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ODT

Test-bench

New AO test-bench in 051: Assembly and Programming Instructions

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CHANGE RECORD

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TABLE OF CONTENTS

1 Scope 6
2 Introduction 6
3 Applicable and Reference Documents 6
3.1 Applicable Documents 6
3.2 Reference Documents 6
4 Overview 6
4.1 Preliminary layout 6
4.2 Test-bench electrical devices 8
4.3 Test-bench mechanical / optical devices 8
5 Assembly of Test-bench 9
5.1 Installation of optical bench in lab 051 9
5.2 Final assembly and mounting of monochromator 9
5.3 Mounting of Light source 9
5.4 Mounting of Integrating Sphere and assembly with diode 9
5.5 Design and manufacturing of cryostat holder 9
5.6 Mounting of additional filter-wheels 9
5.7 Assembly of X-Y- table and mounting 9
5.8 Assembly and mounting of target projector and PSF experiment 9
5.9 Construction and mounting of light hood of test-bench 9
6 LabView programming of test-bench devices 10
6.1 General Programming 10
6.2 Monochromator 11
6.3 Keithley Electrometer 12
6.4 ESP300 Motor Controller (X-Y-Z-table) 13
6.5 NGC CCD camera interface 14
6.6 Vacuum and Temperature Controller 16
6.7 Light source with programmable power supply 17
6.8 Shutter control (via Pulpo and/or external shutter controller) 17
6.9 Programmable 220V power plug distributor 17
6.10 Temperature/Humidity/Ambient Light measurement 17
7 LabView programming of test bench data acquisition 17
First simple end-to-end test to get images from FIERA with working monochromator and ready hardware: in November 2007 17
7.1 General Master Acquisition Panel 18
7.2 Global Parameters 18
7.3 Dark current Parameter as an example 19
7.4 QE-Parameter panel as an further example 20
7.5 Example of LabView QE Data Acquisition 21
APPENDIX: Abbreviations and Acronyms 22

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1 Scope

This document describes the components and functionality of the new AO test-bench in Laboratory 051. It should also define the LabView programming requirements concerning the device functionality.

2 Introduction

This document explains the layout and functionality of the new test-bench, which should be remotely controlled by LabView programs. In the beginning it should be a working guide for ODT students help Eric Müller.
Later it serves as a basis for a general test-bench user manual.

3 Applicable and Reference Documents

3.1 Applicable Documents

User Manuals of test-bench devices (paper and CD-documentation):

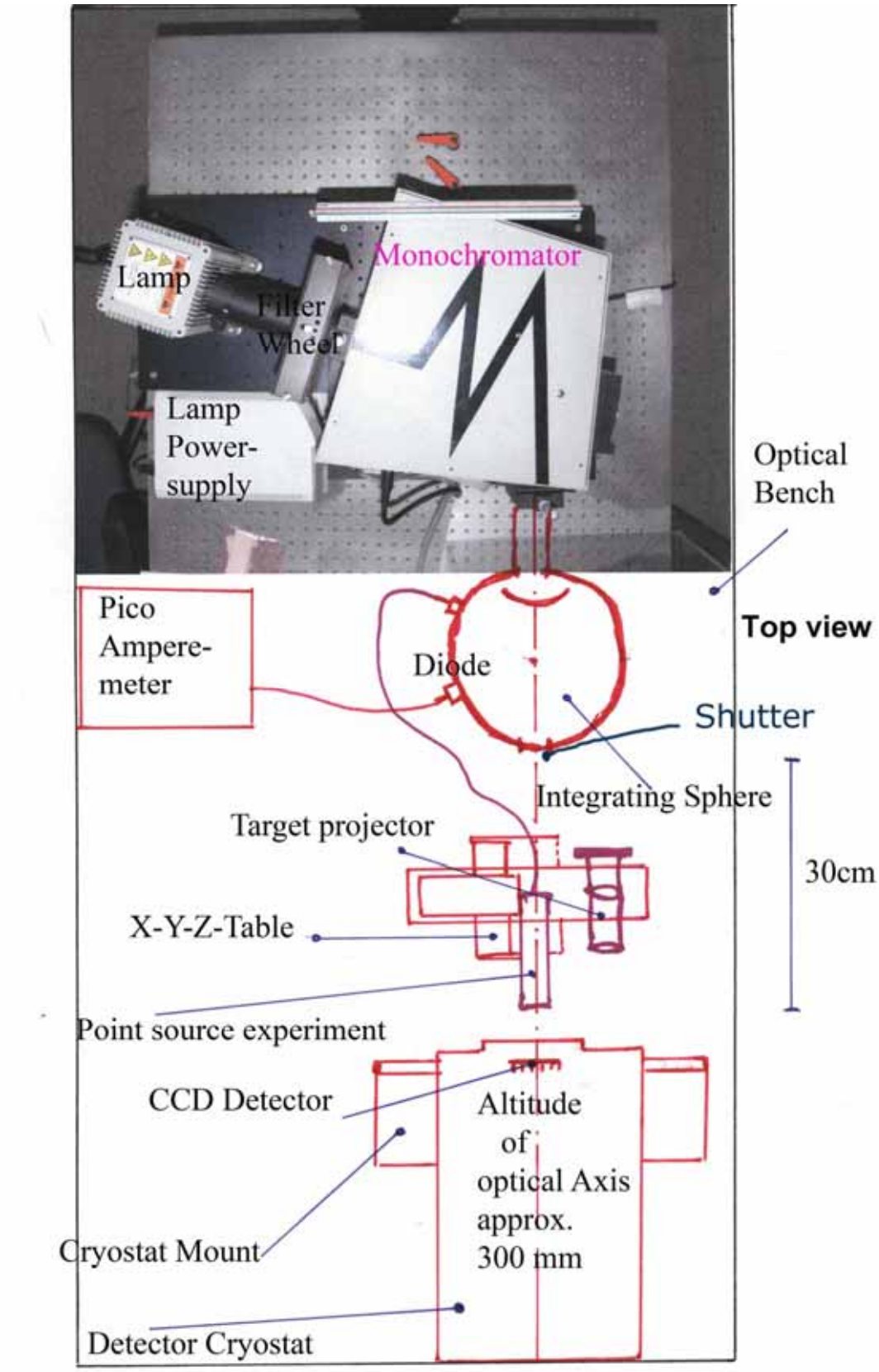
- ORIEL ¼ M MONOCHROMATOR Model MSH301 (Manual)
- ORIEL Monochromator Utility Software Version 3.3
- ORIEL 10 – 100W Lamp Housing LSH101 (Manual)
- ORIEL 100 W Arc Lamp Power Supply LSN110 (Manual)
- Keithley Model 6514 System Electrometer
- Ketthley Safety Standards Conformance Information
- Keithley Software Utlity ELNX-852 Version C02
- Keithley Low-Current/High Resistance Product Information LCHR-950-01 REV.D
- Newport ESP Motion Controller Configuration Procedure Version 3.01
- Newport High-Performance Mid-Range Travel Linear Stage Users's Manual
- Edwards EXPT Pumping Station & TIC Manual and Software
- NGC User's manual and Software documentation: http://www.eso.org/projects/ngc
- FIERA User's Manual and Software documentation: ftp://ftp.eso.org/pub/vlt/vlt/pub/releases/JAN2006/vol-4/VLT-MAN-ESO-13640-1388.pdf
- PULPO User's Manual: http://www.eso.org/projects/odt/pulpo/pulpo.html
- Jumo Imago 500 User's Manual
- ODT test-bench documentation: http://www.eso.org/projects/odt/CCDtestbench/index.html

