



卓時檢測  
TIMEWAY TESTING LABORATORY



ISO/IEC17025 Accredited Lab.

Report No:

FCC 0907141

File reference No:

2009-08-14

Applicant:

Shenzhen soling industrial Co., Ltd

Product:

Car DVD player

Model No:

SL-8401

Trademark:

Soling

Test Standards:

FCC Part 15 Subpart C, Paragraph 15.247

Test result:

It is herewith confirmed and found to comply with the requirements set up by ANSI C63.4&FCC Part 15 Subpart C, Paragraph 15.247 regulations for the evaluation of electromagnetic compatibility

Approved By

*Jack Chung*

Jack Chung  
Manager

Dated:

August 14, 2009

**Results appearing herein relate only to the sample tested**

**The technical reports is issued errors and omissions exempt and is subject to withdrawal at**

**SHENZHEN TIMEWAY TECHNOLOGY CONSULTING CO LTD**

5/F, Block 4, Anhua Industrial Zone., No.8 TaiRan Rd. CheGongMiao, FuTian District, Shenzhen, CHINA.

Tel (755) 83448688

Fax (755) 83442996



### **Special Statement:**

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19.

The testing quality system of our laboratory meets with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

#### **CNAS-LAB Code: L2292**

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:1999 General Requirements) for the Competence of testing Laboratories.

#### **FCC-Registration No.: 899988**

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files. Registration No.:899988.

#### **IC- Registration No.: IC5205A-01**

The EMC Laboratory has been registered and fully described in a report filed with the (IC) Industry Canada. The acceptance letter from the IC is maintained in our files. Registration No.: IC 5205A-01.

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## 1.0 General Details

### 1.1 Test Lab Details

Name : SHENZHEN TIMEWAY TECHNOLOGY CONSULTING CO LTD  
Address: 5/F,Block 4, Anhua Industrial Zone.,No.8 TaiRan Rd.CheGongMiao,FuTian District,  
Shenzhen,CHINA.  
Telephone: (755) 83448688  
Fax: (755) 83442996  
Site on File with the Federal Communications Commission – United States  
Registration Number: 899988  
For 3m & 10 m OATS  
Site Listed with Industry Canada of Ottawa, Canada  
Registration Number: IC: 5205A-01  
For 3m & 10 m OATS

### 1.2 Applicant Details

Applicant: Shenzhen soling industrial co., limitd  
Address: Building A.B and C, Suoling Industrial Park, Xi keng Village, Fumin Community, Guanlan  
Town, Bao'an District, shenzhen  
Telephone: 86 755 28028075  
Fax: 86 755 28028975

### 1.3 Description of EUT

Product:	Car DVD player
Manufacturer:	Shenzhen soling industrial co., limitd
Brand Name:	Soling
Model Number:	SL-8401
Additional Model Name	SL-8402, SL-8403, SL-8405, SL-8406, SL-8348, SL-8658, SL-8368, SL-8388, SL-8398, SL-8318, SL-8378
Additional Trade Name	N/A
Rating:	Input: DC 12V; 10A
Power Supply	N/A
Type of Modulation	FHSS
Frequency range	2402-2480MHz
Number of Channel	79
Frequency Selection	By software
Antenna type	chip dielectric antenna, the antenna gain is 0dBi

### 1.4 Submitted Sample: 1 Sample

### 1.5 Test Duration

2009-07-14 to 2009-08-14

### 1.6 Test Uncertainty

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Conducted Emissions Uncertainty =2.4dB  
Radiated Emissions Uncertainty =4.2dB

1.7 Test Engineer

*Terry Tang*

The sample tested by \_\_\_\_\_

Print Name: Terry Tang

2.0	Test Equipments				
Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	ROHDE&SCHWARZ	ESPI 3	100379	2008-12-05	2009-12-04
Absorbing Clamp	ROHDE&SCHWARZ	MDS-21	100126	2008-12-05	2009-12-04
TWO Line-V-NETW	ROHDE&SCHWARZ	EZH3-Z5	100294	2008-12-05	2009-12-04
TWO Line-V-NETW	ROHDE&SCHWARZ	EZH3-Z5	100253	2008-12-05	2009-12-04
Ultra Broadband ANT	ROHDE&SCHWARZ	HL562	100157	2008-12-05	2009-12-04
ESDV Test Receiver	ROHDE&SCHWARZ	ESDV	100008	2009-04-22	2010-04-21
4-WIRE ISN	ROHDE&SCHWARZ	ENY 41	830663/044	2009-02-18	2010-02-17
GG ENY22 Double 2-Wire ISN	ROHDE&SCHWARZ	ENY22	83066/016	2009-02-18	2010-02-17
Impuls-Begrenzer	ROHDE&SCHWARZ	ESH3-Z2	100281	2009-02-18	2010-02-17
System Controller	CT	SC100	-	2009-02-18	2010-02-17
Printer	EPSON	PHOTO EX3	CFNH234850	2009-02-18	2010-02-17
FM-AM Signal Generator	JUNGJIN	SG-150M	389911177	2009-02-18	2010-02-17
Color TV Pattern Generator	PHILIPS	PM5418	LO621747	2009-02-18	2010-02-17
Computer	IBM	8434	1S8434KCE99BLX LO*	-	-
Oscillator	KENWOOD	AG-203D	3070002	2009-02-18	2010-02-17

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Spectrum Analyzer	HAMEG	HM5012	-	-	-
Power Supply	LW	APS1502	-	-	-
5K VA AC Power Source	California Instruments	5001iX	56060	2009-02-18	2010-02-17
CDN	EM TEST	CDN M2/M3	-	2009-02-18	2010-02-17
Attenuation	EM TEST	ATT6/75	-	2009-02-18	2010-02-17
Resistance	EM TEST	R100	-	2009-02-18	2010-02-17
Electromagnetic Injection Clamp	LITTHI	EM101	35708	2009-02-18	2010-02-17
Signal Generator	ROHDE&SCHWARZ	SMT03	100029	2009-02-18	2010-02-17
Power Amplifier	AR	150W1000	300999	2009-02-18	2010-02-17
Field probe	Holaday	HI-6005	105152	2009-02-18	2010-02-17
Bilog Antenna	Chase	CBL6111C	2576	2009-02-18	2010-02-17
ESPI Test Receiver	ROHDE&SCHWARZ	ESI26	838786/013	2009-02-18	2010-02-17
3m OATS	--	--	N/A	2009-02-18	2010-02-17
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170265	2009-08-16	2010-08-15
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-631	2009-07-03	2010-07-02

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### 3.0 Technical Details

#### 3.1 Summary of test results

The EUT has been tested according to the following specifications:			
Requirement	CFR 47 Section	Result	Notes
Antenna Requirement	15.203, 15.247(b)(4)	PASS	Complies
Maximum Peak Out Power	15.247 (b)(1), (4)	PASS	Complies
Carrier Frequency Separation	15.247(a)(1)	PASS	Complies
20dB Channel Bandwidth	15.247 (a)(1)	PASS	Complies
Number of Hopping Channels	15.247(a)(iii), 15.247(b)(1)	PASS	Complies
Time of Occupancy (Dwell Time)	15.247(a)(iii)	PASS	Complies
Spurious Emission, Band Edge, and Restricted bands	15.247(d),15.205(a), 15.209 (a)	PASS	Complies
Conducted Emissions	15.207(a)	N/A	N/A
RF Exposure	15.247(i), 1.1307(b)(1)	PASS	Complies

#### 3.2 Test Standards

FCC Part 15 Subpart & Subpart C, Paragraph 15.247

#### 4.0 EUT Modification

No modification by Shenzhen Timeway Technology Consulting Co.,Ltd

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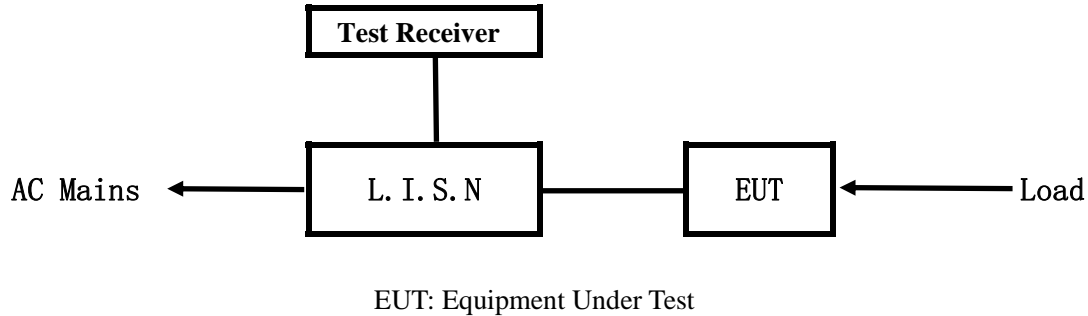
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## 5. Power Line Conducted Emission Test

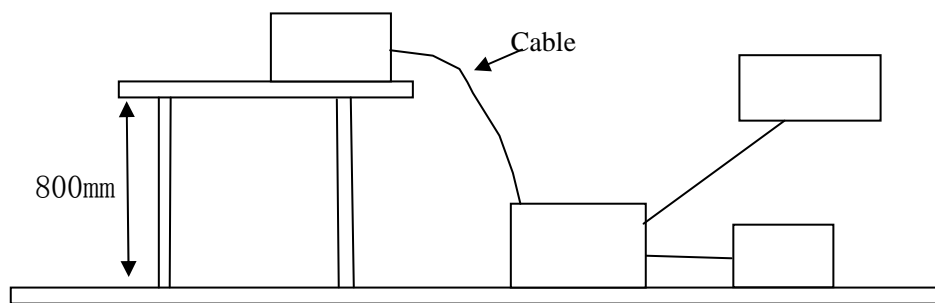
### 5.1 Schematics of the test



### 5.2 Test Method and test Procedure

The EUT was tested according to ANSI C63.4-2003. The Frequency spectrum From 0.15MHz to 30MHz was investigated. The LISN used was 50ohm/50uH as specified by section 5.1 of ANSI C63.4 –2003.

Block diagram of Test setup



### 5.3 Configuration of The EUT

The EUT was configured according to ANSI C63.4-2003. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

79 channels are provided to the EUT





A. EUT

Device	Manufacturer	Model	FCC ID
Car DVD player	Shenzhen soling industrial Co., Ltd	SL-8401	V4HSL-8XXX

B. Internal Device

Device	Manufacturer	Model	FCC ID/DOC
N/A			

C. Peripherals

Device	Manufacturer	Model	FCC ID/DOC	Cable
N/A				

5.4 EUT Operating Condition

Operating condition is according to ANSI C63.4 -2003.

A Setup the EUT and simulators as shown on follow

B Enable AF signal and confirm EUT active to normal condition

5.5 Power line conducted Emission Limit according to Paragraph 15.207

Frequency (MHz)	Class A Limits (dB $\mu$ V)		Class B Limits (dB $\mu$ V)	
	Quasi-peak Level	Average Level	Quasi-peak Level	Average Level
0.15 ~ 0.50	79.0	66.0	66.0~56.0*	56.0~46.0*
0.50 ~ 5.00	73.0	60.0	56.0	46.0
5.00 ~ 30.00	73.0	60.0	60.0	50.0

- Notes:
1. \*Decreasing linearly with logarithm of frequency.
  2. The tighter limit shall apply at the transition frequencies

5.6 Test Results

The frequency spectrum from 0.15MHz to 30MHz was investigated. All reading are quasi-peak values with a resolution bandwidth of 9kHz.

Note: **Owing to DC operation of EUT, this test item is not performed**

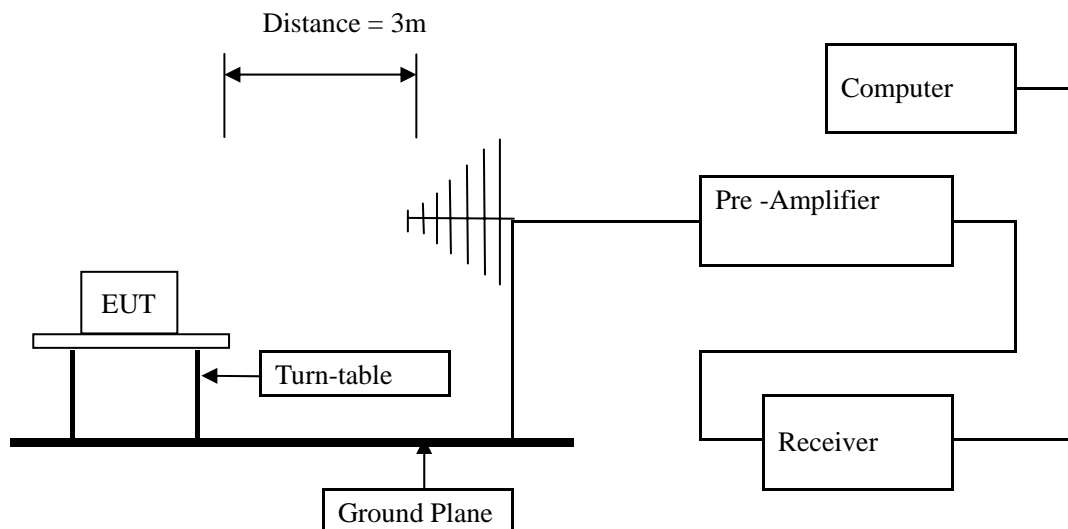


## 6 Radiated Emission Test

### 6.1 Test Method and test Procedure:

- (1) The EUT was tested according to ANSI C63.4 –2003. The radiated test was performed at Timeway Laboratory. This site is on file with the FCC laboratory division, Registration No.899988
- (2) The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.4-2003.
- (3) The frequency spectrum from 30 MHz to 1 GHz was investigated. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz. All readings are above 1 GHz, peak values with a resolution bandwidth of 1 MHz . Measurements were made at 3 meters.
- (4) The antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency.
- (5) Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "QP" in the data table.
- (6) The antenna polarization : Vertical polarization and Horizontal polarization.

#### Block diagram of Test setup



### 6.2 Configuration of The EUT Same as section 5.3 of this report

### 6.3 EUT Operating Condition Same as section 5.4 of this report.

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#### 6.4 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below:

**Frequencies in restricted band are complied to limit on Paragraph 15.209.**

Frequency Range (MHz)	Distance (m)	Field strength (dB $\mu$ V/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

- Note:
1. RF Voltage (dBuV) = 20 log RF Voltage ( $\mu$ V)
  2. In the Above Table, the higher limit applies at the band edges.
  3. Distance refers to the distance in meters between the measuring instrument antenna and the EUT



**Test result**

**General Radiated Emission Data and Harmonics Radiated Emission Data**

**Radiated Emission In Horizontal (30MHz----1000MHz)**

EUT set Condition: Low Channel

**Results: Pass**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
614.560	41.01	V	46.00
754.840	41.59	V	46.00
891.000	42.49	V	46.00
270.000	41.17	H	46.00
377.360	39.48	H	46.00
754.680	43.82	H	46.00

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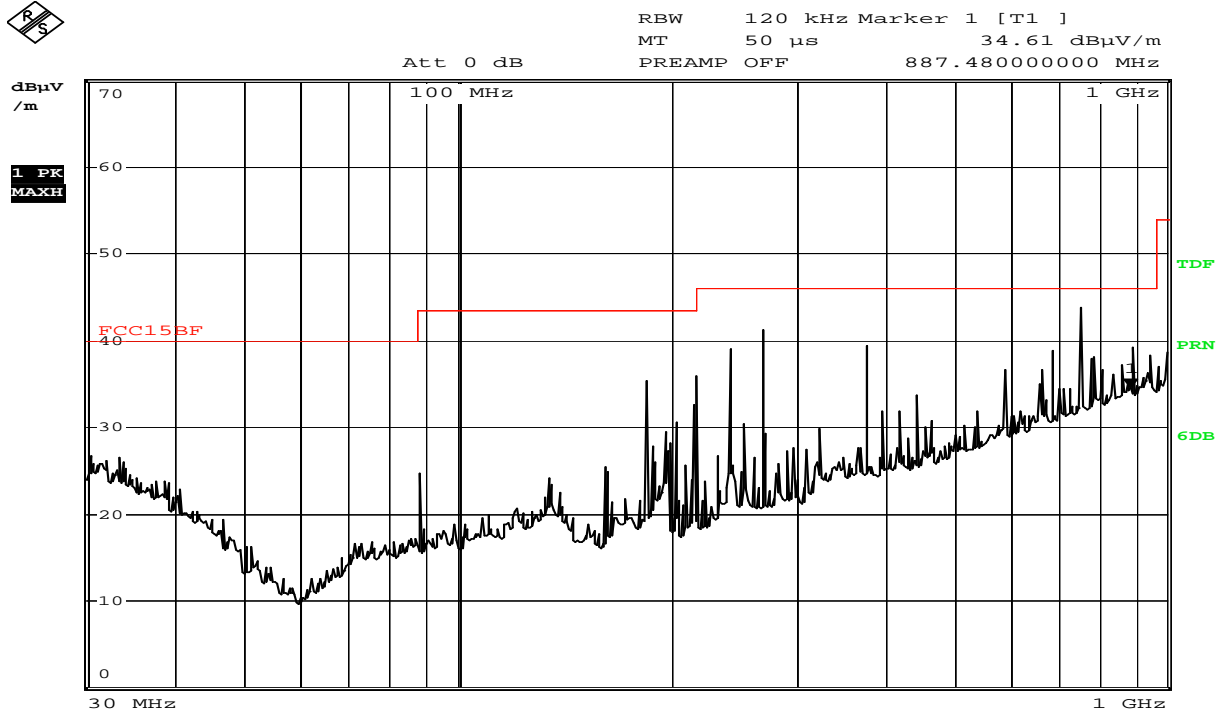
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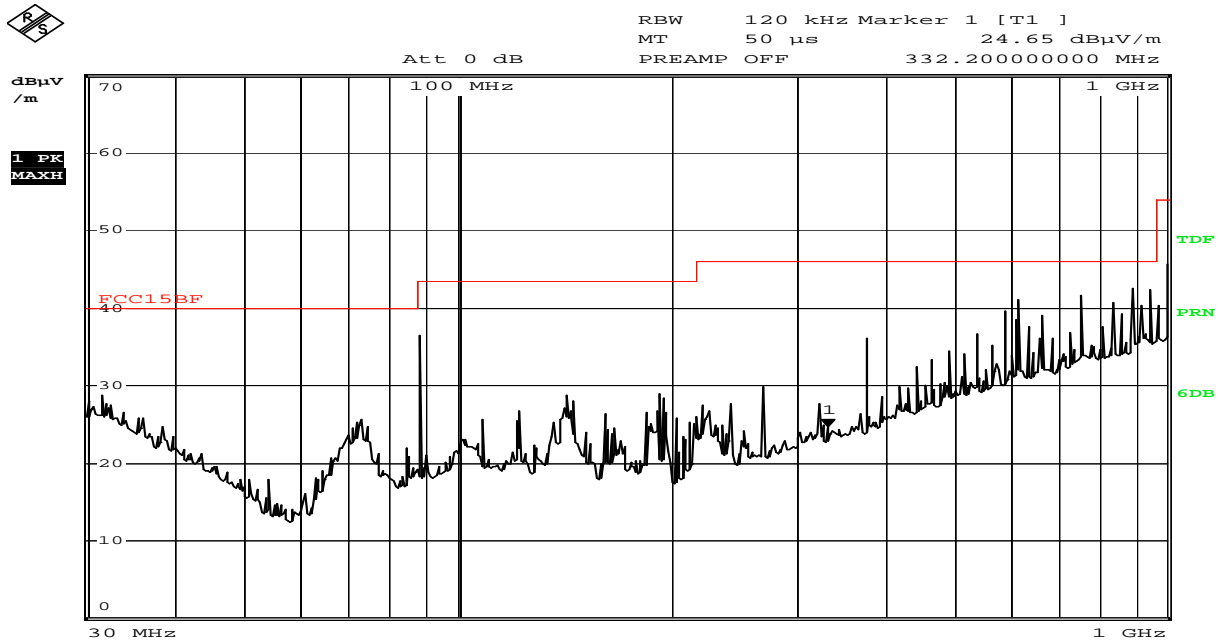
Test Figure: Low Channel

H



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V



Date: 8.AUG.2009 18:04:06

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**EUT set Condition: Middle Channel**

**Results: Pass**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
270.000	42.16	H	46.00
754.560	44.03	H	46.00
870.000	40.84	H	46.00
588.980	42.04	V	46.00
754.560	42.05	V	46.00
891.000	44.00	V	46.00

