



# XWAY™ xRX300/WAVE300 Family

## DUT Graphical User Interface

for  
DUT Tool Package

## User's Guide

Revision 1.1, 2013-05-06

Confidential  
Distribution with NDA by Marketing only

**Edition 2013-05-06**

**Published by  
Lantiq Deutschland GmbH  
Lilienthalstraße 15  
85579 Neubiberg  
Germany**

**© 2013 Lantiq Deutschland GmbH  
All Rights Reserved.**

### **Legal Disclaimer**

The information given in this document is confidential.

SUCH INFORMATION SHALL IN NO EVENT BE REGARDED AS A GUARANTEE OF CONDITIONS OR CHARACTERISTICS. WITH RESPECT TO ANY VALUES STATED AS "TYPICAL" AS WELL AS EXAMPLES OR HINTS PROVIDED HEREIN, INCLUDING THOSE RELATED TO USE AND/OR IMPLEMENTATION OR APPLICATION OF COMPONENTS, LANTIQ DEUTSCHLAND GMBH ("LANTIQ") HEREBY DISCLAIMS ANY AND ALL WARRANTIES AND LIABILITIES OF ANY KIND, INCLUDING WITHOUT LIMITATION, WARRANTIES OF NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF ANY THIRD PARTY. IN PARTICULAR, THOSE VALUES, EXAMPLES OR HINTS ARE NO WARRANTIES OF A CERTAIN FUNCTIONALITY, CONDITION OR QUALITY OF THE LANTIQ COMPONENT AND ALWAYS HAVE TO BE VERIFIED IN THE TARGET APPLICATION.

The information in this document is subject to regular updates and/or corrections via errata sheet(s) or new revisions. It is only valid as updated and/or corrected. Once a new revision or errata sheet is available, it can be downloaded from Lantiq's Competence Center:

[www.lantiq.com/contact-lantiq](http://www.lantiq.com/contact-lantiq)

Any user of this document must ensure that they only use the latest update- and/or corrected revision.

LANTIQ HEREBY DISCLAIMS ANY AND ALL WARRANTIES AND LIABILITIES OF ANY KIND, INCLUDING WITHOUT LIMITATION, WARRANTIES OF NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF ANY THIRD PARTY, WITH RESPECT TO PREVIOUS REVISIONS OF THIS DOCUMENT ONCE AN UPDATE OR ERRATA SHEET IS AVAILABLE.

### **Information**

For further information on technology, delivery terms and conditions and prices, please contact the nearest Lantiq office ([www.lantiq.com](http://www.lantiq.com)).

### **Warning**

Lantiq components must not be used in life-support devices or systems.

Life-support devices or systems are those systems intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.



Confidential

---

**XWAY™ xRX300/WAVE300 Family, DUT Graphical User Interface for DUT Tool Package**

**Confidential**

**Revision History: Revision 1.1, 2013-05-06**

**Previous Revision: Revision 1.0, 2013-03-15**

| Page | Subjects (major changes since last revision)                          |
|------|---|
| 8    | Updated <a href="#">Section 1.5, x86 PC Linux Host Requirements</a> . |
| 47   | Added <a href="#">Chapter 10, Appendix D - Command Line Control</a> . |
|      |   |

**Trademarks of Lantiq**

CONVERGATE™, COSIC™, DUALFALC™, DUSLIC™, ELIC™, EPIC™, FALC™, GEMINAX™, ISAC™, IWORX™, OCTALFALC™, OCTAT™, QUADFALC™, SCOUT™, SEROCCO™, SICOFI™, SLIC™, SMINT™, SOCRATES™, VINAX™, VINETIC™, XWAY™

**Other Trademarks**

ARM™, Bluetooth™ of Bluetooth SIG Inc. CAT-ig™ of DECT Forum. EPCOS™ of Epcos AG. HYPERTERMINAL™ of Hilgraeve Incorporated. IEC™ of Commission Electrotechnique Internationale. IrDA™ of Infrared Data Association Corporation. ISO™ of INTERNATIONAL ORGANIZATION FOR STANDARDIZATION. MATLAB™ of MathWorks, Inc. NUCLEUS™ of Mentor Graphics Corporation. MIPS® of MIPS Technologies, Inc., USA. muRata™ of MURATA MANUFACTURING CO. SOLARIS™ of Sun Microsystems, Inc. Samtec® of Samtec Inc. TEAKLITE™ of CEVA, Inc. TEKTRONIX™ of Tektronix Inc. UNIX™ of X/Open Company Limited. VERILOG™, PALLADIUM™ of Cadence Design Systems, Inc. VxWorks™, WIND RIVER™ of WIND RIVER SYSTEMS.

Last Trademarks Update 2012-01-04

## Table of Contents

|          |   |    |
|----------|---|----|
|          | <b>Table of Contents</b> .....                            | 4  |
|          | <b>List of Figures</b> .....                              | 6  |
|          | <b>List of Tables</b> .....                               | 7  |
| <b>1</b> | <b>Introduction</b> .....                                 | 8  |
| 1.1      | Purpose .....   | 8  |
| 1.2      | About the Test Driver and the DUT GUI Application .....   | 8  |
| 1.3      | Content of the Installation Kit .....                     | 8  |
| 1.4      | Supported Interfaces .....                                | 8  |
| 1.5      | x86 PC Linux Host Requirements .....                      | 8  |
| <b>2</b> | <b>Installing DUT GUI</b> .....                           | 9  |
| <b>3</b> | <b>Launching DUT GUI</b> .....                            | 10 |
| 3.1      | Troubleshooting Launch Errors .....                       | 11 |
| <b>4</b> | <b>Overview of the DUT GUI</b> .....                      | 13 |
| 4.1      | DUT GUI Features .....                                    | 13 |
| 4.2      | The Tab Bar .....   | 13 |
| 4.3      | Log and Messages Pane .....                               | 13 |
| 4.4      | Calibration Data Screen .....                             | 14 |
| <b>5</b> | <b>Using the DUT GUI</b> .....                            | 15 |
| 5.1      | Connection Options .....                                  | 15 |
| 5.1.1    | dut_cfg.txt Configuration Parameters .....                | 15 |
| 5.2      | Setting the DUT's Channel .....                           | 16 |
| 5.3      | Setting Output Power .....                                | 17 |
| 5.4      | Closed Loop Output Power Table .....                      | 18 |
| 5.4.1    | Constant Power .....                                      | 18 |
| 5.4.2    | Back Off Power .....                                      | 19 |
| 5.5      | Using Regulatory Constraints in Closed Loop Tx Mode ..... | 19 |
| 5.5.1    | Regulatory Limitations .....                              | 19 |
| 5.5.2    | Hardware Limitations .....                                | 20 |
| 5.6      | Changing BB and PA Driver Gains .....                     | 20 |
| 5.7      | Transmitting in CW Mode and Changing IFS Section .....    | 21 |
| 5.8      | Setting Antenna Configuration .....                       | 21 |
| 5.9      | Rx Information and PA Detector Information .....          | 22 |
| 5.10     | Chip Gain Information .....                               | 22 |
| 5.11     | DUT and Chip Versions .....                               | 23 |
| 5.12     | Reading and Writing the EEPROM/Flash .....                | 23 |
| 5.12.1   | Configuring EEPROM/Flash Area Size .....                  | 23 |
| 5.12.2   | Burning a File to EEPROM/Flash .....                      | 23 |
| 5.12.3   | Working with Serial Numbers and MAC Addresses .....       | 24 |
| 5.12.4   | Changing Raw Content .....                                | 26 |
| 5.13     | XTAL Calibration .....                                    | 27 |
| <b>6</b> | <b>Available Functions in mt_dut.dll</b> .....            | 28 |
| 6.1      | Init Process .....  | 28 |
| 6.2      | Calibration Process and Tx Tests .....                    | 28 |
| 6.3      | Burning the EEPROM .....                                  | 29 |
| 6.4      | EEPROM Burning New Calibration Method Function .....      | 30 |
| 6.5      | Sensitivity Check .....                                   | 30 |



Confidential

Table of Contents

|           |   |           |
|-----------|---|-----------|
| 6.6       | Finalize the Test .....                                     | 31        |
| 6.7       | Others .....  | 31        |
| <b>7</b>  | <b>Appendix A - PCI EEPROM Address Map .....</b>            | <b>33</b> |
| <b>8</b>  | <b>Appendix B - Example Code for mt_dut.dll Usage .....</b> | <b>34</b> |
| <b>9</b>  | <b>Appendix C - Country Codes .....</b>                     | <b>38</b> |
| <b>10</b> | <b>Appendix D - Command Line Control .....</b>              | <b>47</b> |
| 10.1      | Basic Configurations .....                                  | 48        |
|           | <b>References .....</b>                                     | <b>49</b> |
|           | <b>Terminology .....</b>                                    | <b>50</b> |

## List of Figures

|           |  |    |
|-----------|--|----|
| Figure 1  | DUT Installation Welcome Screen . . . . .                                | 9  |
| Figure 2  | DUT GUI Main Screen (Successful Launch) . . . . .                        | 10 |
| Figure 3  | Main Screen of DUT GUI Application after an Unsuccessful Launch. . . . . | 11 |
| Figure 4  | DUT DLL Log . . . . .  | 12 |
| Figure 5  | DUT GUI Tabs . . . . .   | 13 |
| Figure 6  | Log and Messages Pane . . . . .  | 13 |
| Figure 7  | Calibration Data Screen . . . . .  | 14 |
| Figure 8  | Channel Setting and Transmission Screen . . . . .                        | 16 |
| Figure 9  | Example of Primary and Secondary Channel Selection in CB Mode . . . . .  | 17 |
| Figure 10 | Open Loop Tx Setting. . . . .  | 17 |
| Figure 11 | Closed Loop Tx Setting . . . . .   | 18 |
| Figure 12 | Regulatory Constraints in Closed Loop Tx Mode . . . . .                  | 19 |
| Figure 13 | BB and PA Driver Gain Setting. . . . .                                   | 20 |
| Figure 14 | Transmitting in CW Mode and Changing IFS Section . . . . .               | 21 |
| Figure 15 | Antenna On/Off Section . . . . .   | 21 |
| Figure 16 | RSSI, Packets Counter and PA Detector Information . . . . .              | 22 |
| Figure 17 | Chip Gain Information. . . . .   | 22 |
| Figure 18 | Version Information. . . . .   | 23 |
| Figure 19 | EEPROM/Flash Burning Section . . . . .                                   | 23 |
| Figure 20 | MAC Address and S/N Information R/W. . . . .                             | 24 |
| Figure 21 | EEPROM/Flash Raw Data . . . . .  | 26 |
| Figure 22 | XTAL Calibration. . . . .  | 27 |
| Figure 23 | Burn Calibration Structure . . . . .                                     | 30 |
| Figure 24 | BCL CLI . . . . .  | 47 |
| Figure 25 | Successful CLI Inputs. . . . .   | 47 |

## List of Tables

|         |   |    |
|---------|---|----|
| Table 1 | Typical Launch Errors and Solutions ..... | 11 |
| Table 2 | XTAL Bias Values .....                    | 15 |
| Table 3 | Constant Power .....                      | 18 |
| Table 4 | Back off Power .....                      | 19 |
| Table 5 | Reg Limits .....                          | 19 |
| Table 6 | XTAL Bias Values .....                    | 27 |
| Table 7 | EEPROM Address Map .....                  | 33 |
| Table 8 | Country Codes .....                       | 38 |

## 1 Introduction

### 1.1 Purpose

This user guide explains how to use the DUT GUI application. The application is used for hardware development purposes and evaluations based on Lantiq's WiFi MIMO technology.

### 1.2 About the Test Driver and the DUT GUI Application

The DUT GUI is an application used to help hardware and RF designers test and verify the behavior of their design based on Lantiq's WiFi solution.

DUT GUI uses a specially designed test driver with the firmware that uses all HW and PHY level algorithms. The driver also allows transmission and receiving without the limitations of the IEEE 802.11n standard [4].

The DUT GUI includes an API to control the WiFi functionality (mt\_dut.dll). The API can be used to control the DUT (Device Under Test) from an external application.

Together with wireless LAN test equipment maker LitePoint, Lantiq have integrated this dll into LitePoint's IQFact Design Verification Test (DVT) software. IQFact is a comprehensive set of WiFi physical layer transmitter and receiver tests utilizing a large set of channels, data rates and channel bandwidths. The tool allows you to verify assembly in the production line with a vast test coverage in a short test time

### 1.3 Content of the Installation Kit

The installation package for the DUT GUI installs the following items onto your computer:

- DUT GUI Core
- ActivePerl application - Perl interpreter (used for TCP/IP mode)
- Release Notes [5]
- User's Guide (= this document)

*Note: Contact Lantiq for the latest application version and installation instructions.*

### 1.4 Supported Interfaces

The DUT GUI application allows you to control the WiFi chipset through the following interface:

- TCP/IP - Control the chipset when it is assembled on a Linux based host. In order for the DUT GUI to work, the host should contain operational driver firmware. The following Host and Linux versions are supported:
- Lantiq's Universal Gateway (UGW) software

### 1.5 x86 PC Linux Host Requirements

The DUT system provides following requirements to the x86 Linux host in order to operate properly:

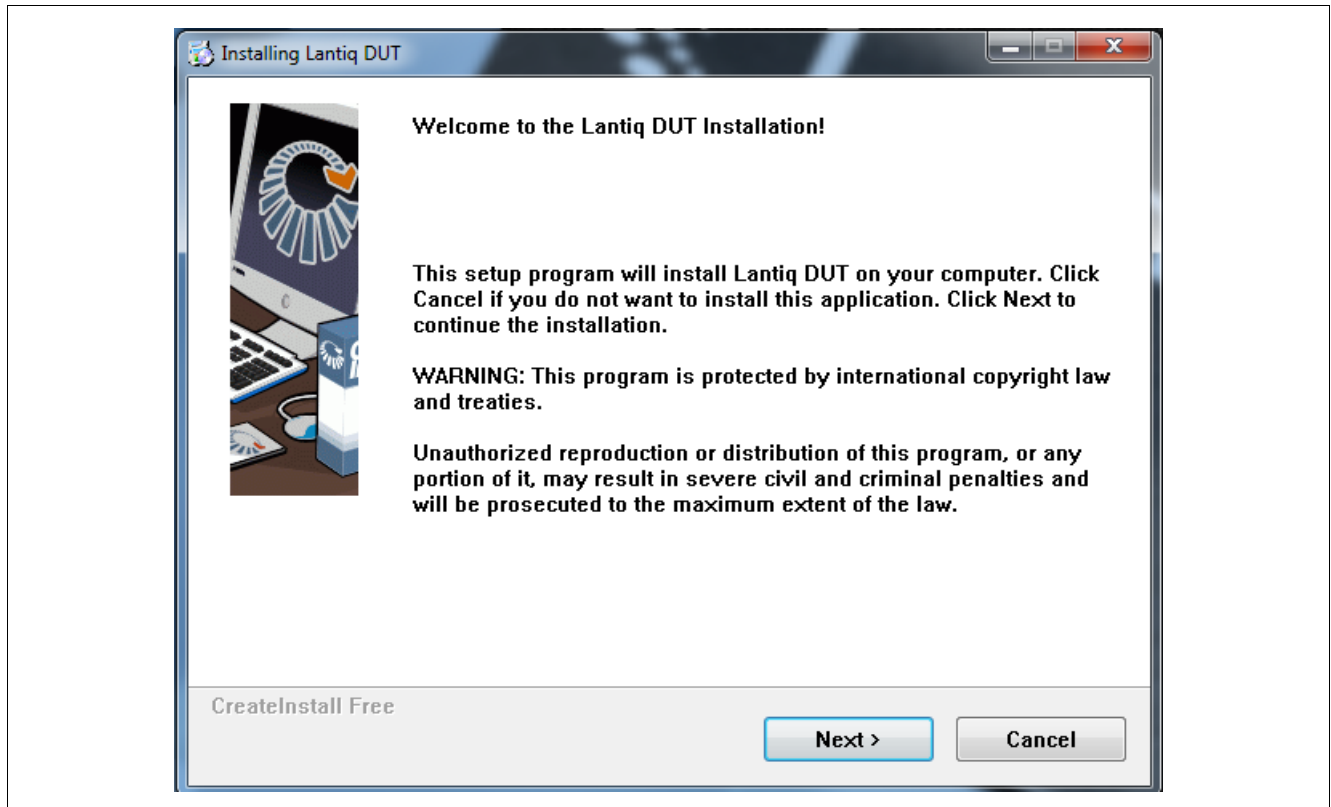
1. Microsoft® Windows® XP SP 3.0 and .NET Framework 2.0 (min. requirement)
2. Support for Microsoft® Windows® 7, 32/64 bit
3. OS login/password required is root/wlan
4. This may be changed by editing the linux\_hosts.txt file in the DUT's installation directory, with a new username/password to be specified in its [PC] section.
5. Tftp client package must be installed.



