TX1000 RF Demo Kit Application Note

RIGOL
Beyond Measure

Product Overview:

TX1000 RF Demo Kit (hereinafter referred to as RFDK-TX) is a signal emission kit released by **RIGOL** to demonstrate the DSA1000 and DSA1000A series spectrum analyzers.

RFDK-TX Features:

◆ Energized by USB; connected with PC for operations and controlled through the program control panel on the PC.

◆ Provide 10MHz reference signal output and can easily realize clock synchronization with other devices of the system.

◆ Built-in 50MHz signal which can be connected to the input port by "switches" to facilitate users' learning, operation and demonstration of the spectrum analyzer.

◆ 500MHz and 1GHz local oscillator signal outputs with good phase noise to convenient users' various measurement needs when there is no signal source.

◆ Modular circuit design; provide interfaces for users to make separate measurement of any component; enable to replace any component.

Contents

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RIGOL Technologies, Inc.

Hardware Modules

The hardware module of the RFDK-TX mainly includes a mixer, a filter and an amplifier (PA), see the schematic diagram below:
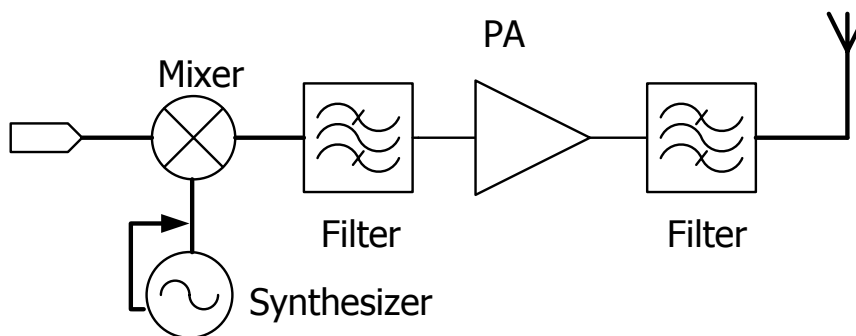

Figure 1 RFDK-TX Schematic Diagram

Software Installation

1. Decompress the installation package (or read the installation disk) and inspect the installation package for completeness. The package should include three folders (**bin, license, supportfiles**) and three files (**nidist.id, setup.exe, setup.ini**), see figure below:
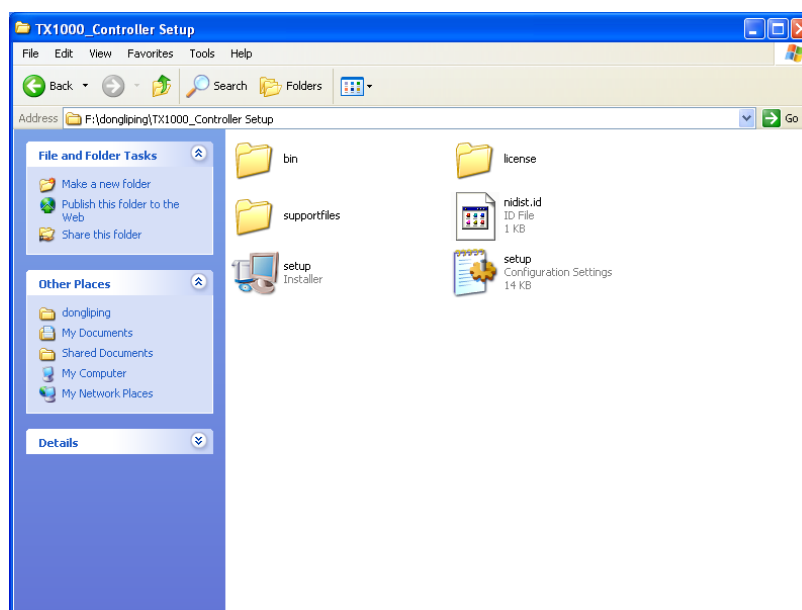

