SALUKI
TECHNOLOGY

VSG20XX Series Vector Signal Generator

User Manual

www.salukitec.com

Preface

Introduction

Saluki vector signal generator products, frequency range covers 100 kHz to 3/6/12/20/22/40/44/50/67GHz, output power The range covers -110dBm to +15dBm, phase noise -138dBc/Hz@1GHz, frequency offset 10kHz, with ultra-low phase noise and spurious. Inside Internally generated baseband real-time modulation bandwidth up to 1GHz; external IQ input , the maximum modulation bandwidth can reach 2GHz. Supports the generation of a variety of modulation signals , It has functions such as pre -distortion calibration.

- Frequency range : 100kHz to 3/6/ 12/20/22/40/44/50/67GHz
- Output power range : -110dBm Up to +15dBm
- Phase Noise： -138dBc/Hz@1GHz Frequency offset 10kHz
- Internal baseband maximum modulation bandwidth : 1GHz
- External baseband maximum modulation bandwidth : 2GHz
- Support digital modulation
- Support multi-tone signal
- Support multi-carrier digital modulation
- Support pulse radar
- Supports continuous wave radar
- Support Gaussian noise
- Support frequency hopping signal
- Support pre-distortion calibration and other functions
- Ultra-low phase noise and spurious

Models

1. VSG2003A Single Channel 3GHz Vector Signal Generator
2. VSG2006A Single Channel 6GHz Vector Signal Generator
3. VSG2012A Single Channel 12GHz Vector Signal Generator
4. VSG2020A Single Channel 20GHz Vector Signal Generator
5. VSG2022A Single Channel 22GHz Vector Signal Generator
6. VSG2040A Single Channel 40GHz Vector Signal Generator
7. VSG2044A Single Channel 44GHz Vector Signal Generator
8. VSG2050A Single Channel 50GHz Vector Signal Generator
9. VSG2067A Single Channel 67GHz Vector Signal Generator

Contents

Precautions

The following are all the operating procedures of the instrument: , safety precautions to be observed. To avoid damage to the instrument and unnecessary bother Please read all the contents of the precautions patiently. The product manual is provided to users in the form of USB storage or printing.

The user is required to use the instrument only for its intended use and within its performance limitations. The intended use and limitations are stated in the instrument documentation. describe , as shown in the manual , printed safety instructions. If you are unsure whether there is proper use , please contact Saluki service department ,if Any part of the instrument is damaged or broken Please stop using the instrument. , do not open the instrument casing, Only Saluki service staff can maintain Repair the instrument.

⚠ Heat dissipation conditions

Place the instrument on a cart or workbench, paying attention to the spacing requirements:

Top and bottom :0 centimeter(0 inch)

Left and right sides :5.08 centimeter(2 inch)

later :0 centimeter(0 inch)

⚠ Environmental conditions

This instrument is generally used in a laboratory environment If the user has field testing requirements , the product shell is not waterproof , waterproof protection is needed. If the device is accidentally flooded , the water that enters will connect the housing to the electrical parts , which may damage the device If the user comes into contact with shell , which may cause electric shock , causing personal injury. Users can use the instrument at an altitude of 2000 meters . Try to avoid placing the instrument in severe In polluted environments, such as dust , smog pollution. For more information on environmental conditions such as ambient temperature and humidity , see Environmental Suitability Planning guarantee.

The following table lists the environmental requirements for your instrument. To achieve instrument accuracy, make sure to warm up the instrument. 20 minutes and meet the following conditions Environmental requirements.

Require	illustrate
Temperature(Working state)	0℃ to 50℃
Humidity(Working state)	5% to 90% relative humidity , No higher than 30℃ 5% to 45% relative humidity , 30℃ to 50℃ non-condensing
Altitude (Working Status)	Up to 2,000 m

⚠ Connecting to the Power Supply

The instrument needs to be connected to a fixed power source for power supply. Caution Electronic products have risks , if electric shock occurs, it may cause fire. Causing personal injury or even death. The instrument operating voltage range is 90V AC to 264V AC , 45 to 65Hz , to reduce the risk of fire and electric shock ,please Ensure that the voltage fluctuation of the mains power supply does not exceed the working voltage range 10%.

To ensure your safety , please take the following measures:

1) Before turning on the instrument, make sure that the voltage and frequency indicated on the instrument match the available power supply. all , please set the correct value;
2) It is recommended that users only use the power cable delivered with the instrument. It complies with country-specific safety requirements;
3) It is recommended that users only insert the plug into a socket with a protective conductor terminal ;
4) Users are advised to use only complete cables.

⚠ Instrument handling

The weight specification of the instrument is ≤ 30kg. For your safety, please try not to move or carry the product by yourself . Place the device in a safe and suitable place , if the instrument must be moved, it can be used For your safety , please use convenient transport when moving the instrument tool , such as a trolley, etc., please follow these instructions when moving.

⚠ Instrument placement

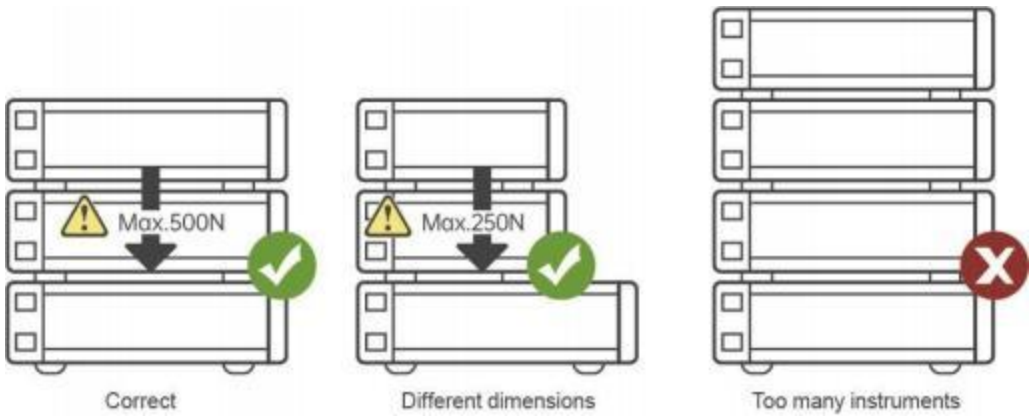
When placing the instrument, always place it on a stable , flat surface with the instrument bottom facing down. If the instrument is aimed at a different position, Protect the instrument from falling. If the instrument has foldable feet , always fully fold the feet in or out to ensure stability. Fold completely , or the instrument is moved without being lifted, the feet will collapse. The foldable feet are designed to carry the weight of the instrument, but Not an additional load. If you need to stack the instruments , please remember , a pile of instruments could fall over and cause injury. The device is installed in the rack , make sure the rack has adequate load capacity and stability. Follow the rack manufacturer's specifications. Always mount the instrument from the bottom to the top to make the rack secure. Secure the instrument so it does not fall off.

A pile of products may fall over and cause injury. Do not stack more than three products on top of each other. , install them in a rack. Note the following:

1) It is best if all products are the same size (width and length);

2) The total minimum product load shall not exceed 500 N;

3) If the smaller product is on top of the lowest product , the total load of the minimum product shall not exceed 250 N.



Equipment transportation

If the instrument needs to be transported, please use the packaging materials that our company sent it with. Using packaging materials other than the specified packaging materials may cause damage to the instrument. Do not use styrene microspheres of any shape as packaging materials. They will not adequately cushion the instrument or prevent the instrument from moving in the carton. And can Can generate static electricity and stay on the instrument shutter , blocking the airflow and causing equipment damage.

Our instruments are equipped with protective caps on the front panel connectors when they leave the factory. , to prevent impact damage during shipping. When returning the instrument for repair ,like Cable required , please remove the cables and place them in a separate protective bag.

Safety Sign Meaning

	Safety labels on the instrument warn of potential hazards. Please read the instrument's software manual. to avoid personal injury or The device is damaged.
	Heavy equipment in transport Be careful when moving or carrying the instrument. At least two people or transport equipment are required to carry the instrument.
	Electrical hazard indicates live parts, which may cause electric shock. , Fire , personal injury, or even death.
	Hotter surface , do not touch. Risk of skin burns , the risk of fire.
	Grounding hole. When using the instrument, you need to ground it through the grounding hole or wear an anti-static wrist strap. If an electrical problem occurs , It can prevent electric shock.
	Universal recycling logo. This logo indicates compliance with the Chinese standard GB required by China RoHS regulations on paper/ fiberboard packaging 18455-2001.
	This symbol indicates that the required input power is AC.
	This mark indicates that the chassis is grounded.

Get Started

Turn on the instrument power

1. Connect the AC power cord to the rear of the instrument.

2. Turn on the instrument using the front panel power button.

Power The (Power) button indicates the three power states of the instrument:

1. Not bright - No power
2. Red - Standby mode
3. Fluorescent green - Power on

Front Panel Description

Front panel connectors

Connectors	describe
Analog Output	These connectors provide analog signals. VSG2003A 3.5 mm -K Panel Connectors VSG2006A 3.5 mm -K Panel Connectors VSG2012A 3.5 mm -K Panel Connectors VSG2020A 3.5 mm -K Panel Connectors VSG2022A 3.5 mm -K Panel Connectors VSG2040A 2.92 mm -K Panel Connectors VSG2044A 2.92 mm -K Panel Connectors VSG2050A 2.4 mm -K Panel Connectors VSG2067A 1.85 mm -K Panel Connectors
USB 2.0	Three USB Host connector (Type A) for connecting a mouse, keyboard or other USB equipment

Front Panel Controls

Buttons/Keys	describe
FREQ (Frequency)	Setting the output frequency
LEVEL (Power)	Setting the output power
Knobs	The general purpose knob is used to increment or decrement the value when the setting is enabled (selected) for change.
Numeric Keypad	The numeric keypad is used to enter numeric values directly into the selected control setting. Unit prefix buttons (G/n , M/ µ, and k/m) is used to fill in input via the numeric keypad. You can press one of the prefix buttons to complete the entry (without pressing the Enter key) . If the unit prefix button for frequency is pressed , the unit is interpreted as G (Ji) 、 M (Mega) or k (thousand) . If the Time or Amplitude button is pressed , the units are interpreted as p (pico) , n (nano) , µ (micro) or m (milli meter) .
RF ON / OFF (RF switch)	Used to switch the RF output status: on or off
MOD ON / OFF (Modulation switch)	Used to switch the modulation output status: open or closed
LOCAL (Local Control)	Switch to local control mode
SETUP	
HELP	
PRESET	Used to restore the instrument to default settings

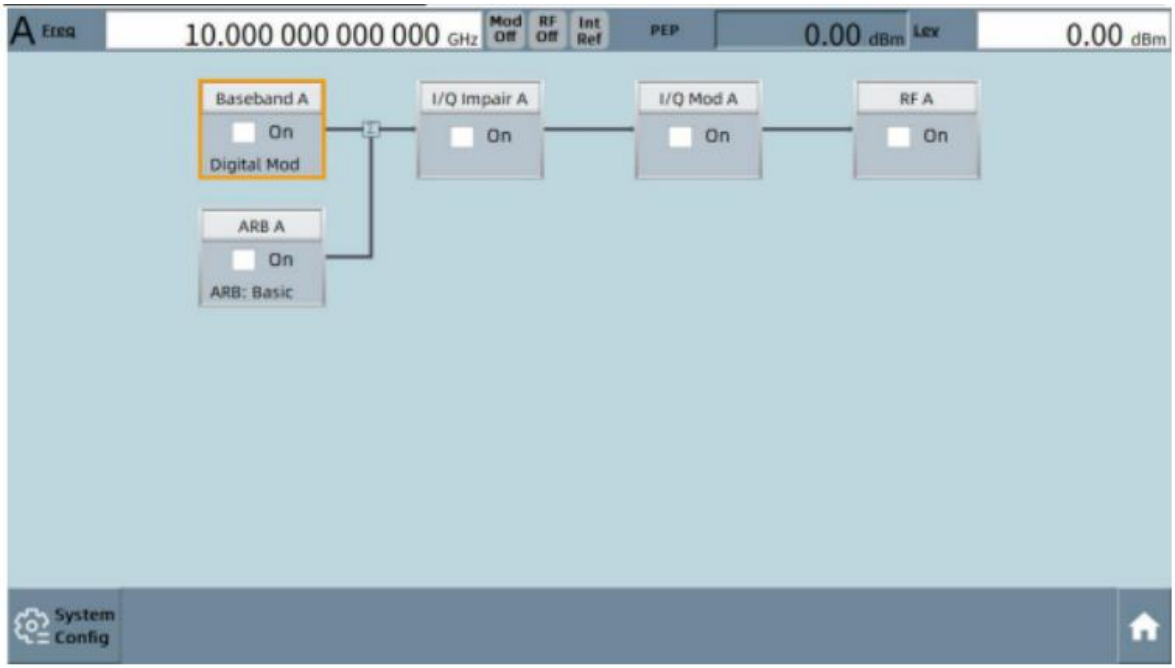
Rear Panel Description

Rear Panel Connectors

Connectors	describe
10 MHzReference input	SMA Type connector for providing reference signal
10 MHzReference output	SMA Type connector for providing reference signal
Trigger input (TRIG IN)	BNC Type input connector for receiving external trigger signals
Synchronous output (SYNC OUT)	BNC Type input connector for providing synchronization signals to external devices
Pulse output signal (PULSE OUT)	BNC Type input connector, used to provide pulse signals to external devices
Pulse input signal (PULSE IN)	BNC Type input connector, used to receive external pulse signal
INT BB-OUT	BNC Type input connector for providing differential analog I, QSignal
EXT BB - IN	BNC Type input connector for receiving external differential analog I, QSignal
LAN	RJ -45 connector is used to connect the instrument to the network
USB	Three USB Host connector (Type A) for connecting a mouse, keyboard or other USB equipment
VGA	VGA The video port is used to connect an external monitor to view a more detailed view of the instrument display . Large copy (duplicate) or expand to desktop monitor.
HDMI	The HDMI video port is used to connect an external monitor to view a more detailed view of the instrument display . Large copy (duplicate) or expand to desktop monitor.
GPIB	Connector for remote operation of the instrument
DEBUG	Test port (not open to the public)
Grounding column	M6Grounding column
power supply	Power line input

Get Started

Generates unmodulated signal



1. On the front panel of the VSG20 vector signal generator , click “PERSET” to restore the instrument to factory settings;

2. Set the frequency:

a. Click “FREQ” on the front panel or click “Block Diagram > Frequency” on the touch screen. Use the numeric keypad to input "1", "0" and "GHz"

b. The frequency can also be set by using the direction keys or knob to select the corresponding setting position

3. Set the power:

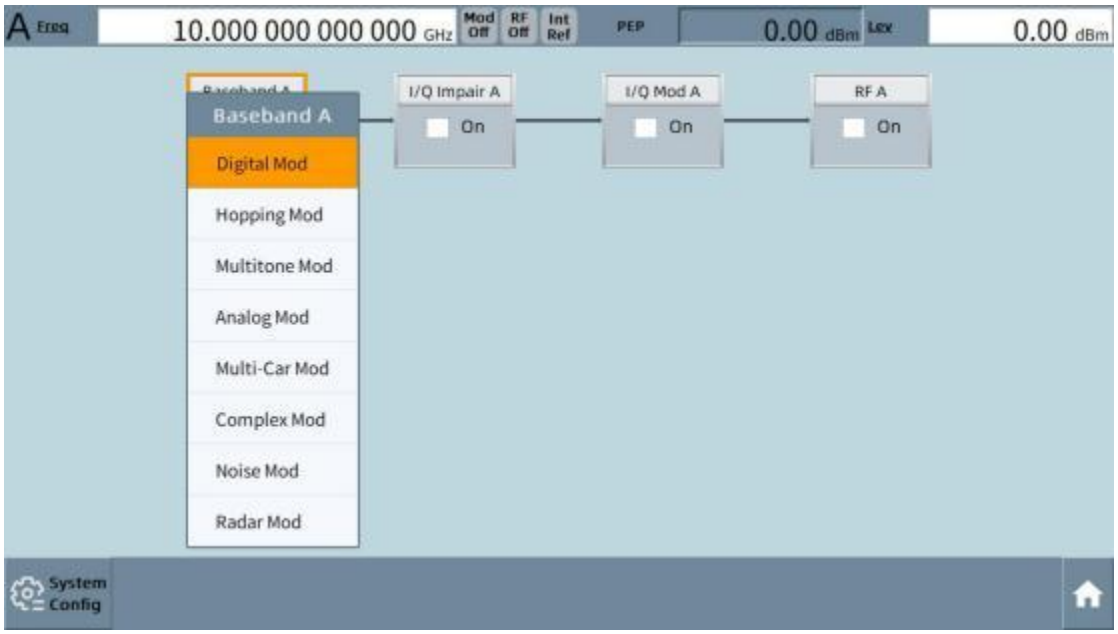
a. Click "LEVEL" on the front panel or click "Block Diagram > Level" on the panel touch screen. After the screen window is highlighted , Use the keyboard to input "1", "0" and "dBm"

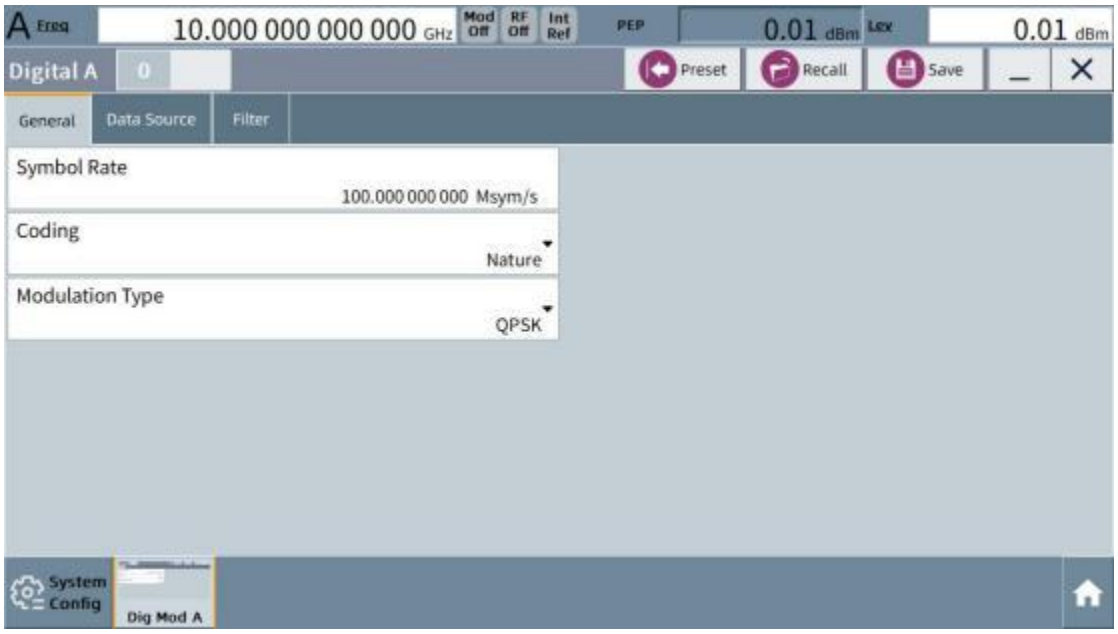
b. The frequency can also be set by using the direction keys or knob to select the corresponding setting position

4. Click "Block Diagram > RF Status Bar > RF ON" on the touch screen to turn on the RF output. , or you can turn it on via the “RF ON/OFF” button on the front panel RF output;

5. The RF signal will be output through the RF connector on the front panel.

Generate digital modulation signal





1. On the front panel of the VSG20 vector signal generator , click “PERSET” to restore the instrument to factory settings;

2. Set the frequency :

c. Click “FREQ” on the front panel or click “Block Diagram > Frequency” on the touch screen. Use the numeric keypad to input "1", "0" and "GHz"

d. The frequency can also be set by using the direction keys or knob to select the corresponding setting position

3. Set the power :

c. Click “LEVEL” on the front panel or click “Block Diagram > Level” on the panel touch screen. After the screen window is highlighted, Use the keyboard to input "1", "0" and "dBm"

d. The frequency can also be set by using the direction keys or knob to select the corresponding setting position

4． On the touch screen, tap “Baseband bar>Digital Mod " jumps to the digital modulation parameter configuration interface

5. Set digital modulation parameters via touch screen or external USB mouse

Symbol Rate： 100Msym/s

Coding: Nature

Modulation Type:QPSK

Data Source:PRBS12

Filter： Root Raised Cosine

Alpha/BT : 0.22

6． Click "Generate" in the upper left corner of the interface , the software will automatically turn on the modulation switch

Digital modulation parameter configuration

Digital modulation supports: PSK (Phase Modulation), QAM (Quadrature Amplitude Modulation), MSK (Minimum Shift Keying), FSK (Frequency Shift Keying), APSK (Amplitude Modulation), Phase Shift Keying)

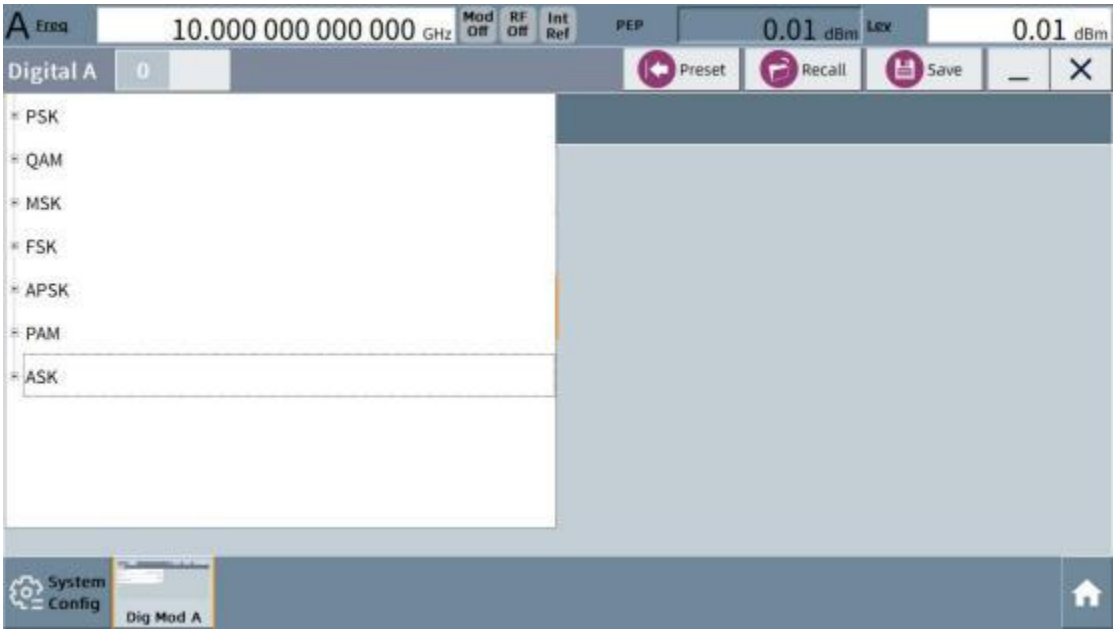
Phase modulation support： BPSK(bipolar code), π /2 BPSK (bipolar code), Q PSK (Quadrature Phase Shift Keying) , π /4 QPSK (Quadrature Phase Shift Keying control), π /2 QPSK (Quadrature Phase Shift Keying)

Quadrature Amplitude Modulation Support : 4-QAM, 8-QAM, 16-QA M, 32-QAM and 64-QAM

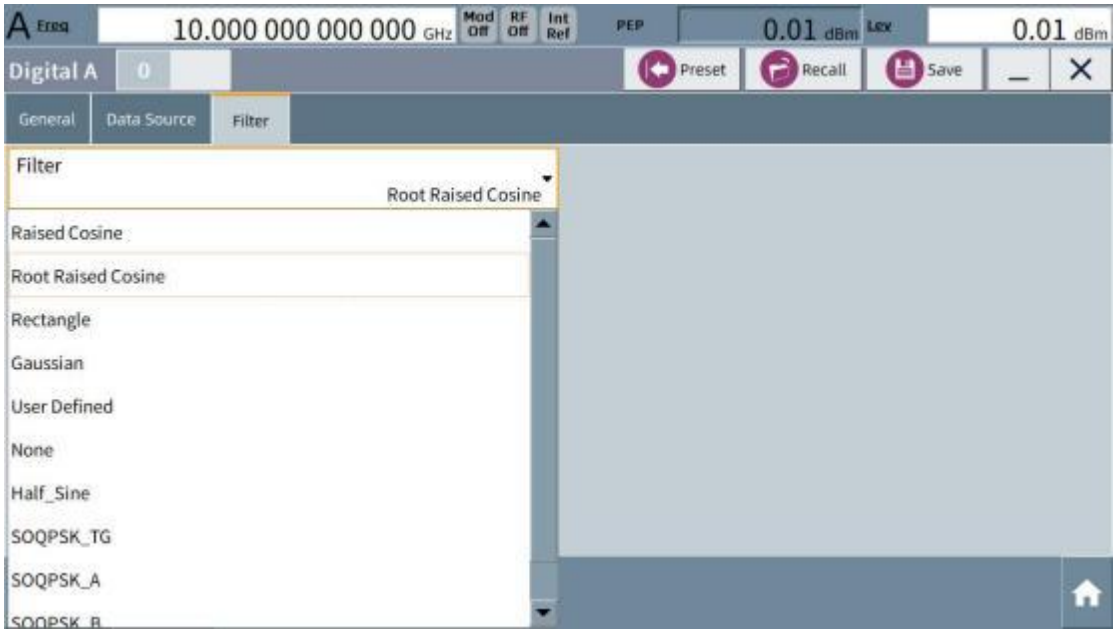
Minimum frequency shift support: Yes MSK (Minimum Shift Keying) , GMS K (Gaussian Minimum Shift Keying), CPM (Continuous Phase Modulation)

Frequency shift keying support: 2-FSK , 4-FSK , 8-F SK , 16-FSK , 32-FSK

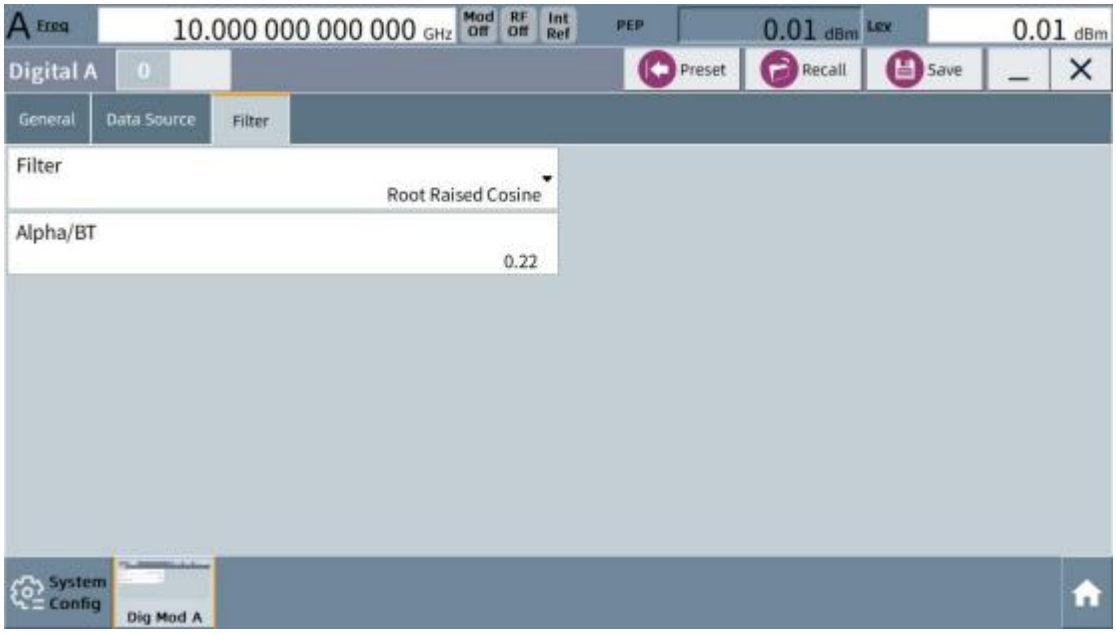
Phase shift keying support: including 16-APSK , 32-APSK , 64-APSK , 128-APSK , 256-APSK



Filter Type Support： raised cosine , rooted raised cosine, rectangle (rectangular window), Gaussian (Gaussian filter) , half-sine (half-band filtering) , user- defined filter coefficients



User-defined filter coefficients are time domain coefficients , for example 0 , 0 , 1 , 1 , 0 , 0 can produce a rectangular window filter, corresponding to the frequency domain is sinc function.

