# Datasheet

## Handheld Field Spectroradiometer | ATP9100/F

### Features

- High sensitivity, new detector quantum efficiency>60%, NIR sensitivity is 40% higher than traditional PDA detector
- Fast speed, sampling time< 10 ms per time
- Fiber probe has light weight & flexible for field usage
- High accuracy, built-in with the second order sorting filter
- Dynamic dark current correction, reduce noise
- Screen can display angles, direction and areas (ATP9100F)
- Water, Dust proof, damage resistant
- Special designed carrying case
- Touch screen with Android software, and applied for spectrometer software
- HD camera for taking spectrum area

### Application

- Geographical Research, Mining exploration
- Remote Sensing Measure
- Agriculture, Crops Monitor
- Forestry & oceanography Research

### Description

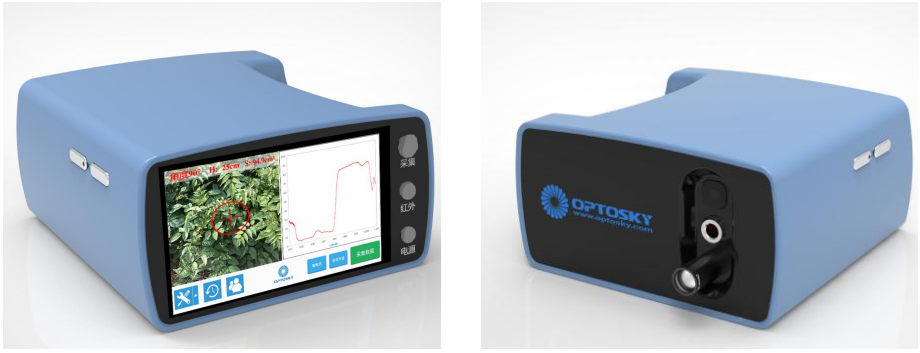
Optosky ATP9100/F is a new handheld field spectroradiometer 300-1100nm, and it's applied to fields of remote sensing measurement, crops monitor, research of forest and oceanography etc.

ATP9100F add a function of intuitive display spectrum area can increase measure accuracy.

It employs high performance, fast and accurate measurement, easy to operate and take to field etc. It's configured powerful software package, and applied to measurement of reflectance,radiometry, photometry and colorimetry.

| Model | Description |
|---|---|
| ATP9100 | Standard Handheld FieldSpec |
| ATP9100F | plus a function of capture distance & area |

1. ATP9100 Handheld FieldSpec



2 ATP9100F Handheld FieldSpec (plus capture distance & area)





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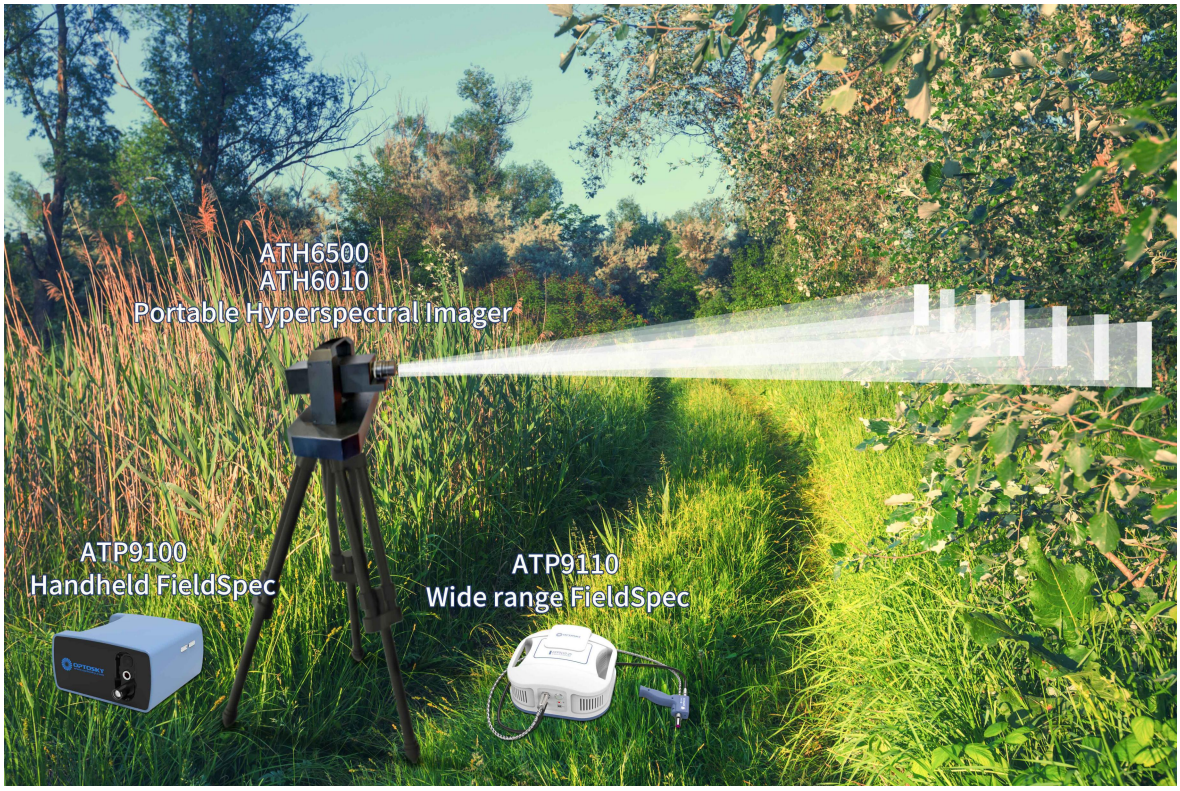


Fig 1 FieldSpec & Hyperspec co work in the field




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# 1. Performance

| Detector | |
|---|---|
| Type | Linear CMOS sensor |
| Detector | 2048pixels |
| **Optical Parameters** | |
| Spectral Range | 300-1100 nm |
| Wavelength Accuracy | ± 0.5 nm |
| Spectral Resolution | 1.4 nm@756nm |
| FOV | narrow FOV lens，1°/8°/15°/25°optional |
| Indicate laser wavelength | 650 nm |
| Indicate laser power | 5 mW |
| SNR | >800 |
| Spectral Sampling Interval | 0.4nm |
| Hardware spectral average | Max. up to 100,000 times |
| **Electrical parameters** | |
| Operation system | Android 6.0 |
| Camera | 13-mega front camera |
| LCD Screen | 5″HD 720*1080 capacitive screen |
| Integration Time | 1 – 10 s/ auto optimization integration time |
| Data Export Port | TYPE-C /USB 2.0, bluebooth |
| Angle data | MC3430 gyroscope optical measure angle: 0°-180° |
| Power supply | Built-in Li battery 5200maH |
| Charging | USB 5V Charger |
| Battery life span | >4H |
| Working Current | <800mA |
| Storage Temp. | -20°C ～ +65°C |
| Operating Temp. | -10 ～ 45 °C |
| Working Humidity | < 90%RH |
| **Physical Parameters** | |
| IP level | IP65 |
| Dimension | 151×157×85mm |
| Weight | 1.1Kg |

