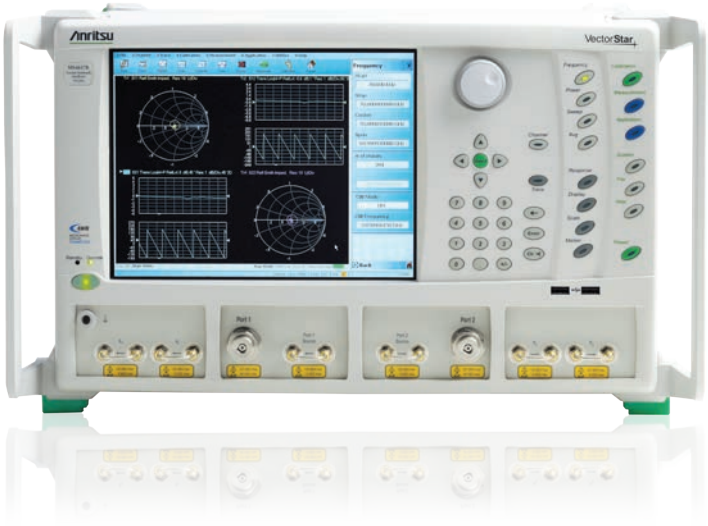
Anritsu Since 1895

Vector Network Analysis
Portfolio Brochure



Confidence
on the Cutting Edge.

In the Lab | On the Manufacturing Floor | In the Field

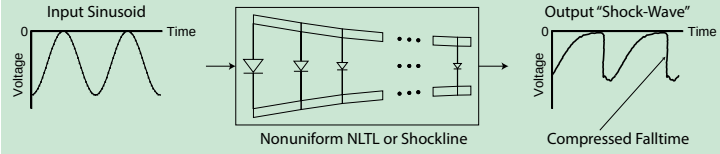
World's first portfolio of VNAs that bring Nonlinear Transmission Line (NLTL) technology to every measurement scenario from on-wafer device characterization to R&D testing to manufacturing and field operations.

Anritsu
envision : ensure

In 1965, Anritsu filed the patent that defined the first modern Vector Network Analyzer (VNA). We are proud to continue that tradition of innovation to the present day—with the world's first portfolio of VNAs that bring Nonlinear Transmission Line (NLTL) technology to every measurement scenario from on-wafer device characterization to R&D testing to manufacturing and field operations.

Anritsu has developed the NLTL technology on a MMIC that delivers cutting edge performance in an efficient and reliable form factor that was previously impossible. Also known as "Shock Line", this technology is used in Anritsu's VNA receivers for the down-conversion of microwave and mm-wave signals into IF frequencies. It provides superior conversion efficiency, improved linearity, increased stability and enhanced reliability. The results are evident to the user as increased dynamic range, improved accuracy, and fewer calibrations.

The NLTL technology allows Anritsu to provide wide variety of solutions to meet the needs of high performance R&D, cost-sensitive manufacturing and portable field applications.



An NLTL is a high-impedance transmission line loaded with varactor diodes at regular intervals. They are capable of generating step-like waveforms that have very sharp fall-times and are rich in harmonics.

Product family	Application	NLTL-based advantage	Benefit to user
VectorStar™ MS464xB ME7838x	On-wafer device characterization and research and development	Superior conversion efficiency in microwave and mm-wave bands	Achieve high performance over broader frequency ranges – e.g. 109 dB dynamic range at 110 GHz, 104 dB at 125 GHz and 94 dB at 145 GHz
		Integrated chip design greatly reduces the temperature variations between and across reflectometer	Longer intervals between calibrations, better measurement accuracy and repeatability
		High performance in a very small form factor	Enables direct connection of mm-wave extension module to wafer probe
ShockLine™	Passive component testing	MMIC based VNA reduces number of internal components, and enhances reliability	Lower maintenance cost, reduced down time and operating costs
		Improved capability-to-cost ratio enables new applications	Dramatic cost reduction in VNA used for manufacturing test
		Integrated chip design greatly reduces the temperature variations between and across reflectometer	Longer intervals between calibrations, better measurement accuracy and repeatability
Microwave Site Master™	Field measurement, installation and maintenance	Highest dynamic range and superior accuracy	Unprecedented dynamic range to 110 dB at 40 GHz
		Superior conversion efficiency in microwave bands	More stable and more linear measurements with longer battery life
		MMIC based VNA reduces number of discrete parts and connectors	Lower maintenance cost, reduced down time and operating costs

