



# RAMaker

Multi-functional Micro Raman Spectroscopy

# MRID

Auto Polarized Image - Switch Lasers Micro Raman Spectroscopy



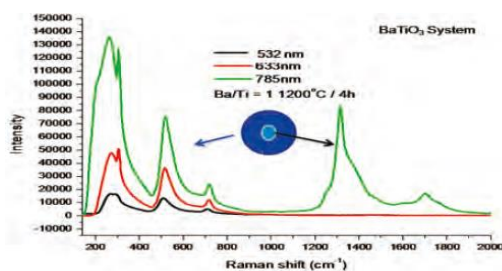
# RAMaker Spectrometer

RAMaker is a professional Raman / PL system which allows multiple excitation wavelengths on a wide range of laser selection. Maximum of 3 lasers can be built-in inside the chamber, available wavelengths are: 355, 375, 405, 473, 488, 532, 633, 785 and 830 nm. UV or NIR sources such as 248, 266 and 325 nm can be mounted externally as well. It has gained Taiwan invention Patent (I709732) and USA invention Patent (US 11,340,114 B2), parallel optical design remains system qualitative without calibration, each laser wavelength is completely fixed and optimized, the optimized Rayleigh filter is automatically switched by the software for wavelength correction and measurement. The switching of different wavelengths is controlled by the software to achieve the purpose of fully automatic micro-Raman switching light source without any manual adjustment.



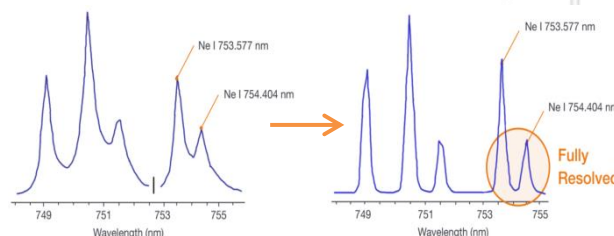
## Automatic measuring system of new design

New patent design for visible light source automatically measuring, software controls the switching of laser, stable optical system, convenient to do sample co-location measurement by using different laser lights.



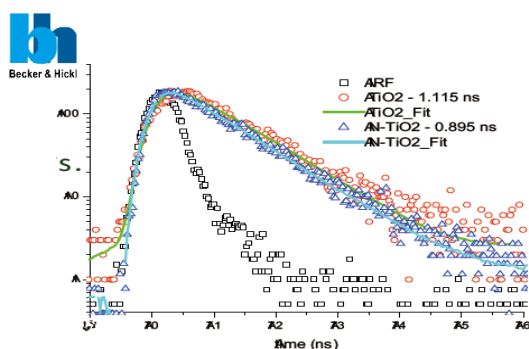
## Novel confocal design

Novel confocal design including two sets of confocal apertures could precisely focus to obtain the best signal. The slit is controlled by software and continuously adjusted from 10μm to 2500 μm and 0.8~8 mm. The confocal aperture can be 10~1000 mm, which can increase the signal resolution by more than 30%.



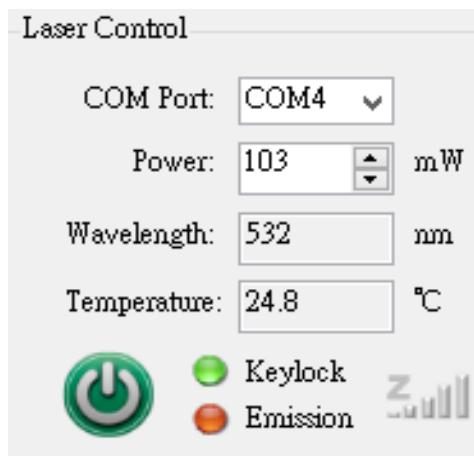
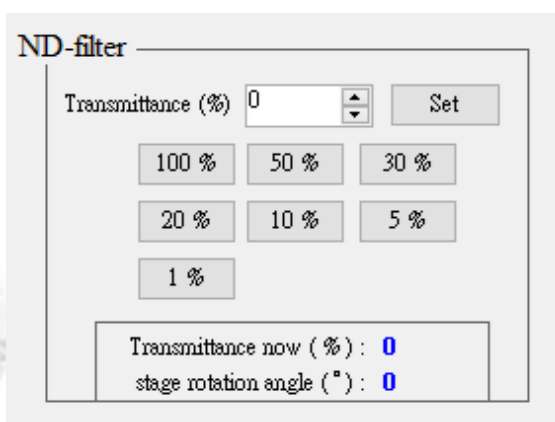
## Micro Fluorescence Lifetime

