



Snap™ Evaluation Kit and Link Debug Tool

User Guide

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Glossary

A glossary of terms used in this document.

Acronym	Definition
AC	Alternating Current
Downstream	Downstream facing USB port
EU	The European Union
FCC	Federal Communications Commission
FS	USB2 Full Speed
HS	USB2 High Speed
IC	Integrated Circuit
I ² C	Inter-Integrated Circuit
LED	Light Emitting Diode
LS	Low Speed
RF	Radio Frequency
SS	Super Speed
TELEC	Telecommunication
Upstream	Upstream facing USB port
U0/W0	Snap active wireless link data transfer state
U2	USB 3.0 link idle, slow exit
U3	USB 3.0 suspend mode
DUT	Device under test

1. General Description

The SiBEAM SK621011/SK621213 Reference Kit is provided to evaluate, test, and debug the Snap™ MOD6210/MOD6211/MOD6212/MOD6213 transceiver module with USB 3.0 support. Figure 1.1 shows the block diagram of a typical usage scenario for the Reference Kit.

The Reference Kit consists of two Snap I/O interface debug boards that provide physical access to USB and an interface to the Snap transceiver module. The SiBEAM Snap transceivers operate as pairs. The upstream debug interface boards connects with a MOD6210/MOD6212 transceiver module. The downstream debug interface board connects with a MOD6211/MOD6213 transceiver module.

The Reference Kit is simple to operate, and requires minimal configuration.

All detection and connection setup is done without initial software configuration. Snap Tool provides a way to debug the setup, and is not required for the establishment of the link.

1.1. Key Features

- Simultaneous USB 3.0 and USB 2.0 connections through USB hub (SS, HS, FS, LS supported)
- Up to 6 Gbps full duplex
- Short range wireless link
- No host driver required
- Intelligent power management automatically drops power based on USB link power state (U0 through U3)
- Low power consumption during scan mode when the transceivers are not in range
- I²C tunneling over wireless link
- Built-in antenna
- Full regulatory certified modules (TELEC, EU, FCC, and IC)
- Powered via +5 V from microUSB connector
- Debug and remote debug function tool suite
- RF performance measurement tool suite

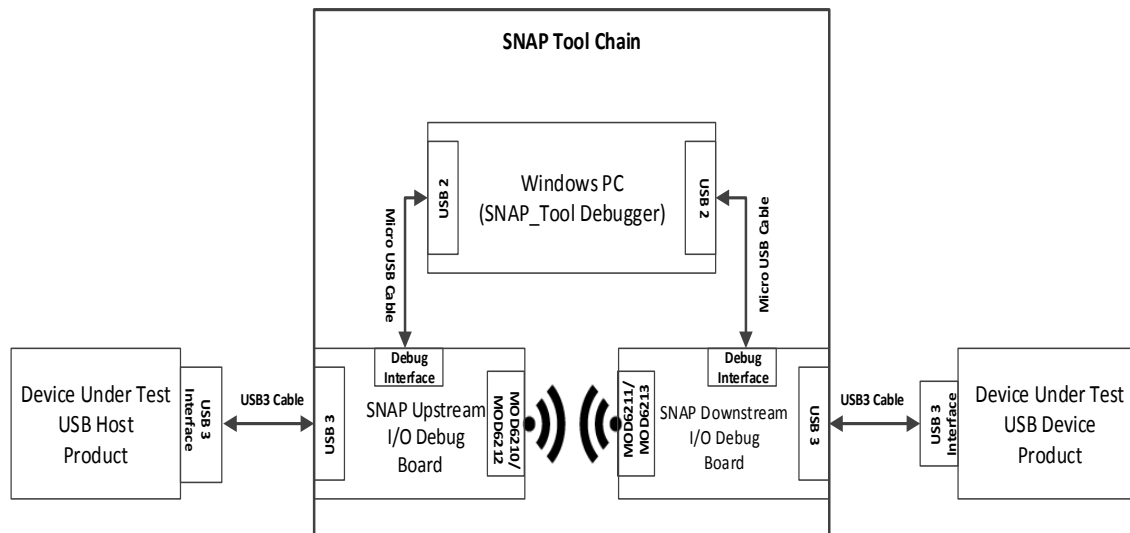


Figure 1.1. Block Diagram of SK621011/SK621213 Reference Kit

The SK621011/SK621213 Reference Kit hardware and software are described below.

1.2. Hardware Components

The SK621011/SK621213 Reference Kit (Figure 1.2) contains the following hardware components:

- Snap Upstream I/O debug board
- Snap Downstream I/O debug board
- MOD6210/MOD6211 transceiver module (End-fire)
- MOD6212/MOD6213 transceiver module (Broadside)
- (2) Micro-USB 2.0 cables
- USB 3.0 Type A to Micro-B cable
- USB 3.0 Flash Memory Drive

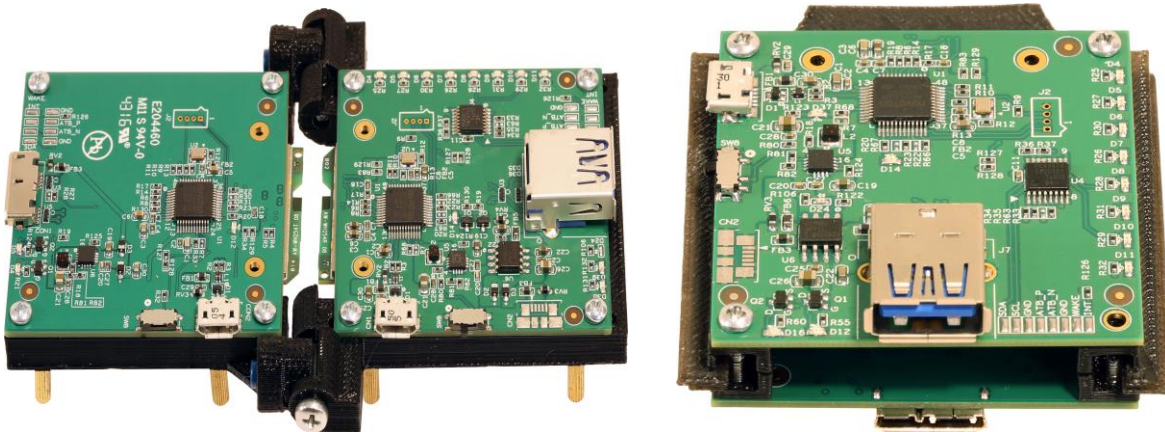


Figure 1.2. SK621011 End to End/SK621213 Broad to Broad Reference Kit

1.3. Software and Documentation

The USB Flash Memory Stick contains the following software and documentation:

- Snap Tool application
- This Reference Kit user guide

2. Getting Started

2.1. System Requirements

The following is a list of minimum system requirements to operate the Snap Tool:

- An x86 compatible PC with two USB ports and Windows 7 or higher. For Windows 7, .net framework 4.0 needs to be installed.
- A display resolution of 1366 x 768 or higher
- 20 MB available disk space for installation (more may be needed for storage of log files)
- SK621011/SK621213 Reference Kit
- Two Type A to Micro-B USB 2.0 cables
- Device Under Test (DUT) USB 2.0 or USB 3.0 Host product
- DUT USB 2.0 or USB 3.0 device product

2.2. Basic Software Specification

Snap Tool is in English only and comes with the following:

- A self-contained Windows installer
- A USB 2.0 WHQL for Windows 7 certified driver

2.3. Equipment Requirements

The following additional pieces of equipment are needed to operate the Reference Kit:

- Windows PC to operate Snap Tool
- DUT USB Host product
- DUT USB Device product

2.4. Setup Procedure

Debugging and complete feature testing involves the following two software and hardware installations:

- Snap Tool application installation
- Snap SK621011/SK621213 Reference Kit installation
- Snap I/O Board LED Lights

2.4.1. Snap Tool Application Installation

A Microsoft Windows PC or laptop is required for installation. Follow the steps below to install the Snap application:

1. Locate SNAP_Tool_Installer.msi file
2. Double click on this Windows installer package file.
3. The following Software License Agreement window appears ([Figure 2.1](#)).



Figure 2.1. Snap Tool – License Agreement

4. Read the Software License Agreement.
5. Select the checkmark box **I accept the terms in the License Agreement**.
6. Press the **Install** button.
7. When the software installation is completed, press the **Finish** button to close the installation window (Figure 2.2).

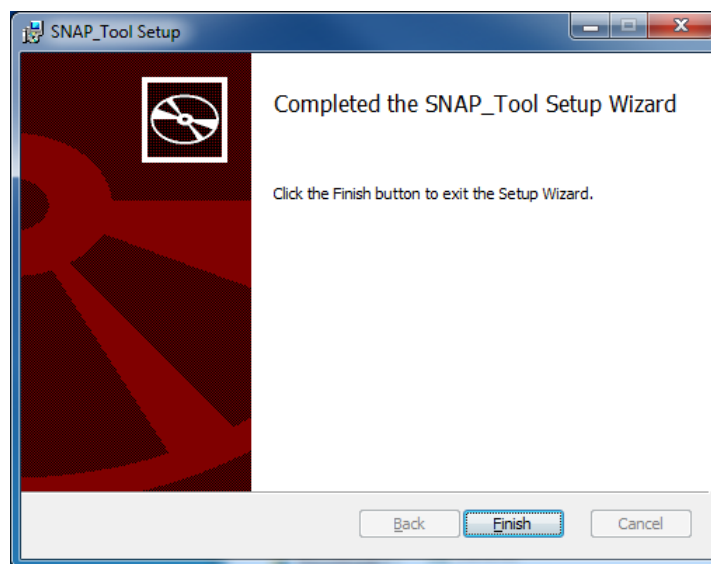


Figure 2.2. Snap Tool – Setup Finish

8. Ensure the Windows Device Manager has recognized the two unique virtual COM Ports, as shown in Figure 2.3.

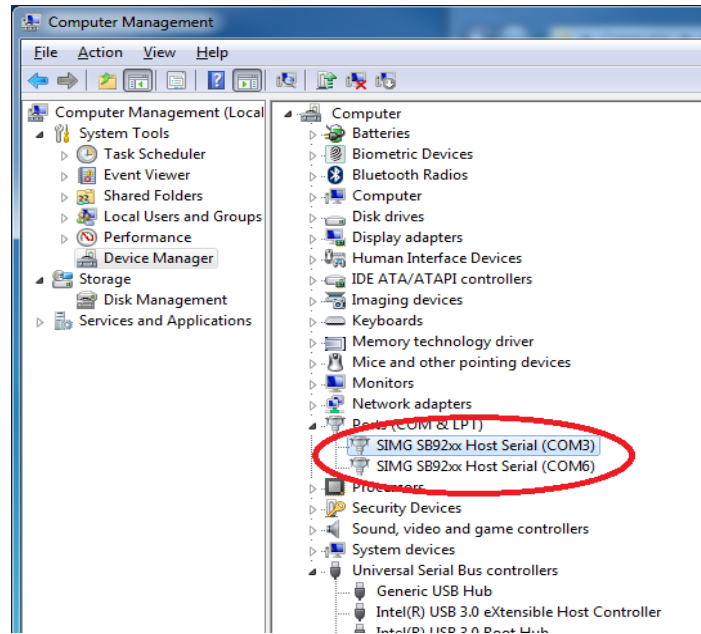


Figure 2.3. Virtual COM Ports Displayed in the Window Device Manager

Once the application tool is installed, the hardware portion of the Reference Kit is ready for set up next.

2.4.2. SK621011/SK621213 Reference Kit Installation

The Reference Kit should be set up with both MOD6210/MOD6212 transceiver module and MOD6211/MOD6213 transceiver module in close proximity to each other.

To install the hardware to perform complete Snap Tool feature testing, follow these instructions in order:

1. Insert the DUT's USB device product, such as a USB 3.0 Flash Memory Stick, into the USB 3.0 Type-A receptacle port of the Snap downstream I/O debug board.
2. Connect the supplied micro-USB 3.0 cable to the micro-USB 3.0 receptacle of the Snap upstream I/O debug board.
3. Connect the other end of the micro-USB 3.0 cable into the DUT's USB host product's USB interface.
4. Connect the first micro-USB 2.0 cable into the Downstream I/O Debug Board's micro-USB receptacle port.
5. Connect the other end of the USB cable into an available Windows PC Type-A receptacle port.
6. Connect the second micro-USB cable into the upstream I/O debug board's micro-USB receptacle port.
7. Connect the other end of the USB cable into an available Windows PC Type-A receptacle port.

Steps 4 to 7 above are required for the following optional debug activities:

- Debug the MOD6210/MOD6212 transceiver module
- Debug the MOD6211/MOD6213 transceiver module
- Monitor performance using Snap Tool

Steps 6 and 7 above are optional if you need to bring up a storage drive letter on the available Windows PC.

If there are no available Windows PC USB ports, step 5 can be changed to connect the USB 2.0 cable Type-A plug into a USB power adapter instead of providing power to the Snap downstream I/O debug board.