3.2 Reference Documents

None.

4 Overview

4.1 Preliminary layout


Lamp
Filter Wheel
Monochromator
Lamp Power-supply
Optical Bench
Top view
Pico Ampere-meter
Diode
Shutter
Integrating Sphere
Target projector
30cm
X-Y-Z-Table
Point source experiment
CCD Detector
Altitude of optical Axis approx. 300 mm
Cryostat Mount
Detector Cryostat

4.2 Test-bench electrical devices

These devices need to be controlled by LABView:

a. LOT/ORIEL Monochromator MSH301 (identical product now purchased by NEWPORT) inclusive motorized filter wheels and motorized slits.

b. Keithley 6514/E Electrometer (Pico-ampere-meter) for measurements of photo-diode currents

c. NEWPORT ESP300-111112 motor controller for three axis motor stages

d. CCD Controller "NGC" (for this an interface to LabView is needed via ethernet) -
If the new test-bench is working with NGC, an interface to the (old) FIERA-CCD controller should be programmed

e. Edwards vacuum controller (via RS232) of type
D39700000 TIC Instrument Controller for a maximum of three vacuum gauges via RS232

f. JUMO Imago 500 temperature/vacuum controller (and/or PULPO temperature/vacuum controller) for Vacuum gauges and Pt100 sensors

g. NEWPORT Light Source controller & power supply

h. Shutter Controller (monochromator shutter and additional external shutter)

i. Relay PCI card in test-bench PC for switching low voltage devices (e.g.: door blinking light, programmable relay-switched 220V plugs)

4.3 Test-bench mechanical / optical devices

a. Holder/stand for detector cryostat
b. Point source experiment
c. Test target projector
d. Table for monochromator
e. Additional motorized filter wheel
f. Halogen light source
g. Table for light source
h. Integrating sphere
i. Table for integrating sphere
j. X-Y-Z table
k. Optical bench
l. Light tight hood for optical bench

5 Assembly of Test-bench

All devices have to be assembled and integrated into the new AO test-bench.
They will be mounted on an optical bench.
Some devices are still not yet available and have to be ordered.
Other devices need to be assembled from parts.
Some mounting units still have to be manufactured by a mechanical workshop.
(Everything assembled, only the shutter driver has to be acquired, therefore shutter cannot be mounted and the un-precise shutter in the monochromator has to be used in the mean-time)

The software programming (see chapter 6) can be started before the installation of the devices onto the optical bench.

5.1 Installation of optical bench in lab 051

5.2 Final assembly and mounting of monochromator

The motorized slits and filter-wheels have to be integrated.
Manufacturing of table to lift monochromator to optical axis.

5.3 Mounting of Light source

And connection to power supply and stabilization; integration of feed-back diode.
Manufacturing of table to lift lamp-housing to optical axis.

5.4 Mounting of Integrating Sphere and assembly with diode

Manufacturing of table to lift integration sphere to optical axis

5.5 Design and manufacturing of cryostat holder

5.6 Mounting of additional filter-wheels

5.7 Assembly of X-Y- table and mounting

5.8 Assembly and mounting of target projector and PSF experiment

5.9 Construction and mounting of light hood of test-bench

6 LabView programming of test-bench devices

6.1 General Programming

The LabView Version 8.0 is used for this programming. As a hardware platform a Pentium4 2.4GHz, 1GB memory PC is used under the MS Windows XP SP2 operating system.