- Becker & Hickl kit
- Measurement life time: 200 ps ~ 500 ns or 500 ns ~ 1 s.
- PMT detector range: 300~800 nm
- NIR detector range: 650~ 1700 nm
- Picosecond pulse laser: 375, 405, 440, 473, 488 and 640 nm
- FLIM (Fluorescence-Lifetime Imaging Microscopy)



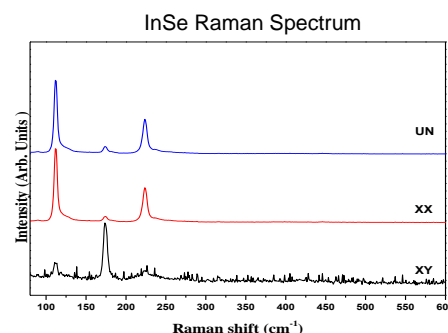
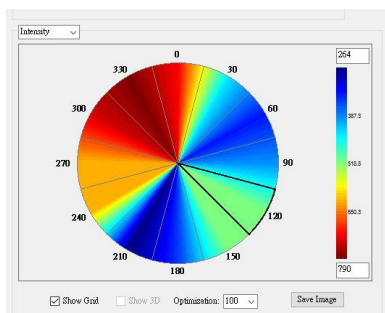
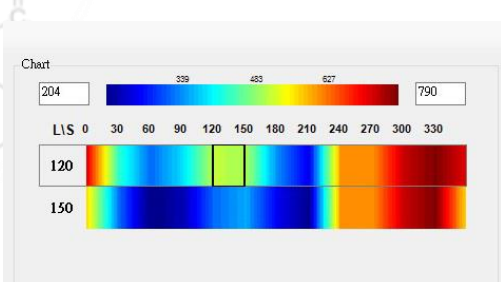
## The power of laser output error less 1%

Laser power output could be directly controlled by software, at 1 mW/step for RGB Lasersystems, one of the major laser brands used in MRID. In addition, system can accurately control the laser power error less 1% because of built-in calibration for different laser light source.



## Multi-angle automatic polarized images scanning function

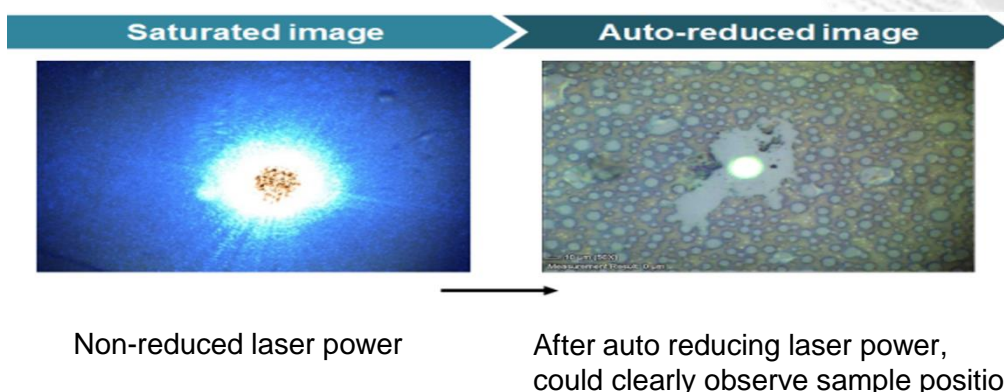
RPRM (Raman Polarization Rotating Mapping) for samples with high crystallinity or thin films, when it is necessary to measure the difference of polarized Raman, the software can automatically search for the laser and the angle of the light-receiving signal; another, the software can automatically find the laser with the best signal or the setting of zero signal angle, which is convenient for researchers to observe the lattice arrangement.



## Auto switching of Scan/View

The micro-Raman system uses a 5-megapixel CCD and a 5-watt LED light source as the sample image observation module, when observing samples, the laser power is reduced to lower than 0.01% so as to keep the balance between laser light and observed white light brightness. Then it can clearly observe the position of laser and precise surface focusing.

Switch between SCAN and VIEW modes is automatically completed by software without manual switch, avoiding shifting the sample from vibration.



# MRID Spectrometer

**MRID (Micro Raman Identification Dual Lasers)**

**MRID** is a microscopic Raman system inbuilt with two lasers automatically switchable by software. This design is granted a Taiwan invention patent I709732 and USA invention patent US 11,340,114 B2. It solves the trouble of optimizing the optical path each time a different laser wavelength is used, and in turn provides a highly reliable optical system that users without optical backgrounds could also handle with ease.