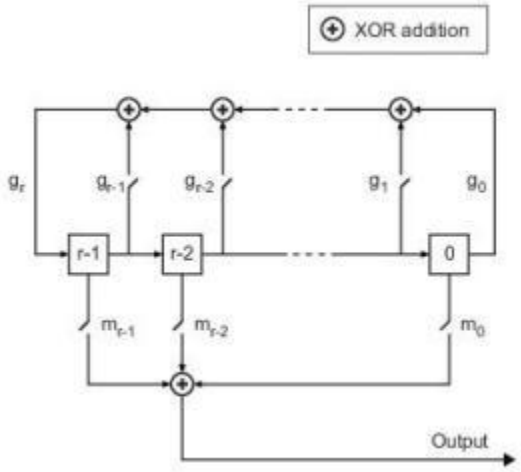


Alpha/BT (filter roll-off factor):

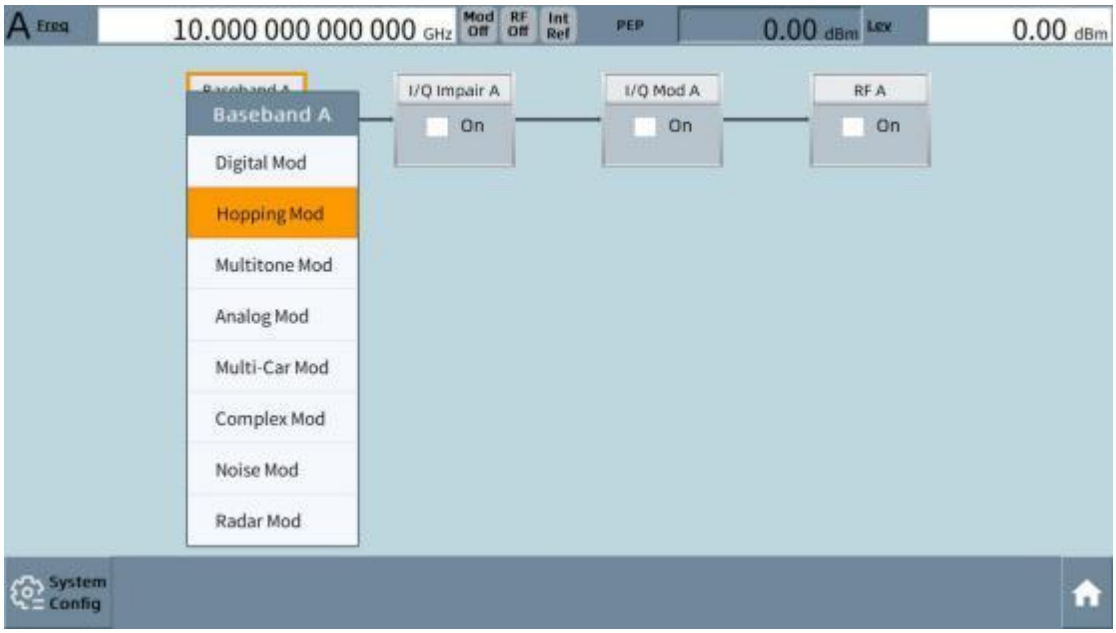
The value range is 0.00~1.00, and the default value is 0.22. , the larger the roll-off factor, the slower the filter passband edge decays. The factor characterizes the excess bandwidth relative to an ideal rectangular filter, Therefore, the actual signal bandwidth = symbol rate * (1 + roll-off factor) , bit error Rate theory is not affected.

The minimum symbol rate supported is 1Hz , maximum according to option , which can support up to 200MHz or 500MHz.

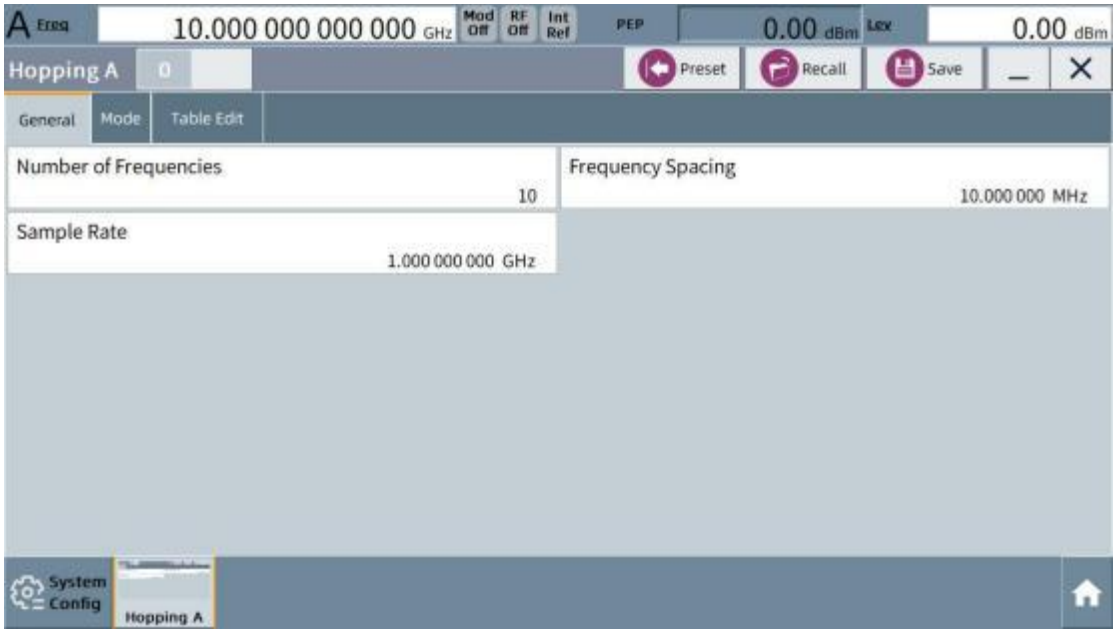
Baseband data can support all 0s and all 1s , PN7/PN9/PN11/PN12/PN15/PN16/PN20/PN21/PN23 , custom files. The PN code is generated by a linear shift register to be fed back. , as shown below:


XOR addition
g_r
g_{r-1}
g_{r-2}
g_1
g_0
r-1
r-2
0
m_{r-1}
m_{r-2}
m_0
Output

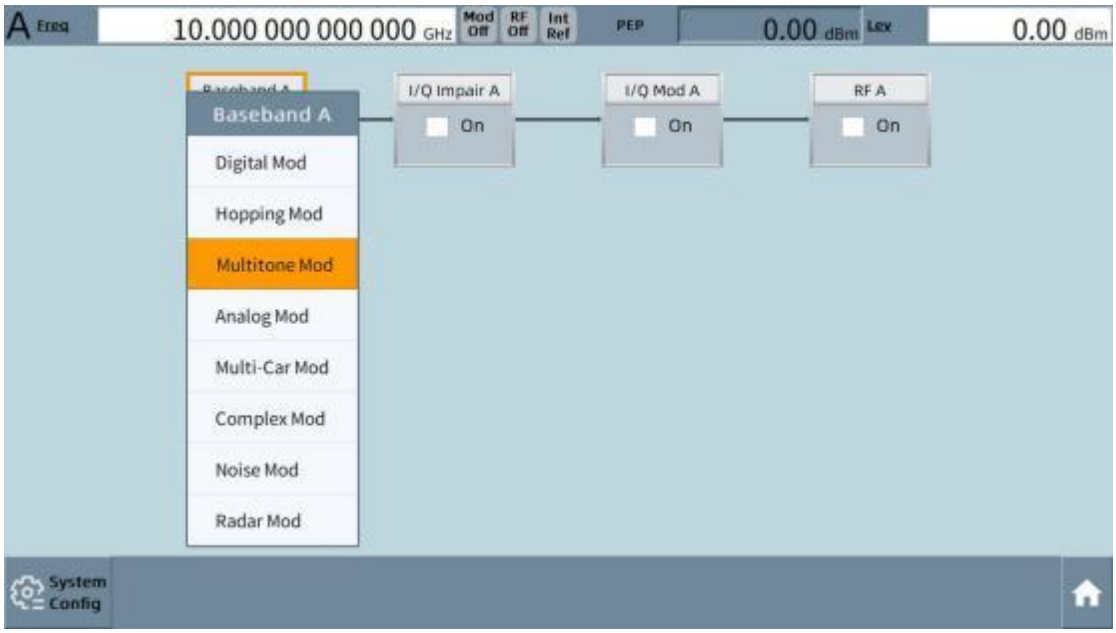
Frequency hopping signal parameter configuration



The frequency hopping signal generation mode is divided into pseudo-random sequence and user list mode. The pseudo-random sequence can realize pseudo-random frequency hopping according to the pattern type based on the number of frequencies. The user list mode starts from the first frequency and performs frequency hopping in sequence according to the multiple frequencies selected by the user. With this Back and forth.



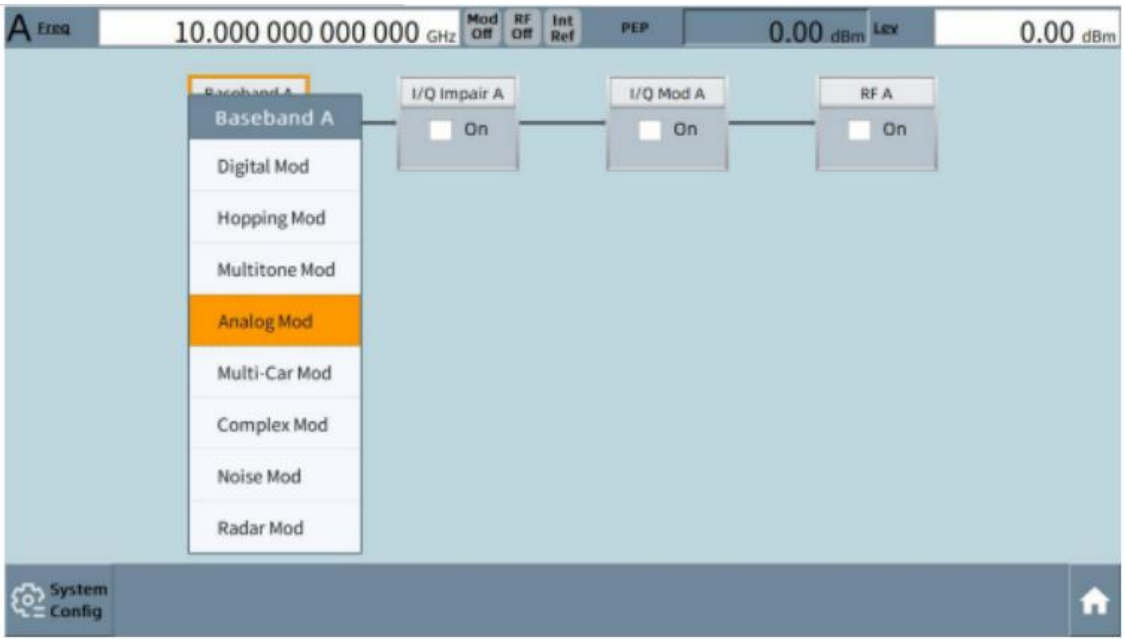
Multi-tone signal parameter configuration

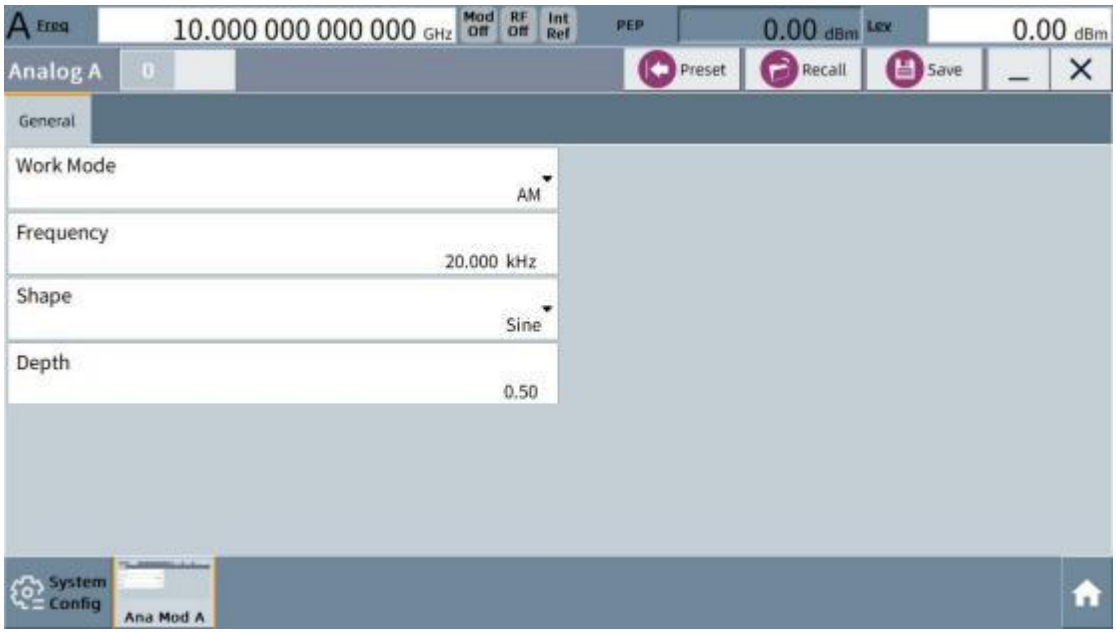


The multi-tone signal generation interface can generate multi-tone signals in the Nyquist frequency range corresponding to the current sampling rate. , users can set the list parameters The frequency of the number generated in the list , set the tone Number (number of polyphonic sounds) After the change , the list will change synchronously , Freq The Distance parameter can adjust the frequency interval between newly generated frequencies .

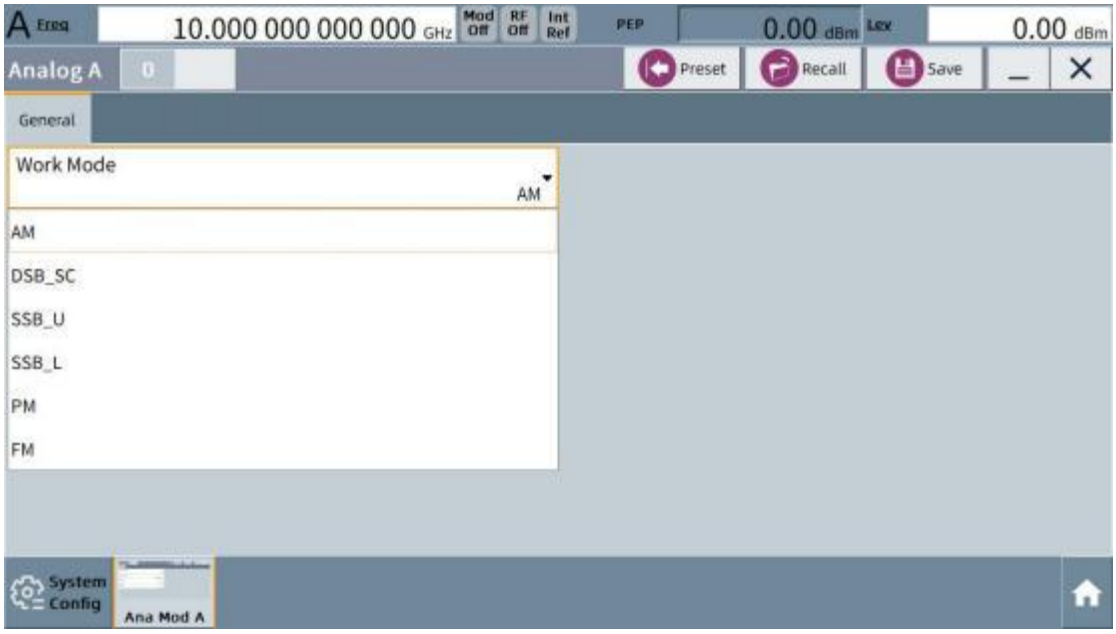
Notice : The frequency range of the generated multi-tone signal must conform to the Nyquist sampling bandwidth.

Analog modulation parameter configuration

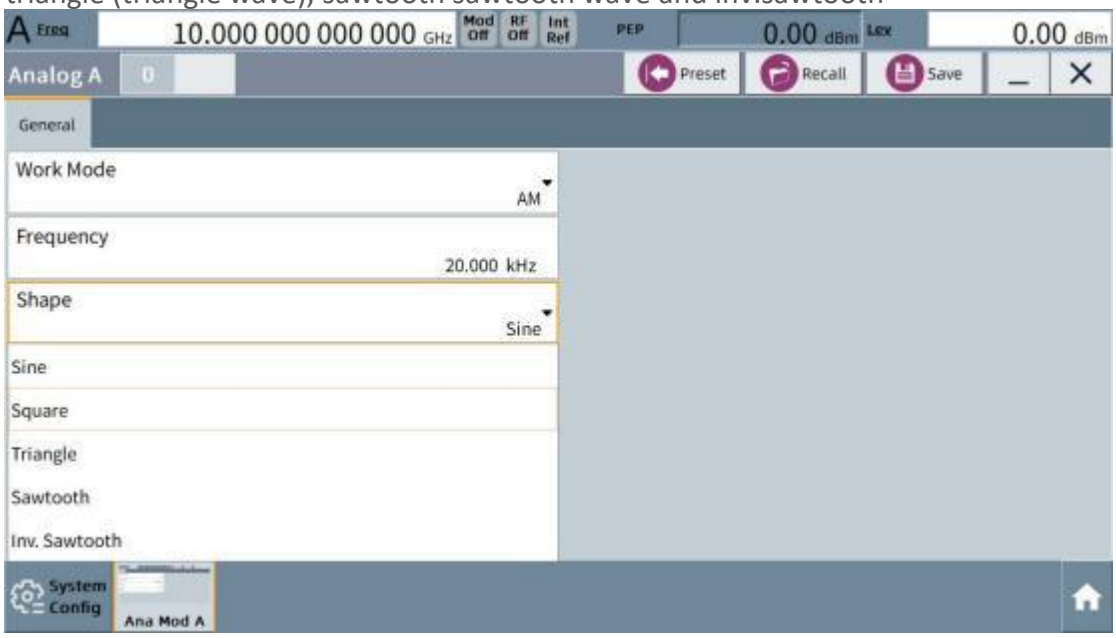




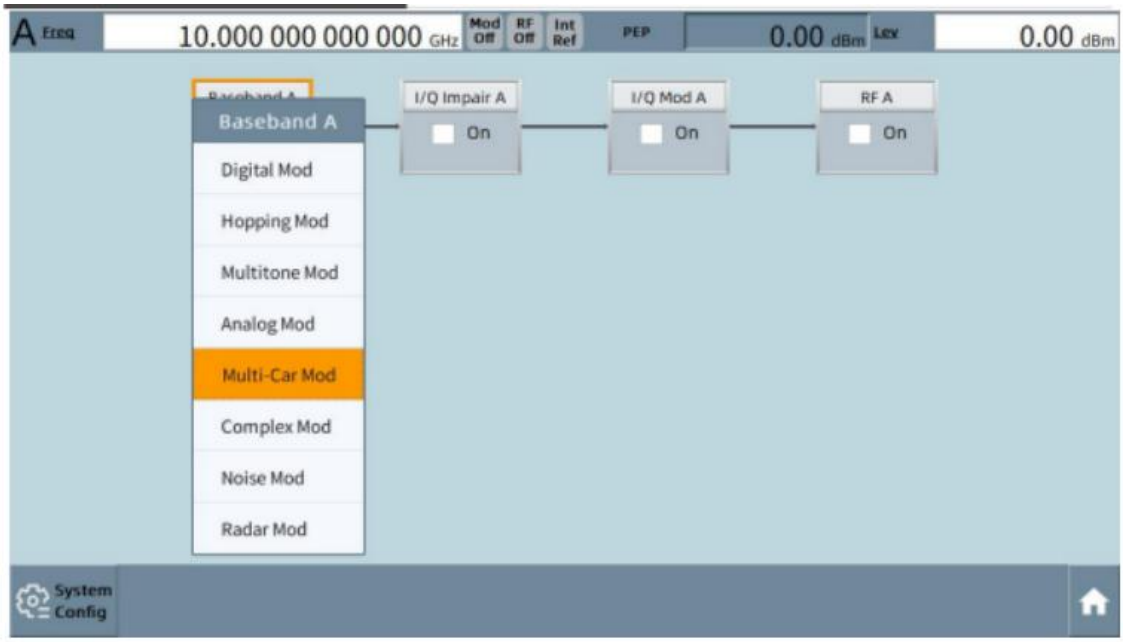
Analog Modulation , Modulation mode support: AM (amplitude modulation), DSB_SC (double sideband modulation), SSB_U (upper sideband modulation) , SSB_L (lower sideband modulation) , PM (Phase Modulation) , FM (Frequency Modulation)