Figure 2 Contents of the Installation Package

2. Double-click the **setup.exe** file in figure above to enter the initialization interface as shown in figure below and wait for the completion of the initialization process.
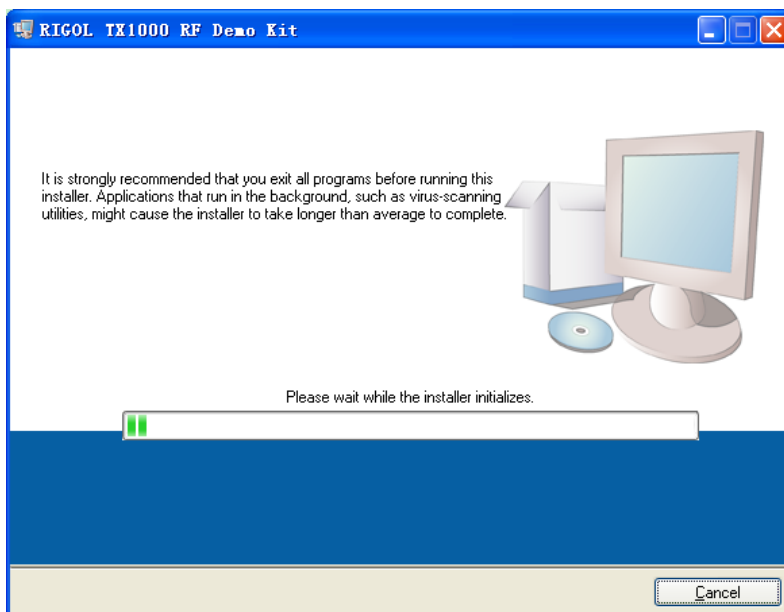

Figure 3 Software Installation Initialization

3. After the initialization finished, the interface as shown in figure 4 is displayed and you can click **Browse** to change the software installation directory (or use the default directory). Then click **Next**.
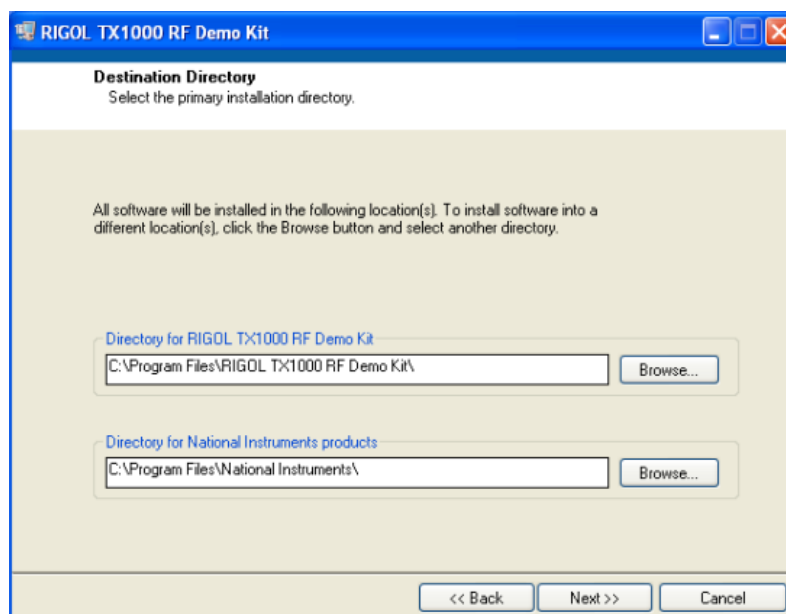

