

# Optical Device Measurement & Analysis System

## User's Manual

*[www.neonphotonics.com](http://www.neonphotonics.com)*

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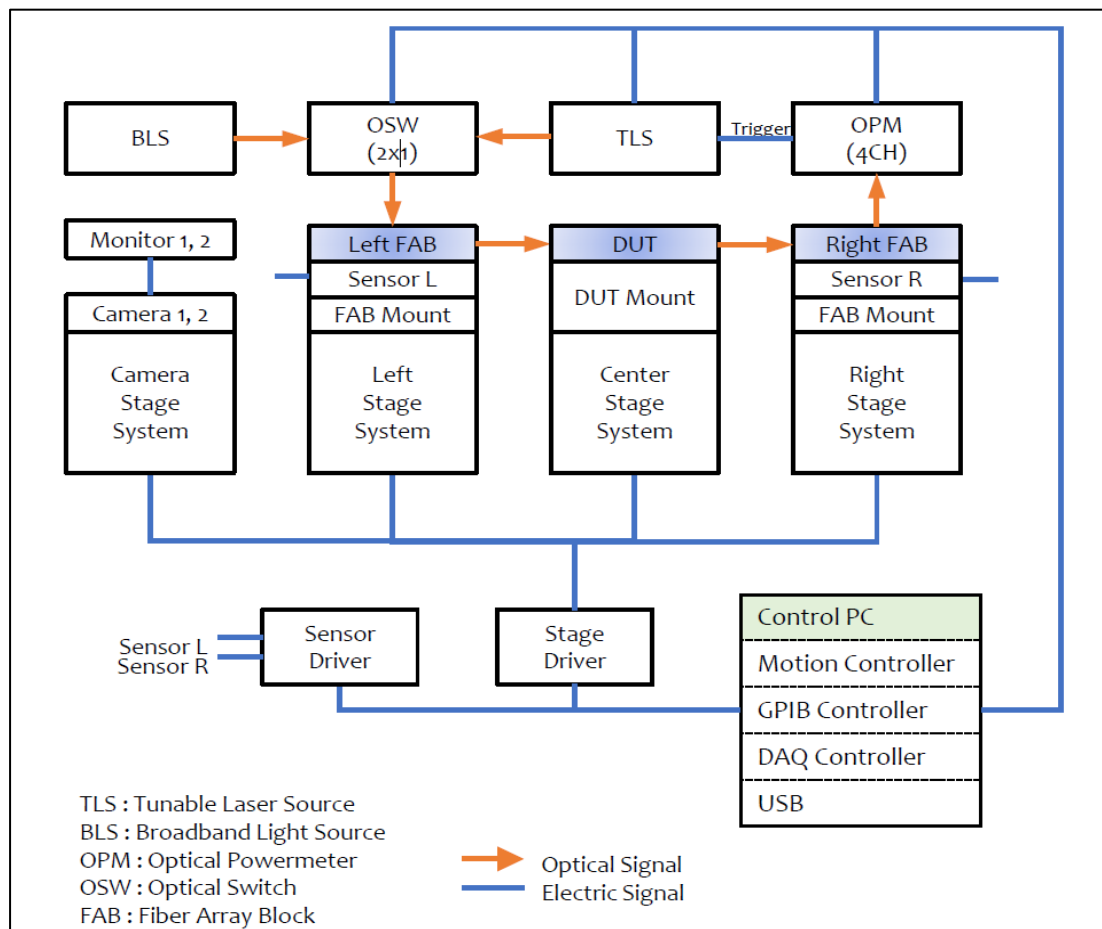
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## 1. General Information

### A. Purpose of System

- To Measure the optical properties of the PLC element by aligning the PLC (Planar Lightwave Circuit) and FAB (Fiber Array Block)
- To Measure O-Band 4 channel CWDM Mux & DeMux chip
- To Measure O-Band 4 channel DWDM Chip