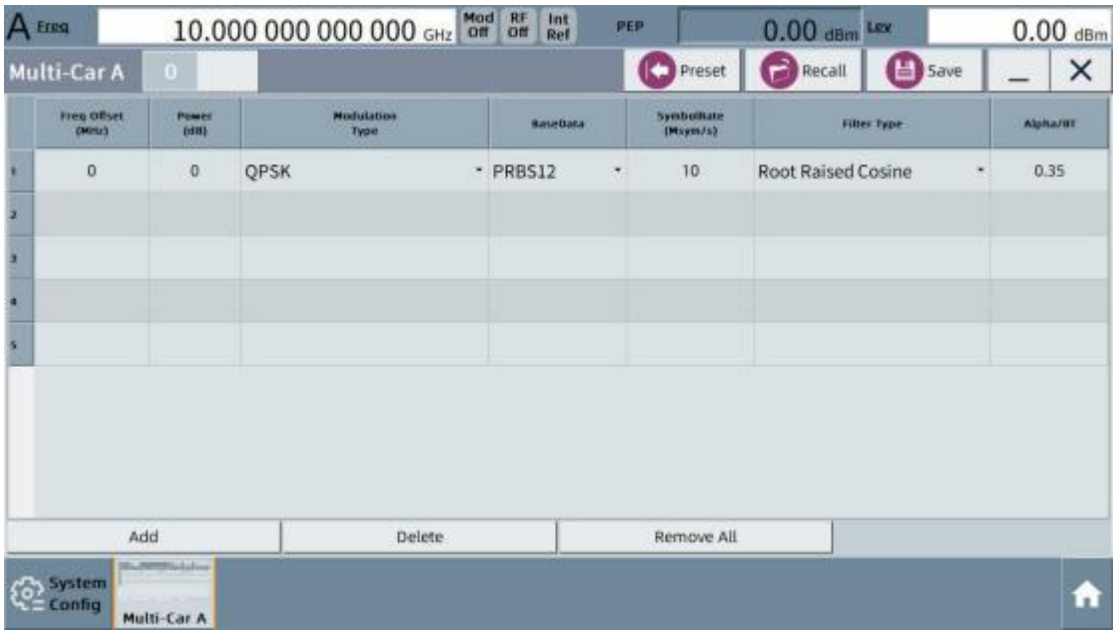


Modulation waveforms supported: sine (sine wave), square (square wave), triangle (triangle wave), sawtooth sawtooth wave and inv.sawtooth



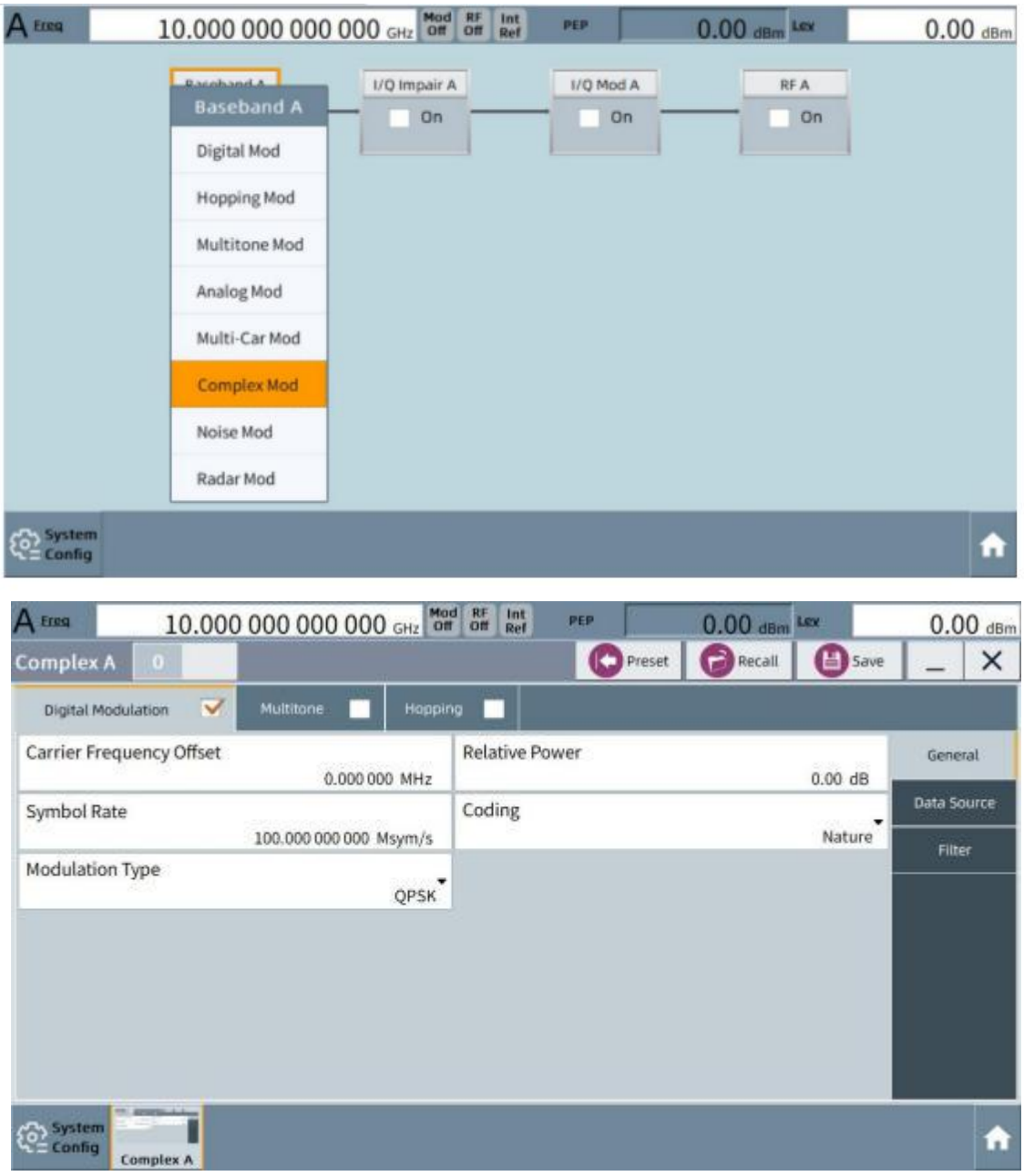
Multi-carrier parameter configuration





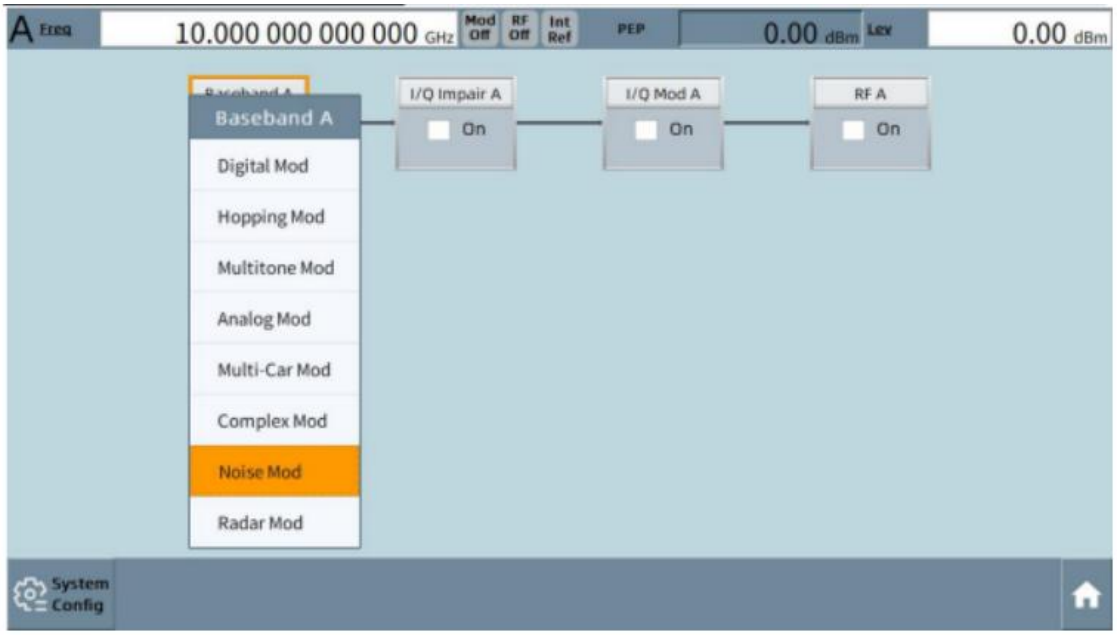
Multi-carrier modulation supports generating different digital modulation signals at different frequency offsets of the carrier . The size of the frequency offset depends on option Options , which can support up to 200MHz or 500MHz.

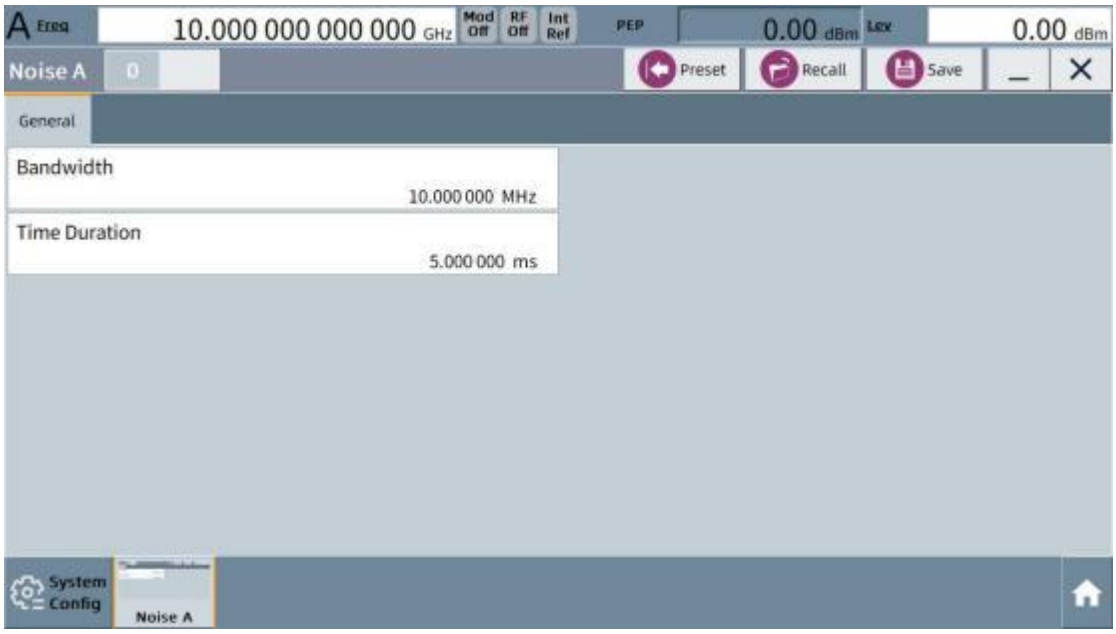
Complex electromagnetic parameter configuration



Complex Electromagnetic , which can generate digital modulation at different frequency offsets of the carrier at the same time , multi-tone and frequency hopping signals. For parameter settings, please refer to Digital Tuning Control parameter configuration , frequency hopping signal parameter configuration and multi-tone signal parameter configuration.

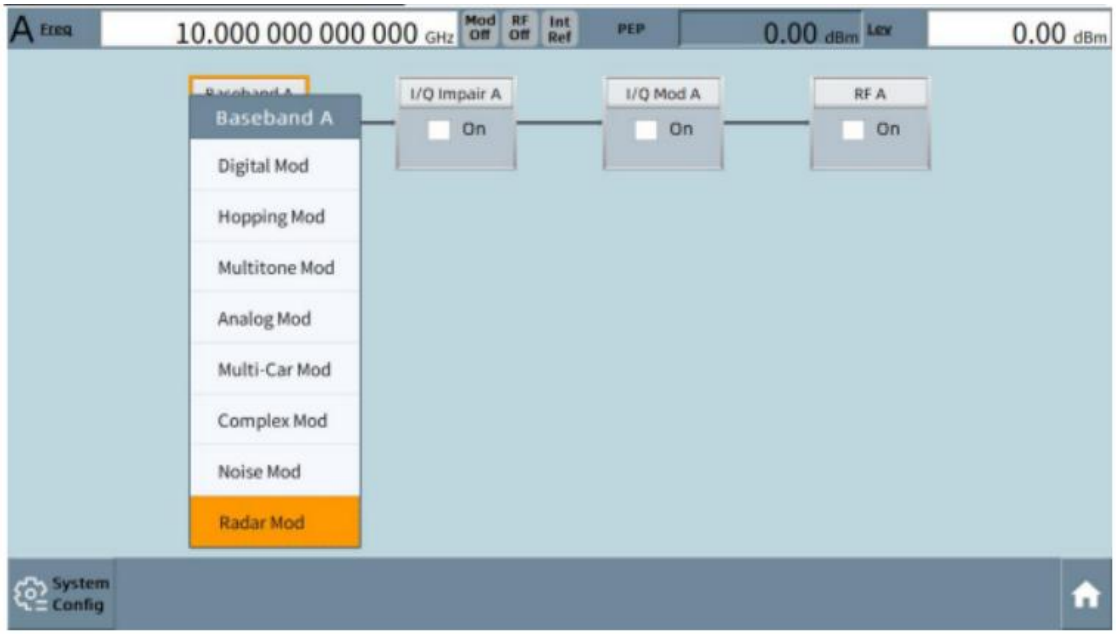
Noise signal parameter configuration

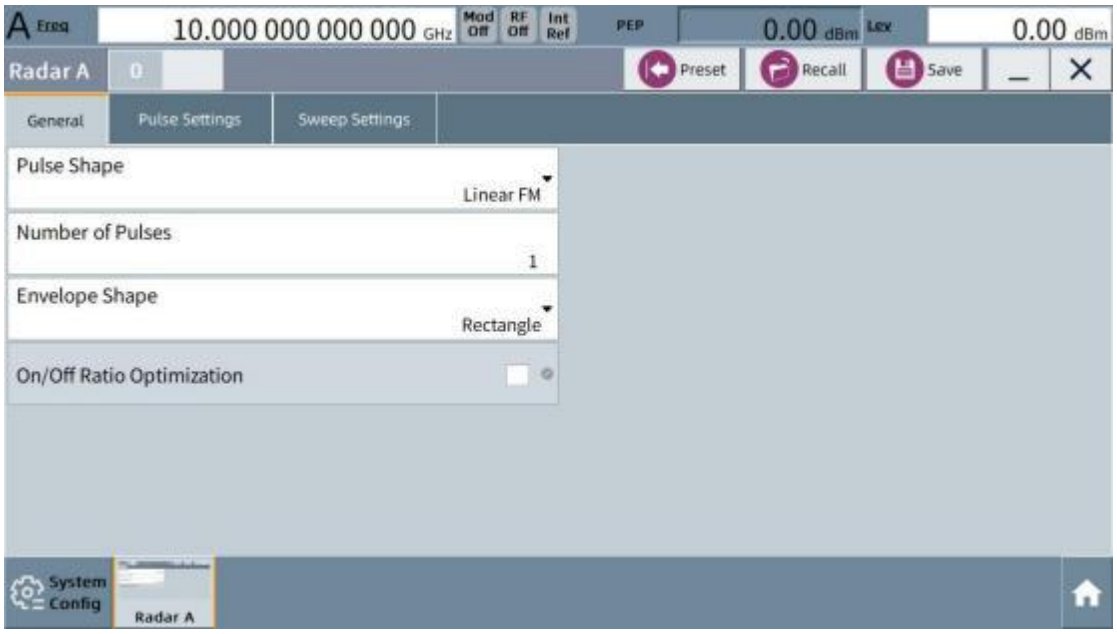




Noise generation mode can generate Gaussian white noise , the generated noise bandwidth can be adjusted.

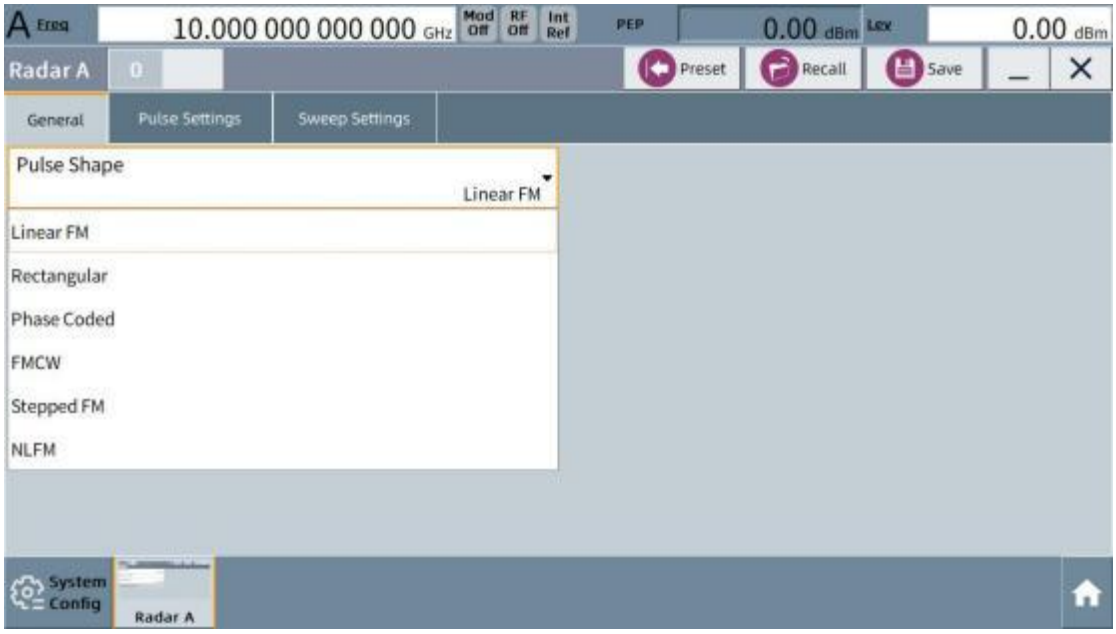
Radar interface parameter configuration



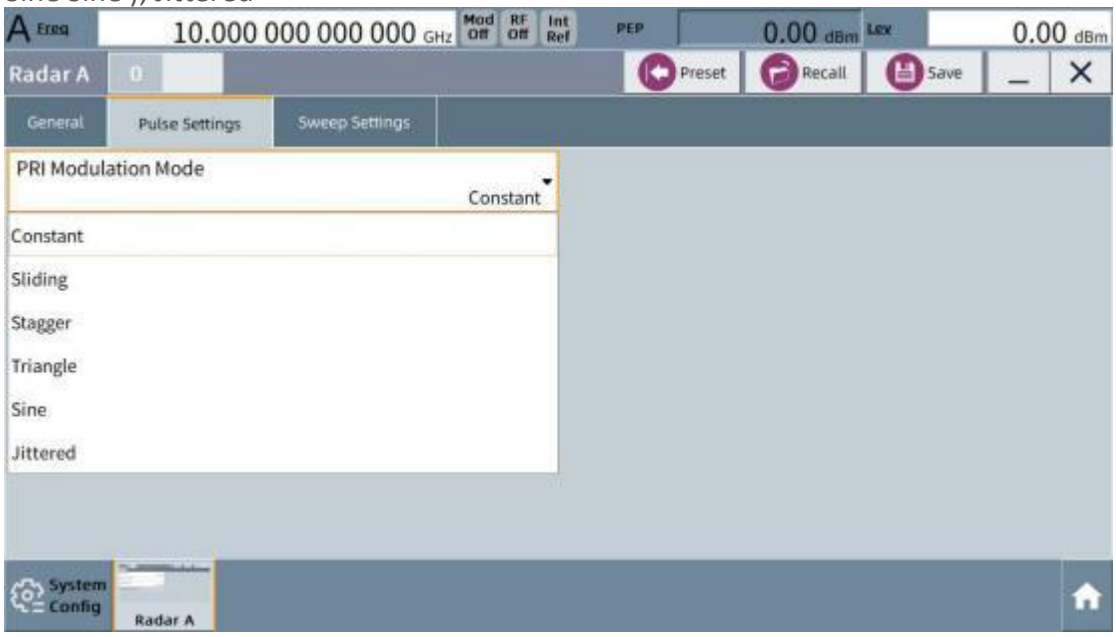


Radar modulation mode: PRI stands for Pulse Repetition Interval (Pulse Period) , The pulse width setting should be smaller than the pulse period. , in the setting Generate Pulse within BandWidth (bandwidth) Number (pulse number) pulse signal.

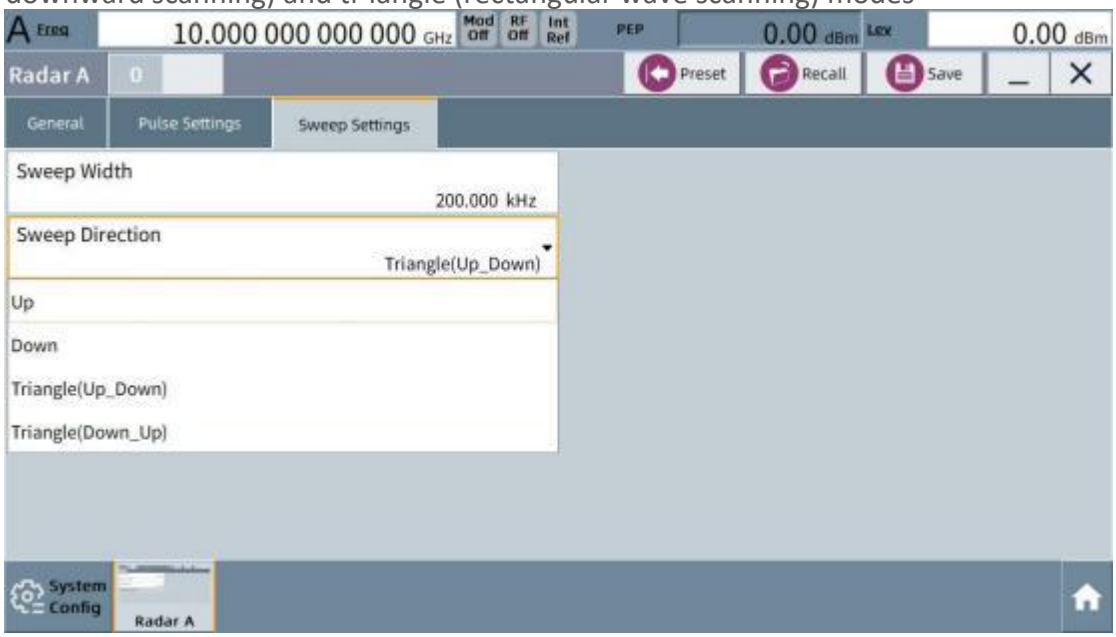
Radar modes include: Linear FM (Linear Frequency Modulation) , rectangular (rectangular wave) , phase coded , FMCW (tuning Frequency Continuous Wave), Stepped FM (Step Frequency Modulation) , NLFM (non-linear frequency modulation).



