January 26, 2005

Applicant:	**Gemtek Technology**
FCC ID#	**MXF-C931019AG**
Correspondence Reference Number:	**28339**
731 Confirmation Number:	**EA177201**
Date of Original E-mail:	**01/13/2005**

1. *Please confirm that this device has no additional modes, such as proprietary modes, of operation than those listed on page 4 of the SAR report.*

Response:
This device does not have any additional modes.

2. *Please describe the differences between configuration 1 and 2 describe on page 16 and modes 4 and 5 described on page 17.*

Response:
The difference between mode 1 and mode 2 is : Mode 1 is for 802.11a normal and Mode 2 is for 802.11a turbo mode.
The difference between mode 4 and mode 5 is : Mode 4 is for 802.11g normal and Mode 5 is for 802.11g turbo mode.

3. *Please describe in details of the test signal used and how it was controlled. Please include data patterns used, duty cycle characteristics, power control.*

Response:
A specific control program was provided by the manufacture to control the EUT. EUT was setup to output the designated power as indicated in the EMC and SAR test reports. The data pattern selected was random code, the duty cycle is 100% as indicated in the Appendix A.

4. *Please describe how power was controlled and set. How will these power conditions be transferred to the final delivered product. Also, how will power for the channels that were not tested be set in the final product.*

Response:

EUT Power was programmed through the control program provided by the manufacture as described in "Appendix B". The final power, as indicated in the test reports, will be programmed into each final device and verified during the manufacture process to ensure that the targeted regulatory compliance can be met (please refer Appendix C). A further internal study, based on product design spec, power variation over the transmitting band and EMC test result, the final output power for each non-tested channels will be carefully determined and verified to make sure that all channels will pass the targeted regulation standard.

Appendix A

DUTY CYCLE REPORT

REPORT NO.: RF931028L08
PRODUCT NAME: Wireless A/G CardBus Network Card
MODEL NO.: WPCA-112AG

APPLICANT: Gemtek Technology Co., Ltd.

ADDRESS: No.1, Jen Ai Road, Hsinchu Industrial Park, Hukou Hsinchu 303, Taiwan, R.O.C.

ISSUED BY: Advance Data Technology Corporation

TEST LOCATION: No. 19, Hwa Ya 2nd Rd., Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

Table of Contents

duty cycle measurement

TEST INSTRUMENT

Description & Manufacturer	Model No.	Serial No.	Calibrated Until
SPECTRUM ANALYZER	FSEK 30	100049	Aug. 12, 2005

NOTE: The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

TEST PROCEDURES

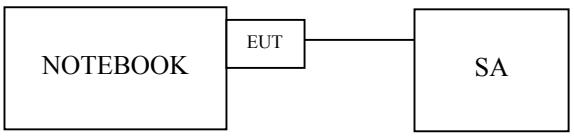
Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.

Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.

Repeat above procedures until all frequencies measured were complete.

CONFIGURATION OF SYSTEM UNDER TEST



EUT OPERATING CONDITIONS

Connected the EUT into the notebook system placed on a testing table.

The notebook system ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.

CONTROL SOFTWARE SETTING

The EUT (Model: WPCA-112AG) set with the parameter settings via the Atheros test program (version: ART 52 build 10). The detail as below:

For Normal Mode (IEEE 802.11a):

CHANNEL	FREQUENCY (MHz)	PARAMETER	VALUE
1	5180	Target Power	15.0
4	5240	Target Power	16.0
5	5260	Target Power	16.0
8	5320	Target Power	14.0
9	5745	Target Power	15.0
11	5785	Target Power	15.5
13	5825	Target Power	16.0

For Turbo Mode (IEEE 802.11a):

CHANNEL	FREQUENCY (MHz)	PARAMETER	VALUE
1	5210	Target Power	16.0
2	5250	Target Power	16.0
3	5290	Target Power	15.0
4	5760	Target Power	16.0
5	5800	Target Power	16.0

CTX data pattern: **RANDOM CODE**.

Software power control procedure: Please see the attached file (Power control.doc).

TEST RESULTS

For Normal Mode (IEEE 802.11a):

CHANNEL	FREQUENCY (MHz)	RESULTS DUTY CYCLE (%)
1	5180	>99.9 %
4	5240	>99.9 %
5	5260	>99.9 %
8	5320	>99.9 %
9	5745	>99.9 %
11	5785	>99.9 %
13	5825	>99.9 %

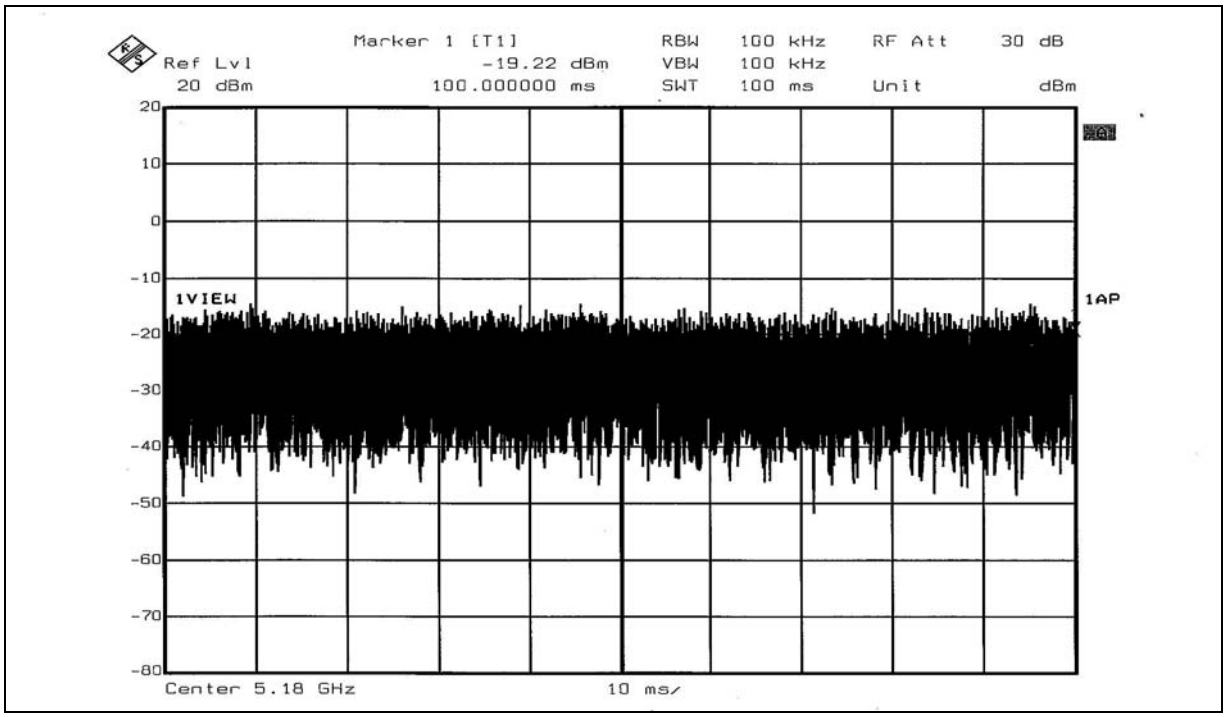
For Turbo Mode (IEEE 802.11a):

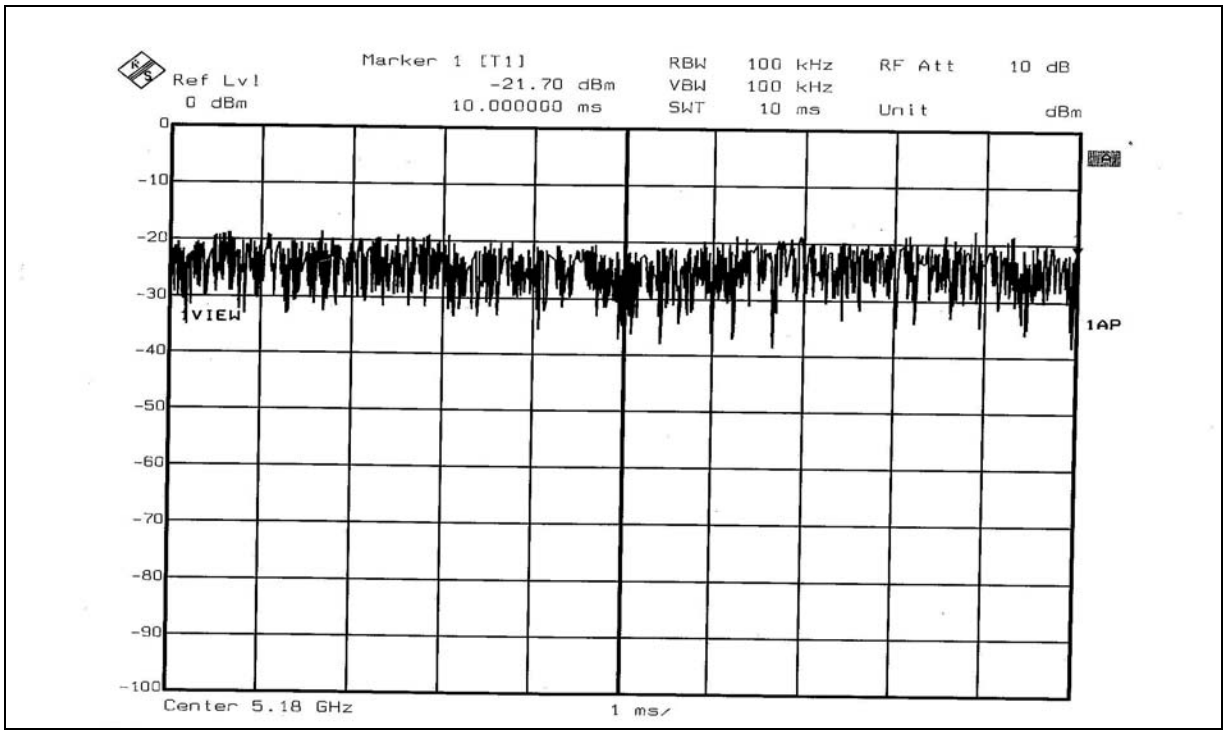
CHANNEL	FREQUENCY (MHz)	RESULTS DUTY CYCLE (%)
1	5210	>99.9 %
2	5250	>99.9 %
3	5290	>99.9 %
4	5760	>99.9 %
5	5800	>99.9 %

NOTE: Test plots of the duty cycle are shown on following pages.