A stand-alone **Panel** will be programmed for or each module (test-bench device).
Each panel will be in a slightly different color. All panels can be integrated into a big all-in-one panel.

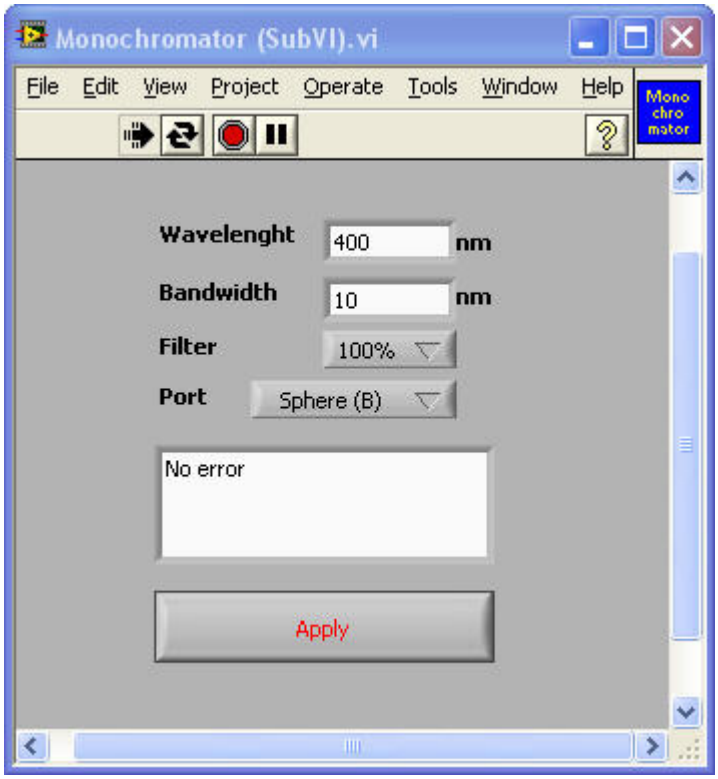
In addition it should be programmed each function of each module. This means, that each module (test-bench device) needs the programming of one or more functions, which are defined in the following and symbolized by an arrow bullet (➢). Each function should be programmed as one LabView "VI" and represents the smallest working unit of this LabView test-bench programming. Each function needs a feedback to signal its success and in the case of failure a proper error visualization. The panels (for manual inter-action with the test-bench) give always the date and result after any action. The functions are needed for automated test-bench routines (scripts) and are basis of the panels.

The functions are programmed with the help of the device documentation. The structure of the referring LabView Vis (flow diagram) will be documented and consist in general of

- Opening the data-communication with device
- Sending commands to the device
- Receiving feedback and information from the device

6.2 Monochromator

Panel:

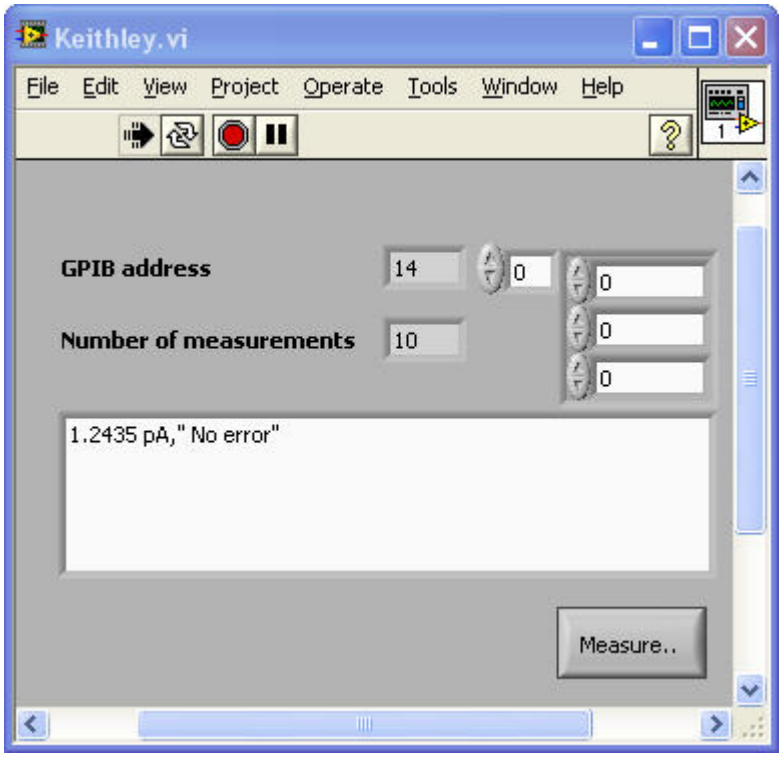


Functions to be programmed:

- Set wavelength (in combination with necessary order-sorting-filter) = done
- Set bandwidth (output slit) = done
- Set attenuation with ND-Filters = done
- Set light output-port of Monochromator = done
- Re-initialisation of Monochromator = done
- Set strength of light (input slit) = not possible
- Feed-back for successful parameter change = done
- Error-log of device = done
- Show HPIB Address = done

6.3 Keithley Electrometer

Panel:

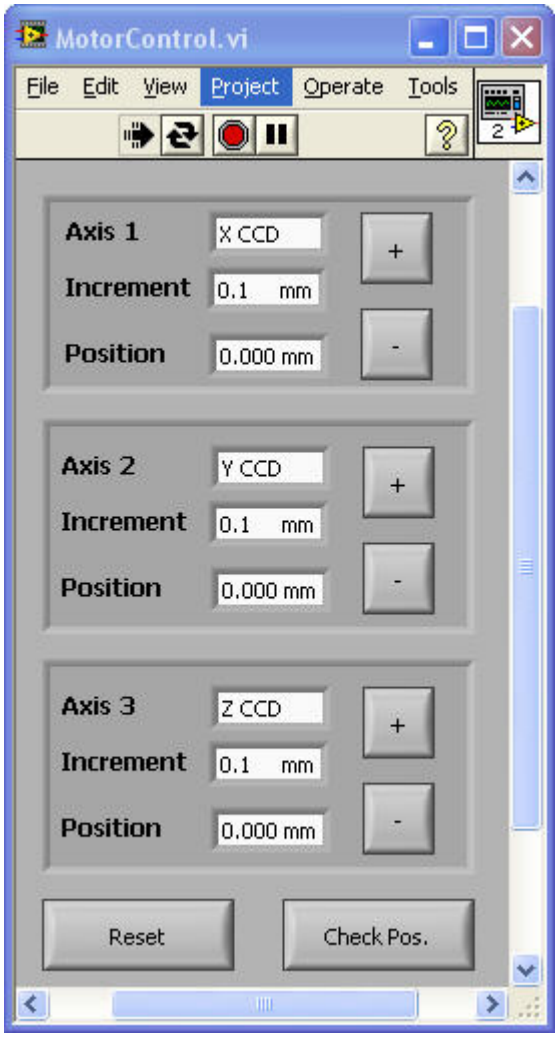


Functions to be programmed

- Number of measurements (samples) = done
- Integration time = not necessary
- Default option knob = done
- Error-log of device = done
- Show HPIB Address = done

6.4 ESP300 Motor Controller (X-Y-Z-table)

Panel:



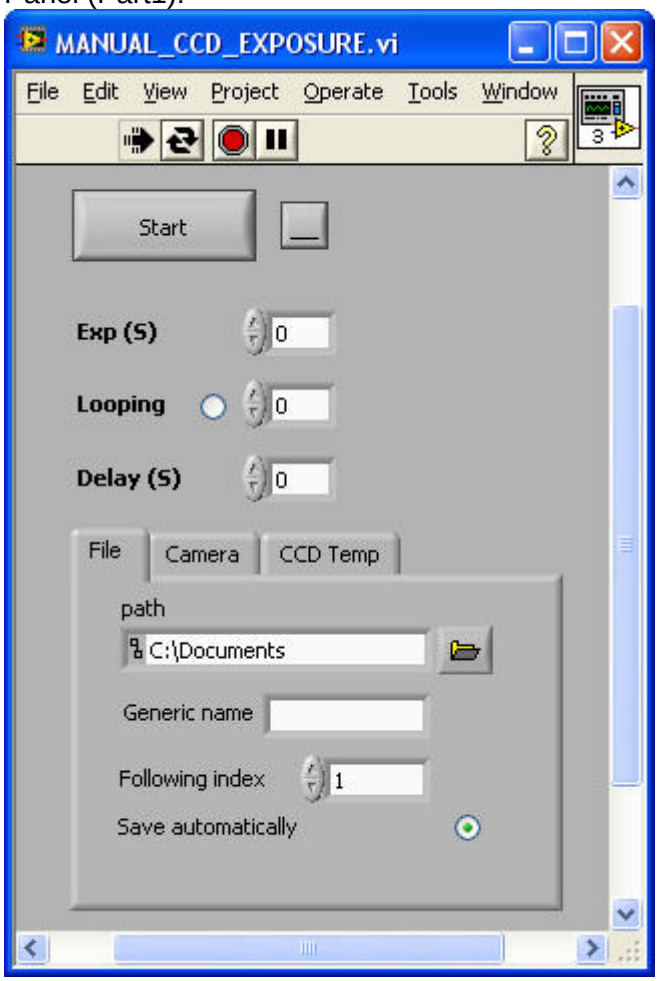
Functions to be programmed

- Set Motor increment = done
- Go + or – motor increment (give feedback, when position has been reached) = done
- Set axis definition = done
- Check positions now (don't change positions) = done
- Set maximum increment = done
- Re-initialisation (Search for home position) = done
- Reset motor position to 0 at current position = not necessary, done by hardware
- Error-log of device = done
- Show HPIB Address = done

6.5 NGC CCD camera interface

This part has to be done with the help of the ODT software people.

