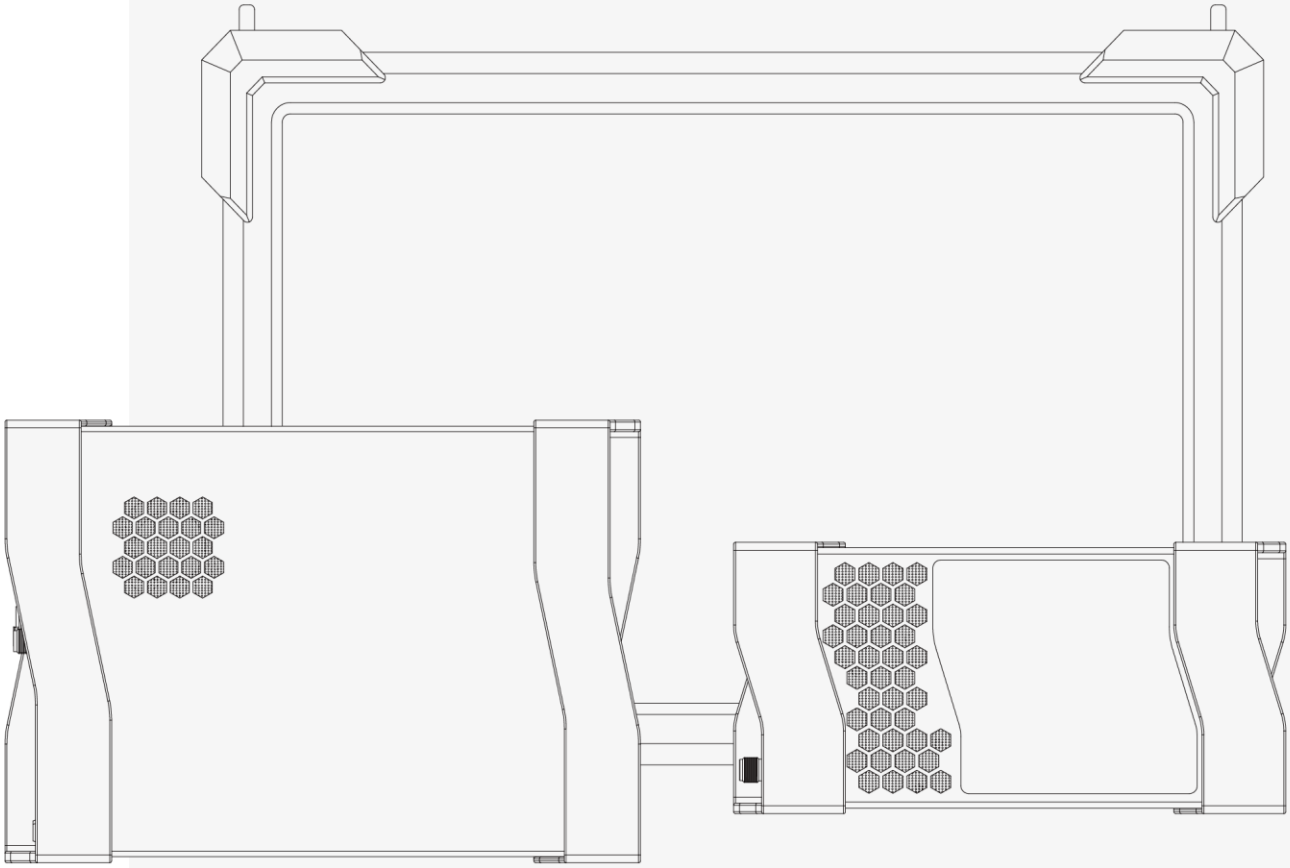
APPLICATION GUIDE

FAQ and Troubleshooting Guide



PX Series

SA Series

NX Series

V2.1

2025/11/18

HAROGIC

CONTENT

Version Management

Updated Description Sheet

Version	Description	Date
V2.1	1. Added: Add Version Management chapter 2. Modified: Content update	11/18/2025
V2.0	1. Initial Version	10/10/2025

1. Troubleshooting Guide

If you find that the device's performance does not meet expectations, the following sections may provide useful tips and information. If the issue persists after following the troubleshooting steps below, please contact technical support.

1.1 Driver Installation Errors

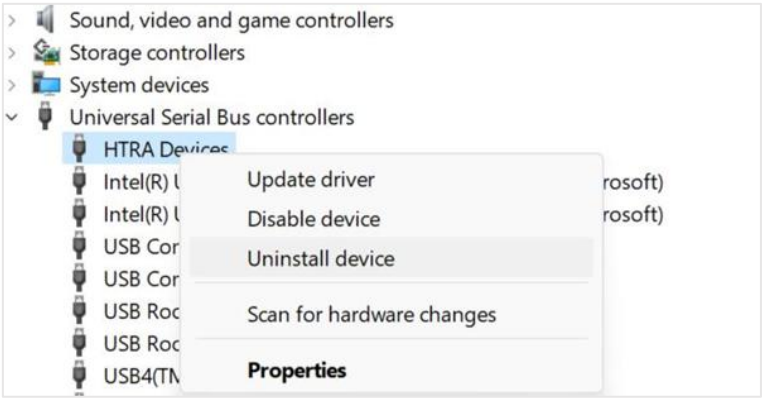
1.1.1 The Device Driver in the Universal Serial Bus Shows a "!" Mark

Description:

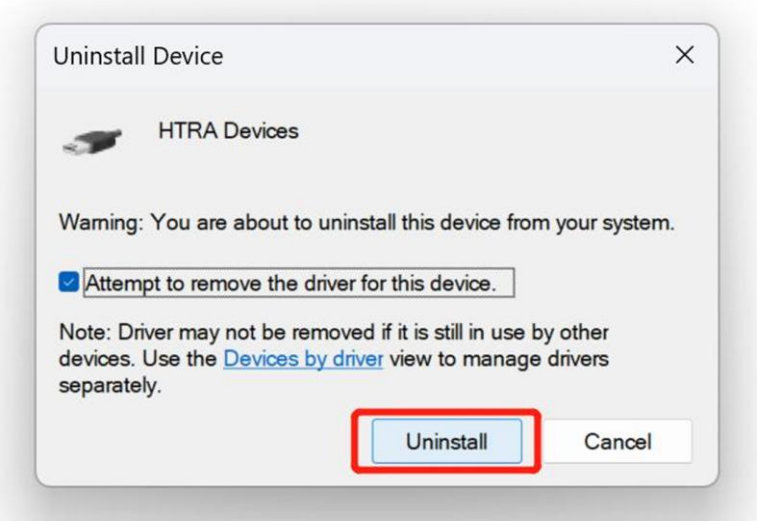
After installing the driver following the driver installation process, it was found that the device driver in the Universal Serial Bus with **!** flag and the device cannot be used.

Troubleshooting Steps:

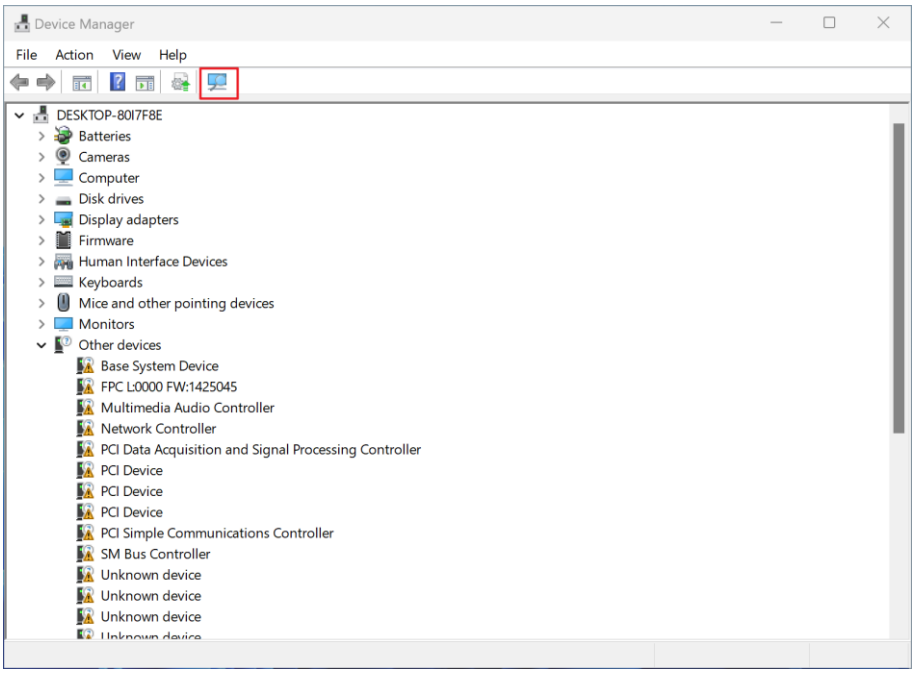
1. Uninstall the "HTRA Devices" driver by right-clicking on it.



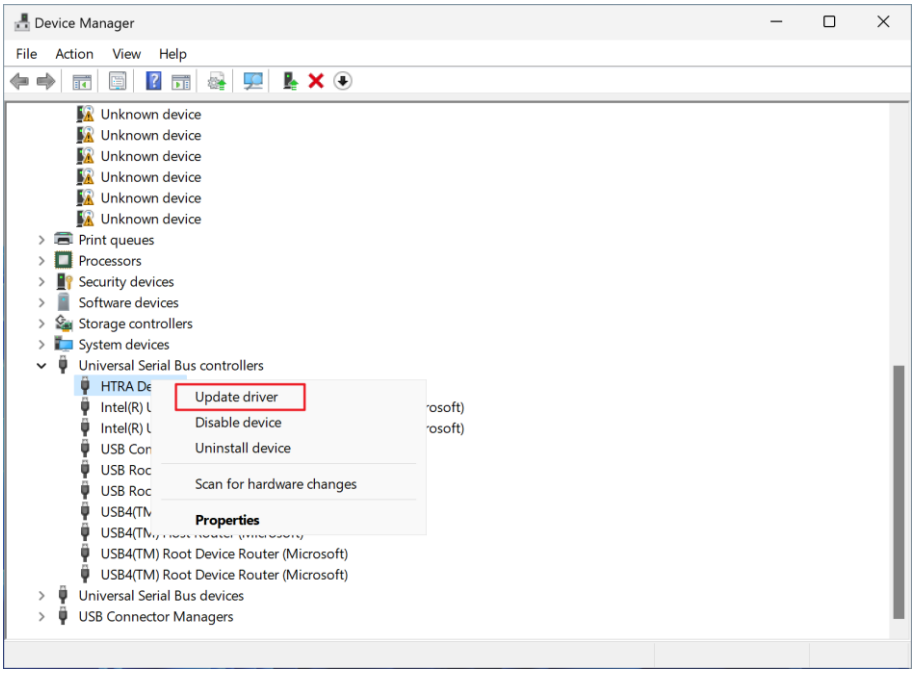
2. When the pop-up window appears, tick the box to attempt to remove the driver for this device, and then click "Uninstall".



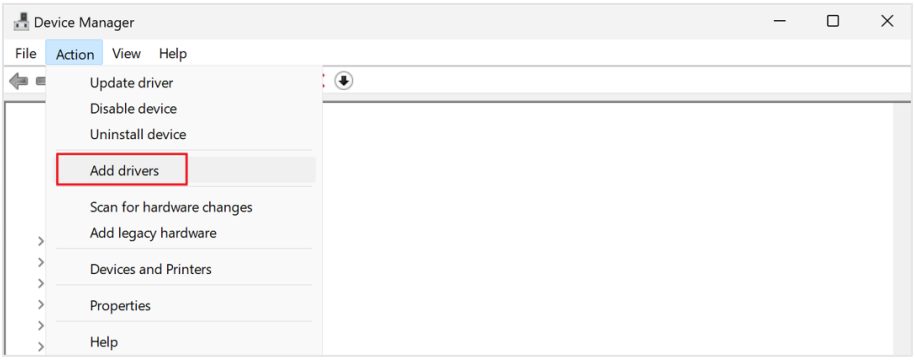
3. After uninstalling the driver, re-plug the data port of the device and click Scan to detect hardware changes.



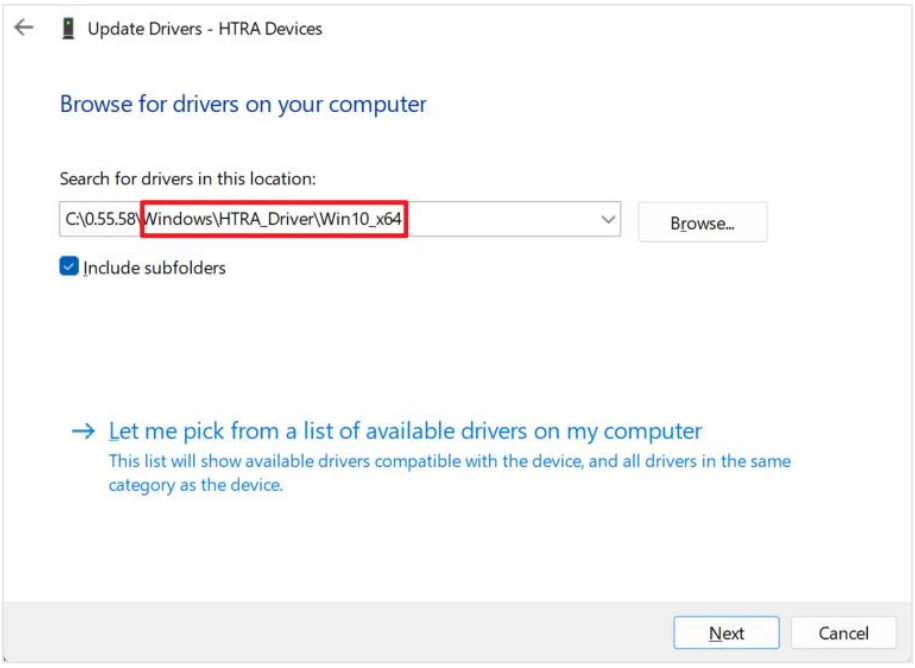
4. Click "Other Devices", right-click "HTRA Devices" and click "Update Driver".



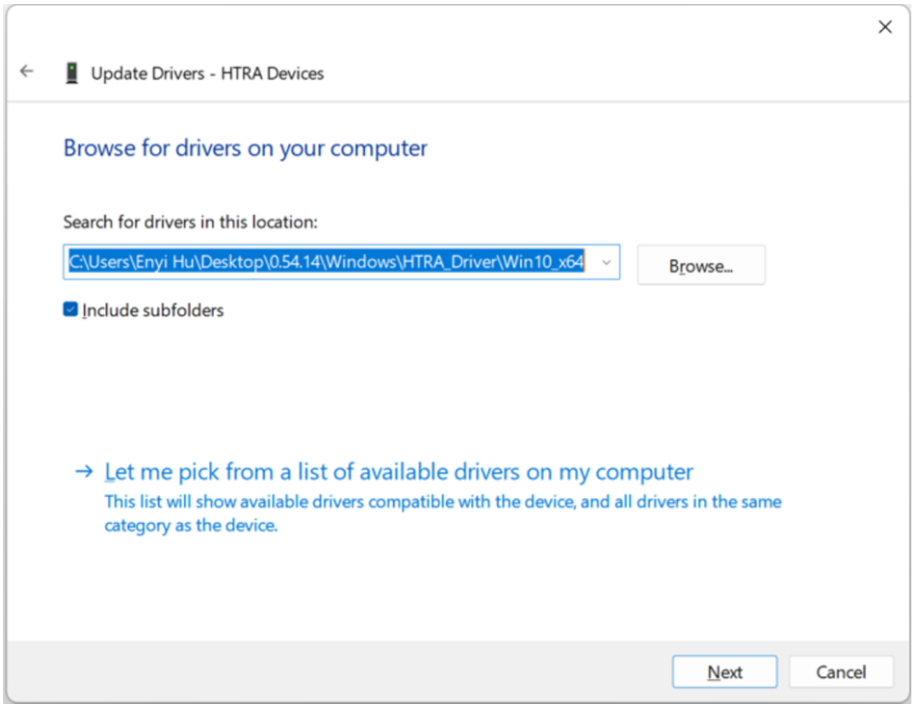
5. If there is no "Other Devices" option, click the upper left corner of the Action, click "Add Driver".



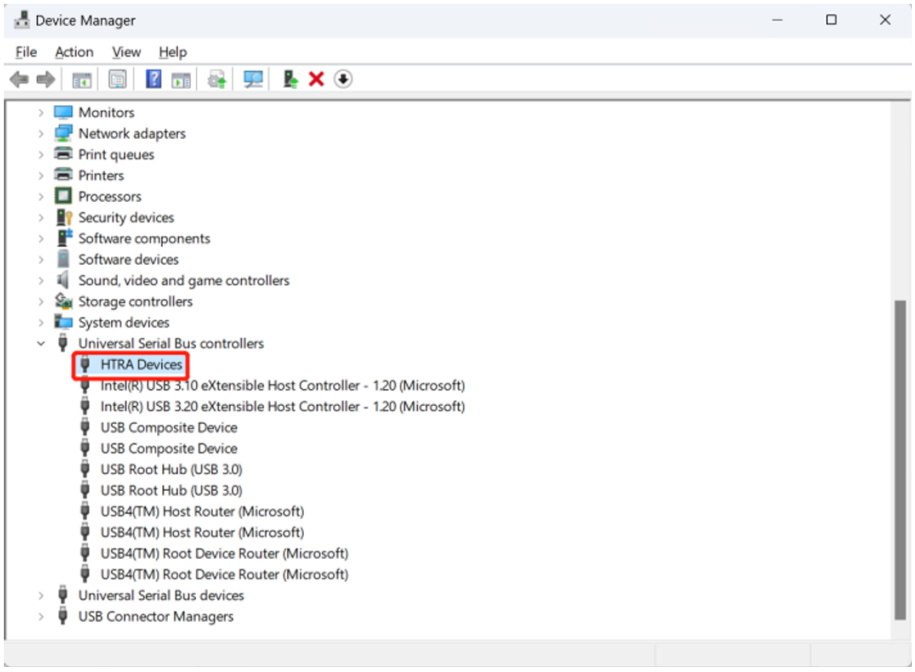
6. Select "Browse" to find the driver in "My Computer".
7. Select the "\Windows\HTRA_Driver\Win10_x64" folder of the shipped USB memory stick and click "Next".



8. Wait a few seconds for the installation to complete and then close it.



9. Open "Universal Serial Bus" in Device Manager and reconnect the device to see the device driver.



Note:

On Windows 7 64-bit systems, if the driver still does not work properly after following the procedure to install the driver manually, please contact technical support to obtain the patch files KB4474419 and KB4490628. after obtaining the corresponding patches, install the KB4474419 file first, then install the KB4490628 file, and then reboot your computer and follow the procedure to install the driver manually again. After obtaining the appropriate patches, install the kb4474419 file and then the kb4490628 file.

1.1.2 Unable to Recognize Device Driver

Description:

After upgrading the host system from Windows 10 to Windows 11, the device driver cannot be recognized.

Troubleshooting Steps:

Uninstall the previously installed driver and reinstall it. For uninstallation, please refer to Steps 1 and 2 in Section 1.1.1. For driver installation, please refer to the Driver Installation section in the *Spectrum Analyzer User Guide*.

1.2 API Malfunction or Errors

1.2.1 Device_Open Returns -1

Description:

The device cannot be opened properly, and the Device_Open function returns an error code of -1 (device opening failed).

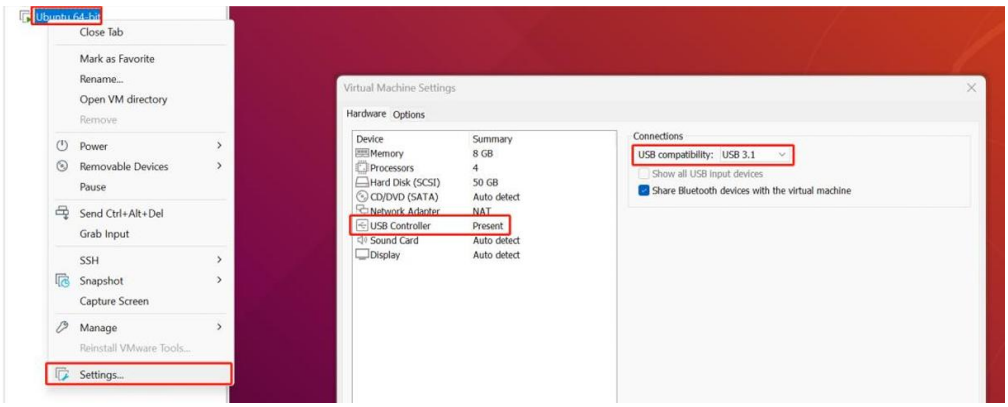
Troubleshooting Steps:

First, please verify that the device firmware version is compatible with the API version. For detailed instructions, refer to the relevant section in the *API Programming Guide*.

1. For SA Devices:

(1) Follow the steps in Chapter 3 of the *Spectrum Analyzer Quick Start Guide* to correctly connect the device and install the driver.

(2) If using the device in a virtual machine, set the VM's USB compatibility to USB 3.1.



(3) Check the parameter configuration in the code. As shown in the figure, when using an SA device, the PhysicalInterface parameter should be set to USB.

```
//For SA series model.
BootProfile.PhysicalInterface = USB;                    //Usb interface for data transfer.
```

(4) If the issue persists, try using a different USB port or data cable on the host computer. If possible, test the device on another computer to check if it functions properly.

2. For NX Devices:

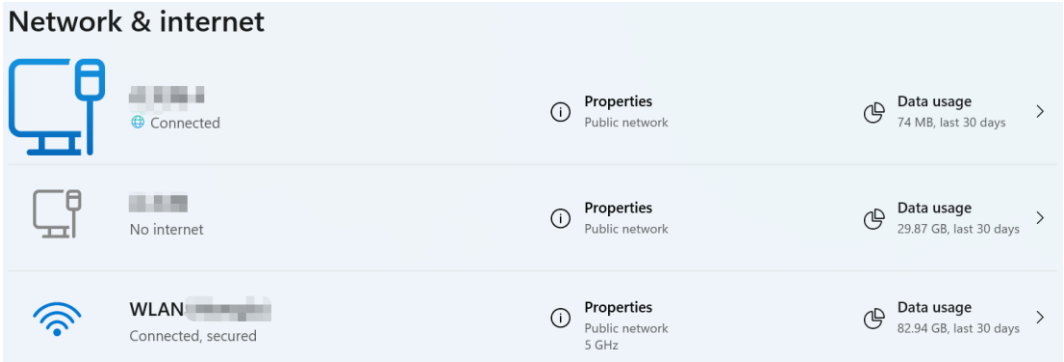
(1) NX devices require approximately 50 seconds after powering on before they can be used with the software or API.

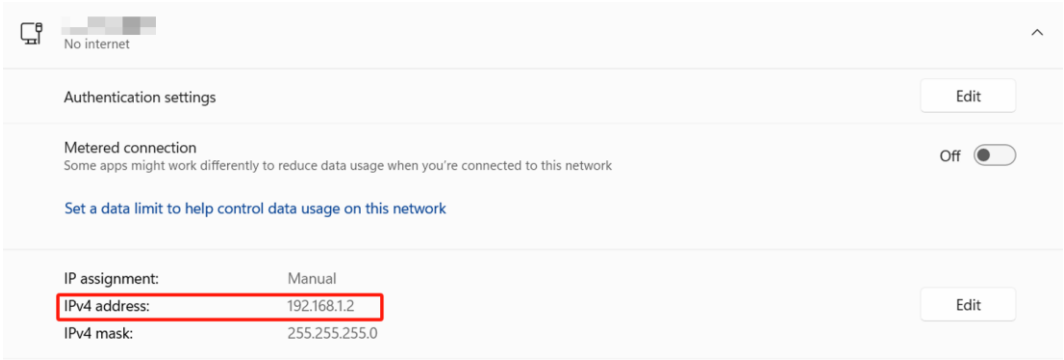
(2) Check the device's power supply. It is recommended to use the original power adapter provided with the device. If unavailable, use a power adapter capable of supplying 12V 2A peak power (allow 9V to 12V voltage range).

(3) Ensure that no other programs or SAStudio4 are currently using the device. If any program is accessing the device, close it and check if normal operation is restored.

(4) Follow the steps in Chapter 4 of the *Spectrum Analyzer Quick Start Guide* to correctly connect the device and configure the network settings.

(5) If multiple network adapters are present on the host computer, check the IP addresses of each network adapter to ensure there are no conflicts between the receiver's network adapter and other adapters.

