

# FCC Certification Test Report of *450MHz to 470MHz Transceiver*

**Applicant** : Gold Apollo Co., Ltd.  
Rm 1, 3rd F1., No. 77, Sec. 1, Hsin Tai Wu Rd.,  
His-Chih, Taipei Hsien, Taiwan, R.O.C.

**Model No.** : TX-125 & TX-125EN

**EUT** : 5W transceiver

**FCC ID** : NDATX500XU

**Report No.** : G1590050048

**Tested by :**

*Training Research Co., Ltd.*

**TEL : 886-2-26461146**

**FAX : 886-2-26461778**

No. 15, Lane 530, Pa-Lian RD., Sec. 1, Hsichih City, Taipei Hsien, Taiwan, R.O.C.

## CERTIFICATION

**We here by verify that:**

The test data, data evaluation, test procedures and equipment configurations shown in this report were made mainly in accordance with the procedures given in ANSI C63.4 (2003) as a reference and ANSI/TIA/EIA-603. All test were conducted by **Training Research Co., Ltd.**, No. 15, Lane 530, Pa-Lian RD., Sec. 1, Hsichih City, Taipei Hsien, Taiwan, R.O.C.. Also, we attest to the accuracy of each.

We further submit that the energy emitted by the sample EUT tested as described in the report is **in compliance with** the technical requirements set forth in the FCC Rules Part 90.

Prepared by: Jason Yeh Project Engineer  
(Jason Yeh)

Authorized by: Jacob Lin V. General Manager  
(Jacob Lin)

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## I . GENERAL

### 1.1 Introduction

The following measurement report is submitted on behalf of applicant in support that the certification in accordance with Part 2 Subpart J and Part 90 of the Commission's Rules and Regulations.

During the testing, the EUT has three kinds of modulations, as below:

- AN ; Analogy, with 12.5KHz channel spacing.
- NB ; Digital, with 12.5KHz channel spacing.
- WB ; Digital, with 25KHz channel spacing.

### 1.2 Description of EUT

The EUT is a POCSAG transmitter, specifications as below:

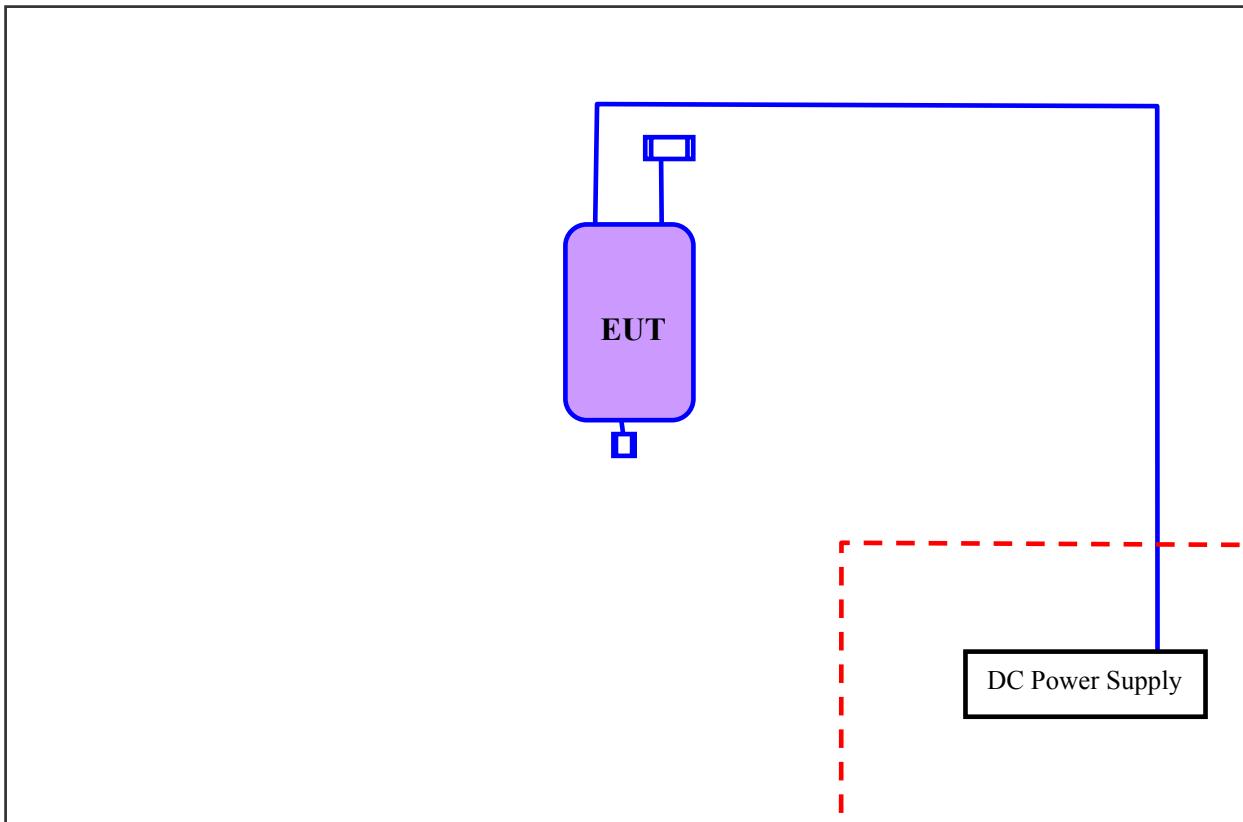
1. Frequency Rang : UHF = 440MHz ~ 470MHz
2. Channel Spacings : 12.5KHz, 25KHz
3. RF Output Power : 5W, 2W
4. Modulation Type : F1D
5. Intermediate Frequency : 45MHz & 450KHz
6. Number of Channels : 16
7. Frequency Source : Synthesizer
8. Power Supply : DC 10V ~ 14V
9. Temperature Range : -30°C ~ 50°C
10. Current Consumption  
Standby : 100mA,  
TX(5W) : < 2A,  
TX(1W) : < 1A,

Transmitter:

1. Carrier Power  
Hi : 5W + / -1 dB,  
Low : 2W + / -1 dB,
2. Frequency Error : + / -2.5ppm
3. Frequency Deviation  
25KHz Channel Spacing : 5KHz ~ 3.8KHz (Peak)  
12.5KHz Channel Spacing : 2.5KHz ~ 1.8KHz (Peak)

4. Audio Frequency response : 300Hz ~ 2.5KHz – 6dB
5. Adjacent Channel Power : < 70dBc
6. Conducted Spurious Emission : - 57dBc

### 1.3 Configuration of System Under Test



#### Connections of EUT:

\*DC Power jack --- via 10 m power cable connected to the DC power supply that located remotely.

\*RS-232 port --- via 1.4 m data cable that terminated.

\*Antenna port --- with a 50ohm terminated.

#### *List of support equipment*

<b>DC Power Supply</b>	<b>:</b>	<b>GW</b>
Model No.	:	GPC-3030D
Serial No.	:	8050549
FCC ID	:	N/A
Power type	:	AC 100 –127 4.0A, 200-240 2.0A, 50 ~ 60Hz
Data cable	:	Non-shielded, 1.8 m long, Plastic, No ferrite core

## **1.4 Location of the Test Site**

The radiated emissions measurements (above 1GHz) required by the rules were performed on the **three-meter, Anechoic Chamber (Registration Number: 93906)** maintained by *Training Research Co., Ltd.* 1F, No. 255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. Complete description and measurement data have been placed on file with the commission. The conducted power line emissions tests and radiated emissions measurements below 1 GHz were performed in an OATS located at Pa-Lian His-chih Training Research Co., Ltd.

No. 15, Lane 530, Pa-Lian RD., Sec. 1, Hsichih City, Taipei Hsien, Taiwan, R.O.C. (Registration No.: 91035) *Training Research Co., Ltd.* is listed by the FCC as a facility available to do measurement work for others on a contract basis.

## **1.5 General Test Condition**

The conditions under which the EUT operates were varied to determine their effect on the equipment's emission characteristics. The final configuration of the test system and the mode of operation used during these tests were chosen as that which produced the highest emission levels. However, only those conditions, which the EUT was considered likely to encounter in normal use were investigated.

### **Normal Temperature and Humidity**

Temperature : 20°C ± 4°C maintained.

Relative Humidity : 60% ± 10% observed.

### **Normal Test Power Source**

Test Voltage : 12 Vdc.

### **Extreme Temperature**

High Temperature : + 50°C maintained.

Low Temperature : - 30°C maintained.

### **Extreme Voltage**

High Voltage : 15.6 Vdc

Low Voltage : 10.2 Vdc

**While testing, device was set in high power and continuously transmitting mode.**

## **II. Emissions Designator (Part 2.201)**

The necessary authorized bandwidth is taken to be the necessary bandwidth.

Using the formulas contained in Par 2.202 the necessary bandwidth calculation for the 25 kHz channel step emission is:

$$B_n = 2 \times D + 2 \times M$$

Where D = maximum deviation: 5.0 kHz

Where M = maximum modulation frequency: 2.5 kHz

$$B_n = 15 \text{ kHz}$$

This is confirmed in the emission designation, 15K0F1D, declared by the client.

Using the formulas contained in Part 2.202 the necessary bandwidth calculation for the 12.5 kHz channel step emission is:

$$B_n = 2 \times D + 2 \times M$$

Where D = maximum deviation: 2.5 kHz

Where M = maximum modulation frequency: 2.5 kHz

$$B_n = 10 \text{ kHz}$$

This is confirmed in the emission designation, 10K0F1D, declared by the client.

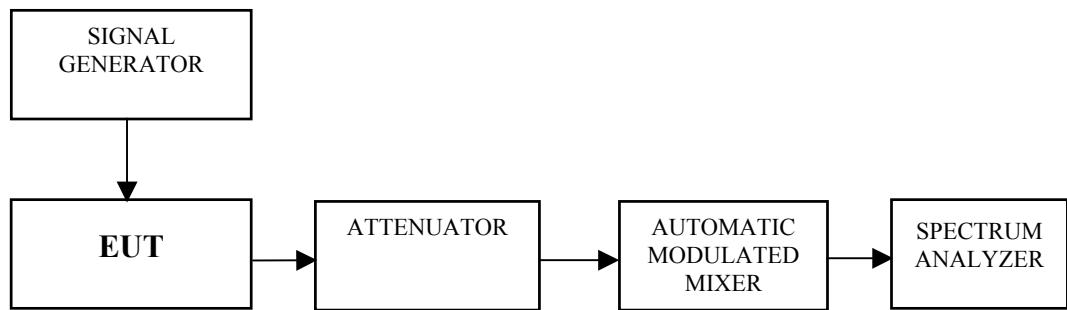
### **III. Modulation Characteristics: (Part 2.1047)**

#### **3.1 Audio Low Pass Filter Test procedure:**

##### **Definition**

The audio low pass filter response is the frequency response of the post limiter low pass filter circuit above 3000 Hz

##### **Method of measurement**

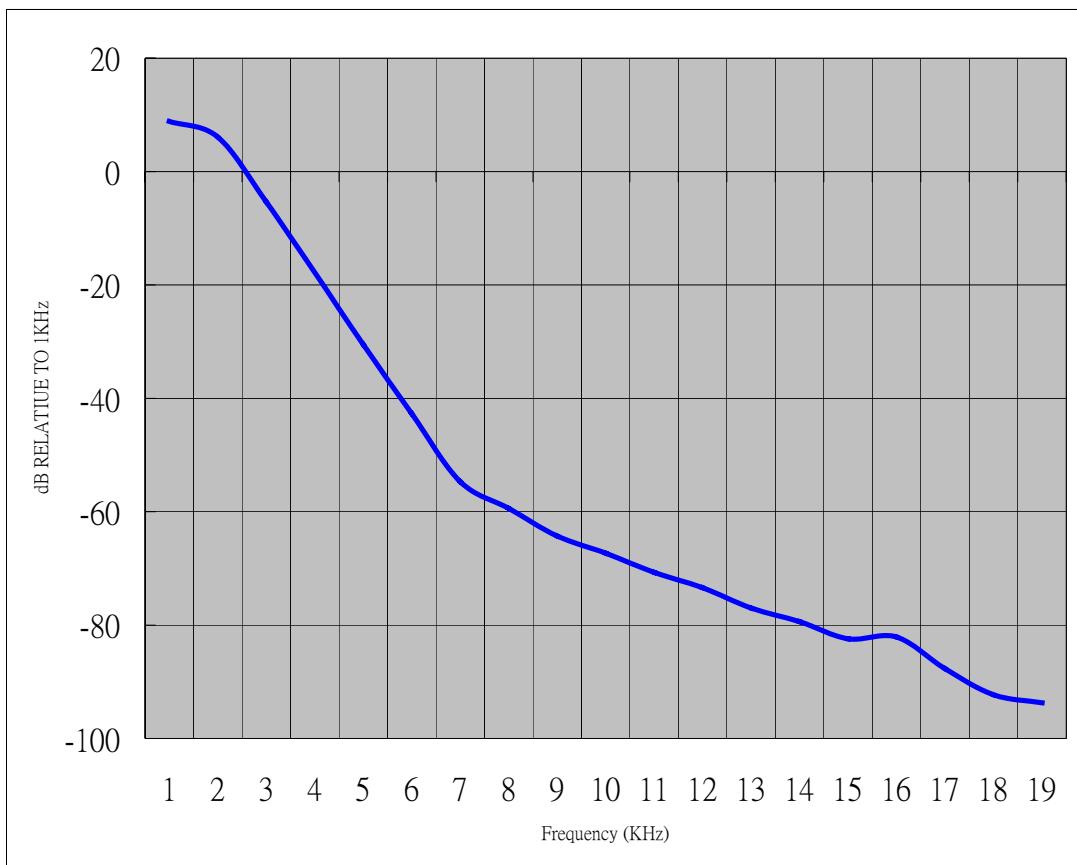


- (1) Connect the equipment as illustrated.
- (2) The signal generator was transmitting modulation signal to the EUT.
- (3) From 1kHz to 20kHz modulation signals have tested.
- (4) During the testing, adjust the amplitude of the signal generator.
- (5) Observe and recorded the test results.
- (6) Describe the test results to a figure.

##### **NOTE:**

Pretest was found the 5W power output is the worst mode than 2W power output, so the test was only the worst mode and recorded the test results

**Measurement Result:**

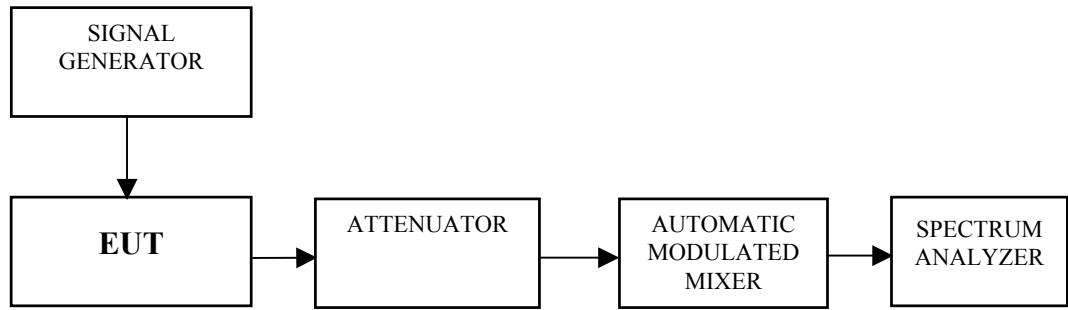


### **3.2 Audio Frequency Response Test procedure:**

#### **Definition**

The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

#### **Method of measurement**

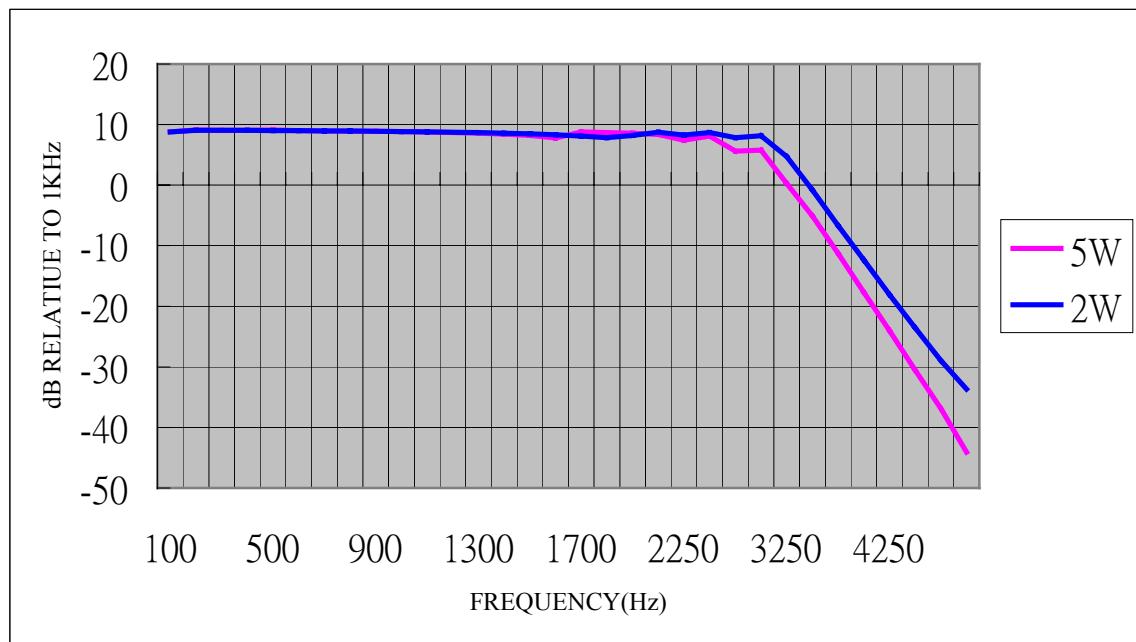


- (1) Connect the equipment as illustrated.
- (2) The signal generator was transmitting modulation signal to the EUT.
- (3) From 100Hz to 5kHz modulation signals have tested.
- (4) Two kinds power have tested.
- (5) During the testing, adjust the amplitude of the signal generator.
- (6) Observe and recorded the test results.
- (7) Describe the test results to a figure.

#### **NOTE:**

Pretest was found the 5W power output is the worst mode than 2W power output, so the test was only the worst mode and recorded the test results

**Measurement Result:**

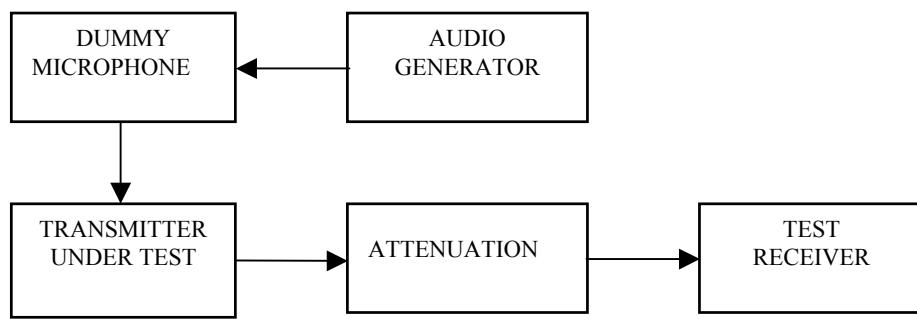


### 3.3 Modulation Limiting Test procedure:

#### Definition

Modulation limiting is the transmitter circuit's ability to limit the transmitter from producing deviations in excess of a rated system deviation.

#### Method of measurement



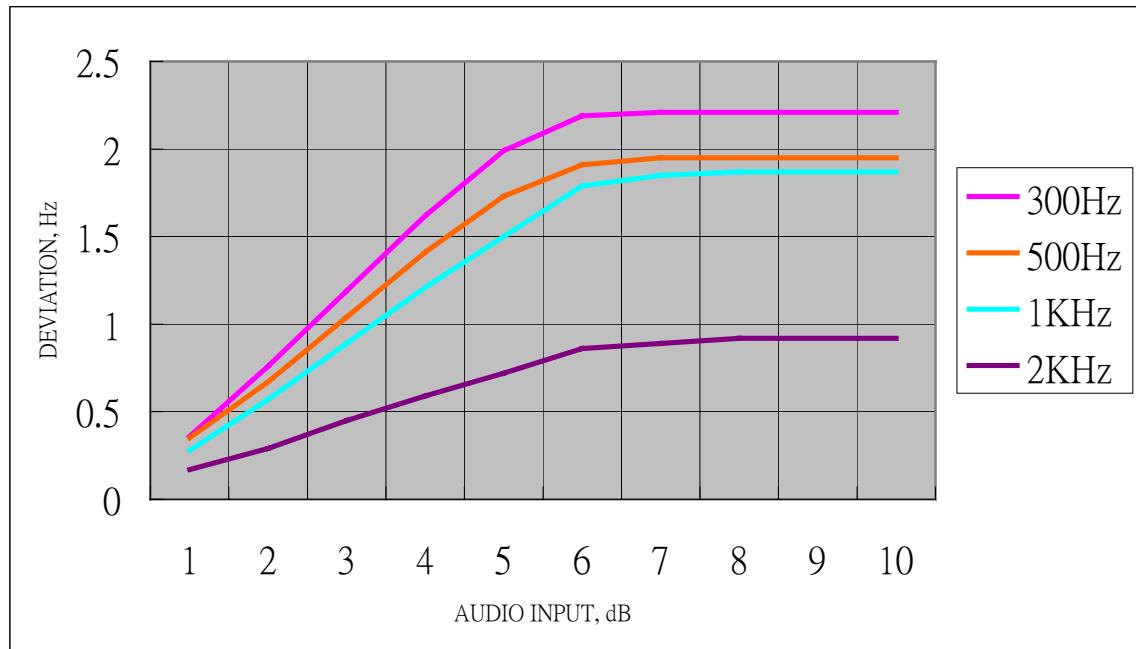
- (1) Connect the equipment as illustrated.
- (2) The signal generator was transmitting modulation signal to the EUT.
- (3) Four modulation signals have tested, they are 300Hz, 500Hz, 1kHz and 2kHz.
- (4) During the testing, adjust the amplitude of the signal generator.
- (5) Measurements were performed for both negative and positive modulation and the respective results were recorded.
- (6) Observe and recorded the test results.
- (7) Describe the test results to a figure.

#### NOTE:

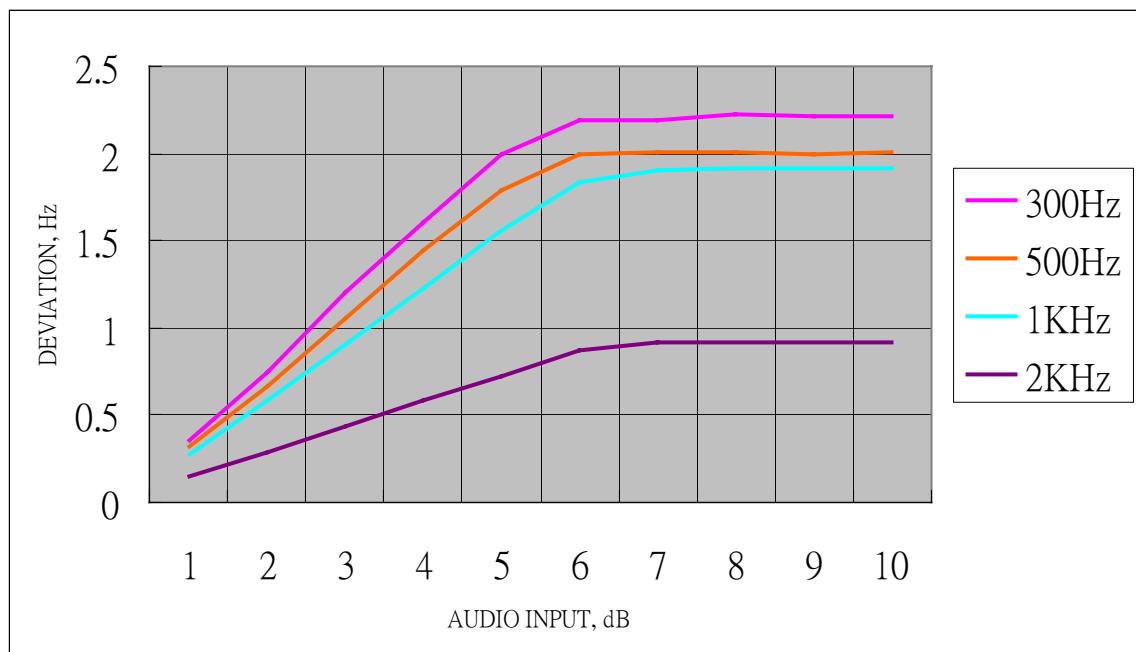
Pretest was found the 5W power output is the worst mode than 2W power output, so the test was only the worst mode and recorded the test results

**Measurement Result:**

**Positive Peaks:**



**Negative Peaks:**



## IV. RF Power Output (Part 2.1046, 90.205)

### 4.1 Test procedure:

- (1) Antenna was replaced with a short connector which was connected with a 40 dB attenuator.
- (2) Set the spectrum., RBW = 100Hz, VBW = 100Hz, SPAN = 1KHz, ATT = 30dB



### 4.2 Test Result:

	Modulation	Channel Spacing (KHz)	Frequency (MHz)	Output power (dBm)	Power (W)
5W	AN	12.5	440	36.91	4.909
5W	NB	12.5	440	37.00	5.011
5W	WB	25	440	36.92	4.920
5W	AN	12.5	455	37.26	5.322
5W	NB	12.5	455	37.29	5.358
5W	WB	25	455	37.29	5.358
5W	AN	12.5	470	37.51	5.636
5W	NB	12.5	470	37.53	*5.662
5W	WB	25	470	37.52	5.649
2W	AN	12.5	440	32.14	1.637
2W	NB	12.5	440	32.63	1.832
2W	WB	25	440	32.32	1.706
2W	AN	12.5	455	32.65	1.840
2W	NB	12.5	455	33.21	*2.094
2W	WB	25	455	32.95	1.972
2W	AN	12.5	470	32.32	1.706
2W	NB	12.5	470	32.80	1.905
2W	WB	25	470	32.78	1.897

“\*”, means the worst case.

