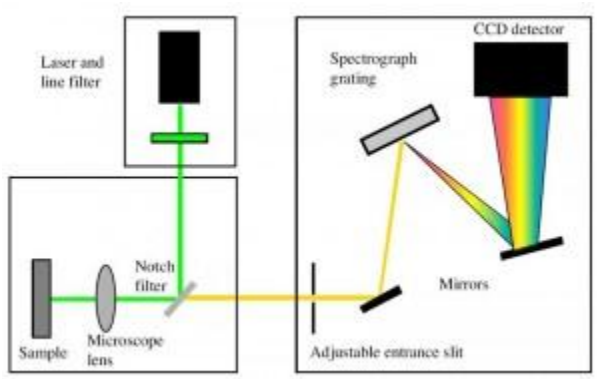
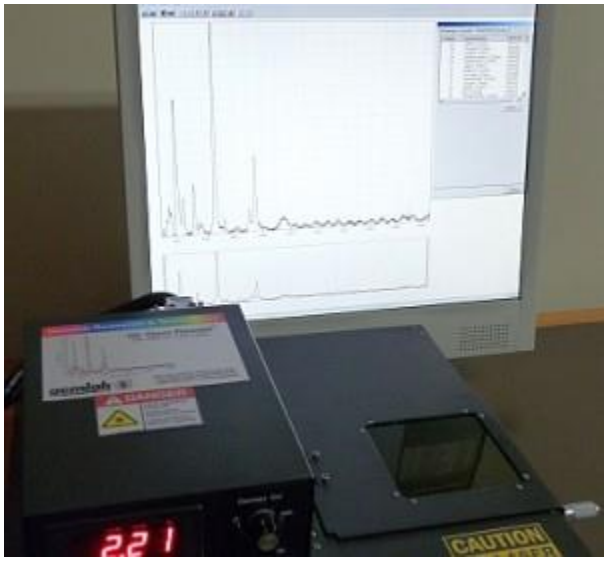
GL Gem Raman



System layout of the GL Gem Raman



GL Gem Raman with database

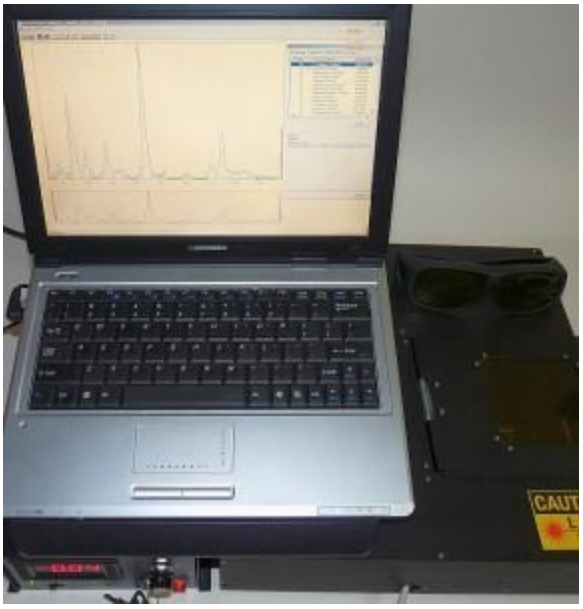
The GL Gem Raman™ is an advanced gem testing instrument for experienced gemmologists, gem dealers, mineral collectors and others; it is also an excellent educational tool

The GL Gem Raman quickly can tell the difference between diamond, cubic zirconia, glass and zircon, distinguish jadeite from nephrite, separate real from faux pearls, tell whether it is ivory or plastic. There is great potential for detecting treatments and colour enhancements in gemstones; it will help in the determination of the nature of diamonds, gemstones and minerals.

The GL Gem Raman software allows real-time spectral acquisition; it can be used to operate both the GL Gem Spectrometer and the GL Gem Raman making them a powerful combo unit for advanced gemstone and mineral identification. It can replace other advanced spectrometer types such as NIR256-2.5 near-infrared spectrometers, FTIR (Fourier transform spectroscopy) spectrometers and temperature regulated Raman units.

