T3VNA Data Sheet
3.2 GHz Vector Network Analyzer

Broad Measurement Range
Frequency Range: 9 kHz to 3.2 GHz

Tools for Improved Debugging

- Vector Network Analyzer, Spectrum Analyzer and Distance To Fault modes.
  - ✓ More application coverage from a single instrument.

- -161 dBm/Hz Displayed Average Noise Level (Typ.)
  - ✓ View and measure very small signals.

- -98 dBc/Hz @ 10 kHz Offset Phase Noise (1 GHz, Typ.)
  - ✓ Improved specification gives more accurate measurement results.

- Built-in Advanced Measurement capability (CHP, ACPR, OBW, CNR, TOI, etc)
  - ✓ Excellent capability across all applications and measurement modes for a better user results

- Built-in switchable pre-amplifier.
  - ✓ Integrated pre-amplifier allows higher sensitivity measurements.

- 10.1 inch (25.65 cm) color WVGA 1024 x 600 display.
  - ✓ Clear and flexible display aids ease of use.

- USB Device, USB Host and LAN support.
  - ✓ Remote control your measurements.

Key Specifications

Model	T3VNA3200
Vector Network Analyzer Frequency Range	100 kHz to 3.2 GHz
Spectrum Analyzer Frequency Range	9 kHz to 3.2 GHz
Resolution Bandwidth	1 Hz to 1 MHz
Displayed Average Noise Level	-161 dBm / Hz
Phase Noise	< -98 dBc / Hz
Total Amplitude Accuracy	< 0.7 dB

Teledyne Test Tools T3VNA3200 Vector Network Analyzers has a Vector Network Analysis frequency range from 100 kHz up to 3.2 GHz and Spectrum Analysis frequency range from 9 kHz up to 3.2 GHz. The small footprint and easy user interface is augmented by a high performance specification with many advanced measurement functions and capabilities.

The high performance Vector Network Analysis capability is enhanced further by the full featured Spectrum Analysis Capability and the Distance To Fault mode.

- High performance Vector Network Analysis capability from 100 kHz to 3.2 GHz

- Full Spectrum Analysis measurements from 9 kHz to 3.2 GHz

- Distance To Fault measurement to > 30 meters.

The Teledyne Test Tools T3VNA3200 Vector Network Analyzer offers comprehensive measurement capabilities supporting the user when conducting more complex measurements and make daily measurement tasks easier and faster.

Typical Applications

- Research Laboratory
- Development Laboratory
- Repair and Maintenance
- Calibration Laboratory
- Automatic Production Test
- General bench-top use

User-friendly Design

- 10.1 inch (25.65 cm) 1024*600 display
- Intuitive, easy to use menu system
- "Preset" and "Auto Tune" for quick set up
- Built-in front panel accessible help system
- File management (support for U-disc and local storage)
- Lightweight, small footprint, easy to transport

Features and Benefits

- Vector Network Analyzer Frequency Range from 100 kHz up to 3.2 GHz

- Spectrum Analyzer Frequency Range from 9 kHz up to 3.2 GHz

- -161 dBm/Hz Displayed Average Noise Level (Typ.)

- -98 dBc/Hz @ 10 kHz Offset Phase Noise (1 GHz, Typ.)

- Total Amplitude Accuracy < 0.7 dB

- 1 Hz Minimum Resolution Bandwidth (RBW)

- All-Digital IF Technology

- Standard Preamplifier

- Distance to fault capability using VNA time domain analysis

- Up to 3.2 GHz Tracking Generator Kit

- Built-in Advanced Measurement capability (CHP, ACPR, OBW, CNR, TOI, etc)

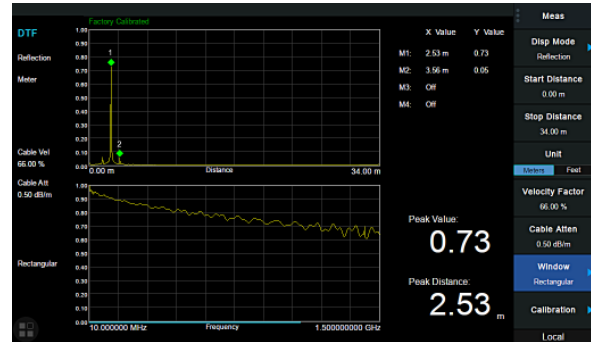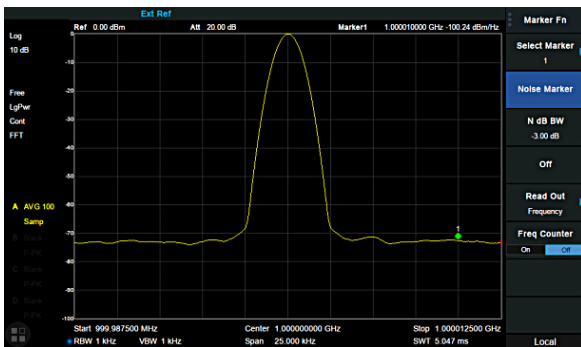- 10.1 Inch WVGA (1024 x 600) Display