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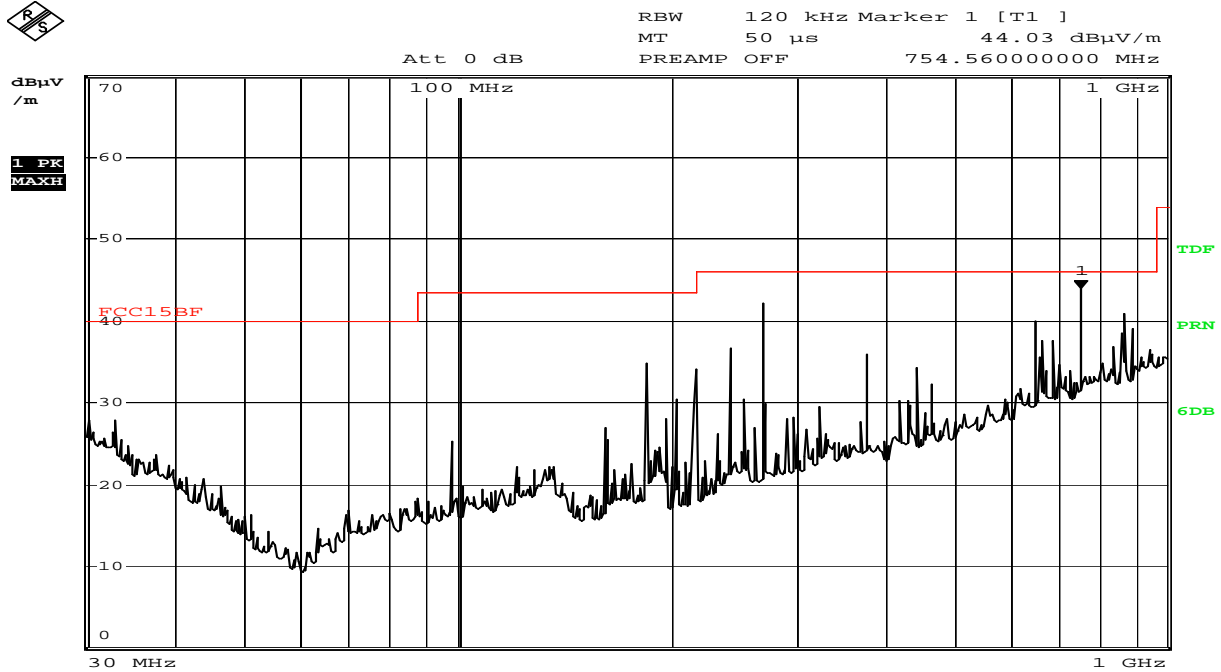
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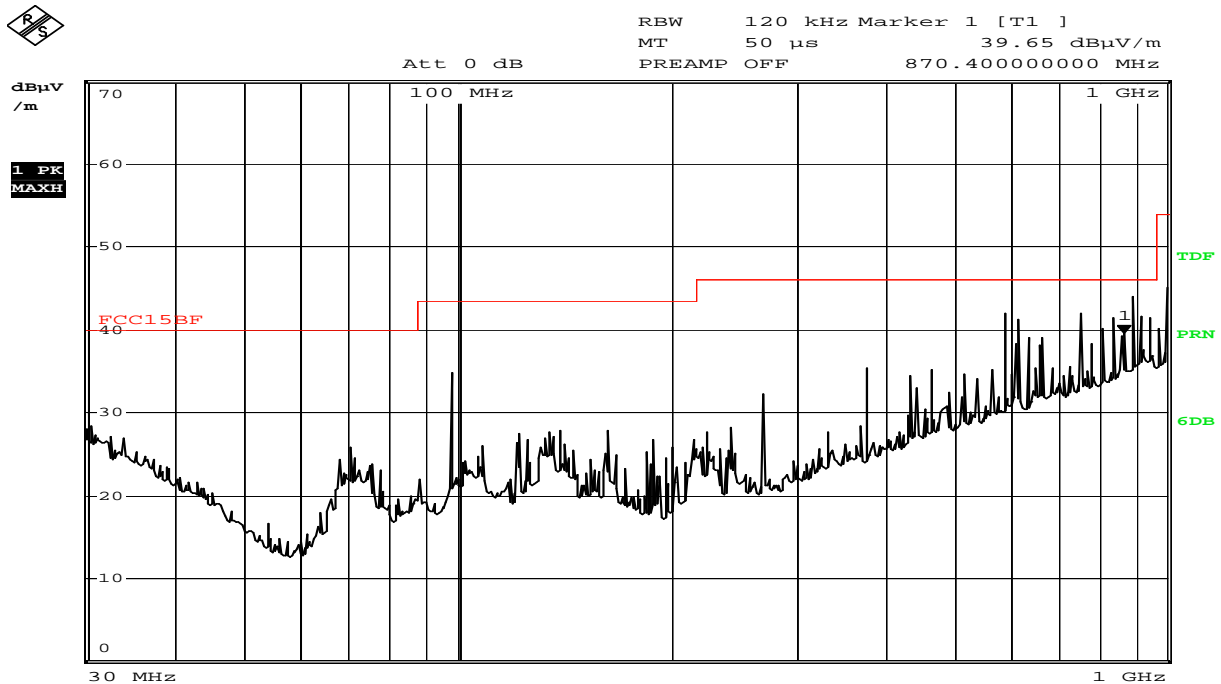
Test Figure: Middle Channel

H



Date: 8.AUG.2009 18:09:54

V



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**EUT set Condition: High Channel**

**Results: Pass**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
270.000	39.92	H	46.00
754.360	45.14	H	46.00
614.480	42.31	V	46.00
754.440	43.08	V	46.00
891.000	43.05	V	46.00

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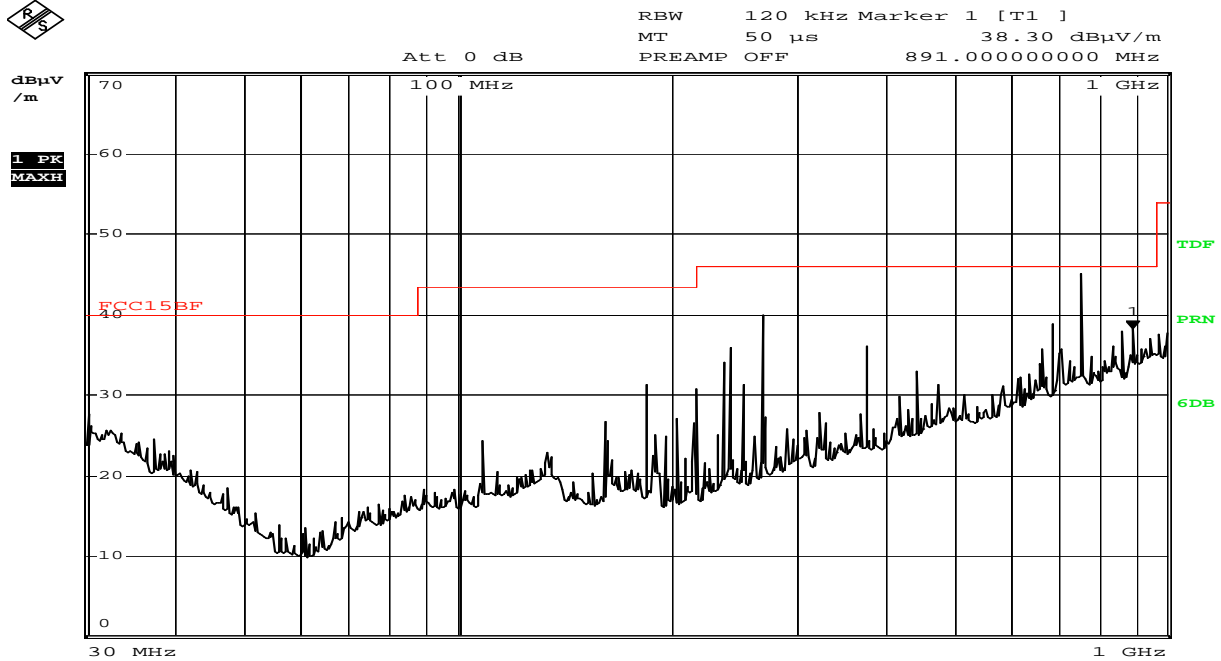
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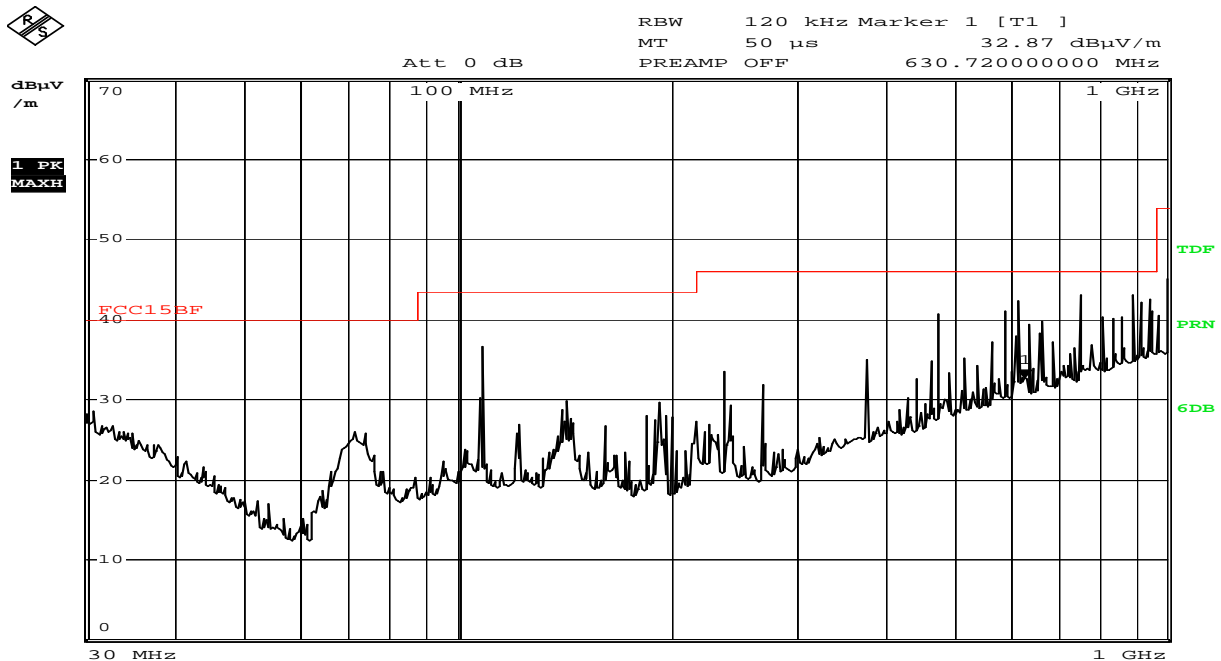
Test Figure: High Channel

H



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V



Date: 8.AUG.2009 18:15:31

Note: 1. Emission level (dBμV/m) = Antenna Factor (dB/m) + Cable loss (dB) + Meter Reading (dBμV).

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**Operation Mode: Transmitting under Low Channel (2402MHz)**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
2402.014	80.5 (PK) /72.3 (AV)	V	Fundamental Frequency
2402.014	86.5 (PK) /78.4 (AV)	H	
4804	51.3 (PK) /42.6 (AV)	H	74(Peak)/ 54(AV)
4804	46.2 (PK) /39.7 (AV)	V	74(Peak)/ 54(AV)
7206		H/V	74(Peak)/ 54(AV)
9608	--	H/V	74(Peak)/ 54(AV)
12010	--	H/V	74(Peak)/ 54(AV)
14412	--	H/V	74(Peak)/ 54(AV)
16814	--	H/V	74(Peak)/ 54(AV)
19216	--	H/V	74(Peak)/ 54(AV)
21618	--	H/V	74(Peak)/ 54(AV)
24020	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit  
2. Remark "---" means that the emissions level is too low to be measured

**Operation Mode: Transmitting g under Middle Channel (2441MHz)**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
2441.032	86.7 (PK) /79.3 (AV)	H	Fundamental Frequency
2441.032	80.2 (PK) /72.6 (AV)	V	
4882.054	46.5 (PK) /38.1 (AV)	H	74(Peak)/ 54(AV)
4882.054	43.8 (PK) /35.3 (AV)	V	74(Peak)/ 54(AV)
7323	--	H/V	74(Peak)/ 54(AV)
9764	--	H/V	74(Peak)/ 54(AV)
12205	--	H/V	74(Peak)/ 54(AV)
14646	--	H/V	74(Peak)/ 54(AV)
17087	--	H/V	74(Peak)/ 54(AV)
19528	--	H/V	74(Peak)/ 54(AV)
21969	--	H/V	74(Peak)/ 54(AV)
24410	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit  
2. Remark "---" means that the emissions level is too low to be measured

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**Operation Mode: Transmitting under High Channel**

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Antenna Polarity	Limit@3m (dB $\mu$ V/m)
2480.030	87.6 (PK) /79.3 (AV)	H	Fundamental Frequency
2480.030	78.9 (PK) /71.2 (AV)	V	
4960.011	44.3 (PK) /36.2 (AV)	V	74(Peak)/ 54(AV)
4960.011	49.6 (PK) /41.8 (AV)	H	74(Peak)/ 54(AV)
7440	--	H/V	74(Peak)/ 54(AV)
9920	--	H/V	74(Peak)/ 54(AV)
12400	--	H/V	74(Peak)/ 54(AV)
14880	--	H/V	74(Peak)/ 54(AV)
17360	--	H/V	74(Peak)/ 54(AV)
19840	--	H/V	74(Peak)/ 54(AV)
22320	--	H/V	74(Peak)/ 54(AV)
24800	--	H/V	74(Peak)/ 54(AV)

Note: 1. Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level - Limit

2. Remark "---" means that the emissions level is too low to be measured

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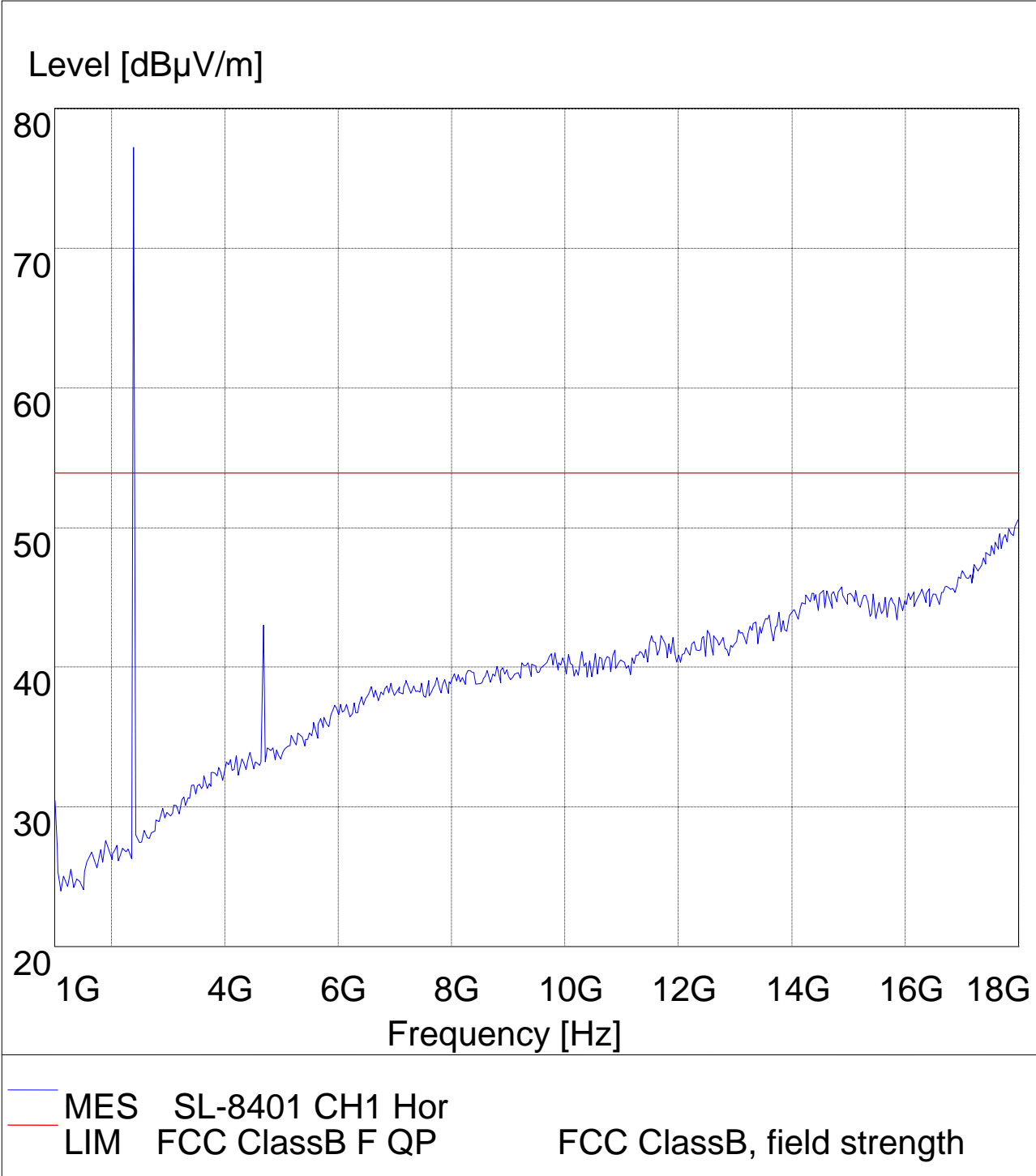
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Please refer to the following test plots for details:

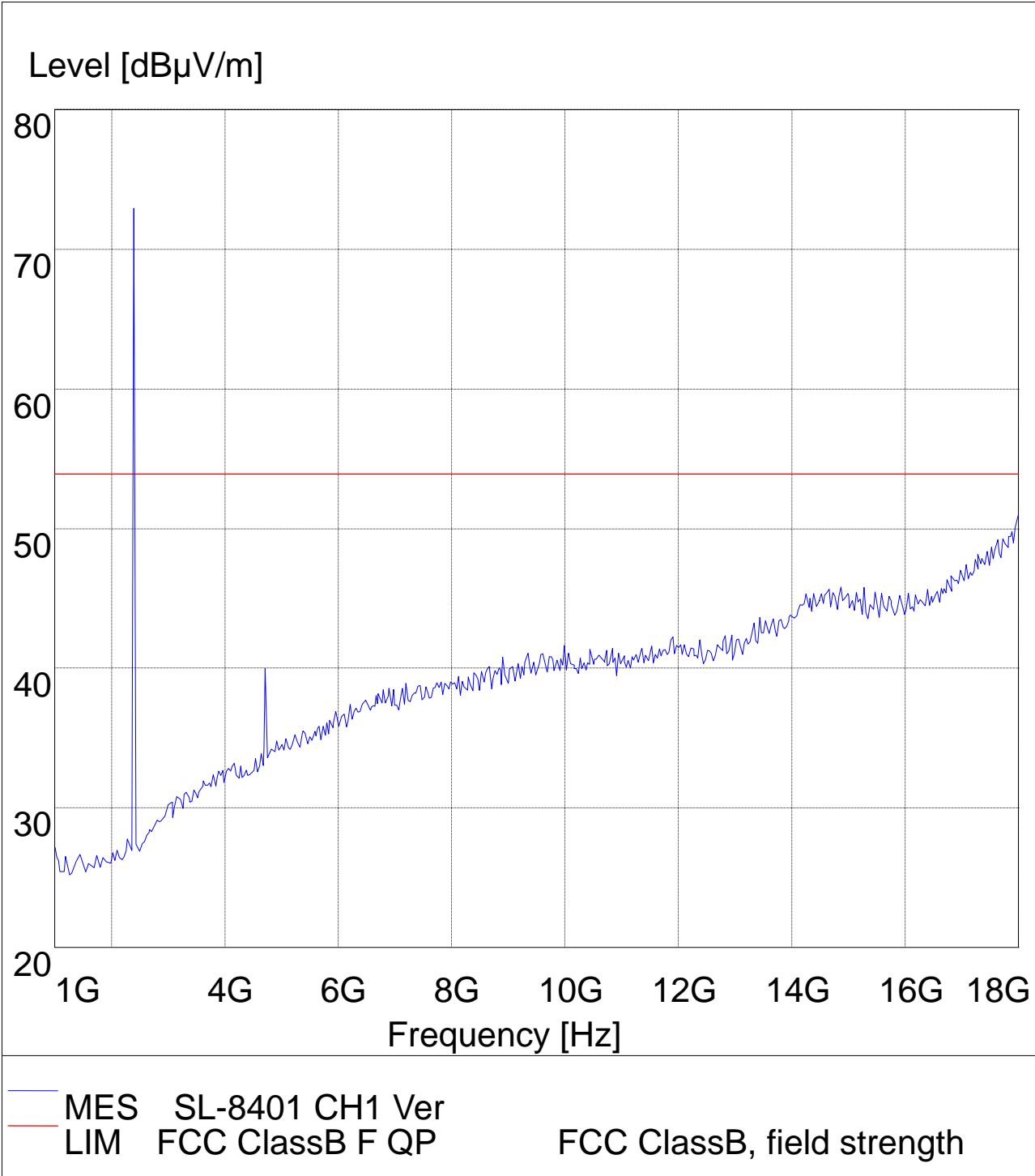
**Low Channel: Horizontal**



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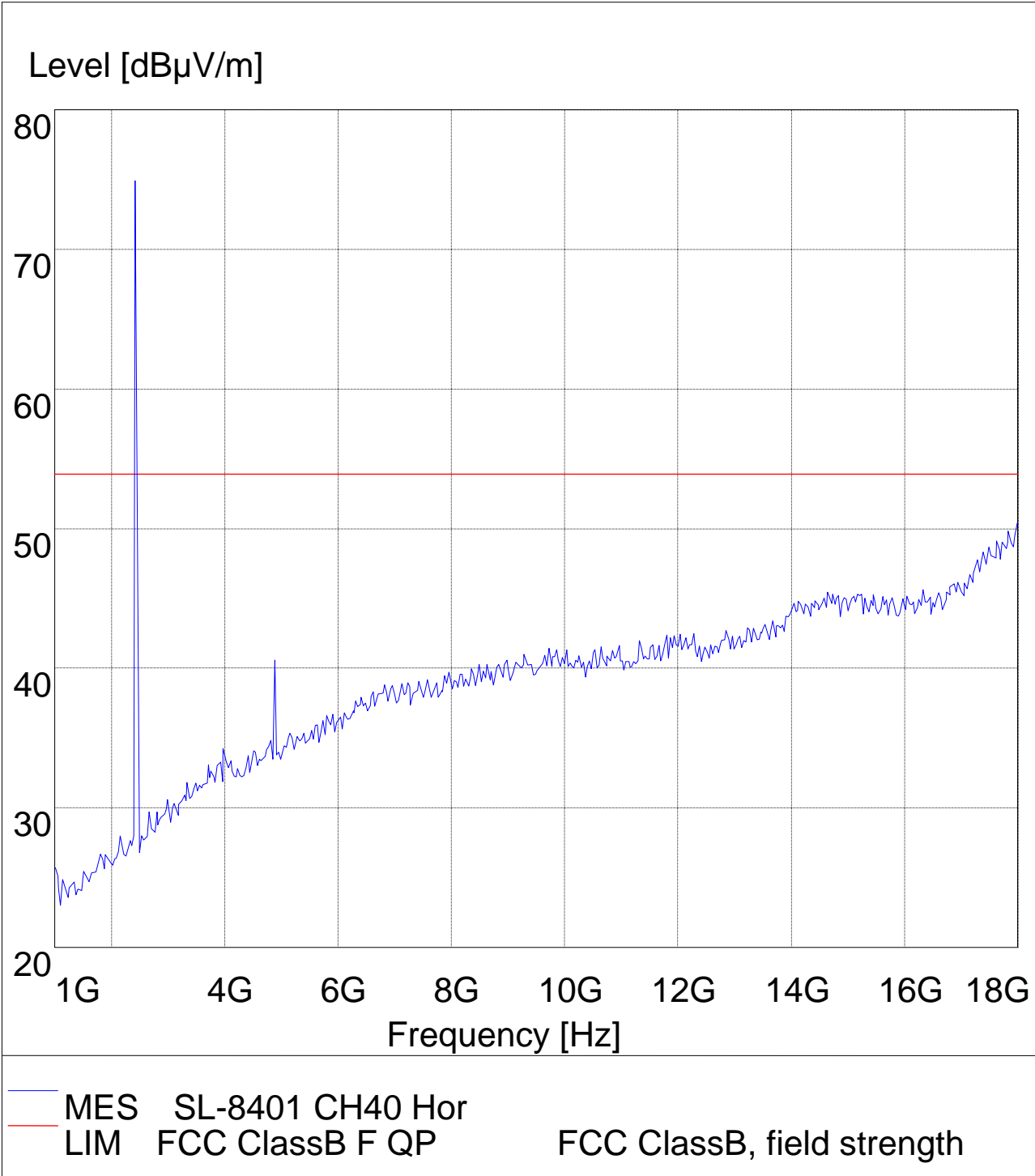
Low Channel : Vertical