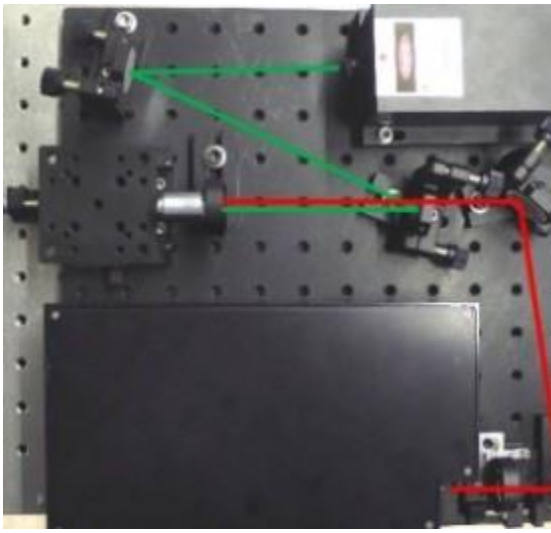
The spectra can be saved and imported into a searchable database program with over 3,000 references; the database is linked to the large on-line mineralogical RUFF database for Raman spectra.

GL Gem Raman users will also have access to the C.I.G. (Canadian Institute of Gemmology) gem reference library which is being compiled from its large gem study collection. Other reference databases can be consulted on-line.



GL Gem Raman with laptop computer

Sample Stage



GL Gem Raman without case (13x13x3" o
33x33x7.6 cm optical board)

Specifications:

- Range: 200 – 2,600 cm-1 Resolution: ~3cm-1
- Spot size: 10 – 15 micron at 20x magnification
- Laser: confocal, 532nm regulated from 100mW to 300mW, Class 3B
- Fully secured system with sampling stage covered by observation lid.
- Size: 33 x 33 x 7.6 cm (13 x 13 x 3″)
- Weight approximately 5 kg (11 lbs)
- Operational system: Windows XP/Vista/Windows 7 32/64 bit, Mac and Linux (in Windows emulation of virtual machine)
- Power supply : 110 – 240 Volts (for laser) and USB connection to computer.

The GL Gem Raman is an ideal addition to the GL Gem Spectrometer which has over 100 users world-wide. It is now available for clients who are familiar with the operation of a Raman unit and calibration procedures (must be conducted with safety goggles). The purchase price includes the GLGemRaman software and the interface to search a database of over 3,000 references compiled and linked to the on-line RUFF database.

A 2 1/2 hour preparation workshop (TBA) to learn the proper operation ot the Raman is recommended for experienced gemmologists, mineral collectors and other users. Testing procedures can be done without safety goggles; however, the user will assume complete liability as to any consequences if the unit is not operated in compliance with instructions provided.

The export of a Raman spectrometer to certain countries may require an official safety certificate. Sales to EU countries as an OEM product is possible as the end user is responsible for safety issues; contact us for further information.

Our Warranty and Commitment

We will repair and replace your GL Gem Raman if necessary due to defective parts, etc during the first 6 months unless other consumer protection regulations exist in your country. We also offer free firmware/CCD upgrades within 12 months if shipped to us at your cost and risk and we will return the unit to you at no cost. After 12 months a processing fee of $ 495 will be charged which covers any firmware update, re-alignment and recalibration, etc. and return shipping charges; other repair services upon request. Software updates are always free.

The GL Gem Raman is a powerful testing tool for gemmologists, mineralogists, jewellery appraisers and collectors.

Here a few comments about the advantages (and disadvantages) of a Raman over other advanced gem testing instruments such as FTIR, UV-VIS-NIR spectrometer, etc:

1. The GL Gem Raman is built to highest operator safety through fully enclosed and screened optics; see diagram for the optical design of the back-scattering geometry. To achieve highest signal strength no fiber optical connections are being used.

2. We have chosen a 300 mW 532nm laser as excitation source as commercial units are now available at economical prices. These devices use diode lasers to "pump" a Nd-YAG laser which operates at 1064 nm. The light in this laser is frequency-doubled to give green 532 nm light outpu. This wavelength is about optimum for both Raman efficiency and the detector operating range. The Raman spectral range is from 200 – 2,500 cm-1 and output under 300 mW is usually sufficient and safe for the sample.

