A compact and cost-effective alternative to bulky and expensive test equipment has been the dream of many an engineer. Elite RF tasked its engineers to develop a multi-purpose RF test equipment product that would be a workhorse for the RF engineer. The goals were to be as versatile as possible, have a small footprint — yet remain affordable compared to the typical RF test equipment on the market. The S-Series product line is the result of that development.

The SPA1241 incorporates a…
12.4 GHz Spectrum Analyzer
12.4 GHz RF Tracking Generator
13.6 GHz Dual Signal Generator
18 GHz RF Power Amplifier
200 MHz & Channel Scope
12.5 GHz RF Power Meter
All in one piece of equipment!

Note 1: Scalar Network Analyzer: The spectrum analyzer and tracking generator can be combined to create a scalar network analyzer.

Note 2: A second power amplifier may be added to the SPA models to fit your custom application, frequency ranges up to 18 GHz, power levels up to 50 watts.

The S-Series product line comes with a 2-year warranty and is proudly made in the USA.
The SPA1241 incorporates a...  
12.4 GHz Spectrum Analyzer  
12.4 GHz RF Tracking Generator  
13.6 GHz Dual Signal Generator  
18 GHz RF Power Amplifier  
200 MHz & Channel Scope  
12.5 GHz RF Power Meter  
all in one piece of equipment!

SPA Models  
SPA1241  
SPA441  
SPA1241  
SPA441  

Model SPA1241 Includes:  
• 110 kHz - 4.4 GHz Spectrum Analyzer  
• 109 kHz - 4.4 GHz RF Tracking Generator  
• 59 MHz - 1.6 GHz Dual Signal Generator  
• 200 MHz & Channel Scope

Model SPA441 Includes:  
• 110 kHz - 4.4 GHz Spectrum Analyzer  
• 109 kHz - 4.4 GHz RF Tracking Generator  
• 54 MHz - 1.6 GHz Dual Signal Generator  
• 200 MHz & Channel Scope  
• 940 MHz RF Power Amplifier  
• 200 MHz & Channel Scope  
• 94 MHz RF Power Meter

Model SA1241 Includes:  
• 100 kHz - 12.4 GHz Spectrum Analyzer  
• 100 kHz - 12.4 GHz RF Tracking Generator  
• 54 MHz - 1.5 GHz Dual Signal Generator  
• 200 MHz & Channel Scope

Model SA1241 Includes:  
• 100 kHz - 12.4 GHz Spectrum Analyzer  
• 505 MHz - 12.4 GHz RF Tracking Generator  
• 54 MHz - 1.5 GHz Dual Signal Generator  
• 200 MHz & Channel Scope

S-Series Options  
• 6 GHz Real-Time Spectrum Analyzer  
• 20 GHz Real-Time Spectrum Analyzer  
• 6 GHz low harmonic signal generator  
• 8 GHz true RMS power sensor  
• 8 GHz peak and average power sensor  
• 20 GHz peak and average power sensor  
• 50 MHz - 6 GHz 10 watt class A-B power amp  
• 20 MHz - 1 GHz 20 watt class A power amp  
• 5 MHz - 2.7 GHz 10 watts class A/B power amp  
• 8 GHz - 12 GHz 10 watt class A power amp  
• RF Power Meter  
• 6 GHz - 10 GHz 2 watt class A power amp

Purchase, Lease and Rental Options Available

Note 1: Scalar Network Analyzer: The spectrum analyzer and tracking generator can be combined to create a scalar network analyzer.

Note 2: A second power amplifier may be added to the SPA models to fit your custom application, frequency range up to 18 GHz, power levels up to 50 watts.

The S-Series product line comes with a 2-year warranty and is proudly made in the USA.

Tired of looking at small screens?  
The S-Series comes with a 7” Front Panel Display.

Independent control of each RF system allows for maximum test flexibility and the system can be connected to a larger monitor for viewing multiple windows at the same time.

A compact and cost-effective alternative to bulky and expensive test equipment has been the dream of many an engineer. Elite RF tasked its engineers to develop a multi-purpose RF test equipment product that would be a workhorse for the RF engineer. The goals were to be as versatile as possible, have a small footprint — yet remain affordable compared to the typical RF test equipment on the market. The S-Series product line is the result of that development.