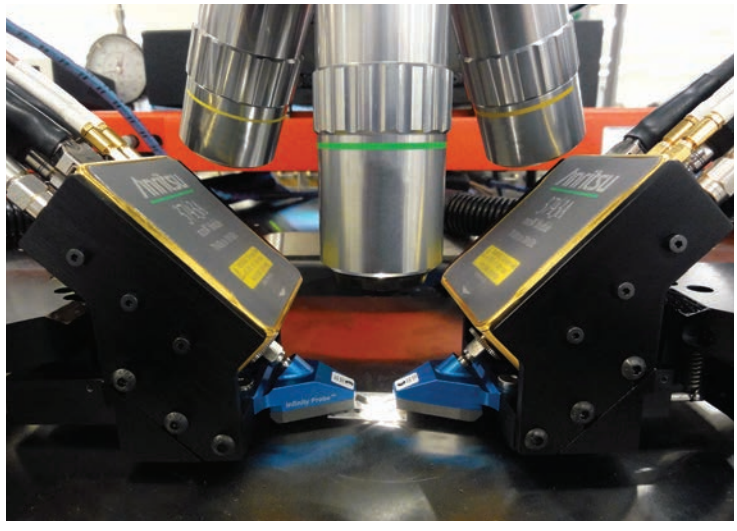
For a more detailed explanation of the operation and benefits of NLTL technology, please see the Anritsu White Paper "Modern Architecture Advances Vector Network Analyzer Performance"

VectorStar® Broadband On-wafer Device Characterization

Don't let expired calibrations spoil your data!

ME7838E: 70 kHz to 110 GHz
ME7838A: 70 kHz to 110 GHz (operational to 125 GHz)
ME7838D: 70 kHz to 145 GHz

The Vector**Star**™ ME7838 Series Broadband Vector Network Analysis System delivers 109 dB of dynamic range at 110 GHz, 104 dB at 125 GHz and 94 dB at 145 GHz for high-sensitivity measurements across 70 kHz to 110 / 125 / 140 GHz (up to 1.1 THz with mm-wave modules) with 0.1 dB and 0.5 degree S_{21} stability over 24 hours. This stable broadband performance means you can make high accuracy measurements all day, with the confidence that your calibration remains rock solid! Spend less time calibrating and more time measuring.



Challenge	VectorStar solution provides:
Maximizing frequency range to develop accurate device models	**Broadest frequency span 70 kHz to 110/125/145 GHz** • Obtain the most thorough and accurate broadband measurements • Accurate low frequency measurements eliminate the time consuming, error-prone concatenation process across the RF, microwave, and millimeter-wave bands
Minimizing accuracy/speed tradeoffs	**Industry-leading performance and speed** • Widest dynamic range of 108 dB at 67 GHz, 109 dB at 110 GHz, 104 dB at 125 GHz, and 94 dB at 145 GHz • Direct-connect to probes further enhances overall system performance • Fastest measurement speed of 110 ms for 401 points at 10 kHz IFBW
Improving stability to increase productivity	**Extended test time by reducing calibration frequency** • Compact integrated frequency extension modules provide enhanced stability as compared with old-style hybrid WG/coax modules • S_{21} stability better than 0.1 dB and 0.5 degree over 24 hours • Improved stability allows for a single calibration to be performed once for a four hour session or even once a day, resulting in an increase in measurement test time of over 37% in a single four hour session!
Protecting early prototypes	**Only broadband VNA system with real-time power leveling** • Power sweep control that provides the best power accuracy and stability to power levels as low as –55 dBm • Highly responsive real-time power leveling • Real-time power level control of up to 55 dB ensures uncompressed linear data and accurate 1 dB compression measurements
Minimizing Size and weight constraints	**Smallest/lightest mm-wave modules** • Compact, lightweight broadband modules for easy, precise, and economical positioning on a wafer probe station • Direct mounting to probes minimizes cable loss and improves both performance and stability

