EMC Testing Laboratories, Inc.

# Test Report
# To Determine Compliance With:
# FCC, Part 15.249
# and RSS-210

**Model number:** TuneLink

**Date:** November 30, 2010

**Manufacturer:** New Potato Technologies
5508 Business Dr
Wilmington, NC, 28405

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## Contents Section

# Section 1

## *GENERAL INFORMATION*

| | |
|---|---|
| **Manufacturer:** | New Potato Technologies<br>5508 Business Dr<br>Wilmington, NC, 28405 |
| **Manufacturer representative:** | **Mr. Yuli Starodubtsev** |
| **Equipment covered by this report:** | Model no. TuneLink |
| **Options covered by this report:** | For use with iPhone, 3G |
| **Equipment serial no.** | Prototype |
| **Test specifications:** | FCC, 15.215, 15.249<br>and RSS-210 |
| **Product ratings:** | 12Vdc |
| **Test report number:** | 10-181-249 |
| **Test commenced:** | November 10, 2010 |
| **Test completed:** | November 30, 2010 |
| **Test engineer:** | Gene Bailey |

**Test Facility:** The test facility used to perform these tests is on file with the FCC under registration number 637500 and located at:

**EMC Testing Laboratories, Inc.**
2100 Brandon Trail
Suite 101
Alpharetta, GA 30004

# Section 2

## *PRODUCT DESCRIPTION and TESTS SUMMARY*

**Product Description:**
TuneLink is designed for use in a car, and is a combination of mobile phone charger, Bluetooth solution, FM Transmitter, and direct audio connection. In a typical setup, a Bluetooth connection is made, streaming audio is received via Bluetooth, and then the audio is either re-transmitted to the car audio system via FM or a cabled connection. The charging feature provides 5VDC via the USB connection. The USB connector is for charging only; TuneLink does not use the USB connection for data communication. Product is intended to be used with iPhone, model no. 3G.

**Operating Temperature Range:** 15°C to 35°C

**Frequency range:** 2401 – 2483 MHz

**Transmit Power:** 5dBm

**Modulation Technique:** FHSS

**Number of Channels:** 68 Channels

**Antenna Type:** Bluetooth, PCB Trace antenna

**Critical Components:**

Printed wiring boards – The following printed wiring boards are utilized:

| **Name** | **Part. no.** |
|---|---|
| TuneLink | 1001-01002-110, Rev. 0.32 |

**Test Operation:**
For all measurements, the equipment under test was and caused to function in a continuous mode of operation for maximum electrical activity as specified by the manufacturer. Specifically, the product was caused to continuously communicate with an iPod and caused to transmit by a cable connected to a radio.

**Test Configuration:**
The equipment under test (EUT) was set-up and configured as specified by the manufacturer as follows:

**1-** The EUT was connected to the following support peripherals:

**A-** An iPhone, model no. G3.

**B-** A radio manufactured by Bose, model no. AWRCC1.

**C-** A power supply manufactured by HP, model no. E3012A.

**2-** The EUT utilized the following cables.

**A-** A 30.5 cm long shielded cable for connection to radio.

**B-** Two 24AWG unshielded conductors for connection to power supply.

**C-** A 103 cm long USB cable for charging phones.

**D-** A 5ft. long type RG214 cable connected from antenna to preamp.

**E-** A 2ft. long type RG214 cable connected from spectrum analyzer to preamp.

**Modifications:**
The following modifications were required to comply with the requirements.

**1-** None.

**Tests Summary:**

**Table 1**

| **Clause** | **Test** | **Result** |
|---|---|---|
| 15.249 (a) | Output power | Pass |
| 15.249(d)(e) | Radiated Emission Test | Pass |
| 15.249(a) | Harmonic Emissions | Pass |
| 15.215 | 20 dB Bandwidth | Pass |

The test results apply only to the products identified in this test report.

**Engineering Statement:**
All measurement data of this test report was taken in accordance with the FCC, parts 15.215, 15.249, ANSI C63.4-2003 and IC, RSS-210 by EMC Testing Laboratories, Inc. located in Alpharetta, Georgia. Although this data is taken under stringent laboratory conditions and to the best of our knowledge represents accurate data, it must be recognized that emissions from or immunity to this type equipment may be greatly affected by the final installation of the equipment. Therefore, EMC Testing Laboratories, Inc., while supporting the accuracy of the data in this report, takes no responsibility for use of equipment based on these tests. The manufacturer of this equipment must take full responsibility for any field problems which may arise, and agrees that EMC Testing Laboratories, Inc., in performing its functions in accordance with its objectives and purposes, does not assume or undertake to discharge any responsibility of the manufacturer to any other party or parties.

**Conclusion:**
With the above-indicated modifications, the product covered by this report has been tested and found to comply with the requirements of the above-indicated standards.

Tested by: **Gene Bailey Engineer** ***Gene Bailey***

Approved by: ***Ed Barnes***
**Edward Barnes, RF Engineer,**
**EMC Testing Laboratories, Inc.**

# Section 3

## *Test Report*

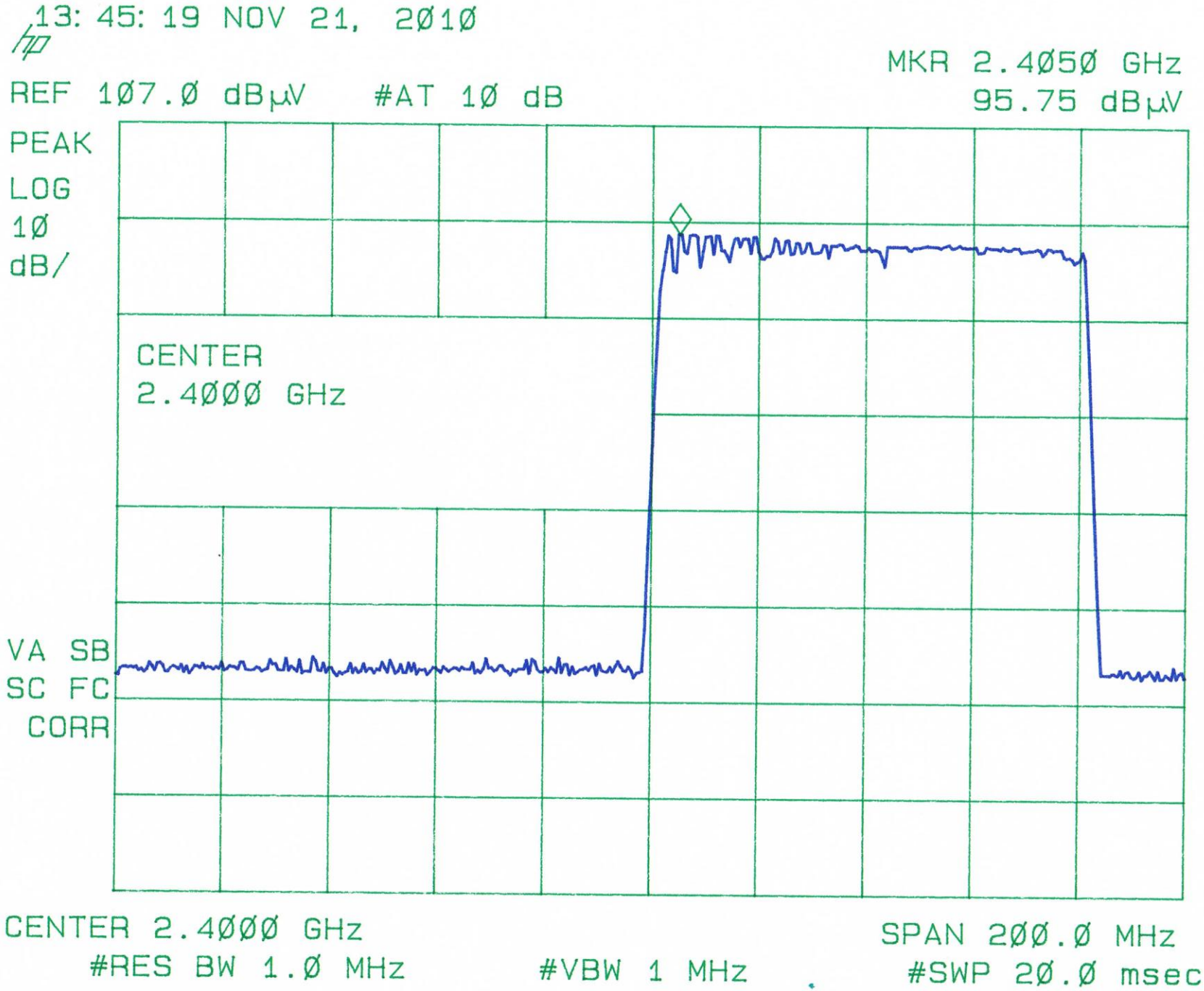
**Subclause 15.249 (a) – Peak Output Power**
**Pass**

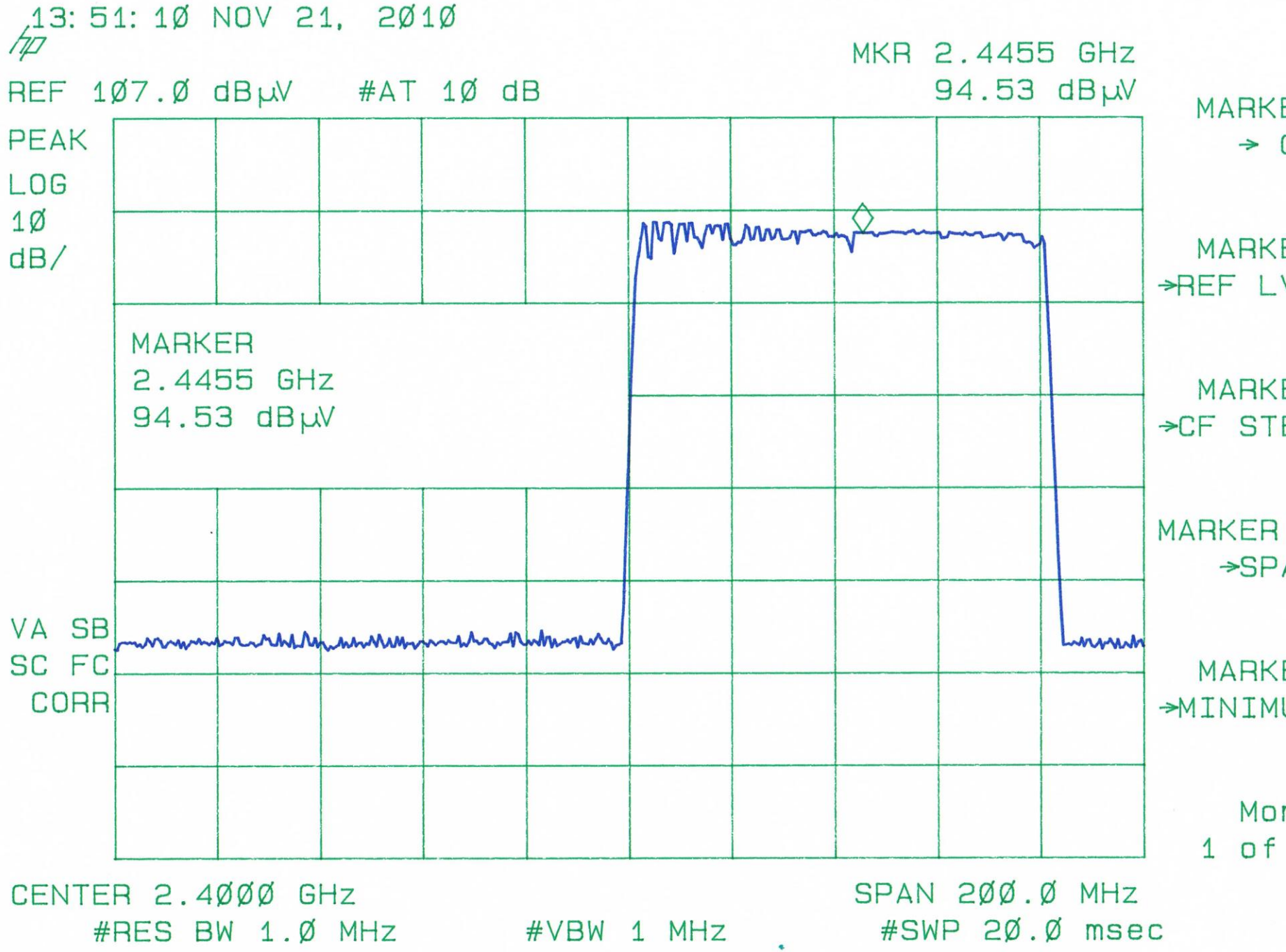
**Test Specification:** FCC Part 15.249
**Mode of operation:** Tx mode (2405MHz, 2445MHz, 2479MHz)
**Port of testing:** Radiated
**Detector:** Peak
**RBW/VBW:** 1MHz / 1MHz
**Supply voltage:** 12VDC from DC power supply
**Temperature:** 23ºC
**Humidity:** 50%

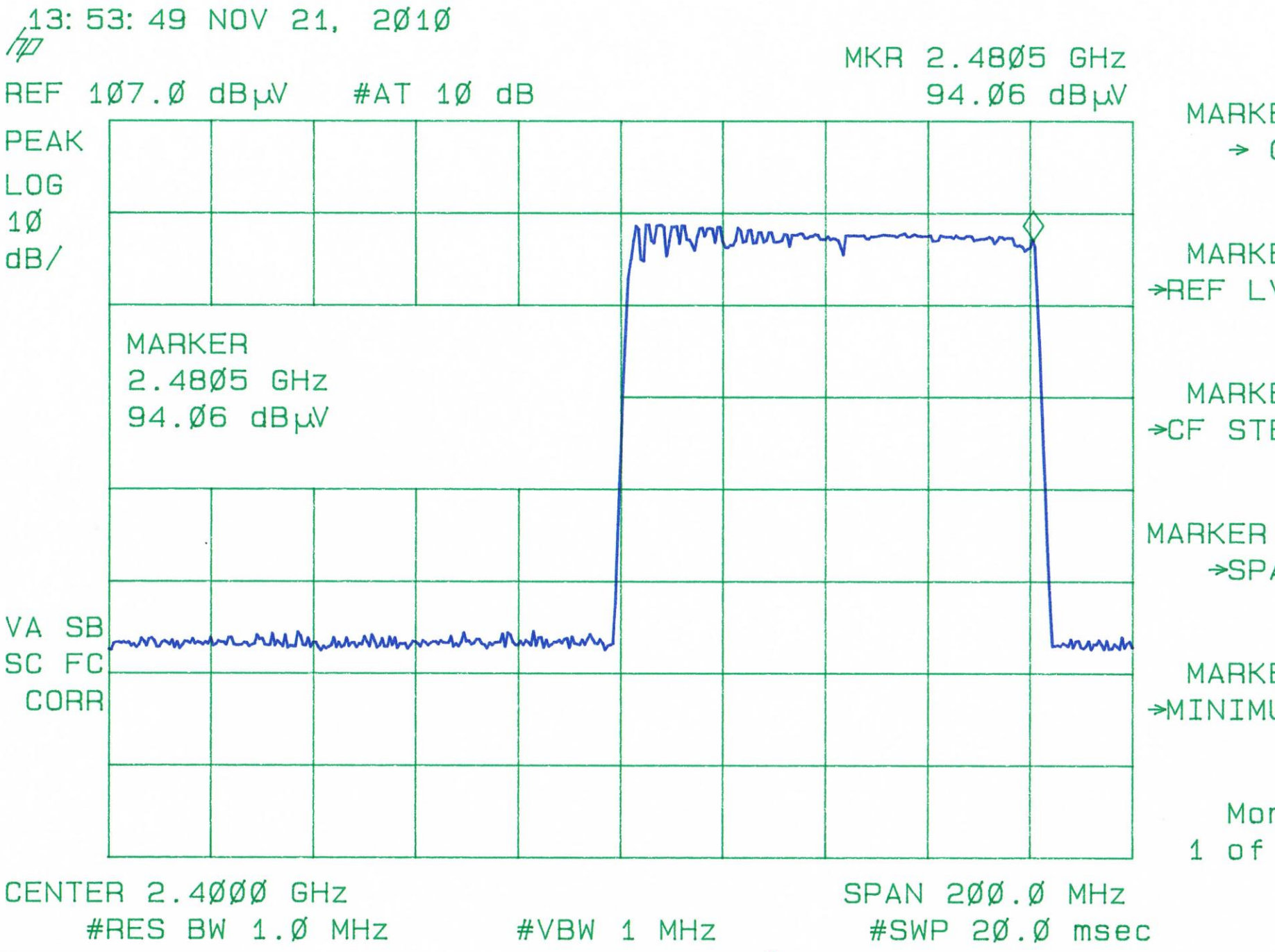
**Results:** See plots the next three pages.

| **Frequency (MHz)** | **Measurement Reading output power (dBμV/m)** | **Corrected Output power (dBμV/m)** | **Limit (dBμV/m)** | **Minimum Margin dBμV/m** |
|---|---|---|---|---|
| 2405 | 95.75 | 98.75 | 104 | -5.25 |
| 2445 | 94.53 | 97.53 | 104 | -6.47 |
| 2479 | 94.06 | 97.06 | 104 | -6.94 |

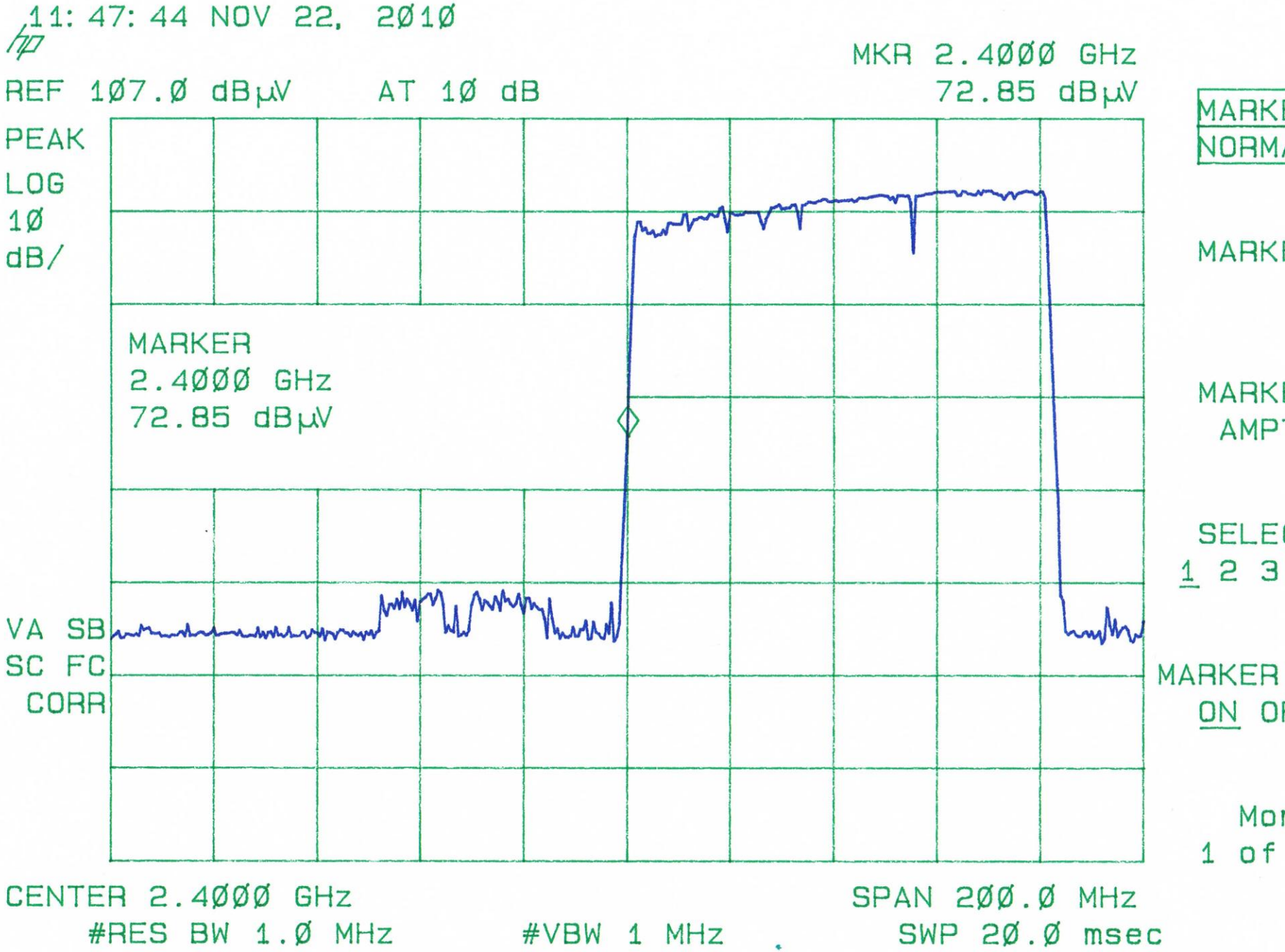
The measuring distance was 1 meter and the limit was increased 10 dBμV/m in Accordance with 15.31 (f) (1). Since the peak value is below the average limit, no Average measurements were required.

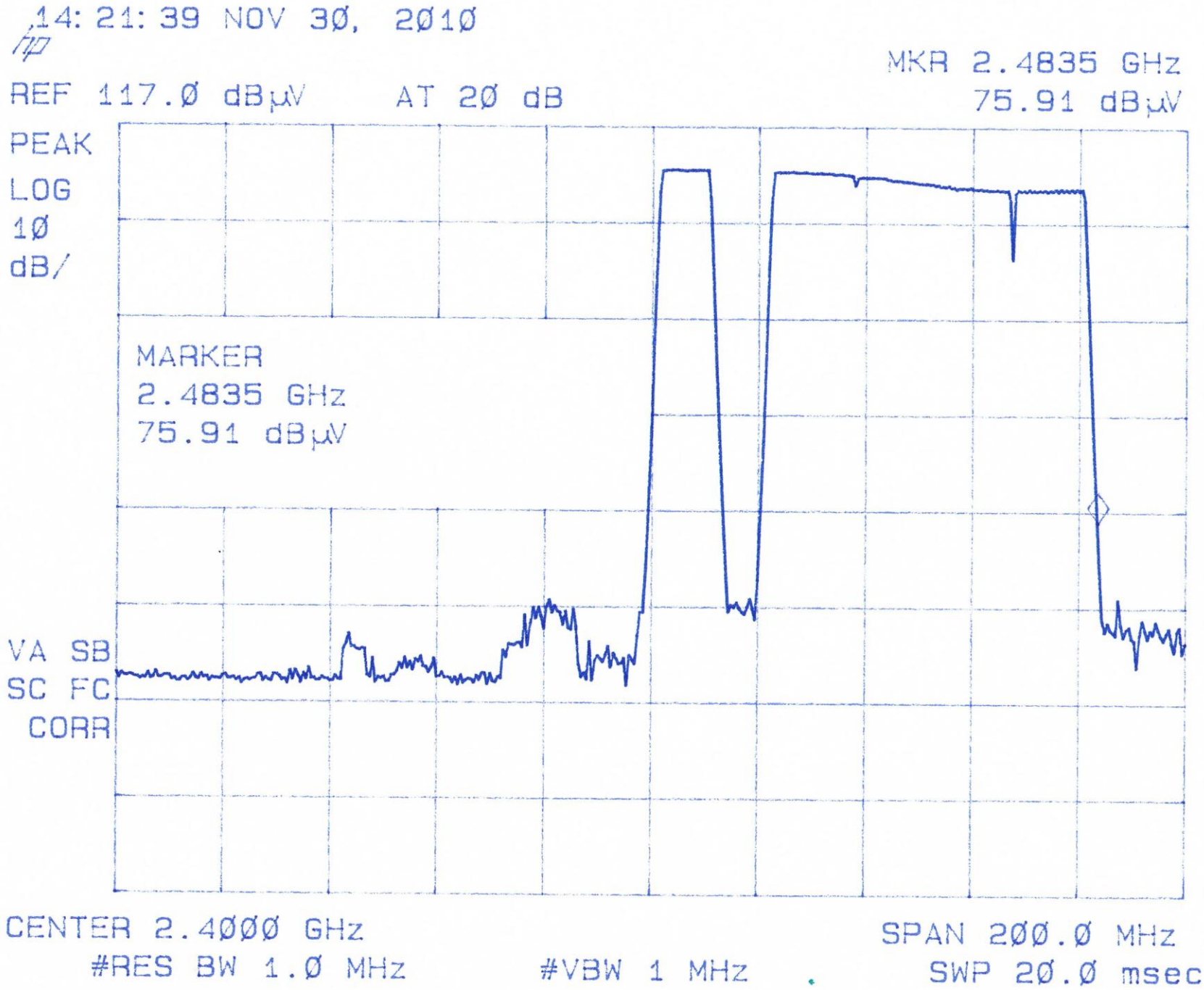

13: 45: 19 NOV 21, 2Ø1Ø
MKR 2.4Ø5Ø GHz
95.75 dBµV
REF 1Ø7.Ø dBµV
#AT 1Ø dB
PEAK
LOG
1Ø
dB/
CENTER
2.4ØØØ GHz
VA SB
SC FC
CORR
CENTER 2.4ØØØ GHz
#RES BW 1.Ø MHz
#VBW 1 MHz
SPAN 2ØØ.Ø MHz
#SWP 2Ø.Ø msec
MARKE
NEX
PEA
NEXT P
RIGH
NEXT P
LEF
Mor
1 of


13: 51: 1Ø NOV 21, 2Ø1Ø
MKR 2.4455 GHz
94.53 dBµV
REF 1Ø7.Ø dBµV
#AT 1Ø dB
PEAK
LOG
1Ø
dB/
MARKER
2.4455 GHz
94.53 dBµV
VA SB
SC FC
CORR
CENTER 2.4ØØØ GHz
#RES BW 1.Ø MHz
#VBW 1 MHz
SPAN 2ØØ.Ø MHz
#SWP 2Ø.Ø msec
MARKE
→ C
MARKE
→REF LV
MARKE
→CF STE
MARKER
→SPA
MARKE
→MINIMU
Mor
1 of


13: 53: 49 NOV 21, 2Ø1Ø
MKR 2.48Ø5 GHz
94.Ø6 dBµV
REF 1Ø7.Ø dBµV
#AT 1Ø dB
PEAK
LOG
1Ø
dB/
MARKER
2.48Ø5 GHz
94.Ø6 dBµV
VA SB
SC FC
CORR
MARKE
→ C
MARKE
→REF LV
MARKE
→CF STE
MARKER
→SPA
MARKE
→MINIMU
Mor
1 of
CENTER 2.4ØØØ GHz
#RES BW 1.Ø MHz
#VBW 1 MHz
SPAN 2ØØ.Ø MHz
#SWP 2Ø.Ø msec

| **Subclause 15.215 (c) - 20dB Bandwidth** | **Pass** |
|---|---|
| **Test Specification:** FCC Part 15.215(c)<br>**Mode of operation:** Tx mode<br>**Port of testing:** Radiated<br>**Detector:** Peak<br>**RBW/VBW:** 1 MHz / 1 MHz<br>**Supply voltage:** 12VDC from DC power supply<br>**Temperature:** 23ºC<br>**Humidity:** 50% | |
| **Results:** See plots the next page. | |
| **Frequency, MHz** | **20dB Bandwidth, dBµV/m** |
| 2400 | 72.85 |
| 2482 | 75.91 |


11: 47: 44 NOV 22, 2010
MKR 2.4000 GHz
REF 107.0 dBµV
AT 10 dB
72.85 dBµV
PEAK
LOG
10
dB/
MARKER
2.4000 GHz
72.85 dBµV
VA SB
SC FC
CORR
CENTER 2.4000 GHz
#RES BW 1.0 MHz
#VBW 1 MHz
SPAN 200.0 MHz
SWP 20.0 msec
MARKE
NORMA
MARKE
MARKE
AMPT
SELEC
1 2 3
MARKER
ON OF
Mor
1 of


14: 21: 39 NOV 30, 2010
MKR 2.4835 GHz
75.91 dBµV
REF 117.0 dBµV
AT 20 dB
PEAK
LOG
10
dB/
MARKER
2.4835 GHz
75.91 dBµV
VA SB
SC FC
CORR
CLEA
WRITE
MA
HOLD
VIEW
BLANK
Trac
A B
Mor
1 of
CENTER 2.400Ø GHz
#RES BW 1.0 MHz
#VBW 1 MHz
SPAN 200.0 MHz
SWP 20.0 msec

# *Radiated Emissions*

**INTRODUCTION:**

The product covered by this report was subjected to electromagnetic interference emissions measurements to determine compliance with the FCC, Parts 15.249 requirements.

Radiated and conducted emissions were measured in accordance with the Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz, ANSI C63.4.

During this test, a radio was connected to the EUT.

**MEASUREMENT CALCULATIONS:**

**Radiated Emissions:**

For radiated emissions measurements, the signal attenuation due to impedance losses in the antenna and signal cable were significant and was added to the spectrum analyzer reading to give corrected signal strength reading. If a preamplifier was used, the signal gain was subtracted from the signal strength reading. Radiated emissions data was specified as decibels above 1 microvolt per meter (dBμV/m) of radiated field strength.

Radiated emissions (dBμV) = Analyzer reading (dBμV) plus antenna factor (dB) plus cable factor (dB) minus Amplifier gain (dB)

**Conducted Emissions:**

For conducted emissions, the signal attenuation due to impedance losses in the LISN and signal cables was negligible and assumed to be 0dB. The conducted emissions were directly equal to the spectrum analyzer reading. Conducted emissions data was specified as decibels above 1 microvolt (dBμV) of conducted line voltage.

Conducted emissions (dBμV) = Analyzer reading (dBμV)

**RADIATED EMISSIONS MEASUREMENT:**

Radiated emissions measurements were performed at an open field test site. The receiving antenna was positioned 1 meter from the equipment under test along the center axis of the test site. Measurements were made with broadband antennas and if necessary, detected emissions were verified with dipole antennas. The dipole antenna was manually tuned to the signal frequency by adjusting the length of the antenna elements.

The radiated emissions were measured for both the horizontal and vertical signal planes by rotating the antennas. Additionally, the EUT was rotated by the turntable and the antenna height was raised and lowered 1 to 4 meters to locate the maximum emission strength at each frequency.

The radiated emissions were measured over the frequency span of 30 MHz to 1000 MHz. The following antennas were used to measure the radiated emissions within the specified frequency spans.

**CONDUCTED EMISSIONS MEASUREMENT:**

Conducted emissions measurements were performed on a ground plane that was electrically bonded to earth ground. The equipment under test was positioned 0.8 meter above the ground plane and 0.8 meter minimum from the LISN that was positioned on the ground plane. The LISN housings were electrically bonded to the ground plane. The conducted emissions for both the ungrounded supply conductor (L1) and the grounded conductor (L2) of the power supply cord were measured. The conducted emissions were measured over the frequency span of 0.15 to 30 MHz. The measurements were conducted in the quasi-peak and average detector modes.

**INSTRUMENTATION:**

Radiated and conducted signal strength measurements were taken with a spectrum analyzer. Radiated emissions were measured with broadband and tuned dipole antennas. Conducted emissions were measured with a 50 UH line impedance stabilization network (LISN).

**DETECTOR FUNCTION:**

Unless otherwise indicated in this report, all measurements were taken using a peak hold signal detector function. In this mode, the spectrum analyzer makes continuous scans across the frequency band and stores the highest emission value detected at each frequency for all scans. The peak hold integration will detect transient or low duty cycle emissions peak, which might be missed on single scan measurement. The emission value at each frequency was a true value.

**SPECTRUM ANALYZER SETTING:**

For all measurements, the spectrum analyzer was set for 10 dB input attenuation, 10 dB/Division vertical scale and 90 or 100 dBμV reference level. The resolution bandwidth was set at 9 KHz for the 0.15 - 30 MHz span and at 120 KHz for 30 - 1000 MHz span. The video bandwidth and sweep rate were automatically coupled by the analyzer.

*Test Method cont…*

## Results

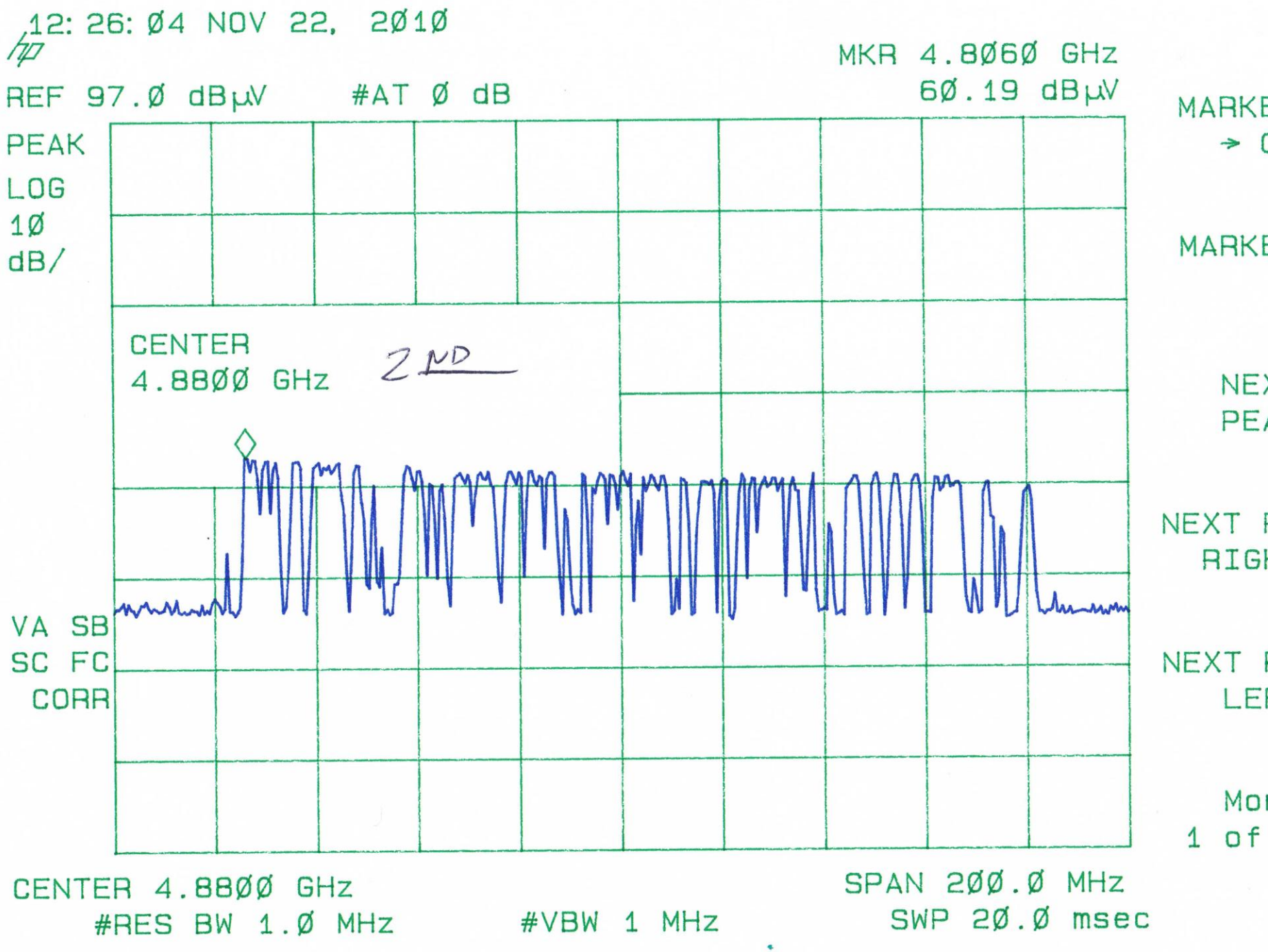
See table below and following three plots for the harmonics.

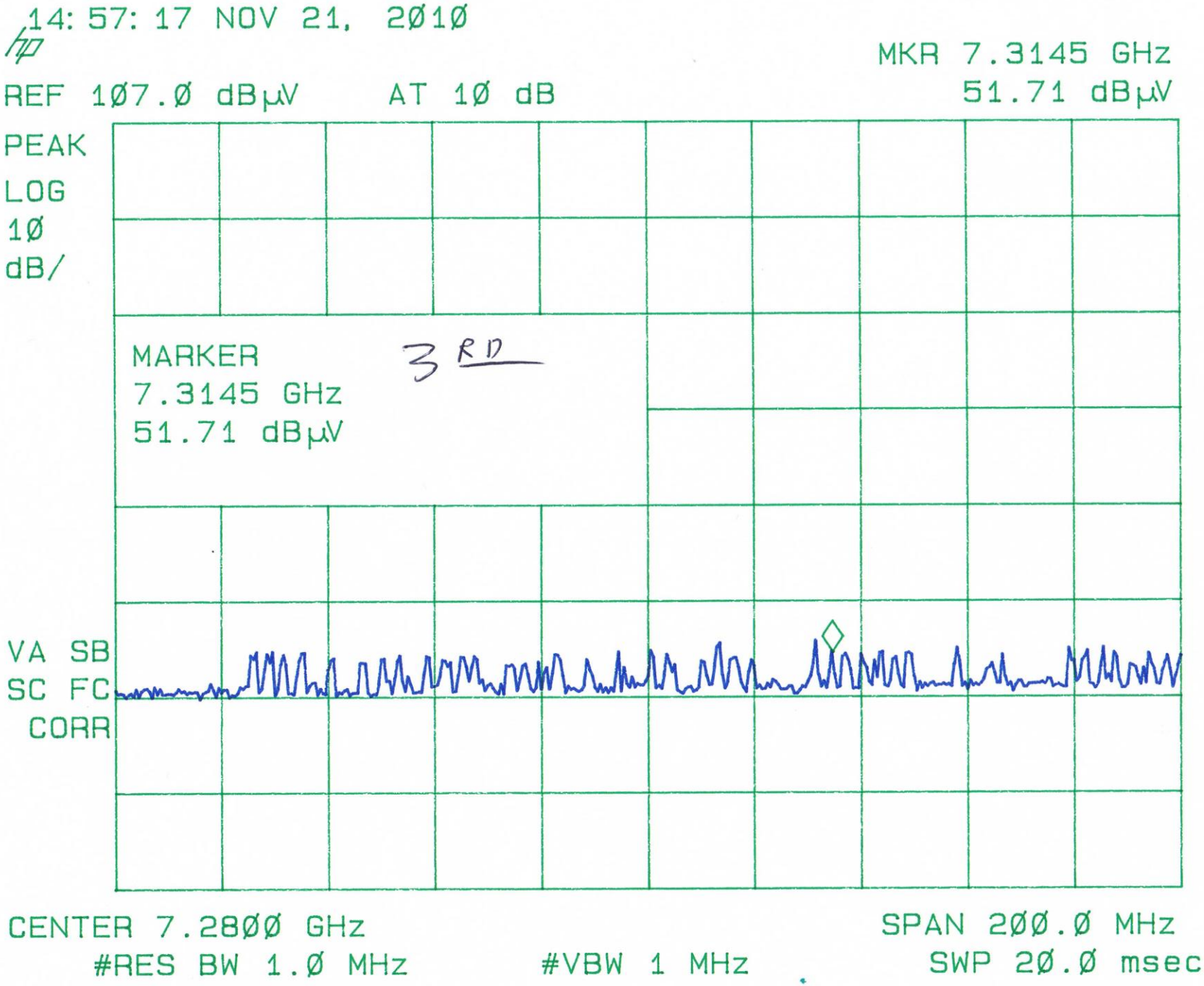
| Frequency, MHz | Measurement Reading, dBμV/m | Corrected Reading, dBμV/m | EN55022 Limit, dBμV/m | Minimum Margin, dBμV/m |
|---|---|---|---|---|
| **Horizontal** | | | | |
| 121.5 | 56.1 | 47.0 | 60.5 | -13.5 |
| **Vertical** | | | | |
| 62.5 | 47.4 | 36.0 | 60.5 | -24.5 |
| 64.6 | 47.5 | 36.1 | 60.5 | -24.4 |
| 79.2 | 46.2 | 35.0 | 60.5 | -25.5 |
| 124.8 | 55.2 | 45.8 | 60.5 | -14.7 |
| 143.7 | 53.3 | 44.9 | 60.5 | -15.6 |

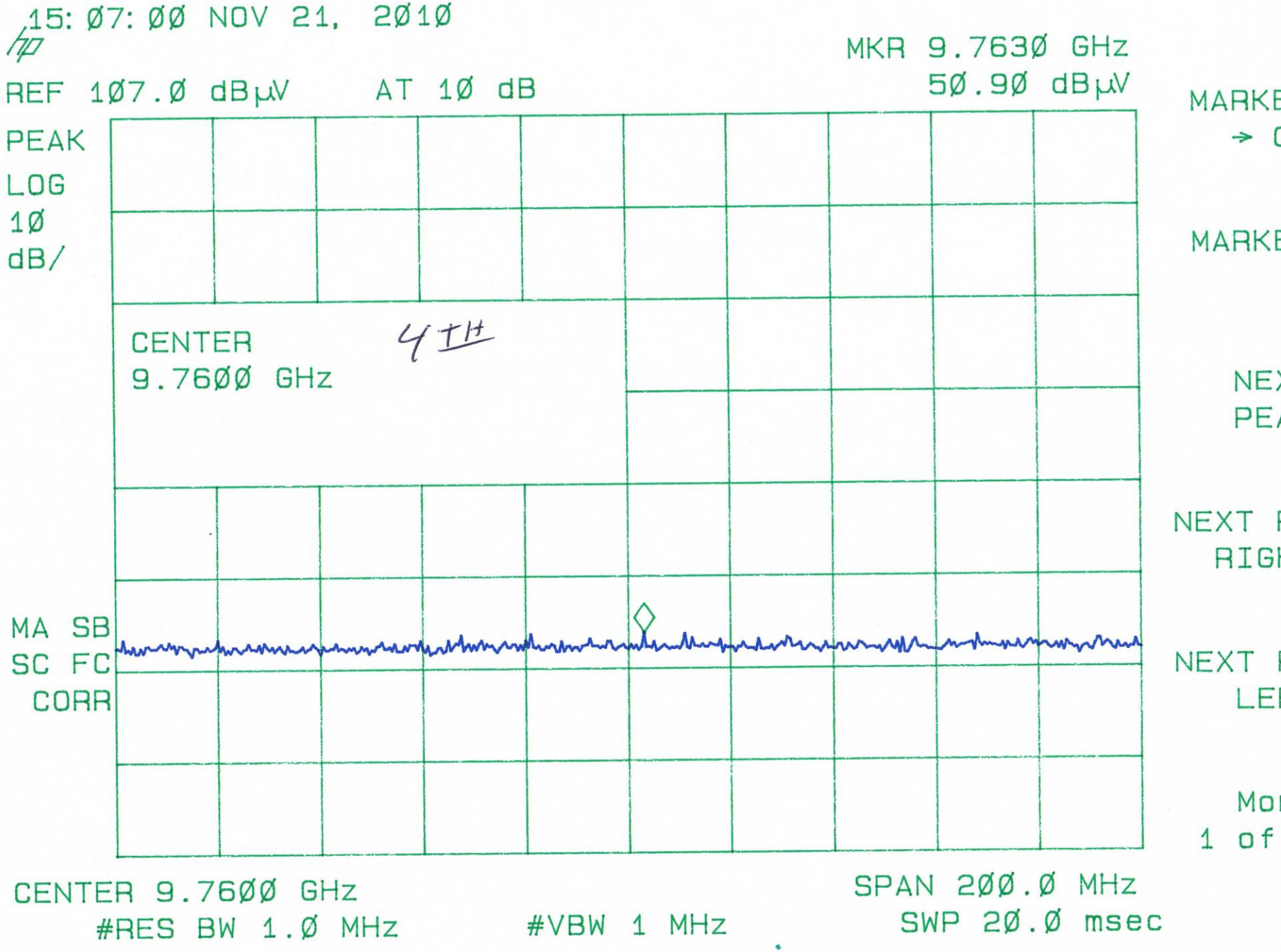
**Harmonic Emissions**

| Frequency (MHz) | Measurement Reading output power (dBμV/m) | Corrected Output power (dBμV/m) | Limit at 1 meter distance (dBμV/m) | Minimum Margin dBμV/m |
|---|---|---|---|---|
| 4808 | 60.02 | 60.52 | 64.00 | -3.48 |
| 7314 | 51.7 | 59.5 | 64.00 | -4.5 |
| 9763 | 50.9 | 60.5 | 64.00 | -3.5 |

The unit was operated on all fundamental frequencies within the frequency band (2.402 GHz to 2.480 GHz). The following plots show the measured levels at the 2nd, 3rd and 4th harmonics of the fundamental. The highest level of each harmonic was found and recorded in the table. No higher order harmonics were found. The unit was tested in both Horizontal and Vertical. Only the vertical are recorded or shown here as they were the highest measured.


12: 26: Ø4 NOV 22, 2Ø1Ø
MKR 4.8Ø6Ø GHz
6Ø.19 dBµV
REF 97.Ø dBµV
#AT Ø dB
PEAK
LOG
1Ø
dB/
CENTER
4.88ØØ GHz
2ND
VA SB
SC FC
CORR
CENTER 4.88ØØ GHz
#RES BW 1.Ø MHz
#VBW 1 MHz
SPAN 2ØØ.Ø MHz
SWP 2Ø.Ø msec


14: 57: 17 NOV 21, 2010
MKR 7.3145 GHz
51.71 dBµV
REF 107.0 dBµV
AT 10 dB
PEAK
LOG
10
dB/
MARKER
7.3145 GHz
51.71 dBµV
3RD
VA SB
SC FC
CORR
CENTER 7.2800 GHz
#RES BW 1.0 MHz
#VBW 1 MHz
SPAN 200.0 MHz
SWP 20.0 msec
CLEA
WRITE
M
HOLD
VIEW
BLANK
Tra
A B
Mo
1 of


15: Ø7: ØØ NOV 21, 2Ø1Ø
MKR 9.763Ø GHz
REF 1Ø7.Ø dBµV
AT 1Ø dB
5Ø.9Ø dBµV
PEAK
LOG
1Ø
dB/
CENTER
9.76ØØ GHz
4TH
MA SB
SC FC
CORR
CENTER 9.76ØØ GHz
#RES BW 1.Ø MHz
#VBW 1 MHz
SPAN 2ØØ.Ø MHz
SWP 2Ø.Ø msec