

FCC Certification Test Report of *VHS 5W Transceiver*

Applicant : Gold Apollo Co., Ltd.
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Hsi-Chih, Taipei Hsien, Taiwan, R.O.C.

Model No. : TX125, TX125-EN

EUT : VHS 5W Transceiver

FCC ID : NDATX500XV

Report No. : G1590070063

Tested by :

Training Research Co., Ltd.

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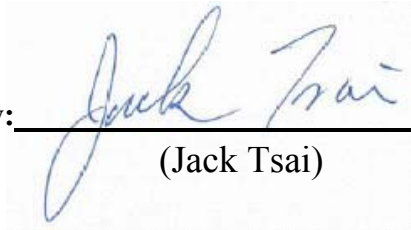
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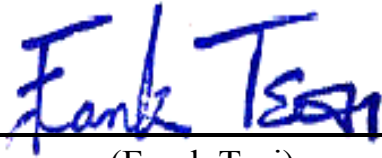
CERTIFICATION

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. 255, Nanyang Street, Shijr, Taipei Hsien 221, 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
(Jack Tsai)

Authorized by:  General Manager
(Frank Tsai)

Test date: 2007/8/13 to 2007/10/25

Issue date: 2007/11/7

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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 : VHF = 150MHz ~ 174MHz
2. Channel Spacings : 12.5KHz, 25KHz
3. RF Output Power : 5W, 1W
4. Modulation Type : F1D, F3E
5. Frequency Source :: Synthesizer
6. Power Supply : DC 10V ~ 14V
7. Temperature Range : -30°C ~ 50°C
8. Current Consumption

Standby : 100mA,

TX(5W) : < 2A,

TX(1W) : < 1A,

Transmitter:

1. Carrier Power

Hi : 5W + / -1 dB,

Low : 1W + / -1 dB,

2. Frequency Error : + / -2.5ppm

3. Frequency Deviation

25KHz Channel Spacing : 5KHz ~ 3.8KHz (Peak)

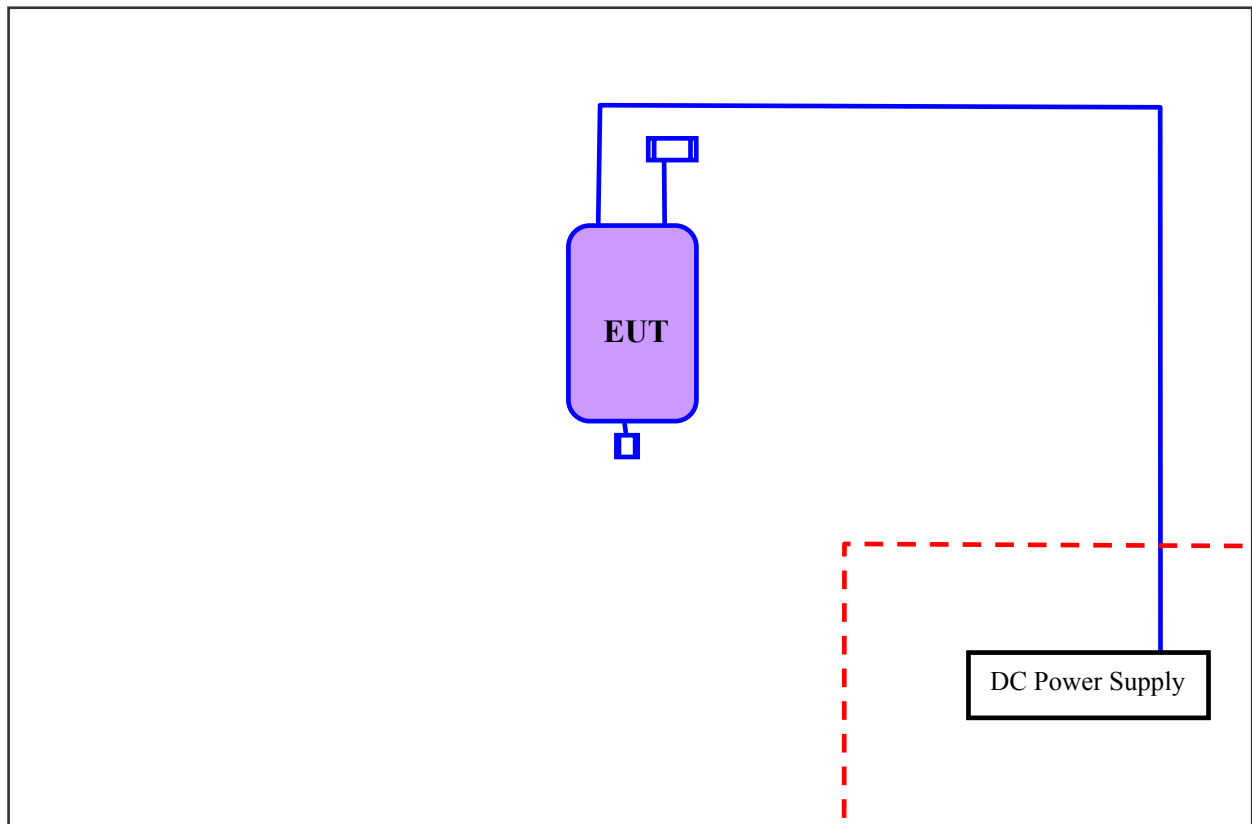
12.5KHz Channel Spacing : 2.5KHz ~ 1.8KHz (Peak)

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 1.5 m power cable connected to the DC power supply that located under table
- *RS-232 port --- via 1.4 m data cable that terminated.
- *Antenna port --- with a 50ohm terminated.

List of support equipment

DC Power Supply	:	Aglient
Model No.	:	E3615A
Serial No.	:	KR83506761
FCC ID	:	N/A
Power type	:	AC 100 –127, 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 required by the rules were performed on the **three-meter, Anechoic Chamber (FCC 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 other test items were performed in a anechoic chamber also located at Training Research Co., Ltd.

No. 255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. *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 $\pm$ 4°C maintained.

Relative Humidity : 60% $\pm$ 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 : 13.8dc

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.

Audio (AN): 12.5kHz channel spacing.

Using the formulas contained in Par 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: 2.0 kHz

Where M = maximum modulation frequency: 2.5 kHz

$$B_n = 9 \text{ kHz}$$

This is confirmed in the emission designation, **9K00F3E**, declared by the client.

Digital (NB): 12.5KHz channel spacing.

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: 0.6 kHz

$$B_n = 6.2 \text{ kHz}$$

This is confirmed in the emission designation, **6K20F1D**, declared by the client.

Digital (WB): 25.0KHz channel spacing.

Using the formulas contained in Part 2.202 the necessary bandwidth calculation for the 25.0 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: 0.6 kHz

$$B_n = 6.2 \text{ kHz}$$

This is confirmed in the emission designation, **11K2F1D**, declared by the client.

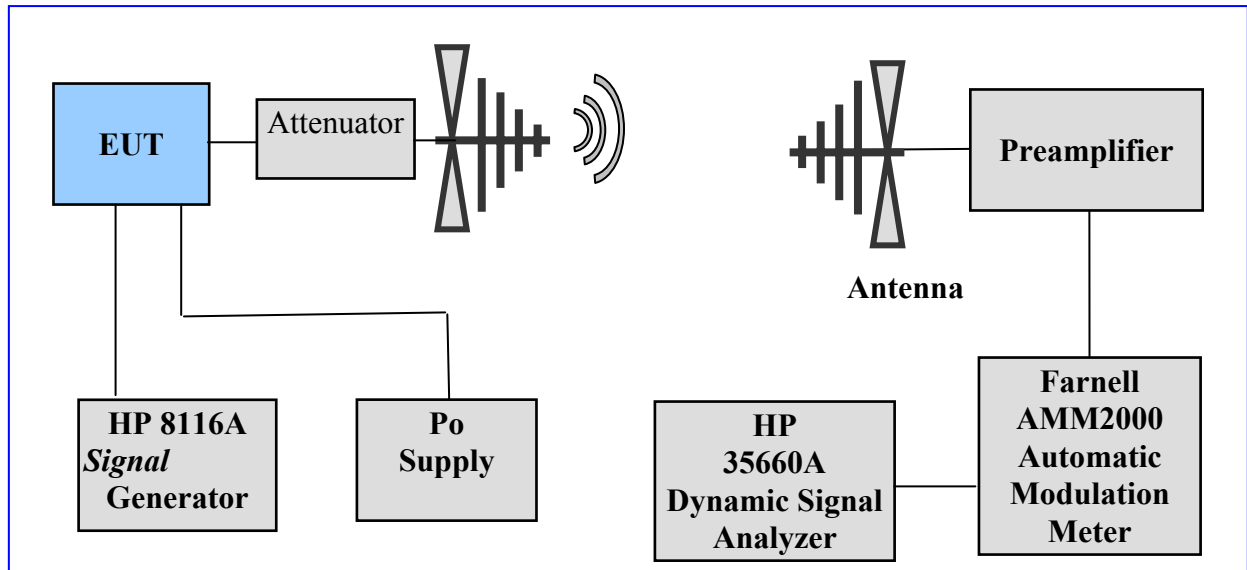
III. Modulation Characteristics: (Part 2.1047)

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 13.8kHz 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 as follow pages.

Instrument Name	Model No	Brand	Serial No.	Next time
Dynamic Signal Analyzer	35660A	HP	2816A00198	12/10/07
Signal Generator 50 MHz	8116A	HP	2910G10000	12/10/07
Automatic Modulation Meter	AMM2000	Farnell	000135	12/11/07
Bi-log Antenna	9168	SCHWARZBECK	231, 232	10/31/07
Preamplifier	PA1F	TRC	1FAC	04/10/08
Spectrum Analyzer	8564E	HP	3720A00840	12/11/07

Measurement Result:

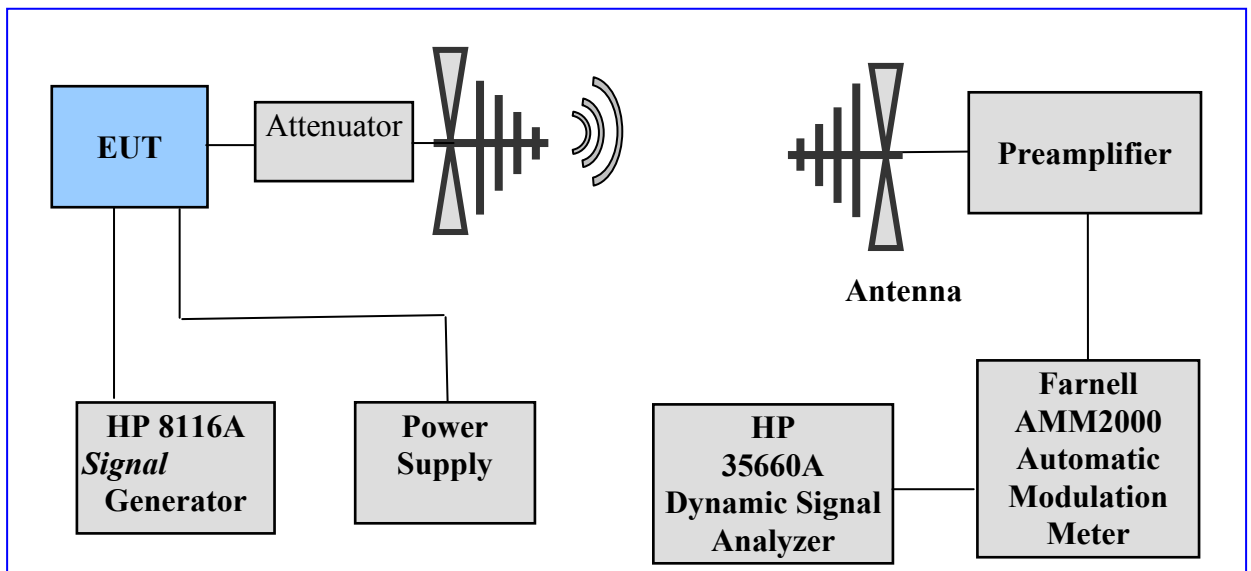


3.2 Audio Frequency Response Test procedure:

Definition

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

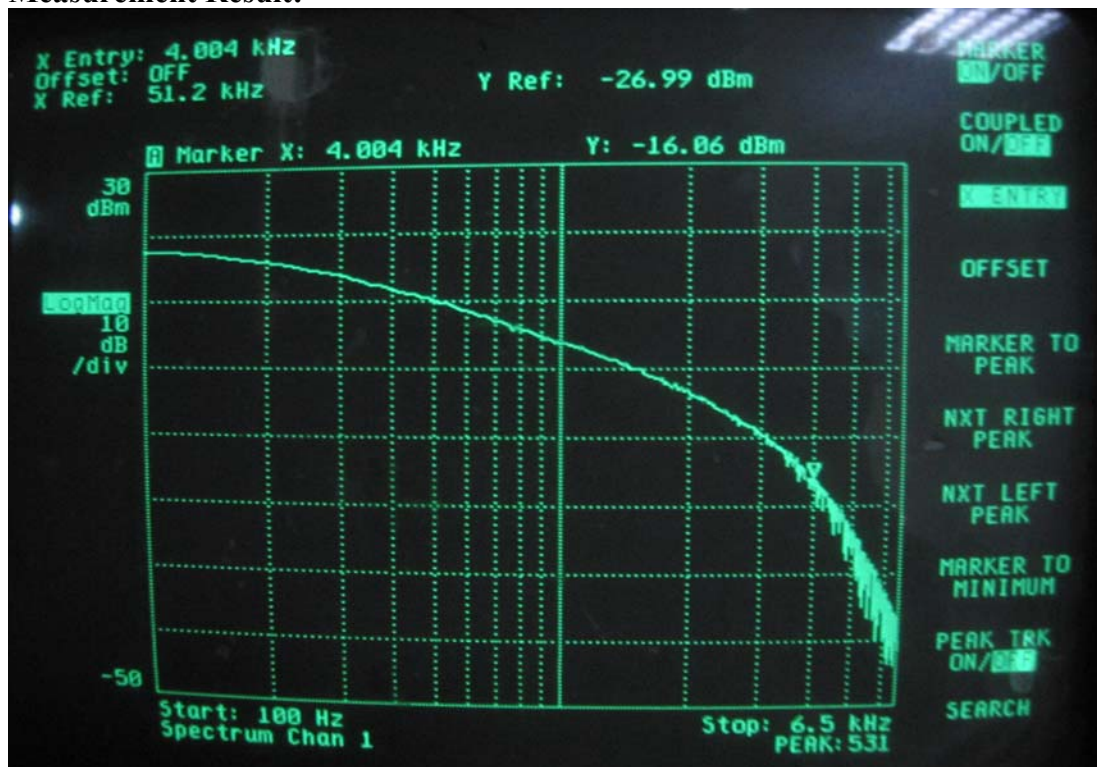
Method of measurement



- (1) Connect the equipment as illustrated.
- (2) The signal generator was transmitting modulation signal to the EUT.
- (3) From 100Hz to 6.5kHz 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 as follow pages