# 2. FieldSpec Pictures




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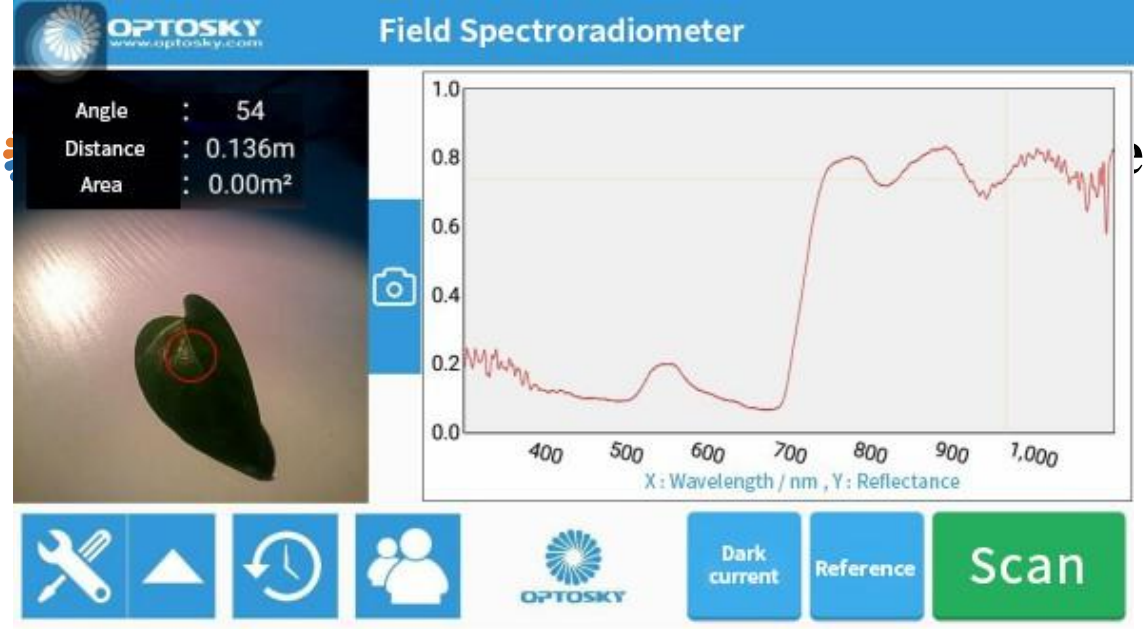


Fig 2 ATP9100F Interface, the left image circled in red triangle, the right reflectance spectrum

Fig 3 FieldSpec measurement case “Red Tide” on the ship on May 11-16, 2020

Fig 4 ATP9100 FieldSpec measurement case in the field




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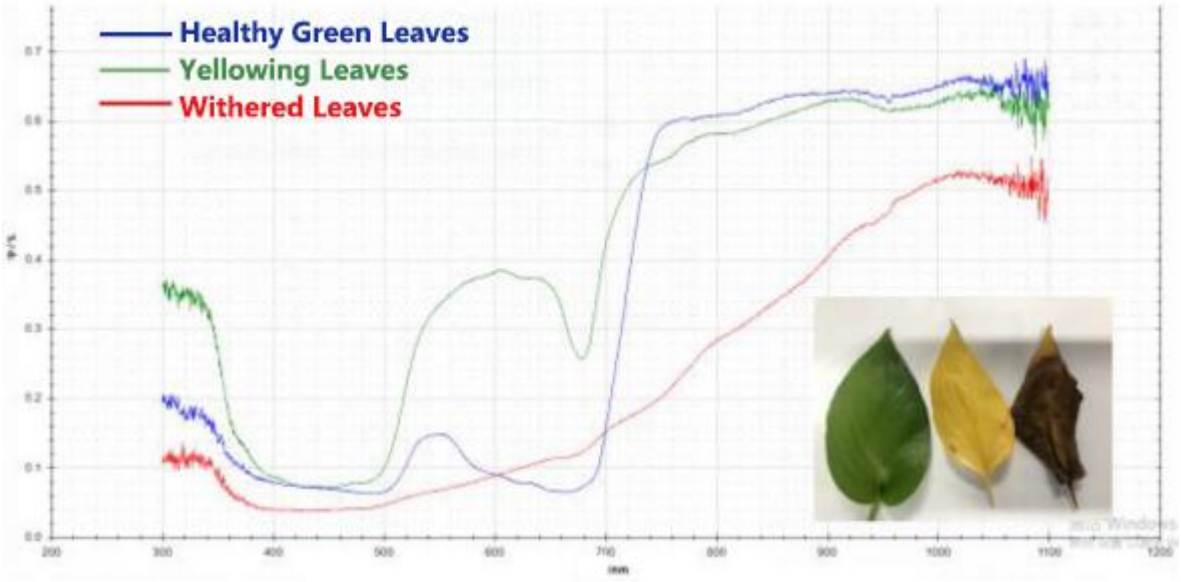


Fig 5 ATP9100 FieldSpec measure Healthy, yellowing and withered leaves

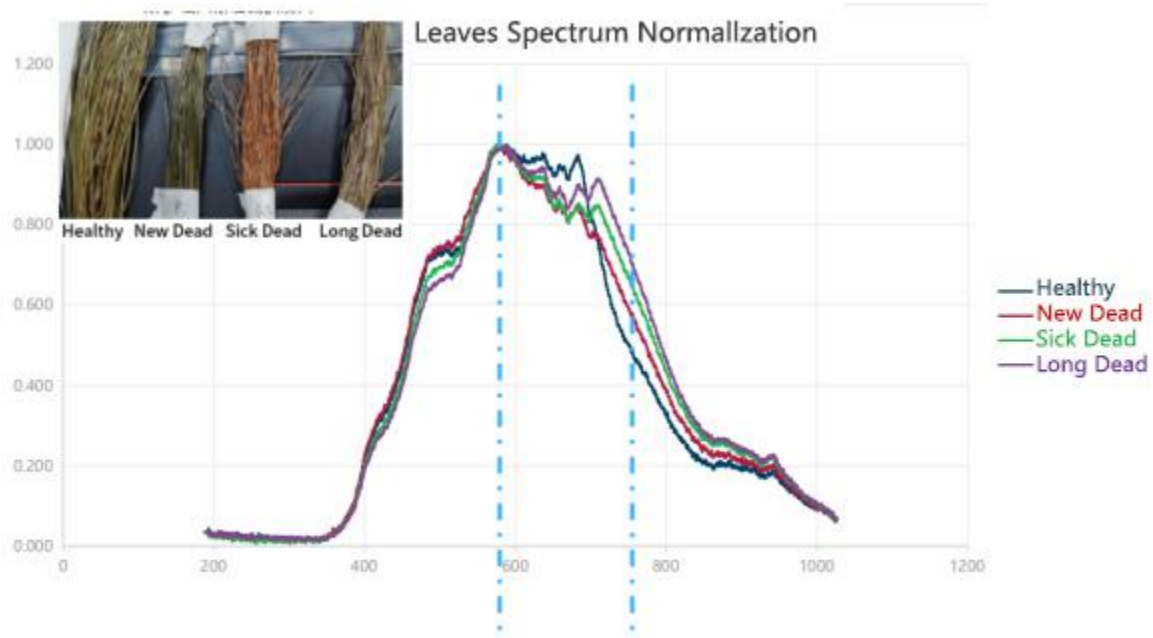


Fig 6 ATP9100 FieldSpec measures Healthy, dead, sick dead, dead long time branches