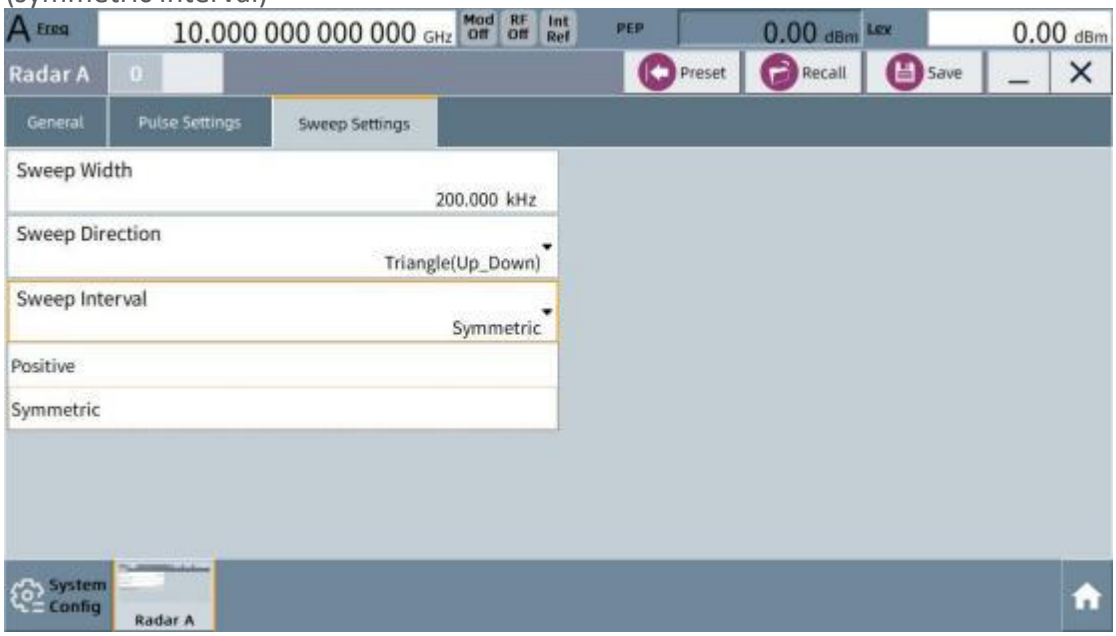
PRI modulation support : Constant ; Sliding ; Stagger ; Triangle （ triangle); Sine Sine); Jittered



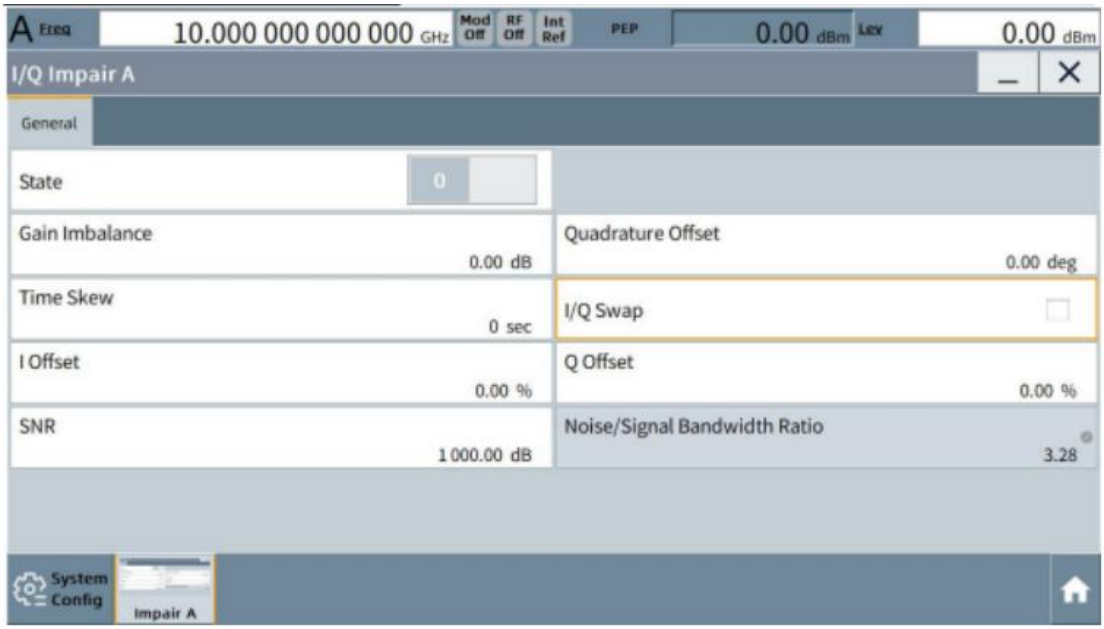
Scan direction support ： up (frequency sweep upward) , down (frequency downward scanning) and tr iangle (rectangular wave scanning) modes



Scan interval support : positive (positive frequency interval) and symmetric (symmetric interval)

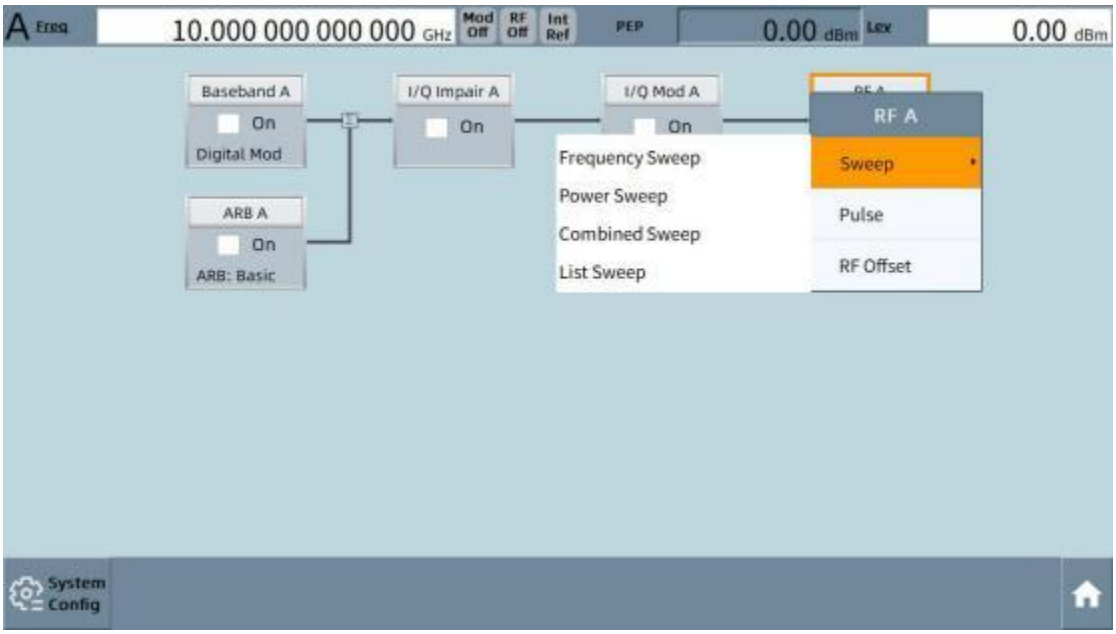


IQ damage reduction parameter configuration

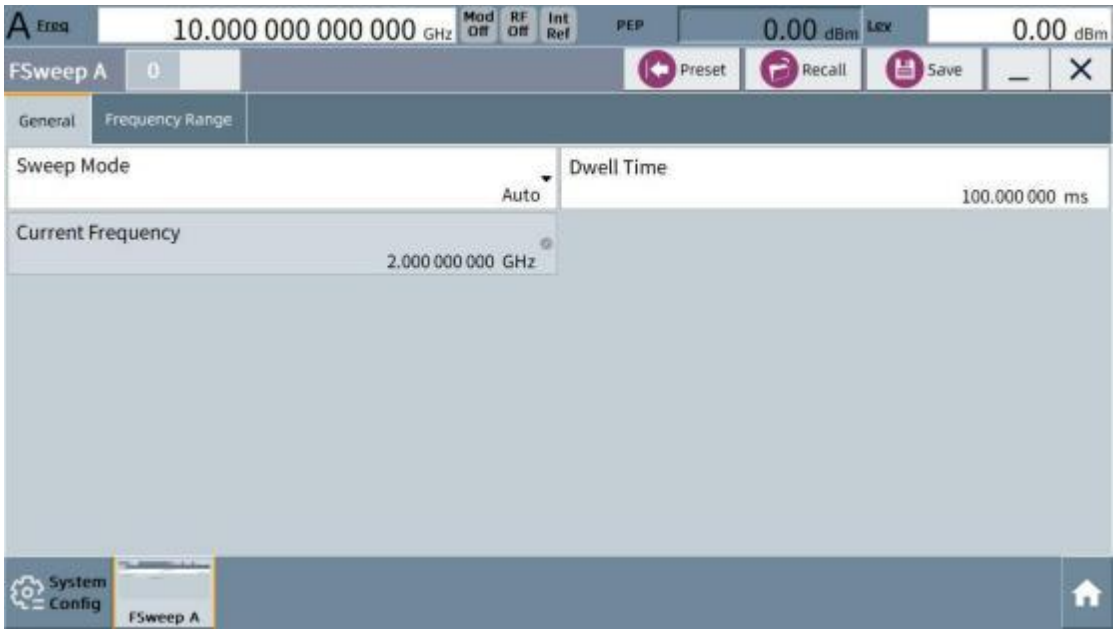


There are IQ impairment configurations on the right side of the digital modulation mode, analog modulation mode, multi-tone signal, frequency hopping signal, radar signal, and noise signal interfaces: Can be used to configure IQ two-way power distribution, phase imbalance, Clock skew , frequency offset , DC bias and signal-to-noise ratio.

Scan parameter configuration



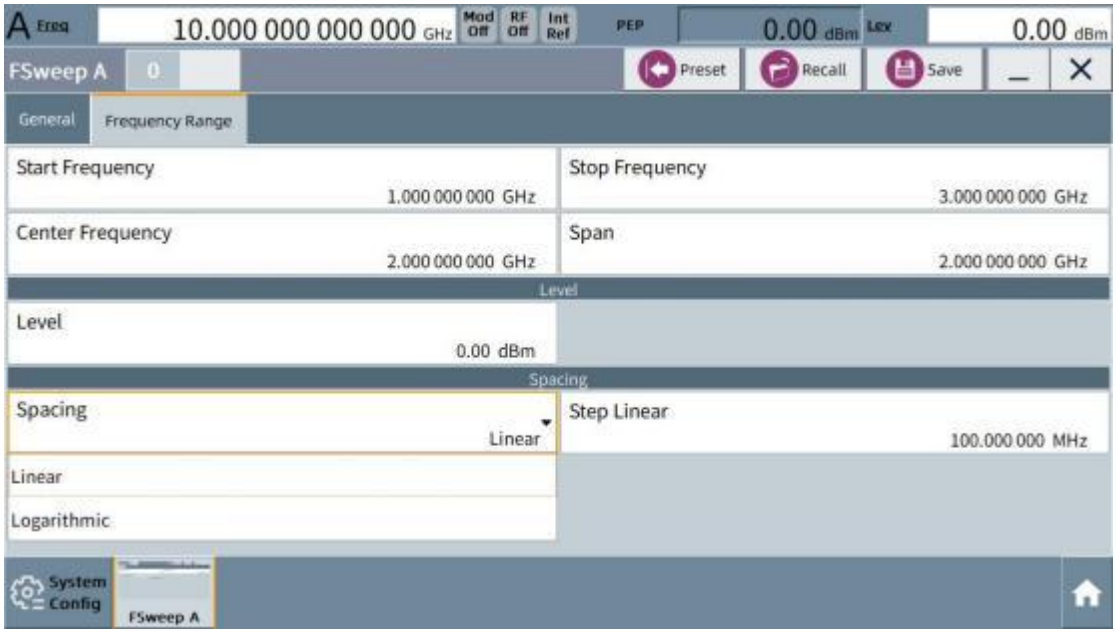
Scanning is divided into frequency scanning and power scanning , combined scan and list scan. When the scan mode is turned on , the frequency and power set on the main interface Not effective.



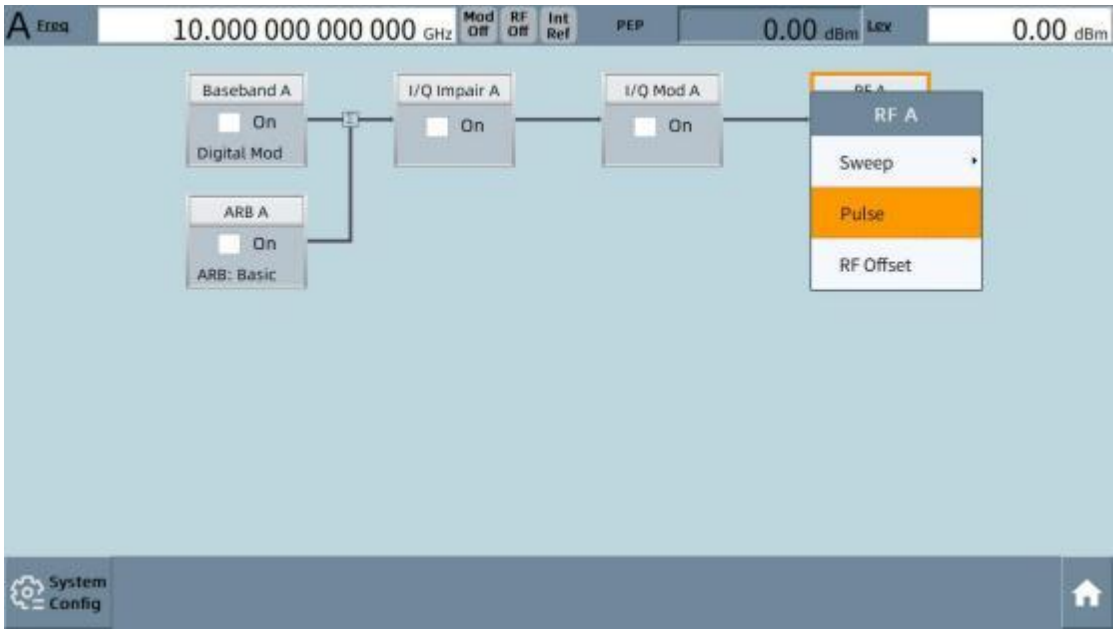
Linear frequency sweep mode: starting from the start frequency and ending at the cutoff frequency, one frequency point is scanned every other step frequency (st artFreq + stepLinear), the time difference between adjacent frequency points is the dwell time.

Among them: the difference between the start frequency and the cut-off frequency is the sweep bandwidth span, and the frequency between the start frequency and the cut-off frequency is the center frequency ; if Starting frequency change , then the cutoff frequency remains unchanged , the sweep bandwidth and center frequency change accordingly , if the sweep bandwidth is changed, The center frequency remains unchanged. The start and end frequencies change.

Notice: The linear sweep mode can only be used when generating an unmodulated signal.

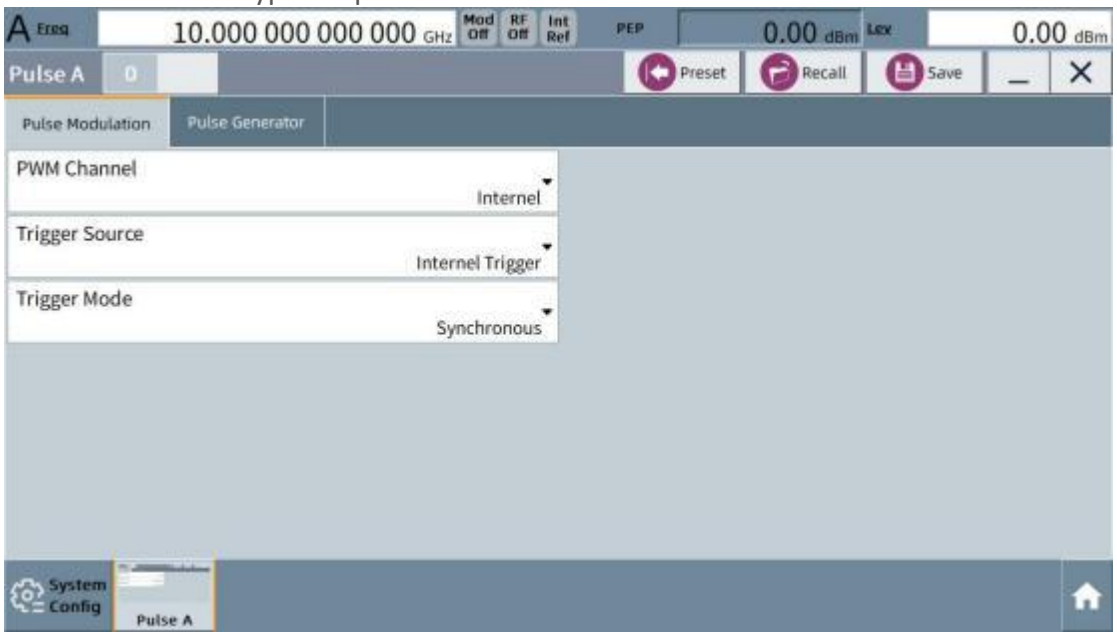


Pulse modulation parameter configuration

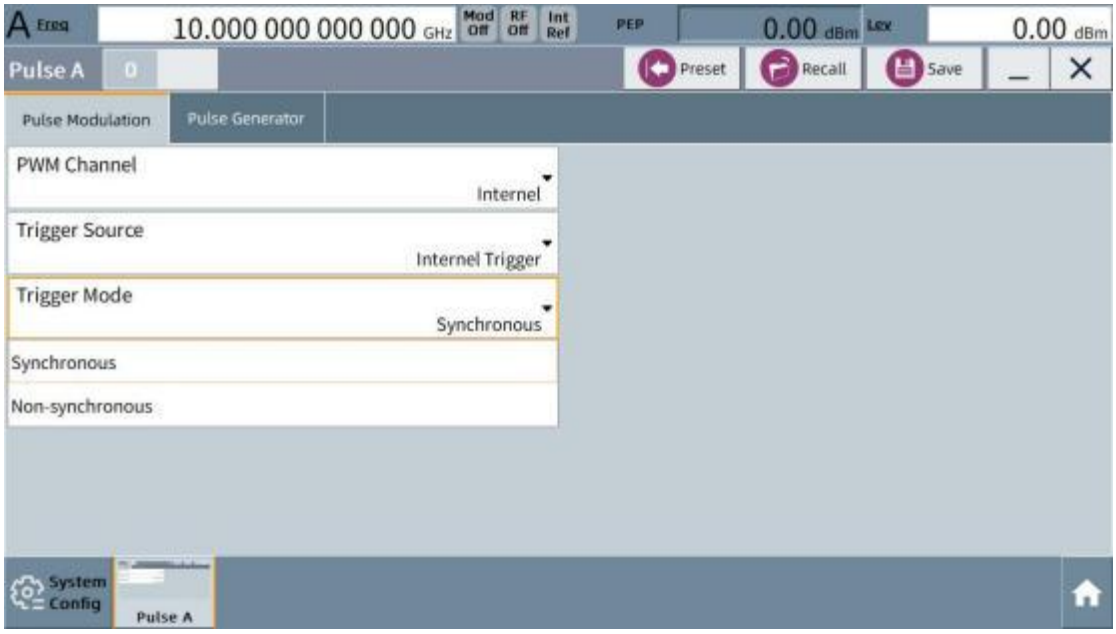


Pulse modulation mode can generate pulse modulation signals , divided into pulse modulation and pulse generation, the pulse modulation module has internal and external pulse trigger options Selection and pulse synchronization delay function; in the pulse generation module: the pulse width setting should be smaller than the pulse period If the pulse width is set greater than the pulse period The software will then roll back the settings.

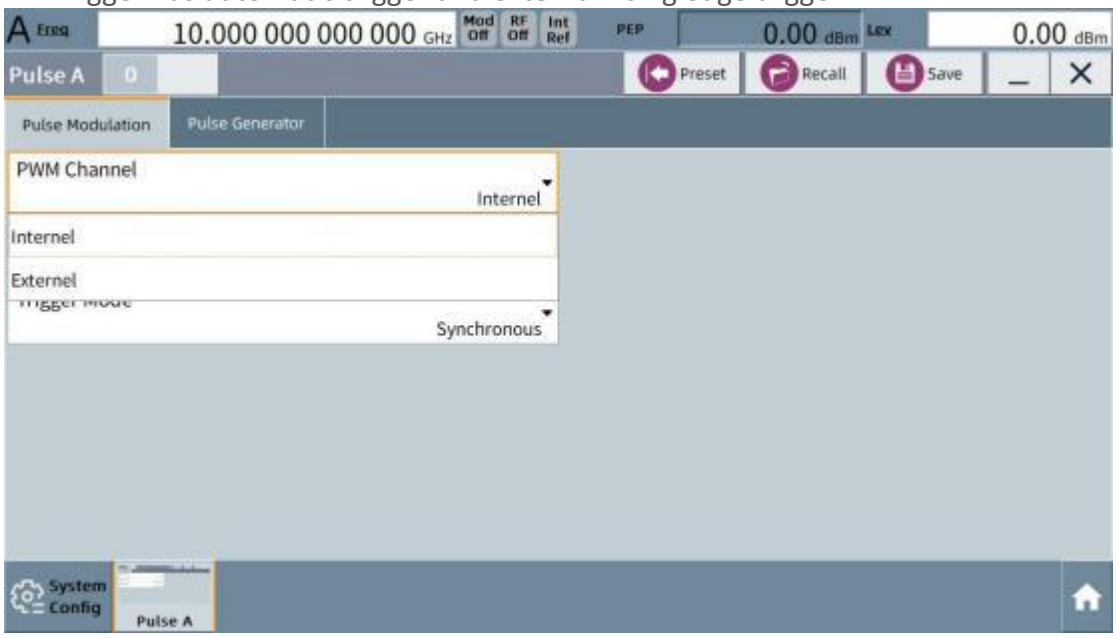
There are two types of pulse channels: internal and external



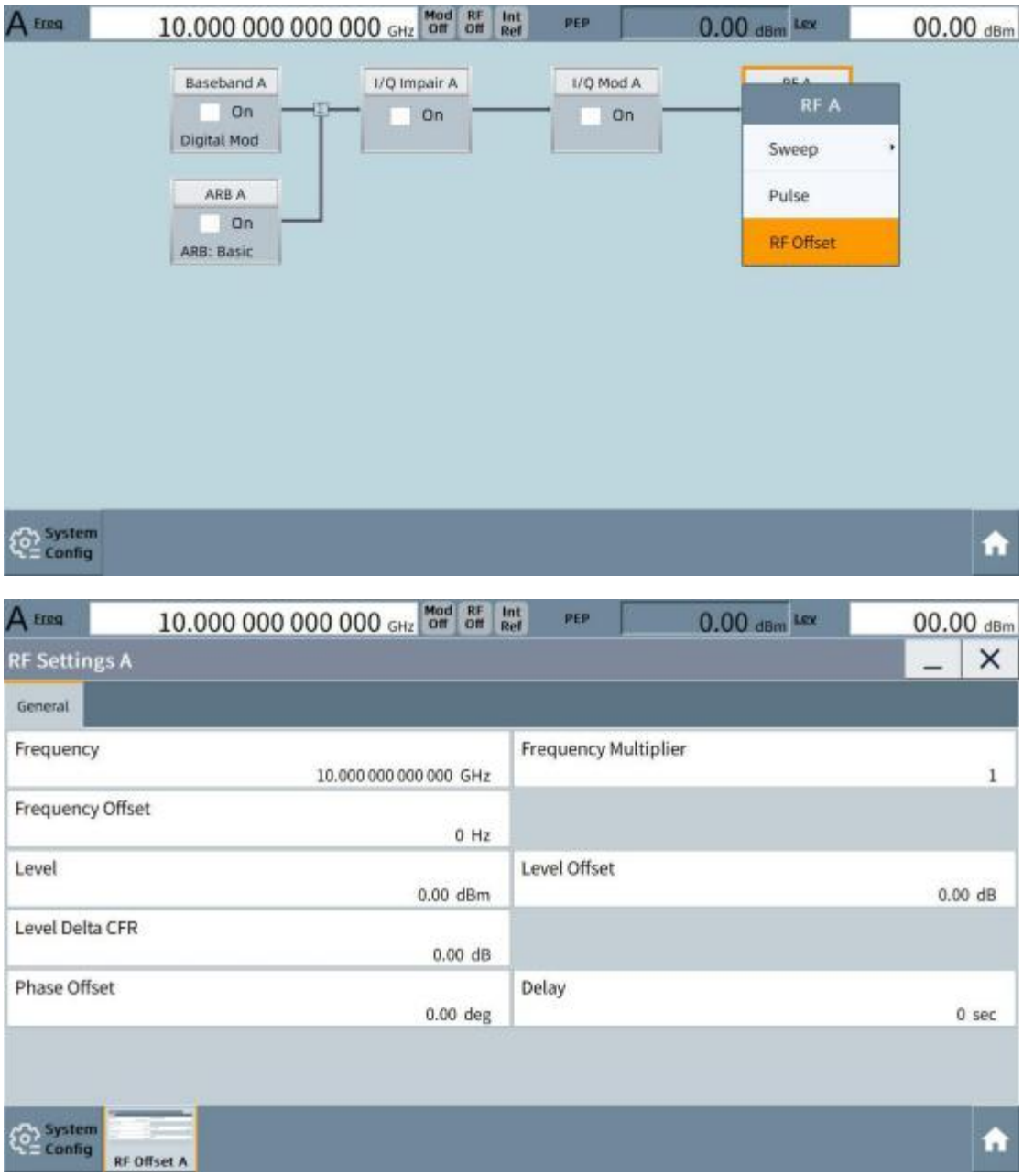
The pulse mode has two modes: pulse synchronous trigger and pulse delay trigger.