The new & innovative S-Series Multi-Purpose RF Test System. It is a flexible alternative to expensive & bulky RF test equipment and can be used for R&D characterization on the bench, EMC assessment and automated production test in the factory. The RF equipment built into the S-Series can be used stand-alone or with other external equipment.

The SPA241 additional features, include:  
• 7” Front Panel Display  
• USB Ports  
• HDMI Output  
• Display Remote Control  
• LAN  
• Internet Access  
• RF Power Relay  
• Wireless Keyboard/Mouse  
• RF Power Attenuator

The SPA241 incorporates a...  
12.5 GHz RF Power Meter  
200 MHz 4 Channel Scope  
10 MHz - 12.5 GHz RF Power Meter  
all in one, cost-effective piece of equipment!

The S-Series product comes with a 2-year warranty and is proudly made in the USA.
Power Amplifiers: Power amplifier testing uses the signal generator, spectrum analyzer and power meter. Figure 4 and Figure 5 show a typical setup. The system software, built on a general-purpose PC platform running Windows 10, allows independent control of each measurement. Each instrument has a user interface that runs on the PC and can work with other measurement systems, such as LabVIEW. Figure 3 shows the system block diagram for one of the key instruments, the DVB/RF test environment. The LabVIEW environment allows the user to run the power amplifier with a software trigger, external, keyboard and mouse. Power for the instruments is supplied through a power supply board. The power supplies are compatible with 100 to 240 VAC power lines.

Setup and Calibration of an Amplifier: In this example, the S-Series is used to calibrate the power amplifier (shown), which covers 500 to 2500 MHz and provides 25 W output power. The S-Series power amplifier can be calibrated using the built-in functions of the S-Series. To calibrate the power and detected voltage across the frequency band, the test system uses the signal generator and power meter with a custom written program to stimulate the amplifier. The power meter measures the output power and gain, and the spectrum analyzer measures the harmonic and spurious signal levels.

Scalar Network Analysis: The spectrum analyzer and tracking generator work with a scalar network analyzer to measure the insertion loss of a filter, attenuator or amplifier (see Figure 3). With a directional coupler, the test setup also measures return loss.

Phase Noise: In the phase noise measurement mode, the spectrum analyzer displays the single-ended phase noise on a logarithmically-scaled spectrum plot for comparison.

Digital Demodulation: The S-Series also has the capability to demodulate a digitally-modulated RF signal by using the spectrum analyzer and a digital signal processor (DSP). The DSP performs several tasks, including spectral analysis and filtering, signal conditioning and format conversion. The DSP also performs advanced mathematical operations, such as modulation detection and demodulation. Figure 4 shows the spectrum analyzer and tracking generator. The system software demodulates the signal, which is presented on a waterfall display. The waterfall display shows the demodulated signal over time, allowing the user to identify any frequency shifts or changes in the signal. The waterfall display also allows the user to zoom in on specific areas of the signal.

True RMS Power Sensor

Specifications:
- Frequency: 50 Hz to 4000 Hz
- Power Range: 0.1 to 1000 W
- Resolution: 0.01 W
- Accuracy: ±0.5% of reading

True RMS detection enables measuring CRF, modulated RF signals, ultrasound signals.

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Range</td>
<td>0.1 to 1000 W</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.01 W</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.5% of reading</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>50 Hz to 4000 Hz</td>
</tr>
<tr>
<td>Power Range</td>
<td>0.1 to 1000 W</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.01 W</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.5% of reading</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Range</td>
<td>0.1 to 1000 W</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.01 W</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.5% of reading</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>50 Hz to 4000 Hz</td>
</tr>
<tr>
<td>Power Range</td>
<td>0.1 to 1000 W</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.01 W</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±0.5% of reading</td>
</tr>
</tbody>
</table>
Power Amplifiers: Power amplifier testing uses the signal generator, spectrum analyzers and power meters to power the amplifier. See Figure 1. The measurement setup only repeats the S-Series product and a power supply and externally powered amplifier being tested. In this example, the harmonic performance of the amplifier, which is pulling out full 10 to 15 dBm, is measured with the spectrum analyzer. While all the measurement windows are open and test on the external equipment, DLMS can be configured to show only one of the instruments, such as the spectrum analyzer for a closer view of the amplifier’s harmonics.