Instrument Name	Model No	Brand	Serial No.	Next time
Dynamic Signal Analyzer	35660A	HP	2816A00198	12/10/07
Signal Generator 50 MHz	8116A	HP	2910G10000	12/10/07
Automatic Modulation Meter	AMM2000	Farnell	000135	12/11/07
Bi-log Antenna	9168	SCHWARZBECK	231, 232	10/31/07
Preamplifier	PA1F	TRC	1FAC	04/10/08
Spectrum Analyzer	8564E	HP	3720A00840	12/11/07

Measurement Result:

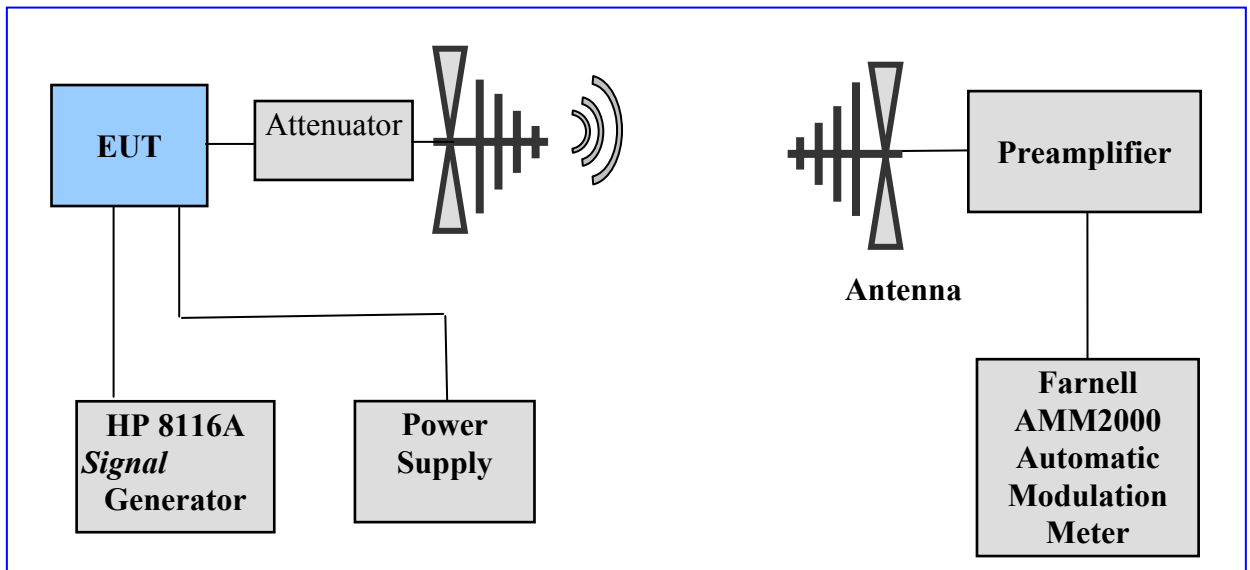


3.3 Modulation Limiting Test procedure:

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, 1kHz, 2kHz and 2.5kHz.
- (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 as follow pages

Instrument Name	Model No	Brand	Serial No.	Next time
Signal Generator 50 MHz	8116A	HP	2910G10000	12/10/07
Automatic Modulation Meter	AMM2000	Farnell	000135	12/11/07
Bi-log Antenna	9168	SCHWARZBECK	231, 232	10/31/07
Preamplifier	PA1F	TRC	1FAC	04/10/08

Chart 3.1 Modulation Limiting Measuerment Positive

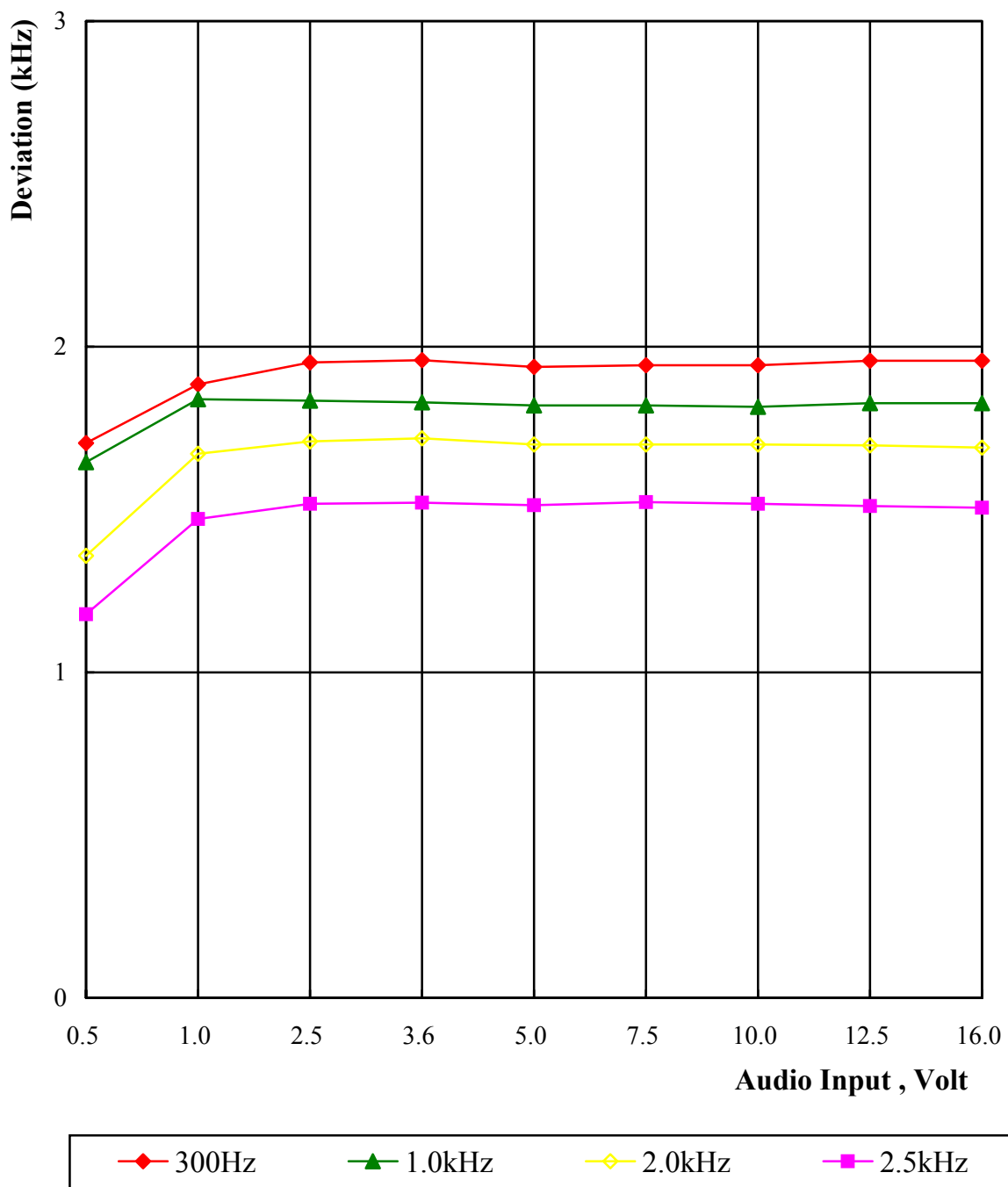
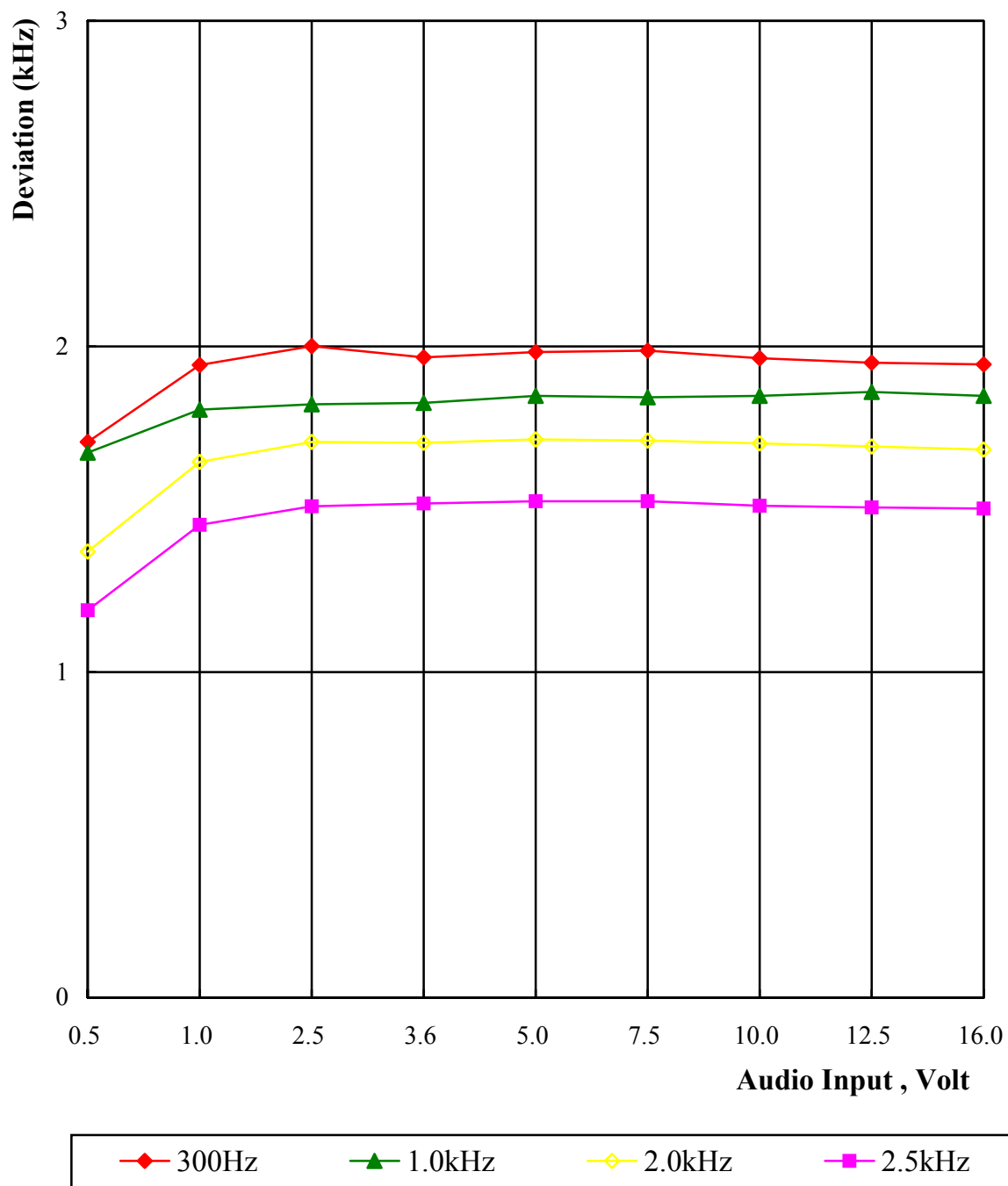


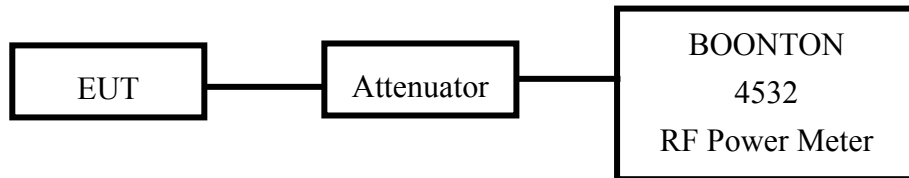
Chart 3.2 Modulation Limiting Measuerment Nagaitive



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 60 dB attenuator and cable loss.