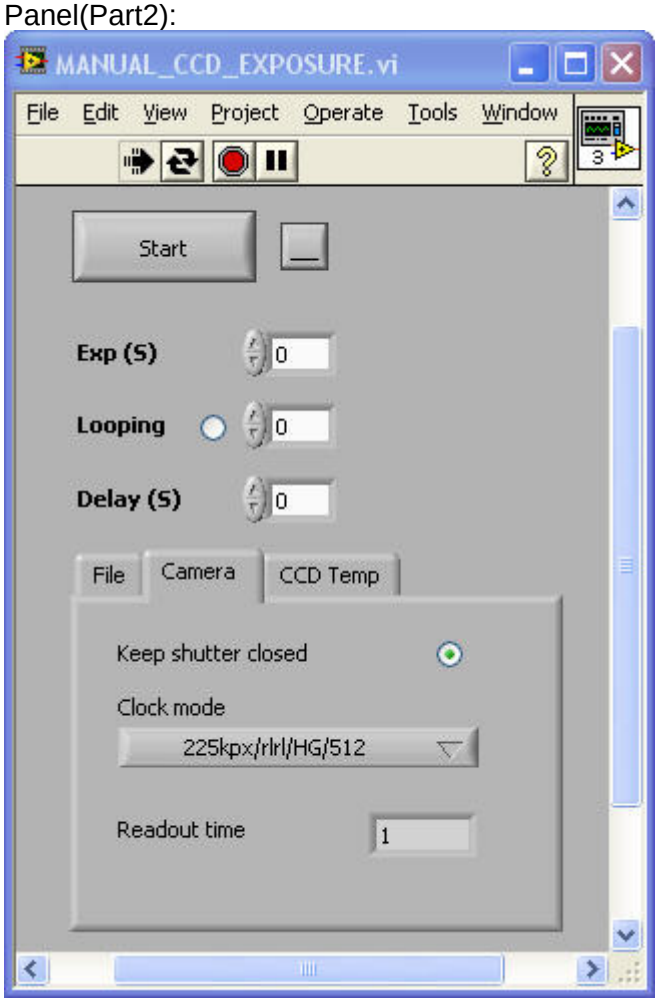
Panel (Part1):



Functions to be programmed (Can only be done, when NGC is available, but all functions available for FIERA):

- Login NGC
- Set Network addresses and data
- Set NGC STARTUP and/or ONLINE
- Set NGC STANDBY and/or SHUTDOWN
- Define Exposure (regular or dark)
- Define Exposure Time
- Define SubPattern
- Readout all relevant CCD parameters (CCDtype, CCDname, CCDvoltages)
- Start Exposure
- Wait for end of exposure (receive signal from NGC that exposure is finished)
- Delay before exposure
- Logging (Give error-log of NGC incl. all warnings)
- Show Ethernet address and login information of NGC LLCU

Panel(Part2):

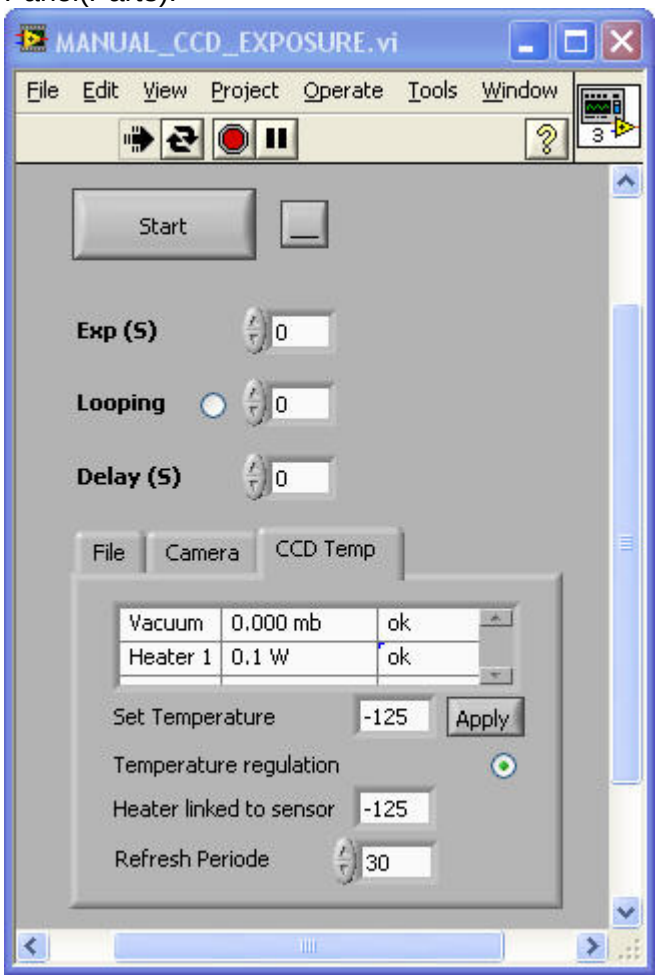


Functions to be programmed:

- Define Directory for Images
- Define Generic File Name
- Define Path of File
- Define File type (FITS or lossless compressed FITS (e.g.: PRiSM cpa-format))
- Define Index of FileName
- Option: Built FITS header
- Option: FileSaving or only display image

6.6 Vacuum and Temperature Controller

Panel(Part3):



Functions to be programmed (functions as available programmed for Pulpo and Edwards Controller, but not done for Jumo, because Jumo is not yet available in ready configuration) :

Possible devices: Pulpo1 (vacuum & temperature), Jumo (vacuum and temperature) and/or Edwards Vacuum Controller

- Show Vacuum in mBar = done
- Set type of Vacuum Gauge (Edwards or Balzers only for Pulpo) = not possible because of Pulpo
- Show all relevant Pulpo values: Temp1..7, Heater1..3, Temperature settings 1..3) = done
- Set temperature (change value) = done
- Set Heater (on/off) and Power of Heater = done
- Real-time plot-function of temperature, pressure, power (of heater) curves = done
- Option: Write Temperature into image-FITS header = done
- Error-log of Pulpo and/or Edward Vacuum Controller = done
- Set Temperature alarm value = done
- Set Vacuum alarm value = done

6.7 Light source with programmable power supply

Functions to be programmed (first hardware tests can be done without these functions):

- Set Lamp ON/OFF = done
- Read Lamp intensity = done
- Set ON/OFF: Feedback control of lamp regulation (only if device is available) = missing delivery from Newport, expected in November 2007
- Give Lamp OK/failure notice = missing delivery from Newport, expected in Nov 2007

6.8 Shutter control (via Pulpo and/or external shutter controller)

First the internal shutter of the monochromator is used, later an external shutter at the exit of the monochromator could be added. Internal shutter cannot be operated by Pulpo.