3. Raman CCD detectors have problems with fluorescence which in some cases "overwhelms" the signal; for example synthetic flame fusion rubies have very strong fluorescence. For those gem materials other testing instruments such as the GL Gem Spectrometer has to be used.

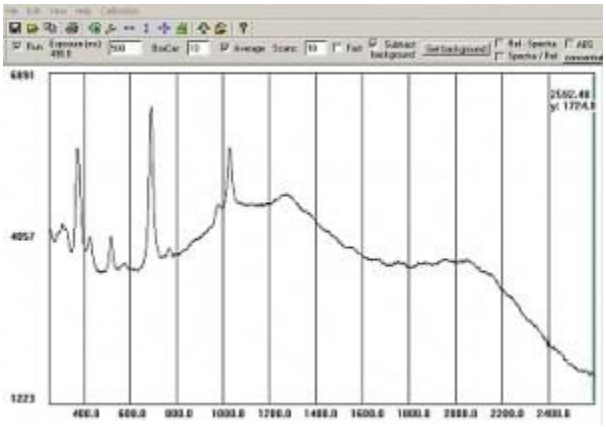
3. Raman spectroscopy is scattering-based, not transmission/reflection; i.e. no need for sample preparation. Only a small sample area is required; there are no movable optical parts and maintenance is minimal.

4. The GL Gem Raman has a sample compartment big enough to accommodate larger specimen and single pieces of jewellery.

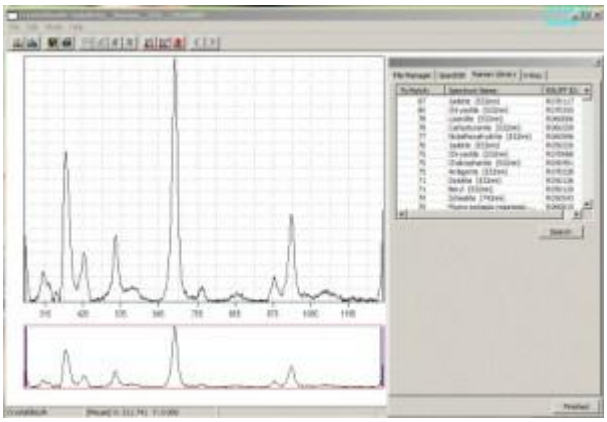
Information about Raman and databases

- How to obtain a spectrum with the GL Gem Raman – (video, no sound – window will pop up), green untreated jadeite
- How to match the Raman spectrum in the database – (video, no sound – window will pop up)
- Abstract submission to Geo-Raman in Nancy, France (June 11 – 13): The GL Gem Raman – a poweful tool in gem and mineral identification (PDF)
- Download preliminary GL Gem Raman info sheet (PDF)

- Here a very good teaching module "Raman Spectroscopy" by the University of Cambridge.
- Read about an interesting project on Raman Spectroscopy and the Analysis of Gemstones.
- **Jasinevicius, R.** (2009) *Characterization of vibrational and electronic features in the Raman spectra of gemstones (PDF)* (MS thesis, unpublished).
- Large reference databases are available on-line such as at the RRUFF Project
- GIA Gem Project with over 200 gems from the Guebelin collection analyzed and Raman data recorded



Raman spectrum recorded with the GLGemRaman



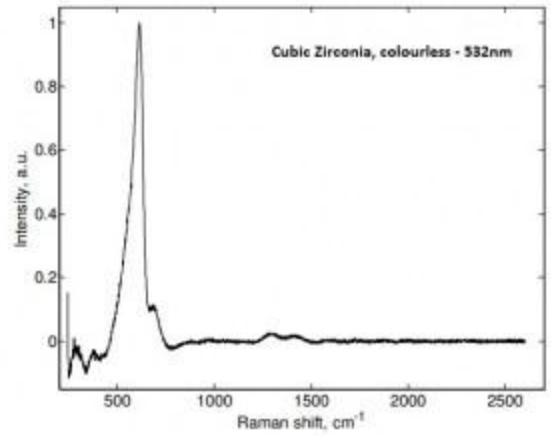
After importing the raw spectrum into CrystalSleuth and searching the RUFF database a match for jadeite was found.

