

# Agilent CSA Spectrum Analyzer

## N1996A

Exceptional performance...  
anytime, anywhere

### Frequency coverage

- Frequency range: 100 kHz to 3 or 6 GHz
- Tracking generator: 10 MHz to 3 or 6 GHz
- Preamplifier to 3 or 6 GHz

### Performance

- DANL: -156 dBm/Hz, normalized to 1 Hz
- Best-in-class dynamic range with +18 dBm TOI
- Overall amplitude accuracy:  $\pm 0.5$  dB

### Compact Design

- Weight: 7.5 kg with built-in tracking generator, preamplifier, and VSWR bridge
- Battery life: 2 hours (typical)

### Features

- Brightest, highest resolution display in its class (21 cm XGA, 1024 x 768)
- 1 dB electronic step input attenuator
- 10 Hz to 5 MHz RBW standard, 1% adjustable to 200 kHz
- USB and LAN standard



Traditional Agilent quality and reliability with  
the performance you need, the convenience you want and the price you can afford



Agilent Technologies

# The Agilent CSA Spectrum Analyzer...

A general purpose spectrum analyzer is the engineer's most flexible test tool. The Agilent CSA spectrum analyzer extends that flexibility with its performance, ease of use, and unprecedented reliability.

## Performance and quality you expect at a price you can afford

The Agilent CSA spectrum analyzer brings a level of performance not seen previously in a compact spectrum analyzer. The highest dynamic range in its price class is achieved with unmatched distortion performance, substantial noise performance, and standard 10 Hz resolution bandwidth. The instrument also offers overall amplitude accuracy of  $\pm 0.5$  dB (95%). The Agilent CSA resets expectations for what is possible now and into the future. Now you get all of this capability and more, with excellent reliability and low service and support costs.

### Ease-of-use means greater efficiency

The user interface is designed to give expert users access to all of the power of the Agilent CSA. Logically grouped hard keys, soft keys, and menus allow intuitive control of parameters like input attenuation, bandwidth, and detector type. Features such as auto-tune, auto-scale, auto-range, 1 dB step attenuator, built-in preamp, and onboard help make the Agilent CSA easy to use even for non-experts.

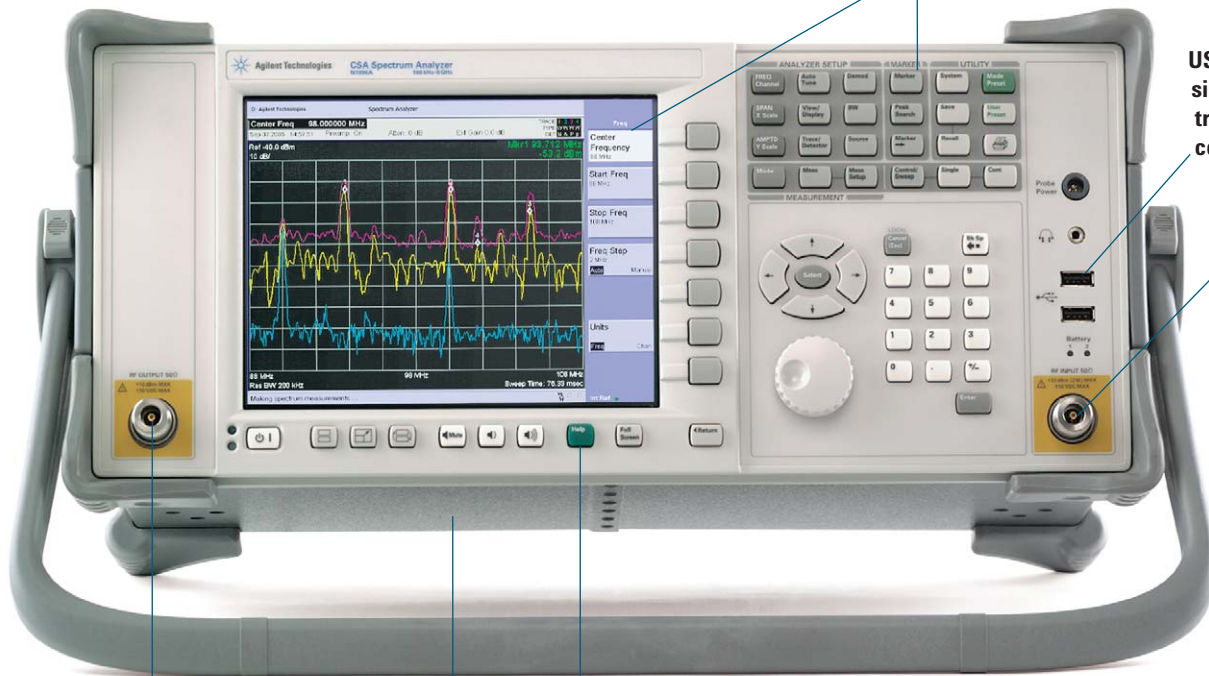
Light weight and portable at 8.5 kg with batteries