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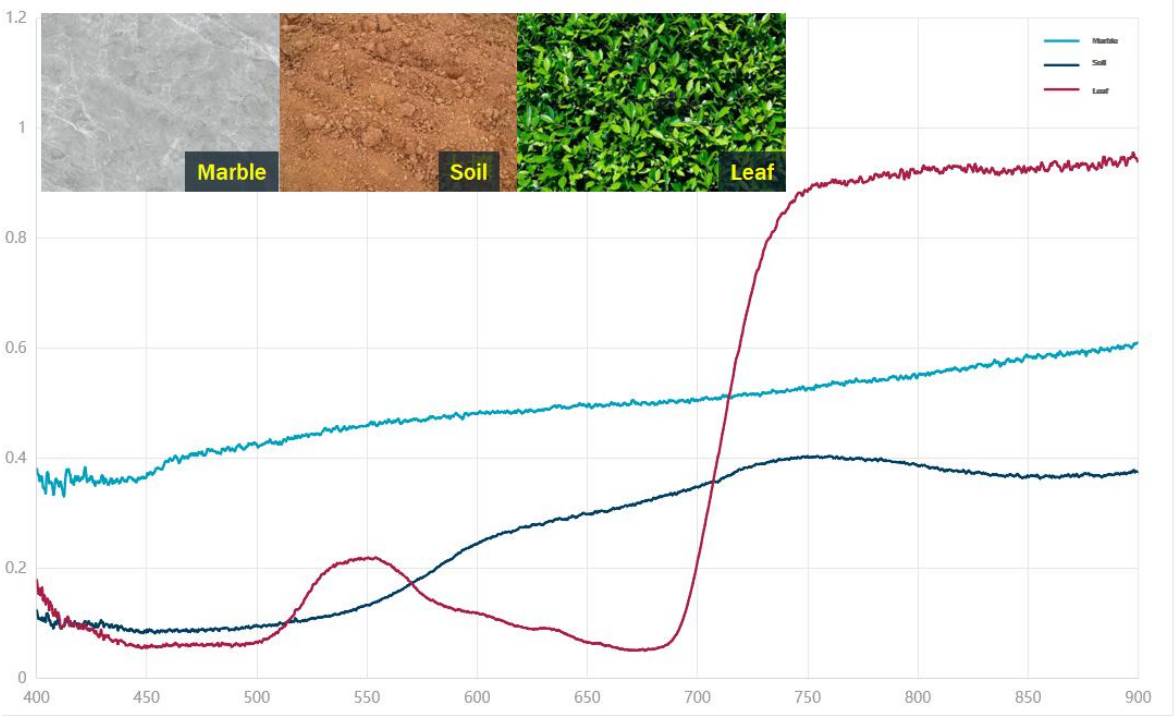


Fig 7 ATP9100 measure marble, soil, and leaves spectra

# 3. Attachment

| Standard Attachment | |
|---|---|
| 1 | USB Data wire |
| 2 | Field fiber patch cable |
| 3 | Exclusive PC software |
| 4 | Charging adaptor 5V/3A |
| 5 | Cosine lens |
| 6 | FOV 25º |
| 7 | Standard Board with box |
| 8 | Carry case |
| **Optional Attachment** | |
| 1 | FOV lens, 1º/5º/8º/10º/15° Optional |
| 2 | Reflectance Probe+leave clip for Reflectance measurement |
| 4 | Halogen lamp /ATG1021 INT:12V |
| 5 | Measure holder+integration sphere for transmittance measurement |
| 6 | Cuvette holder for water quality absorbance measurement |
| 7 | Standard white board 99% Reflectance 10cm*10cm（Customized） |
| 8 | White Board 60% Reflectance 10cm*10cm（Customized） |



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# 4. Application

## 4.1. FieldSpec applied to Oceanic and Water Quality

Red tide is an ecological abnormal phenomenon caused by the sudden proliferation or accumulation of certain phytoplankton, protozoa or bacteria in the seawater in a short period of time under certain environmental conditions. In recent years, toxic red tides have occurred frequently and have been expanding in scale, seriously affecting coastal fisheries, aquaculture and marine ecological environment. Red tide toxins also threaten the safety of human life.

Marine Phaeosporium, Skeletonema costatum, and Leptophyllum denmark are three types of phytoplankton that cause red tides. Red worms are currently the only reported protozoa that can form red tides. They are colorless and feed on phytoplankton. ; Phytoplankton pigments (mainly chlorophyll, carotene and other ancillary pigments), inorganic suspended particulate matter, and colored dissolved organic matter are the three major factors that determine the optical properties of seawater, which together affect the ocean's out-of-water radiation information (such as remote sensing reflectance spectroscopy) ), considering the spectral properties of these three aquatic elements. From the perspective of spectral morphology, in the range of 400~900 nm, different types of red tide spectra show obvious bimodal distributions, especially the second reflection at 687~728nm. The peak is the characteristic reflection peak that distinguishes the red tide water spectrum from the normal sea water spectrum. This has been successfully used in the red tide detection algorithm based on aerial hyperspectral remote sensing.

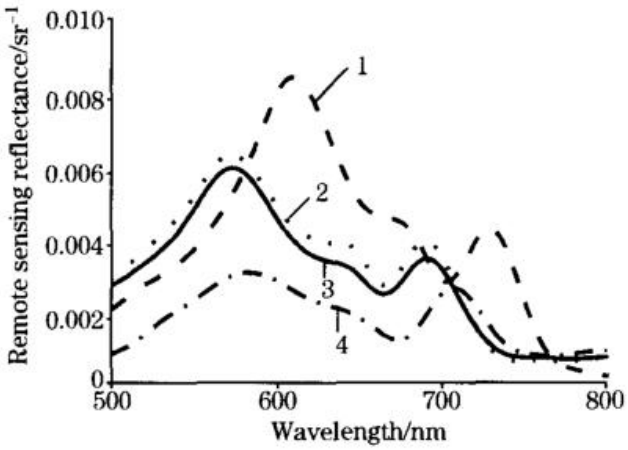


Fig 8 Spectra of different types of red tide 1: Red worms; 2: Skeletonema costatum; 3: Leptocylindrica denmark; 4: Marine Phaeosporium

1) The relatively high concentration of inorganic suspended matter is the main reason for the first reflection peak at 570~585 nm. Due to its strong light scattering effect, the reflection peak of chlorophyll at 550 nm is obliterated, making it invisible from the spectral curve. The ground shows that the appearance of higher concentration of inorganic suspended matter is directly related to the nearshore of the experimental sea area.



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2) Phycocyanin (Phycocyanin), an accessory pigment, absorbs at 615~630nm to form a shoulder peak of the reflection spectrum near the wavelength of 640 nm.

3) The absorption peak near 670 nm originates from the strong absorption of chlorophyll.

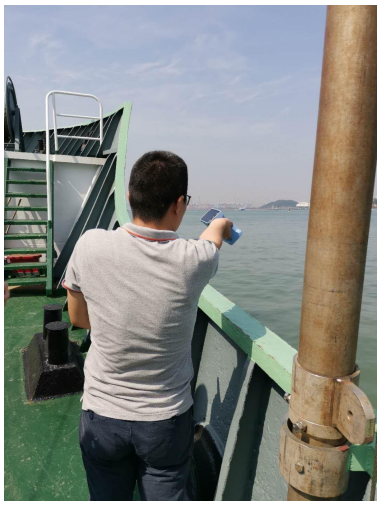
4) The second reflection peak of the red tide water spectrum has nothing to do with the presence and content of yellow substances and suspended sediments, and is attributed to the fluorescence characteristics of chlorophyll in this band.

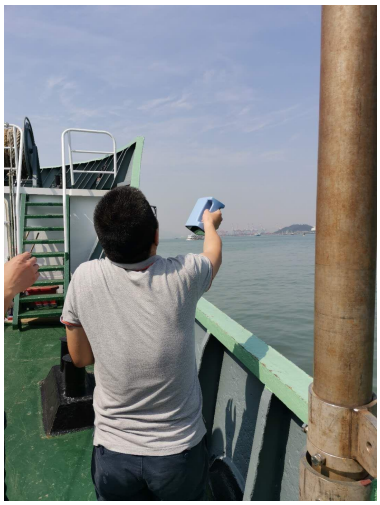
5) In the previous ocean optics research, it is generally believed that the fluorescence peak of chlorophyll is at 685nm. In recent years, experimental observations and spectral simulation studies have shown that as the concentration of chlorophyll a increases, the fluorescence peak intensity increases at the same time that the fluorescence peak The emission wavelength will also be red-shifted.

6) The small reflection peak of the spectral curve near 800 run is caused because pure water has a minimum value of absorption in this waveband.

ATP9100 handheld hyperspectral surface object spectrometer (field spectroradiometer) is the latest product of Optosky, with a wavelength range of 300~1100 nm, suitable for remote sensing measurement, crop monitoring, forest research to oceanographic research, etc. Application in various fields.

