) ' Change the value
    Dim Wnd(30) ' Change the value

    Do While ObsIndex < 30 ' Change the value
        Set Doc(ObsIndex) = ExpVB.Start2() ' Start Acquisition
        ExpVB.WaitForExperiment ' Wait for collection to complete
        Set Wnd(ObsIndex) = Doc(ObsIndex).GetWindow
        Doc(ObsIndex).Close
        Set Wnd(ObsIndex) = Nothing
        ObsIndex = ObsIndex + 1
    Loop

End Sub : Main ' finish and run this script
```

## Workflow of Night

The first night will be mainly for calibration. It is important not to switch EM gain too quick. First, doing the test without the gain, then repeat the same test with the gain on.

For calibration, we can use a standard star field. (I-Chun will provide the assignment file)

Frederic, could you please tell me what you like to do in the first night?

For the rest of nights, here is my suggestion of what to do in each night. You are welcome to add your opinion.

1. filing observation field and corresponded assignment files
2. taking bias and flatfield for different binning (I-Chun will provide the VB scripts for these two tasks.)
3. observing. (observe should write the log like below)

Which fields are confirmed?

1. TNO: 6 field
2. XRB: 1 field
3. YSO: 1 field
4. EXP: ?

file name	binning	EM gain	comment
ddmmyyyy_xxxnnnnn_			

## Data File Naming Convention

To simplify the data reduction process after observations, please following the rules below when naming the data file in “Data File”.

<b>DD</b>	day of the observation
<b>MM</b>	month of the observation
<b>YYYY</b>	year of the observation
<b>XXX</b>	type of scientific objective
<b>NNNNN</b>	5 digits series number, start from 00001
<b>###</b>	number of repeated observation, this is automatically added by WinView.

### **DDMMYYYY\_XXXNNNNN\_###**

The observations which share the same field of view and selected sources should share the same “XXXNNNNN”. They can be distinguished by different combination of DDMMYYYY and ###.

<b>XXX</b>	<b>type of scientific objective</b>
<b>TNO</b>	For Kuiper Belt Objects occultation
<b>XRB</b>	For X-ray binaries, CVs
<b>YSO</b>	For young star objects
<b>MIS</b>	For any other type of observation
<b>TES</b>	For test

For example,

To observe a particular TNO field on 25 February 2010, one should give a name like

25022010\_TNO00001\_

On the other day, said 28 February 2010, the same field is observed again, the name should be

28022010\_TNO00001\_

We suggest that you also follow the same name convention to the fibre assignment file name on the same field

i.e. TNO00001.ASS

Many observation information will be saved in the primary header of final FITS images.



## **Close process**

Quit WinView software.

Turn off the power supply.

Turn off main power source.

Appendix 1: fibre transmission distribution (comparing to fibre 28)

