- Key Features -

- Wide Frequency Coverage
- Calibrated RF Power Output
- USB COM Interface
- Industry Standard SCPI Commands
- OLED Display and Control Buttons
- Very Cost Effective
- Incredibly Compact
- USB Powered
- Models up to 40GHz
- Harmonic Filtering
- Ethernet standard

DS Instruments

SG22000L R22

PORTABLE WIDEBAND SIGNAL GENERATOR

SG22000L – An Economical High-Frequency Microwave Generator

The SG Series of signal generators from DS Instruments enables users to generate high quality microwave signals quickly and easily. An OLED display and interface buttons allow frequency selection, attenuator control, and RF output ON/Off without need for a host PC. The SG22000L output covers the entire bandwidth from 55MHz to >22GHz on a single SMA output port. This synthesized source has its own internal precision 10MHz TCXO oscillator, and can accept an external reference signal if needed.

Power output level is calibrated and adjustable over the entire device bandwidth with the minimum and maximum levels depending on frequency. At 18GHz the typical range is -5 to +13dBm with an adjustment resolution of 0.05dB.

Ease of Use

SG22000L signal generator can be controlled from the front panel interface or by the USB port and a host PC. The user simply connects a PC to the device, and with provided software all settings and functions can be remotely operated in real time.

Signal Generator USB Operation

With the SG22000L connected to the PC via USB type-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 signal generator for automated test applications from many different operating systems and scripting languages and environments.

MADE IN U. S. A.

SG-Series Models Compared

	SG4400L	SG6000L		SG6000X (Dual Channel)	SG6000F	SG12000L	SG22000L	SG30000L	SG40000L
Min Frequency (MHz)	35	25		25	25	25	55	14000	25000
Max Frequency (GHz)	**4.4**	**6.0**		**6.0**	**6.0**	**12.0**	**22.5**	**30**	**40**
10MHz Reference Input	X	X		X	X	X	X	X	X
Sweep Trigger					X	X	X		
Power Output Dynamic Range (dB)	40	40		40	40	40	20	30	30
Extra Harmonic Filtering	X	X			**X**	X		X	X
Standard Ethernet							X	X	X
Min Calibrated Output (dBm)	-25	-23		-18	-25	-25	-5	-15	-13
Max Calibrated Output (dBm)	15	15		14	13	13	13	15	13
Low Phase Noise							X	X	X