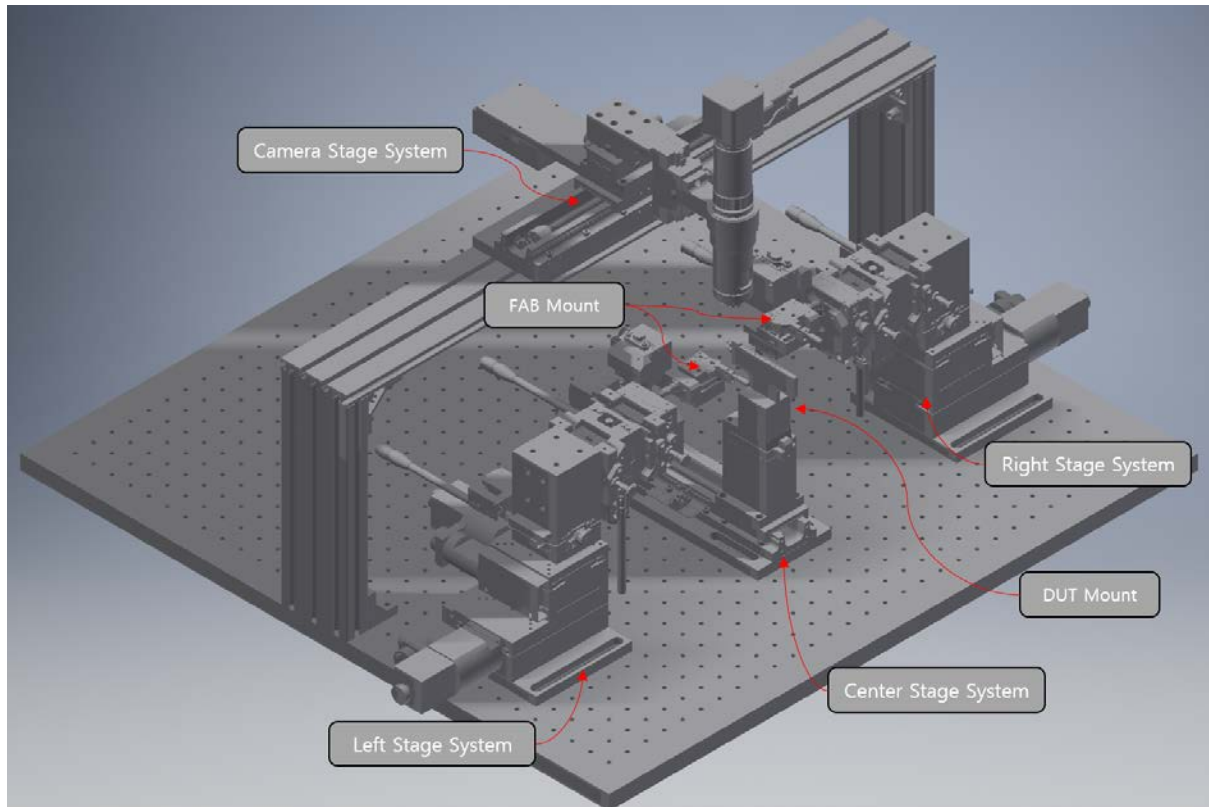


## 2. Outline of System

This is a schematic of the Optical Device Measurement & Analysis System.

BLS source for optical alignment of PLC chip and FAB, and TLS Source for measuring PLC chip are configured and the two sources are connected to the optical switch and adjusted for each situation between measurements.

A 4ch power meter for optical measurement is configured to receive a trigger signal from TLS and to synchronize the chip measurements.

