-Key Features-

- 0.05 to 24GHz coverage
- Wide power output range (>40dB)
- Tiny frequency step size (2Hz)
- Very low phase-noise
- External 10MHz reference input
- Oven-controlled reference source
- USB COM Interface
- Industry standard SCPI commands
- Output phase control
- Ethernet control
- Dual USB-C powered
- Internal harmonic filtering
- Trigger input

DS INSTRUMENTS

SG22000PRO R15

COMPACT WIDEBAND MICROWAVE SIGNAL GENERATOR

SG22000PRO – Wideband, Low-Noise & Reliable

The SG22000PRO was designed with high-frequency in mind, as a performance alternative to the economical SG22000L compact microwave generator. While remaining compact and low-cost, the SG22000PRO brings a powerful set of new features and upgrades:

- Ultra-wide frequency range (**0.05 – 23GHz+**)
- High output power for driving microwave mixers (**+15dBm**)
- Significantly lowered phase noise (-92dBc @ 10KHz offset, 22GHz)
- Small frequency step size (2Hz)
- Multi-stage PLL source with temperature compensation
- Wide dynamic power output range: (>40dB @ 18GHz)
- **Single** multi-band precision **SMA** output port
- Ultra-stable oven-controlled 10MHz reference oscillator
- Full-bandwidth harmonic filtering

Signal Generator Control

Unlike other signal generators in its class, the SG22000PRO allows for stand-alone control AND PC USB remote control via a lightweight windows application or SCPI serial commands. Users can easily generate a microwave signal with no configuration or user manual needed. The stand-alone OLED display and interface buttons allow frequency selection, attenuator control, and RF output control without need for a host PC. All settings can be saved as boot-up defaults for added convenience. Ethernet mirrors the USB functionality for local area network connected devices.

SG22000PRO Applications

- Automated testing environments
- General RF lab use
- Production verification
- Educational / university lab use
- Aerospace / defense research
- Wireless infrastructure
- Radar systems
- Line-of-sight links
- Satellite communications
- Up/Down-converting applications

ENGINEERED IN NEVADA

MADE IN U. S. A.

SG22000PRO Low-Noise Microwave Generator

IN-DEPTH SYSTEM INFORMATION

Ease of Use

The SG22000PRO stand-alone front controls, windows control GUI, and SCPI command set are all designed to be simple, intuitive, and complete.

Signal Generator USB Operation

With the SG22000PRO connected to a PC via USB-C port, industry standard SCPI commands are used to fully control the instrument. The USB port is configured on the host PC as a virtual COM port. This feature allows users to control the SG30000 for automated test applications from many different operating systems, scripting languages, and environments. Drivers for this virtual COM port are built-in to all modern and legacy operating systems including embedded and mobile platforms.

Ethernet Port

The Ethernet port allows identical control to the USB serial port, but over a local network. The SG22000PRO will use DHCP to acquire an address, then our provided standard control application instantly finds the device and seamlessly connects. Users can alternatively open a TCP connection for remote control from many environments or scripting languages.

Precision Reference

The SG22000PRO has an ultra-low-noise precision high-frequency internal oscillator that is phase locked to an oven-controlled ±10PPB 10MHz oscillator. An external 10MHz can be auto-detected and locked to if required via the rear MCX port.

Output Level Control

Calibrated power output level in all internal bands can be controlled via a internal step attenuator and variable attenuator over a range of **>40dB**.

Power Output Calibration

Power output for frequency settings between 0.1GHz and 22GHz is calibrated to ±1.0dB typical.

RF Harmonic Filtering

The SG22000PRO has harmonic and sub-harmonic filtering down to 500MHz for a more clean output waveform. Harmonic levels are typically < -30dBc.

Phase Control

The SG22000PRO supports phase control with 1 degree resolution. This functionality is available down to 150MHz output frequency in the control software. Note that some other device performance can be affected when in phase mode, like minimum frequency step size.

Multi-Purpose Trigger Input Port

The SG22000PRO features and MCX input port that can be configured as a sweep trigger, RFO control switch, pulse trigger, or frequency step trigger. There is a separate application note detailing this port.

