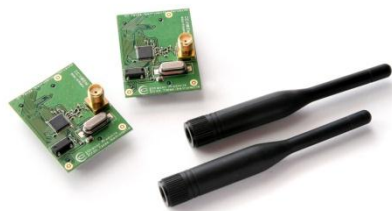


# CC110EMK Quick Start Guide

## Opening the box and running the Packet Error Rate Test on SmartRF04EB

### 1. Kit Contents



2 x CC110EM (433 MHz or 868-915 MHz)  
2 x Antennas (type depending on frequency)

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

FCC/IC Regulatory Compliance  
FCC Part 15 Class A Compliant  
IC ICES-003 Class A Compliant

Antenna types:

868-915 MHz: Pulse W5017, 2 dBi  
433 MHz: Pulse SPWH24433T1, 0 dBi

### 2. How to use the modules

The EMK is an add-on kit to supplement the CC110DK with evaluation boards supporting additional frequency bands.

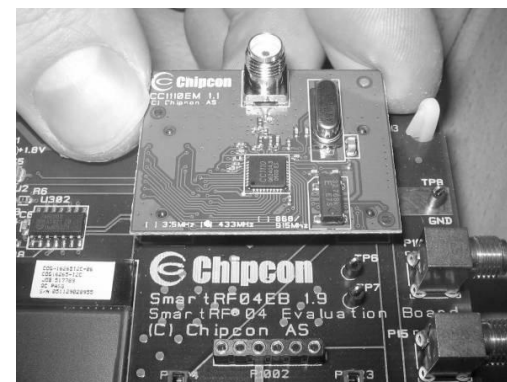
The CC110EM boards can be plugged into several development boards from Texas Instruments. Most notably, you can use the SmartRF04EB, which is included in the CC110-CC111DK. This board lets you run a packet error rate (PER) test, control the device from SmartRF™ Studio and it can be used as a development platform.

It is also possible to plug the EM into the “SoC Battery Board”. This board, together with the CC Debugger, will provide a complete development environment for the CC110. See:

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

This guide will show how to use the modules together with SmartRF04EB.

### 3. Plug EM into EB



Insert a CC110EM into both SmartRF04EBs. The connectors will only fit in one position, so that the EM cannot be inserted the wrong way. Do not force the EM. Remember to connect the antenna as well.



**Caution!** The kit contains ESD sensitive components. Handle with care to prevent permanent damage. To minimize risk of injury, avoid touching components during operation if symbolized as hot.

### 4a. Battery power

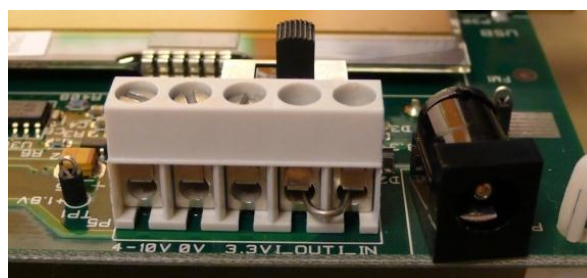


There are three different ways of applying power to the EB:

The first method involves using a battery, either a 9V or a 4xAA battery pack connected to the battery connector on the bottom side of the board

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

### 4b. DC power

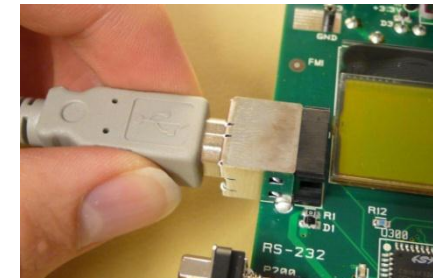


The second method applies DC power using the DC input jack (right in picture, centre is +, sleeve is ground), or by connecting a 4-10V voltage source between the 4-10V and 0V terminals of the power connector (left in picture). It is also possible to connect a 3.3V voltage source between the 3.3V and 0V terminals. The on-board voltage regulators will be bypassed in this case.

External Power Supply Requirements:

Nom Voltage: 6 VDC  
Max Current: 800 mA  
Efficiency Level V

### 4c. USB power



The EB can also be powered from the USB bus. Make sure that the SmartRF™ Studio software is installed before connecting the EB to the PC; otherwise you may experience problems in installing it later due to driver issues.