4.2 Test Result:

	Modulation	Channel Spacing (KHz)	Frequency (MHz)	Output power (dBm)	Power (W)
5W	AN	12.5	150.075	37.49	5.610
5W	NB	12.5	150.075	35.90	3.890
5W	WB	25	150.075	35.80	3.802
5W	AN	12.5	162	37.90	6.166
5W	NB	12.5	162	36.09	4.064
5W	WB	25	162	35.99	3.972
5W	AN	12.5	173.925	38.06	6.397
5W	NB	12.5	173.925	36.25	4.217
5W	WB	25	173.925	36.30	4.266
1W	AN	12.5	150.075	31.08	1.282
1W	NB	12.5	150.075	30.50	1.122
1W	WB	25	150.075	30.56	1.138
1W	AN	12.5	162	31.02	1.265
1W	NB	12.5	162	30.68	1.694
1W	WB	25	162	30.69	1.172
1W	AN	12.5	173.925	31.16	1.306
1W	NB	12.5	173.925	30.95	1.245
1W	WB	25	173.925	30.88	1.225

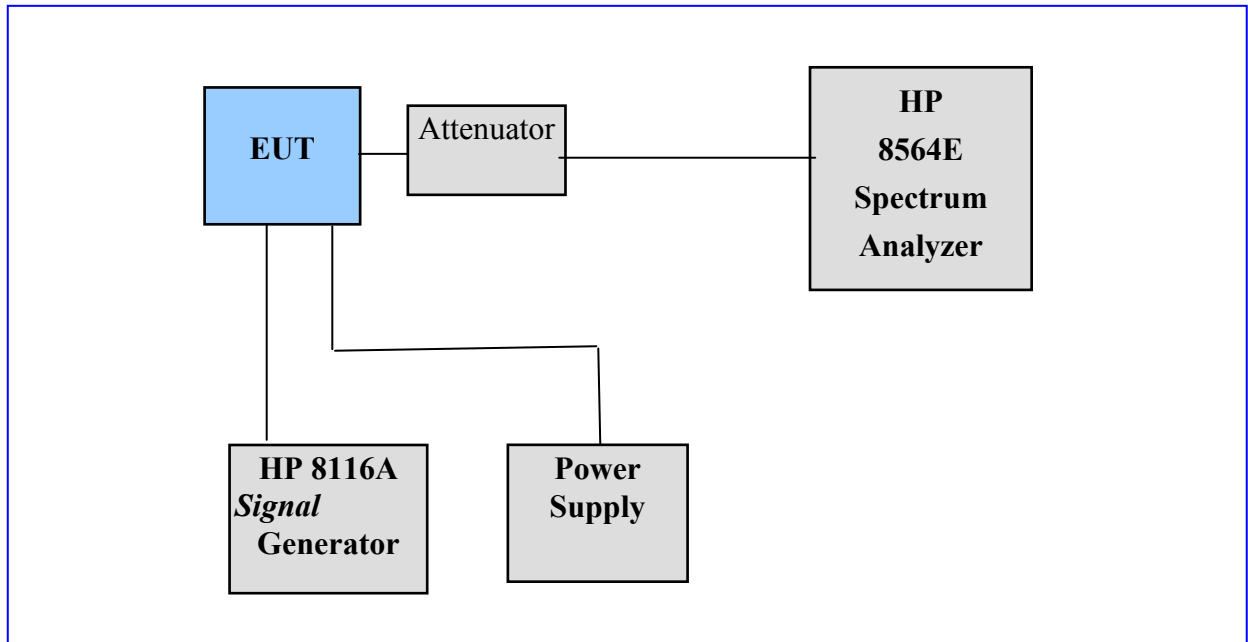
4.3 Test Equipment:

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
RF Power Meter	4532	BOONTON	117501	06/11/07	06/11/08
Peak Power Sensor	57340	BOONTON	2698	06/11/07	06/11/08

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

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) 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 as follow pages.

Instrument Name	Model No	Brand	Serial No.	Next time
Signal Generator 50 MHz	8116A	HP	2910G10000	12/10/07
Spectrum Analyzer	8564E	HP	3720A00840	12/11/07

Part 2.1049 (c) Emission bandwidth:**Part 90.210 (b) Emission Mask B – 25kHz Channel Spacing**

Data in the plots show that on any frequency removed from the assigned frequency by more than 50%, but not more than 100%: At least 25dB. On any frequency removed from the assigned frequency by more than 100%, but not more than 250%: At least 35dB. On any frequency removed from the assigned frequency by more than 250%, of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

Part 90.210 (d) Emission Mask D – 12.5kHz Channel BW equipment

For transmitters designed to operate with a 12.5kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

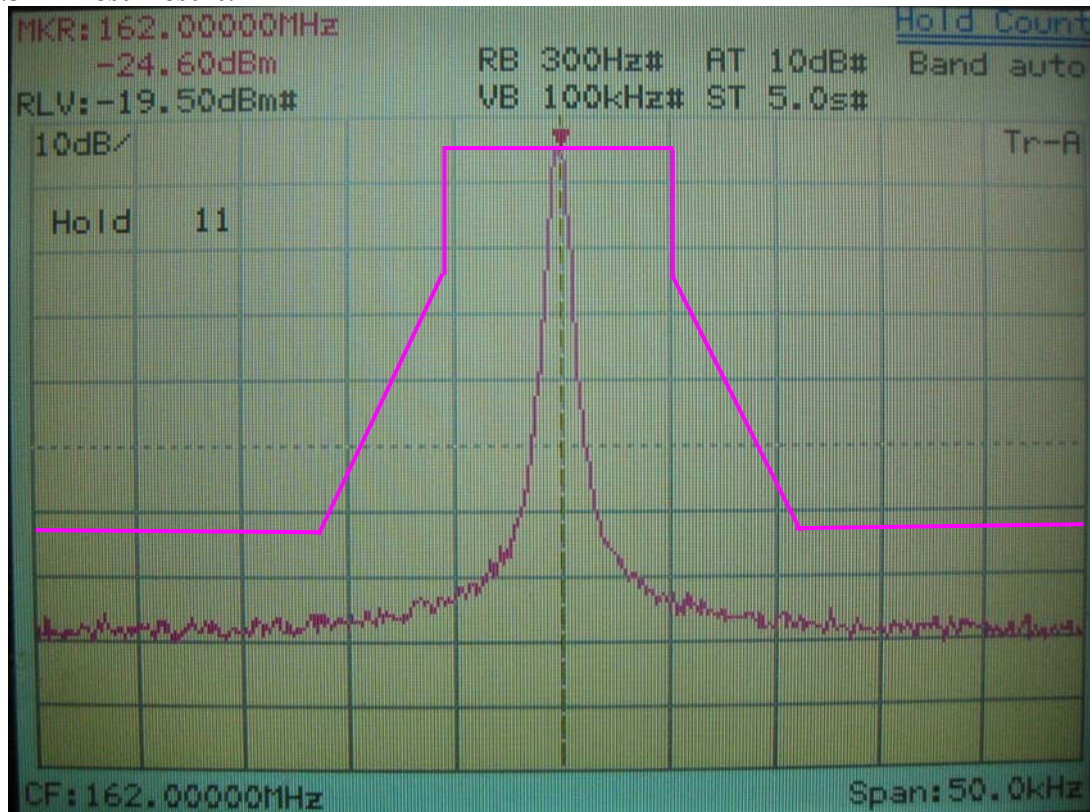
- (1) On any frequency from the center of the authorized bandwidth f_0 to 5.625kHz removed from f_0 : Zero dB.
- (2) On any frequency from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.625 kHz but no more than 12.5kHz: At least $7.27 (f_d - 2.88\text{kHz})$ dB.
- (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10 \log (P)$ dB or 70 dB, whichever is the lesser attenuation.

5.2 Test Equipment:

Instrument Name	Model No.	Brand	Serial No.	Next time
Spectrum Analyzer	MS2665C	Anritsu	6200175476	12/11/07

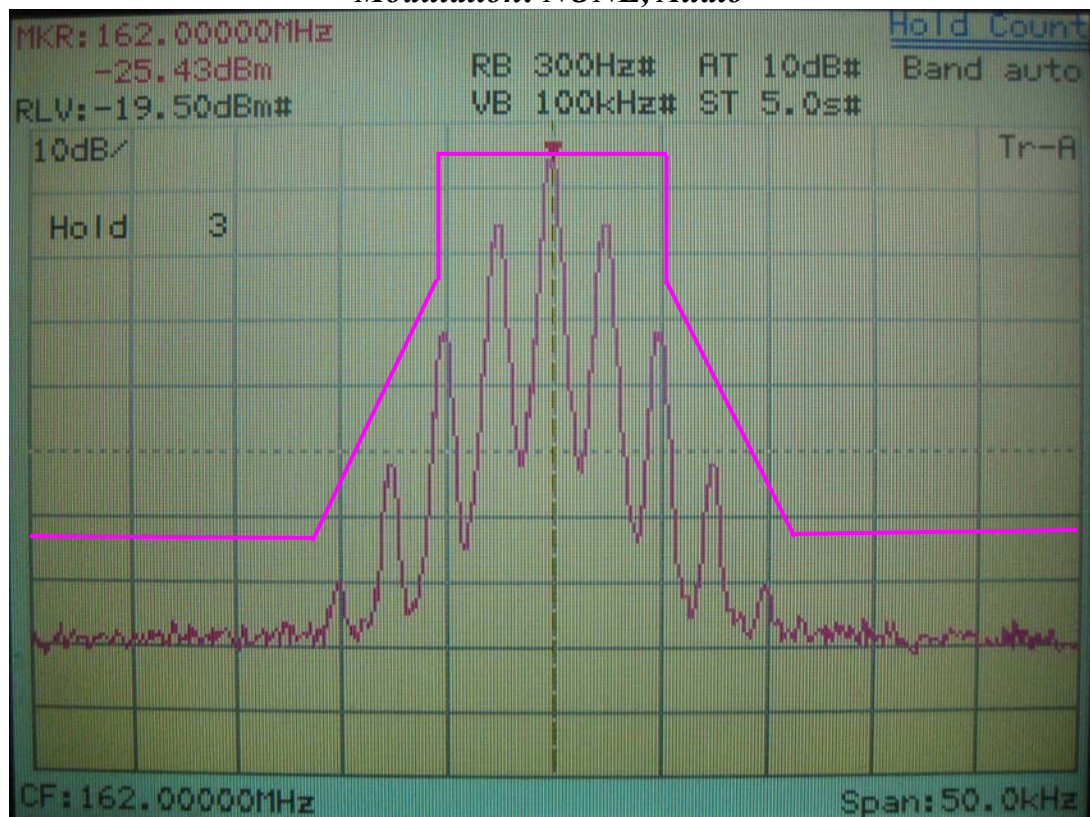
The level of confidence of 95% , the uncertainty of measurement is ± 12 Hz .

