

FCC Test Report

Product Name : Private land mobile radio

Model No. : ST-2112D

FCC ID. : M38-ST-2112D

Applicant : RANGER COMMUNICATIONS (M) SDN, BHD.

Address : NO.8716, BATU BERENDAM FTZ III, 75350 BATU
BERENDAM, MELAKA, MALAYSIA

Date of Receipt : 2014/09/26

Issued Date : 2016/02/02

Report No. : 14A0013R-RFUSP22V00

Report Version : V1.0

The test results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of Corporation.

Test Report Certification

Issued Date : 2016/02/02

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Manufacturer : RANGER COMMUNICATIONS (M) SDN, BHD.

Model No. : ST-2112D

FCC ID. : M38-ST-2112D

EUT Voltage : DC 7.4V (Power by Battery)

Trade Name : SMAR TRUNK

Applicable Standard : ANSI/TIA 603-C: 2004, FCC CFR 47 Part 90,
ANSI C63.4: 2009

Test Result : Complied

The test results relate only to the samples tested.

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Documented By :

(Carol Tsai / Engineering Adm. Specialist)

Reviewed By :

(Bruno Tsai / Assistant Engineer)

Approved By :

(Roy Wang / Director)

Laboratory Information

We, **QuieTek Corporation**, are an independent RF consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted (audited or listed) by the following related bodies in compliance with ISO 17025 specified testing scopes:

Taiwan R.O.C.	: TAF, Accreditation Number: 3024
USA	: FCC, Registration Number: 365520
Canada	: IC, Submission No: 181665 / IC Registration Number: 4075C-4

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site:<http://www.quietek.com/chinese/about/certificates.aspx?bval=5>

The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site :

http://www.quietek.com/index_en.aspx

If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

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E-Mail : service@quietek.com

TABLE OF CONTENTS

Description	Page
1. General Information.....	6
1.1. EUT Description	6
1.2. Test Mode.....	7
1.3. Tested System Details.....	8
1.4. Configuration of tested System	8
1.5. EUT Exercise Software	9
1.6. Test Facility	10
2. RF Power Output	11
2.1. Test Equipment	11
2.2. Test Setup	11
2.3. Limits	11
2.4. Test Procedure	11
2.5. Uncertainty	11
2.6. Test Result	12
3. Modulation Characteristics.....	13
3.1. Test Equipment	13
3.2. Test Setup	13
3.3. Limits	14
3.4. Test Procedure	14
3.5. Test Result	15
3.6. Digital Modulation.....	19
4. Occupied Bandwidth	20
4.1. Test Equipment	20
4.2. Test Setup	20
4.3. Limits	21
4.4. Test Procedure	21
4.5. Uncertainty	21
4.6. Test Result	22
5. Spurious Emissions at Antenna Terminals (Conducted).....	31
5.1. Test Equipment	31
5.2. Test Setup	31
5.3. Limits	32
5.4. Test Procedure	32

5.5.	Uncertainty	32
5.6.	Test Result	33
6.	Field Strength of Spurious Emissions	45
6.1.	Test Equipment	45
6.2.	Test Setup	45
6.3.	Limits	46
6.4.	Test Procedure	46
6.5.	Uncertainty	46
6.6.	Test Result	47
6.7.	Test Photo	59
7.	Frequency Stability	61
7.1.	Test Equipment	61
7.2.	Test Setup	61
7.3.	Limits	62
7.4.	Test Procedure	62
7.5.	Uncertainty	62
7.6.	Test Result	63
8.	Transient Frequency Behavior	66
8.1.	Test Equipment	66
8.2.	Test Setup	66
8.3.	Limits	67
8.4.	Test Procedure	68
8.5.	Uncertainty	68
8.6.	Test Result	69
	Attachement	70
	EUT Photograph	70

1. General Information

1.1. EUT Description

Product Name	Private land mobile radio
Trade Name	SMAR TRUNK
Model No.	ST-2112D
Frequency Range	450~470MHz, 470~512MHz
Channel Spacing	12.5kHz, 6.25kHz
Type of Modulation	FM, FDMA, TDMA
Antenna Gain	3dBi
Antenna Type	Dipole Antenna