Vector Network Analyzer Mode with multi-format overlay display
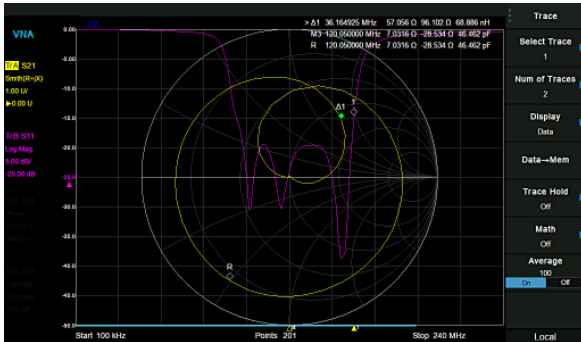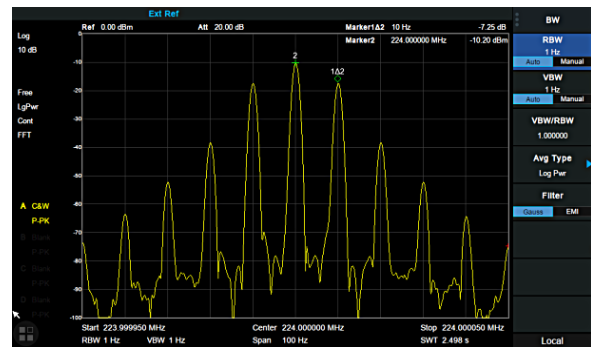

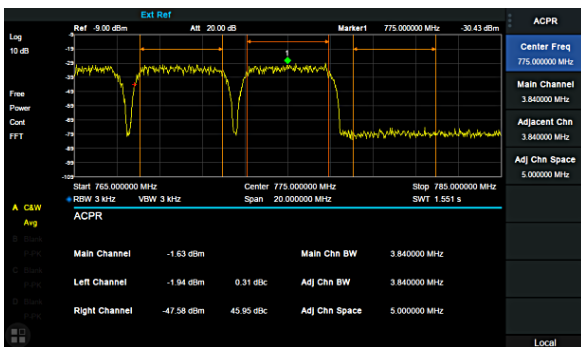## Distance to Fault Mode based on time domain analysis

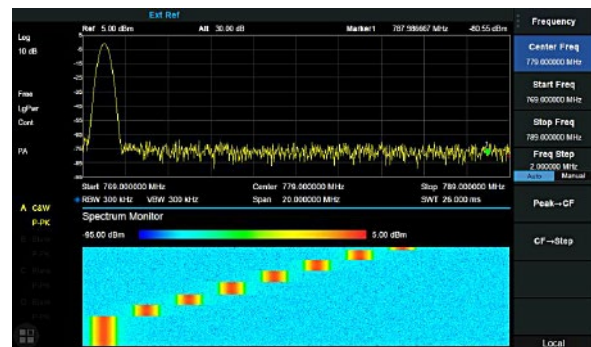## Phase noise -98 dBc/Hz @1 GHz, offset 10 kHz

Minimum 1 Hz Resolution Bandwidth

Adjacent Channel Power Ratio (ACPR) in advanced measurement mode

2D Time – Frequency spectrogram in advanced measurement mode

DESIGN FEATURES

	T3VNA3200
Vector Network Analyzer Frequency Range	100 kHz − 3.2 GHz
Spectrum Analyzer Frequency Range	9 kHz − 3.2 GHz
Resolution Bandwidth	1 Hz − 1 MHz
Displayed Average Noise Level	-161 dBm/Hz
Phase Noise	<-98 dBc/Hz
Total Amplitude Accuracy	< 0.7 dB
Tracking Generator	100 kHz − 3.2 GHz
Touch Screen	Multi Touch, Mouse and Keyboard supported
Advanced Measurement	CHP, ACPR, OBW, CNR, Harmonic, TOI, Monitor
Vector Network Analysis	Vector S11, Vector S21
Distance to Fault	VNA Timing Domain Analysis
Communication Interface	LAN, USB Device, USB Host(USB-GPIB)
Remote Control Capability	SCPI/Labview/IVI based on USB-TMC/VXI-11/Socket/Telnet
Remote Controller	NI-MAX, Web Browser, File Explorer

SPECIFICATIONS

Specifications are valid under the following conditions:
The instrument is within the calibration period, has been stored between 0 and 50°C for at least 2 hours prior to use, and has been powered on and warmed up for at least 40 minutes. The specifications include the measurement uncertainty, unless otherwise noted.

