

Technical Note 3

Some general information about JETI's spectroradiometric equipment

Actually JETI GmbH offers two families of spectroradiometric devices – **specbos** and **spectraval**. The basic units can measure spectral Radiance and in addition with an optional diffusor also spectral Irradiance. Each device with diffusor can be calibrated for spectral Radiant Intensity measurements too. There are integrating spheres available to extend the measurement possibilities to spectral Radiant Flux.

Various devices of the specbos series are/ were in production since 2003. It started with specbos 1100 and was continued with specbos 1201, specbos 1211 and specbos 1211-2. The actual new version is **specbos 2501**. It is a sensitive device for the VIS range of 380 to 780 nm and is also available in VIS/ NIR version (up to 1000 nm) and UVVIS/ NIR version (200 ... 1000 nm). The optical resolution of the standard device is 4 nm (FWHM), but the VIS version is also available with 2 nm (HiRes version) for the measurement of Laser projectors and displays (see fig. 2).

In addition **spectraval 1501** and **1511** are available – a latter is a device with display. It can be used as stand alone device as well as in combination with a PC or laptop.



spectraval 1501



spectraval 1511



specbos 1211-2



specbos 2501

Figure 1: Actually available JETI spectroradiometer

All devices can measure spectral Radiance. In addition, it is possible to measure spectral Irradiance using a diffusor. This can be a simple cap or a fiber extended version for remote measurements. Additional accessories like Integrating spheres (for spectral Radiant flux measurement), filters and beam shaping optics for specific FOVs and measuring spots are available.

All actual instruments are equipped with USB and Bluetooth interface.

Optionally **specbos 2501** and **spectraval 1501** are available with a LAN interface (specbos 2501 with POE).

