



SKY66430-11 / SQN66430-11 SiP

Evaluation Board User Manual

V1.2

*This SiP includes the Sequans
Monarch 3330 chipset*



1.0 Overview

This document provides an overview of the Monarch SiP SKY66430-11 evaluation board, its basic installation procedures and a quick startup reference.

2.0 Evaluation Board Presentation

2.1 Evaluation Board Contents

Out of the box, the evaluation board is delivered with the following:

- The evaluation board: standalone Cellular Modem board with SKY66430-11
- One USB-MiniUSB cable
- One Truphone SIM card (This SIM card offers global LTE Cat M1 connectivity. The SIM card comes with a free 3-month data plan of 150 MB and needs to be activated before first time usage. You need to connect to <https://account.truphone.com/register> to create your Truphone account and activate your SIM card from the Truphone web portal. You will then be able to extend your data plan if needed.

2.2 Evaluation Board Software Dependencies

The evaluation board requires external software to help you perform some operations.

Mandatory

Serial Terminal Emulator under Windows, necessary to interact with the evaluation board through AT Commands. The examples illustrated in this document are based on Tera Term Software.

Optional (Not Needed for Standard Evaluation Usage)

These tools are released on request and when necessary by the Sequans support team.

For inquiries, please contact Sequans support through the Sequans web site contact portal at: <https://www.sequans.com/contact/>

- **Sequans Point-to-Point Protocol Software**

Tool for helping to configure Windows driver for PPP interface settings

- **Sequans Software Upgrade (SFU)**

Tool necessary to perform local modem software upgrade

- **Sequans Debug and Monitoring Tool (DM Tool)**

Tool that provides access to advanced LTE information for debugging purposes

2.3 Evaluation Board Connectors

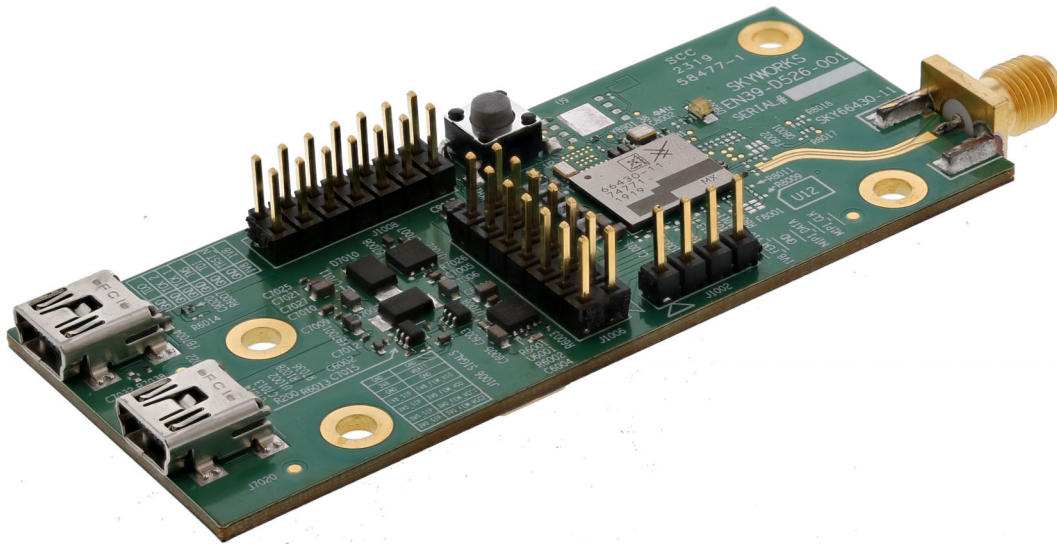


Figure 1. SKY66430-11 Evaluation Board Connector Diagram (Top View)

Note: For jumper default settings, please refer to the appendix.

