MediaTek

META Application Note

For lab testing and factory calibration

Documents Number: MTK_WCP_GSMGPRS_EXT_002.003

Preliminary Information

Revision: 0.08

Release Date: July, 13, 2004

Revision History

Revision	Date	Author	Comments
0.01	4/14/2003	Andy Ueng	First release for META LAB and META factory
0.02	4/28/2003	Andy Ueng	Add description about • Trim I, trim Q, offset I, offset Q (section 3.2.4) • APC DC offset, high weight, low weight (section 3.2.5.5.b) • Slope of AFC (section 3.2.6.2) • Recursive time, APC delta, APC DC offset (section 4.1.1)
0.03	12/25/2003	Andy Ueng	Update for META 3.3
0.04	3/22/2004	Andy Ueng	Update for META 3.5.01
0.05	4/5/2004	Andy Ueng	Update for META 3.5.02
0.06	5/5/2004	Andy Ueng	Update for META 3.5.03
0.07	6/24/2004	Andy Ueng	Update for META 3.5.04
0.08	8/13/2004	Andy Ueng	Update for META 3.5.05

Table of contents

1 Introduction

1.1 Overview

The document is META (Mobile Engineering Testing Architecture) application note. META application is composed of META LAB and META factory. Both META LAB and META factory are window application tools at PC side, but their main applications are different. META LAB offers versatile testing features in RF TX/RX/AFC control, NVRAM access testing and editing, audio related functions, baseband related functions, MMI data download, IMEI download, getting hardware and software version, barcode download, updating parameter, FAT editor and database change list but all testing procedure should be operated manually due to no specific equipment control. Contrarily, META-Factory provides the RF calibration and ADC calibration function required in factory mass production line and Agilent 8960, R&S CMU 200 and power supply control will be supported.

1.2 Environment requirement

OS:

- MS Windows ME, 98, 2000 or XP

The following driver and library are needed for META factory:

- NI (National Instruments) GPIB-USB driver (The driver is bundled with NI GPIB-USB device) or Agilent GPIB-USB driver.

Hardware:

- Generic Pentium III or above PC
- Agilent 8960 or R&S CMU 200

The following hardware is needed for META factory

- NI or Agilent GPIB-USB device
- Agilent 661x or Agilent 663x2 series power supply

2 Installation

Please execute “setup.exe” to start installing META. The install shield will help user to install META step by step. It will registers “controls.dll” automatically. (Figure 1~Figure 4)

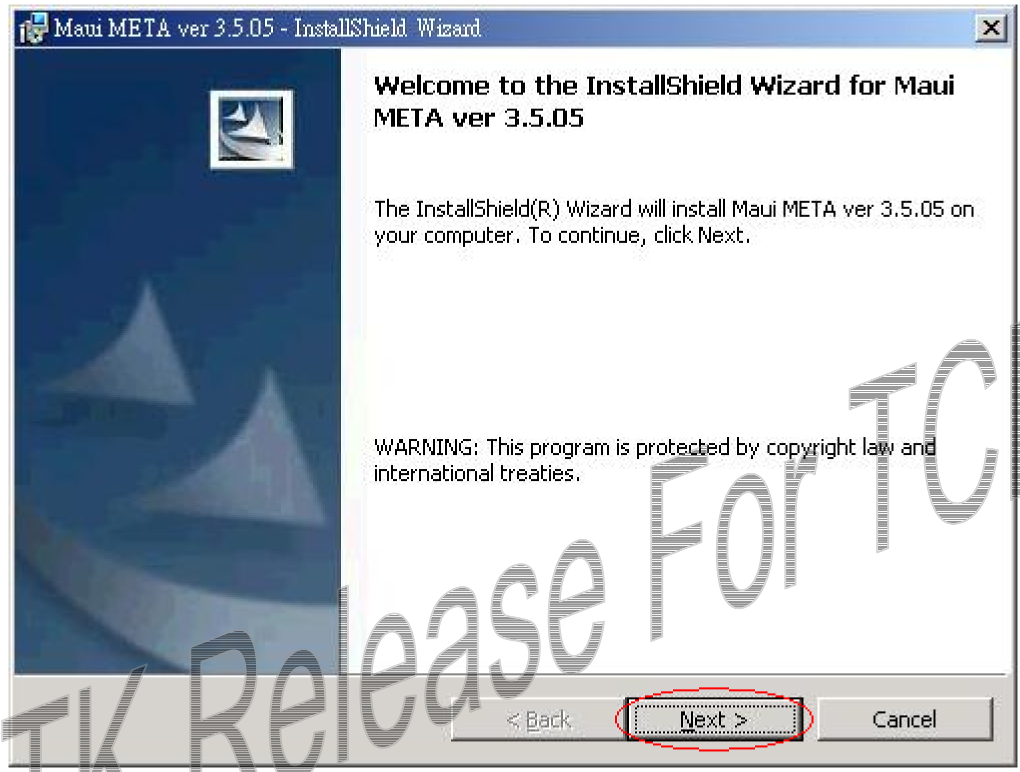

Figure 1 Please click [next >] button.

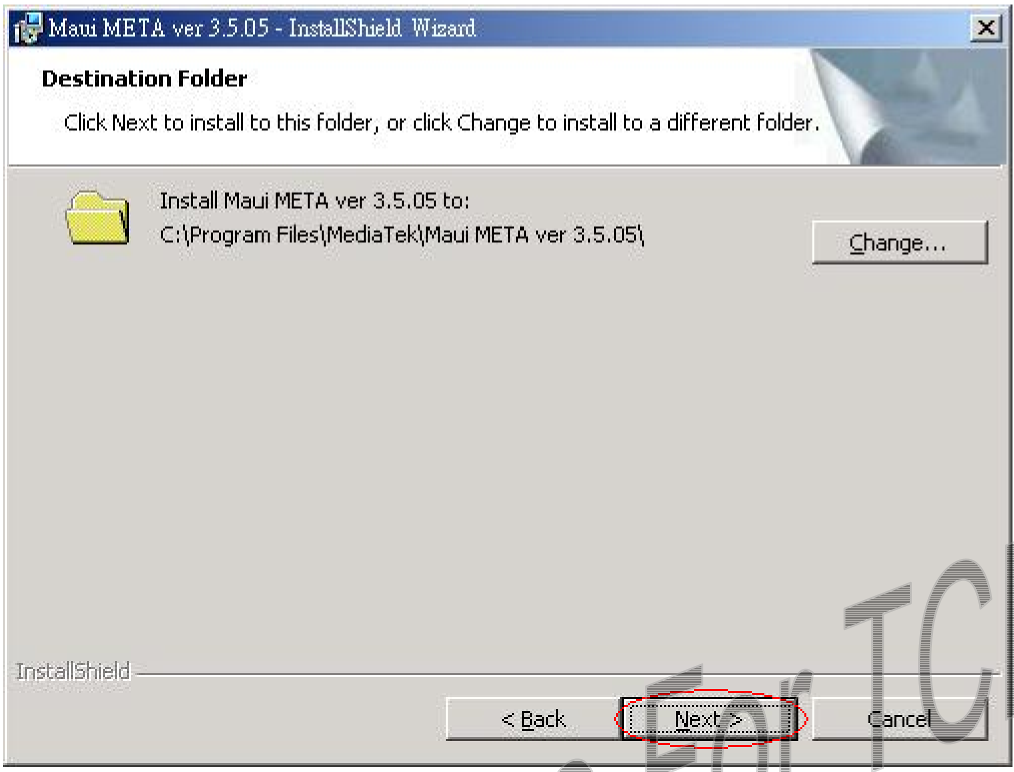

Figure 2 Please select a directory to install and then click [next >] button.

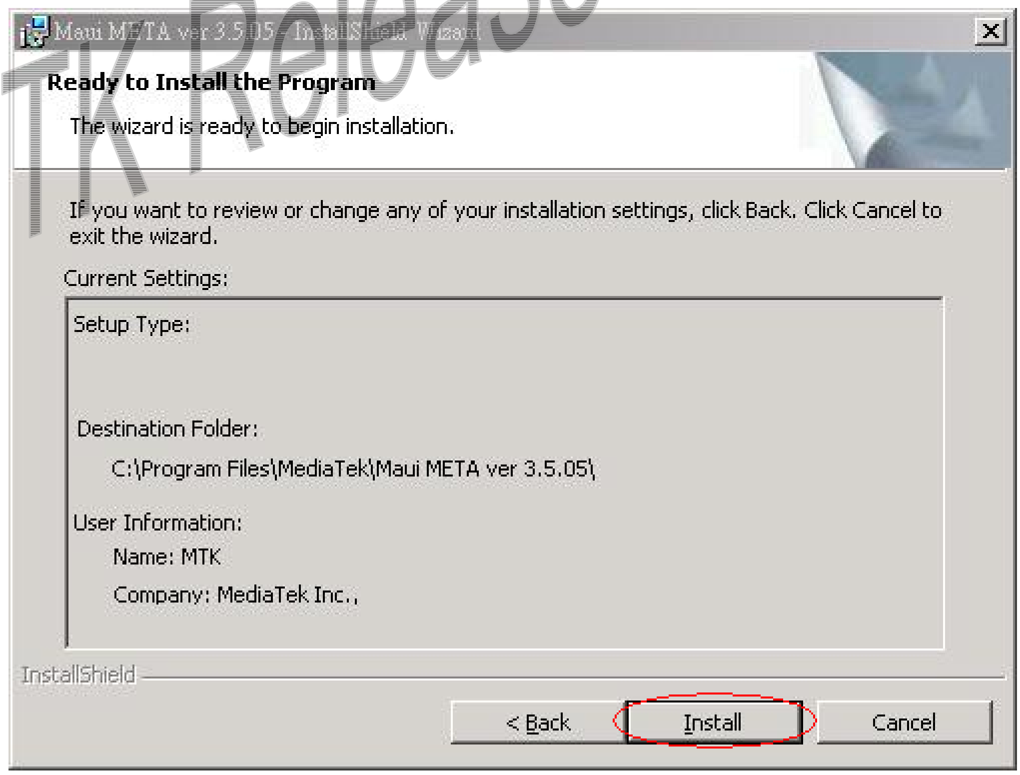

Figure 3 Please confirm installation setting and then click [Install] button.

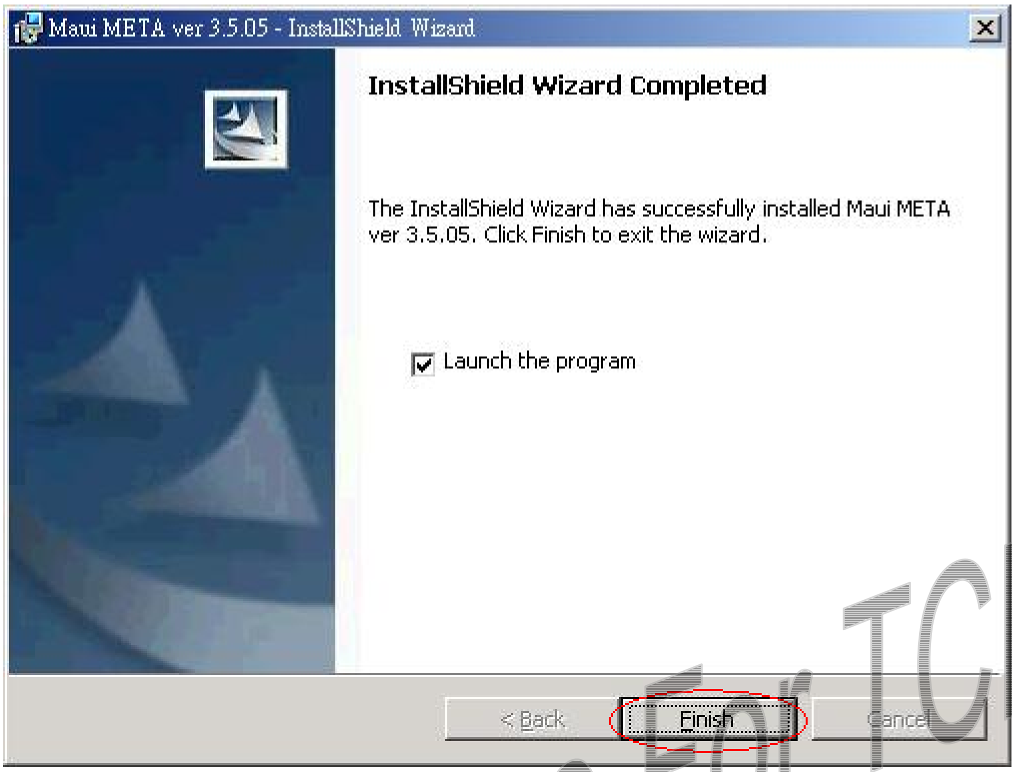

Figure 4 The Installation is complete, please click [Finish] button.

Note: After installation, there will be a META shortcut icon on windows desktop and programs menu. User can click the META icon to start it.

3 META LAB

3.1 Basic configuration

3.1.1 Open NVRAM database

META will initializes with "BPLGInfo" file that is generated at compile time of MS source code. The default directory of "BPLGInfo" is tst\database of MS source code structure.

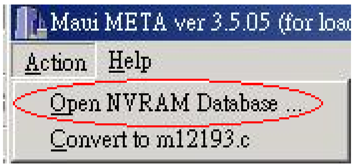

Figure 5 Click [Open NVRAM database] menu item

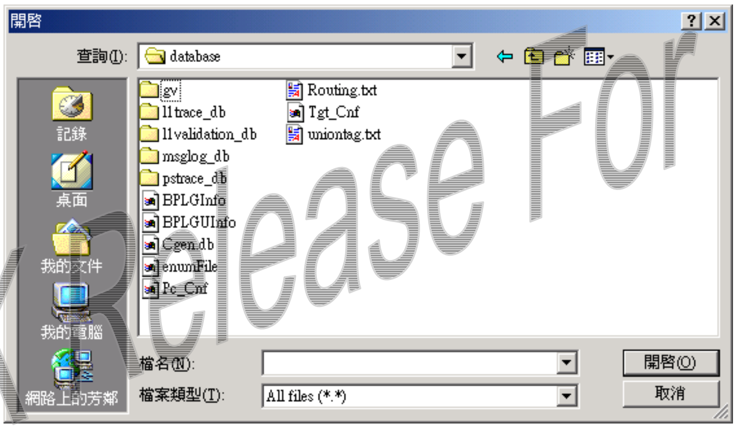

Figure 6 Please open NVRAM database

3.1.2 META_DLL

META_DLL is responsible to communicate with MS via RS232. You can get META_DLL version by clicking the [Help→About] menu item.

Figure 7 Click [META dll version] menu item

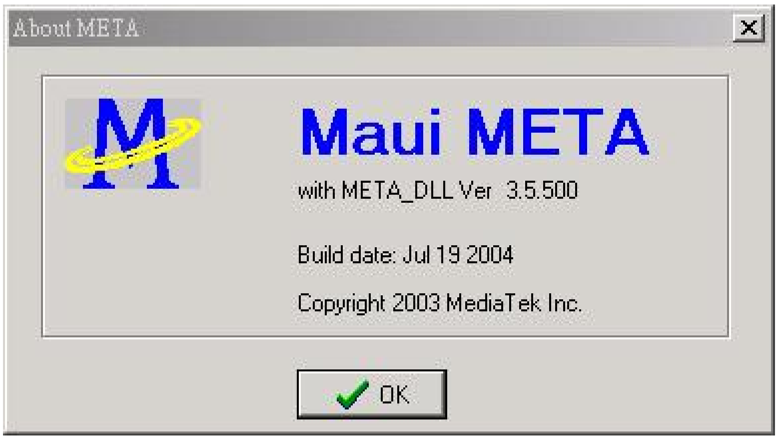

Figure 8 META dll version

3.2 RF tool

After META opens COM port, reads NVRAM database and reset target to test mode, user can start to do all calibration and testing. User can switch to RF tool by selecting [RF tool] from main selection menu.

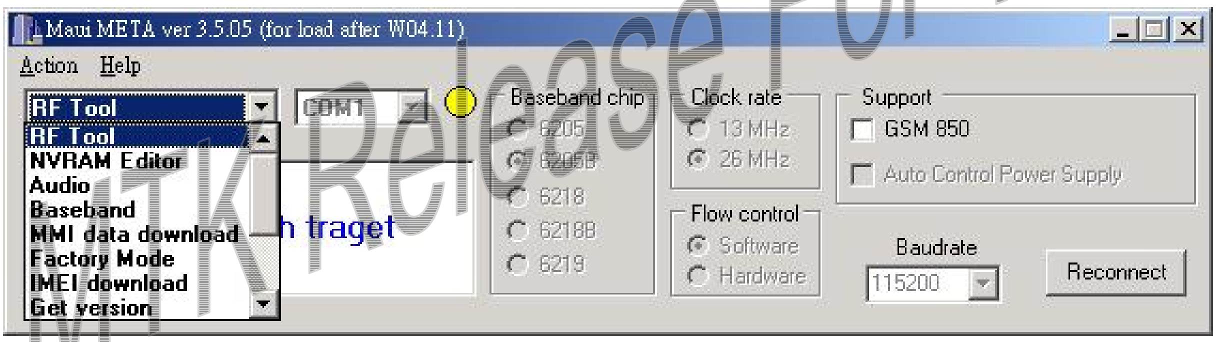

Figure 9 Select [RF Tool] from main selection menu

3.2.1 PM (power measurement)

PM function is used for measuring the power of the indicated channel. User can key in ARFCN, PM/Frame, PM Count and Gain (dB) and then click [Start] button. We can get the deviation from the formula below.

$$Variation(PM) = \frac{\sum_{n=1}^{N}(PM_i - \overline{PM})^2}{N} = \overline{PM^2} - (\overline{PM})^2 = (\frac{\sum_{n=1}^{N} PM_i^2}{N}) - (\frac{\sum_{n=1}^{N} PM_i}{N})^2,$$

$Deviation(PM) = \sqrt{Variation(PM)}$, where N = total measured samples = Testing FN * (Samples per frame)

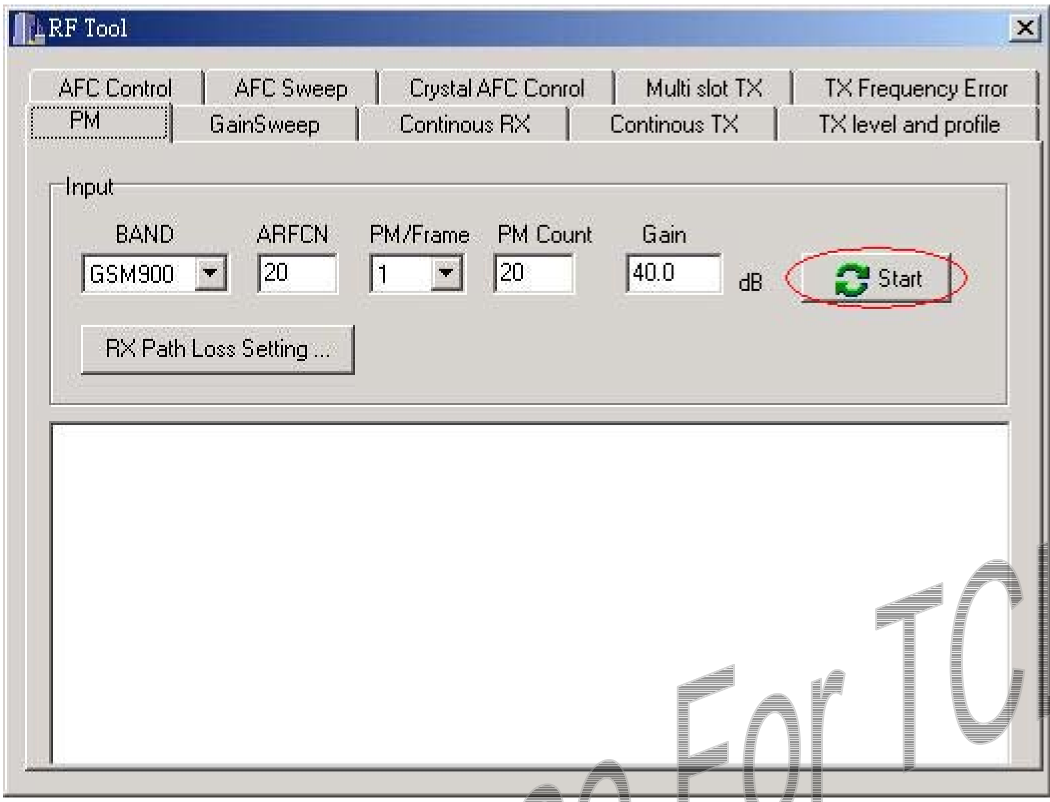

Figure 10 Click [Start] button to start power measurement

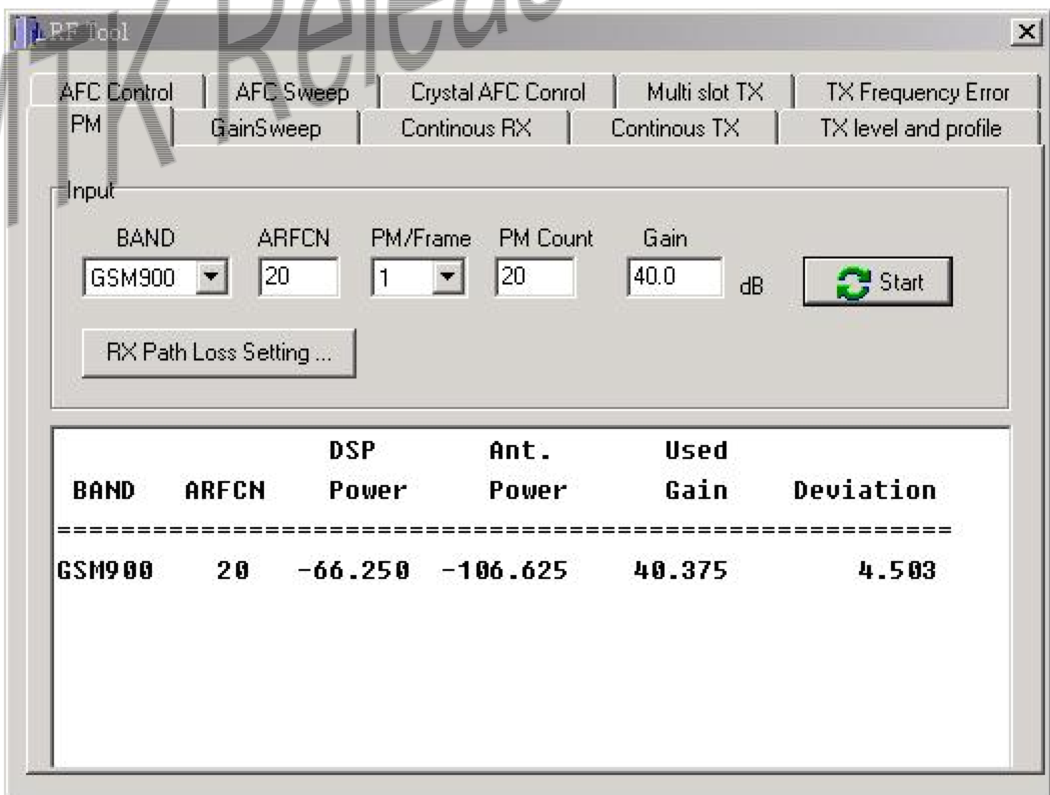

Figure 11 PM result

- DSP power (dBm) : It is the average of power measurement samples at DSP.

- Antenna power (dBm) : It is the average of the power measurement samples at antenna.
- Deviation : It is the deviation value of power measurement samples.
  - Note the value returned from target is square of deviation. PC side program will get deviation from root square of the value returned from target.
- Used Gain (dB) : It is gain of the entire RF module to measure input power.
  - Note the used gain returned may not equal the gain requested since the 2 dB quantization error from PGA of transceiver.

The difference of the downlink cell power and the average power of power measurement done by MS is the RX loss. User can save to flash or file by clicking [RX Path Loss Setting] button. Please refer to section 3.2.1.1.

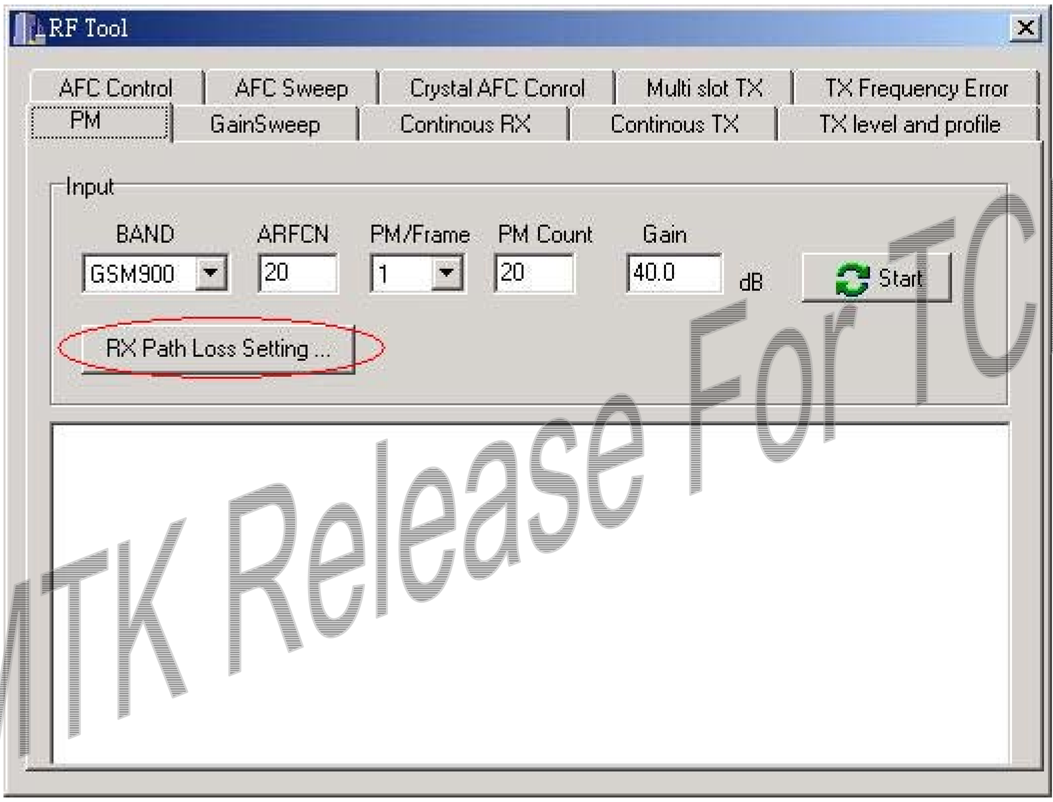

Figure 12 Click [RX Path Loss Setting] button

3.2.1.1 Sub band and path loss window

User can upload or download sub band and path loss values from or to flash. User can load and save these values to files in PC, too. The RX path loss stored in flash of MS will compensate the difference of the downlink cell power and the average power of measurement by RF module.

User can set RX path loss for each band. If the max ARFCN of the (N-1)th and Nth are A, B and the Nth RX loss is C dB, that means MS will set the RX path loss to C for the ARFCN from A+1 to B. The 1st RX loss is set for ARFCNs that are equal and less than 1st ARFCN. The order of max ARFCN and RX loss are from left to right, from up to down. Please refer to Figure 15 .

Example: GSM900 (E-GSM900)

Max ARFCN	15	30	45	60	75	80	100	124	975	1000	1023	-1
RX loss (dB)	-0.25	-0.375	-0.125	0	0	-0.125	-0.5	-0.25	0.75	0.5	0	0

Note that the value –1 in Max ARFCN represents the end of setting.

ARFCN 0 ~ 15: -0.25 dB
ARFCN 16 ~ 30: -0.375 dB
ARFCN 31 ~ 45: -0.125 dB
ARFCN 46 ~ 60: 0 dB
ARFCN 61 ~ 75: 0 dB
ARFCN 76 ~ 80: -0.125 dB
ARFCN 81 ~ 100: -0.5 dB
ARFCN 101 ~ 124: -0.25 dB
ARFCN 125 ~ 975: 0.75 dB
ARFCN 976 ~ 1000: 0.5 dB
ARFCN 1001 ~ 1023: 0 dB

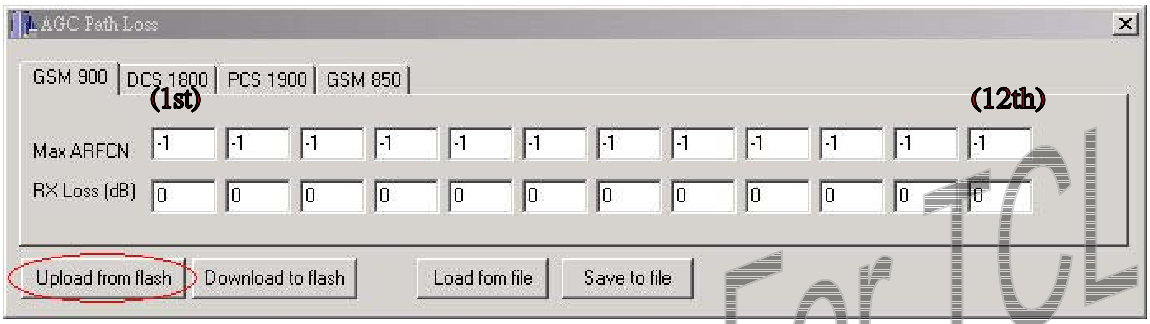

Figure 13 Click [Upload from flash] button to read value from flash

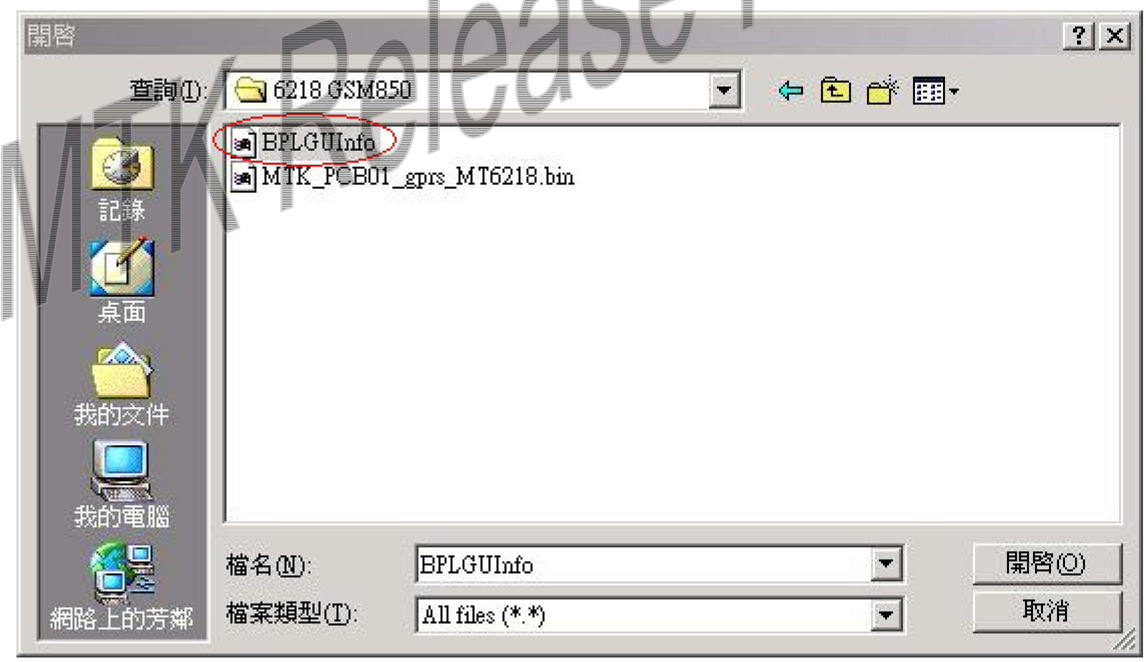

Figure 14 Select NVRAM database file if not selected before

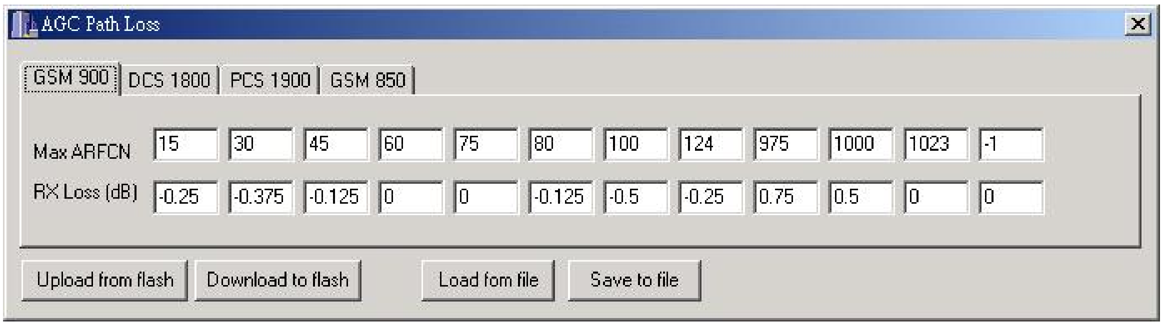

Figure 15 Result of sub band and RX path loss value read from flash

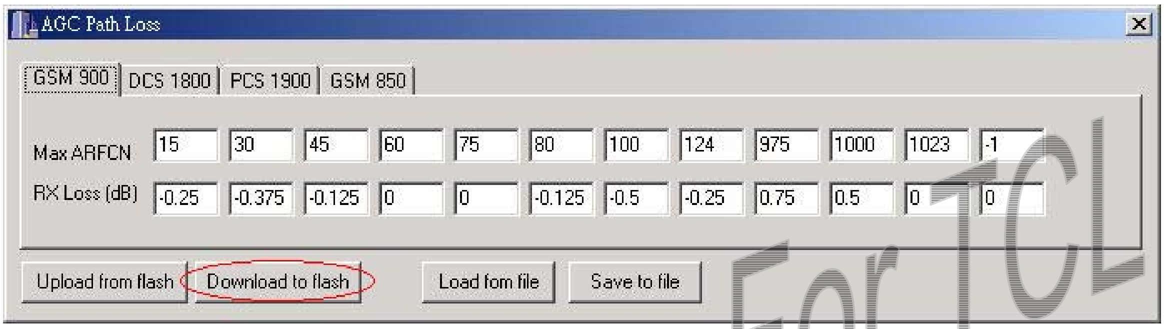

Figure 16 Click [Download to flash] button to write value to flash

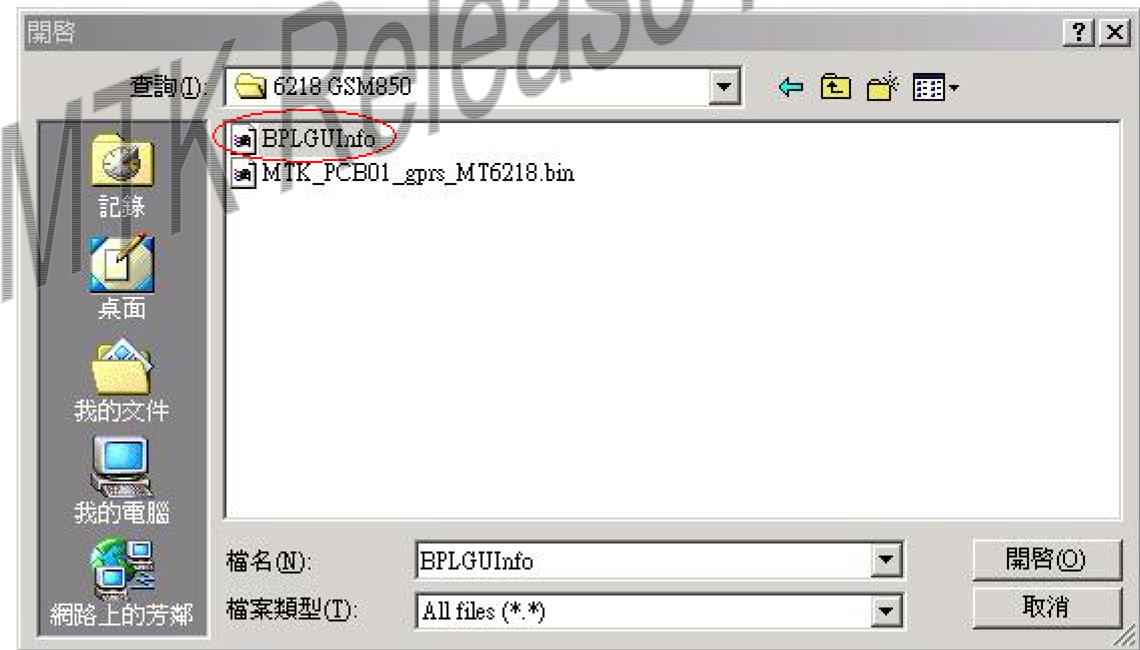

Figure 17 Select NVRAM database file if not selected before

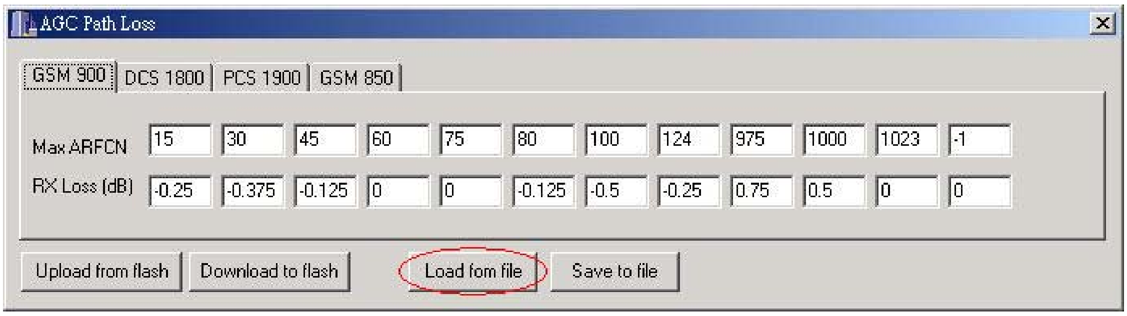

Figure 18 Click [Load from file] button to read value from file

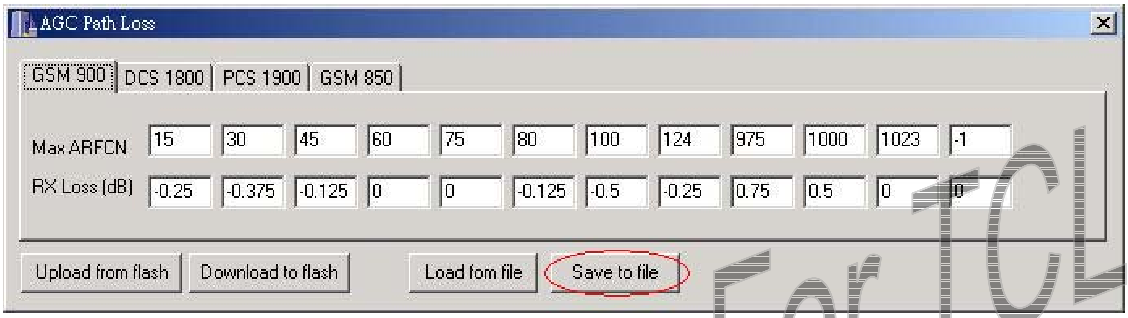

Figure 19 Click [Save to file] button to save value to file

3.2.1.2 Sub band and path loss file format

There is a special text file format when you save the sub band and path loss values. Please follow the file format if you want to change the value in file. Each number must be followed with a comma. The tool can save the path loss value with level ramp table and AFC initial value in single or multiple files.

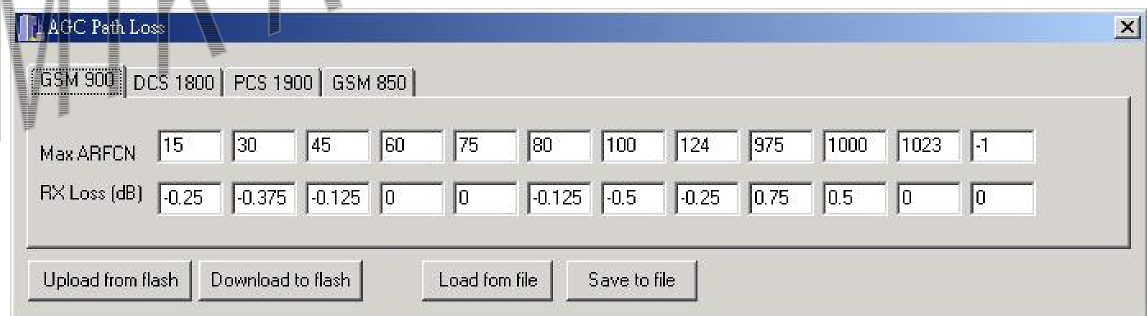

Figure 20 Path loss values

User will get a text file after saving them. The following is a template file that contains RX loss. User will get the text file after saving maximum ARFCN and RX loss to file. Each value must be followed with a comma. Please follow the file format if you want to change the value in file. The Max ARFCN field is corresponding to the Max ARFCN field in path loss window (Figure 20) and RX loss field is corresponding to the RX loss field, too.

[GSM900 Sub band, RX loss]
Max ARFCN=15,30,45,60,75,80,100,124,975,1000,1023,-1
RX loss=-0.250,-0.375,-0.125,0.000,0.000,-0.125,-0.500,-0.250,0.750,0.500,0.000,0.0000

[DCS1800 Sub band, RX loss]
Max ARFCN=550,590,620,650,680,710,740,770,810,850,885,-1
RX loss=6.625,6.500,5.875,4.750,3.625,3.500,3.875,4.750,5.750,7.000,8.500,0.0000

[PCS1900 Sub band, RX loss]
Max ARFCN=550,810,-1,0,0,0,0,0,0,0,0,0
RX loss=0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.0000

Note : -1 indicates the end of the column Max_ARFCN

3.2.2 Gain sweep

Gain Sweep is used for measuring the power of the indicated channel by the different gains.

User can execute Gain Sweep function by following steps:
1) Input Band, ARFCN, PM/Frame, PM Count, Min Gain, Max Gain, and Step Gain.
2) Click Start button.
3) Meta will shows the PM result : Band, ARFCN, DSP Power, Antenna Power, Used Gain, and Deviation.
4) User can stop this operation by clicking Stop button.

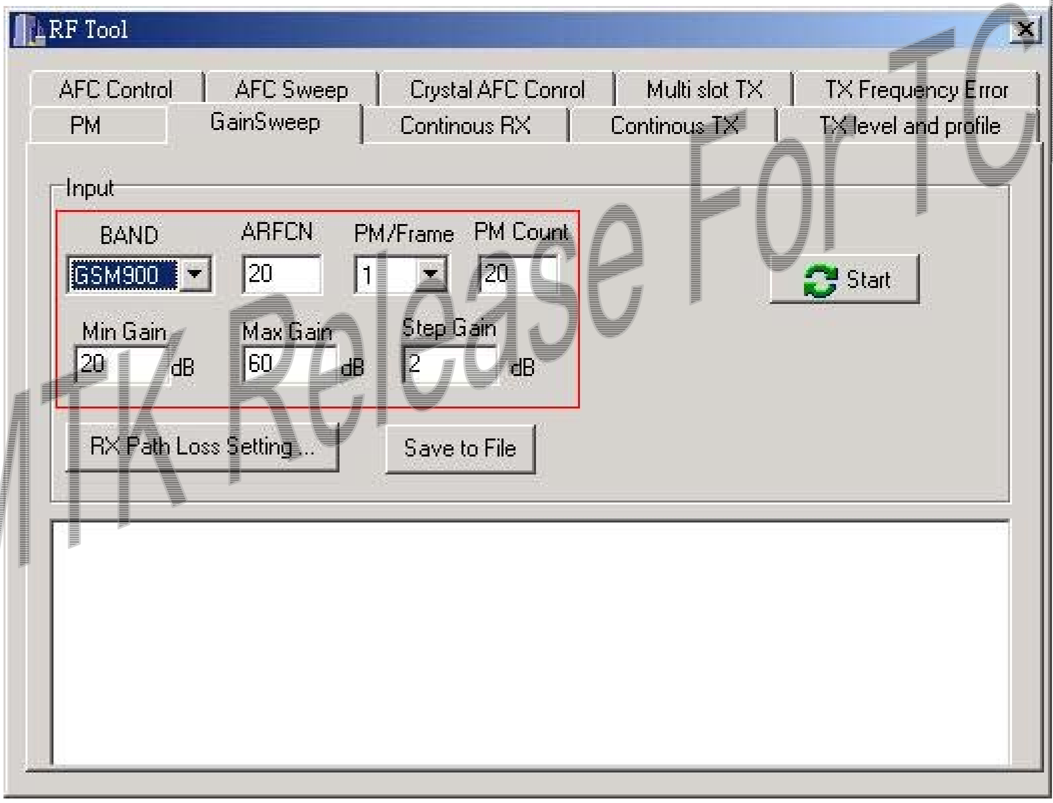

Figure 21 Input Band, ARFCN, PM/Frame, PM Count, Min Gain, Max Gain, and Step Gain.

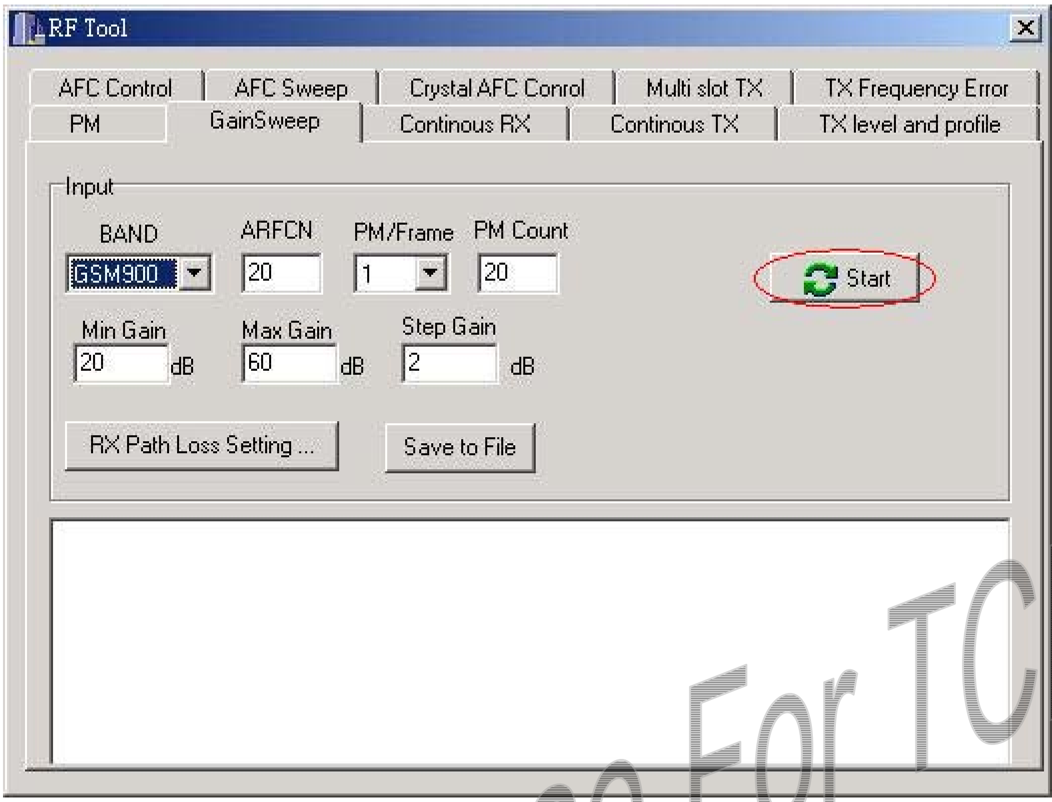

Figure 22 Click [Start] button

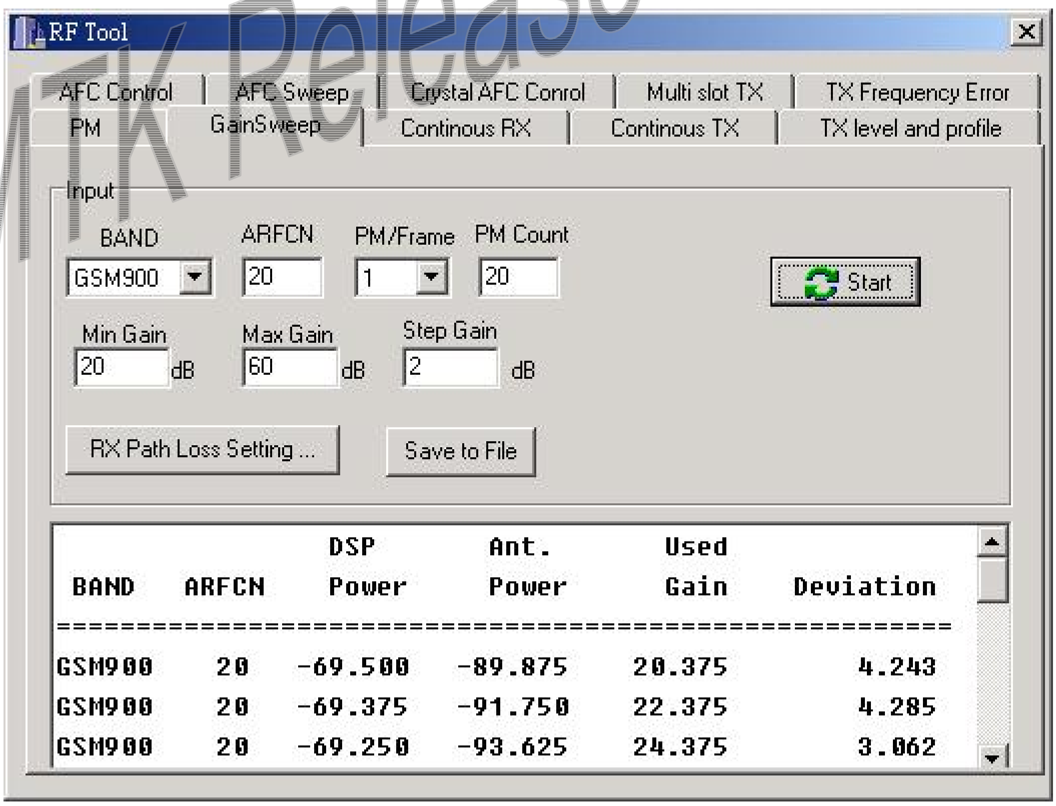

Figure 23 Meta shows gain sweep results

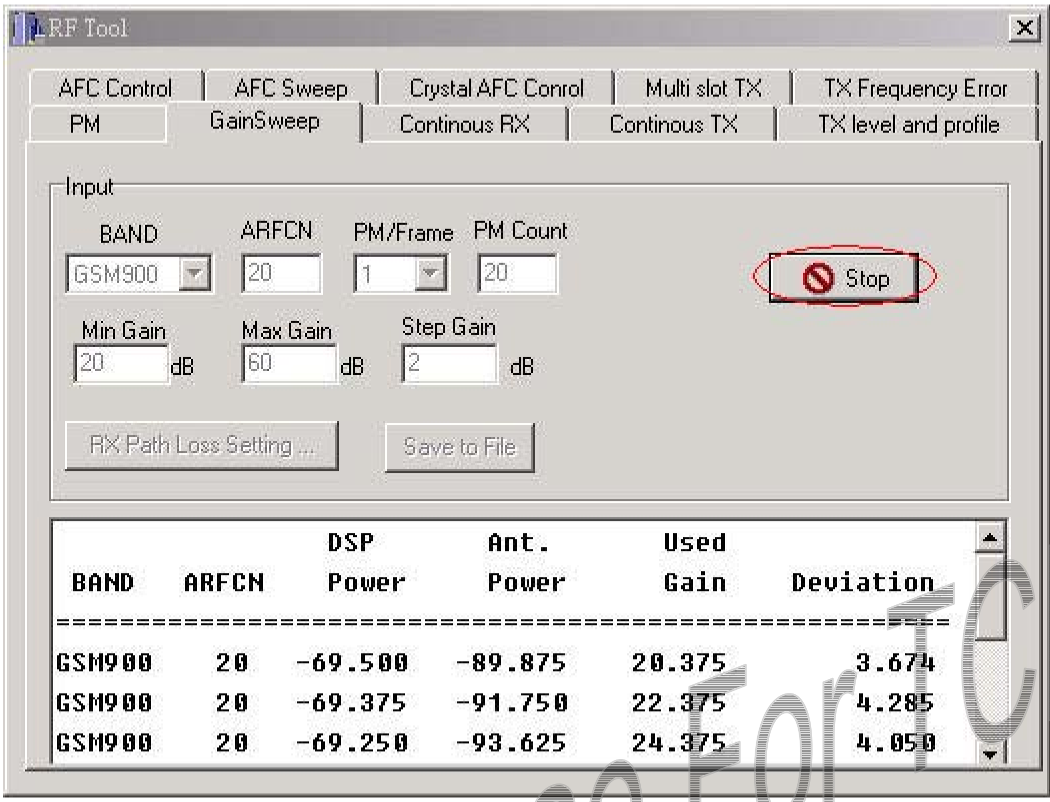

Figure 24 Click [Stop] button to stop gain sweep operation

User can click [*RX Path Loss Setting]* button to show the AGC Path Loss window. Please refer to section 3.2.1.1.

3.2.3 Continuous RX

Continue RX is used for observing RX IQ. User can input ARFCN and Gain (dB) and then click [Start] button to do continuous RX testing. When user wants to stop RX, he can click [Stop] button.

MS will start to do continuous RX of the ARFCN with the gain set by user after getting the continuous RX command from META. It will test RX function of RF module.

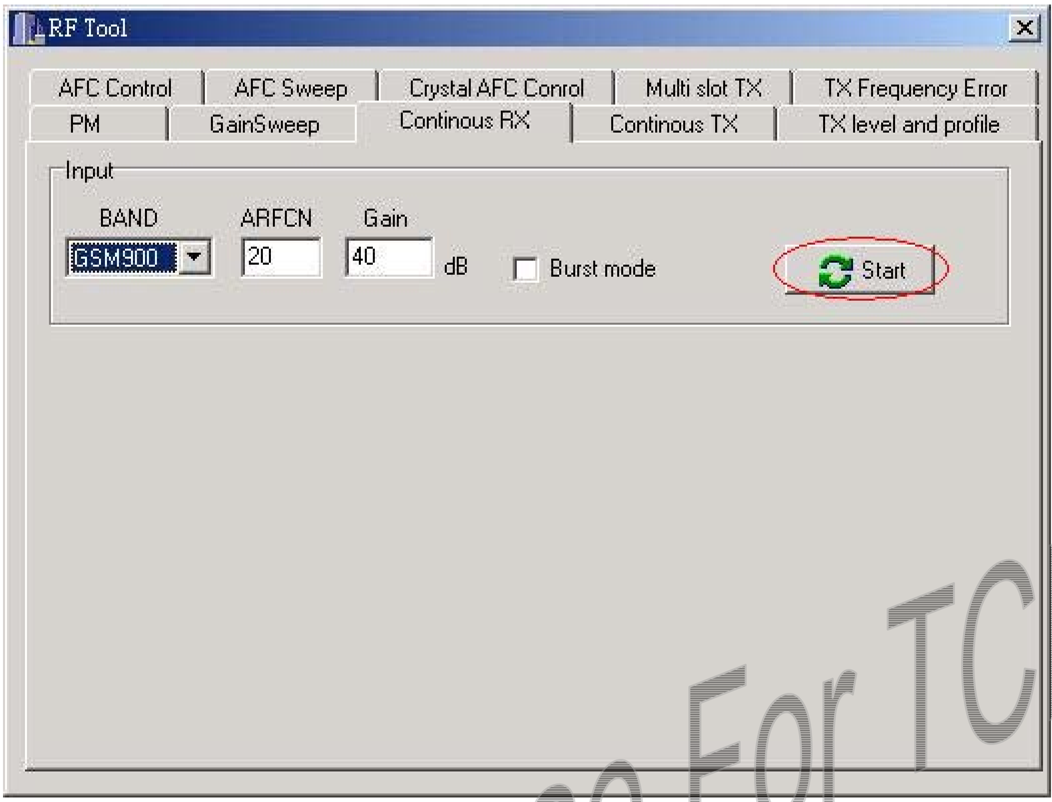

Figure 25 Click [Start] button to start continuous RX testing

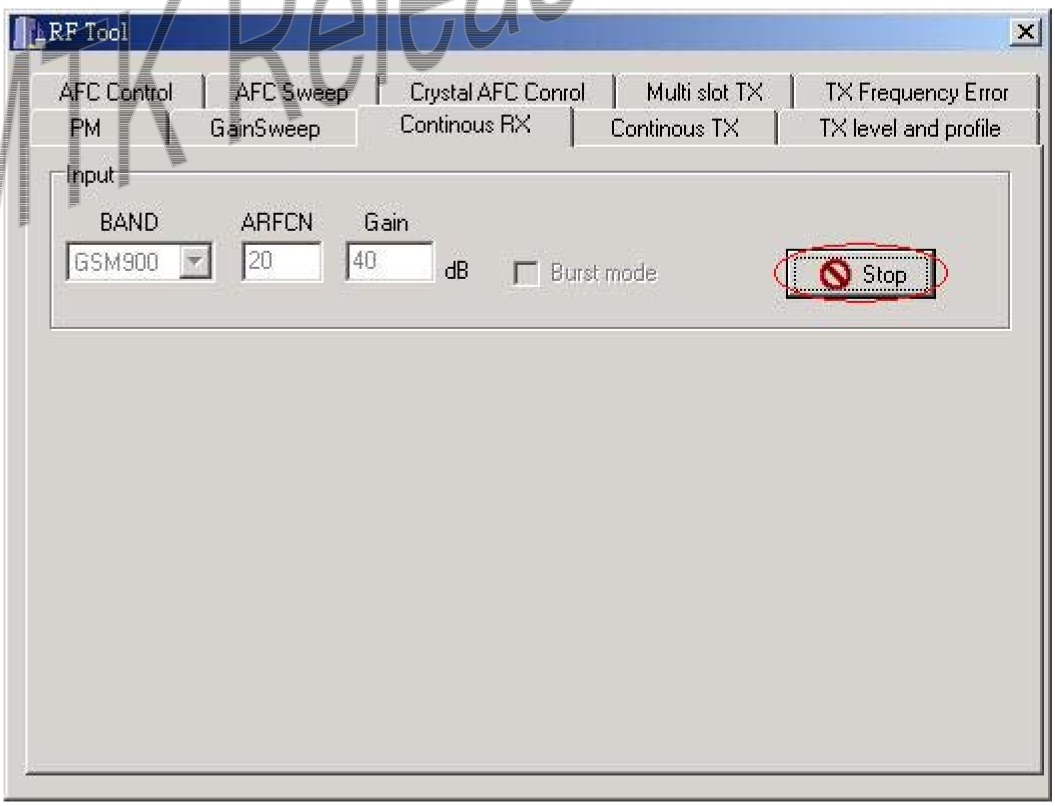

Figure 26 Click [Stop] button to stop continuous RX testing

After clicking [Stop] button, the caption of button will be changed to [Start].

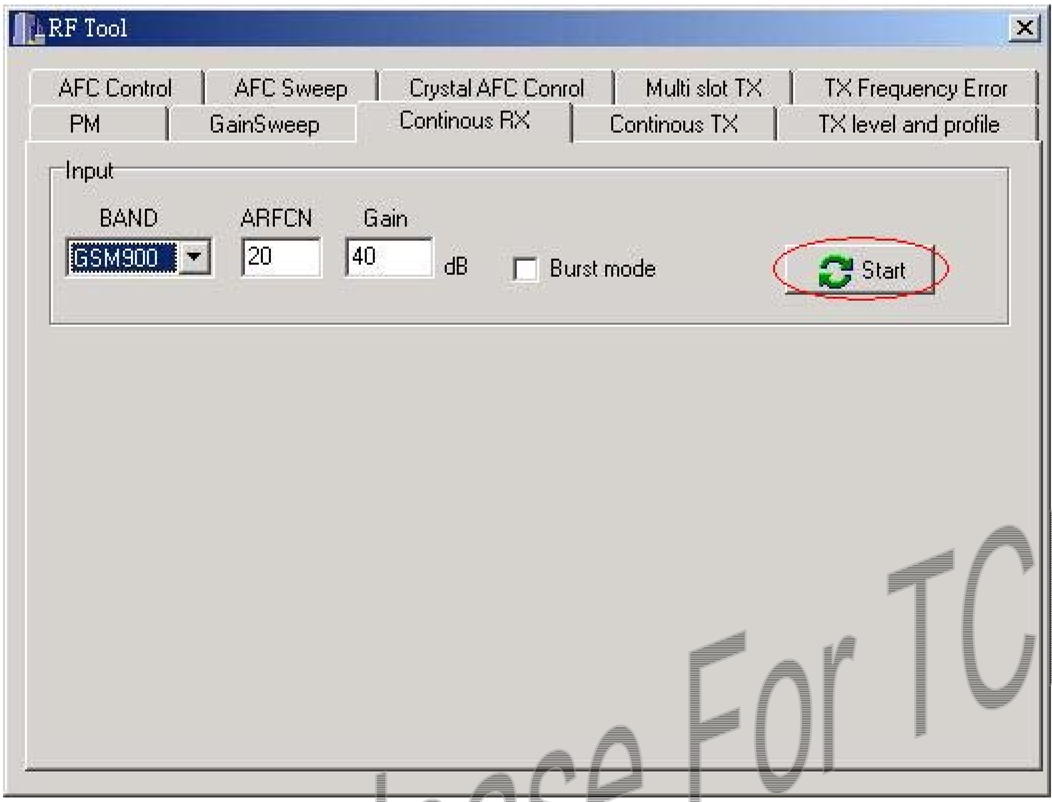

Figure 27 The caption of button will change to [Start]

3.2.4 Continuous TX

Continue TX is used for observing TX IQ. Power amplifier is turned off in this operation. User can input ARFCN value, select BB TX parameters, chose pattern and then click [Start] button to start continuous TX test. After starting continuous TX, the caption of the button will change to [Stop]. User can click [Stop] button to stop it.

MS will start to do TX except for PA circuit on the ARFCN assigned by user continuously after getting the continuous TX command from META. It will test TX function of RF module in MS.

Note: The meaning of BB TX parameters is as follows.

- APC bat low voltage: This field is used to setup APC's voltage compensation threshold under low battery voltage. The unit is voltage.
- APC bat high voltage: This field is used to setup APC's voltage compensation threshold under high battery voltage. The unit is voltage.
- APC bat low temperature: This field is used to setup APC's temperature compensation threshold under low battery temperature. The unit is degree.
- APC bat high temperature: This field is used to setup APC's temperature compensation threshold under high battery temperature. The unit is degree.

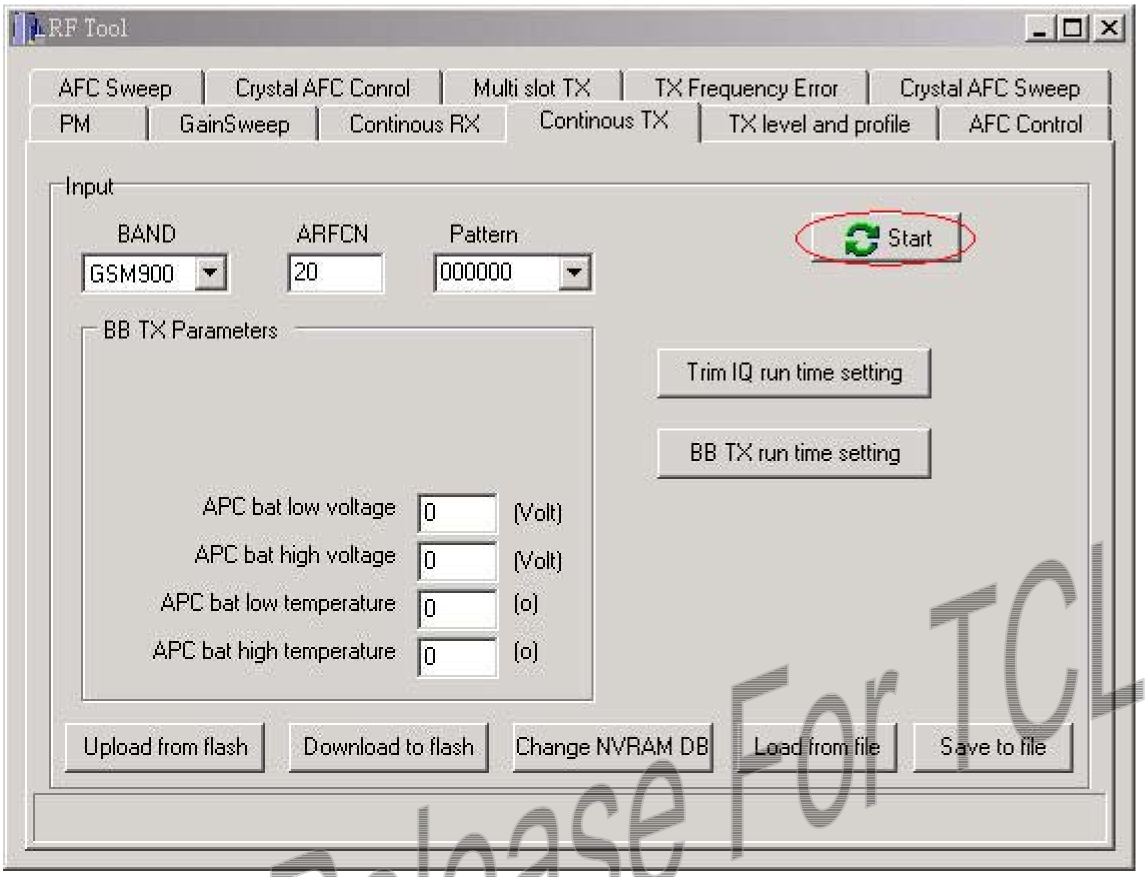

Figure 28 Click [Start] button to start testing

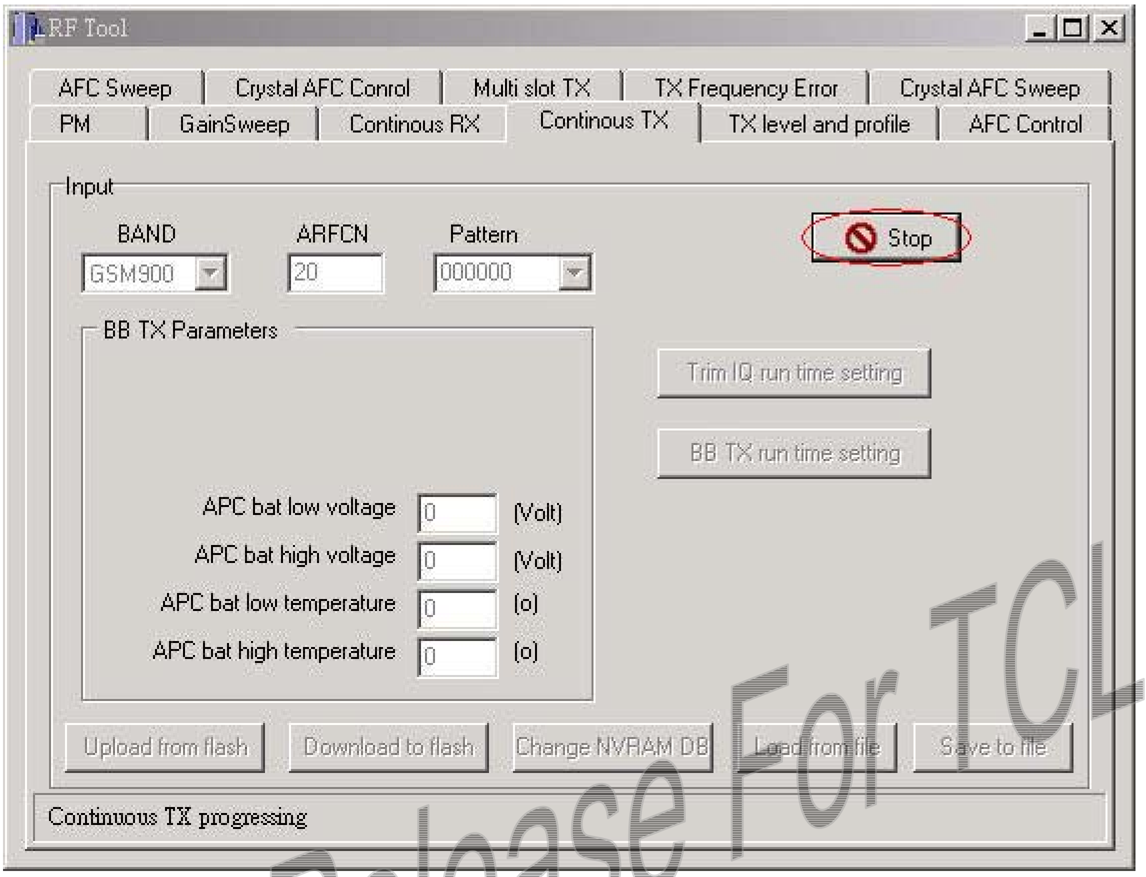

Figure 29 Click [Stop] button to stop testing

After clicking [Stop] button, the caption of button will change to [Start].

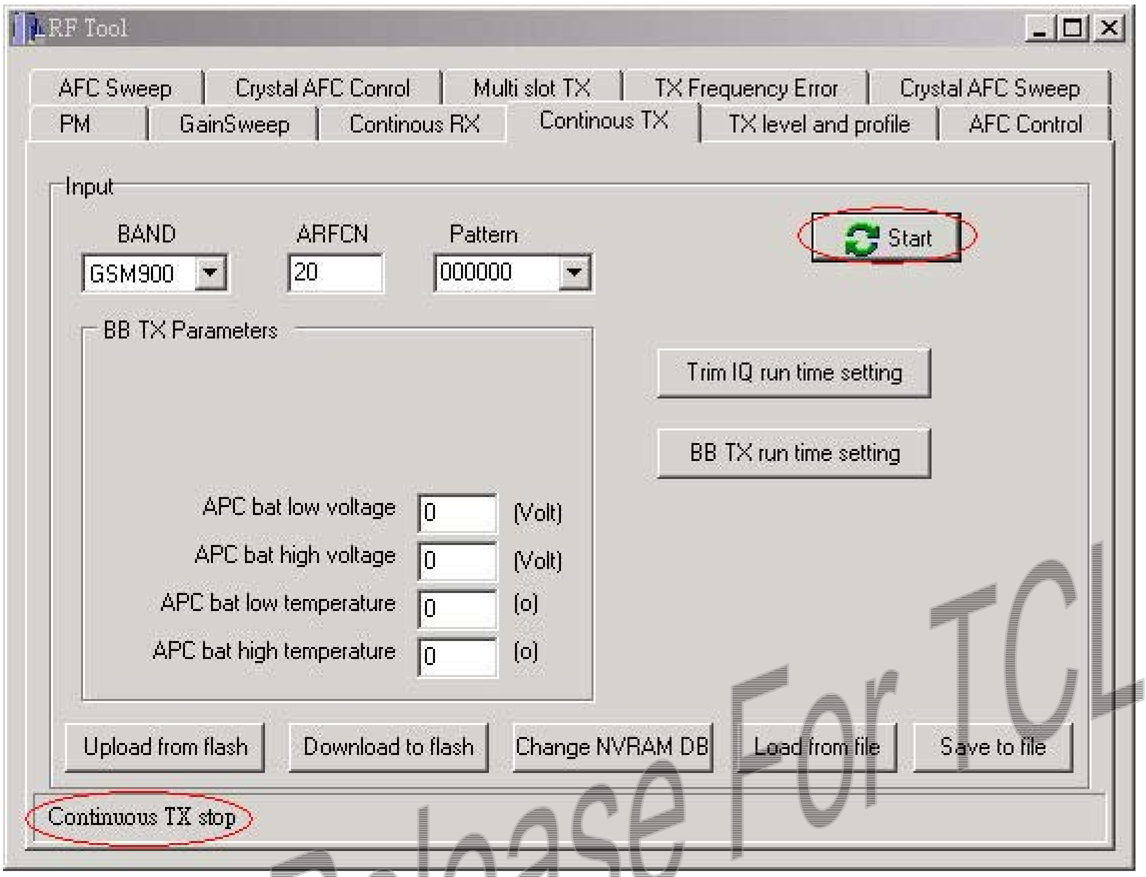

Figure 30 The caption of button will change to [Start]

3.2.4.1 Upload and download BB TX parameter in flash

User can click [Upload from flash] button to read BB TX parameter from flash and click [Download to flash] button to write BB TX parameter to flash.

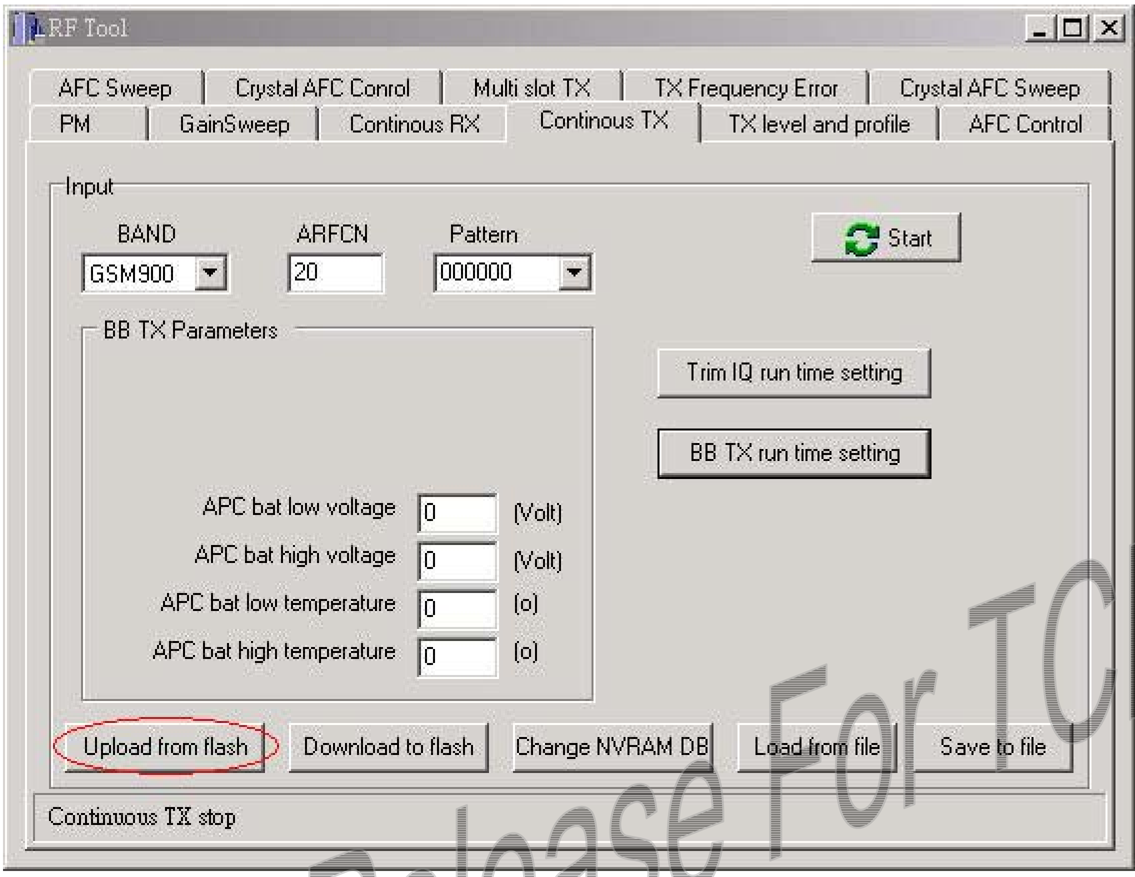

Figure 31 Click [Upload from flash] button to read BB TX parameter from flash

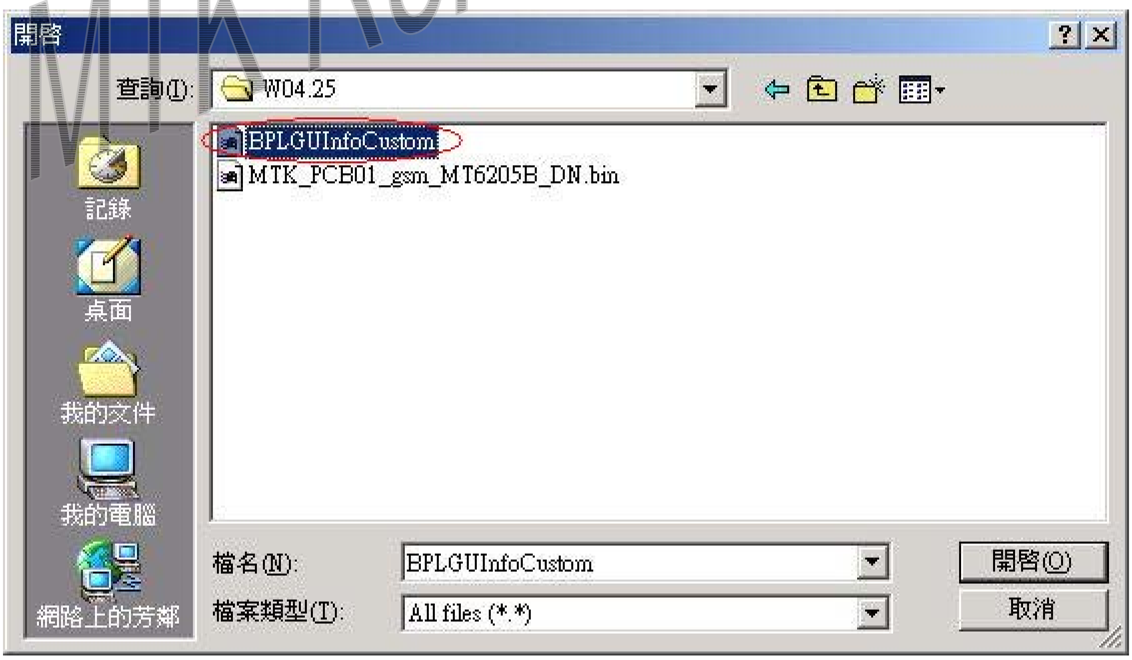

Figure 32 Select NVRAM database file if not selected before

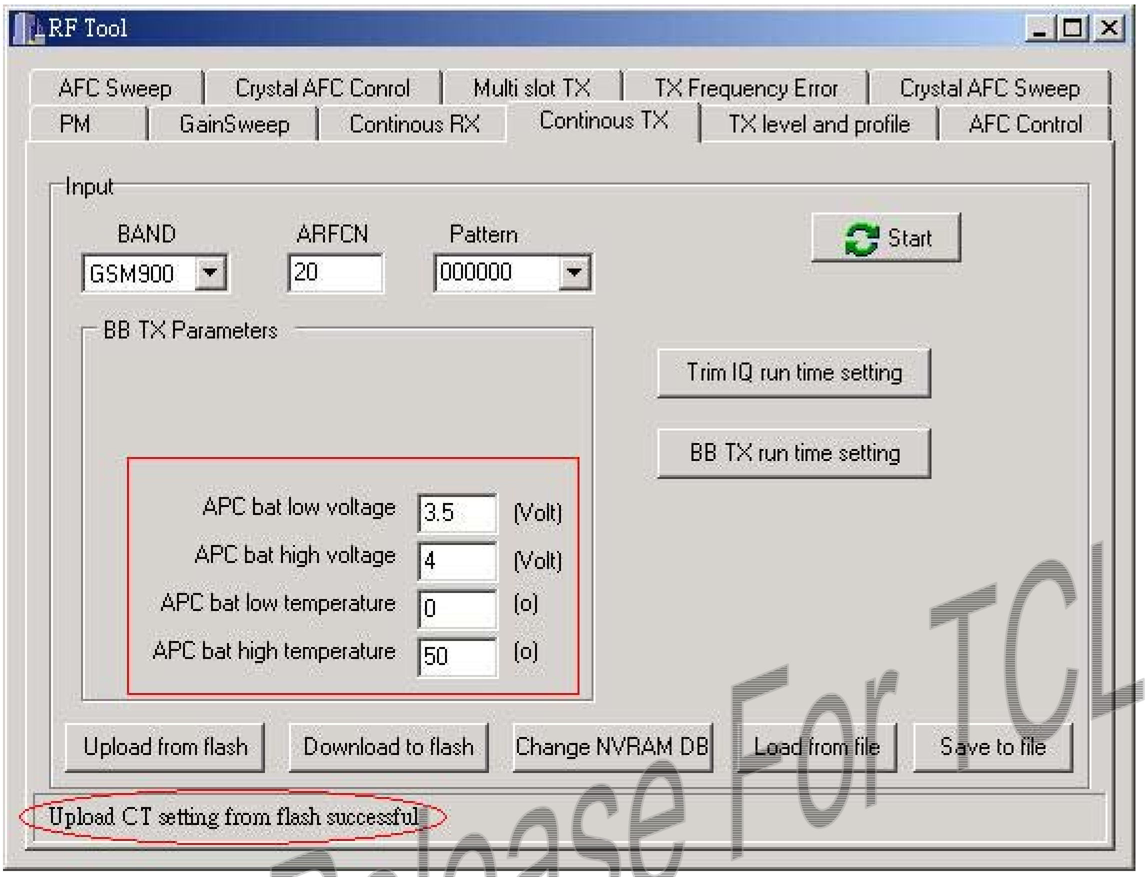

Figure 33 BB TX parameter result

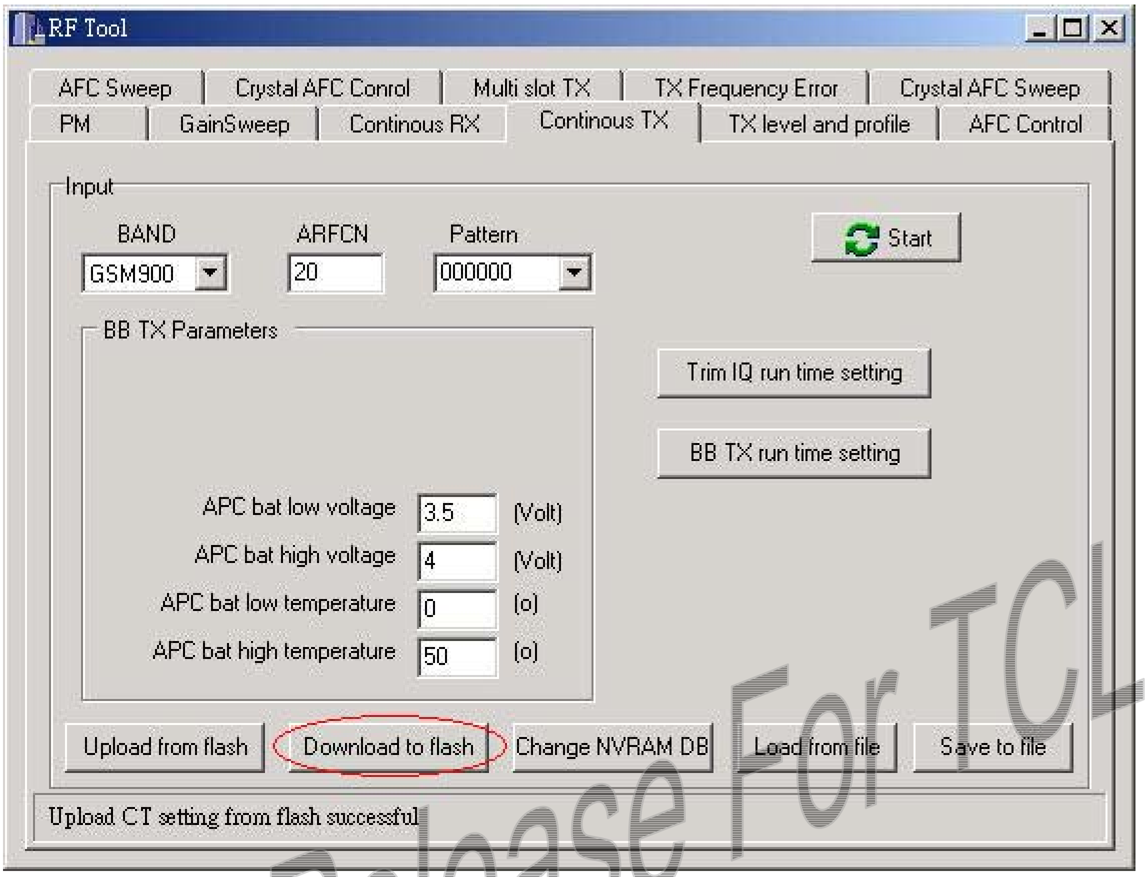

Figure 34 Click [Download to flash] button to download BB TX parameter to flash

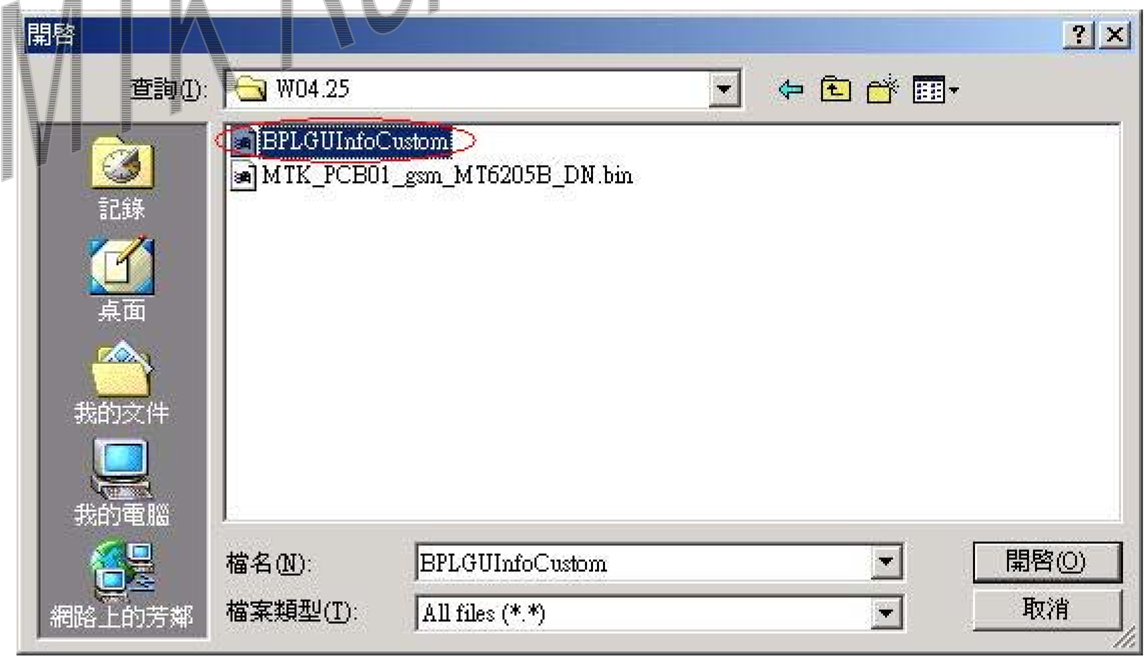

Figure 35 Select NVRAM database file if not selected before

If User wants to change NVRAM database file, he can click [Change NVRAM DB] button.

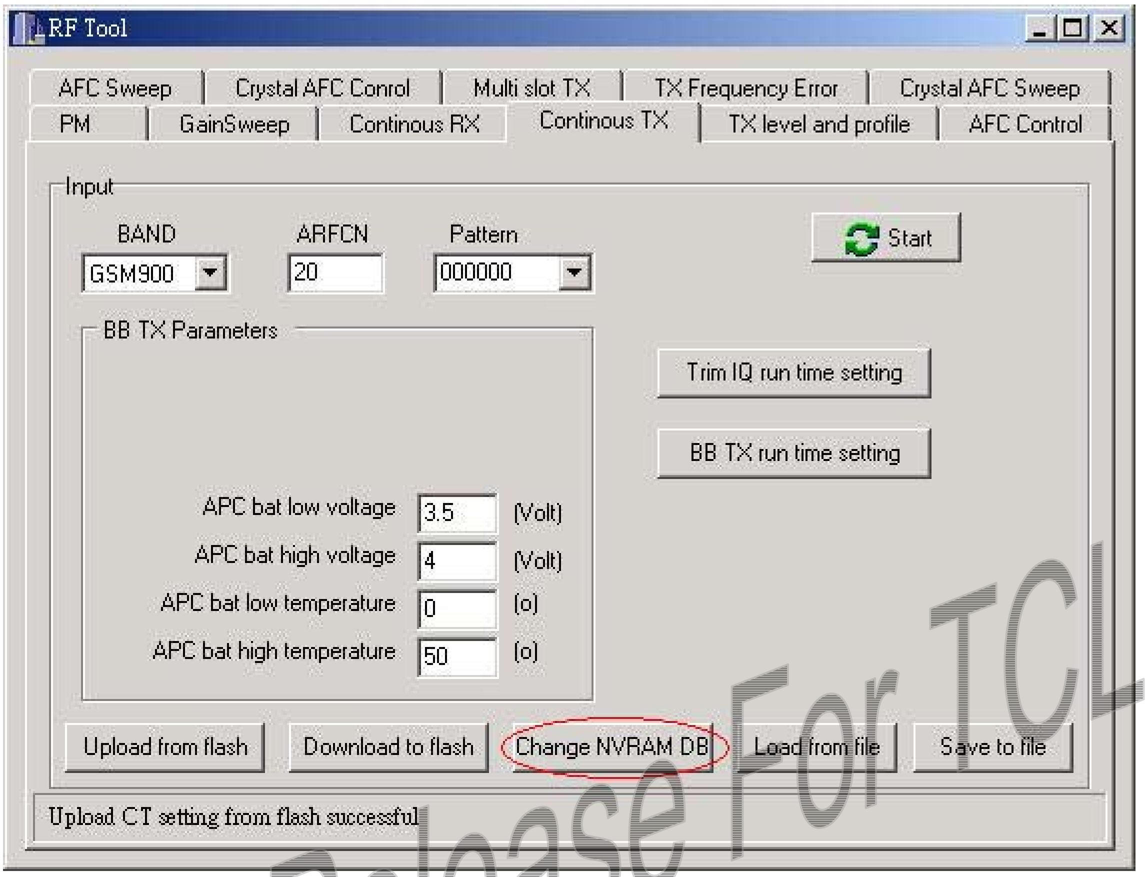

Figure 36 Click [Change NVRAM DB] to change NVRAM database file

3.2.4.2 Read and write BB TX parameter in file

User can click [Load from file] button to read BB TX parameter from file and click [Save to file] button to write BB TX parameter to file.

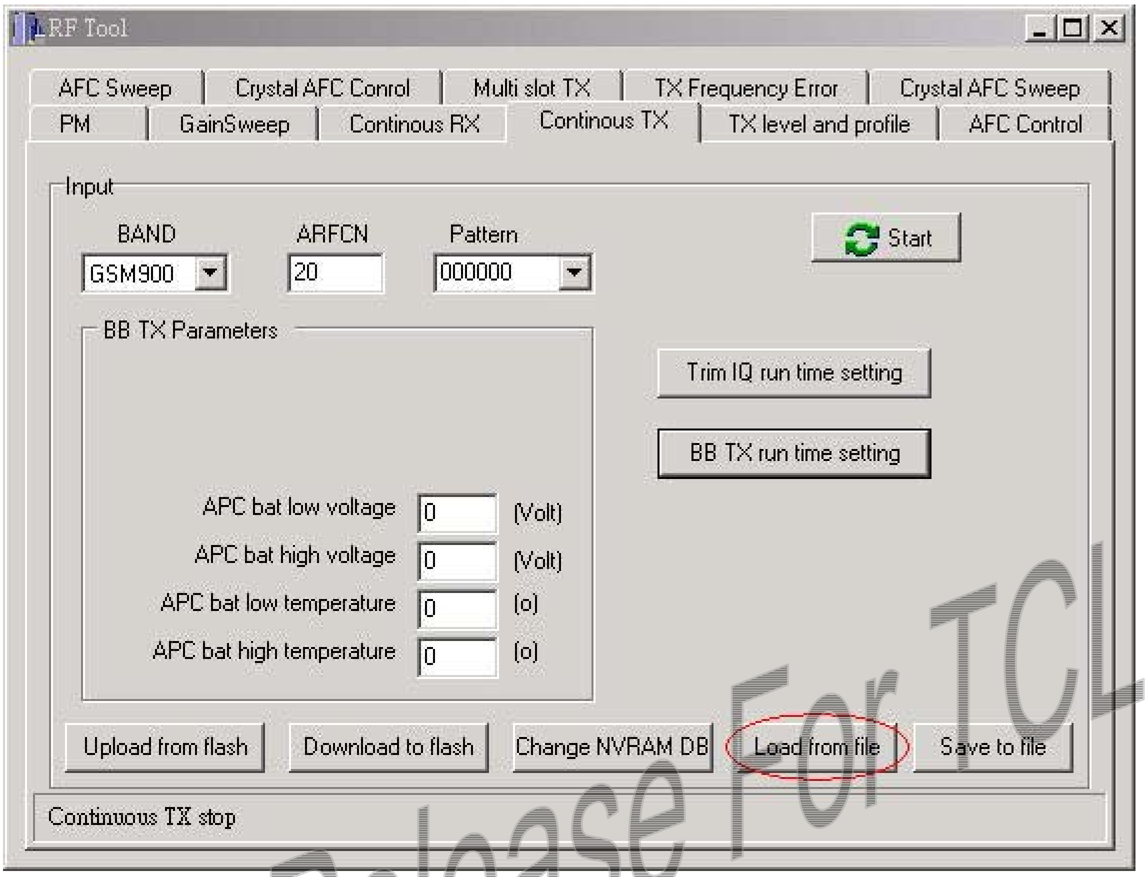

Figure 37 Click [Load from file] button to read BB TX parameter from file

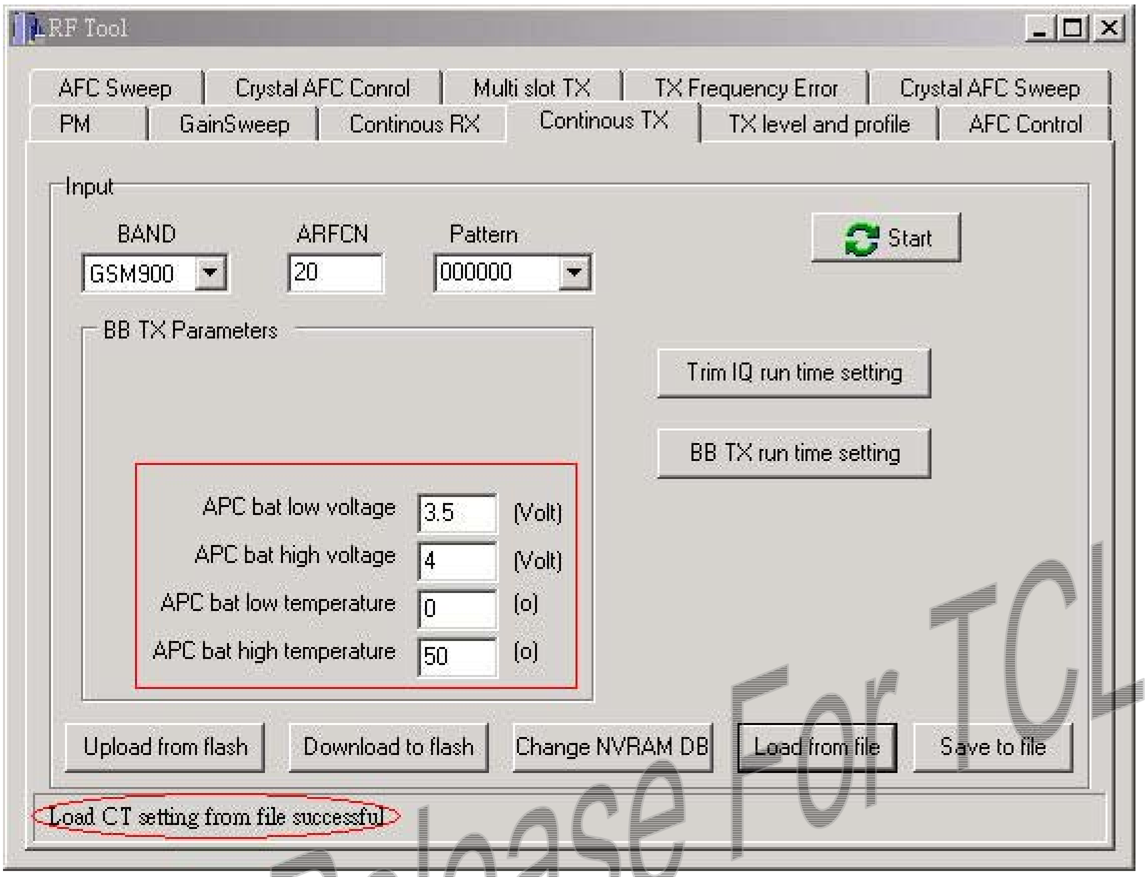

Figure 38 BB TX parameter result

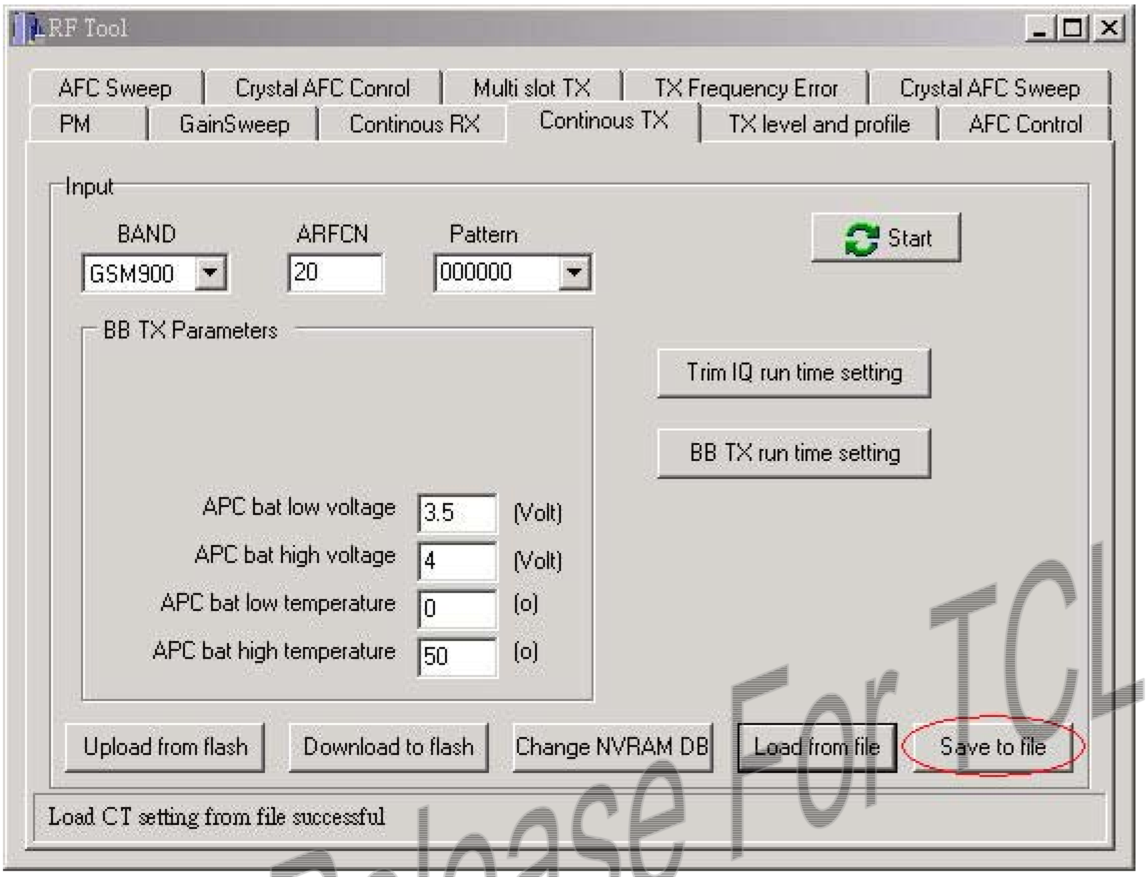

Figure 39 Click [Save to file] button to save BB TX parameter to file

The following is a template file of BB TX parameter. User will get the text file after saving BB TX parameter to file.

[BB TX Parameters]
APC bat low voltage=3.5
APC bat high voltage=4
APC bat low temperature=0
APC bat high temperature=50

3.2.4.3 Trim IQ run time setting

User can click [Trim IQ run time setting] button to show trim IQ and offset IQ run time setting window.

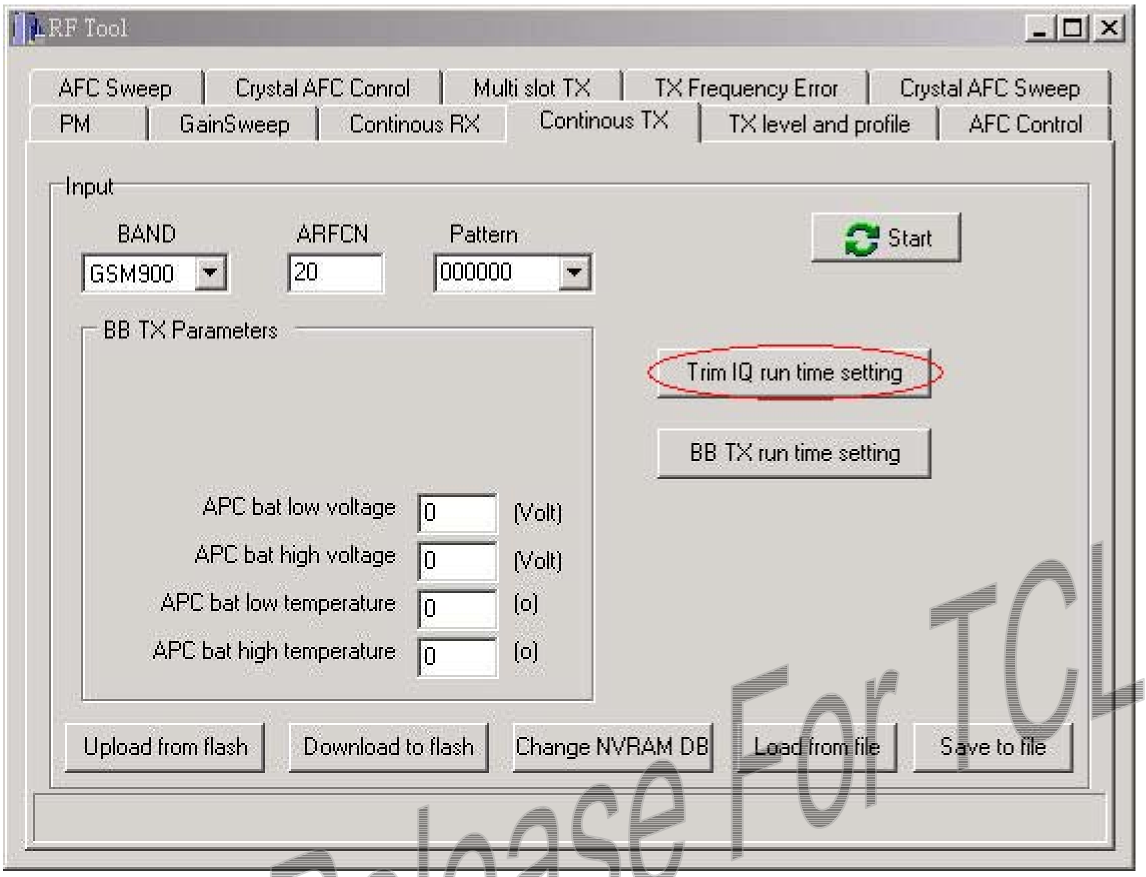

Figure 40 Click [Trim IQ run time setting] button to enter trim IQ and offset IQ run time setting window

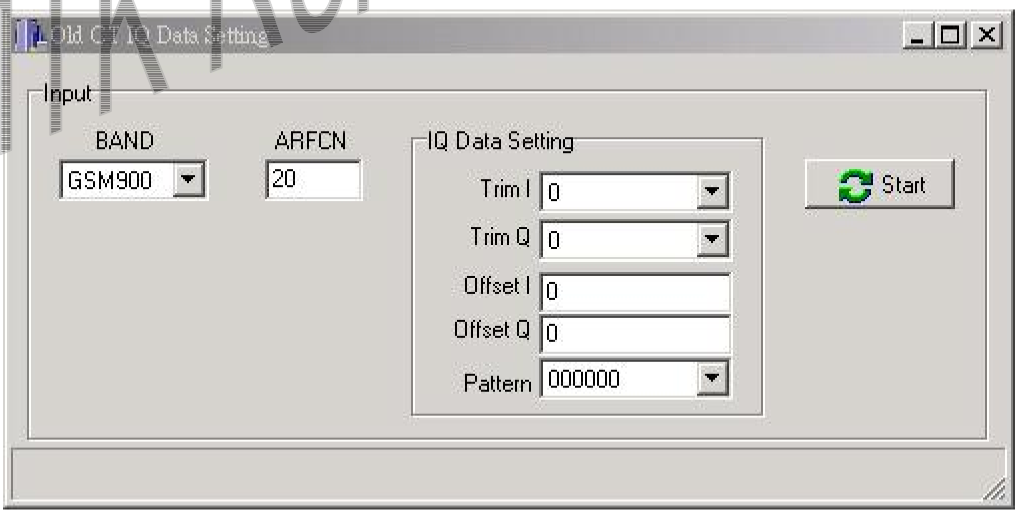

Figure 41 Trim IQ and offset IQ run time setting window

Trim IQ and offset IQ run time setting window is used for user to tune trim IQ and offset IQ. Power amplifier is turned off in this operation. User can input band, ARFCN value, trim IQ, offset IQ and chose pattern and then click [Start] button to start continuous TX test. After starting continuous TX, the caption of the button will change to [Stop]. User can click [Stop] button to stop it.

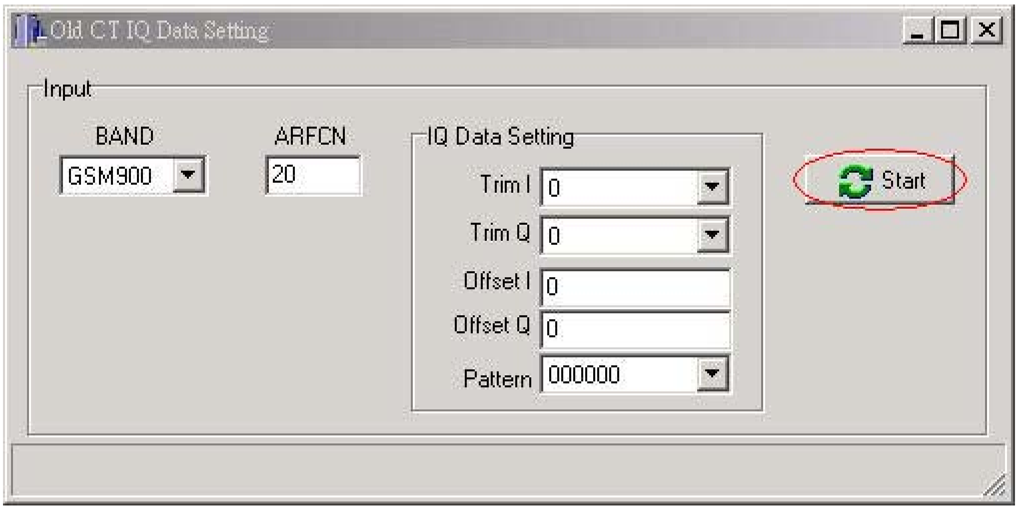

Figure 42 Click [Start] button to start testing

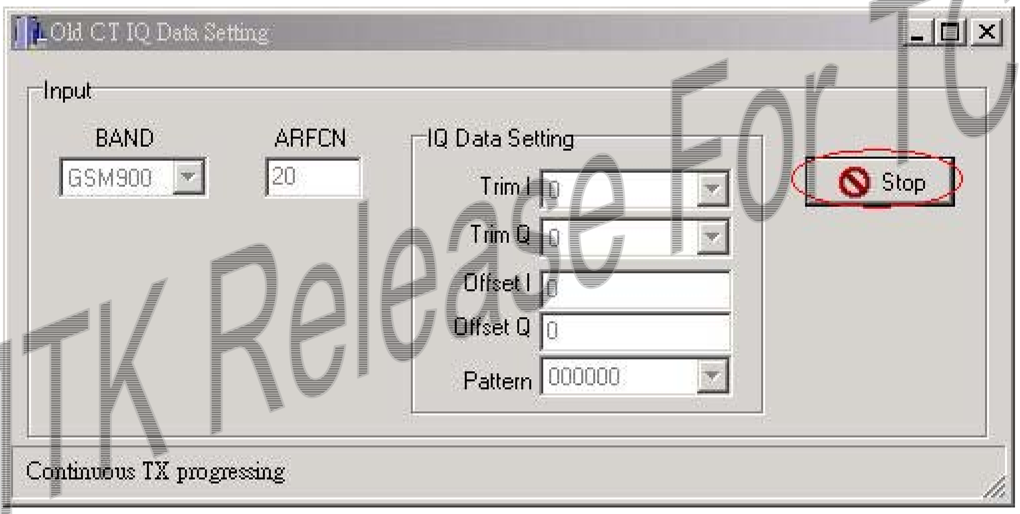

Figure 43 Click [Stop] button to stop testing

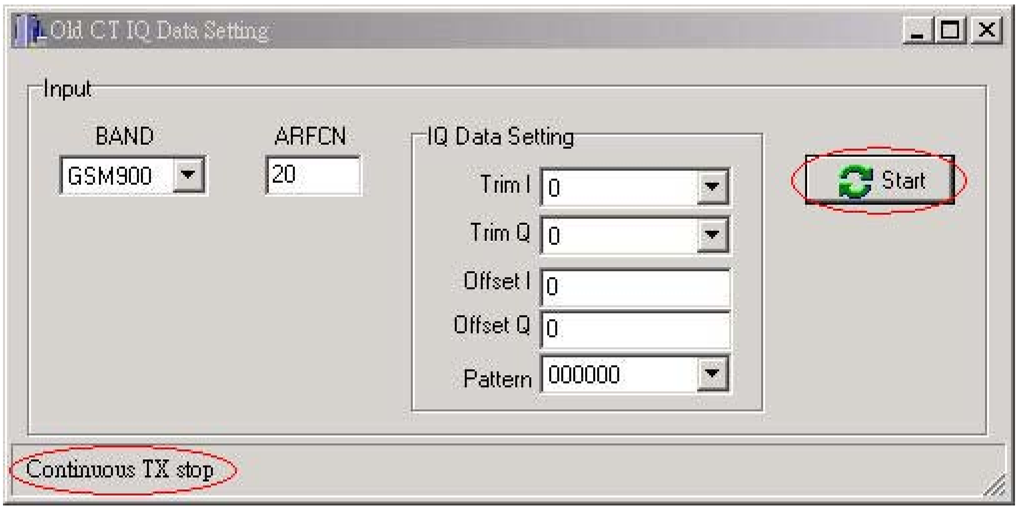

Figure 44 The caption of button will change to [Start]

Note: The meaning of Trim I, Trim Q and Offset I, Offset Q is as follows.

- Trim I: The field is used to control gain trimming of I-channel DAC in BBTX mixed-signal module.
- Trim Q: The field is used to control gain trimming of Q-channel DAC in BBTX mixed-signal module.
- Offset I: The field is used to control value of offset cancellation for I-channel DAC in TX mixed-signal module.
- Offset Q: The field is used to control value of offset cancellation for Q-channel DAC in TX mixed-signal module.

3.2.4.4 BB TX run time setting

User can click [BB TX run time setting] button to show BB TX run time setting window.

Figure 45 Click [BB TX run time setting] button to enter BB TX run time setting window

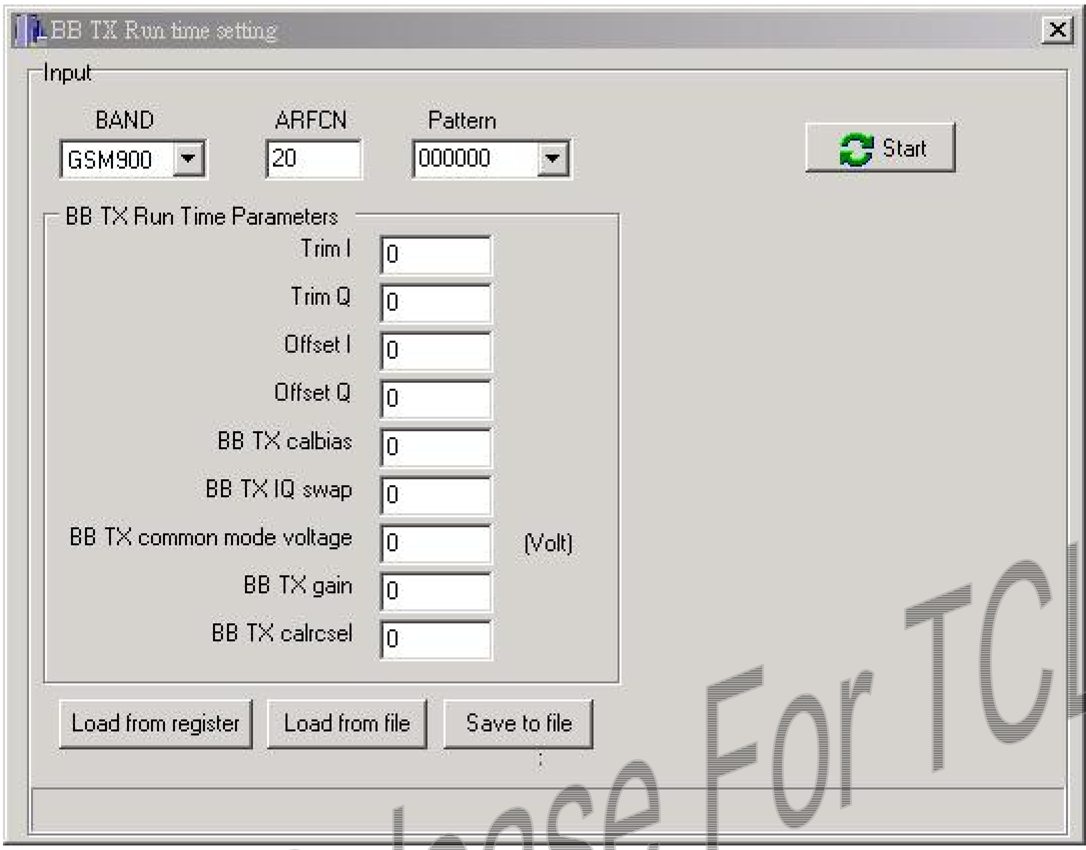

Figure 46 BB TX run time setting window

BB TX run time setting window is used for user to adjust BB TX run time parameter. Power amplifier is turned off in this operation. User can input band, ARFCN value, BB TX run time parameters and chose pattern and then click [Start] button to start continuous TX test. After starting continuous TX, the caption of the button will change to [Stop]. User can click [Stop] button to stop it.

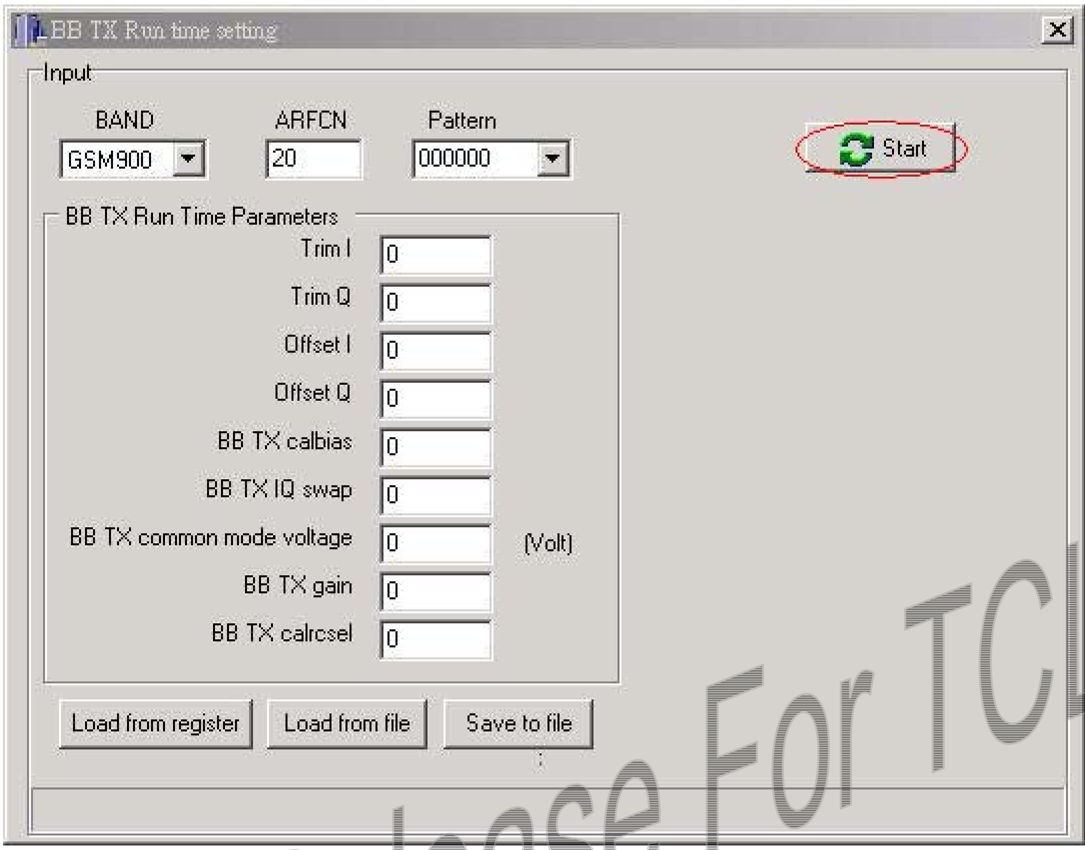

Figure 47 Click [Start] button to start testing

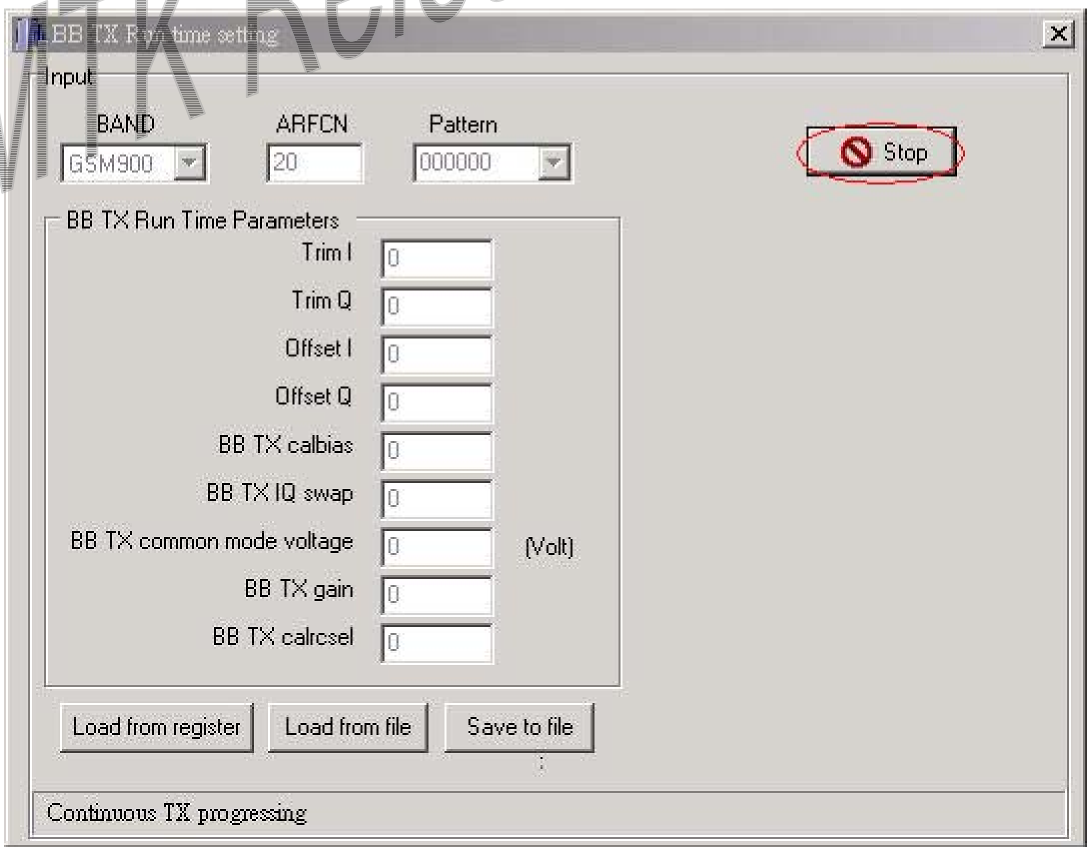

Figure 48 Click [Stop] button to stop testing

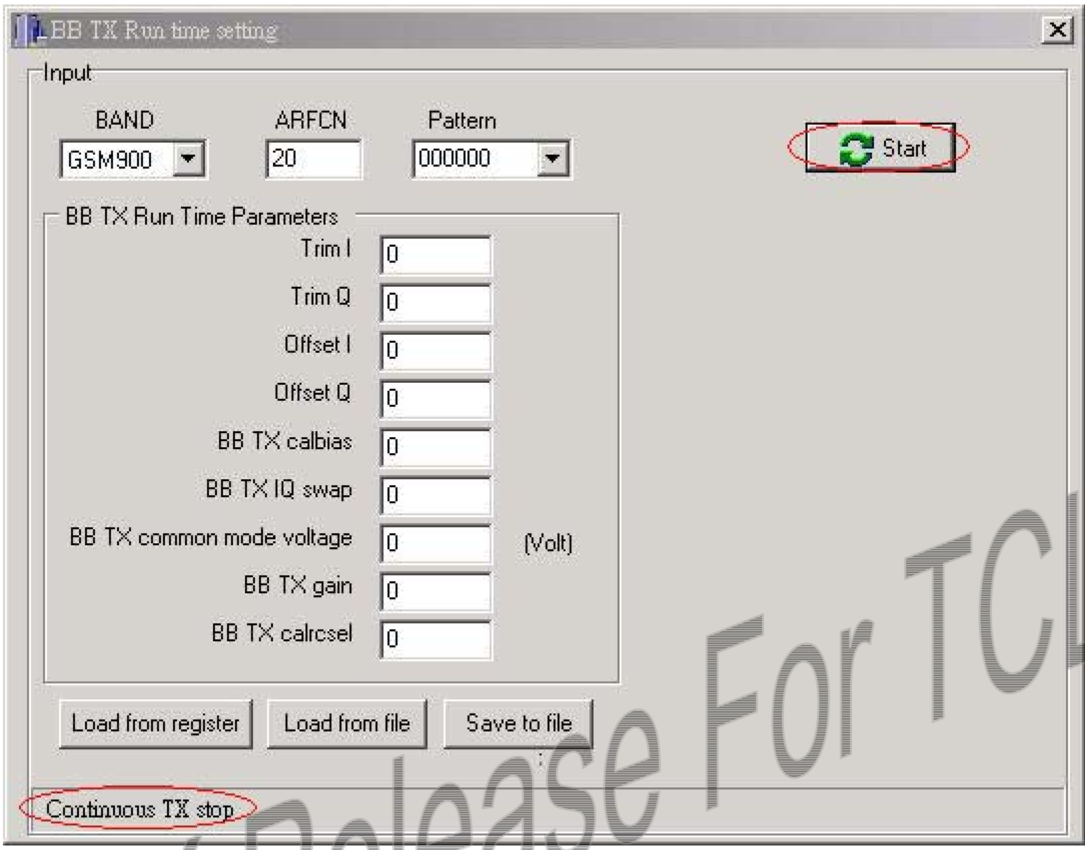

Figure 49 The caption of button will change to [Start]

User can click [Load from register] button to load BB TX run time setting from register.

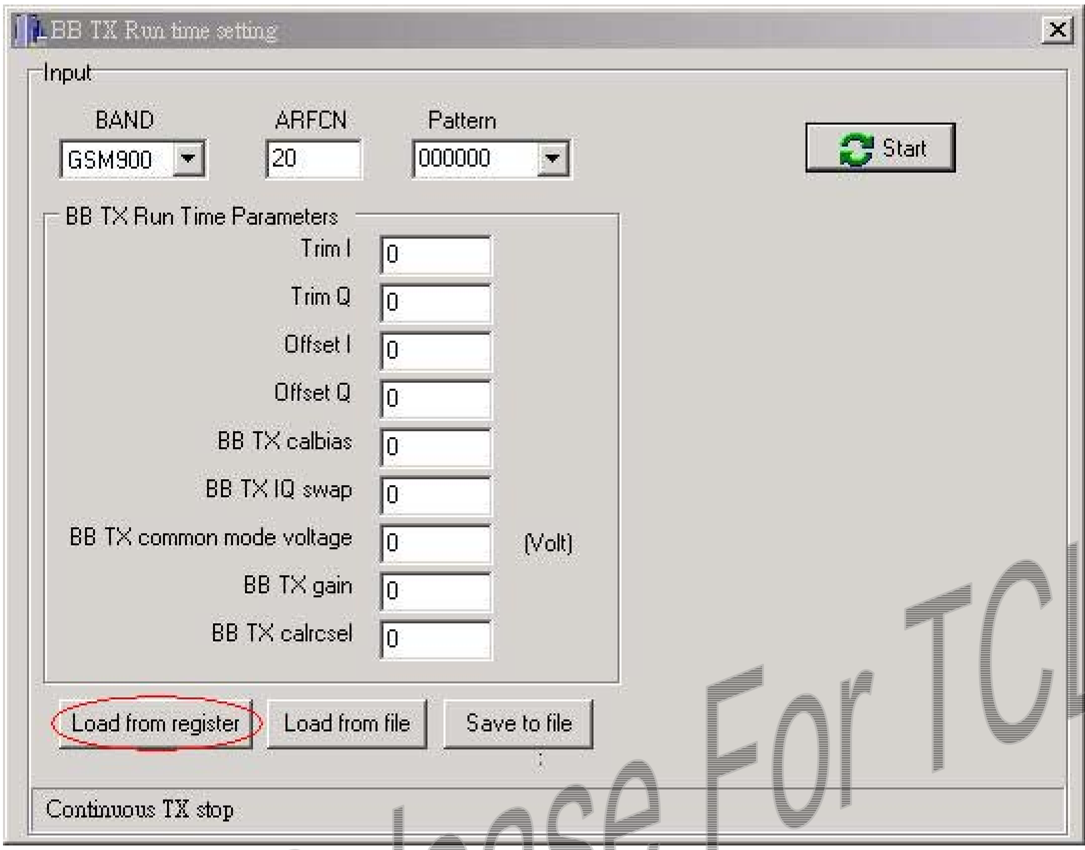

Figure 50 Click [Load from register] button to read BB TX run time parameter from register

User can click [Load from file] button to read BB TX run time parameter from file and click [Save to file] button to write BB TX run time parameter to file.

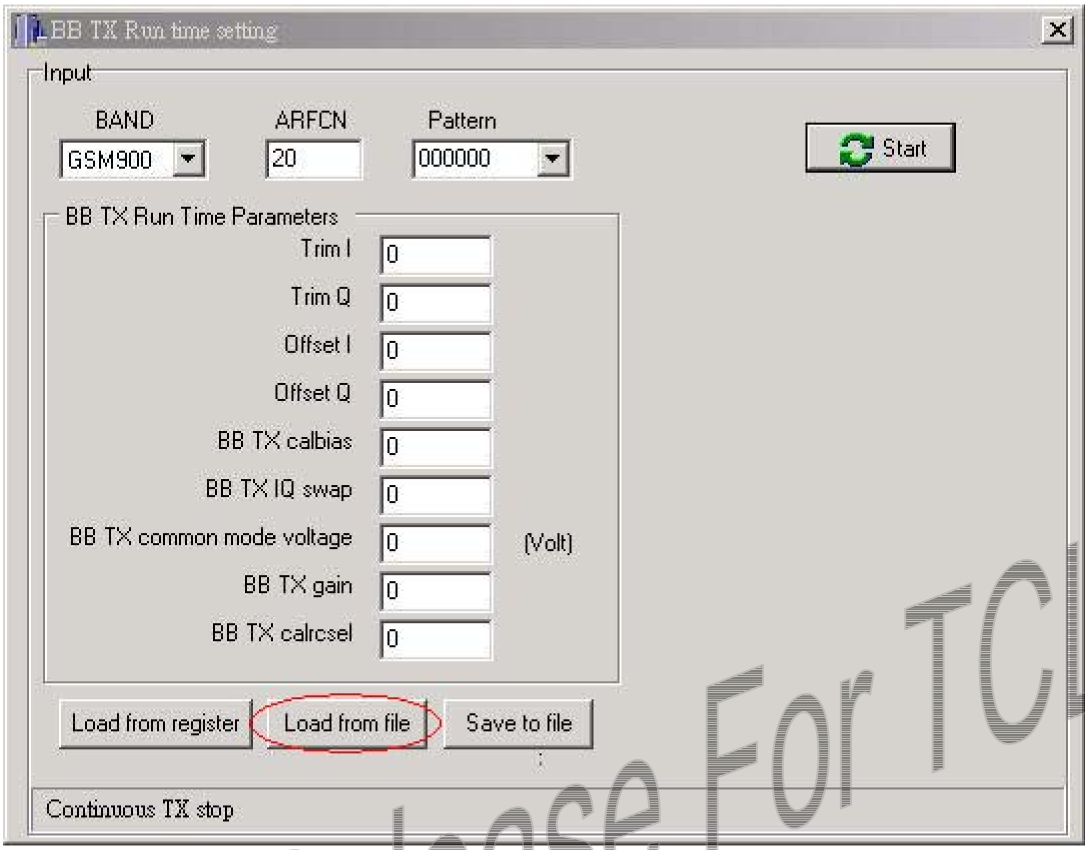

Figure 51 Click [Load from file] button to read BB TX run time parameter from file

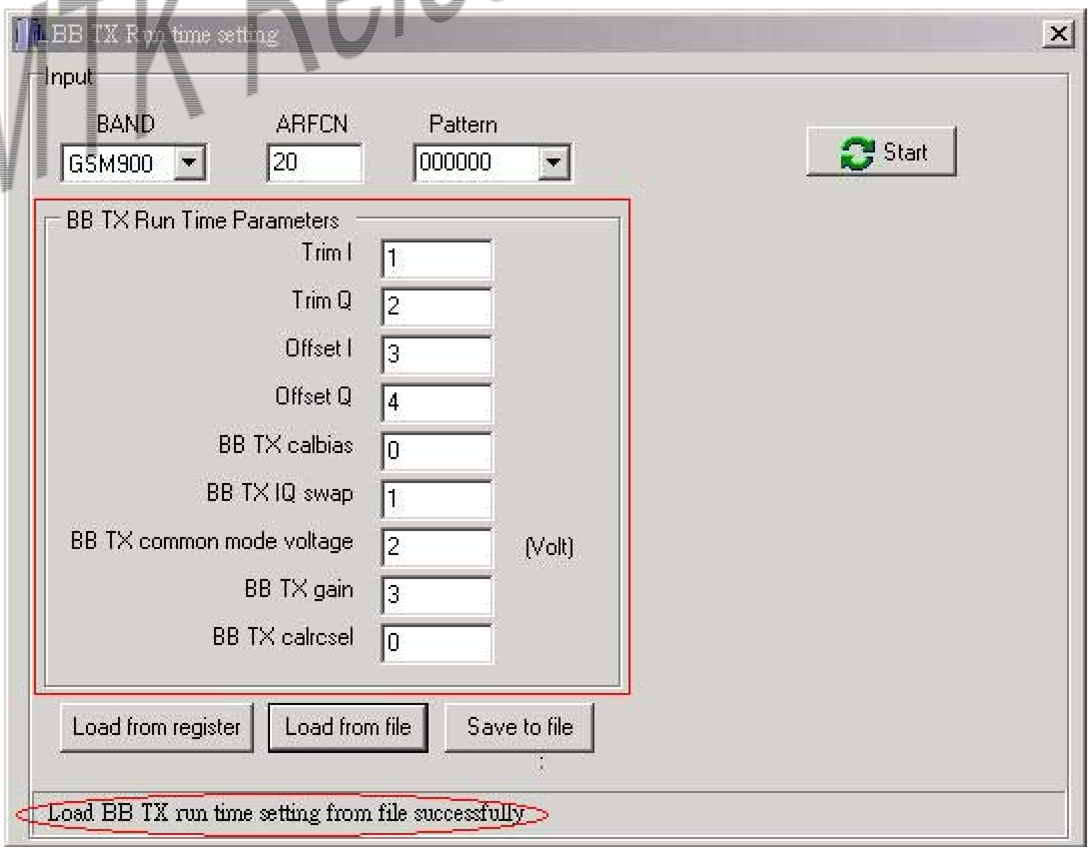

Figure 52 BB TX run time parameter result

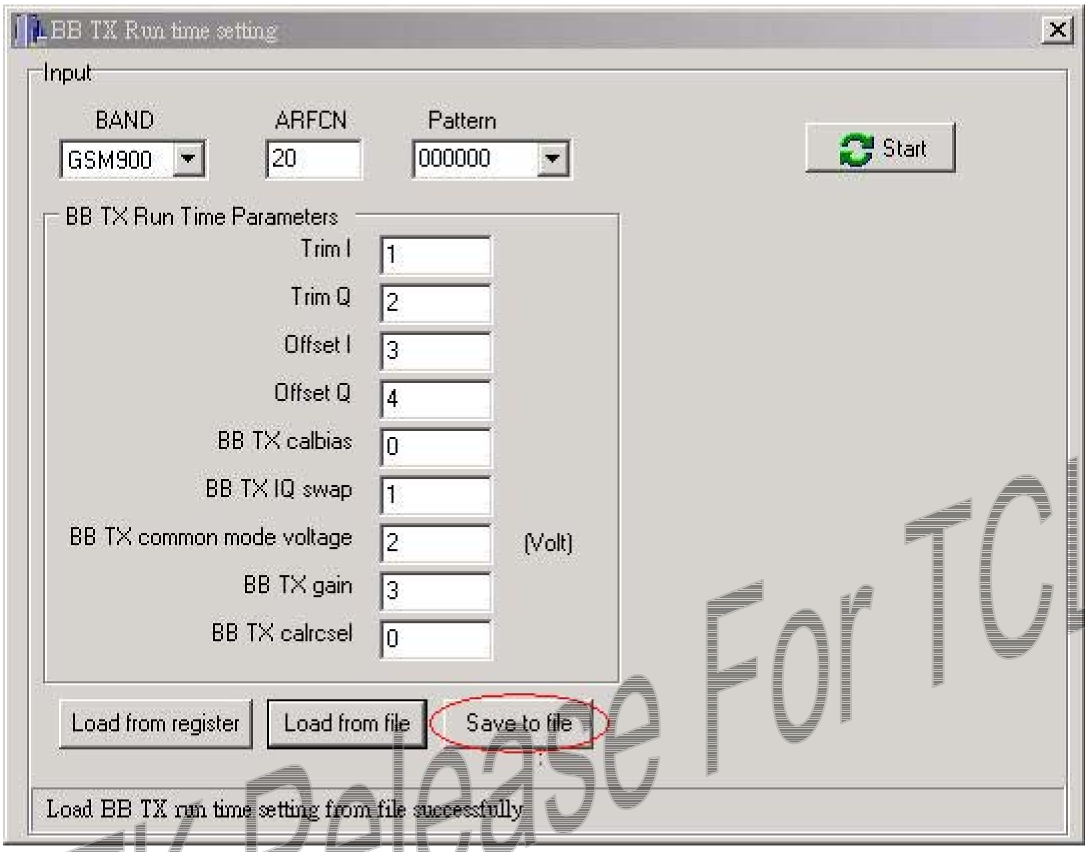

Figure 53 Click [Save to file] button to save BB TX run time parameter to file

The following is a template file of BB TX run time parameter. User will get the text file after saving BB TX run time parameter to file.

[BB TX Run Time Parameters]
Trim I=1
Trim Q=2
Offset I=3
Offset Q=4
BB TX calbias=0
BB TX IQ swap=1
BB TX common mode voltage=2
BB TX gain=3
BB TX calrcsel=0

Note: The meaning of BB TX run time parameters is as follows.

- Trim I: this field is used to control gain trimming of I-channel DAC in BB TX mixed-signal module.
- Trim Q: this field is used to control gain trimming of Q-channel DAC in BB TX mixed-signal module.
- Offset I: this field is used to control value of offset cancellation for I-channel DAC in BB TX mixed-signal module.
- Offset Q: this field is used to control value of offset cancellation for Q-channel DAC in BB TX

mixed-signal module.

- BB TX Calbias: this field is used for control of biasing current in BBTX mixed-signal module.
- BB TX IQSwap: this field is used for control of I/Q swapping. When the bit is set to '1', phase on I/Q plane will rotate inverse direction
- BB TX common voltage gain: this field is used to control common voltage in TX mixed-signal module. It is coded in 2's complement with maximum 3 and minimum -4.
- BB TX gain: this filed is used to control gain of DAC in TX mixed-signal module. It is coded in 2's complement with maximum 3 and minimum -4.
- BB TX calrcsel: This filed is used to select cutoff frequency of smoothing filter in TX mixed-signal module.It is coded in 2's complement with maximum 3 and minimum -4.

3.2.5 TX level and profile

This operation is used for fine tune TX configuration and profiles. Power Amplifier is turned on in this operation and indicated bursts are transmitted. User can input Band, ARFCN, TSC, PCL (Power control level), AFC DAC value and chose burst type and then click [Start] button to test TX power level. MS will start to transmit RF signal with the parameters set by user after MS get the command from META. RF engineer can measure the transmitted power of MS by Agilent 8960 or other measurement instrument.

Note: The meaning of BB TX parameters is as follows.

- APC bat low voltage: This field is used to setup APC's voltage compensation threshold under low battery voltage. The unit is voltage.
- APC bat high voltage: This field is used to setup APC's voltage compensation threshold under high battery voltage. The unit is voltage.
- APC bat low temperature: This field is used to setup APC's temperature compensation threshold under low battery temperature. The unit is degree.
- APC bat high temperature: This field is used to setup APC's temperature compensation threshold under high battery temperature. The unit is degree.

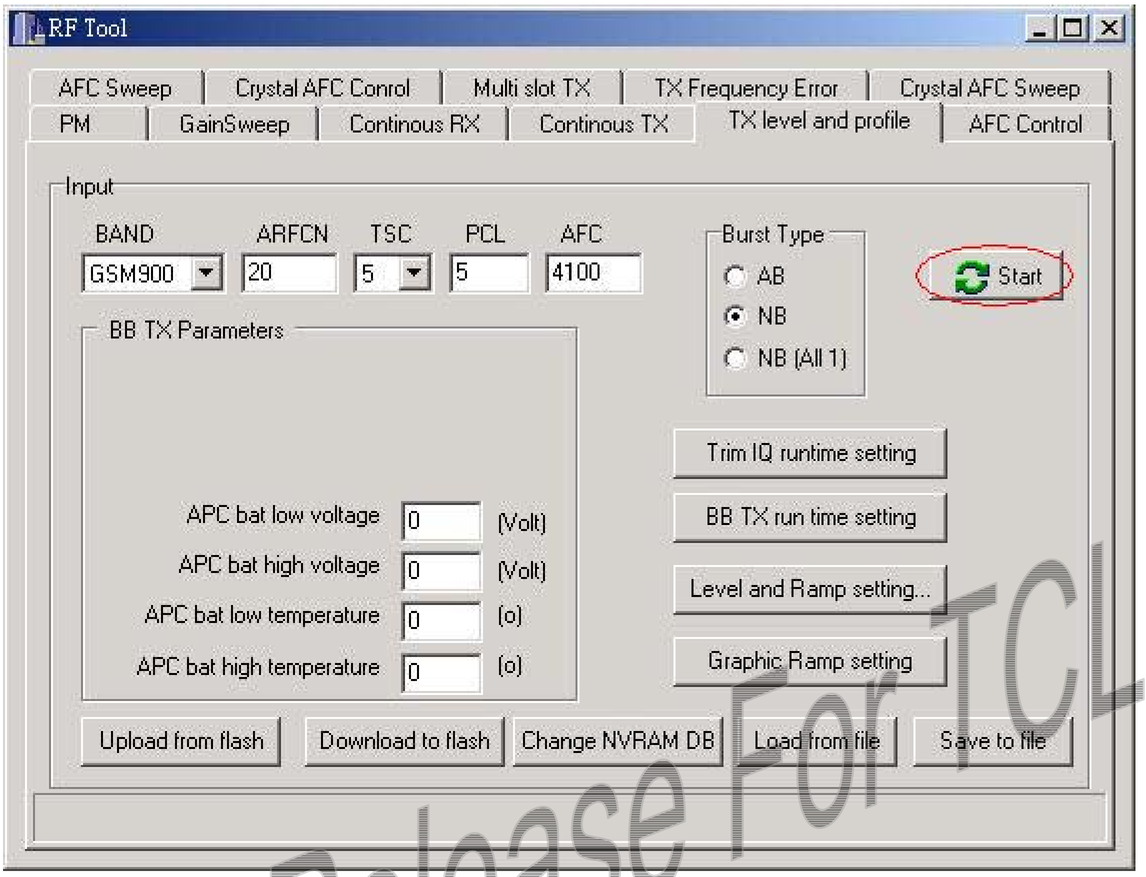

Figure 54 Click [Start] button to start TX level testing.

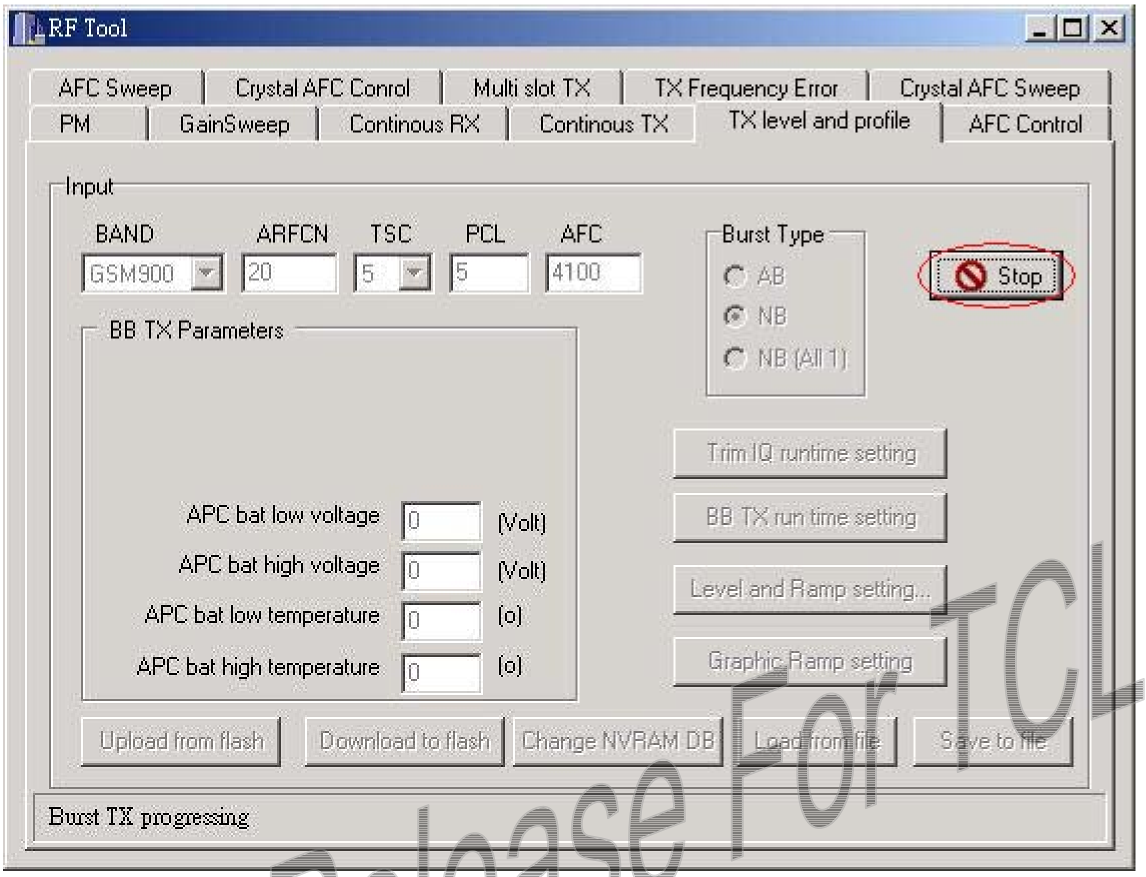

Figure 55 Click [Stop] button to stop TX level testing.

