

# 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 : SP7102  
FCC ID : RXUSP7102  
TRADE NAME :   
Maxon CIC Corp.  
APPLICANT : 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 Held to Face  
FCC Part 90 Private land mobile radio services  
RULE PART(S) : RSS-119 Land Mobile and Fixed Radio Transmitters and Receivers,  
27.4 MHz to 960 MHz  
FCC PROCEDURE : Certification  
DATES OF TEST : March 27, 2008 to April 16, 2008  
DATES OF ISSUE : April 18, 2008  
TEST REPORT No. : BWS-08-RF-0003  
TEST LAB. : BWS TECH Inc.(FCC Registration Number : 553281)

This Two Way Radio SP7102 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.

April 18, 2008  
(Date)



Tested by **CY-choi**

April 18, 2008  
(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

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# 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** SP7102
- **FCC Identifier** RXUSP7102
- **S/N** 0711000001
- **FCC Rule Part(s)** FCC Part 90 Private land mobile radio services  
RSS-119 Land Mobile and Fixed Radio Transmitters and Receivers,  
27.4 MHz to 960 MHz
- **FCC Classification** TNF : Licensed Non-Broadcast Station Transmitter
- **Freq. Range** 136 MHz ~ 174 MHz
- **Channel** 255 Channels
- **Modulation Method** FM
- **Emission Designator** 11K0F3E, 16K0F3E
- **RF Power Output** 1/5 Watt
- **Test Procedure** ANSI C63.4-2003 and ANSI/TIA-603-B-2002
- **Dates of Tests** March 27, 2008 to April 16, 2008
- **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-08-RF-0003

## 2. Description of Test Facility

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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 C IC Corp. Two Way Radio Model : SP7102.

### 3. Product Information

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The Equipment Under Test (EUT) is the MAXON CIC CO LTD Two Way Radio model: SP7102(FCC ID: RXUSP7102).

SP7102 is FM transceiver operating between 136 ~ 174 MHz with an output power of 5 W (1 W at low power).

The SP7102 offers many advanced features found in more expensive Land Mobile Radios.

SP7102 is 255 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 DC Voltage and Currents

The DC voltages applied to and DC currents into the several elements of the final radio frequency amplifying stage for normal operation over power range were;

Standby: 7.4 Volts, 0.12 Ampare

Receive: 7.4 Volts, 0.60 Ampare

Low Power: 7.4 Volts, 0.70 Ampare

High Power: 7.4 volts, 1.90 Ampare

#### 3.2 Emission Designator

Type of Emission : F3E

Necessary Bandwidth and Emission Bandwidth:

12.5 kHz (Narrow Band) : Bn = 11K0F3E

25 kHz (Wide Band) : Bn = 16K0F3E

Calculation:

Maximum Modulation(M) in kHz : 3

Maximum Deviation(D) in kHz : 2.5(NB) and 5(WB)

Constant Factor(k) : 1

$B_n = 2M + 2DK$

### 3.3 General Specification

#### GENERAL

|                        |   |                                                          |                             |
|------------------------|---|----------------------------------------------------------|-----------------------------|
| Equipment Type         | : | Hand portable                                            |                             |
| Band                   | : | VHF                                                      |                             |
| Channel Spacings       | : | 12.5 kHz, 25 kHz programmable                            |                             |
| RF Output Power        | : | 5 / 1 watt                                               |                             |
| Modulation Type        | : | F3E                                                      |                             |
| Audio Power            | : | 500 mW (Ext with 8 ohm)                                  |                             |
|                        | : | 600 mW (Int with 6 ohm)                                  |                             |
| Intermediate Frequency | : | 46.35 MHz & 450 kHz                                      |                             |
| Number of Channels     | : | 255                                                      |                             |
| Frequency Source       | : | Synthesizer                                              |                             |
| Operation Rating       | : | Intermittent                                             |                             |
|                        | : | 90 : 5 : 5 (Standby: RX: TX)                             |                             |
| Power Supply           | : | Rechargeable                                             |                             |
|                        | : | li-ion polymer Battery, 7.4 VDC                          |                             |
| Temperature Range      | : | Storage (- 40° C to + 80° C)                             |                             |
|                        | : | Operating (- 30° C to + 60° C)                           |                             |
|                        | : | Off                                                      | < 1 mA                      |
|                        | : | Standby (Muted)                                          | < 50 mA (Battery Save On)   |
| Current Consumption    | : |                                                          | < 120 mA (Battery Save Off) |
|                        | : | Unmuted, 100 % Max AF Power                              | < 400 mA                    |
|                        | : | Transmit 5 Watt RF Power                                 | < 2.0 A                     |
| Battery Life           | : | (5-5-90% Duty Cycle) 1550 mAh                            | 10 Hrs @ 5 W                |
| Frequency Bands        | : | 136 MHz ~ 174 MHz (TX, RX)                               |                             |
| Dimensions             | : | Radio (120mm)H x (53 mm)W x (32.5 mm)D with battery pack |                             |
| Weight                 | : | Radio 290g (with 1500mAh li-ion polymer battery)         |                             |

#### TRANSMITTER

|                              |   |                                                           |                         |
|------------------------------|---|-----------------------------------------------------------|-------------------------|
| Carrier Power                | : | High (5W), Low (1W)                                       |                         |
| Audio Frequency Deviation    | : | 25 kHz Channel Spacing                                    | Max. ±5.0 kHz           |
|                              | : | 12.5 kHz Channel Spacing                                  | Max. ±2.5 kHz           |
| Audio Frequency Response     | : | Within +1/-3dB of 6dB octave                              |                         |
| Adjacent Channel Power       | : | 25 kHz Channel Spacing                                    | < 70 dBc                |
|                              | : | 12.5 kHz Channel Spacing                                  | < 60 dBc                |
| Conducted Spurious Emission  | : | < -36dBm                                                  |                         |
| Transmitter Audio Distortion | : | < 5% @ 1 kHz (Without CTCSS)                              |                         |
|                              | : | 25 kHz Channel Spacing                                    | > 40 dB (with PSOPH)    |
| Hum & Noise                  | : | 12.5 kHz Channel Spacing                                  | > 40 dB (with no PSOPH) |
| Load Stability               | : | No osc at 10:1 VSWR all phase angles and suitable antenna |                         |

#### RECEIVER

|                              |   |                                                               |                         |
|------------------------------|---|---------------------------------------------------------------|-------------------------|
| Sensitivity (12dB Sinad)     | : | < -118 dBm (0.28µV)                                           |                         |
| Amplitude Characteristic     | : | < ±3 dB                                                       |                         |
| Adjacent Channel Selectivity | : | 25 kHz Channel Spacing                                        | >70 dB                  |
|                              | : | 12.5 kHz Channel Spacing                                      | >60 dB                  |
| Spurious Response Rejection  | : | 70 dB                                                         |                         |
| IMD Response Rejection       | : | 65 dB                                                         |                         |
| Temperature Stability        | : | 0.0005% (-30°C to +60°C)                                      |                         |
| Spurious Emission            | : | Per FCC and IC Rules and Regulations                          |                         |
| AF Distortion                | : | < 5%                                                          |                         |
| Frequency Response           | : | 6 dB/octave de-emphasized response in the range 300 Hz – 3kHz |                         |
|                              | : | 25 kHz Channel Spacing                                        | > 40 dB (with PSOPH)    |
| RX Hum & Noise               | : | 12.5 kHz Channel Spacing                                      | > 40 dB (with no PSOPH) |

### 3.4 EUT operating conditions & test configuration

#### 3.4.1 Client Condition

Temperature : -30 °C ~ +60 °C

Humidity : 95 %

#### 3.4.2 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 : 136 MHz ~ 174 MHz

|                    |     |             |
|--------------------|-----|-------------|
| Test Frequencies : | 1st | 136.025 MHz |
|                    | 2nd | 155.025 MHz |
|                    | 3rd | 173.985 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 | Pass   |
| Radiated Emission Tests                   | §15.209       | RSS-Gen §6     | Pass   |
| RF Power Output (Conducted)               | §2.1046       | RSS-119 §5.4   | Pass   |
| Audio Frequency Response                  | §2.1047(A)    | RSS-119 §5.13  | Pass   |
| Audio Low pass Filter Response            | §2.1047(A)    | RSS-119 §5.13  | Pass   |
| Modulation Limiting                       | §2.1047(B)    | RSS-119 §5.13  | Pass   |
| Occupied Bandwidth                        | §2.1049       | RSS-119 §5.5   | Pass   |
| Spurious Emissions at Antenna Terminals   | §2.1051       | RSS-119 §5.8   | Pass   |
| Field Strength of Spurious Radiation      | §2.1053       | RSS-119 §5.8   | Pass   |
| Frequency Stability/Temperature Variation | §2.1055       | RSS-119 §5.3   | Pass   |
| Transient Frequency Behavior              | §90.214       | RSS-119 §5.9   | Pass   |



## 5. TEST DATA

### 5.1 Power Line Conducted Emission

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 kHz on the 230V AC power and return leads of the EUT according to the methods defined in FCC Part 15.207. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 3.1.5. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position producing maximum conducted emissions.

#### 5.1.1 Test Condition

Frequency Range of Test : 150 kHz to 30 MHz

Test Standard : FCC Part 15.207

Test Date : April 16, 2008

Temperature/Humidity : 24 °C/ 40 %

#### 5.1.2 Test Standard

| Frequency Range<br>(MHz) | Limit (dBuV) |         |
|--------------------------|--------------|---------|
|                          | Quasi-Peak   | Average |
| 0.15 ~ 0.5               | 66 – 56      | 56 – 46 |
| 0.5 ~ 5                  | 56           | 46      |
| 5 ~ 30                   | 60           | 50      |

#### 5.1.3 Test Equipment List

| Equipment Type  | Model               | Manufacture     | Serial No | Cal Due Date |
|-----------------|---------------------|-----------------|-----------|--------------|
| TEST RECEIVER   | ESPI                | ROHDE & SCHWARZ | 100063    | 11. 19. 2008 |
| Conducted Cable | N/A                 | N/A             | N/A       | N/A          |
| LISN            | FCC-LISN-50-50-2-02 | FCC             | 03074     | 11. 02. 2008 |

#### 5.1.4 Test Result of Power Line Conducted Emission

EUT : SP7102  
Input Voltage : 230V, 50Hz

Power Line Conducted Emission Test Results : **PASS**

Test data sheets follow.

| Freq<br>[MHz] | Correction |      | Phase<br>[H/N] | Quasi-Peak Mode |         |                   |        | Average Mode |         |                   |        |
|---------------|------------|------|----------------|-----------------|---------|-------------------|--------|--------------|---------|-------------------|--------|
|               | AMN        | C.L  |                | Limit           | Reading | Emission<br>Level | Margin | Limit        | Reading | Emission<br>Level | Margin |
|               |            |      |                | [dBuV]          | [dBuV]  | [dBuV]            | [dBuV] | [dBuV]       | [dBuV]  | [dBuV]            | [dBuV] |
| 0.186         | 0.06       | 0.03 | H              | 65.00           | 55.80   | 55.89             | 9.11   | 57.71        | 38.48   | 38.57             | 19.14  |
| 0.278         | 0.07       | 0.16 | H              | 62.40           | 53.15   | 53.38             | 9.02   | 54.37        | 37.35   | 37.58             | 16.79  |
| 0.374         | 0.08       | 0.24 | N              | 59.70           | 49.56   | 49.88             | 9.82   | 50.86        | 33.65   | 33.97             | 16.89  |
| 0.462         | 0.07       | 0.28 | H              | 57.10           | 47.90   | 48.25             | 8.85   | 47.53        | 32.40   | 32.75             | 14.78  |
| 0.598         | 0.07       | 0.30 | H              | 56.00           | 50.19   | 50.56             | 5.44   | 46.00        | 33.21   | 33.58             | 12.42  |
| 0.922         | 0.05       | 0.35 | H              |                 | 48.22   | 48.62             | 7.38   |              | 30.85   | 31.25             | -31.25 |
| 1.894         | 0.03       | 0.53 | H              |                 | 48.20   | 48.76             | 7.24   |              | 28.96   | 29.52             | -29.52 |
| 2.690         | 0.03       | 0.58 | H              |                 | 46.45   | 47.06             | 8.94   |              | 28.29   | 28.90             | -28.90 |
| 5.478         | 0.05       | 0.88 | H              | 60.00           | 41.48   | 42.41             | 13.59  | 50.00        |         |                   |        |
| 8.358         | 0.06       | 1.00 | N              |                 | 36.68   | 37.74             | 22.26  |              |         |                   |        |
| 18.774        | 0.07       | 1.33 | H              |                 | 33.90   | 35.30             | 24.70  |              |         |                   |        |
| 29.446        | 0.26       | 1.65 | H              |                 | 41.79   | 43.70             | 16.30  |              |         |                   |        |

#### Notes:

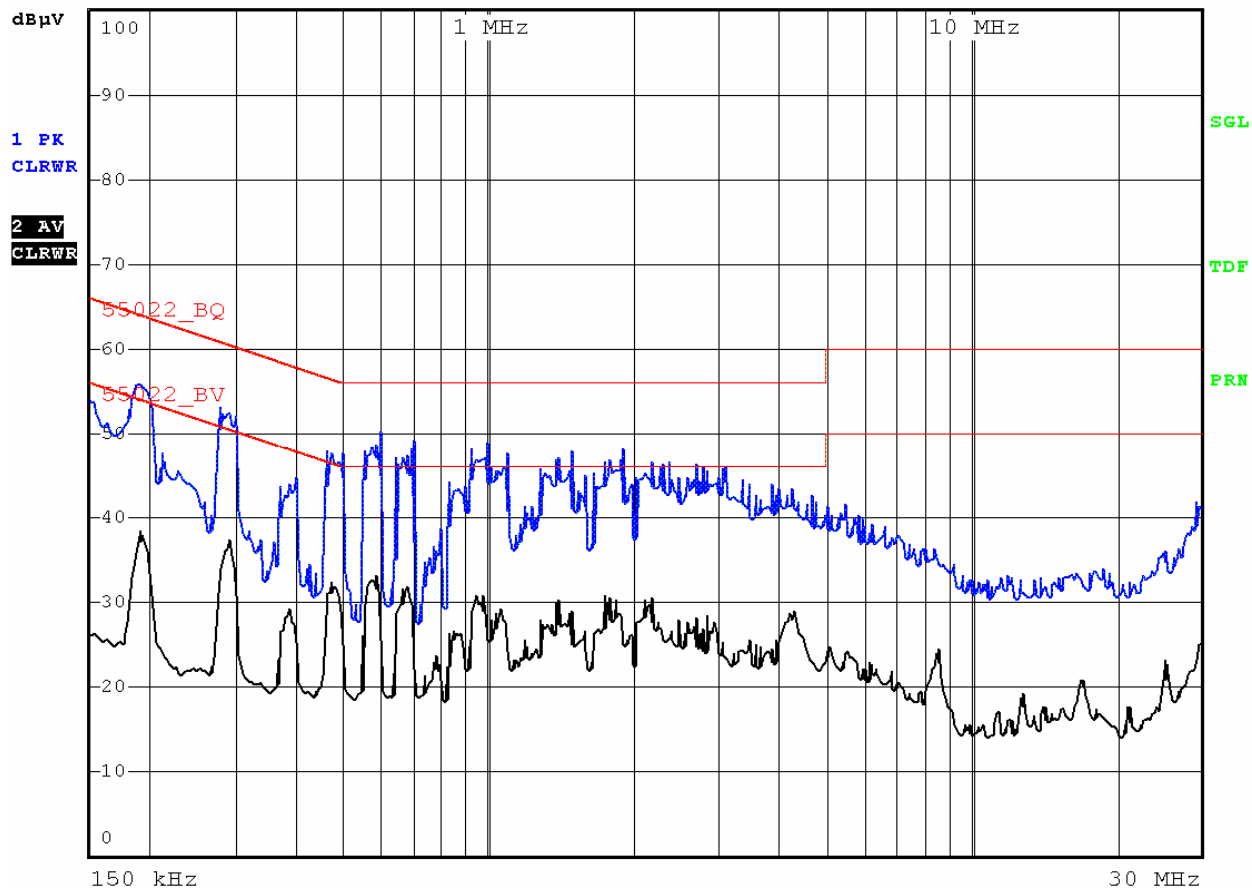
1. All modes of operation were investigated and the worst-case emissions are reported.  
See the plots in next 2 pages.
2. Line N = (Neutral), Line H = (Hot)
3. Measurement uncertainty estimated at  $\pm 1.38$  dB.  
The measurement uncertainty is given with a confidence of 95.45 % with the coverage factor,  $k=2$

## PLOTS OF EMISSIONS



RBW 9 kHz  
MT 20 ms

Att 10 dB AUTO PREAMP OFF



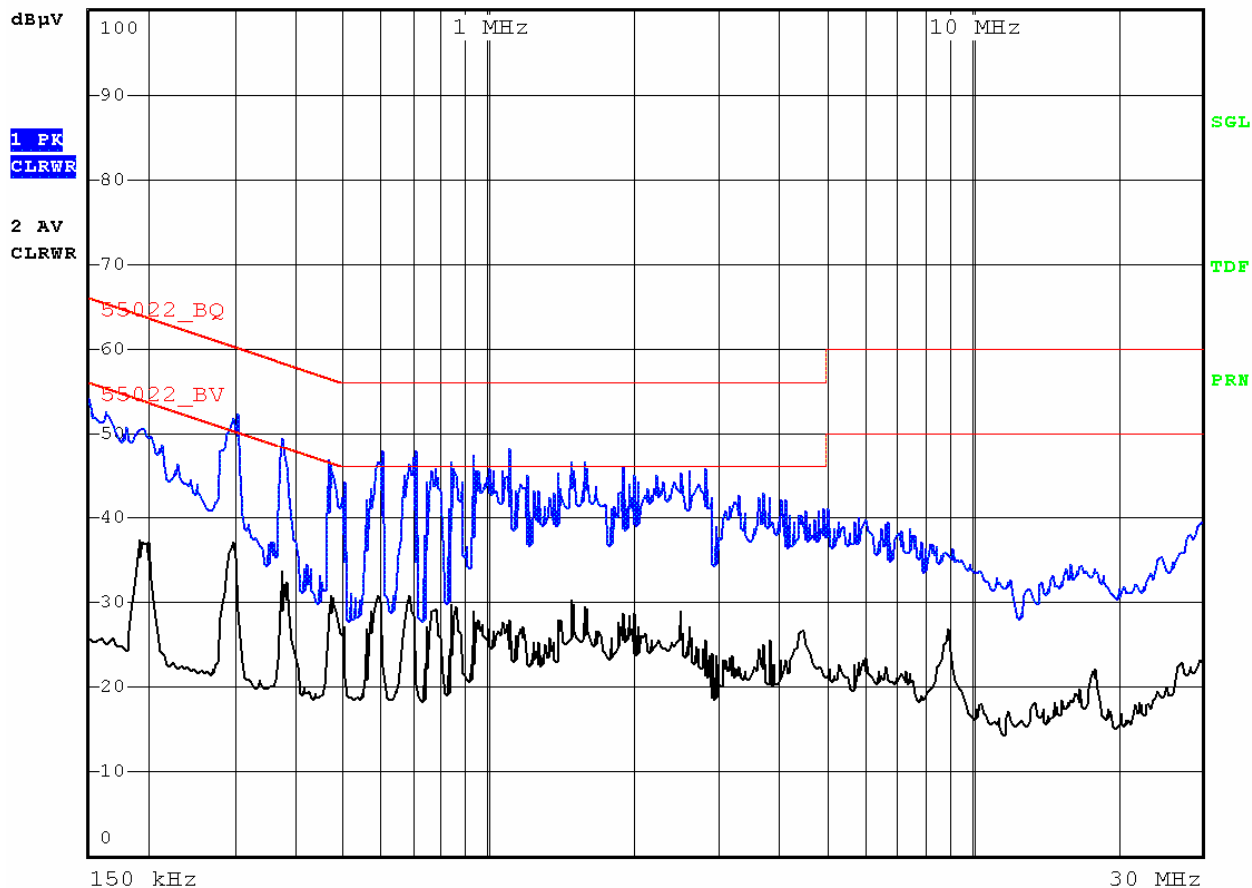
Test Model: SP7102  
Test Mode: HOT  
Classification: FCC Part 15.207

## PLOTS OF EMISSIONS



RBW 9 kHz  
MT 20 ms

Att 10 dB AUTO PREAMP OFF



Test Model: SP7102  
Test Mode: NEUTRAL  
Classification: FCC Part 15.207

## 5.2 Radiated Emission Test (Stand-by and Receive Mode)

Radiated emissions from 30 MHz to 1000 MHz were measured with a bandwidth of 120 kHz according to the methods defined in FCC Part 15.209. The EUT was placed on a nonmetallic stand in the open-field site, 0.8 meter above the ground plane. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

### 5.2.1 Test Condition

Frequency Range of Test : 30 MHz to 1000 MHz  
Test Standard : FCC Part 15.209  
Test Date : April 16, 2008  
Temperature/Humidity : 24 °C/ 40 %

### 5.2.2 Test Standard

| Frequency Range (MHz) | Limit (dBuV) |              |
|-----------------------|--------------|--------------|
|                       | Quasi-Peak   | Average-Peak |
| 30 ~ 88               | 40.0         | N/A          |
| 88 ~ 216              | 43.5         | N/A          |
| 216 ~ 960             | 46.0         | N/A          |
| Above 960             | 54.0         | N/A          |

### 5.2.3 Test Equipment List

| Equipment Type               | Model     | Manufacture     | Serial No  | Cal Due Date |
|------------------------------|-----------|-----------------|------------|--------------|
| Bilog Antenna                | VULB 9160 | SCHWARZBECK     | 9160-3122  | 12. 29. 2008 |
| Open Site Cable              | N/A       | N/A             | N/A        | N/A          |
| Antenna Mast                 | JAC-3     | DAIL EMC        | N/A        | N/A          |
| Antenna Turntable Controller | JAC-2     | JAEMC           | N/A        | N/A          |
| EMI Receiver                 | ESVN30    | ROHDE & SCHWARZ | 832854/010 | 07. 13. 2008 |

#### 5.2.4 Test Result of Radiated Emission

EUT : SP7102

Test distance : 3 m

Radiated Emission Test Result : **PASS**

Test data sheets follow.

| Frequency<br>[MHz]               | Reading<br>[dB $\mu$ V] | Polarization<br>[*H/**V] | Ant.Factor<br>[dB/m] | Cable Loss<br>[dB] | Limit<br>[dB $\mu$ V/m] | Emission<br>Level<br>[dB $\mu$ V/m] | Margin<br>[dB] |
|----------------------------------|-------------------------|--------------------------|----------------------|--------------------|-------------------------|-------------------------------------|----------------|
| <b>1st Channel : 136.025 MHz</b> |                         |                          |                      |                    |                         |                                     |                |
| 182.375                          | 20.60                   | V                        | 11.80                | 3.00               | 43.50                   | 35.40                               | 8.10           |
| 182.375                          | 21.50                   | H                        | 11.80                | 3.00               | 43.50                   | 36.30                               | 7.20           |
| 364.750                          | 17.33                   | V                        | 12.00                | 4.27               | 46.00                   | 33.60                               | 12.40          |
| 364.750                          | 15.52                   | H                        | 12.31                | 4.27               | 46.00                   | 32.10                               | 13.90          |
| <b>2nd Channel : 155.025 MHz</b> |                         |                          |                      |                    |                         |                                     |                |
| 201.375                          | 22.50                   | V                        | 10.14                | 3.16               | 43.50                   | 35.80                               | 7.70           |
| 201.375                          | 22.80                   | H                        | 10.14                | 3.16               | 43.50                   | 36.10                               | 7.40           |
| 402.750                          | 10.19                   | V                        | 15.85                | 4.56               | 46.00                   | 30.60                               | 15.40          |
| 402.750                          | 12.19                   | H                        | 15.85                | 4.56               | 46.00                   | 32.60                               | 13.40          |
| <b>3rd Channel : 173.975 MHz</b> |                         |                          |                      |                    |                         |                                     |                |
| 220.325                          | 23.74                   | V                        | 10.36                | 3.30               | 46.00                   | 37.40                               | 8.60           |
| 220.325                          | 24.44                   | H                        | 10.36                | 3.30               | 46.00                   | 38.10                               | 7.90           |
| 440.650                          | 9.66                    | V                        | 16.71                | 4.73               | 46.00                   | 31.10                               | 14.90          |
| 440.650                          | 8.76                    | H                        | 16.71                | 4.73               | 46.00                   | 30.20                               | 15.80          |

Notes:

- \* H : Horizontal polarization , \*\* V : Vertical polarization
- Emission Level = Reading + Antenna factor + Cable loss
- Margin value = Emission Level - Limit
- All other emissions not reported were more than 25dB below the permitted limit.
- Measurement uncertainty estimated at  $\pm 4.08$  dB.  
The measurement uncertainty is given with a confidence of 95.45 % with the coverage factor, k=2.

## 5.3 RF Power Output (Conducted)

### 5.3.1 Specification

FCC Rules Part 2, Section 2.1046  
FCC Rules Part 90, Section 90.205  
Industry Canada, RSS-119 Section 5.4

### 5.3.2 Method of Measurement

ANSI/TIA-603-B-2002 Section 2.2.1

### 5.3.3 Measurement Set-Up

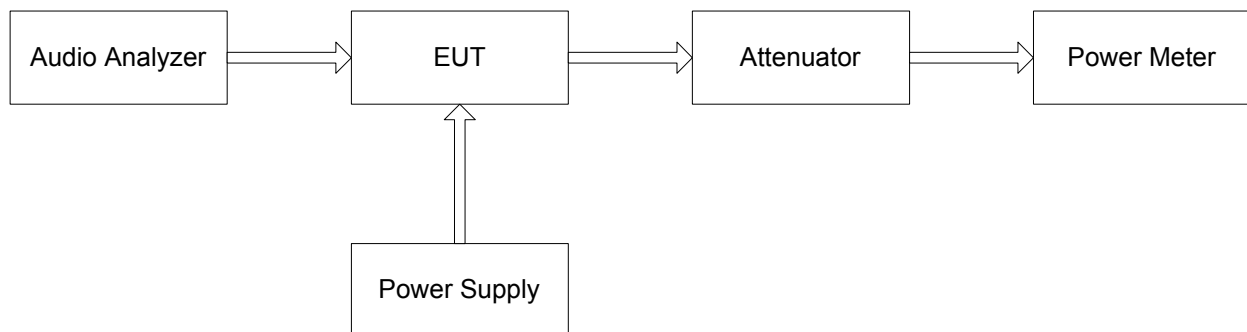


Fig.1

### 5.3.4 Test Equipment List

| Equipment      | Model Name  | Manufacturer    |
|----------------|-------------|-----------------|
| EUT            | SP7102      | Maxon CIC Corp. |
| Power Supply   | IPS-30B03DD | INTERACT        |
| Audio Analyzer | 8903B       | Agilent         |
| Attenuator     | 33-30-33    | WEINSCHEL       |
| Power Sensor   | 8481A       | Agilent         |
| Power Meter    | E4418A      | Agilent         |

### 5.3.5 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 though 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( $F_o$ ) 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.

### 5.3.6 Test Result

| Frequency (MHz)           | Measured Power (dBm) | Rated Power (Watts) |
|---------------------------|----------------------|---------------------|
| Low Power (Ref. 1 Watt)   |                      |                     |
| 136.025                   | 29.93                | 0.98                |
| 155.025                   | 29.74                | 0.94                |
| 173.975                   | 29.97                | 0.99                |
| High Power (Ref. 5 Watts) |                      |                     |
| 136.025                   | 37.00                | 5.02                |
| 155.025                   | 36.95                | 4.96                |
| 173.975                   | 36.95                | 4.96                |



## 5.4 Modulation Characteristics – Audio Frequency Response

### 5.4.1 Specification

FCC Rules Part 2, Section 2.1047(a)  
FCC Rules Part 90, Section 90.207  
Industry Canada, RSS-119 Section 5.13

### 5.4.2 Method of Measurement

ANSI/TIA-603-B-2002 Section 2.2.6

### 5.4.3 Measurement Set-Up

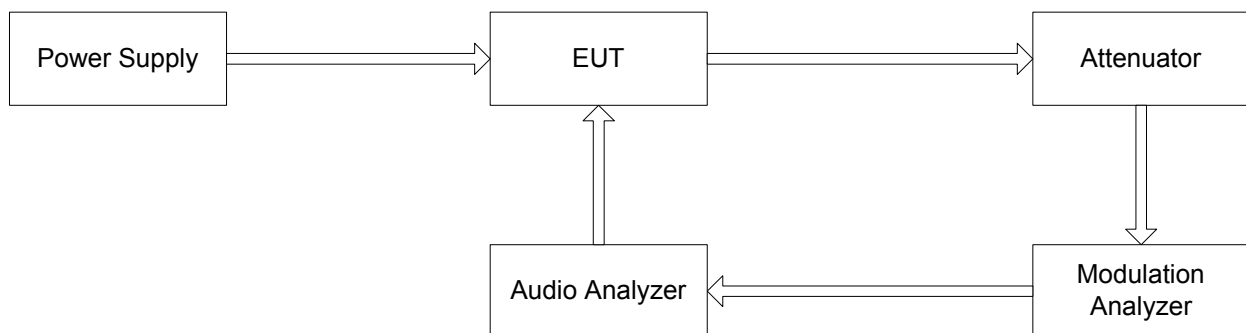


Fig.2

### 5.4.4 Test Equipment List

| Equipment           | Model Name  | Manufacturer    |
|---------------------|-------------|-----------------|
| EUT                 | SP7102      | Maxon CIC Corp. |
| Power Supply        | IPS-30B03DD | INTERACT        |
| Audio Analyzer      | 8903B       | Agilent         |
| Modulation Analyzer | 8901B       | Agilent         |
| Attenuator          | 33-30-33    | WEINSCHEL       |

### 5.4.5 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.

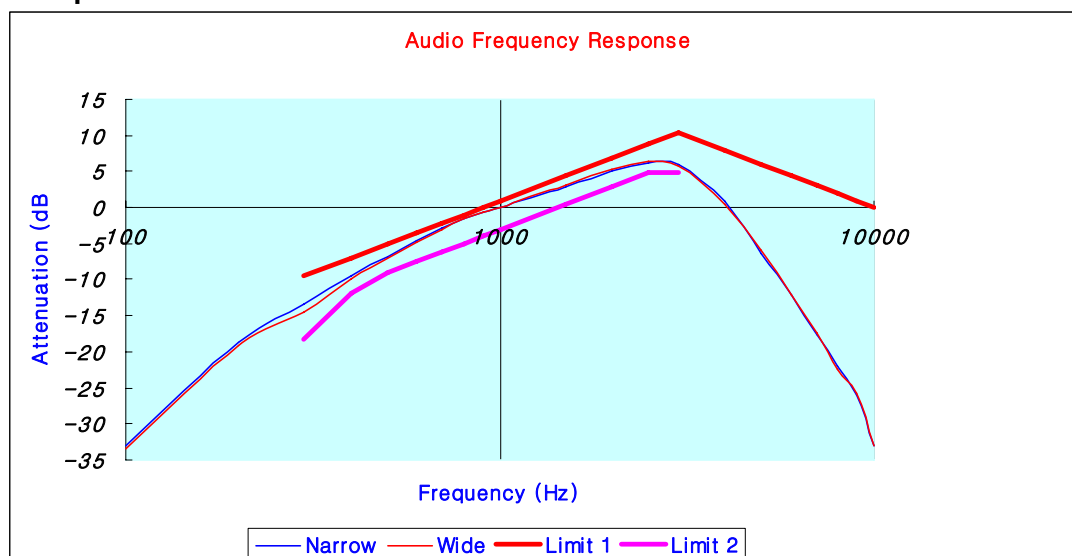
## 5.4.6 Test Results

### 5.4.6.1 Test Data 1

|                       |                             |
|-----------------------|-----------------------------|
| FCC Rules :           | Part 2 §2.1047(a) & §90.207 |
| IC Rules :            | RSS-119 Section 5.13        |
| Operating Frequency : | 136.025 MHz                 |
| Channel :             | 1st Channel                 |
| Reference Voltage :   | 7.4 VDC                     |
| Power Output :        | 5 Watts                     |

| Audio Input Frequency (Hz) | Attenuation (dB)           |                          |
|----------------------------|----------------------------|--------------------------|
|                            | Channel Spacing : 12.5 kHz | Channel Spacing : 25 kHz |
| 100                        | -33.0                      | -33.4                    |
| 200                        | -18.6                      | -19.1                    |
| 300                        | -13.5                      | -14.5                    |
| 400                        | -9.4                       | -9.9                     |
| 500                        | -6.8                       | -7.0                     |
| 600                        | -4.7                       | -4.9                     |
| 700                        | -2.9                       | -3.0                     |
| 800                        | -1.6                       | -1.5                     |
| 900                        | -0.7                       | -0.7                     |
| 1000                       | 0                          | 0                        |
| 1500                       | +2.8                       | +3.0                     |
| 2000                       | +5.0                       | +5.3                     |
| 2500                       | +6.2                       | +6.4                     |
| 3000                       | +6.0                       | +5.8                     |
| 4000                       | +0.8                       | +0.5                     |
| 5000                       | -6.3                       | -6.0                     |
| 6000                       | -12.2                      | -12.0                    |
| 7000                       | -17.5                      | -17.3                    |
| 8000                       | -22.1                      | -22.4                    |
| 9000                       | -26.0                      | -25.8                    |
| 10000                      | -33.0                      | -33.0                    |

### 5.4.6.2 Graph 1

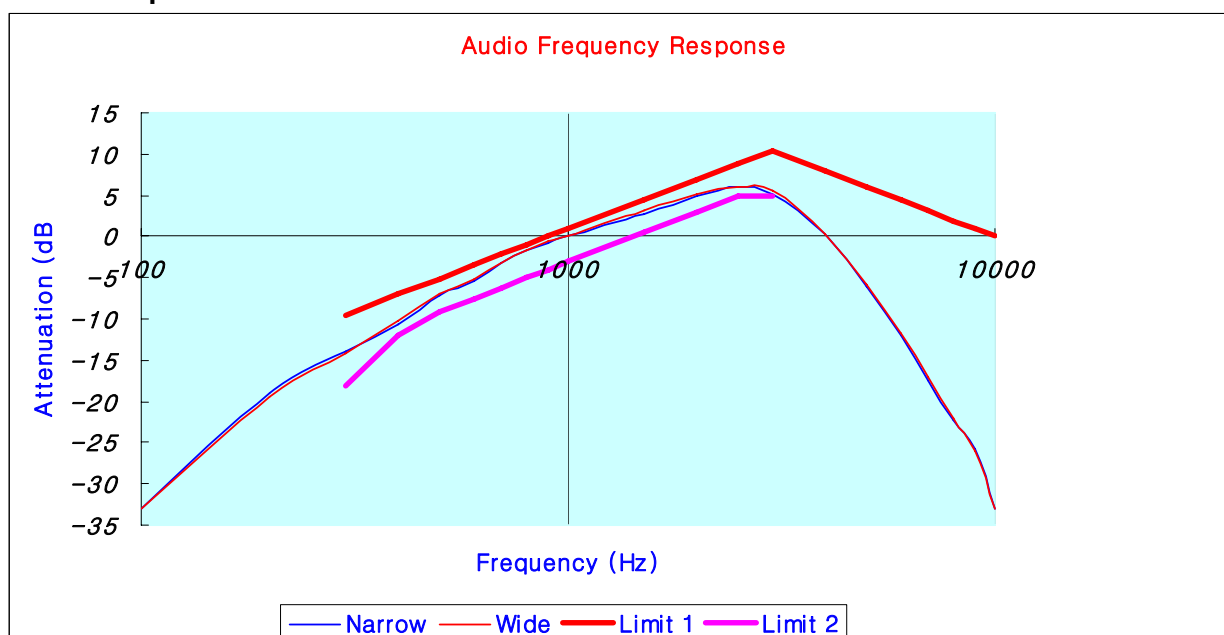


#### 5.4.6.3 Test Data 2

|                       |                             |
|-----------------------|-----------------------------|
| FCC Rules :           | Part 2 §2.1047(a) & §90.207 |
| IC Rules :            | RSS-119 Section 5.13        |
| Operating Frequency : | 155.025 MHz                 |
| Channel :             | 2nd Channel                 |
| Reference Voltage :   | 7.4 VDC                     |
| Power Output :        | 5 Watts                     |

| Audio Input Frequency (Hz) | Attenuation (dB)           |                          |
|----------------------------|----------------------------|--------------------------|
|                            | Channel Spacing : 12.5 kHz | Channel Spacing : 25 kHz |
| 100                        | -33.0                      | -33.1                    |
| 200                        | -19.0                      | -19.4                    |
| 300                        | -14.0                      | -14.1                    |
| 400                        | -10.6                      | -10.2                    |
| 500                        | -7.1                       | -6.9                     |
| 600                        | -5.4                       | -5.1                     |
| 700                        | -3.3                       | -3.1                     |
| 800                        | -1.7                       | -1.6                     |
| 900                        | -0.8                       | -0.6                     |
| 1000                       | 0                          | 0                        |
| 1500                       | +2.8                       | +3.1                     |
| 2000                       | +4.9                       | +5.1                     |
| 2500                       | +5.9                       | +6.1                     |
| 3000                       | +5.1                       | +5.6                     |
| 4000                       | +0.4                       | +0.2                     |
| 5000                       | -6.0                       | -5.8                     |
| 6000                       | -11.9                      | -11.8                    |
| 7000                       | -17.5                      | -17.0                    |
| 8000                       | -22.3                      | -22.0                    |
| 9000                       | -25.7                      | -26.0                    |
| 10000                      | -33.0                      | -33.0                    |

#### 5.4.6.4 Graph 2

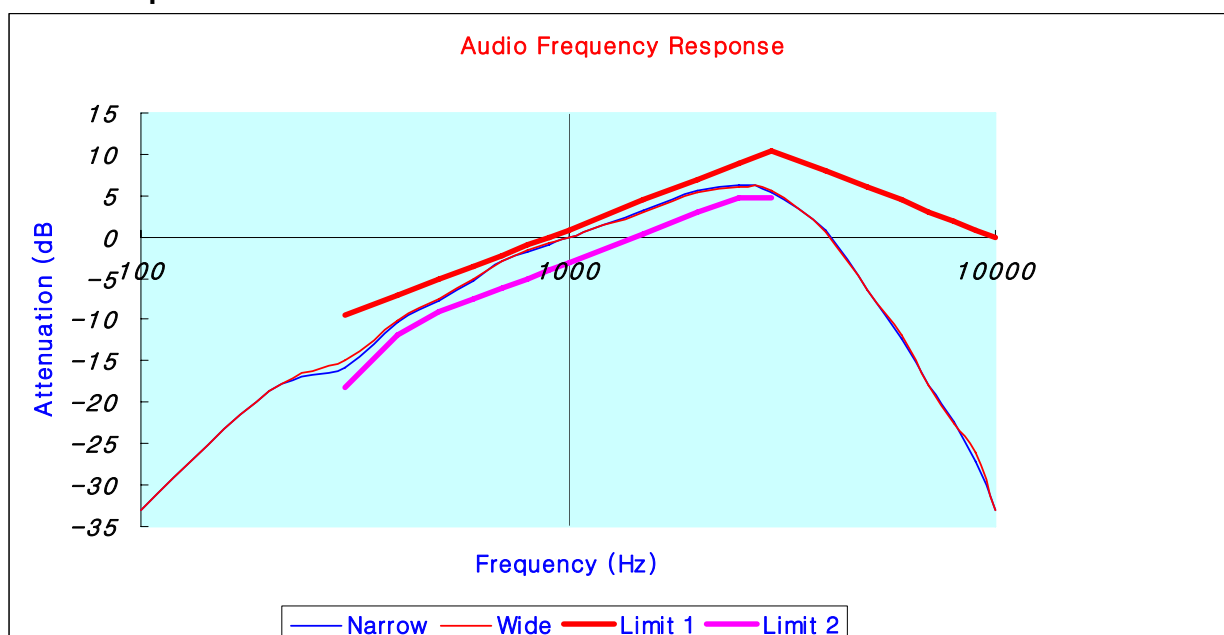


### 5.4.6.5 Test Data 3

|                       |                             |
|-----------------------|-----------------------------|
| FCC Rules :           | Part 2 §2.1047(a) & §90.207 |
| IC Rules :            | RSS-119 Section 5.13        |
| Operating Frequency : | 173.975 MHz                 |
| Channel :             | 3rd Channel                 |
| Reference Voltage :   | 7.4 VDC                     |
| Power Output :        | 5 Watts                     |

| Audio Input Frequency (Hz) | Attenuation (dB)           |                          |
|----------------------------|----------------------------|--------------------------|
|                            | Channel Spacing : 12.5 kHz | Channel Spacing : 25 kHz |
| 100                        | -33.0                      | -33.1                    |
| 200                        | -18.6                      | -18.7                    |
| 300                        | -15.7                      | -15.0                    |
| 400                        | -10.4                      | -10.1                    |
| 500                        | -7.6                       | -7.4                     |
| 600                        | -5.3                       | -5.0                     |
| 700                        | -3.0                       | -2.8                     |
| 800                        | -1.9                       | -1.6                     |
| 900                        | -1.0                       | -0.8                     |
| 1000                       | 0                          | 0                        |
| 1500                       | +3.3                       | +3.1                     |
| 2000                       | +5.7                       | +5.4                     |
| 2500                       | +6.3                       | +6.1                     |
| 3000                       | +5.5                       | +5.7                     |
| 4000                       | +0.7                       | +0.6                     |
| 5000                       | -6.5                       | -6.3                     |
| 6000                       | -12.3                      | -11.9                    |
| 7000                       | -18.0                      | -18.0                    |
| 8000                       | -22.4                      | -22.5                    |
| 9000                       | -27.1                      | -26.0                    |
| 10000                      | -33.0                      | -33.0                    |

### 5.4.6.6 Graph 3



## 5.5 Modulation Characteristics – Audio Low pass Filter Response

### 5.5.1 Specification

FCC Rules Part 2, Section 2.1047(a)  
FCC Rules Part 90, Section 90.207  
Industry Canada, RSS-119 Section 5.13

### 5.5.2 Method of Measurement

ANSI/TIA-603-B-2002 Section 2.2.15

### 5.5.3 Measurement Set-Up

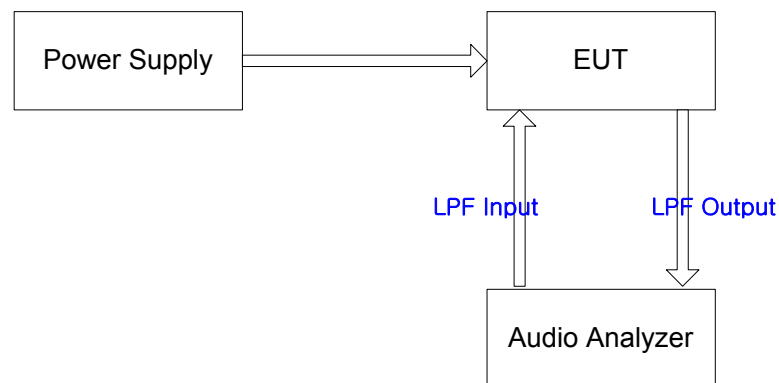


Fig.3

### 5.5.4 Test Equipment List

| Equipment      | Model Name  | Manufacturer    |
|----------------|-------------|-----------------|
| EUT            | SP7102      | Maxon CIC Corp. |
| Power Supply   | IPS-30B03DD | INTERACT        |
| Audio Analyzer | 8903B       | Agilent         |

### 5.5.5 Test Procedure

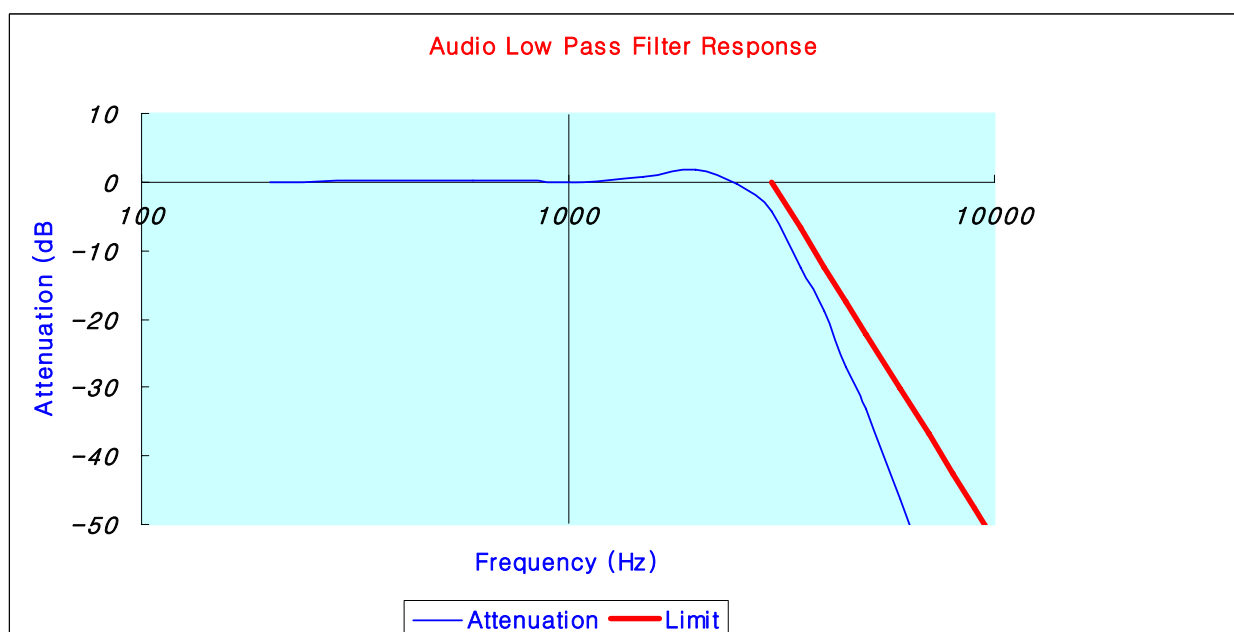
- The unit was turn-up in accordance with the alignment procedure stated in the FIG. 3 , and was loaded into a 50 ohm resistive termination.
- To measure the audio low pass filter response, an audio analyzer were connected to the actual Printed Circuit Board of the transmitter.
- Audio analyzer monitored 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  $LPF\ response = LEV_{FREQ} - LEV_{REF}$
- Audio frequencies in 3 kHz to 15 kHz : Minimum Attenuation to reference point shell be greater than  $40\log(f/3)$  dB, above 15 kHz, at least 28dB attenuation. ("f" in kHz)

## 5.5.5 Test Result

### 5.5.5.1 Data

| Audio Input Frequency (Hz) | Attenuation (dB) | Limit (dB) |
|----------------------------|------------------|------------|
| 100                        | -0.4             | -          |
| 200                        | 0                | -          |
| 400                        | +0.2             | -          |
| 600                        | +0.2             | -          |
| 800                        | +0.2             | -          |
| 1000                       | 0                | -          |
| 1500                       | +0.8             | -          |
| 2000                       | +1.8             | -          |
| 2500                       | -0.4             | -          |
| 3000                       | -4.2             | 0          |
| 3500                       | -12.4            | -6.7       |
| 4000                       | -18.8            | -12.5      |
| 4500                       | -27.0            | -17.6      |
| 5000                       | -33.2            | -22.2      |
| 6000                       | -46.2            | -30.1      |
| 7000                       | -57.6            | -36.8      |
| 8000                       | « -42.6          | -42.6      |
| 9000                       | « -47.7          | -47.7      |
| 10000                      | « -52.3          | -52.3      |

### 5.5.5.2 Graph



## 5.6 Modulation Characteristics – Modulation Limiting

### 5.6.1 Specification

FCC Rules Part 2, Section 2.1047(b)  
FCC Rules Part 90, Section 90.207  
Industry Canada, RSS-119 Section 5.13

### 5.6.2 Method of Measurement

ANSI/TIA-603-B-2002 Section 2.2.3

### 5.6.3 Measurement Set-Up

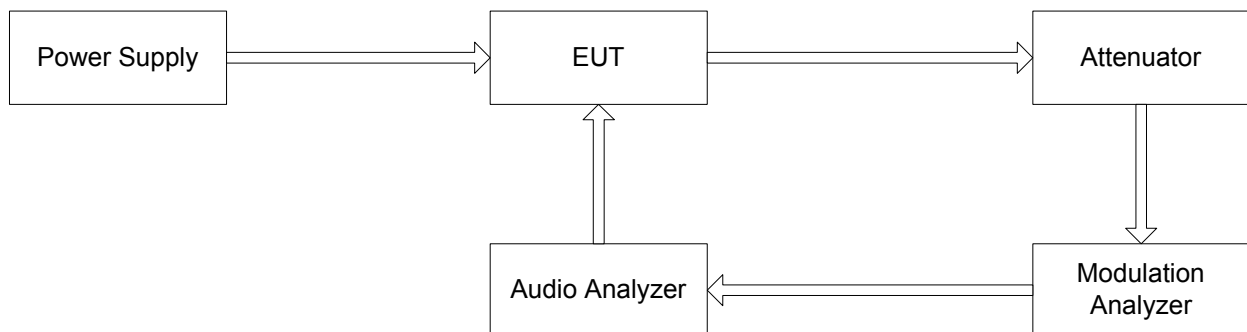


Fig.4

### 5.6.4 Test Equipment List

| Equipment           | Model Name  | Manufacturer    |
|---------------------|-------------|-----------------|
| EUT                 | SP7102      | Maxon CIC Corp. |
| Power Supply        | IPS-30B03DD | INTERACT        |
| Audio Analyzer      | 8903B       | Agilent         |
| Modulation Analyzer | 8901B       | Agilent         |
| Attenuator          | 33-30-33    | WEINSCHEL       |

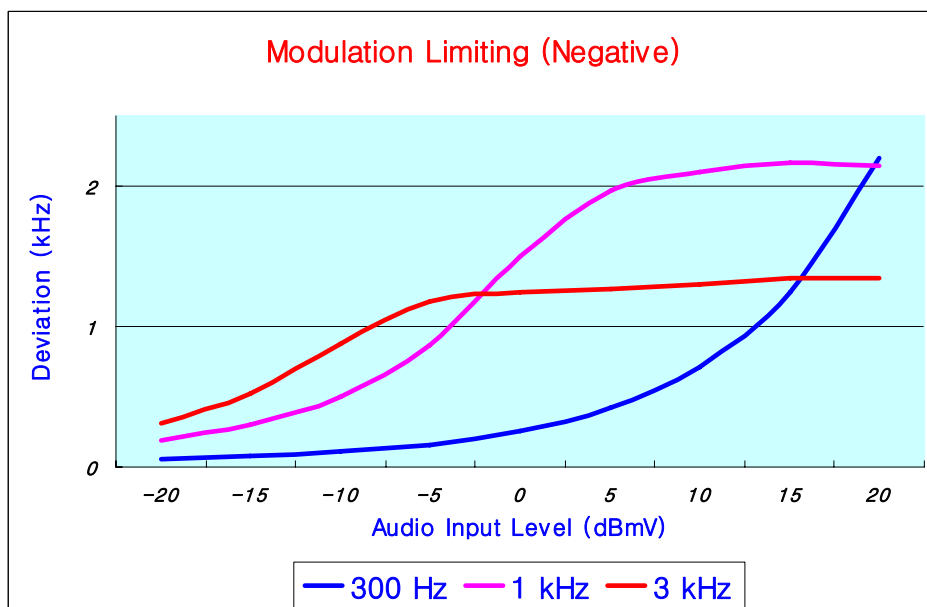
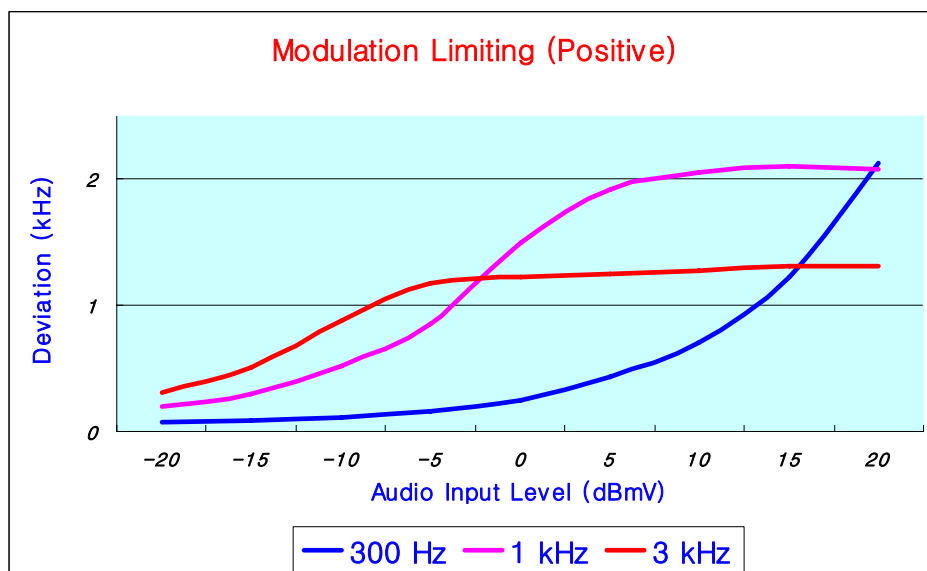
### 5.6.5 Test Procedure

- 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.

## 5.6.6 Test Result

### 5.6.6.1 Narrow Band, 1st Channel

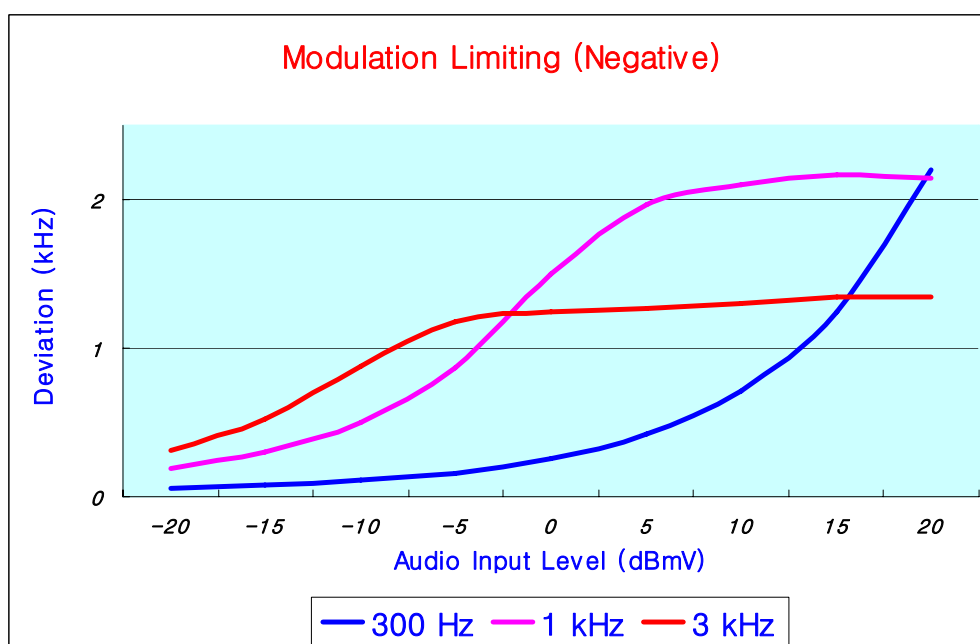
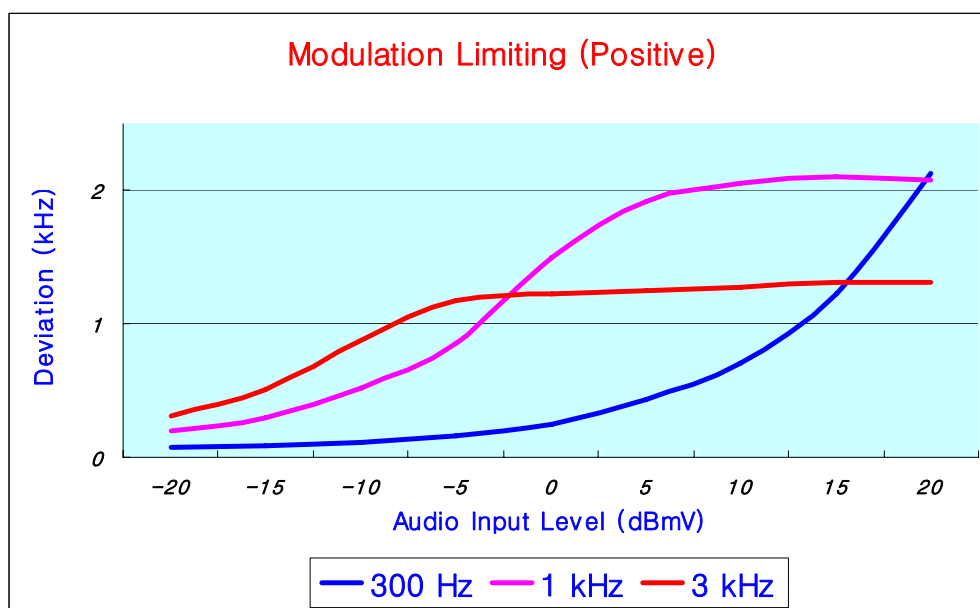
| Audio Input Level (dB) | Positive Peak Deviation (kHz) |       |       | Negative Peak Deviation (kHz) |       |       |
|------------------------|-------------------------------|-------|-------|-------------------------------|-------|-------|
|                        | 300 Hz                        | 1 kHz | 3 kHz | 300 Hz                        | 1 kHz | 3 kHz |
| -20                    | 0.07                          | 0.20  | 0.31  | 0.06                          | 0.19  | 0.31  |
| -15                    | 0.09                          | 0.30  | 0.51  | 0.08                          | 0.30  | 0.52  |
| -10                    | 0.11                          | 0.52  | 0.88  | 0.11                          | 0.50  | 0.88  |
| -5                     | 0.16                          | 0.86  | 1.17  | 0.16                          | 0.87  | 1.18  |
| 0                      | 0.25                          | 1.50  | 1.23  | 0.26                          | 1.50  | 1.25  |
| +5                     | 0.43                          | 1.92  | 1.25  | 0.42                          | 1.97  | 1.27  |
| +10                    | 0.71                          | 2.05  | 1.28  | 0.71                          | 2.10  | 1.30  |
| +15                    | 1.23                          | 2.10  | 1.31  | 1.24                          | 2.17  | 1.34  |
| +20                    | 2.13                          | 2.08  | 1.31  | 2.20                          | 2.14  | 1.34  |





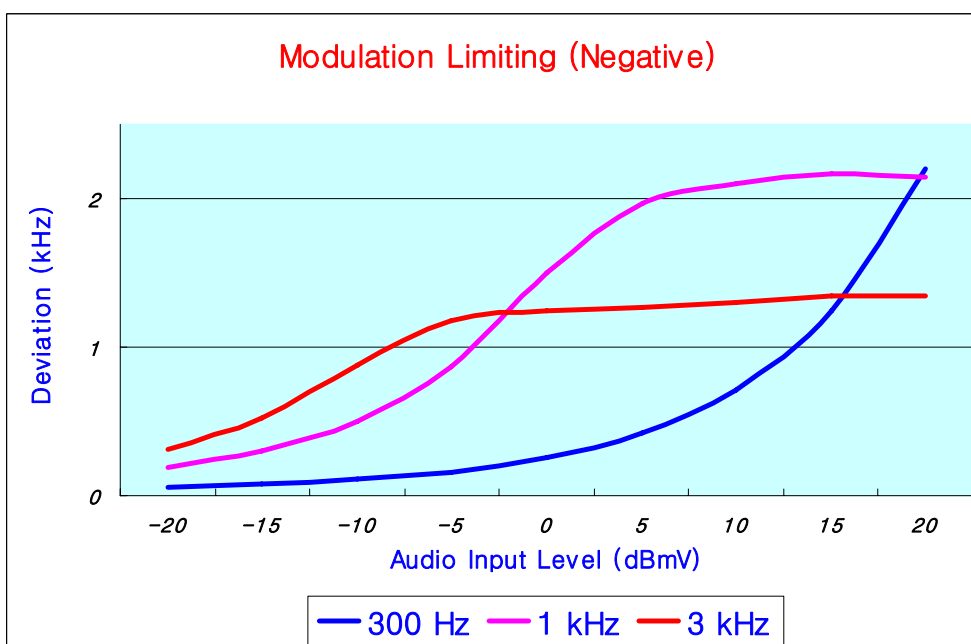
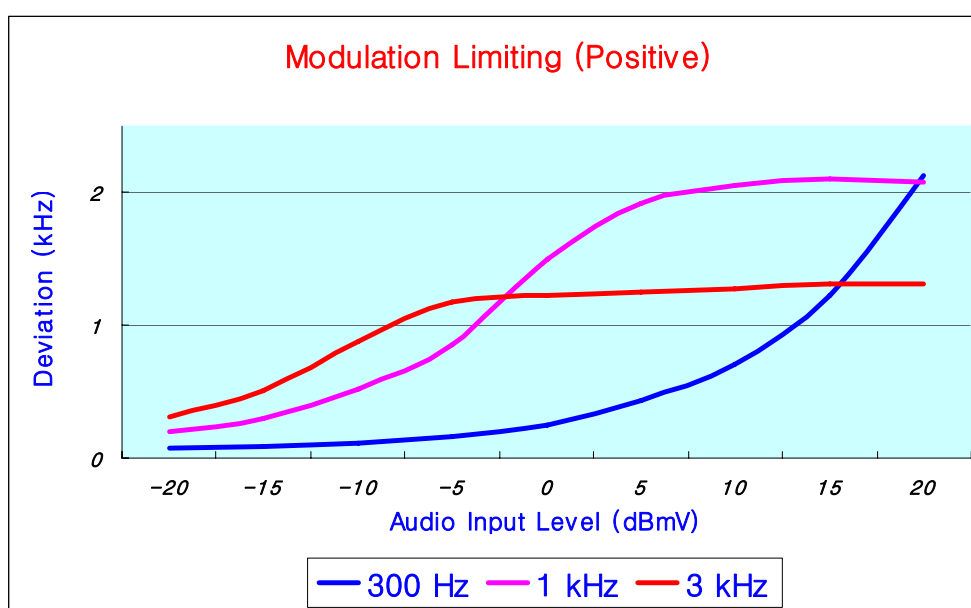
### 5.6.6.2 Narrow Band, 2nd Channel

| 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                    | 0.08                          | 0.19  | 0.31  | 0.07                          | 0.19  | 0.31  |
| -15                    | 0.09                          | 0.30  | 0.50  | 0.08                          | 0.30  | 0.50  |
| -10                    | 0.12                          | 0.50  | 0.87  | 0.11                          | 0.50  | 0.87  |
| -5                     | 0.17                          | 0.86  | 1.16  | 0.17                          | 0.86  | 1.16  |
| 0                      | 0.26                          | 1.50  | 1.22  | 0.26                          | 1.50  | 1.23  |
| +5                     | 0.42                          | 1.90  | 1.25  | 0.42                          | 1.94  | 1.26  |
| +10                    | 0.71                          | 2.05  | 1.28  | 0.71                          | 2.08  | 1.28  |
| +15                    | 1.23                          | 2.10  | 1.31  | 1.23                          | 2.14  | 1.32  |
| +20                    | 2.13                          | 2.09  | 1.31  | 2.16                          | 2.11  | 1.33  |



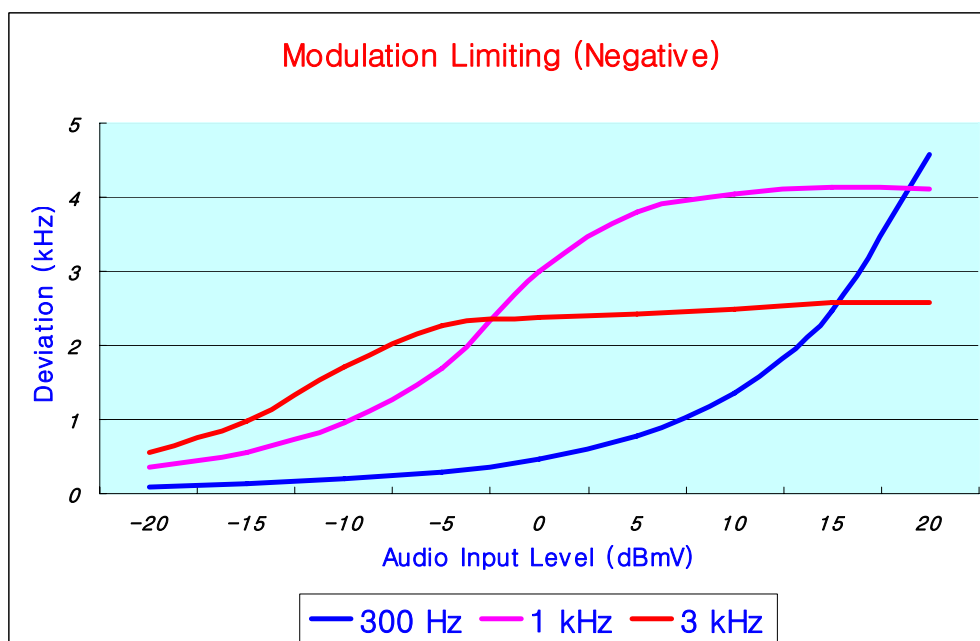
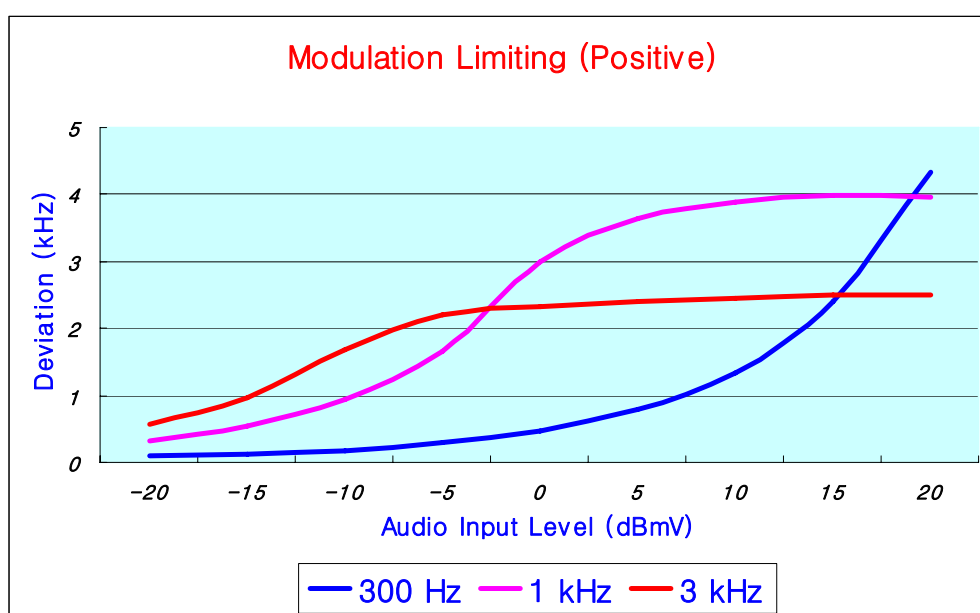
### 5.6.6.3 Narrow Band, 3rd Channel

| 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                    | 0.09                          | 0.21  | 0.32  | 0.10                          | 0.21  | 0.32  |
| -15                    | 0.11                          | 0.33  | 0.52  | 0.11                          | 0.32  | 0.52  |
| -10                    | 0.13                          | 0.51  | 0.88  | 0.14                          | 0.52  | 0.89  |
| -5                     | 0.19                          | 0.88  | 1.18  | 0.19                          | 0.88  | 1.19  |
| 0                      | 0.30                          | 1.50  | 1.25  | 0.29                          | 1.50  | 1.26  |
| +5                     | 0.45                          | 1.97  | 1.28  | 0.45                          | 1.94  | 1.30  |
| +10                    | 0.75                          | 2.08  | 1.31  | 0.75                          | 2.10  | 1.31  |
| +15                    | 1.30                          | 2.13  | 1.31  | 1.27                          | 2.17  | 1.29  |
| +20                    | 2.19                          | 2.13  | 1.30  | 2.19                          | 2.13  | 1.29  |



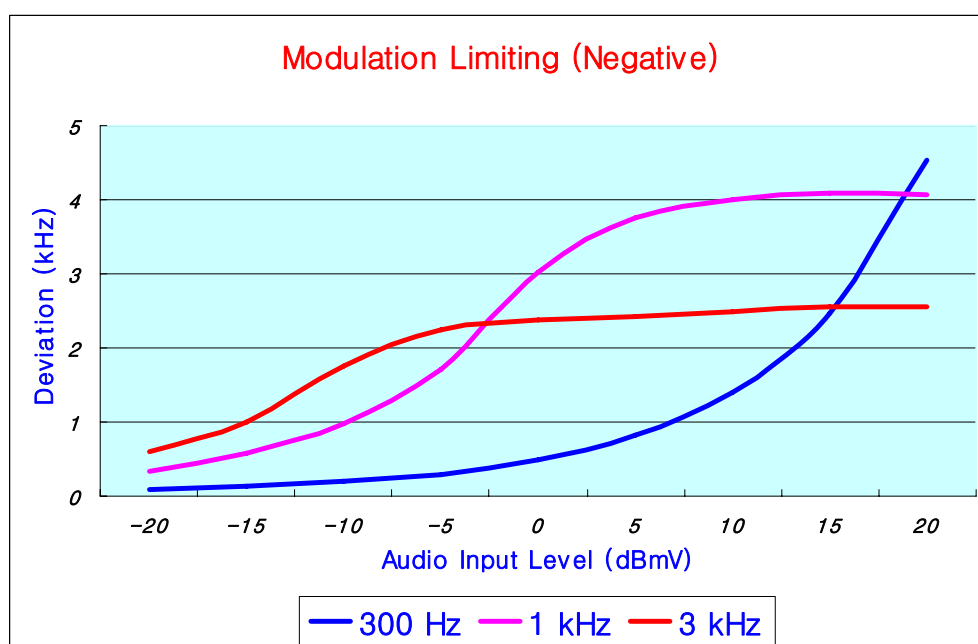
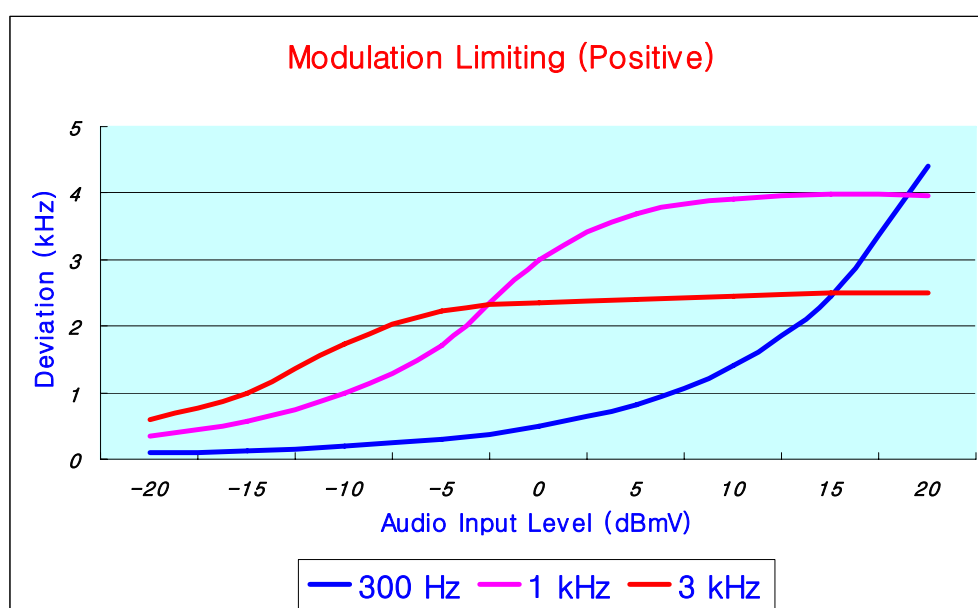
#### 5.6.6.4 WideBand, 1st Channel

| 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                    | 0.09                          | 0.32  | 0.56  | 0.10                          | 0.35  | 0.56  |
| -15                    | 0.12                          | 0.55  | 0.97  | 0.13                          | 0.55  | 0.98  |
| -10                    | 0.18                          | 0.95  | 1.69  | 0.19                          | 0.96  | 1.71  |
| -5                     | 0.29                          | 1.66  | 2.21  | 0.29                          | 1.68  | 2.26  |
| 0                      | 0.46                          | 3.00  | 2.33  | 0.46                          | 3.00  | 2.38  |
| +5                     | 0.79                          | 3.65  | 2.39  | 0.78                          | 3.80  | 2.43  |
| +10                    | 1.34                          | 3.89  | 2.44  | 1.35                          | 4.04  | 2.49  |
| +15                    | 2.39                          | 3.98  | 2.50  | 2.46                          | 4.14  | 2.57  |
| +20                    | 4.33                          | 3.95  | 2.49  | 4.57                          | 4.12  | 2.58  |



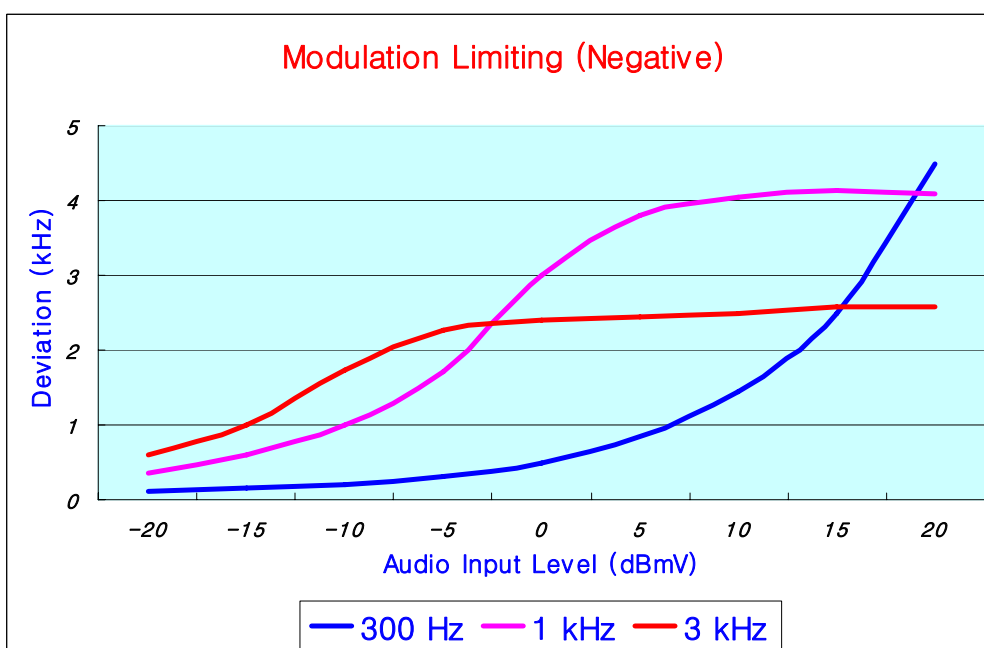
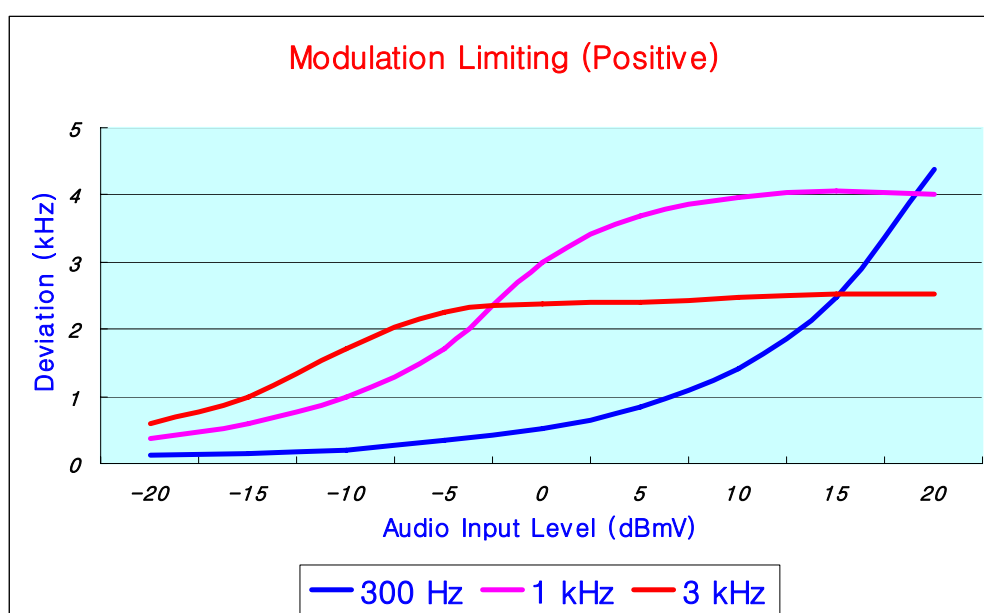
### 5.6.6.5 WideBand, 2nd Channel

| 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                    | 0.10                          | 0.34  | 0.59  | 0.10                          | 0.34  | 0.59  |
| -15                    | 0.13                          | 0.57  | 1.00  | 0.13                          | 0.57  | 1.00  |
| -10                    | 0.20                          | 0.98  | 1.74  | 0.19                          | 0.98  | 1.75  |
| -5                     | 0.30                          | 1.70  | 2.23  | 0.30                          | 1.71  | 2.25  |
| 0                      | 0.49                          | 3.00  | 2.34  | 0.49                          | 3.02  | 2.37  |
| +5                     | 0.82                          | 3.68  | 2.40  | 0.82                          | 3.76  | 2.42  |
| +10                    | 1.40                          | 3.91  | 2.45  | 1.41                          | 4.00  | 2.49  |
| +15                    | 2.44                          | 3.99  | 2.51  | 2.47                          | 4.09  | 2.55  |
| +20                    | 4.40                          | 3.97  | 2.51  | 4.53                          | 4.06  | 2.56  |



#### 5.6.6.6 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                    | 0.12                          | 0.36  | 0.59  | 0.12                          | 0.36  | 0.60  |
| -15                    | 0.16                          | 0.59  | 1.00  | 0.15                          | 0.59  | 1.01  |
| -10                    | 0.21                          | 0.98  | 1.72  | 0.21                          | 0.99  | 1.74  |
| -5                     | 0.34                          | 1.70  | 2.25  | 0.32                          | 1.71  | 2.27  |
| 0                      | 0.51                          | 3.00  | 2.37  | 0.50                          | 3.00  | 2.39  |
| +5                     | 0.84                          | 3.70  | 2.41  | 0.84                          | 3.79  | 2.44  |
| +10                    | 1.42                          | 3.97  | 2.47  | 1.44                          | 4.04  | 2.50  |
| +15                    | 2.47                          | 4.05  | 2.52  | 2.50                          | 4.13  | 2.57  |
| +20                    | 4.37                          | 4.02  | 2.52  | 4.48                          | 4.09  | 2.58  |



## 5.7 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 per-cent 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 band-width: 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.

### 5.7.1 Specification

FCC Rules Part 2, Section 2.1049  
FCC Rules Part 90, Section 90.210  
Industry Canada, RSS-119 Section 5.5  
Industry Canada, RSS-119 Section 5.8

### 5.7.2 Method of Measurement

ANSI/TIA-603-B-2002 Section 2.2.11

### 5.7.3 Measurement Set-Up

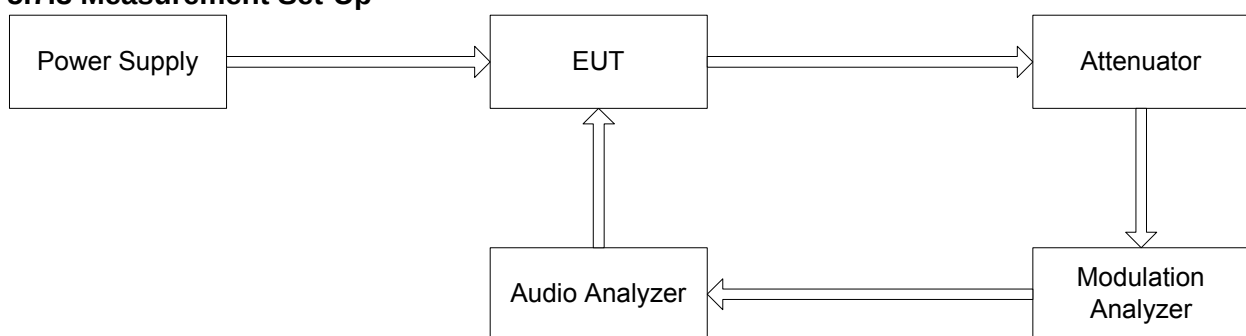


Fig.5

#### 5.7.4 Test Equipment List

| Equipment         | Model Name  | Manufacturer    |
|-------------------|-------------|-----------------|
| EUT               | SP7102      | Maxon CIC Corp. |
| Power Supply      | IPS-30B03DD | INTERACT        |
| Audio Analyzer    | 8903B       | Agilent         |
| Spectrum Analyzer | FSP7        | Rohde & Shwarz  |
| Attenuator        | 33-30-33    | WEINSCHEL       |

#### 5.7.5 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.

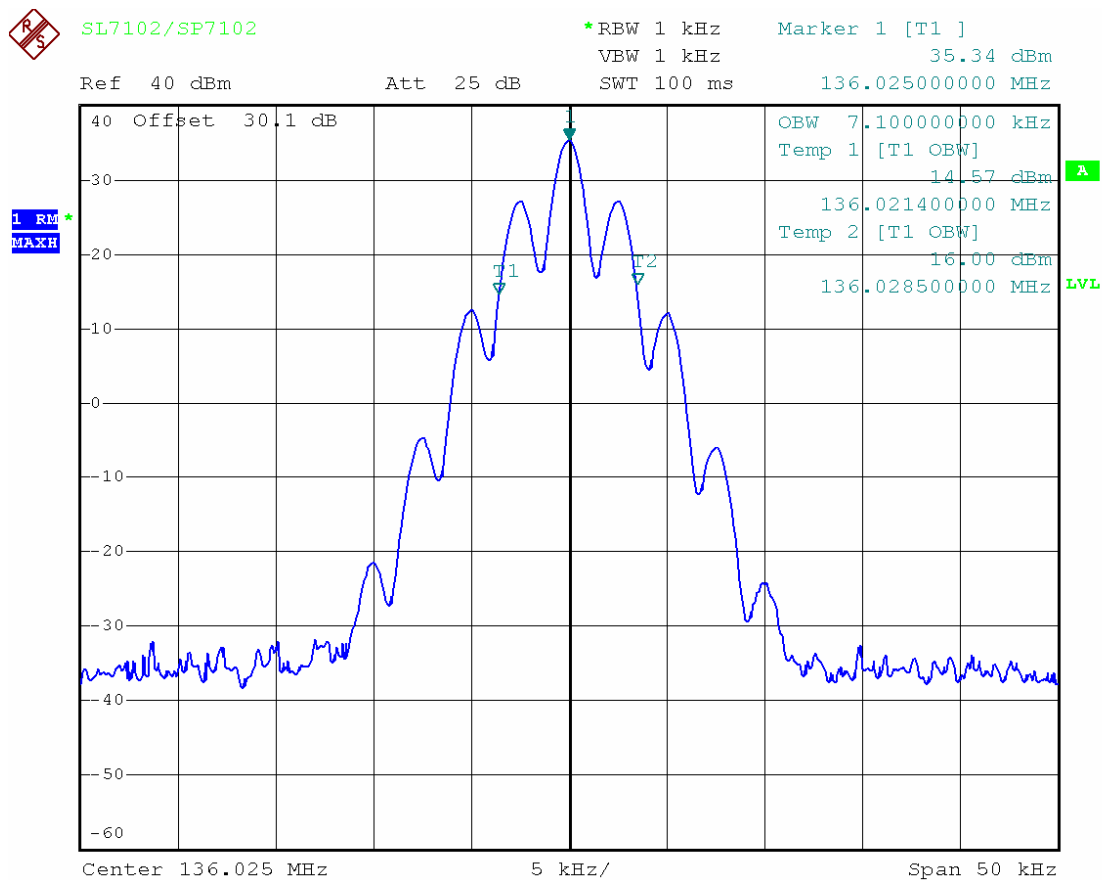
#### 5.7.6 Data

| Frequency (MHz) | Channel Spacing | Mask Type | 99% Bandwidth (kHz) |            | Maximum Authorized Bandwidth (KHz) |
|-----------------|-----------------|-----------|---------------------|------------|------------------------------------|
|                 |                 |           | Low Power           | High Power |                                    |
| 136.025 MHz     | Narrow          | D         | 7.1                 | 7.1        | 11.25                              |
|                 | Wide            | B         | 11.4                | 11.4       | 20.00                              |
| 155.025 MHz     | Narrow          | D         | 7.1                 | 7.1        | 11.25                              |
|                 | Wide            | B         | 11.4                | 11.4       | 20.00                              |
| 173.975 MHz     | Narrow          | D         | 7.1                 | 7.1        | 11.25                              |
|                 | Wide            | B         | 11.5                | 11.5       | 20.00                              |

## 5.7.7 99% Bandwidth

### 5.7.7.1 Plot 1

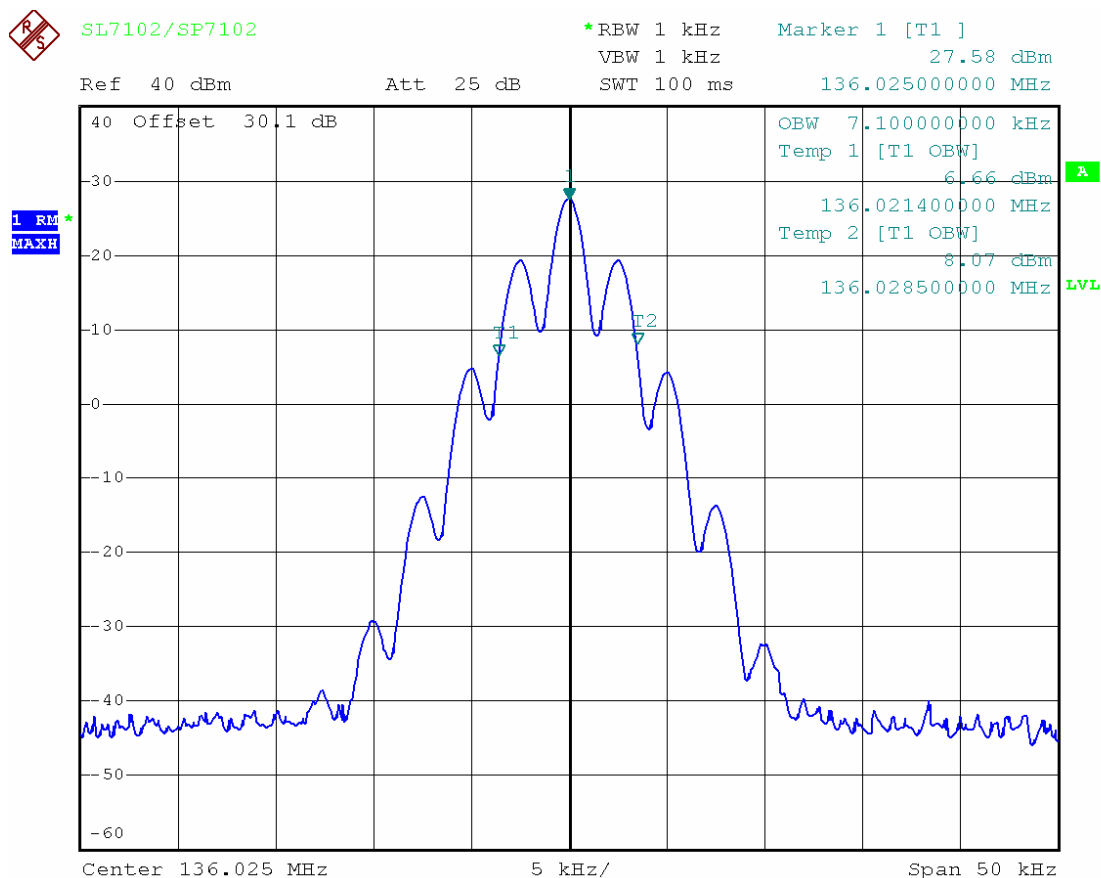
|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.5                        |
| Operating Frequency : | 136.025 MHz                                |
| Channel :             | 1st Channel                                |
| Power Output :        | 5 Watts                                    |
| Channel Spacing :     | Narrow Band                                |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | 99% Bandwidth                              |
| Reference Voltage :   | 7.4 VDC                                    |





### 5.7.7.2 Plot 2

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.5                        |
| Operating Frequency : | 136.025 MHz                                |
| Channel :             | 1st Channel                                |
| Power Output :        | 1 Watts                                    |
| Channel Spacing :     | Narrow Band                                |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | 99% Bandwidth                              |
| Reference Voltage :   | 7.4 VDC                                    |



### 5.7.7.3 Plot 3

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.5                        |
| Operating Frequency : | 136.025 MHz                                |
| Channel :             | 1st Channel                                |
| Power Output :        | 5 Watts                                    |
| Channel Spacing :     | WideBand                                   |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | 99% Bandwidth                              |
| Reference Voltage :   | 7.4 VDC                                    |

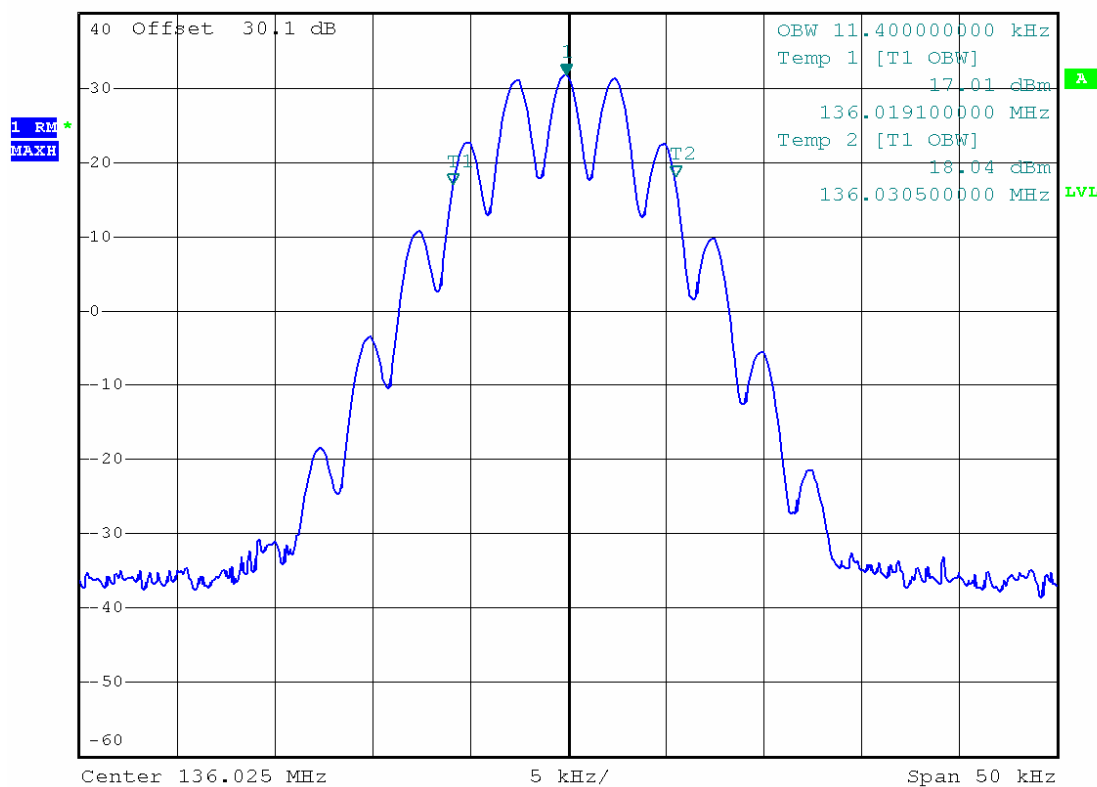


SI7102/SP7102

\*RBW 1 kHz Marker 1 [T1 ]  
VBW 1 kHz 31.75 dBm  
SWT 100 ms 136.024900000 MHz

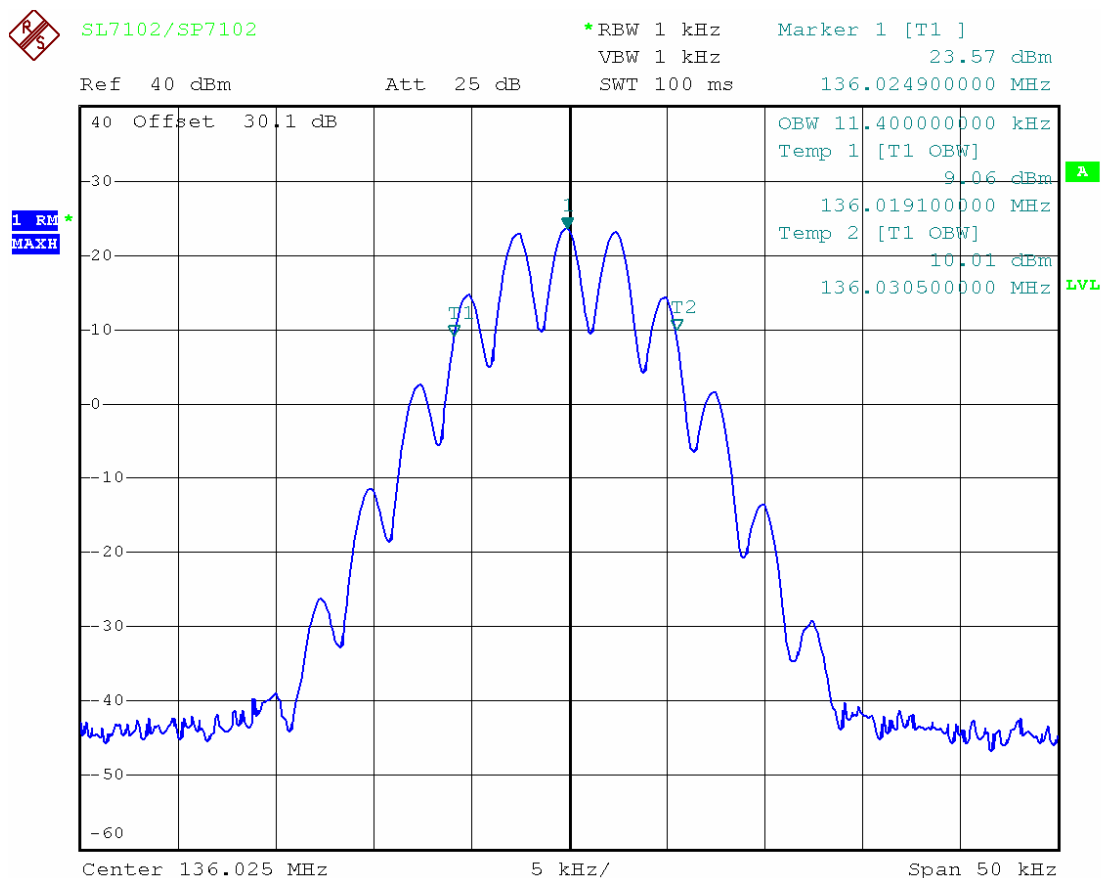
Ref 40 dBm

Att 25 dB



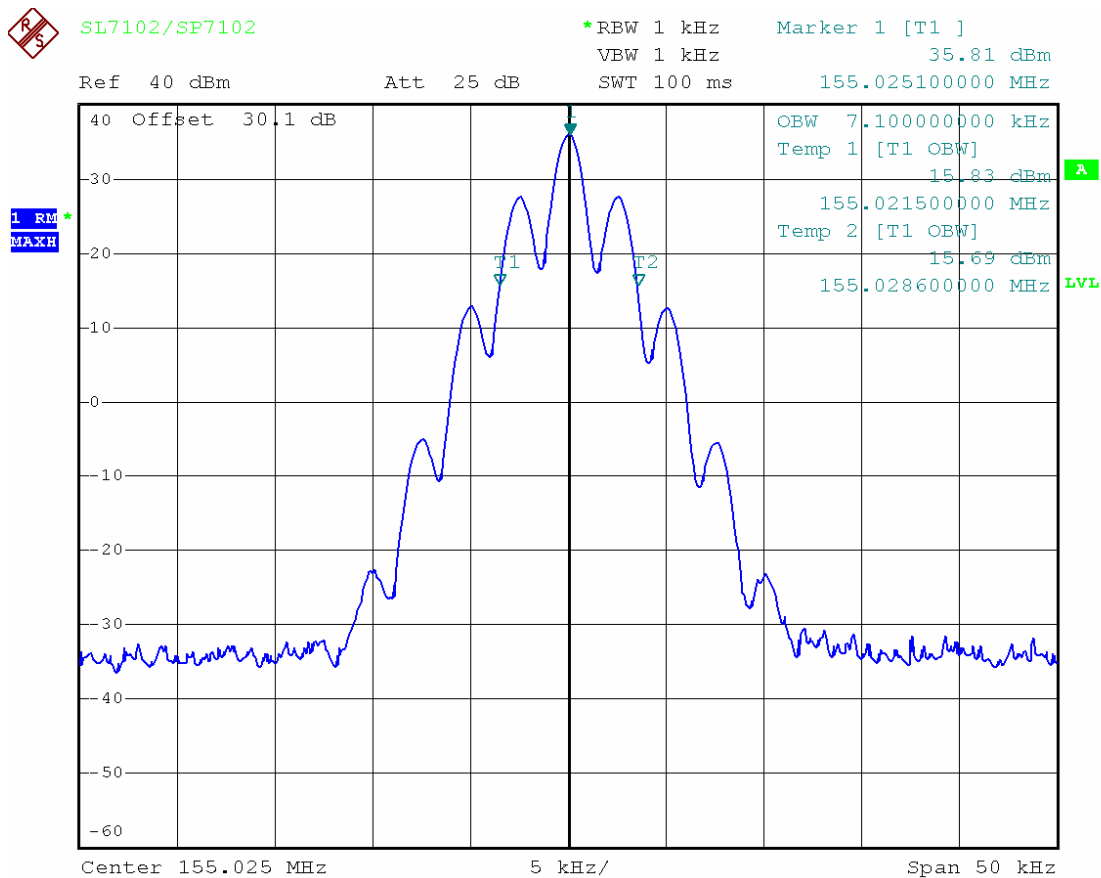
#### 5.7.7.4 Plot 4

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.5                        |
| Operating Frequency : | 136.025 MHz                                |
| Channel :             | 1st Channel                                |
| Power Output :        | 1 Watts                                    |
| Channel Spacing :     | WideBand                                   |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | 99% Bandwidth                              |
| Reference Voltage :   | 7.4 VDC                                    |



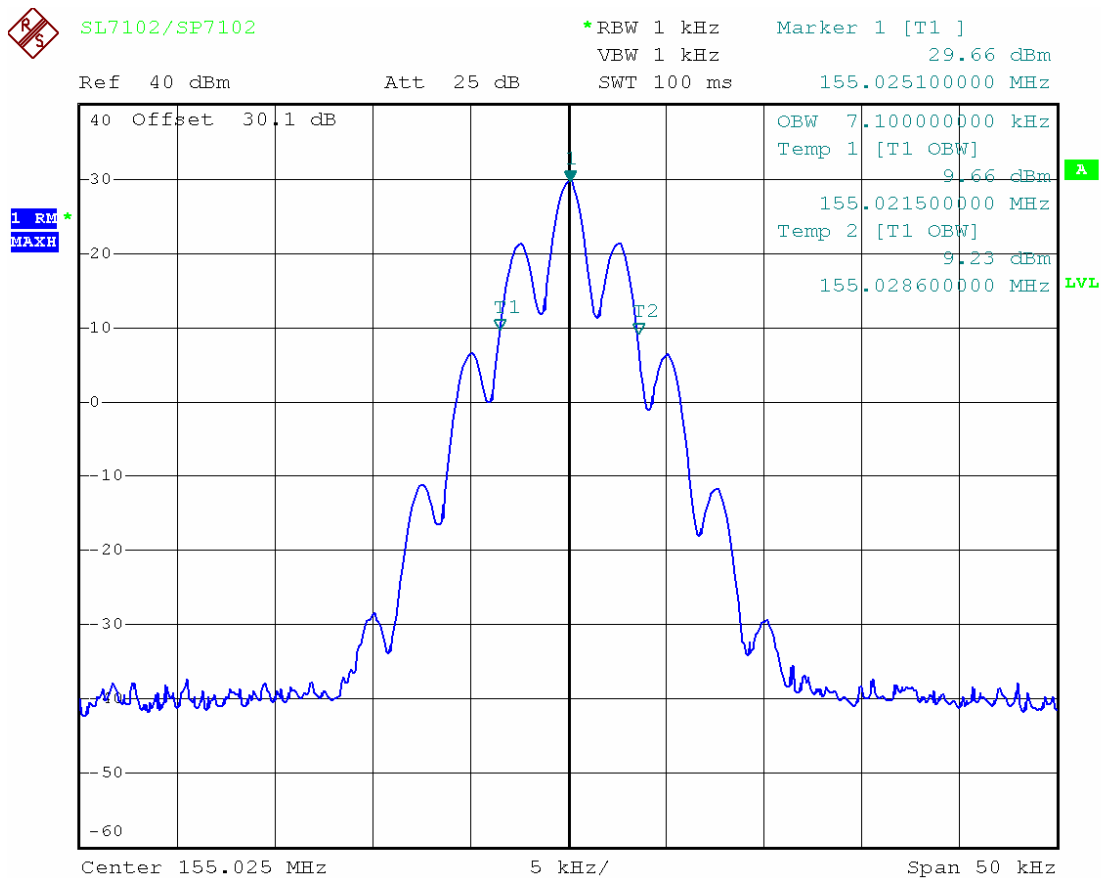
### 5.7.7.5 Plot 5

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.5                        |
| Operating Frequency : | 155.025 MHz                                |
| Channel :             | 2nd Channel                                |
| Power Output :        | 5 Watts                                    |
| Channel Spacing :     | Narrow Band                                |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | 99% Bandwidth                              |
| Reference Voltage :   | 7.4 VDC                                    |



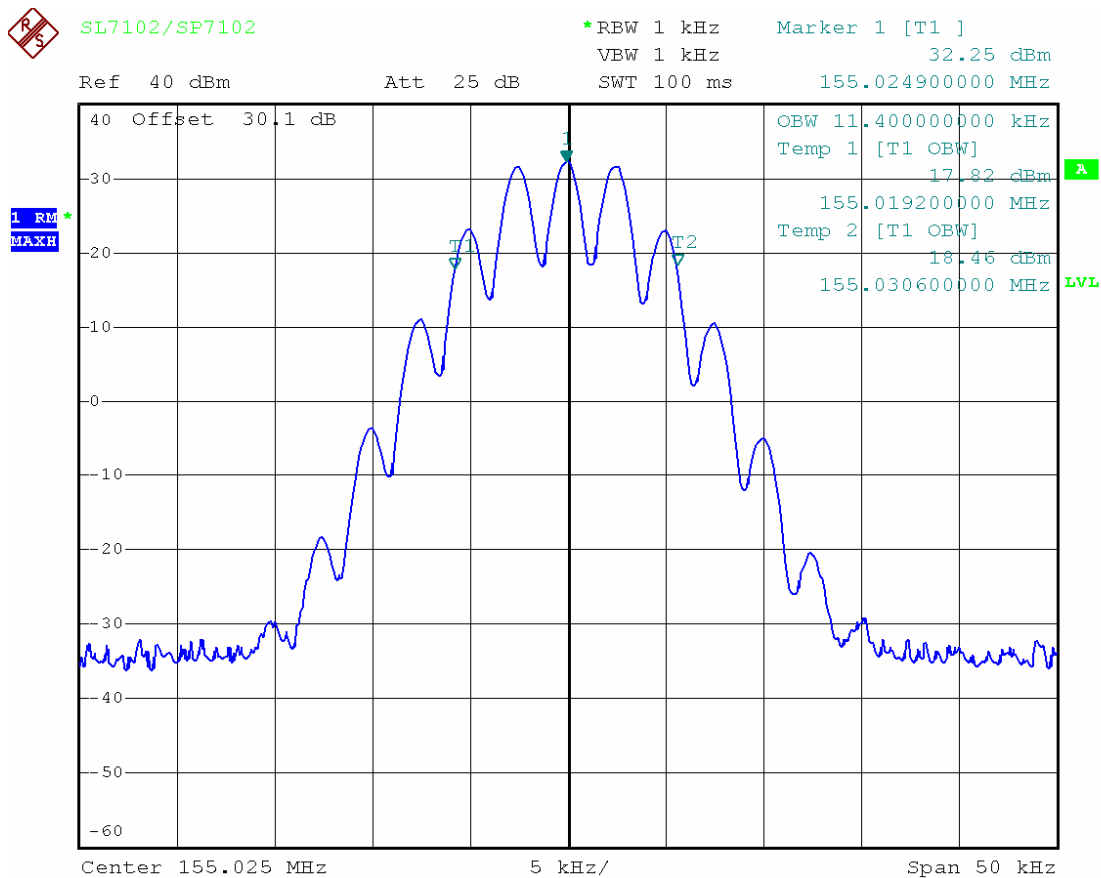
### 5.7.7.6 Plot 6

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.5                        |
| Operating Frequency : | 155.025 MHz                                |
| Channel :             | 2nd Channel                                |
| Power Output :        | 1 Watts                                    |
| Channel Spacing :     | Narrow Band                                |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | 99% Bandwidth                              |
| Reference Voltage :   | 7.4 VDC                                    |



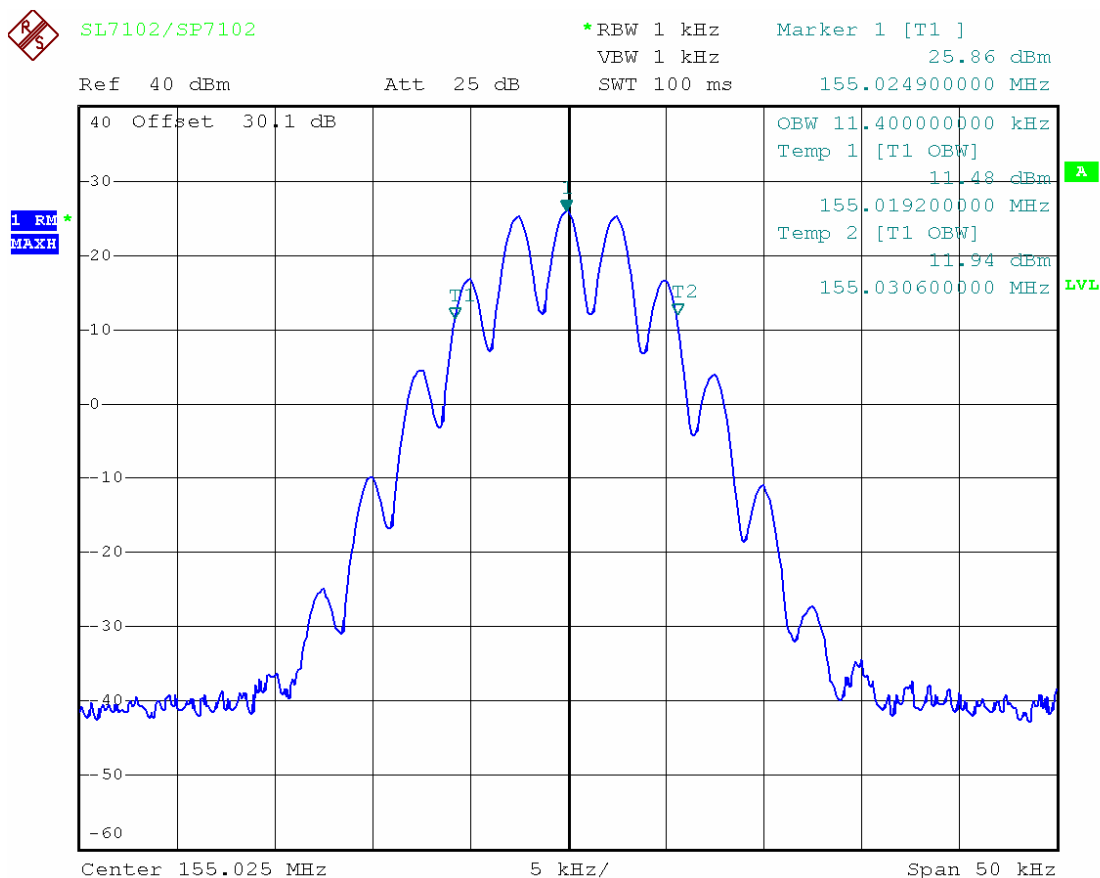
### 5.7.7.7 Plot 7

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.5                        |
| Operating Frequency : | 155.025 MHz                                |
| Channel :             | 2nd Channel                                |
| Power Output :        | 5 Watts                                    |
| Channel Spacing :     | WideBand                                   |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | 99% Bandwidth                              |
| Reference Voltage :   | 7.4 VDC                                    |



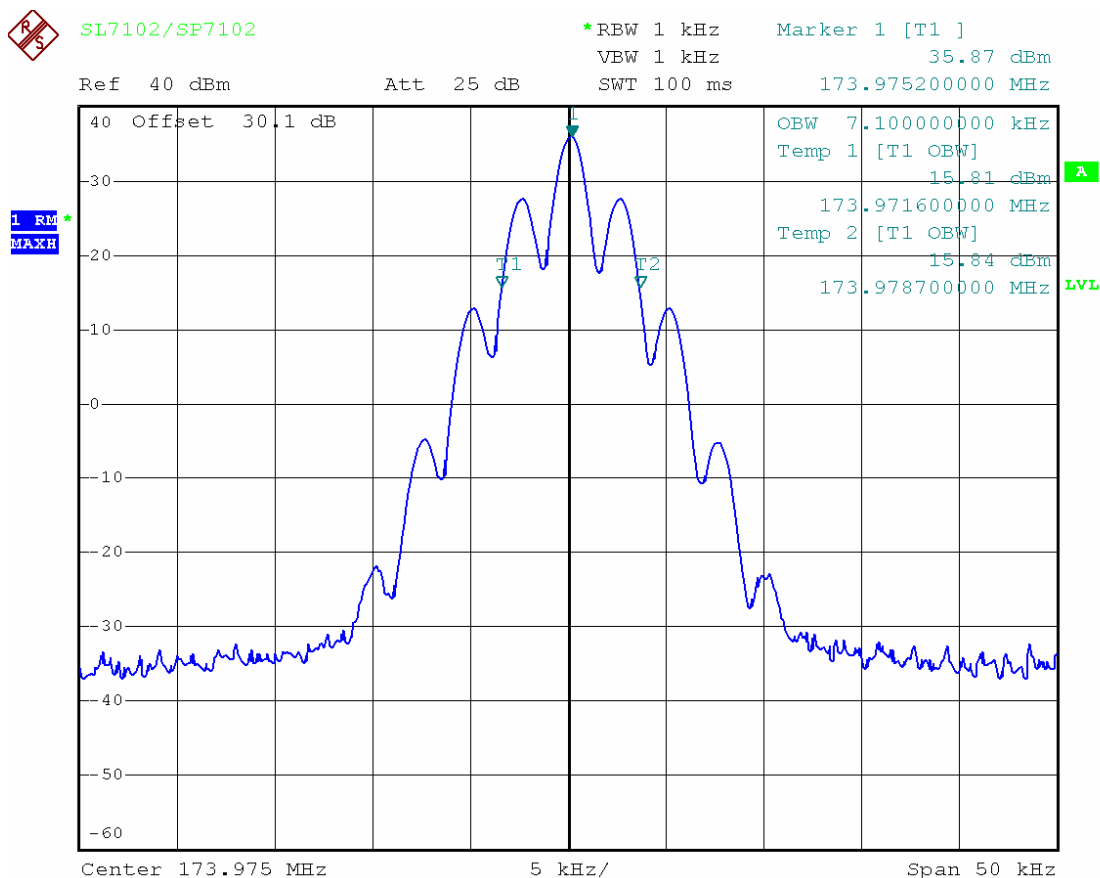
### 5.7.7.8 Plot 8

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.5                        |
| Operating Frequency : | 155.025 MHz                                |
| Channel :             | 2nd Channel                                |
| Power Output :        | 1 Watts                                    |
| Channel Spacing :     | WideBand                                   |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | 99% Bandwidth                              |
| Reference Voltage :   | 7.4 VDC                                    |



### 5.7.7.9 Plot 9

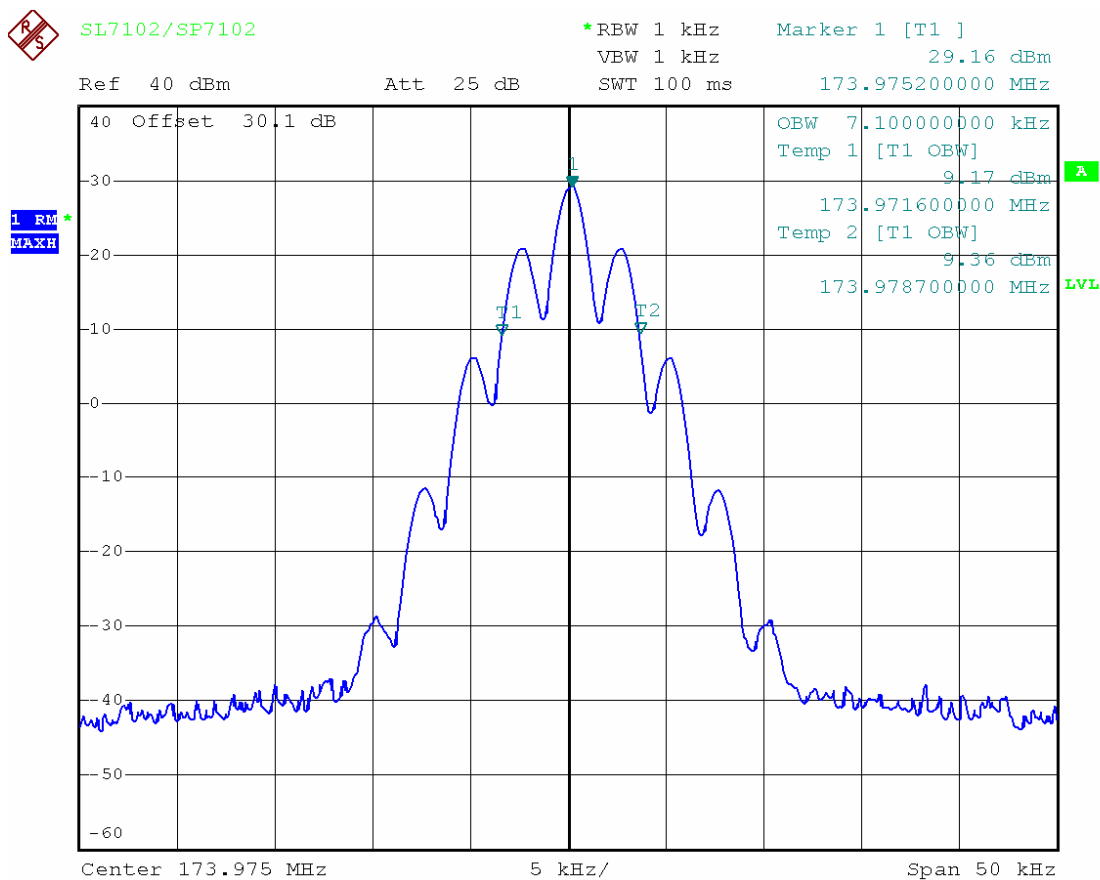
|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.5                        |
| Operating Frequency : | 173.975 MHz                                |
| Channel :             | 3rd Channel                                |
| Power Output :        | 5 Watts                                    |
| Channel Spacing :     | Narrow Band                                |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | 99% Bandwidth                              |
| Reference Voltage :   | 7.4 VDC                                    |





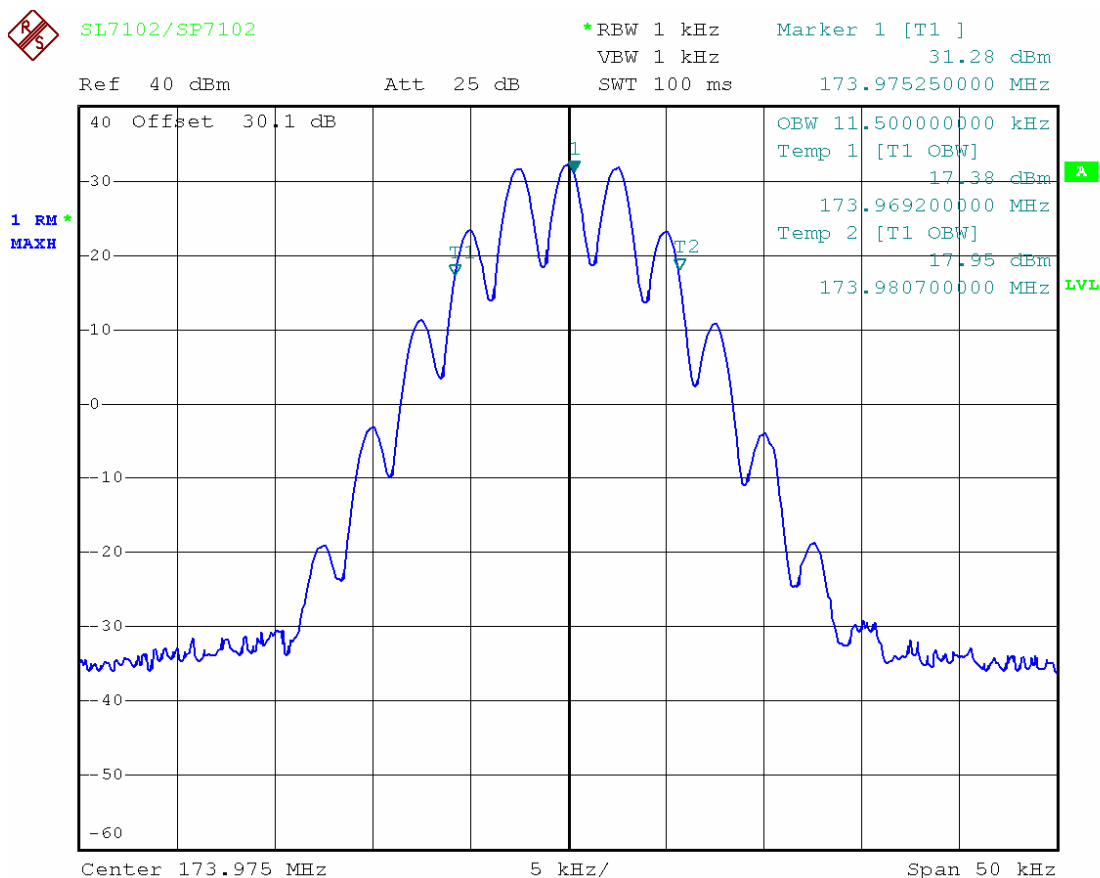
## 5.7.7.10 Plot 10

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.5                        |
| Operating Frequency : | 173.975 MHz                                |
| Channel :             | 3rd Channel                                |
| Power Output :        | 1 Watts                                    |
| Channel Spacing :     | Narrow Band                                |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | 99% Bandwidth                              |
| Reference Voltage :   | 7.4 VDC                                    |



### 5.7.7.11 Plot 11

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.5                        |
| Operating Frequency : | 173.975 MHz                                |
| Channel :             | 3rd Channel                                |
| Power Output :        | 5 Watts                                    |
| Channel Spacing :     | WideBand                                   |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | 99% Bandwidth                              |
| Reference Voltage :   | 7.4 VDC                                    |



## 5.7.7.12 Plot 12

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.5                        |
| Operating Frequency : | 173.975 MHz                                |
| Channel :             | 3rd Channel                                |
| Power Output :        | 1 Watts                                    |
| Channel Spacing :     | WideBand                                   |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | 99% Bandwidth                              |
| Reference Voltage :   | 7.4 VDC                                    |



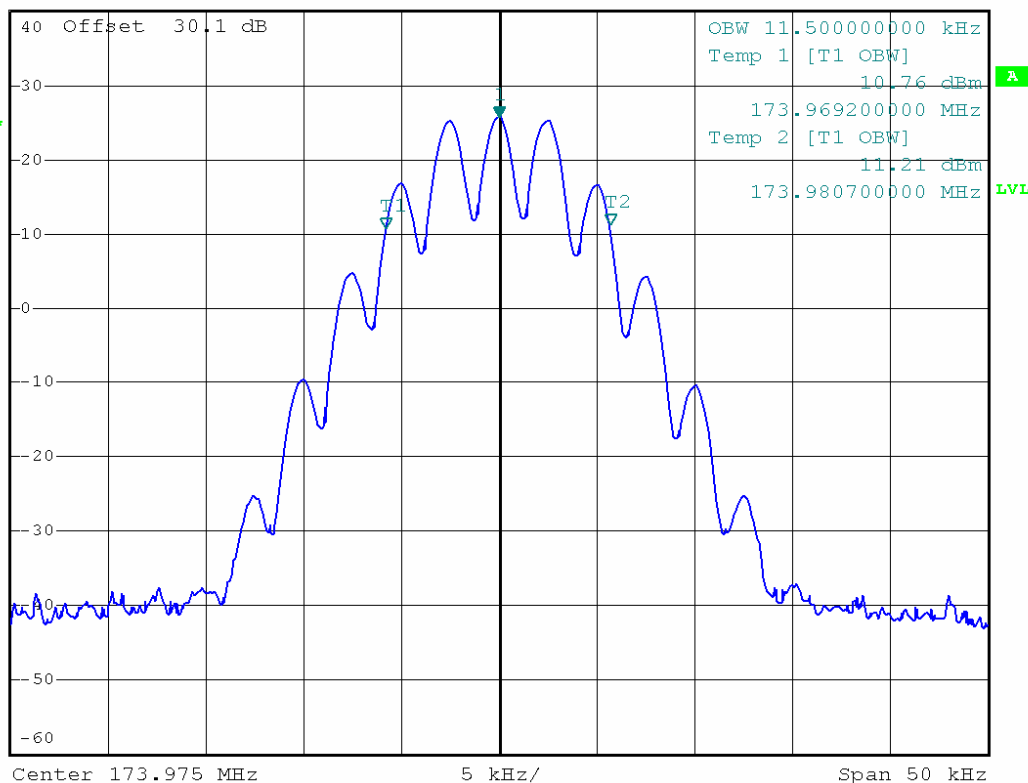
SI7102/SP7102

\*RBW 1 kHz Marker 1 [T1]  
VBW 1 kHz 25.69 dBm  
SWT 100 ms 173.975000000 MHz

Ref 40 dBm

Att 25 dB

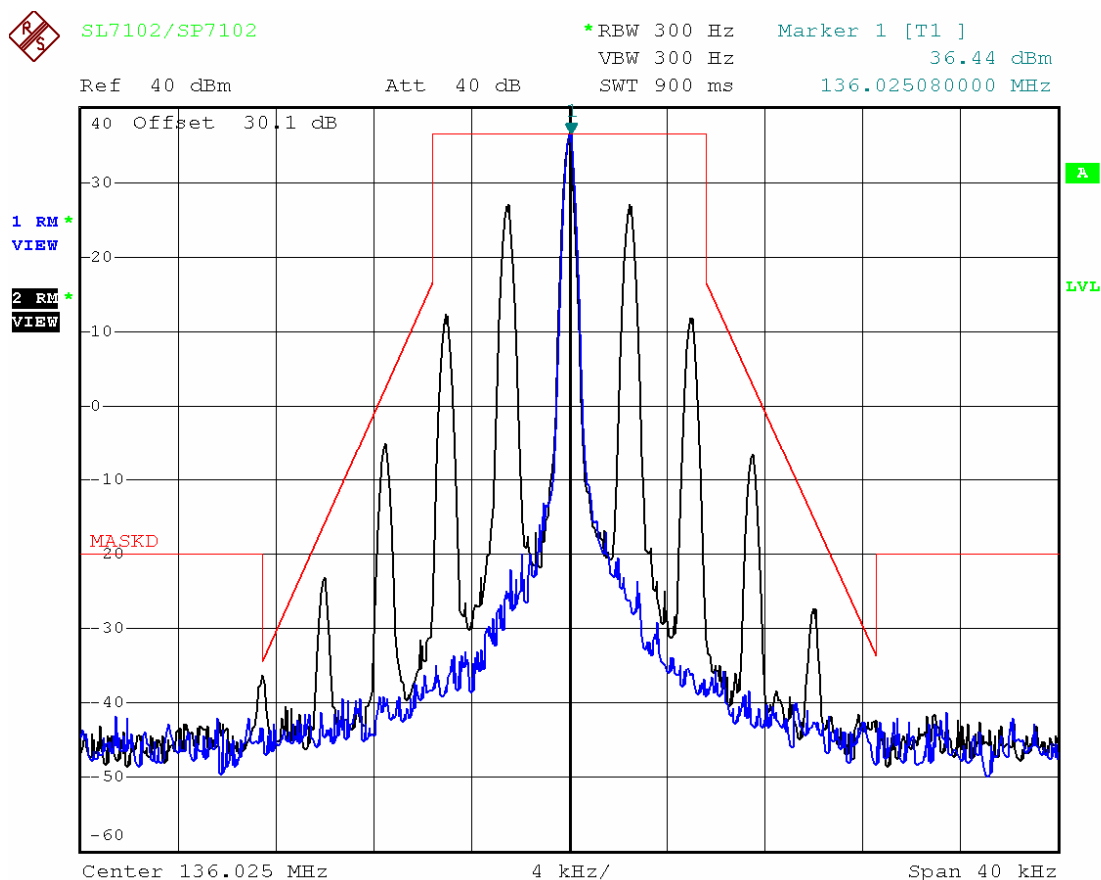
1 RM  
MAXH



## 5.7.8 Emission Mask

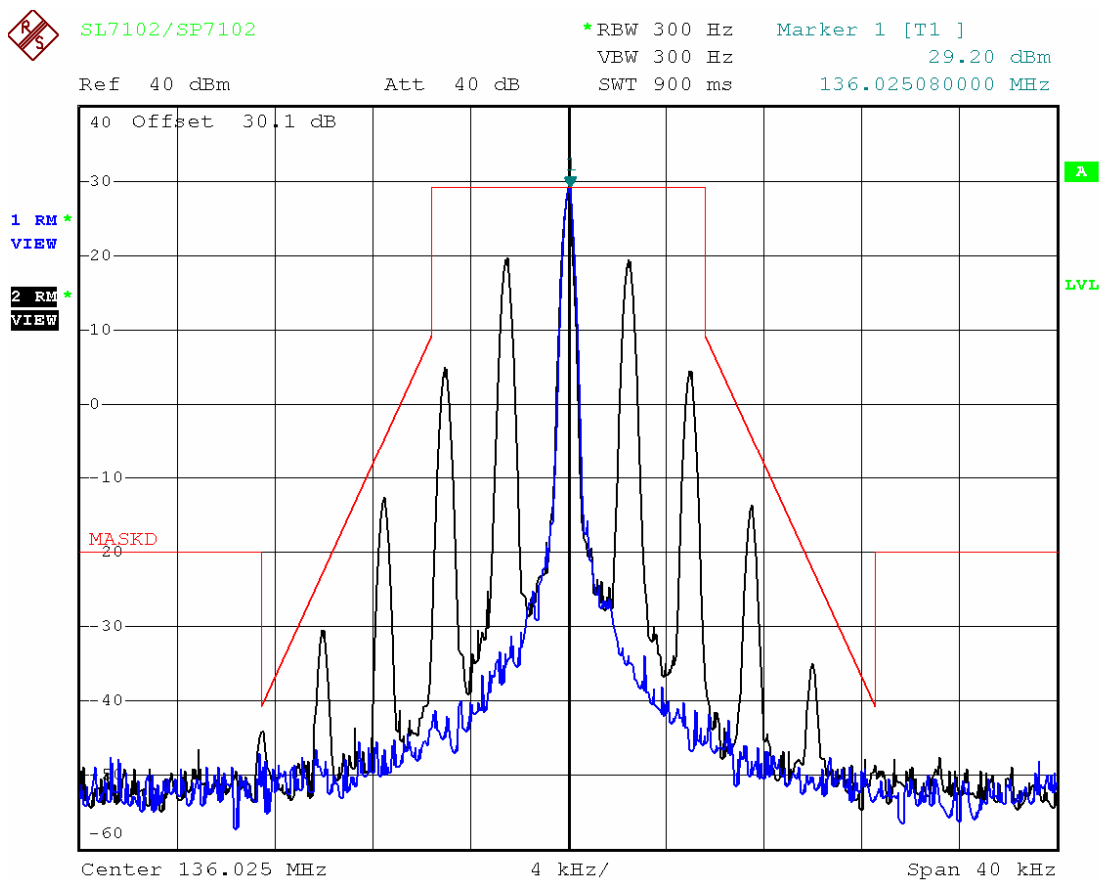
### 5.5.8.1 Plot 1

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.8                        |
| Operating Frequency : | 136.025 MHz                                |
| Channel :             | 1st Channel                                |
| Power Output :        | 5 Watts                                    |
| Channel Spacing :     | Narrow Band                                |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | Mask D                                     |
| Reference Voltage :   | 7.4 VDC                                    |



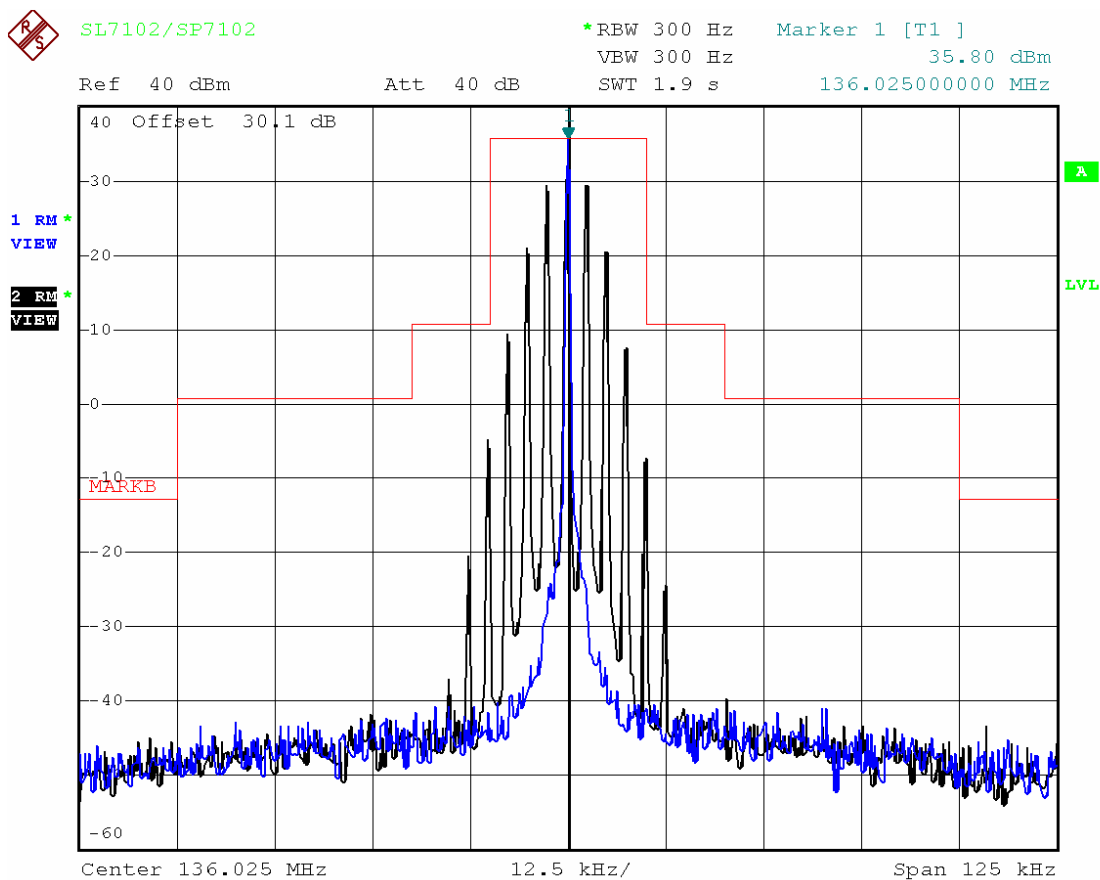
## 5.7.8.2 Plot 2

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.8                        |
| Operating Frequency : | 136.025 MHz                                |
| Channel :             | 1st Channel                                |
| Power Output :        | 1 Watt                                     |
| Channel Spacing :     | Narrow Band                                |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | Mask D                                     |
| Reference Voltage :   | 7.4 VDC                                    |



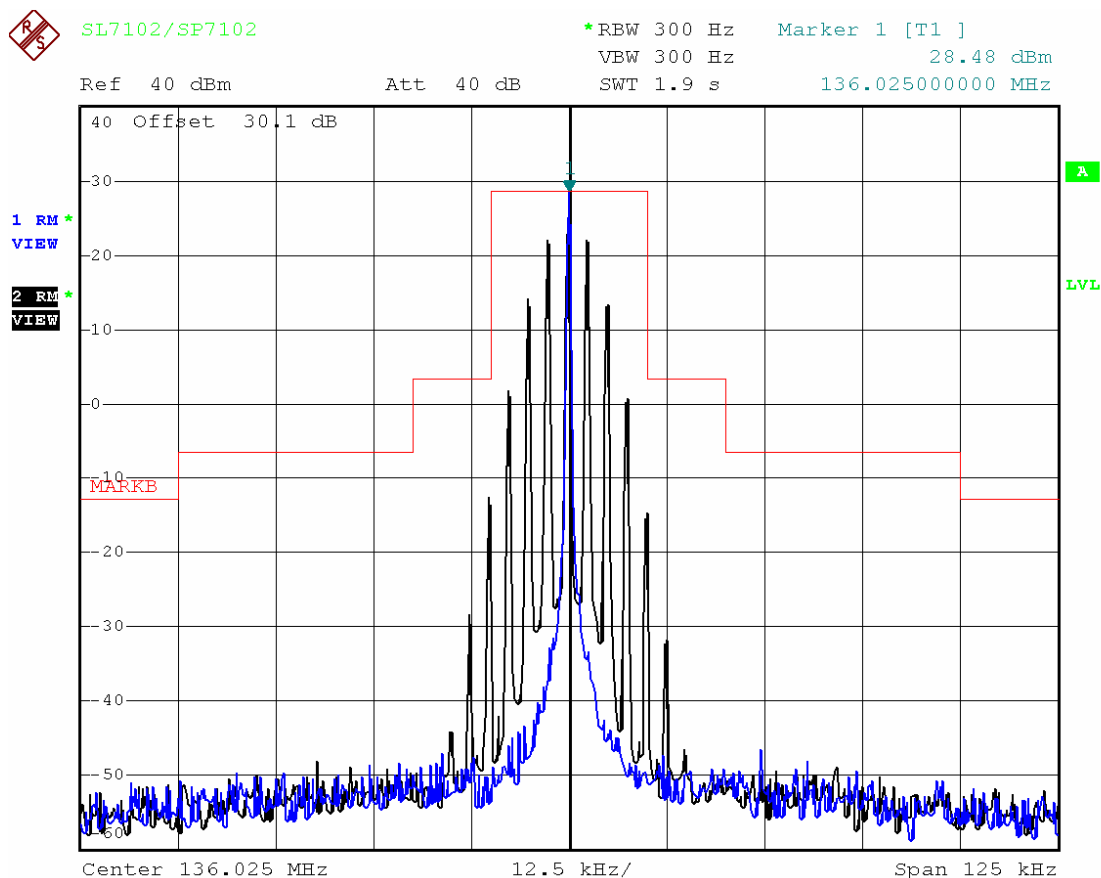
### 5.7.8.3 Plot 3

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.8                        |
| Operating Frequency : | 136.025 MHz                                |
| Channel :             | 1st Channel                                |
| Power Output :        | 5 Watts                                    |
| Channel Spacing :     | WideBand                                   |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | Mask B                                     |
| Reference Voltage :   | 7.4 VDC                                    |



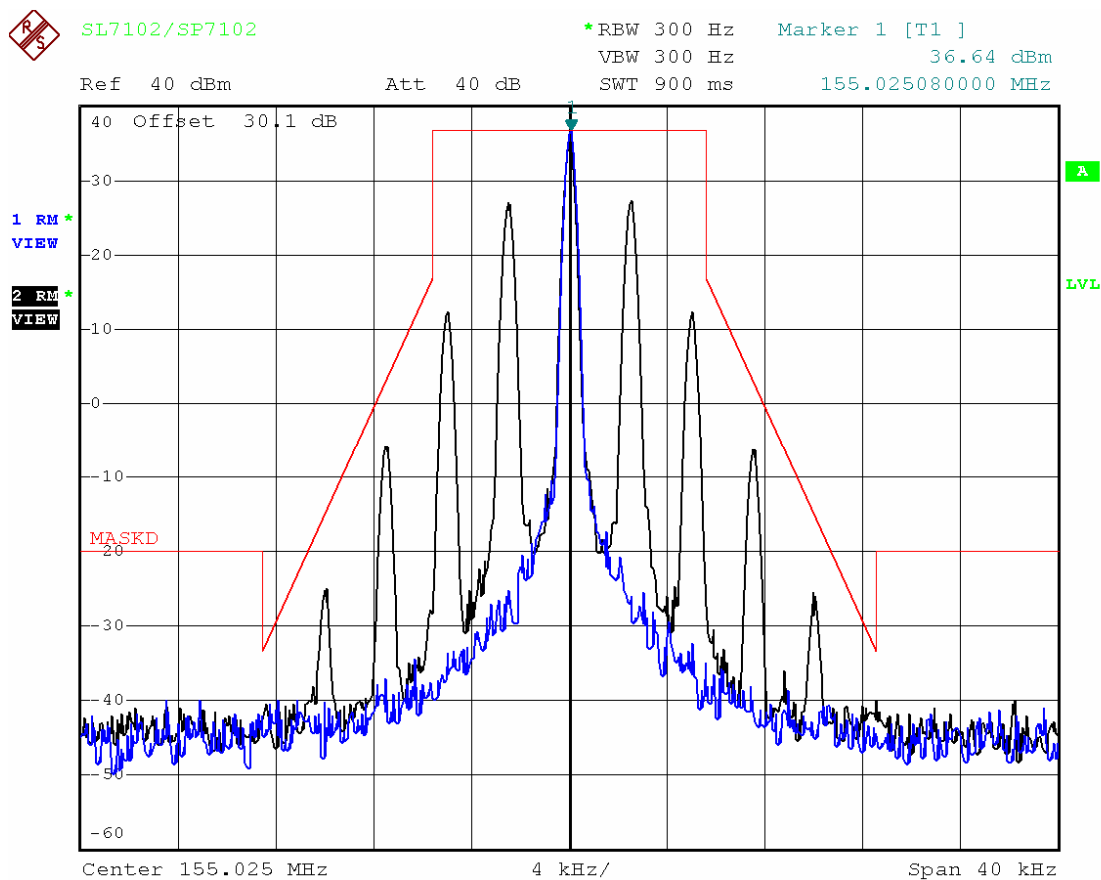
#### 5.7.8.4 Plot 4

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.8                        |
| Operating Frequency : | 136.025 MHz                                |
| Channel :             | 1st Channel                                |
| Power Output :        | 1 Watt                                     |
| Channel Spacing :     | WideBand                                   |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | Mask B                                     |
| Reference Voltage :   | 7.4 VDC                                    |



### 5.7.8.5 Plot 5

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.8                        |
| Operating Frequency : | 155.025 MHz                                |
| Channel :             | 2nd Channel                                |
| Power Output :        | 5 Watts                                    |
| Channel Spacing :     | Narrow Band                                |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | Mask D                                     |
| Reference Voltage :   | 7.4 VDC                                    |





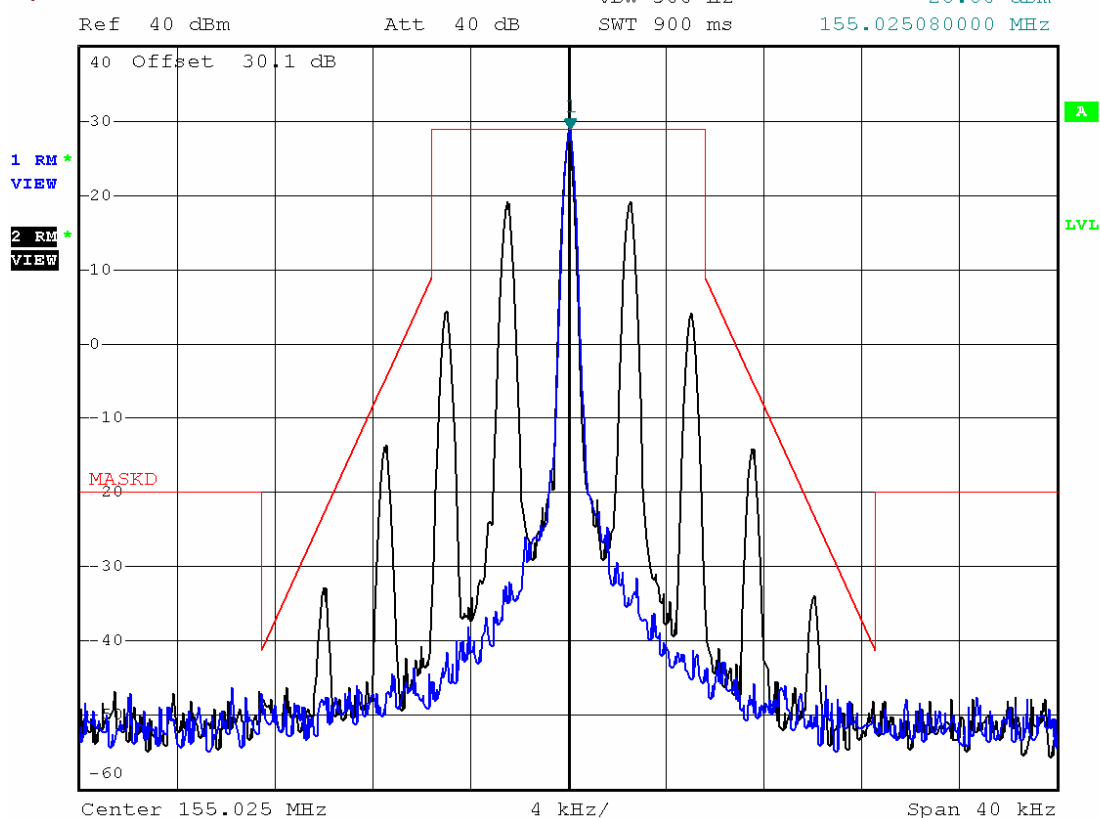
### 5.7.8.6 Plot 6

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.8                        |
| Operating Frequency : | 155.025 MHz                                |
| Channel :             | 2nd Channel                                |
| Power Output :        | 1 Watt                                     |
| Channel Spacing :     | Narrow Band                                |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | Mask D                                     |
| Reference Voltage :   | 7.4 VDC                                    |



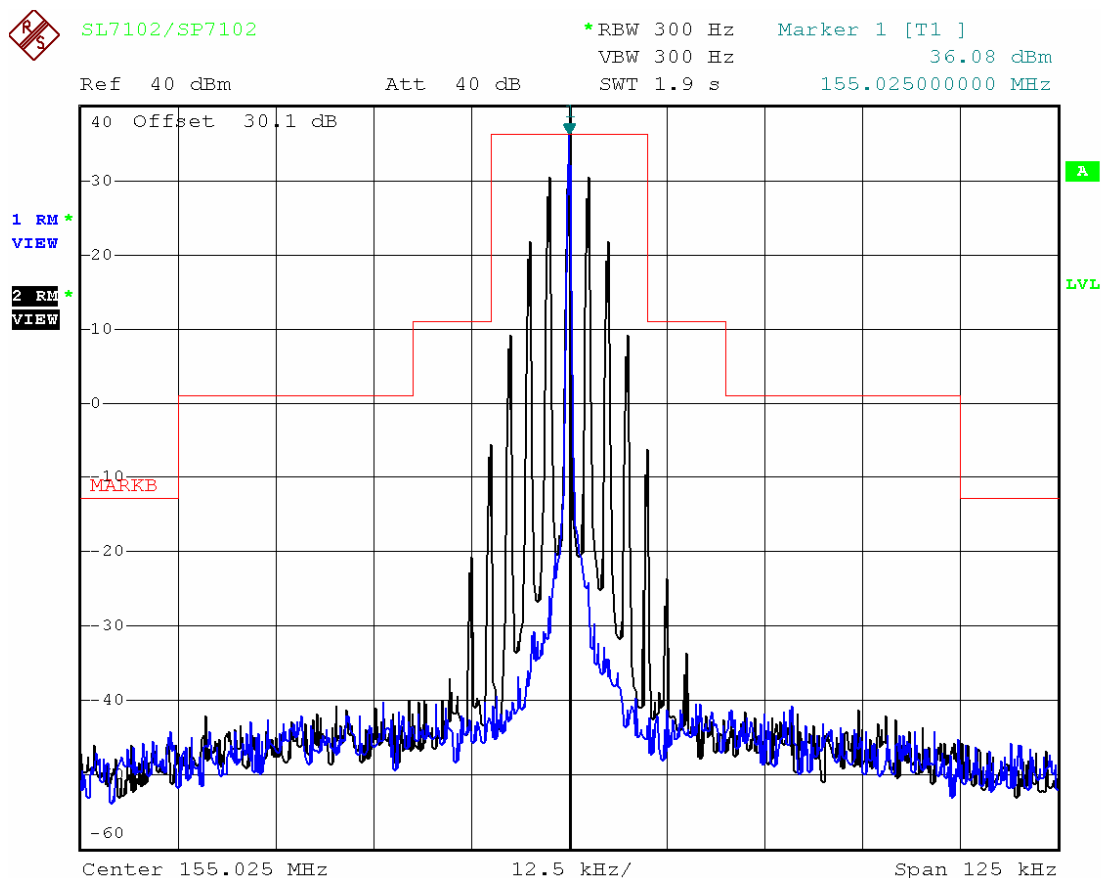
SI7102/SP7102

\*RBW 300 Hz Marker 1 [T1 ]  
VBW 300 Hz 28.80 dBm  
SWT 900 ms 155.025080000 MHz



### 5.7.8.7 Plot 7

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.8                        |
| Operating Frequency : | 155.025 MHz                                |
| Channel :             | 2nd Channel                                |
| Power Output :        | 5 Watts                                    |
| Channel Spacing :     | WideBand                                   |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | Mask B                                     |
| Reference Voltage :   | 7.4 VDC                                    |



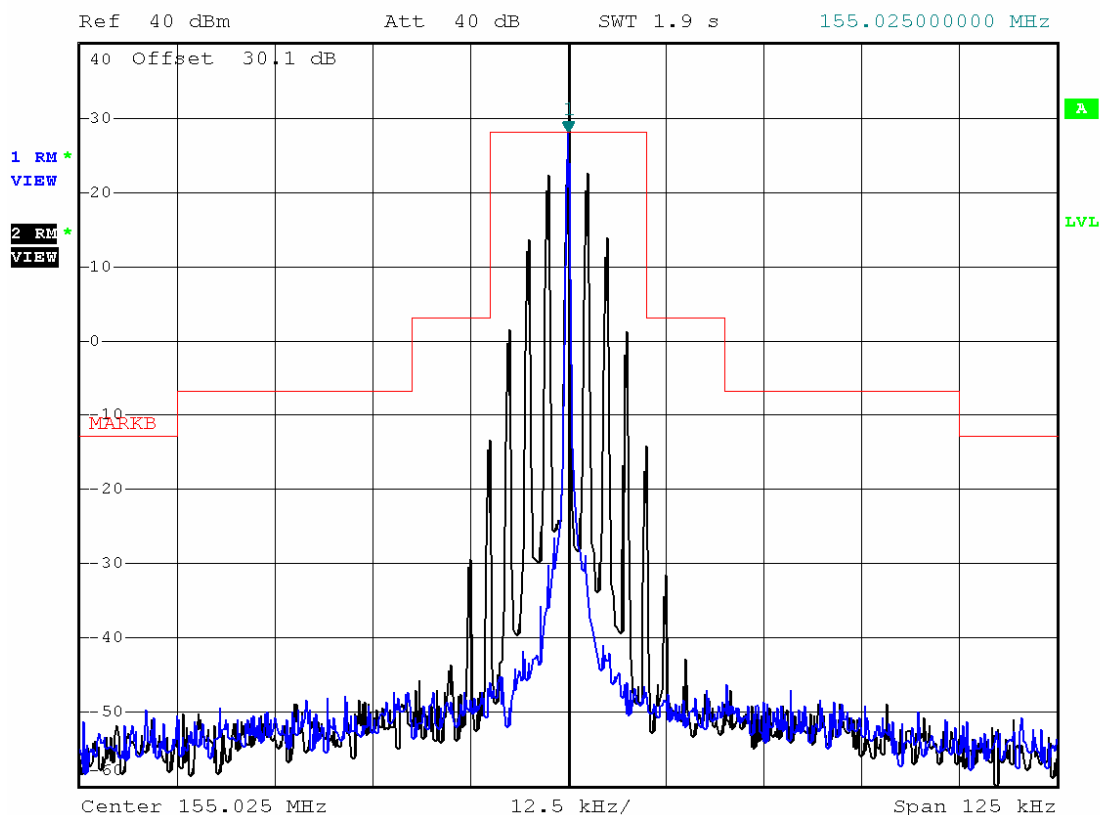
### 5.7.8.8 Plot 8

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.8                        |
| Operating Frequency : | 155.025 MHz                                |
| Channel :             | 2nd Channel                                |
| Power Output :        | 1 Watt                                     |
| Channel Spacing :     | WideBand                                   |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | Mask B                                     |
| Reference Voltage :   | 7.4 VDC                                    |



SI7102/SP7102

\*RBW 300 Hz Marker 1 [T1 ]  
VBW 300 Hz 28.10 dBm  
SWT 1.9 s 155.02500000 MHz



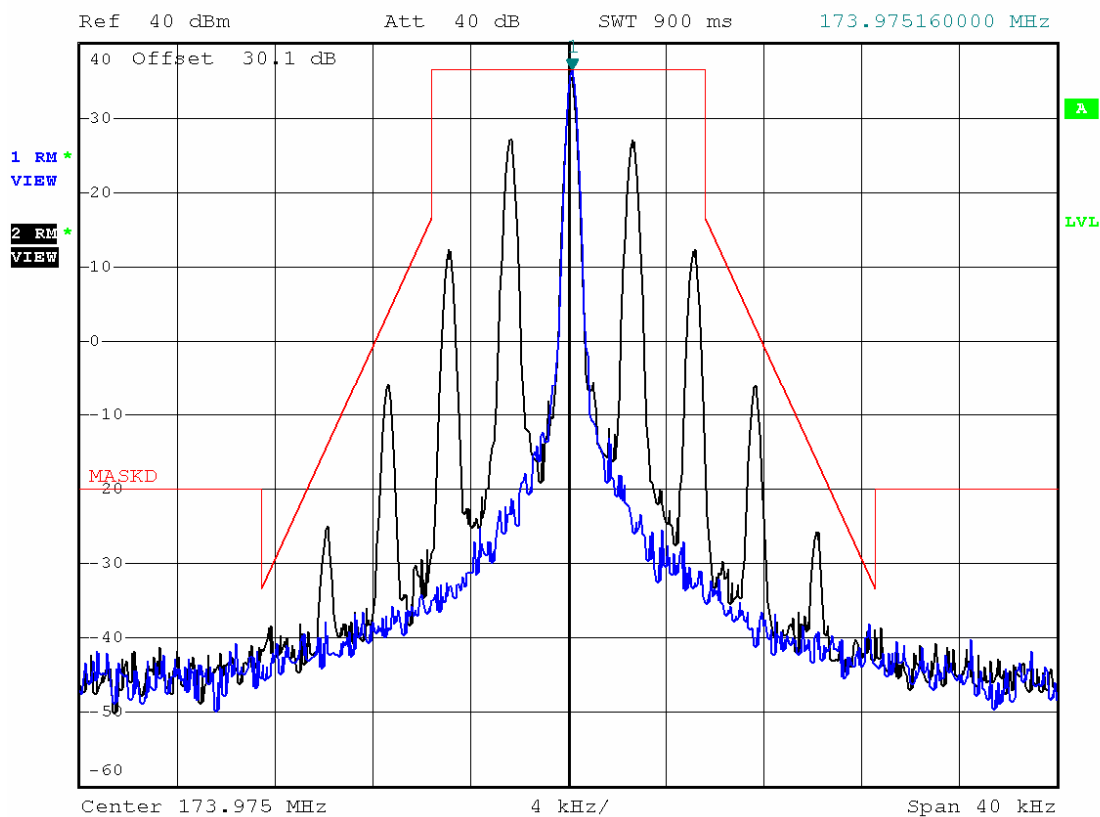
### 5.7.8.9 Plot 9

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.8                        |
| Operating Frequency : | 173.975 MHz                                |
| Channel :             | 3rd Channel                                |
| Power Output :        | 5 Watts                                    |
| Channel Spacing :     | Narrow Band                                |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | Mask D                                     |
| Reference Voltage :   | 7.4 VDC                                    |



SI7102/SP7102

\*RBW 300 Hz Marker 1 [T1 ]  
VBW 300 Hz 36.56 dBm  
SWT 900 ms 173.975160000 MHz



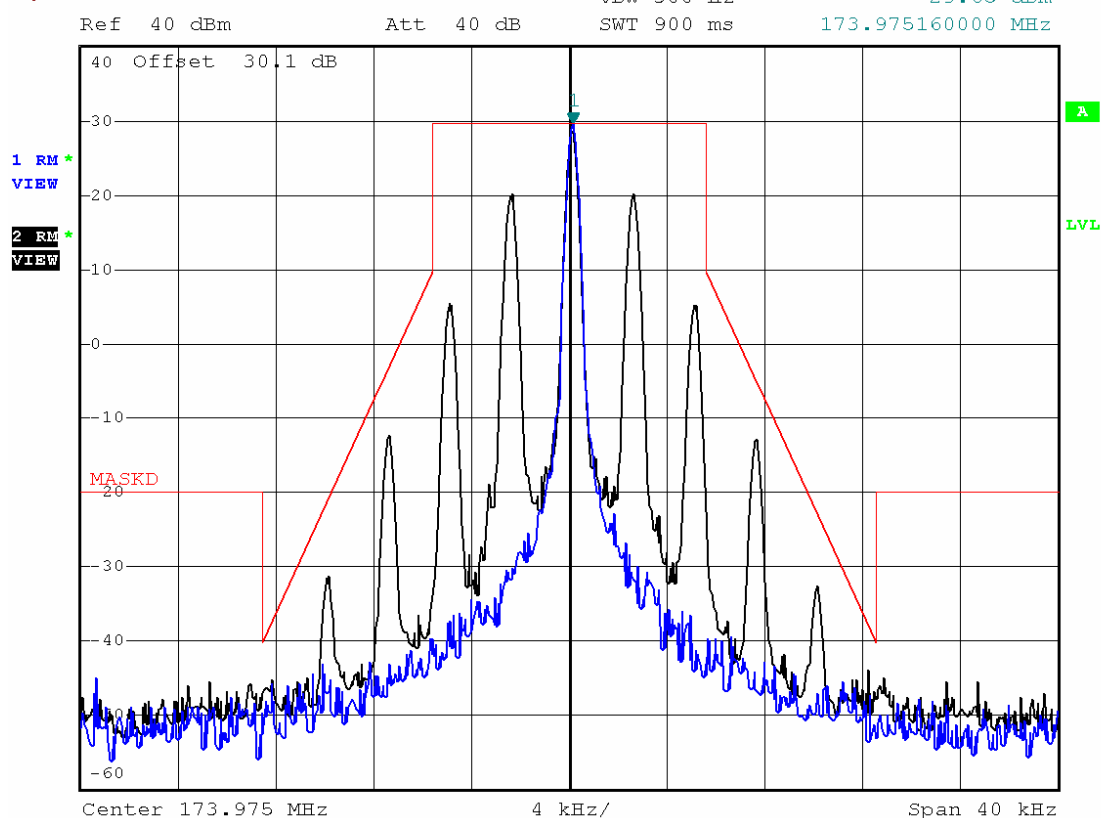
## 5.7.8.10 Plot 10

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.8                        |
| Operating Frequency : | 173.975 MHz                                |
| Channel :             | 3rd Channel                                |
| Power Output :        | 1 Watt                                     |
| Channel Spacing :     | Narrow Band                                |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | Mask D                                     |
| Reference Voltage :   | 7.4 VDC                                    |



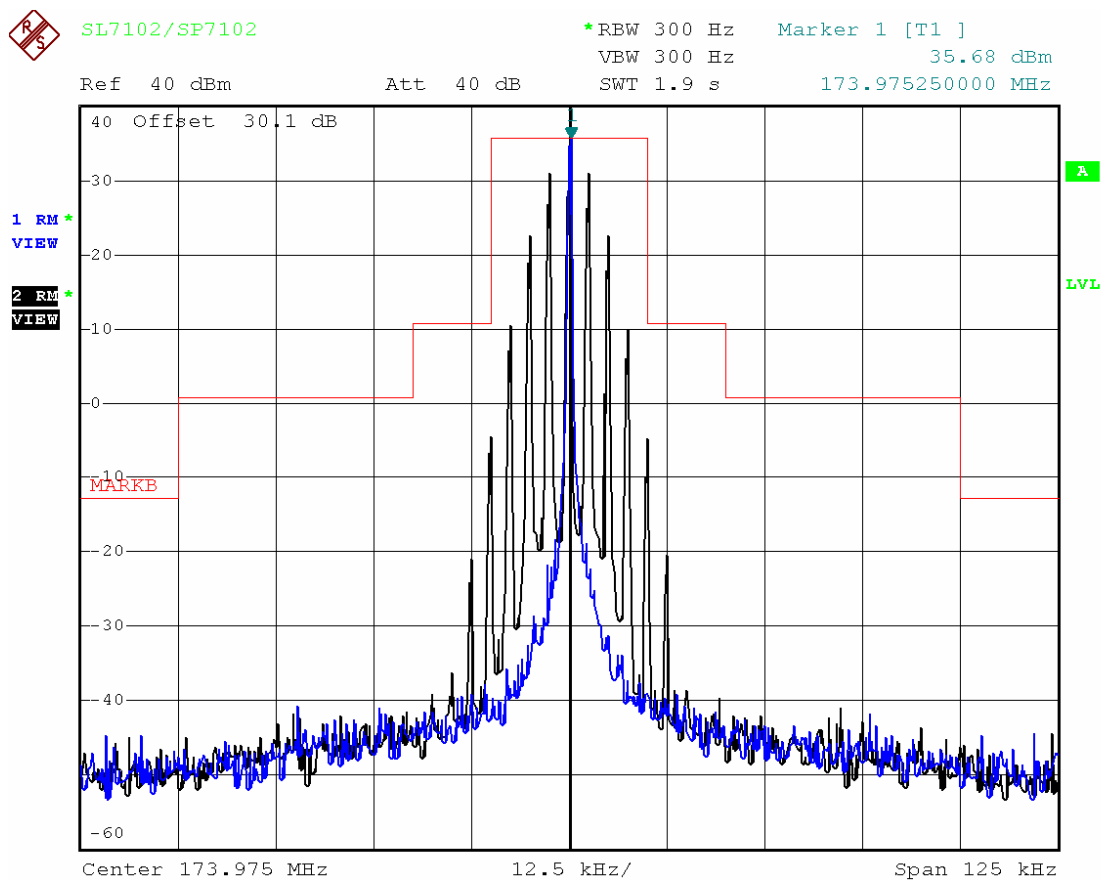
SI7102/SP7102

\*RBW 300 Hz Marker 1 [T1]  
VBW 300 Hz 29.65 dBm  
SWT 900 ms 173.975160000 MHz



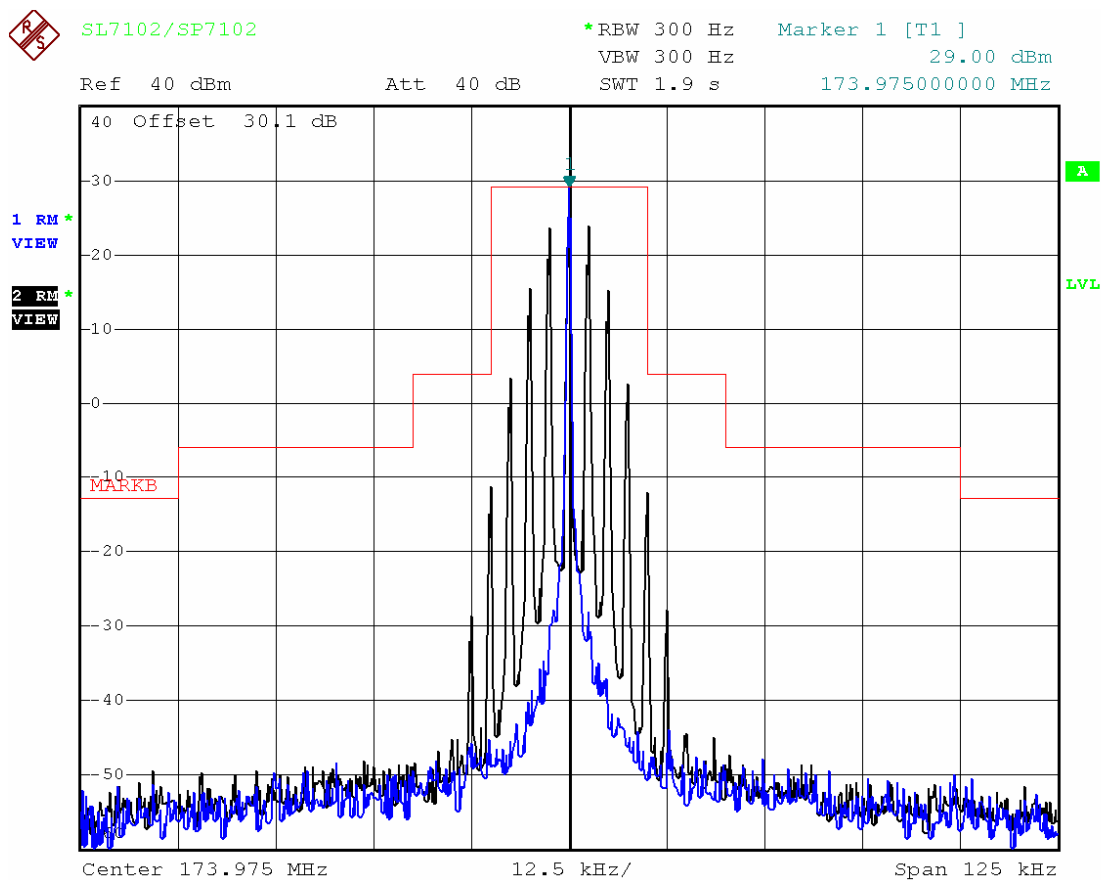
## 5.7.8.11 Plot 11

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.8                        |
| Operating Frequency : | 173.975 MHz                                |
| Channel :             | 3rd Channel                                |
| Power Output :        | 5 Watts                                    |
| Channel Spacing :     | WideBand                                   |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | Mask B                                     |
| Reference Voltage :   | 7.4 VDC                                    |



## 5.7.8.12 Plot 12

|                       |                                            |
|-----------------------|--------------------------------------------|
| FCC Rules :           | Part 2 §2.1053(a) & §90.210                |
| IC Rules :            | RSS-119 Section 5.8                        |
| Operating Frequency : | 173.975 MHz                                |
| Channel :             | 3rd Channel                                |
| Power Output :        | 1 Watt                                     |
| Channel Spacing :     | WideBand                                   |
| Modulation Signal :   | FM modulation with 2.5kHz sine wave signal |
| Emission Mask :       | Mask B                                     |
| Reference Voltage :   | 7.4 VDC                                    |



## 5.8 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.

### 5.8.1 Specification

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

### 5.8.2 Method of Measurement

ANSI/TIA-603-B-2002 Section 2.2.13

### 5.8.3 Measurement Set-Up

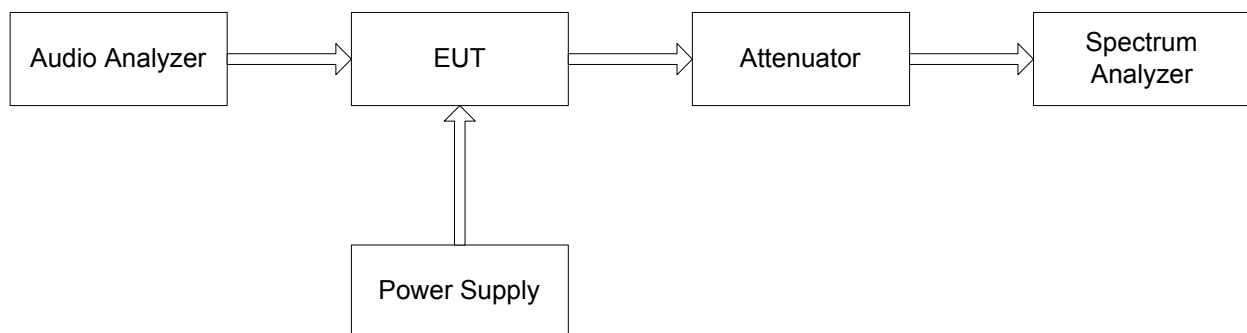


Fig.6

### 5.8.4 Test Equipment List

| Equipment         | Model Name  | Manufacturer    |
|-------------------|-------------|-----------------|
| EUT               | SP7102      | Maxon CIC Corp. |
| Power Supply      | IPS-30B03DD | INTERACT        |
| Audio Analyzer    | 8903B       | Agilent         |
| Spectrum Analyzer | FSP7        | Rohde & Schwarz |
| Attenuator        | 33-30-33    | WEINSCHTEL      |

### 5.8.5 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 test performed at worst case mode. (High power and Narrow Band)
- The limit was applied according the  $50+10\log_{10}(P)$  (P: mean power in Watts) dB.



## 5.8.6 Data

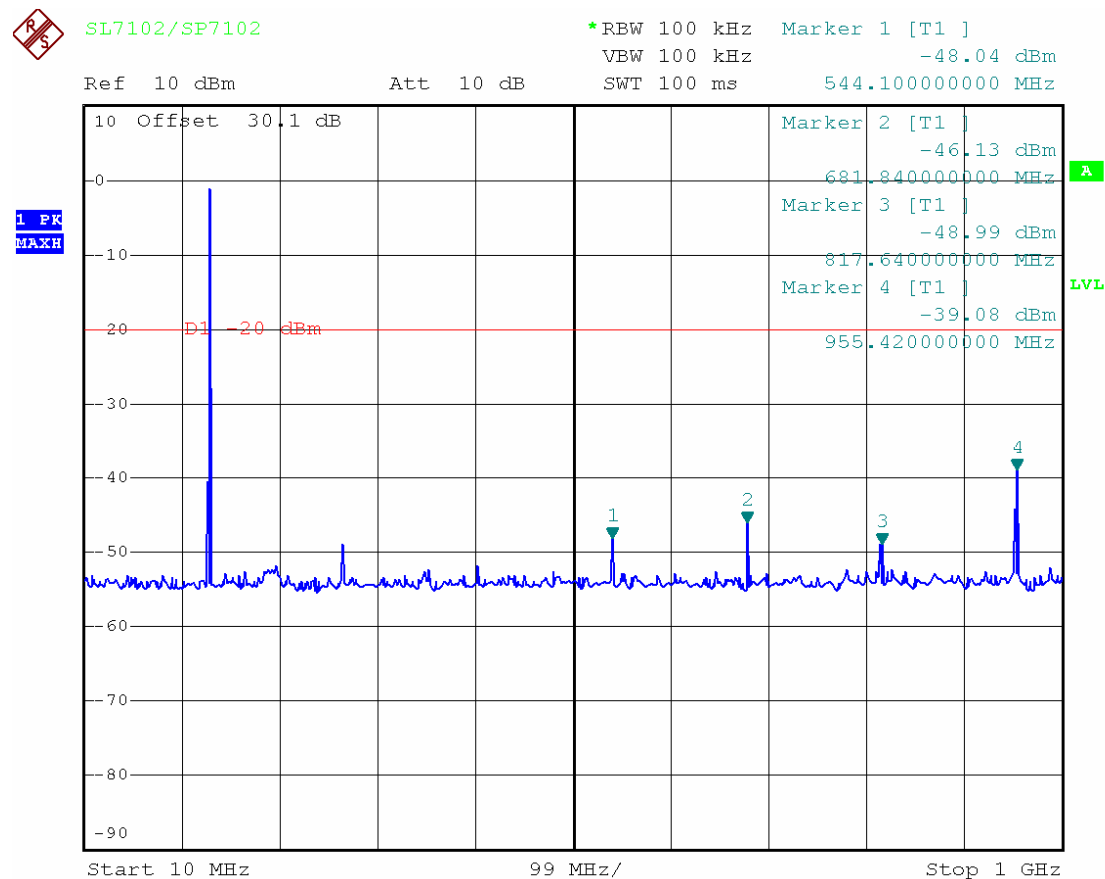
| Frequency (MHz) | Transmitter Spurious Emissions |             |             |
|-----------------|--------------------------------|-------------|-------------|
|                 | Level (dBm)                    | Limit (dBm) | Margin (dB) |
| 272.050         | -48.6                          | -20         | 28.6        |
| 408.075         | -52.3                          |             | 32.3        |
| 544.100         | -48.0                          |             | 28.0        |
| 680.125         | -46.1                          |             | 26.1        |
| 816.150         | -49.0                          |             | 29.0        |
| 952.175         | <b>-39.1</b>                   |             | <b>19.1</b> |
| 310.050         | <b>-38.1</b>                   | -20         | <b>18.1</b> |
| 620.100         | -47.0                          |             | 27.0        |
| 930.150         | -42.1                          |             | 22.1        |
| 1085.175        | -49.1                          |             | 29.1        |
| 347.950         | <b>-40.6</b>                   | -20         | <b>20.6</b> |
| 521.925         | -49.2                          |             | 29.2        |
| 695.900         | -44.5                          |             | 24.5        |
| 869.875         | -44.5                          |             | 24.5        |
| 1043.850        | -48.0                          |             | 28.0        |

### 5.8.7 Plots

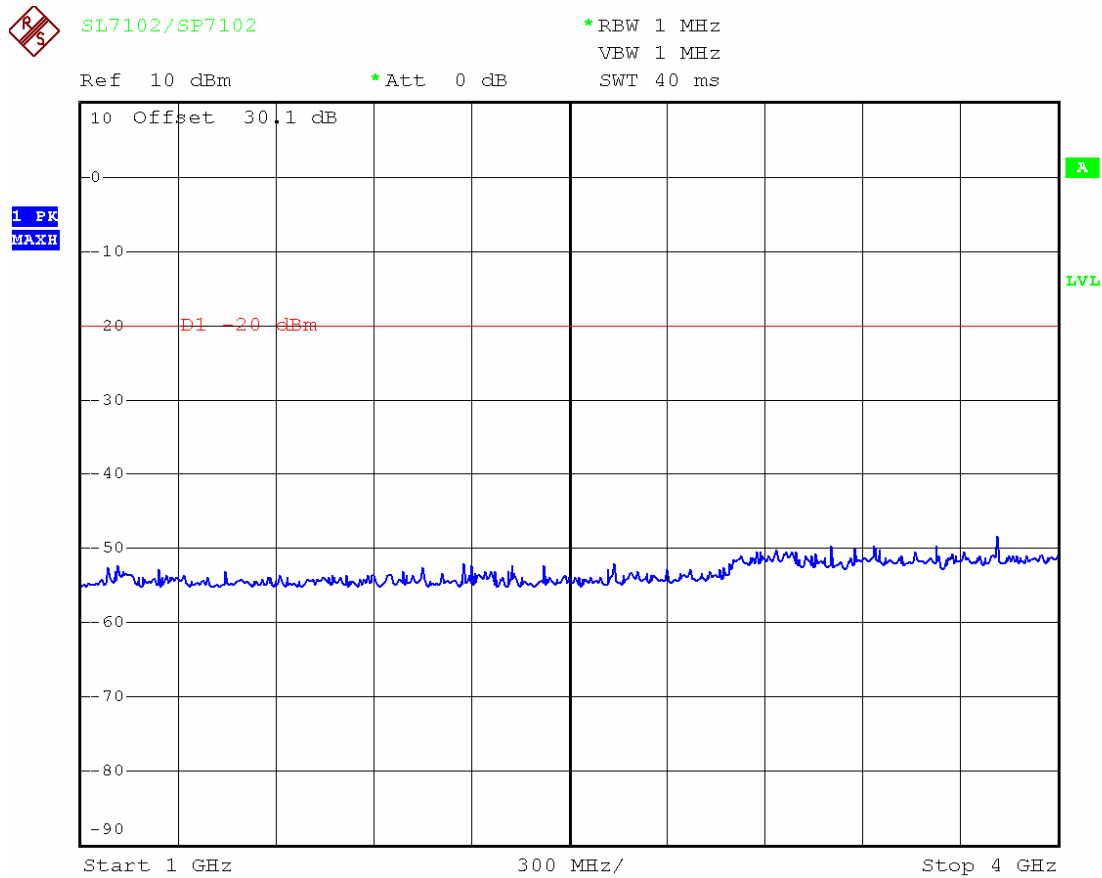
### 5.8.7.1 1st Channel

|                       |                              |
|-----------------------|------------------------------|
| FCC Rules :           | Part 2 §2.1051 & §90.210     |
| IC Rules :            | RSS-119 Section 5.8          |
| Operating Frequency : | 136.025 MHz                  |
| Channel :             | 1st Channel                  |
| Power Output :        | 5 Watts                      |
| Channel Spacing :     | Narrow Band                  |
| Reference Voltage :   | 7.4 VDC                      |
| Limit :               | $50 + 10\log_{10}P$ (-20dBm) |

#### 5.8.7.1.1 10 MHz ~ 1 GHz



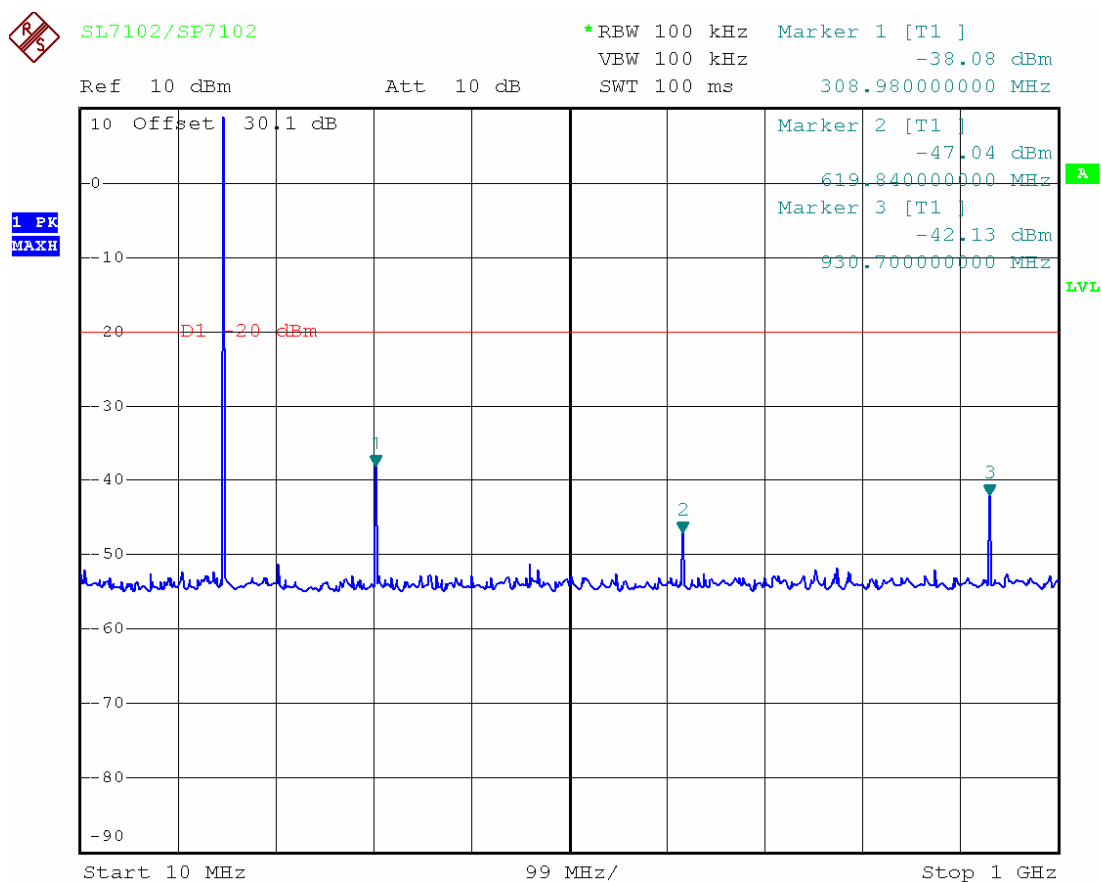
#### 5.8.7.1.2 1 GHz ~ 4 GHz

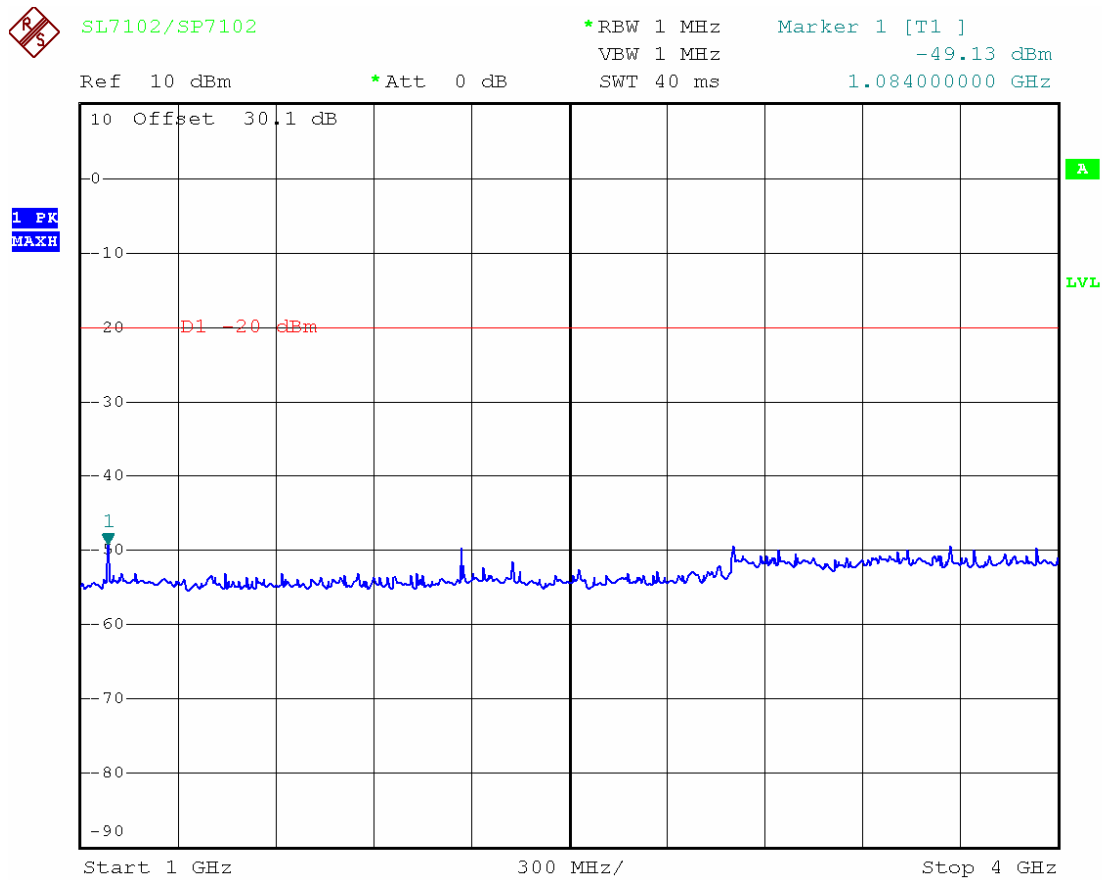


## 5.8.7.2 2nd Channel

|                       |                              |
|-----------------------|------------------------------|
| FCC Rules :           | Part 2 §2.1051 & §90.210     |
| IC Rules :            | RSS-119 Section 5.8          |
| Operating Frequency : | 155.025 MHz                  |
| Channel :             | 2nd Channel                  |
| Power Output :        | 5 Watts                      |
| Channel Spacing :     | Narrow Band                  |
| Reference Voltage :   | 7.4 VDC                      |
| Limit :               | $50 + 10\log_{10}P$ (-20dBm) |

### 5.8.7.2.1 10 MHz ~ 1 GHz

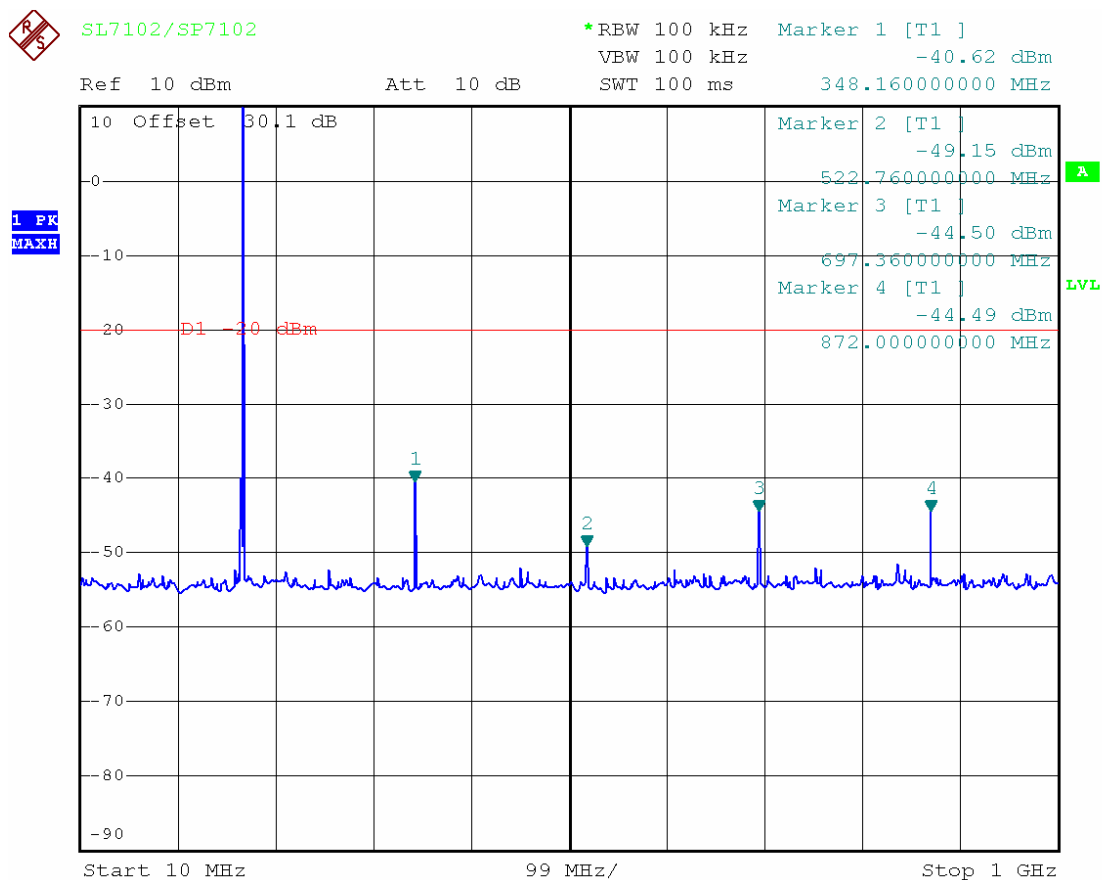




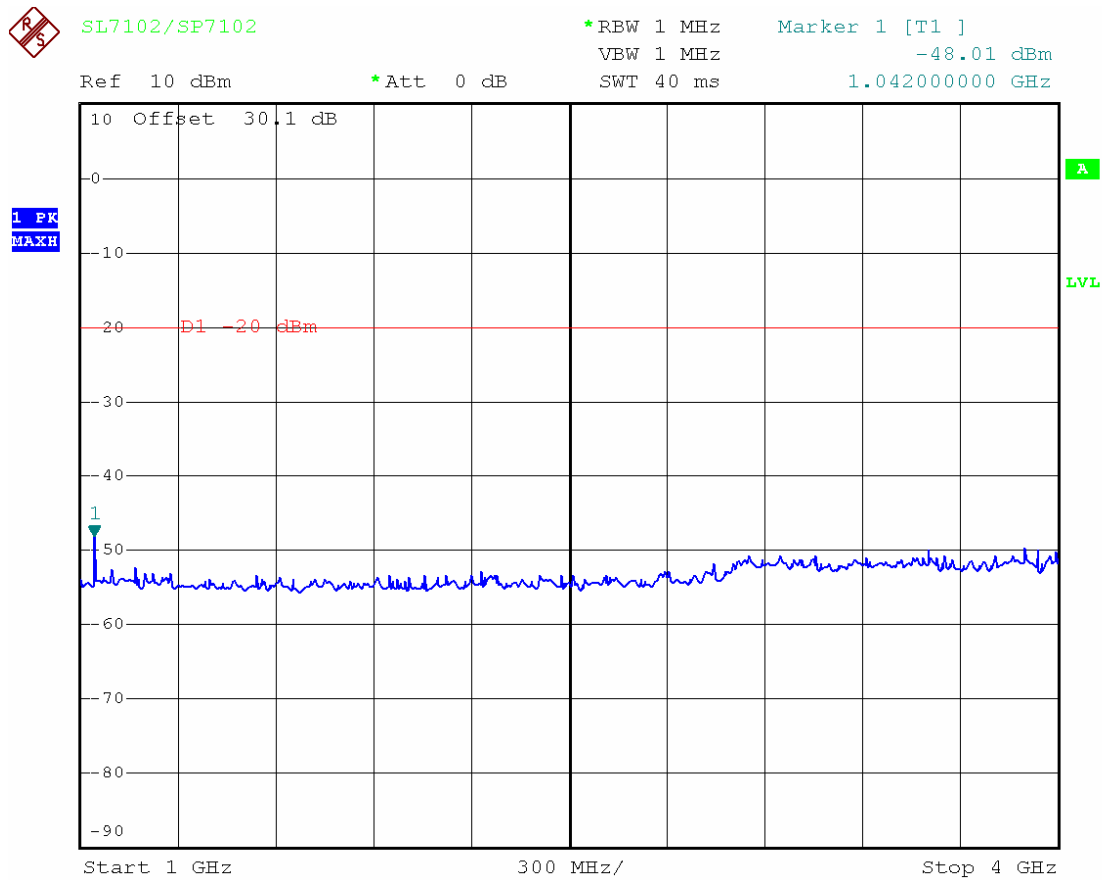
### 5.8.7.3 3rd Channel

|                       |                              |
|-----------------------|------------------------------|
| FCC Rules :           | Part 2 §2.1051 & §90.210     |
| IC Rules :            | RSS-119 Section 5.8          |
| Operating Frequency : | 173.975 MHz                  |
| Channel :             | 3rd Channel                  |
| Power Output :        | 5 Watts                      |
| Channel Spacing :     | Narrow Band                  |
| Reference Voltage :   | 7.4 VDC                      |
| Limit :               | $50 + 10\log_{10}P$ (-20dBm) |

#### 5.8.7.3.1 10 MHz ~ 1 GHz



### 5.8.7.3.2 1 GHz ~ 7 GHz



## 5.9 Field Strength of Spurious Radiation

Radiated spurious emissions are emissions from the equipment when transmitting load on frequency or frequencies which are outside of band sufficient to ensure transmission or information of required quality for the class of communication desired.

### 5.9.1 Specification

FCC Rules Part 2, Section 2.1053(a)  
FCC Rules Part 90, Section 90.210  
Industry Canada, RSS-119 Section 5.8

### 5.9.2 Method of Measurement

ANSI/TIA-603-B-2002 Section 2.2.12

### 5.9.3 Measurement Set-Up

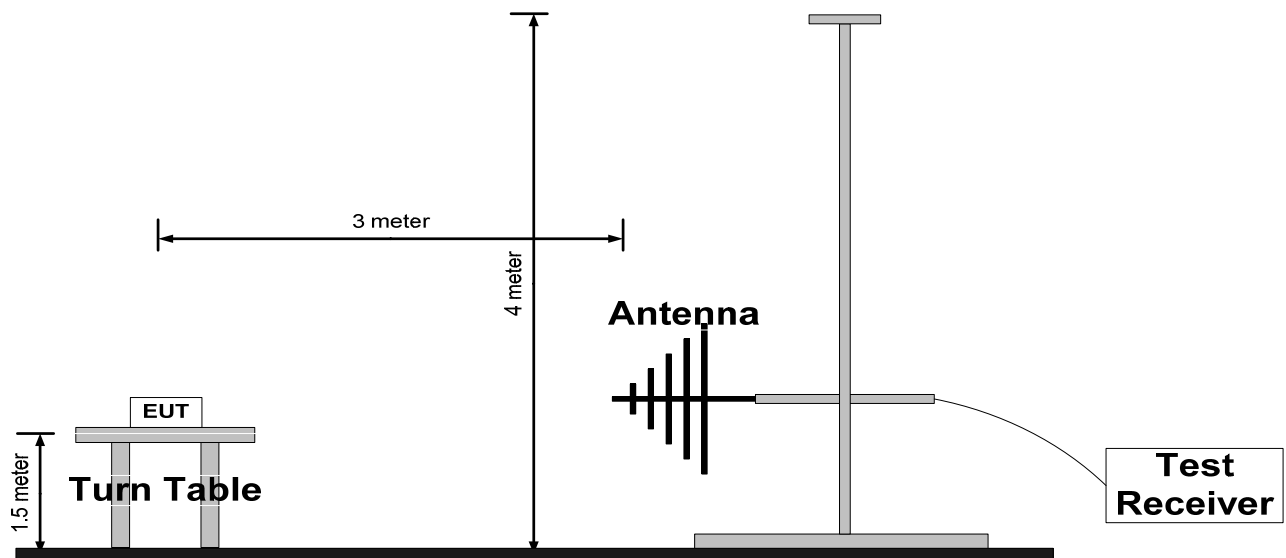


Fig.7

### 5.9.4 Test Equipment List

| Equipment         | Model Name  | Manufacturer    |
|-------------------|-------------|-----------------|
| EUT               | SP7102      | Maxon CIC Corp. |
| Power Supply      | IPS-30B03DD | INTERACT        |
| Audio Analyzer    | 8903B       | Agilent         |
| Spectrum Analyzer | E7403A      | Agilent         |
| Bilog Antenna     | VULB9160    | SWALZBECK       |
| Horn Antenna      | BBHA 9120 D | SWALZBECK       |



## 5.9.5 Test Data

|                     |                                     |
|---------------------|-------------------------------------|
| FCC Rules :         | Part 2 §2.1053(a) & §90.210         |
| IC Rules :          | RSS-119 Section 5.8                 |
| Power Output :      | 5 Watts                             |
| Reference Voltage : | 7.4 VDC                             |
| Channel Spacing :   | Narrow Band                         |
| Limit :             | 50 + 10log <sub>10</sub> P (-20dBm) |

| Frequency [MHz] | Spectrum Reading [dBuV/m] | Ant. Pol. [H/V] | S.G Level [dBm] | Ant. Gain [dBi] | Loss [dB] | Emission Level [dBm] | Limit [dBm] | Margin [dB] |
|-----------------|---------------------------|-----------------|-----------------|-----------------|-----------|----------------------|-------------|-------------|
| 136.025         | 112.3                     | V               | +15.0           | 0.9             | 1.2       | +17.1                | -           | -           |
| 272.050         | 35.0                      | H               | -68.4           | 6.7             | 1.5       | -60.2                | -20         | 40.2        |
| 408.075         | 38.7                      | H               | -65.0           | 6.8             | 1.7       | -56.5                |             | 36.5        |
| 544.100         | 36.3                      | H               | -67.4           | 6.7             | 1.8       | -58.9                |             | 38.9        |
| 680.125         | 40.5                      | V               | -63.0           | 6.3             | 2.0       | -54.7                |             | 34.7        |
| 816.150         | 51.5                      | V               | -51.6           | 5.8             | 2.1       | -43.7                |             | 23.7        |
| 952.175         | 56.4                      | V               | -46.4           | 5.5             | 2.1       | <b>-38.8</b>         |             | <b>18.8</b> |
| 155.025         | 125.2                     | V               | +27.4           | 1.3             | 1.3       | +30.0                | -           | -           |
| 310.050         | 36.6                      | H               | -67.0           | 6.8             | 1.6       | -58.6                | -20         | 38.6        |
| 465.075         | 36.4                      | H               | -67.1           | 6.6             | 1.7       | -58.8                |             | 38.8        |
| 620.100         | 37.1                      | V               | -66.3           | 6.3             | 1.9       | -58.1                |             | 38.1        |
| 775.125         | 50.7                      | V               | -53.0           | 5.9             | 2.0       | <b>-45.1</b>         |             | <b>25.1</b> |
| 930.150         | 49.1                      | V               | -53.9           | 5.7             | 2.1       | -46.1                |             | 26.1        |
| 1085.175        | 30.8                      | -               | -72.7           | 6.0             | 2.3       | -64.4                |             | 34.4        |
| 173.975         | 117.5                     | V               | +18.2           | 2.8             | 1.4       | +22.4                | -           | -           |
| 347.950         | 40.6                      | H               | -63.1           | 6.9             | 1.6       | -54.6                | -20         | 34.6        |
| 521.925         | 32.1                      | V               | -71.7           | 6.8             | 1.8       | -63.1                |             | 43.1        |
| 695.900         | 40.9                      | V               | -62.6           | 6.3             | 2.0       | -54.3                |             | 34.3        |
| 869.875         | 50.4                      | V               | -53.0           | 6.1             | 2.1       | <b>-44.8</b>         |             | <b>24.8</b> |
| 1043.850        | 31.9                      | -               | -71.6           | 6.0             | 2.3       | -63.3                |             | 43.3        |
| 1217.825        | 28.6                      | -               | -76.6           | 7.5             | 2.5       | -66.6                |             | 46.6        |

### Note :

1. The spectrum bandwidth was set to RBW 100 kHz (freq. up to 1GHz) and RBW 1 MHz (freq above 1GHz).
2. Transmitter was set to the high power output (5 watts) condition.
3. The spectrum was checked from 30 MHz up to the 10<sup>th</sup> harmonic of the carrier frequency.
4. All emission not reported were found to be more than 20dB below the limit.
5. The EUT was positioned through 3 orthogonal axis and worst-case are reported.
6. Transmitter was set to the high power output (5 watts) condition because the high power setting is the worst case emission condition.
7. The measurement has been made both narrow and wide band but the attached plots are for narrowband. There is no difference in the test result for the bandwidth setting.
8. ERP measurements were performed using the standard battery with full charged condition.
9. The test performed at worst case mode. (High power and Narrow Band)
10. The limit was applied according to the section 90.210(d) 50+10logP or -20dBm or 70dBc whichever is less.

## 5.10 Frequency Stability / Temperature Variation

### 5.10.1 Specification

FCC Rules Part 2, Section 2.1055  
FCC Rules Part 90, Section 90.213  
Industry Canada, RSS-119 Section 5.3

### 5.10.2 Method of Measurement

ANSI/TIA-603-B-2002 Section 2.2.2

### 5.10.3 Measurement Set-Up

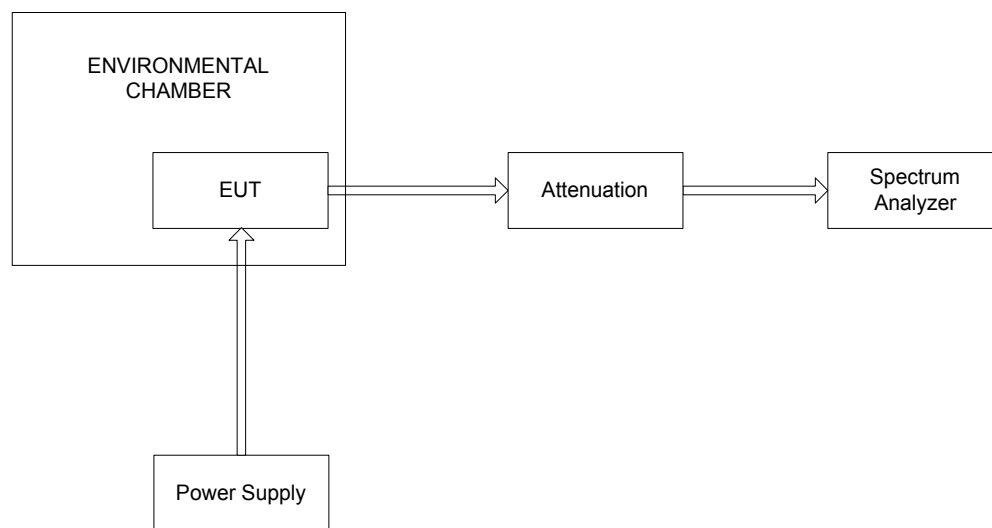


Fig.8

### 5.10.4 Test Equipment List

| Equipment             | Model Name  | Manufacturer    |
|-----------------------|-------------|-----------------|
| EUT                   | SP7102      | Maxon CIC Corp. |
| Power Supply          | IPS-30B03DD | INTERACT        |
| Attenuator            | 33-30-33    | WEINSCHEL       |
| Spectrum Analyzer     | FSP7        | Rohde & Schwarz |
| Environmental Chamber | EN-GLMP-54  | ENEX            |

### 5.10.5 Test Procedure

- The unit was turn-up in accordance with the alignment procedure stated in the FIG. 8 , and was loaded into a 50 ohm resistive termination.
- With all power removed, the temperature was decreased to -30°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute.
- With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency change was noted within one minute.
- The temperature tests were performed for the worst case.
- FCC Limits (according to part 90.213) :  $2.5 \times 10^{-6} \times \text{Frequency}$

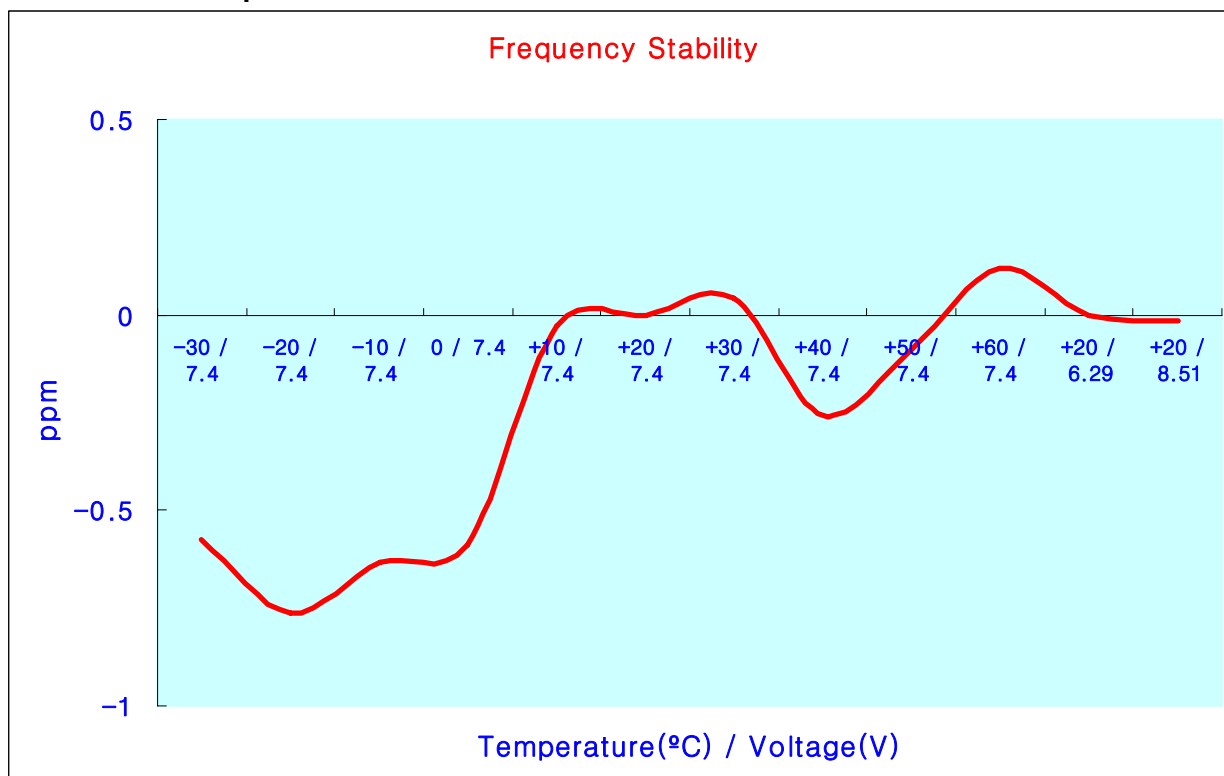
### 5.10.6 Test Result 1

|                       |                          |
|-----------------------|--------------------------|
| FCC Rules :           | Part 2 §2.1055 & §90.231 |
| IC Rules :            | RSS-119 Section 5.3      |
| Operating Frequency : | 136.025 MHz              |
| Channel :             | 1st Channel              |
| Power Output :        | 5 Watts                  |
| Modulation :          | Non-Modulation           |
| Reference Voltage :   | 7.4 VDC                  |

#### 5.10.6.1 Data

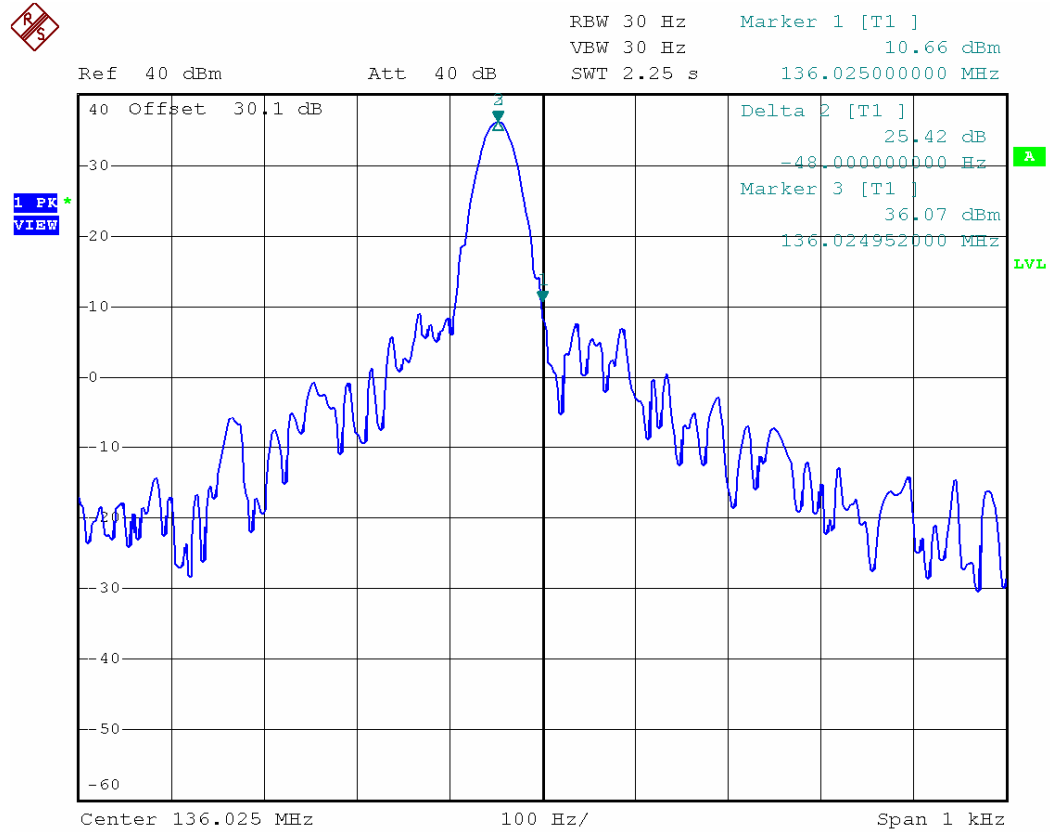
| Voltage (%) | Power Supply (Vdc) | Temperature (°C) | Frequency (MHz) | Deviation (ppm) | Limit (ppm) |
|-------------|--------------------|------------------|-----------------|-----------------|-------------|
| 100 %       | 7.4                | -30              | 136.024960      | -0.57           | 2.5         |
| 100 %       | 7.4                | -20              | 136.024934      | -0.76           | 2.5         |
| 100 %       | 7.4                | -10              | 136.024952      | -0.63           | 2.5         |
| 100 %       | 7.4                | 0                | 136.024958      | -0.58           | 2.5         |
| 100 %       | 7.4                | +10              | 136.025034      | -0.03           | 2.5         |
| 100 %       | 7.4                | +20 (ref)        | 136.025038      | 0               | 2.5         |
| 100 %       | 7.4                | +30              | 136.025044      | +0.04           | 2.5         |
| 100 %       | 7.4                | +40              | 136.025003      | -0.26           | 2.5         |
| 100 %       | 7.4                | +50              | 136.025026      | -0.09           | 2.5         |
| 100 %       | 7.4                | +60              | 136.025054      | +0.12           | 2.5         |
| 85 %        | 6.52               | +20              | 136.025038      | 0               | 2.5         |
| 115 %       | 8.51               | +20              | 136.025036      | -0.01           | 2.5         |

#### 5.10.6.2 Graph

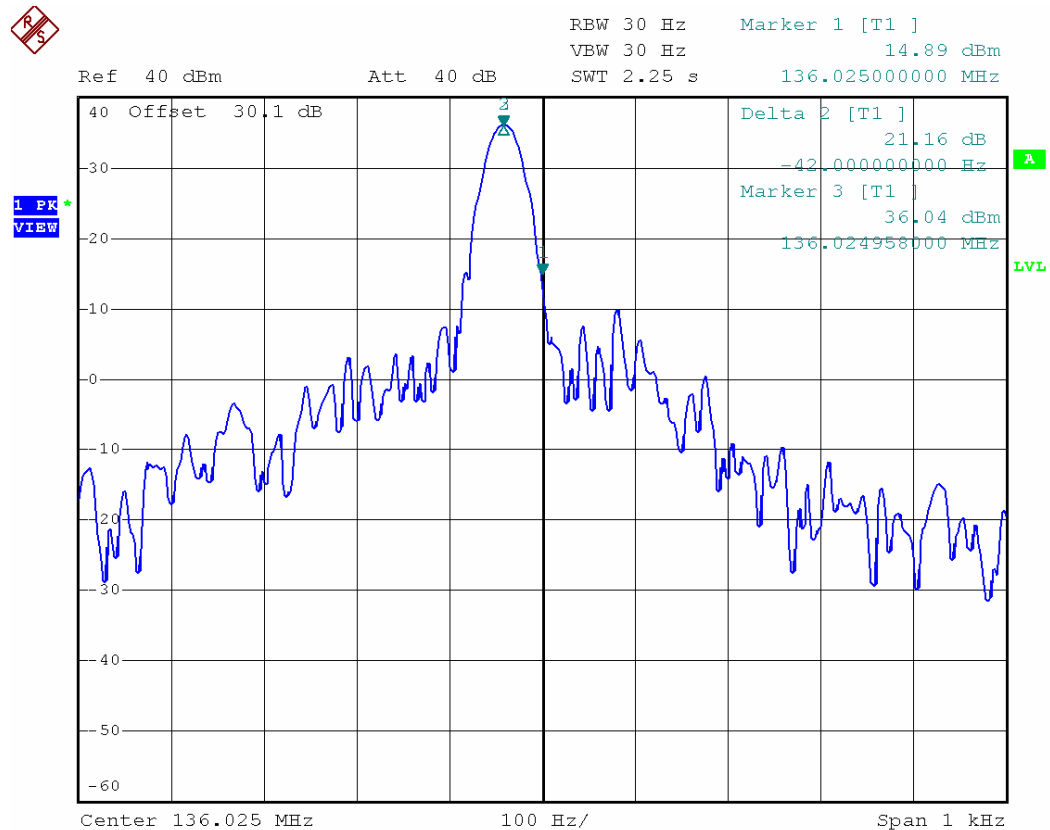




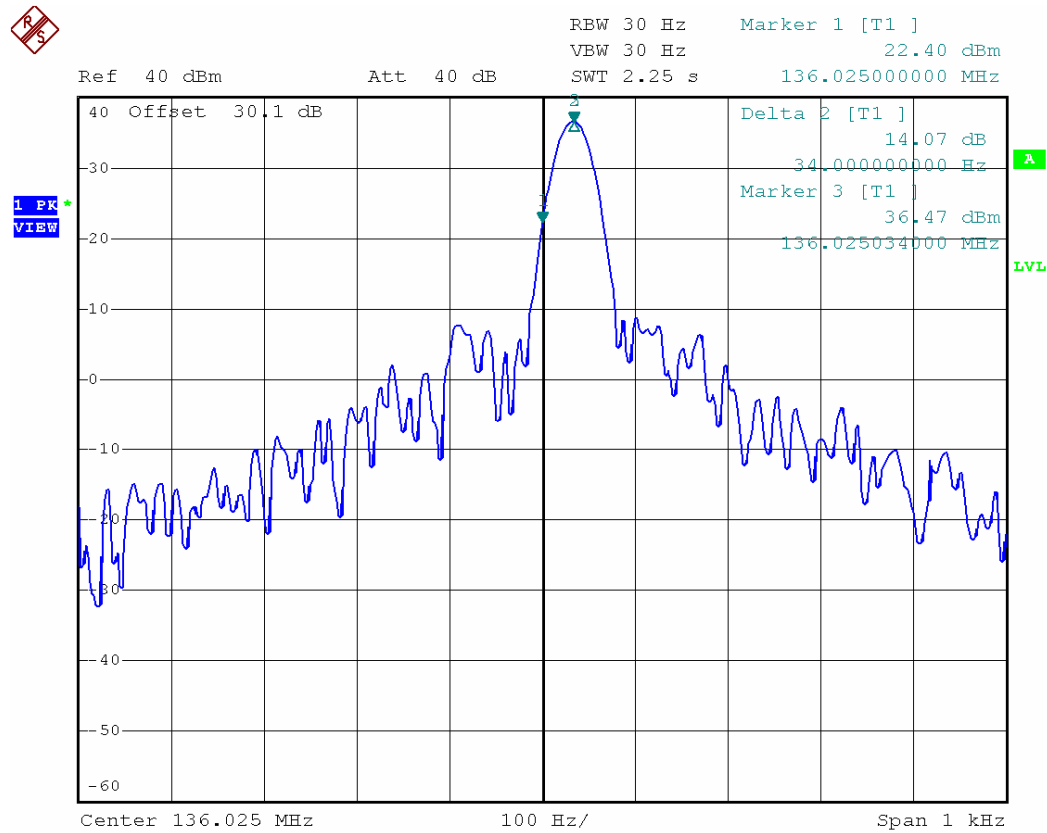
### 5.10.6.5 Plot 3 (-10°C)



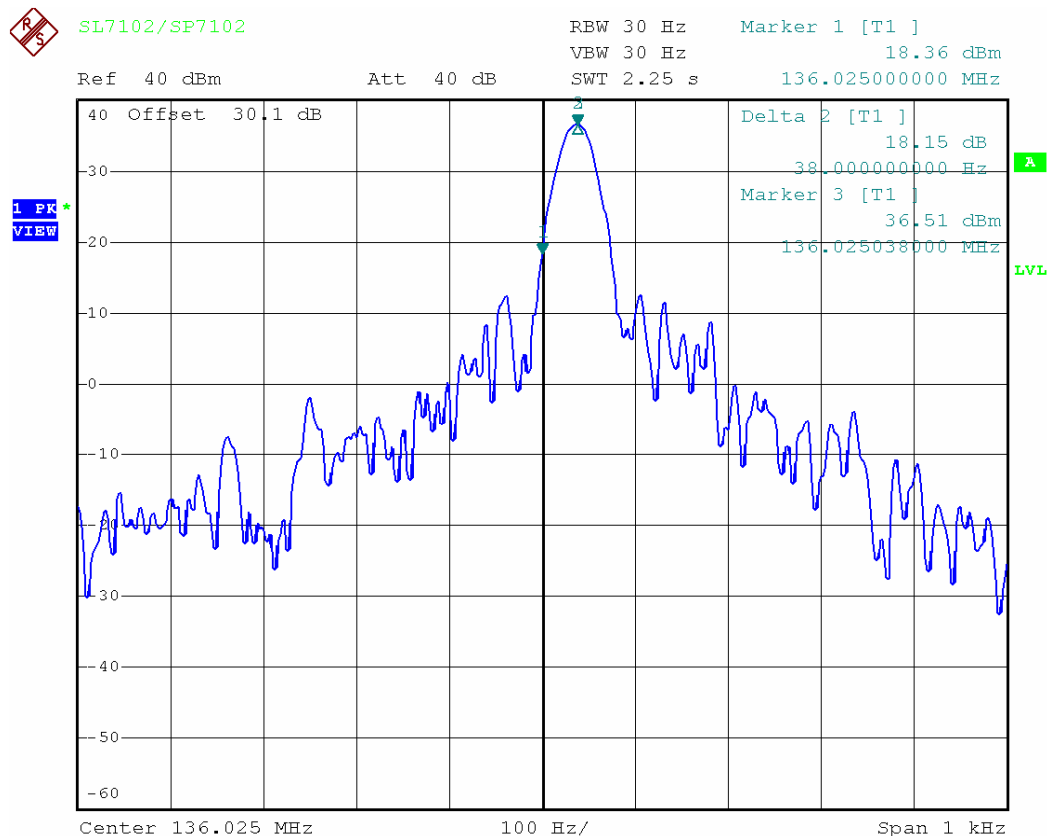
### 5.10.6.6 Plot 4 (0°C)



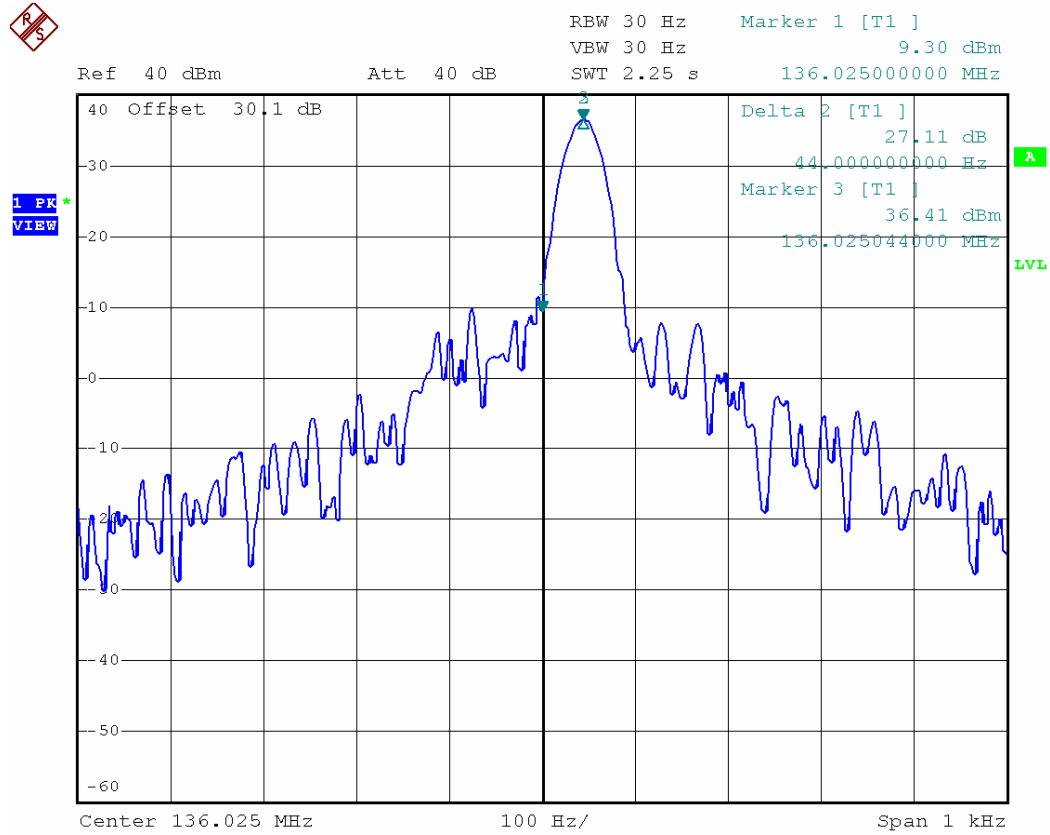
### 5.10.6.7 Plot 5 (+10°C)



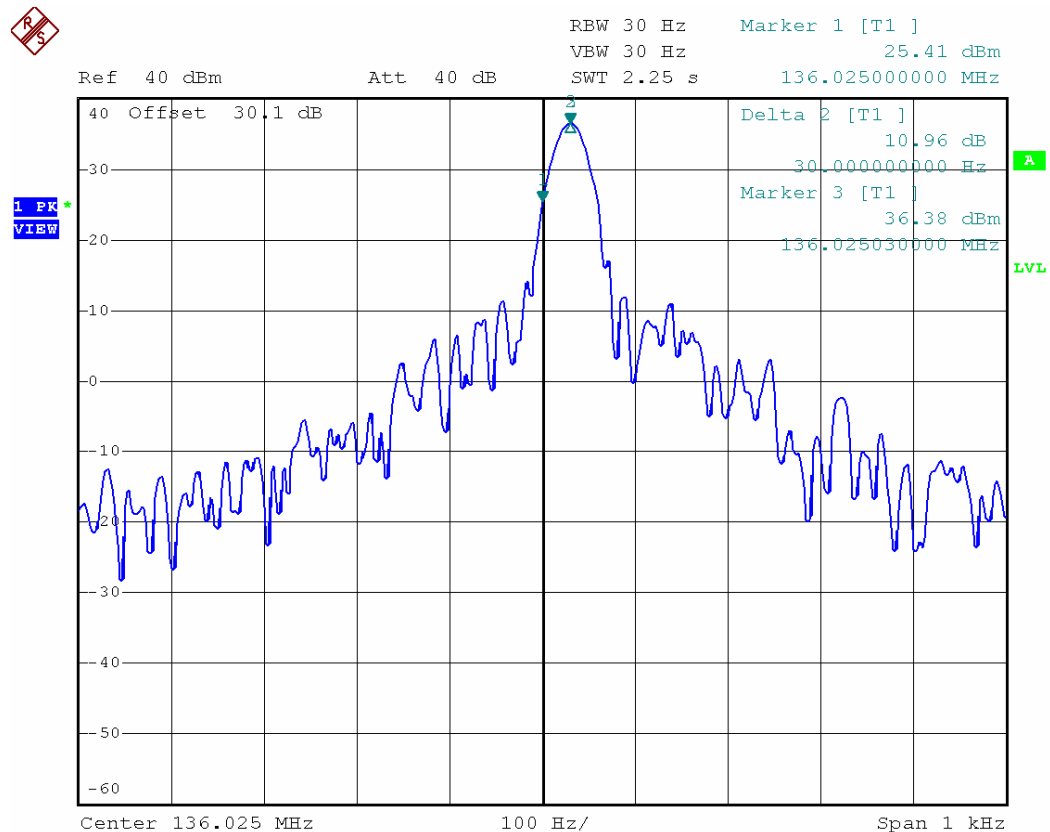
### 5.10.6.8 Plot 6 (+20°C)



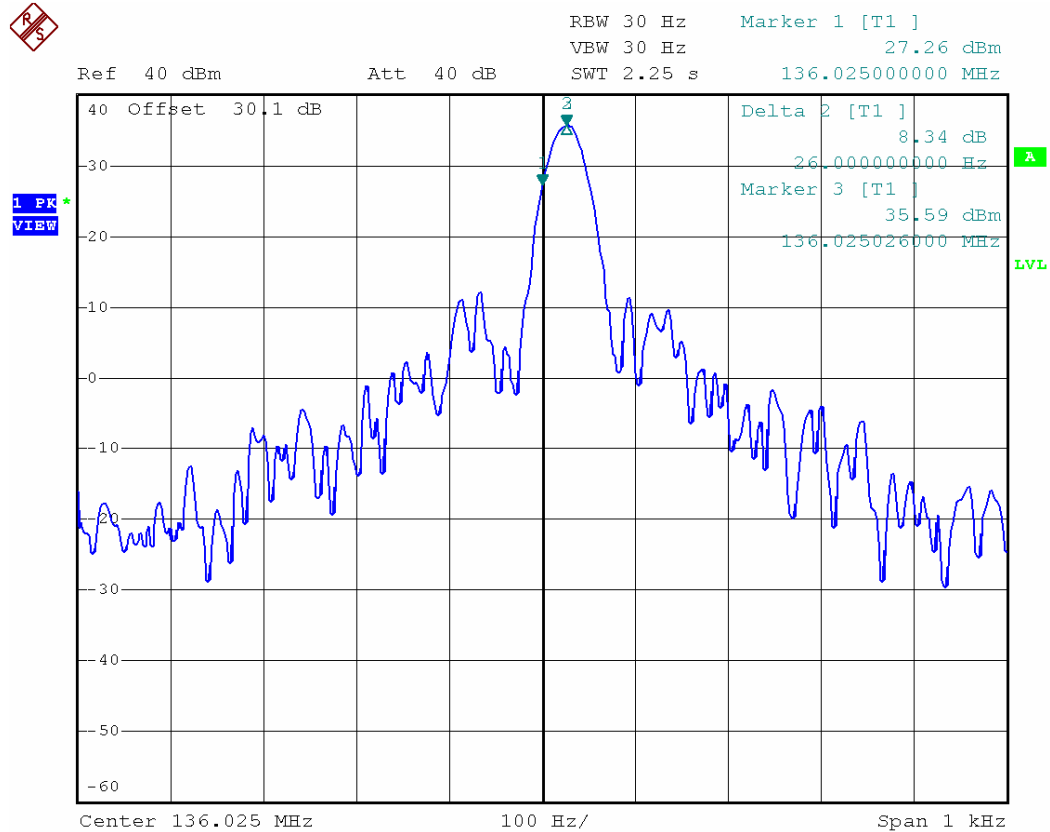
### 5.10.6.9 Plot 7 (+30°C)



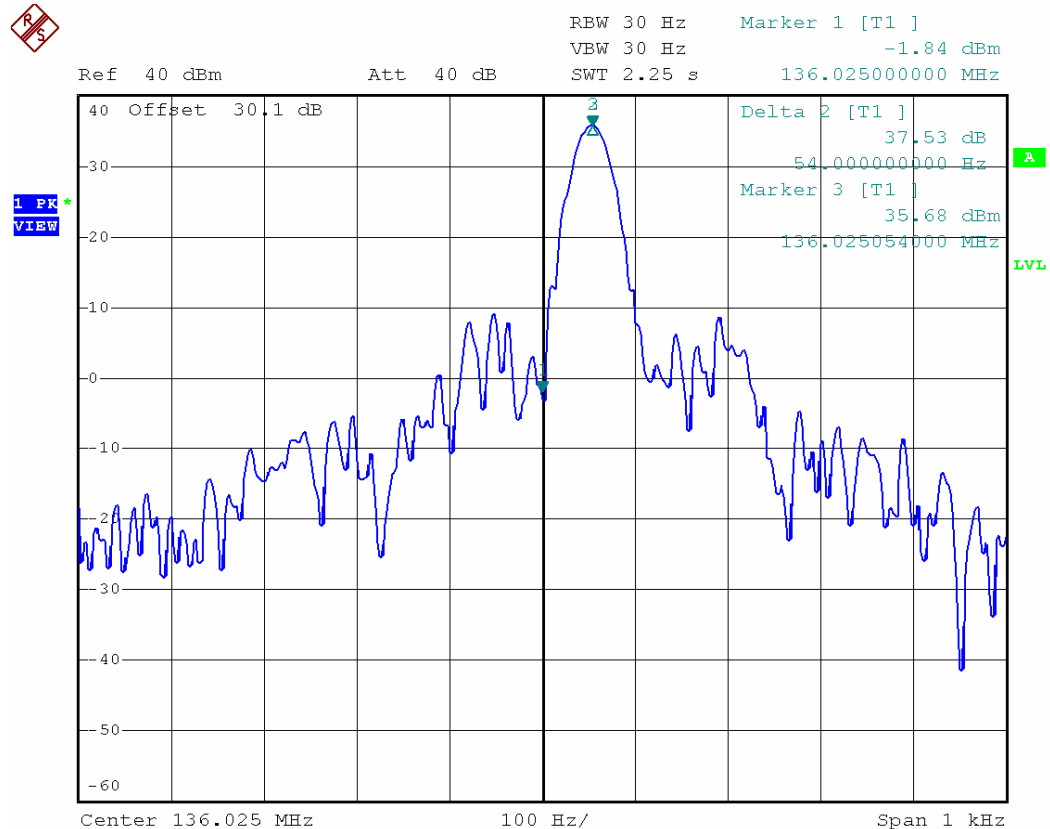
### 5.10.6.10 Plot 8 (+40°C)



### 5.10.6.11 Plot 9 (+50°C)

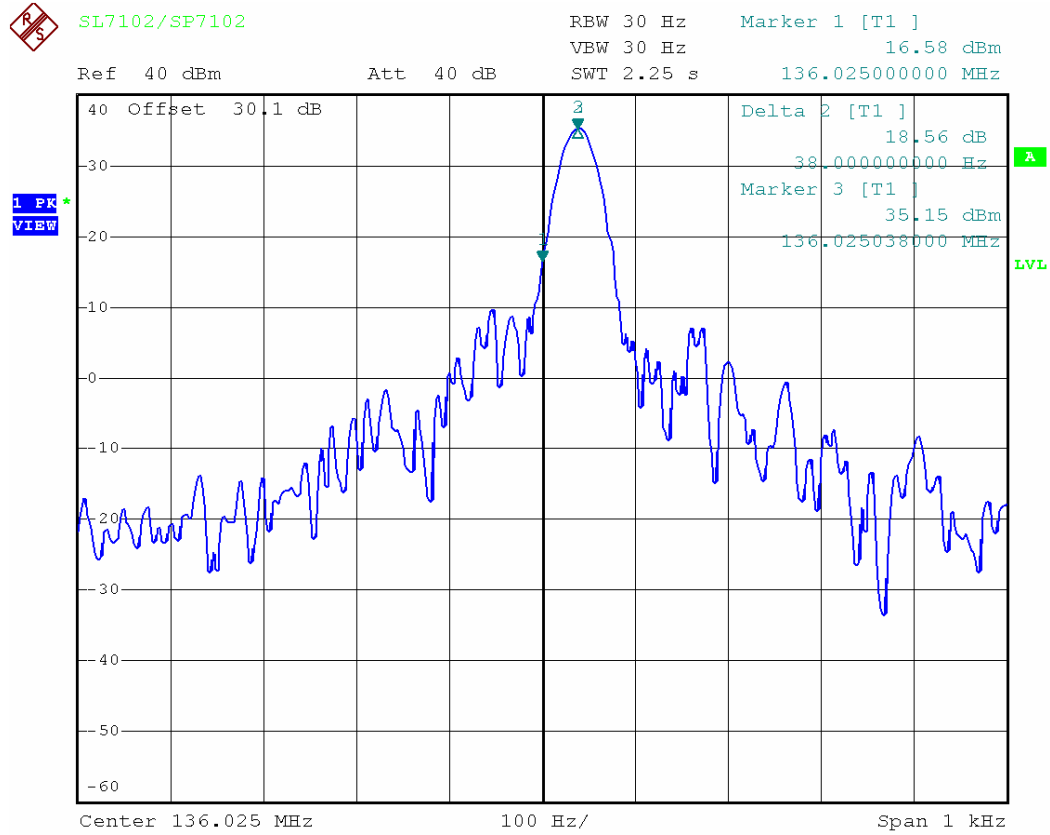


### 5.10.6.12 Plot 10 (+60°C)

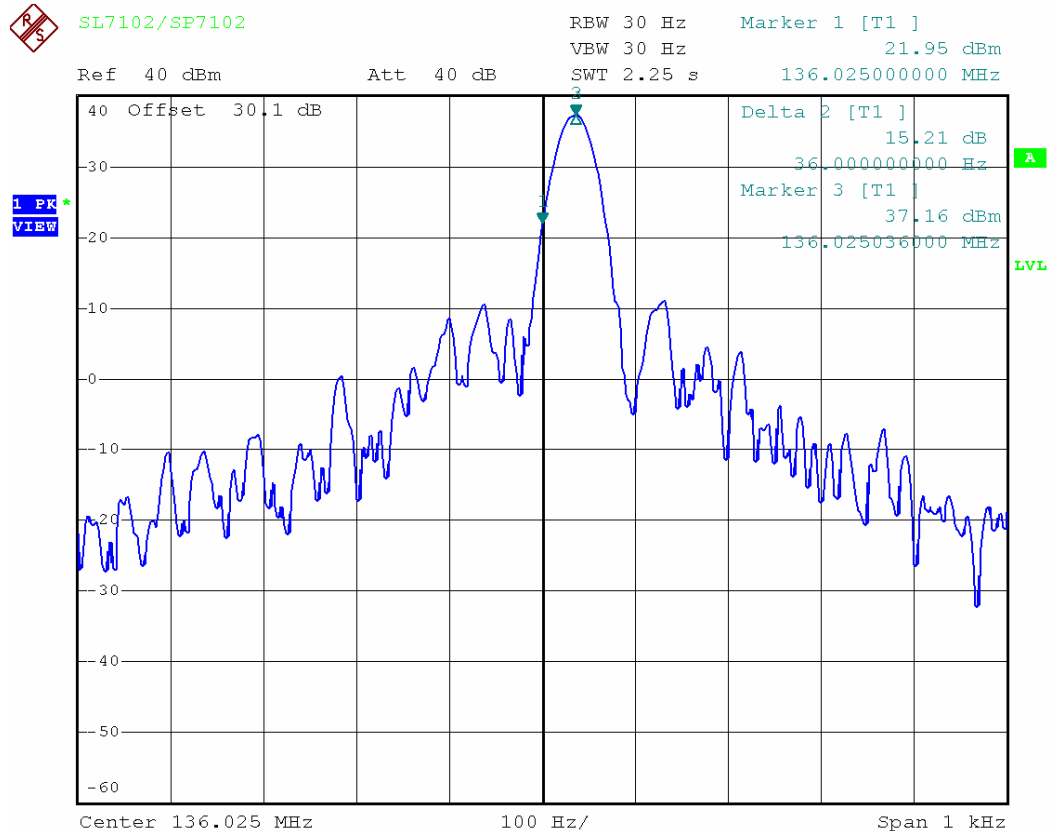




### 5.10.6.13 Plot 11 (20°C, 6.29V)



### 5.10.6.14 Plot 12 (20°C, 8.51V)



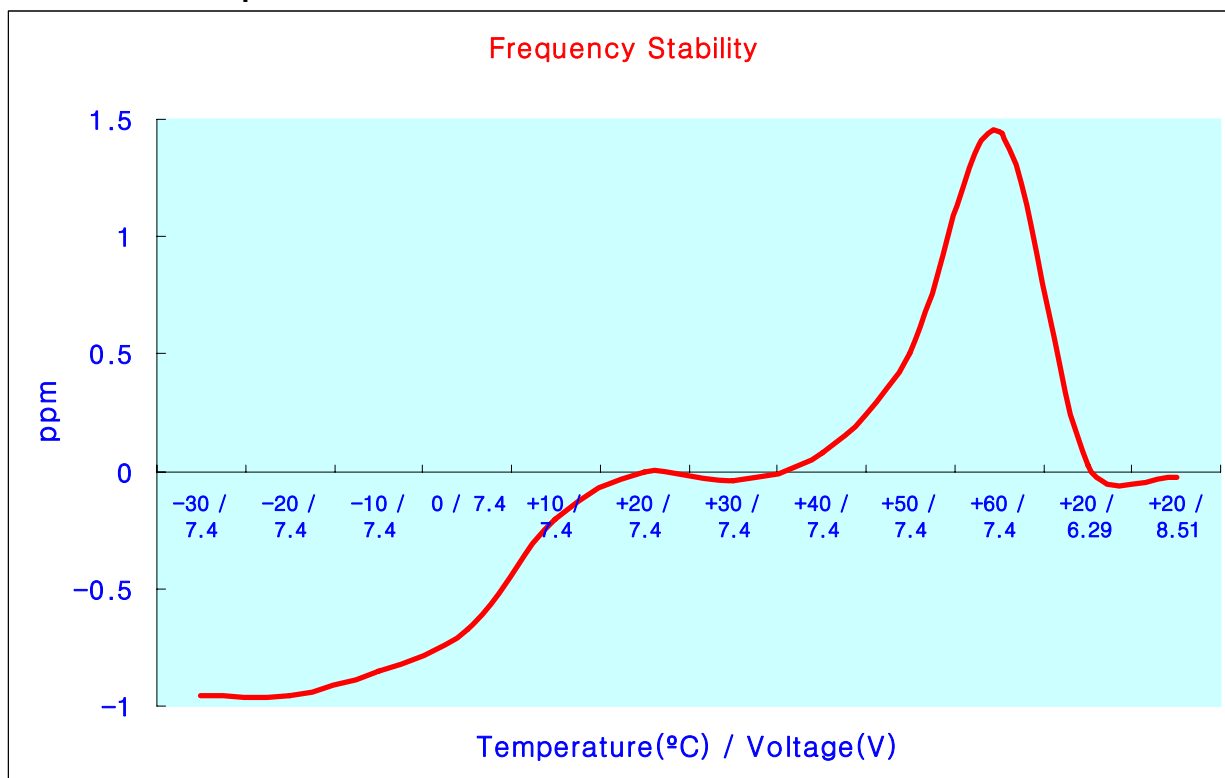
## 5.10.7 Test Result 2

|                       |                          |
|-----------------------|--------------------------|
| FCC Rules :           | Part 2 §2.1055 & §90.231 |
| IC Rules :            | RSS-119 Section 5.3      |
| Operating Frequency : | 155.025 MHz              |
| Channel :             | 2nd Channel              |
| Power Output :        | 5 Watts                  |
| Modulation :          | Non-Modulation           |
| Reference Voltage :   | 7.4 VDC                  |

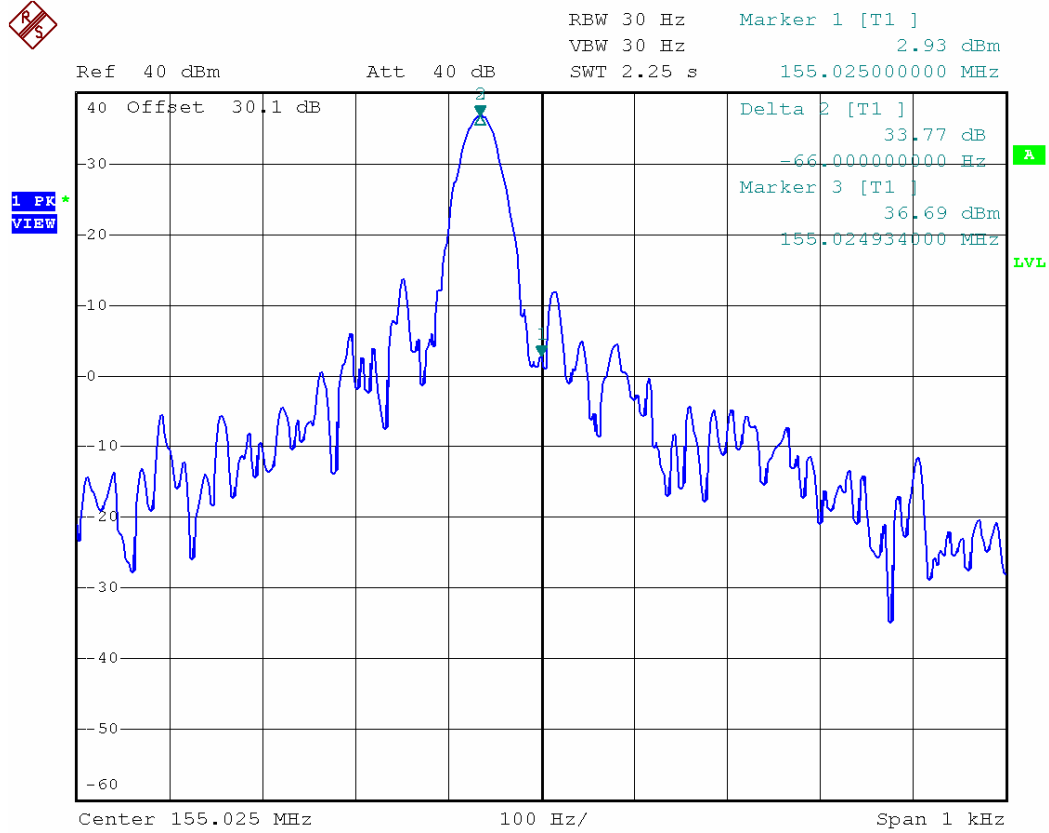
### 5.10.7.1 Data

| Voltage (%) | Power Supply (Vdc) | Temperature (°C) | Frequency (MHz) | Deviation (ppm) | Limit (ppm) |
|-------------|--------------------|------------------|-----------------|-----------------|-------------|
| 100 %       | 7.4                | -30              | 155.024934      | -0.95           | 2.5         |
| 100 %       | 7.4                | -20              | 155.024934      | -0.95           | 2.5         |
| 100 %       | 7.4                | -10              | 155.024950      | -0.85           | 2.5         |
| 100 %       | 7.4                | 0                | 155.024978      | -0.67           | 2.5         |
| 100 %       | 7.4                | +10              | 155.025050      | -0.21           | 2.5         |
| 100 %       | 7.4                | +20 (ref)        | 155.025082      | 0               | 2.5         |
| 100 %       | 7.4                | +30              | 155.025076      | -0.04           | 2.5         |
| 100 %       | 7.4                | +40              | 155.025094      | +0.08           | 2.5         |
| 100 %       | 7.4                | +50              | 155.025160      | +0.50           | 2.5         |
| 100 %       | 7.4                | +60              | 155.025306      | +1.44           | 2.5         |
| 85 %        | 6.52               | +20              | 155.025086      | +0.03           | 2.5         |
| 115 %       | 8.51               | +20              | 155.025078      | -0.03           | 2.5         |

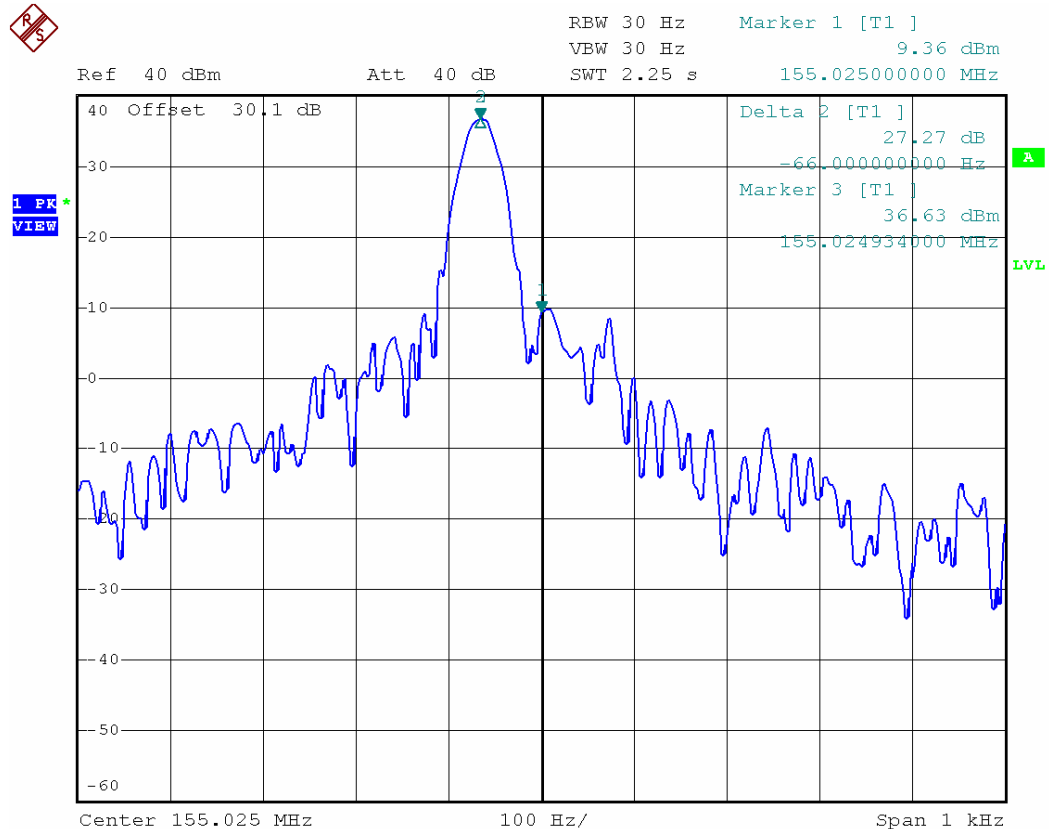
### 5.10.7.2 Graph



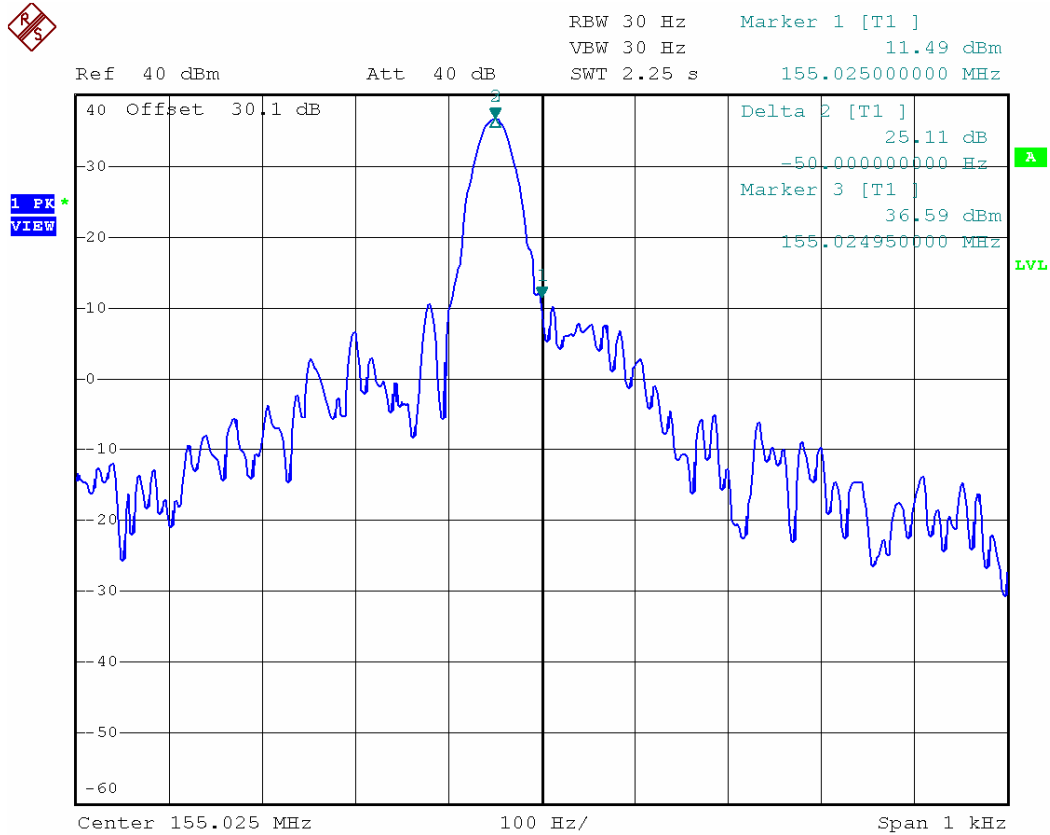
### 5.10.7.3 Plot 1 (-30°C)



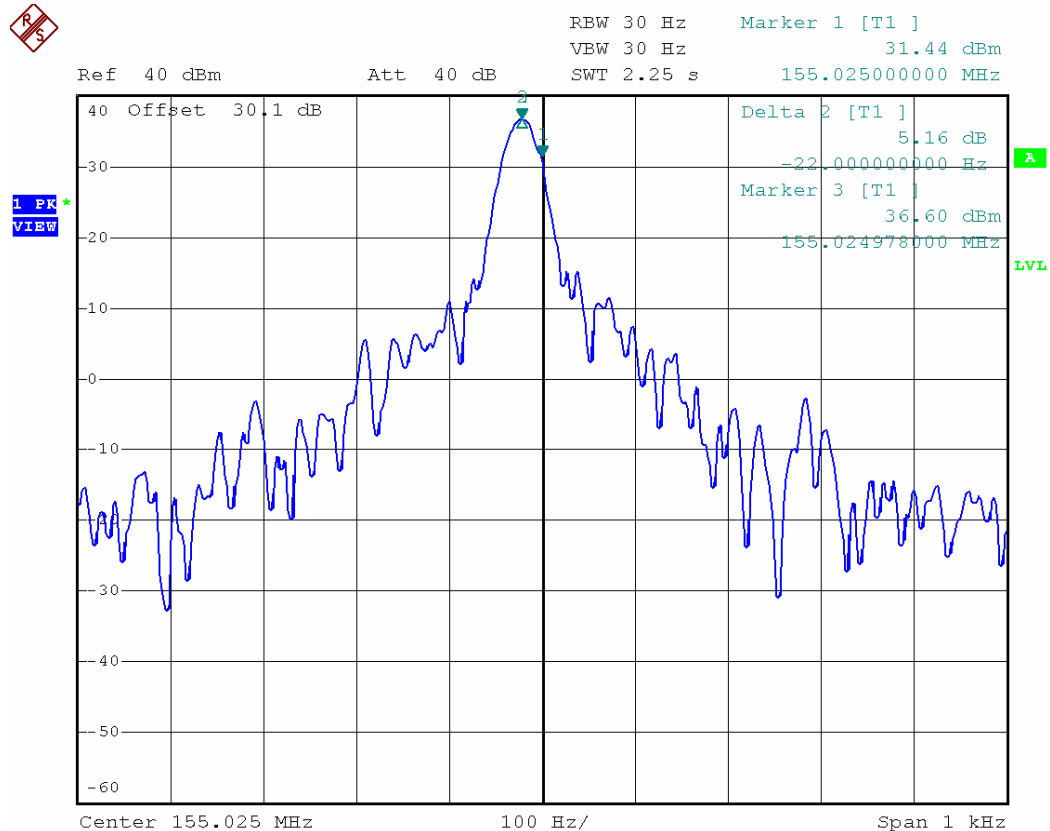
### 5.10.7.4 Plot 2 (-20°C)



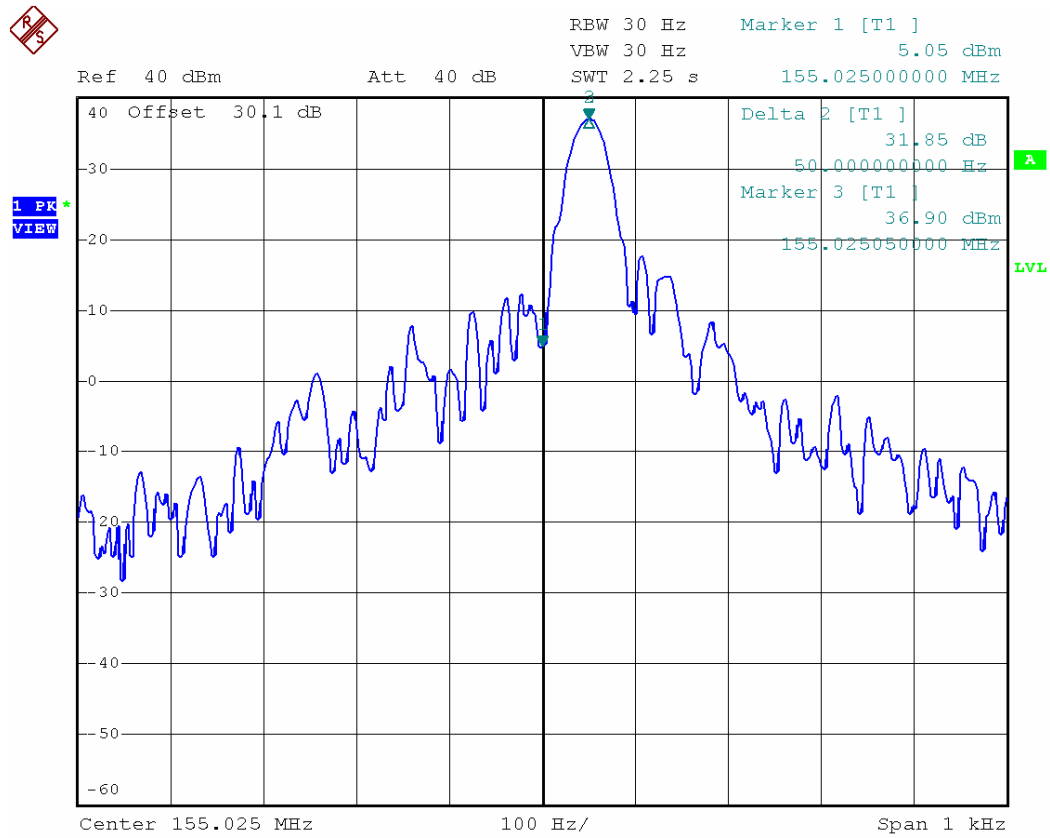
### 5.10.7.5 Plot 3 (-10°C)



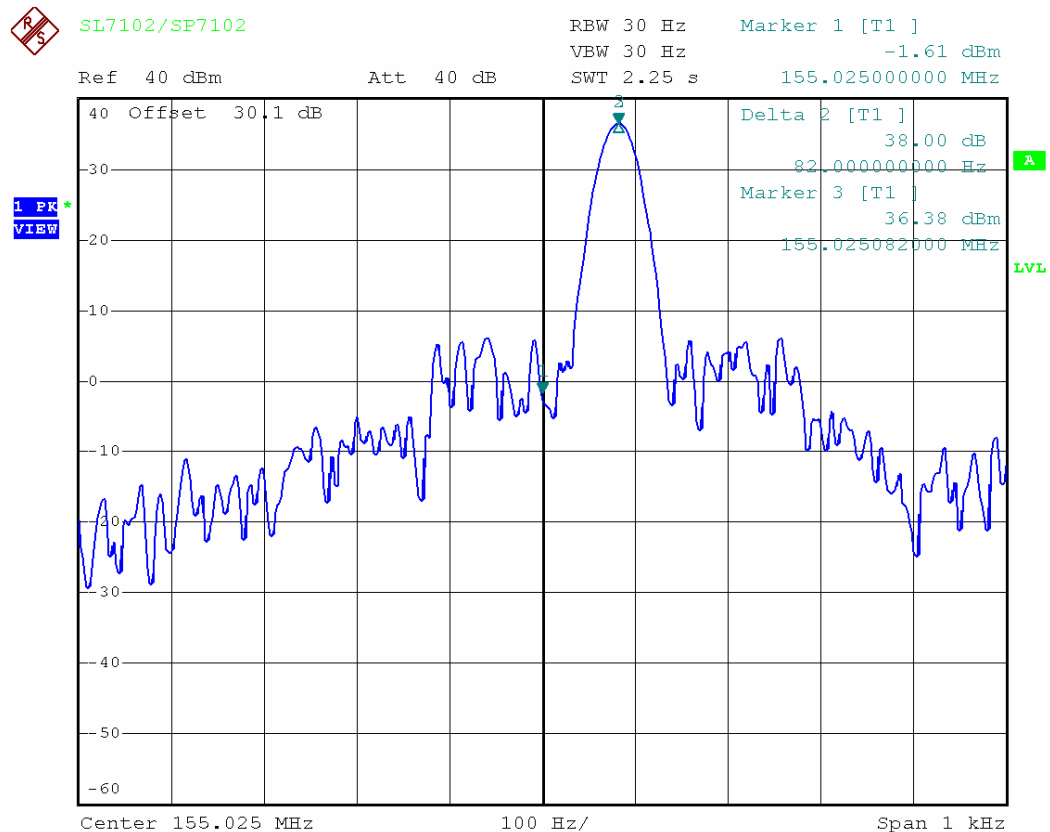
### 5.10.7.6 Plot 4 (0°C)



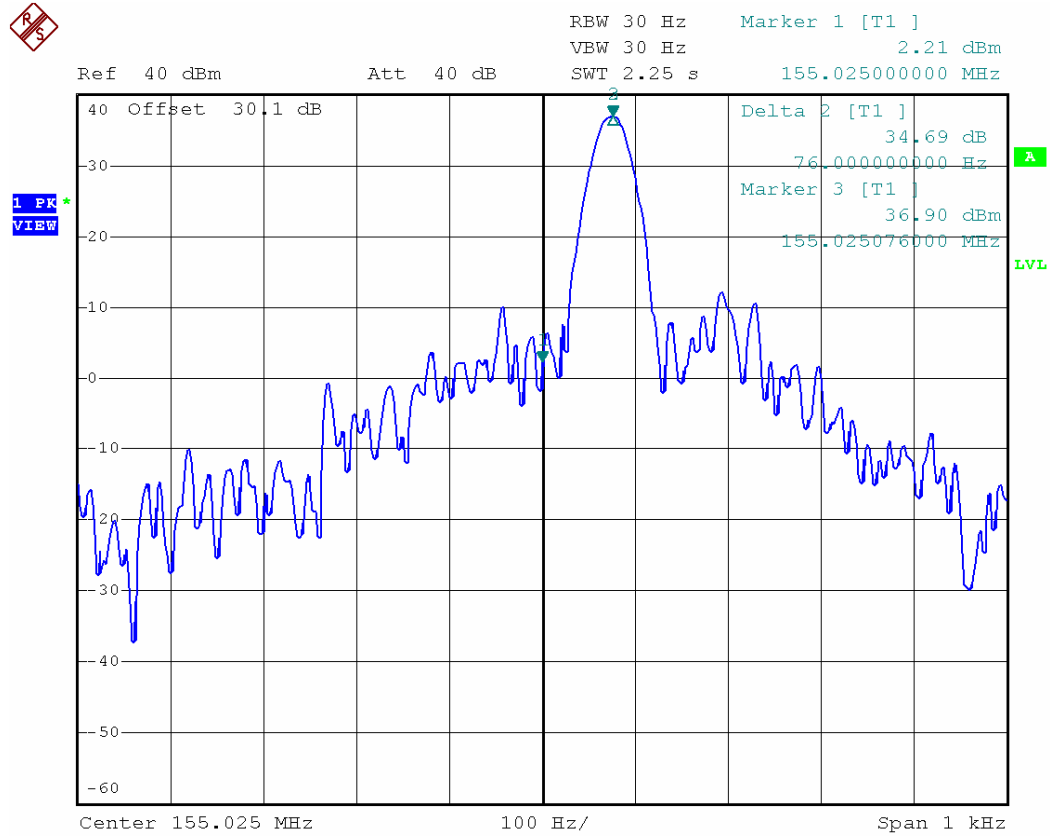
### 5.10.7.7 Plot 5 (+10°C)



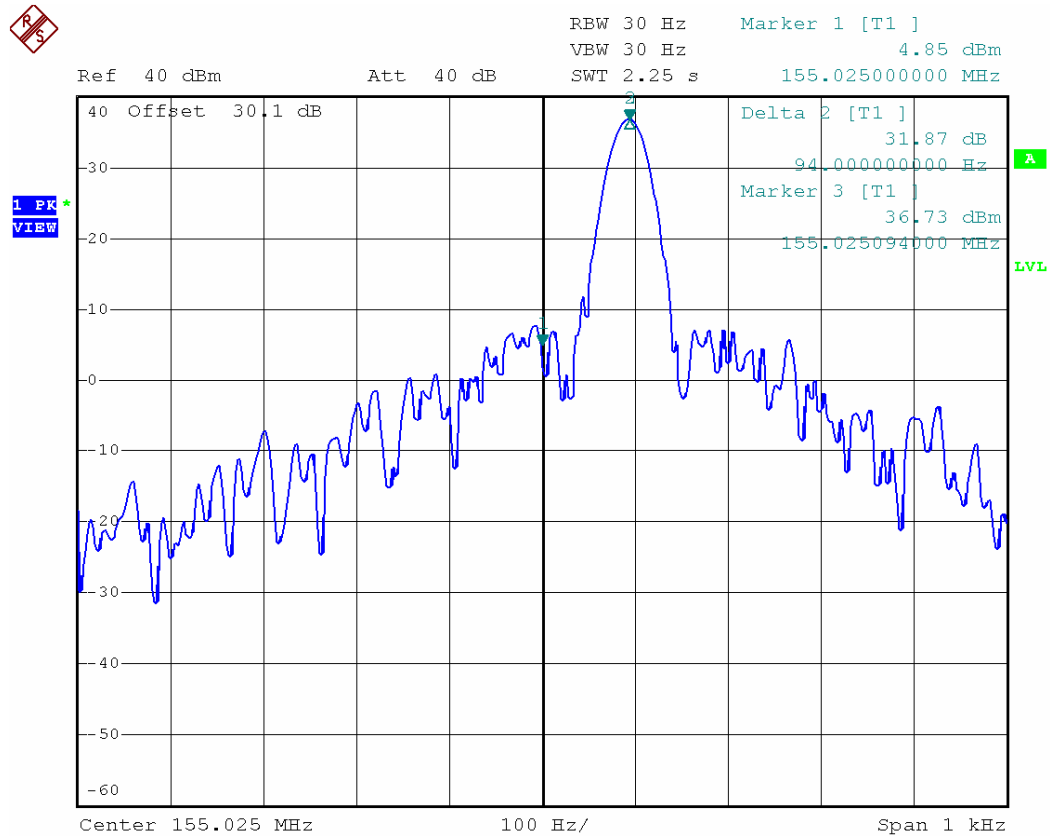
### 5.10.7.8 Plot 6 (+20°C)



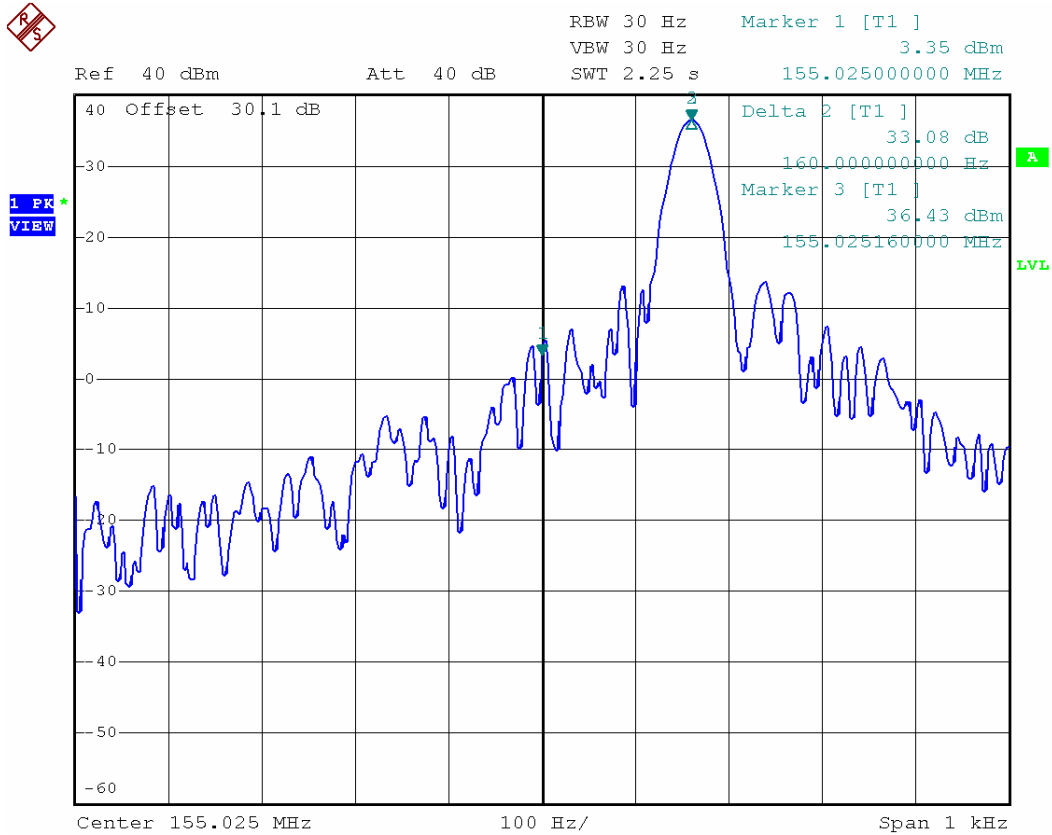
### 5.10.7.9 Plot 7 (+30°C)



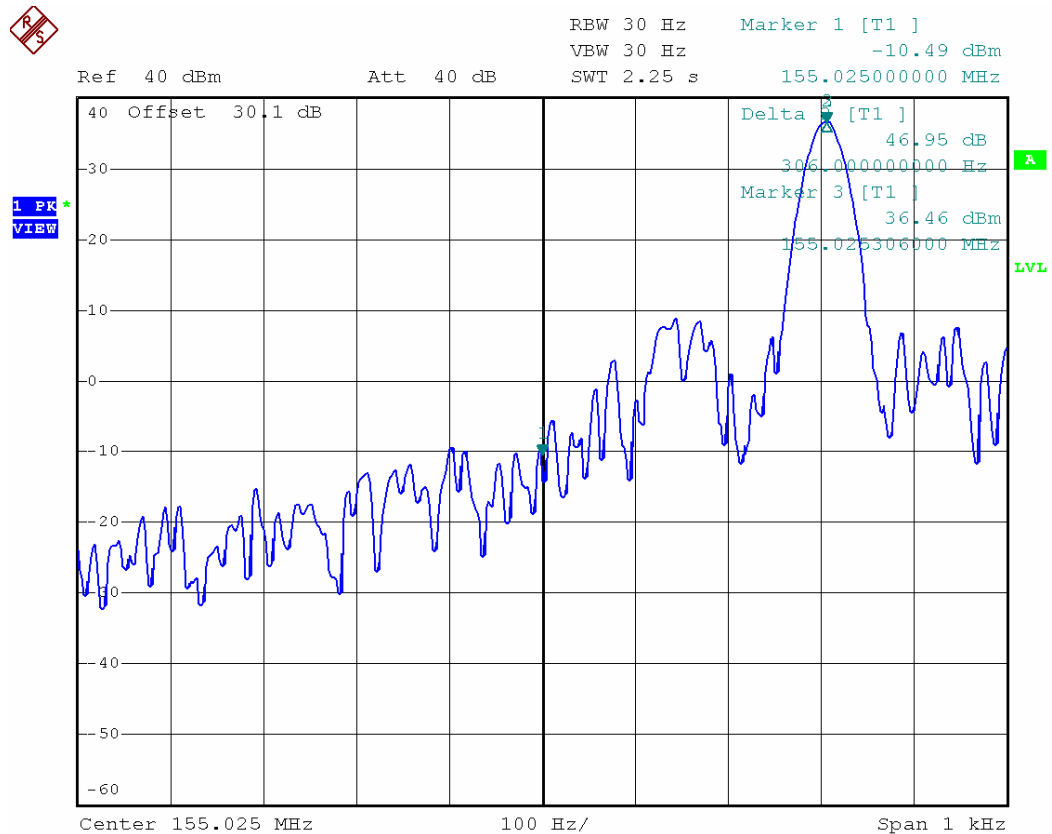
### 5.10.7.10 Plot 8 (+40°C)



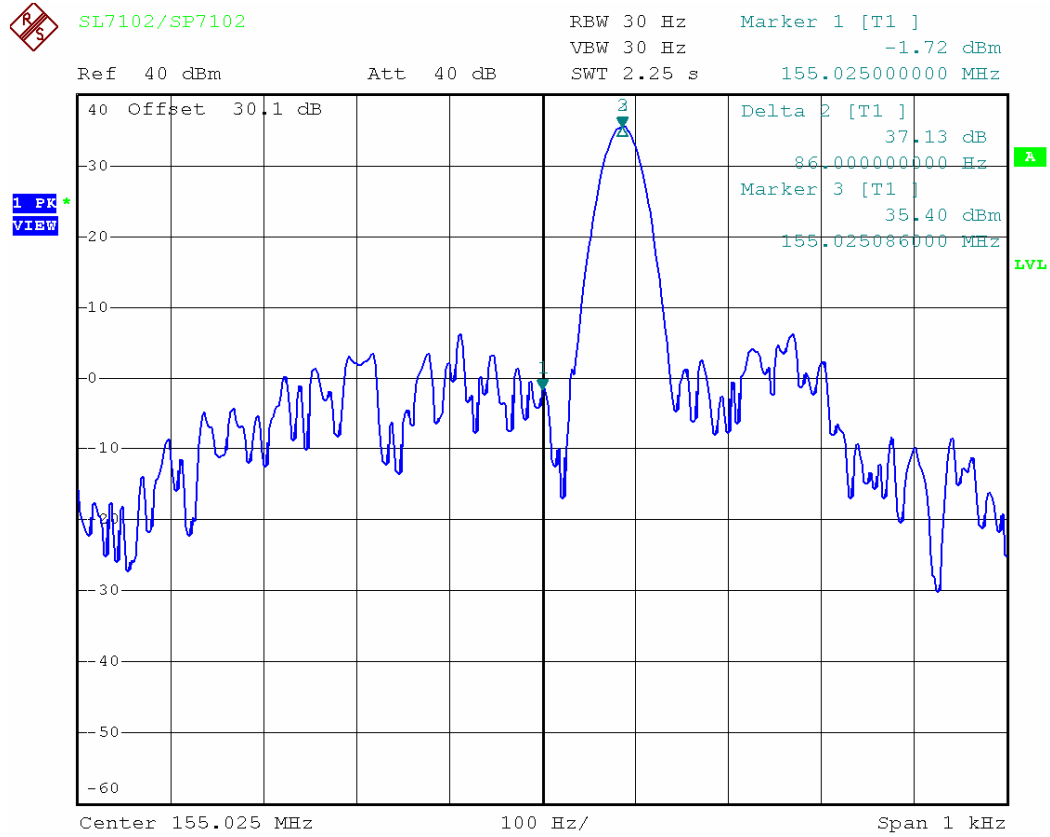
### 5.10.7.11 Plot 9 (+50°C)



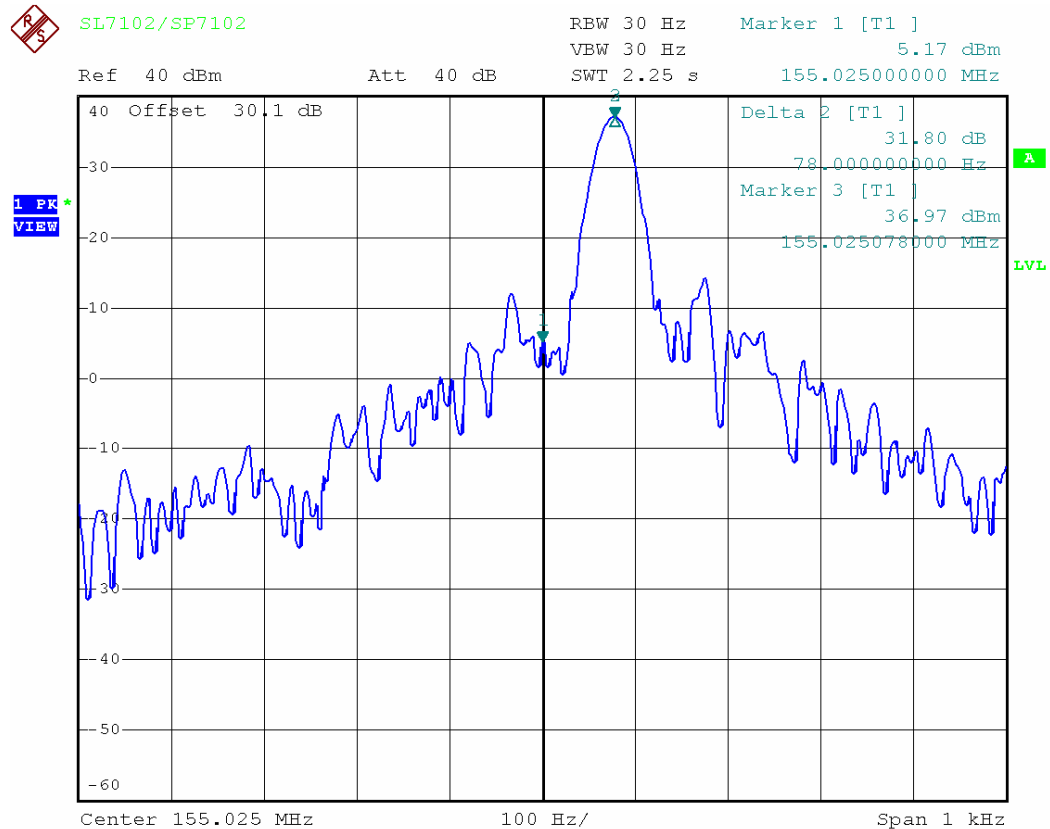
### 5.10.7.12 Plot 10 (+60°C)



### 5.10.7.13 Plot 11 (20°C, 6.29V)



### 5.10.7.14 Plot 12 (20°C, 8.51V)





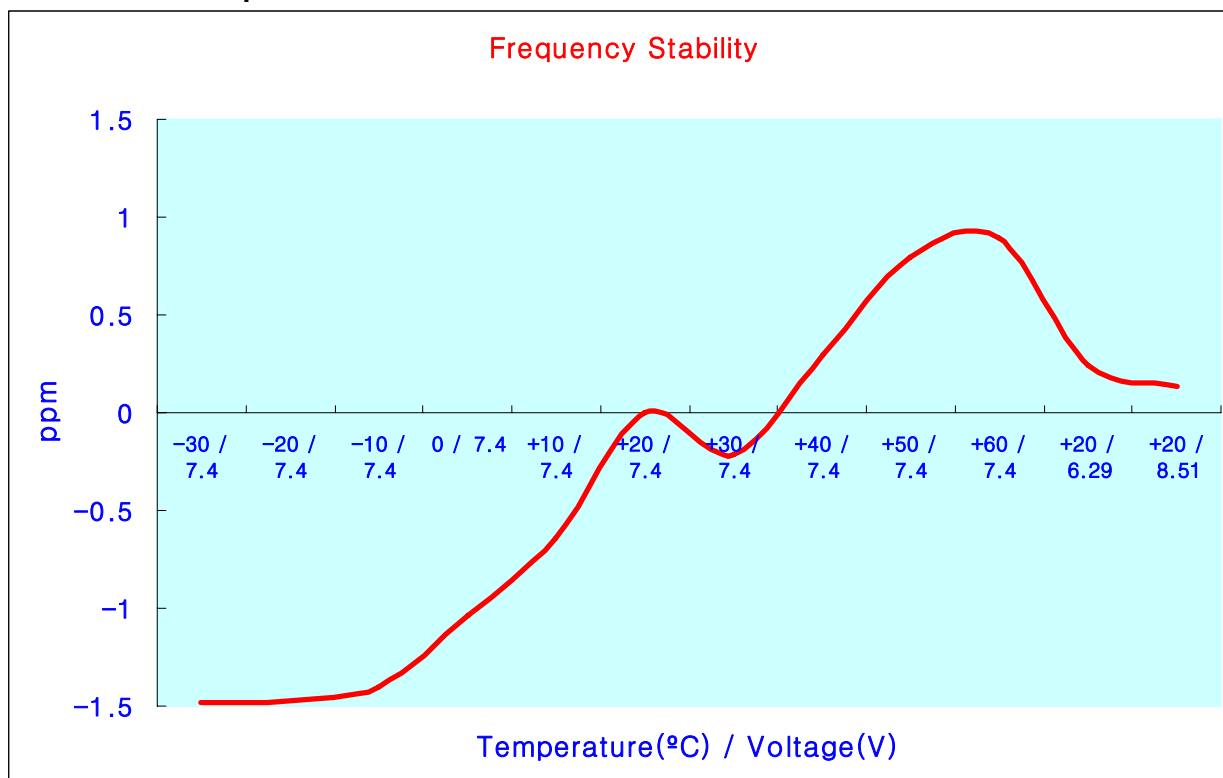
### 5.10.8 Test Result 3

|                       |                          |
|-----------------------|--------------------------|
| FCC Rules :           | Part 2 §2.1055 & §90.231 |
| IC Rules :            | RSS-119 Section 5.3      |
| Operating Frequency : | 173.975 MHz              |
| Channel :             | 3rd Channel              |
| Power Output :        | 5 Watts                  |
| Modulation :          | Non-Modulation           |
| Reference Voltage :   | 7.4 VDC                  |

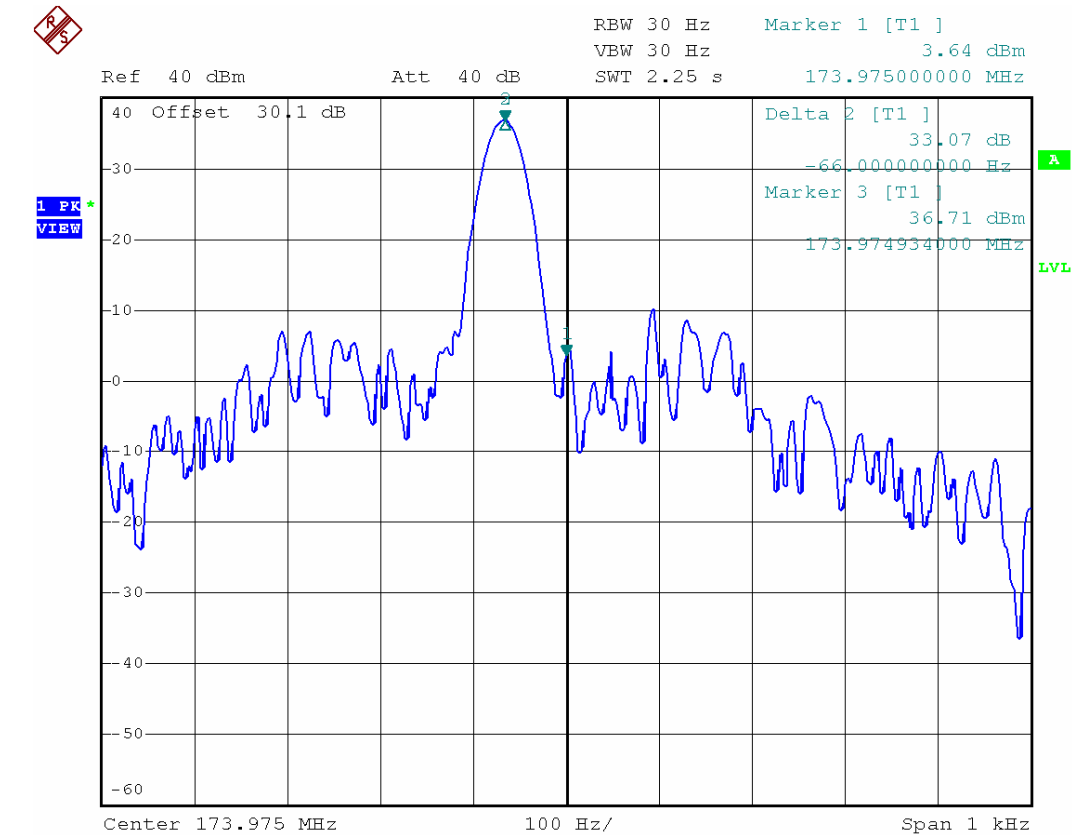
#### 5.10.8.1 Data

| Voltage (%) | Power Supply (Vdc) | Temperature (°C) | Frequency (MHz) | Deviation (ppm) | Limit (ppm) |
|-------------|--------------------|------------------|-----------------|-----------------|-------------|
| 100 %       | 7.4                | -30              | 173.974934      | -1.48           | 2.5         |
| 100 %       | 7.4                | -20              | 173.974936      | -1.47           | 2.5         |
| 100 %       | 7.4                | -10              | 173.974948      | -1.40           | 2.5         |
| 100 %       | 7.4                | 0                | 173.975012      | -1.03           | 2.5         |
| 100 %       | 7.4                | +10              | 173.975080      | -0.64           | 2.5         |
| 100 %       | 7.4                | +20 (ref)        | 173.975192      | 0               | 2.5         |
| 100 %       | 7.4                | +30              | 173.975154      | -0.21           | 2.5         |
| 100 %       | 7.4                | +40              | 173.975244      | +0.30           | 2.5         |
| 100 %       | 7.4                | +50              | 173.975330      | +0.79           | 2.5         |
| 100 %       | 7.4                | +60              | 173.975348      | +0.90           | 2.5         |
| 85 %        | 6.52               | +20              | 173.975234      | +0.24           | 2.5         |
| 115 %       | 8.51               | +20              | 173.975216      | +0.14           | 2.5         |

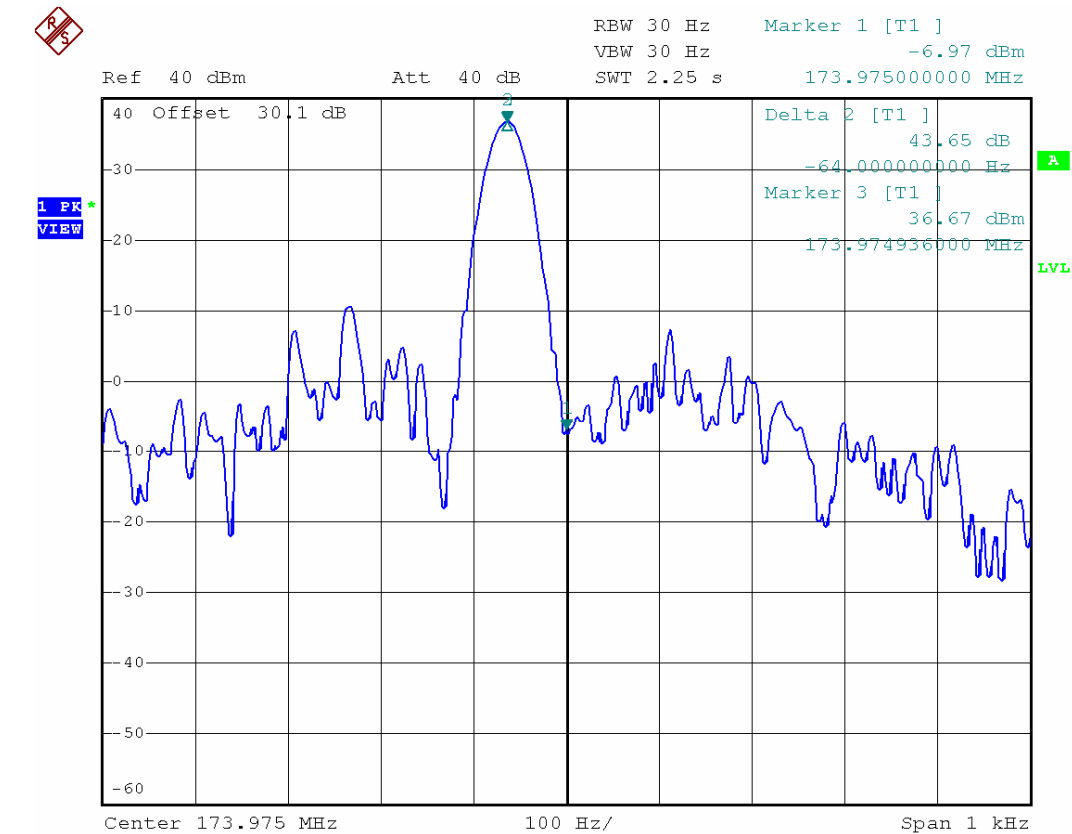
#### 5.10.8.2 Graph



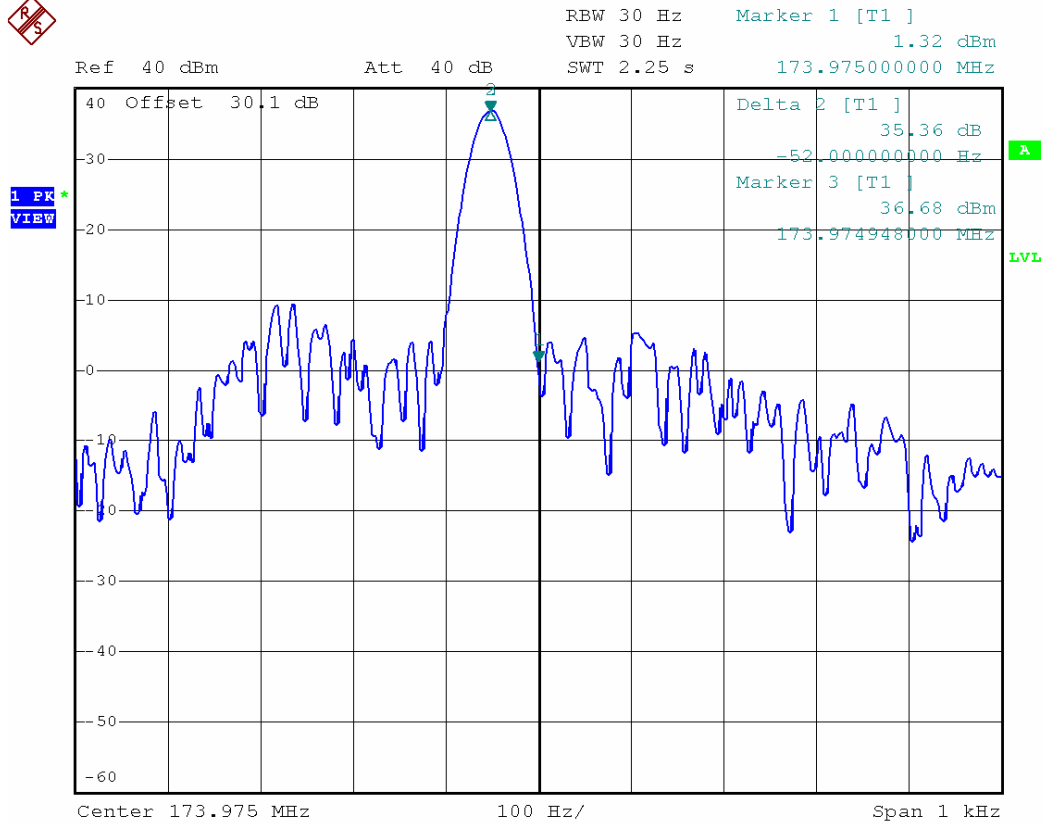
5.10.8.3 Plot 1 (-30°C)



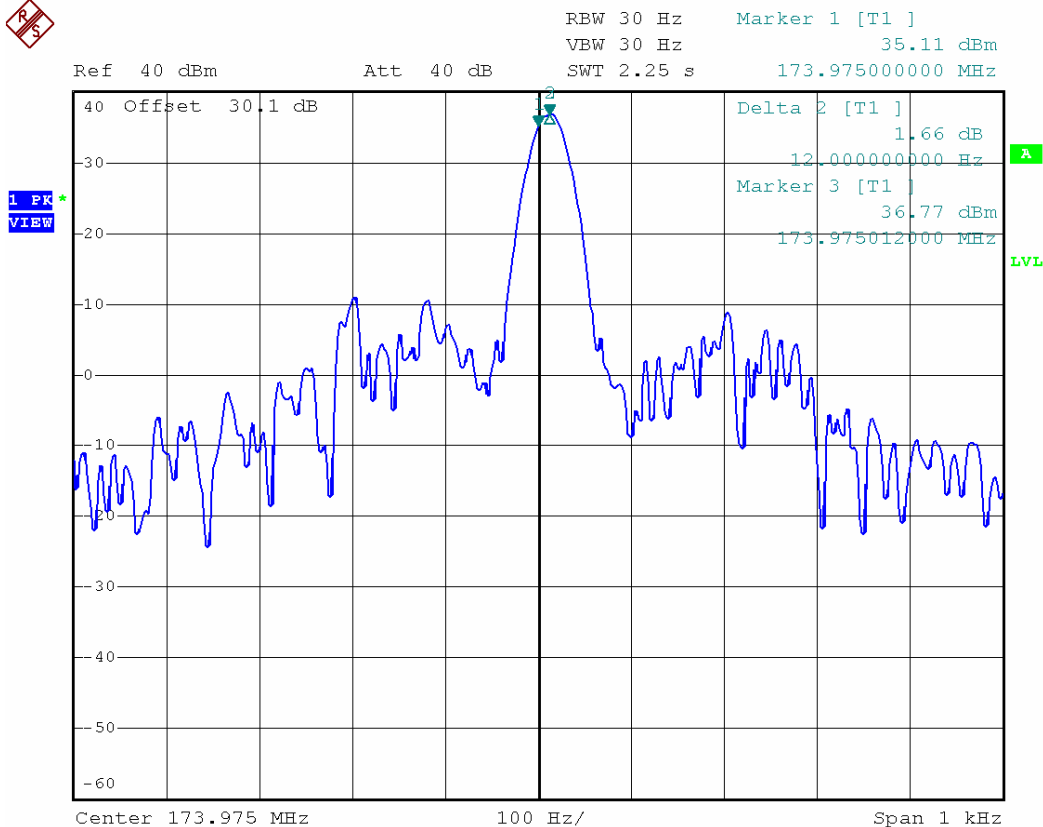
5.10.8.4 Plot 2 (-20°C)



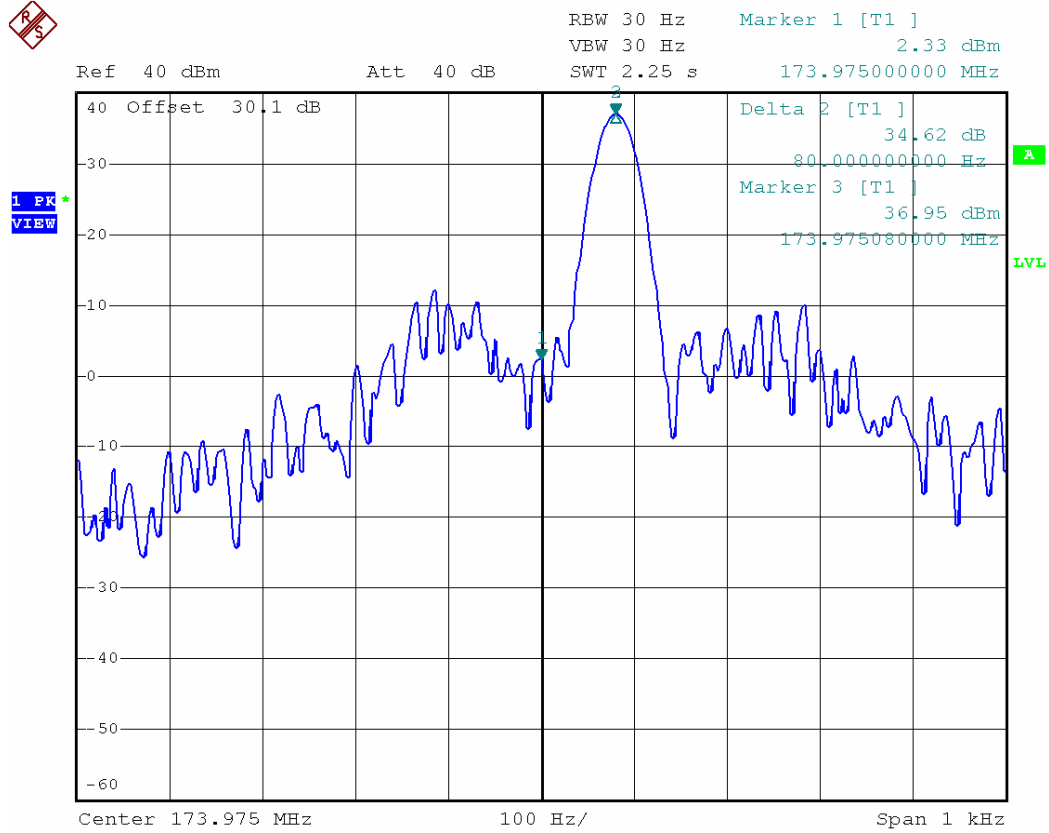
### 5.10.8.5 Plot 3 (-10°C)



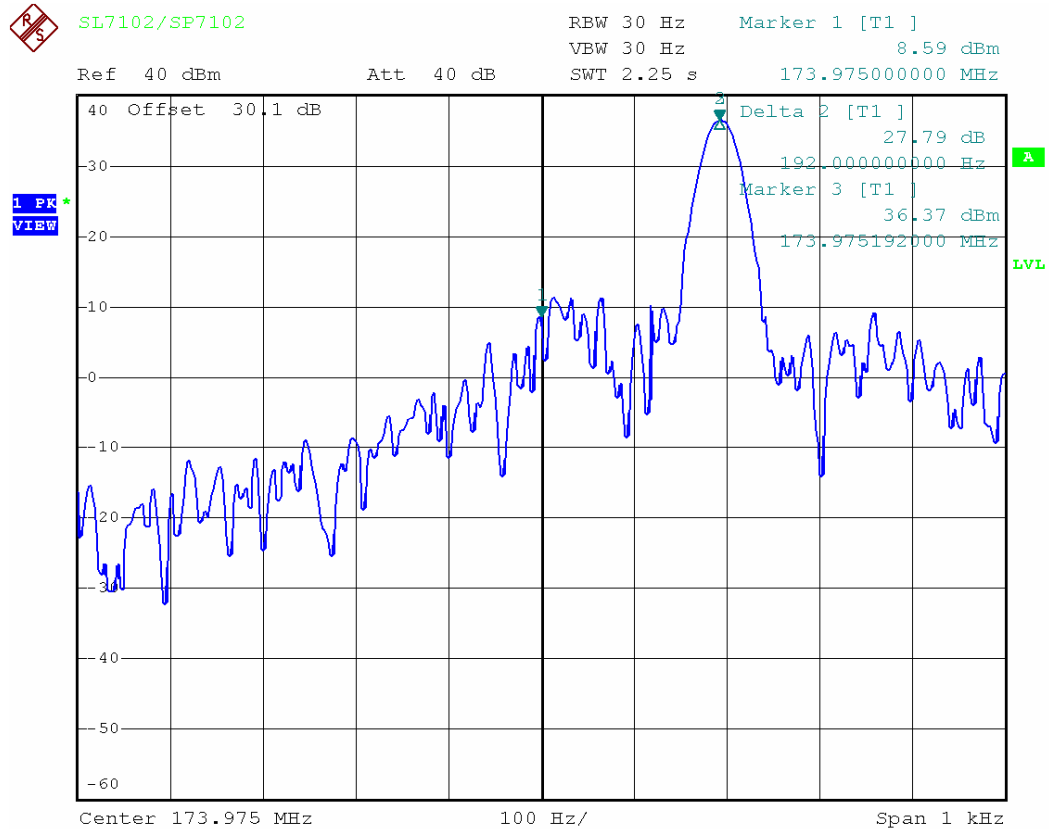
### 5.10.8.6 Plot 4 (0°C)



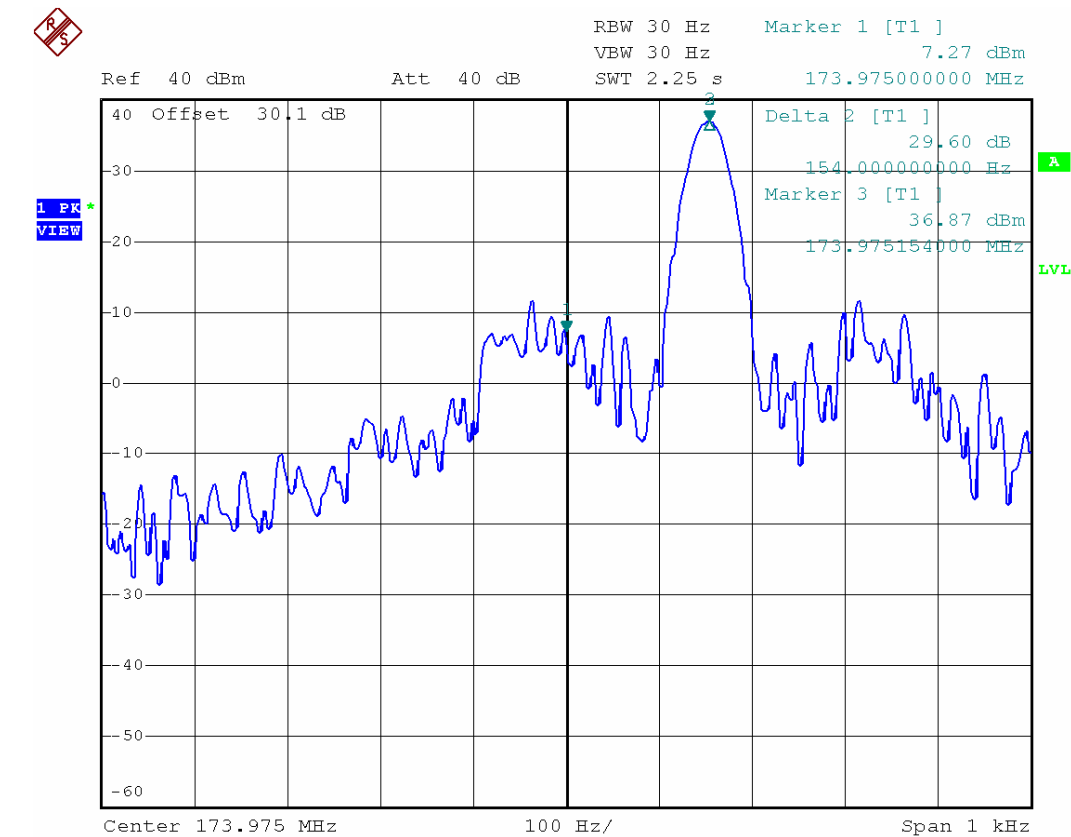
### 5.10.8.7 Plot 5 (+10°C)



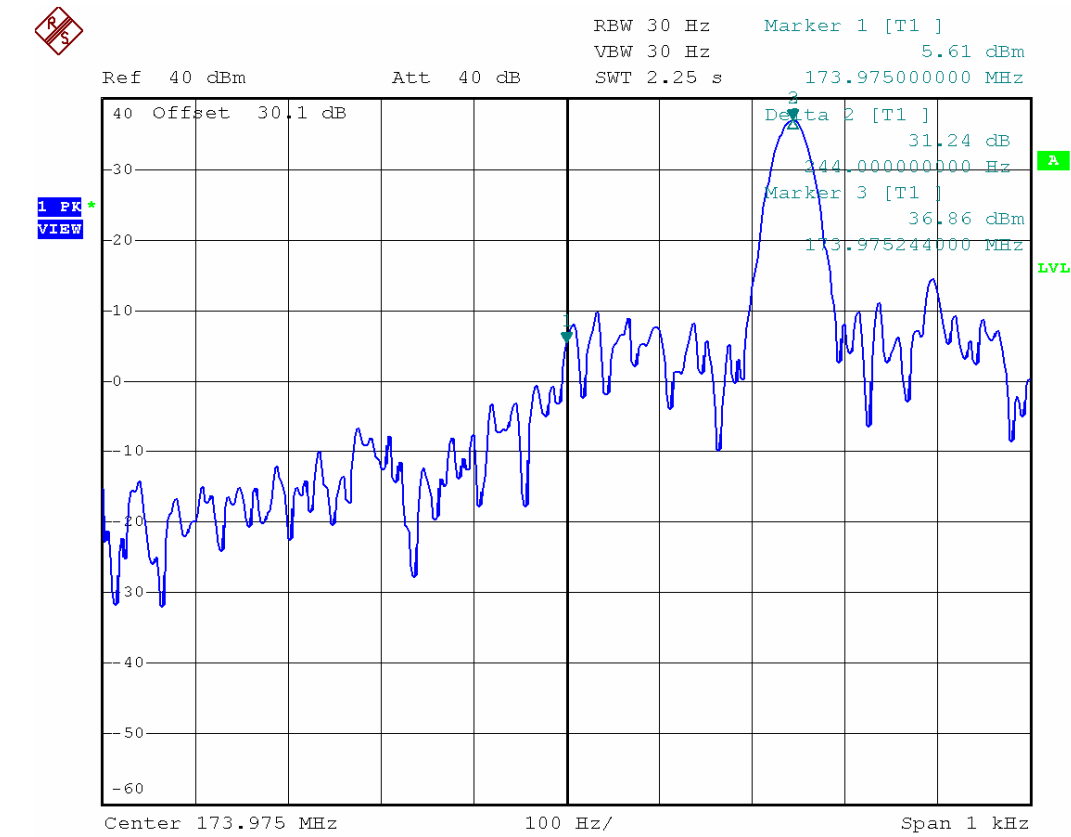
### 5.10.8.8 Plot 6 (+20°C)



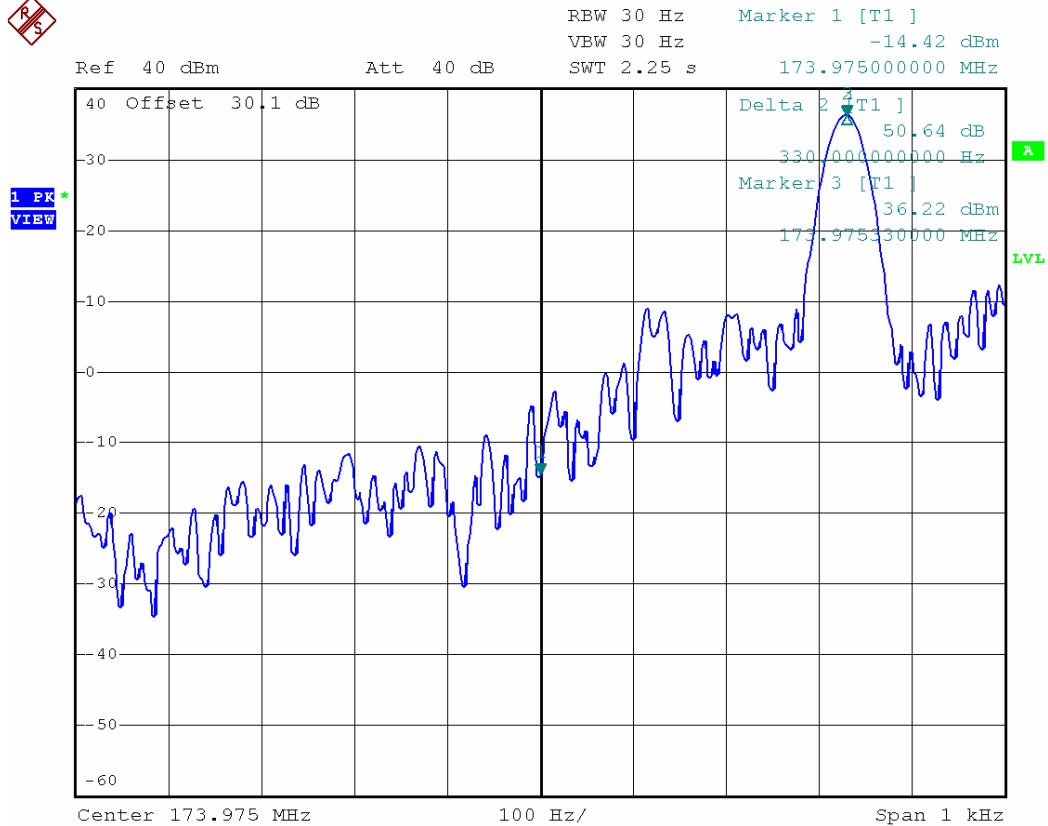
5.10.8.9 Plot 7 (+30°C)



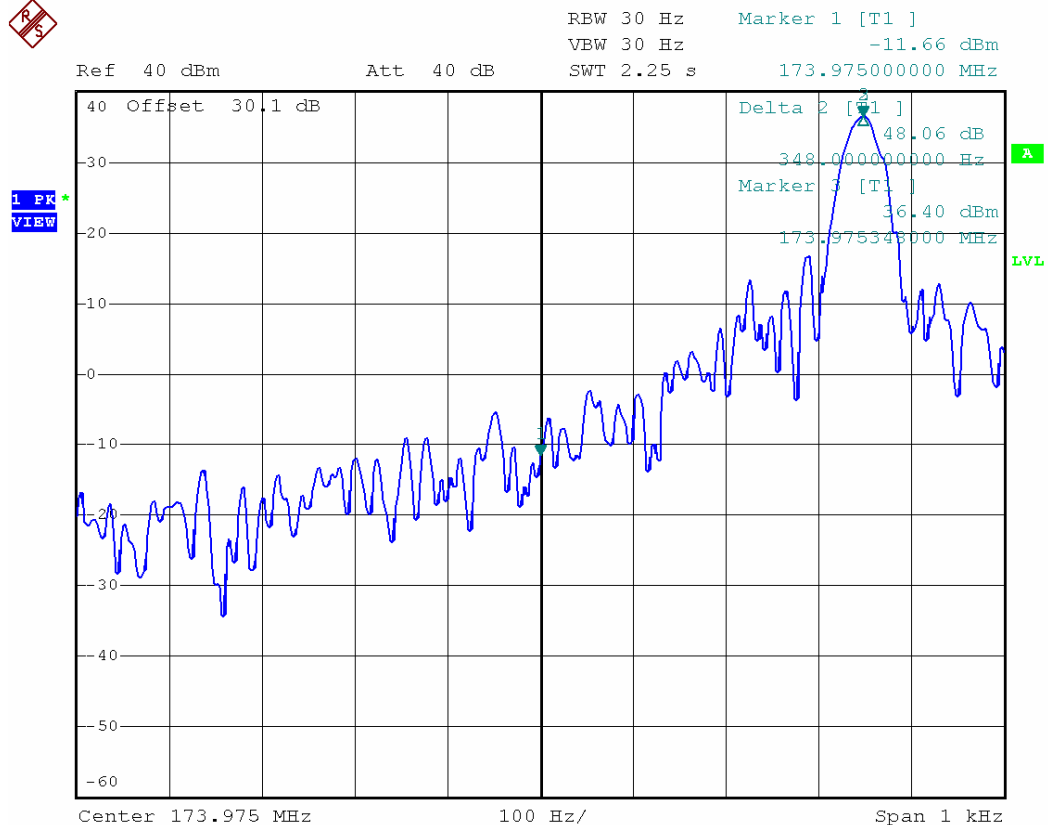
5.10.8.10 Plot 8 (+40°C)



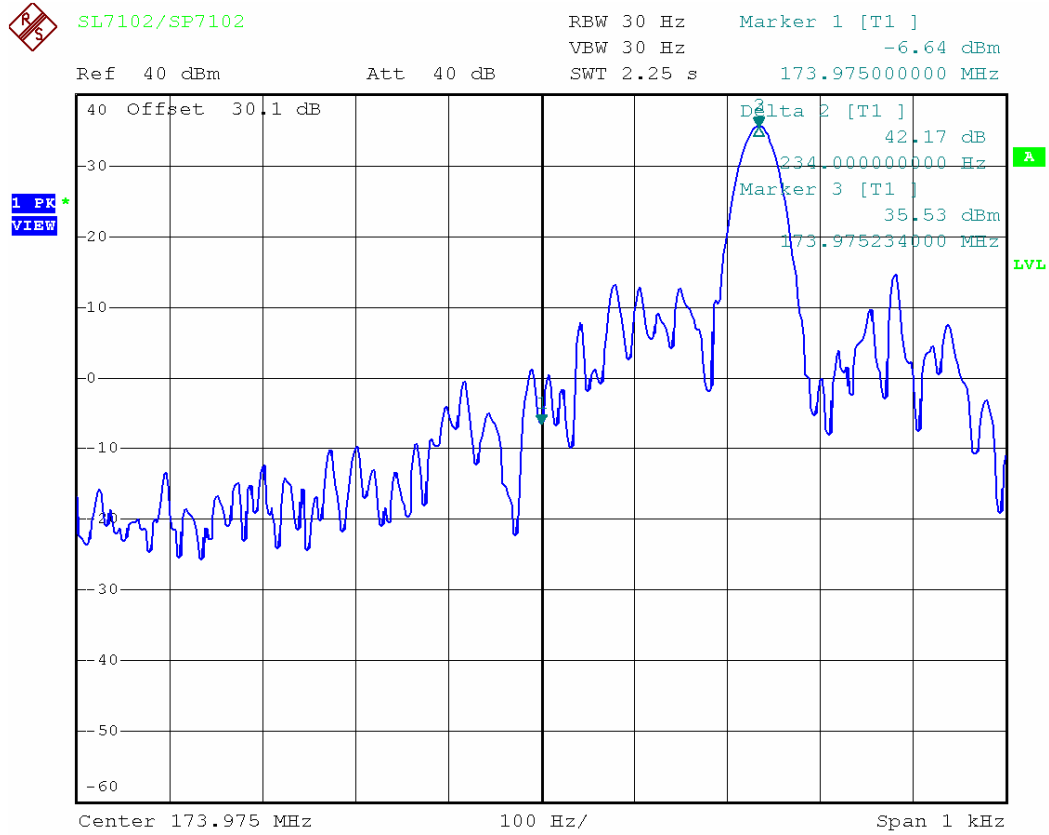
### 5.10.8.11 Plot 9 (+50°C)



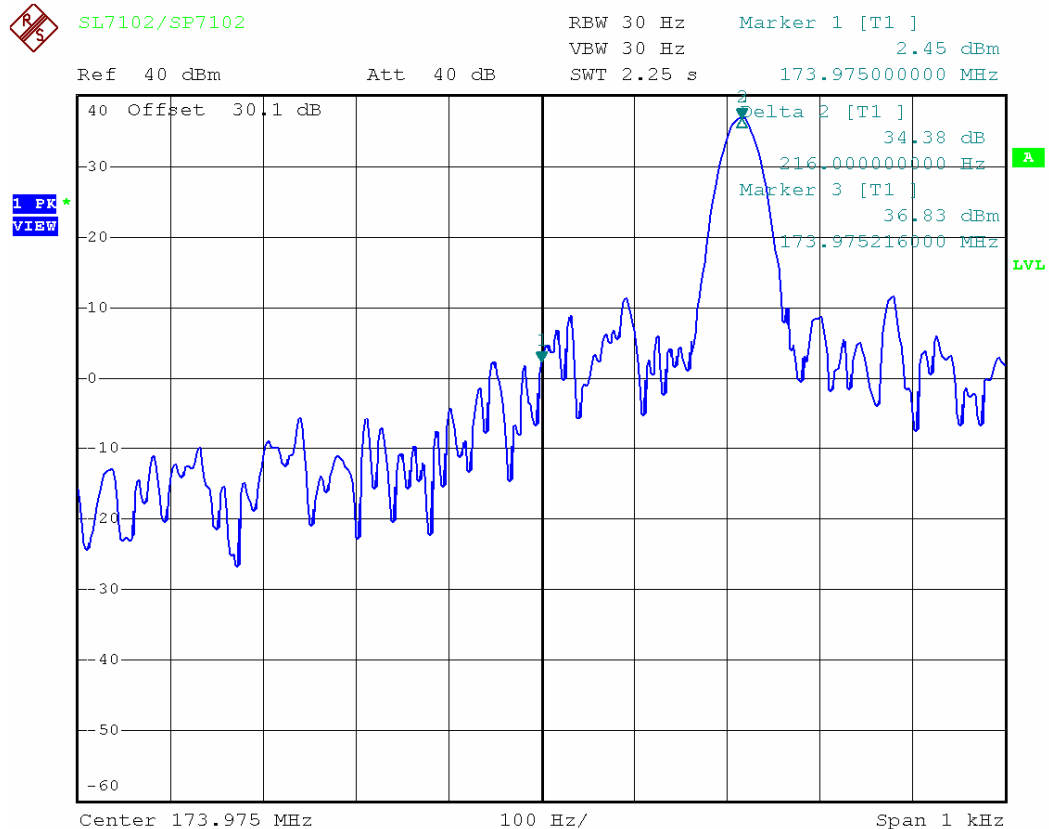
### 5.10.8.12 Plot 10 (+60°C)



### 5.10.8.13 Plot 11 (20°C, 6.29V)



### 5.10.8.14 Plot 12 (20°C, 8.51V)



## 5.11 Transient Frequency Behavior

### 5.11.1 Specification

FCC Rules Part 90, Section 90.214  
Industry Canada, RSS-119 Section 5.9

### 5.11.2 Method of Measurement

ANSI/TIA-603-B-2002 Section 2.2.19

### 5.11.3 Measurement Set-Up

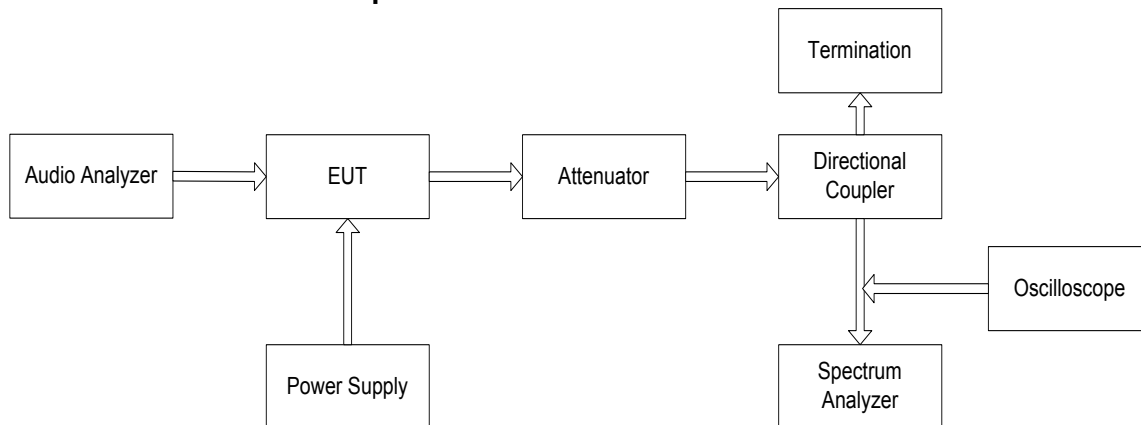


Fig.9

### 5.11.4 Test Equipment List

| Equipment           | Model Name  | Manufacturer    |
|---------------------|-------------|-----------------|
| EUT                 | SP7102      | Maxon CIC Corp. |
| Power Supply        | IPS-30B03DD | INTERACT        |
| Audio Analyzer      | 8903B       | Agilent         |
| Attenuator          | 33-30-33    | WEINSCHEL       |
| Directional Coupler | 778D        | Agilent         |
| Termination         | 8173        | Bird            |
| Oscilloscope        | TDS3032     | Tektronix       |
| Spectrum Analyzer   | FSP7        | Rohde & Shwarz  |

### 5.11.5 Test Procedure

- The unit was turn-up in accordance with the alignment procedure stated in the FIG. 9, and was loaded into a 50 ohm resistive termination.
- Using the variable attenuator the transmitter level was set to 40 dB below the test receivers maximum input level, then the transmitter was turned off.
- With the transmitter off the signal generator was set 20dB below the level of the transmitter in the above step, this level will be maintained with the signal generator through-out the test.
- Reduce the attenuation between the transmitter and the RF detector by 30 dB.
- With the levels set as above the transient frequency behavior was observed & recorded.
- Requirements



### 5.11.6 Limit

**Transient Frequency Difference Limits**

| Time Interval  | Max. Permitted Frequency Difference for 25 and 30 kHz Channel Spacing (in kHz) | Max. Permitted Frequency Difference for 12.5 and 15 kHz Channel Spacing (in kHz) |
|----------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| $t_1$ or $t_3$ | 25                                                                             | 12.5                                                                             |
| $t_2$          | 12.5                                                                           | 6.25                                                                             |

**Transient Duration Limits**

| Time Intervals | Frequency Ranges (MHz) |            |            |
|----------------|------------------------|------------|------------|
| Frequency      | 30 to 174              | 406 to 512 | 806 to 940 |
| $t_1$          | 5.0 ms                 | 10.0 ms    | 20.0 ms    |
| $t_2$          | 20.0 ms                | 25.0 ms    | 50.0 ms    |
| $t_3$          | 5.0 ms                 | 10.0 ms    | 10.0 ms    |

The transient frequency behavior of the transmitter is the variation in time of the transmitter frequency difference from the nominal frequency of the transmitter when the RF output power is switched on and off.

$t_{on}$ : according to the method of measurement described the switch-on instant  $t_{on}$  of a transmitter is defined by the condition when the output power, measured at the antenna terminal, exceeds 0,1 % of the nominal power.

$t_1$ : period of time starting at  $t_{on}$  and finishing.

$t_2$ : period of time starting at the end of  $t_1$  and finishing.

$t_{off}$ : switch-off instant defined by the condition when the nominal power falls below 0,1 % of the nominal power.

$t_3$ : period of time that finishing at  $t_{off}$  and starting.

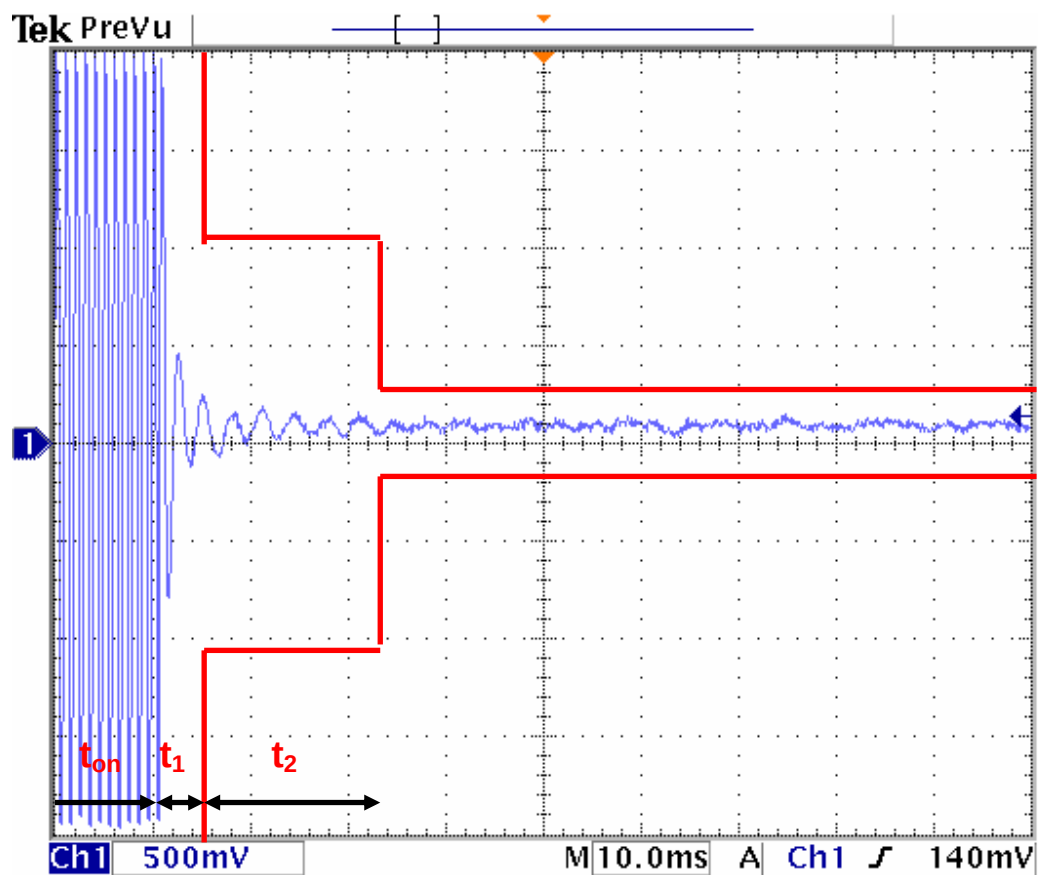
### 5.11.7 Test Data

| Transient Period | Transient Frequency Period (ms) |
|------------------|---------------------------------|
| $t_1$            | « 5.0 ms                        |
| $t_2$            | « 20.0 ms                       |
| $t_3$            | « 5.0 ms                        |
| Uncertainty (%)  | 10                              |

### 5.11.7 Test Plot 1

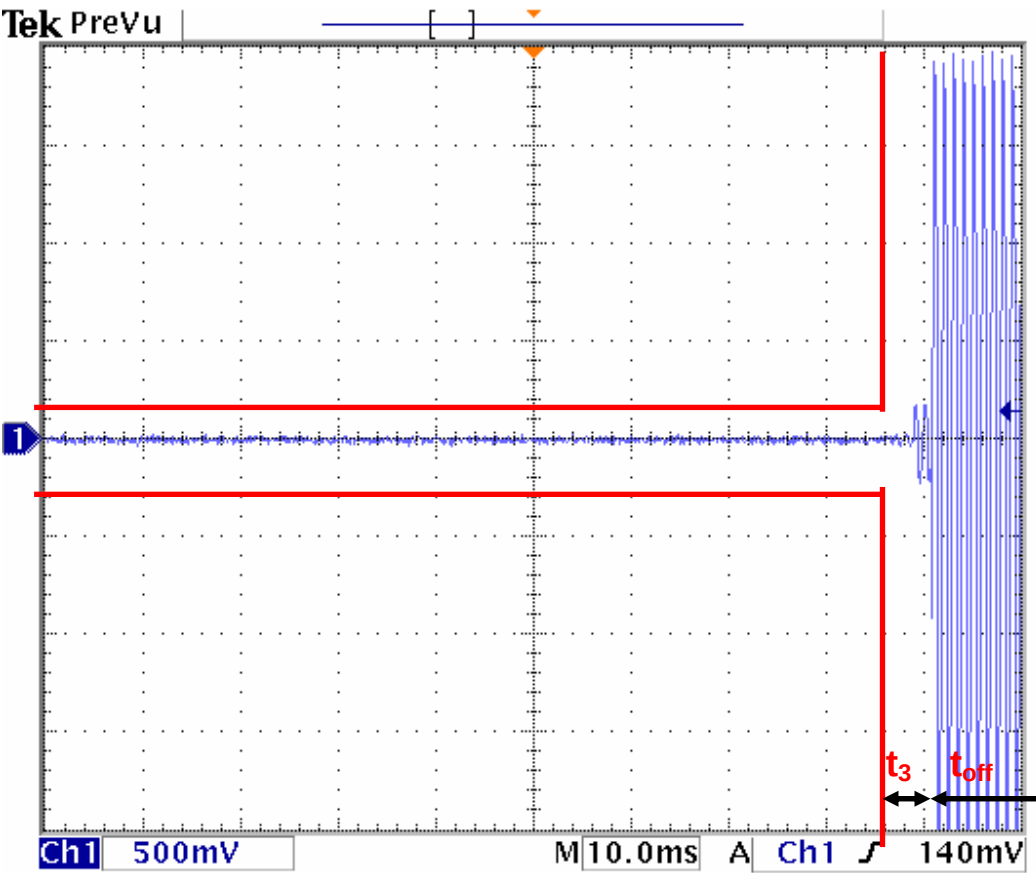
|                       |                     |
|-----------------------|---------------------|
| FCC Rules :           | Part 90 §90.231     |
| IC Rules :            | RSS-119 Section 5.9 |
| Operating Frequency : | 136.025 MHz         |
| Channel :             | 1st Channel         |
| Power Output :        | 5 Watts             |
| Channel Spacing :     | Narrow Band         |
| Reference Voltage :   | 7.4 VDC             |

#### 5.11.7.1 Switch on condition $t_{on}$ , $t_1$ and $t_2$



5.11.7.2

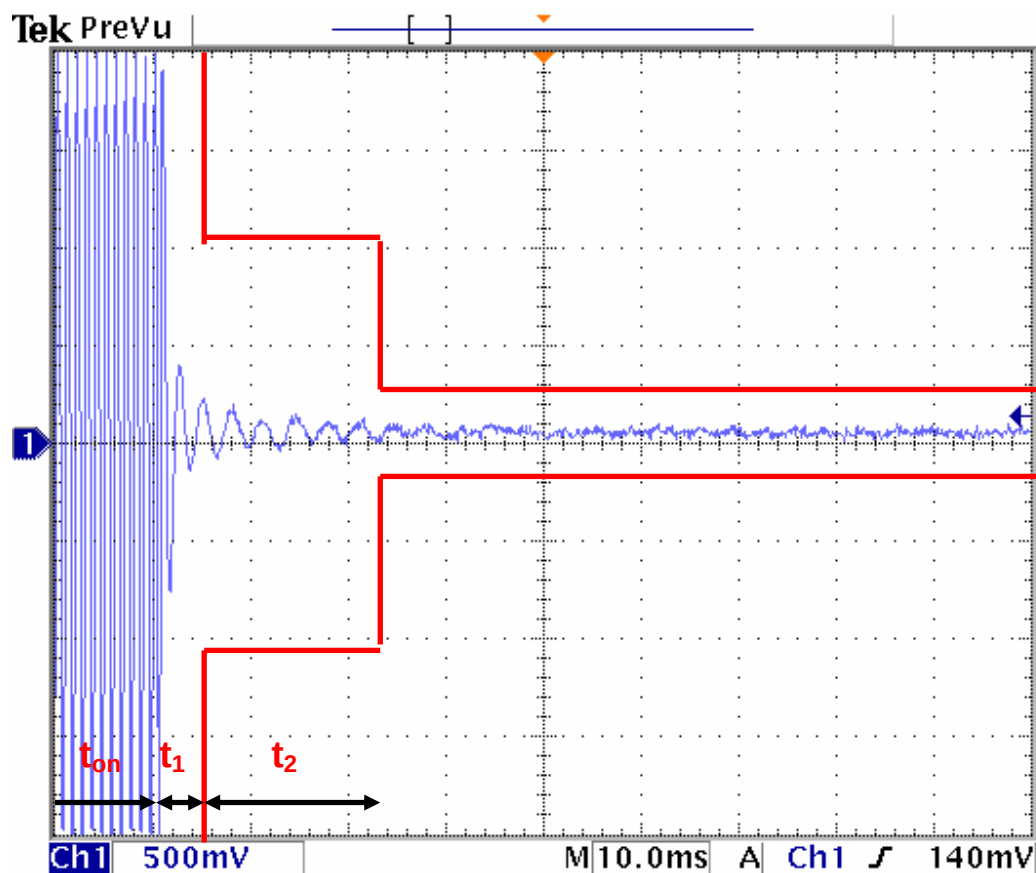
Switch off condition  $t_3, t_{off}$



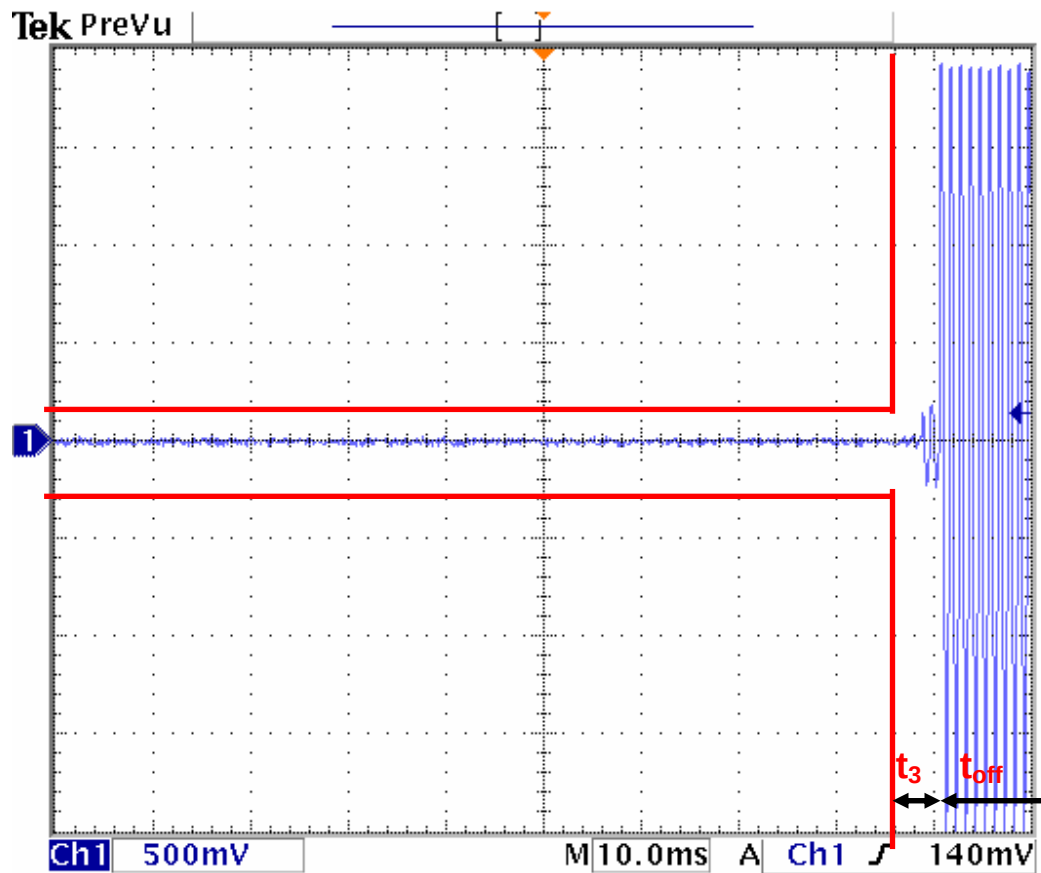
### 5.11.8 Test Plot 2

|                       |                     |
|-----------------------|---------------------|
| FCC Rules :           | Part 90 §90.231     |
| IC Rules :            | RSS-119 Section 5.9 |
| Operating Frequency : | 155.025 MHz         |
| Channel :             | 2nd Channel         |
| Power Output :        | 5 Watts             |
| Channel Spacing :     | Narrow Band         |
| Reference Voltage :   | 7.4 VDC             |

#### 5.11.8.1 Switch on condition $t_{on}$ , $t_1$ and $t_2$



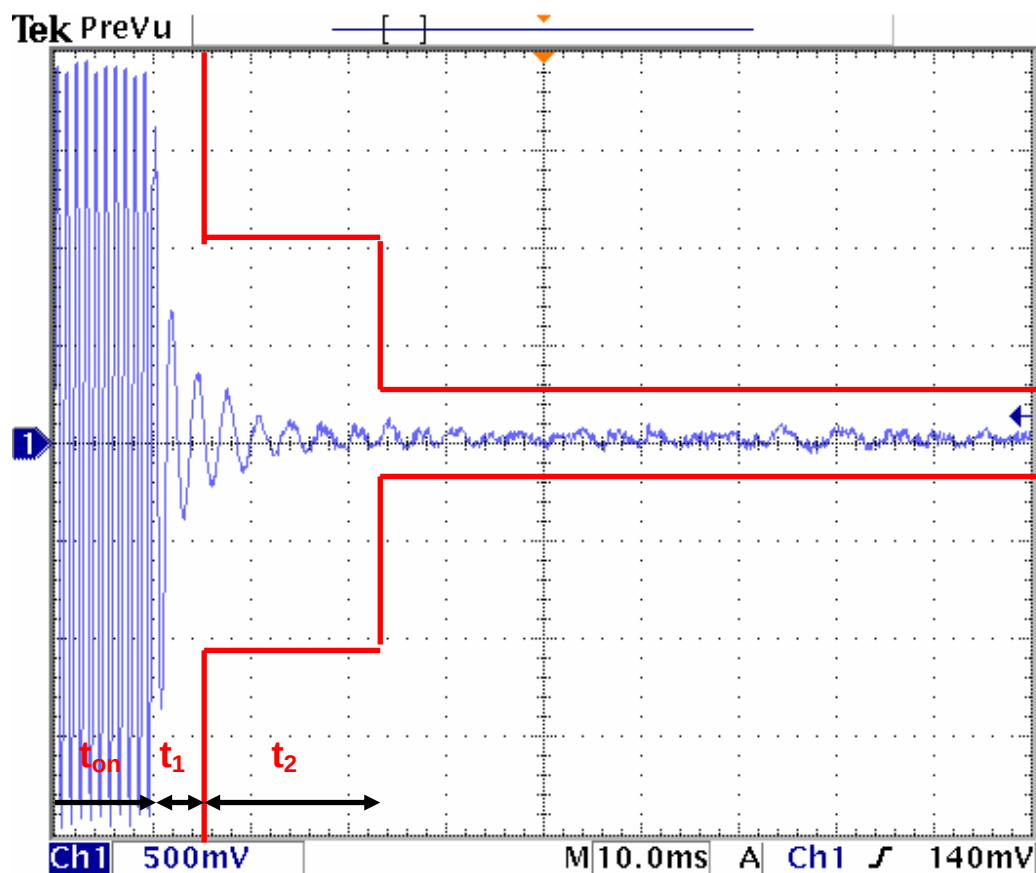
#### 5.11.8.2 Switch off condition $t_3, t_{\text{off}}$



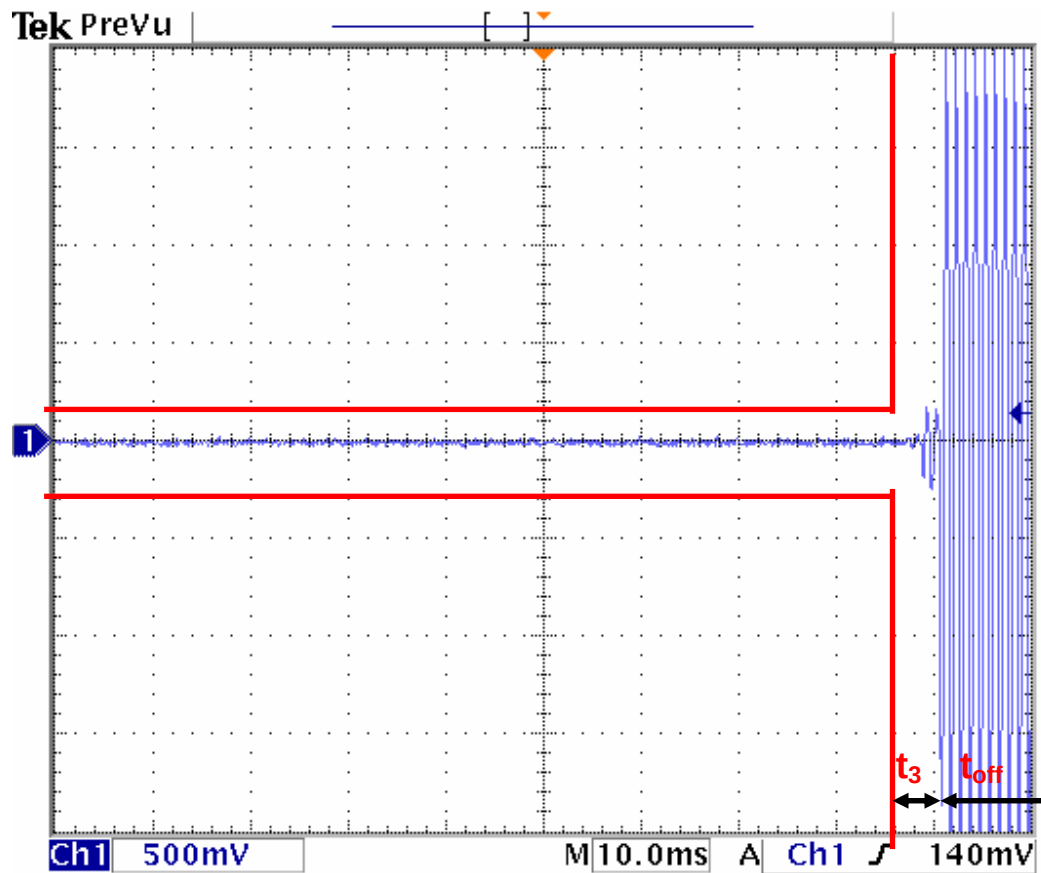
### 5.11.9 Test Plot 3

|                       |                     |
|-----------------------|---------------------|
| FCC Rules :           | Part 90 §90.231     |
| IC Rules :            | RSS-119 Section 5.9 |
| Operating Frequency : | 173.975 MHz         |
| Channel :             | 3rd Channel         |
| Power Output :        | 5 Watts             |
| Channel Spacing :     | Narrow Band         |
| Reference Voltage :   | 7.4 VDC             |

#### 5.9.9.1 Switch on condition $t_{on}$ , $t_1$ and $t_2$



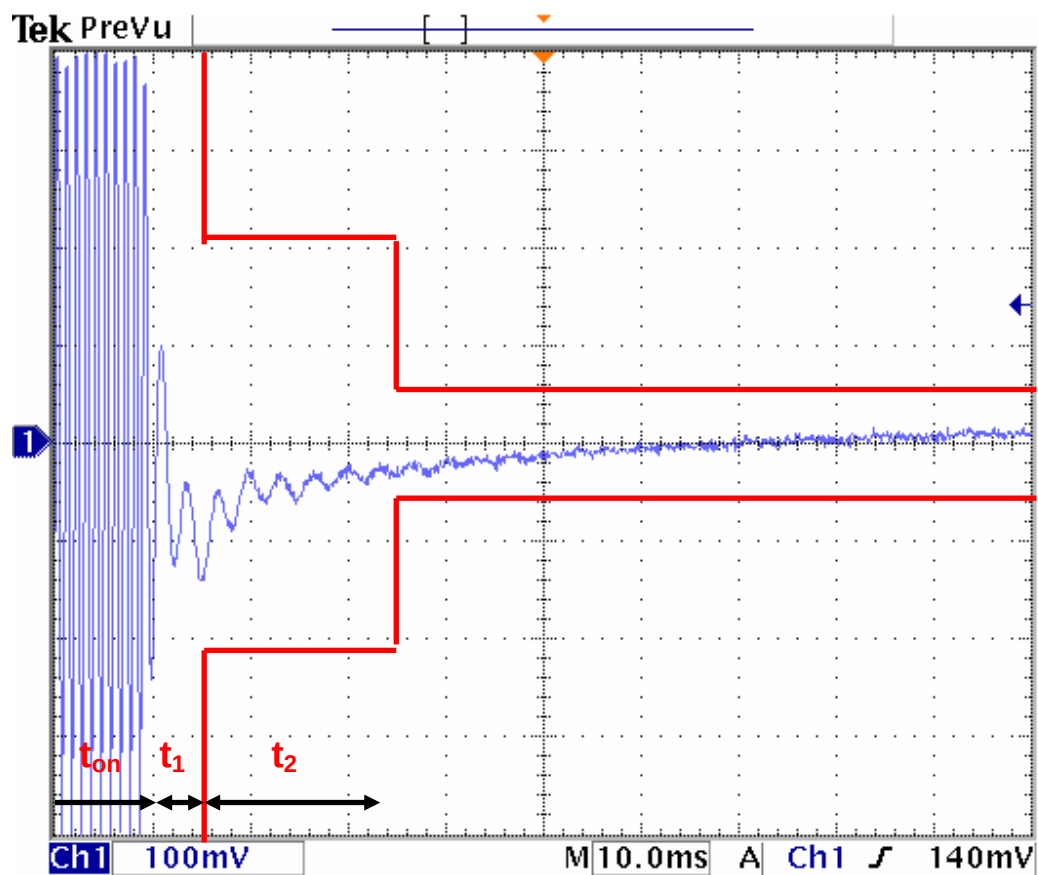
5.11.9.2 Switch off condition  $t_3$ ,  $t_{off}$



### 5.11.10 Test Plot 5

|                       |                     |
|-----------------------|---------------------|
| FCC Rules :           | Part 90 §90.231     |
| IC Rules :            | RSS-119 Section 5.9 |
| Operating Frequency : | 136.025 MHz         |
| Channel :             | 1st Channel         |
| Power Output :        | 5 Watts             |
| Channel Spacing :     | WideBand            |
| Reference Voltage :   | 7.4 VDC             |

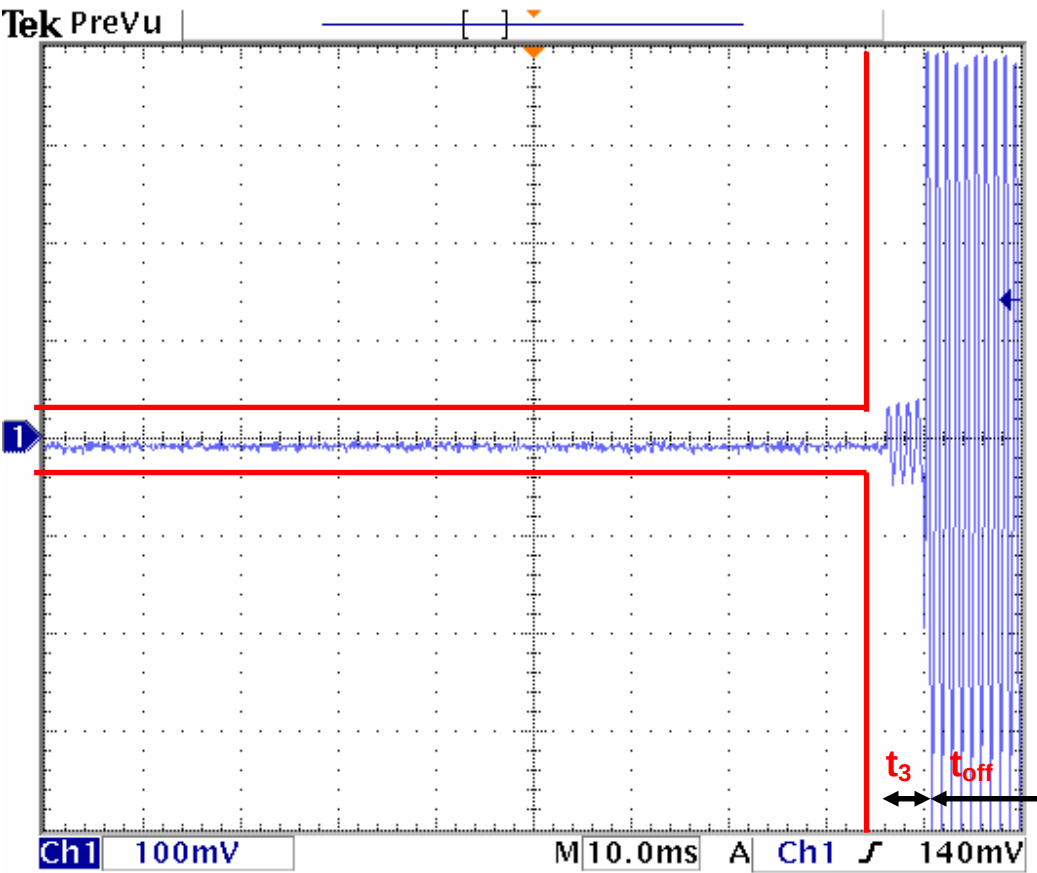
#### 5.11.10.1 Switch on condition $t_{on}$ , $t_1$ and $t_2$





5.11.10.2

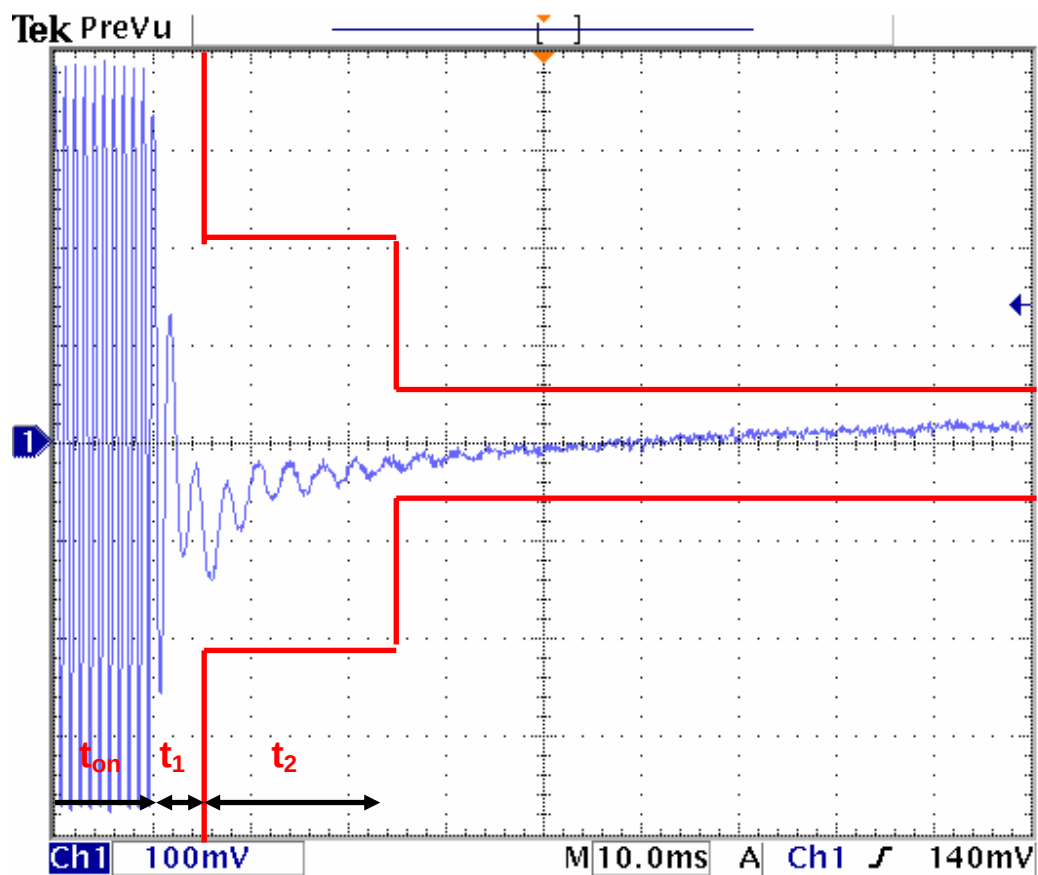
Switch off condition  $t_3, t_{off}$

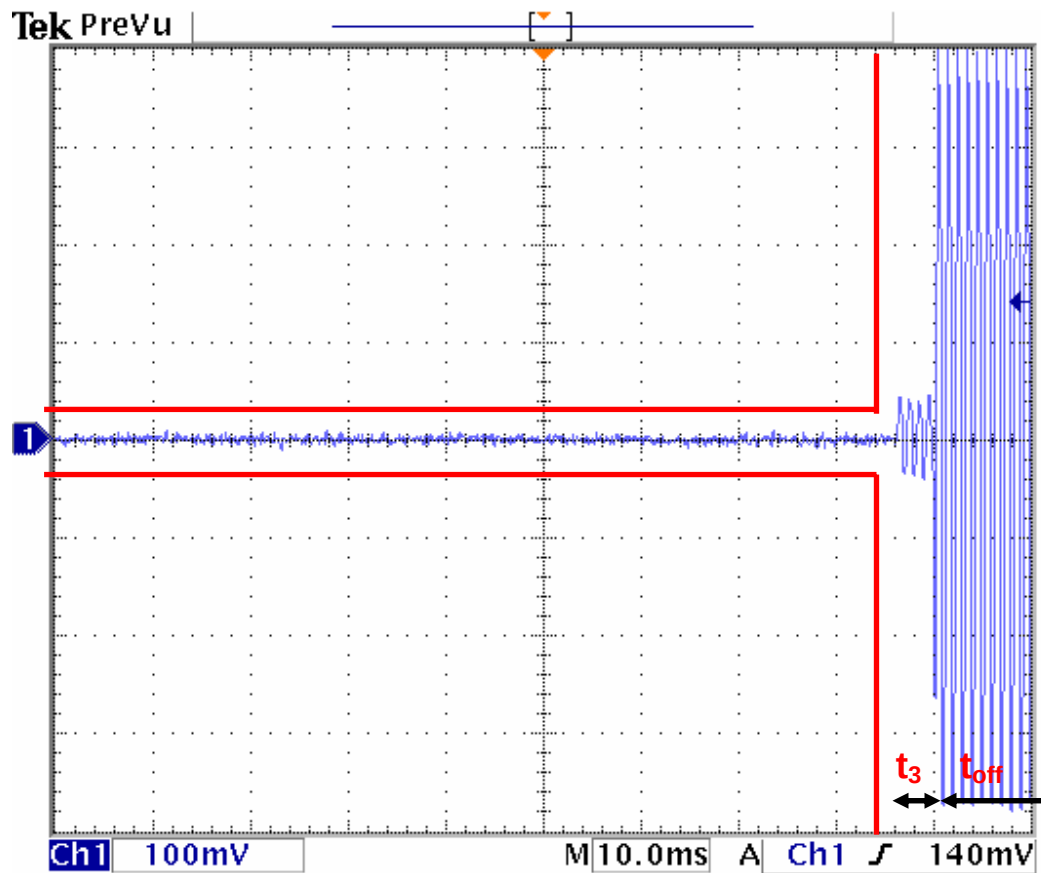


### 5.11.11 Test Plot 6

|                       |                     |
|-----------------------|---------------------|
| FCC Rules :           | Part 90 §90.231     |
| IC Rules :            | RSS-119 Section 5.9 |
| Operating Frequency : | 155.025 MHz         |
| Channel :             | 2nd Channel         |
| Power Output :        | 5 Watts             |
| Channel Spacing :     | WideBand            |
| Reference Voltage :   | 7.4 VDC             |

#### 5.11.11.1 Switch on condition $t_{on}$ , $t_1$ and $t_2$

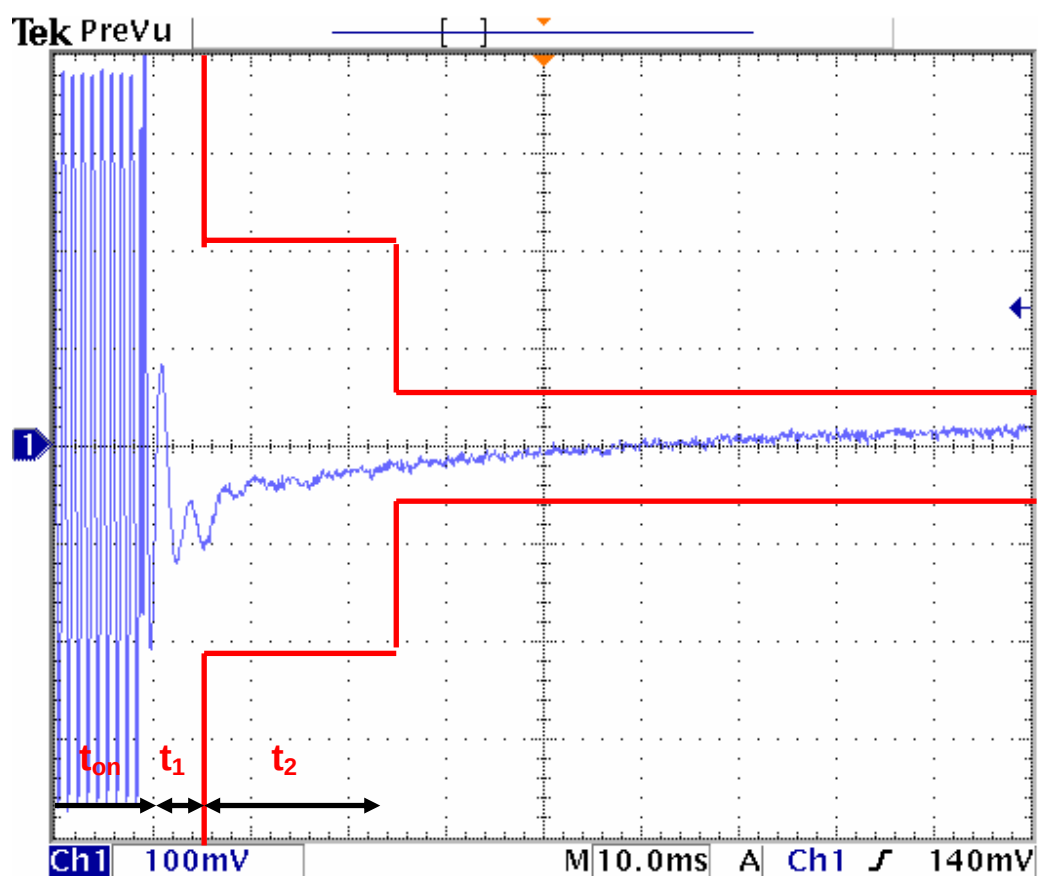




### 5.11.12 Test Plot 7

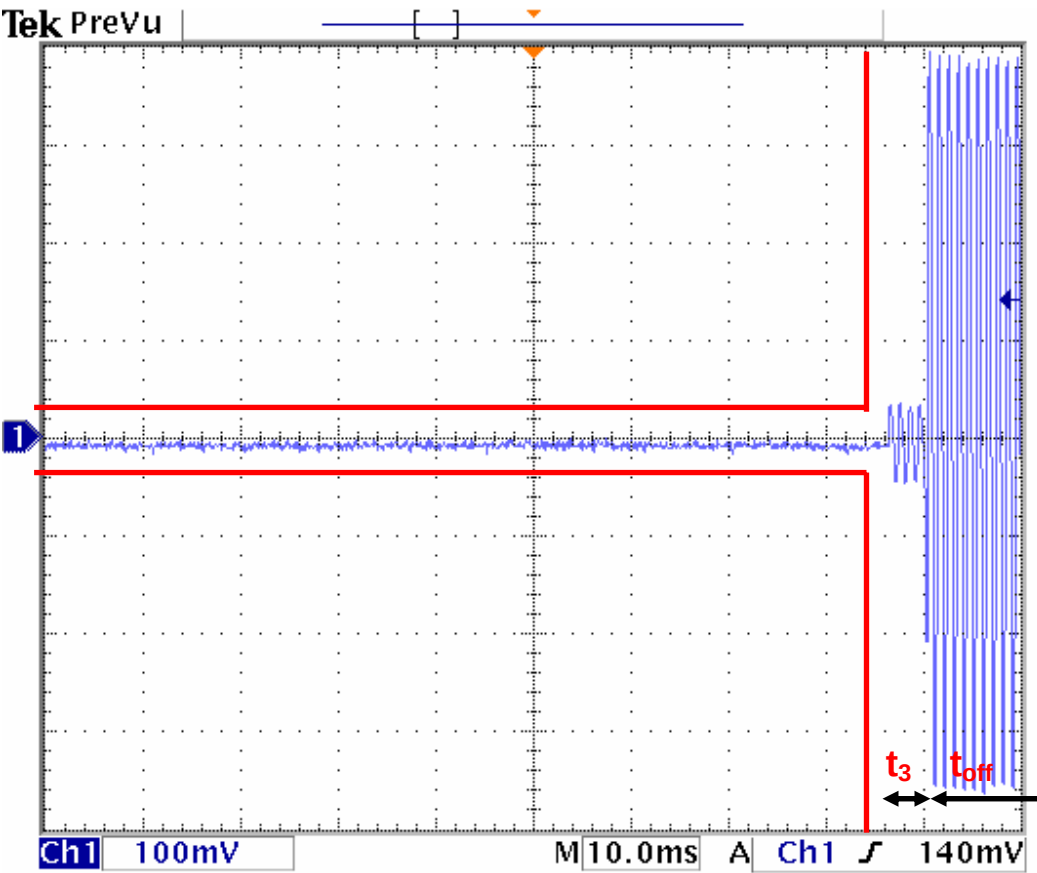
|                       |                     |
|-----------------------|---------------------|
| FCC Rules :           | Part 90 §90.231     |
| IC Rules :            | RSS-119 Section 5.9 |
| Operating Frequency : | 173.975 MHz         |
| Channel :             | 3rd Channel         |
| Power Output :        | 5 Watts             |
| Channel Spacing :     | WideBand            |
| Reference Voltage :   | 7.4 VDC             |

#### 5.11.12.1 Switch on condition $t_{on}$ , $t_1$ and $t_2$



5.11.12.2

Switch off condition  $t_3, t_{off}$



## 6. TEST EQUIPMENTS LIST

|    | EQUIPMENT                         | MODEL       | MANUFACTURE        | SERIAL NUMBER   | Calibration Due date |
|----|-----------------------------------|-------------|--------------------|-----------------|----------------------|
| 1  | Receiver                          | ESVS30      | Rohde & Schwarz    | 832854/010      | 06/22/08             |
| 2  | Spectrum analyzer                 | FSP7        | Rohde & Schwarz    | 100001          | 02/22/09             |
| 3  | Signal Generator                  | E4432B      | Agilent            | US40053157      | 07/15/08             |
| 4  | Signal Generator                  | E4438C      | Agilent            | MY45091894      | 06/22/08             |
| 5  | Signal Generator                  | GT9000      | Gigatronics        | 9604010         | 02/22/09             |
| 6  | Signal Generator                  | 2022D       | Marconi Instrument | 119157/001      | 11/14/2008           |
| 7  | Signal Generator                  | 2030D       | Marconi Instrument | 119330/022      | 11/16/2008           |
| 8  | Modulation Analyzer               | 8901B       | Agilent            | 3028A03124      | 02/22/09             |
| 9  | Audio Analyzer                    | 8903B       | Agilent            | 3011A09344      | 02/22/09             |
| 10 | Digital Oscilloscope              | TDS3032     | Tektronix          | B019436         | 11/20/08             |
| 11 | Frequency Counter                 | R5372       | Advantest          | 41855204        | 02/22/09             |
| 12 | Shield Room<br>(7m x 4m x 3m)     | N/A         | SJEMC              | 0004            | N/A                  |
| 13 | Turn Table                        | OSC-30      | N/A                | BWS-01          | N/A                  |
| 14 | Antenna Mast                      | JAC-3       | Dail EMC           | N/A             | N/A                  |
| 15 | Temperature &<br>Humidity chanber | EN-GLMP-54  | Enex               | N/A             | 03/21/09             |
| 16 | Bilog Antenna                     | VULB9160    | Schwarzbeck        | VULB9160-3122   | 12/29/08             |
| 17 | Bilog Antenna                     | VULB9161    | Schwarzbeck        | VULB9161-4067   | 12/23/08             |
| 18 | Bilog Antenna                     | VULB9161    | Schwarzbeck        | VULB9161-4068   | 12/23/08             |
| 19 | Horn Antenna                      | BBHA 9120 D | Schwarzbeck        | BBHA 9120 D 517 | 05/09/08             |
| 20 | Horn Antenna                      | BBHA 9120 D | Schwarzbeck        | BBHA 9120 D 234 | 03/15/09             |
| 21 | Horn Antenna                      | BBHA 9170   | Schwarzbeck        | BBHA9170157     | 02/13/09             |
| 22 | Power Meter                       | E4418A      | Agilent            | GB38272621      | 11/14/08             |
| 23 | Power Sensor                      | E9301B      | Agilent            | US40010238      | 11/14/08             |
| 24 | Power supply                      | IPS-30B03DD | Interact           | 42052           | 03/20/09             |
| 25 | Directional Coupler               | 778D        | Agilent            | 1144A08477      | 11/14/08             |
| 26 | Power Divider/Combiner            | 11636A      | Agilent            | 05774           | 11/14/08             |
| 27 | Power Divider/Combiner            | 11636A      | Agilent            | 05870           | 11/14/08             |