Figure 4 Change the Software Installation Directory

4. The interface then enters NI software license agreement (see figure below), from where you can select **I accept the License Agreement(s)** and click **Next** to enter the next interface.
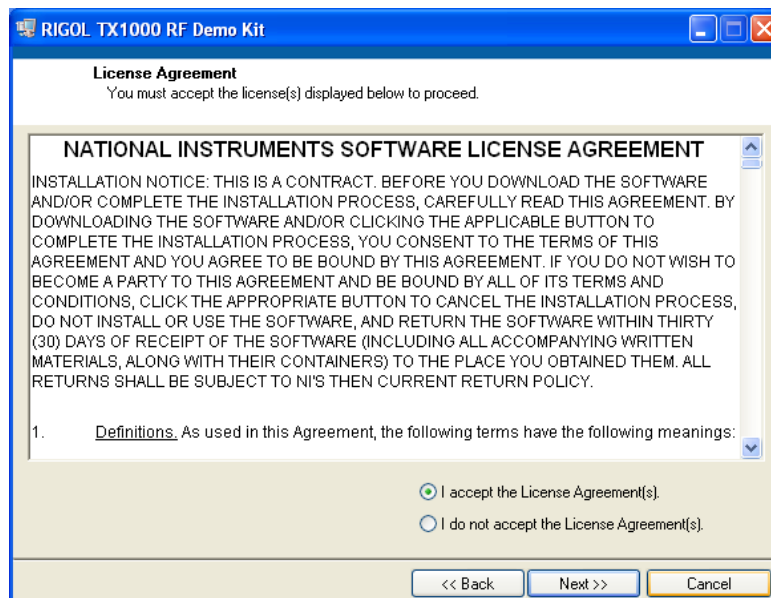

Figure 5 Interface of NI Software License Agreement

5. Please read the following LICENSE AGREEMENT and click **Next** to move to the next step after you select **I accept the License Agreements(s)**.
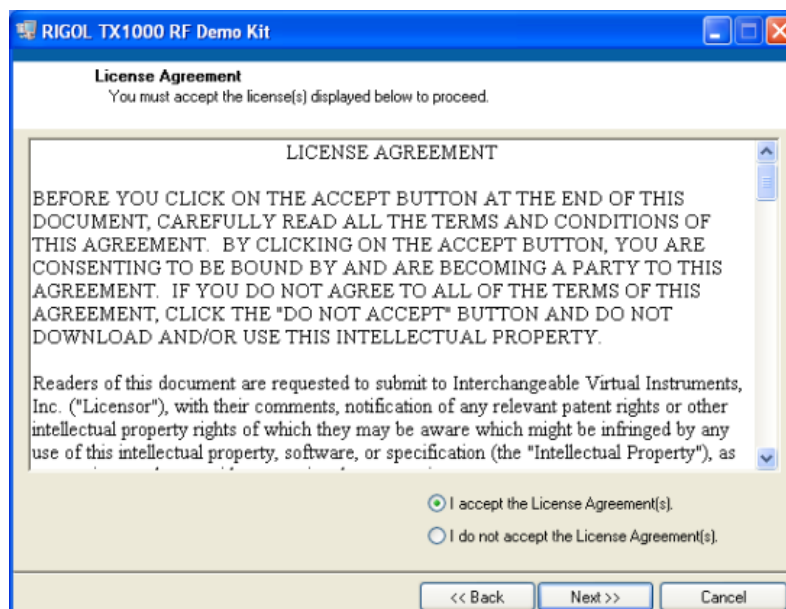

Figure 6 Interface of LICENSE AGREEMENT

6. The program then enters the formal installation interface, click **Next** to move to the next step:
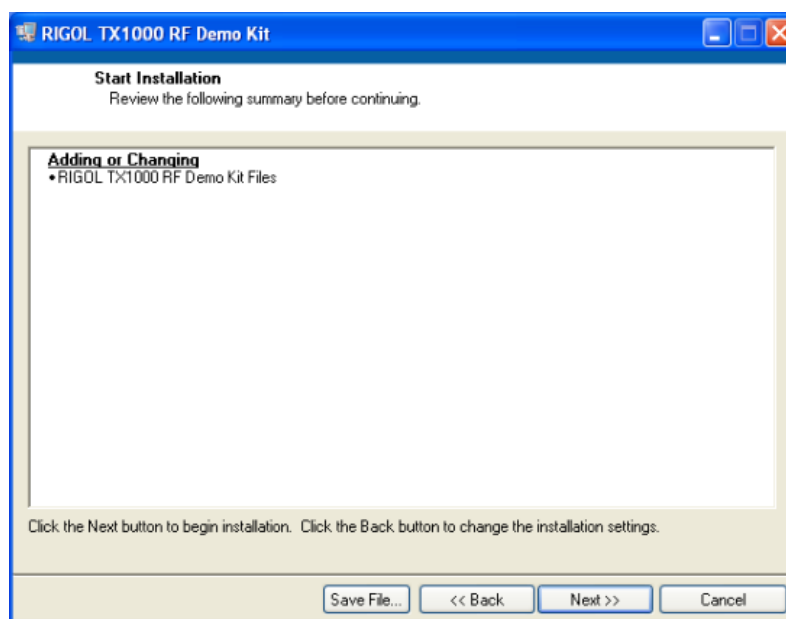