Trigger has automatic trigger and external rising edge trigger

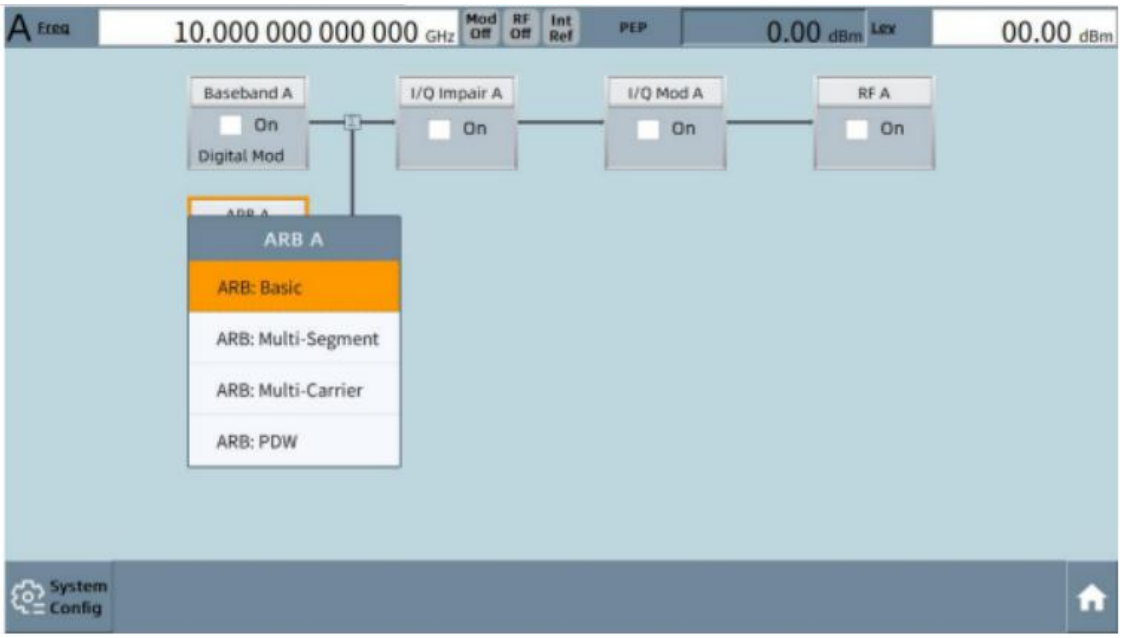


RF bias parameter configuration



RF bias parameter configuration can be used for frequency , power and phase settings with different bias For example： Actual output frequency = main interface frequency + bias frequency

Arbitrary Waveform Mode



User playback file normal IQ

The data file is saved in binary format and contains only IQ data, which are saved as 16-bit signed integers. The data comes after. For example, you can use the following matlab code to store the complex data userData generated by the user:

```
iq = zeros( 1, 2*length( userData) );
iq(1:2:end) = real(userData);
iq(2:2:end) = image(userDat a);
fidIQ = fopen('test.bin', 'wb' );
fwrite( fidIQ , iq , ' int 16 ' );
fclose(fidIQ);
```

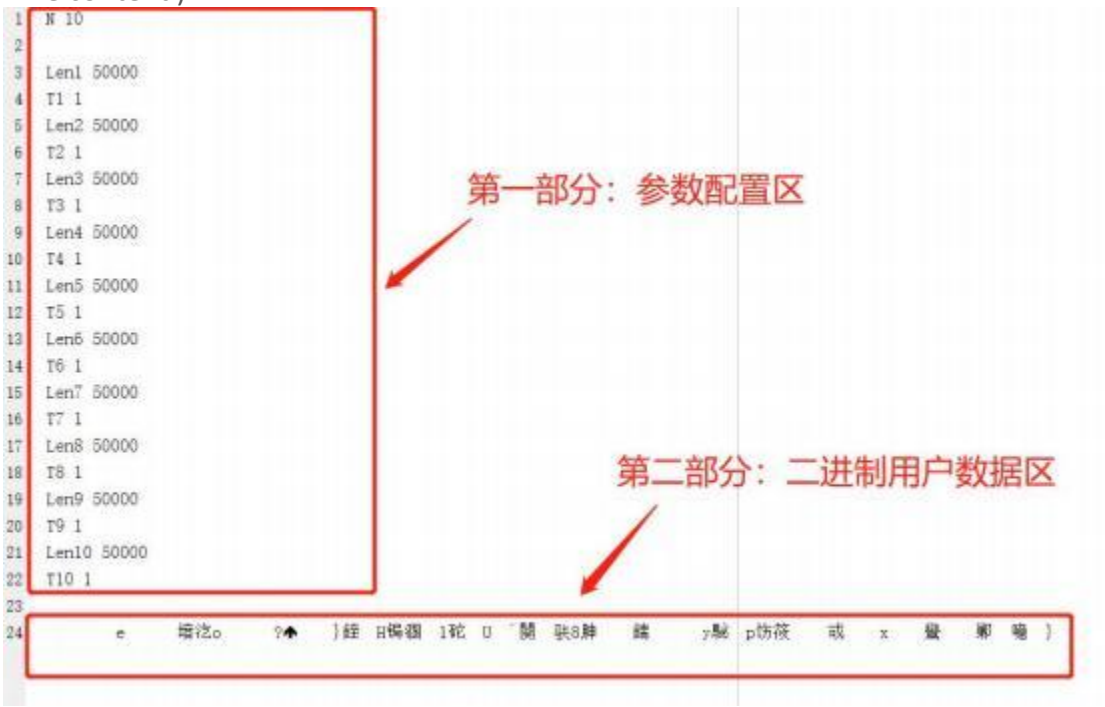
User plays IQ sequence data

The data file consists of 2 modules:

The first part is the parameter configuration area, which stores the number of segments N , the length of each segment and the reserved fields;

The second part is the binary IQ data area.

For example, open the data file userdata1.bin , you can see the following content (the number on the far left is the line number displayed by the text editing software, Non-file content):



The first line N 10, indicating a total of N=10 segments;

The second line is always a blank line;

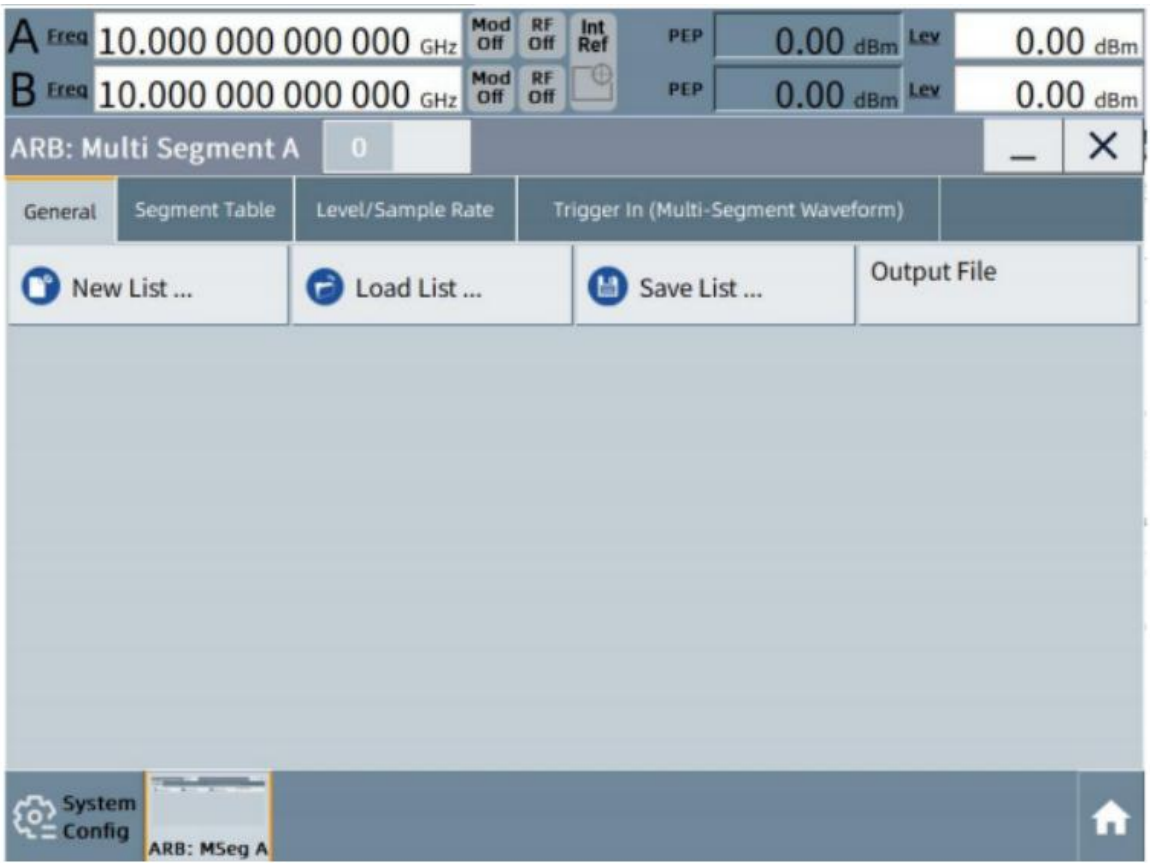
From the third to the twenty-second line , a total of 20 lines, corresponding to the length and parameter information of 10 segments. For example, the third line shows Len1 50000, table The first segment length is 50,000 complex samples (I+jQ) The fourth line shows that T1 1 is a reserved field. , meaningless.

The 2nd*N+3rd line is a blank line, used as a separator , meaningless .

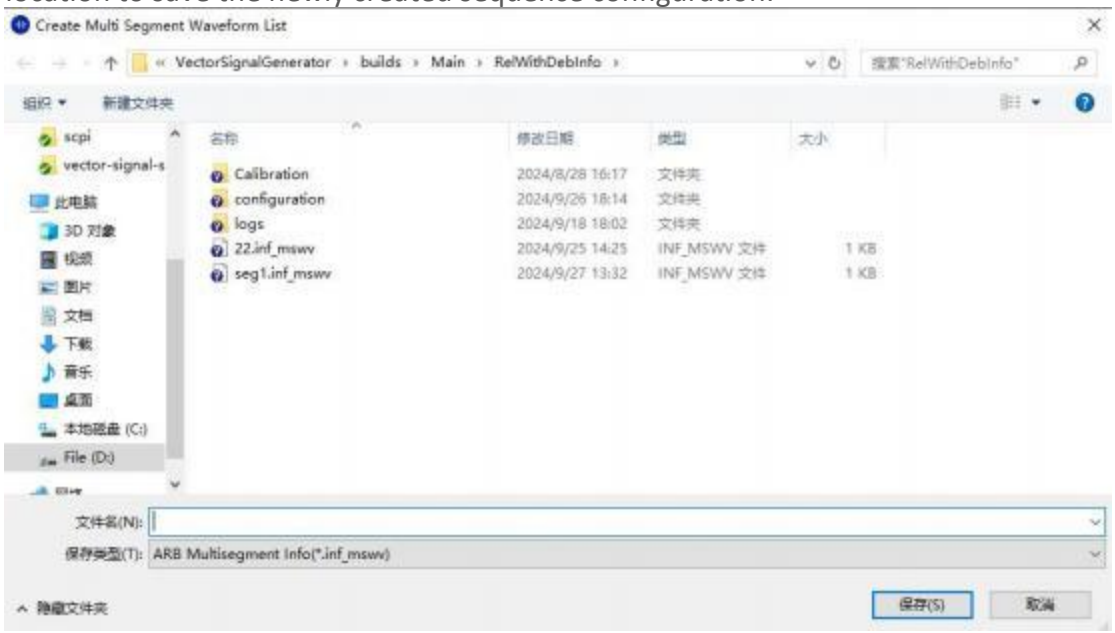
Starting from line 24 , which is the binary data area , continuously store 10 segments of IQ data , are 1- bit and 6-bit signed integers respectively. , I data

in front , Q data comes after.

Sequence File



Click New After List, a sequence configuration file will be created. Select the save location to save the newly created sequence configuration:



Click Load List The sequence configuration file will be called later The configuration information contains the following list:

	Filename	Sample Rate	Samples	Period
1	...SAMP275M_T20240717110908_0.bin	10.000 MHz	16777216	1.678 s
2	...SK_100M_RRC_0.35_100M - 副本.bin	10.000 MHz	178010	17.801 ms

Clicking Save List will save the sequence configuration file;

Click OutPut File and it will be merged

	Filename	Sample Rate	Samples	Period
1	...SAMP275M_T20240717110908_0.bin	10.000 MHz	16777216	1.678 s
2	...SK_100M_RRC_0.35_100M - 副本.bin	10.000 MHz	178010	17.801 ms

Concatenate the sequences in the list into a binary data file and choose the save location:

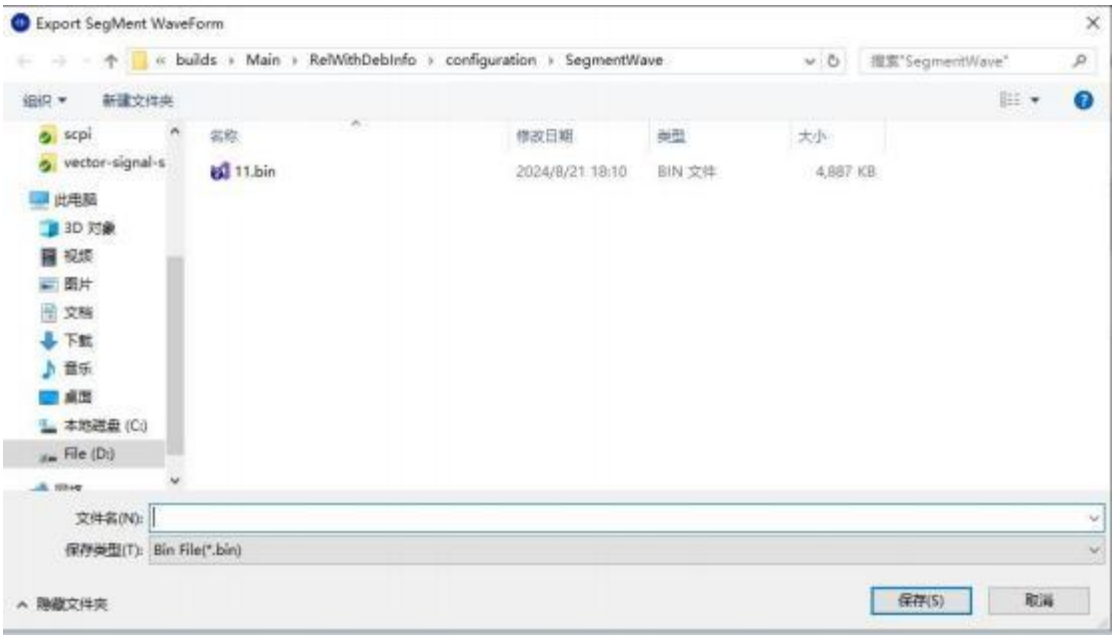
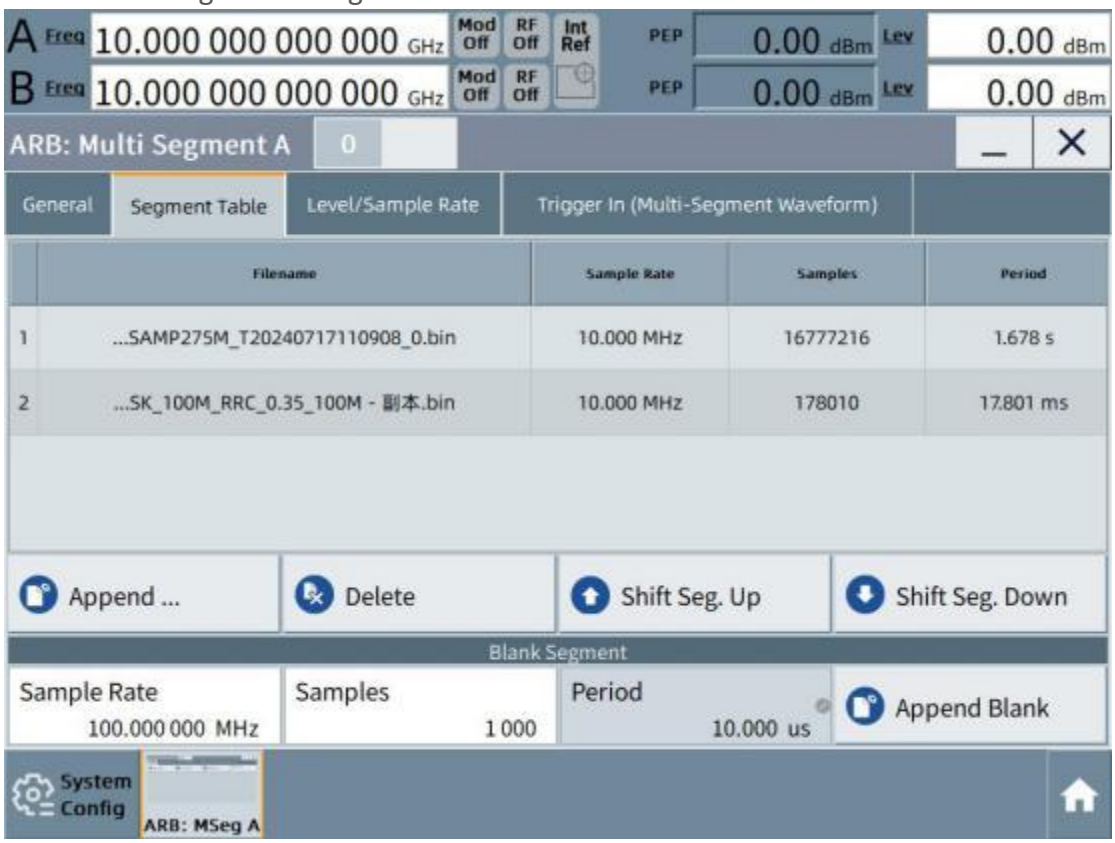
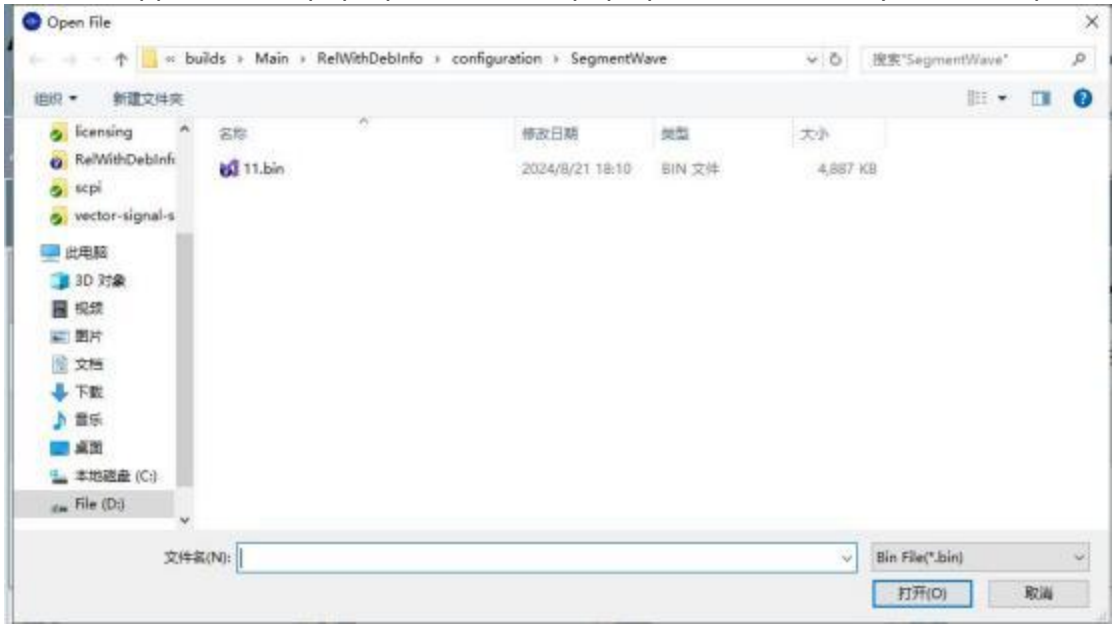


Table Configuration Page



Click Append and a pop-up window will pop up to select a binary data to import:



After successful import:

Click Delete to delete one of the sequence files.

Clicking shift Up will move the current sequence up:

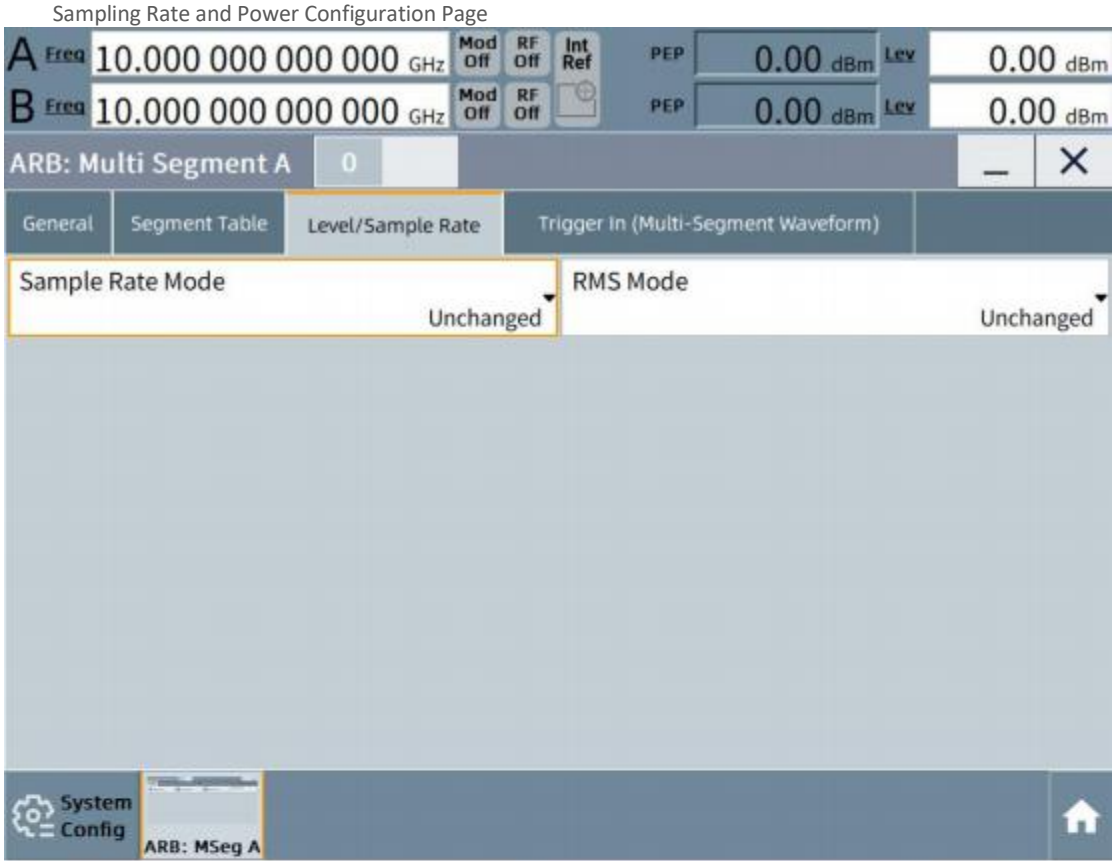
2	...nfiguration/SegmentWave/11.bin	10.000 MHz	1251000	125.100 ms
3	...SK_100M_RRC_0.35_100M - 副本.bin	10.000 MHz	178010	17.801 ms

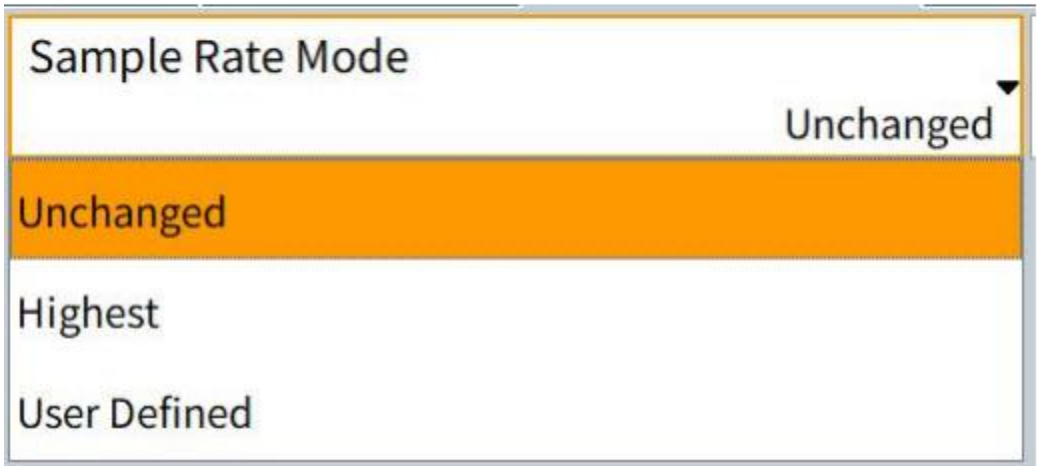
Clicking shift down will move the current sequence down

Clicking Append Blank will add a blank data series:

4	Blank	100.000 MHz	1000	10.000 us

Sampling Rate and Power Configuration Page





Sampling rate configuration mode:

1. Select Unchanged: Do not oversample the sequence file , play at original rate

2. Select Highest: The sampling rate of the sequence with the highest sampling rate will be used as the basis , other sequences are oversampled to their values