Bright, high resolution, 21.4 cm XGA display is excellent for outdoor use

Easy user interface speeds measurement process and reduces training time

USB 1.1 ports simplify data transfer and connectivity

1 dB step attenuator (best in class)



Tracking generator enables system, cable, and component measurements

Shallow depth of 25 cm (with bumpers) conserves bench space

Built-in help

VSWR bridge is built-in, reducing the complexity of stimulus/response measurements

Built-in preamplifier increases sensitivity

Traditional Agilent quality and reliability with the performance you need, the convenience you want and the price you can afford...

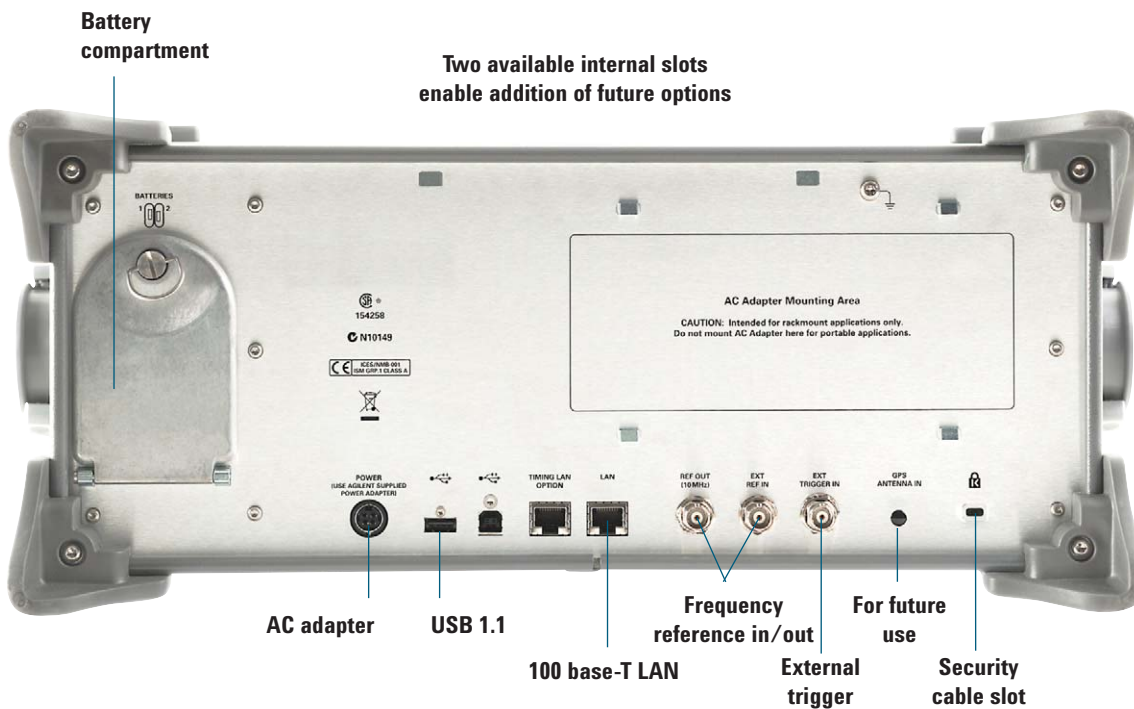
The most reliable spectrum analyzer that we've ever produced.

