Malvern Panalytical
a spectris company

FIELDSPEC 4

The industry-leading portable field spectroradiometer



MEASURE ANYWHERE

The Fastest and Most Accurate Spectral Measurements in the Field

The study of the absorption and emission of light and other radiation by matter, spectroscopy is a crucial exploratory tool in myriad fields of study, including physics, chemistry and astronomy. The ability to conduct measurements out in the field enables faster, more robust and more accurate data collection.

Having pioneered the science of field spectroscopy over 30 years ago, ASD, a Malvern Panalytical Brand, continues to lead the industry with the world's most trusted field-portable NIR spectroradiometers.

Delivering the fastest and most accurate spectral field measurements available from any commercial field-portable spectroradiometer, the ASD FieldSpec® 4 line of full-range spectroradiometers is designed specifically to meet the challenges researchers face when collecting spectral measurements out in the field.

The instrument's portability and flexibility also make it an excellent choice for laboratory measurements giving making it one of the few tools that can really work from field to lab. Continued enhancements to core instrument spectrometers and other critical components have dramatically improved overall performance, signal and integration speeds compared to earlier models.

"The ASD FieldSpec® 4 full spectral range makes it ideal for field campaigns needed to ground-truth orbital measurements, which typically extend to the longer wavelengths."

Dr. Ulyana Horodyskyj
CEO of Science in the Wild



- **Full-range detection capacity** (350 nm – 2500 nm) provides uniform VIS/NIR/SWIR data collection across the entire spectrum.
- **Fast integration speed** allows for high-quality measurements in a limited amount of time.
- **Superior signal throughput, signal-to-noise and radiometric performance** ensures data quality, even in suboptimal conditions.
- **Single element scanning detectors** ensure seamless measurements, eliminating the uncertainty of missing "dead pixels," the need to fill the gaps with data interpolation and any required smoothing with instruments using solid-state array SWIR detectors.
- **Long-range wireless capability** increases collection coverage potential.
- **Permanent fiber optic cable design** provides superior signal throughput over detachable cable systems.
- **Ruggedized design** reduces the risk of signal loss from broken optical fibers.
- **Customized, fully adjustable ergonomic Pro-Pack Backpack** is precisely designed around the challenges of conducting field research. Durable and lightweight, the backpack comes standard with every instrument.
- **A broad portfolio of accessories** enables remote sensing and contact measurements.

BUILT FOR THE ENVIRONMENT
DESIGNED WITH FIELD RESEARCH IN MIND.

ACADEMIA
Inspire your students. The ASD FieldSpec® 4 enables the best and most accurate radiance and reflectance data for your research. Easy to use, the ASD FieldSpec® 4 allows you to collect good quality, repeatable data and limit possible mistakes during collection.

GROUND TRUTH, SENSOR CALIBRATION & IMAGERY ANALYSIS
Ideal for radiometric calibration of a wide range of remote sensing imaging sensors, the ASD FieldSpec® 4 provides the fastest field measurements with optimal signal-to-noise design and wide spectral coverage (350-2500 nm). Users utilize the collected spectra to interpret unknown materials in multispectral and hyperspectral remotely sensed imagery, to validate imaging sensor performance and to evaluate the detectability of target objects in the presence of other materials in a remotely sensed image.

ENVIRONMENTAL
Field-based spectral measurements with the ASD FieldSpec® 4 combined with remote sensing platforms are an indispensable tool for monitoring environmental conditions related to climate change, pollution deposition, natural resource management and land use. The instrument is capable of assessing plants, soil, wood, aquatic sediments, chemical and biological agents, geologic substrate and other resources to provide detailed information about their status and composition, as well as air and water quality monitoring, remote sensing and other activities to indicate ecosystem health.

PRECISION AGRICULTURE
The ASD FieldSpec® 4 increases yields and decreases production risks while monitoring environmental and plant physiological conditions. By providing a powerful, fast and nondestructive technique to evaluate chemical and physical properties of agricultural products whether in the field, the plant or the lab, the ASD FieldSpec® 4 empowers users with the ability to detect and trigger precise mitigation actions early in the growth cycle.