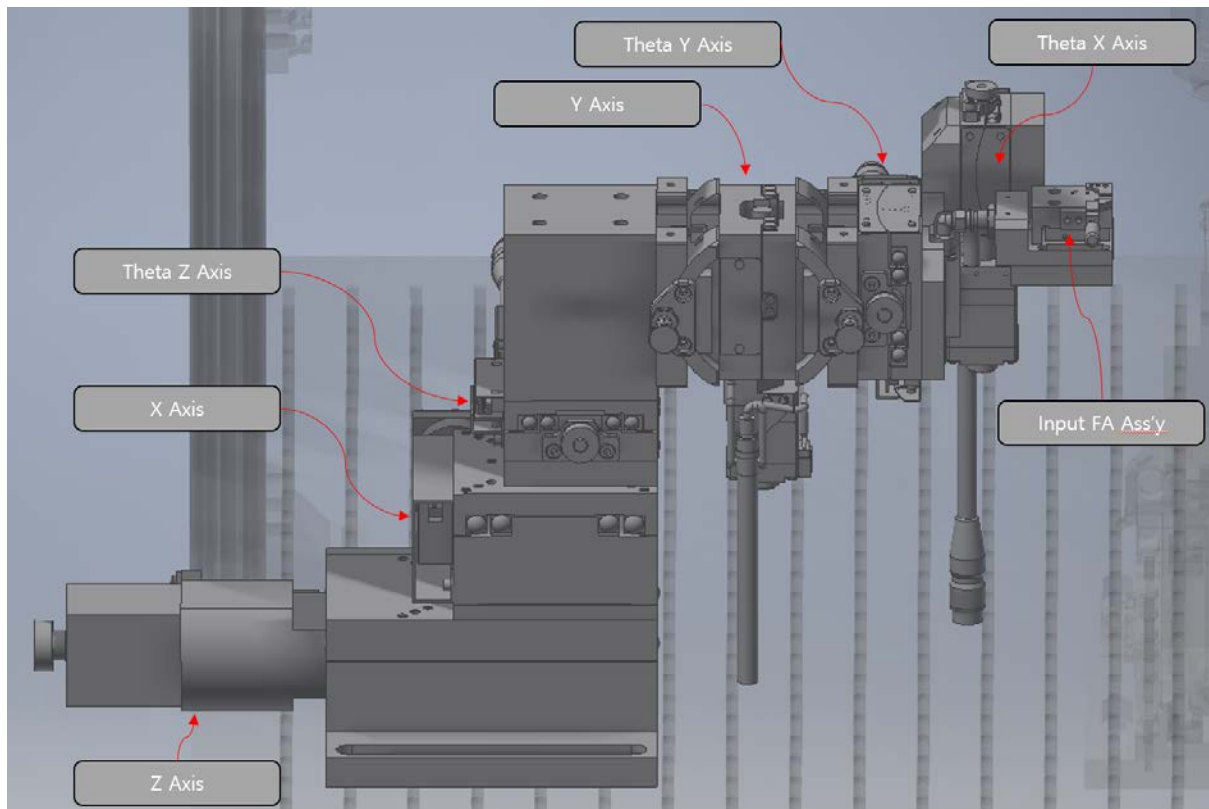


Stage Parts of Optical Device Measurement & Analysis System

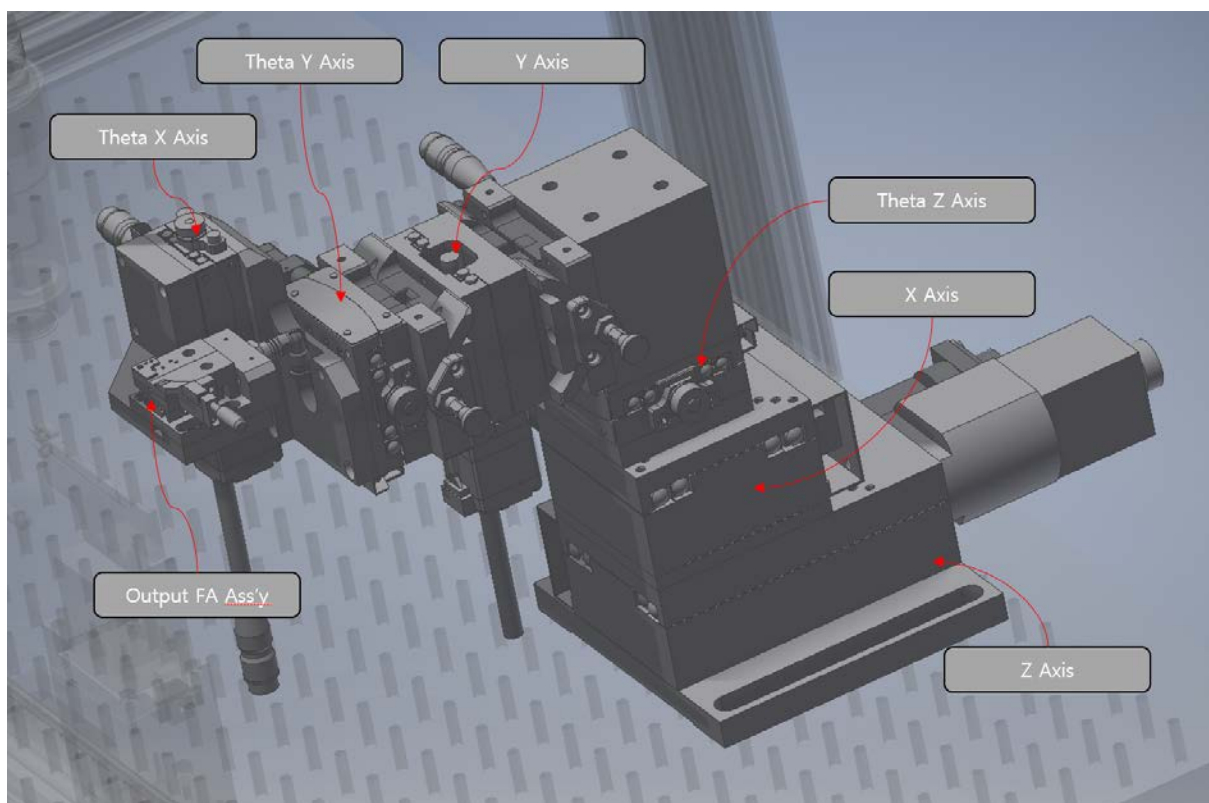
## 2.1 Section 1 – Stage Parts

### Stage Parts

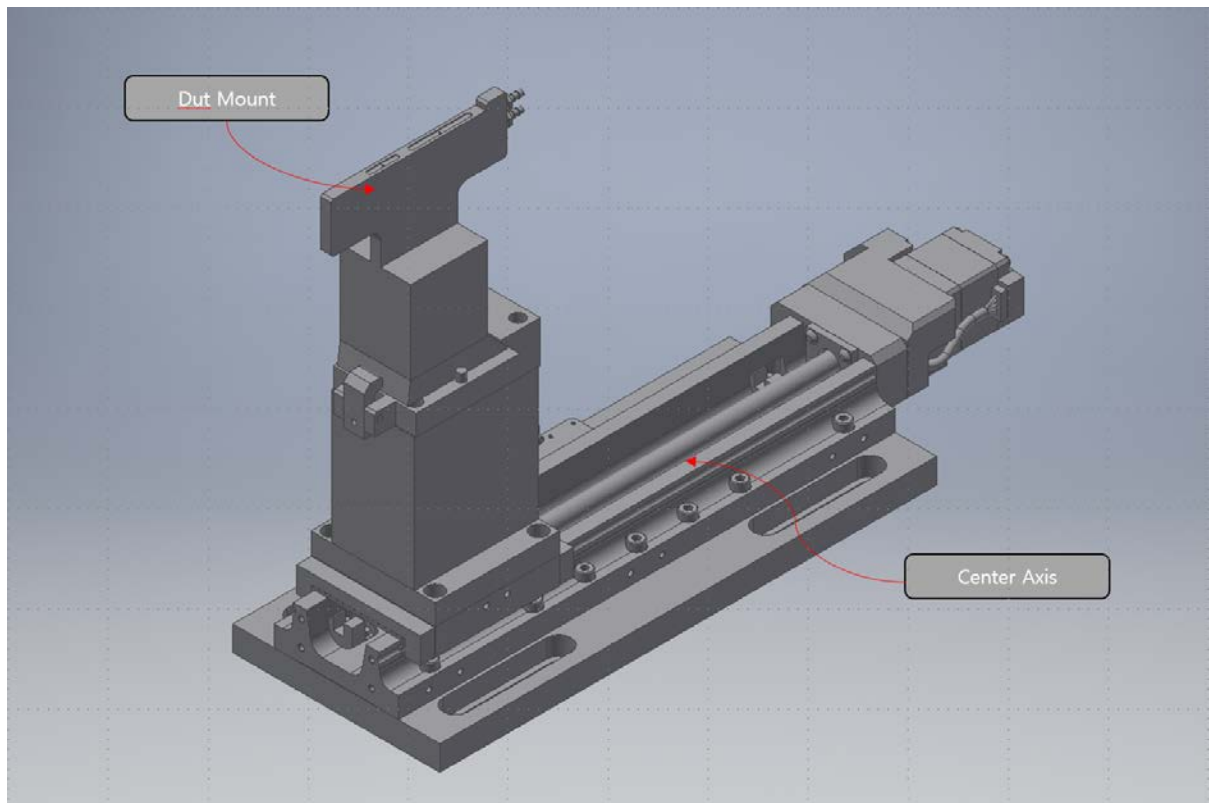
Parts Name	Description
Left Stage	6 Axis (X,Y,Z,TX,TY,TZ) Motorized Stage X,Y,Z Stage : $0.05\mu\text{m}$ TX,TY,TZ Stage : 0.0032 degree
Right Stage	6 Axis (X,Y,Z,TX,TY,TZ) Motorized Stage X,Y,Z Stage : $0.05\mu\text{m}$ TX,TY,TZ Stage : 0.0032 degree
Center Stage	1 Axis Motorized Stage $1\mu\text{m}$
Camera Stage	1 Axis Motorized Stage $1\mu\text{m}$