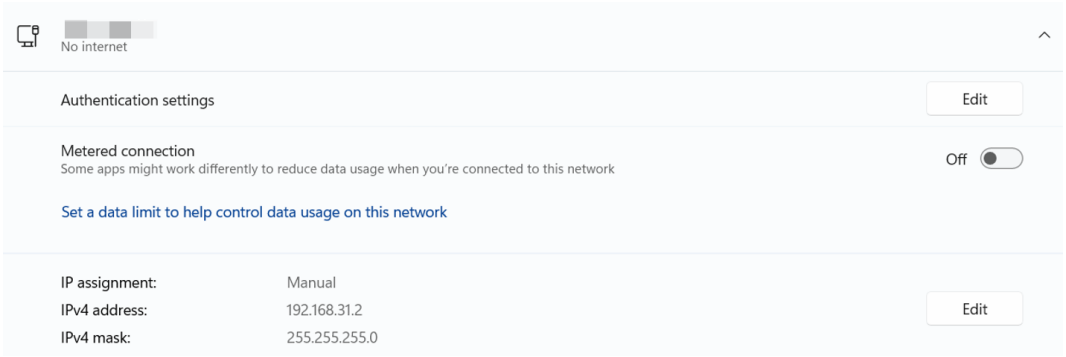




If another network adapter has an IP address in the same subnet as the receiver (e.g., both are 192.168.1.x), you must change the receiver's IP address and reconfigure the network settings as described in Step 2. For example, as shown in the figure, modify

the receiver's IP address to 192.168.31.100, and reconfigure the host computer's network adapter to 192.168.31.2. The receiver's data communication address will then be 192.168.31.100. For detailed steps on modifying the IP address, please refer to Device_GetAndSetIP.cpp in the included USB drive.

```
#if 1 //Set the IP address through the device UID
    uint64_t DeviceUID = NetworkDeviceInfo[0].DeviceUID;//When using, pay attention to the correspondence of the corresponding device number
    uint8_t IPAddress[4] = { 192,168,31,100 };
    uint8_t SubnetMask[4] = { 255,255,255,0 };
    Status = Device_SetNetworkDeviceIP(DeviceUID, IPAddress, SubnetMask); //Set a new IP address and subnet mask
#else //Set the IP address based on the device IP
    uint8_t DeviceIP[4] = { 192,168,1,100 };//Enter the current IP address of the device
    uint8_t IPAddress[4] = { 192,168,31,100 };
    uint8_t SubnetMask[4] = { 255,255,255,0 };
    Status = Device_SetNetworkDeviceIP_PM1(DeviceIP, IPAddress, SubnetMask); //Set a new IP address and subnet mask
#endif
```




```
C:\Users\60536>ping 192.168.31.100

Pinging 192.168.31.100 with 32 bytes of data:
Reply from 192.168.31.100: bytes=32 time<1ms TTL=64
Reply from 192.168.31.100: bytes=32 time<1ms TTL=64
Reply from 192.168.31.100: bytes=32 time<1ms TTL=64
Reply from 192.168.31.100: bytes=32 time<1ms TTL=64
```

(6) Check the parameter configuration in the code. When using an NX device, the PhysicalInterface parameter should be set to ETH, and the ETH-related parameters must be correctly configured (if the device's IP address was modified, ensure that the IPAddress parameter is updated accordingly).

```
//NX series model.
BootProfile.PhysicalInterface = ETH; //ETH interface for data transfer.
BootProfile.ETH_IPVersion = IPv4;    //IPv4 protocol.
BootProfile.ETH_RemotePort = 5000;   //Port number is fixed as 5000.
BootProfile.ETH_ReadTimeOut = 10000; //ETH configuration read time out,ms.
BootProfile.ETH_IPAddress[0] = 192;  //Configure IP address for NS series, default address is 192.168.1.100.
BootProfile.ETH_IPAddress[1] = 168;
BootProfile.ETH_IPAddress[2] = 1;
BootProfile.ETH_IPAddress[3] = 100;
```

(7) If the issue persists, please try replacing the network cable and test again. If possible, you may also try using a different host PC to check whether the device

operates normally. In addition, if you are using a docking station's Ethernet port for data transmission, please verify that the docking station is functioning properly. Note that when using NX series devices, if you switch to another docking station, the local IP address needs to be reconfigured.

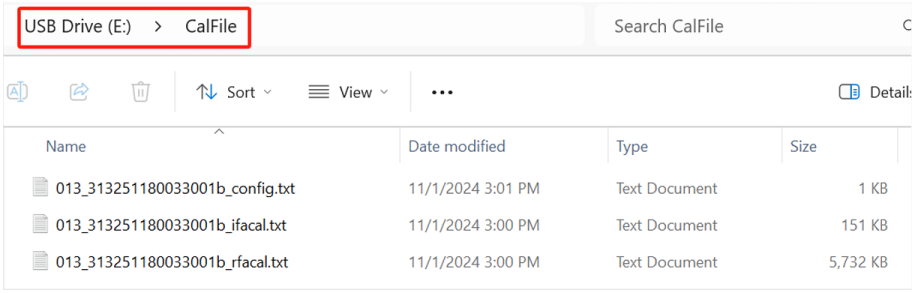
1.2.2 Device_Open Returns -3, -4, or -43

Description:

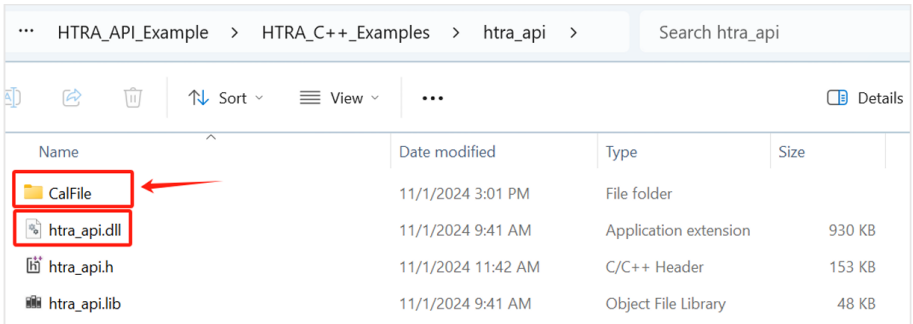
The device cannot be opened properly, and the Device_Open function returns error codes -3, -4, or -43 (calibration file missing).

Troubleshooting Steps:

1. Copy all the files from the CalFile folder located in the root directory of the provided USB drive (if the USB drive is unavailable, please contact technical support to obtain it).

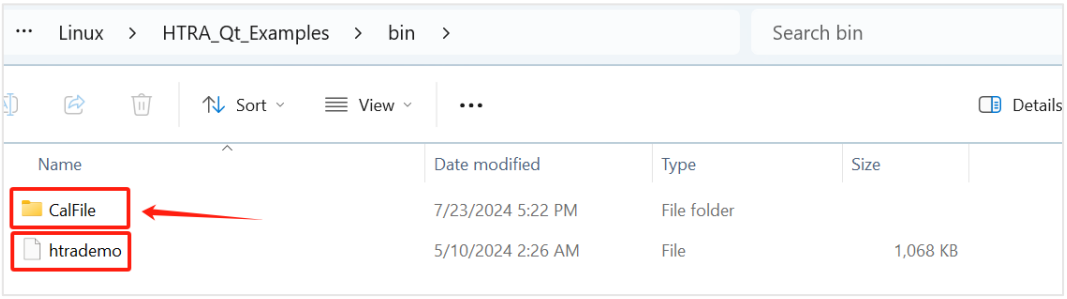


2. When using Windows, copy the files to the CalFile folder at the same level as htra_api.dll. For example, in the provided C++ example, copy the files as shown in the figure. The process is similar for other programming languages.



3. When using Linux, copy the files to the CalFile folder located in the same directory as the executable. Taking the provided Qt examples as a reference,

copy the files as shown in the figure. The same procedure applies to other programming languages except for Python. For Python examples, the CalFile folder needs to be copied to the Python interpreter directory at runtime. For detailed steps, please refer to the Python Example Usage section in the *API Examples Usage Guide*.



1.2.3 Device_Open Returns -8

Description:

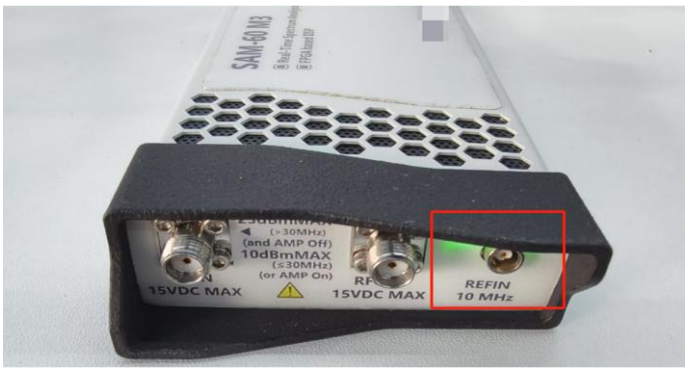
The device cannot be opened properly, and the Device_Open function returns error code -8 (device power issue).

Troubleshooting Steps:

1. For SA Devices:

(1) Follow Sections 3.1.1 and 3.2.1 in the *Spectrum Analyzer Quick Start Guide* to select the appropriate power adapter and reconnect the device. Note: When powering the device try to avoid using the computer USB port to power the device.

(2) Check whether the device's indicator light is steadily on: For SAE and SAN-400 series devices, check the indicator light at the multifunction interface as shown in Figure 1. For SAM and SAN series devices, check the indicator light at the reference clock input as shown in Figure 2. If the indicator light is on steadily, the connection is successful. If not, please replace the power adapter or power/data cable and reconnect the device.



2. For NX Devices:

(1) Follow Sections 4.1.1 and 4.2.1 in the *Spectrum Analyzer Quick Start Guide* to select the appropriate power adapter and reconnect the device. Note: When powering the device try to avoid using the computer USB port to power the device.

(2) Check whether the device's multifunction interface indicator light is steadily on. If the indicator light is on steadily, the connection is successful. If not, please replace the power adapter or power/data cable and reconnect the device.

(3) Check if other programs or SAStudio4 are currently using the device. If any program is accessing the device, close it and check if normal operation is restored.

3. Other Case: When a 32-bit system is flashed onto the Raspberry Pi 4B, using the device may result in a -8 error or a system crash.

The Raspberry Pi 4B is based on the aarch64 architecture (64-bit). If a 32-bit system is installed, it may cause byte misalignment issues, resulting in malfunction.

1.2.4 Any Function Returns -7, -9, or -11

Description:

The device cannot be used properly, and any function returns error codes -7, -9, or -11 (device data issue).

Troubleshooting Steps:

1. Check if other programs or SAStudio4 are currently using the device. If any program is accessing the device, close it and check if normal operation is restored.
2. If the issue persists after closing the programs, unplug the device and reconnect it.
3. If the issue still persists, restart the host computer and try connecting the device to another USB 3.0 port on the host computer.
4. If -9 occurs occasionally when the device is in use, please check whether the power supply of the device meets the minimum requirements (5V2A for SA devices, 12V3A for NX devices), if not, please use the supplied adapter or try to replace the adapter, and try to avoid using the USB port of the computer to supply power to the device.

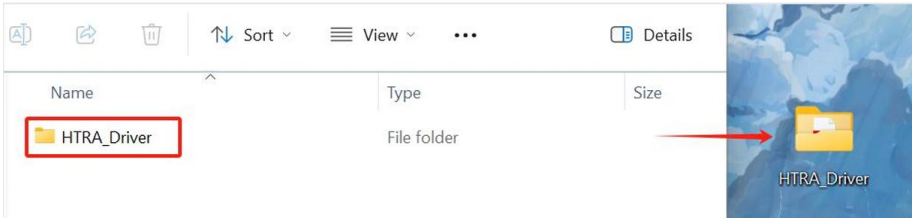
1.2.5 SWP Mode Get Returns -10

Description:

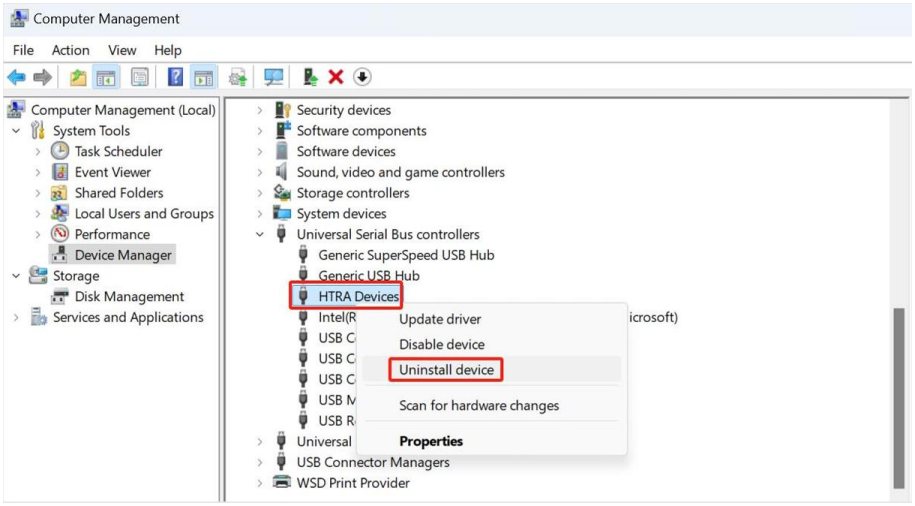
In SWP mode, the input trigger source is set to free-run (i.e., the TriggerSource parameter is set to the default InternalFreeRun). The device opens normally, but get data fails, and the Get function returns error code -10 (get data timeout).

Troubleshooting Steps:

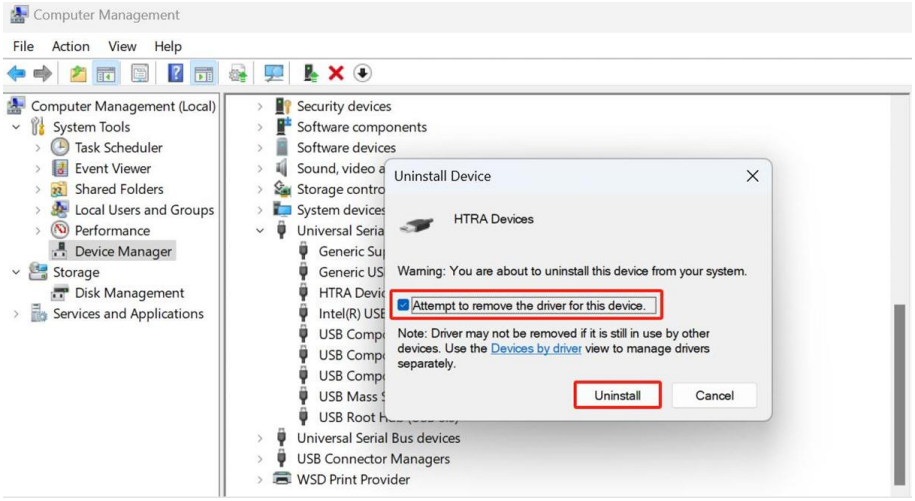
1. Check if other programs or SAStudio4 are currently using the device. If any program is accessing the device, close it and check if normal operation is restored. If the issue persists, continue with the following steps.
2. Find technical support to get the latest version of the device driver and extract it to your desktop.



3. Open the Device Manager and navigate to the Universal Serial Bus Controllers section. Find the device driver labeled "HTRA Devices", right-click, and select Uninstall Driver.



4. When a pop-up window appears, check the box to Delete the driver software for this device, and then click Uninstall.



5. After the driver is uninstalled, unplug the device, wait for 10 seconds, and then reinstall the latest driver downloaded from the website(https://www.harogic.com/support/download-center/), following the steps in Section 3.2 of the *Spectrum Analyzer Quick Start Guide*.

1.2.6 Get Function Returns -10 in IQS, DET, or RTA Mode

Description:

In IQS, DET, and RTA modes, when the input trigger source is set to bus trigger (i.e., the TriggerSource parameter is set to Bus), the device opens normally but fails to get data. The Get function returns error code -10 (get data timeout).

Troubleshooting Steps:

(The following steps use IQS mode as an example. The DET mode follows the same steps as IQS mode, while RTA mode only requires the first three steps.)

1. For SA devices: Use a USB 3.0 data cable to connect the device's data port to the USB 3.0 port on the host computer.
2. For NX devices: Use a Gigabit Ethernet cable to connect the device's Gigabit Ethernet port to the Gigabit Ethernet port on the host computer.
3. After connecting, ensure that the trigger function (IQS_BusTriggerStart) has been correctly called before retrieving data. The logic for calling Adaptive and FixedPoints modes is shown in the reference documentation.

```
//Adaptive
Status = IQS_BusTriggerStart(&Device);                    //Lanuch a bus trigger.

while (1)
{
    Status = IQS_GetIQStream_PM1(&Device, &IQStream);
```

```
//FixedPoints
while (1)
{
    Status = IQS_BusTriggerStart(&Device);                //Lanuch a bus trigger.
    for (int j = 0; j < StreamInfo.PacketCount; j++) {
        Status = IQS_GetIQStream_PM1(&Device, &IQStream);
```

4. If using Adaptive mode: When setting the DecimateFactor: For SA devices, set it to 2 or higher (SAN-45 and SAN-60 can be set to 1 or higher). For NX devices, set it to 16 or higher (NXN-45 can be set to 1 or higher, NXN-60 can be set to 4 or higher). When using Linux, the decimation factor may need to be increased based on host computer performance.

```
IQS_Profile_TypeDef IQS_ProfileIn;

IQS_ProfileDeInit(&Device, &IQS_ProfileIn);
IQS_ProfileIn.CenterFreq_Hz = 1e9;                    //Center frequency.
IQS_ProfileIn.RefLevel_dBm = 0;                       //Reference level.
IQS_ProfileIn.DecimateFactor = 2;                     //Decimate factor.
IQS_ProfileIn.DataFormat = Complex16bit;              //IQ data format.
IQS_ProfileIn.TriggerMode = Adaptive;                 //Specify trigger mode.
IQS_ProfileIn.TriggerSource = Bus;                    //Bus trigger, External for external triiger.
```

5. If Adaptive mode still does not work properly: Check the code to ensure that the Get function runs in a dedicated thread, with no other computations inside the same thread. Refer to the example programs IQS_Multithread_GetIQ_FFT_Write.cpp provided on the included USB drive.

1.2.7 Get Function Returns -12 in Any Mode

Description:

The device opens normally, but the Get function returns error code -12 (IF saturation).

Troubleshooting Steps:

1. For single-tone signal testing: Increase the reference level (RefLevel_dBm) to ensure it is higher than the signal amplitude.
2. For modulated signal testing: If the reference level is already higher than the signal amplitude but -12 is still returned, continue increasing the reference level until the error disappears. This is because modulated signals typically contain multiple frequency components. Although individual components may not

exceed the ADC capture range, the combined signal amplitude may occasionally exceed the range due to time-domain superposition, causing ADC saturation.

3. Note: If the device remains in an IF saturation (-12) state for a long period, it may cause internal hardware damage.

1.2.8 Get Function Returns -15, -16, -17, -18, or -19 in Any Mode

Description:

The device opens normally, but the Get function returns error codes -15, -16, -17, -18, or -19 (hardware unlock failure).

Troubleshooting Steps:

1. Unplug and reconnect the device.
2. Note: If this error occurs frequently, contact technical support.

1.2.9 Any Function Returns 10054, 10060, or 10062 (NX Devices Only)

Description:

During use, any function may return 10054, 10060, or 10062 (network error).

Troubleshooting Steps:

1. Implement error handling in the program: If the device does not respond for a long time and returns error codes 10054, 10060, or 10062, the program should: First, call the Device_Close function to close the device. Then, enter a loop that repeatedly calls Device_Open until it returns 0, indicating the device has successfully reopened. After reopening, resend the configuration commands, and the device should function normally. For details, please refer to the handling method in the Error_handling.cpp of the USB memory stick sent with it.
2. Alternatively, reconnect the Ethernet cable to restore normal operation (using the first method is recommended).

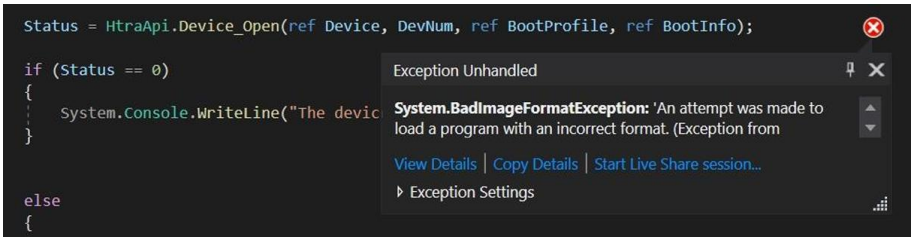
1.2.10 Program Format Incorrect or Invalid, Unable to Start

Description:

As shown in the images, the device cannot be opened. The error messages vary depending on the programming language:

- C++: "The application was unable to start correctly."

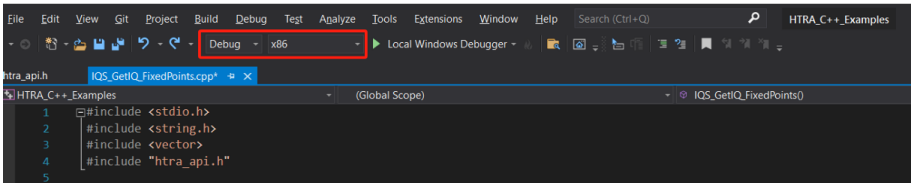
- C#: "An attempt was made to load a program with an incorrect format."

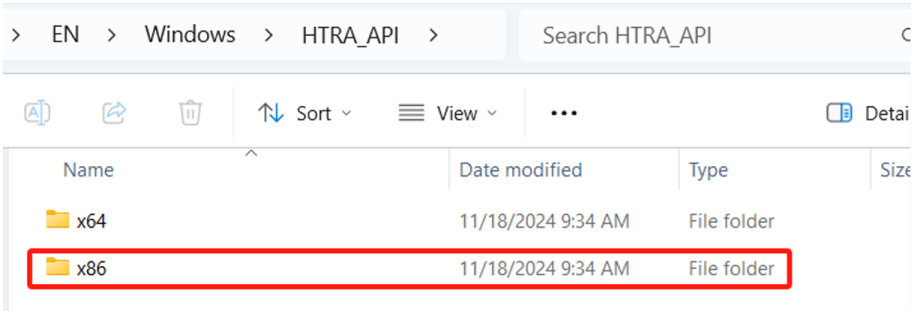


- Python: "Not a valid application."

Troubleshooting Steps:

1. Ensure that the library architecture matches the program architecture. If the program architecture is x86, use the libraries in the Windows\HTRA_API\x86 folder on the provided USB drive. For x64 programs, use the corresponding x64 folder.



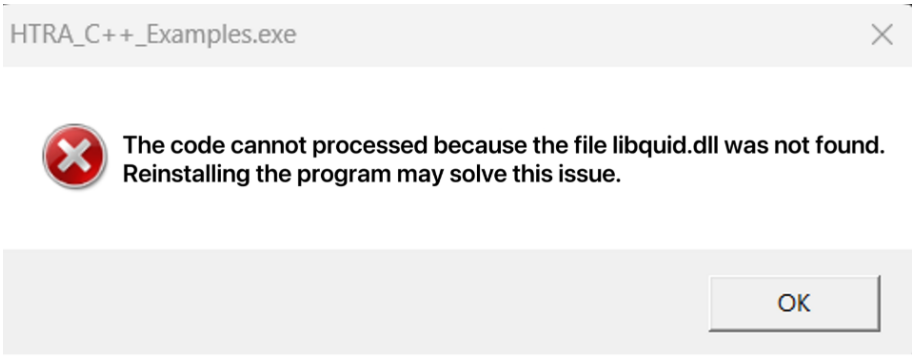


1.2.11 Missing or Unable to Load xxx.dll

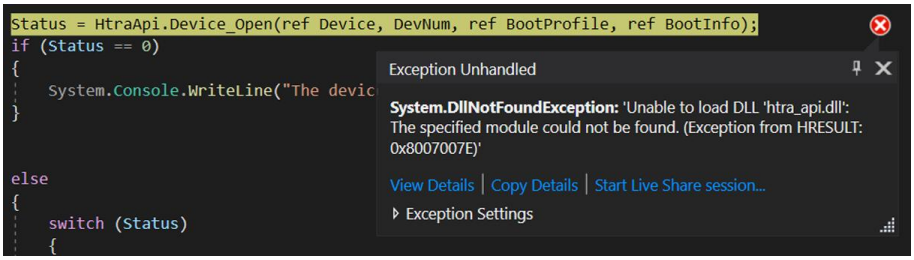
Description:

As shown in the images, the device cannot be opened due to missing or unloaded DLL files. The error messages vary depending on the programming language:

- C++:



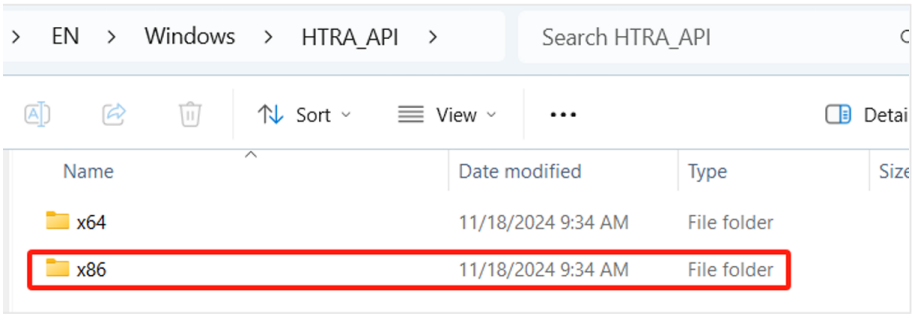
- C#:



- Python:

Troubleshooting Steps:

1. Ensure that all required dependency libraries are present. For x86 programs, use all files from the Windows\HTRA_API\x86 folder on the provided USB drive. For x64 programs, use the corresponding x64 folder.