Component	
Charging Dock	SmarTrunk, CP-D01 I/P : DC 12V 1000mA O/P : DC 800mA
Power Adapter	Sitching, GS2U-012-1201000-L/GS2J-012-1201000-L I/P: 100-240V~50/60Hz 0.5A O/P: DC 12V <u>1000</u> mA Cable Out: Non-shielded, 1.5m

Note:

1. This device is a Private land mobile radio, which including 450-512MHz transmitting and receiving function.
2. Regards to the frequency band operation; the lowest 、middle and highest frequency of channel were selected to perform the test, and then shown on this report.
3. This device is a composite device in accordance with Part 15 regulations. The receiving function receiving was tested and its test report number is 14A0013R-RFUSP16V00 under verification.

1.2. Test Mode

has verified the construction and function in typical operation. The preliminary tests were performed in different data rate, and to find the worst condition, which was shown in this test report. The following table is the final test mode.

TX	Mode 1: Transmit
----	------------------

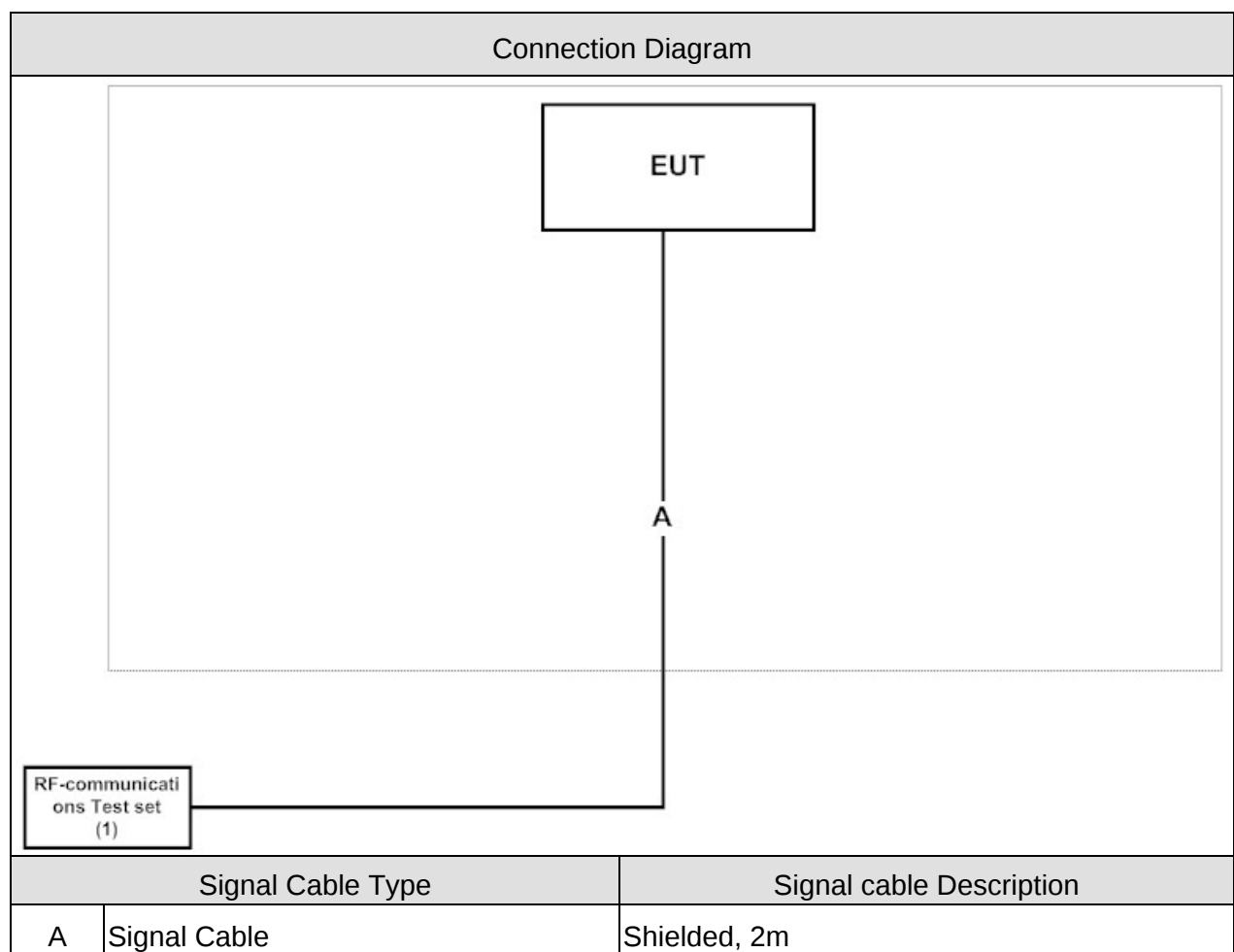
Test Items	Section	Frequency (MHz)	Mode	Result
RF Power Output	90.205	450.1/481.1/511.9	1	Complies
Modulation Characteristics	90.242(b)	450.1/481.1/511.9	1	Complies
Modulation Limiting	90.210	450.1/481.1/511.9	1	Complies
Occupied Bandwidth	90.209 & 90.210	450.1/481.1/511.9	1	Complies
Spurious Emissions at Antenna Terminals (Conducted)	90.210	450.1/481.1/511.9	1	Complies
Field Strength of Spurious Emissions	90.210	450.1/481.1/511.9	1	Complies
Frequency Stability	90.213	450.1/481.1/511.9	1	Complies
Transient Frequency Behavior	90.214	450.1/481.1/511.9	1	Complies