Setup and Calibration of an Amplifier: In this example, the S-Series uses a calibrated amplifier. The RF power amplifier (above), which covers 500 to 2500 MHz and provides 25 W output power. The M-Series power amplifier can be calibrated using the built-in functions of the Spectrum. To calibrate the power and detected voltage across the frequency band, the test equipment uses the signal generator and power meter with a custom written program to store the data points in a look-up table in the power meter’s internal memory. The RF switching relay routes the RF output of the power meter to the external amplifier. The power meter measures the output power and gain, and the spectrum analyzer measures the harmonic and spurious signal levels.

Scalar Network Analysis: The spectrum analyzer and tracking generator are used in a scalar network analyzer. To measure the insertion loss of a filter, attenuator or amplifier (see Figure 3), a vector network analyzer, the test setup also measures return loss.

Phase Noise: In the phase noise measurement mode, the spectrum analyzer displays the single-tone phase noise on a logarithmically-scaled spectrum using a phase noise analyzer. The phase noise is characterized over the frequency range. The test equipment uses the signal generator and power meter with a custom written program to store the data points in a look-up table in the power meter’s internal memory. The RF switching relay routes the RF output of the power meter to the external amplifier. The power meter measures the output power and gain, and the spectrum analyzer measures the harmonic and spurious signal levels.

Digital Demodulation: The S-Series also has the capability to demodulate a digitally-modulated RF signal by using the spectrum analyzer. The digital demodulator module (DAQ) is an option. The digital demodulator allows for demodulation of digital modulation schemes such as ASK, PSK, PSK, QPSK, DPSK, BPSK, DQPSK, D8PSK, π/4 DQPSK, OSK, 8PSK, 8PSK, D8PSK, π/4 DQPSK, 16-QAM.

Four Channel Digital Oscilloscope: The four-channel digital oscilloscope is used in a scalar network analyzer. To measure the insertion loss of a filter, attenuator or amplifier (see Figure 3), a vector network analyzer, the test setup also measures return loss.

True RMS Power Sensing Specifications: The four-channel digital oscilloscope is used in a scalar network analyzer. To measure the insertion loss of a filter, attenuator or amplifier (see Figure 3), a vector network analyzer, the test setup also measures return loss.
The S-Series is a general-purpose, all-inclusive RF test platform running Windows 10, allowing independent control of each instrument display and an HDMI connector on the rear, to connect an external wireless keyboard and mouse, which are provided with the connectors, except for the oscilloscope, which is accessed through a GUI.

The S-Series can be used stand-alone or with other external instruments, providing a complete solution for RF test needs.

**Figure 5**

**Testing Receiver (Typical after 30 min warm-up)**

- **Frequency:** 500 MHz to 4.2 GHz
- **Dynamic Range:** -55 dBm to +20 dBm
- **Frequency Stability:** ±1.5 ppm (100 kHz to 6 GHz)
- **Absolute Accuracy:** ±2.5 dB (6 GHz to 12.4 GHz)
- **±1.5 dB (100 kHz to 6 GHz)**
- **Amplifier 1**
  - **Gain:** 27 dB maximum
  - **Input Impedance:** 50 Ω
  - **Input Power:** ±3.5V Max.
  - **Time Base Precision:** ±0.10%
  - **Bandwidth:** 2K~200 MHz adjustable
  - **DC~25 MHz**
  - **Waveform Frequency:** 25 MHz to 250 MHz
  - **Bandwidth:** 200mV~1000V/div @ x100 probe
  - **2ns/div-1000s/div (1-2-4 sequences)**
  - **Input Impedance:** 1MΩ
  - **Input Power:** 0 to 20 dBm
  - **Waveform Frequency:** 25 MHz to 250 MHz
  - **Bandwidth:** 200mV~1000V/div @ x100 probe
  - **2ns/div-1000s/div (1-2-4 sequences)**
  - **Input Impedance:** 1MΩ
  - **Input Power:** 0 to 20 dBm