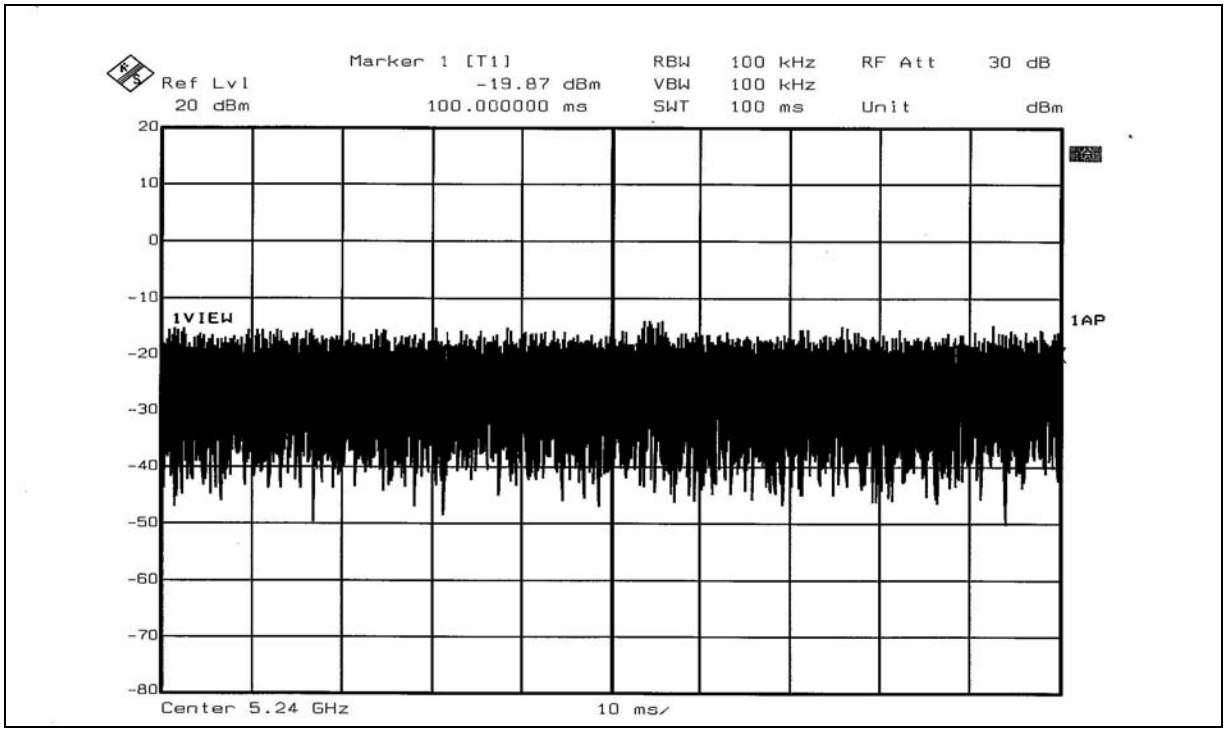
For Normal Mode

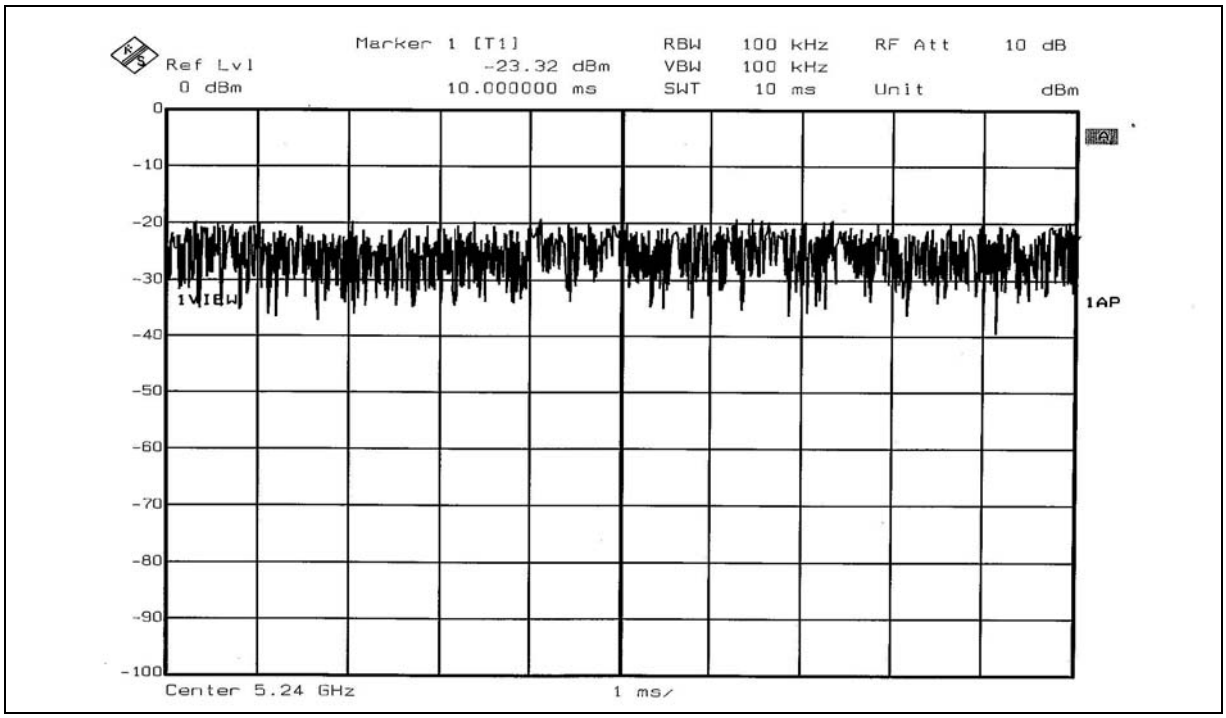
CH 1



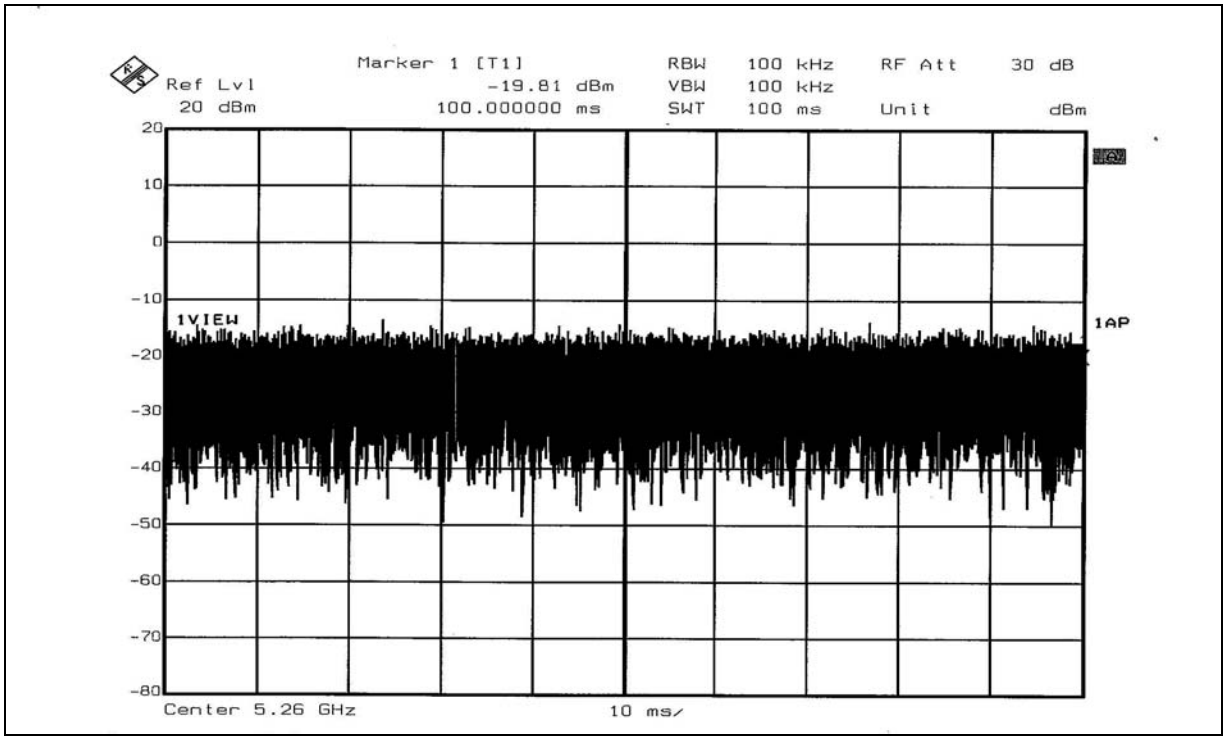


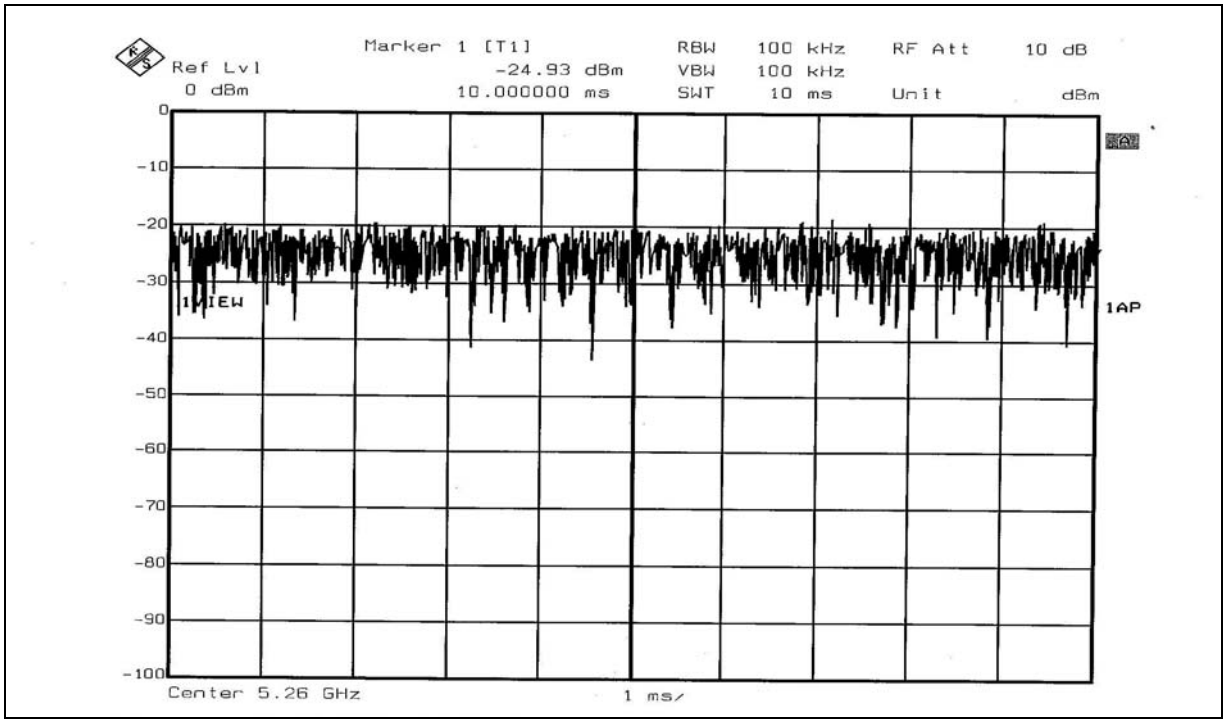
CH 4


Marker 1 [T1]
-19.87 dBm
100.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 100 ms
RF Att 30 dB
Unit dBm
Ref Lvl
20 dBm
1VIEW
1AP
Center 5.24 GHz
10 ms/

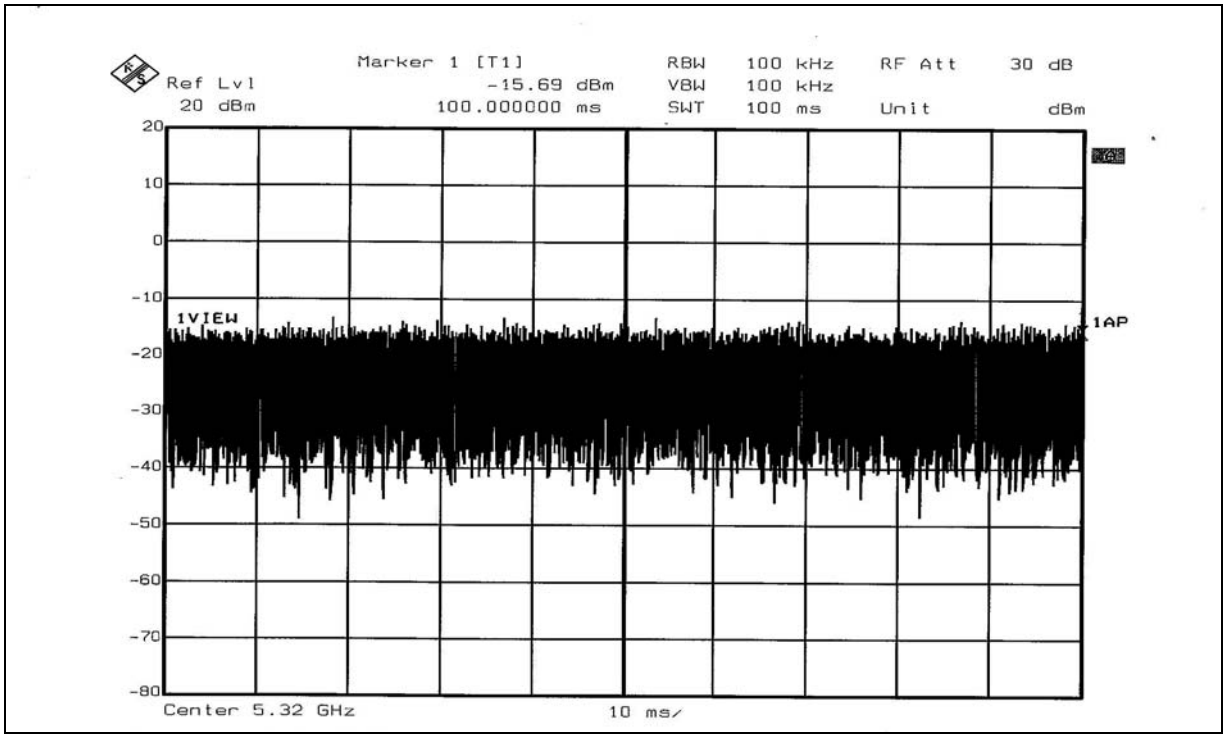

Marker 1 [T1]
-23.32 dBm
10.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 10 ms
RF Att 10 dB
Unit dBm
Ref Lvl
0 dBm
1VIEW
1AP
Center 5.24 GHz
1 ms/

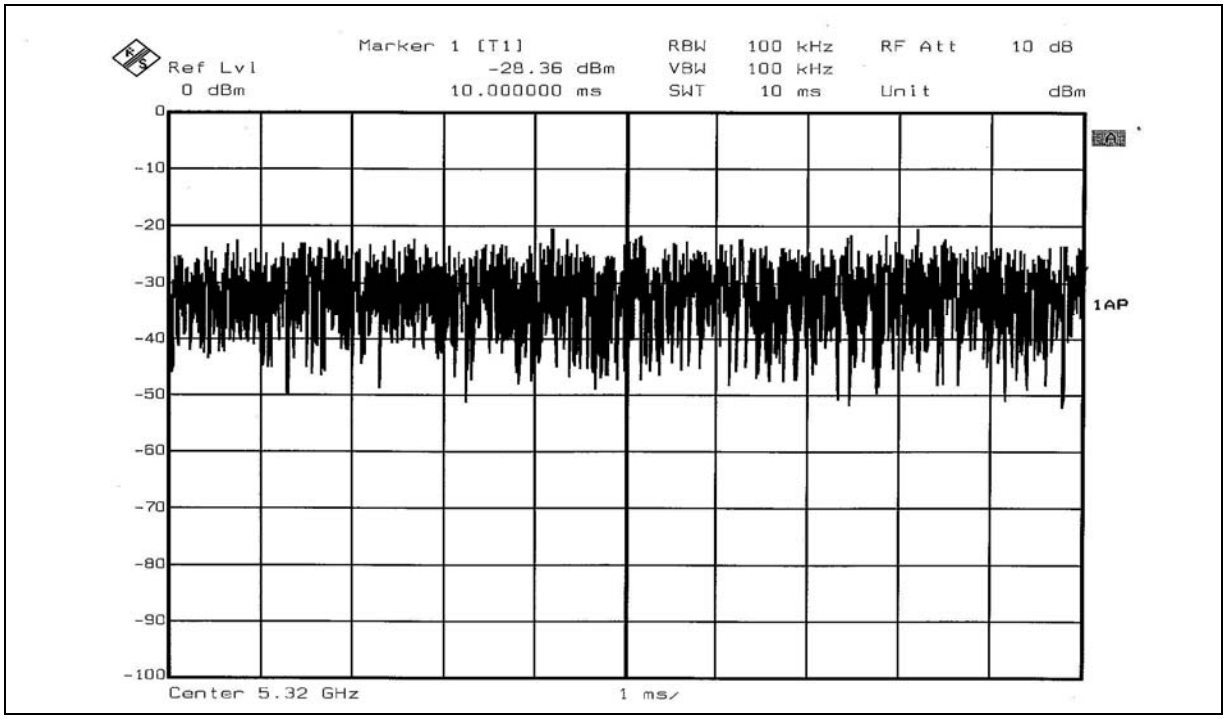
CH 5


Marker 1 [T1]
-19.81 dBm
100.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 100 ms
RF Att 30 dB
Unit dBm
Ref Lvl
20 dBm
1VIEW
1AP
Center 5.26 GHz
10 ms/