After clicking [Stop] button, the caption of button will change to [Start].

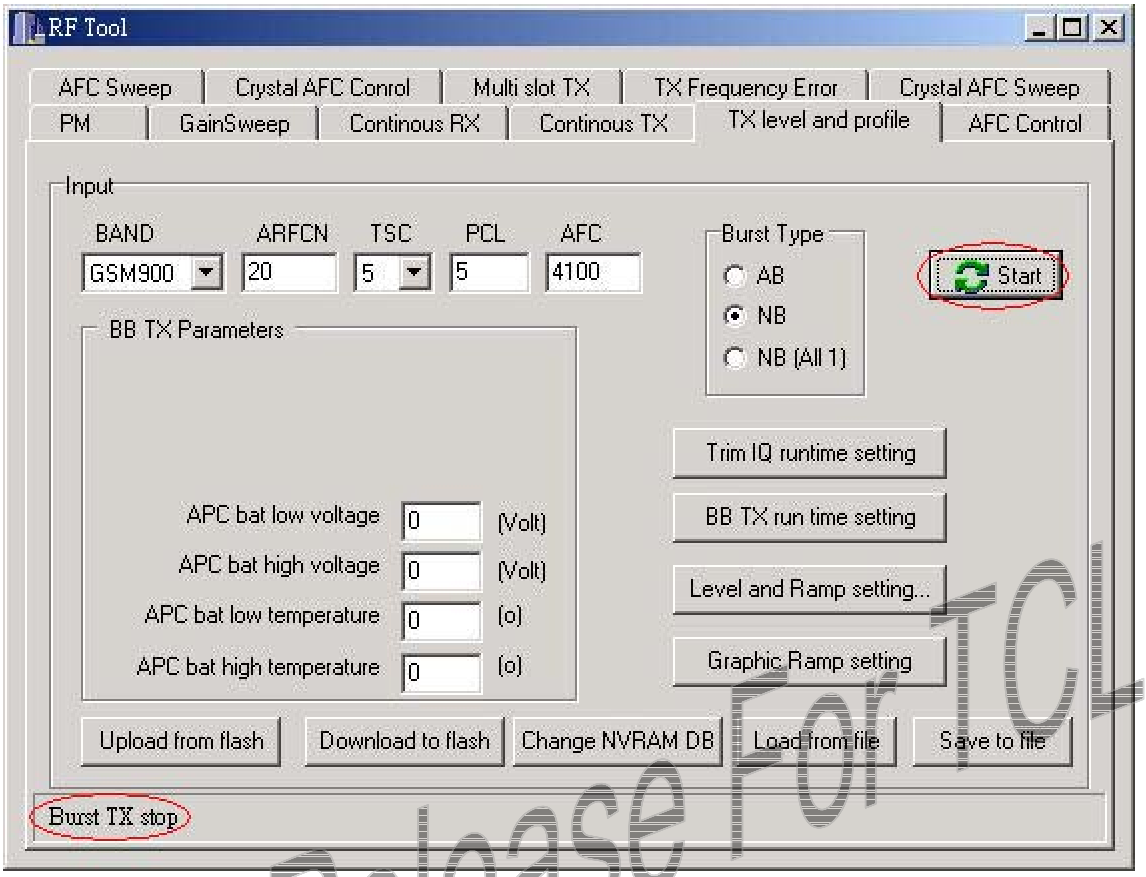

Figure 56 The caption of button will change to [Start]

3.2.5.1 Upload and download BB TX parameter in flash

User can click [Upload from flash] button to read BB TX parameter from flash and click [Download to flash] button to write BB TX parameter to flash.

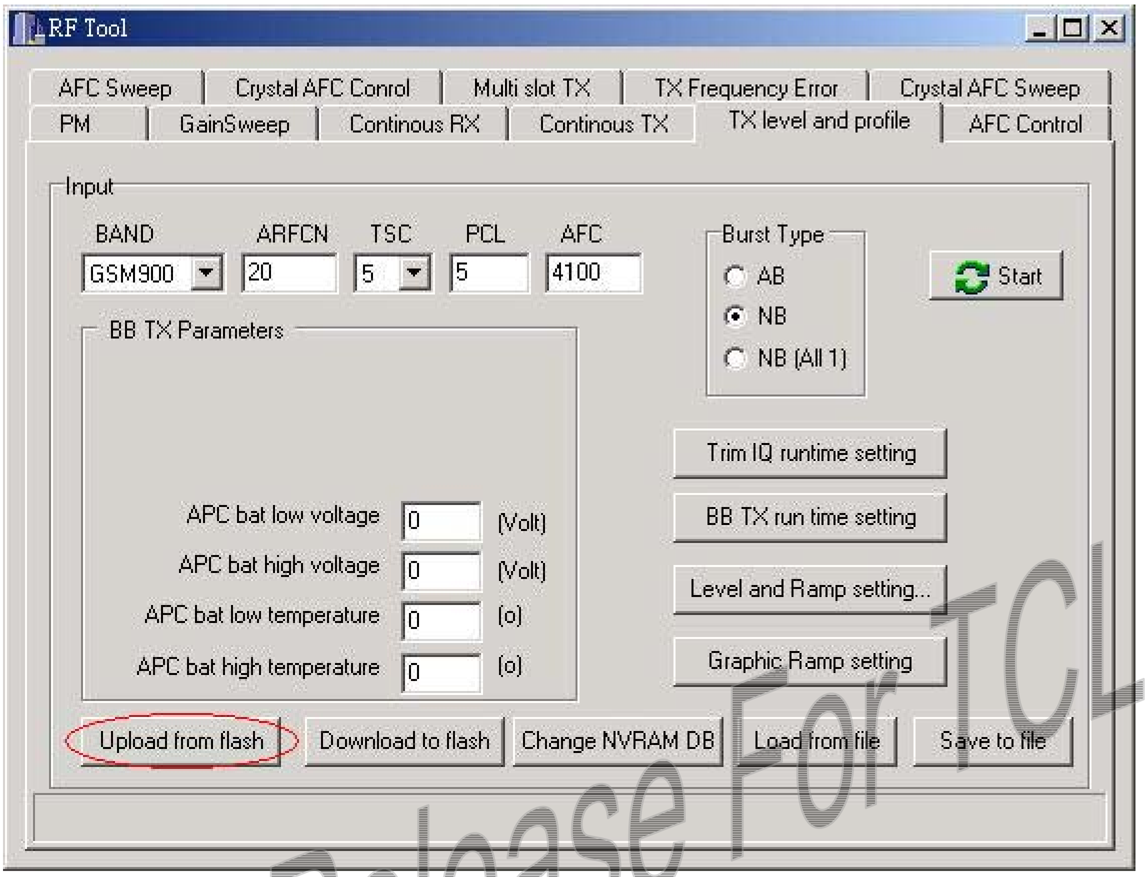

Figure 57 Click [Upload from flash] to read BB TX parameter from flash

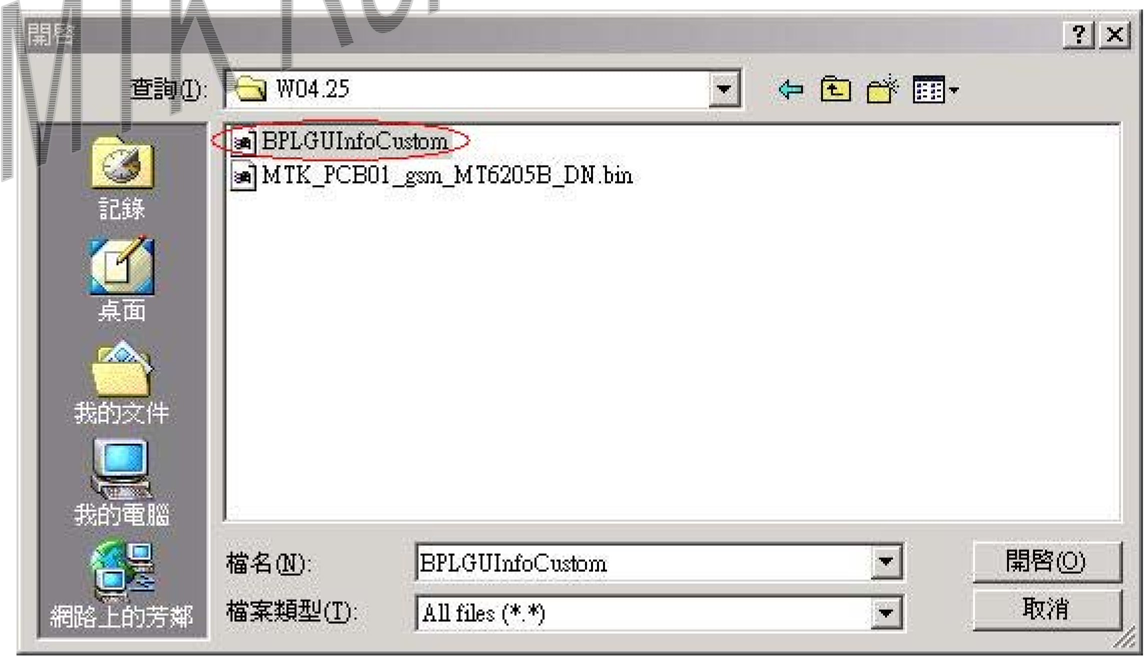

Figure 58 Select NVRAM database file if not selected before

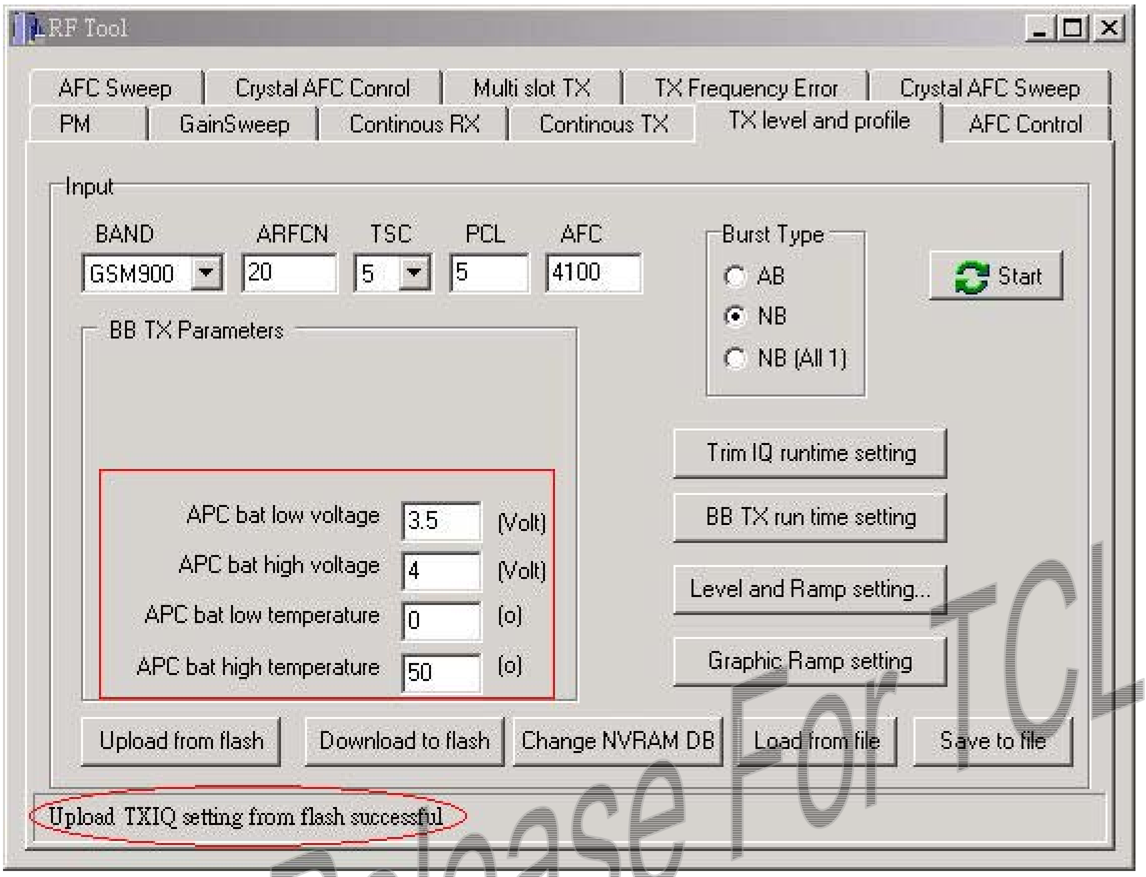

Figure 59 BB TX parameter result

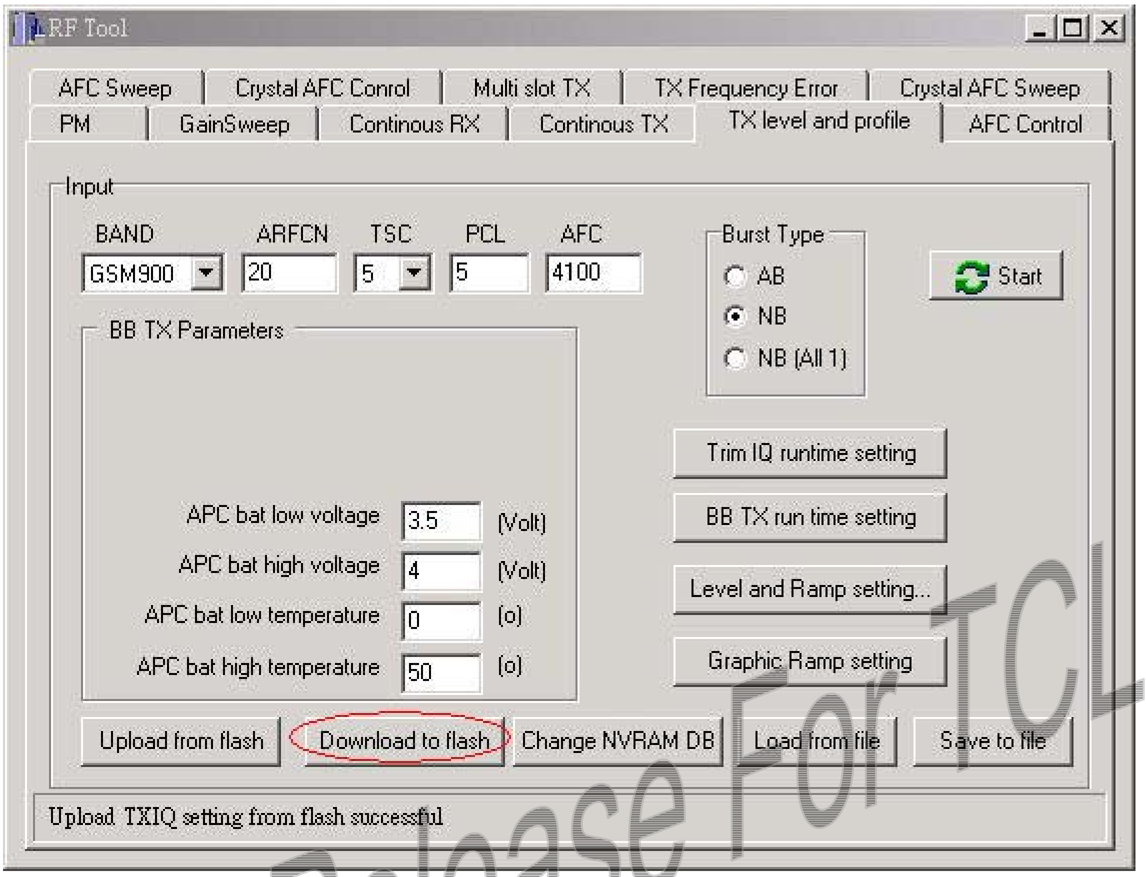

Figure 60 Click [Download to flash] button to download BB TX parameter to flash

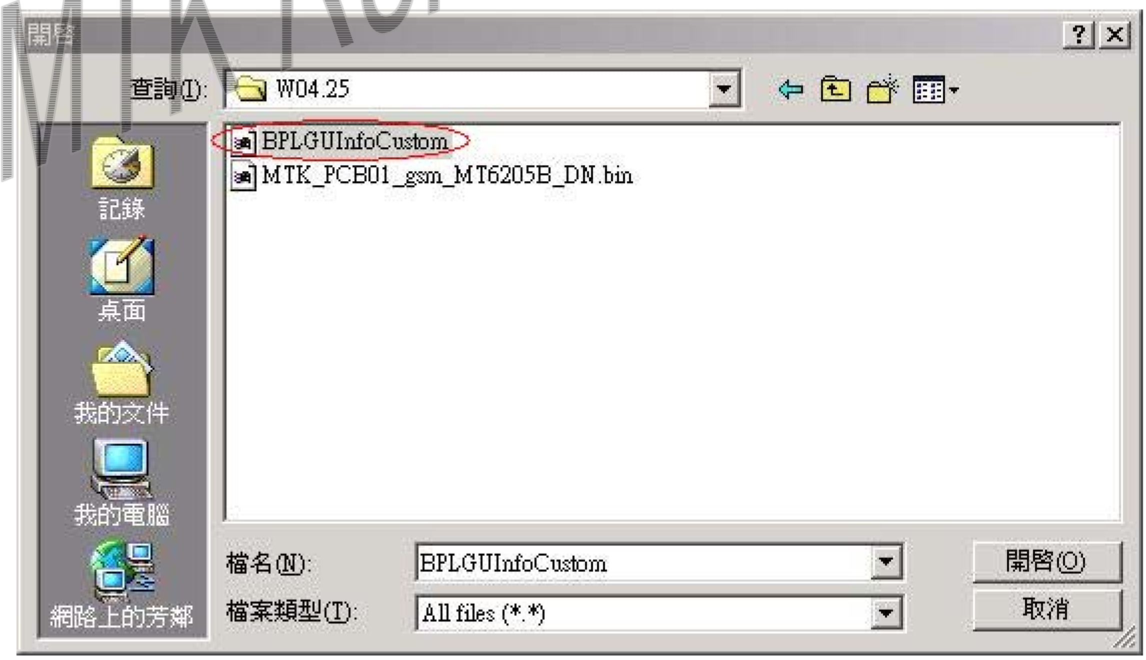

Figure 61 Select NVRAM database file if not selected before

If User wants to change NVRAM database file, he can click [Change NVRAM DB] button.

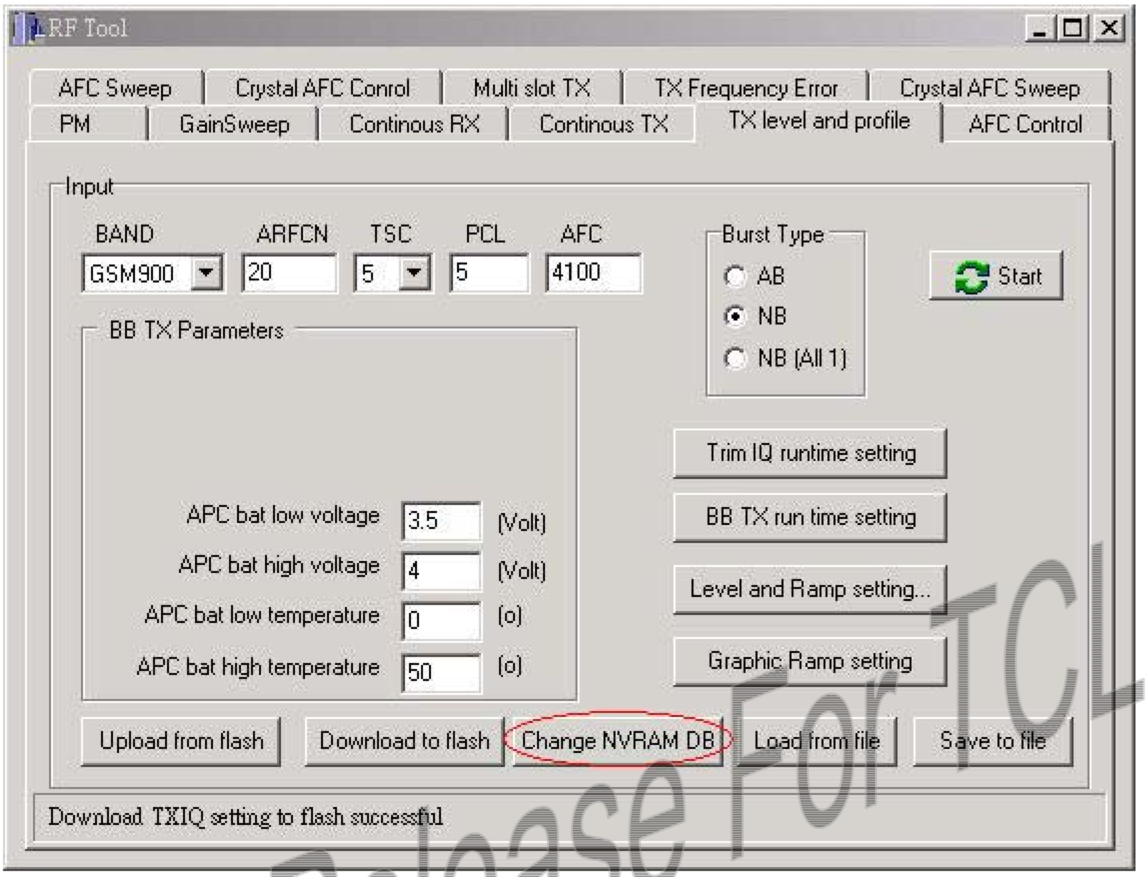

Figure 62 Click [Change NVRAM DB] button to change NVRAM database file

3.2.5.2 Read and write BB TX parameter in file

User can click [Load from file] button to read BB TX parameter from file and click [Save to file] button to write BB TX parameter to file.

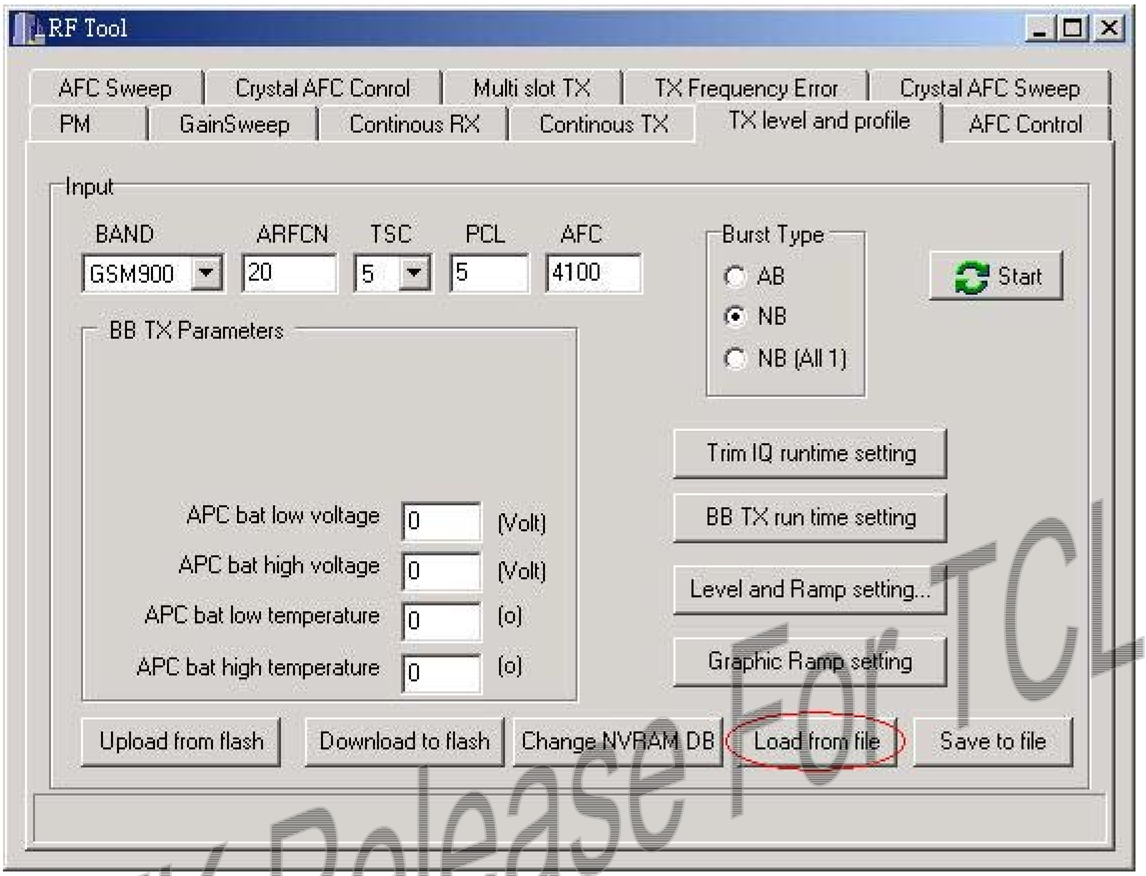

Figure 63 Click [Load from file] button to read BB TX parameter from file

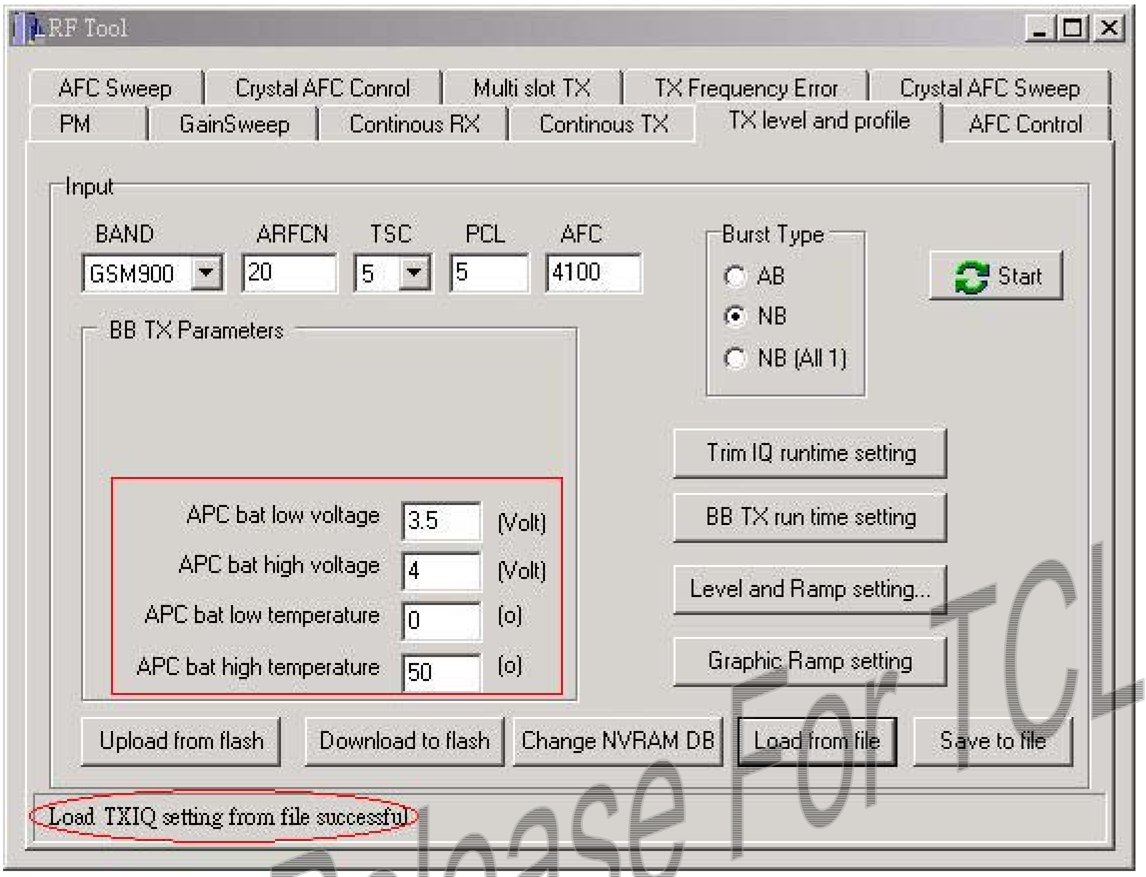

Figure 64 BB TX parameter result

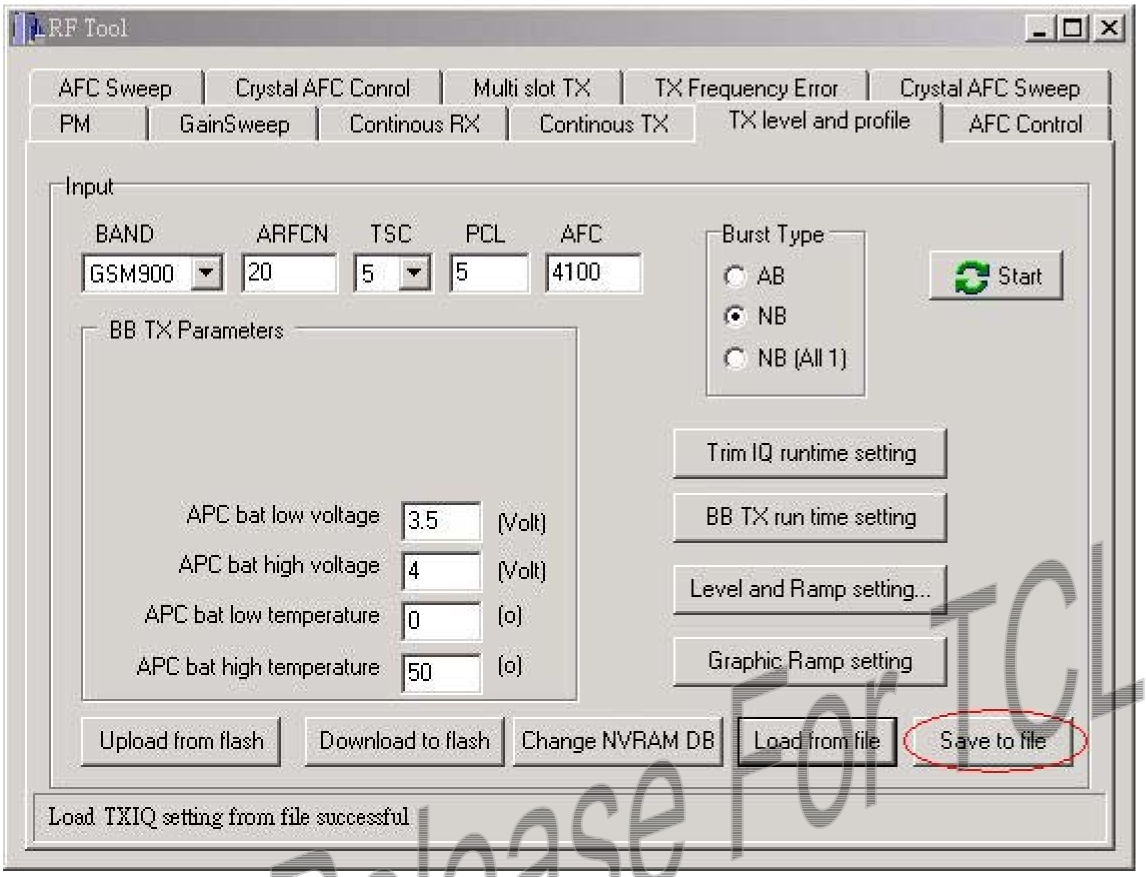

Figure 65 Click [Save to file] button to save BB TX parameter to file

The following is a template file of BB TX parameter. User will get the text file after saving BB TX parameter to file.

[BB TX Parameters]
APC bat low voltage=3.5
APC bat high voltage=4
APC bat low temperature=0
APC bat high temperature=50

3.2.5.3 Trim IQ run time setting

User can click [Trim IQ run time setting] button to show trim IQ and offset IQ run time setting window.

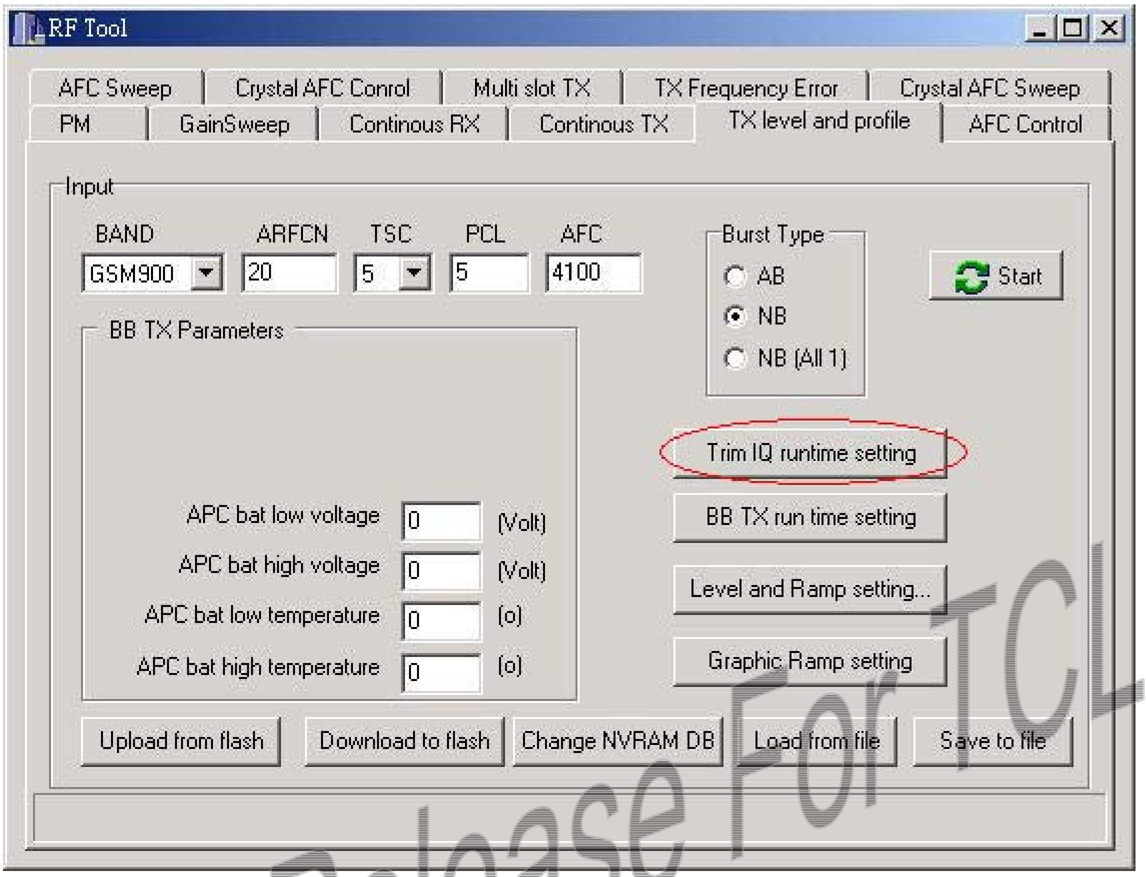

Figure 66 Click [Trim IQ run time setting] button to enter trim IQ and offset IQ run time setting window

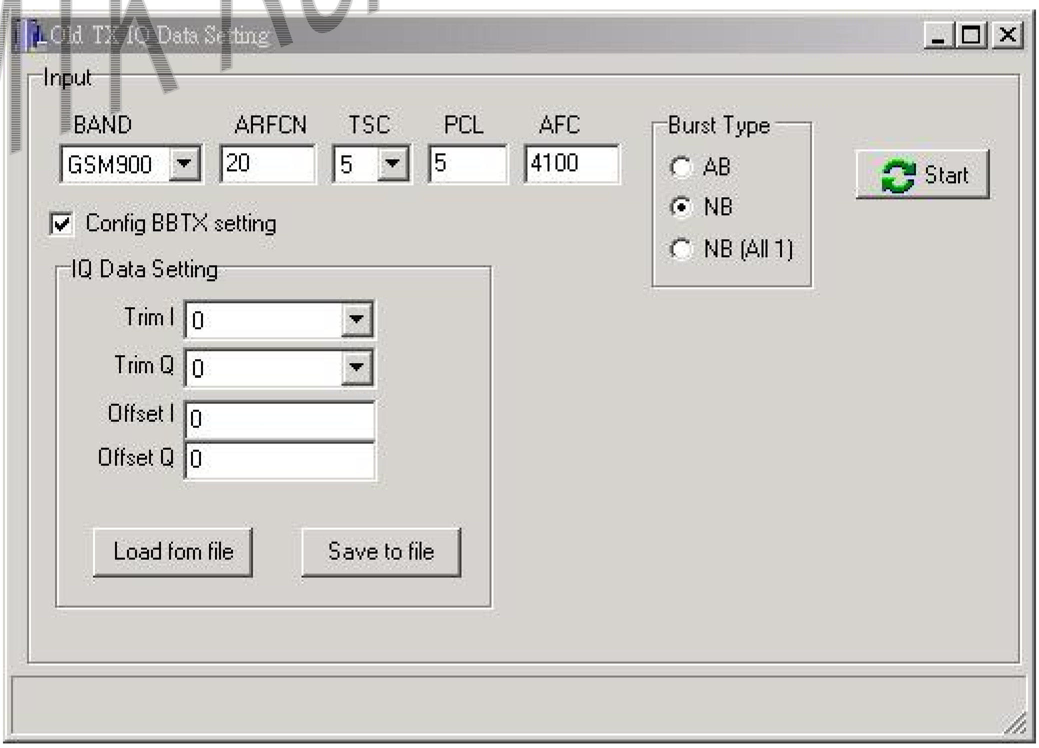

Figure 67 Trim IQ and offset IQ run time setting window

Trim IQ and offset IQ run time setting window is used for user to tune trim IQ and offset IQ. Power amplifier is turned on in this operation. User can input band, ARFCN, TSC (training sequence code), PCL (power control level), AFC DAC value, trim IQ, offset IQ and chose burst type and then click [Start] button to start TX test. After starting TX, the caption of the button will change to [Stop]. User can click [Stop] button to stop it.

If Config BBTX setting checkbox is checked, then Trim IQ and offset IQ value will be set to register, otherwise, Trim IQ and offset IQ value will not be set to register.

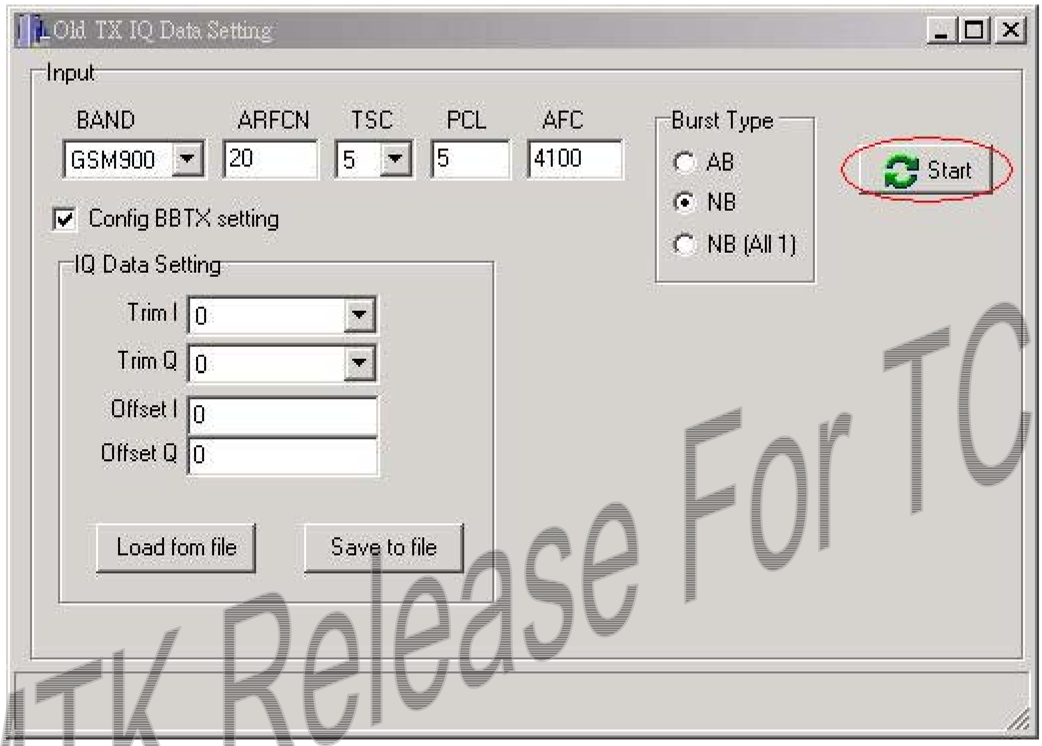

Figure 68 Click [Start] button to start TX level testing

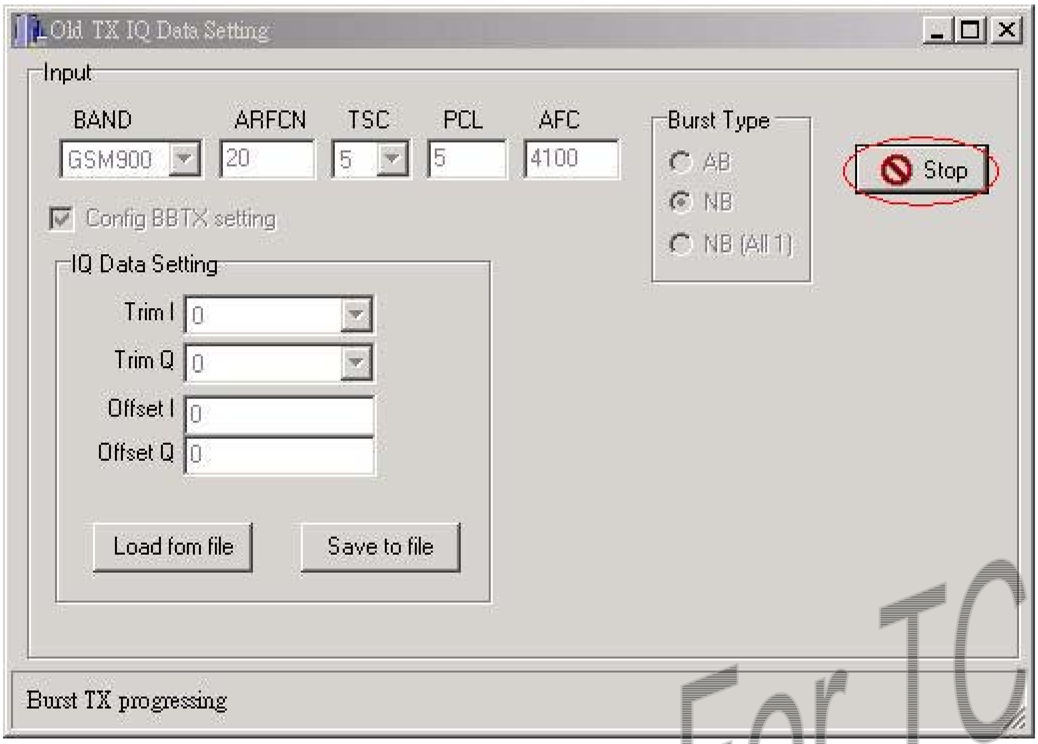

Figure 69 Click [Stop] button to stop testing

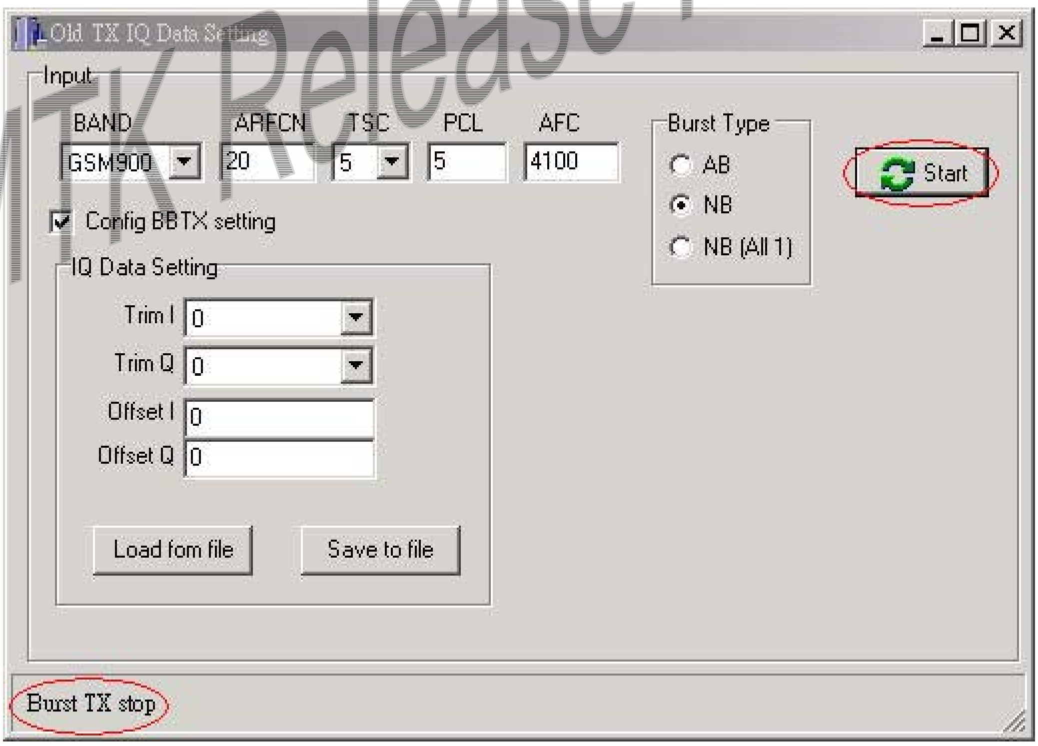

Figure 70 The caption of button will change to [Start]

User can click [Load from file] to load Trim IQ and offset IQ value from text file and click [Save to file] button to save Trim IQ and offset IQ to text file.

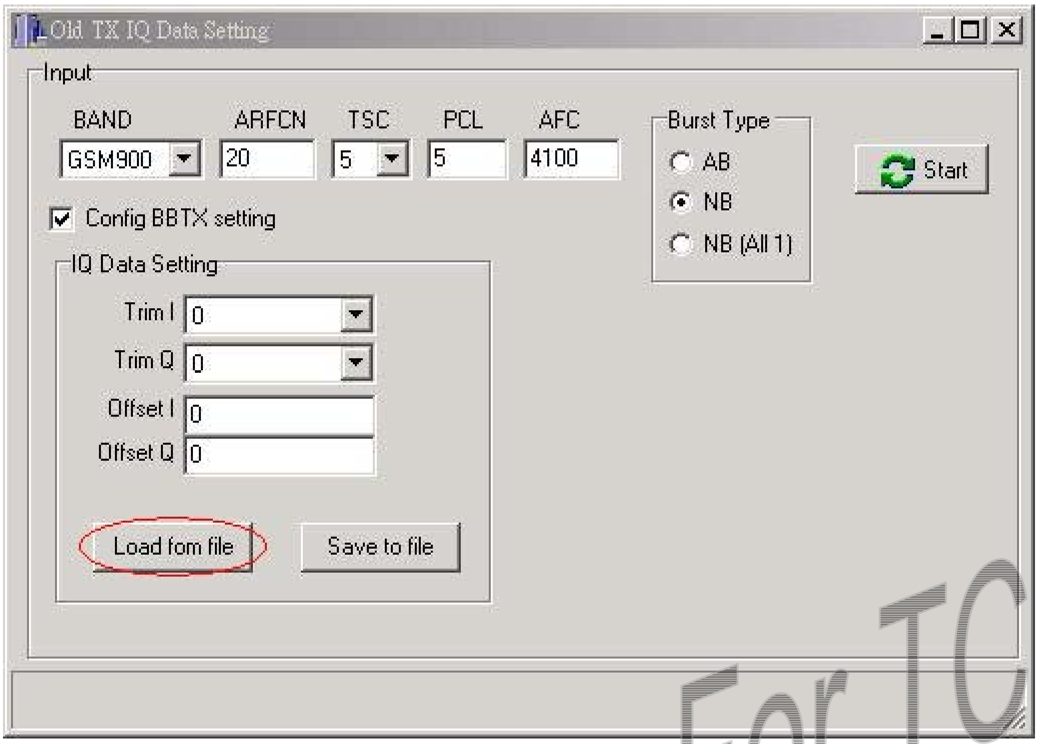

Figure 71 Click [Load from file] button to read Trim IQ and Offset IQ from file

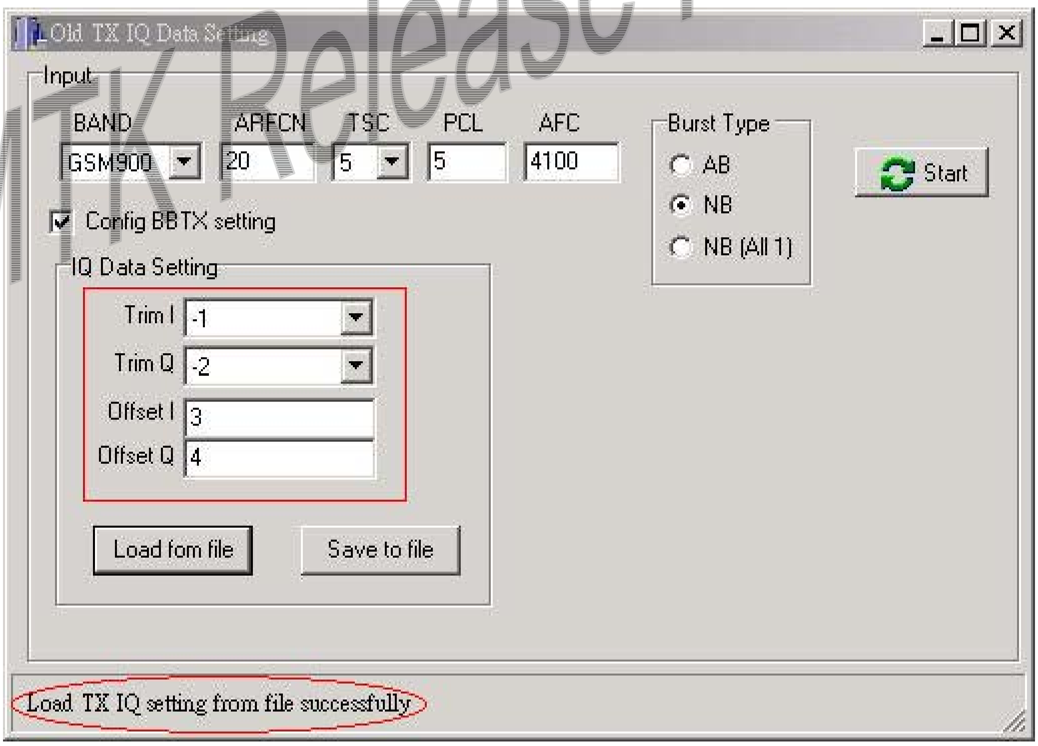

Figure 72 Trim IQ and Offset IQ result

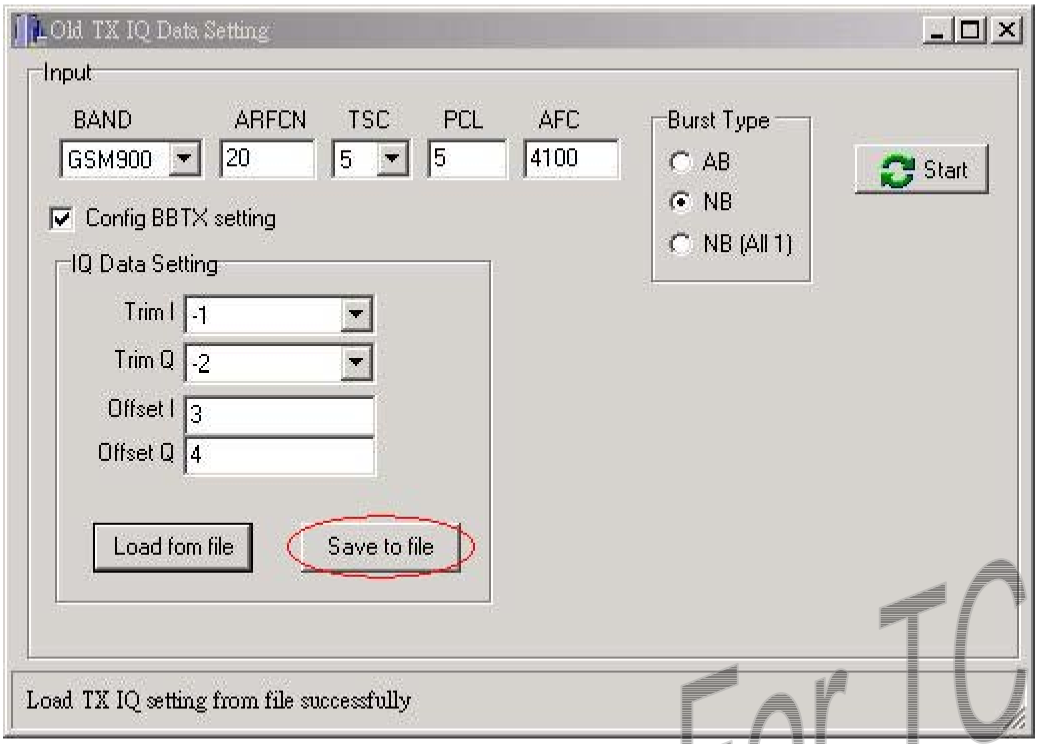

Figure 73 Click [Save to file] button to save Trim IQ and Offset IQ to file

The following is a template file of IQ data setting file. User will get the text file after saving IQ data setting to file.

[TX IQ setting]
Trim I=-1
Trim Q=-2
Offset I=3
Offset Q=4

Note: The meaning of Trim I, Trim Q and Offset I, Offset Q is as follows.

- Trim I: The field is used to control gain trimming of I-channel DAC in BBTX mixed-signal module.
- Trim Q: The field is used to control gain trimming of Q-channel DAC in BBTX mixed-signal module.
- Offset I: The field is used to control value of offset cancellation for I-channel DAC in TX mixed-signal module.
- Offset Q: The field is used to control value of offset cancellation for Q-channel DAC in TX mixed-signal module.

3.2.5.4 BB TX run time setting

User can click [BB TX run time setting] button to show BB TX run time setting window.

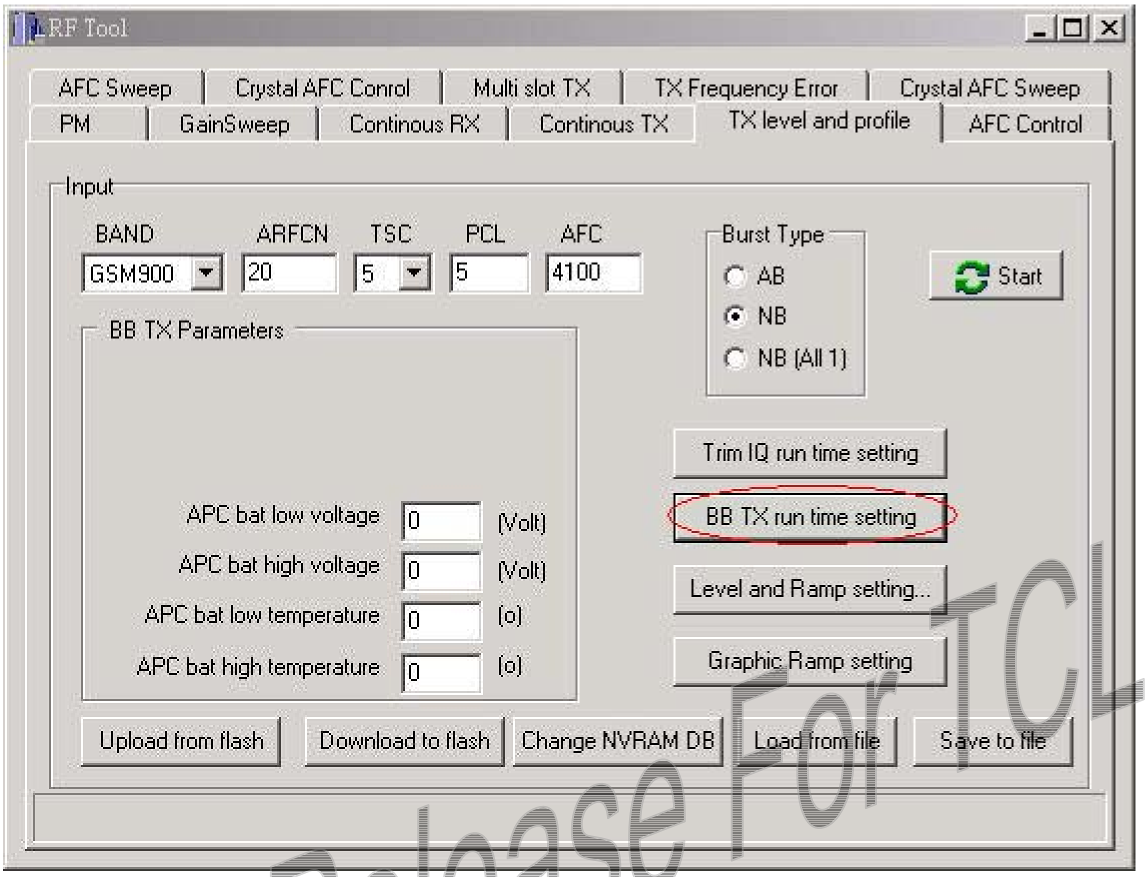

Figure 74 Click [BB TX run time setting] button to show BB TX run time setting window

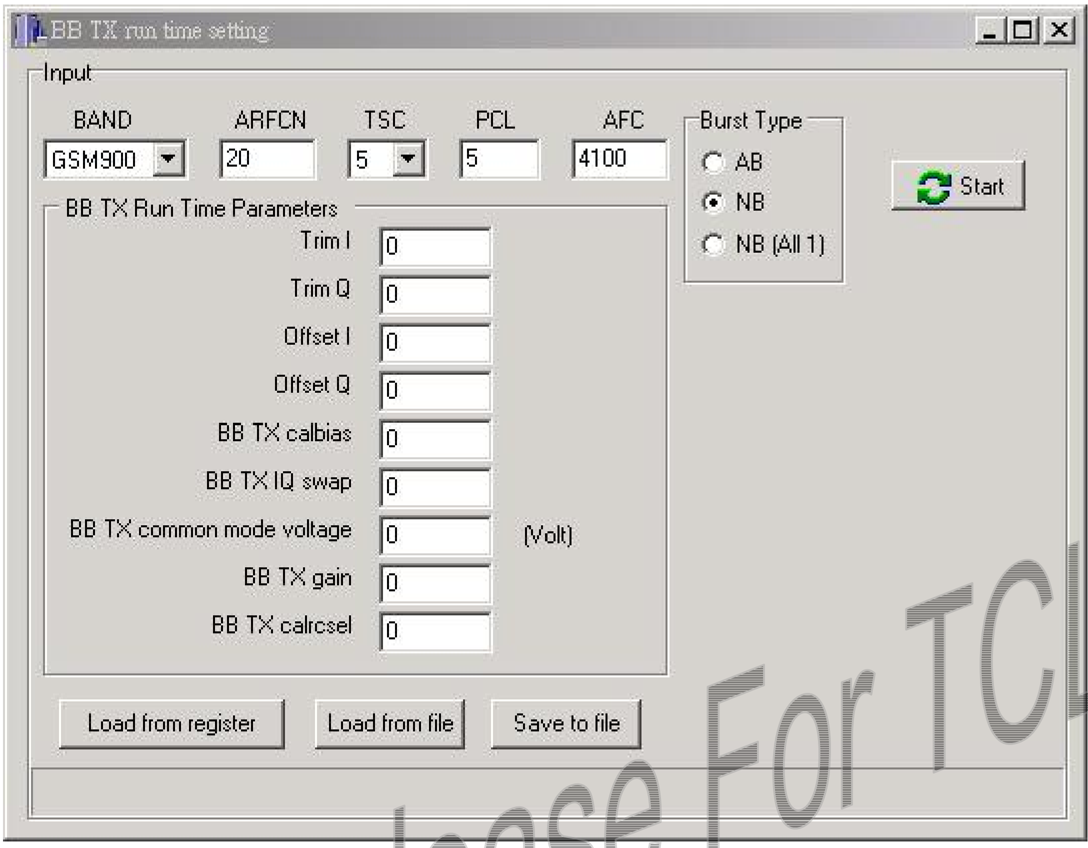

Figure 75 BB TX run time setting window

BB TX run time setting window is used for user to adjust BB TX parameter. Power amplifier is turned on in this operation. User can input band, ARFCN, TSC (training sequence code), PCL (power control level), AFC DAC value, BB TX run time parameters and chose burst type and then click [Start] button to start TX level test. After starting TX level, the caption of the button will change to [Stop]. User can click [Stop] button to stop it.

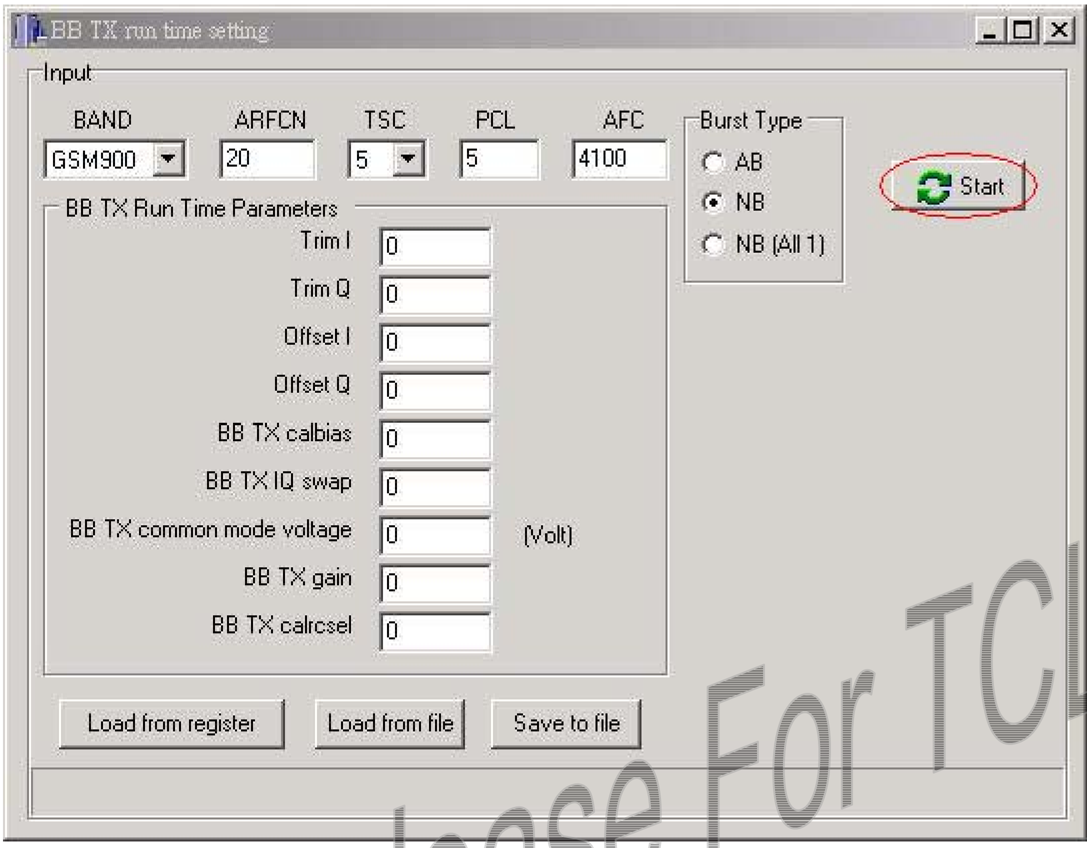

Figure 76 Click [Start] button to start TX level testing

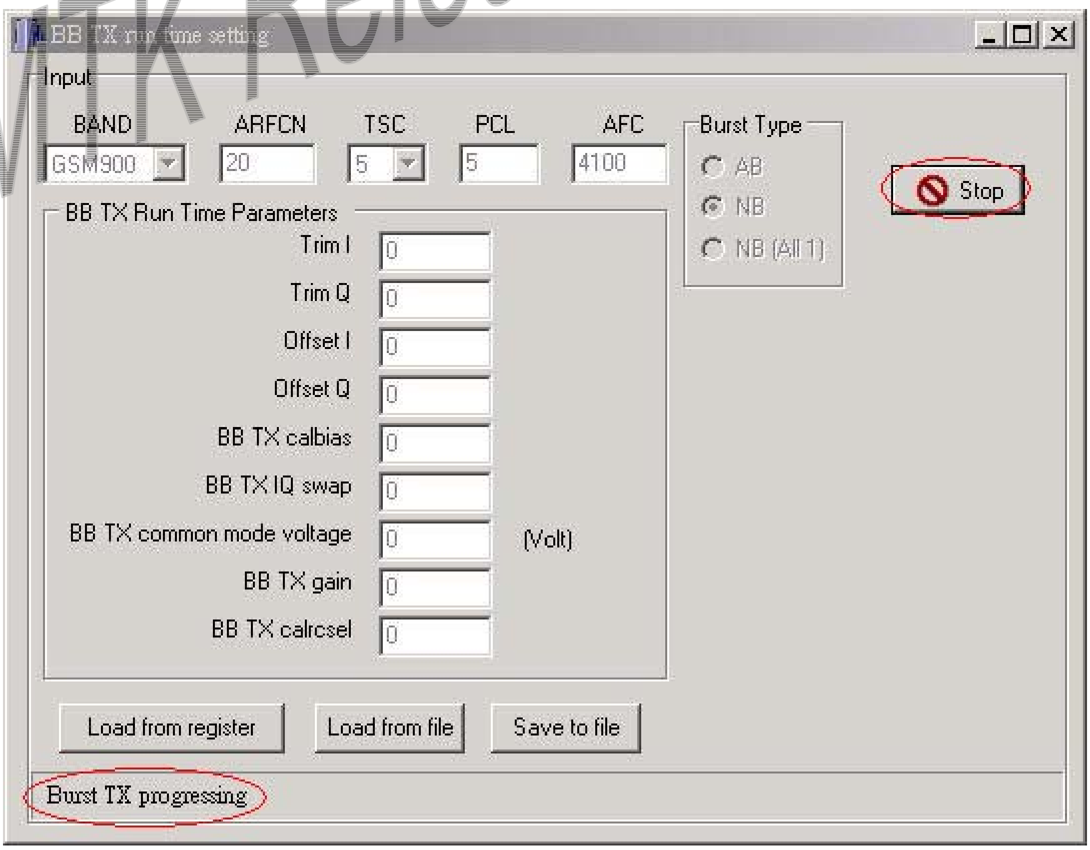

Figure 77 Click [Stop] button to stop testing

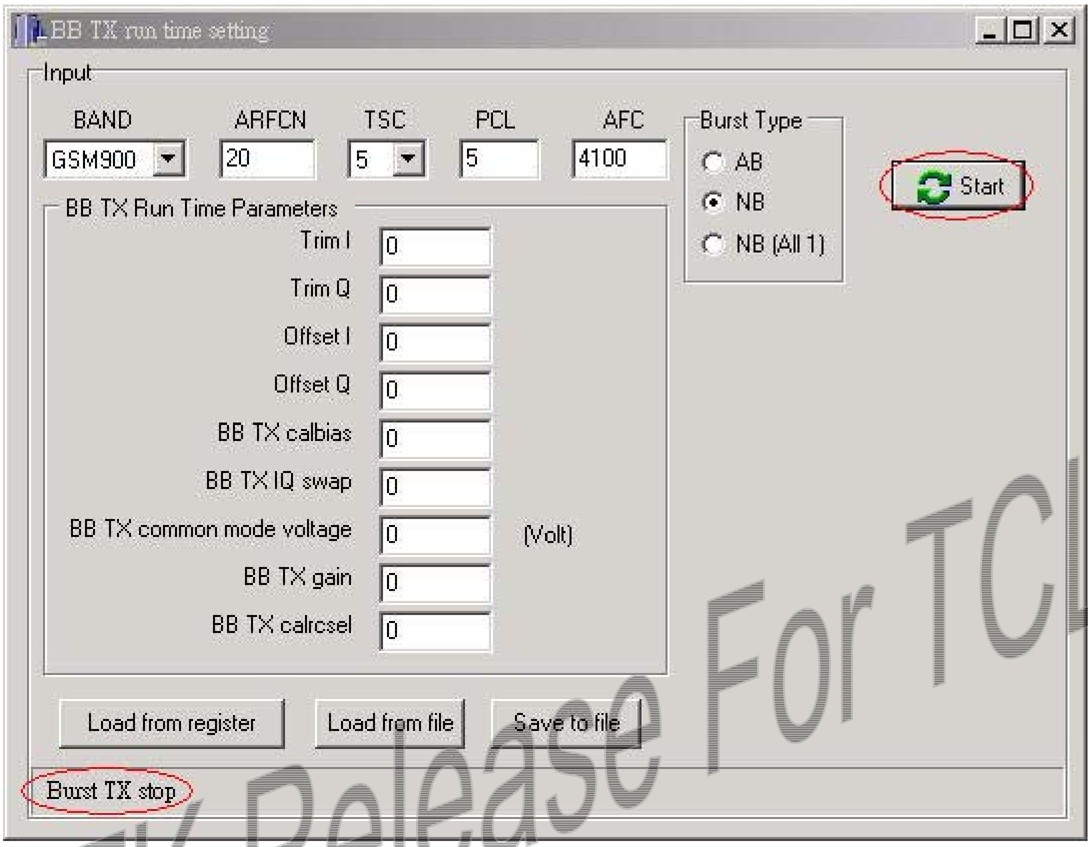

Figure 78 The caption of button will change to [Start]

User can click [Load from register] button to load BB TX run time setting from register.

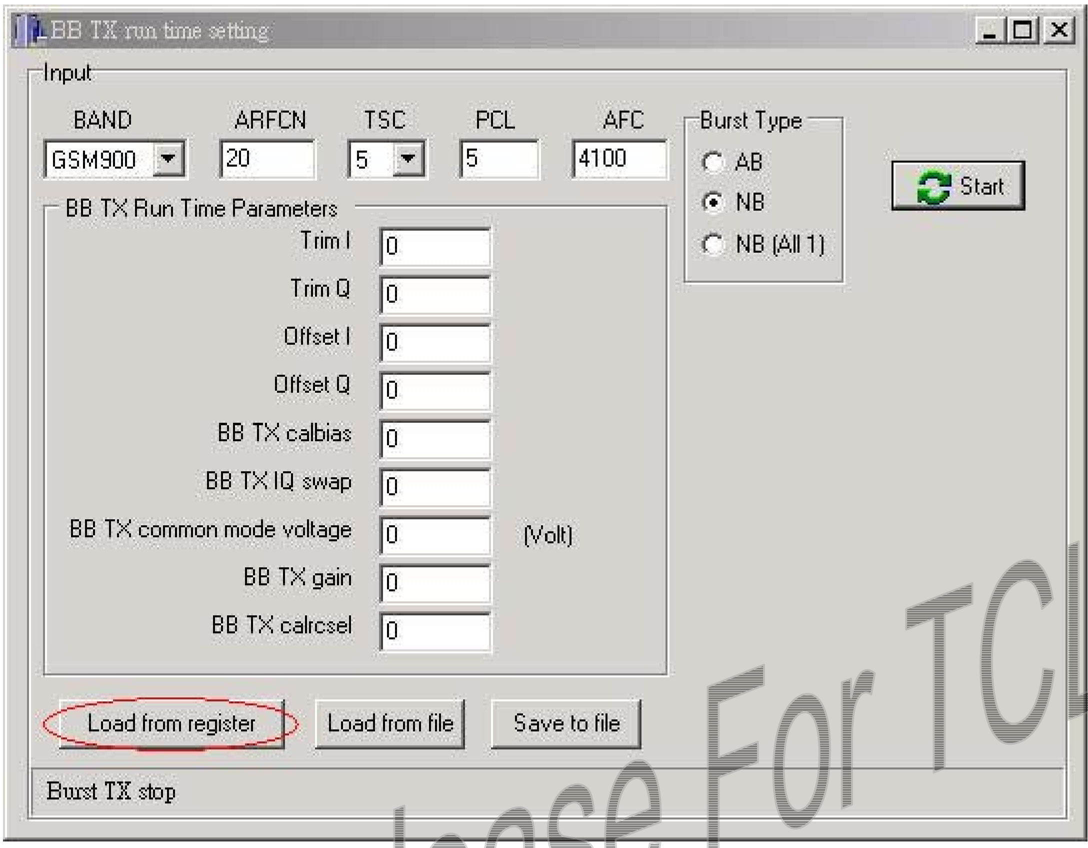

Figure 79 Click [Load from register] to read BB TX run time parameter from register

User can click [Load from file] button to read BB TX run time parameter from file and click [Save to file] button to write BB TX run time parameter to file.

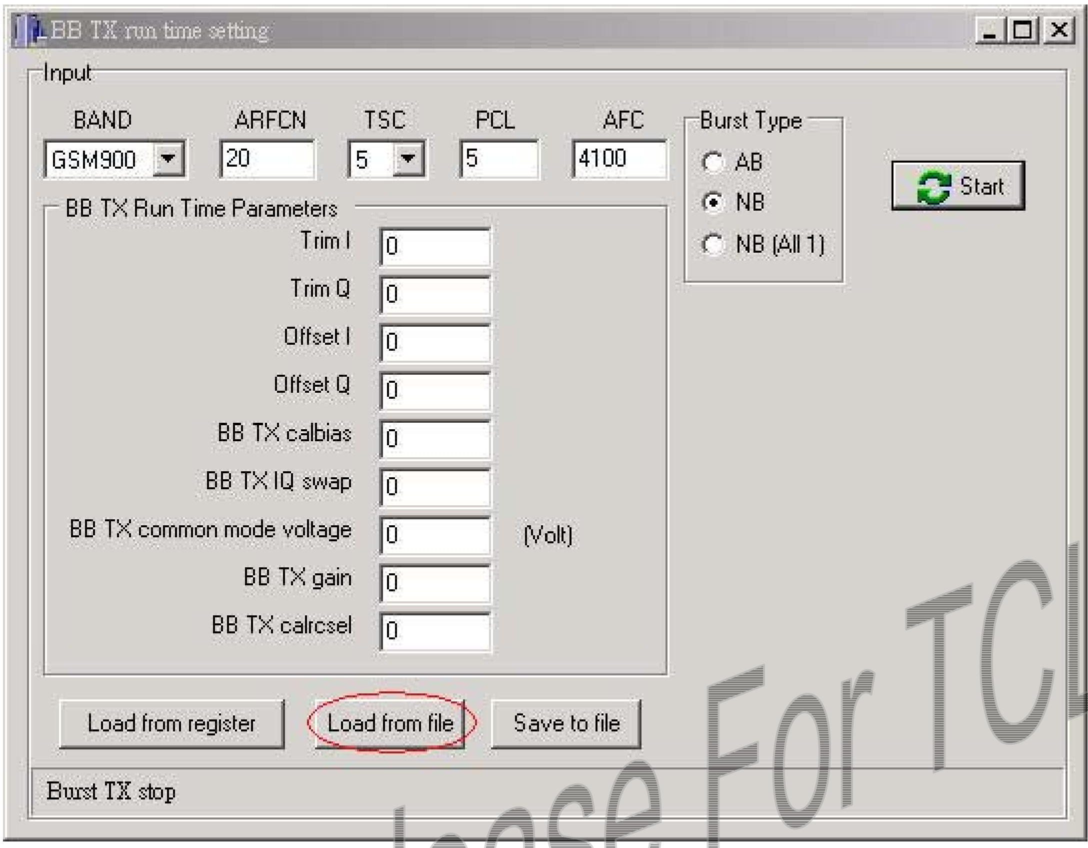

Figure 80 Click [Load from file] to read BB TX run time parameter from file

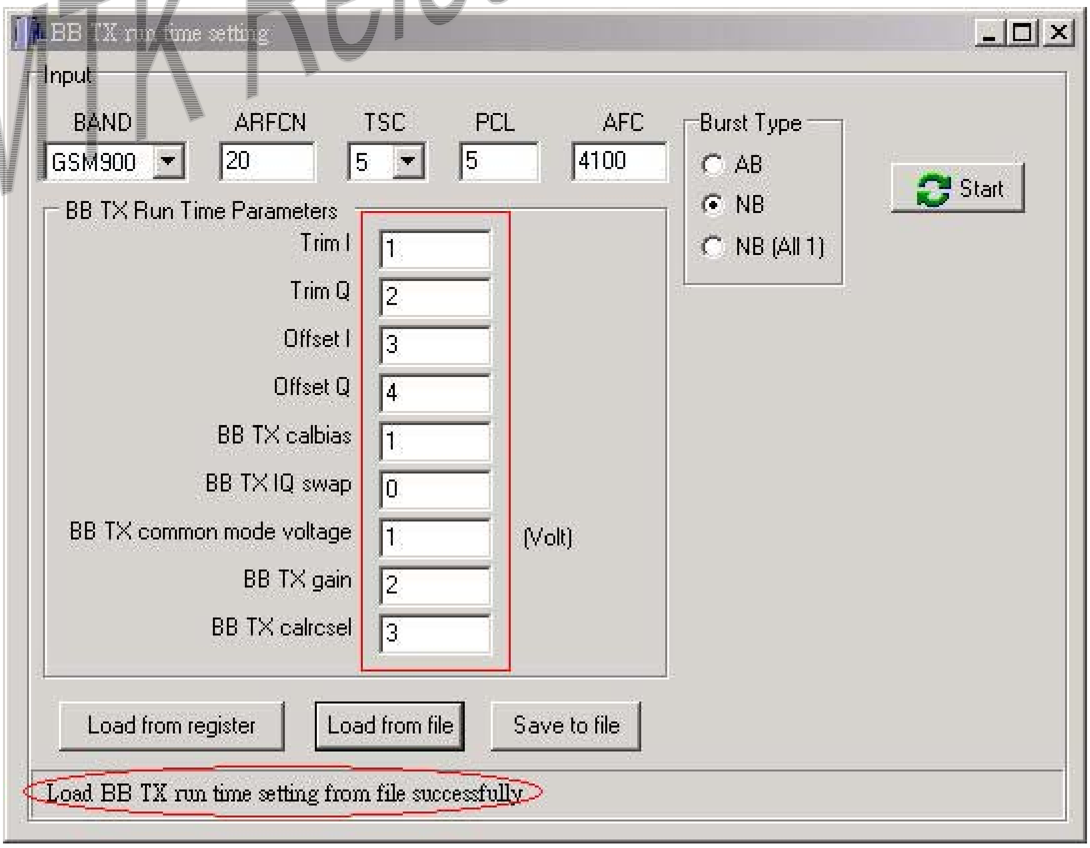

Figure 81 BB TX run time parameter result

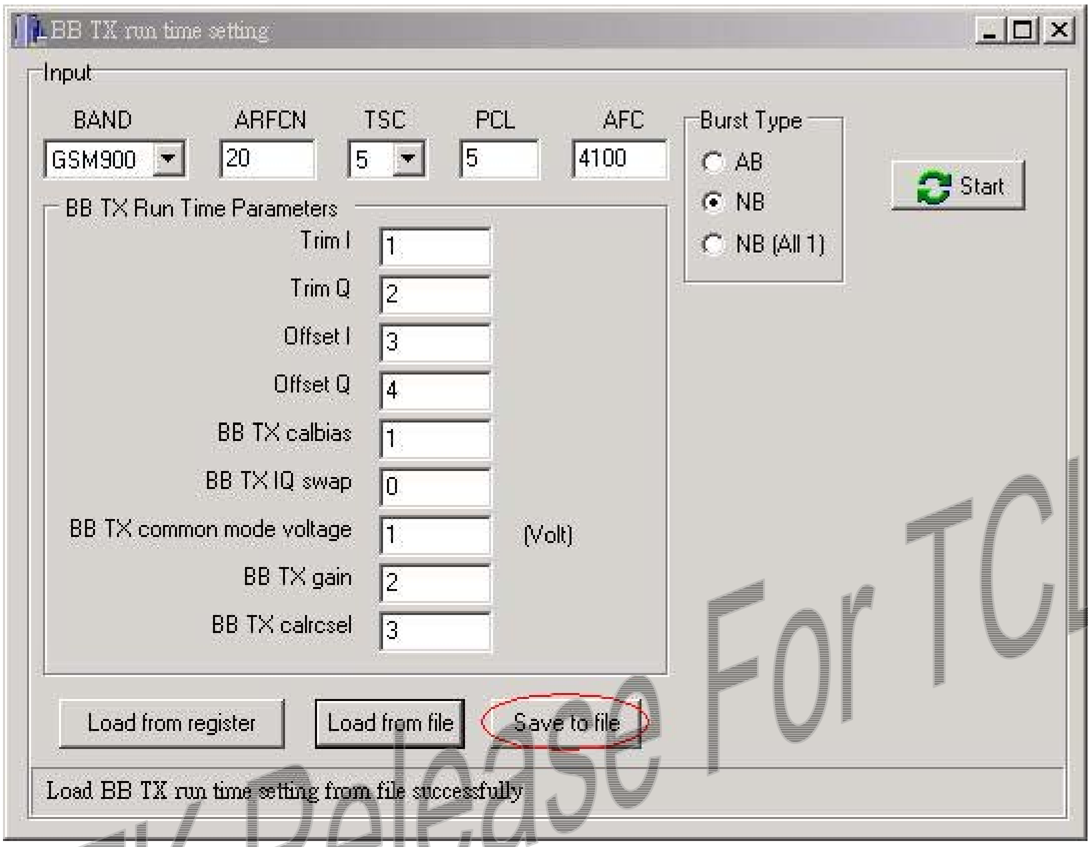

Figure 82 Click [Save to file] to save BB TX run time parameter to file

The following is a template file of BB TX run time parameter file. User will get the text file after saving BB TX run time parameter to file.

[BB TX Run Time Parameters]
Trim I=1
Trim Q=2
Offset I=3
Offset Q=4
BB TX calbias=1
BB TX IQ swap=0
BB TX common mode voltage=1
BB TX gain=2
BB TX calrcsel=3

Note: The meaning of BB TX run time parameters is as follows.

- Trim I: this field is used to control gain trimming of I-channel DAC in BB TX mixed-signal module.
- Trim Q: this field is used to control gain trimming of Q-channel DAC in BB TX mixed-signal module.
- Offset I: this field is used to control value of offset cancellation for I-channel DAC in BB TX mixed-signal module.
- Offset Q: this field is used to control value of offset cancellation for Q-channel DAC in BB TX

mixed-signal module.

- BB TX Calbias: this field is used for control of biasing current in BBTX mixed-signal module.
- BB TX IQSwap: this field is used for control of I/Q swapping. When the bit is set to '1', phase on I/Q plane will rotate inverse direction
- BB TX common voltage gain: this field is used to control common voltage in TX mixed-signal module. It is coded in 2's complement with maximum 3 and minimum -4.
- BB TX gain: this filed is used to control gain of DAC in TX mixed-signal module. It is coded in 2's complement with maximum 3 and minimum -4.
- BB TX calrcsel: This filed is used to select cutoff frequency of smoothing filter in TX mixed-signal module.It is coded in 2's complement with maximum 3 and minimum -4.

3.2.5.5 Level and ramp setting

User can click [level and ramp setting…] button to show the level and ramp window.

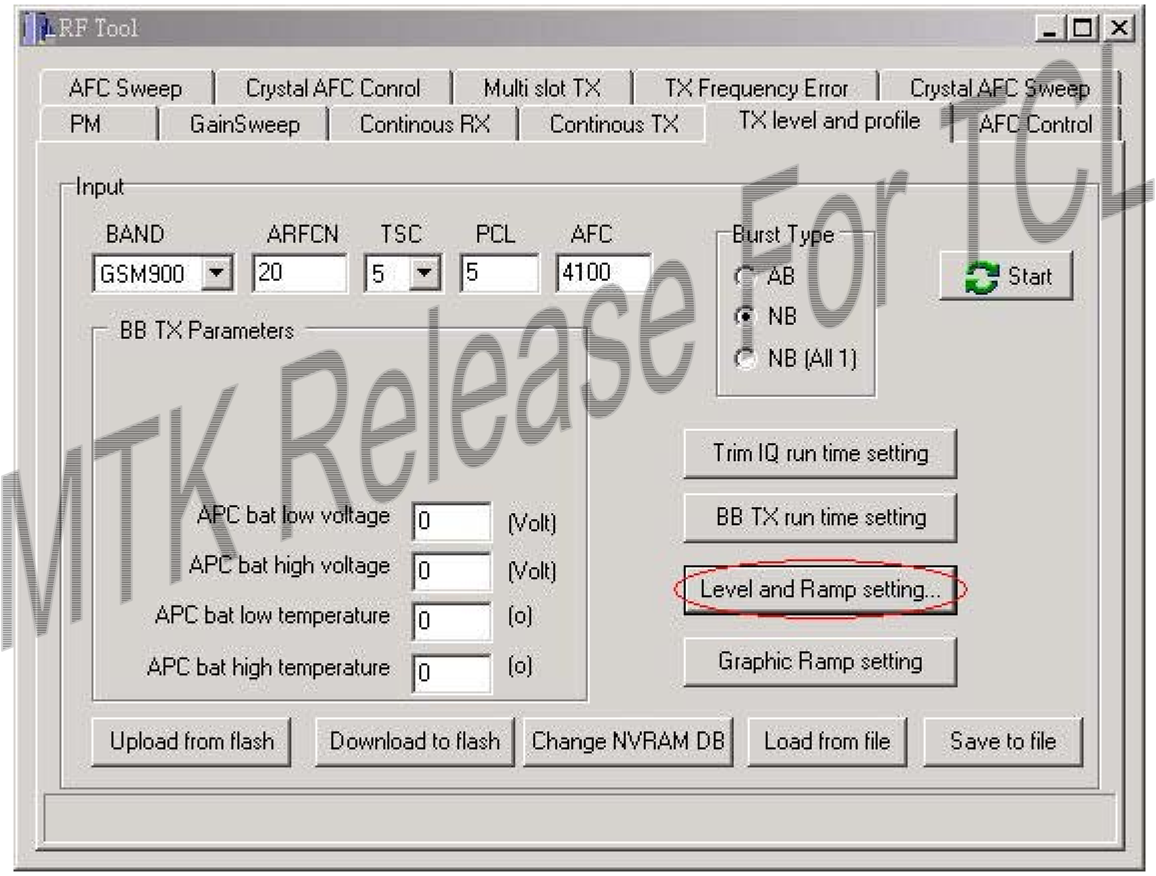

Figure 83 Click [Level and Ramp setting…] button

User can set the TX level (scale factor) for each PCL (power control level). MS will adopt the scale factor for corresponding PCL while transmitting RF. Regarding ramp profile, each PCL could have its own ramp profile.

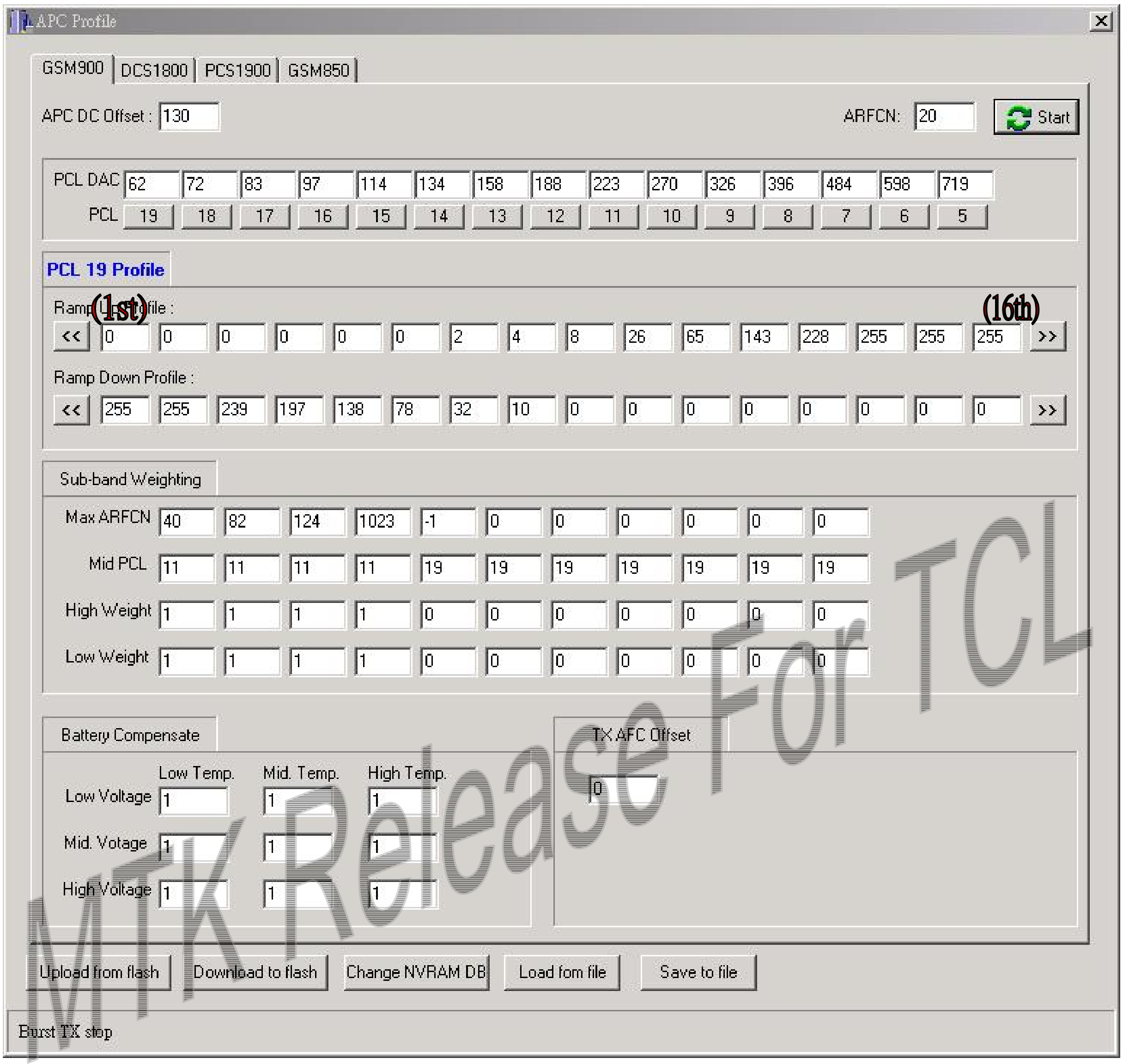

Figure 84 Level and Ramp setting window

Note:

- APC DC offset: the field specifies the pedestal value of the APC unit. The APC D/A converter is powered up biased on the offset value specified by the field.
- Mid PCL : the level below the [Mid PCL] will be multiplied by [low weight], and the level above [Mid PCL] will be multiplied by [high weight].
- high weight : each entry of the ramp profile of level above [Mid PCL] will be multiplied by [high weight].
- low weight : each entry of the ramp profile of level below [Mid PCL] will be multiplied by [low weight].
- Battery compensate: These 3x3 array compensate the APC scaling factor under low/mid/high voltage/temperature.
- TX AFC Offset: the field specifies the crystal TX AFC Offset. Crystal TX AFC DAC = Crystal RX AFC DAC + TX AFC Offset.

User can input APC DAC offset, ARFCN, PCL (power control level) DAC, ramp up/down profile, sub-band weighting and battery compensation value and then press [Start] button to start TX level testing.

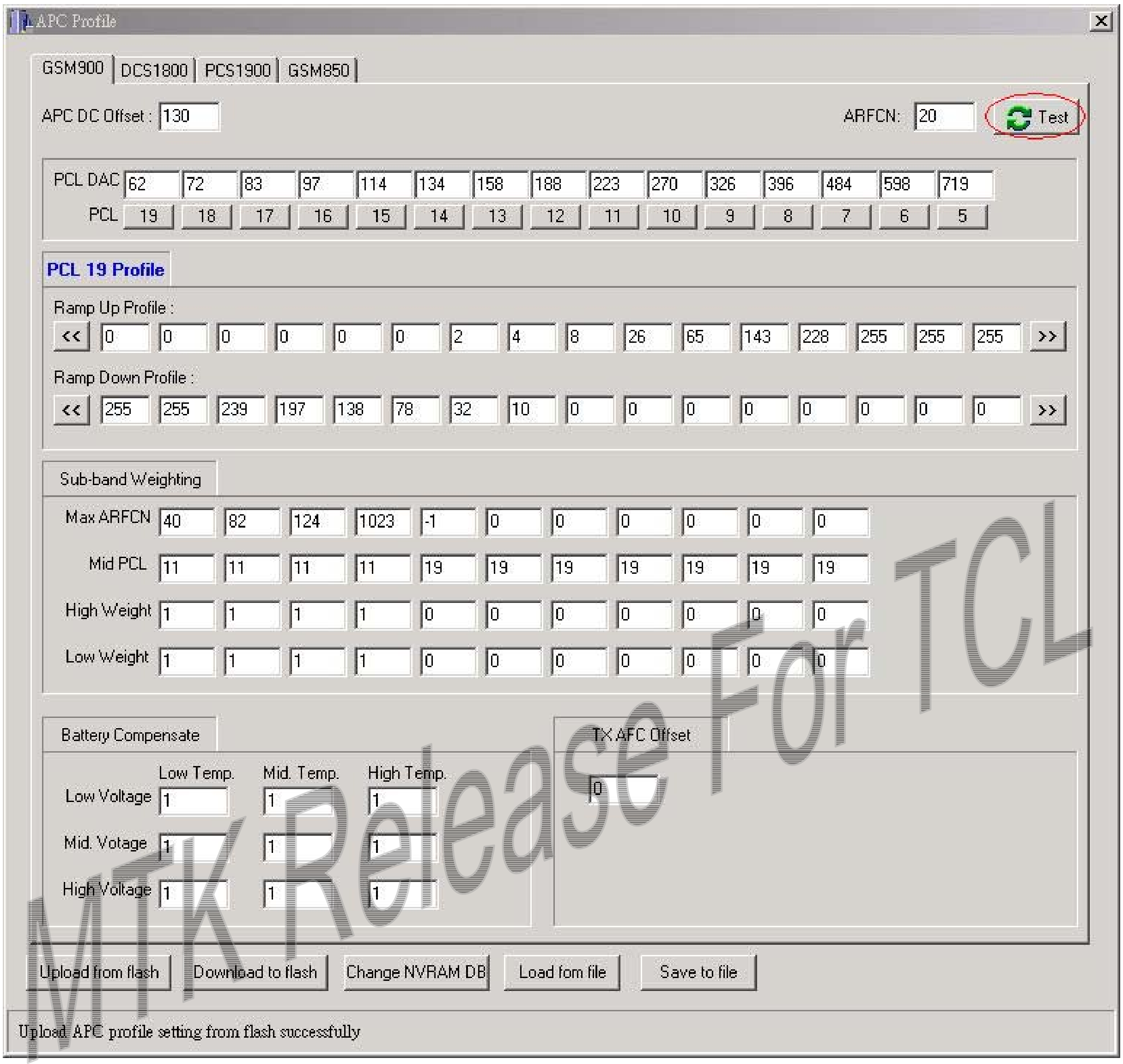

Figure 85 Click [Start] button to start TX level testing

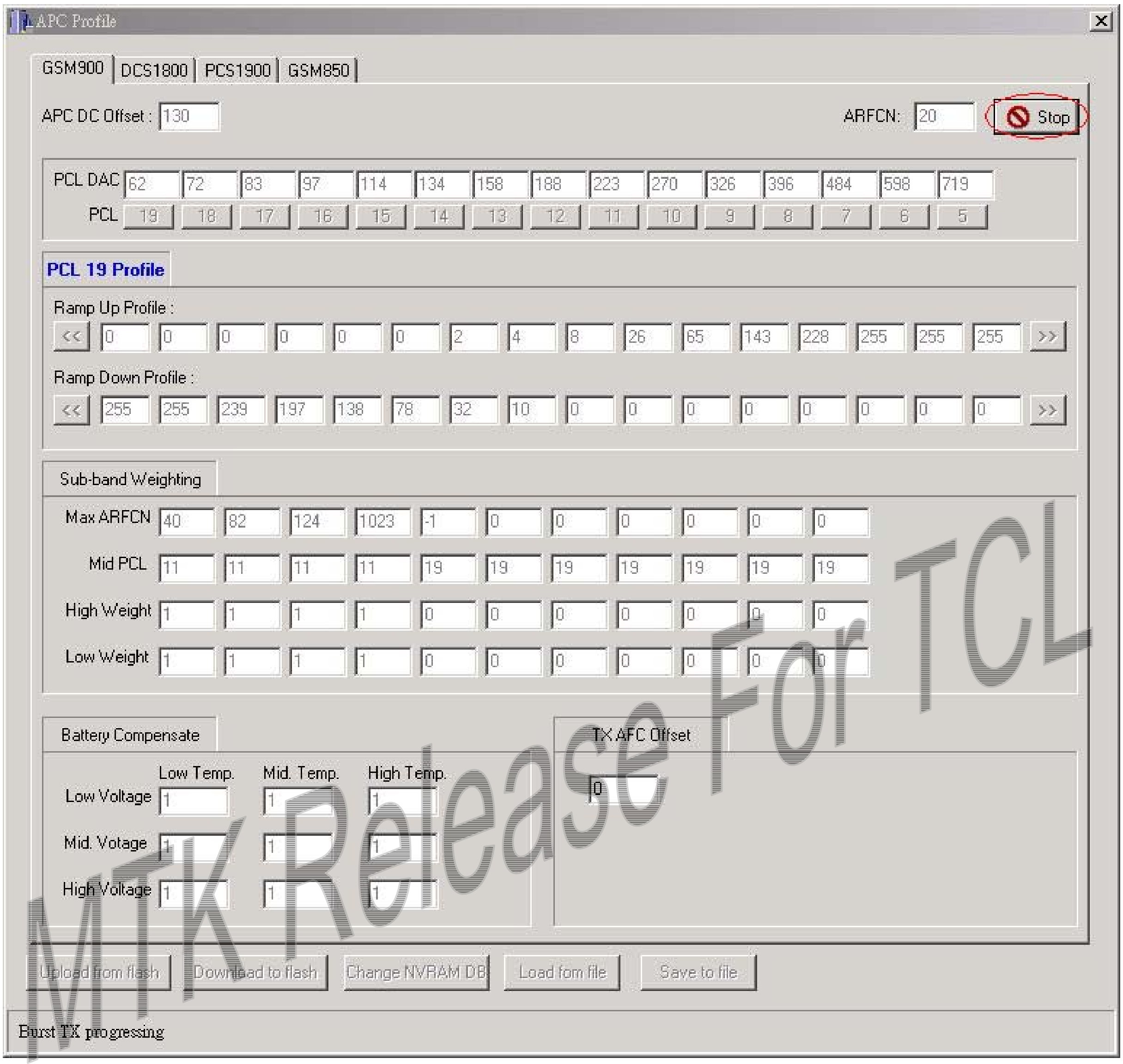

Figure 86 Click [Stop] button to stop testing

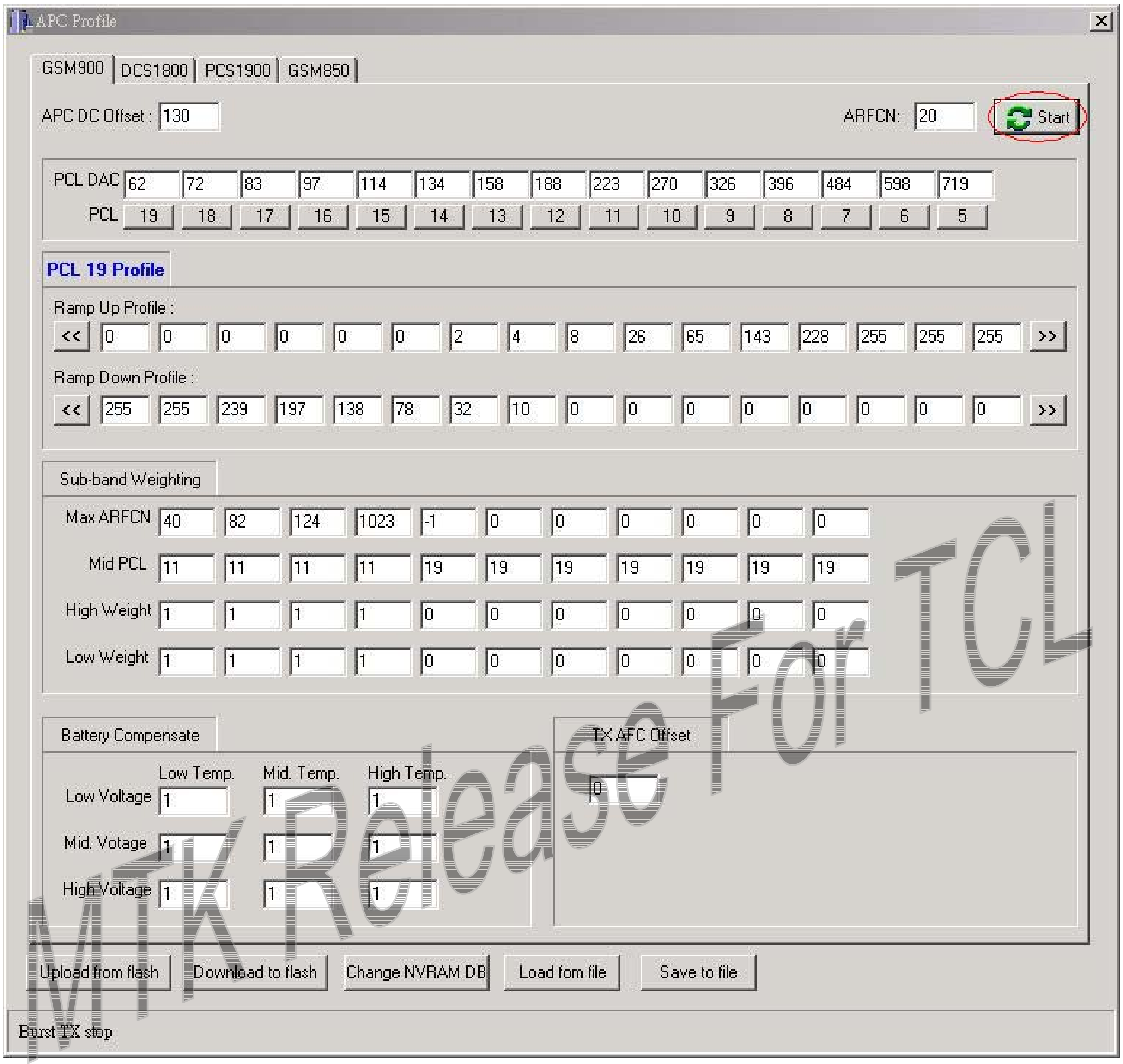

Figure 87 The caption of button will change to [Start]

3.2.5.5.a Read and write the level ramp table in flash

User can click [Upload from flash] button to read level ramp table from flash and click [Download to flash] button to write level ramp table to flash.

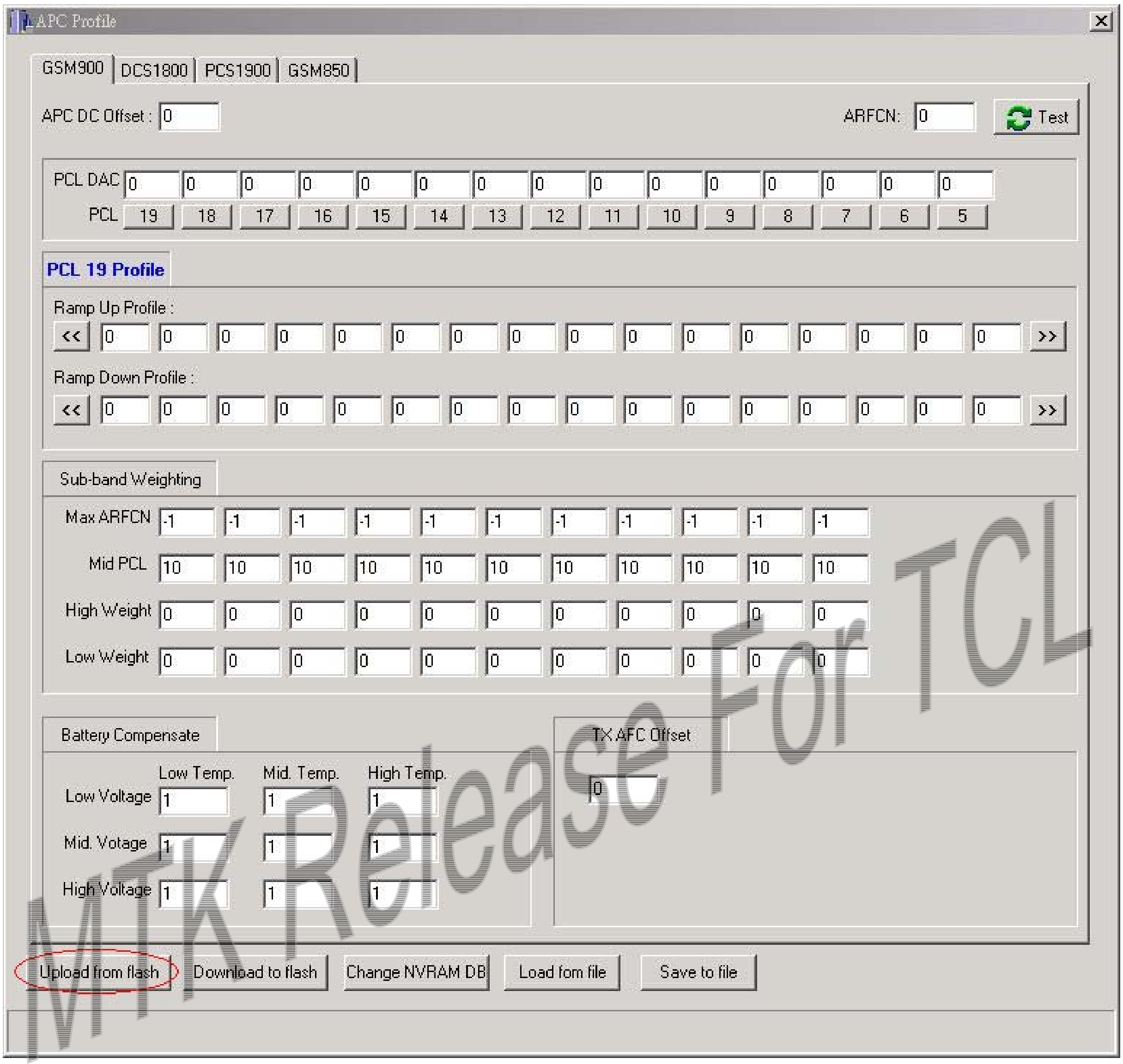

Figure 88 Click [upload from flash] button to read ramp table from flash.

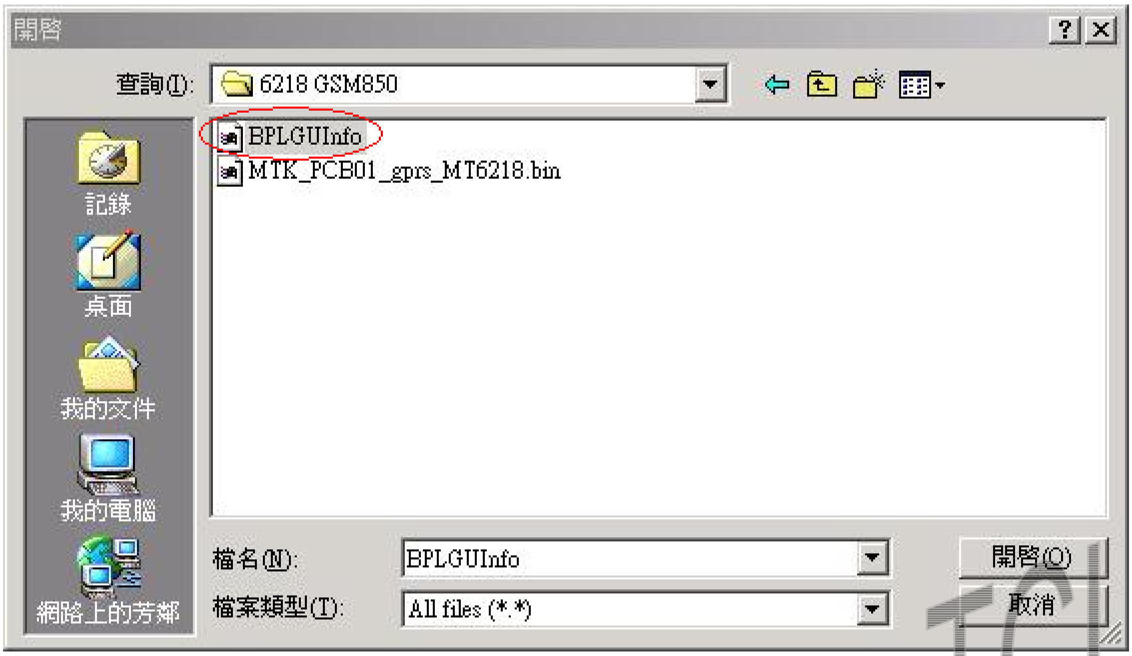

Figure 89 Select NVRAM database file if not selected before

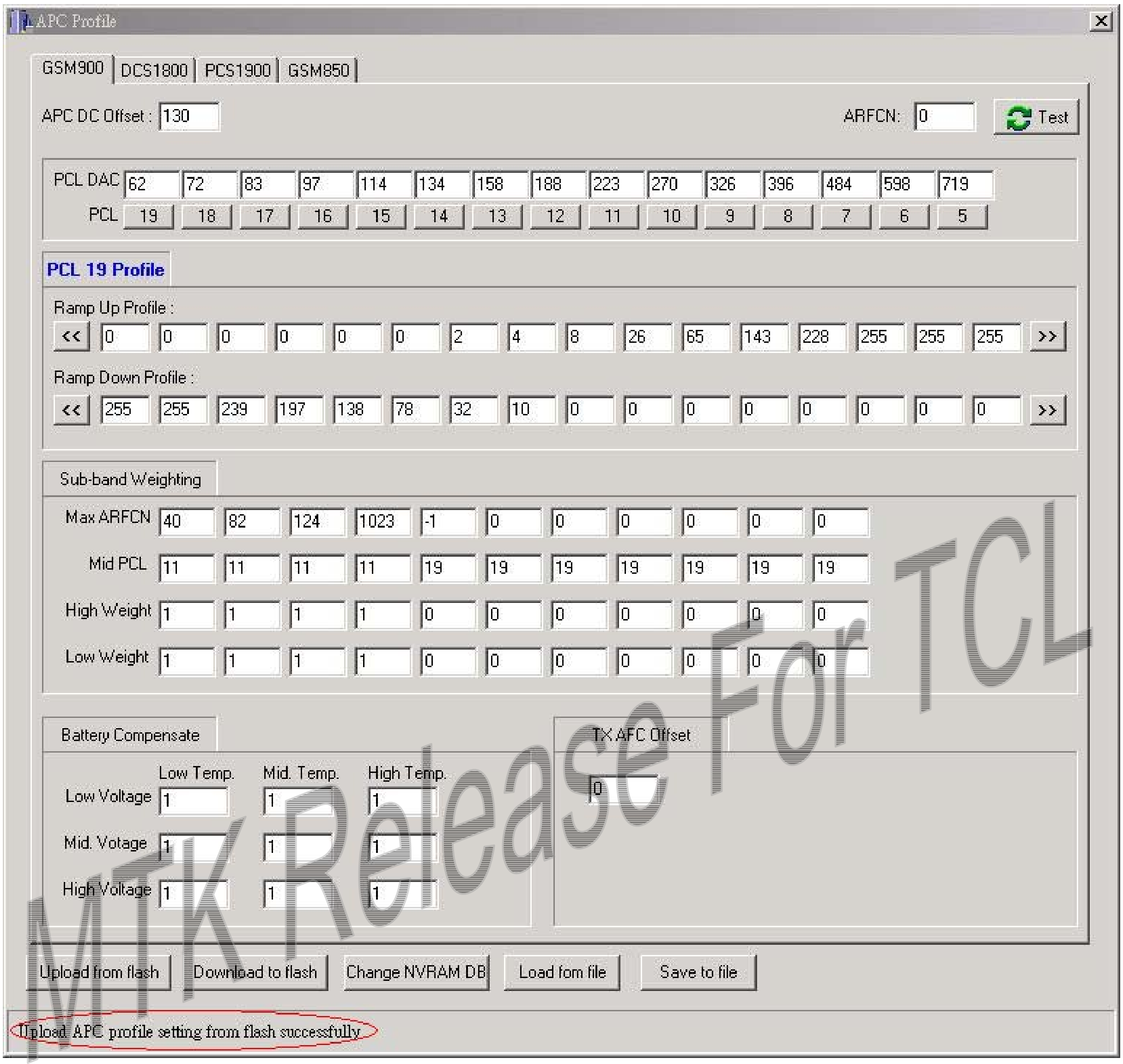

Figure 90 Ramp table result

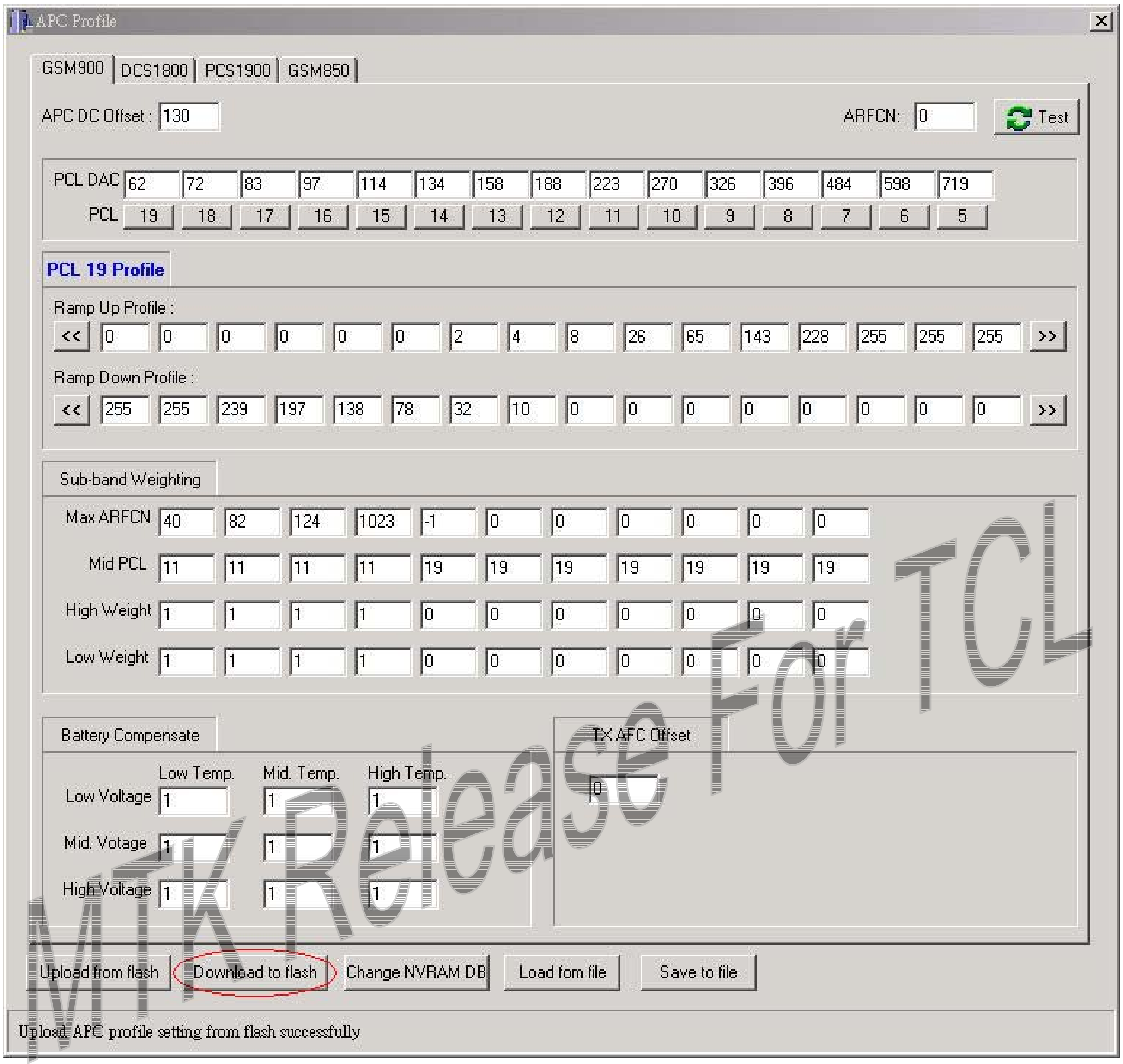

Figure 91 Click [Download to flash] button to save ramp table to flash.

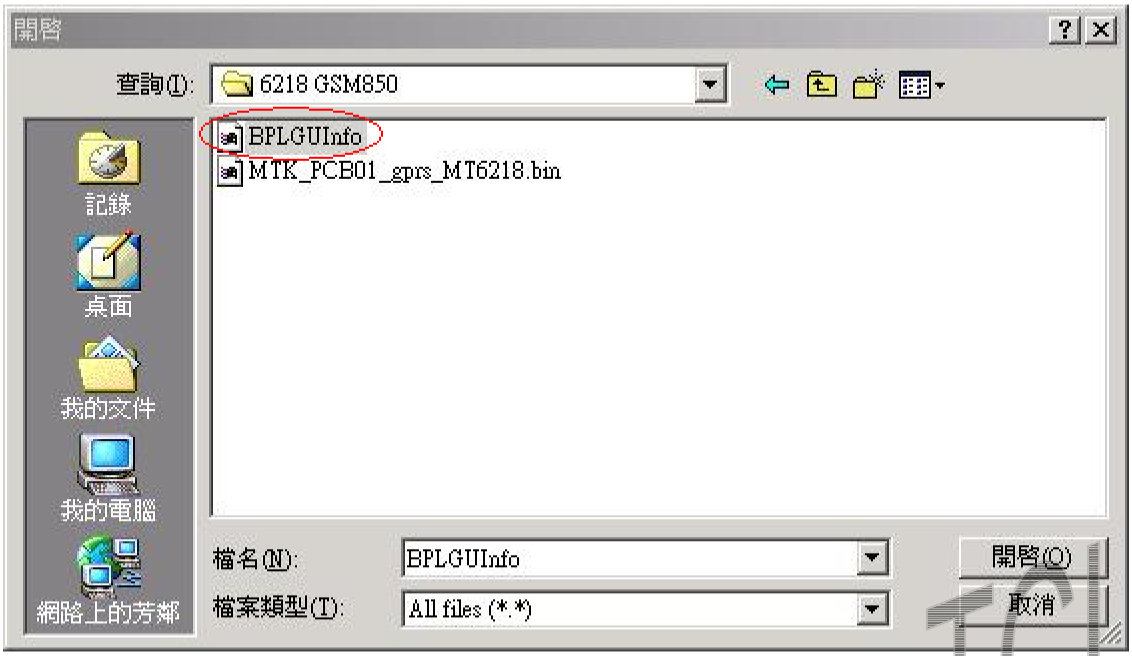

Figure 92 Select NVRAM database file if not selected before

User can click [Change NVRAM DB] to change NVRAM database file.

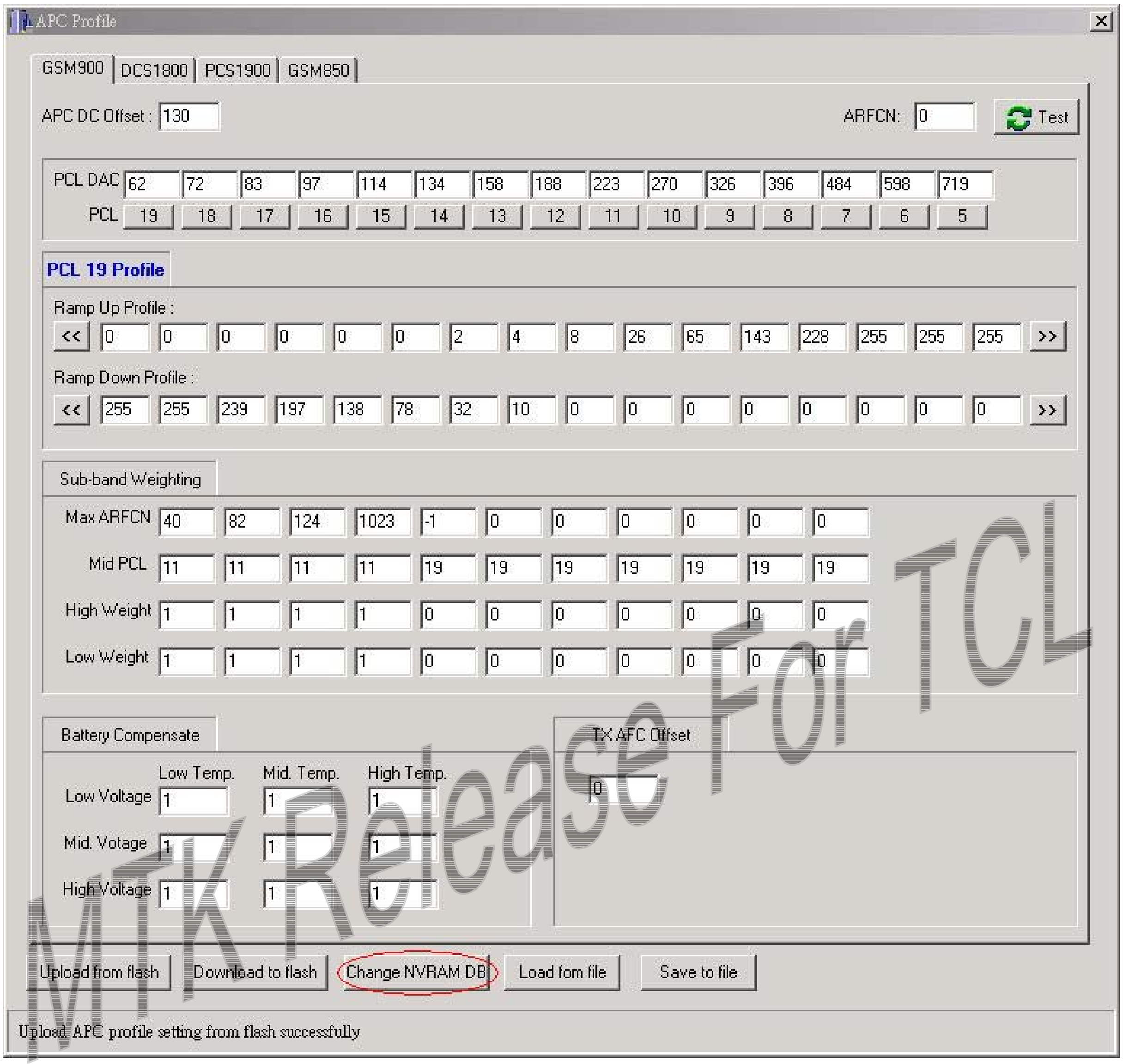

Figure 93 Click [Change NVRAM DB] button to change NVRAM database file

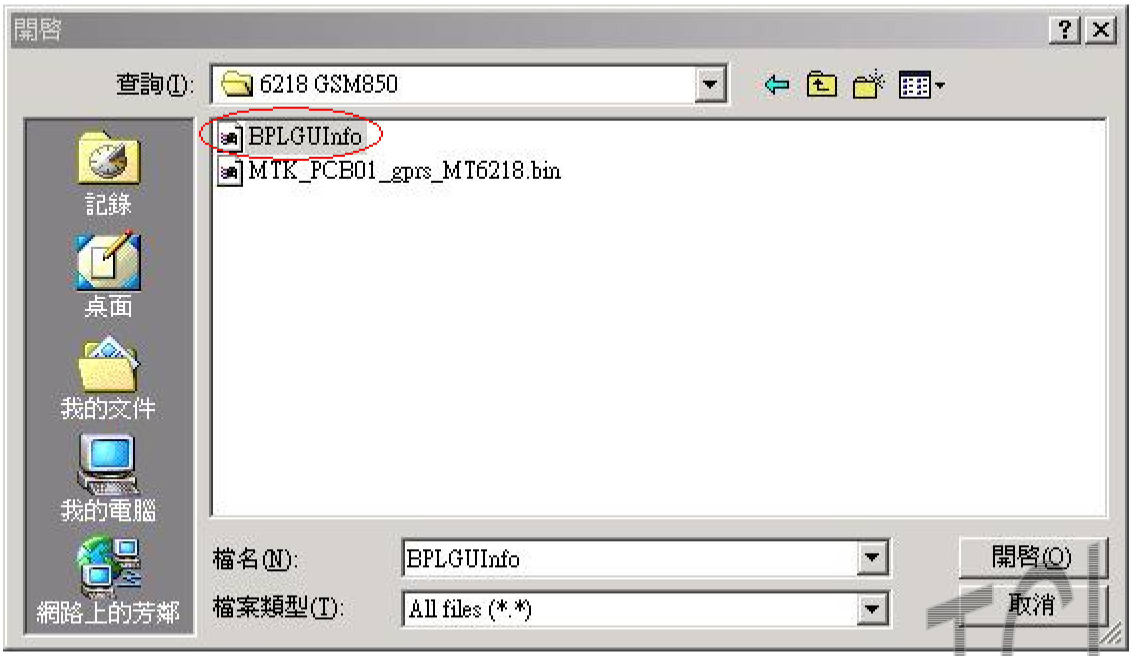

Figure 94 Select NVRAM database file

3.2.5.5.b Read and write the level ramp table in file

User can click [Load from file] button to read level ramp table from text file and click [Save to file] button to write level ramp table to text file. The tool can save it with path loss and AFC initial value in single or multiple files. Each value must be followed with a comma in the TX level, ramp up, ramp down field.

If user save the values in window below:

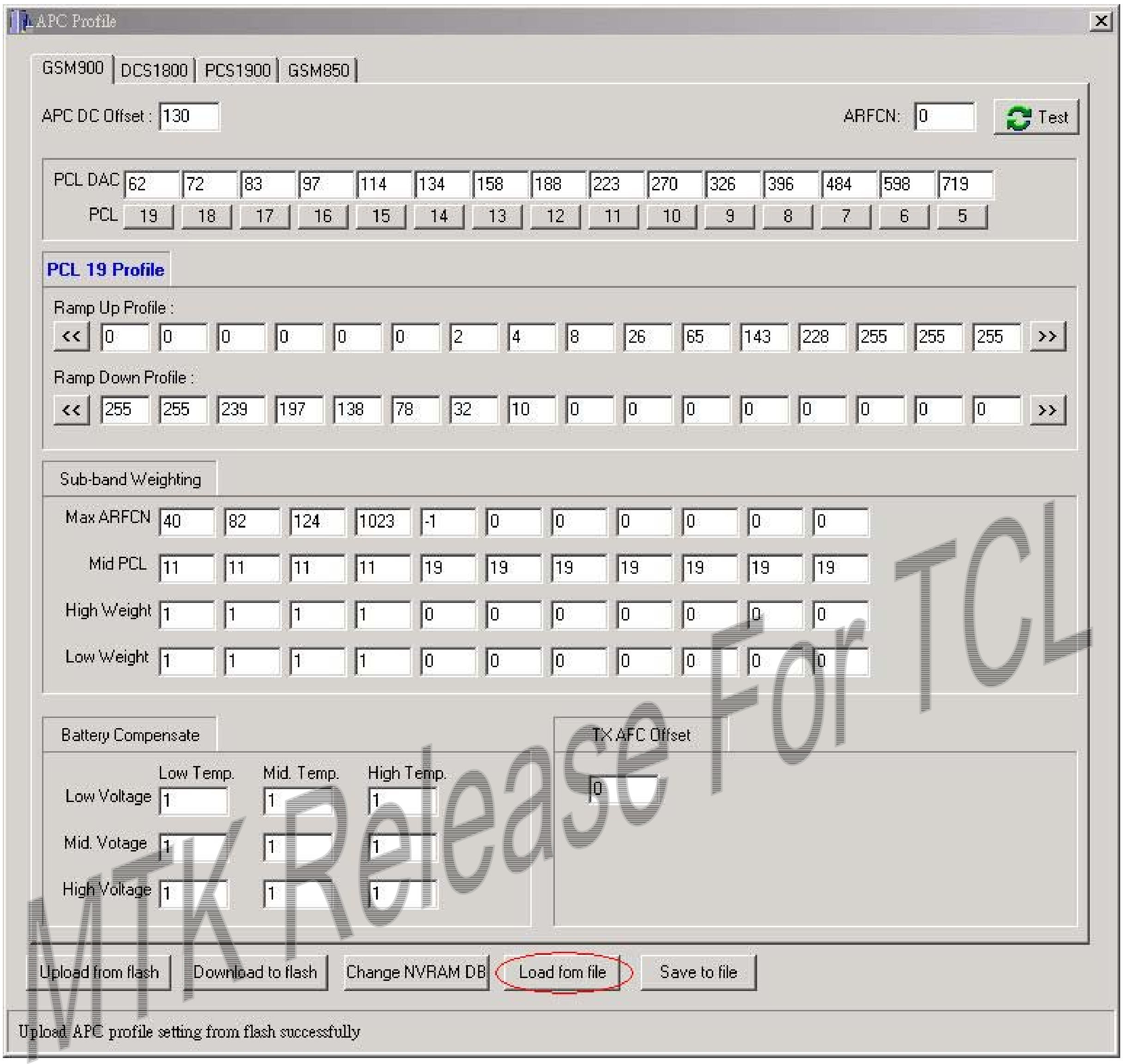

Figure 95 Click [Load from file] button to read ramp table from file

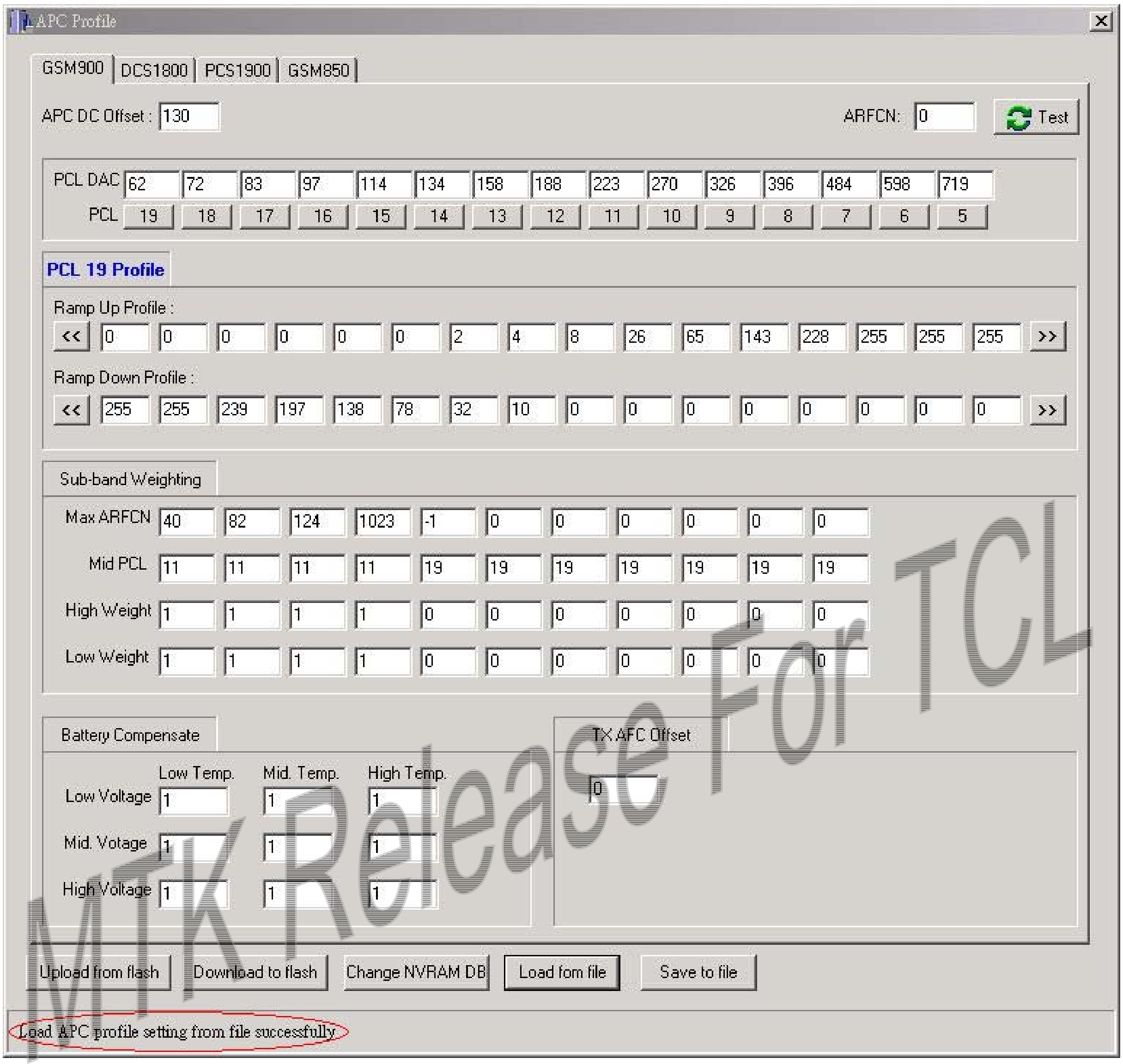

Figure 96 Ramp profile result

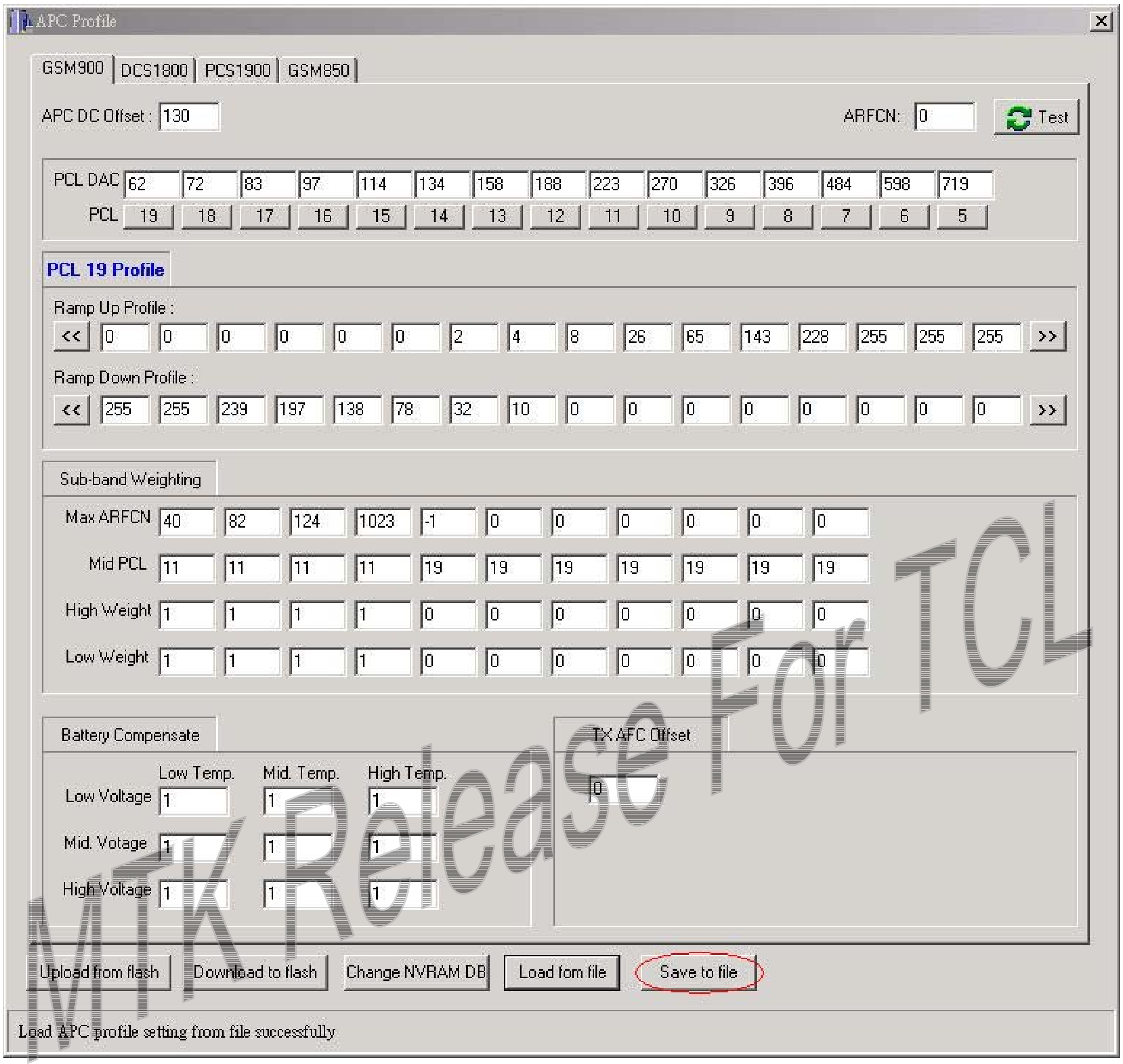

Figure 97 Click [Save to file] button to save ramp table to file

The tool will save a text file and following is the “GSM900 level, ramp” section in it. Each field is corresponding with same field name in the level and ramp window.

[GSM900 level, ramp]
APC dc offset=130
; APC dc offset : the field specify the pedestal value of the APC unit. The APC D/A converter
; is powered up biased on the offset value specified by the field.
TX power level=62,72,83,97,114,134,158,188,223,270,326,396,484,598,719,719
; profile 0 refer to PCL 19, profile 1 refer to PCL 18, ….., profile 14 refer to PCL 5
profile 0 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,228,255,255,255
profile 0 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 1 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,225,255,255,255
profile 1 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 2 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 2 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 3 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255

profile 3 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 4 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 4 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 5 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 5 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 6 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 6 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 7 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 7 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 8 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 8 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 9 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 9 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 10 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 10 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 11 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,255,255
profile 11 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 12 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,250,255
profile 12 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 13 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,250,255
profile 13 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 14 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,250,255
profile 14 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 15 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,250,255
profile 15 ramp down=255,239,197,138,78,32,10,0,0,0,0,0,0,0,0,0
Subband max arfcn=40,82,124,1023,-1,0,0,0,0,0,0
Subband mid level=11,11,11,11,19,19,19,19,19,19,19
Subband high weight=1.000,1.000,1.000,1.000,0.000,0.000,0.000,0.000,0.000,0.000,0.0000
Subband low weight=1.000,1.000,1.000,1.000,0.000,0.000,0.000,0.000,0.000,0.000,0.0000
Battery compensate, low voltage, low temperature=1
Battery compensate, low voltage, mid temperature=1
Battery compensate, low voltage, high temperature=1
Battery compensate, mid voltage, low temperature=1
Battery compensate, mid voltage, mid temperature=1
Battery compensate, mid voltage, high temperature=1
Battery compensate, high voltage, low temperature=1
Battery compensate, high voltage, mid temperature=1
Battery compensate, high voltage, high temperature=1
CAP ID compensate=0

Note:

- APC dc offset : the field specify the pedestal value of the APC unit. The APC D/A converter is powered up biased on the offset value specified by the field.
- Subband mid level : the level below the [suband mid level] will be multiplied by [Subband low weight], and the level above [Subband mid level] will be multiplied by [Subband high weight].
- Subband high weight : each entry of the ramp profile of level above [Subband mid level] will be multiplied by [Subband high weight].
- Subband low weight : each entry of the ramp profile of level below [Subband mid level] will be multiplied by [Subband low weight].
- Battery compensate: These 3x3 array compensate the APC scaling factor under low/mid/high voltage/temperature.

- TX AFC Offset: the field specifies the crystal TX AFC Offset. Crystal TX AFC DAC = Crystal RX AFC DAC + TX AFC Offset.

3.2.5.6 Graphic ramp setting

User can click [Graphic ramp setting] button to show graphic ramp setting window.

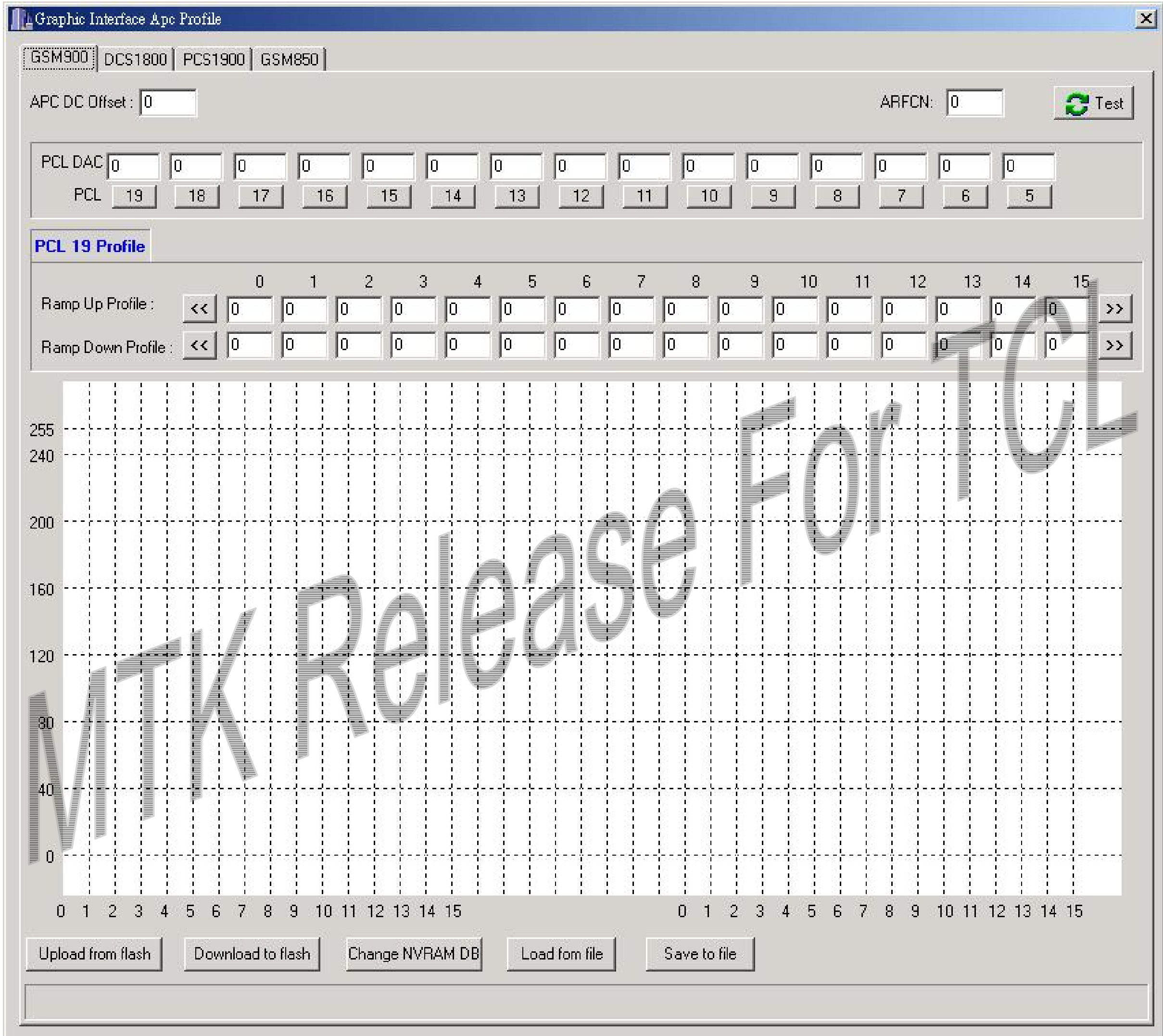

Figure 98 Graphic interface ramp profile window

3.2.5.6.a Graphic ramp profile tuning

Graphic ramp profile window is used for user to fine tune ramp profile. Power amplifier is turned on in this operation. User can input APC DC offset, ARFCN, and then click left button of mouse to drag ramp level (i.e. green point). After user end drag ramp level, TX level testing is started automatically and the caption of the button will change to [Stop]. User can click [Stop] button to stop it.

Figure 99 TX level testing is started automatically

Figure 100 Click [Stop] button to stop testing

Figure 101 The caption of button will change to [Start]

3.2.5.6.b Read and write the level ramp table in flash

User can click [Upload from flash] button to read graphic ramp profile from flash and click [Download to flash] button to write graphic ramp profile to flash.