### Easy to upgrade

Unique among our products, each Agilent CSA spectrum analyzer comes with options installed, ready to be activated. This allows easy upgrades, enabling users to reconfigure the instrument as needs change. Tracking generator and preamplifier upgrades may require service center calibration.

### Flexible

The Agilent CSA spectrum analyzer extends your workbench flexibility with a unique offering of options and design features. Two available card slots for measurement options ensure that the analyzer will meet your future needs.



### Connectivity is simple

Transport data to a PC easily via USB memory device. Download firmware upgrades from the web into the instrument. Remotely control your instruments using SCPI commands over a 100 base-T LAN.

## Accurate, Rugged, Dependable, and Flexible

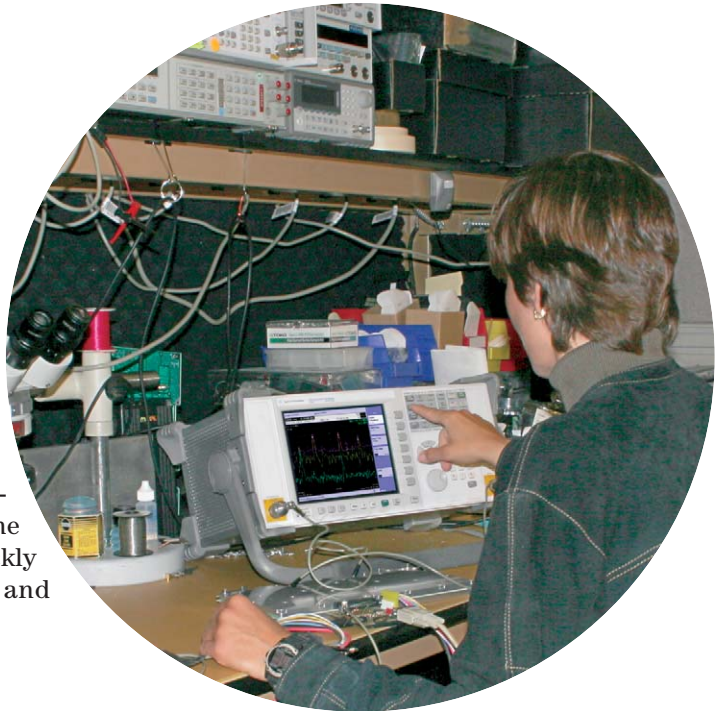


**The Agilent CSA is optimized for manufacturing with its combination of high performance, modern connectivity, and the industry's best reliability.**

The instrument was designed for fast sweep speeds in narrow resolution bandwidths and fast in-channel measurements, as well as the highest achievable dynamic range in its price class. Remote control via 100 base-T LAN and SCPI reduce the complexity and time to develop automation software, enhance compatibility with existing systems, and reduce training time for manufacturing staff. All of these attributes are designed to reduce cost-of-test, while the best reliability in spectrum analysis assures the lowest overall cost of ownership.

**Now you can afford the excellence of an Agilent spectrum analyzer at each engineer's bench!**

You get true Agilent performance with TOI of +18 dBm, 10 Hz minimum RBW with 1% adjustability, and 1 dB step attenuator. The large, bright, 21 cm, 1024 x 768 pixel, XGA display (best in class), convenient form factor, and straightforward portability of data with a USB memory device make the Agilent CSA spectrum analyzer easy to use. Features like auto-tune and auto-scale ensure that newer users can quickly make use of this extensive performance and capability.







**The Agilent CSA's field-ready features make it an ideal choice for installation and maintenance of today's complex communication systems.**

