



Nemko

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Test Report: 2008 05108151 SMK FCC

Project number: 11231-1

Applicant: Sezmi Corporation
1301 Shoreway Road Suite 310
Belmont, CA 94002-4155

Equipment Under Test (EUT): Transmitter (Handheld Remote Control)

Model: SZMI-RCU-01

FCC ID: V4SU2RC

In Accordance With: FCC Part 15 Subpart C, 15.249

Tested By: Nemko USA Inc.
11696 Sorrento Valley Road, Suite F
San Diego, CA 92121

Authorized By: 

Alan Laudani, RF/EMC Test Engineer

Date: June 2, 2008

Total Number of Pages: 29

Section 1. Summary of Test Results

General

All measurements are traceable to national standards

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15; Subpart C. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

This Radio Standards Specification (RSS) sets out the requirements for license exempt low-power intentional radiators. The applicable standard for low-power intentional radiators in Canada, corresponding to FCC Part 15 Subpart C, is RSS-210. The two are very closely harmonized in terms of permitted frequencies, types of operation, and other technical requirements. The test results reported in this report are deemed satisfactory evidence of compliance with Industry Canada Standard RSS-210.

The assessment summary is as follows:

Apparatus Assessed: Transmitter (Handheld Remote Control)

Specification: FCC Part 15 Subpart C, 15.249

Compliance Status: Complies

Exclusions: None

Non-compliances: None

Report Release History:

REVISION	DATE	COMMENTS	
-	06-02-2008	Prepared By:	Ferdinand S. Custodio
-	06-02-2008	Initial Release:	Alan Laudani

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

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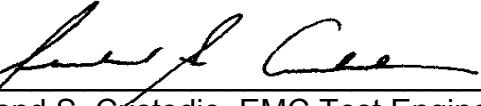
Specification: FCC Part 15 Subpart C, 15.249

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TESTED BY:


Ferdinand S. Custodio, EMC Test Engineer

Date: June 02, 2008

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Section 2: Equipment Under Test

2.1 Product Identification

The Equipment Under Test was identified as follows:

Transmitter (Handheld Remote Control) labelled as SEZMI (SZMI-RCU-01)

Engineering sample, serial number not available during assessment



2.2 Samples Submitted for Assessment

The following samples of the apparatus have been submitted for type assessment:

Sample No.	Description	Serial No.
001	Transmitter (Handheld Remote Control)	NA

2.3 Theory of Operation

The purpose for the unit is to control a set up box. This set up box is similar to a cable box... The unit can operate in IR (infra red) mode or in RF mode. The remote controls the volume, channel, record, fast forwards, etc...

There are a total of 35 keys and a scroll keys. Every time the key is pressed or the scroll is used the data is sent via the RF channel. When a key is not pressed, a heart beat is sent to keep the remote and the receiver in sync. The information sent during the heart beat is similar to that of a key pressed. The only type of data sent is control data. The unit does not send audio or video signals.

The remote communicates with a unit inside of the set up box. This unit is separate of the remote. The communication is done in one and only one frequency. If the unit sees an interferer both set up box and transmitter will switch channel. Never are two frequencies transmitted at the same time.

The antenna used is a meandering antenna with a gain of -2dBi. The antenna is located in front of the remote. It interfaces with the RFIC via a Balun/Matching network. The only intentional source of RF is via this port.

2.4 Technical Specifications of the EUT

Applicant:	Sezmi Corporation
Manufacturer:	SMK Electronics Corp. USA
Operating Frequency:	2.402GHz to 2.477GHz in the 2.400 to 2.4835GHz Band
Emission Designator	2M38G1D
Measured Field Strength:	98.4 dB μ V/m Peak 78.4 dB μ V/m Average
Modulation:	GFSK
Type of Receiver:	None
Antenna Data:	Integral (-2dBi gain)
Power Source:	(2X AA) LR6 alkaline batteries

Section 3: Test Conditions

3.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.249

Operation within the bands 902–928 MHz, 2400–2483.5 MHz, 5725–5875 MHZ, and 24.0–24.25 GHz

3.2 Deviations From Laboratory Test Procedures

No deviations from Laboratory Test Procedure

3.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	19.8 – 22.1 °C
Humidity range	:	38 % - 54%
Pressure range	:	86 - 106 kPa
Voltage	:	(2X) AA Battery: 3.0VDC

3.4 Test Equipment

Nemko ID	Device	Manufacturer	Model	Serial Number	Cal Date	Cal Due Date
114	Antenna, Bicon	EMCO	3104	2997	10-Jan-08	10-Jan-09
110	Antenna, LPA	Electrometrics	LPA-25	1217	10-Jan-08	10-Jan-09
674	Spectrum Analyzer	HP	8568B	2007A00910	11-Apr-08	11-Apr-09
675	Spectrum Analyzer Display	HP	85662A	2005A01282	11-Apr-08	11-Apr-09
676	Quasi-Peak Adapter	HP	85650A	2430A00576	11-Apr-08	11-Apr-09
919	Preamplifier	Spacek Labs MM-Wave Technology	100MHz to 40GHz	3M12 (SLK-35-3) and 3M13 (SLKa-35-4)	12-Mar-08	12-Mar-10
529	Antenna, DRWG	EMCO	3115	2505	27-Aug-07	27-Aug-08
911	Spectrum Analyzer	Agilent	E4440A	US41421266	18-Mar-08	18-Mar-09
625	Antenna, Dbl Ridge Horn	EMCO	3116	2325	01-Apr-08	01-Apr-09

Section 4: Observations

4.1 Modifications Performed During Assessment

No modifications performed during the assessment.

4.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

4.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

4.4 Test Deleted

No Tests were deleted from this assessment.

4.5 Additional Observations

There were no additional observations made during this assessment.

Section 5: Results Summary

This section contains the following:

FCC Part 15 Subpart C: Test Results.

The column headed "Required" indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

N No: not applicable / not relevant

Y Yes: Mandatory i.e. the apparatus shall conform to these test.

N/T Not Tested, mandatory but not assessed. (See section 4.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

5.1 FCC Part 15 Subpart C Test Results

Part 15	Test Description	Required	Result
15.207 (a)	Powerline Conducted Emissions	N ¹	
15.205 (a)	Radiated Emissions within Restricted Bands	Y	Pass
15.215 (c)	Occupied Bandwidth	Y	Pass
15.249 (a)	Radiated Emissions not in Restricted Bands	Y	Pass

Notes:

¹EUT is a device which only employs battery power for operation and does not operate from the AC power lines or contain provisions for AC operation.

Appendix A: Test Results

Clause 15.205(a) Restricted Bands of Operation

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
¹ 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	(²)
13.36–13.41			

Test Conditions:

Sample Number:	001	Temperature:	22.1
Date:	05/30/2008	Humidity:	38
Modification State:	Transmit	Tester:	Ferdinand Custodio
		Laboratory:	Shield Room 1/SOATS

Test Results:

No emissions observed - See Attached Plots.

Additional Observations:

The Spectrum was searched from 30MHz up to 26.5 GHz.

These results apply to emissions found in the restricted bands defined in FCC Part 15 Subpart C, 15.205.

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The EUT was measured on three orthogonal axes. The EUT was tested with freshly charged battery.

All verifications were performed at 3m with a Quasi Peak detector.

There were no emissions observed other than the fundamental as evident from the following prescans performed inside a shield room at 1 meter.

The only emission observed below 1GHz is 181MHz which was verified to be KFMB TV8 San Diego operating between 180-186MHz.

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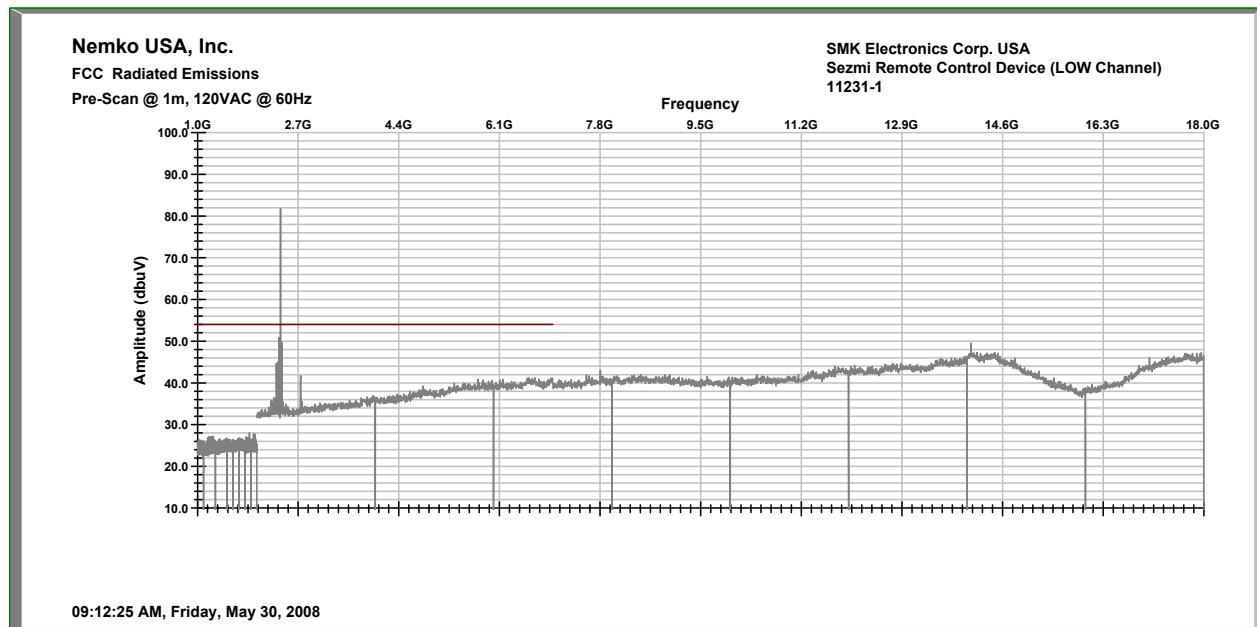
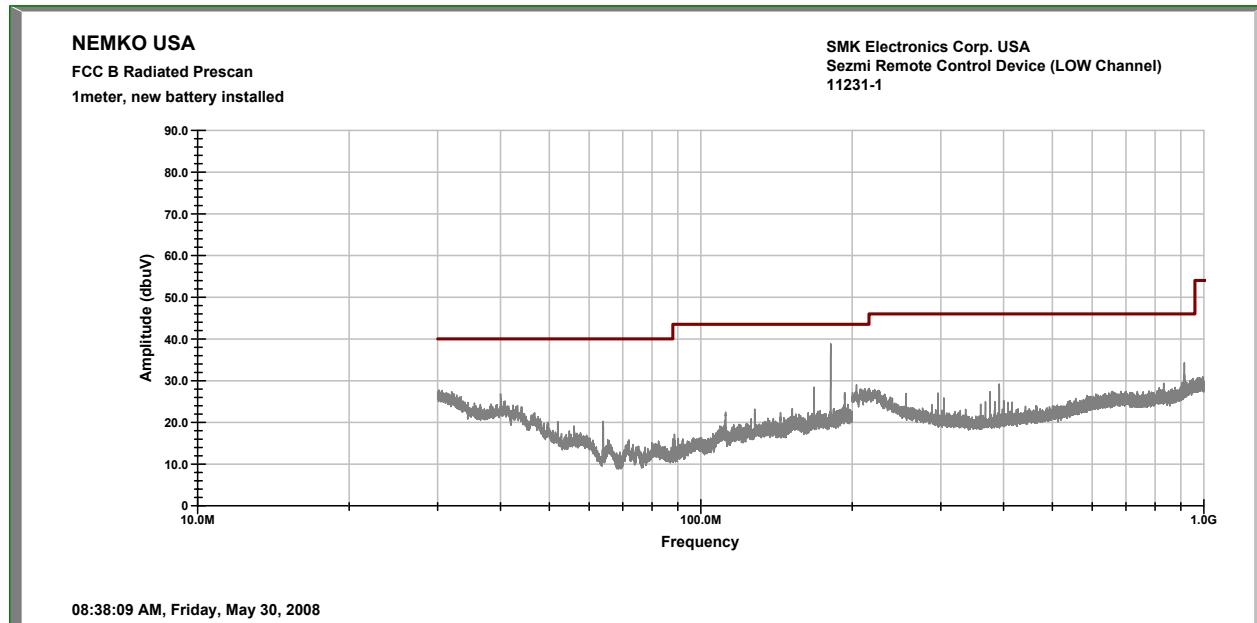
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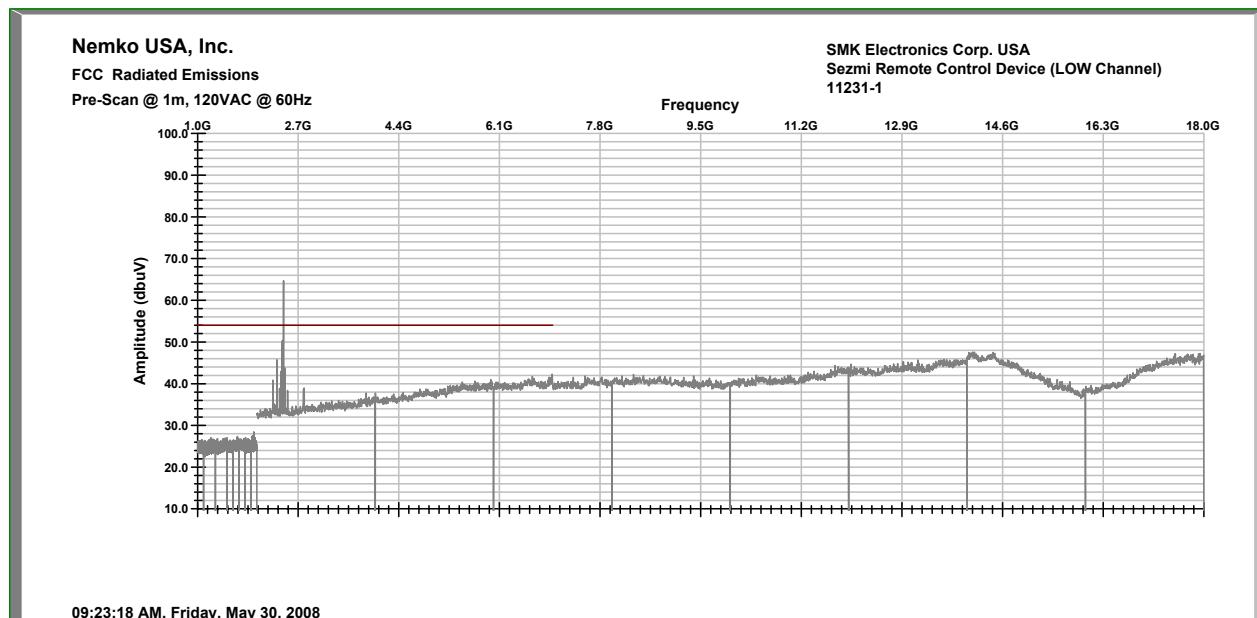
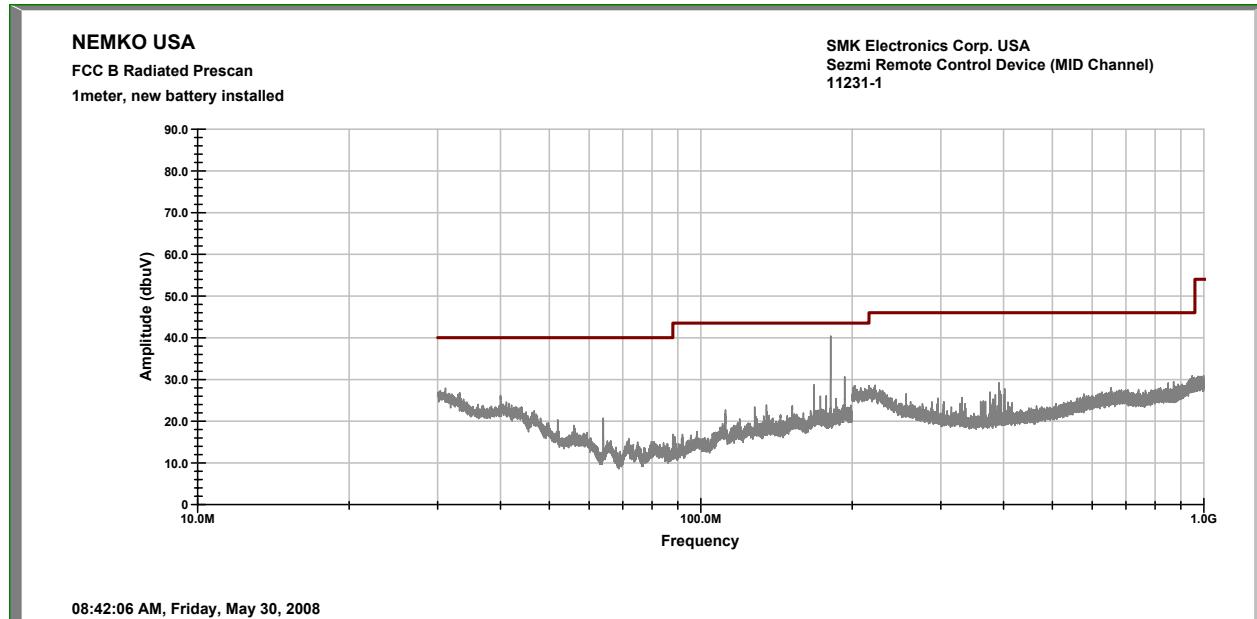
Phone (858) 755-5525 Fax (858) 452-1810

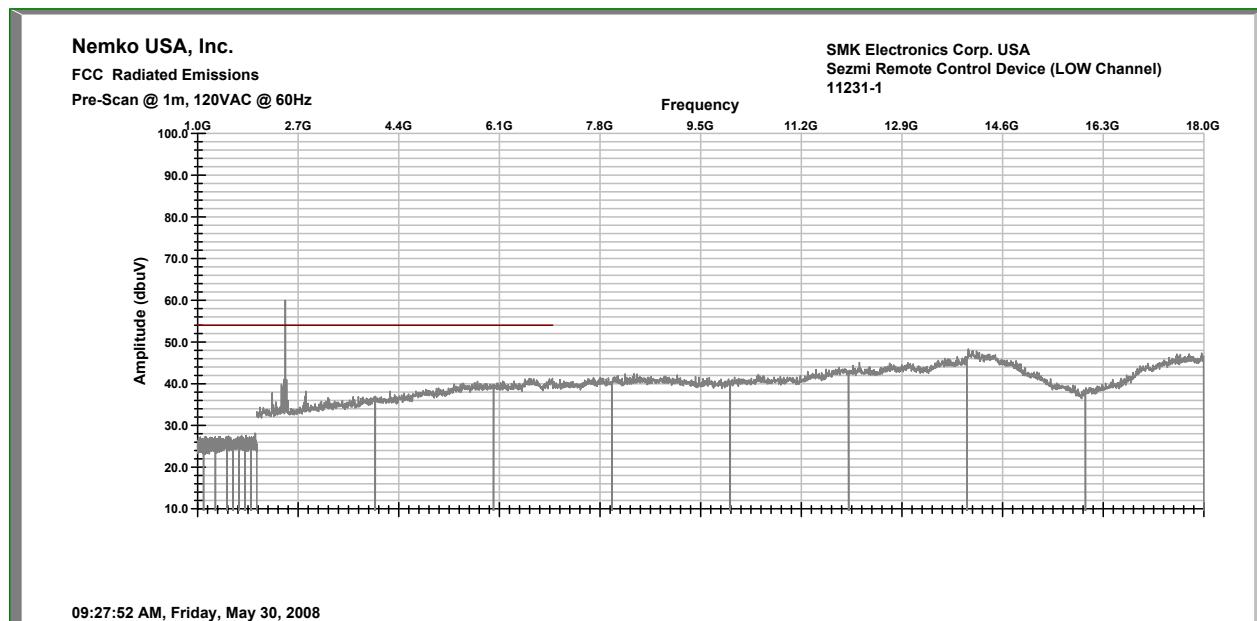
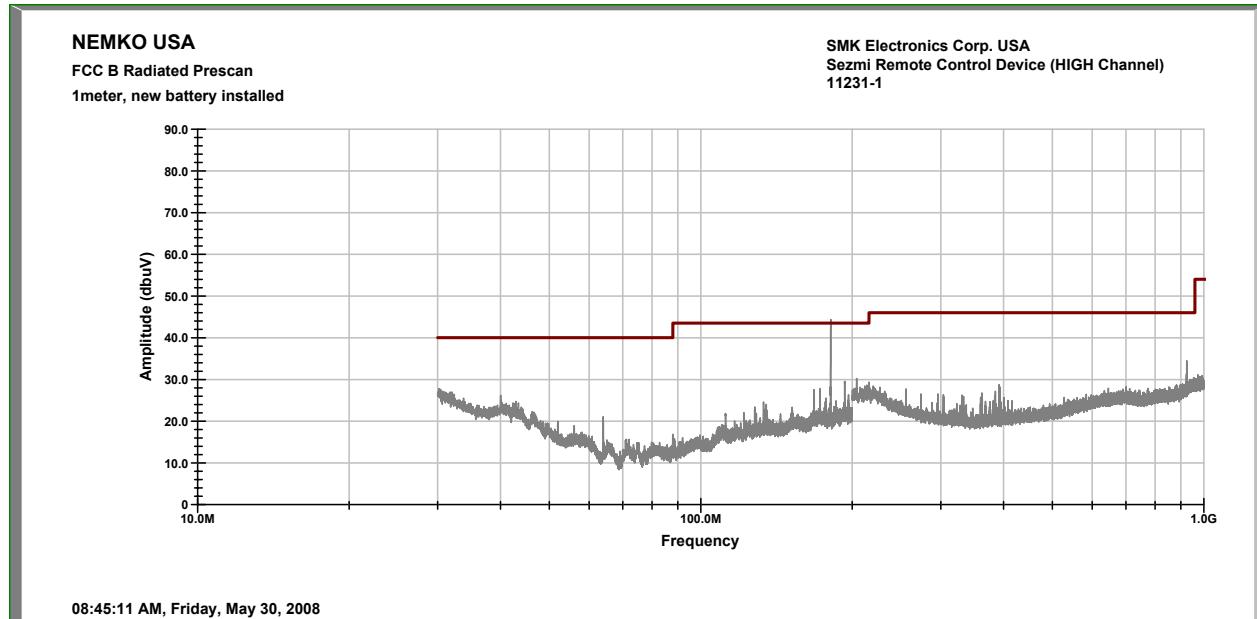
Report Number: 2008 05108151 SMK FCC

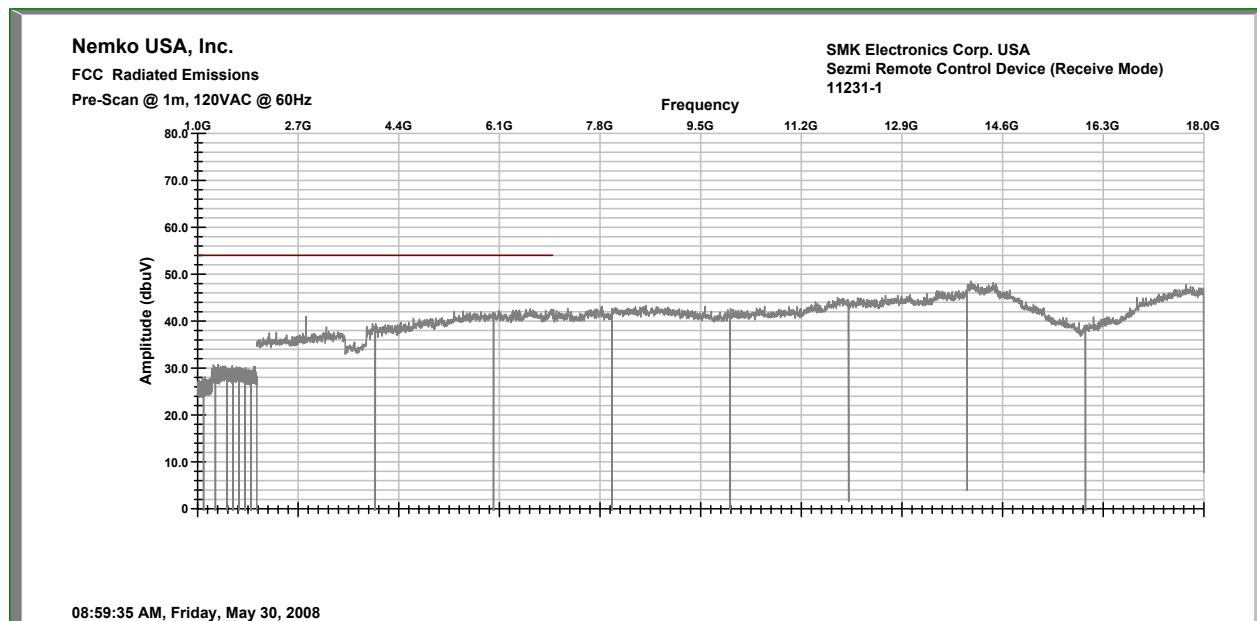
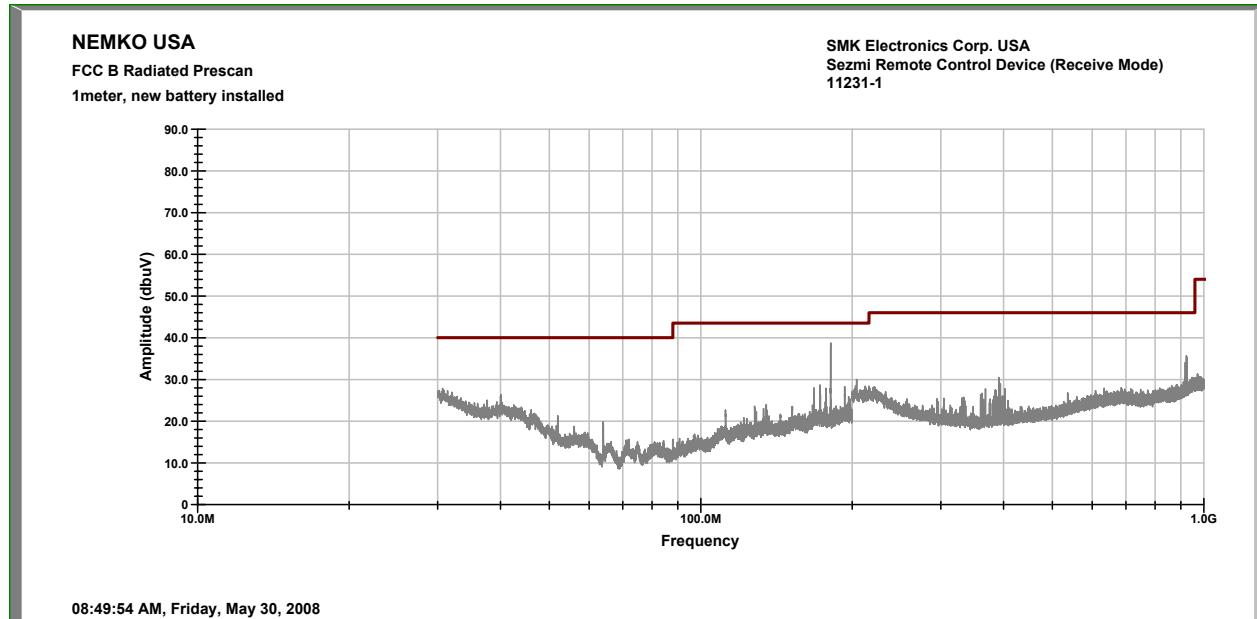
Specification: FCC Part 15 Subpart C, 15.249

Low Channel Prescans @ 1 meter



MID Channel Prescans @ 1 meter

HIGH Channel Prescans @ 1 meter

Receive Mode Prescans @ 1 meter

Clause 15.215(c) Occupied Bandwidth

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in Sec. Sec. 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Test Conditions:

Sample Number:	001	Temperature:	22.1
Date:	05/30/2008	Humidity:	38
Modification State:	Transmit	Tester:	Ferdinand Custodio
Laboratory:			Shield Room #1

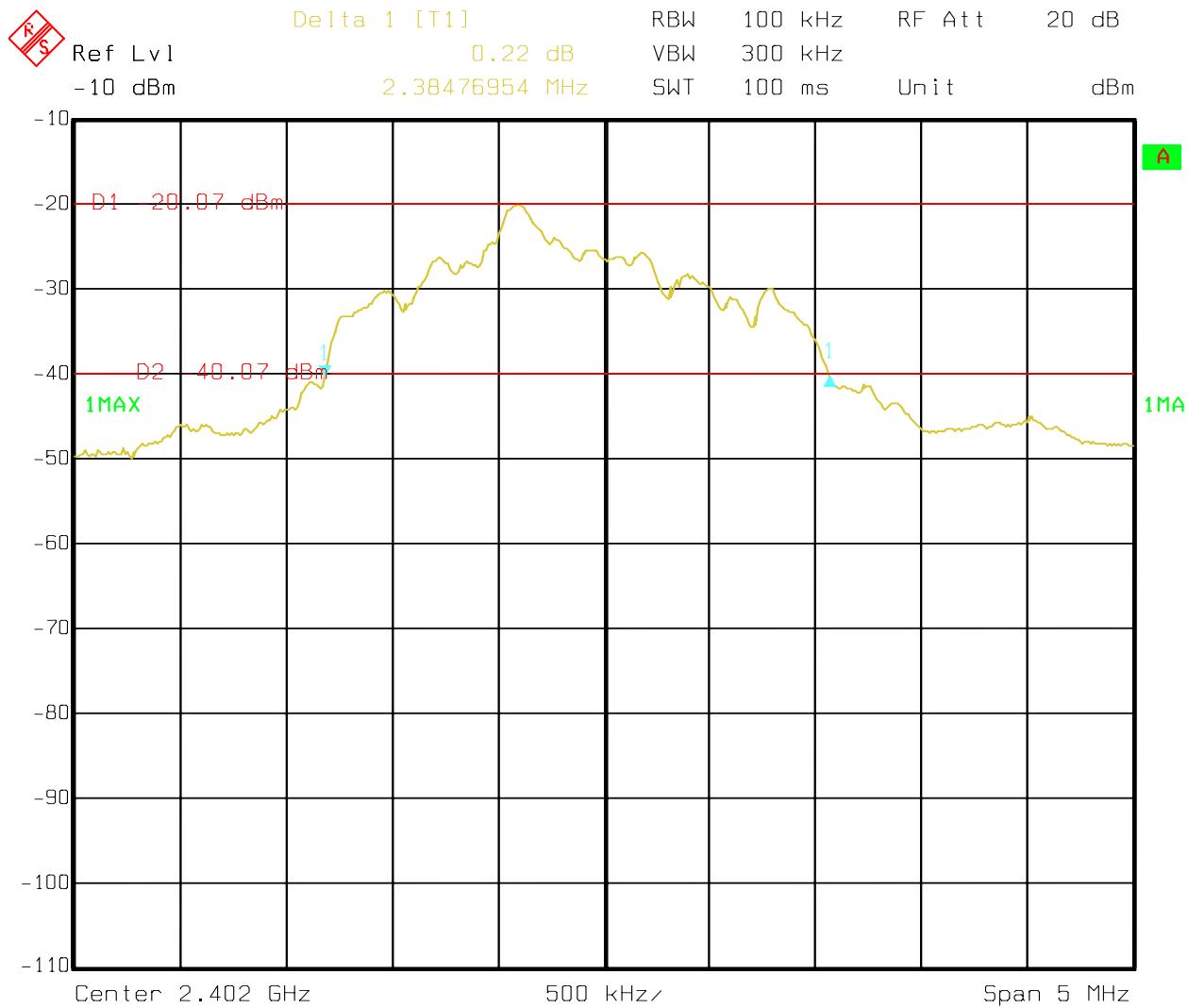
Test Results:

See Attached Plots.

Additional Observations:

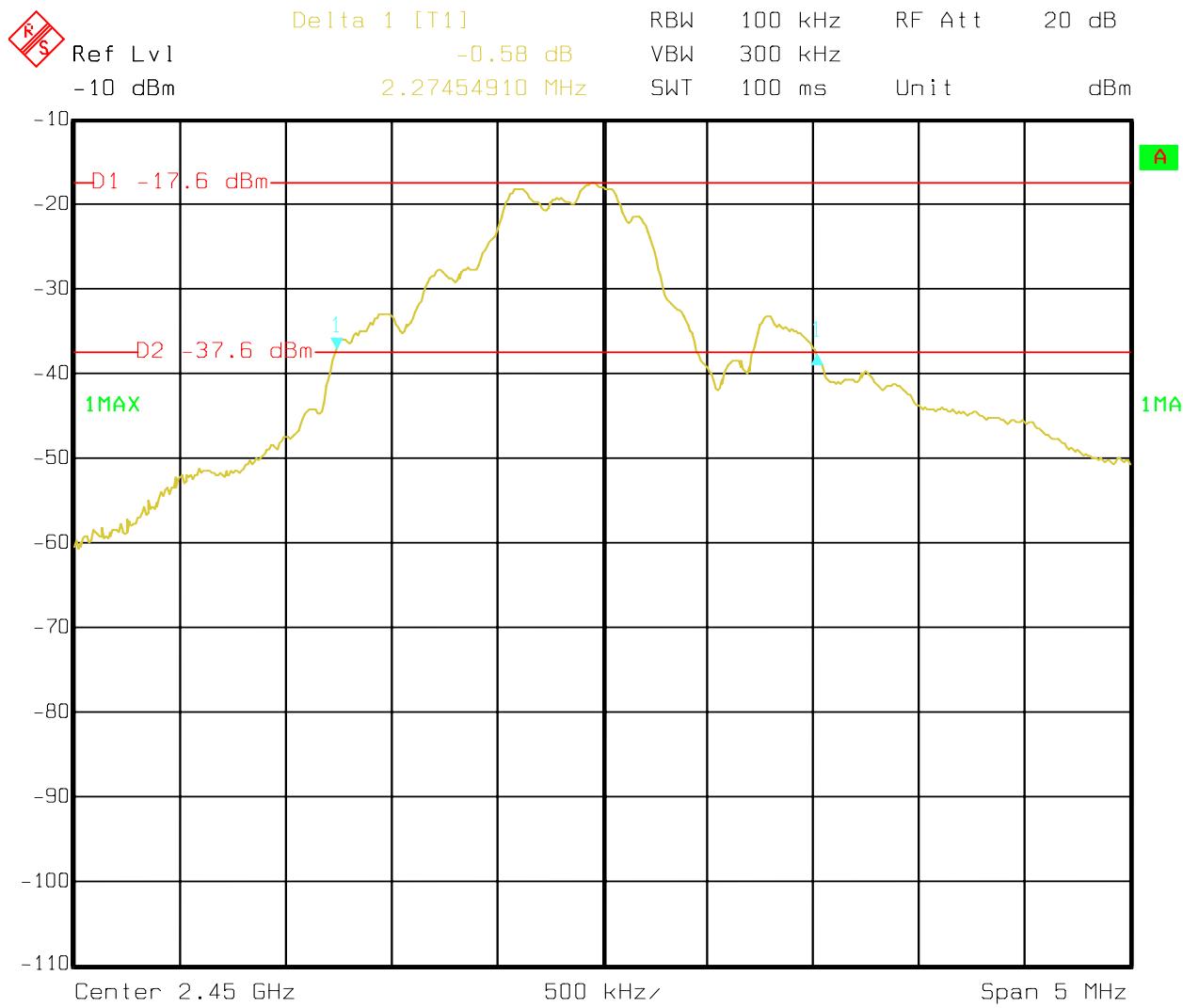
Frequency span set to capture all products of the modulation process including the emission skirts. Max Peak hold.

Video bandwidth set to 3 times the resolution bandwidth.



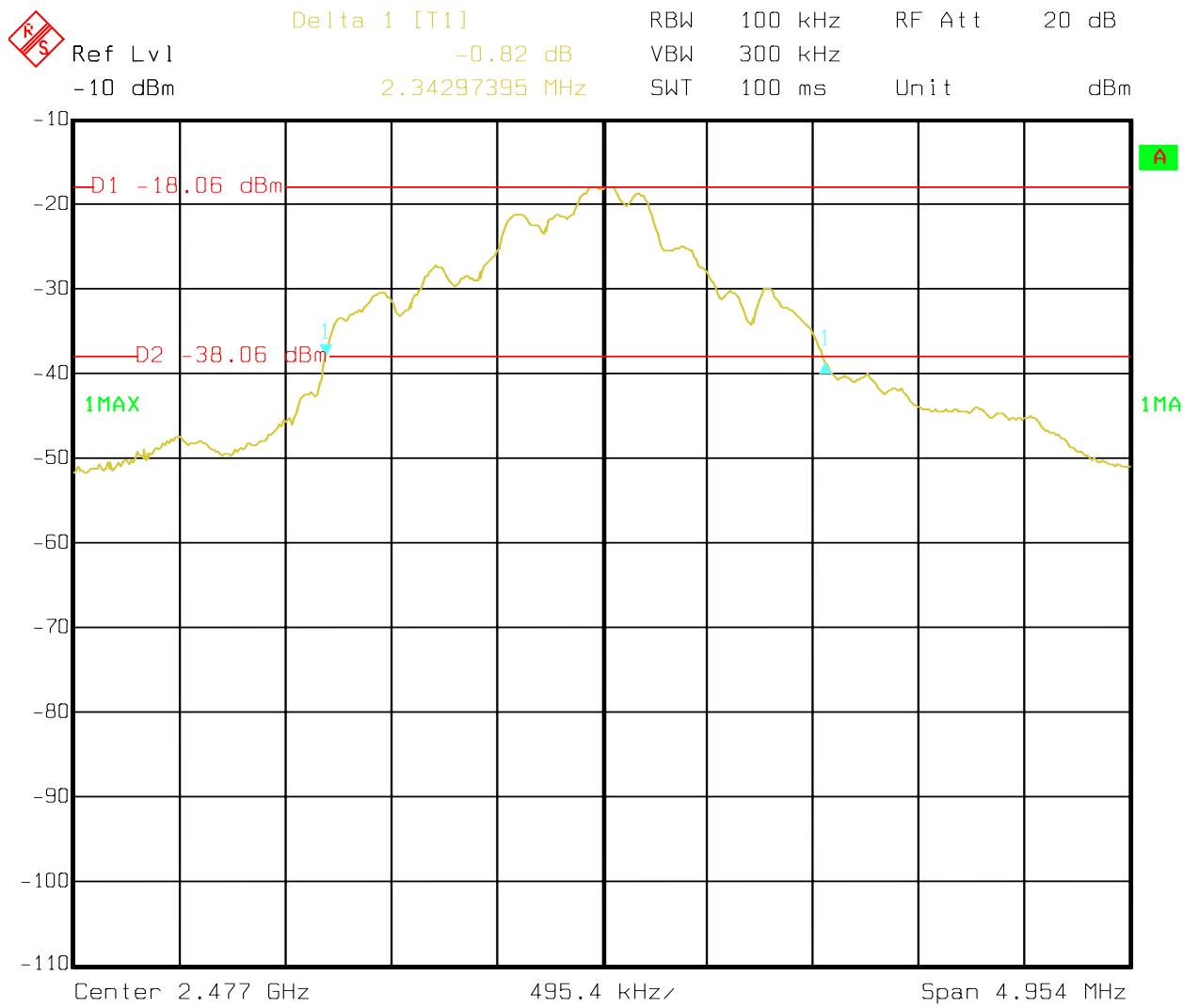
Date: 30.MAY 2008 09:28:47

LOW Channel - Measured Occupied Bandwidth is 2.38MHz.



Date: 30.MAY 2008 09:31:06

MID Channel - Measured Occupied Bandwidth is 2.27MHz.



Date: 30.MAY 2008 09:34:26

HIGH Channel - Measured Occupied Bandwidth is 2.34MHz.

Clause 15.209(a) Radiated Emissions not in Restricted Bands

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

(c) Field strength limits are specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

Test Conditions:

Sample Number:	001	Temperature:	19.8
Date:	05/30/2008	Humidity:	54
Modification State:	Transmit	Tester:	Ferdinand Custodio
		Laboratory:	SOATS

Test Results:

See Attached Plots.

Additional Observations:

The Spectrum was searched from 30 MHz up to 26.5 GHz.

The EUT was measured on three orthogonal axis. The EUT was tested with new battery.

All measurements were measured at 3m using peak detector. Average values were computed using the formula:

$$\text{Average} = \text{Peak} - 20 \log (\text{Duty Cycle Correction Factor})$$

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No harmonics detected as proven by initial prescans presented in Clause 15.205(a) Restricted Bands of Operation.

Resolution bandwidth used for fundamental measurements is 3MHz which is greater than measured occupied bandwidth of 2.38MHz.



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limits

$$\text{Average} = 20 \times \log(50000V) = 93.98 \text{ or } 94.0 \text{ dB}\mu\text{V/m}$$

$$\text{Peak} = \text{Average} + 20 \text{ dB} = 20 + 94 = 114.0 \text{ dB}\mu\text{V/m}$$

Test Configurations:

“X” Configuration

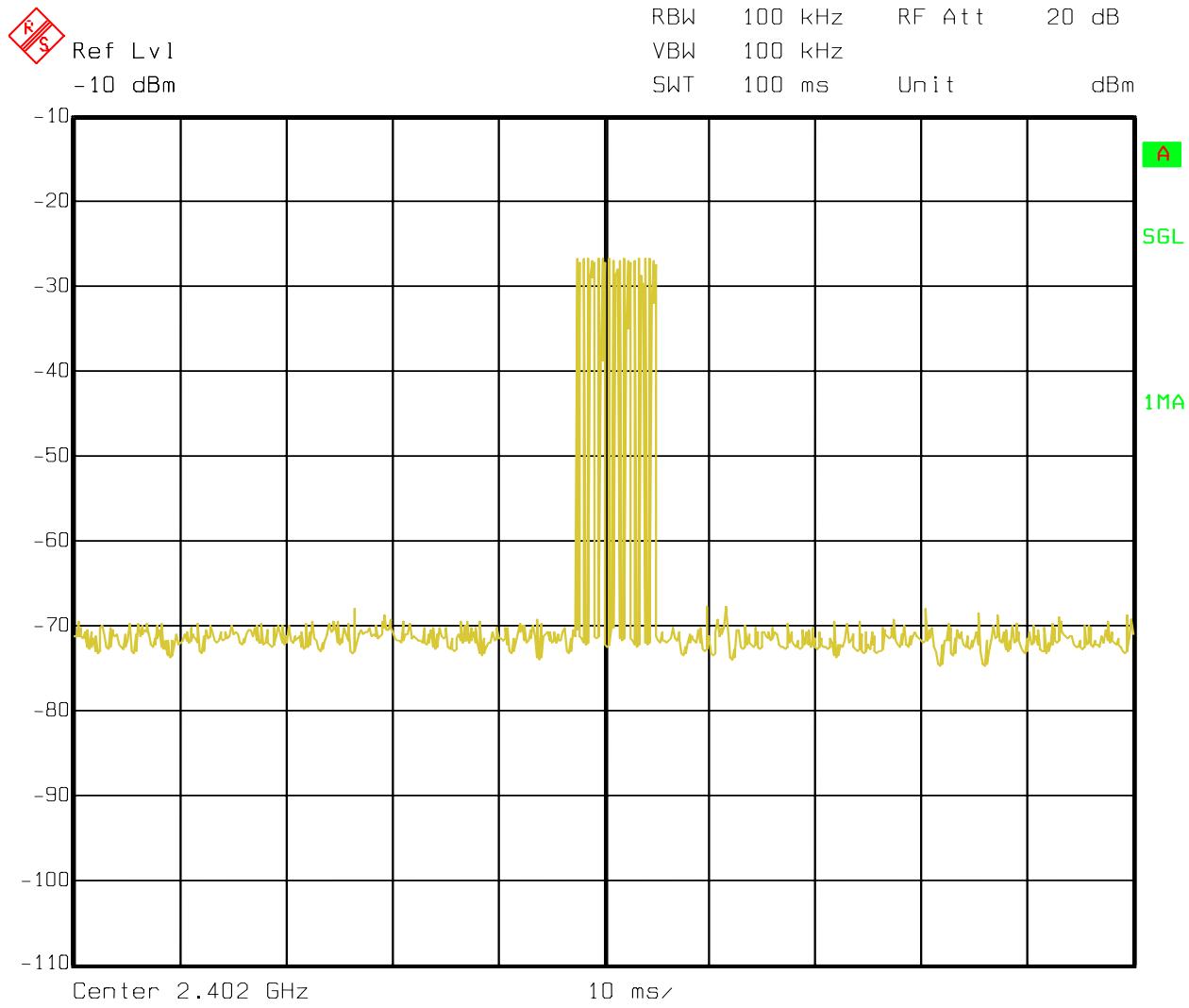


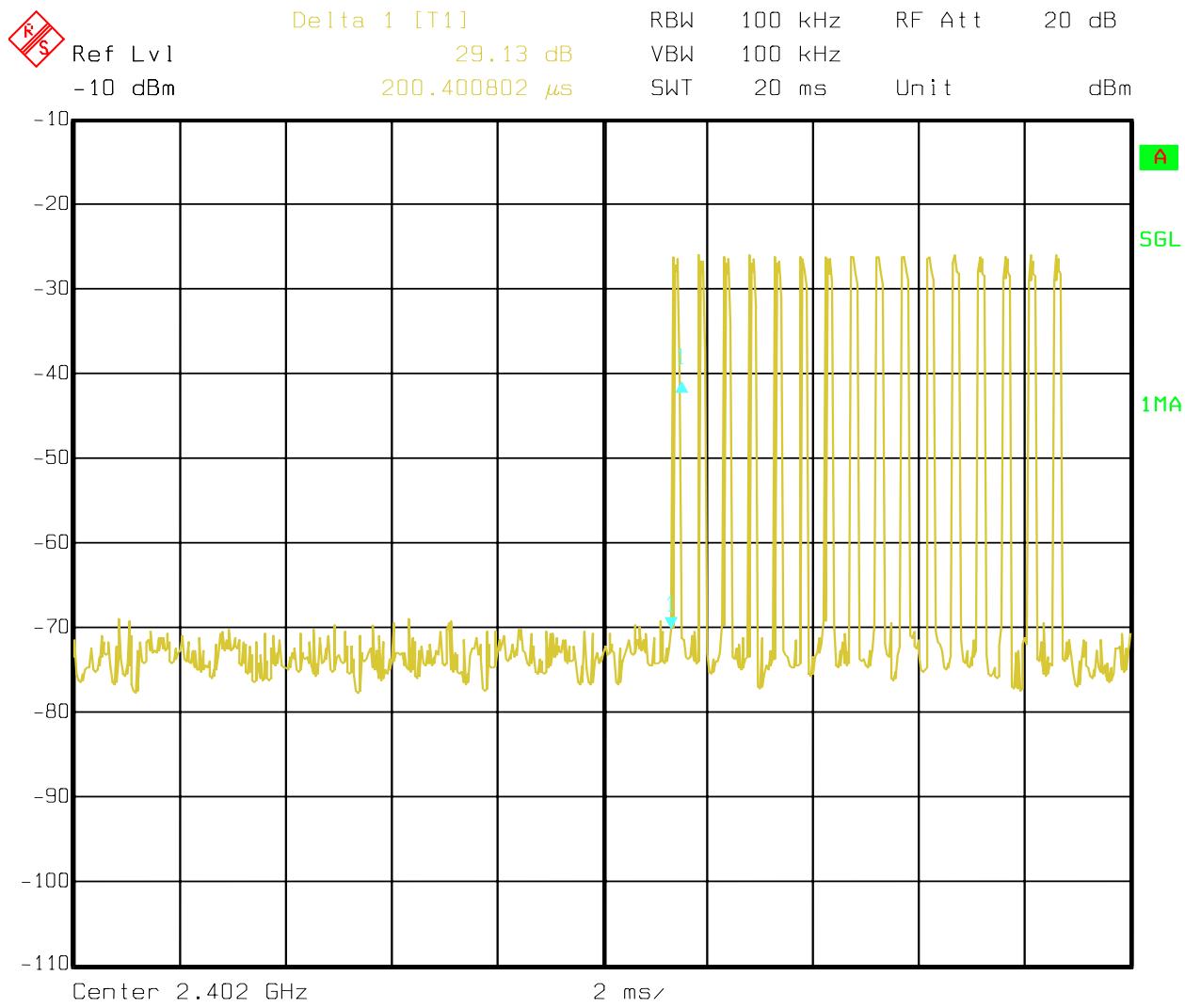
“Y” Configuration



“Z” Configuration



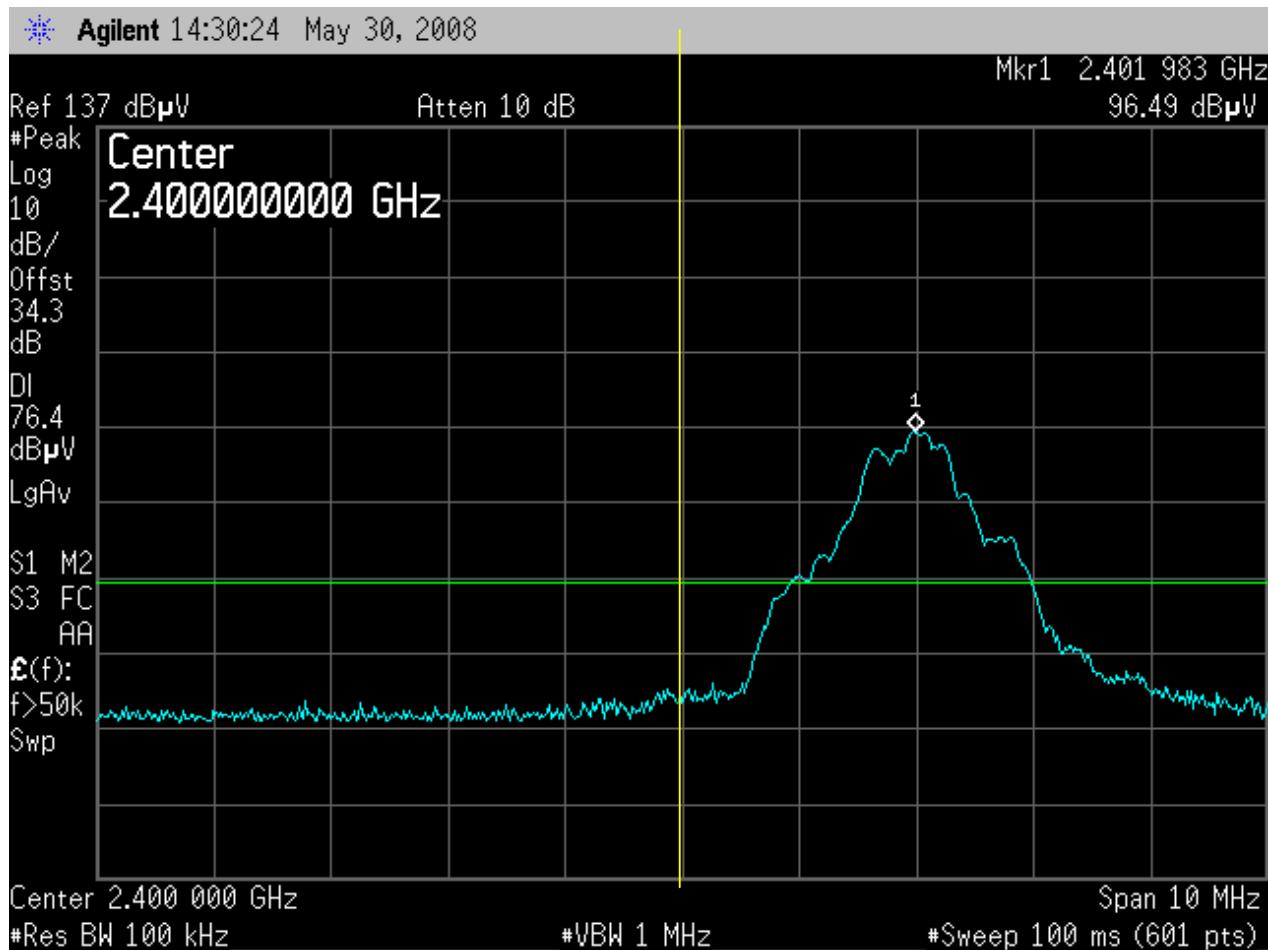
Duty Cycle Calculations:**Duty cycle at 100ms**



$$\begin{aligned}\text{Duty Cycle} &= 200.4\mu\text{s} \times 16 \\ &= 3.2064\text{ms}\end{aligned}$$

$$\begin{aligned}\text{Duty Cycle Factor} &= 3.2064/100 \\ &= 0.032064 \\ &= 3.2\%\end{aligned}$$

Correction Factor = -20 (minimum allowed by FCC)

Band Edge Measurements:

Plot shows maximized low channel, peak hold.

Highest power level measured was 98.4 dB μ V/m, offset added to adjust plotted bandedge. Offset = (98.4 - 96.4) = 2 dB

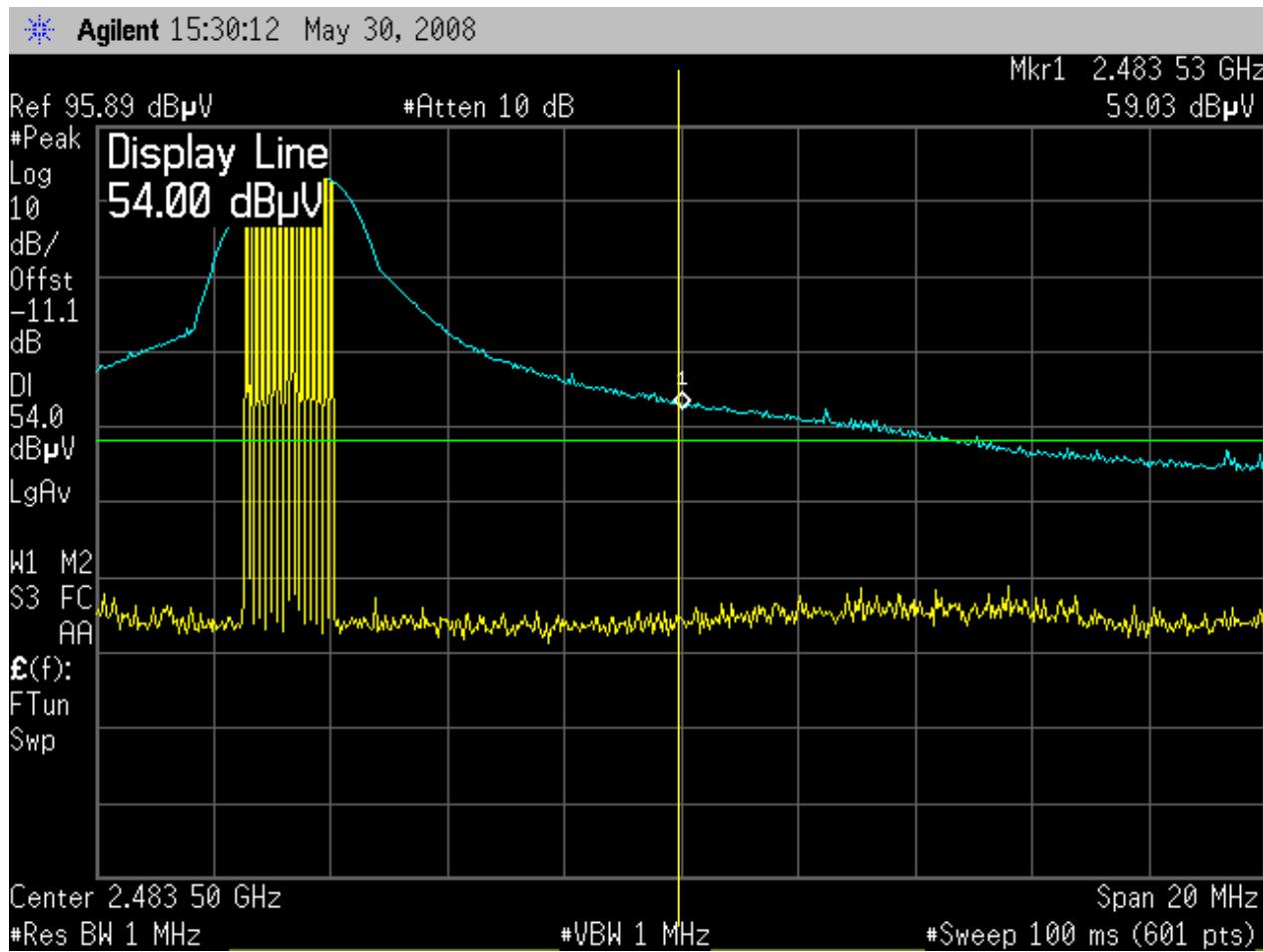
$$\begin{aligned}\text{Limit Line Peak} &= 74 \text{ dB}\mu\text{V/m} + 2 \text{ dB} \\ &= 76\end{aligned}$$

(Green line is 0.4 dB above actual limit.)

Band edge emission meets Peak limit.

Average = Peak -20 dB duty cycle factor'

Band edge emission meets Average limit.

**Center Frequency**

= 2483.5 MHz

Peak @ 2483.5MHz

= 59 dBμV

Peak Limit

= 74 dBμV

Average @ 2483.5MHz

= Peak – Duty Cycle Correction Factor

= 59 -20

= 39 dBμV

Average Limit

= 54 dBμV

Test Notes: Amplifier (Asset # 919) used to improve noise floor.