SG22000PRO

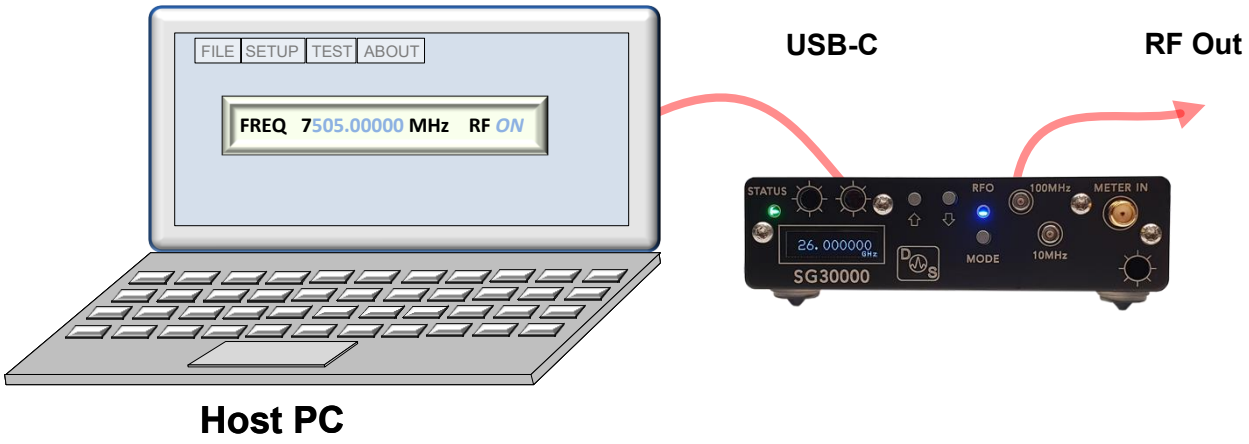
SPECIFICATIONS

Conditions: 25° C, Internal ultra-low phase noise oscillator

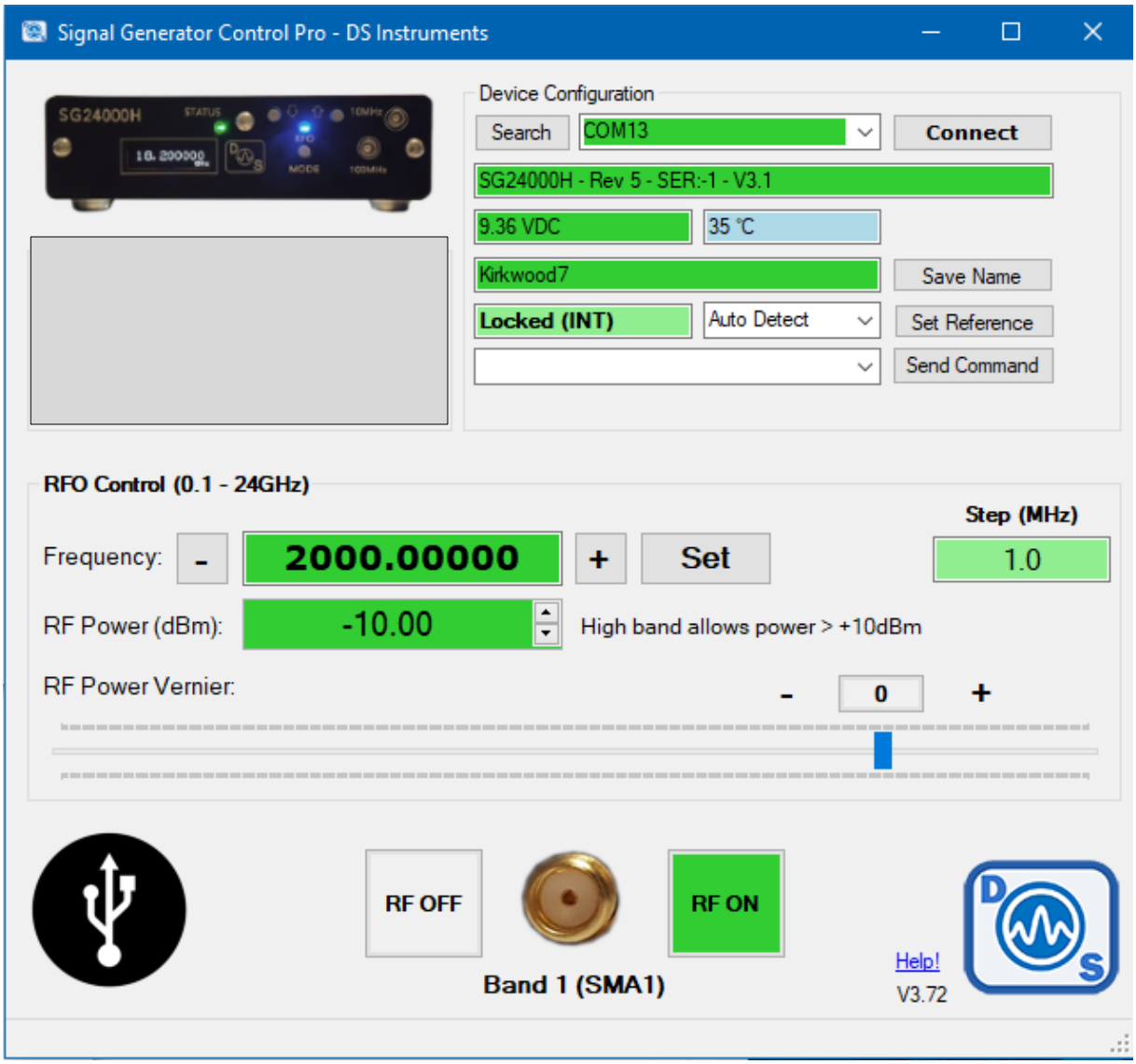
Parameter	Min	Max	Typ	Units
Output Frequency Range (internal switched bands)				
Band 1	0.05	6.0		GHz
Band 2 (X)	6.0	14		GHz
Band 3 (Ku, K)	14	24		GHz
Output power max (calibrated - all bands):			**+15**	dBm
Phase noise (10KHz offset)				
@ 18.0GHz			**-95**	dBc
@ 12.0GHz			**-98**	dBc
@ 6.0GHz			**-103**	dBc
Output RF port return loss:	8		**12**	dB
Frequency step size:			**2**	Hz
Output attenuator step Size:			**0.50**	dB
Power output range (0.05 - 22GHz):	-25	+15		dBm
Absolute calibration accuracy (0.05 – 22GHz):	±2.5		**±1.0**	dB
Power vernier range			**10**	dB
Typical vernier Increment (resolution)		0.1	**0.05**	dB
Typical frequency lock and settle time		5	**3**	mS
Reference oscillator stability OCXO (10MHz)			**±10**	PPB
Operating temperature range	0	55	**25**	C
USB input voltage	4.4	5.4	**5.0**	Vdc
USB current requirement (dual USB-C)	0.75	2.70	**1.8**	A
Harmonic levels (0.5 – 30GHz)		-20	**-30**	dBc
Spurious levels (excluding integer-boundary)		-60	**-70**	dBc
Phase shift step resolution		2	**1**	Deg