Functions to be programmed: Shutter driver missing, maybe N. Haddad from Paranal can help?

- Put shutter OPEN/CLOSE
- Set Shutter time
- Calculate Shutter delay = not possible
- Feedback of shutter (if available) gives the actual shutter state and the true shutter time (results in: “Shutter open” or “Shutter close”) = not possible
- Give Shutter failure notice (if it is sticking at OPEN or CLOSED) = not possible

6.9 Programmable 220V power plug distributor

Door warning lamp – Room illumination

Functions to be programmed:

- Door constant light ON/OFF = done
- Door blinking light ON/OFF = done
- Room light ON/OFF = December 2007

6.10 Temperature/Humidity/Ambient Light measurement

Functions to be programmed:

- Read ambient Temperature = done
- Read ambient Humidity = done
- Read room ambient light sensor = done

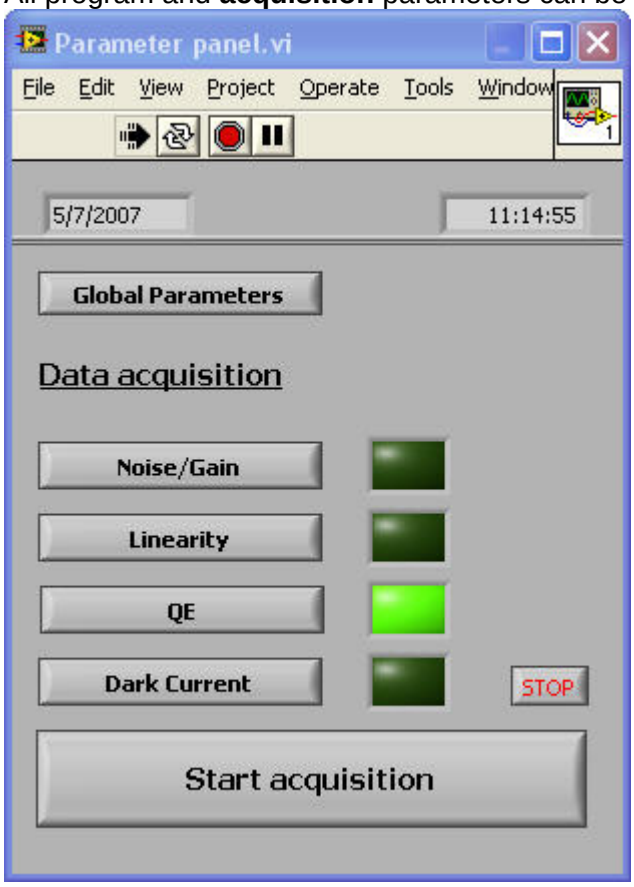
7 LabView programming of test bench data acquisition

First simple end-to-end test to get images from FIERA with working monochromator and ready hardware: in November 2007

With the available functions simple automated data acquisitions should be possible.
E.g.: Move monochromator to 700nm, take 5 exposures of 1 sec exposure time each and store it to a specified file-location inclusive all test-bench parameter information (e.g.: exposure time, exposure type, CCD-type, CCD-name, CCD-voltages, CCD temperature, vacuum pressure, light intensity, motor-position, room light situation etc.) .

7.1 General Master Acquisition Panel

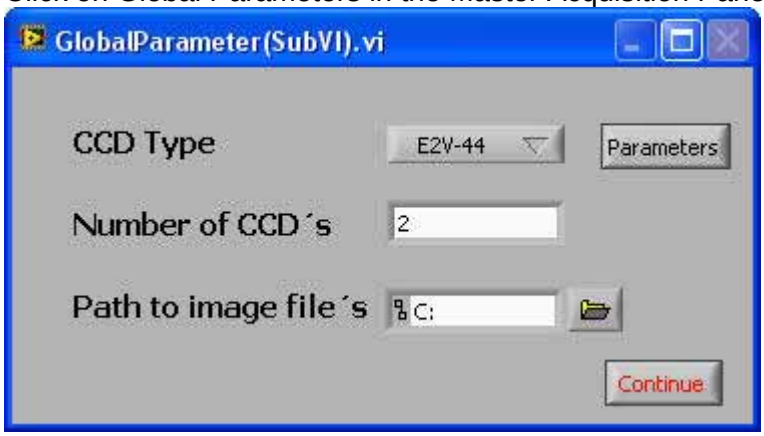
All program and **acquisition** parameters can be set outside of the LabView “source code”