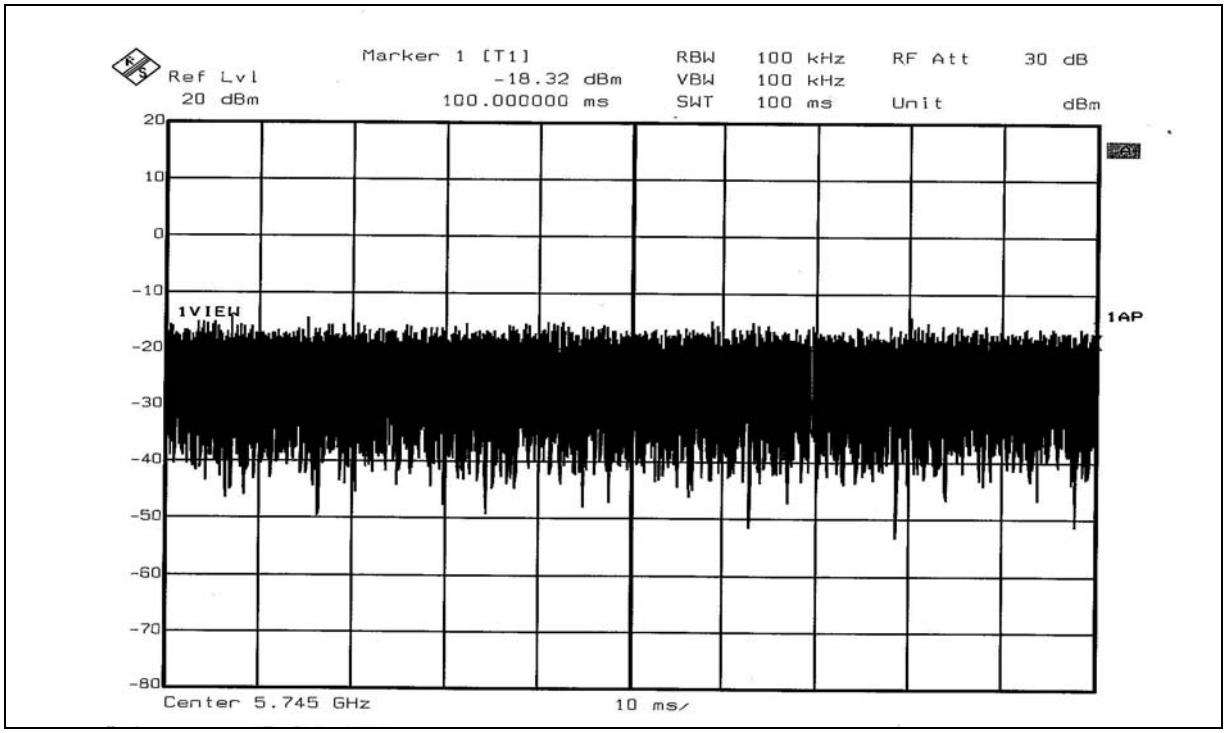

Marker 1 [T1]
-24.93 dBm
10.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 10 ms
RF Att 10 dB
Unit dBm
Ref Lvl
0 dBm
1VIEW
1AP
Center 5.26 GHz
1 ms/

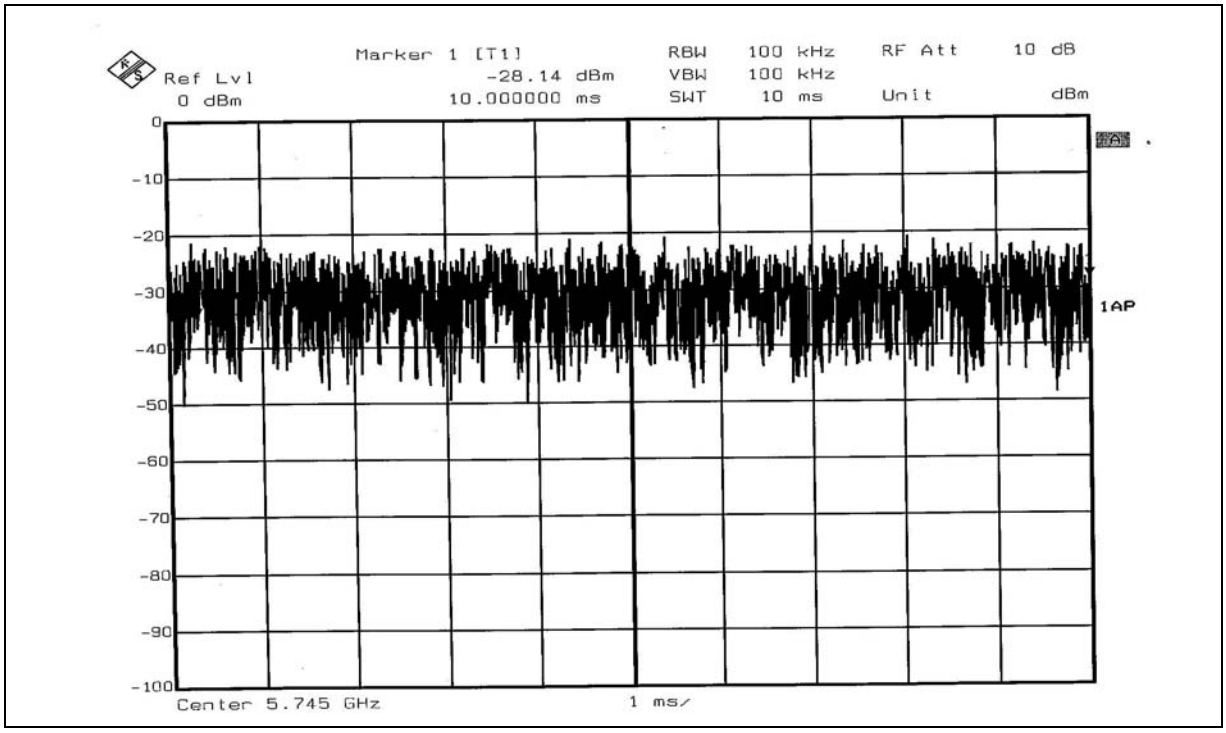
CH 8


Marker 1 [T1]
-15.69 dBm
100.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 100 ms
RF Att 30 dB
Unit dBm
Ref Lvl
20 dBm
1VIEW
1AP
Center 5.32 GHz
10 ms/

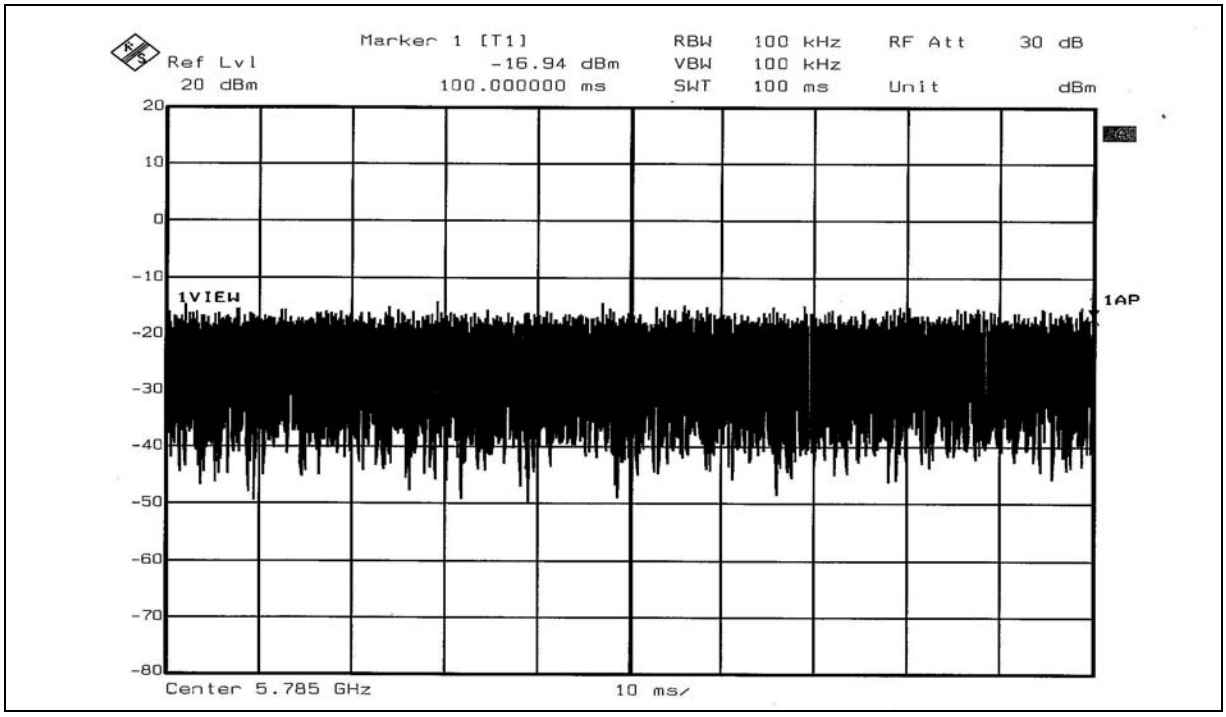

Marker 1 [T1]
-28.36 dBm
10.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 10 ms
RF Att 10 dB
Unit dBm
Ref Lvl
0 dBm
1AP
Center 5.32 GHz
1 ms/

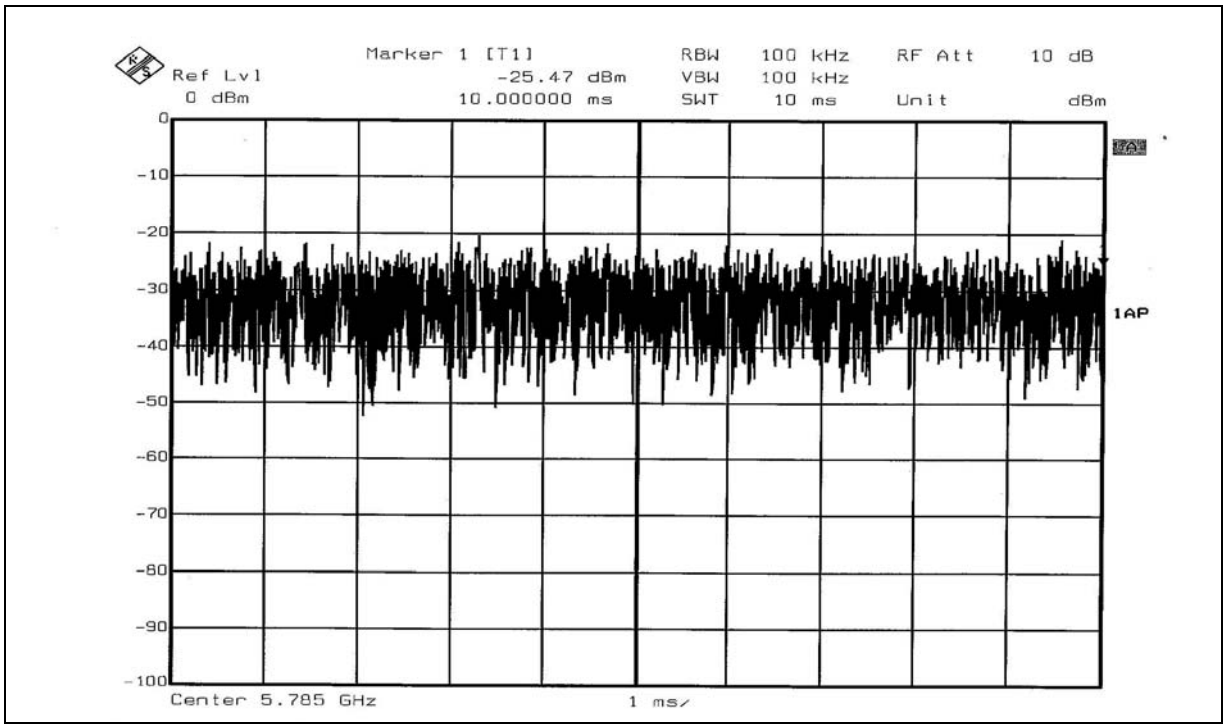
CH 9


Marker 1 [T1]
-18.32 dBm
100.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 100 ms
RF Att 30 dB
Unit dBm
Ref Lvl
20 dBm
1VIEW
1AP
Center 5.745 GHz
10 ms/