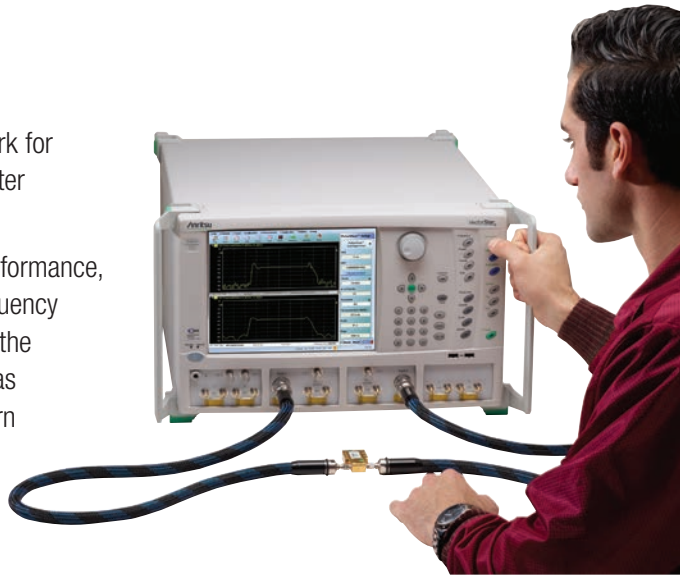
VectorStar® Research and Development

Solve your toughest design challenges with confidence

MS464xB: 10 MHz to 20, 40, 50 and 70 GHz
Optional low frequency extension to 70 kHz
ME7838x: Broadband systems to 145 GHz
Waveguide band extensions to 1.1 THz

The Vector**Star**™ VNA offers a new performance benchmark for S-parameter measurements of RF, Microwave, and Millimeter wave devices.

In addition to maintaining a peak level of measurement performance, each Vector**Star** model can be upgraded to a broader frequency range, higher port count, or additional options fitted. Spec the features you need today, then add new ones in the future as required—without fear of obsolescence or the need to learn a new test system.



Challenge	VectorStar solution provides:
Reducing design cost and cycle time	**Hybrid bridge-coupler VNA architecture** • DC extrapolation errors in modeling minimized by use of bridge structure for capture of high quality low frequency S-parameter data • High frequency data quality assured by use of directional couplers • Higher quality measurement data leads to fewer design turns
Locating impedance problems	**Best time domain analysis due to hybrid bridge-coupler design** • Broadest coverage from 70 kHz to 70 / 110 / 125 / 145 GHz provides best combination of accurate and hi-resolution low-pass time domain results • Time Domain Analysis provides accurate characterization of impedance profiles due to high quality low frequency S-parameter data • 100,000 points provide best-in-class alias-free range and low-pass resolution
Achieving sufficient dynamic range when DUT constrains RF drive level	**Only VNA manufacturer using Nonlinear Transmission Line technology (NLTL)** • NLTL technology used in receivers provides lower noise floor at high end frequencies, test port noise floor of -110 dBm at 70 GHz and -112 dBm at 110 GHz • Use lower drive power and achieve desired dynamic range for low power DUTs • Obtain superior dynamic range when secondary source limits RF drive level
Selecting a VNA for specific application	**Capabilities and options for VectorStar support measurements in the fields of:** • Radar • On-wafer device characterization • Signal integrity • Active and passive components • Antenna measurements • Materials measurements
Protecting investment	**Complete upgradeability within family** • Meet budget targets; buy what is needed now and protect investment by upgrading later • Spread spending across budget years due to ability to add options or upgrade frequency ranges later • Test-set concept permits port-count to be increased when required

SHOCKLINE™ Passive Device Testing

Simple. Economical. High Performance.

MS46322A: 2-port Economy VNA
MS46522A: 2-port RF VNA
MS46524A: 4-port RF VNA

ShockLine™ RF and Microwave VNAs eliminate the need to buy expensive instruments for simple S-parameter measurements. ShockLine delivers good performance to 40 GHz at a substantially lower price. These VNAs are ideal for simple engineering, manufacturing and cost-sensitive education applications.