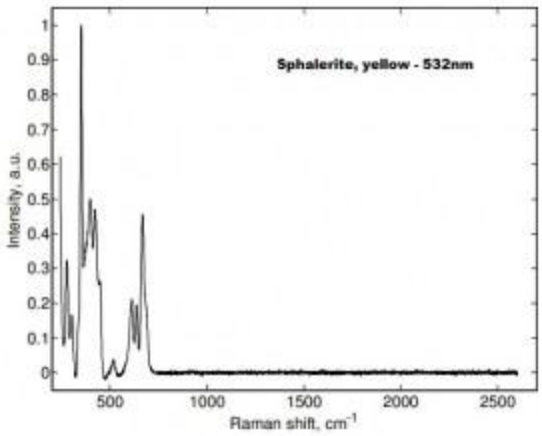
GL R&T together with GL Gem Raman users will build a reference database for the 532nm excitation laser used in the instrument.

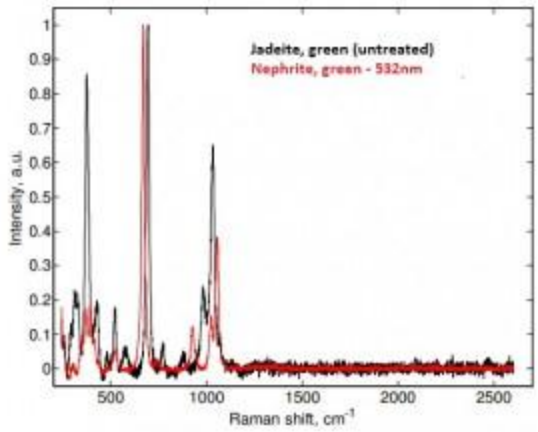
Spectral measurements with the GL Gem Raman are usually done using a focused beam on the table facet of the gemstone (unless otherwise noted); in some cases laser intensity had to be adjusted to avoid "overwhelming" of the Raman signal (detector saturation) caused by sample fluorescence.

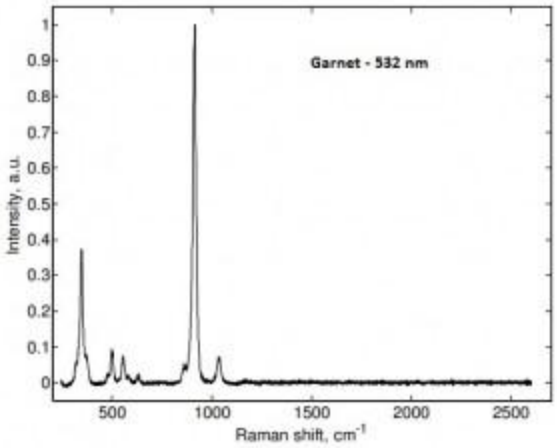
Wolf Kuehn, B.A., M.A., Dipl.oec, F.G.A., F.G.G. – GLR&T Project Manager

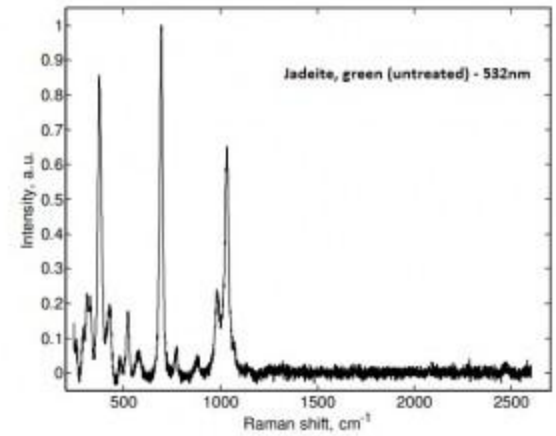
Here a few samples of Raman spectra obtained with the GL Gem Raman spectrometer; more spectra here.

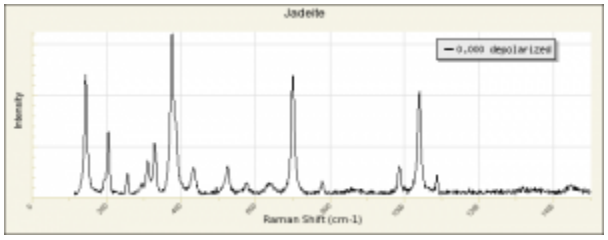












From RUFF Project