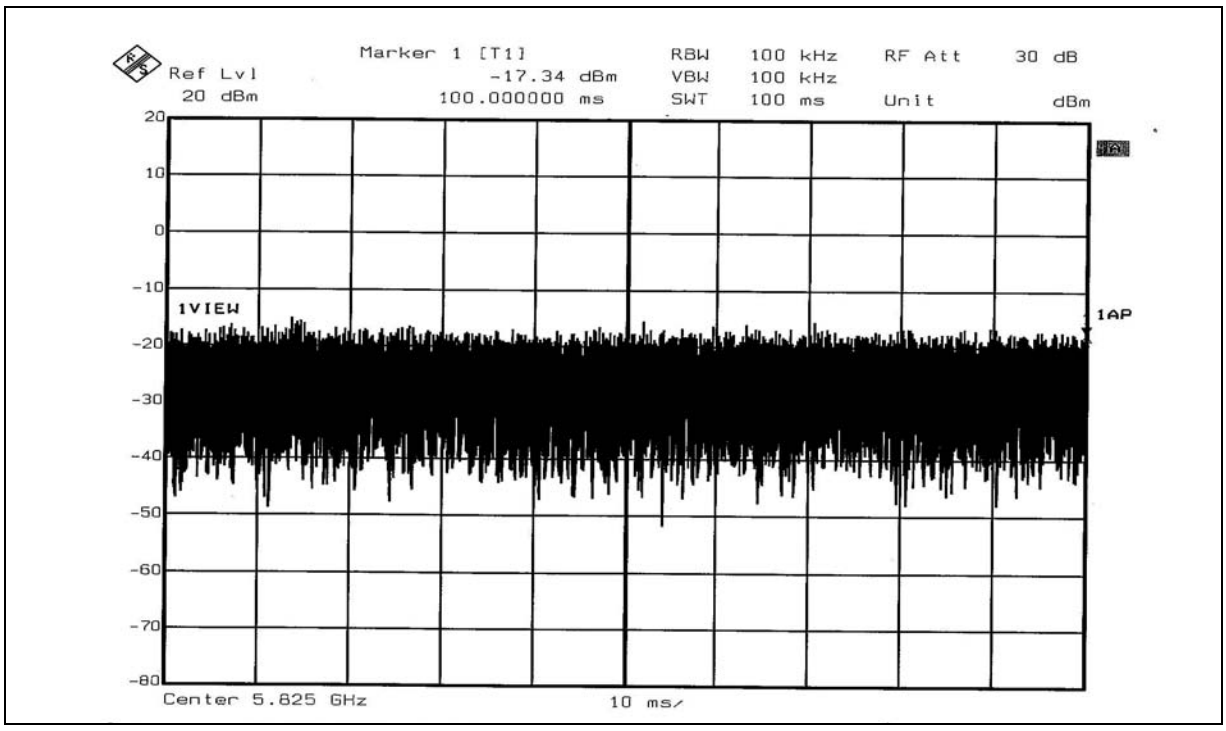

Marker 1 [T1]
-28.14 dBm
10.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 10 ms
RF Att 10 dB
Unit dBm
Ref Lvl
0 dBm
1AP
Center 5.745 GHz
1 ms/

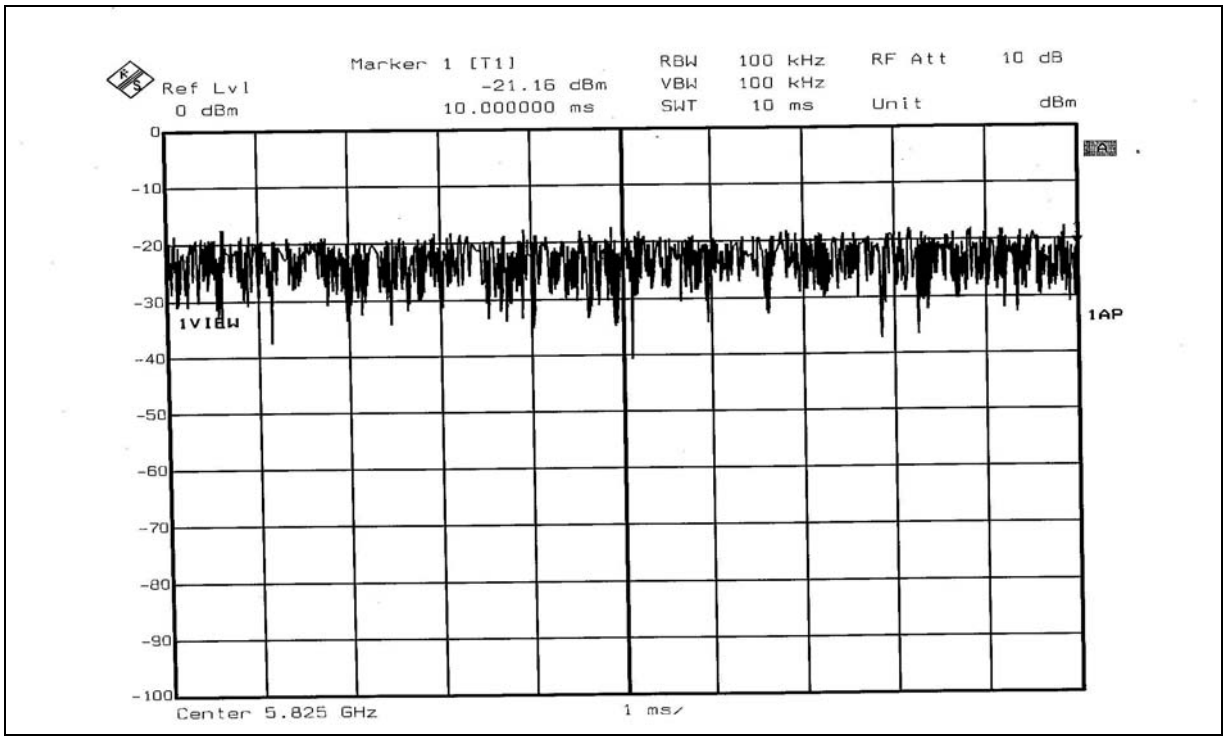
CH 11


Marker 1 [T1]
-16.94 dBm
100.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 100 ms
RF Att 30 dB
Unit dBm
Ref Lvl
20 dBm
1VIEW
1AP
Center 5.785 GHz
10 ms/


Marker 1 [T1]
-25.47 dBm
10.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 10 ms
RF Att 10 dB
Unit dBm
Ref Lvl
0 dBm
1AP
Center 5.785 GHz
1 ms/

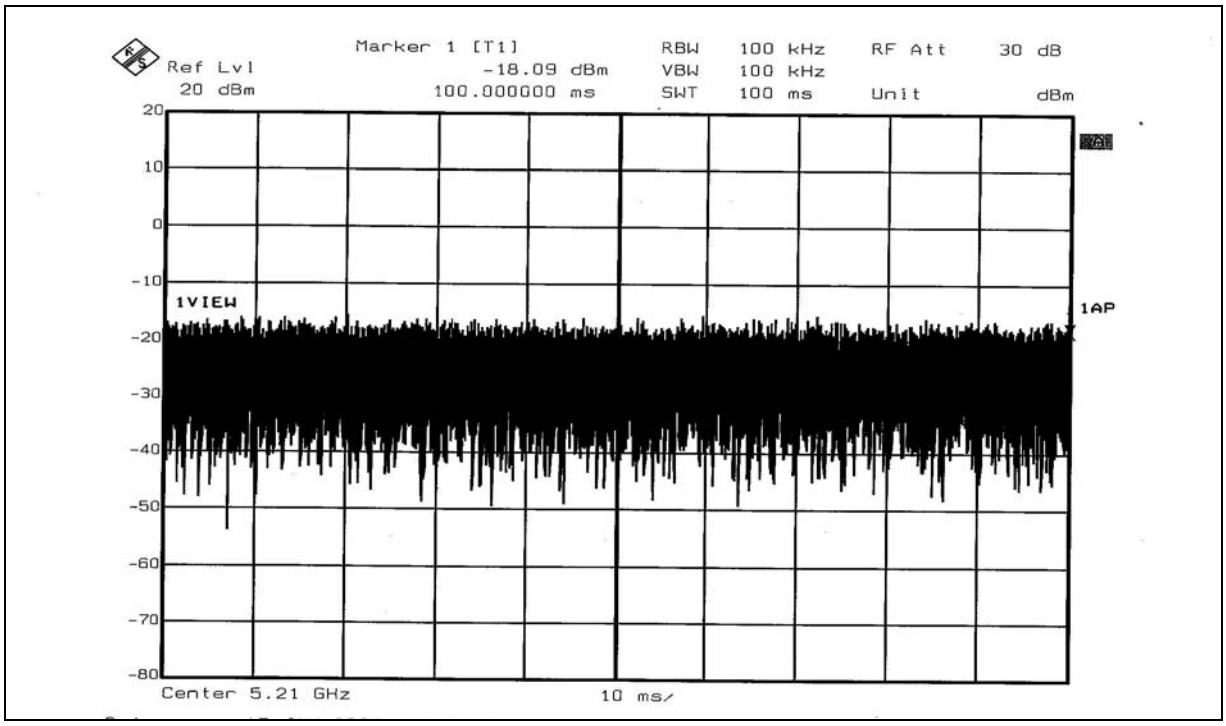
CH 13

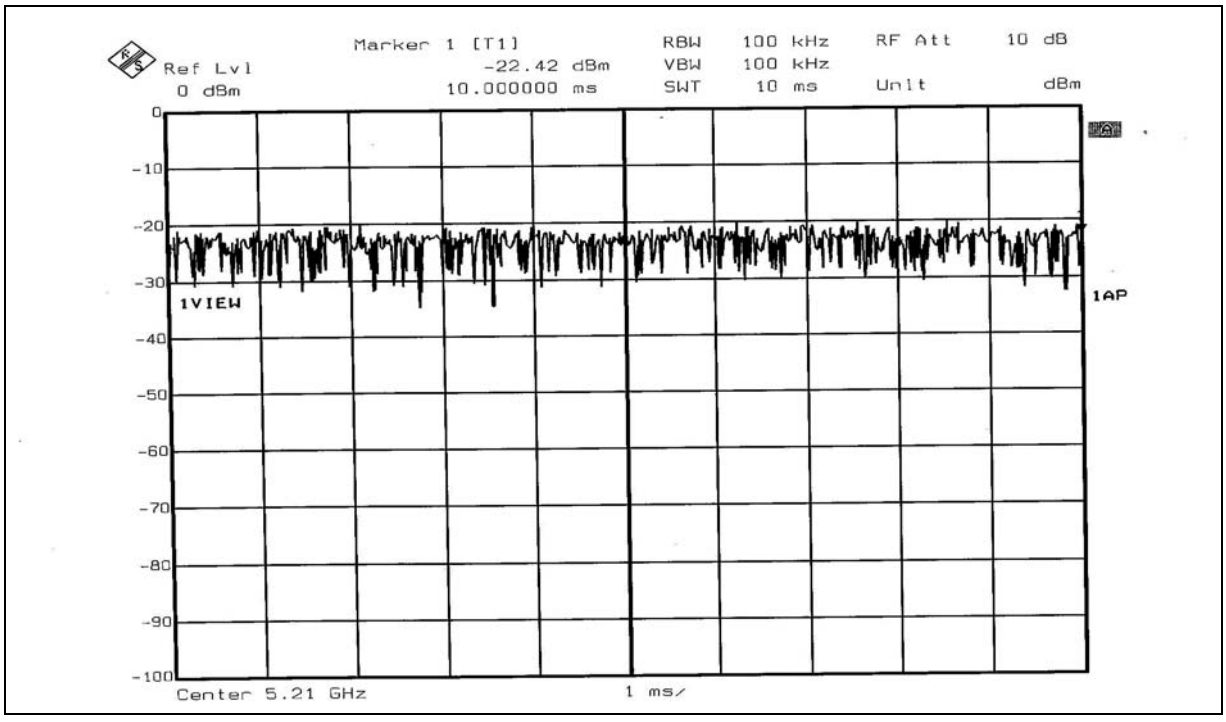

Marker 1 [T1]
-17.34 dBm
100.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 100 ms
RF Att 30 dB
Unit dBm
Ref Lvl
20 dBm
1VIEW
1AP
Center 5.825 GHz
10 ms/


Marker 1 [T1]
-21.16 dBm
10.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 10 ms
RF Att 10 dB
Unit dBm
Ref Lvl
0 dBm
1VIEW
1AP
Center 5.825 GHz
1 ms/

