

|  | <b>SR-3500</b><br><small>spectroradiometer for remote sensing</small>   | <b>SM-3500</b><br><small>spectrometer for mining</small>   |
|--|---|--|
| Spectral Range                                     | 350-2500nm  | 350-2500nm   |
| Spectral Resolution                                | 3.5nm (350-1000nm)  | 3.5nm (350-1000nm)   |
|  | 10nm @ 1500nm   | 10nm @ 1500nm  |
|  | 7nm @ 2100nm  | 7nm @ 2100nm   |
| Spectral Sampling Bandwidth                        | 1.5nm (350-1000nm)  | 1.5nm (350-1000nm)   |
|  | 3.8nm @ 1500nm  | 3.8nm @ 1500nm   |
|  | 2.5nm @ 2100nm  | 2.5nm @ 2100nm   |
| Si Detectors                                       | 512 element Si photodiode array (350-1000nm)  | 512 element Si photodiode array (350-1000nm)   |
| InGaAs Detectors (thermoelectrically cooled)       | 256 element extended wavelength photodiode array (970-1910nm)   | 256 element extended wavelength photodiode array (970-1910nm)  |
|  | 256 element extended wavelength photodiode array (1900-2500nm)  | 256 element extended photodiode wavelength array (1900-2500nm)   |
| FOV Options  | SMA-905 fiber end mount lenses: 1, 2, 4, 5 and 8 degree field of view   | SMA-905 fiber end mount lenses: 1, 2, 4, 5 and 8 degree field of view  |
| Noise Equivalence Radiance (1.2 meter fiber optic) | 0.8x10 <sup>-9</sup> W/cm <sup>2</sup> /nm/sr@400nm<br>1.2x10 <sup>-9</sup> W/cm <sup>2</sup> /nm/sr@1500nm<br>3.0x10 <sup>-9</sup> W/cm <sup>2</sup> /nm/sr@2100nm                   | Not calibrated for radiance  |
| Calibration Accuracy (NIST Traceable)              | ±5% @ 400nm<br>±4% @ 700nm<br>±7% @ 2200nm  | Not calibrated for radiance  |
| Minimum Scan Speed                                 | 100 milliseconds  | 100 milliseconds   |
| Wavelength Reproducibility                         | 0.1nm   | 0.1nm  |
| Wavelength Accuracy                                | ±0.5 bandwidth  | ±0.5 bandwidth   |
| Communications interface                           | USB or Class I Bluetooth- laptop or PDA compatible  | USB or Class I Bluetooth- laptop or PDA compatible   |
| Size   | 8.5" x 12" x 3.5"   | 8.5" x 12" x 3.5"  |
| Batteries  | Optional external Li-ion battery and universal power charger  | Optional external Li-ion battery and universal power charger   |
| Weight   | 7.3 lbs   | 7.3 lbs  |
| Available options bundles:                         | RS-3500 remote sensing bundle includes SR-3500 with fiber optic, field case, backpack, battery and charger, 5x5 inch reflectance panel, pistol grip, Getac handheld digital assistant | SM-3500 mining bundle includes SM-3500 with fiber optic, field case, backpack, battery and charger, 2x2 inch reflectance panel, tungsten halogen contact probe, Getac handheld digital assistant |

