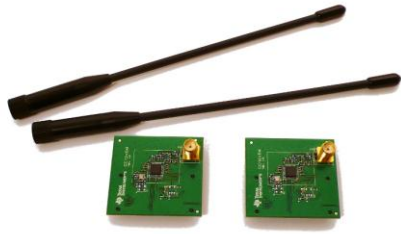TEXAS INSTRUMENTS

# CC112x Evaluation Module Kit Quick Start Guide

## Opening the Box and Running the Packet Error Rate Test

### 1. Kit Contents



2 x CC1120 or CC1121 Evaluation Modules
2 x Antennas (type depending on frequency)

The 868-915 MHz RF boards in this kit are FCC and IC certified. The 169, 420-470 and 868-915 boards are tested to comply with ETSI/R&TTE over temperatures from 0 to +35°C.

FCC/IC Regulatory Compliance (868-915 only)
FCC Part 15 Class A Compliant
IC ICES-003 Class A Compliant

Antenna types:
955 & 868-915 MHz: Pulse W5017, 2 dBi
420-470 MHz: Pulse SPWH24433TI, 0 dBi
169 MHz: Pulse SPHL24169TI

### 2. How to use the Modules

**The EMK is an add-on kit to supplement the CC1120DK with evaluation boards supporting additional frequency bands. This document covers the CC1120EMK and CC1121EMK.**

The CC112xEM boards can be plugged into several development boards from Texas Instruments. Most notably, you can use the SmartRF Transceiver EB, which is included in the CC1120DK. This board lets you run a packet error rate (PER) test, control the device from SmartRF™ Studio and it can be used as a development platform.

It is also possible to connect the EM to other TI development boards with the appropriate connectors or to the basic "SoC Battery Board". The latter can be used as a carrier board for the EM to simplify the connection to other boards with a microcontroller. See:

http://www.ti.com/tool/soc-bb

This guide will show how to use the modules together with SmartRF Transceiver EB (TrxEB).

### 3. Plug the EM into the TrxEB
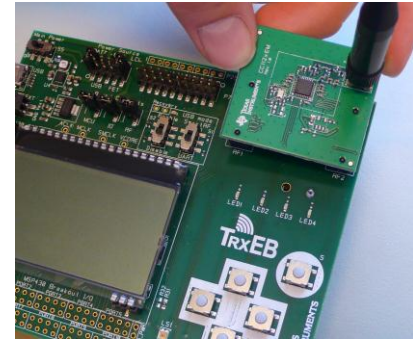


Insert a CC112xEM board into the TrxEB as shown above. Connect the antenna to the SMA connector on the EM.

**Caution!** The kit contains ESD sensitive components. Handle with care to prevent permanent damage.

### 4. Select Board Mode

Use the switches S1 and S2 to select the operating mode of the board. For the sake of this quick start guide, please select "Enable" and "UART". This configuration will make it possible to communicate directly with the MSP430 over a virtual COM port on the PC.
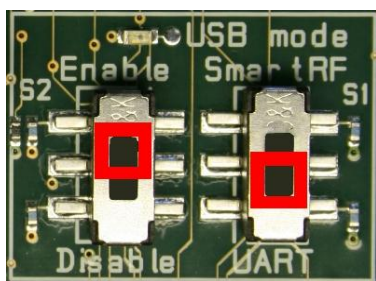


### 5. Power Options

There are several ways of applying power to the TrxEB.

- 2 x 1.5V AA Non-Rechargeable Alkaline Batteries
- USB (5V through USB plug)
- External Power Supply (requirements below)
- MSP430 Debugger

When the power source is batteries or USB, the voltage regulators on the TrxEB will set the on-board supply voltage to 3.3VDC.

External Power Supply[i] Requirements:
Nom Voltage: 3.3VDC
Max Current: 800 mA
Efficiency Level V

**Warning!** To minimize risk of personal injury or property damage, never use rechargeable batteries to power the board.

### 6. Select Power Source
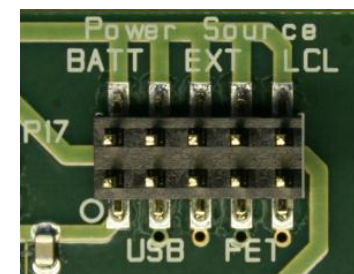


Depending on the power source, make sure you connect jumpers to the appropriate pins on the "Power Source" header. For instance, if you use batteries, use a jumper to short-circuit pin 1 and 2 on the header. The last jumper in the row (pin 9-10) should always be mounted, unless the MSP430 FET is used as the power source.