Figure 7 Formal Installation Interface

7. After the installation process (omitted) finished, the interface as shown in figure 8 is displayed and click **Finish** to complete the installation.
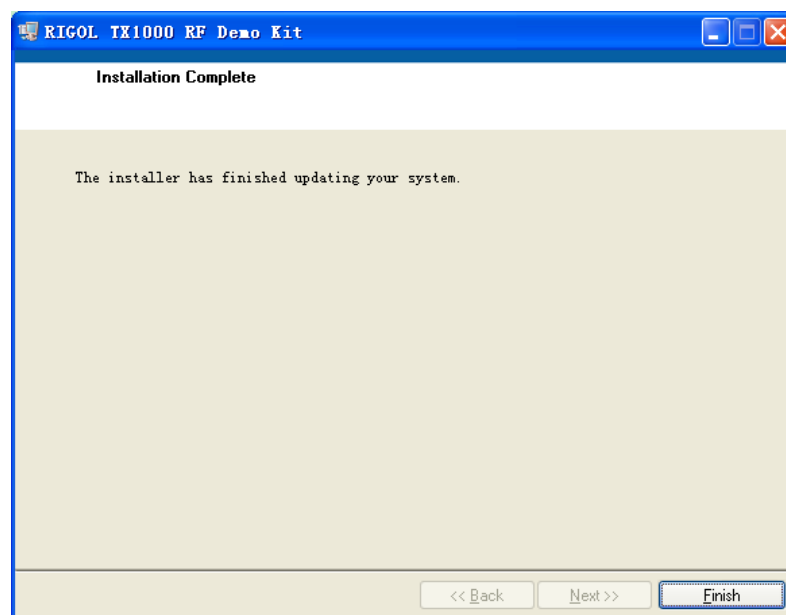

Figure 8 Installation Completion

Software Use Instructions

The operation interface of the control software of the RFDK-TX is brief and clear, which helps the users to grasp the application of the module within the shortest period of time possible to largely improve the working efficiency. Before using the software, connect the module to the PC using the USB cable and then follow the steps below.

1. Open the installation directory of the software. Here, it is **C:\Program Files\RIGOL TX1000 RF Demo Kit**. Users can find the executable program according to the installation directory selected during the installation. Besides, users can also find the startup item of the software in the "Start" menu.
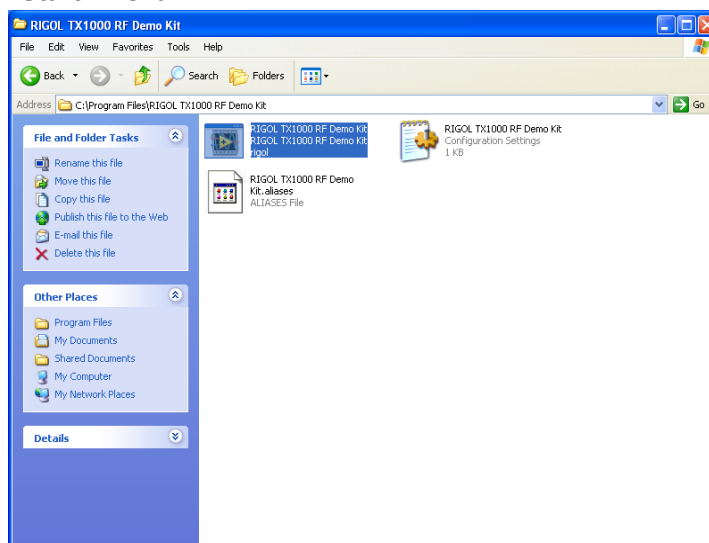
Figure 9 Software Executable Program Catalog