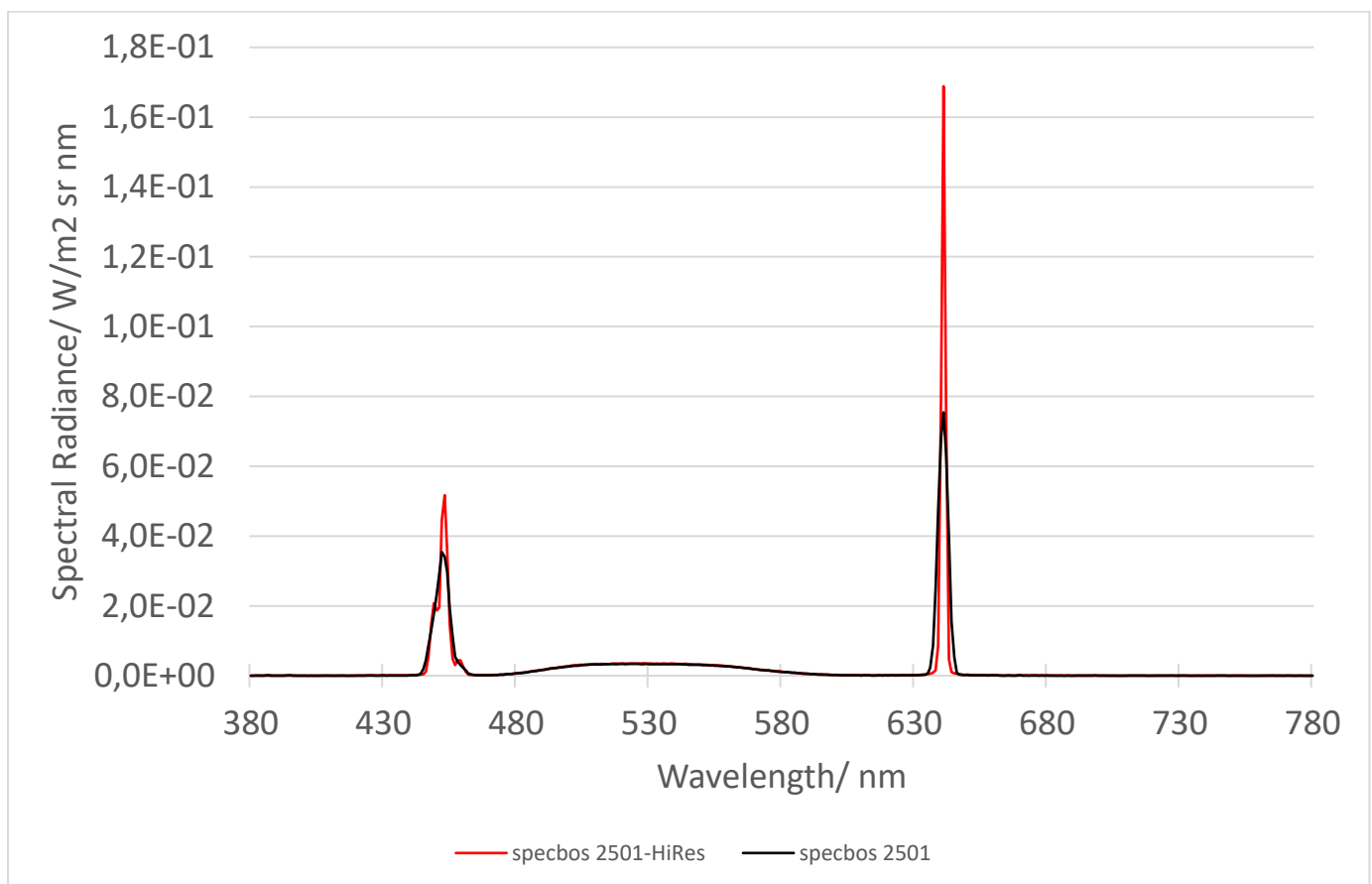


Figure 2: White spectrum of a Laser projector, measured with specbos 2501 and 2501 HiRes

All devices come with the PC software JETI LiVal, which can be used for all four measuring quantities mentioned below. Its development started in 2003 with the basic idea of easy handling and this is still its main property together with a large variety of calculations and functions. The most important of them are:

Calculations:

- Color measurement (basic units as xy, XYZ, CCT, ...), but also CRI, CQS, TLCI, TM-30, Fidelity and Metamerism Indices
- Measurement of color differences
- Hazard measurement according to ISO 62471
- Measurement of museum lighting

- Circadian measurements
- Display blue light measurement

Functionality:

- Switching between SI (lx, cs/m²) and imperial units (fL, fcd)
- A variety of selectable observers
- Customer selectable presentation of results (see figure below)
- Synchronization mode for modulated sources
- Storage possibilities in Excel, as reference file and in Instrument Systems data format
- Issuing of customer specific pdf protocols
- Pass/ Fail and Ranking function
- Writing of History graphs
- Spectral calculations and Transmission/ Reflexion measurement