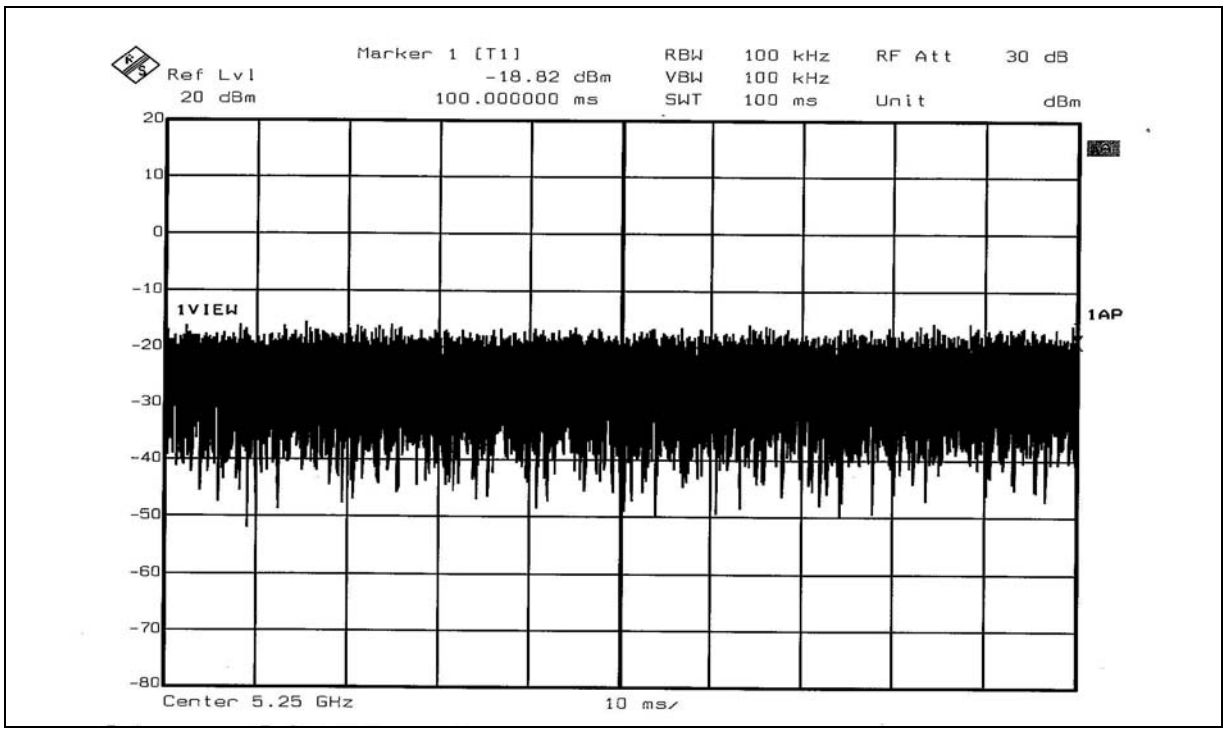
For Turbo Mode

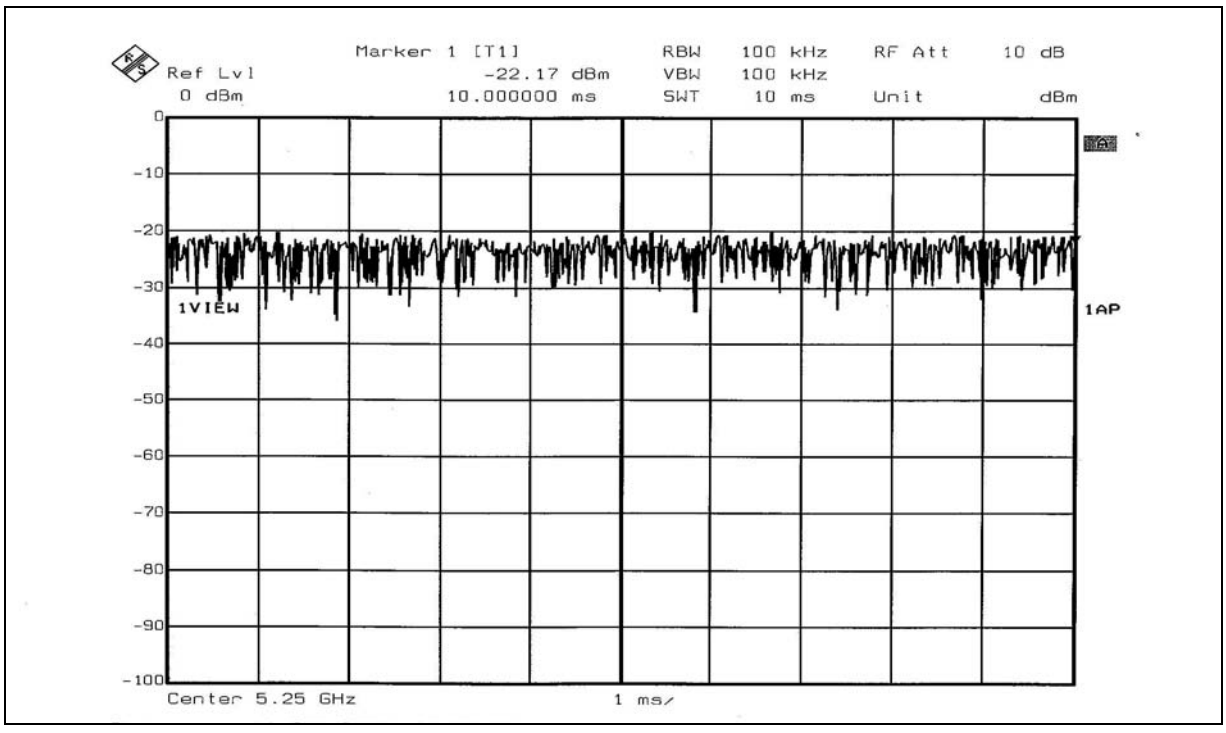
CH 1



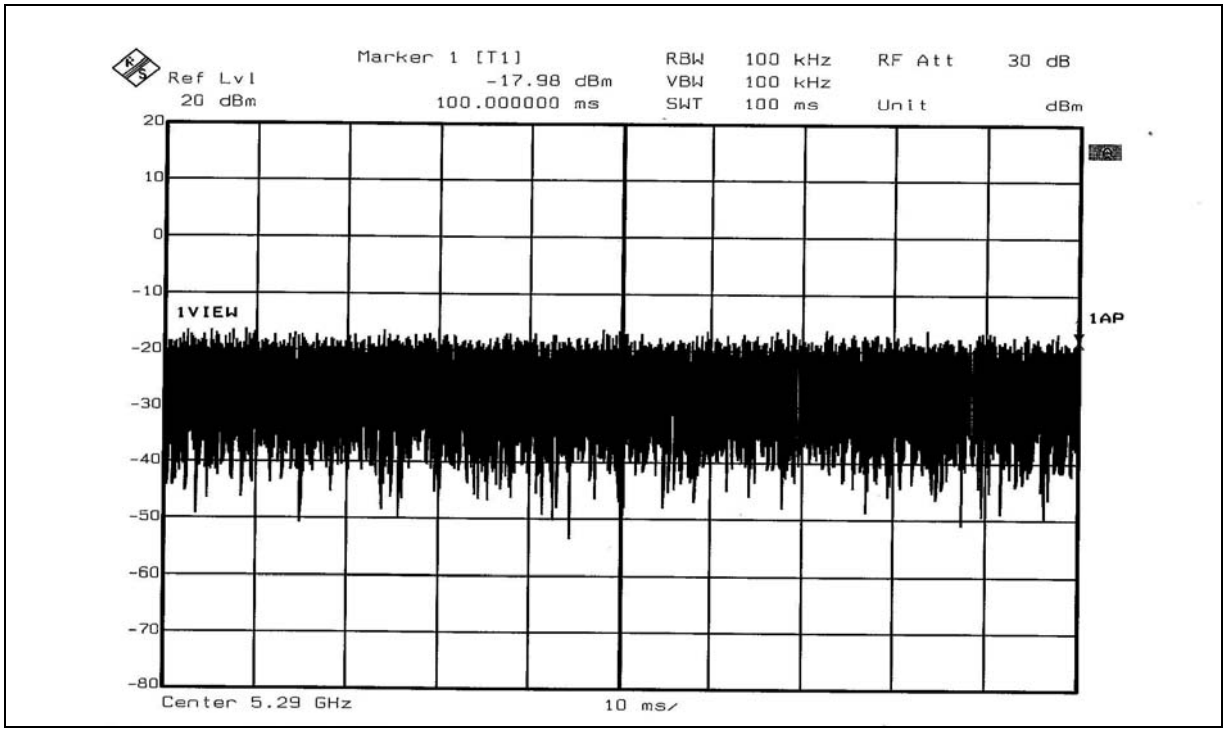


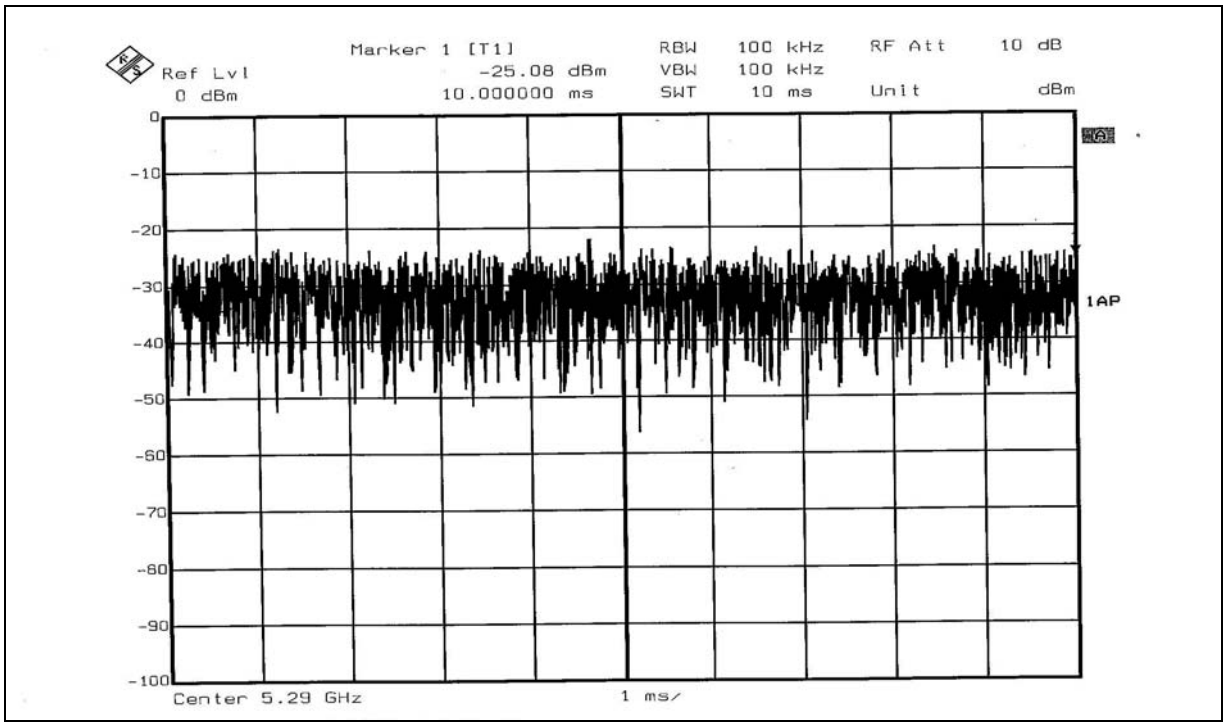
CH 2


Marker 1 [T1]
-18.82 dBm
100.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 100 ms
RF Att 30 dB
Unit dBm
Ref Lvl
20 dBm
1VIEW
1AP
Center 5.25 GHz
10 ms/

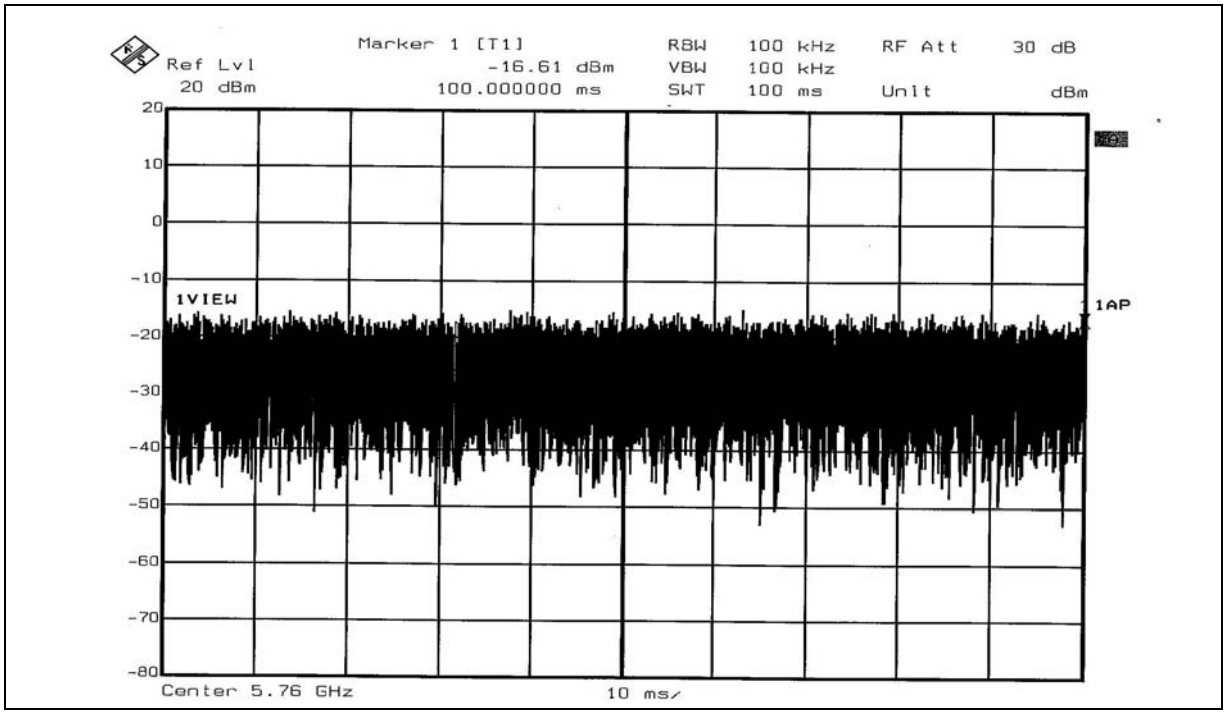

Marker 1 [T1]
-22.17 dBm
10.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 10 ms
RF Att 10 dB
Unit dBm
Ref Lvl
0 dBm
1VIEW
1AP
Center 5.25 GHz
1 ms/

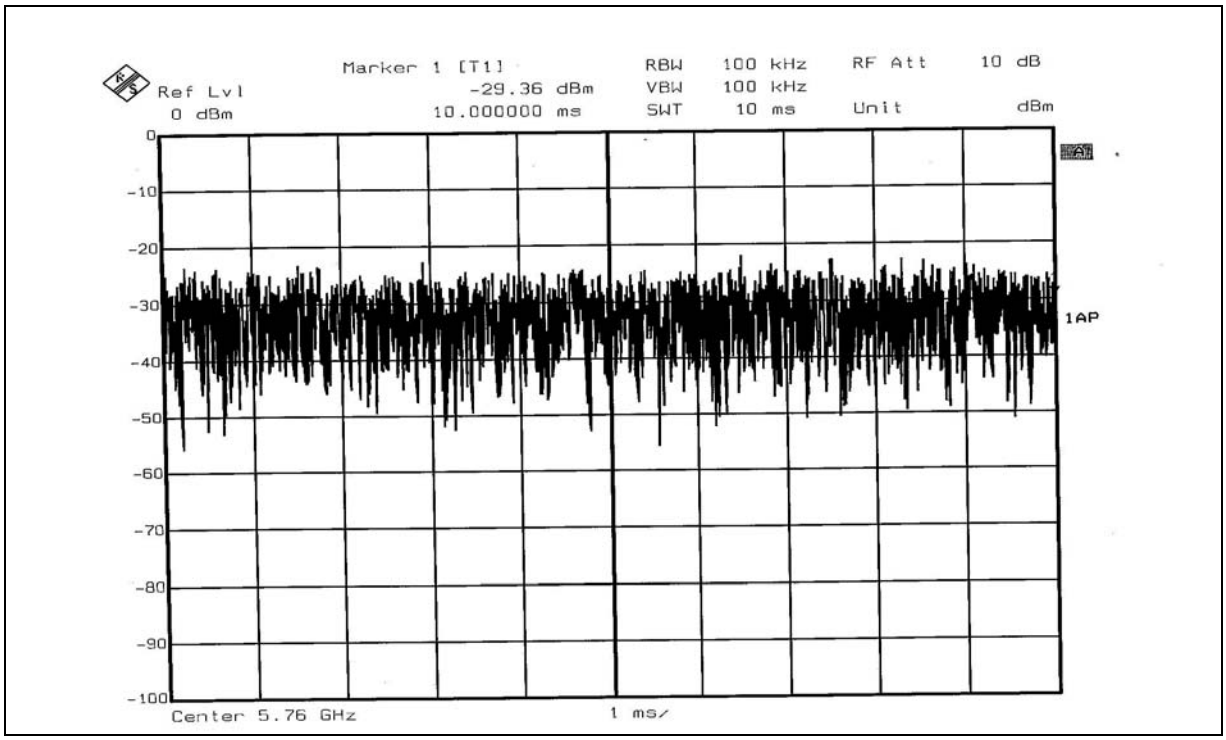
CH 3


Marker 1 [T1]
-17.98 dBm
100.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 100 ms
RF Att 30 dB
Unit dBm
Ref Lvl
20 dBm
1VIEW
1AP
Center 5.29 GHz
10 ms/