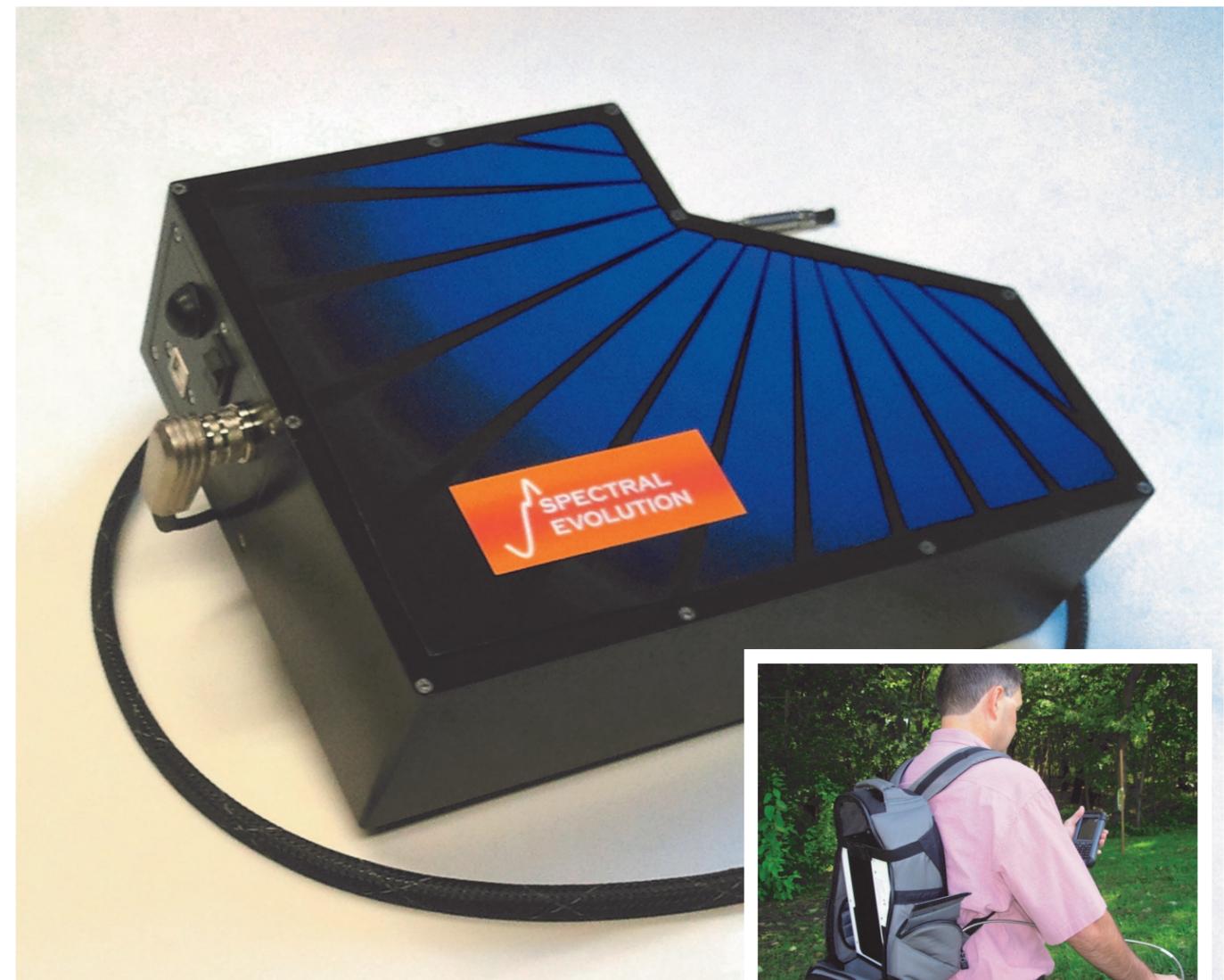


[www.spectralevolution.com](http://www.spectralevolution.com)

For more information, go to:  
[www.spectralevolution.com](http://www.spectralevolution.com)

1 Canal Street ♦ Unit B1  
Lawrence, MA 01840 USA  
Tel: 978 687-1833 ♦ Fax: 978 945-0372  
Email: [sales@spectralevolution.com](mailto:sales@spectralevolution.com)

## Spectrometers for Mining and Environmental Remote Sensing



**SPECTRAL EVOLUTION**  
Full range, fiber optic field portable spectroradiometers and spectrometers for remote sensing and mining



1 Canal Street ♦ Unit B1  
Lawrence, MA 01840 USA  
Tel: 978 687-1833 ♦ Fax: 978 945-0372  
Email: [sales@spectralevolution.com](mailto:sales@spectralevolution.com)

[www.spectralevolution.com](http://www.spectralevolution.com)