ATP9100 ground feature spectrometer has the characteristics of high cost performance, fast and accurate measurement, simple operation and convenient carrying. It is equipped with a powerful software package. In addition to reflectivity measurement, it can also be used for radiometry, photometry and colorimetry. . In April 2020, along with Xiamen University Jiageng in Sanduao waters of Ningde, the red tide was successfully monitored, and the direction of the red tide was judged based on the distribution maps monitored at different times, and the red tide warning was successfully carried out.





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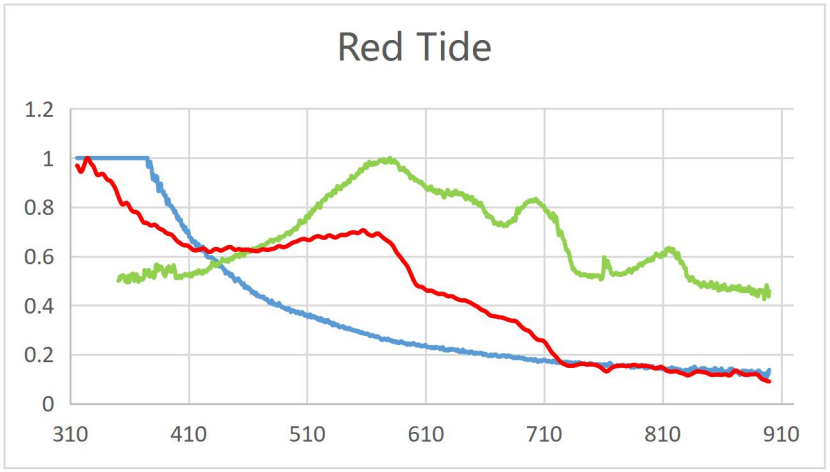
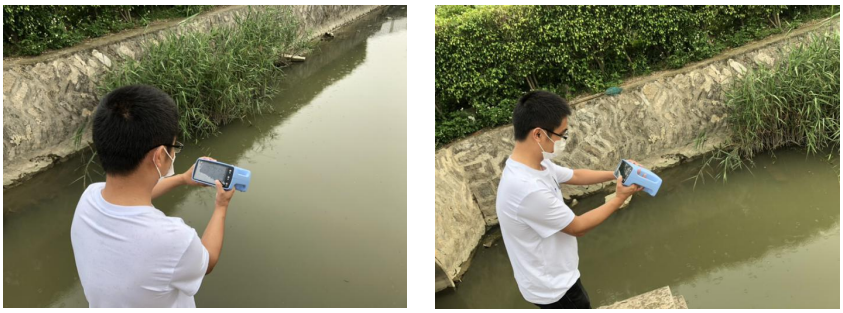



Fig 9 ATP9100 measure spectra of sky, lake and red tide



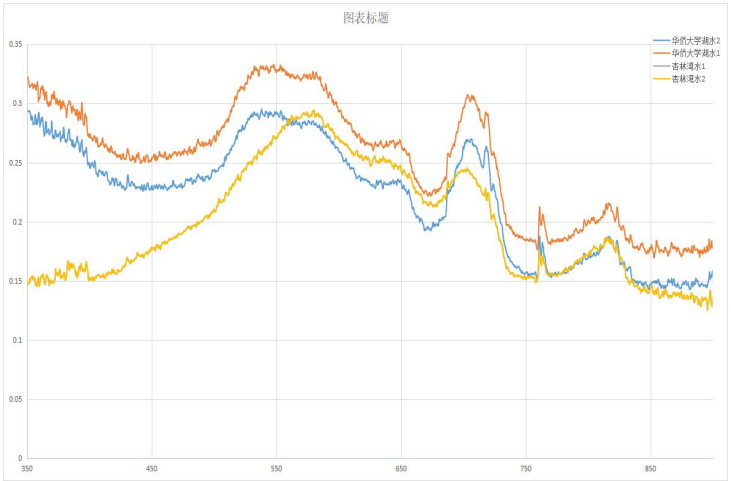



Fig 10 ATP9100 measure lake water color

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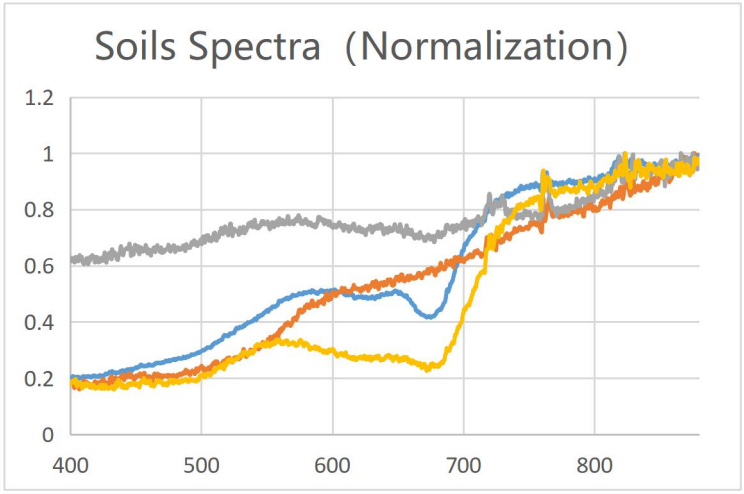


Fig 11 ATP9100 measure soils, blue is normal soil, red is red soil, grey is polluted soil, yellow is moss soil

## 4.2. FieldSpec applied to agriculture

Nitrogen is one of the main limiting factors for crop yield and economic benefits in arid regions. Nitrogen nutrition index (NNI) can effectively judge the abundance and deficiency of nitrogen nutrition in each growth period of crops. Using hyperspectral remote sensing technology to quickly and accurately diagnose the nitrogen nutrition status of drip-irrigated cotton fields, and then optimize the nitrogen supply in each growth period of the crop is a key measure to improve the nitrogen fertilizer use efficiency of the crop and improve the soil environment. With the maturity of hyperspectral technology, the application of hyperspectral technology and algorithms to retrieve crop leaf nitrogen content, chlorophyll concentration, leaf area, biomass and other physiological and biochemical parameters is currently the main method to study the nitrogen nutrition status of cotton. However, these parameters will vary due to differences in growth period, canopy density, plant morphology, climate and light. In addition, the above-mentioned parameters can only give a relatively rough understanding of the nutrient status of cotton, and cannot give a qualitative judgment on the degree of its nutrient deficiency and overnutrition. The vegetation index is highly sensitive to nitrogen and is less disturbed by other factors. Therefore, the change of the vegetation index can be used to predict the change of nitrogen, and the nitrogen nutrition index is more closely combined with the nitrogen content, so the nitrogen nutrition index is monitored The changes can accurately monitor the nitrogen nutrition status of the plants.