Note: SG6000PRO has a separate extended datasheet for the SG PRO series models

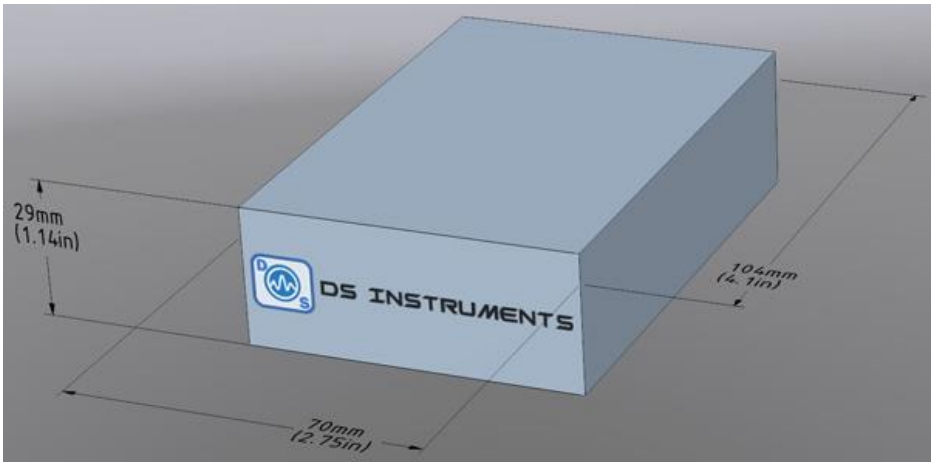
SG22000L

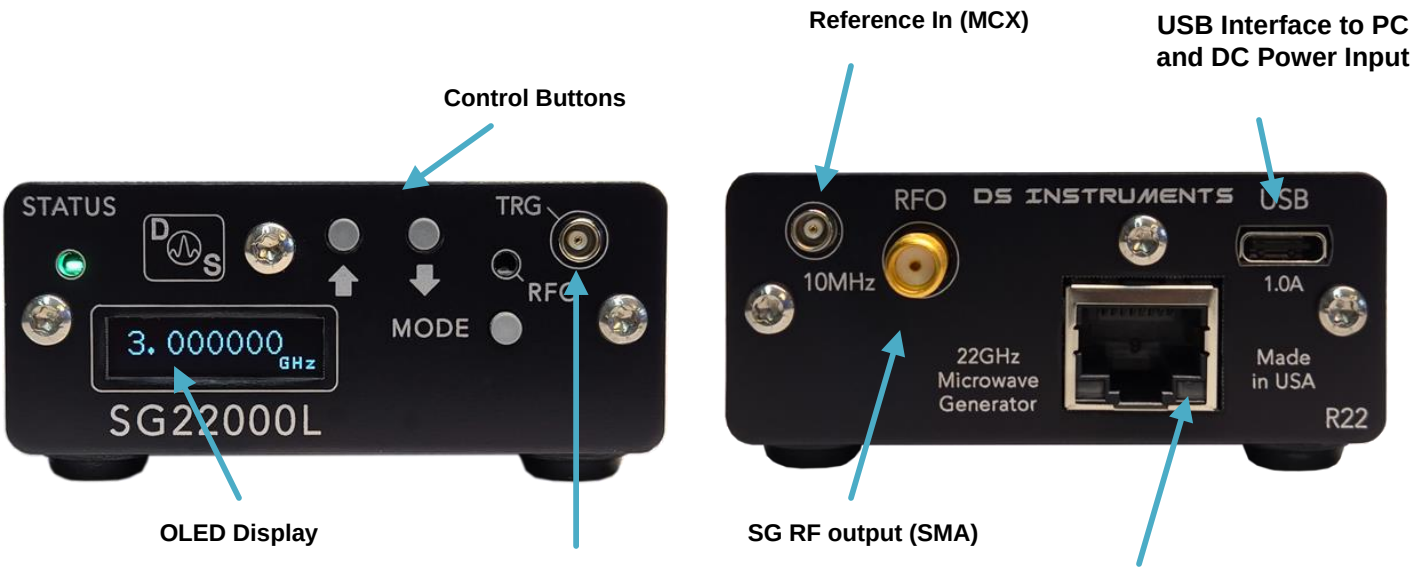
SPECIFICATIONS

Parameter	Min	Max	Typ	Units
Output Frequency Range:	55	22500		MHz
Output Power Range (**calibrated**):	-5	+13		dBm
Output Power Range (Uncalibrated mode) :	-8	+15		dBm
Calibration Accuracy (output flatness):		**± 2.5**	**±1.0**	dB
Phase Noise:				
@ 18GHz, 10KHz Offset			**-90**	dBc
@ 12GHz, 10KHz Offset			**-93**	dBc
@ 6GHz, 10KHz Offset			**-97**	dBc
@ 1GHz, 10KHz Offset			**-106**	dBc
SMA RF output port return loss:	8		**12**	dB
Frequency Step Size:			**10**	Hz
Power Output Level Step Size:			**0.05**	dB
Device Temperature Rating	-30	55	**25**	Deg. C
Harmonic Levels – ½, 2nd, 3rd		-15	**-25**	dBc
External Reference Input Level:	-5	+15	**0**	dBm
Frequency Lock and Settle Time:		5	**3**	mS
Internal 10MHz TCXO Reference Stability:			**± 280**	PPB
USB port Input Voltage:	4.5	5.4	**5.0**	VDC
USB Current Requirement:		1.2	**1.0**	A
Internal Switched Frequency Bands:			**3**	
Spurious levels (excluding integer-boundary):		< -60	**< -70**	dBc
Reference Frequency:			**10.0**	MHz
Sweep Trigger Input (MCX):	0	5.0	**3.3**	VDC
RF Disabled Signal Leakage Level:			**-60**	dBm

