

**Calibration Instructions Note**

**Rev AP4.5**

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# Purpose

This document describes the calibration process for CAVIUM eNB.

# Test Environment

2.1. Equipment

The following equipment comprises the eNB test described in this document:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Qty.** | **Equipment Description** | **Manufacturer** | **Model Number** | **Option** |
| 1 | Windows / Linux Computer | HP |  |  |
| 1 | Signal Generator\* | Keysight | EXG N5172B | ARB Generator |
| 1 | Signal Analyzer\* | Keysight | MXA N9020A | LTE measurement |
| 1 | Wideband Radio Communication Tester\* | Rohde & Schwarz | CMW500 | LTE/LTE-A |
| 2 | RF adapter | RF adapter (N to SMA) |  |  |
| 2 | RF cable | RF cable (SMA to SMA) |  |  |
| 1 | RF splitter |  |  |  |
| 1 | RF circulator (optional) |  |  |  |
| 1 | USB cable (optional) | USB to mini-USB cable |  |  |

\* Note: Calibration software supports RF test equipment **Keysight** or **Rohde & Schwarz**.

2.2. Hardware Setup

* Connect test equipment, PC, and eNB to local network
* Connect mini-USB cable between eNB and PC for serial communication (optional)
* Measure the receive path and transmit path cable loss, and fill in test\_config.py
* Circulator can removed if choose manually switch test equipment
* RS Sensitivity Test: connect 1PPS out (ZEN J9, refkit J6) to Signal Generator’s external trigger

|  |  |  |
| --- | --- | --- |
| **Keysight** |  | **Rohde & Schwarz** |
|  |  |  |

* 1. Software Setup
* Install Pyton 2.7 in PC
* Install serial communication software Putty(Windows) or Minicom(Linux) (optional)
* [Keysight] Save file “ESG\_tc0301\_10m\_low.dat” (or “ESG\_radioframeTx0\_tti\_09.dat”) in EXG N5172B as ARB generator waveform; the sampling frequency is 15.36MHz.

[R&S] Save file “CaviumFRC\_10MHz.wv” in “D:\Rohde-Schwarz\CMW\Data\Waveform\”

* Copy tftpboot package and calibration scripts (rf\_card\_cal) in PC
  1. Description of test\_config.py parameters
* num\_cal\_channel : number of calibration channels
* **band** : enodeB band number
* dl\_freq / ul\_freq : downlink and uplink frequency; set zero for default frequency
* board\_typ : board type [zen\_ad]
* **cal\_bandwidth** : calibration bandwidth in mhz [5,10,15,20]
* tcxo\_ctrl : tcxo control type [pwm, dac, dax]; dax - DAC8571
* attn1 / attn2 : transmitter attenuation
* gain1 / gain2 : receiver gain
* login\_pwd : unit login password
* **enb\_ipaddr** : enodeB IP address
* enb\_tn\_port : enodeB telnet port
* tftp\_server\_ip : TFTP server IP address
* **rssi\_cable\_loss** : receive path cable loss for RSSI test
* **txpwr\_cable\_loss** : transmit path cable loss for TX test
* manual\_switch\_instr : enable/disable stop for switching RF cable
* test\_set : test set type [agilent, rs, anritsu] etc.

[Keysight]

* + **exg\_ipaddr** : EXG IP address
  + exg\_tcp\_port : EXG TCP port
  + **mxa\_ipaddr** : MXA IP address
  + mxa\_tcp\_port : MXA TCP port

[R&S]

* + **cmw500\_ipaddr** : CMW500 IP address
  + **cmw500\_tcp\_port** : CMW500 TCP port
* rf\_driver : Name of RF driver [cn\_rfdriver]
* dsp\_app\_dl : Name of DSP application [pltD.gz]
* max\_atten : make the lowest TX power to start TX power test
* cr\_txpwr\_min : minimum TX output power
* cr\_txpwr\_max : maximum TX output power
* cr\_txevm\_max : maximum TX EVM
* en\_eeprom\_write : enable/disable writing variables in EEPROM; (disable for refkit1)
* eeprom\_record\_ver : record version of EEPROM
* test\_report : enable/disable test report
* instr\_disp : T - enable instrument screen display, F - disable
* **do\_sens\_test\_in\_opt1** : enable/disable sensitivity test in calibration option 1
* **my\_udp\_ipaddr** : UDP IP address for sensitivity test (the PC run Calibration Script)
* my\_udp\_port : UDP port for sensitivity test
* tcid : RX test case ID; corresponding to UL testing waveform [901]
* rx\_gain : RX gain for sensitivity test
* bler\_limit : percentage of BLER pass criteria
* sens\_pass\_limit : sensitivity pass limit
* bb\_port : Linux/Windows serial port
* bb\_baudrate : serial port baudrate [115200]
* bb\_pingip : host PC IP address

# Operating Procedures

1. Start tftpserver in PC
2. Connect RF cables to eNB antenna port 1 & 2 as section 2.2, Power on eNB
3. (option) The serial communication terminal will display the boot up messages. “Log in>” prompt when finish boot.
4. In command line terminal, go to the directory where calibration script locates. Enter command “python main.py”.
5. The calibration options are below:

(1) Calibrate All Items

(2) RX RSSI Calibration

(3) Reference Clock Calibration

(4) IQ Offset Calibration

(5) TX Power Calibration

(6) TX Power Optimization

(7) TX Transmit Test

(8) TX CW Test

(9) RX Sensitivity Test

(19) RX Continuous Test

(10)Flatness Test

(11)Baseboard Test

(12)Load EEPROM variables to uboot

(21)Read Baseboard EEPROM Data

(22)Write Baseboard EEPROM Data

(23)Erase Baseboard EEPROM Data

(q) Quit

Select 1 to do all the calibration tests (sensitivity only test pass limit)

Select 2 to 6 for single calibration test

Select 7 to do TX transmit test; ANT port & TX power attenuation are selectable

Select 8 to do CW transmit test

Select 9 to do RX Sensitivity Test (full sensitivity test)

Select 19 to do RX receiving continuous

Select 10 to copy EEPROM variables to baseboard uboot environment variables

Select 11 to do baseboard functional tests (need to close serial communication program, i.e. minicom)

Select q to exit program

(Note: Reboot eNB before test 4 ~ 7, 9)

1. Test report will generated at ./test\_report of Python script directory