2. Double click the executable program **RIGOL TX1000 RF Demo Kit** in figure 9 to start the program, the program then enters the interface below:
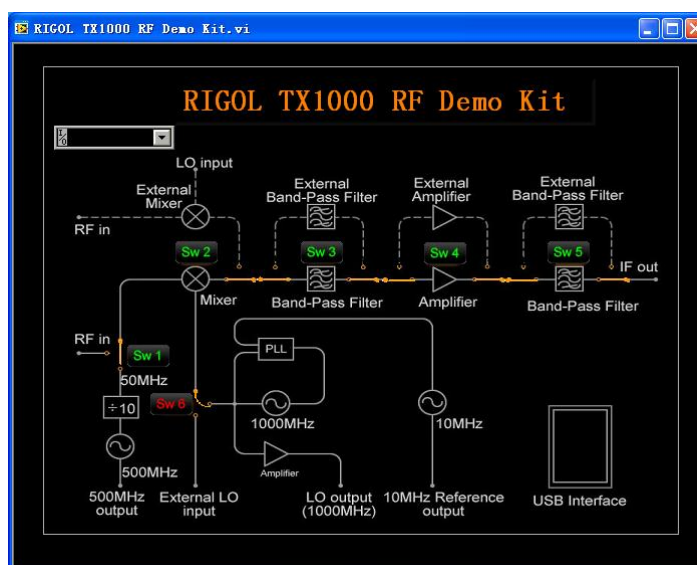
Figure 10 Software Startup Interface

3. Click the dropdown button ▓▌   ▼ at the upper left corner of the resource box and select the source name (here it is USB0::0x9906::0x2004::C02110021100::INSTR) of the RFDK-TX from the dropdown list to establish connection between the hardware module and the control software.

The resource search may take several seconds, so please wait patiently for the appearance of the dropdown list. When multiple devices are connected to the PC, the dropdown list will list the resource names for all the devices and please select the one starting with USB0::0x9906::0x2004 (all the resource names of the RFDK-TX start with this character string). See figure below:
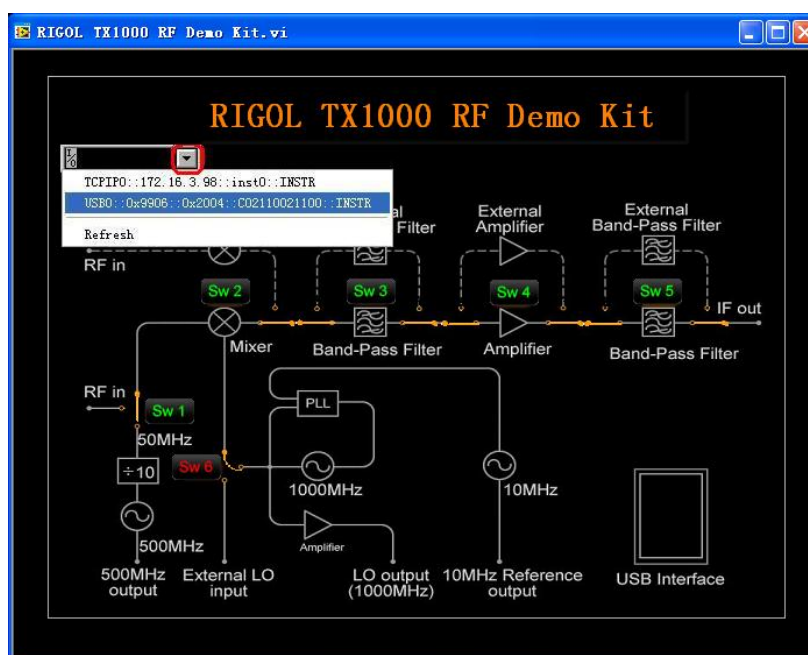
Figure 11 Select the Source Name of the RF Demo Kit

