FCC Certification Test Report of

Hand-Held or Wall Mount POCSAG Paging Transmitters

Applicant	:	Gold Apollo Co., Ltd. Rm 1, 3th F1., No. 77, Sec. 1, Hsin Tai Wu Rd., Hsi-Chih, Taipei Hsien, Taiwan, R.O.C.
EUT	:	Hand-Held or Wall Mount POCSAG Paging Transmitters
Model	:	TE-100
FCC ID	:	NDATX100XU2
Report No.	:	G1590060232

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:_____**Project Engineer**
(Jason Yeh)

Authorized by:_____**General Manager**
(Frank Tsai)

Test date: May 11, 2006
Issue date: June 09, 2006

Tables of Contents

I. GENERAL 5
1.1 Introduction 5
1.2 Description of EUT 5
1.3 Specification of EUT 6
1.4 Configuration of System Under Test 7
1.5 Location of the Test Site 7
1.6 General Test Condition 7

II. Emissions Designator: (Part 2.201) 8

III. RF Power Output (Part 2.1046, 90.205) 9
3.1 Test Procedure 9
3.2 Test Result 9
3.3 Test Equipment 9

IV. Occupied Bandwidth: (Part 2.1049, 90.209) 11
4.1 Test Procedure 11
4.2 Test Equipment 11
4.3 Test Result 11

V. Spurious Emissions at Antenna Terminals (Part 2.1051, 90.210) 15
5.1 Test Procedure 15
5.2 Test Result 15
5.3 Test Equipment 15

VI. Filed Strength of Spurious Radiation (Part 90.210) 22
6.1 Test Procedure 22
6.2 Test Equipment 22
6.3 Test Result 23

VII. Frequency Stability (Part 2.1055, 90.213) 25
7.1 Test procedure (Temperature) 25
7.2 Test Result 25
7.3 Test Equipment 25
7.4 Test procedure (Voltage) 26
7.5 Test Result 26

VIII. Conducted Emission Test (ANSI C63.4 1992)..... 27
8.1 Test Condition and Setup 27

IX. Transient Frequency Behavior (Part 90.214) 28
9.1 Test Procedure 28
9.2 Test Result 28
9.3 Test Equipment 28

X. Maximum Permissible Exposure 32

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 two kinds of modulations, as below:

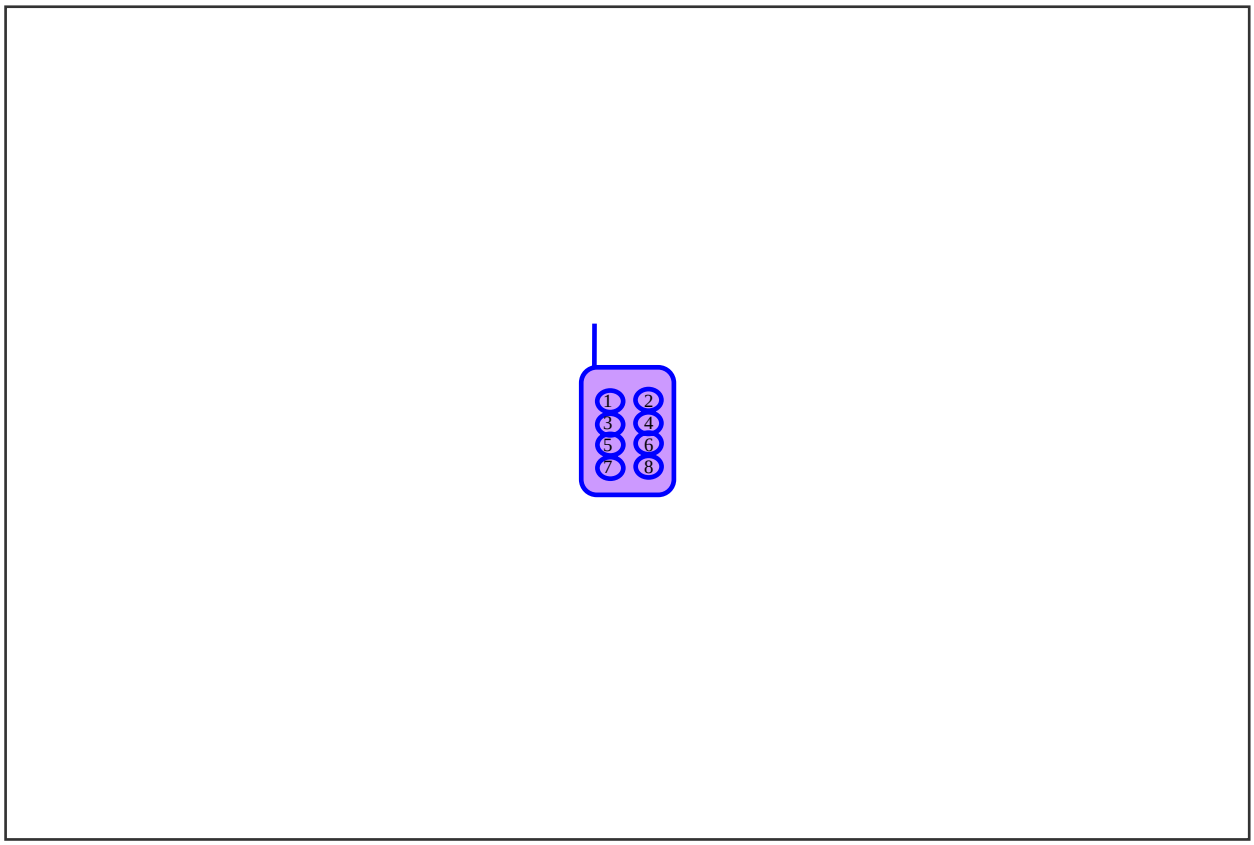
- 12.5KHz channel spacing.
- 25KHz channel spacing.

1.2 Description of EUT

The EUT is a VHF Transmitter, specifications as below:

1. Frequency Rang	: 410MHz ~ 450MHz
2. Modulation Type	: FSK
3. Channel Spacings	: 12.5kHz, 25kHz
4. RF Output Power	: +26dBm
5. Maximum deviation	: ±2.5KHz or ±4.5KHz
6. Harmonic Radiation	: less - 25dBm
7. Frequency stability	: 2.5ppm at -10C~60C
8. Output Connect	: SMA (F)
9. Current Consumption	Standby : 30 μA ; Transmit : 350mA
10. Dimensions	: 58 (W)*112.8 (H)*22.5(D)
11. Weight	: 85g (With Battery & Antenna)

1.3 Configuration of System Under Test



Connections of EUT:

*Put three AAA size, 1.5V battery into the battery cell of EUT.
The EUT does not be connected with any product.

List of support equipment

N/A

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 : 4.5 Vdc.

Extreme Temperature

High Temperature : + 50°C maintained.

Low Temperature : - 30°C maintained.

Extreme Voltage

High Voltage : 5.185 Vdc

Low Voltage : 3.825 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 12.5 kHz channel step emission is:

Bn = 2 x D + 2 x M
Where D = maximum deviation: 4.5 kHz
Where M = maximum modulation frequency: 2.5 kHz
Bn = 14 kHz

This is confirmed in the emission designation, 14K0FSK, 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:

Bn = 2 x D + 2 x M
Where D = maximum deviation: 2.5 kHz
Where M = maximum modulation frequency: 2.5 kHz
Bn = 10 kHz

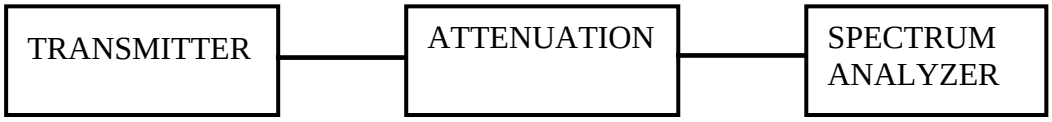
This is confirmed in the emission designation, 10K0FSK, declared by the client.

III. RF Power Output (Part 2.1046, 90.205)

3.1 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



3.2 Test Result:

Channel Spacing (KHz)	Frequency (MHz)	Output power (dBm)	Power (W)
12.5	410	25.48	*0.353
25	410	25.62	*0.365
12.5	425	19.66	0.092
25	425	19.85	0.097
12.5	450	20.35	0.108
25	450	20.45	0.111

"*", means the worst case.