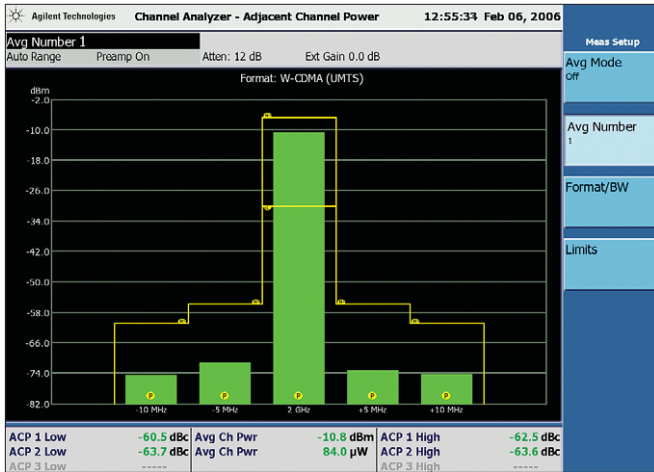
Weighing just 7.5 k (16.5 lbs) with rugged bumpers, and a comfortable, adjustable bail handle, the Agilent CSA spectrum analyzer is able to deliver powerful measurement capability where and when you need it. This analyzer has more than two hours of battery life and a bright, high-resolution display, perfect for use in the field. This instrument combines the functionality of a general-purpose spectrum analyzer, network analyzer, and power meter into a simple, easy-to-use package. The built-in VSWR bridge, optional internal tracking generator, and stimulus response measurement suite confirm the Agilent CSA spectrum analyzer as the best installation and maintenance solution in its price class.

**The Agilent CSA brings the power of spectrum analysis to the teaching lab, enabling professors to easily communicate signal theory to their students.**

Easy transformation between time and frequency domains simplifies the understanding of digital modulation formats. Built-in help and auto-setup features bring full spectrum analysis capability into the hands of aspiring experts. With the shallow form factor conserving valuable lab bench space, exceptional performance, and affordable price, the Agilent CSA spectrum analyzer is a sensible addition to undergraduate and technical teaching lab stations.



# Measurements and Features

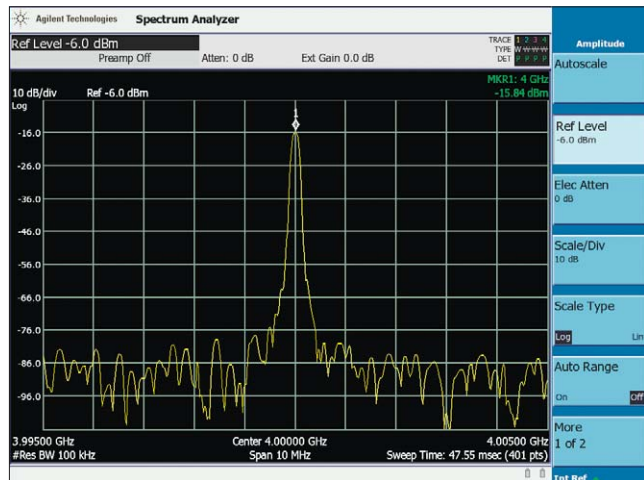
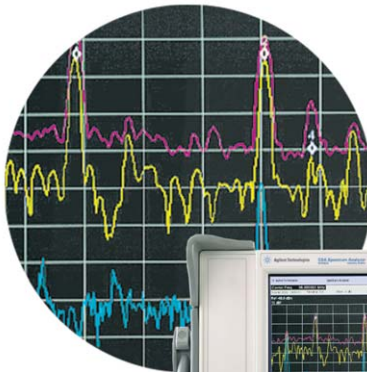


## Communication channel measurements

The Agilent CSA spectrum analyzer includes a number of communication system channel measurements, allowing users to accurately assess the performance of common wireless telephony and other channel-based communication systems and components. Using preset format-based or custom parameters, the operator can easily determine distortion levels and channel power using the adjacent channel power function. Similarly, the occupied bandwidth function quickly determines power and bandwidth of signals with complex modulation. Additional one-button communication measurement capabilities will be added in future releases.