## 2 Installing DUT GUI

### To install DUT GUI:

1. From the installation media, DUT\_setupx.exe.  
The DUT Installation window appears.



**Figure 1 DUT Installation Welcome Screen**

*Note: Components required for the installation/upgrade are automatically selected.*

2. Ensure the correct elements are selected and click Install.  
If an older version is already installed on the computer, you will be prompted to remove the older version before proceeding.

In C:\Program Files\Lantiq\DUT\

- DUT\_GUI.exe - GUI application
- dut\_cfg.txt - Configuration file to determine the output power level desired during close loop transmission operation and basic platform configurations.
- \autoloader\linux\_hosts.txt - configuration file that defines the login and password for the platform
- Regulatory Constraints Folder - Contains information for using regulatory constraints mode
- Developers Folder - Contains XXX.h files for integrating dut.dll in other applications
- DUT GUI User Guide.

Other:

- The log for the DUT GUI application, console.txt, is created in the My Documents folder
- A shortcut to DUT\_GUI.exe is created on your desktop

### 3 Launching DUT GUI

To launch the DUT GUI application:

1. From the desktop, double click the DUT GUI shortcut.
  2. Optionally, change the **“dut\_cfg.txt Configuration Parameters”** on Page 15.  
The application tries to connect to the DUT.
- If the DUT was pre-configured for the proper parameters, the connection succeeds and a ready message is displayed.
  - If the connection is not successful, an error message appears. In this case make sure that the proper parameters and information are correct. For more information on how to troubleshoot an unsuccessful launch, see **“Troubleshooting Launch Errors”** on Page 11.

Main screen of the DUT GUI following a successful launch:

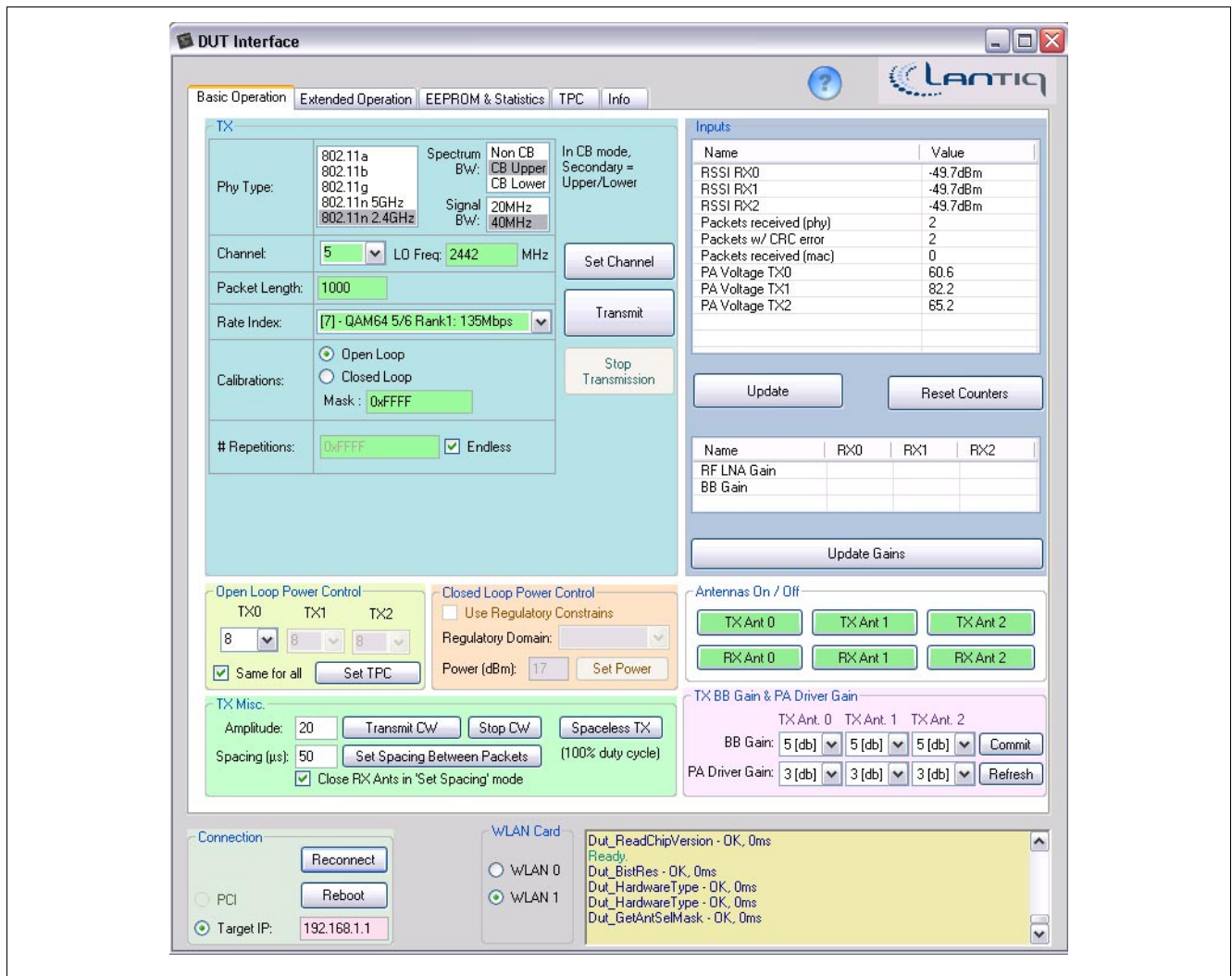


Figure 2 DUT GUI Main Screen (Successful Launch)

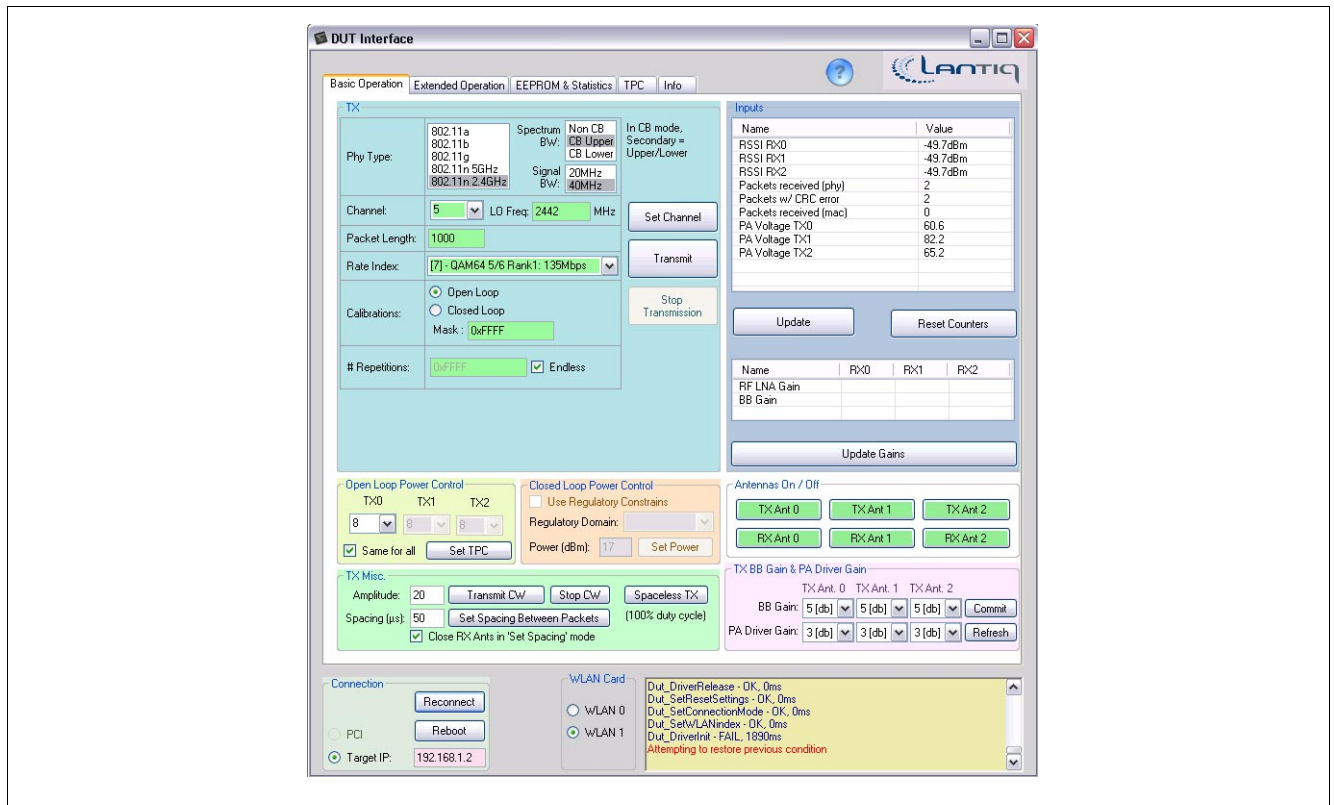
Note: Please pay attention to the “Ready” message in the messages pane.

### 3.1 Troubleshooting Launch Errors

**Table 1 Typical Launch Errors and Solutions**

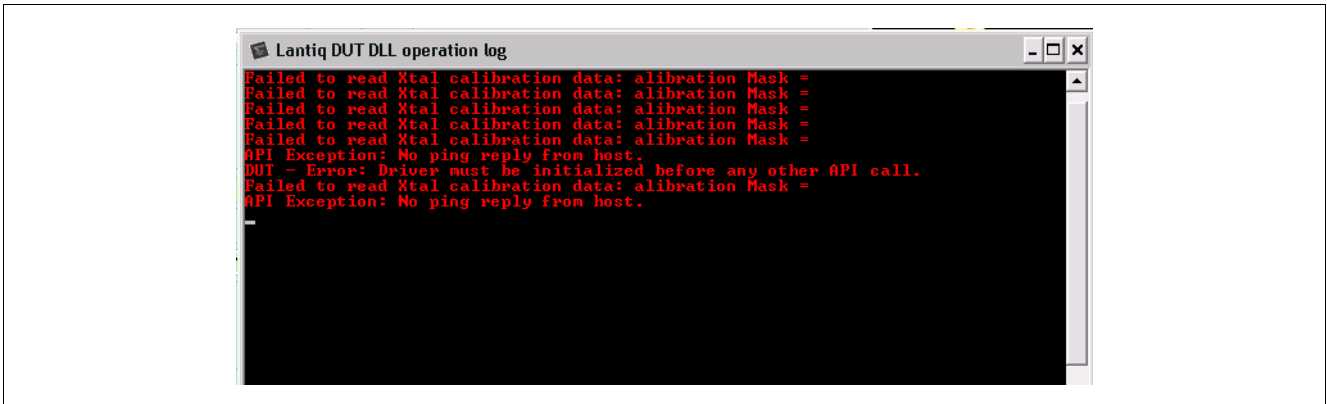
| Possible Cause of Failure                                       | Solution   |
|---|--|
| External power supply is not turned on.                         | Close the DUT GUI.<br>Enter DUT into the host.<br>Turn on the power supply.<br>Run the application again.  |
| For a Linux based host, the IP might not be correct.            | Verify that the IP address is correct and the PC's Ethernet card is properly configured.<br>Restart the host.<br>After approximately 1 minute, press the reconnect button. |
| Another application (IQFact, DUT GUI) is using the test driver. | Close the DUT GUI.<br>Reboot the DUT.<br>After the DUT is up, restart the DUT GUI application.   |
| Wrong dut_cfg.txt configuration file parameters are chosen.     | Choose the correct HW type and version according to the platform type.<br>Make sure that Wlan index in properly selected in case of dual band concurrent platform.         |
| Wrong Band and channel are configured on initial usage          | Insert appropriate Band/Channel and press the reconnect button   |

An example of the main screen of the DUT GUI following an unsuccessful connection:



**Figure 3 Main Screen of DUT GUI Application after an Unsuccessful Launch**

*Note: Please pay attention to the “There is no ping reply” message in the messages pane.*



**Figure 4** DUT DLL Log

*Note: Please pay attention to the “No ping reply from host” message in the log pane.*

## 4 Overview of the DUT GUI

The DUT GUI provides the following functions:

### 4.1 DUT GUI Features

- Change DUT operation to desired channel
- Turn on/off Rx/Tx antennas
- Receive 802.11a/b/g/n packets in nCB/CB Mode and at SISO/MIMO rates
- Transmit 802.11a/b/g/n packets in nCB/CB Mode and at SISO/MIMO rates
- Transmit in Open/Closed loop with Regulatory restrictions
- Read and burn the EEPROM/Flash
- Crystal frequency tuning tool

### 4.2 The Tab Bar

The DUT GUI includes five tabs:

- Basic Operation - Includes all functions needed to control the receiving and transmission for the DUT
- Extended operation - Includes calibration of the on-board Crystal and an option for future Antenna selection
- EEPROM & Statistics - Includes all functions needed to read and write to the EEPROM along with some advance options
- TPC - Includes specific calibration data information represented in the EEPROM/Flash
- INFO - Includes information about current system state, such as power-up self test results

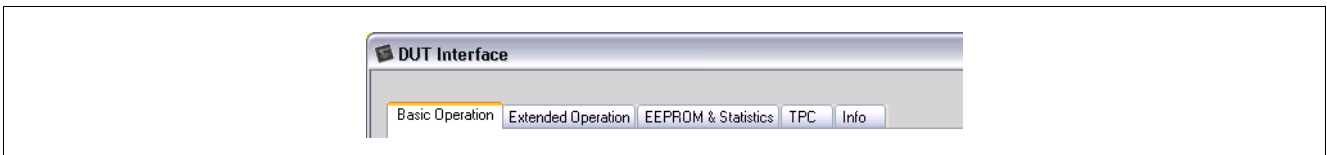


Figure 5 DUT GUI Tabs

### 4.3 Log and Messages Pane

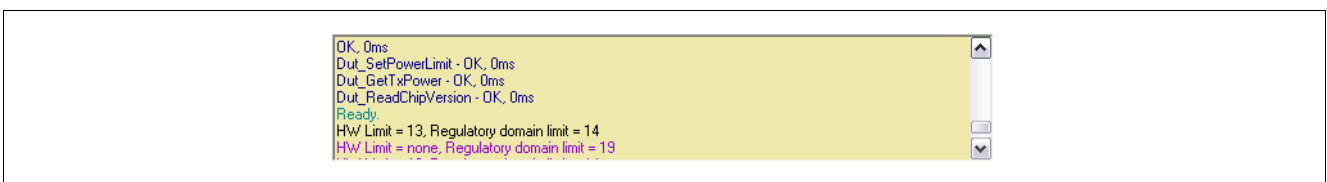


Figure 6 Log and Messages Pane

In the log pane, you can see the status of command execution. Problems are colored in red.