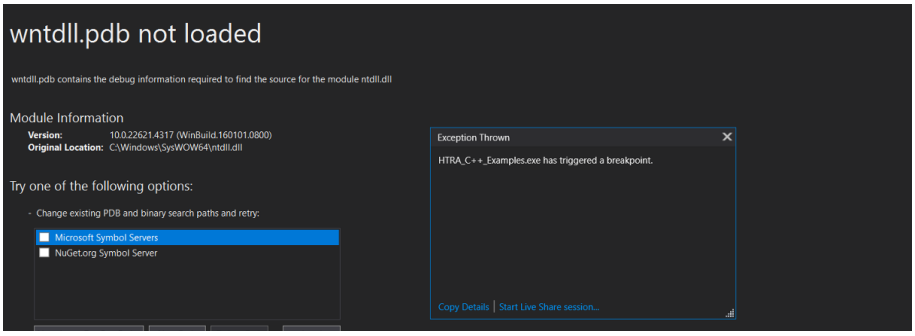


2. If you are using Python and have stored all the libraries correctly as in step 1 but still have the problem, try running the project with a different Python interpreter.

1.2.12 SWP Mode: Pointer/Array Out of Bounds or ntdll.pdb not loaded

Description:

In SWP mode, the device opens normally, but when calling Get, errors related to pointer or array out of bounds or "wntdll.pdb not loaded" appear.



Troubleshooting Steps:

1. If the way to get the whole trace data is to get the data through SWP_GetPartialSweep and then splice it, please make sure that the size of the container to store the spliced data is larger than the result of TraceInfo.TotalHops * TraceInfo.PartialsweepTracePoints.
2. Alternatively, if the goal is to retrieve the entire trace data, use the SWP_GetFullSweep function instead of manually assembling partial sweeps.

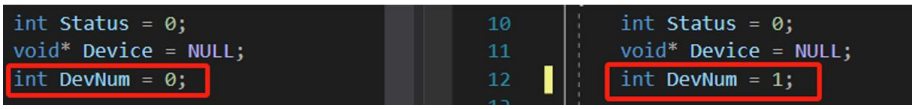
1.2.13 Failure to Open Multiple Modules Simultaneously

Description:

When using multiple devices on the same host PC, running the program directly fails to open the devices.

Troubleshooting Steps:

1. Using multiple programs to open multiple devices: Set different DevNum values for each program.



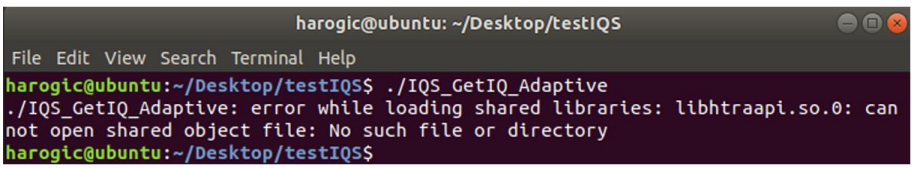
2. Using a single program to open multiple devices: Ensure that Status, Device, DeviceNum, structures, and function calls are set separately for each device, as shown in the reference example. The DevNum must be set to a unique value for each device. Refer to the sample code on the provided USB drive for implementation details.

```
int Status_A = 0;
int Status_B = 0;
void* Device_A = NULL;
void* Device_B = NULL;
int DevNum_A = 0;
int DevNum_B = 1;

BootProfile_TypeDef BootProfile_A;
BootInfo_TypeDef BootInfo_A;
BootProfile_TypeDef BootProfile_B;
BootInfo_TypeDef BootInfo_B;

BootProfile_A.DevicePowerSupply = USBPortAndPowerPort;
BootProfile_B.DevicePowerSupply = USBPortAndPowerPort;
BootProfile_A.PhysicalInterface = USB;
BootProfile_B.PhysicalInterface = USB;

Status_A = Device_Open(&Device_A, DevNum_A, &BootProfile_A, &BootInfo_A);
Status_B = Device_Open(&Device_B, DevNum_B, &BootProfile_B, &BootInfo_B);
```

1.2.14 Library Files Not Found in Linux

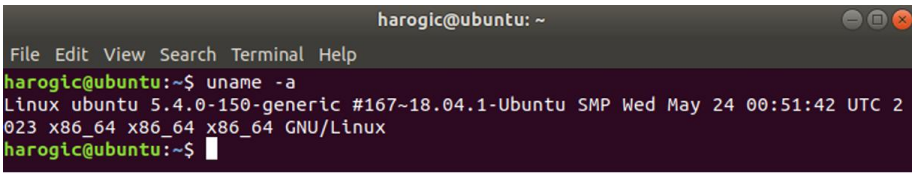
Description:

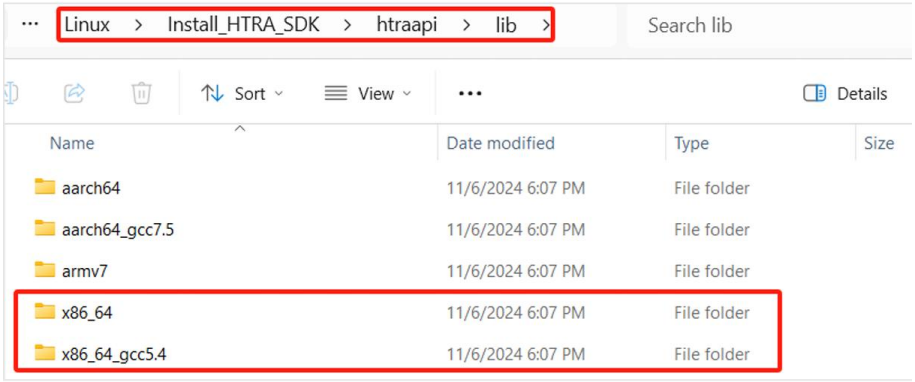
When calling the dynamic link library in Linux, an error appears indicating that libliquid.so, libhtraapi.so, or libusb.so cannot be found.



Troubleshooting Steps:

1. Ensure that the dynamic link libraries are correctly placed in the target path when compiling and building the executable program. Refer to the Makefile in the Linux\HTRA_C++_Examples folder on the provided USB drive.
2. Verify that the library architecture matches the host PC architecture: Run uname -a in the terminal to check the host architecture. Use the dynamic libraries from the USB drive that match the architecture. Example: If the host PC architecture is x86_64, use libraries from the x86_64 or x86_64_gcc5.4 folder. (x86_64_gcc5.4 requires GCC version 5.4 or higher).

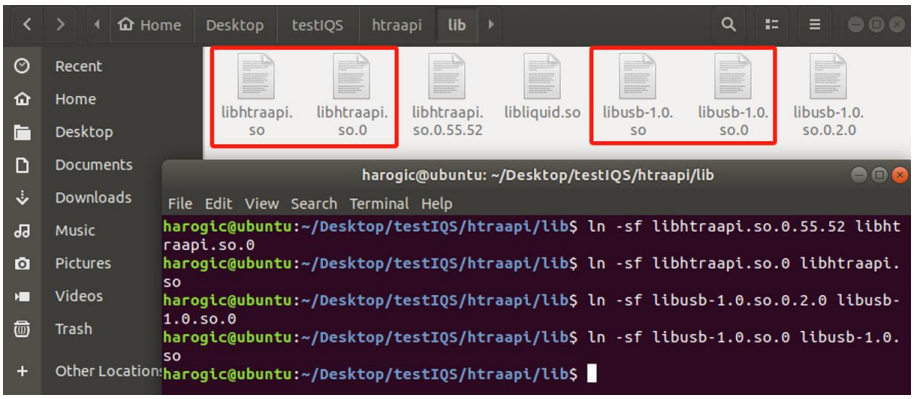




3. Ensure that versioned dynamic libraries have proper symbolic links. For API version 0.55.52, run the following commands in the terminal:

- ln -sf libhtraapi.so.0.55.52 libhtraapi.so.0
- ln -sf libhtraapi.so.0 libhtraapi.so
- ln -sf libusb-1.0.so.0.2.0 libusb-1.0.so.0
- ln -sf libusb-1.0.so.0 libusb-1.0.so

These commands create the necessary symbolic links, ensuring that libhtraapi.so.0, libhtraapi.so, libusb-1.0.so.0, and libusb-1.0.so are properly linked.

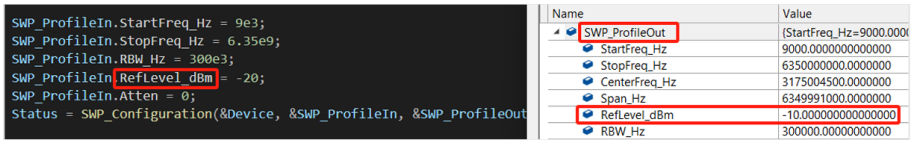


1.3 API Execution Results Do Not Match Expectations

1.3.1 Reference Level Setting Not Taking Effect

Description:

When configuring parameters, the reference level (RefLevel_dBm) does not update correctly and remains fixed at a certain value. Example: Setting the reference level to -20 dBm, but the actual ProfileOut reference level remains at -10 dBm.



Troubleshooting Steps:

1. Check whether attenuation (Atten) is manually configured. By default, Atten = -1, meaning automatic attenuation configuration is used. If Atten is manually set, the API maps the attenuation value to the reference level using the formula(Reference Level = Atten -10), in this case, the reference level setting will not take effect.

1.3.2 Retrieved Device Information Does Not Match Actual Device

Description:

When using the Device_QueryDeviceInfo API to retrieve device information, the string returned in the DeviceInfo_TypeDef structure does not match the actual device information. Example: The UID displayed in SAStudio4 is 4248500b001c0035, But the

UID retrieved from the API is 6437420729844236324.

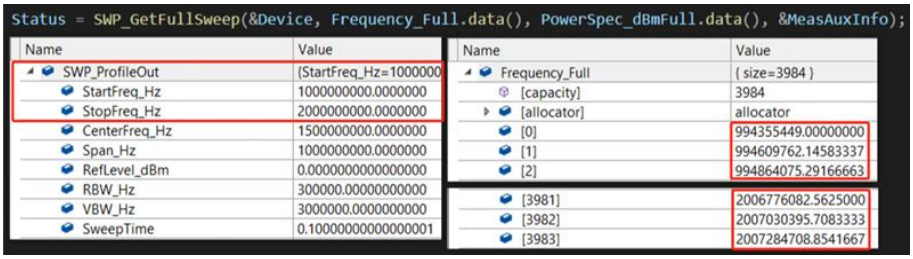
Troubleshooting Steps:

1. Because of the difference between the device information data returned by the API and the actual device information data, for example, the device UID is stored in decimal in the API, but hexadecimal is used in the actual use of the device, so it is necessary to convert the obtained data into hexadecimal. For details, please refer to Device_GetDeviceInfo.cpp in the included USB stick.

1.3.3 SWP Mode Retrieves a Slightly Wider Spectrum

Description:

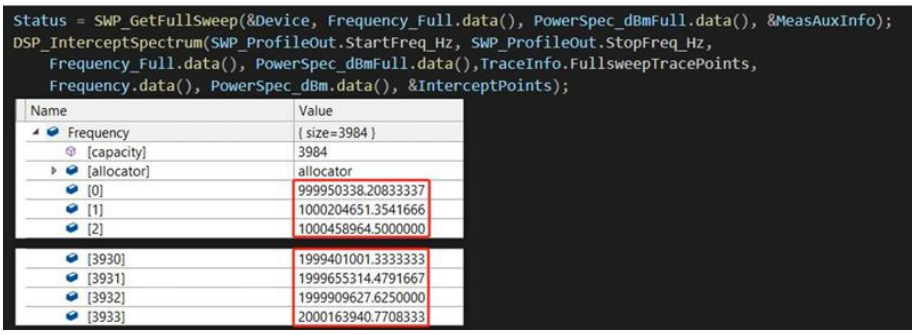
When getting spectrum data in SWP mode, the returned frequency range is slightly wider than the configured range. For example, if the start frequency and end frequency are set to 1GHz and 2GHz respectively when sending the parameter, the start frequency is located at 994MHz and the end frequency is located at 2.007GHz in the acquired frequency container.



Troubleshooting Steps:

1. This is normal when the TracePointsStrategy is set to SweepSpeedPreferred or PointsAccuracyPreferred.In these two modes, in order to ensure that the acquired spectrum data will not lose any information, the device will acquire spectrum data wider than the sending interval by default.

If you only want to obtain the data within the specified interval, you can use the spectrum intercept (DSP_InterceptSpectrum) interface to intercept the data obtained, the following figure shows the effect of the above case after interception.



Note: The actual value of the start-stop frequency after the interception is not exactly equal to the value of the downlink, but contains the closest value of the downlink.

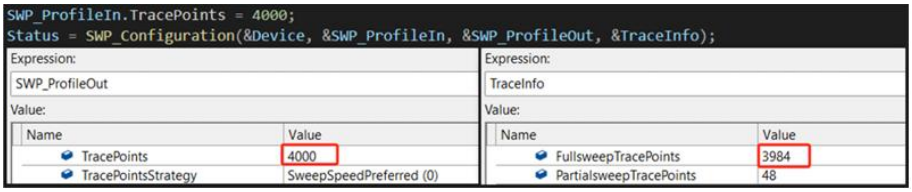
2. In addition to using the intercept function, you can also use the BinSizeAssined mode, in which the start and stop frequencies and the FullsweepTracePoints are sent according to the set values (this mode has a slower sweep speed).In this case, the frequency interval = Span_Hz/(TracePoints-1).

1.3.4 Actual Trace Points in SWP Mode Do Not Match Configured Value

Description:

In SWP mode, the actual number of trace points (FullsweepTracePoints) differs from the configured number (TracePoints). Example: configured trace points: 4000, actual

trace points: 3984



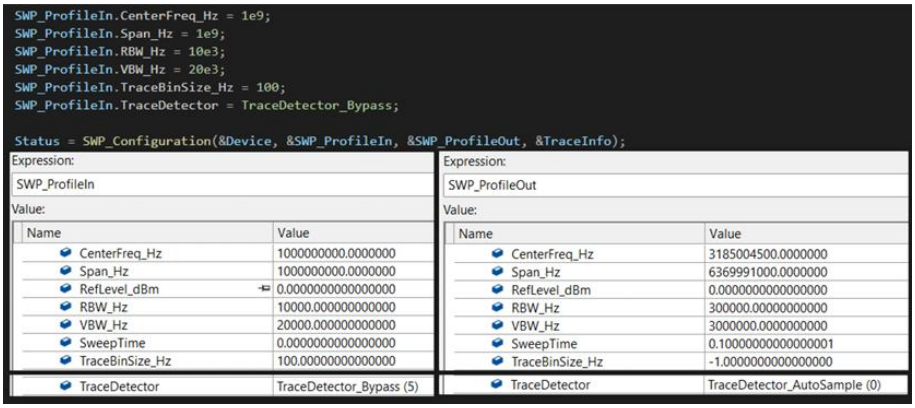
Troubleshooting Steps:

1. This is normal when the TracePointsStrategy is set to SweepSpeedPreferred or PointsAccuracyPreferred. The actual number of traces issued in these two modes is fine-tuned by the device itself according to its own strategy and may differ from the configured value.
2. To ensure the trace points match exactly, follow Step 2 in Section 1.3.3 (using BinSizeAssigned mode).

1.3.5 Some Parameters in SWP Mode Do Not Take Effect

Description:

Certain parameters, such as RBW, VBW, center frequency (CenterFreq_Hz), span (Span_Hz), frequency bin size (TraceBinSize_Hz), or trace detector (TraceDetector), do not apply correctly after being set.



Troubleshooting Steps:

1. RBW or VBW not taking effect: Ensure that the RBW mode (RBWMode) and VBW mode (VBWMode) are set to manual (RBW_Manual, VBW_Manual).

```
SWP_ProfileIn.RBW_Hz = 300e3;
SWP_ProfileIn.RBWMode = RBW_Manual;
SWP_ProfileIn.VBW_Hz = 500e3;
SWP_ProfileIn.VBWMode = VBW_Manual;
```

2. Center frequency (CenterFreq_Hz) or span (Span_Hz) not taking effect: Set frequency assignment mode (FreqAssignment) to center frequency & span mode (CenterSpan).

```
SWP_ProfileIn.CenterFreq_Hz = 1e9;
SWP_ProfileIn.Span_Hz = 100e6;
SWP_ProfileIn.FreqAssignment = CenterSpan;
```

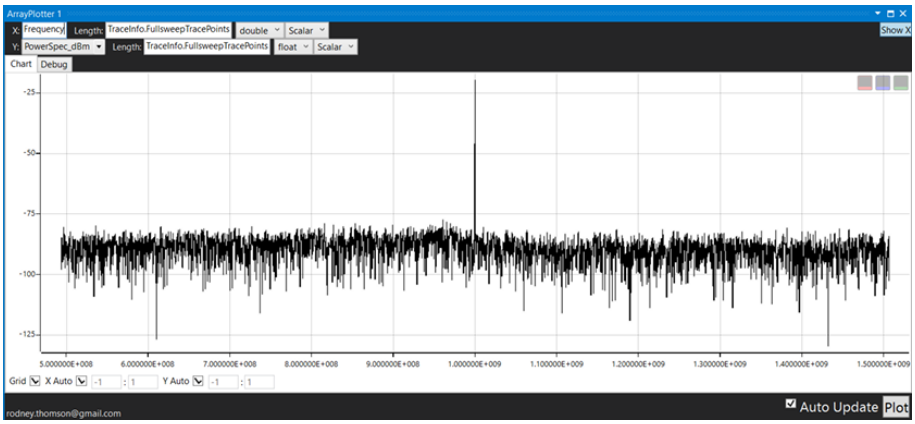
3. TraceBinSize_Hz not taking effect: The bin size cannot be manually modified and defaults to -1, meaning the device calculates it automatically. To specify a fixed bin size, refer to Step 2 in Section 1.3.3.
4. Trace detector not taking effect: Ensure that trace detector mode is set to manual (TraceDetectMode_Manual).

```
SWP_ProfileIn.TraceDetector = TraceDetector_Bypass;
SWP_ProfileIn.TraceDetectMode = TraceDetectMode_Manual;
```

1.3.6 Delay in Data Acquisition in SWP Mode

Description:

When acquiring data in SWP mode, injecting signals into the device or switching off signal injection, there is a time delay of a few seconds for the host computer to update. As shown in the figure below, the signal injection has been switched off, but the signal is still present in the spectrum plot.



Troubleshooting Steps:

1. Ensure that there is no delay functions used after the Get function.
2. Use multi-threading to acquire and process data as efficiently as possible.
3. If the NX device still experiences delays despite meeting the above conditions, it may be due to the performance of the host computer. Since the NX device has built-in buffer storage, slow data retrieval from the host computer can cause data accumulation in the buffer, resulting in delays. Using a higher-performance host computer can help mitigate this issue.

1.3.7 The First Few Frames of Data Obtained from SWP_GetFullSweep Are Not Real-Time

Description:

When using the SWP_GetFullSweep function to continuously acquire data for a period and then pausing before resuming, the first few frames of data obtained upon resumption are not real-time.

Troubleshooting Steps:

1. This phenomenon is normal. The device is designed to collect multiple extra frames of data by default during SWP_Configuration. Therefore, after a pause, the first few frames retrieved may be older data, while the second set of retrieved data will be the most recent.

1.3.8 Many Zeros in IQS Mode Data Acquisition

Description:

When acquiring data in IQ mode with a high decimation factor, many zero values appear in the obtained data, as shown in the figure.

```
Status = IQS_BusTriggerStart(&Device);
while (1)
{
    Status = IQS_GetIQStream_PM1(&Device, &IQStream);
    if (Status == APIRETVAL_NoError)
    {
        int16_t* IQ = (int16_t*)IQStream.AlternIQStream;
        for (int i = 0; i < StreamInfo.PacketSamples; i++)
        {
            I_Data[i] = IQ[i * 2];
            Q_Data[i] = IQ[i * 2 + 1];
        }
    }
```

Expression: I_Data

Value:

Name	Value
[15]	0
[16]	0
[17]	-1
[18]	1
[19]	0
[20]	0
[21]	1
[22]	0
[23]	0
[24]	1
[25]	-1

Troubleshooting Steps:

1. Change the DataFormat parameter to Complex 32-bit. The default setting is 16-bit, and since 16-bit IQ data has lower precision, a high decimation factor can lead to many zero values.
2. This phenomenon only occurs when no signal is present in the bandwidth. As shown in the figure, when a signal is present within the bandwidth, the acquired data is correct.

```
Status = IQS_BusTriggerStart(&Device);
while (1)  ≤ 1ms elapsed
{
    Status = IQS_GetIQStream_PM1(&Device, &IQStream);
    if (Status == APIRETVAL_NoError)
    {
        int16_t* IQ = (int16_t*)IQStream.AlternIQStream;
        for (int i = 0; i < StreamInfo.PacketSamples; i++)
        {
            I_Data[i] = IQ[i * 2];
            Q_Data[i] = IQ[i * 2 + 1];
        }
    }
```

Expression: I_Data

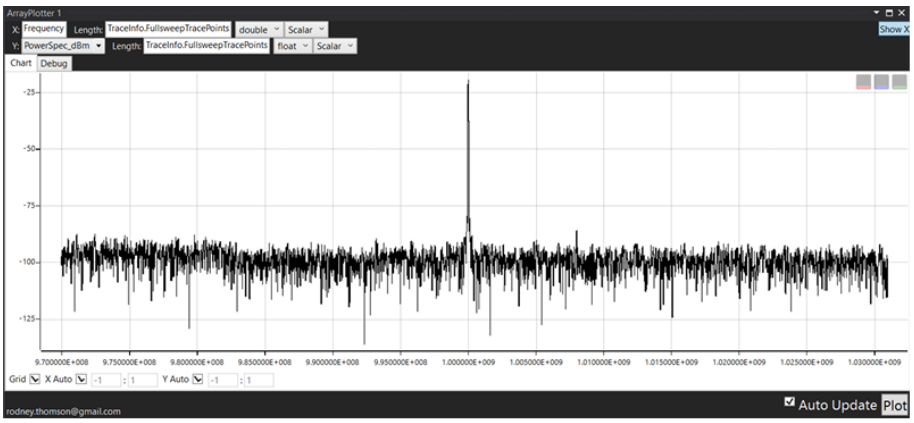
Value:

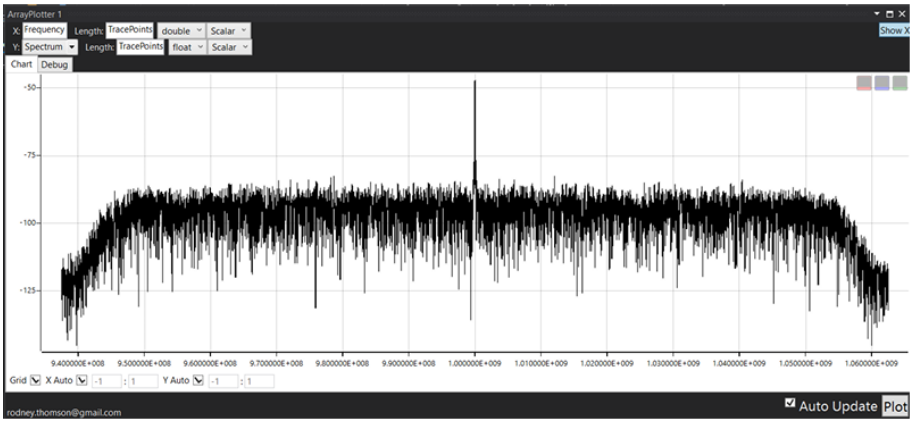
Name	Value
[21]	448
[22]	447
[23]	449
[24]	449
[25]	449
[26]	449
[27]	448
[28]	451
[29]	450
[30]	446
[31]	451
[32]	451

1.3.9 Frequency Spectrum Converted from IQ Data Differs from SWP Mode Spectrum

Description:

After converting IQ data into a frequency spectrum, the resulting spectrum differs from the one observed in SWP mode. For example, when injecting a 1GHz, -20dBm signal, the first spectrum (SWP mode) appears normal. However, the second spectrum (converted from IQ data) shows a signal strength of -50dBm with sidebands on both sides.





Troubleshooting Steps:

1. To correct the amplitude deviation, enable DCCancelerMode by setting it to DCCAutoOffsetMode. For example, in IQS mode, configure the high-pass filter as shown in the figure.

```
IQS_ProfileIn.DCCancelerMode = DCCAutoOffsetMode;
```

2. To address the sideband issue, use the Intercept parameter to crop the acquired spectrum (recommended 80% cropping). Specific examples can be found in the reference files on the provided USB drive. Since anti-aliasing filtering is performed before IQ data collection and decimation, the filter transition band cannot be made perfectly steep, reducing the effective bandwidth to approximately 80%.

```
DSP_FFT_TypeDef IQToSpectrumIn;
IQToSpectrumIn.Intercept = 0.8;
```

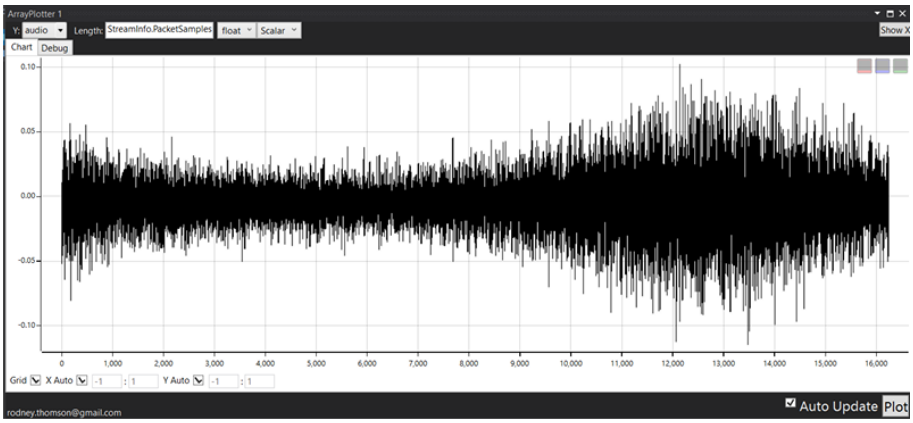
3. Aside from these two issues, the final spectrum converted from IQ data may have slight differences from the spectrum obtained directly in SWP mode due to

factors such as decimation factor, IQ bit depth, and FFT points. However, the overall difference should not be significant. If the discrepancy is too large, refer to the provided USB reference files for further adjustments.

