SSEF instruments the science of gemstone testing®

SCHWEIZERISCHES GEMMOLOGISCHES INSTITUT
SWISS GEMMOLOGICAL INSTITUTE
INSTITUT SUISSE DE GEMMOLOGIE

# portable UV-Vis spectrometer

## for gemstone analysis:

☑ **absorption**

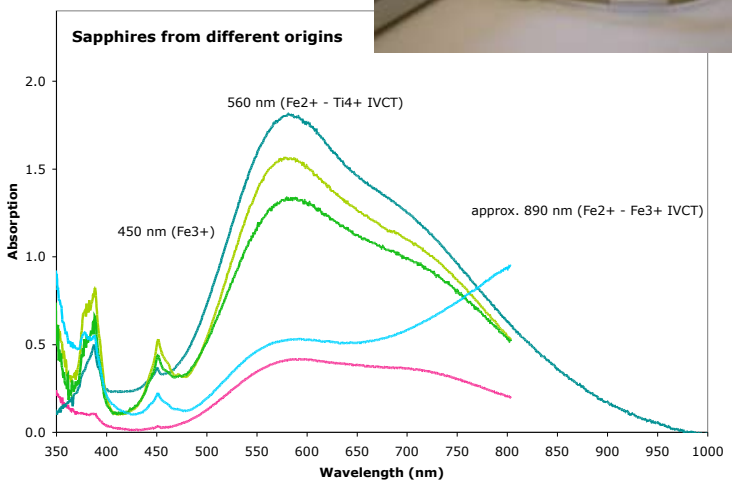
☑ **transmission**

☑ **luminescence**


Developed by the Physics Department of the University Basel and the SSEF Swiss Gemmological Institute.

**main features:**

- Very light and highly sensitive spectrometer
- Large spectral range (290 - 1100 nm)
- Very fast scanning time for a spectrum (few seconds)
- Easy sample handling
- Plug-and-play with USB 2.0 in your PC or laptop
- Large spectral database of gemstones included (spectroPro)
- AvasoftBasic program included
- Protected in safety box
- **Truly portable!** All components fit in a “shoe-box”



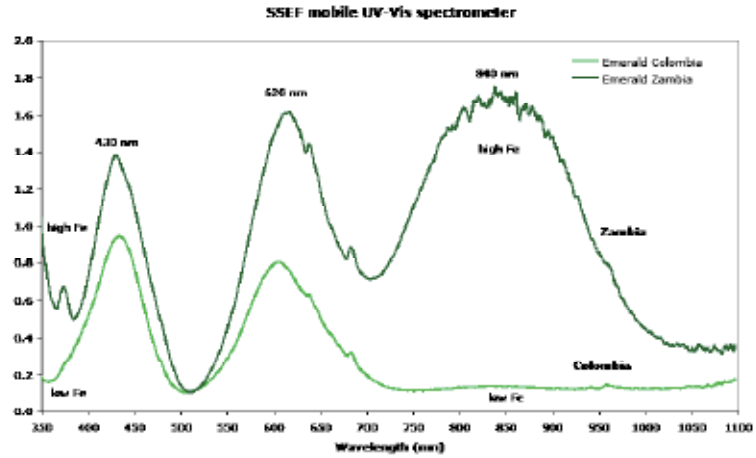
## Absorption and transmission spectrometry:

- UV transparent light diffuser for ensures the best sample illumination
- Visible (halogen) and UV light (LEDs) can be switched on/off seperately
- A number of plastic rings as sample holder to prevent stray light
- UV solarization resistant fiber
- Adjustable signal/noise ratio of spectra (smoothing, averaging)
- Red warning light when bulb is broken
- Tools included for a easy bulb replacement
- Step-by-step manual how to use the instrument

Usually, recording a sample spectrum takes about 1 - 20 seconds.