## 4.4 Calibration Data Screen



**Figure 7 Calibration Data Screen**

During production testing, TX power calibration is performed for enabling closed loop transmission.

The Calibration Data screen includes the information from the EEPROM which was collected during the calibration.

The information displayed is for debugging purposes only.

## 5 Using the DUT GUI

### 5.1 Connection Options

On the Basic Operation tab, the connection options are shown. Target IP should be provided. Reconnect and reboot buttons are available.

Wlan card 0 or 1 can be selected by pressing the desired radio button.

#### 5.1.1 dut\_cfg.txt Configuration Parameters

Before starting the connection, specific parameters should be checked in dut\_cfg.txt file located in C:\Program Files\Lantiq\DUT

##### Reset Hardware Information

```
Reset_HW_Type0 = 64           //Wlan0 HW type (decimal value)
Reset_HW_Type1 = 49           //Wlan1 HW type (decimal value)
Reset_HW_Revision0 = D       //Wlan0 HW revision (decimal value)
Reset_HW_Revision1 = B       //Wlan1 HW revision (decimal value)
```

Set here the HW type and revision of your card. When the EEPROM/Flash is empty, DUT will use those values in order to load the correct progmodels. DUT supports two hardware types for supporting Dual band concurrent platforms.

##### Default WLAN index (0/1)

```
Default_WLAN_Index = 0       // Two Wlan units are supported 0 or 1
```

This value defines DEFAULT WLAN and may be overridden by Dut\_SetWLANindex API call or Wlan card Wlan0 or Wlan1 radio buttons in DUT GUI.

##### Crystal Frequency Tuning

```
ENABLE_XTAL_CALIB = 1
```

1-Read XTAL tuning value from EEPROM/Flash and enable XTAL calibration

0-XTAL calibration is disabled

```
XTAL_CAL_BIAS = 0           // Siward is the default (76)
```

This is the value of the XTAL bias (7 msb of the register).

The following XTAL Bias values are supported:

**Table 2 XTAL Bias Values**

| XTAL Vendor | XTAL Type        | XTAL_CAL_BIAS decimal value |
|-------------|------------------|-----------------------------|
| Siward      | XTL541300A217002 | 76                          |
| Siward      | XTL571100L137002 | 74                          |
| TXC         | 7M36090001       | 70                          |
| Kyocera     | CX32255SBL0FLFA1 | 79                          |

For example: XTAL\_CAL\_BIAS = 70 should be used for TXC part.

### Non-Volatile memory type

```
NV_MEMORY_TYPE0 = 1          // wlan0 memory type
NV_MEMORY_TYPE1 = 1          // wlan1 memory type
```

Select the memory type used for storing HW related data.

1 - eeprom, 2 - flash, 3 - efuse

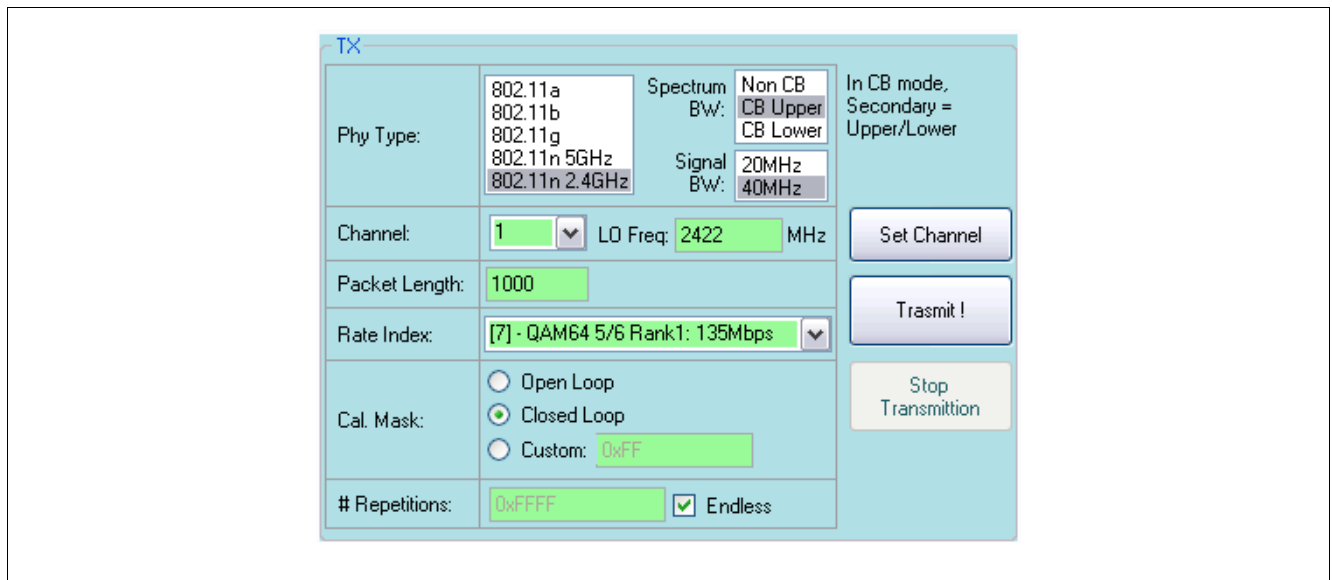
### Fast Operation

```
FAST_RESTART_METHOD = 1
0 - Regular Mode
1- Fast Restart mode
```

Note:

1. Other parameters in dut\_cfg.txt are used for debug and should not be modified.
2. In case improper hardware type was chosen, it may be required to reboot the DUT host (system to which the device is connected) before reconnection.

## 5.2 Setting the DUT's Channel



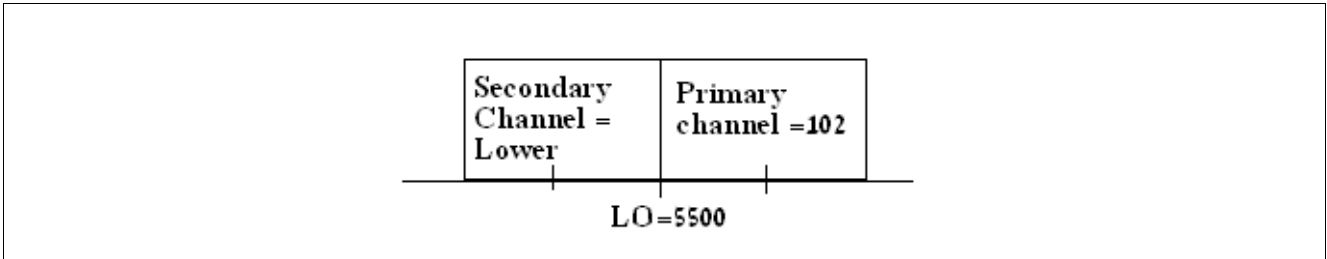
**Figure 8 Channel Setting and Transmission Screen**

When the DUT GUI is initialized, it sets the DUT to a channel according to the last run. You can select different parameters and set the DUT's channel using the following options:

- PHY Type - Used to select the operation band. PHY type also depends on the type of packets the DUT will transmit. However, if a PHY type of 2.4 Ghz is chosen (for example - 802.11b [2] ) the DUT will also receive and analyze 802.11g and 802.11n packets.
- Spectrum BW (Band width) - Dictates the spectrum bandwidth of the transmission:
  - Non-channel Bonding (nCB) = 20 Mhz
  - Channel Bonding (CB) = 40 Mhz



If CB is used, the selected channel is the primary channel and you need to choose if the secondary channel will be on the lower or upper side of the primary channel. The DUT GUI automatically calculates the actual frequency of the DUT's LO according to the channel, the BW, and the location of the secondary channel



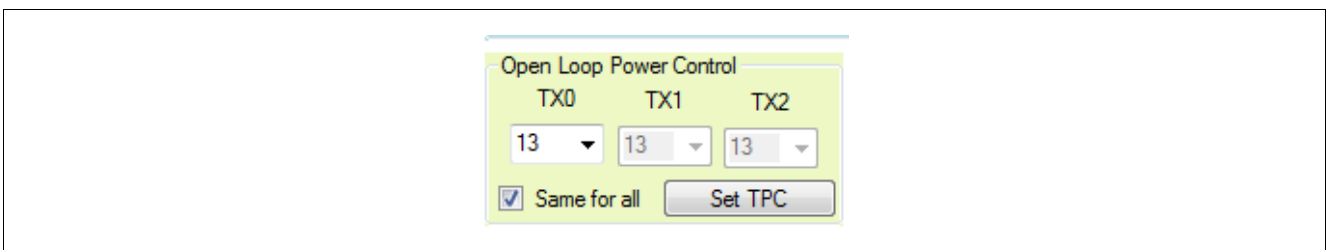
**Figure 9 Example of Primary and Secondary Channel Selection in CB Mode**

- Signal BW - When the 40MHz spectrum BW is chosen, you can choose between CB (40 MHz) Tx or SSB (single side band) transmission.
  - In SSB mode, all Tx and Rx filters are on 40 MHz BW, LO is according to 40 MHz transmission but the actual transmitted signal is only in one side of the LO (according to the location of the primary channel)
  - The difference from the previous option of 20MHz is the location of the signal in comparison to the LO and the filters used.
- Channel - Select a channel according to the 802.11n standard definition of channel. LO Frequency will automatically be calculated according to BW definitions.
- Byte length - The packet length in bytes. The maximum length is 1570 bytes.
- Rate index - According to the MCS table at the 802.11a/b/g/n standards [\[1\]](#)/[\[2\]](#)/[\[3\]](#)/[\[4\]](#). The list of available rate indexes will be according to the protocol type chosen.
- Calibration mask - This influences the initial calibration inside the RF chip after setting channel. The value should be set to 0xFFFF.
- Repetitions - How many times the packet should be transmitted.

*Note: 0xFFFF (65535 in Decimal) = endless transmission*

- Set Channel button - To instruct the DUT to change channel:
  - a.Set all the parameters.
  - b.Click Set Channel.
 When changing channel all transmissions will be stopped.
- Transmit button - To instruct the DUT to start transmitting:
  - a.Set all the parameters.
  - b.Click Transmit.
- Stop Transmission button - Use this to instruct the DUT to stop transmitting (only available when DUT is in Transmit mode).

### 5.3 Setting Output Power



**Figure 10 Open Loop Tx Setting**

When transmission is used, you can select several standard and special configurations:

- Set TPC - This option is only available in open loop (see Calibration Mask details in [“Setting the DUT’s Channel” on Page 16](#)).

TPC is one of the gain controls of the RF chip. Enter 1, to select transmission with the highest power, any number greater than 2 will lower the output power. The maximum value for TPC is 30 (lowest power). You can decide whether to apply the same TPC value to both transmitters or set independent values for each transmitter.

The output power in open loop mode can be changed before or during transmission.

## 5.4 Closed Loop Output Power Table

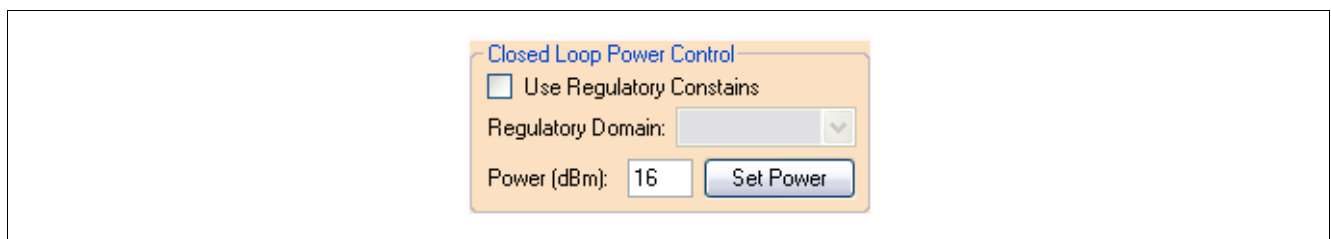


Figure 11 Closed Loop Tx Setting

- Set Tx power - In a closed loop transmission (see Calibration Mask details in [“Setting the DUT’s Channel” on Page 16](#), power is set automatically using pre-calibrated information stored in the EERPOM/flash. The information is stored in the EEPROM/flash during the TPC calibration method implemented by Litepoint’s IQFact application.
- The Tx output power is configured automatically according to the rate (see tables below).
- Output power in closed loop can be changed before or during transmission.
- Close loop power can be set in 1/8 dB resolution example 16.125 dBm, 16.875 dBm etc.
- Power table according to the rate is found and can be adjusted in the file: dut\_cfg.txt which is located in C:\Program Files\Lantiq\DUT.
- There are two options to set the default power per rate. Both are configured using the Use\_TPC\_Power parameter option in the dut\_cfg.txt file: [Constant Power](#) and [“Back Off Power” on Page 19](#).

### 5.4.1 Constant Power

Use\_TPC\_Power = 0

Power is determined according to the following table:

Table 3 Constant Power

| MCS Rate          | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  |
|-------------------|----|----|----|----|----|----|----|----|
| Const_Power_11a   | 17 | 17 | 16 | 15 | 15 | 15 | 15 | 15 |
| Const_Power_11b   | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 |
| Const_Power_11g   | 19 | 19 | 18 | 18 | 17 | 17 | 17 | 17 |
| Const_Power_11n5  | 17 | 16 | 16 | 15 | 15 | 15 | 15 | 15 |
| Const_Power_11n24 |    | 18 | 18 | 17 | 17 | 17 | 17 | 17 |

Note: For 802.11n [4], rates 8-15 have the same power as rates 0-7.