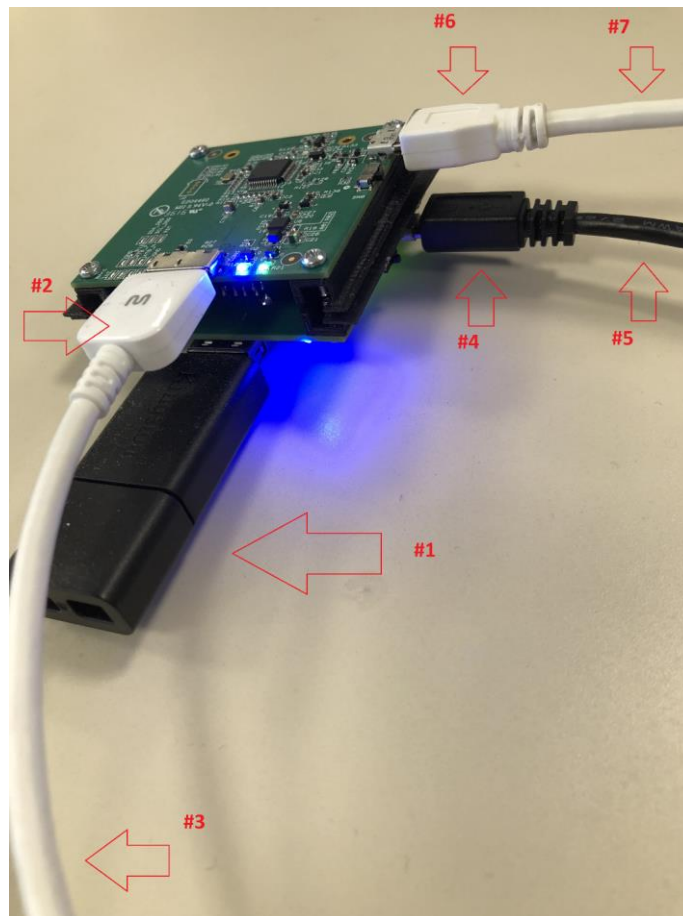


Figure 2.4. Typical SK621213 Reference Kit with Cables and Devices Attached

The result of successful hardware setup, as shown in Figure 2.4 above, is the DUT's USB host product that enumerates and recognizes the DUT's USB device product.

2.4.3. Snap I/O Board LED Lights

There are three LED lights on the Snap upstream I/O board, as circled in red in Figure 2.5. The meaning of each LED is described in Table 2.1.

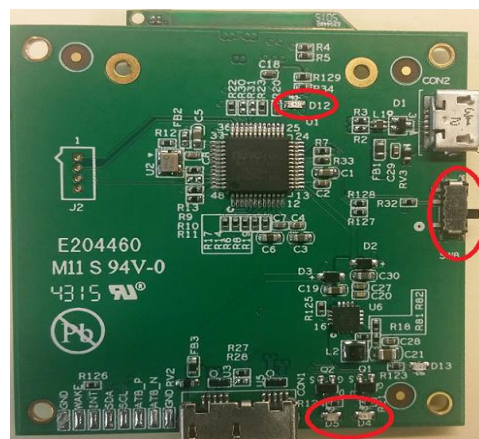


Figure 2.5. Snap Upstream Interface Board – Location of LED Lights

Table 2.1. Snap Upstream I/O Board LED Lights

Diode	Description	Status	Meaning
D12	Debugger heartbeat	Blinking green	Debugger is active.
D4	Link Proximity	Blinking green	Scanning.
		Solid green	Link is up.
D5	USB State Detection	Solid blue	USB is in U0 state.

There are three LED lights on the Snap downstream I/O board, as circled in red in [Figure 2.6](#). The status indication of each LED is described in [Table 2.2](#).

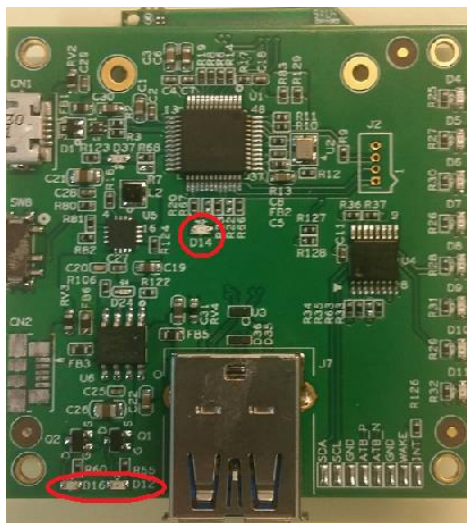


Figure 2.6. Snap Downstream Interface Board – Location of LED Lights

Table 2.2. Snap Downstream I/O Board LED Lights

Diode	Description	Status	Meaning
D14	Debugger heartbeat	Blinking green	Debugger alive.
D12	Link Proximity	Blinking green	Scanning.
		Solid green	Link is up.
D16	USB State Detection	Solid blue	USB is in U0 state.

2.5. How to Upgrade Debug Microcontroller Firmware

The Snap I/O board contains an upgradable Debug Microcontroller firmware which provides debug access to the Snap SK621x transceiver module. Listed below are step-by-step instructions on how to upgrade the Debug Microcontroller Firmware.

1. Slide the switch to the “•” (dot) position, as shown in [Figure 2.7](#).

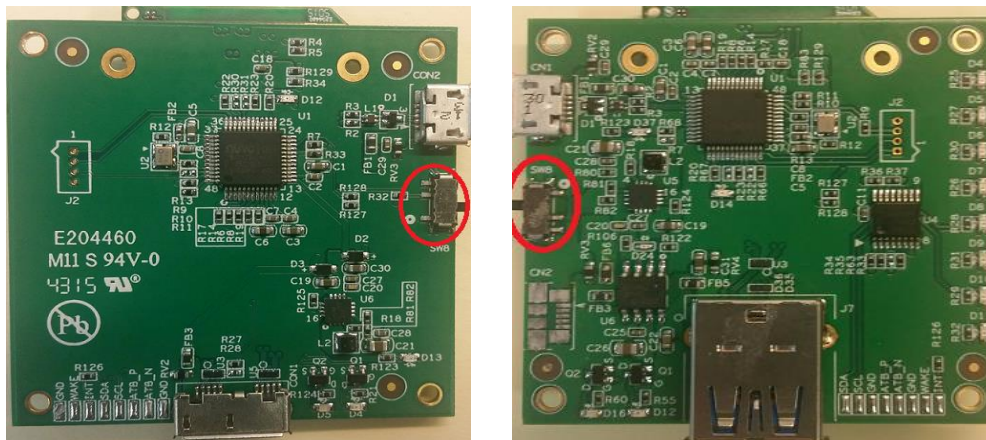


Figure 2.7. Snap Interface Board – Location of Firmware Upgrade Switch

2. Start the Snap Tool application from your PC desktop.
3. Click the **Host Program...** button from the Debug Console page, as shown in Figure 2.8.

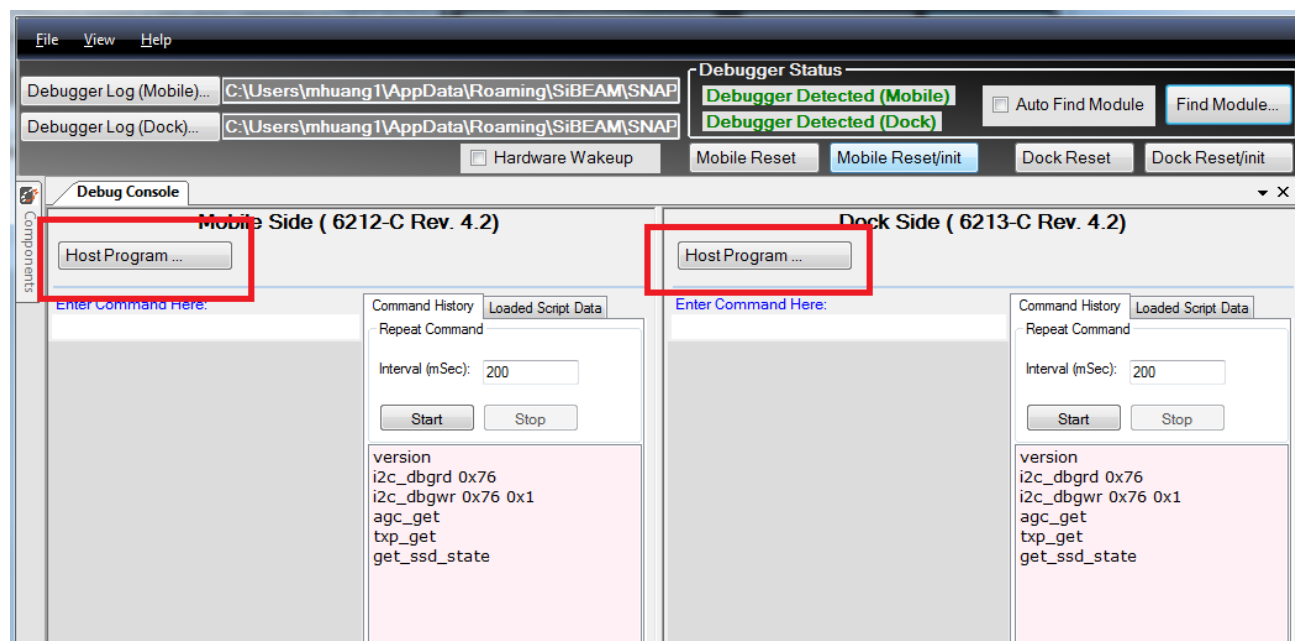


Figure 2.8. Snap Tool – Host Program Button

4. The Host Program Management window appears, as shown in Figure 2.9.

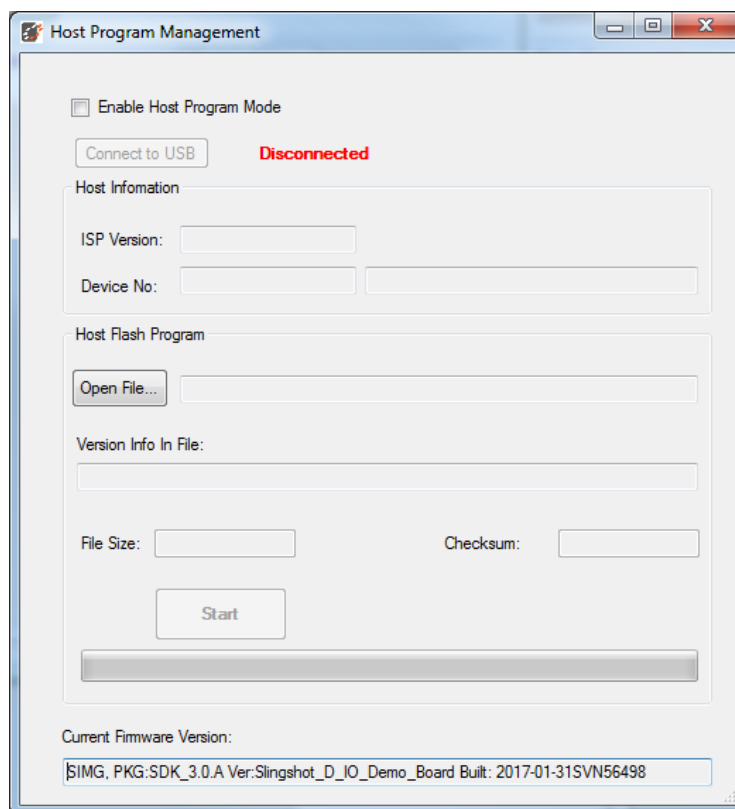


Figure 2.9. Snap Tool – Host Program Management

- a. Click the **Enable Host Program Mode** checkbox to enable the Debug Microcontroller device into programming mode.
- b. Press the **Connect to USB** button to reconnect the Debug Microcontroller device as HID USB device.
- c. Press the **Open File** button to select the binary file for upgrade.
- d. Press the **Start** button to start programming the device.
- e. After programming has been completed, “Program Host Firmware Succeeded!” message appears in green. This means the firmware upgrade is complete and the module is ready to use with the updated firmware.
- f. Close this window by clicking ‘X’ in the top right corner.
- g. Slide the switch away from the “.”(dot) position and unplug/plug micro USB cable to power cycle the board.
- h. If the “Auto Find Module” box is not selected, click the **Find Module** button located near the top right corner of the window to select the device again.

3. Snap Tool Functionality

This section assumes the Snap tool application is installed on the Windows PC, and the Reference kit is setup with all cables and devices connected.

The Snap tool application has the following functions:

- Read from and write to Snap registers (Debug Console Page)
- Test RF packet performance (Throughput Test Page)
- Test USB performance (USB Throughput Test Page)
- Check USB speed, full/high/super (USB Viewer Page)
- Test manual and auto tuning of relevant RF performance (RF Performance Test Page)
- Register Mapping for support from Snap SiBEAM Team (Register Map Page)
- Check RF Link Performance (RF Link Info Page)
- Factory Test (Factory Test Page)
- Factory Test Config (Factory Test Config Page)

To execute the Snap tool application:

1. Make sure the Snap Tool icon is installed on the PC. The default location of the executable is C:\Program Files (x86)\SiBEAM\SNAP_Tool\SNAP_Tool.exe.
2. Connect the necessary USB cables from Snap board to the PC.
3. Execute SNAP_Tool.exe
4. Both upstream and downstream Snap devices should be detected as a COM port, as shown in [Figure 3.1](#).