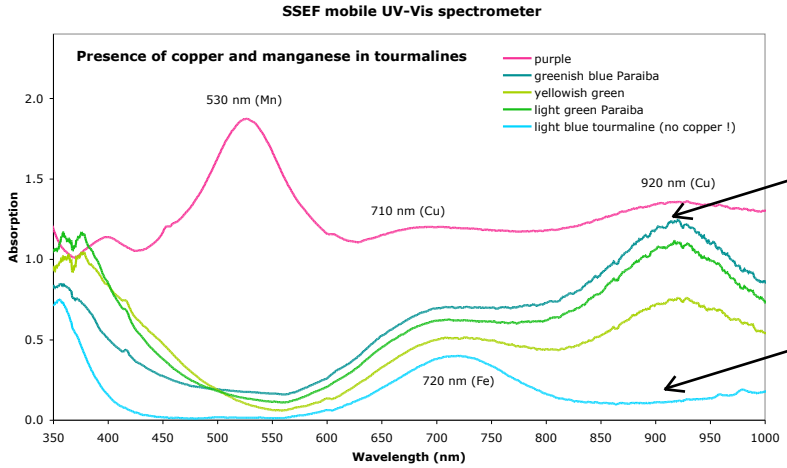
## How can you use it for gemstone analysis?

- Detection of copper in blue tourmaline (Paraiba-type or not?)
- Distinguish Fe-bearing rubies from Fe-free rubies (e.g. from Burma)
- Distinguish Fe-bearing emeralds from Fe-free emeralds (e.g. from Colombia)
- Detection of green dye in jadeite
- Detection of chromium in green jadeite
- Indication of origin of sapphires
- Diamond spectrum (e.g. Cape Ia diamonds...)
- etc...




**high iron**
in emerald
from Zambia
(East-Africa)

**low iron**
in emerald from Colombia




**copper**
in Paraiba-type
blue tourmalines !

**no copper** in
light blue tourmaline !

## Luminescence spectrometry:

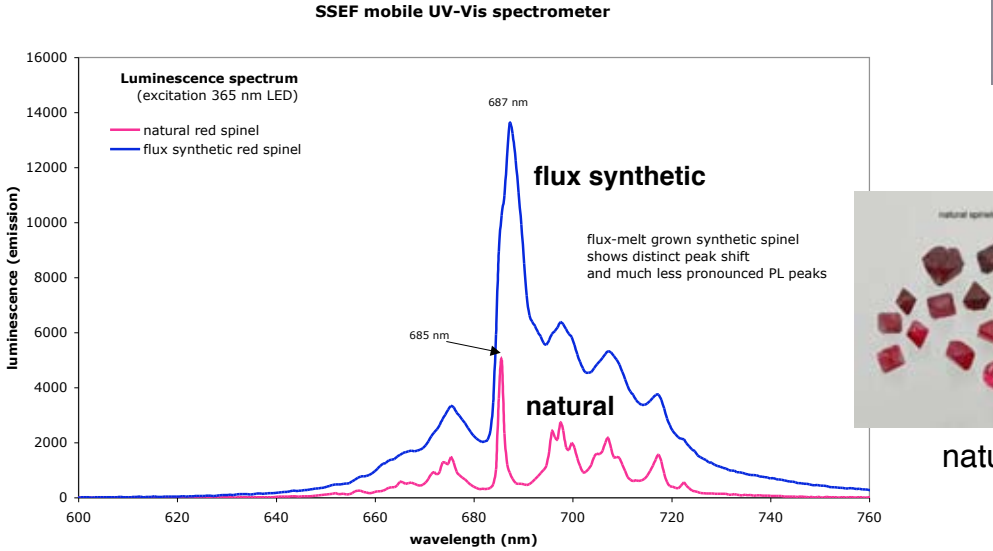
- Metal ring with three monochromatic UV-LEDs (365 nm)
- Dark background subtracted from signal to increase signal/noise ratio

Usually, recording a luminescence spectrum takes about 1 - 100 seconds, depending on the strength of the signal.