ART CONSERVATION
The ASD FieldSpec® 4 can nondestructively examine important works of art, allowing materials to be distinguished by their composition and revealing under-drawings. Leveraging the ASD FieldSpec® 4 for non-destructive identification of pigments can also address issues of attribution, age dating and conservation. Plus, the portability of the instrument ensures the art work can stay in place during examination.

DEFENSE & INTELLIGENCE
Employ the ASD FieldSpec® 4 to identify camouflage netting, foliage and terrain in remotely sensed overflight imagery. The instrument supports remote sensing overflight campaigns when looking for underground military structures as the surrounding landscape, soil and vegetation can be impacted in different ways.

IN THE LAB
The performance advantages of the ASD FieldSpec® 4 can be leveraged in the lab as well. Malvern Panalytical offers a full range of accessories that easily connect to the ASD FieldSpec® 4 fiber optic cable, enabling the measurement of a wide range of substances either through direct contact or in-situ. The Malvern Panalytical team offers full support for the development of spectral libraries and quantitative models via training or consulting.

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WHY FIELD SPECTROSCOPY?

Field spectroscopy measures the reflectance properties of vegetation, soils, rocks and bodies of water in the natural environment, providing value to many disciplines interested in the measurement of light reflected off objects in the natural environment. From atmospheric research and crop science to determining the makeup of food and agricultural products, spectral image groundtruthing and many other industry applications, the ASD FieldSpec® 4 provides value to numerous sectors of business.

The instrument's higher resolution yields greater precision for remote sensing classification applications, producing more information from every pixel generated in an image than ever before. The enhanced spectral resolution has been designed to meet the rigorous demands of the next generation hyperspectral imaging systems, and incorporates photodiode SWIR detectors to provide the smallest available spectral sampling interval in a field-portable device. This increased resolution ensures detection of even the most subtle spectral features.

Which FieldSpec® instrument is best suited for my application?

Not all research needs are created equal, and the spectral reflectance characteristics of different materials can vary greatly. To better accommodate this real-world variability, all ASD FieldSpec® 4 spectroradiometers are available with several spectral resolution options in the short-wave infrared (SWIR) range (1001 nm – 2500 nm), better addressing specific user needs and providing superior performance across the full solar irradiance spectrum (350 nm – 2500 nm).

FieldSpec® 4 Hi-Res NG

The enhanced 6 nm SWIR spectral resolution of the ASD FieldSpec® 4 Hi-Res NG spectroradiometer provides both the sampling interval (bandwidth) and the spectral resolution to support accurate calibration and image classification analysis with the next generation high spectral resolution hyperspectral sensors.

FieldSpec® 4 Hi-Res

With 8 nm SWIR spectral resolution, the ASD FieldSpec® 4 Hi-Res spectroradiometer is the instrument of choice for standard sensor validation and calibration, as well as ground truth measurements and building spectral libraries. The resolution is particularly useful for detecting and identifying compounds with narrow spectral features in the longer wavelengths.

FieldSpec® 4 Standard-Res

The ASD FieldSpec® 4 Standard-Res spectroradiometer, with 10 nm SWIR resolution, is perfectly suited for characterizing spectral features with a resolution of 10 nm to 50 nm, which covers the technical requirements of most field researchers. The instrument has long been the industry's go-to for trusted field spectroscopy because the scope of potential applications is broad.

FieldSpec® 4 Wide-Res

The 30 nm SWIR spectral resolution of the instrument is an ideal fit for applications such as vegetation analysis and vegetation indices that are characterized by broad spectral features. The wider optical slit provides superior signal throughput and signal-to-noise performance.