SG22000PRO

Typical User connections for remote Operation via USB



Windows Control GUI Application



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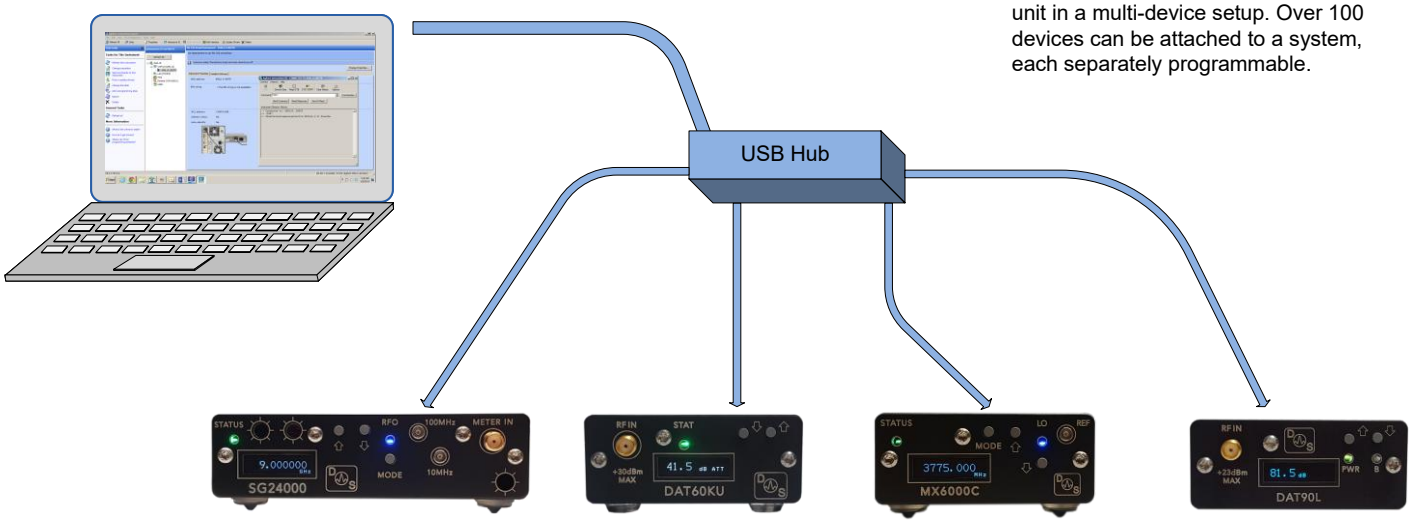
Windows Sweeping Control GUI Application

Multiple DSI Device Setup & Control - USB

Our products feature a programmable DEVICE NAME to identify each specific unit in a multi-device setup. Over 100 devices can be attached to a system, each separately programmable.



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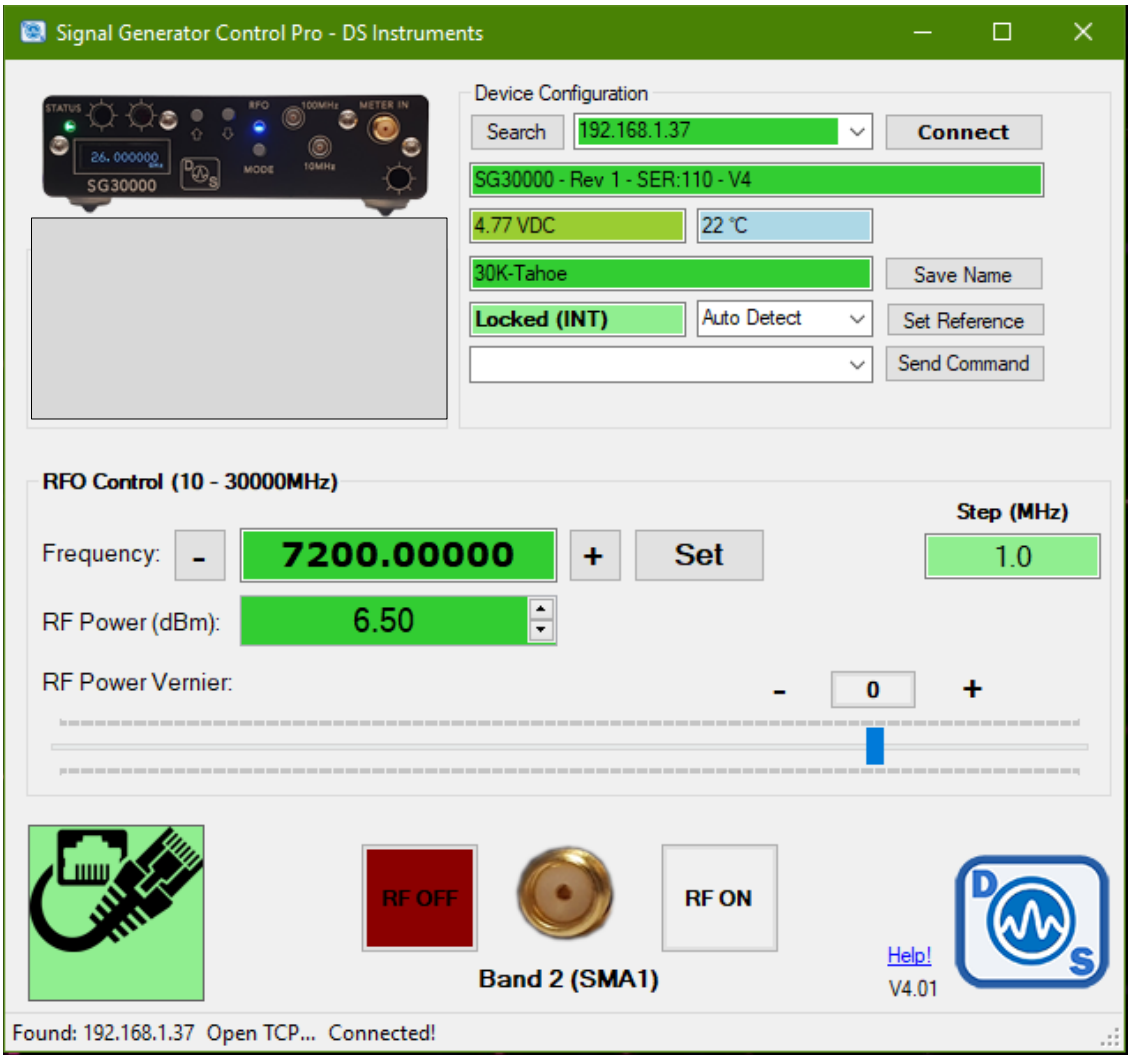
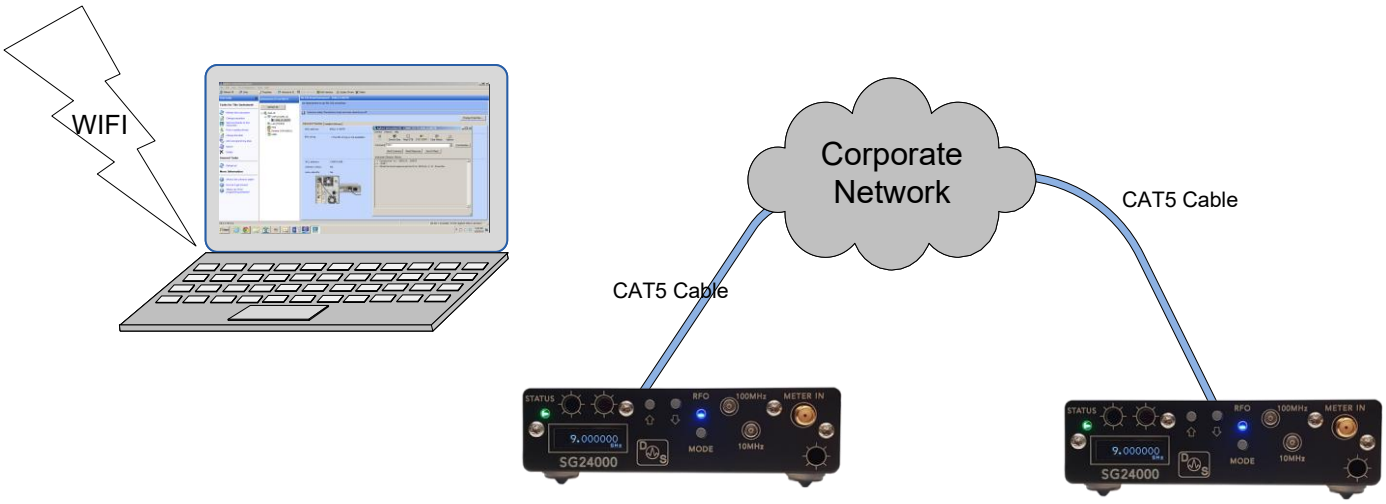
Ethernet Local Area Network Connection