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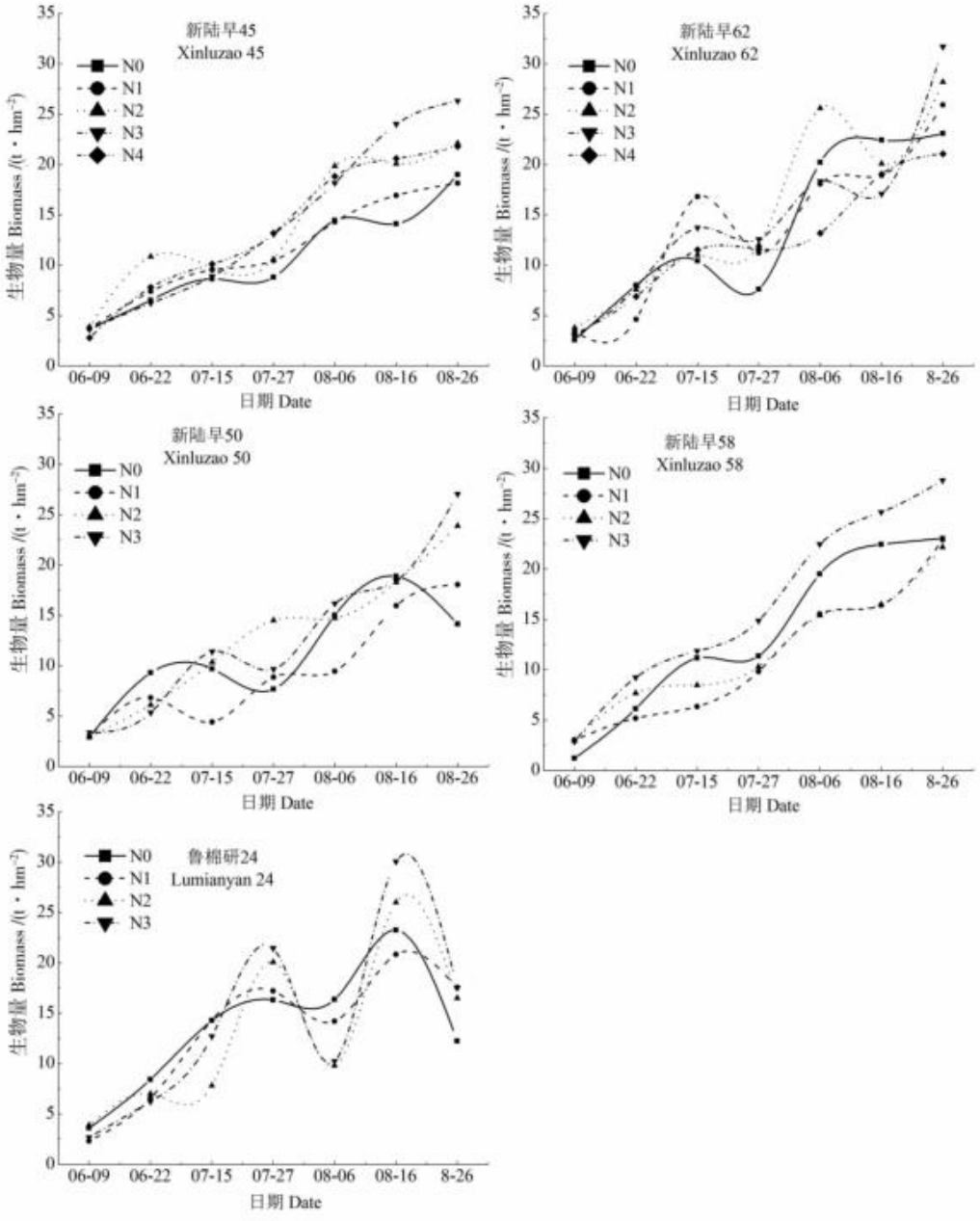


Fig 12 Cotton growth period biomass spectra




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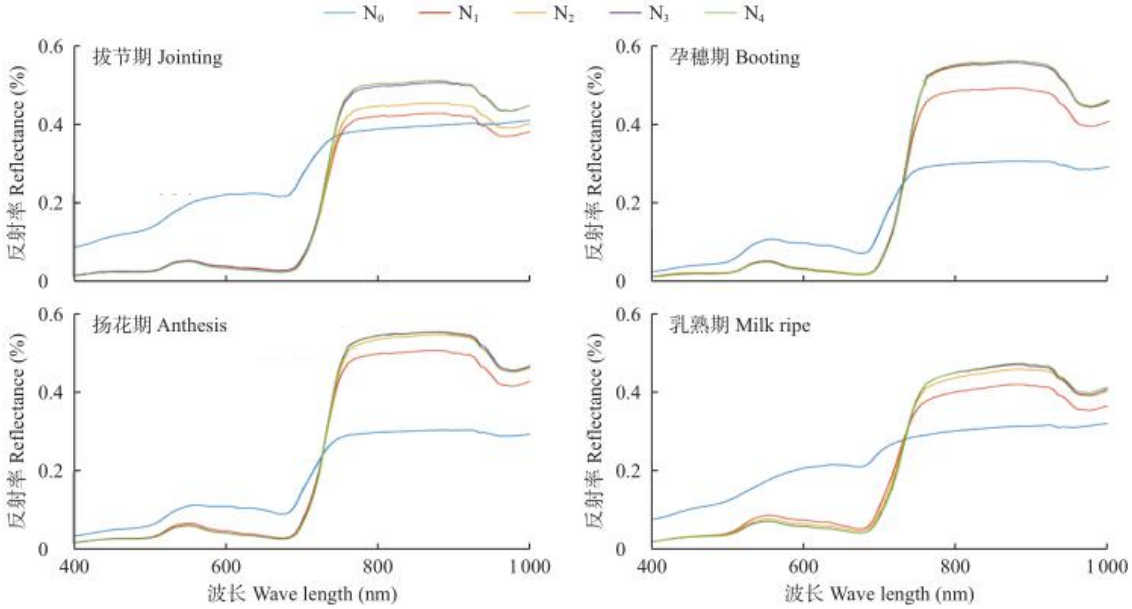


Fig 13 Winter wheat canopy reflectance spectra

Make full use of the advantages of reflectance spectrum data in monitoring physiological and biochemical parameters and the advantages of canopy SIF data in monitoring the photosynthetic physiological state of vegetation, and integrate the reflectance spectrum data with canopy SIF data to invert the incidence of wheat stripe rust. Through the comparative analysis of the experimental data, it is concluded that the accuracy of the monitoring model for wheat stripe rust constructed by synergistic reflectance spectral data and canopy SIF data is higher than that of the monitoring model constructed by reflectance spectral data.

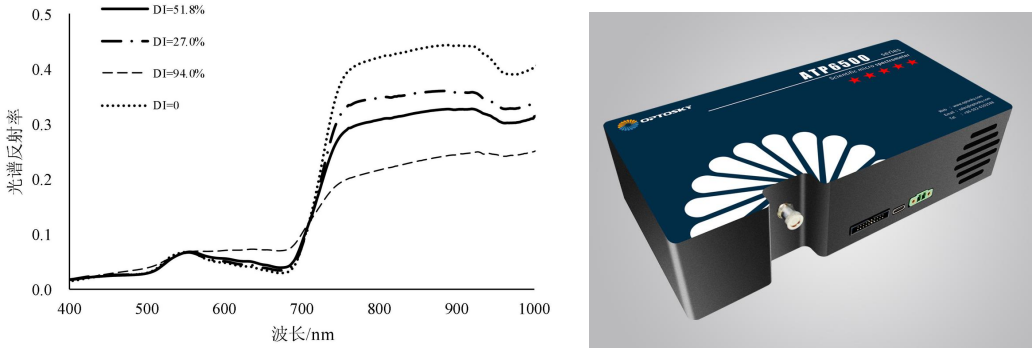


Fig 14 The original curve of the canopy spectrum of different wheat stalk disease severity, combined with the reflectance spectrum data and the canopy SIF data, can improve the monitoring accuracy of the wheat stalk disease severity. The right is SIF detector developed by OPTOSKY

# 5. FieldSpec Series Model




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Fig 15 FieldSpec & Hyperspectral Series