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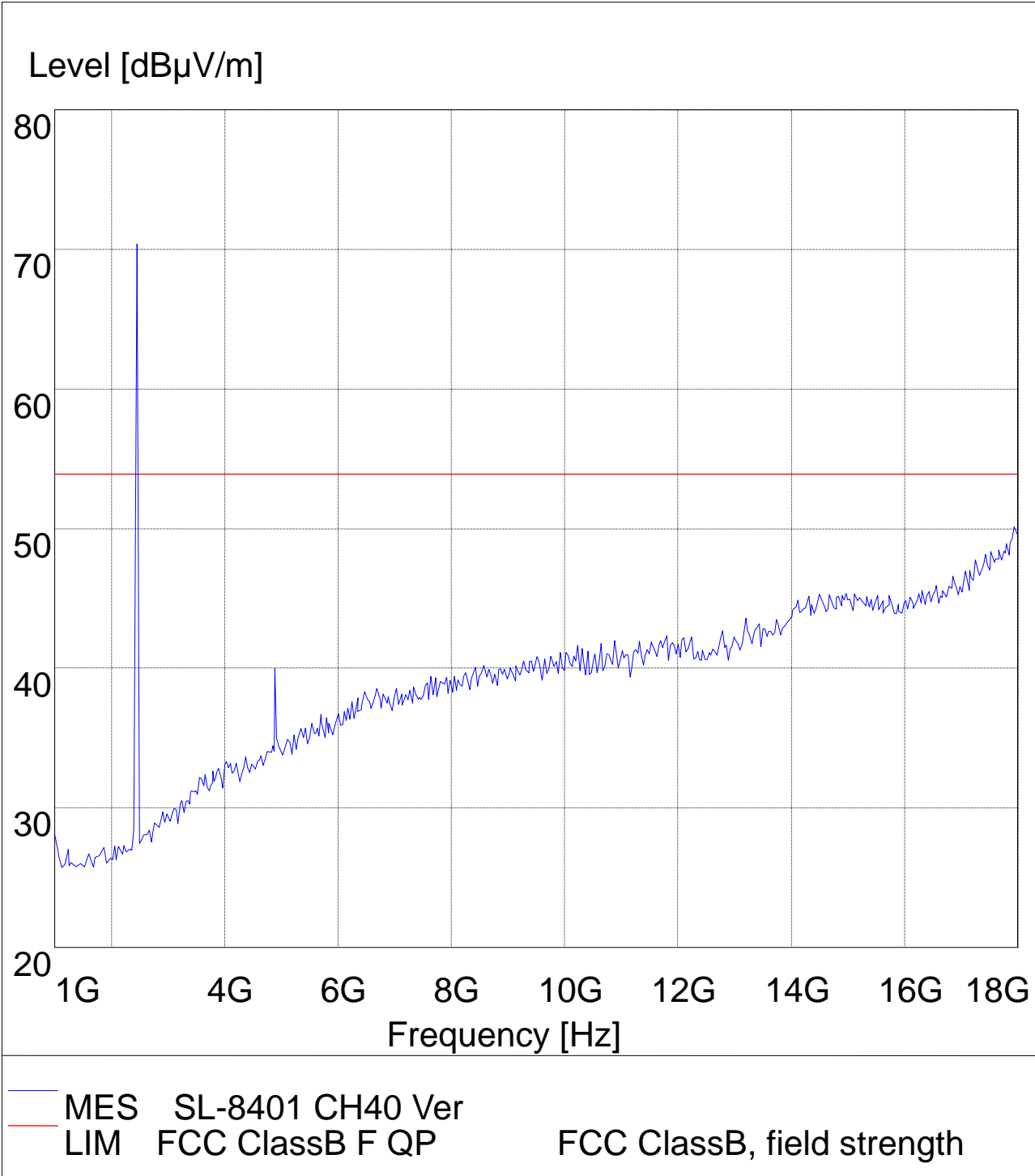
Middle Channel : Horizontal



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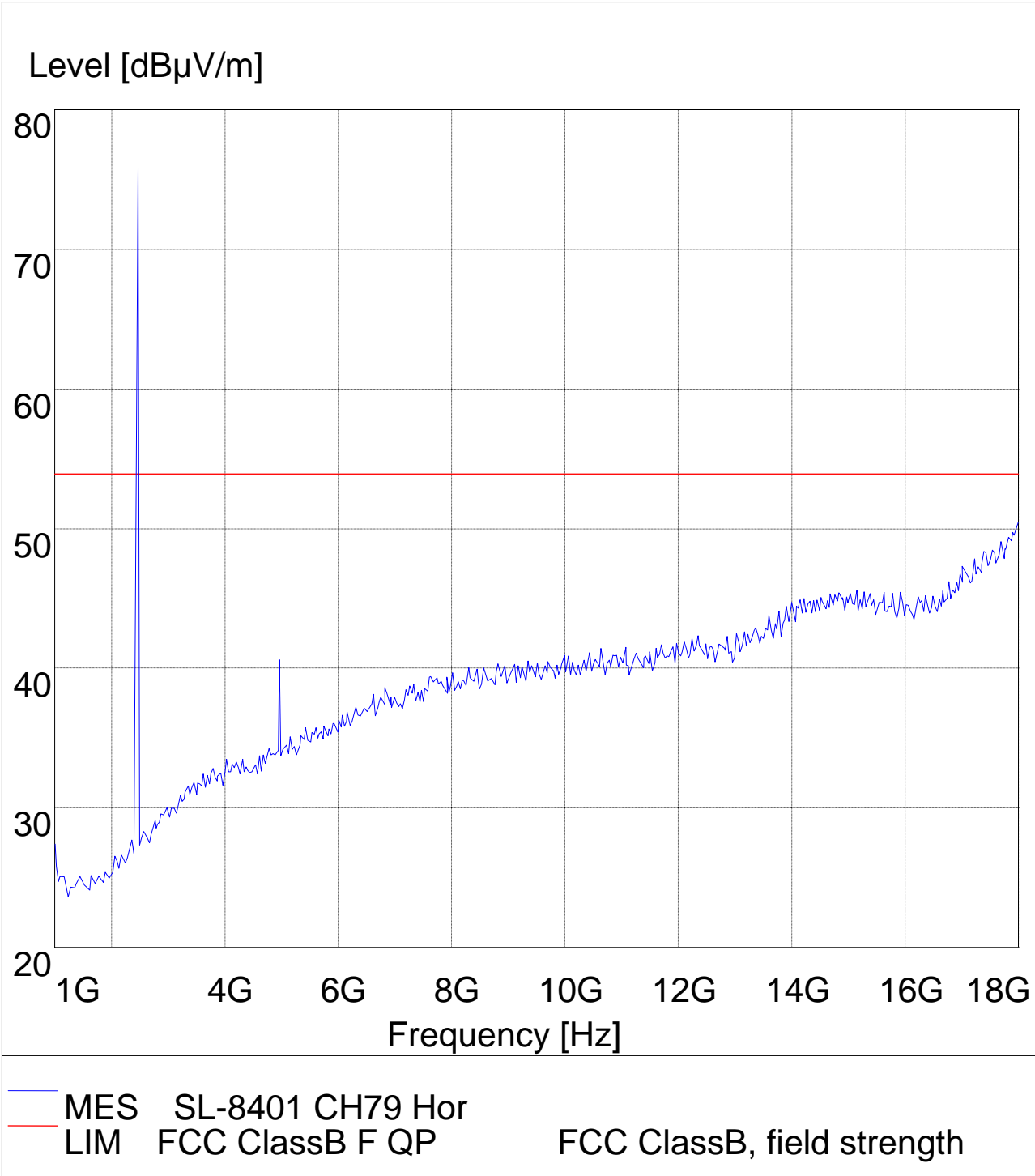
Middle Channel :: Vertical



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High Channel : Horizontal

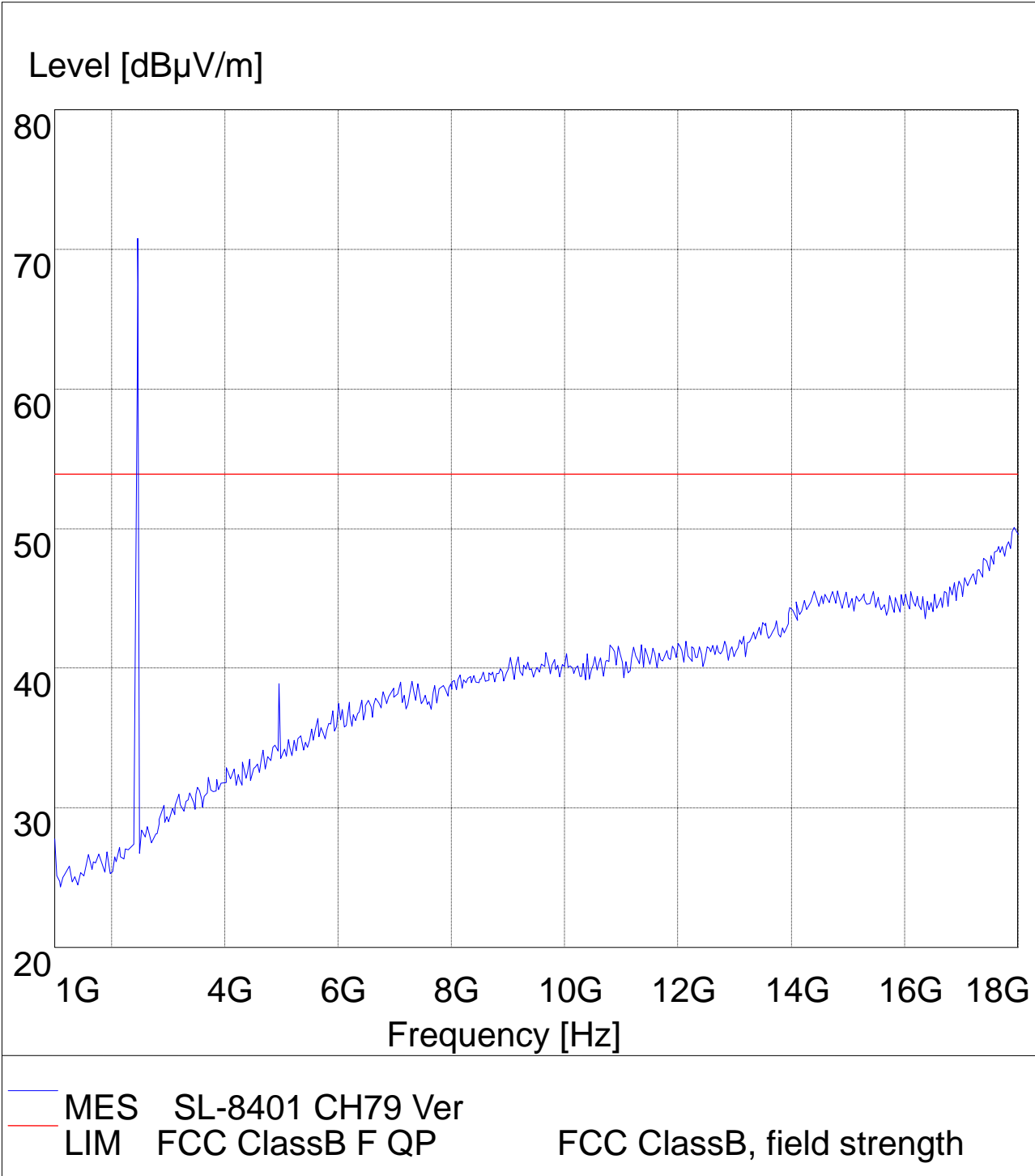


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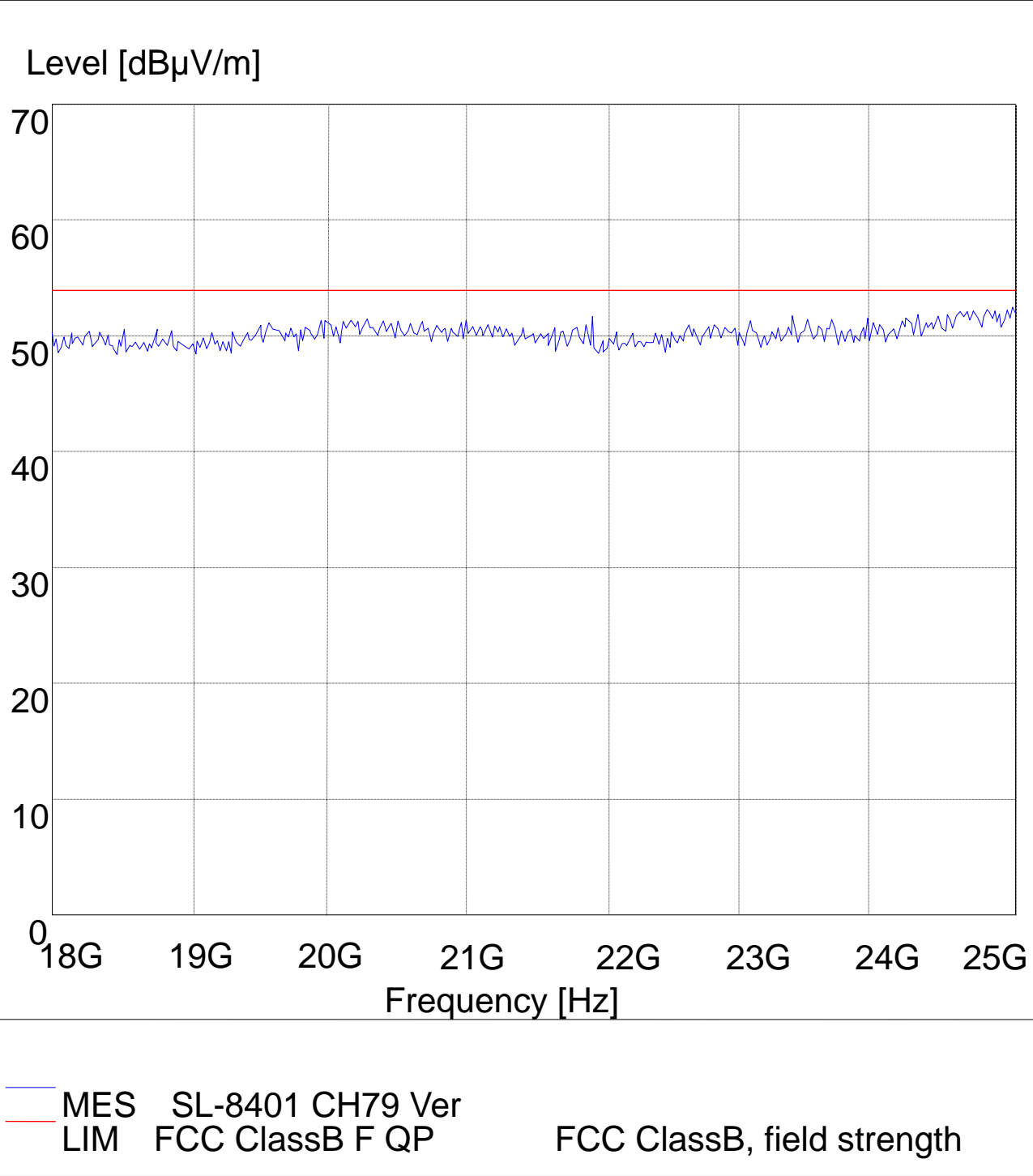
High Channel : Vertical



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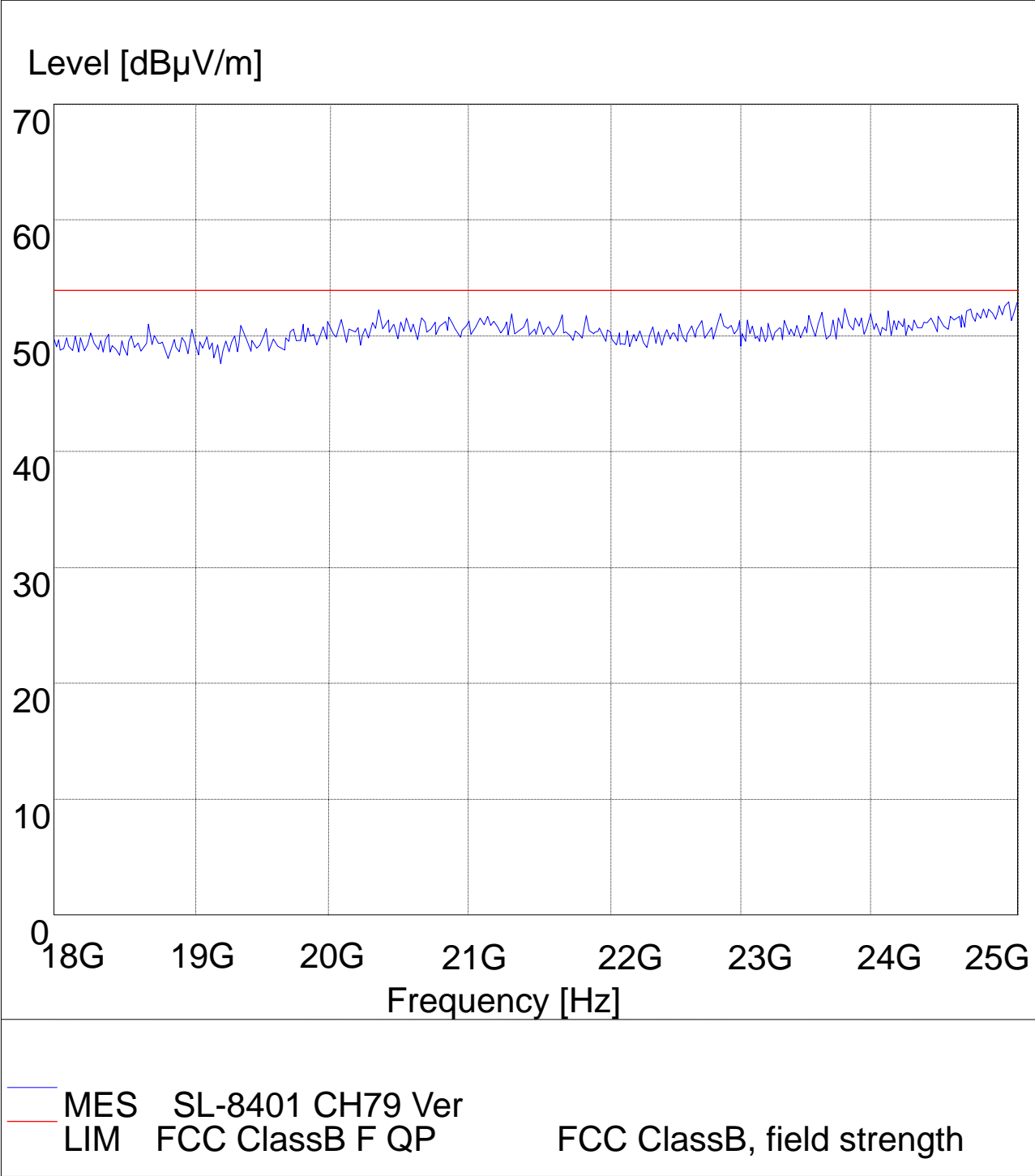
18-25G Horizontal



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18-25G Vertical



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## 7.0 20dB Bandwidth Measurement

### 7.1 Regulation

According to §15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 7.2 Limits of 20dB Bandwidth Measurement

The minimum of 20dB Bandwidth Measurement is <1MHz

### 7.3 Test Procedure.

1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel RBW > the 20 dB bandwidth of the emission being measured VBW ≥ RBW Sweep = auto Detector function = peak Trace = max hold
3. Measure the highest amplitude appearing on spectral display and record the level to calculate results. 6. Repeat above procedures until all frequencies measured were complete.

### 7.4 Test Result

EUT	Car DVD player		Model	SL-8401	
Mode	Keep Transmitting		Input Voltage	DC12V	
Temperature	24 deg. C,		Humidity	56% RH	
Channel	Channel Frequency (MHz)	20 dB Bandwidth (kHz)	Maximum Limit (kHz)	Pass/ Fail	
Low	2402	801	<1000	Pass	
Middle	2441	801	<1000	Pass	
High	2480	801	<1000	Pass	

The report refers only to the sample tested and does not apply to the bulk.