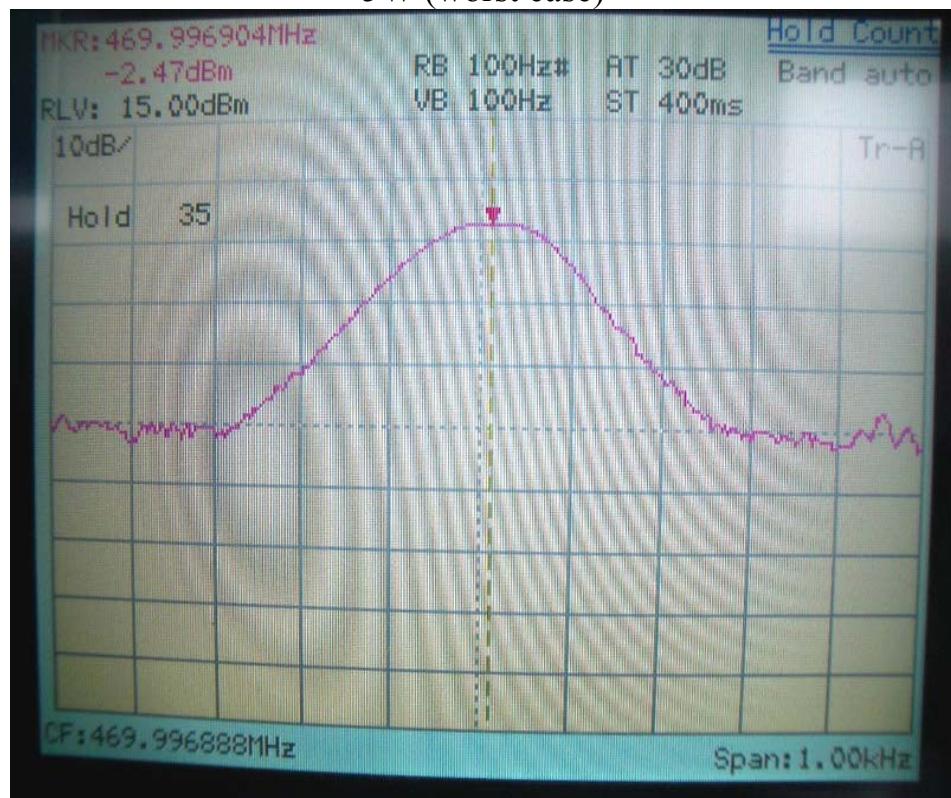
### 4.3 Test Equipment:

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum	MS2665C	Anritsu	6200175476	03/21/05	03/20/06

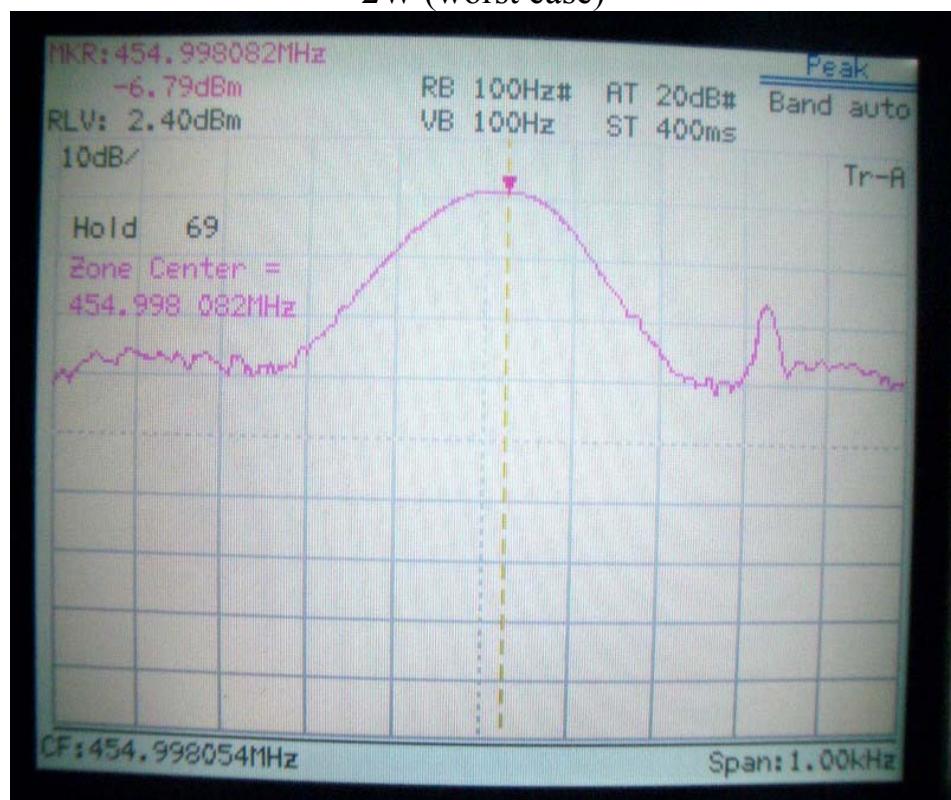
The level of confidence of 95% , the uncertainty of measurement of conducted emission is  $\pm 1.55$  dB .

## Measurement Result:

5W (worst case)

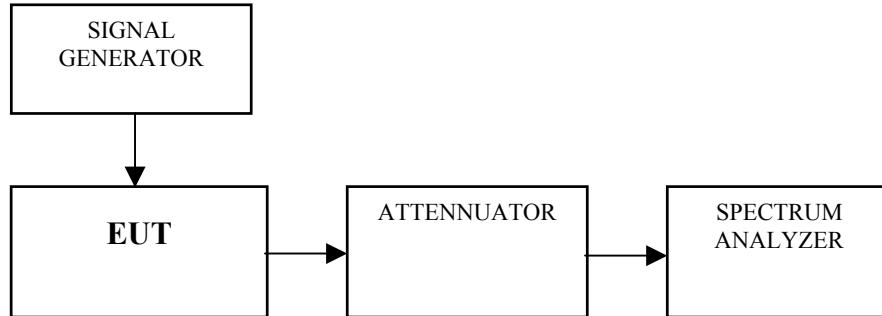


2W (worst case)



## **V. Occupied Bandwidth: (Part 2.1049, 90.209)**

### **5.1 Test procedure:**



- (1) Connect the equipment as illustrated.
- (2) The signal generator was transmitting modulation signal to the EUT.
- (3) Four kinds of modulation signals have tested, they are none, AN, NB and WB.
- (4) During the testing, adjust different modulations.
- (5) Observe and recorded the test results.

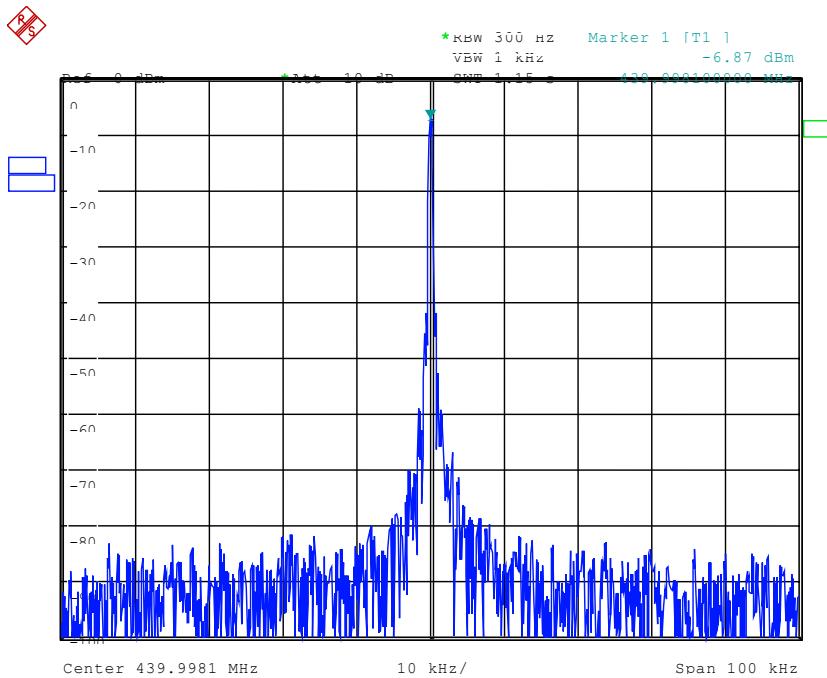
### **5.2 Test Equipment:**

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum	MS2665C	Anritsu	6200175476	03/21/05	03/20/06

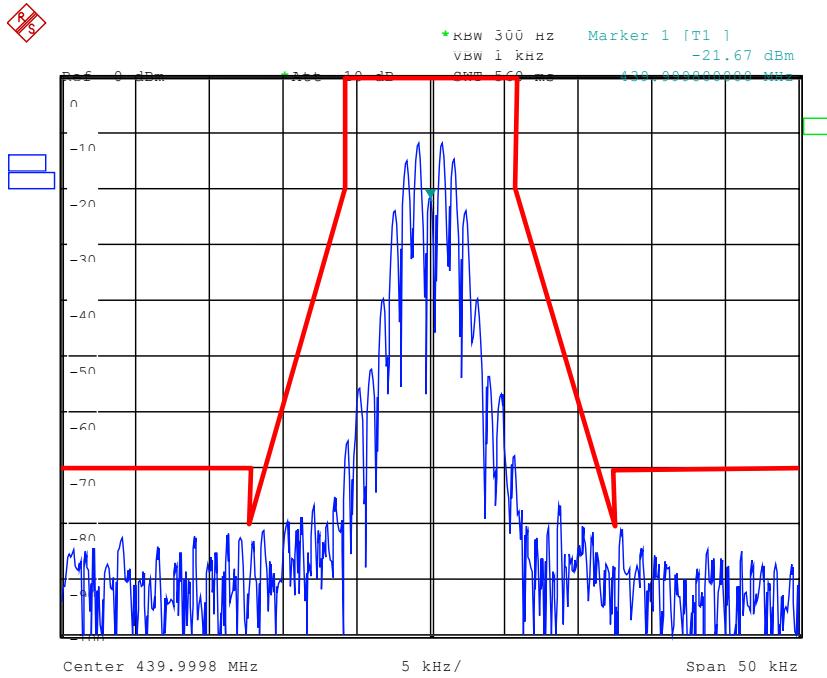
The level of confidence of 95% , the uncertainty of measurement is  $\pm 12$  Hz .

### 5.3 Test Result:

#### Measurement Result:

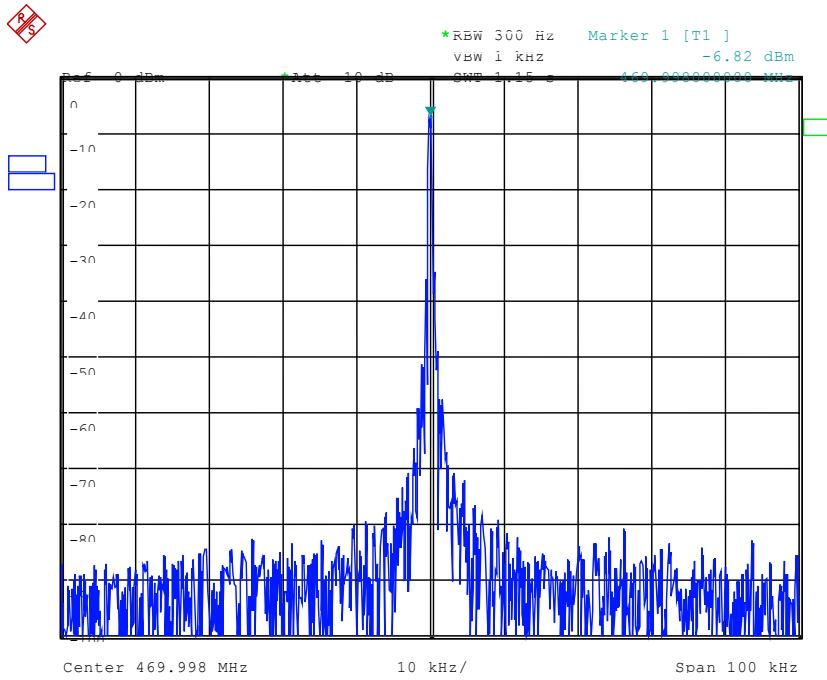


**Power : 2W**  
**Frequency : 440MHz**  
**Modulation : NONE**

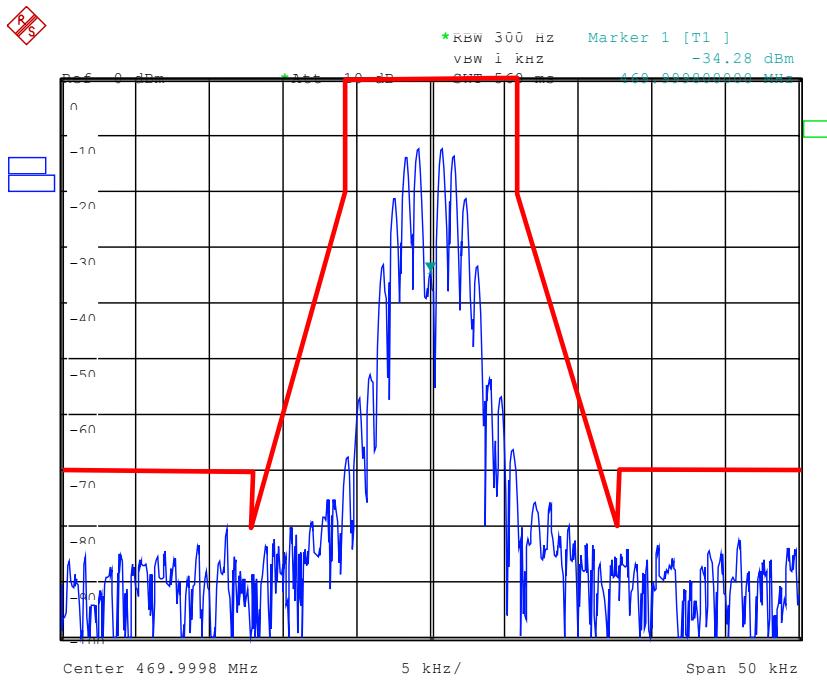


**Power : 2W**  
**Frequency : 440MHz**  
**Modulation : Mask: D, NB**

## Measurement Result:

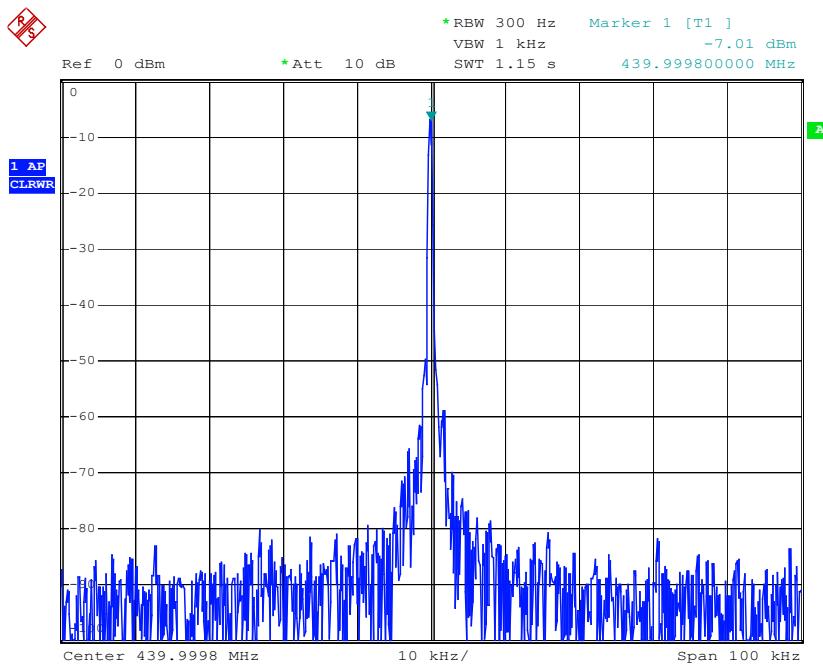


**Power** : 2W  
**Frequency** : 470MHz  
**Modulation** : NONE



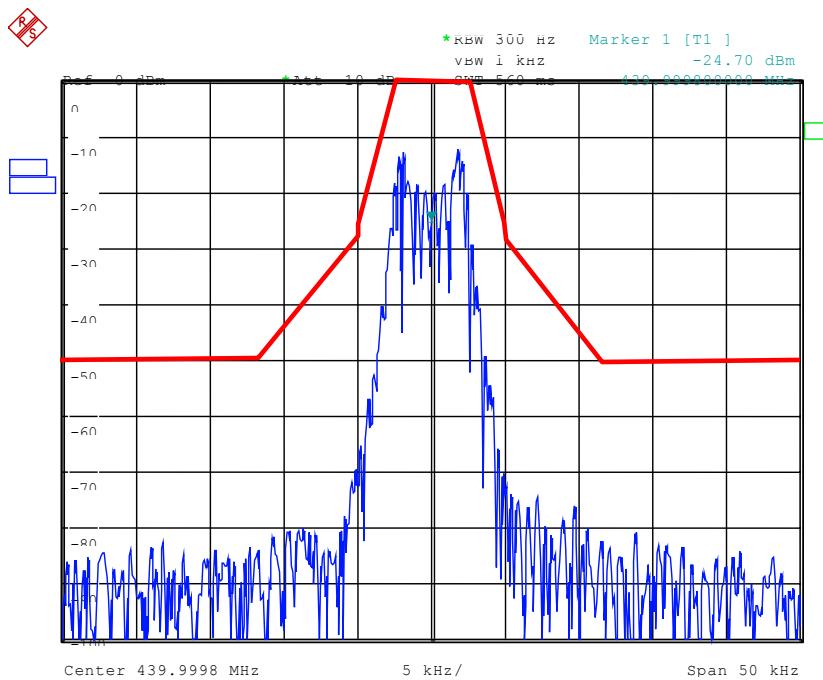
**Power** : 2W  
**Frequency** : 470MHz  
**Modulation** : Mask: D, NB

Measurement Result:



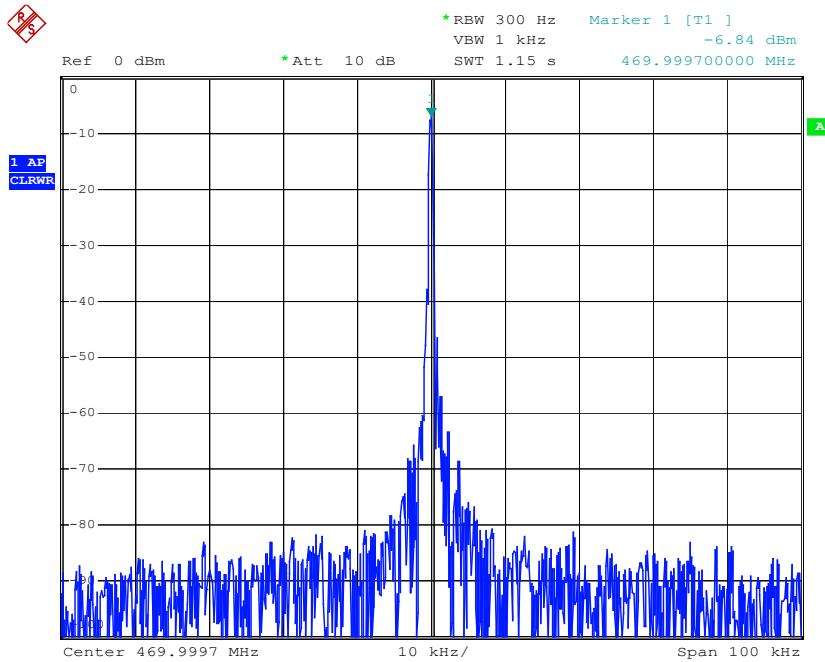
Date: 4.APR.2005 09:00:42

**Power :** 2W  
**Frequency :** 440MHz  
**Modulation :** NONE



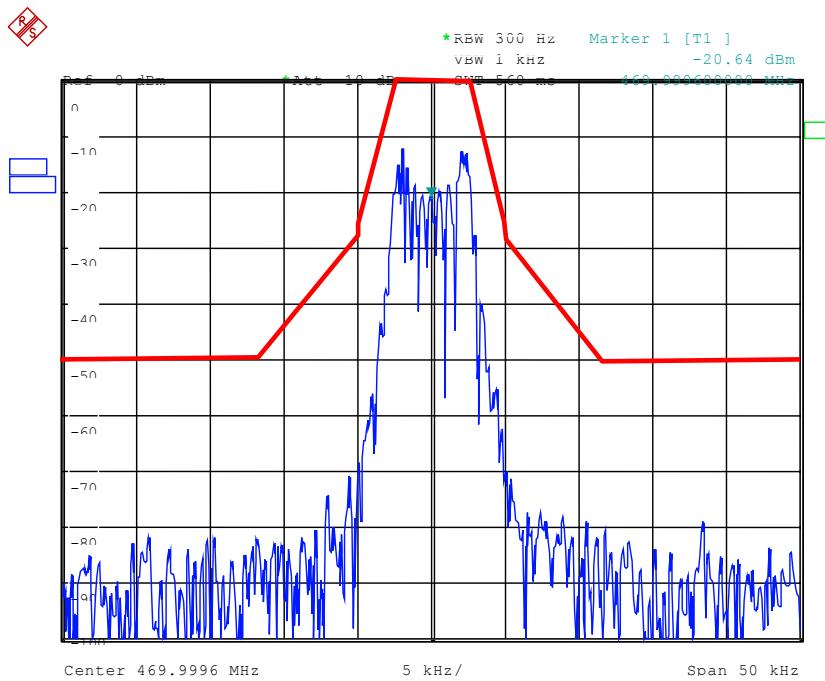
**Power :** 2W  
**Frequency :** 440MHz  
**Modulation :** Mask: C, AN

Measurement Result:



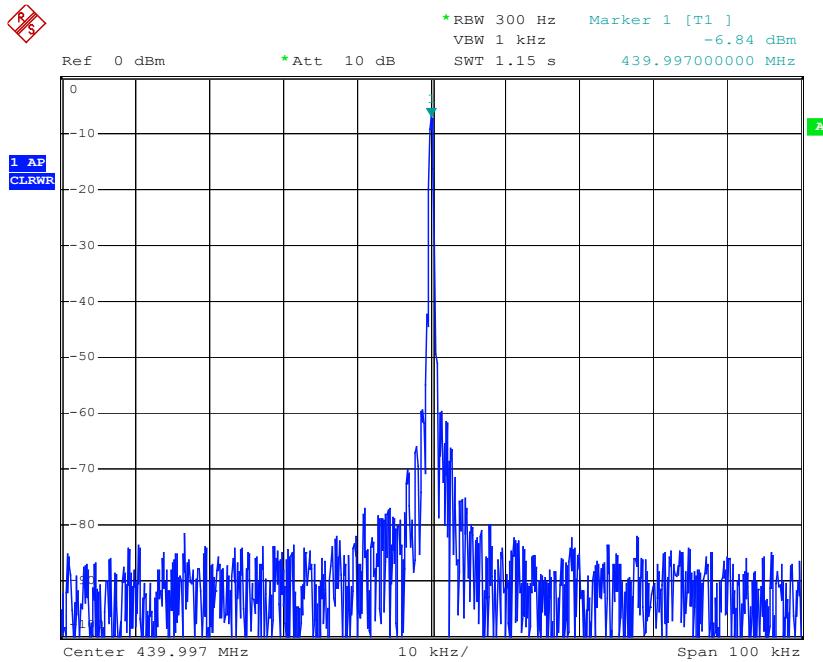
Date: 4.APR.2005 09:13:26

**Power :** 2W  
**Frequency :** 470MHz  
**Modulation :** NONE



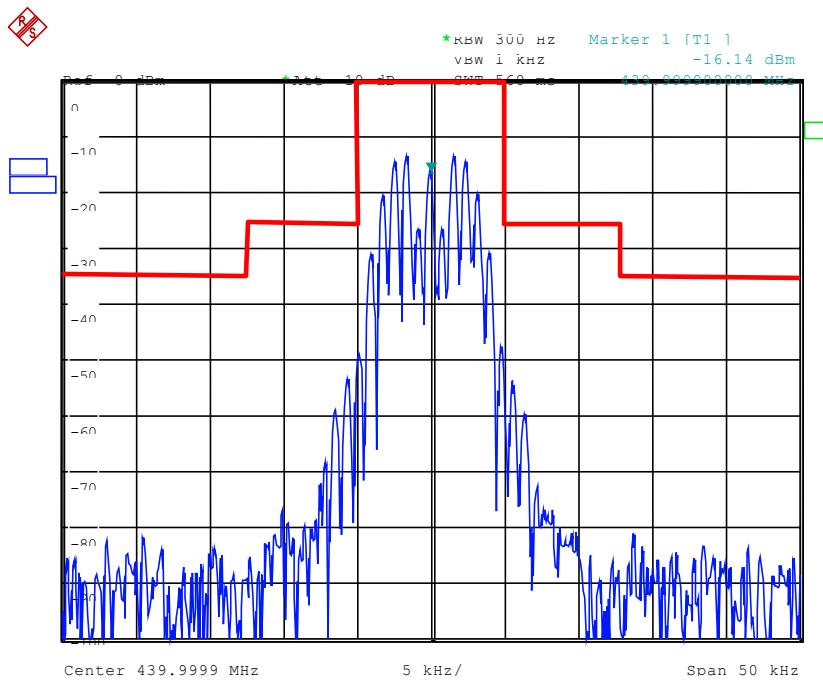
**Power :** 2W  
**Frequency :** 470MHz  
**Modulation :** Mask: C, AN