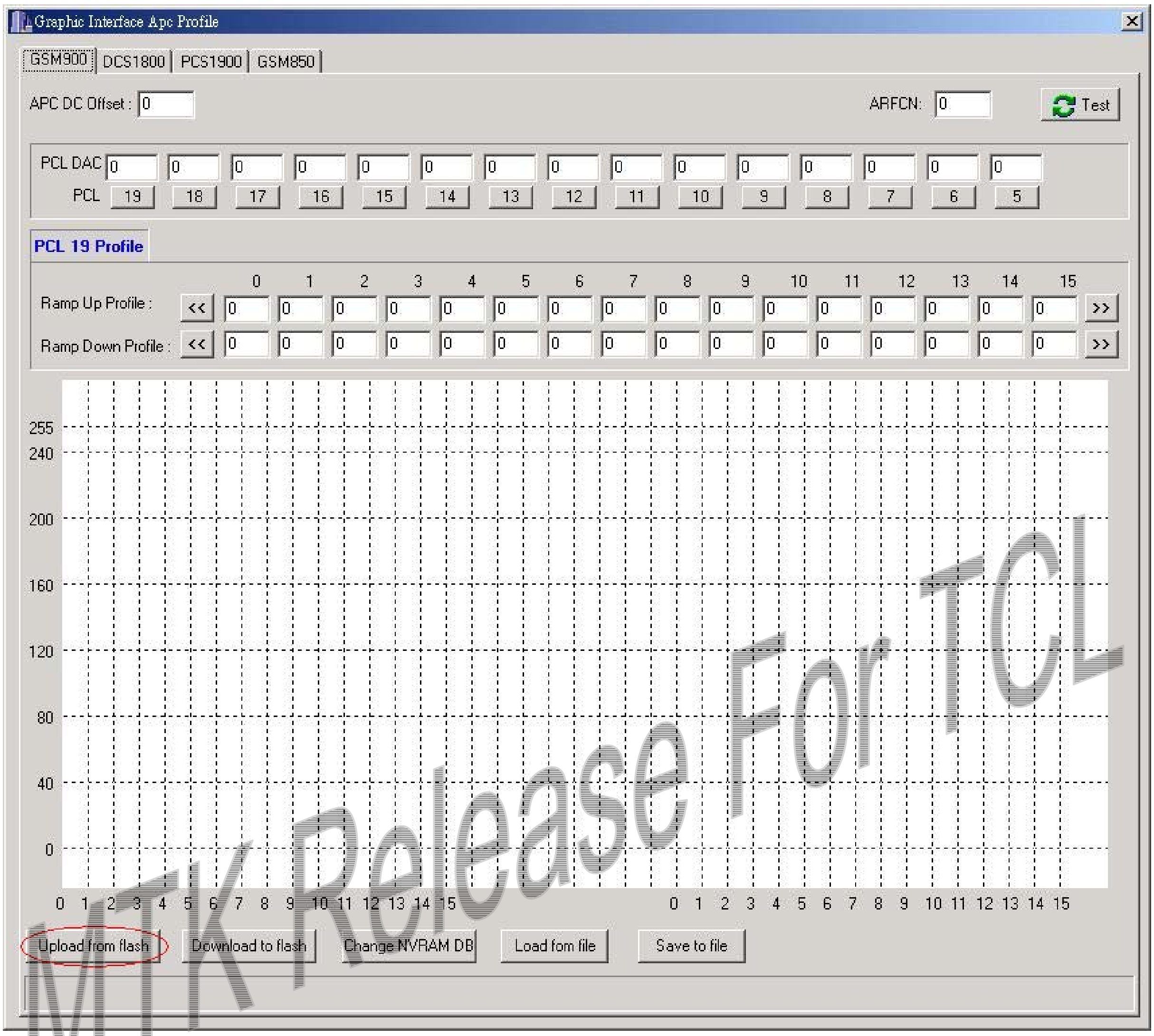

Figure 102 Click [Upload from flash] button to read graphic ramp profile from flash

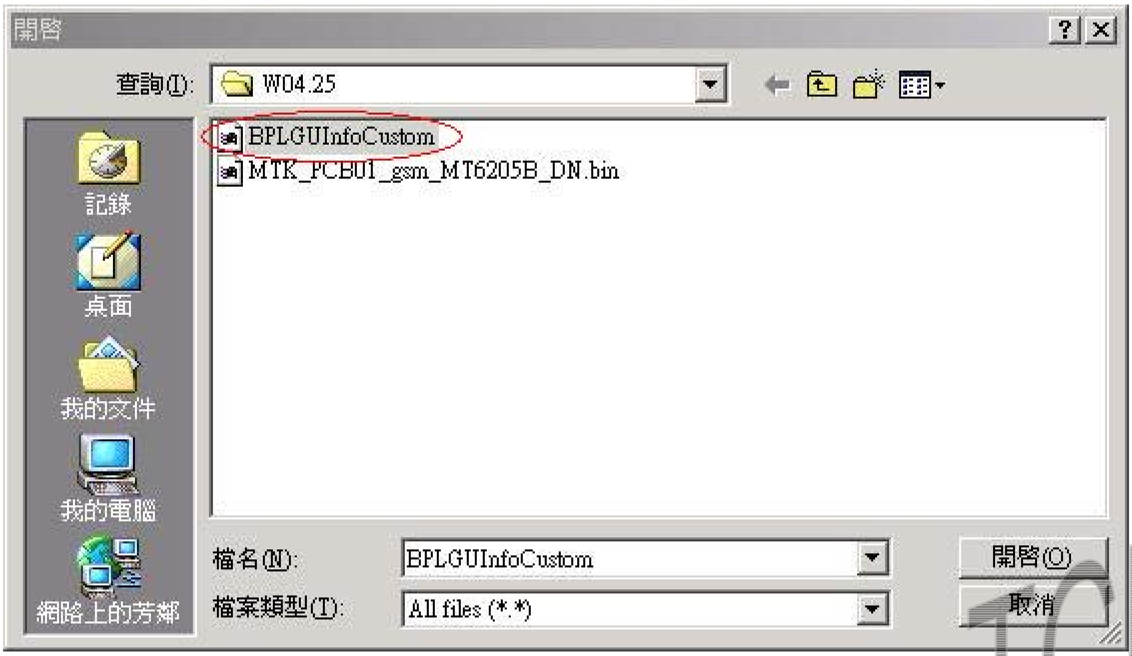

Figure 103 Select NVRAM database file if not selected before

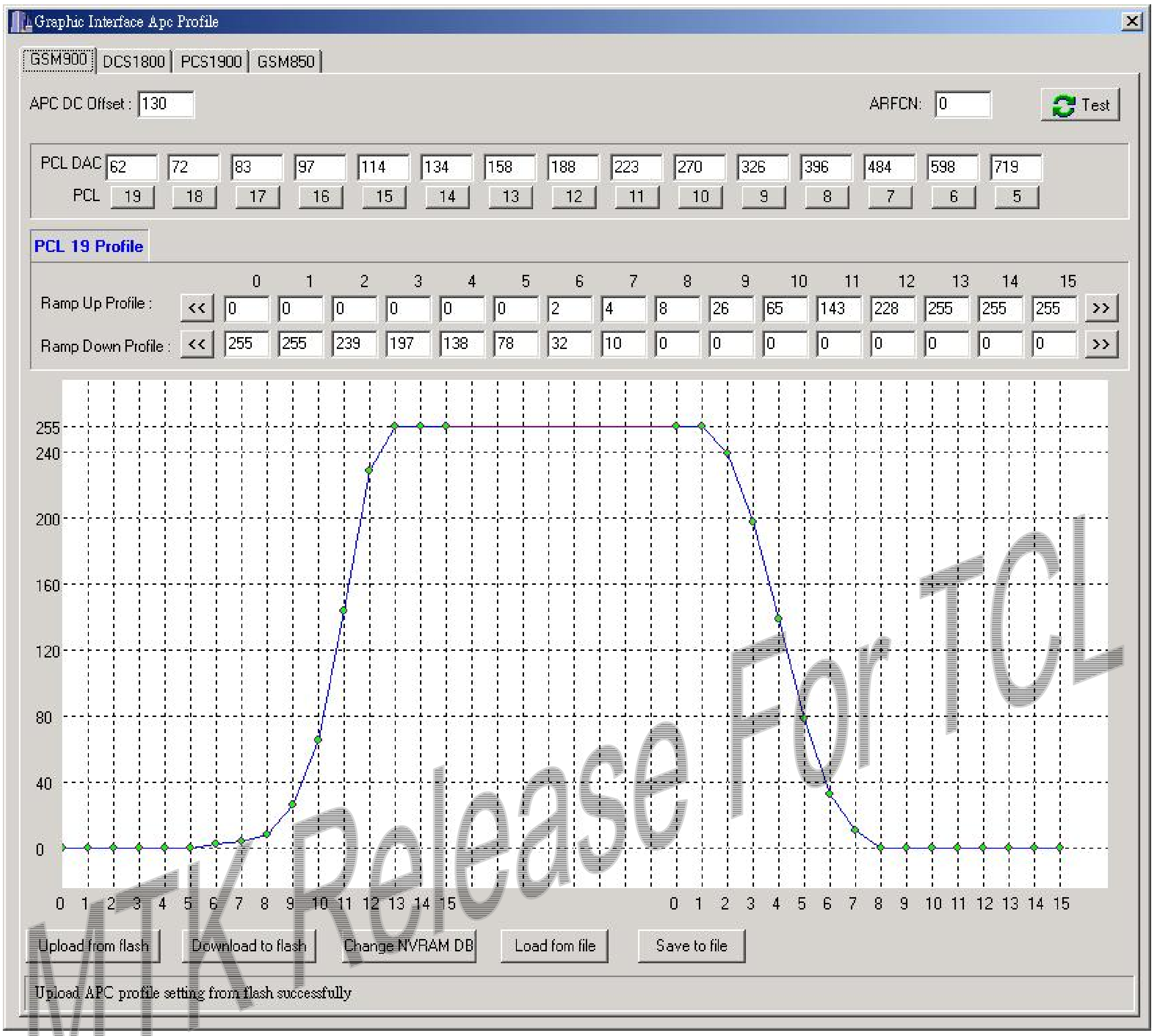

Figure 104 Graphic ramp profile result

Figure 105 Click [Download to flash] to write graphic ramp profile to flash

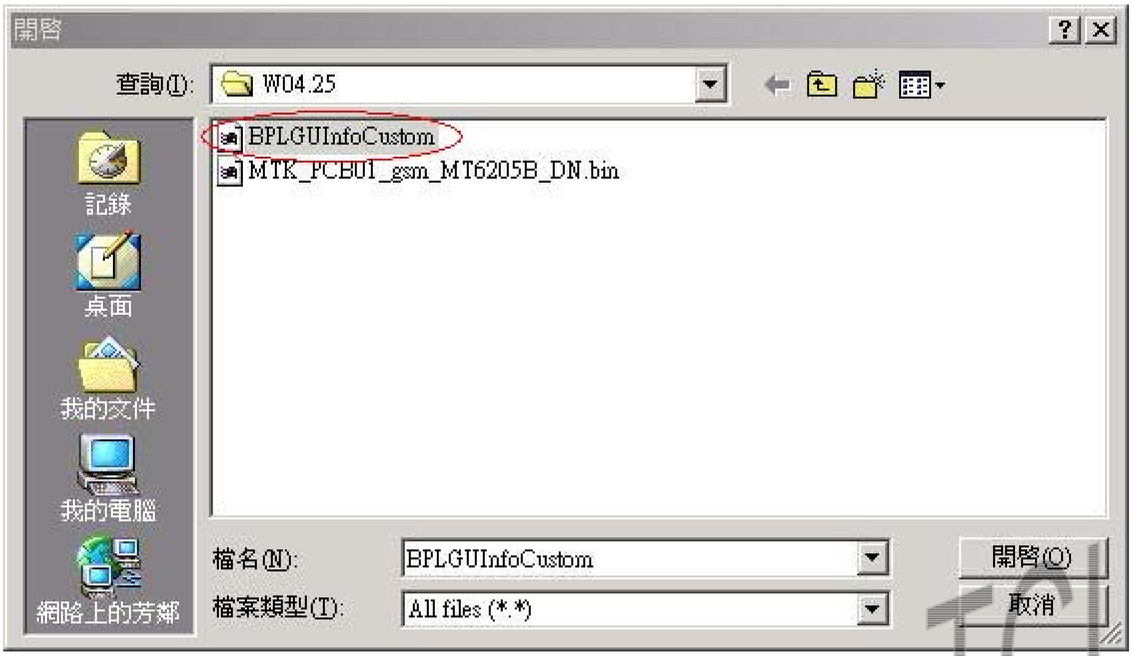

Figure 106 Select NVRAM database file if not selected before

User can click [Change NVRAM DB] button to change NVRAM database file.

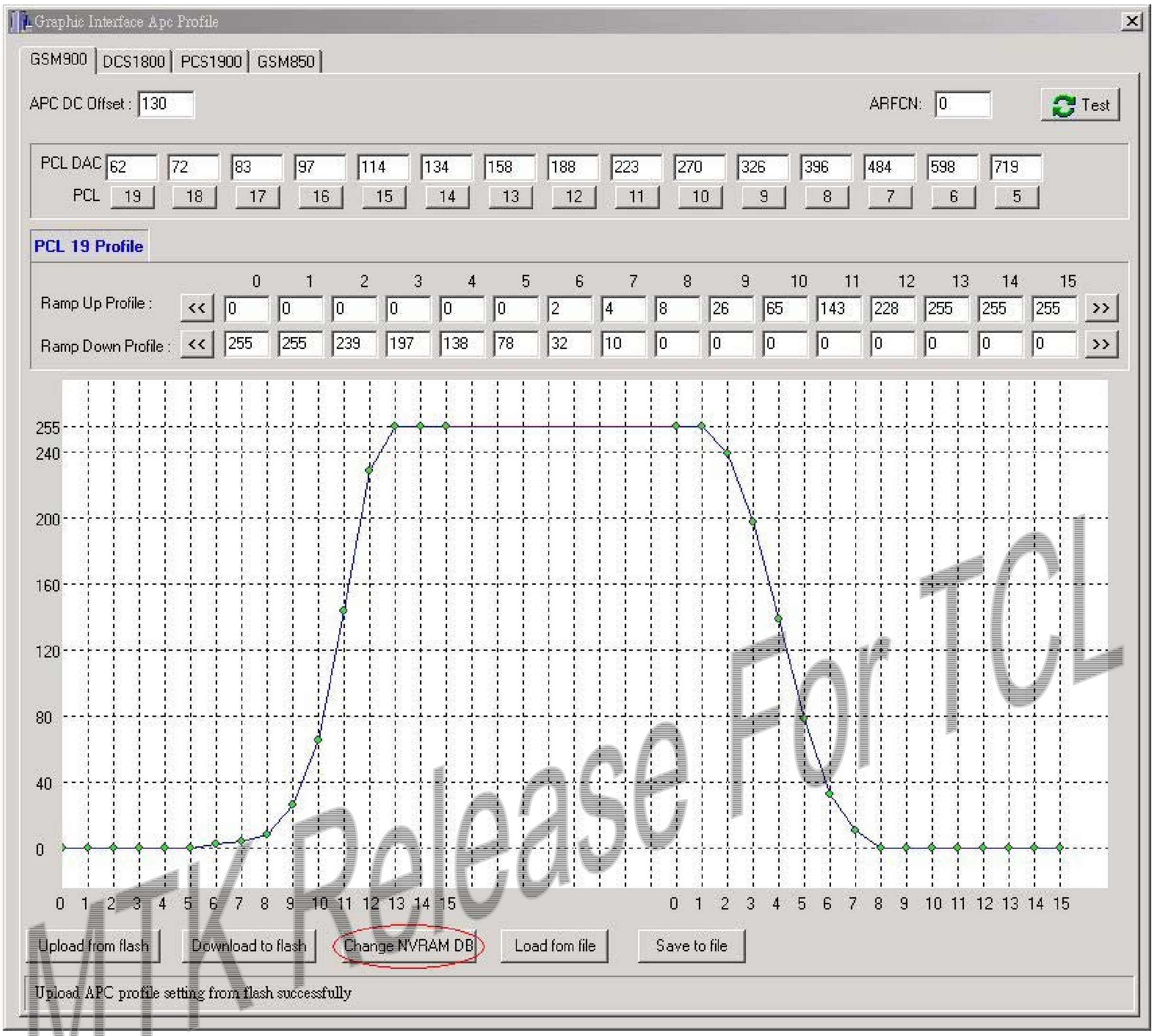

Figure 107 Click [Change NVRAM DB] button to change NVRAM database file

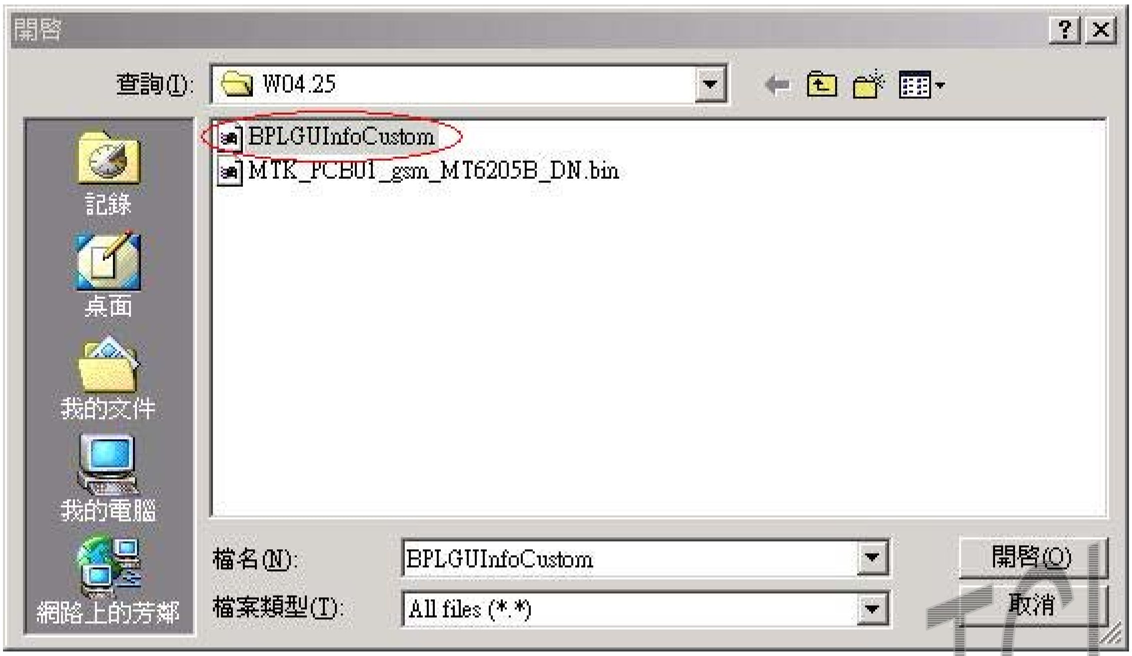

Figure 108 Select NVRAM database file

3.2.5.6.c Read and write the graphic ramp profile in file

User can click [Load from file] button to read graphic ramp profile from text file and click [Save to file] button to write graphic ramp profile to text file. The tool can save it with path loss and AFC initial value in single or multiple files. Each value must be followed with a comma in the TX level, ramp up, ramp down field.

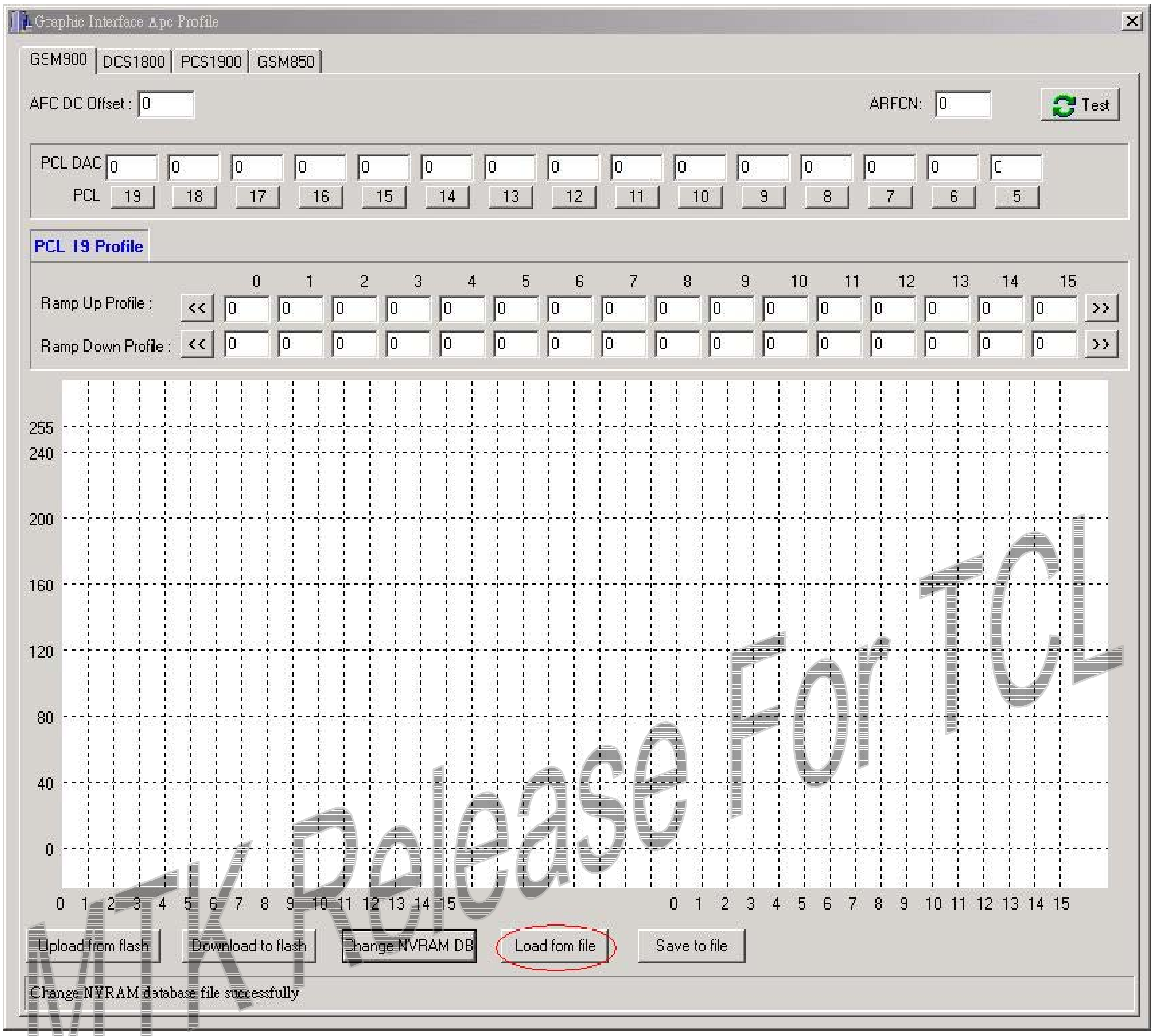

Figure 109 Click [Load from file] button to read graphic ramp profile from file

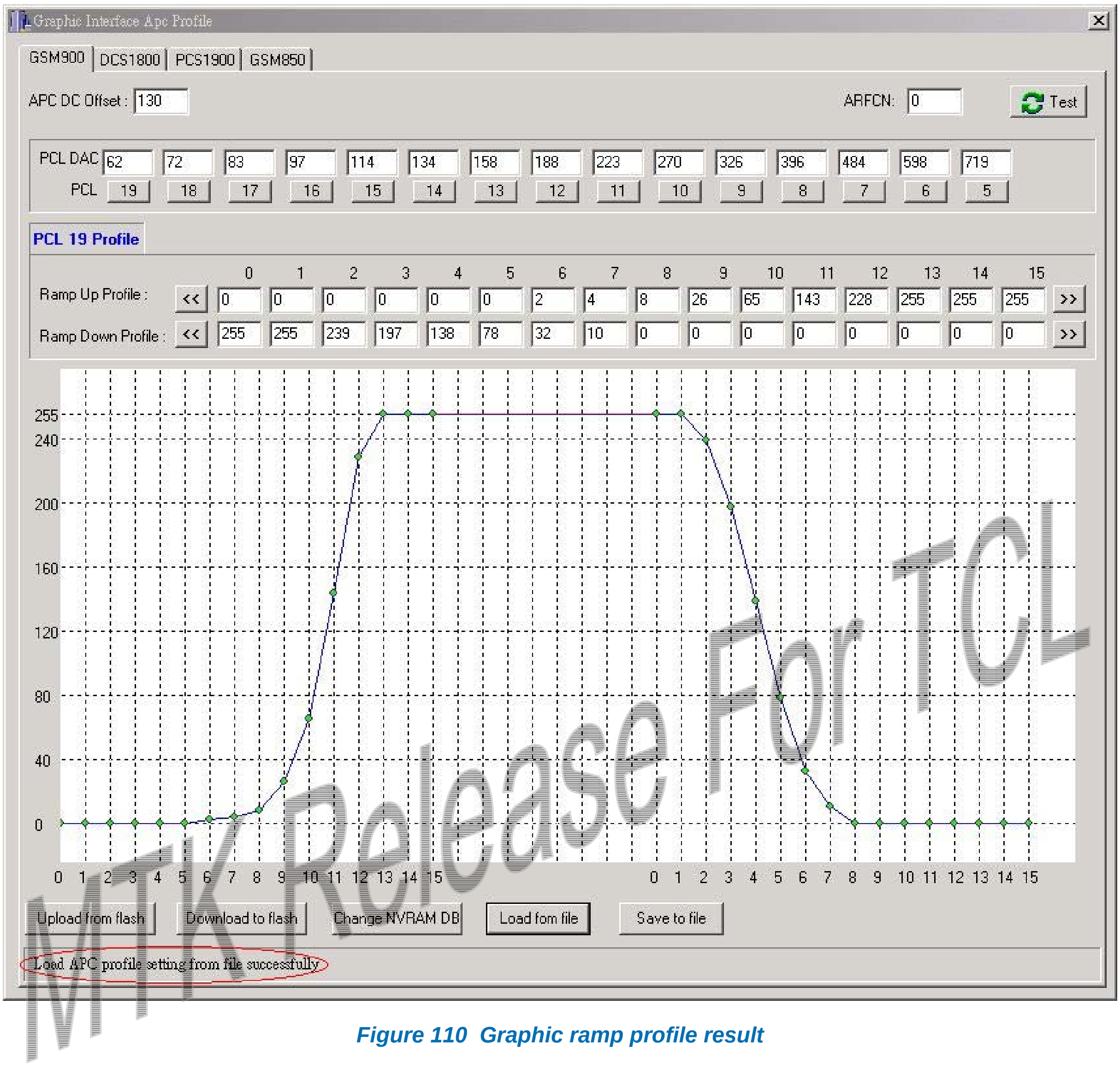

Figure 110 Graphic ramp profile result

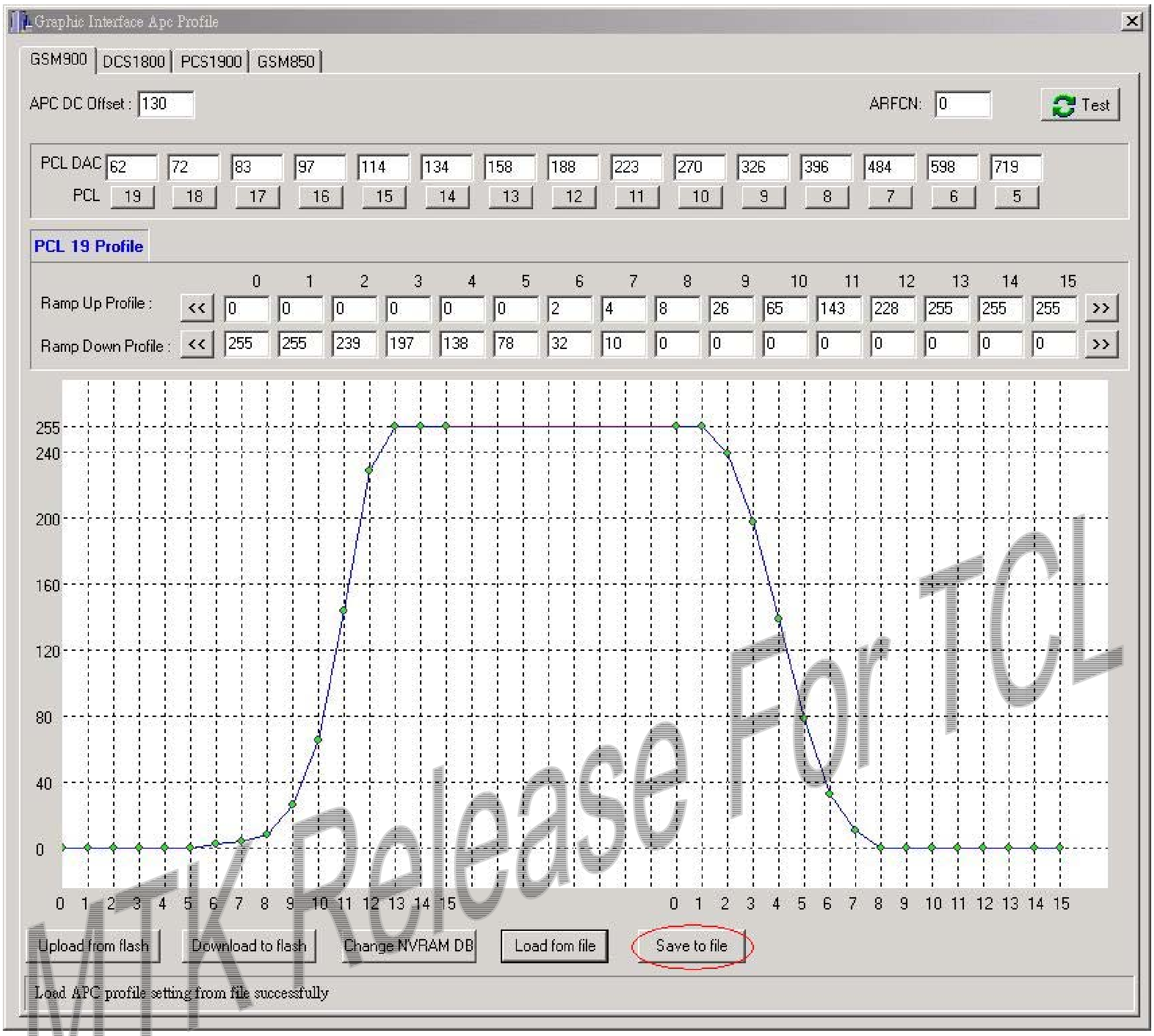

Figure 111 Click [Save to file] button to save graphic ramp profile to file

The following is a template file of graphic ramp profile. User will get this file after saving graphic ramp profile to file.

[GSM900 level, ramp]
APC dc offset=130
; APC dc offset : the field specify the pedestal value of the APC unit. The APC D/A converter
; is powered up biased on the offset value specified by the field.
TX power level=62,72,83,97,114,134,158,188,223,270,326,396,484,598,719,719
; profile 0 refer to PCL 19, profile 1 refer to PCL 18, ….., profile 14 refer to PCL 5
profile 0 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,228,255,255,255
profile 0 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 1 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,225,255,255,255
profile 1 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 2 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 2 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 3 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 3 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 4 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 4 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0

profile 5 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 5 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 6 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 6 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 7 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 7 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 8 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 8 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 9 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 9 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 10 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 10 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 11 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,255,255
profile 11 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 12 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,250,255
profile 12 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 13 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,250,255
profile 13 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 14 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,250,255
profile 14 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 15 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,250,255
profile 15 ramp down=255,239,197,138,78,32,10,0,0,0,0,0,0,0,0,0
Subband max arfcn=40,82,124,1023,-1,0,0,0,0,0,0
Subband mid level=11,11,11,11,19,19,19,19,19,19,19
Subband high weight=1.000,1.000,1.000,1.000,0.000,0.000,0.000,0.000,0.000,0.000,0.0000
Subband low weight=1.000,1.000,1.000,1.000,0.000,0.000,0.000,0.000,0.000,0.000,0.0000
Battery compensate, low voltage, low temperature=1
Battery compensate, low voltage, mid temperature=1
Battery compensate, low voltage, high temperature=1
Battery compensate, mid voltage, low temperature=1
Battery compensate, mid voltage, mid temperature=1
Battery compensate, mid voltage, high temperature=1
Battery compensate, high voltage, low temperature=1
Battery compensate, high voltage, mid temperature=1
Battery compensate, high voltage, high temperature=1
CAP ID compensate=0

Note:

- APC dc offset : the field specify the pedestal value of the APC unit. The APC D/A converter is powered up biased on the offset value specified by the field.
- Subband mid level : the level below the [suband mid level] will be multiplied by [Subband low weight], and the level above [Subband mid level] will be multiplied by [Subband high weight].
- Subband high weight : each entry of the ramp profile of level above [Subband mid level] will be multiplied by [Subband high weight].
- Subband low weight : each entry of the ramp profile of level below [Subband mid level] will be multiplied by [Subband low weight].
- Battery compensate: These 3x3 array compensate the APC scaling factor under low/mid/high voltage/temperature.
- TX AFC Offset: the field specifies the crystal TX AFC Offset. Crystal TX AFC DAC = Crystal RX AFC DAC + TX AFC Offset.

3.2.6 AFC control

User can input ARFCN, AFC DAC value, Gain (dB) and Test Count and then click [Start] button to test AFC control. MS will detect the FB with the parameters set by user after the command from META is received. If MS detection more than one FB, META_LAB will show the FB detection count, otherwise it shows “Fail”.

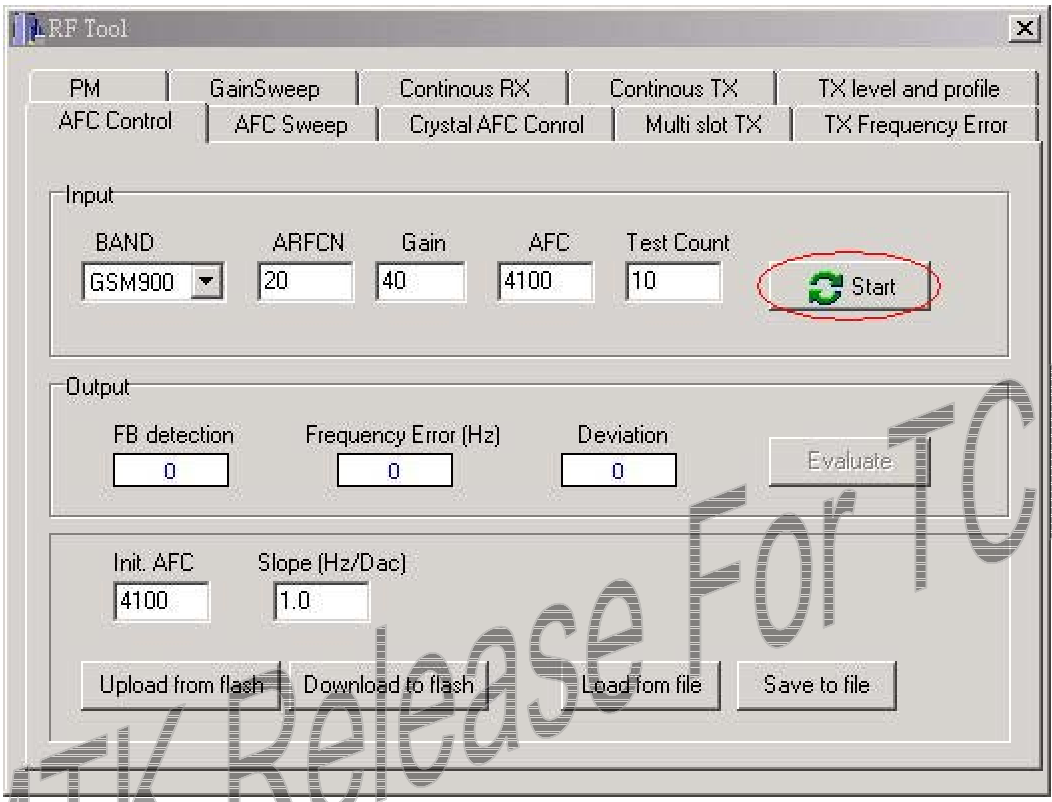

Figure 112 Click [Start] button to start testing

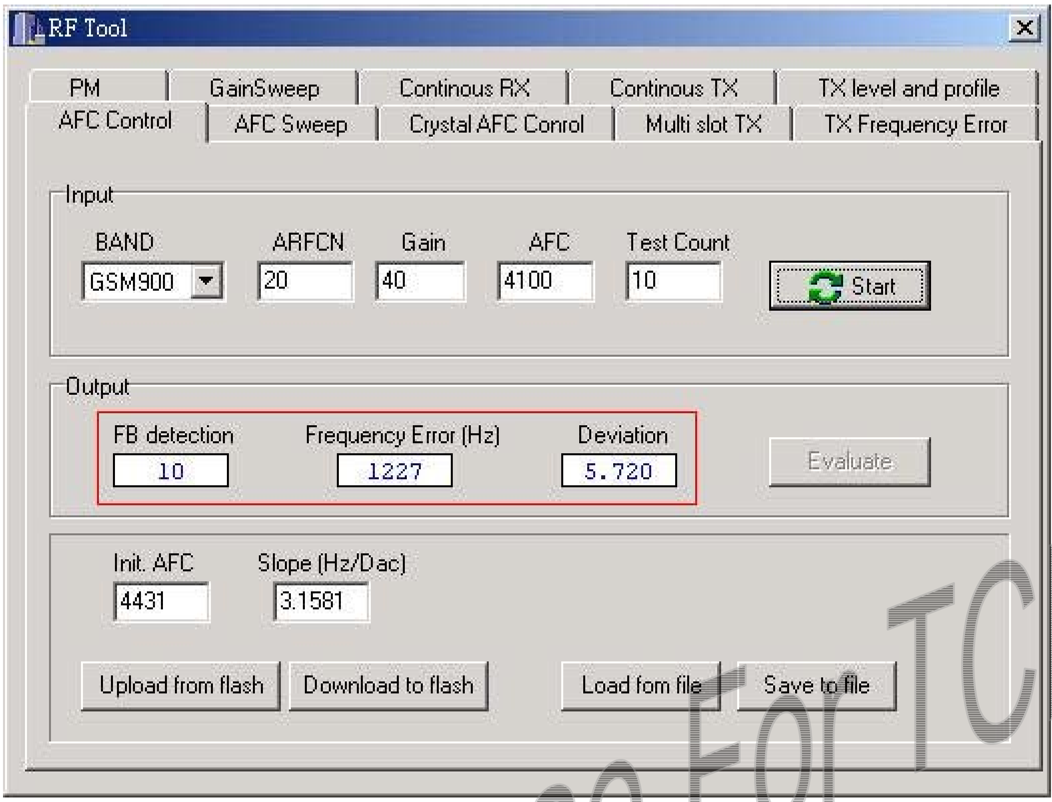

Figure 113 Measurement result of AFC control

- FB detection : It is the total FB detection count of MS among testing numbers.
- Frequency Error : It is the average frequency error of the total FB detection.
- Deviation : It is the deviation of the total FB detection.
  - Same as section 3.2.1 the value returned from target is the square of deviation. PC side program will get deviation from square root of the value returned from target. The user shall limit the test number to prevent deviation overflow if frequency error is large.

3.2.6.1 Upload and download the AFC value in flash

Following describes how to upload and download AFC value from and to flash. User can click [Upload from flash] button to read initial AFC and slope value from flash and click [Download to flash] button to write initial AFC and slope value to flash.

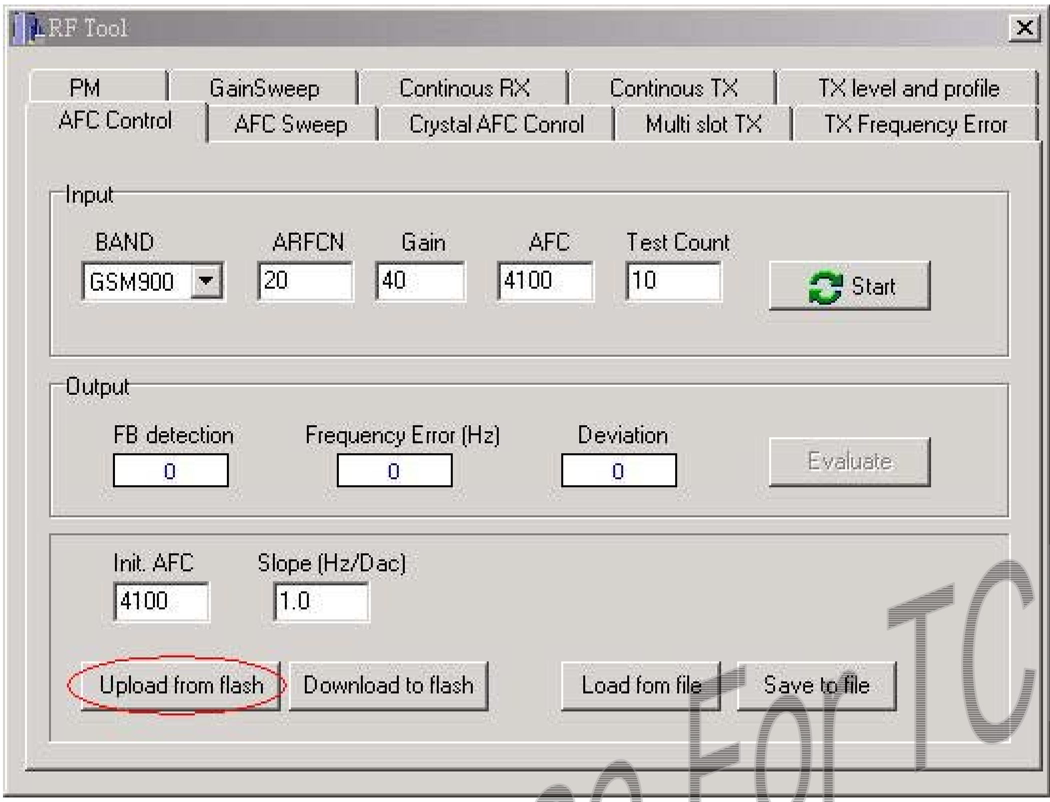

Figure 114 Click [Upload from flash] button to read value from flash

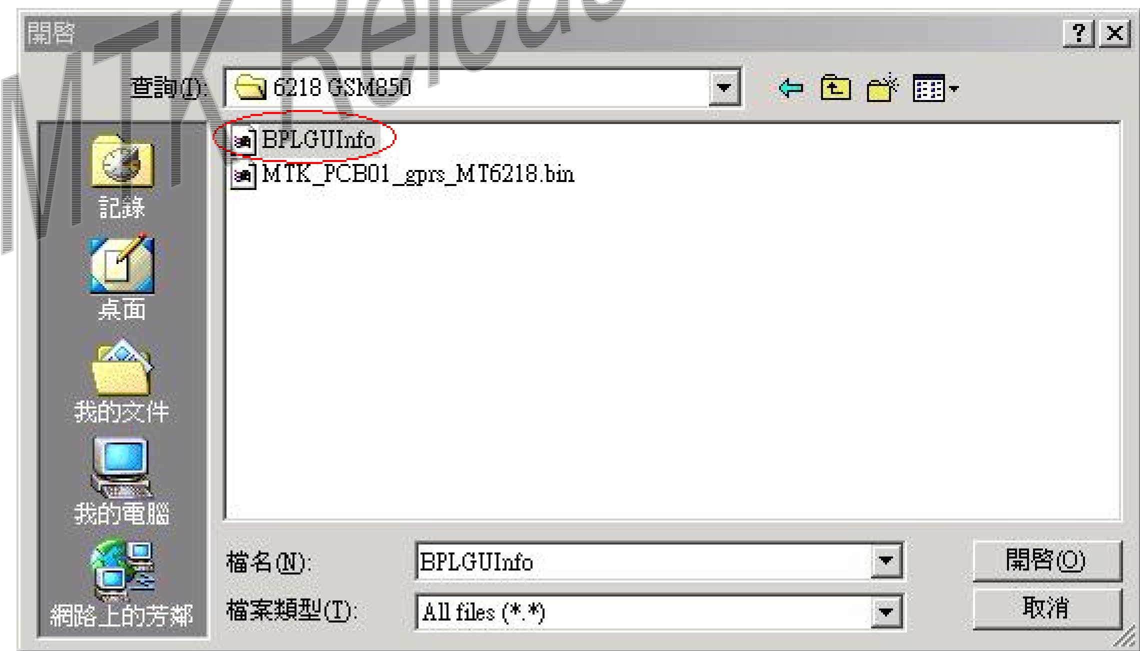

Figure 115 Select NVRAM database file if not selected before

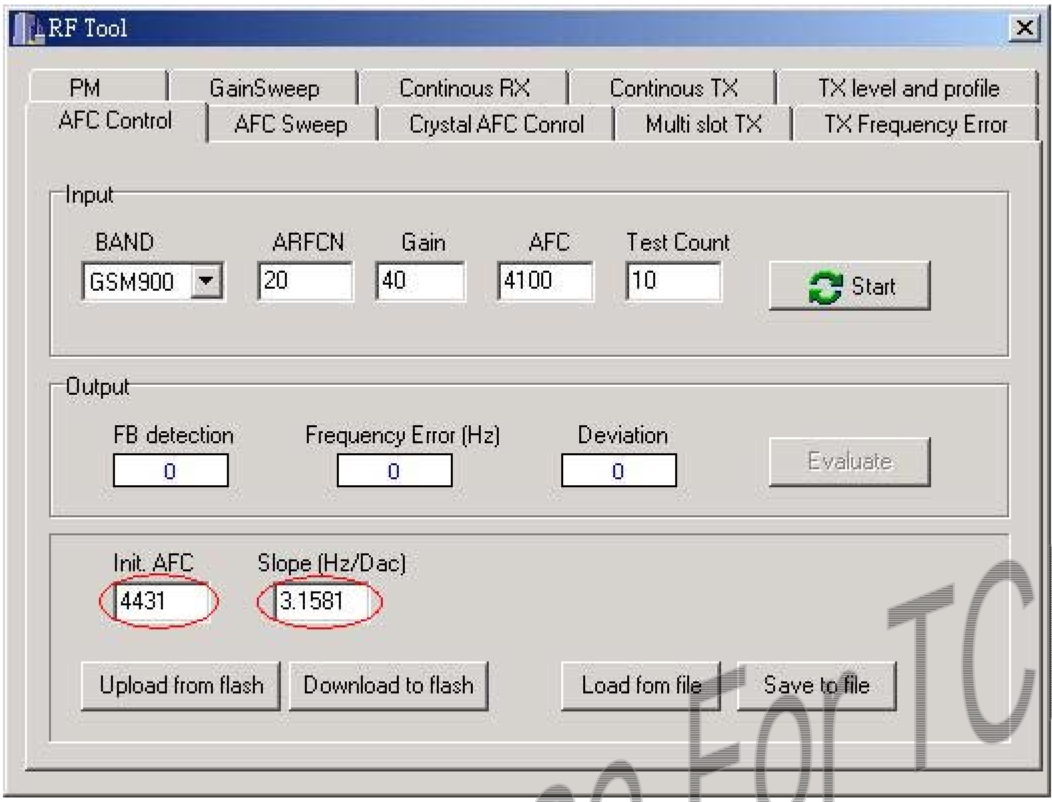

Figure 116 Result of AFC value

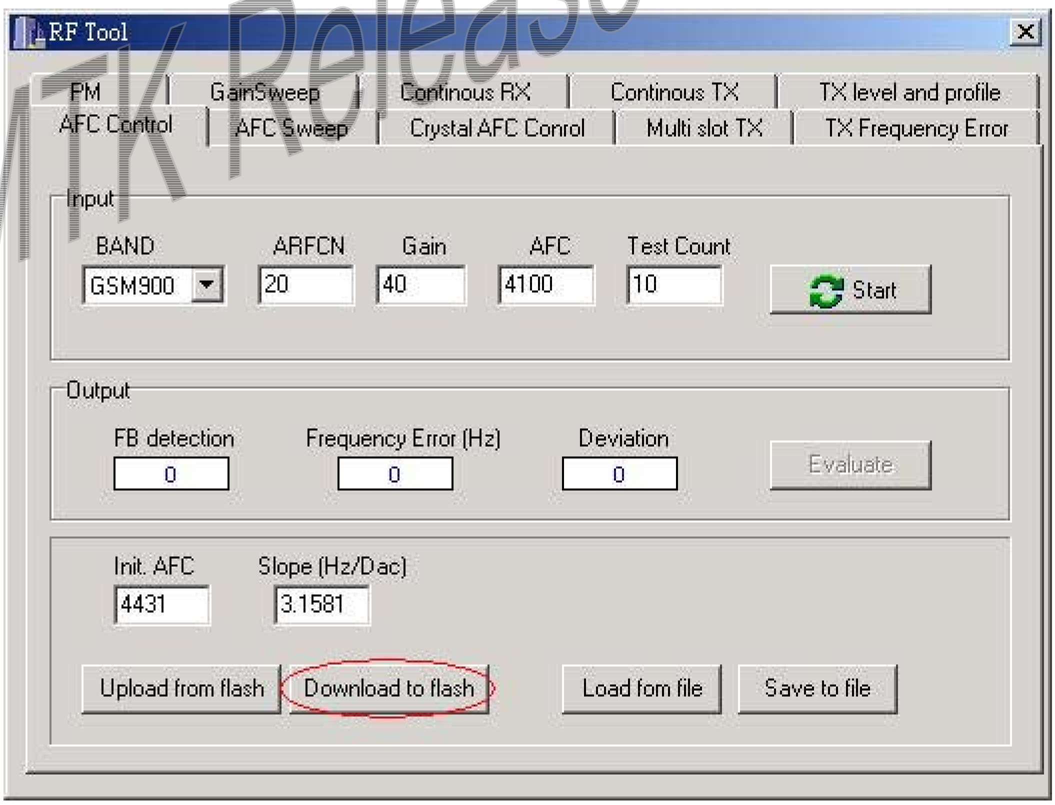

Figure 117 Click [Download to flash] button to write value to flash

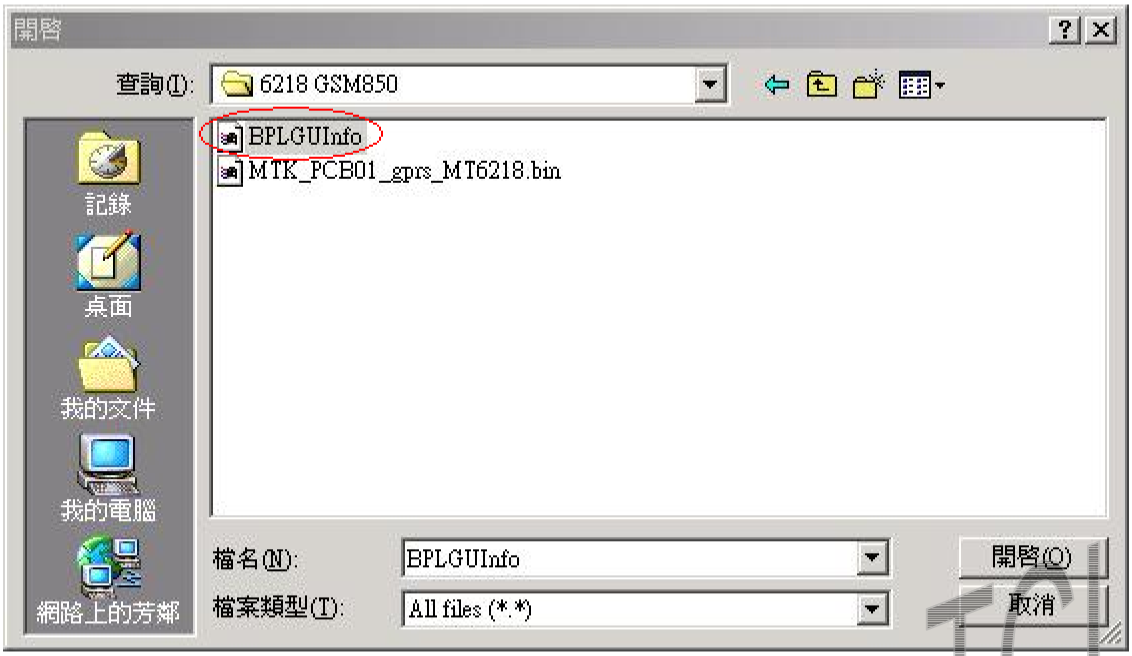

Figure 118 Select NVRAM database file if not selected before

3.2.6.2 Read and write the AFC value in file

User can click [Load from file] button to load initial AFC and slope value from file and click [Save to file] button to save initial AFC and slope value to file.

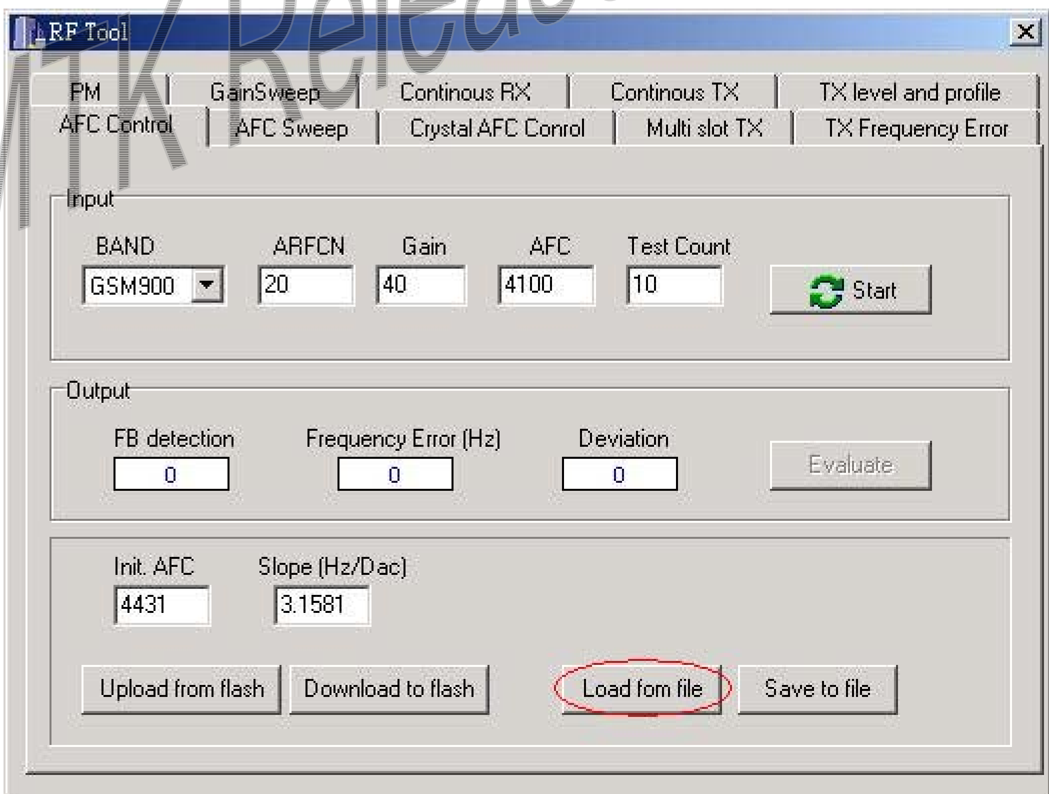

Figure 119 Click [Load from file] button to read value from file

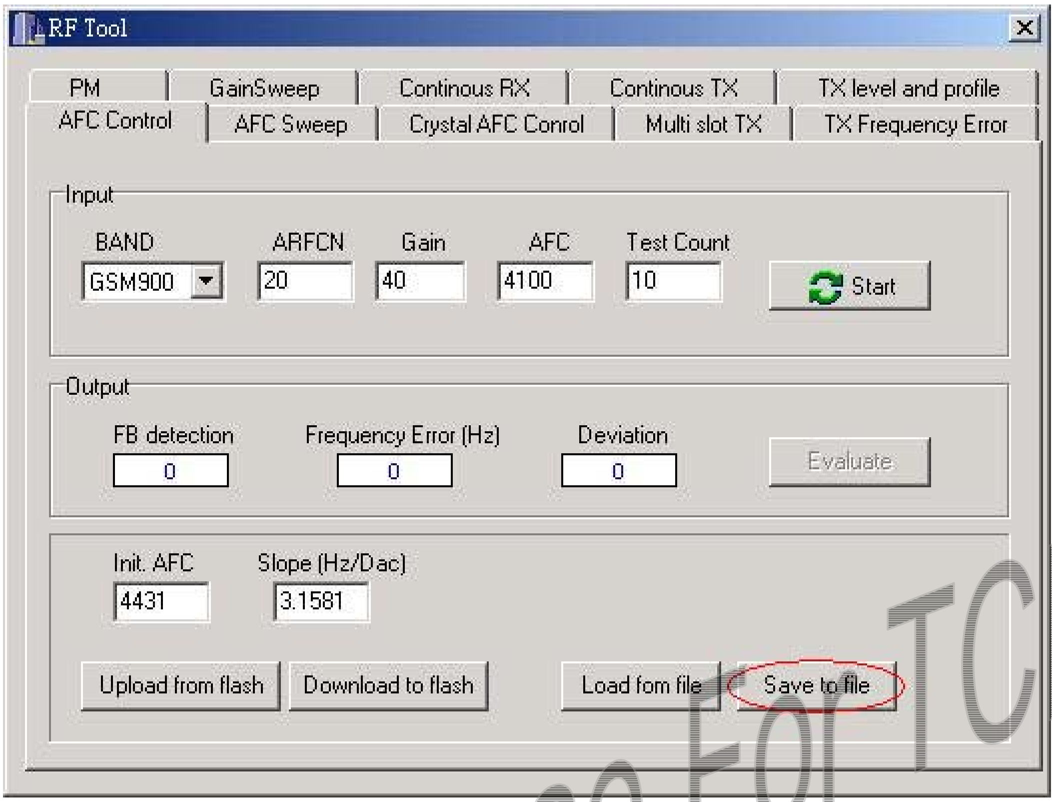

Figure 120 Click [Save to file] button to save value to file.

The following is a template file of AFC control. User will get the text file after saving initial value and slope. Please follow the file format if you want to change the value in file.

[AFC control]
Initial value = 4100
Slope = 2.8016

Note: Slope = $\overline{\Delta f_1} - \overline{\Delta f_2} \Big/ DAC_2 - DAC_1$, where DAC1 and DAC2 are AFC DAC value, and $\overline{\Delta f_1}$ and $\overline{\Delta f_2}$ are averaged frequency error measured at target side.

3.2.7 AFC sweep

AFC sweep is used for detection of FB of the indicated channel by the different AFC DAC value.

User can execute AFC sweep function by following steps:
1) Input Band, ARFCN, Gain (dB), Test Count, Min AFC DAC, Max AFC DAC and step AFC DAC.
2) Click Start button.
3) Meta will show the FB detection result: AFC DAC, frequency offset, deviation and FB detection ok number.
4) User can stop this operation by clicking [Stop] button.

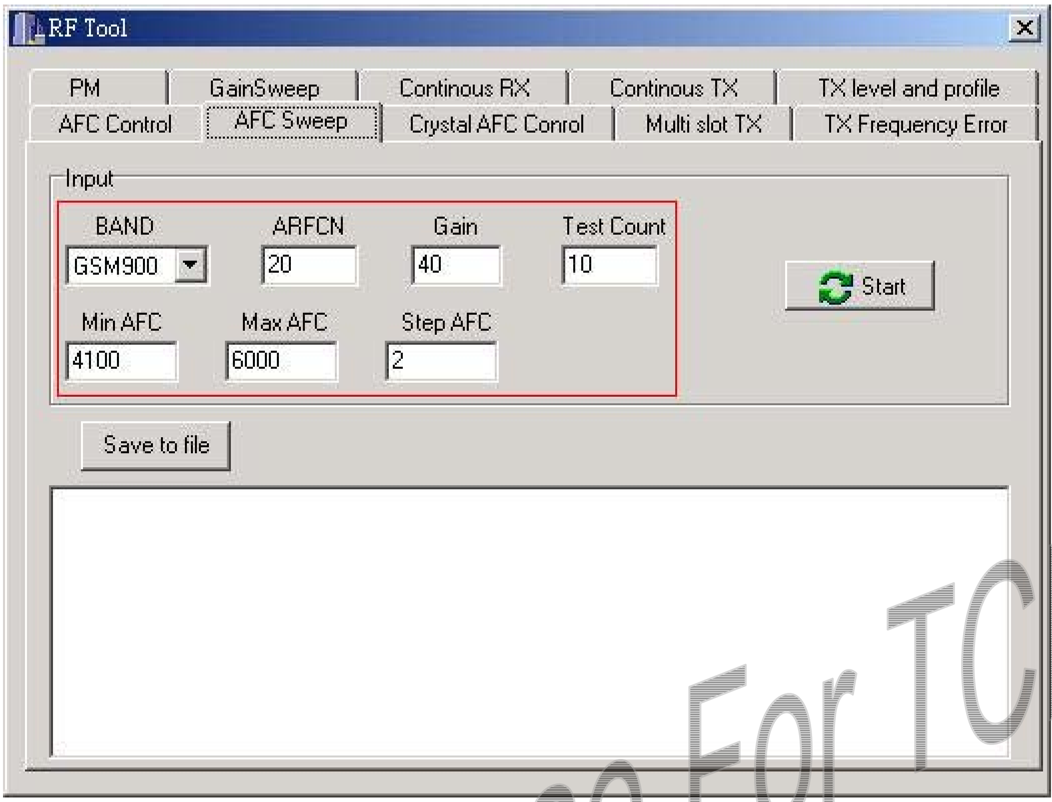

Figure 121 Input Band, ARFCN, Gain (dB), Test Count, Min AFC DAC, Max AFC DAC and step AFC DAC

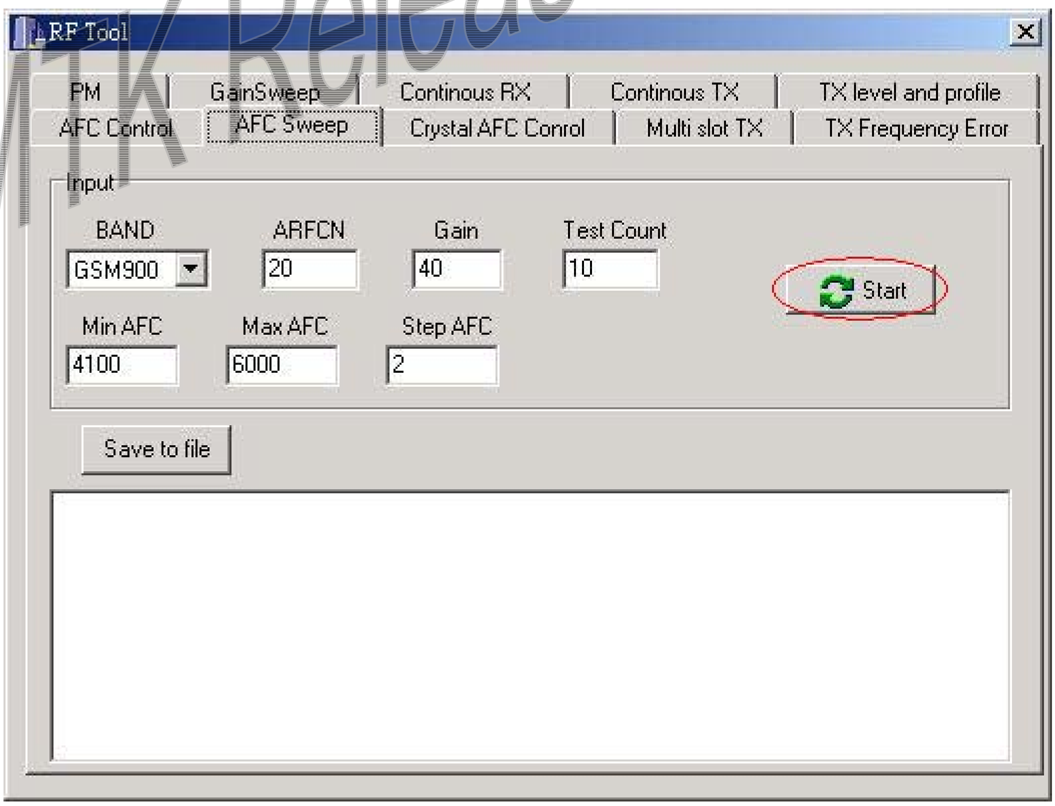

Figure 122 Click [Start] button

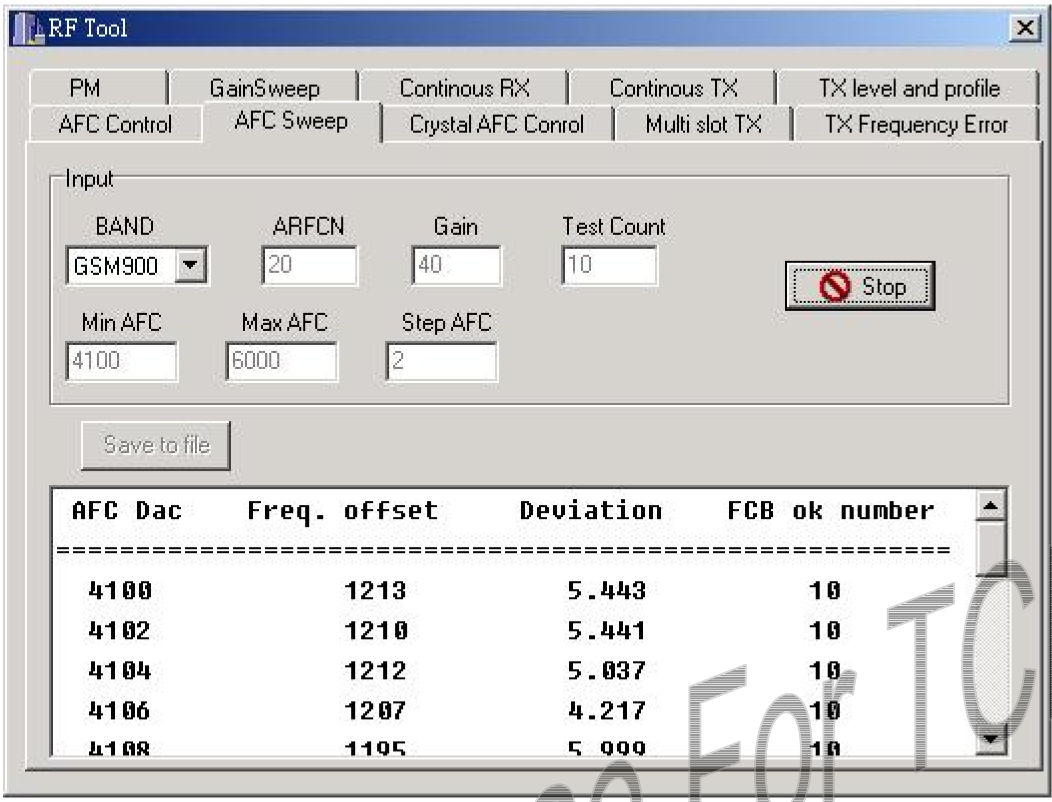

Figure 123 META shows AFC sweep result

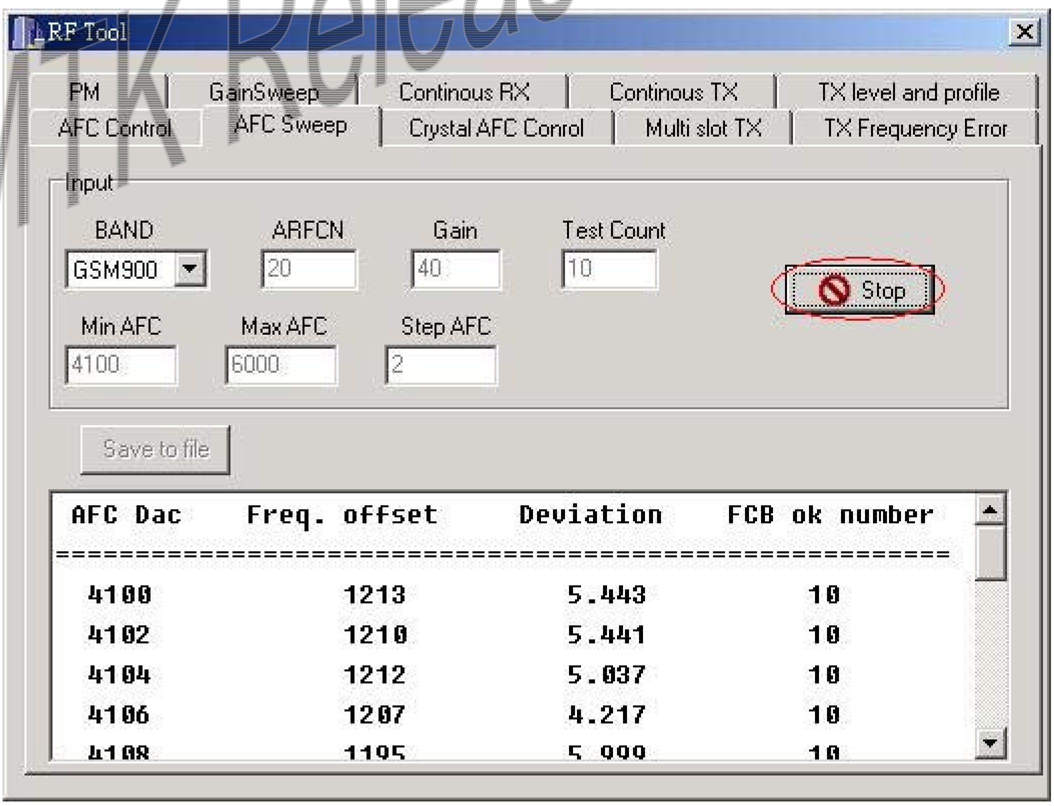

Figure 124 Click [Stop] button to stop AFC sweep operation

User can save AFC sweep result to text file by clicking [Save to file] button.

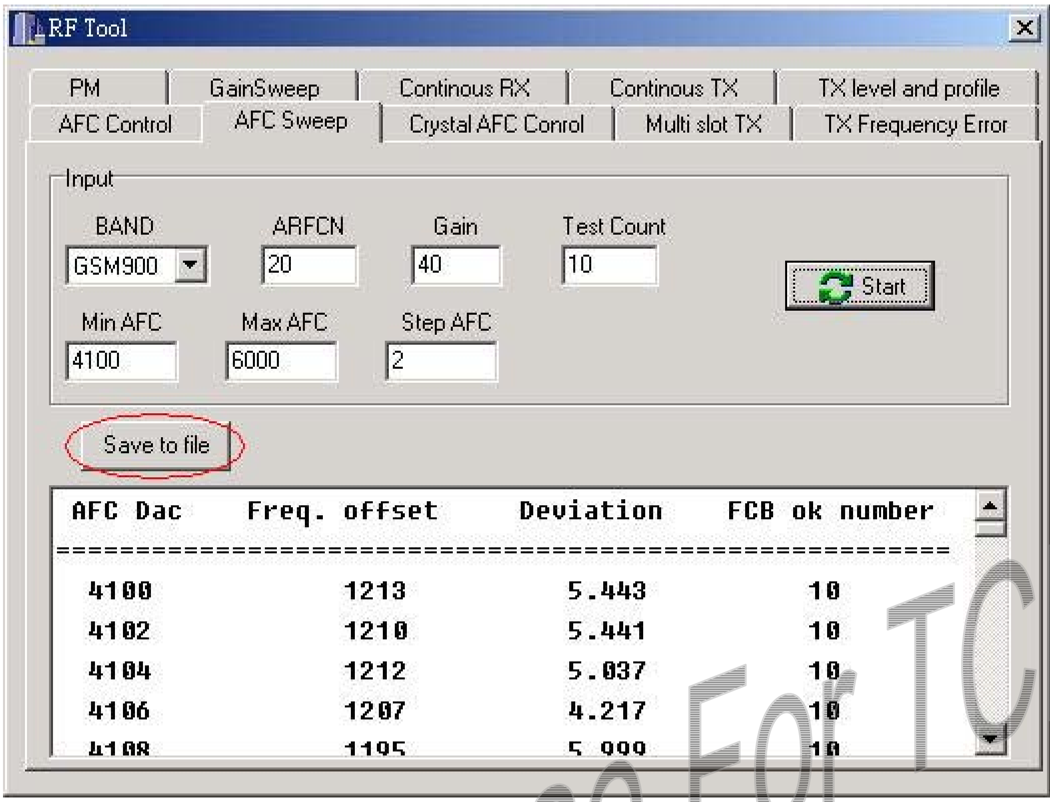

Figure 125 Click [Save to file] button to save AFC sweep result to text file

3.2.8 Crystal AFC control

Crystal AFC control window provides transmitting normal burst to test equipment for user to get TX frequency error, upload or download crystal AFC control value from or to flash and load or save crystal AFC control value in text file.

User can input Band, ARFCN, TSC(training sequence code), PCL(power control level), CAP ID and AFC chosen and then click [Start] button to start crystal AFC control. MS will transmit normal burst with the parameters set by user after the command from META is received. User can get TX frequency error from Agilent 8960 or other test equipment.

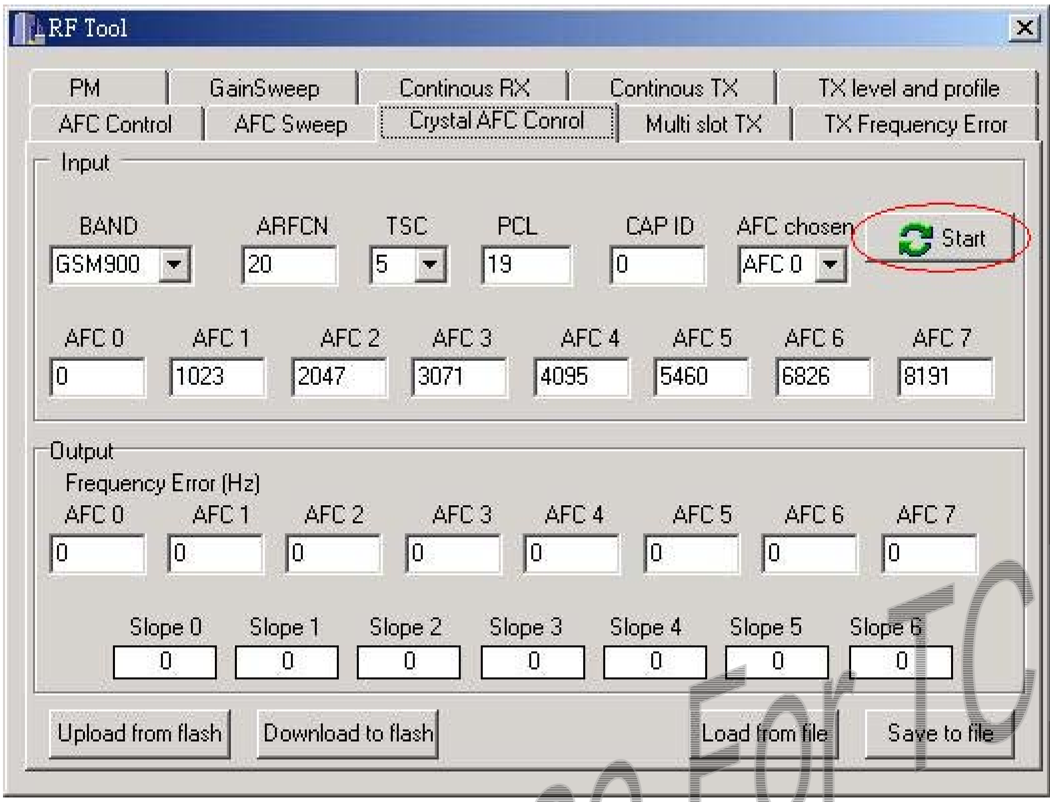

Figure 126 Click [Start] button to start crystal AFC control testing

3.2.8.1 Upload and download the crystal AFC value in flash

Following describes how to upload and download crystal AFC value from and to flash. User can click [Upload from flash] button to read CAP ID, AFC DAC, frequency and slope of AFC0 to AFC7 and from flash and click [Download to flash] button to write CAP ID, AFC DAC, frequency and slope of AFC0 to AFC7 to flash.

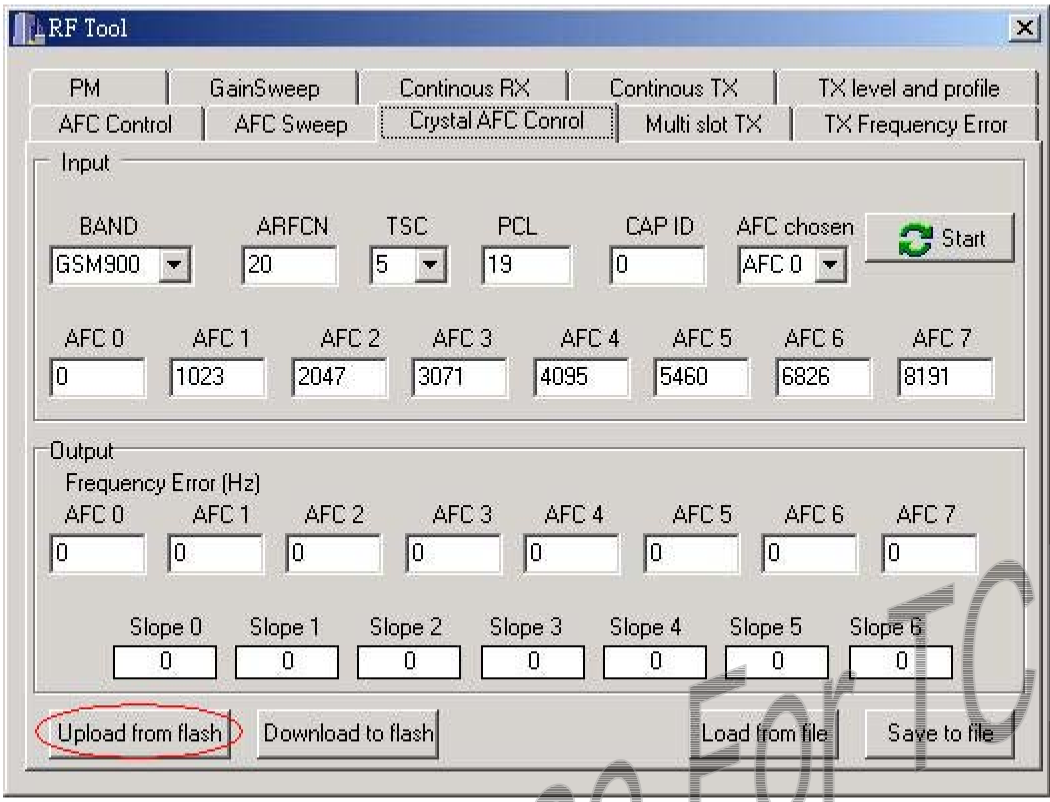

Figure 127 Click [Upload from flash] button to read crystal AFC control value from flash

Figure 128 Select NVRAM database file if not selected before

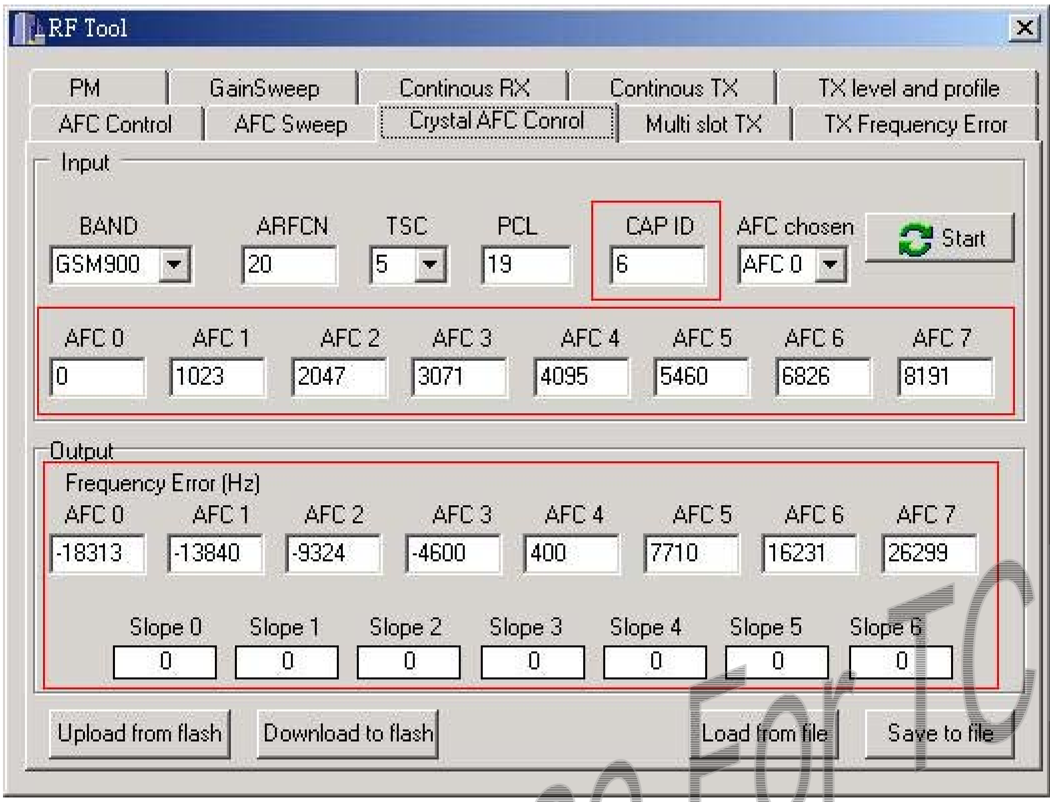

Figure 129 Result of uploading crystal AFC control value from flash

Figure 130 Click [Download to flash] button

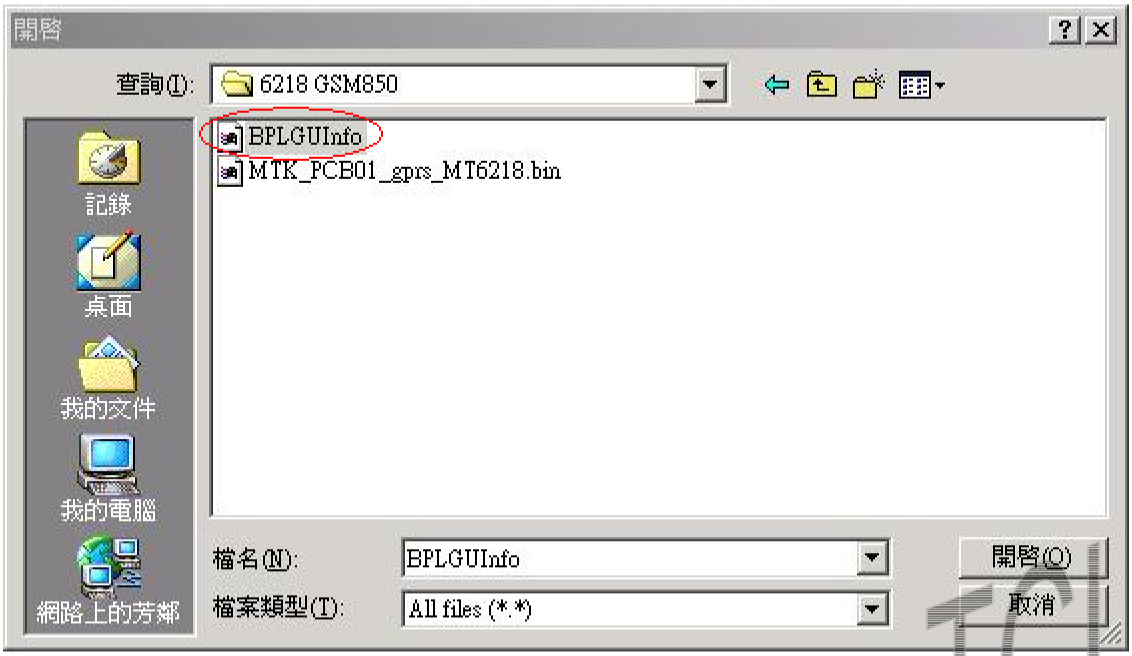

Figure 131 Select NVRAM database file if not selected before

3.2.8.2 Read and write crystal AFC control value in file

Following describes how to load and save crystal AFC value from and to text file. User can click [Load from file] button to read CAP ID, AFC DAC and frequency error of AFC0 to AFC7 from file and click [Save to file] button to write CAP ID, AFC DAC, frequency and slope of AFC0 to AFC7 to file.

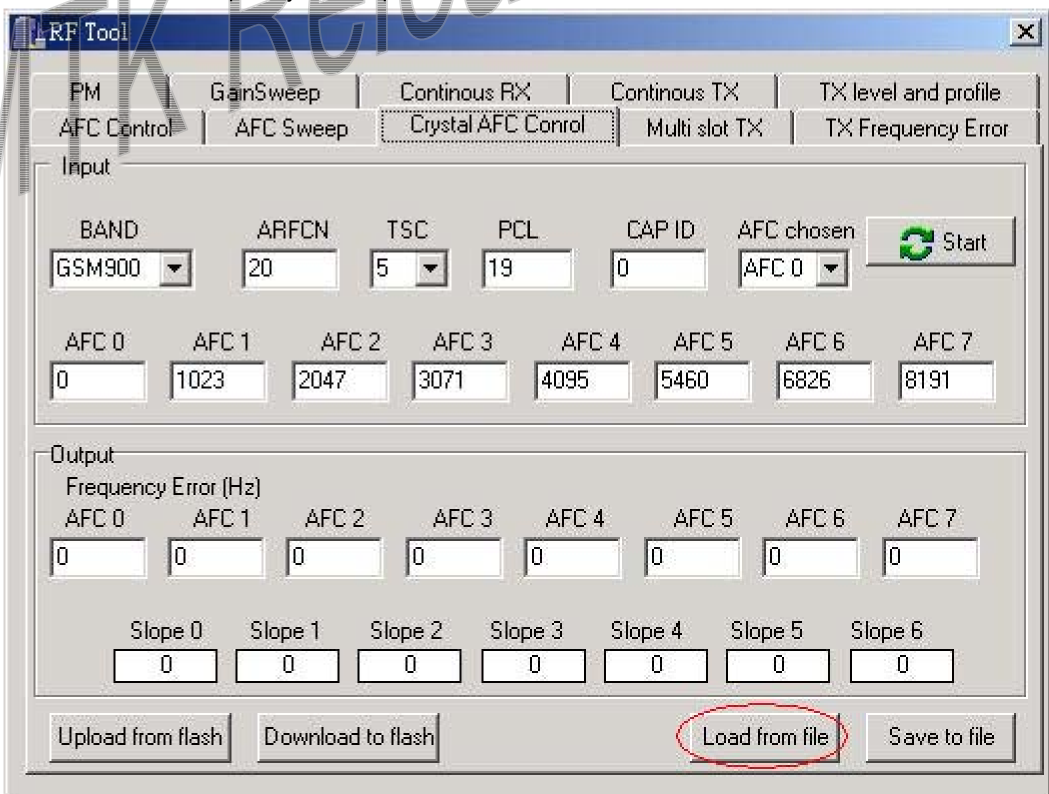

Figure 132 Click [Load from file] to read crystal AFC control value from file

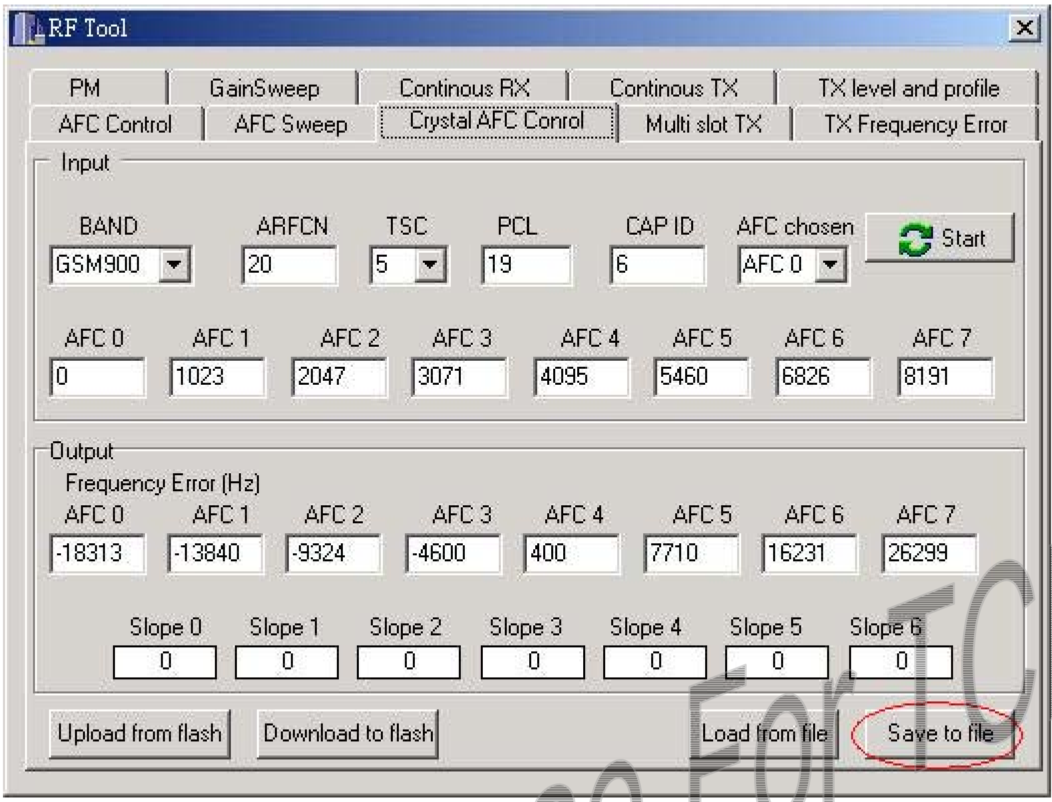

Figure 133 Click [Save to file] button to save crystal AFC control value to file

The following is a template of crystal AFC control file. User will get the text file after clicking [Save to file] button. Please follow the file format if you want to change the value in file.

[Crystal AFC control]
cap_id=6
AFC_DAC_0=0
AFC_DAC_1=1023
AFC_DAC_2=2047
AFC_DAC_3=3071
AFC_DAC_4=4095
AFC_DAC_5=5460
AFC_DAC_6=6826
AFC_DAC_7=8191
FREQ_ERR_0=-18313
FREQ_ERR_1=-13840
FREQ_ERR_2=-9324
FREQ_ERR_3=-4600
FREQ_ERR_4=400
FREQ_ERR_5=7710
FREQ_ERR_6=16231
FREQ_ERR_7=26299

3.2.9 Multi slot TX

This operation is used for user to fine tune multi-slot TX configuration and inter slot ramp profile. Power Amplifier is turned on in this operation and indicated bursts are transmitted. MS will start to transmit RF signal with parameters set by user after MS get the command from META. RF engineer can measure the transmitted power of MS by Agilent 8960 or other measurement instrument.

User can execute multi-slot TX function by following steps:

1) Input Band, ARFCN, TSC (training sequence code), TA (timing advance) and AFC DAC value.
2) Click time slot mask (at most 4 time slots are supported) and enter coding scheme and PCL of corresponding time slot.
3) Click [Start] button.
4) User can stop this operation by clicking [Stop] button.

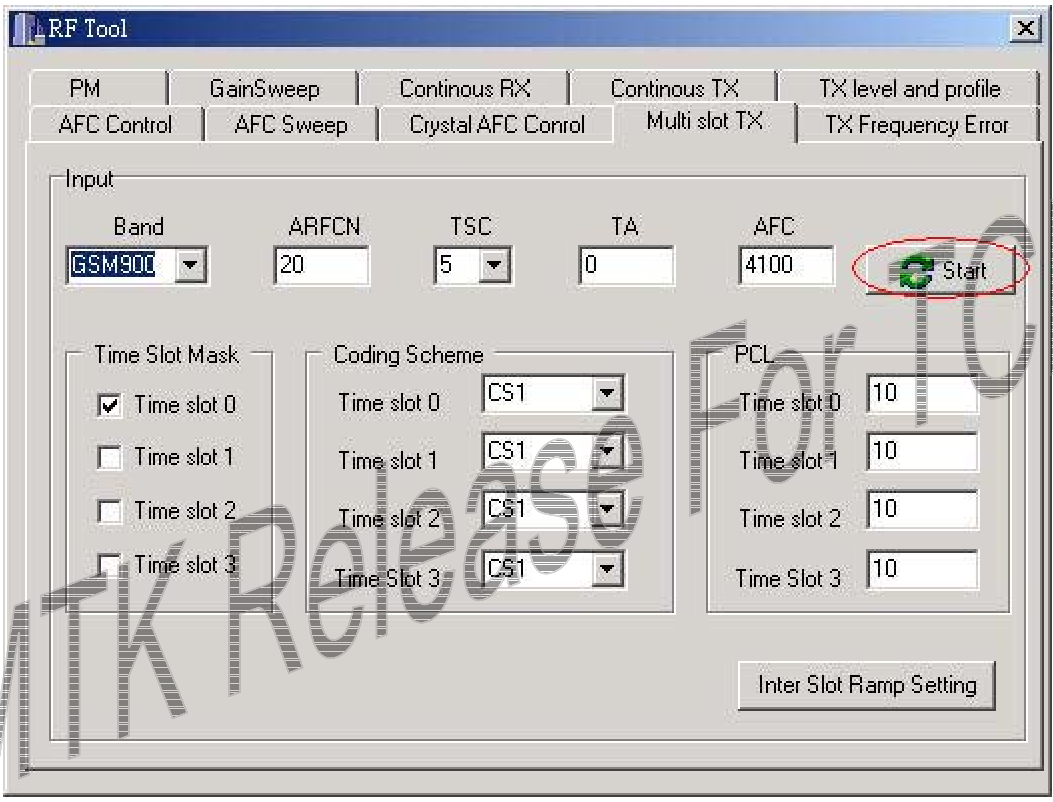

Figure 134 Click [Start] button to start multi slot TX testing

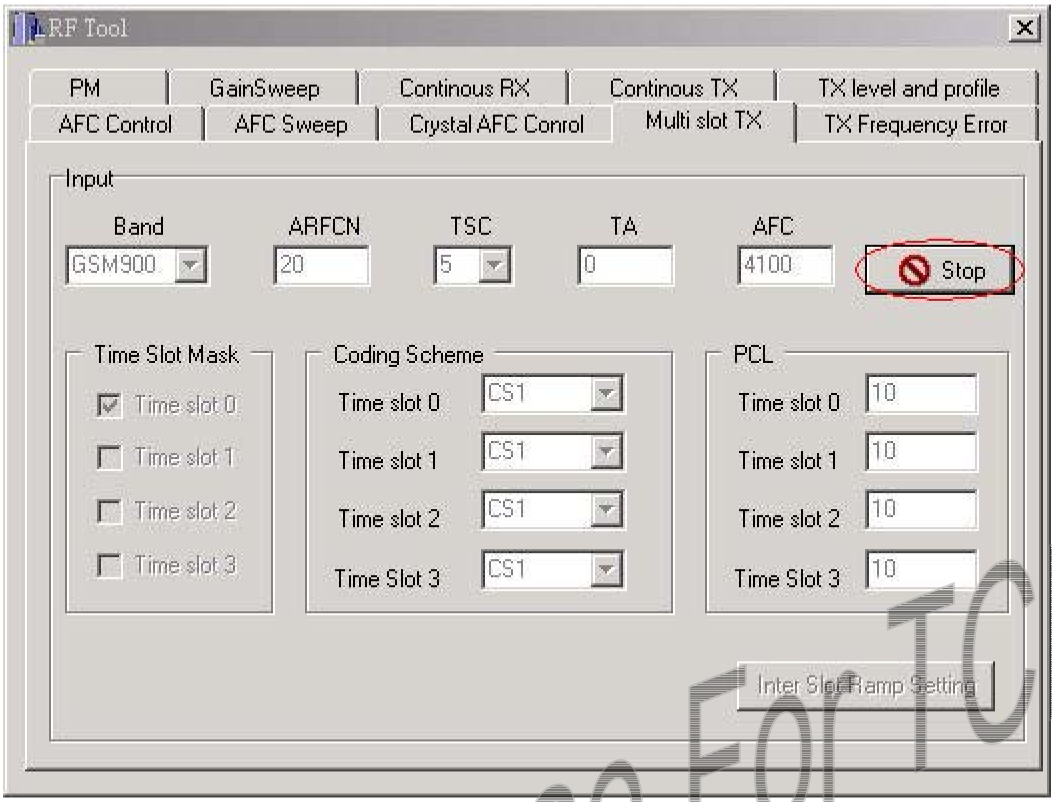

Figure 135 Click [stop] button to stop multi slot TX testing

3.2.9.1 Inter slot ramp setting

User can edit inter slot ramp using inter slot ramp window. User can click [Inter Slot Ramp Setting] button to show inter slot ramp window.

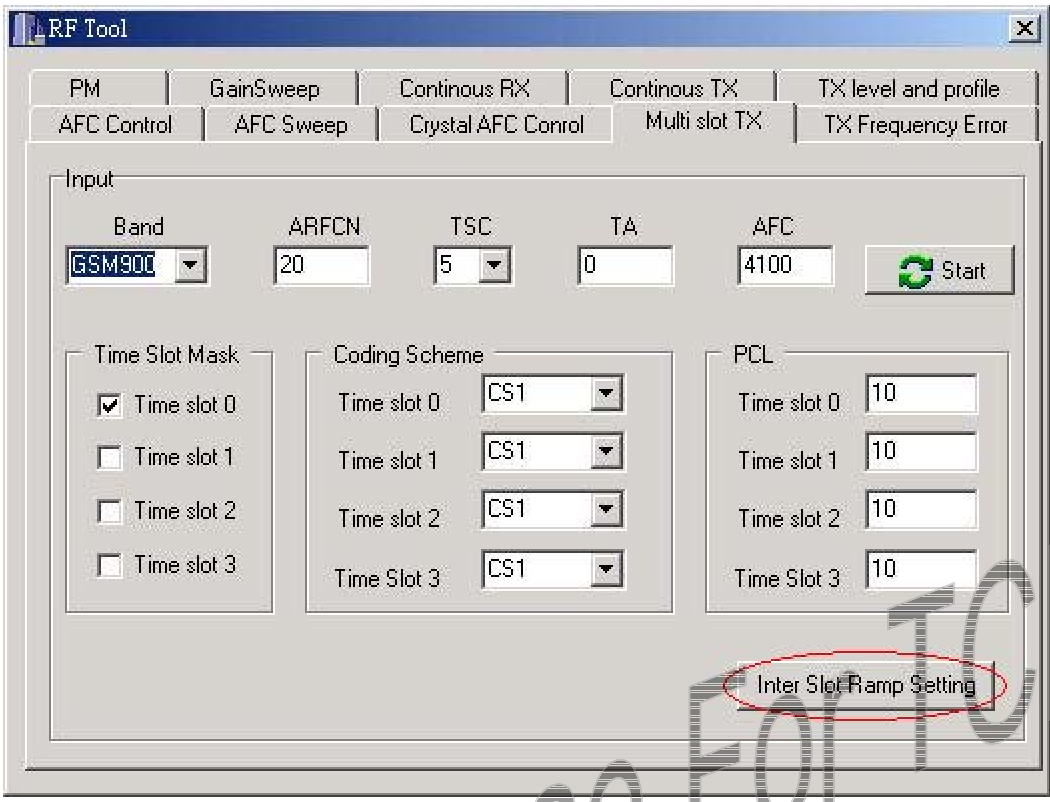

Figure 136 Click [Inter Slot Ramp Setting] button

Figure 137 Inter slot ramp setting window

3.2.9.2 Upload and download inter slot ramp profile in flash

User can read inter slot ramp profile from flash by clicking [Upload from flash] button and write inter slot ramp profile to flash by clicking [Download to flash] button.

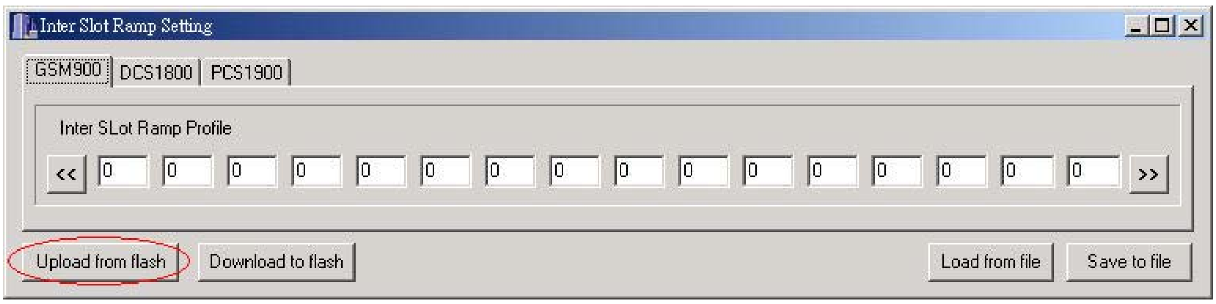

Figure 138 Click [Upload from flash] button to read inter slot ramp profile from flash

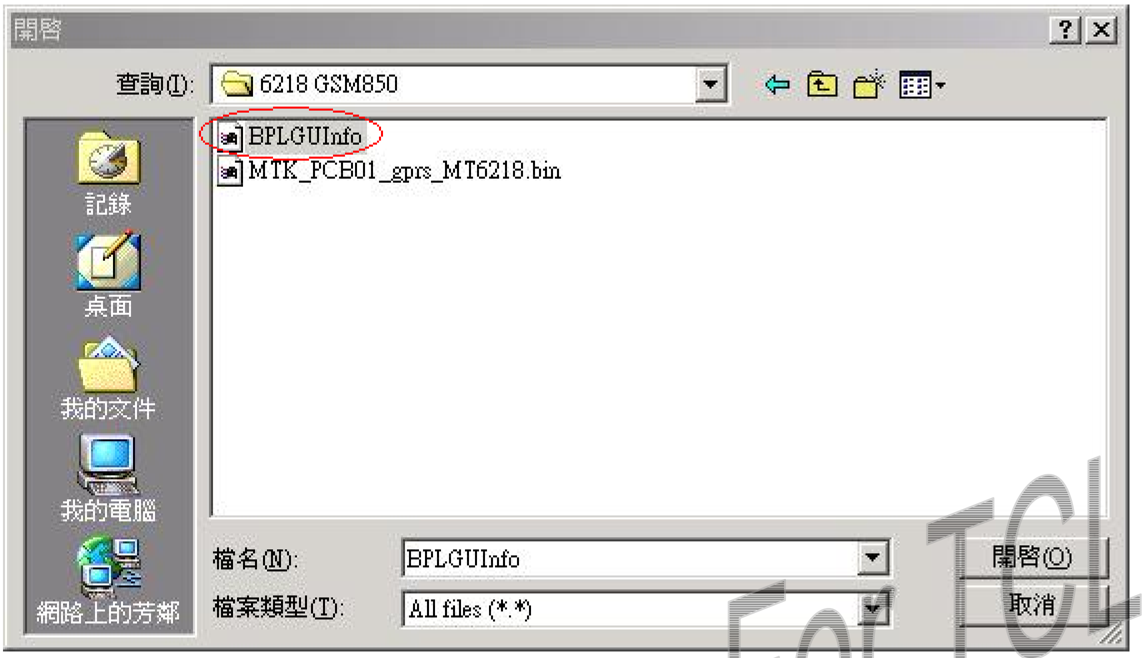

Figure 139 Select NVRAM database file if not selected before

Figure 140 Result of uploading inter slot ramp profile from flash

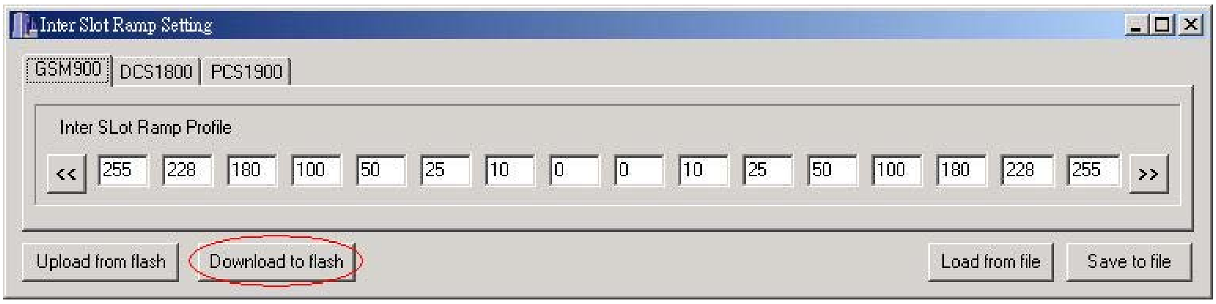

Figure 141 Click [Download to flash] button to download inter slot ramp profile to flash

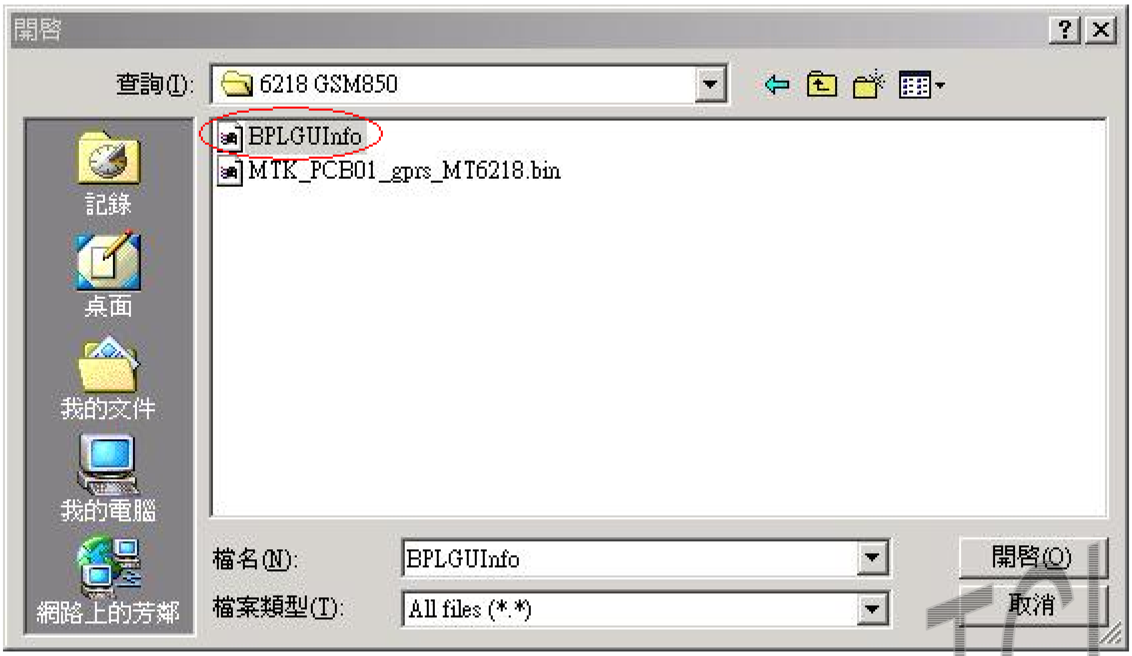

Figure 142 Select NVRAM database file if not selected before

3.2.9.3 Read and write inter slot ramp profile in file

User can read inter slot ramp profile by clicking [Load from file] button and write inter slot ramp profile in file by clicking [Save to file] button.

Figure 143 Click [Load from file] to read inter slot ramp profile from file

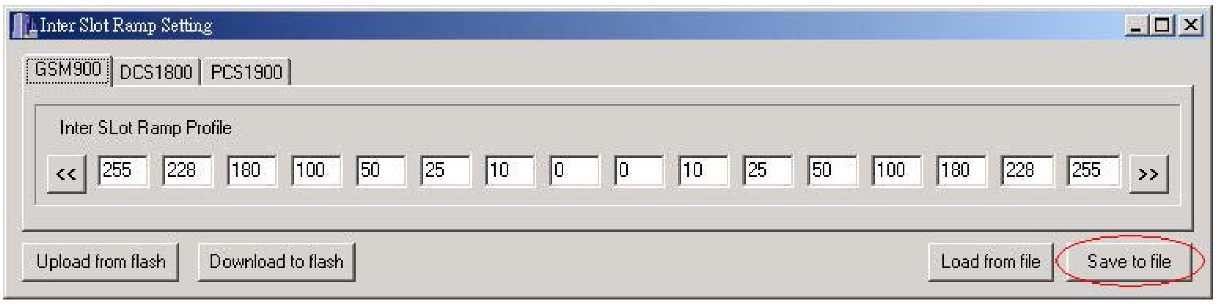

Figure 144 Click [Save to file] button to save inter slot ramp profile to file

The following is a template of inter slot ramp profile file. User will get the text file after clicking [Save to file] button. Each value must be followed with a comma. Please follow the file format if you want to change the value in file.

[GSM900 inter slot ramp]

inter slot ramp profile=255,228,180,100,50,25,10,0,0,10,25,50,100,180,228,255
[DCS1800 inter slot ramp]
inter slot ramp profile=255,228,180,100,50,25,10,0,0,10,25,50,100,180,228,255
[PCS1900 inter slot ramp]
inter slot ramp profile=255,228,180,100,50,25,10,0,0,10,25,50,100,180,228,255

3.2.10 TX frequency error

This operation is used for user to get TX frequency error periodically from Agilent 8960. User can execute TX frequency error function by following steps:

1) Input Band, ARFCN, TSC (training sequence code), PCL (power control level), AFC DAC value, period and ADC channel and select burst type.
2) Click [Setup log file name] button.
2) Click [Start] button.
3) User can stop this operation by clicking [Stop] button.

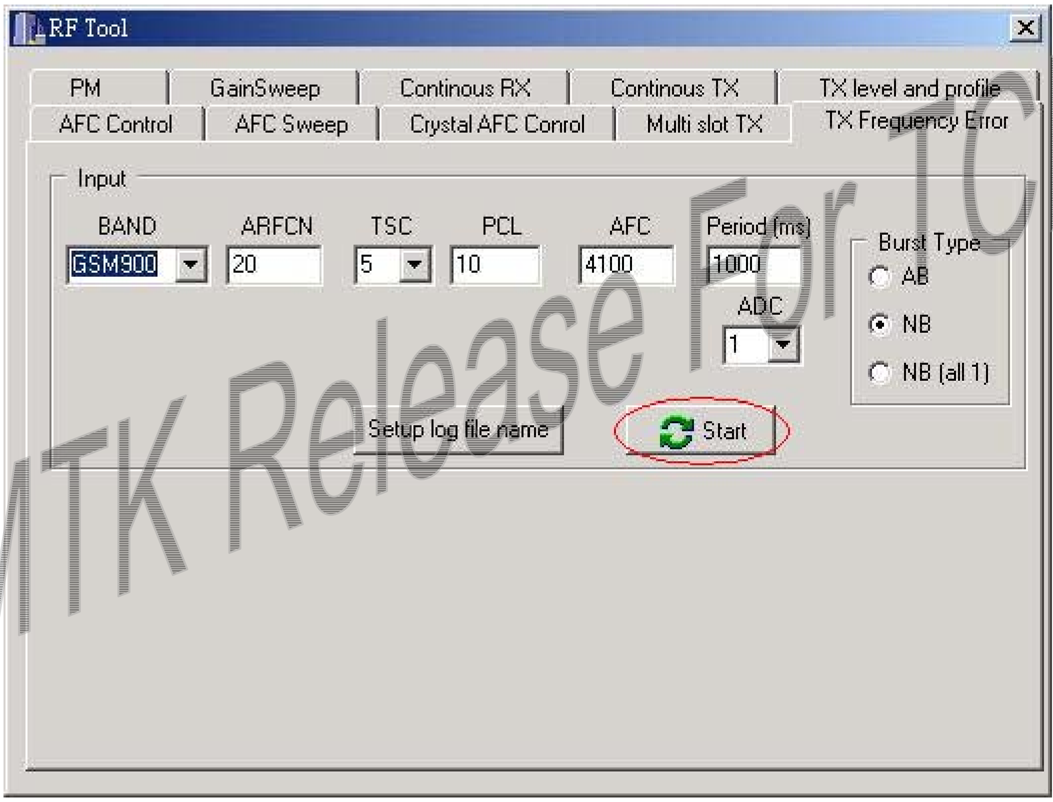

Figure 145 Click [Start] button to start getting TX frequency error

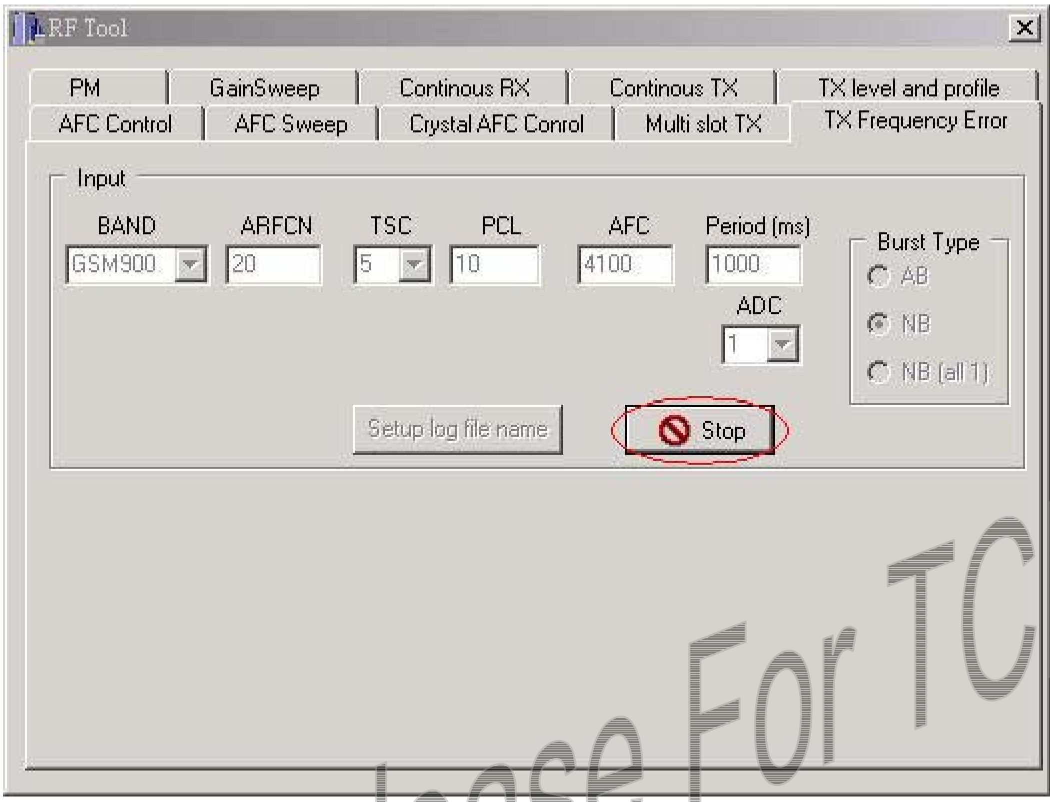

Figure 146 Click [stop] button to stop getting TX frequency error

3.2.11 Crystal AFC sweep

This operation is used for user to get TX frequency error periodically from Agilent 8960. User can execute crystal AFC sweep function by following steps:

1) Setup NVRAM database file, CFG file and log file.

2) Input Band, ARFCN, TSC (training sequence code), PCL (power control level), minimum CAP ID, maximum CAP ID, CAP ID step, minimum AFC DAC, maximum AFC DAC and AFC DAC step.

3) Click [Start] button.

4) User can stop this operation by clicking [Stop] button.

Note: CAP ID field is used to select index of CAP array (range: 0~63) in RF chip.

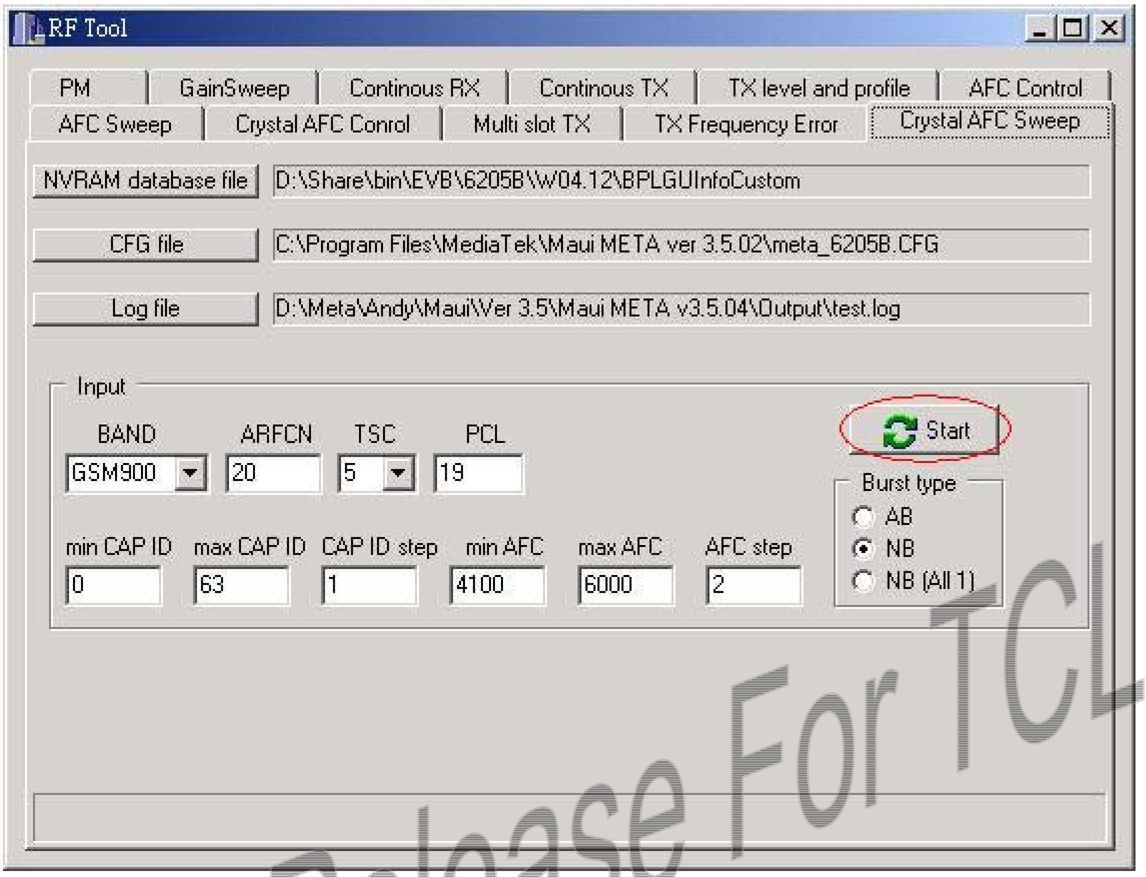

Figure 147 Click [Start] button to start crystal AFC sweep

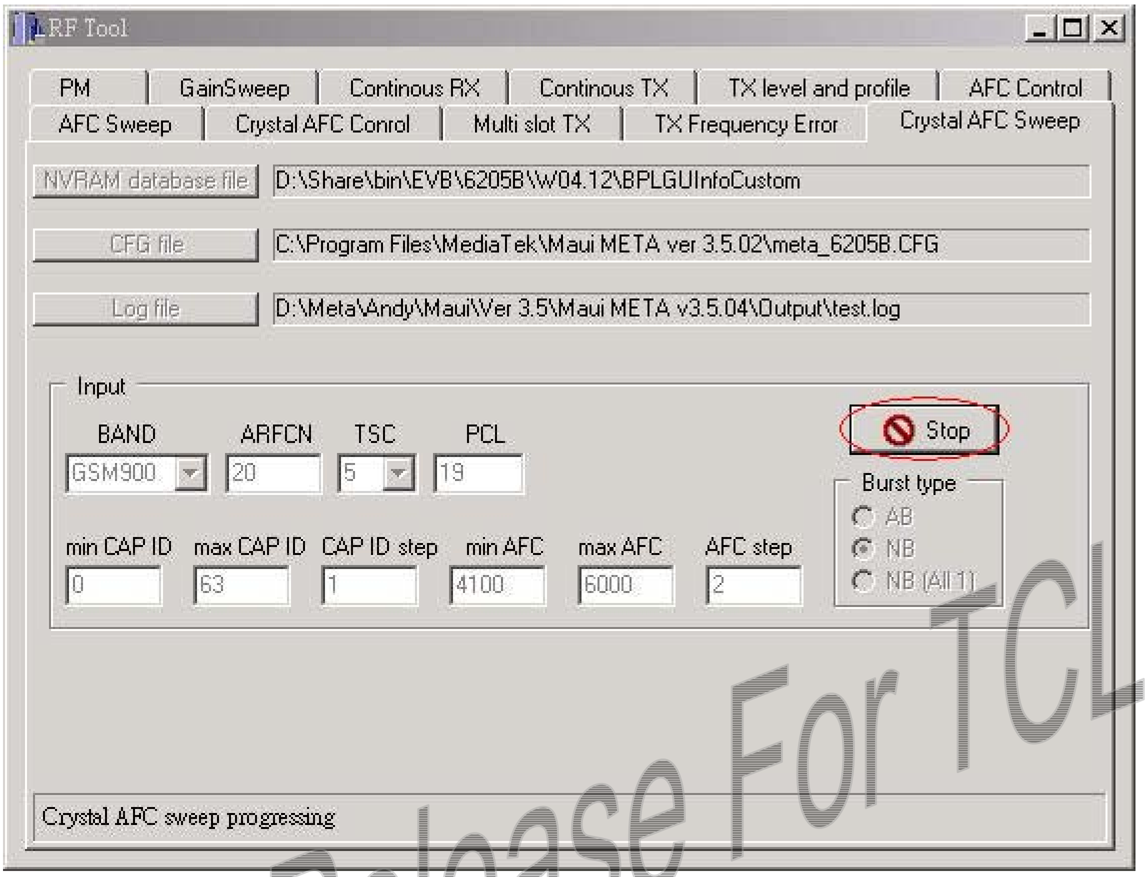

Figure 148 Click [Stop] button to stop crystal AFC sweep

3.3 NVRAM editor

The data saved in flash is constructed by many records. NVRAM editor can edit each value in each record in the flash. The tree at left side window will be automatic generated after opening the NVRAM database file. The window at the right side will display the data structure of the selected record read from NVRAM. User can switch to NVRAM editor by selecting [NVRAM editor] from main selection menu.

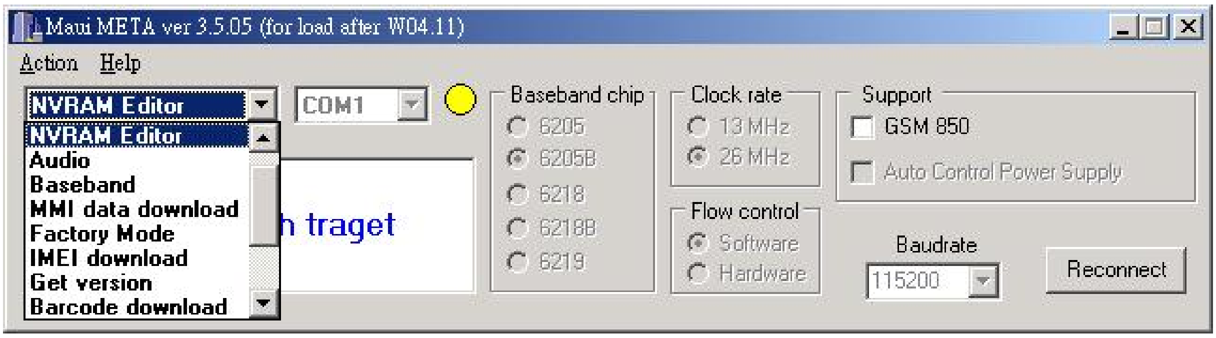

Figure 149 Select [NVRAM Editor] from main selection menu

3.3.1 Read from NVRAM

User can click [read from NVRAM] button to read one record from flash in MS.

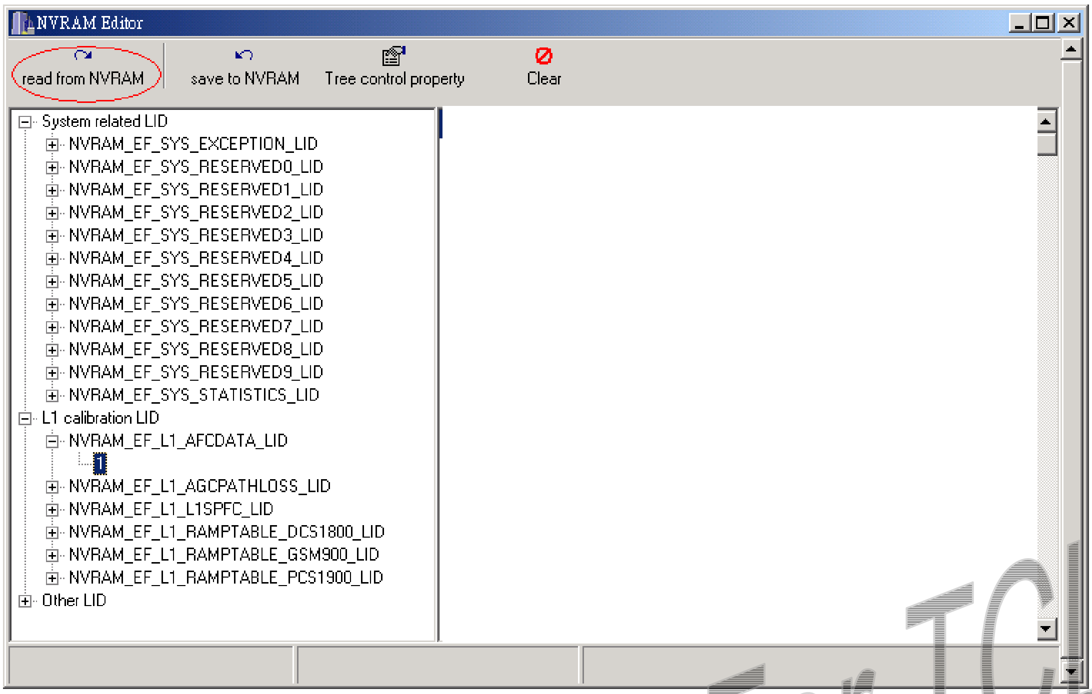

Figure 150 Click [read from NVRAM] button to read one record from flash

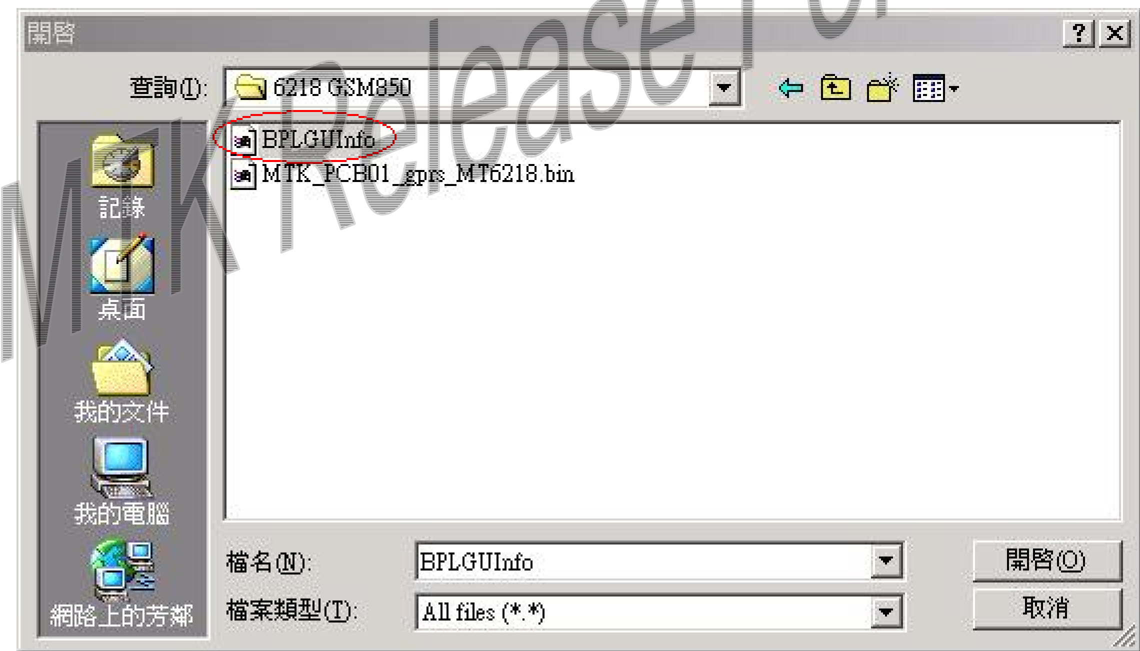

Figure 151 Select NVRAM database file if not selected before

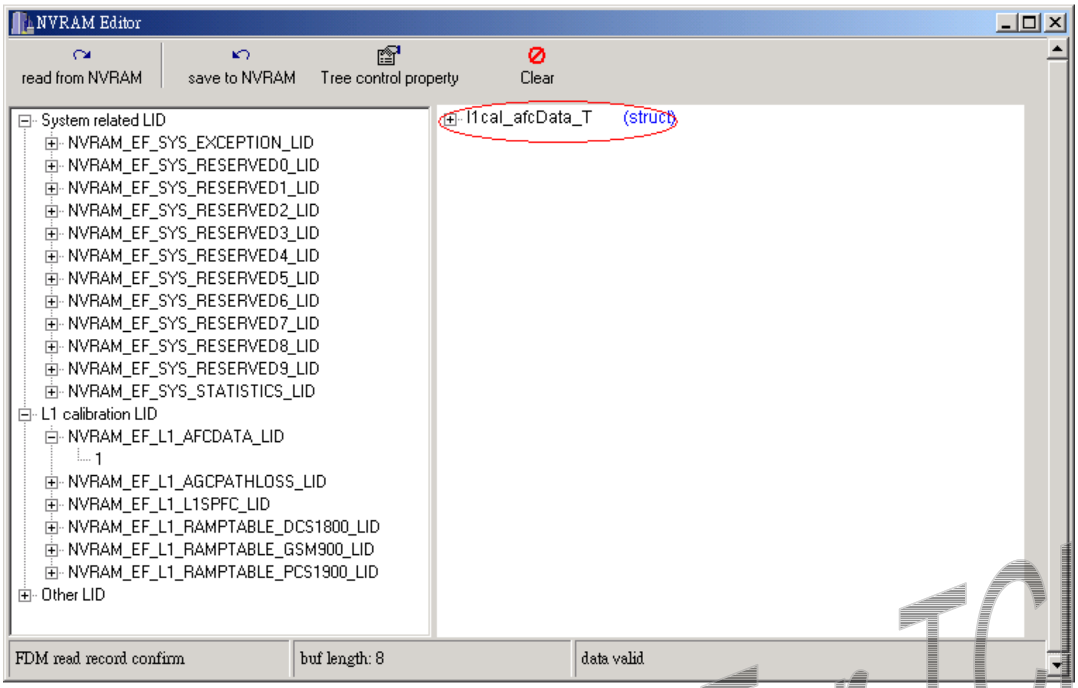

Figure 152 The record read from NVRAM is shown on the right side window

User can click the structure in the right side window to expend the data structure of the record.

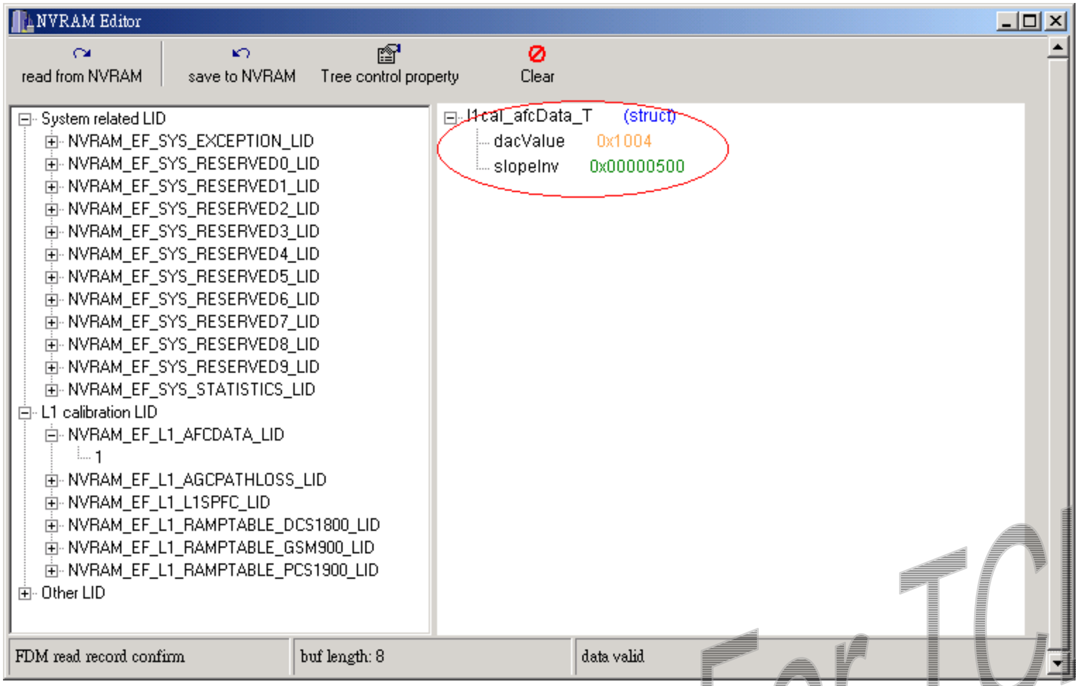

Figure 153 Data structure of the selected record

User can read another record from NVRAM using following steps:
Step 1. Select one record in the tree of the left side window.
Step 2. Click [read from NVRAM] button.

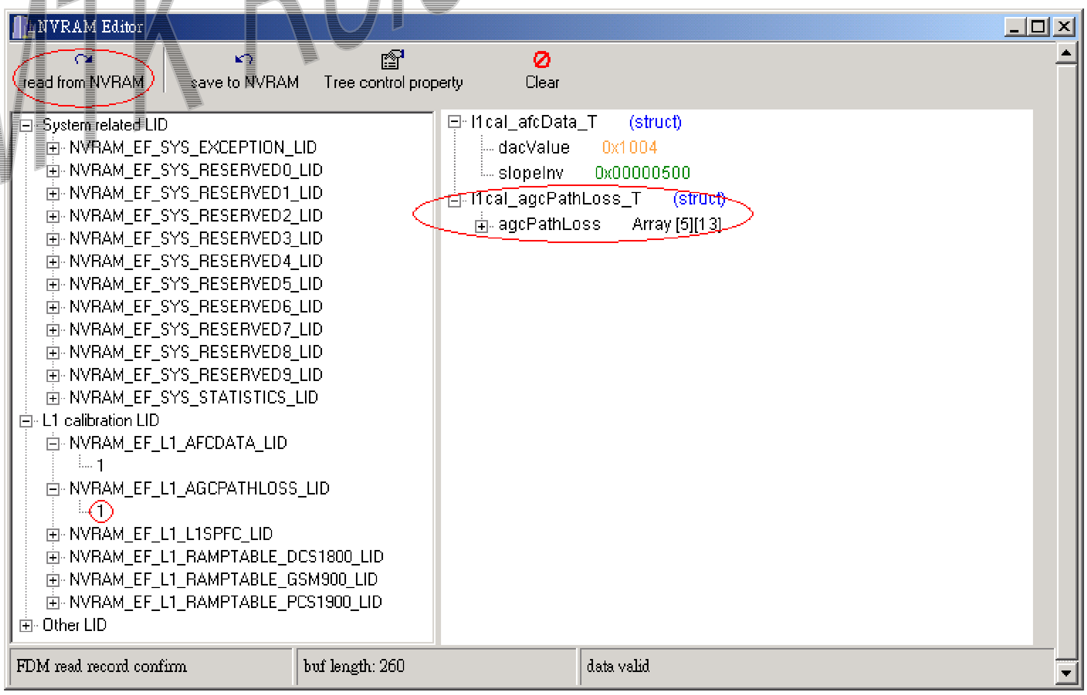

Figure 154 Read another record.

Click the structure you read at the right side window to expand the structure.

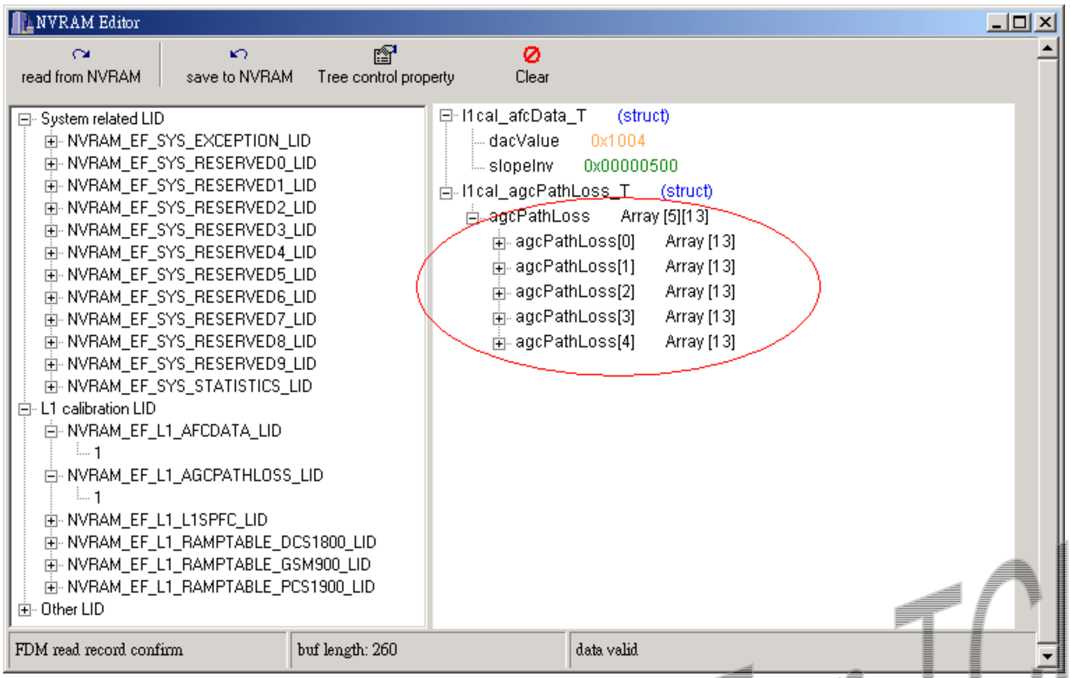

Figure 155 Show the data structure of the selected record

3.3.2 Editing the field in structure

User can select a field of the structure by clicking it. Then input value to the selected field.

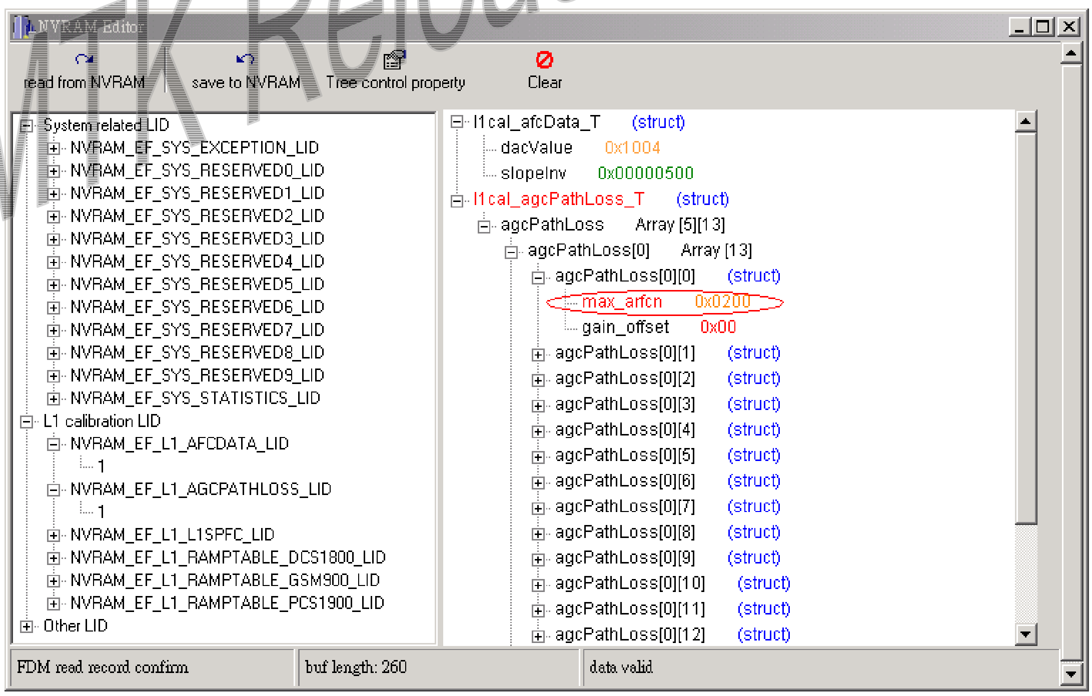

Figure 156 Select a field

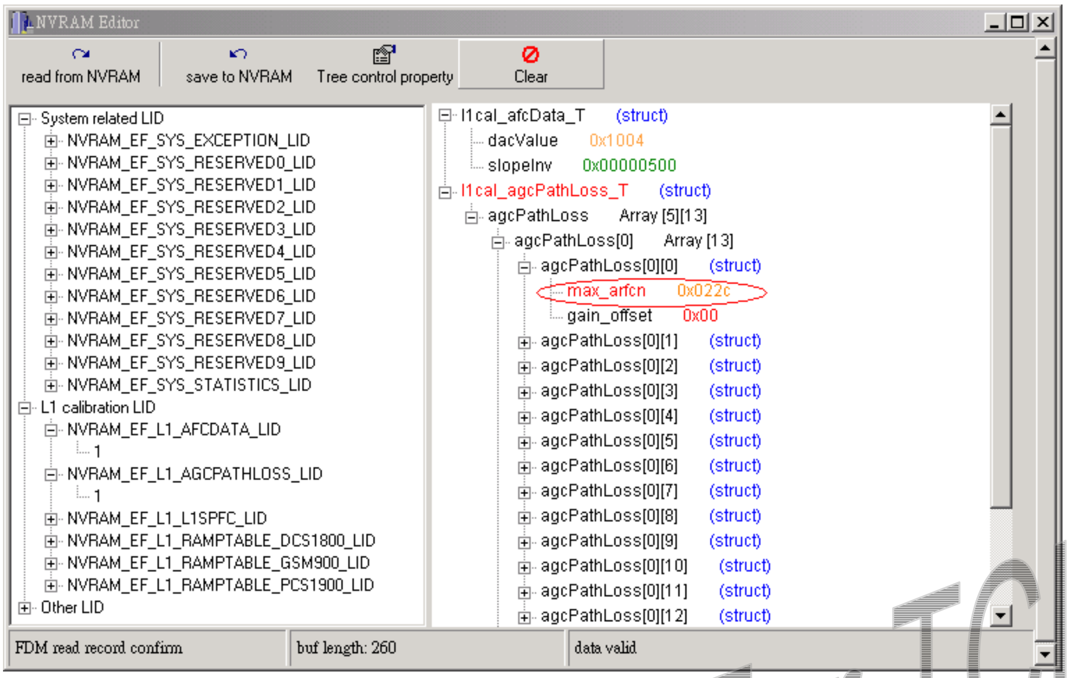

Figure 157 Change value of the field

The modified field and structure will change its color.

3.3.3 Save the record to NVRAM

User must select the record that he wants to save firstly and then click [Save to NVRAM] button to save the record.