## How can you use it for gemstone analysis?

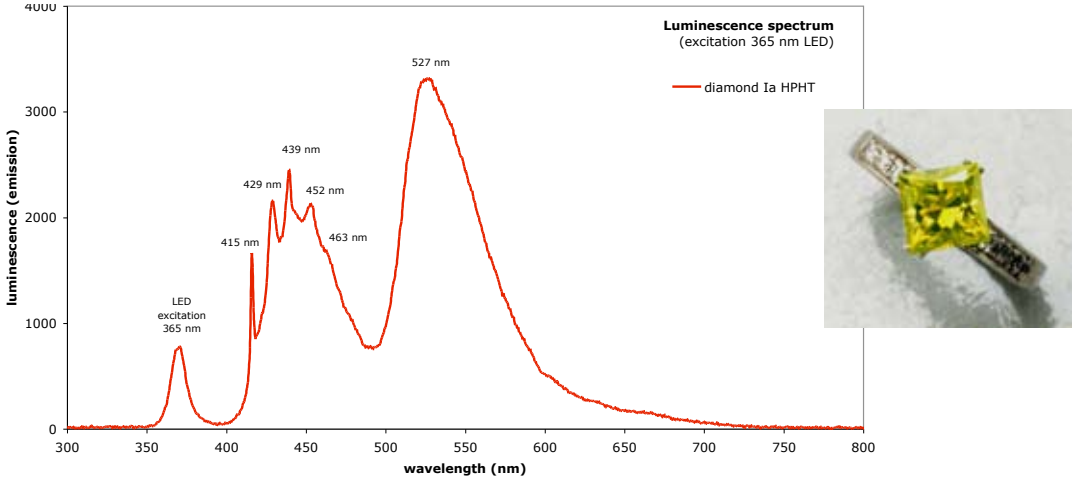
- Distinguish natural and flux synthetic red spinel
- Analyse diamond luminescence
- Analyse fluorescent fissure fillings, e.g. polymer treated jadeite (B-Jade)
- Register chromium in sapphires below XRF detection limits
- etc...

Luminescence spectra of red spinel (natural and flux grown synthetic)



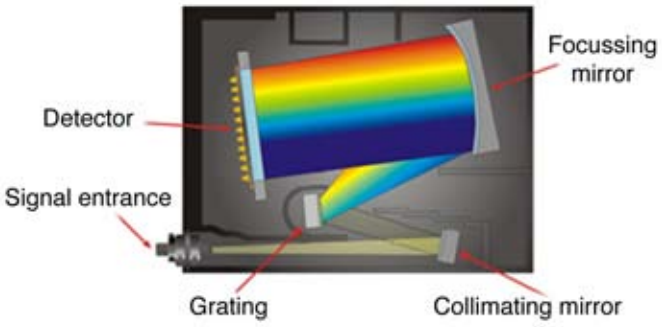

natural | flux melt synthetic

Luminescence spectrum of HPHT treated diamond (type Ia)



## Specifications:

**Spectrometer**:
Avantes AvaSpec-2048 Fiber Optic Spectrometer based on the AvaBench-75 symmetrical Czerny-Turner design with 2048 pixel CCD Detector Array. The spectrometer has a fiber optic entrance connector, collimating and focusing mirror and diffractional grating enables applications in the 200-1100nm range. The AvaSpec-2048 comes with a USB2.0 interface with 16 bit AD converter and ultrafast datasampling of 900 spectra per second and datatransfer in 1.8msec.

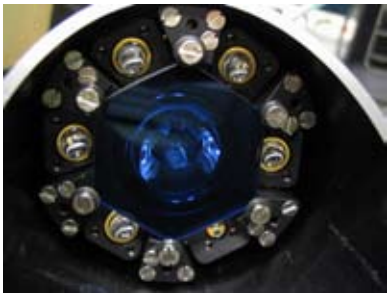



The AvaSpec-2048 is especially suitable for low light level and high resolution applications. An optional detector coating enhances the CCD performance for the UV range and a detector collection lens offers high sensitivity.