Measurement Result:



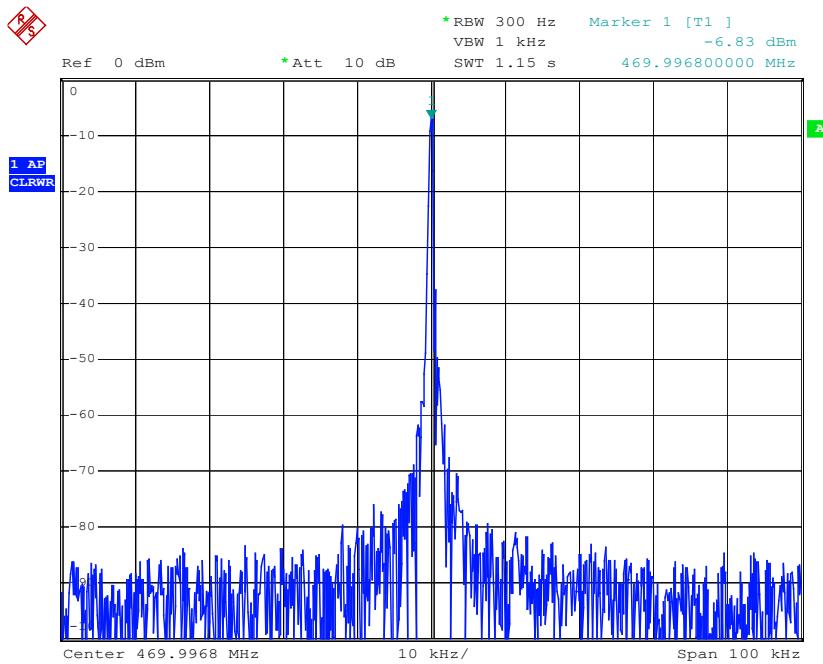
Date: 4.APR.2005 08:55:47

**Power** : 2W  
**Frequency** : 440MHz  
**Modulation** : NONE



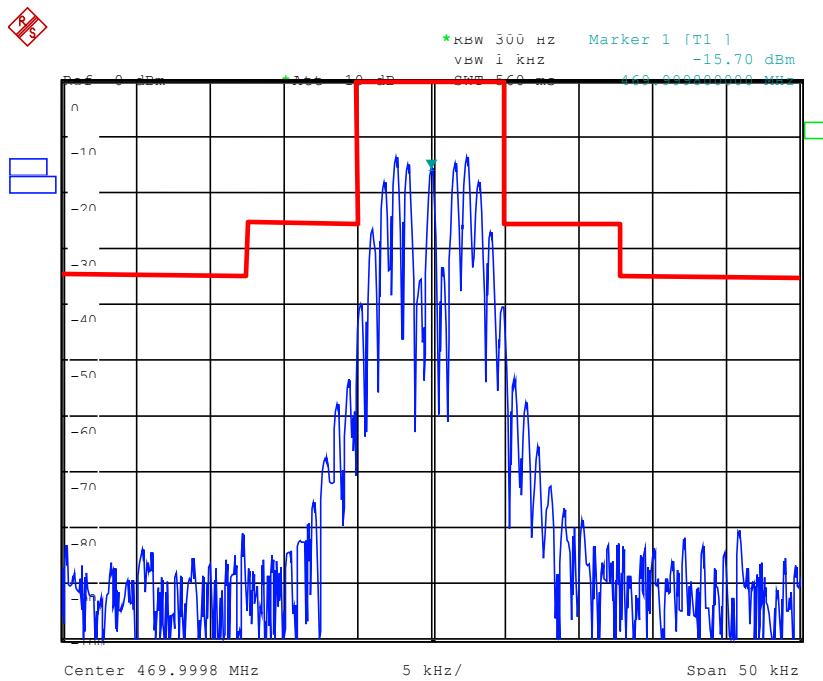
**Power** : 2W  
**Frequency** : 440MHz  
**Modulation** : Mask: B, BW

Measurement Result:



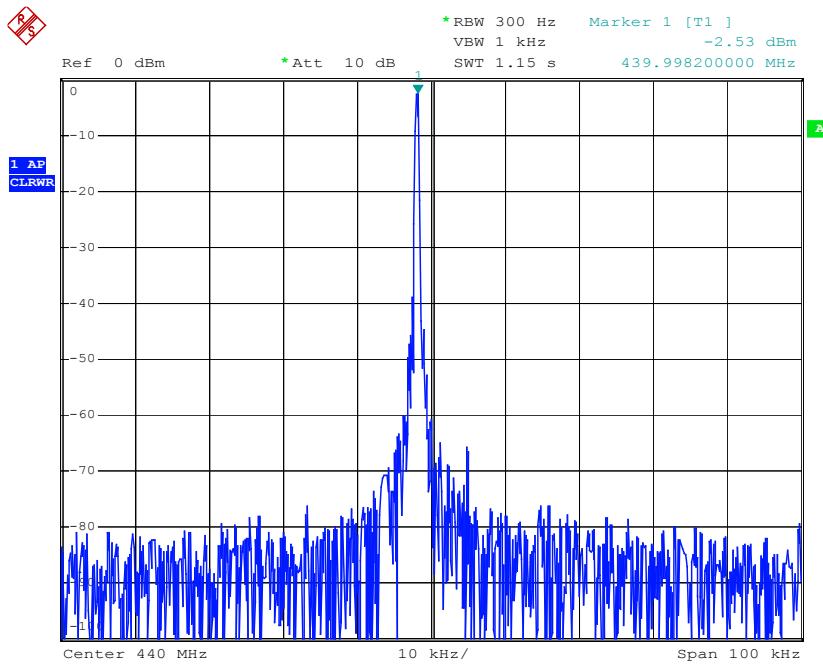
Date: 4.APR.2005 08:52:31

**Power : 2W**  
**Frequency : 470MHz**  
**Modulation : NONE**



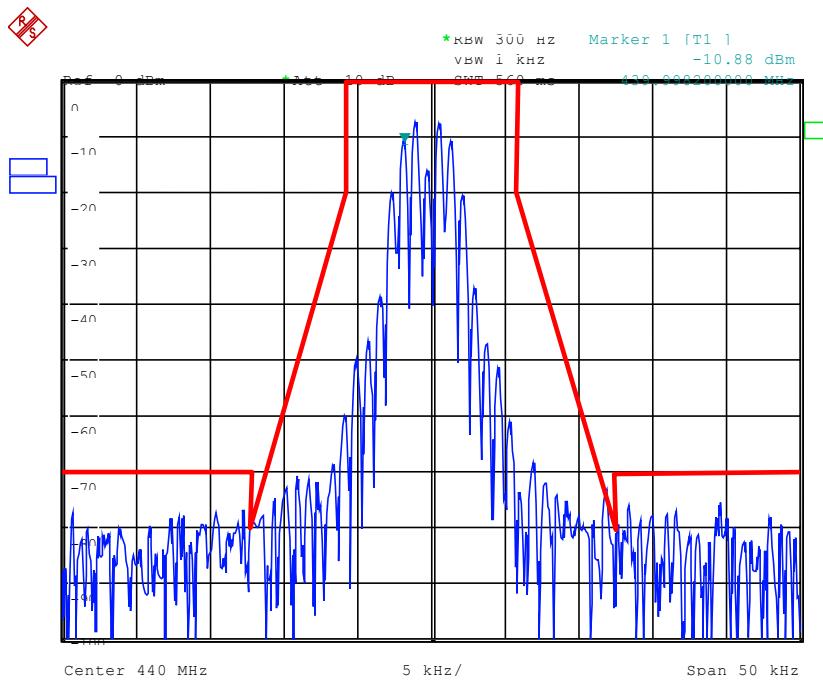
**Power : 2W**  
**Frequency : 470MHz**  
**Modulation : Mask: B, BW**

Measurement Result:



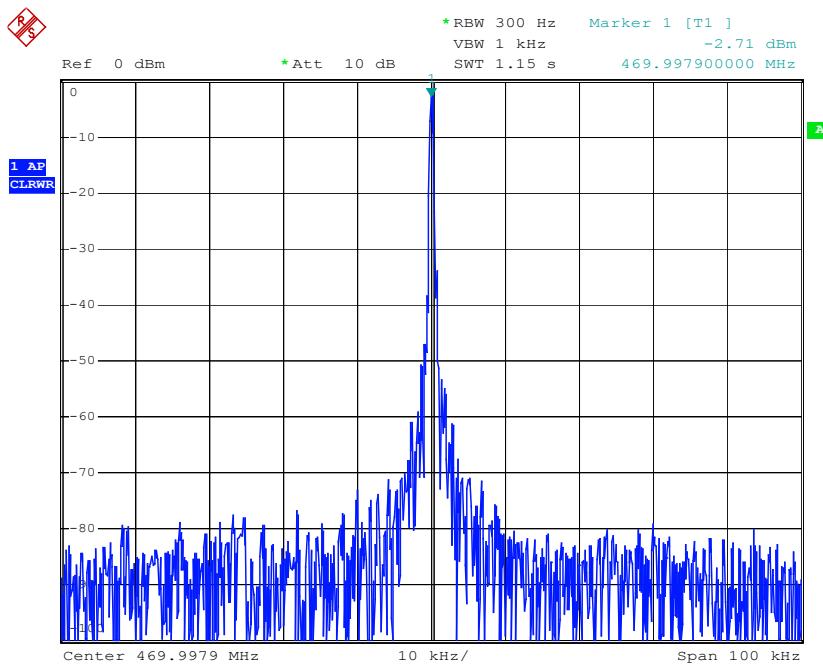
Date: 4.APR.2005 07:49:53

**Power : 5W**  
**Frequency : 440MHz**  
**Modulation : NONE**



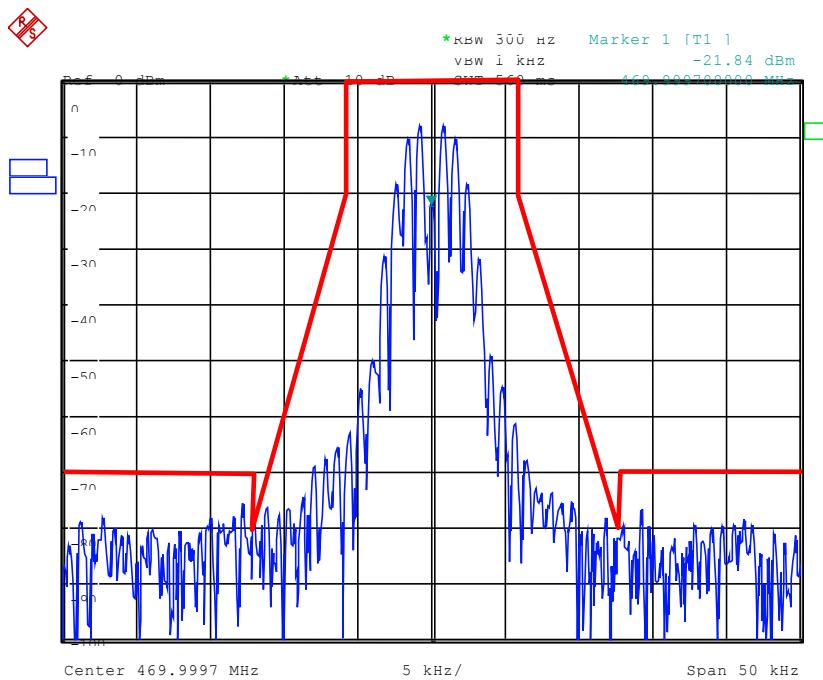
**Power : 5W**  
**Frequency : 440MHz**  
**Modulation : Mask: D, NB**

Measurement Result:



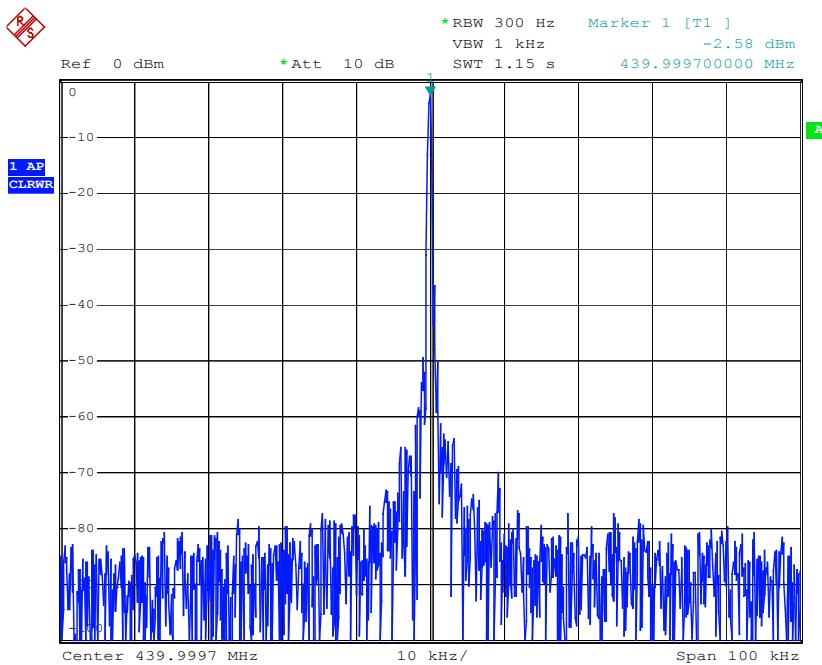
Date: 4.APR.2005 08:24:12

**Power :** 5W  
**Frequency :** 470MHz  
**Modulation :** NONE



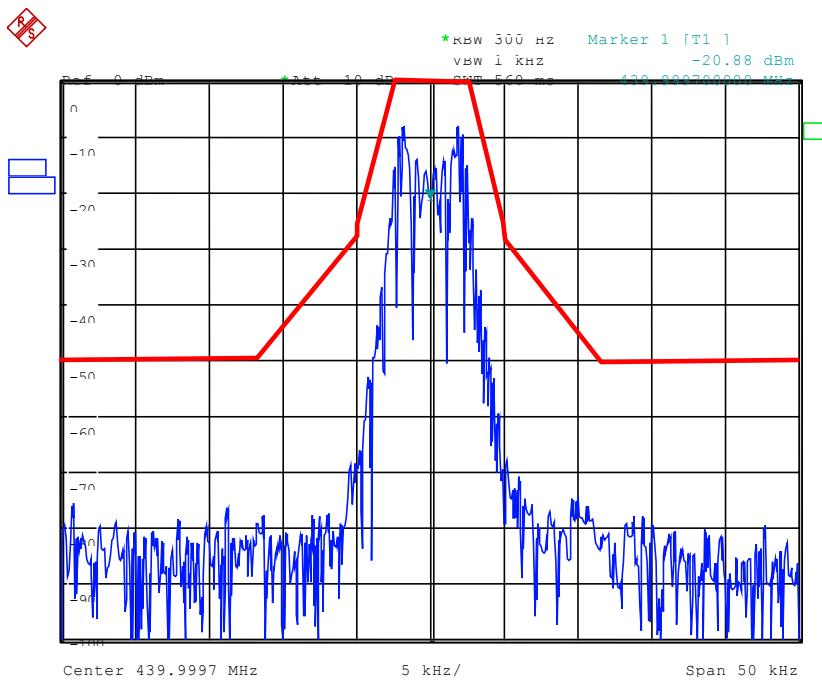
**Power :** 5W  
**Frequency :** 470MHz  
**Modulation :** Mask: D, NB

Measurement Result:



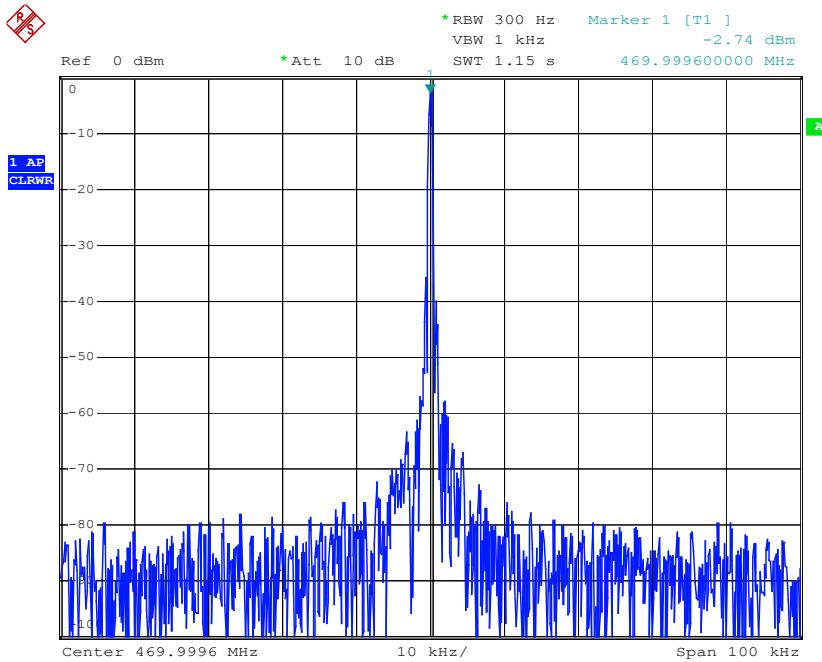
Date: 4.APR.2005 09:04:41

**Power : 5W**  
**Frequency : 440MHz**  
**Modulation : NONE**



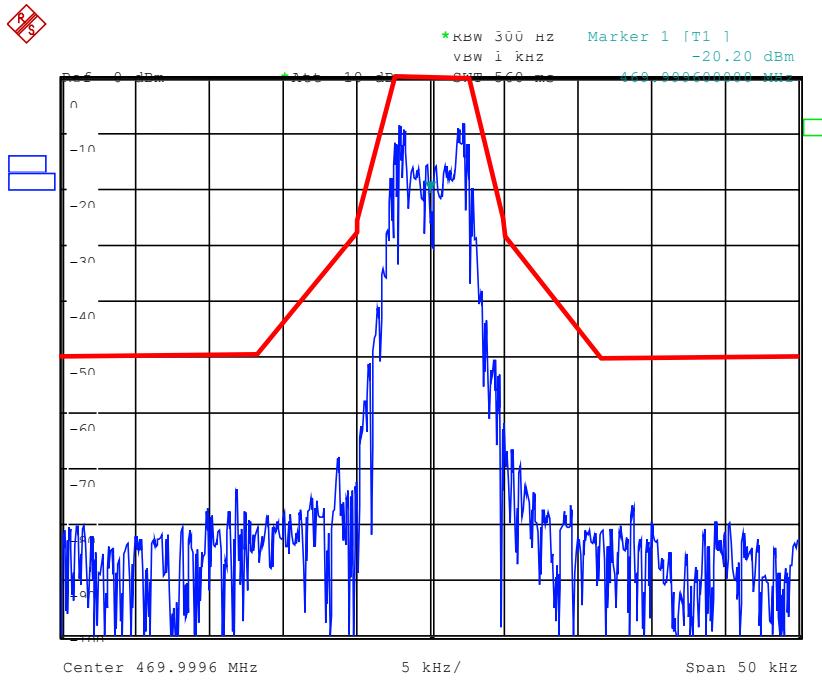
**Power : 5W**  
**Frequency : 440MHz**  
**Modulation : Mask: C, AN**

Measurement Result:



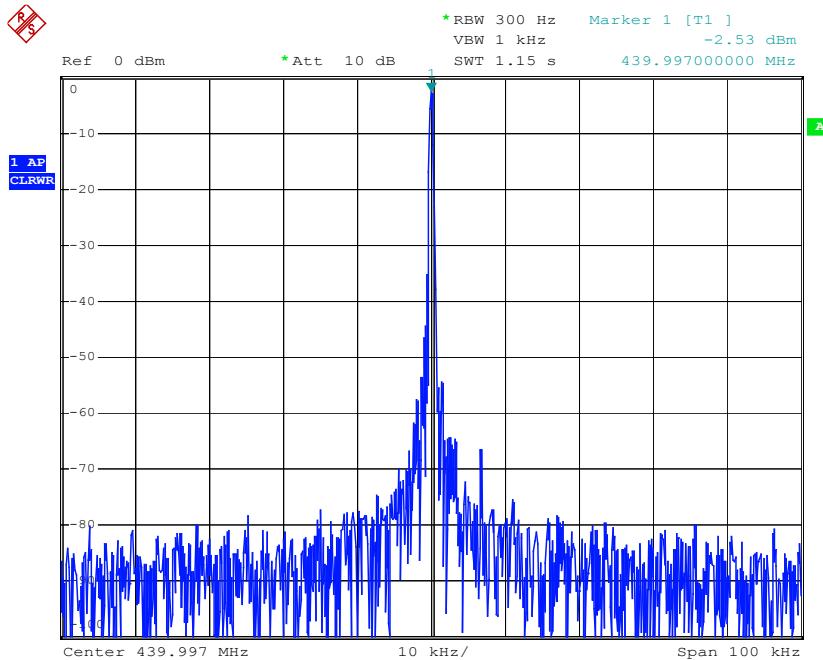
Date: 4.APR.2005 09:07:24

**Power : 5W**  
**Frequency : 470MHz**  
**Modulation : NONE**



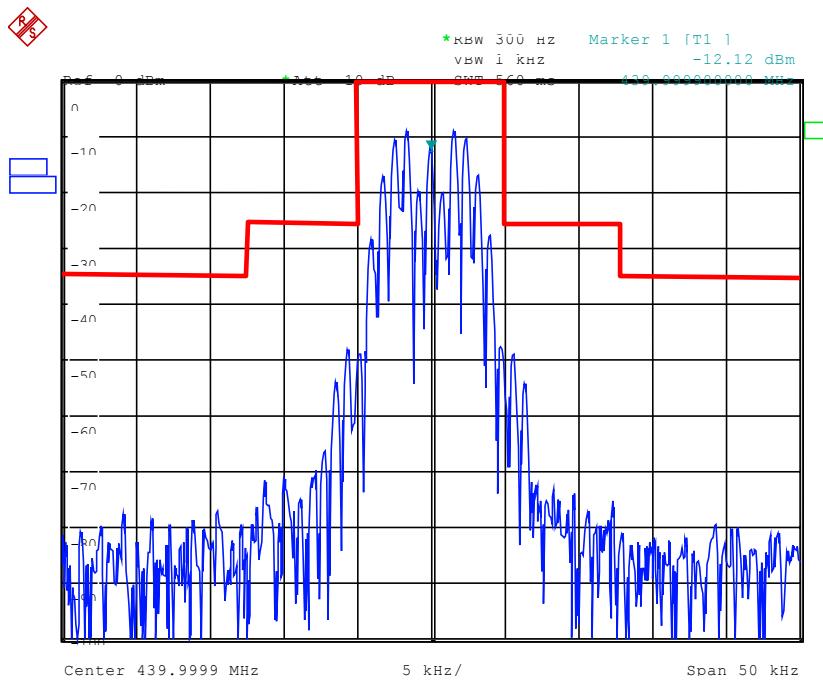
**Power : 5W**  
**Frequency : 470MHz**  
**Modulation : Mask: C, AN**

Measurement Result:



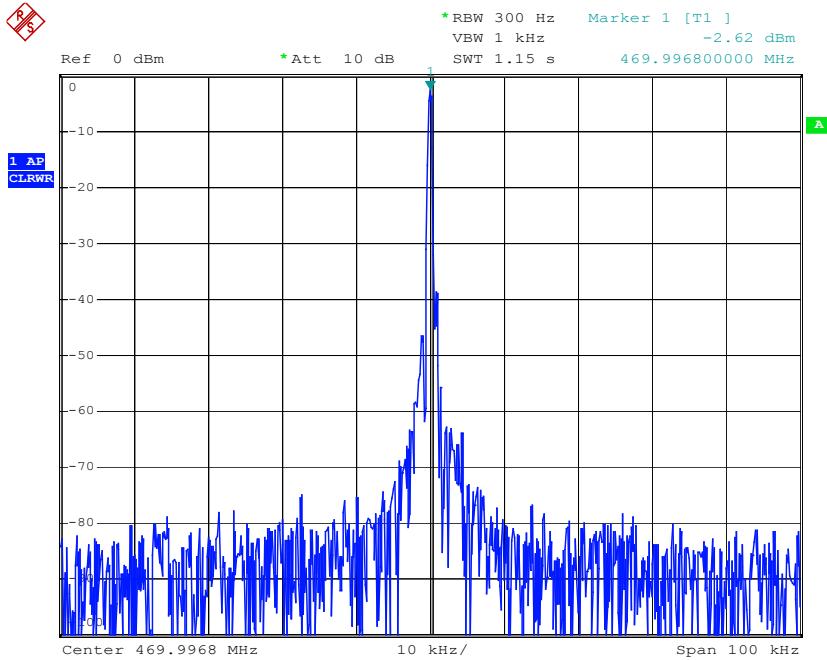
Date: 4.APR.2005 08:09:02

**Power : 5W**  
**Frequency : 440MHz**  
**Modulation : NONE**



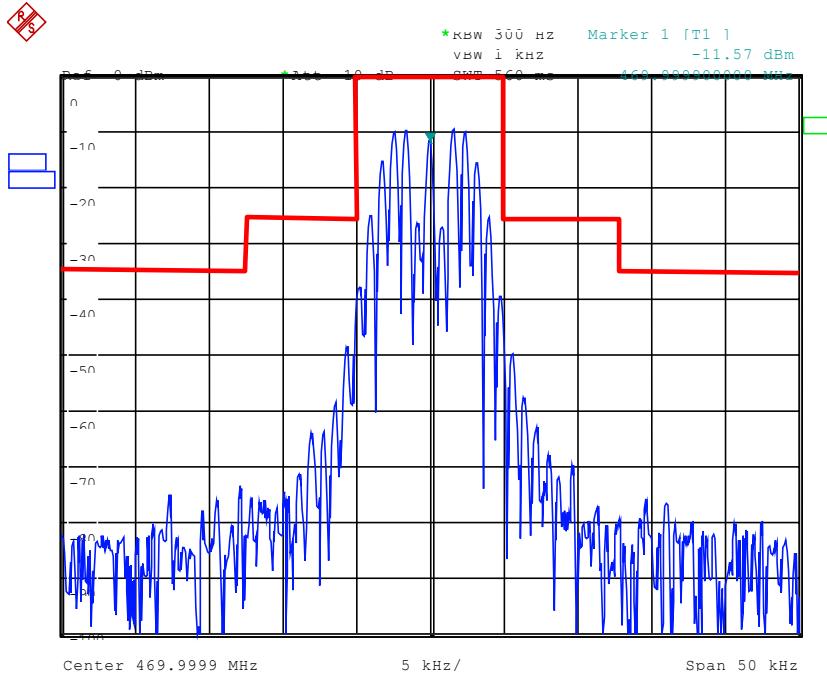
**Power : 5W**  
**Frequency : 440MHz**  
**Modulation : Mask: B, BW**

Measurement Result:

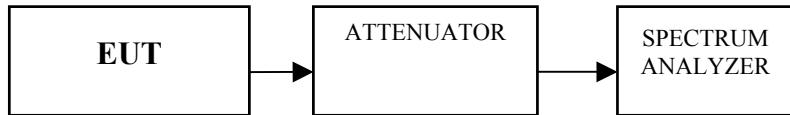


Date: 4.APR.2005 08:17:51

**Power :** 5W  
**Frequency :** 470MHz  
**Modulation :** NONE



**Power :** 5W  
**Frequency :** 470MHz  
**Modulation :** Mask: B, BW

**VI. Spurious Emissions at Antenna Terminals (Part 2.1051, 90.210)****6.1 Test procedure:**

- (1) Set the ref level to the RF power output.
- (2) The EUT was connected with attenuator and spectrum analyzer.
- (3) The spectrum offset was adjusted to compensate the attenuator and losses caused by the connection.
- (4) Connect the EUT as step (2) (3)
- (5) For deviation 2.5KHz, set spectrum Frequency start from 30MHz to 1GHz, RBW = 10KHz, VBW = 10KHz.
- (6) Then set Frequency from 480MHz to 1GHz, 1GHz to 3.0GHz, 3.0GHz to 5.0GHz. RBW = 10KHz, VBW = 10KHz.
- (7) Then set Frequency from 3.0GHz to 5.0GHz. RBW = 10KHz, VBW = 10KHz.
- (8) For deviation 2.5kHz, repeat step (5) to (7).