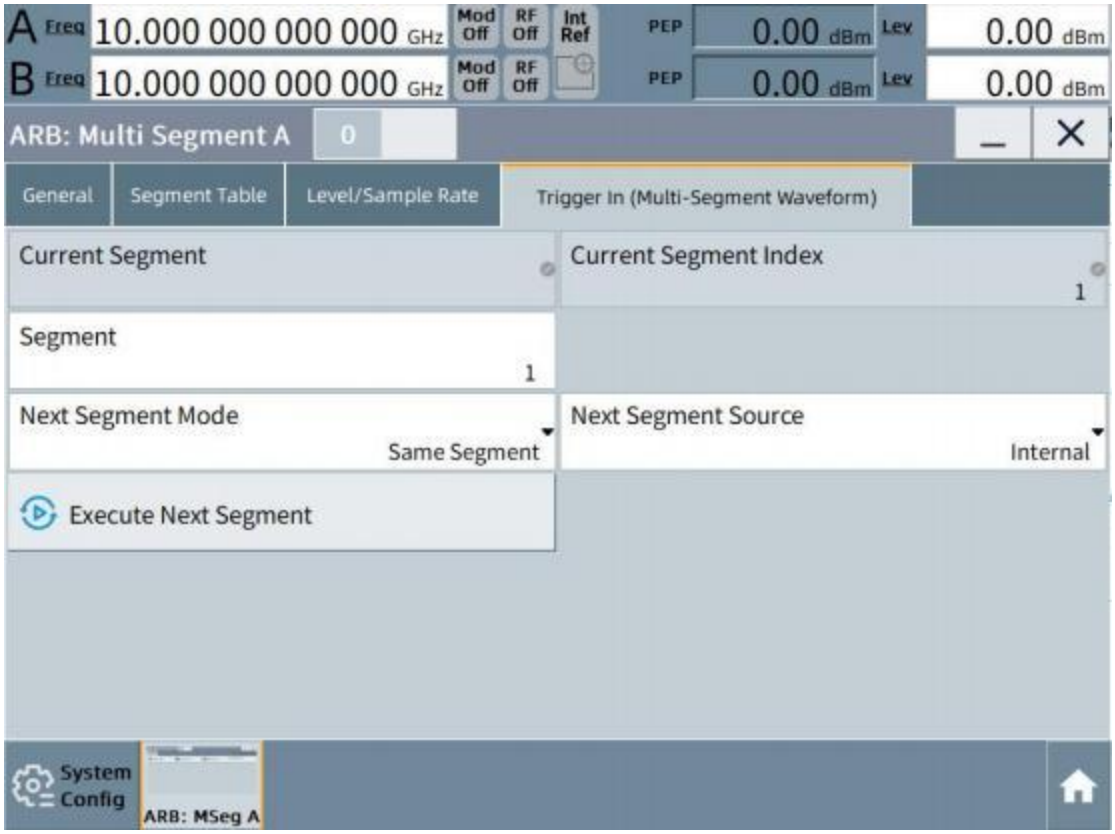
3. Select User Defined: The sampling rate will be based on the user's customized sampling rate. , other sequences are oversampled to their values

Power settings:

1. Select Unchanged: Do not perform power normalization on the original sequence file

2. Select Equal RMS: Unify the RMS of all sequence files to the same value for playback

Trigger configuration:



Current Segment displays the current trigger file

Current Segment Index Displays the current trigger segment index Segment: Set the current index of the trigger

Next Segment Mode:

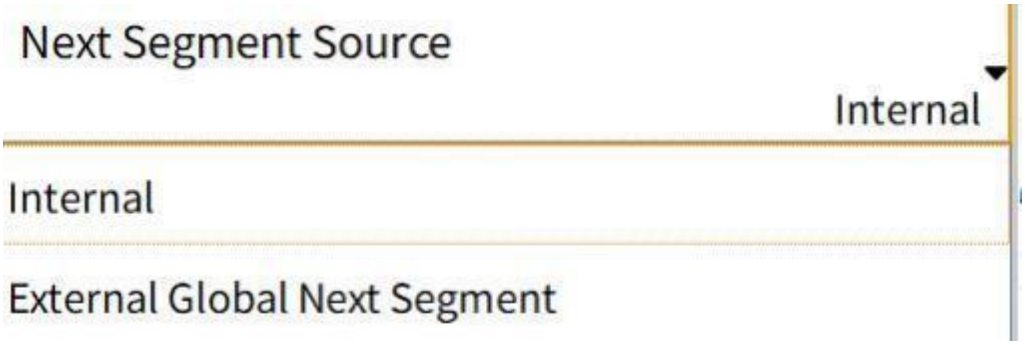
1.Same Segment: The number of segments triggered next time is the same

2.Next Segment: The segment number of the next trigger is the next segment number of the current segment number

3. Next Segment Seamless : The segment number of the next trigger is the next segment number of the current segment number (phase continuous, available in non-oversampling mode)

4.Squencer: The number of segments of the entire sequence table that will be triggered next time

Select internal or external trigger:

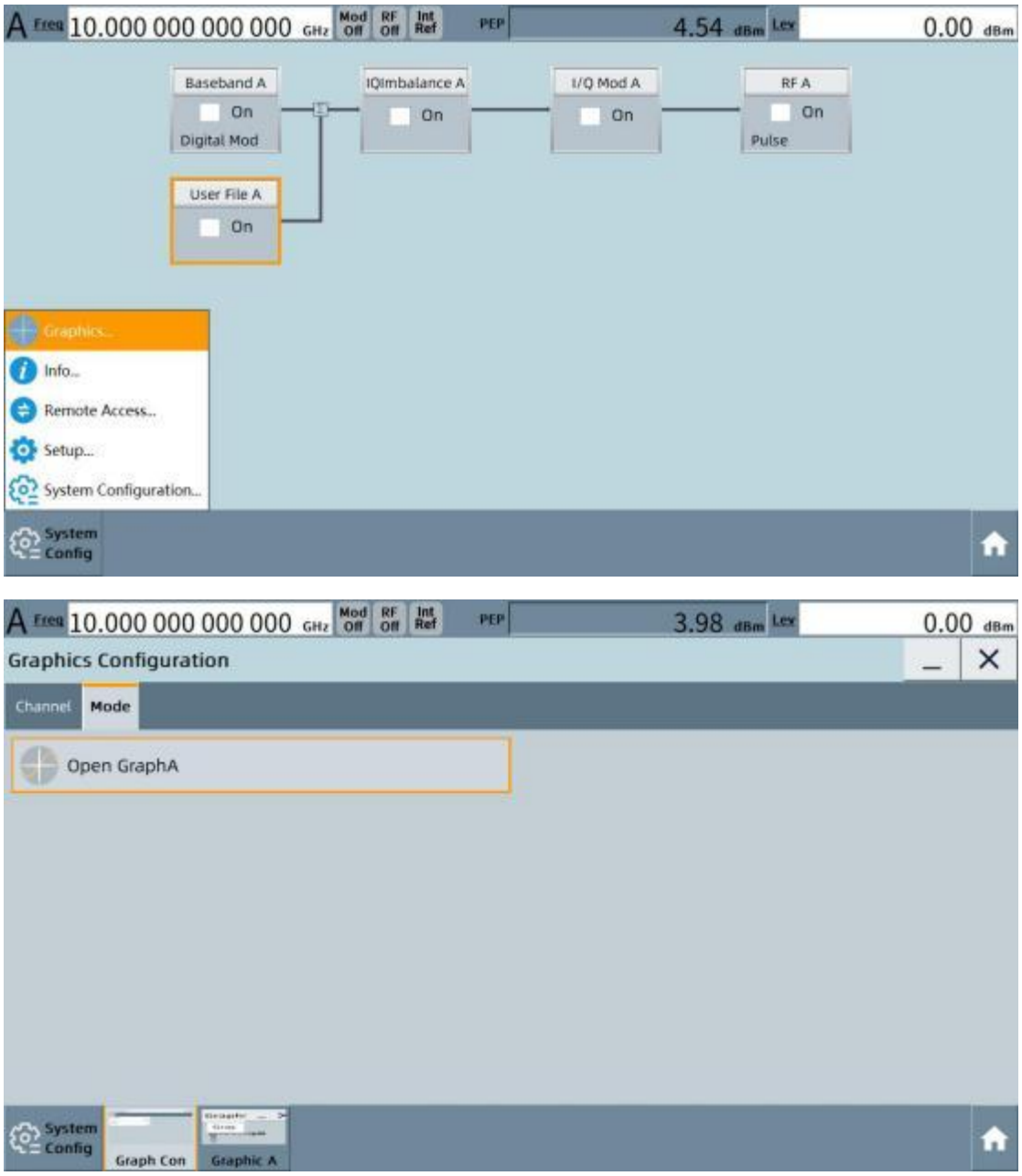


1. Internal: Internal trigger

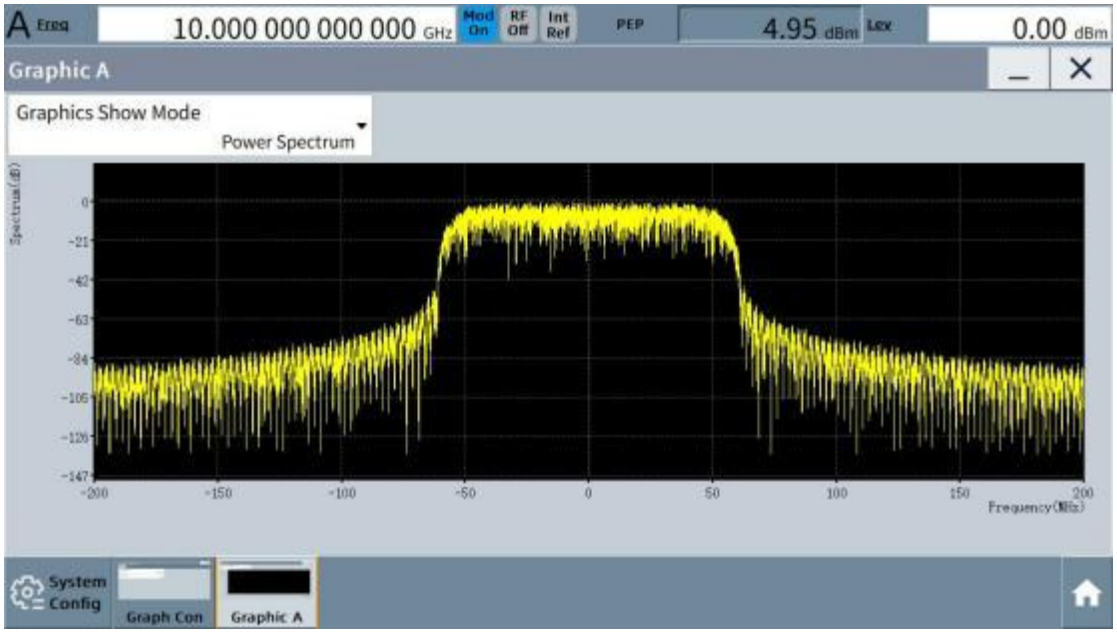
2. External Global Next Segment: External Trigger

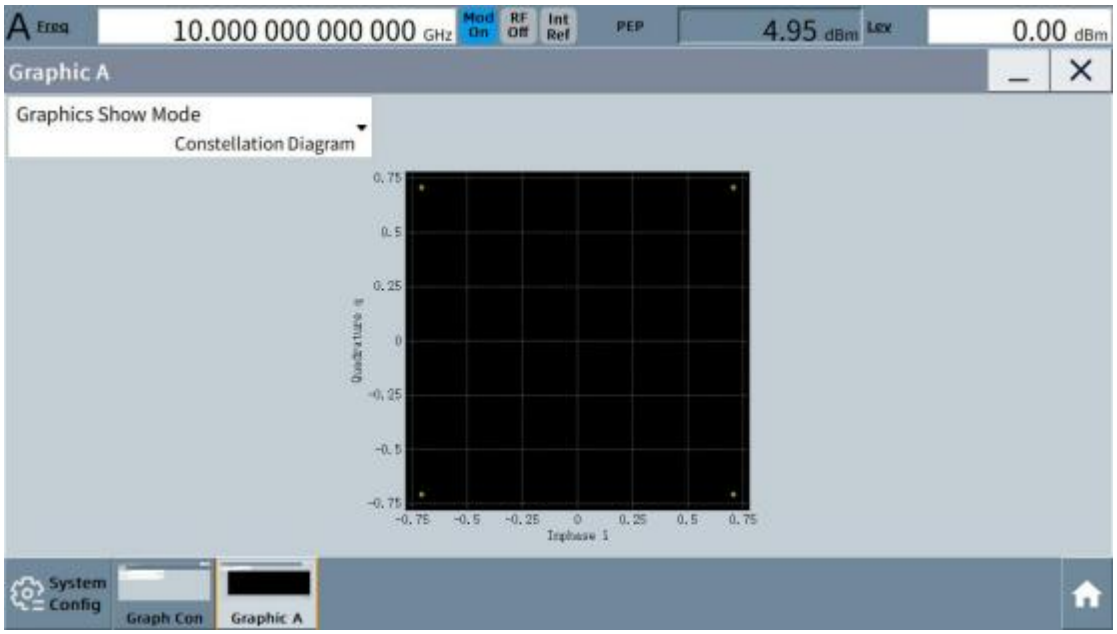
3. After selecting internal trigger Click Execute Next Segment to generate an internal trigger event.

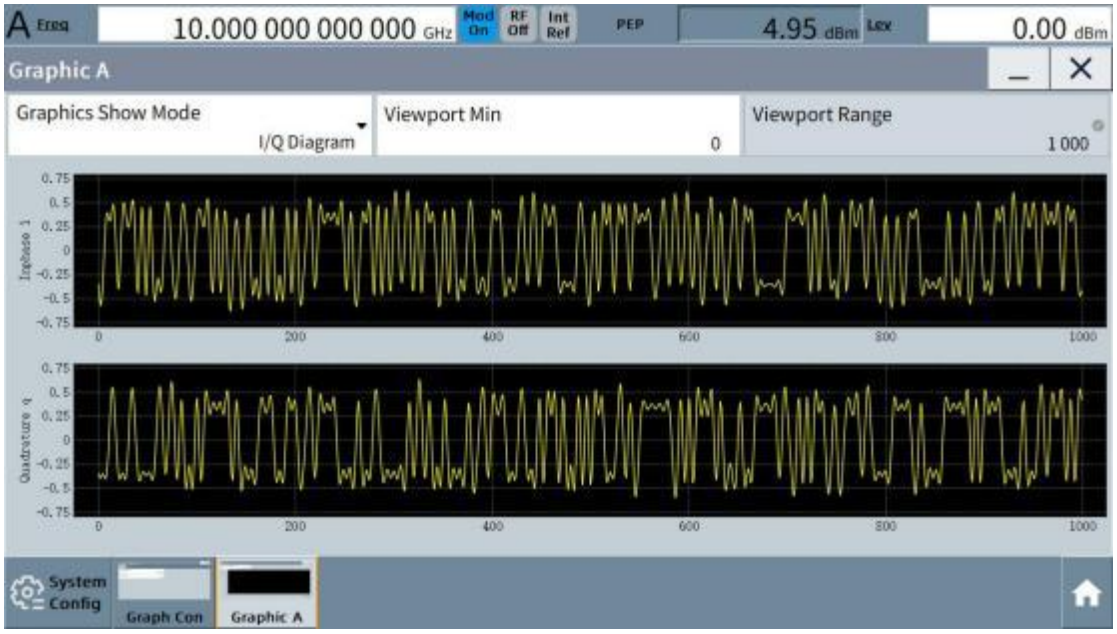
Graphical configuration interface

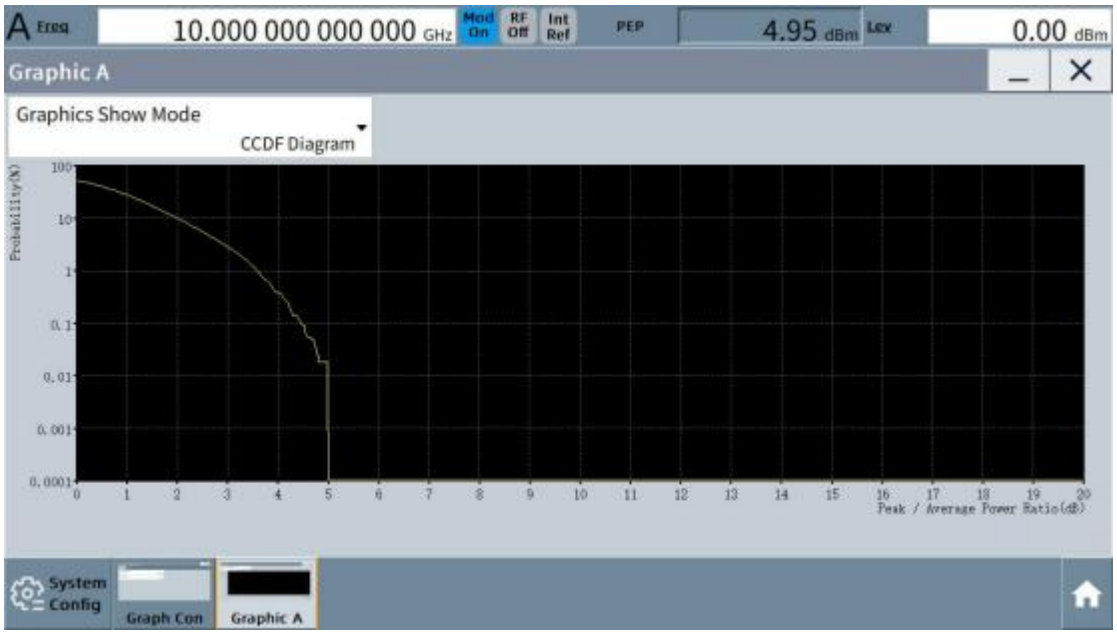


Select the system configuration on the interface by touching the screen or using the arrow keys, and find the Graphics Configuration option. , open the graphics options ,Can Generates a simulated graph of the signal according to the set parameters , which can generate a spectrum diagram , Constellation Map , IQ plots, and complementary cumulative distribution plots.

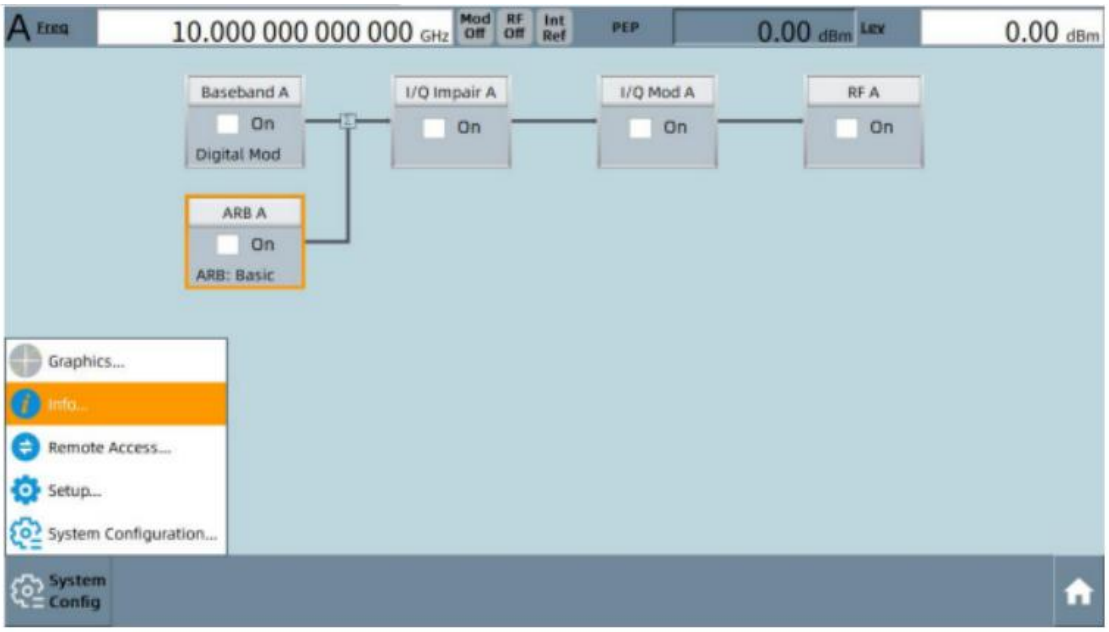

A Freq
10.000 000 000 000 GHz
Mod On
RF Off
Int Ref
PEP
4.95 dBm
Lev
0.00 dBm
Graphic A
Graphics Show Mode
Power Spectrum
Spectrum(dB)
0
-21
-42
-63
-84
-105
-126
-147
-200
-150
-100
-50
0
50
100
150
200
Frequency(MHz)
System Config
Graph Con
Graphic A

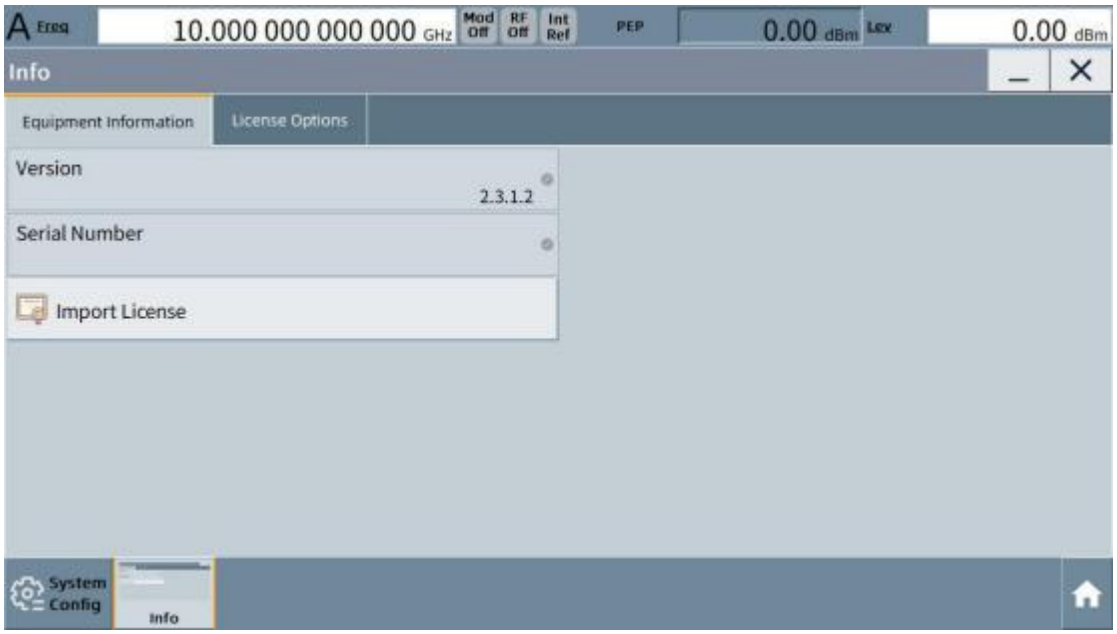

A Freq
10.000 000 000 000 GHz
Mod On
RF Off
Int Ref
PEP
4.95 dBm
Lev
0.00 dBm
Graphic A
Graphics Show Mode
Constellation Diagram
0.75
0.5
0.25
0
-0.25
-0.5
-0.75
-0.75
-0.5
-0.25
0
0.25
0.5
0.75
Inphase I
System Config
Graph Con
Graphic A

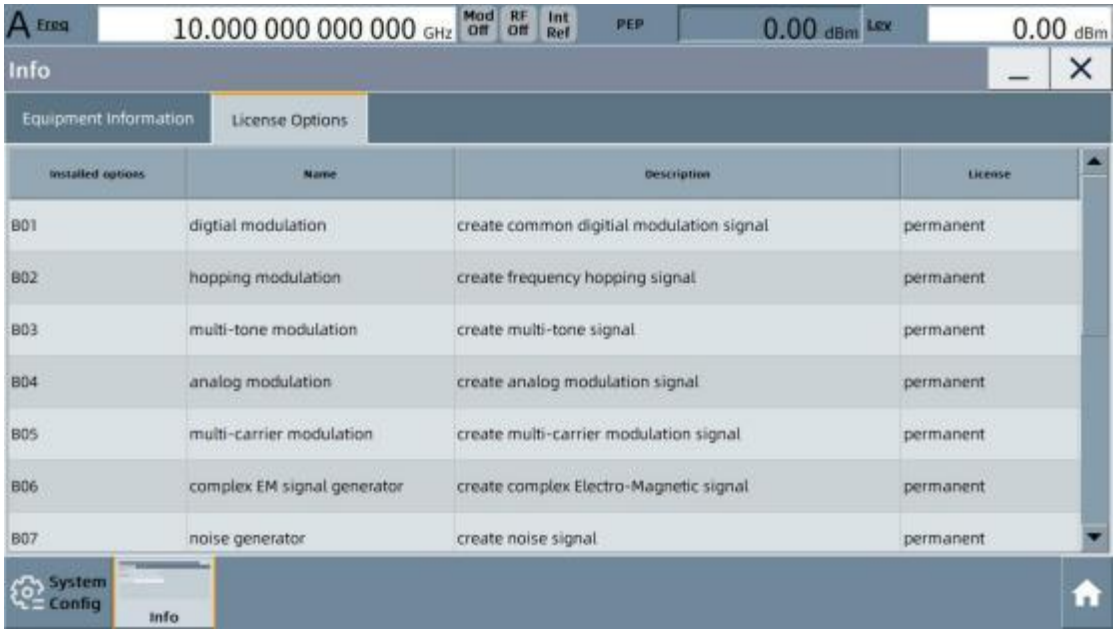

A Freq
10.000 000 000 000 GHz
Mod On
RF Off
Int Ref
PEP
4.95 dBm
Lev
0.00 dBm
Graphic A
Graphics Show Mode
I/Q Diagram
Viewport Min
0
Viewport Range
1 000
Inphase i
Quadrature q
System Config
Graph Con
Graphic A


A Freq
10.000 000 000 000 GHz
Mod On
RF Off
Int Ref
PEP
4.95 dBm
Lev
0.00 dBm
Graphic A
Graphics Show Mode
CCDF Diagram
Probability(%)
Peak / Average Power Ratio(dB)
System Config
Graph Con
Graphic A