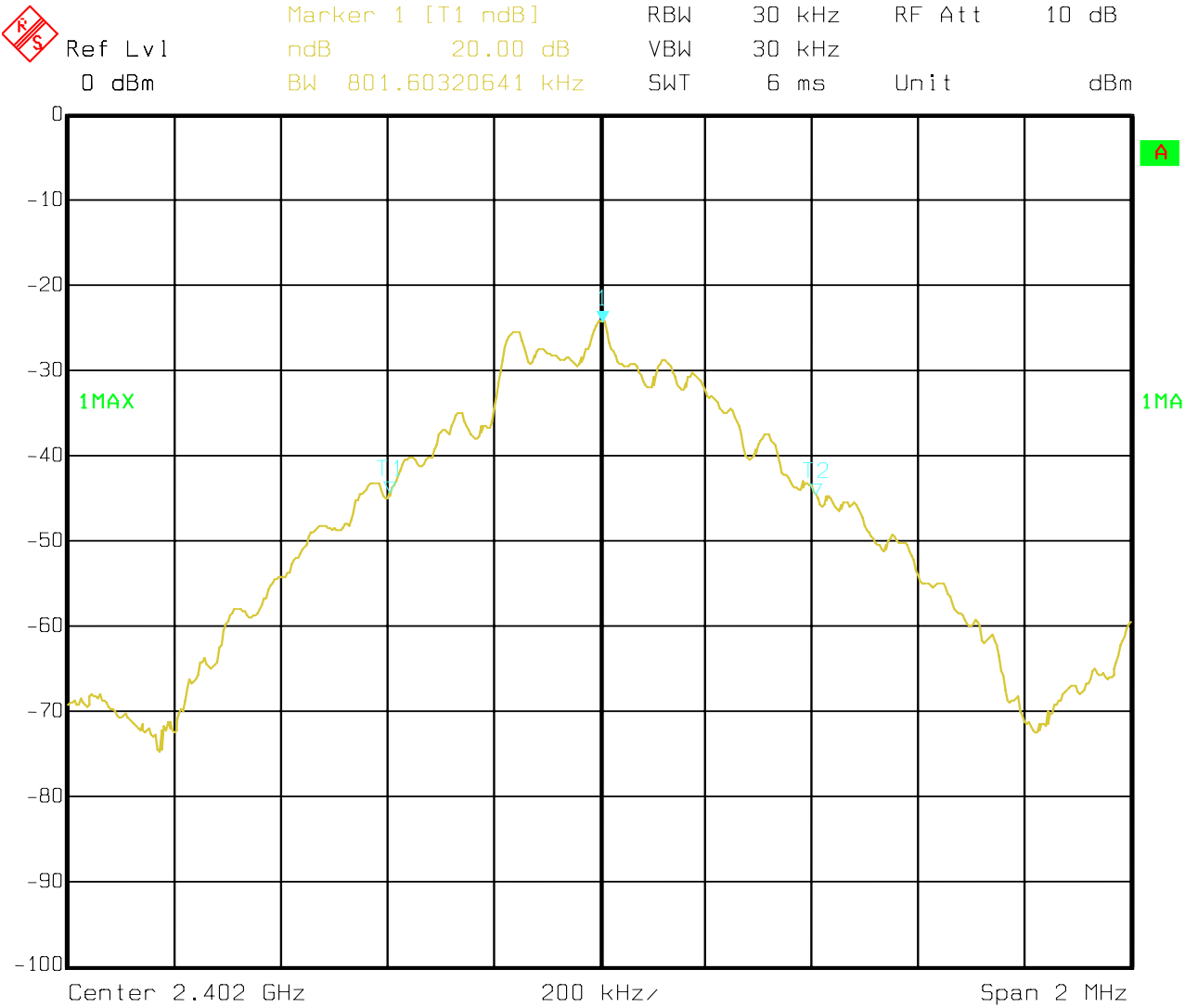
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Test Figure:

1. Condition: Low Channel

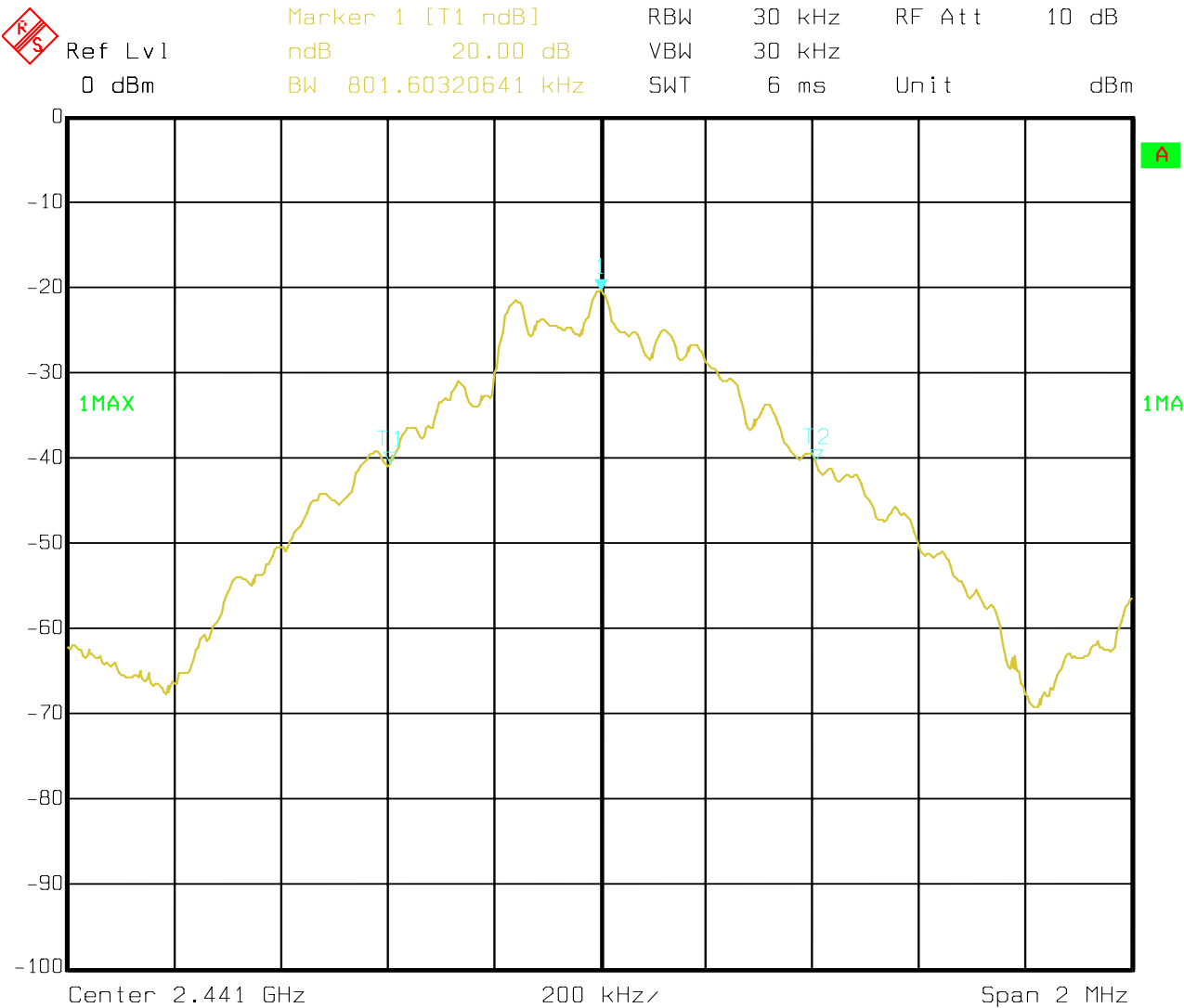


Date: 12.AUG.1909 21:02:16

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2. Condition: Middle Channel



Center 2.441 GHz

200 kHz

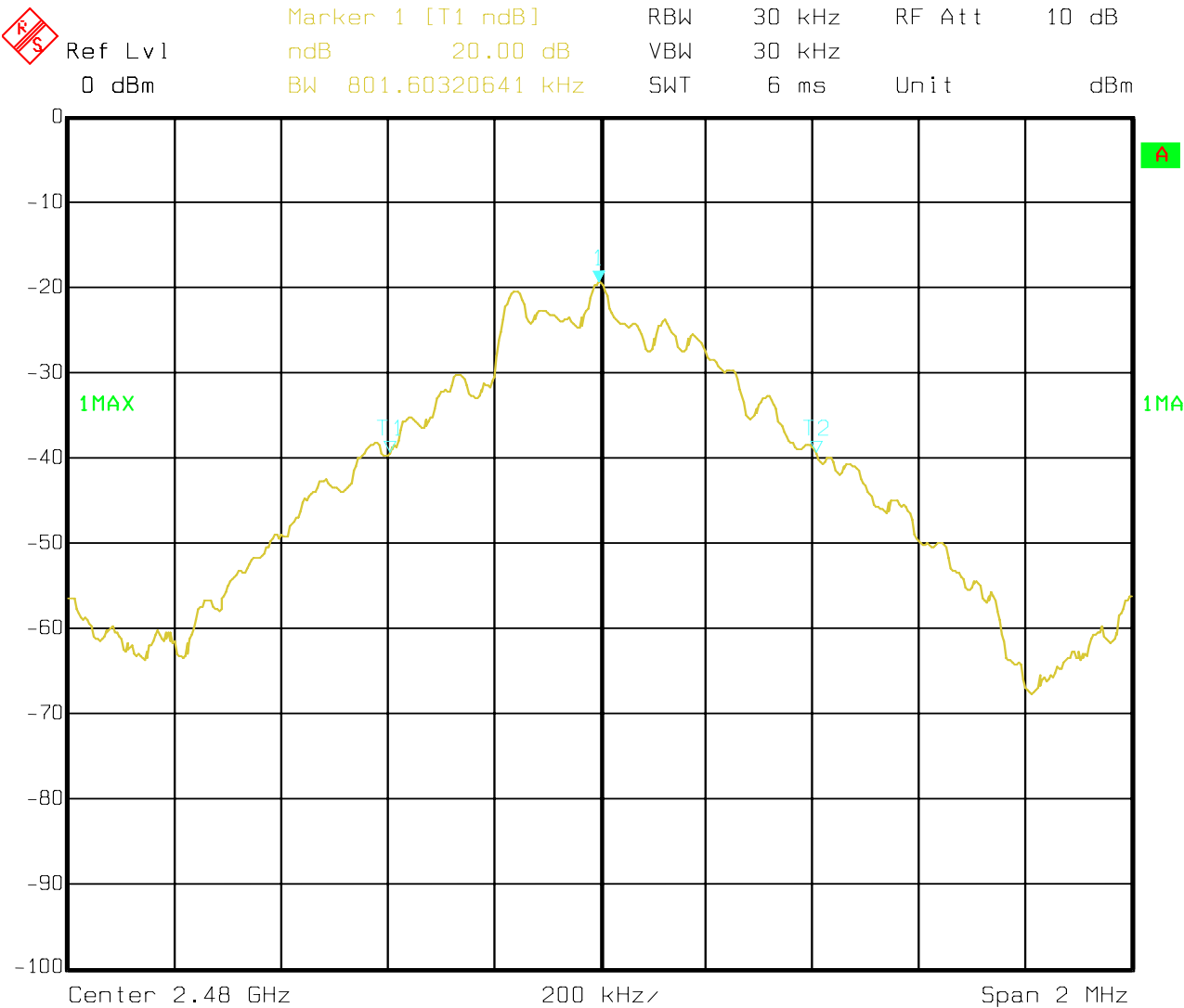
Span 2 MHz

Date: 12.AUG.1909 21:01:16

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3. High Channel



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## **8. Maximum Peak Output Power**

### **8.1 Regulation**

According to §15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5MHz band:0.125 watts. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **8.2 Limits of Maximum Peak Output Power**

The Maximum Peak Output Power Measurement is 30dBm.

### **8.3 Test Procedure**

1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel; RBW > the 20 dB bandwidth of the emission being measured; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold
3. Measure the highest amplitude appearing on spectral display and record the level to calculate results.
4. Repeat above procedures until all frequencies measured were complete.

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#### 8.4 Test Results

EUT		Car DVD player		Model		SL-8401	
Mode		Keeping Transmitting		Input Voltage		DC12V	
Temperature		24 deg. C,		Humidity		56% RH	
Channel	Channel Frequency (MHz)		Peak Power Output (dBm)		Peak Power Limit (dBm)		Pass/ Fail
Low	2402		-22.10		30		Pass
Middle	2441		-19.23		30		Pass
High	2480		-16.17		30		Pass

Note: 1. the result basic equation calculation as follow:

$$\text{Peak Power Output} = \text{Peak Power Reading} + \text{Cable loss} + \text{Attenuator}$$



## 9. Carrier Frequency Separation

### 9.1 Regulation

According to §15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### 9.2 Limits of Carrier Frequency Separation

The Maximum Power Spectral Density Measurement is 25kHz or two-thirds of the 20dB bandwidth of the hopping Channel which is great.

### 9.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = wide enough to capture the peaks of two adjacent channels: Resolution (or IF) Bandwidth (RBW)  $\geq$  1% of the span; Video (or Average) Bandwidth (VBW)  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold
3. Measure the separation between the peaks of the adjacent channels using the marker-delta function.
4. Repeat above procedures until all frequencies measured were complete.

### 9.4 Test Result

EUT		Car DVD player		Model		SL-8401	
Mode		Keeping Transmitting		Input Voltage		DC12V	
Temperature		24 deg. C,		Humidity		56% RH	
Channel	Channel Frequency (MHz)		Carrier Frequency Separation		Limit		Pass/ Fail
Middle	2441		1MHz		≥ 25 kHz or 20 dB bandwidth		Pass

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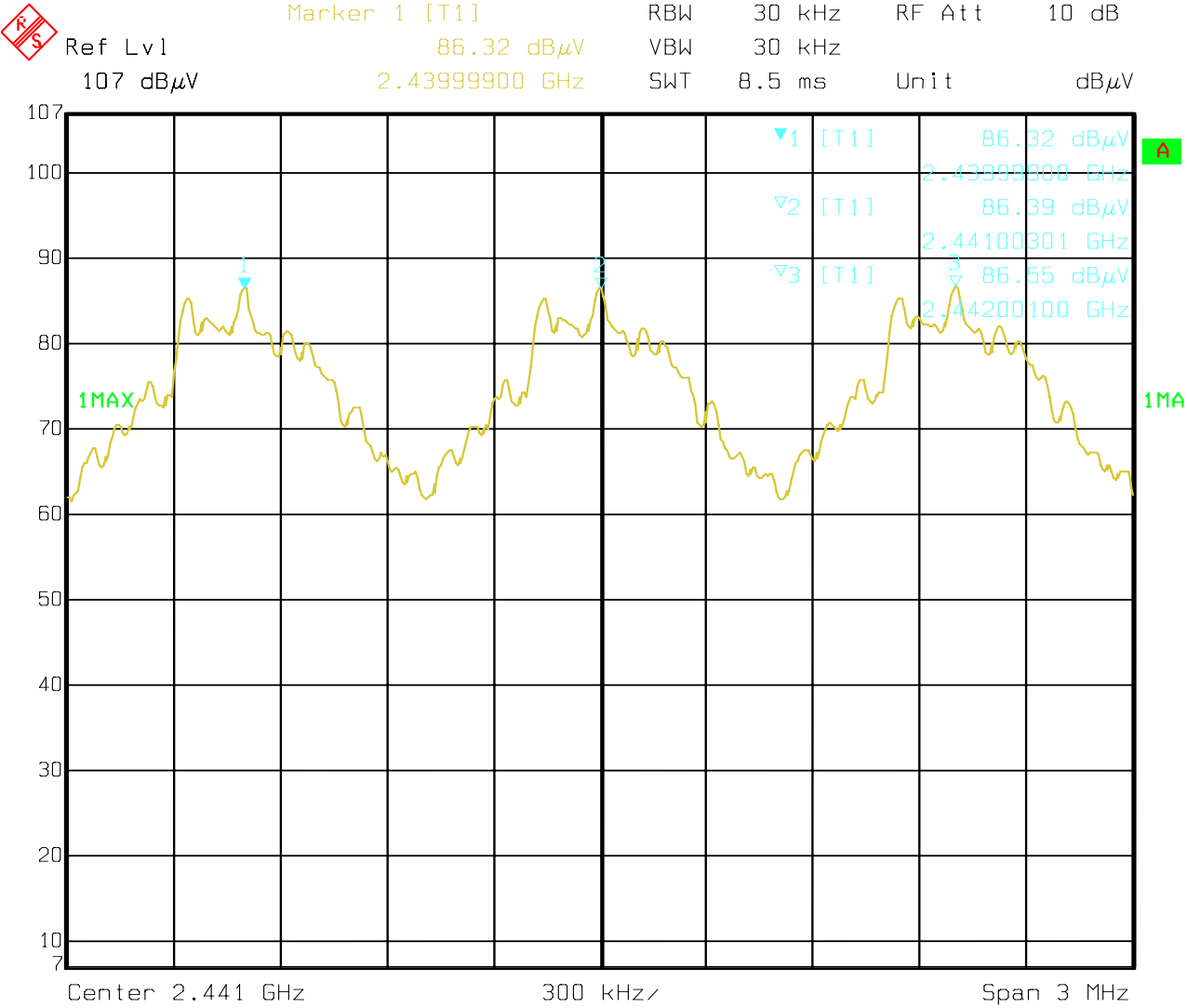
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Test Plots

Middle Channel



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## 10. Number of Hopping Channels

### 10.1 Regulation

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used. According to §15.247(b)(1), for frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

### 10.2 Limits of Number of Hopping Channels

The frequency hopping systems in the 2400-2483.5MHz band shall use at least 15 channels.

### 10.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = the frequency band of operation; RBW  $\geq$  1% of the span; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold
3. Record the number of hopping channels.

### 10.4 Test Result

EUT	Car DVD player	Model	SL-8401
Mode	Keeping Transmitting	Input Voltage	DC12V
Temperature	24 deg. C,	Humidity	56% RH
Operating Frequency	Number of hopping channels	Limit	Pass/ Fail
2402-2480MHz	79	$\geq 15$	Pass

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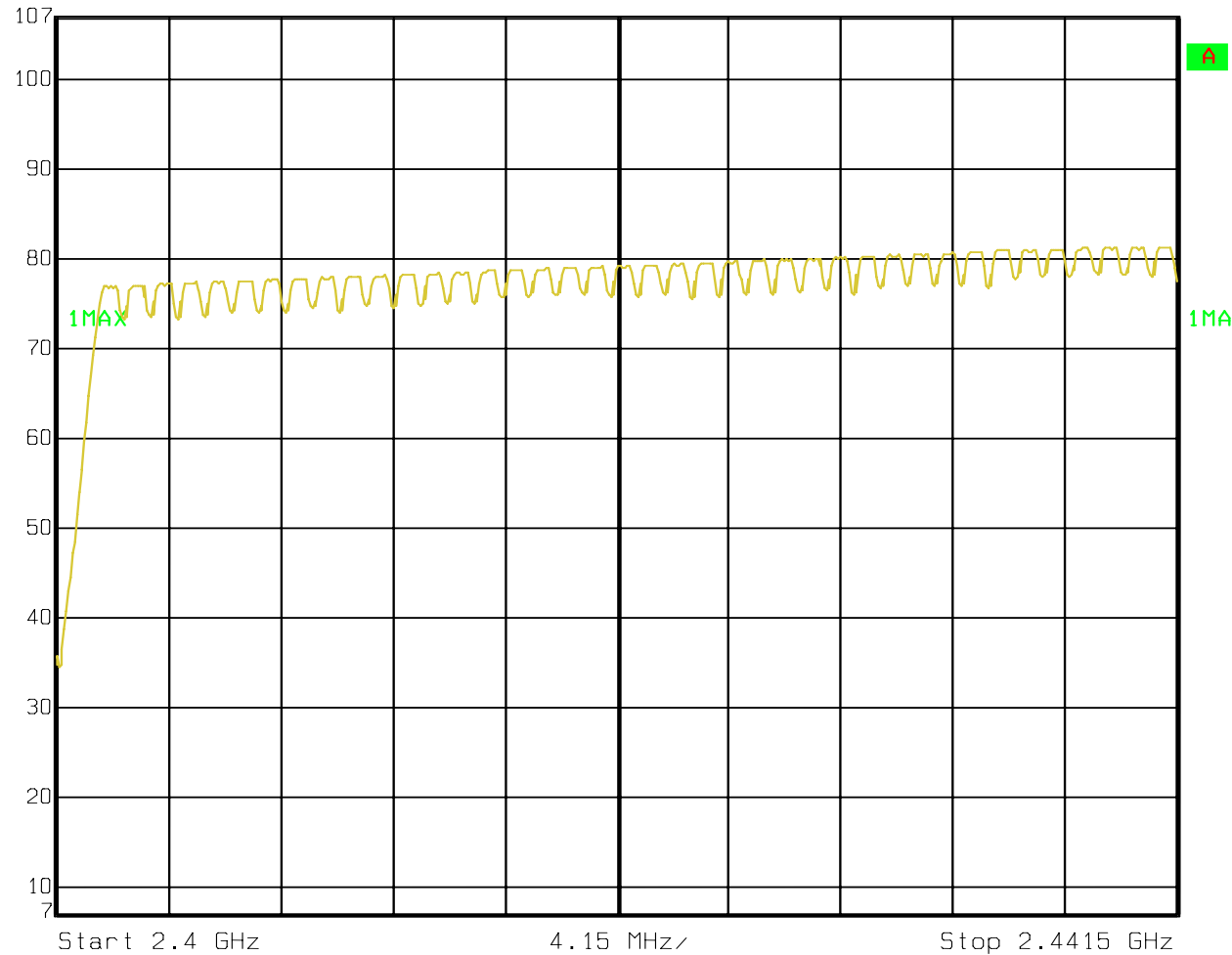