A third laser module or more could be integrated into MRID system thanks to its horizontal interlace design for the optical path. With two of the lasers built in and fixed, the additional laser module(s) connected via optical fiber are swappable and configurable by the users, facilitating a wider range of applications.(customization)



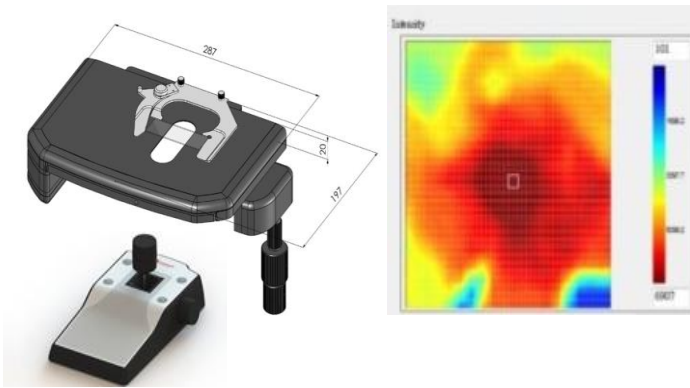
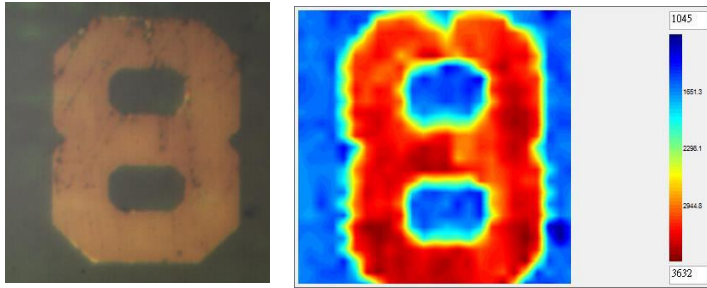
## Dual-Wavelength Acquisition

One click to automatically measure the spectra excited by different wavelengths is another PTT proprietary feature. The two spectra acquired automatically below show at  $520\text{ cm}^{-1}$  as well as NIR range the silicon chip behaves differently under 785-nm and under 532-nm lasers. This feature could also acquire both Raman and Photoluminescence signals respectively and automatically from the same excitation source.



## Raman Mapping(Optional)

- 75 X 50 mm or 100 X 100 mm
- XY minimum step size 0.01  $\mu\text{m}$ , reproducibility +/-0.02  $\mu\text{m}$
- Z minimum step size 0.002  $\mu\text{m}$
- $\Delta$  Raman Shift
- With operating joystick; operating software and video software.
- Containing automatic regression correction function
- Auto focusing samples, good image quality



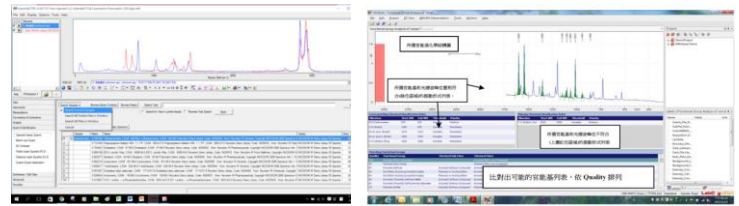
## 4-Point Probe / Temperature Control (Optional)

- Vacuum temperature control : -196 ~ 350/600 $^{\circ}\text{C}$
- Heating stage : up to 1500 $^{\circ}\text{C}$
- Four-point probe measurements
- 4K stage



## Two choice for comparison software

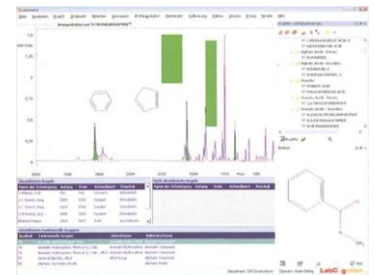
- Inbuilt Raman spectrum folder and search comparison
- Functional group search comparison