SG22000L

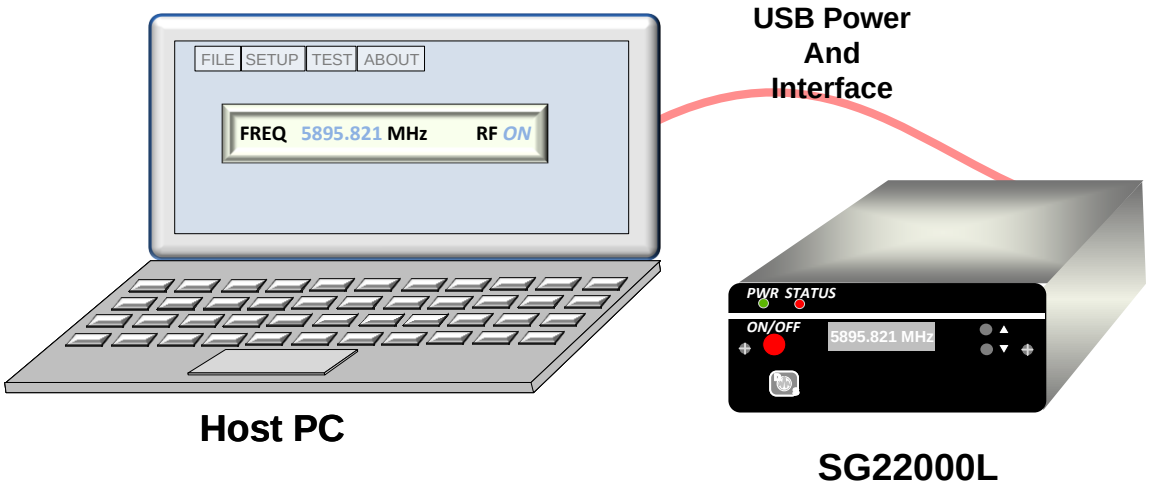
Case Dimensions & Front / Rear Panel Features