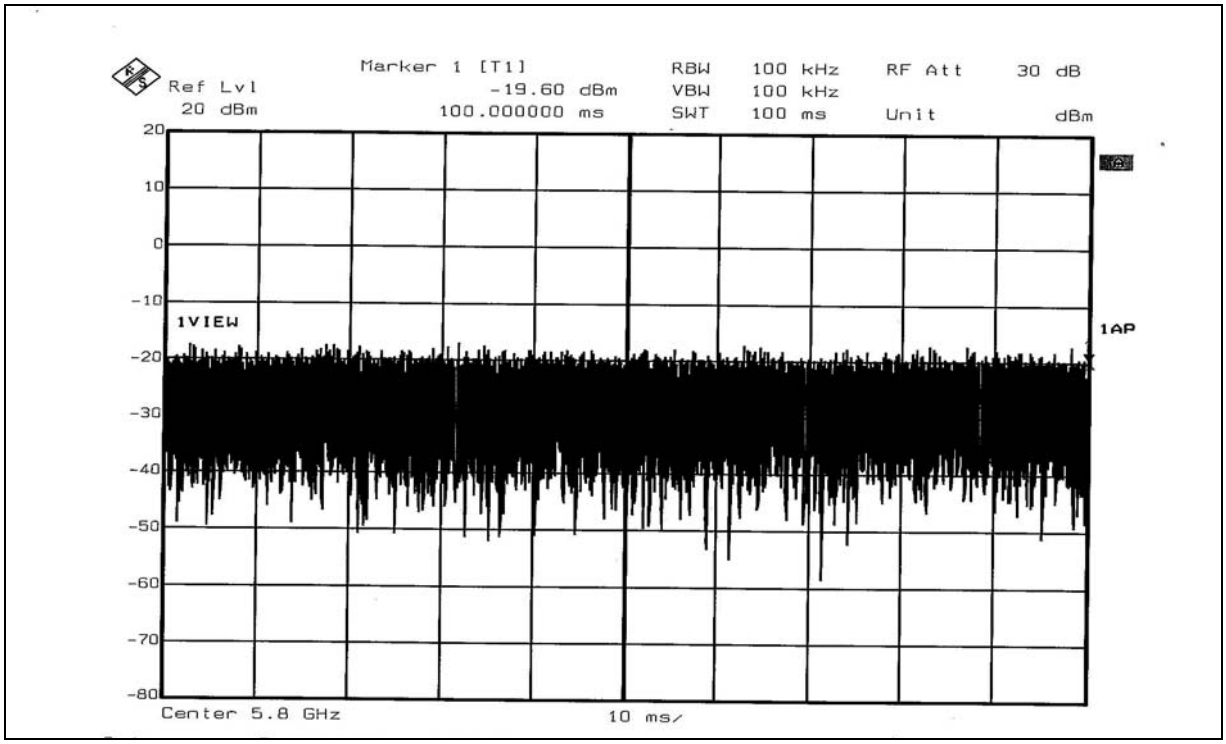

Marker 1 [T1]
-25.08 dBm
10.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 10 ms
RF Att 10 dB
Unit dBm
Ref Lvl
0 dBm
1AP
Center 5.29 GHz
1 ms/

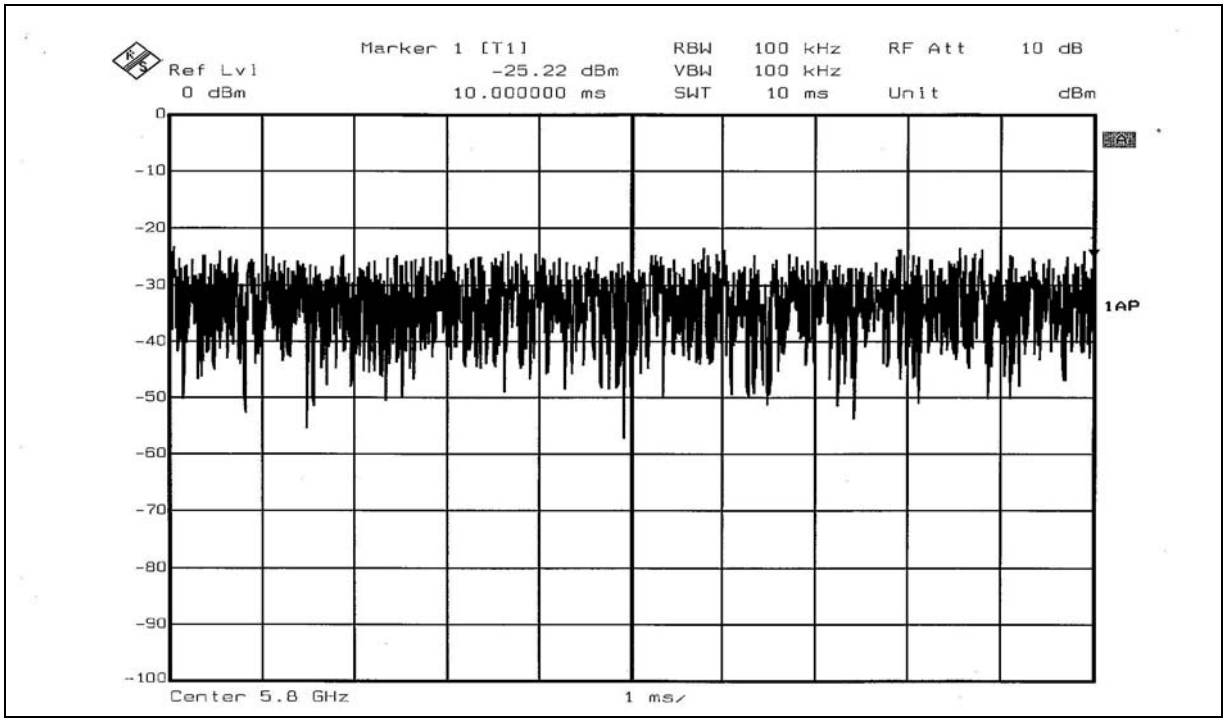
CH 4


Marker 1 [T1]
-16.61 dBm
100.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 100 ms
RF Att 30 dB
Unit dBm
Ref Lvl
20 dBm
1VIEW
1AP
Center 5.76 GHz
10 ms/


Marker 1 [T1]
-29.36 dBm
10.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 10 ms
RF Att 10 dB
Unit dBm
Ref Lvl
0 dBm
1AP
Center 5.76 GHz
1 ms/

CH 5


Marker 1 [T1]
-19.60 dBm
100.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 100 ms
RF Att 30 dB
Unit dBm
Ref Lvl
20 dBm
1VIEW
1AP
Center 5.8 GHz
10 ms/


Marker 1 [T1]
-25.22 dBm
10.000000 ms
RBW 100 kHz
VBW 100 kHz
SWT 10 ms
RF Att 10 dB
Unit dBm
Ref Lvl
0 dBm
1AP
Center 5.8 GHz
1 ms/

Appendix B

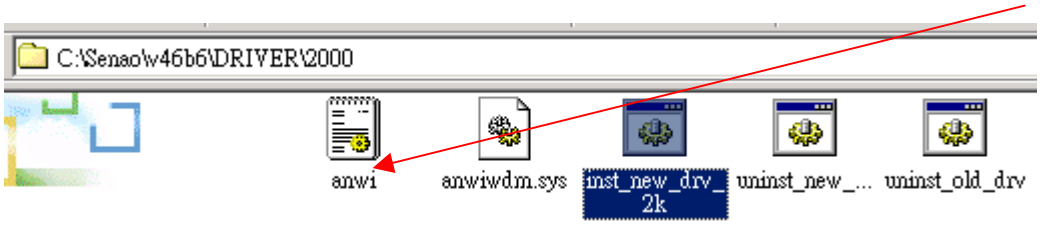
How to set up the drivers and utility program

1. Insert the 2.4GHz cardbus to the laptop and setup its driver, please especially notice the cardbus shall be installed Windows 2000 environment.
2. Then unzip ART_DRIVER.exe this file to your laptop to c:\ or d:\.
3. Going to c:\ART_DRIVER \2000 , double clcik this file to install test driver (inst_new_drv_2k).

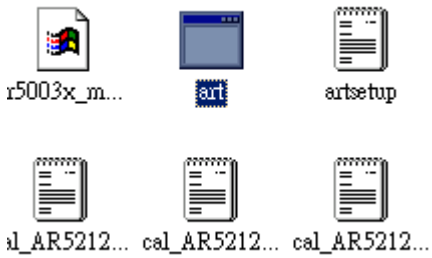
You will see the picture as figure 1.

Figure 1.

4. After you set up its driver completely, insert this product to your laptop.
5. The windows system will search the driver, that is in c:\ART_DRIVER \2000\anwi.ini .



6. Setup ok , run art.exe test program in c:\v46b6.



See the picture as figure 2.