4. After selecting the correct resource name, you can control the RFDK-TX. There are six buttons on the program interface: Sw1, Sw2, Sw3, Sw4, Sw5 and Sw6. Click the buttons to switch their status so as to control the RF output of the module.

Note that if the connection between the module and the PC breaks off (caused by the USB interface disconnection or other reasons), you only need to re-connect the module with the PC using the USB cable rather than restart the control software. What's more, the switch buttons on the control software will be reset automatically after the re-connection.

Typical Applications

Testing the Measurement Instrument Function

Operation procedures:
- Connect the spectrum analyzer, RFDK-TX and PC as shown in figure 12;
- Configure the switches in the software to make the RFDK-TX work in proper state;
- Set the measurement parameters in the spectrum analyzer to obtain the measurement results.

Figure 12 (a) Testing Measurement Instrument Function

Figure 12 (b) Testing Measurement Instrument Function

Testing the Characteristics of Band-pass Filter

Operation procedures:

- Connect the spectrum analyzer, RFDK-TX and PC as shown in figure 13;
- Configure the track source parameters in the spectrum analyzer;
- Configure the switches in the software to make the RFDK-TX work in proper state;
- Set the measurement parameters in the spectrum analyzer to obtain the measurement results.

Figure 13 Testing the Characteristics of the Band-pass Filter

The Influence of the Performance of PA on the System

Operation procedures:

- Connect the spectrum analyzer, RFDK-TX and PC as shown in figure 14 and replace the PA of the RFDK-TX;
- Configure the switches in the software to make the RFDK-TX work in proper state;
- Set the measurement parameters in the spectrum analyzer to obtain the measurement results.