**Note that there should only be one active power source at any one time. Do not leave the board powered when unattended.**
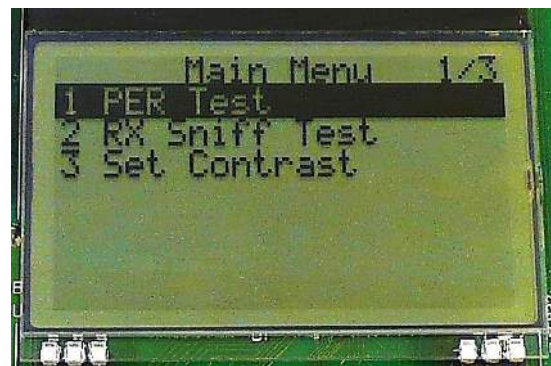
### 7. Welcome Screen
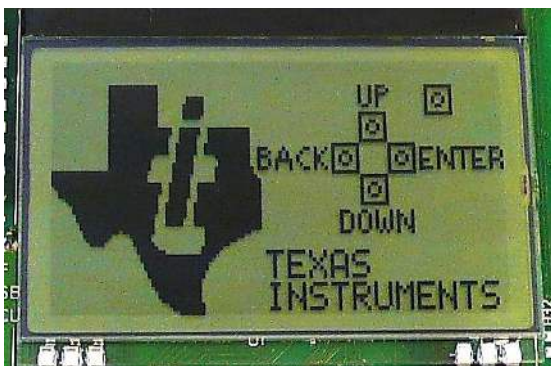


Turn on power with the Main Power switch. You should now see the Texas Instruments logo and a short description of the buttons on the LCD. Pushing any of the five buttons on the board will take you to the main menu.
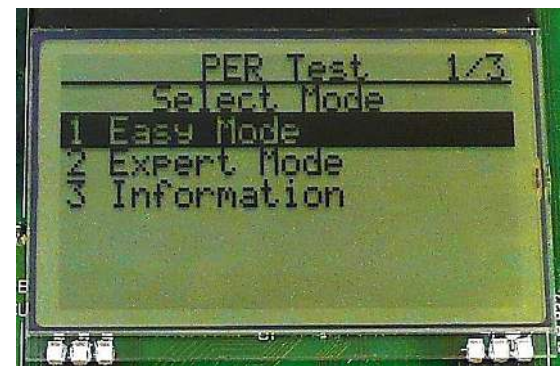
**NB! If you don't see anything on the screen make sure the mode switches are in the correct positions (see step 4 above).**

### 8. Packet Error Rate Test



Select the PER (Packet Error Rate) test by highlighting the selection using the up/down buttons. Confirm your selection by pressing Enter (right button).
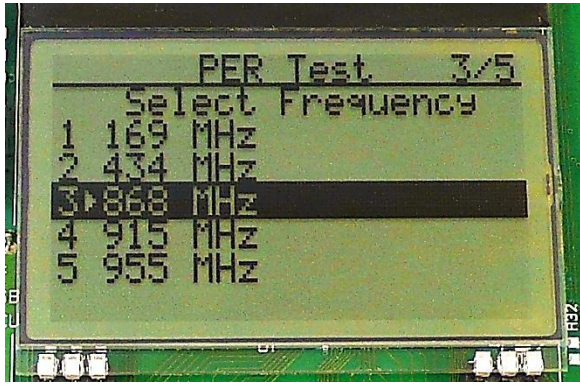
### 9. Select Test Mode



The PER test can be run is several modes. Easy Mode sets up a one-way test and uses default settings. This test is convenient for practical range testing.

The other test modes are described in the "*TrxEB RF PER Test Software Example User's Guide*".

To proceed, highlight "Easy Mode" and press Enter (right button).
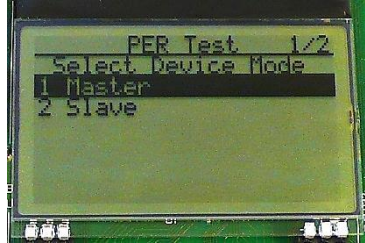
## 10. Select Frequency



Select which frequency to use for the test. Make sure that the evaluation modules you have match the selected frequency.

## 11. Select Mode

One of the boards must operate as the slave (transmitter) and the other as master (receiver). Select Slave on one board…

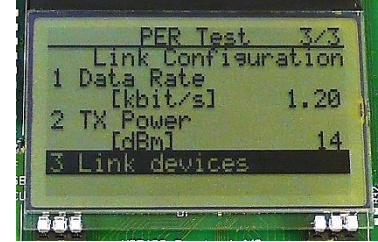

…and Master on the other board.



## 12. Establish Link

The slave node will now wait for a configuration package from the Master. The configuration contains the parameters used for the PER test.