**6.2 Test Result:**

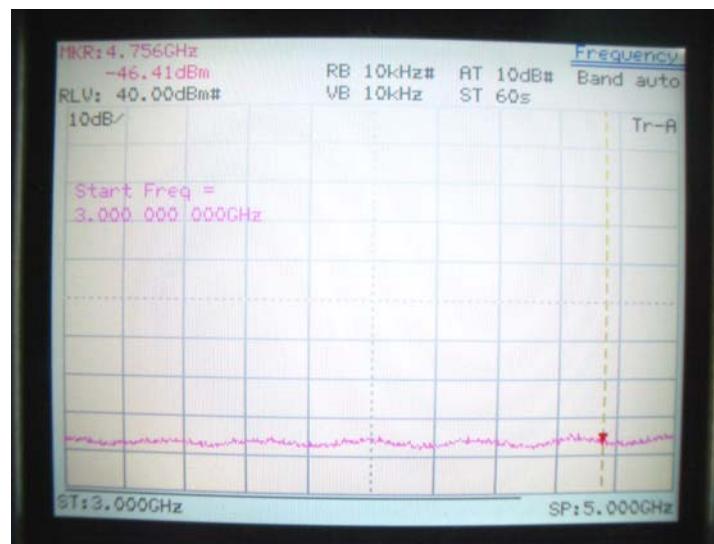
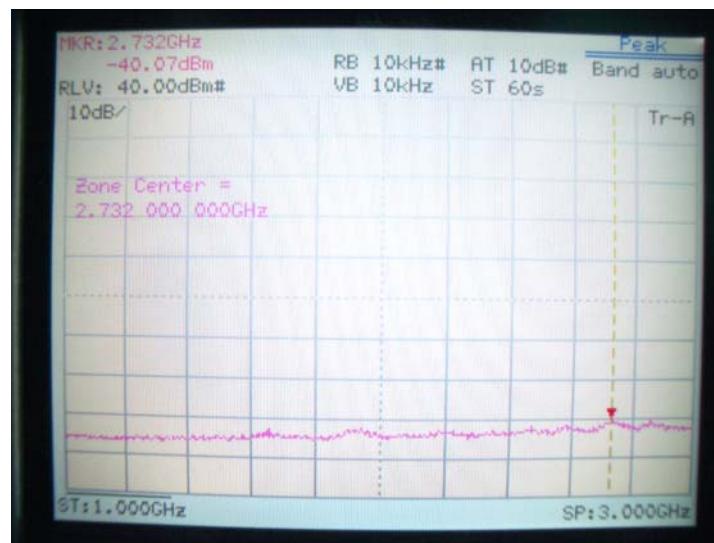
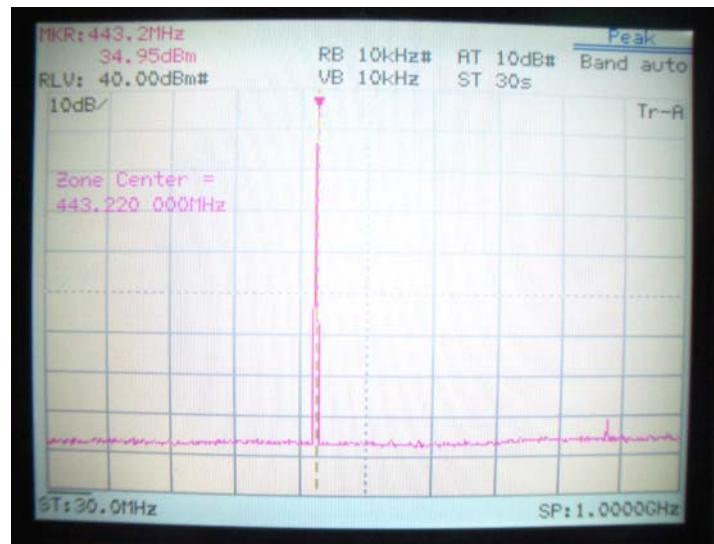
Spurious (dBm)	Limit (dBm)
Under limit	-20

**6.3 Test Equipment:**

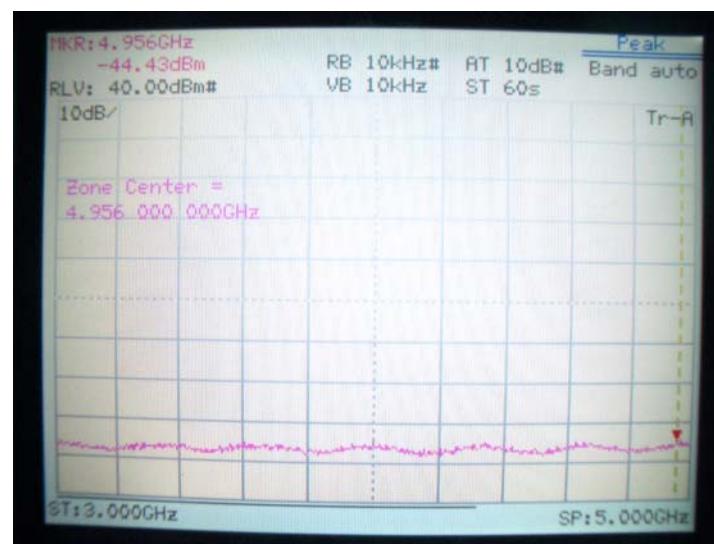
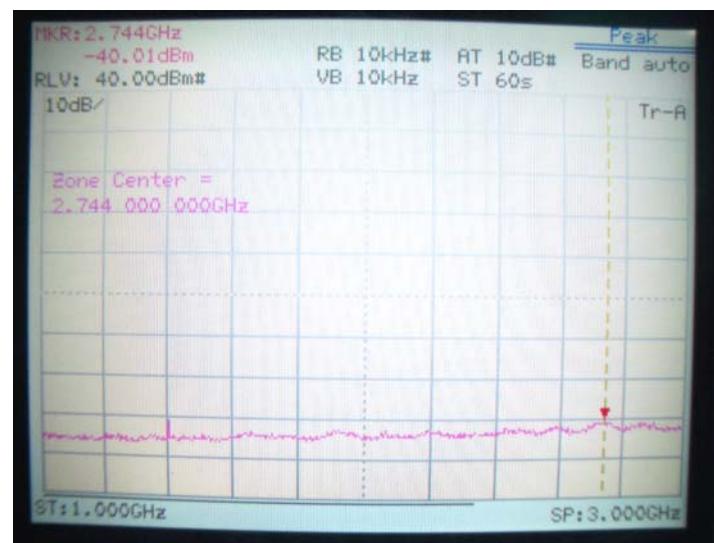
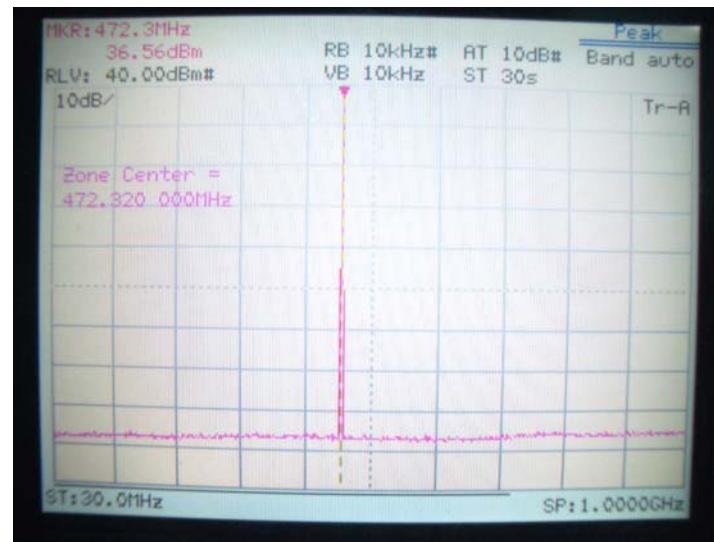
Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum	MS2665C	Anritsu	6200175476	03/21/05	03/20/06

The level of confidence of 95% , the uncertainty of measurement of conducted emission is  $\pm 2.02$  dB .

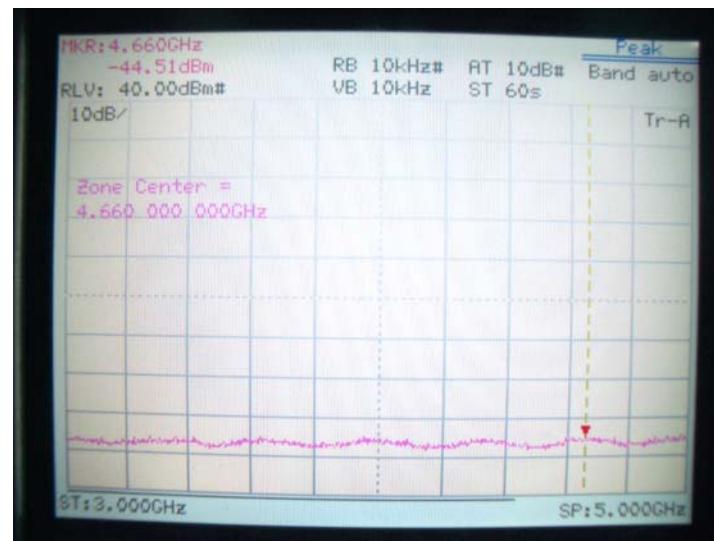
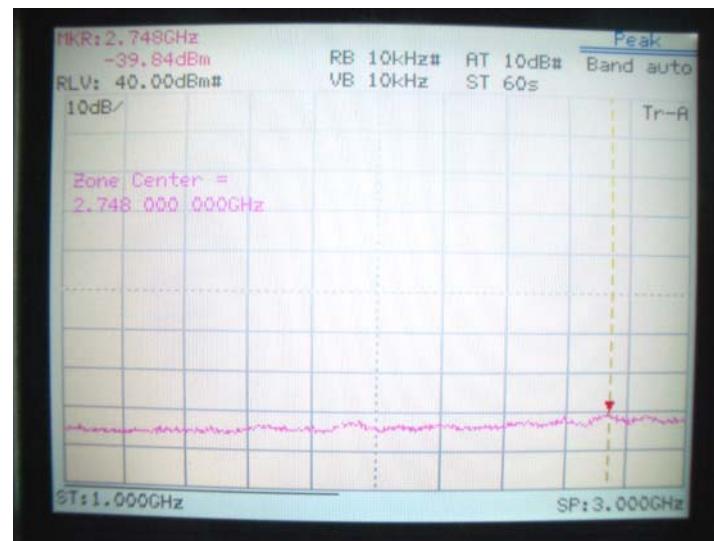
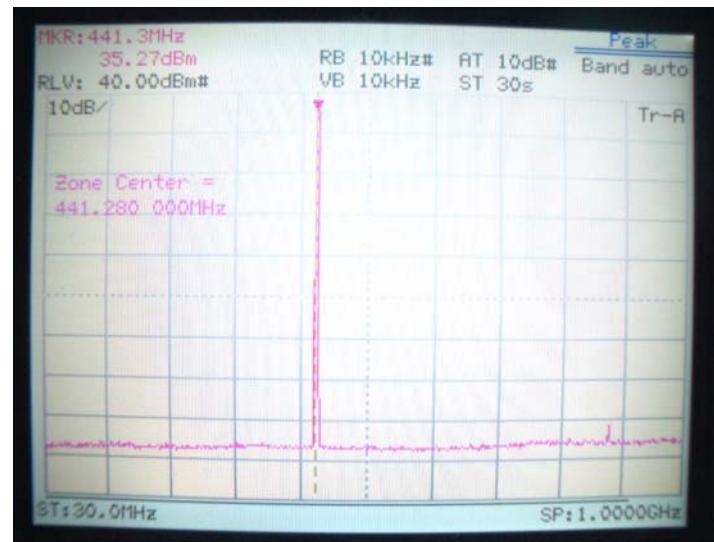
Measurement Result:  
5W, 440MHz, AN



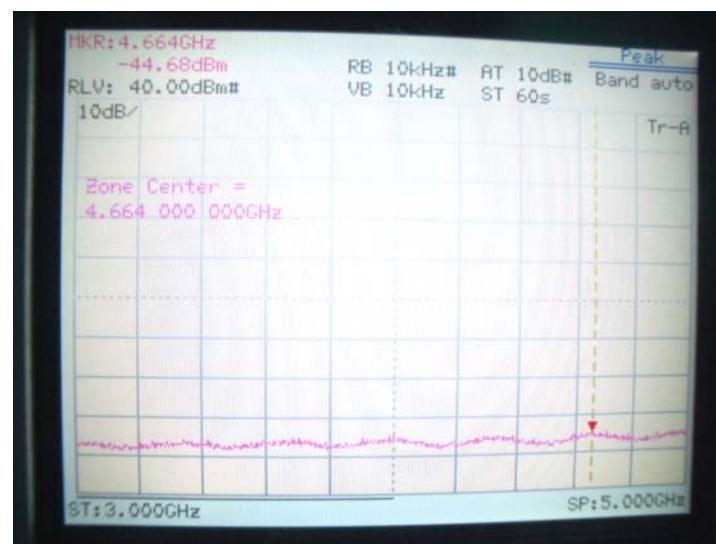
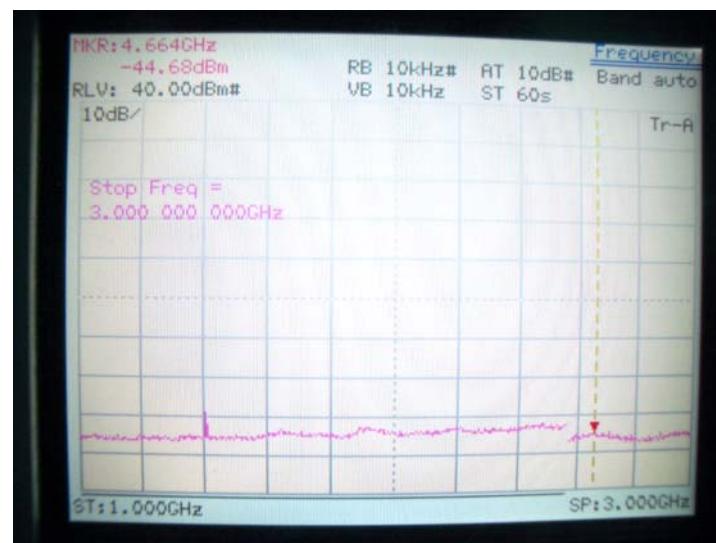
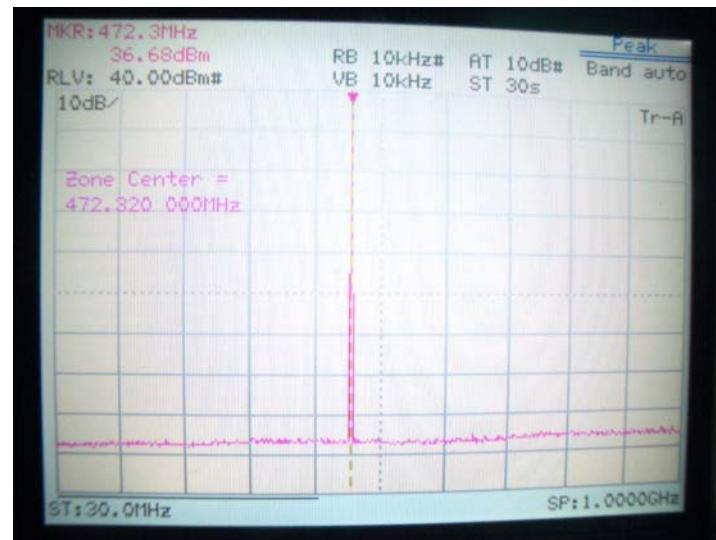
Measurement Result:  
5W, 470MHz, AN



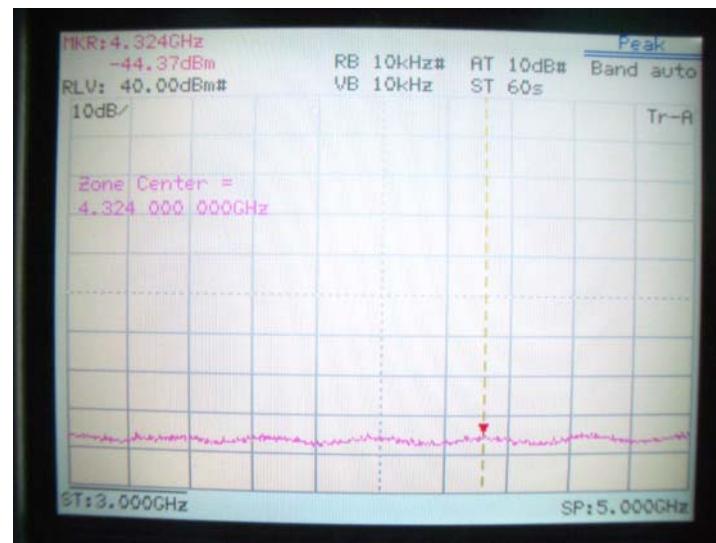
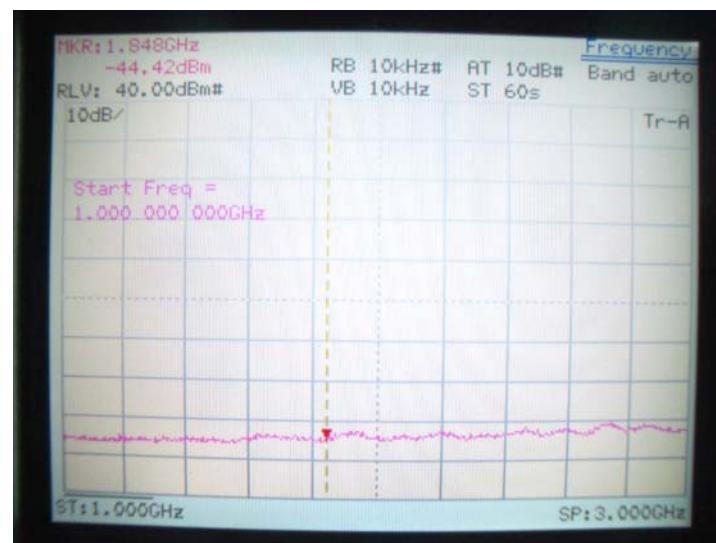
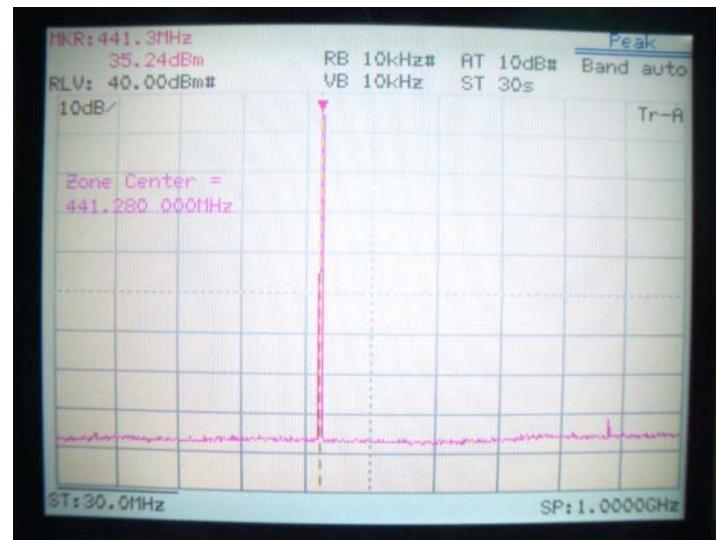
Measurement Result:  
5W, 440MHz, NB



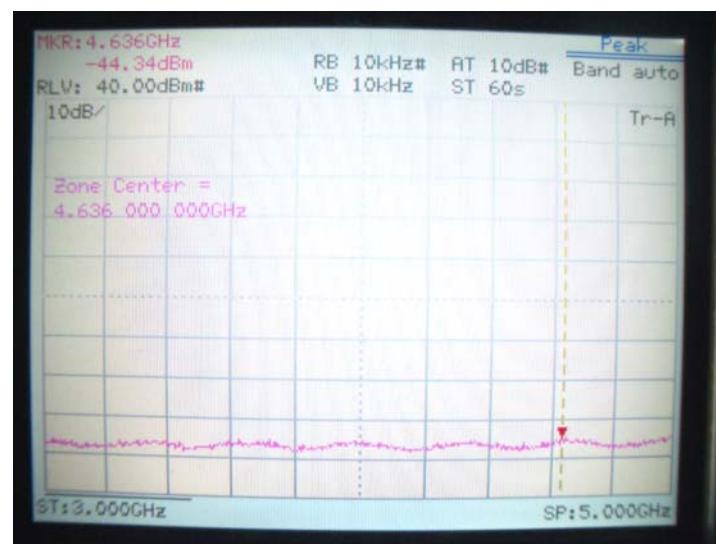
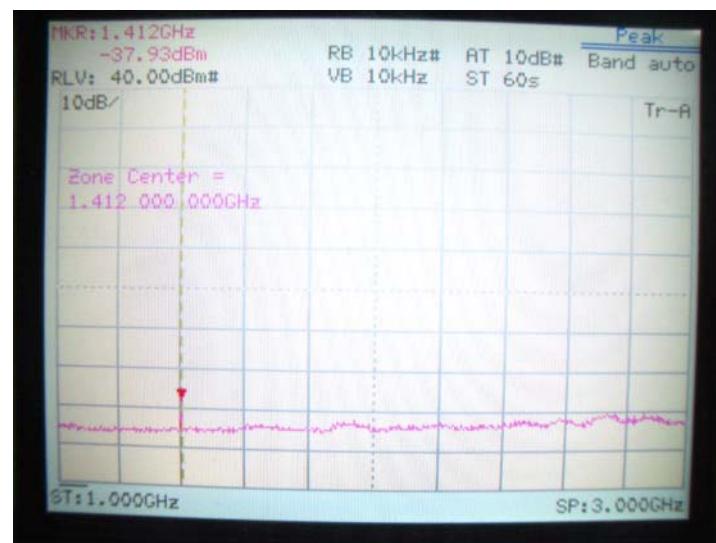
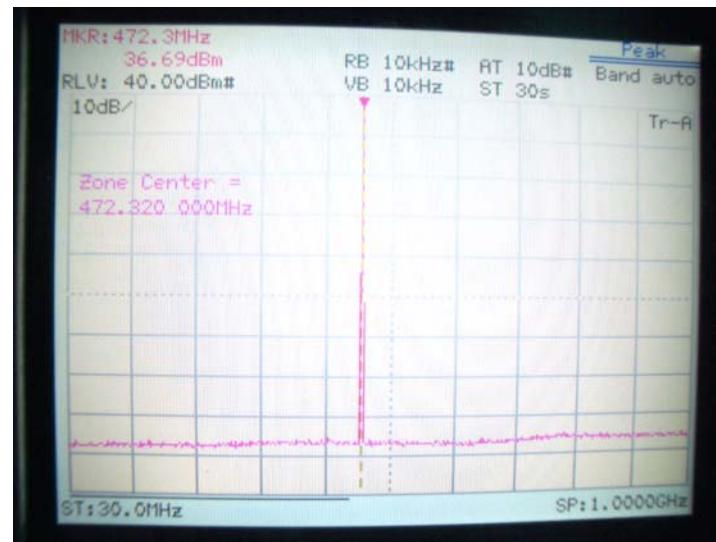
Measurement Result:  
5W, 470MHz, NB