Note that if multiple power sources are connected, the source with the highest voltage will power the EB. **This means that you should disconnect any attached battery when using a lab supply or USB power; otherwise the battery will be drained.**

### 5. Set power switch



If a 3.3V source is used as described in 4b above, the switch should be set to the leftmost position. For all other cases, the switch should be set to the rightmost position. This switch can be used to turn off the EB by switching it to the opposite position of that used to turn it on

**Do not leave the board powered when unattended.**

### 6. Packet error rate test



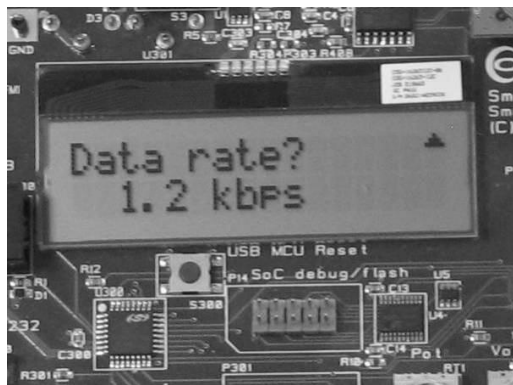
When power is applied to the board, the test program will start. You should see the Chipcon logo with chip name and revision number as shown above on the LCD display on both EBs. Pushing button S1 in the lower right corner of the board will show the first menu item.

### 7. Select Frequency



Select the frequency that you want to use (433 MHz, 868 MHz, 903 MHz or 915 MHz). Move the joystick up or down to display the choices and push button S1 in the lower right corner of the board to select the displayed frequency.

## 8. Select Data Rate



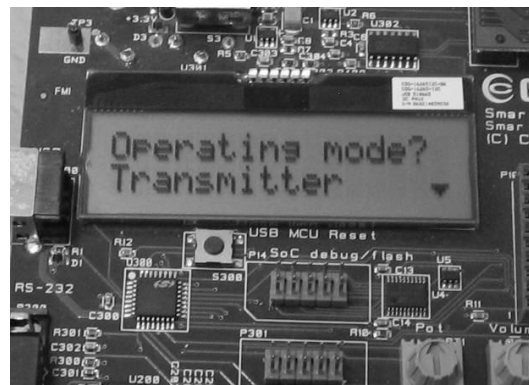
Select which data rate to use (1.2 kbps, 38.4 kbps or 250 kbps) by moving the joystick. Confirm your choice by pushing button S1.

## 9. EB 1: Select Receiver



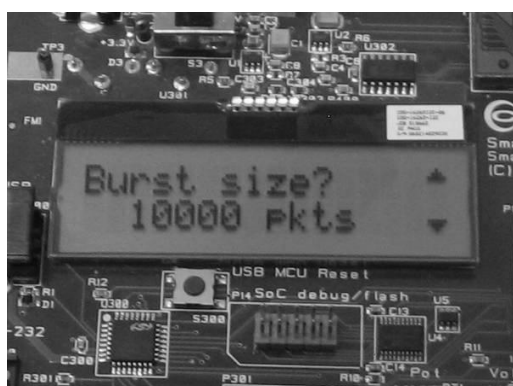
Select Receiver on the first EB by moving the joystick. Confirm by pressing button S1. The Receiving node will display "Ready to receive".

## 10. EB 2: Select Transmitter



Select Transmitter on the other EB by moving the joystick upward. Confirm by pressing button S1.

## 11. EB 2: Number of Packets



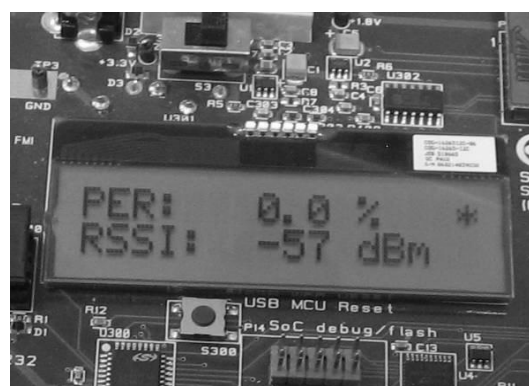
On the transmitter EB, select the number of packets to send. More packets take longer, but give a better statistical result. Confirm by pressing button S1.

## 12. PER Test (Transmitter)



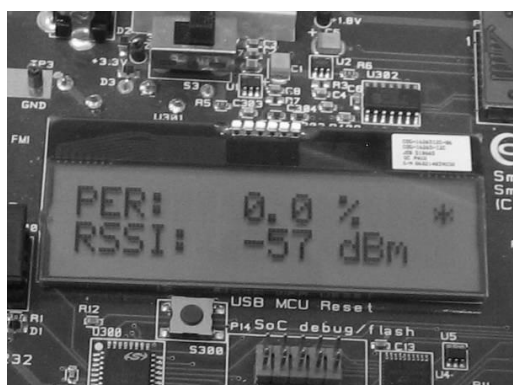
Press S1 button again to start transmitting the packet burst. The transmitter will show a running counter that shows the number of packets sent.