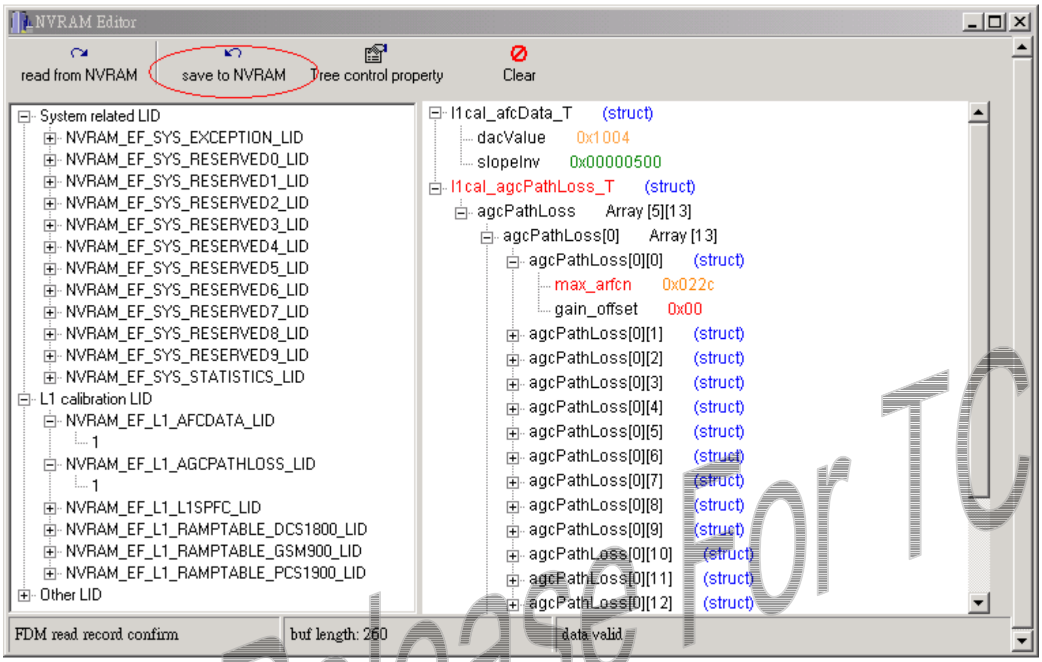

Figure 158 Save the selected record to flash

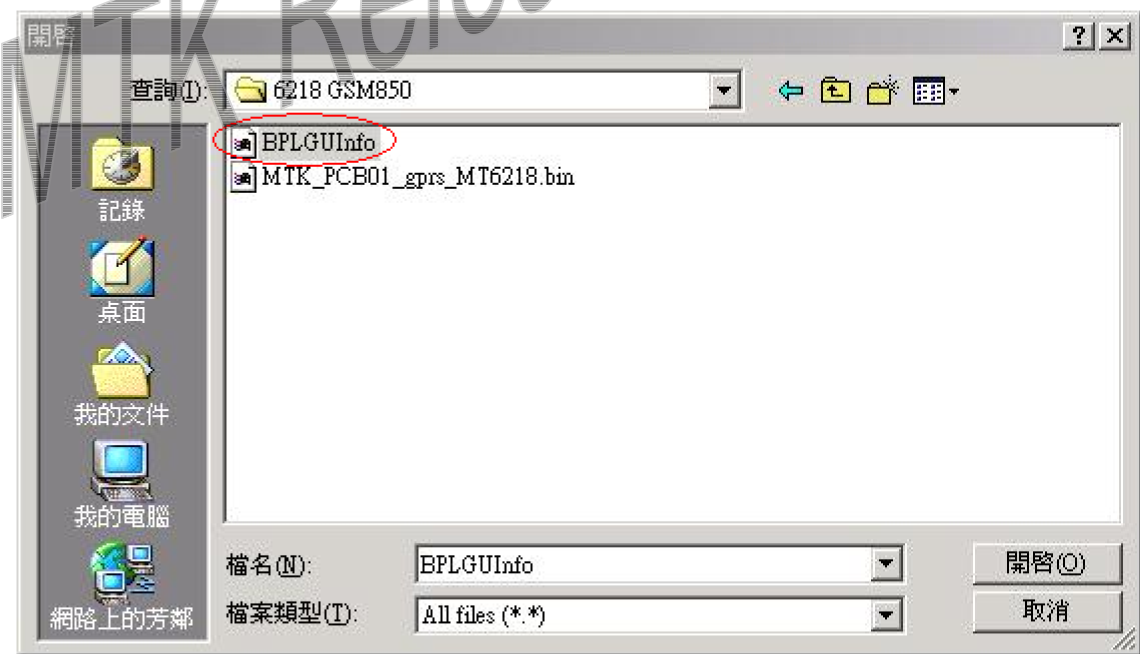

Figure 159 Select NVRAM database file if not selected before

3.3.4 Clear or remove a structure in NVRAM editor

User can click [Clear] button to remove a structure in NVRAM editor.

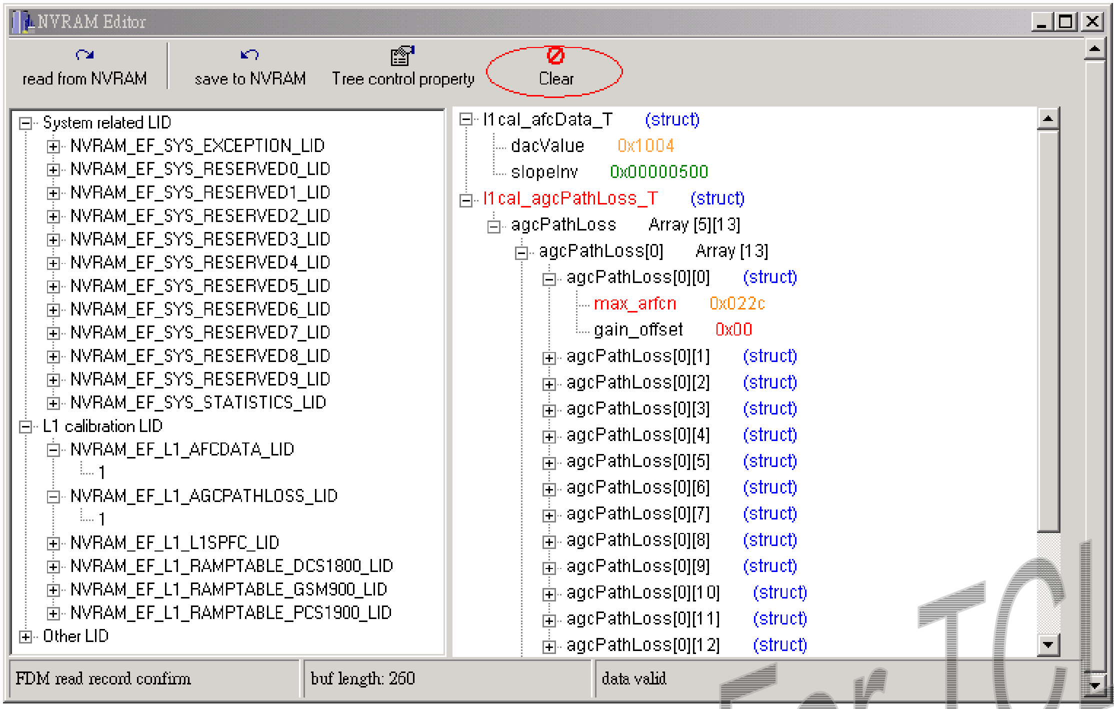

Figure 160 Clear one record in flash

If user wants to clear a modified record, NVRAM editor will pop-up a dialog to ask user to save it or not.

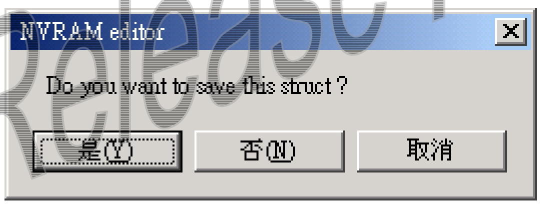

Figure 161 Save or not or cancel

3.3.5 NVRAM editor property setting

User can click [Tree control property] button to set colors of tree at the right side window.

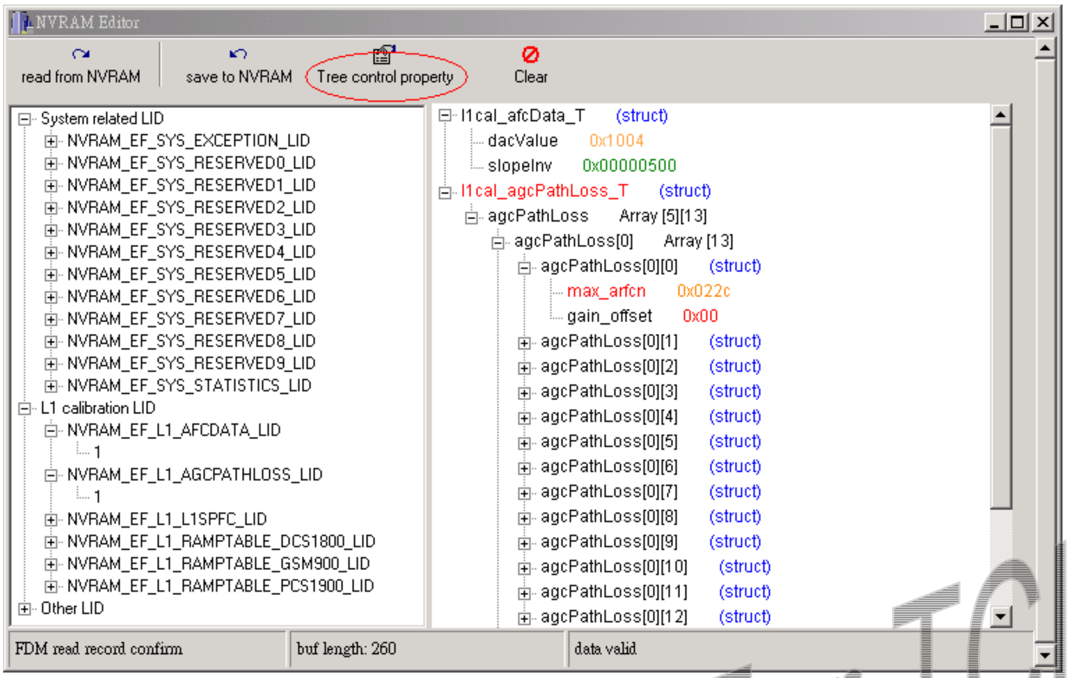

Figure 162 Click [Tree control property] button

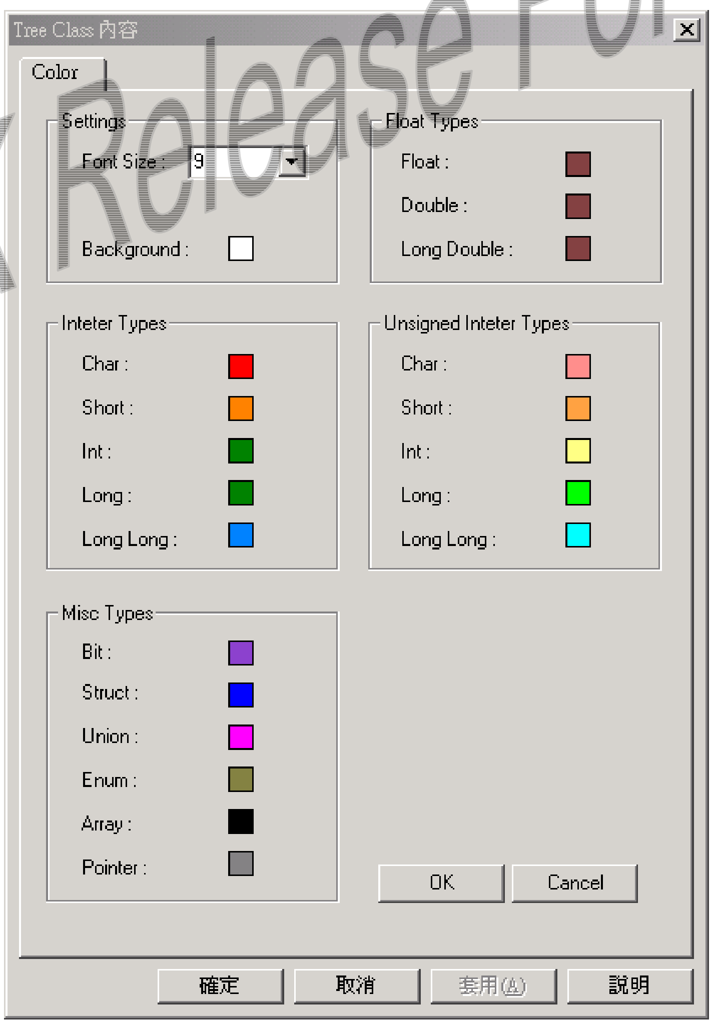

Figure 163 Tree control property window

User can click each little square to change the color of each type in NVRAM editor.

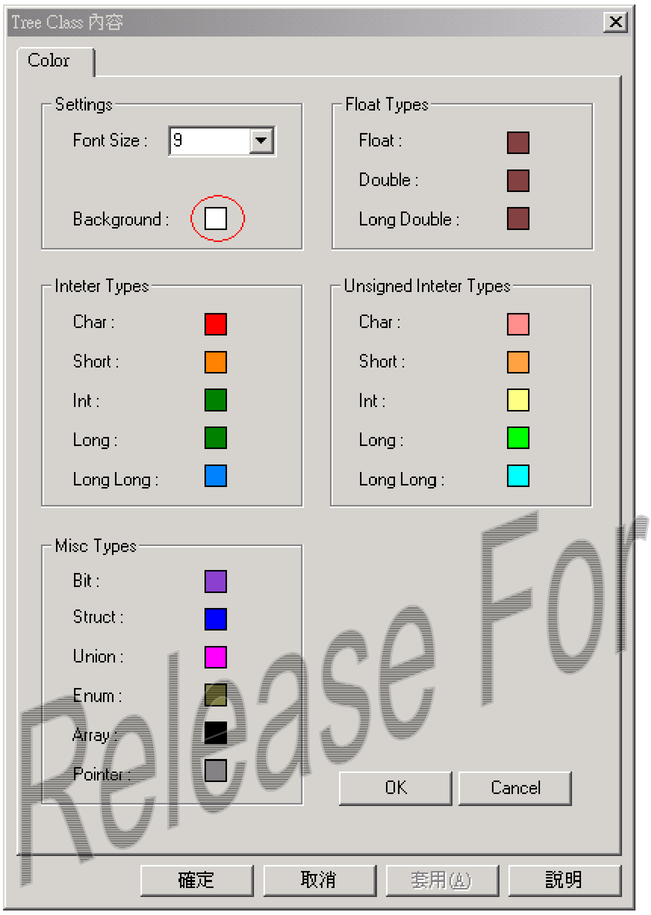

Figure 164 Set color of data type window

After user clicks the square, NVRAM editor will pop-up a little window to show all colors that user can select.

Figure 165 Select color window

3.4 Audio function

There are many audio functions supported by META. They are acoustic FIR-coefficient, additional output FIR-coefficient, AMR FIR-coefficient, melody FIR-coefficient, audio testing, ring composer, play song in FAT, play song using ID, customer volume setting, acoustic FIR tuning and melody FIR tuning. User can switch to audio function by selecting [Audio] from main selection menu.

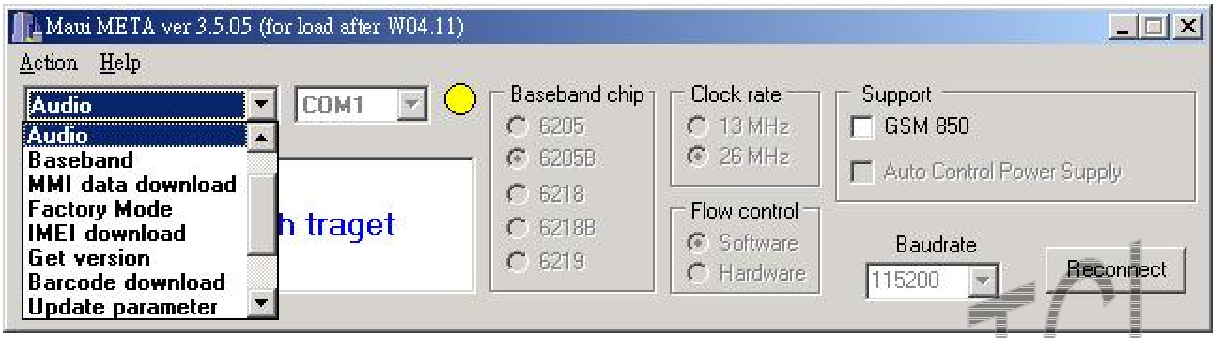

Figure 166 Select [Audio] from main selection menu

3.4.1 Acoustic FIR-coefficient

Acoustic FIR-coefficient window provides interface for user to read or write coefficient in flash, ini file or Matlab file and generating C file. User can click these 12 buttons shown on window to read coefficient from flash, write coefficient to flash, load coefficient from file and save coefficient to file. All values are in decimal format. The range of acoustic FIR coefficient is -32768 ~ 32767. There are four group of coefficient, they are handset input coefficient, handset output coefficient, earphone input coefficient and earphone output coefficient. There are 30 words in each group of coefficient. There are 5 parameters in echo suppression function. They are

Time energy gap: time-and-energy-gap constant for speakerphone application in loud-speaker mode.

Volume constant: gain constant for speakerphone application in loud-speaker mode.

Time energy gap 2: time-and-energy-gap constant for echo loss at maximum speaker volume in normal mode.

Volume constant 2: gain constant for echo loss at maximum speaker volume in normal mode.

Media playback max swing: the maximum output swing to ADC DAC.

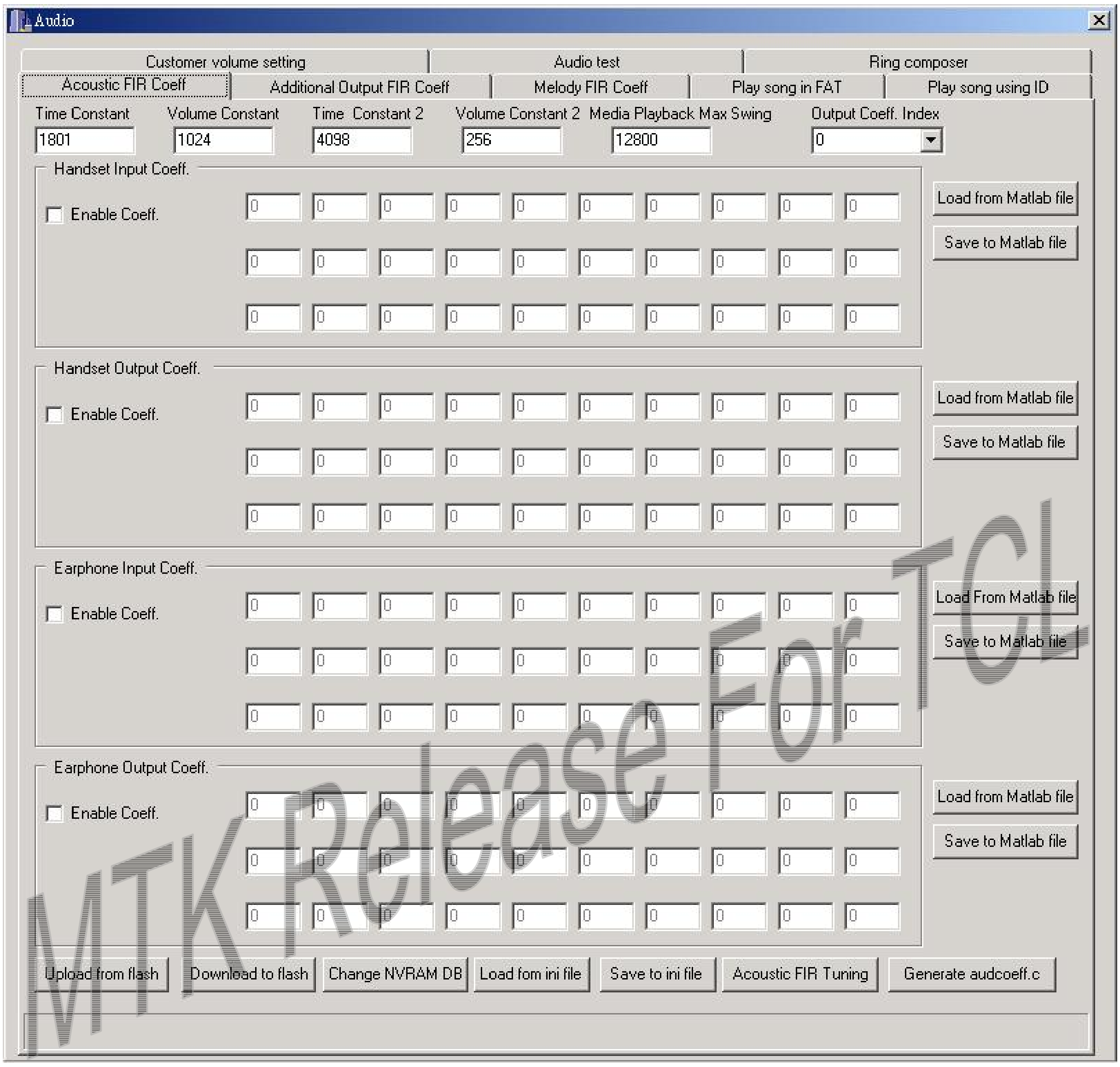

Figure 167 Acoustic FIR-Coefficient window

3.4.1.1 Upload and download acoustic FIR coefficient in flash

User can click [Upload from flash] button to read acoustic FIR coefficient from flash and click [Download to flash] button to write acoustic FIR coefficient to flash.

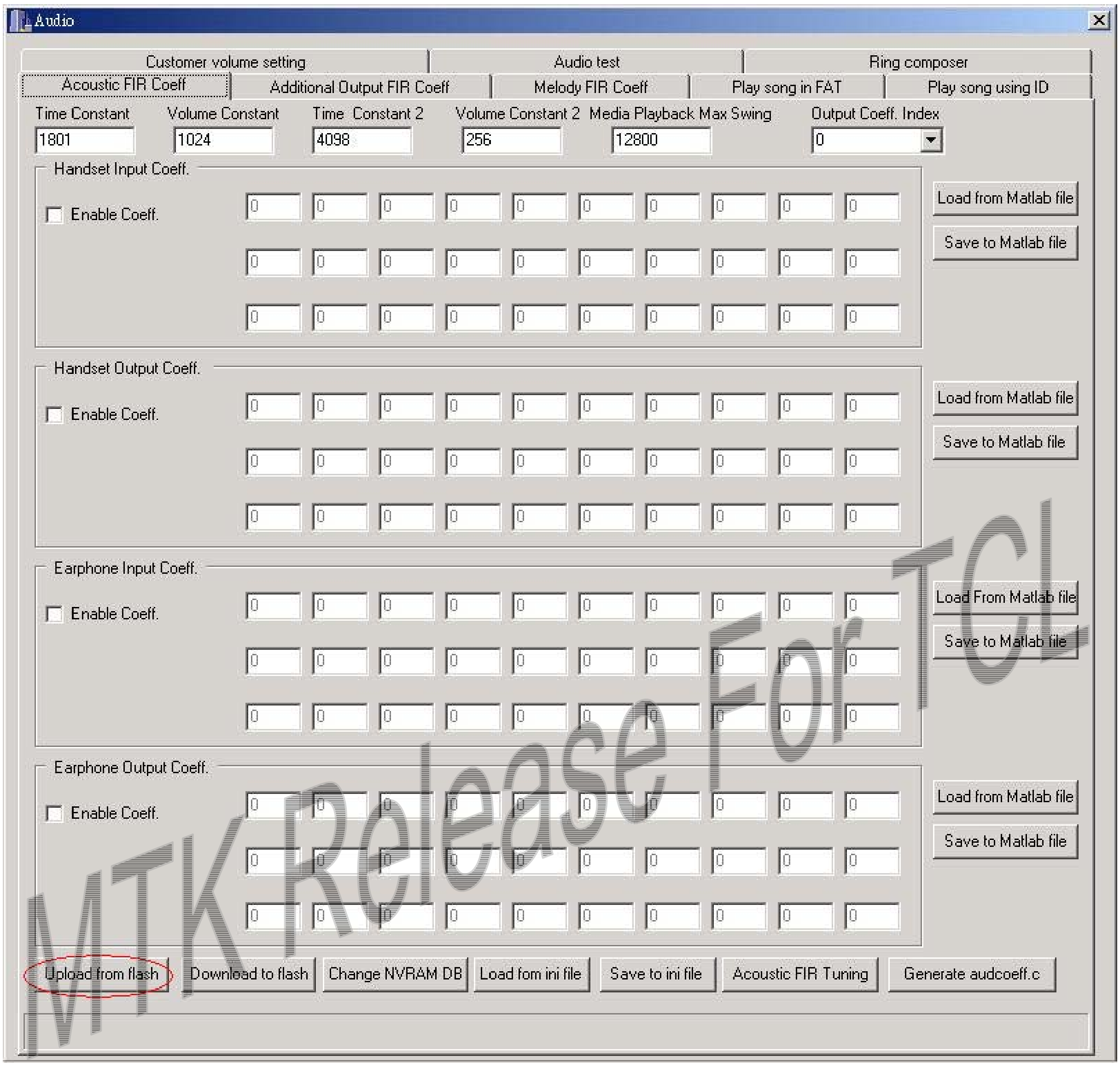

Figure 168 Click [Upload from flash] button to read coefficient from flash

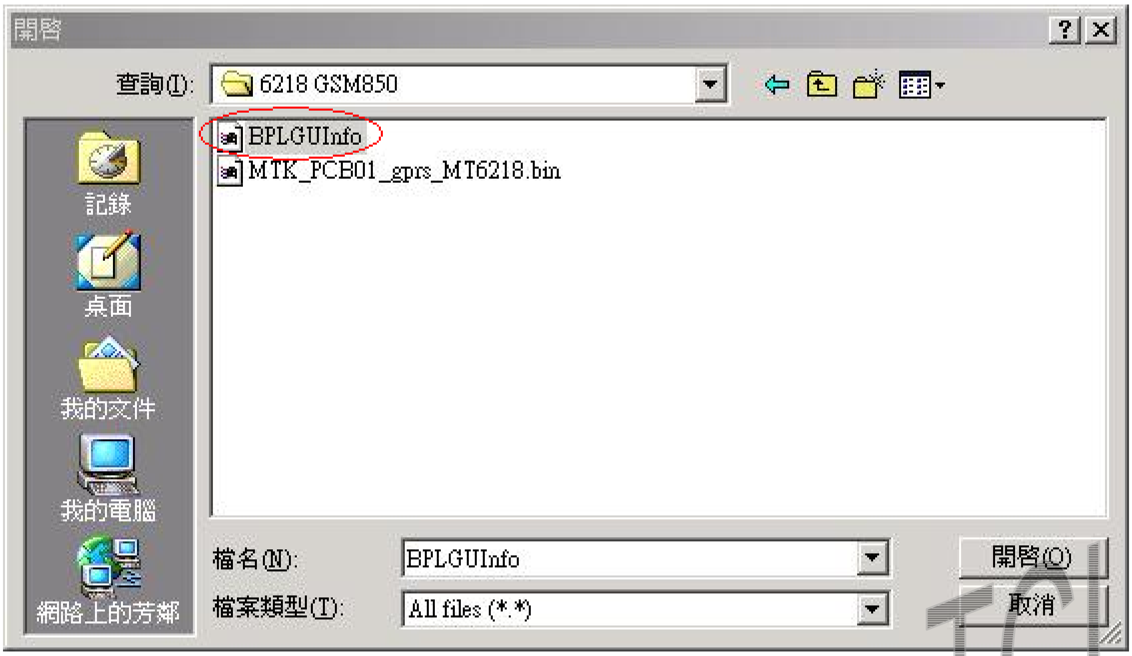

Figure 169 Select NVRAM database file if not selected before

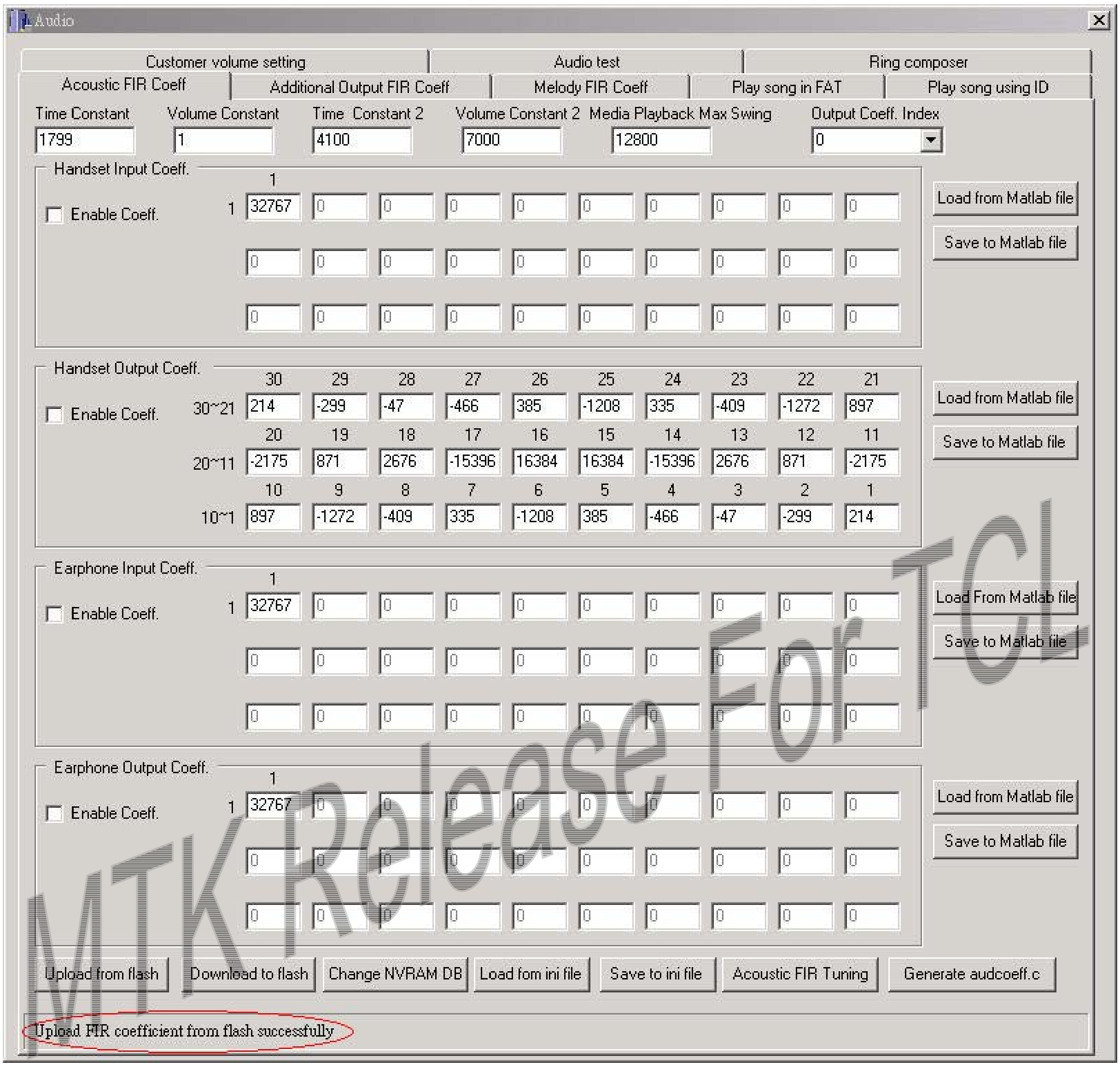

Figure 170 Result of upload acoustic FIR coefficient from flash

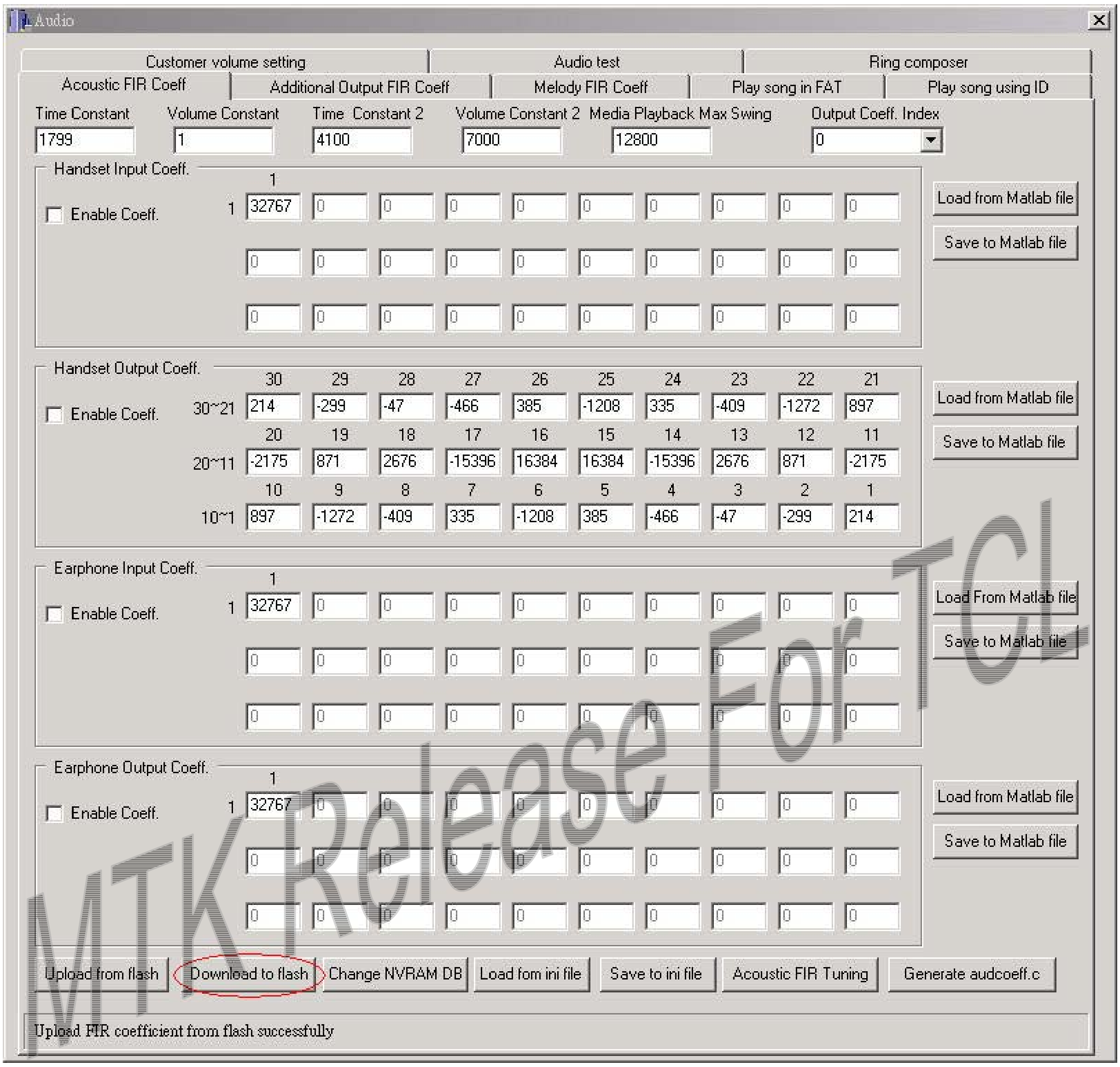

Figure 171 Click [Download to flash] button to save coefficient to flash

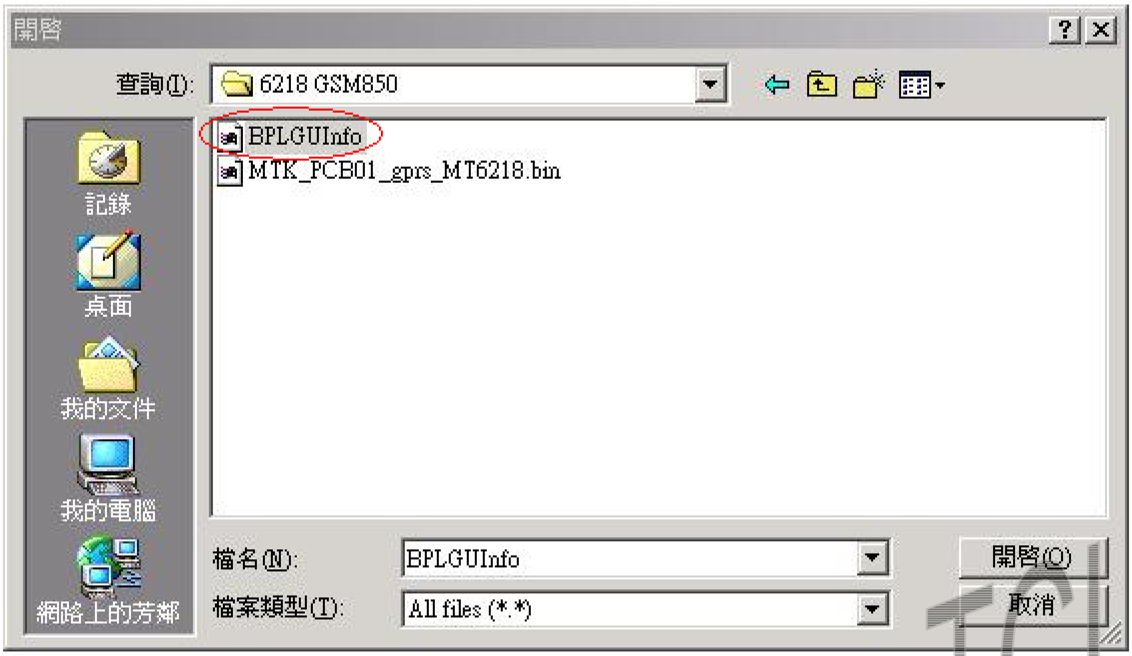

Figure 172 Select NVRAM database file if not selected before

User can click [Change NVRAM DB] button to change NVRAM database file.

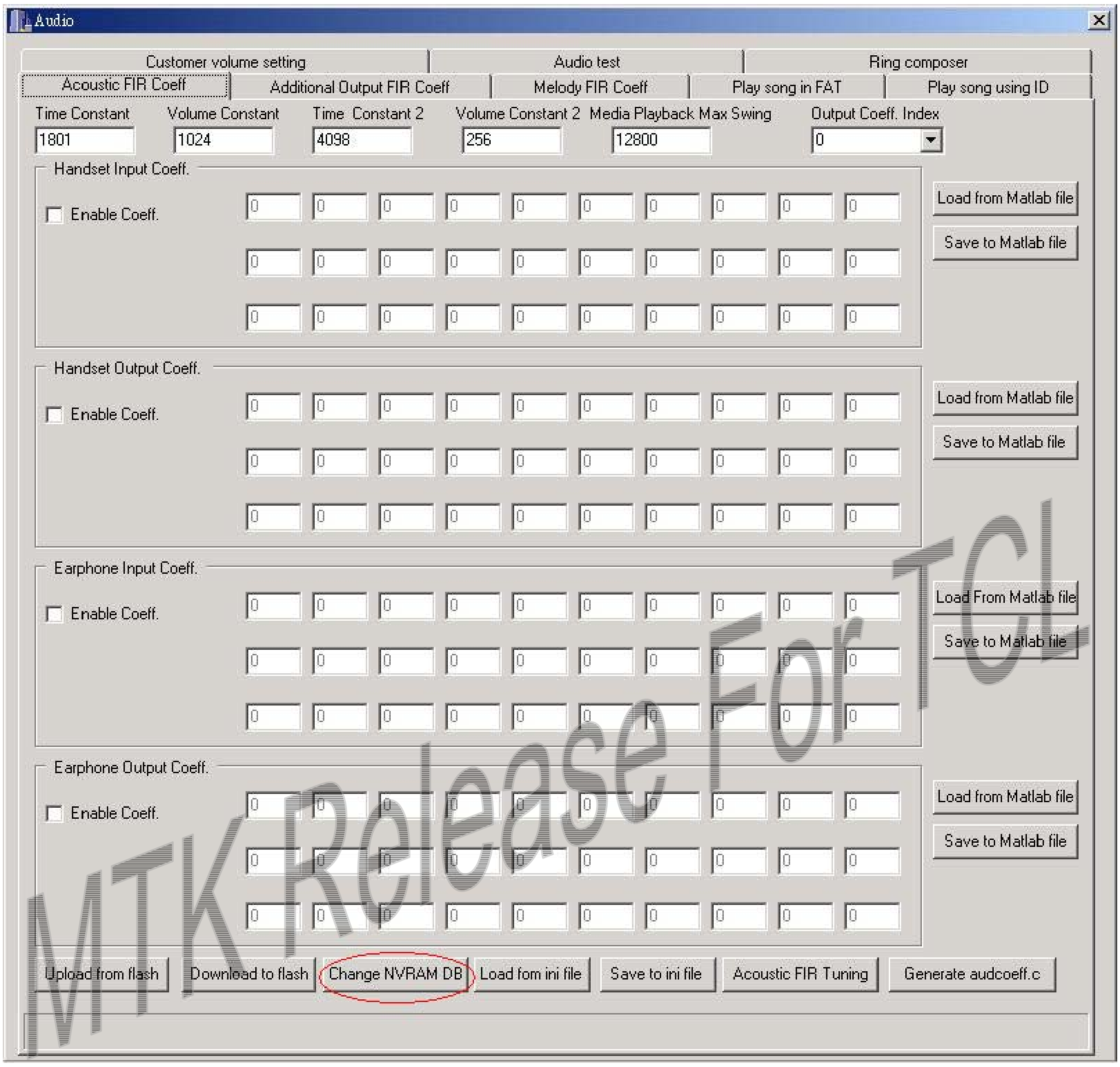

Figure 173 Click [Change NVRAM DB] to change NVRAM database file

3.4.1.2 Read and write acoustic FIR coefficient in file

User can click [Load from file] button to read acoustic FIR coefficient from file and click [Save to file] button to save acoustic FIR coefficient to file.

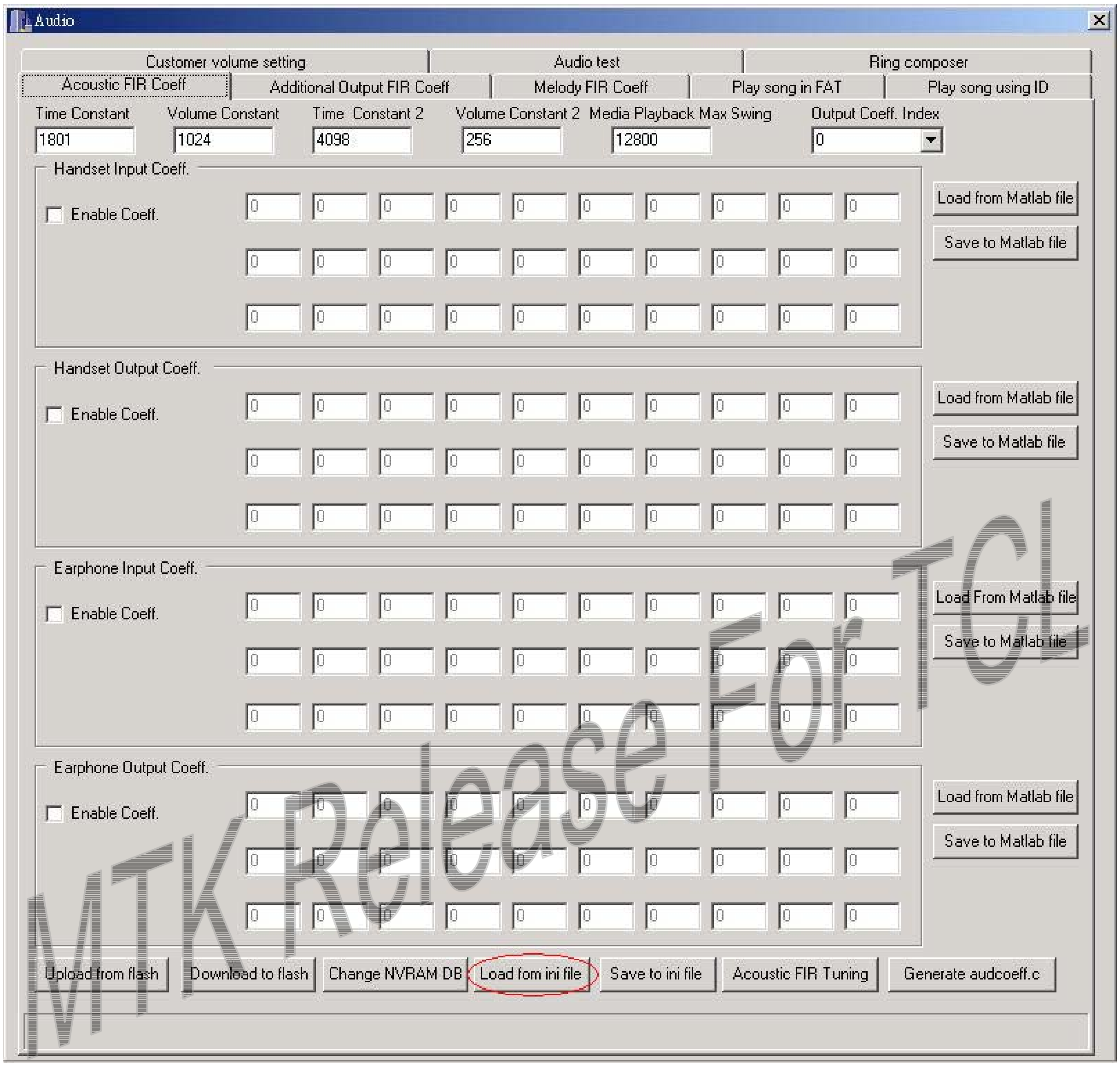

Figure 174 Click [Load from ini file] to read coefficient from file

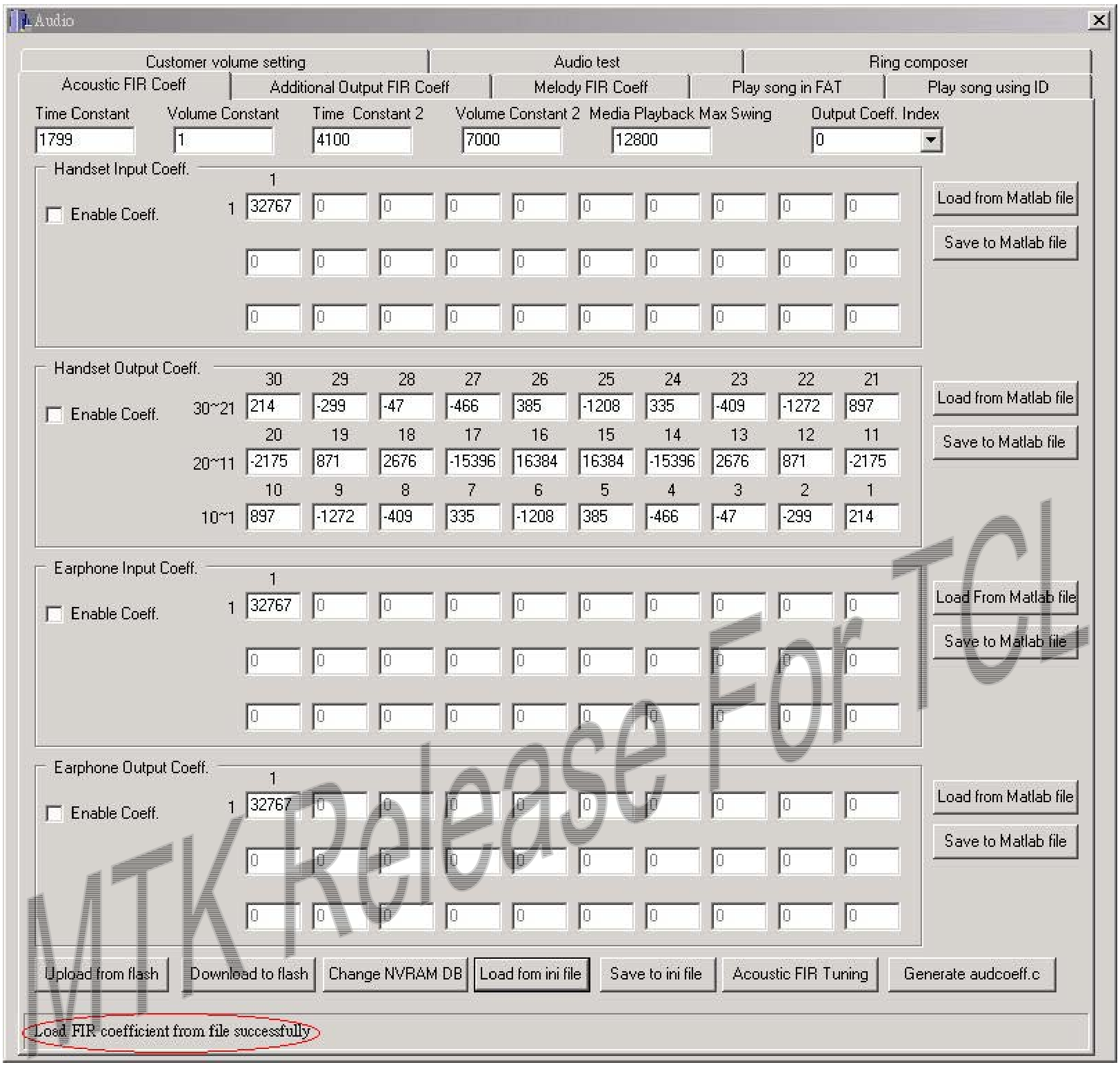

Figure 175 Acoustic FIR coefficient result

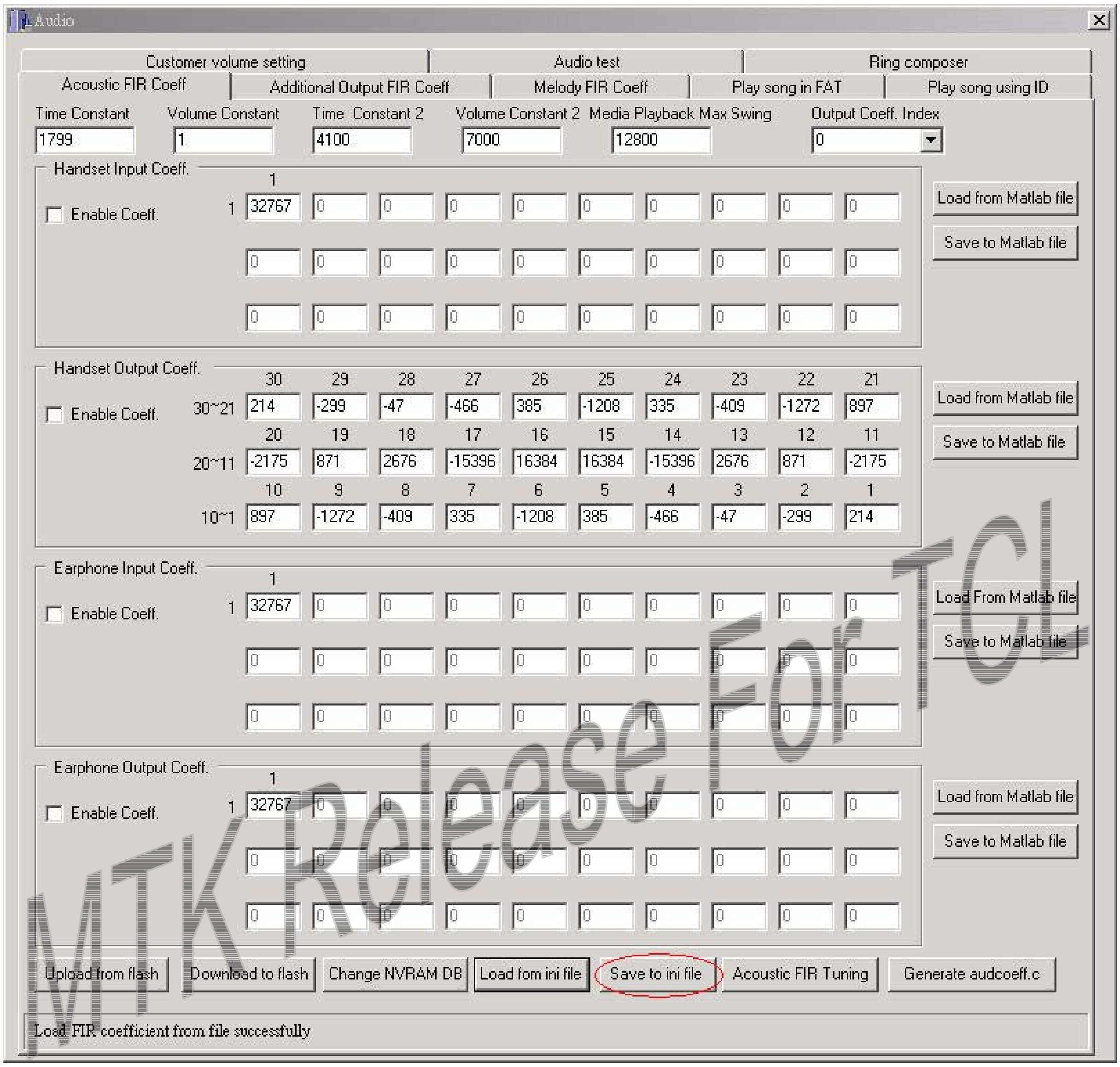

Figure 176 Click [Save to ini file] to save coefficient to file

The following is a template of acoustic FIR coefficient file. User will get the text file after saving acoustic FIR coefficient to file. Each value must be followed with a comma. Please follow the file format if you want to change the value in file.

[Acoustic FIR-Coefficient]
Time Constant=1799
Volume Constant=1
Time Constant 2=4100
Volume Constant 2=7000
Media Playback Max Swing=12800
active output FIR index=0
8k Input (mic)=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
8k Output (speaker)=214,-299,-47,-466,385,-1208,335,-409,-1272,897,-2175,871,2676,-15396,16384,16384,-15396,2676,871,-2175,897,-1272,-409,335,-1208,385,-466,-47,-299,214
8k Input (earphone)=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
8k Output (earphone)=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

Additional 8k 1st Output=0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Additional 8k 2nd Output=0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Additional 8k 3rd Output=0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Additional 8k 4th Output=0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Additional 8k 5th Output=0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
AMR Input (mic)=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0,0,0,0,0,0,0,0,0,0,0
AMR Output (speaker)=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0, 0,0, 0,0,0,0,0,0,0,0,0,0,0,0,0,0
AMR Input (earphone)=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
AMR Output (earphone)=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Melody Output (loud speaker)=-21,-269,7,141,-326,-203,257,-396,-472,1323,192,-6458,15256,-6458,192,1323,-472,-396,257,-203,-326,141,7,-269,-21,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Melody Output (stereo speaker)=-21,-269,7,141,-326,-203,257,-396,-472,1323,192,-6458,15256,-6458,192, 1323,-472,-396, 257,-203,-326,141,7,-269,-21,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

3.4.1.3 Read and write acoustic FIR coefficient in Matlab file

User can click [Load from Matlab file] button to read acoustic FIR coefficient from file generated by Matlab and click [Save to Matlab file] button to save acoustic FIR coefficient to file that can be an input file of Matlab.

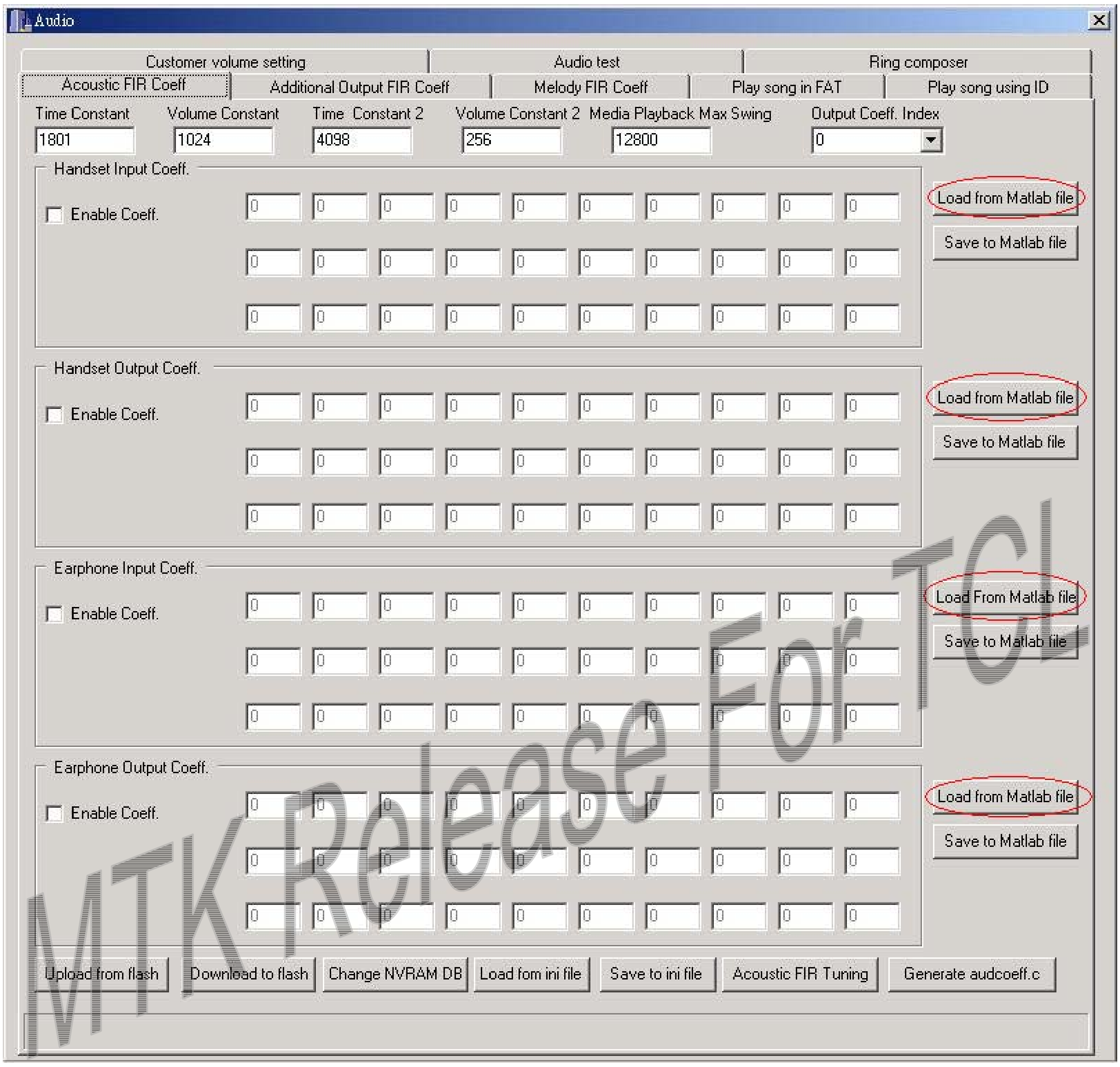

Figure 177 Click [Load from Matlab file] button to read file generated by Matlab

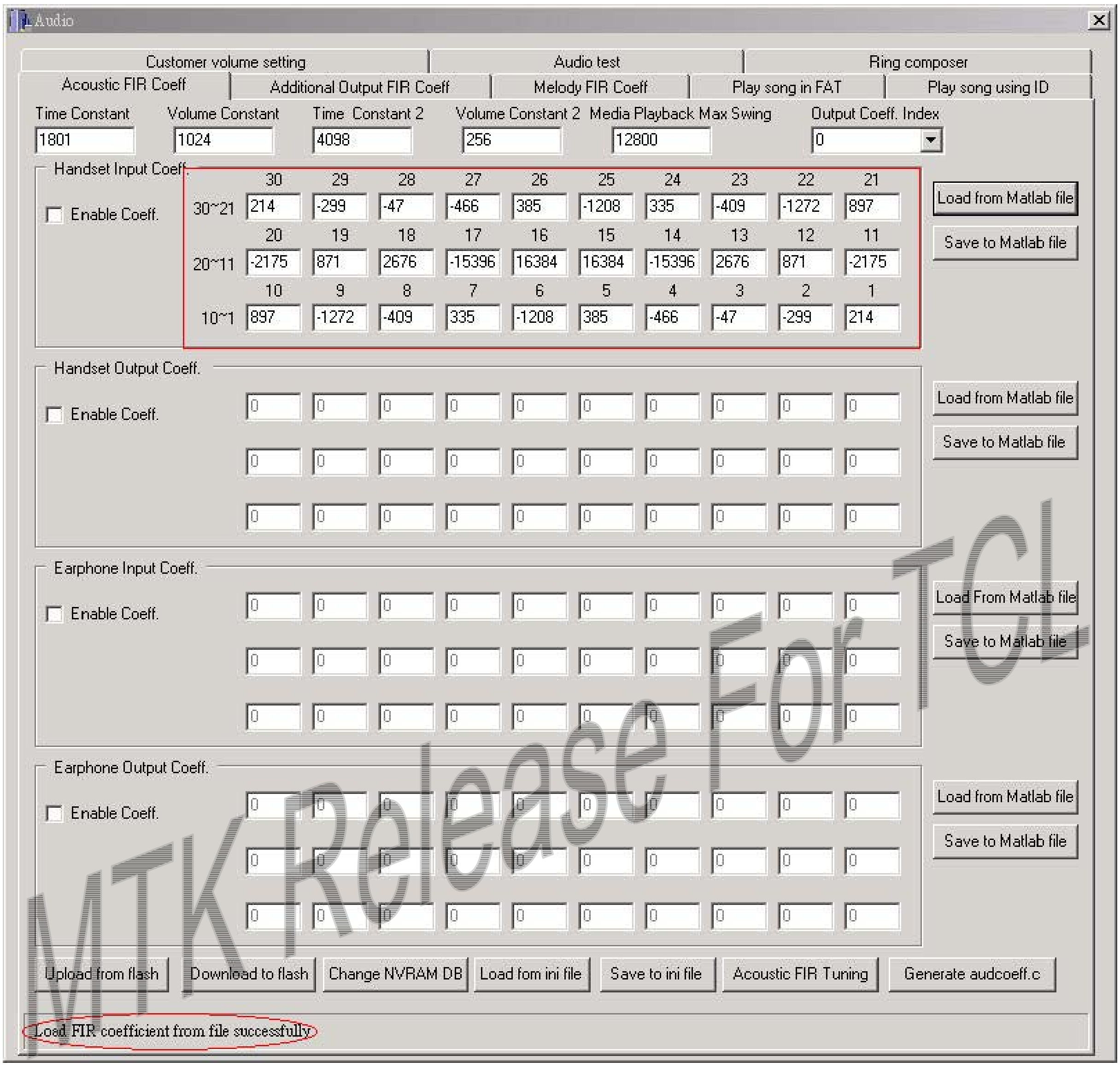

Figure 178 Acoustic FIR coefficient result

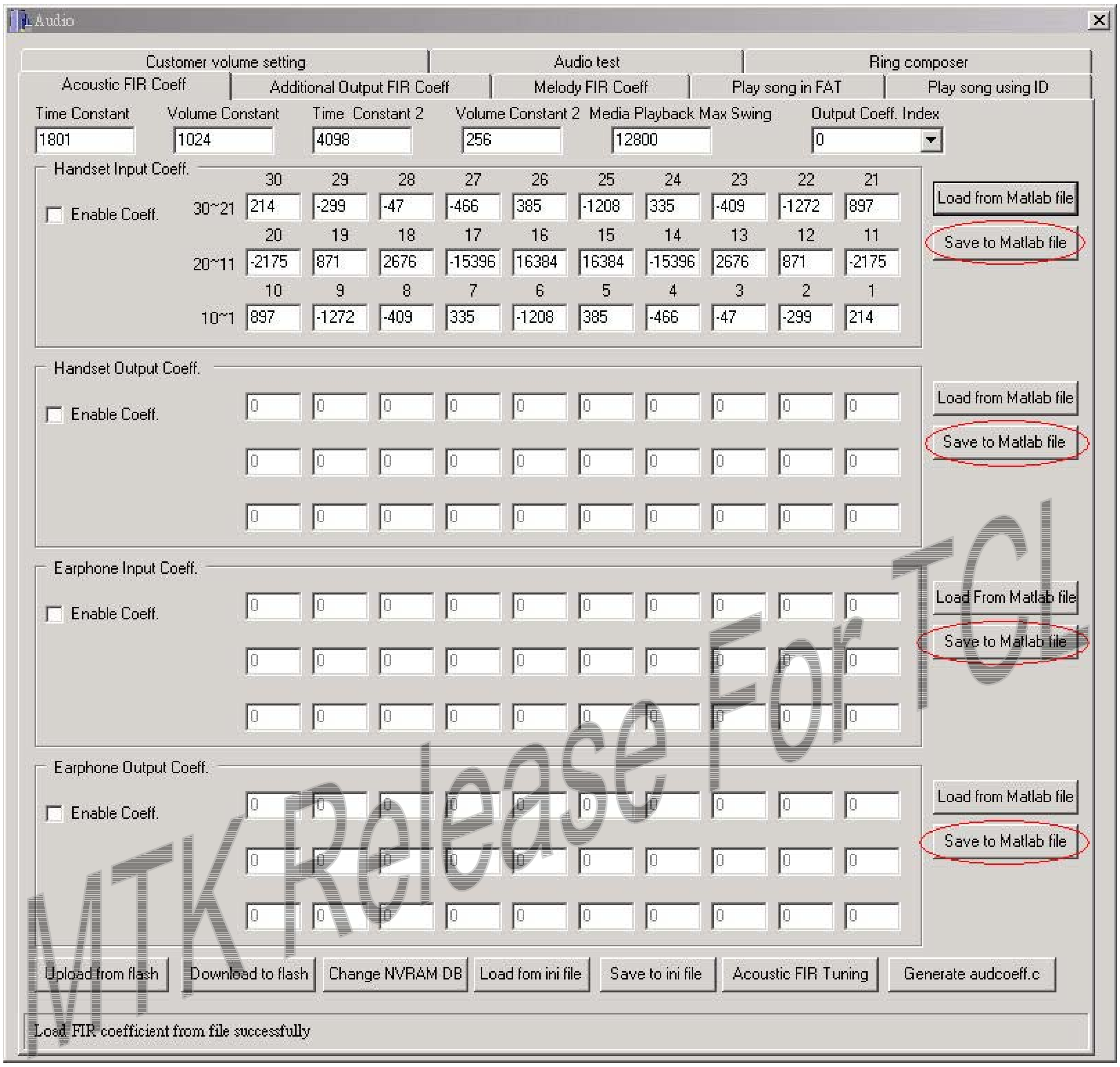

Figure 179 Click [Save to Matlab file] button to save to file that can be accepted by Matlab

The following is a template of acoustic FIR coefficient file that generated by clicking [Save to Malab file] button. The first line indicates the number of acoustic FIR coefficient.

30
214
-299
-47
-466
385
-1208
335
-409
-1272
897
-2175
871
2676

-15396
16384
16384
-15396
2676
871
-2175
897
-1272
-409
335
-1208
385
-466
-47
-299
214

3.4.1.4 Generating FIR-coefficient C file

User can click [Generate audcoeff.c] button to generate FIR-coefficient C file.

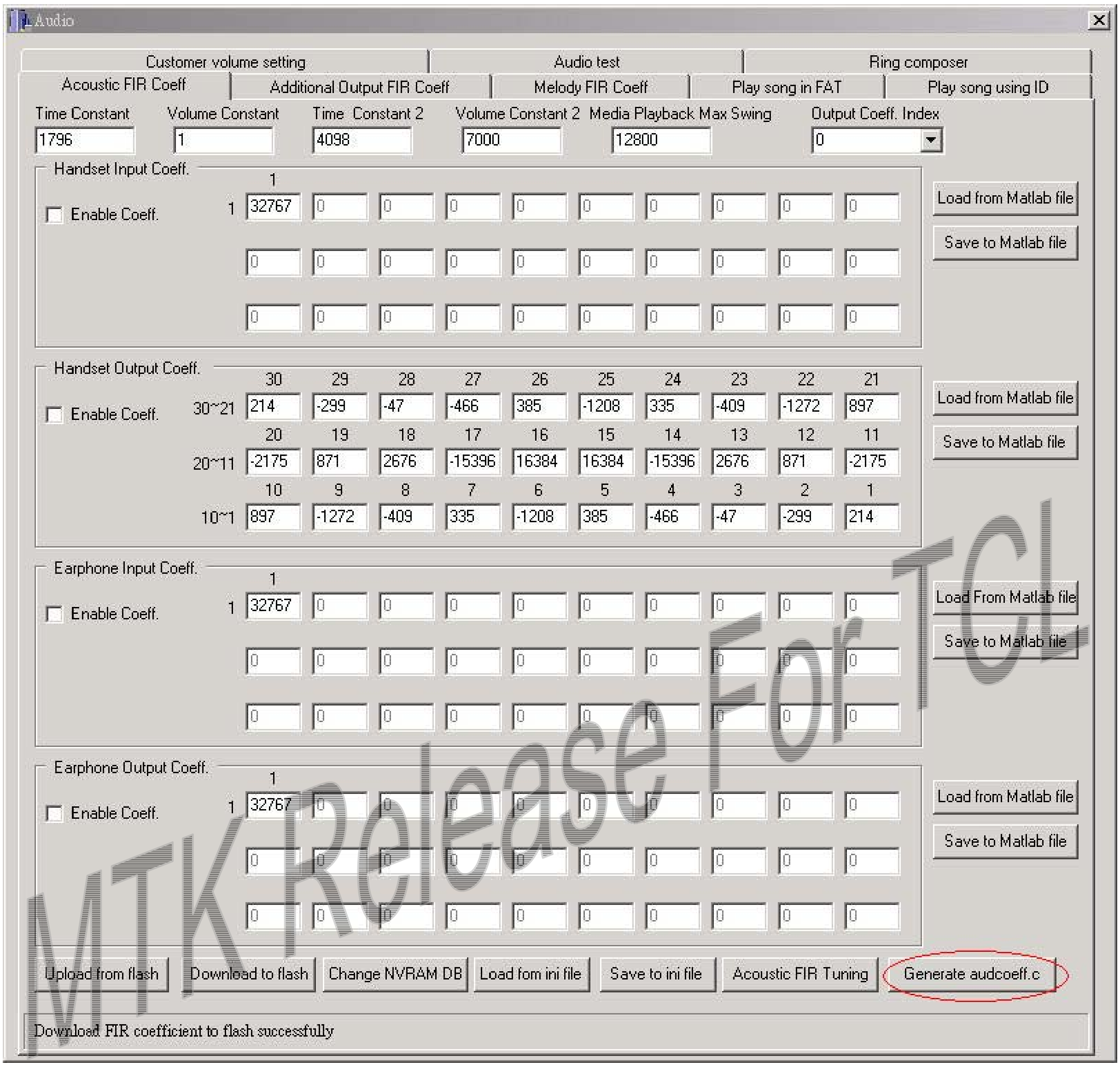

Figure 180 Click [Generate audcoeff.c] button to generate FIR-coefficient C file

The following is a template of FIR-coefficient C file.

```
#include "l1audio.h"

const unsigned char  L1SP_MICROPHONE1  = L1SP_LNA_0;
const unsigned char  L1SP_MICROPHONE2  = L1SP_LNA_1;

const unsigned char  L1SP_SPEAKER1     = L1SP_BUFFER_0;
const unsigned char  L1SP_SPEAKER2     = L1SP_BUFFER_1;
const unsigned char  L1SP_LOUD_SPEAKER = L1SP_BUFFER_0;

const signed short Audio_FIR_Input_Coeff[30] = {
 32767,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
```

```
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0
};

const signed short Audio_FIR_Output_Coeff[30] = {
   214,  -299,   -47,  -466,   385,
 -1208,   335,  -409, -1272,   897,
 -2175,   871,  2676,-15396, 16384,
 16384,-15396,  2676,   871, -2175,
   897, -1272,  -409,   335, -1208,
   385,  -466,   -47,  -299,   214
};

const signed short Audio_FIR_Output_Coeff_a[30] = {
 32767,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0
};

const signed short Audio_FIR_Output_Coeff_b[30] = {
 32767,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0
};

const signed short Audio_FIR_Output_Coeff_c[30] = {
 32767,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0
};

const signed short Audio_FIR_Output_Coeff_d[30] = {
 32767,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0
};

const signed short Audio_FIR_Output_Coeff_e[30] = {
 32767,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
```

```
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0
};

const signed short Audio_FIR_Input_Coeff2[30] = {
 32767,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0
};

const signed short Audio_FIR_Output_Coeff2[30] = {
 32767,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0,
    0,    0,    0,    0,    0
};

const unsigned short ES_TimeConst   = 0x0704;
const unsigned short ES_VolConst    = 0x01;
const unsigned short ES_TimeConst2  = 0x1002;
const unsigned short ES_VolConst2   = 0x1b58;
const unsigned short Media_Playback_Maximum_Swing   = 12800;

const signed short Media_FIR_Melody_Output1_32K_Default[45] = {
   233,   -93,  -151,   473,  -648,   231,   809, -1739,   632,
  2600, -4195,  -888, 10539,  -888, -4195,  2600,   632, -1739,
   809,   231,  -648,   473,  -151,   -93,   233,     0,     0,
     0,     0,     0,     0,     0,     0,     0,     0,     0,
     0,     0,     0,     0,     0,     0,     0,     0,     0

};

const signed short Media_FIR_Melody_Output2_32K_Default[45] = {
   233,   -93,  -151,   473,  -648,   231,   809, -1739,   632,
  2600, -4195,  -888, 10539,  -888, -4195,  2600,   632, -1739,
   809,   231,  -648,   473,  -151,   -93,   233,     0,     0,
     0,     0,     0,     0,     0,     0,     0,     0,     0,
     0,     0,     0,     0,     0,     0,     0,     0,     0

};
```

3.4.2 Additional output FIR–coefficient

Additional output FIR-coefficient window provides interface for user to read or write coefficient in flash, ini file or Matlab file. User can click these 11 buttons shown on window to read coefficient from flash, write coefficient to flash, load coefficient from file and save coefficient to file. All values are in decimal format. The range of acoustic FIR coefficient is -32768 ~ 32767. There are five group of additional output FIR-coefficient. There are 30 words in each group of coefficient. There are 5 parameters in echo suppression function. They are

Time energy gap: time-and-energy-gap constant for speakerphone application in loud-speaker mode.

Volume constant: gain constant for speakerphone application in loud-speaker mode.

Time energy gap 2: time-and-energy-gap constant for echo loss at maximum speaker volume in normal mode.

Volume constant 2: gain constant for echo loss at maximum speaker volume in normal mode.

Media playback max swing: the maximum output swing to ADC DAC.

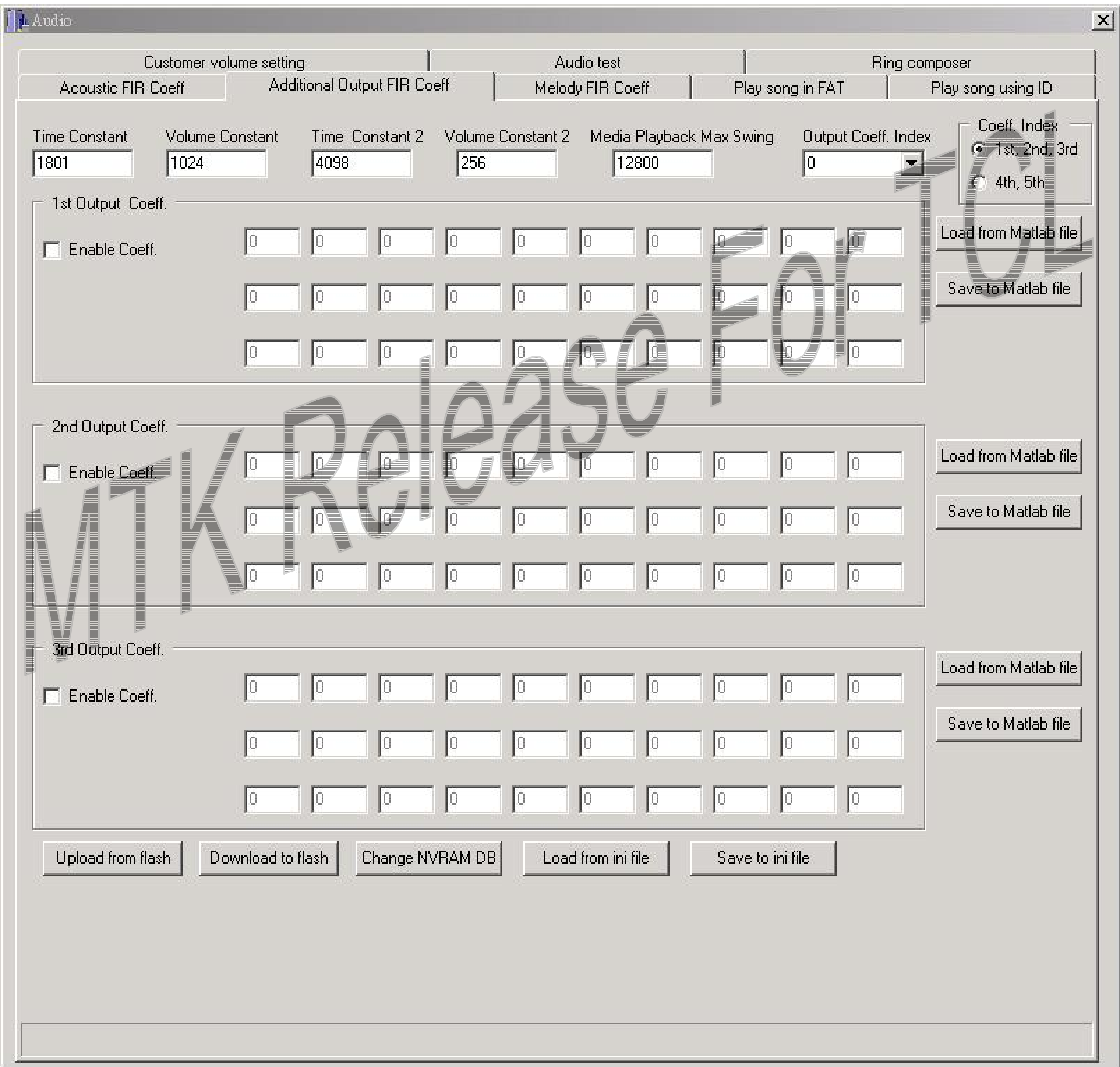

Figure 181 Additional output FIR-coefficient

3.4.2.1 Upload and download acoustic FIR coefficient in flash

User can click [Upload from flash] button to read acoustic FIR coefficient from flash and click [Download to flash] button to write acoustic FIR coefficient to flash.

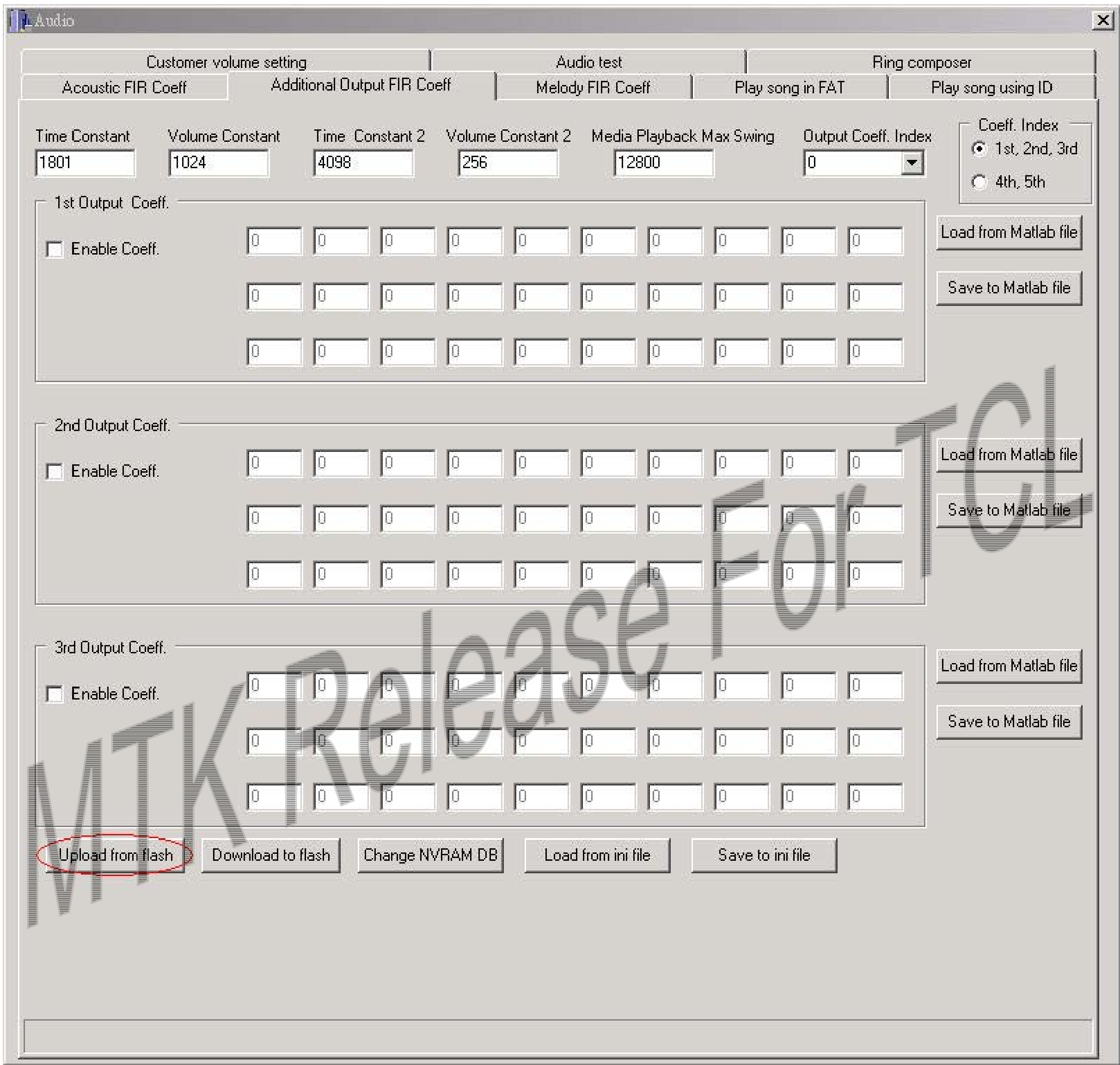

Figure 182 Click [Upload from flash] button to read additional output FIR-coefficient

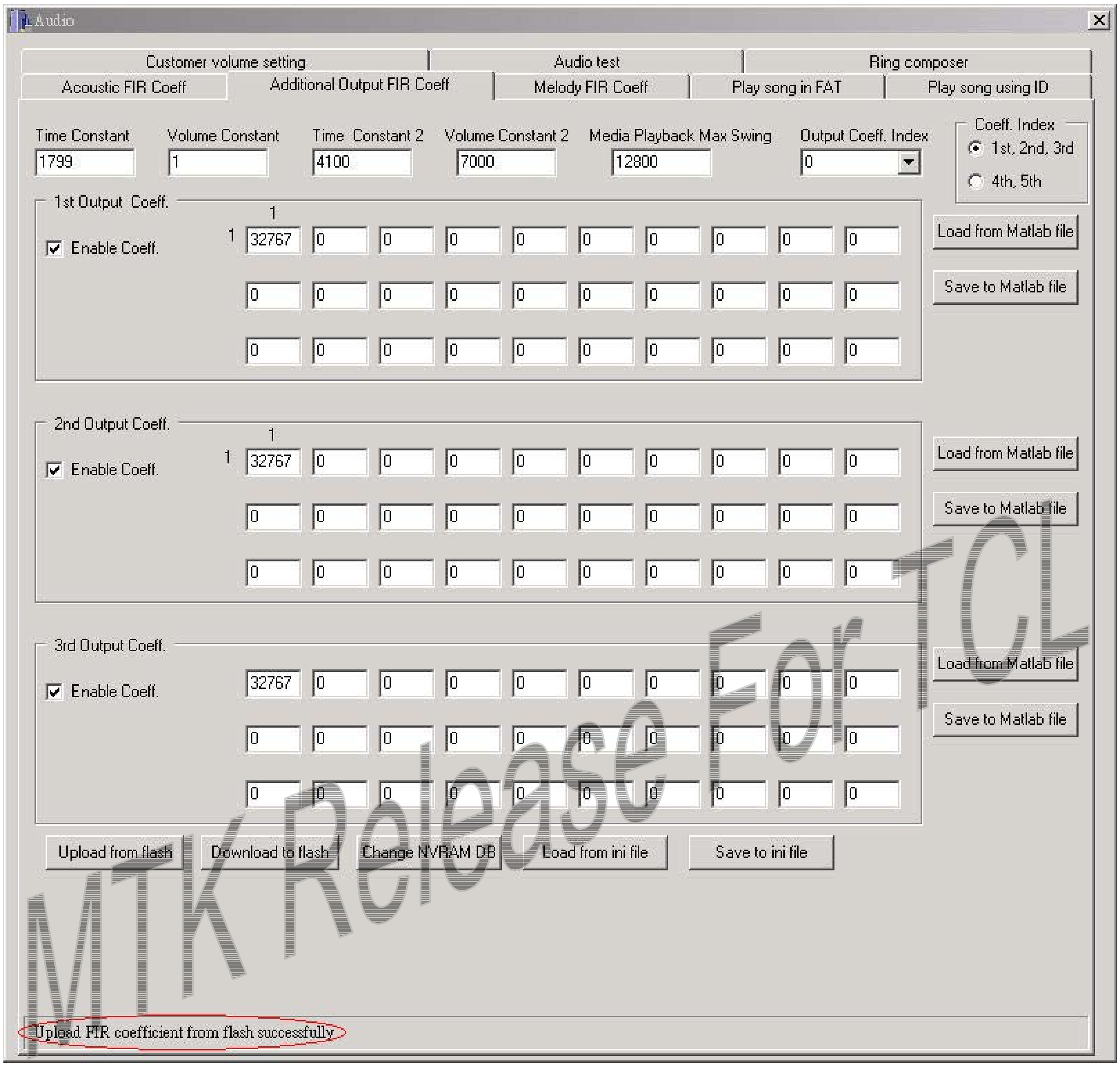

Figure 183 Additional output FIR-coefficient result

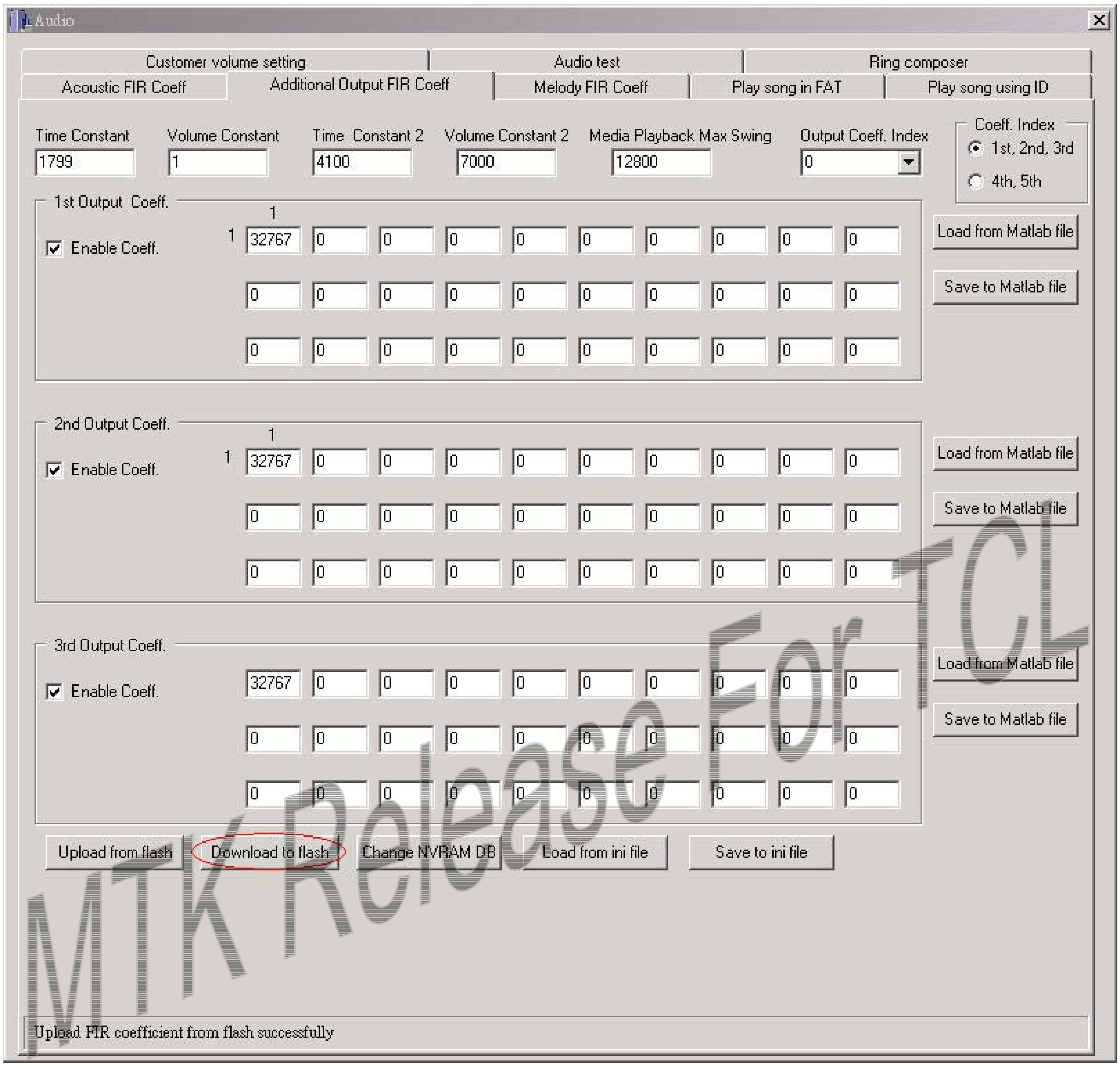

Figure 184 Click [Download to flash] button to write additional output FIR-coefficient to flash

User can click [Change NVRAM DB] button to change NVRAM database file.

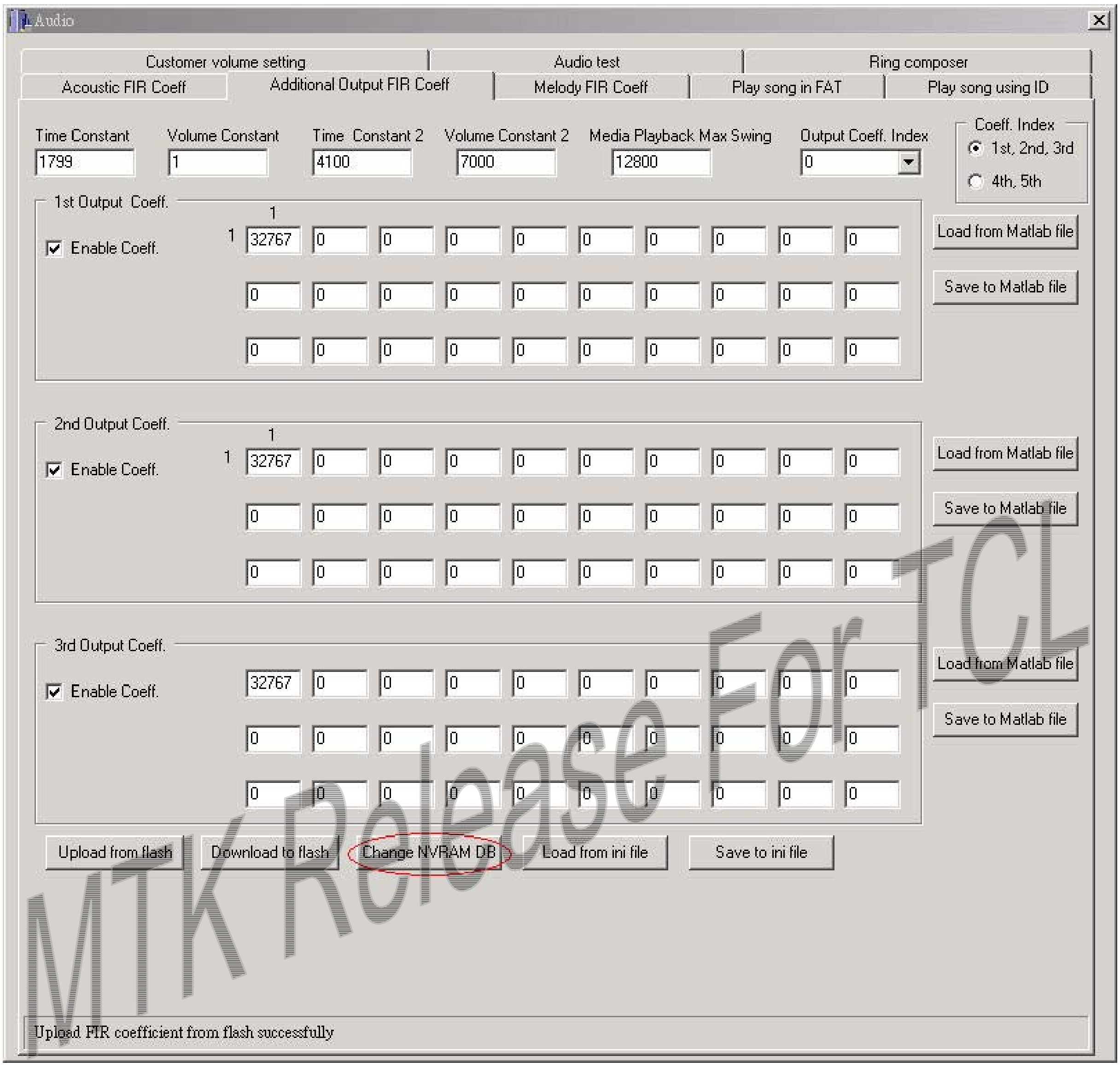

Figure 185 Click [Change NVRAM DB] to change NVRAM database file

3.4.2.2 Read and write acoustic FIR coefficient in file

User can click [Load from file] button to read additional output FIR-coefficient from file and click [Save to file] button to save additional output FIR-coefficient to file.

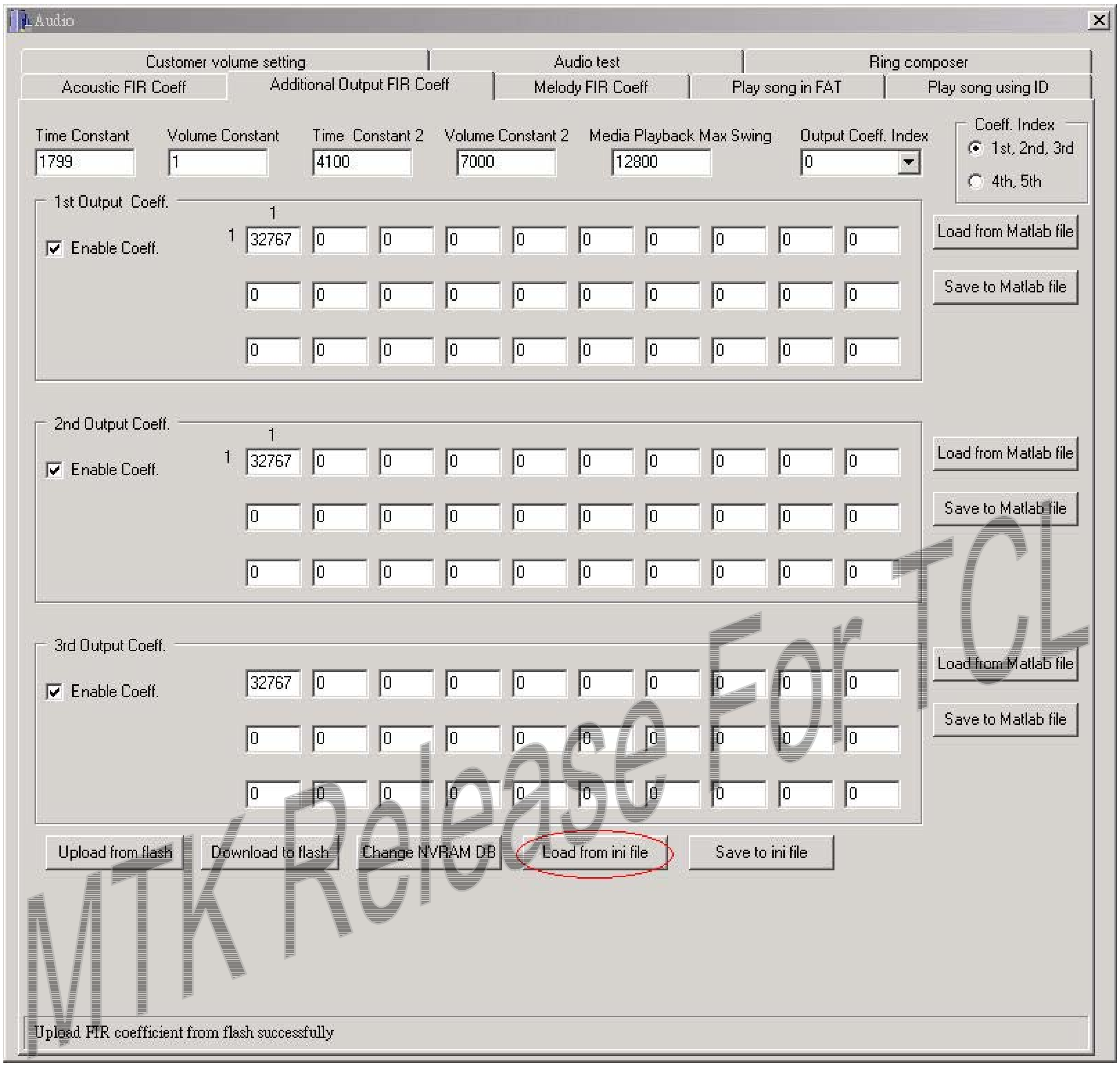

Figure 186 Click [Load from ini file] button to read additional output FIR-coefficient

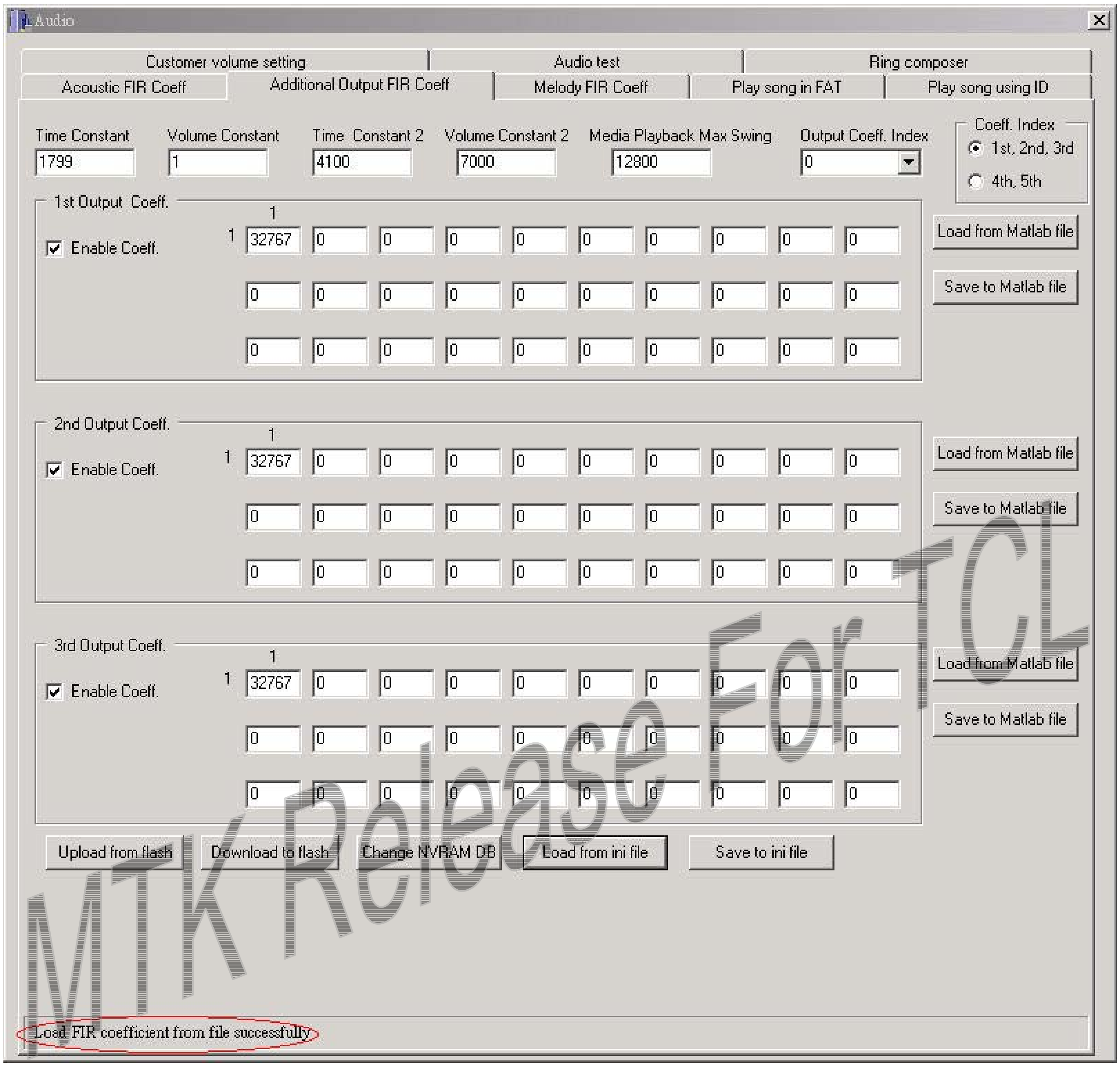

Figure 187 Additional output FIR-coefficient result

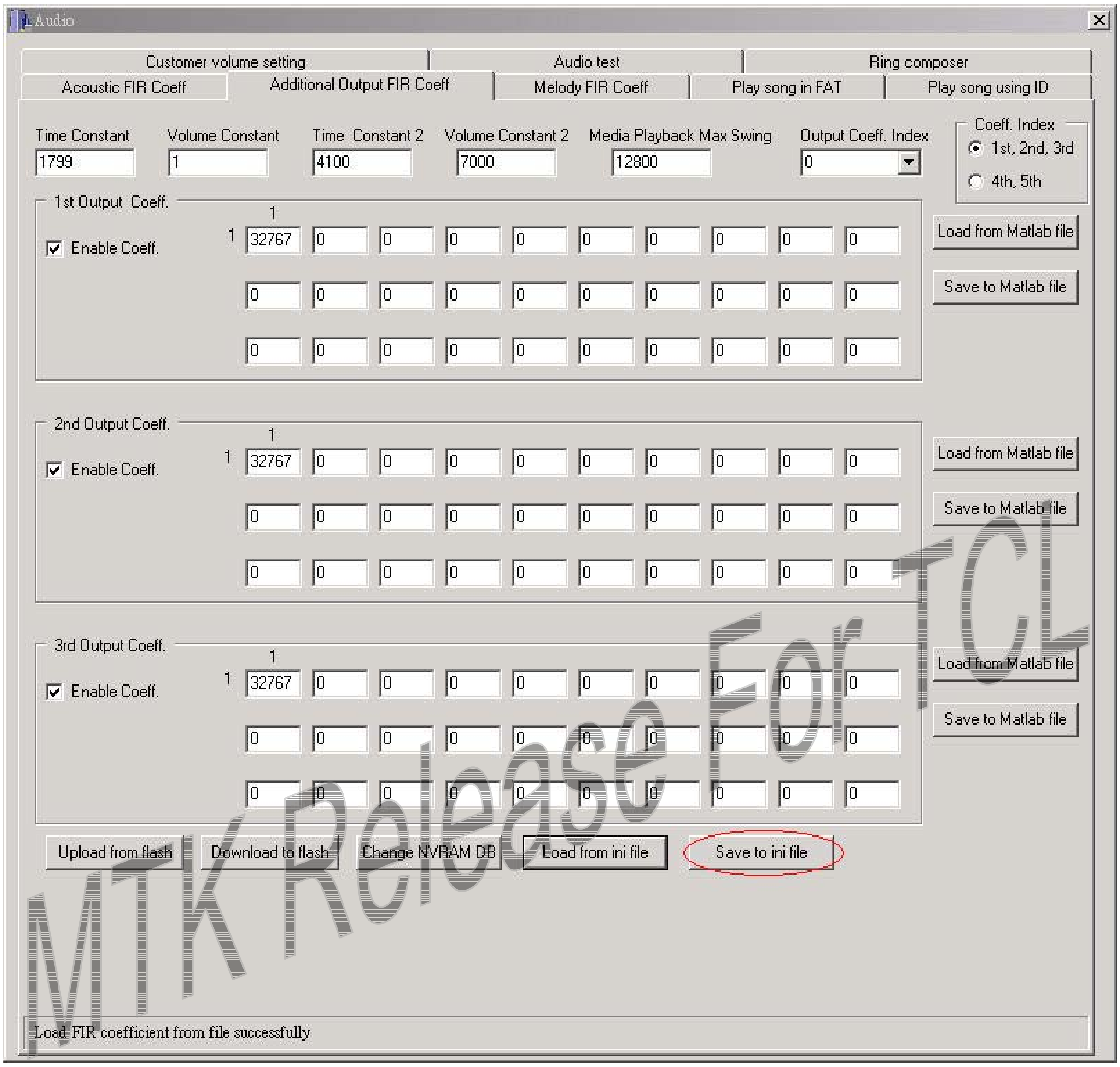

Figure 188 Click [Save to file] button to save additional output FIR-coefficient

The following is a template of acoustic FIR coefficient file. User will get the text file after saving acoustic FIR coefficient to file. Each value must be followed with a comma. Please follow the file format if you want to change the value in file.

[Acoustic FIR-Coefficient]
Time Constant=1799
Volume Constant=1
Time Constant 2=4100
Volume Constant 2=7000
Media Playback Max Swing=12800
active output FIR index=0
8k Input (mic)=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
8k Output (speaker)=214,-299,-47,-466,385,-1208,335,-409,-1272,897,-2175,871,2676,-15396,16384,16384,-15396,2676,871,-2175,897,-1272,-409,335,-1208,385,-466,-47,-299,214
8k Input (earphone)=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
8k Output (earphone)=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

Additional 8k 1st Output=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Additional 8k 2nd Output=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Additional 8k 3rd Output=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Additional 8k 4th Output=0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Additional 8k 5th Output=0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
AMR Input (mic)=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
AMR Output (speaker)=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
AMR Input (earphone)=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
AMR Output (earphone)=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Melody Output (loud speaker)=-21,-269,7,141,-326,-203,257,-396,-472,1323,192,-6458,15256,-6458,192,1323,-472,-396,257,-203,-326,141,7,-269,-21,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Melody Output (stereo speaker)=-21,-269,7,141,-326,-203,257,-396,-472,1323,192,-6458,15256,-6458,192,1323,-472,-396,257,-203,-326,141,7,-269,-21,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

3.4.3 Melody FIR-coefficient

Melody FIR-coefficient window provides interface for user to read or write coefficient in flash, ini file or Matlab file. User can click these buttons shown on window to read coefficient from flash, write coefficient to flash, load coefficient from file and save coefficient to file. All values are in decimal format. The range of melody FIR coefficient is -32768 ~ 32767. There are two group of coefficient, they are loud speaker and stereo speaker coefficient. There are 45 words in each group of coefficient. There are 5 parameters in echo suppression function. They are

Time energy gap: time-and-energy-gap constant for speakerphone application in loud-speaker mode.
Volume constant: gain constant for speakerphone application in loud-speaker mode.
Time energy gap 2: time-and-energy-gap constant for echo loss at maximum speaker volume in normal mode.
Volume constant 2: gain constant for echo loss at maximum speaker volume in normal mode.
Media playback max swing: the maximum output swing to ADC DAC.

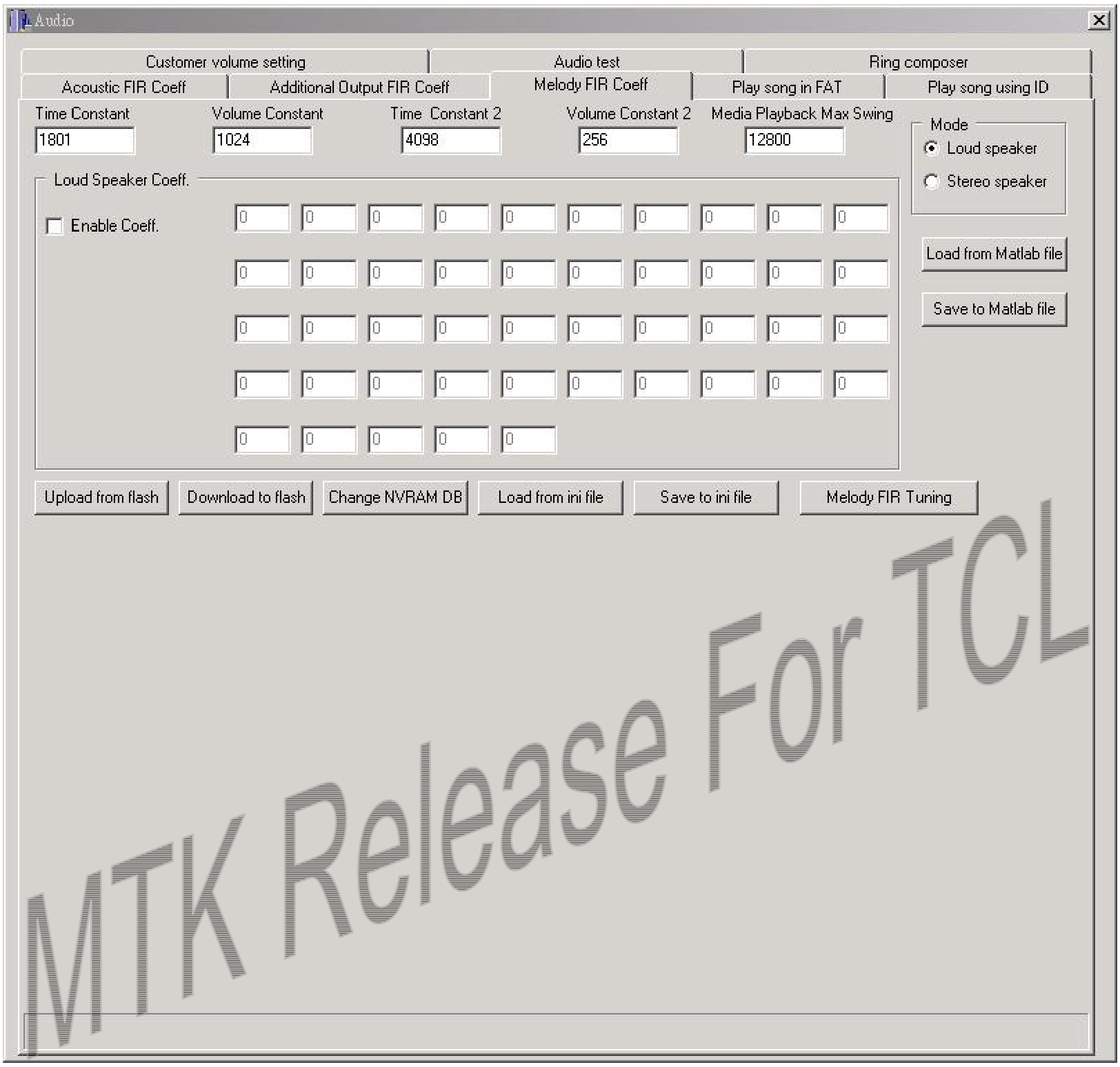

Figure 189 Melody FIR-Coefficient window

3.4.3.1 Upload and download melody FIR coefficient in flash

User can click [Upload from flash] button to read melody FIR coefficient from flash and click [Download to flash] button to write melody FIR coefficient to flash.

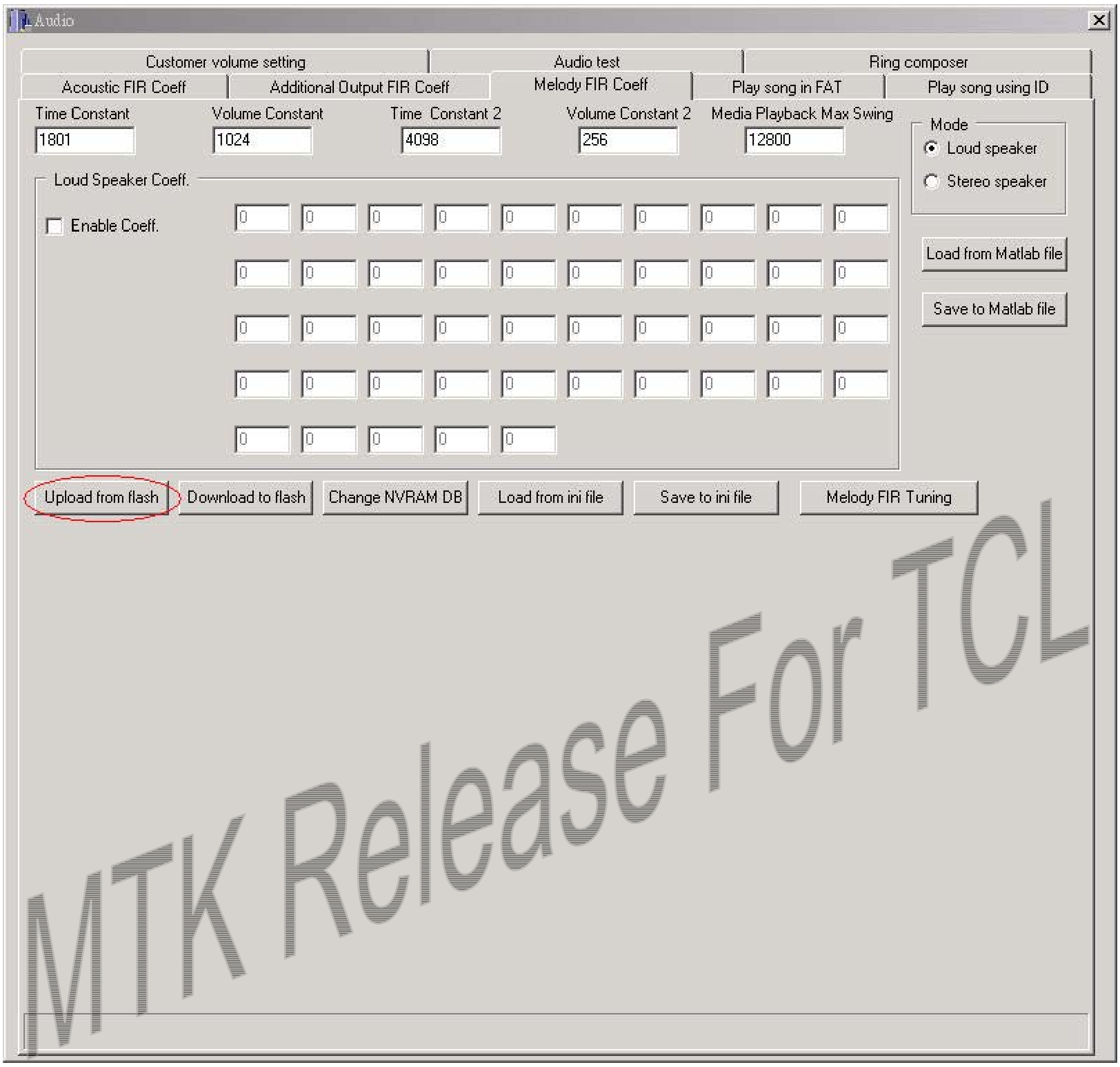

Figure 190 Click [Upload from flash] button to read coefficient from flash

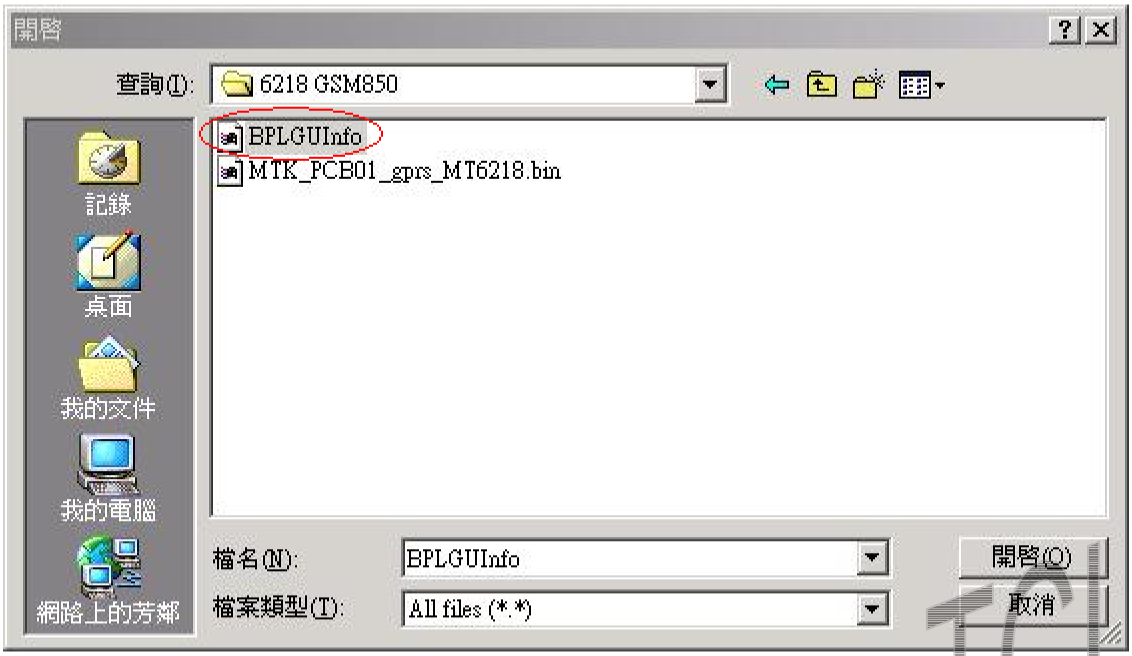

Figure 191 Select NVRAM database file if not selected before

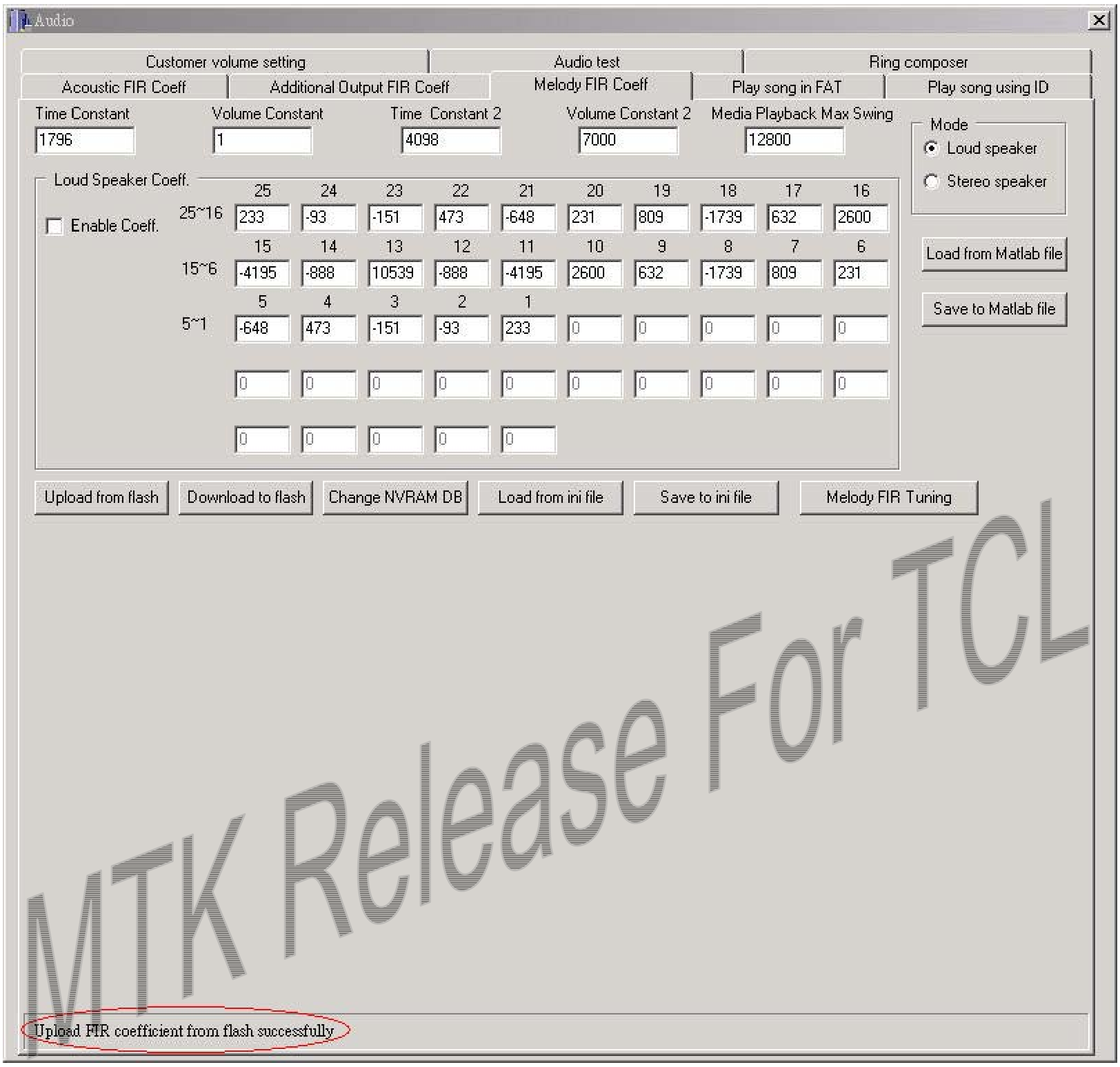

Figure 192 Result of upload melody FIR coefficient from flash

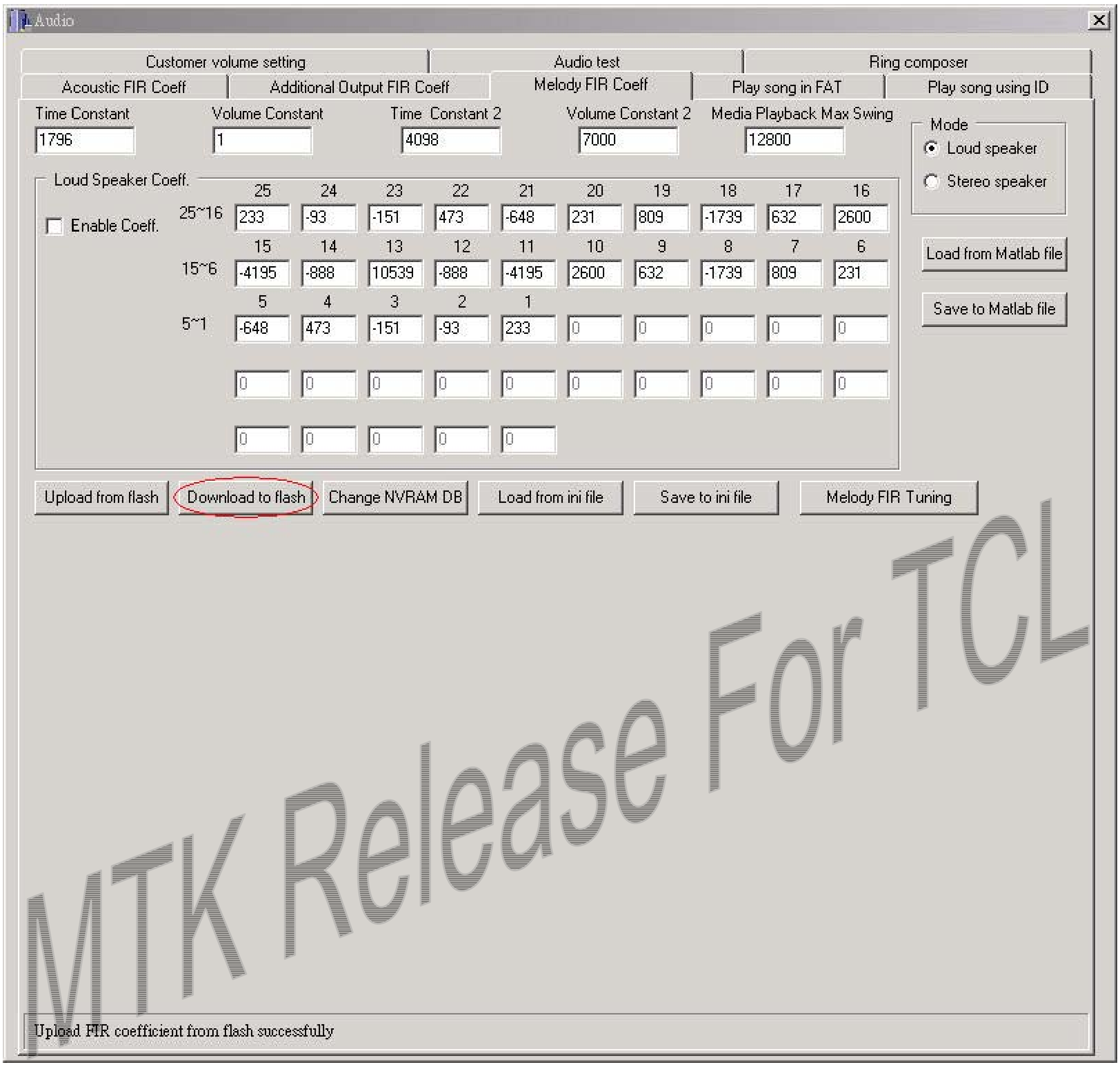

Figure 193 Click [Download to flash] button to save coefficient to flash

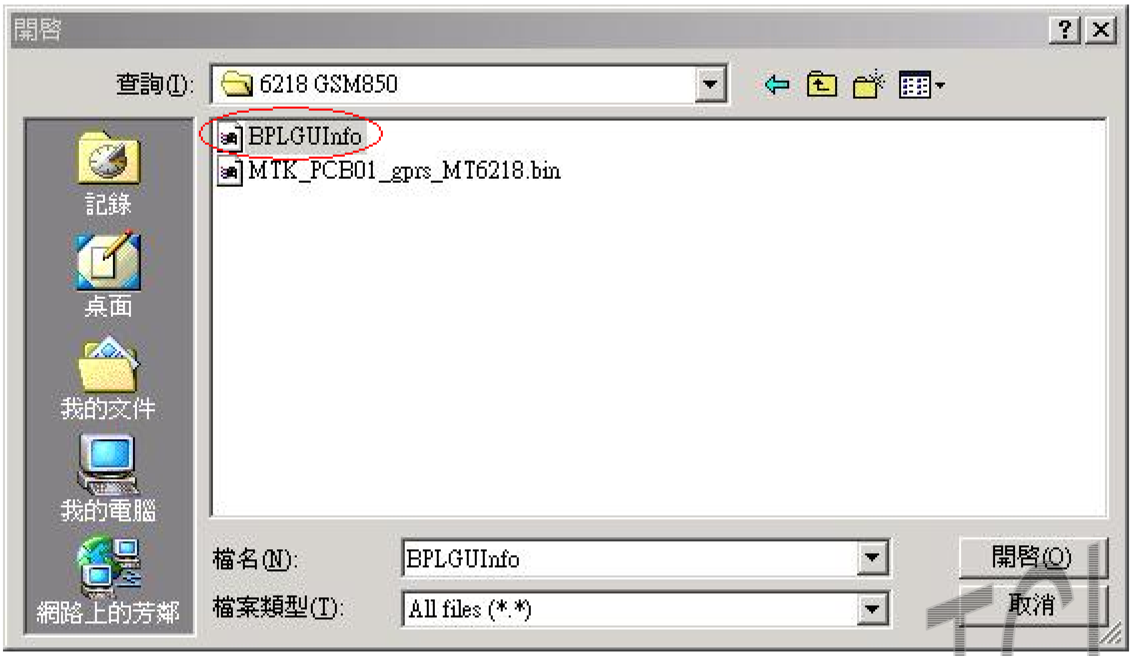

Figure 194 Select NVRAM database file if not selected before

User can click [Change NVRAM DB] button to change NVRAM database file.

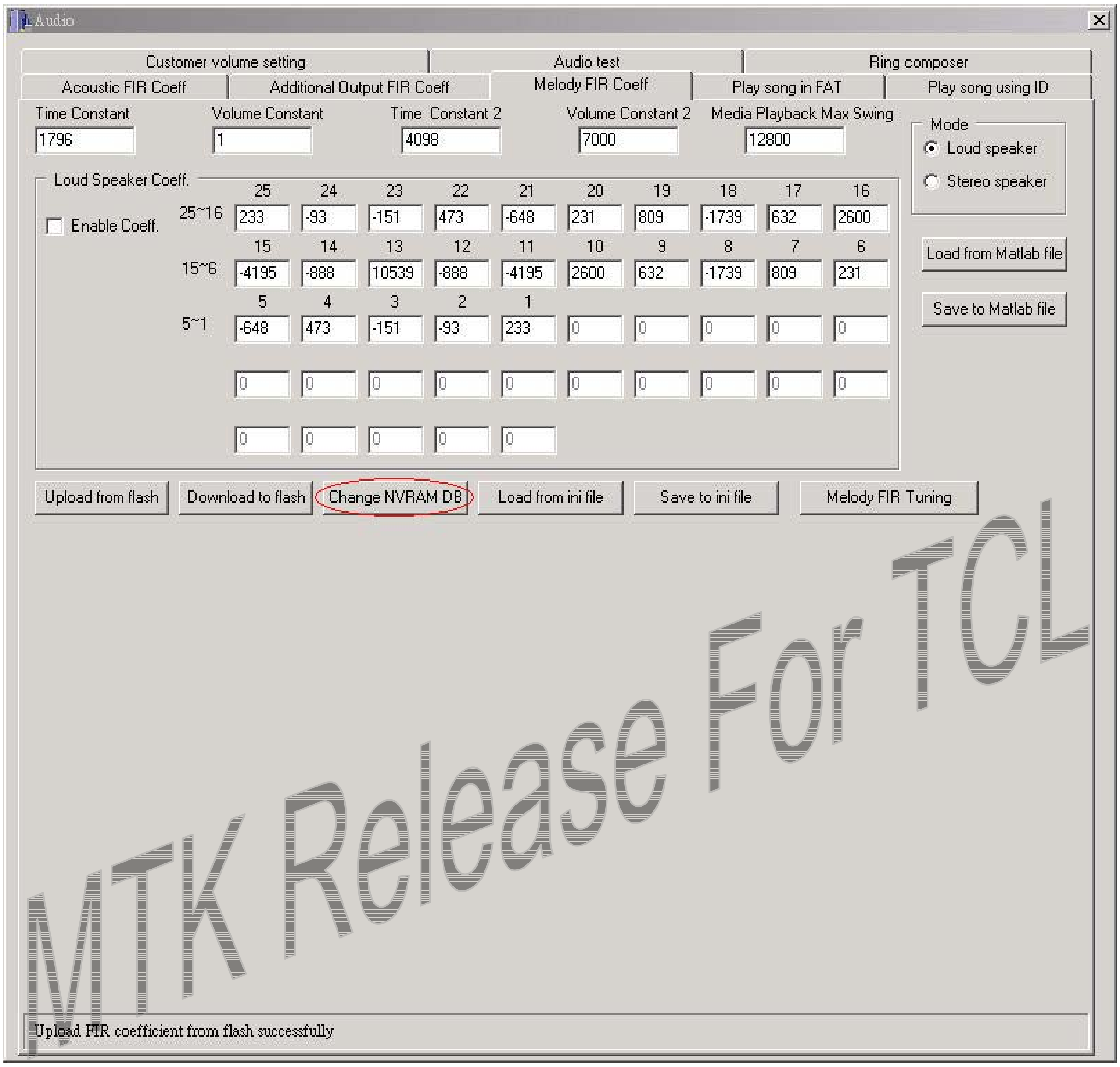

Figure 195 Click [Change NVRAM DB] button to change NVRAM database file

3.4.3.2 Read and write melody FIR coefficient in file

User can click [Load from file] button to read melody FIR coefficient from file and click [Save to file] button to save melody FIR coefficient to file.

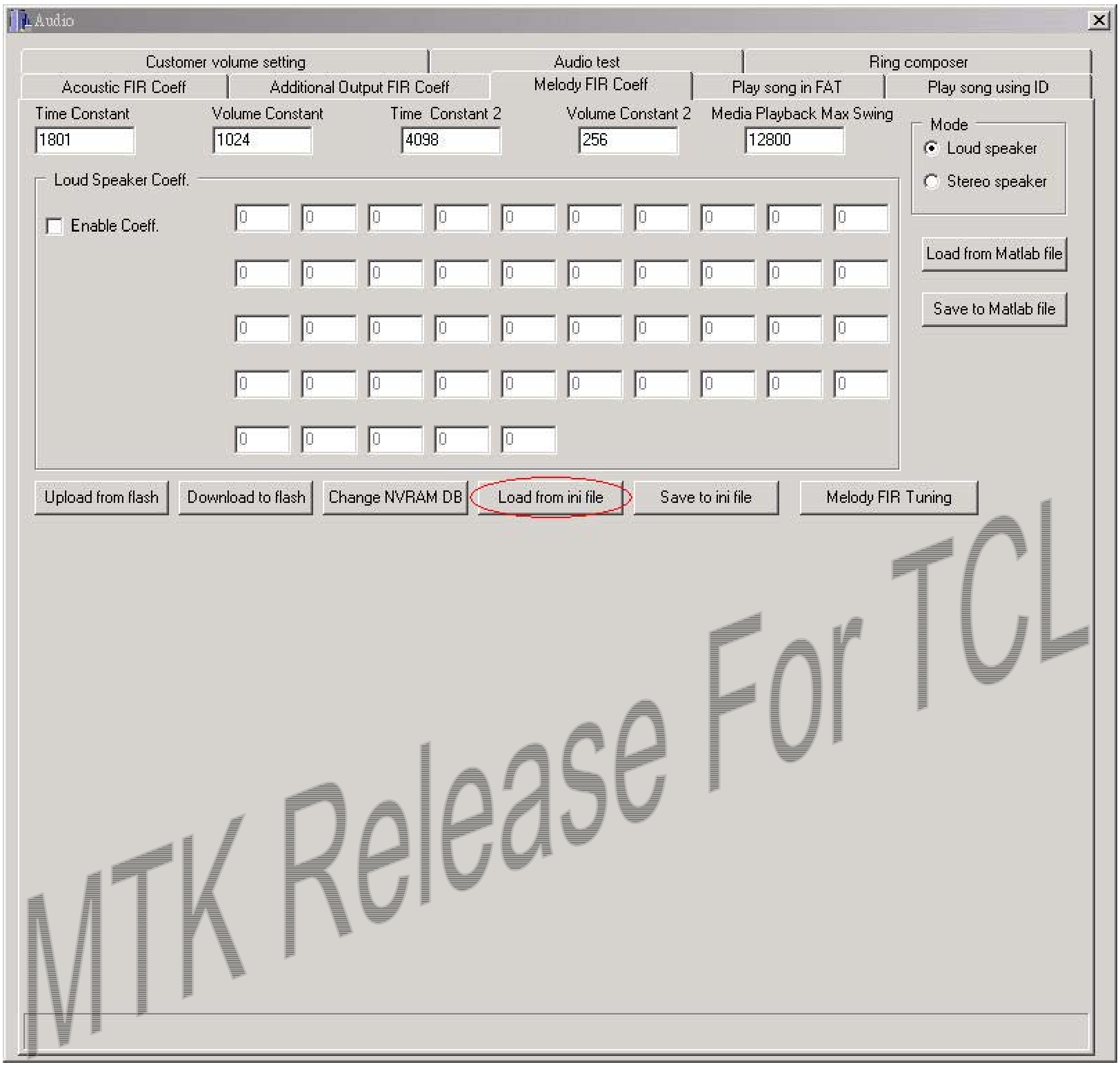

Figure 196 Click [Load from ini file] to read coefficient from file

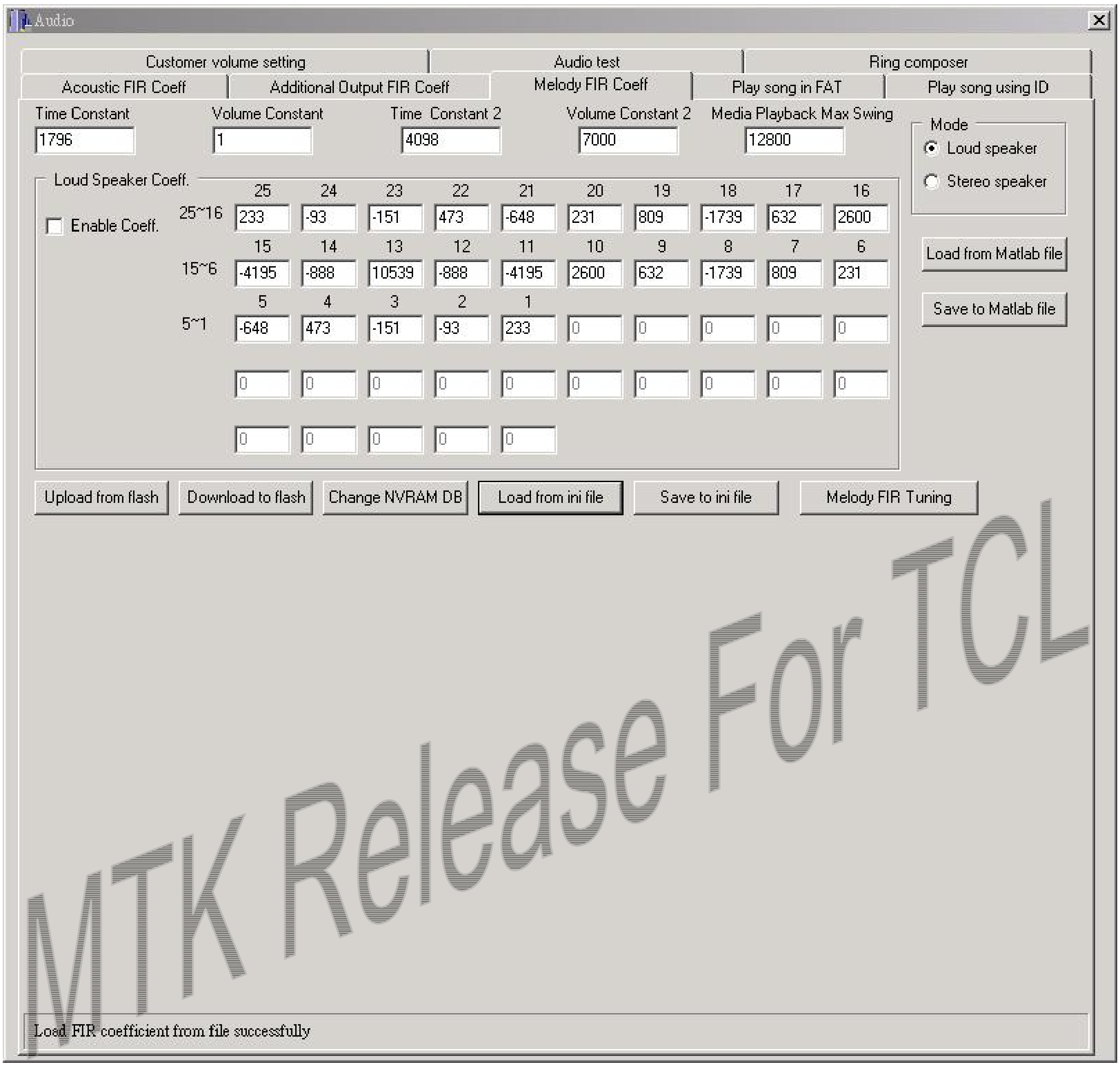

Figure 197 Melody FIR coefficient result

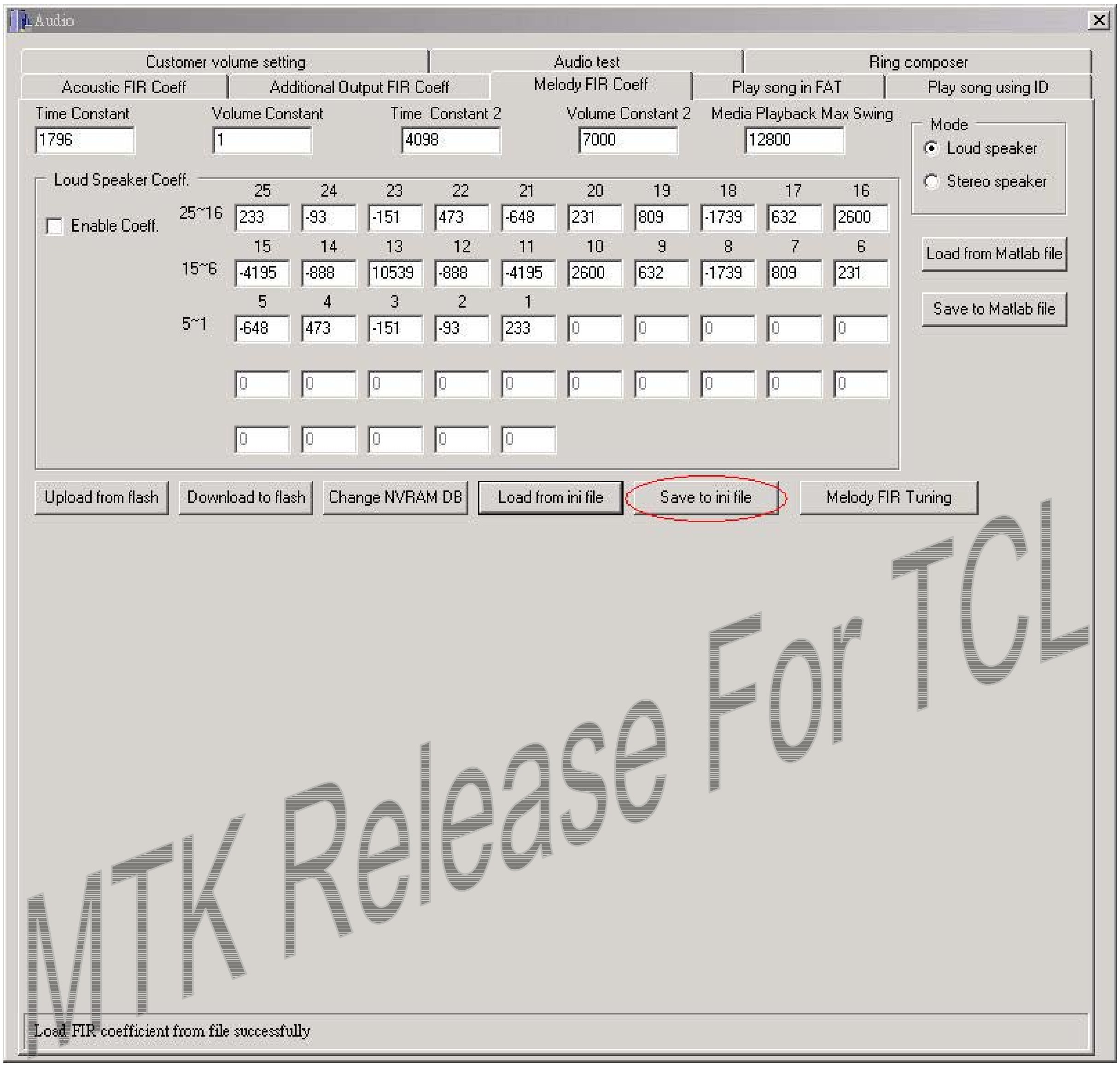

Figure 198 Click [Save to ini file] to save coefficient to file

The following is a template of FIR coefficient file. User will get the text file after saving FIR coefficient to file. Each value must be followed with a comma. Please follow the file format if you want to change the value in file.

[Acoustic FIR-Coefficient]
Time Constant=1796
Volume Constant=1
Time Constant 2=4098
Volume Constant 2=7000
Media Playback Max Swing=12800
8k Input (mic)=123,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
8k Output (speaker)=214,-299,-47,-466,385,-1208,335,-409,-1272,897,-2175,871,2676,-15396,16384,16384,-15396,2676,871,-2175,897,-1272,-409,335,-1208,385,-466,-47,-299,214
8k Input (earphone)=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
8k Output (earphone)=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
active output FIR index=0
Additional 8k 1st Output=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

Additional 8k 2nd Output=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Additional 8k 3rd Output=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Additional 8k 4th Output=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Additional 8k 5th Output=32767,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Melody Output (loud speaker)=233,-93,-151,473,-648,231,809,-1739,632,2600,-4195,-888,10539,-888,-4195,2600,632,-1739,809,231,-648,473,-151,-93,233,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Melody Output (stereo speaker)=233,-93,-151,473,-648,231,809,-1739,632,2600,-4195,-888,10539,-888,-4195,2600,632,-1739,809,231,-648,473,-151,-93,233,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

3.4.3.3 Read and write melody FIR coefficient in Matlab file

User can click [Load from Matlab file] button to read melody FIR coefficient from file generated by Matlab and click [Save to Matlab file] button to save melody FIR coefficient to file that can be an input file of Matlab.

