

# GemmoRaman532 VS GemmoRaman532SG

## Introduction

One of the most frequently asked question we receive from our clients is to explain the difference between the standard model of the GemmoRaman and the Scientific Version (SG). In this brief description we will present the most crucial features in order to let the client decide which unit is the best suitable for his job.



## Overview

Both instruments share the same main unit which includes the laser, optics, electronics and sampling enclosure. In the standard version the spectrometer is embedded inside the unit making it more portable. In the SG-version the spectrometer is separate from the unit and connected to it by a stainless steel jacketed fiber optic and a I/O cable. The standard version needs for one power supply only while the SG have another one for the spectrometer.

## Laser and optics

The laser unit and internal Raman optics are the same in both units.

## Spectrometers

This is the major difference between the 2 instruments. The standard version is equipped with a custom setup based on the Ocean Insight FLAME geometry, while the SG owes its performances to the Ocean Optics QEPro TEC-cooled spectrometer.



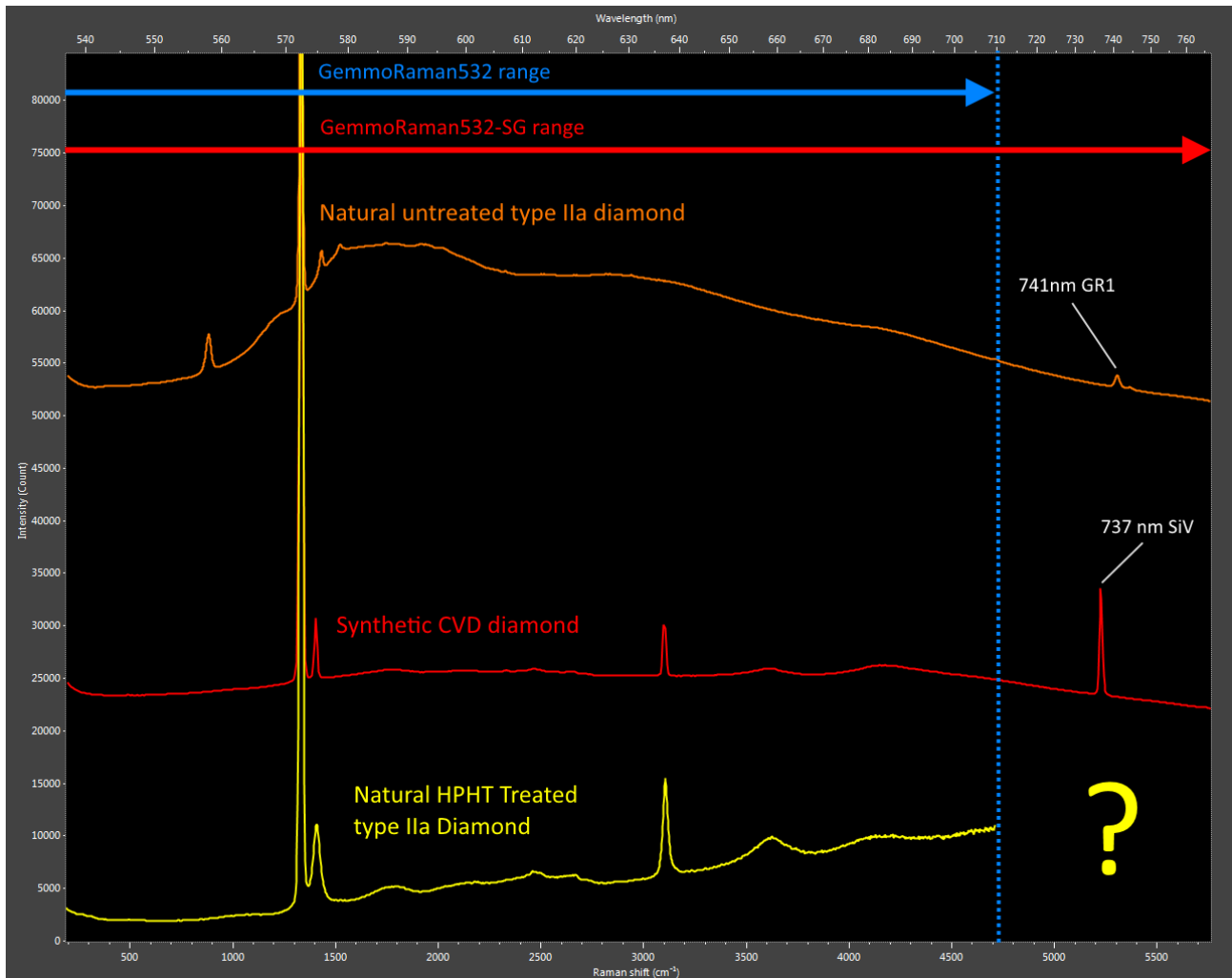
## Performance

Coming to the core of the issue, there are two important features that explain in full the difference between the units; Wavelength range and signal-to-noise ratio.

## Wavelength Range

Sharing the same laser, both instruments wavelength start at the same position (even if the SG gets a bit closer to the laser emission). The important improvement of the SG is more about the range limit towards higher wavelengths. This feature is not actually essential for Raman applications since the “fingerprint” area where most of the Raman scattering exists ends approximately at  $1600\text{ cm}^{-1}$ . The real benefit coming from this extended range is more about photoluminescence applications. As it clearly appears from the image, the approx. more  $1050\text{ cm}^{-1}$  available by the SG (roughly 55nm, speaking of photoluminescence values) are somehow vital nowadays for diamond applications.