Test Plot



Ref Lvl  
107 dB $\mu$ V

RBW 500 kHz RF Att 10 dB  
VBW 500 kHz  
SWT 5 ms Unit dB $\mu$ V



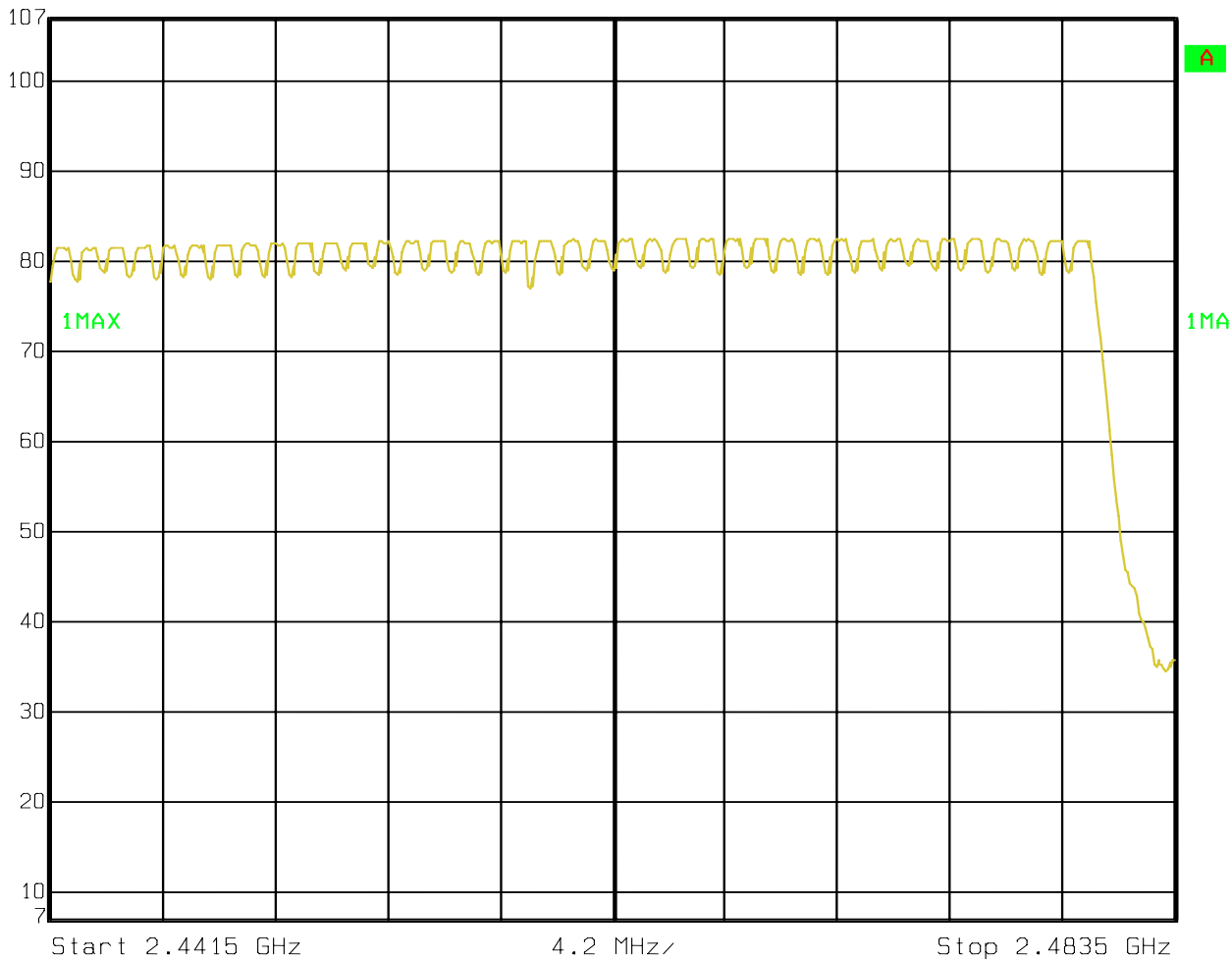
Date: 12.AUG.1909 21:23:20

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Ref Lvl  
107 dBμV

RBW 500 kHz RF Att 10 dB  
VBW 500 kHz  
SWT 5 ms Unit dBμV



Date: 12.AUG.1909 21:25:17

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## **11. Time of Occupancy (Dwell Time)**

### **11.1 Regulation**

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### **11.2 Limits of Carrier Frequency Separation**

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed

### **11.3 Test Procedure**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Set the spectrum analyzer as follows: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW  $\geq$  RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold
3. Measure the dwell time using the marker-delta function.
4. Repeat above procedures until all frequencies measured were complete.
5. Repeat this test for different modes of operation (e.g., data rate, modulation format, etc.), if applicable.

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#### 11.4 Test Result

EUT		Car DVD player		Model	SL-8401
Mode		Keeping Transmitting		Input Voltage	DC12V
Temperature		24 deg. C,		Humidity	56% RH
Channel	Reading	Hoping Rate		Actual	Limit
Low	0.40ms	800 hop/s		0.13s	0.4s
Middle	0.40ms	800 hop/s		0.13s	0.4s
High	0.40ms	800hop/s		0.13s	0.4s

Actual = Reading  $\times$  (Hopping rate / Number of channels)  $\times$  Test period  
Test period = 0.4 [seconds / channel]  $\times$  79 [channel] = 31.6 [seconds]  
NOTE: The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625 $\mu$ s with 79 channels. A DH1 Packet needs 1 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 800 hops per second with 79 channels.

The report refers only to the sample tested and does not apply to the bulk.

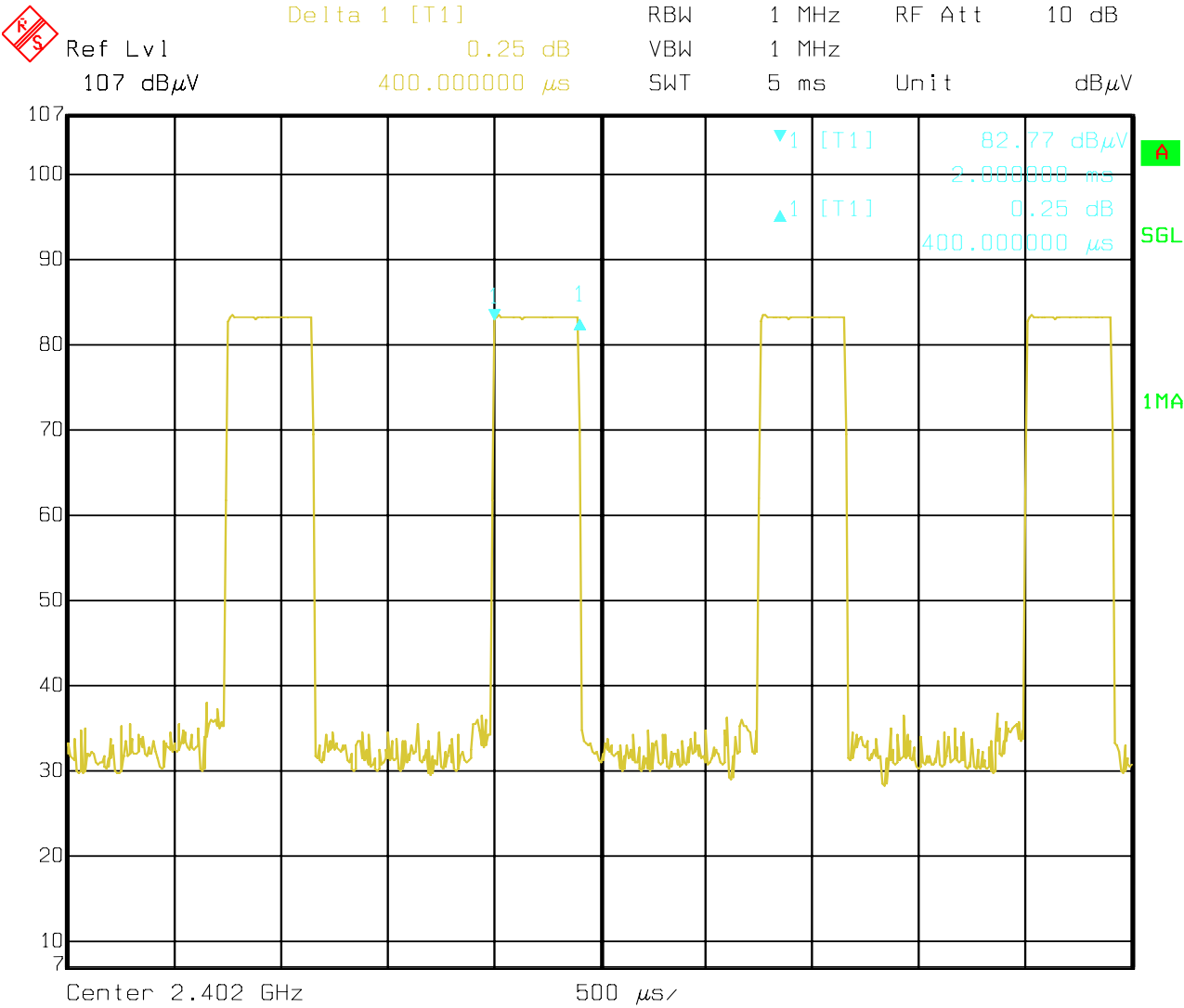
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Test Plots:  
DH1 Low Channel:

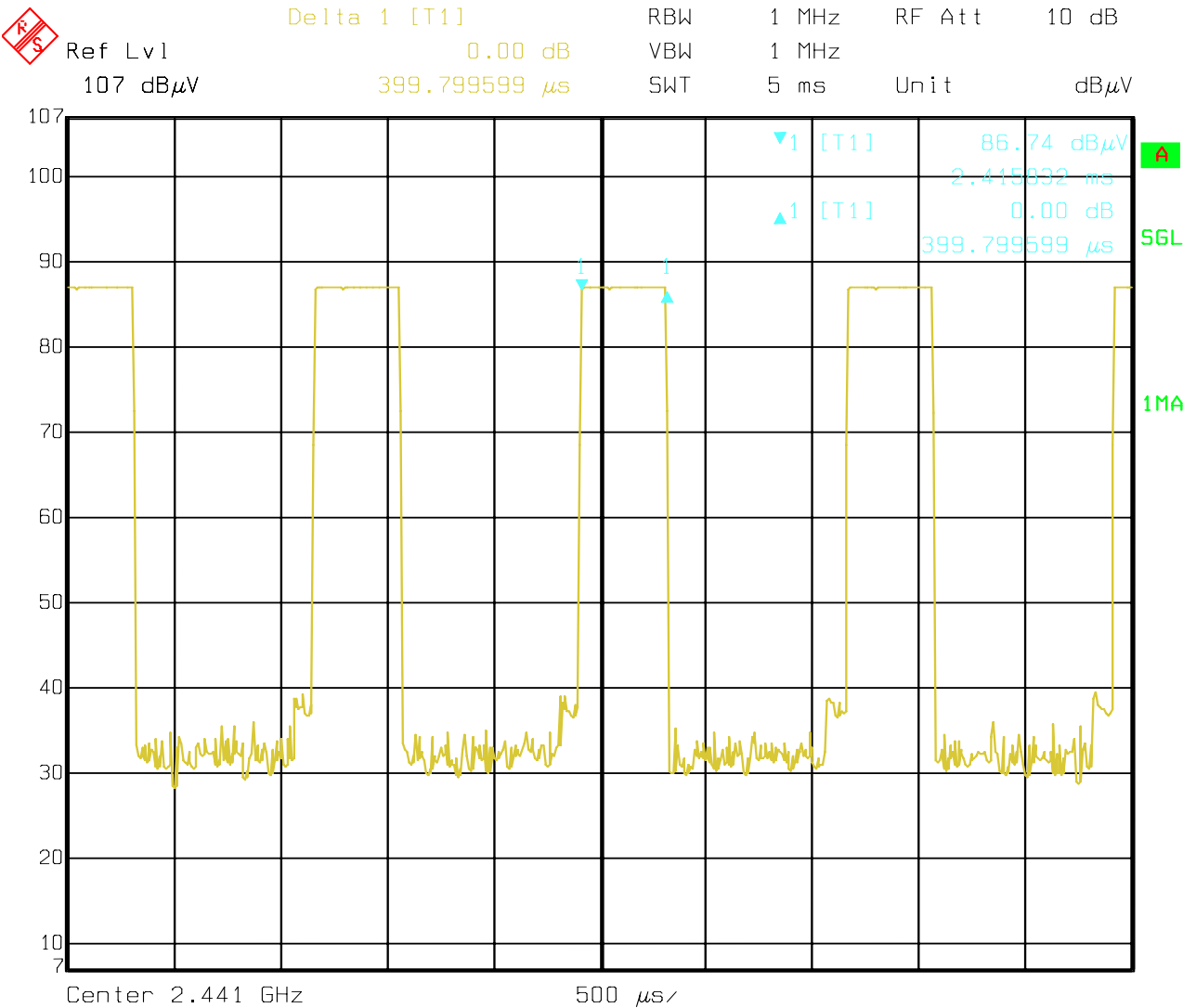


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DH1 Middle Channel:

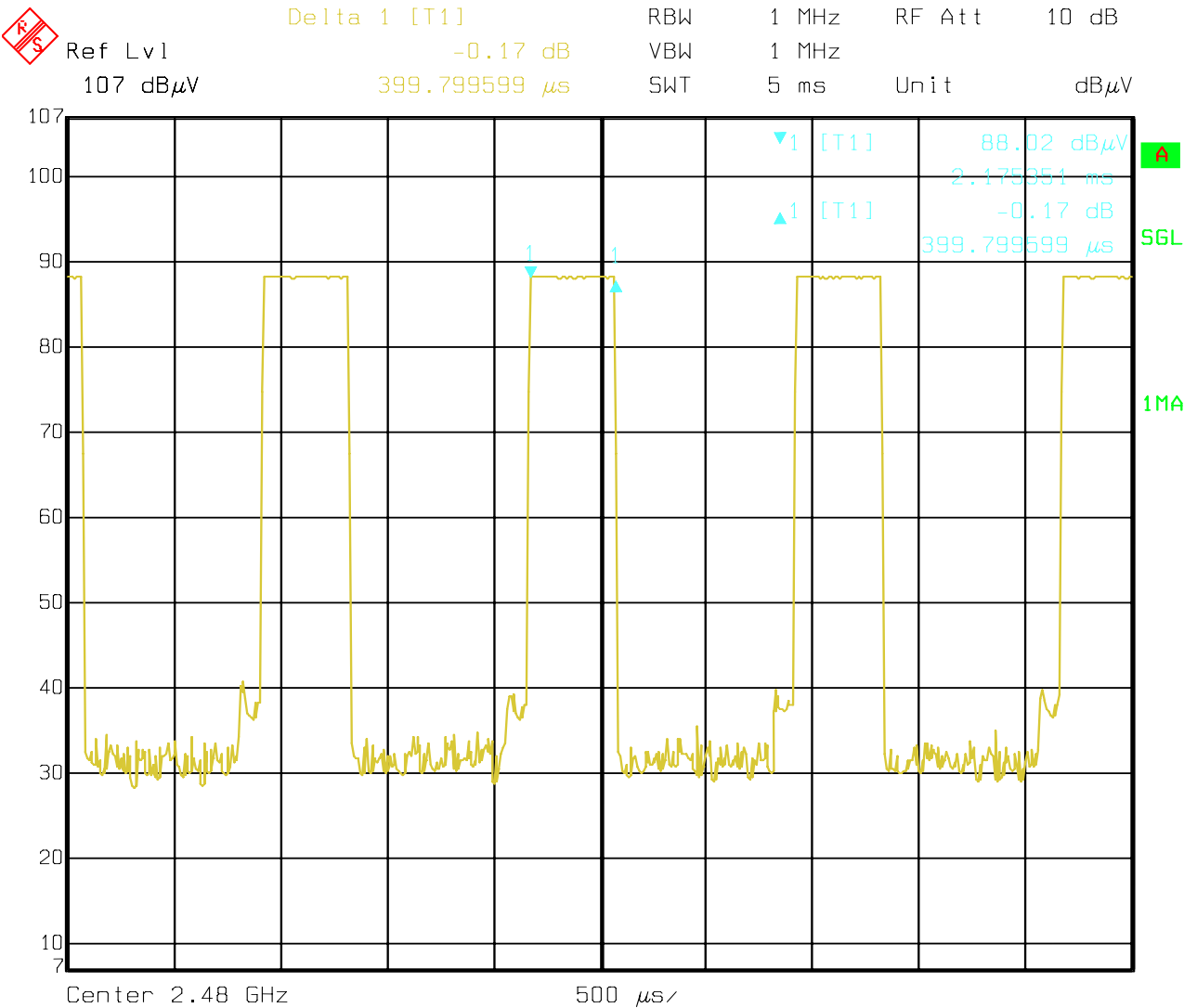


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DH1 High Channel



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EUT	Car DVD player		Model	SL-8401
Mode	Keeping Transmitting		Input Voltage	DC12V
Temperature	24 deg. C,		Humidity	56% RH
Channel	Reading	Hopping Rate	Actual	Limit
Low	1.65ms	400 hop/s	0.27s	0.4s
Middle	1.65ms	400 hop/s	0.27s	0.4s
High	1.65ms	400 hop/s	0.27s	0.4s

Actual = Reading × (Hopping rate / Number of channels) × Test period  
Test period = 0.4 [seconds / channel] × 79 [channel] = 31.6 [seconds]  
NOTE: The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625μs with 79 channels. A DH1 Packet needs 3 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 400 hops per second with 79 channels.

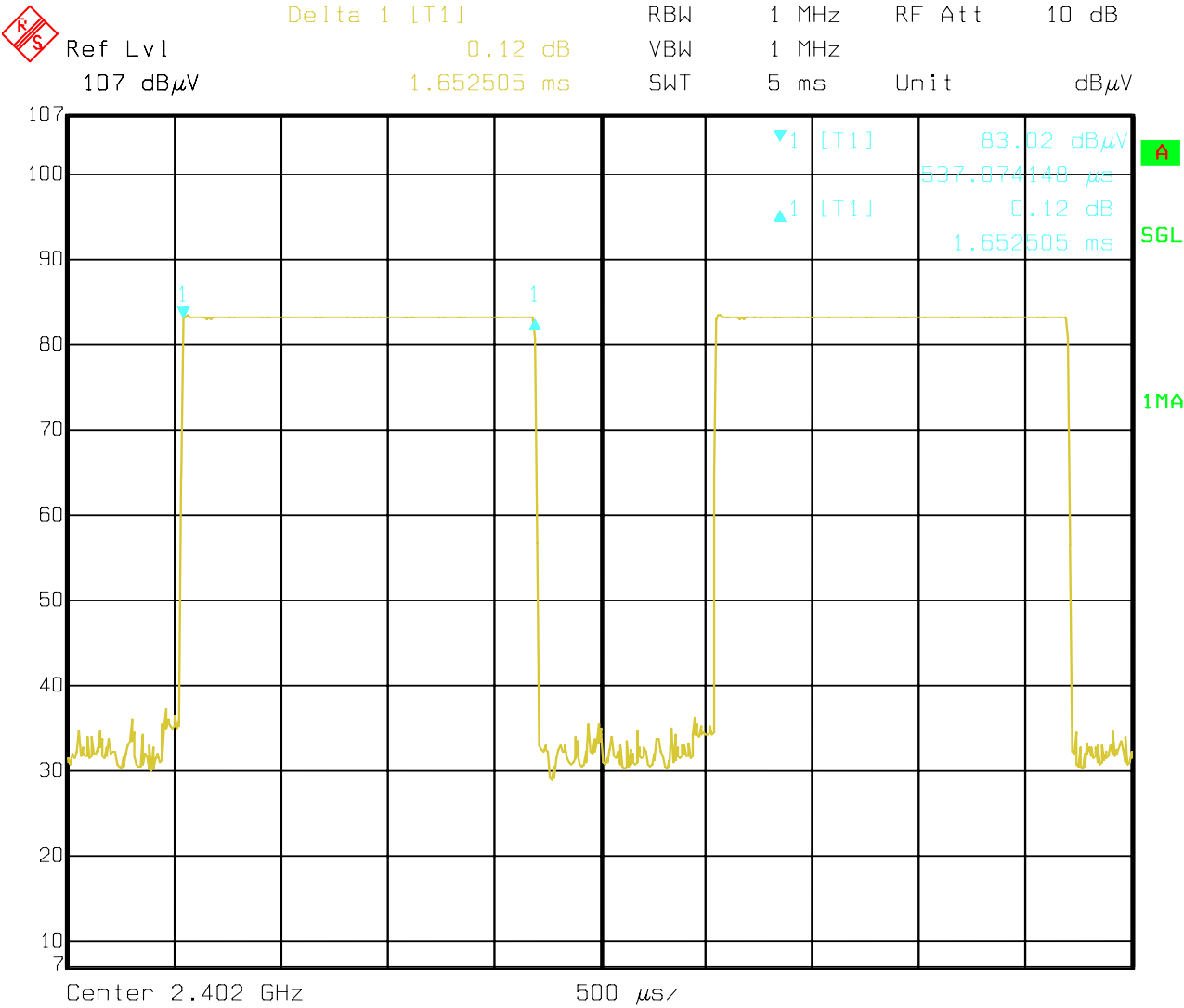
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Test Plots:  
DH3 Low Channel:

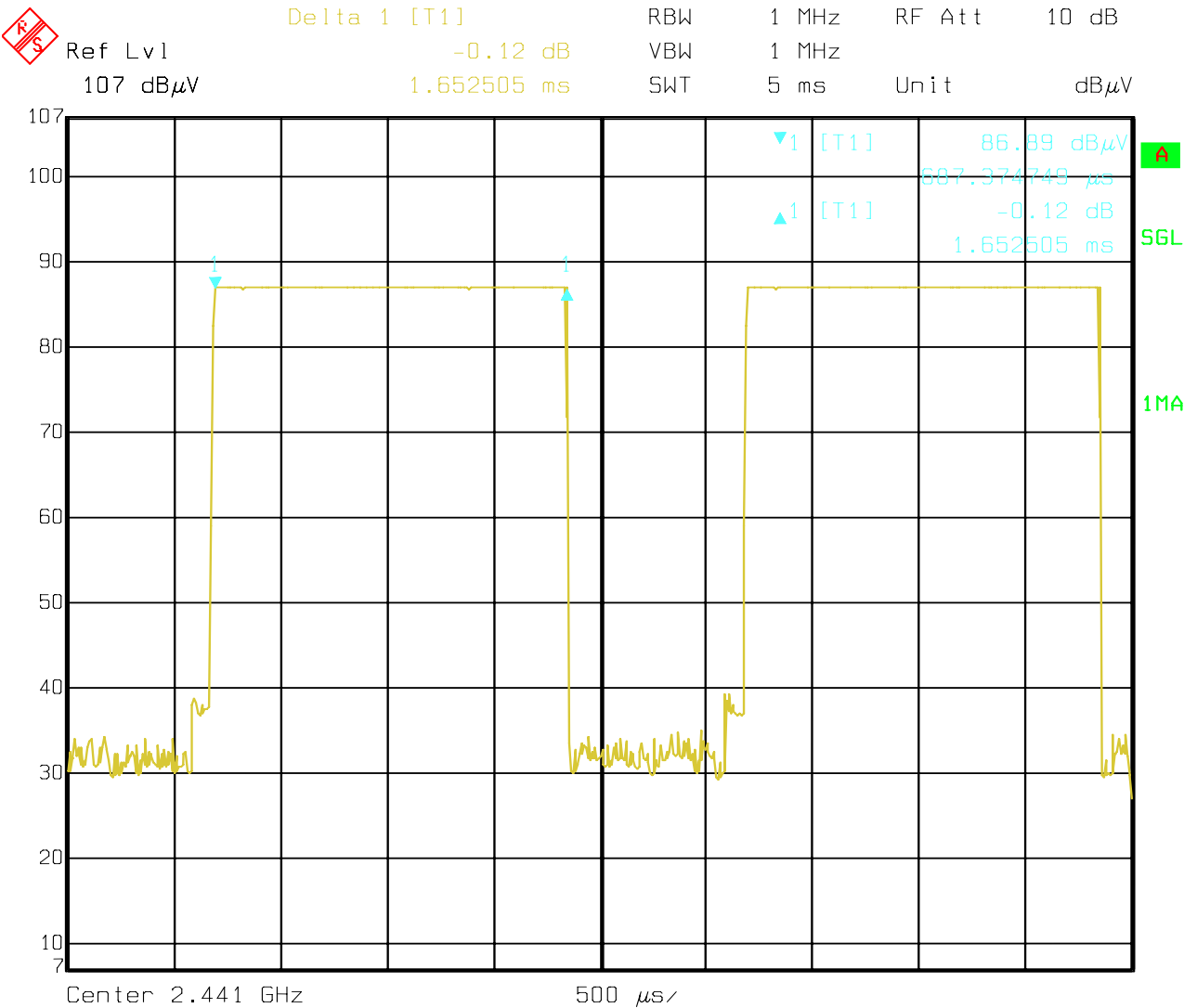


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DH3 Middle Channel:

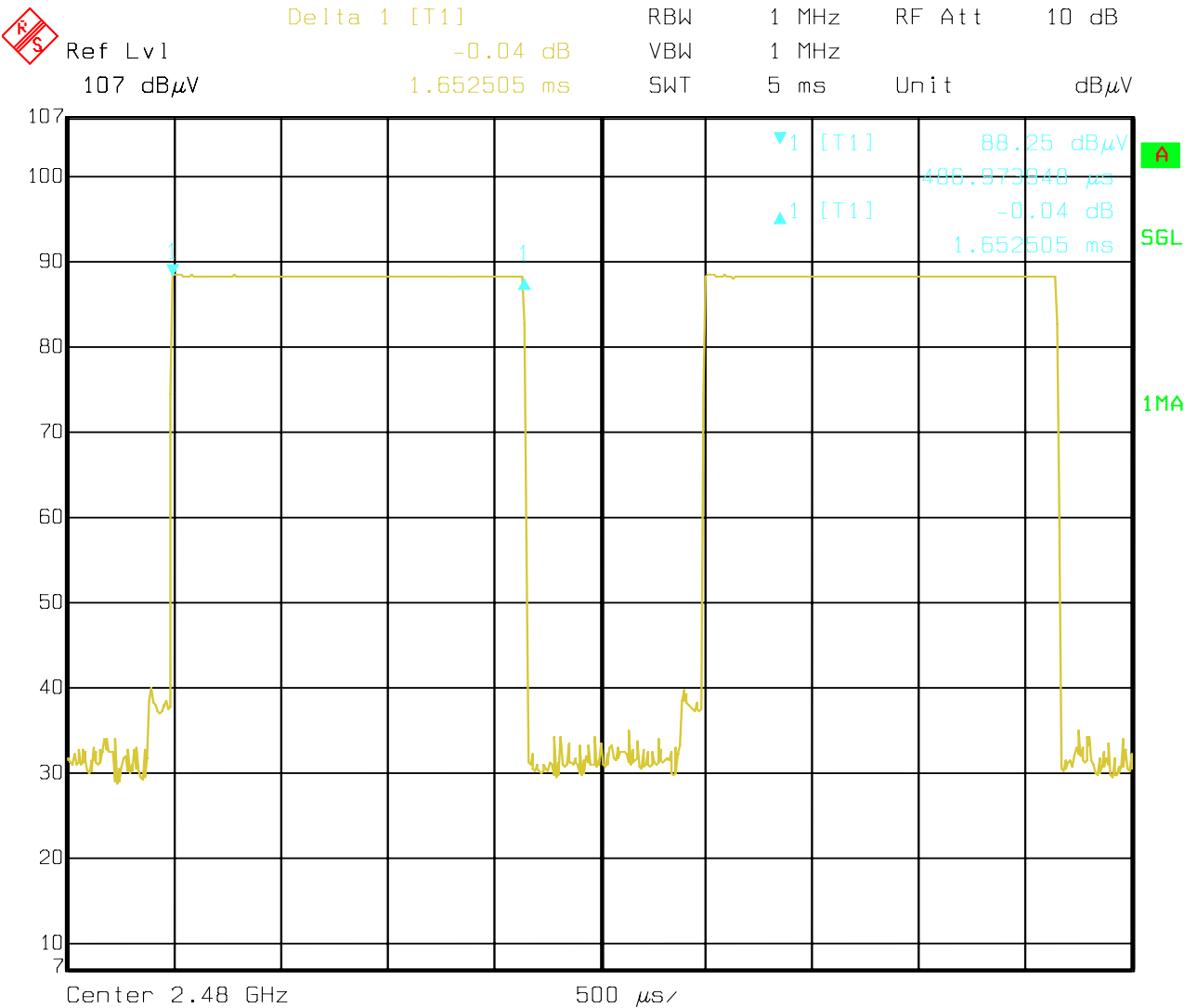


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DH3 High Channel



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EUT	Car DVD player		Model	SL-8401
Mode	Keeping Transmitting		Input Voltage	DC12V
Temperature	24 deg. C,		Humidity	56% RH
Channel	Reading	Hopping Rate	Actual	Limit
Low	2.89ms	266.667 hop/s	0.31s	0.4s
Middle	2.89ms	266.667 hop/s	0.31s	0.4s
High	2.89ms	266.667 hop/s	0.31s	0.4s

Actual = Reading × (Hopping rate / Number of channels) × Test period  
Test period = 0.4 [seconds / channel] × 79 [channel] = 31.6 [seconds]  
NOTE: The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625μs with 79 channels. A DH1 Packet needs 5 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 266.667 hops per second with 79 channels.

The report refers only to the sample tested and does not apply to the bulk.

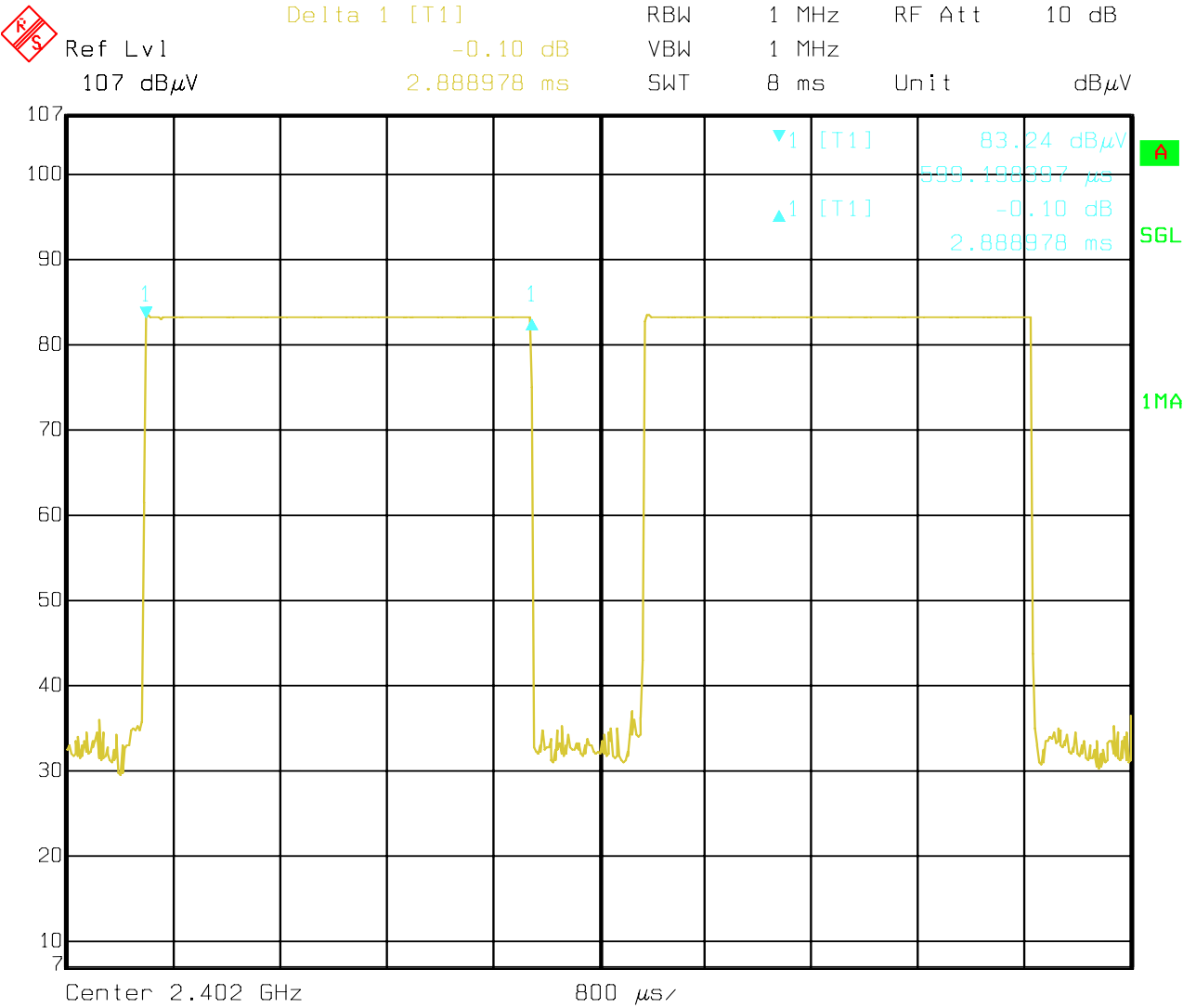
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Test Plots:  
DH5 Low Channel:

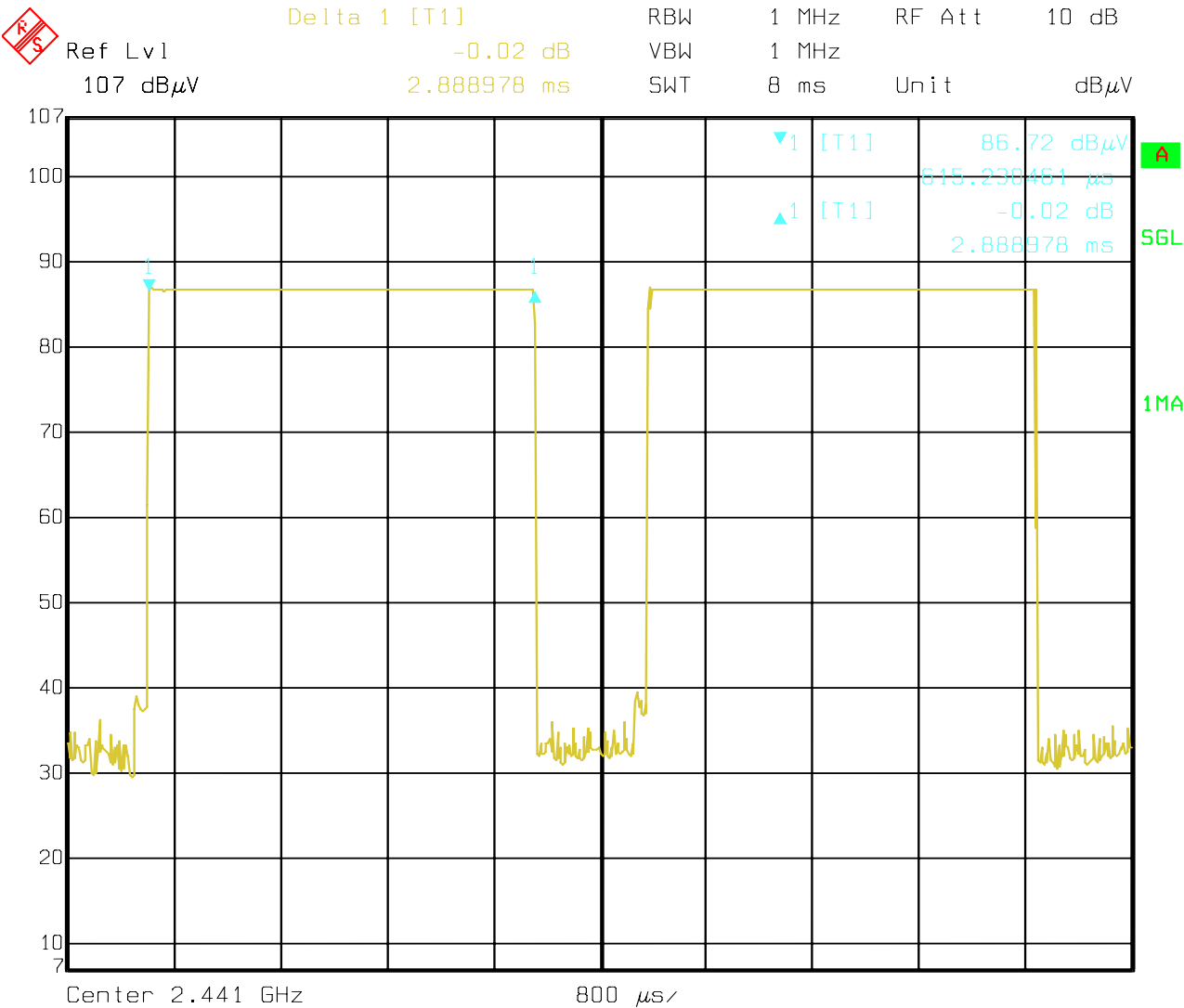


Date: 12.AUG.1909 22:00:36

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DH5 Middle Channel:

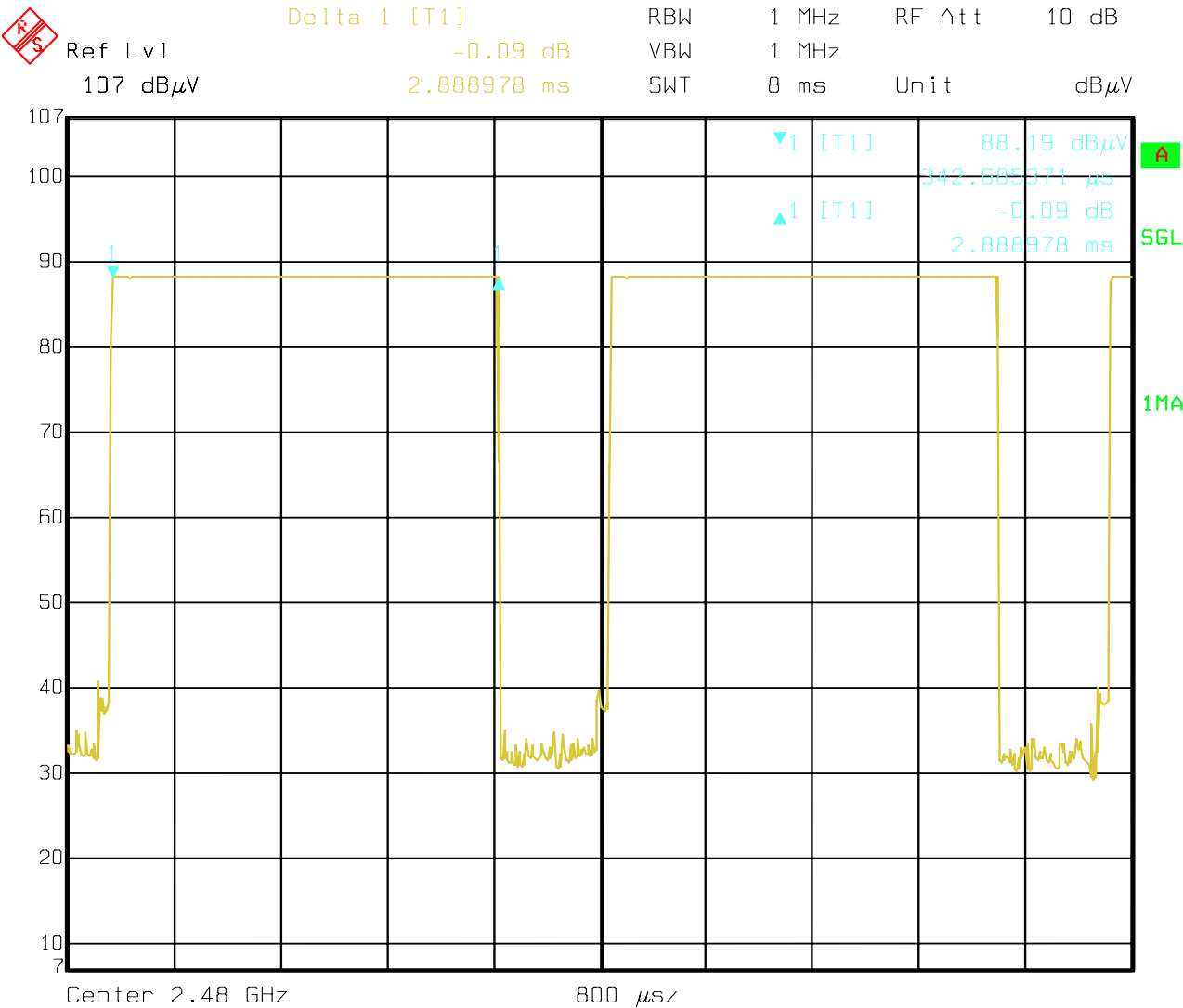


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DH5 High Channel



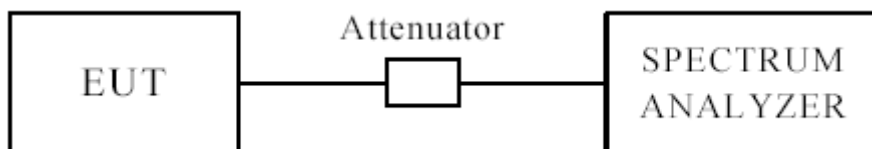
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## 12 Out of Band Measurement

### 10.1 Test Setup



### 12.2 Limits of Out of Band Emissions Measurement

1. Below  $-20\text{dB}$  of the highest emission level of operating band (in 100kHz Resolution Bandwidth).
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

### 12.3 Test Procedure

For signals in the restricted bands above and below the 2.4-2.483GHz allocated band a measurement was made of the amplitude of the spurious emissions with respect to the intentional signals. The relative amplitude, in dBc, was applied to the average and peak field strength of the intentional signal made on the OATS to calculate the field strength of the unintentional signals.

The spectrum plots (Peak RBW=VBW=1MHz; Average RBW=1MHz, VBW=10Hz) are attached on the following pages.