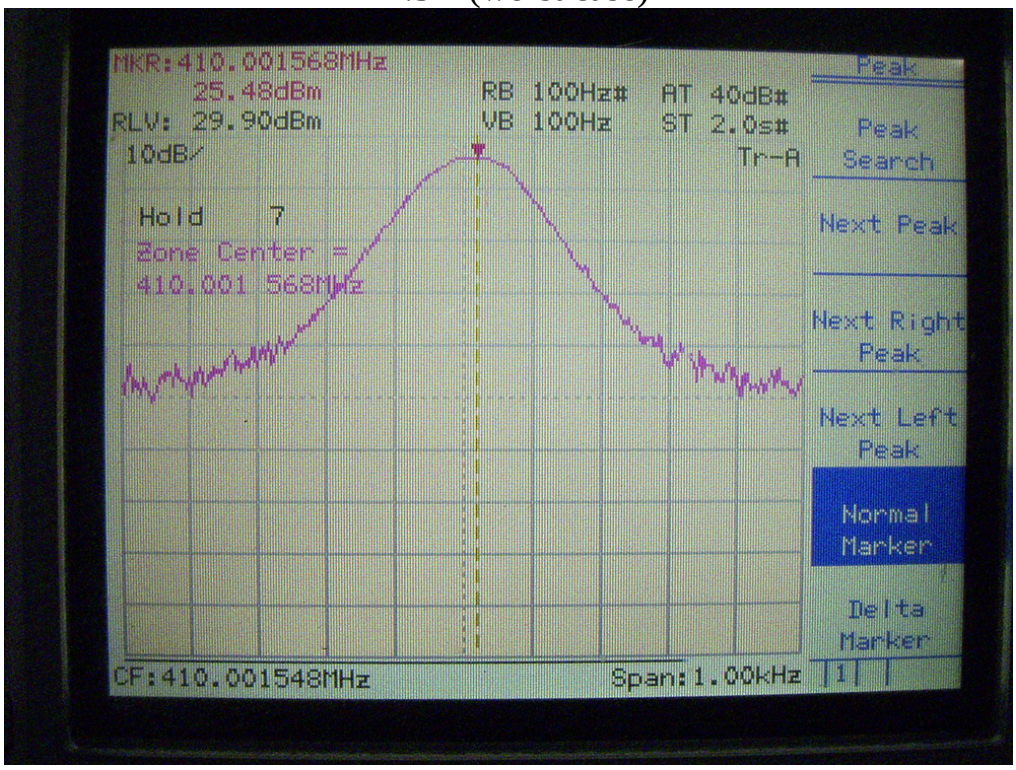
3.3 Test Equipment:

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum	MS2665C	Anritsu	6200175476	03/21/06	03/20/07

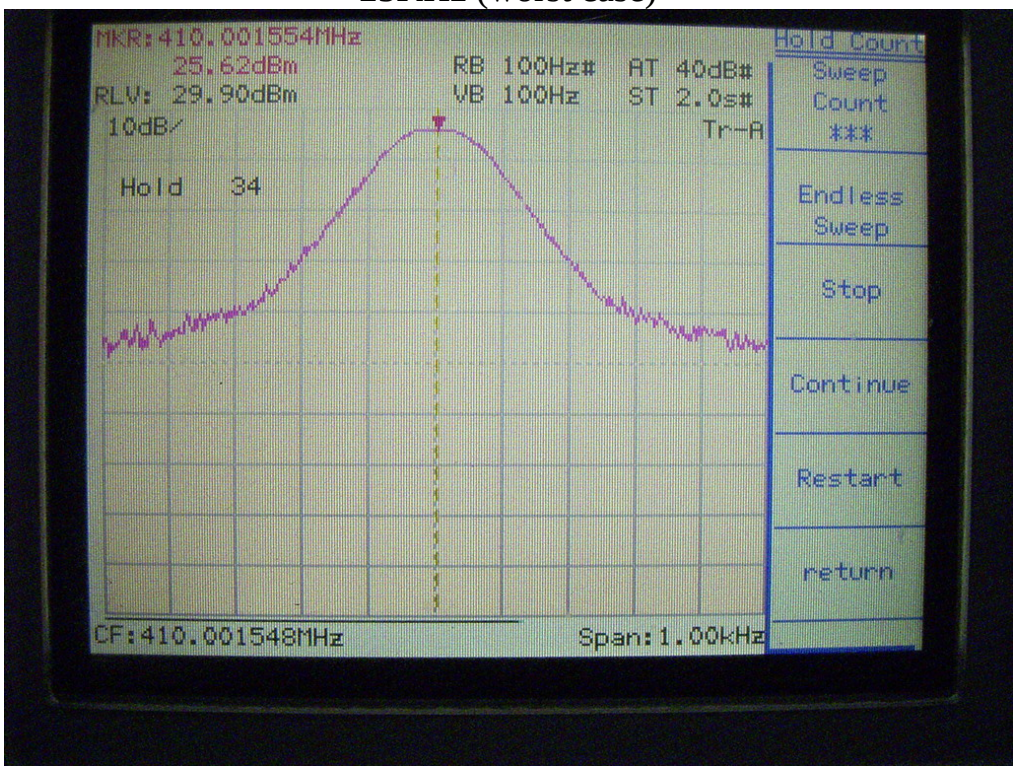
The level of confidence of 95% , the uncertainty of measurement of conducted emission is ± 1.55 dB .

Measurement Result:

12.5K (worst case)

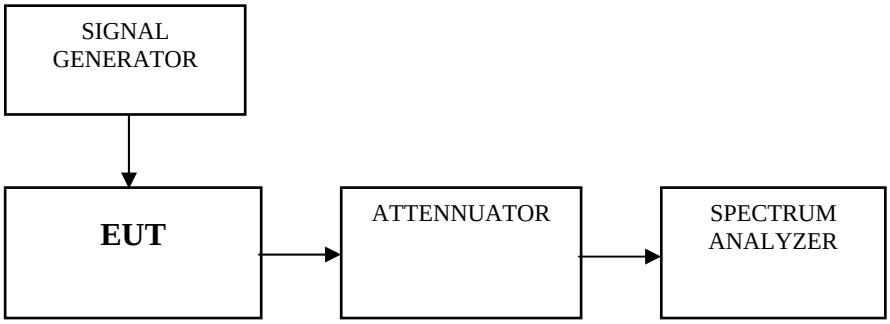


25KHz (worst case)



IV. Occupied Bandwidth: (Part 2.1049, 90.209)

4.1 Test procedure:



(1) Connect the equipment as illustrated.
(2) The signal generator was transmitting modulation signal to the EUT.
(3) Three kinds of modulation signals have tested, they are AN(analog), NB(narrow band) and WB(wide band).
(4) During the testing, adjust different modulations.
(5) Observe and recorded the test results.

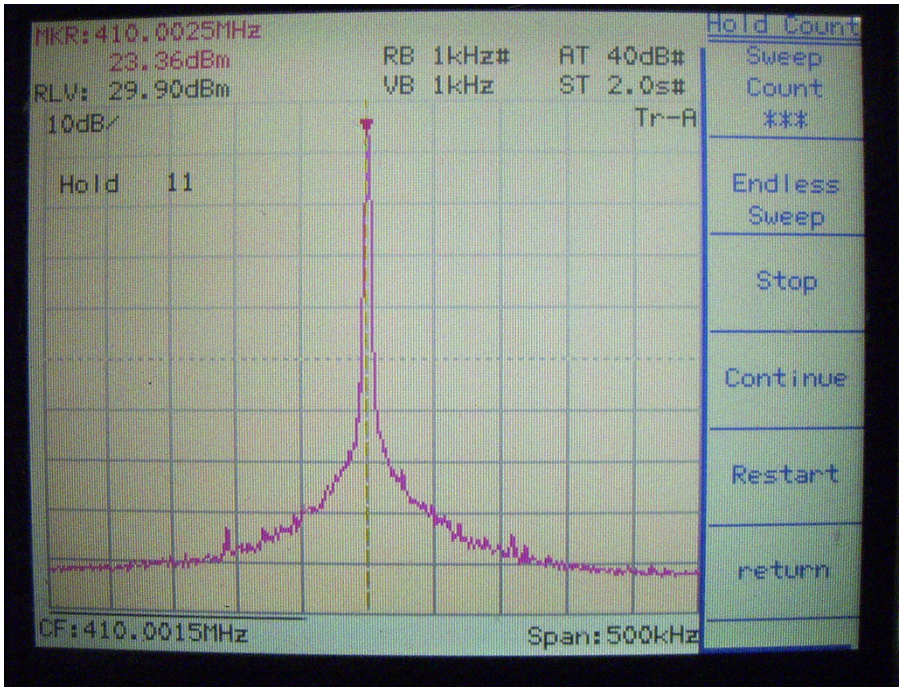
4.2 Test Equipment:

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum	MS2665C	Anritsu	6200175476	03/21/06	03/20/07

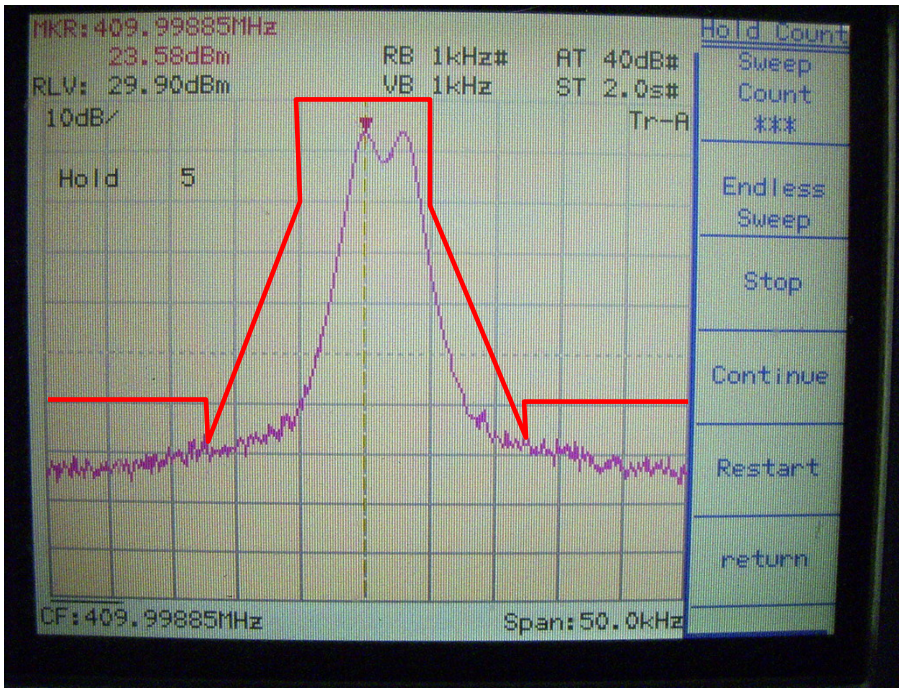
The level of confidence of 95% , the uncertainty of measurement is ± 12 Hz .