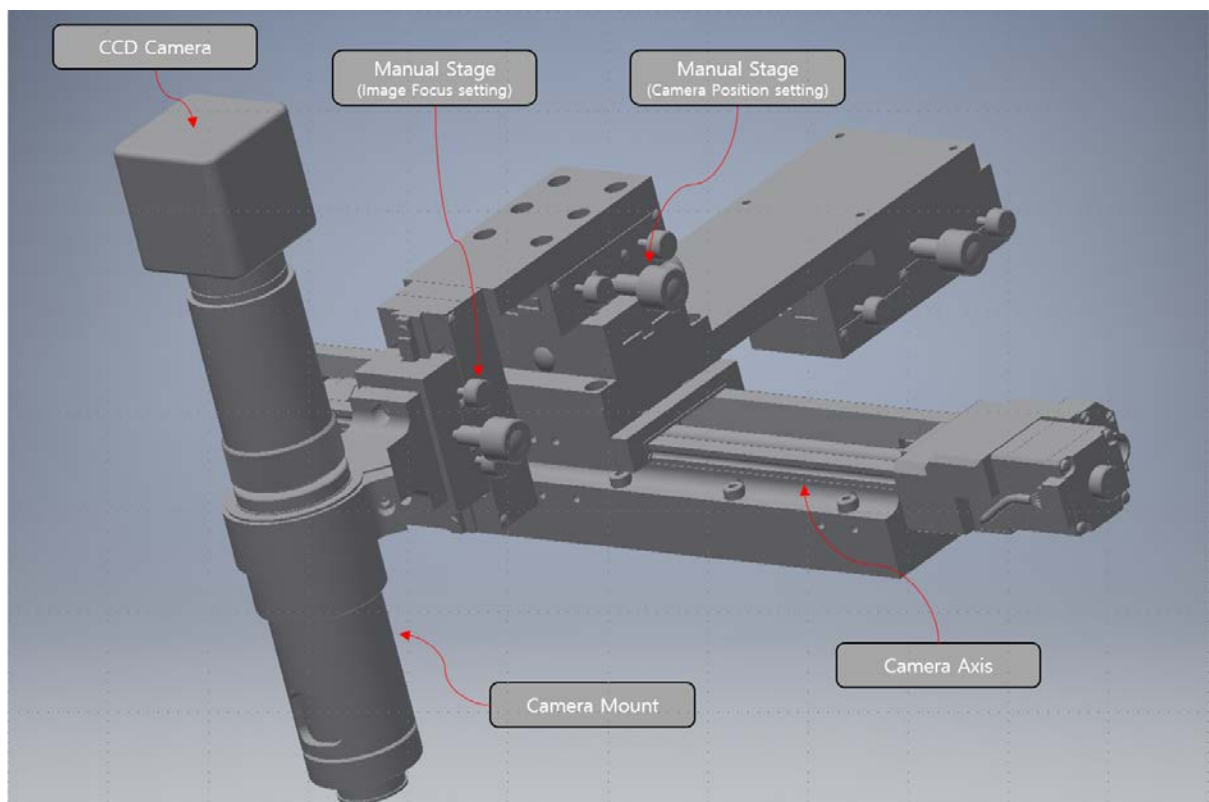
<Left Stage schematic >



<Right Stage schematic >



<Center Stage schematic >



<Camera Stage schematic >

## 2.2 Section 3 – Instrument Part



Alignment Source for optical alignment of DUP chip

1. Output power control lever of each wavelength. (Fixed at all times after initial setting)
2. On/Off button for each wavelength.
3. Output Connector [FC/APC]

### 2.2.2 Optical Switch



Optical switch for output switching of Source 'TLS' for measurement and Source 'Broadband' for optical alignment.

Control the switch inside of the measurement program (Form – refer the Optical Source Controller)

## Instrument Part

Part Name	Description
Tunable Laser Source	Refer to Agilent 8164B User's Manual
Broadband Light Source	Alignment source
Optical Powermeter	Refer to Agilent N7744A User's Manual
Optical Switch (2x1)	Optical switch (switch TLS and BLS)
Fiber Array Block	

## 2.3 Section 4 – user Interface Part

Part Name	Description
Data Analysis Part	Refer the Chapter 3
Component Control Part	Refer the Chapter 3
Stage Control Part	Refer the Chapter 3
Measurement Part	Refer the Chapter 3

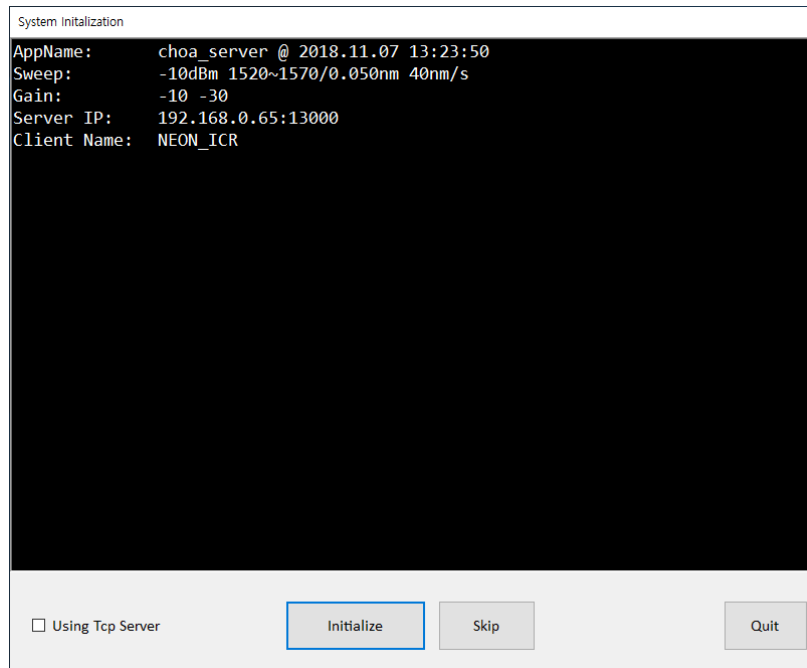
## 2.4 Equipment Installation Environment Specifications

Equipment Installation Specifications.