### 5.4.2 Back Off Power

Back off power from Max power in the EEPROM

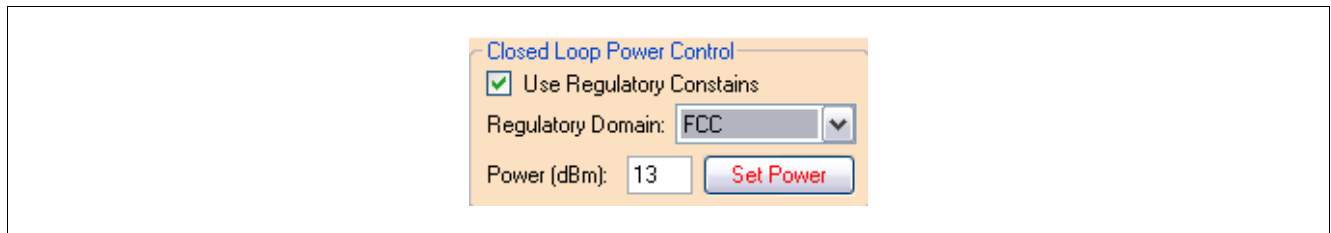
Use\_TPC\_Power = 1

Power is determined according to the maximum power stored in the EEPROM minus the following back off. The back off can be modified differently for each rate:

**Table 4 Back off Power**

| MCS Rate           | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--------------------|---|---|---|---|---|---|---|---|
| TPC_Backoffs_11a   | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 |
| TPC_Backoffs_11b   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TPC_Backoffs_11g   | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 |
| TPC_Backoffs_11n5  | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 3 |
| TPC_Backoffs_11n24 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 3 |

## 5.5 Using Regulatory Constraints in Closed Loop Tx Mode



**Figure 12 Regulatory Constraints in Closed Loop Tx Mode**

For EMI testing, there is an option to limit the transmitted power according to the EMI standards.

**To use this mode:**

1. Consider the regulatory (see [“Regulatory Limitations” on Page 19](#)) and hardware (see [“Hardware Limitations” on Page 20](#)) limitations.
2. Select the Use regulatory constraints mode.

### 5.5.1 Regulatory Limitations

Regulatory limitations are imposed by the ETSI, FCC, and Telec standards for different channels and BW.

The reglimits.csv file is provided (in C:\Program Files\Lantiq\DUT\Regulatory\_Constrains) with all the FCC, ETSI and Telec limitation for all the channels. The DUT GUI uses the information in this table to define the max output power allowed for each of the bands and frequencies. An example is shown in the following table.

**Table 5 Reg Limits**

| Band | Domain | Class | Spacing | Channel | Power Limit | Sm Required |
|------|--------|-------|---------|---------|-------------|-------------|
| 5    | FCC    | 1     | 20      | 36      | 17          | No          |
| 5    | FCC    | 1     | 20      | 40      | 17          | No          |
| 5    | FCC    | 1     | 20      | 44      | 17          | No          |

**Table 5** Reg Limits (cont'd)

| Band | Domain | Class | Spacing | Channel | Power Limit | Sm Required |
|------|--------|-------|---------|---------|-------------|-------------|
| 5    | FCC    | 1     | 20      | 48      | 17          | No          |
| 5    | FCC    | 2     | 20      | 52      | 24          | Yes         |
| 5    | FCC    | 2     | 20      | 56      | 24          | Yes         |
| 5    | FCC    | 2     | 20      | 60      | 24          | Yes         |
| 5    | FCC    | 2     | 20      | 64      | 24          | Yes         |

### 5.5.2 Hardware Limitations

The hardware limitation are different for every type of board. During EMI certification, for example, an RF board might need to lower the output power even more than required in the regulation for the specific channel used because of band edge, 2nd harmonic and other limitations.

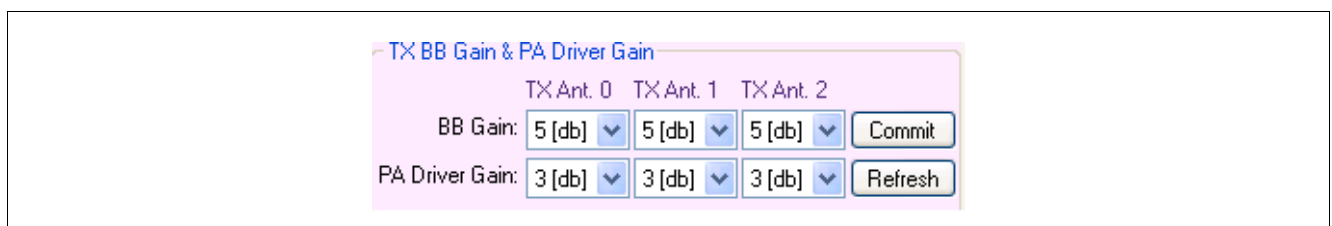
The DUT GUI uses information from the supplied limits.ini file according to the HW Type and HW Version information found in the EEPROM during startup. All known HW types are listed at the top of the ini file.

**Example:**

```
[HWTypes]
0x301a_0x8006_0xc4_0x45= GPB-208
0x301a_0x0007_0x30_0x43 = GPB-304
0x301a_0xC007_0x40_0x44= Easy388 family board (WRX RFIC)
```

If there is no HW limit for the HW used in the specific channel, only the regulatory limits will be taken into account. DUT GUI will not allow users to change the desired Tx power value more than the limitation described above allow. After the desired power is changed, click Set power for the change to take effect.

### 5.6 Changing BB and PA Driver Gains



**Figure 13** BB and PA Driver Gain Setting

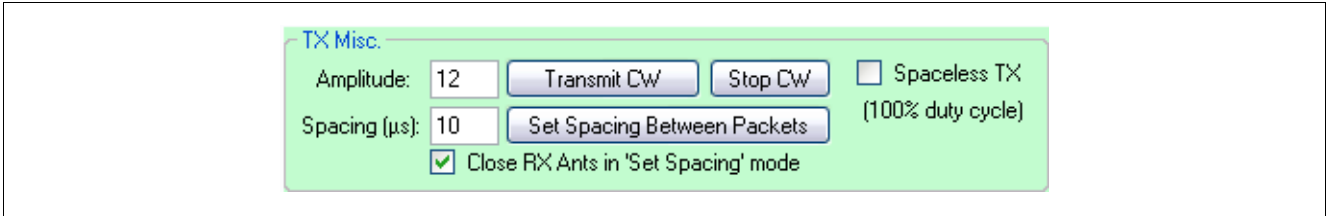
The DUT GUI allows you to control the TPC attenuator in the RF chip and two additional RF chip internal amplifiers:

- Base band gain (BB gain) - In the BB side of the RF chip there is an option to boost dB gain by 0, 2.5, or 5
- PA driver gain - In the RF side of the RF chip there is an option to gain 0 or 3 dB using the PA driver gain control

The system automatically determines the initial value of both gains and this might differ between frequencies and bands.

*Note: This Gain change option is applicable for XWAY™ WAVE300 devices only.*

## 5.7 Transmitting in CW Mode and Changing IFS Section



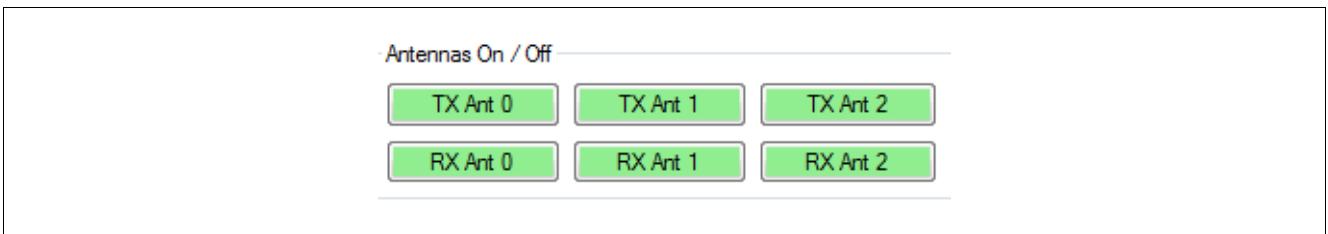
**Figure 14 Transmitting in CW Mode and Changing IFS Section**

- CW mode - To set the DUT to transmit in CW mode, define the CW amplitude and click Transmit CW. To stop the transmission, click Stop CW.

*Note: The amplitude is just an index and is not in dBm. The higher the index used, the higher the CW's amplitude.*

- Changing spacing - To change the IFS (inter frame spacing), set the spacing in  $\mu$ Sec and click Set Spacing Between Packets. When changing the spacing, Rx Antennas are closed to verify that the IFS isn't determined also because of received packets for different 802.11 station in the area.
- Space-less transmission - When this mode is selected, the transmission coming out will be continual, meaning there will be no idle time - 100% Duty cycle. This is not a standard mode of operation and some time is required for certification testing.

## 5.8 Setting Antenna Configuration



**Figure 15 Antenna On/Off Section**

Lantiq's WiFi solution includes three transmit and three receive antenna. You can turn off one or more of the antenna by clicking the relevant button as shown above.

## 5.9 Rx Information and PA Detector Information

| Name                   | Value    |
|------------------------|----------|
| RSSI RX0               | -49.7dBm |
| RSSI RX1               | -49.7dBm |
| RSSI RX2               | -49.7dBm |
| Packets received (phy) | 0        |
| Packets w/ CRC error   | 0        |
| Packets received (mac) | 0        |
| PA Voltage TX0         | 0.0      |
| PA Voltage TX1         | 0.0      |
| PA Voltage TX2         | 0.0      |

**Figure 16 RSSI, Packets Counter and PA Detector Information**

When you click Update, the following are read from the DUT:

- RSSI values (signal strength) for each of the three Rx antennas (in dBm)
- Packets received counters (PHY level) - There are two readings:
  - the upper is for the number of packet received in the modem
  - the lower is for the number of packets received in the modem with CRC error.
- Packets received counter (MAC) - This counter is not used.
- PA voltage - Returns the power indication from the PA detector during transmissions.

The PA detector information enters the BB chip through an 8 bit A/D. The reading in the DUT GUI is an average of several readings and the numbers are on a scale of 0-255. Usually, each step represents approximately 10 mV.

## 5.10 Chip Gain Information

| Name          | RX0  | RX1  | RX2  |
|---------------|------|------|------|
| RF LNA Gain   | High | High | High |
| RF Mixer Gain | N    | N    | N    |
| BB Gain       | 45db | 45db | 45db |

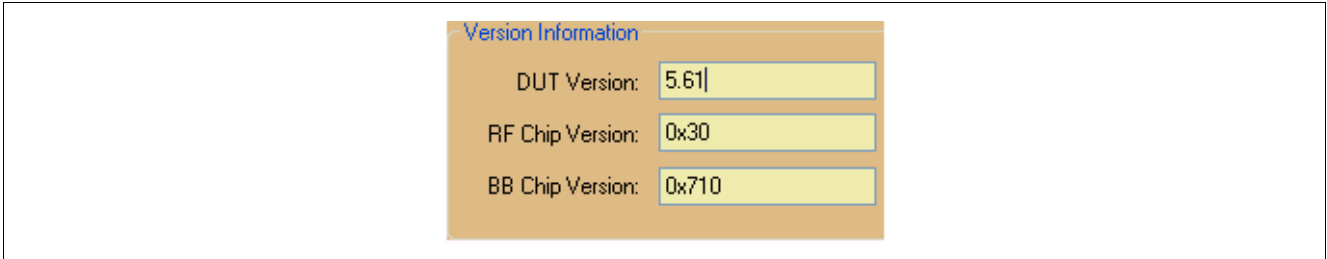
**Figure 17 Chip Gain Information**

When you click Update Gains, the following are read from the DUT:

- RF LNA Gain
- RF Mixer Gain
- BB Gain

*Note: The gain information is applicable for XWAY™ WAVE300 devices only.*

## 5.11 DUT and Chip Versions



**Figure 18 Version Information**

During startup, the DUT GUI reads the RF and BB chip versions from the relevant HW registers in the chips and displays it together with the DUT GUI application version.

The RF chip version 0x30 indicates XWAY™ WAVE300 (PSB 8301, PSB 8304) RFIC

The BB chip version 0x710 indicates XWAY™ WAVE300 (PSB 8221, PSB 8231) BBIC

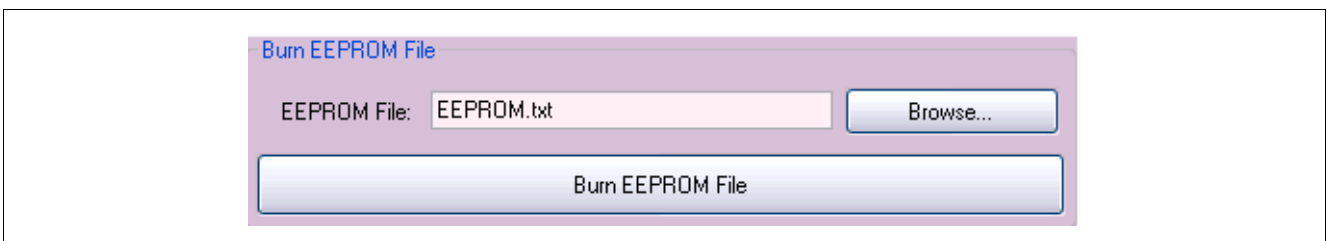
## 5.12 Reading and Writing the EEPROM/Flash

### 5.12.1 Configuring EEPROM/Flash Area Size

EEPROM/Flash area size may be configured via dut\_cfg.txt file.

It is possible to specify EEPROM/Flash area size in bytes by the means of parameter EEPROM\_Size\_Bytes. The default value is 1024 bytes.

### 5.12.2 Burning a File to EEPROM/Flash



**Figure 19 EEPROM/Flash Burning Section**

The EEPROM/Flash contains important information for operation of the module. The information includes:

- PCI information (including Vendor ID and Device ID).
- HW Type and HW version information - To determine which firmware to load to the module.
- TPC calibration information.