Ethernet Controlled Devices



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Front Panel Device Control

The MODE button determined what property the up and down buttons modify. The default upon power up is frequency in large steps.

Mode State Diagram

Frequency (100MHz Step)	Increment or decrement the current frequency by 100MHz.
Frequency (1MHz Step)	Increment or decrement the current frequency by 1MHz.
Frequency (1KHz Step)	Increment or decrement the current frequency by 1KHz.
Power Output Level	Sets the value in dBm of the RF output signal. Uses the internal calibrated digital step attenuators for the appropriate band.
Power Vernier	Changes the output level fine tune. This is a digitally controlled variable attenuator. Resolution depends on frequency but it typically around 0.05 – 0.20dB.
RF Enable	Set the RF output port to on or off.
Sweep Trigger	If there is a saved frequency sweep, trigger it now.
Save Defaults	Save the current device settings into non-volatile memory to be used as power-on defaults

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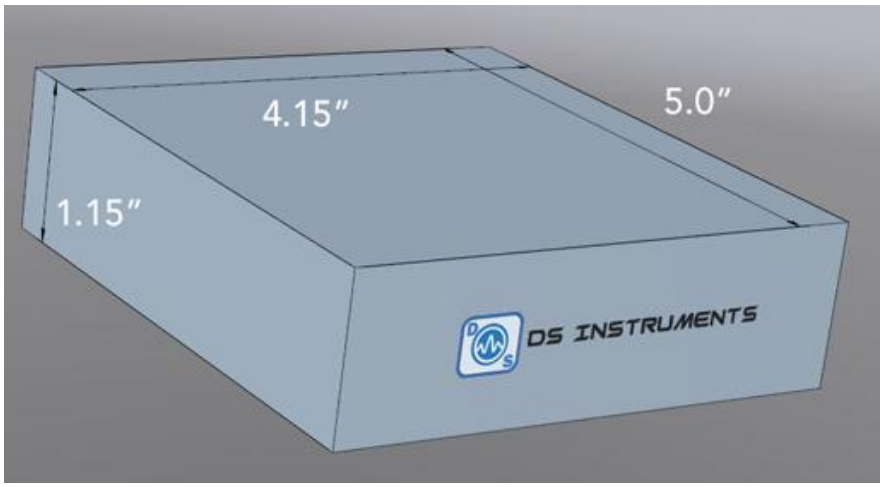
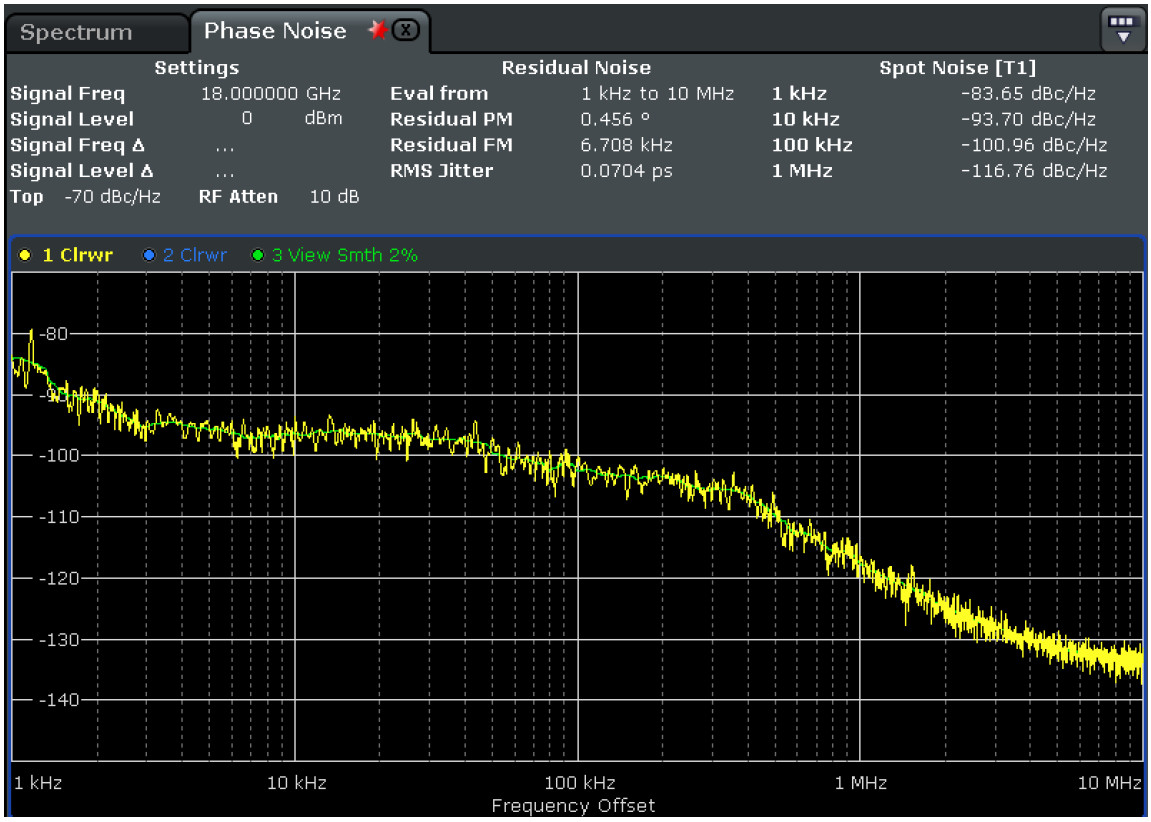
Case Dimensions