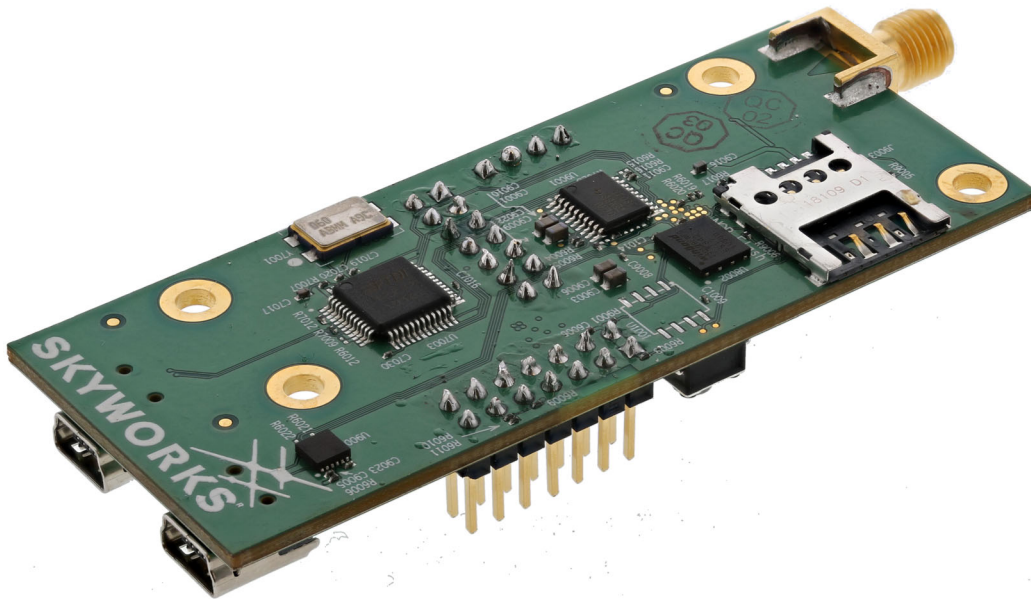


Figure 2. SKY66430-11 Evaluation Board Connector Diagram (Bottom View)

3.0 Getting Started

3.1 Board Preparation

- Connect an antenna or the SMA RF cable of your testing equipment to the board LTE RF SMA Connector
- Insert your 3FF SIM card in the SIM slot
- Plug the mini-USB cable from your PC to the board USB port X

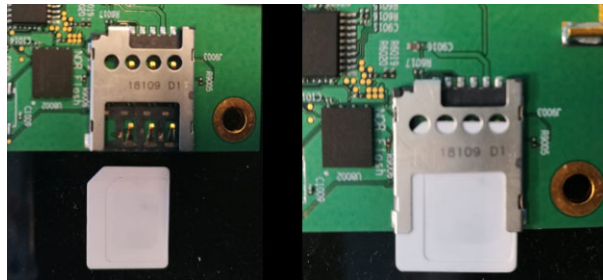


Figure 3. SKY66430-11 Board Preparation

3.2 Drivers Installation

- When you plug the USB connector for the first time in your PC, you need to wait for approximately one minute to allow the drivers to be automatically installed on Windows
- The USB connects the on-board UART-USB bridge IC to provide ACM interfaces (virtual COM) in order to access the board through UART
- You should see a popup window with the following information

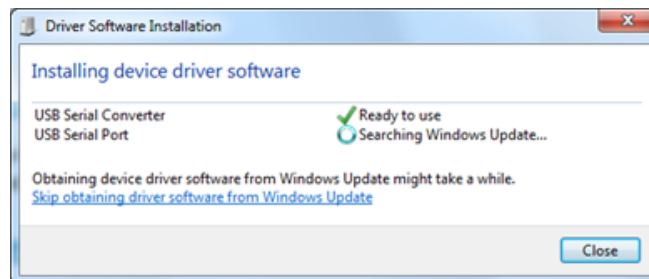


Figure 4. Driver Software Installation Popup Window

- If the driver fails to automatically install on Windows, you can always install manually from <http://www.ftdichip.com/Drivers/VCP.htm> FTDI driver labeled UART/USB
- After driver installation, it is safer to unplug the evaluation board and reboot your PC