= including test of complete acquisition ready February 2008

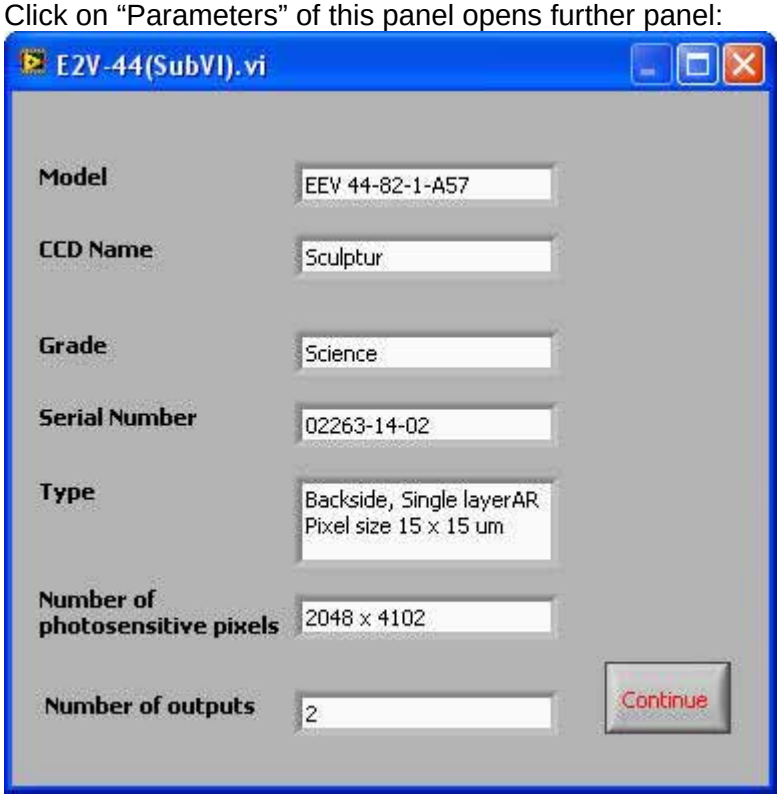
7.2 Global Parameters

Click on Global Parameters in the Master Acquisition Panel results in next panel:



= ready December 2007

Click on “Parameters” of this panel opens further panel:



= ready December 2007

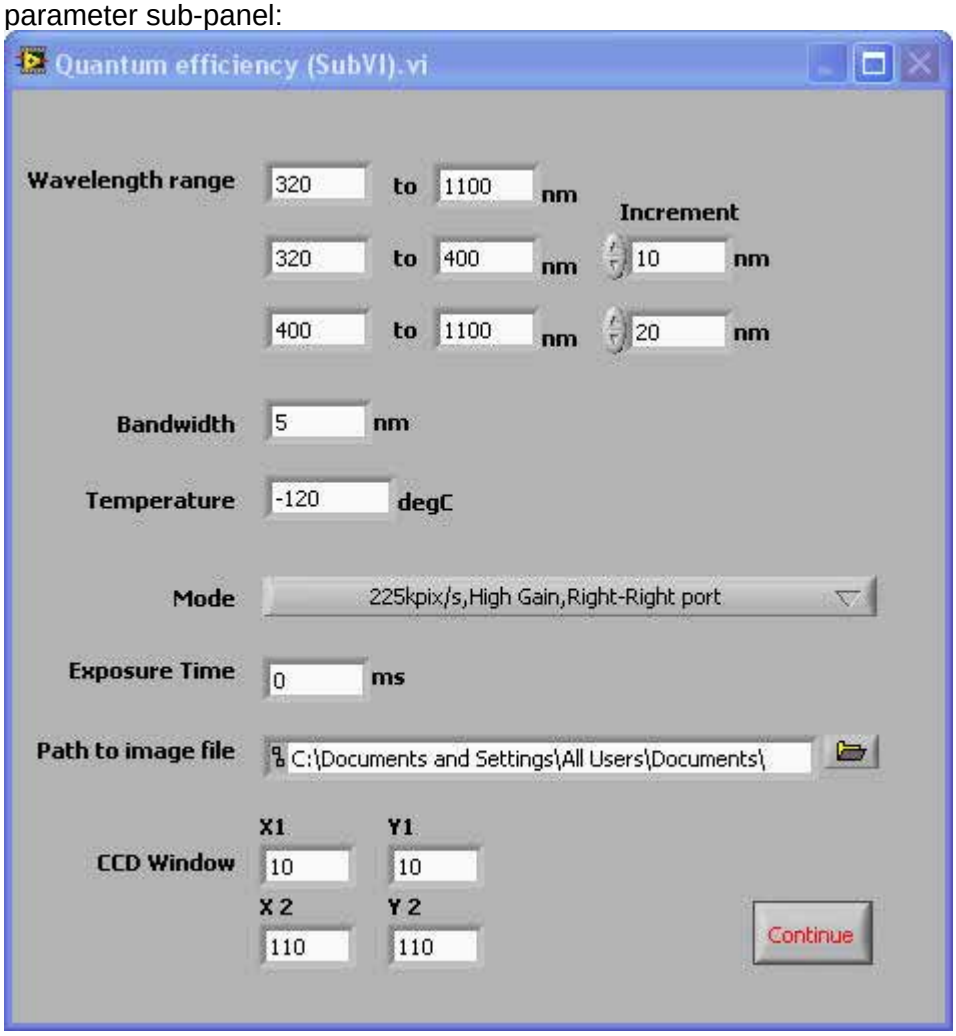
7.3 Dark current Parameter as an example

Click on QE in the Master Acquisition Panel results in the dark current parameter panel:

= **all these individual acquisition** panels ready and tested in January 2008

7.4 QE-Parameter panel as an further example

Click on QE in the Master Acquisition Panel results in the QE measurement parameter sub-panel:

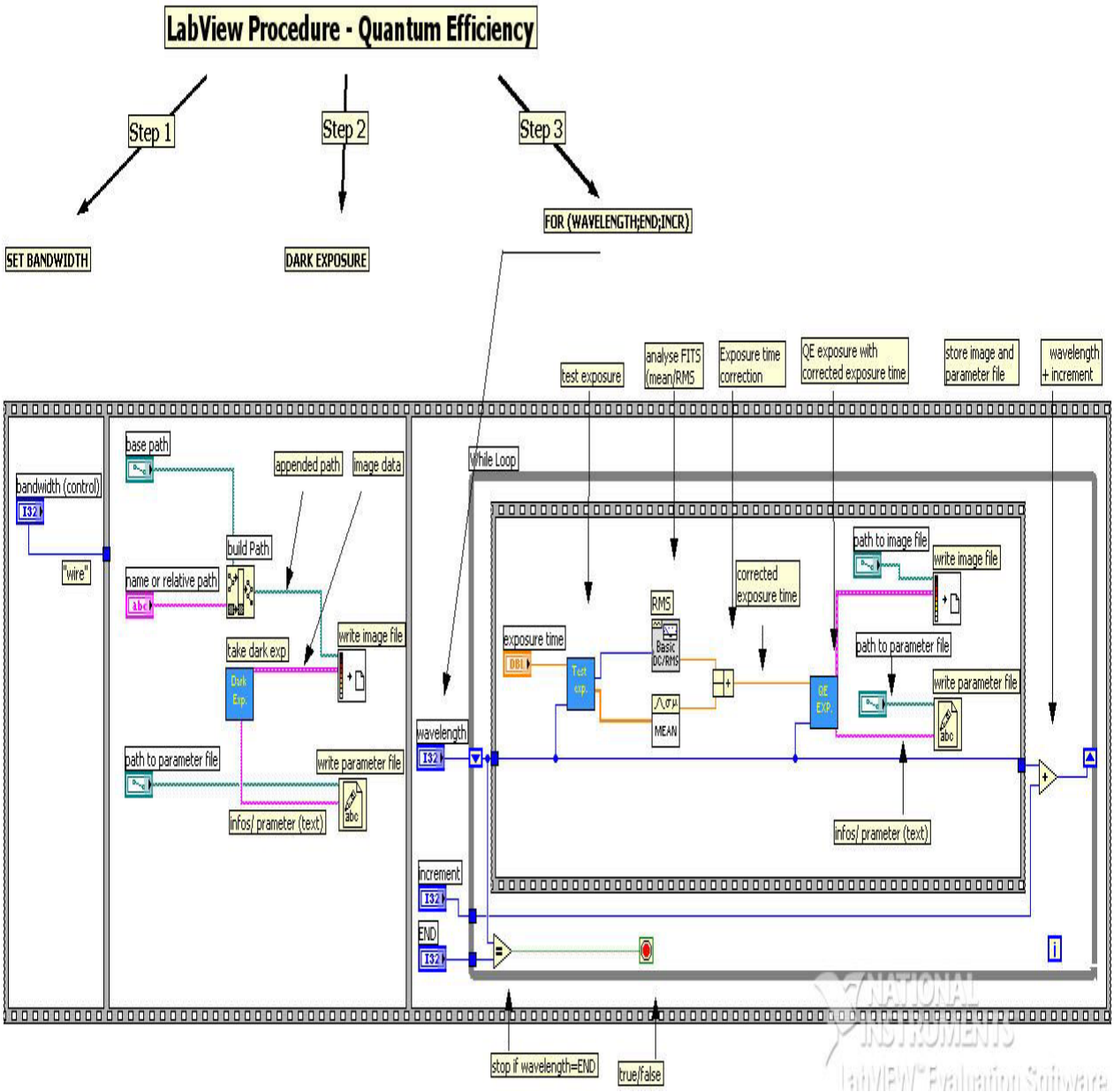


as well ready January 2008

The other sub-panels will be configured in an analogous way.

7.5 Example of LabView QE Data Acquisition

If the button “Start Acquisition” on the master panel is pressed, in this example the QE data acquisition is started.
Here the LabView “source code” of the Quantum efficiency” data acquisition as an example:



APPENDIX: Abbreviations and Acronyms

This document employs several abbreviations and acronyms to refer concisely to an item, after it has been introduced. The following list is aimed to help the reader in recalling the extended meaning of each short expression:

CCD	Charge Coupled Device
Cryostat	Device to cool down a CCD head with its CCD detector mounted
E2V	E2V Technologies (CCD manufacturer http://e2vtechnologies.com)
FIERA	Name of the VLT Optical Detector Controller
HW	Hardware
LabView	Graphical program language especially for measurement systems
LN2	Liquid Nitrogen
N/A	Not Applicable
ODT	Optical Detector Team
Pulpo	ESO Temperature and Shutter Controller
QE	Quantum Efficiency
r.o.n	Read Out Noise
RMS	Root Mean Squared
Sparc	UNIX based computer used to operate FIERA
SW	Software
TBC	To Be Confirmed
TBD	To Be Defined
TB	Test-bench for characterization of (optical) detectors
VI	Virtual Instrument (part of LabView functionality)
VLT	Very Large Telescope
WS	Workstation

End of document