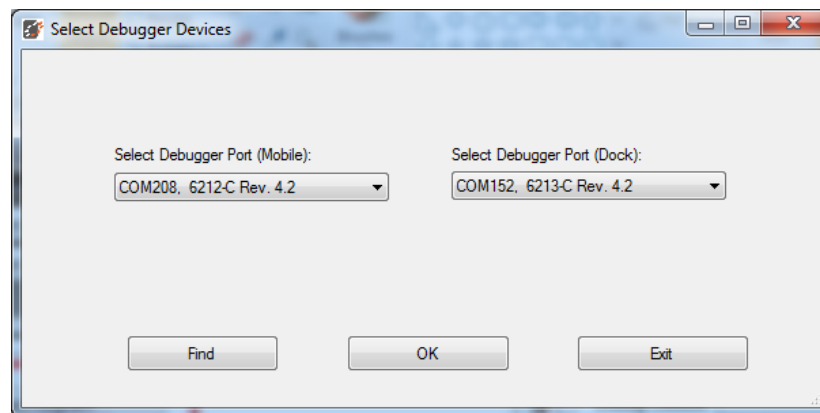


Figure 3.1. Snap Tool – Select Debugger Devices

5. Click **OK**.

3.1. Component Selector

The Component Selector is shown in [Figure 3.2](#). The Snap Tool contains activity areas called components. The default component is the Debug and Log interface which is known as the Console Interface. The component selector allows you to navigate among components to choose an activity.

The following components are currently available:

- Debug Console Page
- Throughput Test Page
- USB Throughput Page
- RF Performance Page

- USB Viewer Page
- Registers Map Page
- Factory Test Page
- Factory Test Config Page
- RF Link Info Page

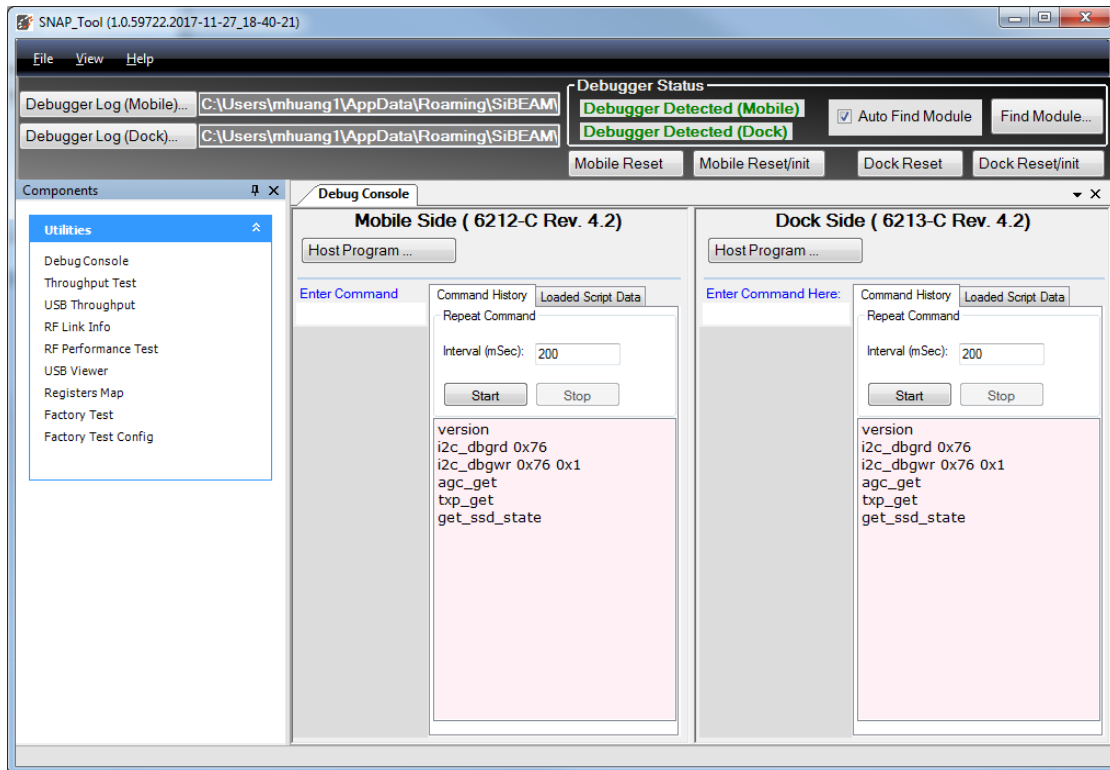


Figure 3.2. The Component Selector of Snap Tool

The component selector is opened by default and shows up on the left side of the tool. It can be closed or hidden by clicking the corresponding icons on the upper right side of the Components window. It can be reopened by selecting **View -> Component** from the menu.

3.2. Debug Console Page

The Debug and Log Console, as shown in [Figure 3.3](#), is the main component used while developing the Snap module. The console is used for the following primary functions:

- Showing the log file of the Snap SB6210/SB6211/SB6212/SB6213 on the module
- Storing the log file for later use
- Debugging using a command line input prompt
- Using a scripting interface for command automation with configurable interval settings
- Running and saving automation command script files

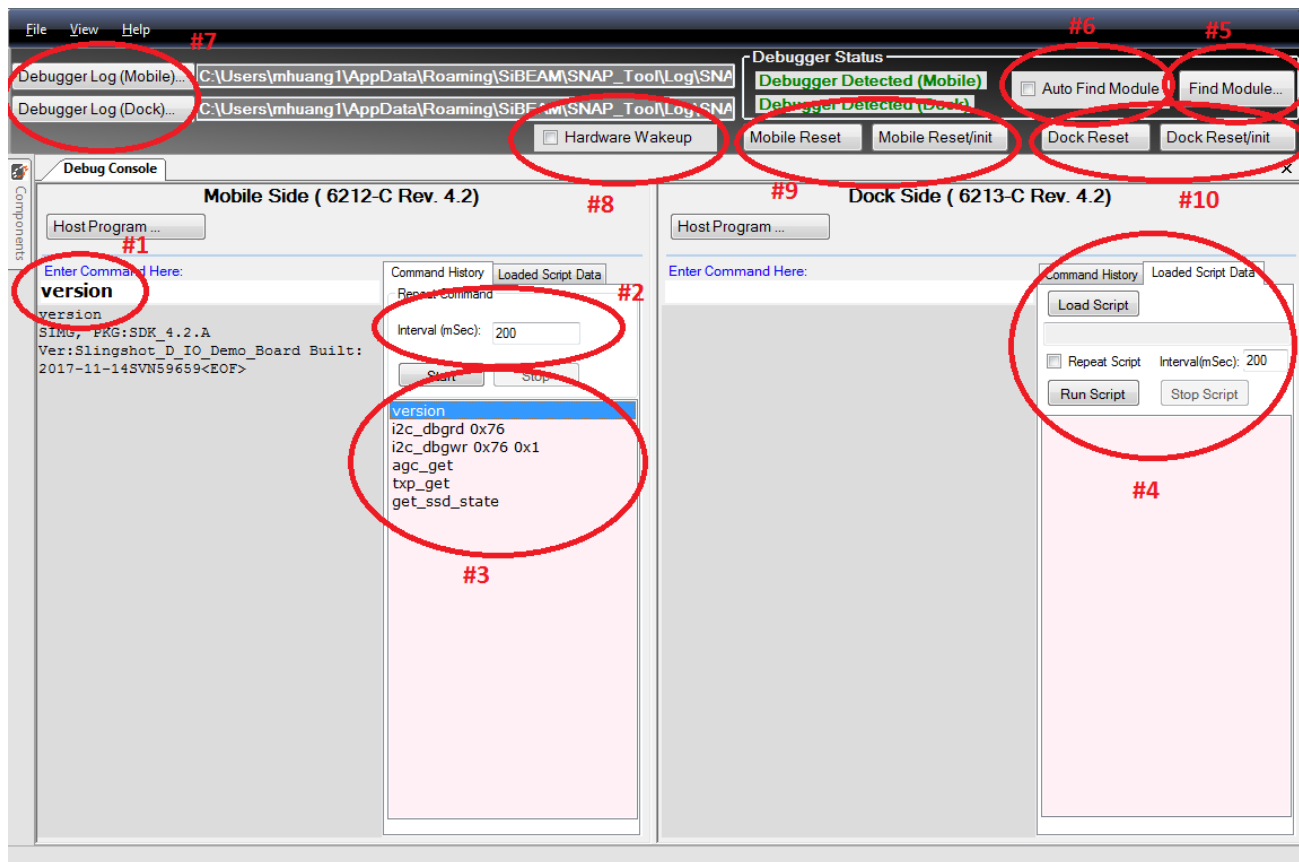


Figure 3.3. Debug Console Page

- Enter debug commands in the “Enter Command Here:” area, such as “version” shown in Figure 3.3 above (1).
- Same command can be executed with desired mSec wait time in “Interval (mSec)” (2).
- Double click on any prior command in “Command History” panel (3).
- Execute a saved script described in text format in “Loaded Script Data” panel. Specify the number of mSec between each command execution (4). You can also continually execute the script by checking the “Repeat Script” option.
- Debug any new Snap devices by clicking the “Find Module” button (5).
- Snap Tool can automatically attach to any new Snap device by checking the “Auto Find Module” option (6).
- Change log file name by pressing “Debugger Log (Mobile)” or “Debugger Log (Dock)” buttons (7).
- Select the method through which the “wakeup” command is used (8). If the box is selected, Snap tool wakes up the chip through a Nuvoton pin. If the box is not selected, Snap tool wakes up the chip through Snap internal registers.
- Mobile Reset button executes “ss_reset” in the mobile console. Mobile Reset/init executes “ss_reset” followed by “ss_init” in the mobile console (9).
- Dock Reset button executes “ss_reset” in the dock console. Dock Reset/init executes “ss_reset” followed by “ss_init” in the dock console (10).

3.3. Throughput Test Page

The Throughput Test Page (Figure 3.4) can capture RF throughput measurements.

3.3.1. RF Throughput Quick-Start Guide

The RF Throughput test displays the Snap wireless connection’s raw transfer bandwidth in each direction as measured on the receive side (upstream or downstream side). A pre-programmed test bit pattern is constantly sent from Snap

upstream MOD6210/MOD6212 to Snap downstream MOD6211/MOD6213. A pre-programmed test bit pattern is also simultaneously sent from Snap downstream MOD6211/MOD6213 to Snap upstream MOD6210/MOD6212.

To quickly start the RF Throughput Test, click the **Start** button as shown in Figure 3.4. You will note the prior results are cleared.

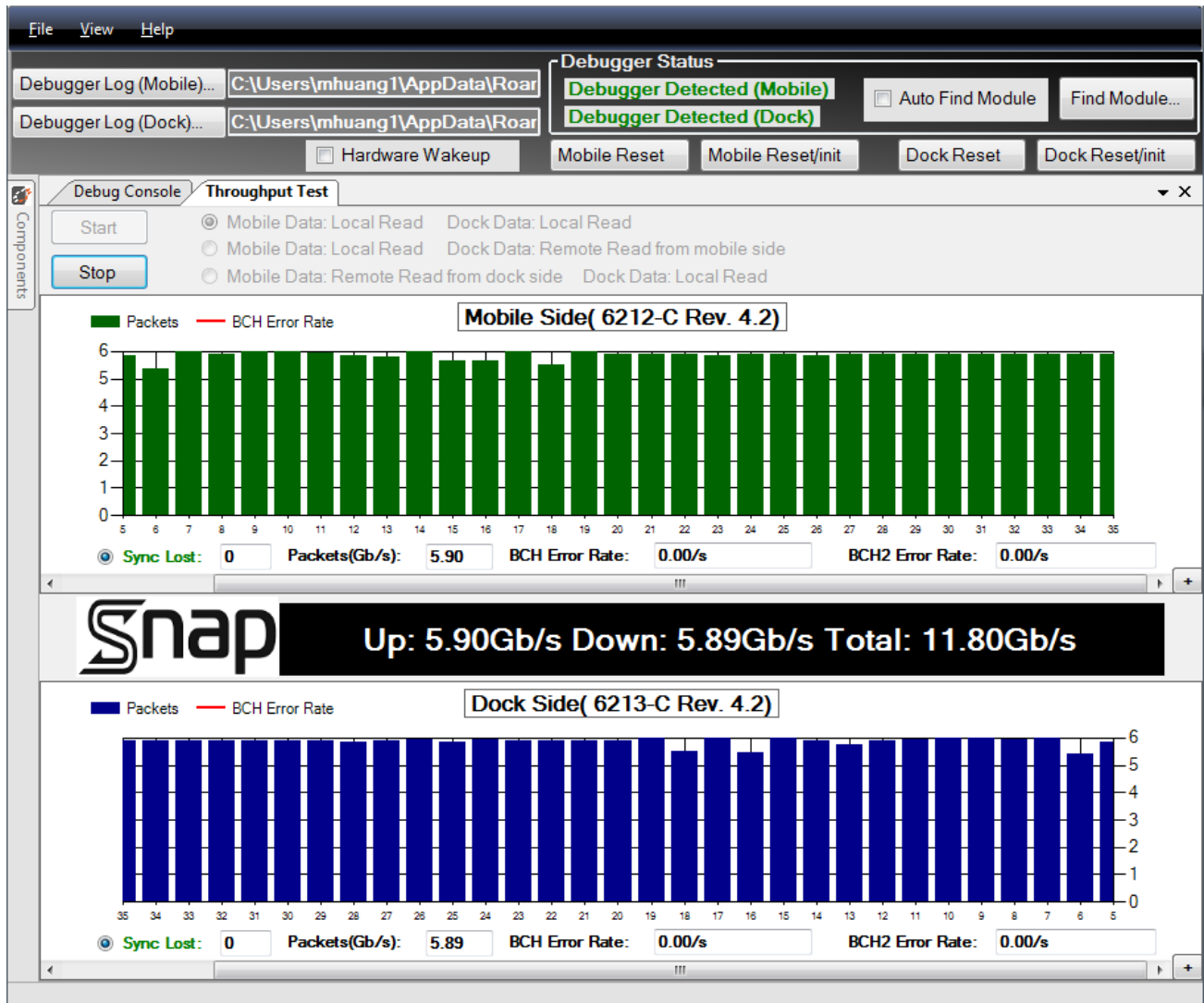


Figure 3.4. Starting RF Throughput Test Page

Numbered highlights are shown in Figure 3.5:

- **Start/Stop** button to start/stop the RF test pattern bitrate measurement (1). Note that any prior graphs are cleared when **Start** button is clicked.
- Source port options for read data (2):
 - mobile data are read from mobile side; dock data are read from dock side;
 - data of both chips are all read from mobile side;
 - data of both chips are all read from dock side;
- Upstream results appear left to right in green (3).
- **Sync Lost** (4) indicates the pair RF link status. If the number is unchanged, this means the RF link is stable.
- **Packets (Gb/s)** (5) shows the throughput of upstream or downstream pattern bitrate as measured in Gigabits per second.

- **BCH Error Rate** (6) shows errors per second as detected on the upstream or downstream side.
- **BCH2 Error Rate** (7) shows number of 2 errors per transmitted package per second.
- Move the horizontal slider (8) from right to left to view the prior history for both upstream and downstream boards.
- Click the + button (9) to freeze the displayed results.
- Display overall RF bi-directional bit rate (i.e. ~12 Gbps).
- Downstream results appear right to left in blue.

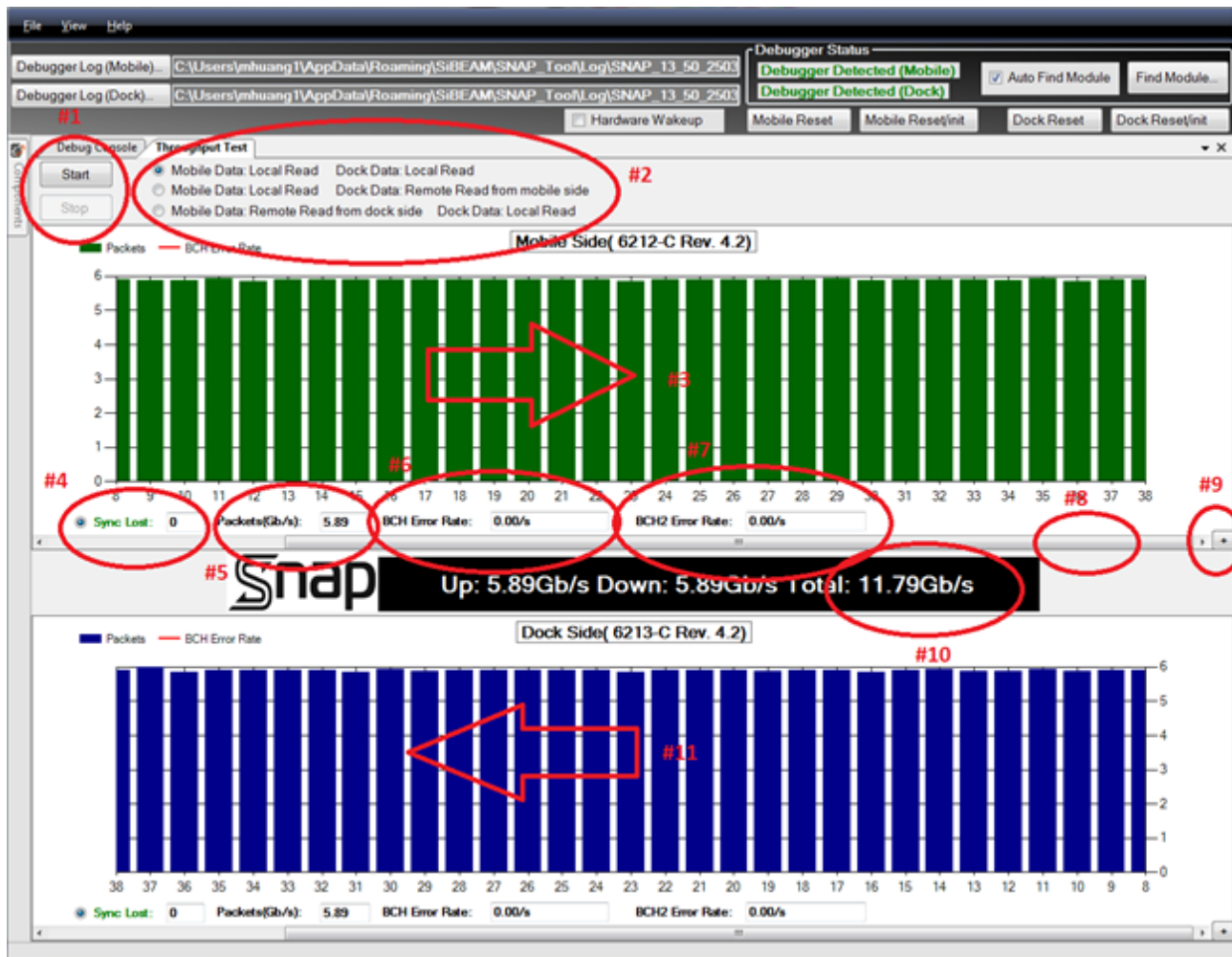


Figure 3.5. Throughput Test Page Highlights

The ideal scenario of Snap devices is operated with the following values for both Device and Host sides:

- Sync Lost: 0 occurrences
- Packets (Gb/s): ~5.9 Gbps
- BCH Error Rate: 0.00 errors per second

The ideal scenario of combined Snap Device and Host bi-directional total is ~11.8 Gbps.

3.4. USB Throughput Test Page

This page can test multiple storage devices' reading/writing speed synchronously. Each device runs in a separate thread. We focus on data transmission speed, so all r/w are sequential, as shown in Figure 3.6.

To quickly start the USB Throughput:

1. Select the test files. Options include 50 MB, 100 MB, 200 MB, and 500 MB.
2. For each device, you can choose **Read**, **Write**, **Read/Write**, or do nothing.
3. Click the **Start** button to start testing.
4. Use the **Refresh Drives** button to update device list.

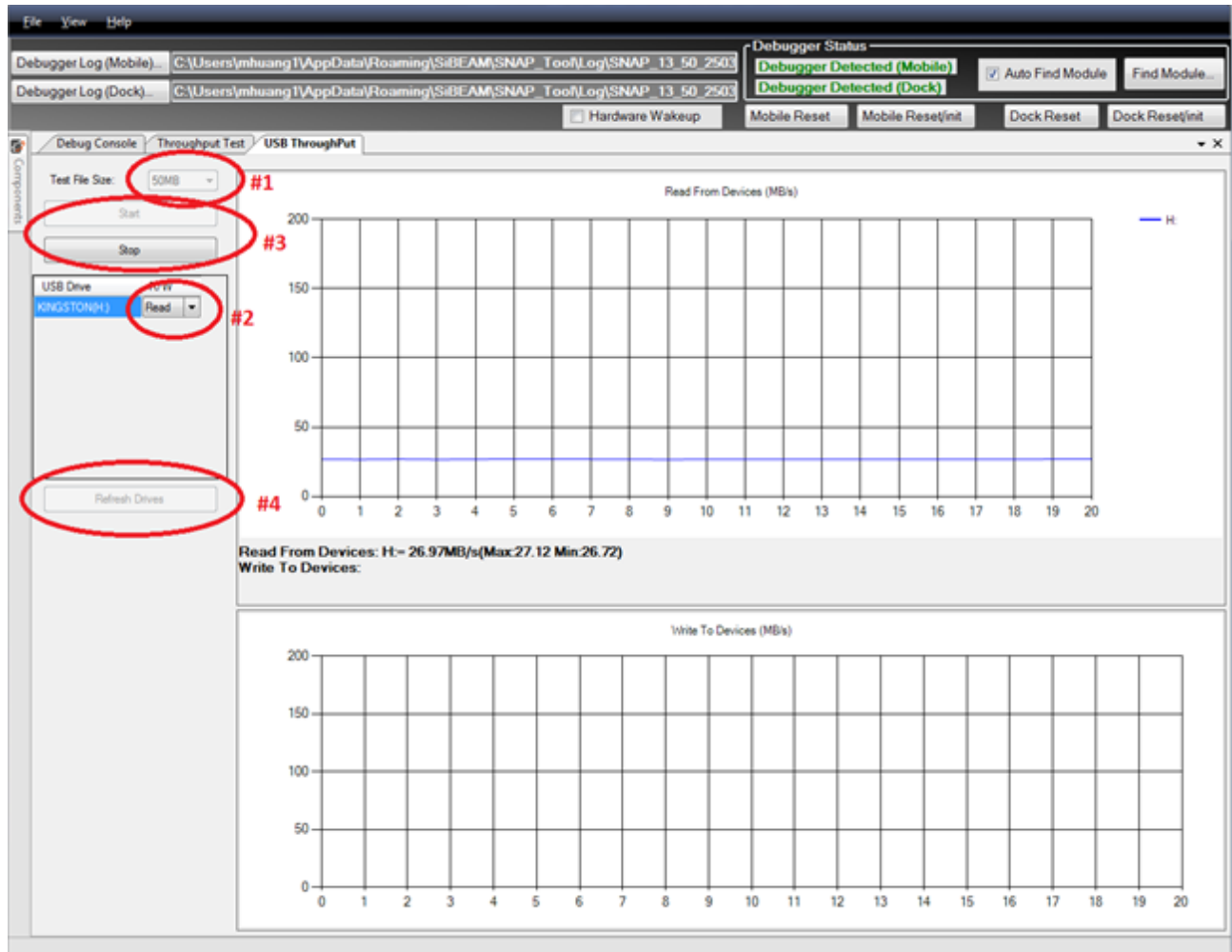


Figure 3.6. USB Throughput Test Page

Notes:

1. Larger size temporary files produces more accurate results at the cost of run time.
2. Texts in the middle show instant r/w data rate.
3. After test stopped, average data rate can be found in:
\\Users\\username\\AppData\\Roaming\\SiBEAM\\SNAP_Tool\\Report\\USB Throughput Test Result.csv.

3.5. USB Viewer

The USB Viewer page shows each of the USB device information from the host PC. The example below (Figure 3.7) shows:

- **USB Mass Storage Device** (1) connects to host PC through Snap connection.
- USB Mass Storage Device speed is shown as **Device bus speed: Super** (2)

Click on any of the device from the left side of the panel. The Snap application updates the right side of the panel with detailed information for the device connected the host PC, as shown in [Figure 3.7](#).

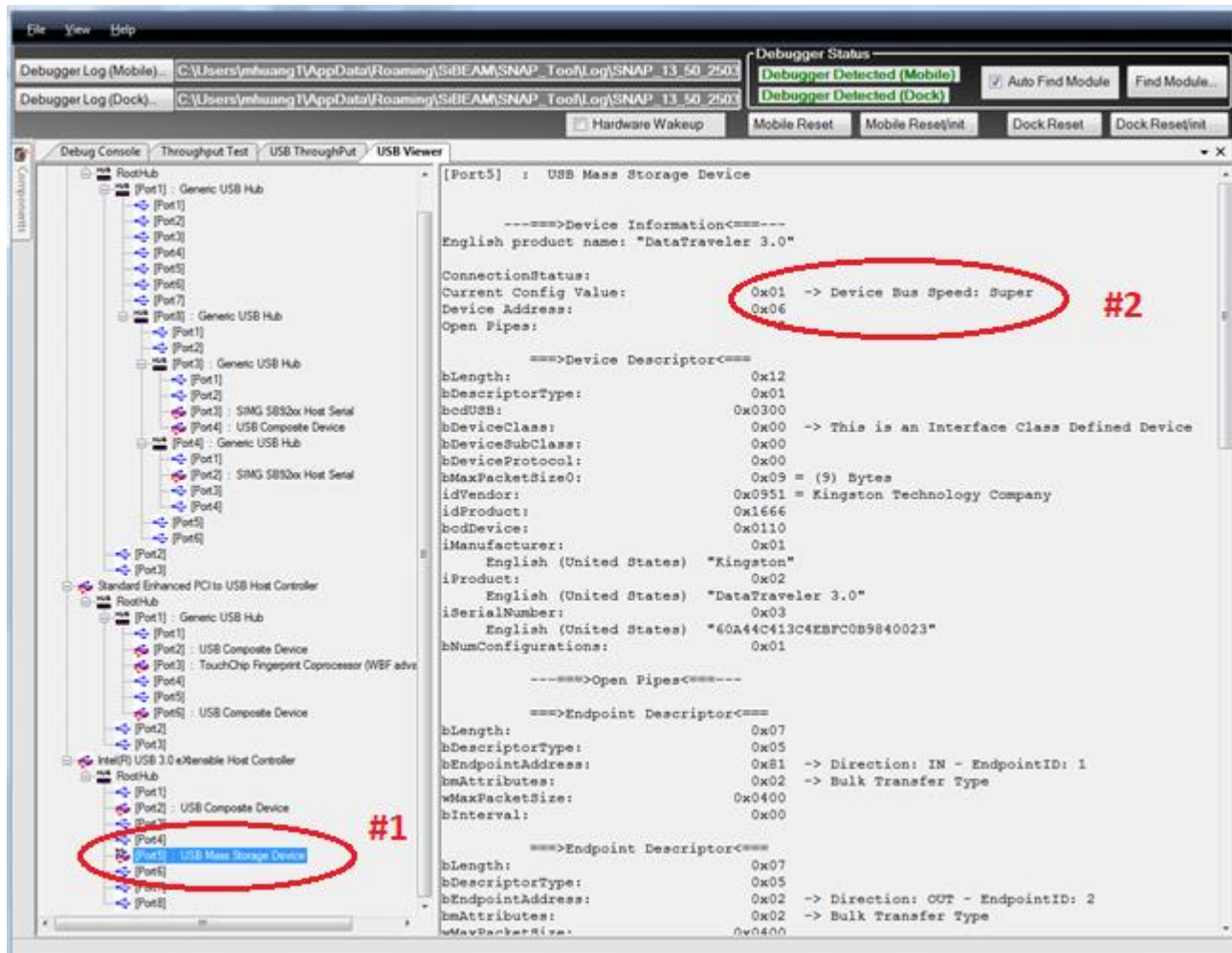


Figure 3.7. USB Viewer Page

3.6. Register Map

The Register Map page is used to read back to local or remote Snap registers value. You can also use the **Save and Send** button to store the registers value and send to the Snap support team to review and analyze the Snap behavior ([Figure 3.8](#)).

- **Local** (1) ([Figure 3.8](#)) reads the local Snap registers value.
- **Remote** (1) ([Figure 3.8](#)) reads remote registers value through the Snap remote debug feature.
- **Refresh Pages** (2) ([Figure 3.8](#)) updates all of the Snap register pages.
- **Refresh Current Page** (2) ([Figure 3.8](#)) updates the current Snap register page.
- **Save and Send** (3) ([Figure 3.8](#)) allows users to store the current registers setting and send the registers setting to the Snap team for review.
- Select **File name** (4) ([Figure 3.9](#)) to store the Snap registers settings.
- Click the **Save** (5) ([Figure 3.9](#)) button to save the file.
- The Mail Saved File dialog box is displayed to allow you to send the .csv file to the Snap team. **Address** (6) ([Figure 3.10](#)) can be SNAPsupport@sibeam.com or any Lattice/SiBEAM contact point.

- **Subject** (7) (Figure 3.10) is the title for this email.
- In **Comment** (8) (Figure 3.10), you can explain the purpose of sending this email to the Snap team.
- Click the **Send** (9) (Figure 3.10) button to send the email to the Snap team.

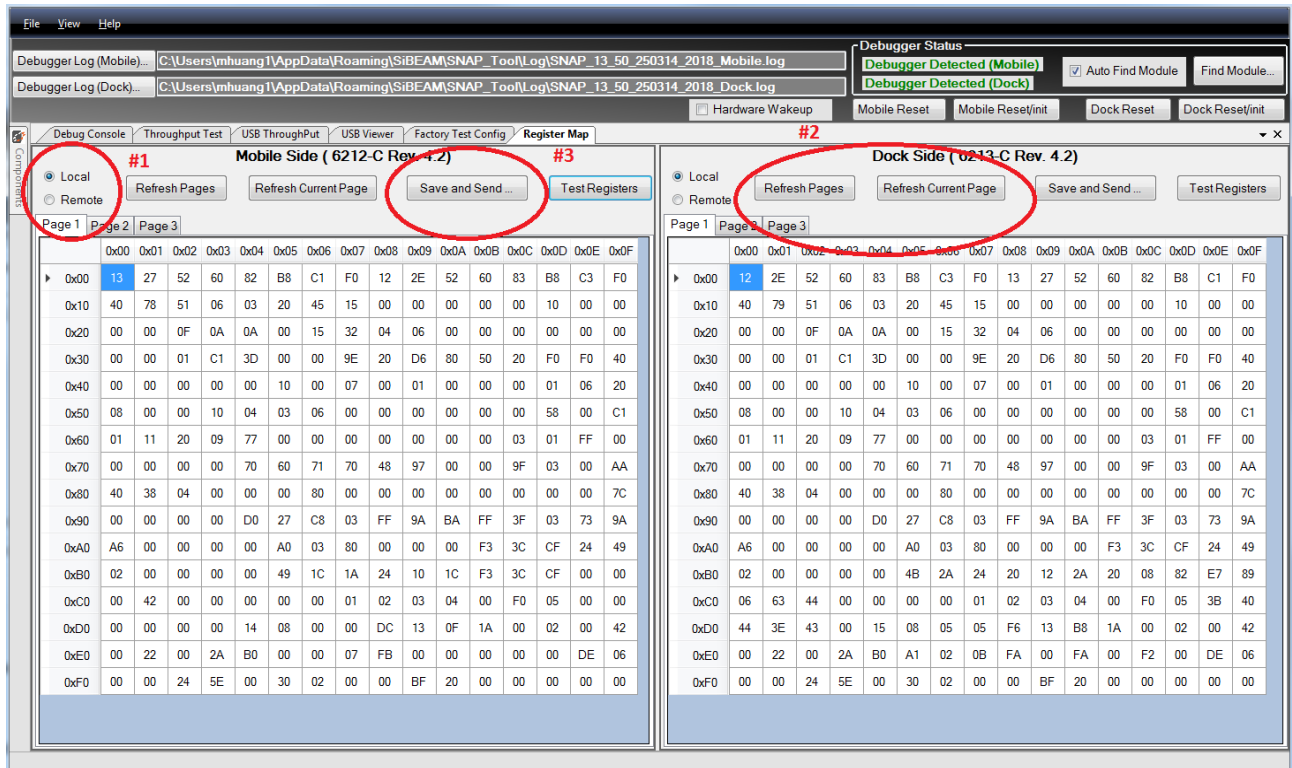


Figure 3.8. USB Register Map Main Page

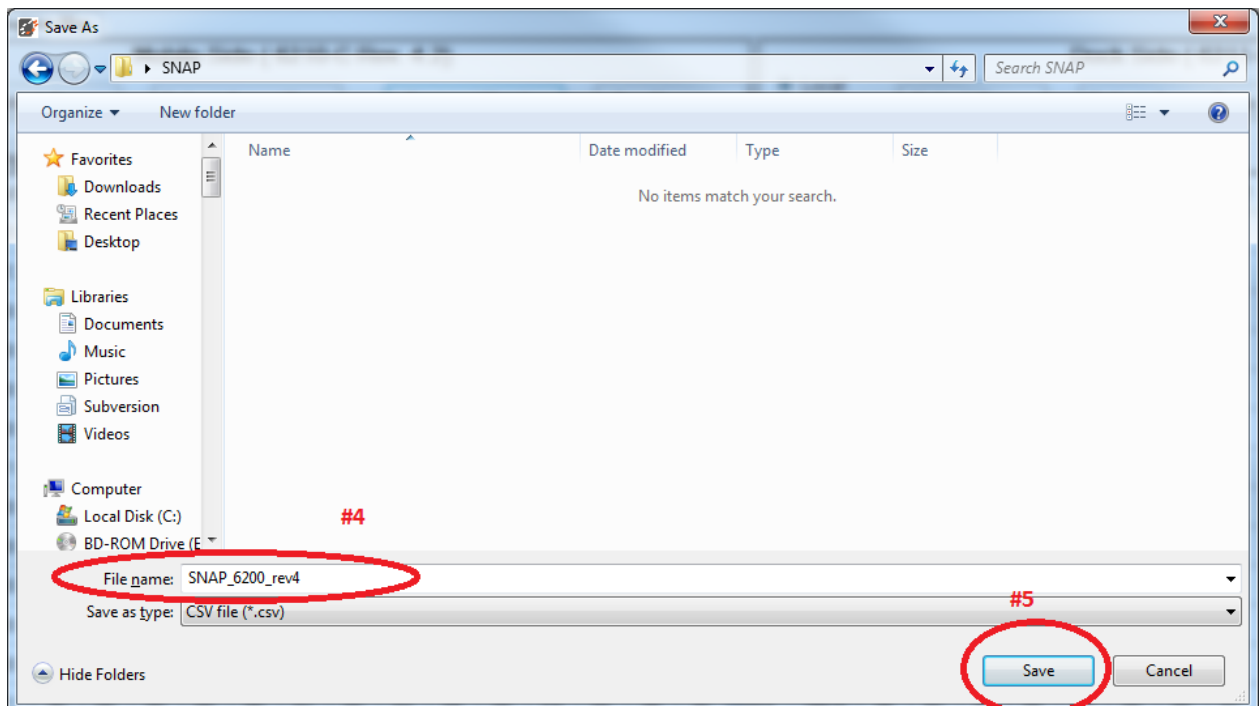


Figure 3.9. USB Register Map Save Registers Setting Page

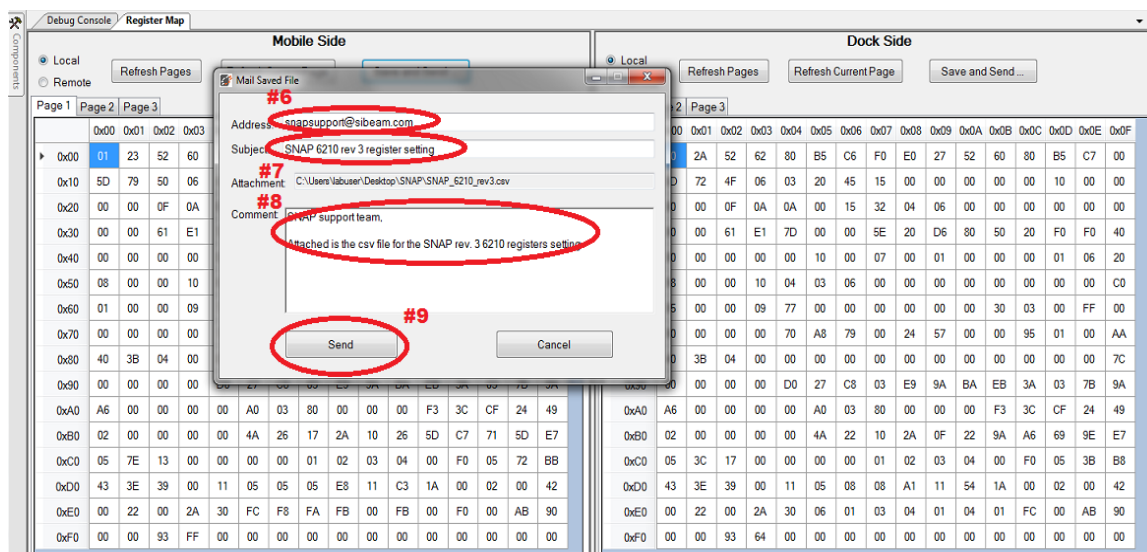


Figure 3.10. USB Register Map Sending Email Page

Note: The contents and meaning of the register map is not disclosed externally. There is no register map description document available to customers and partners. The register map capture is provided for the SiBEAM support team to diagnose eventual issue reports.

3.7. Factory Test/Factory Test Config

The Factory Test and the Factory Test Config are used together to perform the factory testing. You can select and input the parameters to conduct the test using the Factory Test Config page, as shown in Figure 3.11. The test is conducted using the Factory Test page and returns a Pass or Fail result. The results of the test are appended to a text file titled “Factory Text Report.txt” in directory C:\Users\username\AppData\Roaming\SiBEAM\SNAP_Tool\Report\Factory Test Report.txt.

3.7.1. Factory Test Config Quick-Start Guide

To configure the Factory Test (Figure 3.11):

1. Click the **Test Report** button to show the current location of test log file, and change its location.
2. Select **Language** options, which include English, Simplified Chinese, and Traditional Chinese.
3. Enter the test parameters under Device Product Configuration.
 - a. Select **DUT as Local Device** to read both DUT and Golden Unit locally – PC needs to connect to both. Select **DUT as Remote Device** to read from Golden Unit locally and DUT remotely – PC connects only to Golden Unit.
 - b. In **Golden Unit**, select the side against which the DUT is to be tested. The side that is not selected is the DUT. In **DUT Rev**, select the revision number of the DUT.
 - c. Set **BCH Test Interval (sec)** by setting options range from 4 – 10 seconds
 - d. Set maximum BCH/BCH2 error values.
BCH High/BCH2 High indicates DUT side errors. **BCH Low/BCH2 Low** indicates Golden Unit side errors. BCH errors are any packets that have incorrectly transmitted bits. BCH2 errors specifically refer to packets that have exactly two incorrect bits.
 - e. Select the **Use Margin Limit** checkbox to choose your own High/Low Margin (chosen below) for one single run. If the checkbox is not selected, the test runs four times with default margins starting at +4/-4 db.
 - f. Set **DUT Receiver Gain Min/Max** value.
 - g. Set minimum and maximum temperature in **Temperature Min/Max**. A result outside the bounds of this setting returns a fail Hub vendor.
 - h. Select **Measure Crosstalk** to include crosstalk as part of the test.

- The default **Crosstalk Min.** value is 14. A higher value means a stricter test condition.
- i. Select **Skip USB Device Test** to bypass performing a USB device read/write check.
Set the **Device Detect Delay (sec.)** to allow tool to identify USB drives.
- j. Set the **Super Speed UDisk Label** and **High Speed UDisk Label** to find SS/HS USB drive. Label is visible in “My Computer” Directory.
4. Once the settings have been set, click **Apply** to update the test parameters. The Factory Test Config page is closed. The new settings are not applied until the next test cycle.

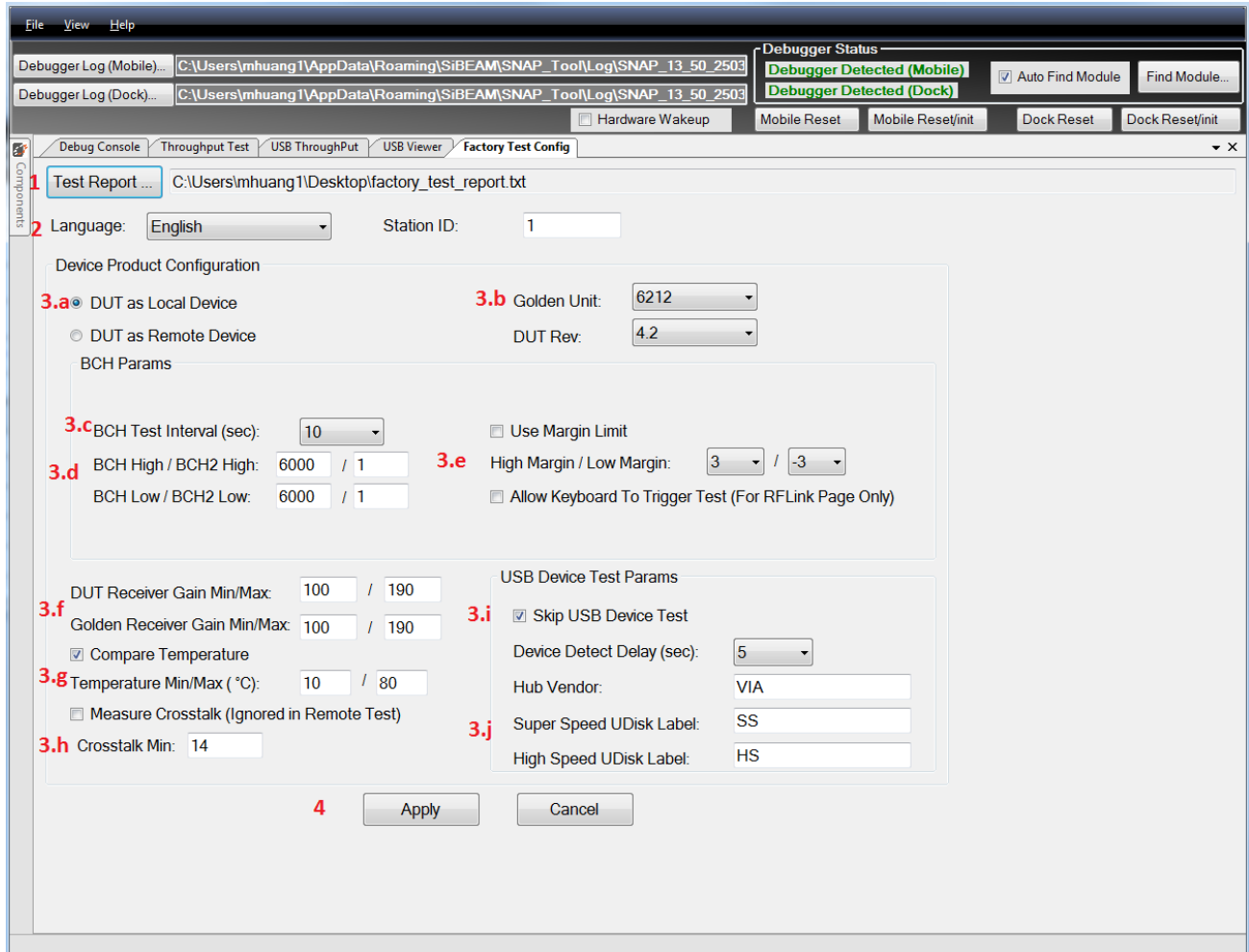


Figure 3.11. Factory Test Config Page

3.7.2. Factory Test Page

The Factory Test Page options are shown in Figure 3.12.

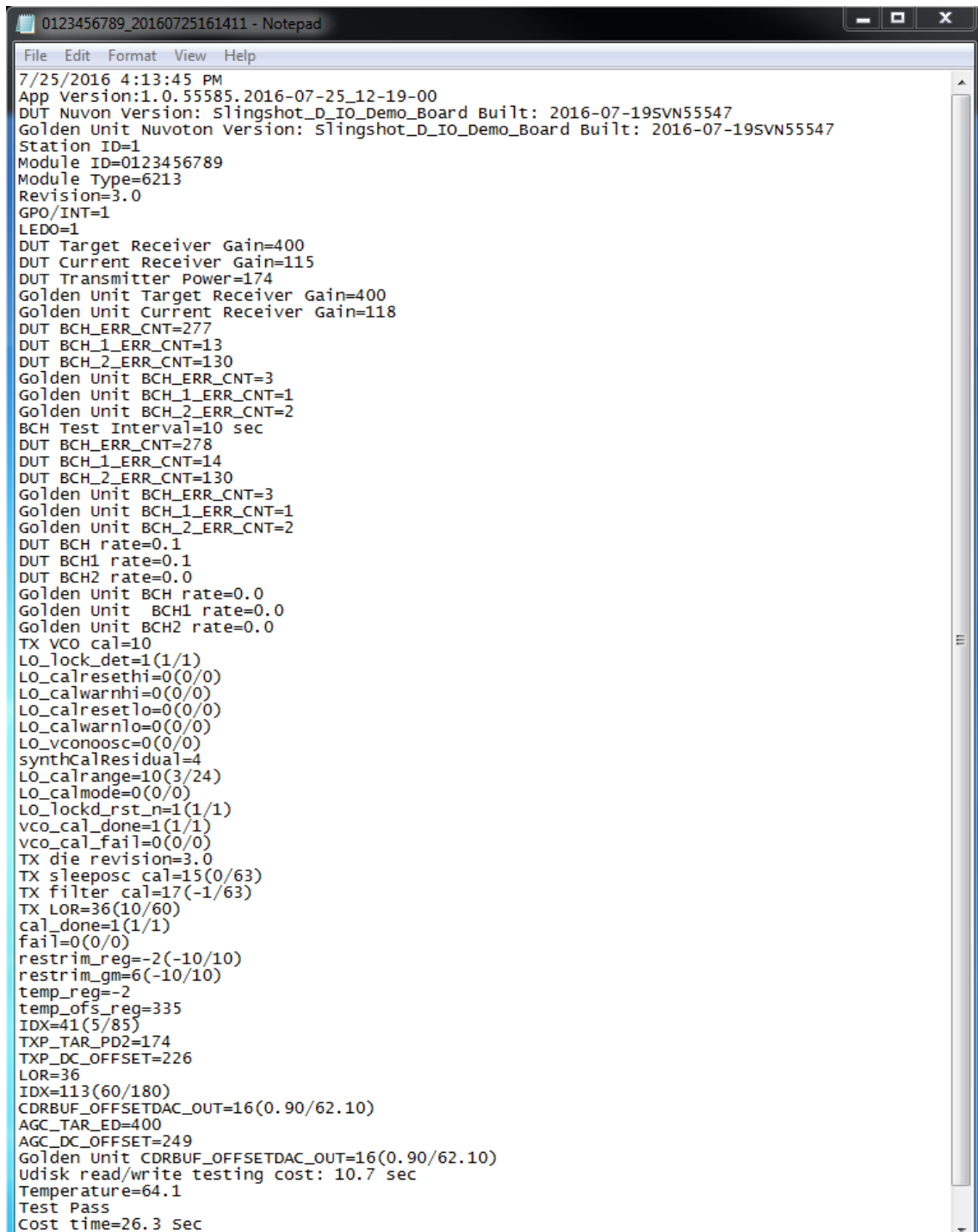
- In **Input Module ID** (1), enter the 10 characters IDs that initiates the test.
 - Once the Module ID is entered, click **OK** in the message prompt.
 - Input Module ID is saved to text file with the Module ID and timestamp as the name.
- **GPO** (2) displays a blue rectangle if USB connection is established between Golden unit and DUT unit.
- **Revision ID** (3) displays version of testing module.
- **Target Receiver Gain** (4) is the maximum value.
Current Receiver Gain (4) changes based on the required gain to establish the link.
Transmitter Power (4) is a preset value.

- **DUT BCH Rate** and **Golden Unit BCH Rate** (5) displays values in red if it exceeds the maximum value set in the Factory Test Config page. **DUT/Golden Unit BCH1** are packets that have exactly one error bit. **DUT/Golden Unit BCH2** have exactly two error bits. DUT/Golden Unit Bit Rate is measured in Gb/s. and is typically around 5.9 Gb/s. This field also shows current TXP value.
- **Cals Result** (6) shows the calibration result.
- **Super Speed Device** and **High Speed Device** (7) USB detection.
- **Temperature** (8).
- **Result of test** (9). “Fail” is displayed in red. “Pass” is displayed in green.

The screenshot shows the 'Factory Test' tab in the Snap tool interface. The main area contains a series of input fields and status indicators, numbered 1 through 9. 1: Input Module ID. 2: GPO. 3: Revision ID. 4: Target Receiver Gain, Current Receiver Gain, Transmitter Power. 5: TXP_Default, DUT BCH Rate, Golden Unit BCH Rate, DUT Bit Rate, Golden Bit Rate. 6: Cals Result. 7: Super Speed Device, High Speed Device. 8: Temperature (°C). 9: Test pass, remove DUT. The Debugger Status bar at the top shows 'Debugger Detected (Mobile)' and 'Debugger Detected (Dock)'.

Figure 3.12. Factory Test Page

Once the test completes, a file is created in directory
C:\Users\username\AppData\Roaming\SiBeam\SNAP_Tool\ModuleID_Timestamp.txt. A test sample completed successfully is shown in [Figure 3.13](#).



```

0123456789_20160725161411 - Notepad
File Edit Format View Help
7/25/2016 4:13:45 PM
App Version:1.0.55585.2016-07-25_12-19-00
DUT Nuvo Version: Slingshot_D_IO_Demo_Board Built: 2016-07-19SVN55547
Golden Unit Nuvo Version: Slingshot_D_IO_Demo_Board Built: 2016-07-19SVN55547
Station ID=1
Module ID=0123456789
Module Type=6213
Revision=3.0
GPO/INT=1
LEDO=1
DUT Target Receiver Gain=400
DUT Current Receiver Gain=115
DUT Transmitter Power=174
Golden Unit Target Receiver Gain=400
Golden Unit Current Receiver Gain=118
DUT BCH_ERR_CNT=277
DUT BCH_1_ERR_CNT=13
DUT BCH_2_ERR_CNT=130
Golden Unit BCH_ERR_CNT=3
Golden Unit BCH_1_ERR_CNT=1
Golden Unit BCH_2_ERR_CNT=2
BCH Test Interval=10 sec
DUT BCH_ERR_CNT=278
DUT BCH_1_ERR_CNT=14
DUT BCH_2_ERR_CNT=130
Golden Unit BCH_ERR_CNT=3
Golden Unit BCH_1_ERR_CNT=1
Golden Unit BCH_2_ERR_CNT=2
DUT BCH rate=0.1
DUT BCH1 rate=0.1
DUT BCH2 rate=0.0
Golden Unit BCH rate=0.0
Golden Unit BCH1 rate=0.0
Golden Unit BCH2 rate=0.0
TX VCO cal=10
LO_lock_det=1(1/1)
LO_calresethi=0(0/0)
LO_calwarnhi=0(0/0)
LO_calresetlo=0(0/0)
LO_calwarnlo=0(0/0)
LO_vconoosc=0(0/0)
synthCalResidual=4
LO_calrange=10(3/24)
LO_calmode=0(0/0)
LO_lockd_rst_n=1(1/1)
vco_cal_done=1(1/1)
vco_cal_fail=0(0/0)
TX die revision=3.0
TX sleeposc cal=15(0/63)
TX filter cal=17(-1/63)
TX LOR=36(10/60)
cal_done=1(1/1)
fail=0(0/0)
restrim_reg=-2(-10/10)
restrim_gm=6(-10/10)
temp_reg=-2
temp_ofs_reg=335
IDX=41(5/85)
TXP_TAR_PD2=174
TXP_DC_OFFSET=226
LOR=36
IDX=113(60/180)
CDRBUF_OFFSETDAC_OUT=16(0.90/62.10)
AGC_TAR_ED=400
AGC_DC_OFFSET=249
Golden Unit CDRBUF_OFFSETDAC_OUT=16(0.90/62.10)
Udisk read/write testing cost: 10.7 sec
Temperature=64.1
Test Pass
Cost time=26.3 Sec

```

Figure 3.13. Factory Test Log Result

3.8. RF Link Info Page

The RF Link Info page contains three tests, as shown in Figure 3.14:

- RF Link status info function
- Link Margin Test function
- Crosstalk measurement

The RF Link status info function section is initially hidden behind a bar. Drag and pull the bar down to display this section. The test reads RF link related information from mobile/dock modules periodically and shows these information. You can specify the time interval and specify which side to read (local or remote).

3.8.1. RF Link Info Functions

Function description (Figure 3.15):

- **Interval** (1) is the time interval between testing cycles.
- **Duration(s)** (2) is the time duration start from clicking the **Start** button.
 - Select **Mobile Data Local Read Dock Data Local Read**: (3) to read all mobile and dock information read from corresponding port.
 - Select **Mobile Data Local Read Dock Data Remote Read from mobile side**: (4) to read all information of both mobile chip and dock chip from mobile side port.
 - Select **Mobile Data Remote Read from dock side Dock Data Local Read**: (5) to read all information of both mobile chip and dock chip all from dock side port.
- **Log File (Mobile)** (6) shows the directory location of the .csv log file. You can change the path by clicking the button.
- **Log File (Dock)** (7) shows the directory location of the .csv log file. You can change the path by clicking the button.

Definition for the read back table (Figure 3.15):

- **FD_BITCNT**: accumulated bit count for RF transfer rate.
- **FD_BITCNT_GB**: accumulated bit count in Gbit format for RF transfer rate.
- **Bit_Rate**: RF transfer data rate per sec. The data rate should keep as ~5.9 Gb/s when the RF link is stable.
- **SYNC_LOST_CNT**: indicator for the RF link status register. If RF link established, the counter should stay the same.
- **BCH_ERR_CNT**: accumulated bch error count before internal error correction. BCH_ERR_CNT should be as low as possible to keep reliable RF link.
- **CHECKER_ERROR_COUNTER**: accumulated checker error count after the internal error correction.
- **BCH_1_ERR_CNT**: single error counter for internal error correction use.
- **BCH_2_ERR_CNT**: double error counter for internal error correction use.
- **AGC_CURRENT**: RF receiver gain index used as RF link strength reference. The value should greater than 130 for reliable RF link.
- **AGC_TARGET**: the maximum receiver gain defined by Snap internally.
- **CDR**: internal clock/data recovery threshold index defined by Snap internally.

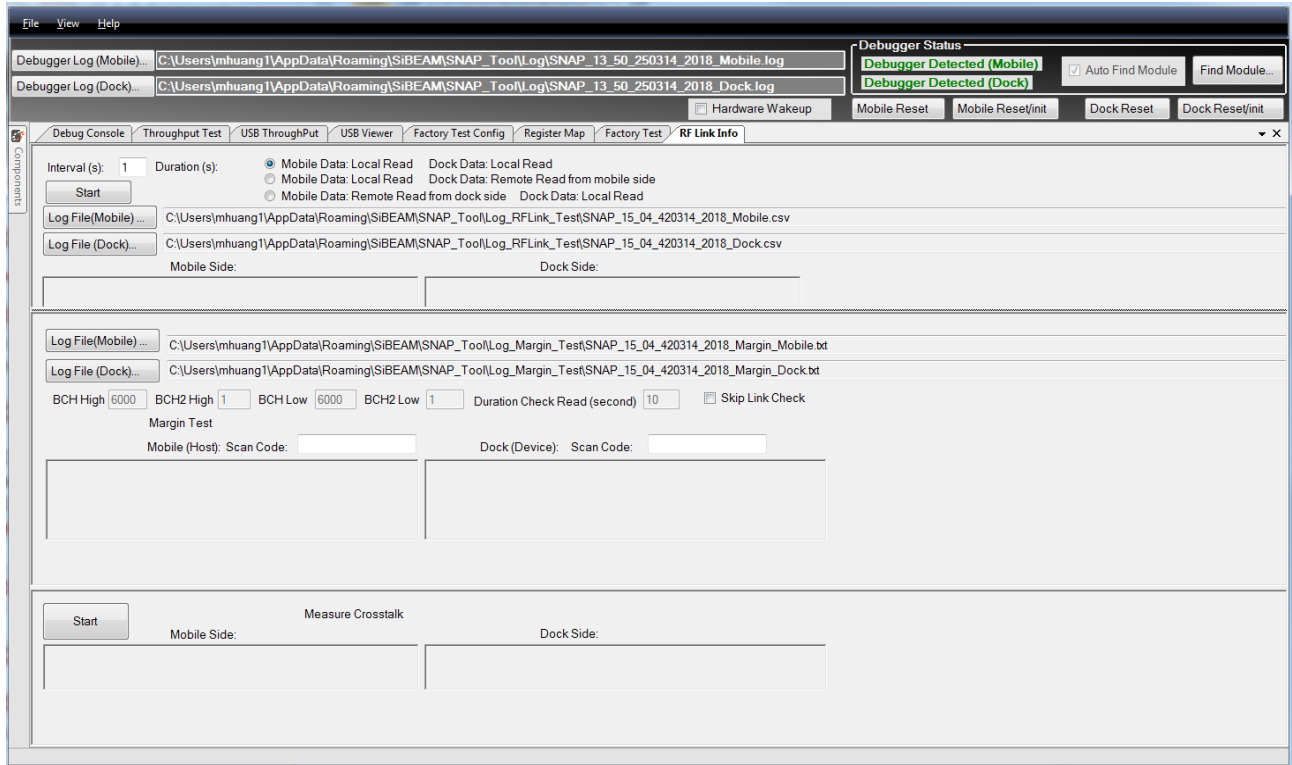


Figure 3.14. RF Link Info Page

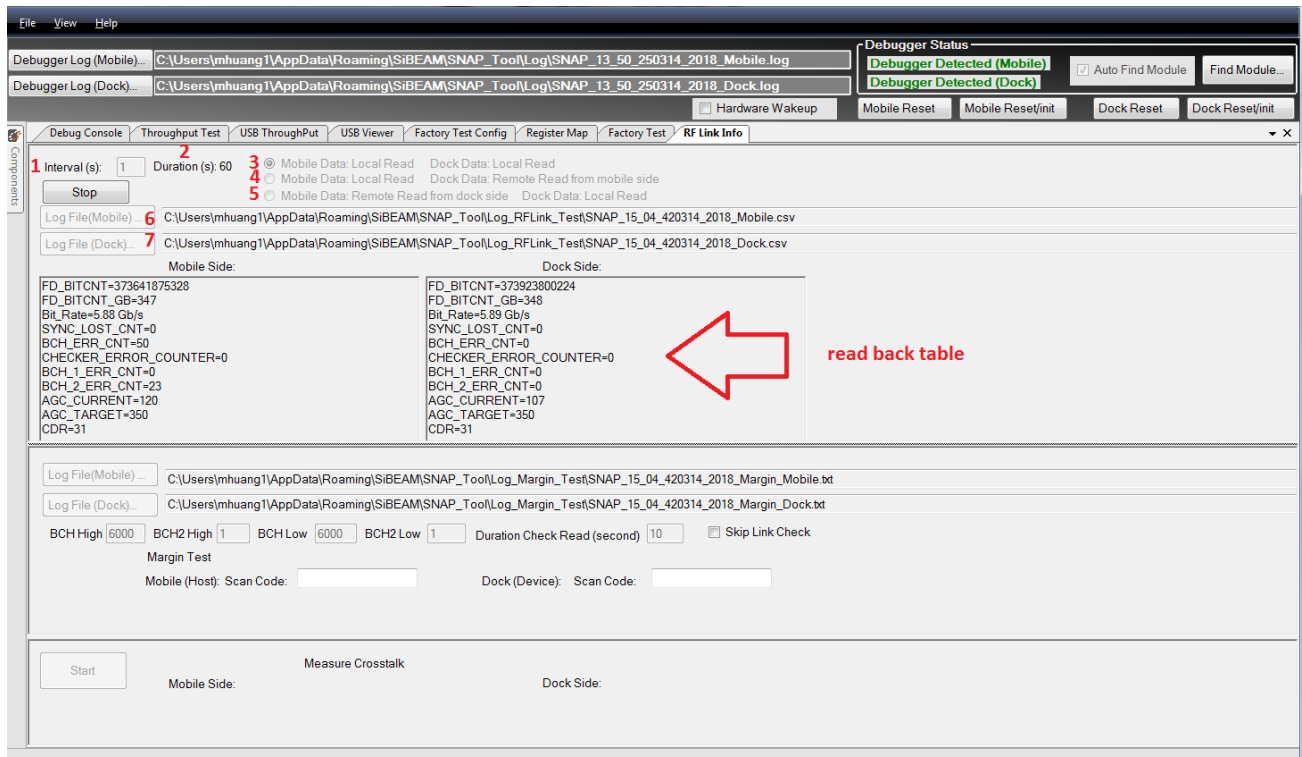


Figure 3.15. RF Link Info Function

3.8.2. Link Margin Test

The second test is the link margin function (Figure 3.17) to check the RF link margin. It changes the transmit power on both mobile and dock side, and reads the corresponding BCH/BCH2 errors. The purpose of the test is to see if there is enough link margin on either side in case there is more/less transmitted power.

- The default margin setting is test +4db/-4db.
4db is the maximum margin for the local side.
-4db is the maximum margin for the remote side.
- The minimum targeted margin for a design should be 2db/-1db. Measured margins lower than this threshold require design changes. Ideally you should target a margin of 4db/-4db.
- Pass means if BCH is less than 6000/s, and if BCH2 is less than 1/s.
- Test condition is defined from the Factory Test Config page, as shown in Figure 3.16.

To run the Link Margin test:

1. Go to Factory Test Config page. Select the **Allow Keyboard to Trigger test** checkbox.
2. Click the **Apply** button to update the configuration. This allows you to use keyboard to update the parameters at the Link Margin Test section.

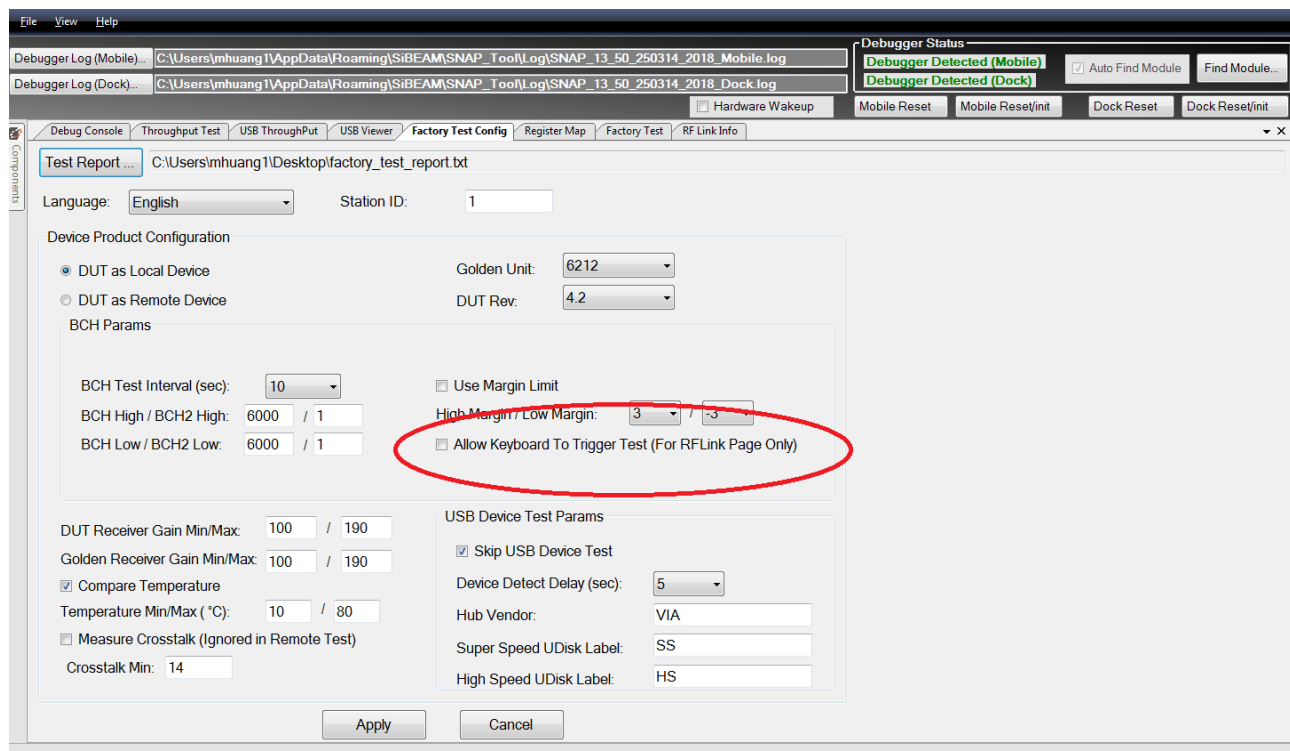


Figure 3.16. Link Margin Test Config

3. Go back to the RF Link Info page and the **Start** button displays, as shown in Figure 3.17.

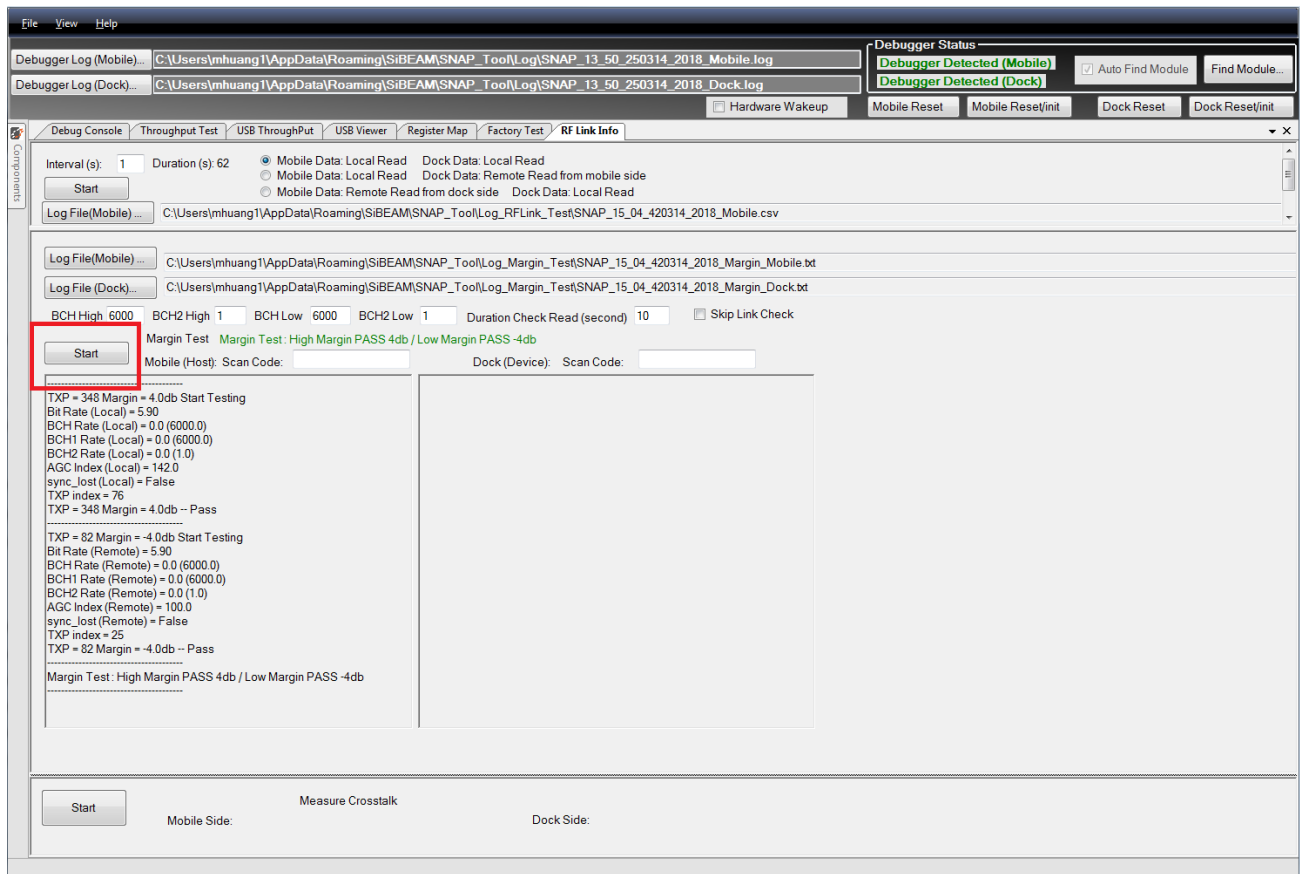


Figure 3.17. Link Margin Test

- Click the **Start** button to start the test, as shown in Figure 3.18.
- Go back to the Factory Test config page to adjust the settings, if needed. Return to this page to repeat step 3.

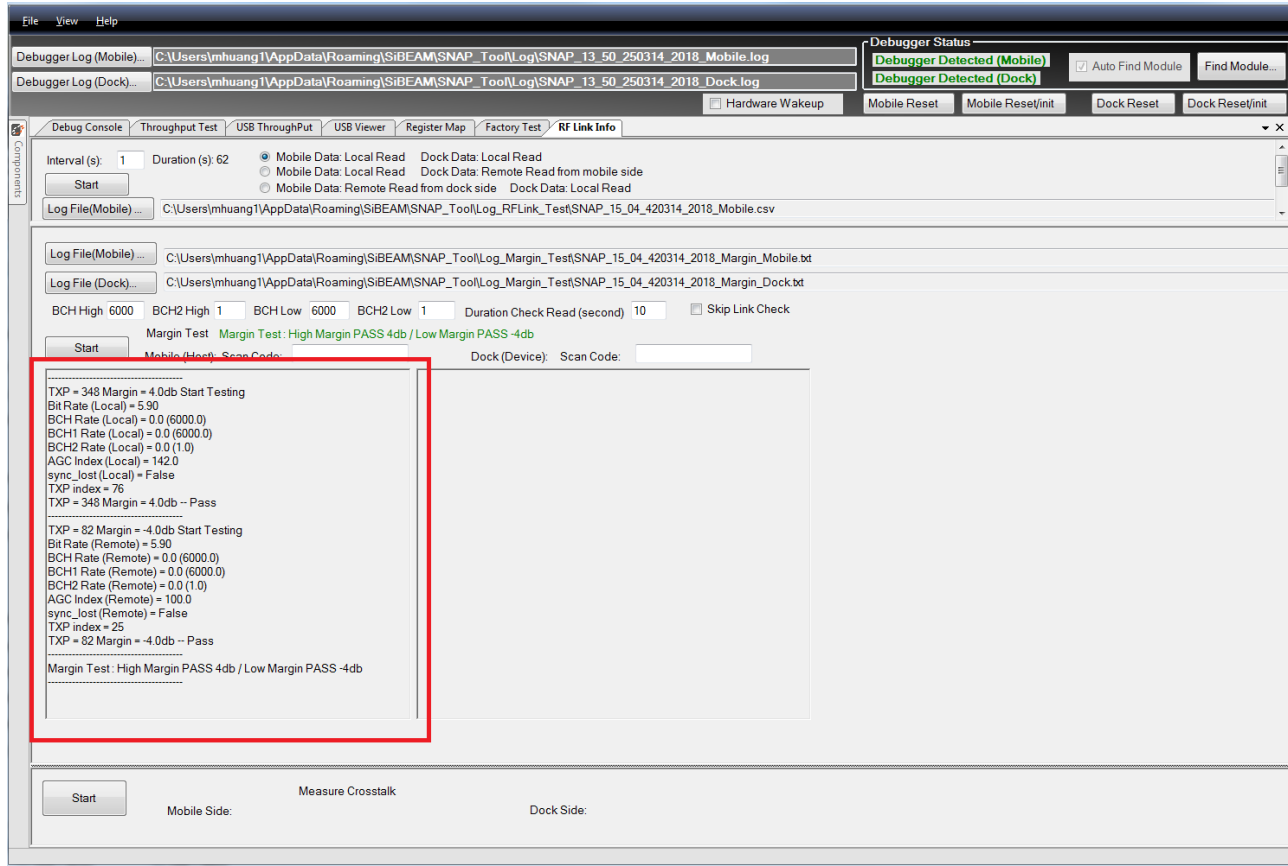


Figure 3.18. Link Margin Test

3.8.3. Crosstalk Measure

Crosstalk ratio from the RF Link Info page (Figure 3.19) is used to check the unwanted signal level. This test measures the crosstalk ratio for both the mobile and the dock side.

With an ideal design, the crosstalk ratio should be greater than 15 db on both sides of the link. The higher the crosstalk value, the lower the unwanted signal.

To run the Crosstalk Measure test:

1. Make sure that the Snap Tool detects both sides as a local device, which means both devices are connected to the test PC USB2 port.

Note: This test takes a few minutes. Be patient and wait until the test is concluded before running other tests.

2. Click the **Start** button to start testing.

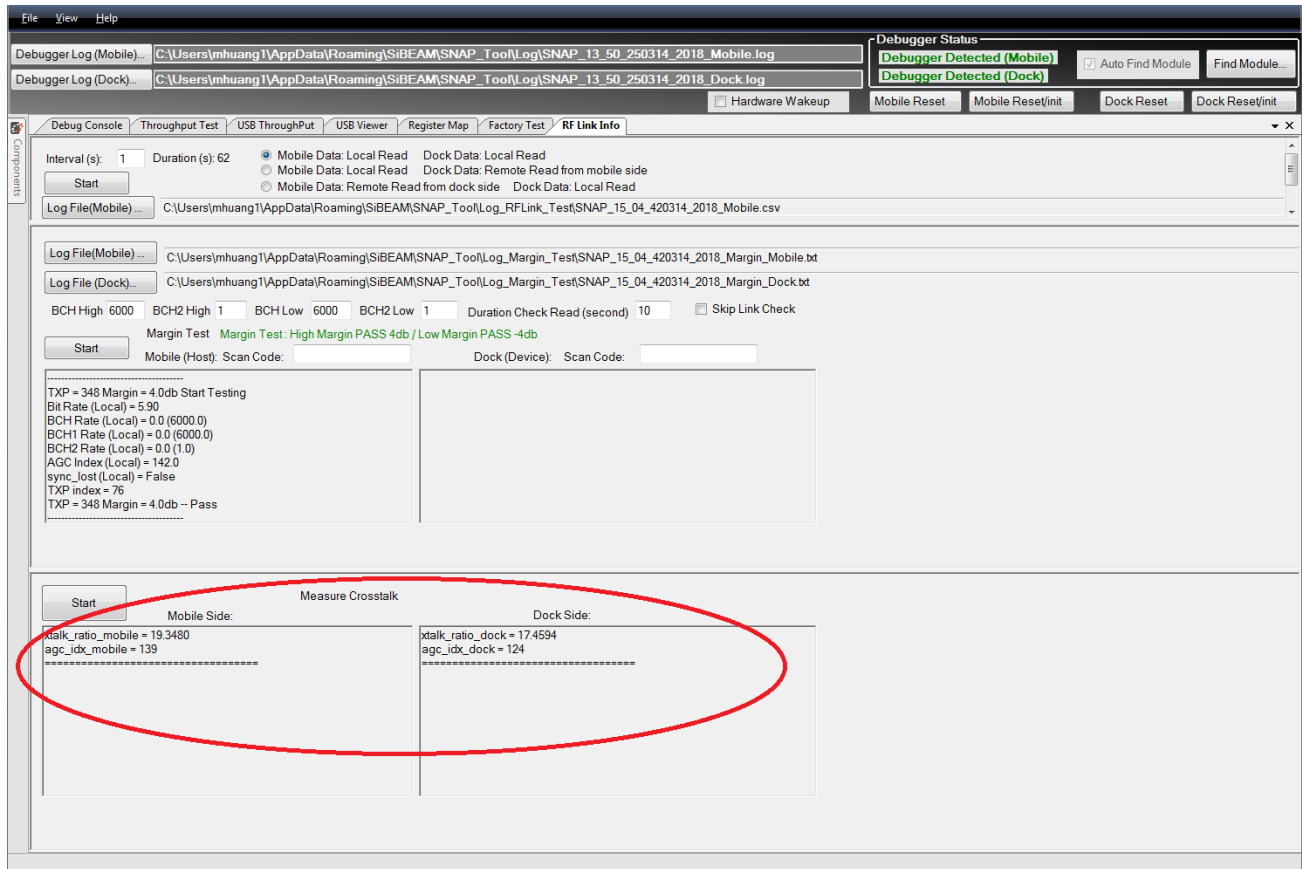


Figure 3.19. Crosstalk Measure

Ordering Information

Production Part Numbers

Module	Part Number
SB6210 based Module with End-fire antennas	MOD6210
SB6211 based Module with End-fire antennas	MOD6211
SB6212 based Module with Broadside antennas	MOD6212
SB6213 based Module with Broadside antennas	MOD6213
Snap Reference Kit end to end configuration	SK621011
Snap Reference Kit broad to broad configuration	SK621213

References

Standards Documents

This is a list of the abbreviations used in this document. Contact the responsible standards groups for more information on these specifications.

Abbreviation	Standards Publication, Organization, and Date
USB 3.0	<i>Universal Serial Bus Specification Version 3.0 Revision 1</i> , Copyright © 2011, Texas Instruments, Hewlett-Packard Company, Intel Corporation, Microsoft Corporation, Renesas Corporation, ST-Ericsson.
USB 2.0	<i>Universal Serial Bus Specification Version 2.0 Revision 2</i> , Copyright © 2000, Compaq, Hewlett-Packard Company, Intel Corporation, Lucent, Microsoft Corporation, NEC, Phillips.

Revision History

Revision A, March 2018

First production release.



7th Floor, 111 SW 5th Avenue
Portland, OR 97204, USA
T 503.268.8000
www.latticesemi.com