Fig 16 FieldSpec Models Guide

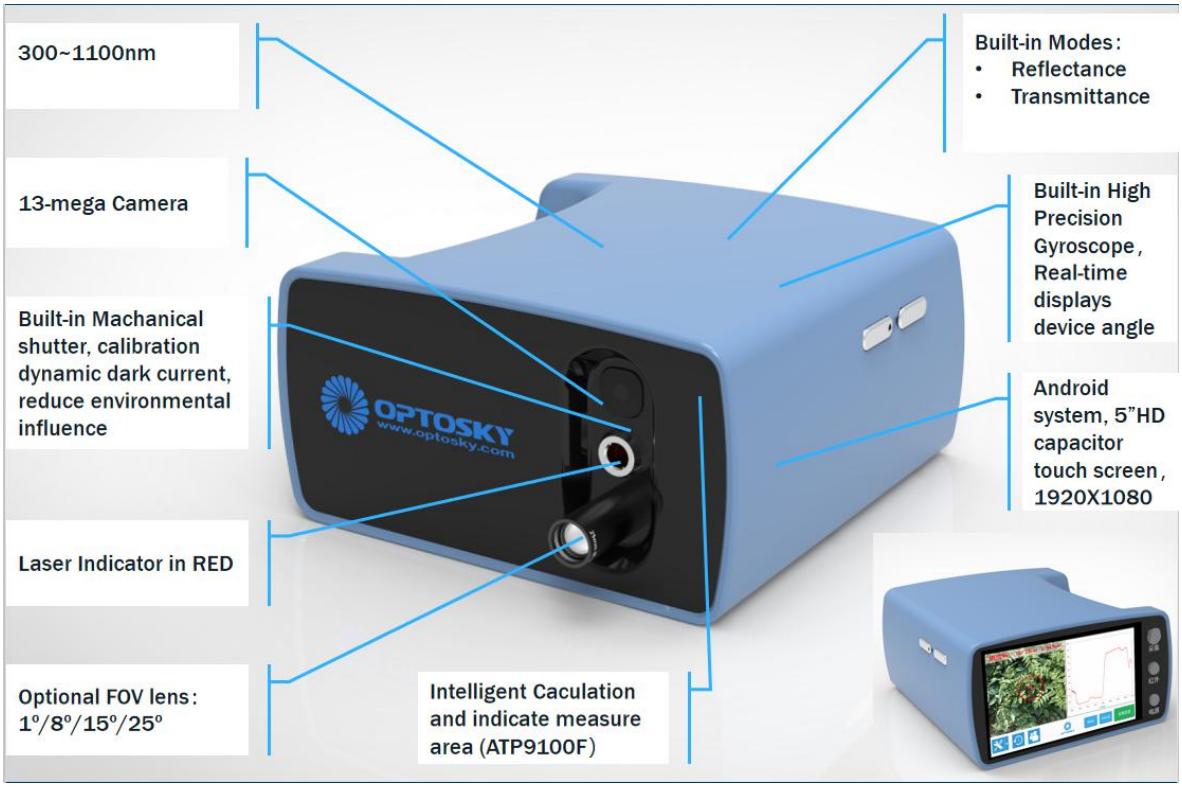


Fig 17 ATP9100 & ATP9100F Introduction




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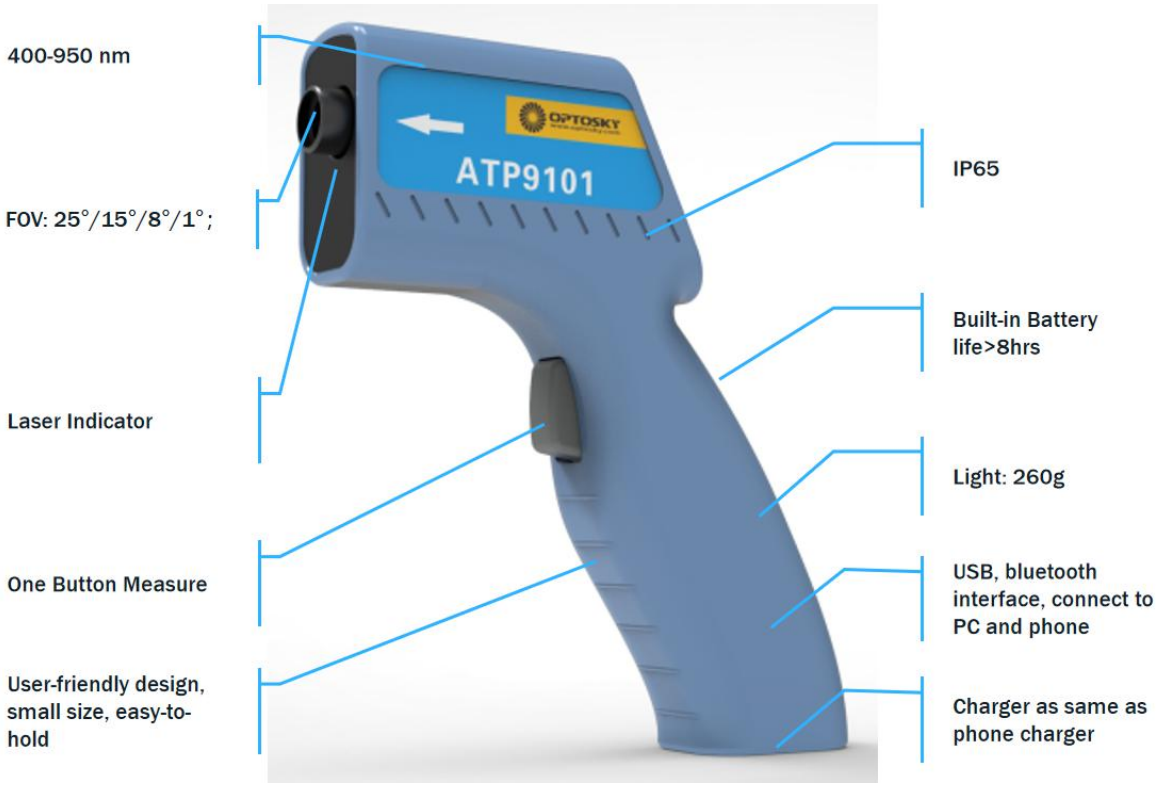


Fig 18 ATP9101 introduction

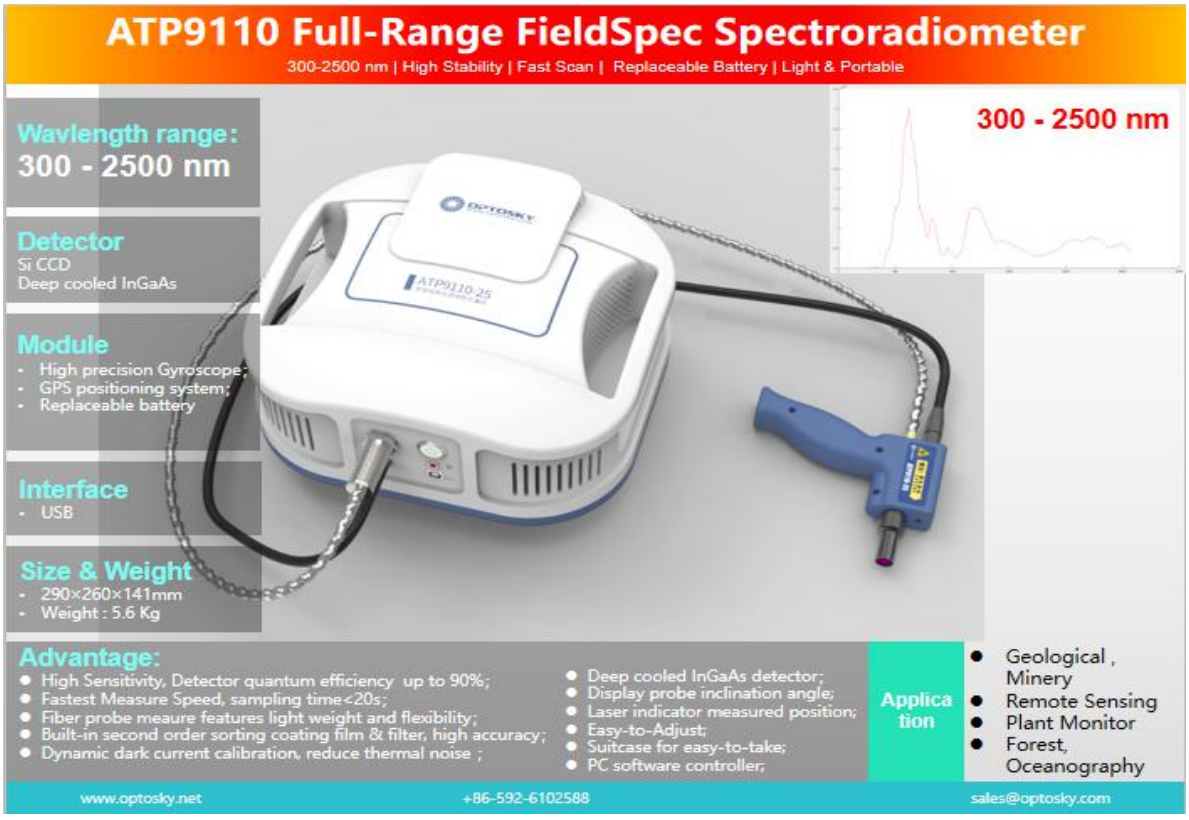


Fig 19 ATP9110 Introduction




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# 1. Company Profile

Optosky company has been providing first-class spectroscopy solution with 20 year, with the headquarter covers a area of 2500 square meter with 50 engineers in Xiamen city where held the international 9th BRICK summit in 2017. Another R&D research centers locates in Wuhu city with 30 engineers covering an area of 2035 square meters.