SG22000L

Windows GUI for remote Operation



SG22000L

SCPI Serial Command List

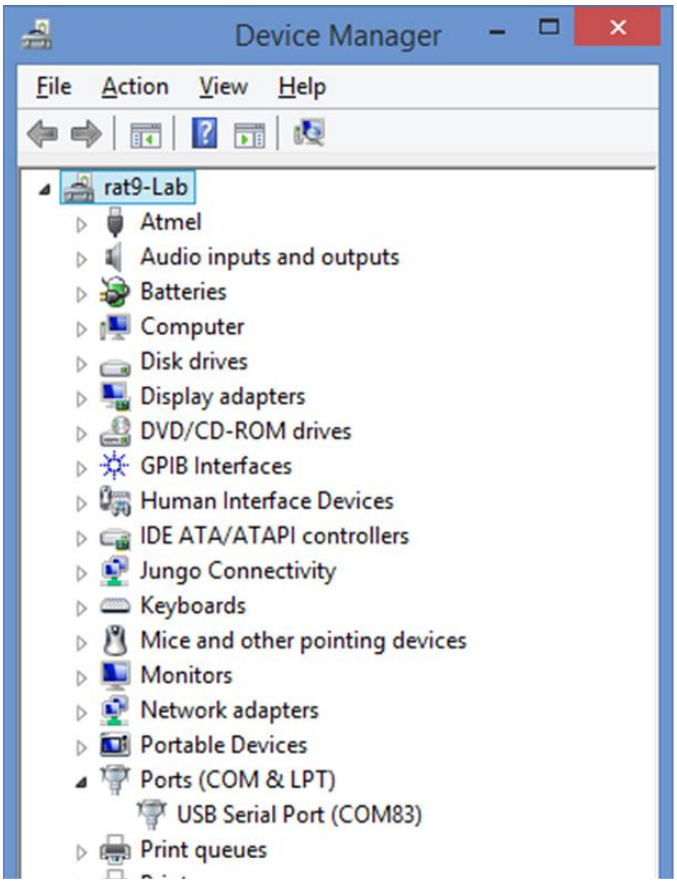
Command	Example 1	Example 2	Description
FREQ:CW	FREQ:CW 400MHZ	FREQ:CW 3.33GHZ	Set output Frequency
FREQ:CW?			Return current Frequency
OUTP:STAT	OUTP:STAT ON	OUTP:STAT OFF	Turn on or off the RF output
OUTP:STAT?			Return if output is enabled
POWER	9	-12.5	Set output power in **dBm**
POWER?			Return current output power
VERNIER	VERNIER 3	VERNIER -22	Fine tune the output power (no units)
VERNIER?			Return vernier setting
***IDN?**			Return the SCPI identification string
*PING?			returns "PONG!" if device is responding
SYST:ERR?			Returns any pending error codes
*CLS			Clears any error codes
SYST:DBG?			Returns last debug status message
*RST			Reset unit now
*INTREF?			Is the internal reference enabled?
*EXTREF?			Is an external reference signal detected?
*INTERNALREF 1			Set reference to internal
*INTERNALREF 0			Set reference to external
*INTERNALREF A			Autodetect 10MHz reference at power up
*DISPLAY	*DISPLAY OFF	*DISPLAY ON	Power on of off the display
*BUZZER	*BUZZER ON	*BUZZER OFF	Mute the buzzer
*SAVESTATE			Save frequency & attenuation as boot defaults
*SYSVOLTS?			Return internal USB voltage
*UNITNAME	*UNITNAME Bob	*UNITNAME DEV-34	Set a unique name in flash memory
*UNITNAME?			Return this device's name
SWE:MODE	SWE:MODE SCAN		Enters sweep mode & arms external sweep trigger
FREQ:START	FREQ:START 1GHZ	FREQ:START 99MHZ	Sweep start frequency
FREQ:STOP	FREQ:STOP 2GHZ	FREQ:STOP 999MHZ	Sweep stop frequency
LIST:DIR	LIST:DIR UP	LIST:DIR DOWN	Sweep direction
SWE:POINTS	SWE:POINTS 10	SWE:POINTS 900	Sweep point count
SWE:DWELL	SWE:DWELL 25	SWE:DWELL 1000	Sweep dwell time in milliseconds
INIT:CONT	INIT:CONT 0	INIT:CONT 1	Sweep continuous mode or single
INIT:IMM			Trigger the sweep now
ABORT			Stop the sweep now
SWE:ACTIVE?			Is the device sweeping now
TRIG:STEP			Mode where trigger command only advances 1 step
TRIG:SWEEP			Trigger command will execute entire sweep (default)

NOTE: An extended sweeping command list and app note is also available

SG22000L

Remote Control Example Code

All of our products can be controlled from any serial-capable programming language or environment. MATLAB, .NET, Linux, python are all popular. We use Visual Studio and C# for our standard GUI. First determine the port number that your device has installed itself as:



Example Code (C# .NET Framework):

```
using System;
using System.IO.Ports;     // include serial port library

SerialPort myPort = new SerialPort("COM83", 115200, System.IO.Ports.Parity.None, 8, System.IO.Ports.StopBits.One);

myPort.Open();          // open the port we just made

myPort.WriteLine("*IDN?");        // send any command here

myPort.ReadTimeout = 250;

string myResponse = myPort.ReadLine();      // read back the response

System.Threading.Thread.Sleep(30);           // delay before sending the next command
```

