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WE3104G
PHY Evaluation Test Utility
User Guide

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. Introduction

The purpose of this document is to provide the usage of the applications for transmit and receive tests to evaluate the RF performance of the WE3104G using a test driver in windows environment.The evaluation board provides the necessary connectors so that you can measure transmit and receive performance of the PHY, using Spectrum Analyzer and Signal Generator in either 2.4GHz , 5GHz.
In general, transmit performance of a radio can be analyzed in three steps.

Maximum power: The user can observe the RF output power for a given maximum gain supported by the RF.
EVM: The user can observe the EVM for a given rated RF power as supported by the RF transceiver.

Spectral Mask: The user can verify whether the WE3104G module meets the spectral mask requirements defined by IEEE standard for a given maximum RF output power, in a particular mode of operation like 11a,11b, 11g,11n

The receive performance of the PHY can be analyzed using Packet Error Ratio (PER) test.

The Rx performance is analyzed by the sensitivities at different data rates. In general, the sensitivity is observed as 10% Packet Error Ratio (PER) point in 11a ,11g,11n and 8% PER point in 11b.

The document contains three major sections.

Section 3.1 describes the usage of the 'WiFi transmit' utility, which provides the options for setting various parameters to carry out transmit tests on the WE3104G device.

Section 3.2 describes the usage of the 'WiFi receive' utility, which enables the user to perform receive tests on the WE3104G device.

2. Test Setup Details

The diagram shown below, illustrates the test setup for evaluating receive and transmit performance of WE3104G WLAN module.
As shown in the test setup, the WE3104G evaluation board (EVB) is connect to pc via UART. The board is connected to a WLAN signal analyzer through a microwave coaxial cable to test the Tx or Rx



performance.

Figure 1: Based RF Evaluation Setup Interface

Following diagram illustrates various software components involved in performing Tx and Rx tests using spectrum analyzer and signal generator respectively.

The ‘transmit’ utility is a command line application to perform Tx tests. Before running the Tx tests, the user is expected to connect WE3104G moudle to a signal analyzer using the RF cable.

The ‘receive’ utility is also a separate command line application that can be used for displaying statistics on the received packets while carrying out the receive sensitivity tests.

3. Application Usage

In general, before performing any tests configure the PHY to operate in the appropriate band. The transmit tests can be performed through a utility called ‘bcmdhd_active.sh’ which is found under ‘wifi’ directory.

Configure the following parameters through this application before running the

tests.