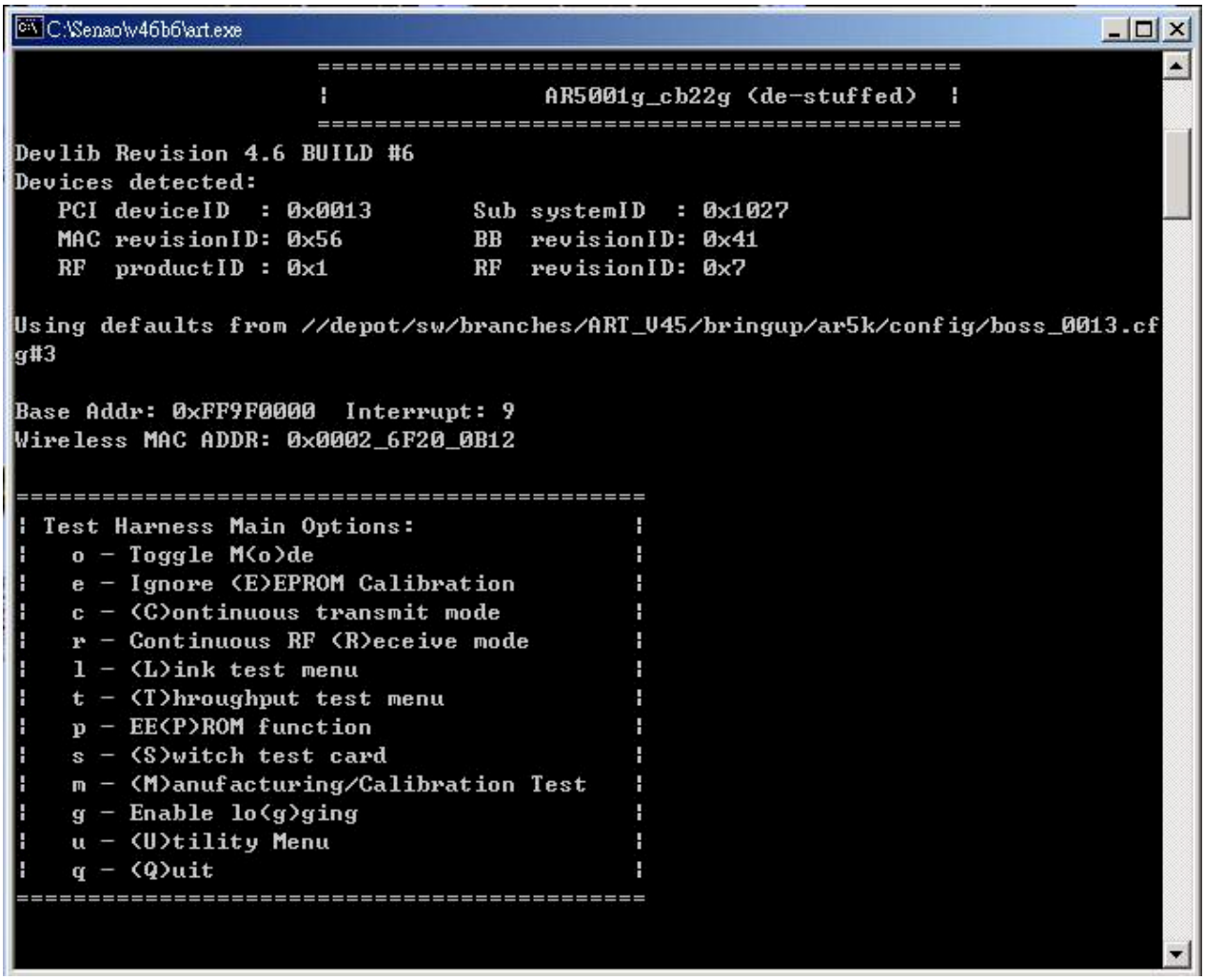


Figure 2

6.1 Type “O” : Switch the frequency band which want to test, 11b or 11g frequency.
Figure 3

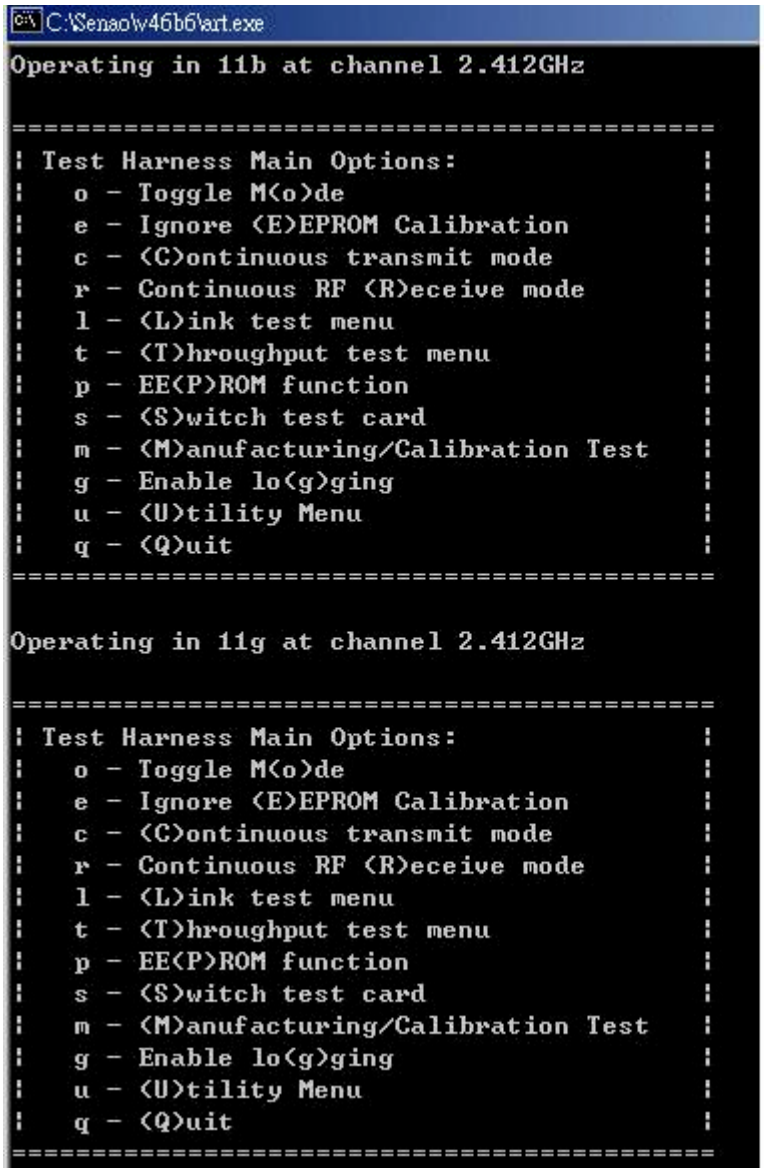
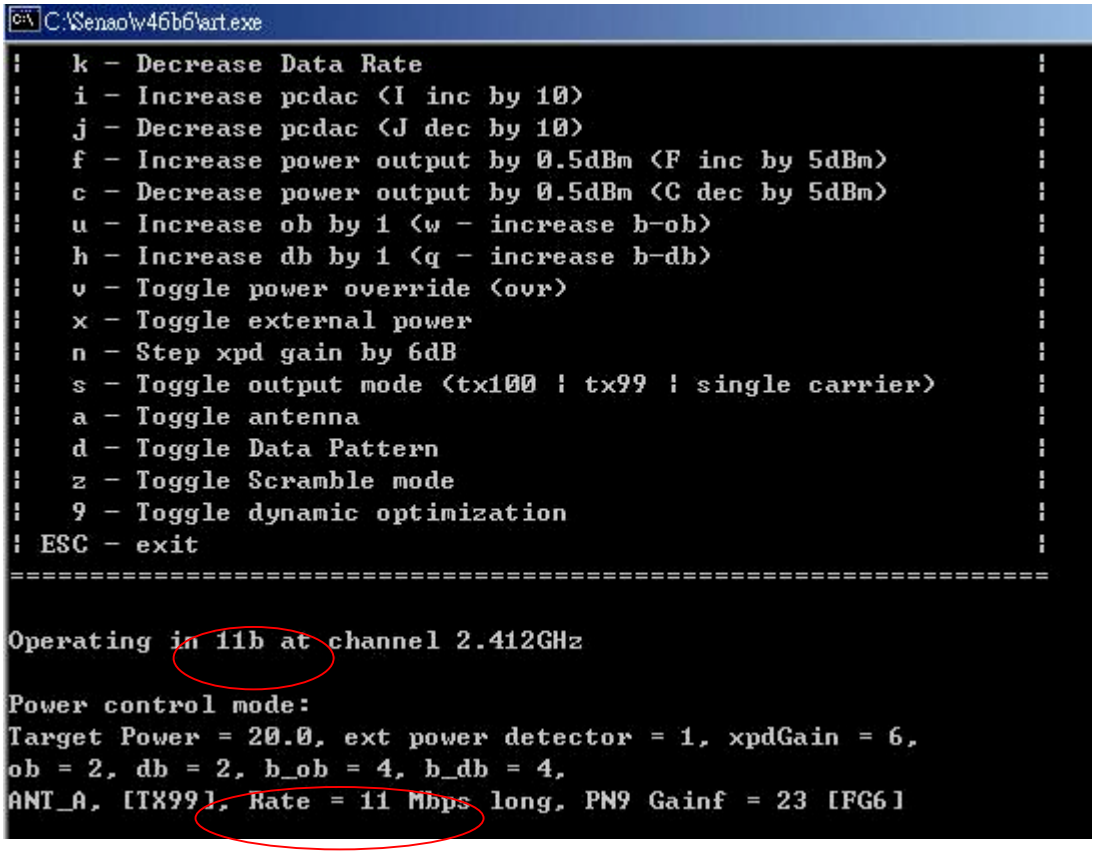


Figure 3

6.2

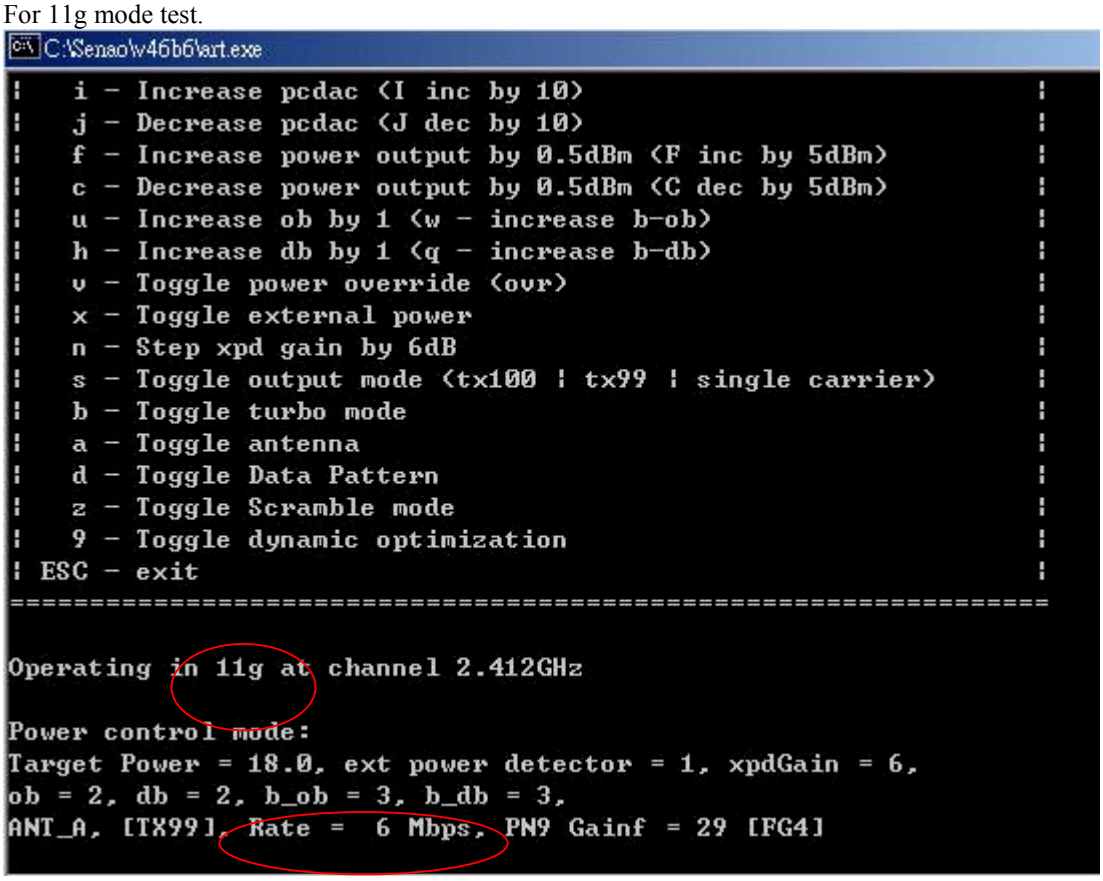
6.3 Type “c” to set the EUT under continuous TX mode, at this moment you can according the command to control the EUT.

For 11b mode test.



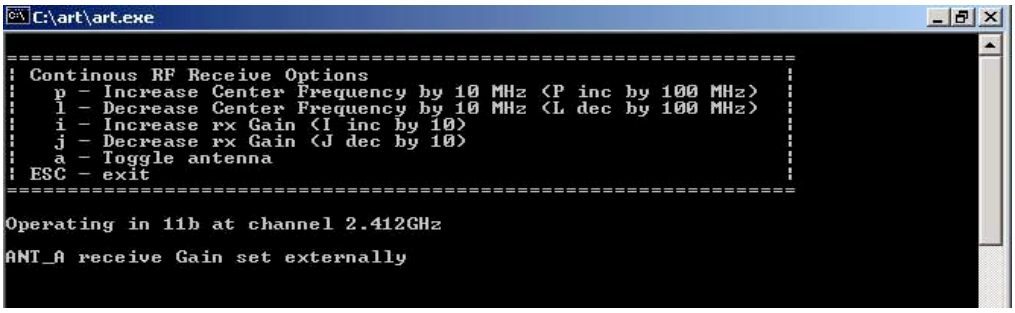
When the test program is running , Type “o” and “k” can change data rate

For 11g mode test.



When the test program is running , Type “o” and “k” can change data rate

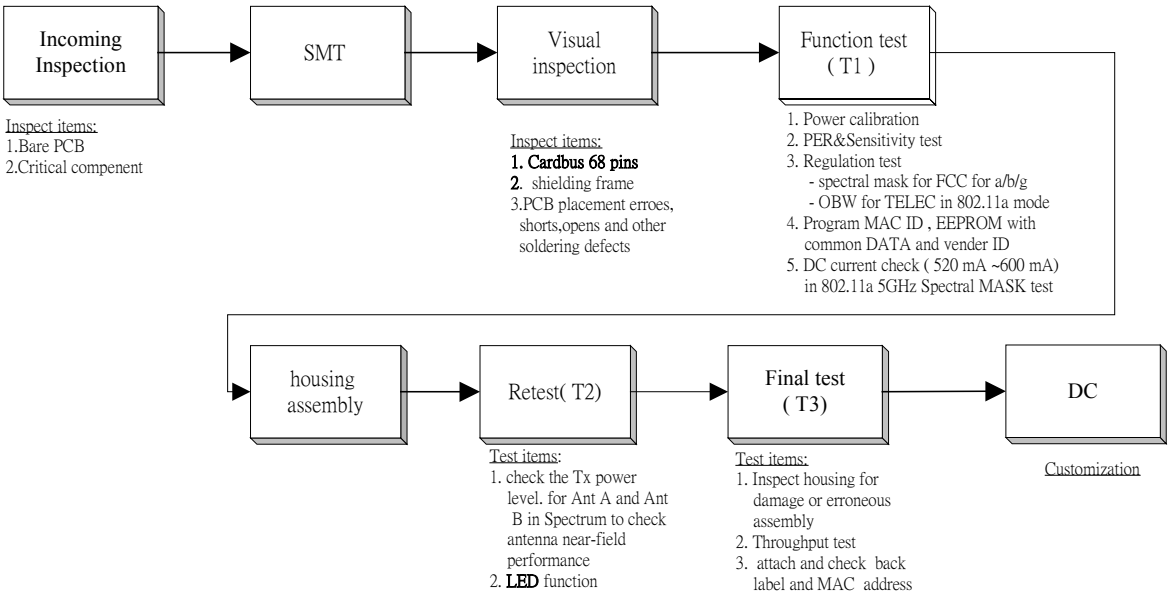
6.3 Type “r” at figure 4 for continuous RX



Appendix C

Test Flow chart of WPCA-107AG/ WPCA-112AG

Mar-30-2004
Rev.1.0

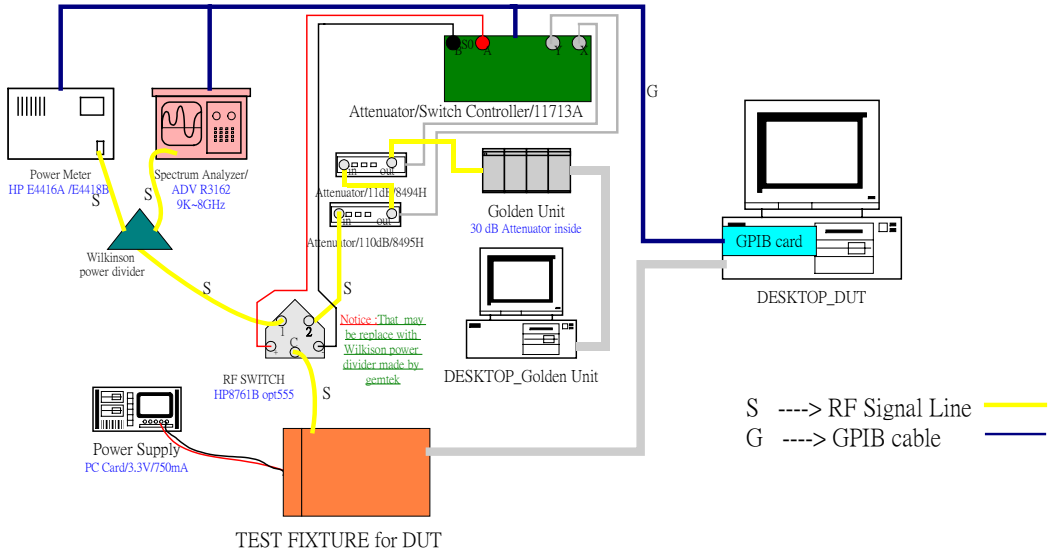


History
2004/03/30
V1.0
new build

T1 : RF and function test

I : block diagram

The Block Diagram
of Dual band (2.4/5 GHz)PC card RF Test System
V1.0



II : Test procedure based on Atheros' s setting befor

e starting test , the engineer in production line have to calibrate the test system ,please refer to *Manual_ART_RF_How to calibrate ART test system.doc*

some setting and limit , please refer to *calsetup_CB42AG.txt*

- **The purpose of the test items will be noted in red form behind every testing sections.**

****

******** Version V2.6 ********

****

Input a MAC address : 000d549896d8

< Scan barcode to enter MAC ID >

Attached to the Device for instance = 1

Loading values for devNum [0] from eep file ar5004x_cb42ag.eep

successed to setup EEP file.