**Technical Data:**

| | |
|---|---|
| Spectrometer platform | AvaSpec-2048-USB2 |
| Optical Bench | Symmetrical Czerny-Turner, 75 mm focal length |
| Wavelength range | 200-1100 nm |
| Resolution | 0.6 nm, depending on configuration |
| Stray light | < 0.1% |
| Sensitivity | 20,000 (16-bit A/D) in counts/$\mu$W per ms integration time |
| Detector | CCD linear array, 2048 pixels<br>>150 nm Deep UV detector coating<br>Detector collection lens to enhance sensitivity, Quartz, 200-1100 nm<br>Slit size 25 $\mu$m |
| Signal/Noise | 200:1 |
| AD converter | 16 bit, 2 MHz |
| Integration time | 1.11 ms - 10 min. |
| Interface | USB 2.0 high speed, 480 Mbps, RS-232, 115.200 bps |
| Sample speed | 1.1 msec /scan with on-board averaging |
| Data transfer speed | 1.8 msec /scan |
| Power supply | Default USB power, 350 mA |

**Lamp sources:**
- Vis: Halogen lamp
- UV: series of 6 LED's 300, 310, 320, 330, 340, 365 nm
- Three UV LED's 365 nm for luminescence spectra

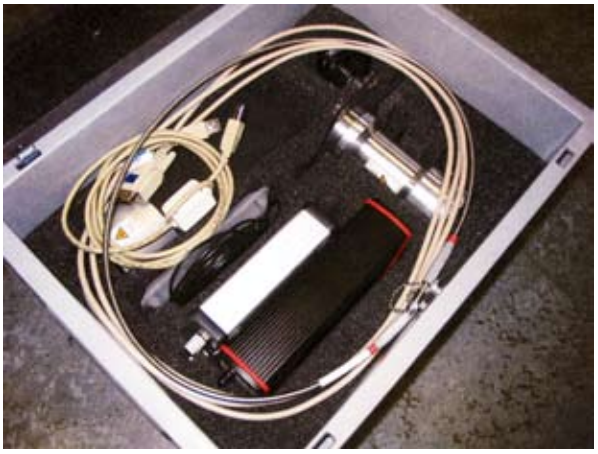


**Sample chamber:**
- Aluminium tube (two parts) with adjustable aperture (depending on sample size)
- Protection cover against surrounding stray light
- Light diffuser: UV transparent quartz plate

**Software:**
- AvasoftBasic with manual

| | |
|---|---|
| **Dimensions, weight** | ca. 400 x 300 x 150 mm, 4.7 kg<br>(dimensions & total weight when stored in protection box)<br>the single components are much smaller and much lighter ! |

**Package**:
- High resolution spectrometer (200-1100 nm)
- Sample chamber
- Fiber optic cable
- Light controller (transmission/luminescence)
- UV transparent light diffuser
- Additional sample holder (plastic rings)
- Avasoft software
- USB 2.0 cable
- Electrical adapter
- System operation manual
- Spare bulbs
- Bulb exchanging tools
- Protection box



**Only for SSEF Spectro Pro:**
- Large spectral database of gemstones
- Laptop (windows OS)
- Software pre-installation (ready-to-go and plug-and-play)
- Metallic trolley with wheels for easy travelling (only for SSEF Spectro Pro)

**Pricing** (VAT and shipping not included):

| | |
|---|---|
| **SSEF portable Spectro PRO** | **30'000.- Swiss Francs** |
| **SSEF portable Spectro** | **24'000.- Swiss Francs** |

SSEF provides also a one day training for the instrument at SSEF laboratory or in your premises (not included in above prices. If interested, please ask for a quote)

**For enquiries, please contact:**

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