		Spec		Remark
Power	Body	2-Phase 220V $\pm 10\%$	2200 VA	50aHz / 60Hz
Pneumatic	Pneumatic	6Kgf / $\text{cm}^2$	$\Phi 6$ Tube	
	Vacuum		$\Phi 4$ Tube	
OTR	Main Machine: 20°C ~ 30°C			
Net weight	Body	400Kg, 1150 x 850 x 1400		



### 3. Software - User Interface



#### 2.2 Beginning of the program – System Initialization Form

Launching the UI of the Choa Server will show the same window as shown in (Figure 1).

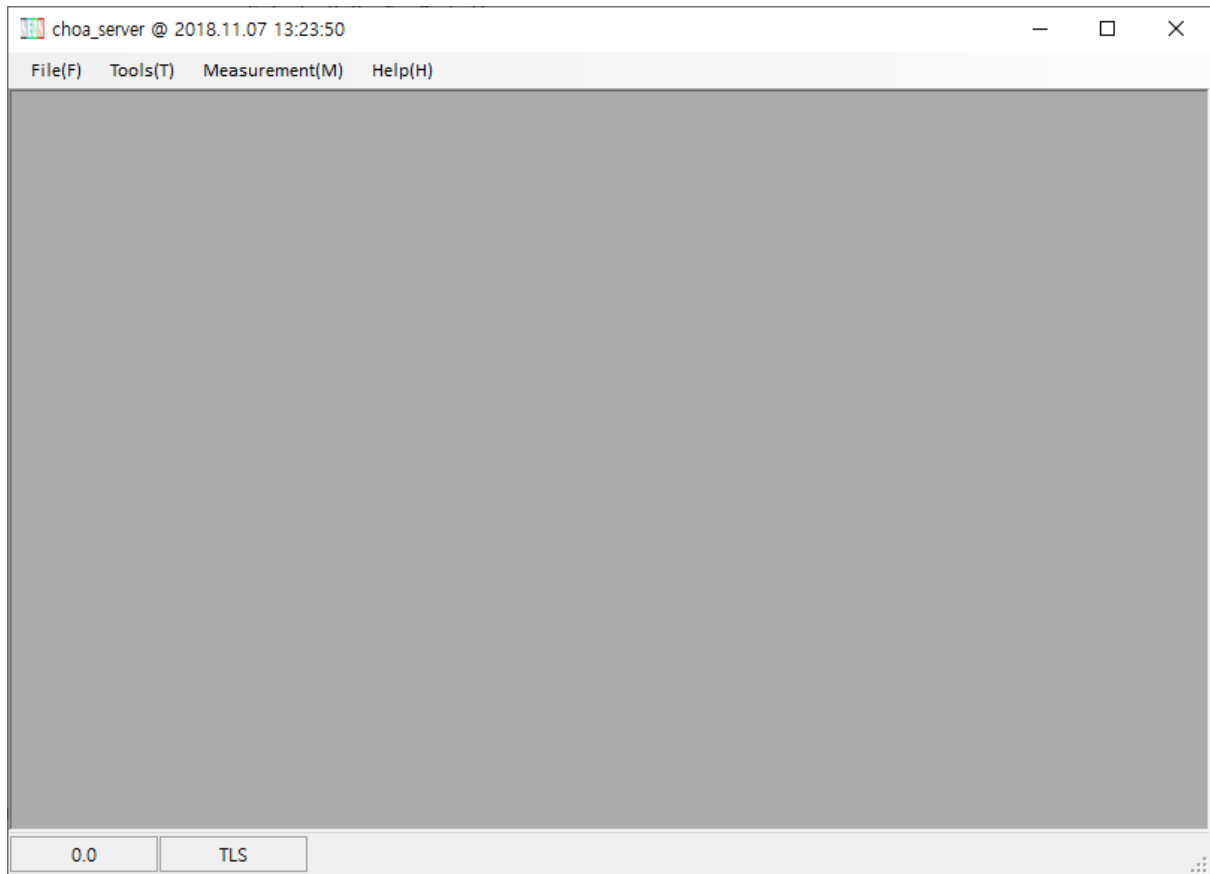
When running the window to initialize the device, the information set in the Config file is displayed.

AppName	: Information for the current program
Sweep	: Sweep info, when measuring Dut (TLS Power   start wave   stop wave   step   sweep speed)
Gain	: Value of 'Gain' of powermeter when measuring Dut
Server IP	: Address of TLS Tcp Server
Client Name	: The name of current equipment.
Using Tcp Server	: Check when using TLS with Tcp Server
Initialize	: Check the status of each equipment & reset the system according to the set conditions
Skip	: Without initializing the equipment, skip to the main form.
Quit	: Quip the program

Select the check box according to the usage environment [Using Tcp Server] of TLS and click

Initialize button

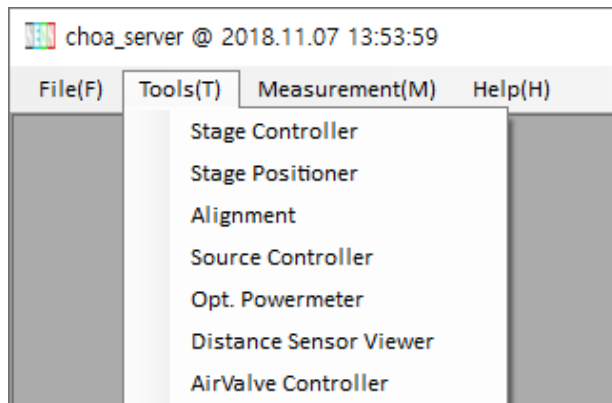
## 2.3 Main Form : Main form of program



Main form of Measurement program

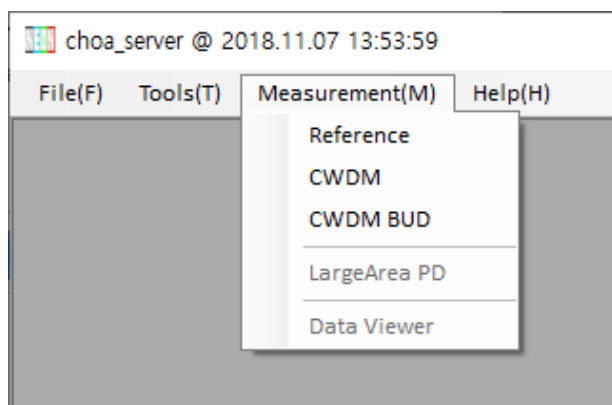
The machine's corresponding function operation Tool and measurement window of Dut chip can be opened.

