NO COMPROMISE PERFORMANCE IN THE
495/495P PORTABLE SPECTRUM ANALYZERS

495/495P
Portable Spectrum Analyzers

GPIB
IEEE-488

• Covers 100 Hz to 1.8 GHz With \(-130\) dBm Sensitivity and \(+1\) dB Frequency Response

• 10\(^{\circ}\) Marker and Center Frequency Accuracy, Built-In Signal Counter, 90 dB Dynamic Range

• Front Panel Execution of Downloaded Programs With the 495P

• Intelligent Markers With Signal Processing Functions

• Pushbutton Occupied Bandwidth and Noise Normalization Functions

• Switch Selectable 50 and 75 \(\Omega\) Impedances (Option 07) for IF, CATV and Local Area Network Applications

• HELP Mode Explains Front Panel Controls and Signal Processing Functions at the Touch of a Button

• Optional MATE/CIIIIL Compatibility

Lab Quality Performance Made Fully Portable and Easy to Use

The Tektronix 495 Spectrum Analyzer offers features essential for lab-grade measurements in a lightweight, portable package. Offering frequency coverage from 100 Hz to 1.8 GHz, with an impressive \(-130\) dBm sensitivity and advanced, intelligent markers with exclusive signal processing capabilities, the 495 is optimized for use in baseband through UHF measurements.

Macro Programming, 10\(^{\circ}\) Frequency Accuracy, Signal Counting, and System Clock Compatibility

Downloadable programming capability (495P only) lets you execute frequently used measurement routines from the spectrum analyzer's nonvolatile memory. An internal high stability reference (Option 05) provides 10\(^{\circ}\) marker or center frequency accuracy for added confidence in measurements. A built-in signal counter with 140 dB dynamic range means you can determine the exact frequency of marked signals only 10 Hz apart, or count the exact delta frequency between two marked signals, even with greatly differing amplitudes. With Option 05 you also have the flexibility of coupling to a system clock, using the instrument's external reference clock capacity.

Nonvolatile memory lets you store up to ten front panel settings and nine waveforms, simplifying setup and making field operation easier. A permanent record of CRT displays can be obtained at the push of a button, without a controller, using the direct plot capability.

Menu-Selected, Intelligent Markers and Signal Processing

New dynamic markers automatically update frequency and amplitude data with every sweep. In conjunction with the 495's powerful signal processing intelligence, you can use PULSE mode to mark the peak of a main lobe and peaks of side lobes at the push of a button. CW mode locates signals exhibiting CW character-
istics and ignores all other signals. SPUR mode marks signals that meet user-definable or automatic threshold criteria. Threshold criteria are available for all signal processing modes.

The 495 also offers hands-off convenience for measuring the bandwidths of filters, amplifiers and other networks. Simply enter the desired bandwidth point, select Bandwidth mode, and markers automatically update to display the new value.

To assist the new, nontechnical, or infrequent operator in using this sophisticated spectrum analyzer, with a minimum of training and supervision, the 495 includes a HELP mode. Contained in ROM, it offers descriptions of controls and functions in plain English.

Switch Selectable 50 and 75 Ω Impedances (Option 07) Add Versatility For applications such as CATV measurements, 75 Ω/dBV greatly simplifies spectrum analysis. You no longer need to manually convert dBm to dBm units or make measurement adjustments for external 50 to 75 Ω transformers. Option 07 also provides a 300 kHz resolution bandwidth filter optimized for VHF/UHF measurements.

Fully Automated Spectrum Analysis The 495P is the GPIB-programmable version of the 495. It simplifies programming and ensures measurement repeatability. You can operate the 495P under program control, change front-panel settings, read data from the CRT display, and send waveforms from internal digital storage memory to other GPIB devices. Tek's Standard Codes and Formats keep commands clear, consistent, and universally understood.

There are many other time-saving and accuracy-enhancing capabilities. See the summary of signal processing and marker functions on page 183 for a more complete idea of the 495 measurement benefits. Talk to your Tektronix Spectrum Analyzer Sales Engineer for complete details.

**CHARACTERISTICS**

The following characteristics apply after a 30-minute warm-up period unless otherwise noted.

**FREQUENCY RELATED**

**Frequency Range**—100 Hz to 1.8 GHz.

**Center and Marker Frequency Accuracy**—
- ±[20% D + (F x Ref. Freq. Error)] + 15 kHz with span/div 200 kHz (Phase locked);
- ±[20% D + (F x Ref. Freq. Error)] + 15 kHz with span/div >200 kHz (unlocked).

