

Report No.:990715  
Client: Listen Technologies Co.  
FCC ID : OMD800-216

October 19, 1999

# **TEST REPORT**

**According to FCC Part 95 Subparts E,G**

**for**

**LOW POWER RADIO SERVICES (LPRS)**

**STATIONARY TRANSMITTING SYSTEMS**

**MODEL: LT-800**

**Prepared for:**

**LISTEN TECHNOLOGIES Corporation  
1762A Prospector Avenue  
Park City, Utah 84060**

**Prepared by**

**JMR Compliance Engineering  
20400 Plummer Street  
Chatsworth, CA 91311  
Phone: 818-993-4801**

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## **PREFACE**

This report describes the results of measurements made on the Low Power Radio Service (LPRS) STATIONARY TRANSMITTERS which falls under the class of intentional radiator by the FCC Part 95 Rules and Regulations.

This EUT is designated: **LPRS Stationary Transmitter - Assistive  
Listening System**  
Model: **LT-800**

The LT-800 is designed and manufactured by Listen Technologies Corporation.

The EUT was tested in full compliance with the FCC Regulations using the methods of FCC Part 95 and Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”. The results of the testing indicate that the LPRS STATIONARY TRANSMITTER LT-800 met the Part 95 limits and requirements.

## 1.0 CERTIFICATION OF TEST DATA

### Certification

The data, data evaluation and equipment configuration represented herein are a true and accurate representation of the test sample (EUT), and measurements obtained as of the dates and the times of the test under the conditions specified and to the methods of FCC Part 95 and Part 2 "Frequency Allocations and Radio Treaty Matters; General Rules and Regulations".

All measurements are traceable to the National Institute of Standards and Technology (NIST).

The test results provided with this report, indicate that the equipment tested:

**Model: LT-800 is compliant** with the following Rules and Regulations:

- A. 47 Code of Federal Regulations, Part 95, Subpart E and G : 10-1-98 Edition
- B. 47 Code of Federal Regulations, Part 2, LPRS transmitters: 10-1-98 Edition

Tests performed by:

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Vlad Shapiro  
EMC Technician

Report approved by:



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Leon Kogan  
Technical Director,  
JMR Compliance Engineering

## **2.0 GENERAL INFORMATION**

### **2.1 Client Information**

Company Name: Listen Technologies Co.  
Contact: Keldon Paxman  
Company Address: 1762A Prospector Avenue  
Park City, Utah 84060  
Phone: (435) 647-0318

### **2.2 Administrative Data**

Device tested: LPRS Stationary Transmitter  
Model: LT-800  
Accessories: N/A  
Expository Statement: This device is designed to operate as LPRS transmitter  
Purpose of test: Demonstrate compliance with FCC Rules, Part 95,  
Subparts E and G  
Date of test: 10/20/99  
Place of the test: JMR Electronics, Inc.  
Compliance Engineering Laboratory  
20400 Plummer Street  
Chatsworth, CA 91311  
Phone: 818-993-4801

### **3.0 EQUIPMENT UNDER TEST (EUT)**

#### **3.1 EUT Nomenclature**

|                    |                             |
|--------------------|-----------------------------|
| Manufacturer:      | Listen Technologies Co.     |
| Model No. ( type ) | LT-800                      |
| Serial No.         | N/A                         |
| Equipment category | LPRS Stationary Transmitter |

#### **3.2 Brief Description of EUT**

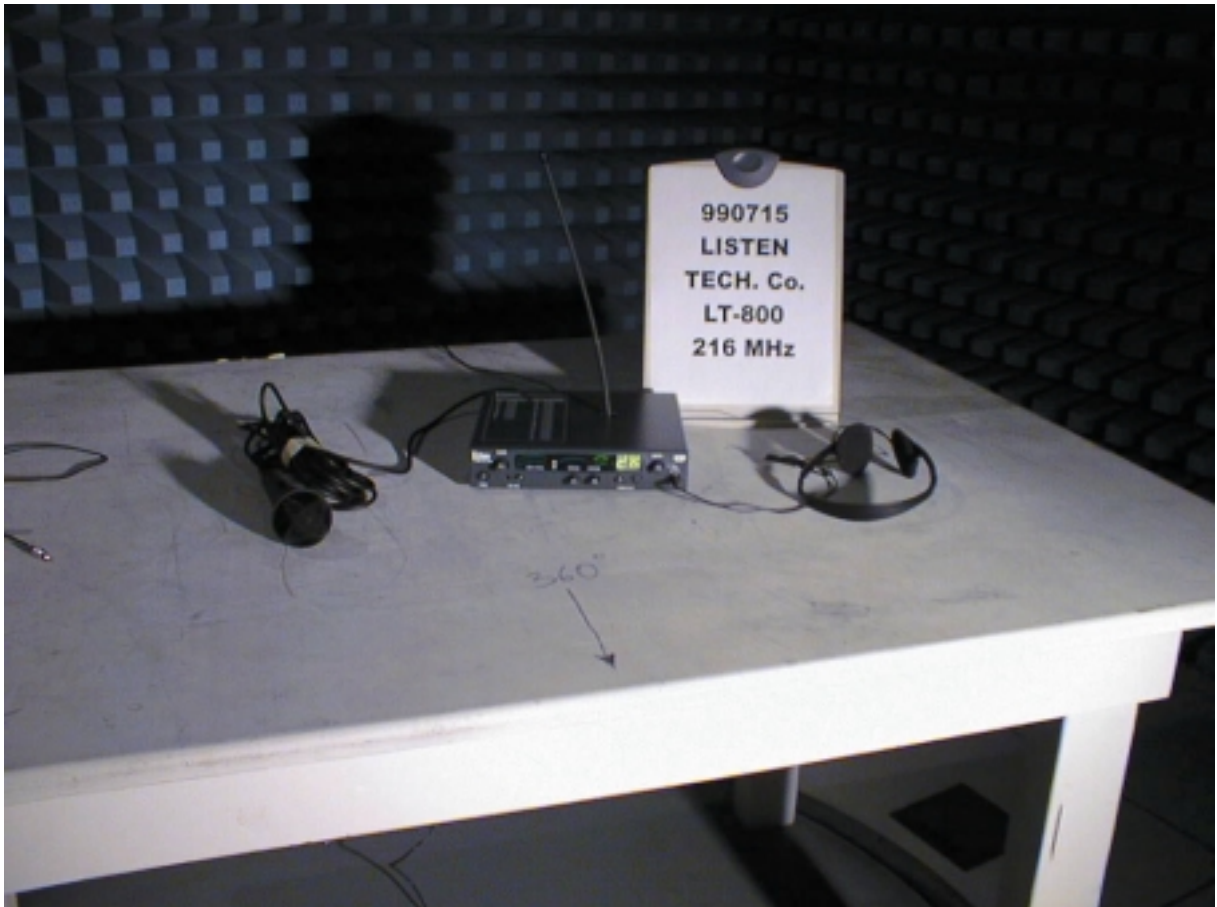
The LT-800 is the LPRS Stationary Transmitter with RF frequency range 216.025 – 216.975 MHz designed to help enhance the ability to hear for hard of hearing people and to use for many other applications including tour group communications and language translation.

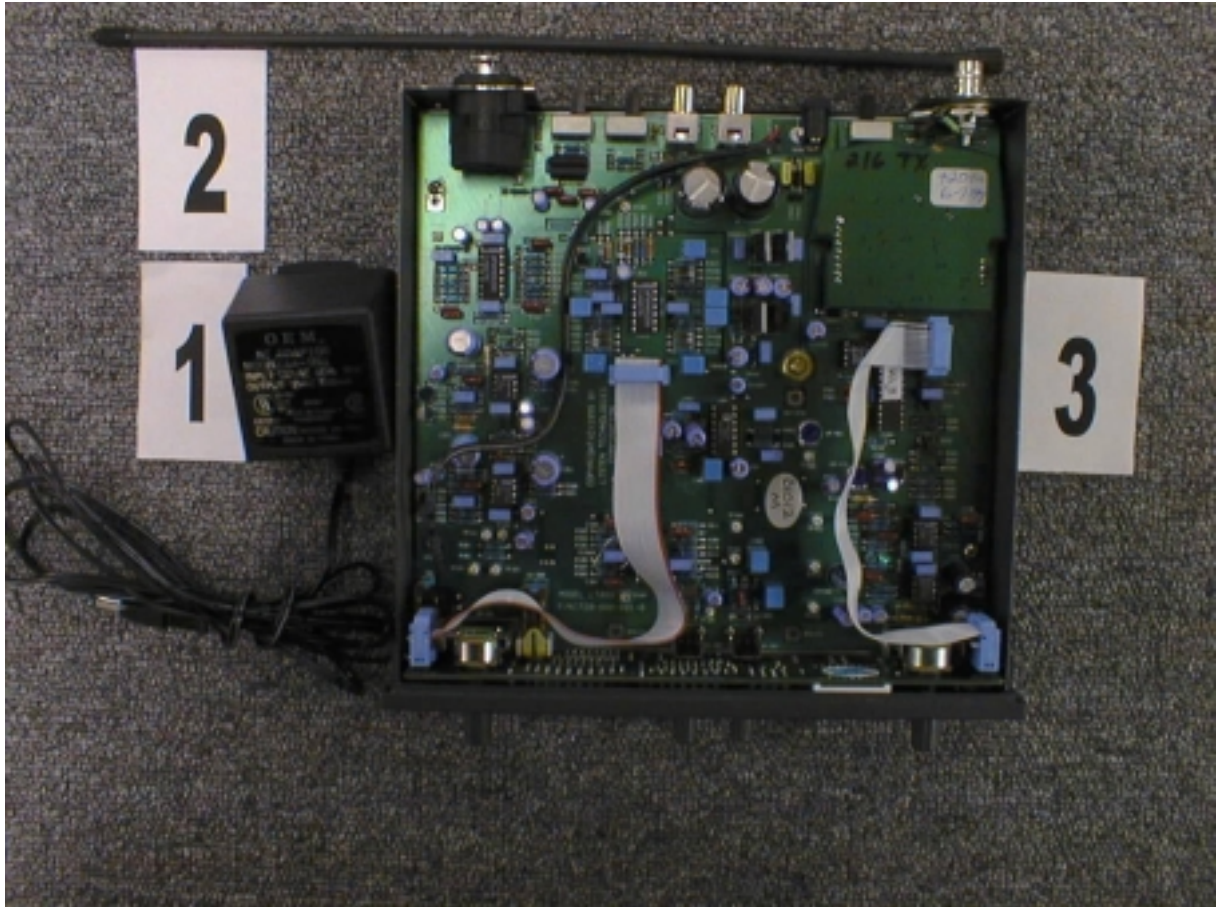
The LT-800 was configured as an independent module and was tested with Rubber Ducky, Directional Antenna and Micriphone, Speaker connected. The modulation frequency was provided by external Test Oscilator

**Operating Frequency:** 216.025 – 216.975 MHz

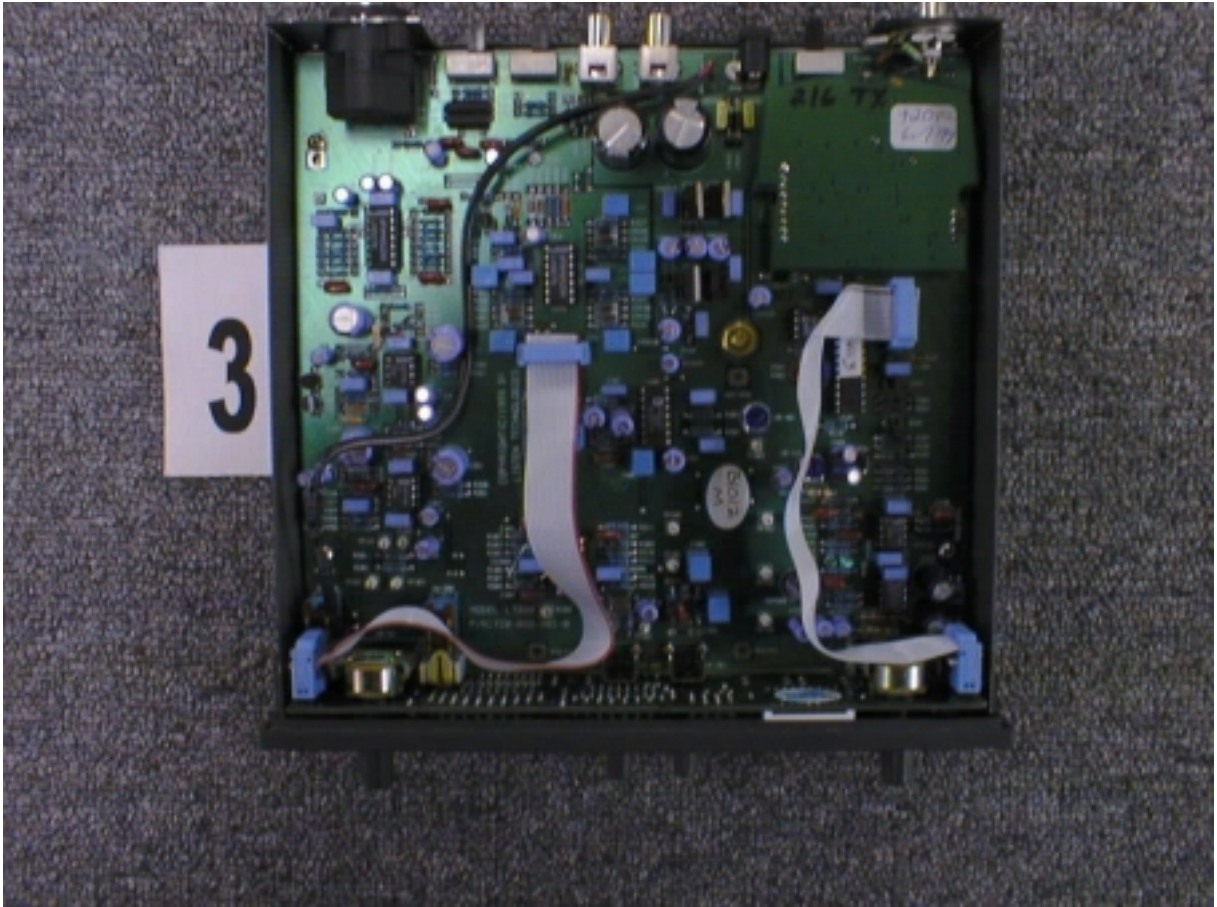
**Power Supply:** External, 12VDC 830 mA  
OEM, AC Adapter, Model : AA-1283

### 3.3 Photographs of EUT





- 1 - AC-DC OEM Power Adaptor
- 2 - Rubber Ducky antenna
- 3 - LT-800 unit without cover



3 - LT-800 unit without cover

### 3.4 Support Equipment List

|            |                                      |
|------------|--------------------------------------|
| Equipment  | OEM , AC Adapter                     |
| Model No.  | AA-1283                              |
| Serial No. | N/A                                  |
| Equipment  | Microphone                           |
| Model No.  | 33-3018 OPTIMUS                      |
| Serial No. | N/A                                  |
| Equipment  | Speaker                              |
| Model No.  | Broadcast Vision                     |
| Serial No. | N/A                                  |
| Equipment  | Test Oscillator                      |
| Model No.  | 651B Test Oscillator, Hewlett Pakard |
| Serial No. | 1230AO8435                           |

### 3.5 Cabling Configuration Power Cords:

|           |                      |
|-----------|----------------------|
| Unit      | AC Adapter to LT-800 |
| MFG       | Generic              |
| Shielded? | No                   |
| Length    | 1.9 m                |
| Unit      | 651B Test Oscillator |
| MFG       | Generic              |
| Shielded? | No                   |
| Length    | 2 m                  |

### I / O Cables External:

|            |                      |
|------------|----------------------|
| Connection | LT-800 to Microphone |
| MFG        | Generic              |
| Shielded?  | No                   |
| Length     | 6.1 m                |

|            |                                |
|------------|--------------------------------|
| Connection | LT-800 to Speaker              |
| MFG        | Generic                        |
| Shielded?  | No                             |
| Length     | 1.3 m                          |
| Connection | LT-800 to 651B Test Oscillator |
| MFG        | RG-174U                        |
| Shielded?  | Yes                            |
| Connector  | BNC                            |
| Length     | 0.6 m                          |

### **3.6 EUT Modifications**

**None**

### **3.7 Photographs of EUT Modification**

**N/A**

### **3.8 EUT Labeling per FCC Requirements**

Each LPRS transmitting device shall bear the following statement in a conspicuous location on the device :

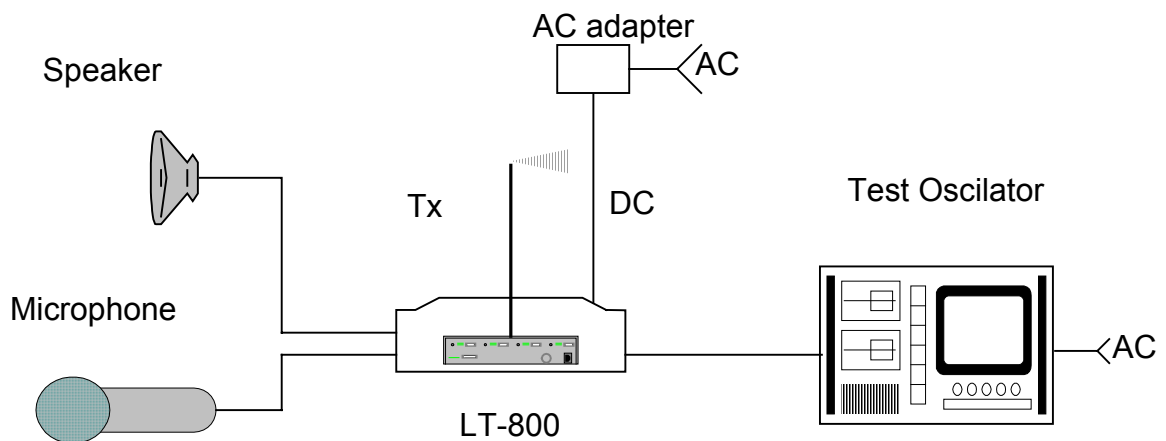
**"This device may not interfere with TV reception or federal government radar, and must accept any interference received, including interference that may cause undesired operation"**

## 4.0 TEST PROCEDURE AND CONFIGURATION

### 4.1 Test Specifications

|                |                                                                                                                                              |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Specification: | FCC 47 CFR, FCC Part 95                                                                                                                      |
| Title:         | Code of Federal Regulations, Telecommunications<br>Part 95 : Personal Radio Services                                                         |
| Specification: | FCC 47 CFR, FCC Part 2                                                                                                                       |
| Title          | Code of Federal Regulations, Telecommunications<br>Part 2 : Frequency Allocations and Radio Treaty<br>Matters; General Rules and Regulations |

### 4.2 Block Diagram of EUT Set-up for the Test



**4.3. Procedure of RF Power Output, Unwanted radiation, Radiated Emission, Modulation Characteristics, Spurious Emissions, Field Strength of Spurious Radiation, Occupied Bandwidth , Frequency Stability Tests**

The EMC test facility consists of a shielded semi-anechoic chamber with attached shielded control room. The semi-anechoic chamber is approximately 18 feet wide by 28 feet long by 19 feet high. A hybrid absorber combines high performance anechoic polyurethane foam with a ferrite tile base to achieve high levels of absorption and power dissipation capability.

The test site is designed according to the ANSI 63.4 -1992 requirements and the anechoic treatment of the chamber is sufficient to achieve the requirements of CISPR 22 and ANSI C63.4. The test site description along with the site attenuation data has been filed with the FCC and a letter of compliance with the requirements of Section 2.948 of the FCC Rules was issued on August 20,1998 by the FCC.

The EUT was tested in compliance with FCC Part 95 Subparts E and G requirements. All data was obtained via the HP 85876A EMI measurement software package using the HP 85462A Receiver.

The LT-800 was configured as an independent module and was tested with Rubber Ducky, Directional Antenna and Microphone, Speaker connected. The modulation frequency was provided by external Test Oscillator (for all tests except RF Power Output and Unwanted Radiation).

EUT operated as a Stationary LPRS Transmitters on the frequencies of the selected channels. Standard band 1A, 1K, 1V and extra band 2A, 2K, 2V channels were chosen as the testing channels.

For all tests except Field Strength of Spurious Radiation the LT-800 was connected directly to the HP 85462A Receiver. Field Strength of Spurious Radiation and Spurious Radiation tests were monitored from the EUT over a frequency range of 30 MHz to 2900 MHz.

The above mentioned set-up allowed the article to perform sufficiently for the test purposes and required time.

Field Strength of Spurious Radiation test were monitored from the EUT over a frequency range of 30 MHz to 2900 MHz in horizontal polarization with the scanning antenna repeatedly moving from 1 to 4 meters in elevation while the turntable rotated through a 360 degree arc. This procedure was then repeated in vertical polarization to confirm the strongest signals and polarization orientation. This part of the test

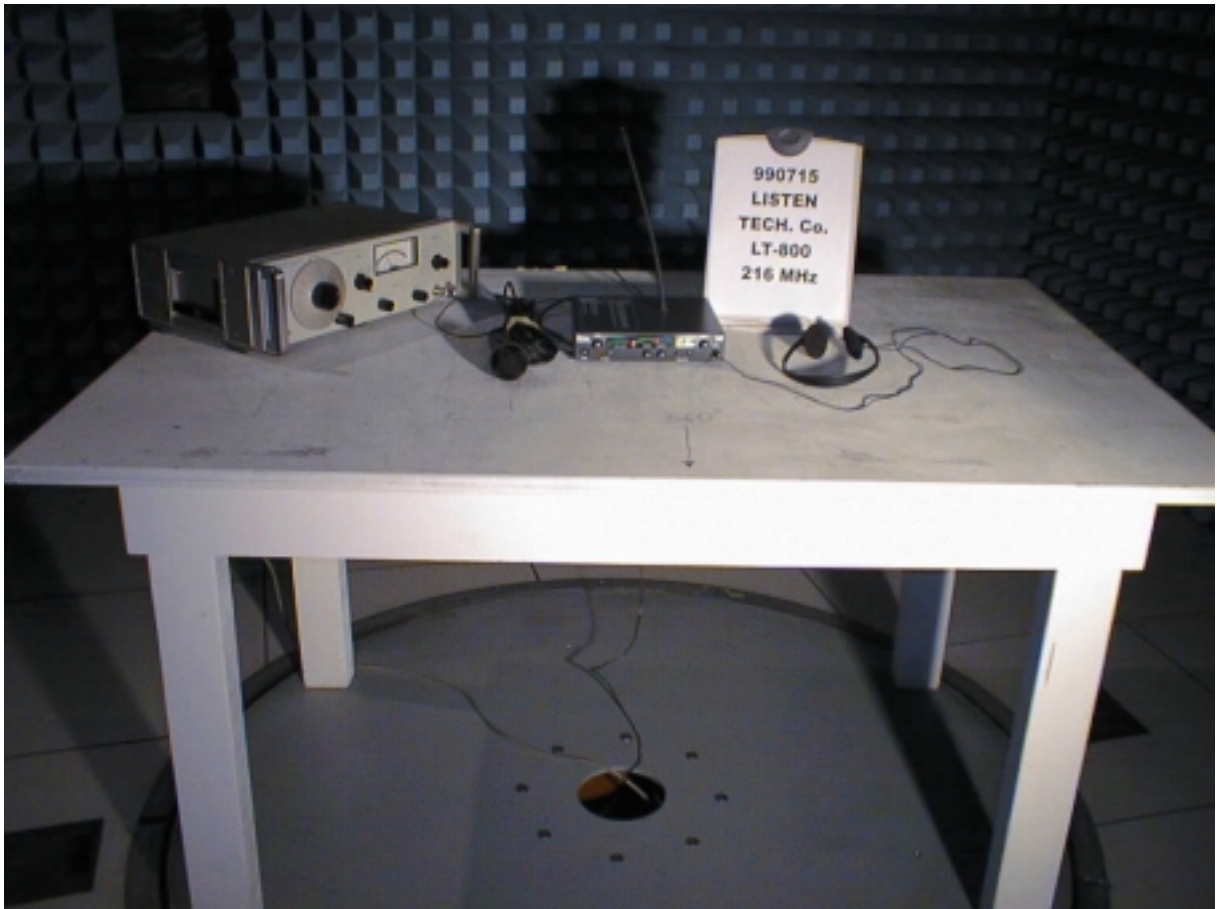
sequence the spectrum check is done in a manual mode.

Frequency stability test was done with variation of ambient temperature from 0° to +50° centigrade and with variation primary supply voltage from 85 to 115 percent of the nominal AC value for the selected standard band channel 1A and extra band channel 2A.

#### 4.4 TEST EQUIPMENT USED

| Device                            | Model No.                                      | Serial No.       | Last Cal. | Next Cal |
|-----------------------------------|------------------------------------------------|------------------|-----------|----------|
| Cable 1                           | 8214                                           | CBL-006          | 6/21/99   | 6/21/00  |
| Analyzer                          | HP85462A                                       | 3325A00120       | 4/01/99   | 4/01/00  |
| Cable 2                           | 8268                                           | CBL-002          | 6/21/99   | 6/21/00  |
| Preselector                       | HP85460A                                       | 3330A00117       | 4/01/99   | 4/01/00  |
| Qpeak Adapter                     | HP85462 Internal                               | Internal         | 4/01/99   | 4/01/00  |
| Pre-Amplifier                     | None                                           |                  |           |          |
| Tower 1                           | EMCO 1050                                      | 9310-1786        | N/A       | N/A      |
| Turntable 1                       | EMCO 1060                                      | 9409-1753        | N/A       | N/A      |
|                                   |                                                |                  |           |          |
| Bilog Antenna                     | 11966P 30-1000 MHz                             | 1167             | 8/20/99   | 8/20/00  |
| DRG Horn Antenna                  | SAS-200/571<br>1-18 GHz                        | 175              | 8/20/99   | 8/20/00  |
| Shielded Semi-Anechoic Chamber    | RANTEC                                         | N/A              | 9/10/99   | 9/10/00  |
| Attenuator                        | Attenuator 10dB<br>WEINSCHEL<br>MODEL 33-10-34 | 10 dB Attenuator | 08/18/99  | 08/18/00 |
| Temperature and Humidity Recorder | Dickson<br>TH8-24C                             | 5097755          | 9/27/99   | 3/27/00  |
| Power Analysis System             | Xitron<br>2503 AHF                             | 25035921001      | 12/17/98  | 12/17/99 |
| AC Power Source                   | Behlman<br>ACP3000-100                         | N/A              | N/A       | N/A      |
| 16 Channel Thermocouple Monitor   | Stanford<br>Research<br>Systems<br>Sr630       | 34202            | 12/17/98  | 12/17/00 |

#### 4.5 Photographs of Test Setup



## 5 TEST RESULTS

The measurements expanded uncertainty equals 2.2. dB with 95% confidence level.

Room Ambient Temperature: 21°C±1°C

Relative Humidity: 47%±5%

### 5.1 RF POWER OUTPUT TEST

**This test was performed in compliance with FCC Regulations using the methods of 2.1046 FCC Part 2.**

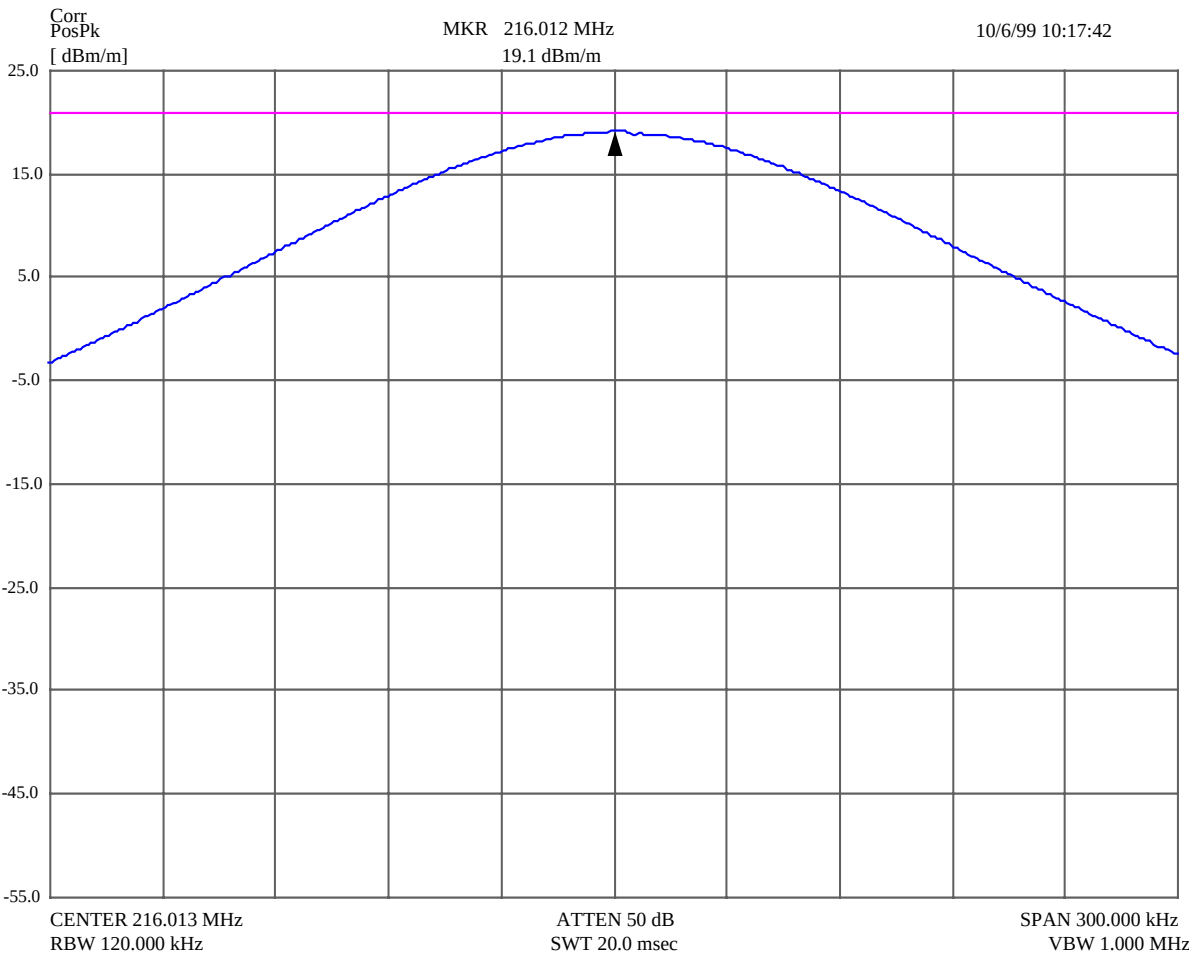
Below is the Peak measurements of the highest value RF POWER OUTPUT signals observed at the frequency of the selected channels.

#### Channel 1A

##### Peak value

| Frequency<br>MHz | Peak<br>dBm | Peak Lmt<br>dBm | DelLim-Pk<br>dB | Status | Comment |
|------------------|-------------|-----------------|-----------------|--------|---------|
| 216.0125         | 19.13       | 21.01           | -1.88           | PASS   |         |

Receiver (Graphic)

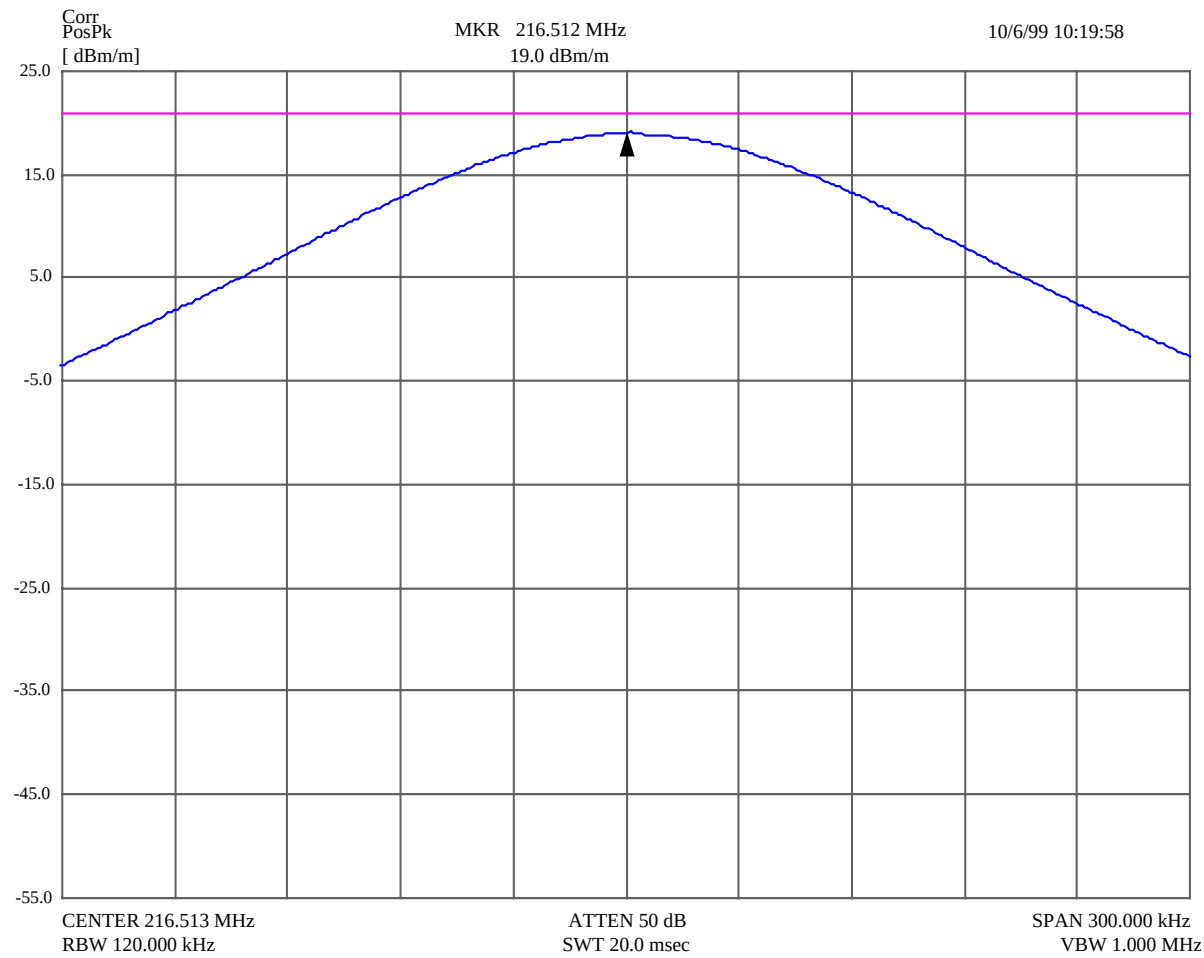


Channel 1K

Peak value

| Frequency<br>MHz | Peak<br>dBm | Peak Lmt<br>dBm | DelLim-Pk<br>dB | Status | Comment |
|------------------|-------------|-----------------|-----------------|--------|---------|
| 216.5125         | 19.02       | 21.01           | -1.99           | PASS   |         |

Receiver (Graphic)

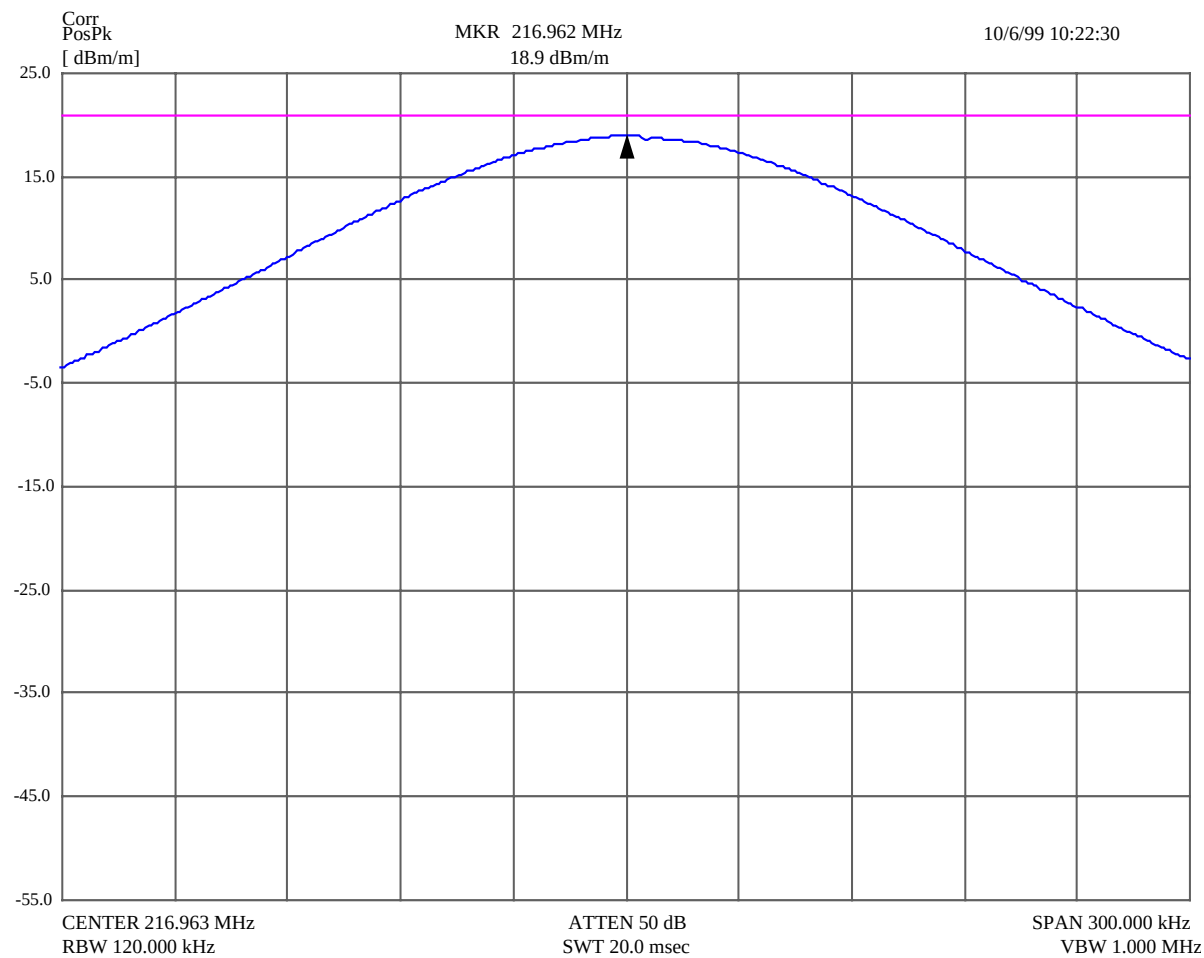


Channel 1V

Peak value

| Frequency<br>MHz | Peak<br>dBm | Peak Lmt<br>dBm | DelLim-Pk<br>dB | Status | Comment |
|------------------|-------------|-----------------|-----------------|--------|---------|
| 216.962496       | 18.95       | 21.01           | -2.06           | PASS   |         |

Receiver (Graphic)

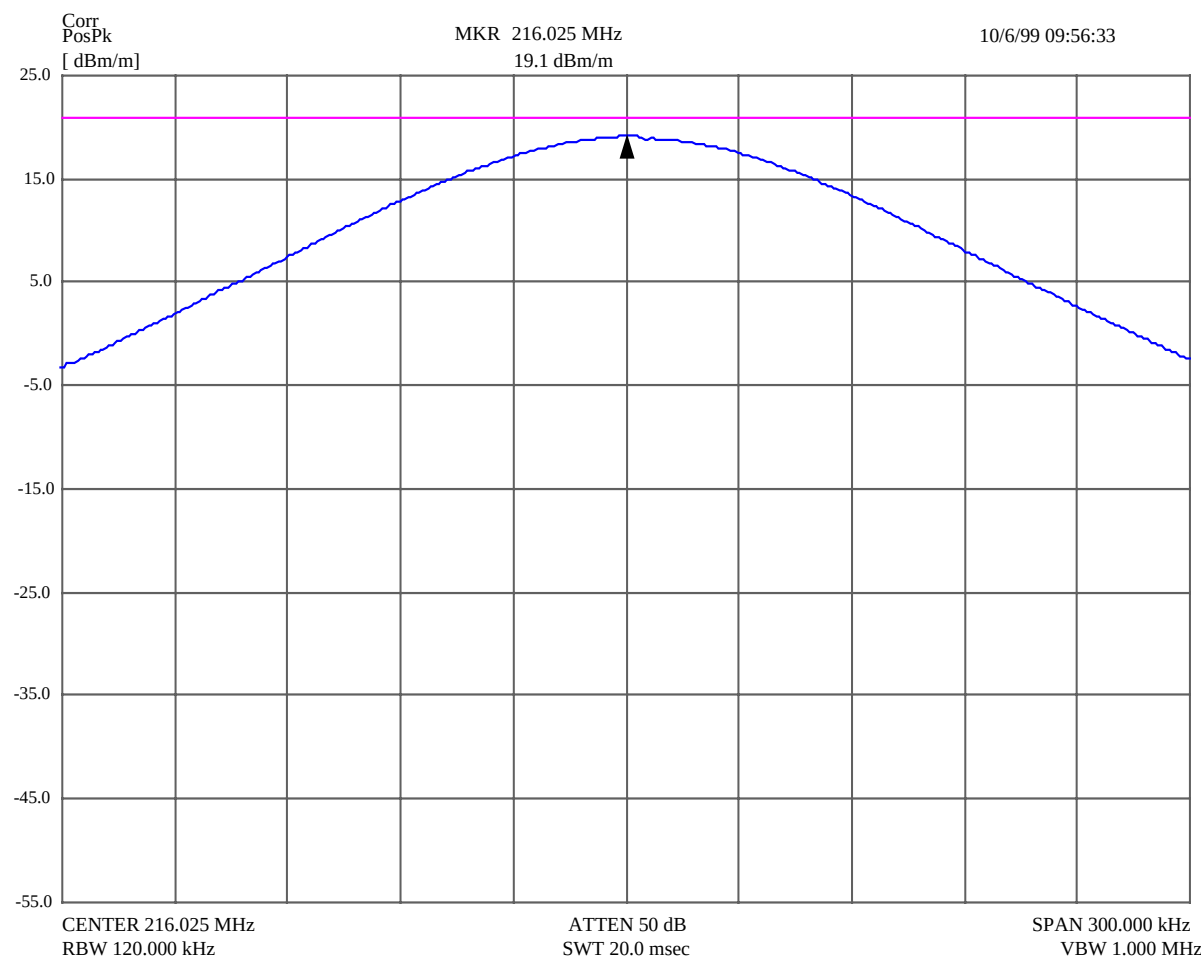


Channel 2A

Peak value

| Frequency<br>MHz | Peak<br>dBm | Peak Lmt<br>dBm | DelLim-Pk<br>dB | Status | Comment |
|------------------|-------------|-----------------|-----------------|--------|---------|
| 216.024992       | 19.13       | 21.01           | -1.88           | PASS   |         |

Receiver (Graphic)

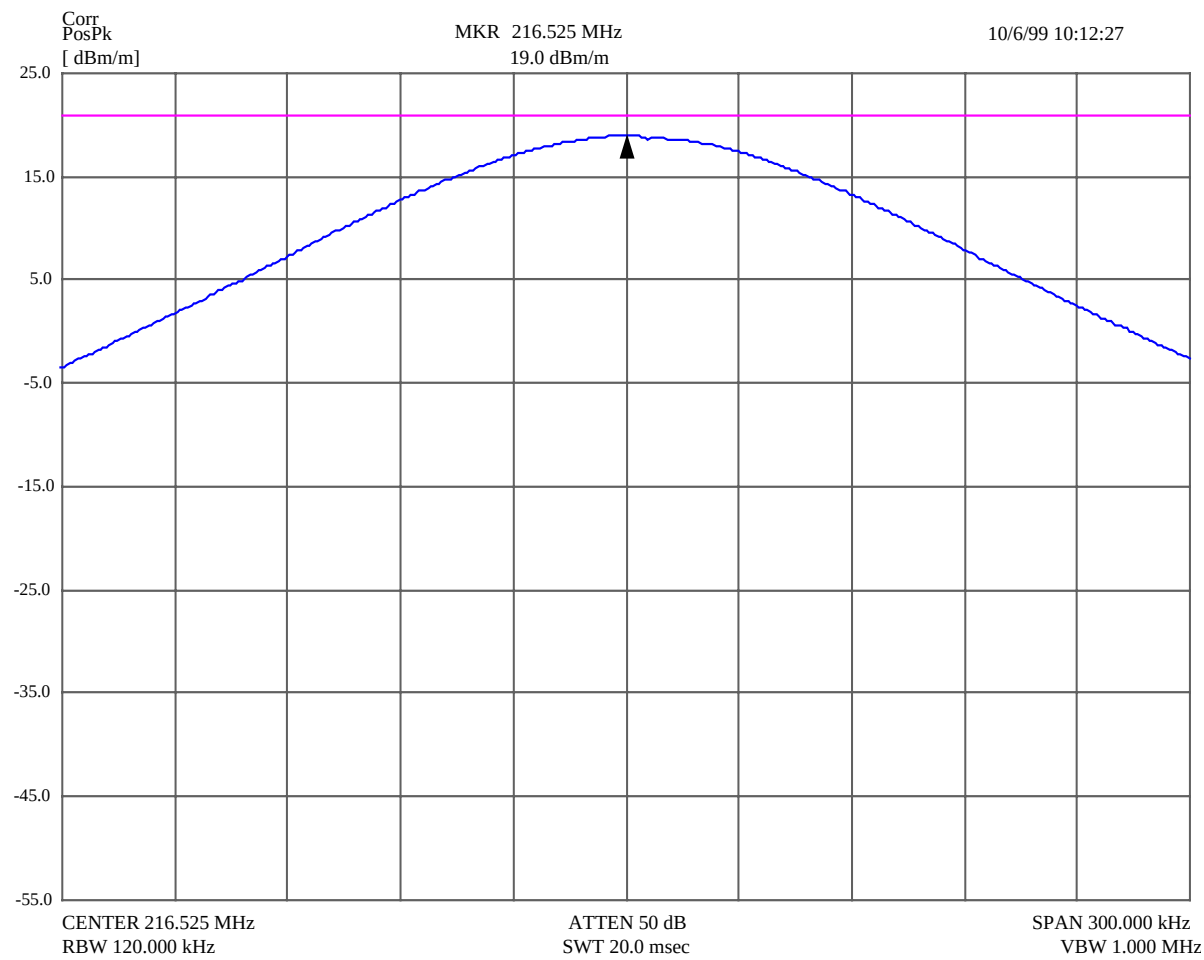


Channel 2K

Peak value

| Frequency<br>MHz | Peak<br>dBm | Peak Lmt<br>dBm | DelLim-Pk<br>dB | Status | Comment |
|------------------|-------------|-----------------|-----------------|--------|---------|
| 216.524992       | 18.99       | 21.01           | -2.02           | PASS   |         |

Receiver (Graphic)

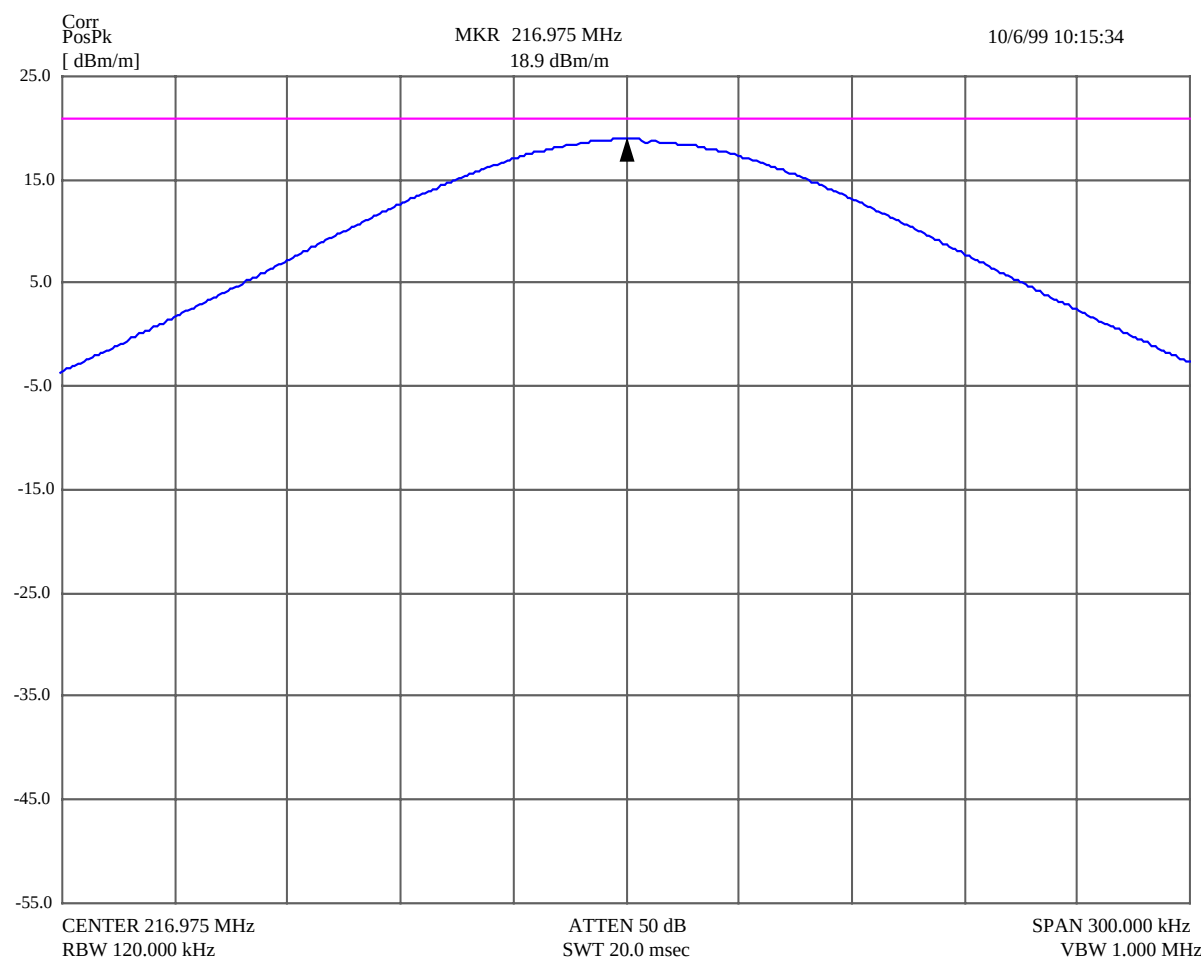


Channel 2V

Peak value

| Frequency<br>MHz | Peak<br>dBm | Peak Lmt<br>dBm | DelLim-Pk<br>dB | Status | Comment |
|------------------|-------------|-----------------|-----------------|--------|---------|
| 216.975008       | 18.92       | 21.01           | -2.09           | PASS   |         |

Receiver (Graphic)



## 5.2. UNWANTED RADIATION TEST

This test was performed in compliance with FCC Regulations using the methods of 95.635 FCC Part 95.

Below is the Peak measurements of the emission value UNWANTED RADIATION signals observed at the frequency carrier of the selected channels.

### Channel 1A

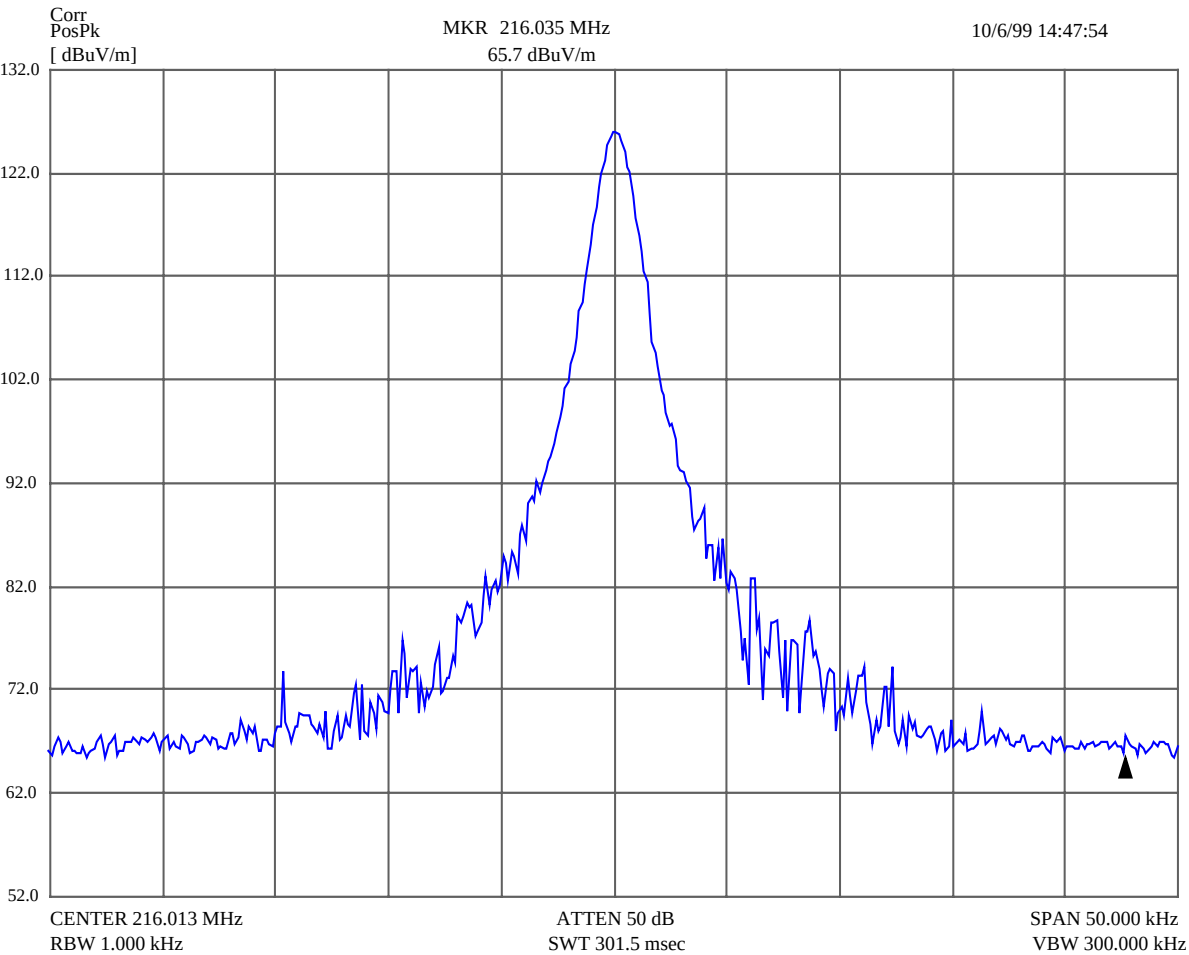
#### Emission values of the unwanted frequencies

| Frequency MHz | Peak dBuV/m | Peak Lmt dBuV/m | DelLim-Pk dB | Status | Comment            |
|---------------|-------------|-----------------|--------------|--------|--------------------|
| 215.989396    | 65.91       | 94              | -28.09       | PASS   | -(12.5...22.5) kHz |
| 215.999120    | 68.56       | 94              | -25.44       | PASS   | > -22.5 kHz        |
| 216.025248    | 67.37       | 94              | -26.63       | PASS   | +(12.5...22.5) kHz |
| 216.035120    | 65.72       | 94              | -28.28       | PASS   | > +22.5 kHz        |

#### Emission value of the frequency carrier

| Frequency MHz | Peak dBuV/m | Peak Lmt dBuV/m | DelLim-Pk dB | Status | Comment  |
|---------------|-------------|-----------------|--------------|--------|----------|
| 216.012624    | 125.91      | 127             | -1.09        | PASS   | Fcarrier |

Receiver (Graphic)



## Channel 1K

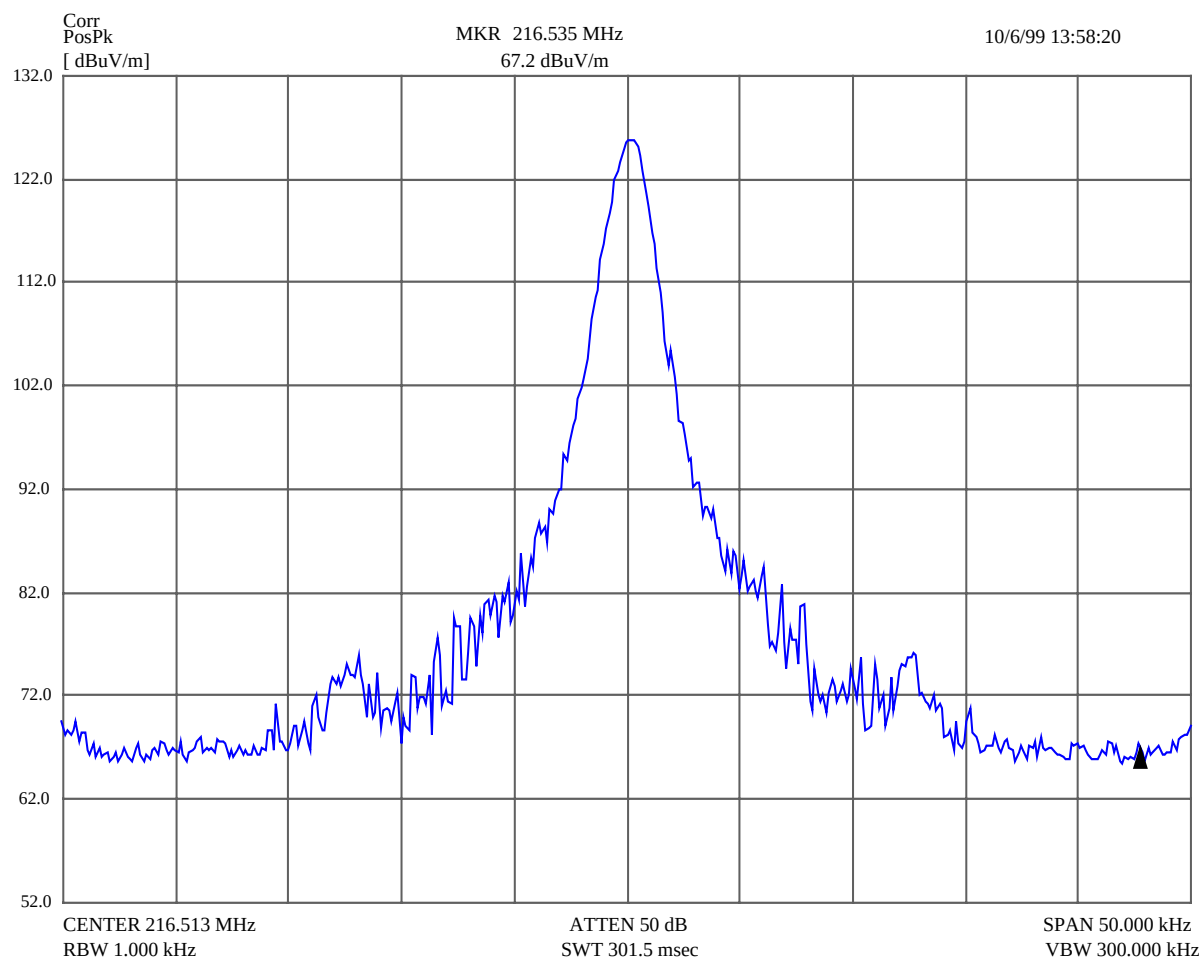
### Emission values of the unwanted frequencies

| Frequency<br>MHz | Peak<br>dBuV/<br>m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Status | Comment            |
|------------------|--------------------|--------------------|-----------------|--------|--------------------|
| 215.489744       | 65.97              | 94                 | -28.03          | PASS   | -(12.5...22.5) kHz |
| 215.499744       | 73.72              | 94                 | -20.28          | PASS   | > -22.5 kHz        |
| 216.524992       | 75.69              | 94                 | -18.31          | PASS   | +(12.5...22.5) kHz |
| 216.535248       | 67.21              | 94                 | -26.79          | PASS   | > +22.5 kHz        |

### Emission value of the frequency carrier

| Frequency<br>MHz | Peak<br>dBuV/<br>m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Status | Comment  |
|------------------|--------------------|--------------------|-----------------|--------|----------|
| 216.512624       | 125.79             | 127                | -1.21           | PASS   | Fcarrier |

Receiver (Graphic)



## Channel 1V

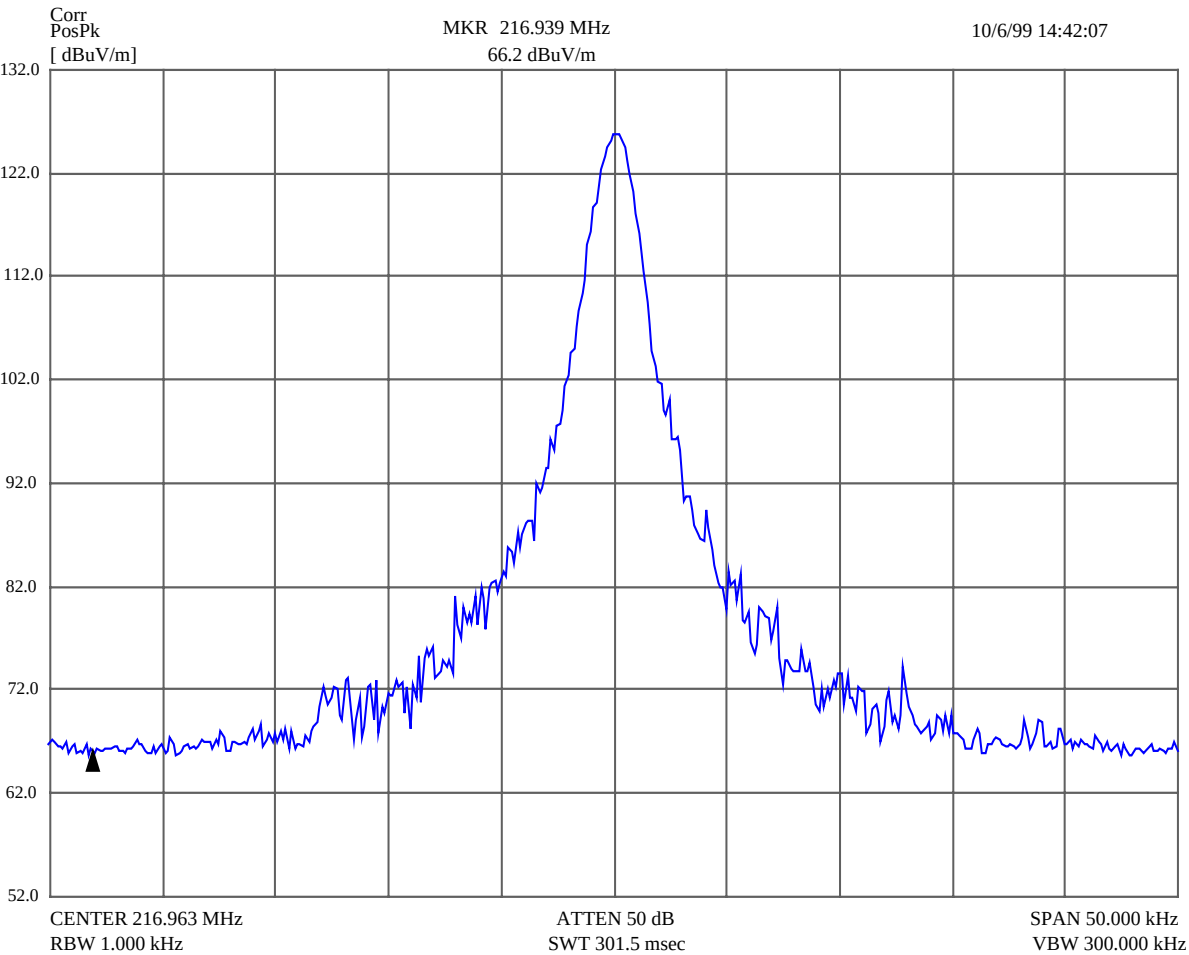
### Emission values of the unwanted frequencies

| Frequency<br>MHz | Peak<br>dBuV/<br>m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Status | Comment            |
|------------------|--------------------|--------------------|-----------------|--------|--------------------|
| 216.939376       | 66.23              | 94                 | -27.77          | PASS   | -(12.5...22.5) kHz |
| 216.949872       | 70.58              | 94                 | -23.42          | PASS   | > -22.5 kHz        |
| 216.975376       | 74.23              | 94                 | -19.77          | PASS   | +(12.5...22.5) kHz |
| 216.985248       | 66.25              | 94                 | -27.75          | PASS   | > +22.5 kHz        |

### Emission value of the frequency carrier

| Frequency<br>MHz | Peak<br>dBuV/<br>m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Status | Comment  |
|------------------|--------------------|--------------------|-----------------|--------|----------|
| 216.962624       | 125.72             | 127                | -1.28           | PASS   | Fcarrier |

Receiver (Graphic)



## Channel 2A

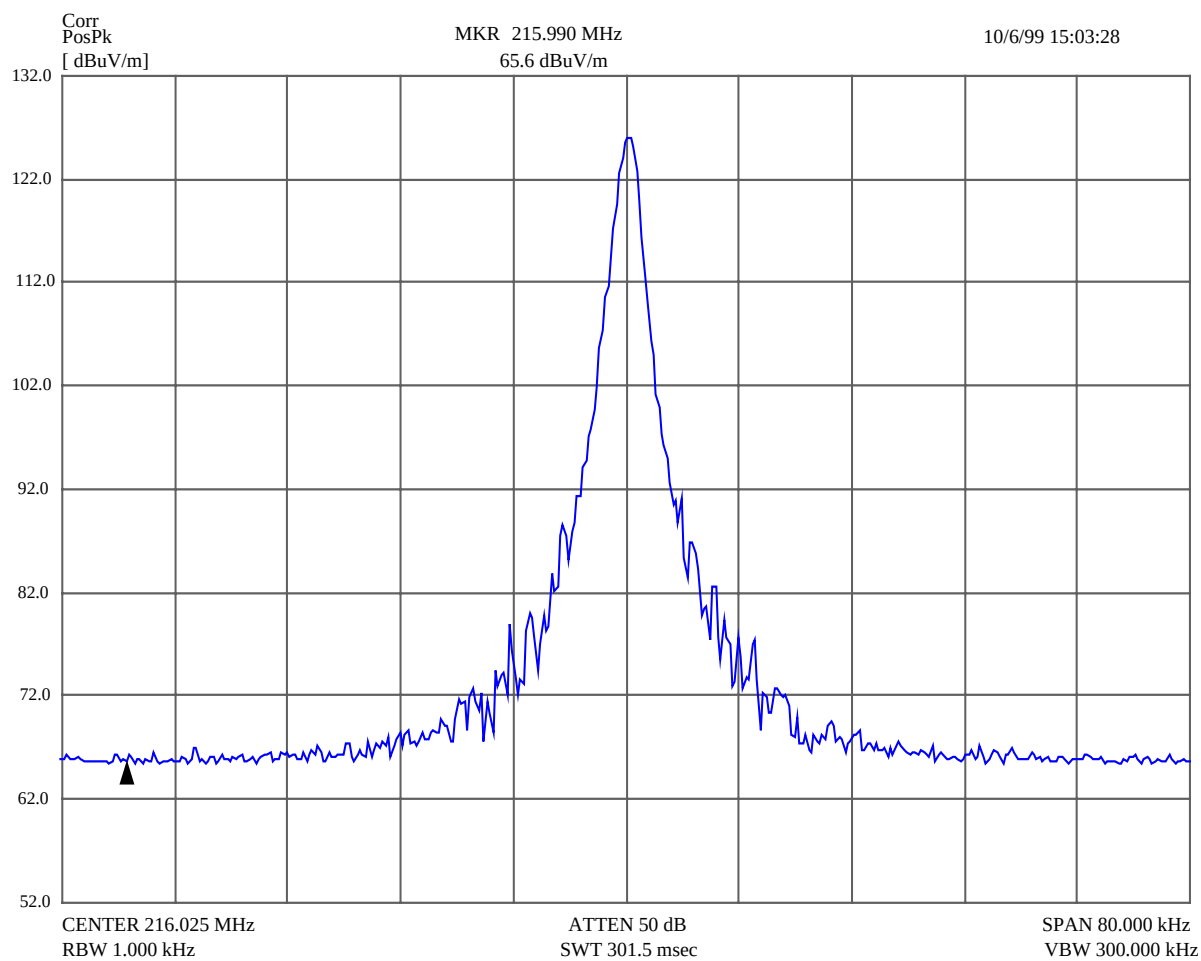
### Emission values of the unwanted frequencies

| Frequency<br>MHz | Peak<br>dBuV/<br>m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Status | Comment        |
|------------------|--------------------|--------------------|-----------------|--------|----------------|
| 215.989600       | 65.63              | 94                 | -28.37          | PASS   | -(25...35) kHz |
| 215.999200       | 65.98              | 94                 | -28.02          | PASS   | > -35 kHz      |
| 216.050400       | 66.00              | 94                 | -28.00          | PASS   | +(25...35) kHz |
| 216.060192       | 65.42              | 94                 | -28.58          | PASS   | > +35 kHz      |

### Emission value of the frequency carrier

| Frequency<br>MHz | Peak<br>dBuV/<br>m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Status | Comment  |
|------------------|--------------------|--------------------|-----------------|--------|----------|
| 216.025200       | 125.87             | 127                | -1.13           | PASS   | Fcarrier |

Receiver (Graphic)



## Channel 2K

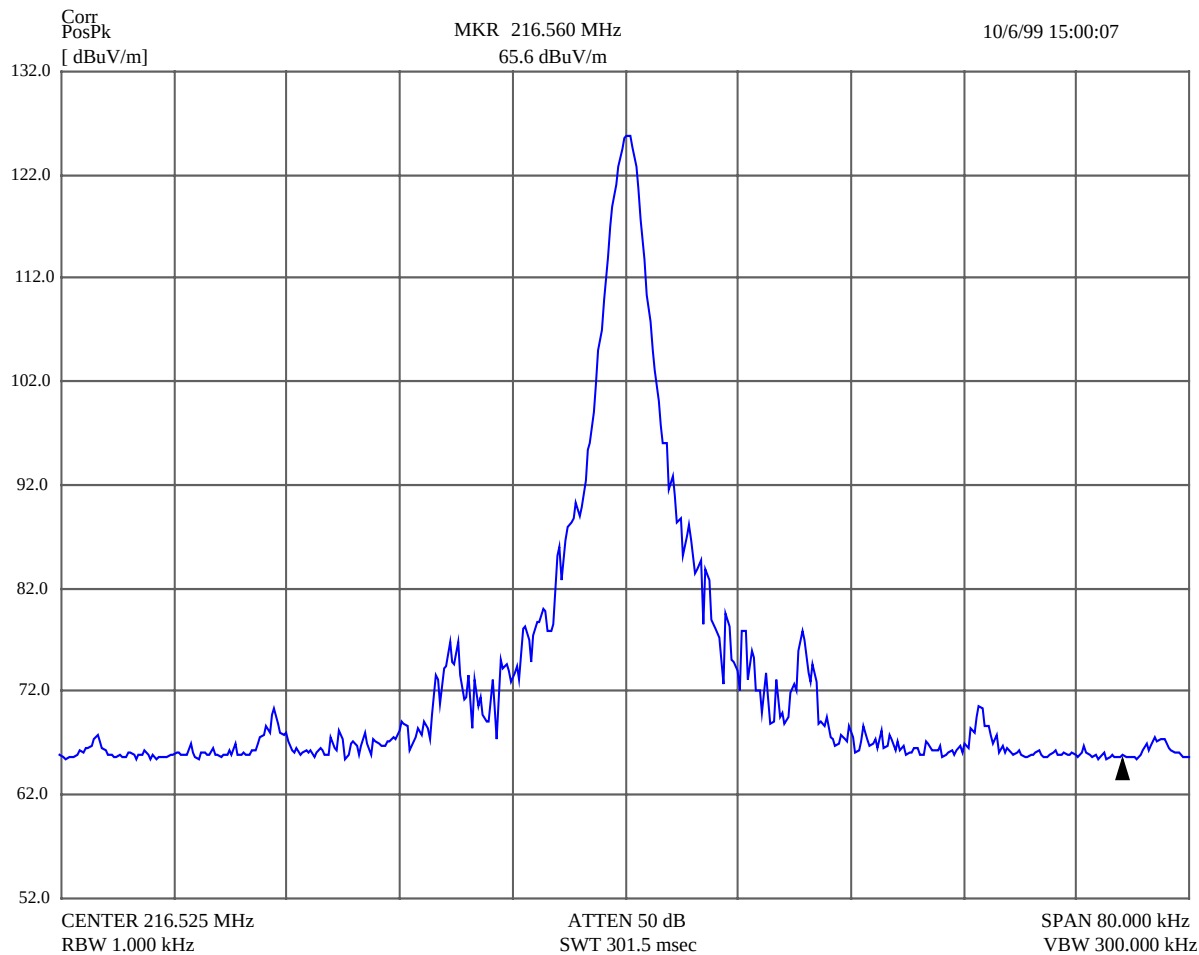
### Emission values of the unwanted frequencies

| Frequency<br>MHz | Peak<br>dBuV/<br>m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Status | Comment        |
|------------------|--------------------|--------------------|-----------------|--------|----------------|
| 216.488000       | 66.48              | 94                 | -27.52          | PASS   | -(25...35) kHz |
| 216.499008       | 67.32              | 94                 | -26.68          | PASS   | > -35 kHz      |
| 216.550208       | 70.60              | 94                 | -23.40          | PASS   | +(25...35) kHz |
| 216.560192       | 65.60              | 94                 | -28.40          | PASS   | > +35 kHz      |

### Emission value of the frequency carrier

| Frequency<br>MHz | Peak<br>dBuV/<br>m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>DB | Status | Comment  |
|------------------|--------------------|--------------------|-----------------|--------|----------|
| 216.525200       | 125.77             | 127                | -1.23           | PASS   | Fcarrier |

Receiver (Graphic)



## Channel 2V

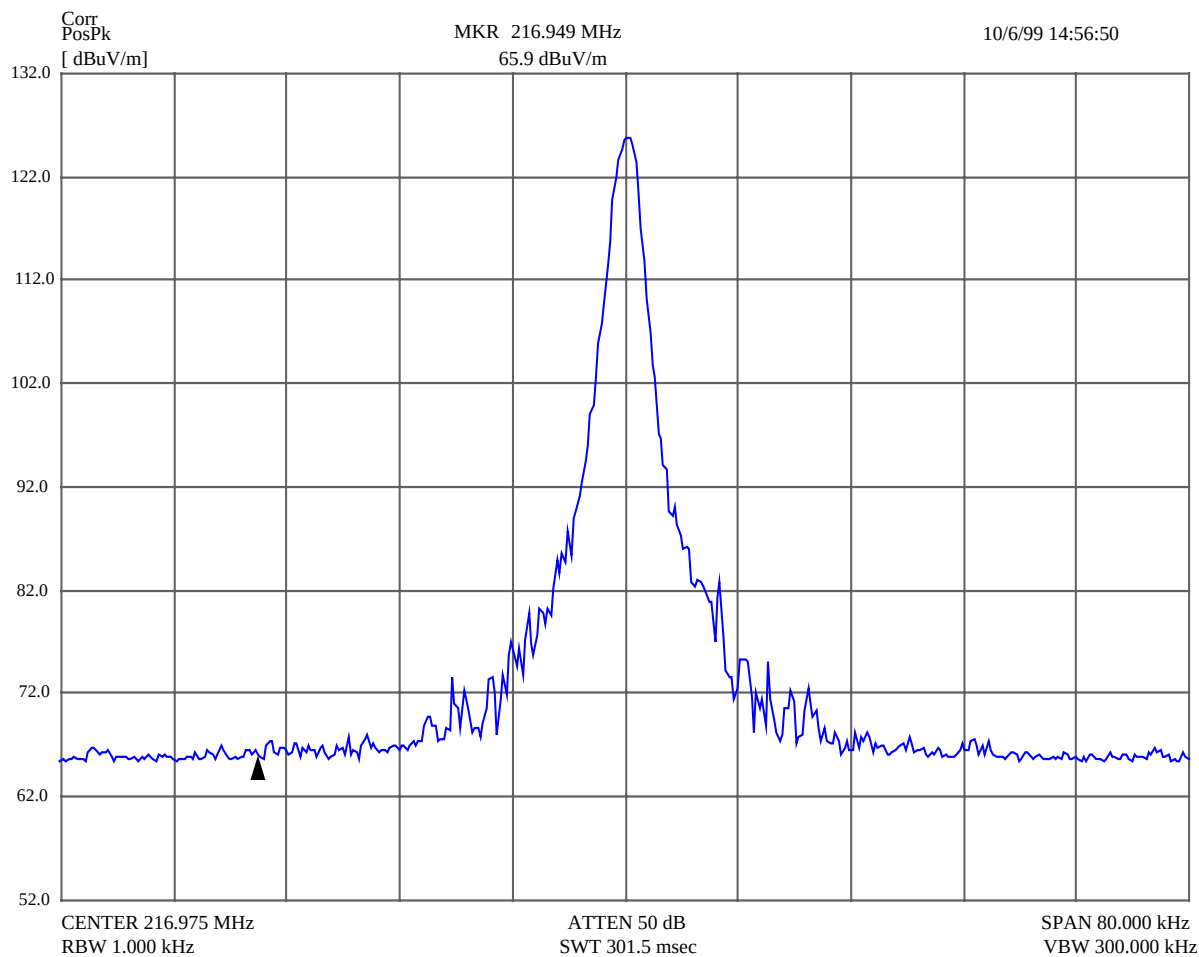
### Emission values of the unwanted frequencies

| Frequency<br>MHz | Peak<br>dBuV/<br>m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Status | Comment        |
|------------------|--------------------|--------------------|-----------------|--------|----------------|
| 216.939392       | 65.83              | 94                 | -28.17          | PASS   | -(25...35) kHz |
| 216.948992       | 65.93              | 94                 | -28.06          | PASS   | > -35 kHz      |
| 217.000368       | 65.93              | 94                 | -28.07          | PASS   | +(25...35) kHz |
| 217.010000       | 65.74              | 94                 | -28.26          | PASS   | > +35 kHz      |

### Emission value of the frequency carrier

| Frequency<br>MHz | Peak<br>dBuV/<br>m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>DB | Status | Comment  |
|------------------|--------------------|--------------------|-----------------|--------|----------|
| 216.975120       | 125.72             | 127                | -1.28           | PASS   | Fcarrier |

Receiver (Graphic)



### 5.3. MODULATION CHARACTERISTICS TEST

This test was performed in compliance with FCC Regulations using the methods of 2.1047 FCC Part 2.

Below is the table of the Tx Peak measurements of the emission value at 3 dB level below Fpeak of the Tx (transmitter).

**MODULATION CHARACTERISTICS** was tested on the Standard band channel 1A and Extra band channel 2A.

#### 1) Channel 1A, Fc = 216.0125 MHz, RBW = 3 kHz

| The modulation<br>Frequency F mod<br>Hz | The modulation<br>amplitude<br>mV | Tx frequency F3dB<br>at 3dB below Fpeak<br>MHz | Tx peak level<br>at 3dB below Fpeak<br>dBuV | Deviation<br>Fc - F3dB<br>kHz |
|-----------------------------------------|-----------------------------------|------------------------------------------------|---------------------------------------------|-------------------------------|
| 1000                                    | 15                                | 216.008                                        | 123                                         | 4.5                           |
| 1500                                    | 15                                | 216.008                                        | 122                                         | 4.5                           |
| 2000                                    | 15                                | 216.007                                        | 121.7                                       | 5.5                           |
| 2500                                    | 15                                | 216.007                                        | 121.4                                       | 5.5                           |
| 3000                                    | 15                                | 216.006                                        | 120.8                                       | 6.5                           |
| 4000                                    | 15                                | 216.007                                        | 120                                         | 5.5                           |
| 5000                                    | 15                                | 216.006                                        | 119.1                                       | 6.5                           |
| 6000                                    | 15                                | 216.005                                        | 118.4                                       | 7.5                           |
| <b>7000</b>                             | <b>15</b>                         | <b>216.005</b>                                 | <b>119.4</b>                                | <b>7.5</b>                    |
| 8000                                    | 15                                | 216.005                                        | 119.8                                       | 7.5                           |
| 9000                                    | 15                                | 216.006                                        | 120.8                                       | 6.5                           |
| 10000                                   | 15                                | 216.007                                        | 121.3                                       | 5.5                           |

The frequency Fmod =7000 Hz that had the highest deviation was chosen to define the amplitude for the Occupied Bandwidth Test.

**2) Channel 2A, Fc = 216.025 MHz, RBW = 3 kHz**

| The modulation Frequency F mod Hz | The modulation amplitude mV | Tx frequency F3dB at 3dB below Fpeak MHz | Tx peak level at 3dB below Fpeak dBuV | Deviation Fc - F3dB kHz |
|-----------------------------------|-----------------------------|------------------------------------------|---------------------------------------|-------------------------|
| 1000                              | 50                          | 216.013                                  | 121.5                                 | 12                      |
| 1500                              | 50                          | 216.011                                  | 120.7                                 | 14                      |
| 2000                              | 50                          | 216.009                                  | 119.8                                 | 16                      |
| 2500                              | 50                          | 216.007                                  | 118.5                                 | 18                      |
| 3000                              | 50                          | 216.004                                  | 117.4                                 | 21                      |
| 4000                              | 50                          | 216                                      | 116.2                                 | 25                      |
| 5000                              | 50                          | 215.999                                  | 115.3                                 | 26                      |
| <b>6000</b>                       | <b>50</b>                   | <b>215.996</b>                           | <b>115.7</b>                          | <b>29</b>               |
| 7000                              | 50                          | 215.998                                  | 115.6                                 | 27                      |
| 8000                              | 50                          | 216                                      | 115.8                                 | 25                      |
| 9000                              | 50                          | 215.998                                  | 115.7                                 | 27                      |
| 10000                             | 50                          | 215.998                                  | 115.7                                 | 27                      |

The frequency Fmod =6000 Hz that had the highest deviation was chosen to define the amplitude for the Occupied Bandwidth Test.

#### 5.4. OCCUPIED BANDWIDTH TEST

This test was performed in compliance with FCC Regulations using the methods of 2.1049 FCC Part 2. The OCCUPIED BANDWIDTH was measured at the level equal 99% of the frequency peak value.

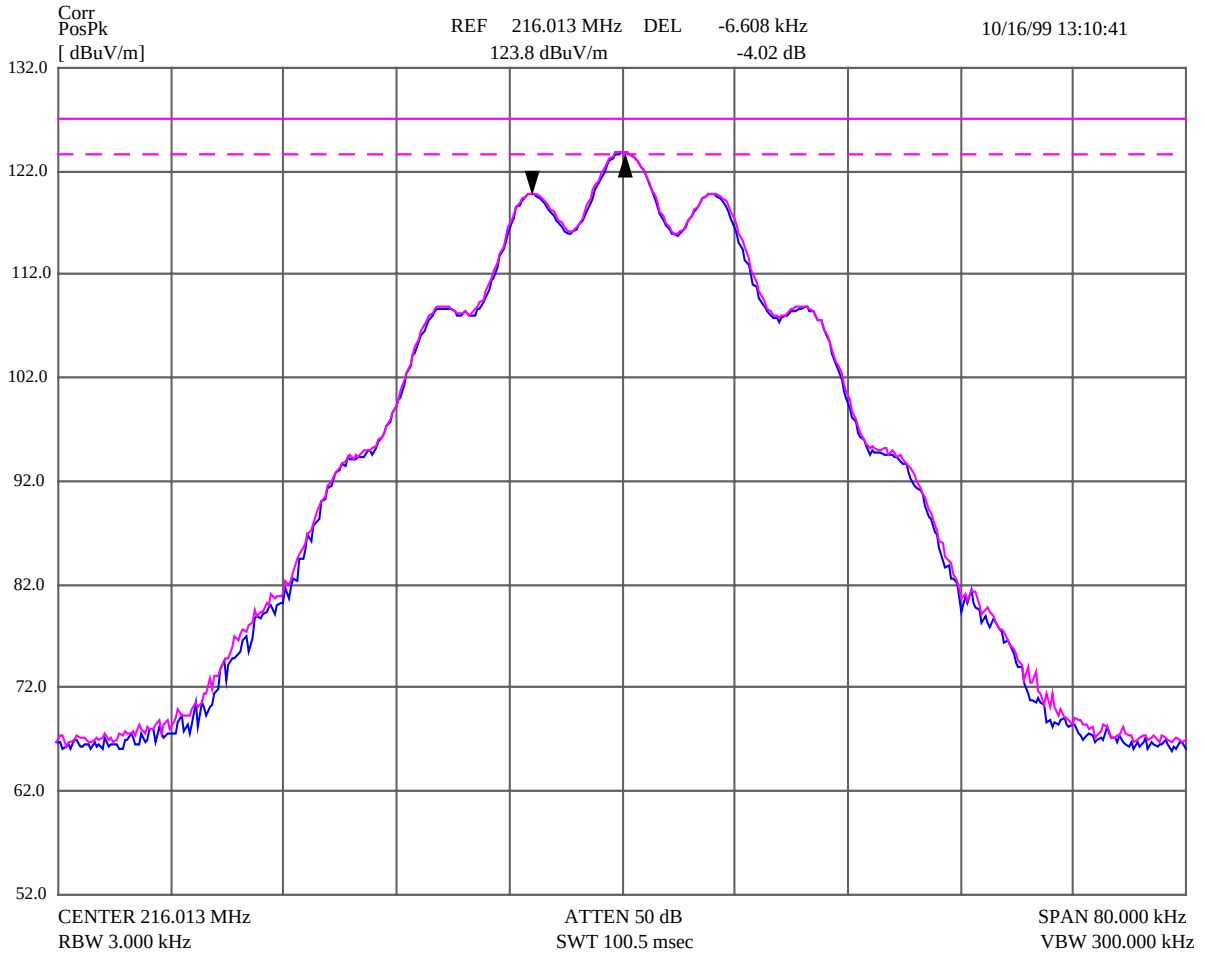
OCCUPIED BANDWIDTH TEST was performed on the selected Standard band channel 1A and Extra band channel 2A.

##### 5.4.1. Channel 1A

1) The following is the data of the modulation frequency amplitude definition.

| Frequency F3dB at 3 dB below Fc MHz | Frequency F3dB peak level dBuV | Occupied bandwidth at~50% modulation kHz | Comment                              |
|-------------------------------------|--------------------------------|------------------------------------------|--------------------------------------|
| 216.006096                          | 119.73                         | 13.2                                     | At the Fmod=7000Hz and ampl. V=10 mV |

## Receiver (Graphic)



### In according to procedure 2.1049 :

- the amplitude 10 mV at the Fmod=7000 Hz converts to dBuV, it comes to 96 dBuV;
- the value of a) increases by 16 dB, it comes to 96 dBuV;
- then the value of b) converts to "V", it comes to 0.063 V;
- Thus, the occupied BW measures at the modulation amplitude =0.063 V and frequency = 2500 Hz

2) The following is the data of the Occupied Bandwidth Channel 1A. The measurement was performed at Fmod=2500 Hz and Vmod=0.063 V

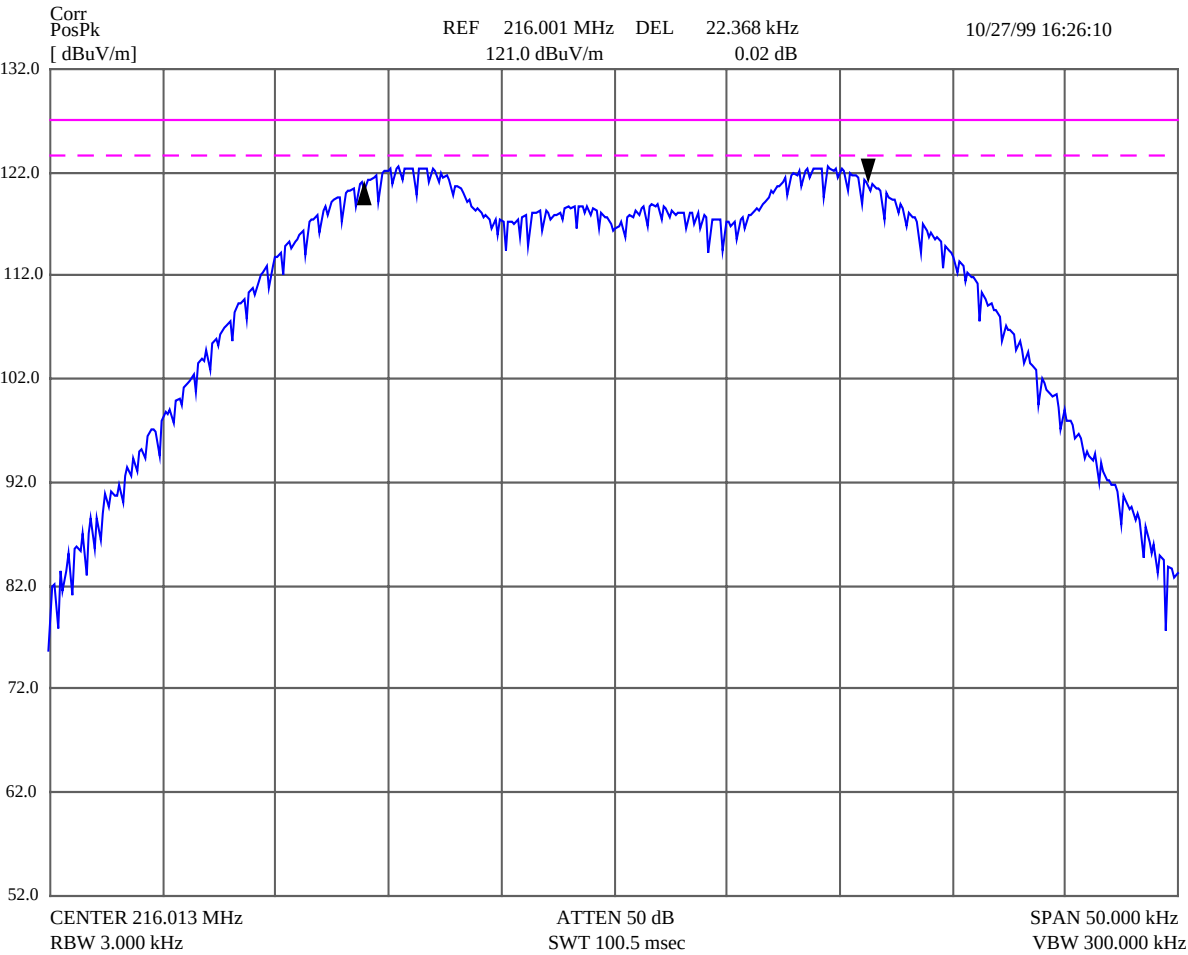
The frequency Peak level

| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-<br>Pk<br>dB | Status | Comment |
|------------------|----------------|--------------------|---------------------|--------|---------|
| 216.00288        | 122.36         | 127                | -4.64               | PASS   |         |

Occupied bandwidth

| Freq. Flow<br>at level 99%<br>of Fpeak<br>MHz | Peak<br>value<br>Flow<br>dBuV | Freq. Fhigh<br>at level 99%<br>of Fpeak<br>MHz | Peak<br>value<br>Fhigh<br>dBuV | Occupied<br>bandwidth<br>BW<br>kHz | Occupied<br>bandwidth<br>LIMIT<br>BWlim<br>kHz | Status |
|-----------------------------------------------|-------------------------------|------------------------------------------------|--------------------------------|------------------------------------|------------------------------------------------|--------|
| 216.001376                                    | 120.99                        | 216.023744                                     | 121.01                         | 22.368                             | 25                                             | PASS   |

Receiver (Graphic)

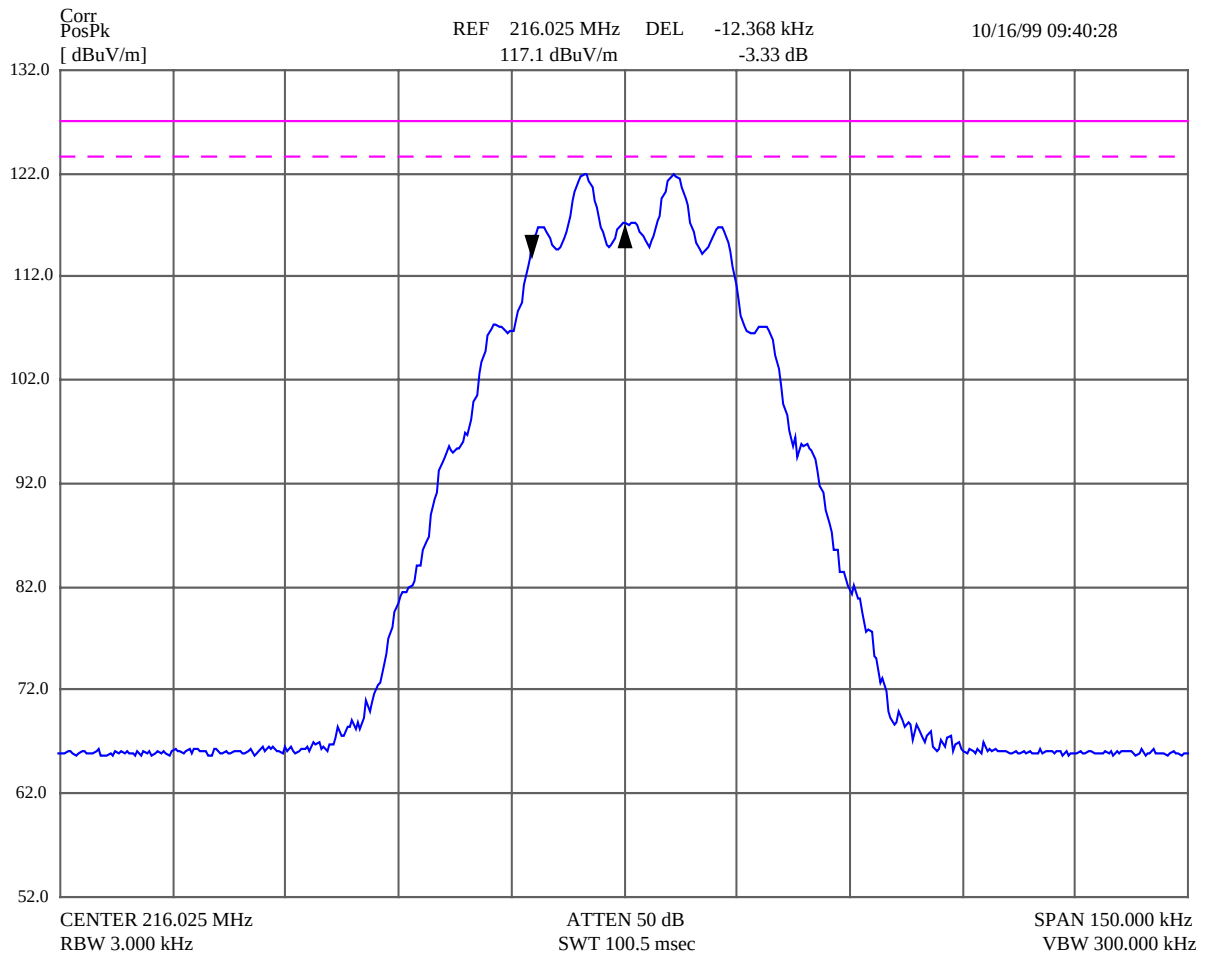


#### 5.4.2. Channel 2A

1) The following is the data of the modulation frequency amplitude definition.

| Frequency F <sub>3dB</sub><br>at 3 dB below F <sub>c</sub><br>MHz | Frequency F <sub>3dB</sub><br>peak level<br>dBuV | Occupied bandwidth<br>at~50% modulation<br>kHz | Comment                                              |
|-------------------------------------------------------------------|--------------------------------------------------|------------------------------------------------|------------------------------------------------------|
| 216.012624                                                        | 113.72                                           | 24.74                                          | At the F <sub>mod</sub> =6000Hz<br>and ampl. V=11 mV |

#### Receiver (Graphic)



In according to procedure 2.1049 :

- a) the amplitude 11 mV at the Fmod=6000 Hz converts to dBuV, it comes to 80.82 dBuV;
- b) the value of a) increases by 16 dB, it comes to 96.82 dBuV;
- c) then the value of b) converts to "V", it comes to 0.069 V;
- d) Thus, the occupied BW measures at the modulation amplitude =0.069 V and frequency = 2500 Hz

2) The following is the data of the Occupied Bandwidth Channel 2A. The measurement was performed at Fmod=2500 Hz and Vmod=0.069 V

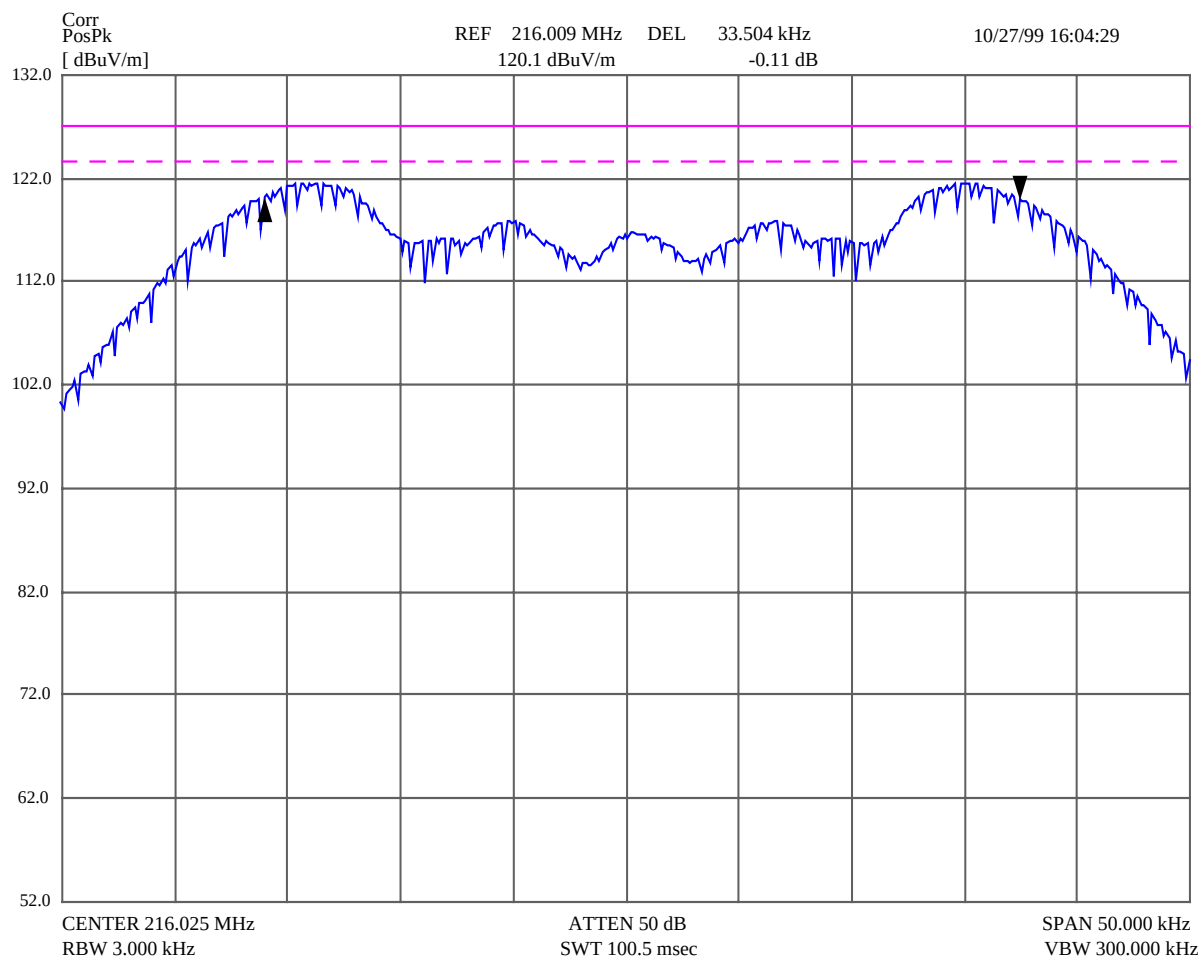
The frequency Peak level

| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DeLim-Pk<br>dB | Status | Comment |
|------------------|----------------|--------------------|----------------|--------|---------|
| 216.011248       | 121.44         | 127                | -5.56          | PASS   |         |

Occupied bandwidth

| Freq. Flow<br>at level 99%<br>of Fpeak<br>MHz | Peak<br>value<br>Flow<br>dBuV | Freq. Fhigh<br>at level 99%<br>of Fpeak<br>MHz | Peak<br>value<br>Fhigh<br>dBuV | Occupied<br>bandwidth<br>BW<br>kHz | Occupied<br>bandwidth<br>LIMIT<br>BWlim<br>kHz | Status |
|-----------------------------------------------|-------------------------------|------------------------------------------------|--------------------------------|------------------------------------|------------------------------------------------|--------|
| 216.008992                                    | 120.12                        | 216.042496                                     | 120.01                         | 33.504                             | 50                                             | PASS   |

Receiver (Graphic)



5.5. SPURIOUS EMISSIONS at antenna terminals

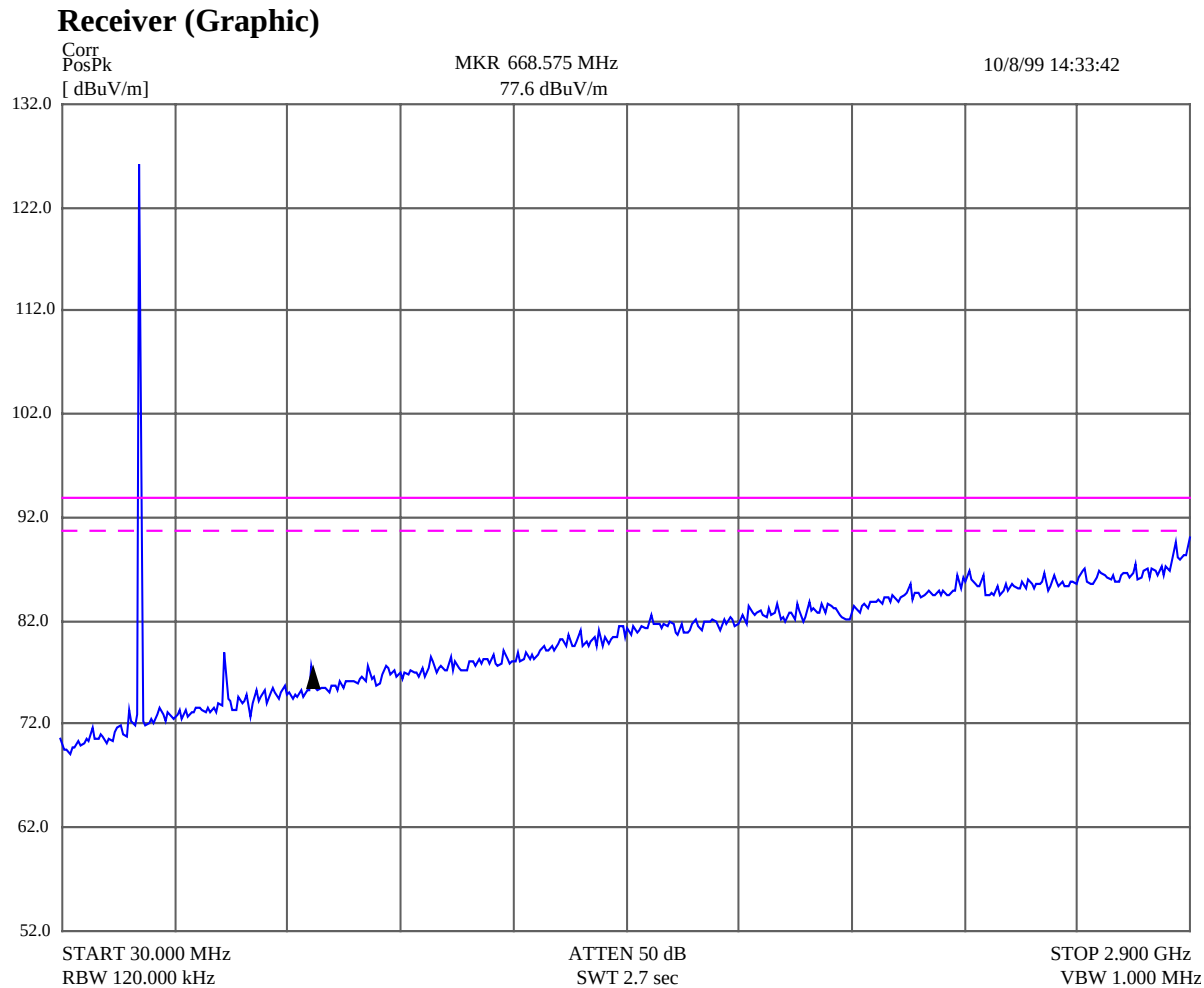
This test was performed in compliance with FCC Regulations using the methods of 2.1051 and 2.1057 FCC Part 2.

SPURIOUS EMISSIONS at antenna terminals were performed on the selected Standard band channel 1A, 1K, 1V at the modulation frequency 2500 Hz, amplitude 0.063V and Extra band channel 2A, 2K, 2V at the modulation frequency 2500 Hz, amplitude 0.069V in the

frequency range from 30 MHz to 2900 MHz.

Channel 1A

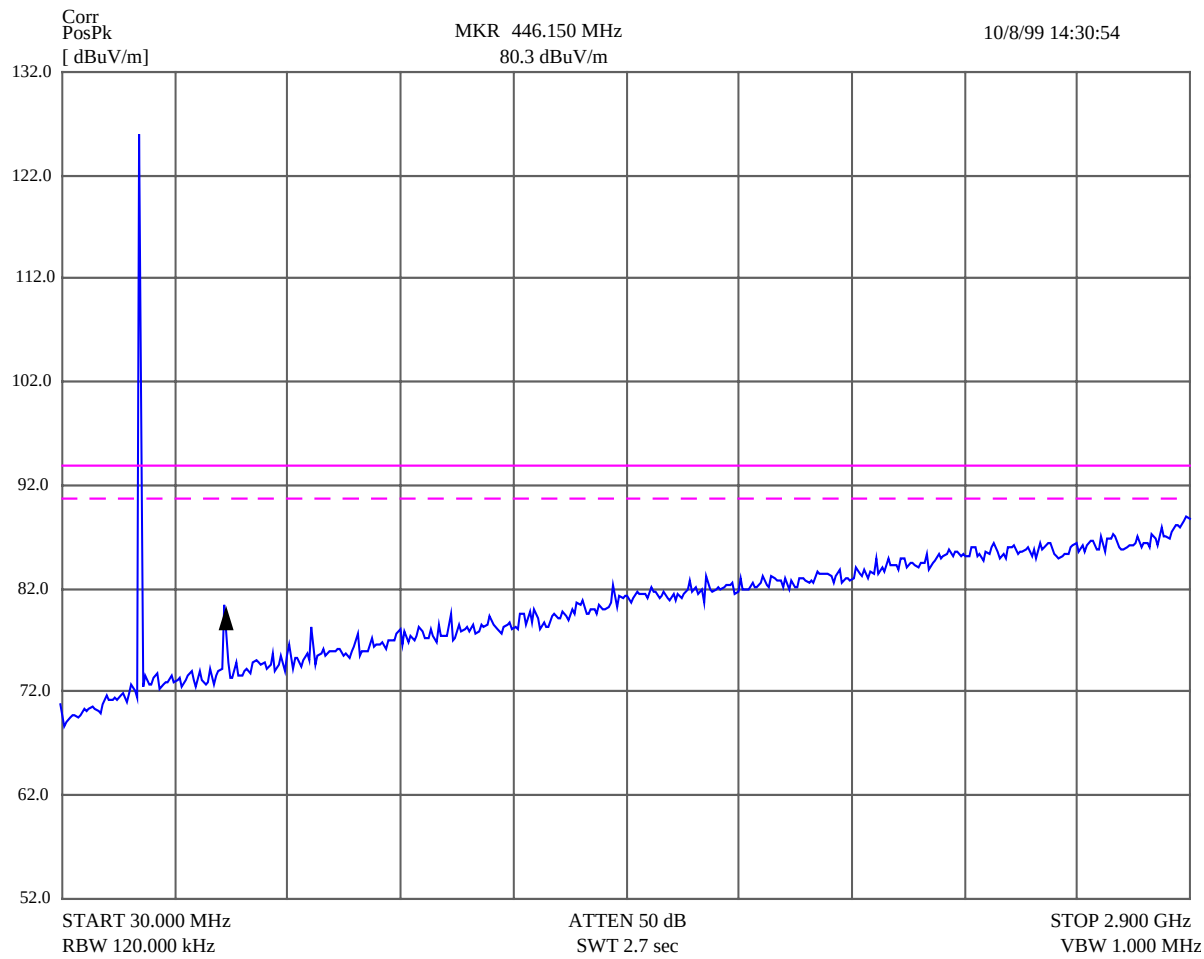
| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Status | Comment |
|------------------|----------------|--------------------|-----------------|--------|---------|
| 446.150016       | 78.89          | 94                 | -15.11          | PASS   |         |
| 668.574976       | 77.61          | 94                 | -16.39          | PASS   |         |



Channel 1K

| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Status | Comment |
|------------------|----------------|--------------------|-----------------|--------|---------|
| 446.150016       | 80.27          | 94                 | -13.73          | PASS   |         |

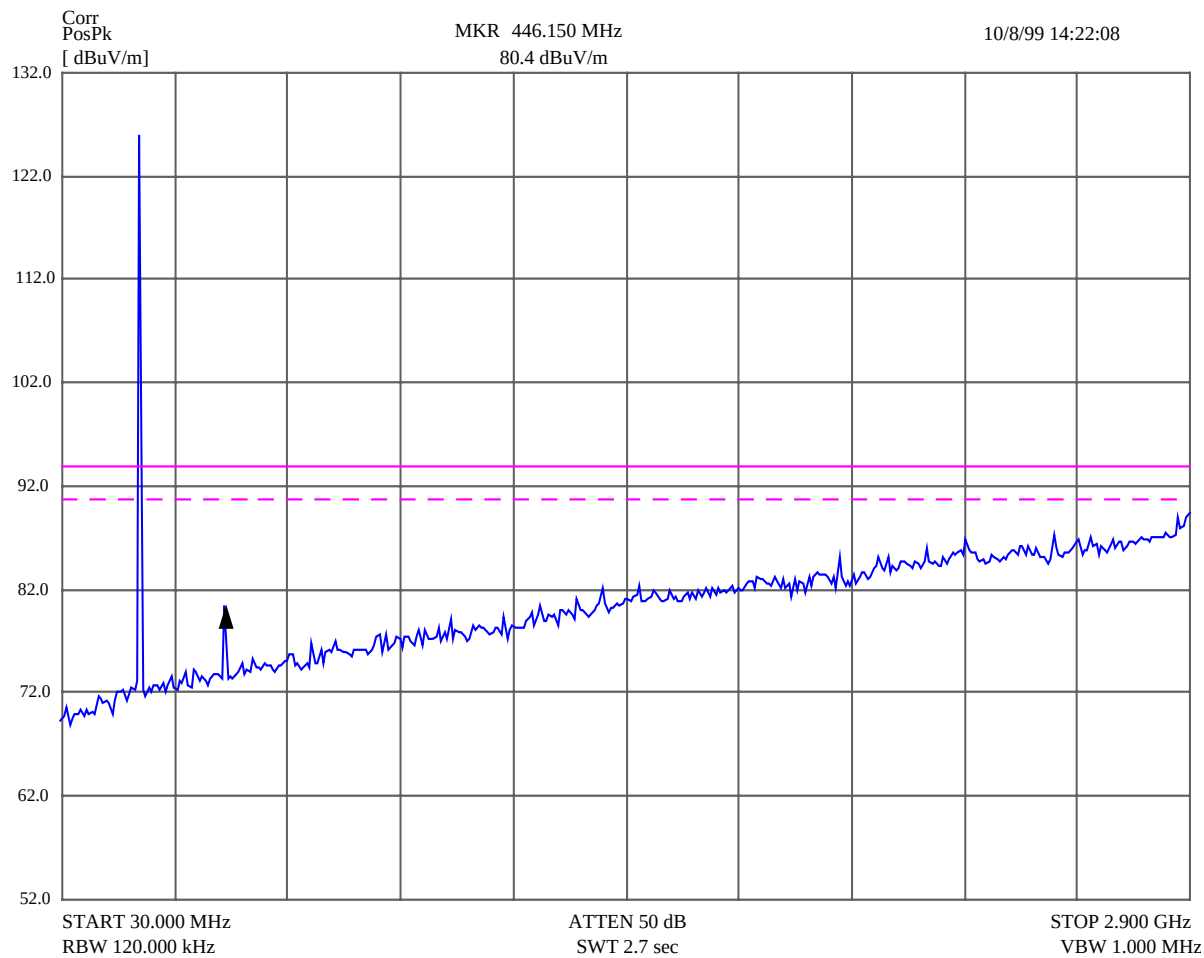
Receiver (Graphic)



Channel 1V

| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Status | Comment |
|------------------|----------------|--------------------|-----------------|--------|---------|
| 446.150016       | 80.43          | 94                 | -13.57          | PASS   |         |

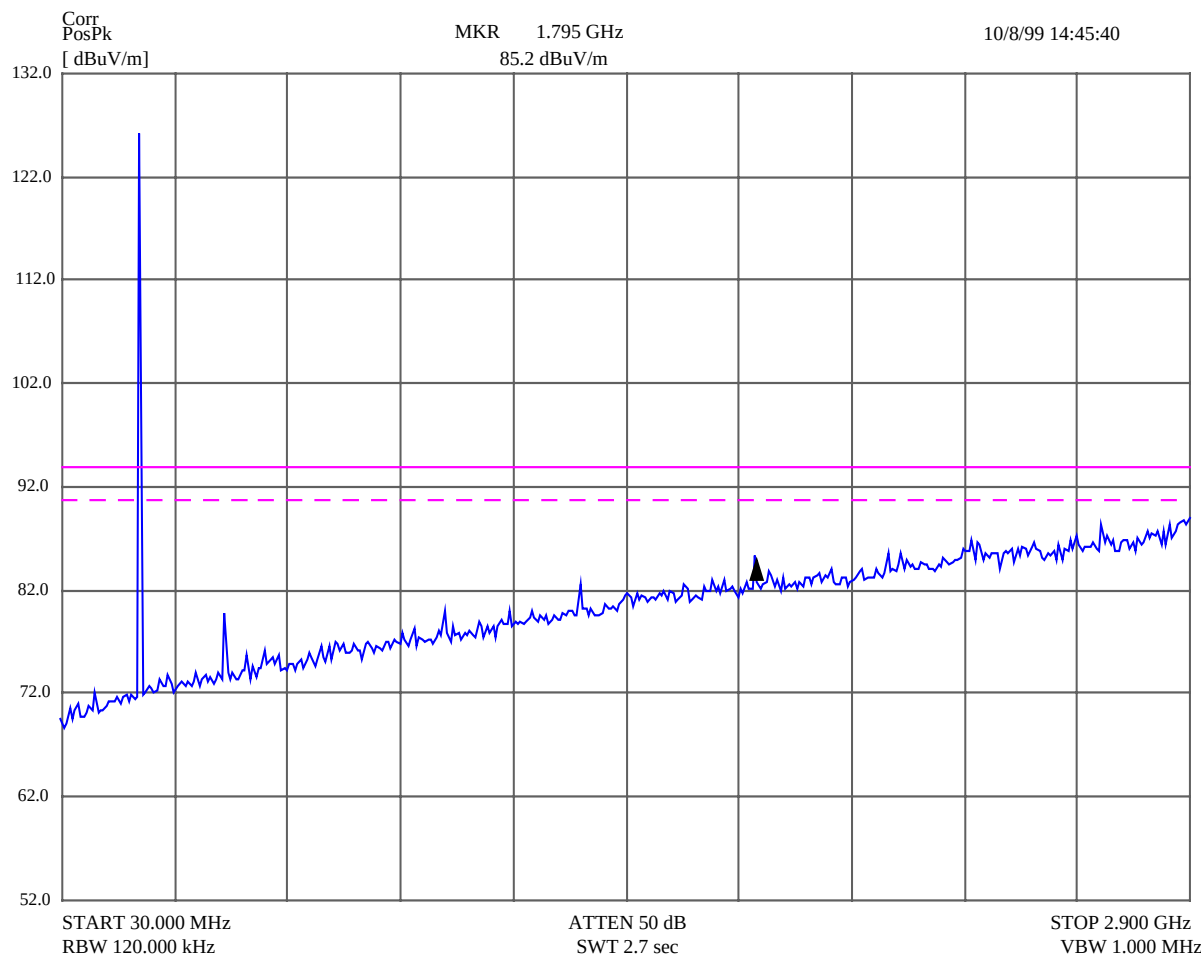
Receiver (Graphic)



Channel 2A

| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Status | Comment |
|------------------|----------------|--------------------|-----------------|--------|---------|
| 446.15           | 79.76          | 94                 | -14.24          | PASS   |         |
| 1005.8           | 79.93          | 94                 | -14.07          | PASS   |         |
| 1350.2           | 82.38          | 94                 | -11.62          | PASS   |         |
| 1795.05          | 85.19          | 94                 | -8.81           | PASS   |         |

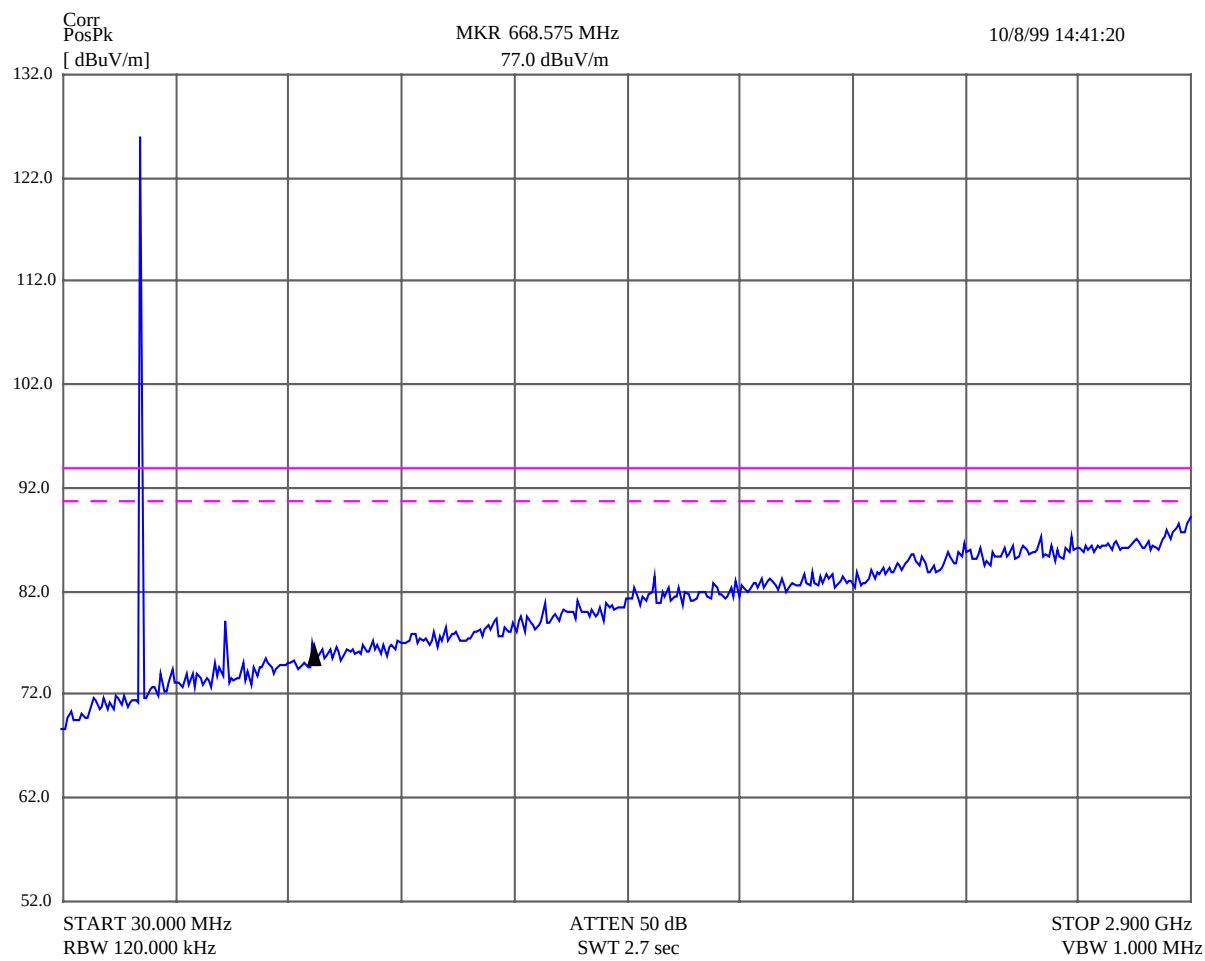
Receiver (Graphic)



Channel 2K

| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Status | Comment |
|------------------|----------------|--------------------|-----------------|--------|---------|
| 446.15           | 79.15          | 94                 | -14.85          | PASS   |         |
| 668.575          | 76.98          | 94                 | -17.02          | PASS   |         |

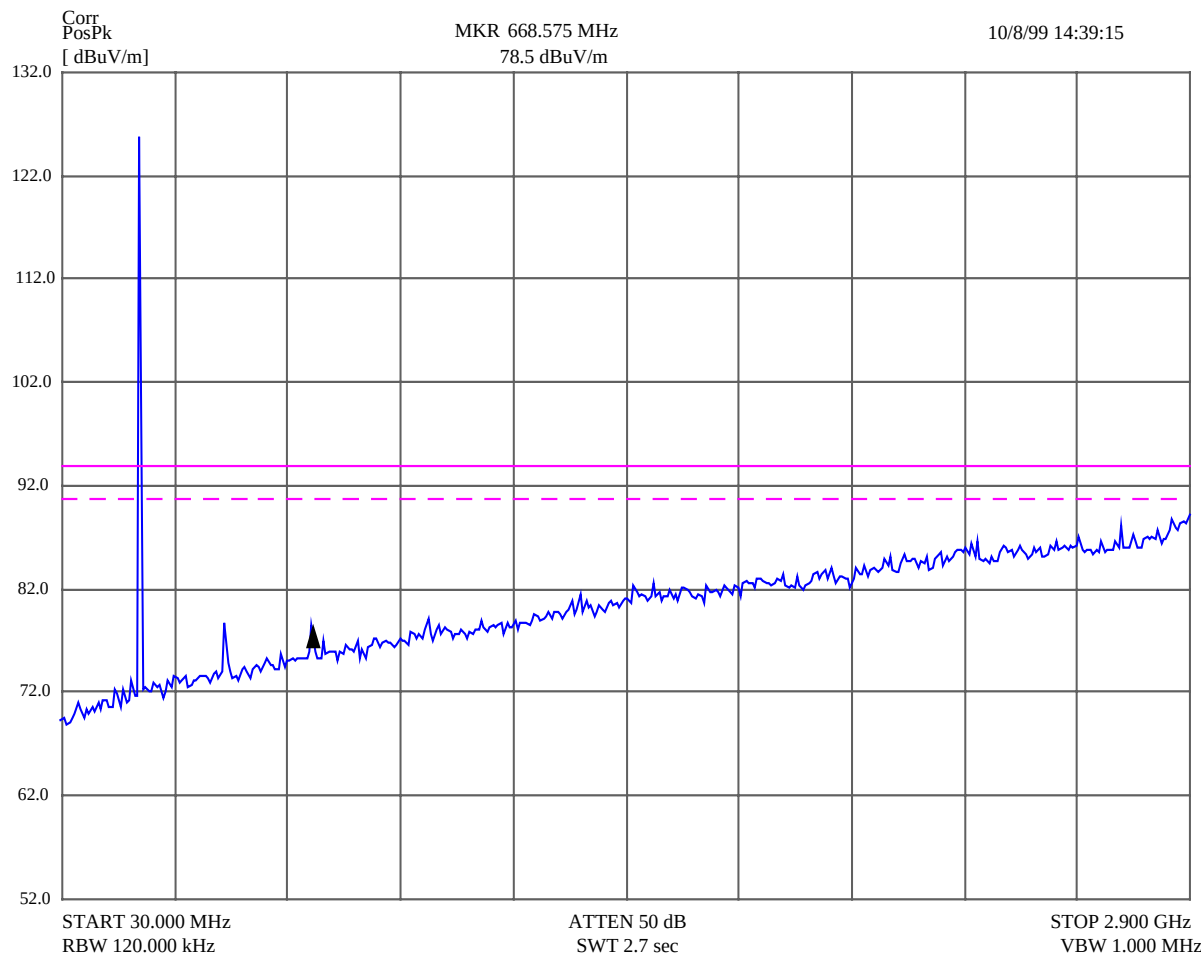
Receiver (Graphic)



Channel 2V

| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Status | Comment |
|------------------|----------------|--------------------|-----------------|--------|---------|
| 446.15           | 78.59          | 94                 | -15.41          | PASS   |         |
| 668.575          | 78.46          | 94                 | -15.54          | PASS   |         |

Receiver (Graphic)



## 5.6. FIELD STRENGTH of SPURIOUS RADIATION

This test was performed in compliance with FCC Regulations using the methods of 2.1053 and 2.1057 FCC Part 2.

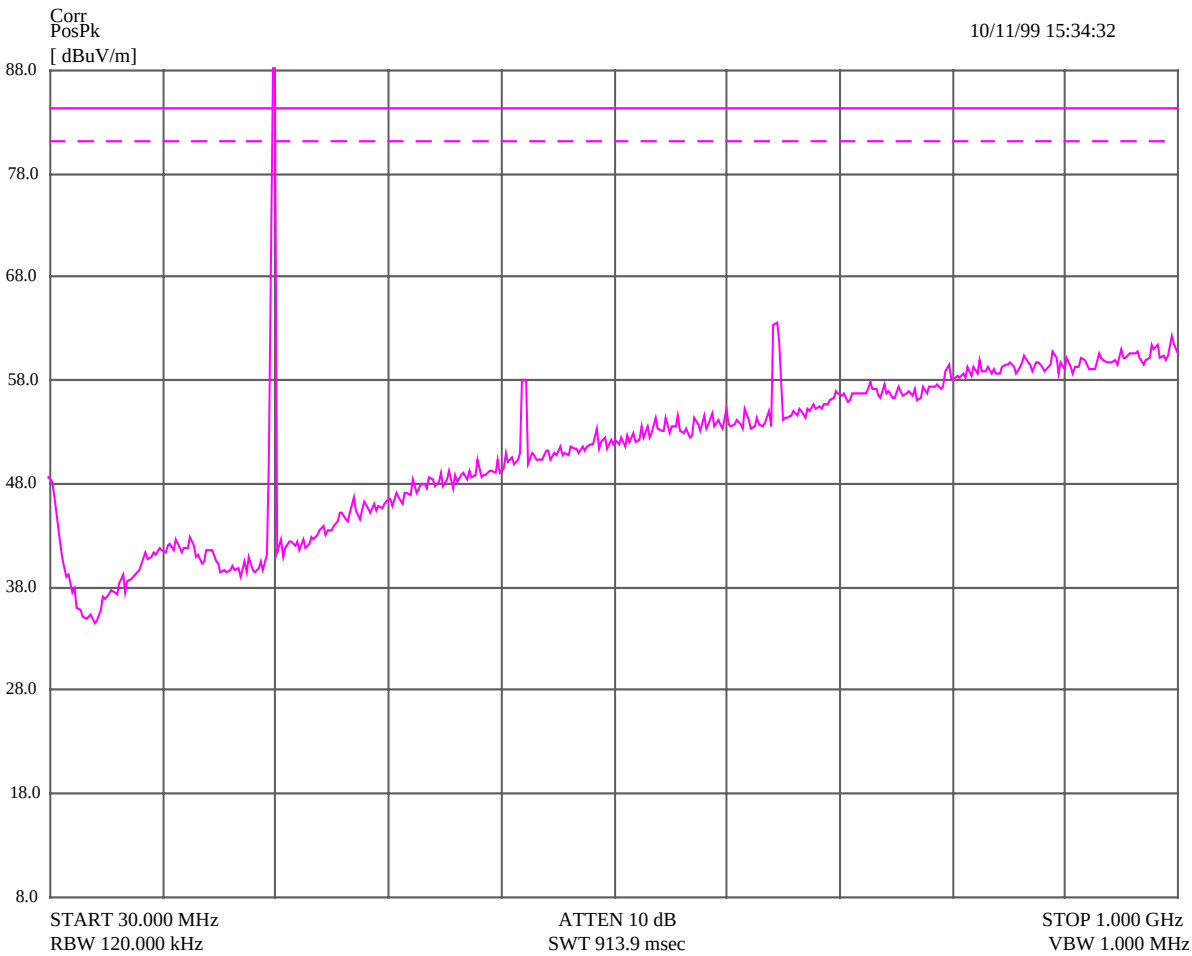
FIELD STRENGTH of SPURIOUS RADIATION were performed on the selected Standard band channel 1A, 1K, 1V at the modulation frequency 2500 Hz, amplitude 0.063V and Extra band channel 2A, 2K, 2V at the modulation frequency 2500 Hz, amplitude 0.069V in the frequency range from 30 MHz to 2900 MHz. A receiver ( that is both horizontal and vertical polarization ) spectrum trace of the magnitude of all the signals throughout the band may be seen below. In these graphics the magnitude of the largest signal measured with Peak Detector is plotted for the configuration that produced the largest signal.

### 1) Channel 1A

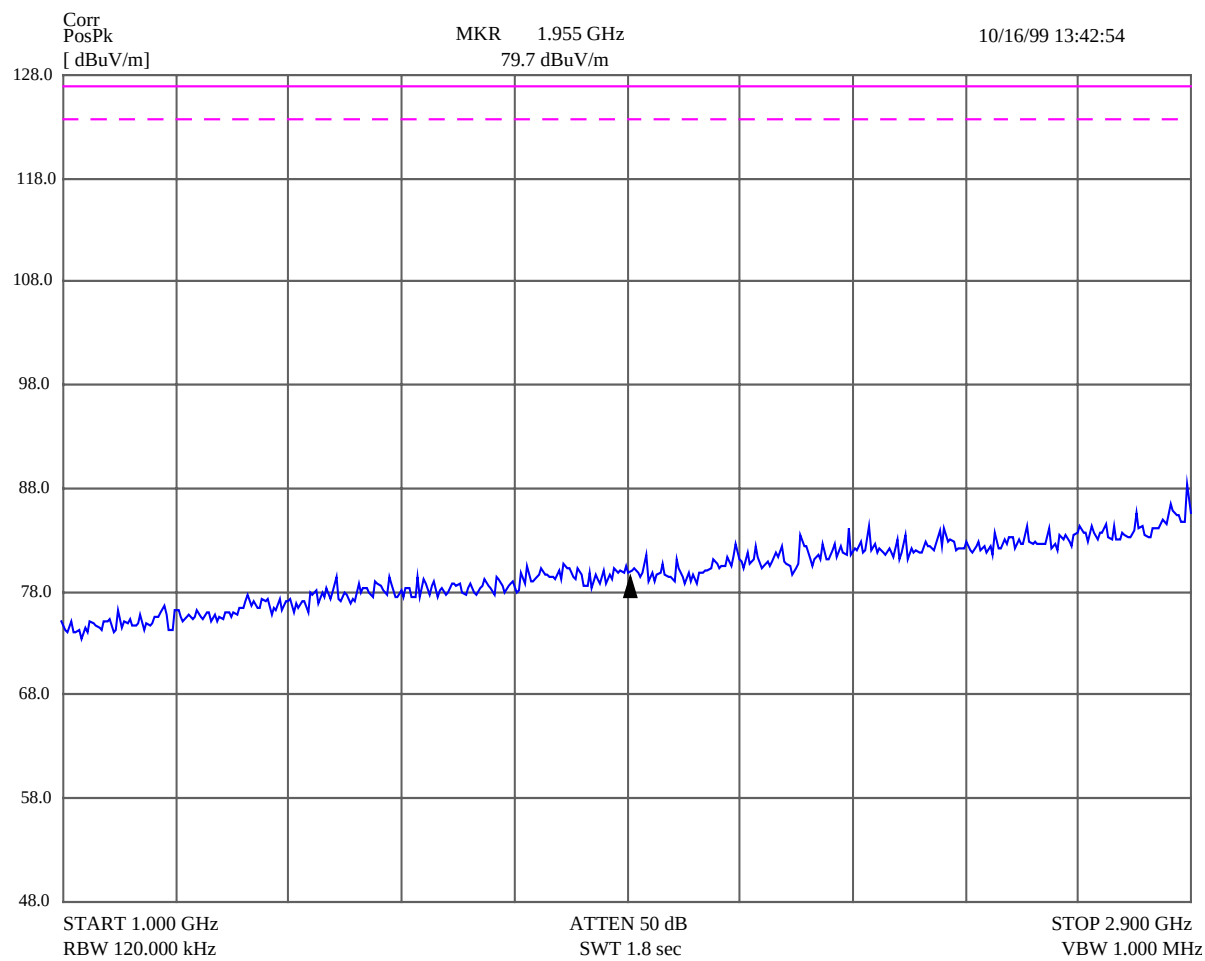
| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Pol  | Angle<br>deg | Hgt<br>cm | Status | Comment |
|------------------|----------------|--------------------|-----------------|------|--------------|-----------|--------|---------|
| 432.075008       | 60.22          | 84.46              | -24.24          | Vert | 146          | 124       | PASS   |         |
| 648.037504       | 68.87          | 84.46              | -15.59          | Vert | 310          | 124       | PASS   |         |

| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Pol  | Angle<br>deg | Hgt<br>cm | Status | Comment   |
|------------------|----------------|--------------------|-----------------|------|--------------|-----------|--------|-----------|
| 216.024992       | 89.63          | 127                | -37.37          | Vert | 267          | 95        | PASS   | F carrier |

Receiver (Graphic) 1



Receiver (Graphic) 2

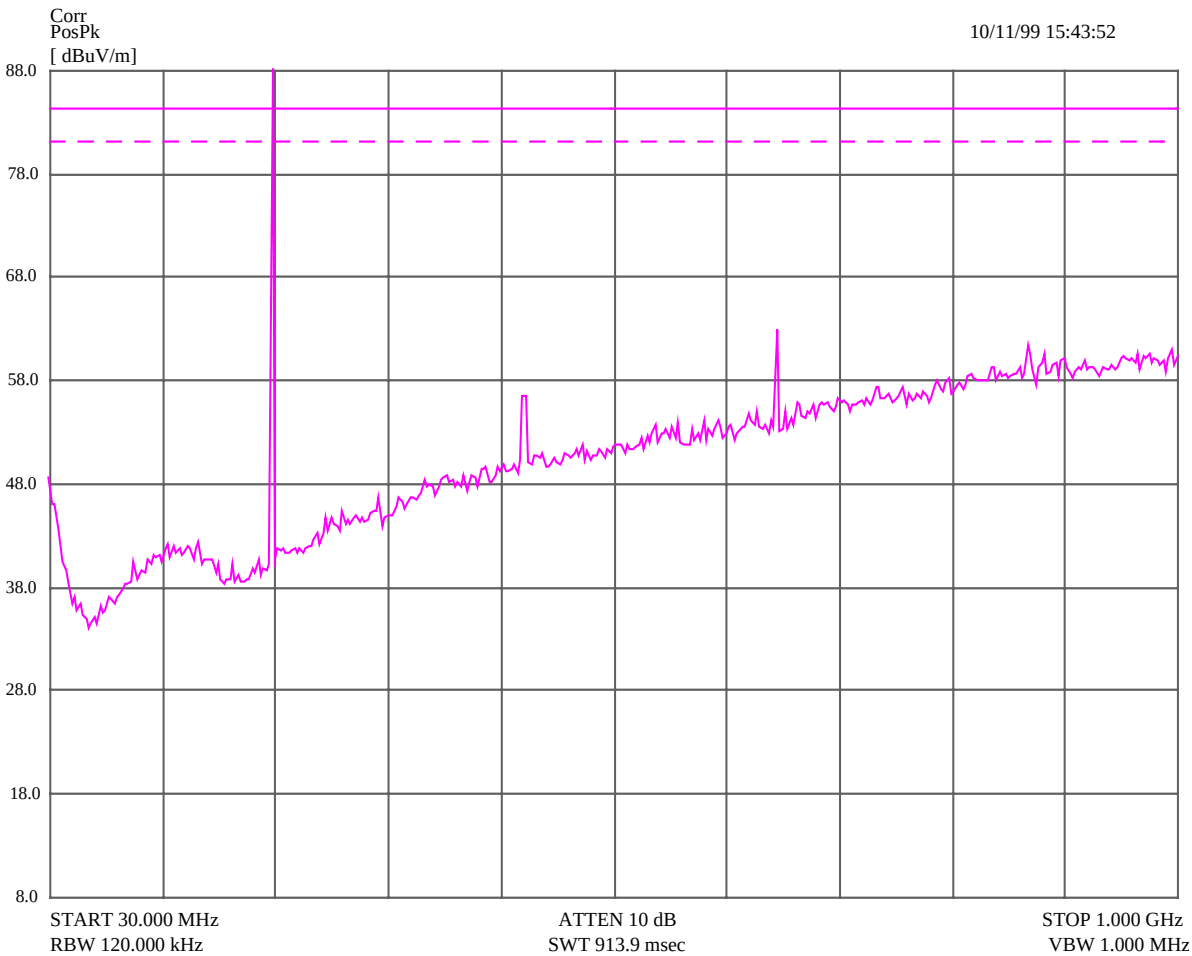


2) Channel 1K

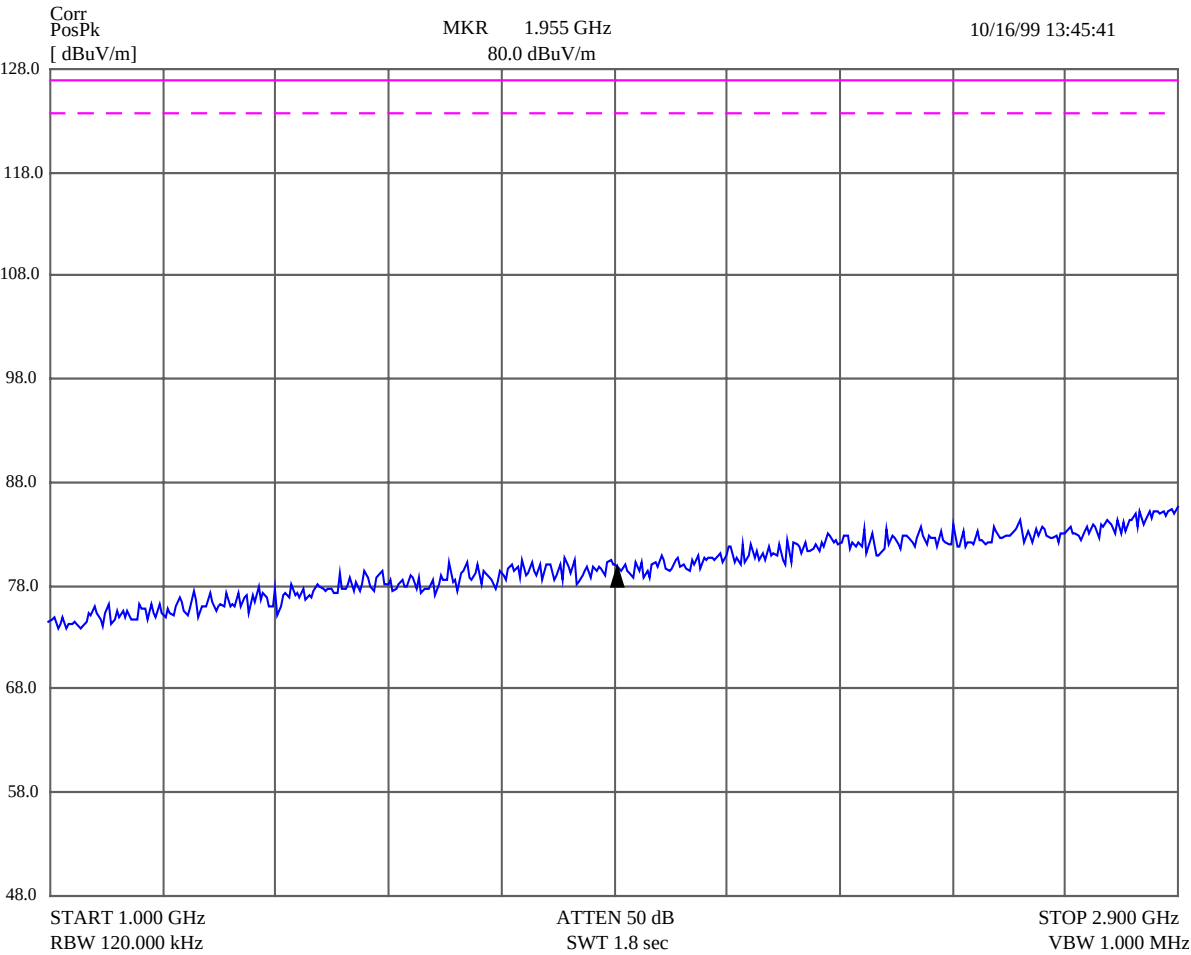
| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Pol  | Angle<br>deg | Hgt<br>cm | Status | Comment |
|------------------|----------------|--------------------|-----------------|------|--------------|-----------|--------|---------|
| 433.049984       | 59.13          | 84.46              | -25.33          | Vert | 140          | 95        | PASS   |         |
| 649.574976       | 69.63          | 84.46              | -14.83          | Vert | 220          | 95        | PASS   |         |

| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Pol  | Angle<br>deg | Hgt<br>cm | Status | Comment  |
|------------------|----------------|--------------------|-----------------|------|--------------|-----------|--------|----------|
| 216.512624       | 89.38          | 127                | -37.62          | Vert | 284          | 95        | PASS   | Fcarrier |

Receiver (Graphic) 1



Receiver (Graphic) 2

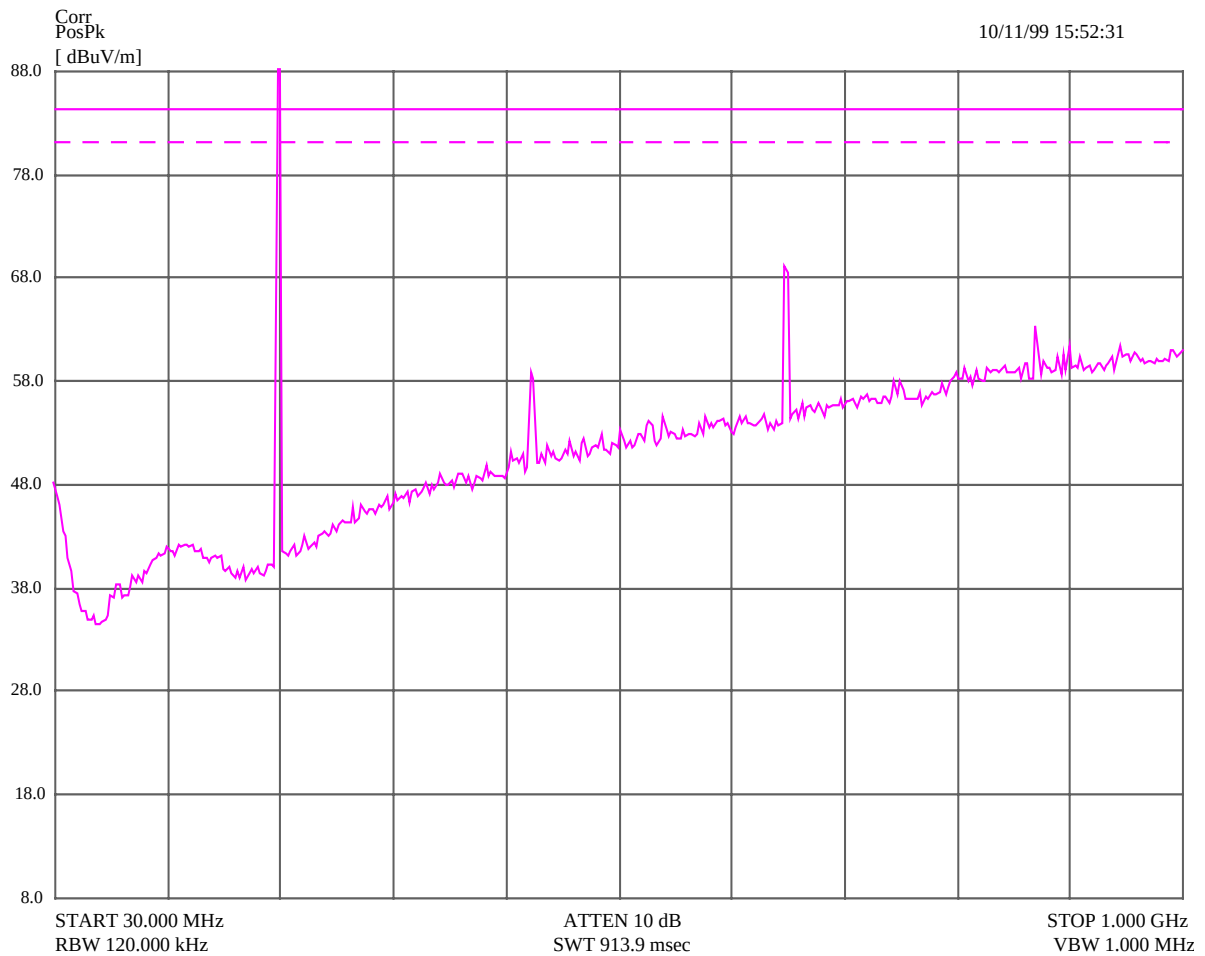


### 3) Channel 1V

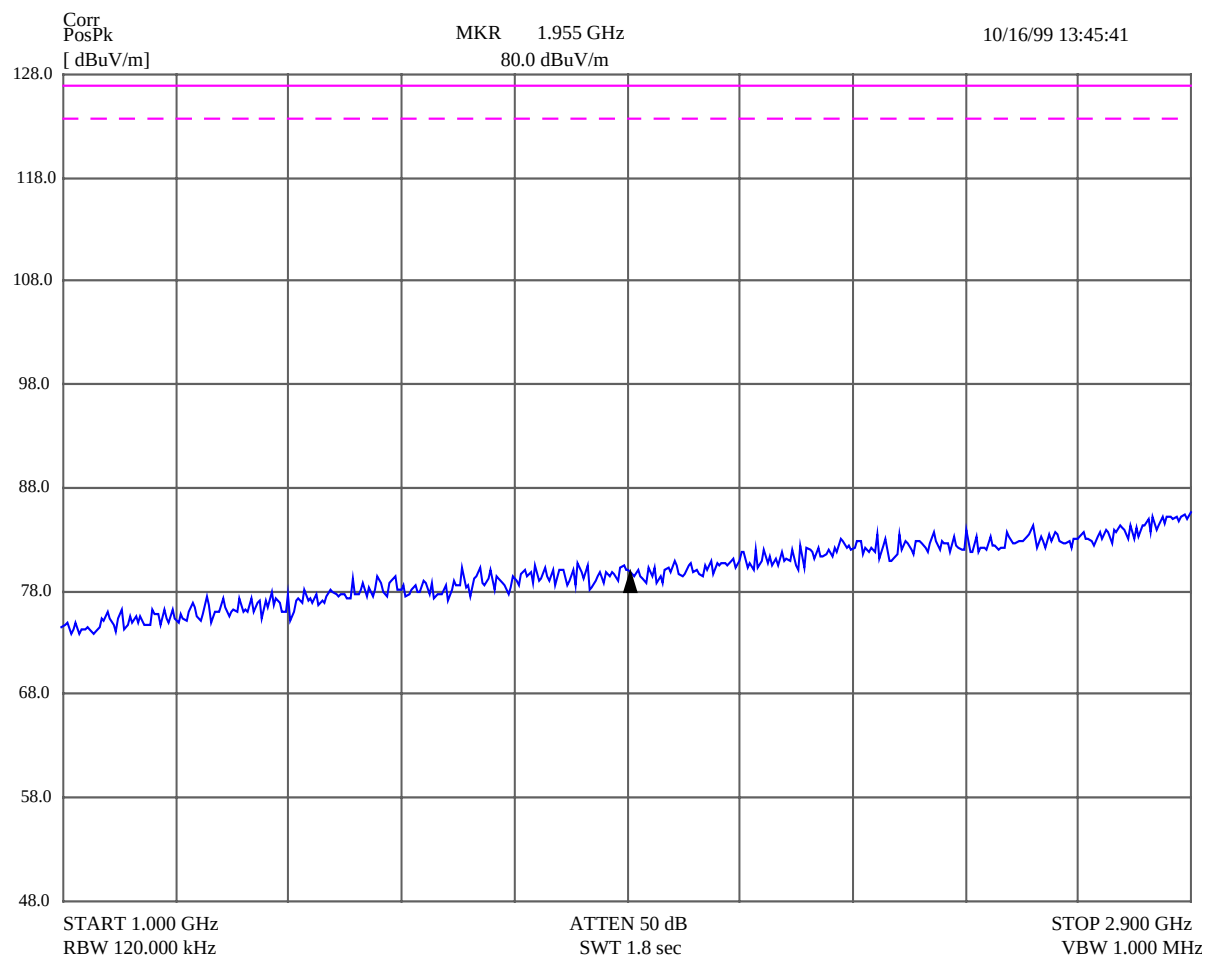
| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Pol  | Angle<br>deg | Hgt<br>cm | Status | Comment |
|------------------|----------------|--------------------|-----------------|------|--------------|-----------|--------|---------|
| 433.9            | 59.09          | 84.46              | -25.37          | Vert | 145          | 95        | PASS   |         |
| 650.875008       | 70.32          | 84.46              | -14.14          | Vert | 212          | 95        | PASS   |         |

| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Pol  | Angle<br>deg | Hgt<br>cm | Status | Comment  |
|------------------|----------------|--------------------|-----------------|------|--------------|-----------|--------|----------|
| 216.962496       | 88.95          | 127                | -38.05          | Vert | 293          | 95        | PASS   | Fcarrier |

### Receiver (Graphic) 1



Receiver (Graphic) 2

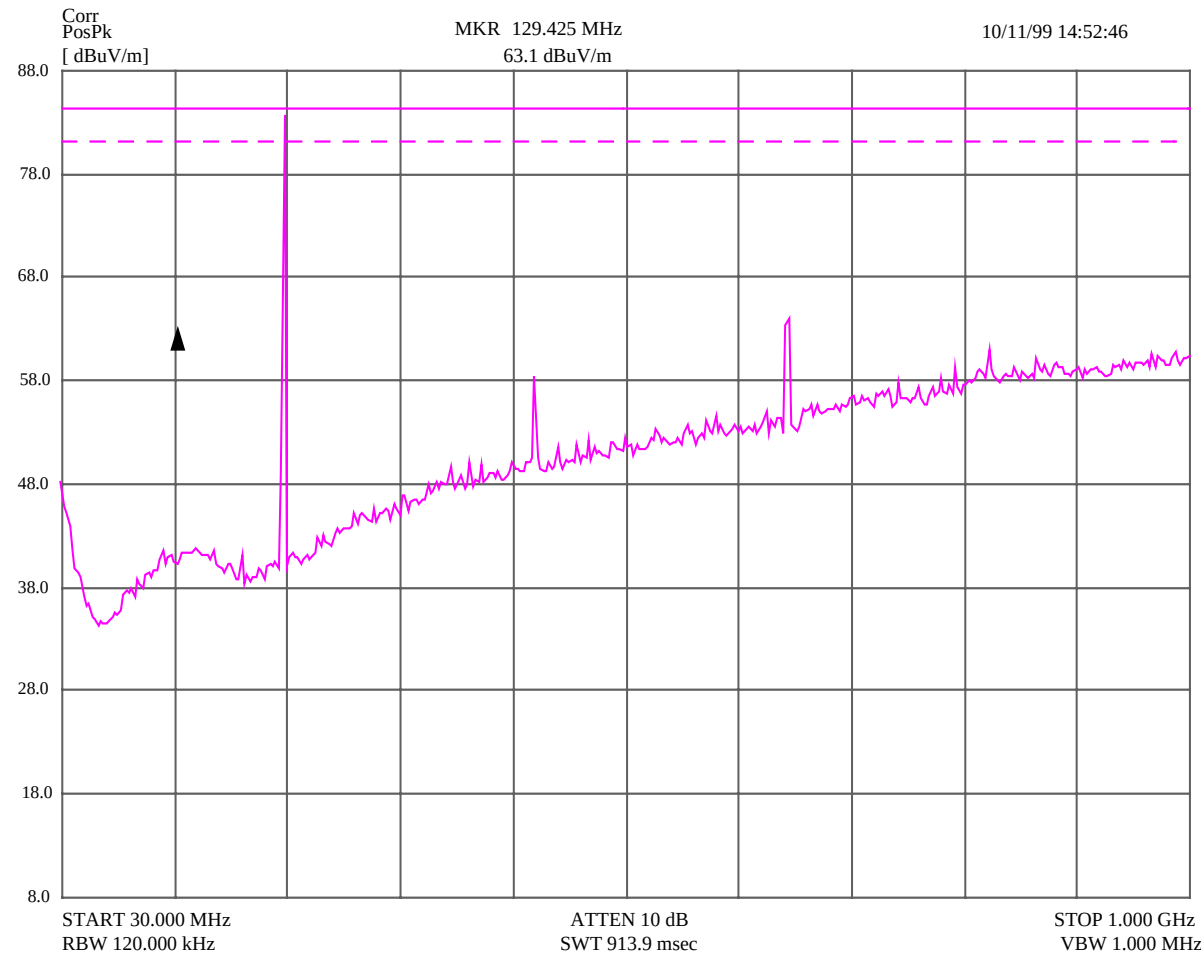


4) Channel 2A

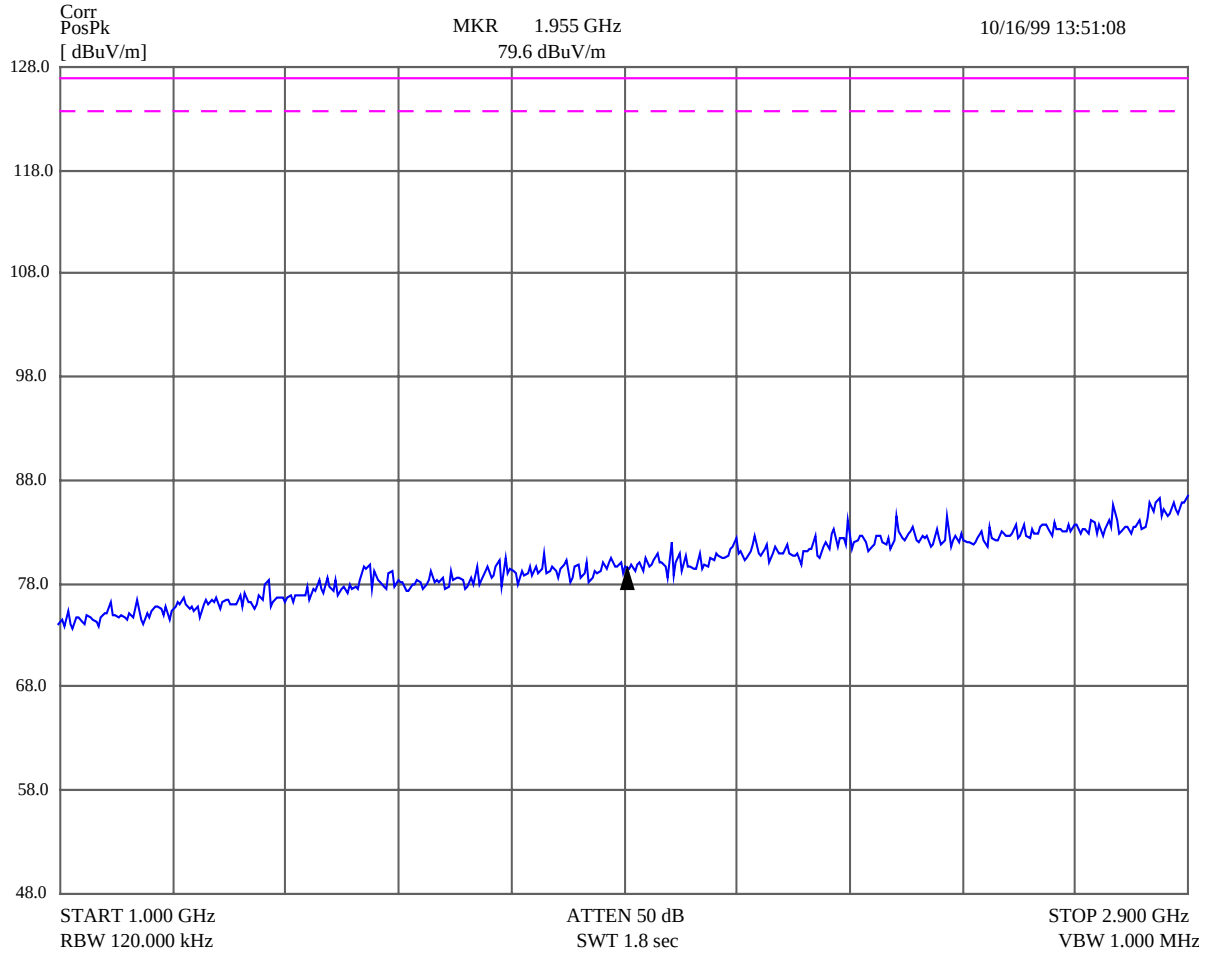
| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Pol  | Angle<br>deg | Hgt<br>cm | Status | Comment |
|------------------|----------------|--------------------|-----------------|------|--------------|-----------|--------|---------|
| 432.015008       | 63.41          | 84.46              | -21.05          | Horz | 195          | 100       | PASS   |         |
| 648.049984       | 63.13          | 84.46              | -21.33          | Horz | 45           | 100       | PASS   |         |

| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Pol  | Angle<br>deg | Hgt<br>cm | Status | Comment  |
|------------------|----------------|--------------------|-----------------|------|--------------|-----------|--------|----------|
| 216.047504       | 89.58          | 127                | -37.42          | Vert | 270          | 100       | PASS   | Fcarrier |

Receiver (Graphic) 1



## Receiver (Graphic) 2

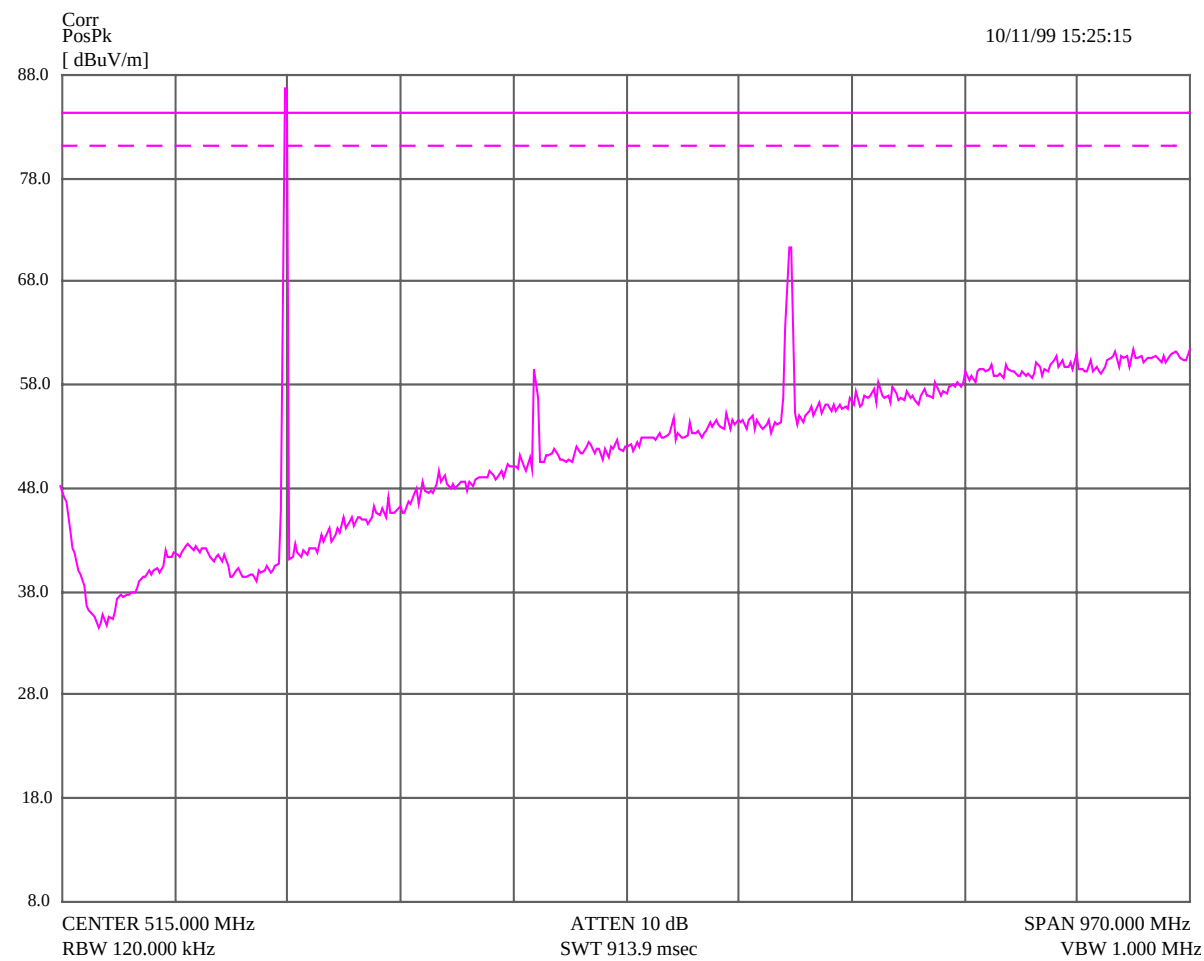


## 5) Channel 2K

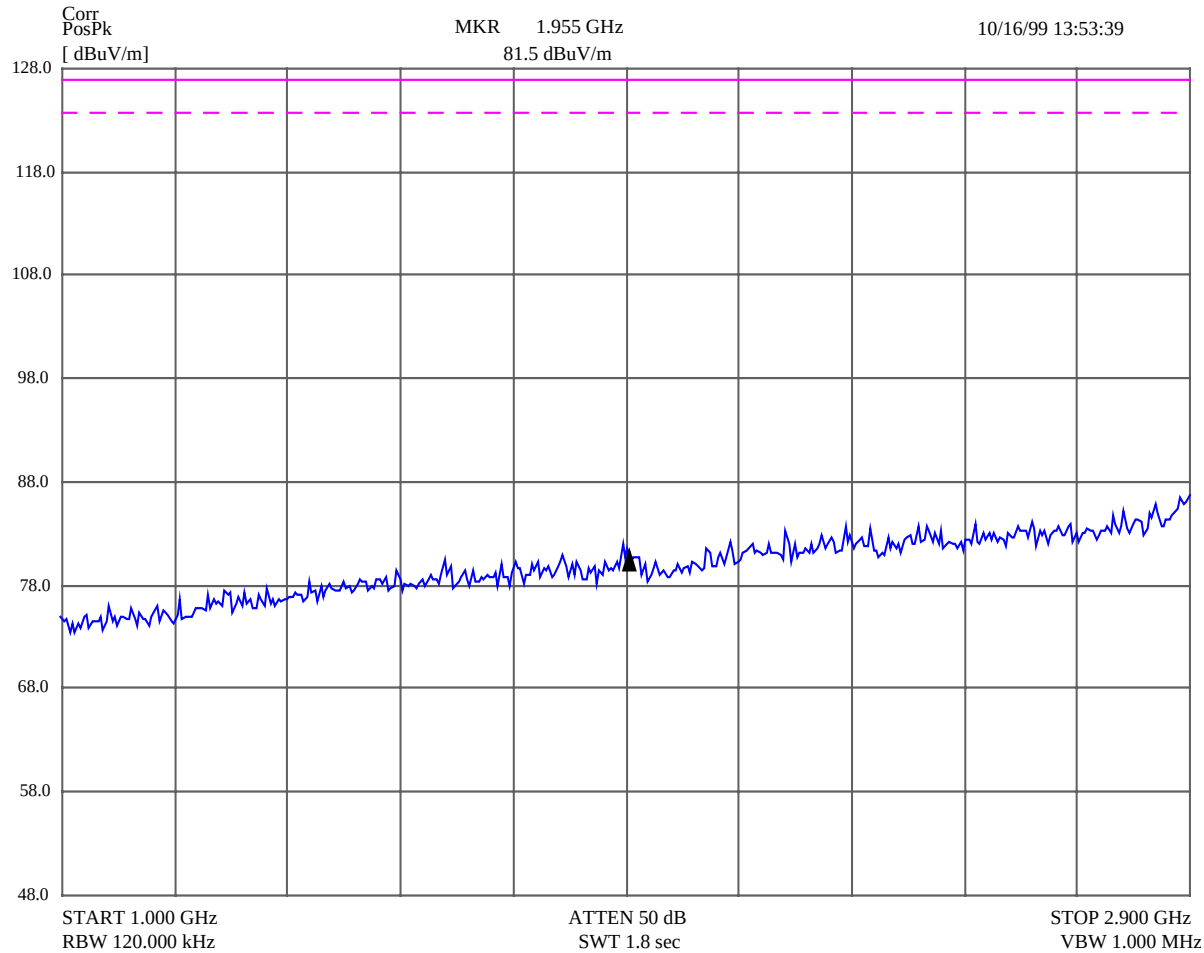
| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Pol  | Angle<br>deg | Hgt<br>cm | Status | Comment |
|------------------|----------------|--------------------|-----------------|------|--------------|-----------|--------|---------|
| 433.044992       | 61.05          | 84.46              | -23.41          | Horz | 190          | 100       | PASS   |         |
| 649.574976       | 70.99          | 84.46              | -13.47          | Vert | 61           | 124       | PASS   |         |

| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Pol  | Angle<br>deg | Hgt<br>cm | Status | Comment  |
|------------------|----------------|--------------------|-----------------|------|--------------|-----------|--------|----------|
| 216.544992       | 89.12          | 127                | -37.88          | Vert | 286          | 100       | PASS   | Fcarrier |

Receiver (Graphic) 1



Receiver (Graphic) 2

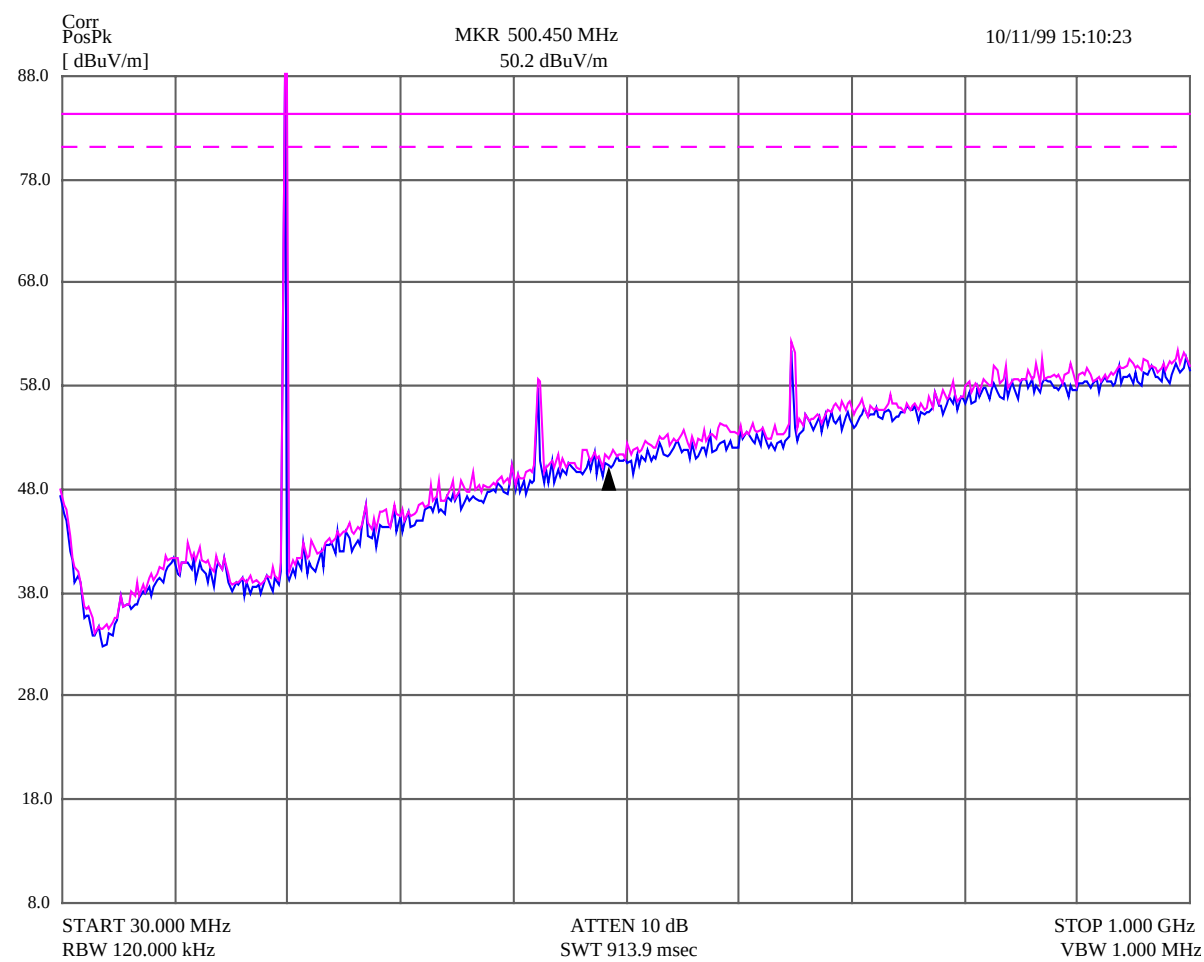


6) Channel 2V

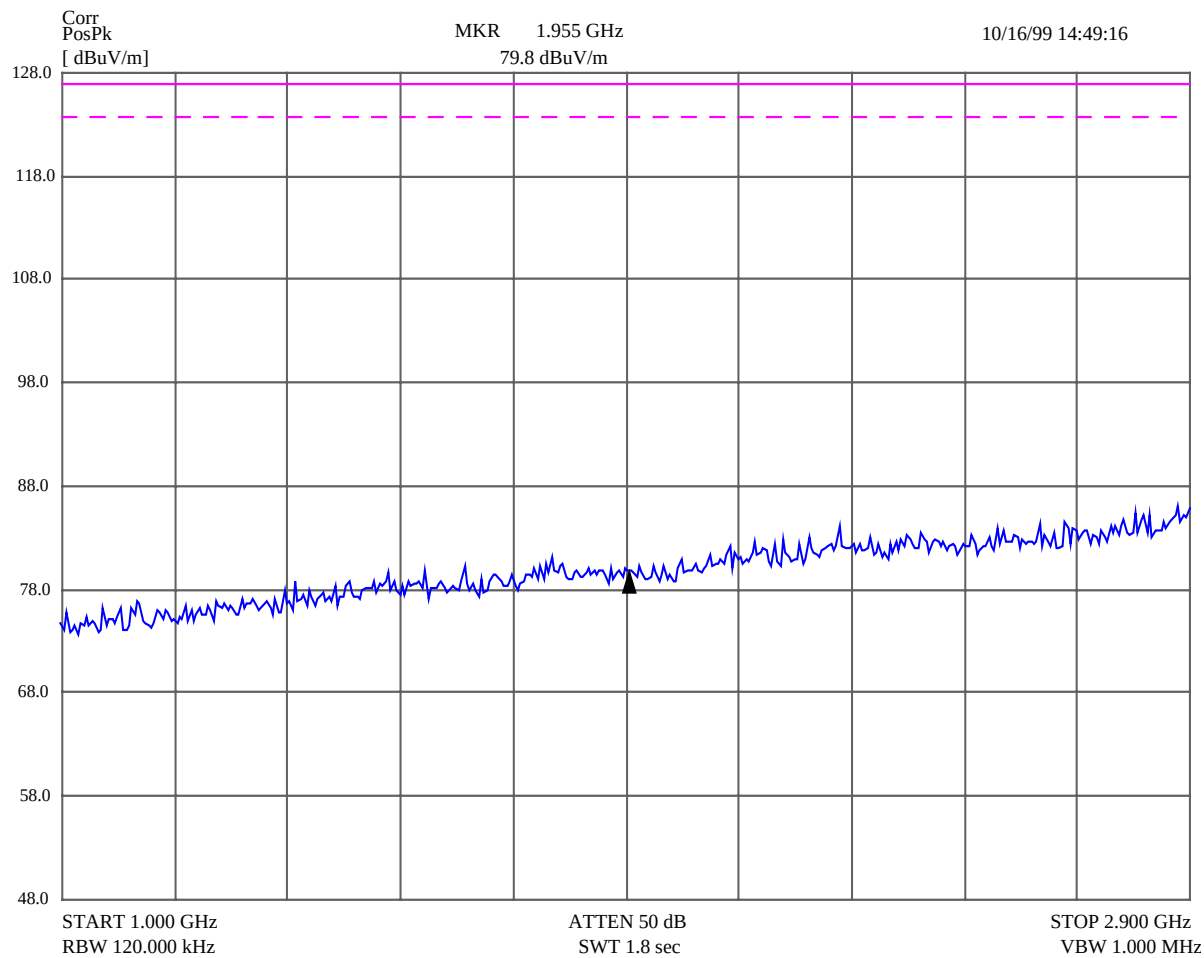
| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Pol  | Angle<br>deg | Hgt<br>cm | Status | Comment |
|------------------|----------------|--------------------|-----------------|------|--------------|-----------|--------|---------|
| 433.964992       | 61.57          | 84.46              | -22.89          | Horz | 196          | 99        | PASS   |         |
| 650.830016       | 66.52          | 84.46              | -17.94          | Horz | 61           | 120       | PASS   |         |

| Frequency<br>MHz | Peak<br>dBuV/m | Peak Lmt<br>dBuV/m | DelLim-Pk<br>dB | Pol  | Angle<br>deg | Hgt<br>cm | Status | Comment  |
|------------------|----------------|--------------------|-----------------|------|--------------|-----------|--------|----------|
| 216.944992       | 89.13          | 127                | -37.87          | Vert | 265          | 100       | PASS   | Fcarrier |

Receiver (Graphic) 1



Receiver (Graphic) 2



## 5.7. FREQUENCY STABILITY

The **FREQUENCY STABILITY TEST** was done :

- with variation of ambient temperature from 0° to +50° centigrade ;
- with variation primary supply voltage from 85 to 115 percent of the nominal AC value for the selected standard channel 1A and extra channel 2A;

Room Ambient Temperature: 21°C±1°C.

Relative Humidity: 47%±5%.

The thermocouple was installed on the MC14519 transmitter chip.

### 1) Channel 1A , Fcarrier (Fc) = 216.0125 MHz

| Temperature measured<br>° C | Frequency measured<br>Fm<br>MHz | Frequency tolerance<br>$\Delta F = F_m - F_c$<br>kHz | Frequency stability<br>Limit, Flim<br>kHz | Status |
|-----------------------------|---------------------------------|------------------------------------------------------|-------------------------------------------|--------|
| 0                           | 216.013952                      | 1.056                                                | 10.8                                      | PASS   |
| 10                          | 216.013942                      | 1.442                                                | 10.8                                      | PASS   |
| 20                          | 216.013504                      | 1.004                                                | 10.8                                      | PASS   |
| 30                          | 216.013248                      | 0.748                                                | 10.8                                      | PASS   |
| 40                          | 216.012544                      | 0.044                                                | 10.8                                      | PASS   |
| 50                          | 216.012256                      | -0.244                                               | 10.8                                      | PASS   |

| Primary supply voltage<br>V | Frequency measured<br>Fm<br>MHz | Frequency tolerance<br>$\Delta F = F_m - F_c$<br>kHz | Frequency stability<br>Limit, Flim<br>kHz | Status |
|-----------------------------|---------------------------------|------------------------------------------------------|-------------------------------------------|--------|
| 102                         | 216.012896                      | 0.396                                                | 10.8                                      | PASS   |
| 120                         | 216.011768                      | -0.732                                               | 10.8                                      | PASS   |
| 138                         | 216.011245                      | -1.255                                               | 10.8                                      | PASS   |

**2) Channel 2A , Fcarrier (Fc) = 216.025 MHz**

| Temperature measured<br>° C | Frequency measured<br>Fm<br>MHz | Frequency Tolerance<br>$\Delta F = F_m - F_c$<br>kHz | Frequency stability<br>Limit, Flim<br>kHz | Status |
|-----------------------------|---------------------------------|------------------------------------------------------|-------------------------------------------|--------|
| 0                           | 216.026592                      | 1.592                                                | 10.8                                      | PASS   |
| 10                          | 216.026400                      | 1.400                                                | 10.8                                      | PASS   |
| 20                          | 216.026048                      | 1.048                                                | 10.8                                      | PASS   |
| 30                          | 216.025504                      | 0.504                                                | 10.8                                      | PASS   |
| 40                          | 216.025152                      | 0.152                                                | 10.8                                      | PASS   |
| 50                          | 216.024656                      | -0.344                                               | 10.8                                      | PASS   |

| Primary supply voltage<br>V | Frequency measured<br>Fm<br>MHz | Frequency tolerance<br>$\Delta F = F_m - F_c$<br>kHz | Frequency stability<br>Limit, Flim<br>kHz | Status |
|-----------------------------|---------------------------------|------------------------------------------------------|-------------------------------------------|--------|
| 102                         | 216.024300                      | -0.700                                               | 10.8                                      | PASS   |
| 120                         | 216.025504                      | 0.504                                                | 10.8                                      | PASS   |
| 138                         | 216.023100                      | -1.900                                               | 10.8                                      | PASS   |