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NRC7292 Evaluation Kit User Guide

(Transmit Power Control)

Ultra-low power & Long-range Wi-Fi

Ver 1.1
Nov 9, 2020

NEWRACOM, Inc.

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Ultra-low power & Long-range Wi-Fi

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1 Overview

The transmit power control (TPC) mechanism dynamically changes the transmission power level as a function of the operating frequency, bandwidth, and MCS as an example in Table 1.1. The mechanism may be useful for controlling the maximum transmission power level to meet the regional regulatory requirements, reducing the power consumption during operation, and adjusting the communication range between access points and stations.

Table 1.1 Example of TPC table

BW	Frequency [MHz]	MCS Index	Target TX Power
1MHz	903.5 ~ 915.5	0, 1, 2, 3, 4, 5, 10	23.0 dBm
		6	18.0 dBm
		7	14.0 dBm
	916.5 ~ 926.5	0, 1, 2, 3, 4, 5, 10	22.0 dBm
		6	18.0 dBm
		7	14.0 dBm
2MHz	905 ~ 917	0, 1, 2, 3, 4	23.0 dBm
		5	22.0 dBm
		6	15.0 dBm
		7	14.0 dBm
	919 ~ 925	0, 1, 2, 3, 4, 5	22.0 dBm
		6	15.0 dBm
		7	14.0 dBm
4MHz	910 ~ 918	0, 1, 2, 3, 4, 5	21.0 dBm
		6	15.0 dBm
		7	14.0 dBm
	922	0, 1, 2, 3, 4, 5	21.0 dBm
		6	15.0 dBm
		7	14.0 dBm

2 Board Data

To use the TPC functionality, the board data as shown in Table 1.1 containing the information of the power levels for frequencies, bandwidths, and MCSs is necessary. For host mode operation, users should provide this board data in the form of file format (board data file) and place it into the **~\nrc_pkg\sw\firmware** directory on the Linux host. On the other hand, in the standalone mode, the board data shall be stored in the flash memory. The Board Data Editor shown in Figure 2.1 is provided to create the board data and generate a board data file (for host mode) or write the board data into the flash memory (for standalone mode). Regarding the Board Data Editor, refer to the document titled TL-7292-009-Board_Data_Editor.docx. When creating a new board data using the editor, users should match the country code to that in the module or board. Otherwise, the TPC function will not operate.
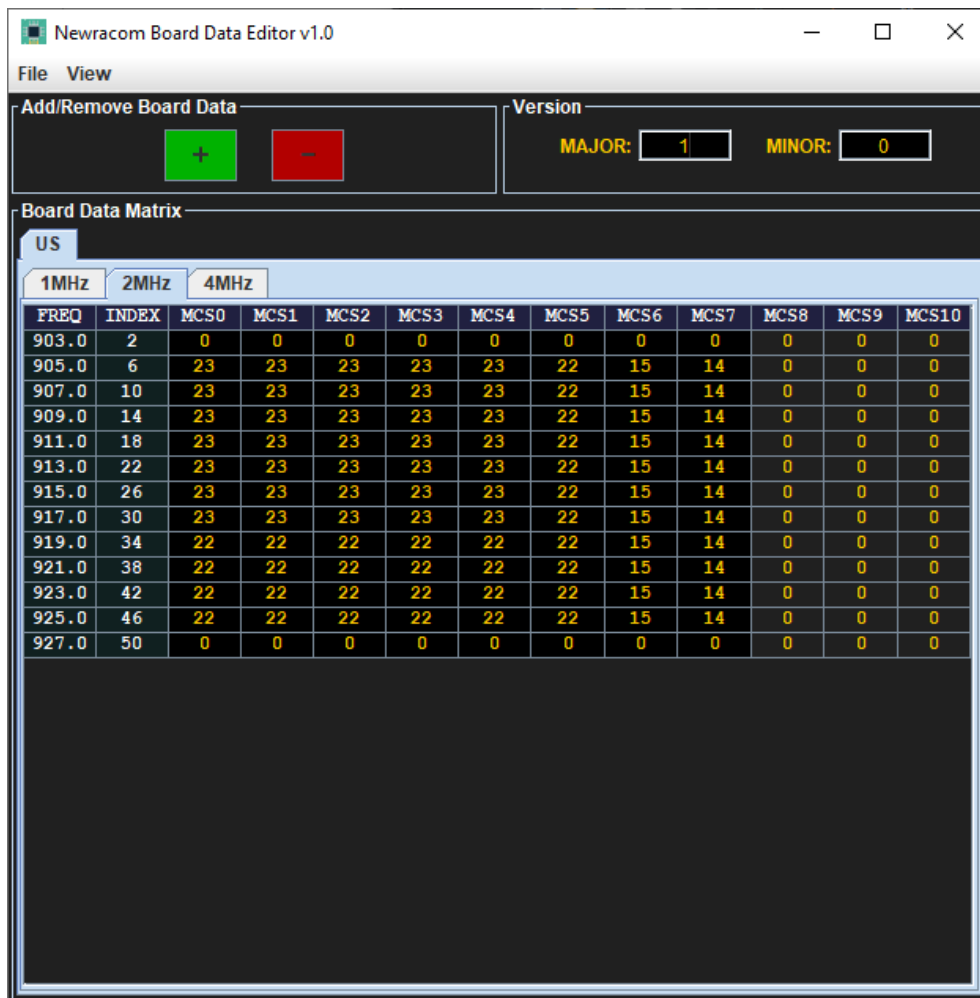