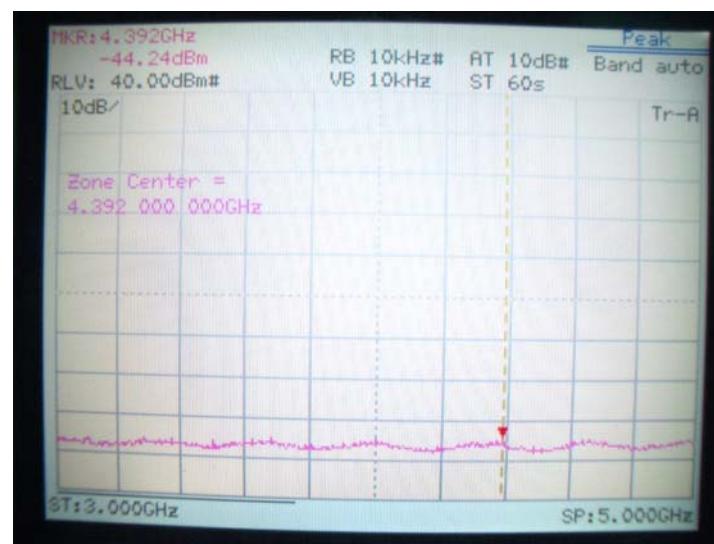
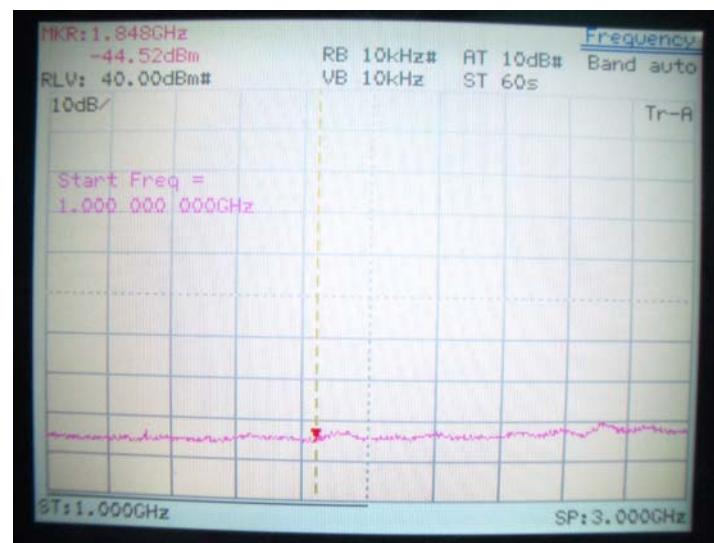
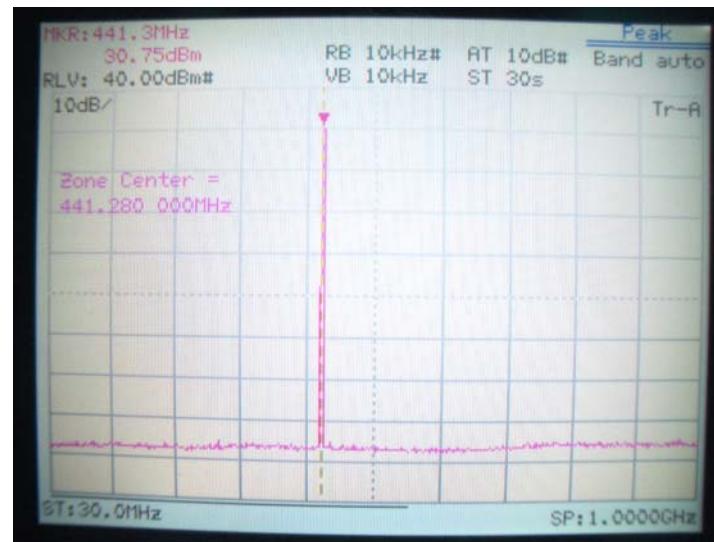
Measurement Result:  
5W, 440MHz, WB



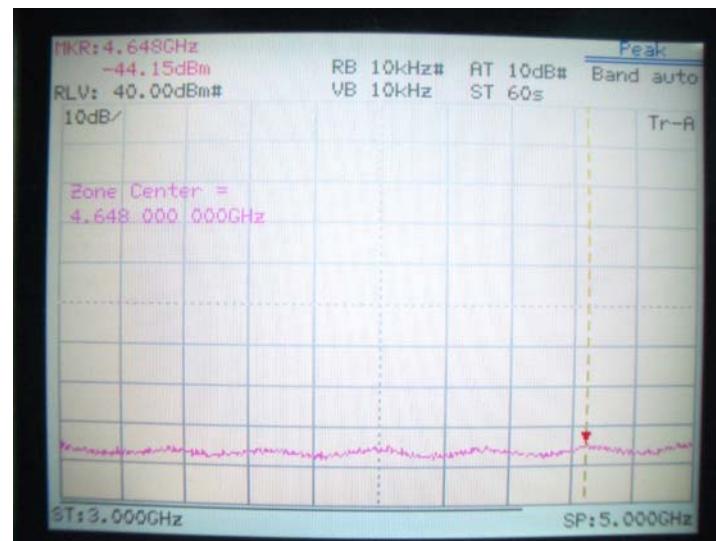
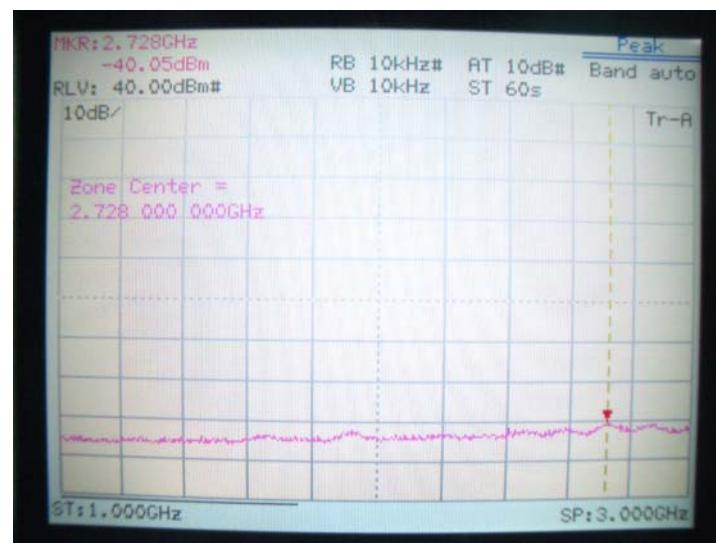
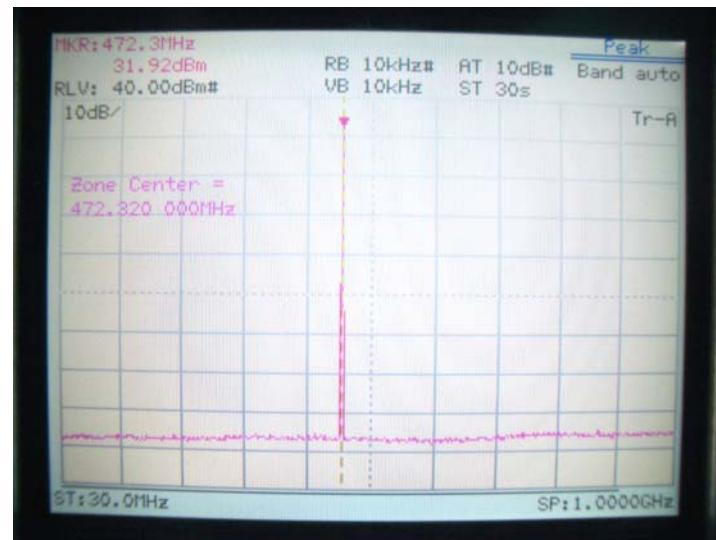
Measurement Result:  
5W, 470MHz, WB



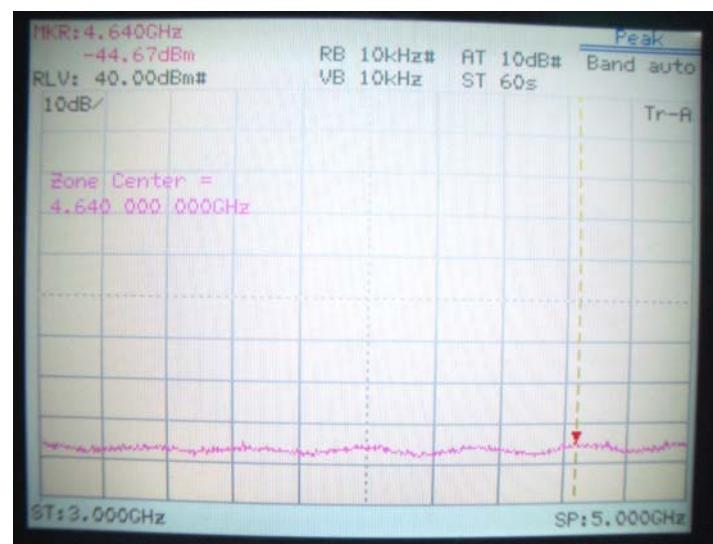
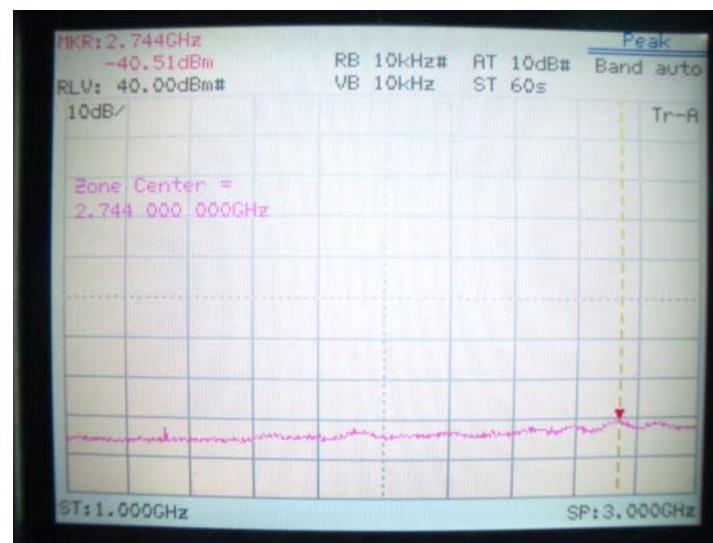
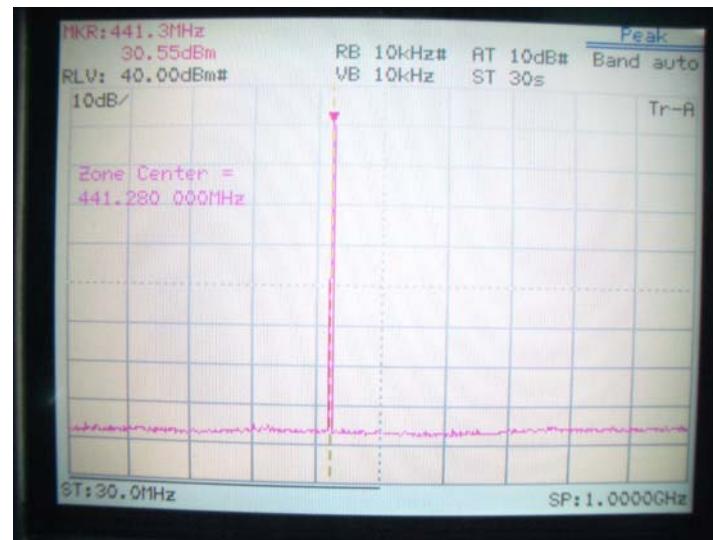
Measurement Result:  
2W, 440MHz, AN



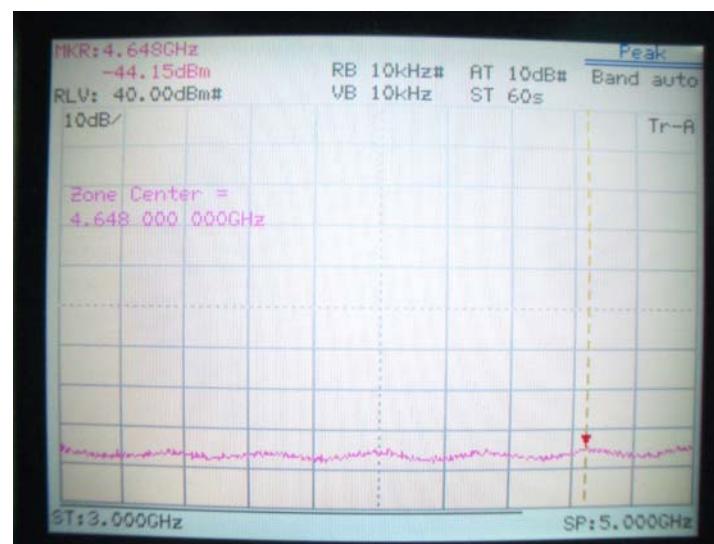
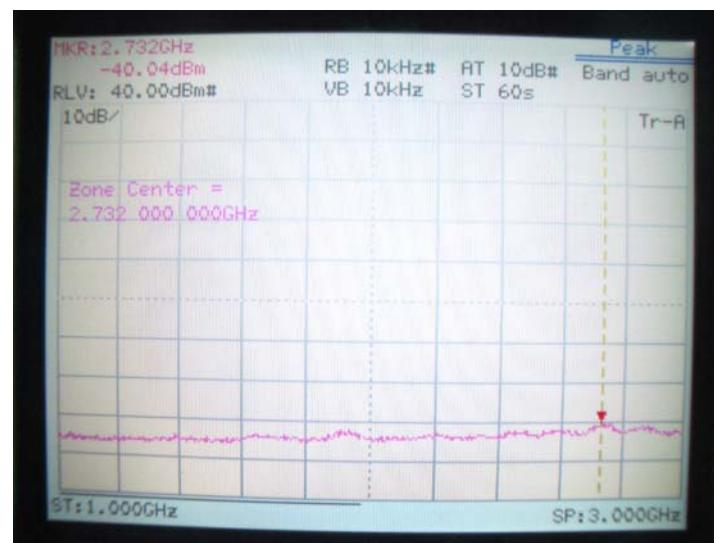
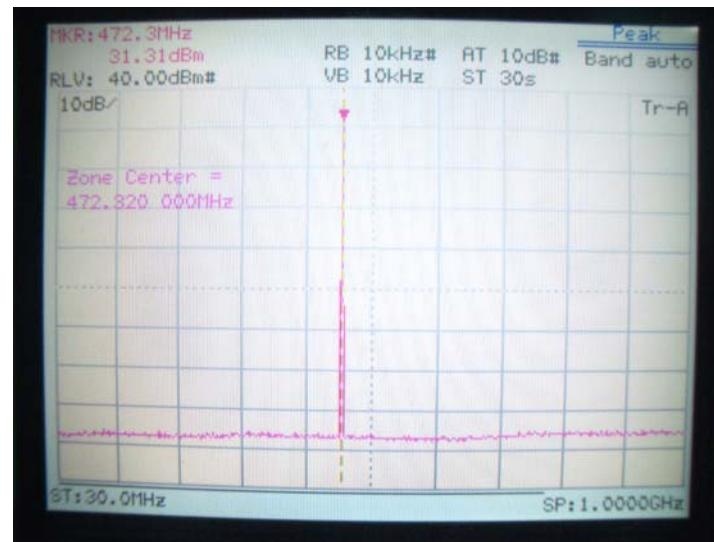
Measurement Result:  
2W, 470MHz, AN



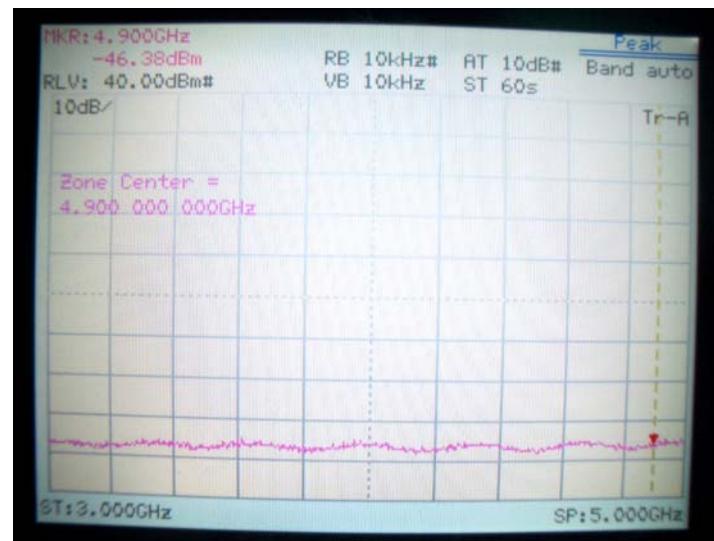
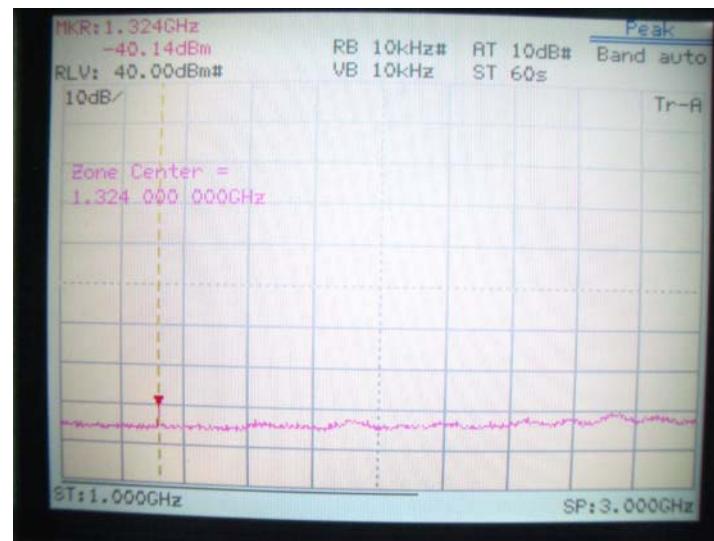
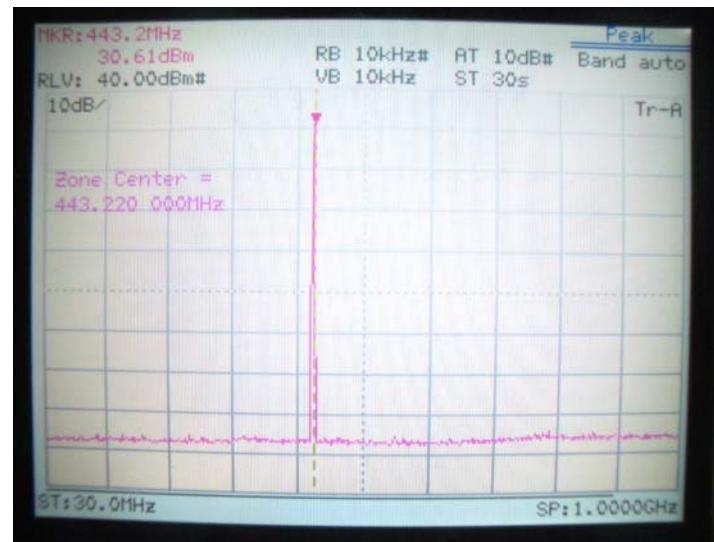
Measurement Result:  
2W, 440MHz, NB



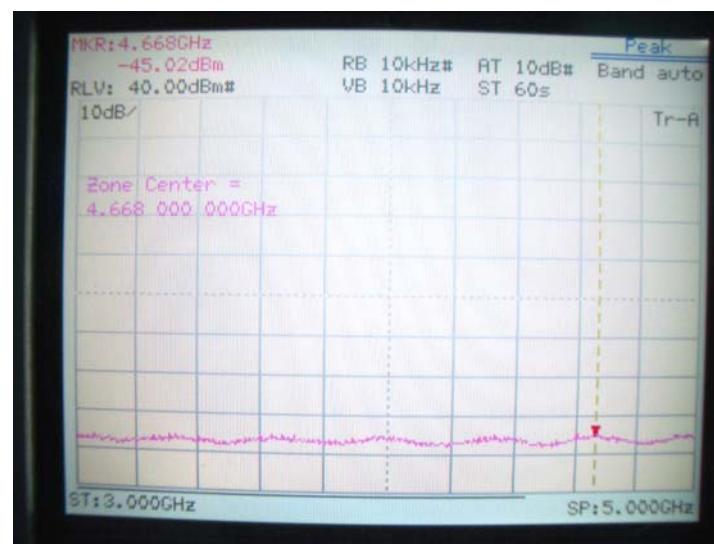
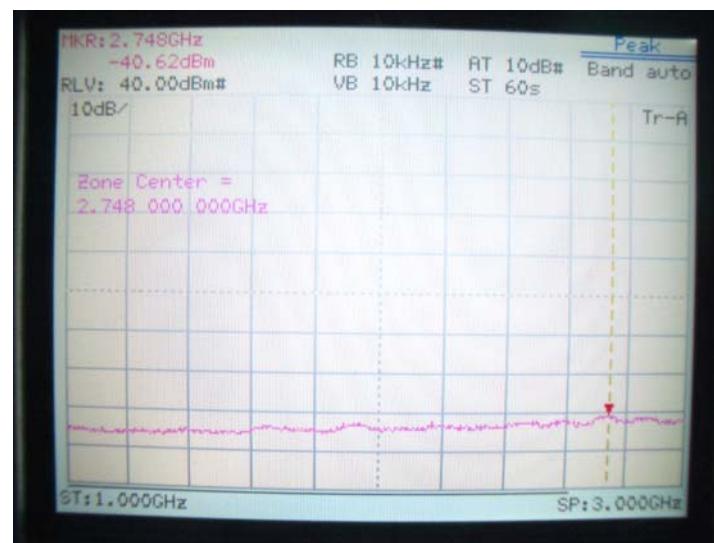
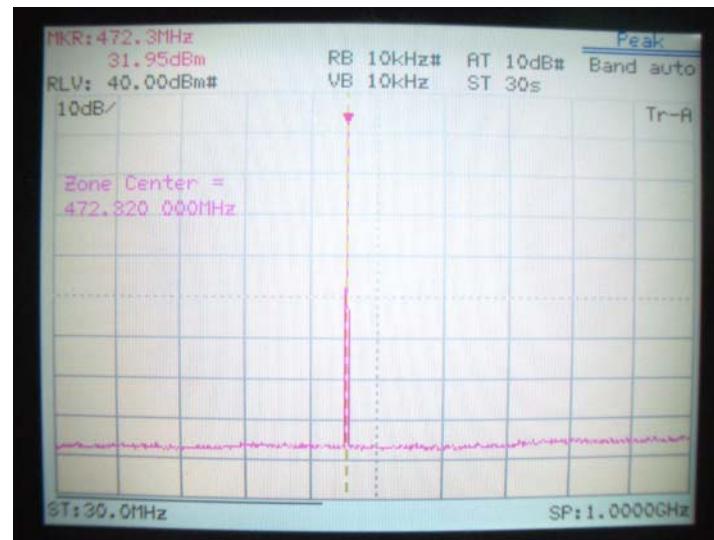
Measurement Result:  
2W, 470MHz, NB



Measurement Result:  
2W, 440MHz, WB



Measurement Result:  
2W, 470MHz, WB



## **VII. Field Strength of Spurious Radiation (Part 90.210)**

### **7.1 Test procedure:**

(1) Set-up followed by TIA/EIA-603 2.2.12 (Substitution Method)

(2)  $P_d \text{ (dBm)} = Pg \text{ (dBm)} - \text{Cable loss (dB)} + \text{antenna gain (dB)}$

(where,  $P_d$  is the equivalent power and  $Pg$  is the generator output into the substitution antenna)

### **7.2 Test Equipment:**

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Receiver	SCR3102	SCHAFFNER	012	03/29/05	03/28/06
Antenna	CBL6141A	SCHAFFNER	4188	11/29/04	11/29/05
Open test side (Antenna, Amplify, cable calibrated together)			05/16/04	05/15/05	
Spectrum Analyzer	8564E	HP	US36433002	11/03/04	11/03/05
Microwave Preamplifier	83051A	HP	3232A00347	08/01/04	08/01/05
Horn Antenna	3115	EMCO	9704 - 5178	12/27/04	12/27/05
Signal Generator	8648D	HP	3613A00117	05/24/04	05/23/05
Dipole Antenna	3121C	EMCO	9707-1311	12/26/04	12/25/05

The level of confidence of 95% , the uncertainty of measurement of radiated emission is  $\pm 3.44\text{dB}$  .