1.3.10 Delay in AM/FM Demodulation

Description:

When performing AM or FM demodulation, there is a delay of several seconds in the response after injecting or stopping the signal. As shown in the figure, even after stopping the FM signal injection, the device still outputs an FM-demodulated signal.



Troubleshooting Steps:

1. In Adaptive mode, if the IQS_GetIQStream function is not called in a timely manner to retrieve data, data accumulation may occur. It is recommended to create a separate thread for the IQS_GetIQStream function, dedicated solely to data retrieval, while data demodulation and processing are handled in other threads.
2. If only a fixed number of points need to be demodulated rather than continuous demodulation, the FixedPoints mode can be used instead.

1.4 Software Abnormal Operation or Errors

1.4.1 No Response or Instant Crash on Windows

Description:

After clicking on the SAStudio4 software, it does not respond or crashes immediately upon opening.

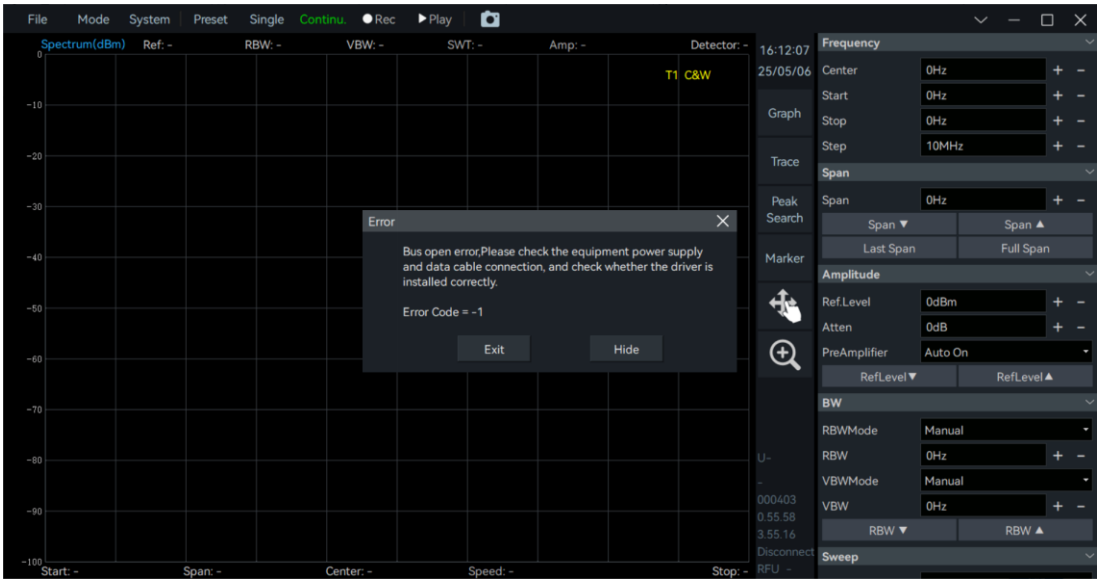
Troubleshooting Steps:

1. Disable antivirus software and firewall on the computer, then copy the software from the USB drive to the host computer and use it.
2. If the issue persists, contact technical support to obtain the software again.

1.4.2 Bus Open Error -1

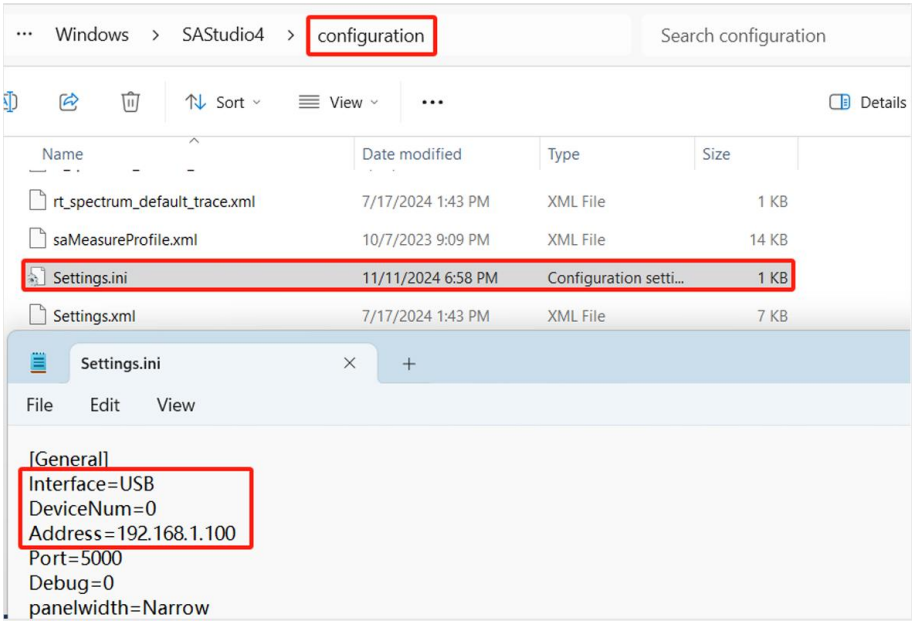
Description:

As shown in the figure, Software displays a "Bus Open Error -1" message upon startup.



Troubleshooting Steps:

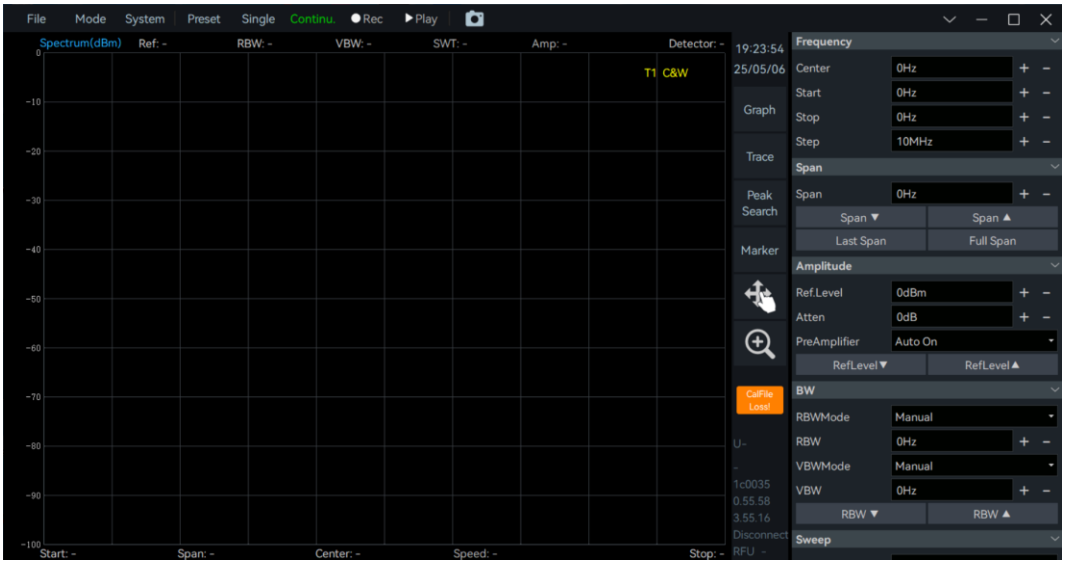
1. Resolve the issue following the steps in section 1.2.1. When configuring the SA device (Step 3) or NX device (Step 4), open the Setting.ini file in the SAStudio4\configuration folder. Set Interface=USB for SA devices. Set Interface=ETH for NX devices and configure Address to the device's IP (default: 192.168.1.100, or the modified IP if changed).



1.4.3 Sidebar Tips CalFileLoss!

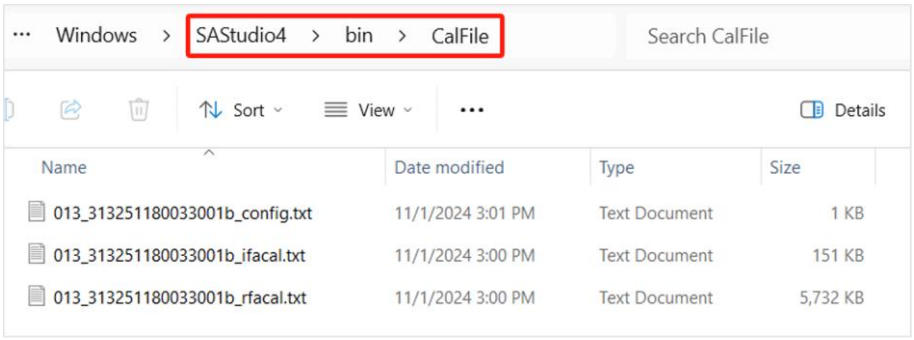
Description:

As shown in the figure, the software opens without spectrum information and the sidebar shows CalFileLoss!



Troubleshooting Steps:

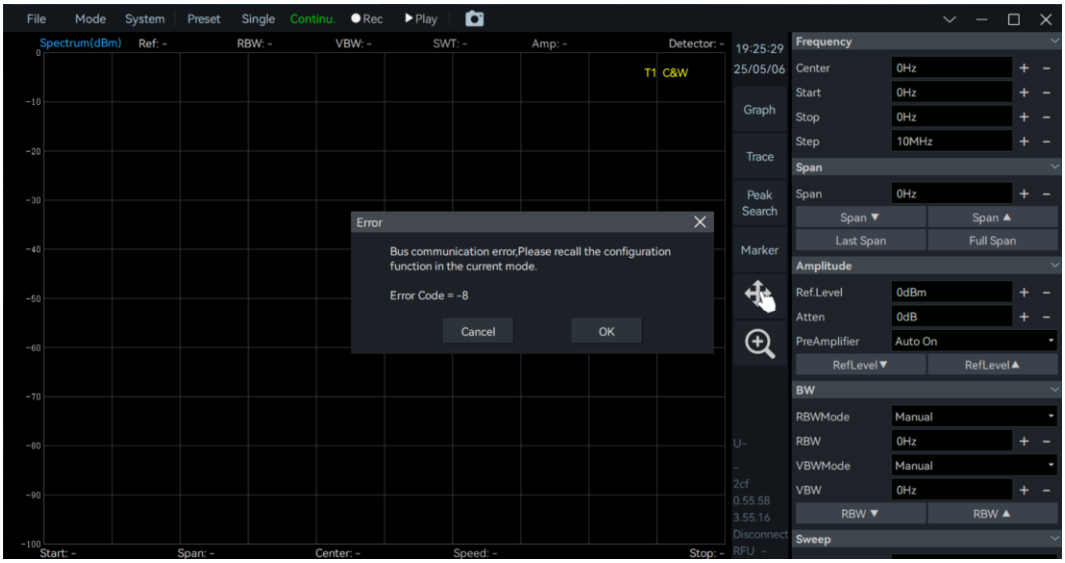
1. Copy all files from the CalFile folder in the root directory of the supplied USB memory stick to the \bin\CalFile folder according to section 1.2.2 (same for Windows and Linux).



1.4.4 Bus Communication Error -8

Description:

As shown in the figure, SAStudio4 displays "Bus Communication Error -8" upon startup.



Troubleshooting Steps:

1. Resolve the issue by following the steps in section 1.2.3.

1.4.5 Error Codes -7, -9, or -11

Description:

SAStudio4 displays an abnormal spectrum with a pop-up error indicating "Strategy Sending to Device Failed -7", "Data Content Error -9", or "Bus Configuration Error -11".

Troubleshooting Steps:

1. Resolve the issue by following the steps in section 1.2.4.

1.4.6 SWP Mode Data Retrieval Timeout -10

Description:

As shown in the figure, in SWP mode with the trigger source set to free run, a pop-up displays "Data Retrieval Timeout -10".

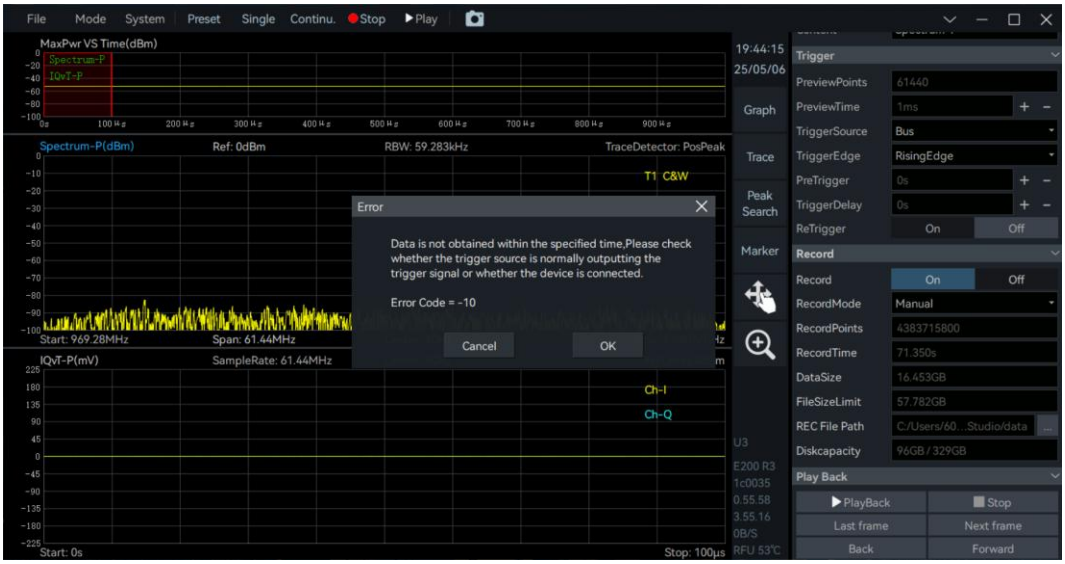
Troubleshooting Steps:

1. Resolve the issue by following the steps in section 1.2.5.

1.4.7 Data Retrieval Timeout -10 in IQS, DET, or RTA Mode

Description:

As shown in the figure, when using IQS, DET, or RTA mode with the trigger source set to bus trigger, a pop-up displays "Data Retrieval Timeout -10".



Troubleshooting Steps:

1. Check the USB connection: SA device please use USB3.0 cable to connect the data port of the device and the USB3.0 data port of the host computer.
2. Check the network cable connection: NX devices should use a Gigabit cable to connect the Gigabit port of the device to the Gigabit port of the host computer.

1.4.8 The sidebar turns red to indicate Overflow!

Description:

As shown in the figure, the spectrogram shows anomalies and the status bar on the right side shows Overflow!

Troubleshooting Steps:

1. Resolve the issue by following the steps in section 1.2.7.

1.4.9 Error Codes 10054, 10060, or 10062 (NX Devices Only)

Description:

As shown in the figure, SAStudio4 stops spectrum refreshing and displays a pop-up error indicating network disconnection (10054), connection attempt failure (10060), or data retrieval failure (10062).

Troubleshooting Steps:

1. This issue is caused by network instability. Click "Cancel" and wait. If the connection is not restored after a long wait, reconnect the network cable and

ensure a stable network connection.

2. If the issue persists, try replacing the network cable or switching network ports.

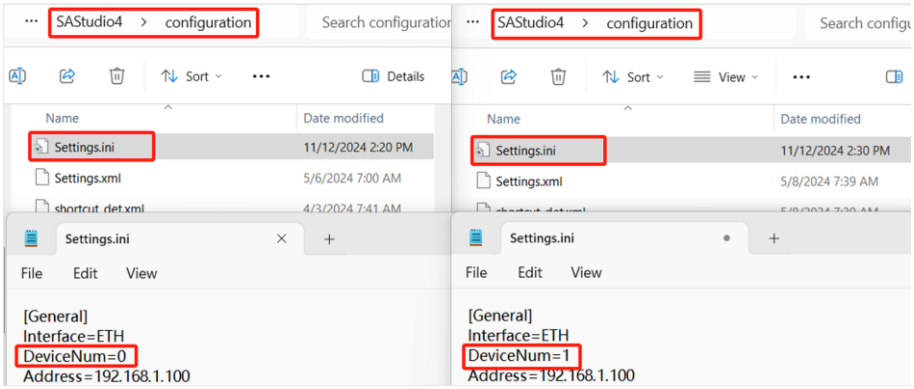
1.4.10 Failure to Open Multiple Modules Simultaneously

Description:

Running SAStudio4 on the same host computer while attempting to open multiple devices results in error codes -7, -9, or -11.

Troubleshooting Steps:

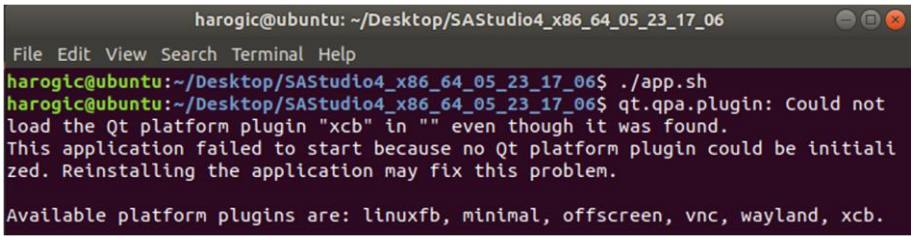
1. Prepare a companion software for each device, as shown in the figure will be each companion software configuration \ Setting.ini file DeviceNum set to a different value to open the different devices.



1.4.11 SAStudio4 Cannot Run on Ubuntu 18.04

Description:

SAStudio4 fails to start on Ubuntu 18.04 and displays an error message.



Troubleshooting Steps:

1. This issue is caused by missing system libraries. Run the following command to install the required library: *sudo apt-get install libxcb-xinerama0*.

1.4.12 Raspberry Pi Data Retrieval Issues When Using Two Devices

Description:

On a Raspberry Pi 4B, retrieving data from two devices simultaneously results in abnormal data acquisition and an error code -8 or -1.

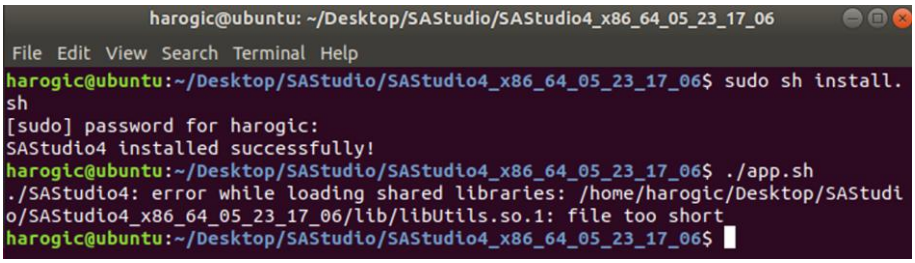
Troubleshooting Steps:

1. The Raspberry Pi has limited power supply capability. When using both USB ports, power may be insufficient. Use a powered USB hub to provide separate power to the device's data port.

1.4.13 "Corrupt Library File" Error on Linux

Description:

Starting SAStudio4 on Linux results in a "Corrupt Library File" error.



Troubleshooting Steps:

1. Ensure the software package is transferred to Linux before extraction. Use command-line extraction to avoid corruption when decompressing on Windows.

1.4.14 "Missing libffi Library" Error on Linux

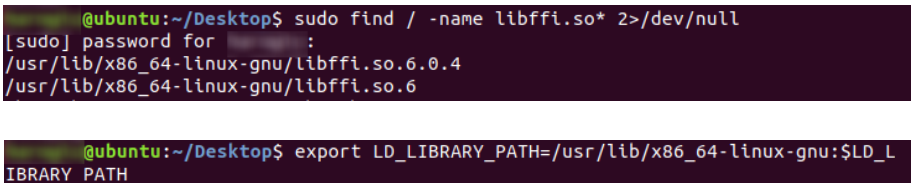
Description:

Starting SAStudio4 on Linux results in the following error message: SAStudio4: error while loading shared libraries: libffi.so.6: cannot open shared object file: No such file or directory.

Troubleshooting Steps:

1. Check if the system has the libffi library by running: *sudo find / -name libffi.so* 2>/dev/null*.

1). If the libffi library version is libffi.so.6, then configure environment variables for it. The following figure when the system /usr/lib/x86_64-linux-gnu folder libffi library version for libffi.so.6, directly configure the environment variable export LD_LIBRARY_PATH=/usr/lib/ x86_64-linux-gnu:$LD_LIBRARY_PATH (the libffi library configuration depends on the actual path).



2). If the libffi library version is libffi.so.7 or libffi.so.8, please make a soft link to point to the .6 version, take libffi.so.7 as an example, input: sudo ln -s /usr/lib/x86_64-linux-gnu/libffi.so.7 /usr/lib/x86 _64-linux-gnu/libffi.so.6.

2. If there is no libffi library in the system, please input it in the terminal:

1). sudo apt update

2). sudo apt install libffi-dev install the libffi library

After installing the libffi library, follow the procedure in the first step.

If you can't install libffi library directly in the custom version of the host computer, please contact the supplier of the development board to get the libffi library.

1.4.15 SAStudio4 Lagging on Linux

Description:

In Linux, SAStudio4 occasionally lags when refreshing the spectrum in SWP mode.

Troubleshooting Steps:

1. This phenomenon is normal. Due to the performance of the Linux host computer and the limitations of the screen resolution, the lag phenomenon will be seen in the visual effect. However, this stuttering is only in the visual effect, the underlying data acquisition is continuous.

1.4.16 Error: "VCRUNTIME140_1.dll Not Found"

Description:

When opening the software, the error "VCRUNTIME140_1.dll not found" is reported.

Troubleshooting Steps:

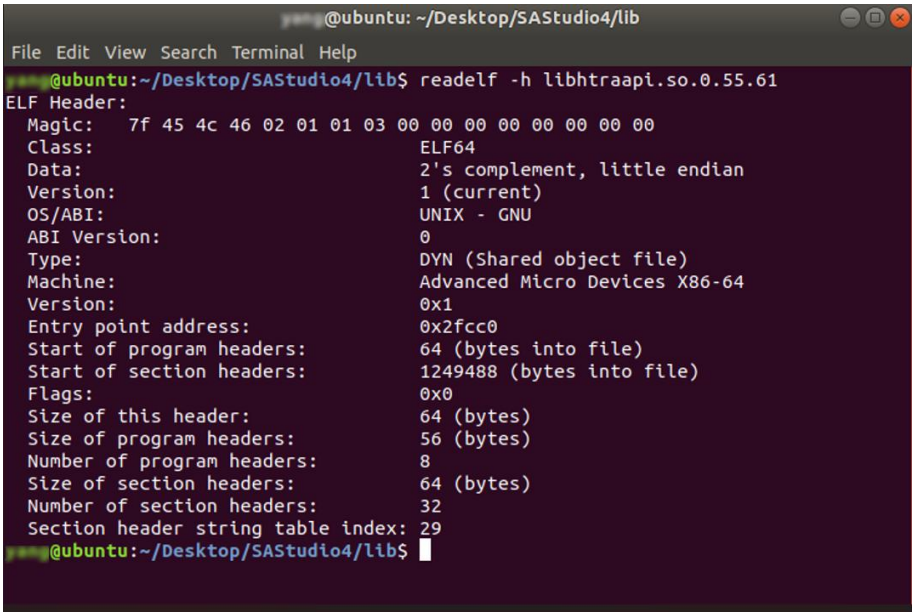
This issue is caused by a missing VC runtime environment. To resolve it, double-click vc_redist.x64.exe located in the \Windows\Software\bin folder of the supplied materials to install the VC runtime environment.

1.4.17 In Linux systems, error "-1" occurs after software installation

Description:

When opening the software, the error " Bus Open Error -1" is reported.

1. Please check whether the device connection and the host PC data interface are functioning properly.(On the customer's system terminal, enter lsusb to verify whether the device is detected.)
2. In the terminal, enter uname -a, gcc -v, and ldd --version to confirm the system architecture, GCC version, and GLIBC version, and ensure they meet the minimum requirements for operation.(Please make sure that the GCC version is higher than 7.5.0 and the GLIBC version is higher than 2.27.)
3. Go to the software's /lib folder, open the terminal, and enter *readelf -h libhtraapi.so.0.x.y*(where x represents the major version number and y the minor version number, e.g., x = 55, y = 61), to verify whether the API library architecture matches the system architecture.