4.3 Test Result:

Measurement Result:

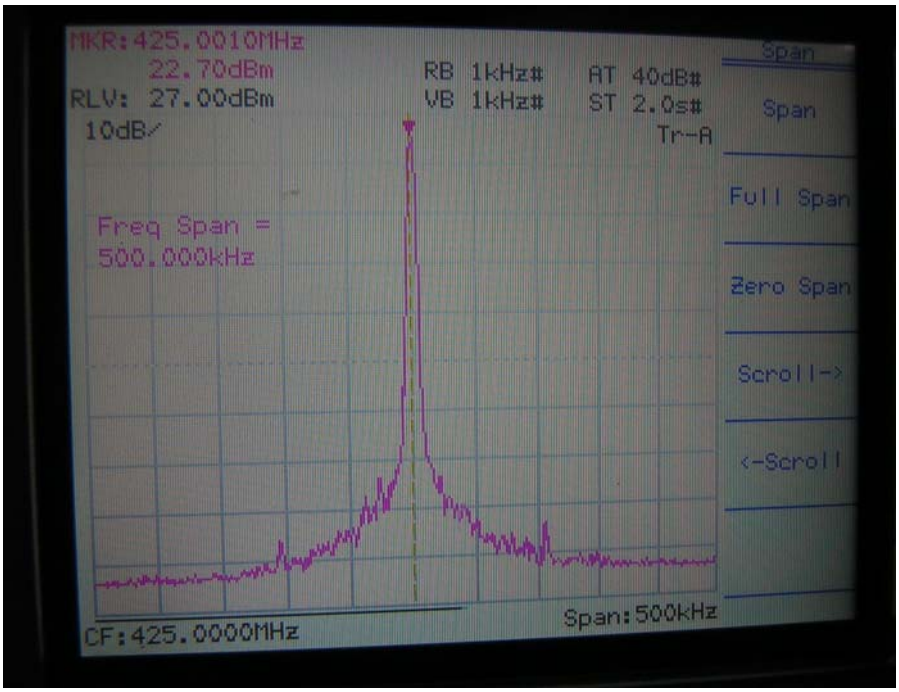


Channel Spacing: **12.5KHz**
Frequency : **410MHz**
Modulation : **NONE**

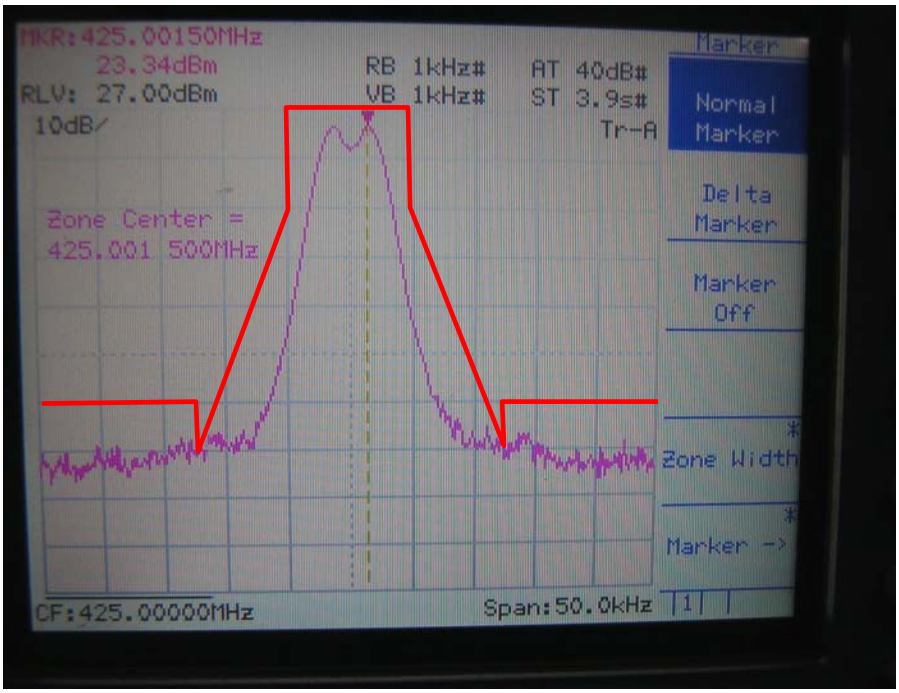


Channel Spacing: **12.5KHz**
Frequency : **410MHz**
Modulation : **Mask: D**

Measurement Result:

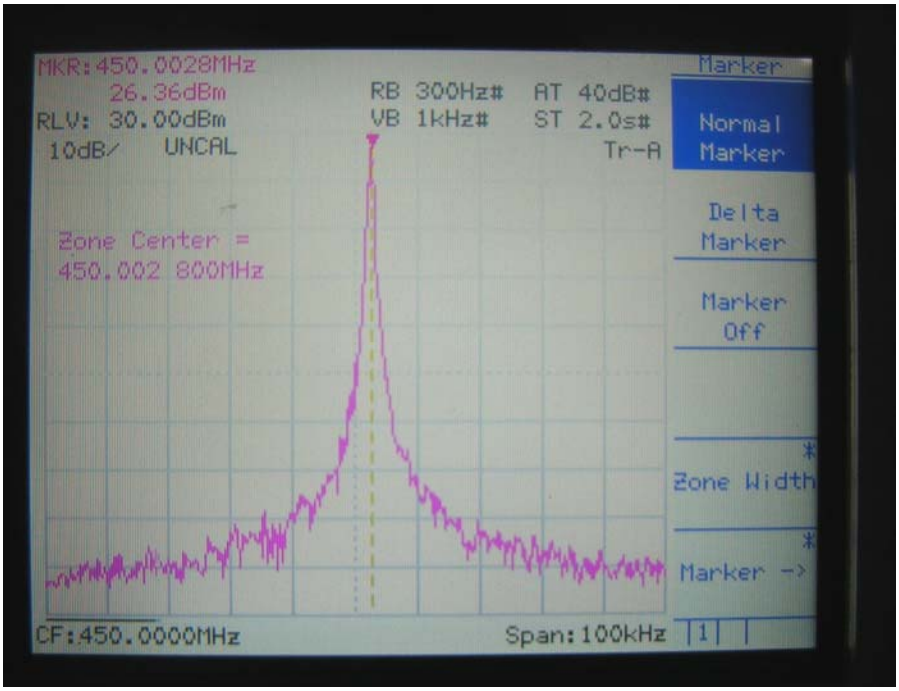


Channel Spacing: **12.5KHz**
Frequency : **425MHz**
Modulation : **NONE**

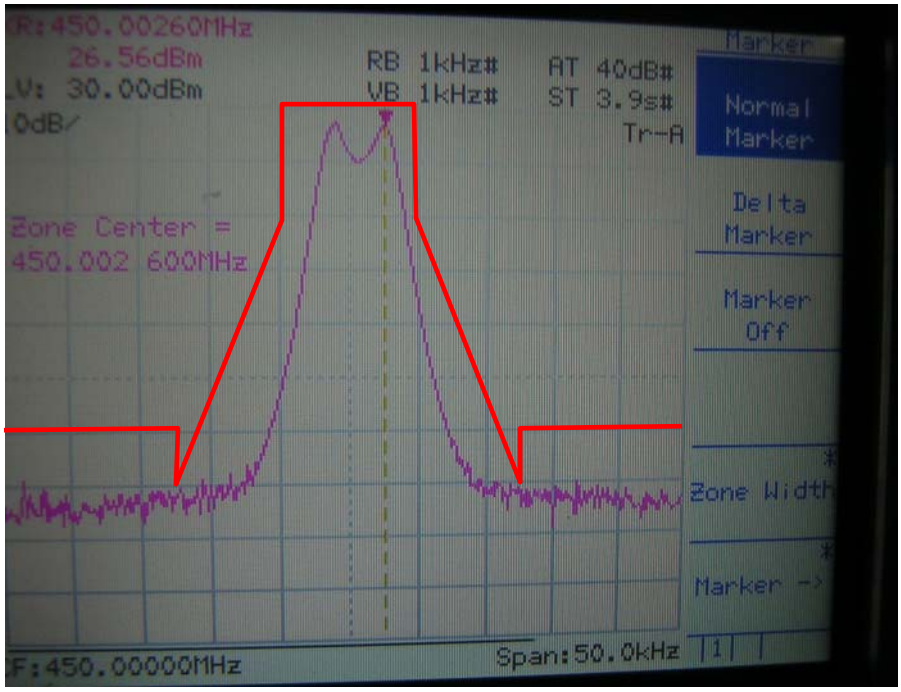


Channel Spacing: **12.5KHz**
Frequency : **425MHz**
Modulation : **Mask: D**

Measurement Result:



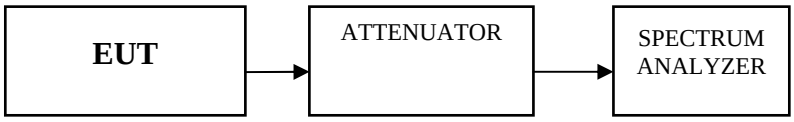
Channel Spacing: **12.5KHz**
Frequency : **450MHz**
Modulation : **NONE**



Channel Spacing: **12.5KHz**
Frequency : **450MHz**
Modulation : **Mask: D**

V. Spurious Emissions at Antenna Terminals (Part 2.1051, 90.210)

5.1 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).