## 13. PER Test (Receiver)



The receiver will show the total accumulated packet error rate (PER) together with the average signal strength (RSSI) of the previous 32 received packets. A symbol in the upper right corner will blink for every 32nd incoming packet to indicate whether the link is maintained.

## 14. Per Test Results



When the PER test is completed, the result will be displayed on the receiver until a new test is started. A new test can be started from the transmitter.

## 15. References

Please visit [www.ti.com](http://www.ti.com) and

<http://www.ti.com/tool/cc1110emk433>

<http://www.ti.com/tool/cc1110emk868-915>

For more information about how to use the CC1110EM, download the CC1110-CC1111DK User Manual, the SmartRF™ Studio PC Tool, software examples, as well as datasheets, reference designs and application notes.

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 CC1110 device.**

## 16. Troubleshooting

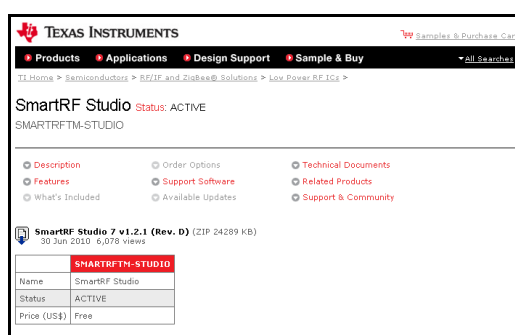
If you are experiencing problems with this test, please check the following:

- If you get poor PER results at short distances, try to move the transmitter and receiver further apart. The CC1110 receiver may experience saturation if it is too close to the other CC1110 transmitting at full output power.
- The data rate affects the range (higher data rate give shorter range).
- Please visit the kit web page and check for updated SW and documentation. Updated SW can be downloaded to the device using IAR or the Flash Programmer application.
- The source code for the packet error rate application is available on the web. You may modify the source code to test at other frequencies or data rates.

See "DN300 -- SmartRF04EB Troubleshooting" for general troubleshooting of your EB board.

# SmartRF™ Studio

## 1. Download and Install



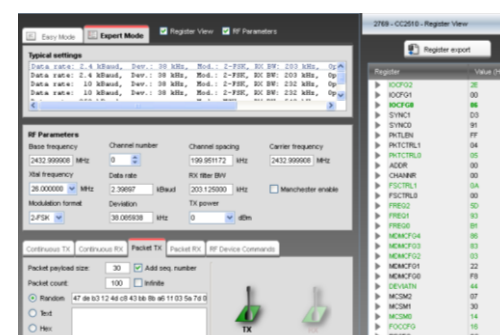
Before connecting SmartRF04EB to your PC, download SmartRF Studio from [www.ti.com/smartrfstudio](http://www.ti.com/smartrfstudio).

## 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 CC1110 device icon.

## 3. Configure the Radio



You can now configure the radio, run tests, export register settings and run link tests with another CC1110 on a SmartRF04EB connected to the PC.

<sup>1</sup> When using an external power supply, make sure it meets the listed requirements in addition to complying with applicable regional product regulatory and safety certification requirements such as UL, CSA, VDE, CCC, and PSE.

## EVALUATION BOARD/KIT/MODULE (EVM) ADDITIONAL TERMS

Texas Instruments (TI) provides the enclosed Evaluation Board/Kit/Module (EVM) under the following conditions:

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please visit [www.ti.com/esh](http://www.ti.com/esh) or contact TI.

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As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

### General Statement for EVMs including a radio

*User Power/Frequency Use Obligations:* This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

### For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

#### Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

### **FCC Interference Statement for Class B EVM devices**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### **For EVMs annotated as IC – INDUSTRY CANADA Compliant**

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### **Concerning EVMs including radio transmitters**

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

### **Concerning EVMs including detachable antennas**

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

### **Concernant les EVMs avec appareils radio**

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

### **Concernant les EVMs avec antennes détachables**

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

## 【Important Notice for Users of this Product in Japan】

**This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan**

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

**Texas Instruments Japan Limited**  
**(address) 24-1, Nishi-Shinjuku 6 chome, Shinjuku-ku, Tokyo, Japan**

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**For Feasibility Evaluation Only, in Laboratory/Development Environments.** Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
3. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

**Certain Instructions.** It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

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