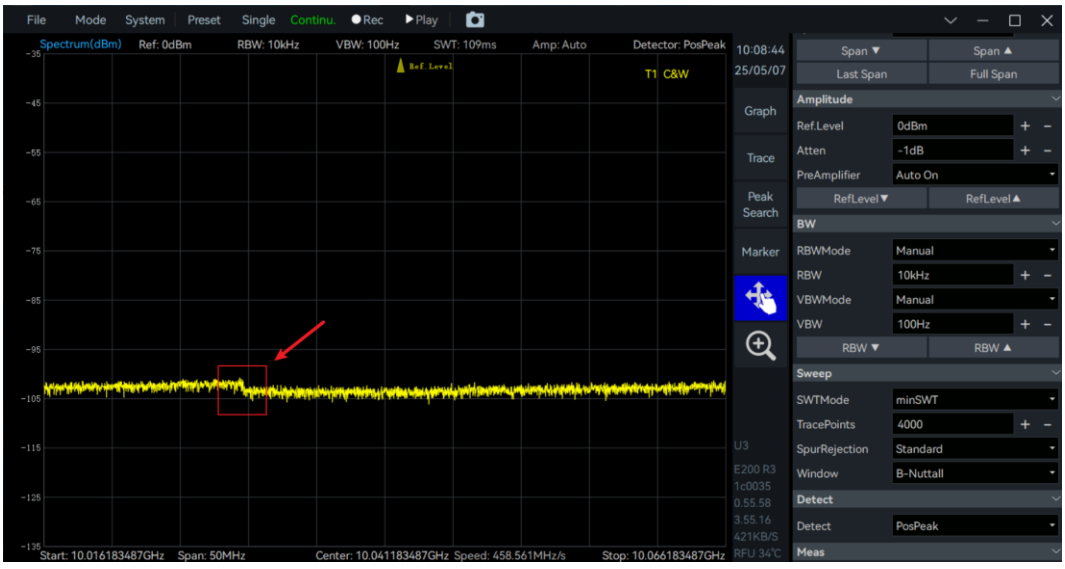
4. Please refer to the section1.2.1 in this document and follow the troubleshooting steps provided there.

1.5 SAStudio4 Measurement Results Deviate from Expectations

1.5.1 Sudden Step Change in Noise Floor in SWP Mode

Description:

As shown in the figure, under certain parameter configurations in SWP mode, the noise floor is uneven and exhibits sudden step changes.



Troubleshooting Steps:

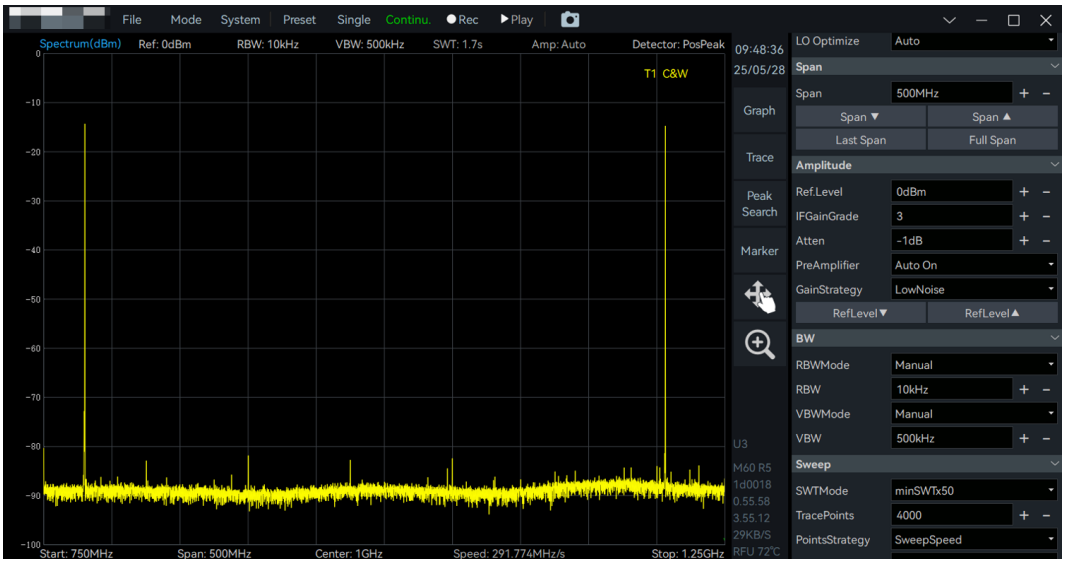
1. This phenomenon is normal. The sudden step changes correspond to the

segmentation points in SWP mode scanning. If a signal is injected at the step change point, the signal amplitude and frequency remain accurate.

1.5.2 Double Peaks in Frequency Sweeping Signal in SWP Mode

Description:

As shown in the figure, when observing the frequency sweeping signal in SWP mode, a double peak phenomenon occurs.



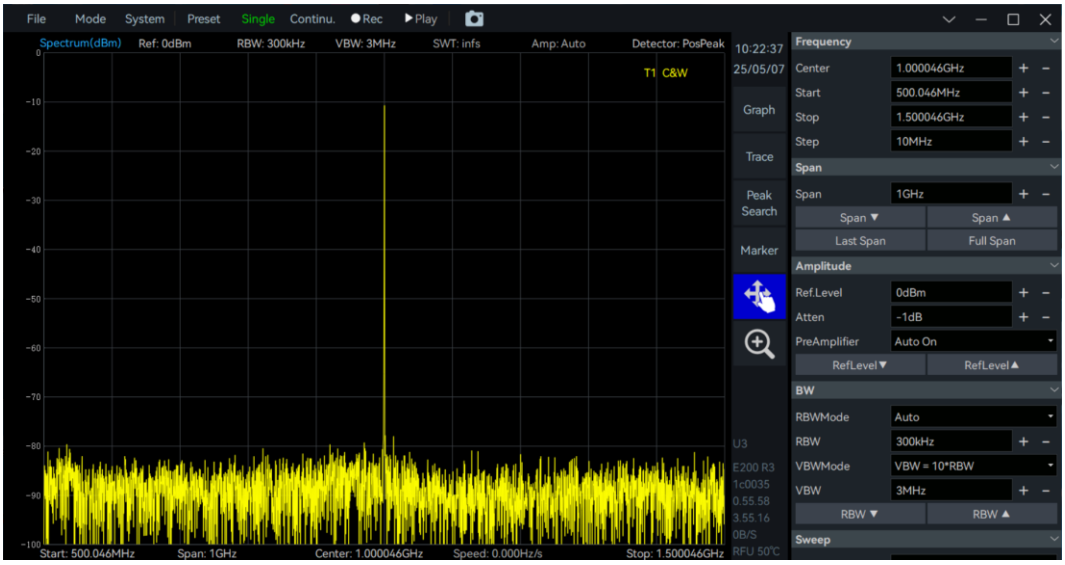
Troubleshooting Steps:

1. This phenomenon is normal but can be avoided by increasing the scan speed. Since SWP mode collects data using a frequency-hopping method, unscanned positions display the spectrum from the previous scan. If the scan speed is too slow, double peaks may appear.

1.5.3 Delayed Spectrum Refresh in NX When Using Single Preview

Description:

When using the single preview function on an NX device, the displayed spectrum is not the latest. As shown in the figure, even after turning off the signal injection, the signal is still visible in the single preview mode.



Troubleshooting Steps:

1. This phenomenon is normal. To maintain a high scan rate, NX devices buffer some data packets. When using the single preview function, although the host PC does not receive new data, the device has already cached data packets. Therefore, the next preview displays the cached data, causing an apparent "delay".

1.5.4 Unstable IQ Data When Using External Reference Clock

Description:

When using an external reference clock for synchronization, the IQ data observed in SAStudio4 is highly unstable.

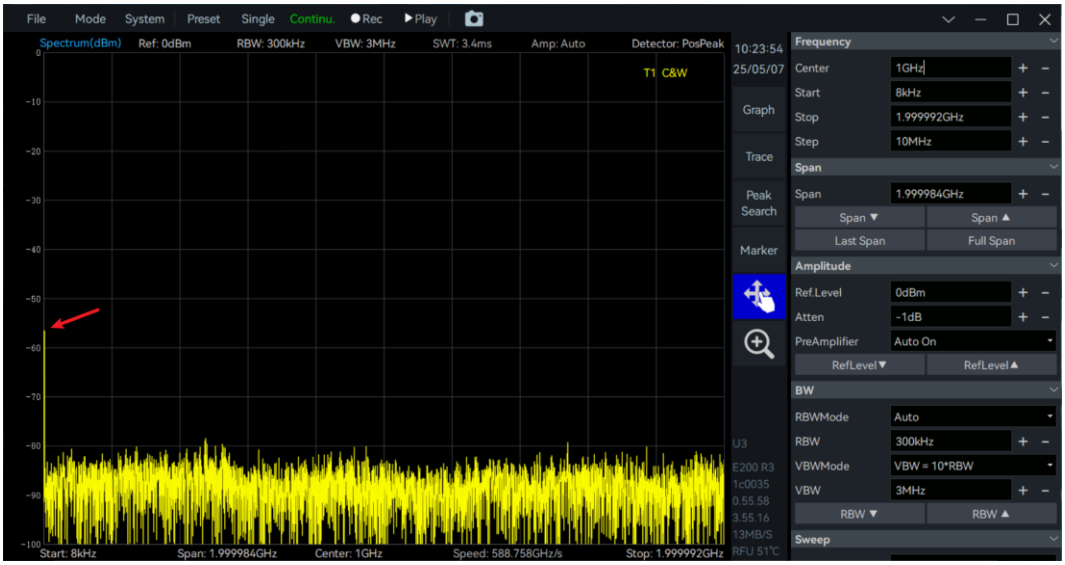
Troubleshooting Steps:

Please refer to the External Reference Input chapter of the *Spectrum Analyzer User Guide* to use the external reference.

1.5.5 Trace Scan Time is Shorter than Frame Scan Time

Description:

When obtaining spectrum information in SWP mode, the trace scan time is shorter than the frame scan time.



Troubleshooting Steps:

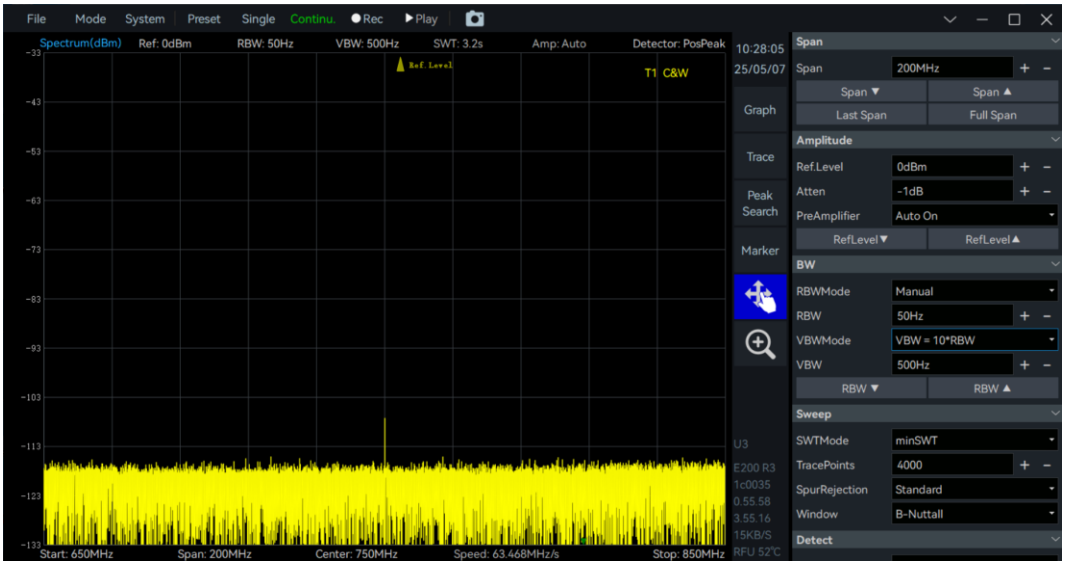
1. This phenomenon is normal. In SAStudio4, the trace scan time is calculated by dividing the sweep width by the scan speed, while the frame scan time represents the time required for the acquisition of a complete data frame at the lower level. If the trace width is smaller than the frame width, the trace scan time will be shorter than the frame scan time.

For example, when the starting frequency is 9kHz, DC drift may be observed on the left side of the spectrogram if the RBW is set to 100kHz; whereas, if the RBW is reduced to 7kHz at this point, DC drift will no longer be shown.

1.5.6 Interference Signal at 125MHz Harmonic Multiples

Description:

When using SAStudio4, interference signals appear at certain 125MHz harmonic multiples.



Troubleshooting Steps:

1. This phenomenon is normal. The receiver system uses a 125MHz system clock, which generates harmonics at 125MHz × N. These harmonic components couple into the RF input and local oscillator paths through cavities and circuits, causing residual responses at certain 125MHz harmonic multiples.

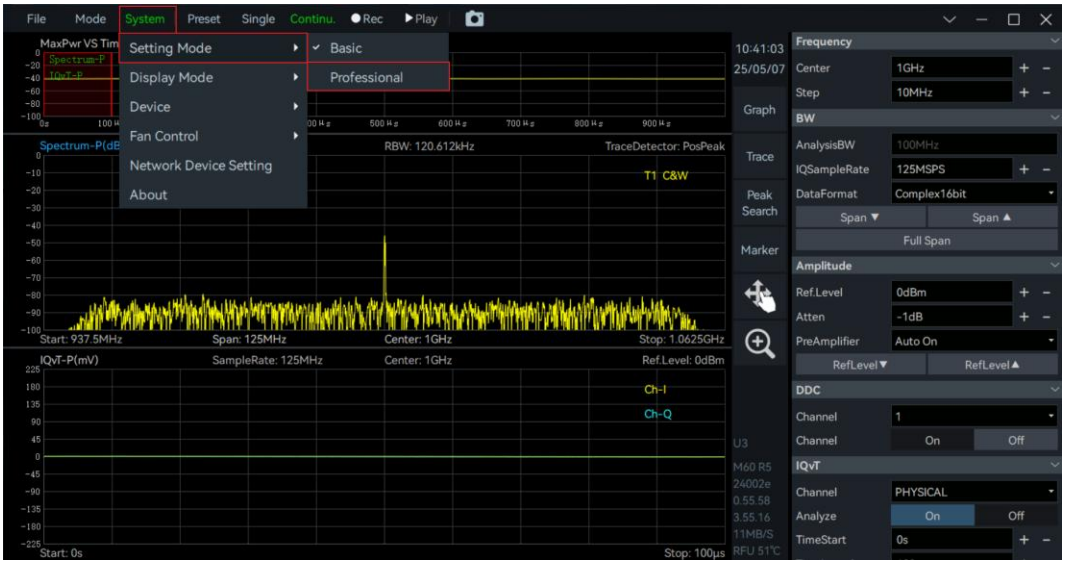
1.5.7 IQ Mode Signal Power Deviation

Description:

When using IQ mode, the signal power displayed on the spectrum differs significantly from the input power. For example, injecting a -20dBm signal into the device, but the spectrum shows around -50dBm.

Troubleshooting Steps:

1. Follow the steps in section 1.3.9 for resolution. The high-pass filter switch is located at the position shown in the figure.



1.5.8 Signal Cannot Be Displayed Properly Under Different Sweep Spans

Description:

When using the software in SWP mode to test a signal at 100 MHz, 0 dBm, the signal can be displayed normally when the sweep span is set to 2 MHz. However, when the sweep span is set to 1 MHz, the signal cannot be displayed properly.

Troubleshooting Steps:

This issue only exists in MCU version 0.55.46 and can be resolved by updating the

firmware remotely. Please visit the official website (https://www.harogic.com/firmware-updater/) -> Support -> Download Center to obtain the firmware update program.

1.5.9 Error -10 When Testing Pulse Signals in DET Mode

Description:

When using the software in DET mode with full span, trigger source set to Level Trigger, and the input signal being a pulse signal, error -10 is reported.

Troubleshooting Steps:

When the pulse signal period is short, it is equivalent to a continuous full-span stream in the software. Due to the speed limitation of USB 3.0, error -10 in this case is normal. To resolve it, you can either reduce the sweep span or increase the pulse signal period.

1.5.10 SAM-60 MK2 Device Reports Error -20

Description:

When using the software with the SAM-60 MK2 device, error -20 is reported.

Troubleshooting Steps:

Error -20 indicates a hardware fault. This issue has been resolved in saAPI version 5.69 and above. Please upgrade to the latest API version. If the error still occurs, the device will need to be returned for repair.

1.5.11 After Connecting the Antenna, the Software Shows Large Fluctuations in Noise Floor

Description:

When the device is used with an antenna connected, the noise floor appears uneven and fluctuates significantly.

Troubleshooting Steps:

After connecting the antenna, the device will capture wireless signals from the

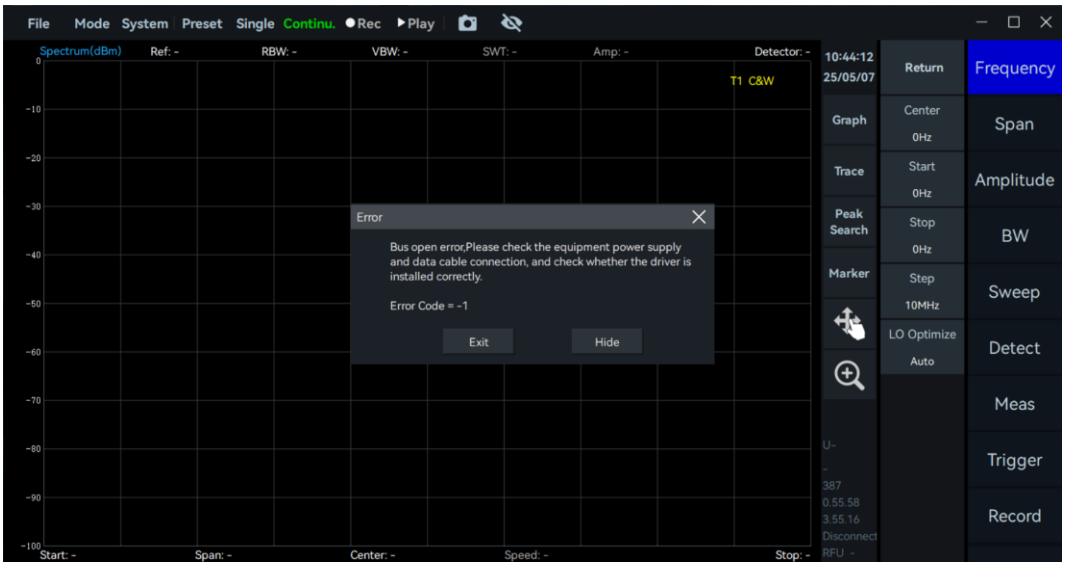
environment (such as Wi-Fi). Therefore, seeing some signals in the display is normal.

1.6 PX Device Abnormalities

1.6.1 Bus Open Error -1

Description:

As shown in the figure, the PX device displays a Bus Open Error -1 message.



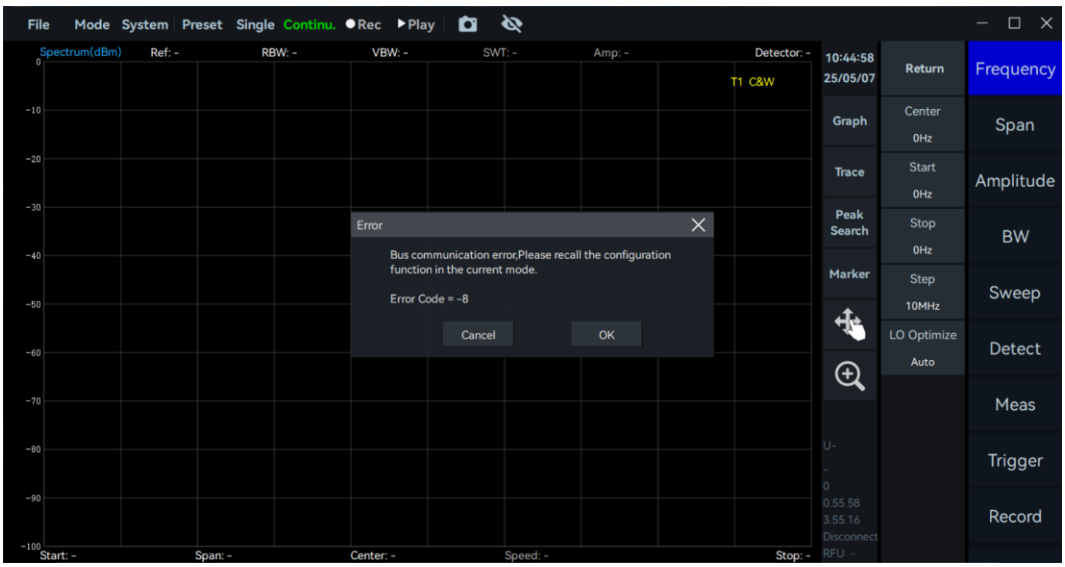
Troubleshooting Steps:

1. Restart the device and ensure it is not in a low-power state.

1.6.2 Bus Communication Error -8

Description:

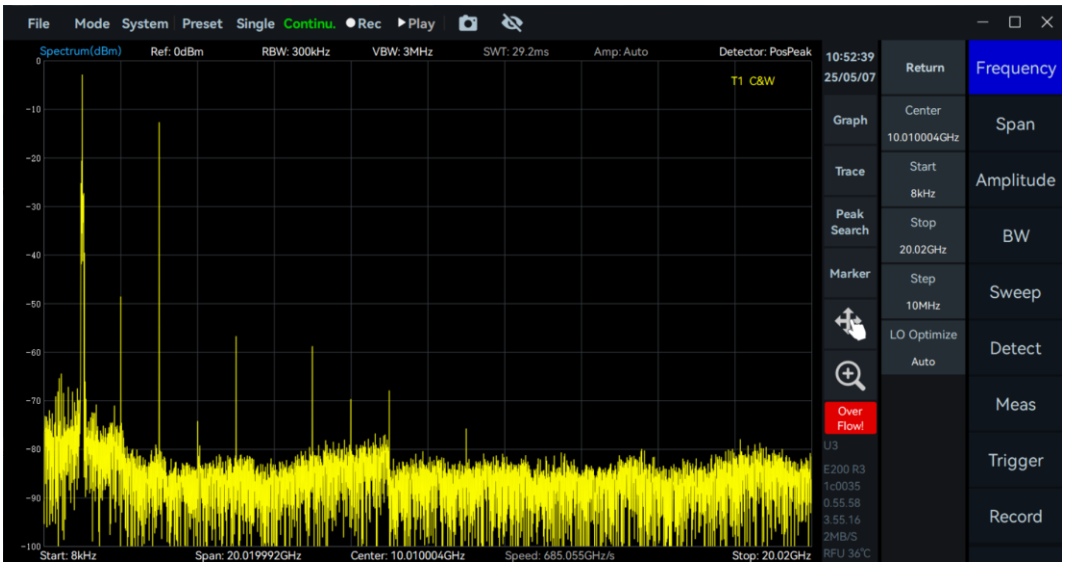
As shown in the figure, the PX device displays a Bus Communication Error -8 message.



Troubleshooting Steps:

1. Restart the device and ensure it is not in a low-power state.

1.6.3 Red Error Bar Displaying "Overflow!"



Troubleshooting Steps:

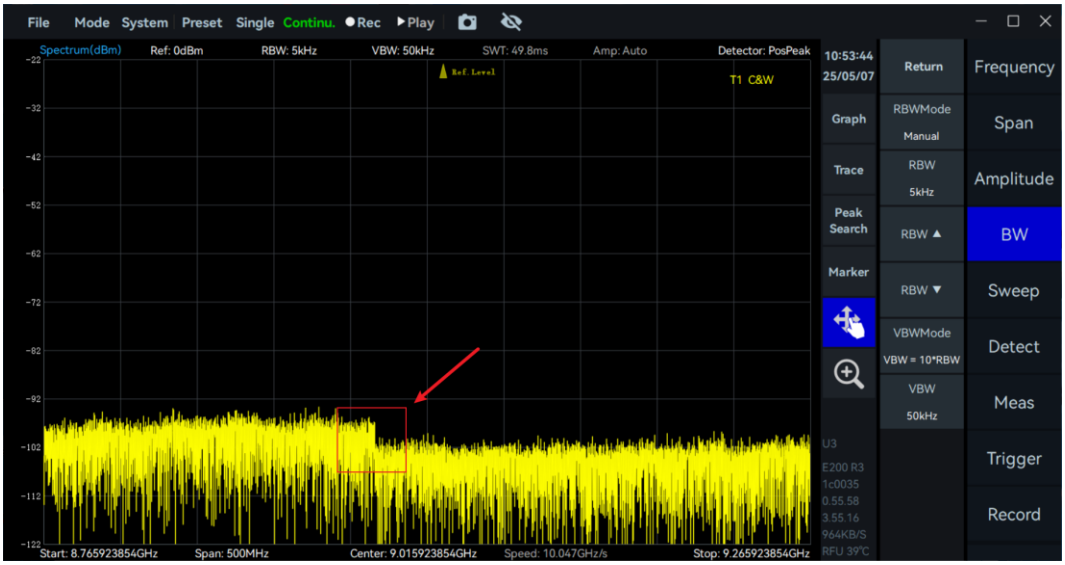
1. Follow the resolution steps in section 1.2.7.

1.7 PX Device Usage Deviates from Expectations

1.7.1 Sudden Step Change in Noise Floor in SWP Mode

Description:

As shown in the figure, under certain parameter configurations in SWP mode, the noise floor is uneven and exhibits sudden step changes.