5.3 Test Result:



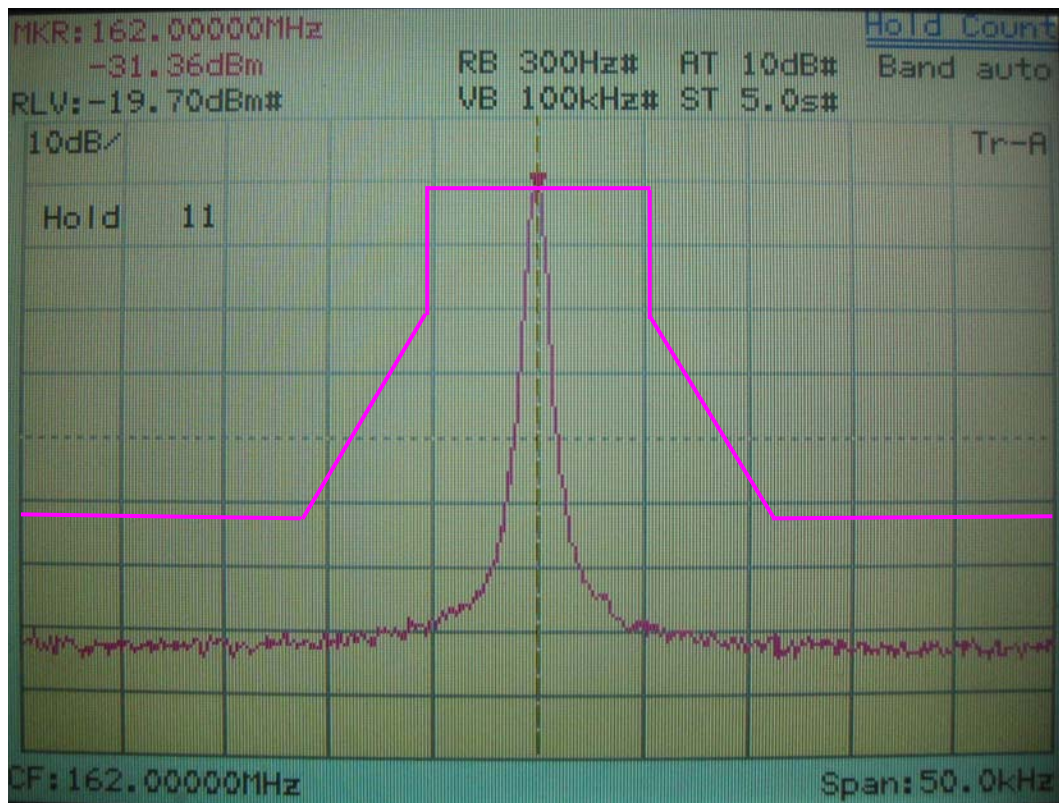
Power: 5W

Modulation: NONE, Audio



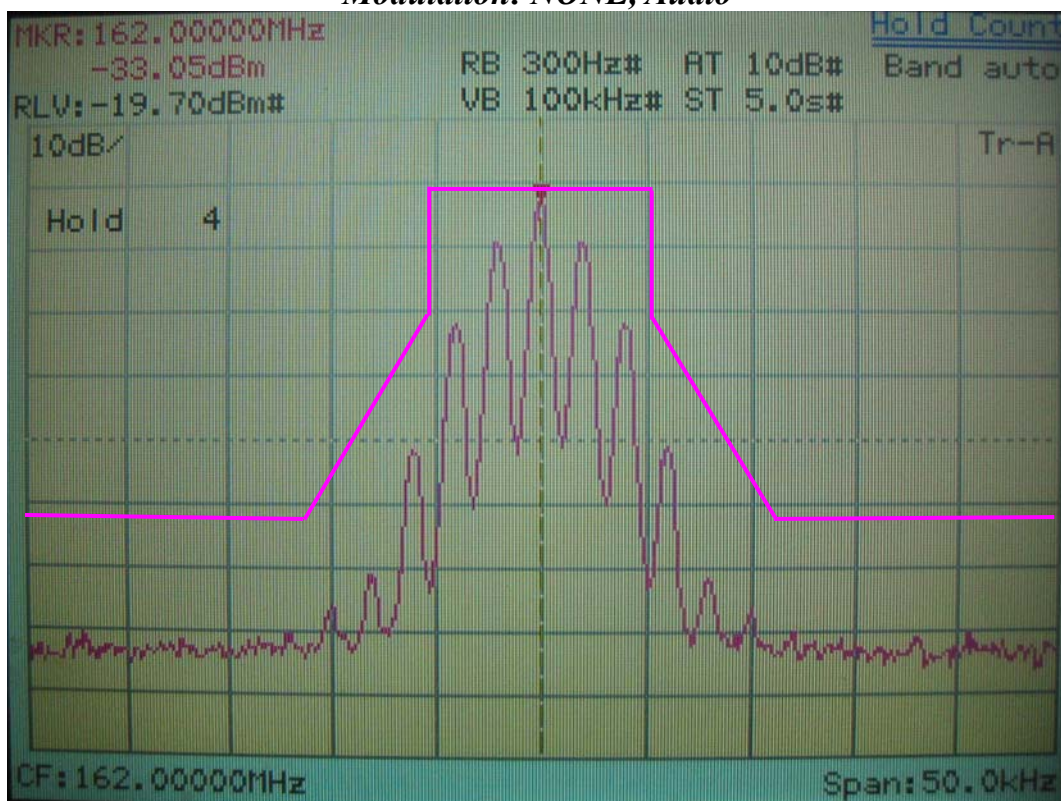
Power: 5W

Modulation: Mask D, Audio



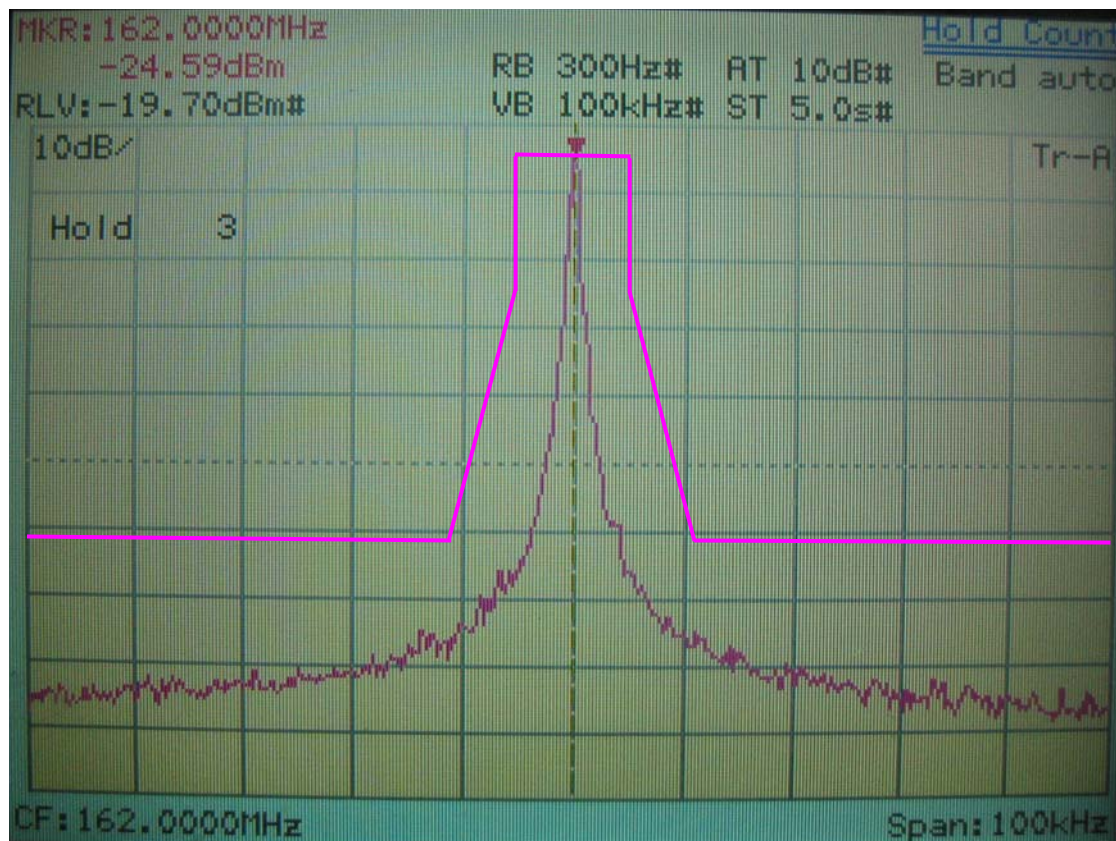
Power: 1W

Modulation: NONE, Audio



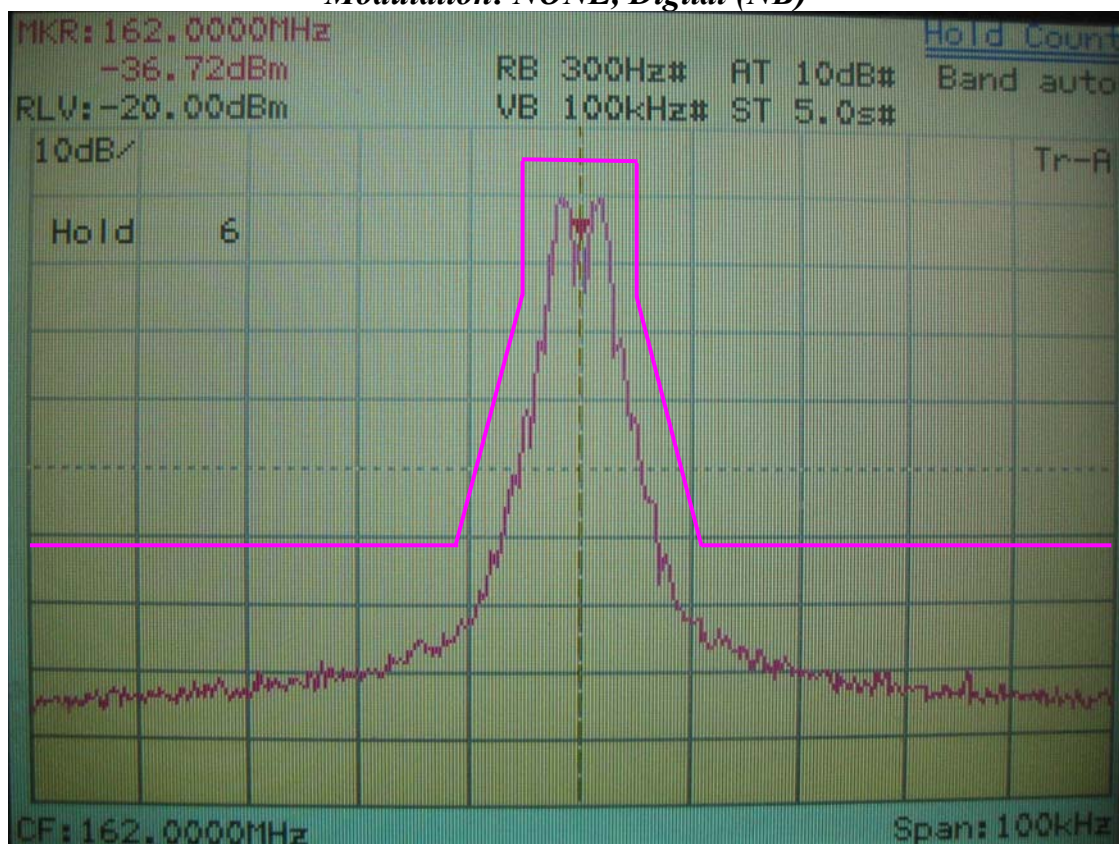
Power: 1W

Modulation: Mask D, Audio



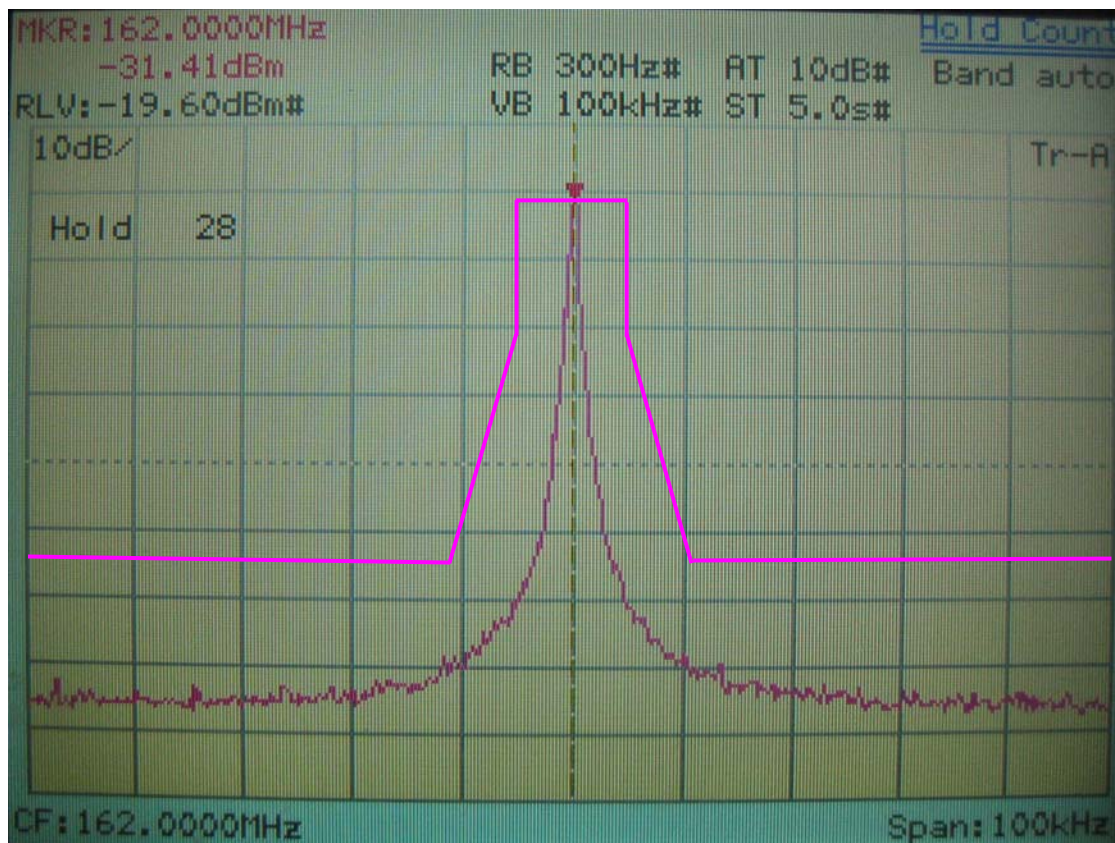
Power: 5W

Modulation: NONE, Digital (NB)



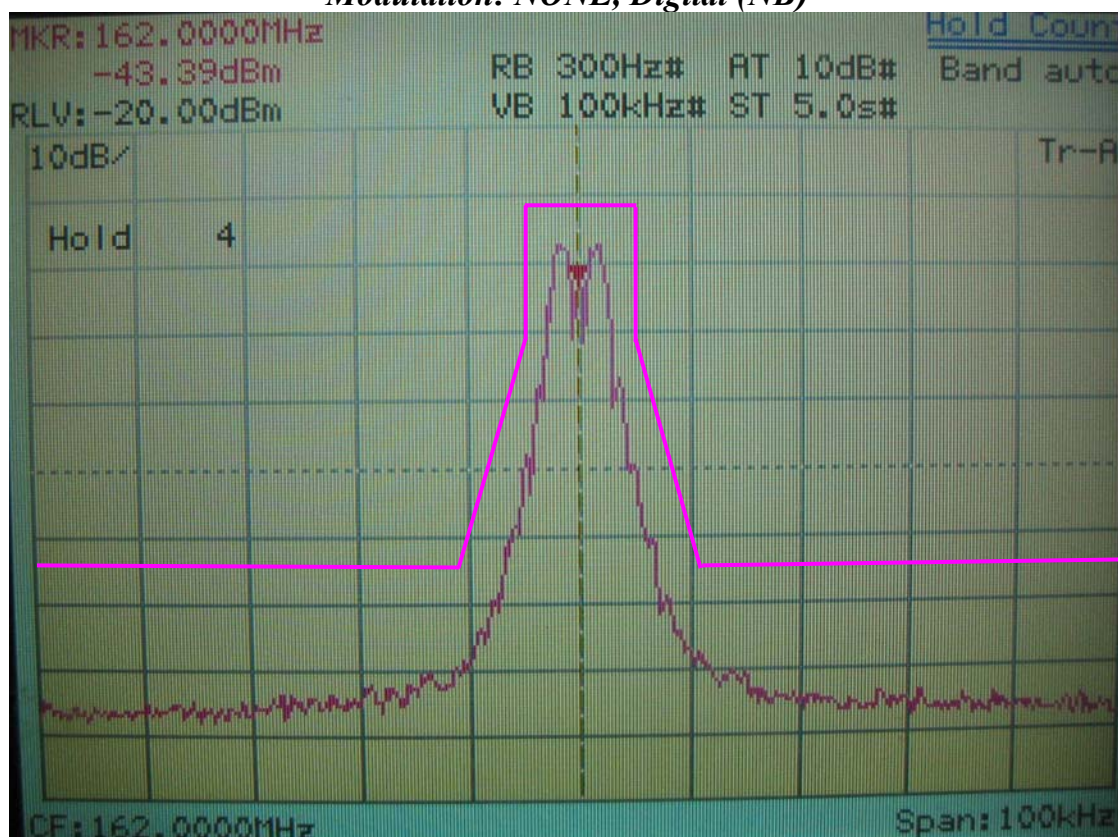
Power: 5W

Modulation: Mask D, Digital (NB)



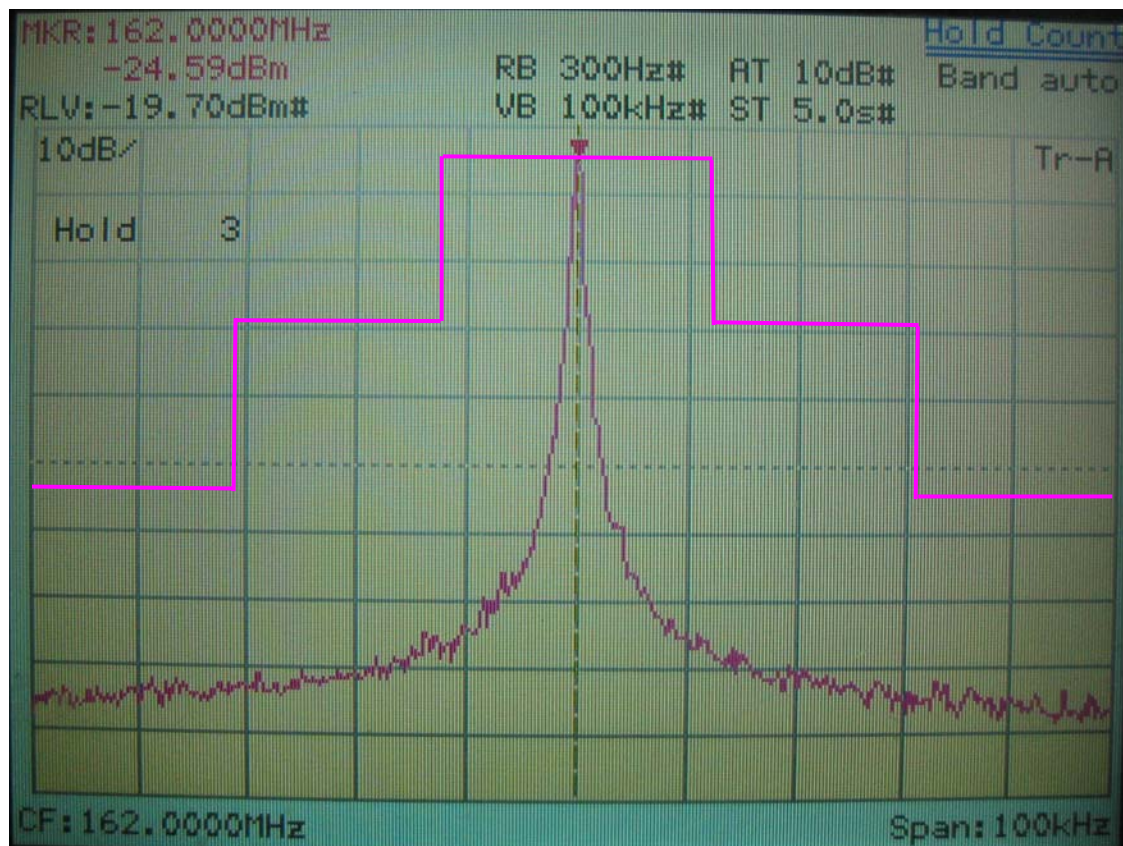
Power: 1W

Modulation: NONE, Digital (NB)



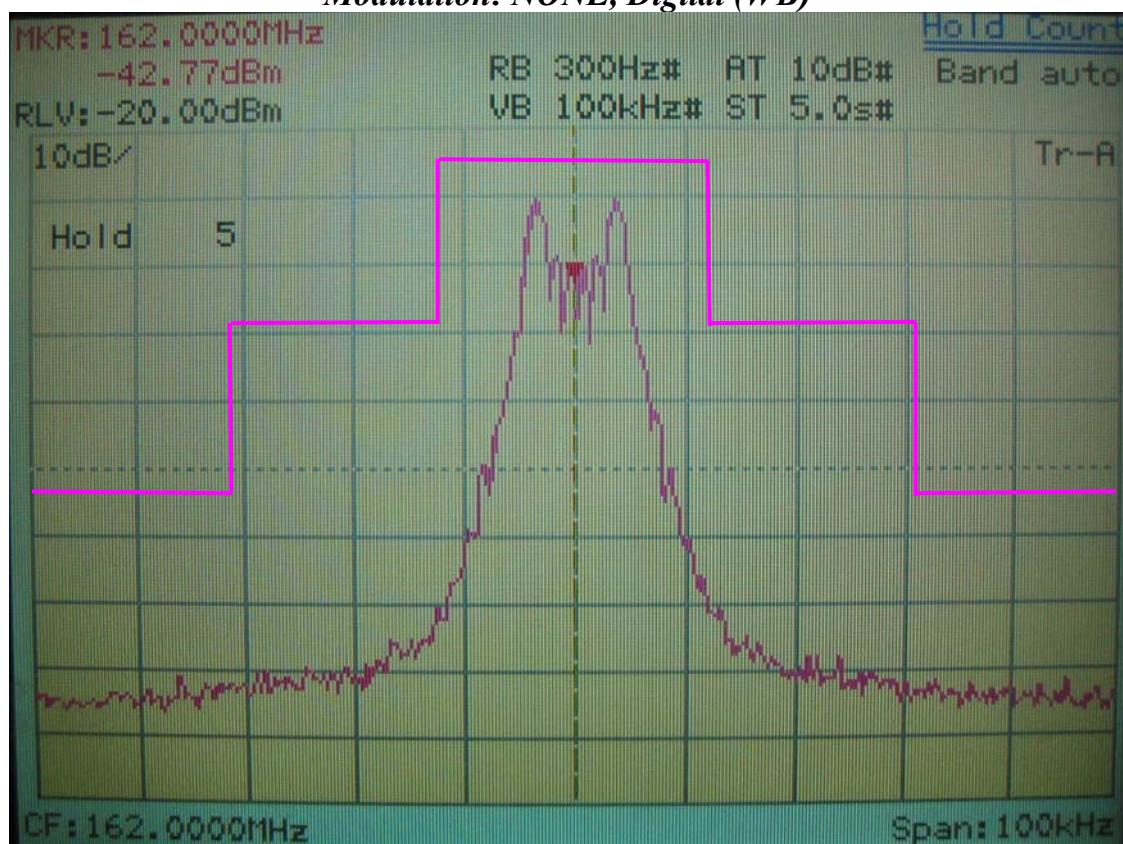
Power: 1W

Modulation: Mask D, Digital (NB)



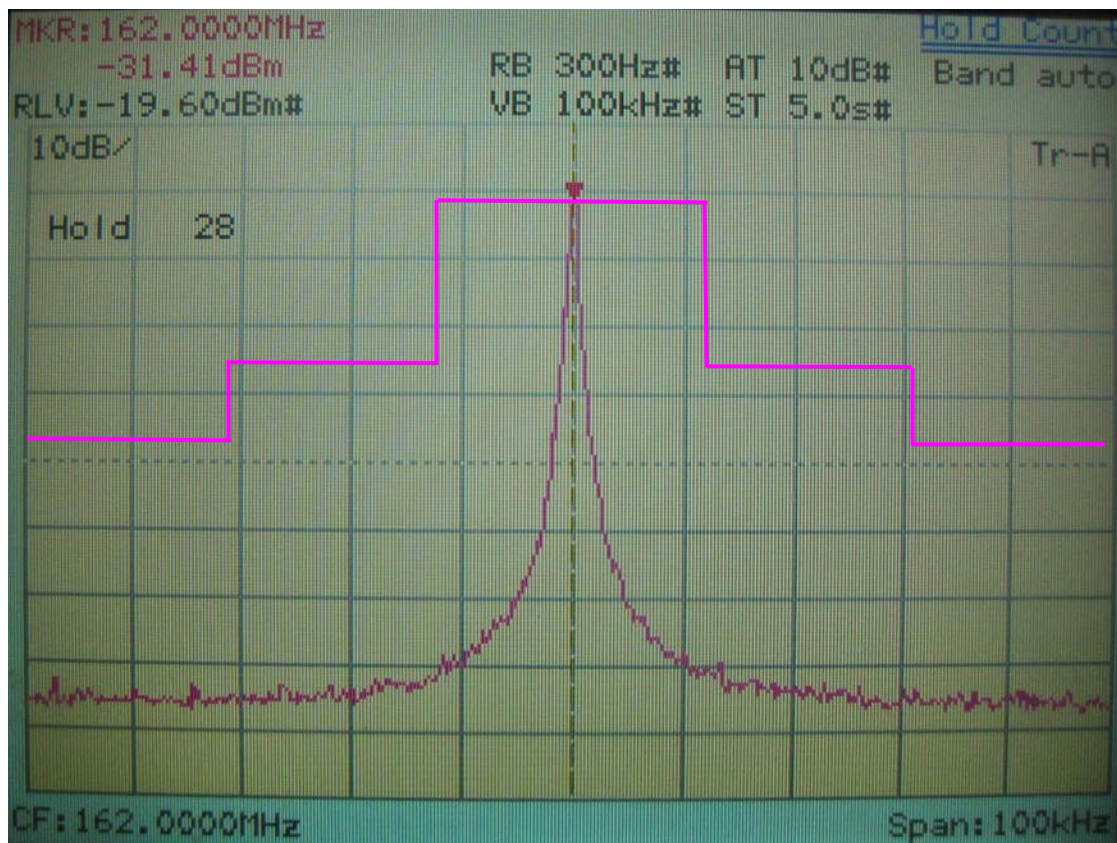
Power: 5W

Modulation: NONE, Digital (WB)



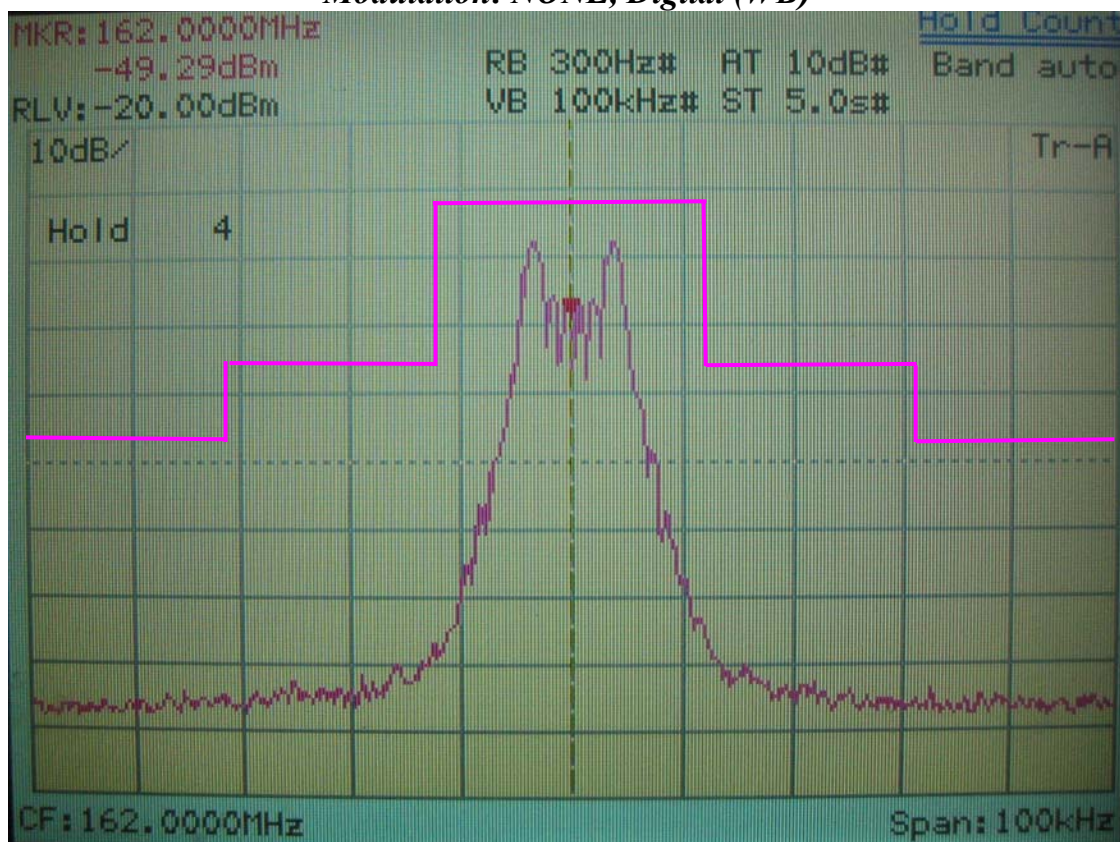
Power: 5W

Modulation: Mask D, Digital (WB)



Power: 1W

Modulation: NONE, Digital (WB)



Power: 1W

Modulation: Mask D, Digital (WB)

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) Record value as below.

6.2 Test Equipment:

Instrument Name	Model No.	Brand	Serial No.	Next time
Spectrum Analyzer	MS2665C	Anritsu	6200175476	12/11/07

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

6.3 Test Result:

Rule Part No.: Part 2.1051(a)

Requirements:

FCC Limit for:

25kHz Channel Spacing: At least $43 + 10 \log (P)$ dB

12.5kHz Channel Spacing: At least $50 + 10 \log (P)$ dB

Method of Measurement: The spectrum was scanned from 30MHz to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard TIA/EIA-603

FCC Limit:

Channel Spacing			Limit (Minimum dBc)
AN (12.5kHz)	5W	Lowest CH	57.48
		Middle CH	57.90
		Highest CH	58.05
	1W	Lowest CH	51.07
		Middle CH	51.29
		Highest CH	51.15
NB (12.5kHz)	5W	Lowest CH	55.89
		Middle CH	56.08
		Highest CH	56.25
	1W	Lowest CH	50.49
		Middle CH	52.28
		Highest CH	50.95
WB (25.0kHz)	5W	Lowest CH	48.80
		Middle CH	48.99
		Highest CH	49.30
	1W	Lowest CH	43.56
		Middle CH	43.68
		Highest CH	43.88

Audio (AN): Lowest CH

RF Output 5W	Operating Frequency	dB below carrier	Limited (Minimum dBc)	RF Output 1W	Operating Frequency	dB below carrier	Limited (Minimum dBc)
12.5kHz	150.075	0	57.48	12.5kHz	150.075	0	51.07
	300.15	65.26			300.15	56.36	
	450.225	67.99			450.225	70.18	
	600.300	80.06			600.300	74.19	
	750.375	80.77			750.375	74.80	
	900.45	81.16			900.45	74.28	
	1050.525	80.74			1050.525	75.22	
	1200.600	80.65			1200.600	75.13	
	1350.675	80.37			1350.675	74.86	
	1500.750	80.40			1500.750	75.27	

Audio (AN): Middle CH

RF Output 5W	Operating Frequency	dB below carrier	Limited (Minimum dBc)	RF Output 1W	Operating Frequency	dB below carrier	Limited (Minimum dBc)
12.5kHz	162.000	0	57.90	12.5kHz	162.000	0	51.29
	324.000	64.54			324.000	56.72	
	486.000	71.18			486.000	71.08	
	648.000	80.93			648.000	74.69	
	810.000	81.26			810.000	74.99	
	972.000	81.10			972.000	73.90	
	1134.000	80.56			1134.000	74.77	
	1296.000	81.17			1296.000	74.82	
	1458.000	80.83			1458.000	74.33	
	1620.000	79.98			1620.000	74.99	

Audio (AN): Highest CH

RF Output 5W	Operating Frequency	dB below carrier	Limited (Minimum dBc)	RF Output 1W	Operating Frequency	dB below carrier	Limited (Minimum dBc)
12.5kHz	173.925	0	58.05	12.5kHz	173.925	0	51.15
	347.850	65.26			347.850	56.26	
	521.775	72.77			521.775	70.43	
	695.700	81.24			695.700	74.21	
	869.625	81.15			869.625	74.41	
	1043.55	80.12			1043.55	74.67	
	1217.475	80.96			1217.475	75.70	
	1391.400	81.27			1391.400	75.37	
	1565.325	80.48			1565.325	75.08	
	1739.250	80.21			1739.250	75.40	

Digital (NB): Lowest CH

RF Output 5W	Operating Frequency	dB below carrier	Limited (Minimum dBc)	RF Output 1W	Operating Frequency	dB below carrier	Limited (Minimum dBc)
12.5kHz	150.075	0	55.89	12.5kHz	150.075	0	50.49
	300.15	65.84			300.15	51.25	
	450.225	69.99			450.225	72.12	
	600.300	78.91			600.300	72.35	
	750.375	80.46			750.375	73.78	
	900.45	79.53			900.45	73.59	
	1050.525	80.39			1050.525	73.35	
	1200.600	80.30			1200.600	72.83	
	1350.675	80.19			1350.675	72.76	
	1500.750	79.14			1500.750	72.97	

Digital (NB): Middle CH

RF Output 5W	Operating Frequency	dB below carrier	Limited (Minimum dBc)	RF Output 1W	Operating Frequency	dB below carrier	Limited (Minimum dBc)
12.5kHz	162.000	0	56.08	12.5kHz	162.000	0	52.28
	324.000	68.49			324.000	53.46	
	486.000	71.51			486.000	73.28	
	648.000	80.25			648.000	74.00	
	810.000	81.70			810.000	73.72	
	972.000	80.11			972.000	73.21	
	1134.000	80.25			1134.000	73.39	
	1296.000	80.14			1296.000	73.02	
	1458.000	79.89			1458.000	73.53	
	1620.000	79.67			1620.000	73.12	

Digital (NB): Highest CH

RF Output 5W	Operating Frequency	dB below carrier	Limited (Minimum dBc)	RF Output 1W	Operating Frequency	dB below carrier	Limited (Minimum dBc)
12.5kHz	173.925	0	56.25	12.5kHz	173.925	0	50.95
	347.850	67.82			347.850	62.76	
	521.775	72.13			521.775	73.65	
	695.700	80.63			695.700	75.60	
	869.625	79.85			869.625	74.24	
	1043.55	80.40			1043.55	73.65	
	1217.475	80.97			1217.475	73.92	
	1391.400	80.95			1391.400	73.15	
	1565.325	80.97			1565.325	73.35	
	1739.250	80.05			1739.250	73.01	

Digital (WB): Lowest CH

RF Output 5W	Operating Frequency	dB below carrier	Limited (Minimum dBc)	RF Output 1W	Operating Frequency	dB below carrier	Limited (Minimum dBc)
25.0kHz	150.075	0	48.80	25.0kHz	150.075	0	43.56
	300.15	66.34			300.15	51.57	
	450.225	69.87			450.225	72.34	
	600.300	79.28			600.300	72.26	
	750.375	80.47			750.375	74.29	
	900.45	79.95			900.45	73.67	
	1050.525	80.31			1050.525	73.61	
	1200.600	80.60			1200.600	73.72	
	1350.675	80.22			1350.675	72.79	
	1500.750	79.58			1500.750	73.18	

Digital (WB): Middle CH

RF Output 5W	Operating Frequency	dB below carrier	Limited (Minimum dBc)	RF Output 1W	Operating Frequency	dB below carrier	Limited (Minimum dBc)
25.0kHz	162.000	0	48.99	25.0kHz	162.000	0	43.68
	324.000	68.50			324.000	52.45	
	486.000	71.70			486.000	71.99	
	648.000	79.41			648.000	73.41	
	810.000	80.76			810.000	73.65	
	972.000	80.01			972.000	73.84	
	1134.000	80.13			1134.000	72.95	
	1296.000	80.85			1296.000	72.73	
	1458.000	80.54			1458.000	73.57	
	1620.000	80.04			1620.000	72.81	

Digital (WB): Highest CH

RF Output 5W	Operating Frequency	dB below carrier	Limited (Minimum dBc)	RF Output 1W	Operating Frequency	dB below carrier	Limited (Minimum dBc)
25.0kHz	173.925	0	49.30	25.0kHz	173.925	0	43.88
	347.850	66.77			347.850	63.36	
	521.775	71.16			521.775	73.11	
	695.700	79.99			695.700	75.47	
	869.625	81.28			869.625	74.68	
	1043.55	80.35			1043.55	74.73	
	1217.475	80.47			1217.475	74.39	
	1391.400	80.22			1391.400	74.10	
	1565.325	81.01			1565.325	73.77	
	1739.250	80.60			1739.250	72.93	

VII. Field Strength of Spurious Radiation (Part 90.210)

7.1 Test procedure:

Rule Part No.: Part 2.1053

Requirements:

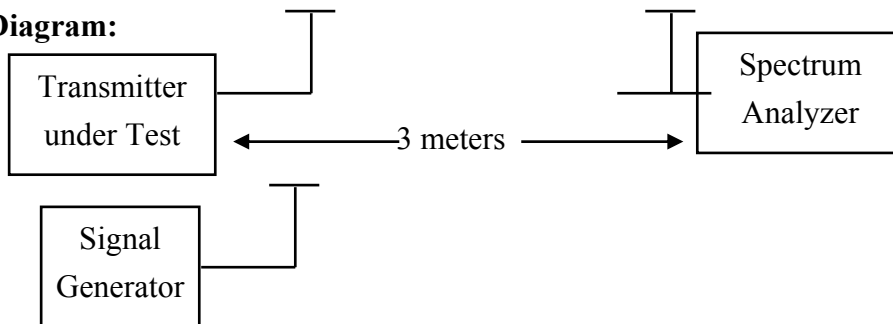
FCC Limit for:

25kHz Channel Spacing: At least $43 + 10 \log (P)$ dB

12.5kHz Channel Spacing: At least $50 + 10 \log (P)$ dB

Method of Measurement: The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned per 30MHz to at least the tenth harmonic of the fundamental. This test was conducted per TIA / EIA STANDARD 603 using the substitution method..

Test Setup Diagram:



FCC Limit:

Channel Spacing			Limit (Minimum dBc)
AN (12.5kHz)	5W	Lowest CH	57.48
		Middle CH	57.90
		Highest CH	58.05
	1W	Lowest CH	51.07
		Middle CH	51.29
		Highest CH	51.15
NB (12.5kHz)	5W	Lowest CH	55.89
		Middle CH	56.08
		Highest CH	56.25
	1W	Lowest CH	50.49
		Middle CH	52.28
		Highest CH	50.95
WB (25.0kHz)	5W	Lowest CH	48.80
		Middle CH	48.99
		Highest CH	49.30
	1W	Lowest CH	43.56
		Middle CH	43.68
		Highest CH	43.88

7.2 Test Equipment:

Instrument Name	Model	Brand	Serial No.	Calibration Date
				Next time
EMI Receiver	8546A	HP	3520A00242	12/06/07
RF Filter Section	85460A	HP	3448A00217	12/06/07
Bi-log Antenna	9168	SCHWARZB ECK	231, 232	10/31/07
Pre-amplifier	PA1F	TRC	1FAC	04/10/08
Auto Switch Box (>30MHz)	ASB-01	TRC	9904-01	04/10/08
Coaxial Cable (Double shielded, 15 Meter)	A30A30-0058-50FS-15M	JYEBAO	SMA-01	04/10/08
Coaxial Cable (1.1 meter)	A30A30-0058-50FS-1M	JYEBAO	SMA-02	04/10/08
Spectrum Analyzer	8564E	HP	3720A00840	12/11/07
Microwave Preamplifier	84125C	HP	US36433002	11/07/07
Horn Antenna	3115	EMCO	9104-3668	02/05/08
Standard Guide Horn Antenna	84125-80008	HP	18-26.5GHz	12/12/07
Standard Guide Horn Antenna	84125-80001	HP	26.5-40GHz	12/12/07
Horn Antenna	1196E (3115)	HP (EMCO)	9704-5178	02/12/08
Pre-amplifier	PA2F	TRC	2F1GZ	04/10/08
Coaxial Cable (3 miter)	A30A30-0058-50FST118	JYEBAO	MSA-05	04/10/08
Coaxial Cable (1 meter)	A30A30-0058-50FST118	JYEBAO	MSA-04	04/10/08

The level of confidence of 95% , the uncertainty of measurement of conducted emission is +3.05/-3.84 dB .

7.3 Test Result:

Audio (AN), 12.5kHz Channel Spacing: Lowest CH

(5W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)	(1W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)
150.075	0	0	57.48	150.075	0	0	51.07
300.15	V	76.32		300.15	V	63.55	
450.225	V	80.50		450.225	V	83.78	
600.300	V	96.68		600.300	V	85.51	
750.375	V	91.72		750.375	V	87.08	
900.45	V	90.77		900.45	V	84.63	
1050.525	V	99.43		1050.525	H	93.36	
1200.600	V	97.81		1200.600	V	92.07	
1350.675	H	98.88		1350.675	H	92.81	
1500.750	H	97.98		1500.750	V	92.40	

Audio (AN), 12.5kHz Channel Spacing: Middle CH

(5W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)	(1W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)
162.000	0	0	57.90	162.000	0	0	51.29
324.000	V	66.77		324.000	V	55.17	
486.000	V	85.04		486.000	V	78.36	
648.000	V	93.41		648.000	V	87.93	
810.000	V	93.62		810.000	V	87.51	
972.000	V	90.27		972.000	V	84.33	
1134.000	V	99.72		1134.000	V	92.01	
1296.000	V	90.58		1296.000	V	93.03	
1458.000	V	99.22		1458.000	V	92.51	
1620.000	V	99.34		1620.000	V	92.13	

Audio (AN), 12.5kHz Channel Spacing: Highest CH

(5W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)	(1W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)
173.925	0	0	58.05	173.925	0	0	51.15
347.850	V	80.71		347.850	V	66.67	
521.775	V	80.48		521.775	V	83.31	
695.700	V	86.57		695.700	V	86.09	
869.625	V	92.55		869.625	V	86.07	
1043.55	V	91.32		1043.55	V	94.12	
1217.475	H	99.22		1217.475	H	92.82	
1391.400	H	99.42		1391.400	H	92.72	
1565.325	H	98.51		1565.325	V	93.27	
1739.250	H	97.71		1739.250	V	93.14	

Digital (NB), 12.5kHz Channel Spacing: Lowest CH

(5W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)	(1W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)
150.075	0	0	55.89	150.075	0	0	50.49
300.15	V	60.08		300.15	V	55.83	
450.225	V	75.32		450.225	V	65.87	
600.300	V	81.73		600.300	V	76.61	
750.375	V	84.82		750.375	V	76.88	
900.45	V	93.25		900.45	V	87.94	
1050.525	V	98.13		1050.525	V	93.09	
1200.600	V	96.79		1200.600	V	91.60	
1350.675	H	97.11		1350.675	H	92.02	
1500.750	H	96.21		1500.750	H	90.88	

Digital (NB), 12.5kHz Channel Spacing: Middle CH

(5W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)	(1W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)
162.000	0	0	56.08	162.000	0	0	52.28
324.000	V	65.09		324.000	V	57.83	
486.000	V	72.47		486.000	V	61.86	
648.000	V	80.42		648.000	V	73.55	
810.000	V	81.32		810.000	V	73.88	
972.000	V	95.86		972.000	V	80.94	
1134.000	H	96.10		1134.000	H	90.91	
1296.000	V	98.12		1296.000	V	92.79	
1458.000	H	97.12		1458.000	H	91.59	
1620.000	H	98.41		1620.000	H	90.30	

Digital (NB), 12.5kHz Channel Spacing: Highest CH

(5W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)	(1W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)
173.925	0	0	56.25	173.925	0	0	50.29
347.850	V	69.63		347.850	V	66.57	
521.775	V	77.73		521.775	V	73.65	
695.700	V	79.05		695.700	V	73.90	
869.625	V	85.32		869.625	V	76.34	
1043.55	V	99.24		1043.55	V	98.86	
1217.475	H	97.40		1217.475	H	92.21	
1391.400	H	97.63		1391.400	H	92.29	
1565.325	H	96.66		1565.325	H	91.52	
1739.250	H	95.69		1739.250	H	90.84	

Digital (WB), 25kHz Channel Spacing: Lowest CH

(5W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)	(1W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)
150.075	0	0	48.80	150.075	0	0	43.56
300.15	V	64.76		300.15	V	54.10	
450.225	V	81.82		450.225	V	67.30	
600.300	V	95.45		600.300	V	69.60	
750.375	V	92.40		750.375	V	73.44	
900.45	V	88.28		900.45	V	75.32	
1050.525	V	98.00		1050.525	V	93.19	
1200.600	V	96.64		1200.600	V	91.77	
1350.675	H	96.99		1350.675	H	91.83	
1500.750	H	96.21		1500.750	H	91.26	

Digital (WB), 25kHz Channel Spacing: Middle CH

(5W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)	(1W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)
162.000	0	0	48.99	162.000	0	0	43.68
324.000	V	67.87		324.000	V	56.83	
486.000	V	83.39		486.000	V	71.87	
648.000	V	93.21		648.000	V	76.61	
810.000	V	93.70		810.000	V	79.88	
972.000	V	91.52		972.000	V	84.94	
1134.000	H	96.08		1134.000	H	90.90	
1296.000	V	97.98		1296.000	V	92.88	
1458.000	H	97.08		1458.000	H	91.70	
1620.000	H	95.33		1620.000	H	90.25	

Digital (WB), 25kHz Channel Spacing: Highest CH

(5W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)	(1W) Emission frequency MHz	Ant. Polarity	dB Below Carrier (dBc)	Limited (Minimum dBc)
173.925	0	0	43.90	173.925	0	0	43.88
347.850	V	71.81		347.850	V	65.57	
521.775	V	81.68		521.775	V	73.65	
695.700	V	91.49		695.700	V	73.90	
869.625	V	91.79		869.625	V	73.34	
1043.55	V	99.25		1043.55	V	93.54	
1217.475	H	97.26		1217.475	H	91.43	
1391.400	H	97.70		1391.400	H	92.32	
1565.325	H	96.62		1565.325	H	91.58	
1739.250	H	95.88		1739.250	H	90.74	

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 162.0000MHz.

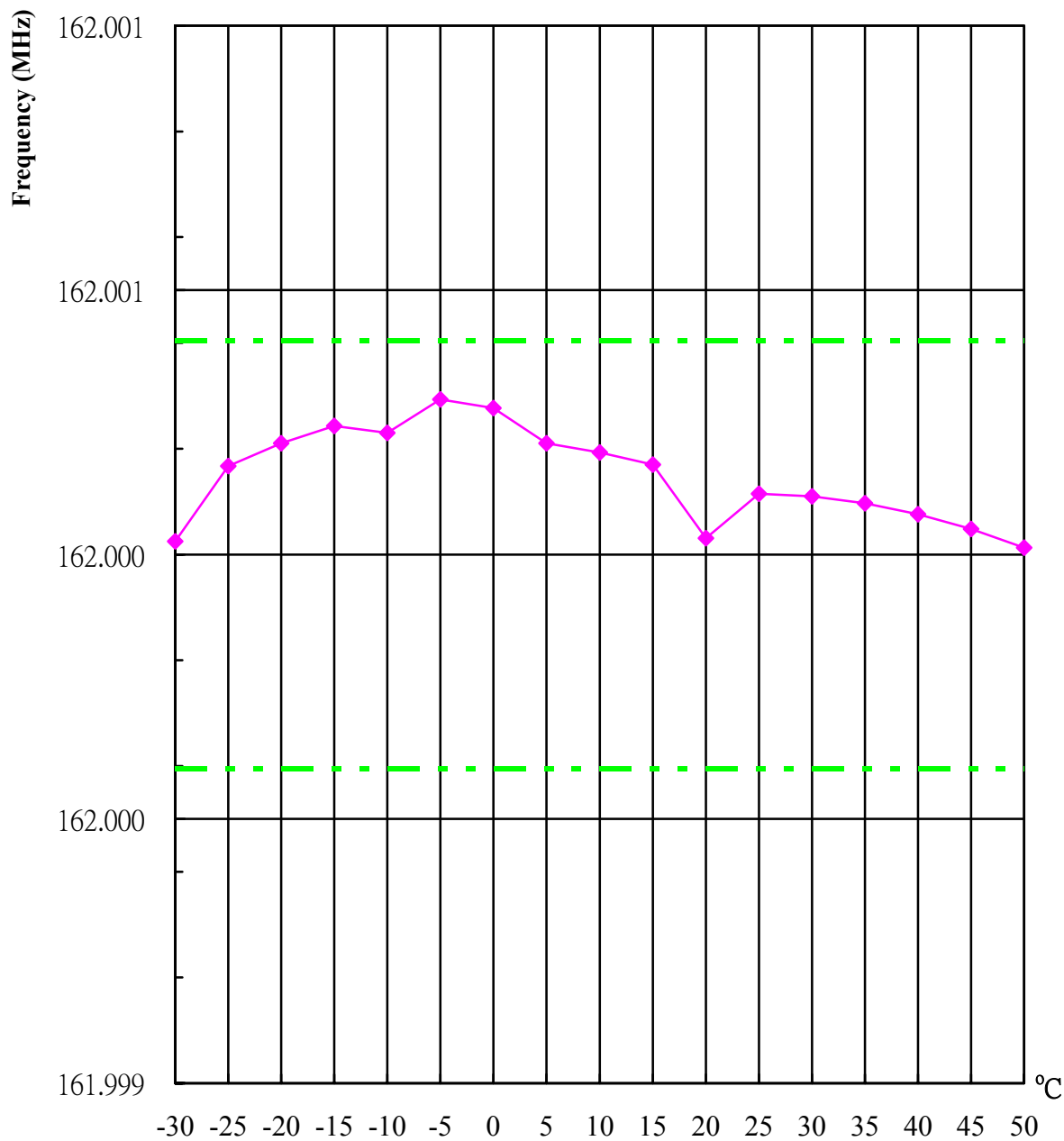
(2) The EUT was put in an environmental chamber and set up the temperature of this chamber from -30°C to +50°C and recorded the frequency has been shift at ± 2.5 ppm..

8.2 Test Result:

Temperature Variation Table

<i>Temperature (Centigrade)</i>	<i>Frequency (MHz)</i>	<i>Frequency Stability (PPM)</i>
-30	162.000025	0.154
-25	162.000167	1.031
-20	162.000210	1.296
-15	162.000243	1.500
-10	162.000230	1.420
-5	162.000293	1.809
0	162.000277	1.710
5	162.000210	1.296
10	162.000193	1.191
15	162.000170	1.049
20	162.000031	1.914
25	162.000115	0.710
30	162.000110	0.679
35	162.000097	0.599
40	162.000076	0.469
45	162.000048	0.296
50	162.000013	0.080

Chart 8.1 Temperatuer Variation Vs. Frequency



8.3 Test Equipment:

Instrument Name	Model No.	Brand	Serial No.	Next time
Spectrum Analyzer	MS2665C	Anritsu	6200175476	12/11/07
Digital Multimeter	GDM-8055	GW	8080365	12/09/07
Temperature & Humidity Chamber	THS-ML1	King Son	240	12/26/07

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 162.0000MHz

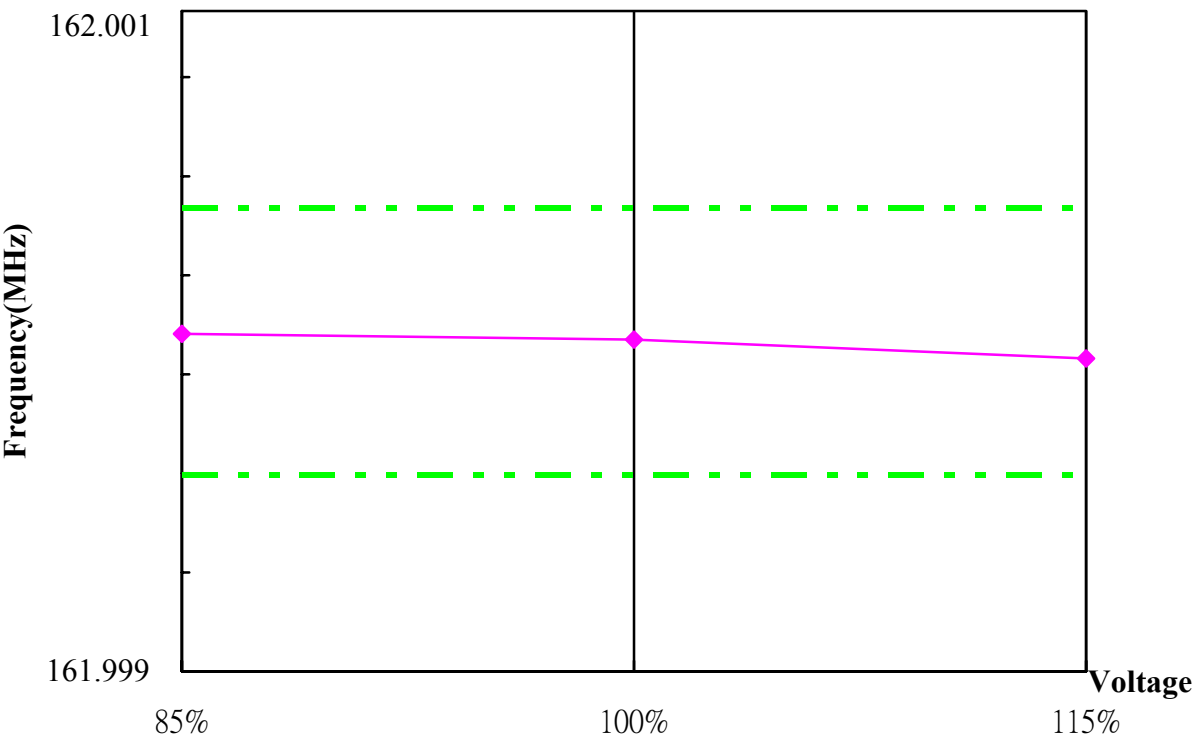
- (2) The EUT was powered at 85% and 115% of nominal.

8.5 Test Result:

Frequency Stability of Voltage Variation Measurement Table

<i>Supply Voltage (Volt)</i>	<i>Frequency (MHz)</i>	<i>Frequency Stability (PPM)</i>
10.20 (85%)	162.000022	0.136
12.00 (100%)	162.000005	0.031
13.80 (115%)	161.999948	-0.321

Chart 8.2 Voltage Variation Vs. Frequency



IX Power Line for 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:

Instrument Name	Model No.	Brand	Serial No.	Calibration Date
				Next time
EMI Receiver	8546A	HP	3520A00242	12/06/07
RF Filter Section	85460A	HP	3448A00217	12/06/07
LISN (EUT)	LISN-01	TRC	99-05	05/10/08
LISN (Support E.)	LISN-01	TRC	9912-03, 04	06/22/08
Pre-amplifier	15542 ZFL-500	Mini – Circuits	0 0117	04/10/08
6dB Attenuator	MCL BW-S6W2	Mini – Circuits	9915 – Conducted	04/10/08
10dB Attenuator	A5542 VAT010	Mini – Circuits	0215 – Conducted	04/10/08
Coaxial Cable(2 meter)	A30A30-0058-50FS-2M	Jyebao	SMA-08	04/10/08
Coaxial Cable(1.1 meter)	A30A30-0058-50FS-1M	Jyebao	SMA-09	04/10/08
Coaxial Cable(20 meter)	RG-214/U	Jyebao	NP-01	04/10/08
Coaxial Cable(20 meter)	RG-214/U	Jyebao	NP-02	04/10/08
Auto Switch Box (< 30MHz)	ASB-01	TRC	9904-01	04/10/08
EMI Receiver	8546A	HP	3520A00242	12/06/07

The level of confidence of 95% , the uncertainty of measurement of conducted emission is +2.43/-2.53 dB .

Test Result : N/A

Report No.: G1590070063

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.

10.2 Test Result:

* See page46 and 47.

Part 2.1055 (a) (1)

Part 90.214 Transmitters designed to operate in the 150-174 MHz and 421-512MHz frequency bands must maintain frequencies within the maximum transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time Intervals	Maximum frequency difference	All Equipment	
		150-174 MHz	421-512 MHz

Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels

t_1^4	± 25.0 kHz	5.0 ms	10.0 ms
t_2	± 12.5 kHz	20.0 ms	25.0 ms
t_3^4	± 25.0 kHz	5.0 ms	10.0 ms

Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels

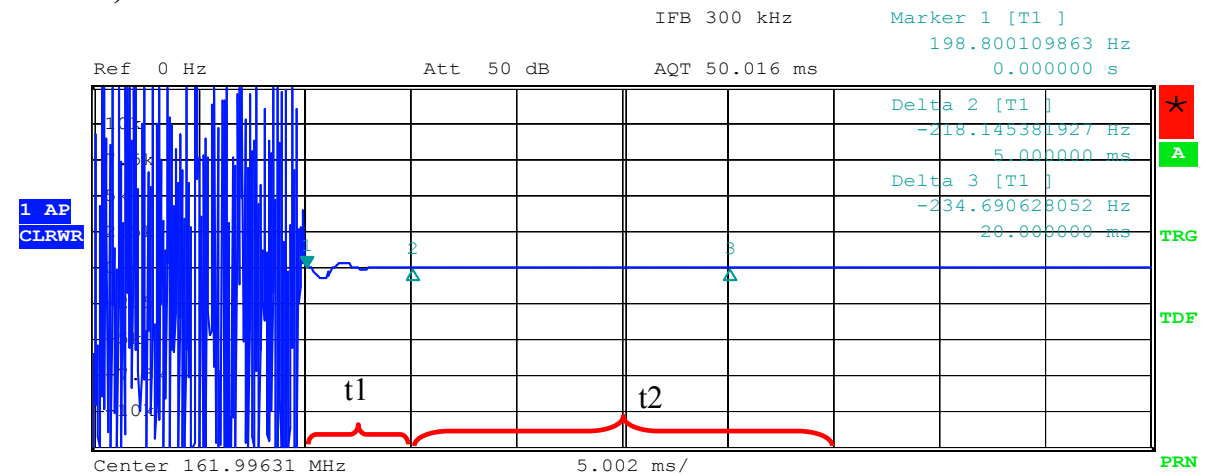
t_1^4	± 12.5 kHz	5.0 ms	10.0 ms
t_2	± 6.25 kHz	20.0 ms	25.0 ms
t_3^4	± 12.5 kHz	5.0 ms	10.0 ms

10.3 Test Equipment:

Instrument Name	Model No.	Brand	Serial No.
Signal Generator	2030	MARCONI	119665/027
Oscilloscope	FSP13	ROHD&SCHWARZ	100126

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

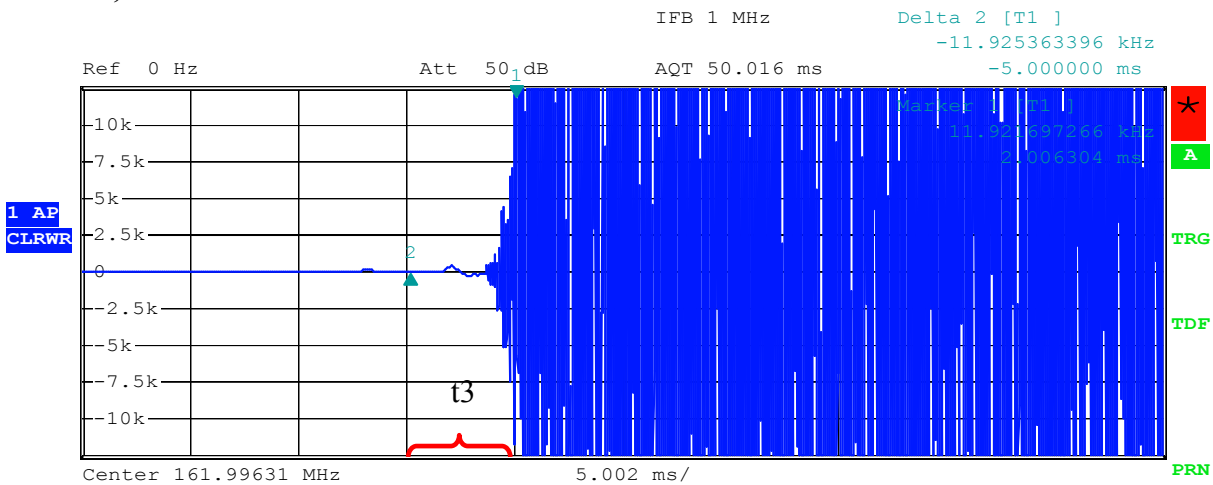
Measurement Result:
12.5 kHz, ON



Frequency Modulation Summary

Coupling	DC	Carrier Offset	-37.178 Hz
Deviation	+peak 21.48 kHz	Carrier Power	38.00 dBm
	-peak -22.69 kHz	Modulation Frequency	--- Hz
	↑peak/2 22.08 kHz	Sampling Rate	31.25 kHz
	RMS 4.278 kHz	Record Length	1564
		Demod Bandwidth	25 kHz

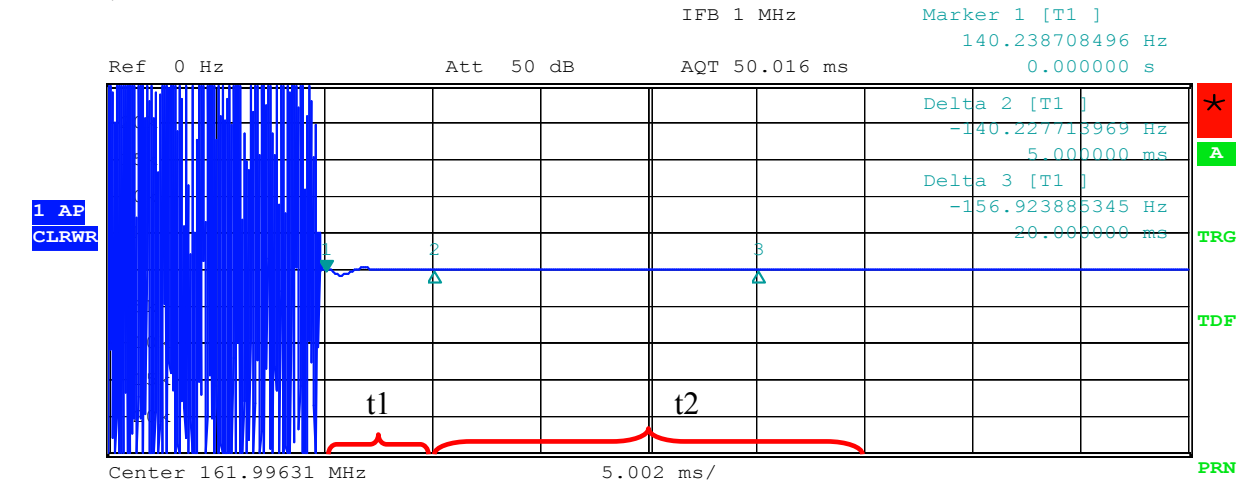
12.5 kHz, OFF



Frequency Modulation Summary

Coupling	DC	Carrier Offset	509.98 Hz
Deviation	+peak 54.20 kHz	Carrier Power	27.77 dBm
	-peak -52.43 kHz	Modulation Frequency	--- Hz
	↑peak/2 53.32 kHz	Sampling Rate	62.5 kHz
	RMS 14.33 kHz	Record Length	3127
		Demod Bandwidth	50 kHz

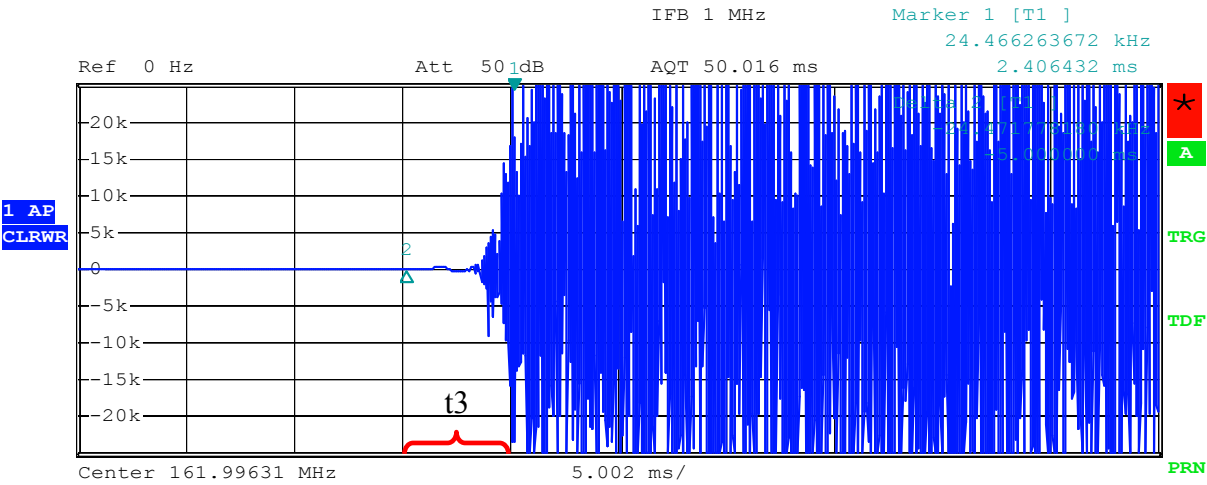
25 kHz, ON



Frequency Modulation Summary

Coupling	DC	Carrier Offset	-7.7865 Hz	
Deviation	+peak	48.07 kHz	Carrier Power	37.99 dBm
	-peak	-54.85 kHz	Modulation Frequency	--- Hz
	↑peak/2	51.46 kHz	Sampling Rate	62.5 kHz
	RMS	8.553 kHz	Record Length	3127
			Demod Bandwidth	50 kHz

25 kHz, OFF



Frequency Modulation Summary

Coupling	DC	Carrier Offset	255.72 Hz	
Deviation	+peak	59.33 kHz	Carrier Power	27.39 dBm
	-peak	-58.07 kHz	Modulation Frequency	--- Hz
	↑peak/2	58.70 kHz	Sampling Rate	62.5 kHz
	RMS	14.86 kHz	Record Length	3127
			Demod Bandwidth	50 kHz