**7.3 Test Result:**

Antenna Polarity: Vertical

Bandwidth: 25K

Frequency [MHz]	Signal Gen Level [dBm]	Cable Loss [dBm]	Tx Antenna Gain	Emission Level [dBm]	Limit [dBm]	Margin [dB]
880.57	-74.58	0.96	6.7	-68.84	-20	-48.84
1410.05	-48.079	4.159	10.3	-41.938	-20	-21.938
1878.33	-53.595	4.713	11.9	-46.408	-20	-26.408
2345.83	-50.798	5.150	13.5	-42.448	-20	-22.448
2813.33	-54.757	5.541	14.8	-45.498	-20	-25.498
3287.92	-59.516	5.852	16.2	-49.168	-20	-29.168

Antenna Polarity: Horizontal

Bandwidth: 25K

Frequency [MHz]	Signal Gen Level [dBm]	Cable Loss [dBm]	Tx Antenna Gain	Emission Level [dBm]	Limit [dBm]	Margin [dB]
880.57	-77.66	0.96	6.7	-71.92	-20	-51.92
1409.99	-49.769	4.159	10.3	-43.628	-20	-23.628
1878.33	-52.265	4.713	11.9	-45.078	-20	-25.078
2345.83	-50.968	5.150	13.5	-42.618	-20	-22.618
2813.33	-54.757	5.541	14.8	-45.498	-20	-25.498

## VIII. Frequency Stability (Part 2.1055, 90.213)

### 8.1 Test procedure:(Temperature)

(1) Frequency shift vs. temperature:

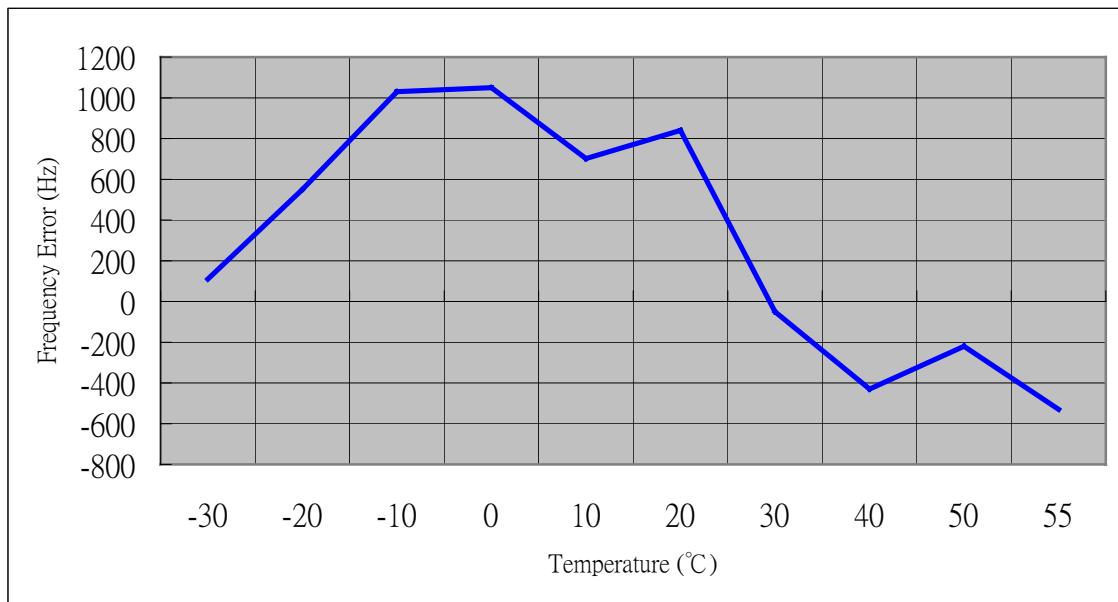
The nominal room temperature 20°C, and the reference frequency is 455.0000MHz.

(2) The EUT was put in an environmental chamber and set up the temperature of this chamber from -30°C to +50°C and recorded the frequency has been shift.

### 8.2 Test Result:

Nominal Frequency: 454.997200MHz Bandwidth: 12.5K

Temperature [°C]	Frequency [MHz]	Frequency Error [Hz]	Limit (2.5PPM)	Error in PPM
-30°C	454.997310	110	1147	0.24
-20°C	454.997750	550	1147	1.20
-10°C	454.998230	1030	1147	2.26
0.0°C	454.998250	1050	1147	2.31
10°C	454.997902	702	1147	1.54
20°C	454.998040	840	1147	1.85
30°C	454.997150	-50	1147	-0.11
40°C	454.996770	-430	1147	-0.95
50°C	454.996980	-220	1147	-0.48



**8.3 Test Equipment:**

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum	8594EM	HP	3619A00198	03/21/05	03/20/06
DC Power Supply	GPC-3030D	LABORATORY		02/03/05	02/02/06
Temperature & Humidity Chamber	THS-ML1	King Son	240	09/15/04	09/14/05

The level of confidence of 95% , the uncertainty of measurement is  $\pm 12\text{Hz}$  .

**8.4 Test procedure:(voltage)**

(1) Frequency shift vs. voltage:

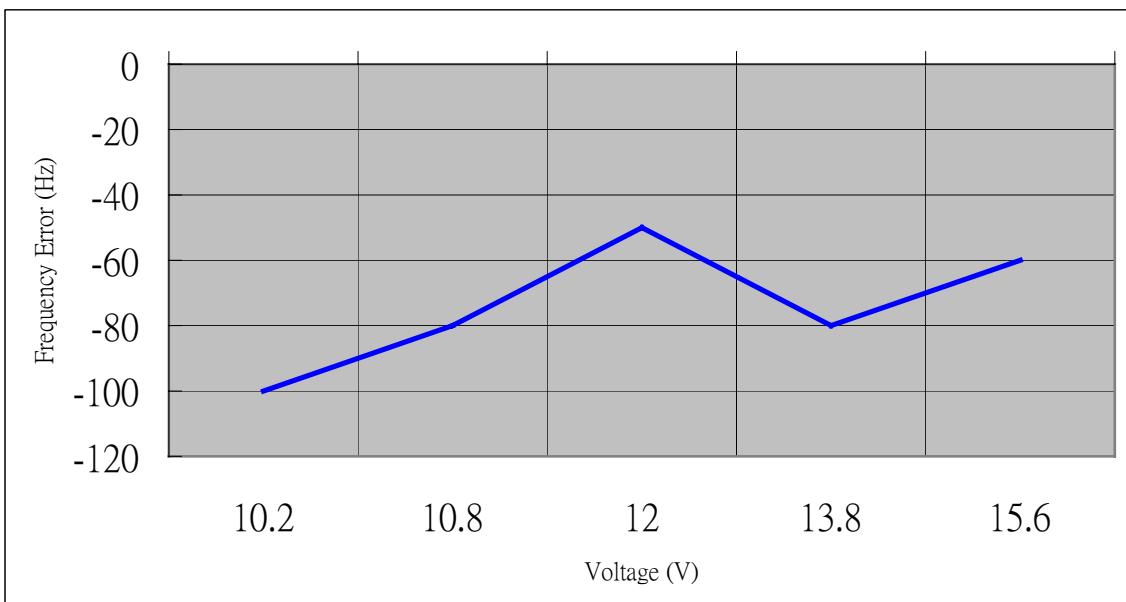
Nominal power is 12 Vdc and the reference Frequency is 455.0000MHz

(2) The EUT was powered at 85% and 115% of nominal.

**8.5 Test Result:**

Nominal Frequency: 454.997200MHz      Nominal Voltage: 12V      Bandwidth: 12.5K

Voltage [V]	Frequency [MHz]	Frequency Error [Hz]	Limit (2.5PPM)	Error (PPM)	Pass/Fail
10.2	454.997100	-100	1147	-0.22	PASS
10.8	454.997120	-80	1147	-0.18	PASS
13.8	454.997120	-80	1147	-0.18	PASS
15.6	454.997240	-60	1147	-0.13	PASS



**IX. Conducted Emission Test (ANSI C63.4)****9.1 Test procedure:**

All the equipment is placed and setup according to the ANSI C63.4.

The EUT is assembled on a wooden table which is 80 cm high, is placed 40 cm from the back-wall which is a vertical conducting plane. One LISN is for EUT, the other LISN is for support equipment. They are all placed on the conductive ground. The EUT's LISN connect a line switch box for selecting L1 or L2, then connect to a preamplifier and spectrum.

The spectrum measured from 150KHz to 30MHz. Conducted emission levels are detected at max. peak mode. But if the max. peak mode failed or over average limit, it will be measured by QP and average detection mode using the Receiver.

While testing, there is the worst-emission plot printed at peak detection mode, and there are more than 6 highest emissions relative to limit recorded. The plot is kept as the original data, not included in test report.

**9.2 Test Equipment:**

<b>Instrument Name</b>	<b>Model No.</b>	<b>Brand</b>	<b>Serial No.</b>	<b>Calibration Date</b>	
				<b>Last time</b>	<b>Next time</b>
Receiver	SCR3102	SCHAFFNER	012	05/13/04	05/12/05
LISN (EUT)	3825/2	EMCO	9411-2284	07/21/04	07/20/05
LISN (Support E.)	3825/2	EMCO	9210-2007	09/03/04	09/02/05
Line switch box	CB-01	TRC	98-04	05/29/04	05/28/05
1dB Attenuator	CAT-1	mini-circuits	-----	05/29/04	05/28/05
FTB-1-6 Attenuator	15542	mini-circuits	9620 03	05/29/04	05/28/05
20dB Attenuator	CAT-20	mini-circuits	9620 13	05/29/04	05/28/05
Coaxial Cable	BNC3200B-0058	Jyebao	CL-05	05/29/04	05/28/05
Coaxial Cable	BNC31VB-0316	Jyebao	IF-01ca0069-036	05/29/04	05/28/05
50ohm terminator	370BNM	NARDA	PWR5W	07/21/04	07/20/05
50ohm terminator	370BNM	NARDA	PWR5W	07/21/04	07/20/05
50ohm terminator	370BNM	NARDA	PWR5W	09/03/04	09/02/05
50ohm terminator	370BNM	NARDA	PWR5W	09/03/04	09/02/05

The level of confidence of 95% , the uncertainty of measurement of conducted emission is +3.1/-4.84 dB .

**Test Result : N/A**

## **X. Transient Frequency Behavior (Part 90.214)**

### **10.1 Test procedure:**

- (1) Set-up followed by TIA/EIA 603. Section 1.2.19
- (2) Turn on the EUT and Record the plot.
- (3) Turn off the EUT and Record the plot.
- (4) Let the EUT modulated and repeat step (3) (4).
- (5) Use the EUT 2 with BW 12.5KHz, repeat step (3)~(5).

### **10.2 Test Result:**

Deviation		2.5KHz	
		Max Frequency Difference	Result
Time Intervals			
t1	10ms	± 12.5KHz	Pass
t2	25ms	± 6.25KHz	Pass
t3	10ms	± 12.5KHz	Pass

\* See Figures 8–11

### **10.3 Test Equipment:**

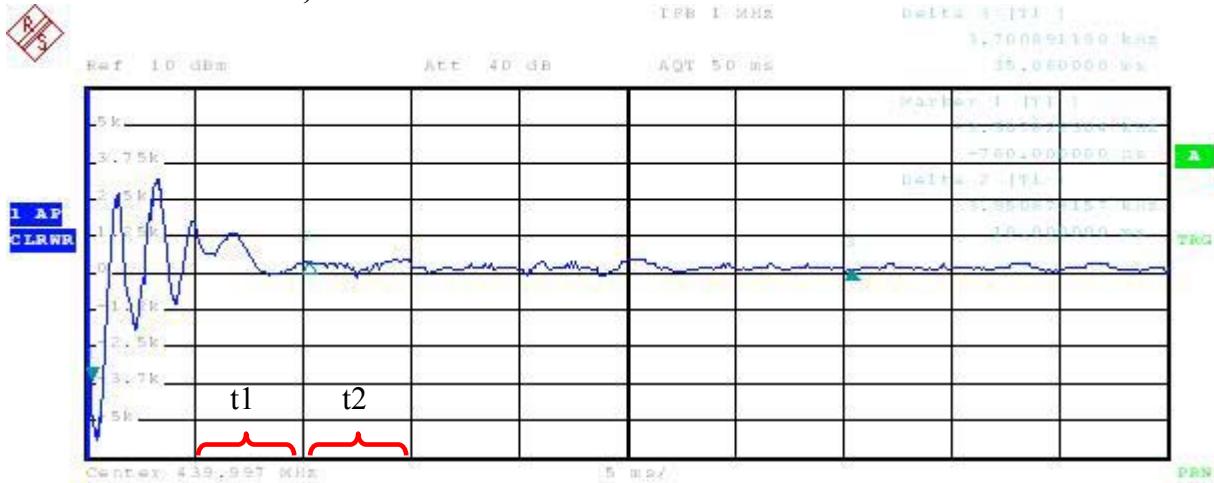
Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Signal Generator	2030	MARCONI	119665/027	07/12/04	07/11/05
Oscilloscope	FSP13	ROHD&SCHWARZ	100126	05/25/04	05/24/05

The level of confidence of 95% , the uncertainty of measurement is ± 0.5KHz .

## Measurement Result:

Frequency: 440MHz

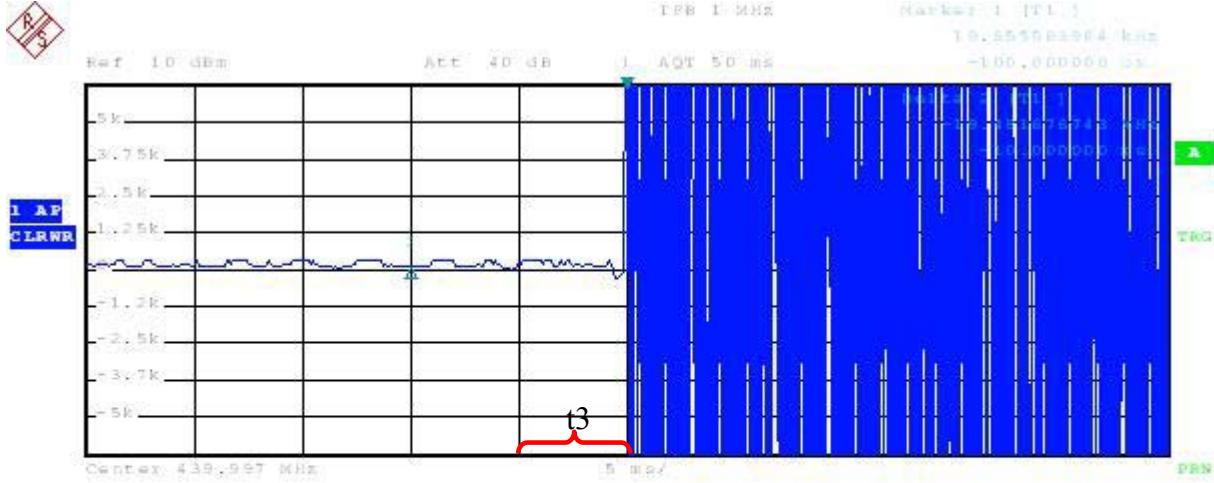
### Deviation: 2.5KHz, Turn ON



### Frequency Modulation Summary

Coupling Deviation	DC +peak -peak $\pm$ peak/2 RMS	47.77 kHz -18.19 kHz 32.98 kHz 1.367 kHz	Carrier Offset Carrier Power Modulation Frequency Sampling Rate Record Length Demod Bandwidth	248.73 Hz -3.26 dBm 19.316 kHz 62.5 kHz 3126 50 kHz
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## Deviation: 2.5KHz, Turn OFF

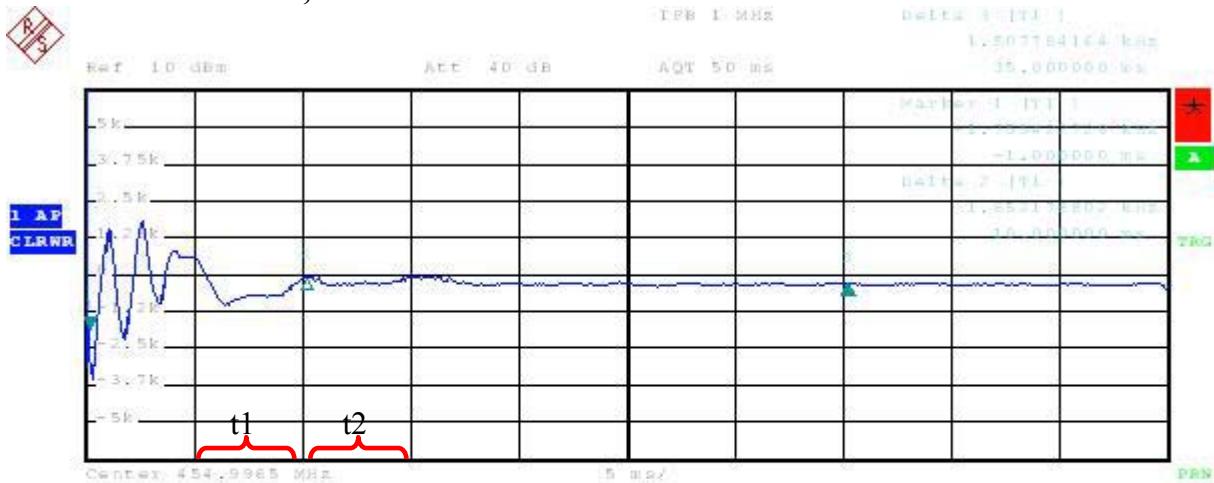


### Frequency Modulation Summary

Coupling Deviation	DC +peak -peak +peak/2 RMS	54.11 kHz -53.61 kHz 53.86 kHz 13.76 kHz	Carrier Offset Carrier Power Modulation Frequency Sampling Rate Record Length Demod Bandwidth	312.76 Hz -6.32 dBm --- Hz 62.5 kHz 3126 50 kHz
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Frequency: 455MHz

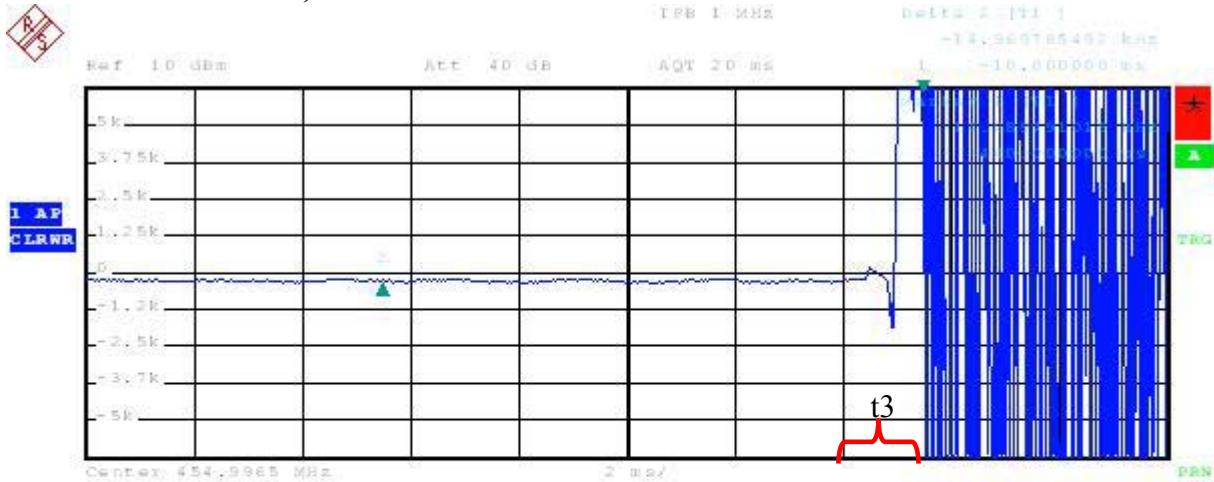
Deviation: 2.5KHz, Turn ON



## Frequency Modulation Summary

Coupling	DC	Carrier Offset	-282.84 Hz
Deviation	+peak	Carrier Power	-3.21 dBm
	-peak	Modulation Frequency	--- Hz
	0peak/2	Sampling Rate	62.5 kHz
	RMS	Record Length	3126
		Demod Bandwidth	50 kHz

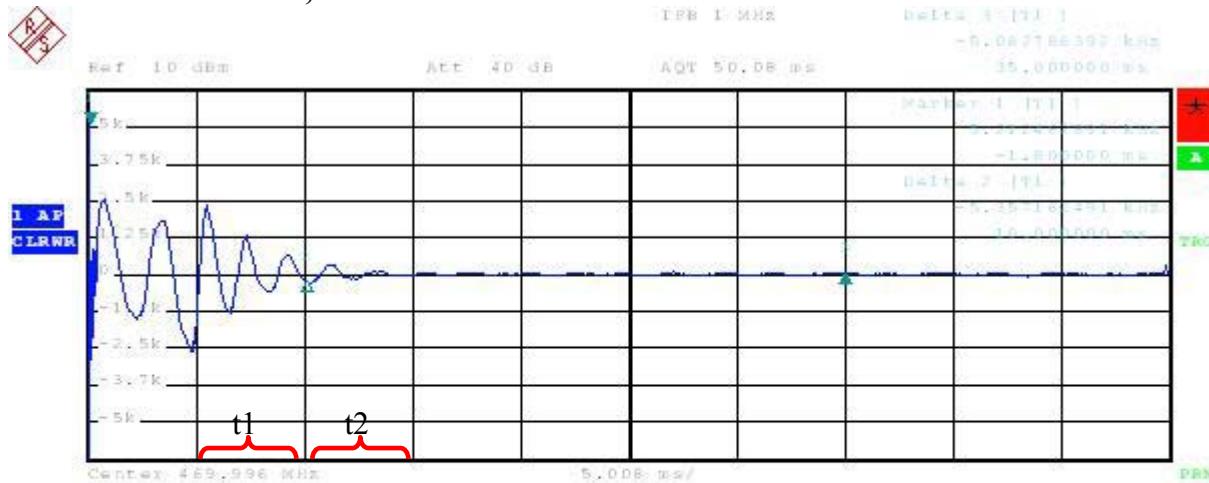
Deviation: 2.5KHz, Turn OFF



## Frequency Modulation Summary

Coupling	DC	Carrier Offset	11.342 Hz
Deviation	+peak	Carrier Power	-3.59 dBm
	-peak	Modulation Frequency	--- Hz
	0peak/2	Sampling Rate	62.5 kHz
	RMS	Record Length	1251
		Demod Bandwidth	50 kHz

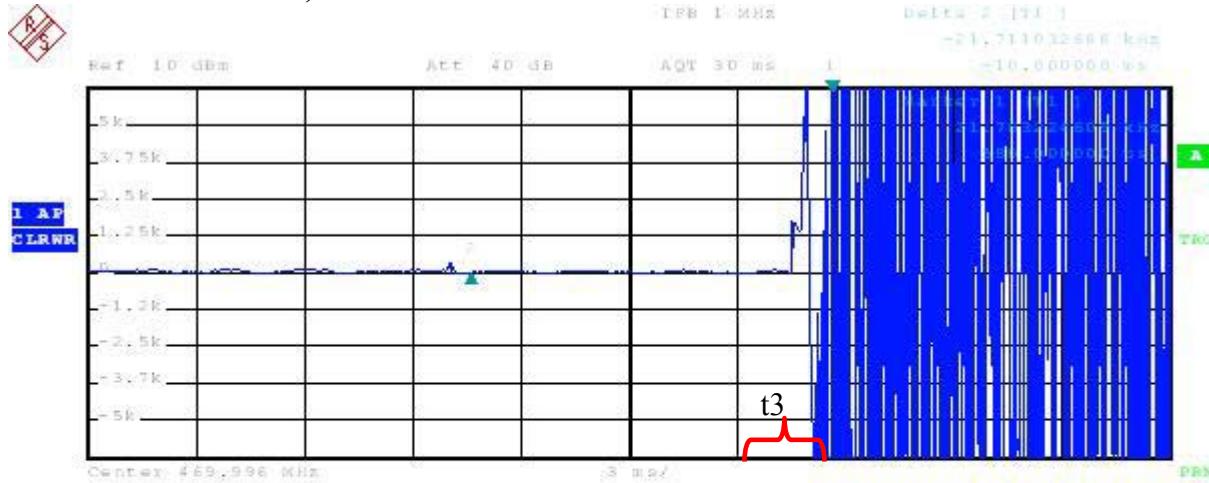
**Frequency: 470MHz**  
**Deviation: 2.5KHz, Turn ON**



## Frequency Modulation Summary

Coupling	DC	Carrier Offset	67.379 Hz
Deviation	+peak	Carrier Power	-3.32 dBm
	-peak	Modulation Frequency	--- Hz
	Peak/2	Sampling Rate	62.5 kHz
	RMS	Record Length	3131
		Demod Bandwidth	50 kHz