## Main Form Menu



**Menu – Tools** : Open windows that control each equipment in the measurement system.

When System Initial finishes, all of the windows for each item are automatically opened.



**Menu – Measurement** : Open the windows for measuring

Reference window : The window for measuring the Reference

CWDM window : The window for measuring Dut chip

## Form – Stage Control [The Form for controlling the stage]

The screenshot shows the StageControl software interface. It is divided into several sections:
 

- Left Stage:** Contains numerical displays for X, Y, and Z axes (all showing 0000.0) and movement buttons (up/down arrows). A red box highlights the X, Y, and Z displays and movement buttons, with callouts 1, 2, and 3.
- Right Stage:** Similar to the Left Stage, with numerical displays and movement buttons. A red box highlights the Z axis display and movement buttons, with callout 5.
- Other Stage:** Includes a Camera section with 'In' and 'Out' buttons (callout 6), a Center section, and a large red 'STOP' button (callout 4).
- Bottom Left:** A Z Axis TrackBar with a 'Set' button and a display showing '10;100;300;1000'. It also has a 'Chip Protection System' checkbox and a '3' button (callout 5).
- Bottom Right:** A section with 'Pos1. Input' and 'Pos2. Output' fields, each with a 'set' button (callout 6).
- Bottom Center:** A section with 'Zero' and 'Option' buttons, and a 'cam' button. Below these are 'Zeroing [Left]', 'Zeroing [Right]', and 'Zeroing [Other]' buttons (callout 7).

1. Current position value for each axis

2. Movement setting value

3. Move button on each axis +,- direction

4. Stage Stop button [ESC Key]

5. Trackbar for setting the movement of Z axis

6. Move after absolute positioning of Camera Stage

7. Run Zeroing for each Aligner

## Form – Optical Powermeter [The form for checking the value of Powermeter]

The screenshot shows the Optical Powermeter software interface. It includes:
 

- Channel Selection:** Two 'Ch' dropdown menus. The first is set to '1' (callout 1) and the second to '4' (callout 2).
- Power Display:** Two large digital displays showing '0.0000' for each channel.
- Unit Setting:** A section with a 'dBm' label and a button (callout 3).
- Control Buttons:** A 'START' button (callout 4) and a 'STOP' button (callout 5).

1. Channel setting ComboBox

2. Optical power value of selected channel

3. Unit Setting button [dBm || mWatt]

4. Start : Start button for monitoring the powermeter

5. Stop : Stop button for monitoring the powermeter

## Form – Alignment

[The form for the optical alignment]

The screenshot shows the 'ALIGNMENT' software window. It features a grid of buttons at the top: 'Zapp', 'Zapp', 'FAR Y', 'FAR Y', 'FAR X', 'FAR X', 'FA ALL', and 'FA ALL'. Below these are tabs for 'SEARCH', 'SCAN', 'BLIND', and 'LOG'. The main area contains various input fields and checkboxes: 'THRESHOLD POWER (dBm)' set to -30, 'ALIGN PORT' with two dropdowns, 'X' and 'Y' coordinates (20, 20) and 'RANGE' (20, 20), 'STEP' (1, 1), checkboxes for 'Use Scan Algorithm' and 'Move To Center', a '0.25' value with an 'Apply Step' button, two 'XY SEARCH' buttons, 'Dist' (750), 'Range' (20), 'Step' (1), 'Threshold' (0.3), a 'Use TLS' checkbox, and '1271' and '1331' values in '[nm]' units. A 'θZ (ROLL)' button is also present. At the bottom is a large red 'STOP' button and an 'align report' link. Numbered callouts (1-19) point to specific elements: 1-4 point to the top button grid; 5 points to the 'XY SEARCH' buttons; 6 points to the 'θZ (ROLL)' button; 7 points to the 'STOP' button; 11 points to the 'THRESHOLD POWER' field; 12 points to the 'ALIGN PORT' dropdowns; 13 points to the 'RANGE' fields; 14 points to the 'STEP' fields; 15 points to the 'Use Scan Algorithm' checkbox; 16 points to the 'Move To Center' checkbox; 17 points to the '0.25' field; 18 points to the 'Threshold' field; and 19 points to the '1271' and '1331' fields.

1. Zapp : Run Z-axis approach
2. FAR Y : Run Theta Y-axis Arrangement
3. FAR X : Run Theta X-axis Arrangement
4. FAR ALL : Run Theta X-axis and Theta Y-axis at the same time
5. XY SEARCH : Run optical alignment
6. θZ (ROLL) : Run Roll (Theta Z-axis) alignment
7. STOP : Force shutdown during each alignment
11. Set the minimum optical power during the optical alignment
12. ALIGN Port : Set both end channels of the standard powermeter channel & Roll aligning during XY SEARCH
13. RANGE : Search range during XY SEARCH
14. STEP : Movement step during XY SEARCH
15. Scan Algorithm : Scanning method for X-axis and Y-axis || Hill Climb Search method
16. Move To Center : When using Scan Algorithm, move to the center after scan(Using for Multi-mode Faber Scan)

17. Apply Step : Set the movement step when using the HillClimb Search method

18. Roll Align setting value [Distance : The distance of both ends of Align Port,

Range : Roll Scan Range

Step : Roll Scan Step

Threshold : Set the failure of Roll Scan

19. Use TLS : Checked – Run Roll using TLS

Un-checked – Run Roll using Broadband

### Form – Optical Source Controller

[The Form of optical switch and TLS control]