Two very important features for diamond applications are in fact included in this range: the 741nm GR1 typical of untreated Type IIa and of some irradiated diamonds and the 737nm (a doublet) peak caused by silicon impurities (SiV- defects) in the crystal lattice, diagnostic for colorless CVD synthetic diamonds.



## Signal-to-noise ratio

The Ocean Insight QEPro spectrometer used in SG-model, features a Thermoelectric Cooling system (TEC) which keeps the temperature of the CCD below of  $-20^{\circ}\text{C}$ . This dramatically reduces the background noise to 0.5 counts for 1 second exposure time. If we compare this value to the more than 200000 counts provided by the 18-bit A/D-conversion, we have a virtually noiseless spectrum. This feature can sometimes be important for getting distinct Raman fingerprint when dealing with gems displaying huge photoluminescence bands. Of course, the standard version spectrometer - in most cases - gets similar results, but the exposure time is usually prolonged 5 times or more.

## Conclusion

This brief explanation doesn't cover all the aspects and differences between the two models. For more detailed info, please refer to the related pages in the product section of the GemmoRaman website. Basically the SG version has been developed with specific diamond applications in mind. Despite it could be a real asset even in testing colored stones, there is not a real reason to face the almost double price and purchase the SG for people who deal in colored stones only.

MAGI would like to give a BIG thank you to Peters Brangulis, Head of the Latvia National Assay Office, whose help has been fundamental for the development of the GemmoRaman532-SG

## Main features comparison

### GemmoRaman532

- ✓ weight: 4.0 kg (8.8 lbs)
- ✓ High quality Ocean insight OEM spectrometer embedded
- ✓ 16 bit A/D resolution (65,535 counts)
- ✓ Range:  $\sim 225\text{-}4700\text{ cm}^{-1}$
- ✓ Resolution:  $11\text{ cm}^{-1}$  FWHM
- ✓ Signal-to-noise Ratio: 250:1
- ✓ Automatic exposure time from 1ms to 12 seconds

### GemmoRaman532-SG

- ✓ weight: 6.0 (13.5 lbs)kg
- ✓ Highest quality external Ocean insight QEPro spectrometer
- ✓ 18 bit A/D resolution ( $>200,000$  counts)
- ✓ Range:  $\sim 170\text{-}5700\text{ cm}^{-1}$  (up to 765nm)
- ✓ Resolution:  $11\text{ cm}^{-1}$  FWHM
- ✓ Signal-to-noise Ratio: 1000:1 (typical)
- ✓ Automatic exposure time from 8 ms to 3 seconds