Device information query

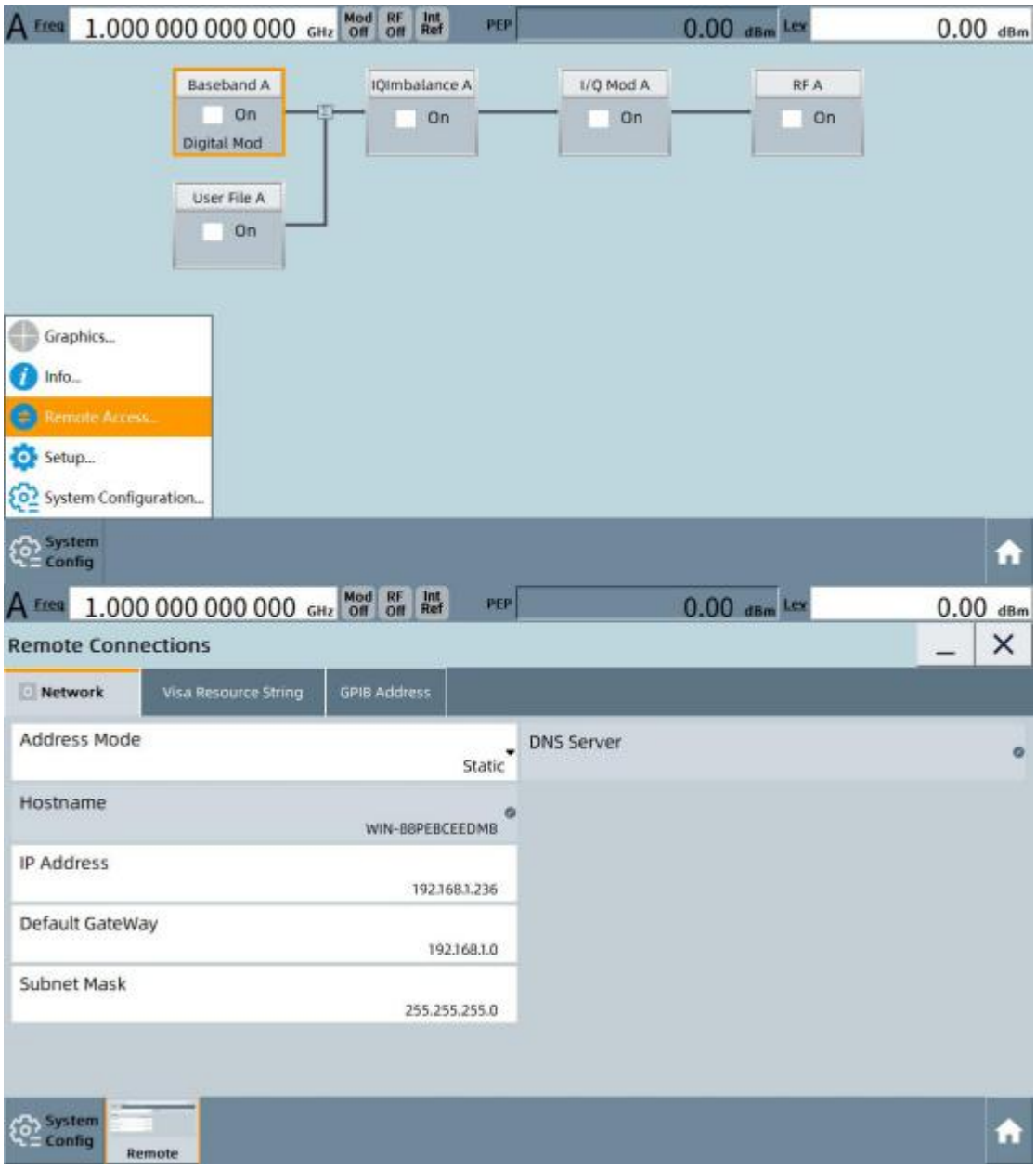






The Info interface can query the software version information and option information of the current device.

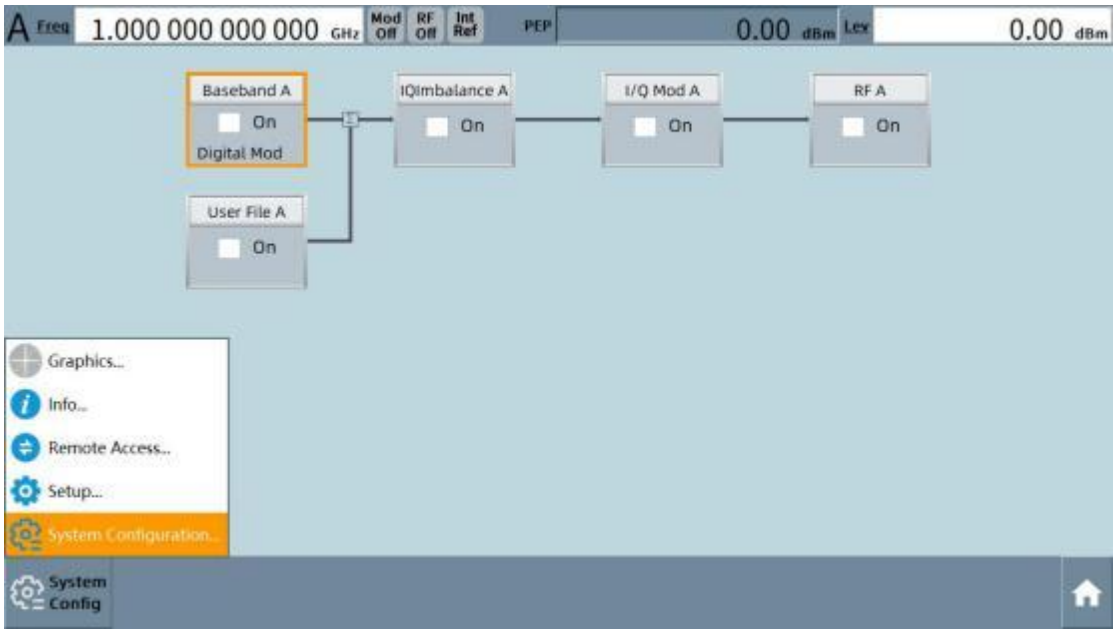
IP address configuration

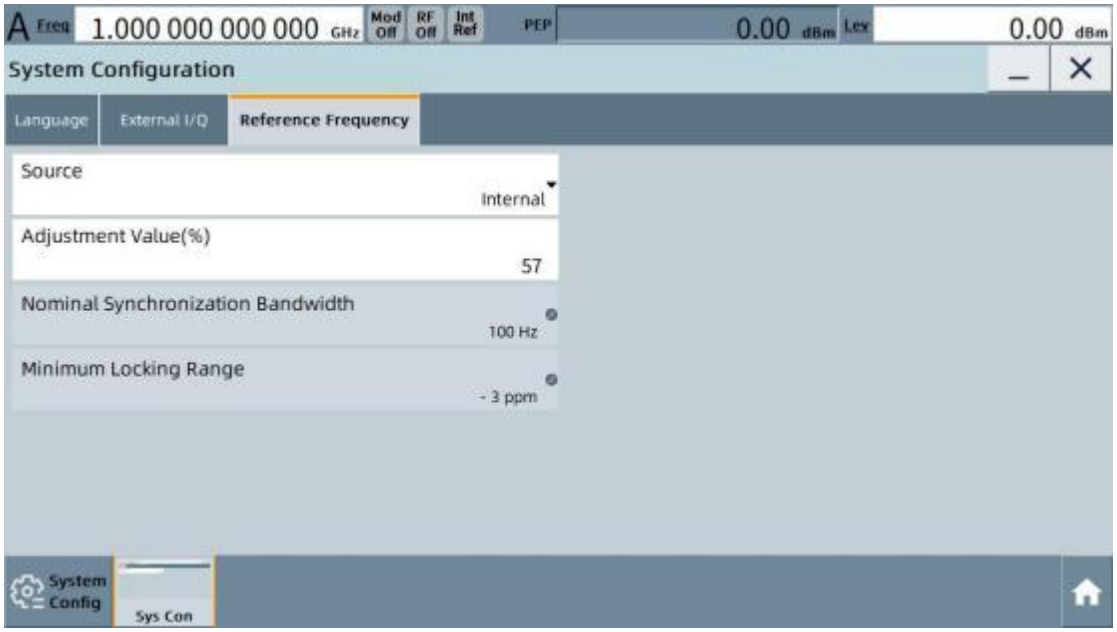


Select System Configuration on the interface and find IP Address Configuration to view the IP address. , gateway and subnet mask, etc., press the ESC button You can exit the operation interface.

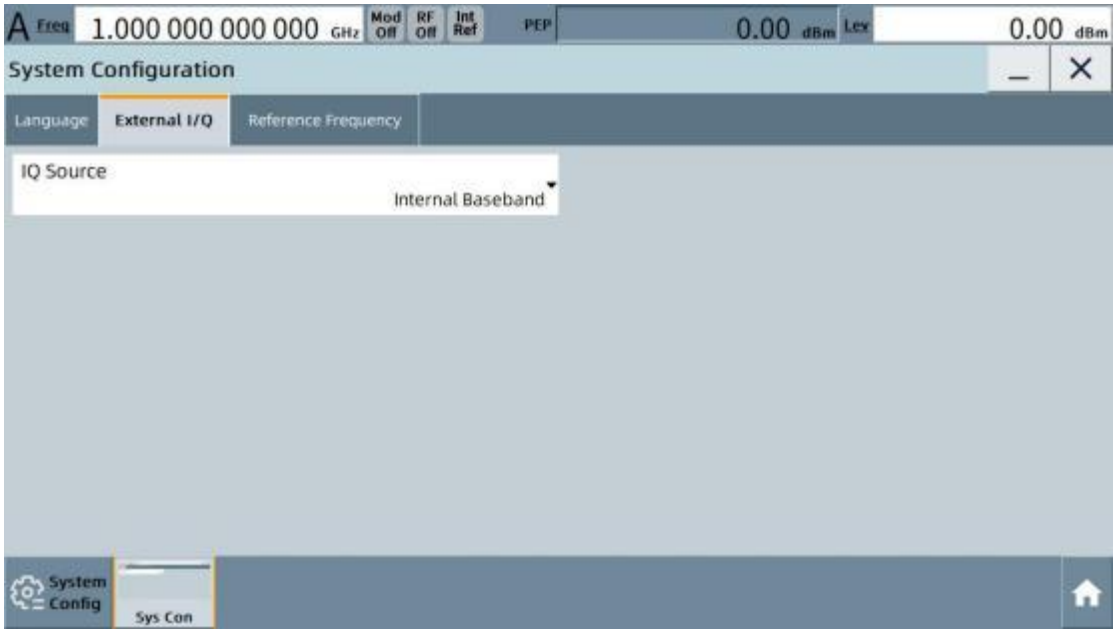
The remote port is :5025

Internal and external reference configuration





Select System Configuration on the interface and find the internal and external reference settings , you can set the internal reference and external reference switch , frequency accuracy adjustment. Select Externall/Q can set the internal and external trigger mode of I/Q , press the ESC button to exit the operation interface.


A Freq 1.000 000 000 000 GHz
Mod Off
RF Off
Int Ref
PEP
0.00 dBm
Lev
0.00 dBm
System Configuration
Language
External I/Q
Reference Frequency
IQ Source
Internal Baseband
System Config
Sys Con

Programming Instructions

When connected to an external controller , you can use the Ethernet interface to connect to perform automatic measurements on the instrument. In addition, remote control commands The SCPI standard , which is known as the global standard, is adopted. , see SCPI 1999.0 (SCPI Consortium).

The general conditions for using the SCPI standard are as follows:

1. Ethernet commands are standardized.

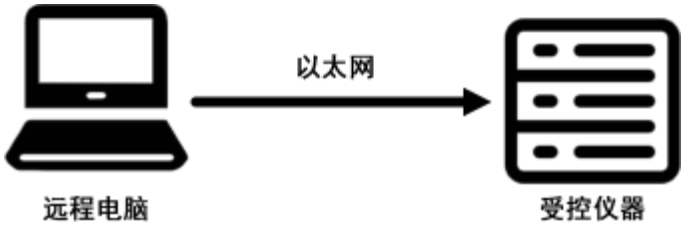
2. The general settings on the system toolbar (for example: setting the time) are not supported , date) and file browsing (e.g. viewing a list of files).

3. All the above conditions can be read through commands.

Network connecti

This section describes the connection of devices using the remote control function and the setup using the Ethernet interface.

The remote control function of the instrument is realized by remotely controlling the instrument from a remote control PC. Use 100M, 1 000M Ethernet interface Connect the instrument to the remote control PC The default working ports are 50 and 25. The example is shown in the figure below.



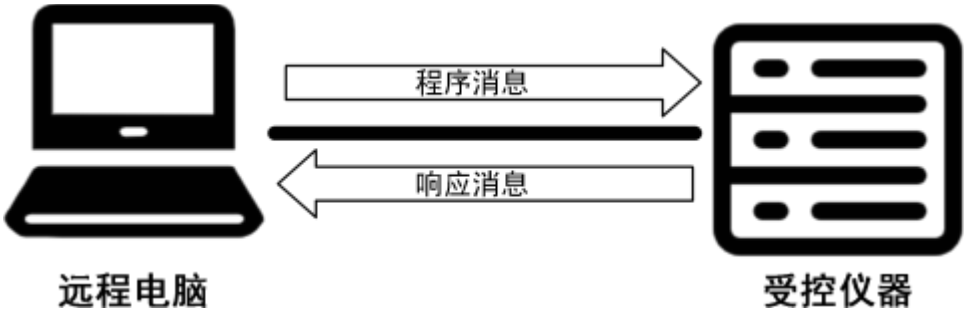
⚠ It is recommended to connect , do not use a HUB but connect directly. When connecting directly, it is recommended to use a crossover cable (cable).

Device Messages

Device messages are data messages transmitted and received between the controller and the device through the system interface. Device messages include program messages and response messages. A program message is an ASCII data message transmitted from the controller to the device. A response message is a data message transmitted from the device to the controller.

Program messages and response messages have the following types:

Program Messages (See Write Command Example)	Response Message (See Read Command Example)
Program instructions • Device Specific Commands (See “SCPI Commands”.) • IEEE 488.2 Common Commands (See "IEEE 488.2 Common Commands".)	Program Query • Response message


程序消息
响应消息
远程电脑
受控仪器

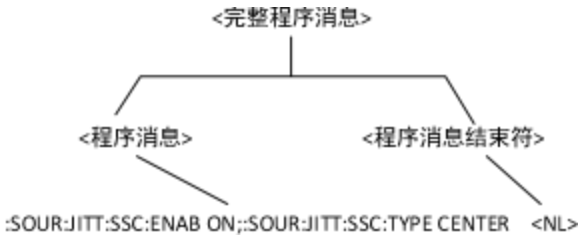
SCPI Command Format

Program Messages

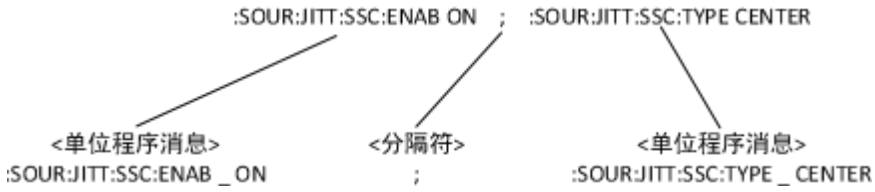
This section describes the format of the instrument's program messages sent from the sender (remote control PC) to the listener (instrument). Comply with SCPI standards, Therefore, SCPI commands are used in the examples in this section.

Program messages are composed of a series of functional elements, which are the smallest units of functions and are enclosed in <>. Program Message> is a functional element.

A <complete program message> is composed of a <program message> and a <program message terminator>.



<Program Message> Combination of one or more <Unit Program Messages >. When there are multiple <Unit Program Messages> , you need to use < Separator > to separate.



The instrument detects the end of program message character (NL) to receive program messages. The functional elements of program messages are described below.

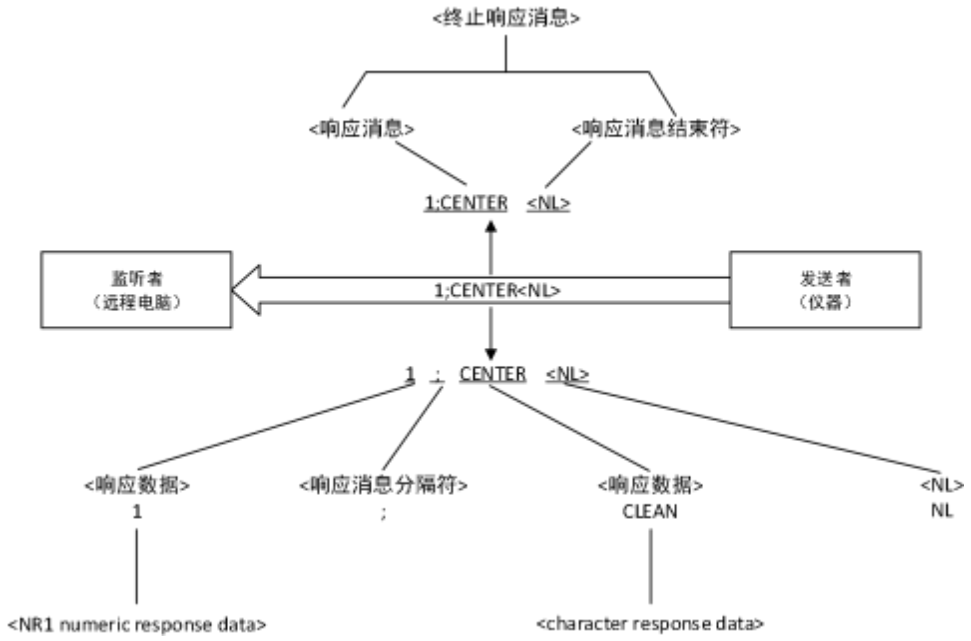
Program message terminator (NL) is defined as a single ASCII code byte 0A (decimal 10) , which is the ASCII control character LF (replace line character).

<Space> is defined as a single ASCII byte in the range 00 to 09, 0B to 20 (0 to 9, 0 to 20 decimal). 11 to 32). This range includes ASCII control characters and space signals except line feed characters , which the instrument simply treats as Spaces or ignore them , without interpreting them as ASCII control characters.

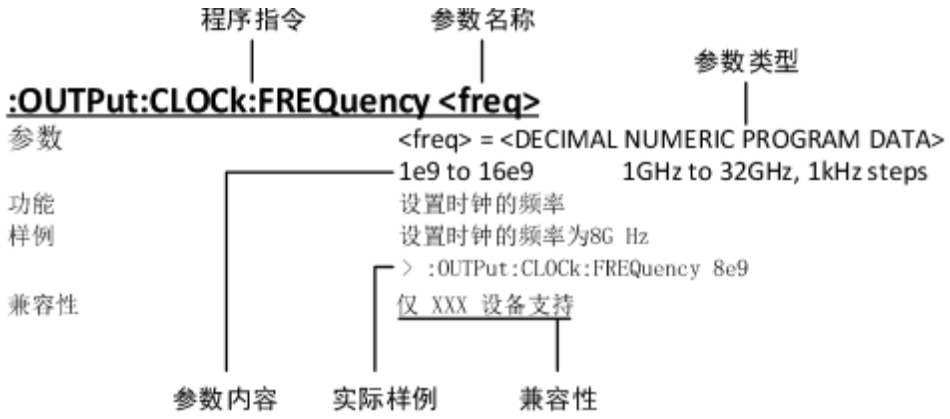
Response Message

This section describes the information that the instrument (transmitter) sends back to the remote computer (Listener) The format of the response message.

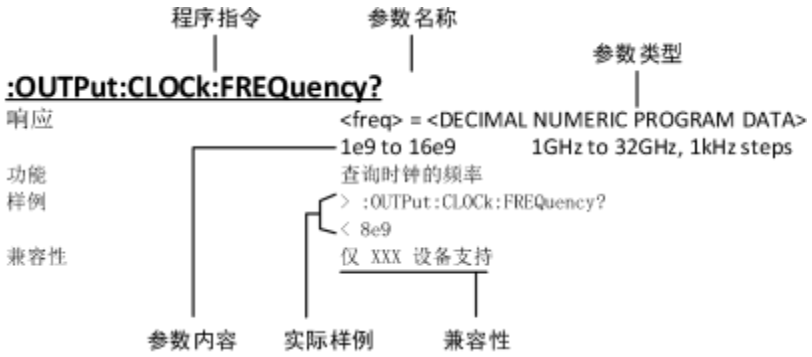
The following diagram shows the SSC switch status query command: "SOUR:JITT:SSC:ENAB?" and the SSC type query command. ": SOUR : JITT : SSC : TYPE ?"



Write command example



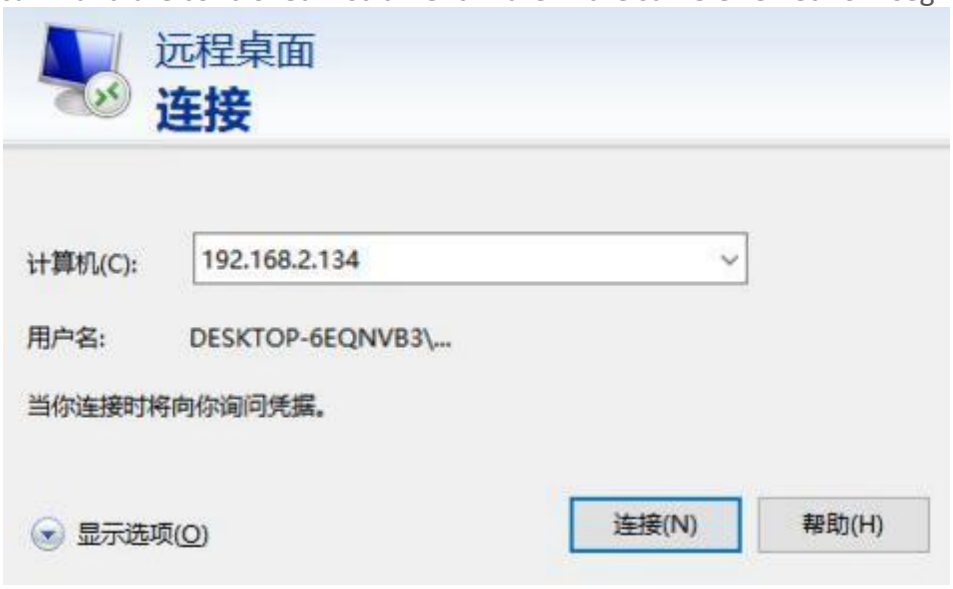
Read command example



Remote desktop

Use a personal computer to control the instrument through Ethernet using Windows Remote Desktop. If the personal computer screen is larger, it is more convenient to view detailed information.

In the remote desktop connection interface, enter the IP address of the controlled instrument and click Connect. Before connecting, please make sure that the local IP and the controlled instrument IP are in the same One network segment.



Command control

1. COMMON Command

Common commands are specified by the IEEE488.2 standard. , starting with 9*I , composed of 3 letters

---

***IDN?**

Query instrument information.

Return value:

<ID> returns 4 fields separated by 9,9 , the fields have the following meanings:

Manufacturer ,model , serial number, Firmware version number

Example:

ISinoIink TechnoIogies,VSG,abcd12,2 .0.2.0I

***OPC?**

Check whether the operation is completed

***RST**

Reset, resets the vector source to the default state.

---

2. OUTPut Subsystem

In the output subsystem , the user can configure the output of the signal, For example, on/off status In the output subsystem , SCPI has a common prefix "OUTPut:"

:OUTPut<hw>[:STATe] <State>

Activate the RF output signal of this channel of the instrument.

Parameters :

<State> 1 | ON | 0 | OF

* RST :0

Example :

:OUTPut:STATe

OFF closure RF

:OUTPut:ALL[:STATe] <State>

Activates all RF output signals of the instrument.

Parameters :

<State> 1 | ON | 0 | OF

* RST :0

Example :

:OUTPut:ALL:STATe

OFF Turn off all RF

---

3. SOURce subsystem
The Source subsystem contains the SCPI commands for configuring the signals.

[:SOURce<hw>]:SELect <Mode>

Open the corresponding mode interface

Parameters :

< **Mode** > DM | ARB | RADar | OFDM | MCCW| ANALog | HOP | NOIS | PULM | Complex |
MCar

Example :

Source1:SELect DM
Select channel A digital modulation mode
Source 2: SELect ARB
Select Channel B User File Mode

DM	Digital Modulation
ARB	User file playback
RADar	radar
OFDM	OFDM
MCCW	Multi-Carrier CW
ANALog	Analog Modulation
HOP	Frequency Hopping
NOIS	noise
PULM	Analog Pulse Modulation
Complex	Complex electromagnetic environment
MCar	Multi-Carrier

[:SOURce<hw>]:IQ:STATe <Stat e>

Switch IQ MOD switch.