5.2 Test Result:

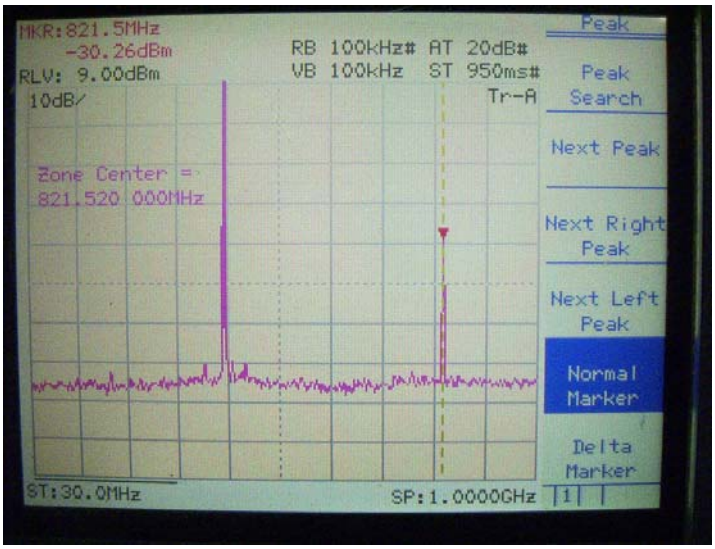
Spurious (dBm)	Limit (dBm)
Under limit	-20

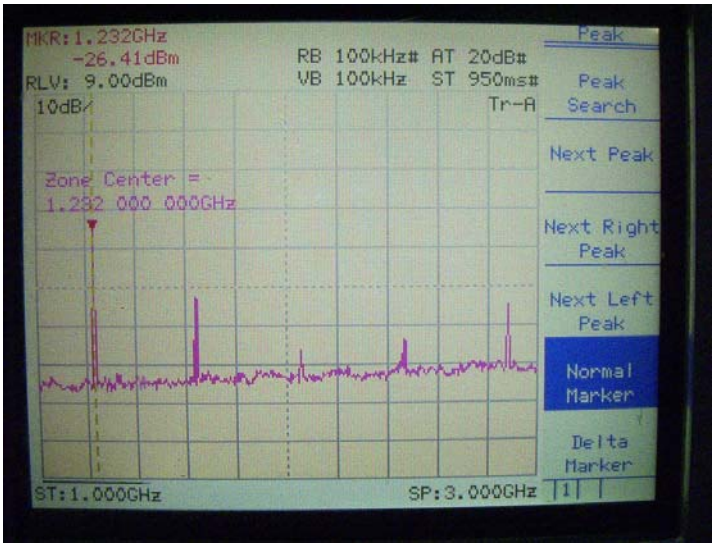
5.3 Test Equipment:

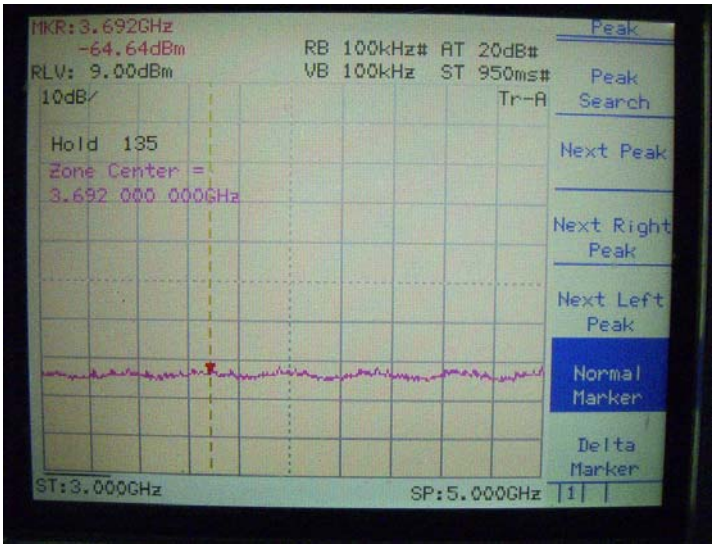
Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum	MS2665C	Anritsu	6200175476	03/21/06	03/20/07

