Generic Spec & Operating Instructions: OSP **VibroView-200** Laser Vibration Testing Station

OmniSensing Photonics，LLC

Contents

1. Introduction

Taking the advantage of photonic integrated circuit (PIC) technology and its proprietary all-in-one packaging design, OmniSensing Photonics (OSP) has developed a series of compact laser vibrometer solutions. The latest generation carries the model series OSP-MV-H-XX for various applications. Based on the MV-H laser vibrometer modules, OSP designed and developed a turn-key solution, called VibroView, which is a vibration characterization station for small size components such as MEMS. The lastest model is VibroView-200, which has following unique features:

- **Integrated System w/ Small Footprint:** Integrated laser vibrometer and digital microscope in a compact footprint.
- **3-axis Control:** Offer 3-axis manual control for easy and accurate location pin point on DUT (Device Under Test).
- **High Precision MV-H Series Laser Vibration Testing w/ Visible Indicating Light**
- **Wide Frequency Range:** DC~2.5MHz.
- **Digital Microscope and Associated Display GUI**

1.1 Core Technology

The key component for the OSP-MV-H series laser displacement sensor is its all-in-one optical assembly (as shown in Fig. 1), which generally consists of a laser diode, a photo detector array, a proprietary optical processing chip (PIC) and an optical lens set (or a pigtailed fiber interface). Fig. 1 explains that how a generic coherent detection scheme is implemented into the all-in-one optical assembly as the core technology of the MV-H series laser vibrometer modules. The all-in-one optical assembly could come with different designs and form-factors, fitting for different applications.

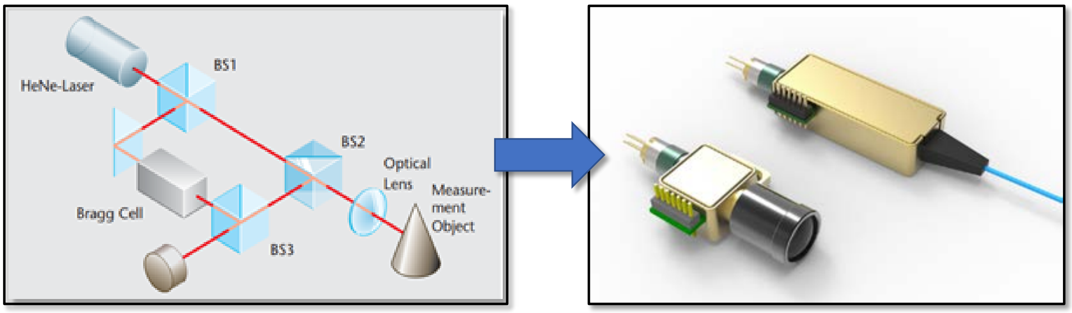


Fig. 1 All-in-one optical assembly that implementing the coherent detection scheme

Fig. 2: MV-H-TR model laser vibrometer

Targeting different application, each type of MV-H laser vibrometer module has its own lens selection (or fiber connector selection), dedicated PCB driving board, defined electronics interface and suitable exterior design. The entire module should meet industrial protection standard IP-65 or greater. Figure 2 shows the most functional MV-H-TR type laser vibrometer module.

1.2. Typical Applications

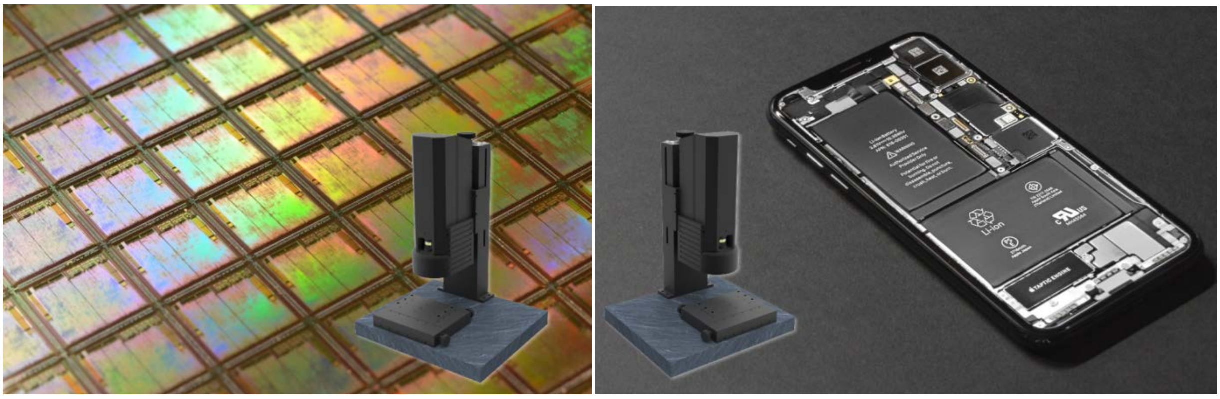
The VibroView-200 series laser vibration testing station has integrated the MV-H-TR type laser vibrometer along with a digital microscope. Mostly for R&D purpose, this testing station is designed to characterize the vibration performance of any small form-factor vibrating devices, components or module/subsystem. As shown in Figure 3, the typical applications could be:

1) Characterizting MEMS PMUT/CMUT devices:

Micromachined ultrasonic transducers, normally design in an array, have various form-factor and application. In example, an PMUTs is designed and babricated to operate at multiple frequencies, so each PMUT should be tested against its original designing performance. These characterization tests can be performed using the VibroView laver vibration testing station, where the testing laser beam can be easily aligned with the device center under the digital microscopeare designed while doing the device visual inspection in the same time.

2) Smart-phone vibration performance check:

The VibroView vibration station could also be used to test out the vibration performance of various common commercial electronics devices, such as the MEMS speaker, motorized vibrator, or vibrating touch screen.



(a) MEMS PMUT/CMUT device characterization (b) Smart-phone vibrator qulity check

Fig. 3: Typical application of VibroView laser vibration testing station

2. Product Description & Specifications

2.1 Product descriptions

Fig. 4 describs the VibroView-200 system:

1) The VibroView-200 system has combined the laser vibromter and digital microscope into one complete system, the external PC can communicate witht the VibroView-2000 through the Eithernet interface for both vibration testing and microscope image displaying.

2) The X/Y moving stage is manual for testing pin-point adjustment; and the Z direction is also manual for a quick focusing distance adjustment.

3) Optics zoom ratio can be adjusted as well from the front, while digital zoom ratio can be changed on the testing GUI.

4) There is a nub for LED light brightness adjustement.

5) The GUI is running on a PC, where the PC is connected to VibroView-200 though the Ethernet cable.

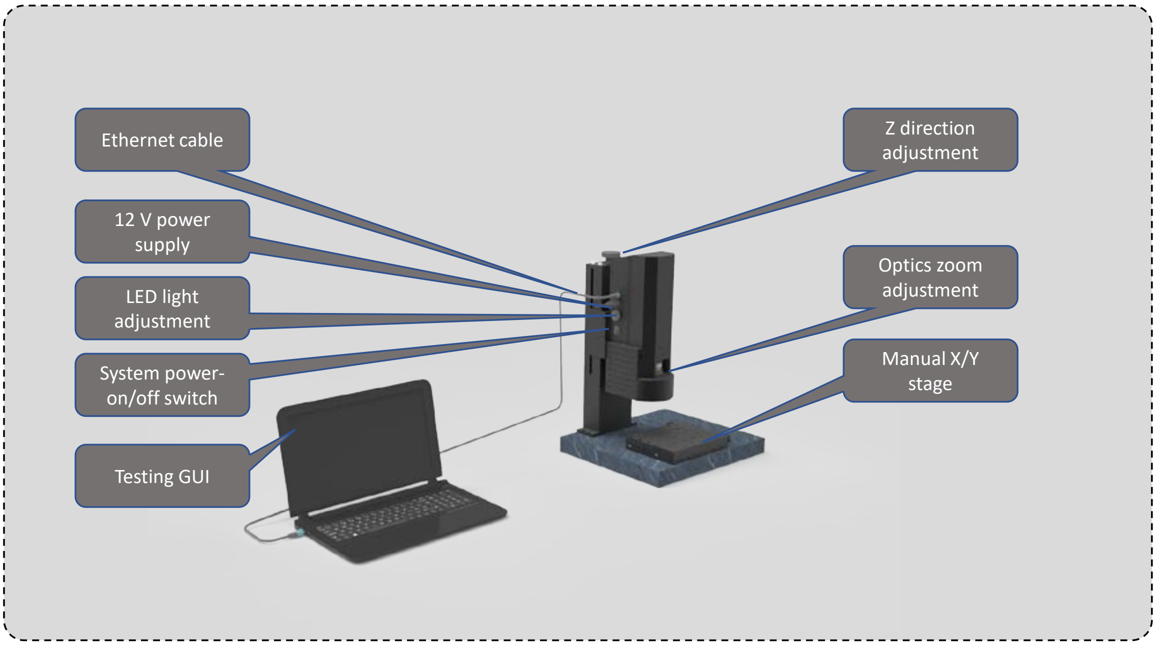


Fig. 4: Descriptions of VibroView-200

2.2 Optical measurement specifications

The following Table 2 shows the specification of VibroView-200 series laser vibration testing station: : .