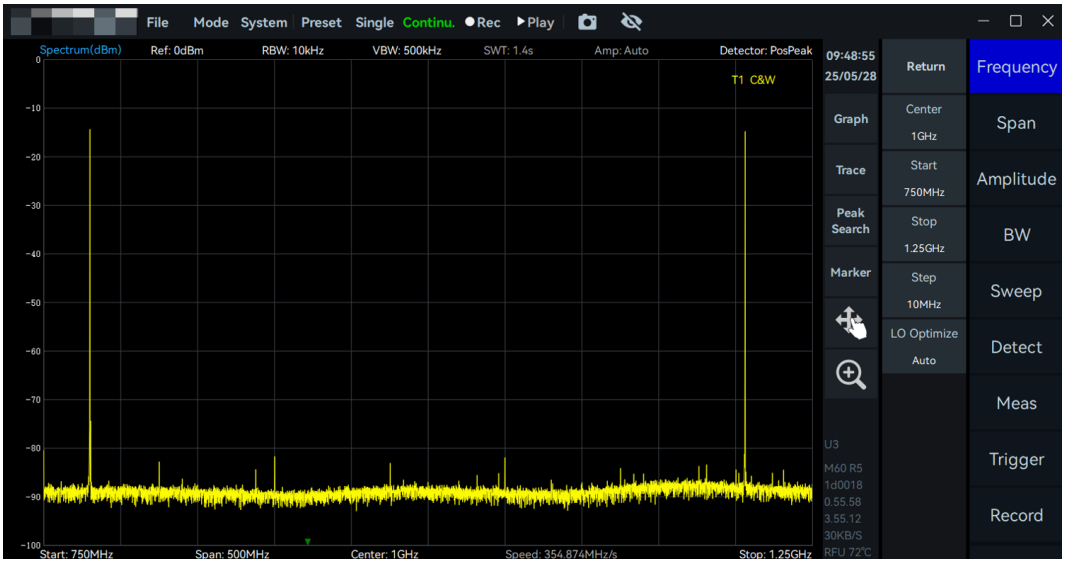
Troubleshooting Steps:

1. This phenomenon is normal. The sudden step changes correspond to the segmentation points in SWP mode scanning. If a signal is injected at the step change point, the signal amplitude and frequency remain accurate.

1.7.2 Double Peaks in Frequency Sweeping Signal in SWP Mode

Description:

As shown in the figure, when observing the frequency sweeping signal in SWP mode, a double peak phenomenon occurs.



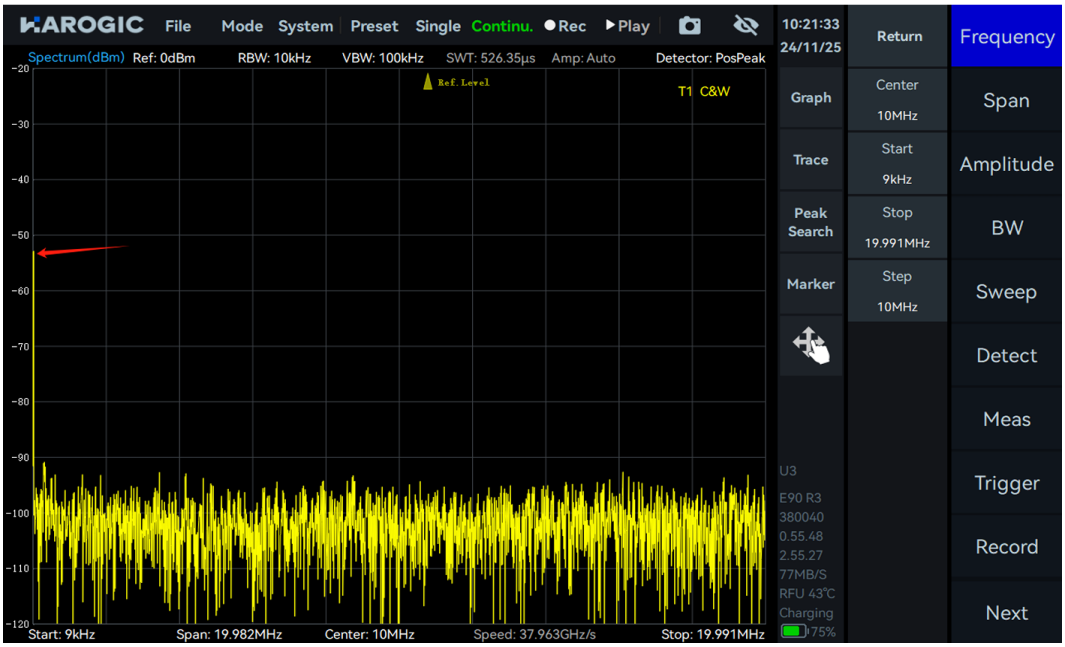
Troubleshooting Steps:

1. Follow the resolution steps in Section 1.5.2.

1.7.3 Interference Signal at the Start Frequency

Description:

As shown in the figure, an "interference signal" is sometimes observed at the start frequency in SWP mode.



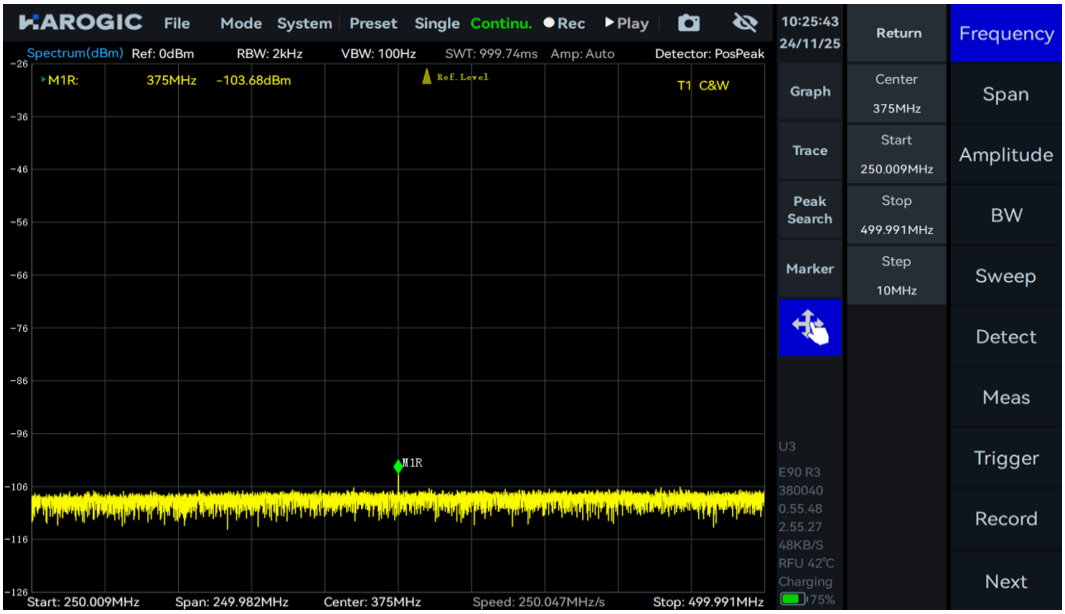
Troubleshooting Steps:

1. Follow the resolution steps in Section 1.5.5.

1.7.4 Interference Signal at 125MHz Harmonic Multiples

Description:

When using the device, interference signals appear at certain 125MHz harmonic multiples.



Troubleshooting Steps:

1. Follow the resolution steps in Section 1.5.6.

2. FAQ

2.1 API Usage and Development

Q: Explanation on Setting Intermediate Frequency (IF) Bandwidth Levels

A: When calling the API: Setting the AnaloglFBWGrade parameter to 0 selects the SAW (Surface Acoustic Wave) filter. Setting the AnaloglFBWGrade parameter to 1 selects the LC filter. Both the SAW filter and LC filter have a bandwidth of 100 MHz, and both are located after the ADC.

Differences between the two filters:

- LC Filter: Slightly worse out-of-band suppression, but better in-band flatness.
- SAW Filter: Better out-of-band suppression, but worse in-band flatness.

Q: What is the endianness of the device's raw acquired IQ data?

A: little-endian.

Q: In RTA mode, is the amplitude variation linear?

A: The amplitude variation is not linear, but the amplitude deviation is guaranteed to remain within the specified range.

Q: Is there a function in the API to modify the IP address of NX devices?

A: NX series devices have two default IP addresses from the factory: 192.168.1.100 (non-modifiable) and 192.168.3.100 (modifiable). You can use the Device_SetNetworkDeviceIP_PM1 function to operate on the modifiable IP.

Q: In a scenario where a signal is present, can the API separately obtain the device's pure noise floor data?

A: Currently, it is not possible.

Q: When the RxPort parameter (RF input port) in SWP_Profile_TypeDef is configured

as InternalPort, can it block external signal reception and switch to receiving internal signals?

A: Yes, but this function is only supported on spectrum analyzer devices equipped with the signal source option.

Q: When calling the API, will configuring only some parameters affect the normal operation of the device?

A: No.

Q: Is there currently an API interface for afterglow time?

A: No. At present, only the acquisition time can be set. The specific depth of the probability density plot needs to be drawn according to requirements after obtaining each frame of the probability density plot.

Q: How to plot a probability density graph in RTA mode

A:

1. Drawing Spectrum Trace:

In RTA mode, the parameter SpectrumTrace[] returned by the functions RTA_GetRealTimeSpectrum or RTA_GetRealTimeSpectrum_Raw is a power array formed by concatenating multiple spectrum trace frames.

1). A total of FrameInfo.PacketFrame frames are returned, with each frame containing FrameInfo.FrameWidth points;

2). Total number of points:

FrameInfo.PacketValidPoints = FrameInfo.FrameWidth * FrameInfo.PacketFrame;

3). Each frame represents a complete spectrum trace.

2. Drawing the Frequency Axis:

1). Start frequency: FrameInfo.StartFrequency_Hz;

2). Stop frequency: FrameInfo.StopFrequency_Hz;

3). Number of points per frame: FrameInfo.FrameWidth;

4). Frequency range:

FrequencyRange = FrameInfo.StopFrequency_Hz - FrameInfo.StartFrequency_Hz;

5). Frequency step:

FrequencyStep = FrequencyRange / (FrameInfo.FrameWidth - 1);

3. Drawing the Power Axis

1). Relative power: SpectrumStream[];

2). Absolute power:

SpectrumStream[] * PlotInfo.ScaleTodBm + PlotInfo.OffsetTodBm;

When plotting the spectrum trace, you can display only the first frame on the UI — that is, use only the first FrameInfo.FrameWidth points of the absolute power array for display.

4. Drawing the Probability Density Plot

In RTA mode, the parameter SpectrumBitMap[] returned by the function RTA_GetRealTimeSpectrum represents the hit count array for each pixel in the probability density plot. Each element indicates the number of "hits" (occurrences) at that pixel.

1). Image width(number of columns): FrameInfo.FrameWidth;

2). Image height(number of rows): FrameInfo.FrameHeight;

3). Array length: FrameInfo.FrameWidth * FrameInfo.FrameHeight;

5. Frequency Axis

Refer to the frequency axis drawing method described in "Drawing Spectrum Trace".

6. Power Axis

Each vertical pixel position *y* corresponds to a power value (in dBm):

P_dBm = y * RTA_PlotInfo.ScaleTodBm + RTA_PlotInfo.OffsetTodBm

7. Drawing Procedure

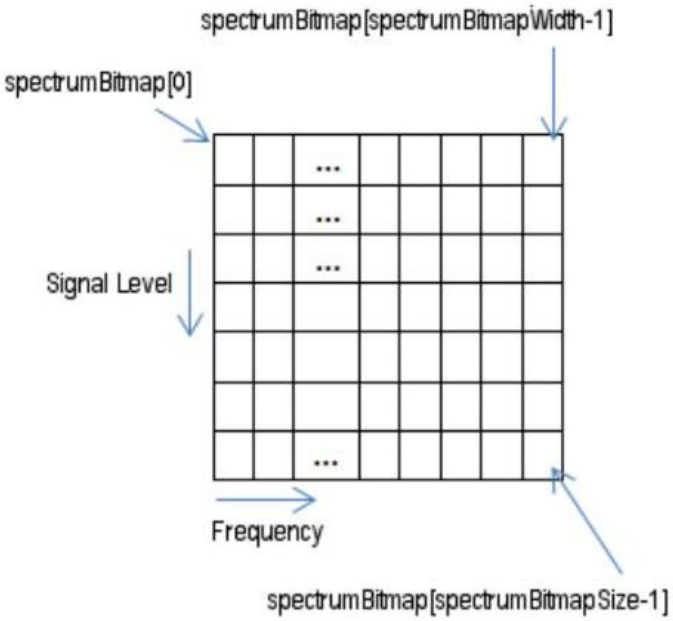
Split the SpectrumBitMap[] array into rows, with each row containing FrameInfo.FrameWidth elements.

Alternatively, reshape it into a 2D array of size [FrameInfo.FrameHeight]

[FrameInfo.FrameWidth] for display;

Draw FrameInfo.FrameHeight rows continuously, following a top-to-bottom, left-to-right order;

The first element (index 0) corresponds to the top-left pixel, and the last element corresponds to the bottom-right pixel.



Q: What is BusTimeout_ms? How should BusTimeout_ms be set?

A: This parameter only applies to IQS / DET / RTA modes.

BusTimeout_ms controls the timeout duration for acquiring data. If the device does not return data within the specified time, error code -10 (timeout) will be thrown. If the host requests data faster than the device can acquire it, the request will wait until the timeout occurs.

BusTimeout_ms can be set as: Points per packet * (Decimation factor / Sampling rate).

Common values for points per packet: Complex16bitIQ: 16242, Complex8bitIQ: 32484, Complex32bitIQ: 8121.

Recommendation: Leave some margin when setting this parameter, and avoid configuring it at the theoretical limit. For example, set it to 2× the theoretical timeout value.

Q: What is the difference between Device_QueryDeviceState() and Device_QueryDeviceState_Realtime()?

A: Both functions can obtain the device status, including device temperature, hardware operating status, and geographic time information (requires option support). The difference is:

Device_QueryDeviceState(): Non-realtime acquisition. It obtains the device status directly from the device pointer without communicating with the device.

Device_QueryDeviceState_Realtime(): Realtime acquisition. It obtains the device status by communicating with the device data interface through the USB interface.

Q: In IQS mode, when collecting 10 million points, which trigger mode is faster?

A: The Adaptive and FixedPoints trigger modes have no difference in data acquisition speed under the same parameter configuration. The data transfer rate is: Native Sampling Rate / Decimation Factor * 2 * Bytes per Sample. Therefore, the transfer speed is independent of the trigger mode; it only depends on the native sampling rate, decimation factor, and data format.

Q: In SWP mode, when calling the SWP_GetPartialSweep() function, what is the time required to obtain spectrum data, and what is the length of each spectrum frame?

A: The time required to obtain spectrum data and the length of each spectrum frame when calling SWP_GetPartialSweep() depend on parameter configurations such as RBW, trace points, sweep span, and trace strategy. They are not fixed values.

Q: In SWP mode, after calling SWP_GetFullSweep() to obtain spectrum data, why is the data not the latest if I call SWP_GetFullSweep() again after some time?

A: When SWP_Configuration() is called, several additional spectrum frames are collected. If SWP_GetFullSweep() is called again after some time, the first few frames obtained may not be the latest. However, from the second call onward, all spectrum data retrieved will be the latest. The number of extra frames collected depends on the

parameter configuration and is not a fixed value.

Q: How should I choose among the Flattop, Blackman_Nuttall, and LowSideLobe window types?

A:

- Flattop Window: Provides the highest amplitude accuracy, used for power measurements.
- Blackman-Nuttall Window: Offers higher frequency selectivity, used in dense spectrum separation, radar signal processing, and frequency accuracy measurements.
- LowSideLobe Window: Provides higher measurement accuracy for low-frequency signals and strong leakage suppression, used when detecting weak signals under strong interference.

Q: With only one device, is it supported to use the software while calling the API at the same time?

A: Not supported for now. It is not allowed to call two different or identical functions simultaneously, nor to open two or more instances of the software at the same time.

Q: Can the trigger edge be set to falling edge trigger?

A: Yes.

Q: When using SWP mode to obtain spectrum data, what is the minimum sweep span that can be set?

A: 100 Hz.

Q: When calling the API to obtain spectrum data in SWP mode, is it possible to get timestamp and geographic coordinates information?

A: Yes. When obtaining spectrum data, an auxiliary information structure (MeasAuxInfo_TypeDef) is returned simultaneously, which includes the absolute

timestamp (AbsoluteTimeStamp) as well as geographic coordinates (Latitude, Longitude).

Q: What is the function of VBWMode? Does it affect the scan speed?

A: The function of VBWMode is to set the VBW. Setting VBW smooths the trace; the smaller the VBW, the more obvious the smoothing effect on the signal, but the slower the scan speed. For a detailed explanation of this parameter, please refer to the *API Programming Guide*.

Q: When using the software, will the RBW setting be affected by different VBWModes?

A: No.

Q: In the API call of the Device_AnysisGNSSTime() function, is the parameter ABSTimestamp in seconds?

A: Yes.

Q: When using the GNSS module, if the GNSS antenna has successfully locked, will the files recorded by SAStudio4 include GNSS information?

A: Yes, the recorded files will include GNSS information, which consists of UTC time, longitude, and latitude.

Q: Which operating systems are supported by NX/SA series devices?

A: NX/SA series devices support the following operating systems: Windows 11/10/8/7 (32-bit / 64-bit, AArch64), Debian 12/11/10 (64-bit, AArch64), Ubuntu 24.04 / 22.04 / 20.04 / 18.04 (64-bit, AArch64), Kylin Desktop OS V10 (AArch64 architecture).

Q: What are the differences among the three DC suppression options: enabling high-pass filter, enabling manual bias, and enabling automatic bias?

A: DC suppression is only required when the analysis bandwidth is 100 MHz.

- Enable High-Pass Filter: Completely suppresses the DC spurious signal, but part of the actual signal will also be lost.
- Enable Automatic Bias: Uses the internal API algorithm to suppress the DC spurious signal without losing the real signal. However, the suppression effect can only reach about -50 dBc, and some residual DC drift will remain.
- Enable Manual Bias: Requires manual adjustment of the DC suppression I-channel and Q-channel bias values. The method is to adjust one channel's bias until the suppression effect no longer improves, then adjust the other channel, repeating the process until optimal suppression is achieved. This can achieve better suppression than automatic bias.

Additionally, both automatic and manual bias suppression effects are influenced by device temperature, as the temperature rises, the suppression performance decreases.

Q: In SWP mode, can the sampling rate parameter be set directly?

A: No. In SWP mode, the sampling rate is determined by the current parameter configuration.

Q: In SWP mode, can the number of sampling points be adjusted?

A: No. Only the number of trace points can be set.

Q: Can the API be called without connecting the device?

A: No. It is only supported when the device is properly connected.

Q: When using the API or the software, is it possible to directly set the attenuation and gain values?

A: The device's attenuation and gain are linked to the reference level and cannot be manually set.

- Attenuation details:

The reference level is calculated as: Reference Level = Attenuation – 10.

In the API, the parameter SWP_ProfileIn.Atten sets the attenuation value. The default

value is -1, which means automatic attenuation configuration. The attenuation range is 0–33 dB.

If you configure the reference level while setting the attenuation to a value > –1, the API will prioritize mapping the attenuation to the reference level, ignoring the manually set reference level: Reference Level = Attenuation – 10

- AGC details:

When the reference level is below –30 dBm, the device automatically decides whether to enable the preamplifier based on the current configuration. The gain amount cannot be manually controlled

Q: Is RBW=20 MHz supported?

A: Not supported at present.

Q: What is the unit of the frequency data obtained by the receiver?

A: Hz.

Q: Can the device be restarted (power cycled) using the software or API?

A: Currently, it is not possible to restart the device through the software or API.

Q: How can I obtain the full sweep span of the device currently connected to the host computer?

A: After calling SWP_ProfileDeInit, StartFreq_Hz to StopFreq_Hz represents the full sweep span of the current device.

Q: What IQ data precisions are available? How should they be set when calling the API in IQS mode?

A: Three precisions are supported: 8-bit, 16-bit, and 32-bit. The IQ data precision is controlled by setting the data format (IQS_ProfileIn.DataFormat).

- When IQS_ProfileIn.DataFormat = Complex16bit, the IQ data precision is 16-bit, and the data type is int16_t.

- When IQS_ProfileIn.DataFormat = Complex32bit, the IQ data precision is 32-bit, and the data type is int32_t.
- When IQS_ProfileIn.DataFormat = Complex8bit, the IQ data precision is 8-bit, and the data type is int8_t.

Q: What is the difference between the IQ data obtained through the API and the IQ data displayed in the software?

A: The IQ data in the software is displayed in microvolts (uV), while the IQ data obtained through the API is raw IQ data without units. To convert the raw IQ data to volts (V), multiply it by IQS_ScaleToV.

Q: What are the uses of Detector Analysis mode and Real-time Spectrum Analysis mode?

A: Detector Analysis mode: Reflects the time-power (dBm) relationship of the signal.

Real-time Spectrum Analysis mode: All time-domain data is used for spectrum processing without any signal loss.

Q: Is the channel power function the sum of the power within the channel?

A: Channel power is defined as the total power within the defined channel bandwidth of a given channel.

Q: The data values obtained in IQ mode are very small. Will this affect performing FFT?

A: Small IQ data values do not affect FFT. However, if there is no signal input, the data format is Complex16bit, and the decimation factor is large, the 16-bit IQ data precision may be insufficient, causing a large number of zeros in the IQ data. This can affect FFT. But if there is a signal input within the bandwidth, the signal display will not be affected. Therefore, under large decimation factors, it is recommended to set the data format to Complex32bit.

Q: In Linux, when using the Qt example, it shows that the library file cannot be found. What should I do?

A: Please ensure that the library file you are using matches the architecture of the Linux system.

Q: In SWP mode, is it normal that the data obtained through the interface appears wider?

A: Yes, this is normal. For a detailed explanation of the reason, please refer to Section 1.3.3 of the *Troubleshooting Guide*.

Q: In SWP mode, can the center frequency be modified directly without calling the SWP_Configuration function?

A: Not supported at present.

Q: Will data loss occur in FixedPoints mode?

A: Yes. In FixedPoints trigger mode, a fixed number of data points are collected after a trigger arrives. If the next trigger comes after the fixed number of points has been collected, there will be a time gap between the end of collection and the arrival of the trigger, and the data within this gap will be lost.

Q: What is the difference between Free Run and Bus Trigger as trigger sources?

A: Free Run does not require a trigger, while Bus Trigger requires a software trigger on either the rising or falling edge to acquire data.

Q: What is the relationship between RBW and frequency spacing?

A: RBW = Frequency Spacing * Window Factor / Trace Detect Ratio (under the condition of no zero padding). Window Factor: 3.77 for Flattop, 1.976 for Nuttall. Trace Detect Ratio: The value of TraceDetectRatio in the SWP_TraceInfo_TypeDef structure.

Q: In SWP mode, a stepped spectrum appears in non-DS segments. Is this normal?

A: Yes, this phenomenon is normal. The steps are segmentation points during the sweep, and the power values at these frequency points are correct. This does not affect normal device operation.

Verification method: Input a single-tone signal at this frequency point and observe that the power at this frequency is accurate.

Q: In SWP mode, under the default FFT strategy, what is the relationship between RBW and the FFT platform?

A: In SWP mode, under the default FFT strategy:

- When RBW < 40 kHz, processing is handled by the CPU, which consumes local resources.
- When RBW ≥ 40 kHz, processing is handled by the FPGA.

The specific processing steps include: VBW, detection, spurious suppression, FFT, and trace detection.

Q: After AM/FM demodulation, is the data still digital IQ?

A: No, after demodulation the data is no longer IQ data, but it is still a digital signal.

Q: Which parameters affect the actual number of trace points returned?

A: The main parameters are TracePoints, RBW, and Span.

Q: How can IQS control the device to acquire data for a specified duration?

A: Set TriggerMode to FixedPoints mode, and set TriggerLength to the specified duration in seconds / (8 ns * DecimateFactor).

Q: How does the preview time in SAStudio4 correspond to the *TriggerLength* parameter set via the API?

A: The conversion between the preview time and TriggerLength is related to the decimation factor and sampling rate. The relationship is as follows:

$$\text{PreviewTime} = \text{TriggerLength}* \frac{\text{DecimationFactor}}{\text{NativeSampleRate}}$$

Introducing API parameters:

In IQS mode:

$$\text{PreviewTime} = \text{IQS\_ProfileIn.TriggerLength}* \frac{\text{IQS\_ProfileIn.DecimationFactor}}{\text{IQS\_ProfileIn.NativeSampleRate\_SPS}}$$

In DET mode:

$$\text{PreviewTime} = \text{DET\_ProfileIn.TriggerLength}*\text{StreamInfo.TimeResolution}$$

Q: How can IQ raw data be converted into power spectrum data in dBm?

A:

Please refer to the following formula:

$$\text{dBm} = 10\log_{10}((\text{I}^2 + \text{Q}^2)*\text{IQS\_ScaleTo}V^2) + 10\log_{10} 20 + \text{w-}20\log_{10} \text{FFTSize}$$

w: Window compensation value = 13.3279

Use this value if you apply a window function through the DSP_GetWindow() function.

(If you use a custom window, please account for its compensation value accordingly.))

FFTSize: Number of valid FFT points.

Additional note: The IQ data obtained from functions such as IQS_GetIQStream, IQS_GetIQStream_PM1, or IQS_GetIQStream_Data are dimensionless raw values.

To convert them into voltage values, multiply both the I and Q data by the ScaleToV coefficient.

Q: Can NX devices and SA devices use the same library?

A: Yes.

Q: Are the versions of the dynamic library, API, Software, MCU, and FPGA backward compatible?

A: Compatibility is ensured when the major and minor version numbers are the same.

1. Special case for Software:

When the major and minor version numbers are 3 and 55, respectively, the highest subversion of Software is backward compatible.

2. Version number explanation:

1). Example 1:

- API version: 0.55.12
- MCU version: 0.55.5
- FPGA version: 0.55.6
- Software version: 1.55.76
- Compatible, since the major version ("0/1") and minor version ("55") match.