Hi-Res	Standard-Res	Wide-Res	
Ideal	Adequate	Not Recommended	
■	■	■	Asbestos Detection
■	■	■	Atmospheric Research
■	■	■	Camouflage
■	■	■	Concrete and Aggregated
■	■	■	Cosmetics
■	■	■	Crop Science
■	■	■	Food and Agricultural Products
■	■	■	Forestry
■	■	■	General Material Identification
■	■	■	Geologic Mapping
■	■	■	Hyperspectral Image Ground Truthing
■	■	■	Landscape Ecology
■	■	■	Multispectral Image Ground Truthing
■	■	■	Pharmaceuticals and Nutraceuticals
■	■	■	Photonics
■	■	■	Pigment/Color Analysis Vegetation
■	■	■	Plant Physiology
■	■	■	Plastics/Petrochemicals
■	■	■	Quantitative Analysis
■	■	■	Sensor and Radiometric Calibration
■	■	■	Snow and Ice Research
■	■	■	Soil Mineralogy
■	■	■	Spectral Library Creation
■	■	■	Water Body/Column Analysis



DUAL CONFIGURATION ENABLES OPTIMAL MEASUREMENT

The ASD FieldSpec® 4 spectroradiometer also offers a capability that is not available anywhere else — a dual configuration that virtually eliminates errors associated with time-varying atmospheric conditions. The software intercalibrates and wirelessly synchronizes two ASD FieldSpec® spectroradiometers to collect near simultaneous white reference and sample target radiance spectra.

ACCESSORIES: OUT IN THE FIELD, IN THE LAB

Malvern Panalytical offers an extensive line of accessories for the ASD brand of Products designed to adapt an instrument to a specific application.

Fore Optics – These accessories offer the ability to constrain the field of view when collecting data samples. There are a number of fore optics available for a variety of different applications related to radiance, irradiance and reflectance, including underwater measurements.



Pistol Grips – Multiple pistol grip options are available for superior ease-of-use and adaptability to a variety of environmental and situational elements. All pistol grip designs include the quick-connect/disconnect fiber optic cable snap-in feature



Contact Probe – Intended for reflectance measurements in the field and in the lab, the innovative optical design of the contact probe minimizes measurement errors associated with stray light. The contact probe is lightweight (1.5 lbs. or .68 kg.) with a slim design and easy-grip handle. It offers a 10 mm spot size and comes with a 1,500-hour halogen bulb.



Plant Probe - Featuring the same great design and functionality as ASD's standard contact probe, the plant probe offers a lower intensity bulb position for nondestructive data collection from live vegetation and other heat-sensitive targets. Combine the Plant Probe with the ASD Leaf Clip for easy one-handed functionality with improved measurements.



Turntable – When the sample size is large or irregularly shaped or characterization of diverse sample mixtures is required (averaging), use the Turntable.



Leaf Clip – Built specifically for use with the Plant Probe to simplify the process of collecting spectra on vegetation, the Leaf Clip's unique design includes a gentle trigger lock/release gripping system for holding the target leaf in place without removing it from its habitat or destroying it. With its unique rotating background panel head, the Leaf Clip assembly is ideal for both reflectance (black panel) or transflectance (white panel).



Rapid Analysis Probe – The Rapid Analysis Probe is useful when fast and convenient measurement is necessary or a 'lower temperature illumination' is needed.



Muglight - Use the Muglight when maximum illumination and sample stability is needed for good signal-to-noise ratio.

PRODUCT SPECIFICATION AT A GLANCE

Performance Specifcations	Standard	Hi-Res	NG
Wavelength range	350 nm – 2500 nm		
Resolution VNIR @ 700 nm	3 nm		
Resolution SWIR @1400 & 2100 nm	10 nm	8 nm	6 nm
Spectral Sampling (Bandwidth) VNIR	1.4 nm		
Spectral Sampling (Bandwidth) SWIR	1.1 nm		
Scanning time	100 milliseconds		
NEdL (Noise Equivalent Radiance) - VNIR @ 700 nm	1.0 x 10-9 W/cm2/nm/sr		
NEdL - SWIR 1 @ 1400 nm	9.0 x 10-10 W/ cm2/nm/sr	1.4 x 10-9 W/ cm2/nm/sr	7.0 x 10-9 W/ cm2/nm/sr
NEdL - SWIR 2 @ 2100 nm	6.0 x 10-10 W/ cm2/nm/sr	8.0 x 10-10 W/ cm2/nm/sr	9.0 x 10-9 W/ cm2/nm/sr
Stray light specification	VNIR 5000:1 (0.02%) NIR 10,000:1 (0.01%)		
Wavelength reproducibility	0.1 nm		
Wavelength accuracy	0.5 nm		
Maximum radiance - VNIR	2x Solar		
Maximum radiance - SWIR	10x Solar		
Data collection speed	2 spectra per second		
Channels	2151		
VNIR (350-1000 nm) detector	512 element NIR-enhanced silicon array		
SWIR1 (1000-1800 nm) detector	Graded Index InGaAs Photodiode, 2 Stage TE Cooled		
SWIR2 (1800-2500 nm) detector	Graded Index InGaAs Photodiode, 2 Stage TE Cooled		
Input	1.5 m fiber optic (25° field of view) Optional fore optics available		
Weight	4 kg		
Calibrations	Wavelength, absolute reflectance, radiance*, irradiance*. All calibrations are NIST traceable. (*radiometric calibrations are optional)		
Instrument Controller	Dell Latitude 5490 or other Windows 10 compatible laptop		
Warranty	One-year full warranty including expert customer support		
Storage temperature (°C)	-15 - 45°C		
Operational temperature range (°C)	0 - 40°C		