Table 1: VibroView-200 series laser vibration testing station specifications

Items	VibroView-200
Laser Vibrometer	
Detectable vibration frequency	DC~2.5MHz
Operating distance((from the lens to DUT)	10mm~30mm
Operation range	+/-15% of working distance
Velocity full scale	±1.5 m/s (regular mode)
Typical vibration resolution	~1nm or better
Testing laser class	Class 1, <5mW output
Testing laser wavelength	1310 nm (invisible near infrared, detector card included)
Visible light wavelength	650nm
Visible light class	Class 2, <1mW
Visible light spot size	~100um
Digital Microscope	
Optics zoom	0.7~4.5
Digital zoom	100
Resolution	4~11um
System	
Weight	~3Kg
Operating temperature	0-50°C
Power supply	12V, typical 10W
Digital interface	Ethernet
Software	GUI

2.3 Mechanical specification for VibroView-200

The following figure defines the mechanical information of VibroView-200.

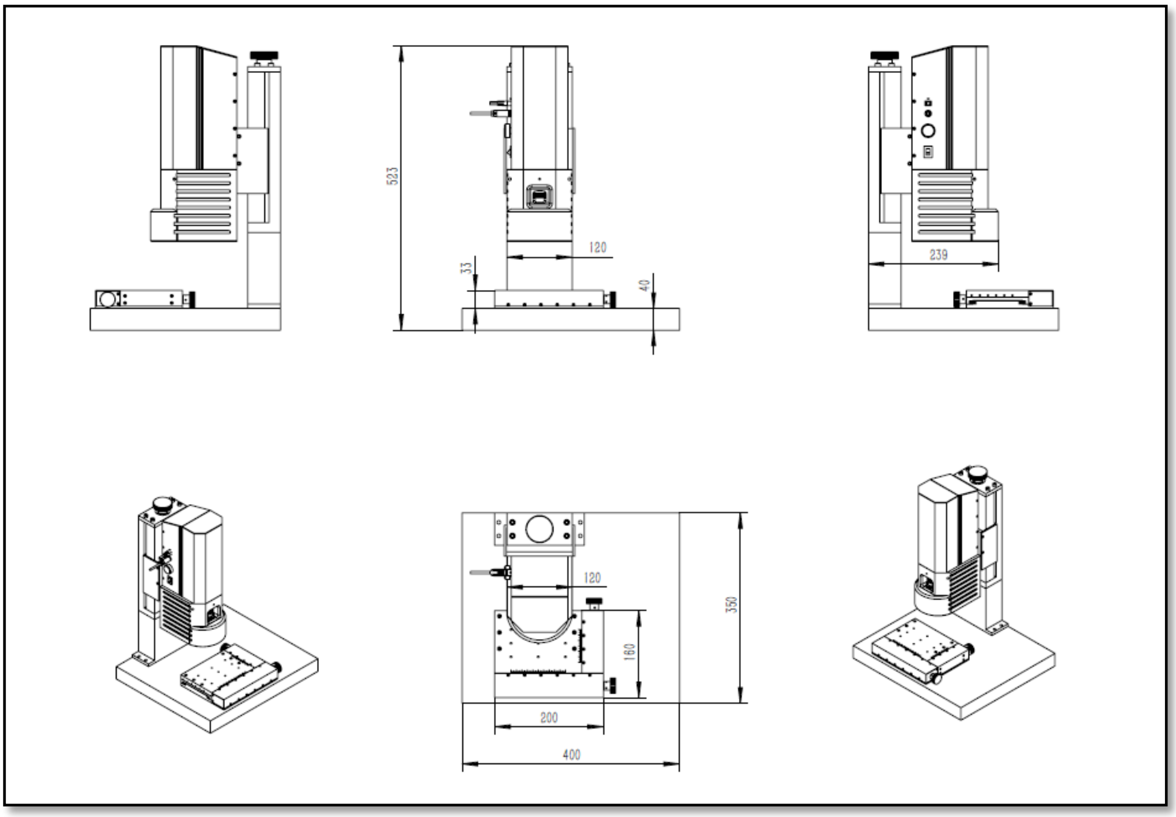


Fig. 5: The mechanical information of VibroView-200 laser vibration testing station

3. Communications & Application Software

The standard electrical interface for OmniSensing Photonics' MV-H series laser vibrometer modules is Ethernet 100Mb/s, so does the digital microscope. The VibroView-200 system has one Ethernet port for external communication, where the Ethernet port is internally connecting to the laser vibrometer and the digital microscope through a built-in Ethernet switch.