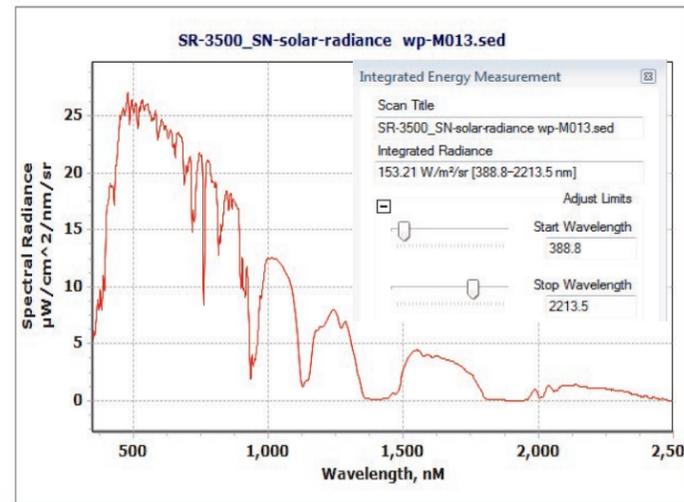
# Field Remote Sensing Systems to Match Your Application

Using NIR reflectance spectroscopy for remote sensing applications delivers the following benefits:

- It's fast— scans can take as little as one second
- It's non-destructive—the sample remains untouched
- It typically doesn't require sample preparation for fast analysis in the field

SPECTRAL EVOLUTION has the field spectroradiometers and spectrometers you require for applications that include:

- Ground truthing—confirming, disputing, or interpreting hyperspectral or multi-spectral data
- Environmental research
- Agricultural analysis
- Ecosystem change
- Forestry research, including canopy studies
- Glacial change and climate studies
- Atmospheric research
- Calibration transfer and satellite sensor validation
- Water body studies
- Plant species identification
- Urban development
- Crop health, including photosynthesis efficiency
- Irrigation assessment
- Topsoil fertility and erosion risks
- Soil degradation, mapping, and monitoring
- Geological remote sensing, including surveying, mineral identification, and geomorphology



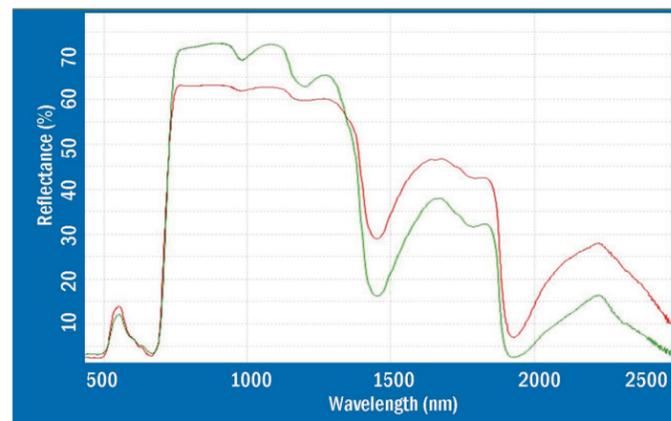
The full range SR-3500 was used to measure outdoor solar radiance using a 4° lens foreoptic and white reflectance panel. Pull down menus allow for easy calculation of integrated energy measurement over user-definable boundary wavelengths.



All SPECTRAL EVOLUTION full range spectrometers and spectroradiometers can be ordered with many convenience options such as the GETAC personal digital assistant (left) for one-handed spectrometer control. The GETAC tags spectra with GPS, photos and voice notes. We also offer many different styles of contact probes and fiber holders such as our tungsten halogen illuminator (right), which features a comfortable handle and scratch resistant sapphire window for direct contact with soils and minerals.



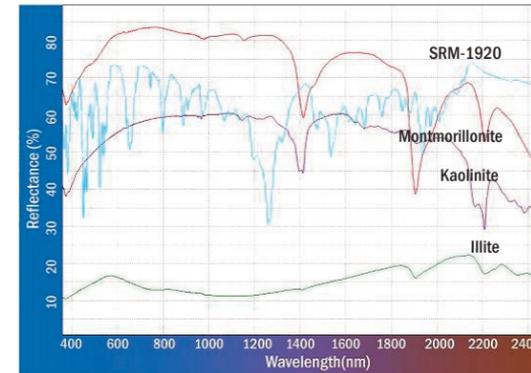
We also offer many different styles of contact probes and fiber holders such as our tungsten halogen illuminator (right), which features a comfortable handle and scratch resistant sapphire window for direct contact with soils and minerals.