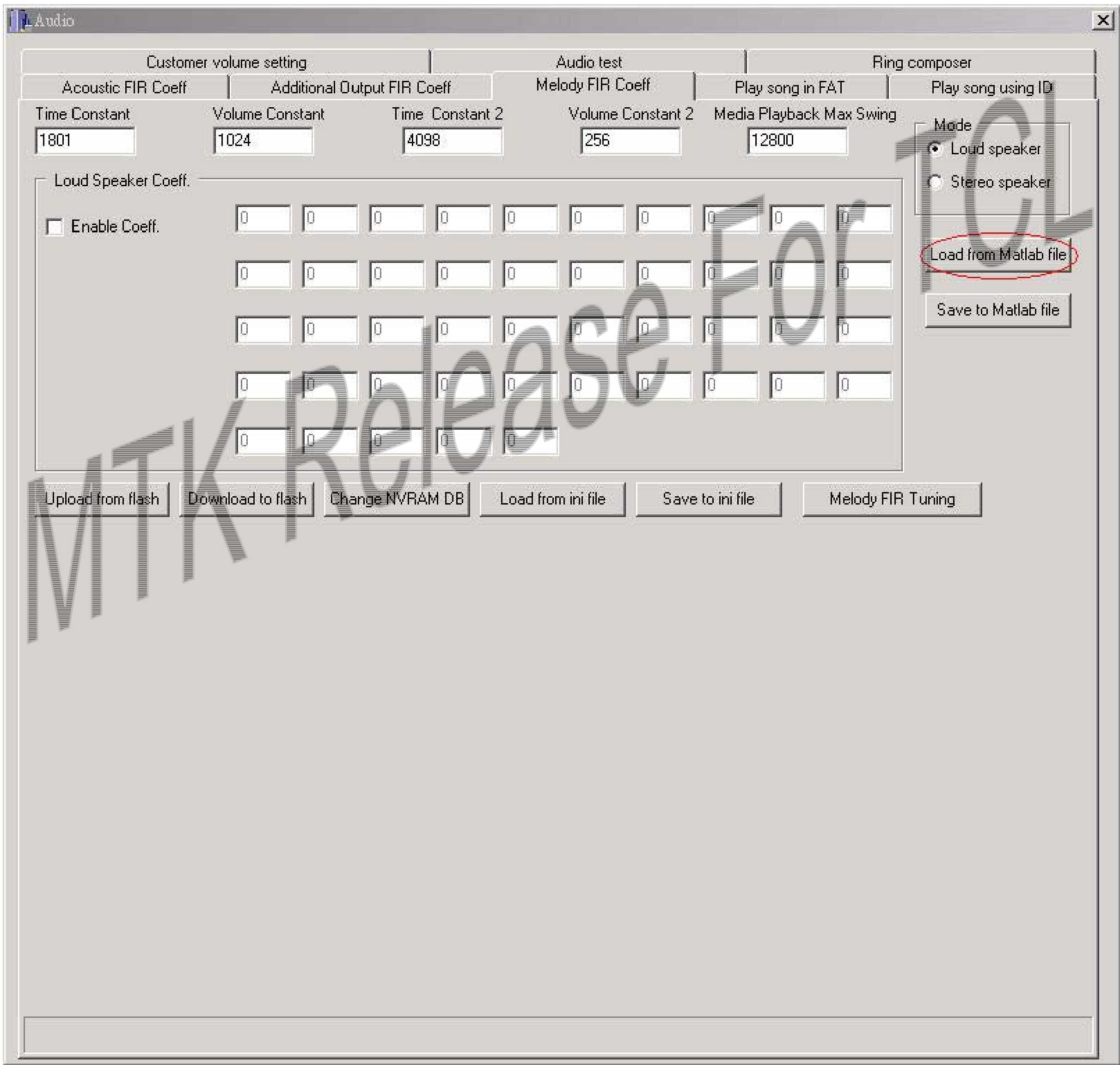

Figure 199 Click [Load from Matlab file] button to read file generated by Matlab

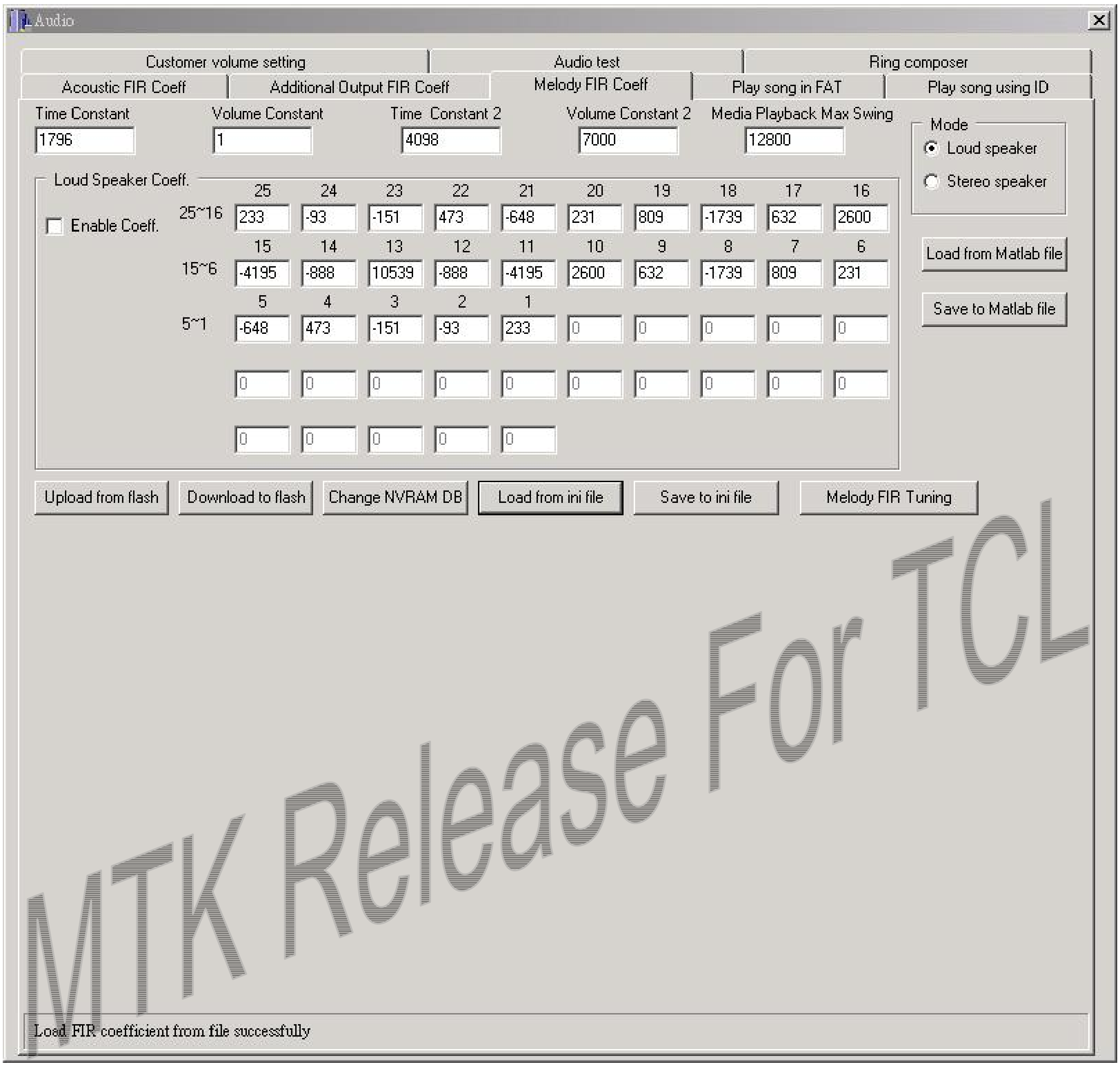

Figure 200 Melody FIR coefficient result

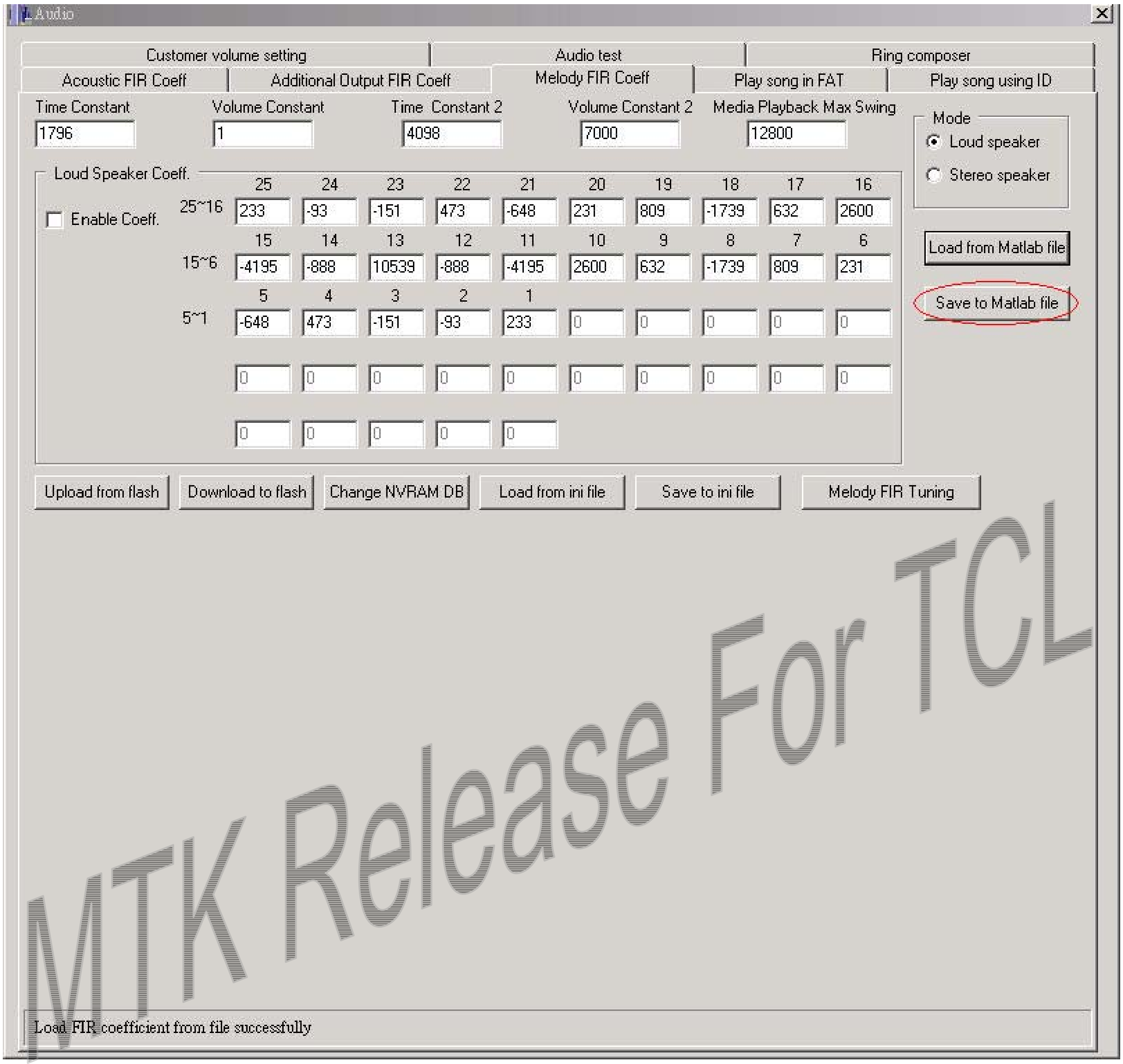

Figure 201 Click [Save to Matlab file] button to save to file that can be accepted by Matlab

The following is a template of melody FIR coefficient file that generated by clicking [Save to Malab file] button. The first line indicates the number of melody FIR coefficient.

25
233
-93
-151
473
-648
231
809
-1739
632
2600
-4195
-888

10539
-888
-4195
2600
632
-1739
809
231
-648
473
-151
-93
233

3.4.4 Audio testing

User can use audio testing function to test weather audio device (speaker or buzzer) generates correct frequency.

User can start audio test by following steps:
1) Select style, duration, frequency and instrument and then set volume (range: 0~6).
2) Click [Start] button to start audio test.

VALUE	STYLE	RATIO OF NOTE TO REST PERIOD
S0	Natural Style (rest between notes), default	20:1
S1	Continues Style (no rest between notes)	No rest
S2	Staccato Style (shorter notes and longer reset period)	1:1

Figure 202 Style format of iMelody

VALUE	DURATION
0	Full note
1	1/2 note
2	1/4 note
3	1/8 note
4	1/16 note
5	1/32 note

Figure 203 Duration format of iMelody

Note:

- If you want to know more detail about iMelody format, please refer to document [iMelody, Infrared Data Association, Specifications for Ir Mobile Communications (IrMC)], the document could be download from http://www.irda.org/standards/pubs/iMelody.pdf

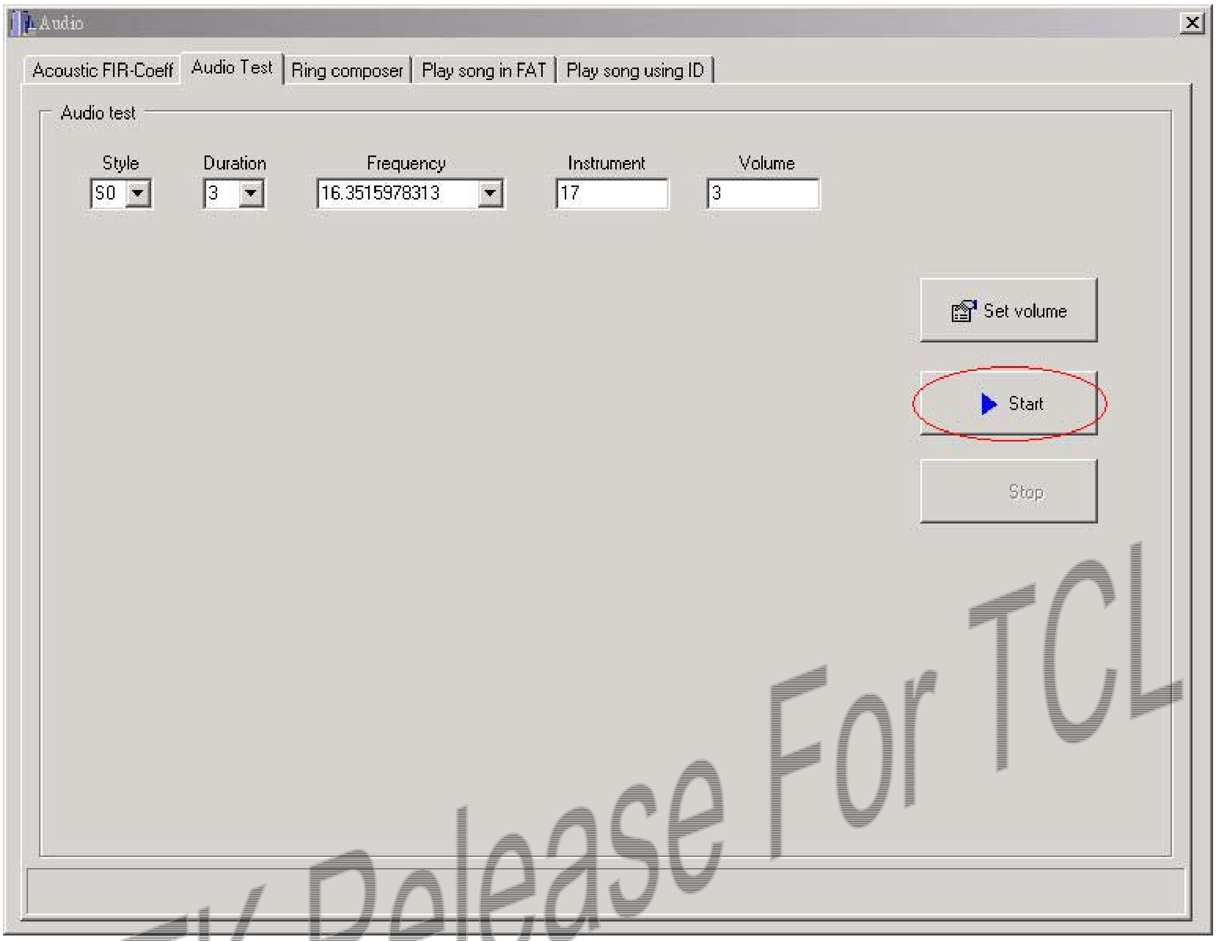

Figure 204 Click [Start] button to start testing

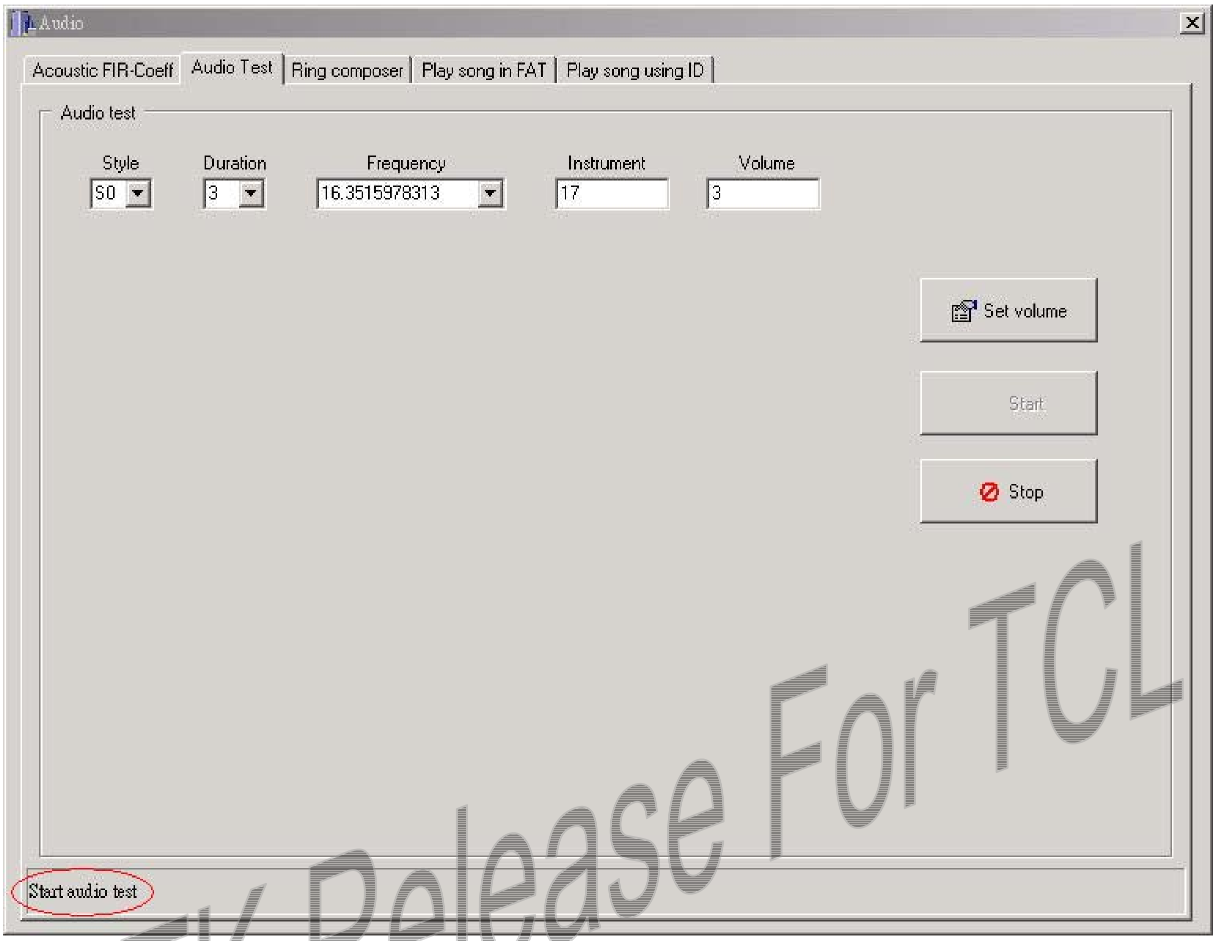

Figure 205 Result of audio test

User can click [Stop] button to stop audio test.

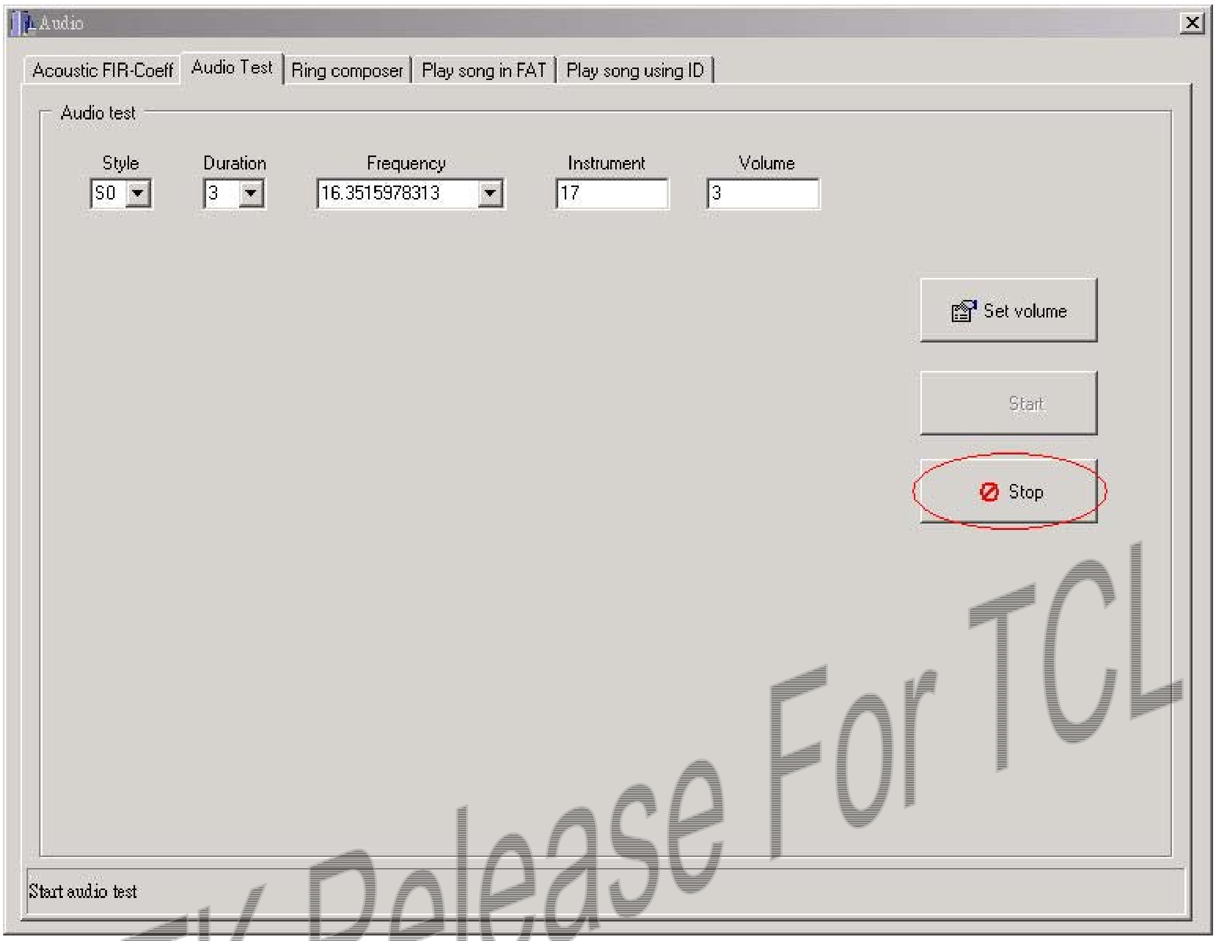

Figure 206 Click [Stop] button to stop testing

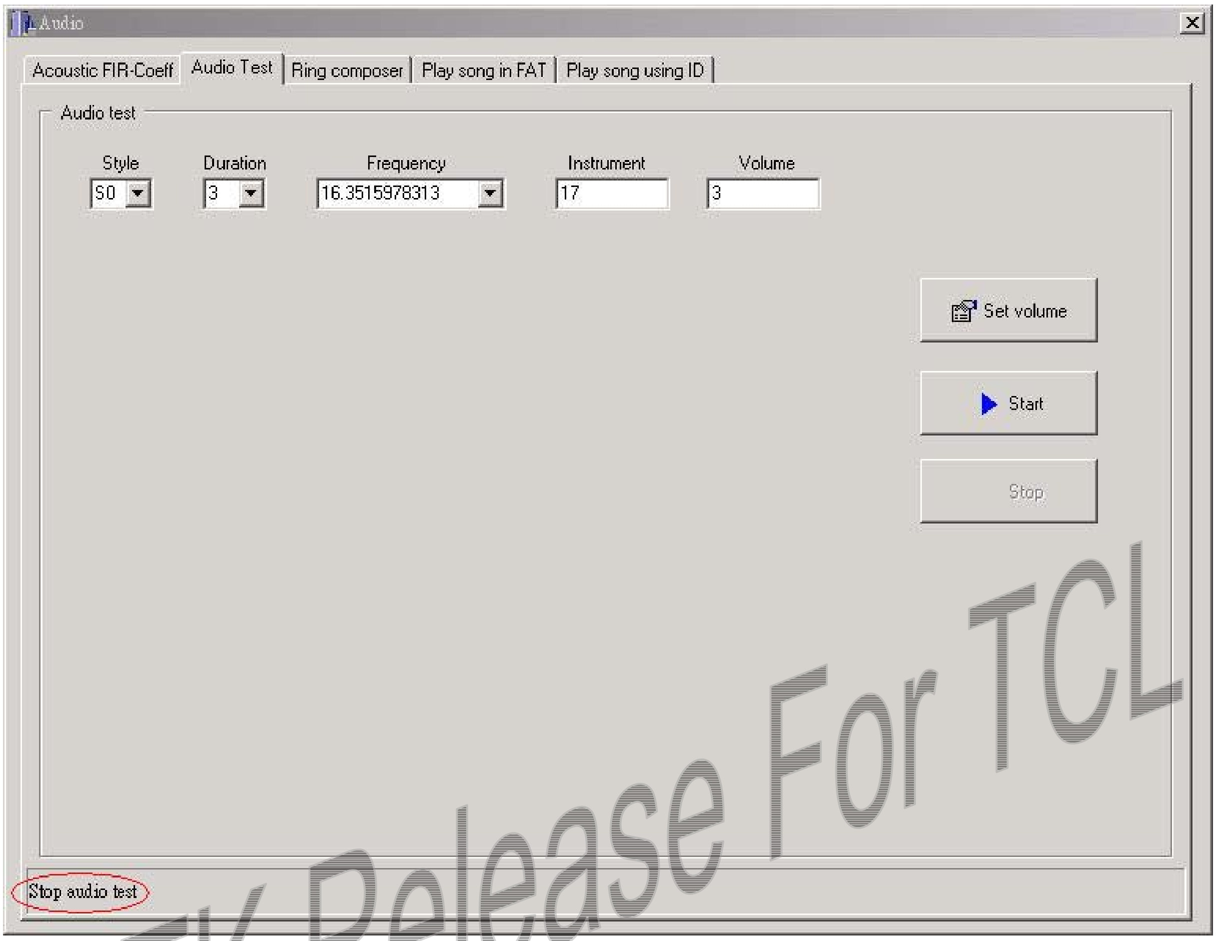

Figure 207 [Start] Button is enabled and result is shown

3.4.5 Ring composer

User can use the ring composer window to compose, play, save and load iMelody songs.

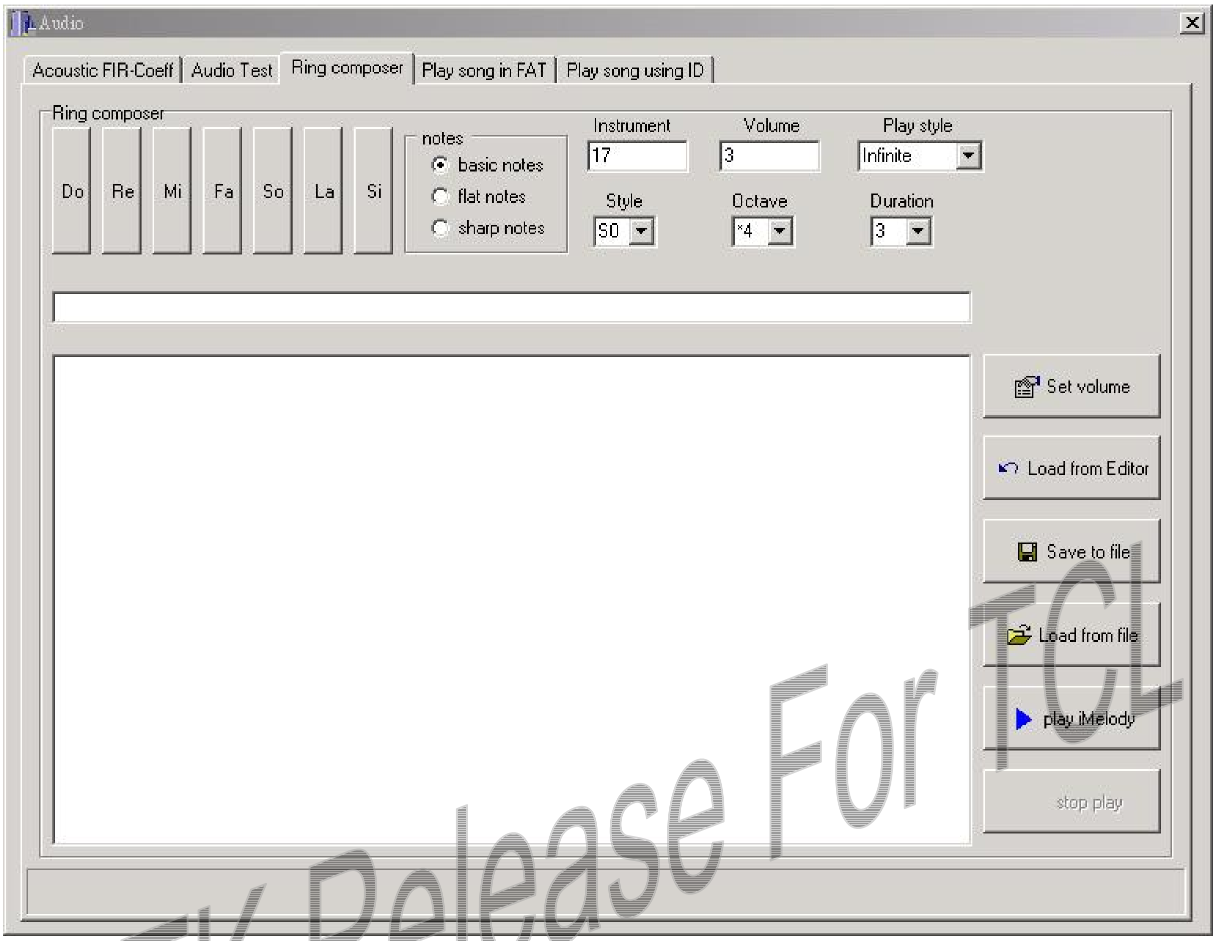

Figure 208 Ring composer window

Note:

- If you want to know more detail about iMelody format, please refer to document [iMelody, Infrared Data Association, Specifications for Ir Mobile Communications (IrMC)], the document could be download from http://www.irda.org/standards/pubs/iMelody.pdf

User can compose iMelody song by following steps:

1) Chose notes (basic, flat or sharp), instrument, volume, play style, style, octave, and duration you want to compose and then click [Do] ,[Re], [Mi], [Fa], [So], [La], or [Si] button.
2) Click [Load from Editor] button.
3) Click [play iMelody] button.

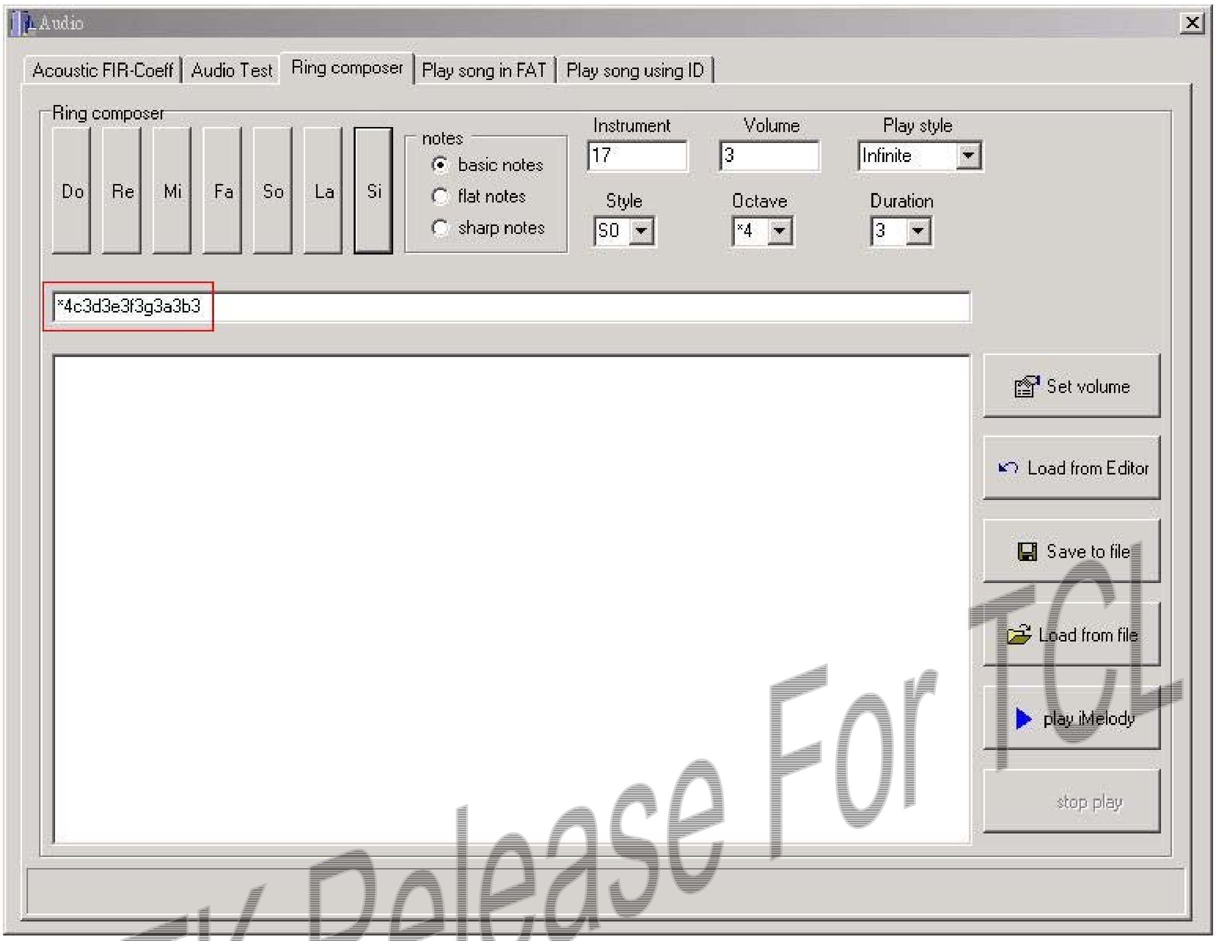

Figure 209 Composed imelody is shown after clicking [Do], [Re], [Mi], [Fa], [So], [La] or [Si] button

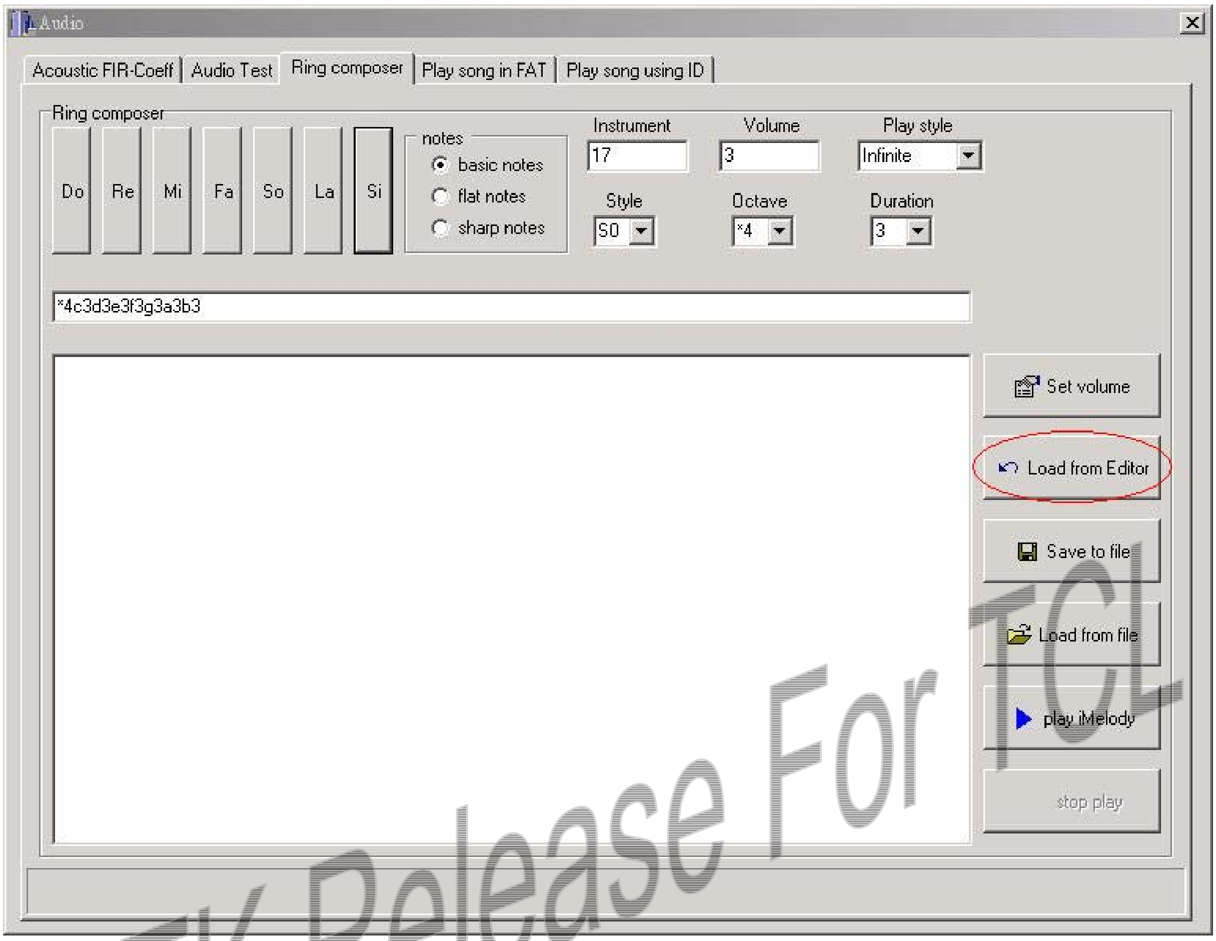

Figure 210 Click [Load form Editor] button

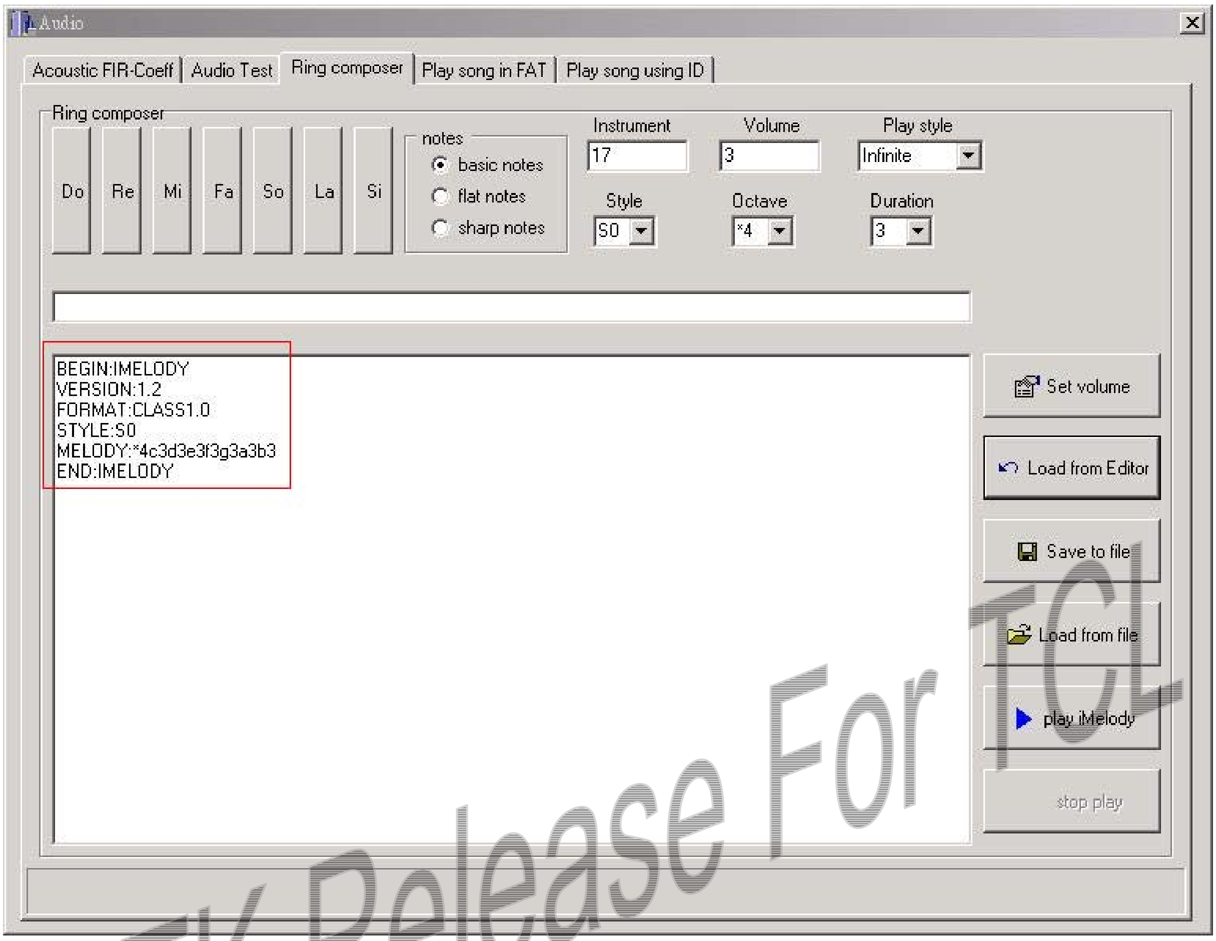

Figure 211 Composed iMelody song is shown

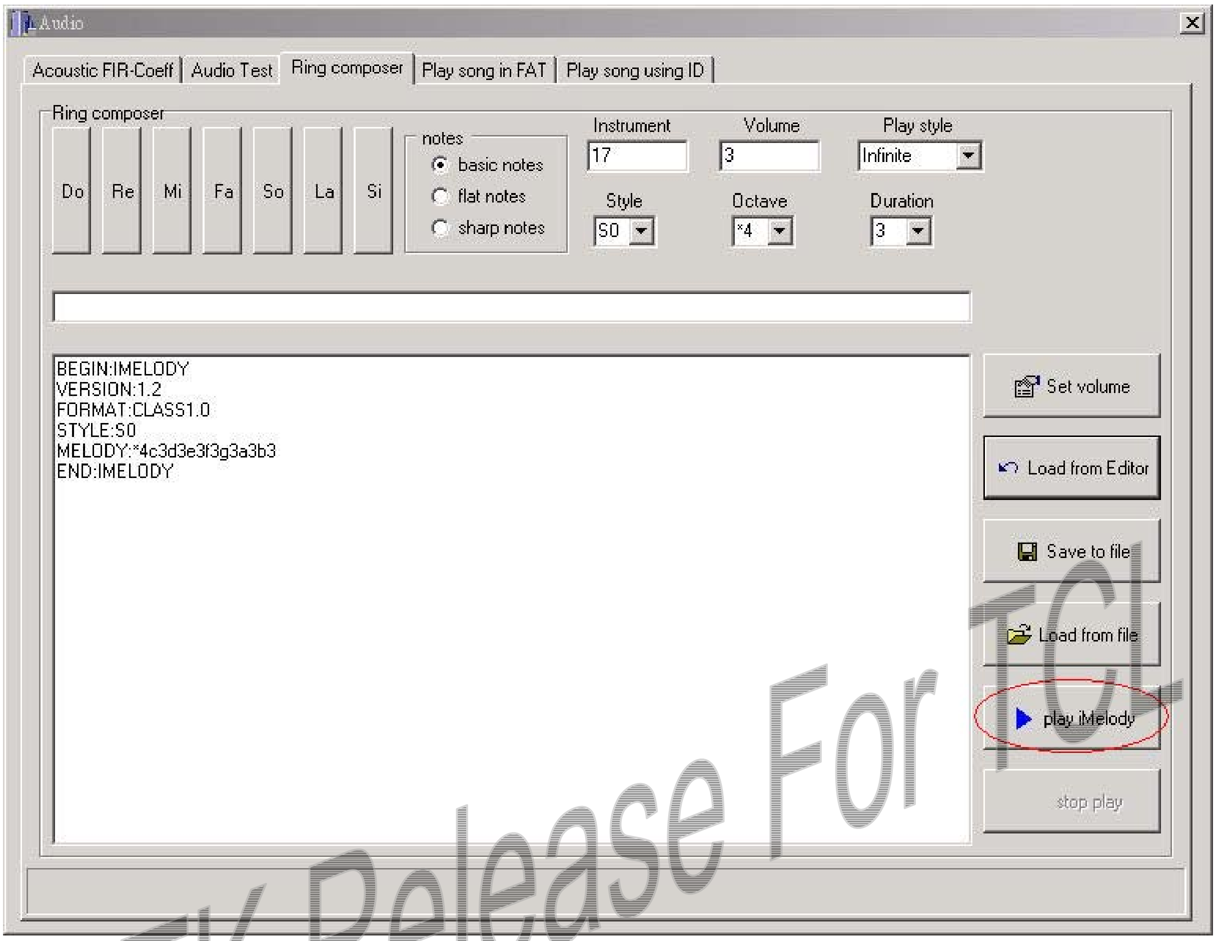

Figure 212 Click [play iMelody] button

User can click [Stop play] button to stop playing iMelody song.

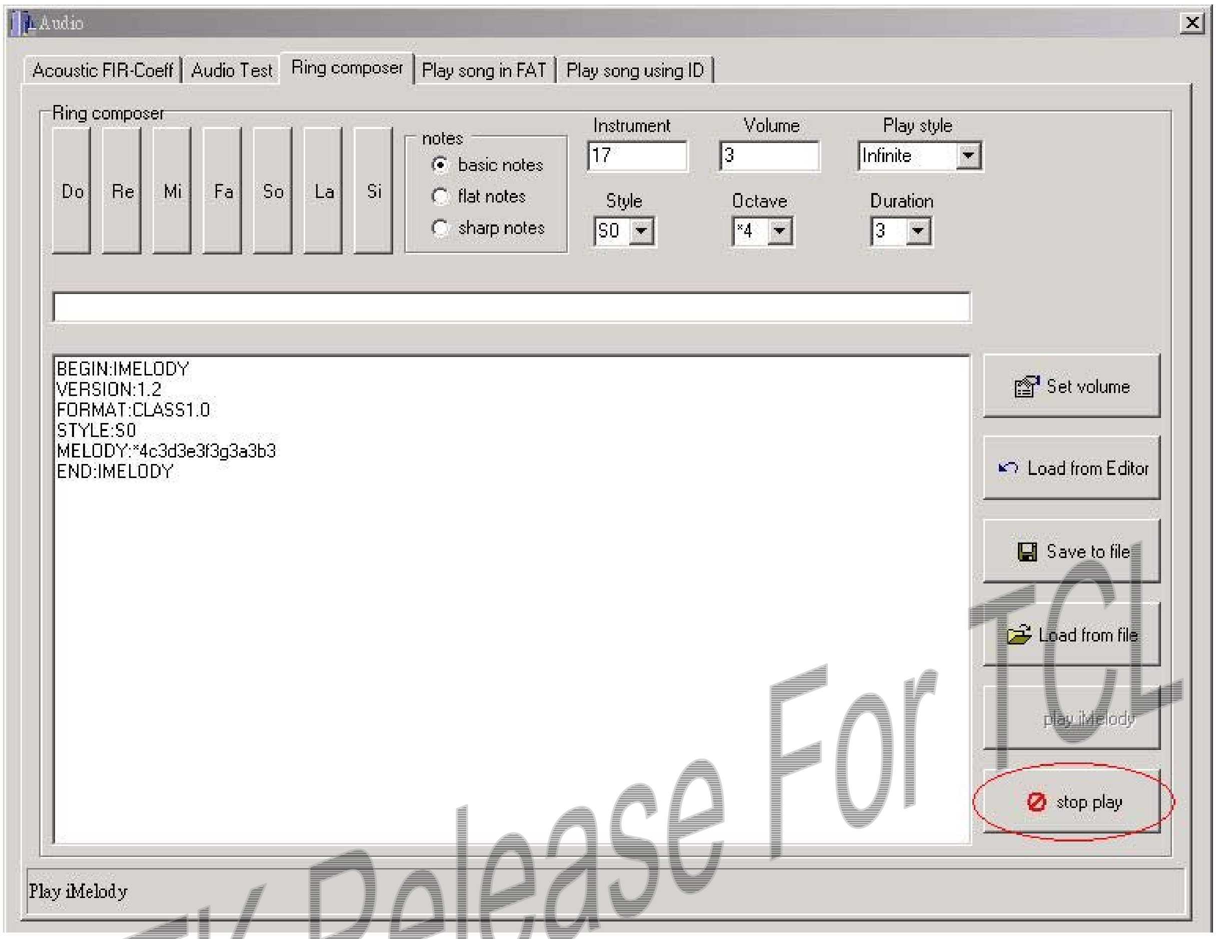

Figure 213 Click [stop play] button

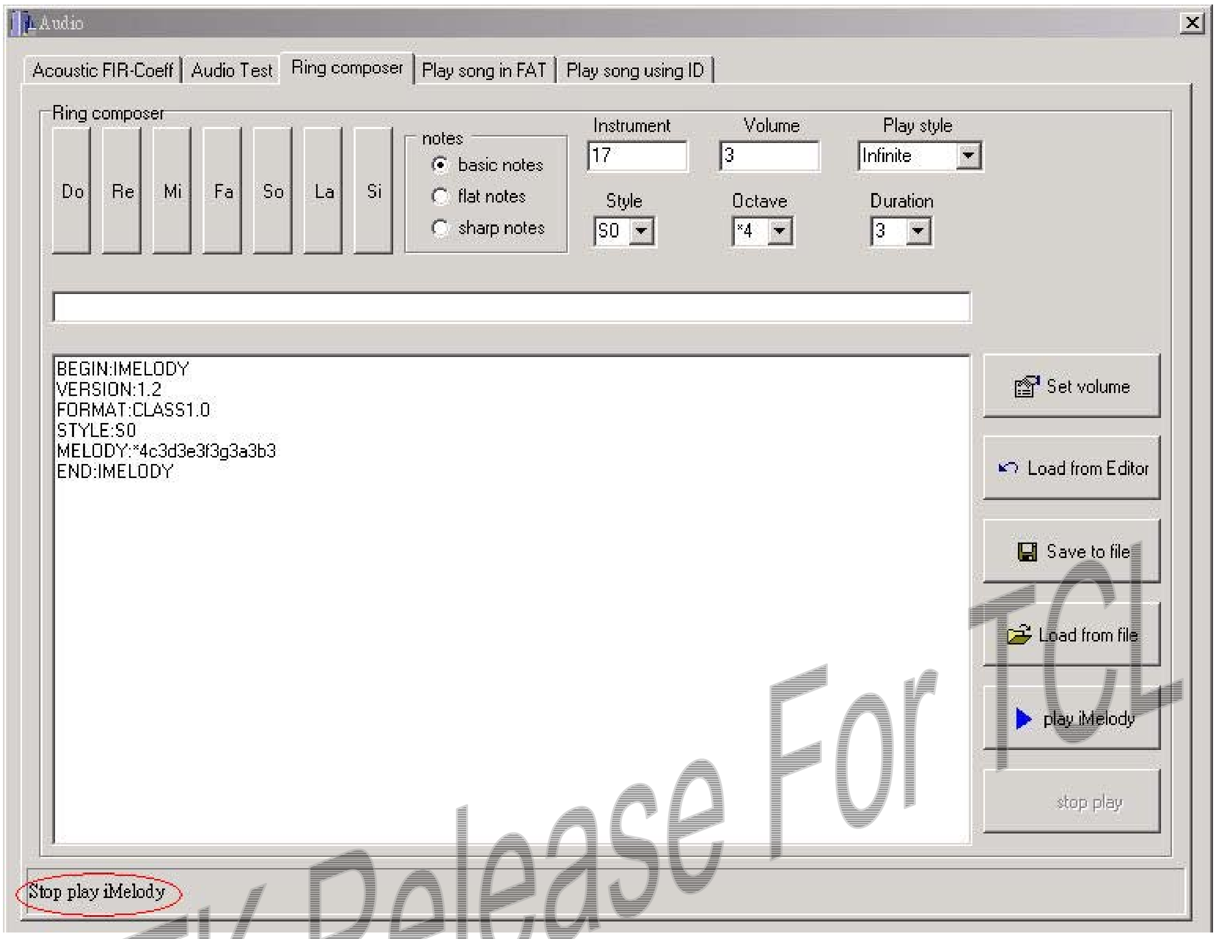

Figure 214 Result of stop play iMelody

3.4.6 Play song in FAT

The Play song in FAT provides an interface for user to play Midi and iMelody files in FAT.

User can play song in FAT by following steps:

- Enter volume (range: 0~6) and choose playing style.
- Select file type.
- Choose midi or iMelody file.
- Click [Play] button to start play song in FAT.
- User can click [Stop play] button to stop playing. [Play] button will be enabled after [Stop play] button is clicked.

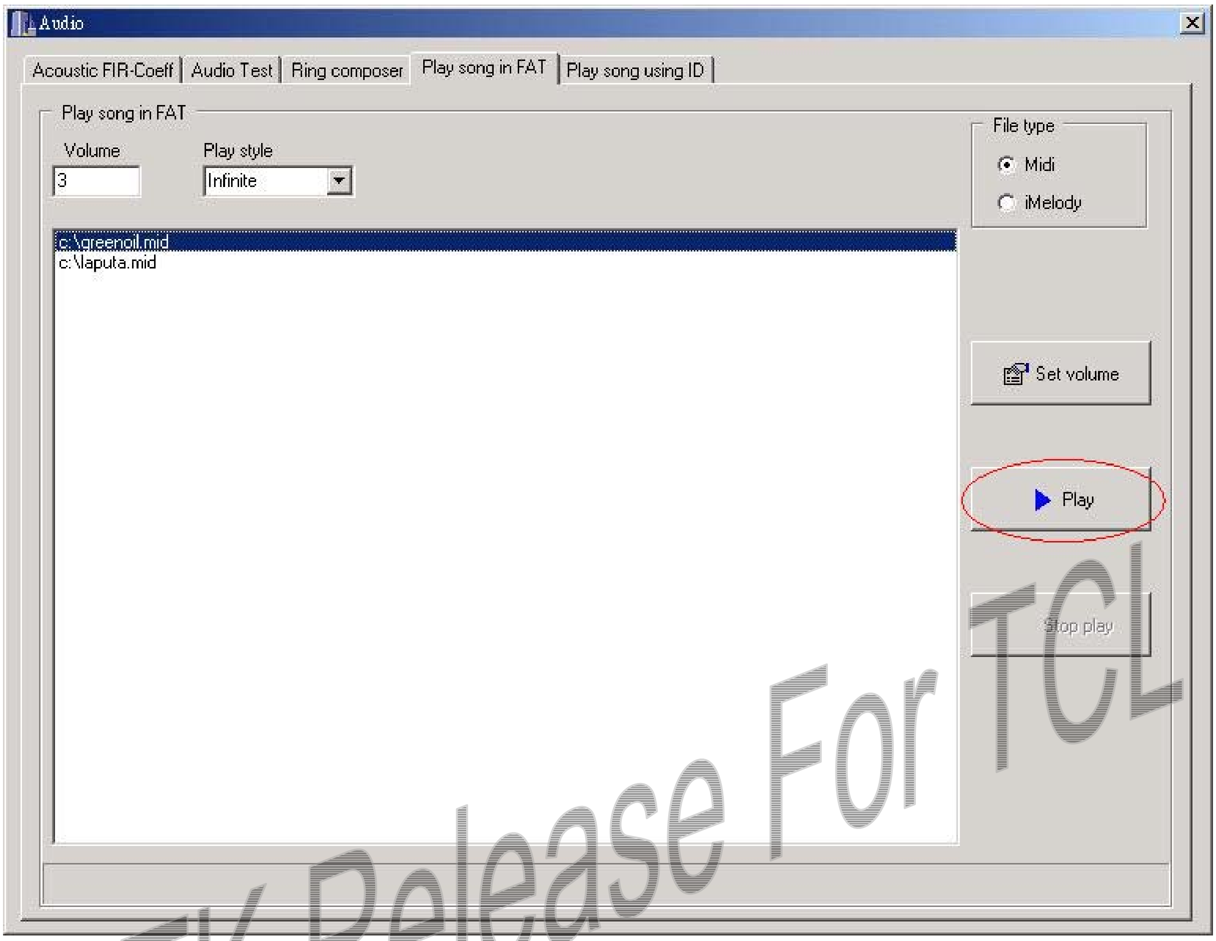

Figure 215 Click [Play] to start playing song in FAT

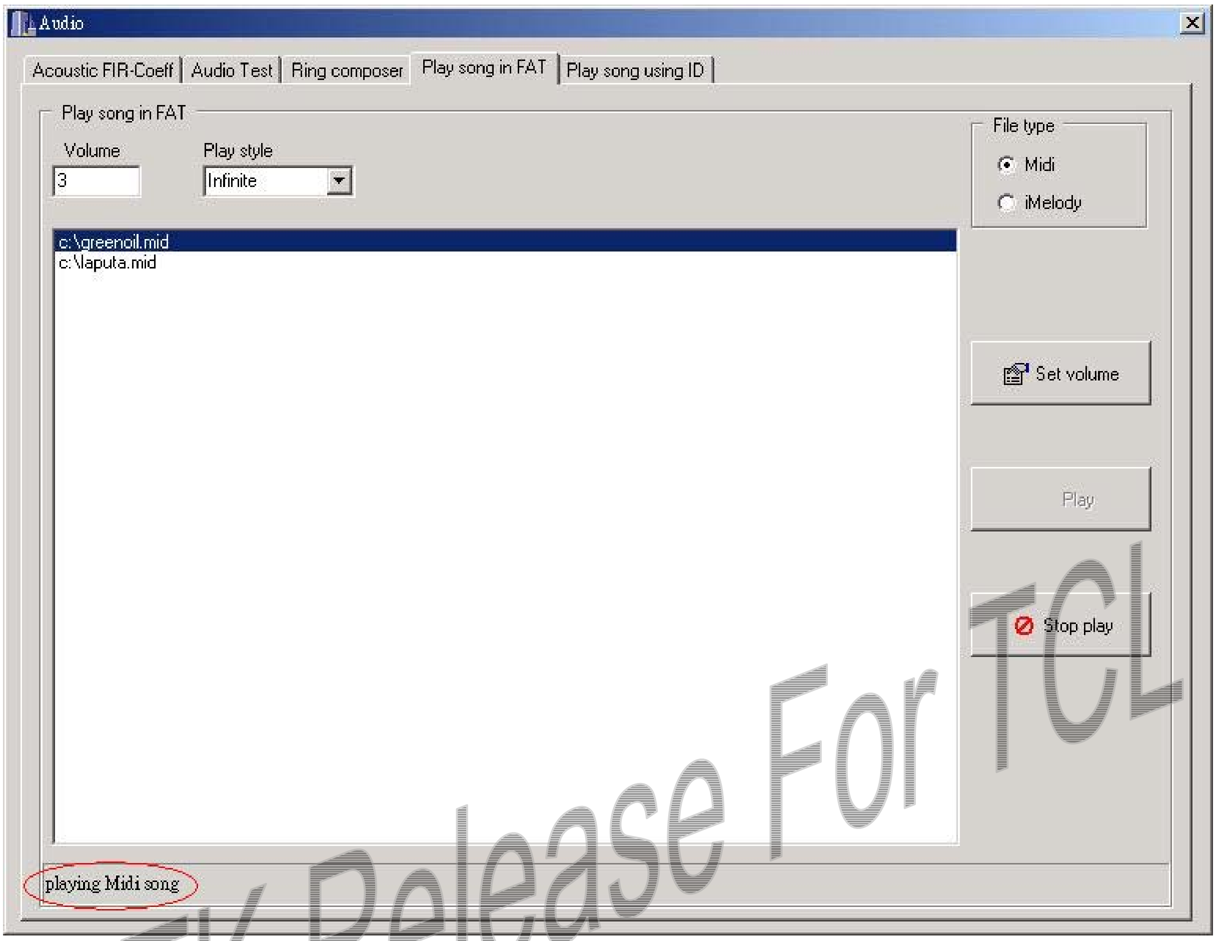

Figure 216 Result of playing song in FAT

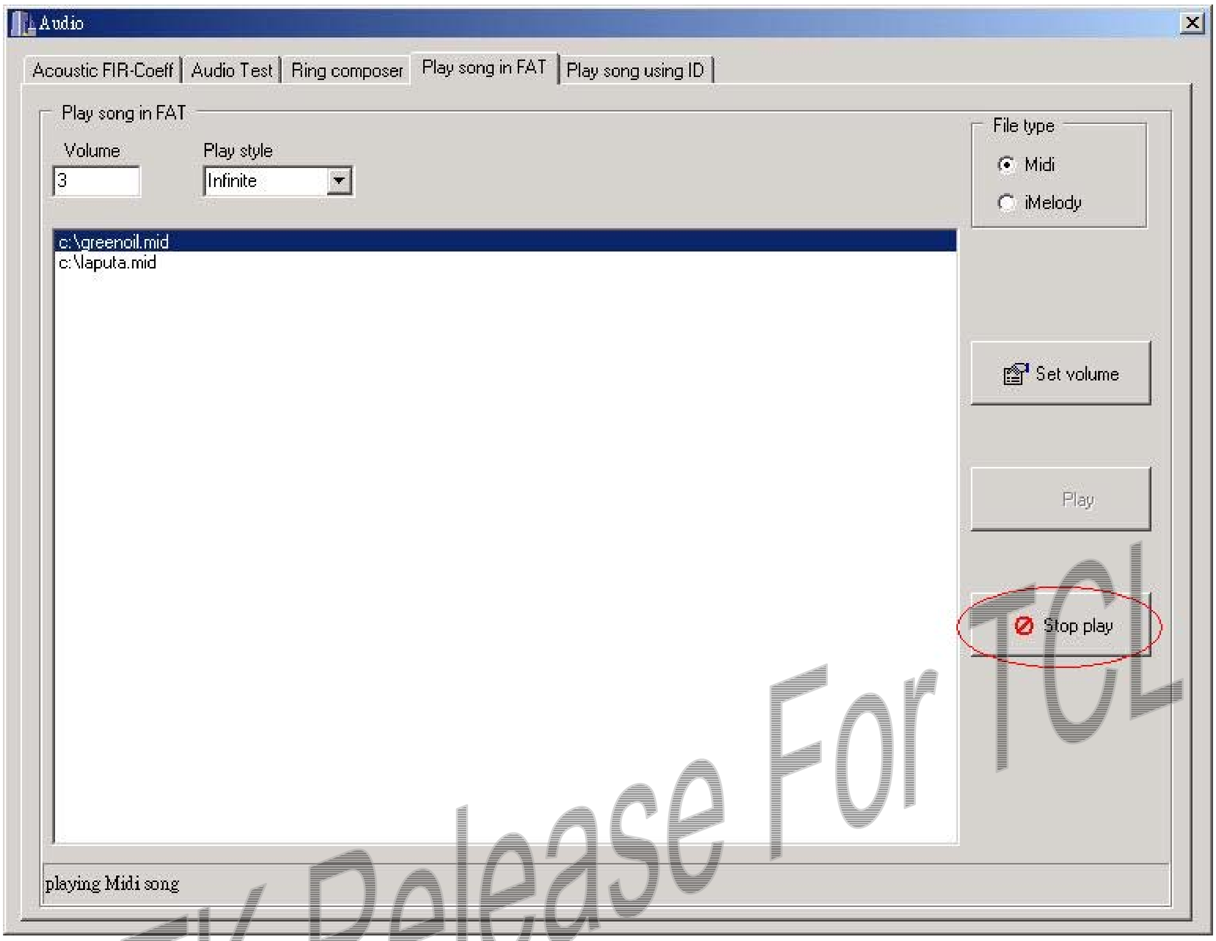

Figure 217 Click [Stop play] button to stop playing song in FAT

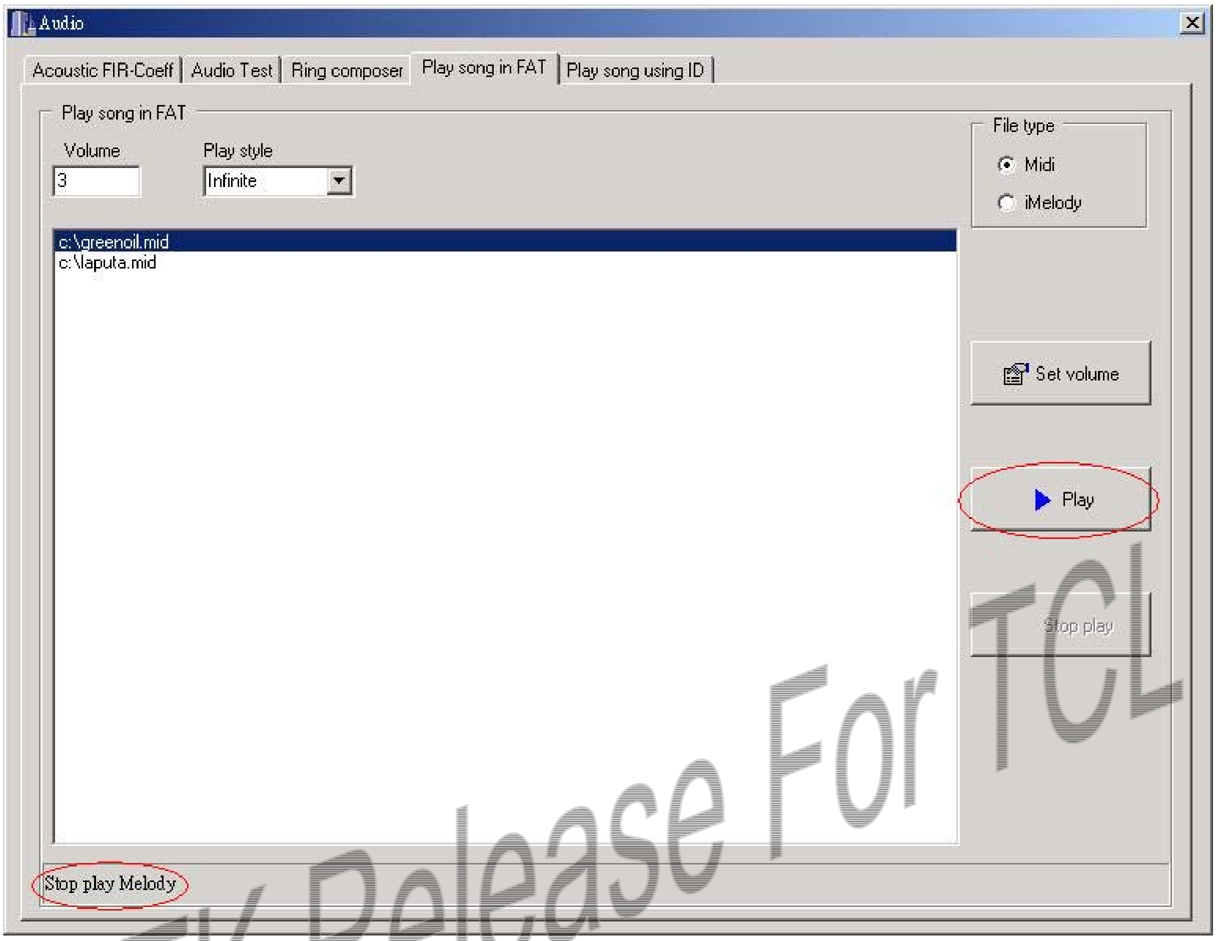

Figure 218 Result of stop playing song in FAT

3.4.7 Play song using ID

Each midi and iMelody songs saved in FAT has ID for user to play. User can play song by ID by following steps:

- Choose ID type.
- Select ID and input volume and play style.
- Click [Play] button to start playing song by ID.
- User can click [Stop play] button to stop playing. [Play] button will be enabled after [Stop play] button is clicked.

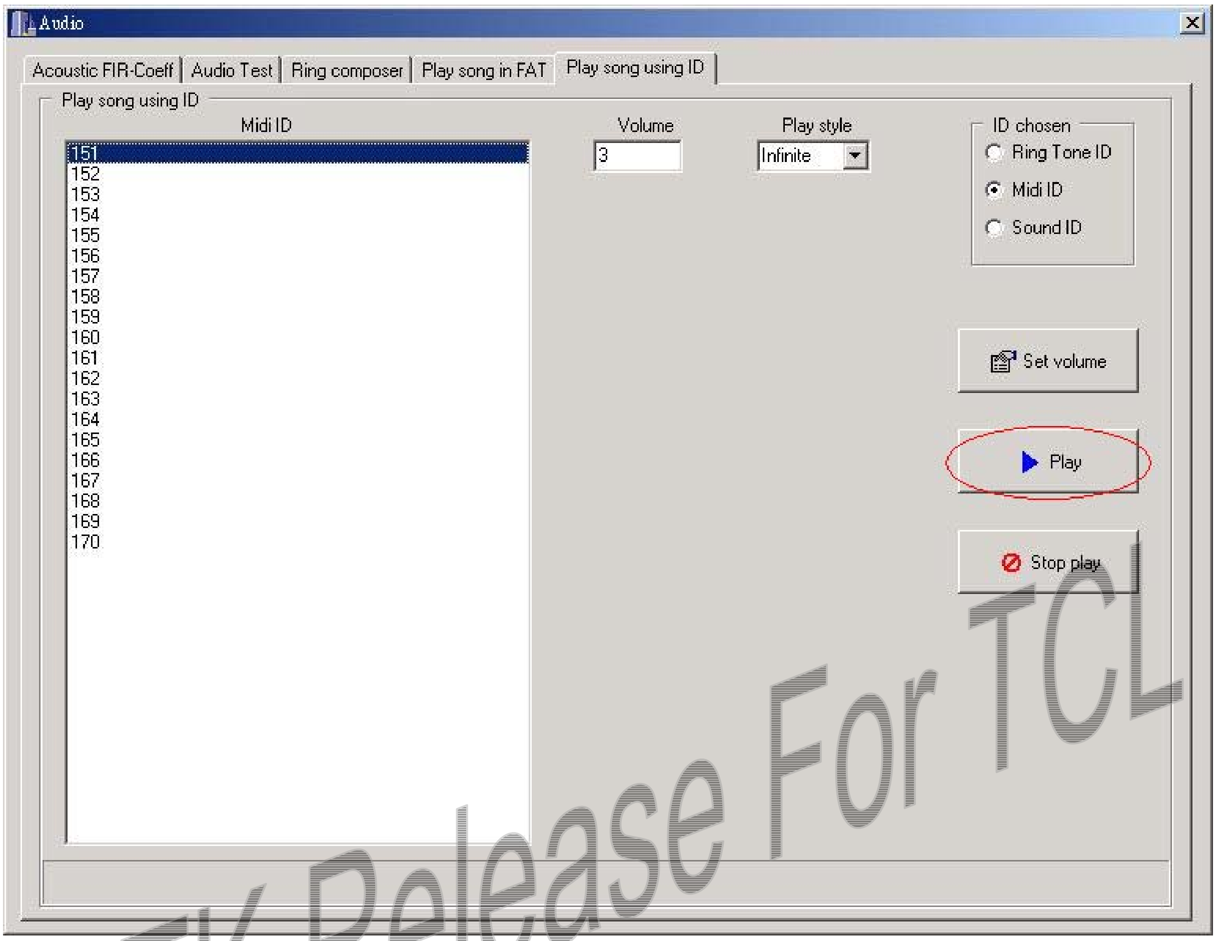

Figure 219 Click [Play] button to start playing song using ID

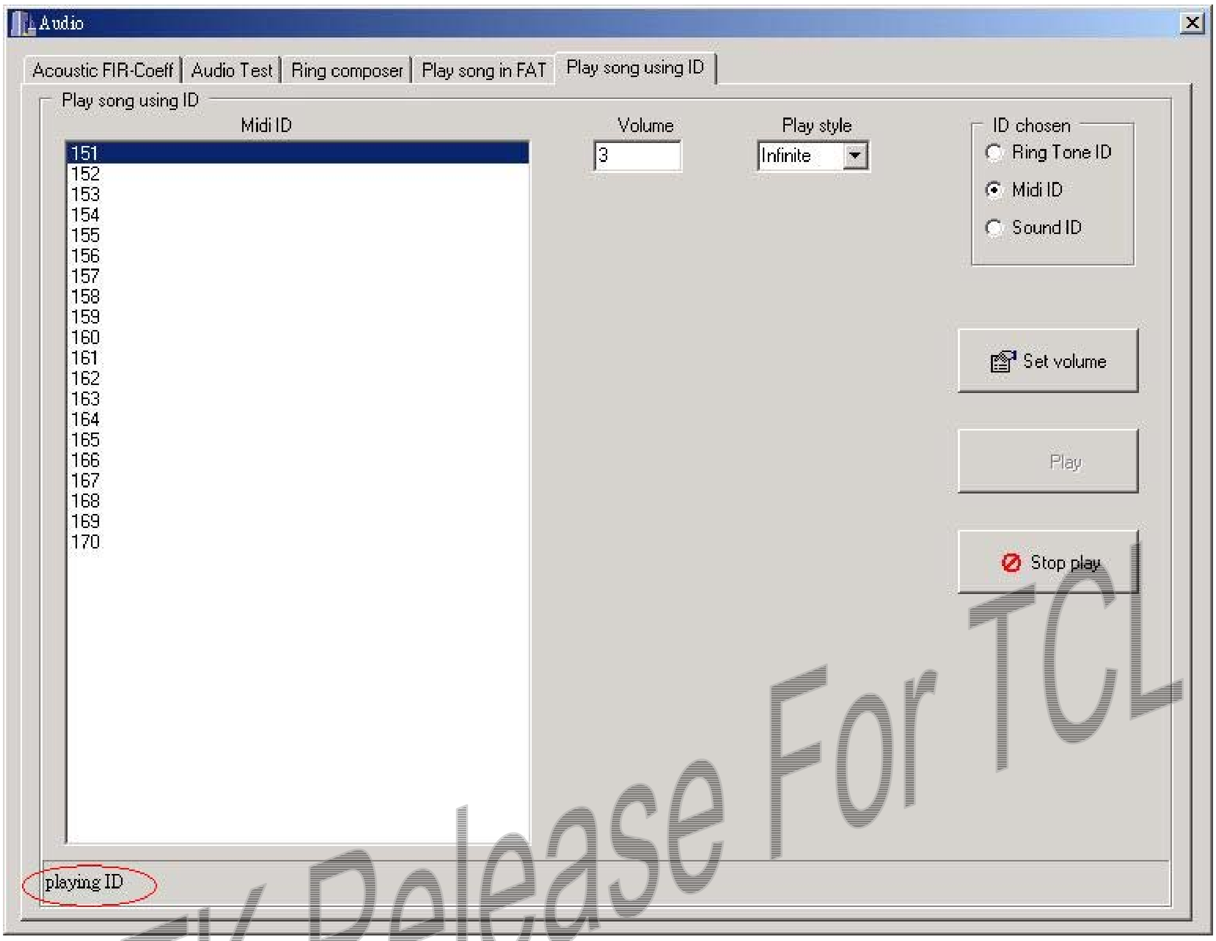

Figure 220 Result of playing song using ID

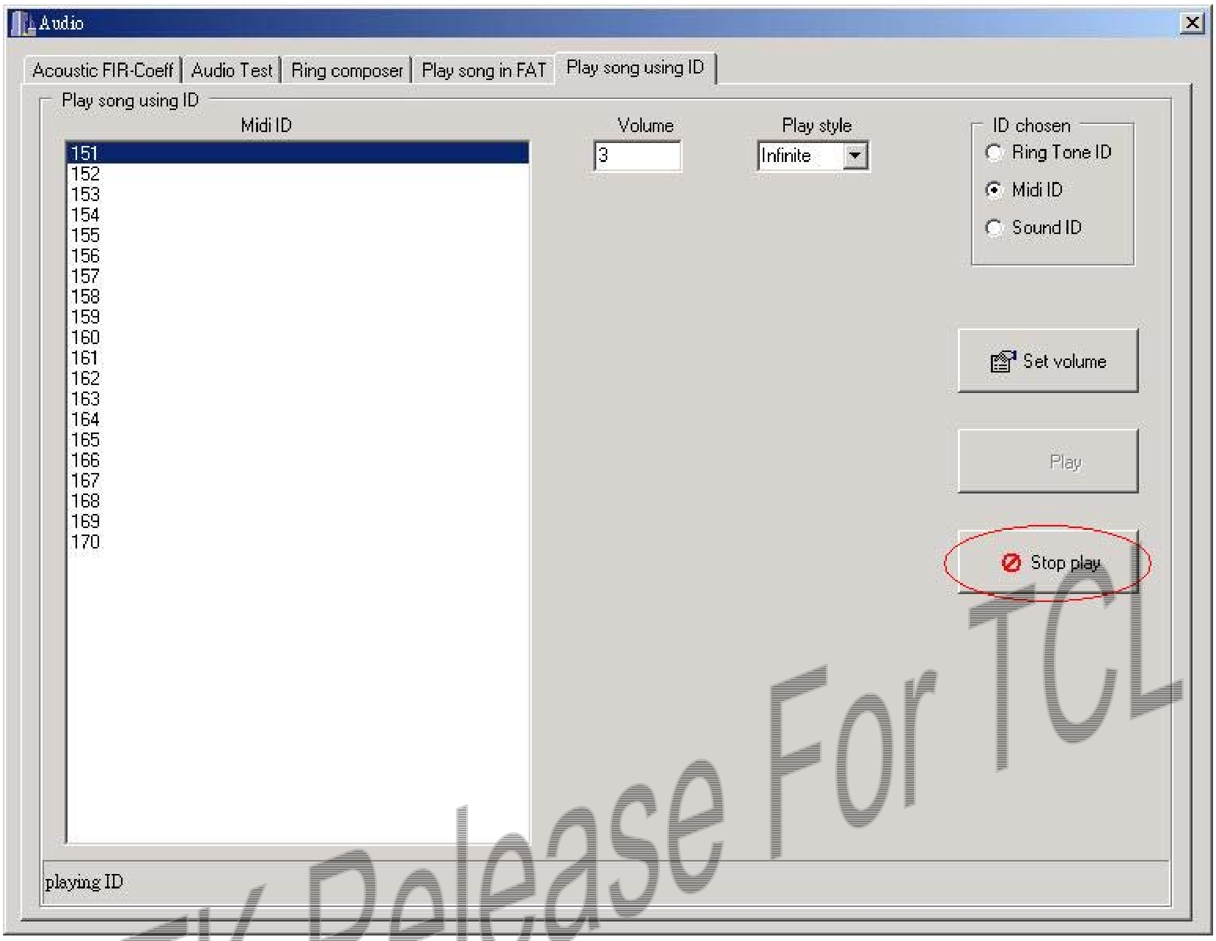

Figure 221 Click [Stop play] button to stop playing song using ID

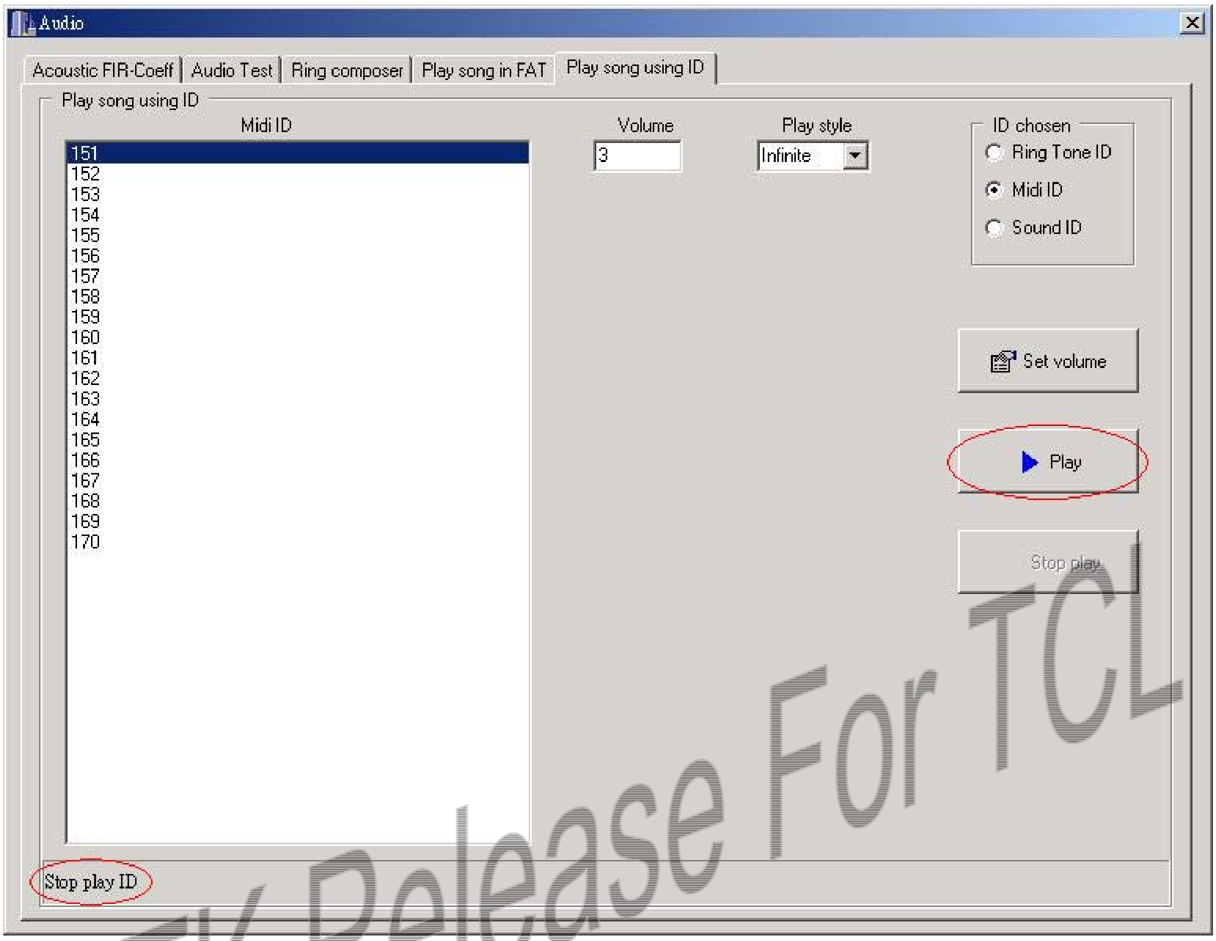

Figure 222 Result of stop playing song using ID

3.4.8 Customer volume setting

User can use customer volume setting window to adjust volume level of each tone and volume gain of each volume level and generate customer volume setting C file. There are total 7 tones, they are call tone, keypad tone, microphone, GMI tone, speech tone, side tone and melody. The range of volume level of these tones is level 0 ~ level 6. The range of volume gain of each level is between 0 ~ 255.

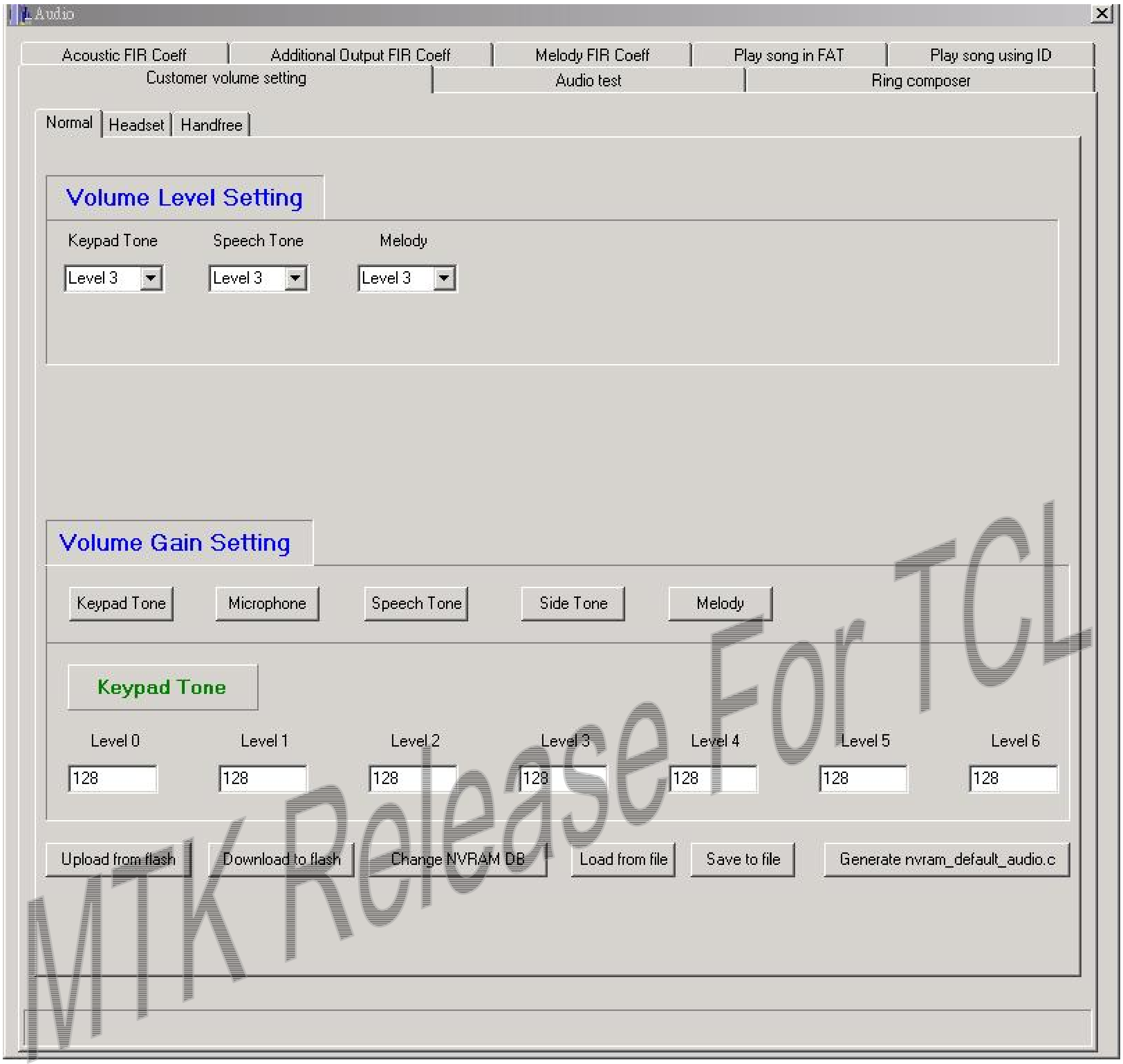

Figure 223 Customer volume setting window

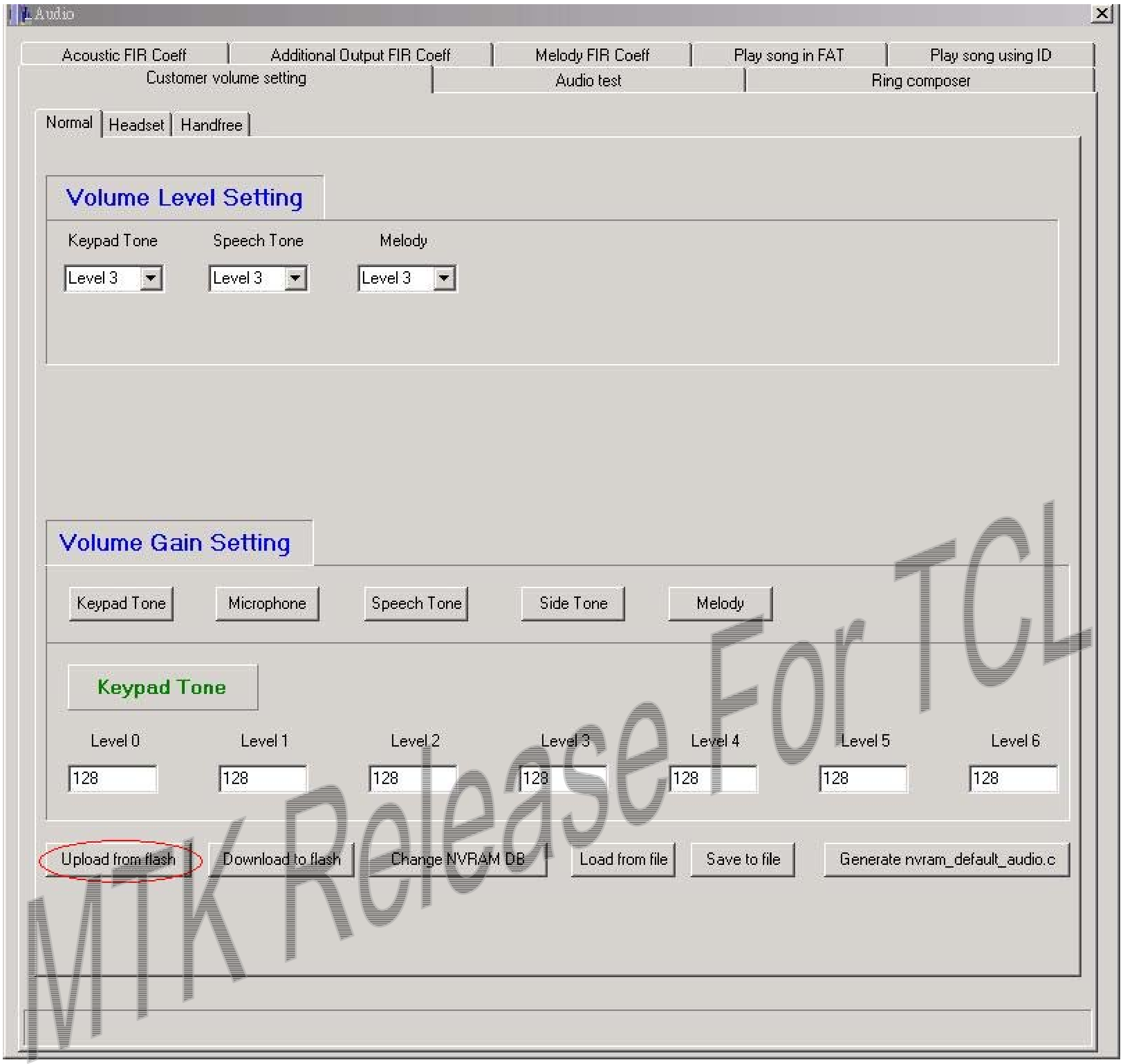

Figure 224 Click [Upload from flash] button to read customer volume setting from flash

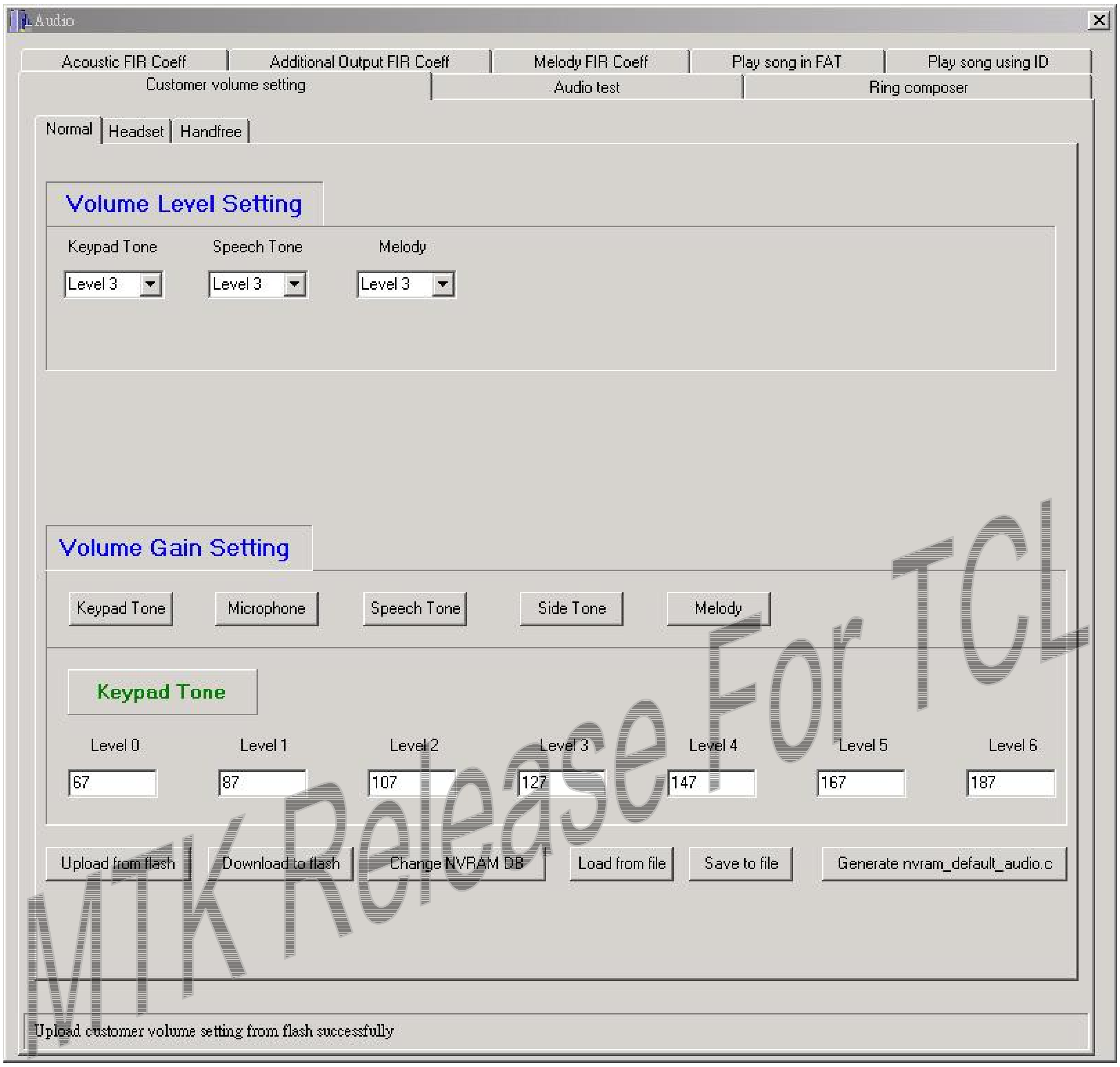

Figure 225 Result of upload from flash

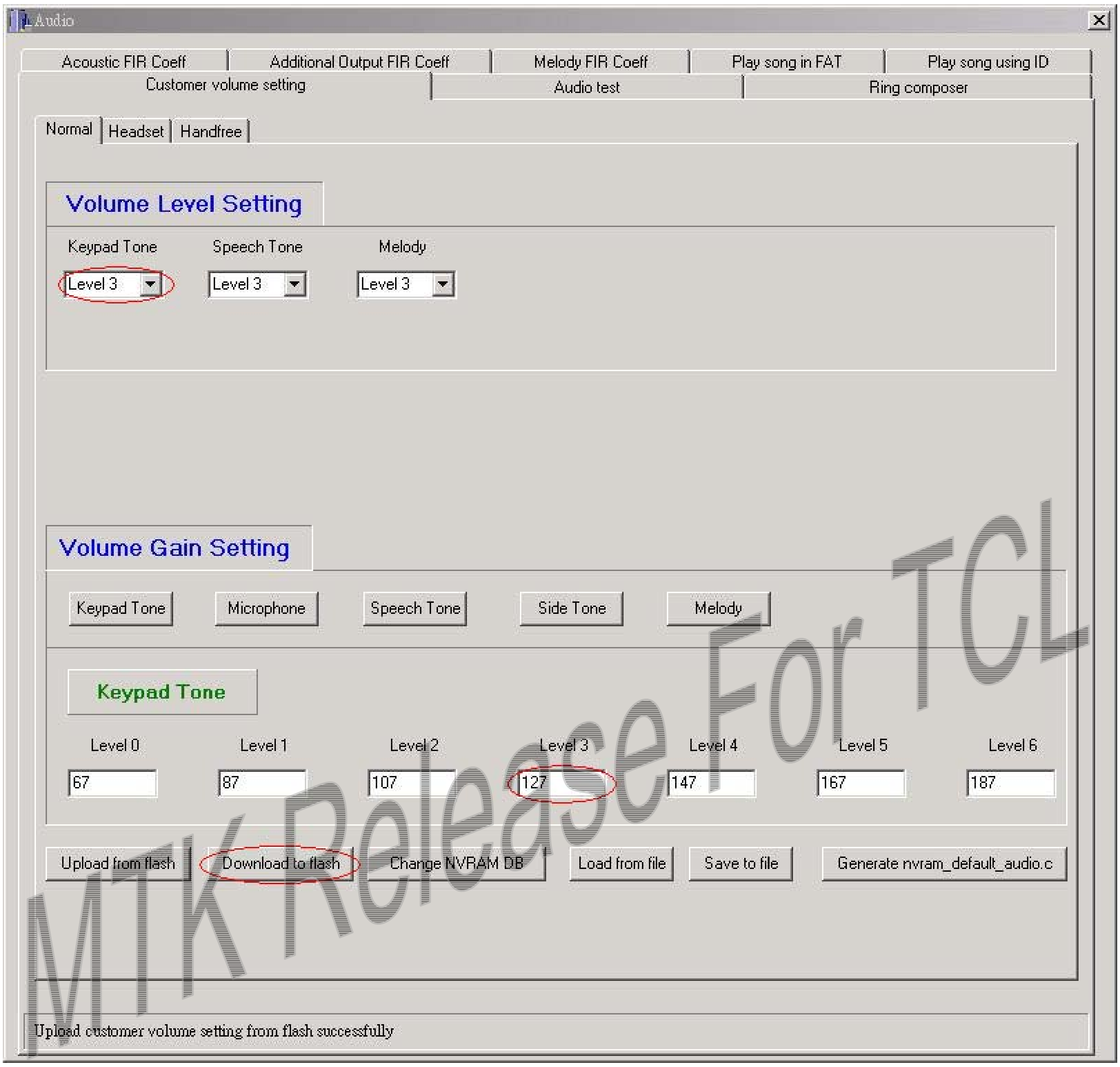

Figure 226 Adjust volume level, change volume gain, and then press [Download to flash] button to apply the new setting

User can click [Change NVRAM DB] button to change NVRAM database file.

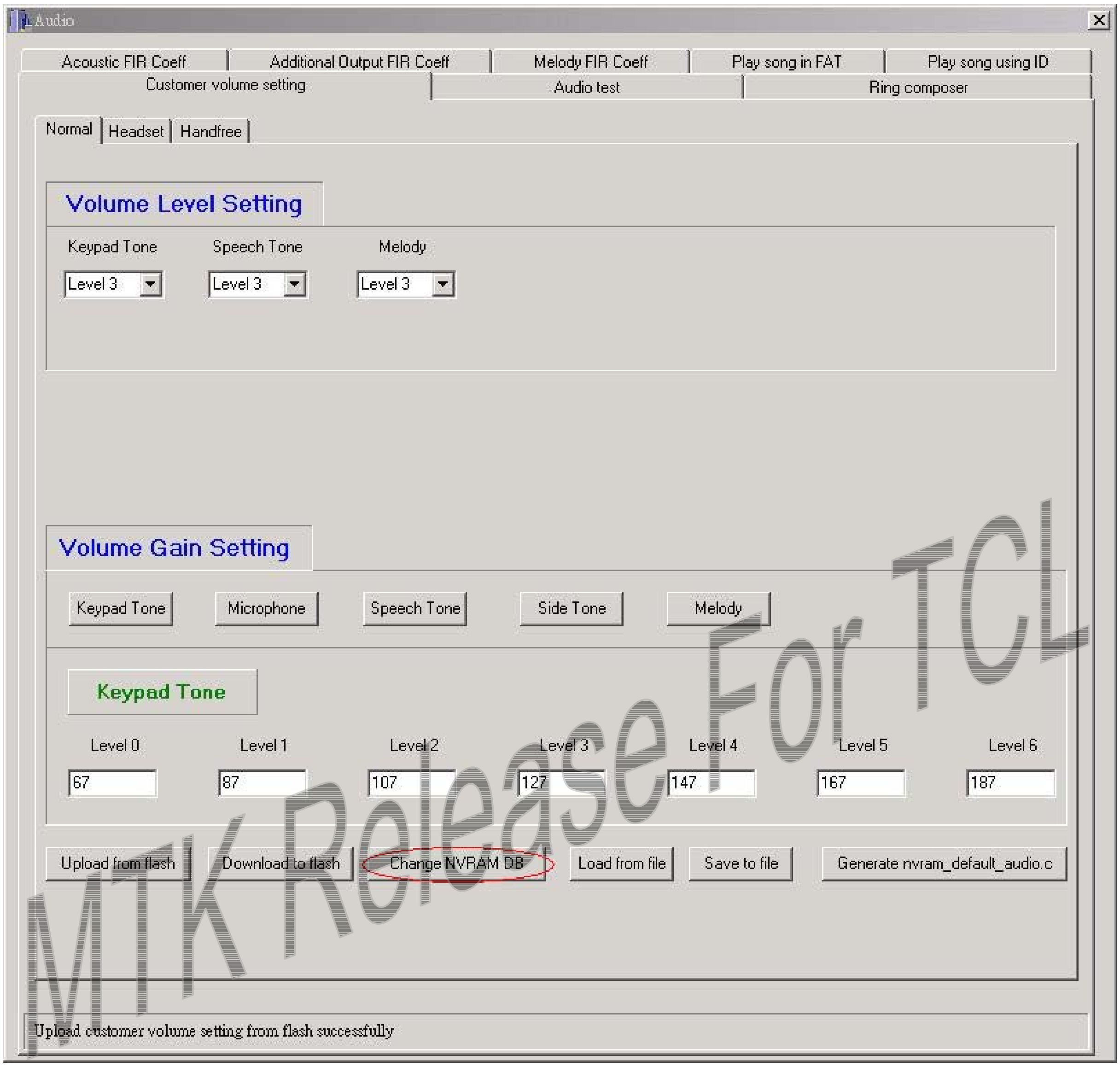

Figure 227 Click [Change NVRAM DB] button to change NVRAM database file

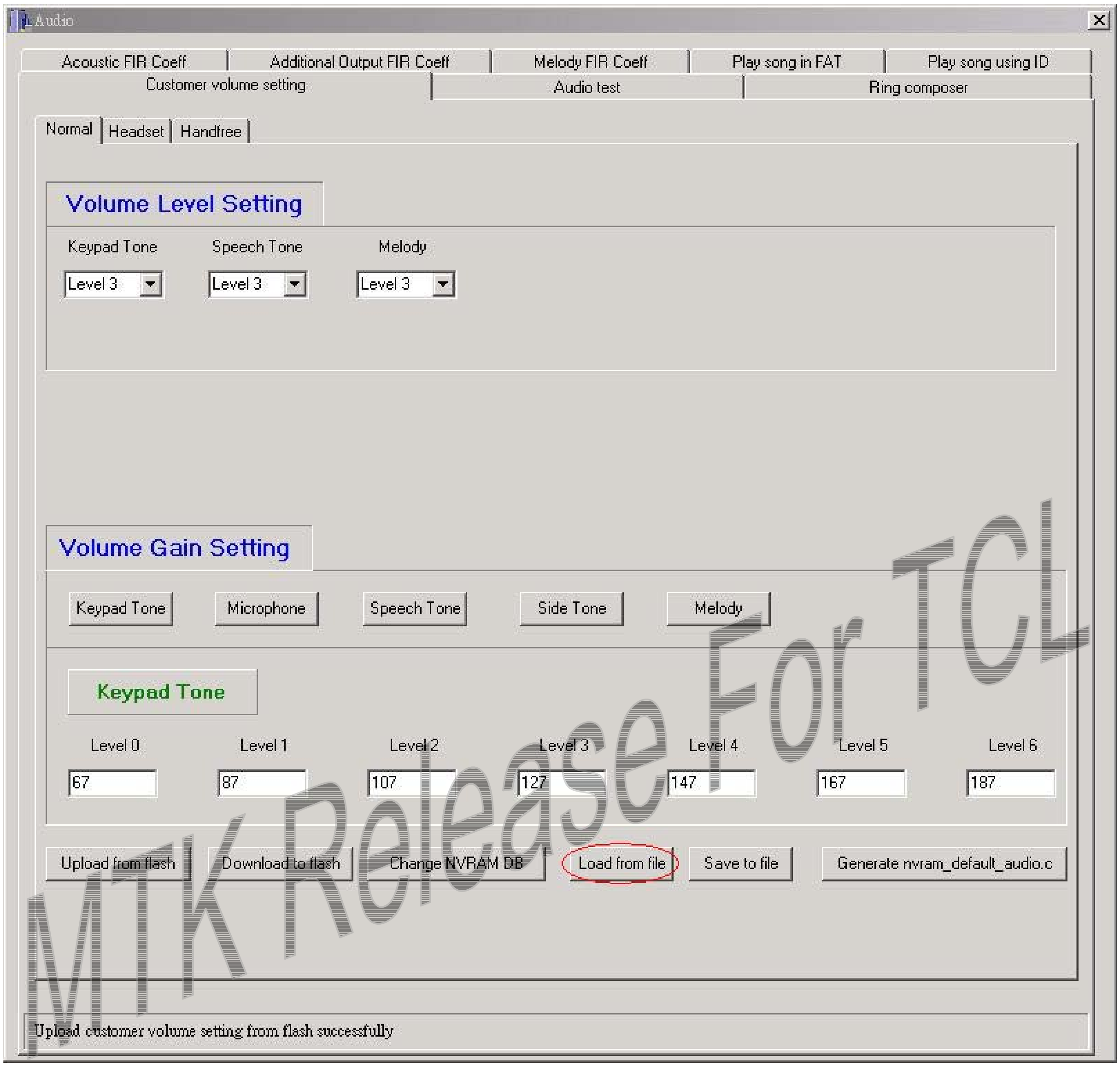

Figure 228 Click [Load from file] button to read customer setting from text file

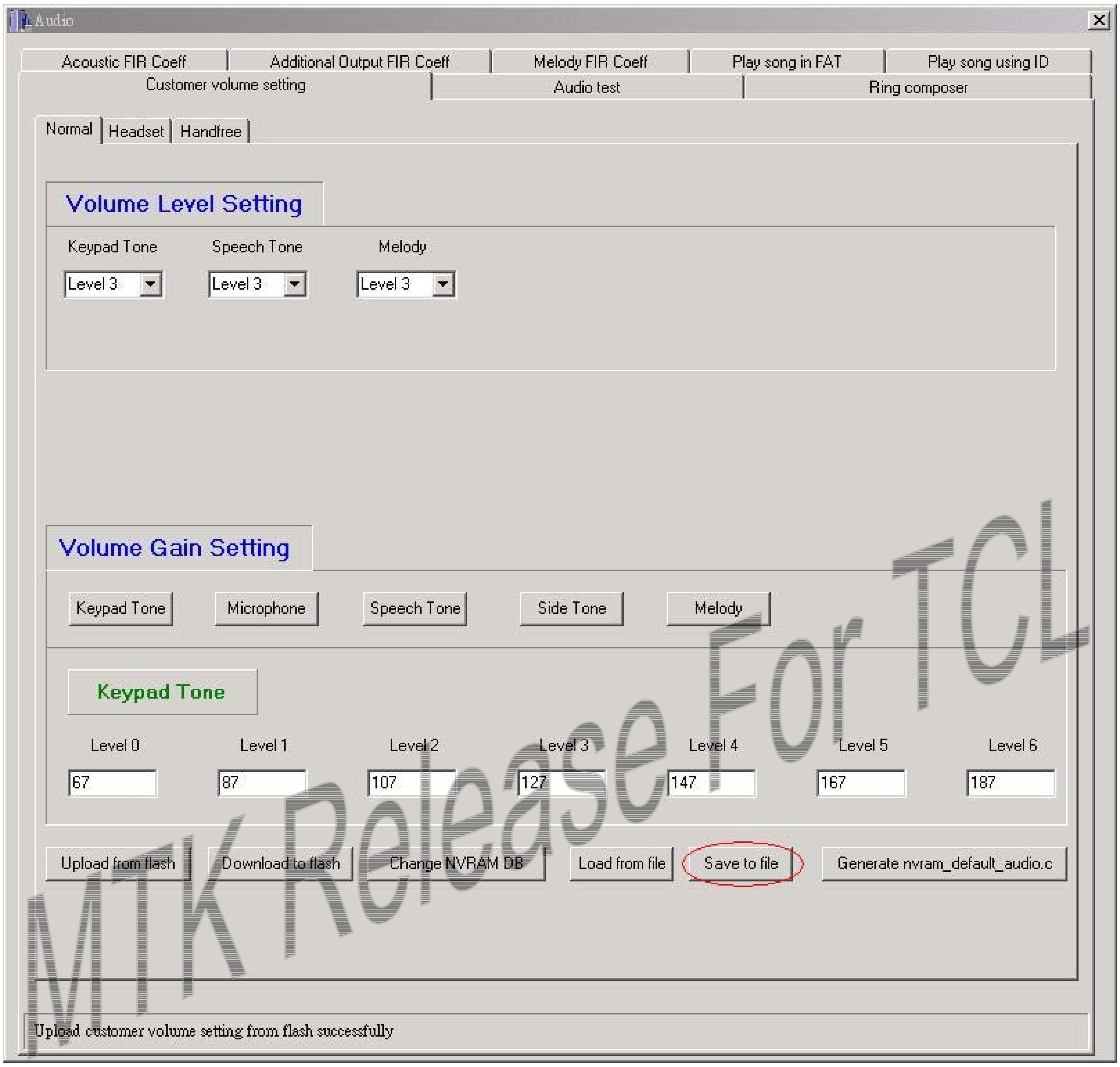

Figure 229 Click [Save to file] button to save customer volume setting to text file

The following is a template file of customer volume setting. The file is generated by clicking [Save to file] button.
[Normal Volume Level]
Call Tone=3
Keypad Tone=3
GMI Tone=3
Speech Tone=3
Melody=3
[Headset Volume Level]
Call Tone=3
Keypad Tone=3
GMI Tone=3
Speech Tone=3
Melody=3
[Handfree Volume Level]
Call Tone=3
Keypad Tone=3

GMI Tone=3
Speech Tone=3
Melody=3
[Normal Volume Gain]
Call Tone Level 0=127
Call Tone Level 1=127
Call Tone Level 2=127
Call Tone Level 3=127
Call Tone Level 4=127
Call Tone Level 5=127
Call Tone Level 6=127
Keypad Tone Level 0=67
Keypad Tone Level 1=87
Keypad Tone Level 2=107
Keypad Tone Level 3=127
Keypad Tone Level 4=147
Keypad Tone Level 5=167
Keypad Tone Level 6=187
Microphone Level 0=112
GMI Tone Level 0=40
GMI Tone Level 1=80
GMI Tone Level 2=120
GMI Tone Level 3=160
GMI Tone Level 4=200
GMI Tone Level 5=240
GMI Tone Level 6=255
Speech Tone Level 0=64
Speech Tone Level 1=80
Speech Tone Level 2=96
Speech Tone Level 3=112
Speech Tone Level 4=144
Speech Tone Level 5=176
Speech Tone Level 6=192
Side Tone Level 0=80
Melody Level 0=0
Melody Level 1=48
Melody Level 2=80
Melody Level 3=112
Melody Level 4=144
Melody Level 5=160
Melody Level 6=176
[Headset Volume Gain]
Call Tone Level 0=127
Call Tone Level 1=127
Call Tone Level 2=127
Call Tone Level 3=127
Call Tone Level 4=127
Call Tone Level 5=127
Call Tone Level 6=127
Keypad Tone Level 0=67
Keypad Tone Level 1=87
Keypad Tone Level 2=107

Keypad Tone Level 3=127
Keypad Tone Level 4=147
Keypad Tone Level 5=167
Keypad Tone Level 6=187
Microphone Level 0=180
GMI Tone Level 0=40
GMI Tone Level 1=80
GMI Tone Level 2=120
GMI Tone Level 3=160
GMI Tone Level 4=200
GMI Tone Level 5=240
GMI Tone Level 6=255
Speech Tone Level 0=48
Speech Tone Level 1=80
Speech Tone Level 2=112
Speech Tone Level 3=144
Speech Tone Level 4=176
Speech Tone Level 5=192
Speech Tone Level 6=208
Side Tone Level 0=0
Melody Level 0=0
Melody Level 1=32
Melody Level 2=64
Melody Level 3=80
Melody Level 4=96
Melody Level 5=112
Melody Level 6=144
[Handfree Volume Gain]
Call Tone Level 0=127
Call Tone Level 1=127
Call Tone Level 2=127
Call Tone Level 3=127
Call Tone Level 4=127
Call Tone Level 5=127
Call Tone Level 6=127
Keypad Tone Level 0=67
Keypad Tone Level 1=87
Keypad Tone Level 2=107
Keypad Tone Level 3=127
Keypad Tone Level 4=147
Keypad Tone Level 5=167
Keypad Tone Level 6=187
Microphone Level 0=144
GMI Tone Level 0=255
GMI Tone Level 1=255
GMI Tone Level 2=255
GMI Tone Level 3=255
GMI Tone Level 4=255
GMI Tone Level 5=255
GMI Tone Level 6=255
Speech Tone Level 0=144
Speech Tone Level 1=160

Speech Tone Level 2=176
Speech Tone Level 3=192
Speech Tone Level 4=208
Speech Tone Level 5=224
Speech Tone Level 6=240
Side Tone Level 0=0
Melody Level 0=0
Melody Level 1=48
Melody Level 2=80
Melody Level 3=112
Melody Level 4=144
Melody Level 5=160
Melody Level 6=176

3.4.8.1 Generating customer volume setting C file

User can click [Generate nvram_default_audio.c] button to generate customer volume setting C file.

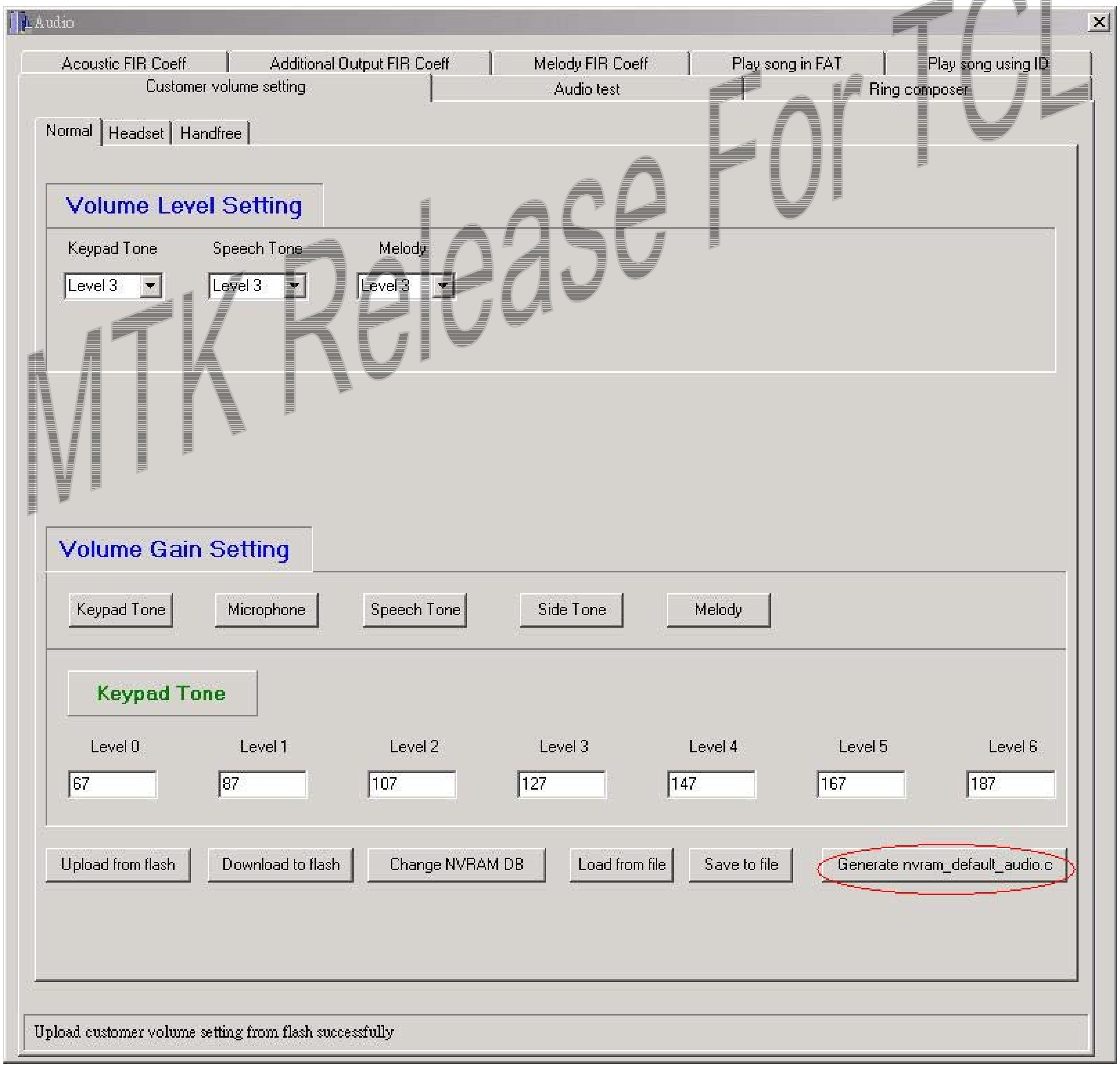

Figure 230 Click [Generate nvram_default_audio.c] button to generate customer volume setting C file

The following file is a template of customer volume setting C file.

```
#include "kal_release.h"

/* define Gain For Normal */
/* speaker, microphone, loudspeaker, buzzer */
#define GAIN_NOR_CTN_VOL      4
#define GAIN_NOR_CTN_VOL0     127
#define GAIN_NOR_CTN_VOL1     127
#define GAIN_NOR_CTN_VOL2     127
#define GAIN_NOR_CTN_VOL3     127
#define GAIN_NOR_CTN_VOL4     127
#define GAIN_NOR_CTN_VOL5     127
#define GAIN_NOR_CTN_VOL6     127

#define GAIN_NOR_KEY_VOL      4
#define GAIN_NOR_KEY_VOL0     67
#define GAIN_NOR_KEY_VOL1     87
#define GAIN_NOR_KEY_VOL2     107
#define GAIN_NOR_KEY_VOL3     127
#define GAIN_NOR_KEY_VOL4     147
#define GAIN_NOR_KEY_VOL5     167
#define GAIN_NOR_KEY_VOL6     187

#define GAIN_NOR_MIC_VOL      4
#define GAIN_NOR_MIC_VOL0     80
#define GAIN_NOR_MIC_VOL1     80
#define GAIN_NOR_MIC_VOL2     80
#define GAIN_NOR_MIC_VOL3     80
#define GAIN_NOR_MIC_VOL4     80
#define GAIN_NOR_MIC_VOL5     80
#define GAIN_NOR_MIC_VOL6     80

#define GAIN_NOR_SND_VOL      3
#define GAIN_NOR_SND_VOL0     40
#define GAIN_NOR_SND_VOL1     80
#define GAIN_NOR_SND_VOL2     120
#define GAIN_NOR_SND_VOL3     160
#define GAIN_NOR_SND_VOL4     200
#define GAIN_NOR_SND_VOL5     240
#define GAIN_NOR_SND_VOL6     255

#define GAIN_NOR_SPH_VOL      4
#define GAIN_NOR_SPH_VOL0     32
#define GAIN_NOR_SPH_VOL1     64
#define GAIN_NOR_SPH_VOL2     96
#define GAIN_NOR_SPH_VOL3     128
#define GAIN_NOR_SPH_VOL4     160
#define GAIN_NOR_SPH_VOL5     192
#define GAIN_NOR_SPH_VOL6     224

#define GAIN_NOR_SID_VOL      2
```

```
#define GAIN_NOR_SID_VOL0     80
#define GAIN_NOR_SID_VOL1     80
#define GAIN_NOR_SID_VOL2     80
#define GAIN_NOR_SID_VOL3     80
#define GAIN_NOR_SID_VOL4     80
#define GAIN_NOR_SID_VOL5     80
#define GAIN_NOR_SID_VOL6     80

#define GAIN_NOR_MED_VOL      3
#define GAIN_NOR_MED_VOL0     40
#define GAIN_NOR_MED_VOL1     80
#define GAIN_NOR_MED_VOL2     120
#define GAIN_NOR_MED_VOL3     160
#define GAIN_NOR_MED_VOL4     200
#define GAIN_NOR_MED_VOL5     240
#define GAIN_NOR_MED_VOL6     255

/* define Gain For Headset */
/* speaker, microphone, loudspeaker, buzzer */
#define GAIN_HED_CTN_VOL      4
#define GAIN_HED_CTN_VOL0     127
#define GAIN_HED_CTN_VOL1     127
#define GAIN_HED_CTN_VOL2     127
#define GAIN_HED_CTN_VOL3     127
#define GAIN_HED_CTN_VOL4     127
#define GAIN_HED_CTN_VOL5     127
#define GAIN_HED_CTN_VOL6     127

#define GAIN_HED_KEY_VOL      4
#define GAIN_HED_KEY_VOL0     67
#define GAIN_HED_KEY_VOL1     87
#define GAIN_HED_KEY_VOL2     107
#define GAIN_HED_KEY_VOL3     127
#define GAIN_HED_KEY_VOL4     147
#define GAIN_HED_KEY_VOL5     167
#define GAIN_HED_KEY_VOL6     187

#define GAIN_HED_MIC_VOL      4
#define GAIN_HED_MIC_VOL0     180
#define GAIN_HED_MIC_VOL1     180
#define GAIN_HED_MIC_VOL2     180
#define GAIN_HED_MIC_VOL3     180
#define GAIN_HED_MIC_VOL4     180
#define GAIN_HED_MIC_VOL5     180
#define GAIN_HED_MIC_VOL6     180

#define GAIN_HED_SND_VOL      4
#define GAIN_HED_SND_VOL0     40
#define GAIN_HED_SND_VOL1     80
#define GAIN_HED_SND_VOL2     120
#define GAIN_HED_SND_VOL3     160
#define GAIN_HED_SND_VOL4     200
```

```
#define GAIN_HED_SND_VOL5    240
#define GAIN_HED_SND_VOL6    255

#define GAIN_HED_SPH_VOL     4
#define GAIN_HED_SPH_VOL0    32
#define GAIN_HED_SPH_VOL1    64
#define GAIN_HED_SPH_VOL2    96
#define GAIN_HED_SPH_VOL3    128
#define GAIN_HED_SPH_VOL4    160
#define GAIN_HED_SPH_VOL5    192
#define GAIN_HED_SPH_VOL6    224

#define GAIN_HED_SID_VOL     2
#define GAIN_HED_SID_VOL0    80
#define GAIN_HED_SID_VOL1    80
#define GAIN_HED_SID_VOL2    80
#define GAIN_HED_SID_VOL3    80
#define GAIN_HED_SID_VOL4    80
#define GAIN_HED_SID_VOL5    80
#define GAIN_HED_SID_VOL6    80

#define GAIN_HED_MED_VOL     3
#define GAIN_HED_MED_VOL0    40
#define GAIN_HED_MED_VOL1    80
#define GAIN_HED_MED_VOL2    120
#define GAIN_HED_MED_VOL3    160
#define GAIN_HED_MED_VOL4    200
#define GAIN_HED_MED_VOL5    240
#define GAIN_HED_MED_VOL6    255

/* define Gain For Handfree */
/* speaker, microphone, loudspeaker, buzzer */
#define GAIN_HND_CTN_VOL     4
#define GAIN_HND_CTN_VOL0    127
#define GAIN_HND_CTN_VOL1    127
#define GAIN_HND_CTN_VOL2    127
#define GAIN_HND_CTN_VOL3    127
#define GAIN_HND_CTN_VOL4    127
#define GAIN_HND_CTN_VOL5    127
#define GAIN_HND_CTN_VOL6    127

#define GAIN_HND_KEY_VOL     4
#define GAIN_HND_KEY_VOL0    67
#define GAIN_HND_KEY_VOL1    87
#define GAIN_HND_KEY_VOL2    107
#define GAIN_HND_KEY_VOL3    127
#define GAIN_HND_KEY_VOL4    147
#define GAIN_HND_KEY_VOL5    167
#define GAIN_HND_KEY_VOL6    187

#define GAIN_HND_MIC_VOL     4
#define GAIN_HND_MIC_VOL0    180
```

```
#define GAIN_HND_MIC_VOL1    180
#define GAIN_HND_MIC_VOL2    180
#define GAIN_HND_MIC_VOL3    180
#define GAIN_HND_MIC_VOL4    180
#define GAIN_HND_MIC_VOL5    180
#define GAIN_HND_MIC_VOL6    180

#define GAIN_HND_SND_VOL     4
#define GAIN_HND_SND_VOL0    255
#define GAIN_HND_SND_VOL1    255
#define GAIN_HND_SND_VOL2    255
#define GAIN_HND_SND_VOL3    255
#define GAIN_HND_SND_VOL4    255
#define GAIN_HND_SND_VOL5    255
#define GAIN_HND_SND_VOL6    255

#define GAIN_HND_SPH_VOL     4
#define GAIN_HND_SPH_VOL0    0
#define GAIN_HND_SPH_VOL1    32
#define GAIN_HND_SPH_VOL2    48
#define GAIN_HND_SPH_VOL3    64
#define GAIN_HND_SPH_VOL4    80
#define GAIN_HND_SPH_VOL5    128
#define GAIN_HND_SPH_VOL6    160

#define GAIN_HND_SID_VOL     2
#define GAIN_HND_SID_VOL0    80
#define GAIN_HND_SID_VOL1    80
#define GAIN_HND_SID_VOL2    80
#define GAIN_HND_SID_VOL3    80
#define GAIN_HND_SID_VOL4    80
#define GAIN_HND_SID_VOL5    80
#define GAIN_HND_SID_VOL6    80

#define GAIN_HND_MED_VOL     3
#define GAIN_HND_MED_VOL0    40
#define GAIN_HND_MED_VOL1    80
#define GAIN_HND_MED_VOL2    120
#define GAIN_HND_MED_VOL3    160
#define GAIN_HND_MED_VOL4    200
#define GAIN_HND_MED_VOL5    240
#define GAIN_HND_MED_VOL6    255

kal_uint8 const NVRAM_EF_CUST_ACOUSTIC_DATA_DEFAULT[] = {
    /* Normal: Call Tone, Keypad Tone, Microphone, GMI Tone, Speech Tone, Side Tone */
    GAIN_NOR_CTN_VOL0, GAIN_NOR_CTN_VOL1, GAIN_NOR_CTN_VOL2, GAIN_NOR_CTN_VOL3,
GAIN_NOR_CTN_VOL4, GAIN_NOR_CTN_VOL5, GAIN_NOR_CTN_VOL6,
    GAIN_NOR_KEY_VOL0, GAIN_NOR_KEY_VOL1, GAIN_NOR_KEY_VOL2, GAIN_NOR_KEY_VOL3,
GAIN_NOR_KEY_VOL4, GAIN_NOR_KEY_VOL5, GAIN_NOR_KEY_VOL6,
    GAIN_NOR_MIC_VOL0, GAIN_NOR_MIC_VOL1, GAIN_NOR_MIC_VOL2, GAIN_NOR_MIC_VOL3,
GAIN_NOR_MIC_VOL4, GAIN_NOR_MIC_VOL5, GAIN_NOR_MIC_VOL6,
```

GAIN_NOR_SND_VOL0, GAIN_NOR_SND_VOL1, GAIN_NOR_SND_VOL2, GAIN_NOR_SND_VOL3, GAIN_NOR_SND_VOL4, GAIN_NOR_SND_VOL5, GAIN_NOR_SND_VOL6,
GAIN_NOR_SPH_VOL0, GAIN_NOR_SPH_VOL1, GAIN_NOR_SPH_VOL2, GAIN_NOR_SPH_VOL3, GAIN_NOR_SPH_VOL4, GAIN_NOR_SPH_VOL5, GAIN_NOR_SPH_VOL6,
GAIN_NOR_SID_VOL0, GAIN_NOR_SID_VOL1, GAIN_NOR_SID_VOL2, GAIN_NOR_SID_VOL3, GAIN_NOR_SID_VOL4, GAIN_NOR_SID_VOL5, GAIN_NOR_SID_VOL6,
GAIN_NOR_MED_VOL0, GAIN_NOR_MED_VOL1, GAIN_NOR_MED_VOL2, GAIN_NOR_MED_VOL3, GAIN_NOR_MED_VOL4, GAIN_NOR_MED_VOL5, GAIN_NOR_MED_VOL6,

/* Headset: Call Tone, Keypad Tone, Microphone, GMI Tone, Speech Tone, Side Tone */
GAIN_HED_CTN_VOL0, GAIN_HED_CTN_VOL1, GAIN_HED_CTN_VOL2, GAIN_HED_CTN_VOL3, GAIN_HED_CTN_VOL4, GAIN_HED_CTN_VOL5, GAIN_HED_CTN_VOL6,
GAIN_HED_KEY_VOL0, GAIN_HED_KEY_VOL1, GAIN_HED_KEY_VOL2, GAIN_HED_KEY_VOL3, GAIN_HED_KEY_VOL4, GAIN_HED_KEY_VOL5, GAIN_HED_KEY_VOL6,
GAIN_HED_MIC_VOL0, GAIN_HED_MIC_VOL1, GAIN_HED_MIC_VOL2, GAIN_HED_MIC_VOL3, GAIN_HED_MIC_VOL4, GAIN_HED_MIC_VOL5, GAIN_HED_MIC_VOL6,
GAIN_HED_SND_VOL0, GAIN_HED_SND_VOL1, GAIN_HED_SND_VOL2, GAIN_HED_SND_VOL3, GAIN_HED_SND_VOL4, GAIN_HED_SND_VOL5, GAIN_HED_SND_VOL6,
GAIN_HED_SPH_VOL0, GAIN_HED_SPH_VOL1, GAIN_HED_SPH_VOL2, GAIN_HED_SPH_VOL3, GAIN_HED_SPH_VOL4, GAIN_HED_SPH_VOL5, GAIN_HED_SPH_VOL6,
GAIN_HED_SID_VOL0, GAIN_HED_SID_VOL1, GAIN_HED_SID_VOL2, GAIN_HED_SID_VOL3, GAIN_HED_SID_VOL4, GAIN_HED_SID_VOL5, GAIN_HED_SID_VOL6,
GAIN_HED_MED_VOL0, GAIN_HED_MED_VOL1, GAIN_HED_MED_VOL2, GAIN_HED_MED_VOL3, GAIN_HED_MED_VOL4, GAIN_HED_MED_VOL5, GAIN_HED_MED_VOL6,

/* Handfree: Call Tone, Keypad Tone, Microphone, GMI Tone, Speech Tone, Side Tone */
GAIN_HND_CTN_VOL0, GAIN_HND_CTN_VOL1, GAIN_HND_CTN_VOL2, GAIN_HND_CTN_VOL3, GAIN_HND_CTN_VOL4, GAIN_HND_CTN_VOL5, GAIN_HND_CTN_VOL6,
GAIN_HND_KEY_VOL0, GAIN_HND_KEY_VOL1, GAIN_HND_KEY_VOL2, GAIN_HND_KEY_VOL3, GAIN_HND_KEY_VOL4, GAIN_HND_KEY_VOL5, GAIN_HND_KEY_VOL6,
GAIN_HND_MIC_VOL0, GAIN_HND_MIC_VOL1, GAIN_HND_MIC_VOL2, GAIN_HND_MIC_VOL3, GAIN_HND_MIC_VOL4, GAIN_HND_MIC_VOL5, GAIN_HND_MIC_VOL6,
GAIN_HND_SND_VOL0, GAIN_HND_SND_VOL1, GAIN_HND_SND_VOL2, GAIN_HND_SND_VOL3, GAIN_HND_SND_VOL4, GAIN_HND_SND_VOL5, GAIN_HND_SND_VOL6,
GAIN_HND_SPH_VOL0, GAIN_HND_SPH_VOL1, GAIN_HND_SPH_VOL2, GAIN_HND_SPH_VOL3, GAIN_HND_SPH_VOL4, GAIN_HND_SPH_VOL5, GAIN_HND_SPH_VOL6,
GAIN_HND_SID_VOL0, GAIN_HND_SID_VOL1, GAIN_HND_SID_VOL2, GAIN_HND_SID_VOL3, GAIN_HND_SID_VOL4, GAIN_HND_SID_VOL5, GAIN_HND_SID_VOL6,
GAIN_HND_MED_VOL0, GAIN_HND_MED_VOL1, GAIN_HND_MED_VOL2, GAIN_HND_MED_VOL3, GAIN_HND_MED_VOL4, GAIN_HND_MED_VOL5, GAIN_HND_MED_VOL6,

/* Normal volume: CTN, SPK, MIC, BUZ, SPH, SID, MED */
GAIN_NOR_CTN_VOL, GAIN_NOR_KEY_VOL, GAIN_NOR_MIC_VOL, GAIN_NOR_SND_VOL, GAIN_NOR_SPH_VOL, GAIN_NOR_SID_VOL, GAIN_NOR_MED_VOL,
/* Headset volume: CTN, SPK, MIC, BUZ, SPH, SID, MED */
GAIN_HED_CTN_VOL, GAIN_HED_KEY_VOL, GAIN_HED_MIC_VOL, GAIN_HED_SND_VOL, GAIN_HED_SPH_VOL, GAIN_HED_SID_VOL, GAIN_HED_MED_VOL,
/* Handfree volume: CTN, SPK, MIC, BUZ, SPH, SID, MED */
GAIN_HND_CTN_VOL, GAIN_HND_KEY_VOL, GAIN_HND_MIC_VOL, GAIN_HND_SND_VOL, GAIN_HND_SPH_VOL, GAIN_HND_SID_VOL, GAIN_HND_MED_VOL
};

3.4.9 Acoustic FIR tuning

Acoustic FIR tuning window is used to get frequency response curve of original and compensated FIR and generates FIR coefficient file automatically. User can click [Acoustic FIR tuning] button to show acoustic FIR tuning window.

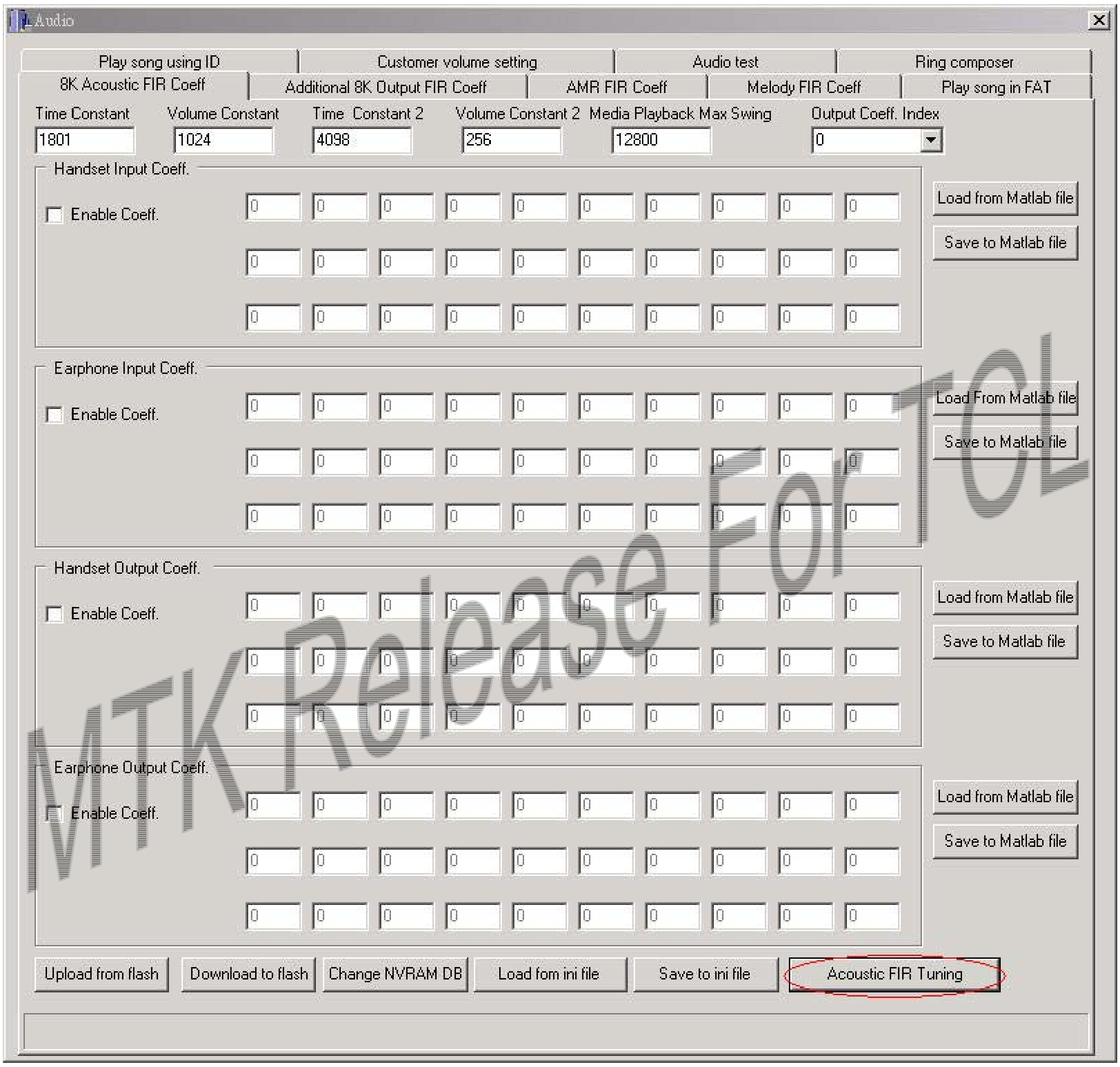

Figure 231 Click [Acoustic FIR tuning] button to show acoustic FIR tuning window

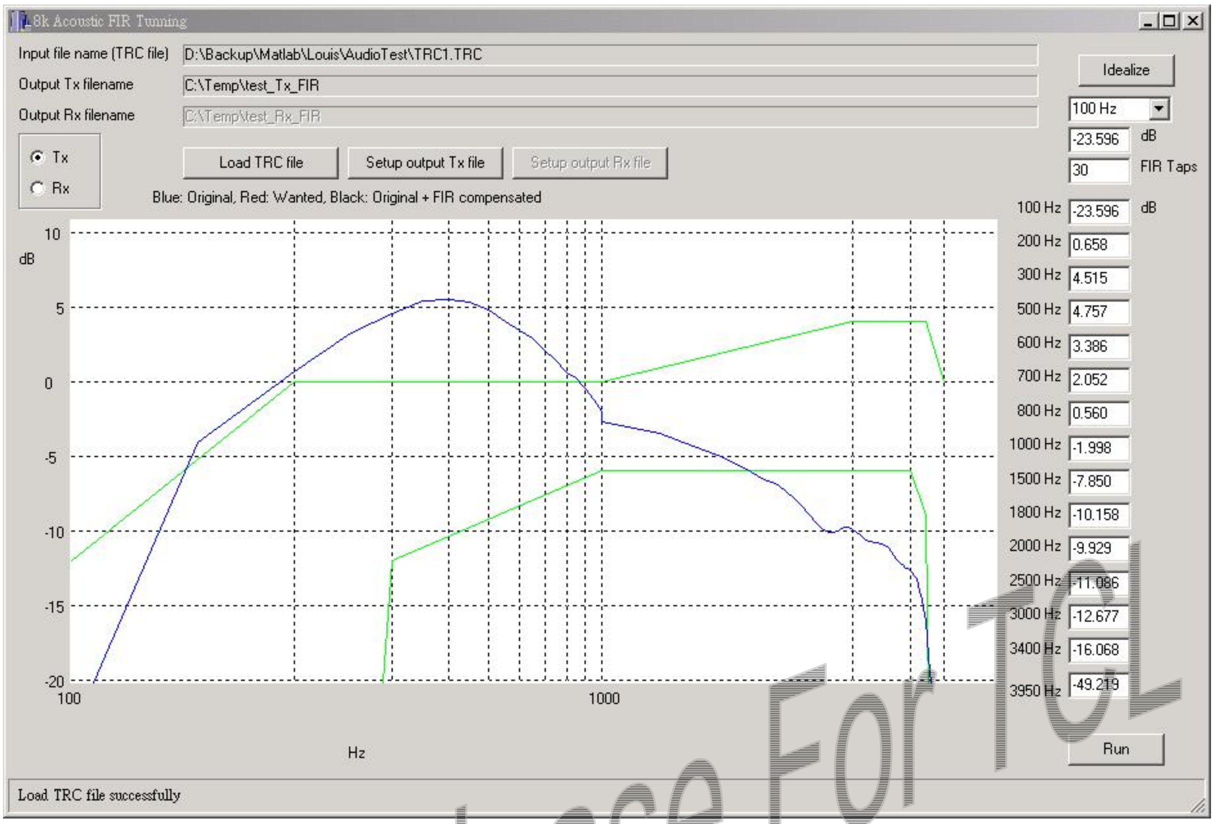

Figure 232 Acoustic FIR tuning window

3.4.9.1 Tuning procedure

The tuning procedure is as follows:

1) Setup input TRC file, output TX FIR file and output RX FIR file.
2) Input taps of FIR coefficient.
3) Click [Idealize] button to generate ideal wanted frequency response curve (red curve).
4) Click [Run] button to generate frequency response curve of original + FIR compensated (black curve).
5) Adjust wanted frequency response curve by drag wanted frequency response curve or updated value of editor.
6) Repeat step 4) and 5) until the frequency response curve of original + FIR compensated (black curve) is inside boundary curve (green curve).