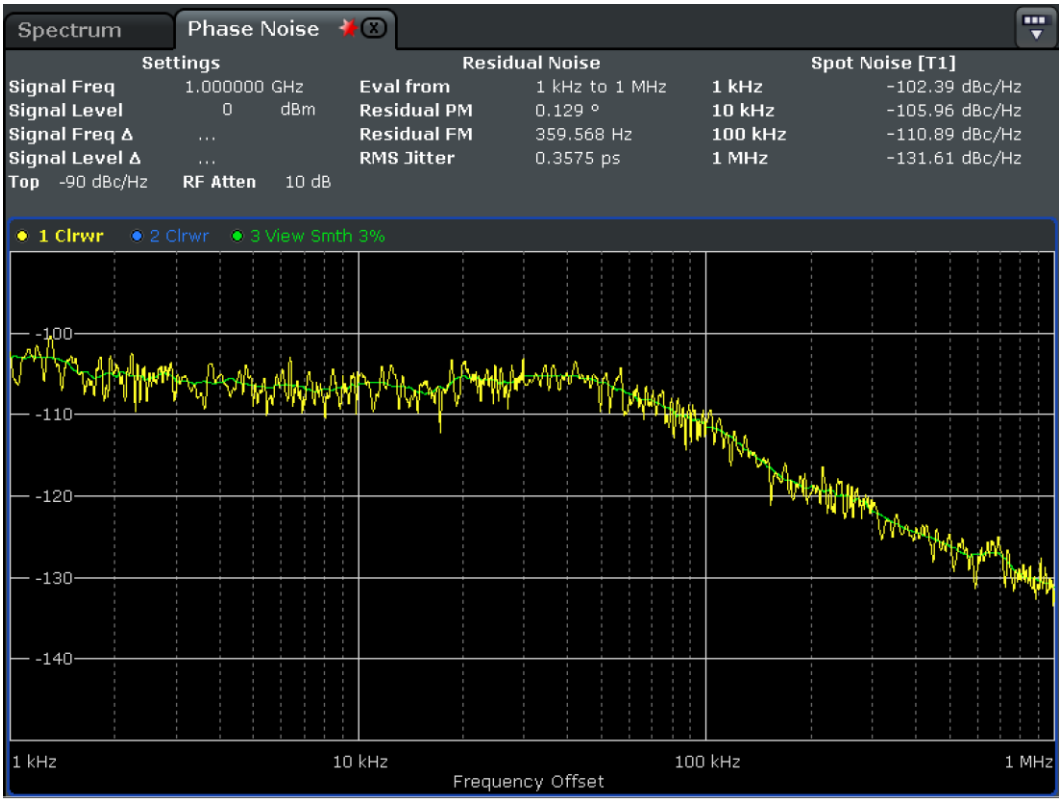
SG22000L

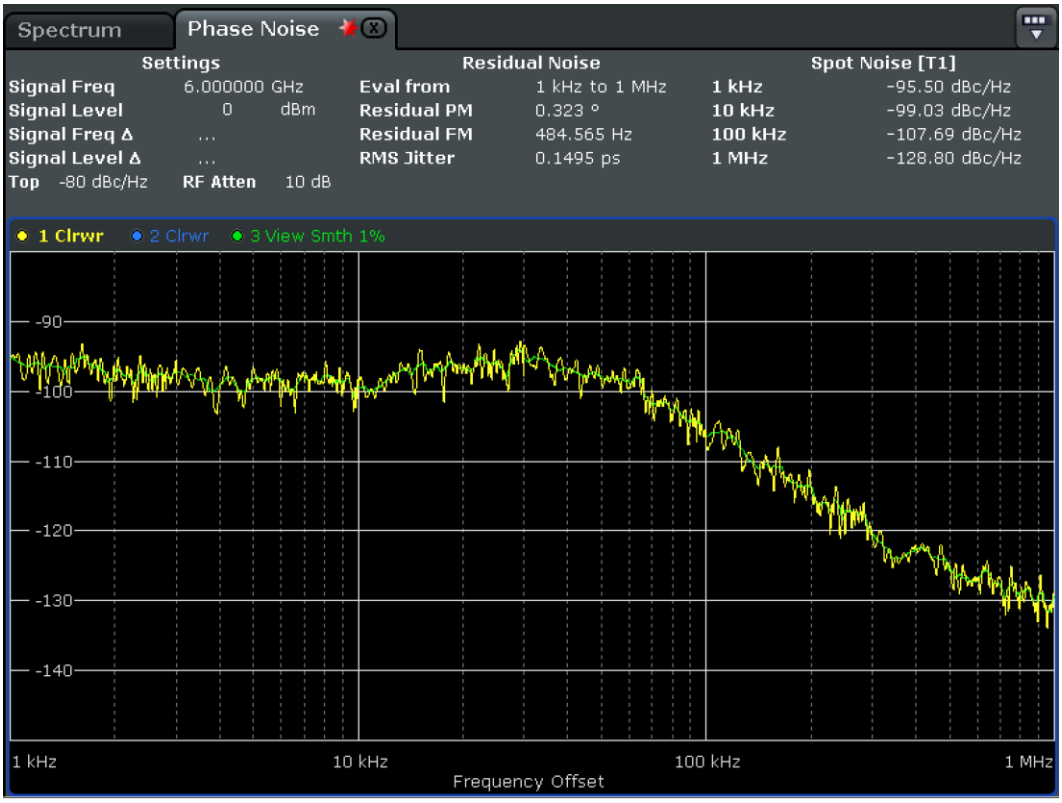
Harmonics

Unfiltered synthesizers can have harmonics near -10dBc extending well beyond the 9th. The SG22000L harmonic filtering is typically able to reduce most harmonics to less than -25dBc. Near internal band edges (0, 6GHz,13GHz, 22GHz), one harmonic will typically breach this level.