**Attention: A module will not work without correct values in the EEPROM/Flash for all three areas mentioned above.**

The EEPROM/Flash is usually burned only once, during the production testing. Information burned into the EEPROM/Flash consists of a text file in the following form:

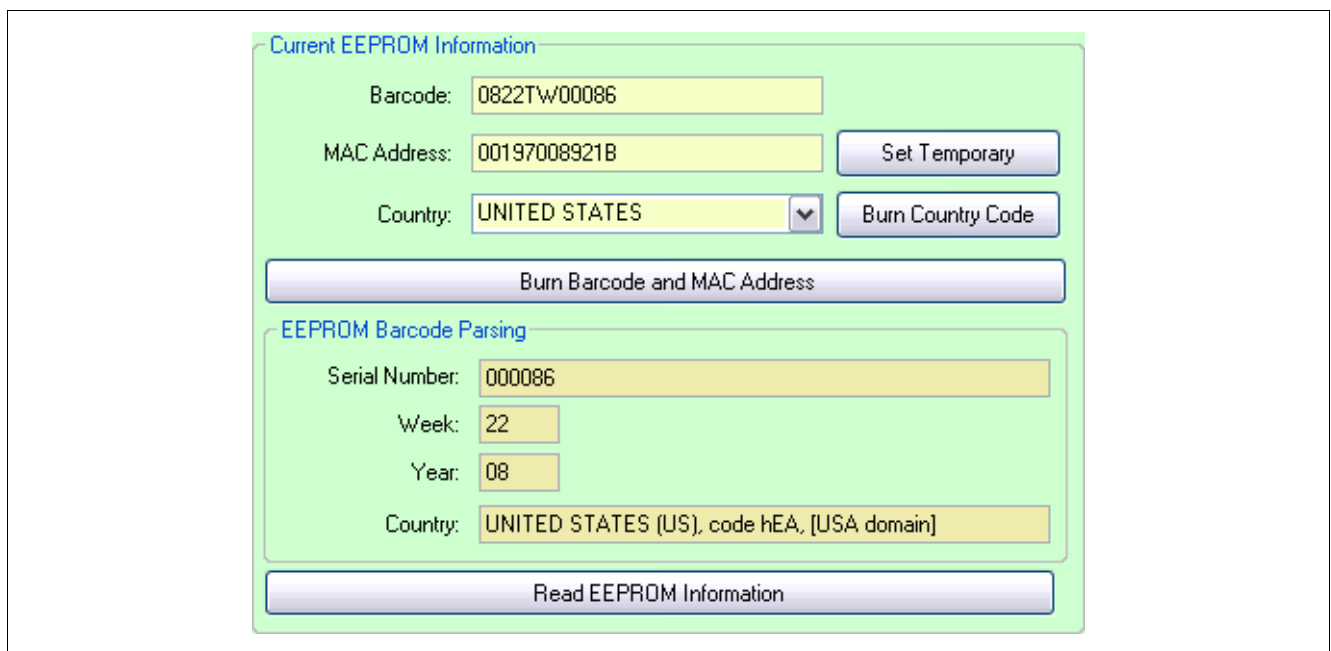
```
<Address><data>
```

**Example:**

```
0000    FC1B
0002    CD00
0004    0000
0006    0100
```

**Attention: Burning the wrong information into the EEPROM/Flash can cause the module to stop working without the possibility to reverse the damage.**

### 5.12.3 Working with Serial Numbers and MAC Addresses



**Figure 20 MAC Address and S/N Information R/W**

The EEPROM/Flash includes MAC address, country code and serial number information burned in the production testing and assembly.

Using the DUT GUI, the following information can be read from the EEPROM/Flash:

- MAC address - is in 12 hexadecimal digits
  - Serial number can be in 2 following formats
  - YYWMMNNNNCC where
    - YY - Year of manufacture
    - WW - Week of manufacture
    - MM - Two letter initials of assembly house (this information is not stored in the EEPROM/Flash)
    - NNNNN - Five digits of sequential serial number
    - CC (optional) - Short country name (two-letters), as listed in the 'Country' drop list, used for regulatory domain limitations.
    - For full country code list see [Appendix C - Country Codes](#)
- Example:** 0825ML12345US

- KKKKKYMNEXXXXXX
  - KKKKK - 5 digits of module name.



- Y - Year of manufacture
  - M - Month of manufacture (A=October, B=November, C= December)
  - N - board revision
  - E - Regulatory domain (Example: E= ETSI)
  - XXXXXX- Five digits of sequential serial number
- Example:** AN66085NE123456

The following options are available in this section:

- **Read EEPROM/Flash Information** - Read current S/N, country code and MAC address information from the EEPROM/Flash
- **Burn Barcode and MAC address** - Write the S/N (barcode) and MAC address information provided by the user to the EEPROM/Flash
- **Set temporary** - Give the module a temporary MAC address. This MAC address will not be saved into the EEPROM/Flash but can be used to filter received packets without this MAC address.
- **Burn Country Code** - Write the chosen country code to the EEPROM/Flash.

The Rx packets counter for packets received with this MAC address can be found in the first tab of the application in the “Rx information” section.

### 5.12.4 Changing Raw Content

To view EEPROM/Flash raw data:

1. From the third tab, click View / Change/ Save EEPROM...  
The following screen appears.

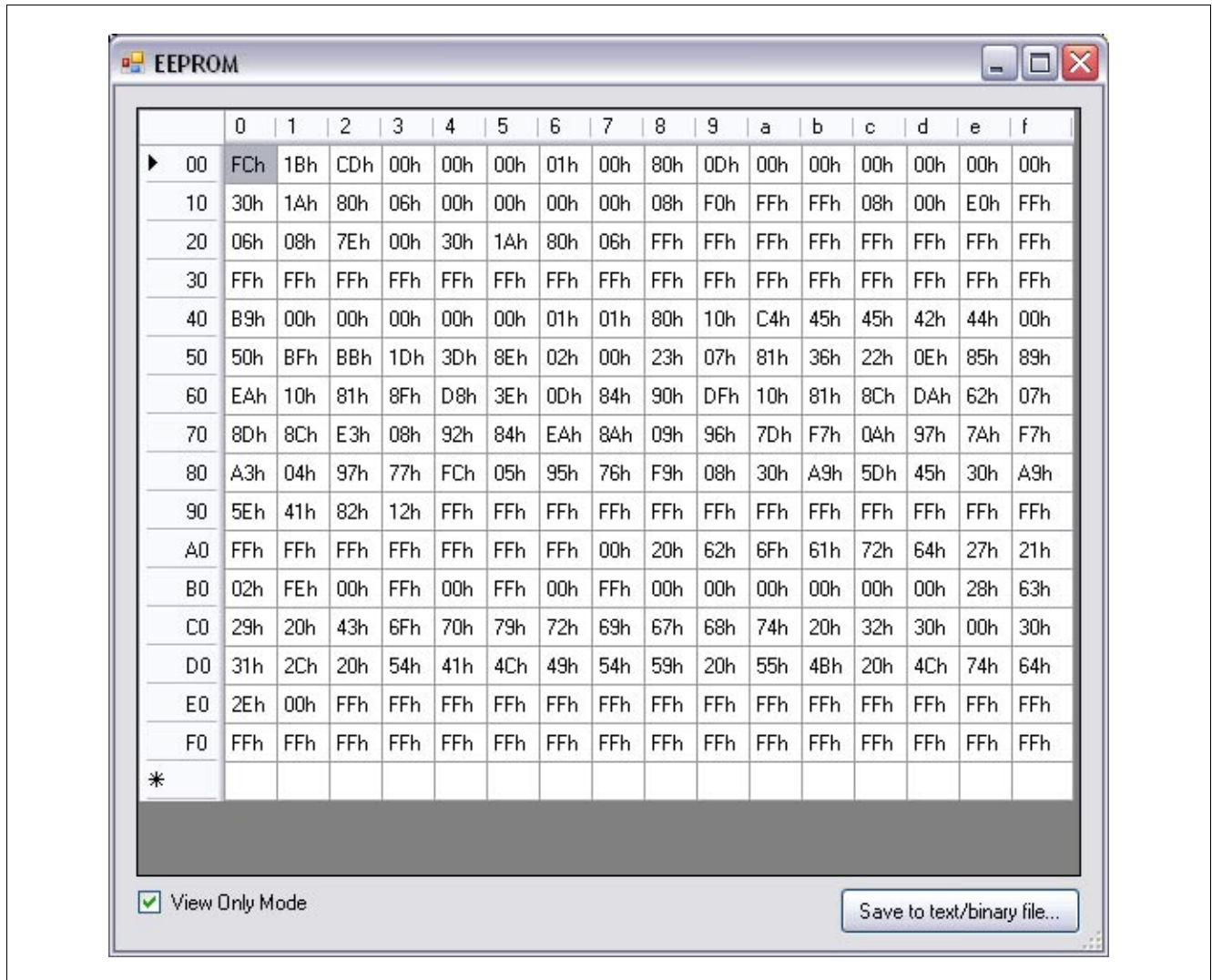


Figure 21 EEPROM/Flash Raw Data

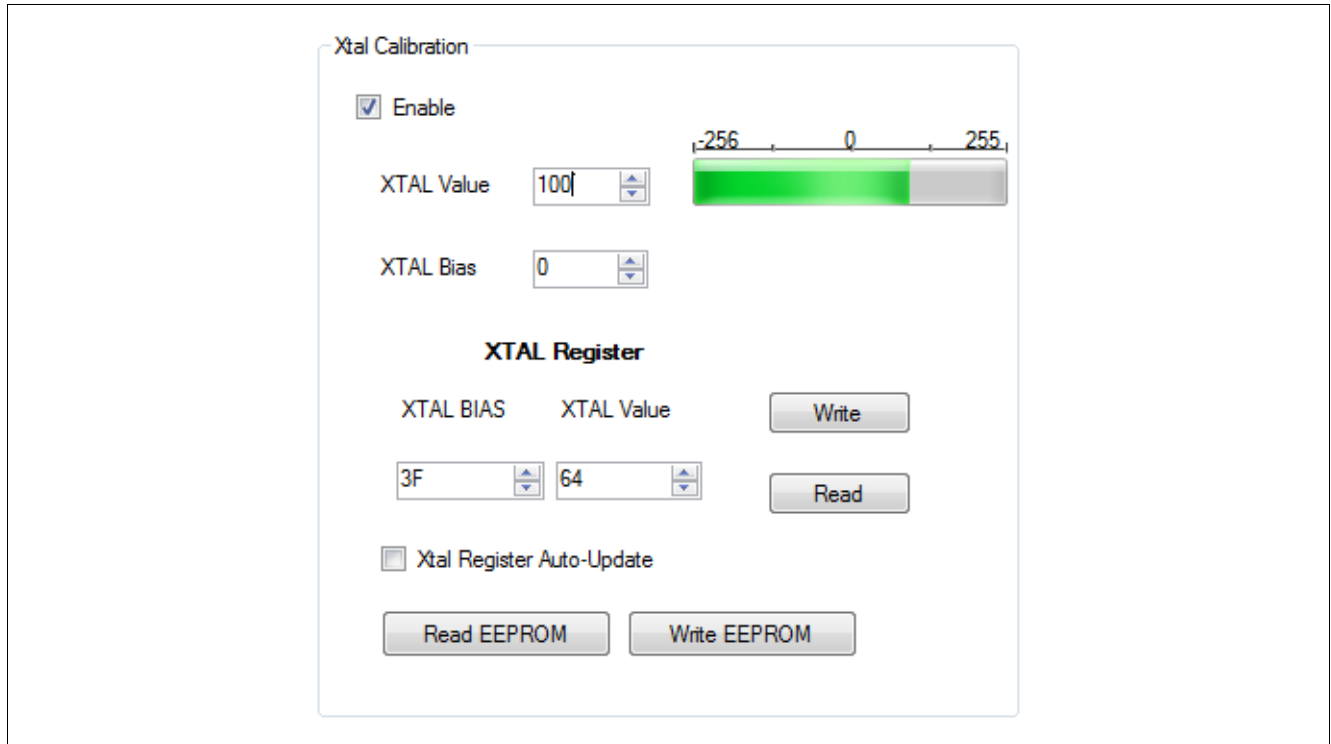
The information is shown as two hexadecimal digits for each address (hexadecimal marked by the 'h' after the two digits). For example, 1Ah (equivalent to 0x1A).

To edit the EEPROM/Flash raw data:

1. Clear the View Only Mode checkbox.
2. Edit the EEPROM/Flash content for each cell separately.  
Burning is performed when the cursor moves from the changed cell
3. To save all the EEPROM/Flash content to a file, click Save to text/binary file.  
The file can be loaded with the “burning EEPROM file” function in the second application tab

### 5.13 XTAL Calibration

This form can be found in the Extended operation tab.



**Figure 22 XTAL Calibration**

Two XTAL configuration fields are available:

- XTAL Value - tuning value register
- XTAL Bias - drive strength value (the XTAL Bias field is supported in XWAY™ WRX312/313 RFIC only)

These fields can be read and written to the RFIC and EEPROM/Flash and used for proper XTAL operation.

The following XTAL Bias values are supported:

**Table 6 XTAL Bias Values**

| XTAL Vendor | XTAL Type        | XTAL_CAL_BIAS decimal value |
|-------------|------------------|-----------------------------|
| Siward      | XTL541300A217002 | 76                          |
| Siward      | XTL571100L137002 | 74                          |
| TXC         | 7M36090001       | 70                          |
| Kyocera     | CX32255SBL0FLFA1 | 79                          |

## 6 Available Functions in mt\_dut.dll

All Int functions will return a value:

- If a function is used to receive information (counter etc.) the value will be returned
- In all other cases, the function will return “1” for success or “0” for fail

Parameters for all functions have names as defined in the header file “DUT\_API.h”. For example:

```
#define DUT_MODE_B 1  
#define DUT_MODE_N 2
```

### 6.1 Init Process

```
Dut_SetConnectionMode(int connectionType, const char* optIPAddr);  
// Set the connection mode to the device. 0=PCI, 1=UART, 2=SPI, 3=LINUX.  
IP addr should be specified for linux connections, can be null otherwise This  
function should be called BEFORE Dut_DriverInit.
```

```
Int Dut_DriverInit(void) // Return 1 after success
```

```
Int Dut_DriverVersion(double *version); // returns the version to the location of  
the pointer
```

```
Int Dut_SetWLANindex(int wlanIndex);  
// In case of concurrent dual-band board, use this function before connection or  
reconnection in order to choose the needed WLAN card index - 0 or 1, where 0 is the  
default. Call this function AFTER calling Dut_SetConnectionMode
```

```
Dut_BistRes(int* BistRes); //Reads results of the BIST
```

### 6.2 Calibration Process and Tx Tests

```
Int Dut_SetChannel(int Mode, int band, int CBMode, int channel, BYTE CalibrationMask)  
// mode={a,b,g,n}, Band={2400,5000}, CBMode={20,40} channel_index (not the actual  
frequency) CalibrationMask - in Hexadecimal
```

```
Int Dut_ChangeScramblerMode(int mode) // {0 ,1}
```

```
Int Dut_SetTPC (int TPC) // {25,..,2}
```

```
Int Dut_TxPackets (int Mode, int RateIndex, , int CBMode, int Length, int  
repetitions) // mode={a,b,g,n}, rate={MSC table}, CBMode={20,40}, length in byte,  
repetitions - number of packets or 0xFFFF for endless transmission.  
Int Dut_EndTxPackets (Void)
```

```
Int Dut_ReadVoltageValue (double* voltages) // Returns the power values in Volts for  
both Tx antennas to the pointer of the value array.
```

**Int Dut\_SetPower**(int power); // Sets the Tx power for close loop only. The value is the desired Tx power per antenna in dBm. The function itself does not change the power: you must call this function before calling Dut\_TxPackets.

**Int Dut\_SetPowerFloat**(float power); // The float version can received more accurate values (in \*1/8db)

### 6.3 Burning the EEPROM

**Int Dut\_BurnEEPROM** (DWORD Address, DWORD length, const BYTE\* value) // Burning information into the EEPROM.

- The address is in hexadecimal.
- The length is in bytes.
- The value is the string in hexadecimal.