1.3. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	FCC ID	Power Cord
1 RF-communications Test set	HP	8920A	3614A08091	DoC	Non-Shielded, 1m

1.4. Configuration of tested System



1.5. EUT Exercise Software

1	Setup the EUT as shown in Section 1.4.
2	Use the Audio Generator input modulation tone
3	Configure the test channel
4	Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Required (IEC 68-1)	Actual
Temperature (°C)	RF Power Output	15 - 35	25
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	Modulation Characteristics	15 - 35	25
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	Occupied Bandwidth	15 - 35	25
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	Spurious Emissions at Antenna Terminals (Conducted)	15 - 35	25
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	Field Strength of Spurious Emissions	15 - 35	25
Humidity (%RH)		25 - 75	65
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	Frequency Stability	15 - 35	25
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	Transient Frequency Behavior	15 - 35	25
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000

2. RF Power Output

2.1. Test Equipment

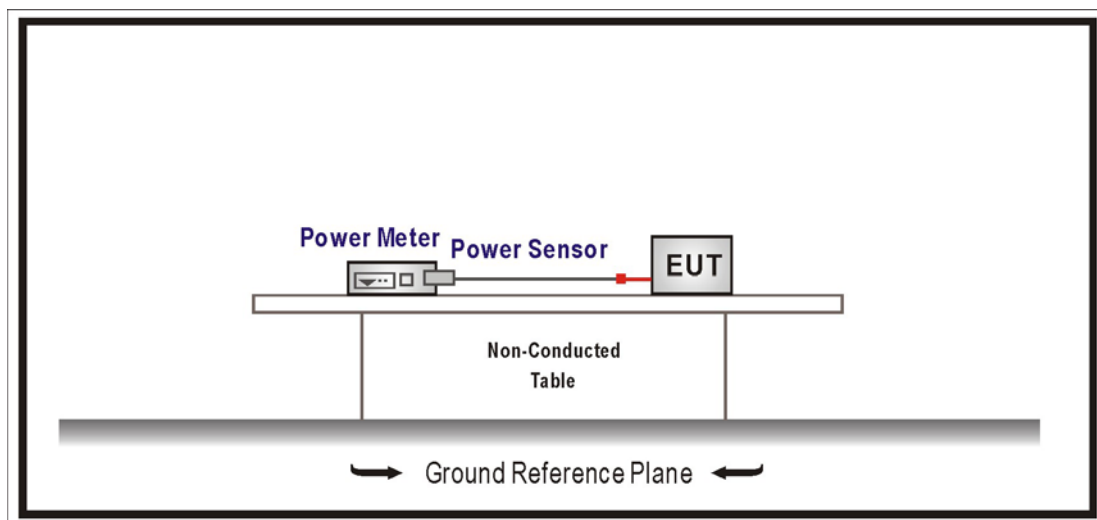
The following test equipments are used during the test:

RF Power Output / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Power Meter	Agilent	N1911A	MY45101353	2016/10/11
Power Sensor	Agilent	N1921A	MY45241670	2016/10/11

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

2.2. Test Setup



2.3. Limits

Please refer to FCC 47 CFR 90.205 for specification details.