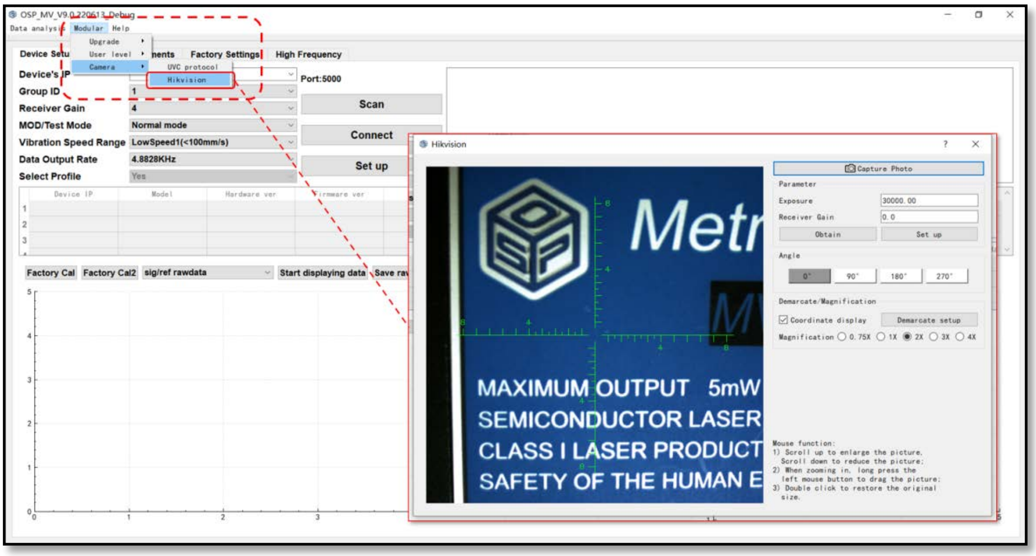
3.1 Ethernet connection and TCP/IP setting：

VibroView-200 uses below Ethnernet setting.

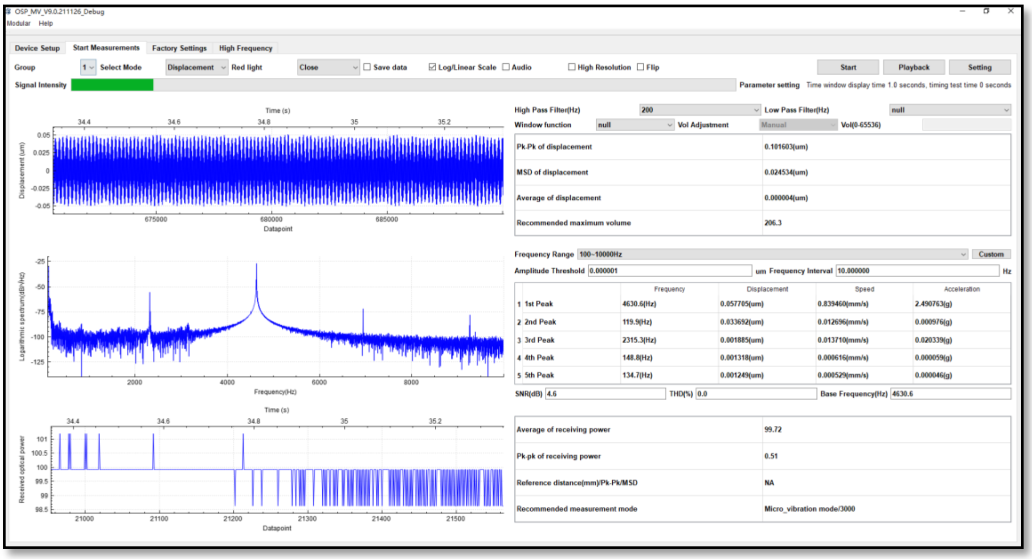
- Support 100Mb/s Ethernet interface
- Support DHCP
- Default IP address:　192.168.1.2
- Communication port：5000

3.2 GUI quick introduction

Unless there is an special request from the customer, OmniSensing Photonics will offer a common testing GUI to all customers.　This testing GUI is an modified SW based on a standard MV-H series laser vibrometer testing GUI. Figure 6(a) shows how the digital microscope function is enabled through the menu, where some basic measurement can be performed though this functional window.



(a)



(b)

Fig. 6: VibroView-200 testing GUI

Figure 6(b) shows the vibration testing page of VibroView-200 system, which is basically the same as a standard MV-H series laser vibrometer.