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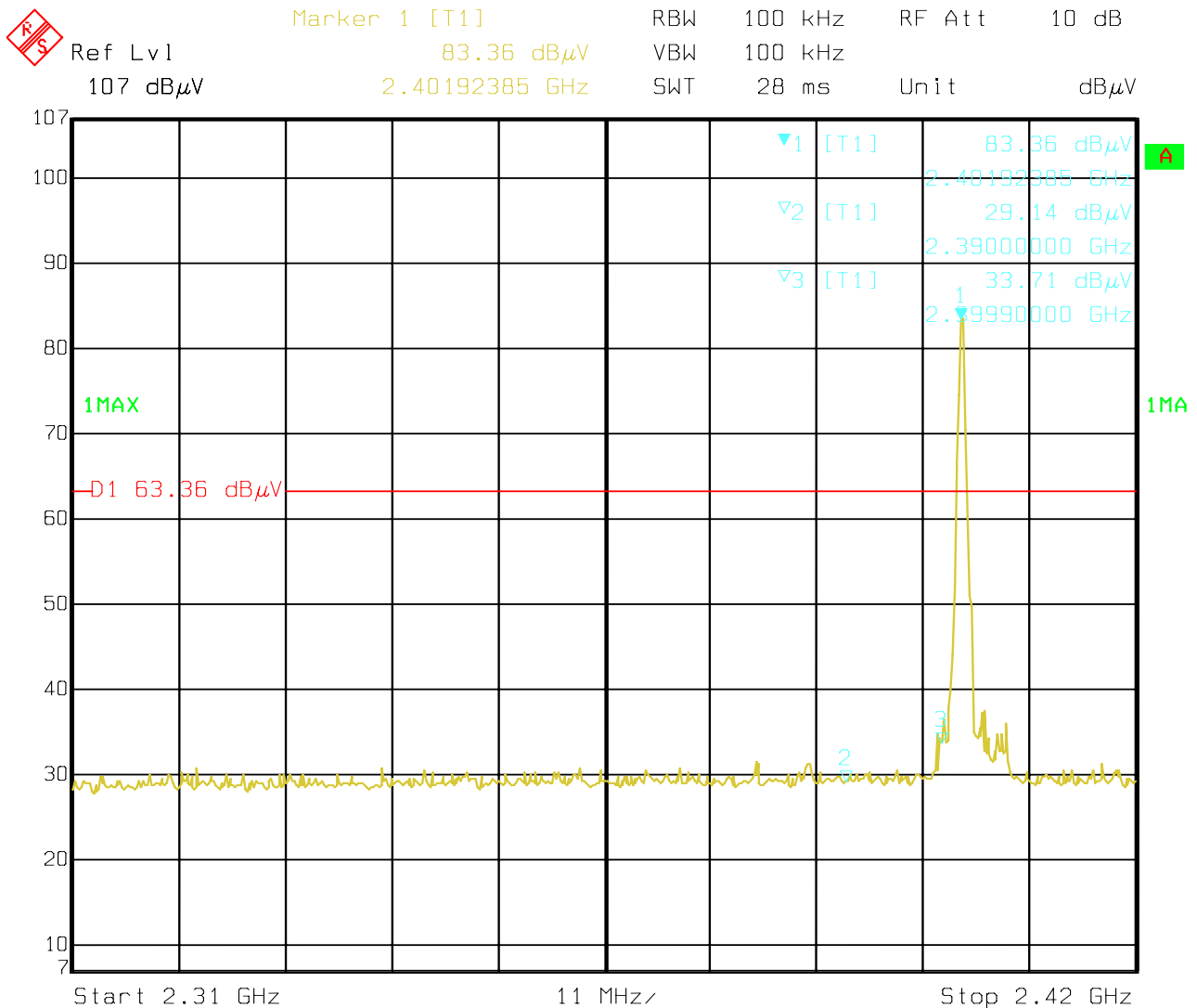
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#### 12.4 Out of Band Test Result

Product:	Car DVD player		Test Mode:	Low Channel
Mode	Keeping Transmitting		Input Voltage	DC12.0V
Temperature	24 deg. C		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in Restrict Band	PK (dBμV/m)	36.8(H)/36.2(V)	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

#### Test Figure:



Date: 12.AUG.1909 21:09:39

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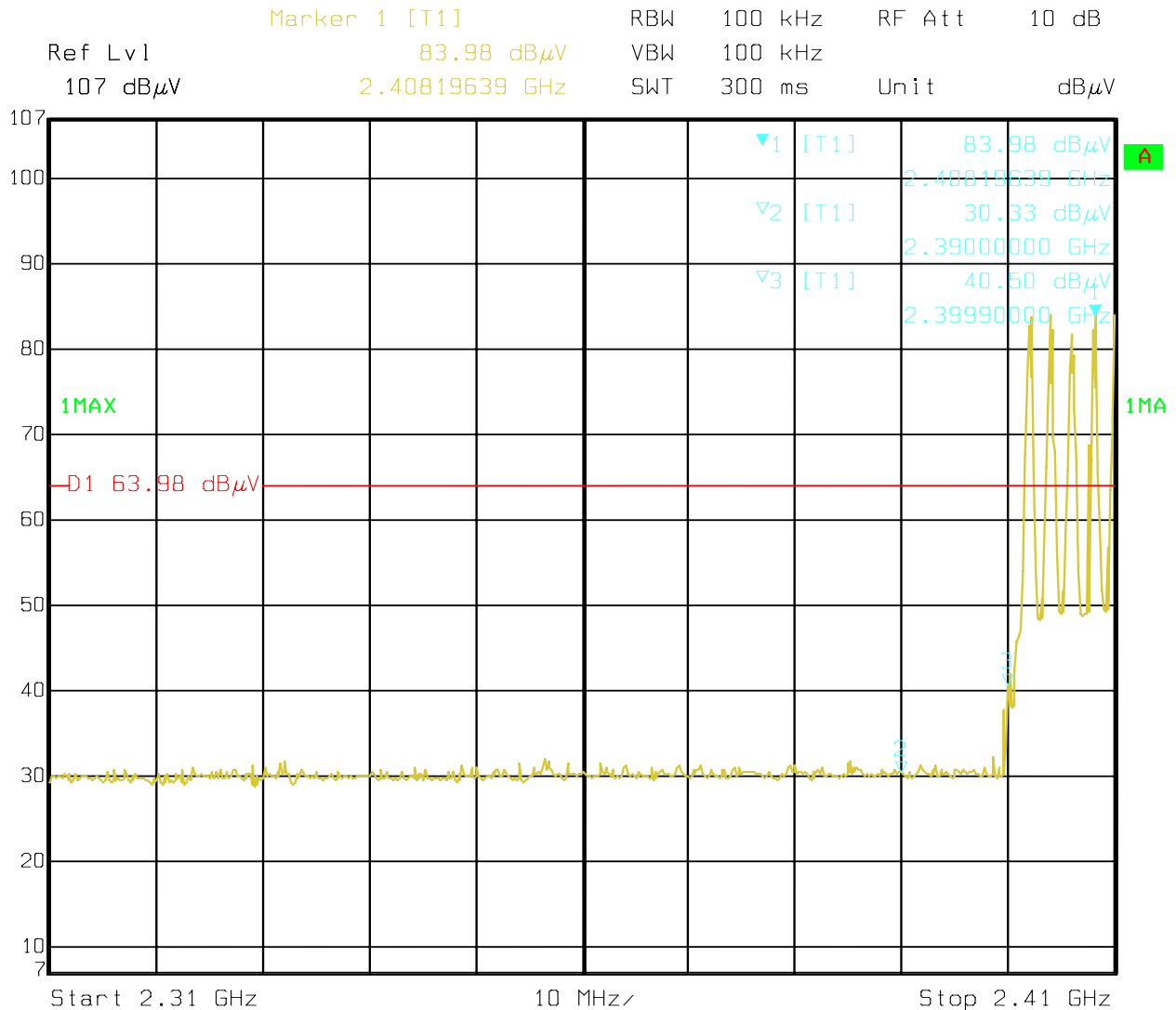
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#### 12.4 Out of Band Test Result

Product:	Car DVD player		Test Mode:	Low Channel
Mode	Hopping mode		Input Voltage	DC12.0V
Temperature	24 deg. C		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in Restrict Band	PK (dBμV/m)	37.6(H)/36.8(V)	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

#### Test Figure:



Date: 11.SEP.2009 17:55:41

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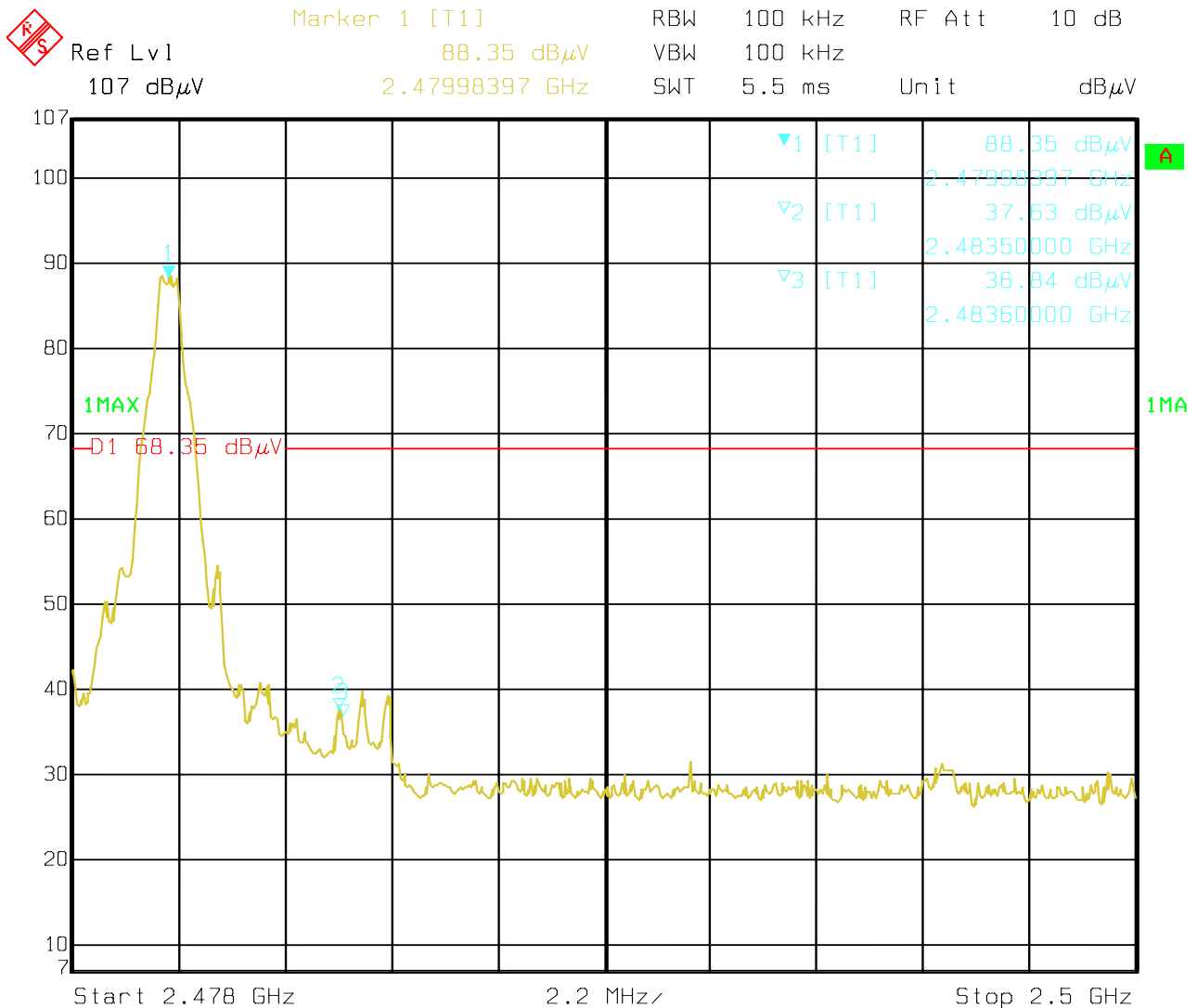
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#### 12.4 Out of Band Test Result

Product:	Car DVD player		Test Mode:	High Channel
Mode	Keeping Transmitting		Input Voltage	DC12V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in Restrict Band	PK (dBμV/m)	47.6(H)/44.6(V)	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

#### Test Figure:



Date: 12.AUG.1909 21:13:32

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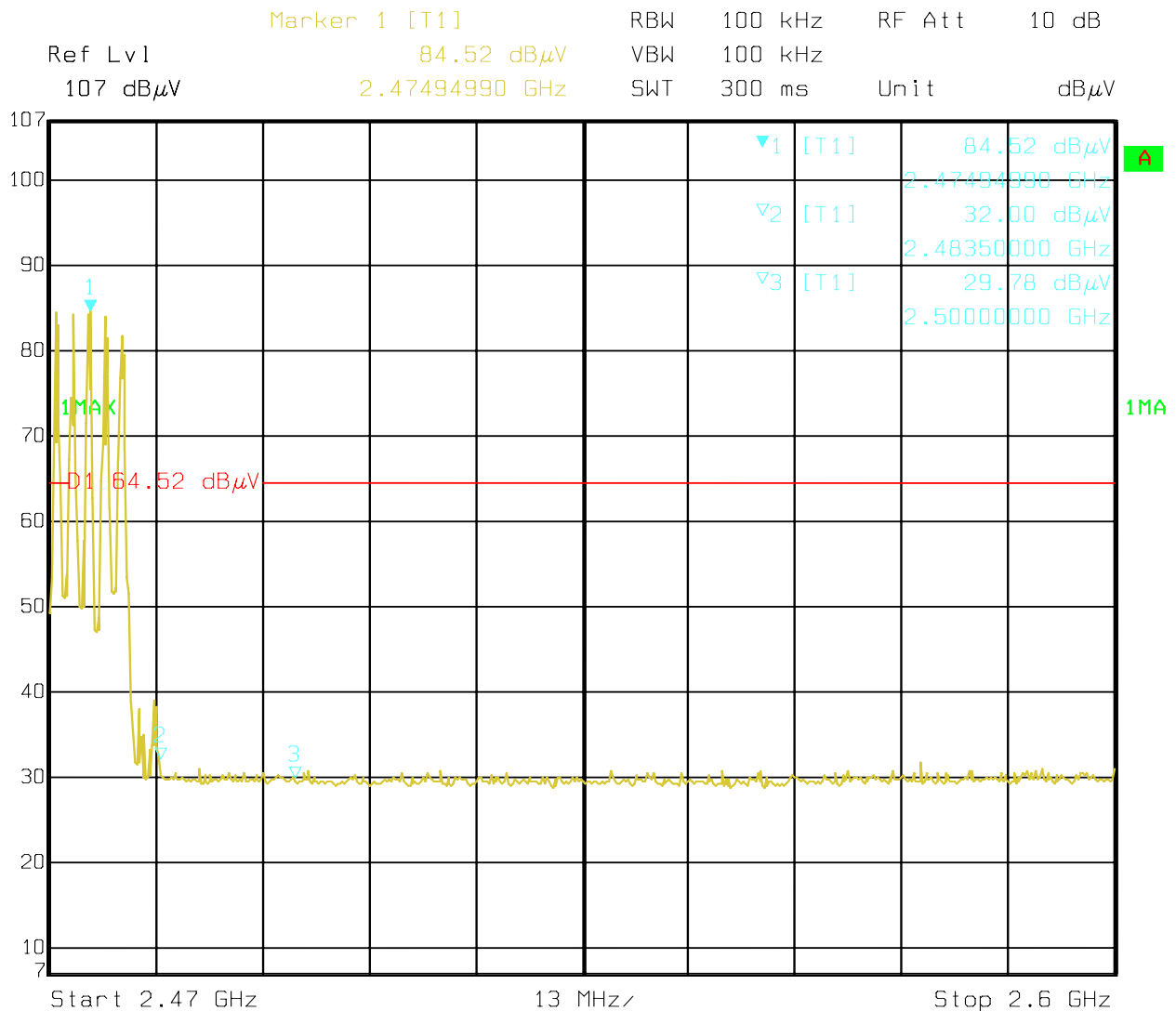
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#### 12.4 Out of Band Test Result

Product:	Car DVD player		Test Mode:	High Channel
Mode	Hopping Mode		Input Voltage	DC12V
Temperature	24 deg. C,		Humidity	56% RH
Test Result:	Pass		Detector	PK
The Max. FS in Restrict Band	PK (dBμV/m)	41.3(H)/39.2(V)	Limit	74(dBμV/m)
	AV(dBμV/m)	--		54(dBμV/m)

#### Test Figure:



Date: 11.SEP.2009 18:08:12

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### **13.0 Antenna Requirement**

#### **14.1 Standard Applicable**

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitter antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### **13.2 Antenna Connected construction**

The antenna is chip dielectric antenna. The maximum Gain of this antenna is 0dBi

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## 14.0 Maximum Permissible Exposure

### Applicable Standard

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2m normally can be maintained between the user and the device.

#### (a) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Averaging Times   E   <sup>2</sup> ,   H   <sup>2</sup> or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100000			5	6

#### (b) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Averaging Times   E   <sup>2</sup> ,   H   <sup>2</sup> or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100000			1.0	30

Note: f=frequency in MHz; \*Plane-wave equivalent power density

### MPE Calculation Method

$$E \text{ (V/m)} = (30 \cdot P \cdot G)^{0.5} / d \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = E^2 / 377$$

**E** = Electric Field (V/m)

**P** = Peak RF output Power (W)

**G** = EUT Antenna numeric gain (numeric)

**d** = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = (30 \cdot P \cdot G) / (377 \cdot d^2)$$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

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### Calculated Result and Limit

Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )	Test Result
1	-16.17	0.024	$4.77 \times 10^{-6}$	1	Compiles

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## 15.0 FCC ID Label

**FCC ID: V4HSL-8XXX**

**This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.**

The label must not be a stick-on paper label. The label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

### Mark Location:



FCC ID Label Location

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## 16.0 Photo of testing

16.1 Conducted test View—N/A

16.2 Emission Radiated test View--



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16.3 Photo for the EUT

Outside View



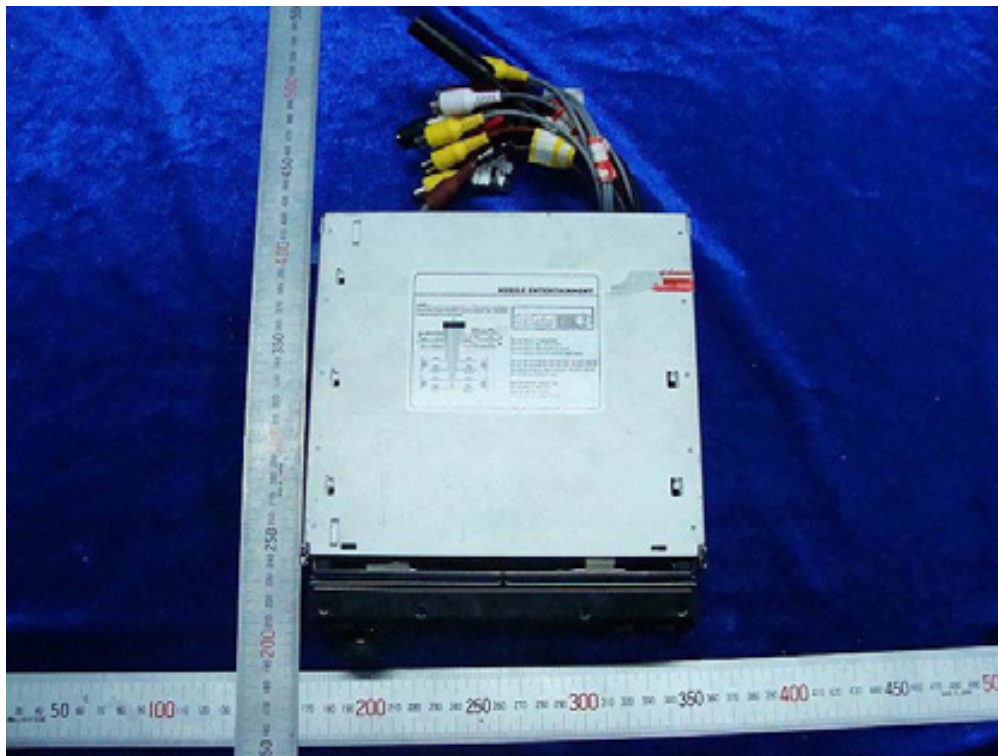
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16.4 Photo for the EUT

Outside View



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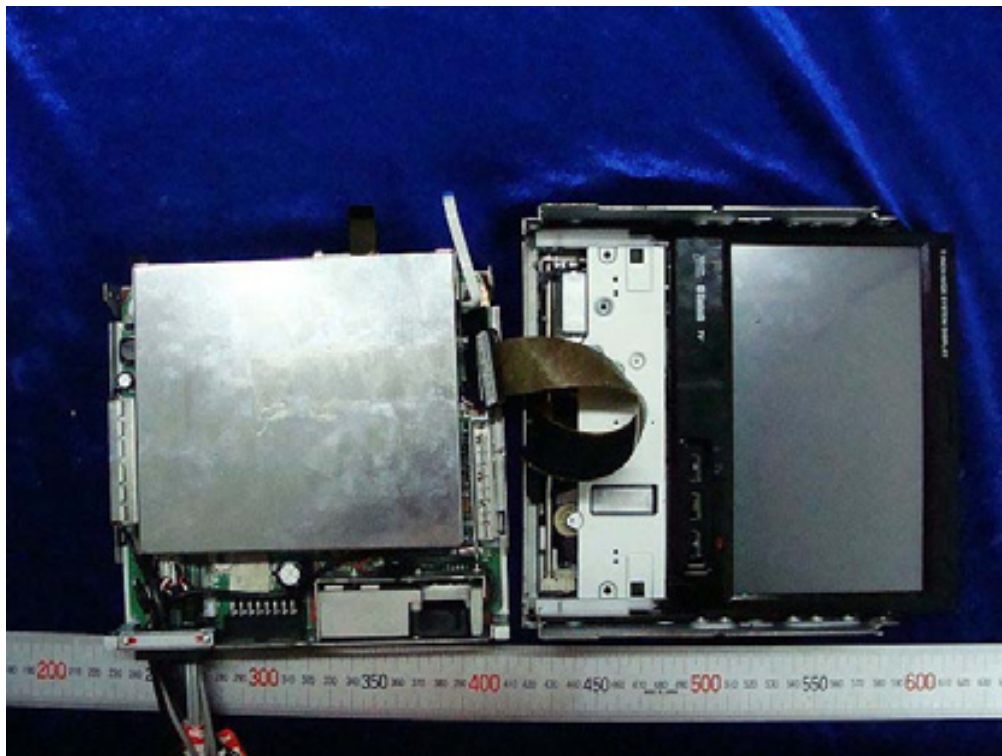
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16.4 Photo for the EUT