Where: D = Span/div or Resolution BW, whichever is greater.

F = Center or Marker Frequency.

**Reference Frequency Error (Internal)**—
- ±1 x 10^-8 per day; ±1 x 10^-9 in the first six months, ±1 x 10^-10 year thereafter; Accuracy 90 minutes after power up within 5 x 10^-9 of the frequency after 24 hours; Within 2 x 10^-9 over the temperature range of -15 to +55°C.

**Signal Counter Accuracy**—±[(F x Ref. Freq. Error) + 5 Hz + 1 LSD]

Where: F = Center, Marker, or Delta Marker Frequency

LSD = Least Significant Digit

**Counter Readout Resolution**—Select from 1 Hz to 100 MHz in decade steps.

**External Reference Input**—Frequency: 1, 2, 5, or 10 MHz with ±5 ppm stability. Power Range:
- -15 to +15 dBm.
- Waveshape: Sine wave, ECL, TTL. (Allowable Duty Cycle symmetry is 40 to 60%).
- Input Impedance: 50 Ω ac, 500 Ω dc; BNC panel BNC input.

**Delta Marker Frequency Accuracy**—±1% of Total Span.

**Frequency Drift (After 1-Hour Warm-Up)**—
- Span/div 200 kHz (Phase Locked): Drift rate ≤50 Hz/min. Correction will occur at the end of sweep times ≥5 s/div. (Drift rate is typically <20 Hz/min after 1 hour warm-up from 25°C storage). Span/div >200 kHz (unlocked); Drift rate <5 kHz/min (typically <25 kHz/min after 30 minute warm-up); ≤1 x 10^-8 over the temperature range of -15 to +55°C without Option 05.

**Frequency Readout Resolution**—1% of span/div to 1 Hz minimum.

**Residual FM**—≤5 Hz peak-to-peak in 20 ns, span/div ≤200 kHz (Phase locked); ≤7 kHz peak to peak in 20 ns, span/div >200 kHz (unlocked).

**Resolution Filters**—10 Hz to 1 MHz in decade steps and 3 MHz (6 dB bandwidth ±20%). Shape factor ≤7.5:1 except 10 Hz where 60 dB BW ≤150 Hz.

**Frequency Span/Division**—0 Hz (ZERO SPAN pushbutton or keypad data entry); 10 Hz to 100 MHz in a 1:2:5 sequence (via span/div knob: 10 Hz to 170 MHz (to two significant digits) via FREQUENCY or MARKER START/STOP, or keypad data entry; 180 MHz via power-up, RESET, or MAX SPAN pushbuttons; accuracy ±5% (±10% <50 Hz/div).

**Frequency Response**—±1.0 dB (measured with 10 dB RF attenuation).

**Zero Frequency Spur**—-24 dBm maximum measured into 50 Ω and open circuit with 0 dB RF attenuation; ±35 dBm typical.

**Power Line Related Sidebands**—≤-55 dBc for line frequencies from 47 to 440 Hz.
AMPLITUDE RELATED
See 490 Series Family Specifications on page 179 for additional amplitude related details.

Display Dynamic Range—90 dB Log mode; 8 divisions Linear mode.

Noise Sidebands

<table>
<thead>
<tr>
<th>dBC/Hz</th>
<th>Offset from Carrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>-80</td>
<td>300 Hz</td>
</tr>
<tr>
<td>-90</td>
<td>3 kHz</td>
</tr>
<tr>
<td>-105</td>
<td>30 kHz</td>
</tr>
<tr>
<td>-115</td>
<td>300 kHz</td>
</tr>
<tr>
<td>-125</td>
<td>3 MHz</td>
</tr>
</tbody>
</table>

Residual Responses—≤ -100 dBm with input terminated and 0 dB RF attenuation.

Harmonic Distortion—≤ -60 dBc for a −30 dBm CW signal with 0 dB RF attenuation in MIN DISTORTION mode.

Third Order Intermodulation Distortion—≤ -70 dBc for any two on-screen CW signals within any frequency span in MIN DISTORTION mode.