Appendix: Operation of VibroView-200 Testing GUI

Below is the installation and operation procedure for the standard application software GUI:

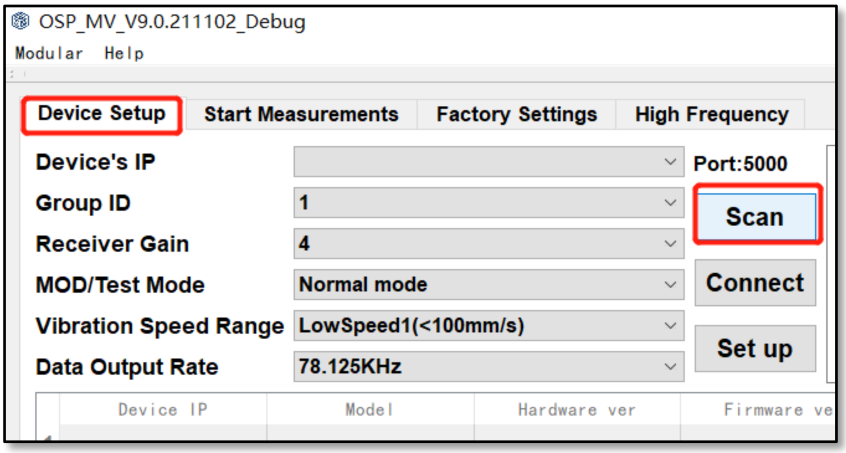
Step 1:Initial steps

1) Turn on the system, and click to open the GUI program on PC

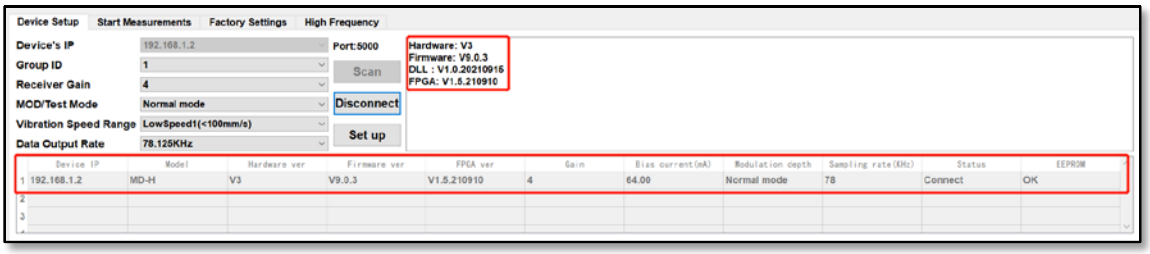
.

Step 2: Connect

On the **"Device Setup"** Page, click the **"Scan"** button and get the IP address.

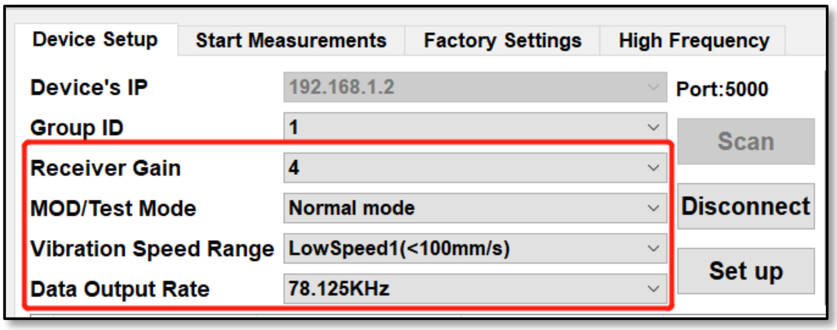


When get the IP address, click the **"Connect"** button, the hardware parameters will be displayed.

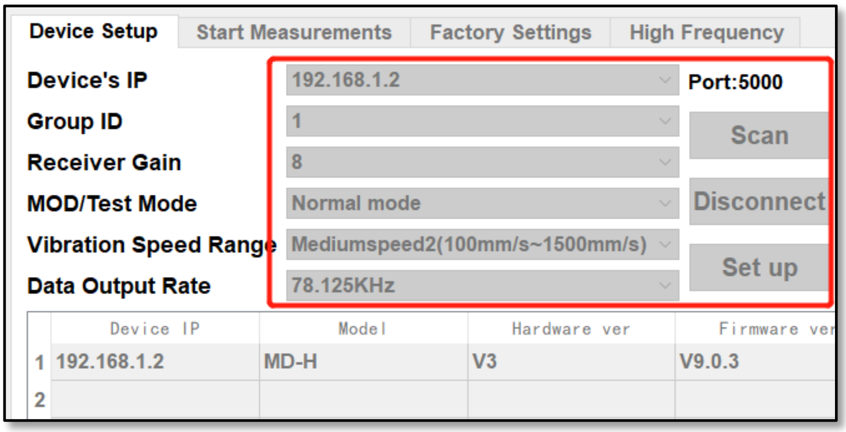


Step 3: Select the basic parameters and click "Set up"

Retain the default Settings: Gian, Test Mode, Vibration Speed Range, Data Output Rate, click the "Set up" button

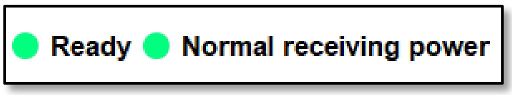


After Set up, the buttons/parameters will change to gray.