Transmit power

Transmit data rate

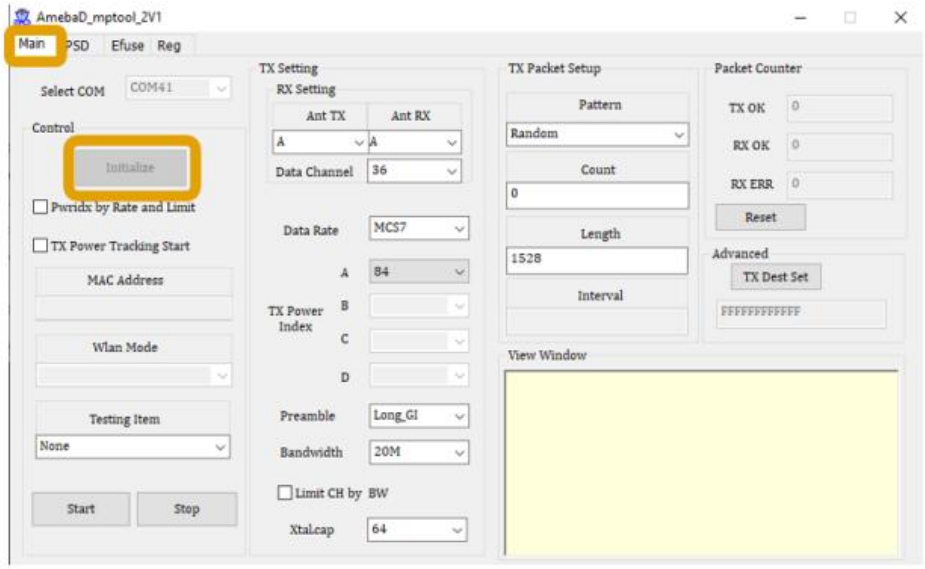
Transmit mode

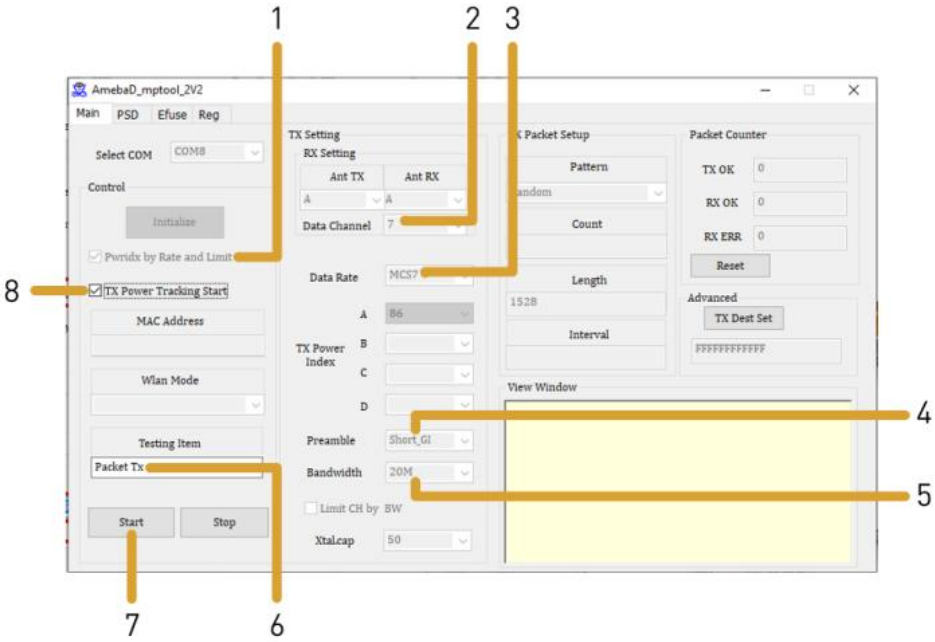
Channel number

3.1 WiFi Tx Application Usage

The application can be started in the following steps:

plug uart EVB into the device and labtop, check the labtop's UART number and set Set up the serial port tool Portland, send the command via uart tools.





3.2 WiFi RX Application Usage

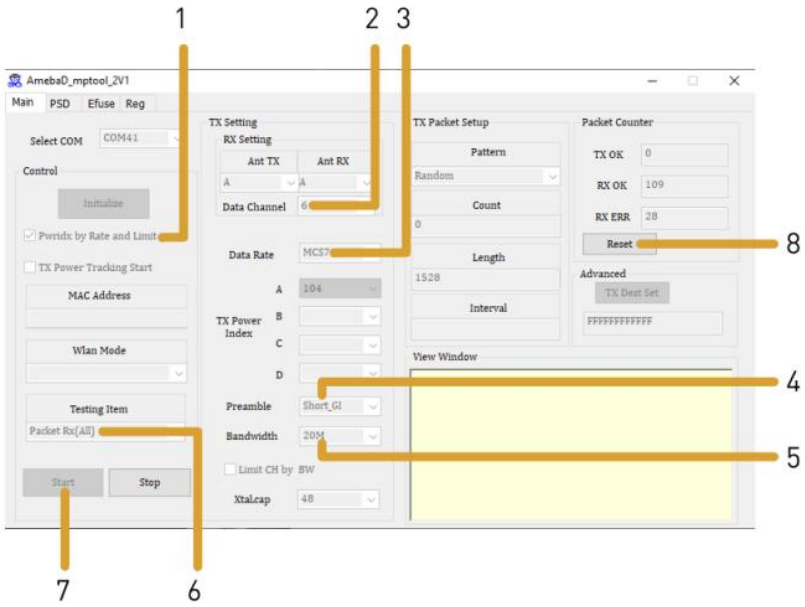
The Rx performance is analyzed by the sensitivities at different data rates. In general, the sensitivity is observed as 10% Packet Error Ratio (PER) point in 11a, 11g, 11n and 8% PER point in 11b.