Signal Generator Panel Features

SG22000PRO

Typical Phase Noise Plots



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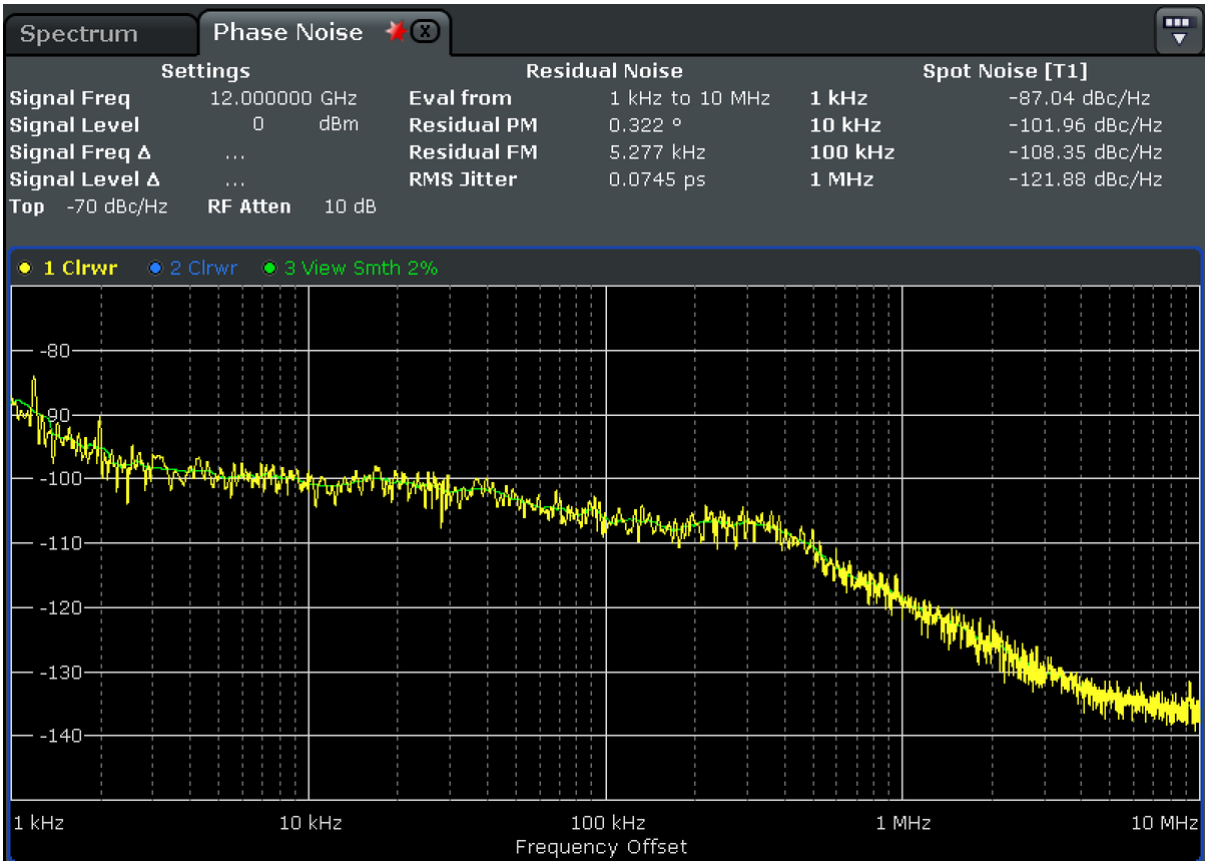
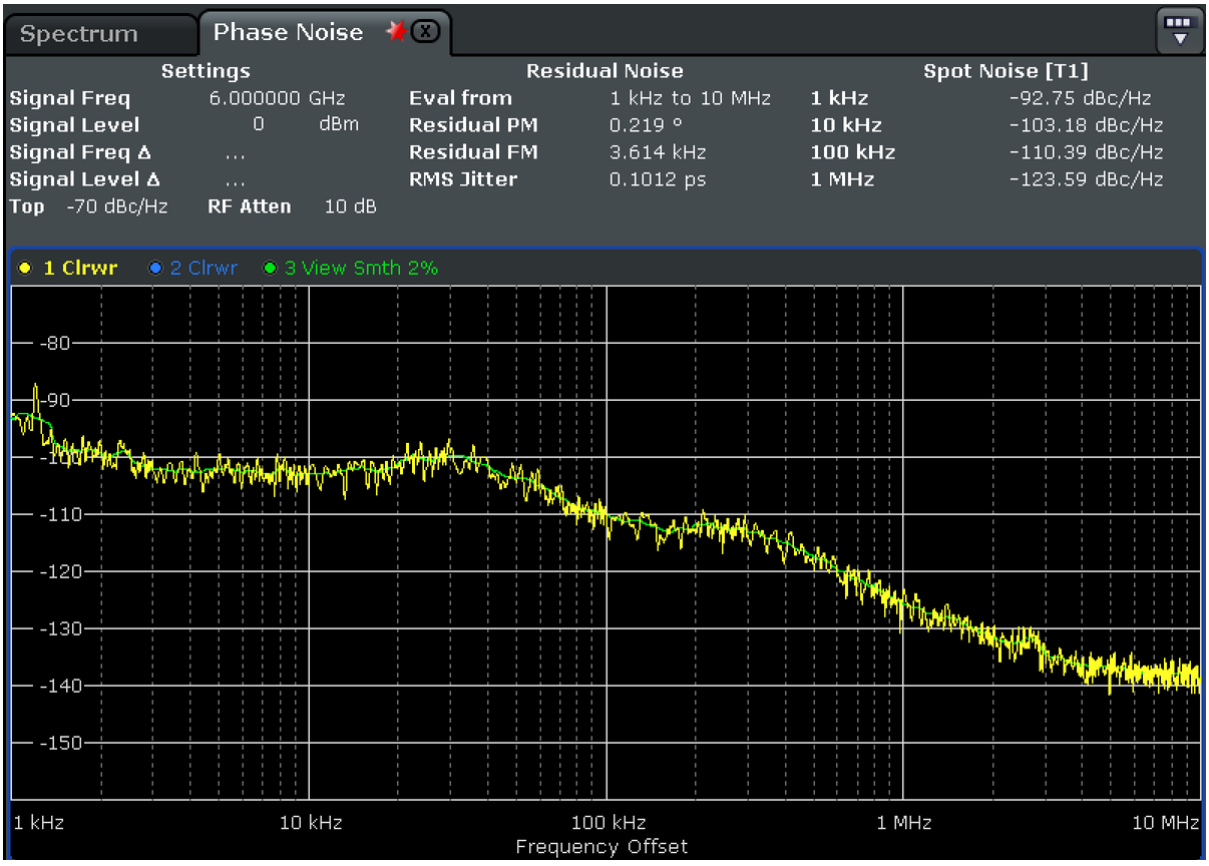
Typical Phase Noise Plots