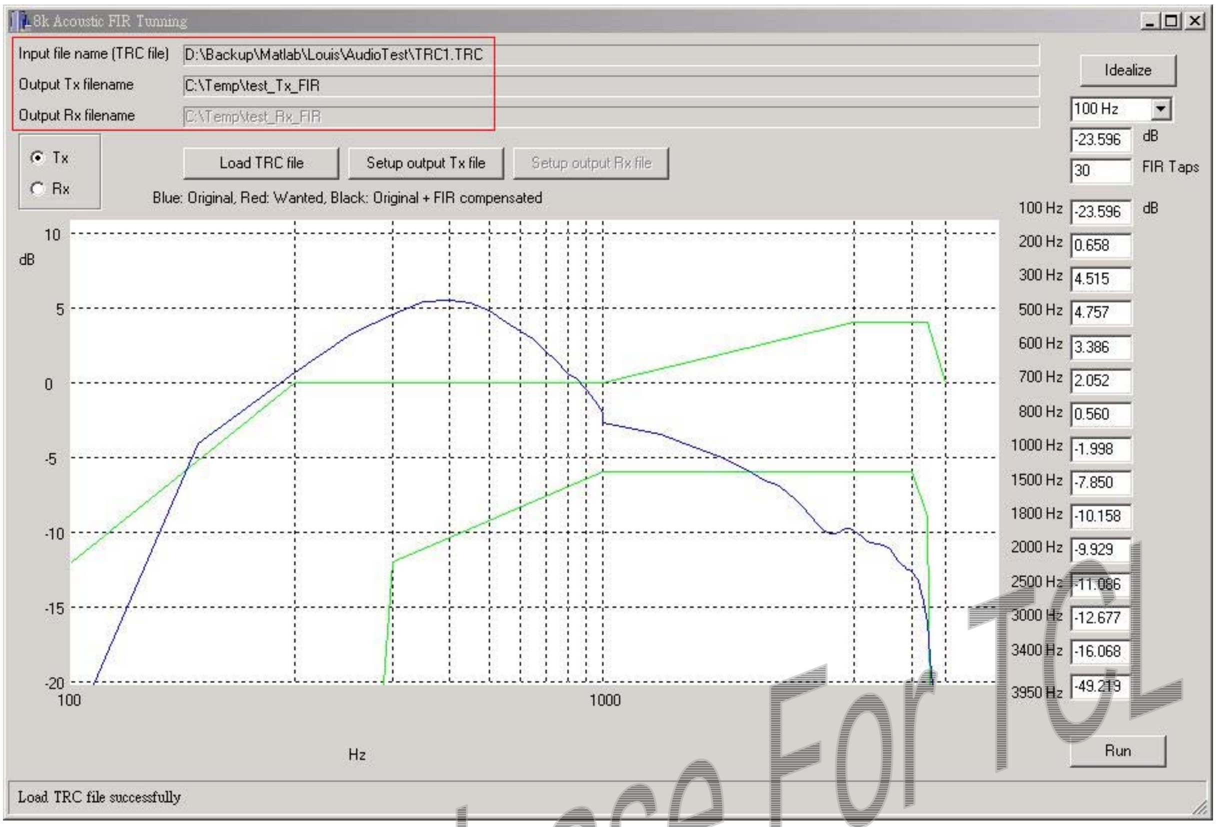

Figure 233 Setup input TRC file, output TX FIR file and output RX FIR file

Figure 234 Input taps of FIR coefficient

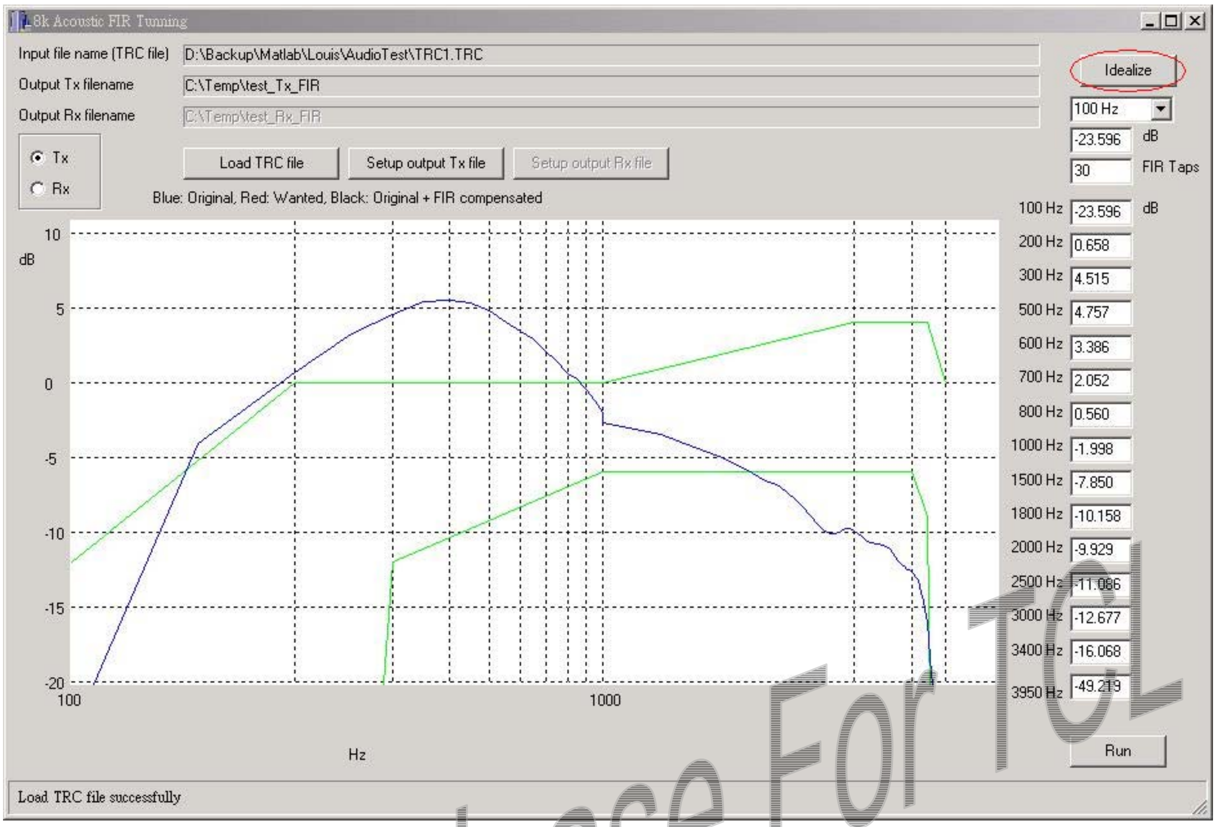

Figure 235 Click [Idealize] button to generate ideal wanted frequency response curve

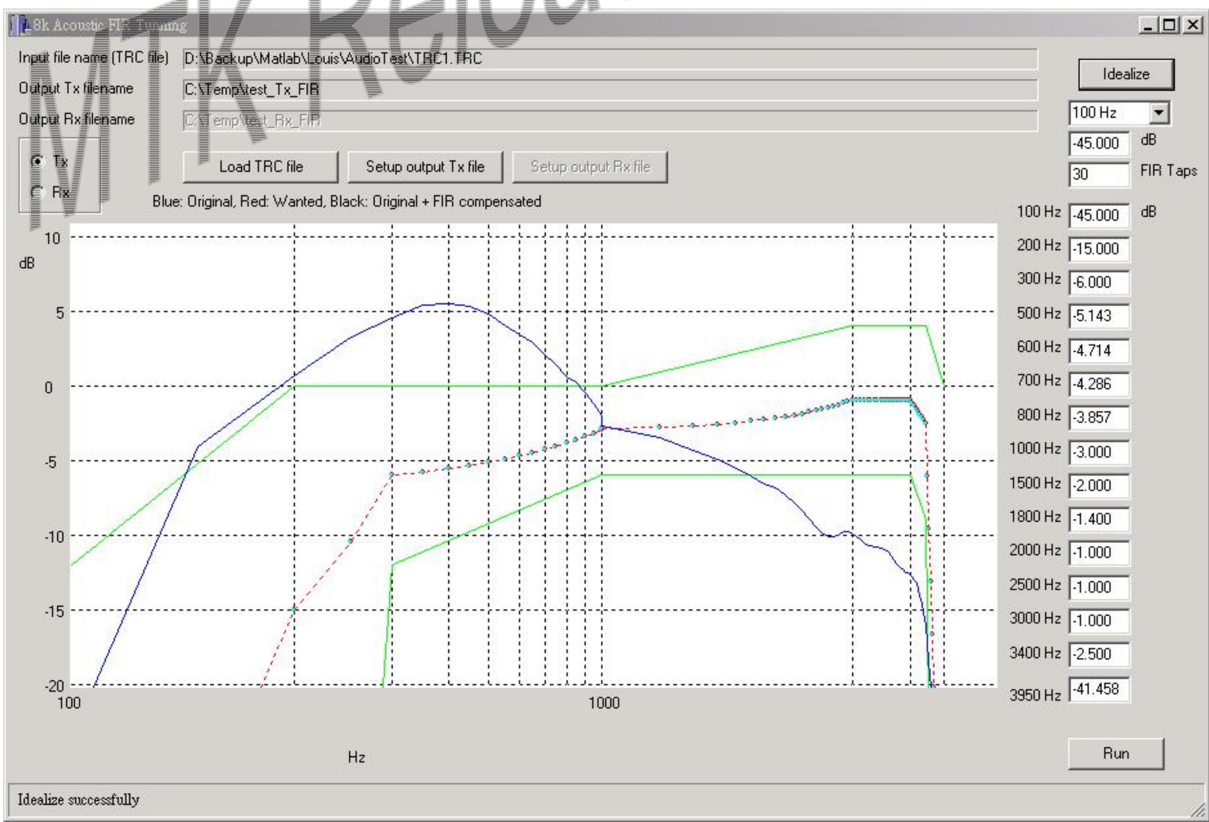

Figure 236 Ideal wanted frequency response curve result

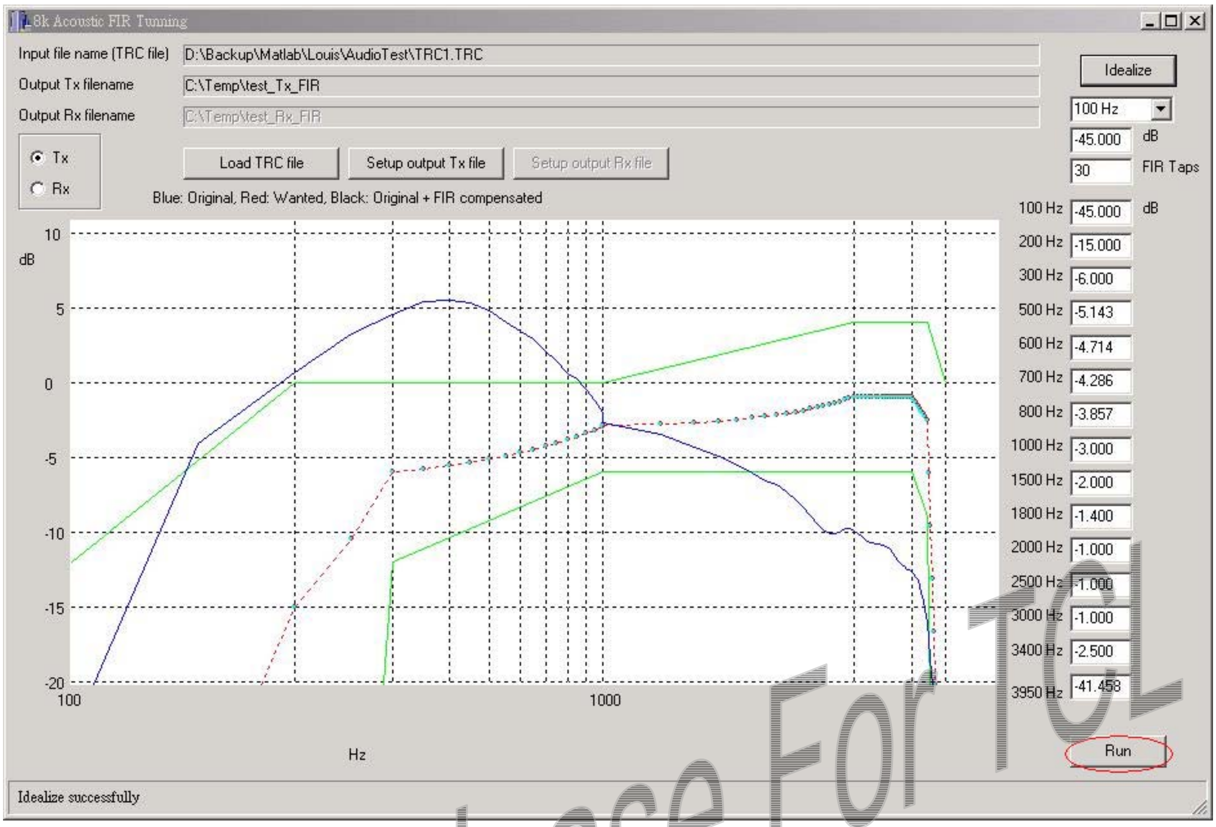

Figure 237 Click [Run] button to generate frequency response curve of original + FIR compensated

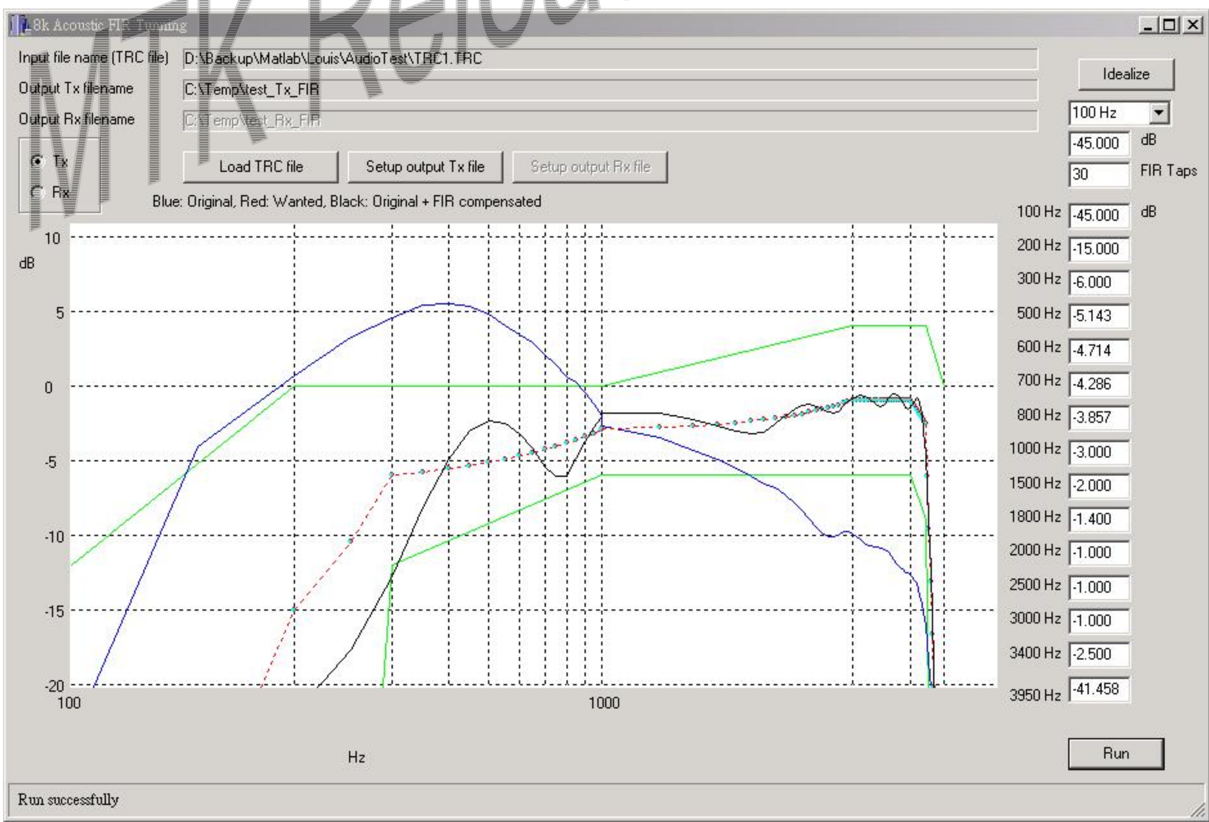

Figure 238 Result of frequency response curve of original + FIR compensated

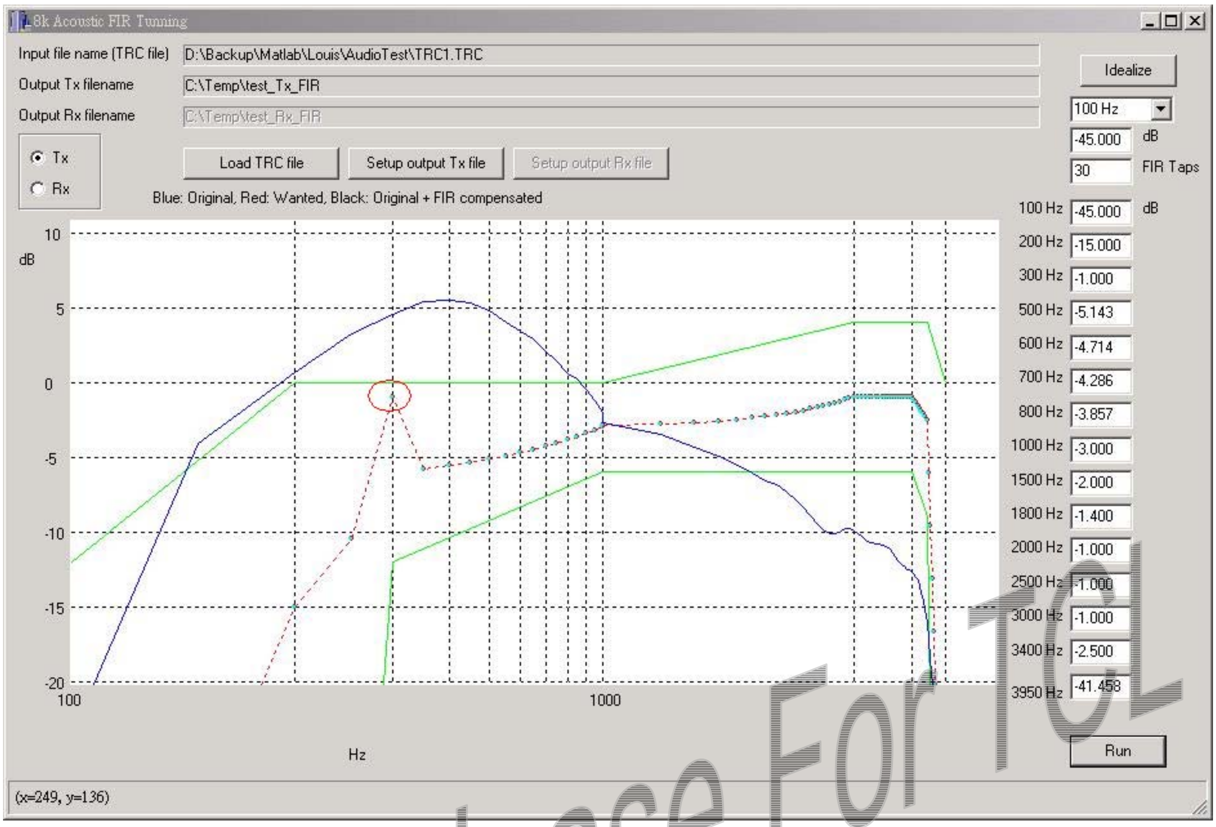

Figure 239 Adjust wanted frequency response curve

Figure 240 Click [Run] button to generate frequency response curve of original + FIR compensated

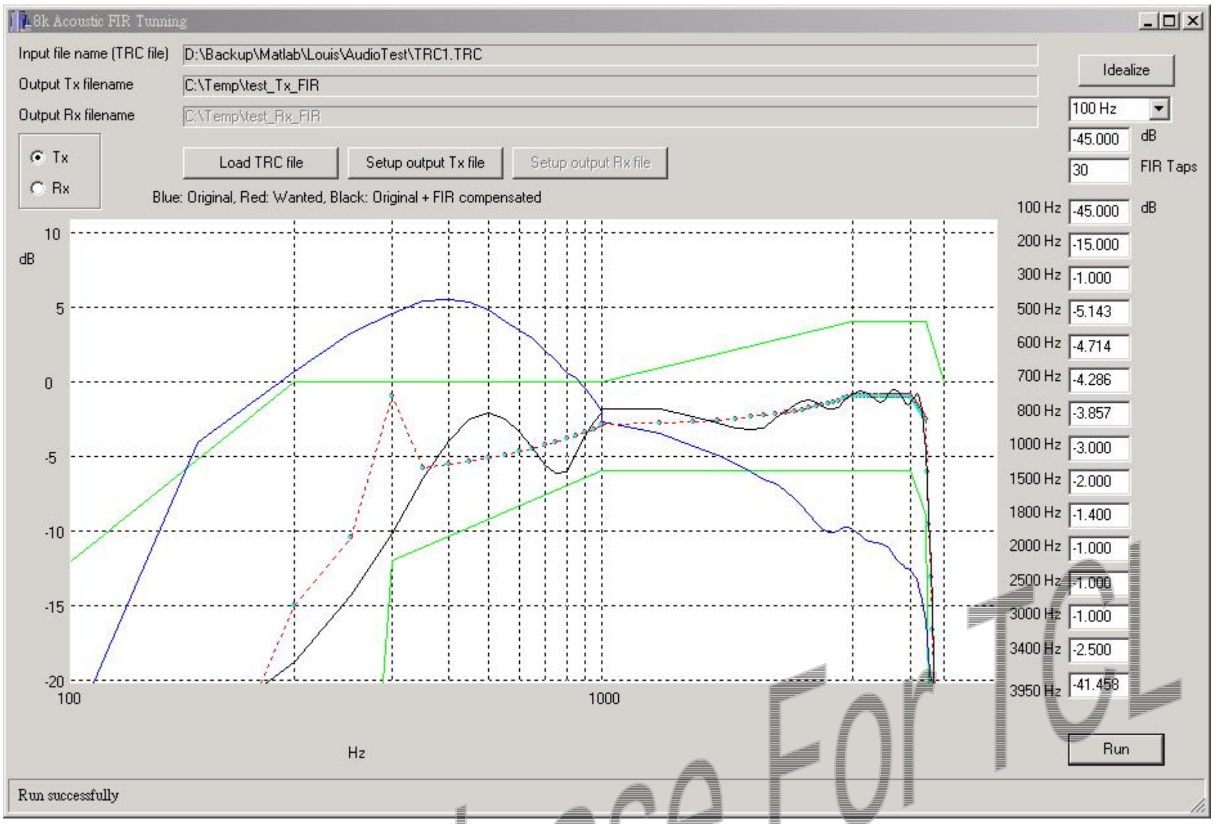

Figure 241 The frequency response curve of original + FIR compensated is inside boundary curve

The following is a template FIR coefficient file, user will get the file after click [Run] button. The number of first line indicates taps of FIR coefficient.

30
1081
-768
309
-313
-254
368
-520
371
-674
-56
1953
-2701
4403
-16383
14068
14068
-16383
4403
-2701
1953
-56
-674

371
-520
368
-254
-313
309
-768
1081

3.4.10 Melody FIR tuning

Melody FIR tuning window is used to get frequency response curve of original and compensated FIR and generates FIR coefficient file automatically. User can click [Melody FIR tuning] button to show melody FIR tuning window.

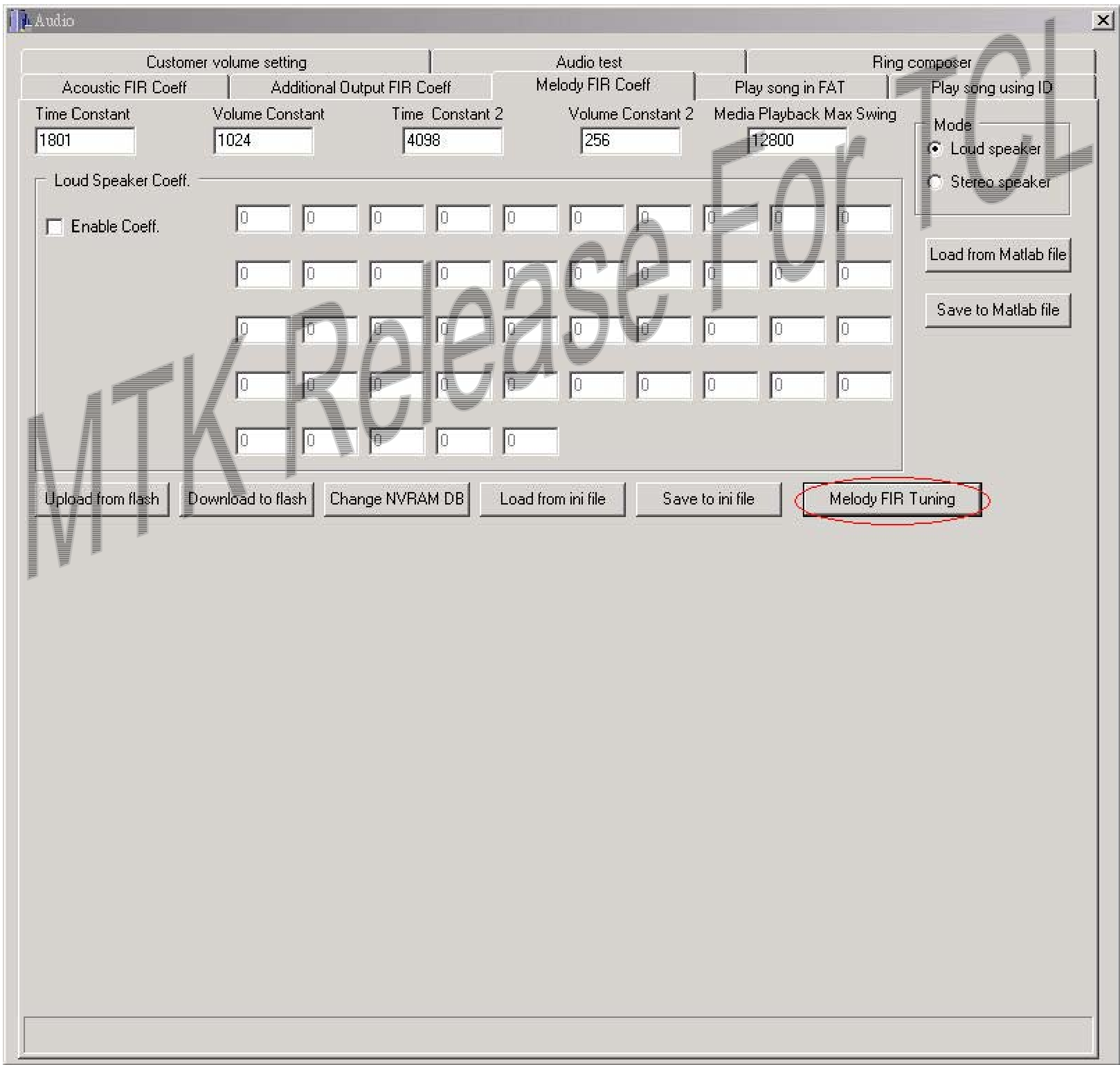

Figure 242 Click [Melody FIR tuning] button to show Melody FIR tuning window

3.4.10.1 Tuning procedure

The tuning procedure is as follows:

1) Setup output file by clicking [Setup output file] button.
2) Input digital scale.
3) Input magnitude (unit: dB) of each frequency (0Hz, 60Hz, …. , 16000Hz)
4) Click [Run] button to generate frequency response curve and melody FIR coefficient

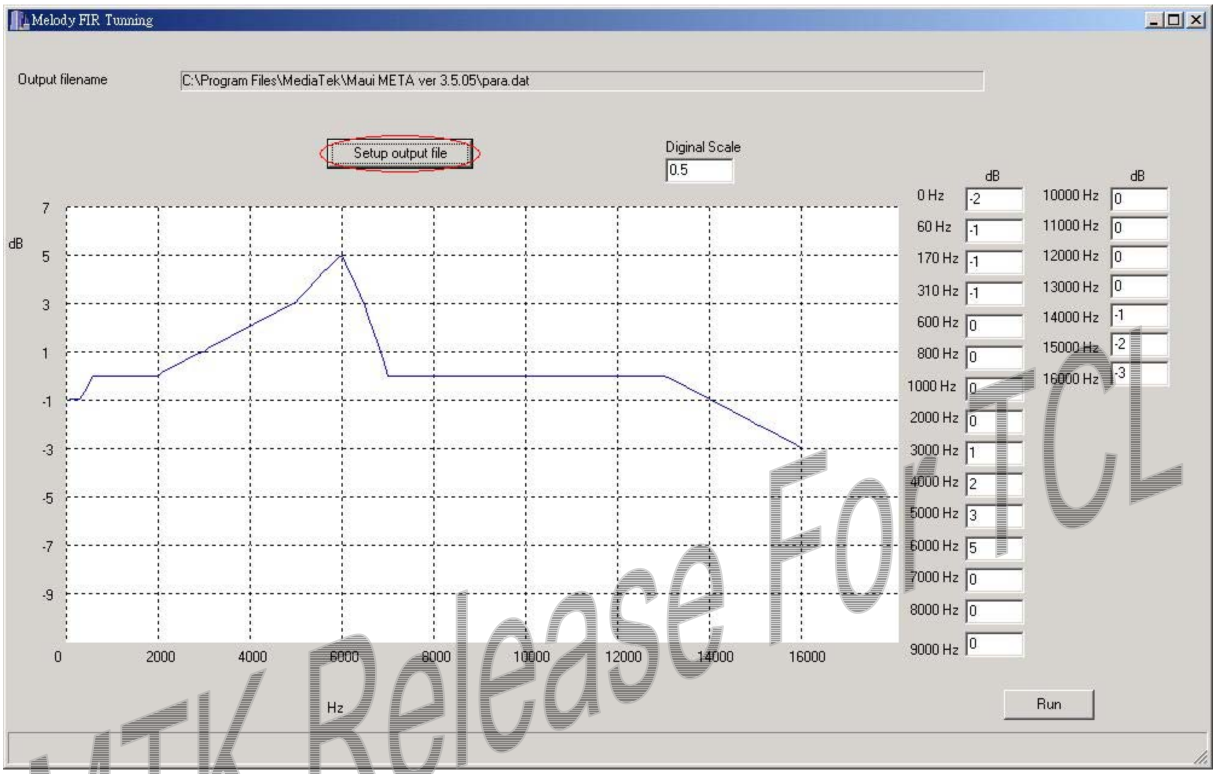

Figure 243 Setup output file by clicking [Setup output file] button

Figure 244 Input digital scale

Figure 245 Input magnitude (unit: dB) of each frequency (0Hz, 60Hz, …. , 16000Hz)

Figure 246 Click [Run] button to generate frequency response curve and melody FIR coefficient

Figure 247 Result of frequency response curve

The following is a template of FIR coefficient file, user will get the file after click [Run] button. The number of first line indicates taps of FIR coefficient.

25
36
327
163
-320
-473
162
532
592
-889
-949
-1062
1163
16383
1163
-1062
-949
-889
592
532
162
-473
-320
163
327
36

3.5 Baseband function

There are many functions in baseband tool: Auxiliary ADC, Baseband Register Read/Write and battery level editor. User can switch to baseband tool by selecting [Baseband] from main selection menu.

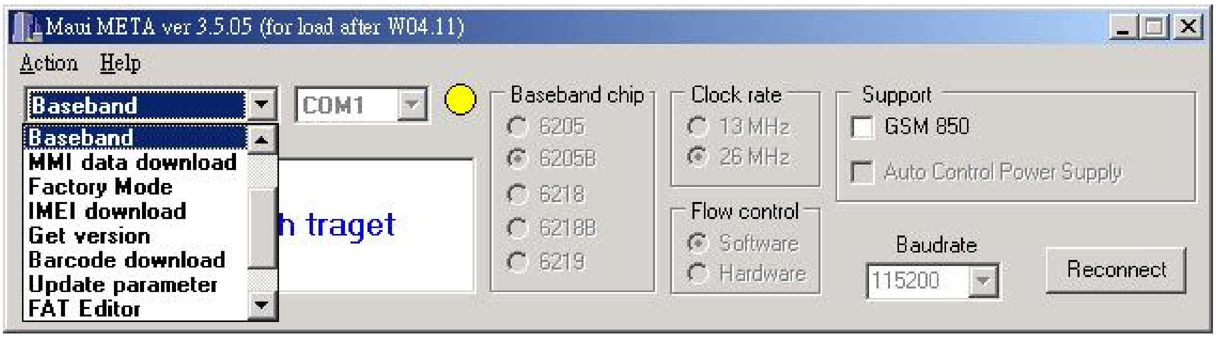

Figure 248 Select [Baseband] from main selection menu

3.5.1 Auxiliary ADC

User can use auxiliary ADC window to measure the slope and offset of auxiliary ADC. For MT6205 and MT6205B, there are 5 ADC channels. For MT6218, MT6218B and MT6219, there are 7 ADC channels.

Execute this operation by following steps:
1) Select ADC channel by clicking ADC 0~6 button.
2) Key in the input voltage and measuring count of 1'st measurement.
3) Click [Start] button to sample the ADC data.
4) Key in the input voltage and measuring count of 2'nd measurement.
5) Click [Start] button to sample the ADC data.
6) The ADC slope and offset is shown on the Result row.
7) If the evaluated result is permitted, click [Apply] button.

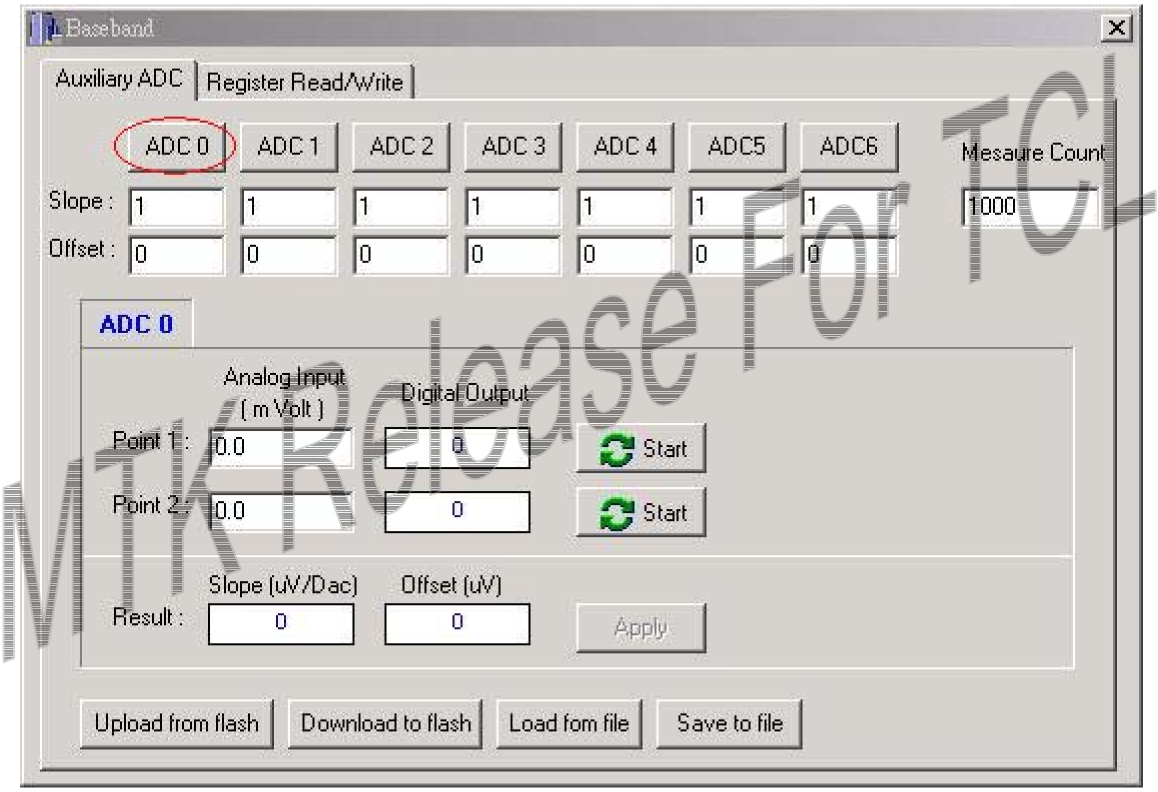

Figure 249 Click [ADC 0] button

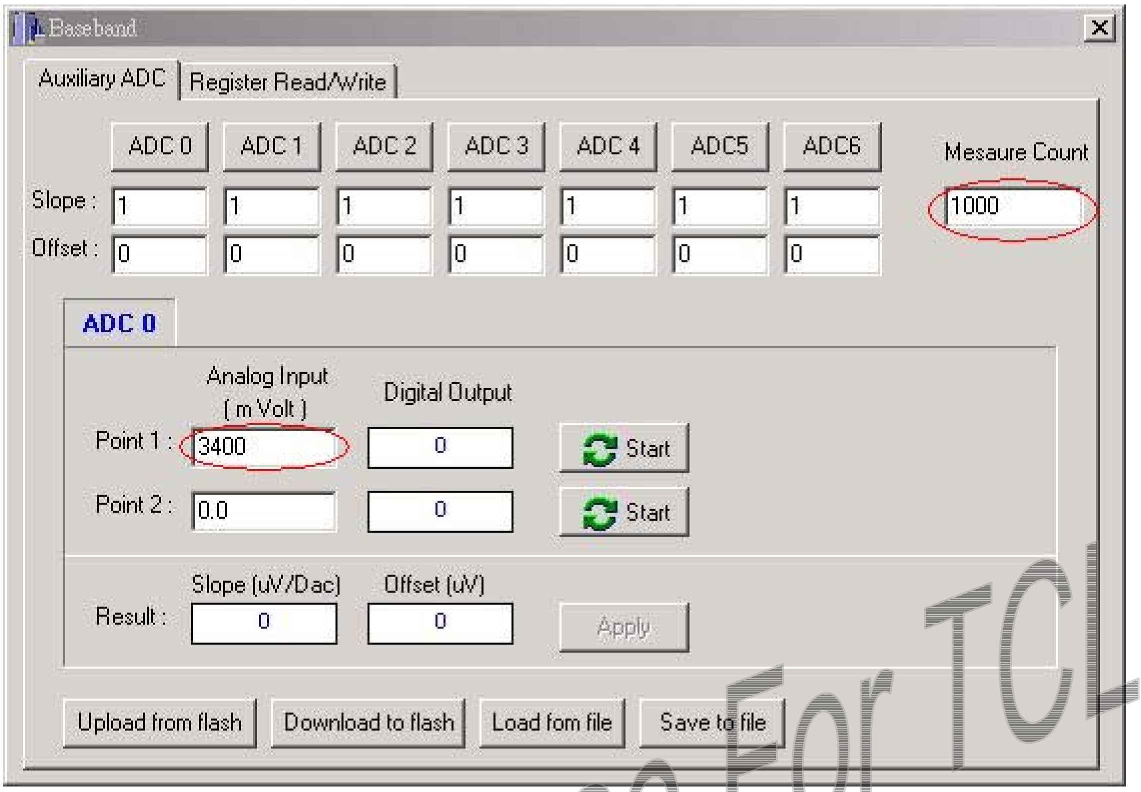

Figure 250 Key in the input voltage and measuring count of 1'st measurement

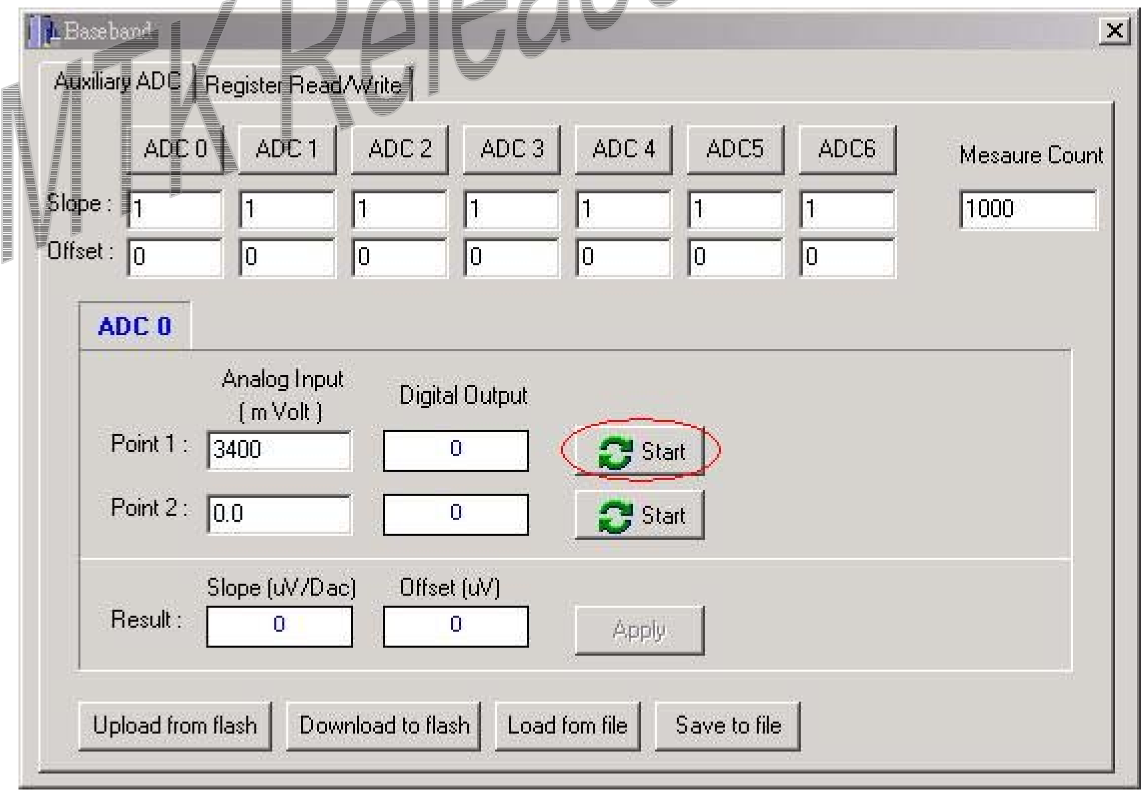

Figure 251 Click [Start] button of Point 1 to sample the ADC data

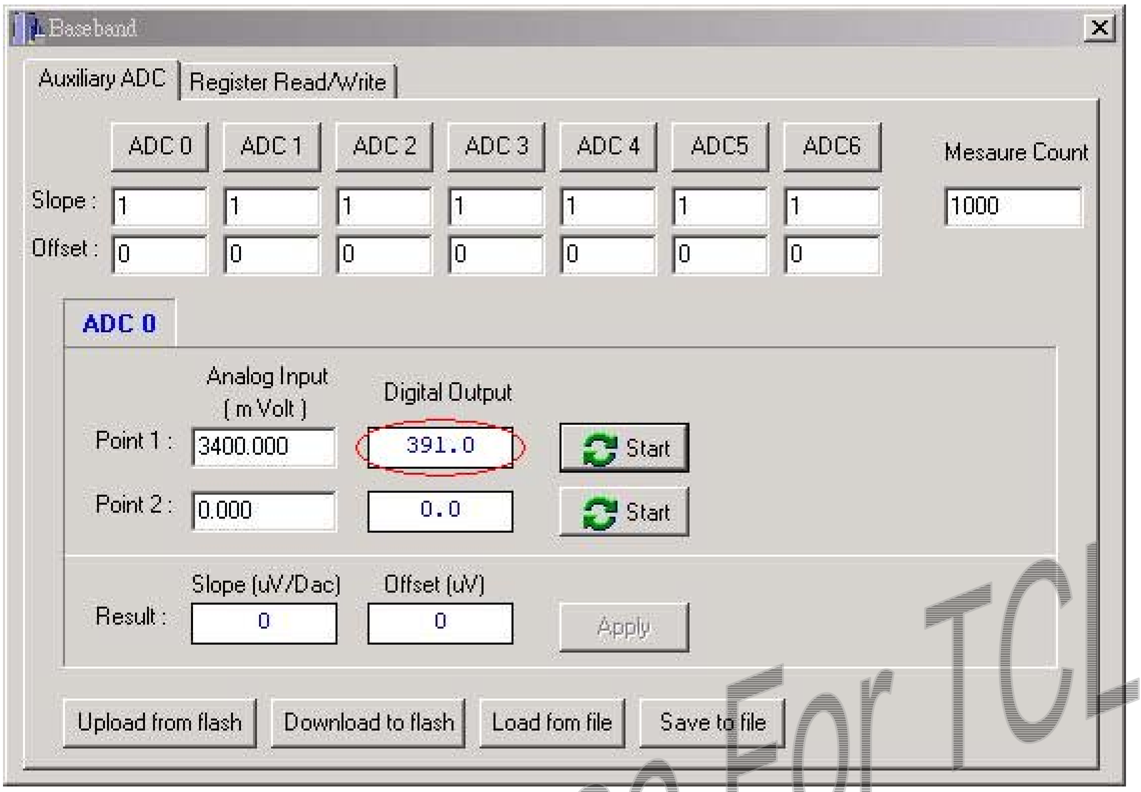

Figure 252 Result of 1st measurement

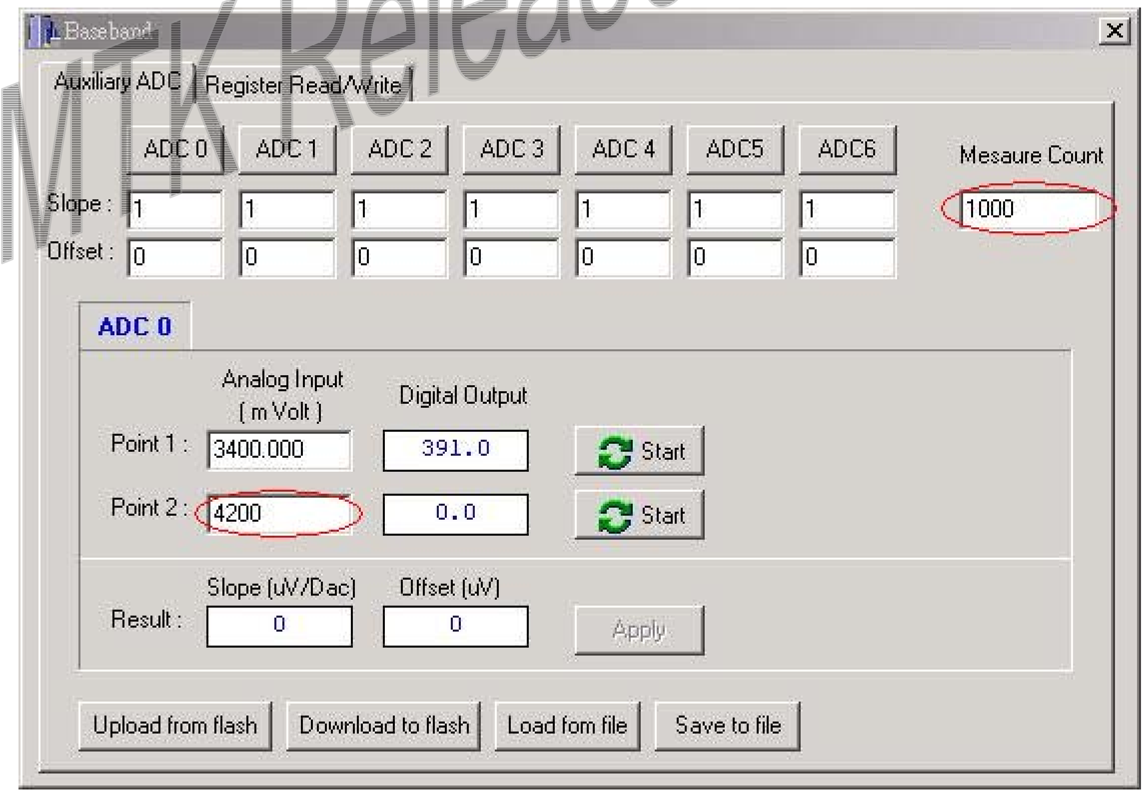

Figure 253 Key in the input voltage and measuring count of 2'st measurement

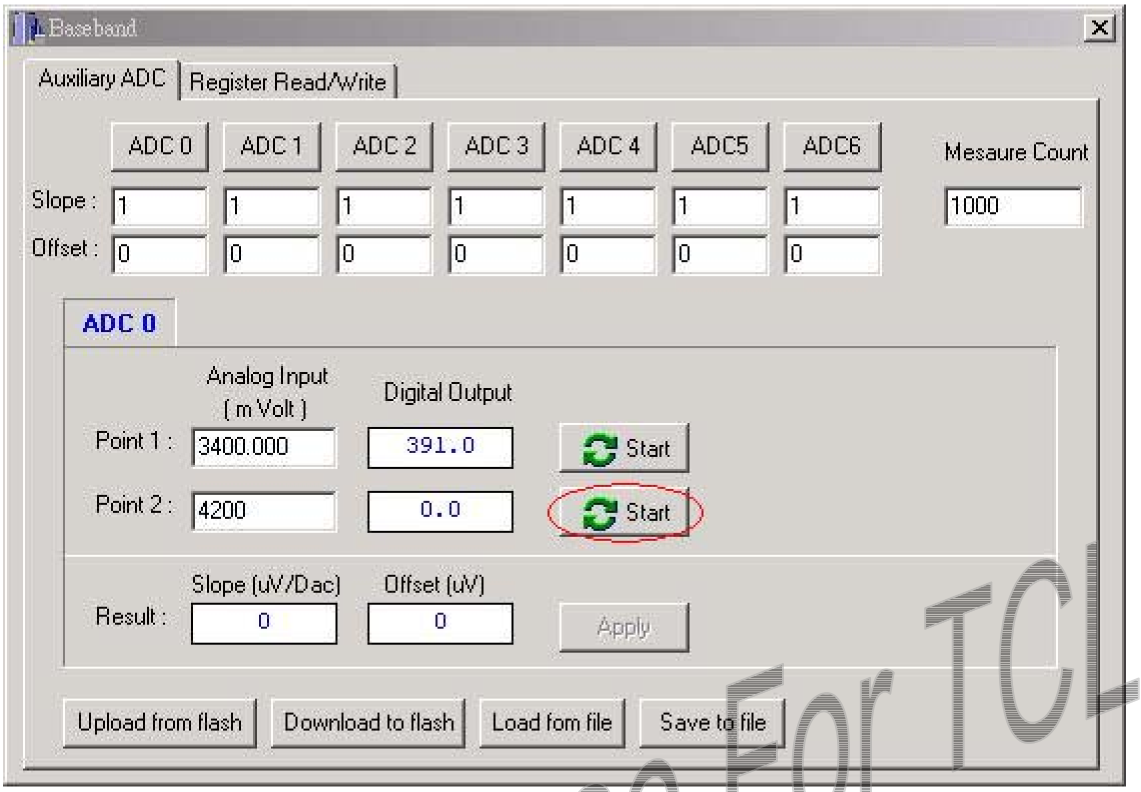

Figure 254 Click [Start] button of Point 2 to sample the ADC data

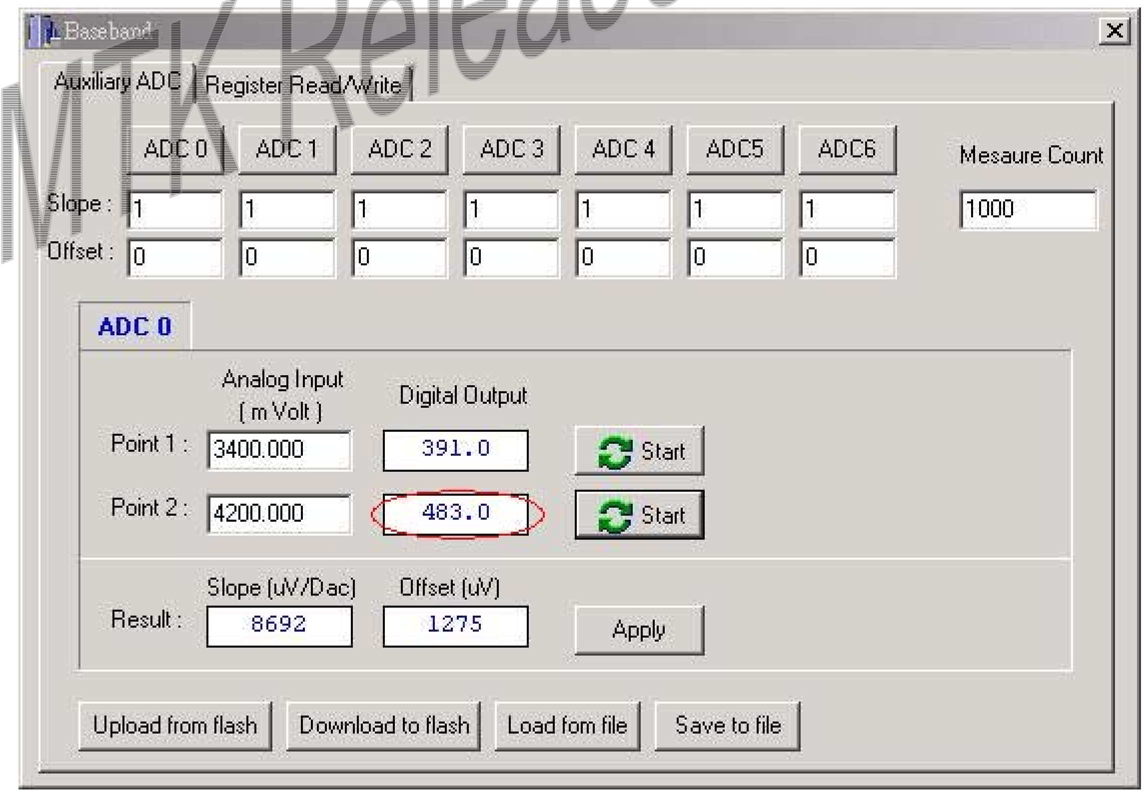

Figure 255 Result of 2^{nd} measurement

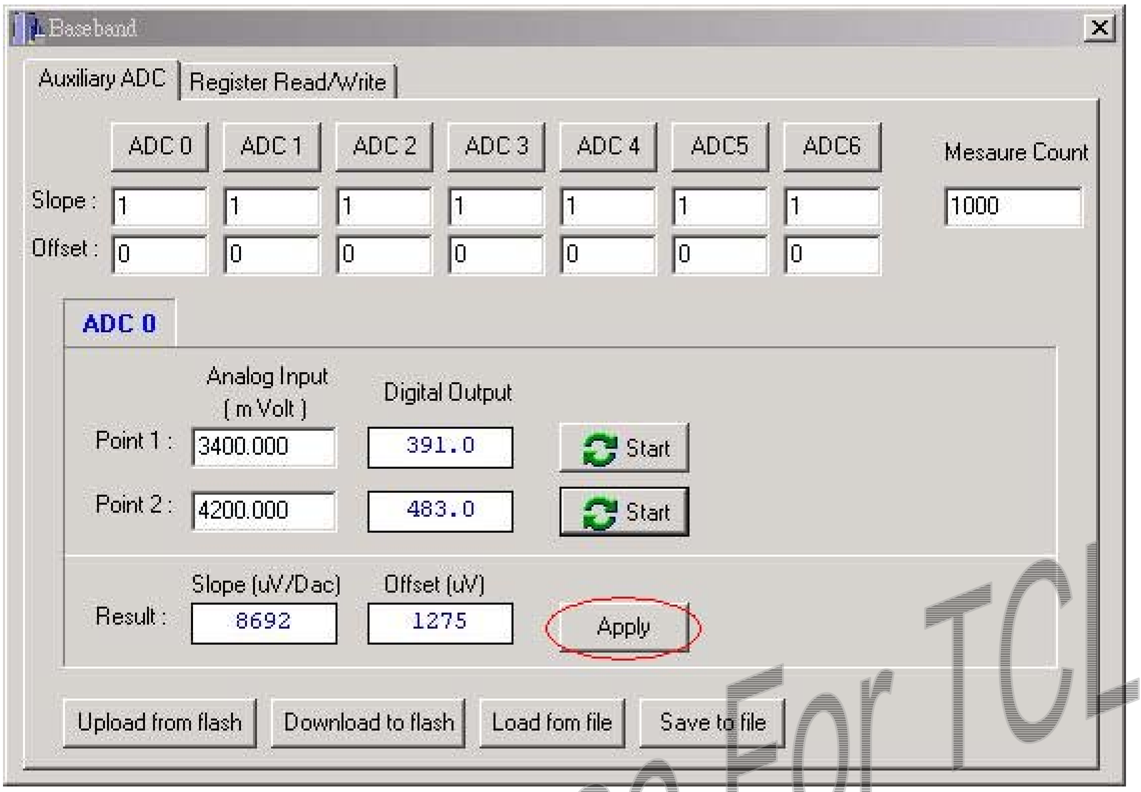

Figure 256 Click [Apply] button

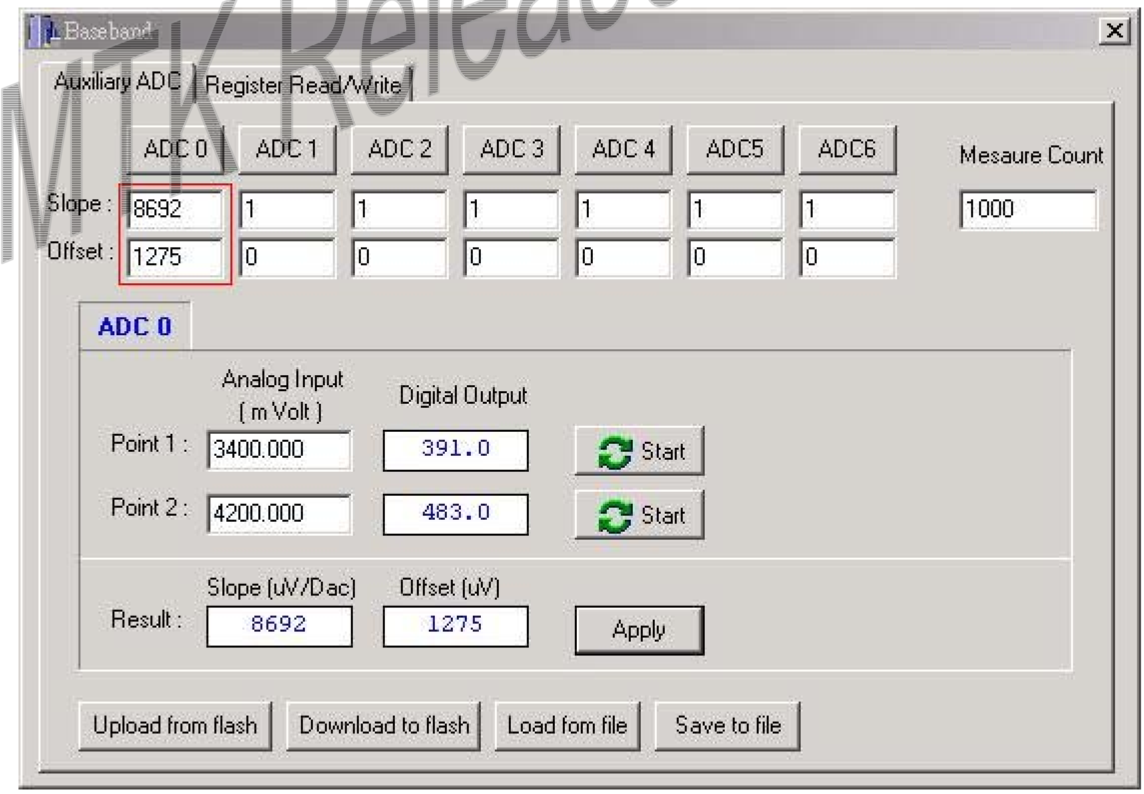

Figure 257 Result after Clicking [Apply] button

3.5.1.1 Upload and download ADC slope and offset value in flash

User can click [Upload from flash] button to read ADC slope and offset value from flash and click [Download to flash] button to write ADC slope and offset value to flash.

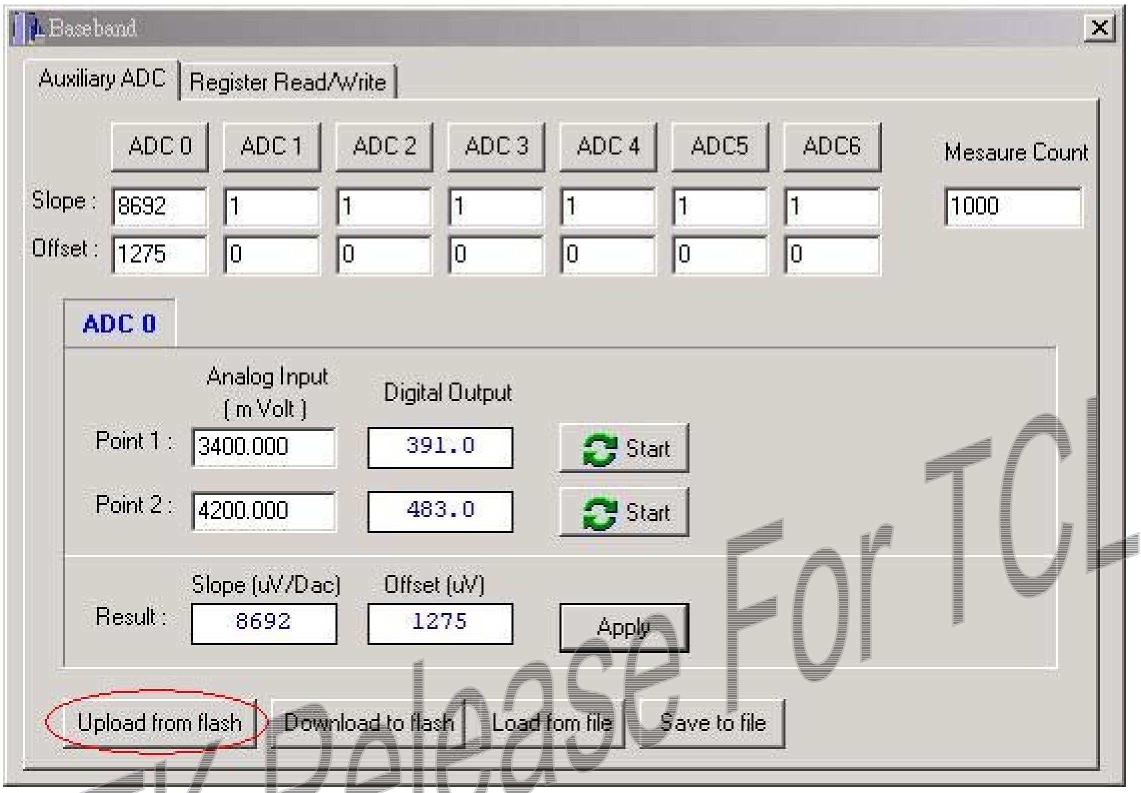

Figure 258 Click [Upload from flash] button to read slope and offset from flash

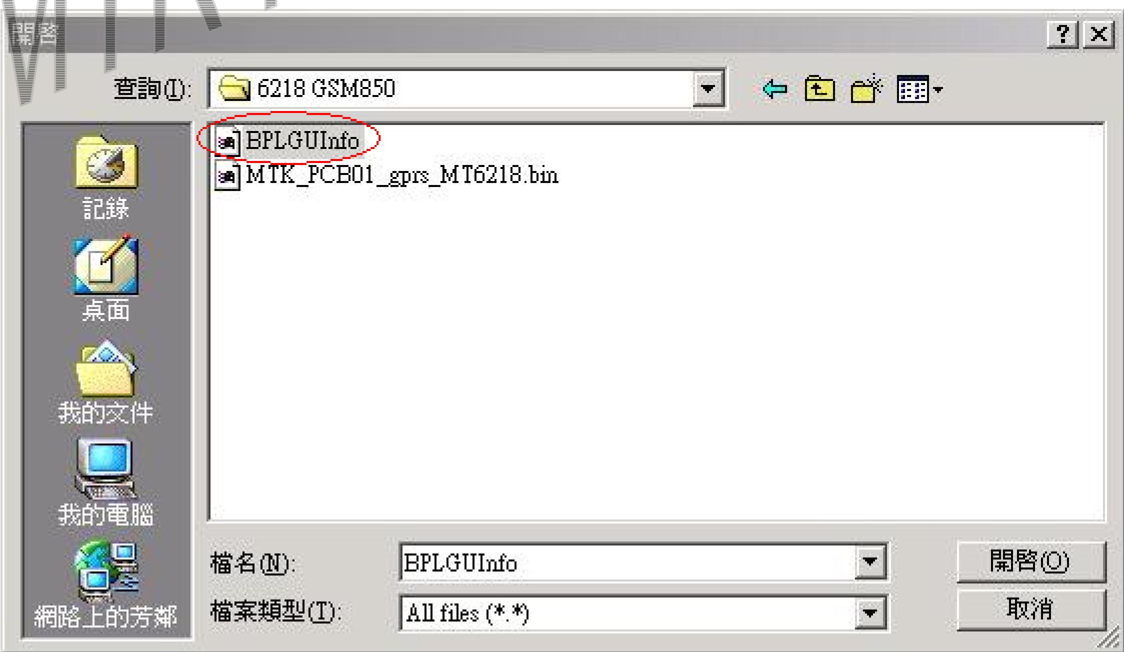

Figure 259 Select NVRAM database file if not selected before

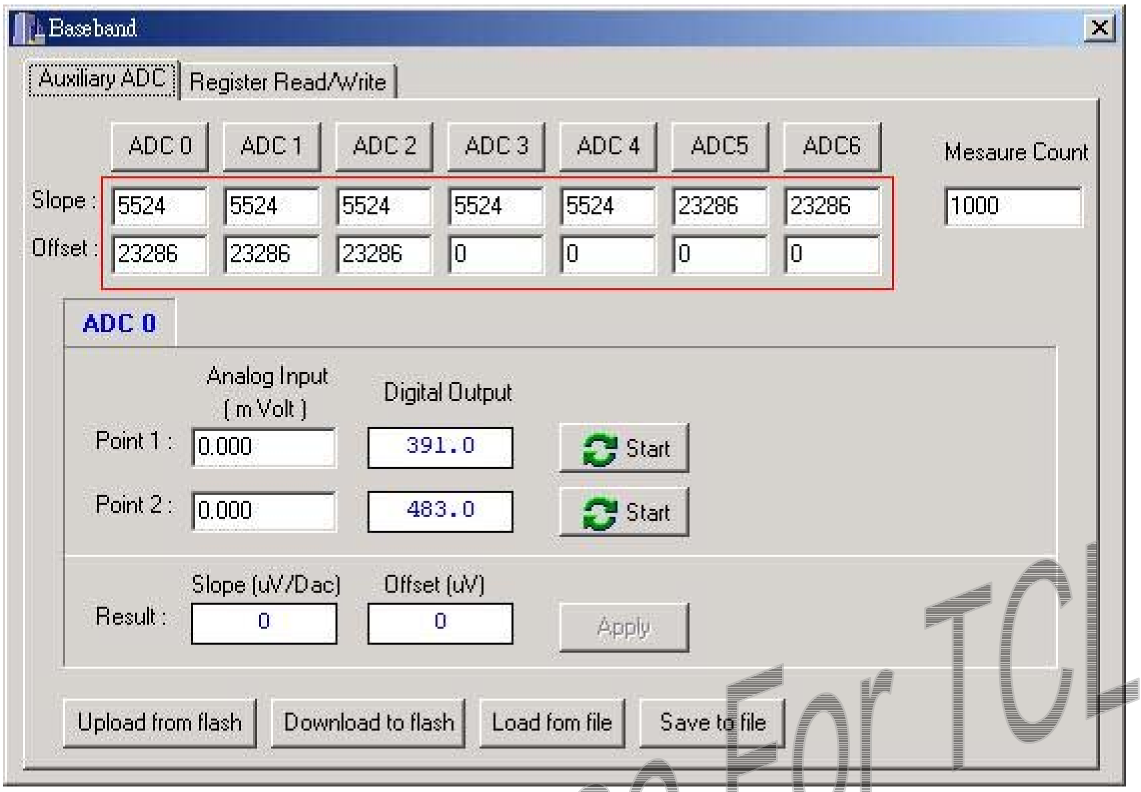

Figure 260 Result of auxiliary ADC slope and offset

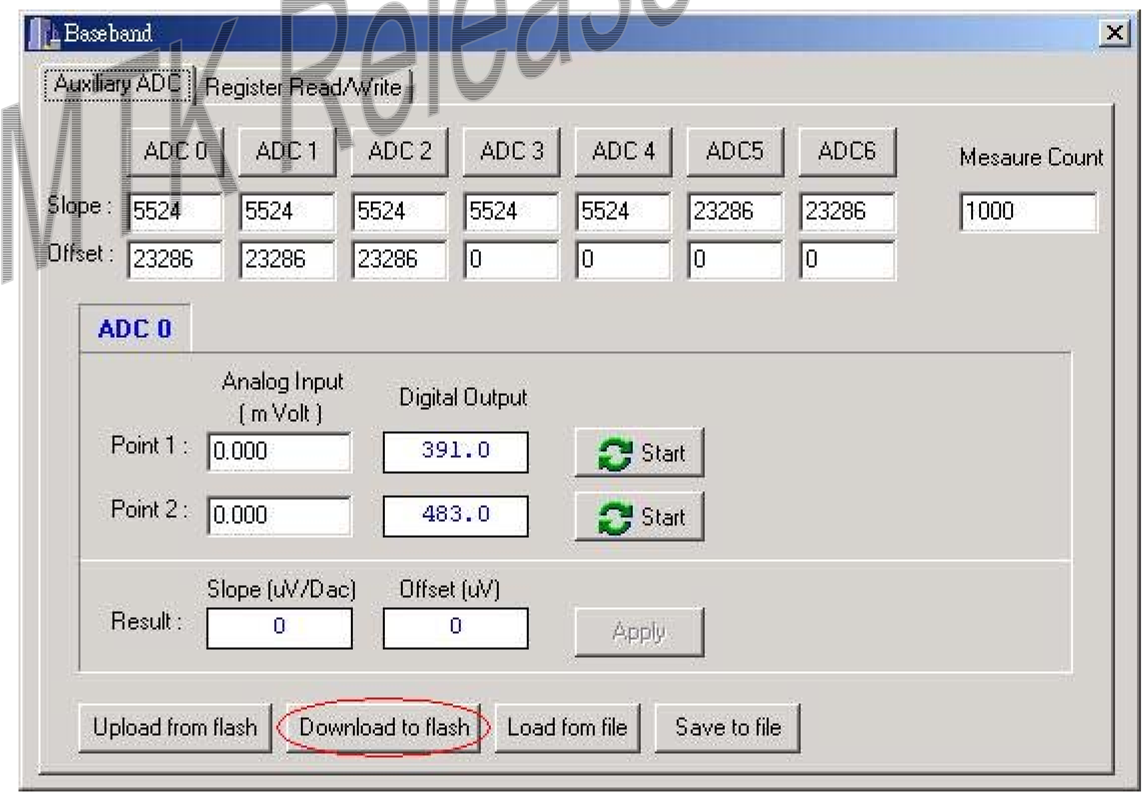

Figure 261 Click [Download to flash] button to write slope and offset value to flash

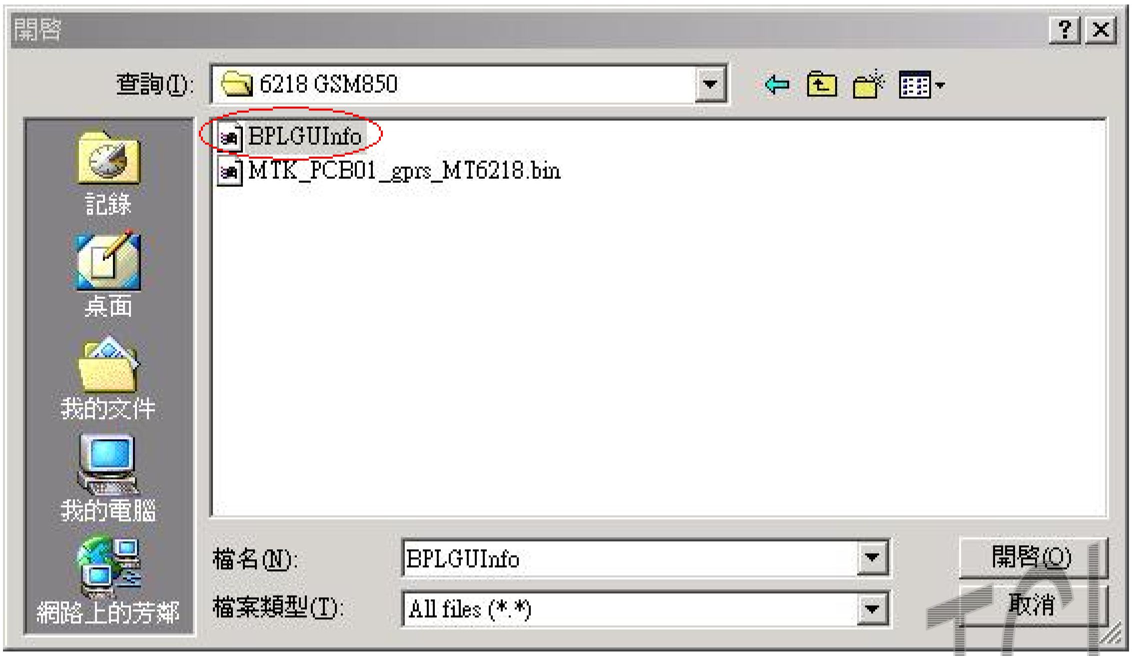

Figure 262 Select NVRAM database file if not selected before

3.5.1.2 Read and write ADC slope and offset in file

User can click [Load from file] button to read ADC slope and offset value in file and click [Save to file] button to write ADC slope and offset value to file.

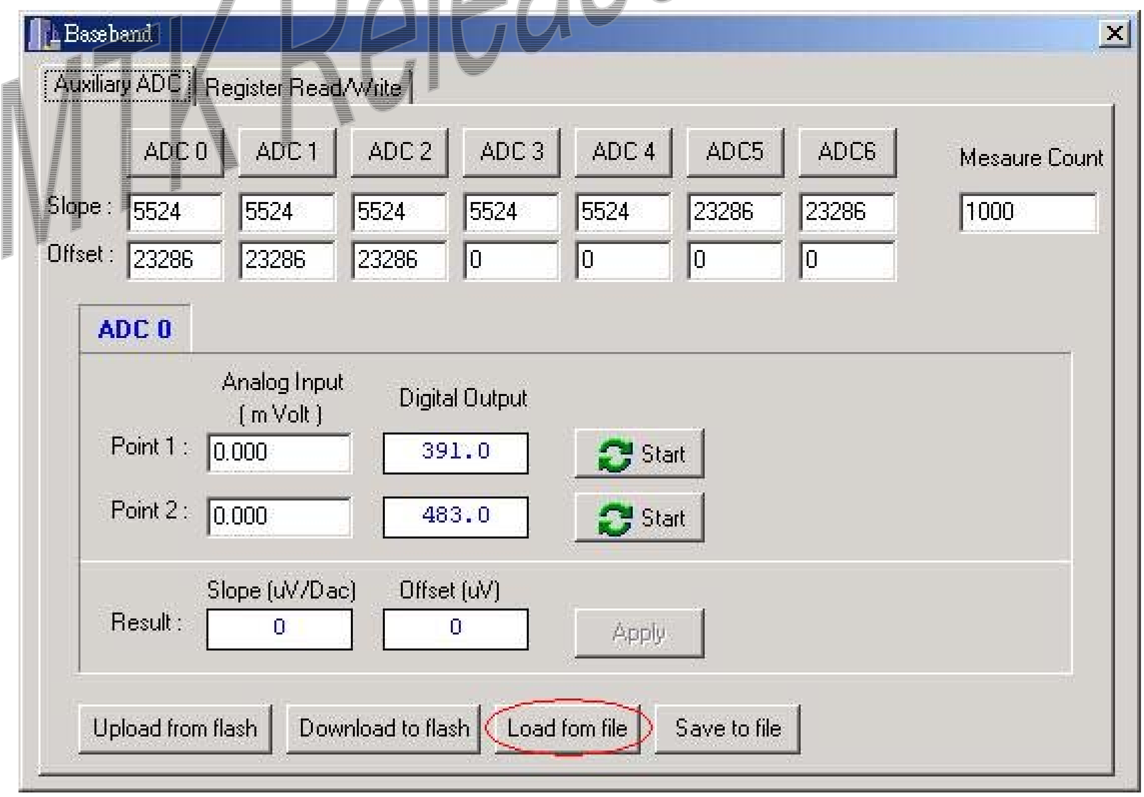

Figure 263 Click [Load from file] button to read slope and offset value from file

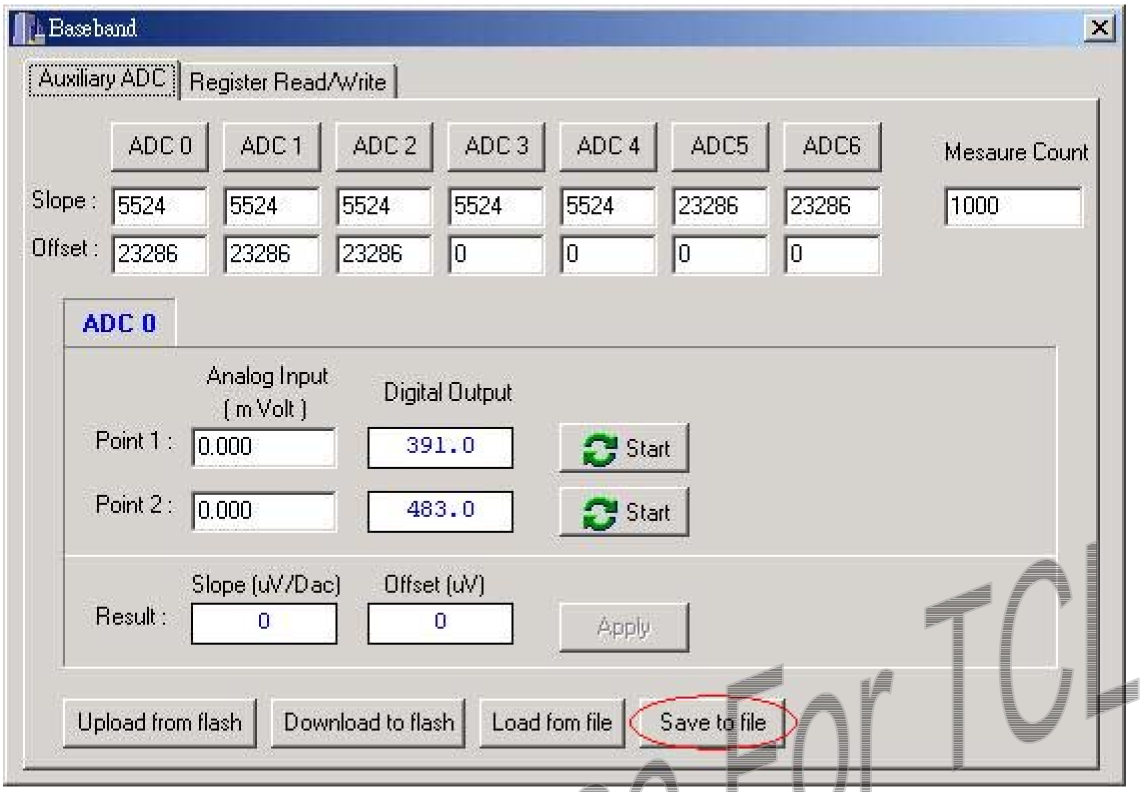

Figure 264 Click [Save to file] button to write slope and offset value to file

The following is a template of auxiliary ADC file. User will get the text file after saving ADC offset and slope to file. Each value must be followed with a comma. Please follow the file format if you want to change the value in file.

[ADC control]
offset=23286,23286,23286,0,0,0,0
slope=5524,5524,5524,5524,5524,23286,23286

3.5.2 Peripheral Register read/write

This operation is used to read or write the register of baseband chip.

User can read register by following steps:
1) Input address of register by hex base.
2) Click [Read] button.
3) Register value is shown on value filed.
4) User can click [Value (Hex)] button to toggle the value base (Hex or Dec).

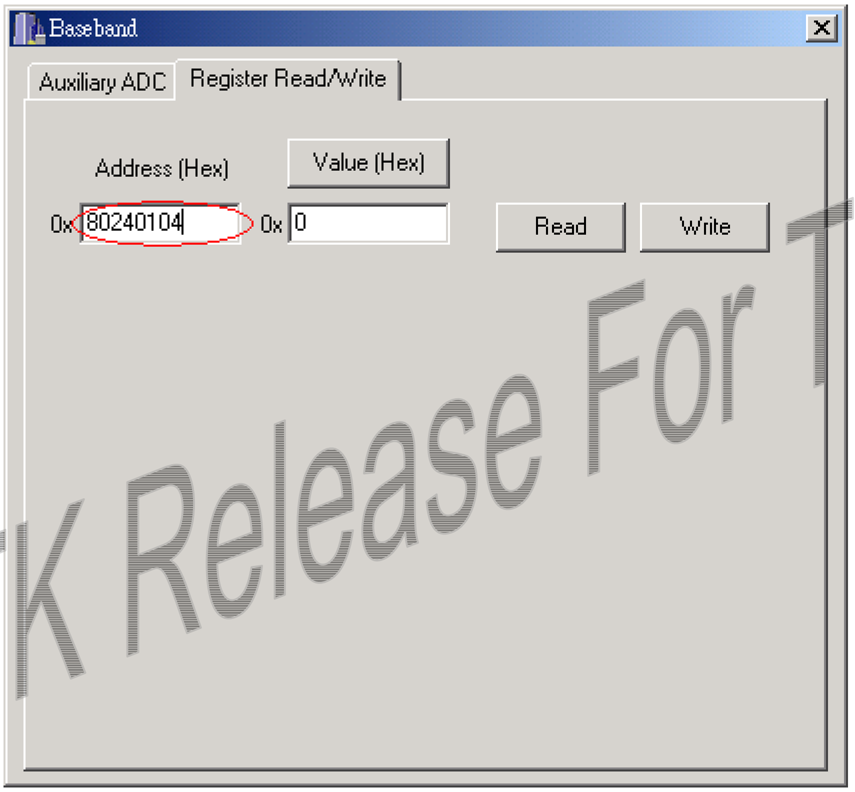

Figure 265 Input address of register by hex base

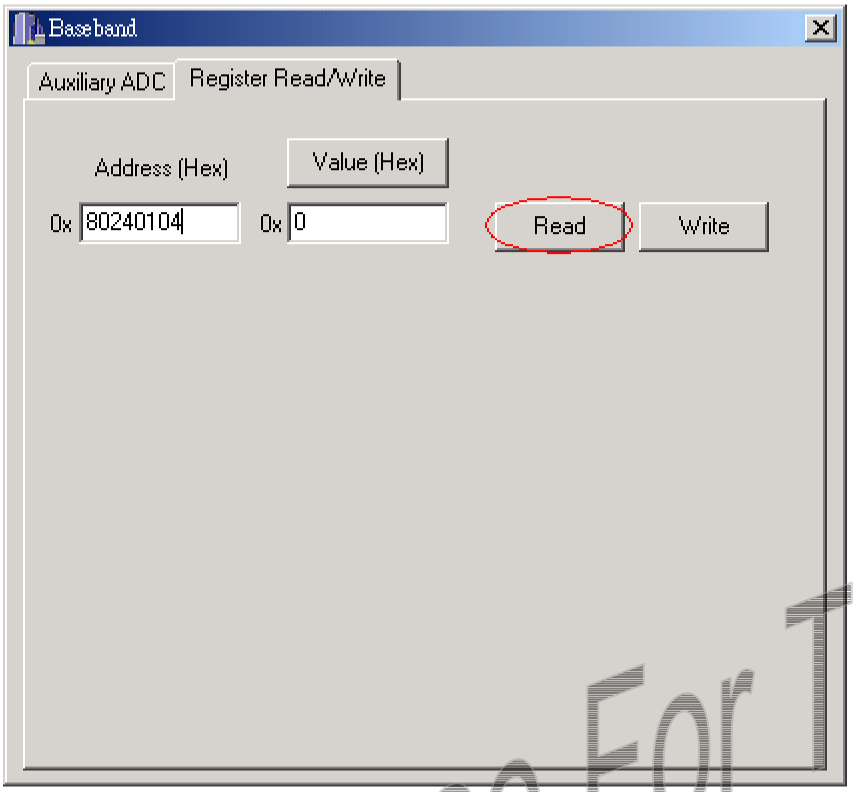

Figure 266 Click [Read] button to read value from register

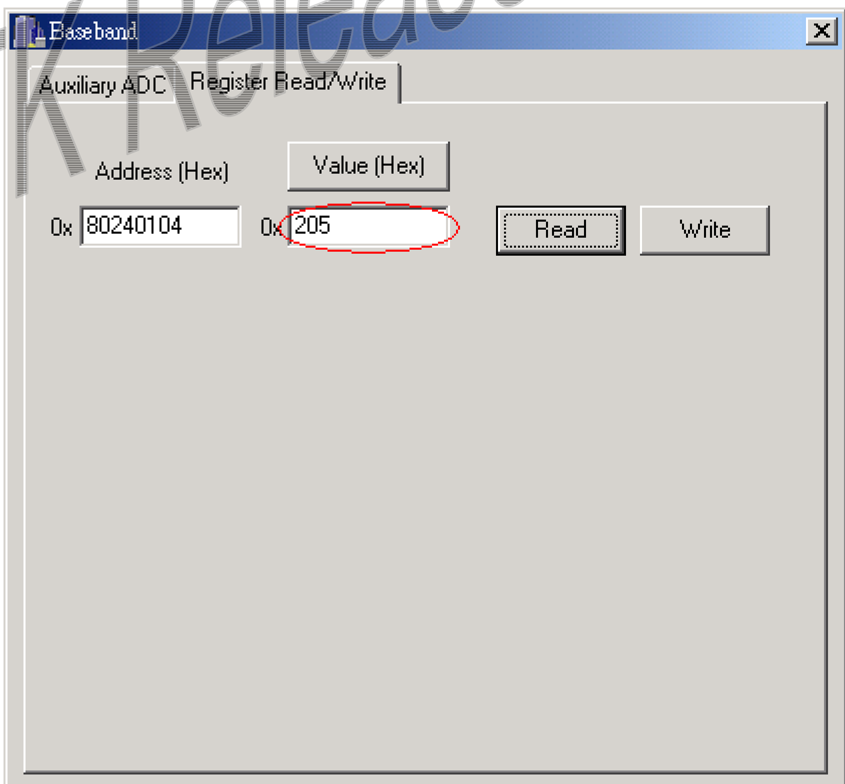

Figure 267 Register value is shown on value filed

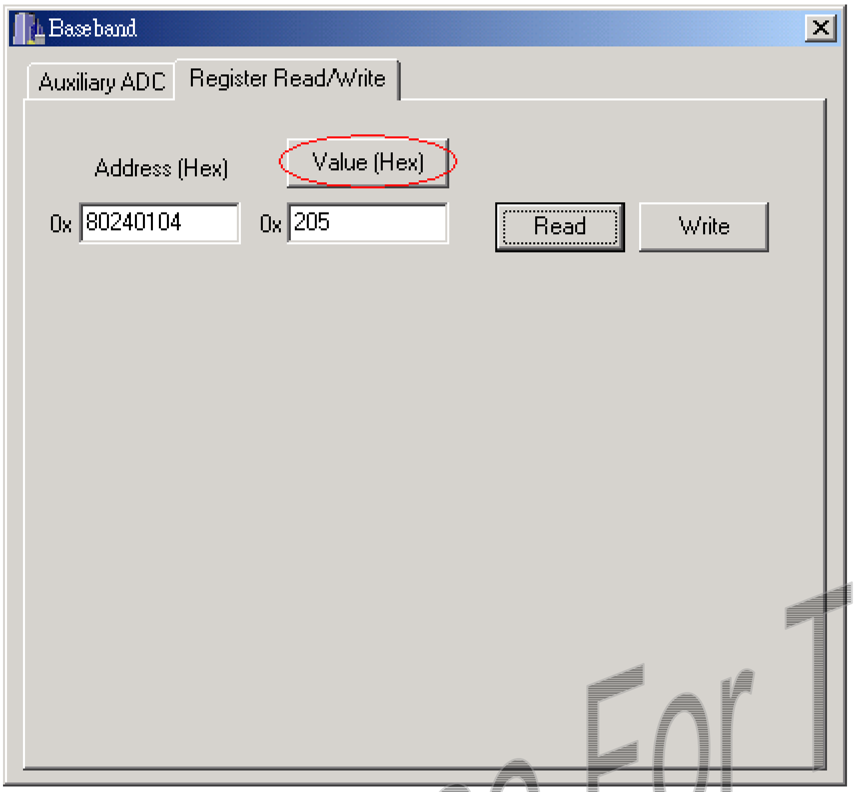

Figure 268 click [Value (Hex)] button to toggle the value base to Dec

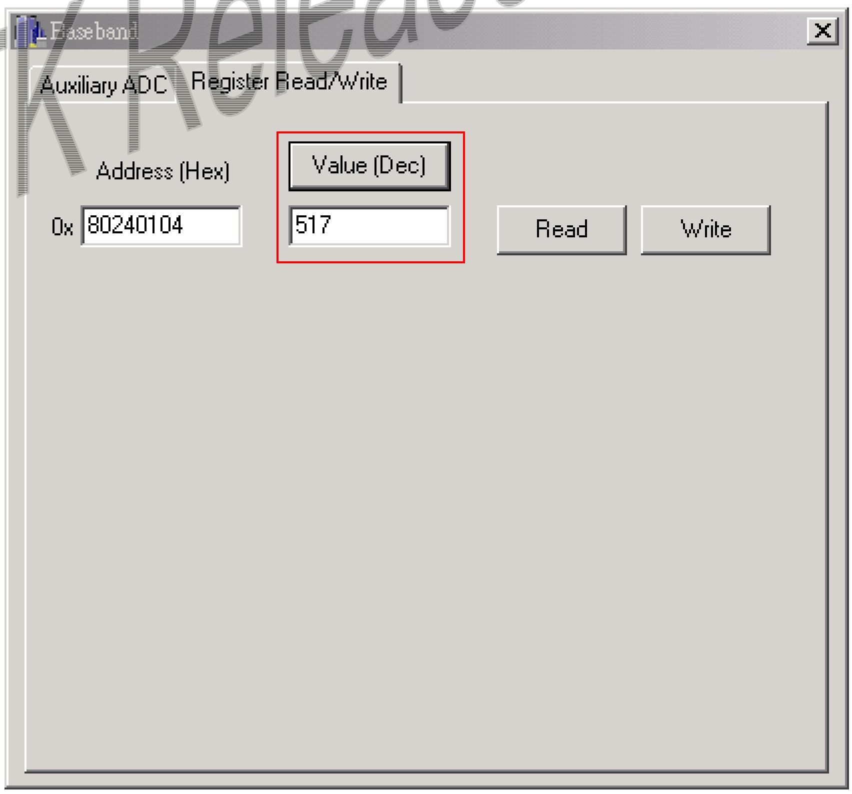

Figure 269 Result after toggling the value base to Dec

User can write register by following steps:
1) Input address of register by hex base.
2) Input value in the value field (User can click [Value (Hex)] button to toggle the value base (Hex or Dec)).
3) Click [write] button.

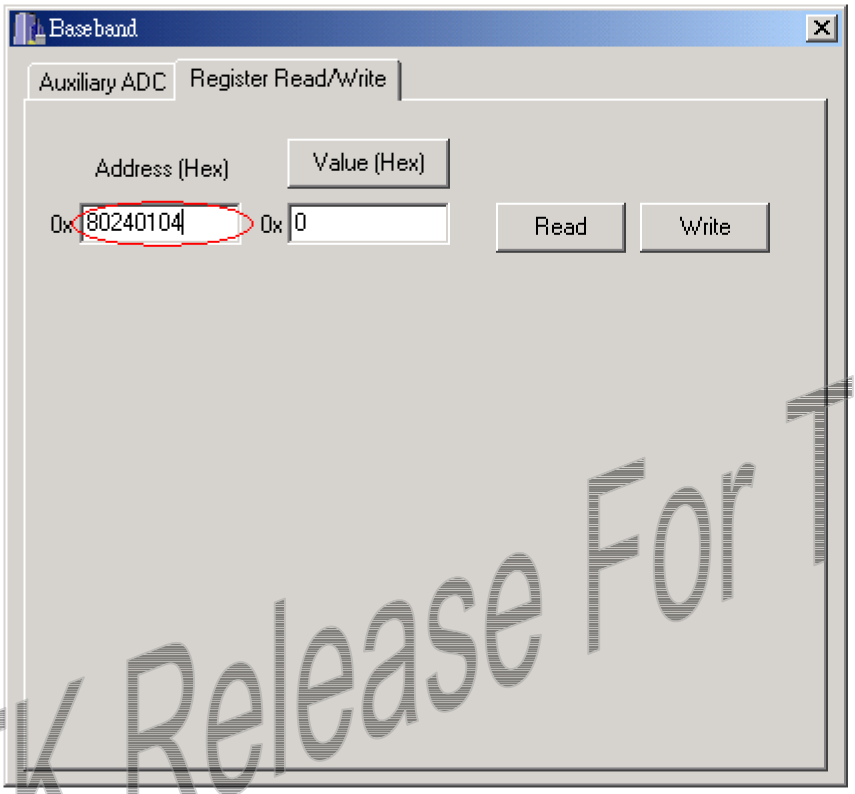

Figure 270 Input address of register by hex base

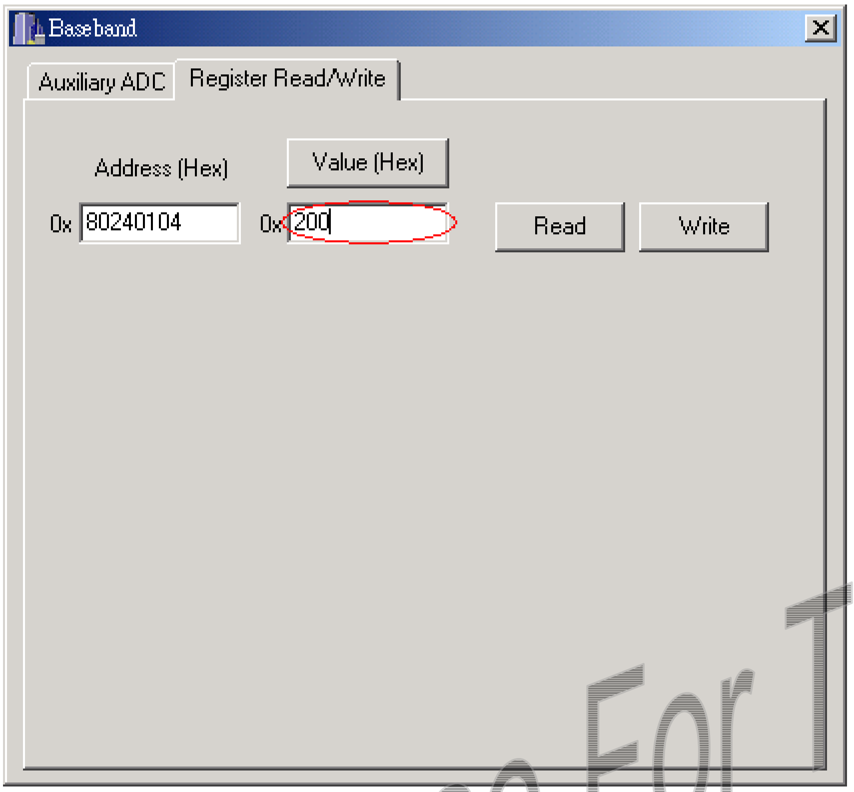

Figure 271 Input value in the value field

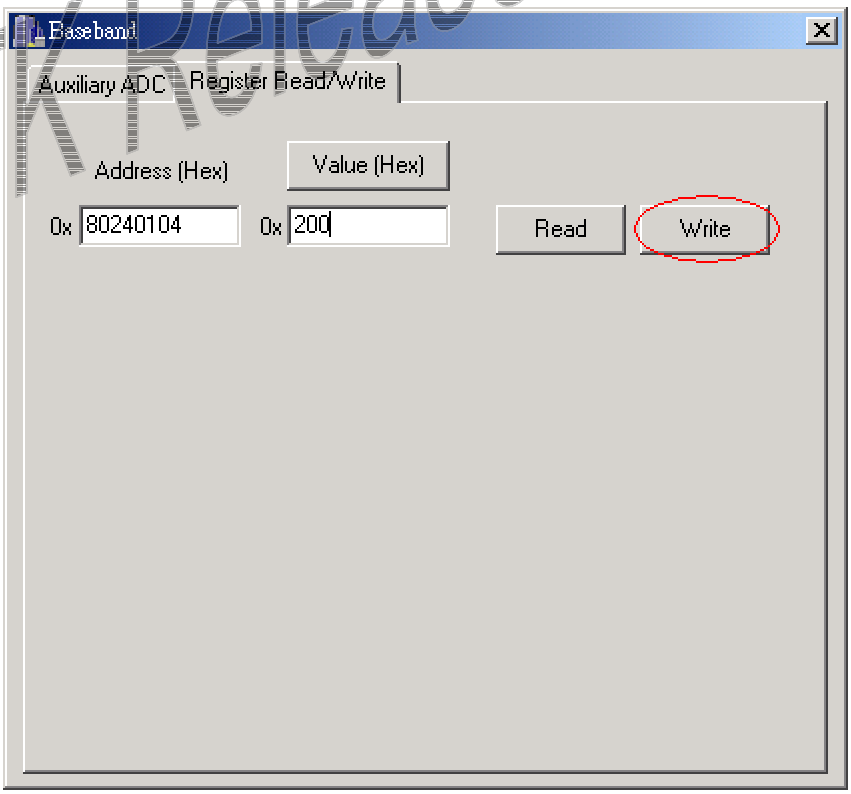

Figure 272 Click [write] button to write value to register

3.5.3 Battery level editor

User can use battery level window to set voltage of each battery level. There are 4 battery level can be adjusted. They are battery level 0, 1, 2 and 3. Shutdown, no MO call and low battery warning are all belong to battery level 0 .

3.5.3.1 Upload and download voltage setting of each battery level in flash

User can click [Upload from flash] button to read voltage setting of each battery level from flash and click [Download to flash] button to write voltage setting of each battery level to flash.

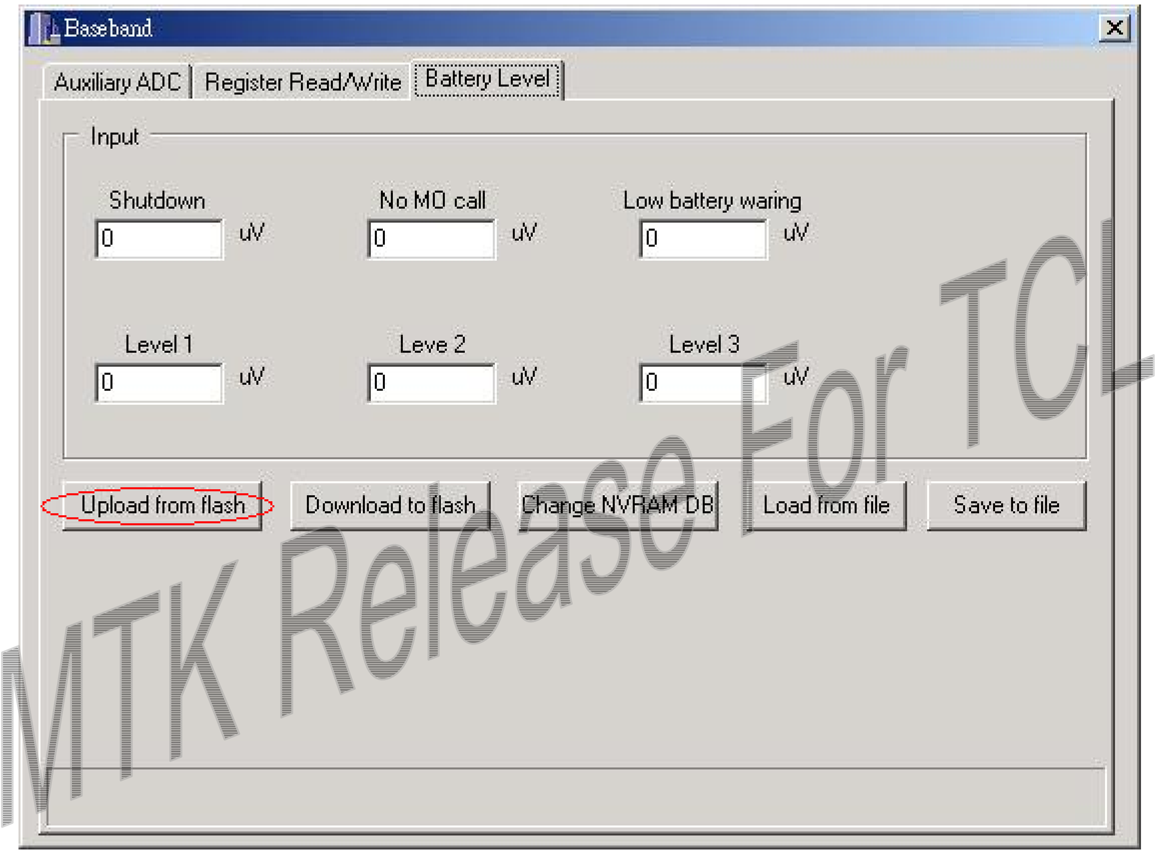

Figure 273 Click [Upload from flash] button to read voltage setting of each battery level from flash

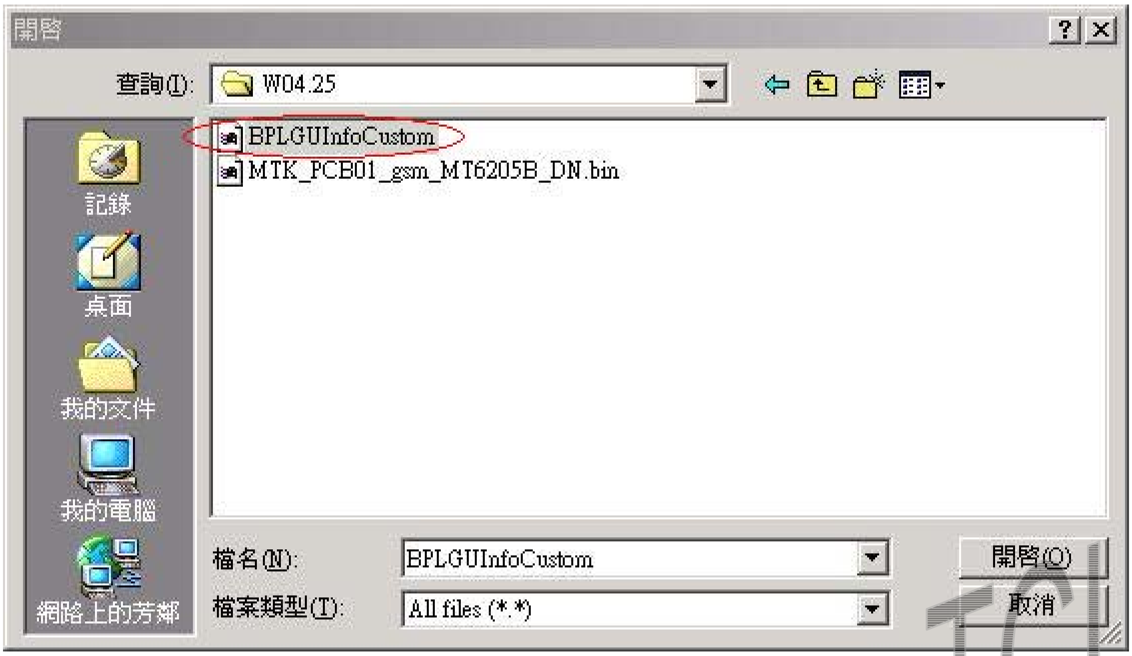

Figure 274 Select NVRAM database file if not selected before

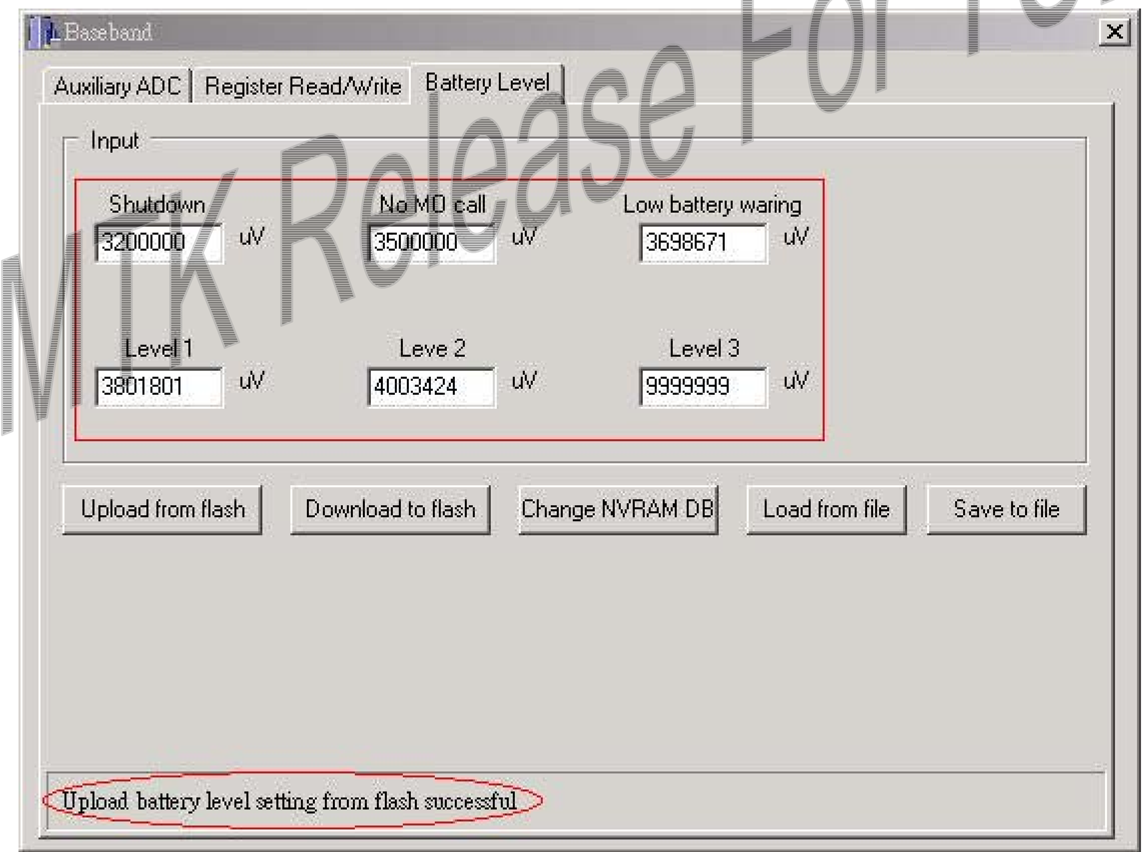

Figure 275 Result of voltage setting of each battery level

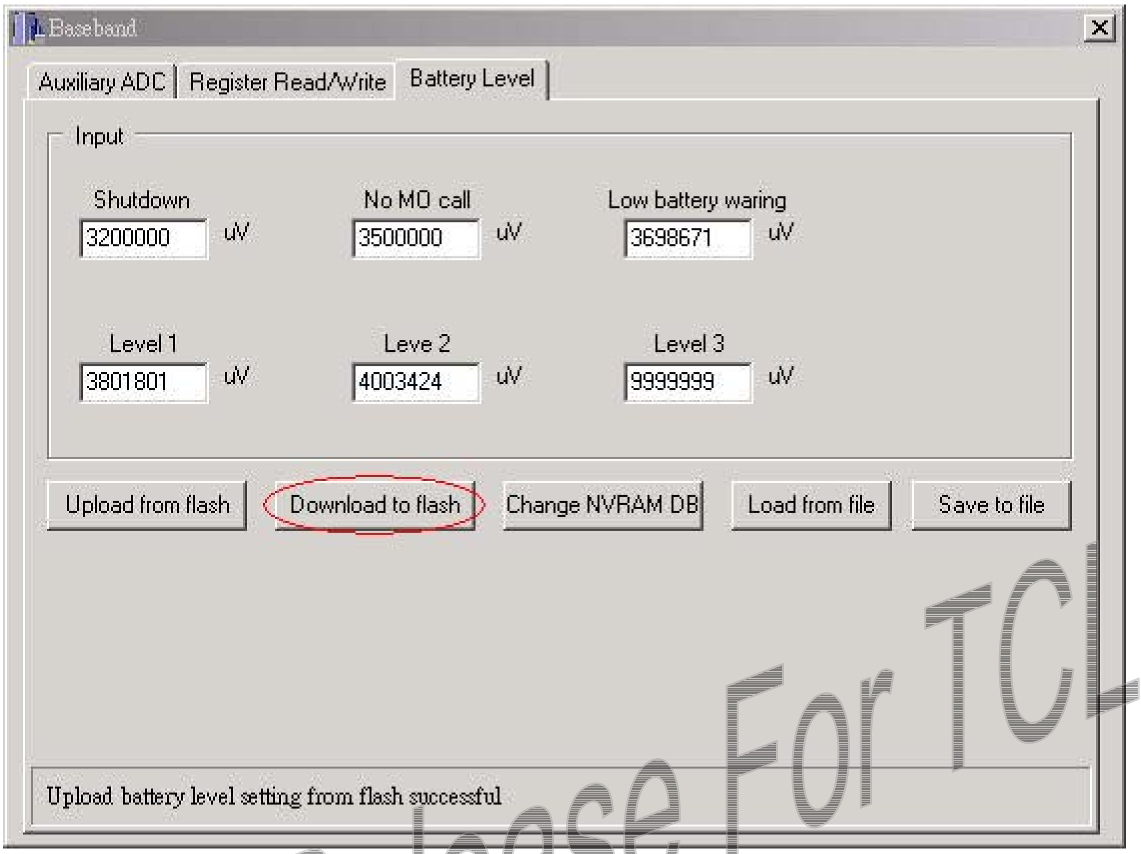

Figure 276 Click [Download to flash] button to write voltage setting of each battery level to flash

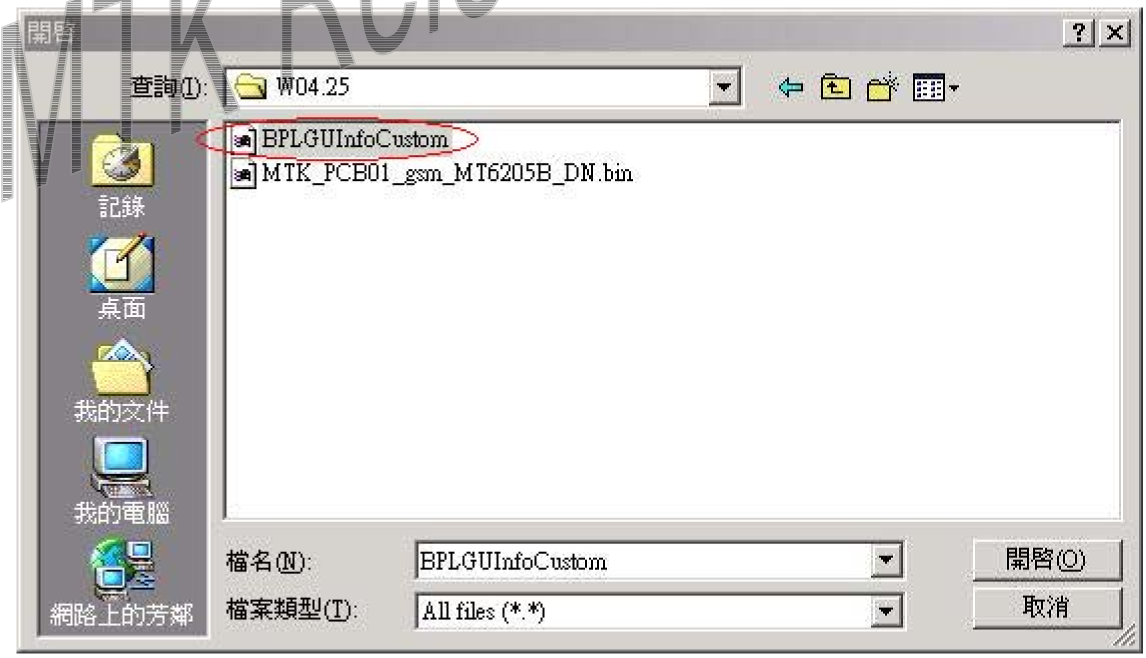

Figure 277 Select NVRAM database file if not selected before

If User wants to change NVRAM database file, he can click [Change NVRAM DB] button.

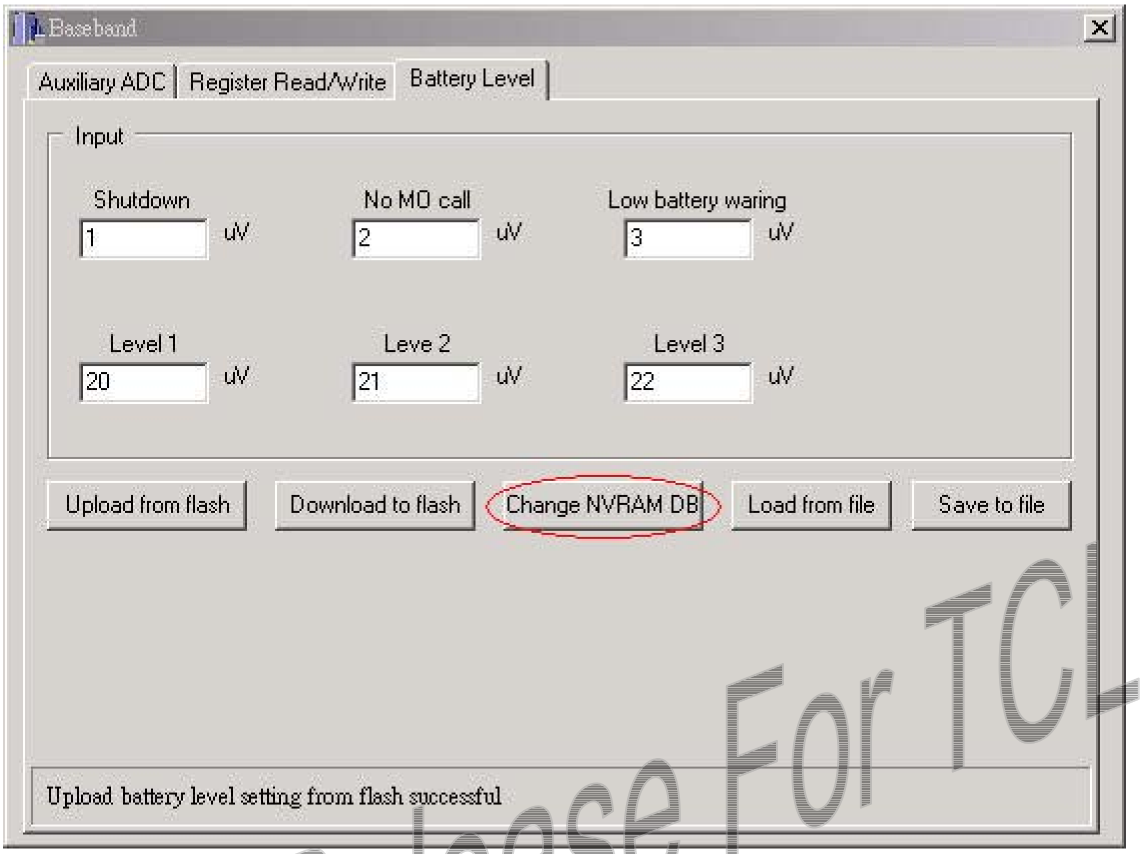

Figure 278 Click [Change NVRAM DB] button to change NVRAM database file

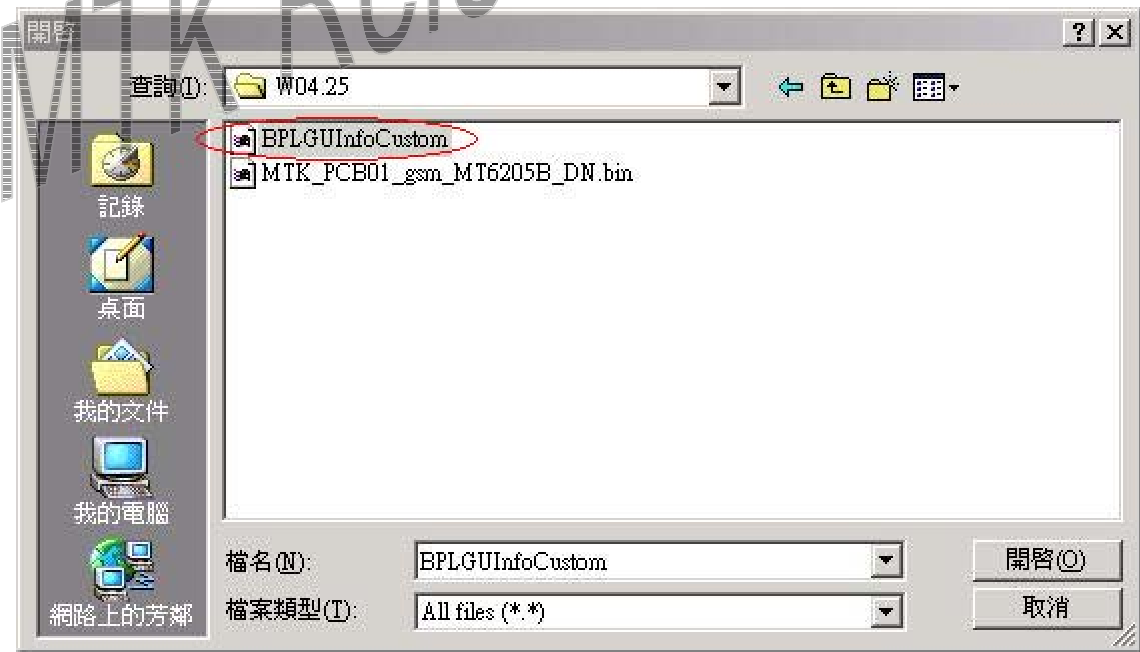

Figure 279 Select NVRAM database file

3.5.3.2 Read and write voltage setting of each battery level in file

User can click [Load from file] button to read voltage setting of each battery level in file and click [Save to file] button to write voltage setting of each battery level to file.

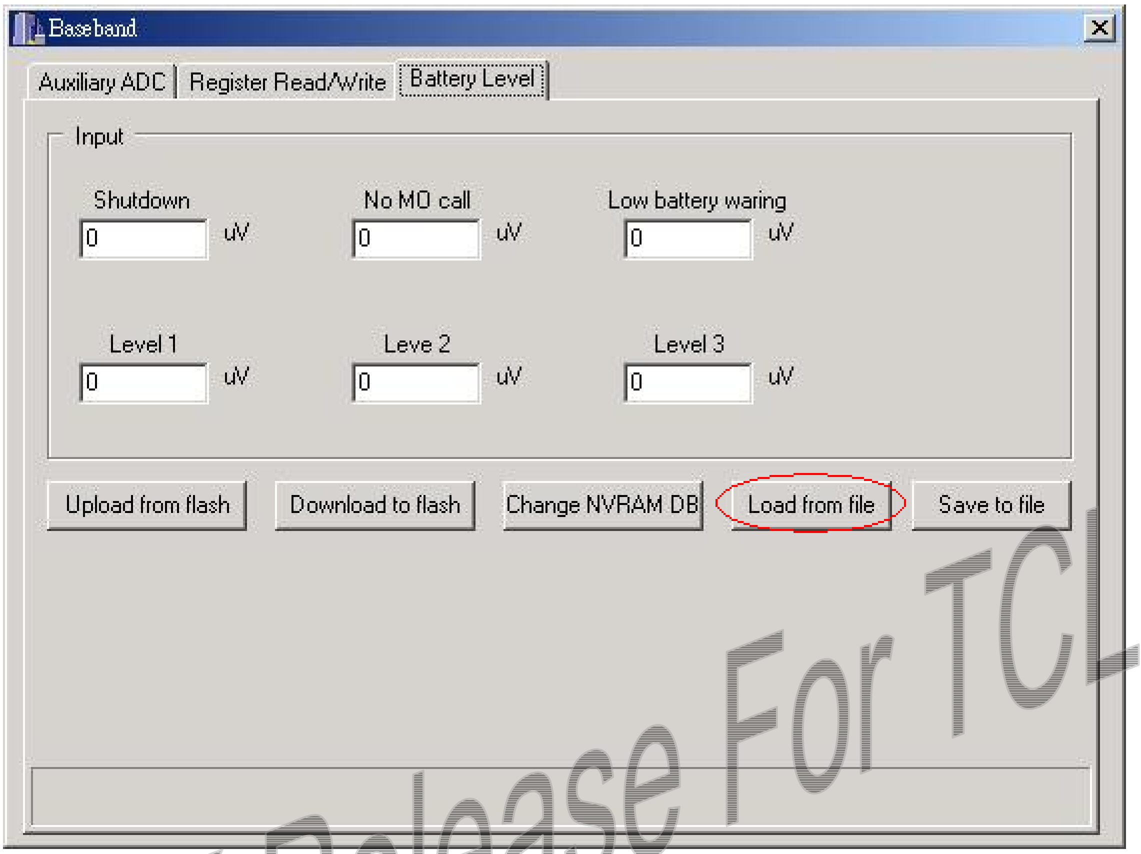

Figure 280 Click [Load from file] button to read voltage setting of each battery level from file

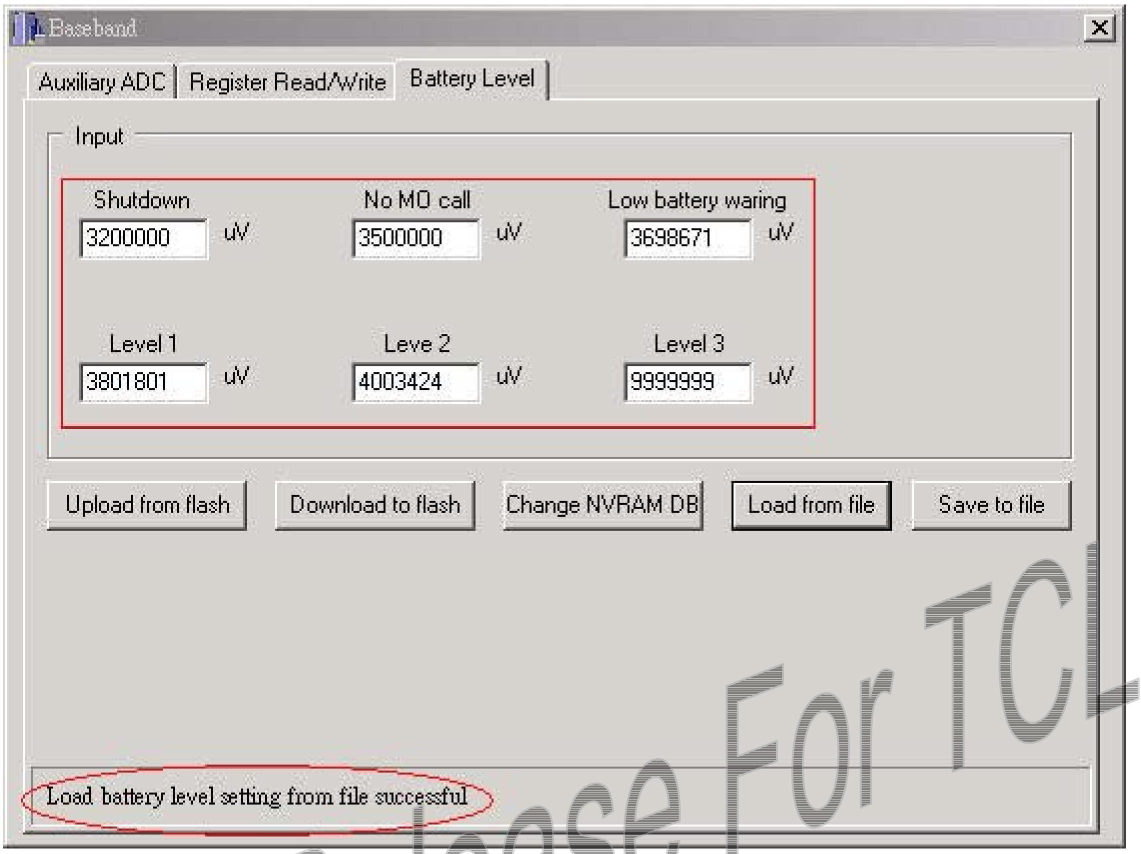

Figure 281 Result of voltage setting of each battery level

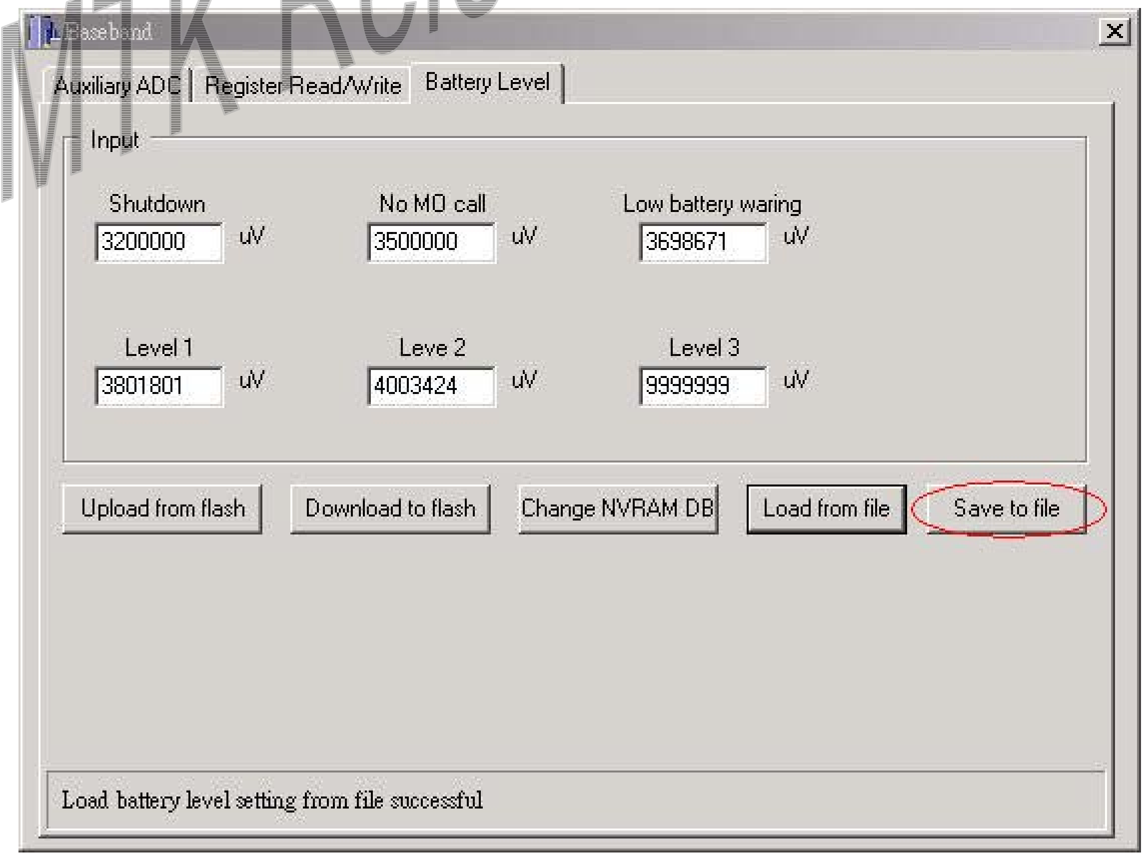

Figure 282 Click [Save to file] button to save voltage setting of each battery level

The following is a template file of voltage setting of each battery level. User will get the text file after saving voltage setting of each battery level to file.

[Battery level]
Shutdown voltage=3200000
No MO call voltage=3500000
Low battery warning voltage=3698671
Level 1 votage=3801801
Level 2 votage=4003424
Level 3 votage=9999999

3.6 MMI Data Download

User can use MMI data download window to download full screen, associate, EMS, midi and iMelody files to FAT. User can switch to MMI data download window by selecting [MMI data download] from main selection menu.

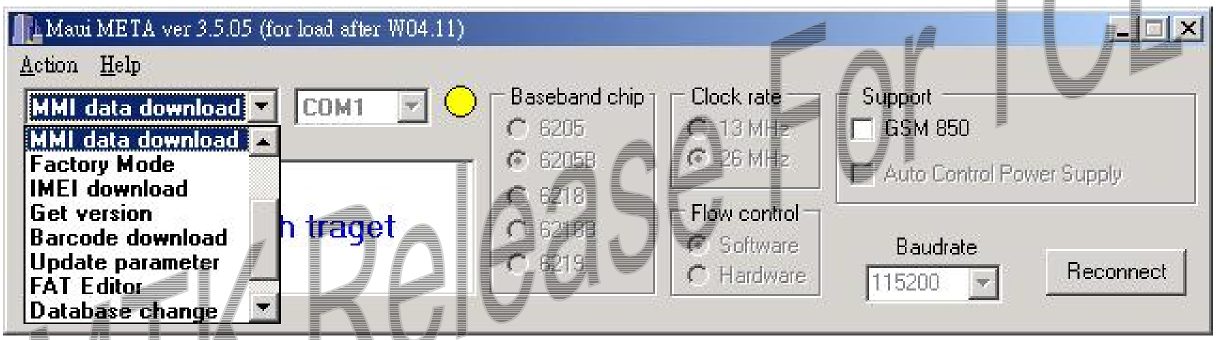

Figure 283 Select [MMI data download] from main selection menu

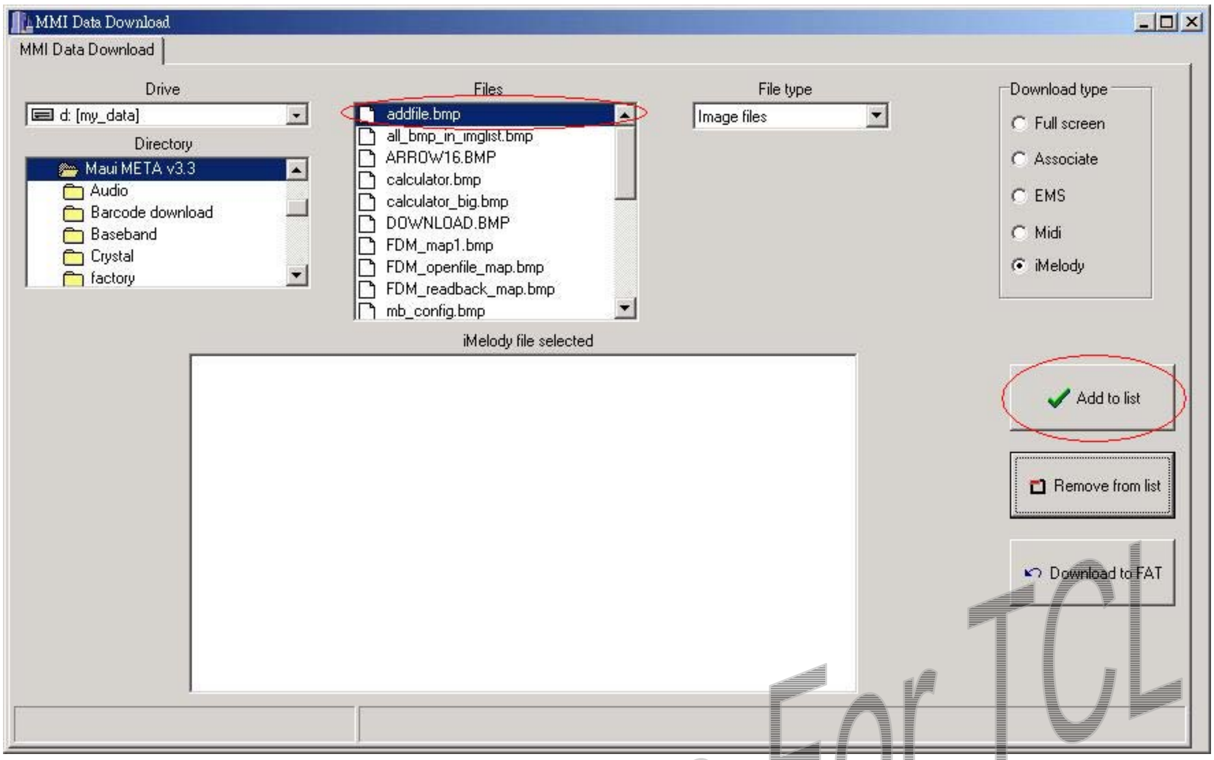

Figure 284 Choose file and then click [Add to list] button to add file to file selected list

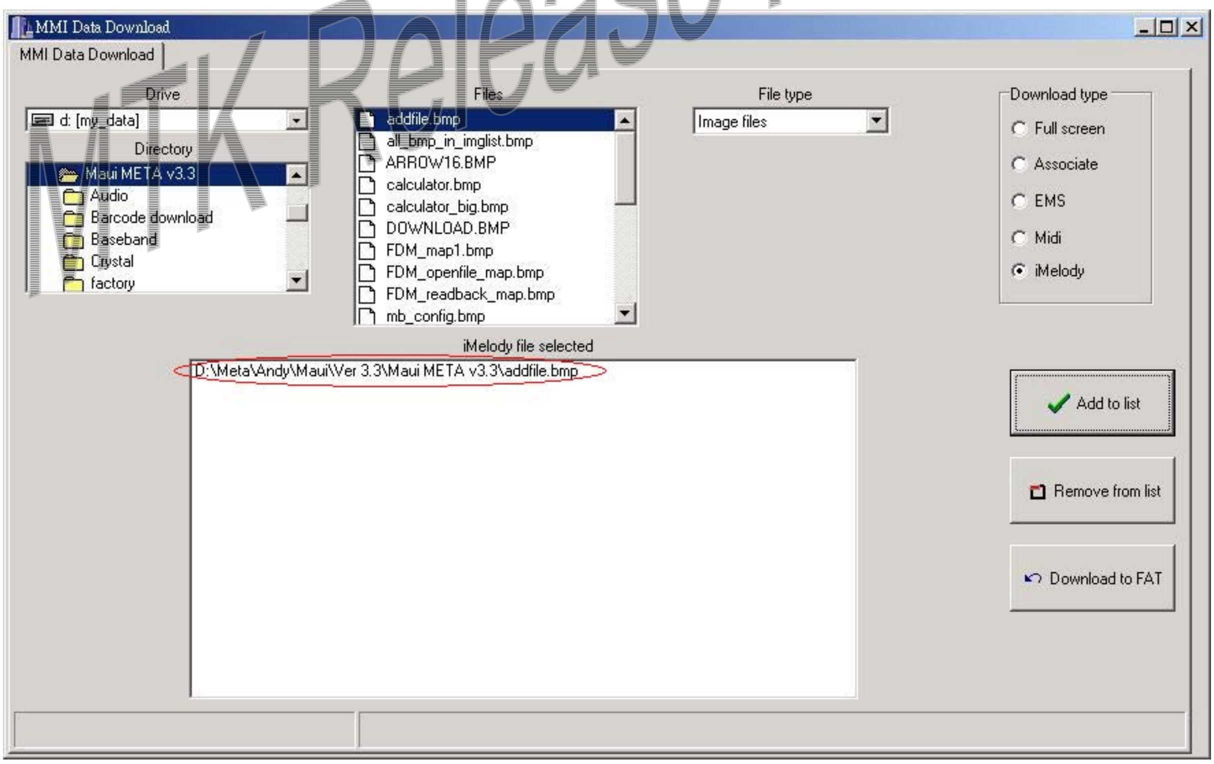

Figure 285 Result of adding file to list

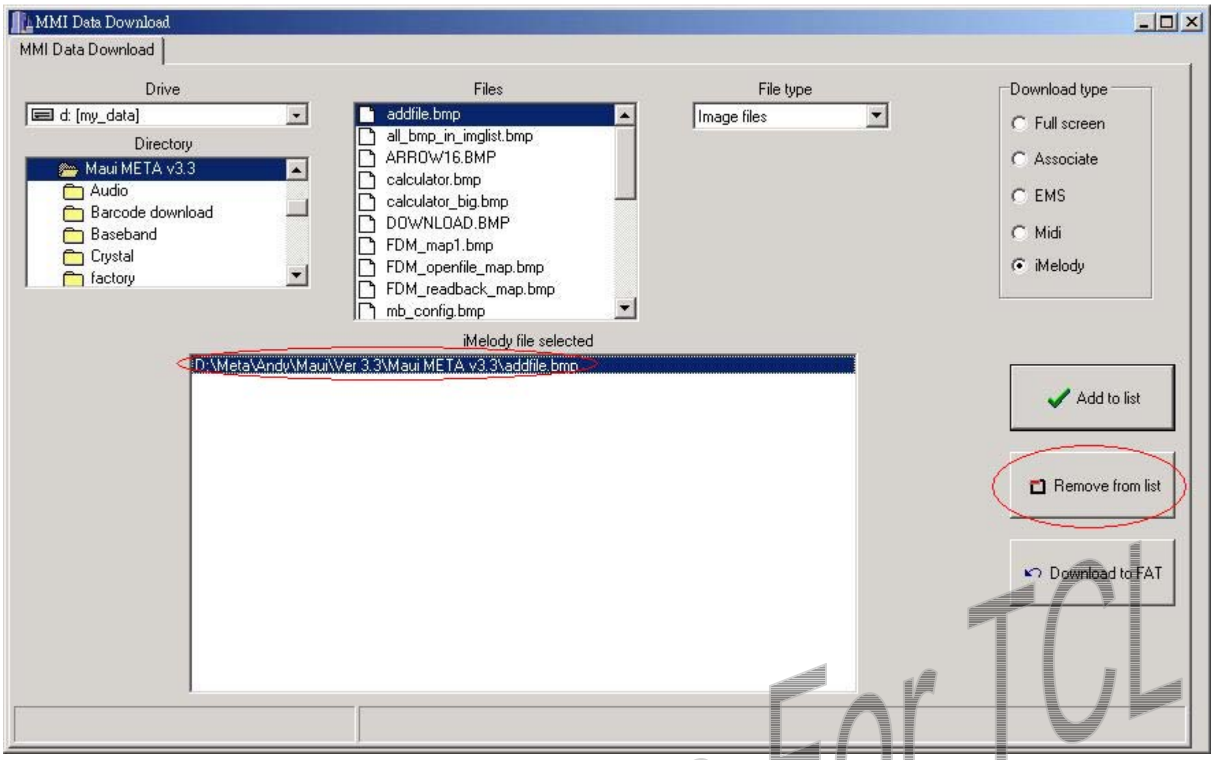

Figure 286 Select file and then click [Remove from list] button to remove file from selected list

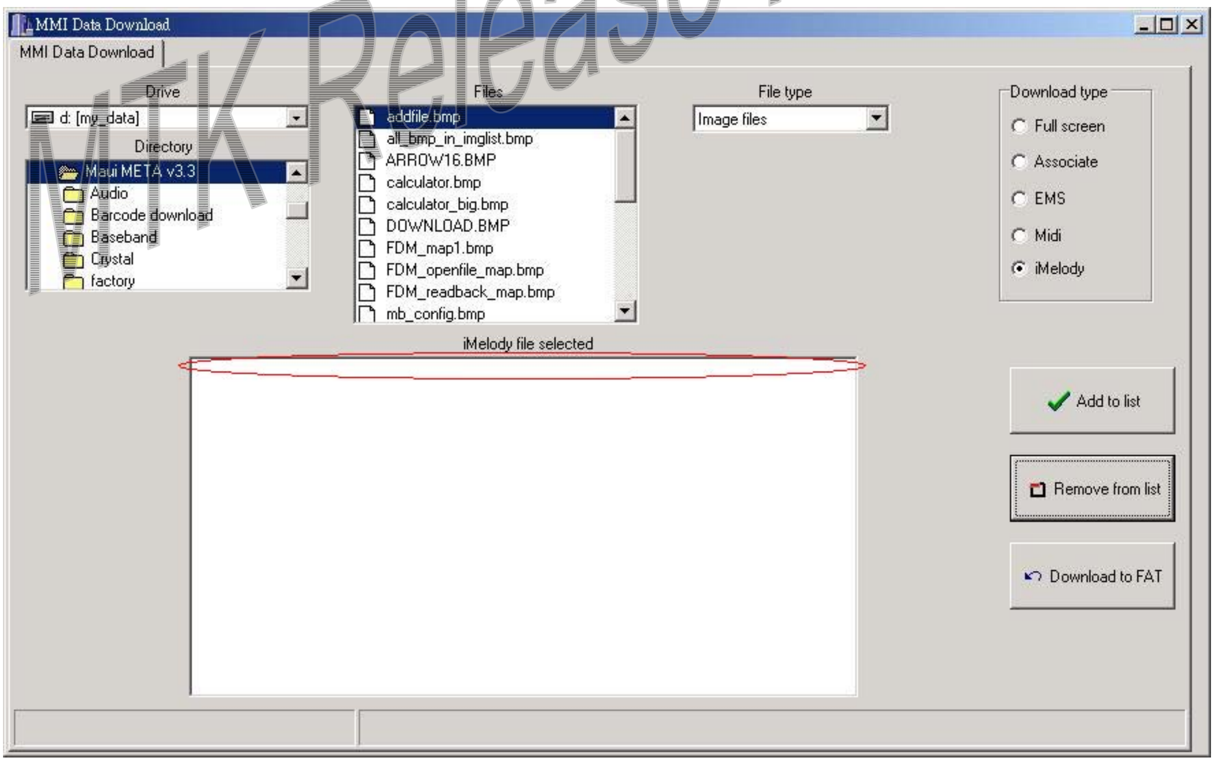

Figure 287 Result of removing file from list

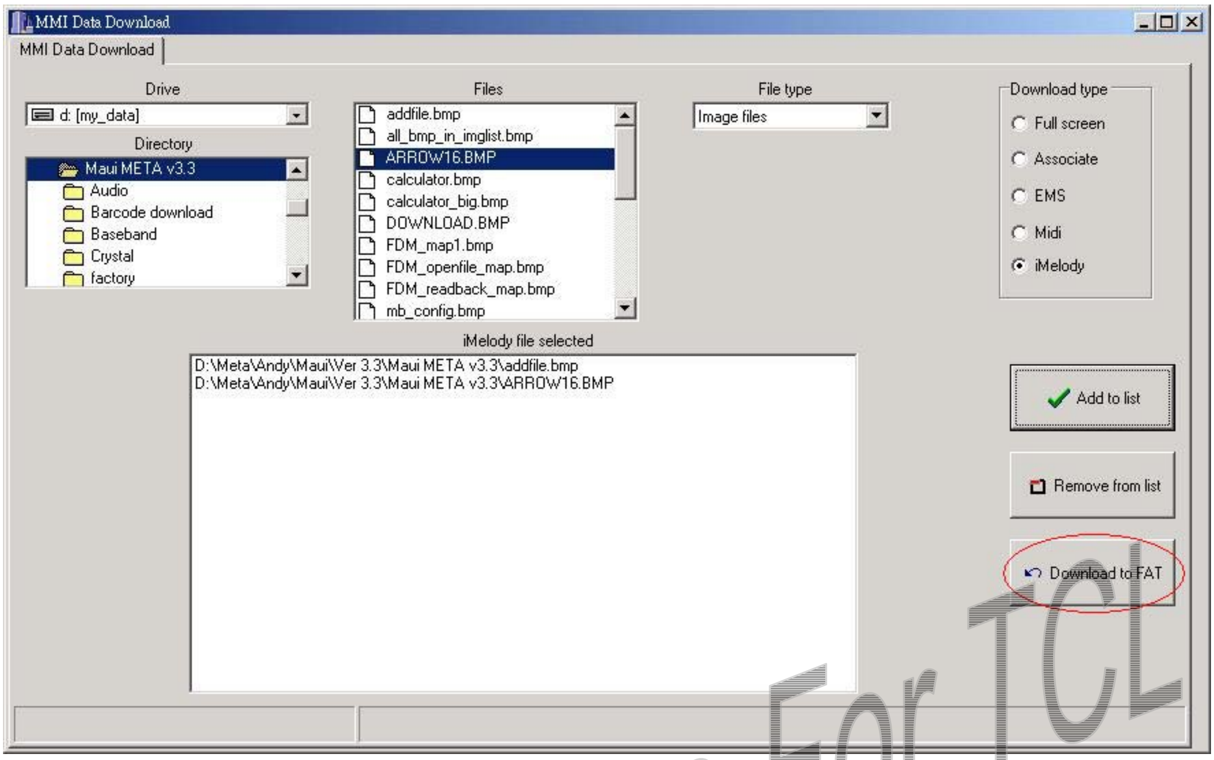

Figure 288 Click [Download to FAT] button to download all selected files to FAT

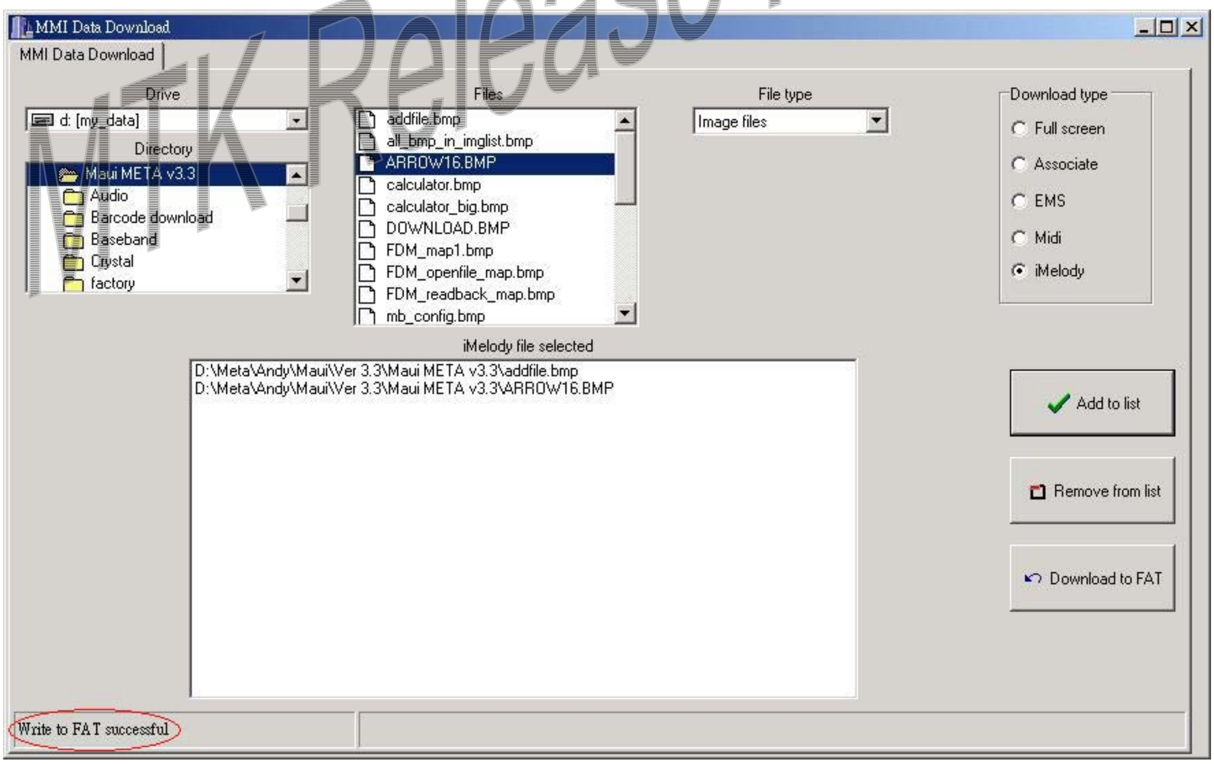

Figure 289 Result of downloading selected files to FAT

When user close MMI data download window. The MMI data download data type, default FAT path, maximum file count, default local file will be saved to MF_Setup.txt. The following is a template of MF_Setup.txt.

```
[MMI data download table]
download_type =imelody
; the default download_type when enter MMI data download window

[Default fullscreen file table]
DEFAULT_FULLSCREEN_PATH = c:\def_image\fullscreen\
; default full screen FAT path, full screen files will be downloaded to this FAT path
MAX_FULLSCREEN_FILE_COUNT = 5
; maximum full screen file count to download to FAT
default_fullscreen_file_count=5
; selected full screen file count
default_fullscreen_file1=D:\Meta\Andy\Maui\ver 3.2\Maui META v3.2\Output\addfile.bmp
default_fullscreen_file2=D:\Meta\Andy\Maui\ver 3.2\Maui META v3.2\Output\w1.bmp
default_fullscreen_file3=D:\Meta\Andy\Maui\ver 3.2\Maui META v3.2\Output\w2.bmp
default_fullscreen_file4=D:\Meta\Andy\Maui\ver 3.2\Maui META v3.2\Output\w3.bmp
default_fullscreen_file5=D:\Meta\Andy\Maui\ver 3.2\Maui META v3.2\ARROW16.BMP
; selected full screen file name

[Default assoicate file table]
DEFAULT_ASSOCIATE_PATH = c:\def_image\assoicate\
; default associate FAT path, associate files will be downloaded to this FAT path
MAX_ASSOCIATE_FILE_COUNT = 5
; maximum associate file count to download to FAT
default_assoicate_file_count=5
; selected associate file count

default_assoicate_file1=D:\Meta\Andy\Maui\ver 3.2\Maui META v3.2\addfile.bmp
default_assoicate_file2=D:\Meta\Andy\Maui\ver 3.2\Maui META v3.2\all_bmp_in_imglist.bmp
default_assoicate_file3=D:\Meta\Andy\Maui\ver 3.2\Maui META v3.2\ARROW16.BMP
default_assoicate_file4=D:\Meta\Andy\Maui\ver 3.2\Maui META v3.2\calculator.bmp
default_assoicate_file5=D:\Meta\Andy\Maui\ver 3.2\Maui META v3.2\calculator_big.bmp
; selected associate file name

[Default EMS file table]
DEFAULT_EMS_PATH = c:\def_image\ems\
; default EMS FAT path, EMS files will be downloaded to this FAT path
MAX_EMS_FILE_COUNT = 5
; maximum EMS file count to download to FAT
default_EMS_file_count=1
; selected EMS file count
default_EMS_file1=D:\Meta\Andy\Maui\ver 3.2\Maui META v3.2\calculator_big.bmp
; selected EMS file name

[Default midi file table]
DEFAULT_MIDI_PATH = c:\def_sound\other\
; default midi FAT path, midi files will be downloaded to this FAT path
MAX_MIDI_FILE_COUNT = 5
; maximum midi file count to download to FAT
default_midi_file_count=5
; selected midi file count
default_midi_file1=D:\Meta\Midi\Midi song\doraemon.mid
default_midi_file2=D:\Meta\Midi\Midi song\empire.mid
```

default_midi_file3=D:\Meta\Midi\Midi song\greenoil.mid
default_midi_file4=D:\Meta\Midi\Midi song\laputa.mid
default_midi_file5=D:\Meta\Midi\Midi song\mission.mid
; selected midi file name

[Default imelody file table]
DEFAULT_IMELODY_PATH = c:\def_sound\imelody\
; default iMelody FAT path, iMelody files will be downloaded to this FAT path
MAX_IMELODY_FILE_COUNT = 5
; maximum iMelody file count to download to FAT
default_imelody_file_count=5
; selected iMelody file count
default_imelody_file1=D:\Meta\iMelody\90210.imy
default_imelody_file2=D:\Meta\iMelody\90210_1.imy
default_imelody_file3=D:\Meta\iMelody\abdelaze.imy
default_imelody_file4=D:\Meta\iMelody\adams.imy
default_imelody_file5=D:\Meta\iMelody\agadoo.imy
; selected iMelody file name

3.7 IMEI Download

User can use IMEI download window to upload/download IMEI from/to flash or load/save IMEI from/to file. User can switch to IMEI download window by selecting [IMEI download] button from main selection menu.