VALUABLE SERVICES AND UNMATCHED SUPPORT

Leveraging more than 30 years in field spectroscopy, the ASD brand of instruments has earned an international reputation for both its technical superiority and its support team, ensuring a user's success regardless of application. Committed to unparalleled customer service, both before and after the sale, Malvern Panalytical technical support, training and applications staff will work with you to ensure your application success.

Annual Maintenance and Warranties

To ensure proper operation of the instrument, it is recommended that a maintenance check is performed once per year. Annual maintenance is covered under the initial and the extended warranty. If you no longer have a warranty, you may have the option to renew after a brief instrument review by our tech support team.

Additional warranty is available through your sales representative.

Performance Checks

To ensure your ASD brand spectrometer is performing at its best, schedule an instrument performance check with Malvern Panalytical's highly experienced technical support team. Malvern Panalytical's spectrometer experts will conduct a full performance check on your instrument, including:

- Fiber optic cable check
- IR scanner motor and scanner linkage exam
- New wavelength calibration
- Gratings check in all three regions
- Software upgrade to the latest version

SUMMITCAL

Applications Support

The SummitCAL Solutions Team is a professional services group within Malvern Panalytical dedicated to creating materials measurement solutions for our customers. Simply put, SummitCAL converts complex data into actionable solutions to real-world natural resource materials measurement problems via chemometric modeling.

By focusing on providing a range of spectrometer application services, including multivariate modeling and development of advanced calibrations across a broad range of industrial applications, both quantitative and qualitative in nature, the advantages of working with SummitCAL are numerous:

- Better understanding of your measurement needs.
- Improved implementation time.
- Highly accurate libraries or models.
- Access to technical expertise on an as-needed basis.
- A full, targeted solution when paired with an ASD brand instrument from Malvern Panalytical.

Contact Malvern Panalytical sales to receive more information about any of these services.

Training

Malvern Panalytical offers a variety of training options that cover basic to advanced chemometrics and field spectroscopy techniques to fit your needs. Customized training can take place at your site using your instruments or at a location of your choice

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WHY CHOOSE **MALVERN PANALYTICAL**?

We are global leaders in materials characterization, creating superior, customer-focused solutions and services which supply tangible economic impact through chemical, physical and structural analysis.

Our aim is to help you develop better quality products and get them to market faster. Our solutions support excellence in research, and help maximize productivity and process efficiency.

Malvern Panalytical is part of Spectris, the productivity-enhancing instrumentation and controls company.

www.spectris.com

SERVICE & **SUPPORT**

Malvern Panalytical provides the global training, service and support you need to continuously drive your analytical processes at the highest level. We help you increase the return on your investment with us, and ensure that as your laboratory and analytical needs grow, we are there to support you.

Our worldwide team of specialists adds value to your business processes by ensuring applications expertise, rapid response and maximum instrument uptime.

- Local and remote support
- Full and flexible range of support agreements
- Compliance and validation support
- Onsite or classroom-based training courses
- e-Learning training courses and web seminars
- Sample and application consultancy



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