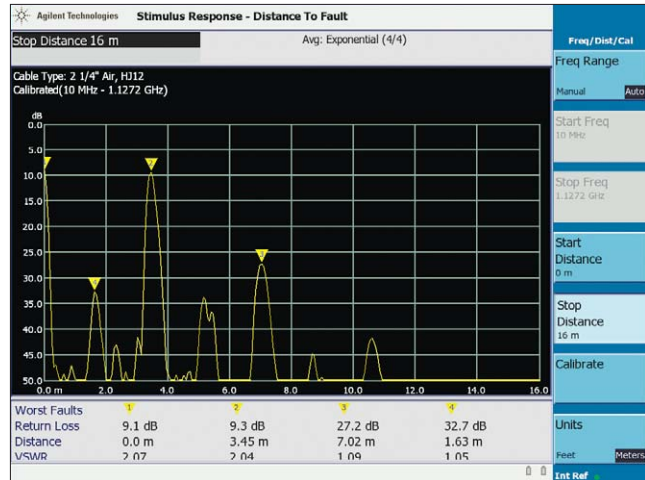
## New general purpose features

The Agilent CSA offers a wide range of innovative features designed to assist non-expert users to easily set up and make valid measurements. The one button auto-tune function centers the largest signal on screen and reduces the frequency span, allowing the user to quickly zoom in. Auto-scale sets the reference level and amplitude scale for best signal viewing. Auto-range performs a full-band background sweep, optimizing input attenuation and preamplifier settings, ensuring that off-screen signals are not compressing the RF stage, assuring accurate measurement results.



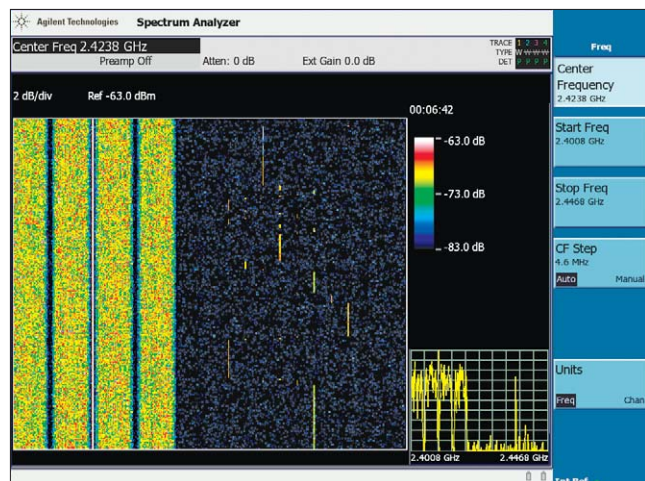
## Return loss, cable fault, and insertion loss capabilities

The Agilent CSA's built-in tracking generator and VSWR bridge enable a powerful range of scalar measurements not commonly found in general purpose spectrum analyzers. With the stimulus response measurement suite, the Agilent CSA spectrum analyzer can characterize active and passive single and dual-port devices such as cables, filters, amplifiers, multiplexers, antennas, and switches. Measurements included are 1 and 2 port insertion loss, return loss, and distance-to-fault. The combination of robust capabilities and spectrum analysis tools can greatly simplify and accelerate installation and maintenance of complex components and systems.



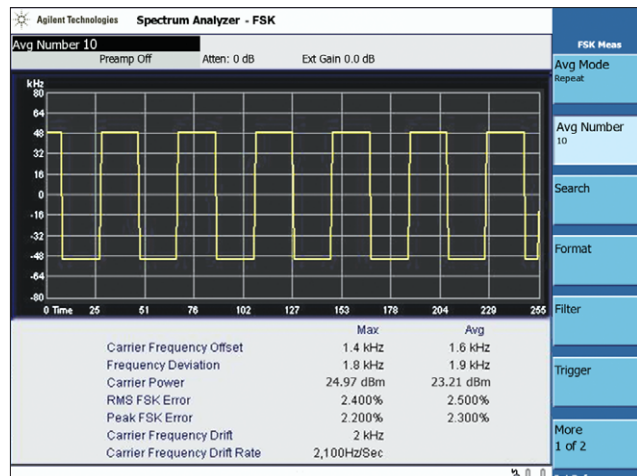
## Use the spectrogram to analyze the stability of a signal over time, or to detect and identify signals interfering with the system of interest.

The spectrogram view is essentially a time capture of spectral activity that can be optimized to focus on an area of interest, detailing differences in the frequency and amplitude of spectral components as a function of time. A common use for spectrograms is in the identification and eradication of unwanted interference in communications systems. Spectrograms can also monitor the stability of a circuit or system over time, temperature, vibration, etc.



## The Agilent CSA's optional modulation measurement suite\* provides functional and parametric analysis of widely used formats.

The Agilent CSA spectrum analyzer is ideal for development, manufacturing, system maintenance, and educational uses. It is able to measure modulation parameters of AM, FM, ASK, and FSK\* signals. ASK and FSK analysis is useful in the development and manufacture of RFID devices and cordless telephones, for example.