**Four Channel Digital Oscilloscope**

- **Generator Mode**
  - **Duty Cycle, Arbitrary Waveform**
  - **Positive Width, Negative Width,**
  - **Amplitude steps:** 100mV ~ 2V/div
  - **Time Base:** 250µs to 200s (1-2-4 sequences)
  - **Input Impedance:** 50 Ω
  - **Bandwidth:** 200mV~1000V/div @ x100 probe
  - **2ns/div-1000s/div (1-2-4 sequences)**
  - **Input Impedance:** 1MΩ
  - **Input Power:** 0 to 20 dBm
  - **Waveform Frequency:** 25 MHz to 250 MHz
  - **Bandwidth:** 200mV~1000V/div @ x100 probe
  - **2ns/div-1000s/div (1-2-4 sequences)**
  - **Input Impedance:** 1MΩ
  - **Input Power:** 0 to 20 dBm

**True RMS Power Sensor**

- **Frequency:** 10 MHz to 12.5 GHz
- **Bandwidth:** 200MHz
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
- **Reference Power:** ±100mV
- **Gain:** 27 dB
- **Input Impedance:** 50 Ω
- **Input Power:** ±100V Max.
A compact and cost-effective alternative to bulky and expensive test equipment has been the dream of many an engineer. Elite RF tasked its engineers to develop a multi-purpose RF test equipment product that would be a workhorse for the RF engineer. The goals were to be as versatile as possible, have a small footprint — yet remain affordable compared to the typical RF test equipment on the market. The S-Series product line is the result of that development.

The new & innovative S-Series Multi-Purpose RF Test System. It is a flexible alternative to expensive & bulky RF test equipment and can be used for R&D characterization on the bench, EMC assessment and automated production test in the factory. The RF equipment built into the S-Series can be used stand-alone or with other external equipment.

The SPA 1241 additional features, include:

- 7" Front Panel Display
- USB Ports
- HDMI Output
- Display Remote Control
- LAN
- Internet Access
- RF Power Reliability
- Wireless Keyboard/Mouse
- RF Power Attenuator

Independent control of each RF system allows for maximum test flexibility and the system can be connected to a larger monitor for viewing multiple windows at the same time.

Model SPA441 includes:

- 100 kHz - 12.4 GHz Spectrum Analyzer
- 100 kHz - 12.4 GHz RF Tracking Generator
- 54 MHz - 13.6 GHz Dual Signal Generator
- 20 MHz - 1 GHz 1 watt Power Amplifier
- 200 MHz 4 Channel Scope
- 10 MHz - 12.5 GHz RF Power Meter

S-Series options:

- 6 GHz Real-Time Spectrum Analyzer
- 20 GHz Real-Time Spectrum Analyzer
- 6 GHz low harmonic signal generator
- 6 GHz peak and average power sensor
- 6 GHz peak and average Power sensor
- 50 MHz - 6 GHz 10 watt class AB power amp
- 20 MHz - 1 GHz 20 watt class A power amp
- 20 MHz - 2 GHz 10 watts class A power amp
- 50 MHz - 12 GHz 10 watt class AB power amp
- 20 MHz - 18 GHz 2 watt class A power amp
- 50 MHz - 18GHz 2 watt class A power amp

Custom configurations available upon request.

The SPA1241 incorporates a...

- 12.4 GHz Spectrum Analyzer
- 12.4 GHz RF Tracking Generator
- 13.6 GHz Dual Signal Generator
- 18 GHz RF Power Amplifier
- 200 MHz 4 Channel Scope
- 12.5 GHz RF Power Meter

All in one piece of equipment!

Note 1: Scalar Network Analysis: The spectrum analyzer and tracking generator can be combined to create a scalar network analyzer.

Note 2: A second power amplifier may be added to the SPA models to fit your custom application, frequency ranges up to 18 GHz; power levels up to 50 watts.

Units starting at $19,995

Optional Power Amplifier R2 can be customized to your application. Purchase, Lease and Rental Options Available

Independent control of each RF system allows for maximum test flexibility and the system can be connected to a larger monitor for viewing multiple windows at the same time.