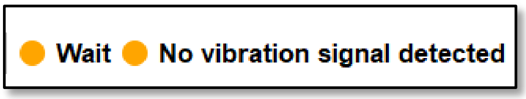


Step 4: Adjust exposure parameters

1) Before the test, the receiving signal strength/condition should meet certain exposure state:



- Exposure fine

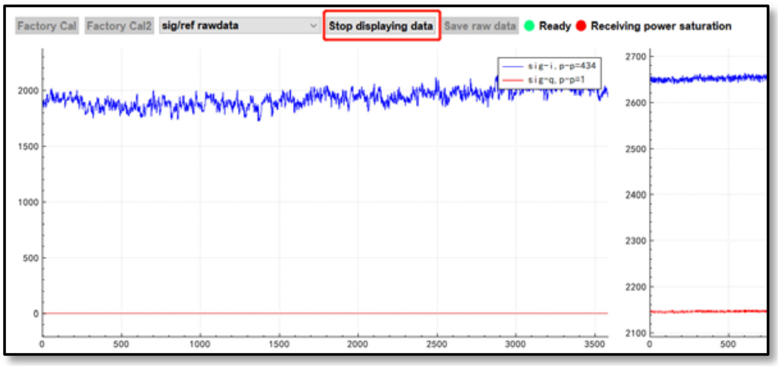


- Underexpose

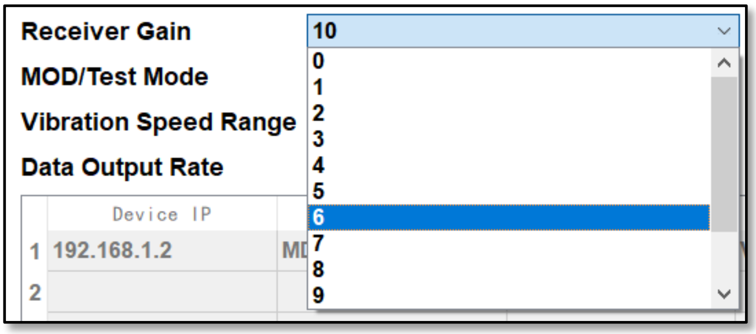
- Overexposure

2) To adjust the exposure state

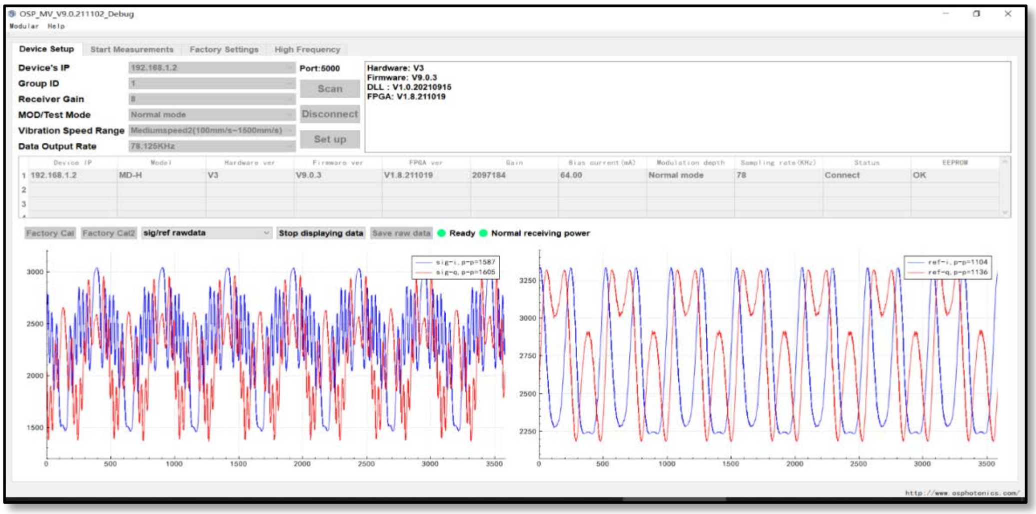
- When the exposure state is not fine (underexpose or overexposure), **click the “Stop displaying data”** button.