2). Example 2:

- API version: 0.54.55
- MCU version: 0.55.5
- FPGA version: 0.55.6
- Software version: 1.55.76
- Not compatible, because the API's minor version ("54") differs from the others ("55").

Q: How can I convert the acquired IQ signals in volts to spectrum in LabVIEW?

A: The DSP_FFT_IQSToSpectrum.vi is provided to convert IQ signals to spectrum.

Q: When calling the Devcie_SetFreqResponseCompensation function to perform amplitude compensation for a certain frequency band, are the correction values the same for different reference levels, and only related to frequency?

A: In theory, it has nothing to do with the reference level, only with the frequency.

Q: When cross-compiling ARM programs in an x86 Linux virtual machine, should I install ARM libraries or x86 libraries?

A: You need to install ARM libraries.

Q: Is the saAPI library provided for the x64 platform?

A: Yes, it is provided by default along with the materials shipped with the device.

Q: When calling the API, are there any differences in parameter configuration between SWP_GetFullSweep() and SWP_GetPartialSweep() for obtaining spectrum data?

A: There is no difference.

Q: Why are there many negative frequencies during SWP acquisition, and is it possible to acquire only the data from the start to stop frequency?

A: When acquiring spectrum data, the default result includes some extra data beyond the start and stop frequencies. You can use the DSP_InterceptSpectrum function to intercept the desired spectrum range.

Q: How to reduce the noise floor?

A: Reduce the reference level and RBW to lower the device noise floor.

Q: Is IQ data acquired through IQS_BusTriggerStart?

A: It is acquired through IQS_GetIQStream. For explanations of each function in the API, please refer to the "API Programming Guide."

Q: Does the API support wavelet transform?

A: Not supported at the moment.

Q: Why are the spectrum data waveforms obtained from SWP mode and IQS mode different?

A: Different reference levels, RBW, and other parameters will affect the waveform. Please try to ensure the comparison is under the same configuration.

Q: After acquiring IQ data and performing FFT, is there a provided method to view the spectrum?

A: No plotting examples are provided. Only interfaces for acquiring IQ data and examples of converting IQ data to dBm are available.

Q: Besides using the FFTW3 open-source library to correctly draw the spectrum after converting IQ to spectrum, are there other ways to perform the conversion and plotting?

A: IQ-to-spectrum conversion can be done correctly using FFTW3, Liquid, or MKL

libraries.

Q: When calling saAPI, SA_OpenDevice and IQS_Extend_Configuration both return status 0, but IQS_GetIQStream returns -8.

A: If using bus trigger, you need to call IQS_SoftTRGStart first before acquiring data. For external trigger or other trigger modes, you also need to provide a trigger signal to the device, otherwise it will not capture data.

Q: Why does the IQ data collected by the mk2 device show one channel with all positive values and the other with all negative values?

A: Because the mk2 device has DC offset, you need to perform DC offset removal first.

Q: How does the detector work, and how many samples are needed for calculation?

A: According to the detector characteristics, detection is performed point by point across multiple frames of data, and finally a feature value frame is generated. For detailed explanations, please refer to the "API Programming Guide."

Q: Is an API provided for Linux?

A: By default, three Linux libraries are provided: aarch64, armv7, and x86_64.

Q: How to convert IQ data into spectrum data?

A: Please refer to the example DSP_IQSToSpectrum.cpp in the folder Windows\HTRA_API_Example\HTRA_C++_Examples\HTRA_C++_Examples\HTRA_C++_Examples included with the shipped materials.

Q: Does the htra_api library in Linux distinguish between ARM and x86?

A: Yes. Please refer to the folders under \Linux\Install_HTRA_SDK\htraapi\lib in the shipped materials, which correspond to the htraapi libraries for different processors.

Q: How to control device gain when acquiring data?

A: The device does not support direct gain settings. Gain is linked to the reference level.

When the reference level is about -30 dBm and the preamplifier is in auto mode, the device will automatically enable the preamplifier depending on the frequency band. For example, on the SAE-90, when the reference level is -30 dBm, the preamplifier will be enabled, providing a gain of 15.5 dB for non-DS bands (90 MHz–9.5 GHz).

Q: After synchronizing the reference clocks of multiple spectrum analyzer modules, can the acquired IQ or spectrum data be seamlessly stitched?

A: Spectrum data can be stitched, but care must be taken to avoid placing the signal exactly at the boundary between two devices, otherwise the signal shape may be distorted. IQ data cannot be stitched, because stitching requires strict phase alignment between IQ waveforms, which cannot be ensured by clock synchronization alone.

Q: When calling the API, does the RBW return value represent the configured value or the value calculated from span/actual trace points?

A: It returns the configured value. RBW calculation does not directly depend on span or actual trace points, but also involves windowing and zero-padding.

The calculation formula is:

$$\mathrm{RBW} = \frac{\mathrm{Fs}}{\mathrm{D} * \mathrm{Samples}} * \mathrm{ENBW}$$

Where: Fs: sampling rate; D: decimation factor; Samples: actual number of samples used for FFT; ENBW: window factor (main lobe width, also known as equivalent noise bandwidth).

Q: What is the unit of AbsoluteTimeStamp in the MeasAuxInfo_TypeDef structure?

A: The unit is seconds. You can call the Device_AnysisGNSSTime function to parse it into year, month, day, hour, minute, and second.

Q: Can code written on Windows that calls the API be used on Linux Ubuntu?

A: Yes. The libraries provided for Linux and Windows are synchronized. However, you need to confirm whether your code references Windows-only headers or libraries

(such as Windows.h). If such dependencies are included, the code cannot be used directly on Ubuntu.

Q: In IQS mode, how to acquire data of a fixed duration in FixedPoints trigger mode?

A: The FixedPoints mode collects data by point count, which indirectly achieves fixed-duration acquisition. The duration can be calculated based on the sample rate, decimation factor, and trigger point count:

$$T = \frac{1}{Fs} * D * Triggerlength$$

where: Fs: sample rate; D: decimation factor; Triggerlength: number of sampling points after triggering.

Q: Can parameter configuration functions be called multiple times when using API functions?

A: Yes. Except for Device_Open and Device_Close, all other functions can be called multiple times. However, you must follow the logical sequence described in the "API Programming Guide" and ensure that only one function call is executed at a time. Additionally, after each Device_Open execution, you must call Device_Close once to properly close the device.

Q: Can the software or API provide signal-to-noise ratio (SNR)?

A: Not supported at the moment.

Q: What is the difference between the detector and the trace detector in SWP mode?

A:

- Detector: At the same local oscillator frequency point, multiple frames of data are acquired and detected point by point according to detector characteristics, and a feature value frame is finally generated.
- Trace detector: Based on the selected trace detector, detection is performed across the entire spectrum trace at trace-detector intervals, generating a feature value trace.

Q: In software IQ mode, with full span and FixedPoints as the trigger mode, how

should the external trigger period and preview time be set to avoid error -10?

A: The preview time must satisfy the following relationship:

$$\text{PreviewTime} = \frac{\text{External Trigger Period}}{2} * 0.8$$

Q: When the reference level is reduced from -10 dBm to -20 dBm, does the internal device gain increase by 10 dB?

A: Yes.

Q: When using a new spectrum analyzer, does the existing program need to be recompiled due to replacement of calibration files?

A: No recompilation is needed. You only need to copy all calibration files from the CalFile folder included with the new device into the program's CalFile folder.

Q: Can sweep time be obtained, and how are trace sweep time and frame sweep time calculated?

A:

- When SweepTimeMode = SWTMode_Manual, the trace sweep time equals the set SweepTime value (minimum 0.1 s). In other modes, it can only be calculated by adding timers before and after Get.
- Frame sweep time = Trace sweep time / TraceInfo.TotalHops.
- Note: TraceInfo.FrameTime represents the acquisition time of each frame by the device, excluding FFT, data transfer, and other processing delays.

Q: Is there an AM demodulation example?

A: Yes. The DSP_AMDemod.cpp example for AM demodulation can be found in the folder: \Windows\HTRA_API_Example\HTRA_C++_Examples\Htra_Demodulation\Htra_Demodulation.

Q: How to convert the acquired two-channel IQ data into voltage values in volts?

A: Multiply each of the two acquired IQ data channels by IQStream.IQS_ScaleToV to convert them into voltage values.

Q: When continuously acquiring IQ data, should the API interface be called in a loop? What is the recommended calling interval?

A: Yes, you need to continuously call the Get function in a loop. Each packet of IQ data contains 16,242 points, so the sampling time for each packet is:

$$T=16242*\frac{\text{DecimationFactor}}{\text{SampleRate}}$$

Q: In Adaptive configuration, is the data also acquired through IQS_GetIQStream_Data?

A: Yes, both FixedPoints and Adaptive modes use the same acquisition function.

Q: How to configure parameters for real-time acquisition of IQ data, for example, 20 seconds?

A: Set TriggerMode to Adaptive and use the default Bus as the trigger source. The decimation factor should be configured according to the required bandwidth, with a maximum of 2 decimation / 50 MHz bandwidth (USB3.0).

Q: Can the analysis bandwidth in IQS mode be set? If so, which variable in IQS_Profile corresponds to it?

A: Yes, it can be set indirectly through the decimation factor. 1 decimation corresponds to 100 MHz, 2 decimation to 50 MHz, and the decimation factor range is 2^0 to 2^12.

Q: Can FM and AM demodulation interfaces directly return a sine wave?

A: If the input FM or AM signal is a modulated single-tone signal, then the demodulated result will be a sine wave.

Q: Why does RBW affect the noise floor?

A: The noise floor is the total noise power within the RBW bandwidth. Therefore:

- When RBW decreases, the total power within the bandwidth decreases, and the noise floor lowers.
- When RBW increases, the total power within the bandwidth increases, and the noise floor rises.

Q: How to calculate the time of each frame in RTA mode?

A: After calling RTA_Configuration, use the parameters in the RTA_FrameInfo_TypeDef structure to calculate:

- FrameInfo.PacketAcqTime / FrameInfo.PacketFrame;
- FrameInfo.TimeResolution × FrameInfo.FFTSize.

Q: What is the difference between Adaptive and FixedPoints trigger modes?

A:

- FixedPoints: After the rising edge of the trigger, the device acquires a fixed number (TriggerLength) of IQ points. It does not respond to new triggers during acquisition, and waits for the next trigger after completion.
- Adaptive: After the rising edge of the trigger, acquisition starts and continues until the falling edge of the trigger. The acquisition length is determined by the duration of the trigger high level.

Q: How to draw the time axis of an IQ waveform?

A: The first IQ point corresponds to time 0. The time interval between adjacent IQ points is determined by the sampling rate. For example:

- At 1 decimation, the sampling rate is 125 MHz, so the interval is 8 ns.
- At 2 decimation, the sampling rate is 125 MHz / 2, so the interval is 16 ns.
  The total duration of the time axis is (Number of IQ points * Point interval).

Q: Can the device acquire and store IQ data for 2–3 seconds continuously over 30–108 MHz?

A: Currently, the device cannot continuously acquire and store IQ data for 2–3 seconds

when the bandwidth exceeds 50 MHz.

Q: Can the device acquire only a single IQ point? Can the IQS mode bandwidth be set to 0?

A: No. A minimum of 32 IQ points are acquired per capture in IQ mode; the minimum bandwidth in IQS mode is 125 MHz / 4096 ≈ 30.5 kHz.

Q: Is there a function to apply power compensation to the spectrum?

A: Yes. The Devcie_SetFreqResponseCompensation function can be used. For details, refer to the "API Programming Guide".

Q: I encounter errors when using libraries other than htra_api.

A: Please refer to the programming documentation of the respective library.

Q: MATLAB crashes when running the SWP example.

A: First check whether Device_Open returns Status = 0. If it is non-zero, look up the specific error code and follow the corresponding handling steps described earlier in this document.

Q: In SWP mode, why is the reference level setting ineffective? I set it to 0, but it returns −10.

A: When Attenuation ≥ 0, the reference level is computed automatically as ReferenceLevel = Attenuation − 10, and manual settings are ignored. Only when Attenuation is set to −1 can you manually specify the reference level (this mechanism has been optimized).

Q: How do I configure RBW in SWP mode?

A:

- RBW_Auto: RBW is calculated automatically by RBW = Span / 2000.
- RBW_Manual: RBW is set by the user; the actual value equals the configured

parameter, as long as it's within the allowed range.

Q: Why can't I run the Qt example?

A: Refer to the Qt section of the "API Programming Guide" to configure the Qt build and debugging environment.

2.2 Software Usage

Q: Does the software have requirements for computer screen resolution?

A: Yes. The minimum resolution required is 1280×800.

Q: Please provide the calculation method for the sweep speed in Software.

A: The sweep speed in SAStudio4 is calculated by using timestamps at the lower level to measure the total frequency span swept within one second. The sweep speed is determined according to the following formula:

$$\text{Sweep Speed} = \frac{\text{Total Frequency Span}}{1\ \text{s}}$$

Q: What are the differences between the trace points parameter and the actual trace points parameter in the software?

A: The trace points parameter is the expected value set by the user, while the actual trace points parameter is the real value adjusted by the device according to its internal strategy. The device acquires spectrum data based on the actual trace points.

Q: How to estimate the total number of spectrum points recorded by the software in SWP mode?

A: The formula is:

$$\text{Total points} = \frac{\text{Total recording time}}{\text{Trace sweep time}} * \text{Trace points}$$

where trace sweep time is the time required to acquire one trace, and trace points are the number of points contained in each trace.

Q: Can the recording function of the software include GNSS information and timestamps?

A: Yes. When the device has a GNSS option installed (optional for SA series, basic version included in NX/PX series) and GNSS has successfully locked onto satellites, the recorded files will contain GNSS information (latitude and longitude) and absolute

timestamps.

Q: When using the recording function of the software, how long can it record continuously?

A: In theory, there is no fixed time limit. As long as storage space is sufficient and an appropriate sampling rate is chosen based on the device model, recording can continue. For the specific maximum supported sampling rate, search the document for "maximum sampling rate" and refer to the specifications of each device series.

Q: In software, what is the maximum supported sampling rate for different device series when recording data in IQS mode?

A:

1. Fixed-duration recording mode

- SAN series (except SAN-400): default 7.8125 MHz (SAN-45), 31.25 MHz (SAN-60);
- SAM series: default 125 MHz; maximum 130 MHz;
- SAE / SAN-400: default 122.88 MHz; maximum 130 MHz;
- NXN series: default 7.8125 MHz;
- NXM series: default 125 MHz; maximum 130 MHz;
- NXE series / NXN-400: default 125 MHz; maximum 130 MHz;
- PXE / PXN series: default 122.88 MHz; maximum 130 MHz.

2. Manual recording mode

- SAN series (except SAN-400): default 7.8125 MHz (SAN-45), 31.25 MHz (SAN-60);
- SAM series: default 62.5 MHz; maximum 65 MHz;
- SAE / SAN-400: default 61.44 MHz; maximum 65 MHz;
- NXN series: default 7.8125 MHz;
- NXM series: default 7.8125 MHz; maximum 8.125 MHz;
- NXE series / NXN-400: default 7.68 MHz; maximum 8.125 MHz;

- PXE / PXN series: default 30.72 MHz; maximum 32.5 MHz.

Note: Some standard devices (E90/E200/N400) support adjustable native sampling rates in the range of 110 MSa/s to 130 MSa/s, hence the distinction between default and maximum sampling rates.

Q: In SWP mode, are channel power, phase noise, adjacent channel power ratio (ACPR), IM3, and occupied bandwidth measurements performed inside the spectrum analyzer or on the host PC?

A: These measurements are processed on the host PC.

Q: In software SWP / IQS mode, how to improve the frequency accuracy of test results?

A: Example signal: single-tone signal at 1 GHz, 0 dBm.

1. SWP mode:

- Method 1: Refer to the *Specification Test Document* for the frequency accuracy test method.
- Method 2: Improve accuracy by properly setting span, RBW, spurious suppression, trace point strategy, and trace points.
- Example 1: Span = 2 kHz, RBW = 20 Hz -> Peak ≈ 999.999228 MHz.
- Example 2: Span = 100 MHz, RBW = 10 kHz, Trace points = 200,000 -> Peak ≈ 999.999772 MHz.

2. IQS mode:

- With fixed span, frequency accuracy can be improved by adjusting preview points and FFT analysis points.
- Example: Span = 62.5 MHz, Preview points = 500,000, FFT points = 65,536 -> Peak ≈ 999.999523 MHz.

Q: In software DET mode, why does switching detectors not change the trace display?

A: When the detection ratio = 1, switching detectors may not affect the trace. Only

when the detection ratio is set to >1 will the trace display differ when changing detectors.

Q: In software SWP mode, why are phase noise test results inaccurate at 100 Hz and 10 MHz offsets?

A:

- At 10 MHz offset: If the sweep span is set to 2 MHz (not following the recommended parameters), the phase noise test can only measure up to 2 MHz offset. To measure up to 10 MHz offset, set the span to 2 * maximum offset = 20 MHz.
- At 100 Hz offset: Set the software's main frequency offset start value to less than 100 Hz (e.g., 99 Hz) to correct this issue.

Q: In software or when calling the API, how to ensure that the set trace points in SWP mode equal the actual returned trace points?

A：

1. TraceBinBW_Hz = RBW

When TracePointsStrategy_TypeDef is set to BinSizeAssined, the number of trace points is calculated as:

$$\text{Trace Points} = \frac{\text{Span}}{\text{RBW}}$$

This ensures that the frequency point spacing is exactly equal to the RBW,

but the scanning speed will be relatively slower.

2. TraceBinBW_Hz ≈ RBW

Refer to the example SWP_RBW_Spaced_Trace.cpp.

By properly setting the detection ratio, you can make the trace spacing approximately equal to the RBW.

Q: What is the reason for the 32.5 MHz maximum bandwidth limit in digital demodulation?

A: To ensure good EVM performance, the digital demodulation algorithm requires at least 4× oversampling. Except for the SAN-45 and SAN-60 series, other models have a maximum native sampling rate of 130 MSPS, hence the maximum demodulation bandwidth is limited to 32.5 MHz.

Q: In the software, can the playback function select file playback?

A: Yes. Please refer to the *SAStudio4 User Guide*, section "Streaming and Playback."

Q: Is the streaming function in the software the same as screen recording?

A: No, it directly records data.

Q: Can the recorded files from the software be read by other programs?

A:

1. IQ mode streaming data: Can be replayed using SDR#.
2. SWP, DET, RTA data: Currently can only be replayed in the software.

Additionally, we provide example code that can be used to read streaming data recorded in SWP, IQS, DET, and RTA modes. For detailed file format descriptions, please refer to the Recorded File Format Description document.

Q: When using the software in IQS mode with an external reference, how can frequency accuracy be improved?

A: Increase the preview points and FFT analysis points.

Q: In IQS mode, when adjusting preview points and FFT points, why does the error "Buffer Overflow, Please check the configuration" occur?

A: Please appropriately reduce the preview points and FFT points.

- Preview points: The amount of IQ data acquired by the device.
- FFT points: The number of data points selected for FFT processing.

When both are set too high at the same time, the host PC may not have enough performance to process the data in real time, which causes a buffer overflow error.

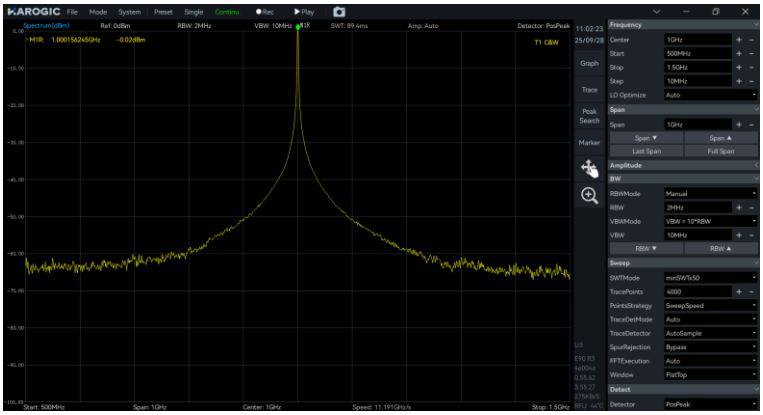
Q: How to test a pulse signal with a carrier frequency of 1 GHz, power of 0 dBm, pulse width of 40 µs, and pulse period of 80 µs?

A:

1. Measure the peak power of the pulse signal in SWP mode:

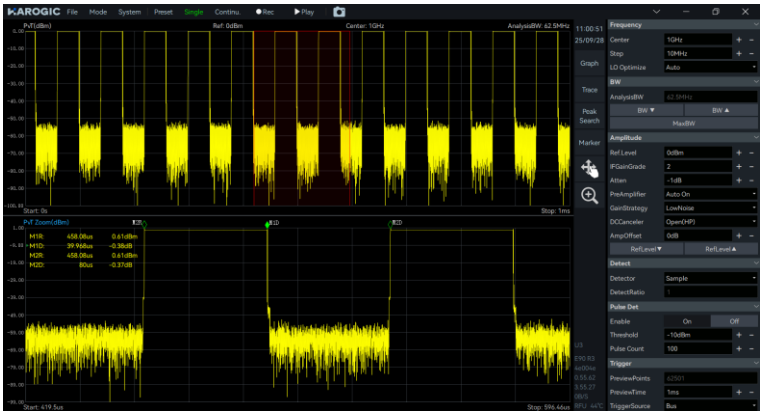
Open SAStudio4 and switch to SWP mode, then set the following parameters:

- Center Frequency: 1 GHz
- Span: 1 GHz
- RBW: 1 MHz
- Sweep Time Mode: minSWT×50
- Spurious Suppression: None
- Window Type: FlatTop
- Other parameters: default settings

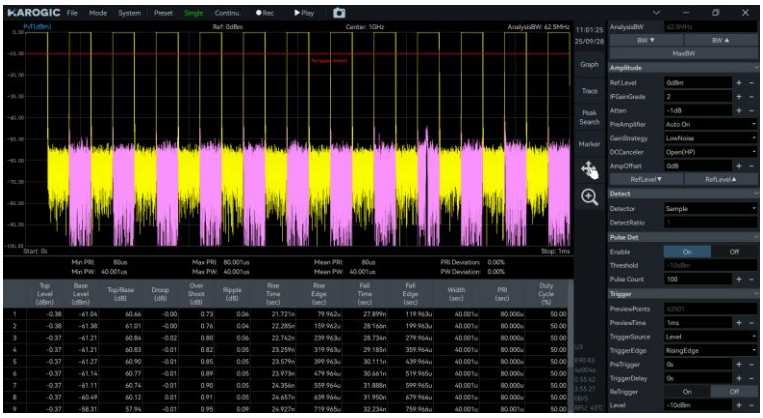


2. Measure the pulse signal in DET mode:

Open SAStudio4 and switch to DET mode. Set the center frequency to 1 GHz, enable Zoom, and activate two pairs of cursors to observe and measure the pulse width and pulse period of the signal.



In DET mode, use the pulse signal detection function to set the pulse signal. For detailed instructions, please refer to the "Pulse Signal Detection" section in the Software User Guide.



Q: Why is the trace sweep time in the software smaller than the frame sweep time?

A: Because the actual acquired span is often larger than the configured span.

- Trace sweep time: calculated based on the configured span.
- Frame sweep time: calculated based on the actual acquired span.

Therefore, when the spectrum consists of only one frame of data, the trace time may be smaller than the frame sweep time.

Q: Is version 38 of the software available for Linux?

A: Yes, it is provided.

Q: Can the software control two MK2 devices?

A: Currently not supported, and there are no development plans for this in the near

future.

Q: When using the software in Linux, why does stuttering occur periodically?

A: Because Linux performance is slightly lower than Windows, and if the screen resolution is higher than the resolution at which the software was compiled, it can also cause stuttering. However, this does not affect data transmission.

Q: After installing SAStudio4 on Ubuntu 24.04 / 22.04 / 20.04, the desktop icon cannot be used properly

A: Please install SAStudio4 by following the steps below**:**

1. Enter unzip SAStudio4.zip;
2. Enter cd SAStudio4 to enter the SAStudio4 folder;
3. Enter sudo sh install.sh to install SAStudio4;
4. After installation, enter ./app.sh to run SAStudio4. Once the software runs successfully, close SAStudio4;
5. Right-click the desktop icon and select "Allow Launching";
6. Double-click the SAStudio4 desktop icon to launch the software.

Q: How to set the scale of the power axis in the software?

A: Please refer to the *SAStudio4 User Guide*, the section on scales.

Q: How to modify the marker value in the software?

A: Please refer to the *SAStudio4 User Guide*, the section on markers.

Q: Does the actual trace points in the software correspond to FullsweepTracePoints in the SWP_TraceInfo_TypeDef structure?

A: Yes.

Q: How are sweep speed and trace sweep time calculated in the software?

A:

- Trace sweep time = Span ÷ Sweep speed.
- Sweep speed calculation: The system uses timestamps to count the total bandwidth swept within 1 second. For example, each time the Getpartial function is called, a portion of the bandwidth is acquired. Summing all acquired bandwidths within 1 second gives the total bandwidth. Then, sweep speed = Total bandwidth ÷ 1 s.

Q: Is it supported to observe spectra of different frequency bands on two screens?

A: It depends:

- Single spectrum analyzer: It is not possible to observe different frequency bands on two PCs simultaneously.
- Two spectrum analyzers + two PCs: Yes, each analyzer can be connected to a different PC, and each PC can observe a different frequency band.
- Two spectrum analyzers + one PC: Yes, both analyzers can be connected to different USB ports on the same PC to observe different frequency bands simultaneously.