This scan was taken with an SR-3500 in the field using the leaf clip bundle accessory package. The red trace is acer saccharum and the green is rhododendron decorum. The leaf clip bundle option includes an ILM-105 fiber optic illumination module fitted with a one meter fiber optic bifurcated cable.



Our leaf clip bundle is specifically designed for leaf reflectance measurements. It features a separate tungsten halogen illuminator (ILM-105) to keep heat away from leaves during measurements to prevent burnout. An integral swing-away reflectance panel provides easy reference measurements



## Geological Remote Sensing for Mineral Identification

SPECTRAL EVOLUTION spectroradiometers cover the UV/Vis/NIR spectra using three photodiode arrays with no moving parts. This makes them supremely reliable in the field. The SR-Series can collect spectra in as little as 100 milliseconds and store up to 999 scans in the unit without a computer. The exclusive DARWin SP Data Acquisition Module included with each unit allows for full featured instrument control and data handling and is compatible with a wide range of 3rd party analytical software, including: SpecMIN, GRAMS, The Spectral Geologist (TSG) and others. In the graph, the SR-3500 was used to measure reflectance of kaolinite (purple), illite (green), montmorillonite (red) and SRM-1920 (cyan).

## Field Instruments for Every Budget

### SR/SM-Series Systems

Our SR-3500 spectroradiometers feature NIST-traceable calibration for spectral radiance or irradiance measurements depending on your optics choice) so you can get to work immediately. They are also ideal for reflectance measurements in applications like vegetative studies and geological remote sensing. For mining applications that don't require NIST-traceable calibration, the SM-3500 spectrometer provides the same advantages at slightly reduced cost.

### SR/SM-Series Advantages

The SR/SM-Series delivers:

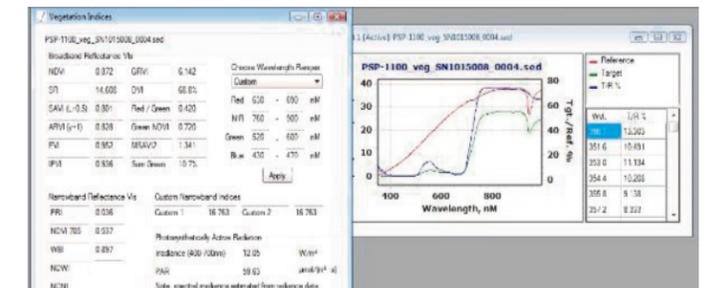
- Fast, full spectrum UV/VIS/NIR measurements (350-2500nm) with a single scan
- Ultra-fast auto shutter, auto exposure, and autodark correction before each new scan, with no optimization step
- Superior field reliability with no moving parts to break down
- Lightweight and compact—the SR/SM-3500 weighs only 3.3kg/7.3lbs—small enough to carry on-board a plane and around a field or forest
- Small, lightweight rechargeable Li-ion batteries are available as an option to provide up to 4 hours of field use per battery
- Removable fiber optic cable—field swappable and easy to replace
- Optional SMA-905 FOV lenses available for increased flexibility
- Best in class NER (low noise equivalent radiance)
- Bluetooth connectivity (Class I)
- Rugged, handheld GETAC PS336 PDA with auto-focus digital camera, e-compass, altimeter, voice note capability, GPS tagging, and sunlight readable VGA display
- DARWin SP Data Acquisition software for one-touch scan-



ning, automatically saves data as ASCII files for use with 3rd party software (no post-processing), displays reflectance/transmittance data (percentage) or absorbance (logarithmic) versus wavelength, and produces single and multiple spectral plots

### USGS Library & Vegetation Indices

Access to the USGS spectral library for vegetation and nineteen vegetation indices, is provided by a pull down menu, in our DARWin SP software. The vegetation indices include:



- NDVI (Normalized Difference Vegetation Index)
- SR (Simple Ratio Vegetation Index)
- SAVI (Soil Adjusted Vegetation Index)
- ARVI (Atmospherically Resistant Vegetation Index)
- EVI (Enhanced Vegetation Index)
- IPVI (Infrared Percentage Vegetation Index)
- PRI (Photochemical Reflectance Index)
- WBI (Water Band Index)
- PAR (Photosynthetically Active Radiation)
- GRVI (Green Ratio Vegetation Index)