Parameters :

<State> 1 | ON | 0 | OFF
* RST :0

Example :

SOURce1:IQ:STAT
e 0 closure IQ
MOD

[:SOURce<hw>]:FREQuency:FREQuency <Fixed>

Set the frequency of the RF output signal (display frequency, including offset).

Parameters :

<Fixed> float

Value range: RFmin to RFmax
*RST: profile

Example :

SOURce 1: FREQuency : FREQuency
6000000000 Set the output frequency
to 6GHz

[:SOURce<hw>]:FREQuency[:CW|FIXed] <Fixed>

Set the frequency of the RF output signal (actual frequency, excluding offset).

Parameters :

<Fixed> float
Value range: RFmin to RFmax
*RST: profile

Example :

SOURce 1: FREQuency 6000000000

[:SOURce<hw>]:POWer[:LEVel][:IMMediate][:AMPLitude]

Set the amplitude of the RF output connector (display amplitude, including offset).

Parameters :

<Power> float
Value range: Powermin to Powermax
*RST: profile

Example :

SOURce1:POWer 15

[:SOURce<hw>]:POWer:POWer <Power>

Set the amplitude of the RF output connector (actual amplitude, excluding offset).

Parameters :

<Power> float
Value range: Powermin to Powermax
*RST: profile

Example :

SOURce1:POWer:POWer 15

3.1 SOURce:BB:IMPairment Subsystem

[:SOURce]:BB:IMPairment:RF<ch>:IQRatio[: MAGNitude] <IqRatio>

Sets IQ gain imbalance.

Parameters :

<IqRatio> float
Value range : -100 to 100
* RST : 0
Default unit: dB

Example:

SOURce:BB:IMPairment:RF:IQRatio:MAGNitu de 10

[:SOURce]:BB:IMPairment:RF<ch>: QUADrature[:ANGLe] <Angle>
Sets the IQ phase imbalance.

Parameters :

<Angle> float

Value range : -180 to 180
* RST : 0
Default units: DEG

Example:

SOURce:BB:IMPairment:RF:QUADrature -5

[:SOURce]:BB:IMPairmen t:RF<ch>:SKEW <Skew>
Set the time offset between IQ.

Parameters :

<Skew> float

Value range: -100 to 100
Stepping: 1E-12
Default unit: s
* RST : 0

Example:

SOURce:BB:IMPairment: RF:SKEW -5

[:SOURce]:BB:IMPairment:RF<ch>:SNR <Snr>
Set the signal-to-noise ratio.

Parameters :

<Snr> float

Value range: -1000 to 1000
Default unit: dB
*RST: 1000

Example:

SOURce:BB:IMPairment:RF:SNR -5

3.2 SOURce:BB:DM Subsystem
[:SOURce<hw>]:BB:DM:STATe <State>

Enable/disable digital modulation.

Parameters :

<State> 1 | ON | 0 | OFF
* RST : 0

Example :

SOURce:BB:DM:STATe ON

[:SOURce<hw>]:BB:DM:FORMat <Format>

Select the modulation type.

Parameters :

< Format > BPSK|P2BP|QPS K|APSK16|OQPS|3P8P8|P2QP etc.

*RST: QPSK

Example :

:BB:DM:FORMat BPSK

PSK	**QAM**	**MSK**	**APSK**	**PAM**
BPSK	QAM4	MSK	APSK16	PAM4
P2BPsk	QAM8	GMSK	APSK32	PAM8
QPSK	QAM16	CPM	APSK64	PAM16
P4QPsk	QAM32		APSK128	
P2QPsk	QAM64	**FSK**	APSK 256	**ASK**
OQPSk	QAM128	FSK2	APSK16D23	ASK
SOQPsk	QAM256	FSK4	APSK16D34	ALSO
UQPSk	QAM512	FSK8	APSK16D45	
PSK8	QAM1024	FSK16	APSK16D56	
P2P8	QAM2048	FSK32	APSK16D89	
3P8P8	QAM4096		APSK16D90	
OPSK8	QAM8192		APSK32D34	
PSK16	QAM16384		APSK32D45	
P2DBpsk			APSK32D56	
DQPSk			APSK32D89	
P4DQpsk			APSK32D90	
D8PSK				
D16PSK				

[:SOURce<hw>]:BB:DM:CODi ng <CODing>

Select an encoding.

Parameters :

< Format > NATUre|GRAY

*RST: NATUre

Example :

:BB:DM:CODing GRAY

[:SOURce<hw>]:BB:DM:CODi ng <CODing>

Select an encoding.

Parameters :

< Format >

NATUre | GRAY

*RST: NATUre

Example:

:BB:DM:CODing GRAY

[:SOURce<hw>]:BB:DM:FILTer:FORMAT <Type>

Select the baseband filter type.

Parameters :

<Type> RCOSine | COSine | GAUSs | RECT | NONE | HALF | SOQT | SOQA | SOQB

*RST: RCOSine

Example:

:BB:DM:FILTer:FORMAT RCOSine

[:SOURce<hw>]:BB:DM:PRBS <Type>

Sets the length of the pseudo-random sequence.

Parameters :

<Type> ALLZero | ALLOne | PATTern | 7 | 9 | 11 | 12 | 15 | 16 | 20 | 21 | SOQB

*RST: profile

Example:

:BB:DM:FILTer:PRBS 7

[:SOURce<hw>]:BB:DM:FILTer:PARameter:COSine[:ROLLoff] <Cosine>
[:SOURce<hw>]:BB:DM:FILTer:PARameter:GAUSs <Gauss>
[:SOURce<hw>]:BB:DM:FILTer:PARameter:RCOSine <RCosine>

设置滤波器参数**.**

Example:

SOURce:BB:DM:FILTer:PARameter:RCOSine 0.5

[:SOURce<hw>]:BB:DM:SRATe <SRate>

Set digital modulation symbol rate. Units sym/s/ksym/s/Msym /s.

Parameters :

<SRate> float

Value range: 50 to options

Stepping: 1E-3

Default unit: sym/s

Example :

SOURce:BB:DM:SRATe 50 ksym/s

[:SOURce<hw>]:BB:DM:ASK:DEPTh <Depth>

Sets the modulation depth for ASK type modulation.

Parameters :

<Depth> float

Value range: 0.1 to 1
Step: 0.01
* RST : 0.1

Example :

BB:DM:ASK:DEPT 0.5

[:SOURce<hw>]:BB:DM:FSK:DEViation <Deviation>

Set the frequency deviation for FSK type modulation.

Parameters :

<Depth> float

Value range: 1 to 80e6
*RST: 1e3

Example :

SOURce:BB:DM:FSK:DEViation 1MHZ

3.3 SOURce:BB:ARBitrary Subsystem

[:SOURce<hw>]:BB:ARBitrary:STATe <State>

Play/stop user file single segment mode. (Can only play when wave file is selected)

Parameters :

<State> 1 | ON | 0 | OFF
* RST : 0

Example :

SOURce : BB : ARBitrary : STATe ON

[:SOURce<hw>]:BB:ARBitrary:CLOCk <Clock>

User file mode sets the sampling rate.

Parameters :

<Clock> float

Value range: options
Step: 0.001
Default units: Hz
*RST: profile

Example :

SOURce : BB : ARBitrary : CLOCk ?

[:SOURce<hw>]:BB:ARBitrar y:WAVeform:SELect <Filename>
Select an existing waveform file.
Parameters :
<Filename> string file name
Example :
SOURce:BB:ARBitrary:WAVeform:SELect D:\Assist\data\500_2 _MT.dat

---

Sequence Mode:
[:SOURce<hw>]:BB:ARBitrary:WSEGment:CONFigure:SEL ect <Filename>
Select an existing sequence pattern waveform file.
Parameters :
<Filename> string file name
Example :
SOURce : BB : ARBitrary : WSEGment :
CONFigure : SELect D:\Assist\data\freq.seg

---

trigger:
[:SOURce<hw>]:BB:ARBitrary:TRIGger[:E XTernal]:INTerval <INTerval>
Automatic continuous triggering The time interval between the end of playing a file and the next repeated playing of the file
Parameters :
< INTerval > float
Value range: 1E-9 - 10
Stepping: 1E-12
Default unit: s
*RST: 10E-6
Example :
:BB:ARBitrary:TRIGger: INTerval 1E-3

[:SOURce<hw>]:BB:ARBitrary:TRIGger[:EXT ernal]:TDELay <ExtTimeDelay>
Trigger delay
Parameters :
< ExtTimeDelay > fl oat
Value range: 600E-9 - 10
Stepping: 1E-12
Default unit: s
* RST : 600E-9
Example :

: BB : ARBitrary : TRIGger : TDELay 2E-3

[:SOURce<hw>]:BB:ARBitrary[:TRIGger] :SEQuence <Sequence>

Select the trigger mode

Parameters :

< Sequence > AUTO | SINGle

* RST : AUTO

Example :

:BB:ARBitrary:SEQuence SINGle

[:SOURce<hw>]:BB:ARBitrary :TRIGger:EXECute

Manual execution trigger

3.4 SOURce:BB:RADar Subsystem

The SOURce:BB:RADar subsystem is used to configure the generation of radar signals.

[:SOURce<hw>]:BB: RADar :STATe <State>

Play/Stop Radar

Parameters :

<State> 1 | ON | 0 | OFF

* RST : 0

Example :

SOURce:BB:RADar:STATe ON

[:SOURce<hw>]:BB:RADar:S HAPe <SHAPe>

Radar mode settings transmit waveform.

Parameters :

<SHAPe> Linear FM| Rectangular| Phase Coded| FM CW

* RST : Linear FM

Example :

BB:RADar:SHAPe Recta ngular

[:SOURce<hw>]:BB:RADar:PRI <Pri>

Radar mode sets the pulse repetition interval.

Parameters :

< Pri > float

Value range: 20ns ~ 50ms

Stepping: 1ns
Default unit: s
*RST: 100us

Example :

BB:RADar:PRI 20E-9
BB:RADar:PRI 20ns

[:SOURce<hw>]:BB:RADar:PWID th <Width>

Radar mode sets pulse width.

Parameters :

<Width> float
Value range: 20ns ~ 50ms
Stepping: 1ns
Default unit: s
* RST : 50 us

Example :

BB:RADar:PWIDth 20e-9
BB:RADar:PWIDth 20ns

[:SOURce<hw>]:BB:RADar:SWID th <SWIDth>

Radar LFM and FMCW modes set scan bandwidth .

Parameters :

<SWIDth> float
Value range: ≥ 100kHz The upper limit depends on the hardware configuration and "S weep Interval" parameter, For example, in the 1G bandwidth vector source, set "Sweep Interval" parameter is Symmetric ,That Then the maximum scanning bandwidth is 1G;
If the 1G bandwidth vector source is set to "Sweep The "Interval" parameter is Positive ,That Then the maximum scanning bandwidth is 500M.
Stepping: 1
Default units: Hz
* RST : 200e3

Example :

BB:RADar:SWIDth 400MHz

[:SOURce<hw>]:BB:RADar:SDURation <Duration>

Radar FMCW mode sets the scan time.

Parameters :

<Duration> float
Value range: ≥ 1ns
*RST: 10us
Stepping: 1ns
Default unit: s

Example :

BB:RADar:SDURation 100ns

[:SOURce<hw>]:BB:RA Dar:SINTerval <Interval>

Radar LFM and FMCW mode settings scan range .

Parameters :

<Interval> Positive|Symmetric

*RST: Positive

Example :

BB:RADar:SINTerval Symmetric

[:SOURce<hw>]:BB:RADar:CODE <Co de>

Radar Phase Coded mode sets the encoding type.

Parameters :

<Code> Barker|Frank|P1|P2|PX|P3|P4|Taylor_QuadriPhase

* RST : Barker

Example :

BB:RADar:Code P1

[:SOURce<hw>]:BB:RADar:CWIDth <Width>

Radar Phase Coded mode sets chip width.

Parameters :

<Width> float

Value range: ≥ 1ns

Default unit: s

*RST: 10us

Example :

BB:RADar:CWIDth 5us Set the chip width to 5us

[:SOURce<hw>]:BB:RADar:BARKer <Number>

Radar Phase Coded Mode Setting BARKer Coding Type Number of Chips.

Parameters :

<Number> 2|3|4|5|7|11|13

* RST : 2

Example :

BB : RADar : BARKer 5

[:SOURce<hw>]:BB:RADar:QUARd <Number>

Radar Phase Coded mode setting TAYLOR four-phase coding type chip number.

Parameters :

<Number> 13|25|27 |28A|28B

*RST: 13

Example :

BB:RADar:QUARd 25

[:SOURce<hw>]:BB:RADar:CNUMber <Number>

Radar Phase Coded mode sets the number of chips for other coding types.

Parameters :

<Number> integer

Value range: 0-10000

* RST : 4

Example :

BB:RADar:CNUMer 100

3.5 SOURce:BB:OFDM Subsystem

SOURce:BB:OFDM subsystem is used to configure the generation of OFDM signals

[:SOURce<hw>]:BB:OFDM:NSUBcarriers <NoOfSubCarr>

Set the number of available subcarriers for OFDM

Parameters :

<NoOfSubCarr> integer

Value range: 64 to 16384

* RST : 64

Example :

SOURce1:BB:OFDM:NSUBcarriers 256

[:SOURce<hw>]:BB:OFDM:NOCCupied <NumOccSc>

Set the number of occupied subcarriers

Parameters :

<NumOccSc> integer

Value range: 1 to 13107

* RST : 53

Example:

SOURce1:BB:OFDM:NOCCupied 202

[:SOURce<hw>]:BB:OFDM:SCSPace <SubCarSp>

Set the subcarrier frequency spacing

Parameters :

<SubCarSp> float

Value range: 1e3 to 2e6

Stepping: 1

*RST: 0.3125

Default units: Hz

Example:

SOURce1:BB:OFDM:SCSPace 15kHz

[:SOURce<hw>]:BB:OFDM: SEQLength <SeqLen>

Set the number of OFDM symbol sequences

Parameters :

<SeqLen> integer

Value range: 1 to 1000

*RST: 10

Example:

SOURce1:BB:OFDM:SEQ Length 20

[:SOURce<hw>]:BB:OFDM:CPLength <CpLength>

Set the prefix length , the maximum prefix length is the number of subcarriers

Parameters :

<CpLength> integer

Value range: 0 to depends on settings

*RST: 16

Example:

SOURce1:BB:OFDM:CPLength 18

[:SOURce<hw>]:BB:OFDM:ALLoc<ch0>:MODulation <BaseModType>

Set the modulation mode

Parameters:

<BaseModType> BPSK | QPSK | QAM16 | QAM64 | QAM256

*RST: QPSK

Example:

SOURce1:BB:OFDM:ALLoc1:MODulation QAM256

[:SOURce<hw>]:BB:OFDM:DCMode <DCMode>

Sets the DC Subcarrier mode.

Parameters :

<DCMode> UTIL | PUNC

UTIL: All symbol assignments use the DC subcarrier to transmit data

PUNC： DC subcarrier uses 0 Placeholder

*RST: UTIL

Example:

SOURce1: BB:OFDM:DCM ode PUNC

3.6 SOURce:BB:MCCW Subsystem

SOURce:BB:MCCW subsystem is used to configure the generation of multi-tone signals

---

[:SOURce<hw>]:BB: MCCW:STATe <State>

Play/Stop polyphonic

Parameters:

<State> 1 | ON | 0 | OFF

*RST: 0

Example:

SOURce:BB:MCCW:STATe ON

[:SOURce<hw>]:BB:MCCW:CARRier:COUNt <Count>

Set the number of available subcarriers for MCCW

Parameters :

<Count> integer

Value range: 1 to 8192

*RST: 10

Example :

SOURce1:BB:MCCW:CARRier:COUNt 64

[:SOURce<hw>]:BB:MCCW:CARRier: SPACing <Spacing>

Set the subcarrier frequency spacing

Parameters :

<Spacing> float

Value range: 100e3 to 100e6

Step: 0.01

*RST: 10e6

Default units: Hz

Example:

SOURce1:BB:MCCW:CARRier:SPACing 20e6

[:SOURce<hw>]:BB:MCCW:CLOCk <Clock>

Setting the Sample Rate

Parameters :

<Clock> float

Value range: 100e6 to 1.4e9

Step: 0.01

*RST: 1e9

Default units: Hz

Example:

SOURce1:BB:MCCW:CLOC k 150e6

[:SOURce<hw>]:BB:MCCW:RANDomphase <Randomphase>

Set whether to enable random phase

Parameters :

<Randomphase> 1 | O N | 0 | OFF

* RST : 0

Example:

SOURce1:BB:MCCW:RANDomphase ON

Enable random phase

3.7 SOURce Analog Modulation Subsystem

The analog modulation subsystem is used to configure the generation of analog signals

---

[:SOURce<hw>]:LFOutput<ch>:FREQuency <Frequency>

Setting the frequency

Parameters :

< Frequency > float

Value range: 1e3 to installed options

Stepping: 1

*RST:

0.3125

Default

units: Hz

Example:

SOURce1:LFOutput:FREQuency 15kHz

[:SOURce<hw>]:LFOutput<ch>:SHAPe <Shape>

Setting the Waveform

Parameters :

<Shape > SINE | SQUare | TRIangle | Sawtooth | INV.Sawtooth

*RST: SINE

Example:

SOURce1:LFOutput: SHAPe 1

Set to rectangular wave

[:SOURce<hw>]:AM<ch>[:DEPTh] <Depth>

Setting AM modulation depth

Parameters :

<Depth > float

Value range: 0-100

Example:

SOURce1:AM:DEPTh 50

Set AM modulation depth to 50%

[:SOURce<hw>]:FM<ch>[:DEViation] <Deviation>

Set FM modulation depth

Parameters :

<Depth > float

Value range: 0- max
Default units: Hz

Example:

SOURce1:FM: DEVIATION 500KHz

Set FM modulation depth to 500KHz

[:SOURce]:PM<ch>[:DEViation] <Deviation>

Setting PM modulation depth

Parameters :

<Depth > float
Value range: -10- 10
Default unit: deg

Example:

SOURce1:PM: DEViation 10

Set PM modulation depth to 10 degrees

3.8 SOURce:BB:HOPPing Subsystem

SOURce:BB:Hopping subsystem is used to configure the generation of frequency hopping signals

[:SOURce<hw>]:BB:Hopping:STATe <State>

Play/Stop frequency hopping

Parameters :

<State> 1 | ON | 0 | OFF
* RST : 0

Example :

SOURce:BB:Hopping:ST ATe ON

[:SOURce<hw>]:BB:Ho pping:CARRier:COUNt <Count>

Set the number of available subcarriers

Parameters :

<Count> integer
Value range: 1 to 8192
*RST: 10

Example :

SOURce1:BB:Hopping:CA RRier:COUNt 64

[:SOURce<hw>]:BB:Hopping:CARR ier:SPACing <Spacing>

Set the subcarrier frequency spacing

Parameters :

<Spacing> float

Value range: 0 to 1e9

Step: 0.01

*RST: profile

Default units: Hz

Example:

SOURce1:BB:Hopping:CARRier:SPACing 20e6

[:SOURce<hw>]:BB:Hopping:CLOCk <Clock>

Setting the Sample Rate

Parameters :

<Clock> float

Value range: 700 to 1.4e9

Step: 0.01

*RST: profile

Default units: Hz

Example:

SOURce1:BB:Hopping:CLOCk 150e6

[:SOURce<hw>]:BB:Hopping:MODE <MOD E>

Set the pattern to a pseudo-random sequence or user-specified

Parameters :

< MODE > RA NDom | TABLe

*RST: RANDom

Example:

SOURce1:BB:Hopping:MODE TABLe

Enable user-specified mode

[:SOURce<hw>]:BB:Hopping:PRBS <LENGth>

Set the length of the pseudo-random sequence

Parameters :

< LENGth > 7 | 9 | 11 | 12 | 15 | 16 | 20 | 21

*RST: 12

Example:

SOURce1:BB:Hopping:PRBS 7

Set the length of the pseudo-random sequence PRBS7

3.9 SOURce:NOISe Subsystem

SOURce:NOISe subsystem is used to generate random Gaussian white noise

[:SOURce<hw>]:NOISe:BWIDth <bandwidth>

Set the bandwidth of Gaussian white noise

Parameters :

< bandwidth > Bandwidth

Default Units : Hz

*RST: 10MHz

Example:

:SOURce:NOISe:BWIDth 1e9

Set the Gaussian white noise bandwidth to 1 GHz

[:SOURce<hw>]:NOISe:D URation <duration>

Set the duration of Gaussian white noise

Parameters :

< duration > Duration

* RST : 5 ms

Example:

:SOURce:NOISe: DURAT 5e-3

Set the Gaussian white noise duration to 5ms

---

4. MMEMory Subsystem

MMEMory subsystem (Mass Memory) is used to load data into the internal files of the instrument.

:MMEMory:DATA <Filename>, <BinaryBlock>

Write the block data <BinaryBlock> to the file named by <Filename>

Parameters :

<Filename> string file name

If Filename is not an absolute path, the path is in D:\ waveform

<BinaryBlock>

#<number><length_entry><data>

<number>: Indicates the decimal length of

<length_entry> (1 decimal digit The value range is 1-9)

<length_entry>: Data body length , in bytes

<data>: Data body

Example :

:MMEMory:DATA "D:\waveform\1.bin", # 215hellohellohello

2 means <length_entry> is 2 decimal digits; 15 means the data body <data> It consists of 15 bytes.

5. Pulse modulation subsystem

SOURce:PULM subsystem is used to generate pulse modulation

[:SOURce<hw>]:PULM:STATe <State>

Set the pulse output switch

< State > Pulse status

0 | off: turn off the output

1 | on: turn

on output **Example:**

: PULM:STATe 1

Set the pulse to output state

[:SOURce<hw>]:PULM:Gen <Gen>

Set the pulse output switch

< Gen > Pulse modulation status

0 | off: turn off the output

1 | on: turn

on output **Example:**

:

PULM:Gen

1 Turn on

pulse

modulation

[:SOURce<hw>]:PULM:PERiod <Period>

Set the pulse period

Parameters :

< Period > Pulse period

Value range: 10E-6 - 50

Stepping: 1E-12

Default unit: s

* RST : 20E-9

Example:

SOURce:PULM:PERiod

10e-6 Set the pulse

period to 10us

[:SOURce<hw>]:PULM:WIDth <Period>

Setting the Pulse Width

Parameters :

< Period > Pulse Width

Value range: 10E-6 - 50

Stepping: 1E-12

Default unit: s

* RST : 20E-9

Example:

SOURce:PULM:WIDth 8e-6

Set the pulse width to 8us

[:SOURce<hw>]:PULM: SOURce <Source>

Set internal and external trigger

Parameters :

< Source > Internal and external triggers

Internel: Internal trigger

Externel: External trigger

Example:

SOURce:PULM:SOURce Internel

Set internal trigger

[:SOURce<hw>]:PULM:TRIGger:SOURce <Source>

Setting Trigger

Internal and
external triggers

Parameters :

< Source > tigger Internal and external triggers

Internel Trigger: tigger Internal trigger

External Trigger: tigger external trigger

Example:

SOURce:PULM:TRIGger:SOURce Internel

Trigger Setting up tigger Internal trigger

[:SOURce<hw>]:PULM:TRIGger:SYNCh <Synch>

Set the trigger synchronization mode

Parameters :

< Synch > Set trigger to synchronous or asynchronous

Synchronous: Trigger synchronization

Non-synchronous: Trigger asynchronously

Example:

SOURce:PULM:TRIGger:SYNCh Synchronous Set
trigger to trigger synchronization

[:SOURce<hw>]:PULM:TRIGger:SYNCh:DELay < Delay >

Set the trigger edge

Parameters :

< Delay > Synchronous trigger delay

Value range: 10E-6 - 50
Stepping: 1E-12
Default unit: s
* RST : 20E-9

Example:

SOURce : PULM : TRIGger : SYNCh :DELay 8e-6

set 8us Synchronization delay

[:SOURce<hw>]:PULM:TRIGger:EDG E < Edge>

Set the trigger edge **Parameters** :
<Edge> Postive : rising edge trigger
Negative: Falling edge trigger

Example:

SOURce:PULM:TRIGger:EDGE Postive
Set to rising edge trigger

[:SOURce<hw>]:PULM:TRIGger: MODE <Mode>

Set the trigger mode
Parameter s :
<Mode> Single: Single trigger
Pulse-train: Pulse train trigger

Example:

SOURce:PULM:TRIGger:Mode
Single Set to single trigger

[:SOURce<hw>]:PULM:TRAIn:NUMBer < NUMBer >

Set the trigger mode
Parameter s :
< NUMBer > integer
Value range: 1 to 65535
*RST: 10

Example:

SOURce:PULM:TRAIn:NUMBe
r 100 Set pulse train to 100

[:SOURce<hw>]:PULM:TRAIn:PERiod < PERiod >

Set the trigger mode
Parameter s :
< PERiod > integer
Value range: 1 to 65535
*RST: 10

Example:

SOURce:PULM:TRAIn:PERiod

---

	200 Set the pulse train period to 200	