PER: Packet Error Ratio (PER) is calculated by measuring the number of packets received correctly and comparing with the number of packets expected.

%Packet error rate = 100*(1- ((Received packets/expected packets))

For carrying out the receive test, connect the EVB to a Vector Signal Generator (VSG). Then set the RF amplitude, signal waveform and the channel in the signal generator before starting the receive tests.

You need to configure the channel (as mentioned below) in the EVB with the same channel which is set in Signal Generator.



FCC Declaration

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.

(2) This device must accept any interference received, including interference that may cause undesired operation.

NOTE: 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

NOTE: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

ORIGINAL EQUIPMENT MANUFACTURER (OEM) NOTES

The OEM must certify the final end product to comply with unintentional radiators before declaring compliance of the final product to Part 15 of the FCC rules and regulations. Integrationinto devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change.

The OEM must comply with the FCC labeling requirements. If the module's label is not visible when installed, then an additional permanent label must be applied on the outside of the finished product which states:

"Contains transmitter module FCC ID: SMQES3WIFI. Additionally, the following statement should be included on the label and in the final product's user manual: "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 interferences, and

(2) this device must accept any interference received, including interference that may cause undesired operation."

The module is limited to installation in mobile or fixed applications. Separate approval is required for all other operating configurations, including portable configuration with respect to Part 2.1093 and different antenna configurations.*****

The requirement for KDB 996369 D03:

List of applicable FCC rules

FCC CFR Title 47 Part 15 Subpart C Section 15.247, Part 15 Subpart E Section 15.407

Summarize the specific operational use conditons

This module has been granted Single Modular Approval for mobile applications. OEM integrators for host products may use the module in their final products without

additional FCC certifications if they meet the following conditions. Otherwise, additional FCC approvals must be obtained.

The host product with the module installed must be evaluated for simultaneous transmission requirements

The user's manual for the host product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.

This module has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. The antenna is permanently fixed. It cannot be replaced.

Model Name	Frequency Band	Type	Gain (dBi)
2.4G Wi-Fi	2400-2500MHz	FPC Antenna	2.51dBi
5G Wi-Fi	5180-5240MHz	FPC Antenna	2.89dBi
5G Wi-Fi	5745-5825MHz	FPC Antenna	2.91dBi

A label must be affixed to the outside of the host product product with the following statement: This device contains FCC ID: SMQES3WIFI

The final host/Module combinations may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorizaed for operation as a Part 15 digital device.

Information on test modes and additional testing requirements

Date transfer module demo board can control the EUT work in RF test mode at specified test channel.

Additional testing, Part 15 Subpart B disclaimer

The module without unitentional-radiator digital circuit, so the module does not required an evaluation by FCC Part 15 Subpart B. The host be evaluated by the FCC Subpart B.

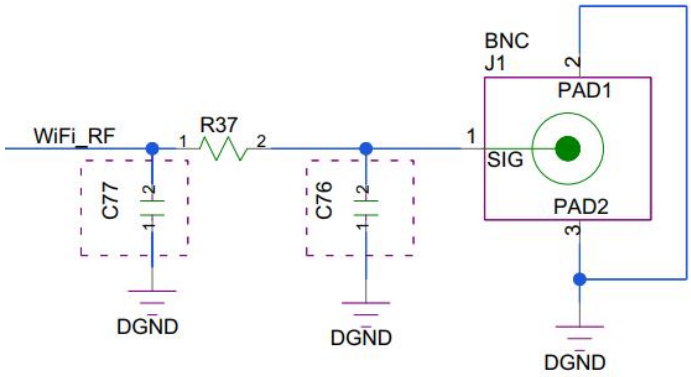
Single module procedures

The module has meet the requirements to satisfy the conditions.

External antenna designs

Please refer to Picture for the RF Link’s schematic diagram. The designed antenna meets the wifi hardware module’s requirements

WiFi ANT



RF exposure considerations

The host device manufacturer should confirm that a separation distance of 20cm or more should be maintained between the antenna of this host device and persons during the host device operation.

Lable and compliance information

If this certified module is installed inside the host device, then the outside of the host must be labeledwith "Contains FCC ID: “SMQES3WIFI "