## Deviation: 2.5KHz, Turn OFF

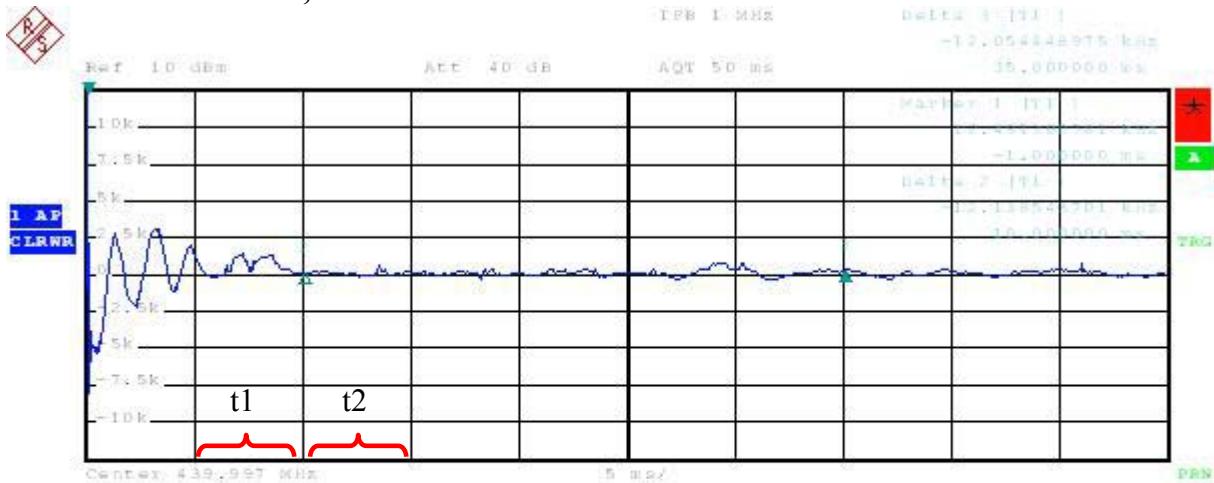


## Frequency Modulation Summary

Coupling	DC	Carrier Offset	-66.184 Hz
Deviation	+peak	Carrier Power	-4.13 dBm
	-peak	Modulation Frequency	--- Hz
	Peak/2	Sampling Rate	62.5 kHz
	RMS	Record Length	1876
		Demod Bandwidth	50 kHz

Frequency: 440MHz

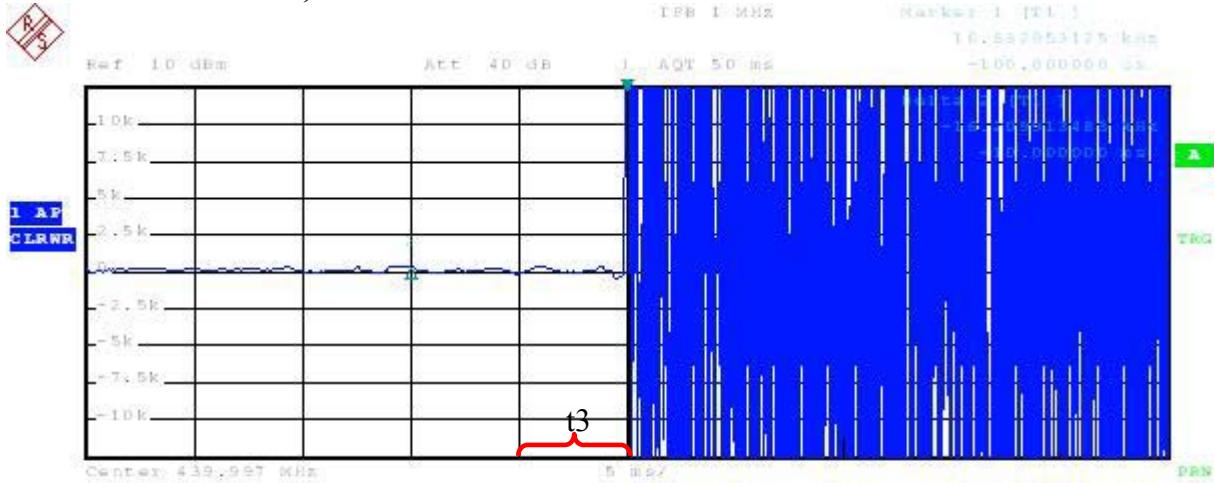
Deviation: 4.5KHz, Turn ON



## Frequency Modulation Summary

Coupling	DC	Carrier Offset	215.35 Hz
Deviation	+peak	Carrier Power	-3.26 dBm
	-peak	Modulation Frequency	14.018 kHz
	0peak/2	Sampling Rate	62.5 kHz
	RMS	Record Length	3126
		Demod Bandwidth	50 kHz

Deviation: 4.5KHz, Turn OFF

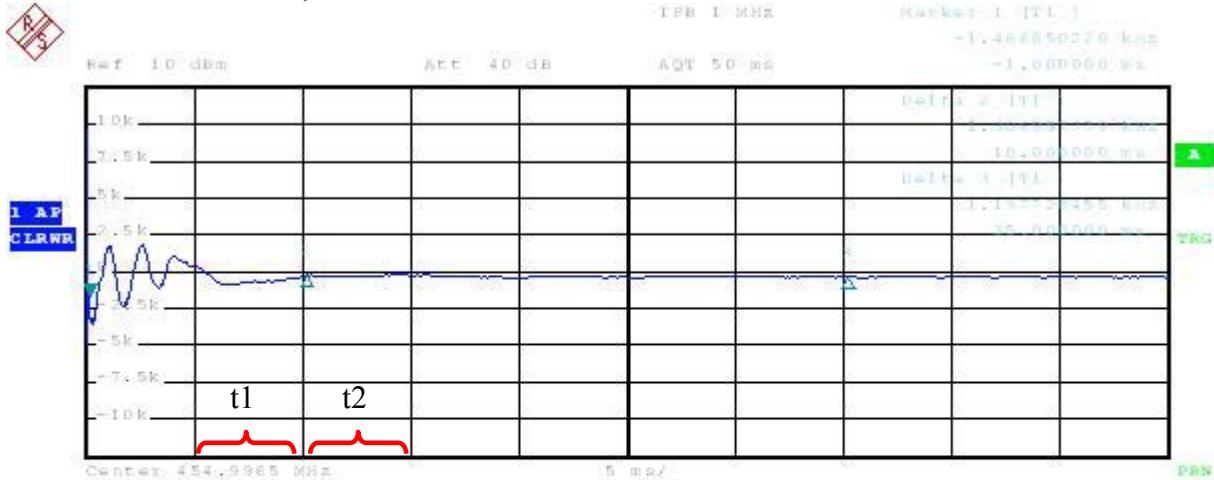


## Frequency Modulation Summary

Coupling	DC	Carrier Offset	312.76 Hz
Deviation	+peak	Carrier Power	-6.32 dBm
	-peak	Modulation Frequency	---
	0peak/2	Sampling Rate	62.5 kHz
	RMS	Record Length	3126
		Demod Bandwidth	50 kHz

Frequency: 455MHz

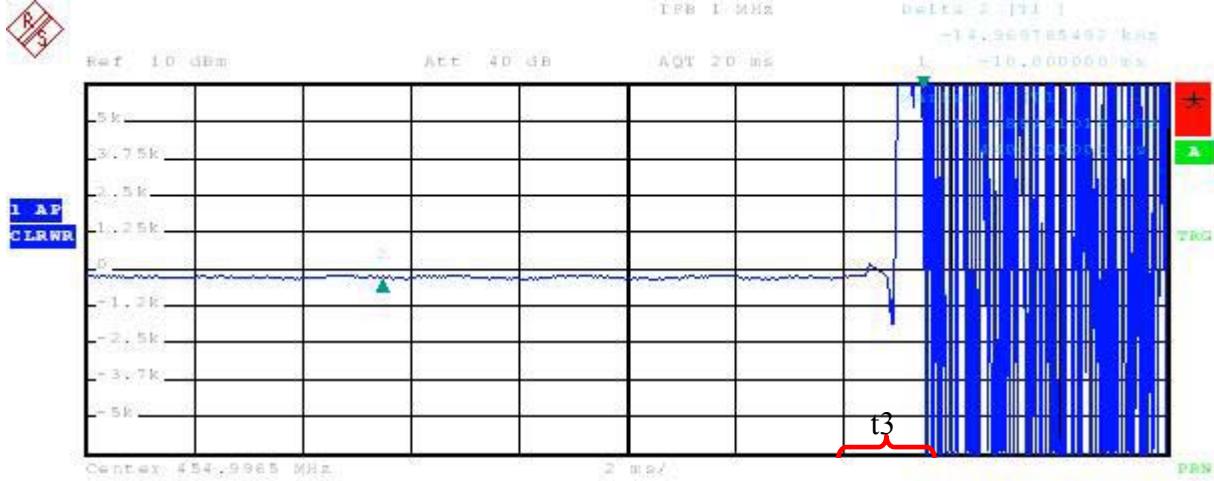
Deviation: 4.5KHz, Turn ON



## Frequency Modulation Summary

Coupling	DC	Carrier Offset	-288.07 Hz
Deviation	+peak	9.580 kHz	-3.21 dBm
	-peak	-4.964 kHz	Modulation Frequency
	Peak/2	7.272 kHz	Sampling Rate
	RMS	562.4 Hz	Record Length
			Demod Bandwidth

Deviation: 4.5KHz, Turn OFF

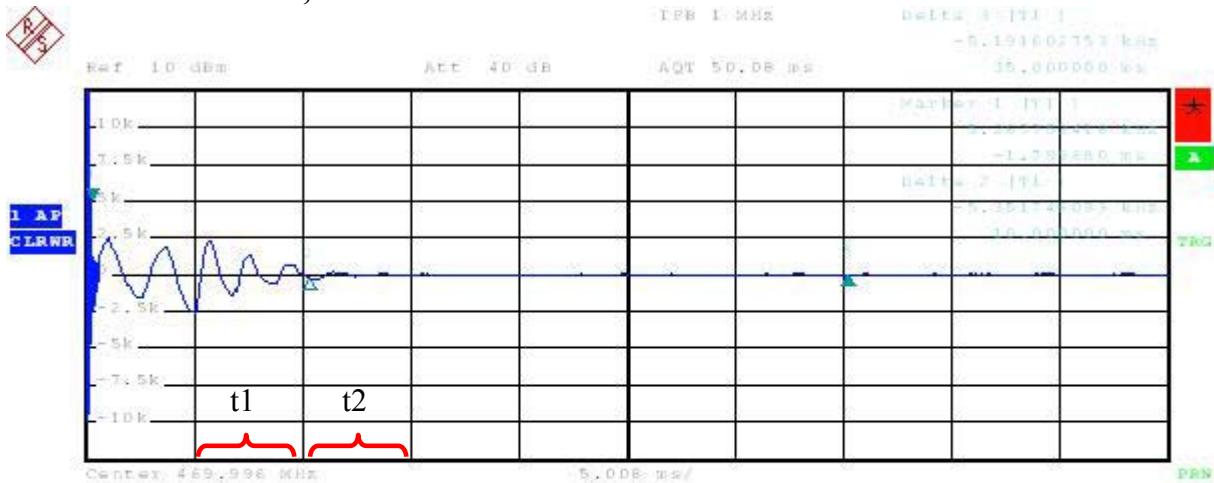


## Frequency Modulation Summary

Coupling	DC	Carrier Offset	11.342 Hz
Deviation	+peak	45.21 kHz	-3.59 dBm
	-peak	-48.50 kHz	Modulation Frequency
	Peak/2	46.86 kHz	Sampling Rate
	RMS	9.576 kHz	Record Length
			Demod Bandwidth

Frequency: 470MHz

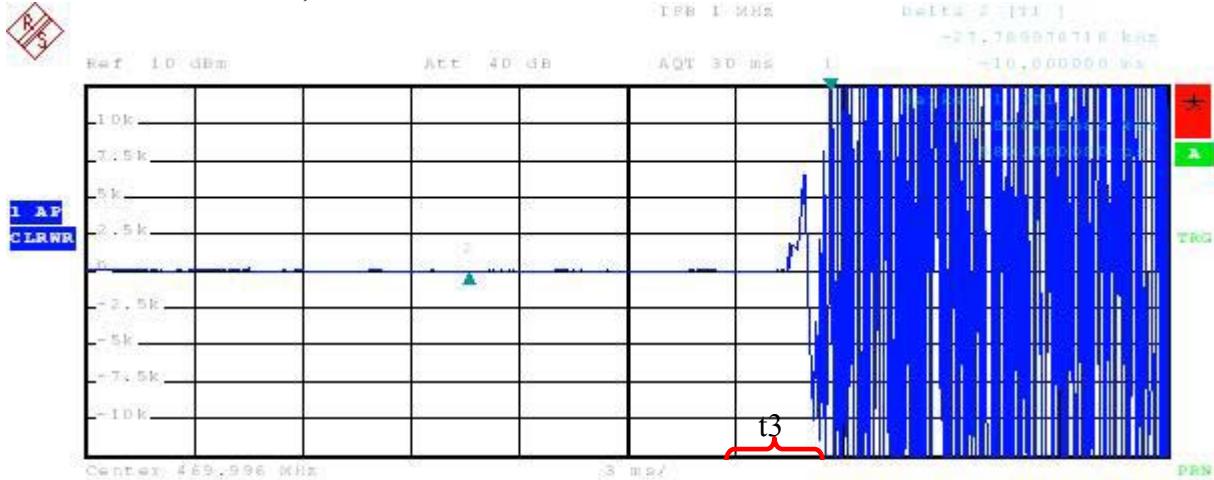
Deviation: 4.5KHz, Turn ON



## Frequency Modulation Summary

Coupling	DC	Carrier Offset	67.295 Hz
Deviation	+peak	Carrier Power	-3.33 dBm
	-peak	Modulation Frequency	--- Hz
	0peak/2	Sampling Rate	62.5 kHz
	RMS	Record Length	3131
		Demod Bandwidth	50 kHz

Deviation: 4.5KHz, Turn OFF



## Frequency Modulation Summary

Coupling	DC	Carrier Offset	-9.6731 Hz
Deviation	+peak	Carrier Power	-4.13 dBm
	-peak	Modulation Frequency	--- Hz
	0peak/2	Sampling Rate	62.5 kHz
	RMS	Record Length	1876
		Demod Bandwidth	50 kHz

## XI. Maximum Permissible Exposure

According to **OET BULLETIN 56 Fourth Edition/August 1999**,

**Equation for Predicting RF Fields:**

$$S(W/m^2) = PG/4 \pi R^2;$$

$$R = \sqrt{\frac{PG}{4 \pi S}} \quad r = \sqrt{\frac{5662 \times 10}{4 \pi (470 / 300)}} = 53.63\text{cm}$$

Where: S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)

P = power input to the antenna (in appropriate units, e.g., mW)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

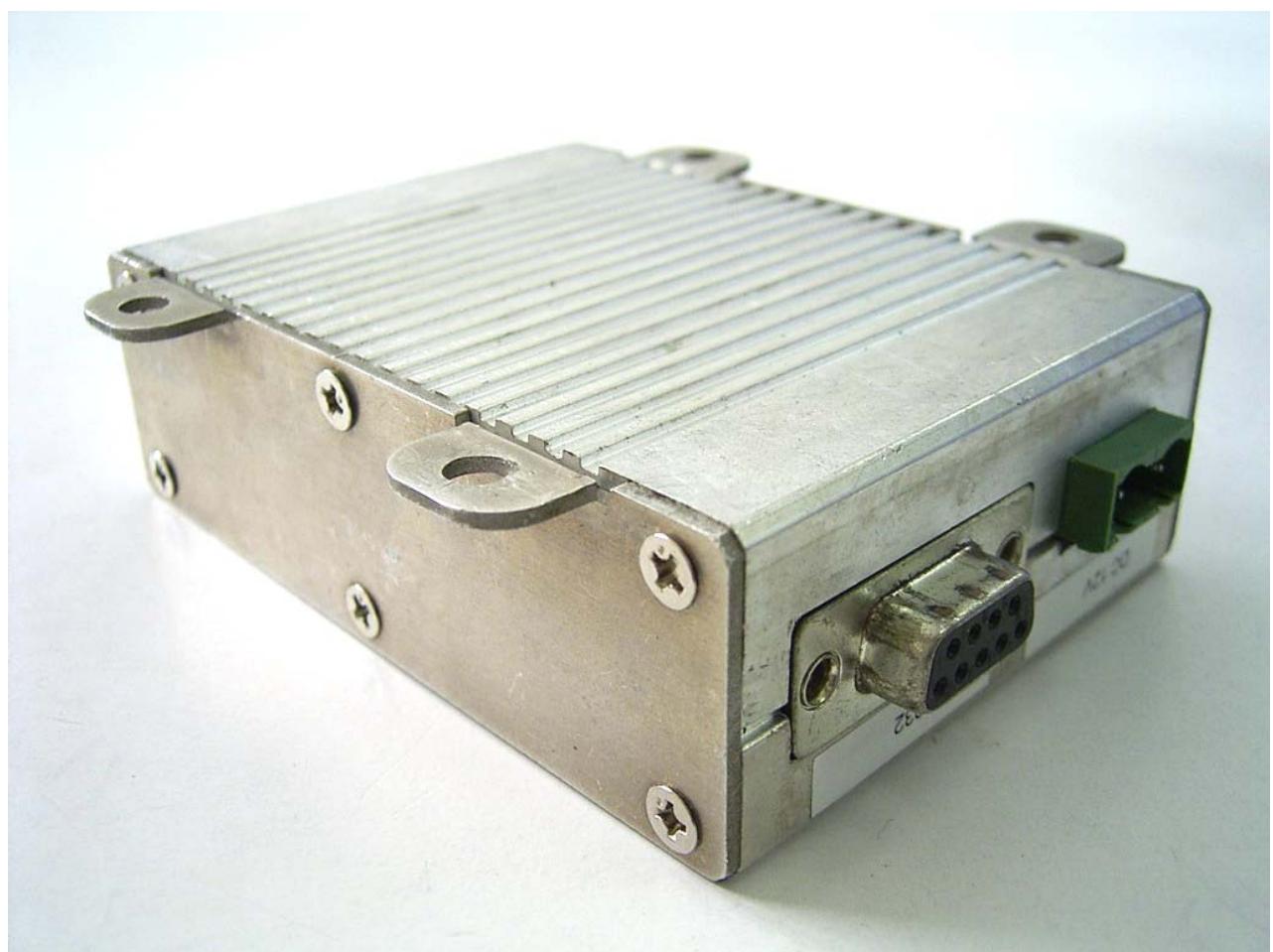
The Numeric gain G of antenna with a gain specified in dB is determined by:

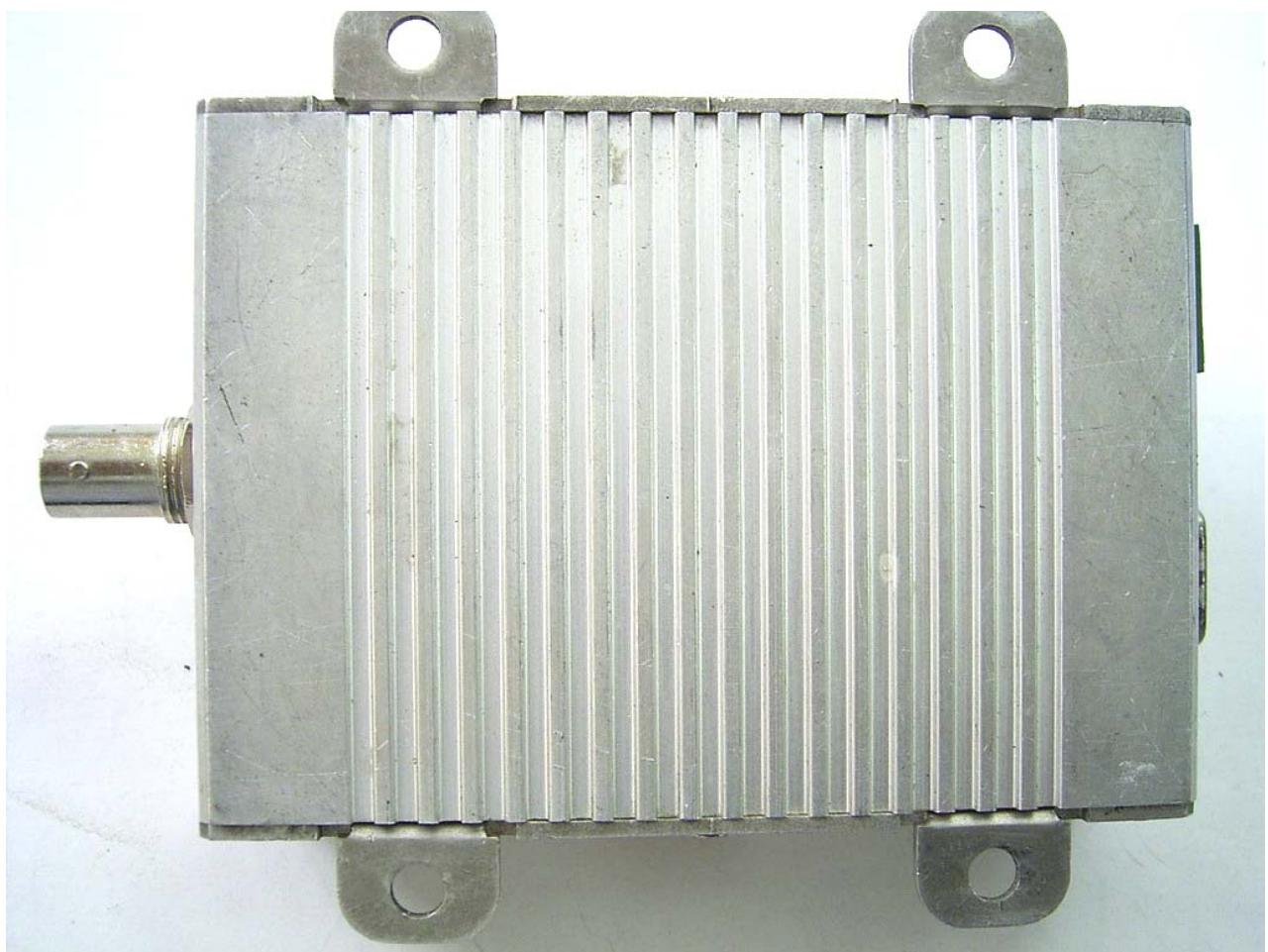
$$G = \text{Log}^{-1} (\text{dBi antenna gain}/10)$$

$$G = \text{Log}^{-1} (2/10) = 1.58$$

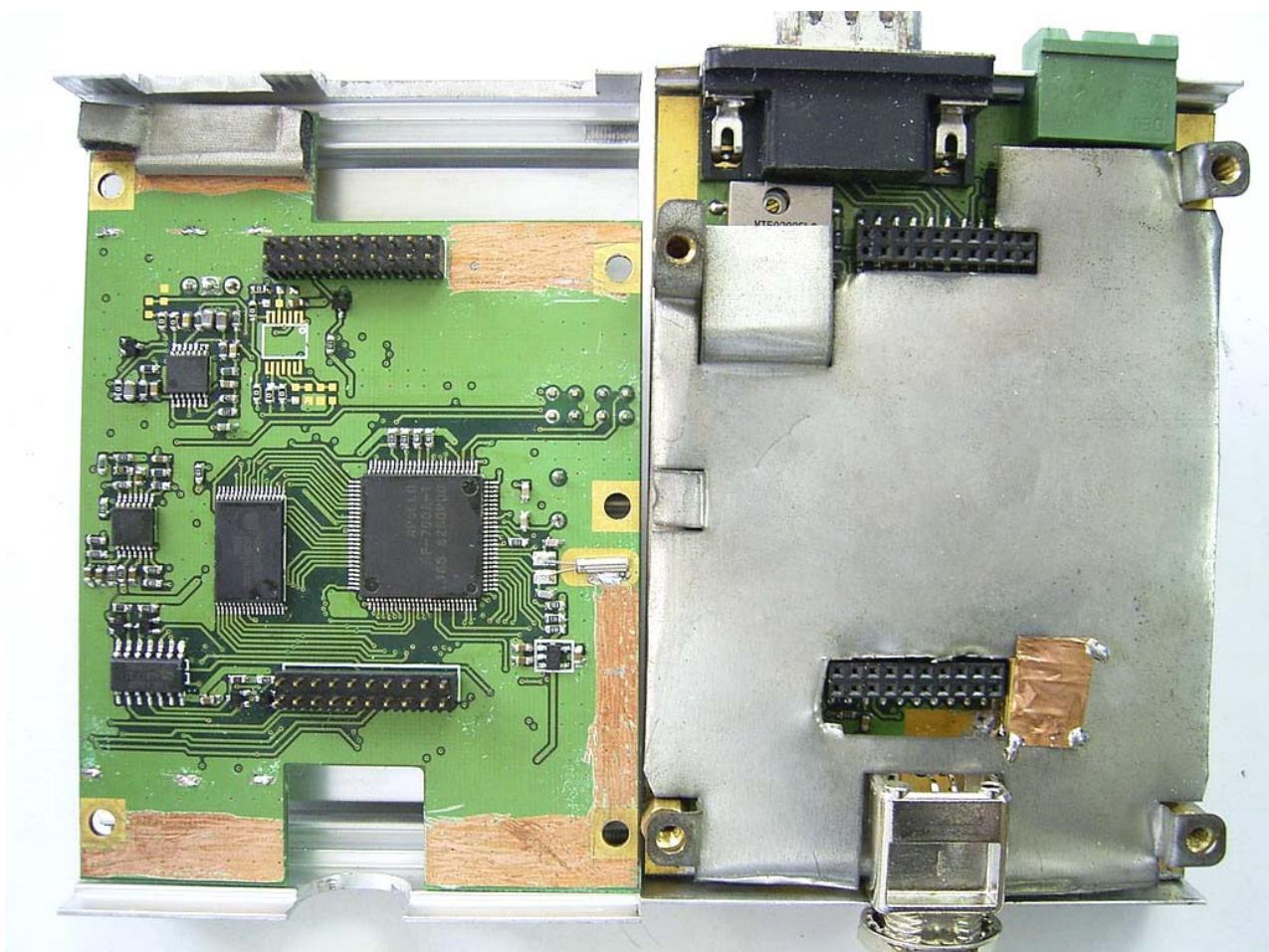
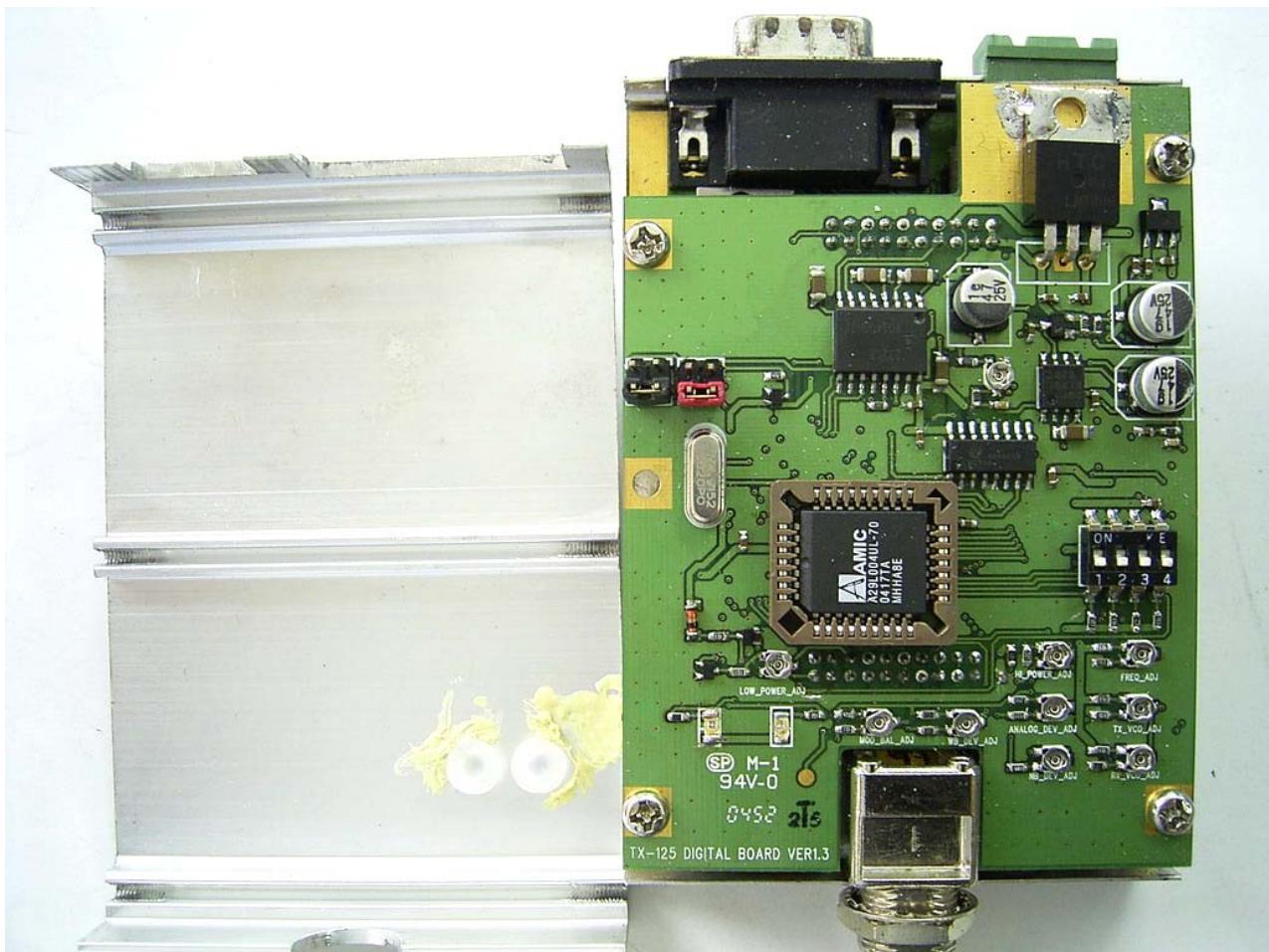
### Limits for Maximum Permissible Exposure (MPE)