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

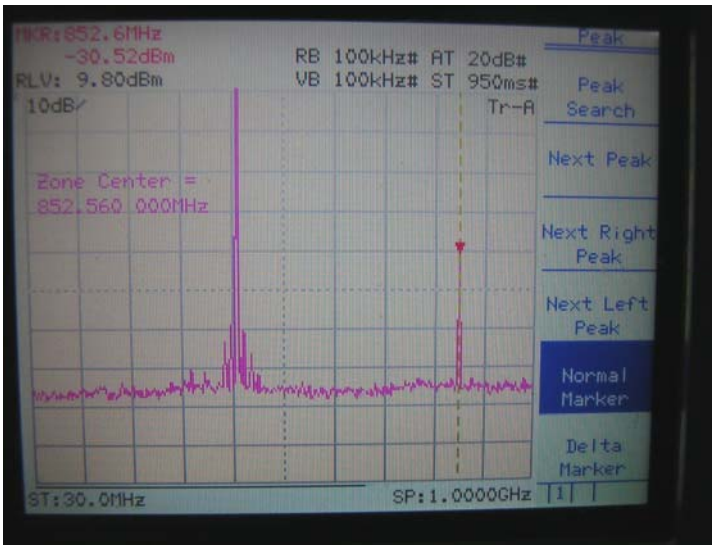
Measurement Result:
12.5KHz, 410MHz

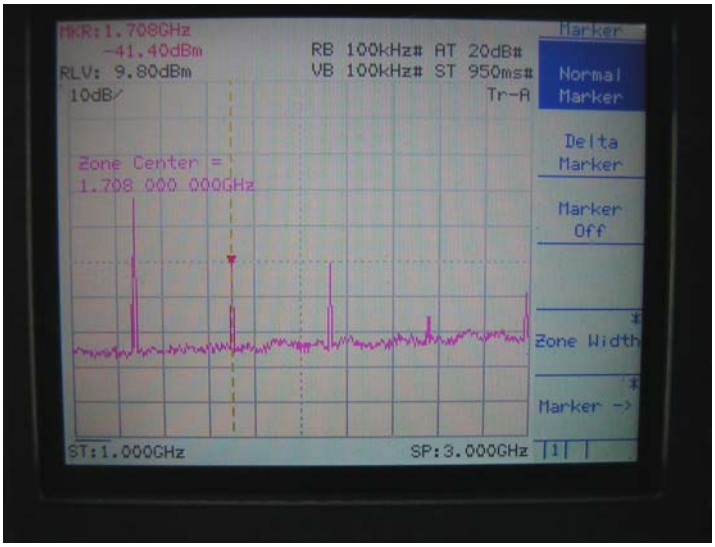


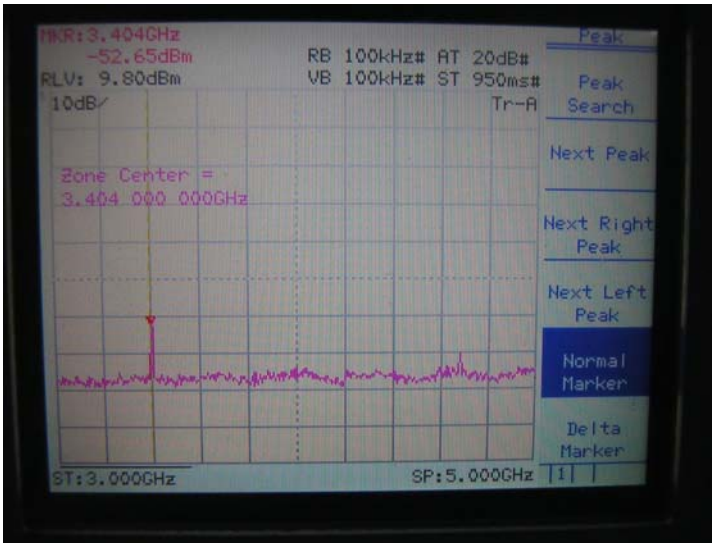




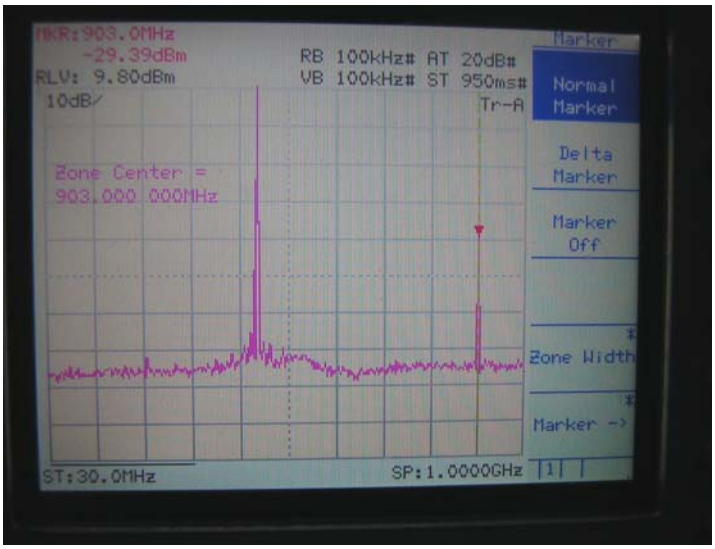
Measurement Result:
12.5KHz, 425MHz

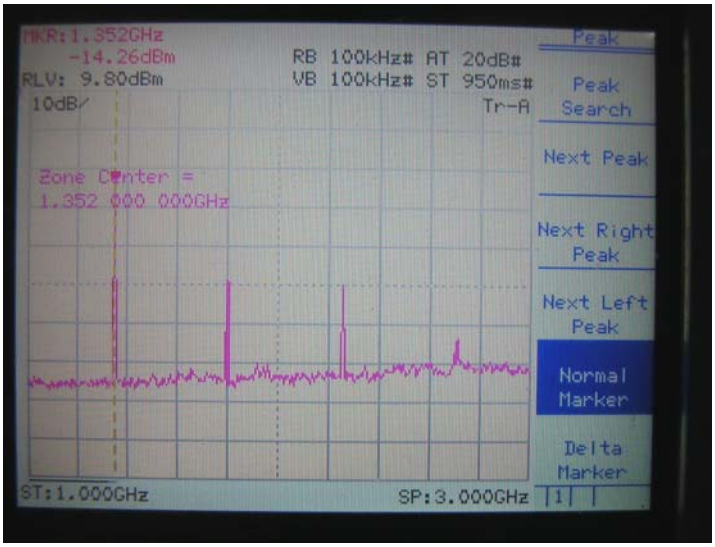


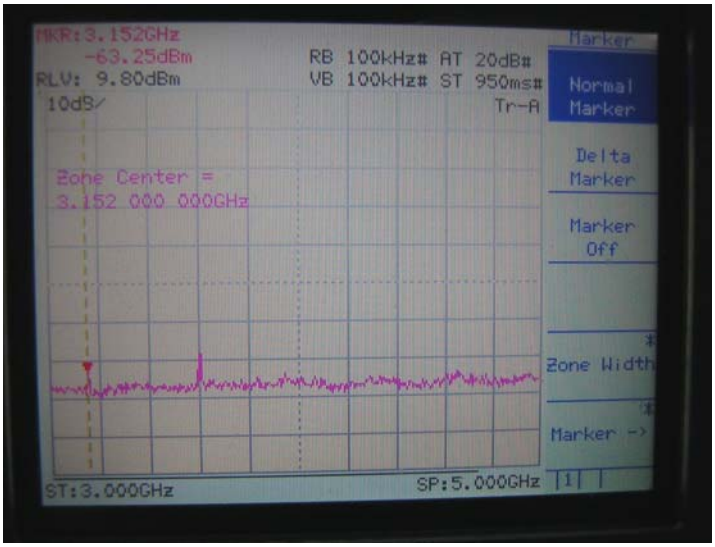




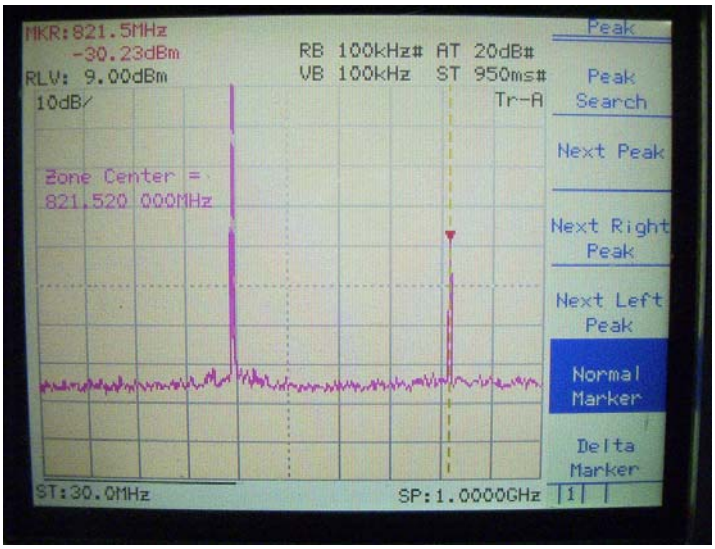
Measurement Result:
12.5KHz, 450MHz

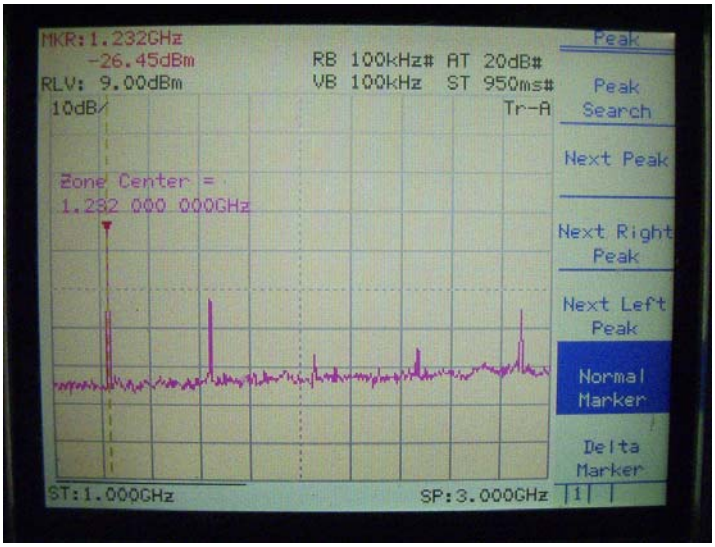


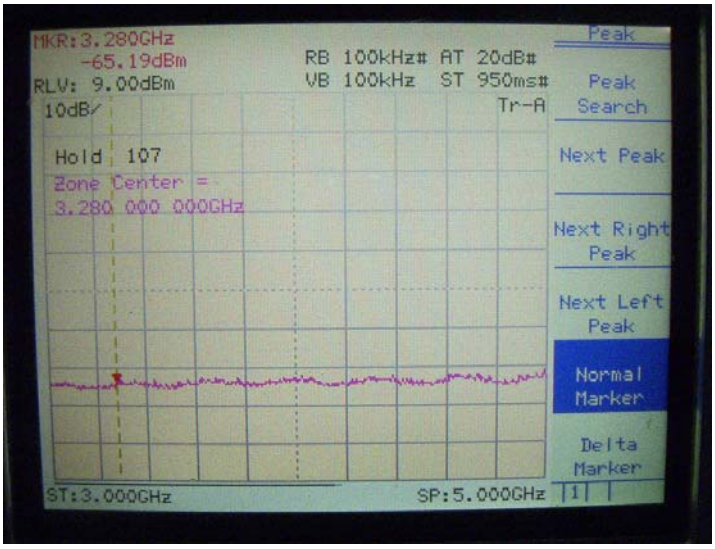




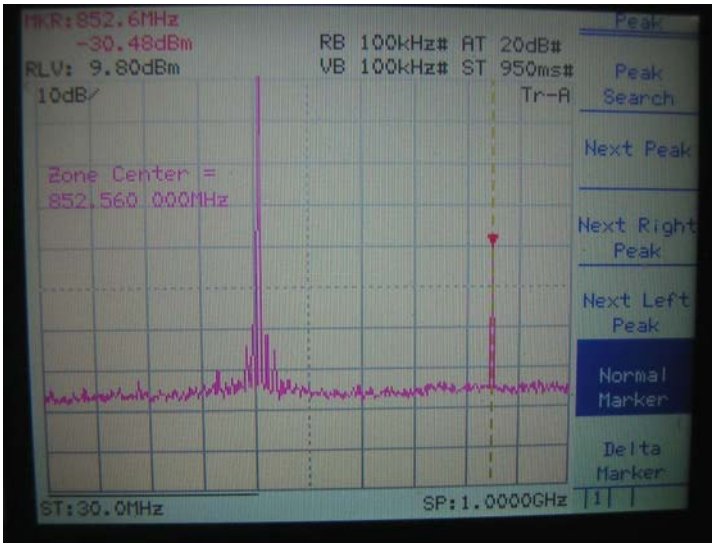
Measurement Result:
25KHz, 410MHz

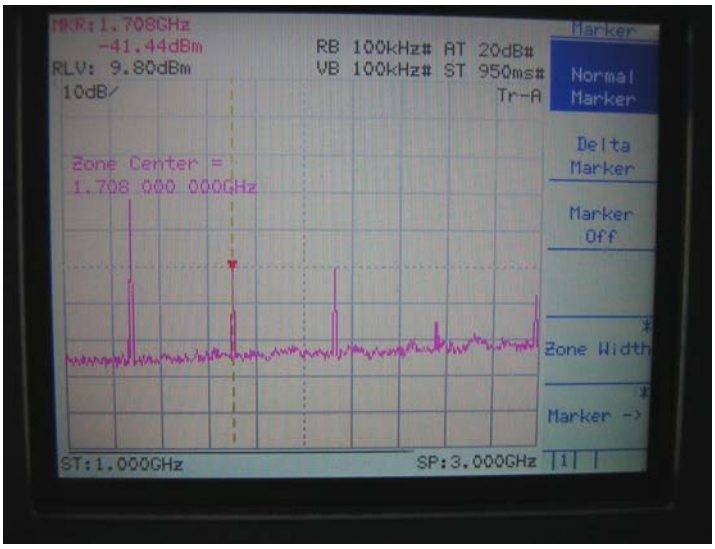


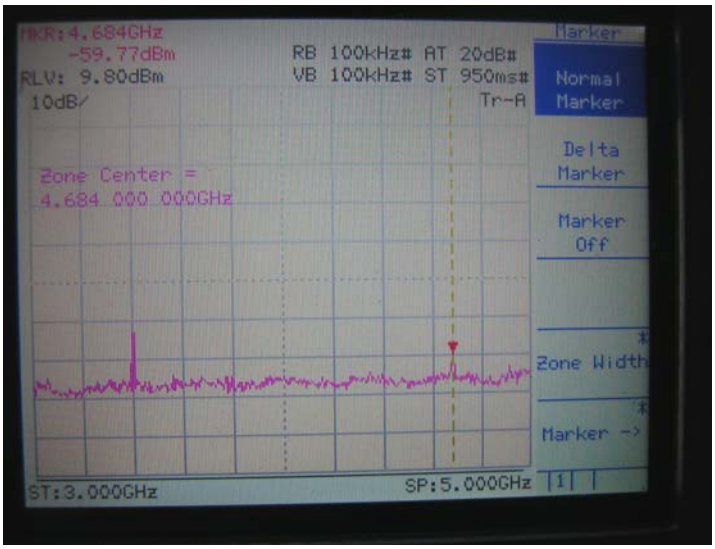




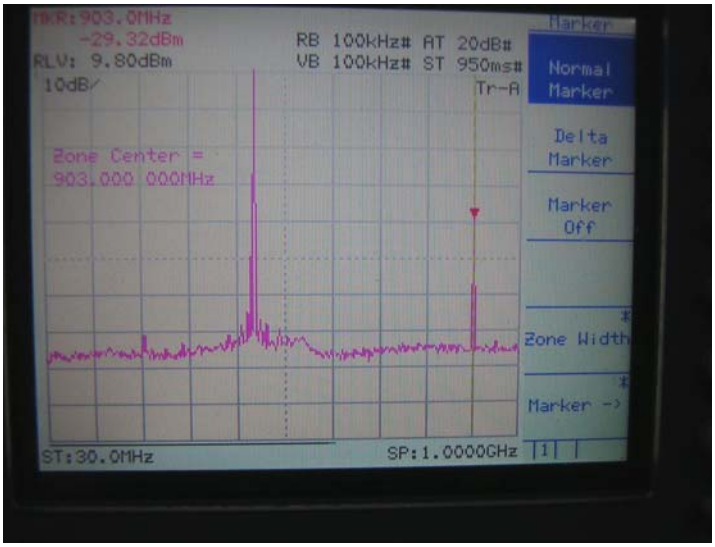
Measurement Result:
25KHz, 425MHz

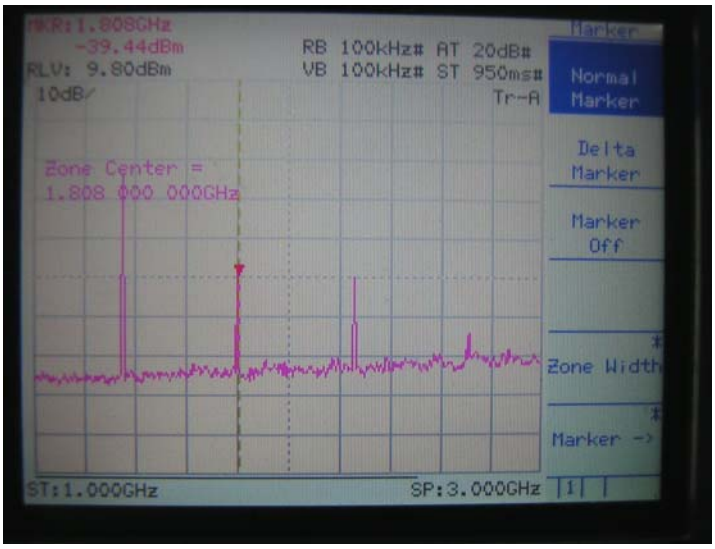


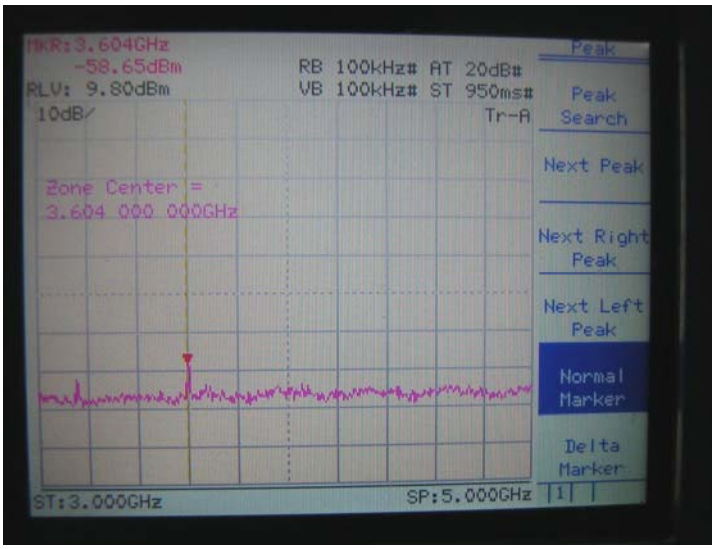




Measurement Result:
25KHz, 450MHz







VI. Field Strength of Spurious Radiation (Part 90.210)

6.1 Test procedure:

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

(2) Pd (dBm) ＝ Pg (dBm) － Cable loss (dB) ＋ antenna gain (dB)

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

6.2 Test Equipment:

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Receiver	SCR3102	SCHAFFNER	012	03/29/06	03/28/07
Antenna	CBL6141A	SCHAFFNER	4188	11/29/05	11/29/06
Open test side (Antenna, Amplify, cable calibrated together)				05/16/06	05/15/07