ShockLine family employs multiple architectures that reduce manufacturing costs, enhance calibration stability and minimize measurement uncertainty.

ShockLine VNAs can be used to measure S-parameters, time domain characteristics and signal integrity of passive 1-port, 2-port, 3-port or 4-port devices.

Challenge	ShockLine™ solution provides:
Performance at Low Price	Three different instrument series at various price and performance levels
Minimize test times and maximize throughput	Wide dynamic range and fast sweep speed shorten test time and increase throughput
Calibration stability	Less frequent calibrations as a direct result of the NLTL receivers' thermal stability
Better measurement accuracy and repeatability	NLTL sampling yields better noise performance than harmonic mixing at higher RF frequencies
Locating and troubleshooting problem areas in devices	Easier and faster testing with time domain lowpass and bandpass mode with time gating capability
Reliable and fast remote control interface	LAN interface is more robust than USB and faster than GPIB
Reduce Learning Curve	Common GUI and SCPI interface
Efficient use of rack space	Small form factor (2U) with no display or keypad to conserve space
Protect investment	Upgradable to higher frequency models while reducing switching costs
Worry-free purchase	3-year standard warranty and worldwide technical support

SiteMaster The Field-ready VNA

The industry standard sets a new benchmark—40 GHz

S820E: 1 MHz to 8/14/20/30/40 GHz

The new Microwave Site Master™ S820E extends Anritsu's leadership with a dozen new benchmarks—including unprecedented dynamic range to 110 dB at 40 GHz for true benchtop performance in the field.

In spite of its compact form factor, Microwave Site Master is a full Vector Network Analyzer in a portable lightweight package. Inside is the same cutting edge NLTL sampler technology as Anritsu's premium benchtop VNA's with 4 complete receivers, and a fully reversing synthesized source with 1Hz frequency resolution. Future software options will enable support for full 2-port S-parameter measurements as well as industry standard S1P and S2P files.

Challenge	Site Master solution provides:
Ever increasing test frequencies	Broadest frequency span from 1 MHz to 8, 14, 20, 30, and 40 GHz
Microwave testing requires greater dynamic range	Unprecedented dynamic range to 110 dB at 40 GHz for real benchtop performance
Need for maximum productivity in the field	Fastest handheld sweep speed of 650 us/data point for quick field measurements
RF interference in field operations	Highest RF immunity of +17 dBm for operation in harsh RF field environments
Need for accurate field measurements	Unsurpassed directivity in a handheld for maximum field accuracy
Field battery-operated equipment requires recharging	Longest battery life with four hours of operation for the most field uptime on one charge
Reading measurements under harsh field conditions	Largest and highest resolution display (8.4 inch, 800 x 600) for maximum readability in all lighting conditions with an intuitive graphical user touchscreen interface
Calibration for all temperature conditions	Full temperature coax calibration kits from -10 ˚C to +55 ˚C for field precision measurement
Maintaining calibration	Widest calibration temperature window of ± 10 ˚C requiring less recalibrations
Need to measure reflection/transmission loss on long, permanently embedded devices	Unique 2-port swept reflection/transmission loss measurement across the whole frequency range of interest in a quick one-step measurement
Simplifying waveguide calibration	The most pre-loaded waveguide calibration component coefficients in the instrument with ten bands for SSL and SSLT calibrations making it convenient for the customer to quickly make calibrations.
Worry-free purchase	3-year standard warranty and worldwide technical support