##########

Counter = 3624

##########

< Counter : After test 5000 times, the counter will reset to zero and should calibrate the test system and then continue to test >

Setting up Power Meter

Setting up Spectrum Analyzer

Setting up Attenuator

using cal fixed gain for mode 11a from calsetup.txt ... FG6

using cal fixed gain for mode 11b from calsetup.txt ... FG6

using cal fixed gain for mode 11g from calsetup.txt ... FG6

Manufacturing Test start ...

MACID = 000000000000
Span 66M PPM power=-1.070313 dbm
Span 220k PPM power=-2.093750 dbm
PPM=4.328727
< PPM test : check the accuracy of RF local signal >
Collecting raw data for the adapter for mode 11a
Ch1: 5180 --> max pwr is 16.56 dBm
Ch4: 5240 --> max pwr is 15.5 dBm
Ch5: 5260 --> max pwr is 15.55 dBm
Ch8: 5320 --> max pwr is 14.0 dBm
Ch9: 5745 --> max pwr is 16.06 dBm
Ch11: 5785 --> max pwr is 16.01 dBm
Ch13: 5825 --> max pwr is 16.52 dBm
Turbo mode:
Ch1: 5210 --> max pwr is 15.04 dBm
Ch2: 5250 --> max pwr is 16.8 dBm
Ch3: 5290 --> max pwr is 14.04 dBm
Ch4: 5760 --> max pwr is 16.02 dBm
Ch5: 5800 --> max pwr is 16.0 dBm

Collecting raw data for the adapter for mode 11g
Ch1: 2412 --> max pwr is 16.5 dBm
Ch6: 2437 --> max pwr is 18.0 dBm
Ch11: 2462 --> max pwr is 16.0 dBm
Turbo mode:
Ch6: 2437 --> max pwr is 18.3 dBm

Collecting raw data for the adapter for mode 11b
Ch1: 2412 --> max pwr is 18.0 dBm
Ch6: 2437 --> max pwr is 18.2 dBm
Ch11: 2462 --> max pwr is 18.1 dBm
< power calibration for 802.11a , b ,g.

start Target Power Control Test in 11a mode

FREQ	6Mbps	36Mbps	48Mbps	54Mbps	Limits:+1.5/-1.5 dB
					measured/target
CH1 :5180	16.5/16.56	15.4/15.56	14.3/14.56	13.4/13.56	
CH4 :5240	15.4/15.5	14.3/14.5	13.4/13.5	12.4/12.5	
CH5 :5260	15.5/15.55	14.3/14.55	13.4/13.55	12.5/12.55	
CH8 :5320	13.5/14.0	12.6/13.0	11.8/12.0	10.7/11.0	
CH9 :5745	15.5/16.06	14.7/15.06	13.7/14.06	12.8/13.06	
CH11 :5785	15.8/16.01	14.9/15.01	13.7/14.01	12.8/13.01	
CH13 :5825	16.2/16.52	15.3/15.52	14.1/14.52	13.4/13.52	
Turbo mode:					
CH1 :5210	14.8/15.04	13.9/14.04	12.7/13.04	11.9/12.04	
CH2 :5250	16.5/16.8	15.3/15.8	14.7/14.8	13.5/13.8	
CH3 :5290	13.8/14.04	12.9/13.04	11.7/12.04	10.9/11.04	
CH4 :5760	15.7/16.02	14.9/15.02	13.7/14.02	12.9/13.02	
CH5 :5800	15.8/16.0	14.7/15.0	13.7/14.0	12.9/13.0	

< target power test : After building calibration information table in EEPROM, The ART verifies the output power followed target power table to check if the calibration information table is correct and meet the tolerance in 802.11A >

Start Spectral Mask Test in 11a mode

spec mask – chan165:5825

Start Occupied Bandwidth Test

Ch38:5180, obw:16.7, margin:1.02

< Occupied bandwidth test : check if OBW can meet TELEC spec. >

Start PER and SEN Test in 11a mode

FREQ 6Mbps 36Mbps 48Mbps 54Mbps ppm ():RSSI

CH1 :5180 PER 100(33) 100(30) 100(29) 100(28) -10

SEN 100(26) 99(26)

CH4 : 5240 PER

SEN

CH5 :5260 PER

SEN

CH8 : 5320 PER 100(33) 100(31) 100(29) 100(28) -10

SEN 100(26) 100(26)

CH9 : 5745 PER

SEN

CH11: 5785 PER

SEN

CH13:5825 PER 100(31) 100(29) 100(28) 100(27) -9

SEN 100(27) 99(27)

< PER & sensitivity test : In each band , FCC UNII 1, 2 ,3 and Europe Hyperlan2 , select 1 or 2 channel to check PER (Tx RF signal quality) and sensitivity(10% PER) >

FREQ 12Mbps 72Mbps 96Mbps 108Mbps ppm TURBO MODE TESTING

CH1 :5210 PER

SEN

CH2 :5250 PER

SEN

CH3 :5290 PER

SEN

CH4 :5760 PER

SEN

CH5 :5800 PER

SEN

< PER & sensitivity test of turbo mode: To check PER (Tx RF signal quality) and sensitivity >

start Target Power Control Test in 11g mode

FREQ 6Mbps 36Mbps 48Mbps 54Mbps Limits:+1.5/-1.5 dB

measured/target

CH1 : 2412 16.2/16.5 16.1/16.5 16.3/16.5 16.4/16.5

CH6 : 2437 17.6/18.0 17.7/18.0 17.5/18.0 17.8/18.0

CH11 : 2462 15.6/16.0 15.8/16.0 15.7/16.0 15.9/16.0

Turbo mode:

CH6 : 2437 18.1/18.3 17.9/18.3 18.0/18.3 17.8/18.3

< target power test : after building calibration information table in EEPROM, ART would verify the output power follows target power table to check if the calibration

information table is correct and meet the tolerance in 802.11G >

Start Spectral Mask Test for mode 11g

spec mask - chan:2437

< Spectrum mask test >

Start PER and SEN Test in 11g mode
FREQ 6Mbps 36Mbps 48Mbps 54Mbps ppm ():RSSI
CH1 :2412 PER 100(37) 100(35) 100(33) 100(32) -9
SEN 100(26) 100(26)
CH6 :2437 PER
SEN
CH11:2462 PER
SEN
FREQ 12Mbps 72Mbps 96Mbps 108Mbps ppm TURBO MODE TESTING
CH6 : 2437 PER
SEN

< PER & sensitivity test in both normal and turbo mode : To check PER (Tx RF signal quality) and sensitivity(10% PER) >

Start Target Power Control Test in 11b mode
FREQ 1Mbps 5.5Mbps(S) 11Mbps(L) 11Mbps(S) Limits:+1.5/-1.5 dB
measured/target
CH1 : 2412 17.8/18.0 17.6/18.0 17.9/18.0 17.7/18.0
CH6 : 2437 18.0/18.2 17.8/18.2 17.9/18.2 17.7/18.2
CH11 : 2462 17.7/18.1 17.9/18.1 18.0/18.1 17.8/18.1

< target power test : after building calibration information table in EEPROM, The ART verifies the output power followed target power table to check if the calibration information table is correct and meet the tolerance in 802.11B >

Start Spectral Mask Test for mode 11b

spec mask - chan:2437

< Spectrum mask test : >

Start PER and SEN Test in 11b mode
FREQ 1Mbps 5.5Mbps(S) 11Mbps(L) 11Mbps(S) ():RSSI
CH1 :2412 PER
SEN
CH6 :2437 PER
SEN

CH11:2462 PER
SEN

< About PER and sensitivity test of 2.4GHz band including 802.11b/g , due to the RF front-end circuit is the same and consider that 11G Tx signal quality is sensitive to output power . So we test CH1 ,CH6, CH11 in 11g PER&SEN test >

00904B774014
==========
Wrote MAC address: 0090:4B77:4014
==========

****

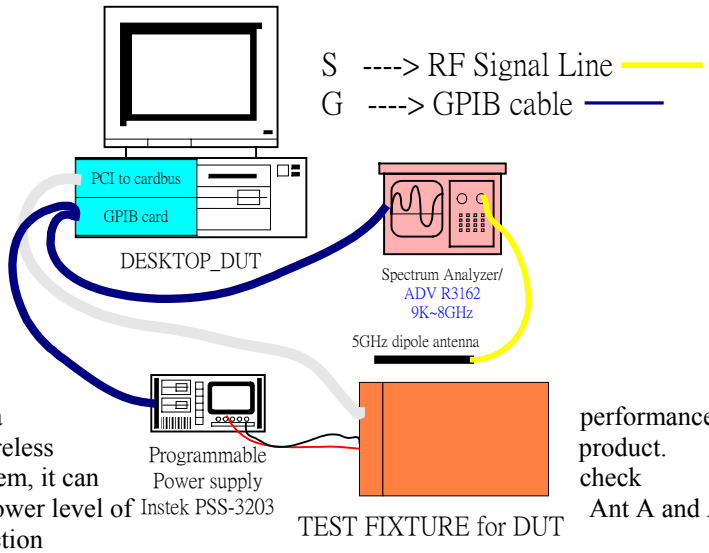
```
*****   TEST   OK    *****
****************************
        * * *
       *     *
       *     *
       *     *
        * * *      ============================================================
          Please Pull Out Card
         Press <ESC> key  to quit
==============================================================
```

Input a MAC address :

Sub-Conclusion : In some test item , for instance, PER& Sensitivity test, spectrum mask test, we have checked RF performance for each channel and each band in EVT .

T2 : Retest

I : block diagram



II : purpose : Antenna performance and function is also important for wireless product.

In this test system, it can check

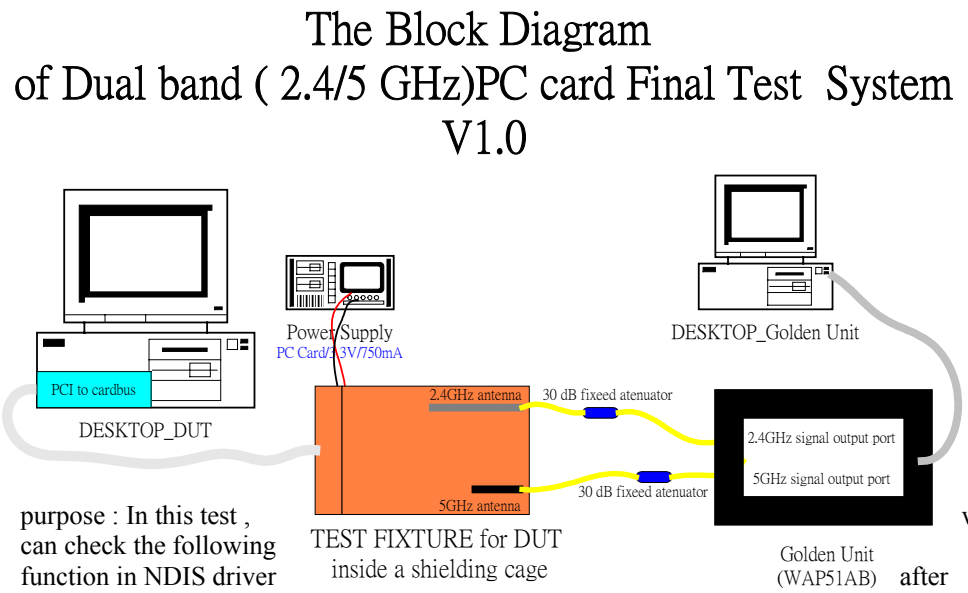
relative output power level of Ant A and Ant B to verify the antenna function

check antenna switch and some RF matching circuit

- check LED function

T3 : Final test

I : block diagram



II : purpose : In this test , we can check the following function in NDIS driver after finishing housing assembly.

Check the DUT can work in NDIS driver normally.
throughput test in 802.11g (2.4GHz band)and 802.11a (5GHz band)
usually, the limit is 17 Mbps[1] depend on test environment ,setup , golden AP
WEP function : 128 bit in 802.11G , 152bit in 802.11A
We also add some fixed attenuator in RF path to get suitable RSSI about 35~40
Control and Print back label including MAC address and serial number

[1] For 802.11 a/b/g products, 54Mbps is the DATA rate in base-band processor chip ,not throughput inNDIS driver via TCP/IP ,UDP..etc.
When PC card works in NDIS driver , the practical DATA rate (throughput) is about 20 Mbps based on IEEE 802.11a or 11g PPDU frame format. And the throughput really depend on test setup including two antenna coupling angle, polarization ,etc. What solution of AP is also important. The different solution of AP will get different (lower)throughput in both PUSH and PULL mode. By the way,the test environment is in shielding cage. It is a small volume .we have to put test fixture including card reader , two coupling antennae, some RF cable and fixed attenuators inside the shielding cage. they will degrade a little bit throughput because of the effect of multi-path , too. Normally. The throughput we test is around 18~19 Mbps in this environment. It is suitable and appropriate to set limit in 17 Mbps.