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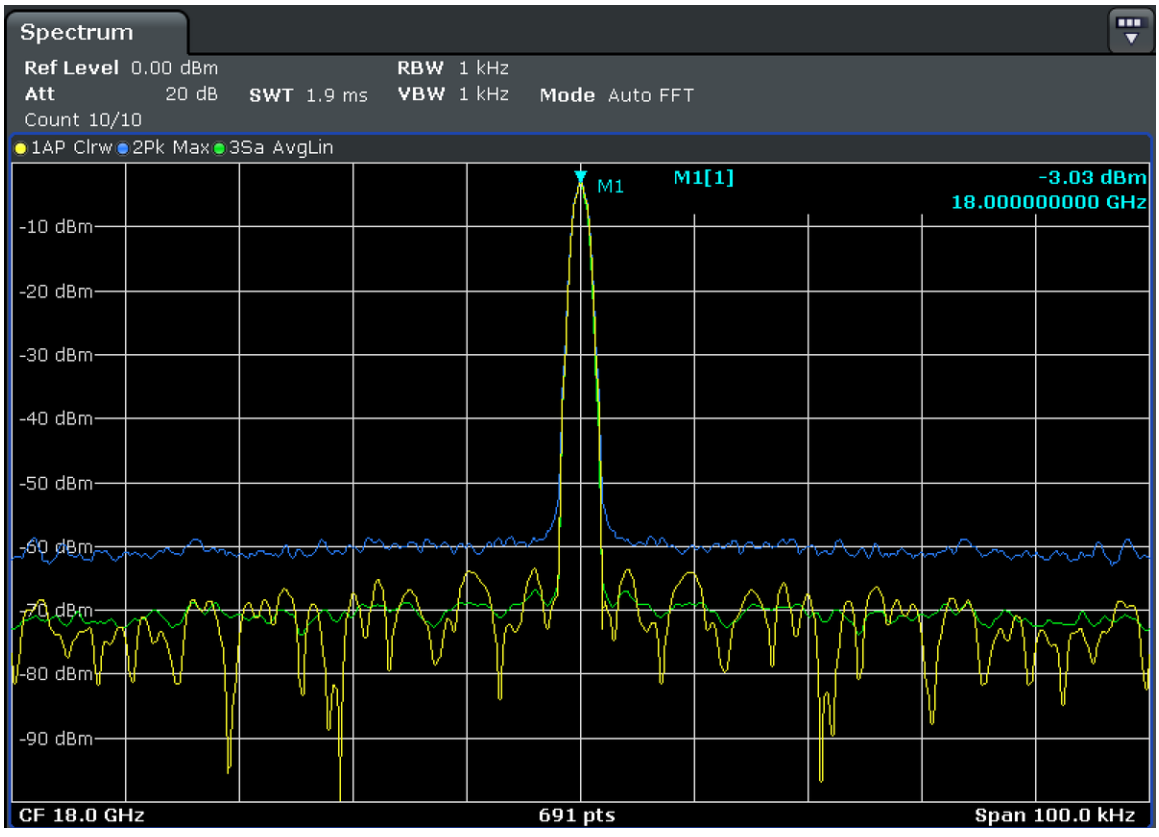
Typical Output Spectrums



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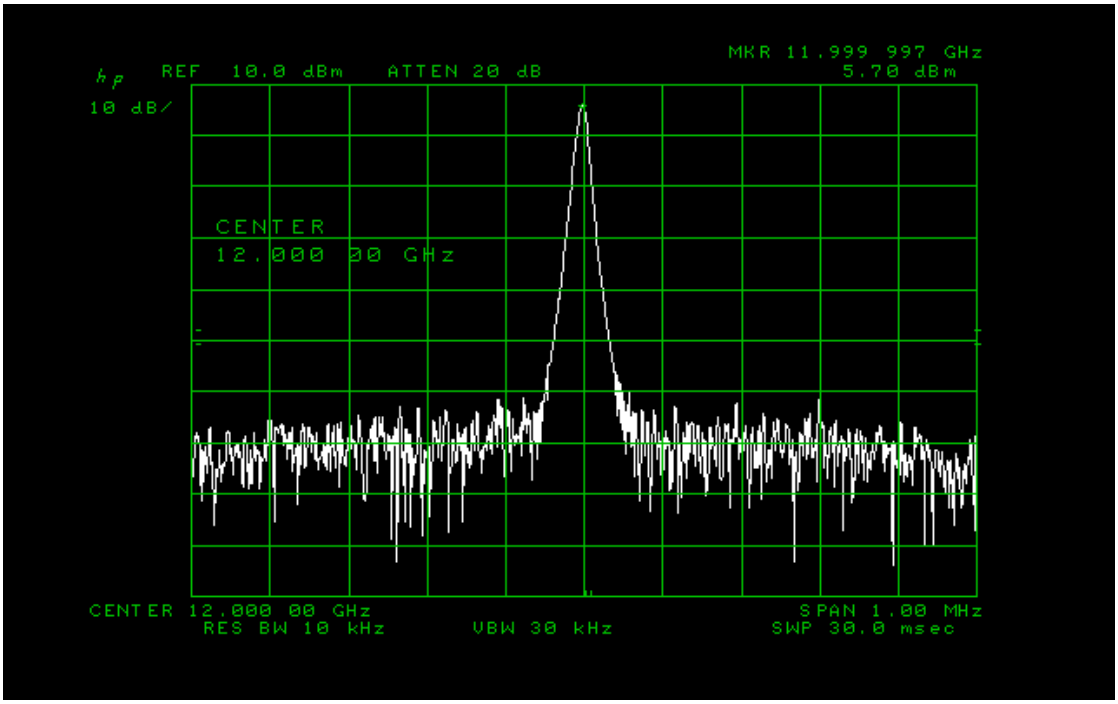
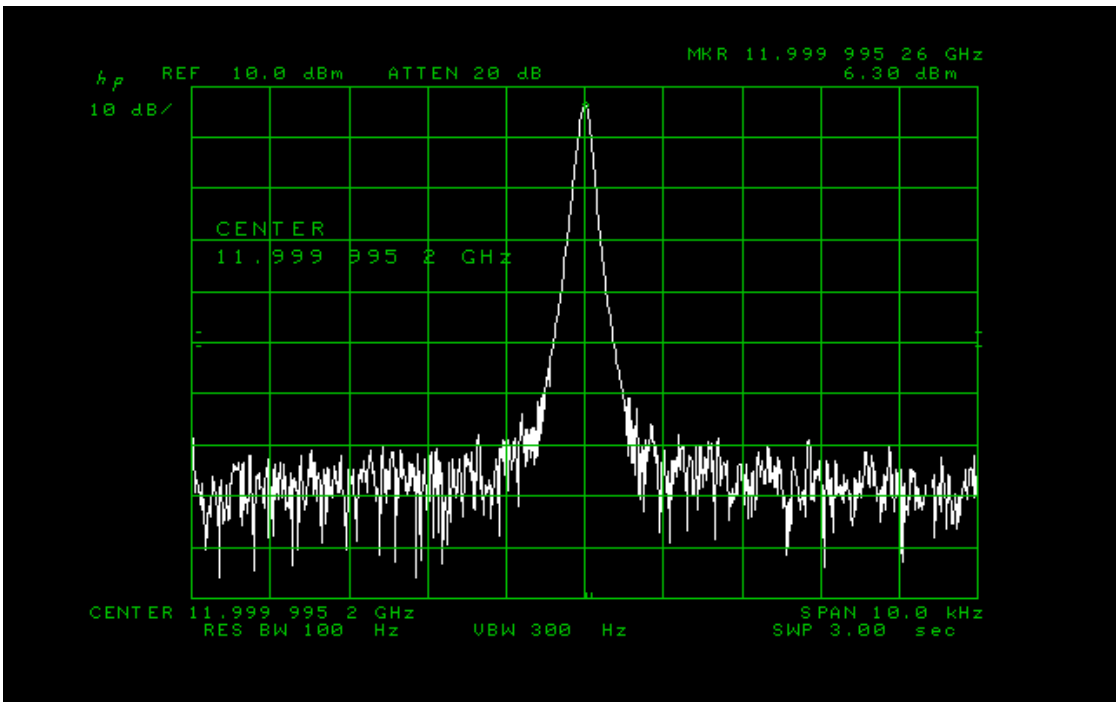
Typical Output Spectrums (12GHz)