The company founder & CEO Dr.Hongfei,Liu received Doctor degree in Chinese Academic of Science and postdoctoral degree in Xiamen University, by cooperating with two top Universities' spectroscopy technology to integrate into Optosky company aiming at developing global leading spectroscopy solution provider.

The company technology bases on Optomechatronics, Spectroscopy Analysis, Process Weak Optical and Electrical Signals, Cloud Computing, and have been developed wide products line of Raman spectroscopy products, micro spectrometer, hyperspectral imager, field spectroradiometer, fluorescence spectroscopy, LIBS etc. Driven by advanced technologies and products, Optosky brand has been well-known to customers all over the world.

Optosky company base on technology innovation, market-driven innovation, customer first, provides first-class products and services, and one-stop solutions to many fortune 500 companies in many industries. The company received praise from leading industrial companies, as well as many innovative intellectual properties, software copyright, qualification certification, and winner awards over hundred numbers.The company has received over 26 IPs, 35 innovative patents, and 32 copy rights.

Optosky receives top class A introduced the high-tech company to international Xiamen city, the national high-tech and new innovative technology company award. The founder Dr.Hongfei Liu receives the innovation talent award by the ministry of science and technology.

The company is currently conducting the exclusive project of major industrialization national oceanic administration with a total fund of five million US dollars. Optosky company in charge of drafting 7 Chinese National Standards (GB) , including VNIR and SWNIR Field Spectroradiometer, Hazmat detector based on Raman spectroscopy, Buoy-type Monitor eco-environment, water quality monitor in the unmanned vessel, online water quality monitor by spectroscopy, UV-absorbent measure fabrics etc.

Optosky company received ISO9001:2015 certification, CE certification, Police Administration Certification, FDA approval compliant, IQOQPQ compliant.




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Figure 1 Optosky (Xiamen) Photonics Inc. Company Headquarter

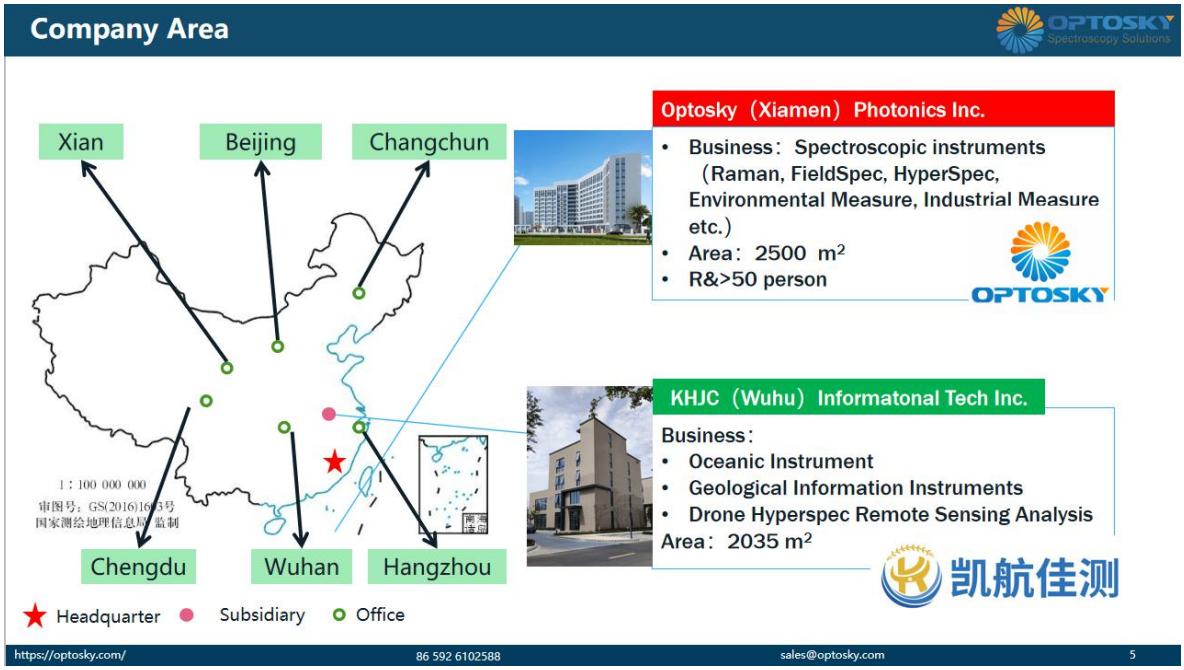


Figure 2 Optosky Company Area




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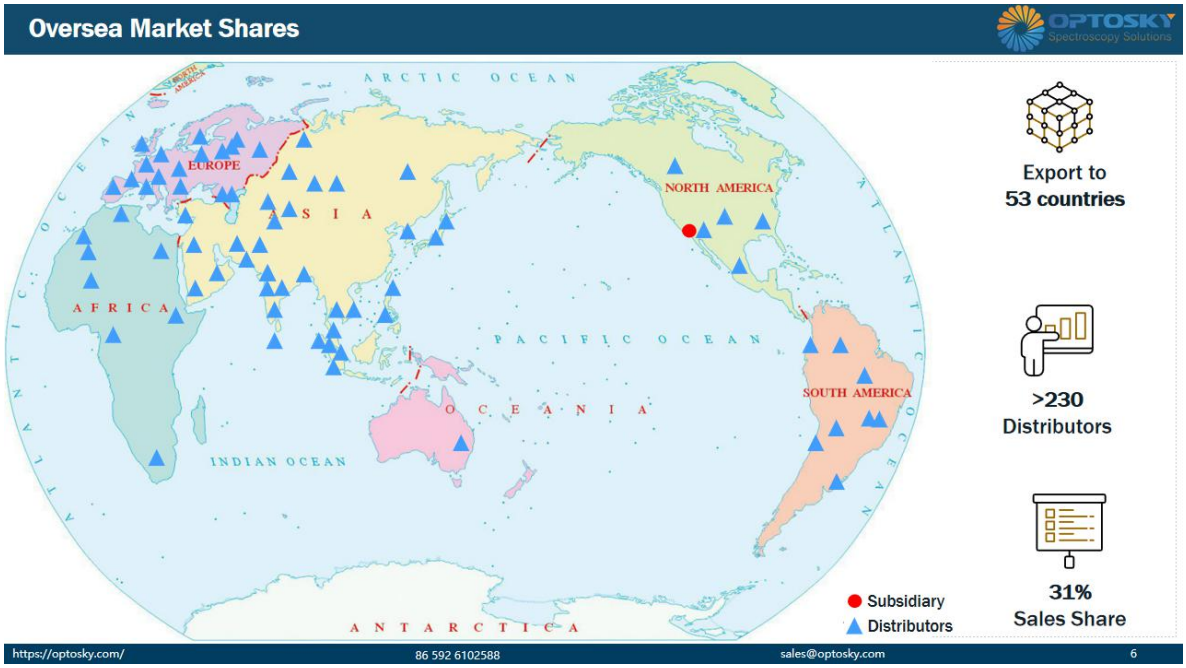


Figure 3 Oversea Market Shares


Figure 4 Optosky Chair and Draft National Standards Lists.