Steps for case 3:

- Connect the first spectrum analyzer to a PC USB port and run the software in *Windows**Software**bin* provided with the package.
- Connect the second spectrum analyzer to another PC USB port, then modify the corresponding directory file *Windows**Software**configuration**Settings.ini* by changing DeviceNum=0 to DeviceNum=1, and run the software from the same path.
- Now both spectrum analyzers can run on the same PC, each displaying different frequency bands.

Q: Is a user guide provided for version 38 of the software?

A: Yes, it is provided.

Q: In the software, is the spectrum displayed above IQ mode obtained through the SWP_GetPartialSweep function?

A: No. IQ data is first acquired, and then the DSP_FFT_IQSToSpectrum function is used to perform FFT on the IQ data to obtain the spectrum.

Q: Do SAM-60 M3 and SAM-60 MK2 devices have Linux software?

A: SAM-60 MK2 does not have Linux software, but SAM-60 M3 does.

Q: In DET mode, is the maximum preview time limited to 20 ms?

A: Yes, the software restricts the maximum preview time in DET mode to 20 ms.

2.3 Device Feature

Q: Can the amplitude accuracy of all device series reach ±0.5 dB?

A: No. For specific amplitude accuracy, please refer to the corresponding product manual. However, users may attempt self-calibration to improve accuracy.

Q: What is the minimum input power for phase noise measurement?

A: The typical minimum input power for the phase noise function is −50 dBm.

Q: Which device series support SDR++?

A: As of now, all 55-version devices support SDR++. Other versions are not yet adapted.

Q: What are the frequency and level ranges for external triggering? Is external trigger related to duty cycle? Does it support microsecond-level trigger periods?

A:

1. Frequency range:
   - In software: Minimum pulse width is 2 ms, maximum pulse width is 2s (since BusTimeout_ms is fixed at 2 s and cannot be modified by the user).
   - In API: Minimum pulse width is 2 ms, maximum pulse width is 5 s.
2. Trigger level range: High level is 2.31 V to 3.3 V;
3. Relation to duty cycle: External trigger is not related to duty cycle;
4. Microsecond-level support: Supported-minimum period can reach 200μs, but it must meet the condition that the external trigger period is longer than a single acquisition time.

Q: What is the duty cycle of timer trigger in IQS / DET / RTA modes?

A: 50%.

Q: Can the kernel/SA module be controlled via network communication?

A: The kernel/SA module itself does not support network communication control. For network control, an additional NX development board must be purchased and used.

- Supported: Devices with firmware version 0.55.

- Not supported: Devices with firmware versions 0.38 or 0.54.

Q: Does using IF gain levels affect the amplitude of the acquired signal?

A: Yes, there will be some impact. At certain frequencies, IF gain level 1 and level 4 may differ by about 1 dBm.

Q: What are the driver names currently used across all versions?

A: HTRA Device and Cypress FX3 USB StreamerExample Device.

Q: Why is the maximum reference level of the DS band on the E200 device limited to 6 dBm?

A: On the latest E200 devices, the DS band reference level is limited to 6 dBm. This is for design and protection considerations. However, the actual damage threshold of the device can still reach about 10 dBm.

Q: Are the dimensions of SAM-60 MK2, SAM-60 MK3, and SAM-60 M3 the same?

A: Yes, the dimensions of SAM-60 MK2, SAM-60 MK3, and SAM-60 M3 are the same. However, the appearance of SAM-60 MK2 / MK3 differs from that of SAM-60 M3. For details, please refer to the device dimension diagrams.

Q: What protocol is used by the network interface of NX series devices?

A: TCP protocol.

Q: What is the timing accuracy of the timer trigger in IQS / DET / RTA modes?

A: 8 ns.

Q: In Adaptive trigger mode, what is the minimum supported decimation factor for SA series and NX series devices?

A:

1. SA series devices (USB transfer)

1). SAN-45 / SAN-60

- USB 3.0: 1 decimation / 1 decimation
- USB 2.0: 16 decimation / 4 decimation

2). SAM series / SAE series / SAN-400

- USB 3.0: 2 decimation
- USB 2.0: 16 decimation

2. NX series devices (Ethernet transfer)

1). NXN-45 / NXN-60

- Gigabit: 1 decimation / 4 decimation
- 100M: 4 decimation / 16 decimation

2). NXM series / NXE series / NXN-400

- Gigabit: 16 decimation
- 100M: 64 decimation

Q: What is the minimum RBW (Resolution Bandwidth) of SA/NX/PX series devices?

A: The minimum RBW of SA/NX series devices is 0.1 Hz; for PX series devices, it is 1 Hz.

Q: In IQS / RTA mode, is it possible to enable spurious suppression?

A: No. The spurious suppression algorithm relies on the spurious distribution characteristics during spectrum scanning to identify and remove spurs. In IQS / RTA fixed-frequency-point modes, the device does not perform frequency hopping, so this feature cannot be used.

Q: In IQS / DET / RTA modes, can the analysis bandwidth be set to any arbitrary value?

A: No, it cannot be set arbitrarily. The device's native sampling rate is determined by the ADC.

The analysis bandwidth and sampling rate are adjusted by changing the decimation factor:

- Analysis bandwidth = Native sampling rate / Decimation factor
- Sampling rate = Native sampling rate / Decimation factor

The decimation factor must be a power of 2, so the analysis bandwidth can only take fixed values rather than arbitrary ones.

Example:

SAM-60 R5 native sampling rate = 125 MHz

- Decimation factor = 2 -> Analysis bandwidth = 62.5 MHz
- Decimation factor = 4 -> Analysis bandwidth = 31.25 MHz

And so on.

Q: Is the device UID fixed? Are calibration files universal?

A: The device UID is fixed and unique. Calibration files are one-to-one matched with devices and are not universal. Different devices' calibration files are distinguished by UID.

Q: Can the standard spectrum analyzers of each series operate normally outdoors at temperatures below 0 °C?

A: The minimum operating temperature of standard spectrum analyzers is 0 °C. Below this temperature, normal operation cannot be guaranteed. For use in environments from −20 °C to 65 °C, the optional T1 temperature extension must be selected to ensure normal operation.

Q: When using level trigger / external trigger (pulse signal) / GNSS-1PPS trigger as the trigger source, how is a high-level rising edge determined to be valid? What is the timing criterion?

A: Before the rising edge of a high level arrives, there must be at least 1 ns of continuous low level. If this condition is met, the rising edge is judged as a valid rising edge. The timing criterion is 1 ns.

Q: Do the device's power port and data port (USB/Ethernet) need to be connected in a specific order?

A: No strict order is required. As long as the power and data cables are correctly connected, all series devices can operate normally.

Q: Can any series of devices support long-term outdoor operation?

A: Yes. As long as the device operates within the temperature range and power requirements specified in the product manual, and the data transmission and power

interfaces are correctly connected, the device can support long-term outdoor operation.

Q: Is it necessary to install drivers before using NX series devices?

A: No. NX series devices use Ethernet interfaces and do not require driver installation.

Q: What is the tunable range of the device center frequency?

A:

- N45: 9 kHz to 4.5 GHz
- N60 / M60: 9 kHz to 6.3 GHz
- M80: 9 kHz to 8.5 GHz
- E90: 9 kHz to 9.5 GHz
- E200: 9 kHz to 20 GHz
- N400: 9 kHz to 40 GHz

Q: For some N400 R2 devices, why can't the reference level reach 23 dBm in non-DS bands?

A:

1. The module is compact with high component density, and mismatches between components may introduce about ±1.x dB gain uncertainty.
2. The integration of the entire signal chain may also introduce some gain deviation.
3. Differences between the device calibration temperature and the actual operating temperature can also affect the reference level.
4. Hardware design will be optimized in future revisions to reduce gain uncertainty.

Q: Can the 10 MHz reference clock output be used?

A: Yes, it can be used on E90, E200, and N400. No reference clock output is available on M60, M80, N60, or N45.

Q: If the computer data interface only provides 0.9 A peak current, will it affect long-term operation?

A: No, it will not affect long-term operation.

Q: How often should customers send devices back for calibration?

A: Normally, amplitude calibration of spectrum analyzers is not required. Frequency drift is about 1 ppm per year, but frequency can be calibrated through the API. Therefore, there is currently no fixed recommendation; typically, recalibration every 2 to 3 years is sufficient.

Q: How large is the device's internal data buffer?

A: 128 MByte.

Q: What is the native sampling rate of the devices? Which devices have adjustable native sampling rates, and which do not? What is the minimum adjustment step?

A:

1. Native sampling rates:

- M60, M80: 125 MHz
- N45: 7.8125 MHz
- N60: 31.25 MHz
- E90, E200, N400: 122.88 MHz

2. Adjustable / non-adjustable models:

- Non-adjustable: N45, N60, M60 R4, M80 R4
- Adjustable: M60 R5, M80 R5, E90, E200, N400

3. Adjustment range & step:

- Range: 110 MHz ~ 130 MHz
- Minimum step: 1 kHz

Q: What is the configurable range of decimation factors?

A:

- N45: 2^0 to 2^8
- N60: 2^0 to 2^10
- Other models: 2^0 to 2^12

Q: What is the difference between native sampling rate and analysis bandwidth?

A:

- Native sampling rate: The sampling rate at 1 decimation, i.e., the actual ADC sampling rate.
- Analysis bandwidth:

$$\text{Analysis Bandwidth} = \frac{\text{Native Sampling Rate}}{\text{Decimation Factor}} * \mathbf{0.8}$$

Q: When using level trigger, what is the low-level judgment time before the signal reaches the threshold?

A: 1 ns.

Q: When using level trigger as the trigger source, what is the function of debounce safety time and what is its valid range?

A: The debounce safety time is used to validate the high level. For example, if the debounce safety time is set to 1 s, then only when the high level lasts longer than 1 s will it be considered valid. Its range is 0 to (2^32−1) * 8 ns = 0 to 34,359,738,360 ns (default is 0).

Q: What is the valid range of trigger delay?

A: 0 to (2^32−1) * 8 ns = 0 to 34,359,738,360 ns (default is 0).

Q: What is the USB data transmission power consumption of SA series devices?

A: Please refer to the table below:

Device Model	SWP Mode	IQS Mode	DET Mode	RTA Mode
SAN-45 R5	1.73 W	2.06 W	2.07 W	2.49 W
SAN-60 R5	1.87 W	1.99 W	1.99 W	2.61 W
SAM-60 R5	2.09 W	2.10 W	2.11 W	2.99 W
SAM-80 R5	2.02 W	2.07 W	2.06 W	2.95 W
SAE-90 R3	2.46 W	2.60 W	2.53 W	4.07 W
SAE-200 R3	2.53 W	2.58 W	2.48 W	4.01 W

SAN-400 R2	2.57 W	2.60 W	2.52 W	4.06 W

Q: Why must LO-related spurs be observed at multiples of 125 MHz, and are they related to the sampling rate?

A: The device's high-speed reference clock is 125 MHz, and the RF LO (PLL) uses this clock as a reference. Therefore, LO-related spurs mainly originate from this reference and appear at offsets of N × 125 MHz from the carrier. LO-related spurs are not related to the sampling rate. The ADC clock in the system is independent of the LO reference clock and does not affect LO spurs.

Thus, regardless of how the ADC sampling rate is set, LO-related spurs are always distributed based on the 125 MHz reference.

Q: What are the "spurious" signals observed at multiples of 125 MHz?

A: These are the device's residual responses. The receiver system uses a 125 MHz system clock, which generates harmonic components at N × 125 MHz. These harmonics couple into the RF input and LO paths through cavities and circuits, resulting in residual responses at certain 125 MHz harmonic points.

Q: In the software SWP mode, why does sweep speed sometimes decrease when the span is reduced?

A: Because device component configurations, switching times, and PLL lock times differ across frequency ranges, in some cases reducing the span may actually slow down the overall sweep speed.

Q: Is the frequency of the analog IF output signal fixed? What is its frequency and purpose?

A: The analog IF output is the signal before ADC sampling, provided for user post-processing. Its center frequency is within 307.2 MHz ± 50 MHz. The signal is filtered but may still contain some spurious components.

Q: Does the device have data storage capability? Will the data remain after power-off?

A: The device itself does not have data storage capability. After power-off, the acquired data will be lost when powered on again.

Q: What is the polarity of the trigger output pulse?

A: The trigger output only supports positive pulses.

Q: What is the maximum pre-trigger time?

A: 8000 * 8 ns * decimation factor.

Q: Does the device support modulation recognition?

A: Not supported at the moment.

Q: Can the device's start frequency be set from 4 kHz?

A: Currently, the minimum supported start frequency is 9 kHz.

Q: The device label says input power must be less than 10 dBm. Does this mean the preamplifier turns on below 10 dBm?

A: By default, the preamplifier turns on at around −30 dBm reference level. The 10 dBm refers to the maximum damage power after the preamplifier is enabled.

Q: When using two devices in Linux and checking with *lsusb*, will two IDs be displayed?

A: Yes, two IDs will be displayed.

Q: What are the power supply voltage and current specifications for the SA spectrum analyzer?

A: 5 V / 2 A, with a voltage range of 4.75 to 5.25 V.

Q: Can one host PC control multiple devices?

A: Yes. The steps are as follows:

1. Refer to the *SA-NX Series Spectrum Analyzer User Guide* (Quick Start section) to complete device connection.
2. Copy each device's calibration files into the folder: *Included_Materials\Windows\Software\bin\CalFile*.

3. Open the software — by default, it will connect to device number 0.
4. Go to *Included_Materials\Windows\Software\configuration* folder and edit the *Settings.ini* file.
5. Change DeviceNum=0 to DeviceNum=1.
6. Double-click the software in *Included_Materials\Windows\Software\bin* again to connect to device number 1.
7. To open more devices, repeat steps 3–5.

Q: What are the differences between NXN devices and NXE devices?

A:

1. The maximum frequency that can be acquired is different.
2. NXE has faster sweep speed, fewer spurs, and better RF performance.

Q: In NX devices, is the Ethernet port only for data reading?

A: Yes.

Q: If the device with the temperature extension option is rated for –20 ℃ minimum operating temperature, will operating at –25 ℃ cause major issues?

A: We can only guarantee normal operation within the specified -20 ℃ limit in the manual. Using the device at -25 ℃ may cause some components to malfunction, so operation outside the specified range is not recommended.

Q: Can the device's maximum damage power be adjusted?

A: Currently not supported.

Q: Which connector is used for the external reference clock input?

A: Please refer to the *SAStudio4 User Guide*, Quick Start section, under interface descriptions.

Q: Can a specification sheet for the device be provided?

A: Yes. Please download it from the official website (https://www.harogic.com/support/download-center/) -> Support -> Download

Center.

Q: How are the criterion values in the quality inspection report determined, and why are they specified this way?

A: The criterion values are internal standards set during factory quality inspection. Only devices meeting these standards are shipped. For example, the manual specifies an in-band flatness of ±2.0 dB, but for that production batch we adopted the criterion values shown in the report for testing. Different batches may use slightly different criterion values, but the manual's specified values remain the official reference for users.

Q: What are the power supply requirements for NX series spectrum analyzers?

A: NX series spectrum analyzers require 9 V / 2 A or 12 V / 1.5 A. The acceptable voltage range is 9 to 12 V.

Q: Can multiple modules share a single reference clock?

A: Yes, as long as the reference clock source voltage meets the requirements.

Q: What is the difference between the power indicator being steady and flashing?

A: Flashing indicates that the device clock is out of lock; steady on indicates normal operation.

Q: If a GPS signal at −130 dBm passes through an antenna with 30 dB gain, resulting in −100 dBm, can the spectrum analyzer successfully sample it?

A: Yes, it can.

Q: Is there a driver available for Windows Server systems?

A:

- First, check which Windows version the customer's Windows Server is based on (for example, Windows 10).
- Then go to *Included_Materials\Windows\HTRA_Driver\Win10_x64* folder and install the driver according to the *Quick Start Guide*.

Q: Are the dimensions of SAM-60 MK3H and SAM-60 MK2 the same without protective shells and structural accessories?

A: Yes, they are the same.

Q: How is DANL in dBm/Hz understood? For example, if RBW = 10 kHz and the observed noise floor is −30 dBm, what is the normalized value per Hz?

A: dBm/Hz represents the power density normalized to 1 Hz bandwidth. The calculation is:

$$P_{dBm/Hz} = P_{dBm} - \mathbf{10\log_{10}(RBW)}$$

So for −30 dBm at RBW = 10 kHz:

$$\mathbf{-30 - 10\log_{10}(RBW) = -70dBm/Hz}$$

This means the normalized noise floor is −70 dBm/Hz.

Q: What is the operating temperature range of spectrum analyzer modules?

A: Please refer to the operating temperature specifications in the product manual of the corresponding device.

Q: When using external trigger, is it necessary to reset the trigger source for each acquisition after powering on?

A: No, it is not necessary.

Q: Why is the analysis bandwidth equal to sampling rate * 0.8?

A: Before acquiring IQ data and performing decimation, anti-aliasing filtering is applied. Since the filter transition band cannot be made perfectly steep, only 80% of the effective bandwidth is preserved.

Q: Are there any differences between the drivers for SAM-60 and SAE-90?

A: No. All USB devices based on the HTRA architecture use the same universal driver.

Q: What is the maximum DC voltage that the RFIN port can withstand?

A: Please refer to the *Maximum DC Voltage* specification in the product manual of the corresponding device. To obtain the manual, visit the official website

(https://www.harogic.com/support/download-center/) -> Support -> Download Center.

Q: In DET mode, what is the time interval between each data point?

A: The interval depends on the sampling rate and the decimation factor:

$$\mathbf{T = \frac{Decimation\ Factor}{Sampling\ Rate}}$$

Where:

- T: time interval between two adjacent points (seconds)
- Sampling rate: native sampling rate (e.g., 125 MHz)
- Decimation factor: 1, 2, 4 … up to 4096

Q: During testing, does the RFIN need a DC block?

A: Please consult the datasheet of the corresponding device to confirm the maximum allowable DC input voltage. If the test signal contains, or might contain, DC voltage exceeding this limit, it is recommended to use a DC block to protect the device.

Q: Does the device require a separate power supply?

A: Yes. Both SA and NX series devices require a separate power supply.

2.4 Hardware Features

Q: Do NX devices have air ducts on the chassis?

A: No. The chassis has no air ducts; heat dissipation relies on the internal finned heat sink structure.

Q: Is there a 12 V output at the NX Ethernet port?

A: No. The power marking at the Ethernet port refers to the PoE power input from an external Ethernet source, not a 12 V output from the device board. This power function is not yet in use.

Q: For the GNSS high-quality module, what is the model of the power connector next to the Type-C port, and what is the matching plug model?

A:

- Connector model: WAFER-MX1.25-2PWB
- Matching plug: MX1.25

Q: Can the device coupling mode be adjusted?

A: No. The device uses fixed AC coupling and does not support adjustment.

Q: Can customers make their own power cables for NX devices?

A: Yes. But this requires soldering at both ends of the diode near the device's internal power connector.

Q: Must NX devices be powered using PD3.0 protocol?

A:

- If powered by an adapter, PD3.0 protocol must be supported.
- If powered directly from a current source, PD3.0 compliance is not required.

Q: In the USB integrated MUXIO multifunction interface of the SAM / SAN series, are EXT_TRG_IO1F and EXT_TRG_IO2F the same? And in the SAE / SAN-400 series MUXIO interface, are EXT_TRG_IO1 and EXT_TRG_IO3 the same?

A: No.

1. SAN / SAM series:

- EXT_TRG_IO1F: Trigger input
- EXT_TRG_IO2F: Trigger output

2. SAE / SAN-400 series:

- EXT_TRG_IO1: Trigger input
- EXT_TRG_IO3: Trigger output

Q: What is the ADC model used in SA / NX / PX series spectrum analyzers, and how many bits is it?

A: The main models are AD9642 and AD9634. Some devices may also use domestic ADCs or mixed configurations, but the performance is consistent. The ADC resolution is 14 bits.

Q: Does the core module have conformal coating (three-proofing treatment)?

A: No. Users need to implement the corresponding protection in their integrated structure.

Q: Is pin 6 (3V3) of the multifunction interfaces currently available for use?

A: Not yet available.

Q: Is pin 5 (LFADC IN, Low-Frequency ADC Input) of the multifunction interface directly connected to the ADC externally?

A: Hardware-wise, this pin signal is directly connected to the MCU, but the interface is not currently available for use.

Q: What is the power consumption of the device fan?

A: A single small fan consumes 5 V × 300 mA = 1.5 W.

1. SA / NX series: equipped with 1 small fan.
2. PX series: equipped with 2 small fans.
3. Future device series fan power consumption will depend on the actual number of fans used.

Q: Why can't the preamplifier state be selected on N400 R1?

A: Because the N400 R1 does not have a preamplifier.

Q: Do all device series have ESD (Electrostatic Discharge) protection?

A: Yes, details are as follows:

1. RF input port

- N45 / N60 / M60 / M80 / E90: 4 kV protection
- E200: Class 2C (4 kV protection)
- N400: Class 1C (8 kV protection)

2. SA series

- Data port: 2 kV protection
- Power port: 2 kV protection

3. NX series

- Ethernet port: 2 kV protection
- Power port: 30 kV protection

4. PX series

- USB data port: 2 kV protection
- Power port: 30 kV protection

Q: By default, at what temperature do the fans turn on in SA / NX series devices?

A:

1. SAN / SAM series devices (excluding SAN-400):

- When using software: Fans automatically turn on at ≥50 °C; turn off at ≤40 °C.
- When using API: Fans automatically turn on at ≥50 °C; turn off at ≤40 °C.

2. SAE series / SAN-400 devices:

- Fans turn on automatically when the device is powered on.

3. NX series devices:

- Fans turn on automatically when the device is powered on.

Q: What protocols are used by the Type-C power supply interfaces of each series?

A:

- SA series: Type-C power supply supports USB 3.0 protocol.
- NX series: Type-C power supply supports PD3.0 protocol (12 V).
- PX series: Type-C power supply supports PD3.0 protocol (20 V).

Q: Is the accuracy of the GNSS module one second? Can it perform TDOA? How to obtain timestamps for each time-domain IQ point?

A:

- The intrinsic accuracy of GNSS is 1 second.
- If the device is connected to both GNSS 1PPS pulse and 10 MHz reference clock, TDOA can be achieved.

Timestamp acquisition method:

- The timestamp of the first IQ point is treated as the current GNSS second-level time.
- The timestamp of the N-th IQ point is calculated as:

$$T_n = T_{Gnss} + N * T$$

Where:

- T: Time interval between IQ samples, T = Decimation factor/Sampling rate
- N: Index of the IQ sample, starting from 0
- T_{Gnss}: Start time provided by GNSS (in seconds)

Even if the first point timestamp is not exactly aligned with a full second, as long as multiple devices use the same calculation method, the error depends only on each GNSS module's inherent accuracy.

Q: Do PX series devices currently support pairing with higher-precision and high-quality GNSS modules?

A: Yes, they do.

Q: What positioning systems and frequency bands are supported by the provided GNSS boards? Can the complete GNSS message information be obtained?

A:

1. Supported positioning systems and frequency bands:

- L26-T, M8T: GPS (L1C/A), Galileo (E1), BDS (B1I), QZSS (L1C/A)

2. Message information: Complete GNSS message information cannot be obtained at the moment.

Q: What is the function of the DOCXO (Double Oven-Controlled Crystal Oscillator)?

A: It provides optimization only for phase noise at the 1 GHz frequency point.

Q: For devices already in use, can the temperature extension option be added later?

A: No. The temperature extension option can only be configured during device production and cannot be retrofitted after shipment.

Q: If the RF input port is damaged, can it be replaced by the user?

A: No. The RF input port replacement requires disassembly of the device, followed by recalibration. The device must be returned for repair.

Q: How can the Linux control board inside NX devices be accessed?

A: You can log in and control the device using terminal tools such as MobaXterm, with the username root.

Q: Are the two USB cables provided with the device shielded?

A: Yes, they are shielded.

Q: When connecting an active antenna to the device, does the antenna require separate power supply?

A: Yes, it does.

Q: What is the localization (domestic component) rate of the device?

A: Approximately 60% to 70%.

Q: What is the gain of the preamplifier?

A:

1. DS Band (9 kHz – DS, typical):

- N45, N60, M60 R4: None
- N45, N60, M60 R5: 16 dB
- M80: 16 dB
- E90, E200, N400 R2: 16 dB

2. Non-DS Band (typical):

- N45, N60, M60 R4: 17 dB
- N45, N60, M60 R5: 19.5 dB
- M80: 19.5 dB
- E90: 15.5 dB
- E200: DS–9 GHz: 15.5 dB; 9–20 GHz: 22 dB
- N400 R2: DS–9 GHz: 15.5 dB; 9–22 GHz: 23.5 dB; 22–40 GHz: 19.5 dB

Q: What is the maximum USB interface rate supported by the SAN-400?

A: 260 MByte/s. Calculation:

Maximum continuous streaming sample rate (130/2 MHz) × 2 (I/Q data channels) × 2 bytes = 260 MByte/s.

Q: Will the supply current of the host PC motherboard's USB port affect device operation?

A: No, as long as the supply current of the motherboard's USB port complies with the USB 2.0 or USB 3.0 standard protocol, the device will operate normally.

www.harogic.com
info@harogic.com
+65-8299 8857