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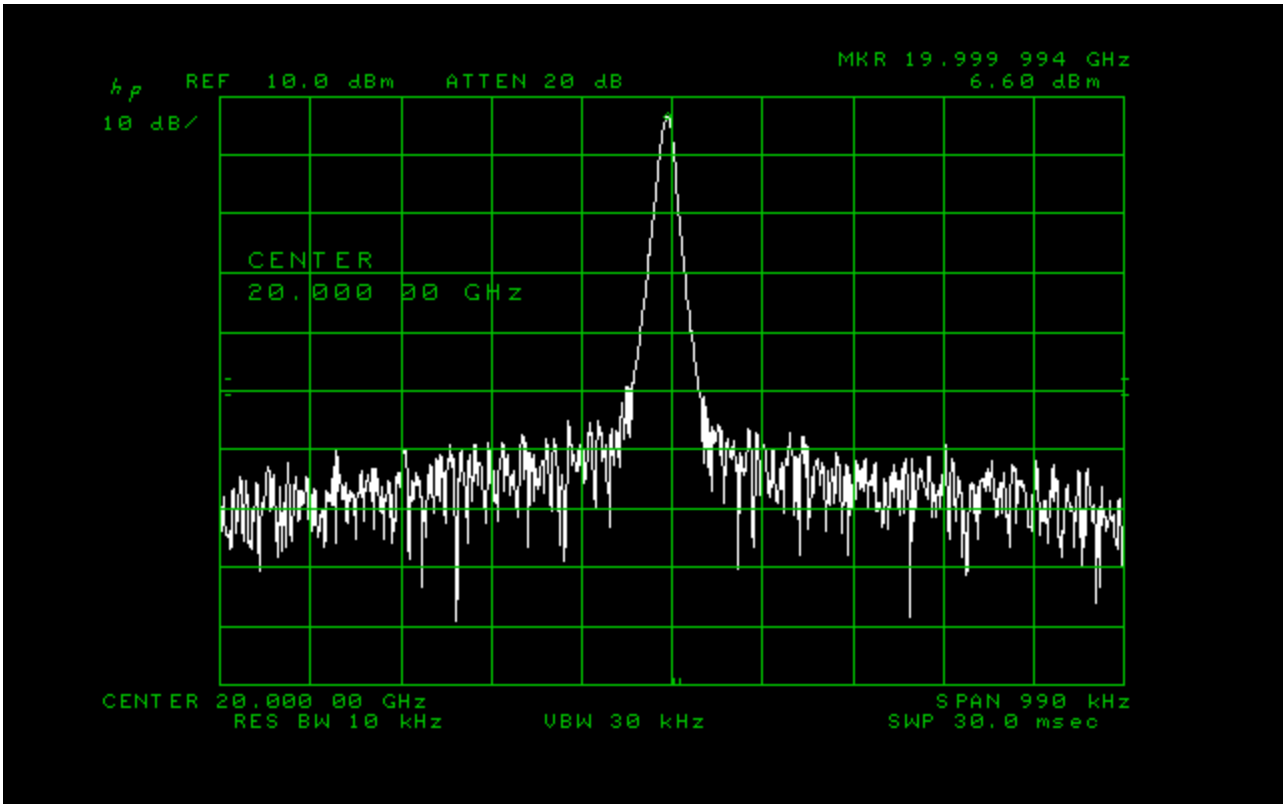
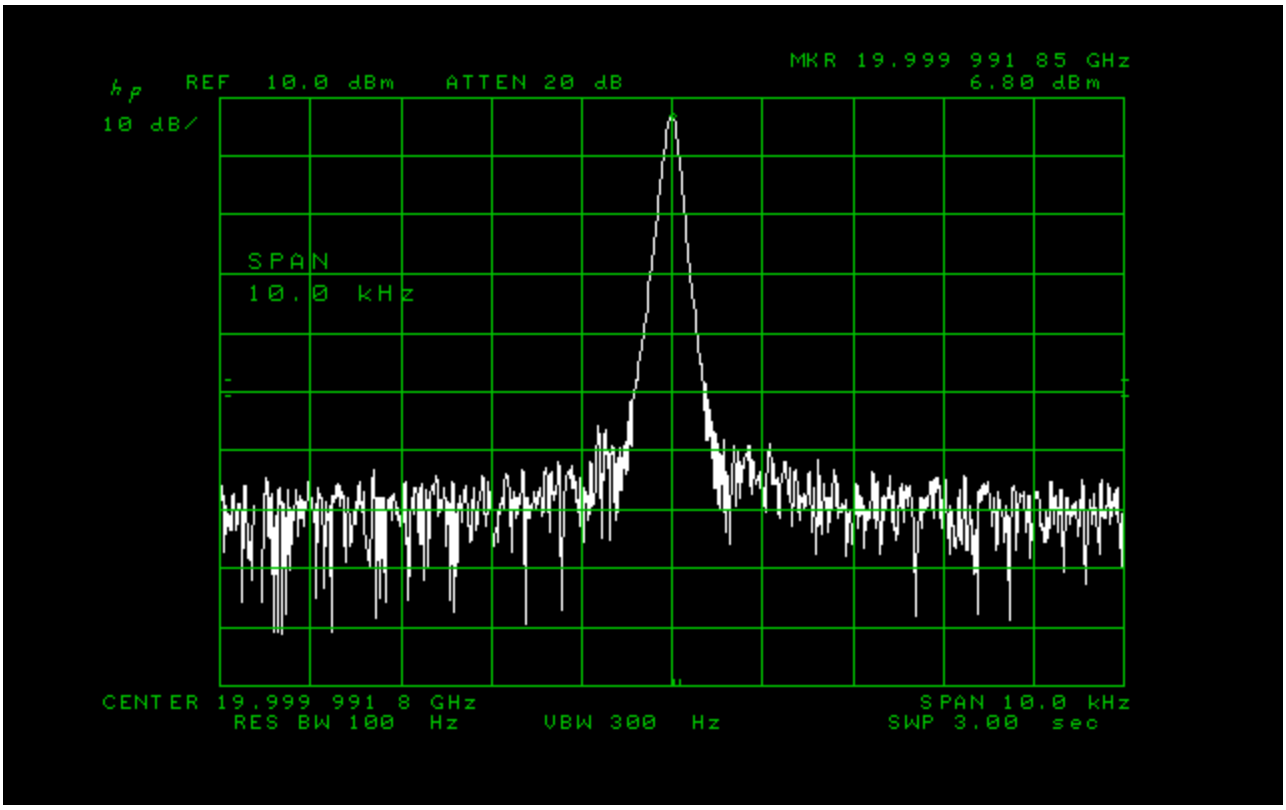
Typical Output Spectrums (20GHz)





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Typical Harmonics

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SCPI COM Command List

FREQ:CW 8GHz	Set output Frequency
FREQ:CW?	Return current Frequency
OUTP:STAT	Turn on or off the RF output
OUTP:STAT?	Return if output is enabled
POWER 5.0	Set output RF level in dBm
POWER?	Return current attenuation value
VERNIER 0.6	Set the output power level vernier (fine tune variable attenuator)
VERNIER?	Return vernier setting
*IDN?	Return the SCPI identification string
*UNITNAME ted	Set a unique name in flash memory
*UNITNAME?	Return this device's name
SYST:ERR?	Returns any pending error messages
SYST:DBG?	Returns last status message
*RST	Reset unit now
*DISPLAY OFF	Power ON or OFF the display
*BUZZER OFF	Mute the buzzer
*SAVESTATE	Save frequency & attenuation as boot defaults
SWE:MODE LIST	Select the mode for sweeping (LIST, SCAN)
SWE:DWELL 100	Sweep dwell time in milliseconds
LIST:DIR DOWN	Sweep direction
INIT:IMM	Start the sweep now
INIT:CONT	Sweep continuous mode or single
ABORT	Stop the sweep now
SWE:ACTIVE?	Is the device sweeping now
FREQ:START 9GHZ	Sweep start frequency
FREQ:STOP 10GHZ	Sweep stop frequency
SWE:POINTS 10	Sweep point count
LIST:ADD 11GHZ	Add a point to the end of the sweeping list
LIST:CLEAR	Clear the working frequency list and start over

*NOTE: Full command list is available as a separate document

SG22000PRO

Ordering Information

SG22000PRO – OLED Display, Ethernet, Dual USB Type-C	**$4999**

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