- Repeat step 3, select the suitable value from “0” to “12”



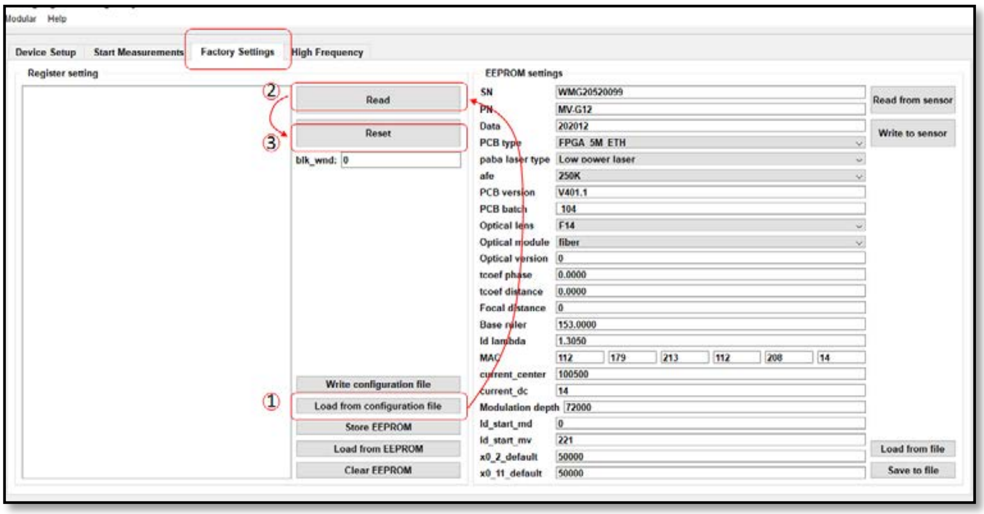
- Repeat step 4, until the exposure fine.



Exposure ready

- When ready, **click the “Stop displaying data”** button. Setting finished.

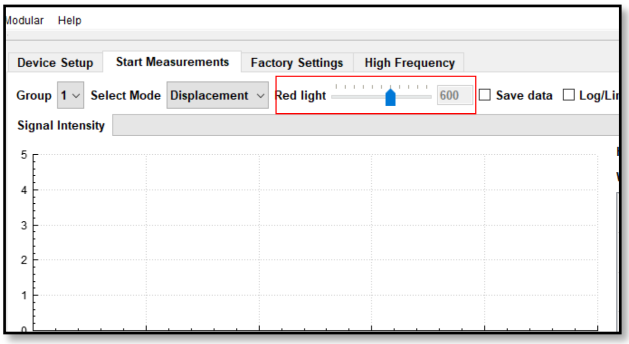
<u>Step 5: Loading configuration file if provided</u>



Turn to the “Factory Setting” page, following the 3 steps showing on the figure to load in the **.rcf** file provided. Then switch back to “Start Measurement” page to do the testing.

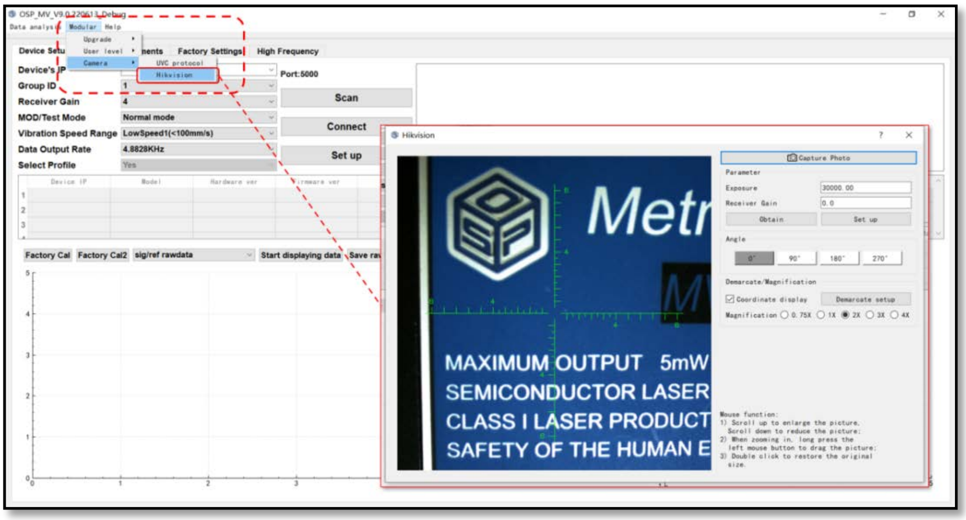
Step 6: Turn on the visible Red Light on “Start Measurement” page

Turn on the “Red light” by sliding the current setting nub to the proper value, maybe around 600.