SG22000L

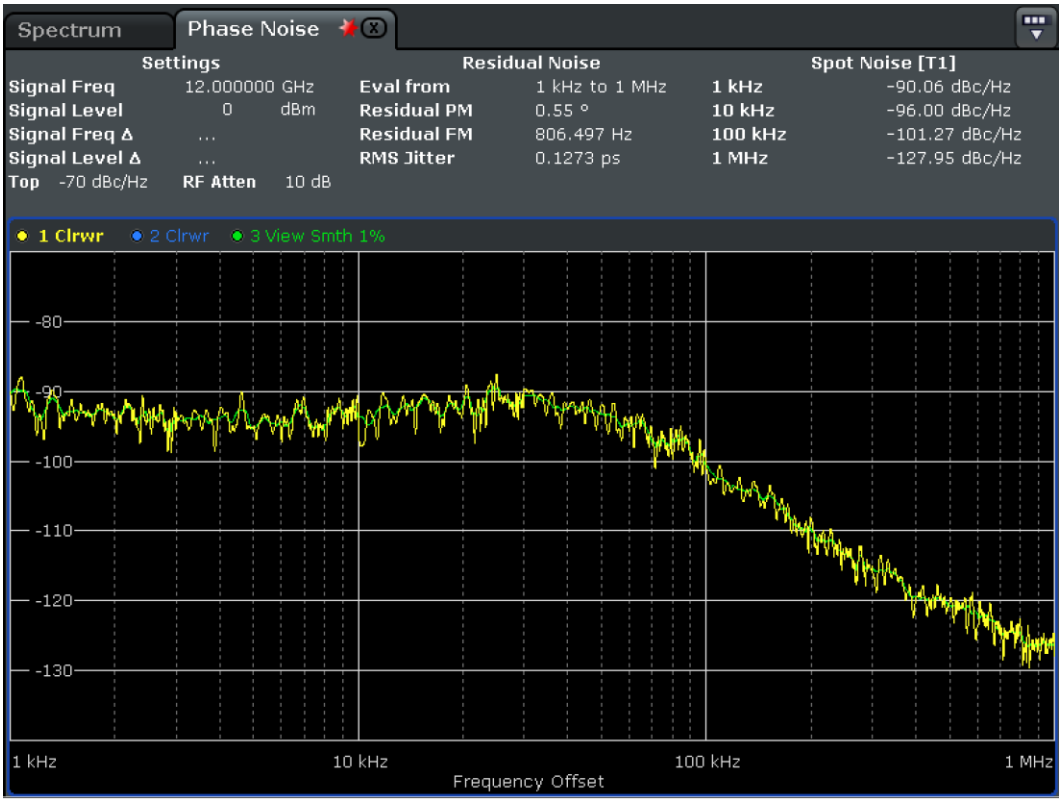
Typical Phase Noise

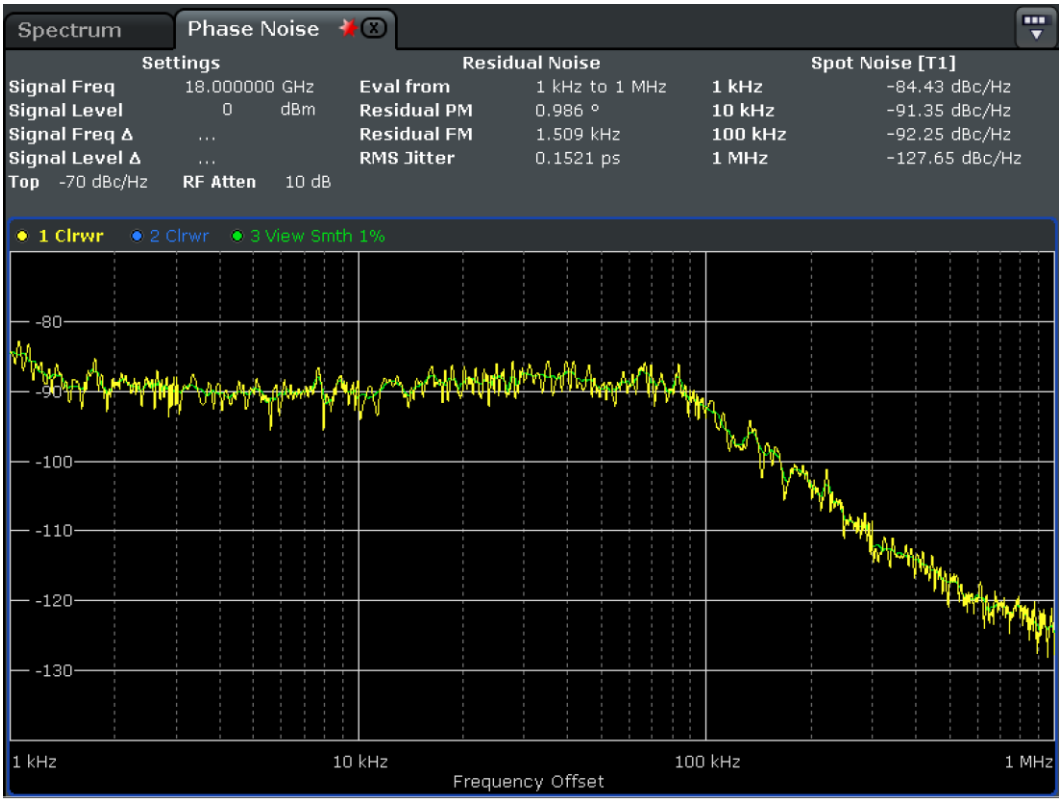




SG22000L

Typical Phase Noise





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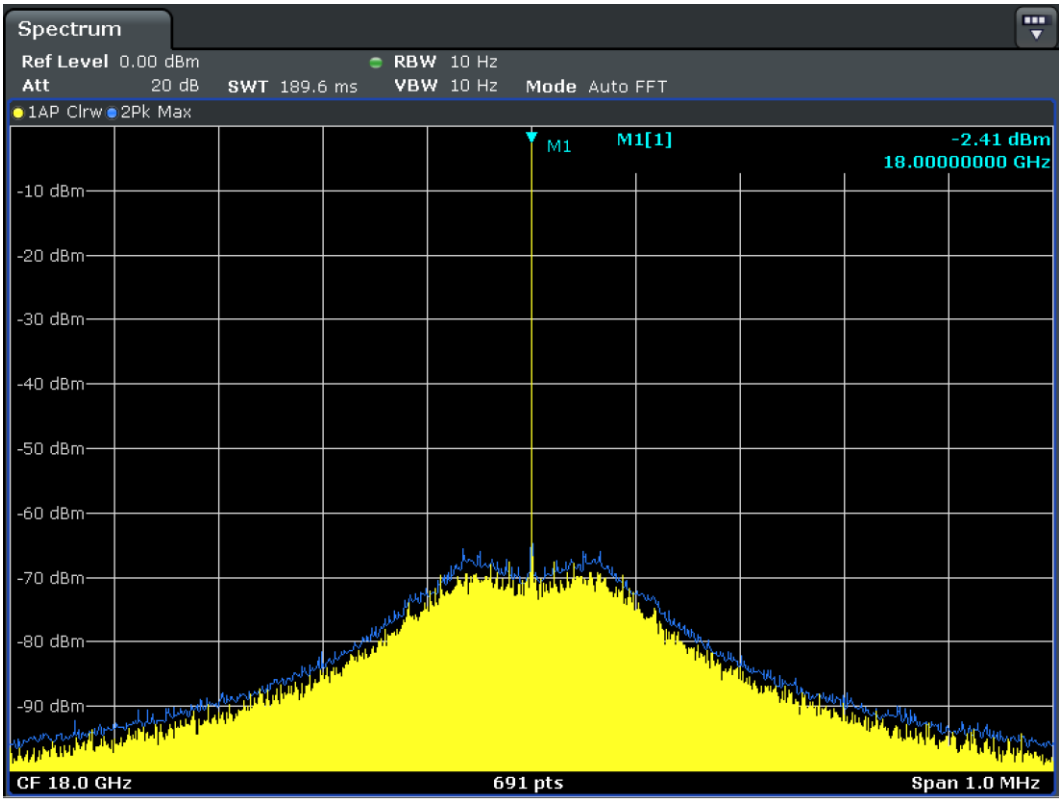