**Examples:**

```
Dut_BurnEEPROM (C4, 2, FFAF)
Dut_BurnEEPROM (2D, 4, 01F499A3)
```

**Int Dut\_ReadEEPROM** (DWORD address, DWORD length, BYTE\* data); // Read data from the EEPROM, at a specified address. Length is the number of bytes.

**Int Dut\_Burn\_MAC\_Address** (const BYTE \*mac\_address) // Used to burn the MAC address (length of 6 bytes).

**Int Dut\_Burn\_Date** (int year, int week) // Used to burn the date of the mPCI production.

**Int Dut\_Burn\_SN** (DWORD SN) // Used to burn the S/N (3 Bytes)

**Int Dut\_Burn\_File** (const char\* filename) // Used to burn file with address and information to the EEPROM. The file should be in the form of:  
<Address> <Data>

**Example:**

```
0040 AAFF
```

Dut\_Burn\_File can also be called instead of Dut\_DriverInit, which in this the file will be burned before the init process first reads the EEPROM.

**Int Dut\_BurnInfo**(const char\* barcode, const BYTE\* macAddr, const char\* filename) // One function that burns the S/N from the barcode, the MAC address, and the EEPROM file.

**Int Dut\_Burn\_Cal\_Data** (const Dut\_CalDataStruct\* pCarStr) // Used to burn the calibration data. The structure is in the form of:

|                           | Freq<br>1 | Freq<br>2 | Freq<br>3 | Freq<br>4 | Freq<br>5 | Freq<br>6 |
|---------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| uint Channel {0-255}      |           |           |           |           |           |           |
| Bool Band (0=2.4, 1= 5)   |           |           |           |           |           |           |
| uint Ant0 TPC {0-31}      |           |           |           |           |           |           |
| uint Ant0 Max power{0-31} |           |           |           |           |           |           |
| double a <sub>0</sub>     |           |           |           |           |           |           |
| double b <sub>0</sub>     |           |           |           |           |           |           |
| uint Ant1 TPC {0-31}      |           |           |           |           |           |           |
| uint Ant1 Max power{0-31} |           |           |           |           |           |           |
| double a <sub>1</sub>     |           |           |           |           |           |           |
| double b <sub>1</sub>     |           |           |           |           |           |           |

Figure 23 Burn Calibration Structure

## 6.4 EEPROM Burning New Calibration Method Function

```
extern MT_RET PASCAL Dut_EEPROM3_Burn_Cal_Data(const Dut_CalDataStruct3*
inCalArray, Dut_CalDataStruct3* outCalArray, int numStructures);

// Burn calibration data using the Dut_CalDataStruct3 for EEPROM Version 3 (defined
// above)
// int numStructurs - # of Dut_AntCalDataStruct3 structures in calArray (2.4 + 5 GHz)
// outCalArray is an optional parameter (can be NULL). If specified, the function
// fills the outCalArray with the linear correlation (LR) results.
// You can use the function Dut_EEPROM3_Test_Cal_Data to verify the LR results for
// part or all of the structures before burning.

extern MT_RET PASCAL Dut_EEPROM3_Test_Cal_Data(const Dut_CalDataStruct3*
inCalArray, Dut_CalDataStruct3* outCalArray, int numStructures);
// Same as Dut_EEPROM3_Burn_Cal_Data but without burning to the EEPROM.
```

## 6.5 Sensitivity Check

```
Int Dut_SetMACAddress(const BYTE* macAddr);
// Sets the MAC address for the testing procedure. Does NOT burn to EEPROM. macAddr
is a BYTE[6] array. This function can and should be called before the call to
Dut_DriverInit(). It sets the Rx filter in the lower Mac for packets only in this
MAC address.

Int Dut_SetRxAntenna(int rx_antenna_mask);
```

```
// options = {001, 010, 100, 011, 101, 110, 111}. Returns 1 following a success.
```

```
Int Dut_PHYPacketsCounter (unsigned int* packetsCounters)  
// Returns the current value of the received packet counter and CRC error counter.  
Read before and after transmission. Values will be returned in decimal to the  
location of the array. The array should be composed of two values of uint type. The  
first is for the packet counter and the second is for the CRC error counter. This  
function returns the counters from the PHY layer and does not filter packets  
according to MAC address.
```

```
Int Dut_MACPacketsCounter (unsigned int* packetsCounters)  
// As above, but returns the counter from the lower MAC level. Packets are filtered  
according to the MAC address set in the MAC (by using the function Dut_SetMACAddress.
```

```
Int Dut_ResetPacketsCounter ()  
// Resets the packets and CRC error counters.
```

```
Int Dut_RSSIVector (double* RSSI) // Returns the RSSI value of three Rx antennas at  
the time of the call to the location of the array. The array should be composed of  
3 values of double type. Values are in dBm.
```

## 6.6 Finalize the Test

```
Int Dut_DriverRelease(void);  
// Used to terminate your driver control when you have allocated some resources, e.g.  
memory. Can be just a dummy return if your driver has nothing to release.
```

## 6.7 Others

```
Int Dut_WriteReg(DWORD address, DWORD Data, DWORD mask); // For the BB chip
```

```
Int Dut_ReadReg(DWORD address, DWORD* pData, DWORD mask); // For the BB chip
```

```
Int Dut_ReadRFReg(DWORD address, DWORD* pData, DWORD mask); // For the RF chip
```

```
Int Dut_WriteRFReg(DWORD address, DWORD data, DWORD mask); // For the RF chip
```

```
Int Dut_ReadChipVersion(DWORD* RF_chip_version, DWORD* BB_chip_version)
```

```
Int Dut_ChangeRFChipMode(DWORD mode);  
// Changes the mode of operation of the RF chip. In all modes which are not listen,  
the gen risc is disabled. To re-enable, you must return to listen mode.
```

Possible options are:

```
#define DUT_RF_MODE_LISTEN 0xF77 // Tx turned off  
#define DUT_RF_MODE_STANDBY 0x800 // Only LO is kept on  
#define DUT_RF_MODE_POWERDOWN 0
```

```
Int Dut_ReadRFGain(BYTE* RF_Gain_Values); // Read RF Gain - RF_Gain_Values must be an array of 6 bytes with:
```

- 0 - RX0\_LNA\_Gain
- 1 - RX0\_MIXER\_GAIN\_6DB
- 2 - RX1\_LNA\_Gain
- 3 - RX1\_MIXER\_GAIN\_6DB
- 4 - RX2\_LNA\_Gain
- 5 - RX2\_MIXER\_GAIN\_6DB

```
Int Dut_ReadBBGain(int* BB_Gain_Values); // Read BB Gain - BB_Gain_Values must be an array of three integers for each antenna - returns total of LPF1+LPF2+VGA in db
```

```
Int Dut_ReadDetector(BYTE* detector_values); // Read Detector - detector_values must be an array of four bytes:
```

- 0 - PLL\_Lock
- 1 - THD0 (Threshold detector RX0 output)
- 2 - THD1 (Threshold detector RX1 output)
- 3. - THD2 (Threshold detector RX2 output)

```
"Int Dut_ReadVoltageValueEx(double* pVoltage, int numSamples) // Same as ReadVoltageValue, numSamples - # of samples for each antenna for averaging. Default value for numSamples (used in Dut_ReadVoltageValue) function is 35
```

**Tx Gains Set/Get for each TX antenna:**

```
Int Dut_SetTxGains(int* bbGains, int* driverGains);  
Int Dut_GetTxGains(int* bbGains, int* driverGains);
```

```
// Parameters:
```

```
// bbGains - array of 2 ints (for each TX ant). Each value can be 0 for 0[db], 1 for 2.5[db] and 2 for 5[db]
```

```
// driverGains - array of 2 ints (for each TX ant). Each value can be 0 (Low) or 1 (High)
```

```
Dut_StopRISC() // Stops the GenRISC processor (PHY)
```

```
Dut_StartRISC() // Starts the GenRISC processor (PHY)
```



## 7 Appendix A - PCI EEPROM Address Map

The eeprom structure includes four major sections:

1. Executive control Region (00-04h)  
The first two words are the eeprom signature. The signature is a known number which indicates valid eeprom information (e.g. not empty).
2. PCI spec RunTime registers (05-0Bh)  
These registers are the PCI configuration registers which must be in any PCI device. These registers with combination of the CIS (see section 4), define the HW installed at the PCI bus. This region is restricted for PCI HW definition native needs.
3. RunTime registers - (0C-3Fh)  
These registers are used as default configuration for the PCI Initiator and target HW. It includes Device and Vendor Id, shared RAM address and configuration space address.
4. Initialization section - (40-F8h)  
This section is used to save initialization parameters as Card type and version, MAC address, serial number, calibration data and other Metlink's native information.

**Table 7 EEPROM Address Map**

| Data   | Address     |
|--|-------------|
| Header   | 0x40-0x47   |
| HW configuration Sub Section type  | 0x48        |
| HW configuration Sub Section length  | 0x49        |
| HW type  | 0x4A        |
| HW revision  | 0x4B        |
| Country code (for Regulation domain) See APPENDIX F for full country code list | 0x4C        |
| BB chip ID   | 0x4D        |
| RF chip ID   | 0x4E        |
| MAC address  | 0x4F-0x54   |
| Serial number  | 0x55-0x57   |
| Week and Year  | 0x58-0x59   |
| TPC Calibration data Sub Section type  | 0x5A        |
| TPC Calibration data Sub Section length  | 0x5B        |
| TPC Calibration data   | 0x5C - 0xF8 |

*Note: Modification of all sections off the EEPROM is forbidden and could result in initialization failure.*

## 8 Appendix B - Example Code for mt\_dut.dll Usage

Use the mt\_dut.dll to develop automatic applications to control the DUT. The following files are available to you (in C:\Program Files\Lantiq\DUT\Developers):

- dut\_api.h
- mt\_types.h
- MT\_DUT.lib

### Example code:

This C source code defines the functions used by the supplied command line demo application.

The Dut\_XXX functions are declared in the supplied dut\_api.h according to the specifications, and you can also use the supplied MT\_DUT.LIB for easier access to the MT\_DUT.DLL.

```
#include "../dut_api.h" // Set to your path of the dut_api.h file
#include <stdio.h>
#include <stdlib.h>

/// Prints the API error in case ret is MT_RET_FAIL
int TryRunning(int ret)
{
    if (ret == MT_RET_FAIL) printf("%s\n", Dut_GetLastError());
    return ret;
}

/// Prints the driver or API version
int DriverVersion()
{
    double version;
    Dut_DriverVersion(&version);
    printf("Driver version: %.2f\n", version);
    return MT_RET_OK;
}

// Initialize the driver (in our command line application, it is called
// automatically)
int DriverInit()
{
    return TryRunning(Dut_DriverInit());
}

// Releases the driver, and exits the application
int DriverRelease()
{
    if (!TryRunning(Dut_DriverRelease())) return MT_RET_FAIL;
    exit(MT_RET_OK);
    return MT_RET_OK;
}
```

```
int SetChannel(int Mode, int band, int BW, int channel, BYTE calibrationMask)
{
    return TryRunning(Dut_SetChannel(Mode, band, BW, channel, calibrationMask));
}

int ChangeScramblerMode(BYTE mode)
{
    return TryRunning(Dut_ChangeScramblerMode(mode));
}

int SetTPC(int TPC)
{
    return TryRunning(Dut_SetTPC(TPC));
}

int TxPackets(int mode, int rateIndex, int BW, int length, int repetitions)
{
    return TryRunning(Dut_TxPackets(mode, rateIndex, BW, length, repetitions));
}

int EndTxPackets()
{
    return TryRunning(Dut_EndTxPackets());
}

int BurnEEPROM(DWORD address, BYTE value)
{
    return TryRunning(Dut_BurnEEPROM(address, 1, &value));
}

int ReadEEPROM(DWORD address)
{
    BYTE value;
    if (!TryRunning(Dut_ReadEEPROM(address, 1, &value))) return MT_RET_FAIL;
    printf("Got %02Xh from the EEPROM\n", (int)value);
    return MT_RET_OK;
}

int SetRxAntenna(int mask)
{
    return TryRunning(Dut_SetRxAntenna(mask));
}

int SetTxAntenna(int mask)
{
    return TryRunning(Dut_SetTxAntenna(mask));
}

int MacPacketsCounter()
```

```
{
    DWORD PacketsCounter;
    if(!TryRunning(Dut_MacPacketsCounter(&PacketsCounter))) return
MT_RET_FAIL;
    printf("MAC PacketCounter = %d\n", (int)PacketsCounter);
    return MT_RET_OK;
}

int PhyPacketsCounter()
{
    int i;
    double PacketsVector[2];
    if(!TryRunning(Dut_PacketsCounter(PacketsVector))) return MT_RET_FAIL;
    for (i=0; i<2; ++i)
        printf("PacketCounter %d=%f\n", i, PacketsVector[i]);
    return MT_RET_OK;
}

int ResetPacketsCounter()
{
    if(!TryRunning(Dut_ResetPacketsCounter())) return MT_RET_FAIL;
    return MT_RET_OK;
}

int RSSIVector()
{
    int i;
    double RSSIVector[3];
    if (!TryRunning(Dut_RSSIVector(RSSIVector))) return MT_RET_FAIL;
    for (i=0; i<3; ++i)
        printf("RSSI Ant %d=%f\n", i, RSSIVector[i]);
    return MT_RET_OK;
}

// Directly writes a masked 32-bit value to the firmware memory space.
int WriteReg(DWORD address, DWORD data, DWORD mask)
{
    return TryRunning(Dut_WriteData(address, data, mask));
}

int ReadReg(DWORD address, DWORD mask)
{
    DWORD data = 0;
    if (!TryRunning(Dut_ReadData(address, &data, mask))) return MT_RET_FAIL;
    printf("Received data: 0x%08X\n", data);
    return MT_RET_OK;
}

int ReadVoltageValue(int antenna)
{

```

```
double voltage = 0.0;
if (!TryRunning(Dut_ReadVoltageValue(antenna, &voltage))) return
MT_RET_FAIL;
printf("Antenna voltage: %f\n", voltage);
return MT_RET_OK;
}

int BURN_DATE(int year, int week)
{
    return (TryRunning(Dut_Burn_Date(year, week)));
}

int BURN_MAC_ADDRESS(BYTE b0, BYTE b1, BYTE b2, BYTE b3, BYTE b4, BYTE b5)
{
    BYTE macAddr[6] = {b0, b1, b2, b3, b4, b5};
    return (TryRunning(Dut_Burn_MAC_Address(macAddr)));
}

int BURN_CAL_DATA(int channel, int band, int TPC0, int maxPower0, double a0, double
b0)
{
    int i;
    Dut_CalDataStruct calData;
    calData.band = band;
    calData.channel = channel;
    for (i=0; i<2; ++i) // In this example, we use the same variables for ant0
and ant1
    {
        calData.ants[i].TPC = TPC0;
        calData.ants[i].a = a0;
        calData.ants[i].b = b0;
        calData.ants[i].maxPower = maxPower0;
    }
    return (TryRunning(Dut_Burn_Cal_Data(&calData)));
}

// Burn an example file to the EEPROM
int BURN_FILE()
{
    return (TryRunning(Dut_Burn_File("eeprom_file.txt")));
}

// Burns the serial number to the EEPROM
int BURN_SN(unsigned int SN)
{
    return (TryRunning(Dut_Burn_SN(SN)));
}
```