Sensitivity (Equivalent Input Noise)—

<table>
<thead>
<tr>
<th>Sensitivity dBM</th>
<th>Resolution Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>-81</td>
<td>10 Hz</td>
</tr>
<tr>
<td>-76</td>
<td>100 Hz</td>
</tr>
<tr>
<td>-66</td>
<td>1000 Hz</td>
</tr>
<tr>
<td>-56</td>
<td>10 kHz</td>
</tr>
<tr>
<td>-41</td>
<td>300 kHz</td>
</tr>
<tr>
<td>-36</td>
<td>1 MHz</td>
</tr>
<tr>
<td>-31</td>
<td>3 MHz</td>
</tr>
</tbody>
</table>

50 Ω RF Input—

-90 (dBM) 300 kHz

Input Impedance—75 Ω; VSWR 1.35:1 (17 dB RL) maximum, 5 to 800 MHz; VSWR 1.6:1 (13 dB RL) maximum, 800 to 1000 MHz; BNC female.

Maximum Input Level—With 0 dB Attenuation: +78 dBmV, 100 V maximum (dc + ac peak).

Calibrator (Cal Out)—+20 dBmV ±0.5 dB; 75 Ω impedance nominal.

Sensitivity (Equivalent Input Noise)—

75 Ω Input (5 to 1000 MHz)

<table>
<thead>
<tr>
<th>Sensitivity (dBMV)</th>
<th>Resolution Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>-50</td>
<td>10 kHz</td>
</tr>
<tr>
<td>-60</td>
<td>100 Hz</td>
</tr>
<tr>
<td>-70</td>
<td>1000 Hz</td>
</tr>
<tr>
<td>-80</td>
<td>10 kHz</td>
</tr>
<tr>
<td>-90</td>
<td>300 kHz</td>
</tr>
</tbody>
</table>

INPUT SIGNAL

RF Input—Type “N” female, 50 Ω nominal impedance.

VSWR—1.3:1 maximum, 1.2:1 typical, with 10 dB or more RF attenuation; 2:1 maximum, 1.9:1 typical, with 0 dB attenuation.

Maximum Safe Input (0 dB RF Attenuation)—30 dBm (1 W) continuous, 75 W peak, 1 sec pulse width, 0.001 duty, 0 V dc.

1 dB Gain Compression—10 dBm with 0 dB RF attenuation in MIN NOISE; 20 dBm with 0 dB RF attenuation in MIN DISTORTION; No gain compression can be observed on screen.

LO Emissions—≤ -70 dBm with 0 dB RF attenuation.

CHARACTERISTICS

50/75 Ω OPTION 07
75 Ω INPUT RELATED

Provides 75 Ω input and dBmV calibration in addition to the normal 50 Ω input and dBm calibration. The 100 kHz resolution filter is replaced by 300 kHz to optimize the instrument for broadcast and CATV uses.

Center Frequency Range—1 to 1000 MHz.

Frequency Response—±2.0 dB from 5 to 1000 MHz; Typical response for the 1 to 5 MHz frequency range is <3 dB down from the 5 MHz response.

Reference Level Range—68 dBmV to +79 dBmV (+80 dBmV is achievable in MIN NOISE mode and +90 dBmV in Reduced Gain mode).

INTERNATIONAL POWER PLUG OPTIONS

Option A1—Universal Euro 220 V, 50 Hz.
Option A2—UK 240 V, 50 Hz.
Option A3—Australia 240 V, 50 Hz.
Option A4—North American 240 V, 60 Hz.
Option A5—Switzerland 220 V, 50 Hz.

WARRANTY PLUS SERVICE PLANS

See Service section.

Option M1—2 Calibrations.

(495) + $1,735
(495P) + $1,810

Option M2—2 Years Service.

(495) + $2,875
(495P) + $3,015

Option M3—2 Years Service and 4 Calibrations.

(495) + $3,470
(495P) + $3,620

OPTIONAL ACCESSORIES

TR 503 Tracking Generator—For more information see page 201. $7,080
75 to 50 Ω Power Splitter—Order 067-1232-00. $250
75 to 50 Ω Minimum Loss Attenuator—Order 011-0112-00. $80
DC Block N to N—Order 015-0590-00. $250
P6201 FET Probe to 900 MHz—Order 015-0659-00. $1,250
1405 TV Sideband Adapter—525/60 Markers. See page 201. $5,780
TV Trigger Synchronizer—Order 015-0261-01. $850
(Round) Order 016-0658-00. $795
(Self) Order 016-0659-00. $130
Rear Panel Protective Cover—Order 337-3274-00. $5
Lab Cart—K213. $625
Camera—C-5C. $495

Note: 400 Series spectrum analyzers are compatible with all Tektronix C-50 Series cameras. Battery pack 016-0270-02 is required for C-50, C-51, C-52, and C-53 cameras.

Porta& Keypad Adaptor—Order 016-0844-00. $630
* To order, contact your local Tektronix Sales Office.