\* Future options.



# Specifications

## Frequency

Range	100 kHz to 3 GHz (Option 503) 100 kHz to 6 GHz (Option 506)
Frequency readout accuracy	$\pm \{ \text{frequency indication} \times \text{frequency reference accuracy} + 1\% \times \text{span} + 10\% \times \text{RBW} + 0.5 \times [\text{span}/(\text{sweep points} - 1)] + 1\text{Hz} \}$
Internal reference accuracy	$\leq \pm 5$ ppm/year (within 2 years of adjustment)
Aging rate	$\leq \pm 2$ ppm/year
Temperature stability	$\leq \pm 1$ ppm

<b>Resolution bandwidth (RBW)</b>	10 Hz to 200 kHz in 1% steps, 250 kHz, 300 kHz, 1 MHz, 3 MHz, 5 MHz
Selectivity (60 dB/3 dB bandwidth ratio)	Digital, approximately Gaussian shape
Span > 0; RBW $\leq$ 200 kHz	< 8.4:1 (nominal)
Span > 0; RBW $\geq$ 250 kHz	< 4.5:1 (nominal)
Zero span; RBW $\leq$ 10 kHz	< 6.5:1 (nominal)
Zero span; RBW $\leq$ 200 kHz	< 3:1 (nominal)
Accuracy	
(RBW $\leq$ 200 kHz)	< 2% zero span; < 7% span > 0 (nominal)
(RBW = 250 kHz, 300 kHz, 1 MHz, 3 MHz)	< 4% zero span; < 4% span > 0 (nominal)

Displayed average noise level (typical)	Preamp on	Preamp off	Preamp on
	10 Hz RBW	10 Hz RBW	norm to 1 Hz
500 MHz	-148 dBm	-130 dBm	-158 dBm/Hz
1 GHz	-146 dBm	-128 dBm	-156 dBm/Hz
2 GHz	-142 dBm	-124 dBm	-152 dBm/Hz
3 GHz	-144 dBm	-130 dBm	-154 dBm/Hz
4 GHz	-142 dBm	-128 dBm	-152 dBm/Hz
5 GHz	-139 dBm	-125 dBm	-149 dBm/Hz
6 GHz	-136 dBm	-122 dBm	-146 dBm/Hz

<b>Phase noise</b>	-85 dBc at 10 kHz offset (500 MHz to 2.5 GHz, typical) -124 dBc at 1 MHz offset (10 MHz to 2.2 GHz, nominal)
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## Sweep and trace update times

Sweep time setting range (zero span)	2 $\mu$ s to 10 s*
Local trace update	
Span $\leq$ 100 MHz	3 updates/sec maximum
Span = 1 GHz	1 update/sec maximum
Remote sweep and trace transfer	
Span = 0	120 ms minimum
Span $\leq$ 100 MHz	180 ms
Span = 3 GHz	1 sec

## Amplitude accuracy (20 to 30 °C)

Overall amp accuracy (95%) (20 to 30 °C, peak detector, preamplifier off, input signal 0 dBm to -50 dBm)	$\pm 0.5$ dB 10 MHz to 1 GHz $\pm 0.6$ dB 1 GHz to 3 GHz $\pm 0.8$ dB 3 GHz to 6 GHz
Absolute amp accuracy at 50 MHz ref	$\pm 0.4$ dB
Frequency response (when RBW $\leq$ 200 kHz)	$\pm 0.7$ dB 250 kHz to 10 MHz $\pm 0.4$ dB 10 MHz to 1 GHz $\pm 0.6$ dB 1 GHz to 2.7 GHz $\pm 0.7$ dB 2.7 GHz to 3 GHz $\pm 1.1$ dB 3 GHz to 6 GHz
Scale fidelity	$\pm 0.2$ dB (-10 to -80 dBm mixer level)
RBW switching	$\pm 0.3$ dB
Attenuator switching	$\pm 0.2$ dB (nominal)

\* RBW dependent, refer to technical specifications for details



# Specifications, continued

## Amplitude

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Maximum average continuous power (Attenuator $\geq$ 19 dB)	+33 dBm
Maximum DC	50 V dc
Input attenuator range	0 to 40 dB in 1 dB step
1 dB gain compression	+13 dBm (nominal)