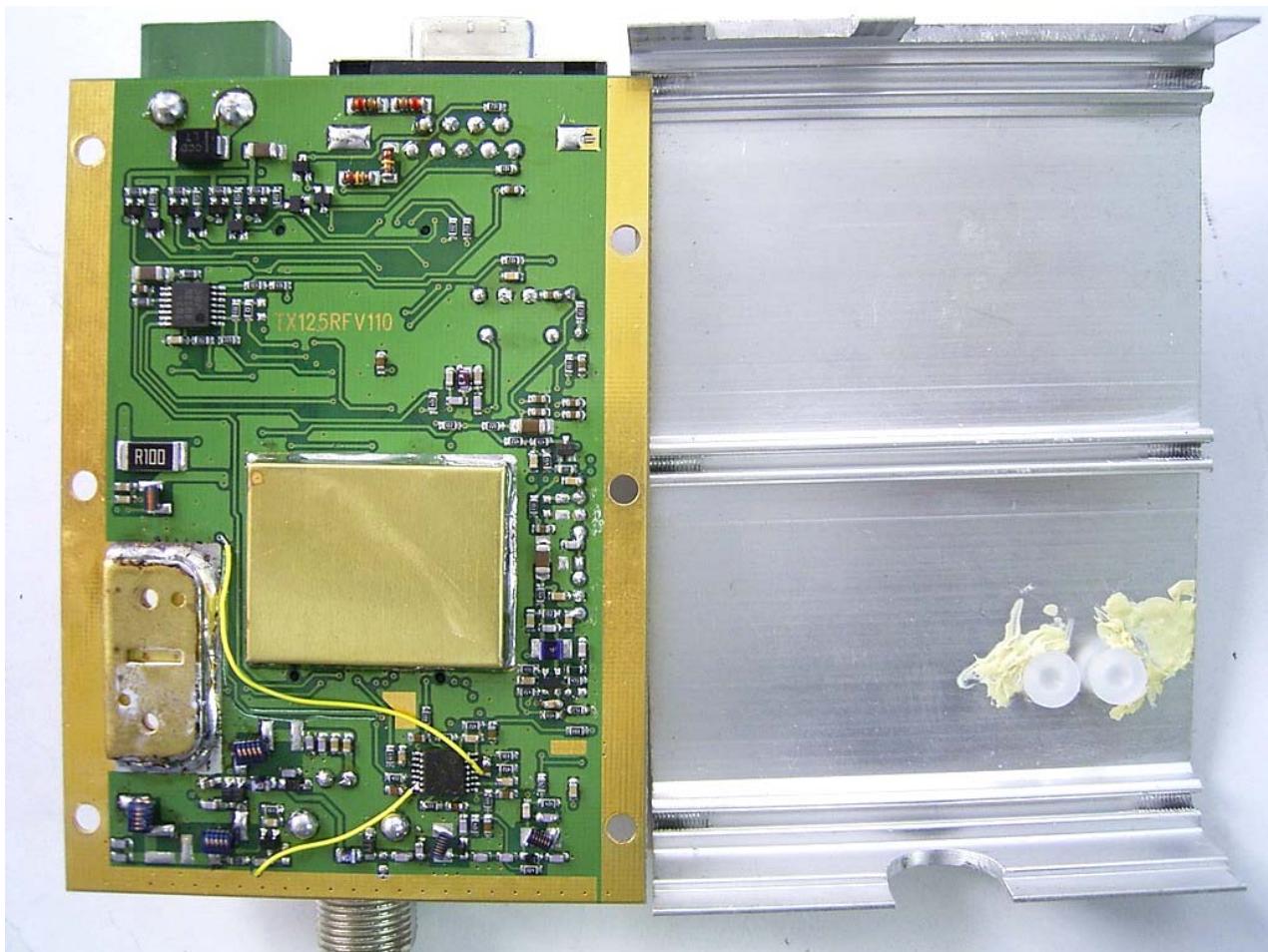
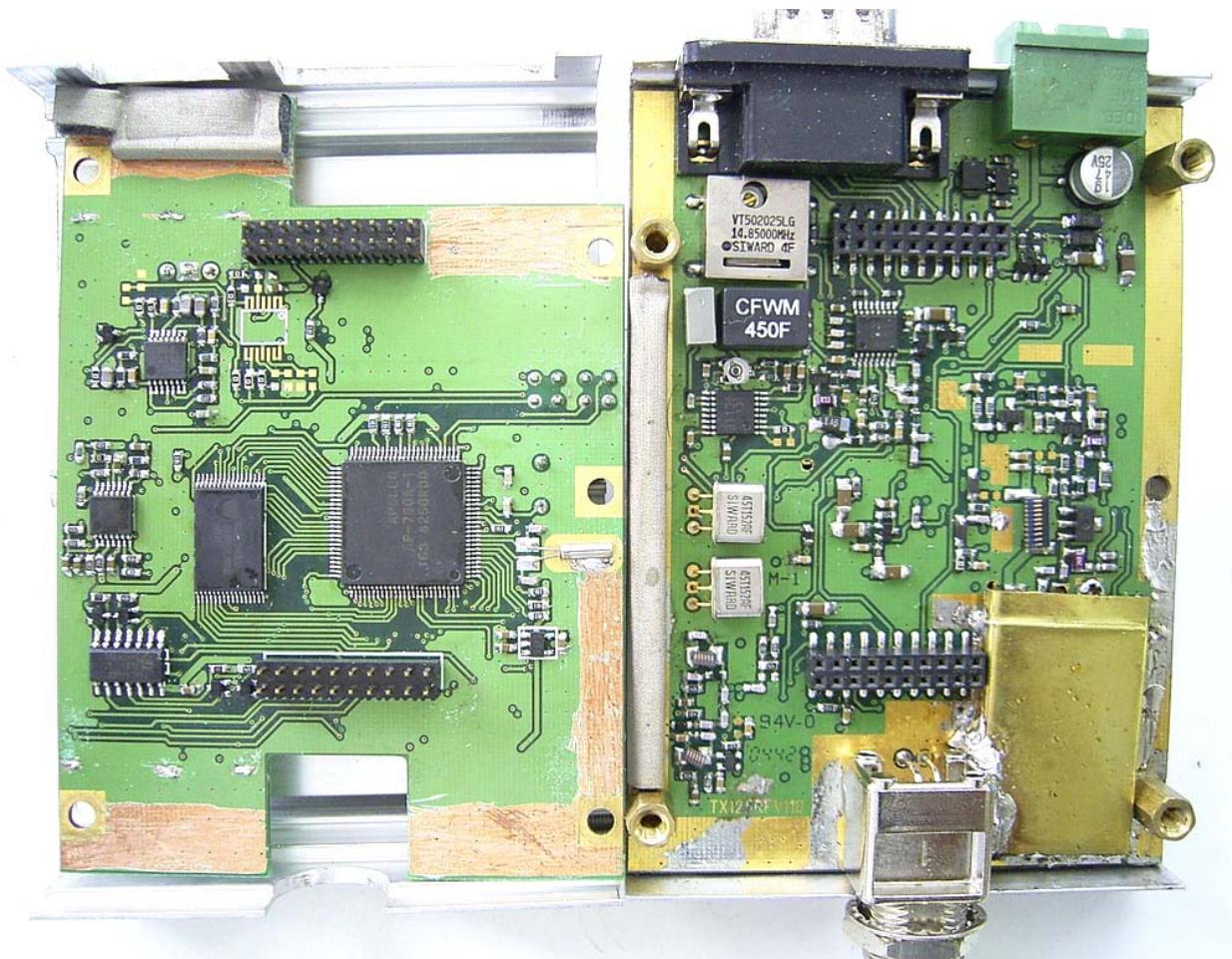
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Filed Strength (H) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes)
<b>(A) Limits for Occupational/Controlled Exposure</b>				
0.3-3.0	614	1.63	100	6
3.0-30	1842/f	4.89/f	900/f <sup>2</sup>	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	100	30
1.34-30	824/f	2.19/f	180/f <sup>2</sup>	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

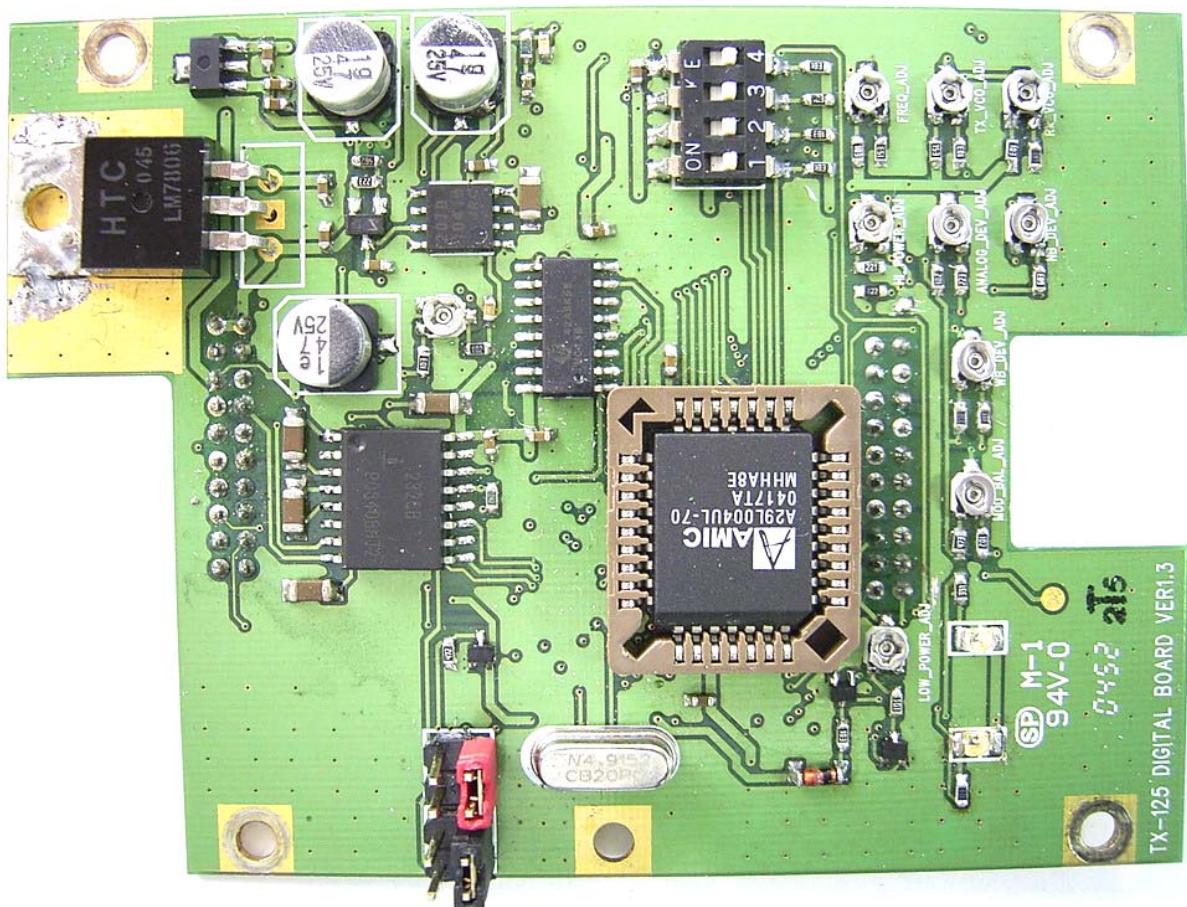
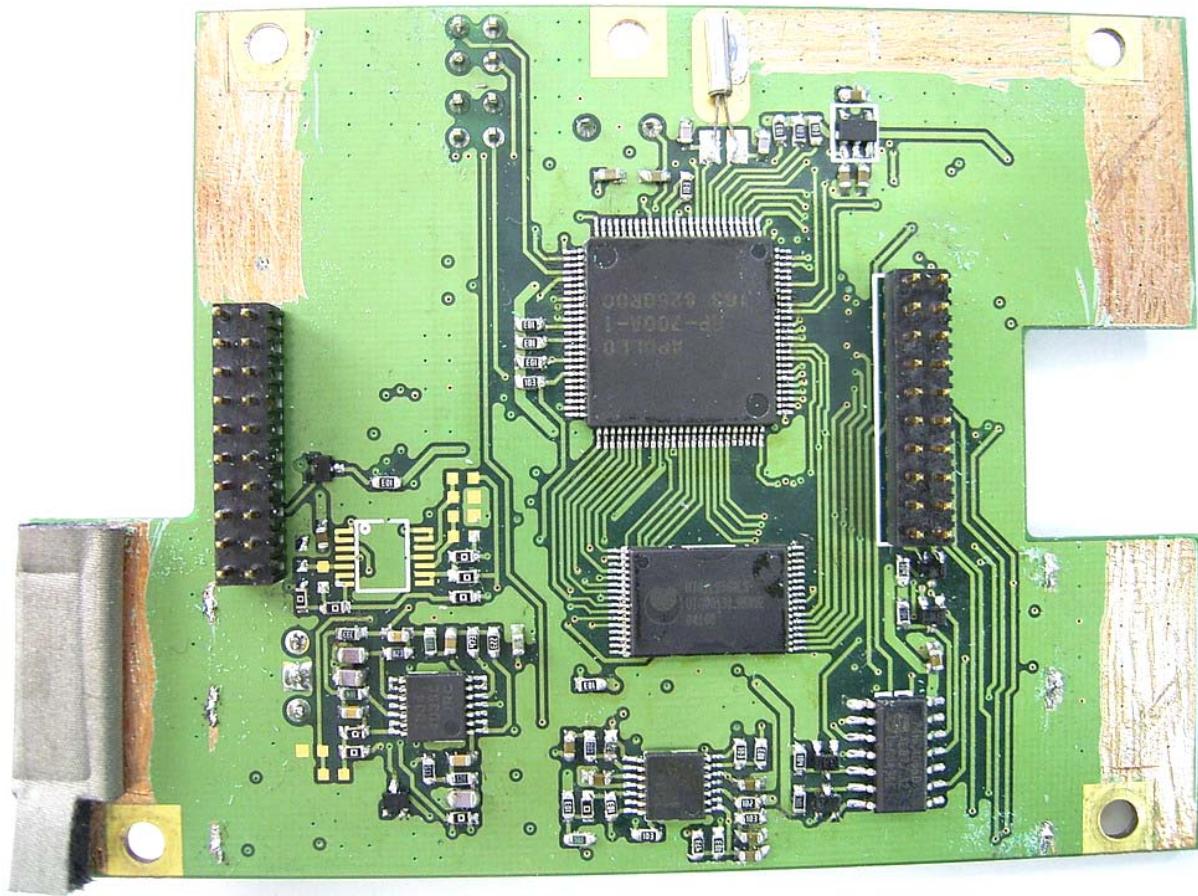


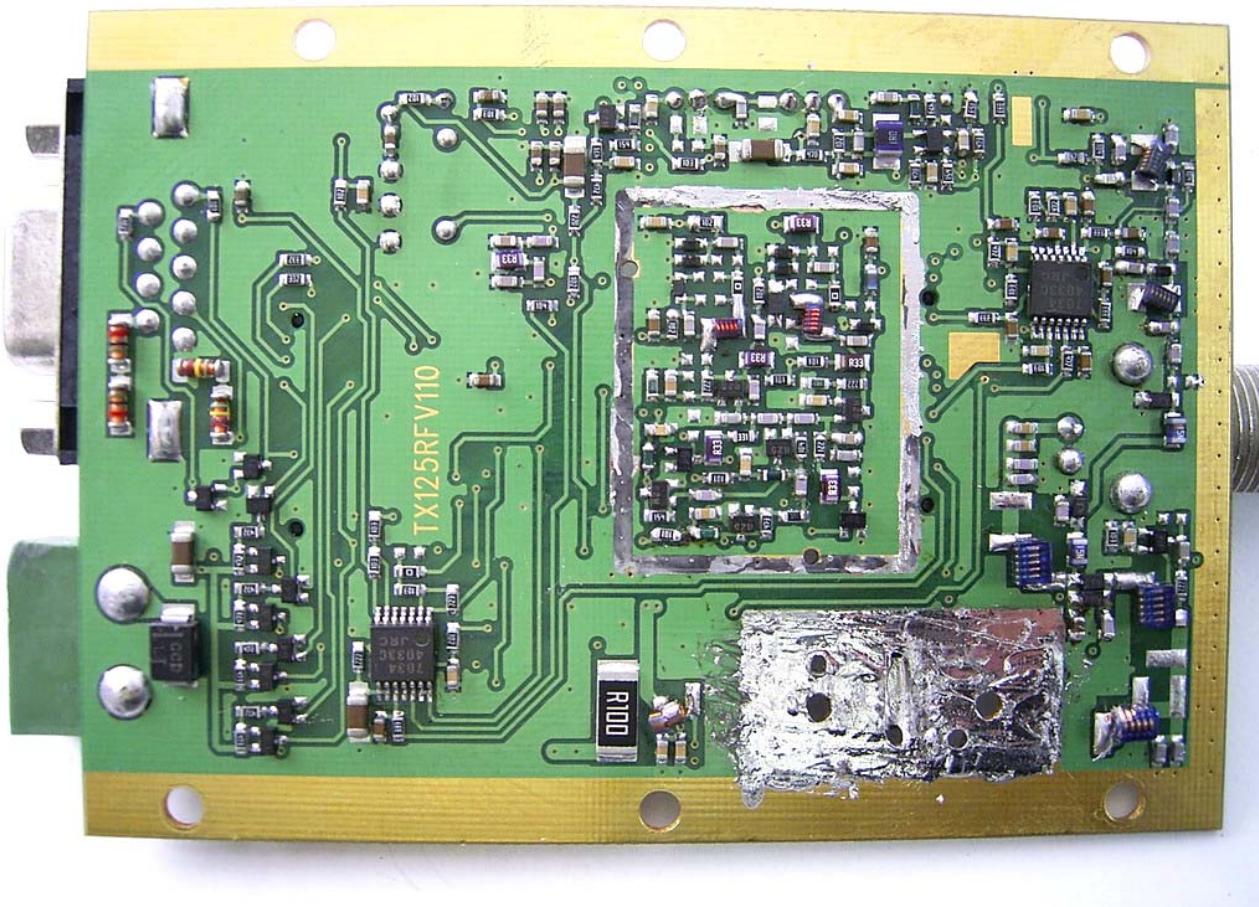
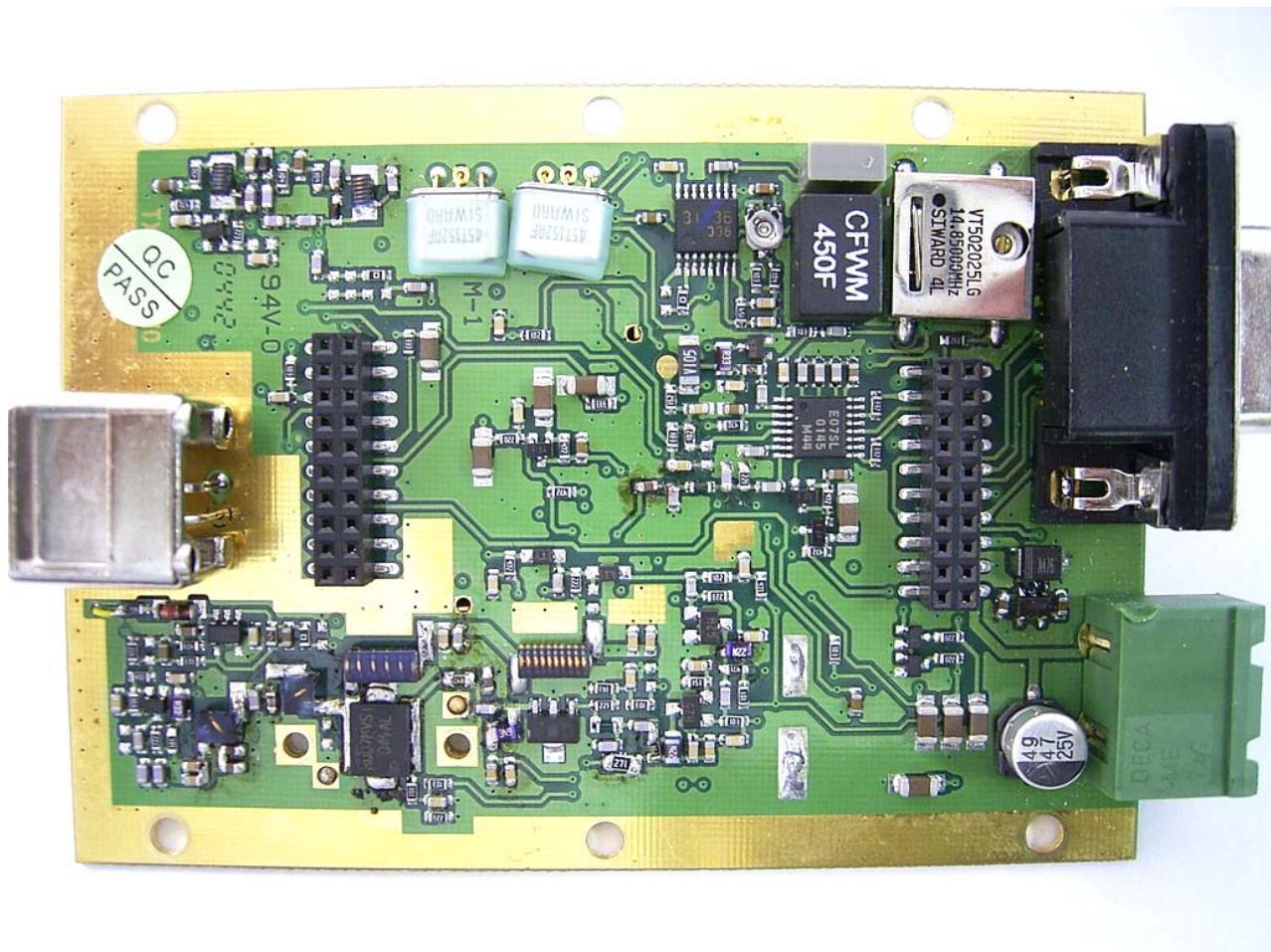












LABEL Format:



LABEL Size: 60x 42 mm

LABEL Position:

