

# FCC / INDUSTRY CANADA MEASUREMENT REPORT

## CERTIFICATION OF COMPLIANCE FCC PART90 & INDUSTRY CANADA RSS-119 CERTIFICATION

PRODUCT : Two Way Radio Land Mobile Service (LMR)  
MODEL/TYPE NO : SM5102  
FCC ID : RXUSM5102  
TRADE NAME :   
APPLICANT : Maxon CIC Corp.  
Chongho Building, #7-61 Yangjae-Dong, Seocho-Gu, Seoul, 137-130,  
Korea  
Attn. : Hyun Koo Kang / Senior Manager  
CLASSIFICATION : TNF Licensed Non-Broadcast Station Transmitter  
FCC Part 90 Private land mobile radio services  
RULE PART(S) : RSS-119 Land Mobile and Fixed Radio Transmitters and Receivers,  
Issue 9 27.4 MHz to 960 MHz  
FCC PROCEDURE : Certification  
DATES OF TEST : July 6, 2009 to July 31, 2009  
DATES OF ISSUE : July 31, 2009  
TEST REPORT No. : BWS-09-RF-0005  
TEST LAB. : BWS TECH Inc.(FCC Registration Number : 553281)

This Two Way Radio SM5102 has been tested in accordance with the measurement procedures specified in ANSI C63.4-2003 and ANSI/TIA-603-B-2002 at the BWS TECH/EMC Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part 90 and Industry Canada RSS-119.

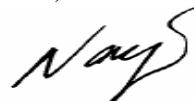
I attest to the accuracy of data. All measurement herein was performed by me or were made under my supervision. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. The results of testing in this report apply to the product/system, which was tested only. Other similar equipment may not necessarily produce the same results due to production tolerance and measurement uncertainties.

July 31, 2009  
(Date)



Tested by Hyunsup, Jin

July 31, 2009  
(Date)



Reviewed by TaeHyun, Nam

### BWS TECH Inc.

[www.bws.co.kr](http://www.bws.co.kr)

#611-1 Maesan-Ri, Mohyeon-Myeon, Yongin-Si, Gyeonggi-Do, 449-853 Korea  
TEL: +82 31 333 5997 FAX: +82 31 333 0017

## TABLE OF CONTENTS

	Pages
<b>1. General Information</b>	3
<b>2. Description of Test Facility</b>	4
<b>3. Product Information</b>	5
<b>4. Summary of Test Results</b>	7
<b>5. Test Data</b>	8
<b>5.1. RF Power Output (Conducted)</b>	8
<b>5.2. Modulation Characteristics – Audio Frequency Response</b>	10
<b>5.3. Modulation Characteristics – Audio Lowpass Filter Response</b>	14
<b>5.4. Modulation Characteristics – Modulation Limiting</b>	16
<b>5.5. Occupied Bandwidth</b>	25
<b>5.6. Spurious Emissions at Antenna Terminals</b>	39
<b>5.7. Field Strength of Spurious Radiation</b>	90
<b>5.8. Frequency Stability/Temperature Variation</b>	93
<b>5.9. Transient Frequency Behavior</b>	110
<b>6. Test Equipment List</b>	114

**Appendix 1. Test Setup Photos**

**Appendix 2. FCC ID Label and location**

**Appendix 3. External Photos of EUT**

**Appendix 4. Internal Photos of EUT**

**Appendix 5. Block Diagram**

**Appendix 6. Schematics**

**Appendix 7. Theory of Operation**

**Appendix 8. Part List / Tune up Procedure**

**Appendix 9. User Manual**

# FCC / INDUSTRY CANADA TEST REPORT

**Scope** – Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)

## 1. General Information

### Applicant

**Company Name** Maxon CIC Corp.  
**Company Address** Chongho Building, #7-61 Yangjea-Dong, Seocho-Gu, Seoul, 137-130, Korea  
**Phone/Fax** Phone : +82-2-3498-3060 Fax : 02-3498-3115

### Manufacturer

**Company Name** Maxon CIC Thailand Co., Ltd(MCTL)  
**Company Address** 40/23 Moo 5 Rojana Industrial Park Tambol U-Thai, Amphur U-Thai Ayutthaya 13210 Thailand  
**Phone/Fax** Tel No. : +66-(0)35-719-498~501 Fax No. : +66-(0)35-719-492

- **EUT Type** Two Way Radio (LMR)
- **Model Number** SM5102
- **FCC Identifier** RXUSM5102
- **S/N** Proto Type
- **FCC Rule Part(s)** FCC Part 90 Private land mobile radio services  
RSS-119 Issue 9 Land Mobile and Fixed Radio Transmitters  
and Receivers, 27.4 MHz to 960 MHz
- **FCC Classification** TNF : Licensed Non-Broadcast Station Transmitter
- **Freq. Range** 148 MHz ~ 174 MHz
- **Channel** 208 Channels
- **Modulation Method** FM
- **Emission Designator** 11K0F3E / 16K0F3E
- **RF Power Output** 5/50 Watt
- **Test Procedure** ANSI C63.4-2003 and ANSI/TIA-603-B-2002
- **Dates of Tests** July 6, 2009 to July 31, 2009
- **Place of Tests** BWS TECH Inc.(FCC Registration Number : 553281)  
#611-1 Maesan-Ri, Mohyeon-Myeon, Yongin-Si, Gyeonggi-Do, 449-853 Korea  
TEL: +82 31 333 5997 FAX: +82 31 333 0017
- **Test Report No.** BWS-09-RF-0005

## **2. Description of Test Facility**

The measurement for radiated and conducted emission test were conducted at the open area test site of BWS TECH Inc. facility located at #611-1 Maesan-Ri, Mohyeon-Myeon, Yongin-Si, Gyeonggi-Do, 449-853 Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-2000 and CISPR Publication 16. The BWS TECH measurement facility has been filed to the Commission with the FCC for 3 and 10-meter site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-2000 and registered to the Federal Communications Commission (Registration Number : 553281 ).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C.63.4-2000) was used in determining radiated and conducted emissions from the Maxon CIC Corp. Two Way Radio Model : SM5102.

### 3. Product Information

The Equipment Under Test (EUT) is the MAXON CIC CO LTD Two Way Radio model: SM5102 (FCC ID: RXUSM5102).

SM5102 is FM transceiver operating between 148 ~ 174 MHz with an output power of 50 W (5 W at low power).

The SM5102 offers many advanced features found in more expensive Land Mobile Radios.

SM5102 is 208 channel portable FM transceiver constructed with a microprocessor controlled, temperature compensated Phase Locked Loop (PLL) frequency synthesizer. The radio features a double conversion receiver and a direct FM transmitter modulator.

#### 3.1 Technical specification of EUT

<b>Equipment Type</b>	: Hand-portable
<b>Performance Specifications</b>	: FCC PART90 & INDUSTRY CANADA RSS-119 CERTIFICATION
<b>Band</b>	: VHF (148 ~ 174 MHz)
<b>Channel Spacings</b>	: 12.5 kHz / 25 kHz
<b>RF Output Power</b>	: 50 / 5 Watt
<b>Modulation Type</b>	: 11KOF3E /16KOF3E (FM)
<b>Audio Power</b>	: 4 W (INT with 16 Ω)
<b>Intermediate Frequencies</b>	: 1 <sup>st</sup> 45.1 MHz
	: 2 <sup>nd</sup> 455 kHz
<b>Channels</b>	: 208 Channel
<b>Frequency Source</b>	: PLL Synthesizer
<b>Physical Dimensions</b>	: 175(W) x 158(D) x 48(H) mm
<b>Weight</b>	: 1.44kgs
<b>Power Supply</b>	: 13.8 Vdc NOMIN
<b>ESD</b>	: 20kV(C-MIC=15kV)
<b>Programmer</b>	: SMP 6001

## 3.2 EUT operating conditions & test configuration

### 3.2.1 Client Condition

Temperature : -30 °C ~ +60 °C

Humidity : 95 %

### 3.2.2 EUT Operating Condition

Operating Mode : Transmitter was operated in a continues transmission mode with the carrier modulated as specified in the test data.

Special test Software : Not Used.

Special test Hardware : Not Used.

TX Frequency Band : 148 MHz ~ 174 MHz

Test Frequencies :	1st	148.025 MHz
	2nd	161.025 MHz
	3rd	173.975 MHz

Modulation : FM Modulation

Modulation Signal Source : External Source

## 4. Summary of Test Results

TEST REQUIREMENTS	FCC Paragraph	IC Paragraph	Result
Power Line Conducted Emission	§15.207	RSS-Gen §7.2.2	N/A <sup>1)</sup>
RF Power Output (Conducted)	§2.1046	RSS-Gen §6	Pass
Audio Frequency Response	§2.1047(A)	RSS-119 Issue 9 §5.2	Pass
Audio Low pass Filter Response	§2.1047(A)	RSS-119 Issue 9 §5.5	Pass
Modulation Limiting	§2.1047(B)	RSS-119 Issue 9 §5.2	Pass
Occupied Bandwidth	§2.1049	RSS-119 Issue 9 §5.5	Pass
Spurious Emissions at Antenna Terminals	§2.1051	RSS-119 Issue 9 §5.8	Pass
Field Strength of Spurious Radiation	§2.1053	RSS-119 Issue 9 §5.8	Pass
Frequency Stability/Temperature Variation	§2.1055	RSS-119 Issue 9 §5.3	Pass
Transient Frequency Behavior	§90.214	RSS-119 Issue 9 §5.9	Pass

1) This equipment uses DC power source.

## 5. TEST DATA

### 5.1 RF Power Output (Conducted)

#### 5.1.1 Specification

FCC Rules Part 2, Section 2.1046  
FCC Rules Part 90, Section 90.205(d)  
Industry Canada, RSS-119 Issue 9 Section 5.4

#### 5.1.2 Method of Measurement

ANSI/TIA-603-B-2002 Section 2.2.1

#### 5.1.3 Measurement Set-Up

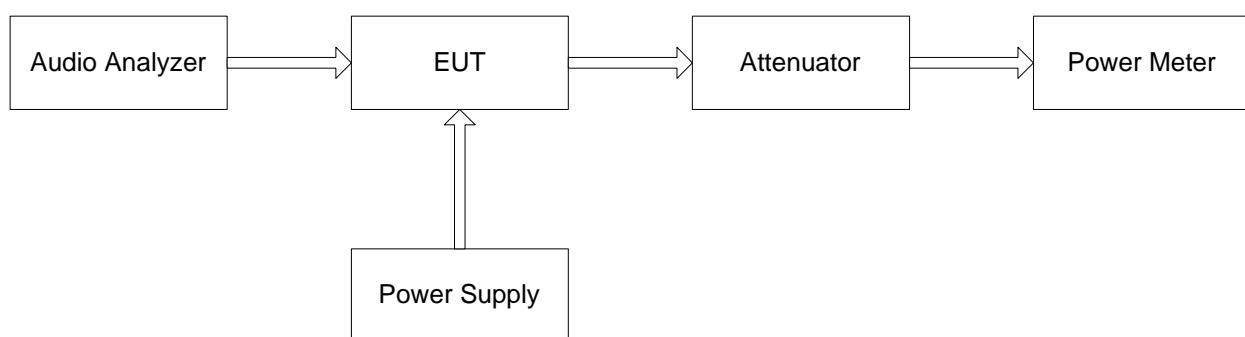


Fig.1

#### 5.1.4 Test Equipment List

Equipment	Model Name	Manufacturer
EUT	SM5102	Maxon CIC Corp.
Power Supply	6206-60	CHROMA
Audio Analyzer	8903B	Agilent
Attenuator	RFA500NMF30	
Power Sensor	8481A	Agilent
Power Meter	E4418A	Agilent

#### 5.1.5 Test Procedure

- The unit was turn-up in accordance with the alignment procedure stated in the FIG. 1 , and was loaded into a 50 ohm resistive termination.
- The unit was powered through its normally accompanied power cord by a DC power supply.
- Power supply voltage was set to nominal voltage at the power supply terminals with transmitter off.
- The unit was operated for three consecutive test cycles of 15 minutes standby and 5 minutes in transmitting.
- The EUT was aligned for transmitter operation on three frequencies(Fo) at full rated power per the tune-up procedure outlined in the Product Specification. This represents frequencies at the 1st, 2nd, 3rd and 4th end of the EUT operating frequency band.

### 5.1.6 Test Result

<b>Test Mode</b>	<b>Frequency (MHz)</b>	<b>Measured Power Output (dBm)</b>	<b>Rated Power (Watts)</b>	<b>FCC Limit (Watts)</b>
<b>Low Power (5W)</b>	<b>148.025</b>	37.78	5.99	Varies
	<b>161.025</b>	37.30	5.79	Varies
	<b>173.975</b>	37.59	5.74	Varies
<b>High Power (50W)</b>	<b>148.025</b>	47.40	54.95	Varies
	<b>161.025</b>	47.41	55.08	Varies
	<b>173.975</b>	47.11	51.40	Varies

## 5.2 Modulation Characteristics – Audio Frequency Response

### 5.2.1 Specification

FCC Rules Part 2, Section 2.1047(a)  
FCC Rules Part 90, Section 90.207 & 90.242(b)(8)  
Industry Canada, RSS-119 Issue 9 Section 5.2

### 5.2.2 Method of Measurement

ANSI/TIA-603-B-2002 Section 2.2.6

### 5.2.3 Measurement Set-Up

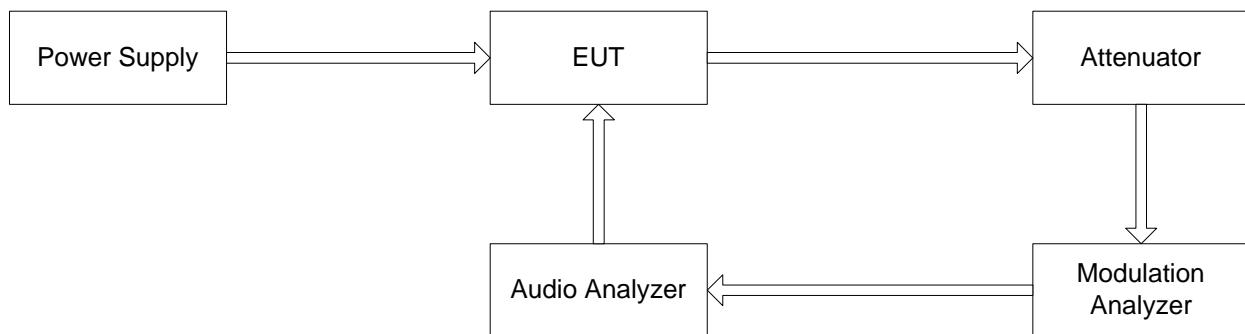


Fig.2

### 5.2.4 Test Equipment List

Equipment	Model Name	Manufacturer
EUT	SM5102	Maxon CIC Corp.
Power Supply	6206-60	CHROMA
Audio Analyzer	8903B	Agilent
Modulation Analyzer	8901B	Agilent
Attenuator	RFA500NMF30	

### 5.2.5 Test Procedure

- The unit was turn-up in accordance with the alignment procedure stated in the FIG. 2 , and was loaded into a 50 ohm resistive termination.
- The audio analyzer was connected to the audio input circuit/microphone of the EUT.
- The audio signal input was adjusted to obtain 20% modulation at 1 kHz, and this point was taken as the 0 dB reference level.
- With input levels held constant and below limiting at all frequencies, the audio signal generator was varied from 100 Hz to 10 kHz.
- The response in dB relative to 1 kHz was then measured, using the HP 8901A Modulation Analyzer.
- No limit is required by the FCC for audio frequency response. The measured audio response data shows the role-off curve at 3 kHz.

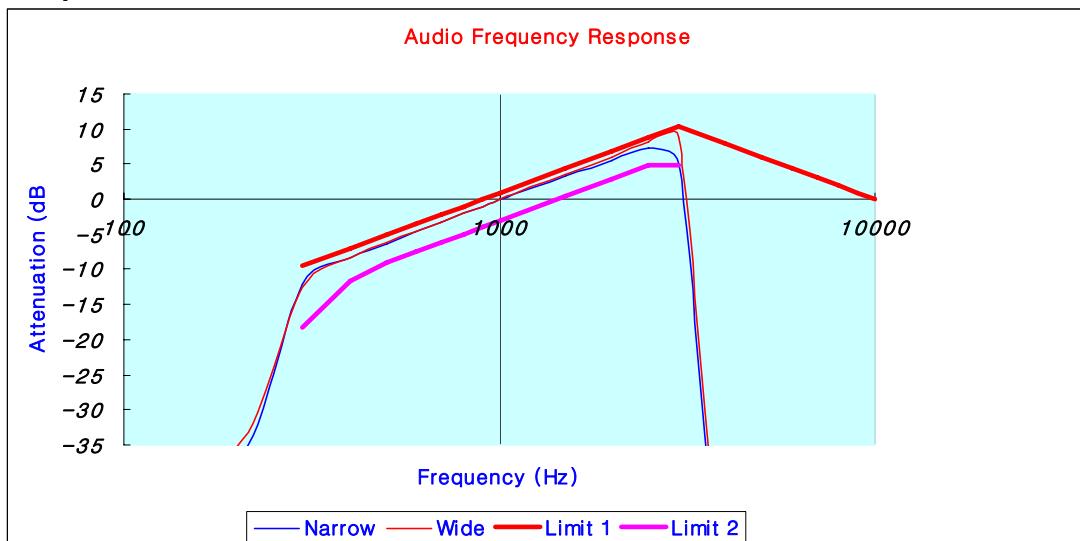
## 5.2.6 Test Results

### 5.2.6.1 Test Data 1

FCC Rules :	Part 2 §2.1047(a) & §90.242(b)(8)	
IC Rules :	RSS-119 Issue 9 Section 5.2	
Operating Frequency :	148.025 MHz	
Channel :	1st Channel	
Reference Voltage :	13.8 VDC	
Power Output :	50 Watts	

Audio Input Frequency (Hz)	Attenuation (dB)	
	Channel Spacing : 12.5 kHz	Channel Spacing : 25 kHz
100	-38.8	-39
200	-37.2	-35.2
300	-12.2	-12.5
400	-8.4	-8.4
500	-6.3	-6.2
600	-4.6	-4.6
700	-3.2	-3.3
800	-2	-2
900	-1	-1
1000	0	0
1500	3.4	3.6
2000	5.6	5.9
2500	7.2	8.2
3000	5	8.8
4000	-60.3	-56.7
5000	-60.3	-56.7
6000	-60.3	-56.7
7000	-60.3	-56.7
8000	-60.3	-56.7
9000	-60.3	-56.7
10000	-60.3	-56.7

### 5.2.6.2 Graph

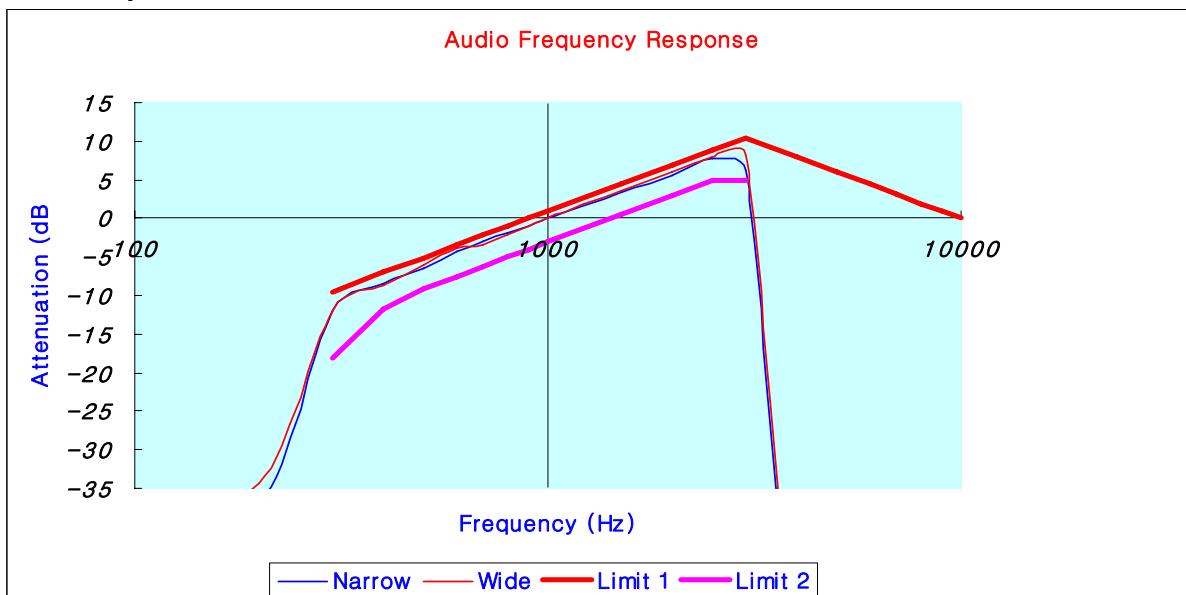


### 5.2.6.3 Test Data 2

FCC Rules :	Part 2 §2.1047(a) & §90.242(b)(8)	
IC Rules :	RSS-119 Issue 9 Section 5.2	
Operating Frequency :	161.025 MHz	
Channel :	2nd Channel	
Reference Voltage :	13.8 VDC	
Power Output :	50 Watts	

Audio Input Frequency (Hz)	Attenuation (dB)	
	Channel Spacing : 12.5 kHz	Channel Spacing : 25 kHz
100	-37.8	-38.5
200	-37	-34.4
300	-11.9	-11.9
400	-8.5	-8.6
500	-6.4	-6
600	-4.3	-3.9
700	-2.9	-3.4
800	-1.9	-2
900	-1	-1.1
1000	0	0
1500	3.4	3.5
2000	5.5	6.1
2500	7.8	7.9
3000	6.2	8.1
4000	-59.8	-56.4
5000	-59.8	-56.4
6000	-59.8	-56.4
7000	-59.8	-56.4
8000	-59.8	-56.4
9000	-59.8	-56.4
10000	-59.8	-56.4

### 5.2.6.4 Graph 2

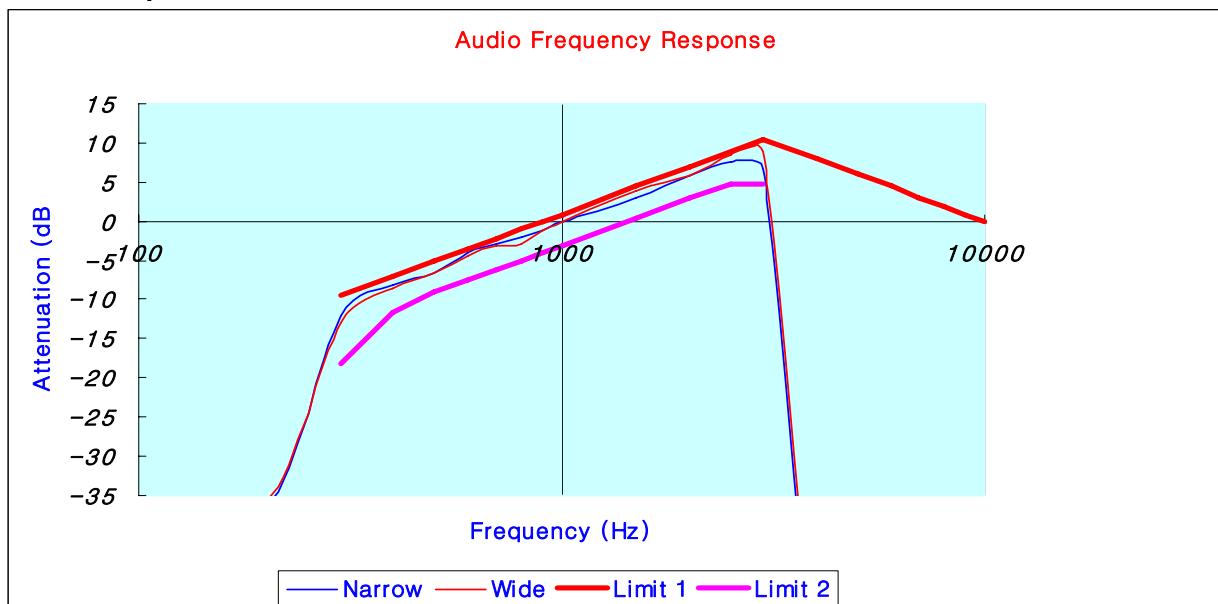


### 5.2.6.5 Test Data 3

FCC Rules :	Part 2 §2.1047(a) & §90.242(b)(8)	
IC Rules :	RSS-119 Issue 9 Section 5.2	
Operating Frequency :	173.975 MHz	
Channel :	3rd Channel	
Reference Voltage :	13.8 VDC	
Power Output :	50 Watts	

Audio Input Frequency (Hz)	Attenuation (dB)	
	Channel Spacing : 12.5 kHz	Channel Spacing : 25 kHz
100	-37.5	-39.3
200	-36.6	-35.8
300	-12.1	-12.9
400	-8.1	-8.5
500	-6.6	-6.6
600	-4.1	-4.5
700	-2.8	-3.2
800	-2	-2.8
900	-1.1	-1.1
1000	0	0
1500	2.9	3.8
2000	5.8	5.8
2500	7.6	8.4
3000	6.6	8.9
4000	-59.6	-56.3
5000	-59.6	-56.3
6000	-59.6	-56.3
7000	-59.6	-56.3
8000	-59.6	-56.3
9000	-59.6	-56.3
10000	-59.6	-56.3

### 5.2.6.6 Graph 3



## 5.3 Modulation Characteristics – Audio Low pass Filter Response

### 5.3.1 Specification

FCC Rules Part 2, Section 2.1047(a)  
FCC Rules Part 90, Section 90.207 & 90.242(b)(8)  
Industry Canada, RSS-119 Issue 9 Section 5.5

### 5.3.2 Method of Measurement

ANSI/TIA-603-B-2002 Section 2.2.15

### 5.3.3 Measurement Set-Up

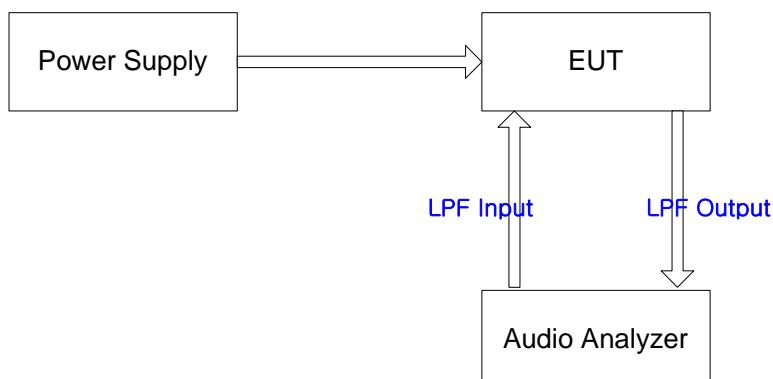


Fig.3

### 5.3.4 Test Equipment List

Equipment	Model Name	Manufacturer
EUT	SM5102	Maxon CIC Corp.
Power Supply	6206-0	CHROMA
Audio Analyzer	8903B	Agilent

### 5.3.5 Test Procedure

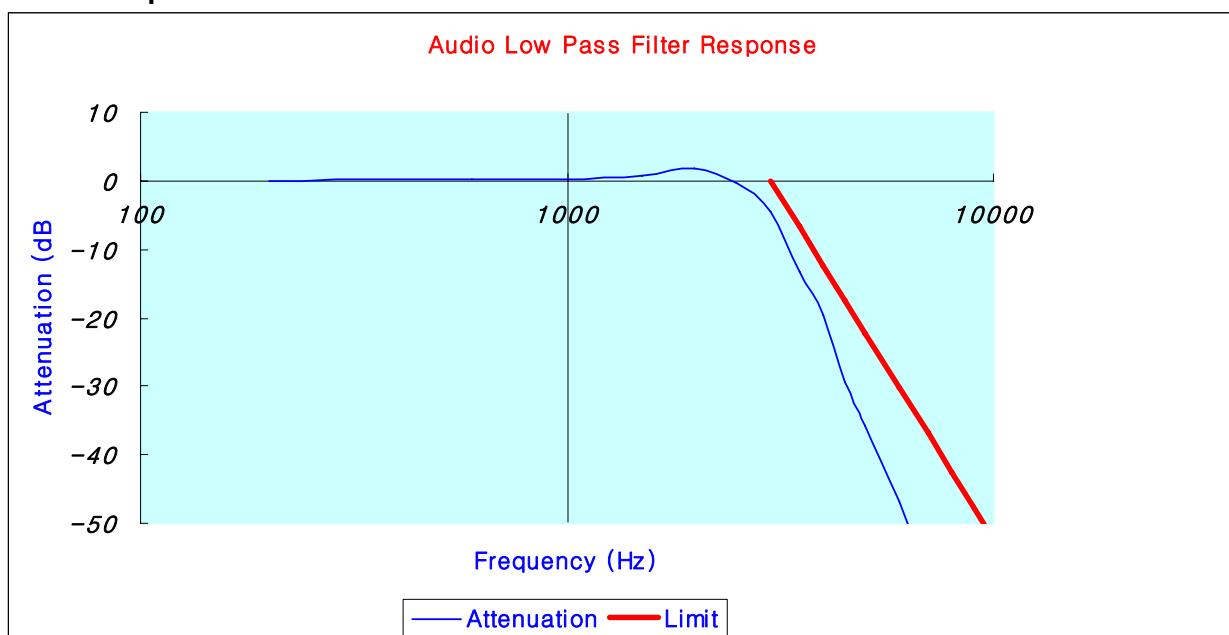
- The unit was turn-up in accordance with the alignment procedure stated in the FIG. 3 , and was loaded into a 50 ohm resistive termination.
- To measure the audio low pass filter response, an audio analyzer were connected to the actual Printed Circuit Board of the transmitter.
- Audio analyzer monitored the output of the audio filter.
- An AF input level was maintained constant at least 10 dB below the saturation level at 1 kHz tone.
- Record the dB level of the 1 kHz tone of the audio analyzer.
- Set the audio input frequency to desired test frequency between 3 kHz and upper low pass filter limit.
- Record dB level on the audio analyzer.
- Calculate the audio frequency response as  $LEV_{FREQ} - LEV_{REF}$
- Audio frequencies in 3 kHz to 20 kHz : Minimum Attenuation to reference point shell be greater than  $60\log(f/3)$  dB, above 20 kHz, at least 50dB attenuation. ("f" in kHz)

### 5.3.5 Test Result

#### 5.3.5.1 Data

Audio Input Frequency (Hz)	Attenuation (dB)	Limit (dB)
100	-0.3	
200	0	-
400	0.3	-
600	0.3	-
800	0.3	-
1000	0.2	-
1500	0.8	-
2000	1.9	-
2500	-0.3	-
3000	-4.6	0
3500	-13.2	-6.7
4000	-19.6	-12.5
4500	-29.4	-17.6
5000	-35.6	-22.2
6000	-46.8	-30.1
7000	-58	-36.8
8000	-69.4	-42.6
9000	-74.3	-47.7
10000	-84.5	-52.3

#### 5.4.5.2 Graph



## 5.4 Modulation Characteristics – Modulation Limiting

### 5.4.1 Specification

FCC Rules Part 2, Section 2.1047(b)  
FCC Rules Part 90, Section 90.207  
Industry Canada, RSS-119 Issue 9 Section 5.2

### 5.4.2 Method of Measurement

ANSI/TIA-603-B-2002 Section 2.2.3

### 5.4.3 Measurement Set-Up

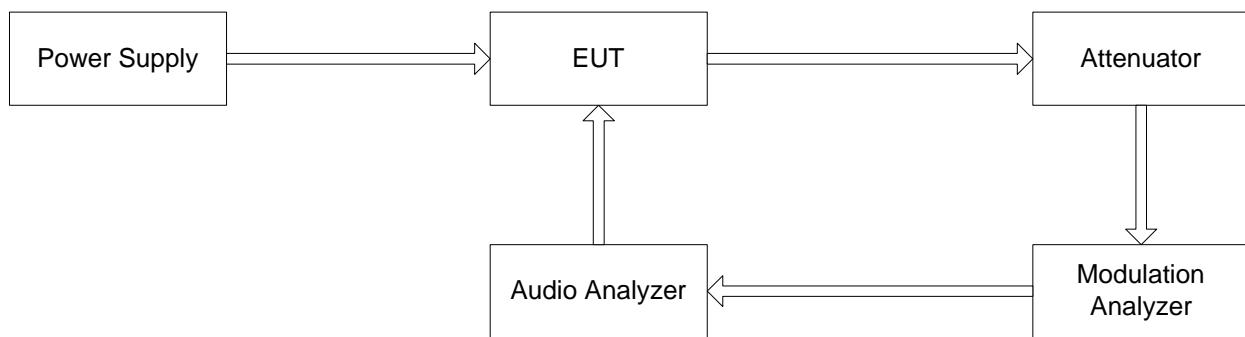


Fig.4

### 5.4.4 Test Equipment List

Equipment	Model Name	Manufacturer
EUT	SM5102	Maxon CIC Corp.
Power Supply	620-60	CHROMA
Audio Analyzer	8903B	Agilent
Modulation Analyzer	8901B	Agilent
Attenuator	RFA500NMF30	

### 5.4.5 Test Procedure

- The unit was turn-up in accordance with the alignment procedure stated in the FIG. 4, and was loaded into a 50 ohm resistive termination.
- Apply an 1kHz modulating signal to EUT from the audio frequency analyzer, and adjust the level to obtain 60% of full rated system deviation.
- Increase the level from the AF generator by  $\pm 20$  dB in one step.
- Measure the steady-state deviation.
- With the AF generator level hold constant, vary the audio frequency from 300 Hz to 3000 Hz. Record the maximum deviation.
- Set the modulation analyzer to measure the peak negative deviation and repeat the test above.

## 5.4.6 Test Result

### 5.4.6.1 Data (Narrow Band, 1st Channel)

Audio Input Level (dB)	Positive Peak Deviation (kHz)			Negative Peak Deviation (kHz)		
	300 Hz	1 kHz	3 kHz	300 Hz	1 kHz	3 kHz
-20	0.07	0.18	0.29	0.07	0.17	0.28
-15	0.1	0.29	0.51	0.09	0.28	0.49
-10	0.15	0.52	0.89	0.14	0.49	0.86
-5	0.24	0.89	1.24	0.23	0.87	1.23
0	0.39	1.5	1.3	0.38	1.5	1.33
+5	0.68	1.76	1.35	0.66	1.78	1.39
+10	1.19	1.8	1.37	1.17	1.91	1.39
+15	1.53	1.9	1.37	1.55	1.96	1.39
+20	1.68	1.93	1.37	1.69	1.98	1.4

### 5.4.6.2 Data (Narrow Band, 2nd Channel)

Audio Input Level (dB)	Positive Peak Deviation (kHz)			Negative Peak Deviation (kHz)		
	300 Hz	1 kHz	3 kHz	300 Hz	1 kHz	3 kHz
-20	0.07	0.18	0.28	0.07	0.18	0.28
-15	0.12	0.3	0.55	0.09	0.29	0.5
-10	0.15	0.55	0.89	0.15	0.49	0.88
-5	0.25	0.89	1.25	0.24	0.87	1.23
0	0.36	1.5	1.32	0.38	1.5	1.34
+5	0.68	1.8	1.35	0.66	1.78	1.39
+10	1.2	1.8	1.36	1.19	1.93	1.39
+15	1.55	1.9	1.37	1.55	1.96	1.39
+20	1.71	1.94	1.37	1.7	1.98	1.4

### 5.4.6.3 Data (Narrow Band, 3rd Channel)

Audio Input Level (dB)	Positive Peak Deviation (kHz)			Negative Peak Deviation (kHz)		
	300 Hz	1 kHz	3 kHz	300 Hz	1 kHz	3 kHz
-20	0.07	0.18	0.29	0.08	0.18	0.29
-15	0.12	0.29	0.54	0.1	0.31	0.52
-10	0.16	0.54	0.9	0.15	0.45	0.89
-5	0.24	0.91	1.24	0.25	0.88	1.23
0	0.37	1.5	1.31	0.38	1.5	1.36
+5	0.68	1.79	1.35	0.69	1.78	1.39
+10	1.24	1.82	1.36	1.2	1.94	1.39
+15	1.55	1.91	1.38	1.56	1.96	1.39
+20	1.71	1.94	1.38	1.7	1.98	1.41

#### 5.4.6.5 Data (WideBand, 1st Channel)

Audio Input Level (dB)	Positive Peak Deviation (kHz)			Negative Peak Deviation (kHz)		
	300 Hz	1 kHz	3 kHz	300 Hz	1 kHz	3 kHz
-20	0.22	0.38	1.04	0.18	0.44	0.89
-15	0.28	0.65	1.79	0.29	0.8	1.54
-10	0.38	1.14	2.81	0.35	1.09	2.72
-5	0.54	1.98	3.09	0.58	1.85	3.16
0	0.88	3	3.14	0.79	3	3.24
+5	1.52	3.5	3.27	1.39	3.59	3.39
+10	2.5	3.69	3.28	2.45	3.94	3.4
+15	2.84	3.79	3.28	2.99	4.04	3.4
+20	3.08	3.82	3.28	3.24	4.11	3.4

#### 5.4.6.6 Data (WideBand, 2nd Channel)

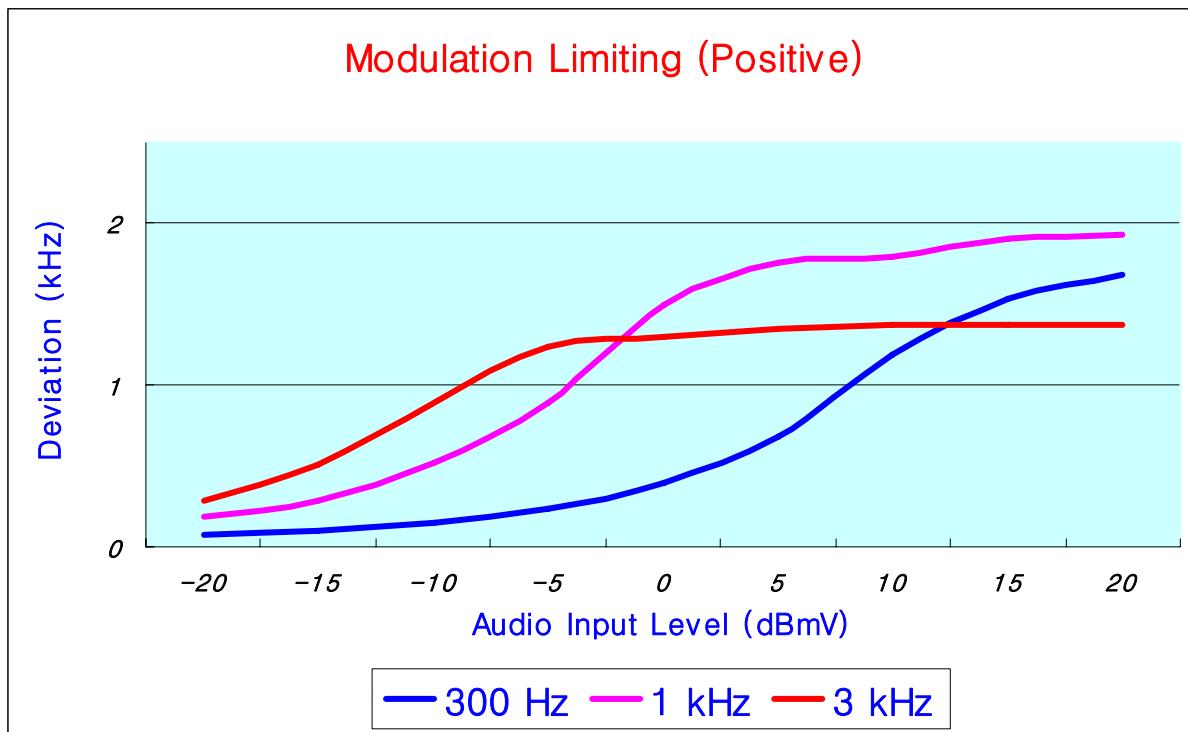
Audio Input Level (dB)	Positive Peak Deviation (kHz)			Negative Peak Deviation (kHz)		
	300 Hz	1 kHz	3 kHz	300 Hz	1 kHz	3 kHz
-20	0.24	0.38	1.05	0.16	0.45	0.86
-15	0.29	0.69	1.81	0.27	0.82	1.5
-10	0.36	1.1	2.83	0.36	1.11	2.72
-5	0.55	2.01	3.12	0.59	1.85	3.15
0	0.89	3	3.15	0.81	3	3.26
+5	1.56	3.56	3.26	1.41	3.62	3.38
+10	2.52	3.7	3.28	2.46	3.99	3.39
+15	2.84	3.81	3.29	2.98	4.05	3.4
+20	3.11	3.82	3.29	3.3	4.12	3.4

#### 5.4.6.7 Data (WideBand, 3rd Channel)

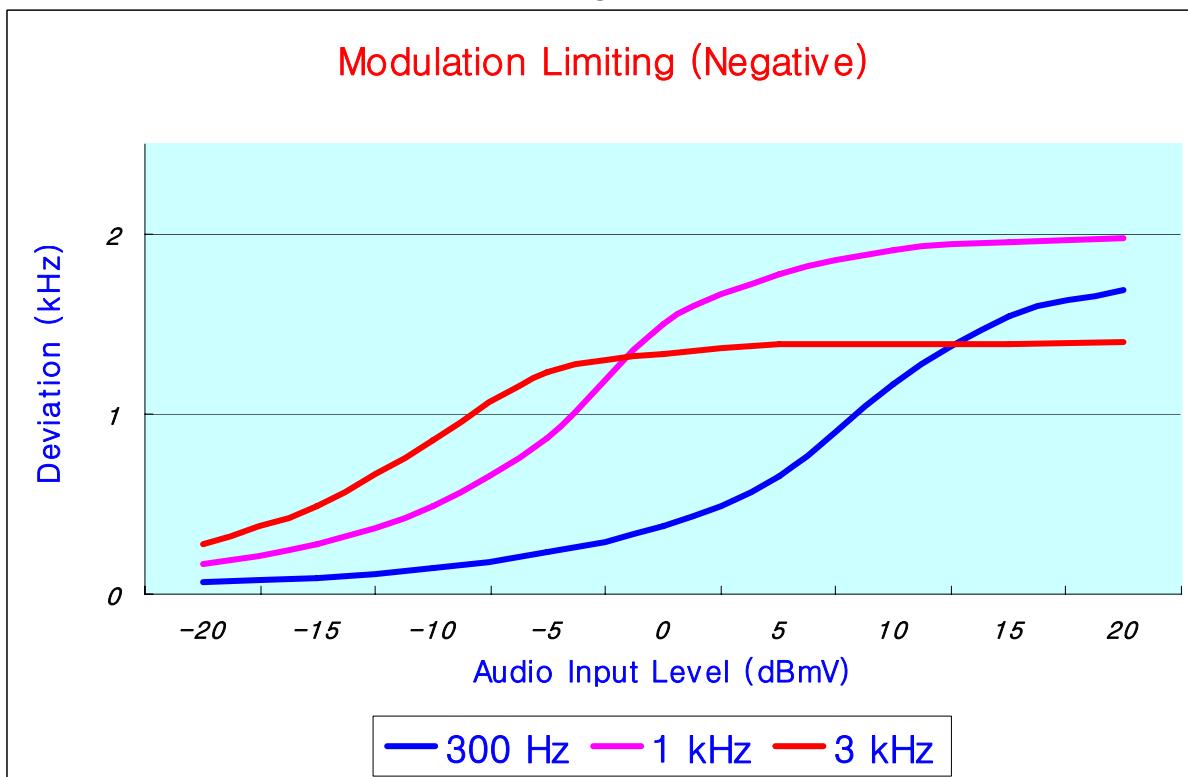
Audio Input Level (dB)	Positive Peak Deviation (kHz)			Negative Peak Deviation (kHz)		
	300 Hz	1 kHz	3 kHz	300 Hz	1 kHz	3 kHz
-20	0.25	0.36	1.06	0.16	0.45	0.88
-15	0.26	0.66	1.8	0.28	0.79	1.5
-10	0.38	1.16	2.81	0.35	1.1	2.7
-5	0.52	1.99	3.11	0.59	1.85	3.15
0	0.83	3	3.14	0.79	3.12	3.26
+5	1.54	3.55	3.27	1.41	3.62	3.39
+10	2.49	3.71	3.28	2.46	3.95	3.39
+15	2.86	3.8	3.28	2.98	4.04	3.4
+20	3.09	3.82	3.29	3.26	4.12	3.4

### 5.4.7 Graph

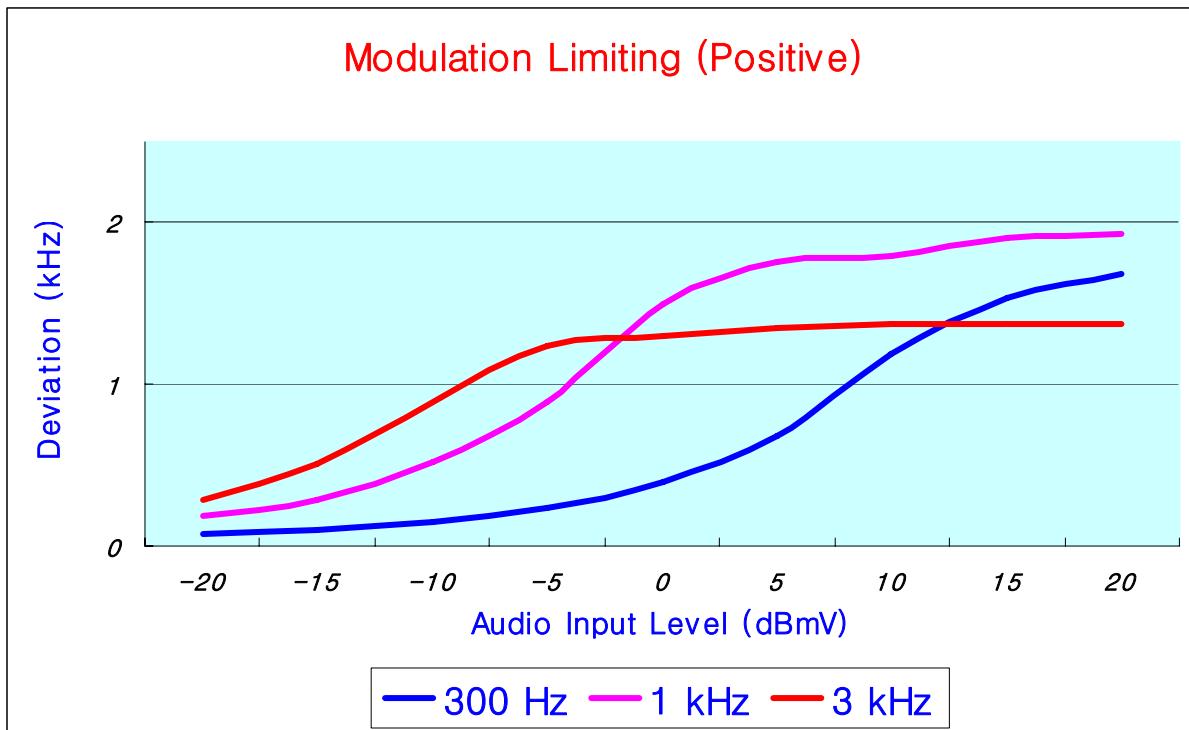
#### 5.4.7.1 Narrow Band, 1st Channel, Positive



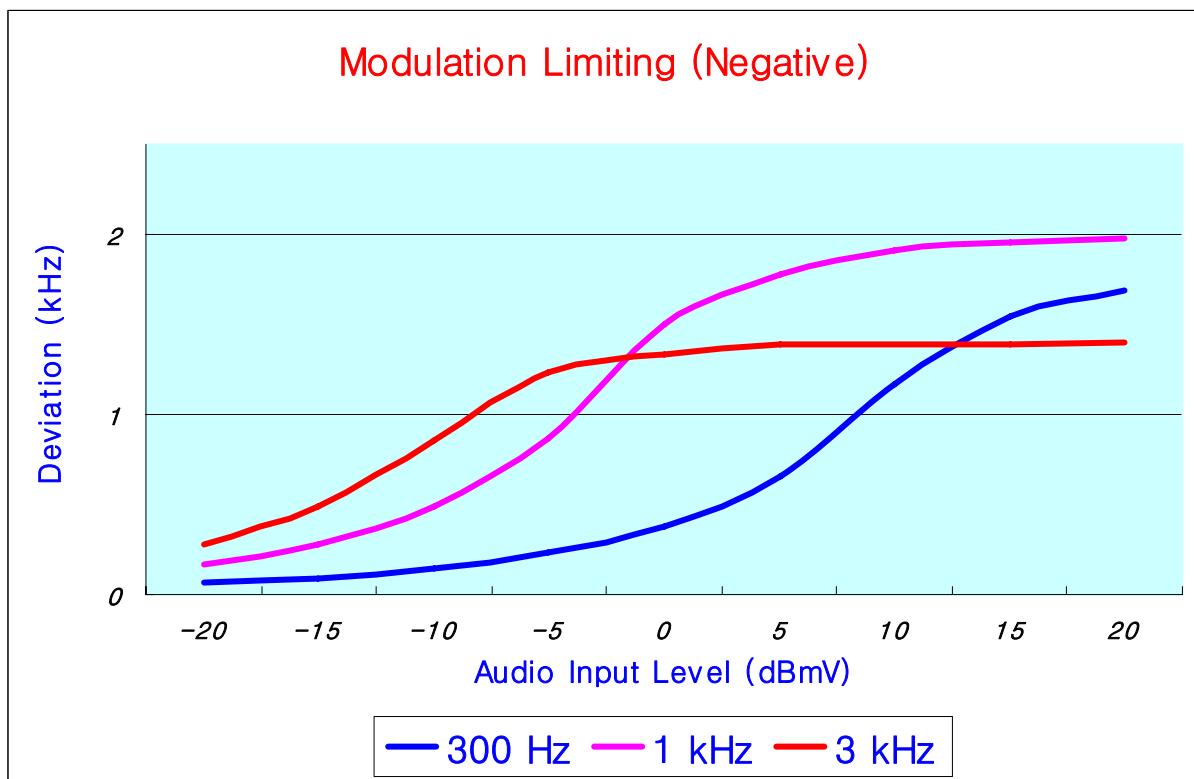
#### 5.4.7.2 Narrow Band, 1st Channel, Negative



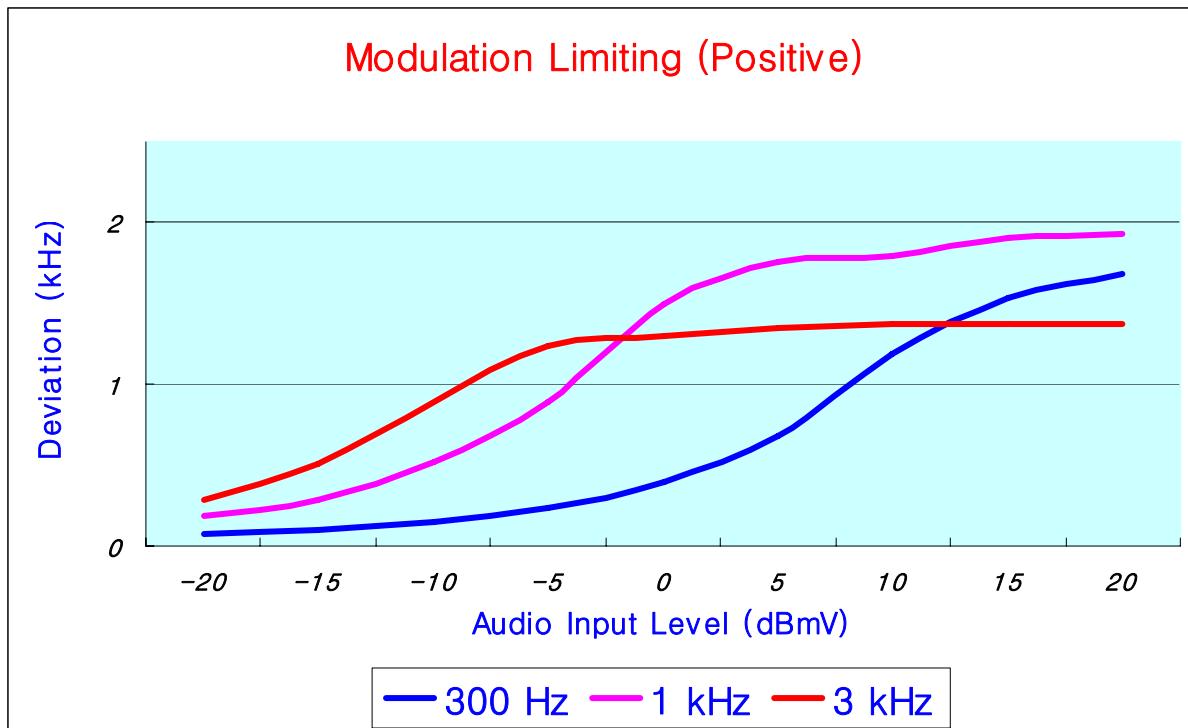
**5.4.7.3      Narrow Band, 2nd Channel, Positive**



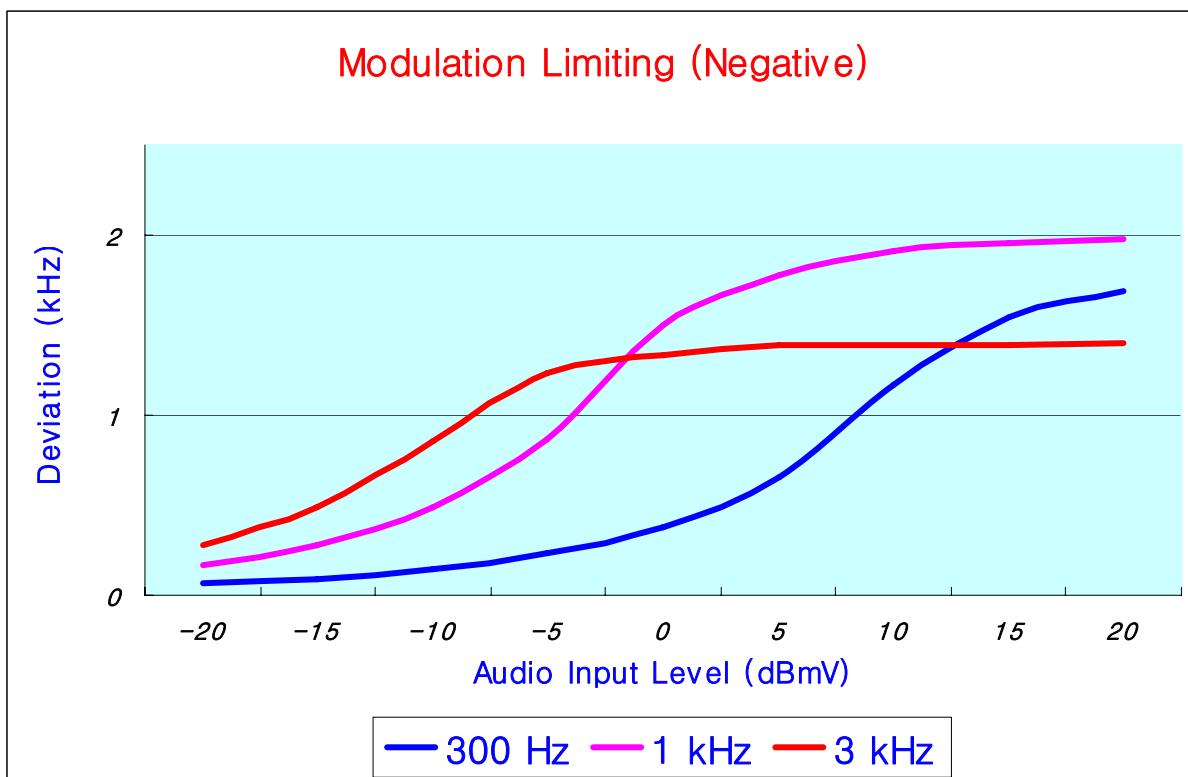
**5.4.7.4      Narrow Band, 2nd Channel, Negative**



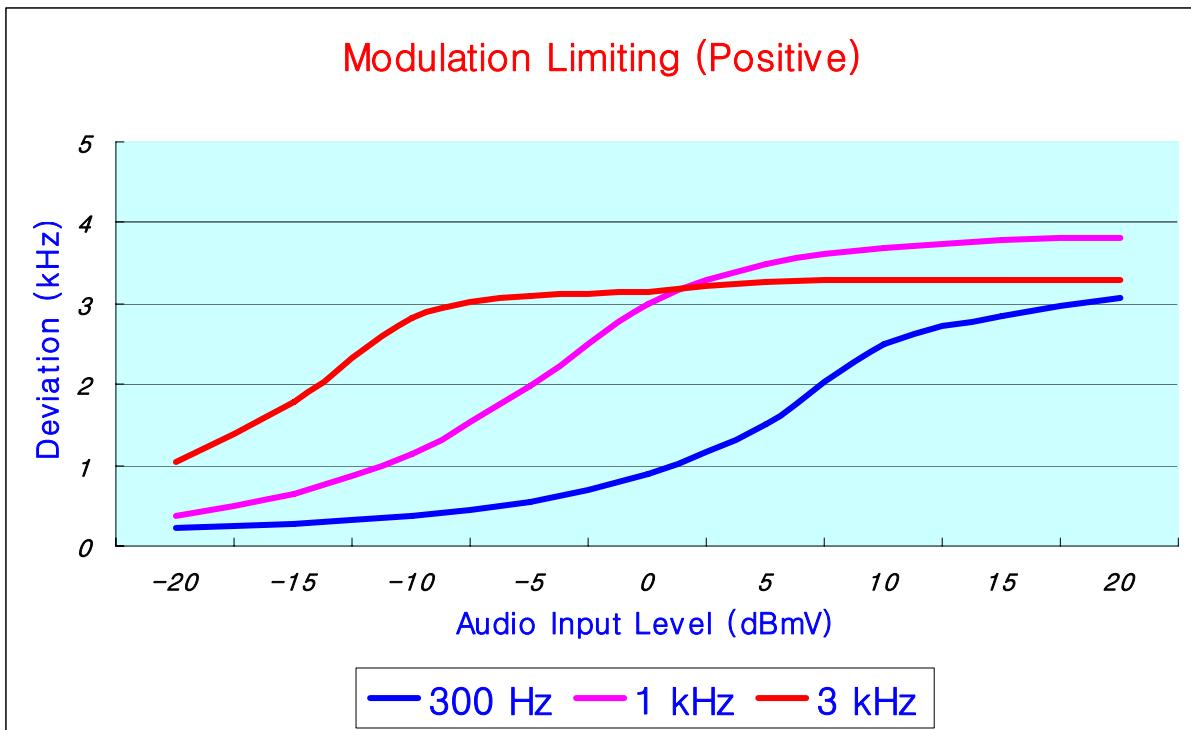
**5.4.7.5      Narrow Band, 3rd Channel, Positive**



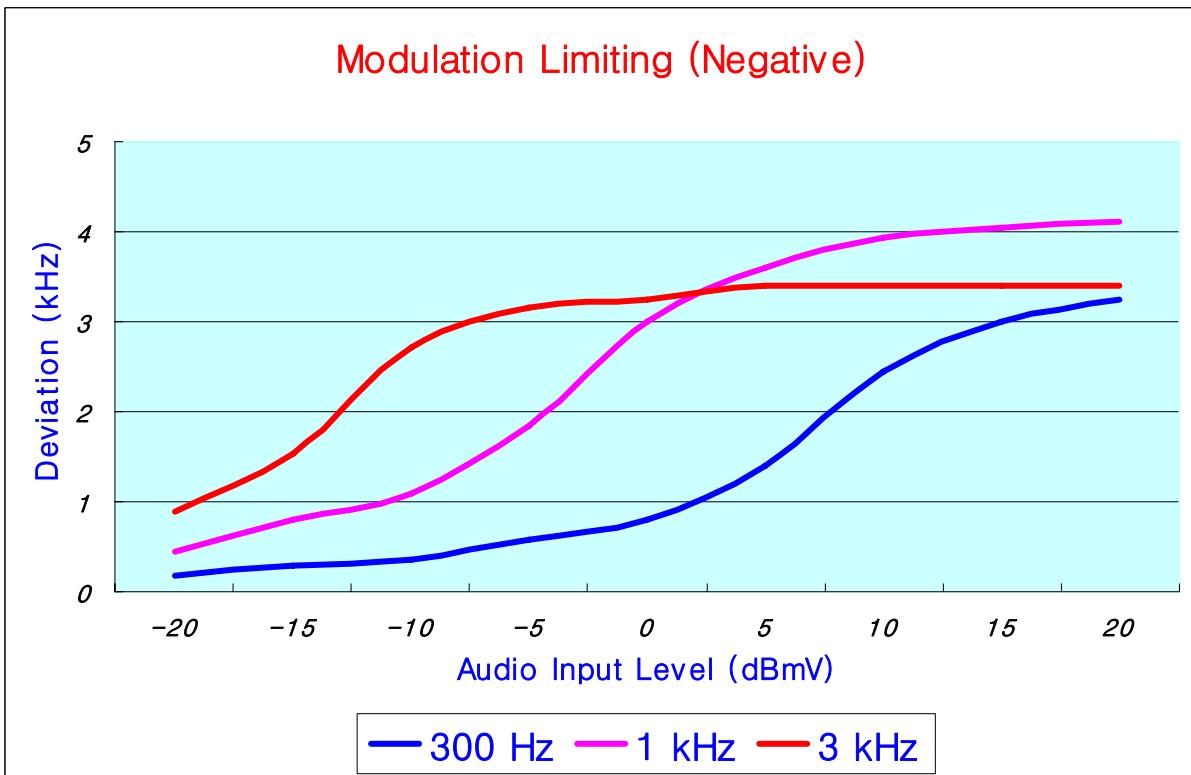
**5.4.7.6      Narrow Band, 3rd Channel, Negative**



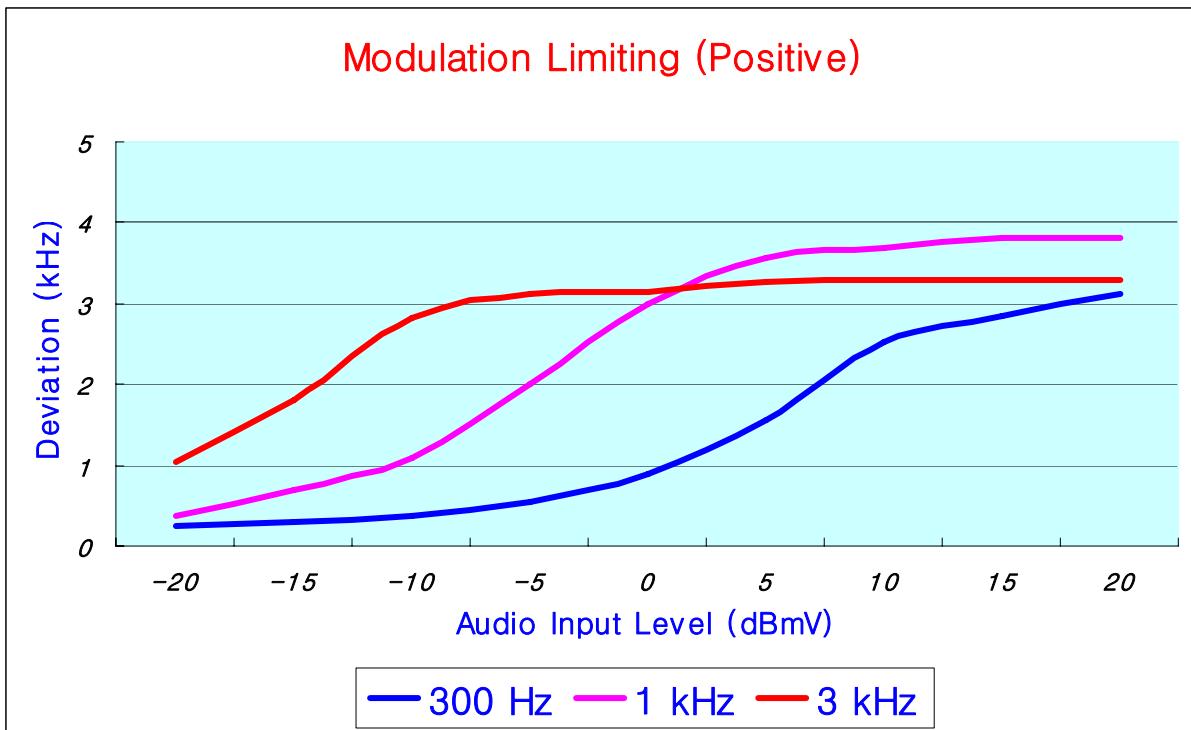
**5.4.8.7      WideBand, 1st Channel, Positive**



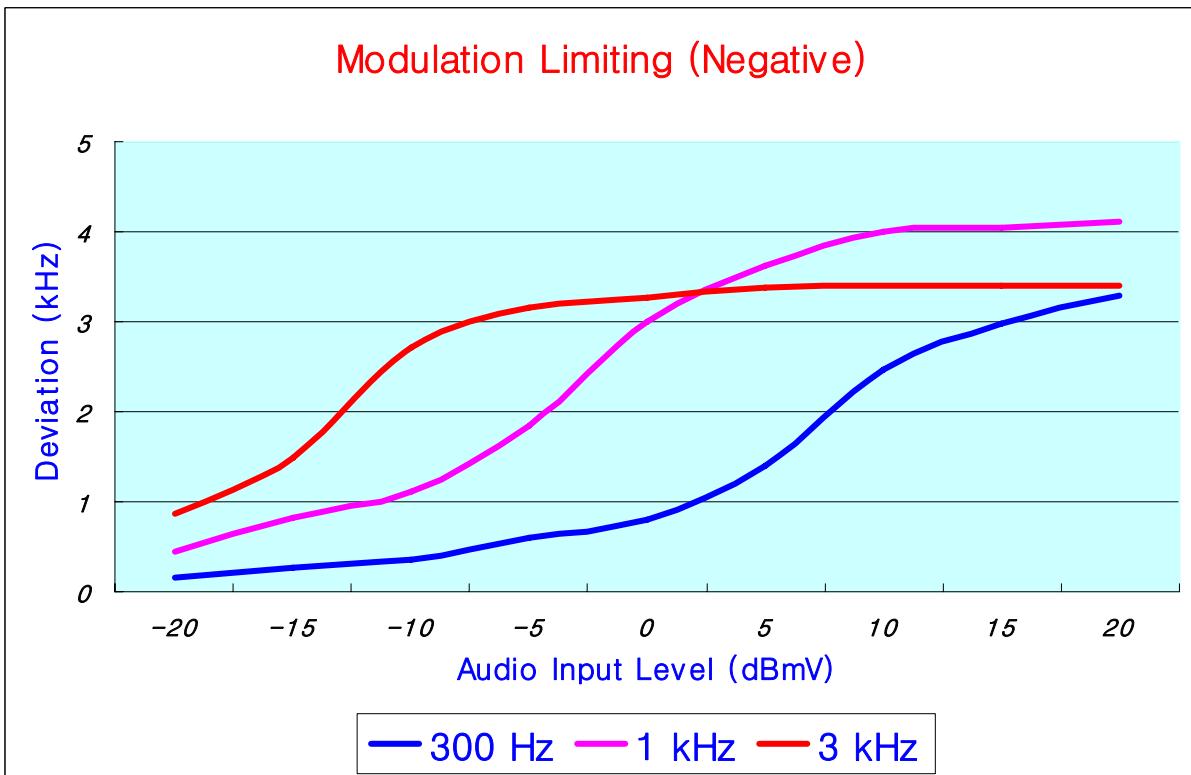
**5.4.8.8      WideBand, 1st Channel, Negative**



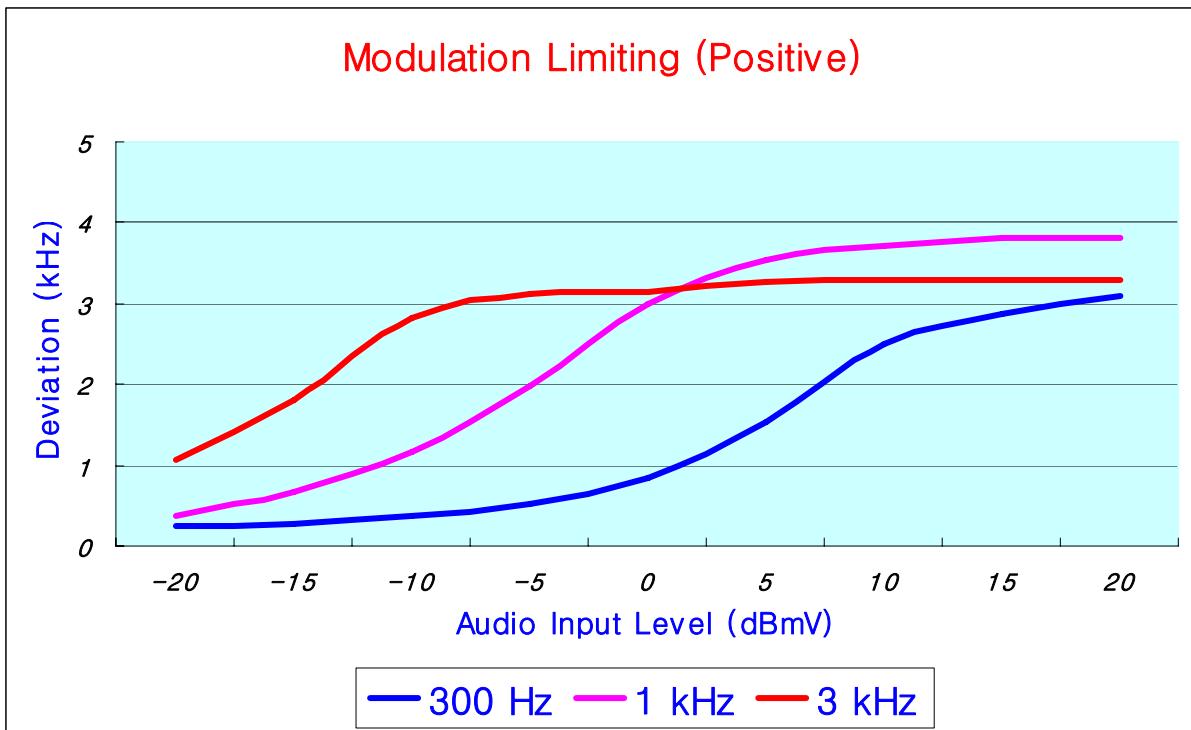
**5.4.8.9      WideBand, 2nd Channel, Positive**



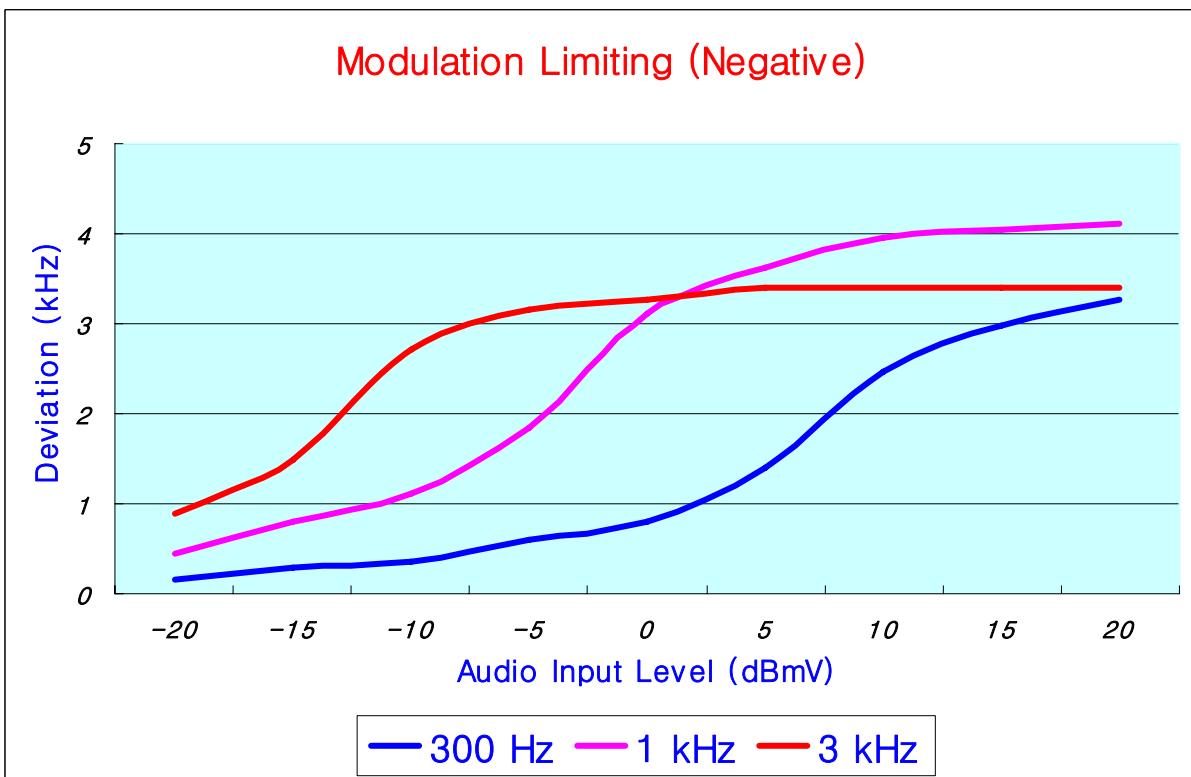
**5.4.8.10      WideBand, 2nd Channel, Negative**



**5.4.8.11 WideBand, 3rd Channel, Positive**



**5.4.8.12 WideBand, 3rd Channel, Negative**



## 5.5 Occupied Bandwidth

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission. Specified limits according to the emission mask per section 90.210 is as below.

**Emission Mask B.** For transmitters that are equipped with an audio low-pass filter, the power of any emission must be below the unmodulated carrier power (P) as follows:

- (1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
- (2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
- (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least  $43 + 10 \log (P)$  dB.

**Emission Mask D.** For transmitters designed to operate with a 12.5 kHz 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 5.625 kHz removed from  $f_0$ : Zero dB.
- (2) On any frequency removed 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 12.5 kHz: 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.

### 5.5.1 Specification

FCC Rules Part 2, Section 2.1049  
FCC Rules Part 90, Section 90.210  
Industry Canada, RSS-119 Issue 9 Section 5.5

### 5.5.2 Method of Measurement

ANSI/TIA-603-B-2002 Section 2.2.11

### 5.5.3 Measurement Set-Up

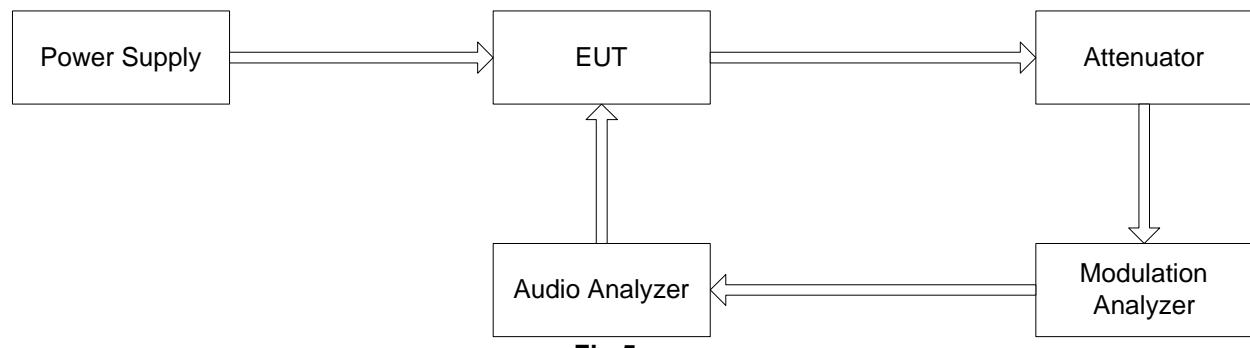


Fig.5

#### 5.5.4 Test Equipment List

Equipment	Model Name	Manufacturer
EUT	SM5102	Maxon CIC Corp.
Power Supply	6206-60	CHROMA
Audio Analyzer	8903B	Agilent
Spectrum Analyzer	FSP7	Rohde & Schwarz
Attenuator	RFA500NMF30	

#### 5.5.5 Measurement Procedure

- The unit was turn-up in accordance with the alignment procedure stated in the FIG. 5 , and was loaded into a 50 ohm resistive termination.
- The radio transmitter was modulated by a 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation. The input level shall be established at the frequency of maximum response of the audio modulating circuit.
- The occupied bandwidth data is obtained for 25kHz and 12.5 kHz channel bandwidth.

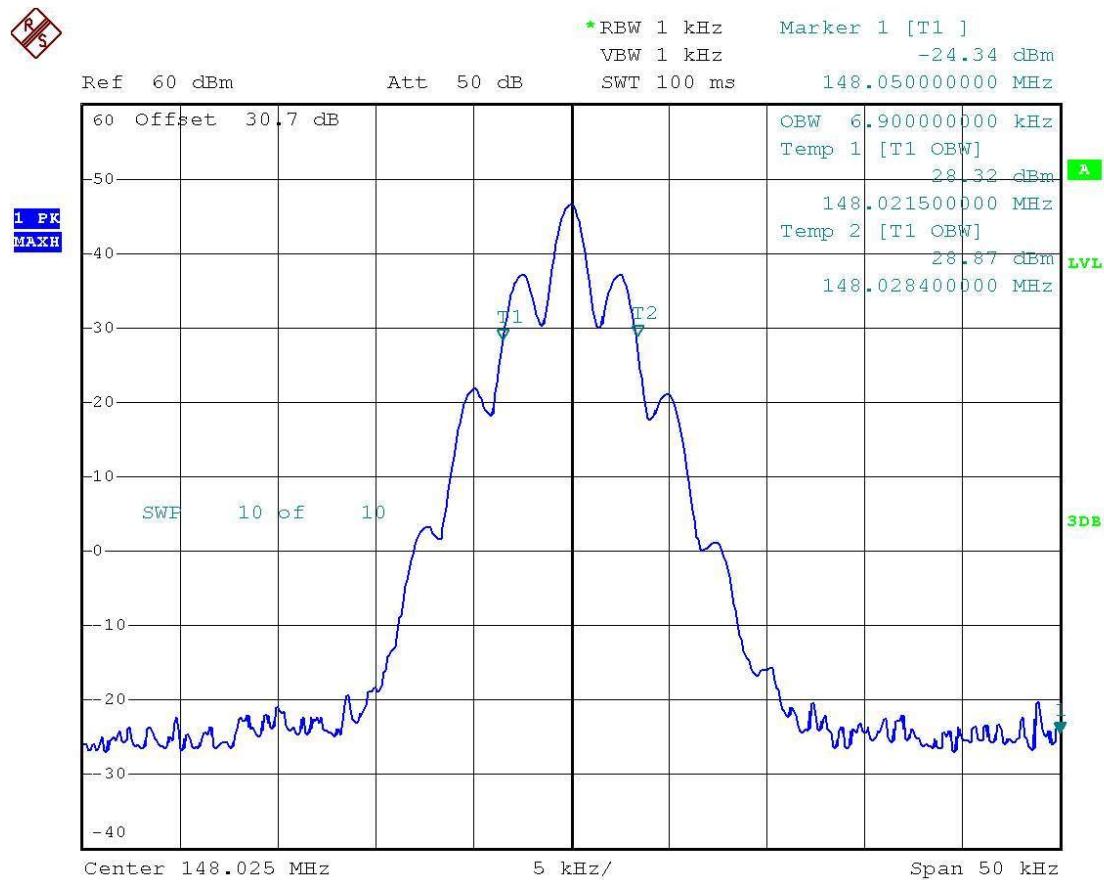
#### 5.5.6 Data

Frequency (MHz)	Channel Spacing	Applicable Emission Mask	99% Bandwidth (kHz)	Maximum Authorized Bandwidth (KHz)
148.025 MHz	Narrow	D	6.9	11.25
	Wide	B	11.7	20.00
161.025 MHz	Narrow	D	7.0	11.25
	Wide	B	12.0	20.00
173.975 MHz	Narrow	D	7.0	11.25
	Wide	B	12.5	20.00

## 5.5.7 99% Bandwidth

### 5.5.7.1 Plot 1

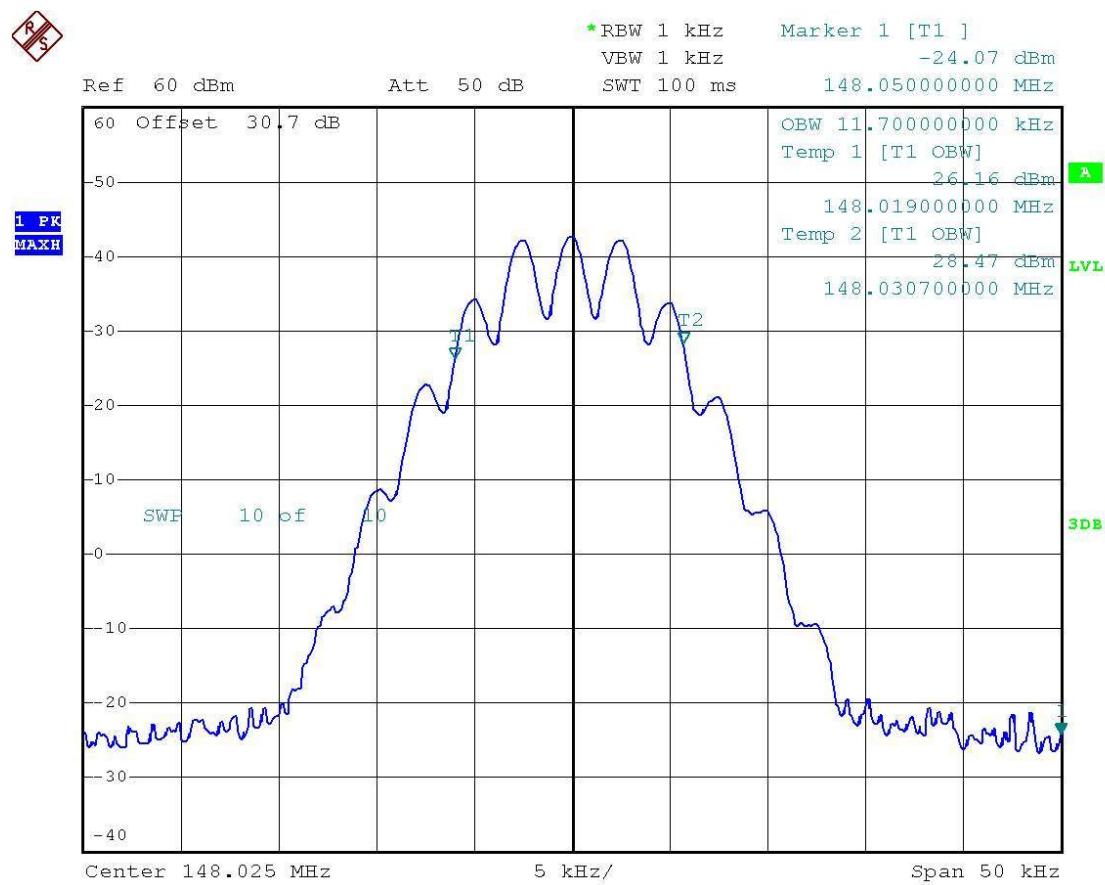
FCC Rules :	Part 2 §2.1053(a) & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.5
Operating Frequency :	148.025 MHz
Channel :	1st Channel
Power Output :	50 Watts
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	13.8 VDC



Date: 28.JUL.2009 03:54:13

### 5.5.7.2 Plot 2

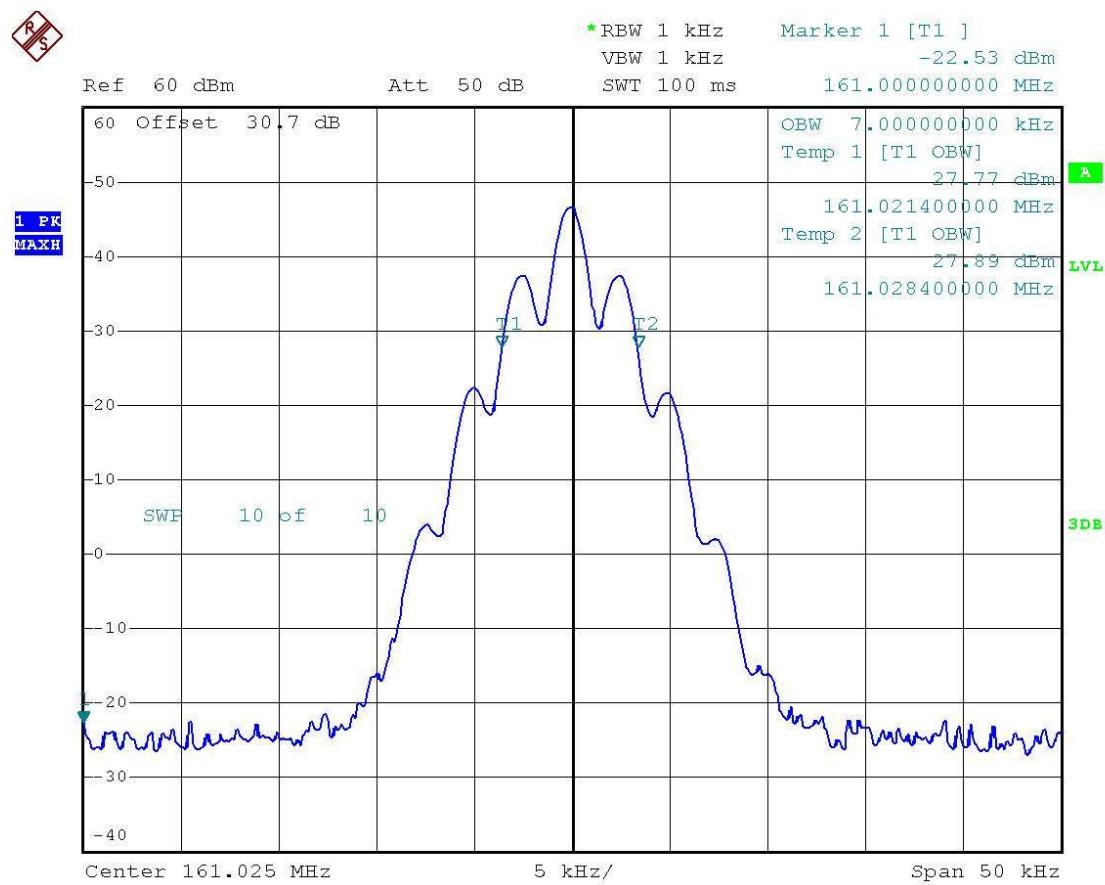
FCC Rules :	Part 2 §2.1053(a) & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.5
Operating Frequency :	148.025 MHz
Channel :	1st Channel
Power Output :	50 Watts
Channel Spacing :	WideBand
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	13.8 VDC



Date: 28.JUL.2009 03:55:31

### 5.5.7.3 Plot 3

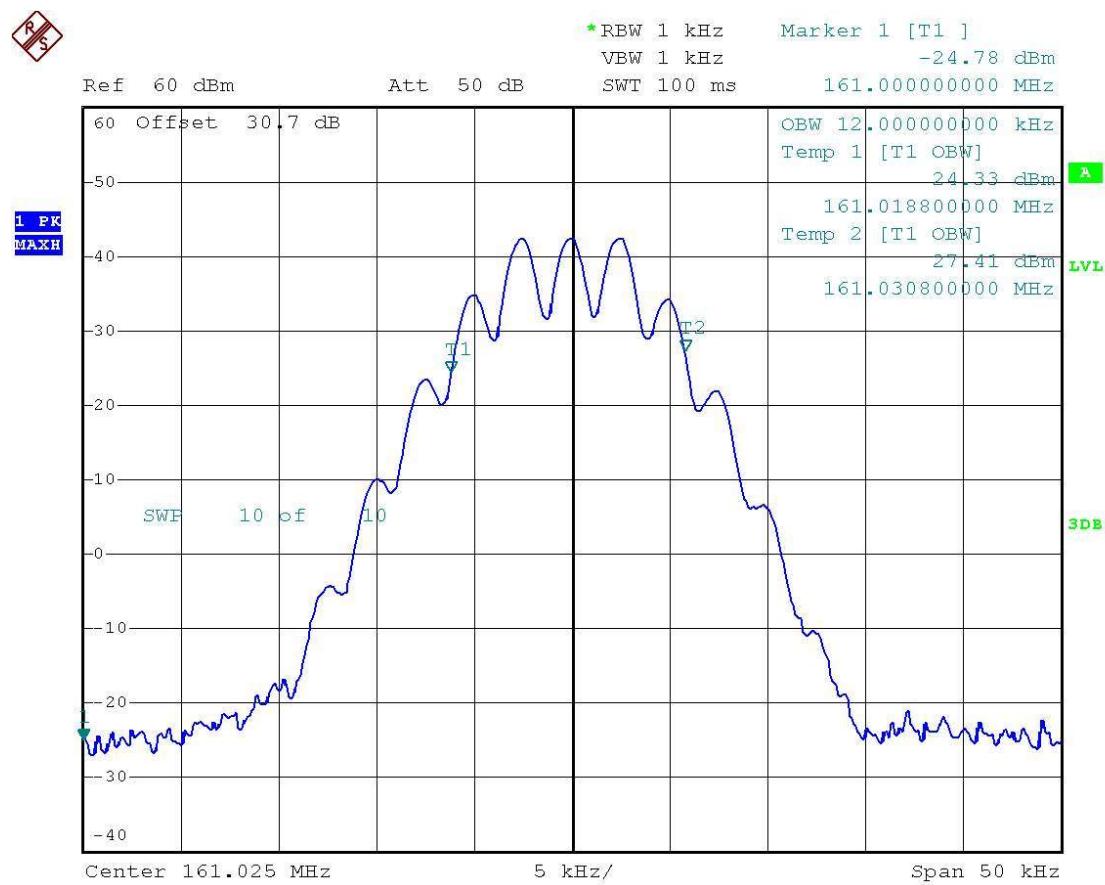
FCC Rules :	Part 2 §2.1053(a) & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.5
Operating Frequency :	161.025 MHz
Channel :	2nd Channel
Power Output :	50 Watts
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	13.8 VDC



Date: 28.JUL.2009 03:57:39

**5.5.7.4 Plot 4**

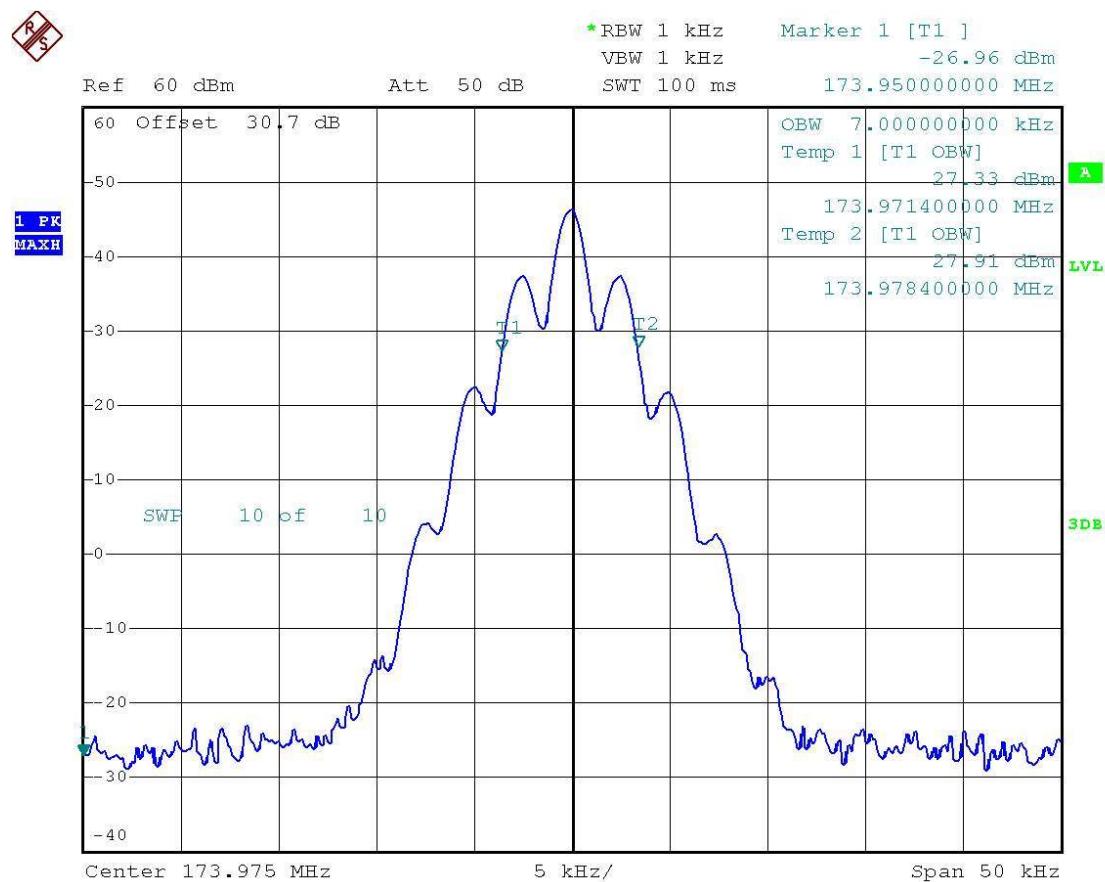
FCC Rules :	Part 2 §2.1053(a) & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.5
Operating Frequency :	161.025 MHz
Channel :	2nd Channel
Power Output :	50 Watts
Channel Spacing :	WideBand
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	13.8 VDC



Date: 28.JUL.2009 03:56:51

**5.5.7.5 Plot 5**

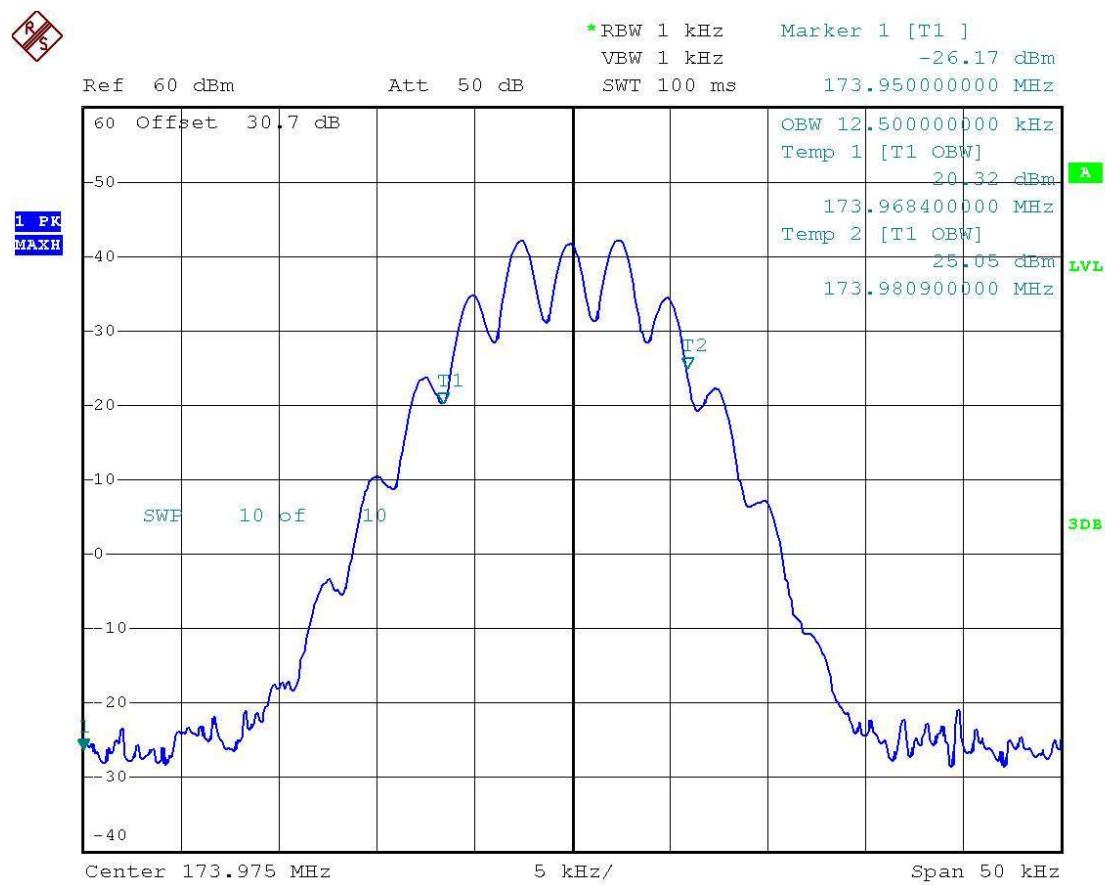
FCC Rules :	Part 2 §2.1053(a) & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.5
Operating Frequency :	173.975 MHz
Channel :	3rd Channel
Power Output :	50 Watts
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	13.8 VDC



Date: 28.JUL.2009 03:58:36

**5.5.7.6 Plot 6**

FCC Rules :	Part 2 §2.1053(a) & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.5
Operating Frequency :	173.975 MHz
Channel :	3rd Channel
Power Output :	50 Watts
Channel Spacing :	WideBand
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	99% Bandwidth
Reference Voltage :	13.8 VDC

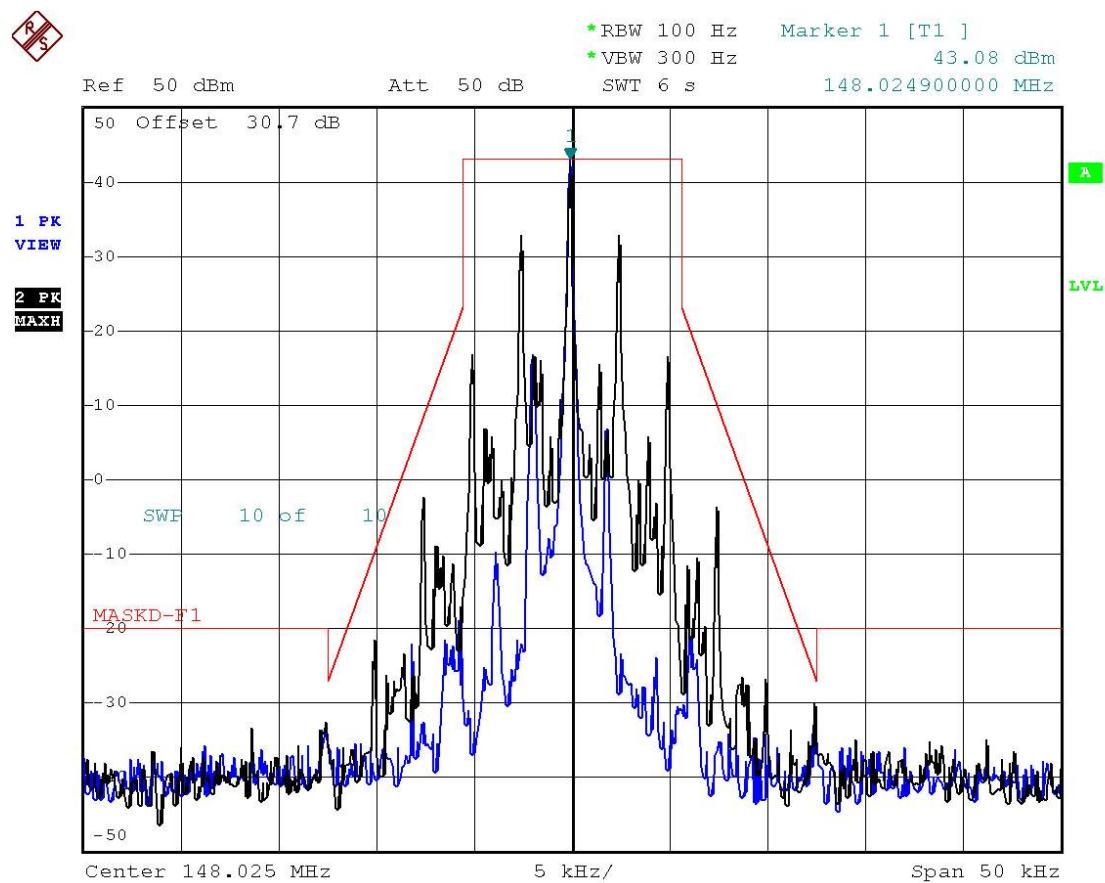


Date: 28.JUL.2009 03:59:19

## 5.5.8 Emission Mask

### 5.5.8.1 Plot 1

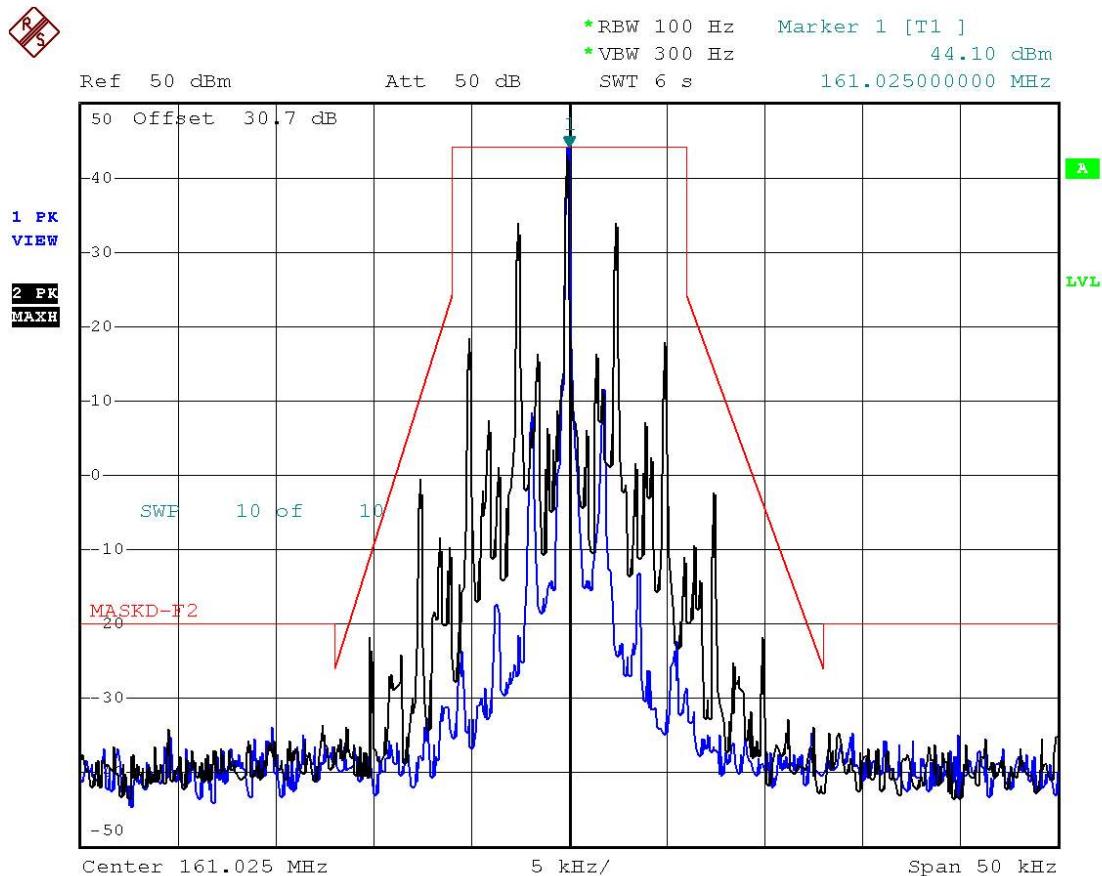
FCC Rules :	Part 2 §2.1053(a) & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.5
Operating Frequency :	148.025 MHz
Channel :	1st Channel
Power Output :	50 Watts
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	Mask D
Reference Voltage :	13.8 VDC



Date: 29.JUL.2009 13:55:47

**5.5.8.2 Plot 2**

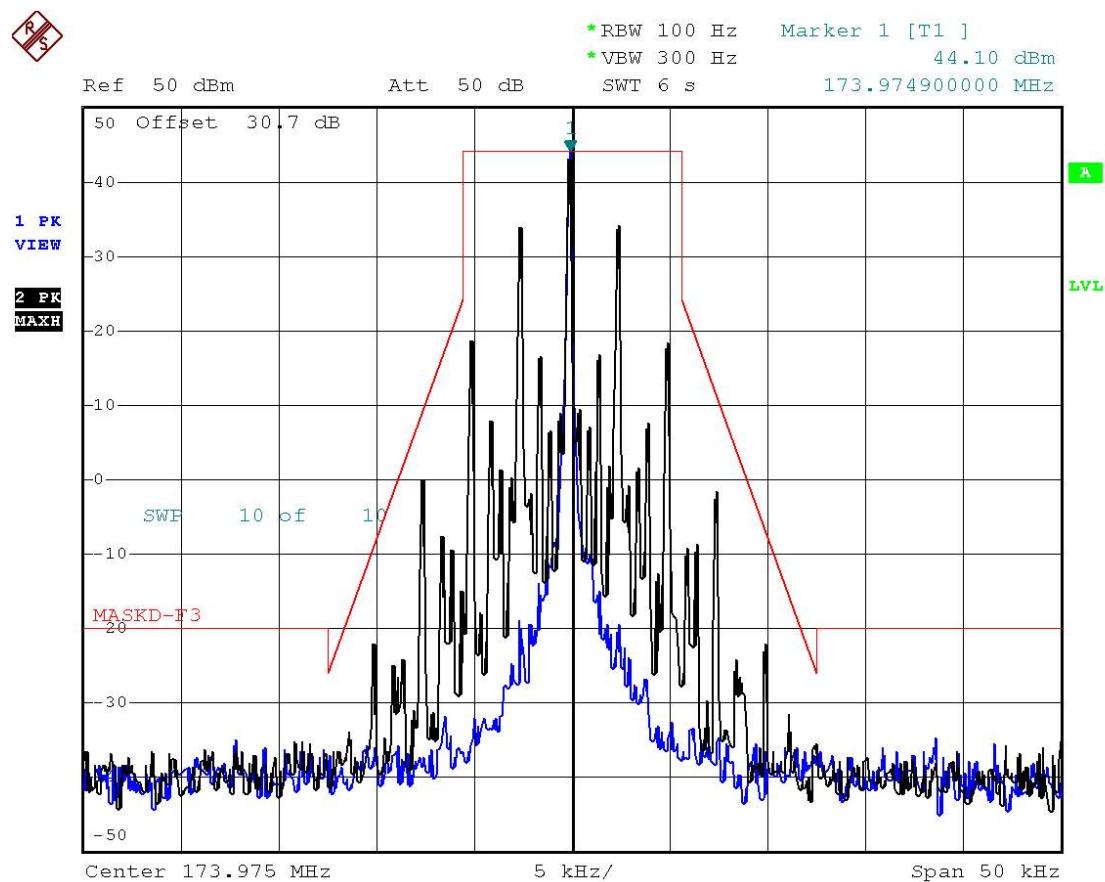
FCC Rules :	Part 2 §2.1053(a) & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.5
Operating Frequency :	161.025 MHz
Channel :	2 nd Channel
Power Output :	50 Watts
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	Mask D
Reference Voltage :	13.8 VDC



Date: 29.JUL.2009 13:59:16

### 5.5.8.3 Plot 3

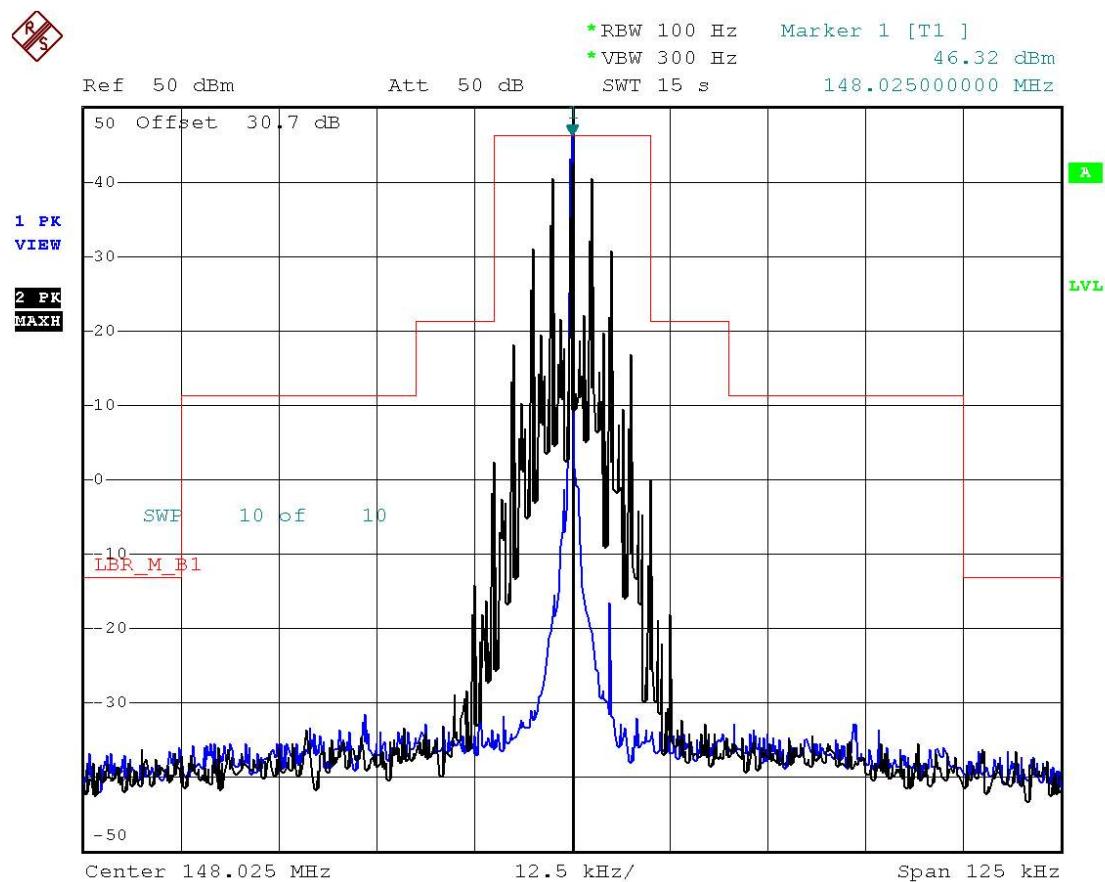
FCC Rules :	Part 2 §2.1053(a) & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.5
Operating Frequency :	173.975 MHz
Channel :	3 rd Channel
Power Output :	50 Watts
Channel Spacing :	Narrow Band
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	Mask D
Reference Voltage :	13.8 VDC



Date: 29.JUL.2009 14:01:49

**5.5.8.4 Plot 4**

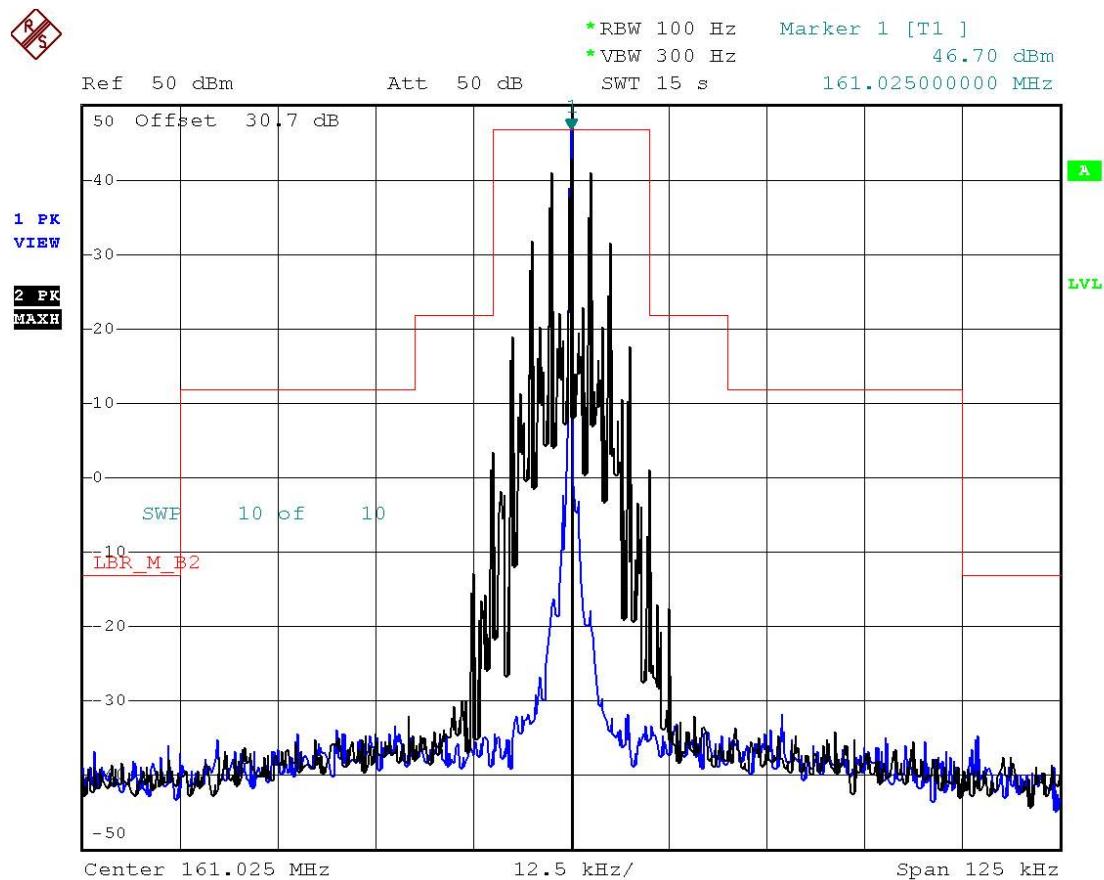
FCC Rules :	Part 2 §2.1053(a) & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.5
Operating Frequency :	148.025 MHz
Channel :	1st Channel
Power Output :	50 Watts
Channel Spacing :	WideBand
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	Mask B
Reference Voltage :	13.8 VDC



Date: 20.AUG.2009 15:42:16

**5.5.8.5 Plot 5**

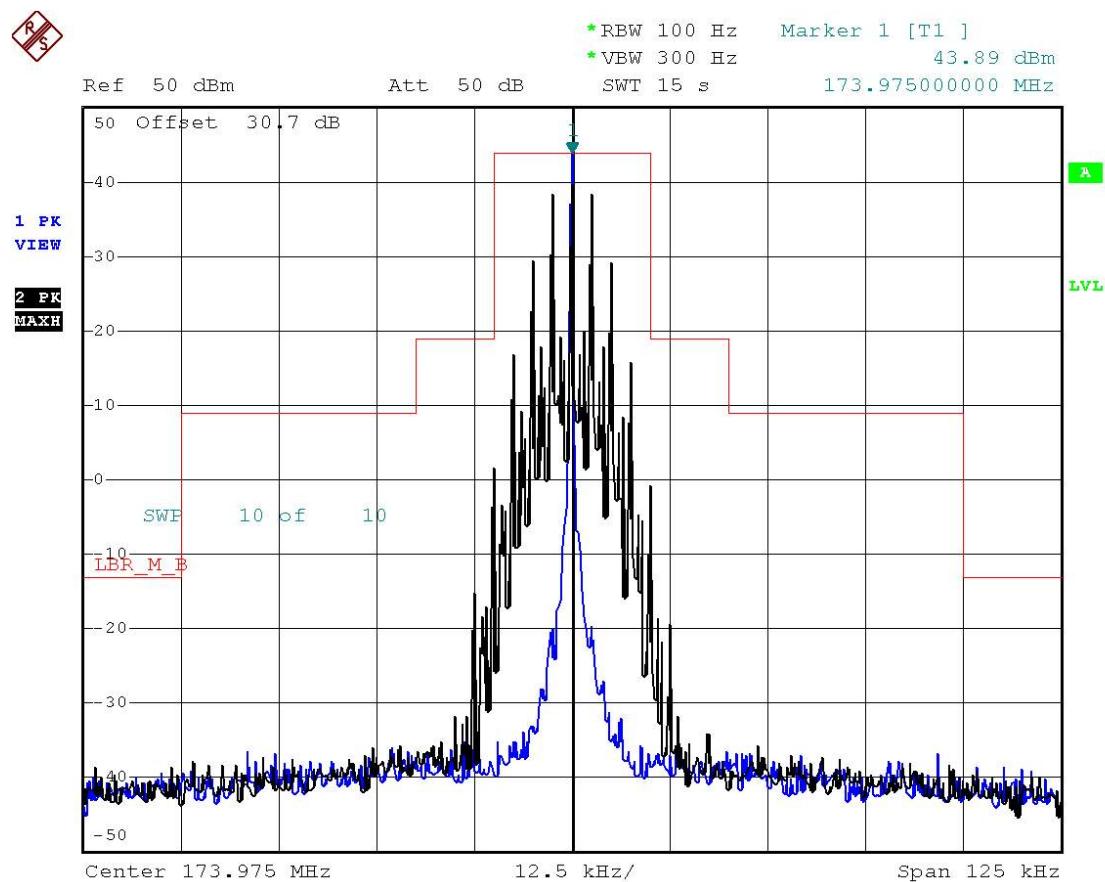
FCC Rules : Part 2 §2.1053(a) & §90.210  
 IC Rules : RSS-119 Issue 9 Section 5.5  
 Operating Frequency : 161.025 MHz  
 Channel : 2nd Channel  
 Power Output : 50 Watts  
 Channel Spacing : WideBand  
 Modulation Signal : FM modulation with 2.5kHz sine wave signal  
 Emission Mask : Mask B  
 Reference Voltage : 13.8 VDC



Date: 20.AUG.2009 15:47:48

## 5.5.8.6 Plot 6

FCC Rules :	Part 2 §2.1053(a) & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.5
Operating Frequency :	173.975 MHz
Channel :	3rd Channel
Power Output :	50 Watt
Channel Spacing :	WideBand
Modulation Signal :	FM modulation with 2.5kHz sine wave signal
Emission Mask :	Mask B
Reference Voltage :	13.8 VDC



Date: 20.AUG.2009 15:56:33

## 5.6 Spurious Emissions at Antenna Terminals

Conducted spurious emissions are emissions at the antenna terminals on a frequency or frequencies which are outside of band sufficient to ensure transmission or information of required quality for the class of communication desired.

### 5.6.1 Specification

FCC Rules Part 2, Section 2.1051  
FCC Rules Part 90, Section 90.210  
Industry Canada, RSS-119 Issue 9 Section 5.8

### 5.6.2 Method of Measurement

ANSI/TIA-603-B-2002 Section 2.2.13

### 5.6.3 Measurement Set-Up

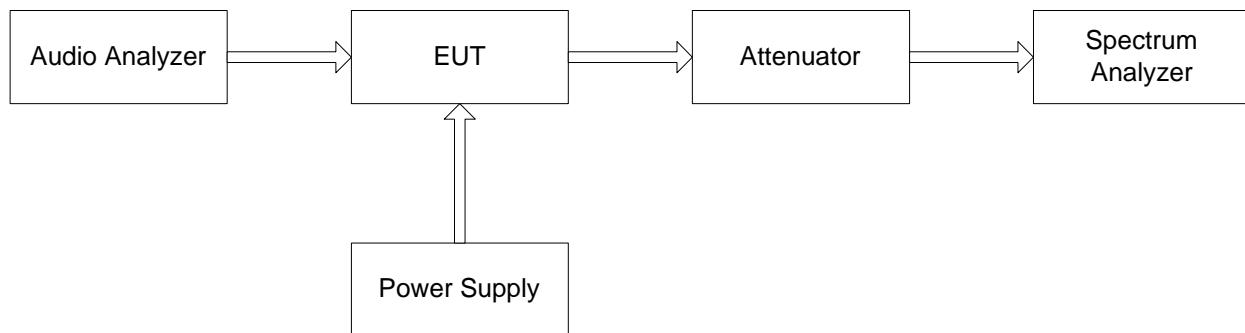


Fig.6

### 5.6.4 Test Equipment List

Equipment	Model Name	Manufacturer
EUT	SM5102	Maxon CIC Corp.
Power Supply	6206-60	CHROMA
Audio Analyzer	8903B	Agilent
Spectrum Analyzer	FSP7	Rohde & Schwarz
Attenuator	RFA500NMF30	

### 5.6.5 Measurement Procedure

- The unit was turned-up in accordance with the alignment procedure stated in the FIG. 6, and was loaded into a 50 ohm resistive termination.
- The antenna output terminal of the EUT was connected to the input of a 50 ohm spectrum analyzer through a matched 10 dB attenuator and notch filter.
- Transmitter was set to the maximum power output condition.
- The unit was modulated with a 2.5 kHz audio tone at an input level 16dB greater than that required 50% modulation. The spectrum was scanned from the lowest frequency generated in the equipment to the 10<sup>th</sup> harmonic of the carrier.
- The limit was applied according the  $50 + 10\log_{10}(P)$ : mean power in Watts) dB.

### 5.6.6 Data(50W High Power , 25kHz bandwidth)

Test Mode (TX/RX)		Spurious Emissions			
		Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
148.025MHz	TX	295.12	-21.78	-13	8.78
		443.62	-37.50		24.5
		740.62	-35.30		22.3
	RX	1926.00	-77.87	-64	13.87
	TX	322.84	-36.92	-13	23.92
		483.22	-32.85		19.85
161.025MHz	RX	1664.00	-77.72	-64	13.72
	TX	346.6	-32.77	-13	19.77
	RX	1514.00	-77.68	-64	13.68

### 5.6.7 Data(50W High Power , 12.5kHz bandwidth)

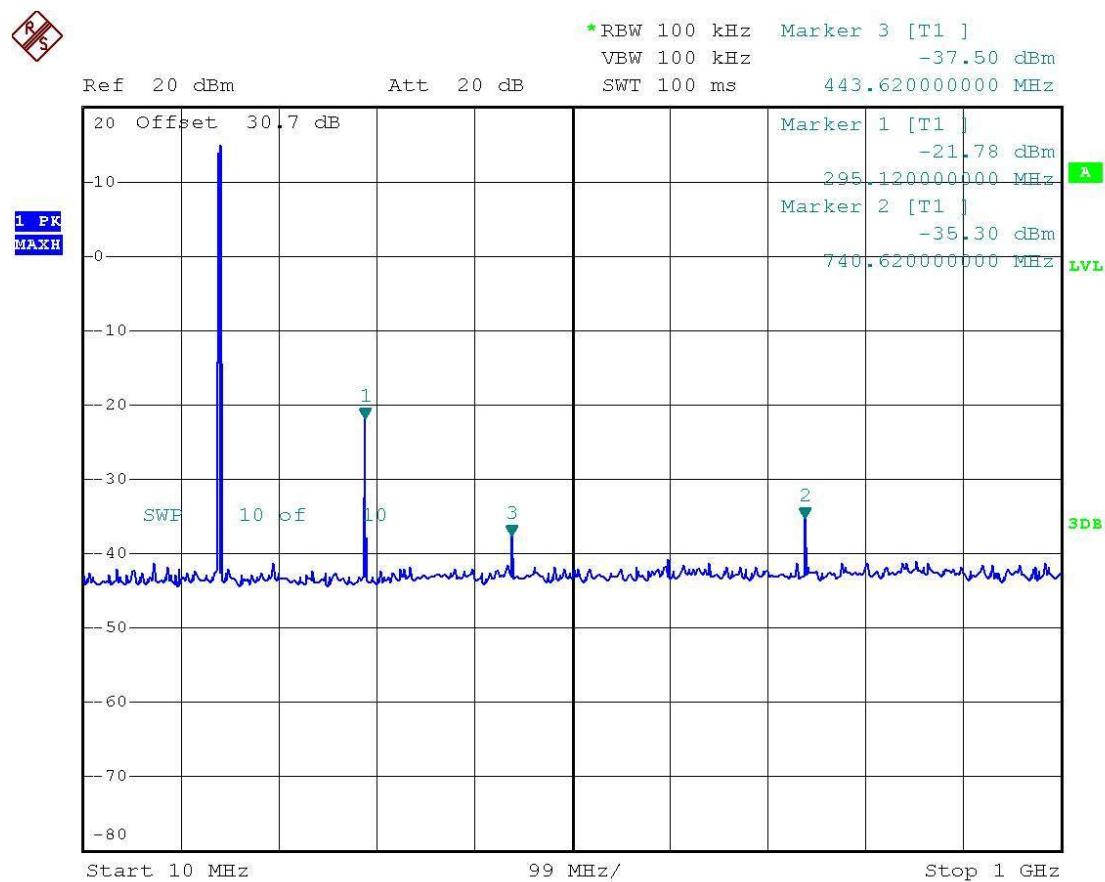
Test Mode (TX/RX)		Spurious Emissions			
		Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)
148.025MHz	TX	295.12	-20.21	-20	0.21
		443.62	-36.33		16.33
		592.12	-42.91		22.91
		740.62	-36.66		16.66
	RX	1390.00	-78.67	-64	14.67
161.025MHz	TX	322.84	-37.61	-20	17.61
		483.22	-31.50		11.50
	RX	1802.00	-77.78	-64	13.78
	TX	348.16	-42.83	-20	22.83
173.975MHz	RX	1072.00	-78.57	-64	14.57

## 5.6.8 Plots

### 5.6.8.1 1st Channel

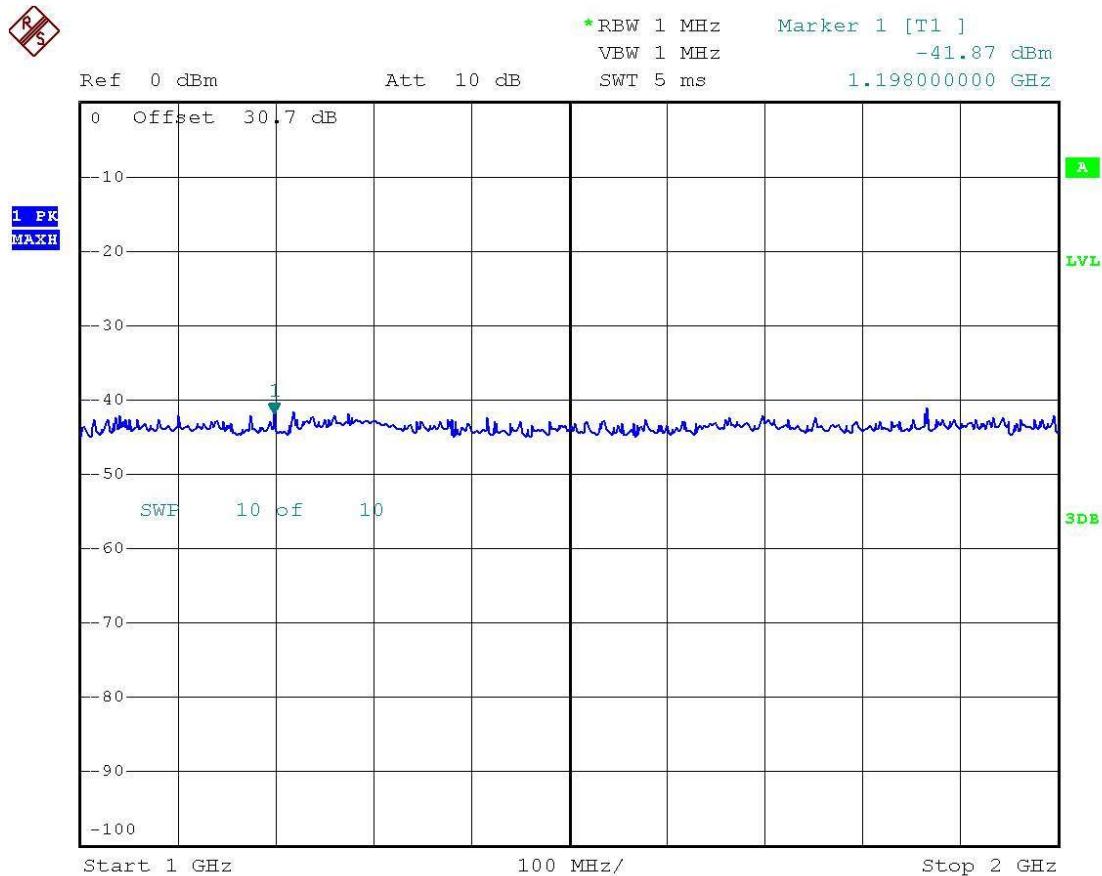
FCC Rules :	Part 2 §2.1051 & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.8
Operating Frequency :	148.025 MHz
Channel :	1st Channel
Power Output :	50 Watts
Channel Spacing :	WideBand
Reference Voltage :	13.8 VDC
Limit :	$43 + 10\log_{10}P$ (-13dBm)

#### 5.6.8.1.1 10 MHz ~ 1 GHz



Date: 28.JUL.2009 05:17:51

**5.6.8.1.2 1 GHz ~ 2 GHz**

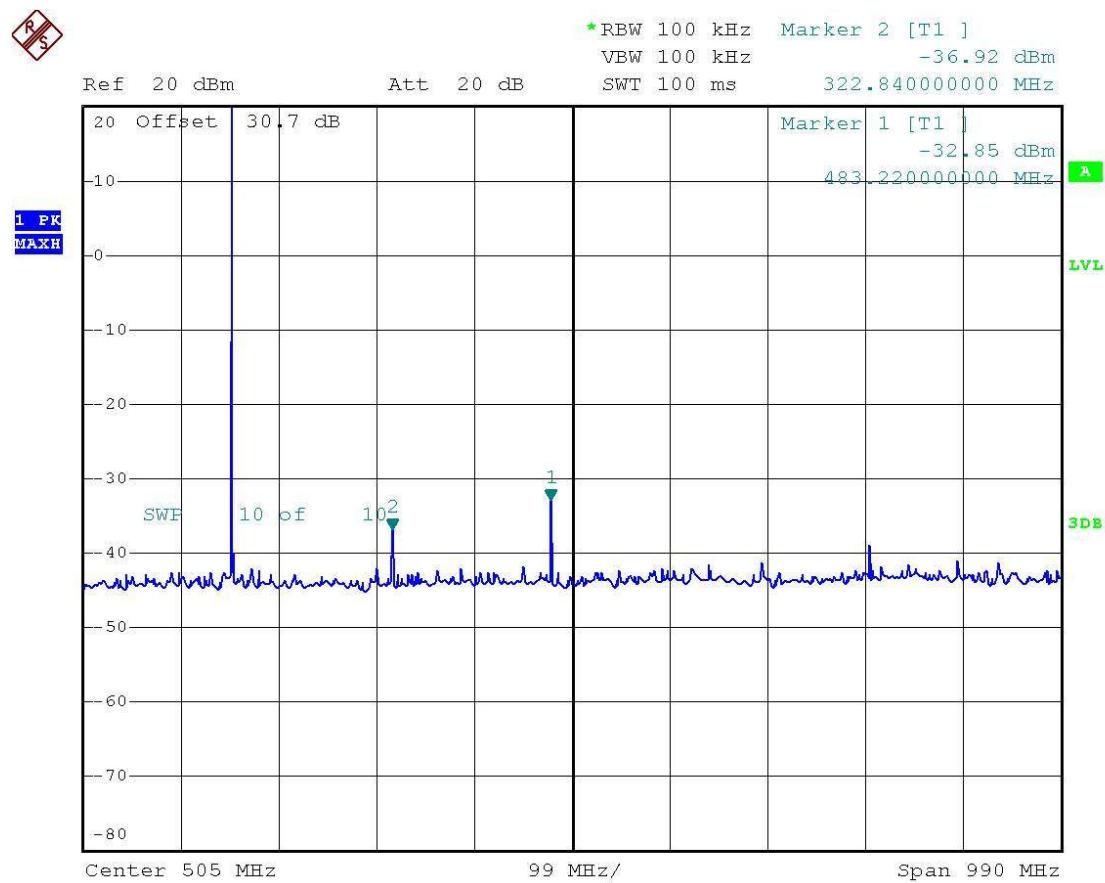


Date: 28.JUL.2009 05:18:40

### 5.6.8.2 2nd Channel

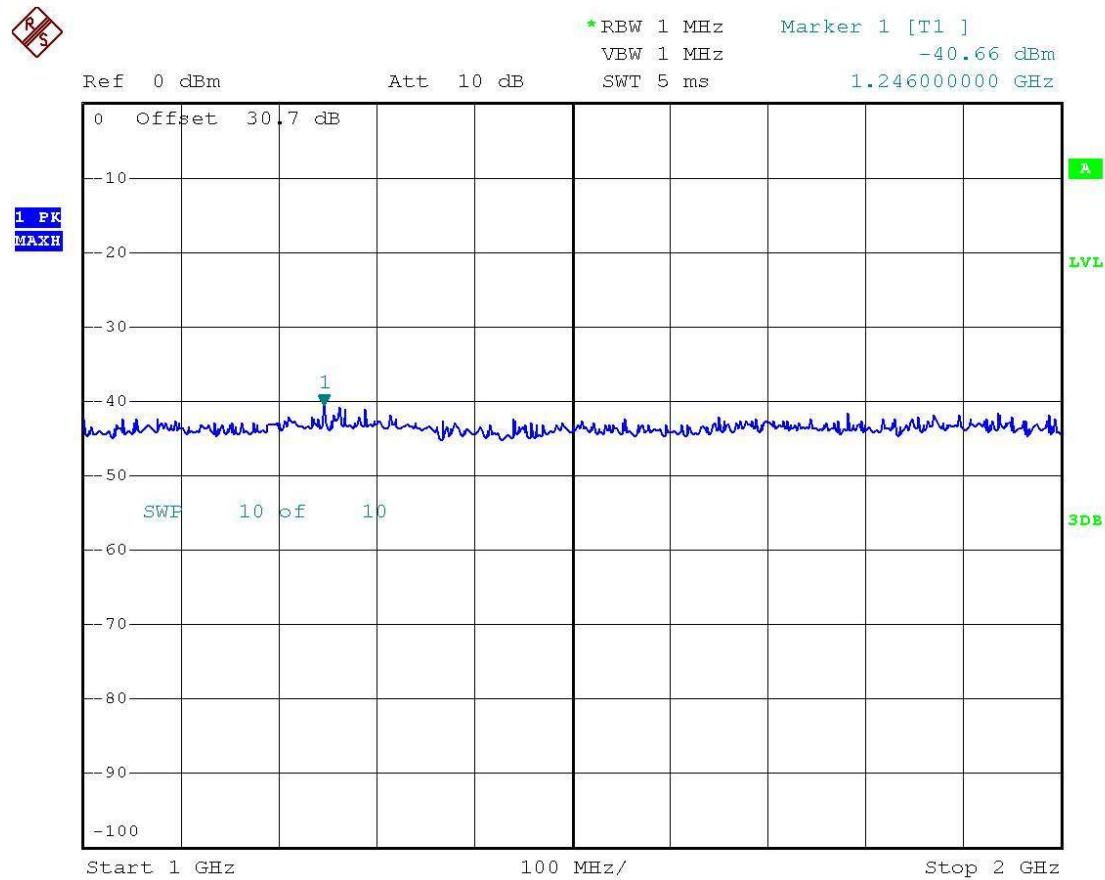
FCC Rules :	Part 2 §2.1051 & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.8
Operating Frequency :	161.025 MHz
Channel :	2nd Channel
Power Output :	50 Watts
Channel Spacing :	WideBand
Reference Voltage :	13.8 VDC
Limit :	$43 + 10\log_{10}P$ (-13dBm)

#### 5.6.8.2.1 10 MHz ~ 1 GHz



Date: 28.JUL.2009 05:19:36

**5.6.8.2.2 1 GHz ~ 2 GHz**

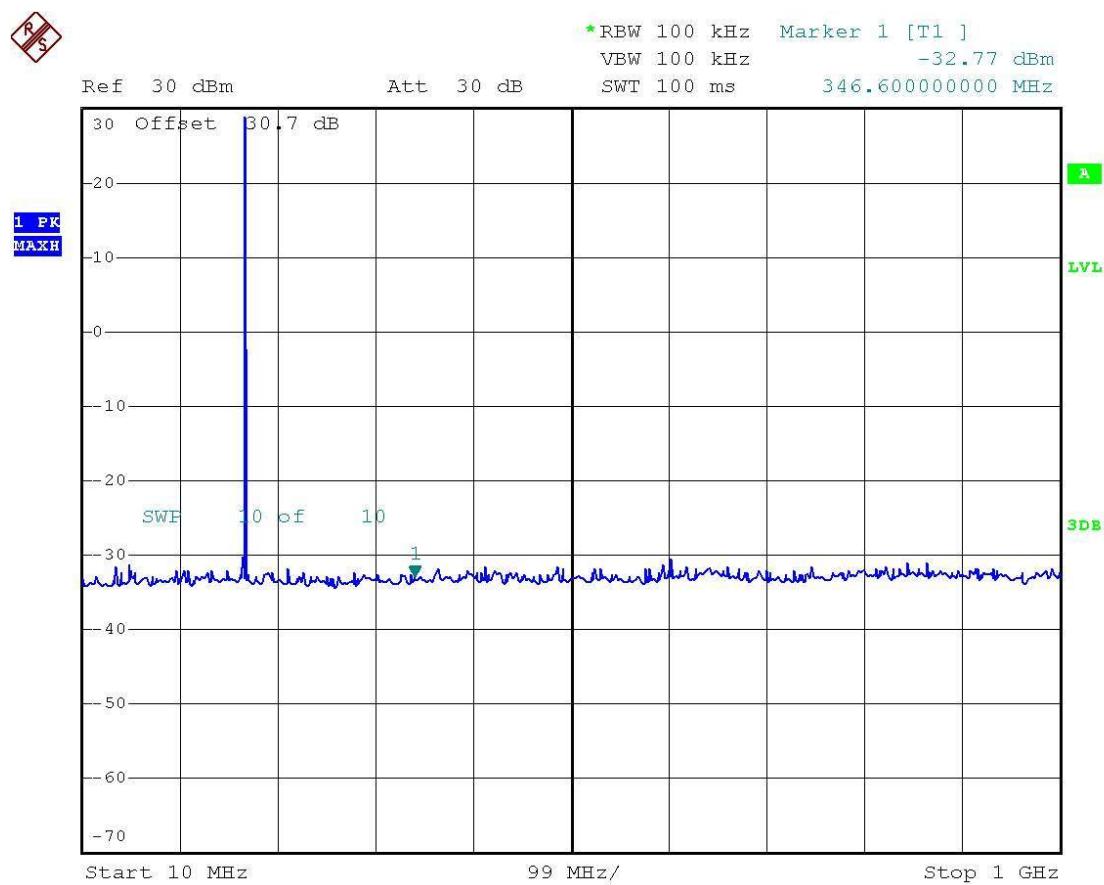


Date: 28.JUL.2009 05:20:07

### 5.6.8.3 3rd Channel

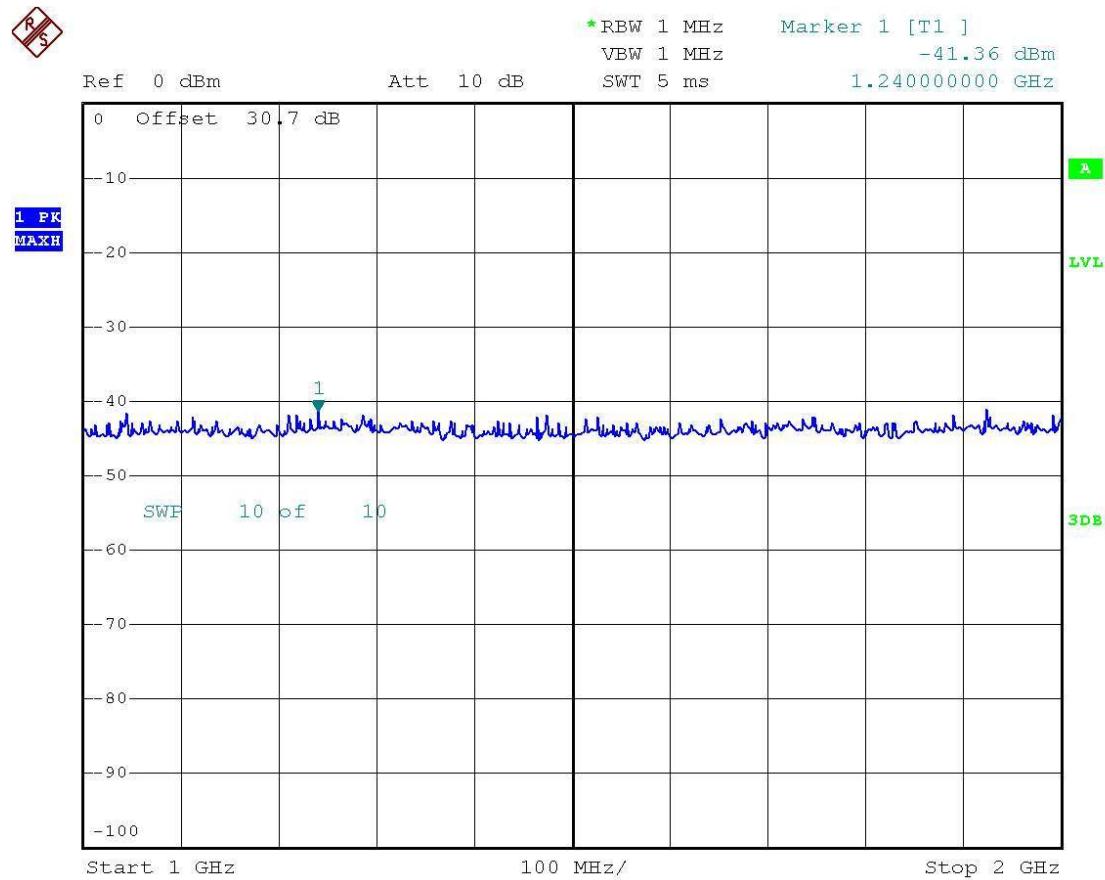
FCC Rules :	Part 2 §2.1051 & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.8
Operating Frequency :	173.975 MHz
Channel :	3rd Channel
Power Output :	50 Watts
Channel Spacing :	WideBand
Reference Voltage :	13.8 VDC
Limit :	$43 + 10\log_{10}P$ (-13dBm)

#### 5.6.8.3.1 10 MHz ~ 1 GHz



Date: 28.JUL.2009 05:21:41

**5.6.8.3.2 1 GHz ~ 2 GHz**

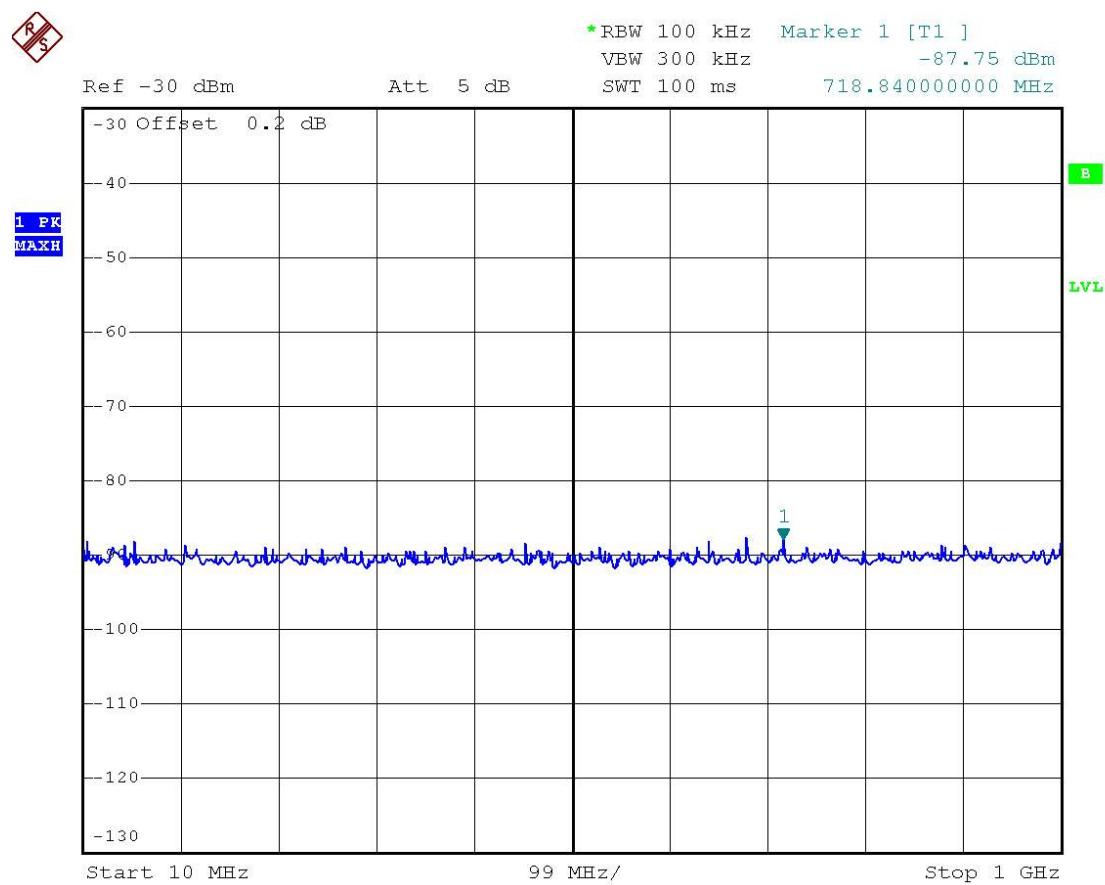


Date: 28.JUL.2009 05:22:32

### 5.6.8.4 1st Channel

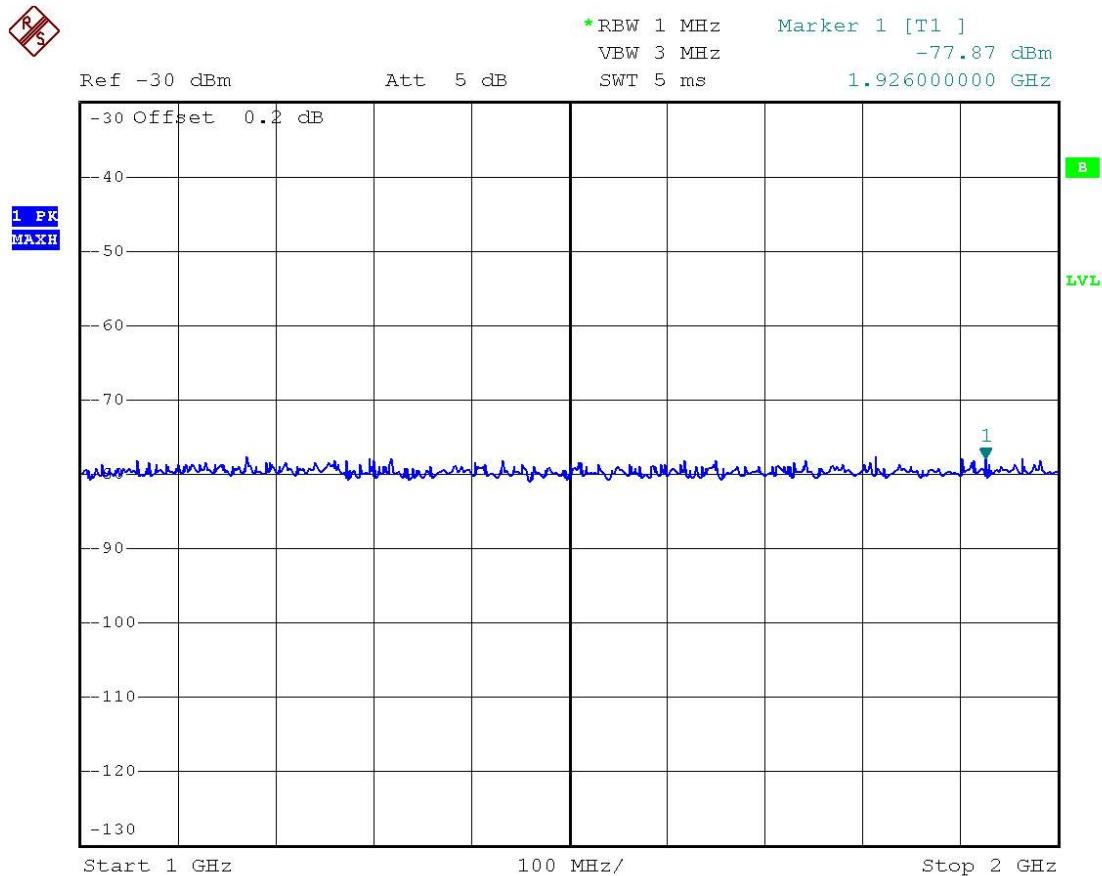
FCC Rules :	Part 2 §2.1051 & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.8
Operating Frequency :	148.025 MHz
Channel :	1st Channel
Power Output :	Stand-By
Channel Spacing :	WideBand
Reference Voltage :	13.8 VDC

#### 5.6.8.4.1 10 MHz ~ 1 GHz



Date: 29.JUL.2009 14:26:22

**5.6.8.4.2 1 GHz ~ 2 GHz**

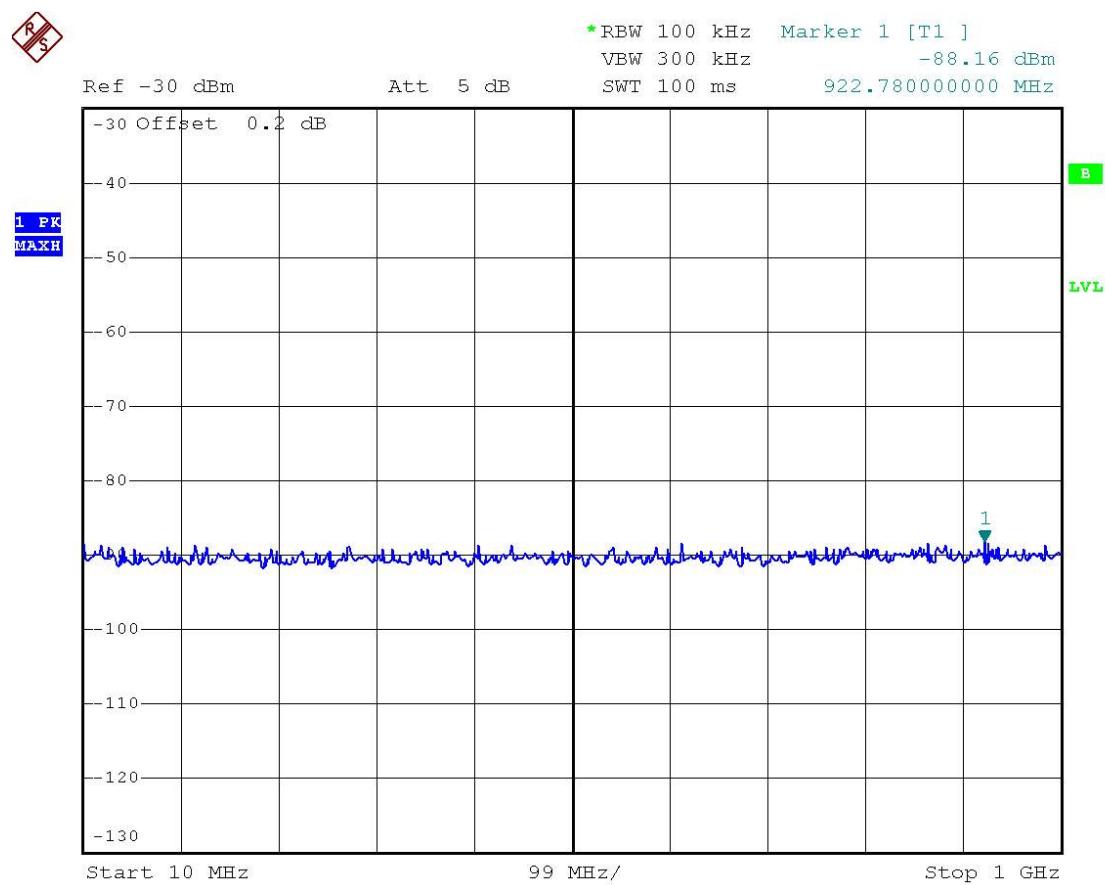


Date: 29.JUL.2009 14:26:04

### 5.6.8.5 2nd Channel

FCC Rules :	Part 2 §2.1051 & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.8
Operating Frequency :	161.025 MHz
Channel :	2nd Channel
Power Output :	Stand-By
Channel Spacing :	WideBand
Reference Voltage :	13.8 VDC

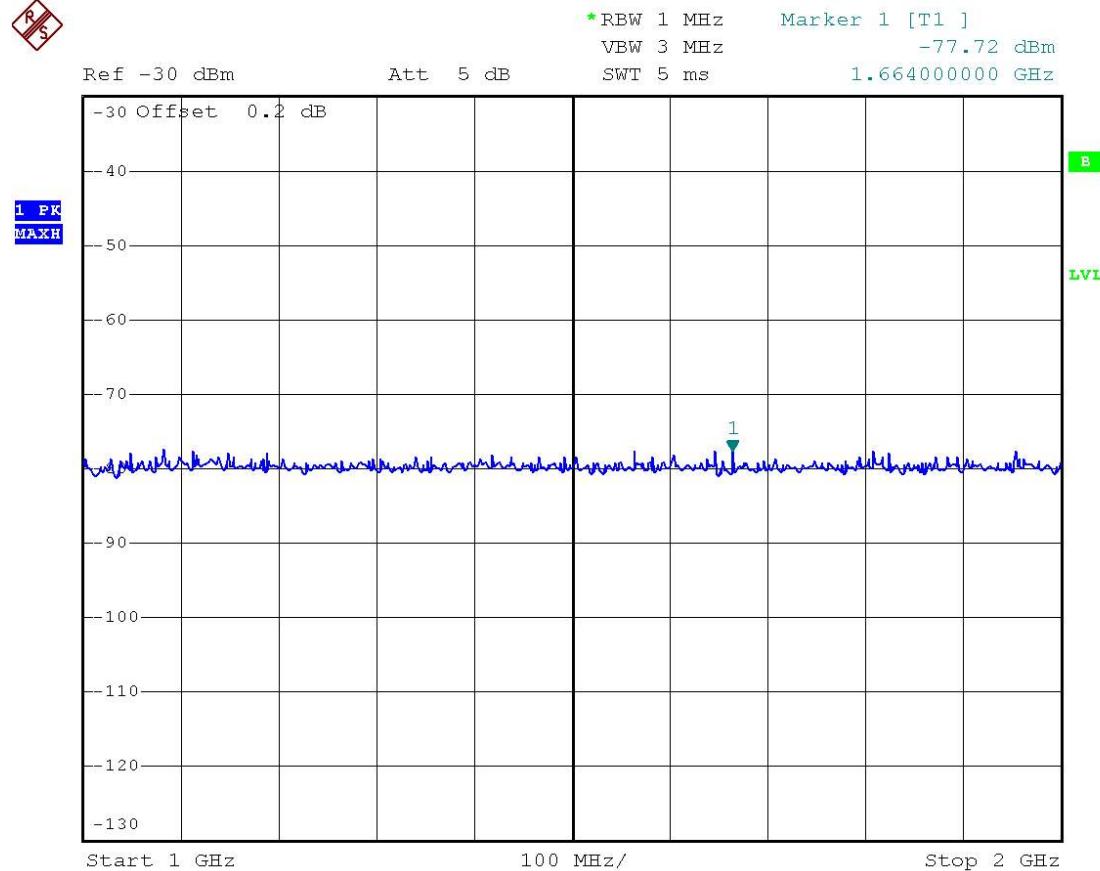
#### 5.6.8.5.1 10 MHz ~ 1 GHz



Date: 29.JUL.2009 14:26:37

**5.6.8.5.2 1 GHz ~ 2 GHz**

**R  
S**

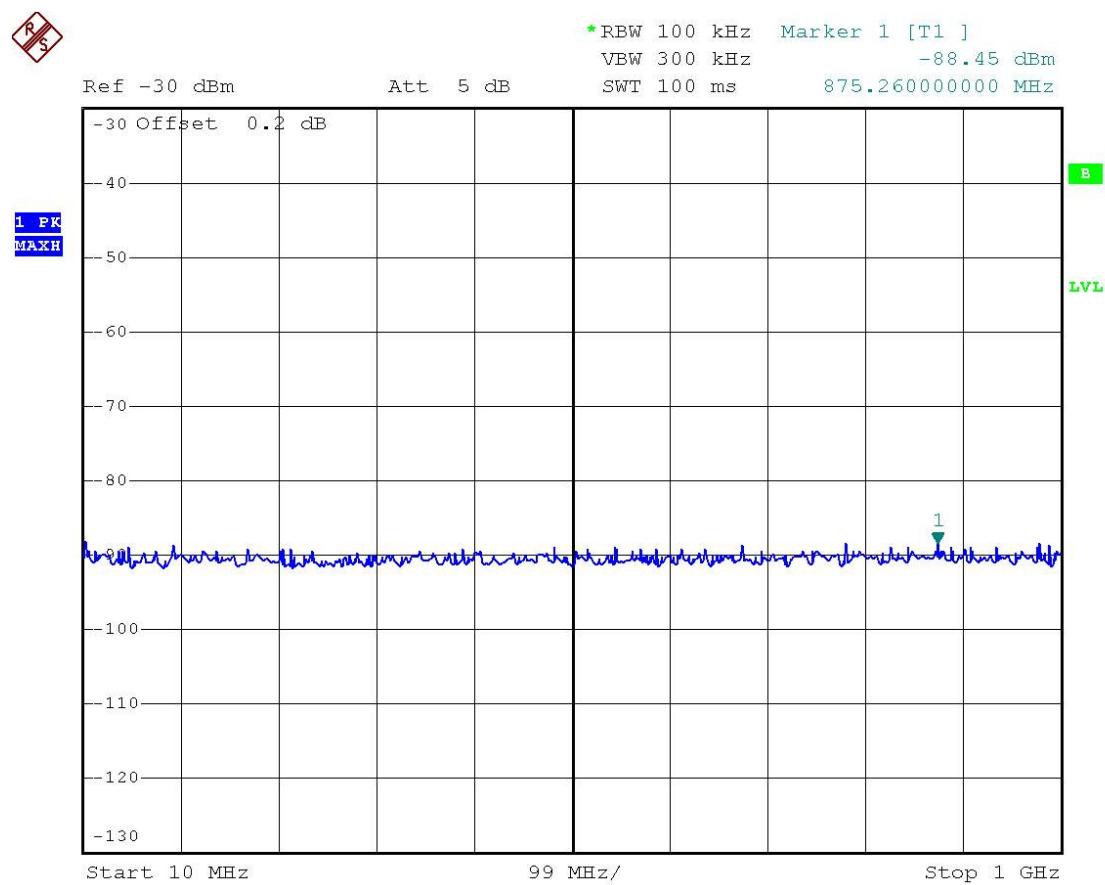


Date: 29.JUL.2009 14:26:53

### 5.6.8.6 3rd Channel

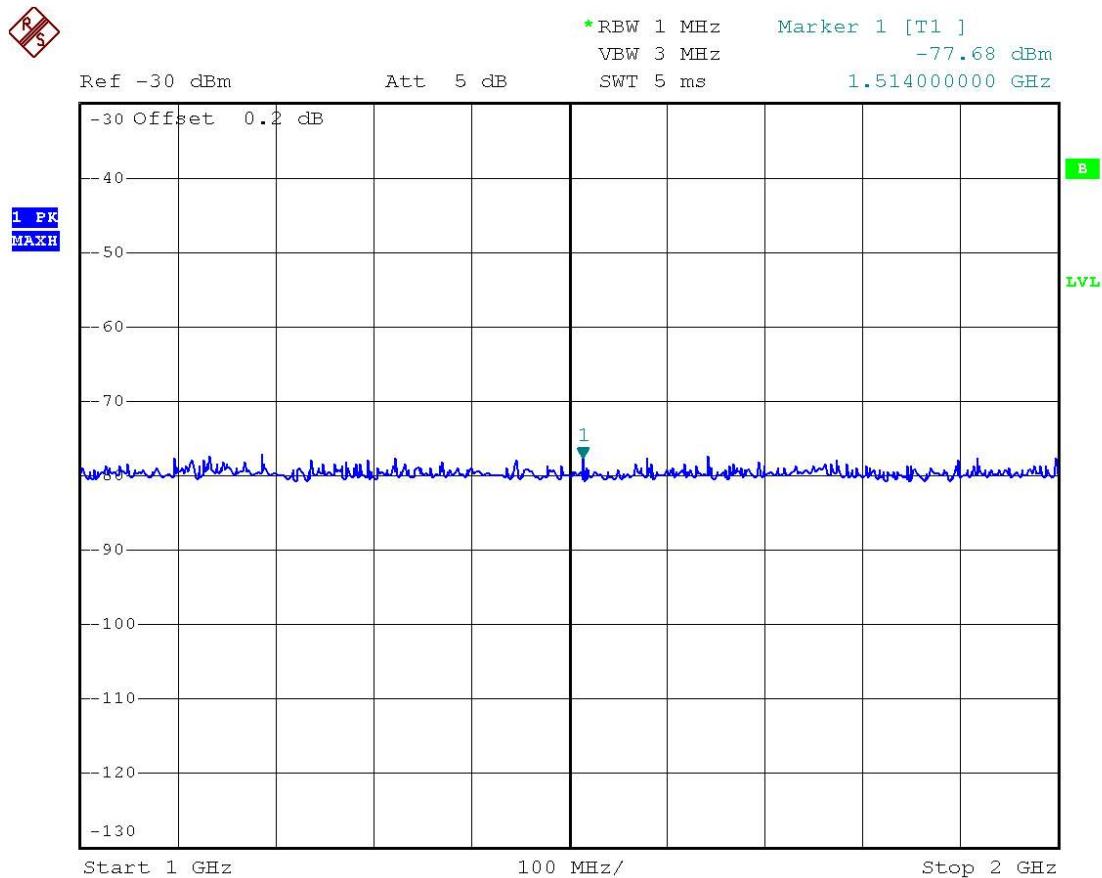
FCC Rules :	Part 2 §2.1051 & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.8
Operating Frequency :	173.975 MHz
Channel :	3rd Channel
Power Output :	Stand-By
Channel Spacing :	WideBand
Reference Voltage :	13.8 VDC

#### 5.6.8.6.1 10 MHz ~ 1 GHz



Date: 29.JUL.2009 14:27:10

**5.6.8.6.2 1 GHz ~ 2 GHz**

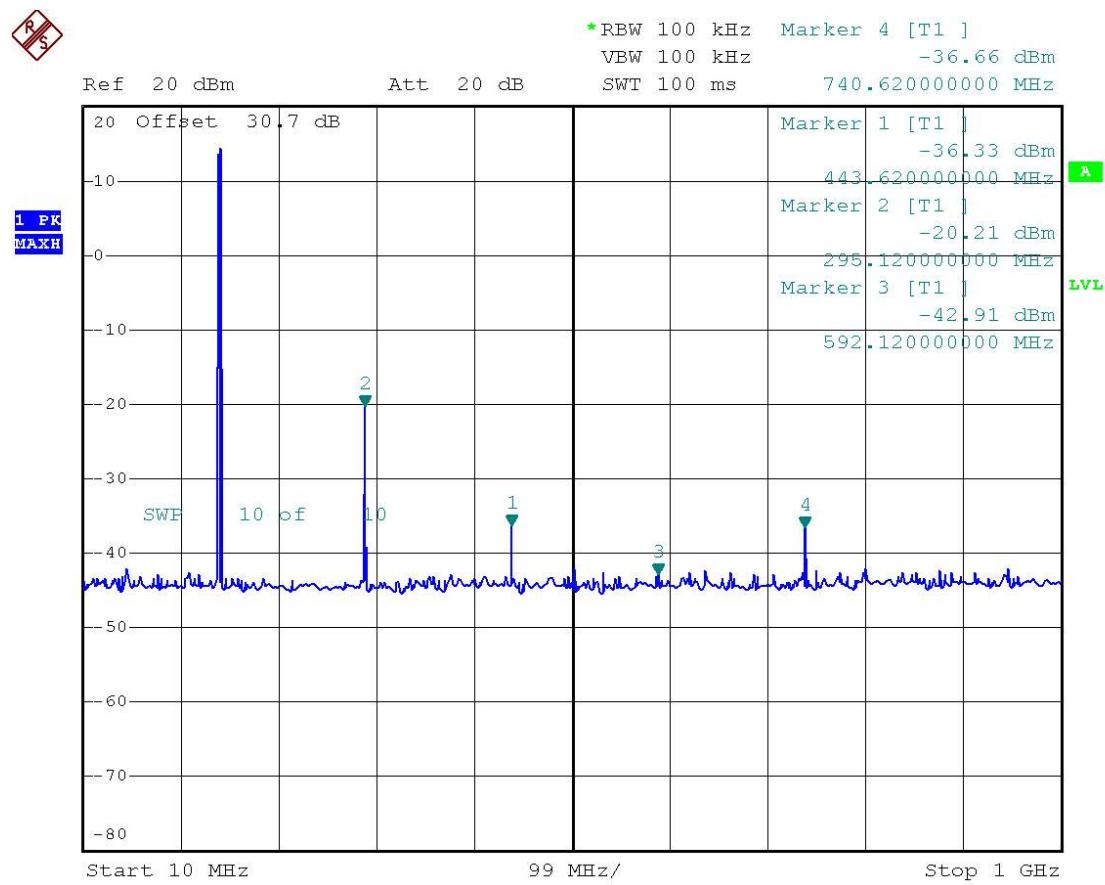


Date: 29.JUL.2009 14:27:28

### 5.6.8.7 1st Channel

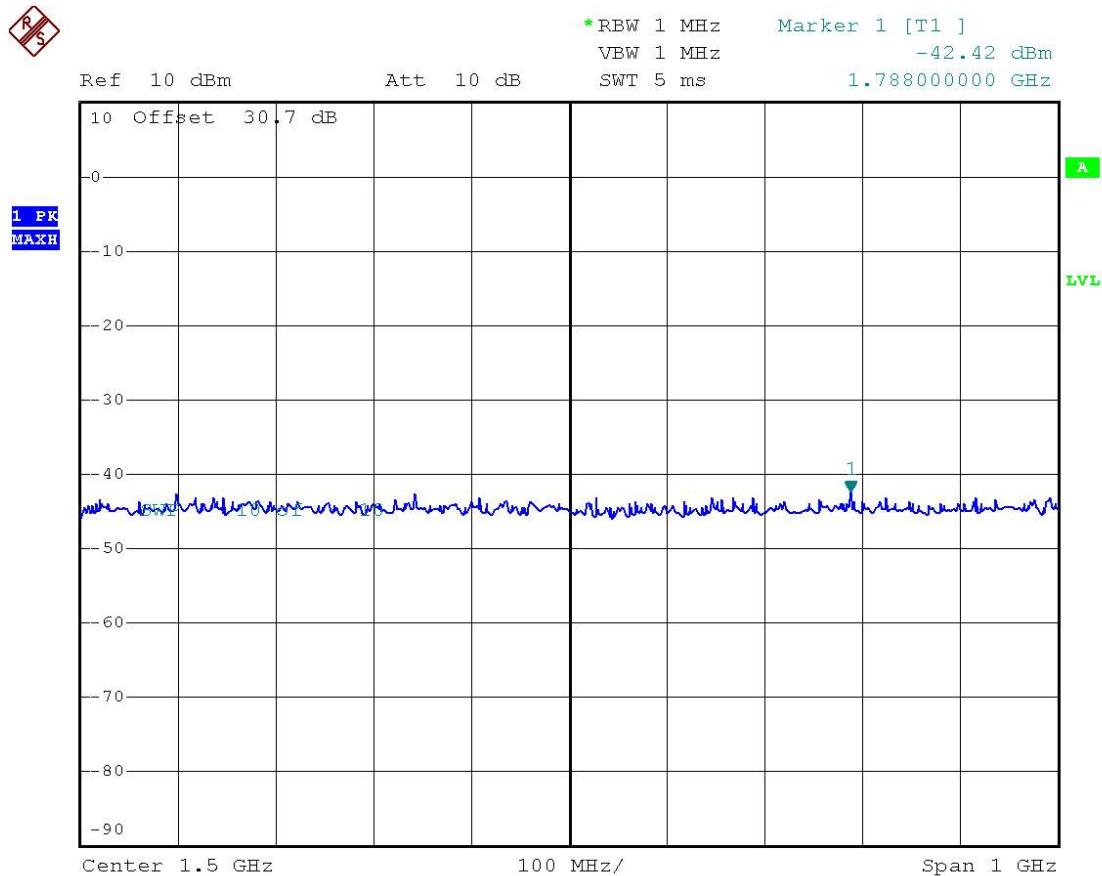
FCC Rules :	Part 2 §2.1051 & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.8
Operating Frequency :	148.025 MHz
Channel :	1st Channel
Power Output :	50 Watts
Channel Spacing :	Narrow Band
Reference Voltage :	13.8 VDC
Limit :	$50 + 10\log_{10}P$ (-20dBm)

#### 5.6.8.7.1 10 MHz ~ 1 GHz



Date: 20.AUG.2009 17:20:33

**5.6.8.7.2 1 GHz ~ 2 GHz**

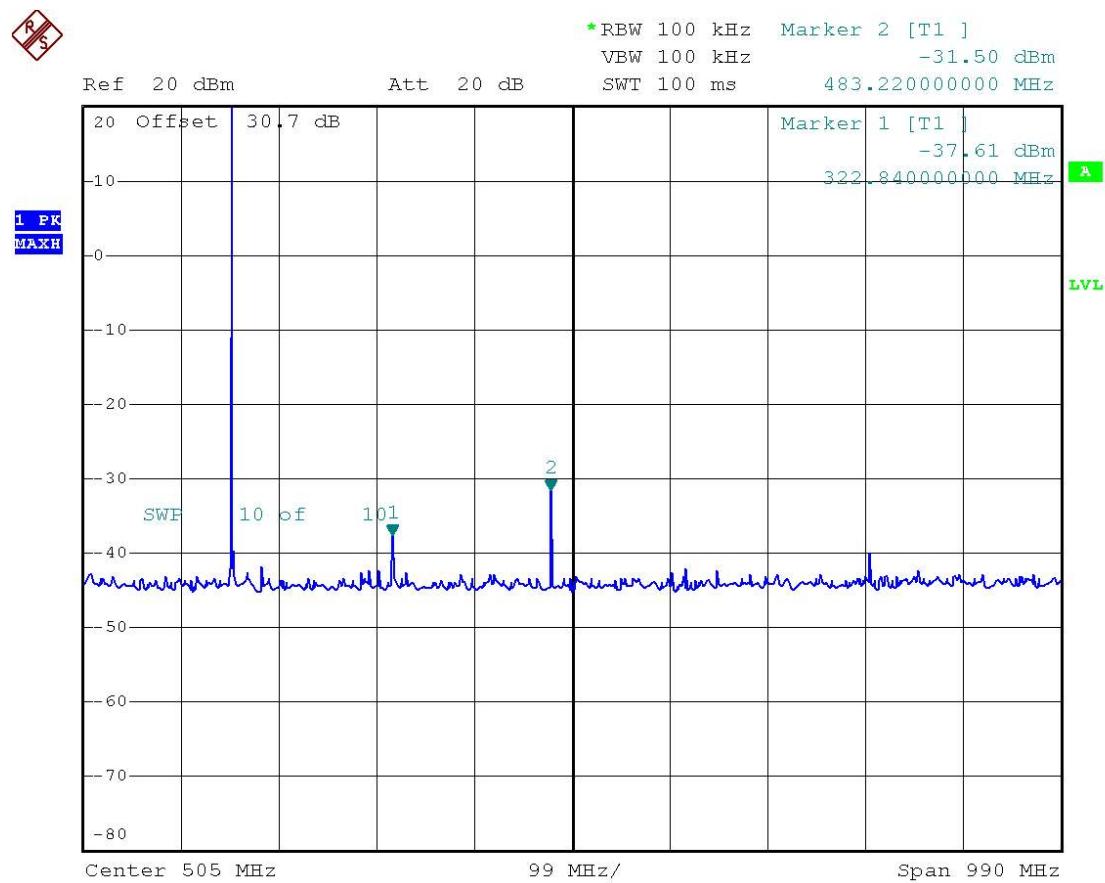


Date: 20.AUG.2009 17:04:35

### 5.6.8.8 2nd Channel

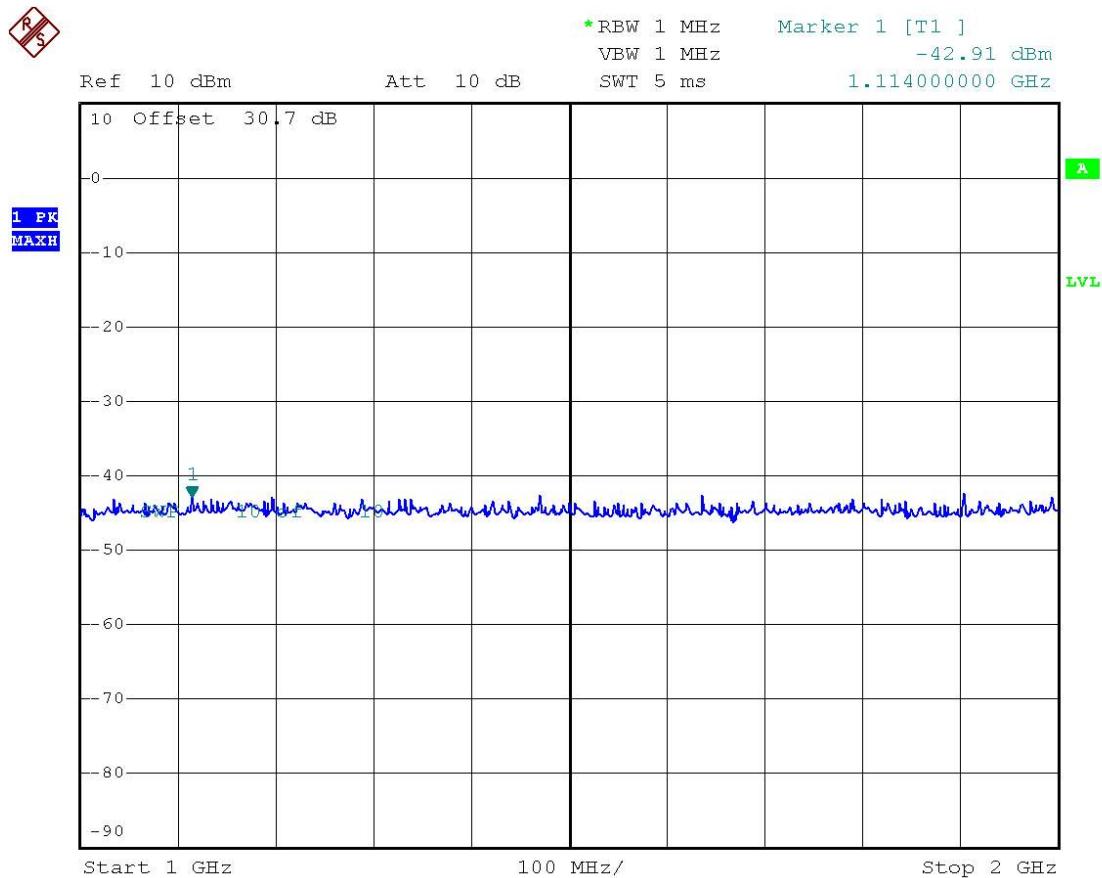
FCC Rules :	Part 2 §2.1051 & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.8
Operating Frequency :	161.025 MHz
Channel :	2nd Channel
Power Output :	50 Watts
Channel Spacing :	Narrow Band
Reference Voltage :	13.8 VDC
Limit :	$50 + 10\log_{10}P$ (-20dBm)

#### 5.6.8.8.1 10 MHz ~ 1 GHz



Date: 20.AUG.2009 17:22:13

**5.6.8.8.2 1 GHz ~ 2 GHz**

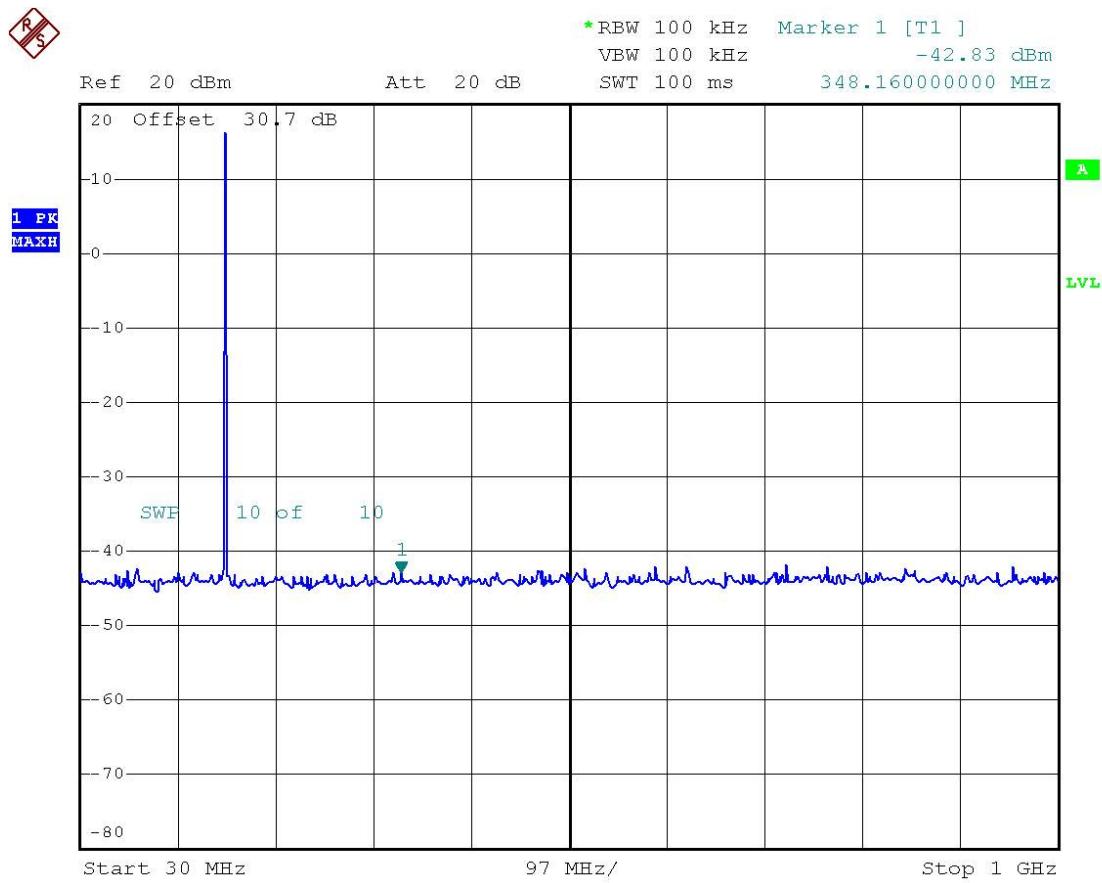


Date: 20.AUG.2009 17:07:11

## 5.6.8.9 3rd Channel

FCC Rules :	Part 2 §2.1051 & §90.210
IC Rules :	RSS-119 Issue 9 Section 5.8
Operating Frequency :	173.975 MHz
Channel :	3rd Channel
Power Output :	50 Watts
Channel Spacing :	Narrow Band
Reference Voltage :	13.8 VDC
Limit :	$50 + 10\log_{10}P$ (-20dBm)

## 5.6.8.9.1 10 MHz ~ 1 GHz



Date: 20.AUG.2009 17:09:08