Specifications: The T3VNA3200 is guaranteed to meet published specifications when operating at room temperature (approximately 25°C), unless otherwise noted.

Typical: Performance deemed typical implies that 80 percent of the measurement results will meet the typical published performance with a 95th percentile confidence level at room temperature (approximately 25°C). Typical performance is not warranted and does not include measurement uncertainty.

Nominal: The expected performance or design attribute.

SPECIFICATIONS

Vector Network Analyzer Mode

	T3VNA3200
Stimulus and Measurement	
Frequency Range	100 kHz − 3.2 GHz
Measurement	S11, S21
IFBW	10 kHz
Port1 Stimulus Power	-5 dBm (Nom.)
Format	Lin Mag, Log Mag, Phase, Group Delay, SWR,
	Smith Chart (Lin/Phase, Log/Phase, Real/Imag, R+j*X, G+j*B),
	Polar Chart (Lin/Phase, Log/Phase, Real/Imag)
Sweep Points	101 − 751, default 201
Trace	4 traces, Mem, Math, Hold, Overlay
Marker	(6 + Ref) * 4 traces
Calibration	
Directivity of Calibration	S11, Log mag, Average = 50, >50MHz
Dynamic Range	> 40 dB
	S21, IFBW = 10 kHz, Port1 level = -5 dBm, Log Mag, Average = 50
	100 kHz − 10 MHz 75 dB
	10 MHz − 1.5 GHz 80 dB
	1.5 GHz − 3.2 GHz 80 dB
Trace Noise	10 kHz RBW, Log mag, Average = 50, >10 MHz
	0.1 dB
Calibration	Full 1-Port(OSL), Open Response, Short Response
	Response Through, Enhanced Response,
Mechanical Calibration Kit	Open, Short, Load, Through;
	User Cal Kit
Port Extensions	Port 1, Port 2, Auto Open Port 1
System Z0	50 Ω
Velocity Factor	0.1 − 1

Spectrum Analyzer Mode

Frequency	
Frequency range	9 kHz − 3.2 GHz
Frequency resolution	1 Hz
Frequency Span	
Range	0 Hz, 100 Hz to Max Frequency
Accuracy	± Span / (number of display points - 1)
Internal Reference Source	
Reference frequency	10.000000 MHz
Reference frequency accuracy / uncertainty	± [(time since last adjustment × frequency ageing rate) + temperature stability + initial calibration accuracy]
Initial calibration accuracy	<1 ppm
Temperature stability	<1 ppm/year, 0 °C − 50 °C
Frequency aging rate	<0.5 ppm/first year, 3.0 ppm/20 years
Marker	
Marker resolution	Span / (number of display points - 1)
Marker uncertainty	± [frequency indication × reference frequency uncertainty + 1% × span + 10% × resolution bandwidth + marker resolution]
Freq Counter resolution	0.01 Hz
Bandwidths	
Resolution bandwidth (-3 dB)	1 Hz − 3 MHz, in 1-3-10 sequence
Resolution filter shape factor	< 4.8 : 1 (60 dB : 3 dB), Gaussian-like
RBW uncertainty	<5 %
Video bandwidth (-3 dB)	1 Hz − 10 MHz, in 1-3-10 sequence
VBW uncertainty	<5 %

SPECIFICATIONS

	T3VNA3200
Sweep and Trigger	
Sweep time	1 ms to 3200 s
Sweep mode	RBW = 30 Hz − 1 MHz, Sweep RBW = 1 Hz − 10 kHz, FFT
Sweep rule	Single, Continuous
Trigger source	Free, Video, External
External trigger	5 V TTL level, Rising edge/Falling edge