Spectrum Analyzer	8564E	HP	US36433002	11/03/05	11/03/06
Microwave Preamplifier	83051A	HP	3232A00347	08/01/05	08/01/06
Horn Antenna	3115	EMCO	9704 – 5178	12/27/05	12/27/06
Signal Generator	8648D	HP	3613A00117	05/24/06	05/23/07
Dipole Antenna	3121C	EMCO	9707-1311	12/26/05	12/25/06

The level of confidence of 95% , the uncertainty of measurement of radiated emission is ± 3.44dB .

6.3 Test Result:

Antenna Polarity: Vertical Bandwidth: 12.5K

Frequency [MHz]	Signal Gen Level [dBm]	Cable Loss [dBm]	Tx Antenna Gain	Emission Level [dBm]	Limit [dBm]	Margin [dB]
1200.00	-65.00	2.17	6.56	-56.27	-20	-36.27
1600.00	-63.40	2.63	6.74	-54.03	-20	-34.03
3200.00	-55.50	4.36	9.45	-41.69	-20	-21.69
4000.00	-58.50	4.79	11.81	-41.90	-20	-21.90

Antenna Polarity: Horizontal Bandwidth: 12.5K

Frequency [MHz]	Signal Gen Level [dBm]	Cable Loss [dBm]	Tx Antenna Gain	Emission Level [dBm]	Limit [dBm]	Margin [dB]
1600.00	-61.20	2.63	6.74	-51.83	-20	-31.83
2000.00	-58.70	2.85	8.19	-47.66	-20	-27.66
2400.00	-61.50	3.08	8.27	-50.15	-20	-30.15
3200.00	-59.90	4.36	9.45	-46.09	-20	-26.09

Antenna Polarity: Vertical Bandwidth: 25K

Frequency [MHz]	Signal Gen Level [dBm]	Cable Loss [dBm]	Tx Antenna Gain	Emission Level [dBm]	Limit [dBm]	Margin [dB]
1200.00	-64.90	2.17	6.56	-56.17	-20	-36.17
1600.00	-61.80	2.63	6.74	-52.43	-20	-32.43
2000.00	-66.90	2.85	8.19	-55.86	-20	-35.86
2400.00	-65.60	3.08	8.27	-54.25	-20	-34.25