Inside View

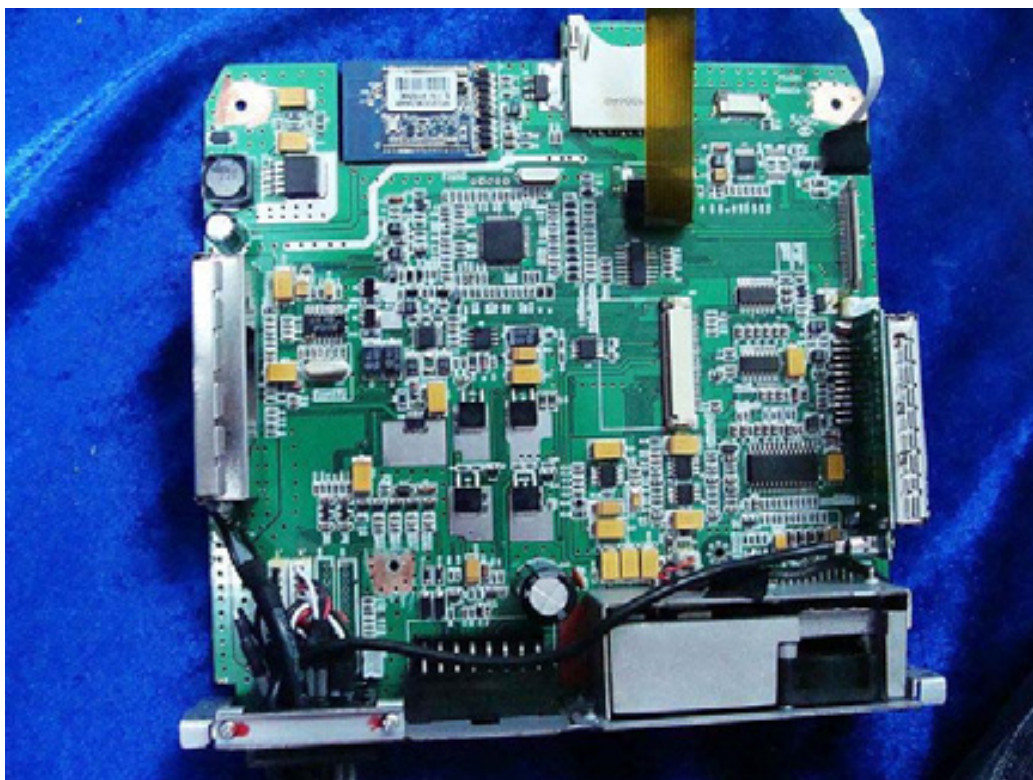


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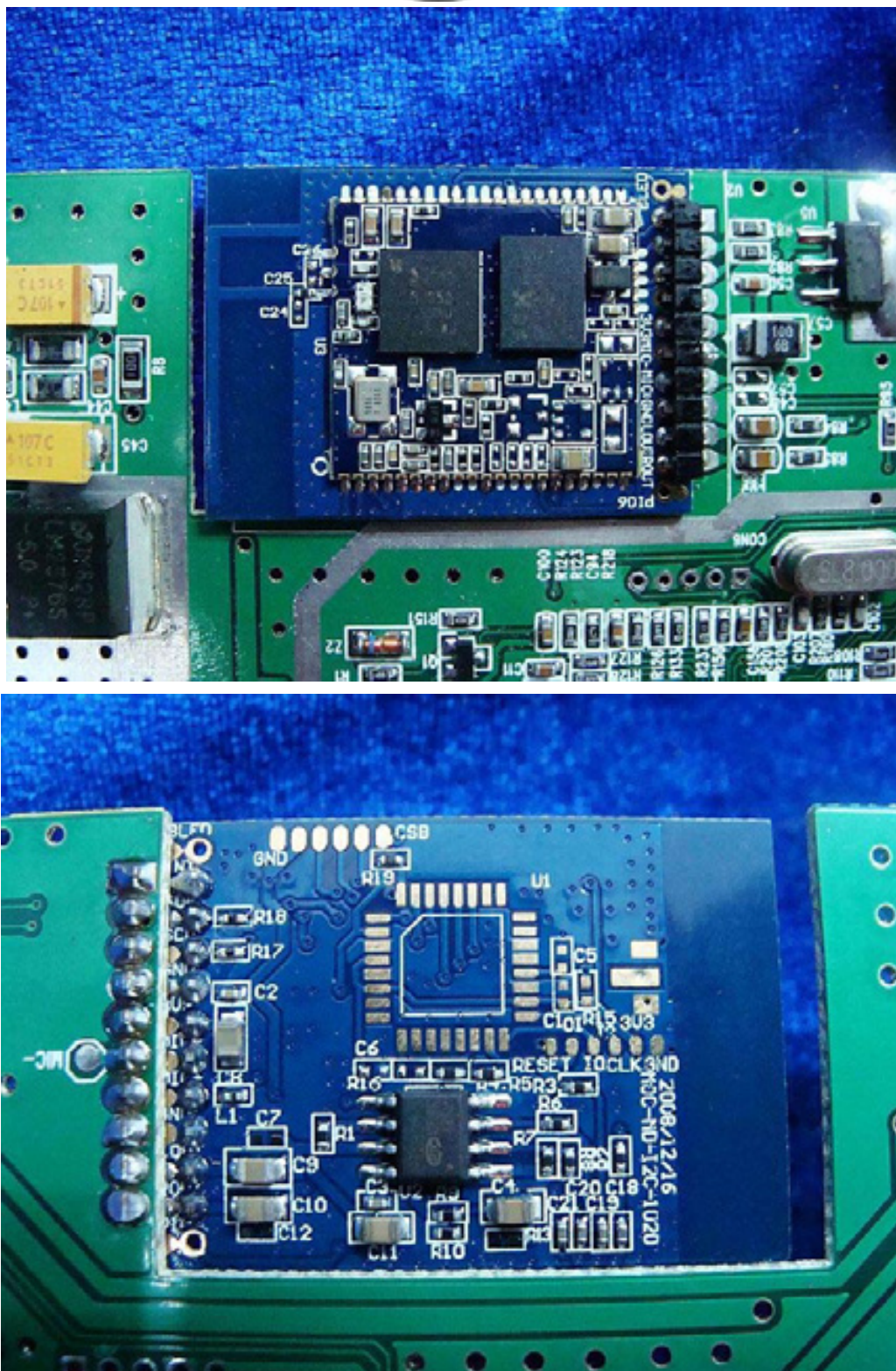




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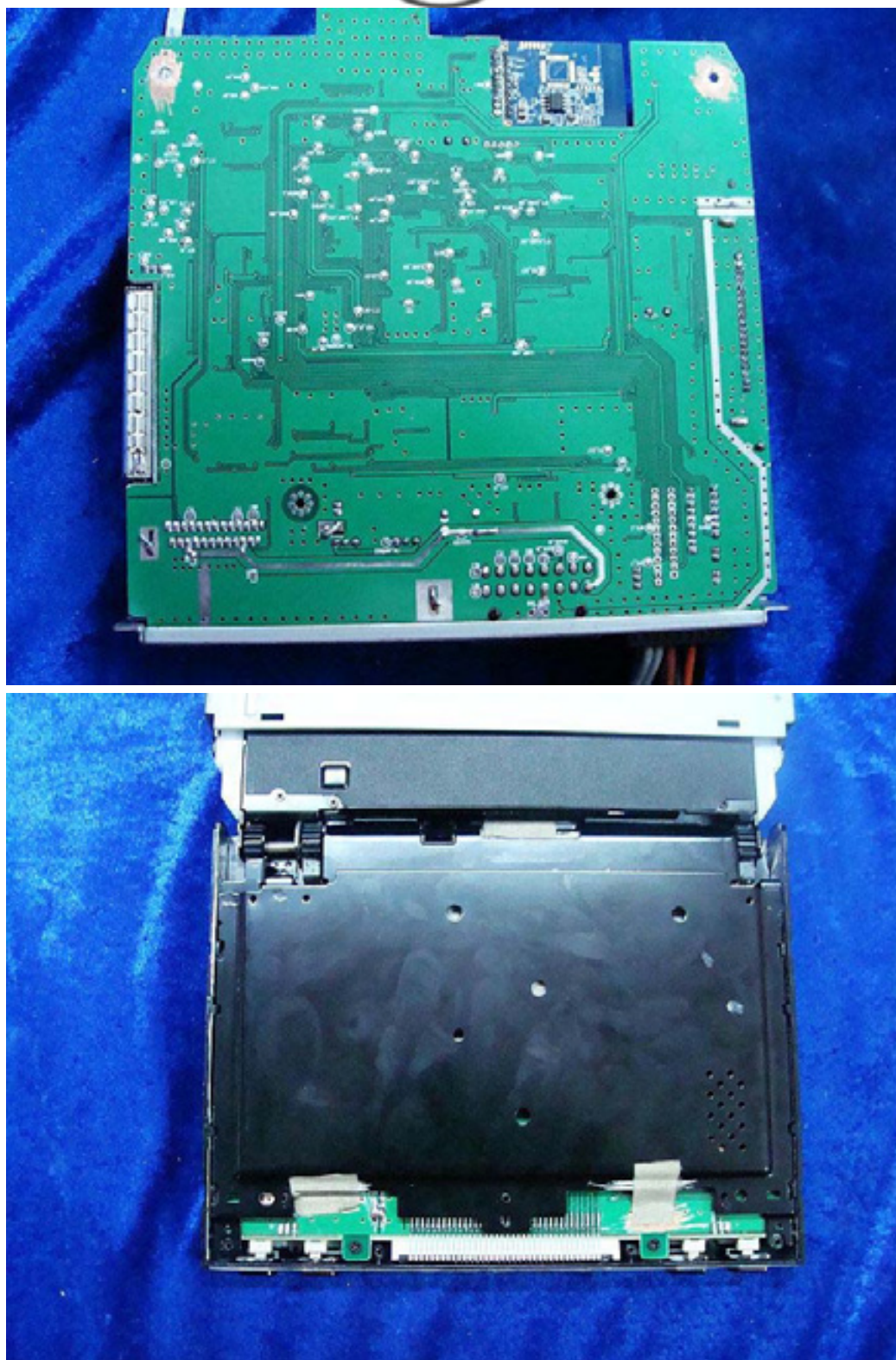
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Inside View



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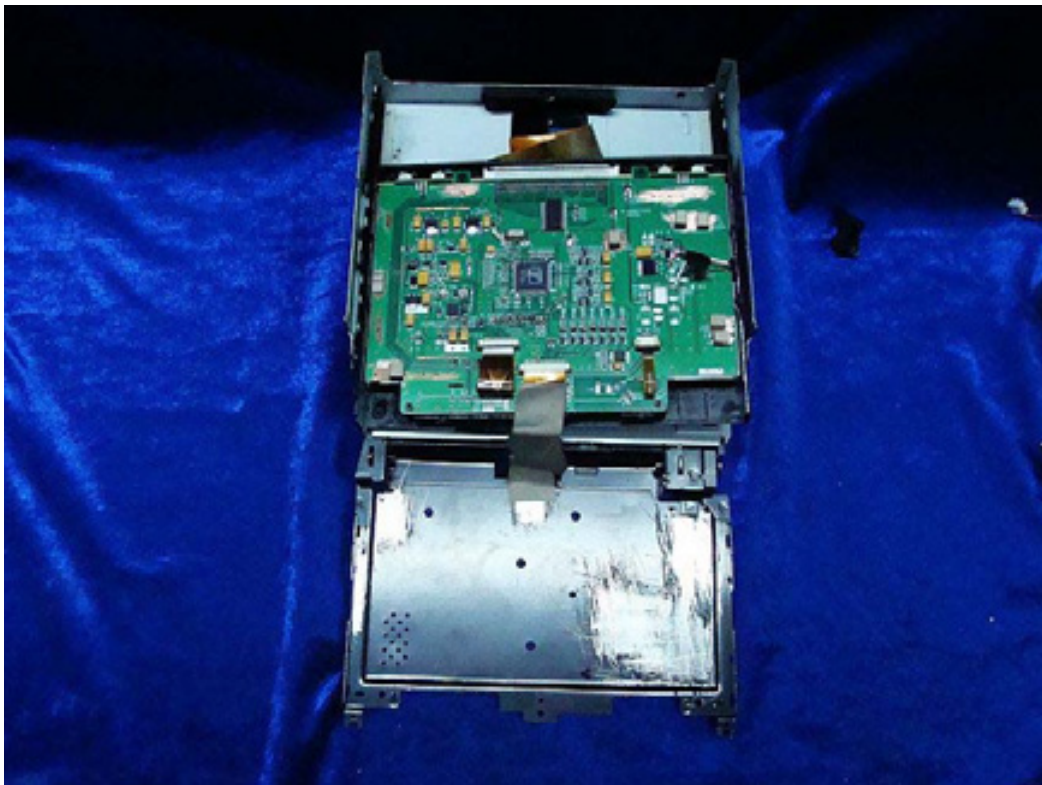
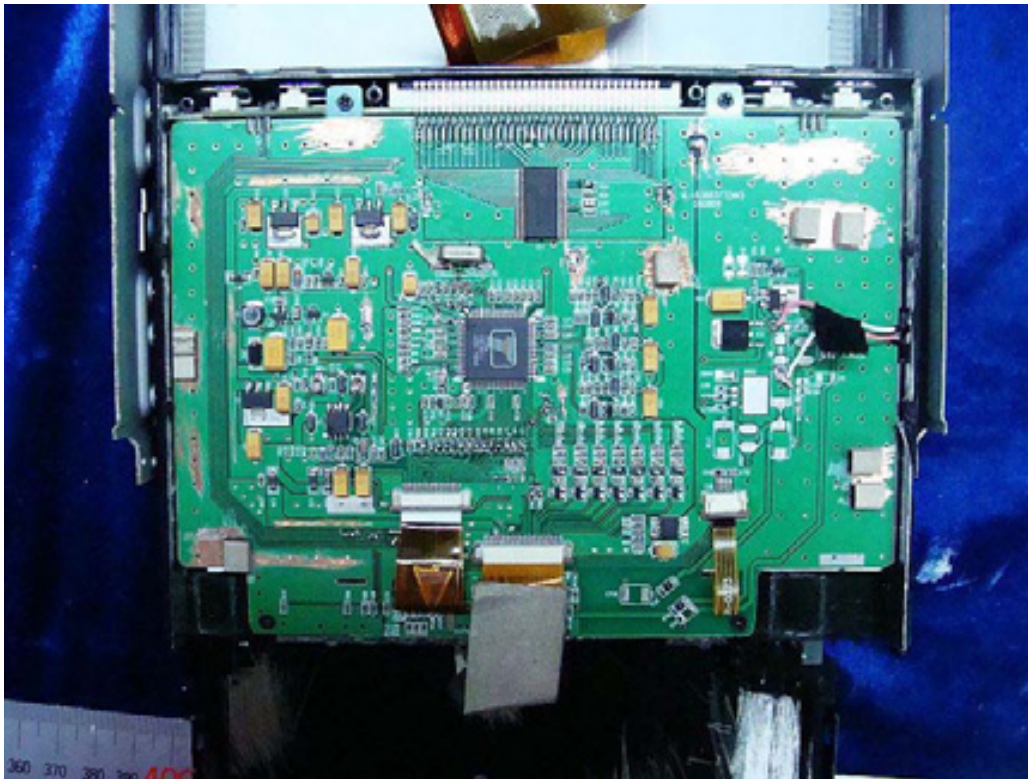
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Inside View

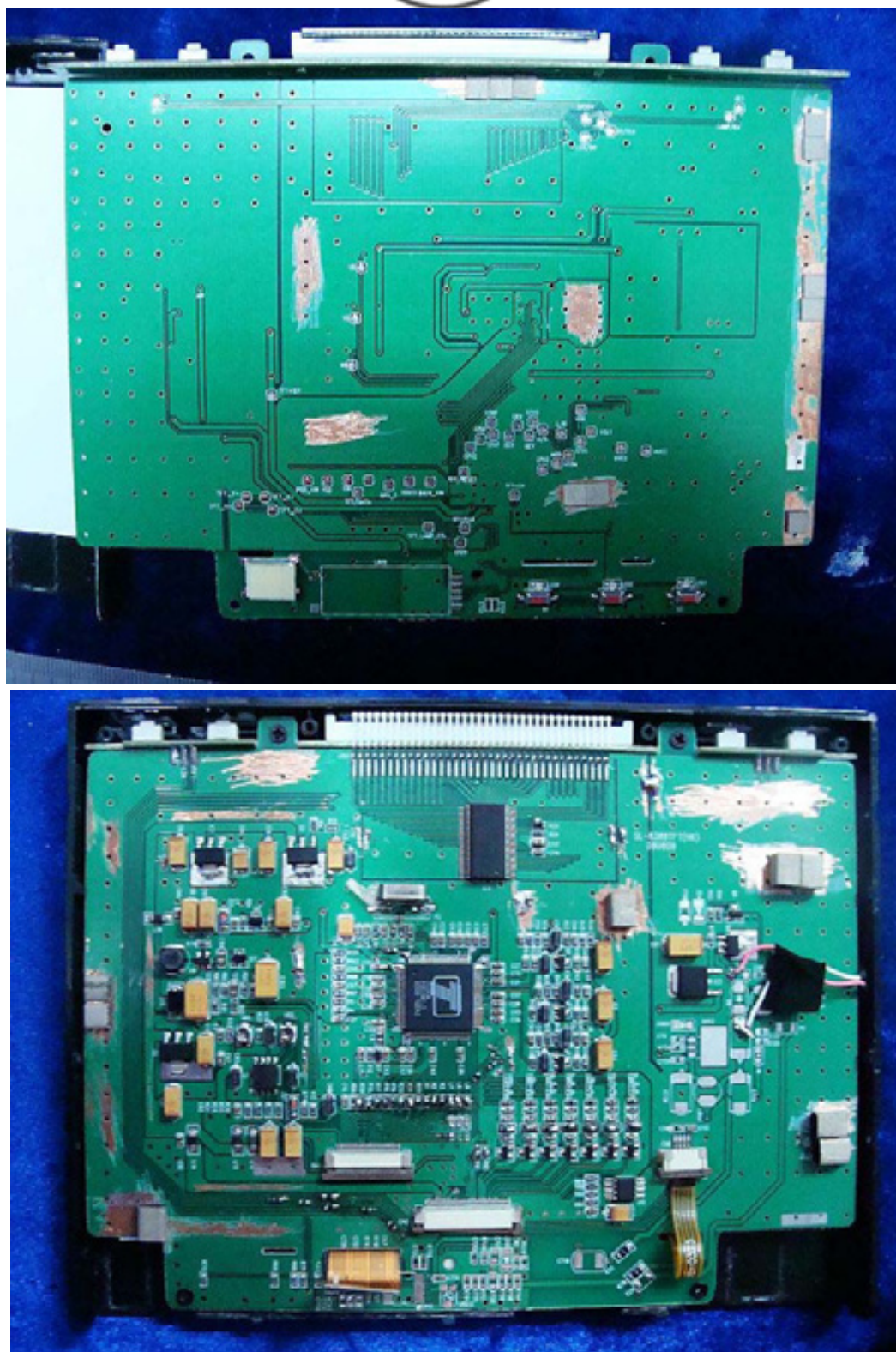


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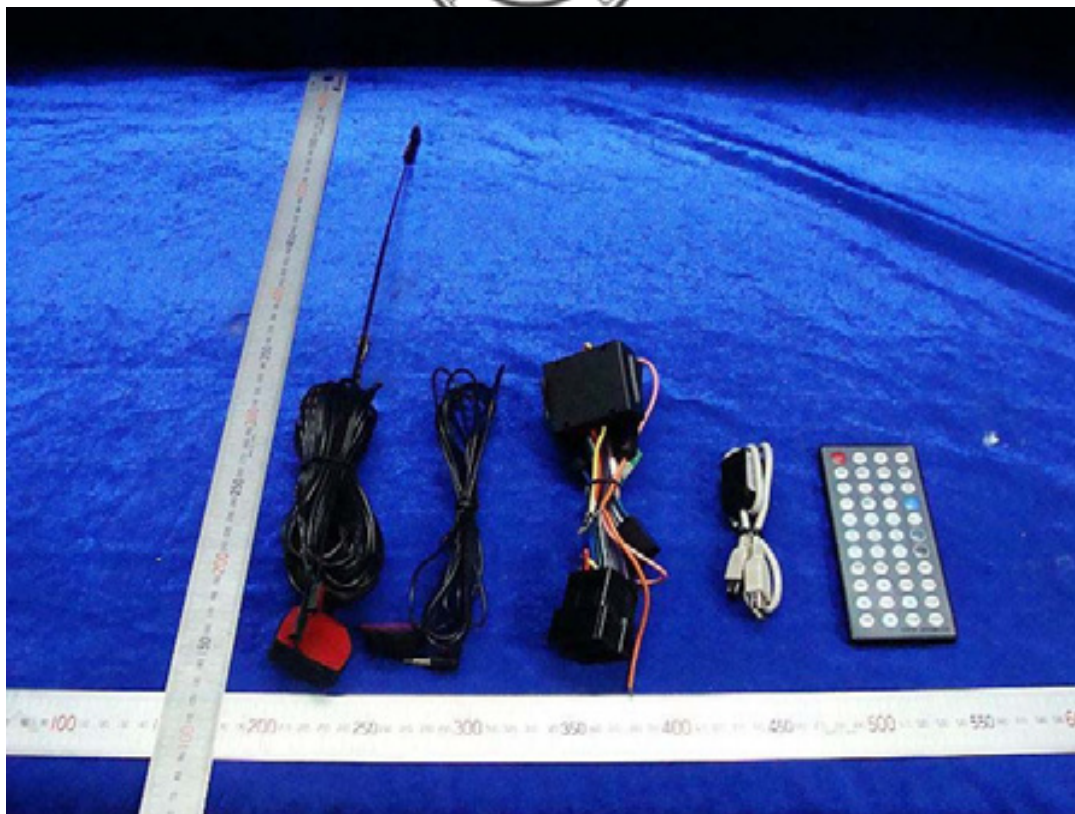




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**End of the report**

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