Figure 14 The Influence of the Performance of PA on the System

The Influence of the Performance of the Filter on the System

Operation procedures:
- Connect the spectrum analyzer, RFDK-TX and PC as shown in figure 15 and replace the filter of the RFDK-TX;
- Configure the switches in the software to make the RFDK-TX work in proper state;
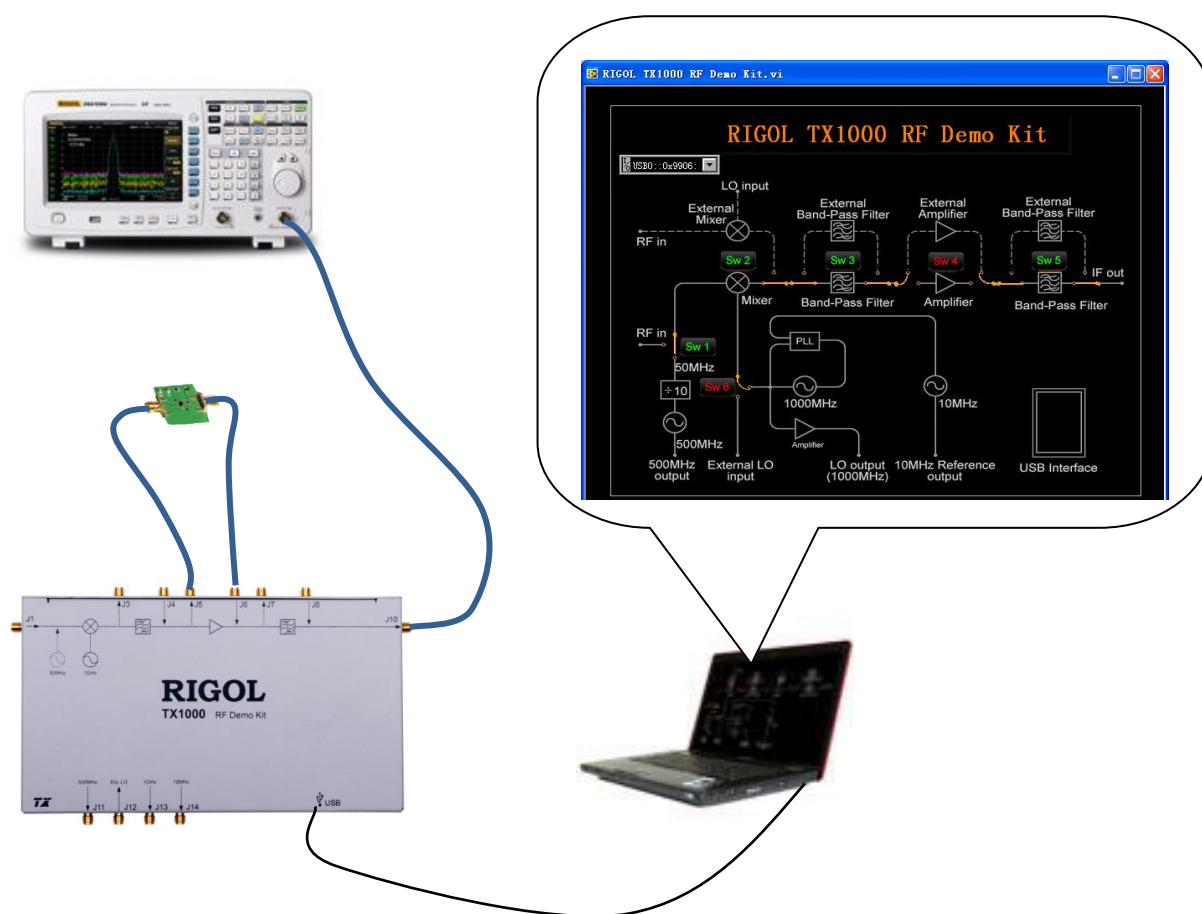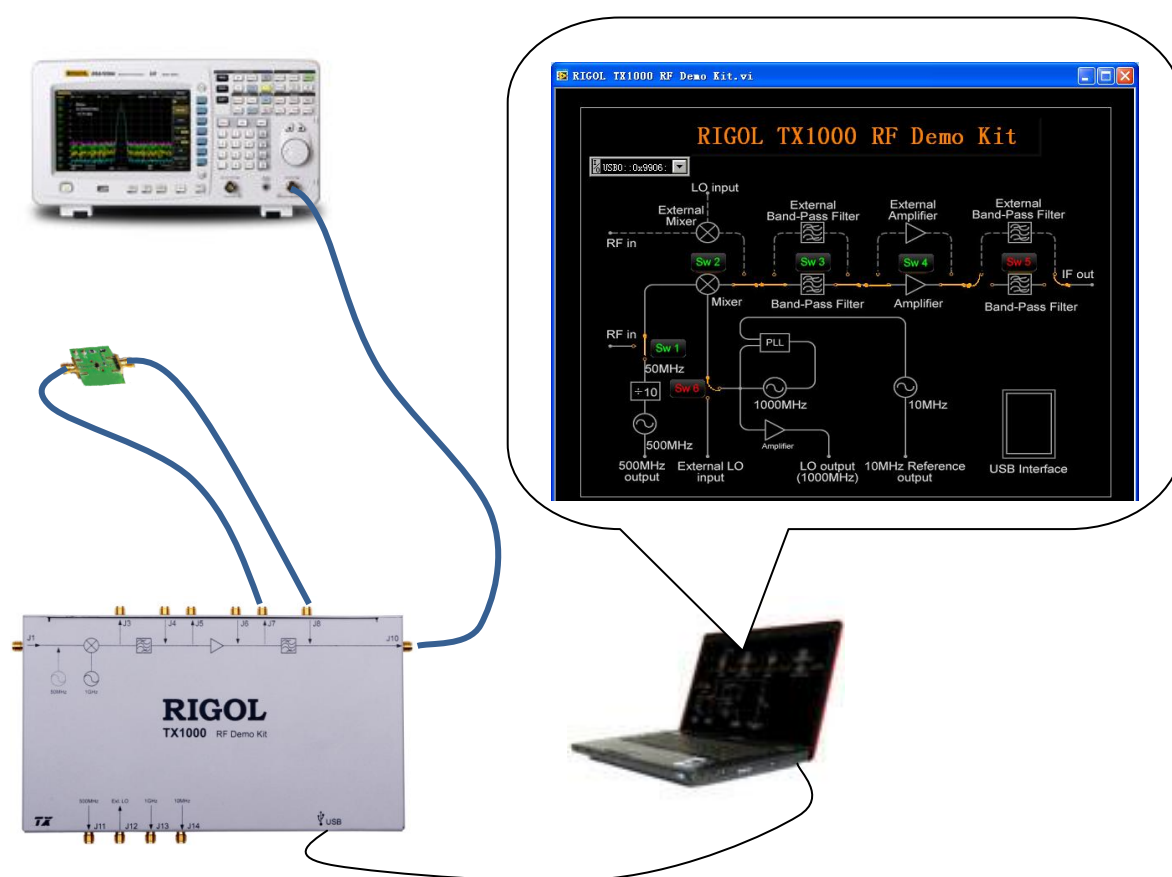- Set the measurement parameters in the spectrum analyzer to obtain the measurement results.