Antenna Polarity: Horizontal Bandwidth: 25K

Frequency [MHz]	Signal Gen Level [dBm]	Cable Loss [dBm]	Tx Antenna Gain	Emission Level [dBm]	Limit [dBm]	Margin [dB]
1600.00	-61.40	2.63	6.74	-52.03	-20	-32.03
2000.00	-59.50	2.85	8.19	-48.46	-20	-28.46
2400.00	-59.90	3.08	8.27	-48.55	-20	-28.55
3200.00	-51.80	4.36	9.45	-37.99	-20	-17.99

VII. Frequency Stability (Part 2.1055, 90.213)

7.1 Test procedure:(Temperature)

(1) Frequency shift vs. temperature:

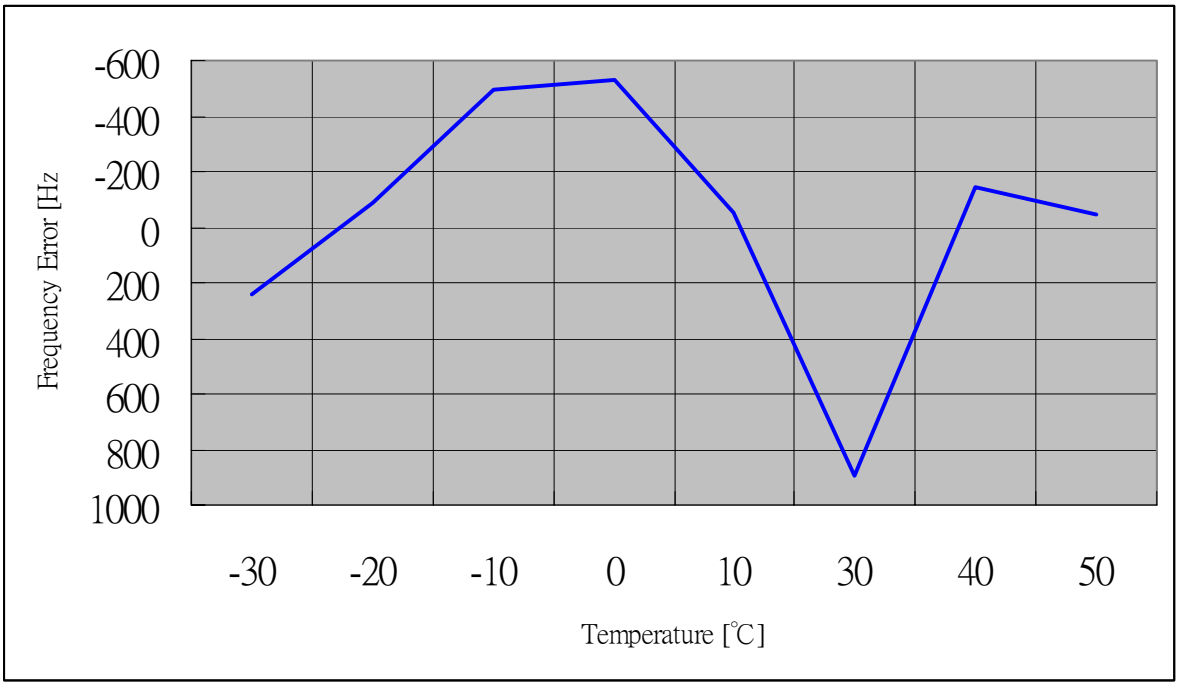
The nominal room temperature 20℃, and the reference frequency is 460.25000MHz.

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

7.2 Test Result:

Nominal Frequency: 425.000420MHz Bandwidth: 12.5K

Temperature [℃]	Frequency [MHz]	Frequency Error [Hz]	Limit (2.5PPM)	Error in PPM
-30℃	425.000178	242	1147	0.57
-20℃	425.000510	-90	1147	-0.21
-10℃	425.000914	-494	1147	-1.16
0℃	425.000952	-532	1147	-1.25
10℃	425.000476	-56	1147	-0.13
30℃	424.999528	892	1147	2.10
40℃	425.000562	-142	1147	-0.33
50℃	425.000464	-44	1147	-0.10



7.3 Test Equipment:

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum	8594EM	HP	3619A00198	03/21/06	03/20/07
DC Power Supply	GPC-3030D	LABORATORY		02/03/06	02/02/07
Temperature & Humidity Chamber	THS-ML1	King Son	240	09/15/05	09/14/06

The level of confidence of 95% , the uncertainty of measurement is ± 12Hz .

7.4 Test procedure:(voltage)

(1) Frequency shift vs. voltage:

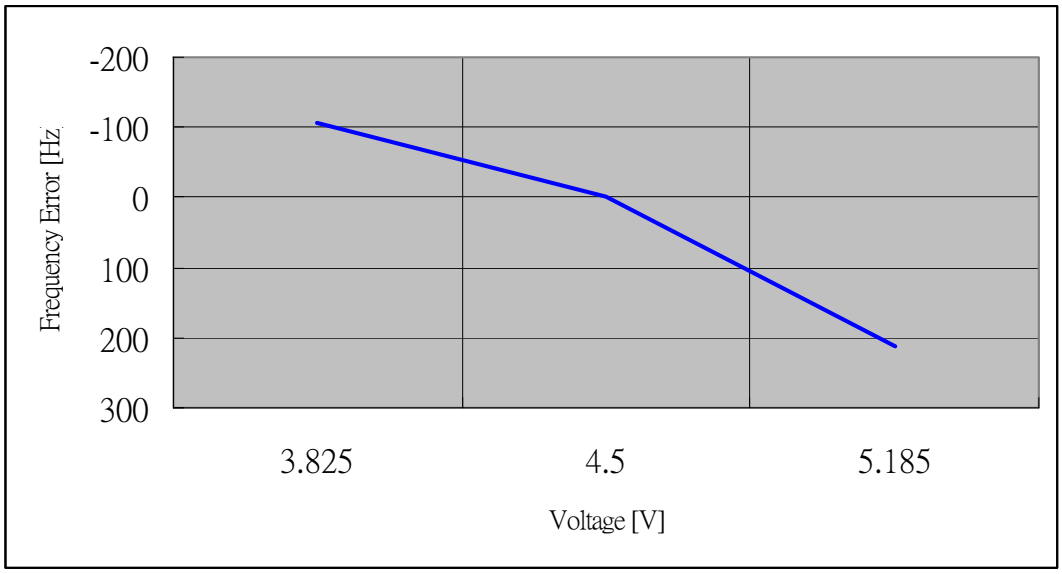
Nominal power is 8.4Vdc and the reference Frequency is 460.2500MHz

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

7.5 Test Result:

Nominal Frequency: 425.000420MHz Nominal Voltage: 4.5V Bandwidth: 12.5K

Voltage [V]	Frequency [MHz]	Frequency Error [Hz]	Limit (2.5PPM)	Error (PPM)	Pass/Fail
3.825	425.000526	-106	1147	-0.25	PASS
5.185	425.000208	212	1147	0.50	PASS



VIII. Conducted Emission Test (ANSI C63.4)

8.1 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.

8.2 Test Equipment:

				Calibration Date	
Instrument Name	**Model No.**	**Brand**	**Serial No.**	**Last time**	**Next time**
Receiver	SCR3102	SCHAFFNER	012	05/13/06	05/12/07
LISN (EUT)	3825/2	*EMCO*	9411-2284	07/21/05	07/20/06
LISN (Support E.)	3825/2	EMCO	9210-2007	09/03/05	09/02/06
Line switch box	CB-01	TRC	98-04	05/29/06	05/28/07
FTB-1-6 Attenuator	15542	mini-circuits	9620 03	05/29/06	05/28/07
20dB Attenuator	CAT-20	mini-circuits	9620 13	05/29/06	05/28/07
Coaxial Cable	BNC3200B-0058	Jyebao	CL-05	05/29/06	05/28/07
Coaxial Cable	BNC31VB-0316	Jyebao	IF-01ca0069-036	05/29/06	05/28/07
50ohm terminator	370BNM	NARDA	PWR5W	07/21/05	07/20/06
50ohm terminator	370BNM	NARDA	PWR5W	07/21/05	07/20/06
50ohm terminator	370BNM	NARDA	PWR5W	09/03/05	09/02/06
50ohm terminator	370BNM	NARDA	PWR5W	09/03/05	09/02/06

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

Test Result : N/A

IX. Transient Frequency Behavior (Part 90.214)

9.1 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).