3.3 Verifying Your Installation

- After completing the drivers' installation, whenever you plug the USB cable you should be able to see the following, under Windows Control Panel > Device Manager

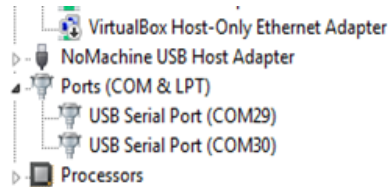


Figure 5. Windows Control Panel > Device Manager

- Indeed, port enumeration can be different on your PC from the given the example, depending on your local settings (e.g., COM23, COM24, etc.)

3.4 Overview of the COM Ports

The following table summarizes the COM ports under Windows and their mapping and configuration to the evaluation board.

3.4.1 COM Ports Overview Tables

Table 1. USB Port X

Board Mapping	Port Enumeration	Usage	Baudrate	Data Bits	Flow Control	Parity	Stop
UART 0	COMa (e.g., COM29)	AT Command Data Over PPP	115200	8	Hardware	None	1
UART 1	COMb (e.g., COM30)	DM Tool and Upgrade Port	921600	8	Hardware	None	1

Table 2. USB Port Y

Board Mapping	Port Enumeration	Usage	Baudrate	Data Bits	Flow Control	Parity	Stop
UART 2	COMc (e.g., COM31)	Console	115200	8	None	None	1

IMPORTANT: COM ports cannot be shared between two different applications at the same time. One of the applications will be in error.

3.5 Configuring and Verifying Installed COM Ports

After COM drivers are installed, open the Windows device manager, expand Ports (COM&LPT) label and click on each one of the USB Serial Port (COMx), tab Port Settings and enter the appropriate values as described in the COM ports overview table.

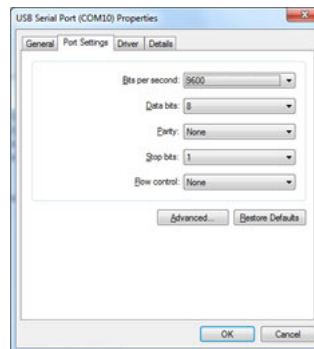


Figure 6. USB Serial Port Properties

4.0 Using the Evaluation Board

4.1 AT Commands

- The evaluation board configuration and usage is all being done through AT commands
- In order to send AT commands to the board, you need to use a Serial Terminal program under Windows (e.g., Tera Term freeware)
- To send an AT command to the board, you need to connect your Serial Terminal to the "UART 0" port, corresponding to COMa on Windows enumeration. Please refer to the table in Overview of the COM Ports on page 5 to determine the exact COM port on your PC
- Configure the correct Baud rate 115200 and the other settings in the terminal

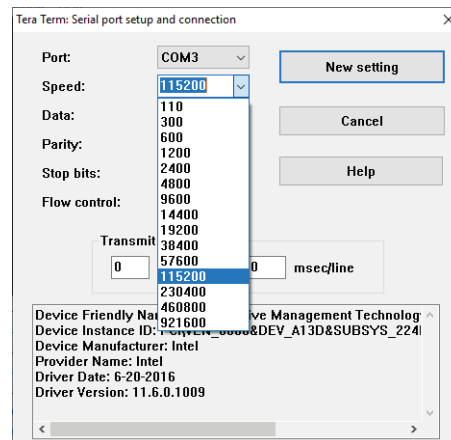


Figure 7. Tera Term Serial Port Setup

- Once the correct setting is done, you should be able to start sending AT commands and receiving their corresponding output
- You can start with ATE1 to enable the echo for the current session

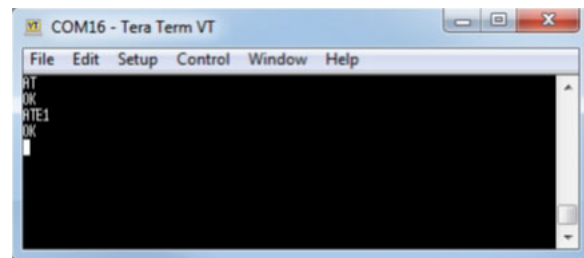


Figure 8. AT Command Window

Note: You can access the latest version of the AT Command Reference Manual through the same channel where you obtained this document. This reference manual describes the complete list of AT commands supported by SKY66430 SiP firmware.

4.2 Console Terminal

Connecting a serial terminal to the COM port mapped on UART 2 of the evaluation board will allow you to access to the evaluation board console. The console is a maintenance window and not necessary for regular operations. However, it is useful to have during maintenance phases, such as firmware upgrade or to observe the boot messages after hitting the reset button.

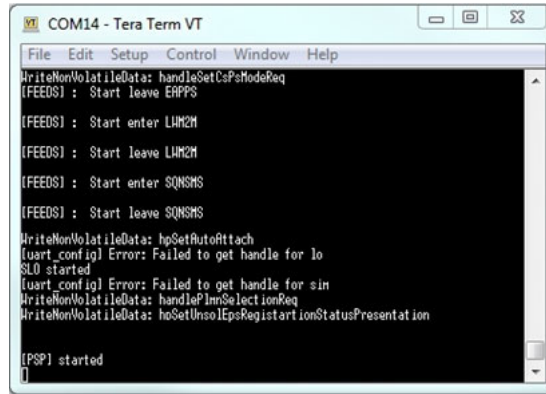


Figure 9. Console Window

5.0 Supported Operators

EVb is provided with a SIM card - In order to check the supported operators, please refer to the Truphone web site.

5.1 List of Supported Operators

The list of the operators is predefined in the software and automatically configured when inserting their SIM card is presented in [Connecting the Board to a Network on page 9](#).

The modem can support up to 18 LTE bands. Scanning all the bands takes several minutes. In order to reduce the scanning duration, it is possible to configure the list of bands that need to be scanned with the AT+SQNBANDSEL command.

6.0 Connecting the Board to a Network

Refer to the *Sequans AT Command Reference Manual* and Monarch Module Use cases with AT commands for more details.

If you have access to an LTE-M 4G network or similar:

- Connect the RF cable or the antenna to the RF port of the board
- Configure bands to be scanned – AT+SQNBANDSEL=0,"standard",2,4,12
 - 2,4,12 is used as an example to attach to AT&T bands for a device in the United States
- Insert your SIM card in the SIM slot (cf Board Preparation)
- To check the SIM card state:
 - From the terminal, enter:
 - AT+CFUN=4
 - AT+CPIN?
 - The SIM card will be read when the UE is in +CFUN=1 or +CFUN=4 states.
 - The response will be:

+CPIN: **<code>**

<code> = Ready : SIM card is present and unlocked

<code>=SIM PIN : Modem is waiting SIM PIN to be entered

<code>= SIM PUK : Modem is waiting SIM PUK to be given

or ERROR, when SIM is not inserted or not detected

- From the terminal, enter AT+CEREG=1
 - This command will allow getting notification every time there is a change of the network registration status
- From the terminal, enter AT+CFUN=1
- The response will be:
 - OK
 - Followed by:

CEREG=**<stat>**

<stat>=0 : Modem is not registered and is not currently searching an operator to register to

Possible cause: SIM card error or registration ongoing

<stat>=1 : Modem is registered on network -board connected-

<stat>=2 : Modem is not registered, but is currently trying to attach or is searching for an operator to register to

Possible causes:

No network available

Available networks have bad coverage

PLMN available but the registration is rejected

<stat>=3 : Registration denied

Possible causes:

Illegal mobile equipment

IMSI unknown at HLR

PLMN not allowed

Location area not allowed

Roaming not allowed in this location area

Network failure

Network congestion

6.1 Checking the Signal Strength

When your board is connected to a network, you can check the signal strength and characteristics through the following AT command:

- AT+CSQ

- Response will be

+CSQ:<rss>,<ber>

where <rss> represents the signal strength at the antenna and <ber> is the bit error rate in %.