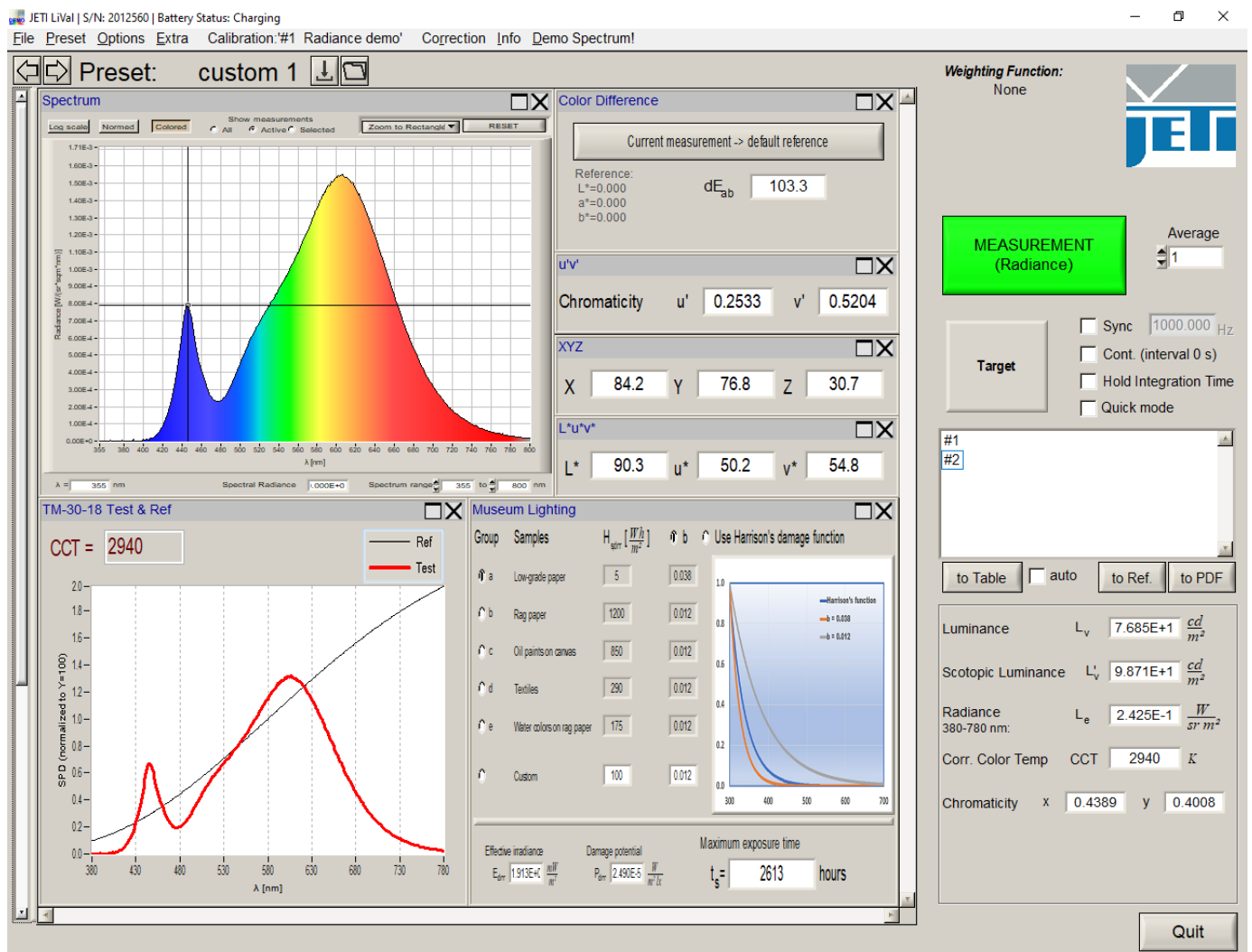


Figure 3: Screen shot of JETI LiVal with an individually arranged design

In addition, the devices are supplied with the JETI SDK (software development kit), which allows to operate them from an own application. The DLLs of the SDK are divided in spectrometric and radiometric versions, additionally they exist in different levels with various extend of setting possibilities.

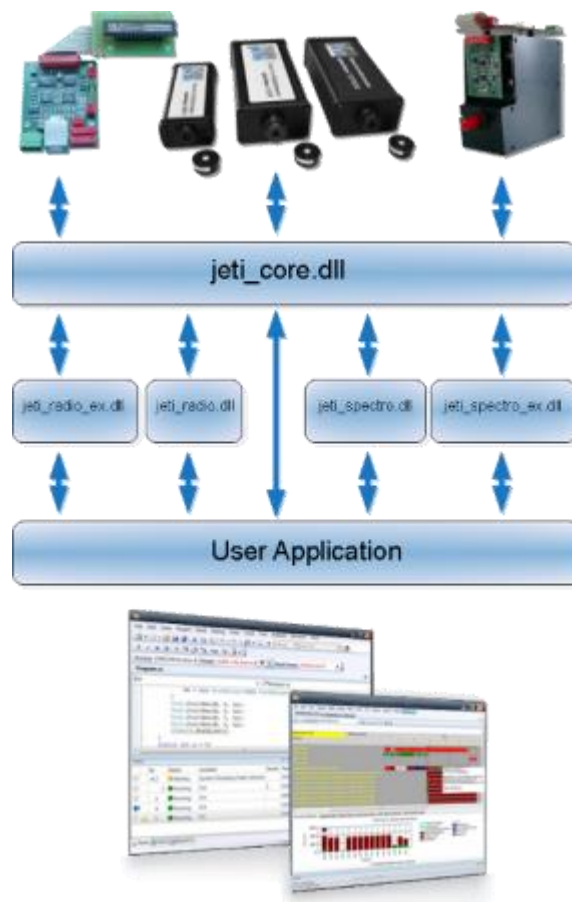


Figure 4: Scheme of the JETI SDK

The SDK is compatible with a Windows environment only. But it is possible to operate all JETI spectroradiometers also using firmware commands directly. This can be done also in other environments than Windows like Mac OS and Linux (see Technical Note 16).

All main photometric and radiometric calculations can be proceeded with such firmware commands. These commands are SCPI syntax compatible and include the following main categories:

*PARAMeter	Get and set general parameters
*CONfigure	Get and set configuration data
*INITiate	Start a configured measurement

*FETCH	Get data from previous measurement
*READ	Start a configured measurement and get the data (combination of *INIT and *FETCH)
*MEASure	Configure, start the measurement and get the data (combination of *CONF, *INIT and *FETCH)
*CONTRol	Control peripheral components
*CALCulate	Calculate data from the previous measurement
*CALIBrate	Calibrate the unit and get calibration data

The following quantities can be obtained directly from the instruments using the firmware commands:

- spectral radiometric values in wavelength steps down to 1 nm
- integrated radiometric and photometric values
- Chromaticity x,y and u',v'
- Dominant wavelength and color purity
- Correlated Color Temperature
- Color Rendering Indexes with selectable reference illuminant
- Peak wavelength and FWHM

The output of the general measuring command *MEAS:ALLVAlues in irradiance mode is shown here as an example:

```

irradiance[W/m^2]:      1.458
illuminance[lx]:       393.628
x:      0.3214
y:      0.3428
u':     0.1987
v':     0.4768
dominant wavelength[nm]: 502.9
colour purity:         3.6
color temperature[°K]: 5997
CRI_DC:      2.816058e-03
CRI_Ra:      91.7
CRI_R01:     95.9
.....
CRI_R12:     81.6
CRI_R13:     96.3
CRI_R14:     89.0
  
```

Summary:

spechbos 2501 and **spectraval 1501/ 1511** are modern, very versatile and economic miniature spectroradiometers for all four basic light measuring quantities (radiance, irradiance, radiant flux and radiant intensity). They can be used for light measurement and radiometric applications like the characterization of displays and projections, measurement of lamps and luminaires, UV irradiation facilities, museum lighting, circadian and other health related light measurement and many other applications.