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## Spurs and residuals

Third order intermodulation TOI (third order intercept)	+18 dBm nominal
Second order harmonic (SHI)	+45 dBm (> 700 MHz); +30 dBm (< 700 MHz)
Input related spurs	< -60 dBc (with exceptions, as noted in the technical specifications)
Residuals	< -90 dBm (with exceptions, as noted in the technical specifications)

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## Preamplifier

	100 kHz to 3 GHz (Option P03)
	100 kHz to 6 GHz (Option P06)
Gain	22 dB (nominal) < 2.7 GHz 18 dB (nominal) < 6 GHz

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## Tracking generator and internal bridge

10 MHz to 3 or 6 GHz (Option TG3 or TG6)

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## General

Internal data storage	2 MB for user states and traces
Display	21.3 cm (8.4 inches), color, XGA TFT-LCD
Weight with batteries	8.5 kg
Weight without batteries	7.5 kg
Dimensions without bumpers and handles	17.7 x 42.5 x 23.2 cm
Operating temperature	A/C power: 0 to 40 °C; battery power: 0 to 50 °C
Probe power output	+15 V at 150 mA -12 V at 150 mA
EMI compatibility	
Radiated emissions	CISPR 11, Class A
Conducted emissions	CISPR 11, Class A

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## Input/output

RF input	Type N, female (50 $\Omega$ )
Tracking generator output	Type N, female (50 $\Omega$ )
USB-A	USB 1.1 (low power device only)
LAN 10/100 Base-T	RJ-45 connector
Reference out	BNC (female), 10 MHz, 0 dBm nominal
Reference in	BNC (female), 1 MHz, 2.048 MHz, 4.95 MHz, 10 MHz, 13 MHz, 15 MHz, 19.6608 MHz, 0.5 Hz (even second clock), -5 to +10 dBm nominal
External trigger input	BNC (female)

# Ordering Information

- N1996A-503 CSA base box 3 GHz
- N1996A-506 CSA base box 6 GHz
- N1996A-P03 Preamp 3 GHz
- N1996A-P06 Preamp 6 GHz
- N8995A-1FP Stimulus/response suite (requires TG3 or TG6)
- N1996A-TG3 Tracking generator 3 GHz (requires N8995A-1FP)
- N1996A-TG6 Tracking generator 6 GHz (required N8995A-1FP)
- N1996A-271 Spectrogram
- N1996A-SRK Stimulus/response cal. kit
- N1996A-1CM Rack-mount kit
- N1996A-1CP Rack-mount kit with handles
- N1996A-BAT Battery pack (2 batteries)
- N1996A-BCG External battery charger
- N1996A-SCC Soft carrying case
- N1996A-HTC Transit case (hard cover)
- N1996A-ABA Manual hard copy (English)
- N1996A-ABJ Manual hard copy (Japanese)
- N1996A-AB2 Manual hard copy (Simplified Chinese)
- N1996A-0BW Service documentation



**Stimulus/response calibration kit recommended to improve the accuracy of the stimulus/response measurement suite (N8995A-1FP)**

## Configuration requirement notes

The Agilent CSA spectrum analyzer includes documentation on CD and an AC adapter.

1. The 3 GHz tracking generator (Option TG3) requires a frequency range of 100 kHz to 3 GHz (Option 503) and the N8995A Stimulus/response measurement personality.
2. The 6 GHz tracking generator (Option TG6) requires a frequency range of 100 kHz to 6 GHz (Option 506) and the N8995A Stimulus/response measurement personality.
3. The 3 GHz preamplifier (Option P03) is for use with the 100 kHz to 3 GHz frequency range (Option 503).
4. The 6 GHz preamplifier (Option P06) is for use with the 100 kHz to 6 GHz frequency range (Option 506).
5. N8995A Stimulus/response measurement personality requires either a 3 or 6 GHz tracking generator (Option TG3 or TG6).
6. The N1996A-HTC transit case is designed to be used with the N1996A-SCC soft carrying case



**Transit case (hard cover)**



**Soft carrying case**



**External battery charger (batteries not included)**



**Battery pack (2 batteries)**





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