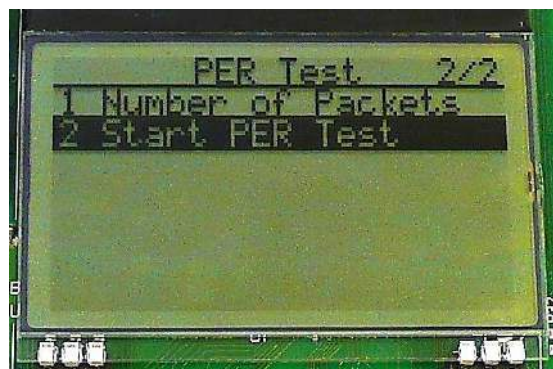The configuration package will be sent when you select "link devices" on the master node.



## 13. Link Established

When the initial linking has completed, the slave node will start the test by continuously transmitting packets to the master.
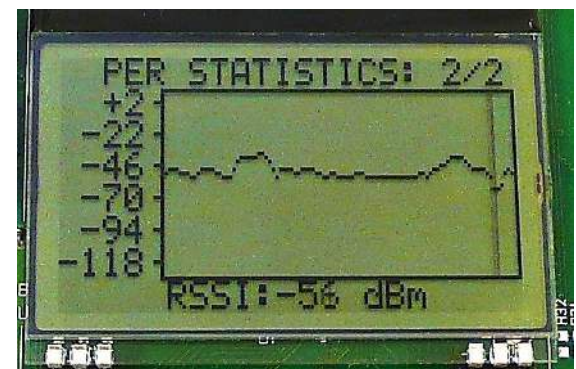


## 14. Start the Receiver (master)

On the master node, you can select the number of packets you want to receive in order to calculate the packet error.



When selecting "Start PER Test", the master (receiver) will begin to count the number of received packets and provide some statistics.

## 15. PER Test Results

The master will display a window that plots the received signal strength (RSSI) for each packet.



Press the "Up" button to go to the detailed statistical window.

## 16. PER Test Results

The statistics window will show the error rate based on the number of lost or erroneous packets divided by the total number of packets that should have been received.



## 17. Troubleshooting

It you are experiencing problems with this test, please check the following:

- Nothing is shown in the display! Make sure the mode switches are in the correct positions (see step 4 above).

- Please visit the kit web page and check for updated SW and documentation. Updated SW can be downloaded to the device using IAR EW430 or SmartRF Flash Programmer.

- If you get poor PER results at short distances, try to move the transmitter and receiver further apart. The CC1120/CC1121 receiver may be saturated if it is too close to the other CC1120/CC1121 transmitting at full output power.

## 18. References

Please visit www.ti.com and

http://www.ti.com/tool/cc1120emk-169
http://www.ti.com/tool/cc1120emk-420-470
http://www.ti.com/tool/cc1120emk-868-915
http://www.ti.com/tool/cc1121emk-868-915
http://www.ti.com/tool/cc1120emk-955

On the kit product page, you will find additional documentation, links to other related kits and devices, updated software examples and software tools like SmartRF Studio.

You will also find a lot of information on the TI E2E forum at http://e2e.ti.com

**We hope that you will enjoy working with the CC1120 and CC1121 devices.**

# SmartRF™ Studio

## 1. Download and Install
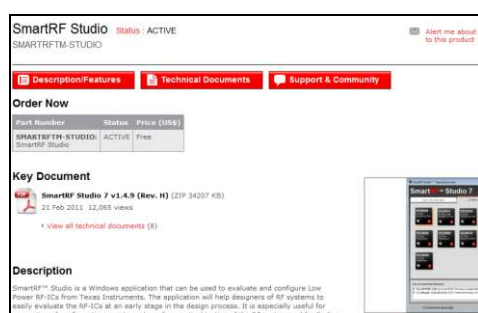


Before connecting SmartRF TrxEB to your PC, download and install SmartRF Studio from www.ti.com/smartrfstudio.

## 2. Launch SmartRF Studio



After installing the tool, connect the EB to the PC using the USB cable and start SmartRF Studio. Select the "Sub 1 GHz" tab and double click the highlighted CC1120 or CC1121 device icon.

## 3. Test the Radio
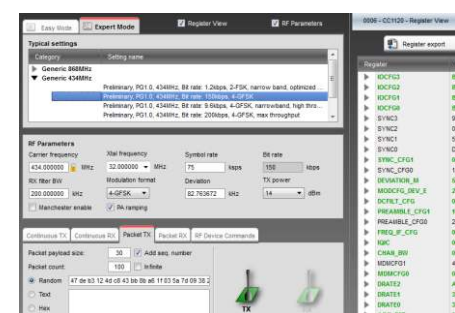


You can now configure the radio, run performance tests, export register settings and run link tests with another CC1120 or C1121 on a SmartRF TrxEB connected to the PC.

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