Step 7: Enable the digital microscope functional window

Following the below instructions to enable the digital microscope functional window



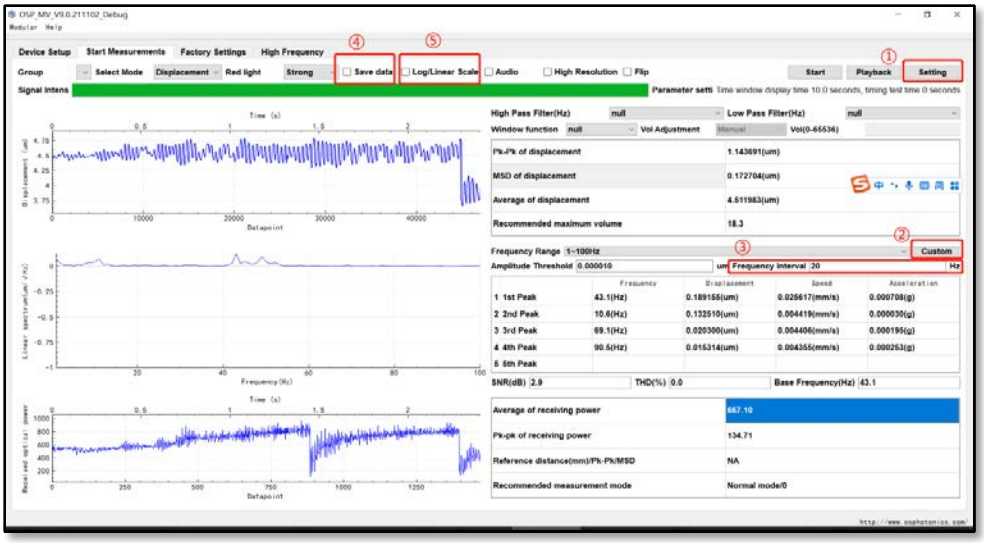
<u>Step 8: Position adjustment through the digital microscope</u>

1) Adjust the optics zoom selection on the front of the VibroView-200 system, i.e. 2X
2) Select the same optics zoom option on the digital microscope function window
3) While looking at the "live" image dispayed by the digital microscope, adjust the Z direction nub to get the most clear picture, so does the Red light spot, which indicating the testing laser spot location.
4) Adjust the X/Y stage, to move the DUT to the right location
5) Adjust the Z direction when needed.

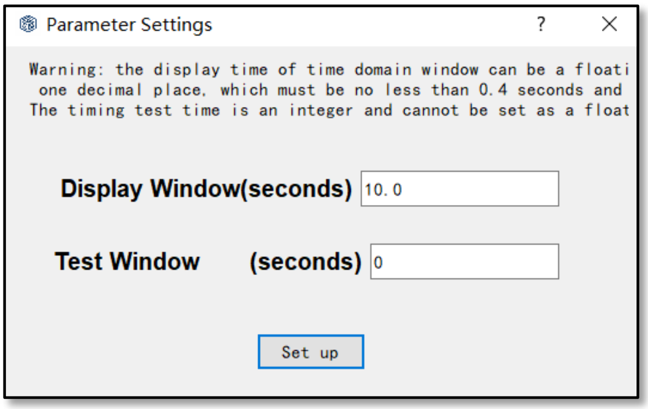
<u>Step 9: Doing the vibration testing</u>

Switch to the **"Start Measurements"** page.

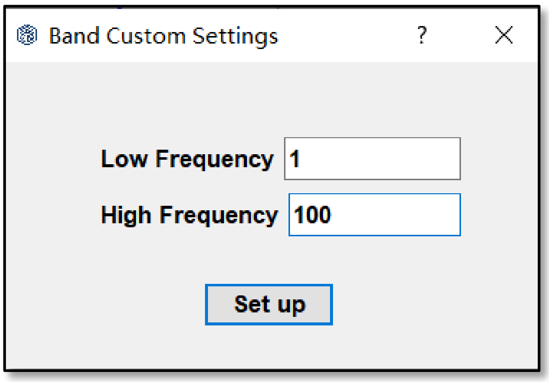
1) Setting measurement Parameters



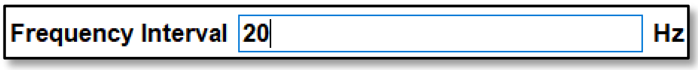
(1) Set display windows



(2) Set **frequency range** customized(1-100Hz)



(3) Set **frequency interval** (20Hz)



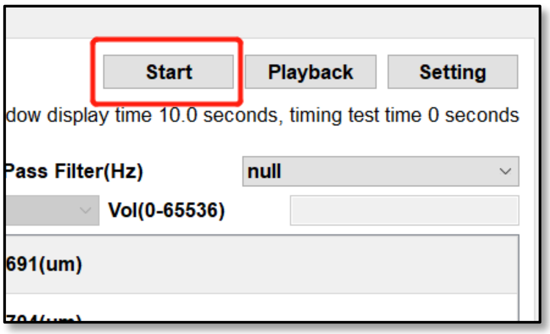
(4) Choose **Save data** or not

(5) Choose **Log or linear scale**

(6) Other settings: default

2) Start measurement

(1) Press "Start" button to start. We can see real-time data in the Windows.



(2) Windows

① Time domain graph; ② Frequency domain graph; ③ Optical power chart;
④ ⑤ ⑥ Analysis parameter table

Step 10: Store(Save) the data when needed

Details to be added.