Figure 2.1   Newracom's Board Data Editor

3   Enable/Disable TPC Functionality

The 'start.py' script file used in a host mode operation contains two TPC parameters, *bd_download* and *bd_name*. By setting the *bd_download* to '1', users can enable the TPC. However, users should also give the correct name of the board data file to the *bd_name* for proper TPC operation. Otherwise, the TPC will not work.

Note: if no board data binary file in the **~/nrc_pkg/sw/firmware** directory or wrong name of the file specified to the *bd_name* cause disabling the TPC functionality even when *bd_download* is set to '1.'

```
##################################################################################
# Default Configuration (you can change value you want here)
model           = 7292      # 7292 or 7192
hif_speed       = 16000000  # HSPI Clock
gain_type       = 'phy'     # 'phy' or 'nrf(legacy)'
txpwr_val       = 17        # TX Power
maxagg_num      = 8         # 0(AMPDU off) or  >2(AMPDU on)
cqm_off         = 0         # 0(CQM on) or 1(CQM off)
fw_download     = 1         # 0(FW Download off) or 1(FW Download on)
fw_name         = 'uni_s1g.bin'
bd_download     = 0         # 0(Board Data Download off) or 1(Board Data Download on)
bd_name         = 'nrc7292_bd.dat'
guard_int       = 'long'    # 'long (LGI) or 'short' (SGI)
supplicant_debug = 0        # WPA Supplicant debug option : 0(off) or 1(on)
hostapd_debug   = 0         # Hostapd debug option    : 0(off) or 1(on)
max_cpuclock    = 1         # RPi Max CPU Clock : 0(off) or 1(on)
relay_type      = 0         # 0 (wlan0: STA, wlan1: AP) 1 (wlan0: AP, wlan1: STA)
power_save      = 0         # power save : 0(off) or 1(on)
##################################################################################
```

Figure 3.1   TPC parameters in 'start.py' (host mode)

Users can check whether the TPC functionality is enabled or not by using the CLI application (cli_app) with the '*show autotxgain*' command. If the response of the command presents '*Auto txgian: on*', it means TPC is enabled. Otherwise, the TPC is disabled.

Note: '*set txpwr*' command in the CLI application can cap the maximum transmission power. In other words, when the transmission power is set to 15 dBm by the '*set txpwr*' command, the transmission power of MCS6 in 903.5 MHz frequency in Table 1.1 is capped to 15 dBm instead of 18 dBm. However, the output power of MCS7 is still limited to 14 dBm because it is lower than 15 dBm.

As mentioned above, users can use the Board Data Editor to write the board data to the flash memory used in a standalone mode. Once the editor stores the board data, the TPC functionality is enabled automatically. However, users can disable or enable again the function as well by using an SDK API called. It supports to set bdf_use status using 'nrc_wifi_set_bdf_use(uint8_t bdf_use)'. And it also supports to get the current board data use status using 'bool nrc_wifi_get_bdf_use(void)'. Please refer the 'UG-7292-005-Standalone SDK API.pdf' for detail description.

4 Revision History

Revision No	Date	Comments
Ver 1.0	08/21/2020	First version
Ver 1.1	11/09/2020	Contents of the document modified