## 9 Appendix C - Country Codes

**Table 8 Country Codes**

| EEPROM Value (Hex) | EEPROM Value (Decimal) | Country Name           | Country Code | Regulatory Domain |
|--------------------|------------------------|------------------------|--------------|-------------------|
| 1                  | 1                      | AFGHANISTAN            | AF           | Europe            |
| 2                  | 2                      | ÅLAND ISLANDS          | AX           | Europe            |
| 3                  | 3                      | ALBANIA                | AL           | Europe            |
| 4                  | 4                      | ALGERIA                | DZ           | Europe            |
| 5                  | 5                      | AMERICAN SAMOA         | AS           | Europe            |
| 6                  | 6                      | ANDORRA                | AD           | Europe            |
| 7                  | 7                      | ANGOLA                 | AO           | Europe            |
| 8                  | 8                      | ANGUILLA               | AI           | USA               |
| 9                  | 9                      | ANTARCTICA             | AQ           | Europe            |
| 0A                 | 10                     | ANTIGUA AND BARBUDA    | AG           | USA               |
| 0B                 | 11                     | ARGENTINA              | AR           | USA               |
| 0C                 | 12                     | ARMENIA                | AM           | Europe            |
| 0D                 | 13                     | ARUBA                  | AW           | USA               |
| 0E                 | 14                     | AUSTRALIA              | AU           | Japan             |
| 0F                 | 15                     | AUSTRIA                | AT           | Europe            |
| 10                 | 16                     | AZERBAIJAN             | AZ           | Europe            |
| 11                 | 17                     | BAHAMAS                | BS           | USA               |
| 12                 | 18                     | BAHRAIN                | BH           | Europe            |
| 13                 | 19                     | BANGLADESH             | BD           | Japan             |
| 14                 | 20                     | BARBADOS               | BB           | USA               |
| 15                 | 21                     | BELARUS                | BY           | Europe            |
| 16                 | 22                     | BELGIUM                | BE           | Europe            |
| 17                 | 23                     | BELIZE                 | BZ           | USA               |
| 18                 | 24                     | BENIN                  | BJ           | Europe            |
| 19                 | 25                     | BERMUDA                | BM           | USA               |
| 1A                 | 26                     | BHUTAN                 | BT           | Japan             |
| 1B                 | 27                     | BOLIVIA                | BO           | USA               |
| 1C                 | 28                     | BOSNIA AND HERZEGOVINA | BA           | Europe            |
| 1D                 | 29                     | BOTSWANA               | BW           | Japan             |
| 1E                 | 30                     | BOUVET ISLAND          | BV           | Japan             |
| 1F                 | 31                     | BRAZIL                 | BR           | USA               |

**Table 8 Country Codes (cont'd)**

| EEPROM Value (Hex) | EEPROM Value (Decimal) | Country Name                          | Country Code | Regulatory Domain |
|--------------------|------------------------|---------------------------------------|--------------|-------------------|
| 20                 | 32                     | BRITISH INDIAN OCEAN TERRITORY        | IO           | Japan             |
| 21                 | 33                     | BRUNEI DARUSSALAM                     | BN           | Japan             |
| 22                 | 34                     | BULGARIA                              | BG           | Europe            |
| 23                 | 35                     | BURKINA FASO                          | BF           | Japan             |
| 24                 | 36                     | BURUNDI                               | BI           | Europe            |
| 25                 | 37                     | CAMBODIA                              | KH           | Europe            |
| 26                 | 38                     | CAMEROON                              | CM           | Europe            |
| 27                 | 39                     | CANADA                                | CA           | USA               |
| 28                 | 40                     | CAPE VERDE                            | CV           | Japan             |
| 29                 | 41                     | CAYMAN ISLANDS                        | KY           | USA               |
| 2A                 | 42                     | CENTRAL AFRICAN REPUBLIC              | CF           | Europe            |
| 2B                 | 43                     | CHAD                                  | TD           | Europe            |
| 2C                 | 44                     | CHILE                                 | CL           | USA               |
| 2D                 | 45                     | CHINA                                 | CN           | Japan             |
| 2E                 | 46                     | CHRISTMAS ISLAND                      | CX           | Japan             |
| 2F                 | 47                     | COCOS (KEELING) ISLANDS               | CC           | Japan             |
| 30                 | 48                     | COLOMBIA                              | CO           | USA               |
| 31                 | 49                     | COMOROS                               | KM           | Europe            |
| 32                 | 50                     | CONGO                                 | CG           | Europe            |
| 33                 | 51                     | CONGO, THE DEMOCRATIC REPUBLIC OF THE | CD           | Japan             |
| 34                 | 52                     | COOK ISLANDS                          | CK           | Japan             |
| 35                 | 53                     | COSTA RICA                            | CR           | USA               |
| 36                 | 54                     | CÔTE D'IVOIRE                         | CI           | Japan             |
| 37                 | 55                     | CROATIA                               | HR           | Europe            |
| 38                 | 56                     | CUBA                                  | CU           | USA               |
| 39                 | 57                     | CYPRUS                                | CY           | Europe            |
| 3A                 | 58                     | CZECH REPUBLIC                        | CZ           | Europe            |
| 3B                 | 59                     | DENMARK                               | DK           | Europe            |
| 3C                 | 60                     | DJIBOUTI                              | DJ           | Japan             |
| 3D                 | 61                     | DOMINICA                              | DM           | USA               |

**Table 8 Country Codes (cont'd)**

| EEPROM Value (Hex) | EEPROM Value (Decimal) | Country Name                | Country Code | Regulatory Domain |
|--------------------|------------------------|-----------------------------|--------------|-------------------|
| 3E                 | 62                     | DOMINICAN REPUBLIC          | DO           | USA               |
| 3F                 | 63                     | ECUADOR                     | EC           | USA               |
| 40                 | 64                     | EGYPT                       | EG           | Europe            |
| 43                 | 67                     | EL SALVADOR                 | SV           | USA               |
| 44                 | 68                     | EQUATORIAL GUINEA           | GQ           | Europe            |
| 45                 | 69                     | ERITREA                     | ER           | Europe            |
| 46                 | 70                     | ESTONIA                     | EE           | Europe            |
| 47                 | 71                     | ETHIOPIA                    | ET           | Europe            |
| 48                 | 72                     | FALKLAND ISLANDS (MALVINAS) | FK           | USA               |
| 49                 | 73                     | FAROE ISLANDS               | FO           | Europe            |
| 4A                 | 74                     | FIJI                        | FJ           | Japan             |
| 4B                 | 75                     | FINLAND                     | FI           | Europe            |
| 4C                 | 76                     | FRANCE                      | FR           | Europe            |
| 4D                 | 77                     | FRENCH GUIANA               | GF           | Europe            |
| 4E                 | 78                     | FRENCH POLYNESIA            | PF           | Europe            |
| 4F                 | 79                     | FRENCH SOUTHERN TERRITORIES | TF           | Japan             |
| 50                 | 80                     | GABON                       | GA           | Europe            |
| 51                 | 81                     | GAMBIA                      | GM           | Europe            |
| 52                 | 82                     | GEORGIA                     | GE           | Europe            |
| 53                 | 83                     | GERMANY                     | DE           | Europe            |
| 54                 | 84                     | GHANA                       | GH           | Japan             |
| 55                 | 85                     | GIBRALTAR                   | GI           | Europe            |
| 56                 | 86                     | GREECE                      | GR           | Europe            |
| 57                 | 87                     | GREENLAND                   | GL           | USA               |
| 58                 | 88                     | GRENADA                     | GD           | USA               |
| 59                 | 89                     | GUADELOUPE                  | GP           | Europe            |
| 5A                 | 90                     | GUAM                        | GU           | Japan             |
| 5B                 | 91                     | GUATEMALA                   | GT           | USA               |
| 5C                 | 92                     | GUERNSEY                    | GG           | Europe            |
| 5D                 | 93                     | GUINEA                      | GN           | Europe            |
| 5E                 | 94                     | GUINEA-BISSAU               | GW           | Europe            |
| 5F                 | 95                     | GUYANA                      | GY           | USA               |



**Table 8 Country Codes (cont'd)**

| EEPROM Value (Hex) | EEPROM Value (Decimal) | Country Name                           | Country Code | Regulatory Domain |
|--------------------|------------------------|--|--------------|-------------------|
| 60                 | 96                     | HAITI                                  | HT           | USA               |
| 61                 | 97                     | HEARD ISLAND AND MCDONALD ISLANDS      | HM           | Japan             |
| 62                 | 98                     | HOLY SEE (VATICAN CITY STATE)          | VA           | Europe            |
| 63                 | 99                     | HONDURAS                               | HN           | USA               |
| 64                 | 100                    | HONG KONG                              | HK           | Japan             |
| 65                 | 101                    | HUNGARY                                | HU           | Europe            |
| 66                 | 102                    | ICELAND                                | IS           | Europe            |
| 67                 | 103                    | INDIA                                  | IN           | Japan             |
| 68                 | 104                    | INDONESIA                              | ID           | Japan             |
| 69                 | 105                    | IRAN, ISLAMIC REPUBLIC OF              | IR           | Europe            |
| 6A                 | 106                    | IRAQ                                   | IQ           | Europe            |
| 6B                 | 107                    | IRELAND                                | IE           | Europe            |
| 6C                 | 108                    | ISLE OF MAN                            | IM           | Europe            |
| 6D                 | 109                    | ISRAEL                                 | IL           | Europe            |
| 6E                 | 110                    | ITALY                                  | IT           | Europe            |
| 6F                 | 111                    | JAMAICA                                | JM           | USA               |
| 70                 | 112                    | JAPAN                                  | JP           | Japan             |
| 71                 | 113                    | JERSEY                                 | JE           | Europe            |
| 72                 | 114                    | JORDAN                                 | JO           | Europe            |
| 73                 | 115                    | KAZAKHSTAN                             | KZ           | Europe            |
| 74                 | 116                    | KENYA                                  | KE           | Europe            |
| 75                 | 117                    | KIRIBATI                               | KI           | Europe            |
| 76                 | 118                    | KOREA, DEMOCRATIC PEOPLE'S REPUBLIC OF | KP           | Japan             |
| 77                 | 119                    | KOREA, REPUBLIC OF                     | KR           | Japan             |
| 78                 | 120                    | KUWAIT                                 | KW           | Europe            |
| 79                 | 121                    | KYRGYZSTAN                             | KG           | Europe            |
| 7A                 | 122                    | LAO PEOPLE'S DEMOCRATIC REPUBLIC       | LA           | Japan             |
| 7B                 | 123                    | LATVIA                                 | LV           | Europe            |
| 7C                 | 124                    | LEBANON                                | LB           | Europe            |

**Table 8 Country Codes (cont'd)**

| EEPROM Value (Hex) | EEPROM Value (Decimal) | Country Name                               | Country Code | Regulatory Domain |
|--------------------|------------------------|--|--------------|-------------------|
| 7D                 | 125                    | LESOTHO                                    | LS           | Europe            |
| 7E                 | 126                    | LIBERIA                                    | LR           | Europe            |
| 7F                 | 127                    | LIBYAN ARAB JAMAHIRIYA                     | LY           | Europe            |
| 80                 | 128                    | LIECHTENSTEIN                              | LI           | Europe            |
| 81                 | 129                    | LITHUANIA                                  | LT           | Europe            |
| 82                 | 130                    | LUXEMBOURG                                 | LU           | Europe            |
| 83                 | 131                    | MACAO                                      | MO           | Europe            |
| 84                 | 132                    | MACEDONIA, THE FORMER YUGOSLAV REPUBLIC OF | MK           | Europe            |
| 85                 | 133                    | MADAGASCAR                                 | MG           | Europe            |
| 86                 | 134                    | MALAWI                                     | MW           | Europe            |
| 87                 | 135                    | MALAYSIA                                   | MY           | Japan             |
| 88                 | 136                    | MALDIVES                                   | MV           | Japan             |
| 89                 | 137                    | MALI                                       | ML           | Europe            |
| 8A                 | 138                    | MALTA                                      | MT           | Europe            |
| 8B                 | 139                    | MARSHALL ISLANDS                           | MH           | Japan             |
| 8C                 | 140                    | MARTINIQUE                                 | MQ           | Europe            |
| 8D                 | 141                    | MAURITANIA                                 | MR           | Europe            |
| 8E                 | 142                    | MAURITIUS                                  | MU           | Europe            |
| 8F                 | 143                    | MAYOTTE                                    | YT           | Europe            |
| 90                 | 144                    | MEXICO                                     | MX           | USA               |
| 91                 | 145                    | MICRONESIA, FEDERATED STATES OF            | FM           | Japan             |
| 92                 | 146                    | MOLDOVA, REPUBLIC OF                       | MD           | Europe            |
| 93                 | 147                    | MONACO                                     | MC           | Europe            |
| 94                 | 148                    | MONGOLIA                                   | MN           | Europe            |
| 95                 | 149                    | MONTENEGRO                                 | ME           | Europe            |
| 96                 | 150                    | MONTSERRAT                                 | MS           | Europe            |
| 97                 | 151                    | MOROCCO                                    | MA           | Europe            |
| 98                 | 152                    | MOZAMBIQUE                                 | MZ           | Europe            |
| 99                 | 153                    | MYANMAR                                    | MM           | Europe            |
| 9A                 | 154                    | NAMIBIA                                    | NA           | Europe            |
| 9B                 | 155                    | NAURU                                      | NR           | Japan             |