Optical Source Controller

Optical Switch

☐ Align ☐ TLS

Tunable Laser Source

P [dBm] -15.0

λ [nm] 1550.00

Apply

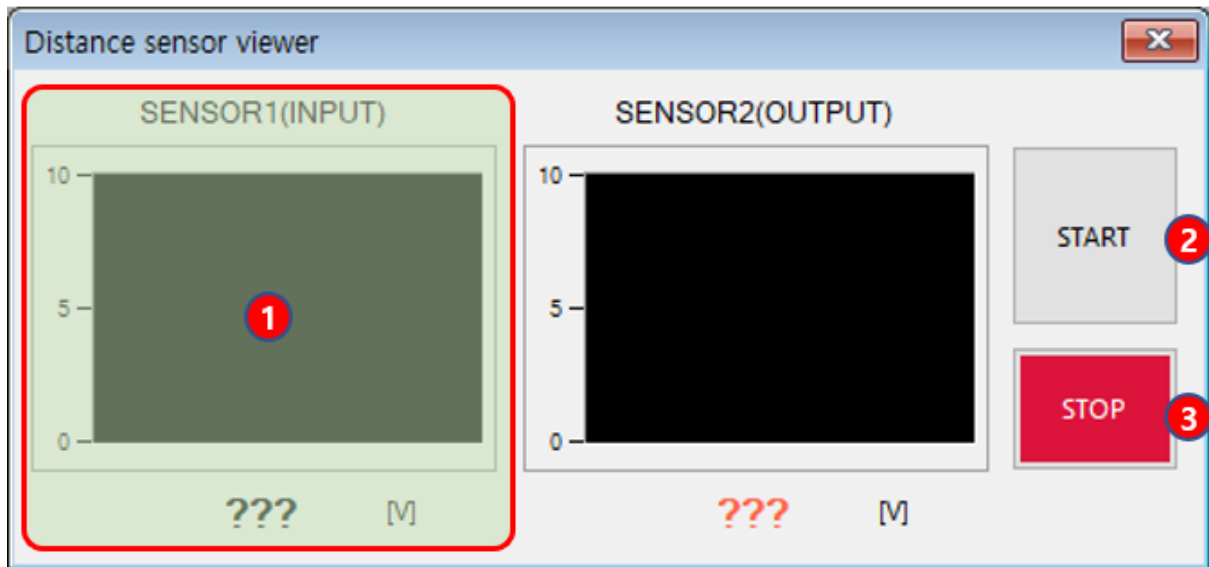
1271  
1291  
1311  
1331

1. Optical Switch : Switch Align Source and TLS
2. Change the wavelength setting of TLS
3. Set the wavelength and Power value of TLS
4. Apply the above setting

※ Tunable Laser Source cannot be used in Tcp\_Server mode.

## Form – Distance Sensor viewer

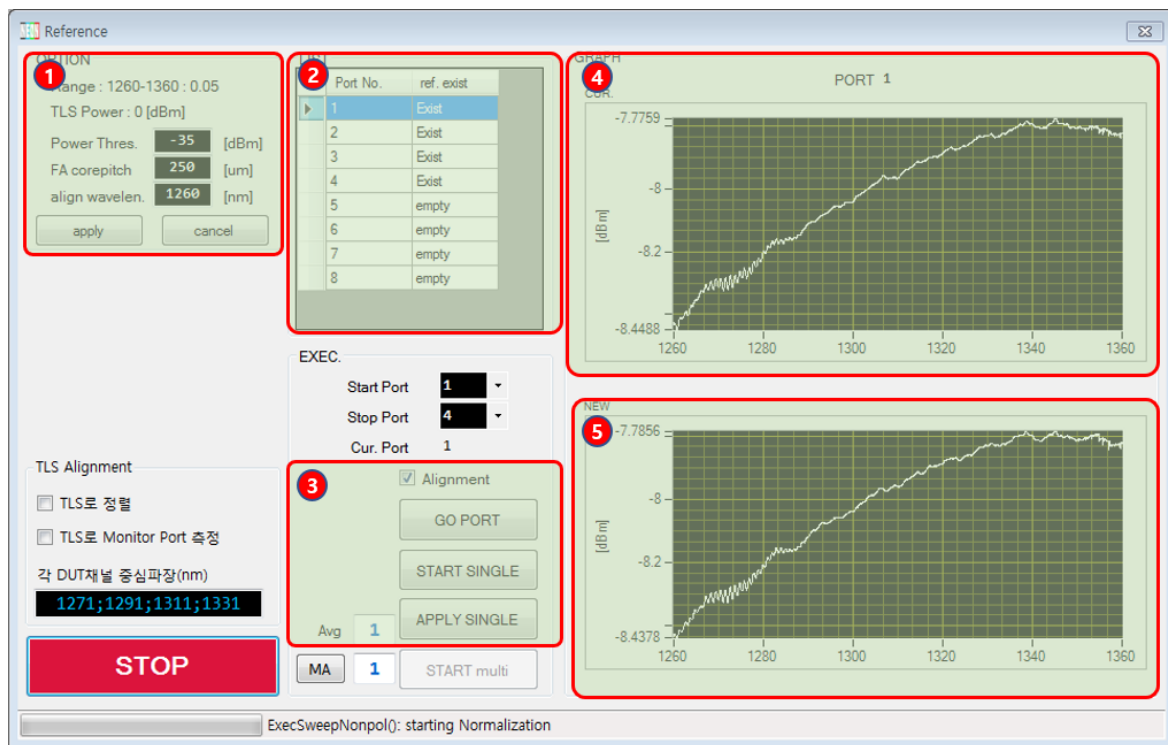
[The Form for confirming the contact sensor value]



1. Volt value and progress graph of current sensor
  2. Sensor monitor 'Start' button
  3. Sensor monitor 'Stop' button
- ※ Using for monitoring only for setting the sensor, and close the window during the chip measurement.