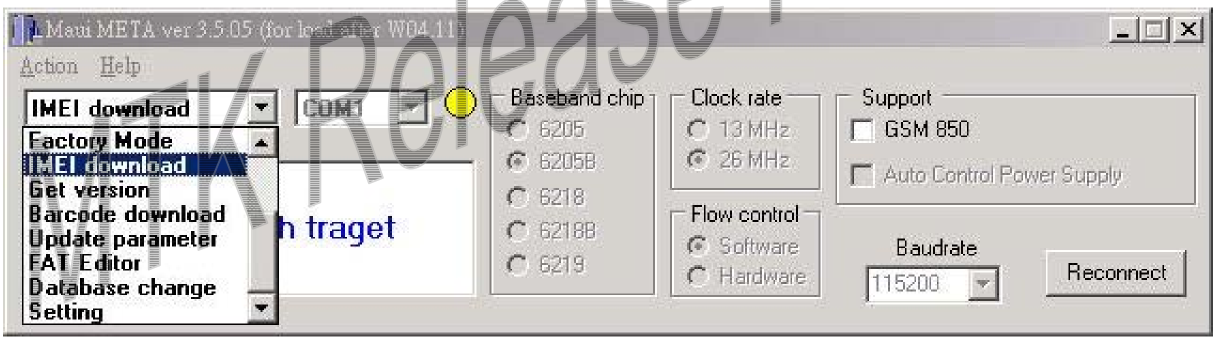

Figure 290 Select [IMEI download] button from main selection menu

3.7.1.1 Change NVRAM database file

User can click [Change NVRAM Database File] button to change NVRAM database file.

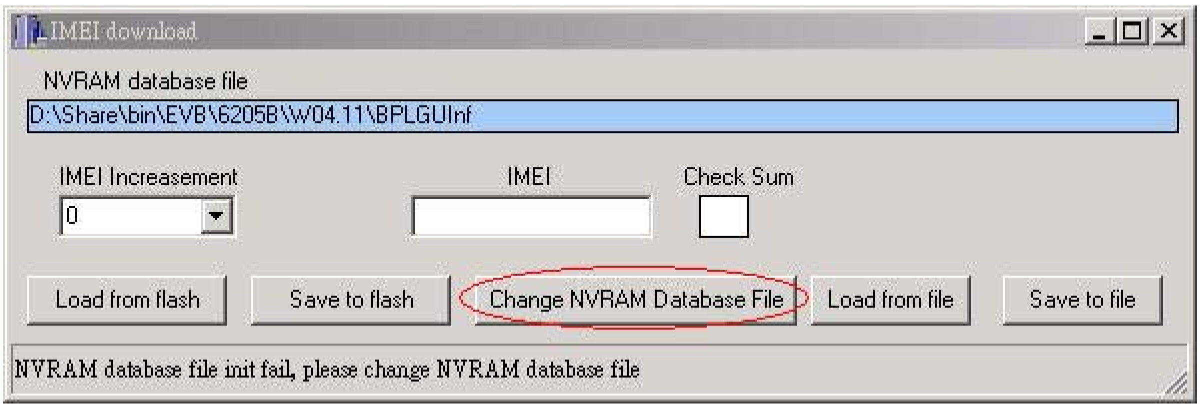

Figure 291 Click [Change NVRAM Database File] button to change NVRAM database file

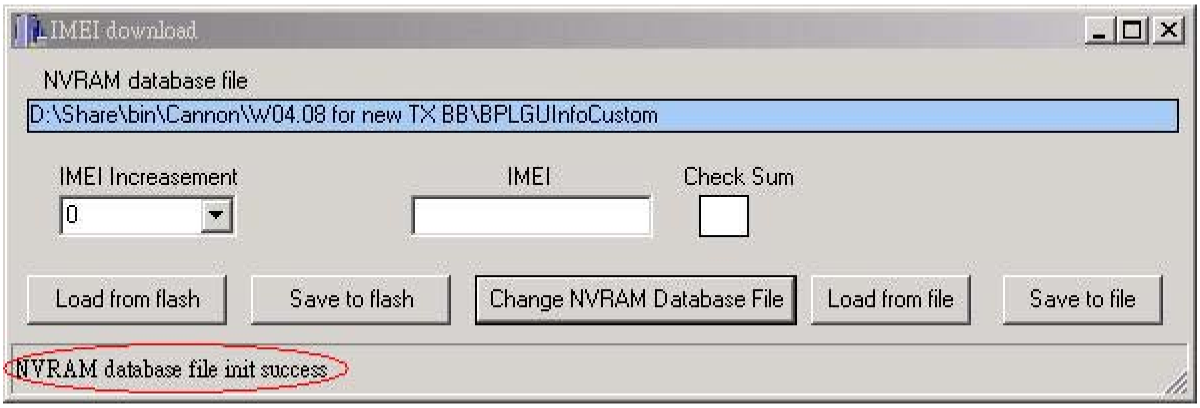

Figure 292 Result of change NVRAM database file

3.7.1.2 Upload and download IMEI in flash

User can click [Load from flash] button to read IMEI from flash and click [Save to flash] button to save IMEI to flash. After user click [Save to flash] button, the IMEI field will increase as indicated in IMEI increasement.

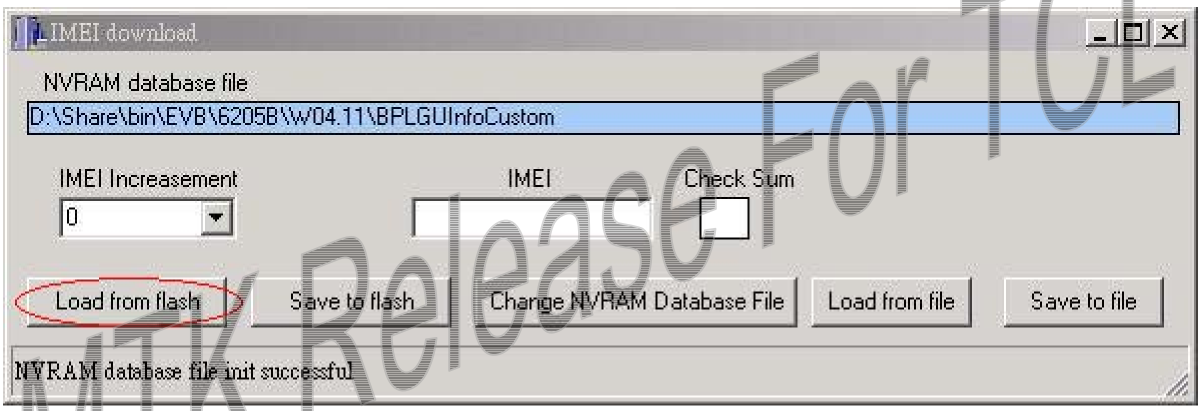

Figure 293 Click [Upload from flash] button to read IMEI from flash

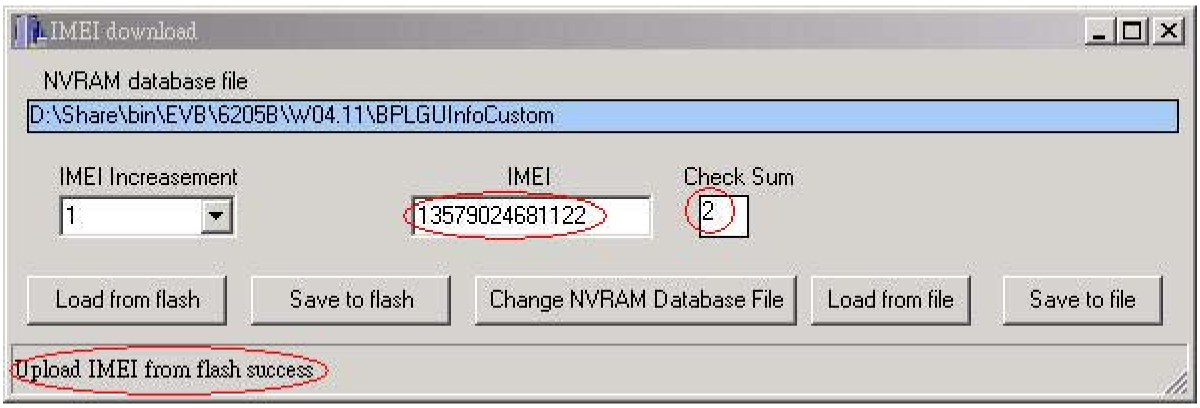

Figure 294 Result of load IMEI from flash

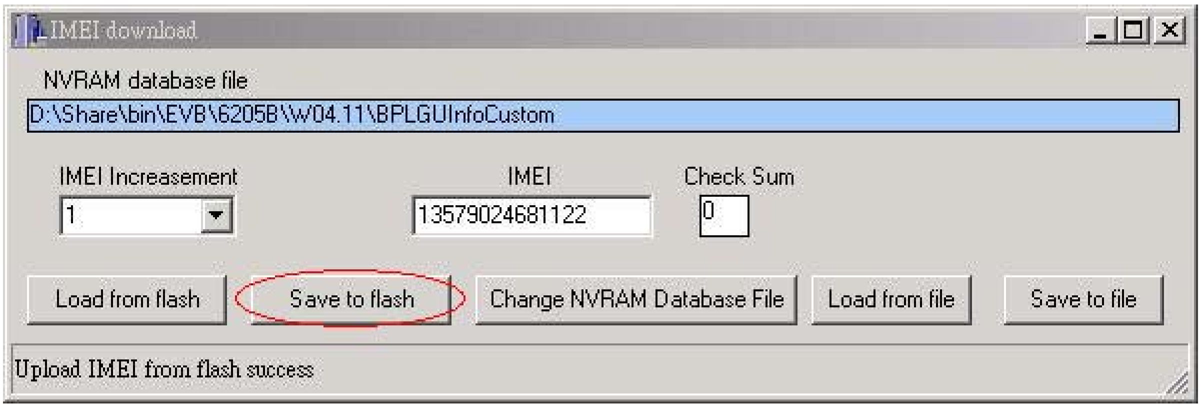

Figure 295 Click [Save to flash] button to write IMEI to flash

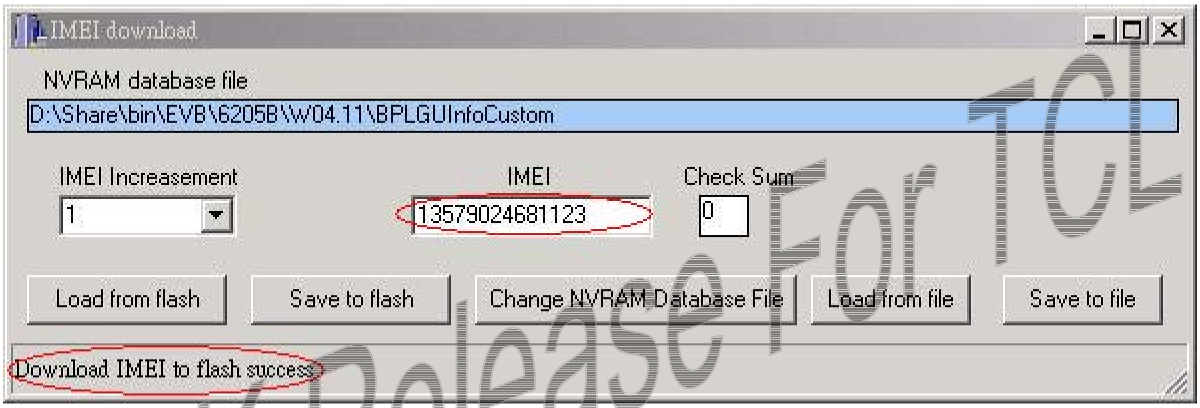

Figure 296 Result of save IMEI to flash

3.7.1.3 Read and write IMEI in file

User can click [Load from file] button to load IMEI from file and click [Save to file] button to save IMEI to file.

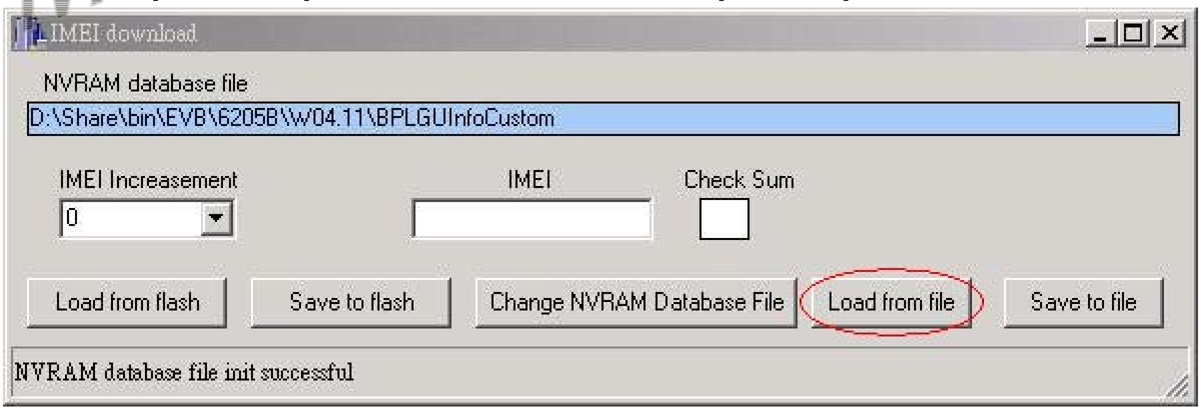

Figure 297 Click [Load from file] button to read IMEI from file

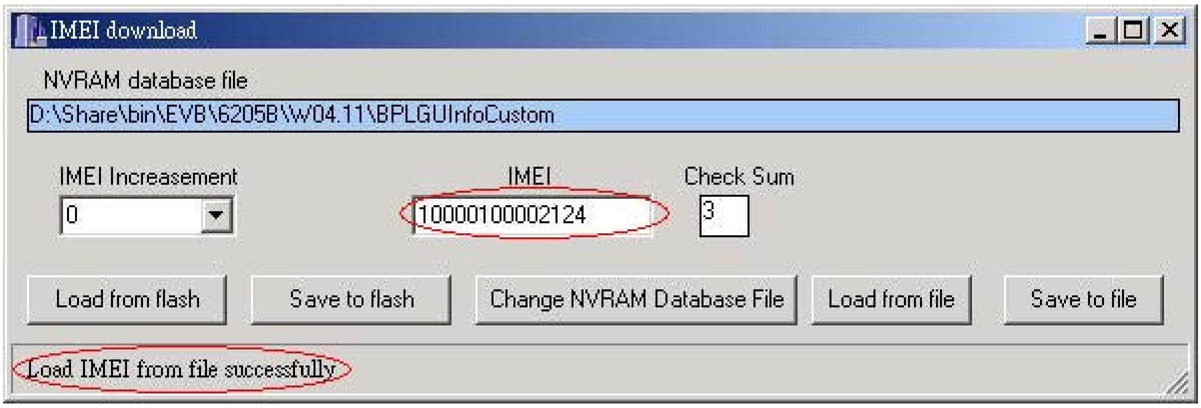

Figure 298 Result of load IMEI from file

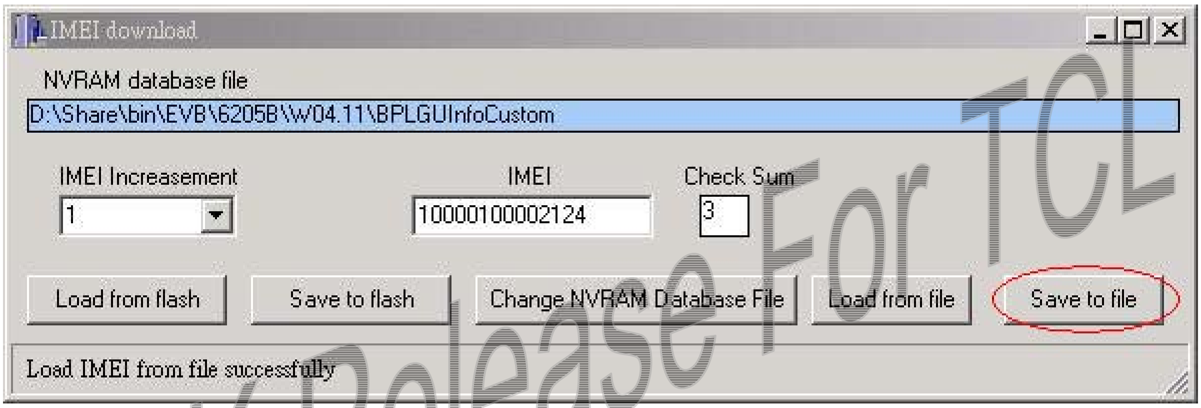

Figure 299 Click [Save to file] button to write IMEI to file

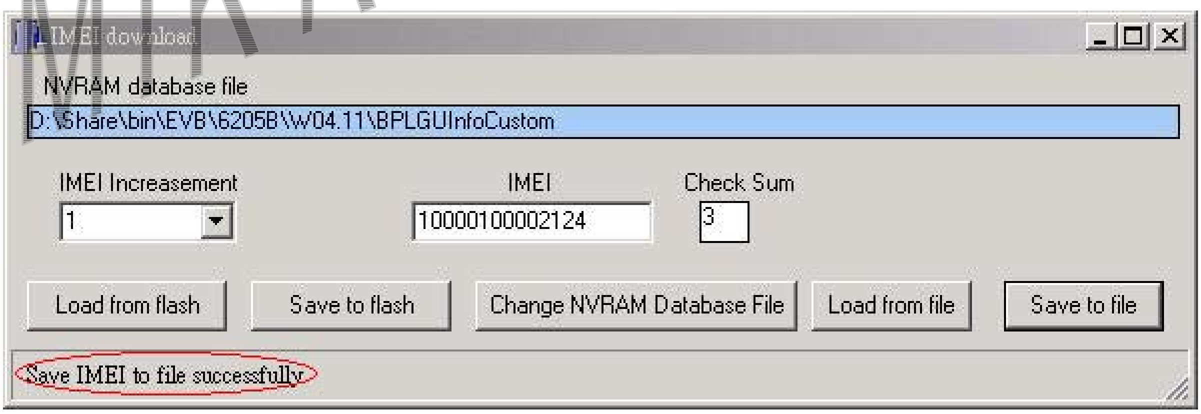

Figure 300 Result of save IMEI to file

The following is a template file that contains IMEI. User will get the text file after saving IMEI to file. Please follow the file format if you want to change the value in file.

[IMEI]
IMEI=10000100002124

3.8 Get Version

User can use Get version window to get version of baseband chip, ECO, DSP firmware, DSP patch, software, hardware and melody. User can switch to get version window by selecting [Get version] from main selection menu.

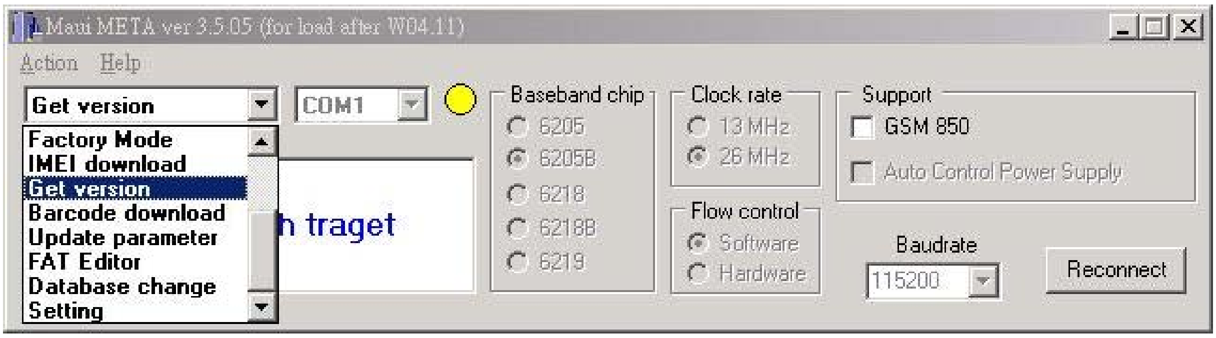

Figure 301 Select [Get version] from main selection menu

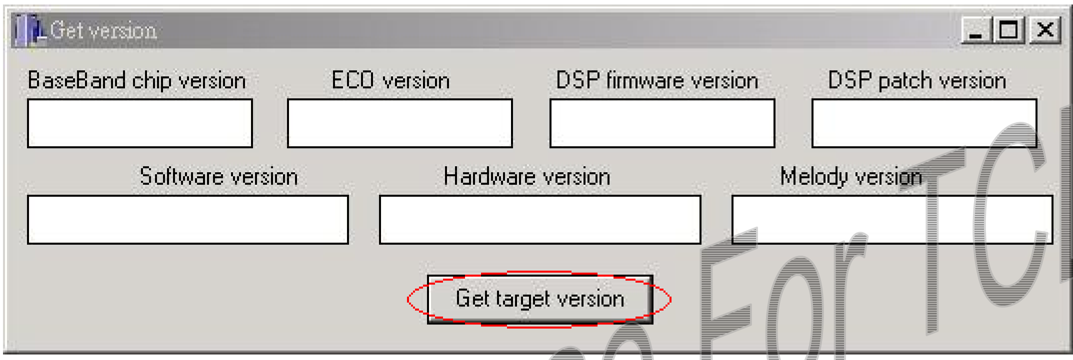

Figure 302 Click [Get target version] button to get version

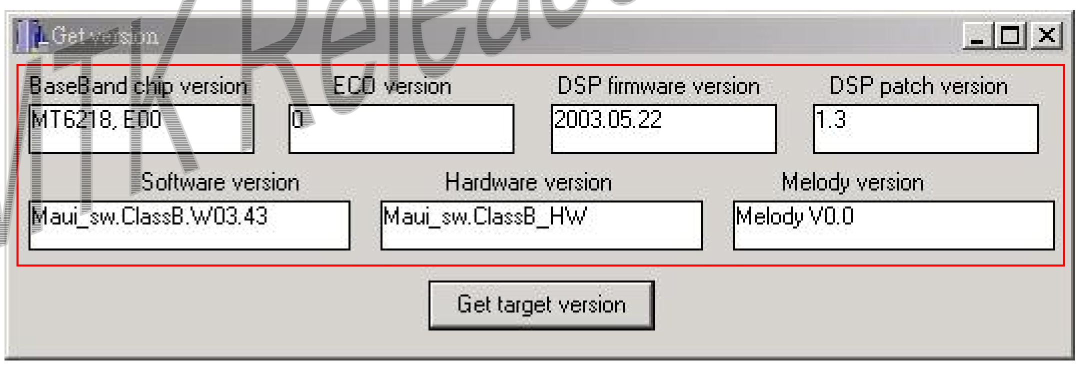

Figure 303 Result of getting target version

3.9 Barcode Download

User can use barcode download window to upload/download barcode from/to flash or load/save barcode from/to file. User can switch to barcode download window by selecting [Barcode download] from main selection menu.

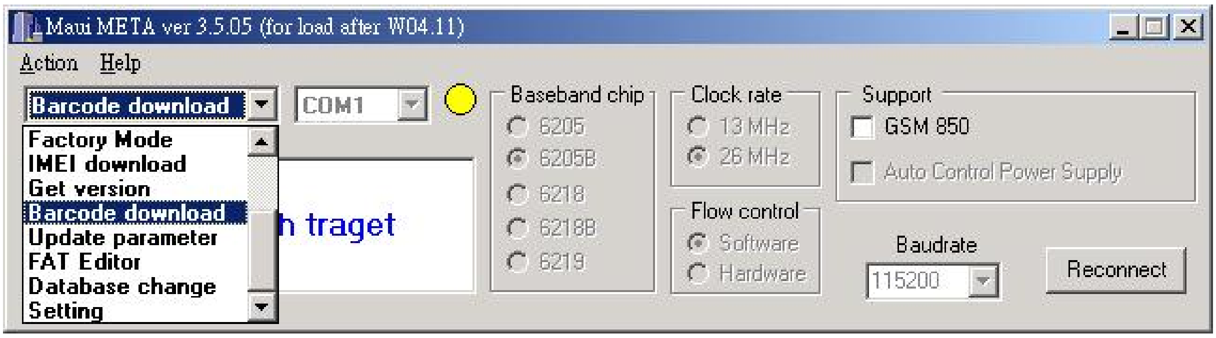

Figure 304 Select [Barcode download] from main selection menu

3.9.1.1 Upload and download barcode in flash

User can click [Load from flash] button to read barcode from flash and click [Save to flash] button to save barcode to flash.

Figure 305 Click [Load from flash] button to read barcode from flash

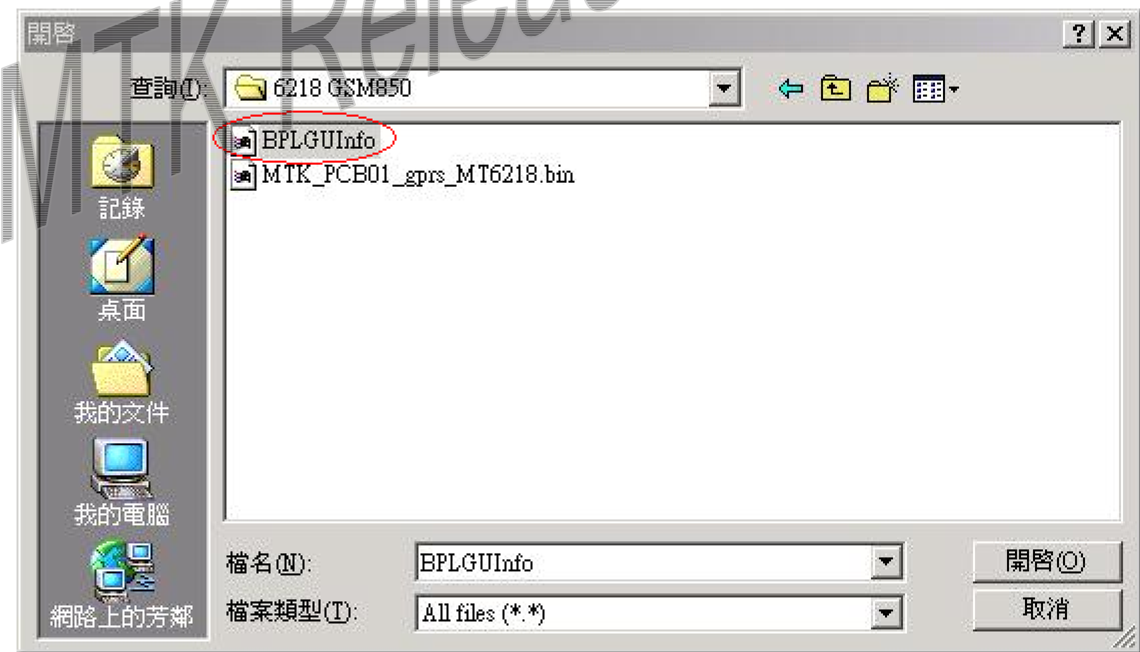

Figure 306 Select NVRAM database file if not selected before

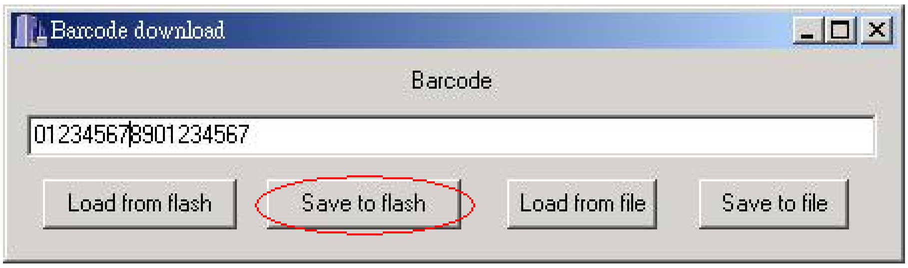

Figure 307 Click [Save to flash] button to write barcode to flash

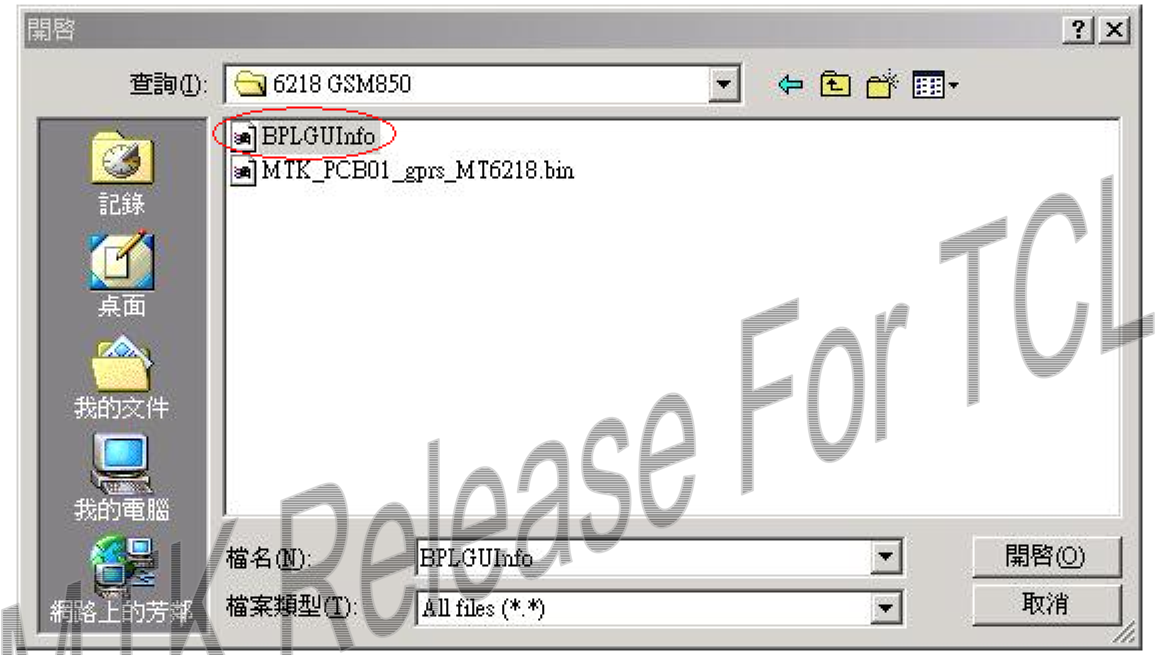

Figure 308 Select NVRAM database file if not selected before

3.9.1.2 Read and write barcode in file

User can click [Load from file] button to read barcode from file and click [Save to file] button to save barcode to file.

Figure 309 Click [Load from file] button to read barcode from file

Figure 310 Click [Save to file] button to write barcode to file

The following is a template file that contains barcode. User will get the text file after saving barcode to file. Please follow the file format if you want to change the value in file.

[Barcode]
Barcode=012345678901234567

3.10 Update Parameter

User can use update parameter window to upload/download RX path loss, AFC, APC and ADC calibration parameter or load/save RX path loss, AFC, APC and ADC calibration from/to file. User can switch to update parameter window by selecting [Update parameter] from main selection menu.

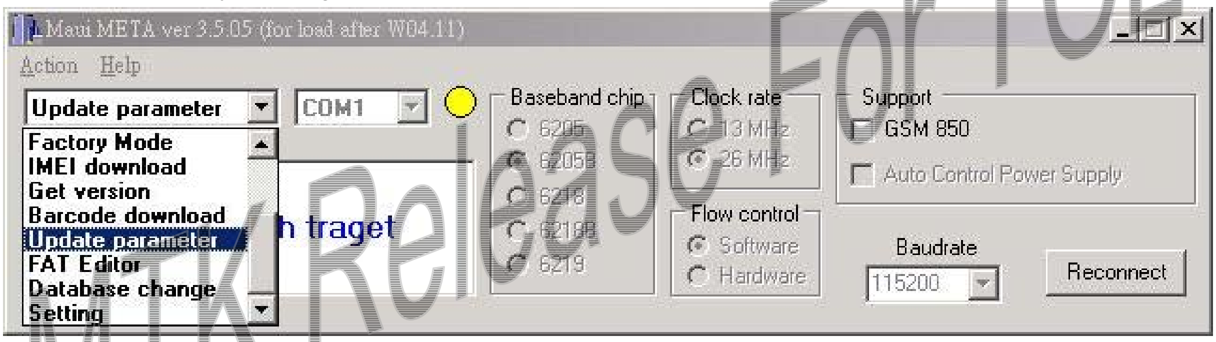

Figure 311 Select [Update parameter] from main selection menu

3.10.1.1 Upload and download parameter in flash

User can choose parameter that he wants to update and then click [Upload from flash] button to upload selected parameter from flash and click [Download to flash] button to save selected parameter to flash.

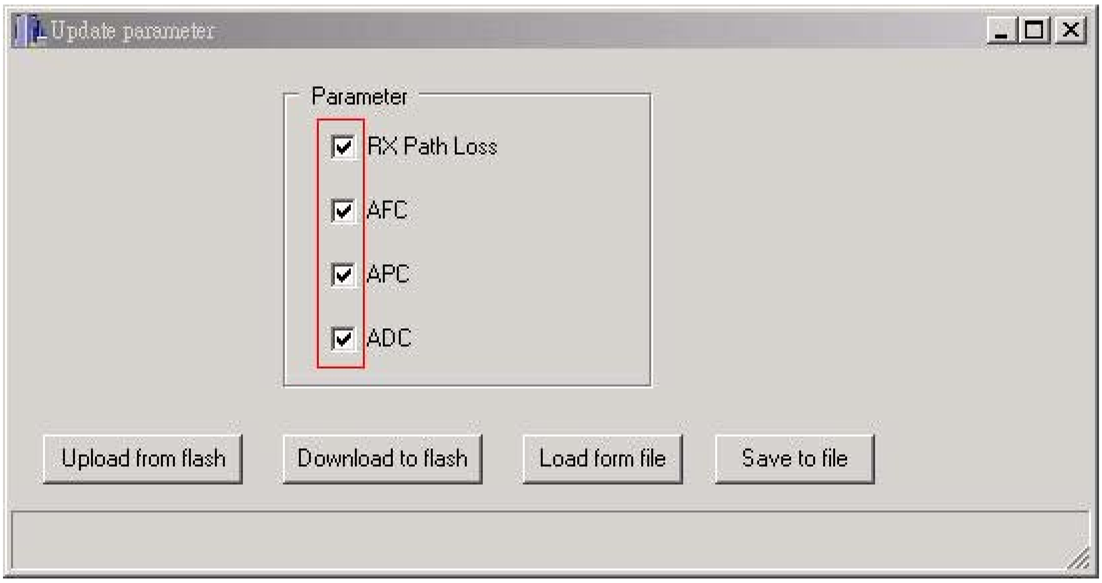

Figure 312 Click which parameter you want to update

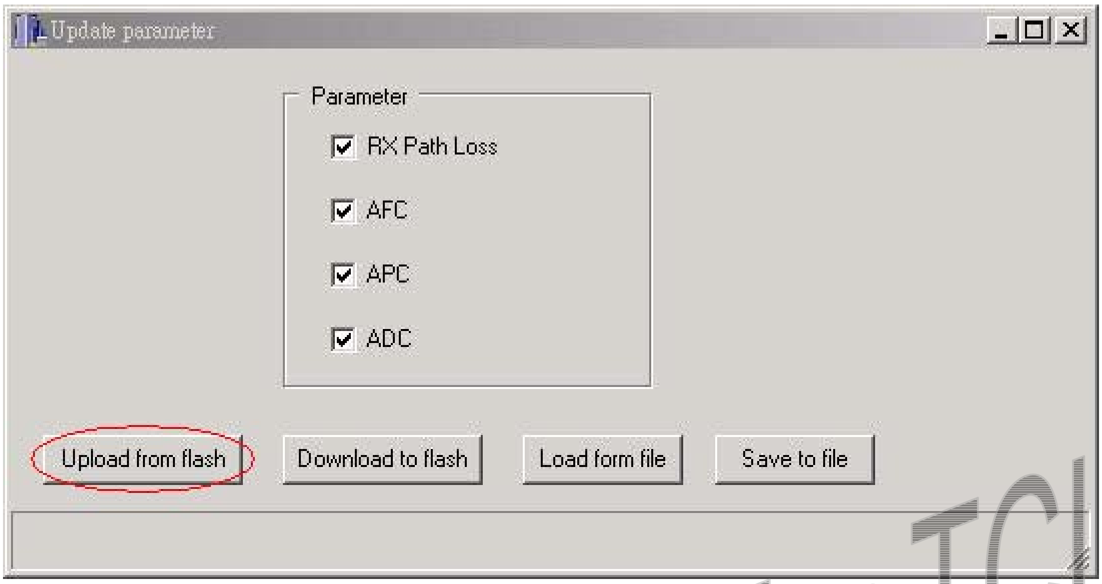

Figure 313 Click [Upload from flash] button to read parameter from flash

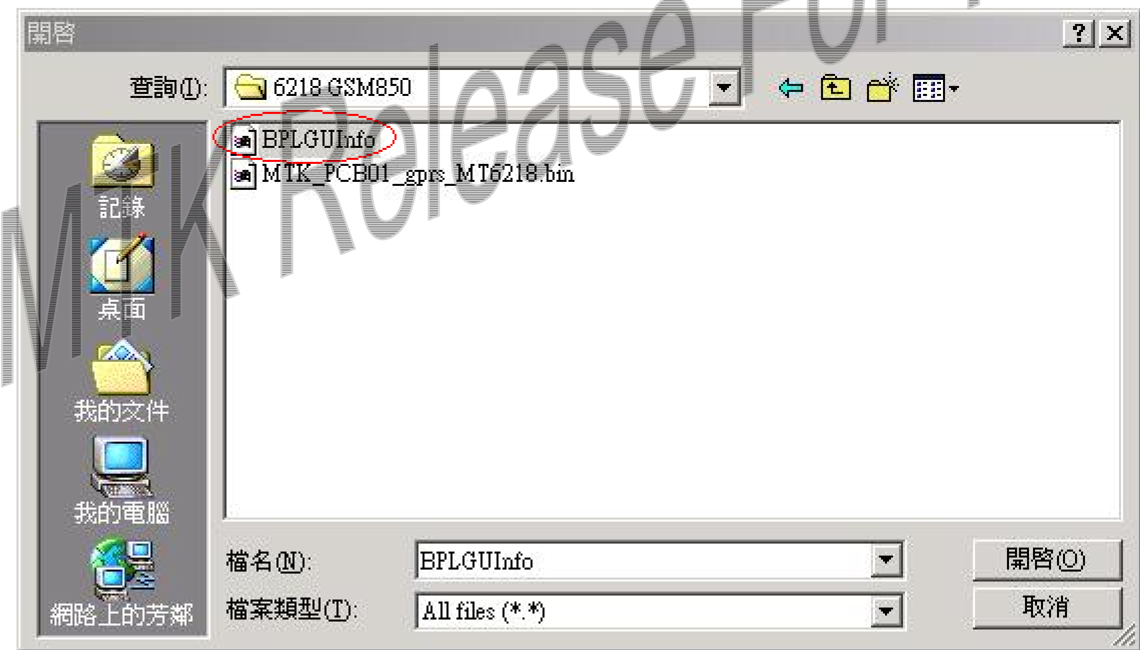

Figure 314 Select NVRAM database file if not selected before

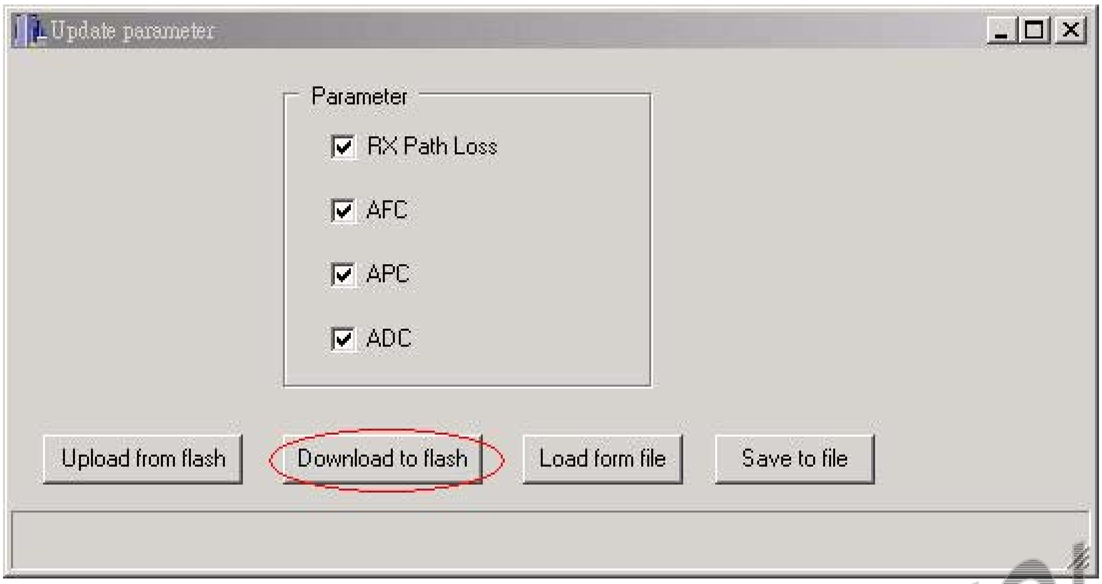

Figure 315 Click [Download to flash] button to write parameter to flash

Figure 316 Select NVRAM database file if not selected before

3.10.1.2 Read and write parameter in file

User can choose parameter that he wants to update and then click [Load from file] button to read selected parameter from file and click [Save to file] button to save selected parameter to file.

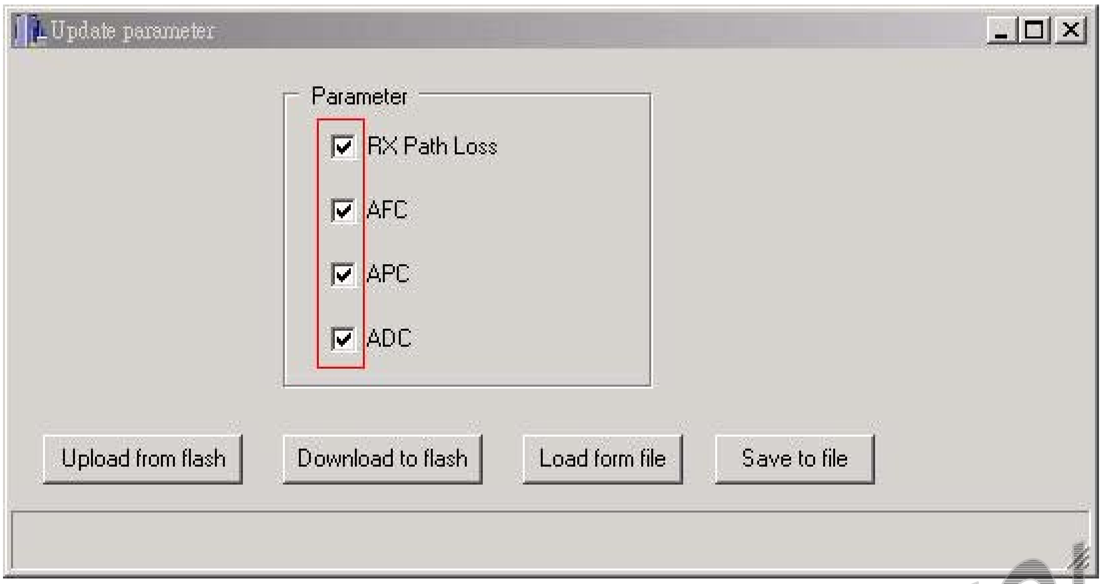

Figure 317 Click which parameter you want to update

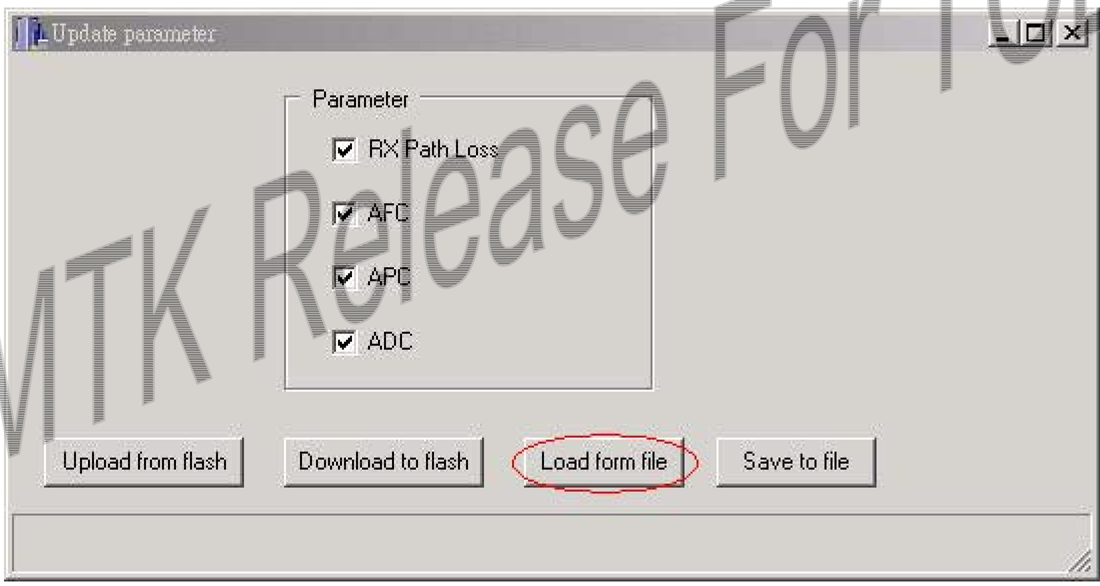

Figure 318 Click [Load from file] button to read parameter from file

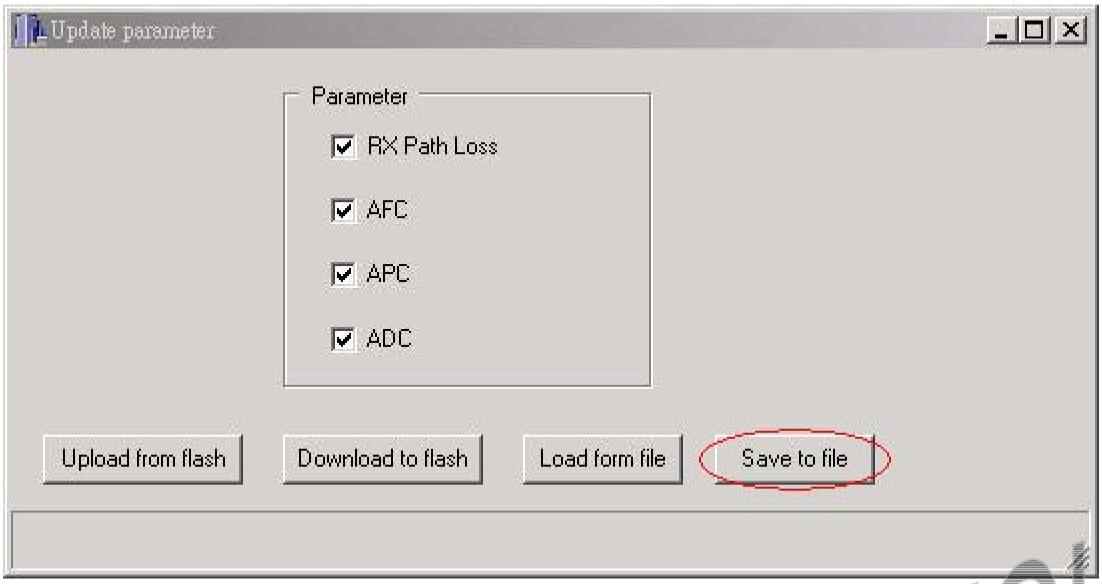

Figure 319 Click [Save to file] button to write parameter to file

The following is a template of parameter file. User can get the text file after saving parameter to file. Please follow the file format if you want to change the value in file. Please refer to 4.1.4 for the description of these parameters.

[GSM900 Sub band, RX loss]
Max ARFCN=1,20,40,60,70,80,100,124,975,1000,1023,-1
RX loss=0.375,0.125,0.500,0.875,0.875,0.625,0.250,0.750,1.125,1.000,0.375,0.0000
[DCS1800 Sub band, RX loss]
Max ARFCN=515,560,600,640,680,710,740,770,810,850,885,-1
RX loss=1.375,1.375,1.125,1.375,1.750,2.125,2.375,2.125,1.375,0.875,1.375,0.0000
[PCS1900 Sub band, RX loss]
Max ARFCN=515,540,570,600,630,660,690,720,750,780,810,-1
RX loss=1.625,1.375,1.625,1.875,2.250,2.250,2.125,1.875,1.750,2.625,4.000,0.0000
[AFC control]
Initial value=4100
Slope=3.2000
[GSM900 level, ramp]
APC dc offset=130
; APC dc offset : the field specify the pedestal value of the APC unit. The APC D/A converter
; is powered up biased on the offset value specified by the field.
TX power level=48,57,67,81,96,112,134,161,194,235,288,354,436,530,625,625
; profile 0 refer to PCL 19, profile 1 refer to PCL 18, ….., profile 14 refer to PCL 5
profile 0 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,228,255,255,255
profile 0 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 1 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,225,255,255,255
profile 1 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 2 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 2 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 3 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 3 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 4 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 4 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0

profile 5 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 5 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 6 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 6 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 7 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 7 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 8 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 8 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 9 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 9 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 10 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 10 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 11 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,255,255
profile 11 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 12 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,250,255
profile 12 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 13 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,250,255
profile 13 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 14 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,250,255
profile 14 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 15 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,250,255
profile 15 ramp down=255,239,197,138,78,32,10,0,0,0,0,0,0,0,0,0
Subband max arfcn=1,40,124,975,1023,-1,0,0,0,0,0
Subband mid level=13,13,13,13,13,5,5,5,5,5,5
Subband high weight=0.990,1.000,1.030,0.960,0.980,0.000,0.000,0.000,0.000,0.000,0.0000
Subband low weight=1.000,1.000,1.000,1.000,1.000,0.000,0.000,0.000,0.000,0.000,0.0000
;Subband mid level : the level below the [suband mid level] will be multiplied by [Subband low weight], and the level above [Subband mid level] will be multiplied by [Subband high weight].
;Subband high weight : each entry of the ramp profile of level above [Subband mid level] will be multiplied by [Subband high weight].
;Subband low weight : each entry of the ramp profile of level below [Subband mid level] will be multiplied by [Subband low weight].
Battery compensate, low voltage, low temperature=1
Battery compensate, low voltage, mid temperature=1
Battery compensate, low voltage, high temperature=1
Battery compensate, mid voltage, low temperature=1
Battery compensate, mid voltage, mid temperature=1
Battery compensate, mid voltage, high temperature=1
Battery compensate, high voltage, low temperature=1
Battery compensate, high voltage, mid temperature=1
Battery compensate, high voltage, high temperature=1
; These 3x3 array compensate the APC scaling factor under low/mid/high voltage/temperature

[DCS1800 level, ramp]
APC dc offset=130
TX power level=48,55,64,75,88,104,124,146,174,206,247,297,359,437,536,608
; profile 0 refer to PCL 15, profile 1 refer to PCL 14, ….., profile 15 refer to PCL 0
profile 0 ramp up=0,0,0,0,1,2,4,8,32,70,145,185,232,252,255,255
profile 0 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 1 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,250,255,255
profile 1 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 2 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,250,255,255

profile 2 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 3 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,250,255,255
profile 3 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 4 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,250,255,255
profile 4 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 5 ramp up=0,0,0,0,1,2,4,8,30,65,143,219,250,255,255,255
profile 5 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 6 ramp up=0,0,0,0,1,2,4,8,30,65,143,219,250,255,255,255
profile 6 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 7 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 7 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 8 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 8 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 9 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 9 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 10 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 10 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 11 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 11 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 12 ramp up=0,0,0,0,0,0,1,2,4,8,30,65,143,219,255,255
profile 12 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 13 ramp up=0,0,0,0,0,0,1,2,4,8,30,65,143,219,255,255
profile 13 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 14 ramp up=0,0,0,0,0,0,1,2,4,8,30,65,143,219,255,255
profile 14 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 15 ramp up=0,0,0,0,0,0,0,3,7,24,60,120,172,232,255,255
profile 15 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
Subband max arfcn=520,560,600,630,660,680,720,730,750,800,885
Subband mid level=15,15,15,15,15,15,15,15,15,15,15
Subband high weight=0.950,0.960,0.970,0.980,0.990,1.000,1.000,1.000,1.010,1.020,1.0300
Subband low weight=1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.0000
;Subband mid level : the level below the [suband mid level] will be multiplied by [Subband low weight], and the level above [Subband mid level] will be multiplied by [Subband high weight].
;Subband high weight : each entry of the ramp profile of level above [Subband mid level] will be multiplied by [Subband high weight].
;Subband low weight : each entry of the ramp profile of level below [Subband mid level] will be multiplied by [Subband low weight].
Battery compensate, low voltage, low temperature=1
Battery compensate, low voltage, mid temperature=1
Battery compensate, low voltage, high temperature=1
Battery compensate, mid voltage, low temperature=1
Battery compensate, mid voltage, mid temperature=1
Battery compensate, mid voltage, high temperature=1
Battery compensate, high voltage, low temperature=1
Battery compensate, high voltage, mid temperature=1
Battery compensate, high voltage, high temperature=1
; These 3x3 array compensate the APC scaling factor under low/mid/high voltage/temperature

[PCS1900 level, ramp]
APC dc offset=120
TX power level=47,54,62,73,85,102,121,144,174,210,255,311,381,471,587,670
; profile 0 refer to PCL 15, profile 1 refer to PCL 14, ….., profile 15 refer to PCL 0

profile 0 ramp up=0,0,0,0,0,0,2,7,24,60,120,172,232,255,255,255
profile 0 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 1 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 1 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 2 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 2 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 3 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 3 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 4 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 4 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 5 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 5 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 6 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 6 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 7 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 7 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 8 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 8 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 9 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 9 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 10 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 10 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 11 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 11 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 12 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 12 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 13 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 13 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 14 ramp up=0,0,0,0,0,1,2,4,8,24,60,120,172,232,255,255
profile 14 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 15 ramp up=0,0,0,0,0,1,2,4,8,24,56,130,172,232,255,255
profile 15 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
Subband max arfcn=520,560,600,630,660,680,720,730,750,800,810
Subband mid level=15,15,15,15,15,15,15,15,15,15,15
Subband high weight=1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.0000
Subband low weight=1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.0000
;Subband mid level : the level below the [suband mid level] will be multiplied by [Subband low weight], and the level above [Subband mid level] will be multiplied by [Subband high weight].
;Subband high weight : each entry of the ramp profile of level above [Subband mid level] will be multiplied by [Subband high weight].
;Subband low weight : each entry of the ramp profile of level below [Subband mid level] will be multiplied by [Subband low weight].
Battery compensate, low voltage, low temperature=1
Battery compensate, low voltage, mid temperature=1
Battery compensate, low voltage, high temperature=1
Battery compensate, mid voltage, low temperature=1
Battery compensate, mid voltage, mid temperature=1
Battery compensate, mid voltage, high temperature=1
Battery compensate, high voltage, low temperature=1
Battery compensate, high voltage, mid temperature=1
Battery compensate, high voltage, high temperature=1
; These 3x3 array compensate the APC scaling factor under low/mid/high voltage/temperature

[ADC control]
offset=23286,23286,23286,0,0,0,0
slope=5524,5524,5524,5524,5524,23286,23286

3.11 FAT Editor

User can use FAT editor window to read, write, delete files in FAT and get FAT disk information which contains sector per cluster, FAT total size and FAT free space. User can switch to FAT editor window by selecting [FAT editor] from main selection menu.

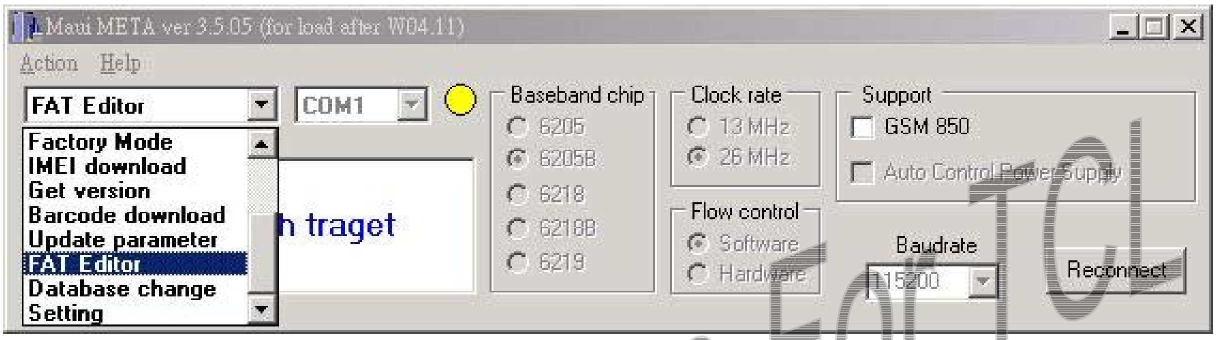

Figure 320 Select [FAT editor] from main selection menu

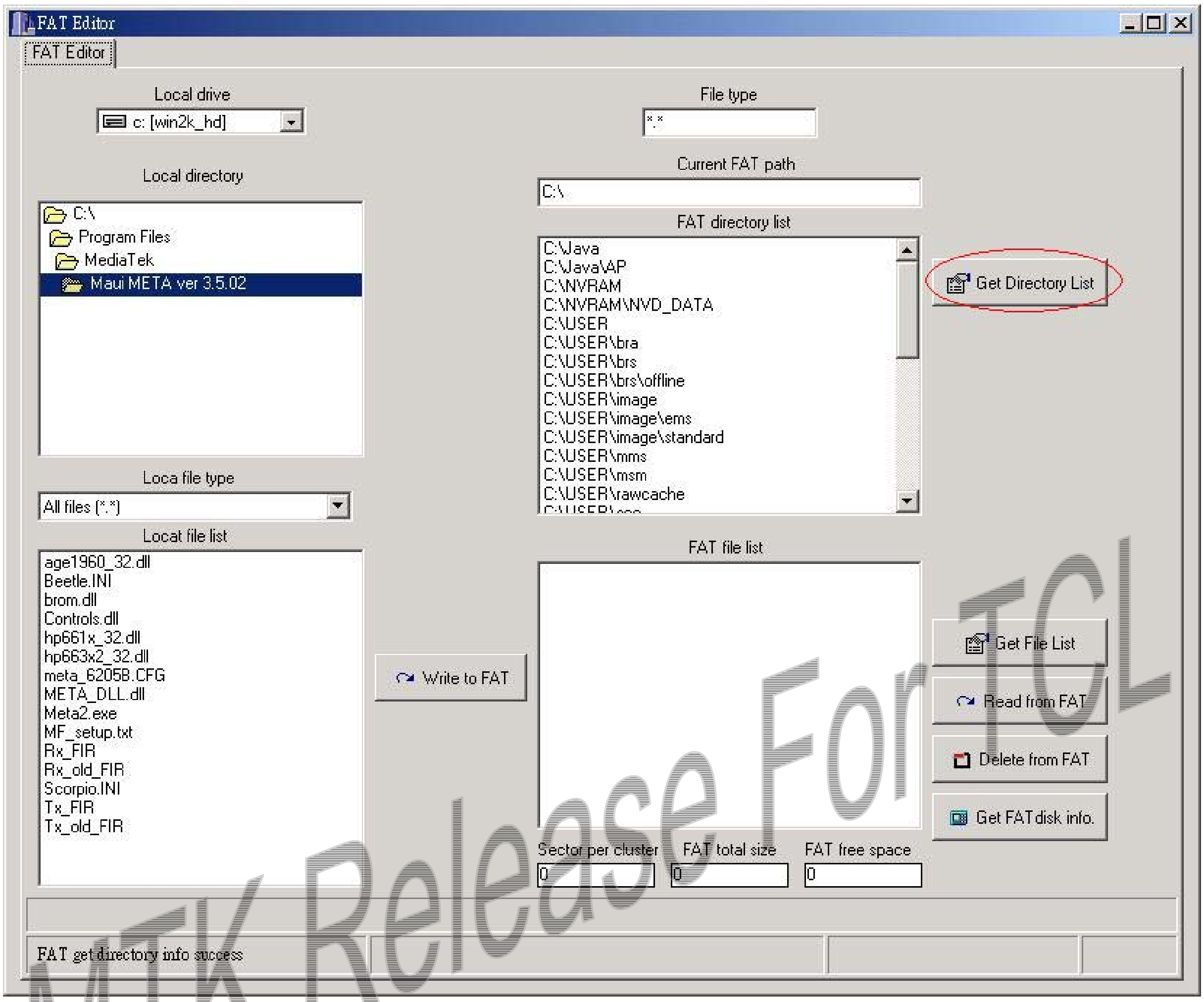

Figure 321 Click [Get directory list] button to get all FAT directory list

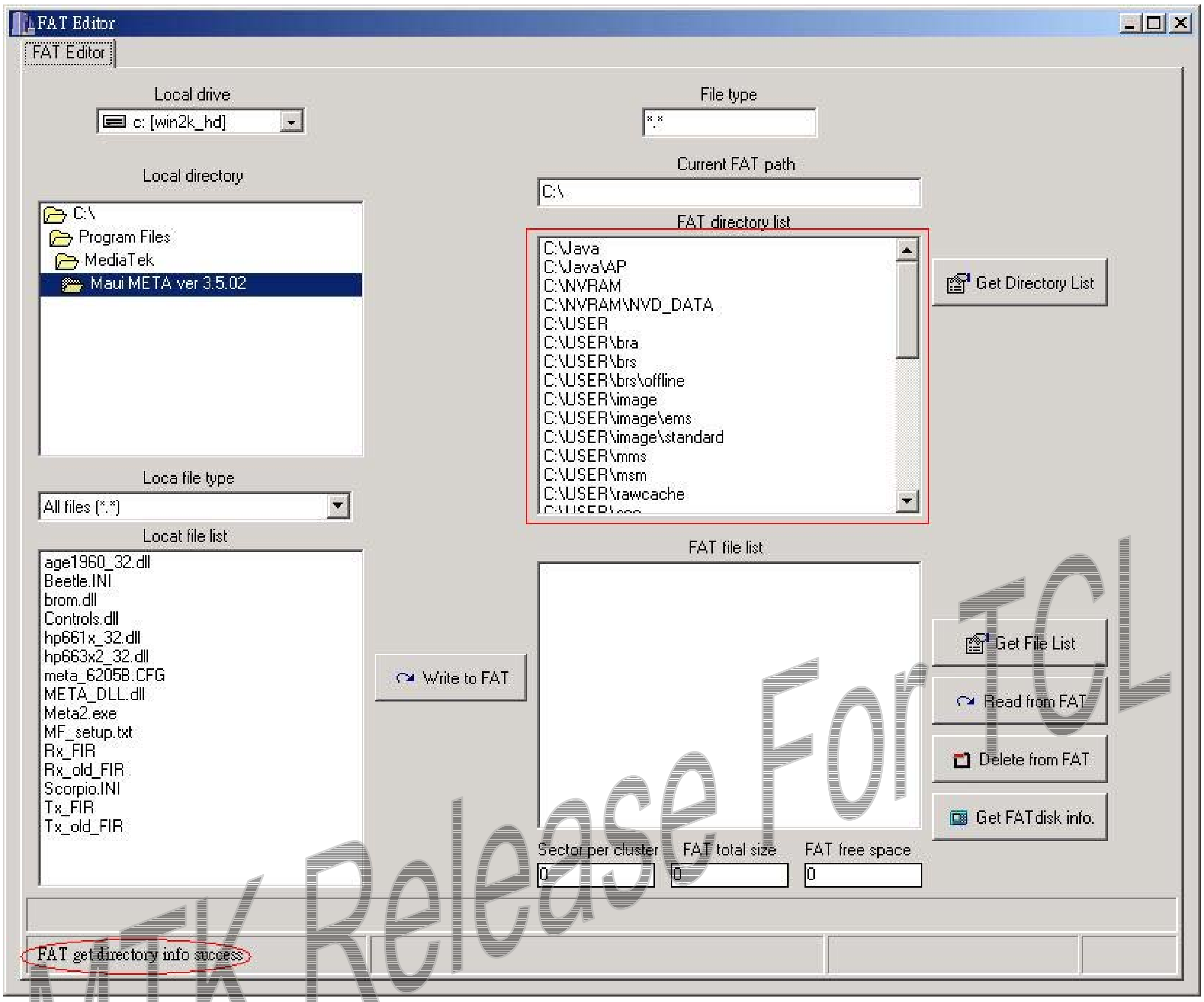

Figure 322 Result of getting directory list

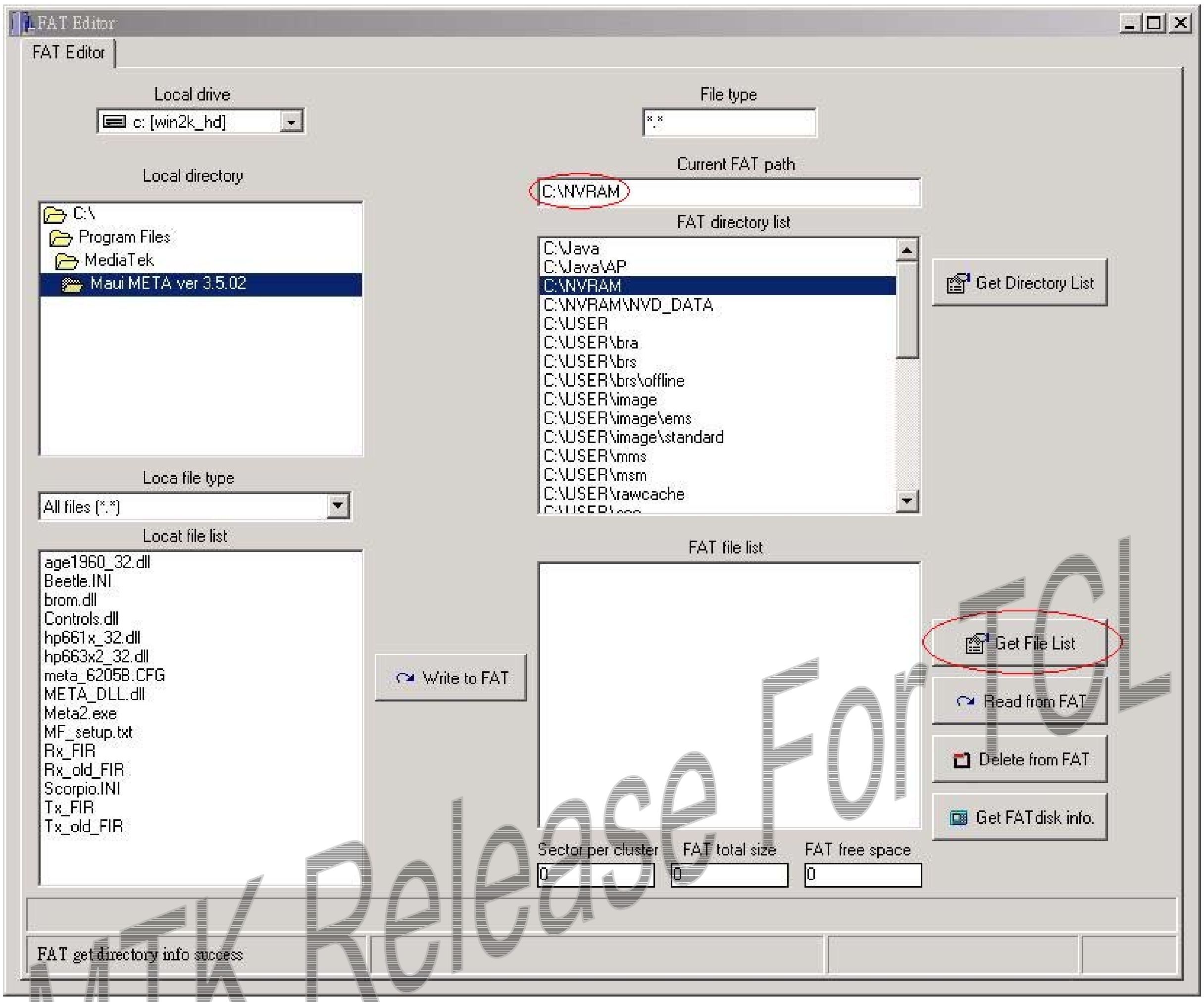

Figure 323 Enter FAT path and then click [Get File List] button to get FAT file list

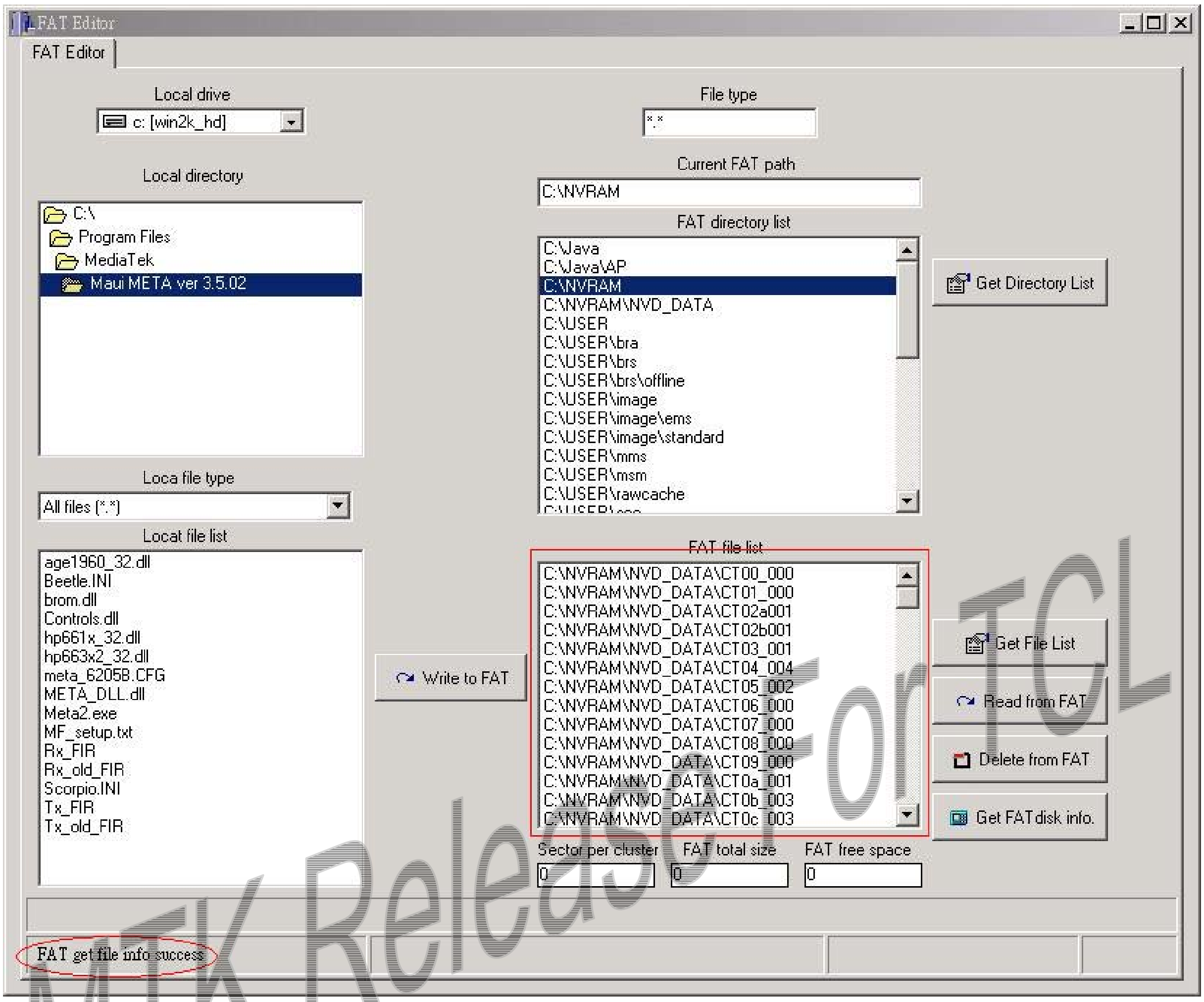

Figure 324 Result of getting FAT file list

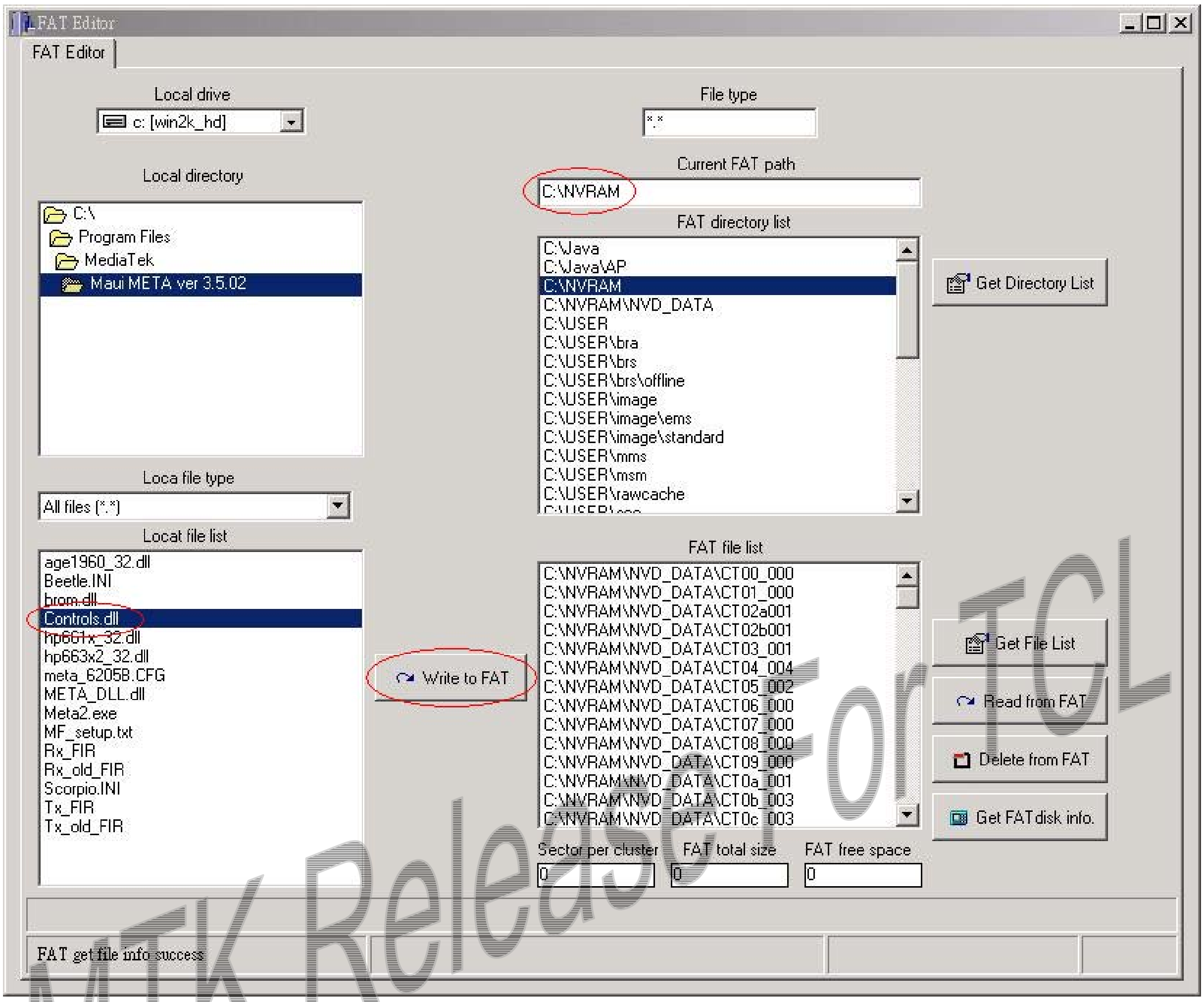

Figure 325 Select local file, enter FAT path and then click [Write to FAT] button to write file to FAT

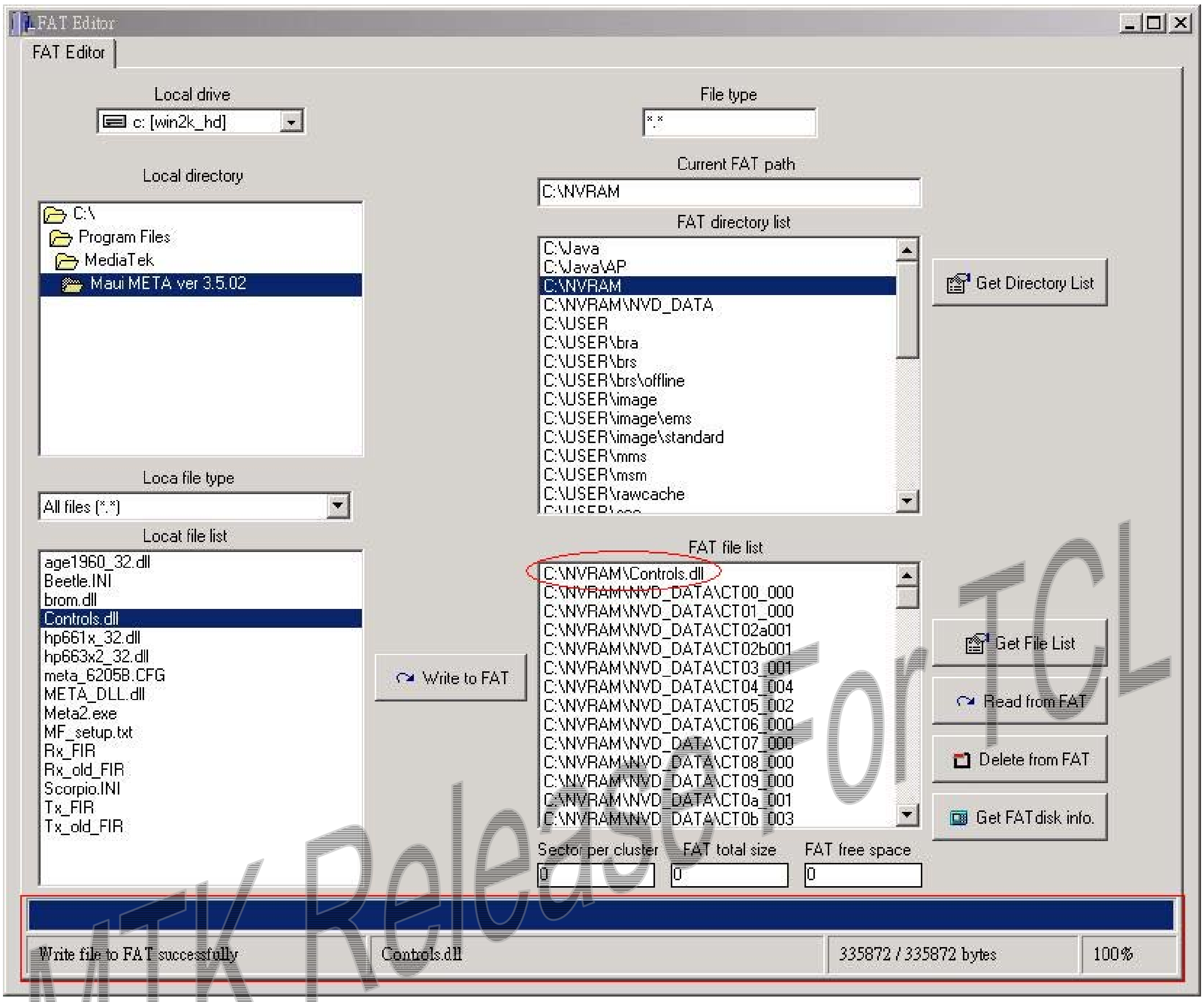

Figure 326 Result of writing file to FAT

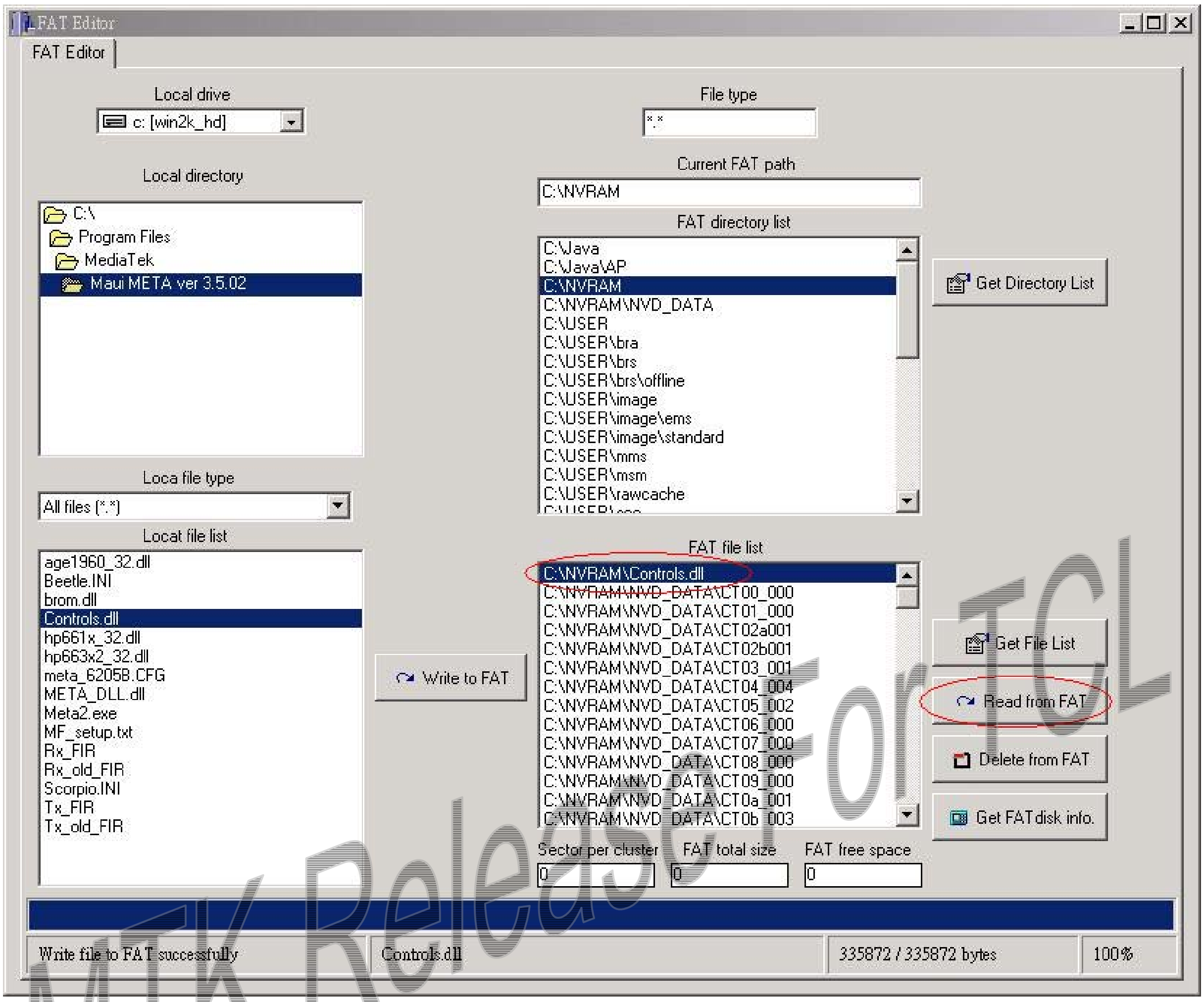

Figure 327 Select FAT file and then click [Read from FAT] button to read file from FAT

Figure 328 Select folder and file name to save FAT file to local disk

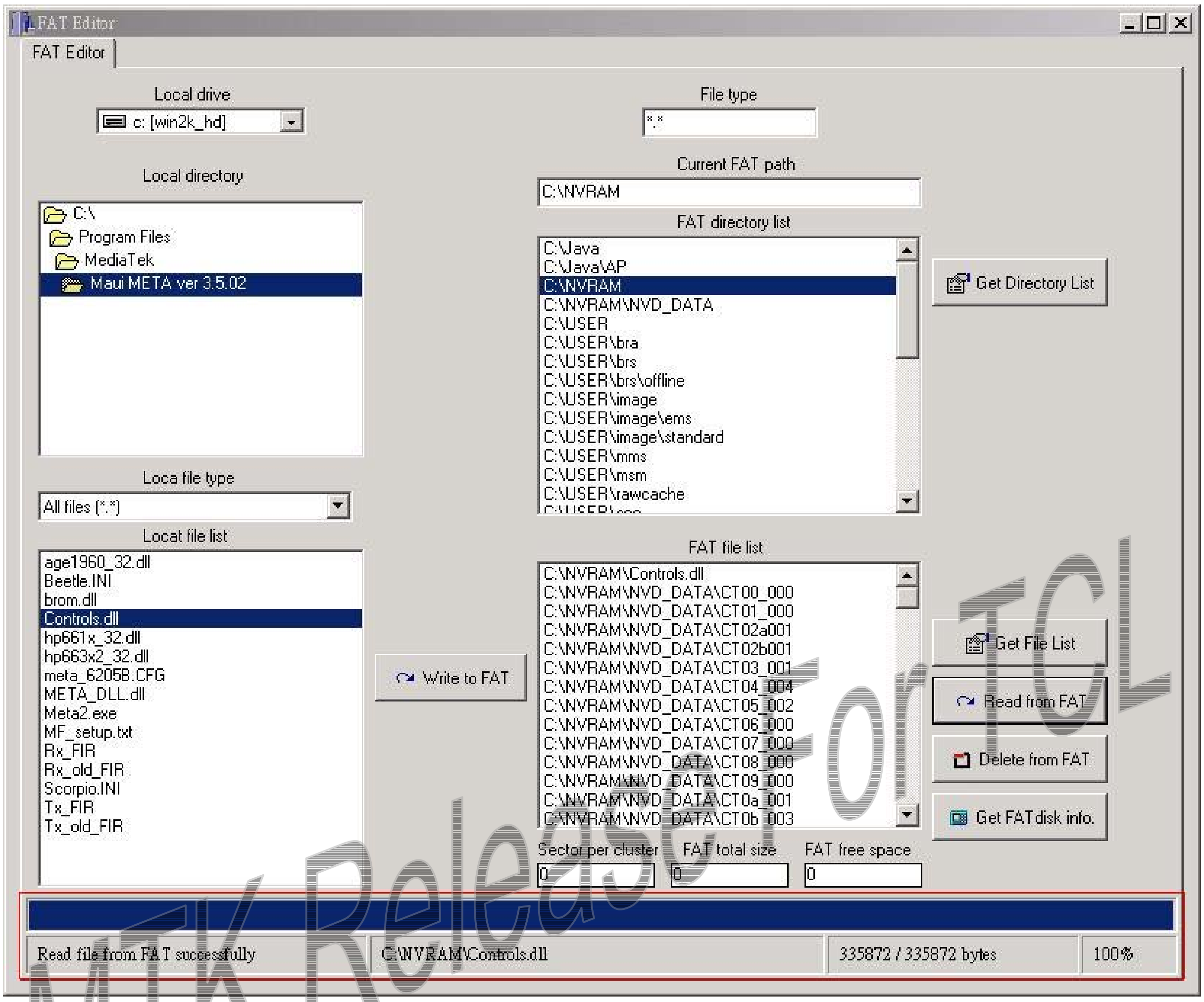

Figure 329 Result of reading FAT file

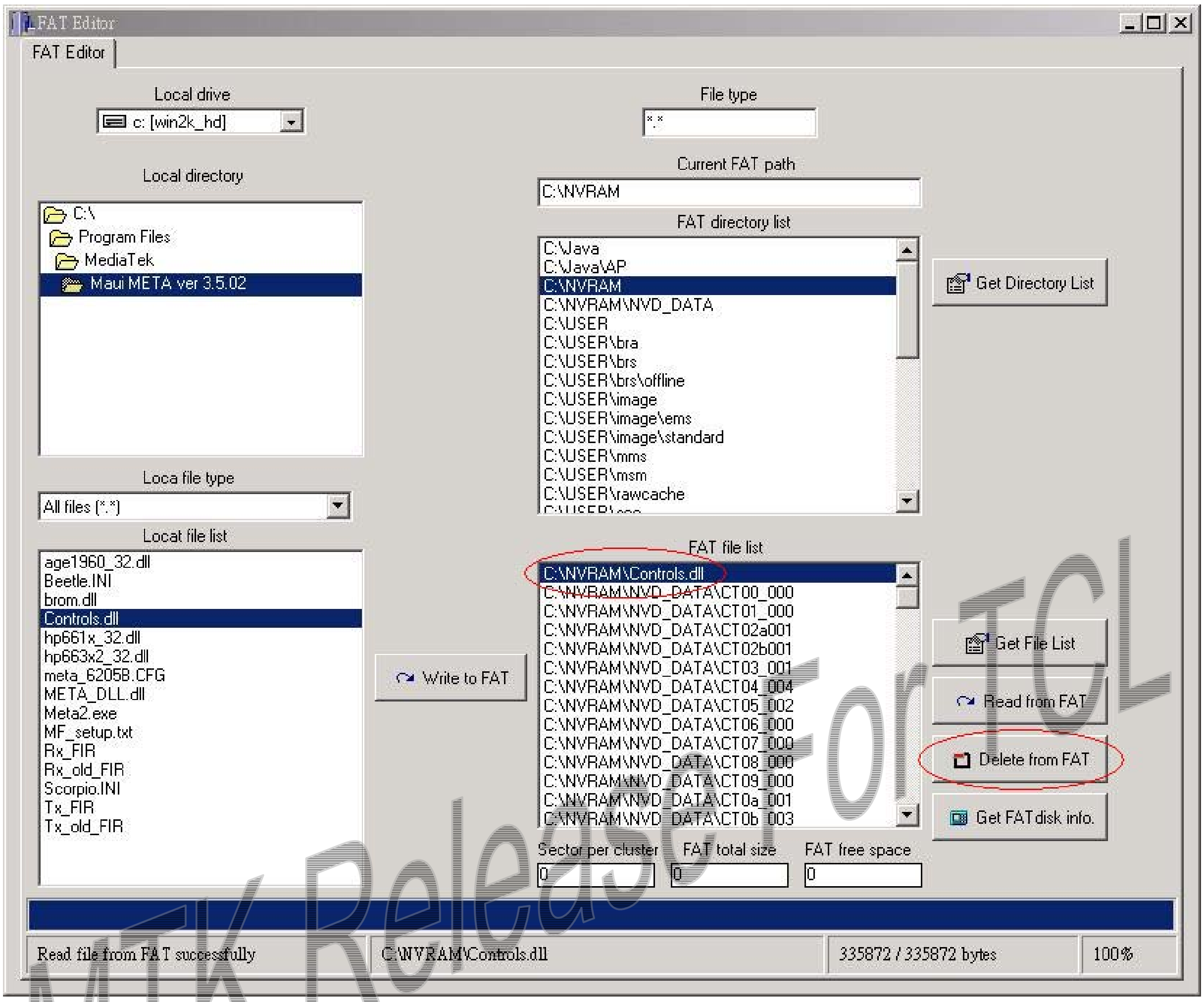

Figure 330 Select FAT file then click [Delete from FAT] button to delete FAT file

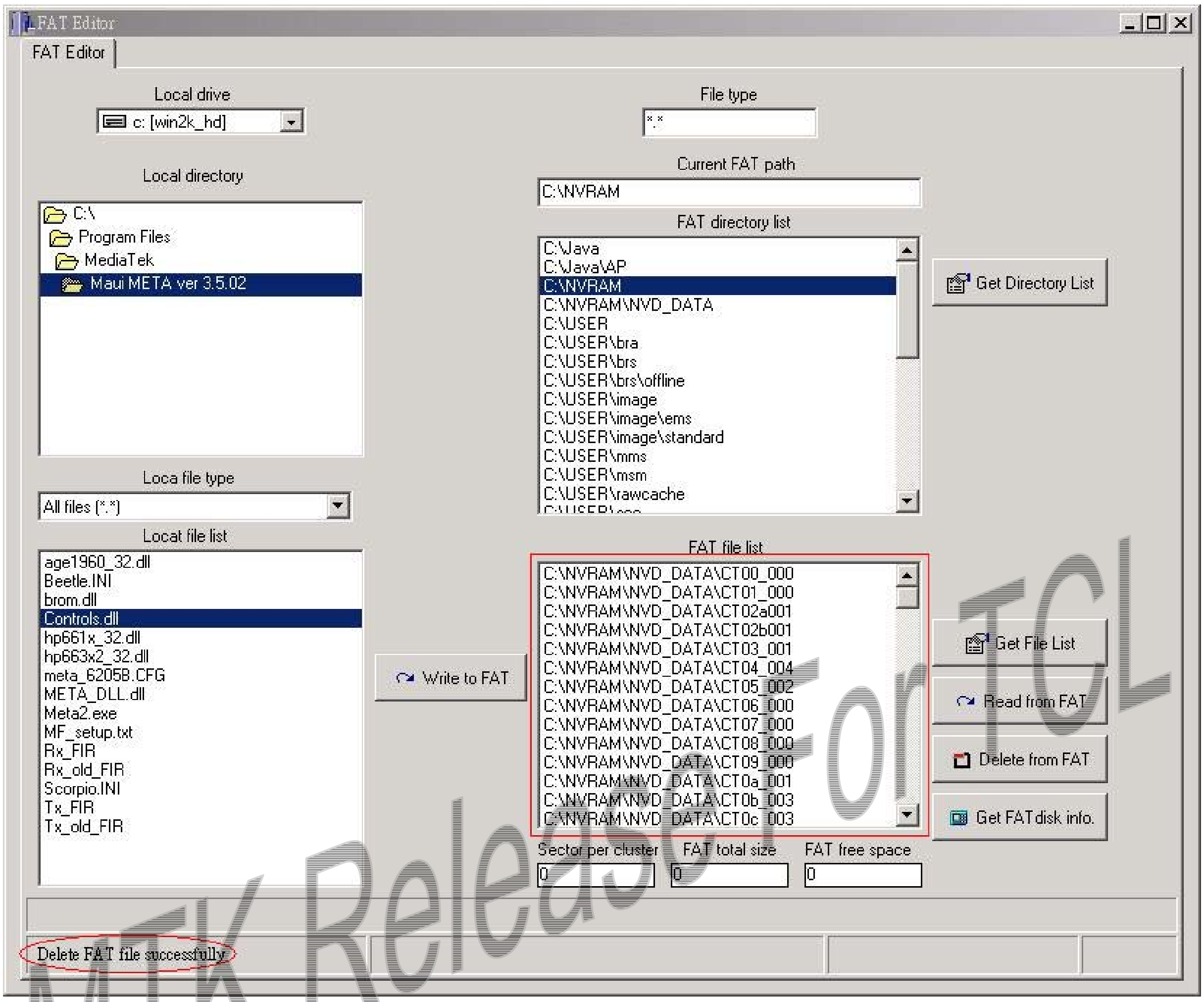

Figure 331 Result of deleting FAT file

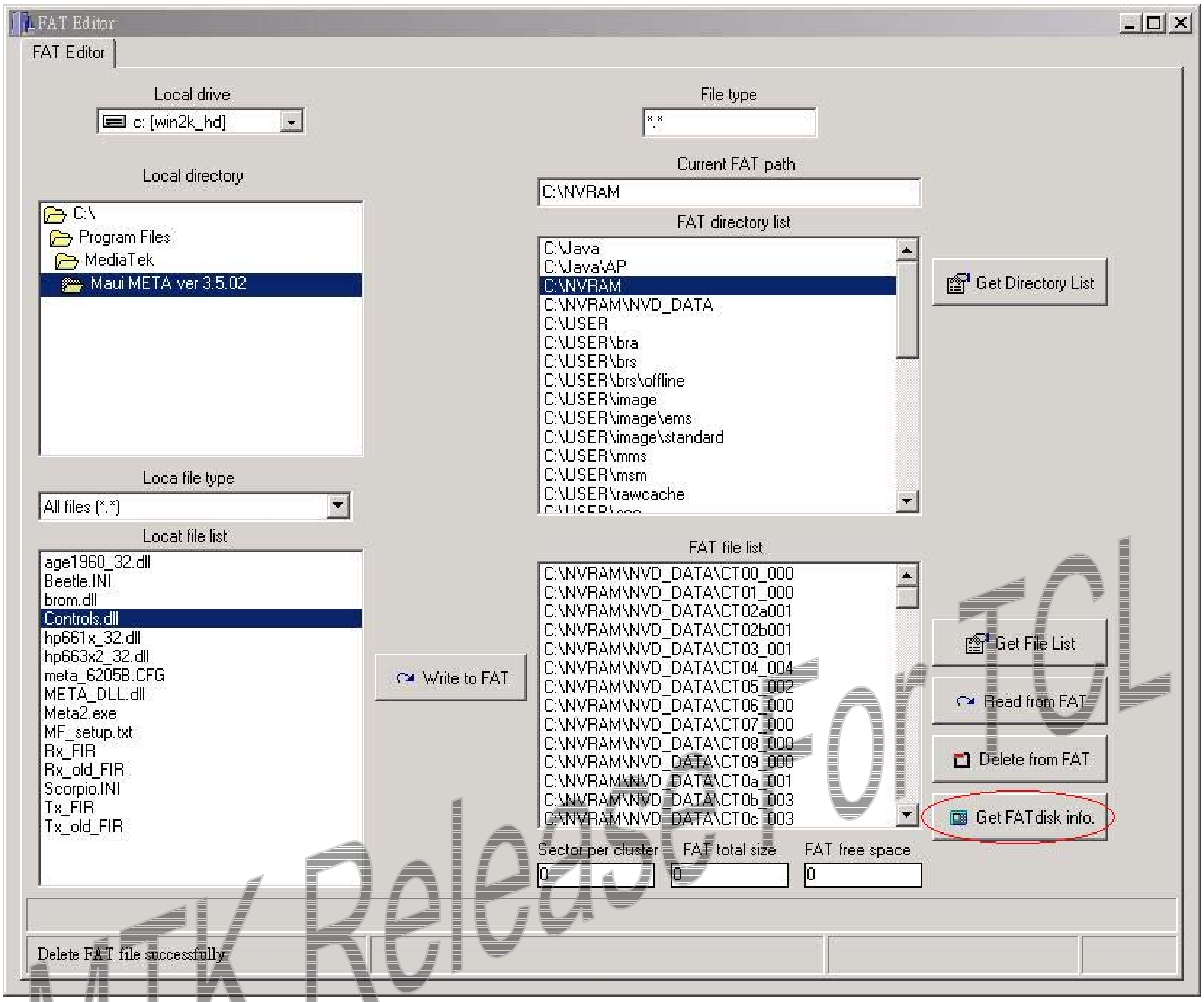

Figure 332 Click [Get FAT disk info.] button to get FAT disk information

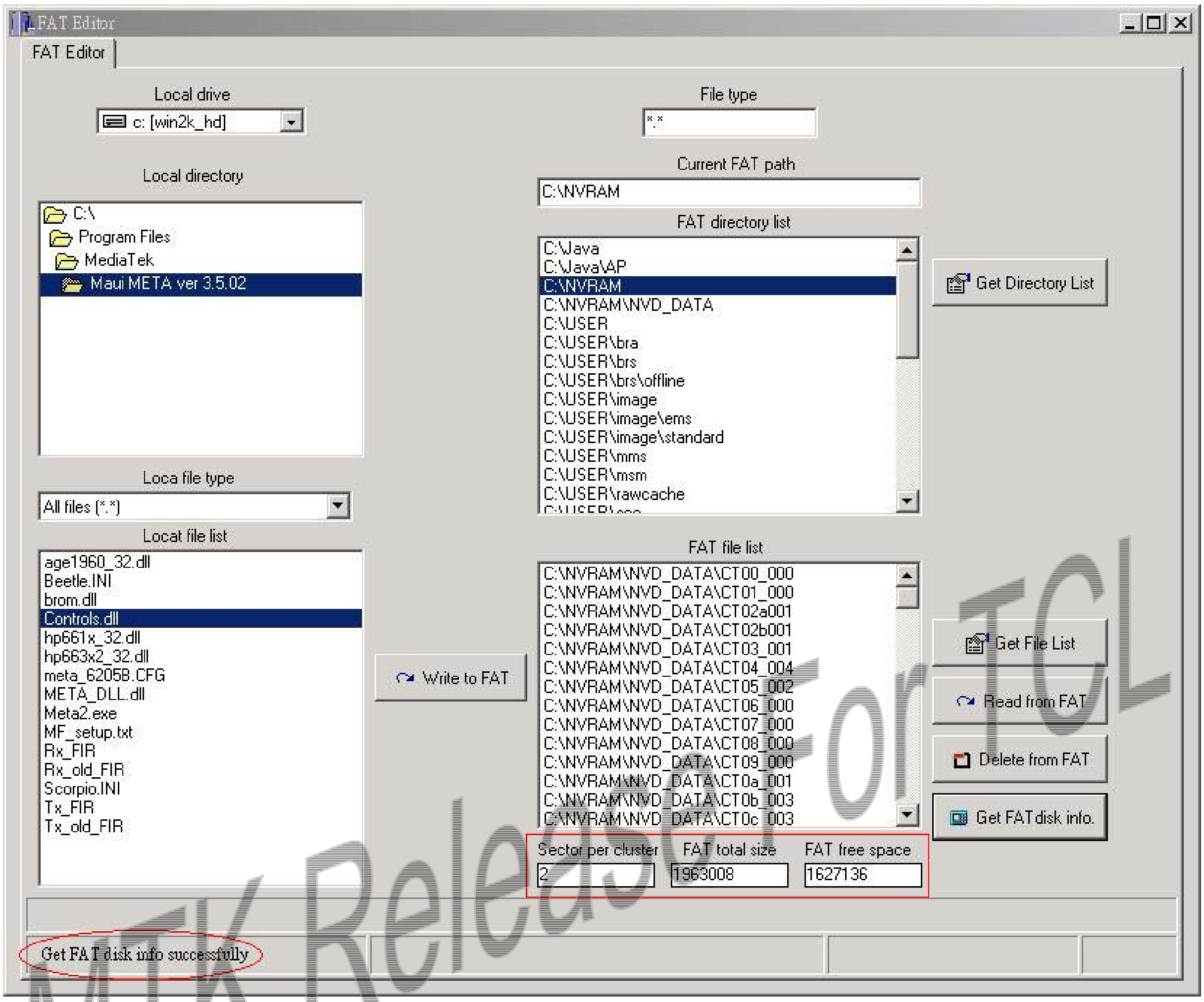

Figure 333 Result of getting FAT disk info.

3.12 Database Change

User can use database change window to get database change list between two NVRAM database files and FAT free space. User can switch to database change window by selecting [Database change] from main selection menu.

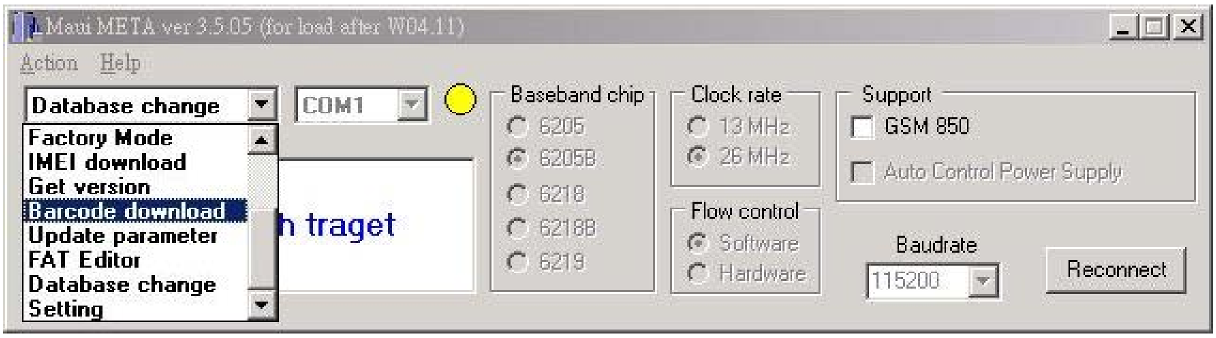

Figure 334 Select [Database change] from main selection menu

User can click [Get FAT free space] button to get FAT free space of old database file, NVRAM size of old database file, overhead of transforming from old NVRAM database to new NVRAM database and NVRAM size of new database file.

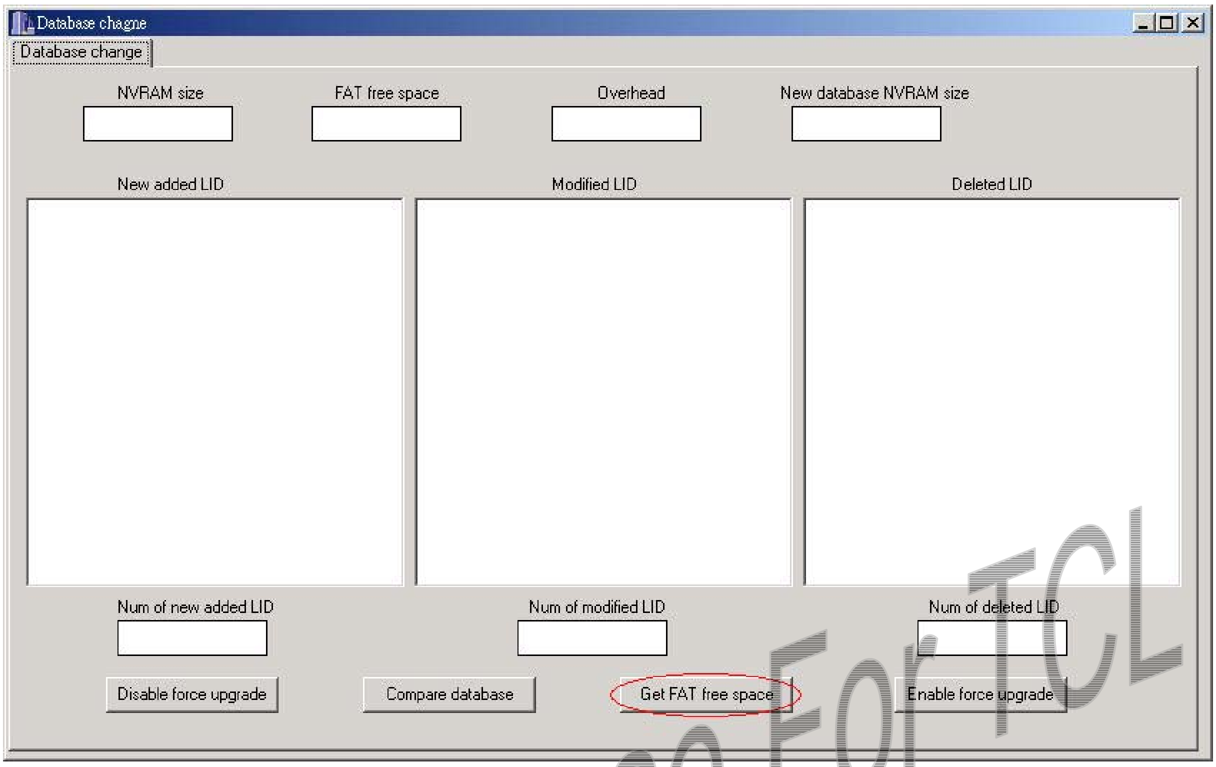

Figure 335 Click [Get FAT free space] button to get NVRAM size, FAT free space, overhead and new database NVRAM size

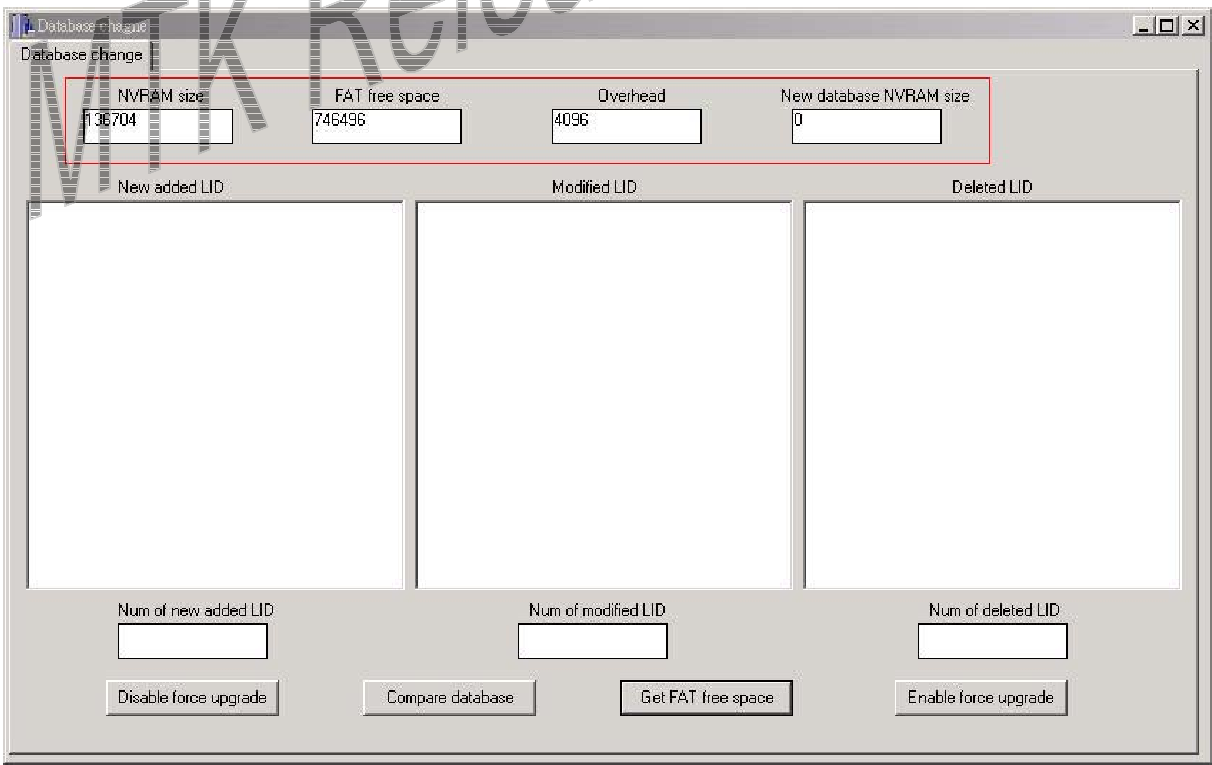

Figure 336 Result of getting FAT free space

User can click [Compare database] button to get difference between two NVRAM database files. These differences include modified LID list, deleted LID list, number of new added LID, number of modified LID and number of deleted LID. META will also get NVRAM size, FAT free space, overhead and new database NVRAM size when user click [Compare database] button.

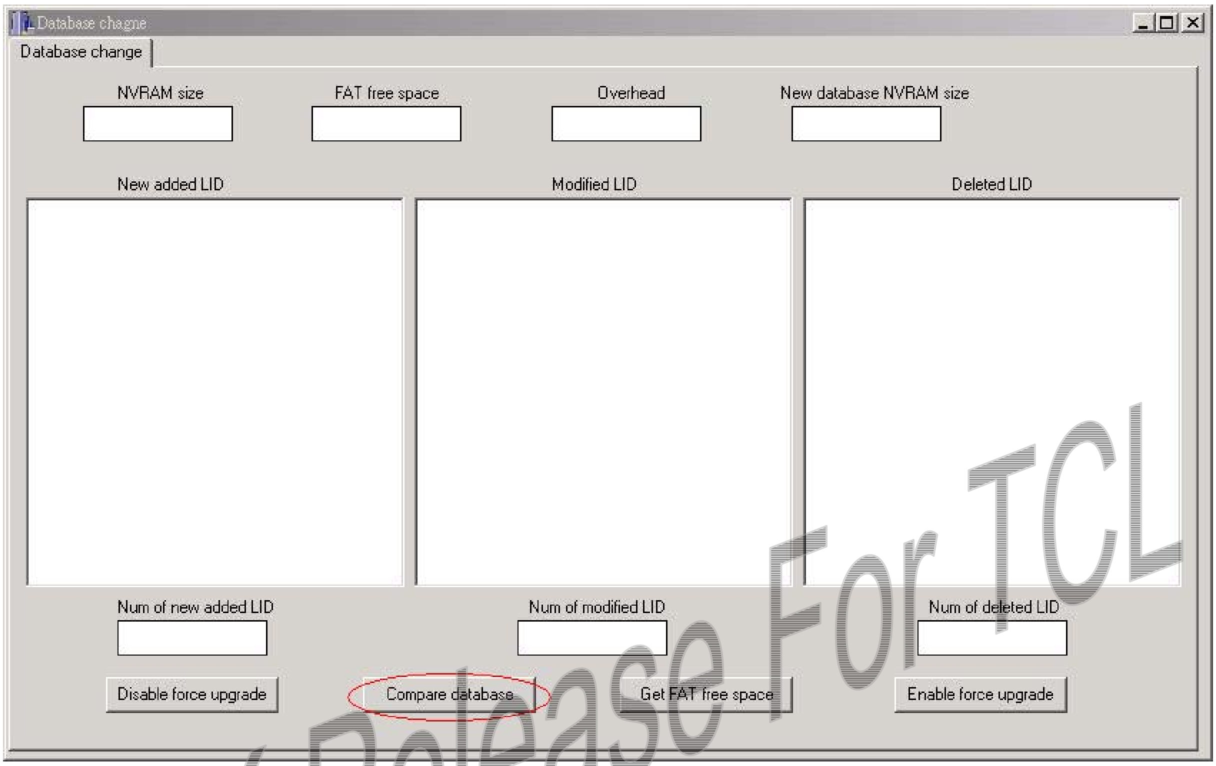

Figure 337 Click [Compare database] button to get difference list between two NVRAM database files

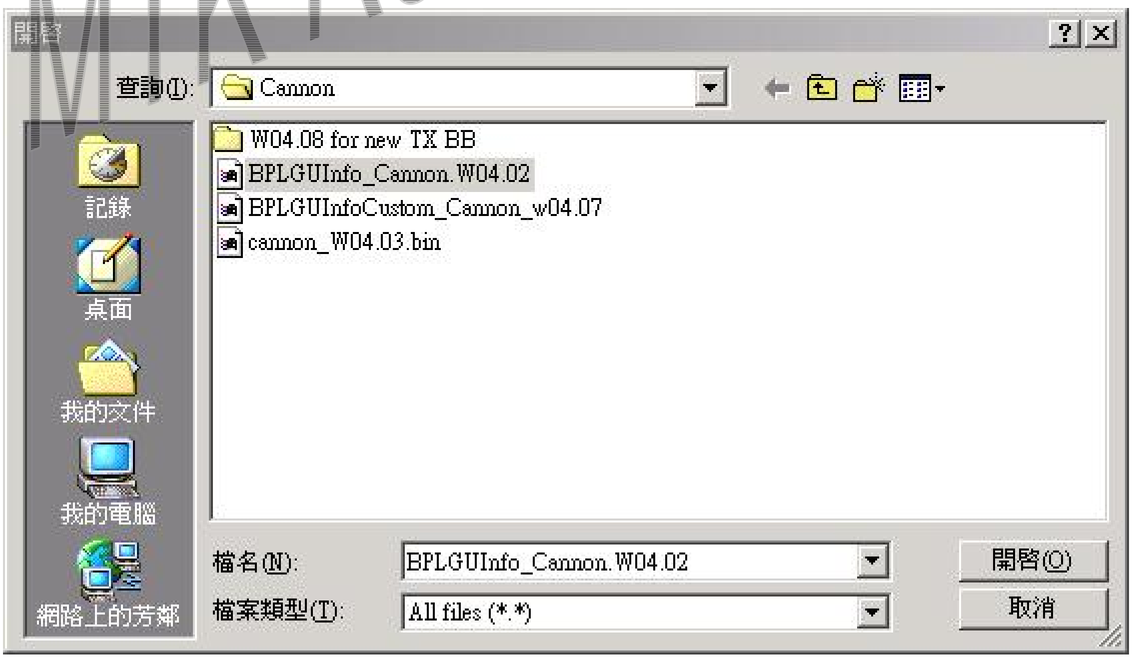

Figure 338 Open first NVRAM database file

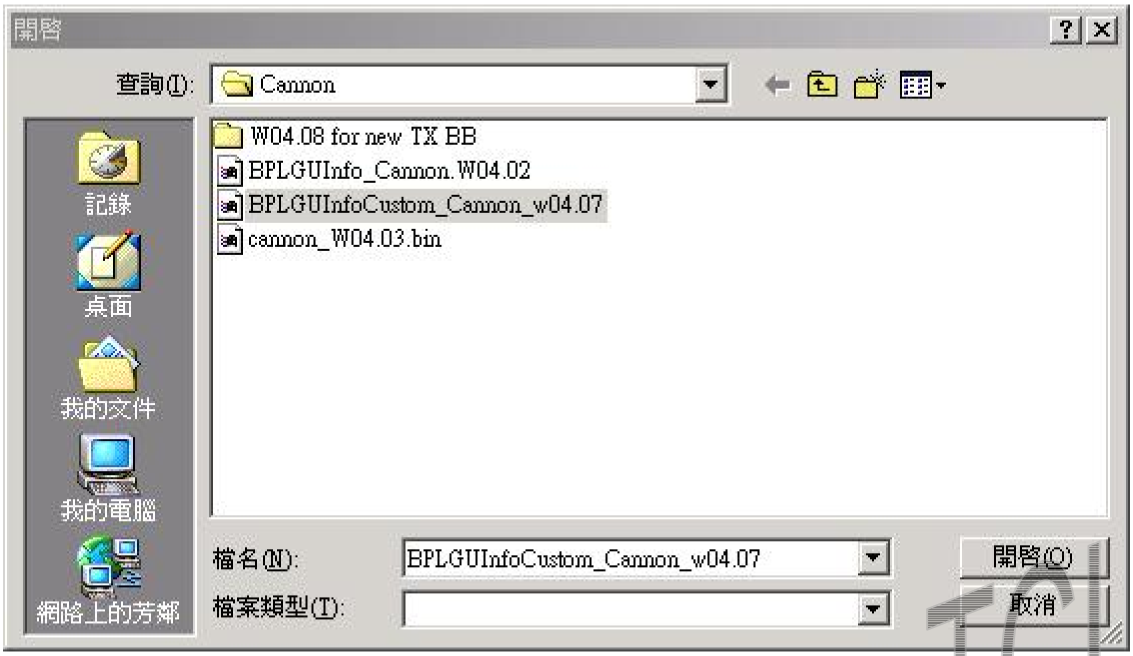

Figure 339 Open second NVRAM database file

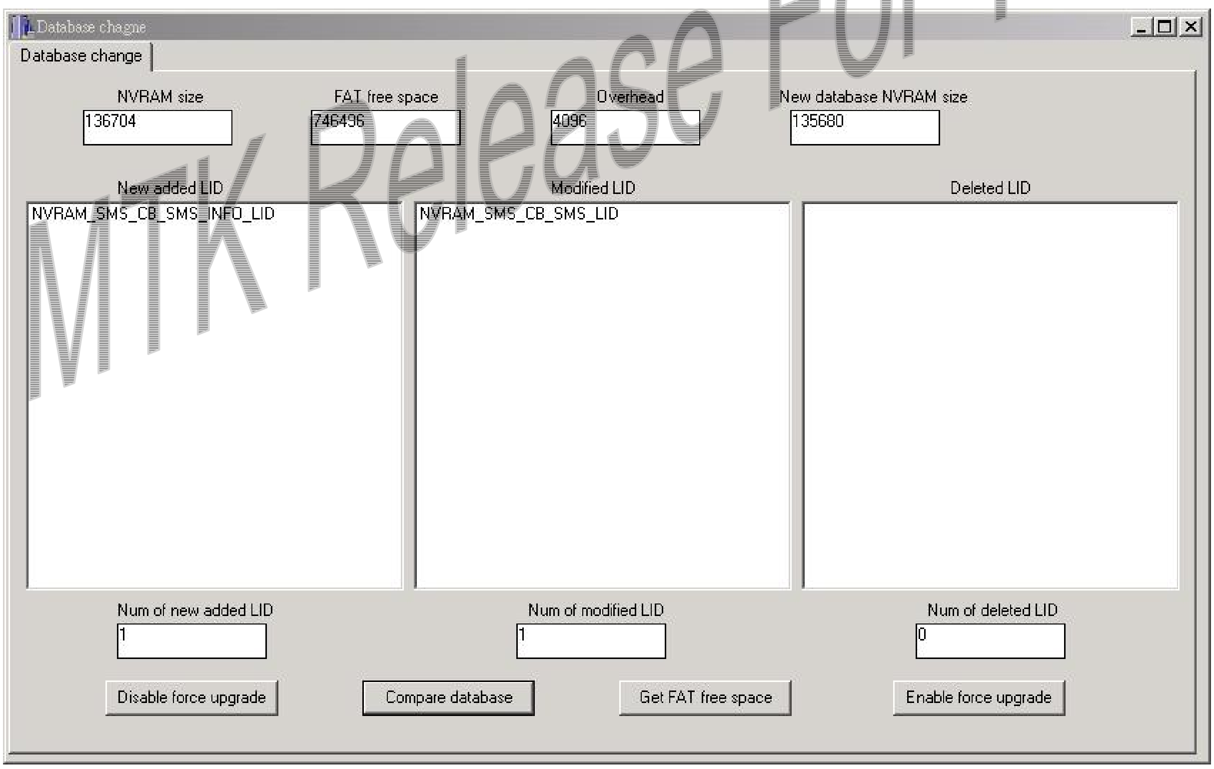

Figure 340 Result of comparing NVRAM database

User can click [Enable force upgrade] button to upgrade difference LID from old format to new format and click [Disable force upgrade] button to disable upgrade difference LID from old format to new format.

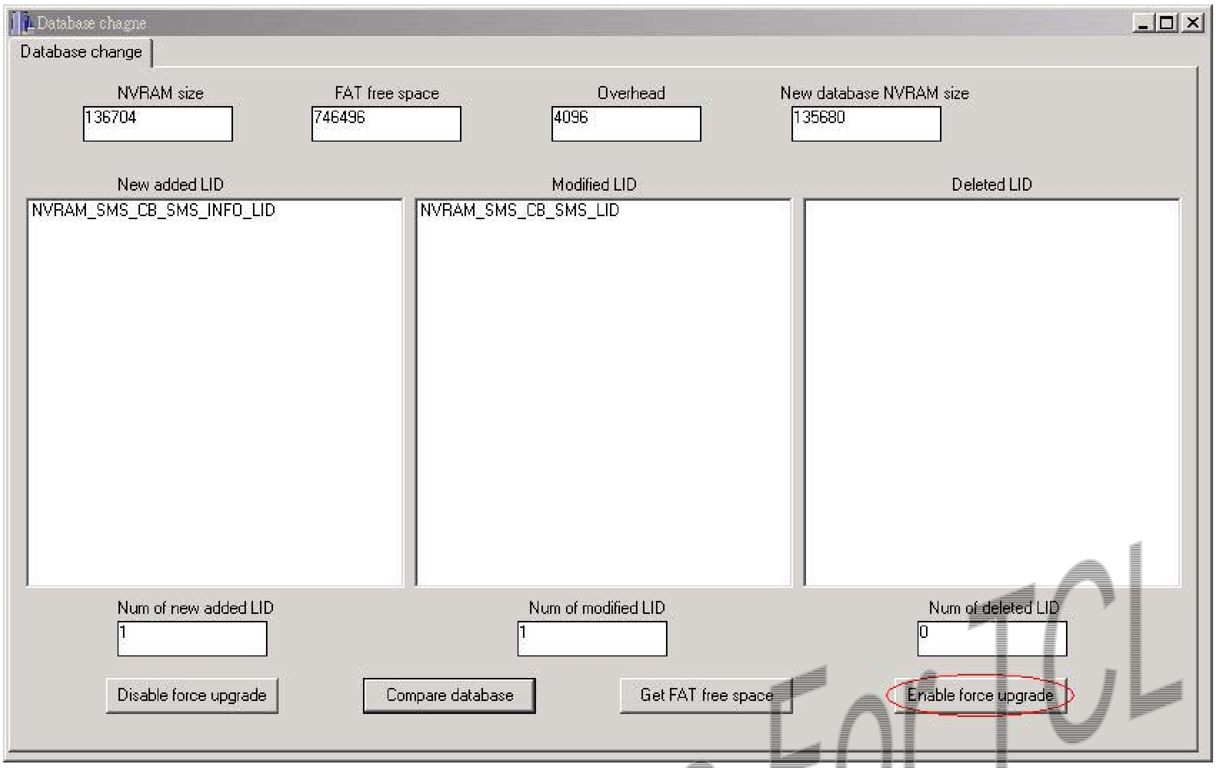

Figure 341 Click [Enable force upgrade] button to upgrade difference LID from old format to new format

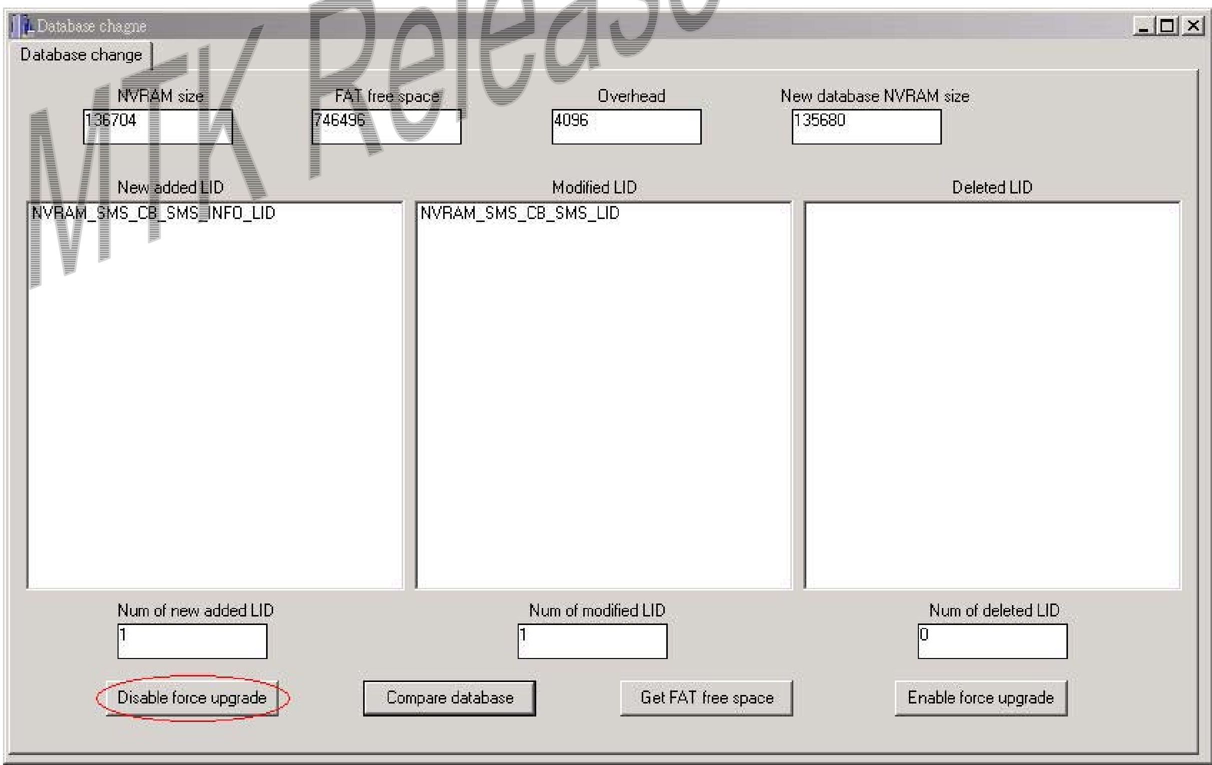

Figure 342 Click [Disable force upgrade] button to disable upgrade difference LID from old format to new format

3.13 Setting

User can use setting window to get or set mobile setting. User can switch to setting window by selecting [Setting] from main selection menu.

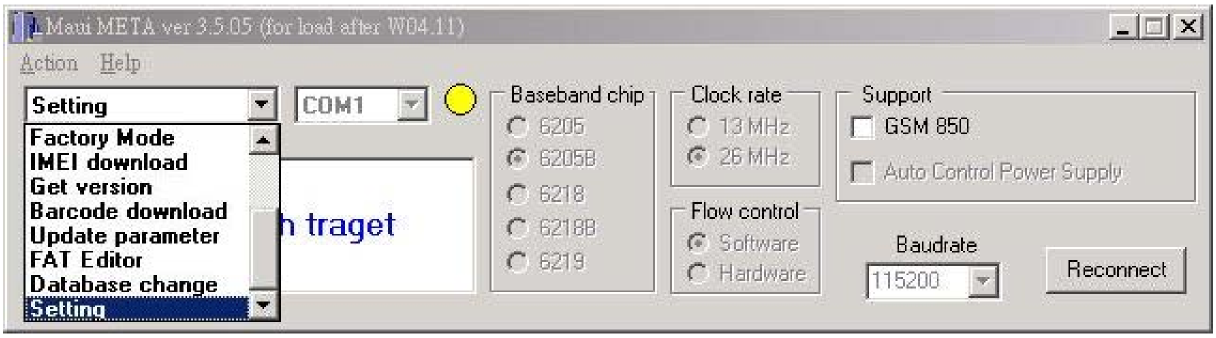

Figure 343 Select [Setting] from main selection menu

3.14 Band setting

User can use band setting window to get or set band setting of mobile. There are 4 band mode supported by MediaTek mobile phone. They are GSM 900, DCS 1800, PCS 1900 and Dual mode (GSM 900 and DCS 1800).

3.14.1 Upload and download band setting in flash

User can click [Upload from flash] button to read band setting from flash and click [Download to flash] button to write band setting to flash.

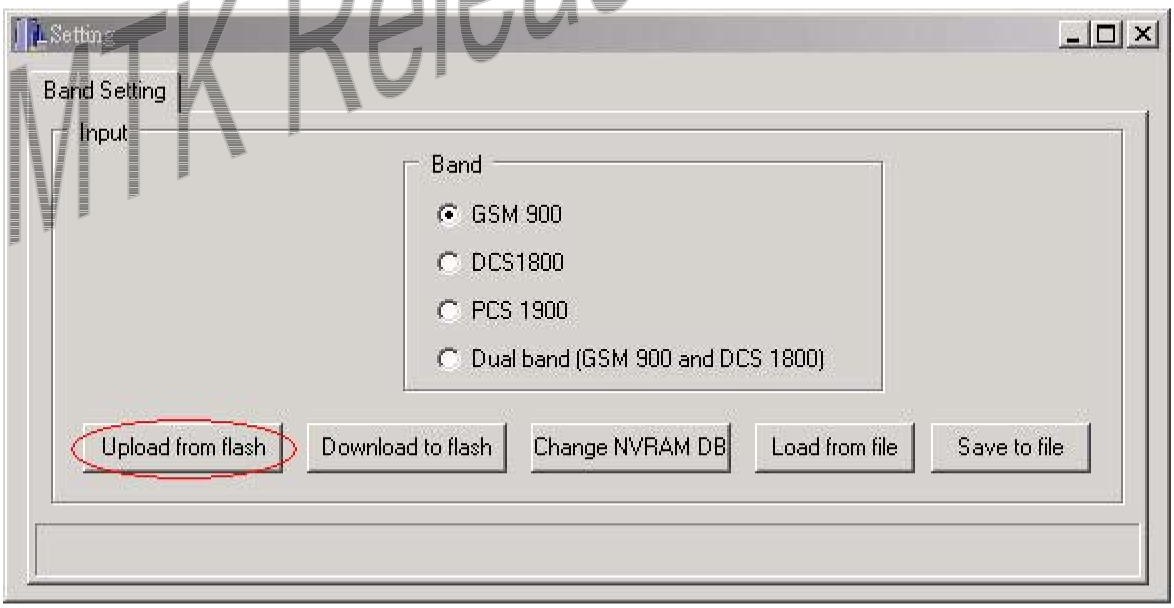

Figure 344 Click [Upload from flash] button to read band setting from flash

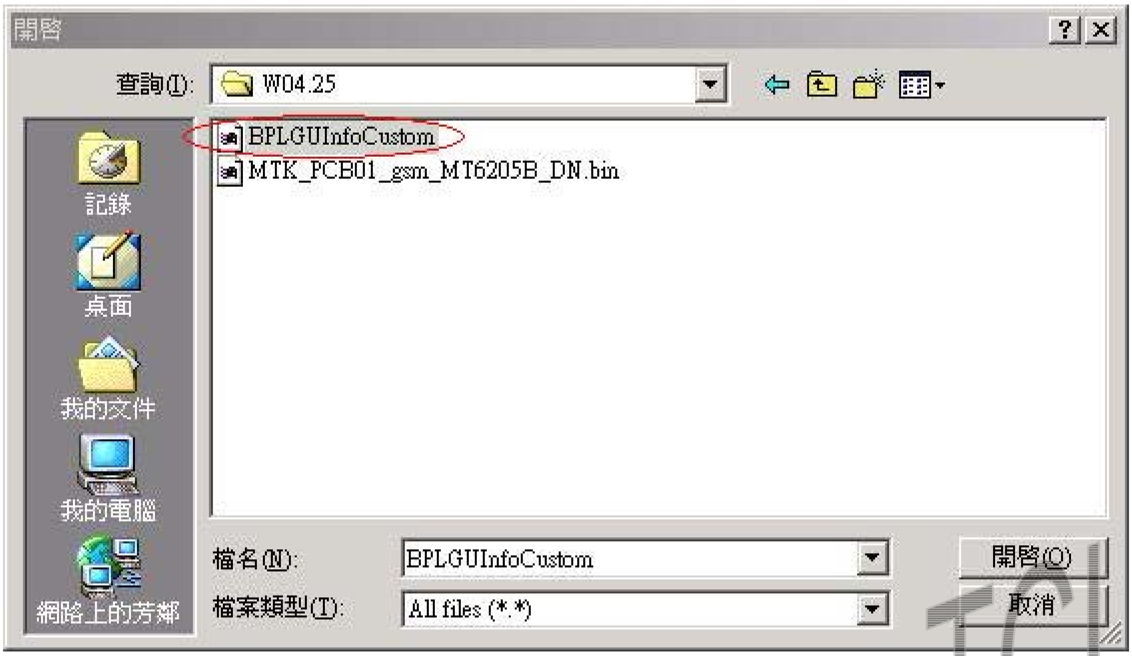

Figure 345 Select NVRAM database file if not selected before

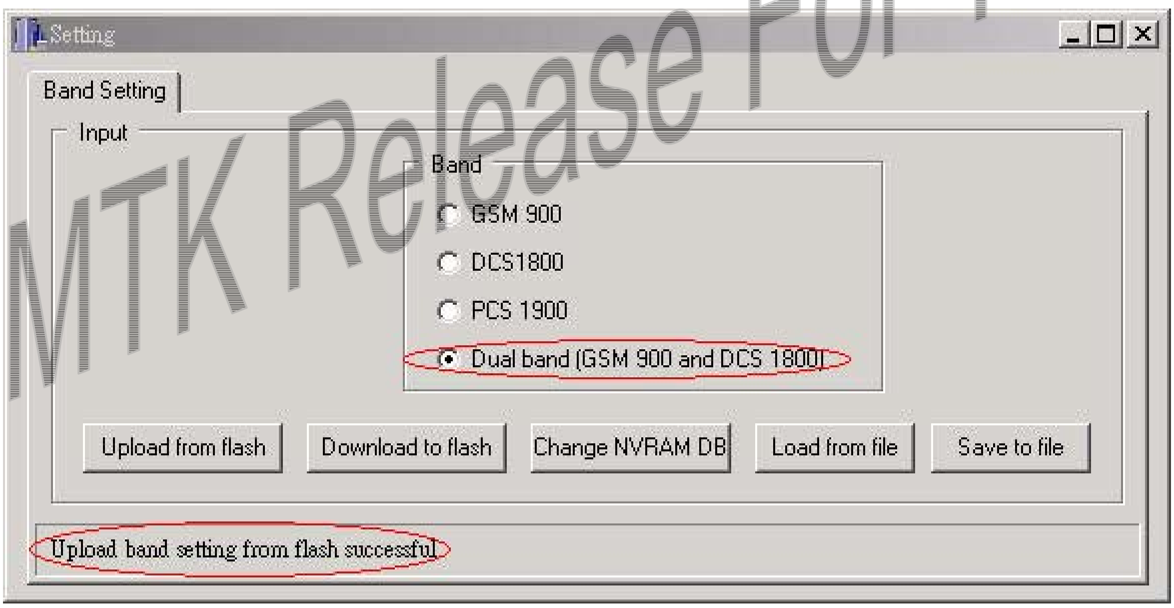

Figure 346 Result of band setting

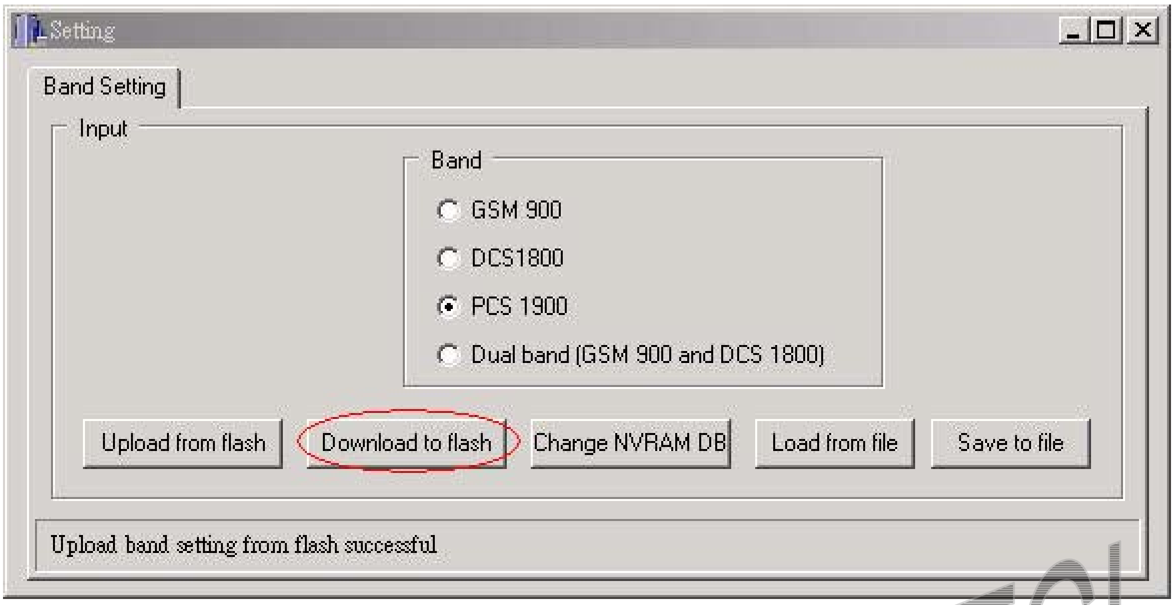

Figure 347 Click [Download to flash] button to write band setting to flash

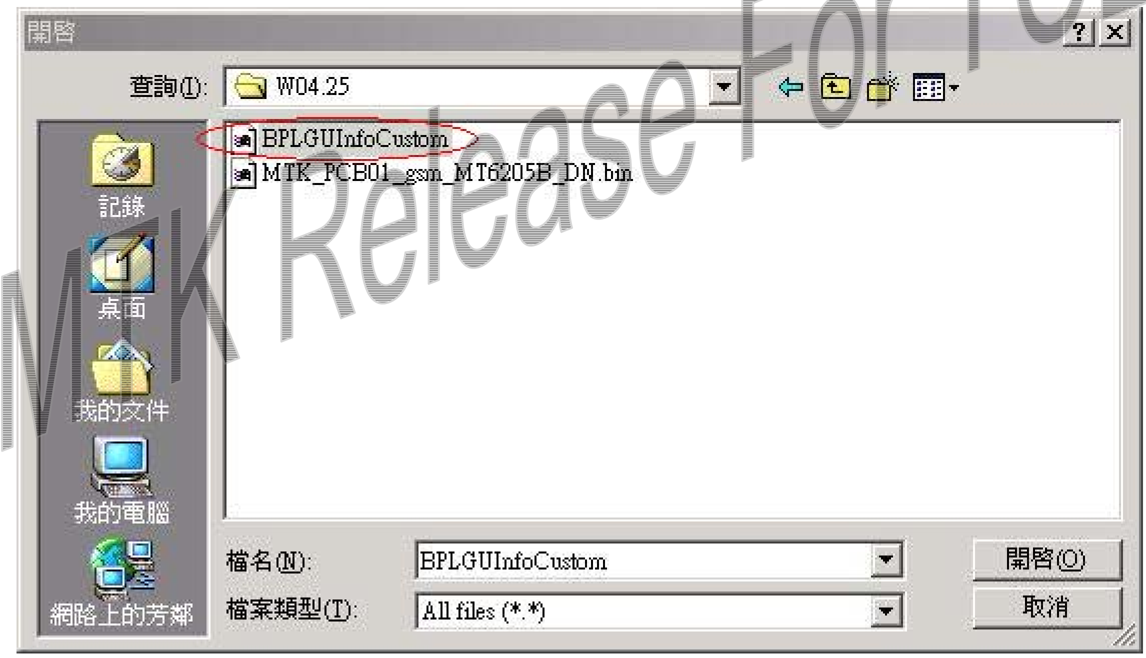

Figure 348 Select NVRAM database file if not selected before

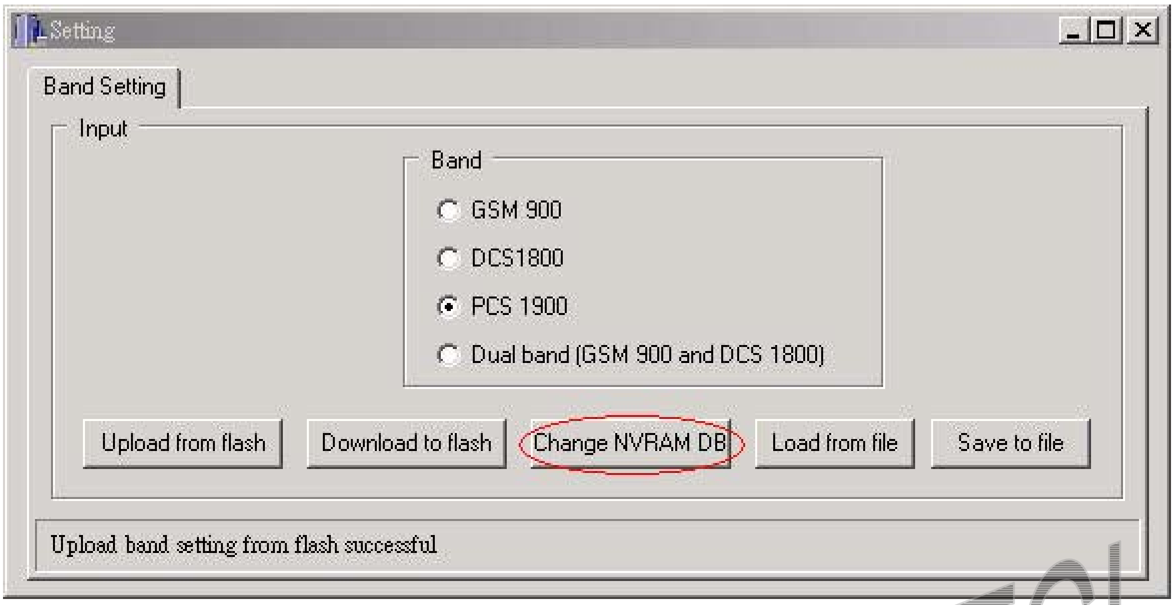

Figure 349 Click [Change NVRAM DB] button to change NVRAM database file

3.14.2 Read and write band setting in file

User can click [Load from file] button to read band setting in file and click [Save to file] button to write band setting to file.