9.2 Test Result:

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

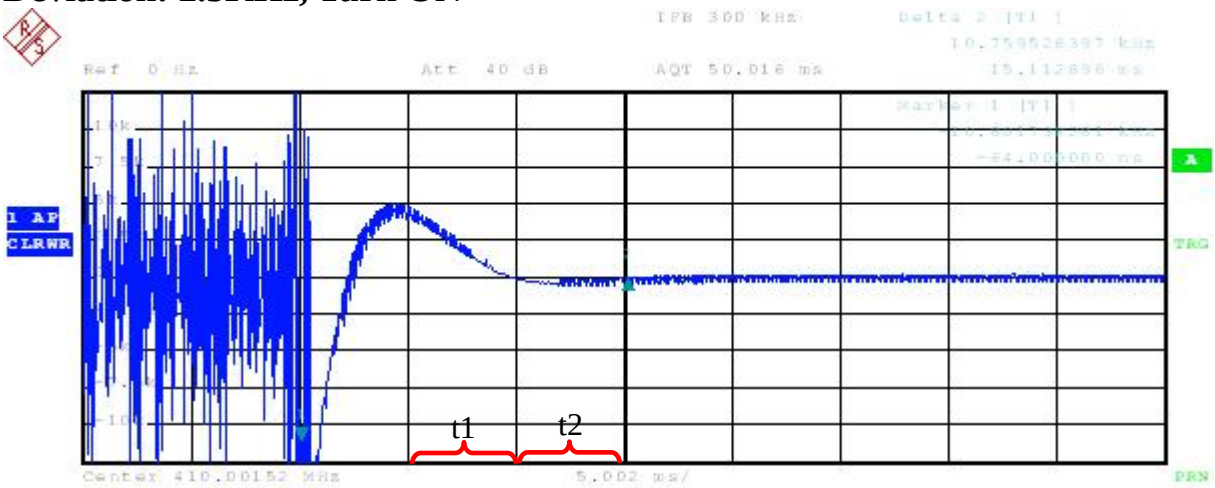
* See Figures 8－11

9.3 Test Equipment:

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Signal Generator	2030	MARCONI	119665/027	07/12/05	07/11/06
Oscilloscope	FSP13	ROHD&SCHWARZ	100126	05/25/06	05/24/07

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

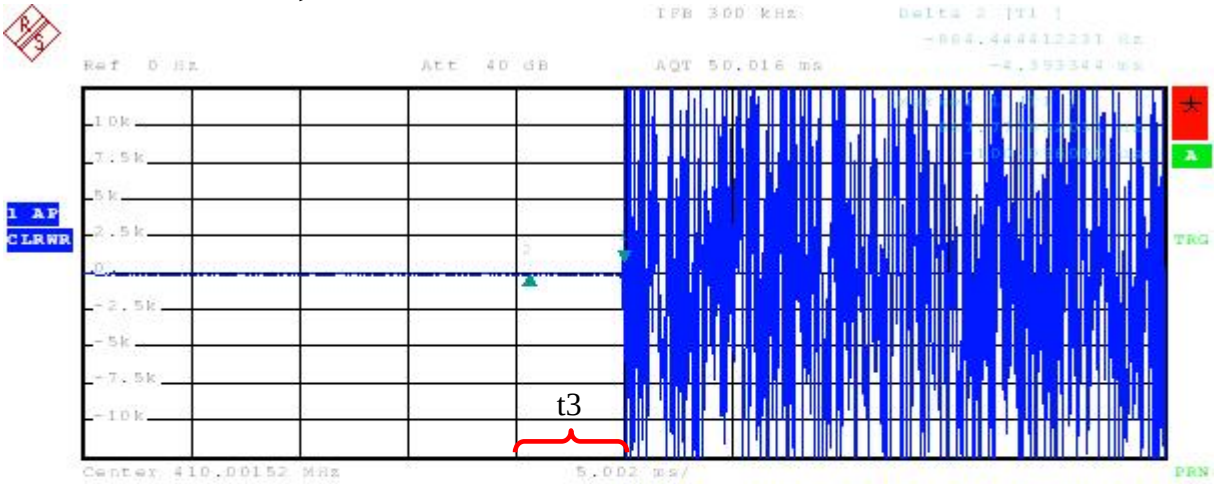
Measurement Result:
Frequency: 410MHz
Deviation: 2.5KHz, Turn ON



Frequency Modulation Summary

Coupling	DC		Carrier Offset	201.42	Hz
Deviation	+peak	26.27 kHz	Carrier Power	7.19	dBm
	-peak	-31.12 kHz	Modulation Frequency	---	Hz
	⇕peak/2	28.70 kHz	Sampling Rate	31.25	kHz
	RMS	3.835 kHz	Record Length	1564	
			Demod Bandwidth	25	kHz

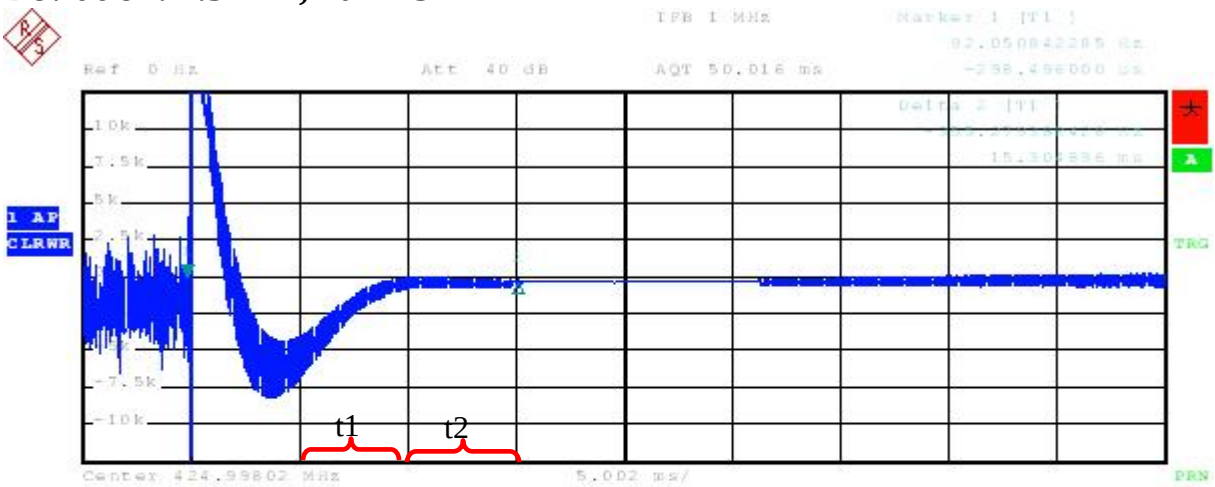
Deviation: 2.5KHz, Turn OFF



Frequency Modulation Summary

Coupling	DC		Carrier Offset	387.17	Hz
Deviation	+peak	30.82 kHz	Carrier Power	4.27	dBm
	-peak	-25.41 kHz	Modulation Frequency	---	Hz
	⇕peak/2	28.11 kHz	Sampling Rate	31.25	kHz
	RMS	6.947 kHz	Record Length	1564	
			Demod Bandwidth	25	kHz

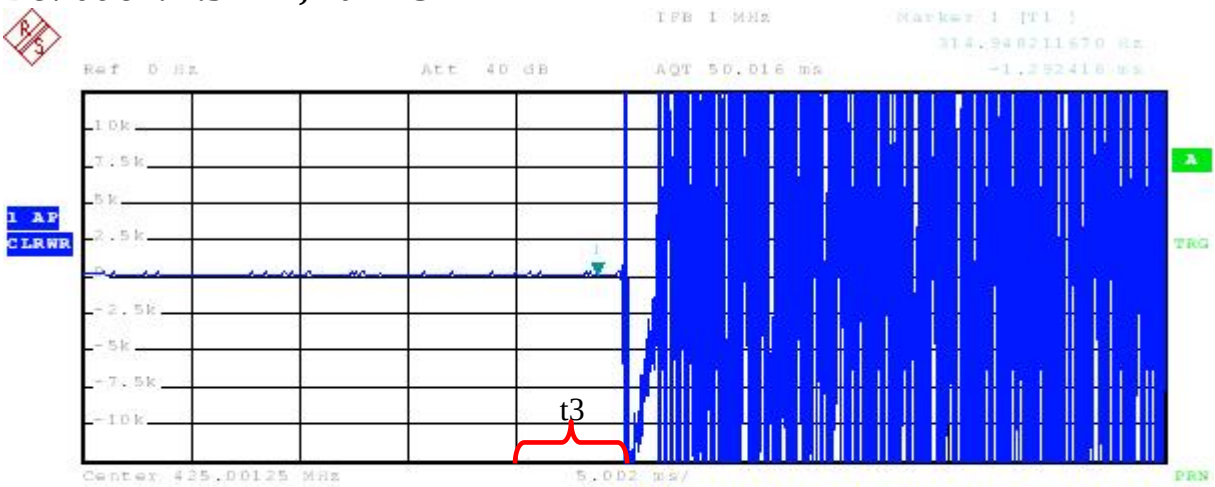
Frequency: 425MHz
Deviation: 2.5KHz, Turn ON



Frequency Modulation Summary

Coupling	DC		Carrier Offset	-525.28 Hz
Deviation	+peak	39.35 kHz	Carrier Power	4.80 dBm
	-peak	-31.15 kHz	Modulation Frequency	25.6150 kHz
	⇕peak/2	35.25 kHz	Sampling Rate	62.5 kHz
	RMS	14.82 kHz	Record Length	3127
			Demod Bandwidth	50 kHz

Deviation: 2.5KHz, Turn OFF



Frequency Modulation Summary

Coupling	DC		Carrier Offset	-282.41 Hz
Deviation	+peak	54.22 kHz	Carrier Power	0.93 dBm
	-peak	-50.33 kHz	Modulation Frequency	--- Hz
	⇕peak/2	52.28 kHz	Sampling Rate	62.5 kHz
	RMS	13.48 kHz	Record Length	3127
			Demod Bandwidth	50 kHz