Table 3. <rss> Conversion Table

<rss> Parameter	Signal Description with RSSI Value Range
0-9	Marginal: -113 dBm to -95 dBm
10-14	OK: -93 dBm to -85 dBm
15-19	Good: -83 dBm to -75 dBm
20-30	Excellent: -73 dBm to -53 dBm
31	Excellent: -51 dBm or greater
99	Unknown or not detectable

Table 4. <ber> Conversion Table

<ber> Parameter	Bit Error Rate (in %)
0	Less than 0.2%
1	0.2% to 0.4%
2	0.4% to 0.8%
3	0.8% to 1.6%
4	1.6% to 3.2%
5	3.2% to 6.4%
6	6.4% to 12.8%
7	More than 12.8%
99	Unknown or not detectable

6.2 Sending Data Through the Evaluation Board

- When your Kit is connected to a network, you can attempt to do a ping to a remote server using AT+PING

Example:

```
AT+PING="sequans.com"
```

Response:

```
+PING: 184.106.55.83.190.39
```

```
+PING: 184.106.55.83.200.39
```

```
+PING: 184.106.55.83.200.39
```

```
+PING: 184.106.55.83.200.39
```

- Documentation for PING as well as other AT commands allowing to open TCP, UDP sockets, send data requests over HTTP or connect to an MQTT broker can be found in the AT commands Reference Manual, see [1].

7.0 Power Measurement

Power consumption measurement can be performed on EVB by setting the modem into specific mode. For details, refer to the *Skyworks Power Consumption Measurement Guideline* document.

8.0 Device Maintenance

8.1 Introduction

This section is not part of the default usage of the evaluation board. It is to be used as a reference in case you have been in contact with the support team, and they invited you to run some of the following actions.

8.2 Firmware Upgrade

8.2.1 Firmware Upgrade Introduction

This section is only informative in case you are invited to upgrade the SW of the evaluation board.

The evaluation board you received is normally loaded with up-to-date software and it is ready to work. However, your support at Sequans may ask you to upgrade the default software for some reasons at any time.

To upgrade your board you need to obtain the following from Sequans:

- The Sequans Firmware Upgrade (SFU) Tool
 - *sfu_1.1-xxx*
- The SFU User Manual
 - Monarch_SFU_UserGuide-RevX.pdf
 - The new firmware to upload on the evaluation board: it is a file with the .dup extension (e.g., SQN66430-REV2_B1B2B3B4B5B8B12B13B14B17B18B19B20B25B26B28B66B85_BBA1-RFA3-SKY6643011_LR5.4.1.0-49576.dup)

The first time you use SFU, you need to install it on your PC.

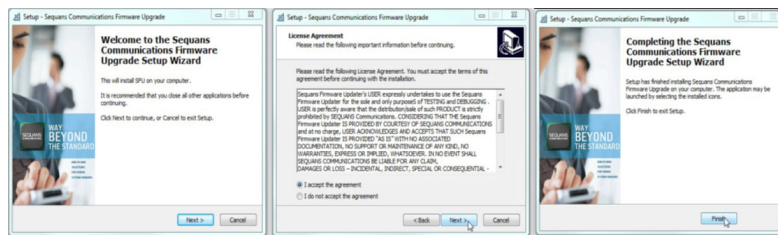


Figure 10. Sequans Firmware Upgrade (SFU) Program

Note: The SFU program operates on "UART 1". Refer to COM Ports Overview Tables on page 5 to map it for your setup.

8.2.2 Upgrading the Evaluation Board

For detailed SFU usage, please refer to the Monarch Software Release Note and the SFU User Manual documents.

8.3 DM Tool

This section is only informative in case you are invited to use DM Tool.

DM Tool is a Sequans proprietary tool, only needed for troubleshooting 3GPP protocols issues.

In general, all the operations on the evaluation board are to be run through AT Commands via serial terminal. DM Tool can allow performing specific deep Monitoring and Debugging sessions.

When you are invited to use DM Tool, you need to have access to the following deliverables from your Sequans support.

- **DM Tool Installation Program (sqn4gdm_setup_1.x-xxx.exe)**

Basic DM documentations are embedded in the tool itself, through the help Menu.

- **DM Tool Application Note** Document

8.3.1 Connecting DM Tool to the Board

DM Tool has to be connected to UART 1. Plug the mini-USB cable from your PC to the USB **Port X** of the board.

8.3.2 Using DM Tool

Read the **DM Tool Application Note** to configure and use the DM tool.

9.0 Troubleshooting Issues

9.1 Most Common Issues

The following is a list of common issues and possible ways to fix the issue.

Symptom	Solution
The board doesn't boot up	Check your USB cable connection
No RF signal	Check that the RF cable is properly connected on the UE side and on the eNB simulator side Check network coverage
Weak LTE signal	Check that the RF cable is properly connected on the eNB side and UE side Check that the power level on the eNB is set to a proper level Check that there is no additional attenuator inserted in the RF cable chain Check network coverage
No eNB detected	Check that the eNB simulator power is ON and that the cell signal generation is turned ON
The UE doesn't find the cell signal due to incorrect frequency value	Check that the band/earfcn value set on the eNB simulator side matches with the band capabilities of the evaluation board
The UE finds the cell but doesn't attach due to USIM	Check that the PLMN value of the USIM card used matches with the PLMN value set on the eNB simulator side Check the USIM card status with AT+CPIN? ; if ERROR is returned it could be a HW issue (voltage or USIM wrongly/not inserted) ; if PIN is returned, the USIM needs to enter a PIN CODE to be unlocked.
The UE finds the cell but doesn't attach due to eNB not configured for LTE CatM	Check that the eNB is configured for LTE Cat M
The UE finds the cell but doesn't attach due to eNB sending a NAS Attach Reject message	Check the APN settings: name, IP type and authentication
eDRX or PSM is not enabled	Check that eDRX or PSM is enabled on eNB and UE side
The UE cannot enter IDLE	Check there is no undesirable UL or DL traffic Verify Windows chatty services

10.0 Appendix

- Below is the default jumper setting for the SKY66430 evaluation board.
- It is set up at the factory. However, if a jumper gets knocked off during shipment or if you are instructed by technical support to change a setting during a maintenance session, the following diagram shows the proper jumper settings:

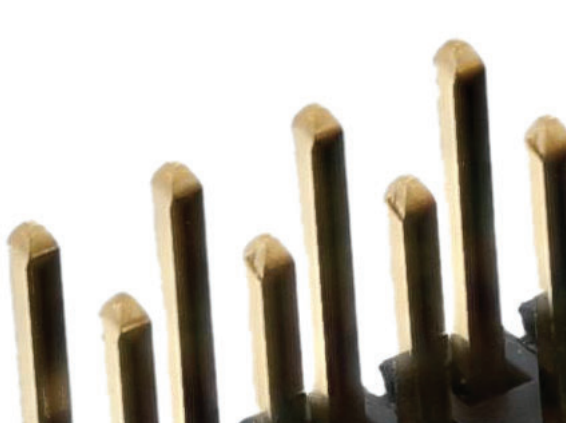


Figure 11. Default Jumper Settings

11.0 References

Document Name	Document Title
<i>Sequans AT Command Reference Manual</i>	Monarch-LR5410-ATCmdRefMan_Rev2.pdf
<i>Monarch Module Use Cases with AT Commands</i>	
<i>Data over UART with PPP</i>	
<i>Software Release Note</i>	
<i>Power Consumption Measurement Application Note</i>	

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