Amplitude Accuracy and Range Specifications

Amplitude and Level	
Measurement range	DANL to +10 dBm, 100 kHz − 1 MHz, preamplifier off DANL to +20 dBm, 1 MHz − 3.2 GHz, preamplifier off
Reference level	-200 dBm to +30 dBm, 1 dB steps
Preamplifier	20 dB (nom.)
Input attenuation	0 − 50 dB, 1 dB steps
Maximum input DC voltage	+/- 50 V_{DC}
Maximum average power	30 dBm, 3 minutes, fc ≥10 MHz, attenuation >20 dBm, preamp off
Maximum damage level	33 dBm, fc ≥10 MHz, attenuation >20 dBm, preamp off
Displayed Average Noise Level (DANL)	
	20°C to 30°C, attenuation = 0 dB, sample detector, trace average > 50, Normalized to 1 Hz, TG off
Preamp off	-107 dBm, -111 dBm (typ.)
	-132 dBm, -136 dBm (typ.)
	-137 dBm, -141 dBm (typ.)
	-135 dBm, -139 dBm (typ.)
	-126 dBm, -132 dBm (typ.)
Preamp on	-132 dBm, -137 dBm (typ.)
	-148 dBm, -154 dBm (typ.)
	-156 dBm, -161 dBm (typ.)
	-155 dBm, -158 dBm (typ.)
	-145 dBm, -149 dBm (typ.)
SSB Phase Noise	
	20°C to 30°C, fc = 1 GHz, Normalized to 1 Hz
10 kHz offset	< -95 dBc/Hz, < -98 dBc/Hz (typ.)
100 kHz offset	< -96 dBc/Hz, < -97 dBc/Hz (typ.)
1 MHz offset	< -115 dBc/Hz, < -117 dBc/Hz (typ.)
Level Display	
Logarithmic level axis	1 dB to 200 dB
Linear level axis	0 to reference level
Units of level axis	dBm, dBmV, dBμV, dBμA, Volt, Watt
Number of display points	751
Number of traces	4
Trace detectors	Positive-peak, Negative-peak, Sample, Normal, Average(Voltage/RMS/Video), Quasi-peak
Trace functions	Clear write, Max Hold, Min Hold, View, Blank, Average, Math
Frequency Response	
	20°C to 30°C, 30% to 70 % relative humidity, att = 20 dB, relative to fc = 50 MHz
Preamp off	±0.8 dB, ±0.4 dB (typ.)
Preamp on	±1.2 dB, ±0.5 dB (typ.)

	T3VNA3200
Error and Accuracy	
Resolution bandwidth switching uncertainty	Logarithmic resolution, relative to RBW = 10 kHz
	± 0.2 dB (nom.)
Input attenuation switching uncertainty	20 °C to 30 °C, fc = 50 MHz, preamp off, relative to att = 20 dB
	± 0.5 dB
Absolute amplitude accuracy	20 °C to 30 °C, fc = 50 MHz, RBW = VBW = 1 kHz, att = 20 dB, peak detector, 95 % reliability
	±0.4 dB, input signal -20 dBm, Preamp off
	±0.6 dB, input signal -40 dBm, Preamp on
Total amplitude accuracy	20 °C to 30 °C, fc >100 kHz, input signal -50 dBm − 0 dBm, att = 20 dB, RBW = VBW = 1 kHz, peak detector, preamp off, 95 % reliability
	±0.7 dB
RF input VSWR	Att = 10 dB, >1 MHz
	<1.5 (nom.)
Distortion and Spurious Responses	
Second harmonic distortion (SHI)	20 °C to 30 °C, fc ≥ 50 MHz, mixer level -20 dBm, att = 0 dB, preamp off
	-65 dBc / +45 dBm (nom.)
Third-order intercept (TOI)	20 °C to 30 °C, fc ≥ 50 MHz, two -20 dBm tones spaced by 100 kHz, att = 0 dB, preamp off
	+10 dBm (typ.)
1 dB gain compression	20 °C to 30 °C, fc ≥ 50 MHz, att = 0 dB, preamp off
	> -5 dBm (nom.)
Residual response	20 °C to 30 °C, input terminated = 50 Ω, att = 0 dB
	< -90 dBm
Input related spurious	20 °C to 30 °C, mixer level = -30 dBm
	< -65 dBc

Tracking Generator

Frequency Parameter	
Frequency Range	100 kHz − 3.2 GHz
Frequency resolution	1 Hz, Zero Span
RBW	100 Hz − 1 MHz, sweep mode
Power Parameter	
Output level	-20 dBm − 0 dBm
Output level resolution	1 dB
Output flatness	+/-3 dB (nom.)
Normalization Trace	Ref A/B/C/D → Ref
VSWR	< 2 (nom.)
Connector and Impendence	N-type female, 50 Ω
Average safe reverse power	Total : 30 dBm (1 W)
Maximum safe reverse level	Voltage: ±50 V_{DC}