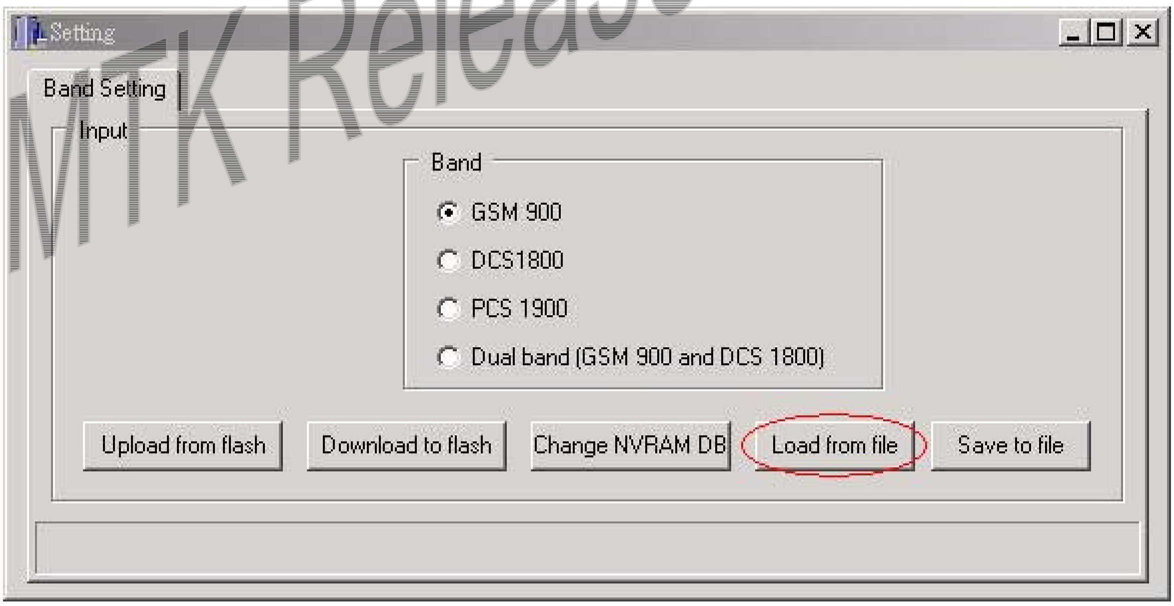

Figure 350 Click [Load from file] button to read band setting from file

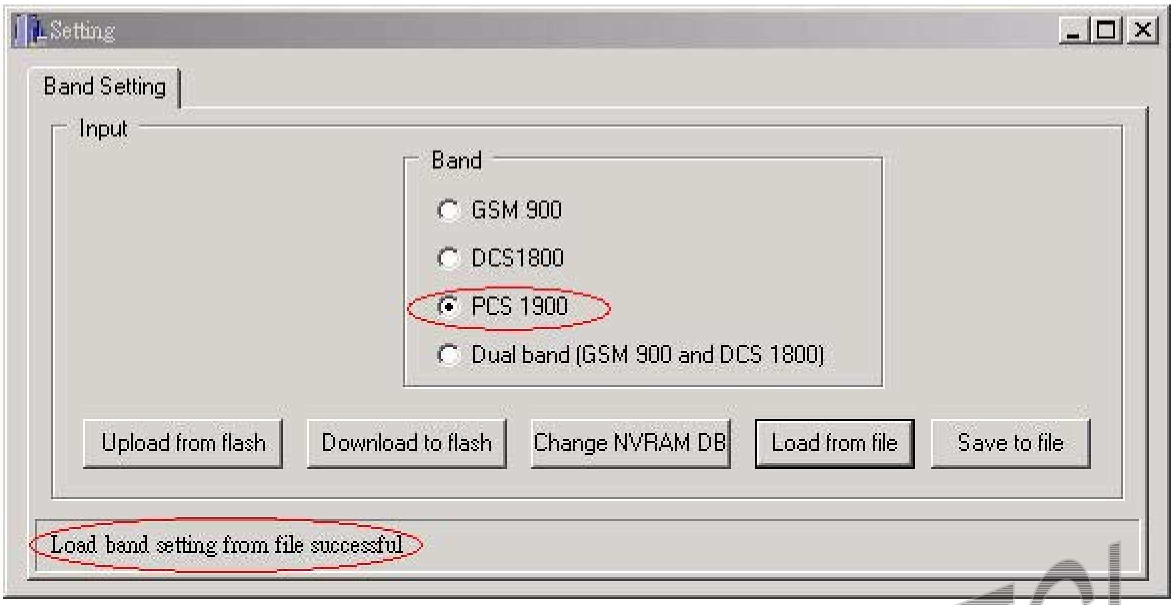

Figure 351 Result of band setting

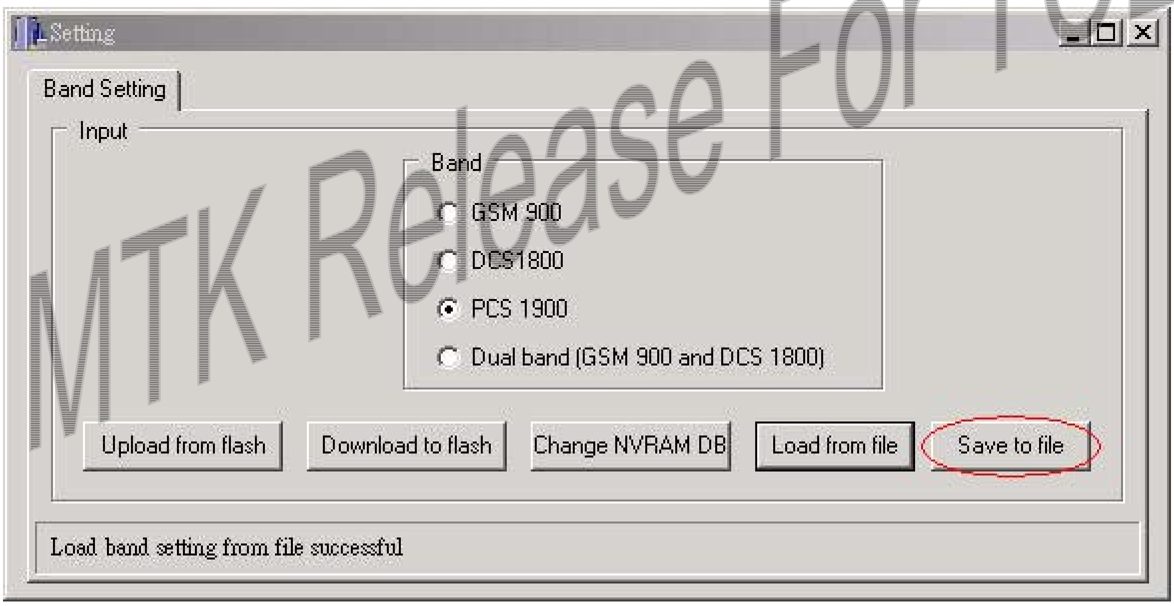

Figure 352 Click [Save to file] button to save setting to file

The following is a template file of band setting. User will get the text file after saving band setting to file.

[band setting]
band =PCS 1900

4 META -Factory

META factory is one mode of META tool. User can switch to META factory mode by selecting [Factory Mode] from main selection menu. The tool controls Agilent 8960, R&S CMU 200, power supply and target to do the calibration procedure. Before using this tool, user must install driver of GPIB card. The META factory current support

- Agilent 8960 with GSM only mode (i.e. E1960A software) and GSM/GPRS combine mode (i.e. E1968A or E6701C softwrare).
- CMU200.
- Agilent 663x2 series power supply.
- Agilent 661x series power supply.
- Agilent and NI GPIB card

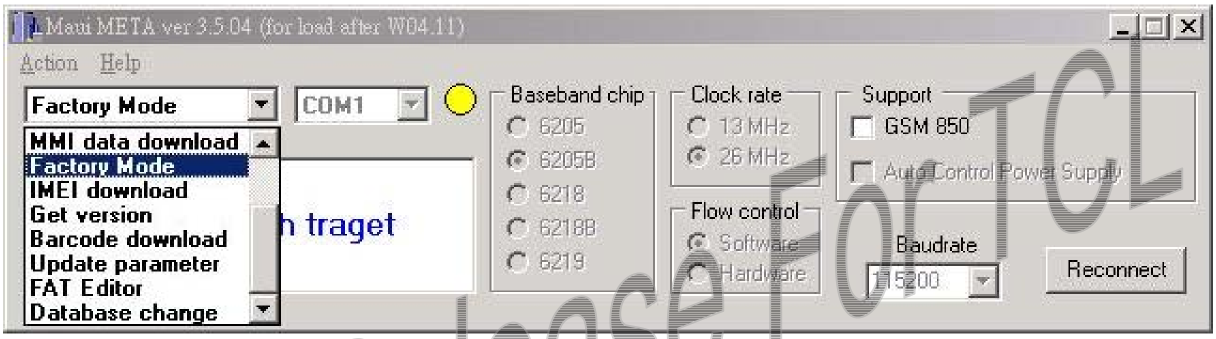

Figure 353 Select [Meta factory] from main selection menu

4.1 Setup files

User must open NVRAM database file, configuration file, calibration data initial file, result file and setup logging file. META factory will save these 5 files setting to MF_Setup.txt file before closed. User can use previous setting or open other files.

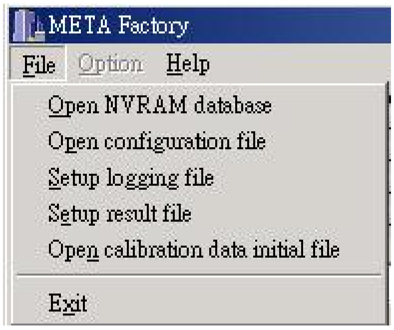

Figure 354 Setup files

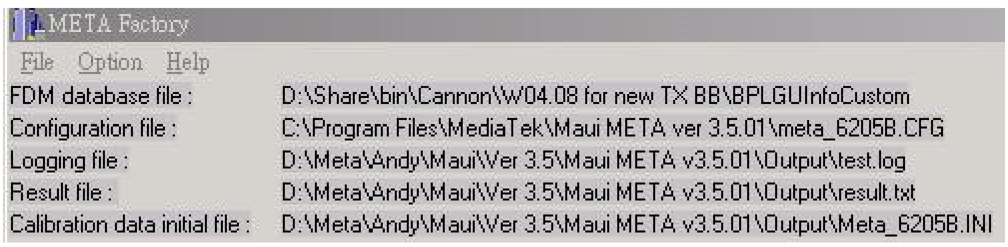

Figure 355 Current file setting

The following is a template of MF_Setup.txt that contains current file setting.
[META factory]
FDM database file=D:\Share\bin\Cannon\W04.08 for new TX BB\BPLGUInfoCustom
Configuration file=C:\Program Files\MediaTek\Maui META ver 3.5.01\meta_6205B.CFG
Logging file=D:\Meta\Andy\Maui\Ver 3.5\Maui META v3.5.01\Output\test.log
Calibration data initial file=D:\Meta\Andy\Maui\Ver 3.5\Maui META v3.5.01\Output\Meta_6205B.INI
Result file=D:\Meta\Andy\Maui\Ver 3.5\Maui META v3.5.01\Output\result.txt

4.1.1 Configuration file

This file is used to keep the configurable data, which could be modified by phone maker's setup to cooperate their factory production line. The "Time out" value is in unit of millisecond. If the communication time between tool and Agilent 8960, R&S CMU 200 and power supply is more than time out value, the tool will show a time out error message.

Note:

- The sentences after semicolon are comment. Please refer to calibration procedure in section 4.2 for detail information.
- RF engineers must tune the C values (GSM900_C, DCS1800_C, …etc.) for their RF module. The best C value is that target can issue TX power meet the specification between MAX_P and MIN_P after writing new scale factor to flash.

The following is a template format of configuration file.

[8960 Initialization]
8960 GPIB Address = GPIB0::15::INSTR
Time Out = 5000
GSM400 cable loss = -1.0
GSM850 cable loss = -1.0
GSM900 cable loss = -1.0
DCS1800 cable loss = -1.5
PCS1900 cable loss = -1.5
;"8960 GPIB Address" is GPIB address of Agilent 8960.
;"GSM900 cable loss" is cable loss between Agilent 8960 and MS at GSM900 bank.

[Frequency Bank] // specify the band supported by MS
bank = 0x1C
; GSM450 0x01
; GSM850 0x02
; GSM900 0x04
; DCS1800 0x08
; PCS1900 0x10
; The meaning of "0x1C" is that META will do GSM900, DCS1800 and PCS1900 bank auto calibration.

[C0 for each Bank] //specify the TX level testing ARFCN for each bank
arfcn_C0_GSM = 60
arfcn_C0_DCS = 750
arfcn_C0_PCS = 660
;Channel number for GSM, DCS and PCS bank.

[Downlink power] //specify the downlink cell power used in testing

P_DL = -60

[RX measurement samples] //specify the parameter for PM testing
N_PM = 5
M_PM = 4
; refer to section 3.2.1 for the limitation N_PM * M_PM <=2000
; N_PM is testing frames number of RX
; M_PM is samples per frame. Max value is 4.

[RX path loss table]

GSM900_MAX_RX_LOSS = 5.000,5.000,5.000,5.000,5.000,5.000,5.000,5.000,5.000,5.000,5.000,5.0000,
GSM900_MIN_RX_LOSS = -5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.0000,
; GSM900_MAX_RX_LOSS is the maximum limitation of GSM900 RX path loss
; GSM900_MIN_RX_LOSS is the minimum limitation of GSM900 RX path loss

DCS1800_MAX_RX_LOSS = 5.000,5.000,5.000,5.000,5.000,5.000,5.000,5.000,5.000,5.000,5.000,5.0000,
DCS1800_MIN_RX_LOSS= -5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.0000,
; DCS1800_MAX_RX_LOSS is the maximum limitation of DCS1800 RX path loss
; DCS1800_MIN_RX_LOSS is the minimum limitation of DCS1800 RX path loss

PCS1900_MAX_RX_LOSS = 5.000,5.000,5.000,5.000,5.000,5.000,5.000,5.000,5.000,5.000,5.000,5.0000,
PCS1900_MIN_RX_LOSS= -5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.000,-5.0000,
; PCS1900_MAX_RX_LOSS is the maximum limitation of PCS1900 RX path loss
; PCS1900_MIN_RX_LOSS is the minimum limitation of PCS1900 RX path loss

[AFC Calibration] //specify the AFC testing paramter
N_AFC = 5
DAC1=4000
DAC2=4500
; N_AFC is testing frames number of AFC

[AFC table]
MAX_INIT_AFC_DAC = 65535
MIN_INIT_AFC_DAC = 0
MAX_AFC_SLOPE = 5.000
MIN_AFC_SLOPE = 0.000
; MAX_INIT_AFC_DAC is the maximum limitation of initial AFC DAC value
; MIN_INIT_AFC_DAC is the minimum limitation of initial AFC DAC value
; MAX_AFC_SLOPE is the maximum limitation of AFC slope
; MIN_AFC_SLOPE is the minimum limitation of AFC slope

[TX PCL table] //specify TX level specification
GSM900_CAL_PCL = 17, 12, 5,
; Calibrated PCL of 3 point PCL calibration
GSM900_PCL = 19,18,17,16,15,14,13,12,11,10,9,8,7,6,5,
; Calibrated PCL of full PCL calibration
GSM900_CHECK_PCL = 19,18,17,16,15,14,13,12,11,10,9,8,7,6,5,
; Specify the PCL need to be check when do APC calibration check
GSM900_MAX_P = 5.5, 7.5, 9.5,11.5,13.5,15.5,17.5,19.5,21.5,23.5,25.5,27.5,29.5,31.5,32.8,
; MAX power level
GSM900_WANTED_P = 5.0,7.0,9.0,11.0,13.0,15.0,17.0,19.0,21.0,23.0,25.0,26.7,28.7,30.2,32.2,

; Idea power level for each PCL
GSM900_MIN_P = 5,7,9,11,13,15,17,19,21,23,25,26.5,28.5,30,31.5,
; Min power level
GSM900_C = 10,10,10,10,10,10,10,10,10,10,10,10,10,10,10,
; A weighted value is used for TX power level calibration. Please refer to section 4.2.5.
GSM900_CORRECTION = 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
; Correction using when doing 3 PCL calibration

DCS1800_CAL_PCL = 13, 8, 1,
DCS1800_PCL = 15,14,13,12,11,10, 9, 8, 7, 6, 5,4,3,2,1,0,
DCS1800_CHECK_PCL = 15,14,13,12,11,10, 9, 8, 7, 6, 5,4,3,2,1,0,
DCS1800_MAX_P = 1, 2.5, 4.5,6.5,8.5,10.5,12.5,14.5,16.5,18.5,20.5,22.5,24.5,26.5,28.5,29.8,
DCS1800_WANTED_P = 0.5,2.5,4.5,6.5,8.5,10.0,12,14,16,18,20,22,24,25.5,27.5,29.2,
DCS1800_MIN_P = 0,2,4,6,8,10,12,14,16,18,20,22,24,25,27,28,
DCS1800_C = 10,10,10,10,10,10,10,10,10,10,10,10,10,10,10,10,
DCS1800_CORRECTION = 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,

PCS1900_CAL_PCL = 13, 8, 1,
PCS1900_PCL = 15,14,13,12,11,10, 9, 8, 7, 6, 5,4,3,2,1,0,
PCS1900_CHECK_PCL = 15,14,13,12,11,10, 9, 8, 7, 6, 5,4,3,2,1,0,
PCS1900_MAX_P = 0.5, 2.5, 4.5,6.5,8.5,10.5,12.5,14.5,16.5,18.5,20.5,22.5,24.5,26.5,28.5,30.5,
PCS1900_WANTED_P = 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,
PCS1900_MIN_P = -0.5,1.5,3.5,5.5,7.5,9.5,11.5,13.5,15.5,17.5,19.5,21.5,23.5,25.5,27.5,29.5,
PCS1900_C = 1,2,2,3,4,5,7,9,10,13,13,13,14,14,15,20,
PCS1900_CORRECTION = 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,

TSC = 5
Recursive Times = 5 ; the maximum times to calibrate one power level
APC Delta = 0.1 ; if power level is in the range of (wanted power level – APC delta, wanted power level + APC delta), jump to calibrate next power level
; TSC is the cell TSC value in Agilent 8960
; WANTED_P is wanted power in dBm for corresponding PCL
; MAX_P is MAX limitation power in dBm for corresponding PCL
; MIN_P is MIN limitation power in dBm for corresponding PCL
; C is a weighted value used for TX power level calibration. Please refer to section 4.2.5.
; MAX_P, WANTED_P, MIN_P and C can be integer or floating point.

[ADC table]
ADC_V1 = 3400
ADC_V2 = 4200
ADC_CHECK_VOLTAGE = 3600
NORMAL_VOLTAGE = 3800
MAX_BATTERY_ADC_SLOPE = 5300.0
MIN_BATTERY_ADC_SLOPE = 5100.0
MAX_BATTERY_ADC_OFFSET = 100000000
MIN_BATTERY_ADC_OFFSET = 0
BATTERY_CHANNEL = 0
CHARGER_CHANNEL = 3
ADC_RESISTANCE = 0.33
MAX_VOLTAGE_DIFFERENCE = 0.04
MAX_CURRENT_DIFFERENCE = 0.02
ADC_MEASUREMENT_COUNT = 1000

; ADC_V1 is the voltage of ADC calibration point 1, unit = mV
; ADC_V2 is the voltage of ADC calibration point 2, unit = mV
; ADC_CHECK_VOLTAGE is the voltage of ADC calibration voltage check, unit = mV
; NORMAL_VOLTAGE is the voltage of power supply after calibration finish, unit = mV
; MAX_BATTERY_ADC_SLOPE is the maximum limitation of battery ADC slope
; MIN_BATTERY_ADC_SLOPE is the minimum limitation of battery ADC slope
; MAX_BATTERY_ADC_OFFSET is the maximum limitation of battery ADC offset
; MIN_BATTERY_ADC_OFFSET is the minimum limitation of battery ADC offset
; BATTERY_CHANNEL is the first channel to do ADC calibration
; CHARGER_CHANNEL is the second channel to do ADC calibration
; ADC_RESISTANCE is the resistance when do ADC current limitation check
; MAX_VOLTAGE_DIFFERENCE is the maximum voltage difference between voltage of power supply and estimated voltage, unit = V
; MAX_CURRENT_DIFFERENCE is the maximum current difference, unit = A
; ADC_MEASUREMENT_COUNT is the ADC measurement count

4.1.1.1 CFG file editor

User can choose edit on META factory window to which kind of CFG parameters that he wants to edit. There are six kinds of CFG parameter, they are common, TCVCXO AFC, crystal AFC, RX path loss, TX PCL and ADC CFG parameters.

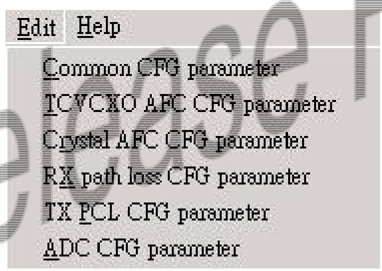

Figure 356 Choose Edit then select which CFG parameter to edit

4.1.1.1.a Common CFG parameters

User can click [Common CFG parameter] to show Common CFG parameter window. User can click [Load from CFG file] button to read common CFG parameters from CFG file and click [Save to CFG file] to save common CFG parameters to CFG file.

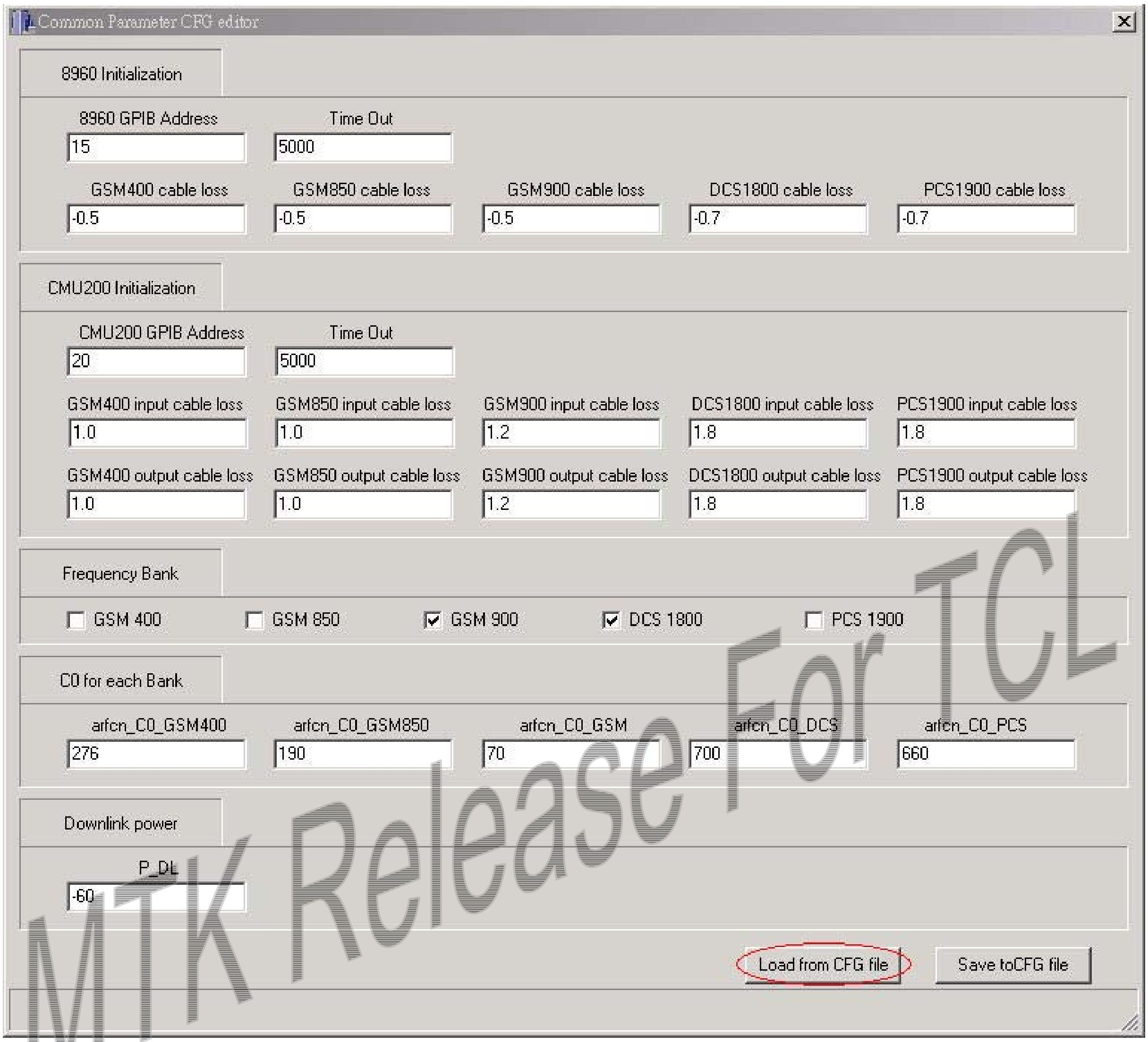

Figure 357 Click [Load from CFG file] button to read common CFG parameters from CFG file

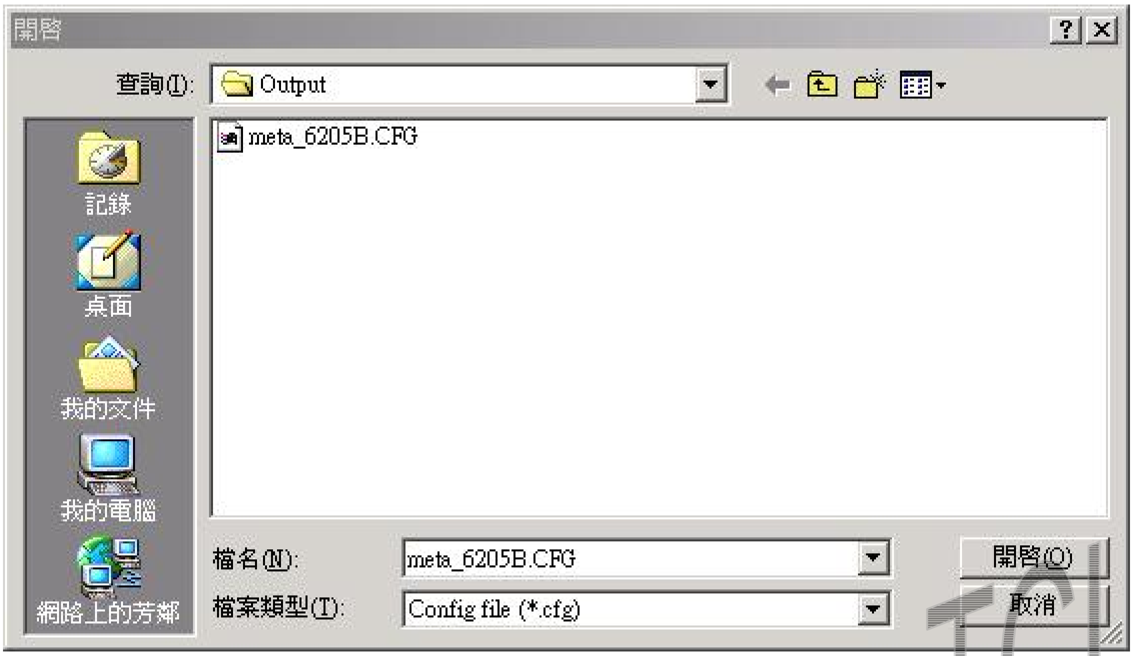

Figure 358 Select CFG file

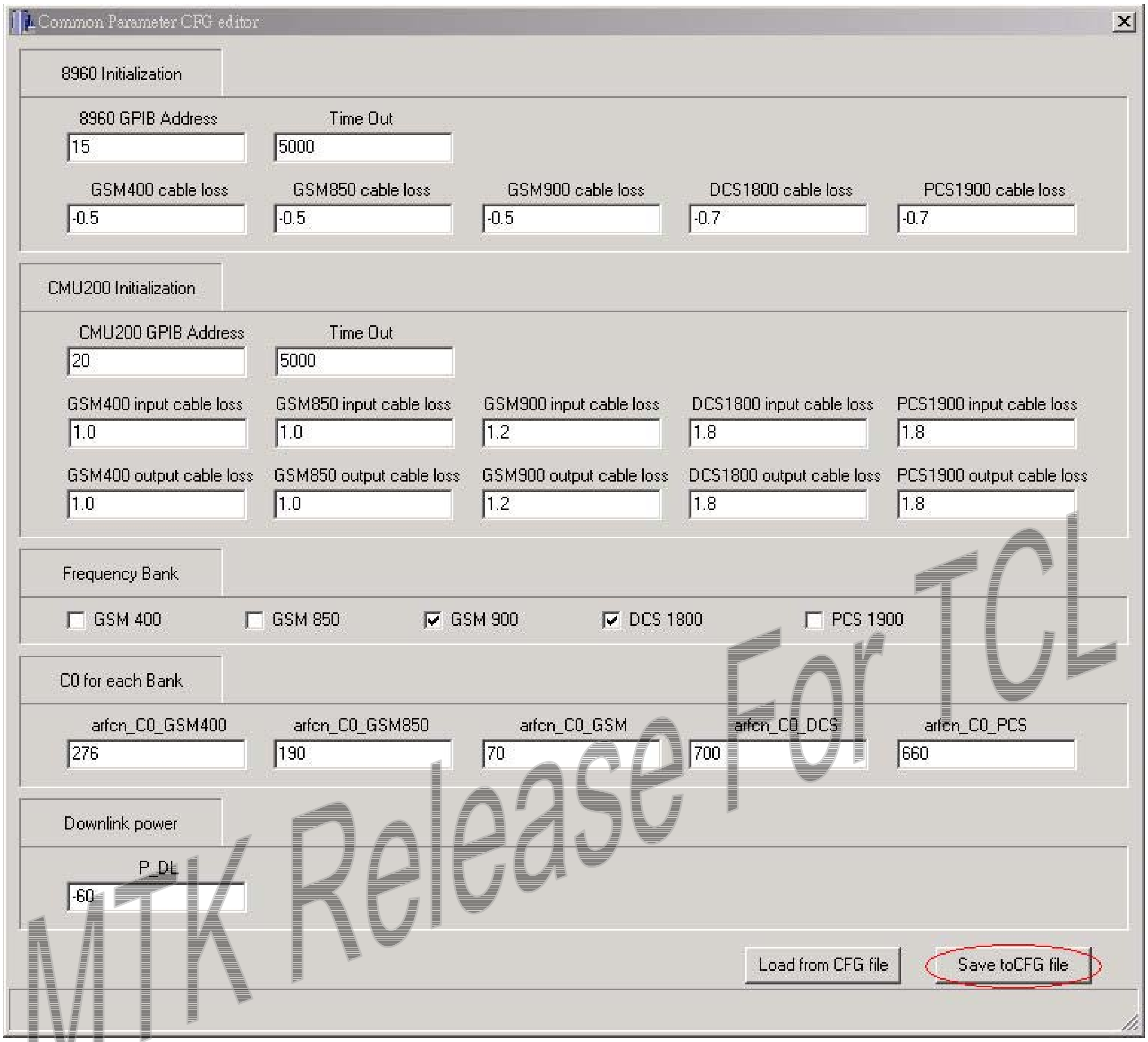

Figure 359 Click [Save to CFG file] to save common CFG parameters to CFG file

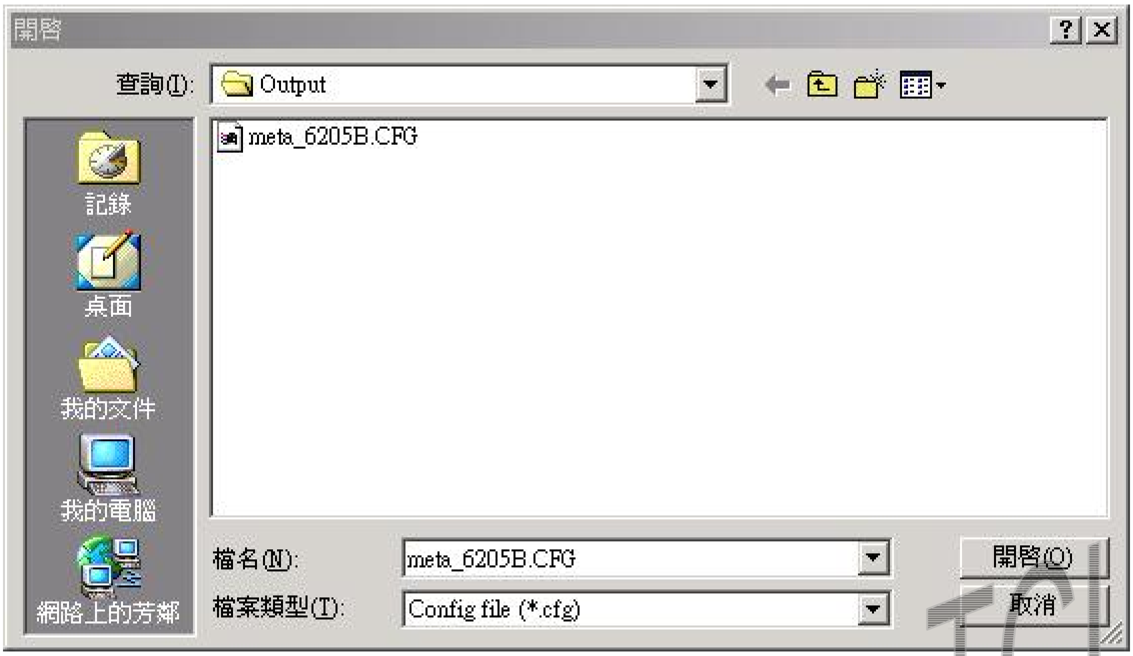

Figure 360 Select CFG file

4.1.1.1.b TCVCXO AFC CFG parameters

User can click [TCVCXO AFC CFG parameter] to show TCVCXO AFC CFG parameter window. User can click [Load from CFG file] button to read TCVCXO AFC CFG parameters from CFG file and click [Save to CFG file] to save TCVCXO AFC CFG parameters to CFG file.

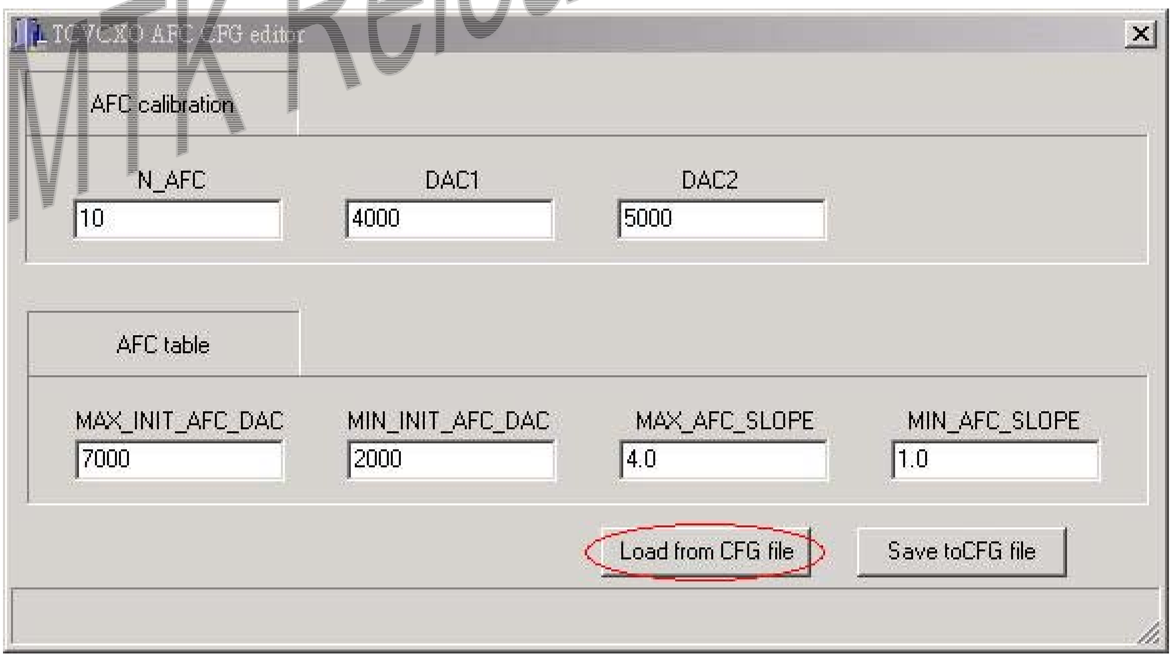

Figure 361 Click [Load from CFG file] button to read TCVCXO AFC CFG parameters from CFG file

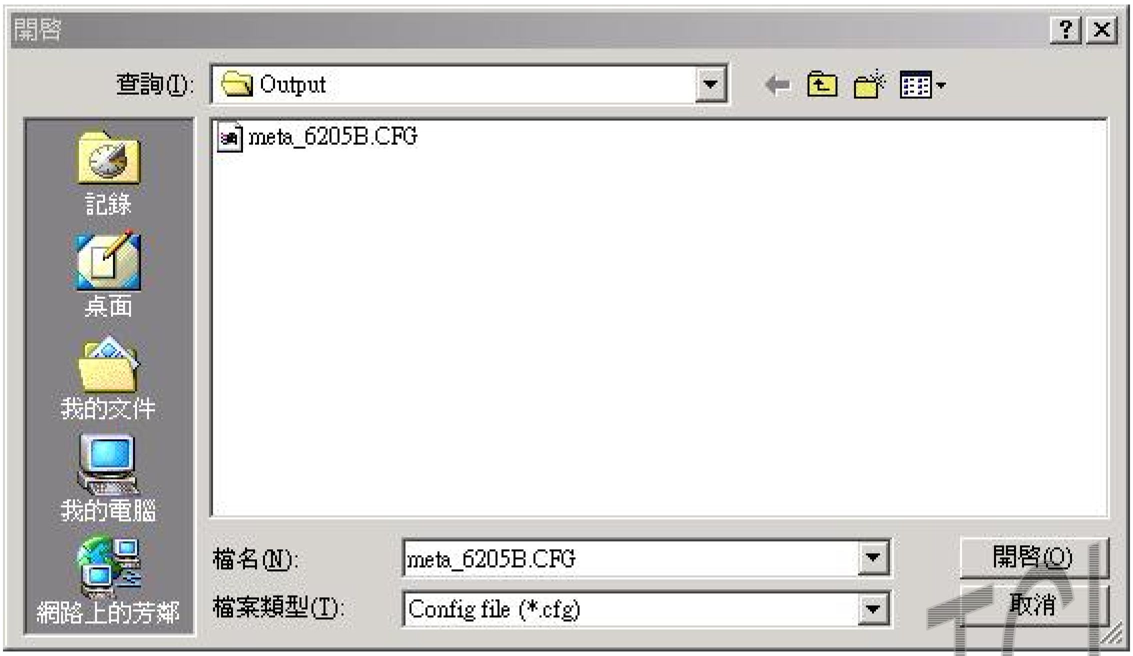

Figure 362 Select CFG file

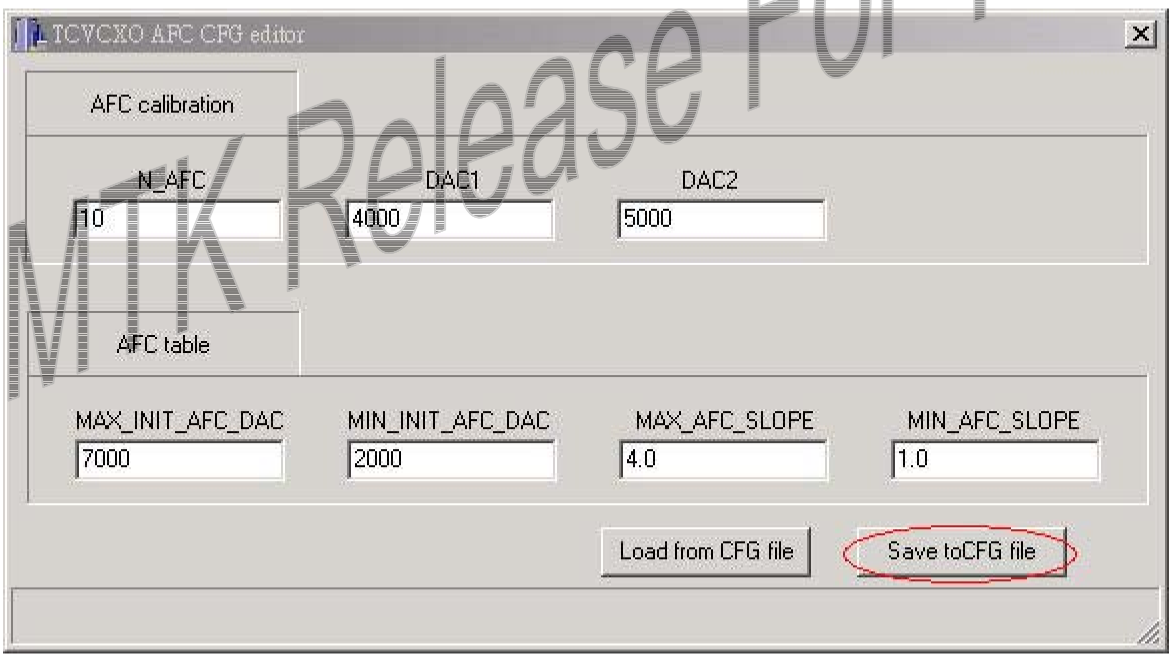

Figure 363 Click [Save to CFG file] to save TCVCXO AFC CFG parameters to CFG file

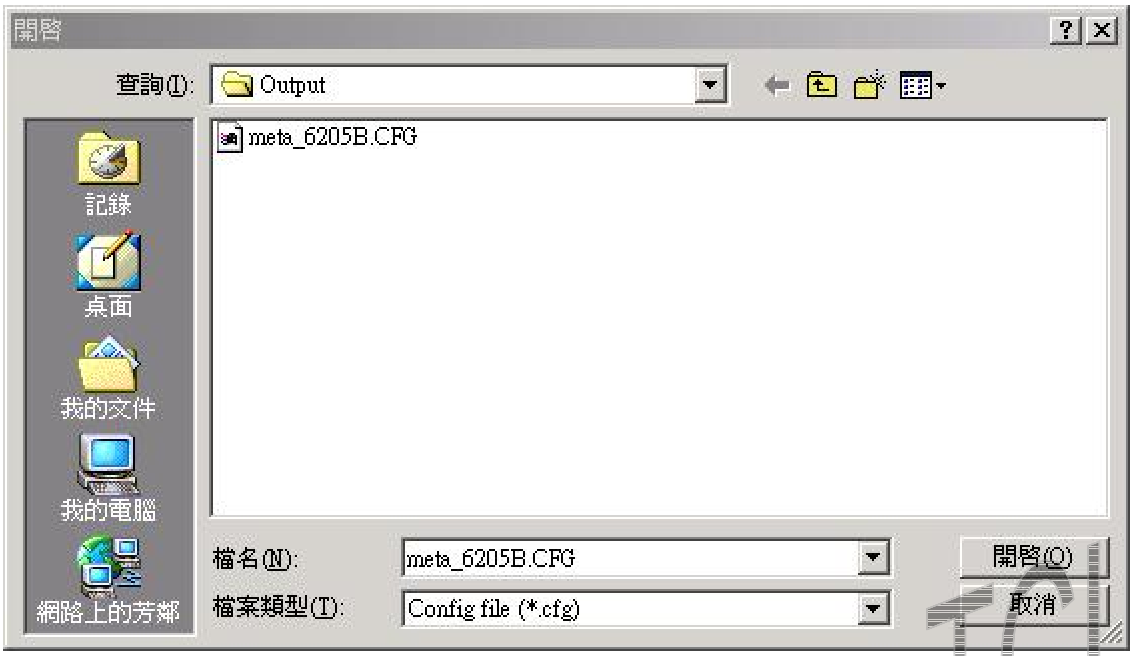

Figure 364 Select CFG file

4.1.1.1.c Crystal AFC CFG parameters

User can click [Crystal AFC CFG parameter] to show crystal AFC CFG parameter window. User can click [Load from CFG file] button to read crystal AFC CFG parameters from CFG file and click [Save to CFG file] to save crystal AFC CFG parameters to CFG file.

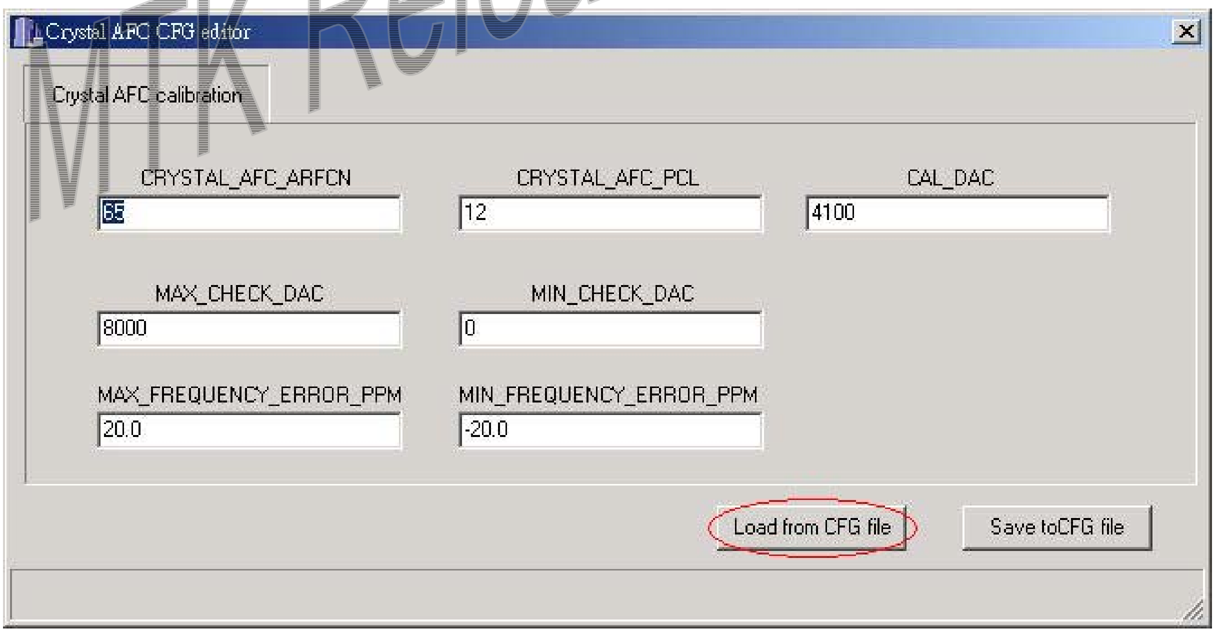

Figure 365 Click [Load from CFG file] button to read crystal AFC CFG parameters from CFG file

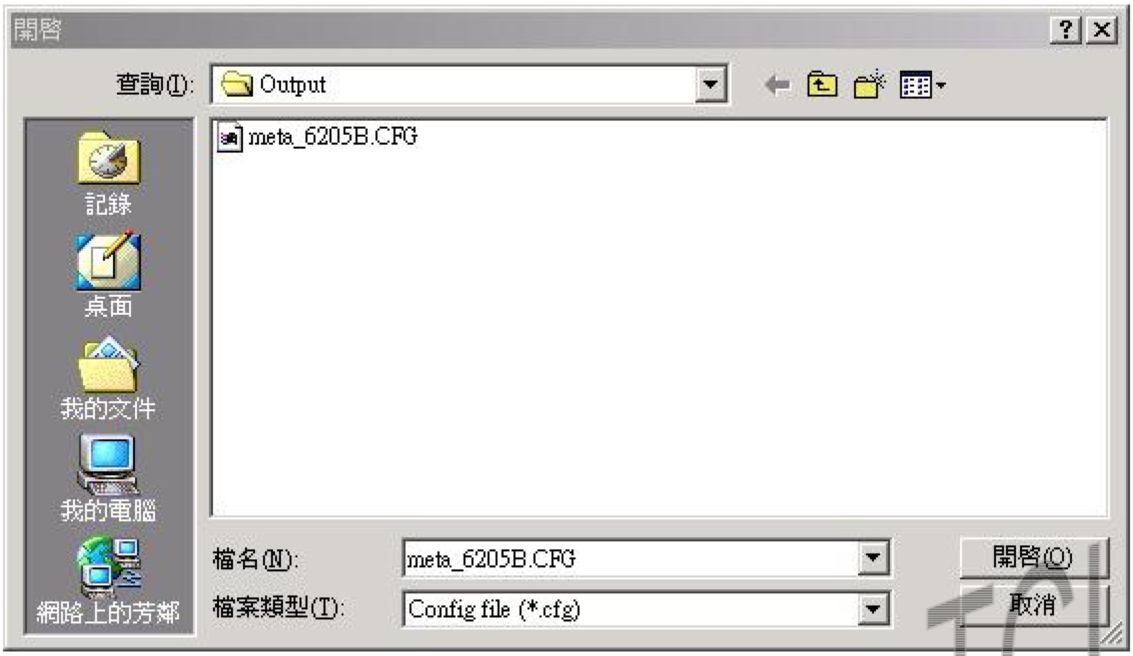

Figure 366 Select CFG file

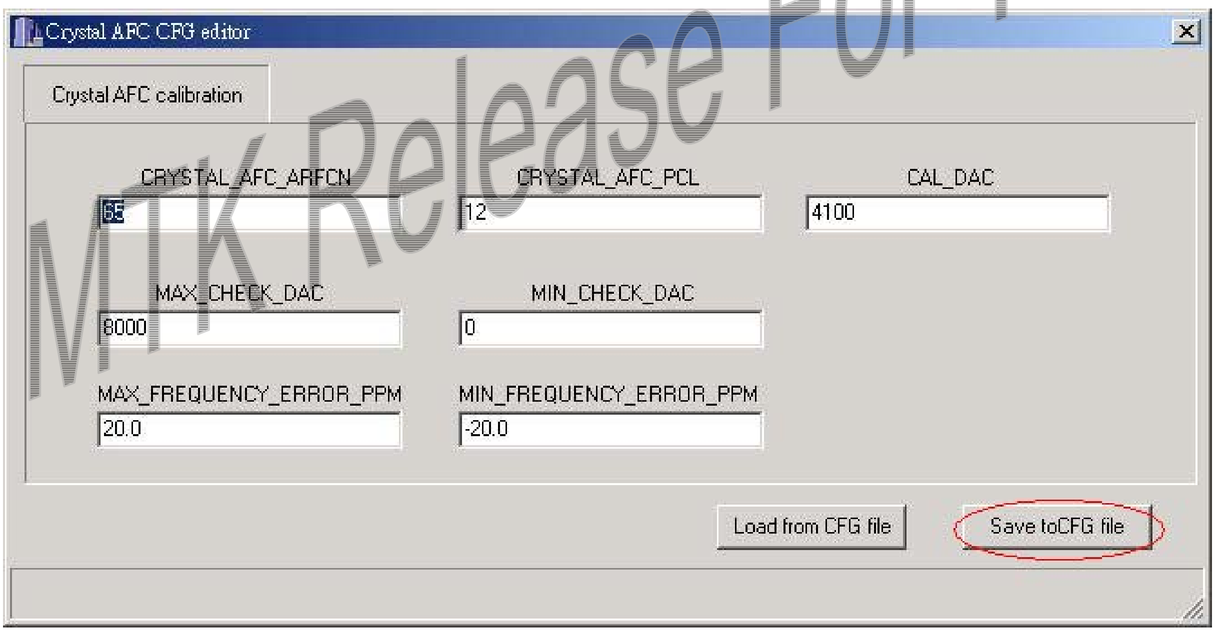

Figure 367 Click [Save to CFG file] to save crystal AFC CFG parameters to CFG file

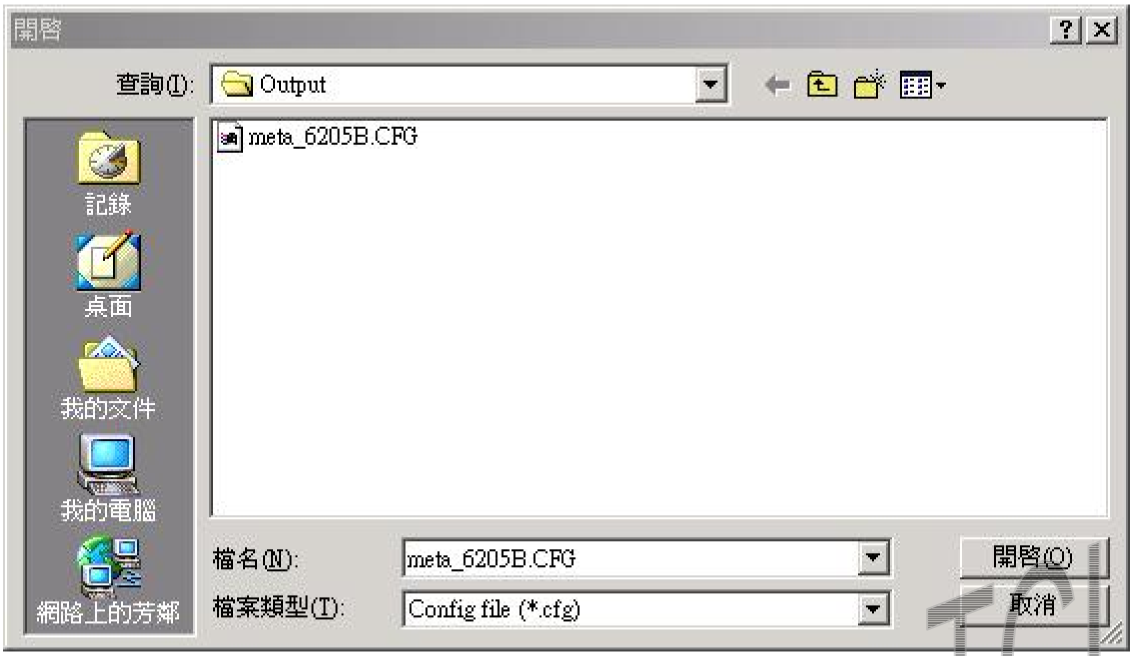

Figure 368 Select CFG file

4.1.1.1.d RX path loss CFG parameters

User can click [RX path loss CFG parameter] to show RX path loss CFG parameter window. User can click [Load from CFG file] button to read RX path loss CFG parameters from CFG file and click [Save to CFG file] to save RX path loss CFG parameters to CFG file.

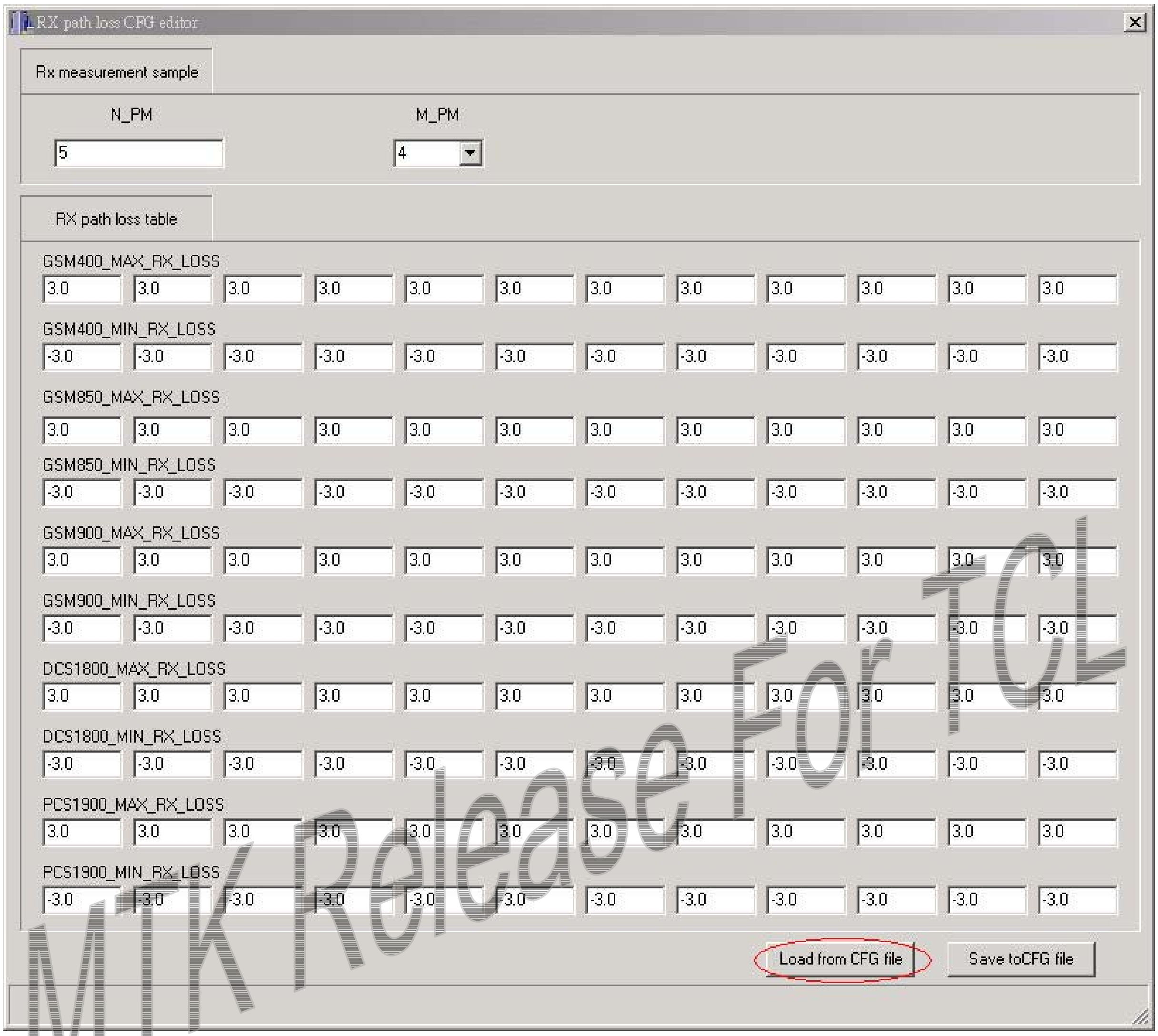

Figure 369 Click [Load from CFG file] button to read RX path loss CFG parameters from CFG file

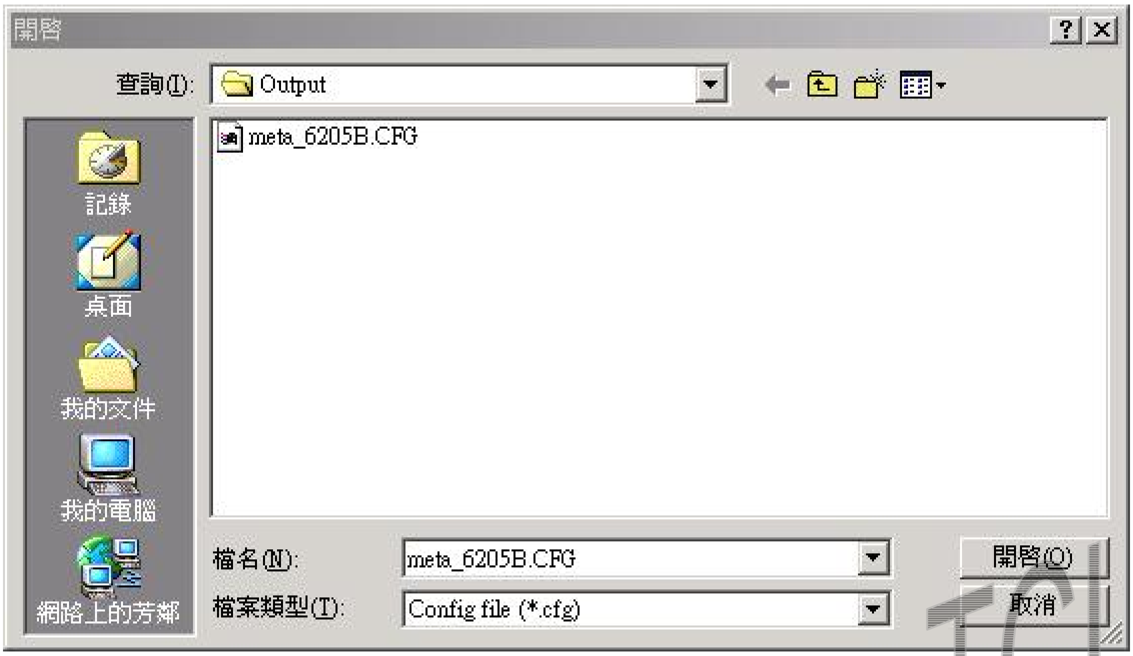

Figure 370 Select CFG file

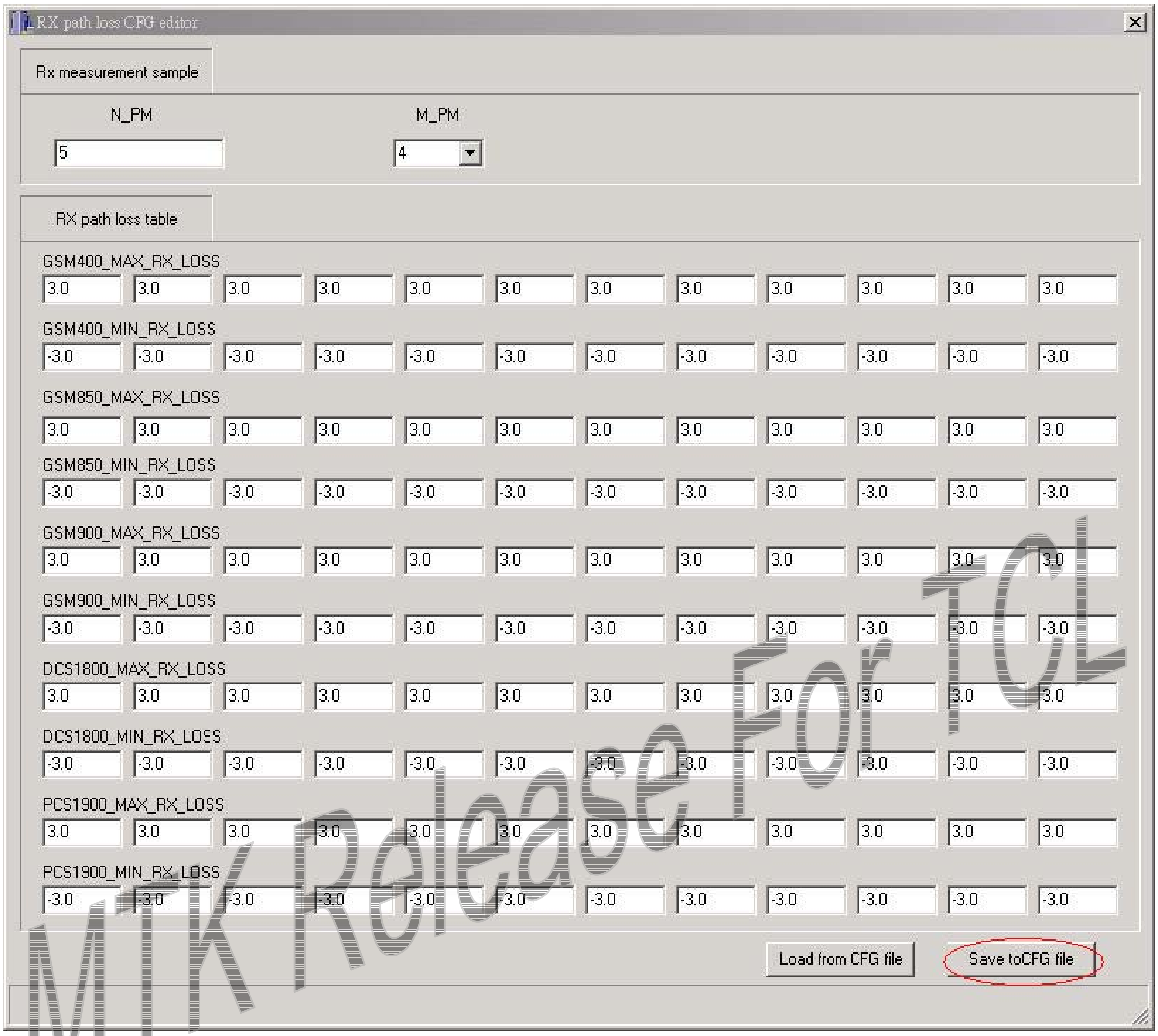

Figure 371 Click [Save to CFG file] to save RX path loss CFG parameters to CFG file

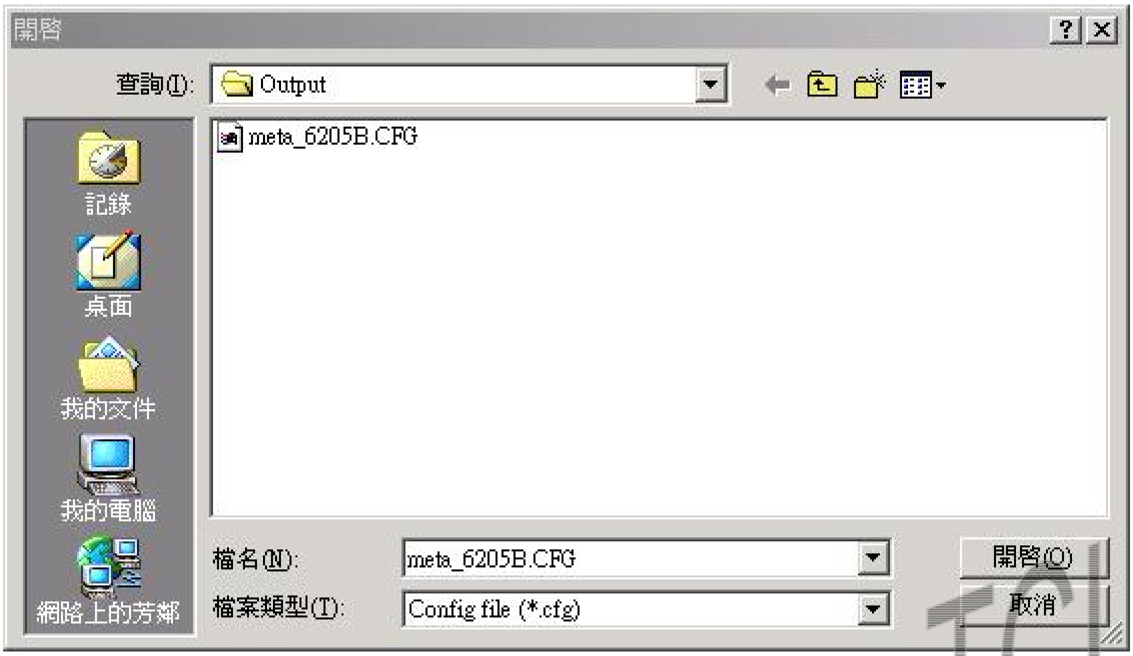

Figure 372 Select CFG file

4.1.1.1.e TX PCL CFG parameters

User can click [TX PCL CFG parameter] to show TX PCL CFG parameter window. User can click [Load from CFG file] button to read TX PCL CFG parameters from CFG file and click [Save to CFG file] to save TX PCL CFG parameters to CFG file.

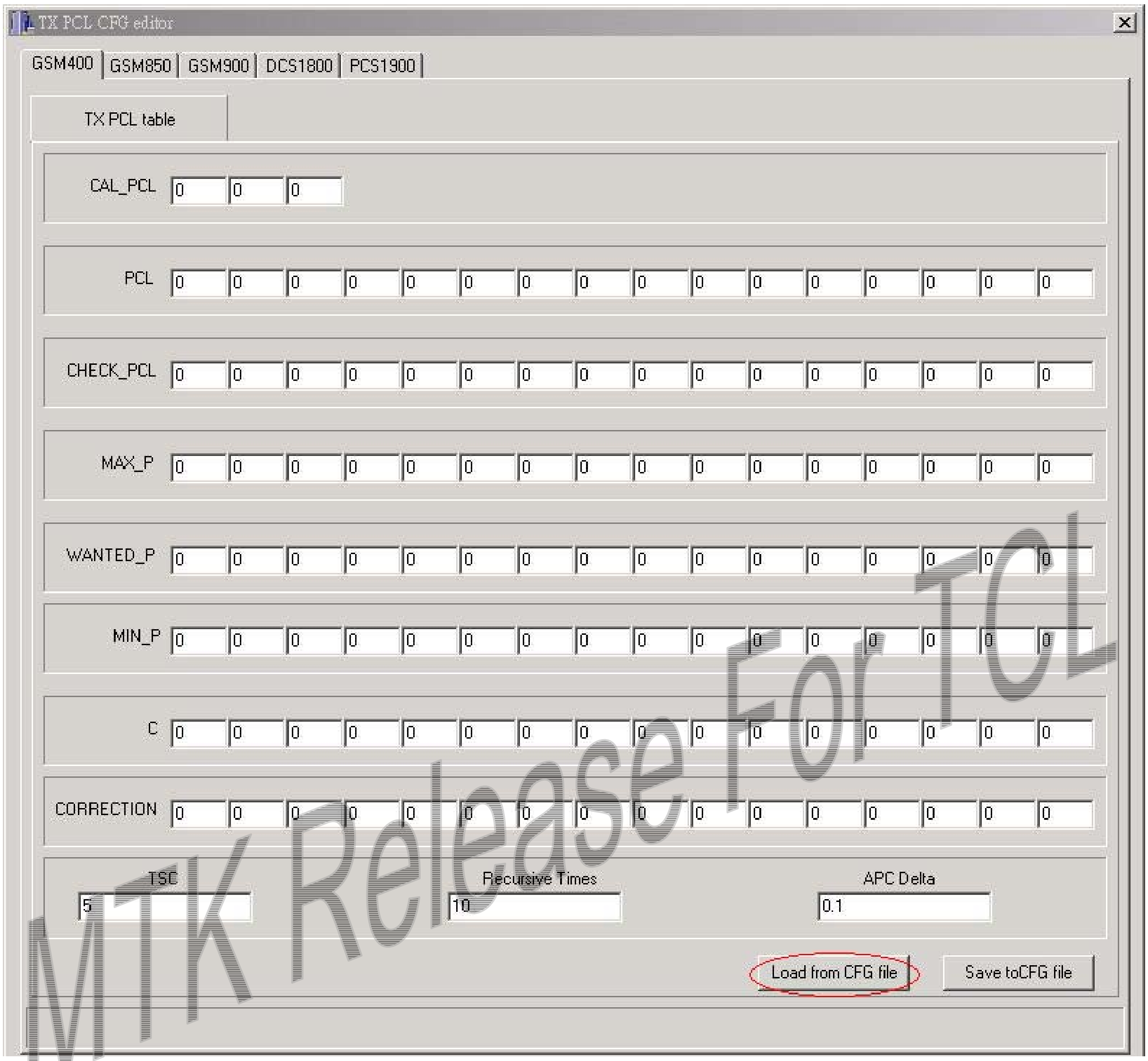

Figure 373 Click [Load from CFG file] button to read TX PCL CFG parameters from CFG file

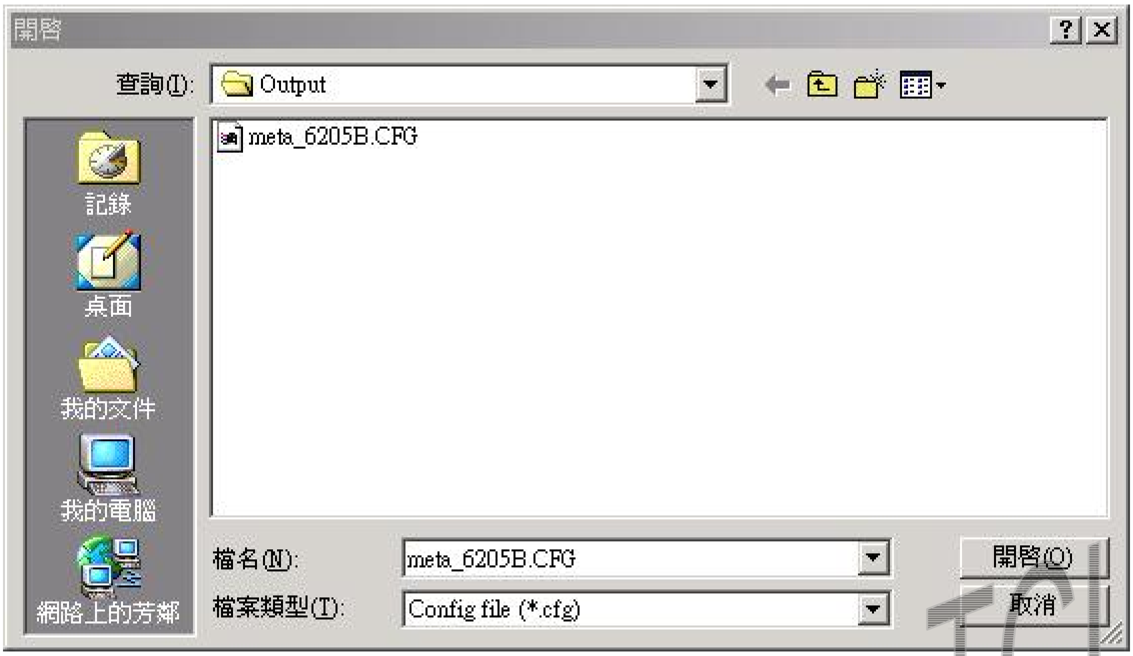

Figure 374 Select CFG file

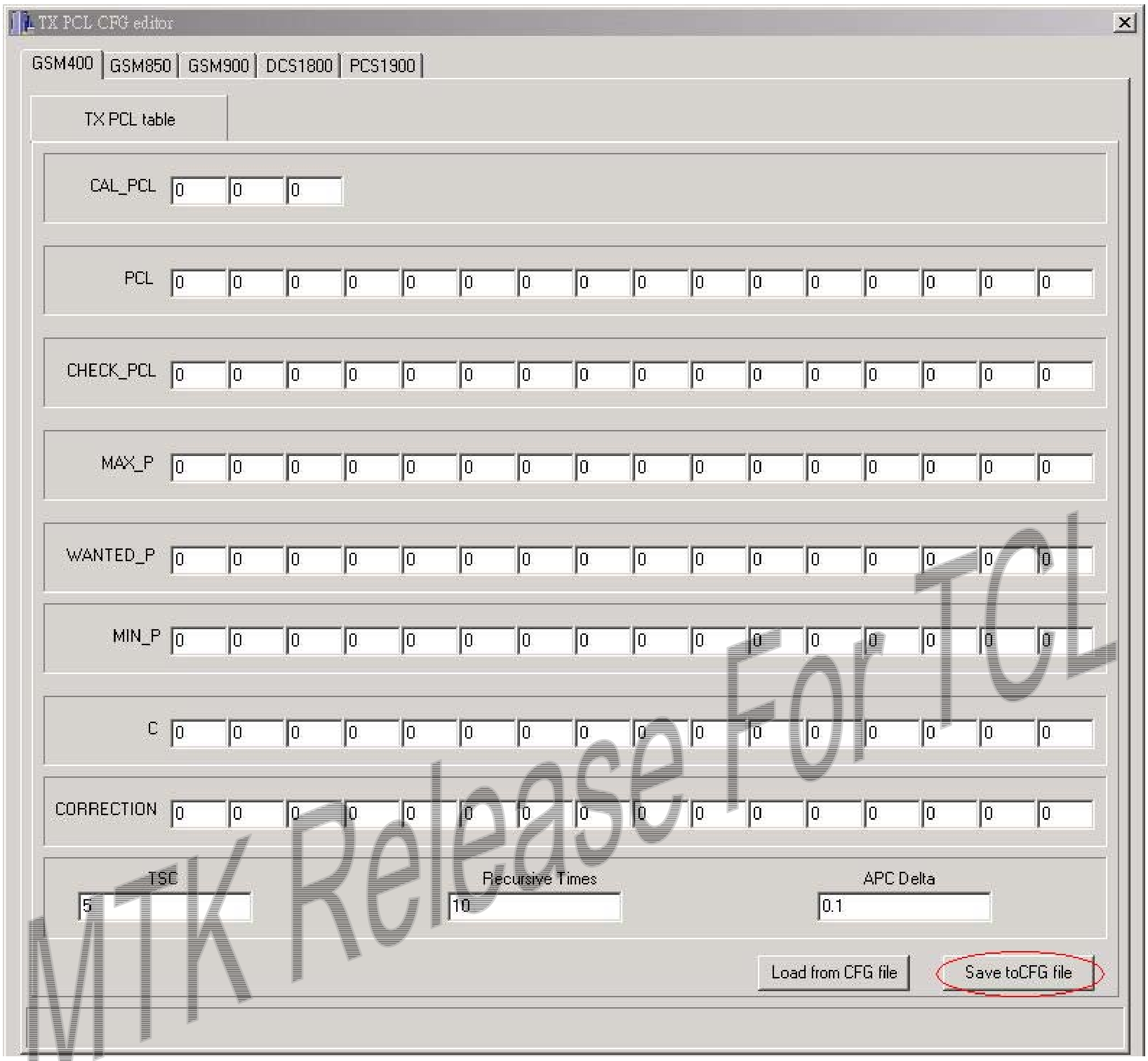

Figure 375 Click [Save to CFG file] to save TX PCL CFG parameters to CFG file

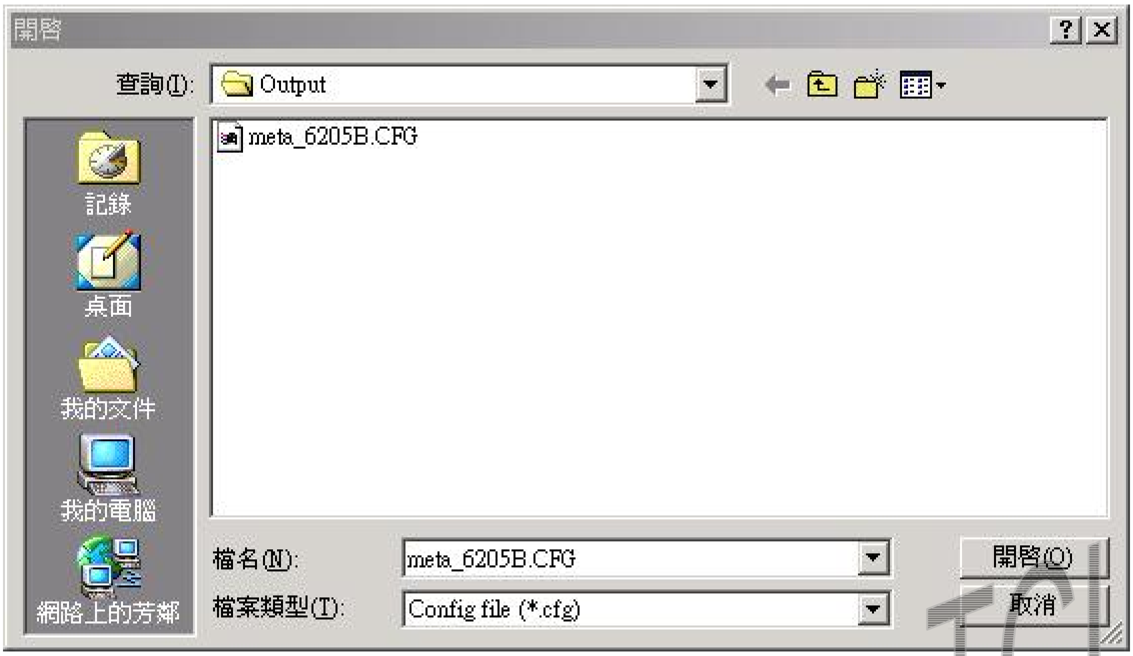

Figure 376 Select CFG file

4.1.1.1.f TX PCL CFG parameters

User can click [TX PCL CFG parameter] to show TX PCL CFG parameter window. User can click [Load from CFG file] button to read TX PCL CFG parameters from CFG file and click [Save to CFG file] to save TX PCL CFG parameters to CFG file.

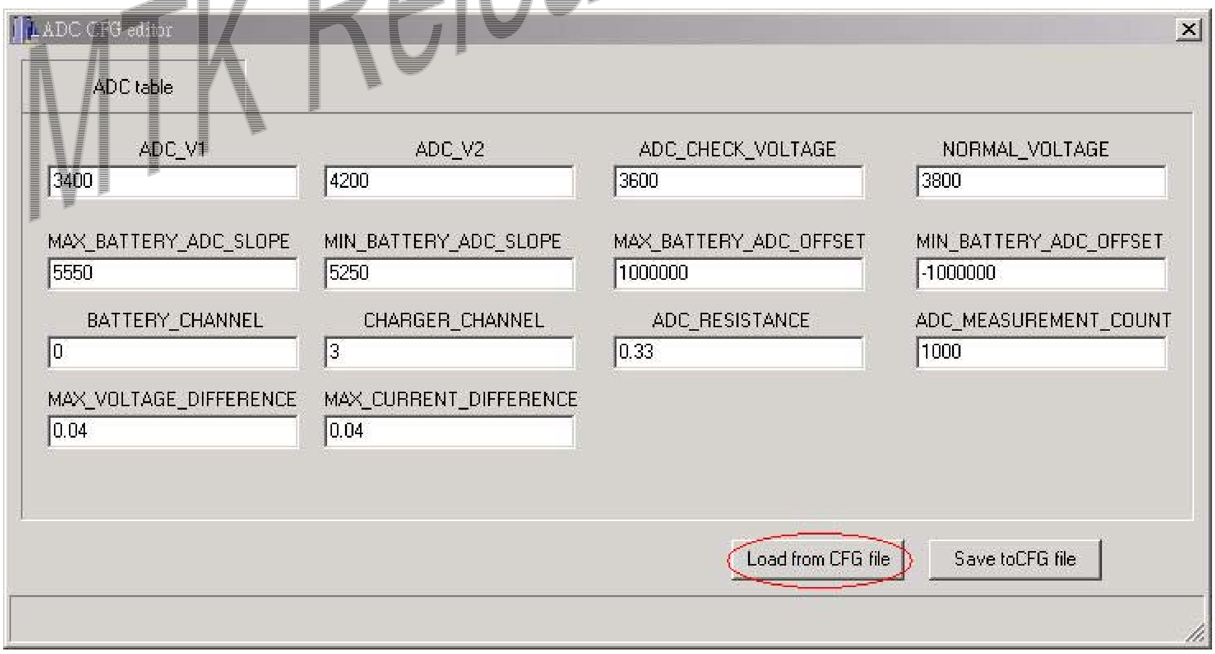

Figure 377 Click [Load from CFG file] button to read TX PCL CFG parameters from CFG file

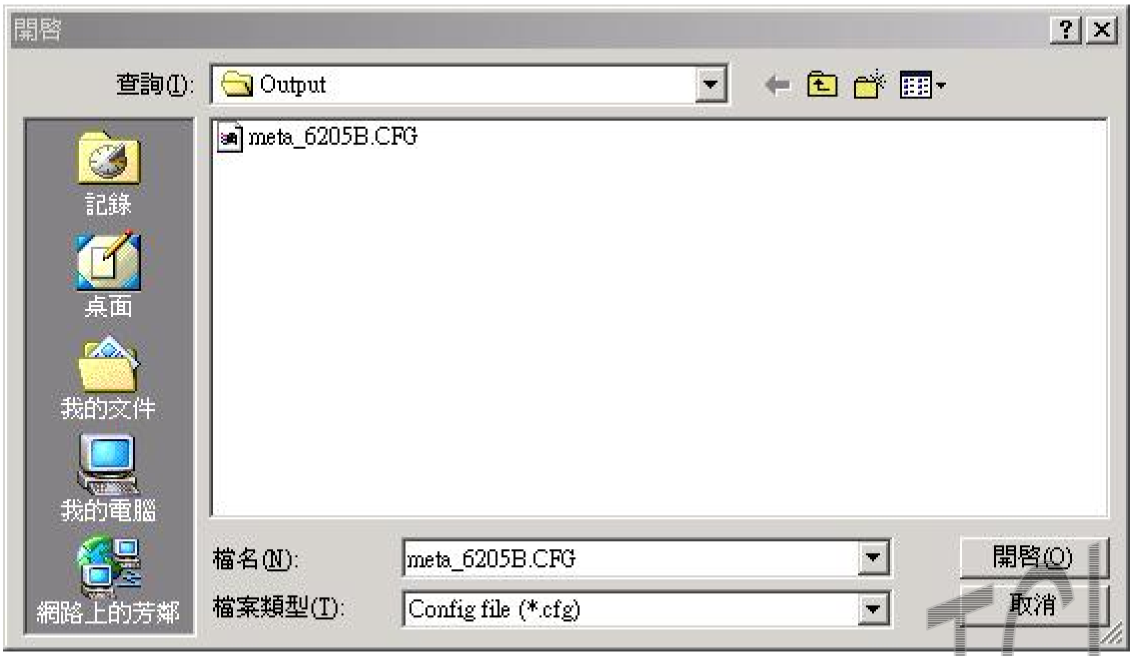

Figure 378 Select CFG file

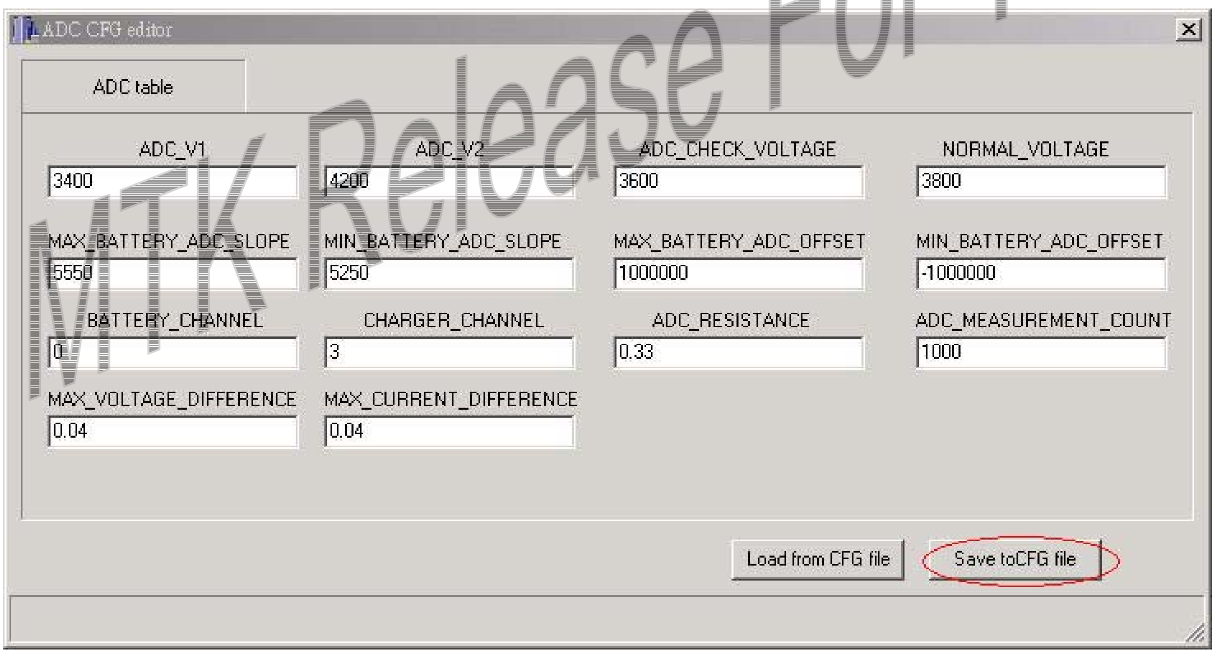

Figure 379 Click [Save to CFG file] to save TX PCL CFG parameters to CFG file

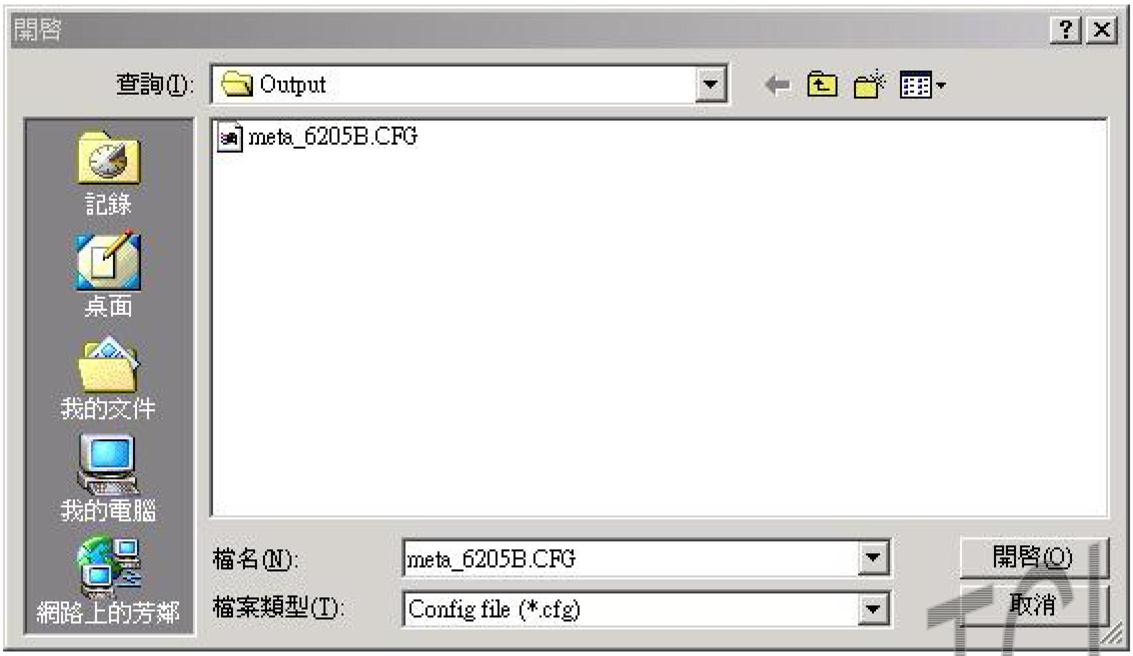

Figure 380 Select CFG file

4.1.2 Logging file

The logging file is the history of the given parameters and output values evaluated during calibration procedure. The content of the logging file can be variant based on real phone module design.

The logging file contains the following record.

1. Label. It is input by user in “Logging file label” in META factory window. Please refer to Figure 384 .
2. ID. When you use the same label to calibration N times, the tool will keep the ID from 0 to N-1for all N times testing.
3. System date and time: the META factory tool logs system time automatically.
   Example:
   2002/8/22 PM 03:58:45
4. The commands and values sent to target.
   Example:
   Target< TX: ARFCN = 60, BSIC = 5, power = 12, frames = 200, dac value = 4768
5. The commands and values sent to Agilent 8960.
   Example:
   Agilent 8960< initial
   Agilent 8960< reset
   Agilent 8960< operating mode: test mode
   Agilent 8960< BCH ARFCN: 60

6. Values read from target:
   Example:
   Target> FB detection=5, Freq Error=21, the square of Deviation=50.66
7. TX power measured by Agilent 8960:
   Example:
   Agilent 8960> power = -660
8. delta s and delta L
   delta s is Δs defined in section 4.2.5 and delta L is ΔL defined in section 4.2.4.

Example:
delta s = 27
delta L = 19

4.1.3 Result file

The file is used to store all calibration result, the result include start ID (i.e. barcode), rx path loss value, AFC slope and offset, TX power (dBm) and battery ADC slope and offset. User can setup the folder of calibration result file by clicking [Setup calibration data result file path] in File pull down menu.

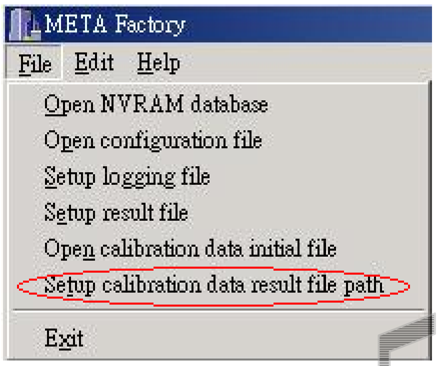

Figure 381 Click [Setup calibration data result file path] to show calibration data result file path window

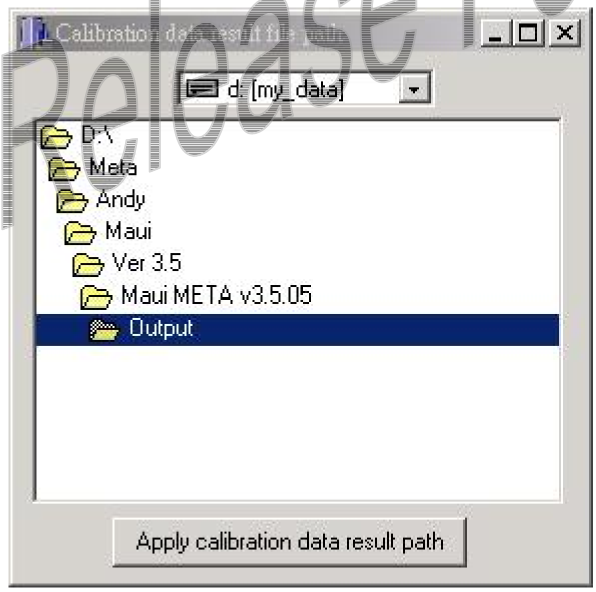

Figure 382 Calibration data result file path window

User can change drive and folder and then click [Apply calibration data result path] button to apply calibration data result file path.

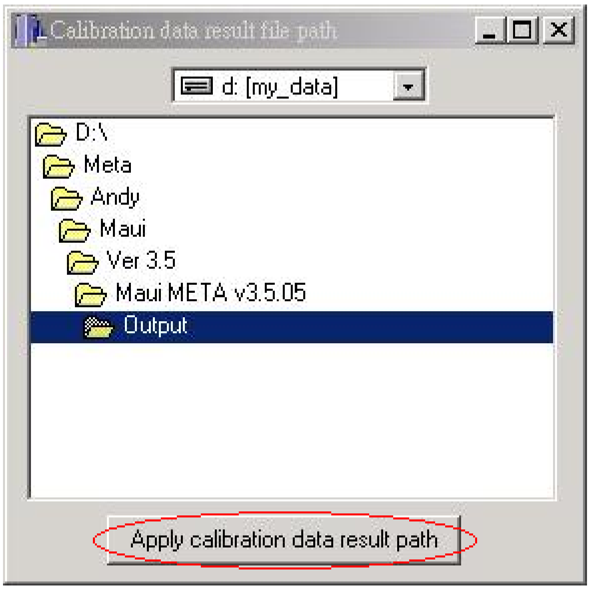

Figure 383 click [Apply calibration data result path] button to apply calibration data result file path

4.1.4 Calibration data initial file

This file is used to keep the default calibration data, normally provided by RF engineer. The tool will read these values as initial calibration values. These values will be different for each mobile model. This file can be acquired in R&D phase via META LAB tool assistance. Therefore, each filed is corresponding to META_LAB window UI.

Note:

- The max ARFCN in EGSM is 1023. If the initial value in Max ARFCN is 1024, the tool will adopt 1023 in calibration procedure.
- RF engineers must tune the TX level values (initial scale factor) of supported bank to speed up TX power control level calibration. The better TX level initial value will help the calibration result more precise to meet the specification. If the initial TX level value is not suitable for the RF module, the TX power calibration result will be out of specification.

The following is a template of the calibration data initial file. Each value must be followed with a comma. Please follow the file format if you want to change the value in file.

[META version]
META version= ver 3.5
; META version

[GSM900 level, ramp]
APC dc offset=115
; APC dc offset : the field specify the pedestal value of the APC unit. The APC D/A converter
; is powered up biased on the offset value specified by the field.
TX power level=57,66,76,90,106,124,147,177,213,258,315,387,478,561,675,675
; profile 0 refer to PCL 19, profile 1 refer to PCL 18, ….., profile 14 refer to PCL 5
profile 0 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,228,255,255,255
profile 0 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 1 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,225,255,255,255
profile 1 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0

profile 2 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 2 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 3 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 3 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 4 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 4 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 5 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 5 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 6 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 6 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 7 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 7 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 8 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 8 ramp down=255,255,239,197,138,78,32,10,0,0,0,0,0,0,0,0
profile 9 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 9 ramp down=255,239,197,138,78,32,10,0,0,0,0,0,0,0,0,0
profile 10 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 10 ramp down=255,239,197,138,78,32,10,0,0,0,0,0,0,0,0,0
profile 11 ramp up=0,0,0,0,0,0,2,4,8,26,65,143,219,250,255,255
profile 11 ramp down=255,239,197,138,78,32,10,0,0,0,0,0,0,0,0,0
profile 12 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,250,255
profile 12 ramp down=255,239,197,138,78,32,10,0,0,0,0,0,0,0,0,0
profile 13 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,250,255
profile 13 ramp down=255,239,197,138,78,32,10,0,0,0,0,0,0,0,0,0
profile 14 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,250,255
profile 14 ramp down=255,239,197,138,78,32,10,0,0,0,0,0,0,0,0,0
profile 15 ramp up=0,0,0,0,0,0,0,2,4,8,26,65,143,219,250,255
profile 15 ramp down=255,239,197,138,78,32,10,0,0,0,0,0,0,0,0,0
Subband max arfcn=40,82,124,1023,-1,0,0,0,0,0,0
Subband mid level=11,11,11,11,19,19,19,19,19,19,19
Subband high weight=1.000,1.000,1.000,1.000,0.000,0.000,0.000,0.000,0.000,0.000,0.0000
Subband low weight=1.000,1.000,1.000,1.000,0.000,0.000,0.000,0.000,0.000,0.000,0.0000
;Subband mid level : the level below the [suband mid level] will be multiplied by [Subband low weight], and the level above [Subband mid level] will be multiplied by [Subband high weight].
;Subband high weight : each entry of the ramp profile of level above [Subband mid level] will be multiplied by [Subband high weight].
;Subband low weight : each entry of the ramp profile of level below [Subband mid level] will be multiplied by [Subband low weight].
Battery compensate, low voltage, low temperature=1
Battery compensate, low voltage, mid temperature=1
Battery compensate, low voltage, high temperature=1
Battery compensate, mid voltage, low temperature=1
Battery compensate, mid voltage, mid temperature=1
Battery compensate, mid voltage, high temperature=1
Battery compensate, high voltage, low temperature=1
Battery compensate, high voltage, mid temperature=1
Battery compensate, high voltage, high temperature=1
; These 3x3 array compensate the APC scaling factor under low/mid/high voltage/temperature

[DCS1800 level, ramp]
APC dc offset=115
TX power level=51,58,67,78,91,106,126,147,172,203,238,285,340,408,474,540

; profile 0 refer to PCL 15, profile 1 refer to PCL 14, ….., profile 15 refer to PCL 0
profile 0 ramp up=0,0,0,0,1,2,4,8,32,70,145,185,232,252,255,255
profile 0 ramp down=255,255,239,197,138,78,32,10,2,0,0,0,0,0,0,0
profile 1 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,250,255,255
profile 1 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 2 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,250,255,255
profile 2 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 3 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,250,255,255
profile 3 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 4 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,250,255,255
profile 4 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 5 ramp up=0,0,0,0,1,2,4,8,30,65,143,219,250,255,255,255
profile 5 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 6 ramp up=0,0,0,0,1,2,4,8,30,65,143,219,250,255,255,255
profile 6 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 7 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 7 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 8 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 8 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 9 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 9 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 10 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 10 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 11 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 11 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 12 ramp up=0,0,0,0,0,0,1,2,4,8,30,65,143,219,255,255
profile 12 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 13 ramp up=0,0,0,0,0,0,1,2,4,8,30,65,143,219,255,255
profile 13 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 14 ramp up=0,0,0,0,0,0,0,3,7,24,60,130,179,239,255,255
profile 14 ramp down=255,239,209,158,97,60,20,7,0,0,0,0,0,0,0,0
profile 15 ramp up=0,0,0,0,0,0,0,3,7,24,60,130,179,239,255,255
profile 15 ramp down=255,239,209,158,97,60,20,7,0,0,0,0,0,0,0,0
Subband max arfcn=520,560,600,630,660,680,720,730,750,800,885
Subband mid level=4,4,4,4,4,4,4,4,4,4,4
Subband high weight=1.050,1.040,1.030,1.020,1.010,1.000,1.000,0.995,0.990,0.985,0.9800
Subband low weight=1.100,1.050,1.010,1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.0000
;Subband mid level : the level below the [suband mid level] will be multiplied by [Subband low weight], and the level above [Subband mid level] will be multiplied by [Subband high weight].
;Subband high weight : each entry of the ramp profile of level above [Subband mid level] will be multiplied by [Subband high weight].
;Subband low weight : each entry of the ramp profile of level below [Subband mid level] will be multiplied by [Subband low weight].
Battery compensate, low voltage, low temperature=1
Battery compensate, low voltage, mid temperature=1
Battery compensate, low voltage, high temperature=1
Battery compensate, mid voltage, low temperature=1
Battery compensate, mid voltage, mid temperature=1
Battery compensate, mid voltage, high temperature=1
Battery compensate, high voltage, low temperature=1
Battery compensate, high voltage, mid temperature=1
Battery compensate, high voltage, high temperature=1

; These 3x3 array compensate the APC scaling factor under low/mid/high voltage/temperature

[PCS1900 level, ramp]
APC dc offset=115
TX power level=60,68,77,89,103,116,134,156,182,217,260,310,373,454,565,675
; profile 0 refer to PCL 15, profile 1 refer to PCL 14, ….., profile 15 refer to PCL 0
profile 0 ramp up=0,0,0,0,0,0,2,7,24,60,120,172,232,255,255,255
profile 0 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 1 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 1 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 2 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 2 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 3 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 3 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 4 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 4 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 5 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 5 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 6 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 6 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 7 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 7 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 8 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 8 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 9 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 9 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 10 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 10 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 11 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 11 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 12 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 12 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 13 ramp up=0,0,0,0,0,1,2,4,8,30,65,143,219,255,255,255
profile 13 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 14 ramp up=0,0,0,0,0,1,2,4,8,24,60,120,172,232,255,255
profile 14 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
profile 15 ramp up=0,0,0,0,0,1,2,4,8,24,56,120,172,232,255,255
profile 15 ramp down=255,255,239,209,158,107,65,20,7,0,0,0,0,0,0,0
Subband max arfcn=520,560,600,630,660,680,720,730,750,800,810
Subband mid level=7,7,7,7,7,7,7,7,7,7,7
Subband high weight=1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.0000
Subband low weight=1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.000,1.0000
;Subband mid level : the level below the [suband mid level] will be multiplied by [Subband low weight], and the level above [Subband mid level] will be multiplied by [Subband high weight].
;Subband high weight : each entry of the ramp profile of level above [Subband mid level] will be multiplied by [Subband high weight].
;Subband low weight : each entry of the ramp profile of level below [Subband mid level] will be multiplied by [Subband low weight].
Battery compensate, low voltage, low temperature=1
Battery compensate, low voltage, mid temperature=1
Battery compensate, low voltage, high temperature=1
Battery compensate, mid voltage, low temperature=1

Battery compensate, mid voltage, mid temperature=1
Battery compensate, mid voltage, high temperature=1
Battery compensate, high voltage, low temperature=1
Battery compensate, high voltage, mid temperature=1
Battery compensate, high voltage, high temperature=1
; These 3x3 array compensate the APC scaling factor under low/mid/high voltage/temperature
[GSM900 Sub band, RX loss]
Max ARFCN=15,30,45,60,75,80,100,124,975,1000,1023,-1
RX loss=-1.125,-1.000,-1.000,-1.125,-1.250,-1.250,-0.750,-0.500,-0.500,-0.875,-1.250,0.0000
[DCS1800 Sub band, RX loss]
Max ARFCN=550,590,620,650,680,710,740,770,810,850,885,-1
RX loss=-0.375,-0.750,-0.875,-0.875,-1.000,-1.000,-0.750,-0.750,-0.875,-0.750,-0.125,0.0000
[PCS1900 Sub band, RX loss]
Max ARFCN=550,810,-1,0,0,0,0,0,0,0,0,0
RX loss=-4.000,-4.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.000,0.0000

[AFC control]
Initial value=4531
Slope=2.5425

[ADC control]
offset=-23466,-23466,-23466,-3796,-23466
slope=5391,5391,5391,5383,5391

4.2 Calibration procedure

Following is the calibration procedure of META factory.

4.2.1 Initialization

1. Configure META-DLL.
2. Agilent 8960 or R&S CMU 200 Configuration and the cable loss compensation.
3. Open configuration file and import the default RF calibration from initial data file. These default RF calibration data will be written down to NVRAM.

4.2.2 TCVCXO AFC calibration

1. Command Agilent 8960 or R&S CMU 200 to set BCCH carrier on arfcn_C0_GSM (1~124) and downlink power of P_{DL} (in dBm),
2. Issues AFC testing request to MS via META DLL, test AFC on arfcn_C0_GSM over N_AFC sample, with request gain of –35- P_{DL} and AFC DAC value of DAC_1
3. Wait the averaged frequency error $\overline{\Delta f_1}$ reported from META-DLL,
4. Issues AFC testing request to MS via META DLL, test AFC on arfcn_C0_GSM over N_AFC sample, with request gain of –35- P_{DL} and AFC DAC value of DAC_2, where DAC_2 > DAC_1
5. Wait the averaged frequency error $\overline{\Delta f_2}$ reported from META-DLL,
6. Slope = $\left(\overline{\Delta f_1} - \overline{\Delta f_2}\right) / \left(DAC_2 - DAC_1\right)$, therefore $slope\_inv = 4096 / slope$

7. AFC equation $y-\overline{\Delta f_1}=-slope\times(x-DAC_1)$. In order to get the initial value, set y=0, then initial value should be $\overline{\Delta f_1}/slope+DAC_1$
8. Write $slope\_inv$ and initial value to target via META-DLL interface

Note:

- P_{DL} is value of P_DL in [Downlink power] section in configuration file.
- DAC_1 is value of DAC1 in [AFC Calibration] section in configuration file.
- DAC_2 is value of DAC2 in [AFC Calibration] section in configuration file.

4.2.3 Crystal AFC calibration

1.Command Agilent 8960 or R&S CMU 200 to set BCCH carrier on CRYSTAL_AFC_ARFCN (1~124) and downlink power of P_{DL} (in dBm), TSC value and respected MS uplink PCL.
2. Set first_cap_id = 0 , last_cap_id = 63, cal_cap_id and min_cap_id to the value of cap_id specified in ini file, and min_Ferr = infinity.
3. Issues NB (normal burst) TX request to MS via META DLL, NB TX on CRYSTAL_AFC_ARFCN with request TX PCL of CRYSTAL_AFC_PCL, AFC DAC value of CAL_DAC and.
4.Command the Agilent 8960 or R&S CMU 200 to measure the received MS uplink frequency error Ferr N.
If Ferr N is small than min_Ferr, set min_Ferr = Ferr N.
5.Adjust first_cap_id, last_cap_id and cal_cal_cap_id by the following rule:
If Ferr N < 0 at step 3, set last_cap_id = cal_CapIdFreqErr.cap_id.
If Ferr N > 0 at step 3, set first_cap_id = cal_CapIdFreqErr.cap_id + 1.
If Ferr N = 0 at step 3, set min_cap_id = cal_cap_id, go to step 6.
cal_cap_id = (first_cap_id+last_cap_id) /2.
6.Repeat step 3 and step 4 until first_cap_id >= last_cap_id.
7. Issues NB (normal burst) TX request to MS via META DLL, NB TX on CRYSTAL_AFC_ARFCN with request TX PCL of CRYSTAL_AFC_PCL, AFC DAC value of MIN_CHECK_DAC.
8. Command the Agilent 8960 or R&S CMU 200 to measure the received MS uplink frequency error Ferr C.
Set Fppm C= Ferr C/center frequency of CRYSTAL_AFC_ARFCN .
9.If Fppm C < 0 and Fppm C<d_MIN_FREQUENCY_ERROR_PPM, the check result is pass, otherwise the check result is fail. If Fppm C >= 0 and Fppm C > d_MAX_FREQUENCY_ERROR_PPM, the check result is pass, otherwise the check result is fail.
10.Write min_cap_id to target via META-DLL interface if the check result is pass.
11. Run the TCVCXO AFC calibration algorithm as described in previous section.

4.2.4 RF path loss calibration

1. Command Agilent 8960 or R&S CMU 200 to set BCCH carrier on ARFCN1 and downlink power of P_{DL} (in dBm),
2. Via META-DLL, Issues PM request on ARFCN1 over N_PM frames and M_PM samples per frame, with request gain of –35- P_{DL}

3. Wait $P_{DL,rep}$ reported from META-DLL, the path loss on ARFCN1 could be evaluated as ΔL_1(dB)= P_{DL} - $P_{DL,rep}$
4. Repeat step 1~3, until path loss $\Delta L_2 \sim \Delta L_n$ for GSM bank, where n is up to 12, are complete.
5. Repeat step 1~4, until path loss table for all bank MS supported are complete.
6. Write the updated path loss table $L + \Delta L$ to target via META-DLL interface

Note: ARFCN can be acquired from the path loss table for each bank. It is the "Max ARFCN" for each bank in initial data file. L is value of "RX loss" for each bank in initial data file. P_{DL} P_DL, N_PM and M_PM are read from configuration file.

4.2.5 TX power control level (PCL) calibration

4.2.5.1 3 point TX power control level (PCL) calibration

1. Command Agilent 8960 or R&S CMU 200 to set BCCH carrier as arfcn_C0_GSM, BSIC value and respected MS uplink PCL.
2. Issue the TX command to target with the parameter of arfcn_C0_GSM, testing period in frames, DAC initial value gotten in AFC calibration and TX power in PCL.
3. Command the Agilent 8960 or R&S CMU 200 to measure the received MS uplink power, and check whether it is in the range specified by the configuration file.
4. Follow 3, if it is in the range. Jump to step 5. Otherwise, adjust scale factor s as $s + \Delta s$ $\Delta s = c_n \times (P_{wanted} - P_{meas})$, where s is the range of 0~1023 and c_n is unique for each PCL calibration.
5. Get APC control voltage V_set by the following formula
   V_set = (APC DC offset + S) / 1024.0 * 2.8 * 15.0 / 25.0, where APC DC offset is value specified in section [level, ramp] in initial file.
6. Repeat step 1~5 for 3 PCL (PCL_h, PCL_mid, PCL_low), until V_set_h, V_set_mid and V_set_low are complete.
7. Calculate Rload_high by PCL_h, V_set_h, PCL_mid, V_set_mid and the following formula
   Rload_high=[(8/3/√2*(V_set_h - V_set_mid))/(√PCL_h - √PCL_mid)]^2.
8. Calculate K1_high using the following formula
   K1_high = 8/3/√2*V_set_mid – √(Rload_high*PCL_mid).
9. Calculate Vset of each power level from PCLmax to PCLmid by the following formula
   Vset=3/8*√2*(√(Rload_high*PCL_power)+K1_high), where PCL_power =
   (10^((P_{wanted} + Correction)/10))/1000, Correction is listed in [TX PCL table] section of CFG file.
10. Calculate Rload_low by PCL_mid, Vset_mid, PCL_low, Vset_low and the following formula
    Rload_low=[(8/3/√2*(V_set_mid - V_set_low))/(√PCL_mid - √PCL_low)]^2.
11. Calculate K1_low by the following formula
    K1_low= 8/3/√2*V_set_mid – √(Rload_low*PCL_mid).
12. Calculate Vset of each power level from PCL_mid to PCL_min by the following formula
    Vset=3/8*√2*(√(Rload_low*PCL_power)+K1_low), where PCL_power =
    (10^((P_{wanted} + Correction)/10))/1000, Correction is listed in [TX PCL table] section of CFG file.
13. Calculate scaling factor of each power level by the following formula
    scaling factor = V_set*1024.0/2.8 * 25.0 / 15.0 – APC DC offset.
14. Repeat step 1~13 for each bank, until the whole scale factor are complete.
15. Write the scaling factor and ramp-profile to target via META-DLL interface.

Note:

- arfcn_C0_GSM could be at the middle of the bank
- c_n is the value of GSM900_C, DCS1800_C, PCS1900_C in configuration file.
- Correction is value of GSM900_CORRECTION, DCS1800_CORRECTION, and PCS1900_CORRECTION in configuration file.
- Pwanted is the value of GSM900_WANTED_P, DCS1800_WANTED_P, PCS1900_WANTED_P in configuration file.
- Pmeas is TX power measurement by Agilent 8960 or R&S CMU 200.
- s is the value of TX level in initial file.
- The range in step 3 is GSM900_MIN_P <= range <= GSM900_MAX_P, DCS1800_MIN_P <= range <= DCS1800_MAX_P and PCS1900_MIN_P <= range <= PCS1900_MAX_P. These MAX_P and MAX_P values are read from configuration file.

4.2.5.2 Full TX power control level (PCL) calibration

1.Command Agilent 8960 or R&S CMU 200 to BCCH carrier as arfcn_C0_GSM, BSIC value and respected MS uplink PCL.
2.Issue the TX command to target with the parameter of arfcn_C0_GSM, testing period in frames, DAC initial value gotten in AFC calibration and TX power in PCL.
3.Command the Agilent 8960 or R&S CMU 200 to measure the received MS uplink power, and check whether it is in the range specified by the configuration file.
4.Follow 3, if it is in the range. Jump to step 5. Otherwise, adjust scale factor s as $s+\Delta s$ $\Delta s = c_n \times (P_{wanted} - P_{meas})$, where s is the range of 0~1023 and c_n is unique for each PCL calibration
5.Repeat step 1~4 for each PCL, until scale factor are complete
6.Repeat step 1~5 for each bank, until the whole scale factor are complete
7.Write the scale factor and ramp-profile to target via META-DLL interface

Note:

- arfcn_C0_GSM could be at the middle of the bank
- c_n is the value of GSM900_C, DCS1800_C, PCS1900_C in configuration file.
- Pwanted is the value of GSM900_WANTED_P, DCS1800_WANTED_P, PCS1900_WANTED_P in configuration file.
- Pmeas is TX power measurement by Agilent 8960 or R&S CMU 200.
- s is the value of TX level in initial file.

The range in step 3 is GSM900_MIN_P <= range <= GSM900_MAX_P, DCS1800_MIN_P <= range <= DCS1800_MAX_P and PCS1900_MIN_P <= range <= PCS1900_MAX_P. These MAX_P and MAX_P values are read from configuration file.

4.2.6 ADC calibration

1.Command output voltage of power supply to ADC_V1.
2.Measure output voltage of power supply. The output voltage is named as ADC_Measure_Voltage_0.
3.Command the target to do ADC measurement using BATTERY_CHANNEL and CHARGER_CHANNEL. The measure count is ADC_MEASUREMENT_COUNT in configuration file. The measurement result is BATTERY_ADC_Output_0 and CHARGER_ADC_Output_0.
4.Command output voltage of power supply to ADC_V2.
5.Measure output voltage of power supply. The output voltage is named as ADC_Measure_Voltage_1.
6.Command the target to do ADC measurement using BATTERY_CHANNEL and CHARGER_CHANNEL. The measure count is ADC_MEASUREMENT_COUNT in configuration file. The measurement result is BATTERY_ADC_Output_1 and CHARGER_ADC_Output_1.

7.Calculate ADC slope and offset of BATTERY_CHANNEL and CHARGER_CHANNEL by the following formula

slope(BATTERY_CHANNEL) = (ADC_Measure_Voltage_1 - ADC_Measure_Voltage_0) / (BATTERY_ADC_Output_1 - BATTERY_ADC_Output_0)

offset(BATTERY_CHANNEL) = ADC_Measure_Voltage_0 - slope(BATTERY_CHANNEL)* BATTERY_ADC_Output_0

slope(CHARGER_CHANNEL) = (ADC_Measure_Voltage_1 - ADC_Measure_Voltage_0) / (CHARGER _ADC_Output_1 - CHARGER _ADC_Output_0)

offset(CHARGER_CHANNEL) = ADC_Measure_Voltage_0 - slope(CHARGER_CHANNEL) * CHARGER_ADC_Output_0

8.Apply slope and offset of all other ADC channel except CHARGER_CHANNEL to slope(BATTERY_CHANNEL) and offset(BATTERY_CHANNEL).

9.Save slope and offset of all ADC channel to NVRAM.

10.Get CHARGER_ADC_Predict_Voltage1 and BATTERY_ADC_Predict_Voltage1 by the following formula

BATTERY_ADC_Predict_Voltage1 = (offset(BATTERY_CHANNEL) + slope(BATTERY_CHANNEL) *BATTERY_ADC_Output_1) /1000000.0

CHARGER_ADC_Predict_Voltage1 = (offset(CHARGER_CHANNEL) + slope(CHARGER_CHANNEL) * CHARGER_ADC_Output_1) /1000000.0

11.Calculate current difference by the following formula

current_difference = |BATTERY_ADC_Predict_Voltage - CHARGER_ADC_Predict_Voltage| / ADC_RESISTANCE

If current_difference is large than MAX_CURRENT_DIFFERENCE, ADC current difference check fail, abort ADC check procedure. Otherwise, ADC current difference check pass.

Note: ADC_RESISTANCE, MAX_CURRENT_DIFFERENCE is specified in configuration file.

12. Command output voltage of power supply to ADC_CHECK_VOLTAGE, ADC_CHECK_VOLTAGE is specified in configuration file.

13. Measure output voltage of power supply. The output voltage is named as ADC_Measure_Voltage_2.

14.Command the target to do ADC measurement using BATTERY_CHANNEL. The measure count is ADC_MEASUREMENT_COUNT in configuration file. The measurement result is BATTERY_ADC_Output_2.

15.Get BATTERY_ADC_Predict_Voltage2 and CHARGER_ADC_Predict_Voltage2 by the following formula

BATTERY_ADC_Predict_Voltage2 = (offset(BATTERY_CHANNEL) + slope(BATTERY_CHANNEL) *BATTERY_ADC_Output_2) /1000000.0

16.Calculate the voltage difference by the following formula

voltage_difference = | BATTERY_ADC_Predict_Voltage2 - ADC_Measure_Voltage_2|

If voltage_difference is large than MAX_VOLTAGE_DIFFERENCE, ADC voltage difference check is fail, Otherwise, ADC current difference check pass.

17.Check slope(BATTERY_CHANNEL) and offset(BATTERY_CHANNEL) in the range. (i.e. MIN_BATTERY_ADC_SLOPE <= slope(BATTERY_CHANNEL) <= MAX_BATTERY_ADC_SLOPE, MIN_BATTERY_ADC_OFFSET <= offset(BATTERY_CHANNEL) <= MAX_BATTERY_ADC_SLOPE)). If slope(BATTERY_CHANNEL) and offset(BATTERY_CHANNEL) is outside the range, ADC slope and offset check is fail, abort ADC check procedure. Otherwise, ADC slope and offset check is pass.

Note:

- The value of ADC_V1, ADC_V2, ADC_CHECK_VOLTAGE, MAX_BATTERY_ADC_SLOPE, MIN_BATTERY_ADC_SLOPE, MAX_BATTERY_ADC_OFFSET, MIN_BATTERY_ADC_OFFSET, BATTERY_CHANNEL, CHARGER_CHANNEL, ADC_RESISTANCE, MAX_VOLTAGE_DIFFERENCE, MAX_CURRENT_DIFFERENCE and ADC_MEASUREMENT_COUNT is specified in section [ADC table] in configuration file.

4.3 Start calibration

After 5 files are opened and set, user must click [Start] button to start auto calibration. User can click [Stop] button to stop current calibration procedure. There are many option for user to choose, these option are as follows:

- Initial value: this group indicates the initial RF and ADC calibration parameter from flash or ini file.
- Calibration item: this group indicates the calibration items, they are RF calibration and ADC calibration.
- TX PCL calibration: this group indicates the TX PCL calibration algorithm used, they are 3 PCL or full PCL calibration.
- Power supply: this group indicates the power supply type used, they are Agilent 663x2 or Agilent 661x series power supply.
- Enter META Factory: this group indicate items will be done when enter META factory mode, these items include read barcode from, barcode increase, auto start calibration.
- Exit META Factory: this group indicate items will be done when exit META factory mode, these items include barcode increase, save barcode to NVRAM, save barcode to file, terminate META.
- Calibration success: this group indicate items will be done when calibration is successful, these items include barcode increase, save barcode to NVRAM, save barcode to file, turn off power supply, terminate META.
- Calibration fail: this group indicate items will be done when calibration is fail, these items include barcode increase, save barcode to NVRAM, save barcode to file, turn off power supply, terminate META.

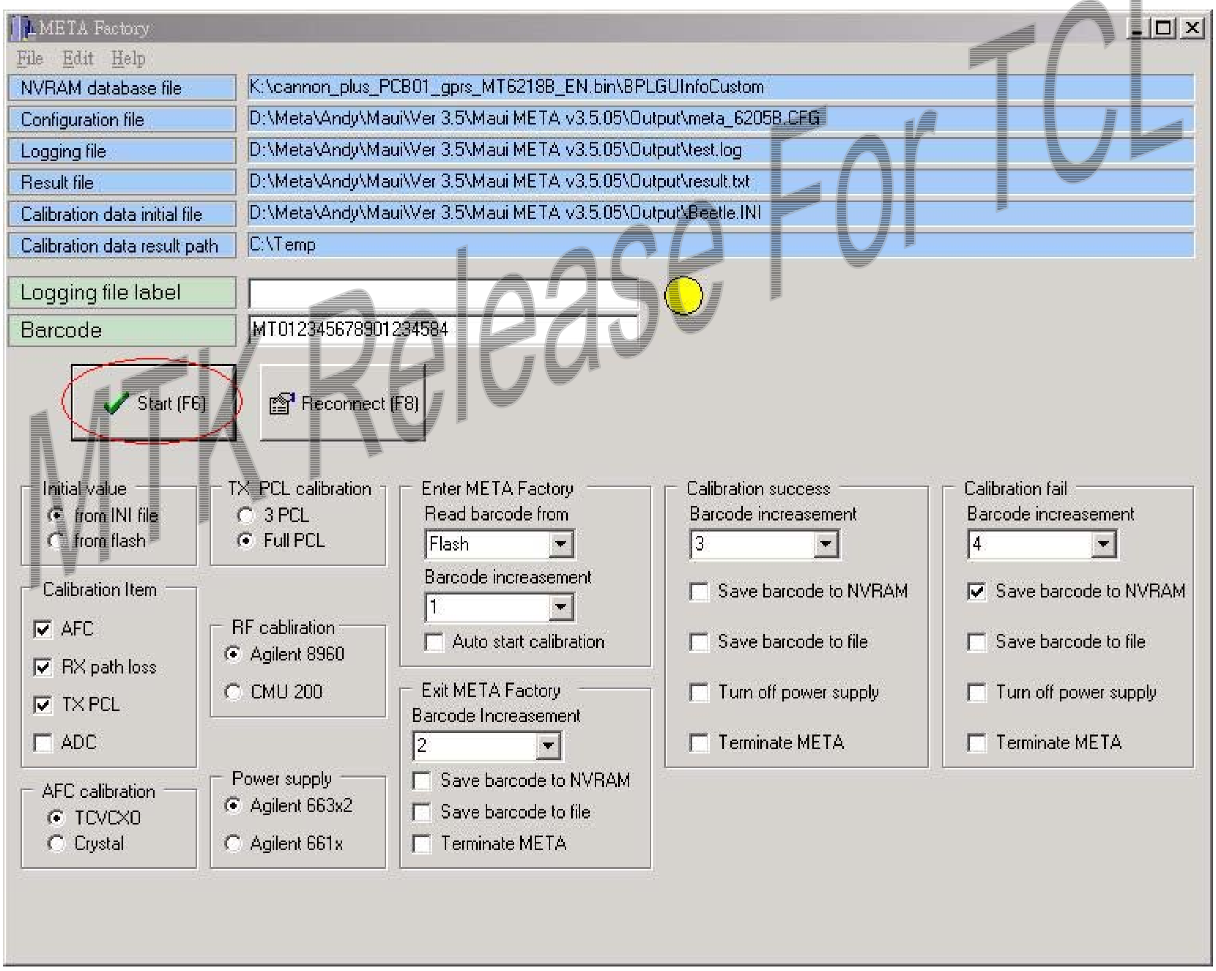

Figure 384 Click [Start] button to start auto calibration

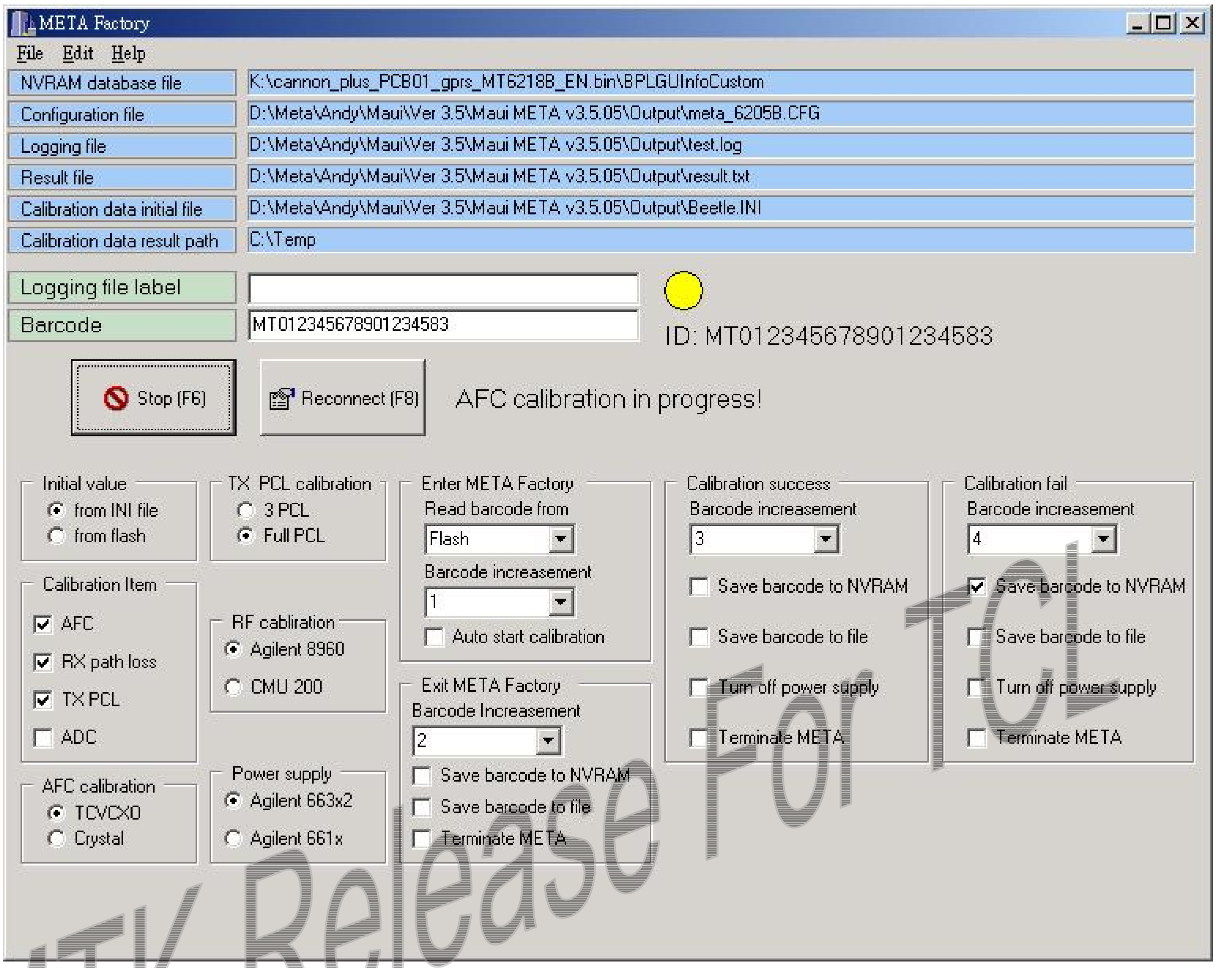

Figure 385 AFC calibration

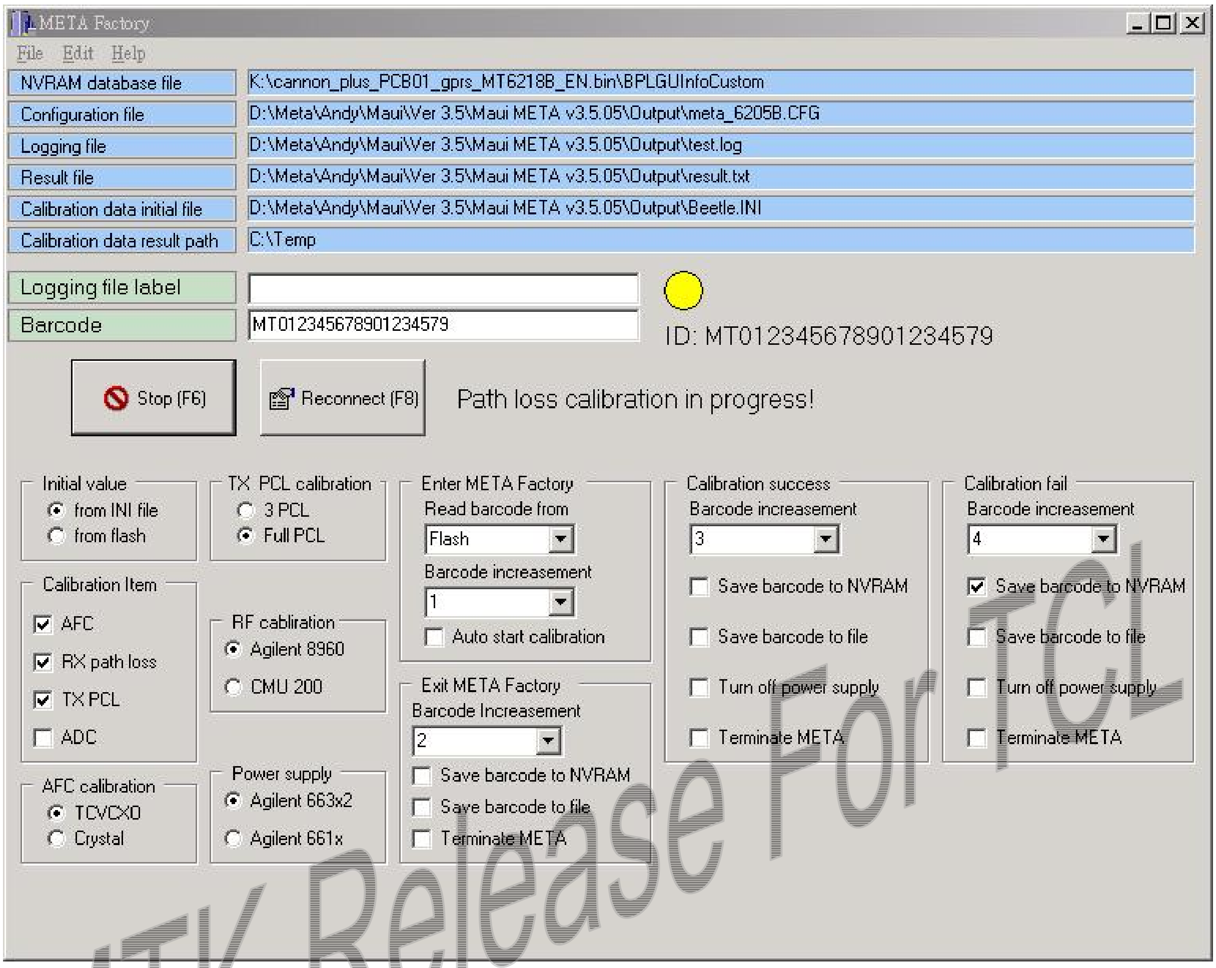

Figure 386 RX path loss calibration

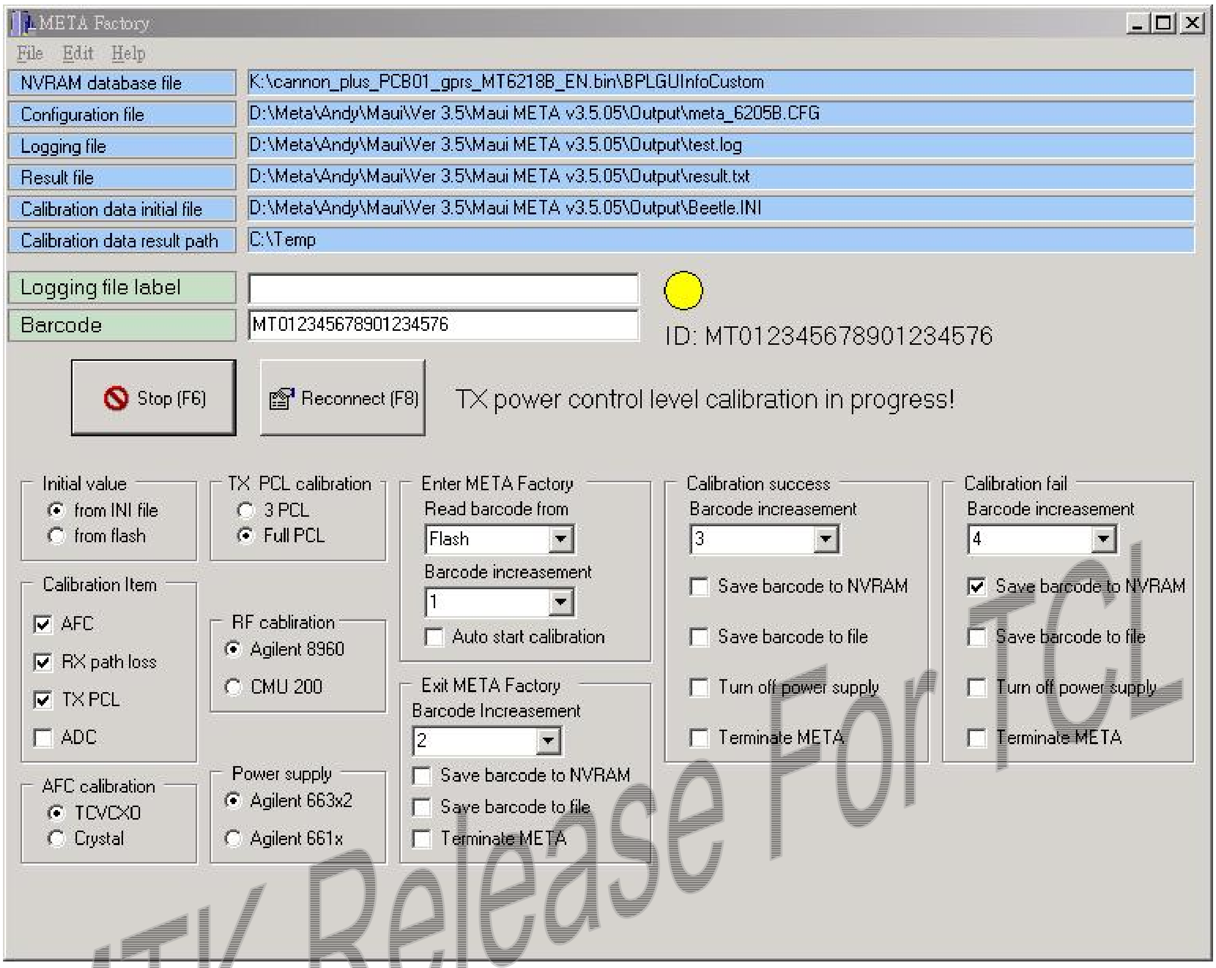

Figure 387 TX power control level calibration

Note: User can read the logging file after calibration done.

User can click [Reconnect] button to reconnect another mobile with META. The Boot ROM negotiation procedure will be re-initiated.

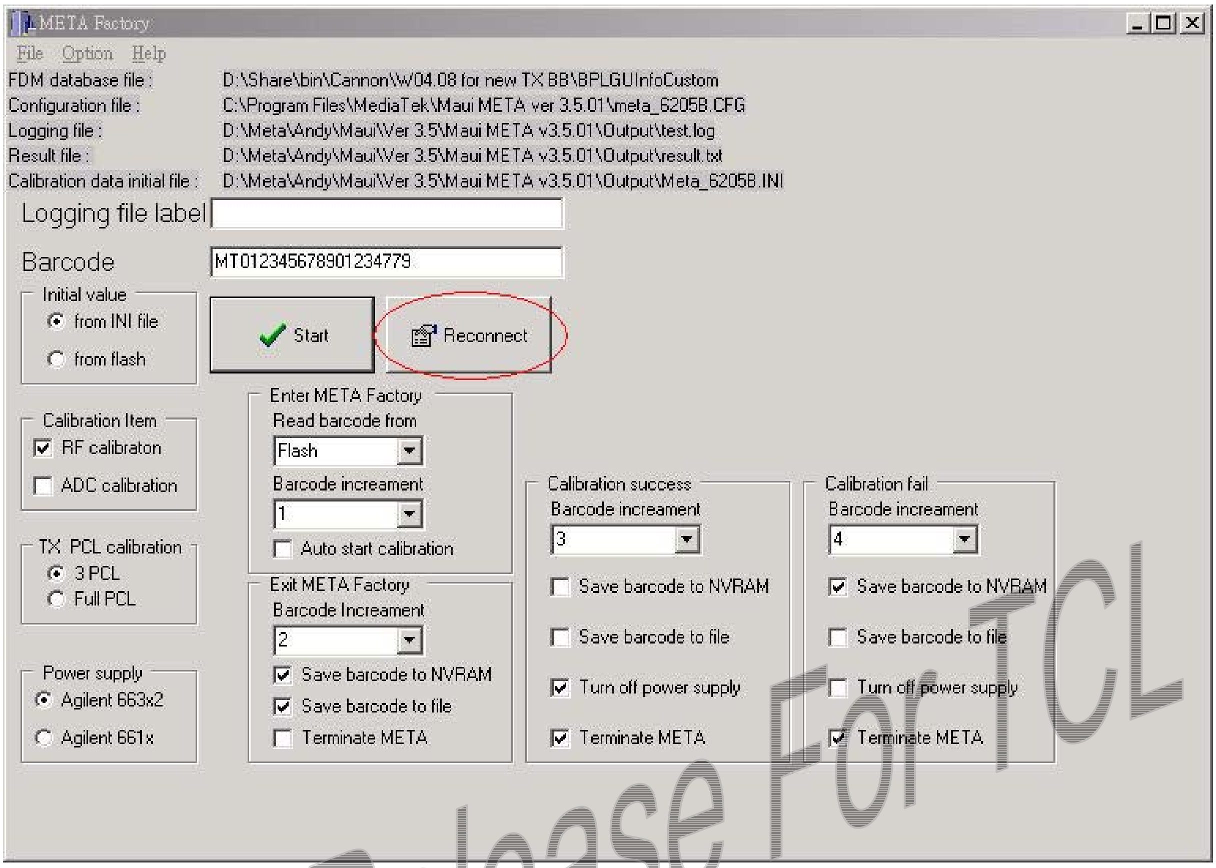

Figure 388 Click [Reconnect] button to reconnect META with other mobile

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