**Table 8 Country Codes (cont'd)**

| EEPROM Value (Hex) | EEPROM Value (Decimal) | Country Name                | Country Code | Regulatory Domain |
|--------------------|------------------------|-----------------------------|--------------|-------------------|
| 9C                 | 156                    | NEPAL                       | NP           | Japan             |
| 9D                 | 157                    | NETHERLANDS                 | NL           | Europe            |
| 9E                 | 158                    | NETHERLANDS<br>ANTILLES     | AN           | USA               |
| 9F                 | 159                    | NEW CALEDONIA               | NC           | Japan             |
| A0                 | 160                    | NEW ZEALAND                 | NZ           | Japan             |
| A1                 | 161                    | NICARAGUA                   | NI           | USA               |
| A2                 | 162                    | NIGER                       | NE           | Europe            |
| A3                 | 163                    | NIGERIA                     | NG           | Europe            |
| A4                 | 164                    | NIUE                        | NU           | Japan             |
| A5                 | 165                    | NORFOLK ISLAND              | NF           | Japan             |
| A6                 | 166                    | NORTHERN<br>MARIANA ISLANDS | MP           | Japan             |
| A7                 | 167                    | NORWAY                      | NO           | Europe            |
| A8                 | 168                    | OMAN                        | OM           | Europe            |
| A9                 | 169                    | PAKISTAN                    | PK           | Europe            |
| AA                 | 170                    | PALAU                       | PW           | Japan             |
| AB                 | 171                    | PANAMA                      | PA           | USA               |
| AC                 | 172                    | PAPUA NEW<br>GUINEA         | PG           | Europe            |
| AD                 | 173                    | PARAGUAY                    | PY           | USA               |
| AE                 | 174                    | PERU                        | PE           | USA               |
| AF                 | 175                    | PHILIPPINES                 | PH           | Japan             |
| B0                 | 176                    | PITCAIRN                    | PN           | Japan             |
| B1                 | 177                    | POLAND                      | PL           | Europe            |
| B2                 | 178                    | PORTUGAL                    | PT           | Europe            |
| B3                 | 179                    | PUERTO RICO                 | PR           | USA               |
| B4                 | 180                    | QATAR                       | QA           | Europe            |
| B5                 | 181                    | RÉUNION                     | RE           | Europe            |
| B6                 | 182                    | ROMANIA                     | RO           | Europe            |
| B7                 | 183                    | RUSSIAN<br>FEDERATION       | RU           | Europe            |
| B8                 | 184                    | RWANDA                      | RW           | Europe            |
| B9                 | 185                    | SAINT<br>BARTHÉLEMY         | BL           | USA               |
| BA                 | 186                    | SAINT HELENA                | SH           | Europe            |
| BB                 | 187                    | SAINT KITTS AND<br>NEVIS    | KN           | USA               |
| BC                 | 188                    | SAINT LUCIA                 | LC           | USA               |

**Table 8** Country Codes (cont'd)

| EEPROM Value (Hex) | EEPROM Value (Decimal) | Country Name                                 | Country Code | Regulatory Domain |
|--------------------|------------------------|--|--------------|-------------------|
| BD                 | 189                    | SAINT MARTIN                                 | MF           | USA               |
| BE                 | 190                    | SAINT PIERRE AND MIQUELON                    | PM           | USA               |
| BF                 | 191                    | SAINT VINCENT AND THE GRENADINES             | VC           | USA               |
| C0                 | 192                    | SAMOA  | WS           | Japan             |
| C1                 | 193                    | SAN MARINO                                   | SM           | Europe            |
| C2                 | 194                    | SAO TOME AND PRINCIPE                        | ST           | Europe            |
| C3                 | 195                    | SAUDI ARABIA                                 | SA           | Europe            |
| C4                 | 196                    | SENEGAL                                      | SN           | Europe            |
| C5                 | 197                    | SERBIA                                       | RS           | Europe            |
| C6                 | 198                    | SEYCHELLES                                   | SC           | Japan             |
| C7                 | 199                    | SIERRA LEONE                                 | SL           | Europe            |
| C8                 | 200                    | SINGAPORE                                    | SG           | Japan             |
| C9                 | 201                    | SLOVAKIA                                     | SK           | Europe            |
| CA                 | 202                    | SLOVENIA                                     | SI           | Europe            |
| CB                 | 203                    | SOLOMON ISLANDS                              | SB           | Japan             |
| CC                 | 204                    | SOMALIA                                      | SO           | Europe            |
| CD                 | 205                    | SOUTH AFRICA                                 | ZA           | Europe            |
| CE                 | 206                    | SOUTH GEORGIA AND THE SOUTH SANDWICH ISLANDS | GS           | Europe            |
| CF                 | 207                    | SPAIN  | ES           | Europe            |
| D0                 | 208                    | SRI LANKA                                    | LK           | Japan             |
| D1                 | 209                    | SUDAN  | SD           | Europe            |
| D2                 | 210                    | SURINAME                                     | SR           | USA               |
| D3                 | 211                    | SVALBARD AND JAN MAYEN                       | SJ           | Europe            |
| D4                 | 212                    | SWAZILAND                                    | SZ           | Europe            |
| D5                 | 213                    | SWEDEN                                       | SE           | Europe            |
| D6                 | 214                    | SWITZERLAND                                  | CH           | Europe            |
| D7                 | 215                    | SYRIAN ARAB REPUBLIC                         | SY           | Europe            |
| D8                 | 216                    | TAIWAN, PROVINCE OF CHINA                    | TW           | Japan             |

**Table 8 Country Codes (cont'd)**

| <b>EEPROM Value (Hex)</b> | <b>EEPROM Value (Decimal)</b> | <b>Country Name</b>                  | <b>Country Code</b> | <b>Regulatory Domain</b> |
|---------------------------|-------------------------------|--------------------------------------|---------------------|--------------------------|
| D9                        | 217                           | TAJIKISTAN                           | TJ                  | Europe                   |
| DA                        | 218                           | TANZANIA, UNITED REPUBLIC OF         | TZ                  | Europe                   |
| DB                        | 219                           | THAILAND                             | TH                  | Japan                    |
| DC                        | 220                           | TIMOR-LESTE                          | TL                  | Japan                    |
| DD                        | 221                           | TOGO                                 | TG                  | Europe                   |
| DE                        | 222                           | TOKELAU                              | TK                  | Japan                    |
| DF                        | 223                           | TONGA                                | TO                  | Europe                   |
| E0                        | 224                           | TRINIDAD AND TOBAGO                  | TT                  | Europe                   |
| E1                        | 225                           | TUNISIA                              | TN                  | Europe                   |
| E2                        | 226                           | TURKEY                               | TR                  | Europe                   |
| E3                        | 227                           | TURKMENISTAN                         | TM                  | Europe                   |
| E4                        | 228                           | TURKS AND CAICOS ISLANDS             | TC                  | USA                      |
| E5                        | 229                           | TUVALU                               | TV                  | Japan                    |
| E6                        | 230                           | UGANDA                               | UG                  | Europe                   |
| E7                        | 231                           | UKRAINE                              | UA                  | Europe                   |
| E8                        | 232                           | UNITED ARAB EMIRATES                 | AE                  | Europe                   |
| E9                        | 233                           | UNITED KINGDOM                       | GB                  | Europe                   |
| EA                        | 234                           | UNITED STATES                        | US                  | USA                      |
| EB                        | 235                           | UNITED STATES MINOR OUTLYING ISLANDS | UM                  | USA                      |
| EC                        | 236                           | URUGUAY                              | UY                  | USA                      |
| ED                        | 237                           | UZBEKISTAN                           | UZ                  | Europe                   |
| EE                        | 238                           | VANUATU                              | VU                  | Japan                    |
|                           |                               |                                      |                     |                          |
| F0                        | 240                           | VENEZUELA                            | VE                  | USA                      |
| F1                        | 241                           | VIET NAM                             | VN                  | Japan                    |
| F2                        | 242                           | VIRGIN ISLANDS, BRITISH              | VG                  | USA                      |
| F3                        | 243                           | VIRGIN ISLANDS, U.S.                 | VI                  | USA                      |
| F4                        | 244                           | WALLIS AND FUTUNA                    | WF                  | Europe                   |
| F5                        | 245                           | WESTERN SAHARA                       | EH                  | Europe                   |
| F6                        | 246                           | YEMEN                                | YE                  | Europe                   |

**Table 8** Country Codes (cont'd)

| <b>EEPROM Value<br/>(Hex)</b> | <b>EEPROM Value<br/>(Decimal)</b> | <b>Country Name</b> | <b>Country Code</b> | <b>Regulatory Domain</b> |
|-------------------------------|-----------------------------------|---------------------|---------------------|--------------------------|
| F7                            | 247                               | ZAMBIA              | ZM                  | Europe                   |
| F8                            | 248                               | ZIMBABWE            | ZW                  | Europe                   |

## 10 Appendix D - Command Line Control

During the DUT GUI installation, the DUT\_BCL command line application is also installed.

The application enables 3 options for control of the Platform (all information can be seen with `-help` command):

- Opening a dedicated command window application  
Syntax: `DUT_BCL.exe -i <IP> -w<WLAN interface 0/1>`
- Providing direct commands (one command at a time)  
Syntax: `DUT_BCL.exe -i<IP> -w<Wlan interface 0/1> -s -c <DUT Command + correct syntax>`
- Running a script file with various command  
Syntax: `DUT_BCL.exe -i<IP> -w<Wlan interface 0/1> -s -f <file name>`

1. Run the tool from `C:\Program Files\Lantiq\DUT\DUT_BCL.exe`.

The cmd window appears ([Figure 24](#)).



**Figure 24 BCL CLI**

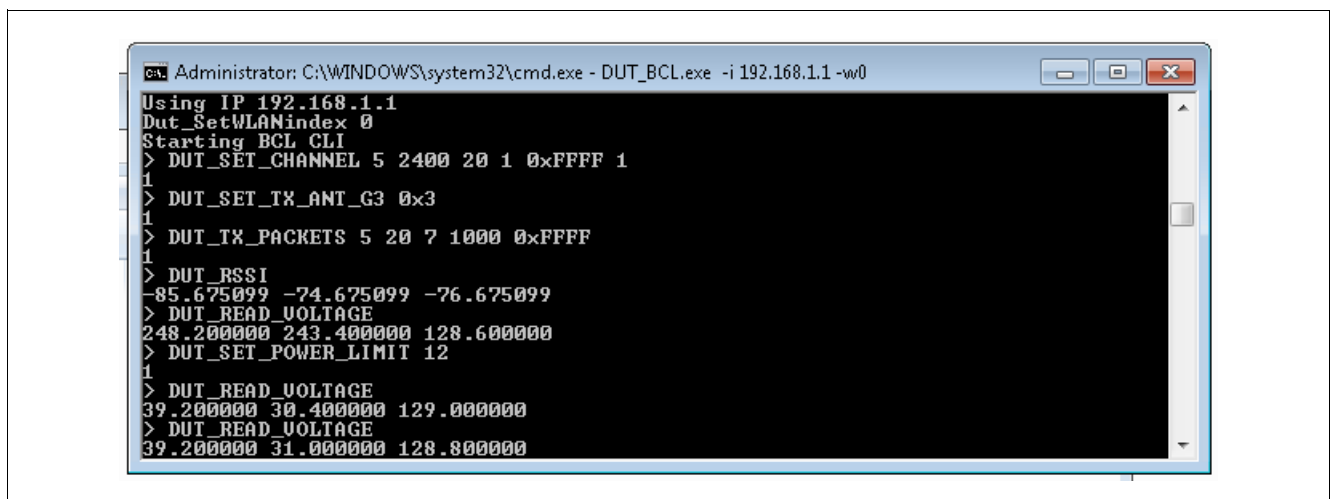
2. Type `help` at the command prompt to see the complete list of available functions.
3. Type the command name to see the correct syntax for that command.

For example:

```
> DUT_SET_CHANNEL
```

Incorrect number of parameters.

See [Figure 25](#) for a successful command



**Figure 25 Successful CLI Inputs**

## 10.1 Basic Configurations

### Mode

- 0 for 802.11a
- 1 for 802.11b
- 2 for 802.11g
- 4 for 802.11n 5 GHz
- 5 for 802.11n 2.4 GHz

### Band

2400 or 5000

### BW

20 or 40

### Channel

In accordance to channel index

### calibrationMask

Always use `0xFFFF`

### Closedloop

- 0 of open loop
- 1 for closed loop

### Antenna Configuration

3 bits:

- Bit 0 for Ant1
- Bit 1 for Ant2
- Bit 2 for Ant3



## References

- [1] IEEE 802.11a-1999 High-speed Physical Layer in the 5 GHz band  
<http://standards.ieee.org/getieee802/download/802.11a-1999.pdf>
- [2] IEEE 802.11b-1999 Higher Speed Physical Layer Extension in the 2.4 GHz band  
<http://standards.ieee.org/getieee802/download/802.11b-1999.pdf>
- [3] IEEE 802.11g-2003 Further Higher Data Rate Extension in the 2.4 GHz Band  
<http://standards.ieee.org/getieee802/download/802.11g-2003.pdf>
- [4] IEEE 802.11n-2009—Amendment 5: Enhancements for Higher Throughput  
<http://standards.ieee.org/getieee802/download/802.11n-2009.pdf>
- [5] XWAY™ xRX300/WAVE300 DUT Tool Package Release 6.30 Release Note Rev. 2.4

## Terminology

### A

ACL Access Control List

AP Access Point.

### B

BBIC Baseband Integrated Circuit

BPF Band Pass Filter

BSS The Basic Service Set (BSS) is the basic building block of a wireless LAN. Coverage of one access point is called a BSS. An access point acts as a master to control the stations within that BSS. Each BSS is identified by an SSID.

### C

CB Channel Bonding (40 MHz transmission)

CLI Command Line Interface

### D

DUT Device Under Test

### E

ERP Extended Rate Policy

ESSID Extended Service Set Identifier

### I

IOCTLS Input/output controls - typically employed to allow userspace code to communicate with hardware devices

### L

LDPC Low-Density Parity-Check code (LDPC code) - An error correcting code. A method of transmitting a message over a noisy transmission channel.

### M

MIMO Multiple-Input and Multiple-Output - The use of multiple antennas at both the transmitter and receiver to improve communication performance. One of several forms of smart antenna technology.

mPCI Mini PCI - A bus standard for attaching peripherals to a motherboard. Adapted from the Peripheral Component Interconnect (PCI) bus. Originally designed for laptops and other small-footprint computer systems.

Multicast The delivery of information to a group of destinations simultaneously using the most efficient strategy to deliver the messages over each link of the network only once, creating copies only when the links to the destinations split.

### N

NCB Non Channel bonding (20 MHz transmission)

nCB Non-Channel Bonding

NFS Linux's "Network File System" - A way to share files between machines on a network as if the files were located on the client's local hard drive.

NWID Network Identification Designator.

### O

|          |   |
|----------|---|
| OCS      | Optimal Channel Selection   |
| <b>P</b> |   |
| PBC      | Push Button Configuration   |
| <b>R</b> |   |
| RFIC     | RF Integrated Circuit   |
| RSSI     | Received Signal Strength Indication - a measurement of the power present in a received radio signal.  |
| <b>S</b> |   |
| SISO     | Single Input Single Output  |
| STA      | Infrastructure Station  |
| <b>U</b> |   |
| UUID     | Universally Unique Identifier   |
| <b>W</b> |   |
| WEP      | Wired Equivalent Privacy - The original security protocol for Wi-Fi networks.   |
| WPA      | WiFi Protected Access - A security protocol for Wi-Fi networks which provides stronger security than WEP via enhanced encryption and user authentication. |
| WPS      | WiFi Protected Setup - A protocol designed to make it easier to set up and configure security on Wi-Fi networks.  |

## **CE**

CE RF Radiation Exposure Statement:

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

## FCC Information

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.

Note: This equipment has been tested and found to comply with the limits for CLASS B digital device, pursuant to Part 15 of 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 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 correct the interference by one or more of the following measures:

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

## WARNING

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

## Information for OEM Integrator

This device is intended only for OEM integrators under the following conditions:

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

### End product labelling

The label for end product must include "Contains FCC ID: O6ZT9".

"CAUTION : Exposure to Radio Frequency Radiation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment must be installed and operated with minimum distance of 20cm between the radiator and your body. This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users."



[www.lantiq.com](http://www.lantiq.com)

Published by Lantiq Deutschland GmbH