Figure 15 The Influence of the Performance of the Filter on the System

Specifications

The range of the test temperature is from 0 ℃ to 45 ℃ and the instrument has been working for at least 30 minutes.

Parameters	Explanation
Input Port	
Input Frequency (Standard)	50MHz ± 10MHz
(Expansion)	10MHz to 1000MHz
Input Power	≤0dBm
Output Port	
Output Frequency (Standard)	950MHz ±10MHz
(Expansion)	DC to 1000MHz
Output Power	+3dBm ± 2dB
Internal Local Oscillator Output	
Output Frequency	1000MHz
Phase Noise	-98dBc/Hz@10kHz, Typical
Output Power	-17dBm ± 2dB
Reference Frequency	
Frequency	10MHz
Temperature Stability	±1ppm (0℃ to 45℃)
Aging Rate	±1ppm/year
Output Power	+3dBm ± 2dB
Distortion	
SHI	+40dBm
IP3	+20dBm
P1dB	+5dBm
Mixer	
RF/LO Input Frequency Range	50MHz to 1000MHz
IF Medium Frequency Output Frequency Range	DC to 1000MHz
Local Oscillator Drive Power	+7dBm
Insertion Loss	8dB (Maximum)
Band-pass Filter	
Center Frequency	950MHz
1dB BandWidth	30MHz
Insertion Loss	3.2dB (Typical), 4.0dB (Maximum)

| In-band Flatness | 0.8dB (Typical), 1.5dB (Maximum) |
| Restrain at Center Frequency +/-40MHz | >40dB |

Power Amplifier

Working Frequency	DC to 2GHz
Gain	20dB (Typical)
P1dB	9.8dBm
NF	3.3dB

USB Interface

| Port | B Socket |
| Protocol | 1.1 Version |

Environment Temperature

Working Temperature	0℃ to 45℃
Storage Temperature	-20℃ to 70℃
Relative Humidity	<95%

Aerial

Frequency Range	824 to 894/1710 to 1880 (MHz)
Frequency BandWidth	70/170 (MHz)
Voltage Standing Wave Ratio	≤1.5
Gain	3.5dBi
Maximum Power	50W
Port Input	50Ω

Others

Connector Type	SM (JACK)
Port Input/output Impedance	50Ω
Power Consumption	1.5W
Dimension	225mm×132.5mm×25.5mm
Weight	0.7kg

Contact Us

If you have any problem or requirement when using our products or if you want to get more information about the product and its accessories, please contact **RIGOL** Technologies, Inc. or visit: www.rigol.com.