## Form – Reference

[Form for measuring the Reference power]



1. Option : Reference measurement option setting

Power Thres : Threshold power value during alignment.

FA corepitch : Chip pitch of Output FAB

Align wavelen. : Set the wavelength when using TLS alignment

Apply : Save and apply the option setting value

2. List : Select the measurement for each channel and check the Reference value

3. Alignment : When measuring the Reference, perform the alignment before the measurement

GO PORT : Move function to selected channel from the List

START SINGLE : Measure the reference of the selected channel

APPLY SINGLE : Apply and save the measured Reference value

4. Current Graph : Graph of Reference value previously measured and applied

5. NEW Graph : Graph of newly measured Reference values by clicking 'START SINGLE'



## Form – CWDM Mux (Fiber Array)

[Dut Chip measurement]

The screenshot shows the 'CWDM Mux (Fiber Array)' software window. It features a left sidebar with numbered callouts 11 through 16, a central area with callouts 1 through 3, a top-right graph area with callout 4, and a bottom-right analysis table with callout 5.

**Callout 1:** Points to the 'List' input field where the serial number 'TESTCHIP-0-0-A0-' is entered.

**Callout 2:** Points to the large empty rectangular area for the measurement list.

**Callout 3:** Points to the 'MEASURE' button.

**Callout 4:** Points to the graph titled 'TVC07200123-0-0-x0-Master' showing a grid with wavelength on the x-axis and power in dBm on the y-axis.

**Callout 5:** Points to the 'Analysis' table.

**Callout 11:** Points to the 'Options' section, including 'Chip Width' and 'Channel Space' fields.

**Callout 12:** Points to the 'Out FAB' section with radio buttons for 'SMF (5~8)' and 'MMF (1~4)'.

**Callout 13:** Points to the 'Channel Direction' section with icons for '1271' and '1331'.

**Callout 14:** Points to the 'Gains' section with radio buttons for '1' and '2'.

**Callout 15:** Points to the 'FA Arrangement' section with checkboxes for 'FA Arrangement', 'Alignment', 'Roll', 'Approach', 'Auto Repeat', 'Auto Return', 'OutAlign#', and 'Center Stage'.

**Callout 16:** Points to the 'AutoSave' section with radio buttons for 'Full' and 'Range'.

1. The window for inputting the serial of DUT Chip and number of Barchip
2. Measurement List window : Output the list for the number of Serial entered, and display the measurement status
3. MEASURE button : Start button for measuring DUT Chip
4. Graph : IL graph of measured DUT chip
5. Analysis : Result analyzing window of measured DUT chip
11. Option
  - Chip width : Chip spacing – the distance between chip to Barchip
  - Channel Space : Output core pitch of Dut chip
12. Out FAB : Always fix it with MMF(1~4) and measuring it
13. Channel Direction : Set the order of wavelength by channel of Dut chip (Forward || Reverse)
14. Gains : Measure it once after fixing the measurement Gain value of Powermeter || Calculate the Data after measuring 'two' of Gain value

15. FA Arrangement : Theta X-axis, Theta Y-axis Alignment, Measurement : Run sweep

Alignment : Perform the optical alignment,

Clading : Measure the Clading mode (2 times of sweep is performed)

Roll : Perform the roll alignment

Auto Repeat : Repeat measurement

Approach : Perform Z-axis approach ,

Auto Return : Return to first position after all chip measurement is finished.

OutAlign# : Output optical alignment only in multiples of the corresponding value when measuring Barchip

Center Stage : Center Stage usage status

Align by TLS : Perform the optical alignment using TLS

16. Save

AutoSave : Automatically save values after chip measurement

Full : Save all range values of sweep.

Range : Save the value only by the set range

Save Folder : Set the save folder

Create Wafer Folder : Create a folder with the name of the wafer in the save folder and save the data.

## 4. Software - Config Setting

### A. **Config\_init** [Initial setting file for program and equipment]

- i. APP\_NAME : Application Name
- ii. GPIB\_BOARD : GPIB Board Number (Check NI Max)
- iii. IsTlsFrame : Check both THL and P.M are installed on mainFrame (false setting)
- iv. IS\_AGILENT\_TLS : Agilent TLS status (Setting True)
- v. GPIB\_TLS : TLS Frame address (Check NI Max)
- vi. GPIB\_PM : PowerMeter address (Check NI Max)
- vii. TLS\_PARAM : Sweep setting  
TLS power ; Start Wave ; Stop Wave ; Step Wave ; Sweep Speed
- viii. POWERMETER\_GAIN : Gain value of PowerMeter measurement
- ix. PM\_ALIGN\_GAIN : Gain value of PowerMeter alignment
- x. COMPORT\_OSW1 : Optical Switch address (Check device manager)
- xi. OSW\_ALIGN\_PORT : (Align source connection number)
- xii. OSW\_TLS\_PORT: TLS source connection number
- xiii. OSW\_Using : Optical Switch usage status
- xiv. OSW\_IS\_NEON : (Setting false)
- xv. MC\_Type : (Setting Nova)
- xvi. Center\_Info : [Usage status] ; [MC-axis] ; [Forward F || Reverse R]
- xvii. Camera\_Info : [Usage status] ; [MC-axis] ; [Forward F || Reverse R]
- xviii. DAQ\_AICH\_ADDRESS : DAQ connection address of Distance Sensor
- xix. DAQ\_AICH\_RSE : RSE status (Setting false)

- xx.     DAQ\_AICH\_VOLT           : Daq volt setting (Setting 0;10)
- xxi.    DAQ\_IS\_SFAC            : (Setting false)
- xxii.   DAQ\_AIR\_Using          : (Setting false)
- xxiii.   DAQ\_AIR\_LEFT          : (Setting 0)
- xxiv.    DAQ\_AIR\_RIGHT         : (Setting 1)

B.   Server Config.txt           [Setting the address of TCP Server]

- i.     192.168.0.1            : IP Address of TCP Server