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Figure 5 Qualification

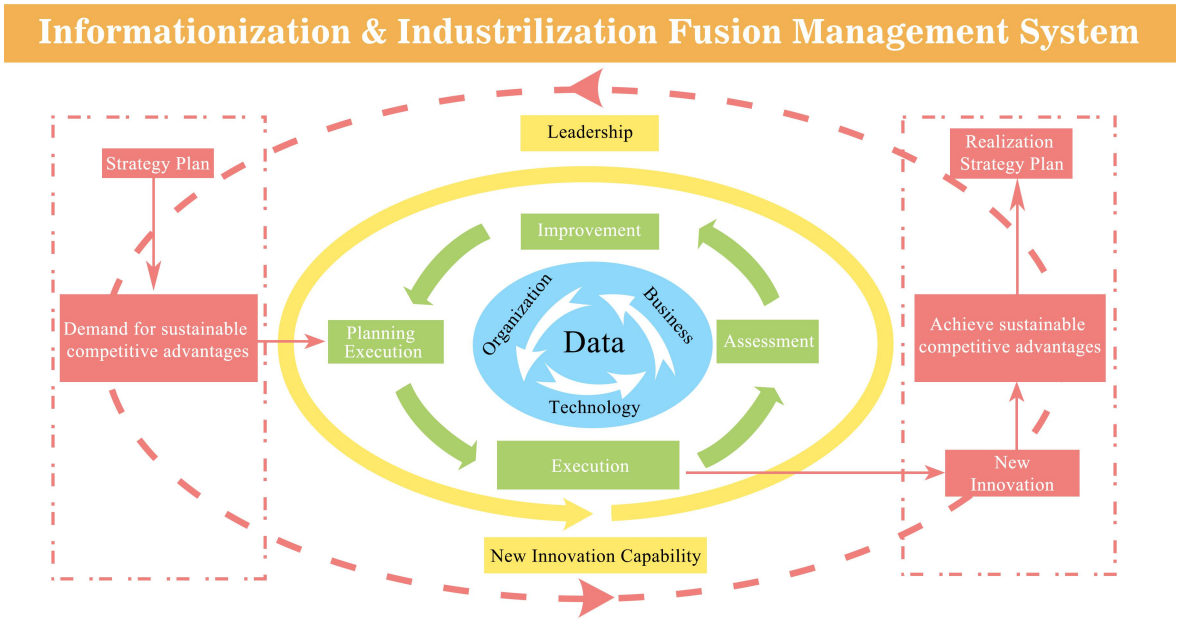


Figure 6 GB/T 23001_Informationization & Industrilization Fusion Management System



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Figure 7 Optosky's Co-founder_Dr. Hongfei Liu

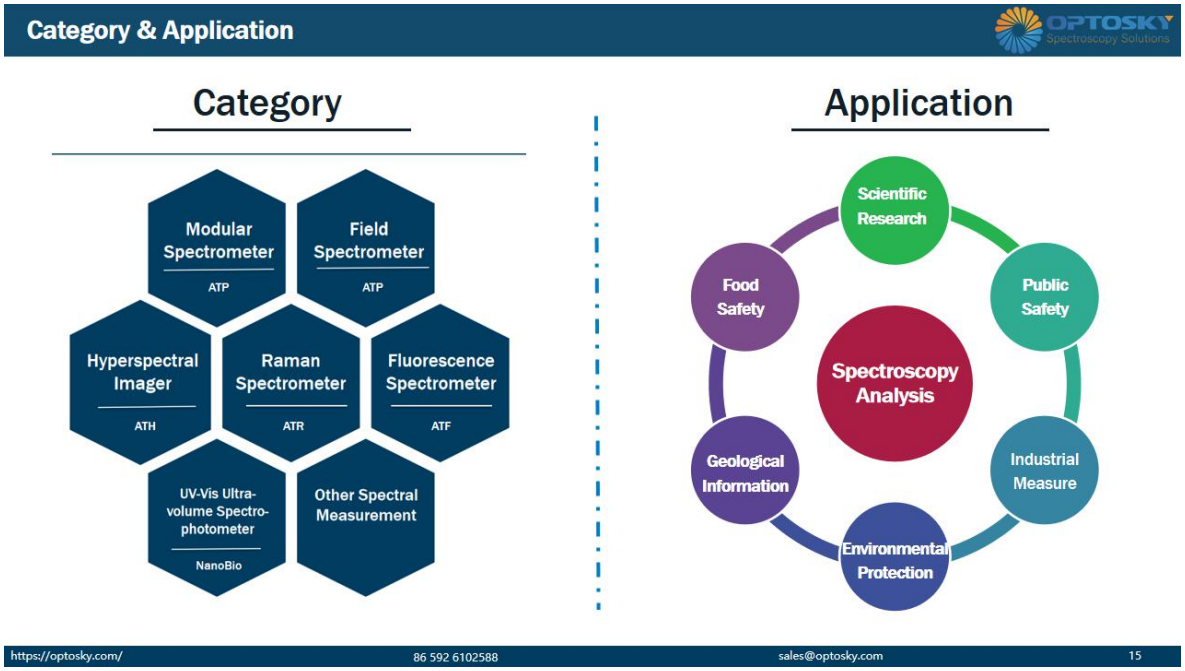


Figure 8 Category & Application




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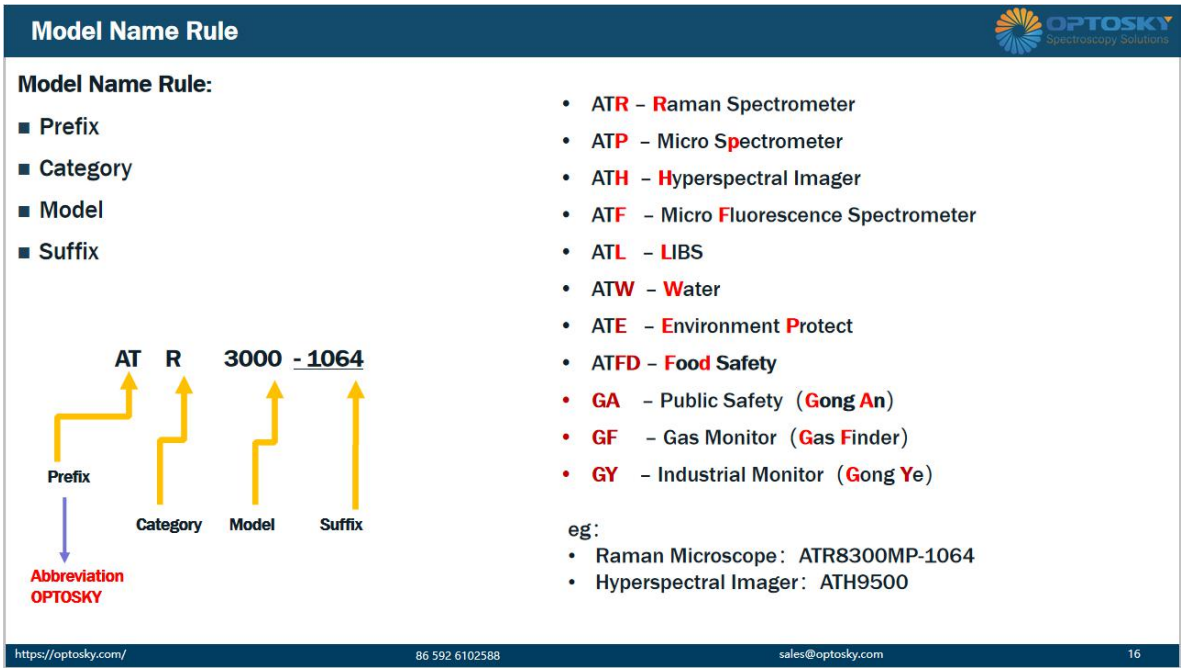


Figure 9 Model Name Rule




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