## Raman database



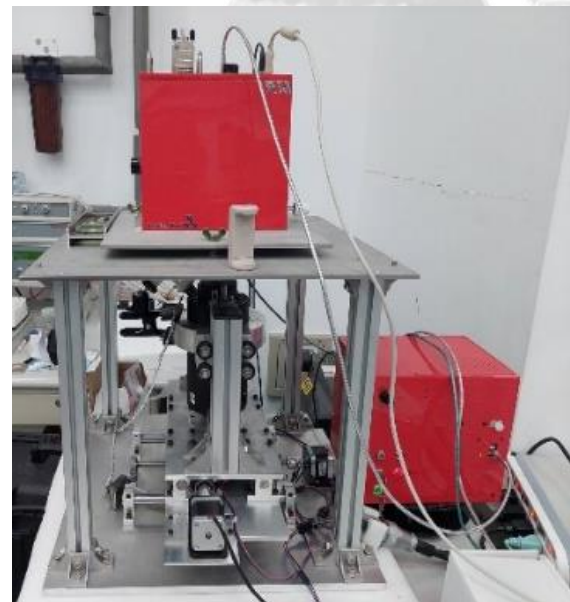
- Raman standard database
- AIST certification
- Raman, IR graphic library



## STM TERS (Upgrade, Taiwan only )

The MRI/MRID system combines STM to form a certain range of resonance area at the tip to enhance the Raman signal, which is called TERS (Tip Enhanced Resonance Raman Scattering).

This resonance area is generally called a hot zone. In this area, the nanometers characteristic of STM, hope use it to achieve Raman signal difference of a tens-of-nanometer resolution.



## Laser module

- Commonly used laser light sources all have no peak sidebands.
- 325 nm Helium Cadmium Laser, 25 mW, TEM00 M2 < 1.2. Power software continuous adjustment, the error is less than 1%.
- 325 nm laser filter: use two-stage Edge Rayleigh filter, spectral range 100 cm<sup>-1</sup> ~ 11000 cm<sup>-1</sup>, reflectivity ≥ 95%, transmittance ≥ 80%.
- 532 nm laser, 100 mW, TEM00 M2 < 1.2. The software power is continuously adjusted, and the laser power can be controlled by the software. The minimum step size of the software-controlled and continuously adjusted laser power is 0.1 mW, power software continuous adjustment, the error is less than 1%.
- 532 nm laser filter: use two-stage Edge Rayleigh filter, spectral range 50 cm<sup>-1</sup> ~ 8000 cm<sup>-1</sup>, reflectivity ≥ 95%, transmittance ≥ 80%.
- 633 nm laser, 40 mW, TEM00 M2 < 1.2. Software power continuous adjustment.
- Software control laser power, its continuously adjustable minimum step size is 0.1 mW, power software continuous adjustment, the error is less than 1%.
- 633 nm laser filter: use two-stage Edge Rayleigh filter, spectral range 50 cm<sup>-1</sup> ~ 6000 cm<sup>-1</sup>, reflectivity ≥ 95%, transmittance ≥ 80%.
- 785 nm laser, 250 mW, TEM00 M2 < 1.2. Power software continuous adjustment, the error is less than 1%.
- The laser power can be controlled by software, and the minimum step size of the software-controlled and continuously adjusted laser power is 0.1 mW.

## Reference Specifications

- RAMaker: Can internally equip with 3 lasers and add 3 additional lasers. High-efficiency Edge filter set can be customized. Raman shift can start from 10 cm<sup>-1</sup>; TE cooled CCD -50°C ~ 100°C, Active pixels : 1024X255/1650X200/2000X256 pixels, the best resolution can reach 0.3 cm<sup>-1</sup>.
- MRID system is inbuilt with two lasers of your selected wavelengths at 375, 405, 473, 532, 633, 785, 808 and 830 nm based on your needs for either Raman or Photoluminescence spectroscopy. The adopted micro design lasers are made by highly reliable RGB Lasersystems.
- Spectral range is customizable. With the use of high performance edge filter cut off at 50 cm<sup>-1</sup> according wavelength and sample, normal range for standard 532 nm is 79 ~ 3500 cm<sup>-1</sup> / resolution 1.8 cm<sup>-1</sup> or 79 ~ 2100 cm<sup>-1</sup> / resolution 1.3 cm<sup>-1</sup>. Such as sulfur, the 85 cm<sup>-1</sup> signal can be measured. The range of 785 nm is: 150~3500 cm<sup>-1</sup> / resolution 1.8 cm<sup>-1</sup>. Others depend on the laser wavelength.
- The most commonly seen 532 nm laser beam size is approx. 2~3 μm on the sample surface through a 100X objective lens. Available objective lenses include 10X, 40X, 50X, 100X, etc.



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