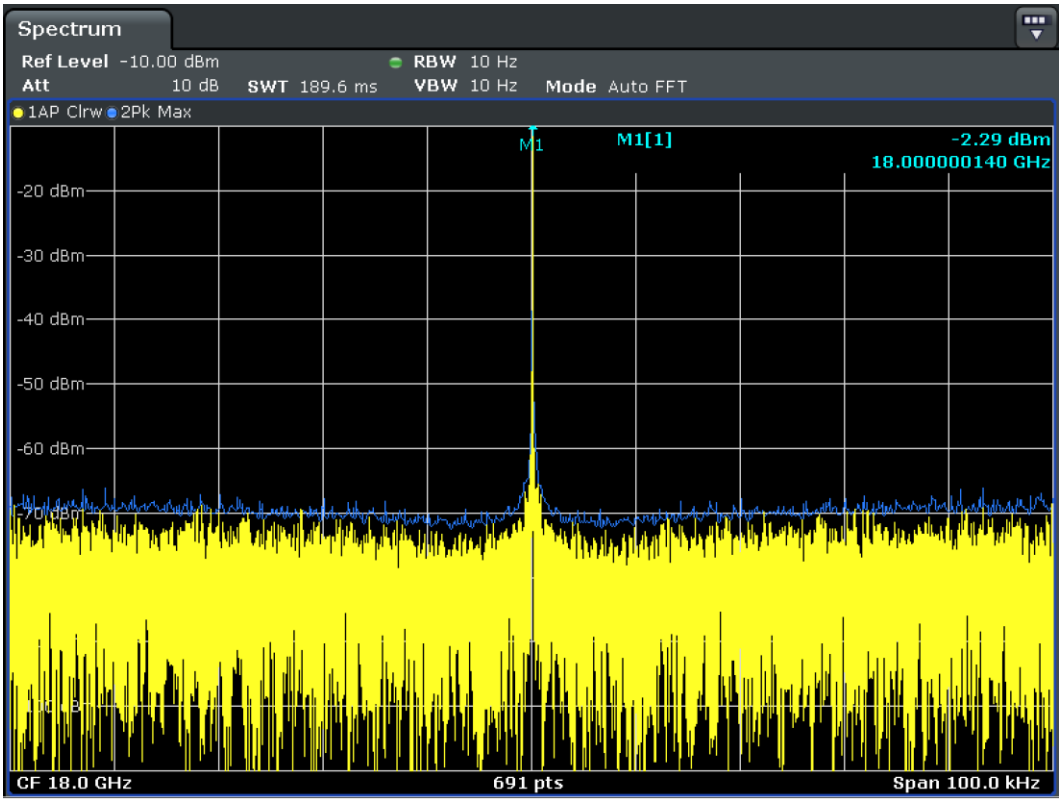
Typical Output Power Spectrums

[25 Deg. C, USB Power , internal 10MHz]





SG-Series Models

Ordering Information

SG4400L – Standard Version – 35 to 4400MHz

SG6000L – Standard Version – 25 to 6000MHz

SG6000F – Extended Harmonic Filtering – 25 to 6000MHz

SG6000X – Dual Channel – 25 to 6000MHz

SG12000L – 25MHz to 12GHz Output

SG22000L – 55MHz to 22GHz Output

SG30000L – 15 to 30GHz Output

SG40000L – 25 to 40GHz Output

Contact Information

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