Advanced Measurements

Power Measurement	
CHP, Channel Power	Channel Power, Power Spectral Density
ACPR, Adjacent Channel Power Ratio	Main CH Power, Left channel power, Right channel power
OBW, Occupied Bandwidth	Occupied Bandwidth, Transmit Frequency Error
T-Power, Time Domain Power	Zero Span Integrated Power
CNR, Carrier Noise Ratio	C/N, Noise Power
Non-Linear Measurement	
Harmonic measurement	Max Harmonic number 10
TOI, Third-Order Intercept	Measure the third-order products and intercepts from two tones
Spectrum Monitor Measurement	
Spectrogram	

SPECIFICATIONS

Distance to Fault Mode

	T3VNA3200
Measurement	
Frequency Range	100 kHz − 3.2 GHz
Maximum Distance (meters)	(76800 × Velocity Factor) / (stop freq − start freq (MHz))
Resolution (meters)	(150 × Velocity Factor) / (stop freq − start freq (MHz))
Windows	Rectangular, Hamming
Calibration	Full 1-Port (OSL)
Velocity Factor	0.1 − 1

External input and external output

Front panel RF input, Port 2	50 Ω, N-female Front
Front panel TG output, Port 1	50 Ω, N-female Front
10 MHz reference output	Ⓐ 10 MHz, >0 dBm, 50 Ω, BNC-female
10 MHz reference input	Ⓑ 10 MHz, -5 dBm to +10 dBm, 50 Ω, BNC-female
External Trigger input	Ⓒ 10 kΩ, 5 V TTL , BNC-female
Security	Ⓓ Kensington Lock point

Communication Interface

USB Host	USB-A 2.0
USB Device	Ⓔ USB-B 2.0
LAN	Ⓕ LAN (VXI11), 10/100 Base, RJ-45

SPECIFICATIONS

General Specification

	T3VNA3200
Display	TFT LCD, 1024 × 600 (waveform area 751 × 501), 10.1 inch (25.65 cm)
Storage	Internal (Flash) 256 MByte, External (USB storage device) 32 GByte
Source	Input voltage range (AC) 100 V − 240 V, AC frequency supply 50/60 Hz or 100 − 120V 400 Hz, Power consumption 35 W
Temperature	Working temperature 0 °C to 40 °C, Storage temperature -20 °C to 70 °C
Humidity	90 % RH up to 30 °C; derates to 50 % at 50 °C
Dimensions	393 mm × 207 mm × 116.5 mm (W × H × D)
Weight	T3VNA3200 4.40 kg (9.7 lb)
Warranty	3 years return to Teledyne LeCroy

Electromagnetic Compatibility and Safety

EMC	EN 61326-1:2013
Electrical safety	EN 61010-1:2015

Ordering Information

Product Description	T3VNA Vector Network Analyzer	Order Number
Product code	Vector Network Analyzer, 9 kHz − 3.2 GHz	T3VNA3200
Standard configurations	A Quick Start, A USB Cable, A Calibration Certificate, Power cord, Calibration Kit, Utility Kit	
Near Field Probe Kits	Near Field Probe: H field probe set, 30 MHz − 3.0 GHz (4 H Field Probes: 25 mm, 10 mm, 5 mm, 2 mm)	T3SA3000-NFP
	Near Field Probe: H / E field probe set, 300 kHz − 3.0 GHz (3 H Field Probes: 20 mm, 10 mm, 5 mm) (1 E Field Probe: 5 mm)	T3NFP3

TELEDYNE TEST TOOLS
Everywhere**you**look™

Company Profile

Teledyne LeCroy is a leading provider of oscilloscopes, protocol analyzers and related test and measurement solutions that enable companies across a wide range of industries to design and test electronic devices of all types. Since our founding in 1964, we have focused on creating products that improve productivity by helping engineers resolve design issues faster and more effectively. Oscilloscopes are tools used by designers and engineers to measure and analyze complex electronic signals in order to develop high-performance systems and to validate electronic designs in order to improve time to market.

The Teledyne Test Tools brand extends the Teledyne LeCroy product portfolio with a comprehensive range of test equipment solutions. This new range of products delivers a broad range of quality test solutions that enable engineers to rapidly validate product and design and reduce time-to-market. Designers, engineers and educators rely on Teledyne Test Tools solutions to meet their most challenging needs for testing, education and electronics validation.

Location and Facilities

Headquartered in Chestnut Ridge, New York, Teledyne Test Tools and Teledyne LeCroy has sales, service and development subsidiaries in the US and throughout Europe and Asia. Teledyne Test Tools and Teledyne LeCroy products are employed across a wide variety of industries, including semiconductor, computer, consumer electronics, education, military/aerospace, automotive/industrial, and telecommunications.

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