Anritsu Product Line Comparison

Family	VectorStar MS4640B VectorStar ME7838x	ShockLine MS46522A/MS46524A	ShockLine MS46322A	Microwave Site Master S820E
Applications	Device characterization, research and development	Engineering, manufacturing, education	Engineering, manufacturing, education	Field use
Device under test type	Active, Passive, Nonlinear, Frequency translated, Pulsed	Passive only	Passive only	Optimized for field use
Frequency range	10 MHz (70 kHz option) to 20, 40, 50, 70, 110, 145 GHz*	50 KHz to 8.5 GHz	1 MHz to 4, 8, 14, 20, 30, 40 GHz	1 MHz to 8, 14, 20, 30, 40GHz
Number of ports	2 and 4-port	2 and 4-port	2-port	2-port
Dynamic range (@ 10 Hz IFBW)	122 dB (10 MHz to 2.5 GHz) 124 dB (2.5 GHz to 20 GHz) 122 dB (2.5 GHz to 40 GHz) 114 dB (70 GHz) 109 dB (110 GHz) 94 dB (145 GHz)	100 dB (500 KHz to 3 MHz) 110 dB (3 MHz to 6 GHz) 105 dB (6 to 8 GHz) 90 dB typ (8 to 8.5 GHz)	≥ 85 dB (1 MHz to 20 MHz) ≥ 100 dB (20 MHz to 40 GHz)	≥ 85 dB (1 MHz to 20 MHz) ≥ 100 dB (20 MHz to 40 GHz)
Trace noise (rms)	4.5 mdB (500 KHz to 20 GHz) 6 mdB (20 GHz to 67 GHz) 8 mdB (to 70 GHz)	6 mdB (<8 GHz), 100 Hz IFBW	6 mdB 100 Hz IFBW	6 mdB 100 Hz IFBW
Port power	-25 to +10 dBm (<10 MHz) -25 to +12 dBm (.01 to 2.5 GHz) -20 to +13 dBm (2.5 to 20 GHz) -25 to +9 dBm (20 to 40 GHz) -25 to -3 dBm (70 GHz)	-30 to +15 dBm (0.3 to 6 GHz) -30 to +12 dBm (6 to 8 GHz) -30 to +10 dBm (to 8.5 GHz) -30 or 0 dBm (8.5 to 40 GHz)	High State : -3 dBm Low state : -20 dBm	High State : -3 dBm Low state : -20 dBm
Corrected directivity	>50 dB (20 GHz using 36585K AutoCal) >45 dB (70 GHz using 3657-1 Multi-line cal kit)	> 42 dB	> 42 dB	> 42 dB
Measurement speed, typical (@widest IFBW)	20 µs/point	70 µs/point	220 µs/point	650 µs/point
Sweep type	Freq: Lin, CW, Segment Power: Lin, log, and constant power sweep or constant power slope over frequency sweep	Freq: Linear, CW, Segment Power: Linear	Freq: Linear, CW, Segment	Linear
Max number of points	100,000	20,000	16,000	130, 259, 517, 1033, 2065
Calibration	SOLT, SSLT, SSST, SOLR, LRL, LRM, A-LRM™, AutoCal, Thru Update	SOLT, SOLR, LRL, LRM, WG, Microstrip	SOLT, SSLT (WG)	SOLT, SSLT (WG)
Embedding, de-embedding	Yes, including multiple networks and extraction utility	Yes, including multiple networks and extraction utility	Yes, including multiple networks and extraction utility	N/A
Built-in bias tee and step attenuator options	Yes	No	No	No
Marker statistics function	Mean, max, min, standard deviation per trace or over a marker region	Mean, max, min, standard deviation per trace or over a marker region	Mean, max, min, standard deviation per trace or over a marker region	Max, min, peak, valley, delta
Pass/fail testing	Yes	Yes	Yes	Yes
Remote control	GPIB, LAN, USB	LAN	LAN	LAN, USB
Programming	SCPI, LabView, LabWindows/CVI, .NET/COM	SCPI, IVI drivers	SCIP, IVI drivers. LabView, LabWindows	SCPI
Major options	Time domain, Rack Mount, Receiver Offset, Dual Source, IF Digitizer, Noise Figure, PulseView™, DifferentialView™, Direct Access Loops, Active Measurement Suite, 70 kHz Low End Extension	Time Domain, Rack Mount	Time Domain, Rack Mount	VNA, full reversing 2-port VNA Time Domain VVM with A/B ratio (options available later in 2014)

* Waveguide extensions available to 1.1 THz

Above data are highlights, please see individual data sheets for full details

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