2.4. Test Procedure

The RF power output was measured at the antenna feed point using a peak power meter. A 50-ohm, resistive wattmeter was connected to the RF output connector.

2.5. Uncertainty

The measurement uncertainty is defined as ± 1.27 dB.

2.6. Test Result

Product	Private land mobile radio			
Test Item	RF Power Output			
Test Mode	Mode 1: Transmit			
Date of Test	2016/02/02	Test Site	SR7	

12.5KHz

Channel No.	Frequency (MHz)	Measure Level (dBm)	Measure Level (W)	Limit (dBm)
Low	450.1	36.030	4.009	Reference 90.205
Mid	481.1	36.060	4.036	Reference 90.205
High	511.9	36.050	4.027	Reference 90.205

6.25KHz

Channel No.	Frequency (MHz)	Measure Level (dBm)	Measure Level (W)	Limit
Low	450.1	36.050	1.021	Reference 90.205
Mid	481.1	29.930	0.985	Reference 90.205
High	511.9	30.120	1.029	Reference 90.205

3. Modulation Characteristics

3.1. Test Equipment

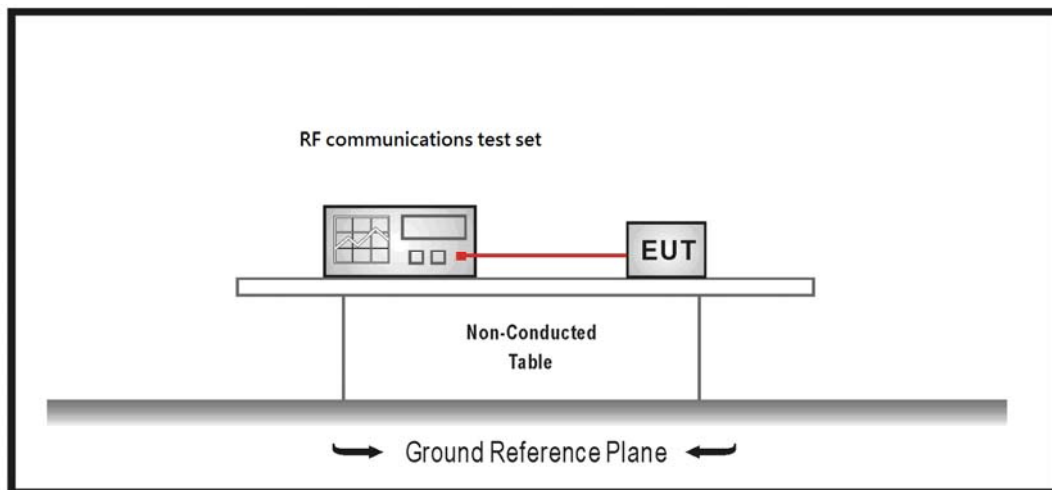
The following test equipments are used during the radiated emission tests:

Modulation Characteristics / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
RF-communications Test set	HP	8920A	3614A08091	2015/04/27
Receiver	Agilent	N9038A	MY53220121	2015/07/26

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

3.2. Test Setup



3.3. Limits

§ 90.242(b): Recommended audio filter attenuation characteristics are given below:

Audio band	Minimum Attenuation Rel. to 1 kHz Attenuation
3 – 20 KHz 20 – 30 KHz	$60 \log_{10}(f/3)$ dB where f is in kHz 50dB

Note: Audit Freq Response and Modulation limiting tests were performed only for 12.5 & 25 kHz channel spacing.

These tests were not performed for 6.25 kHz ch spacing as there is no FM voice capability for this device.

3.4. Test Procedure

Audio frequency response

The audio frequency response was measured in accordance with ANSI/TIA 603-C: 2004.

Audio Low Pass Filter

The audio low pass filter for voice-modulated equipment was measured in accordance with ANSI/TIA 603-C: 2004.

Audio Input versus modulation

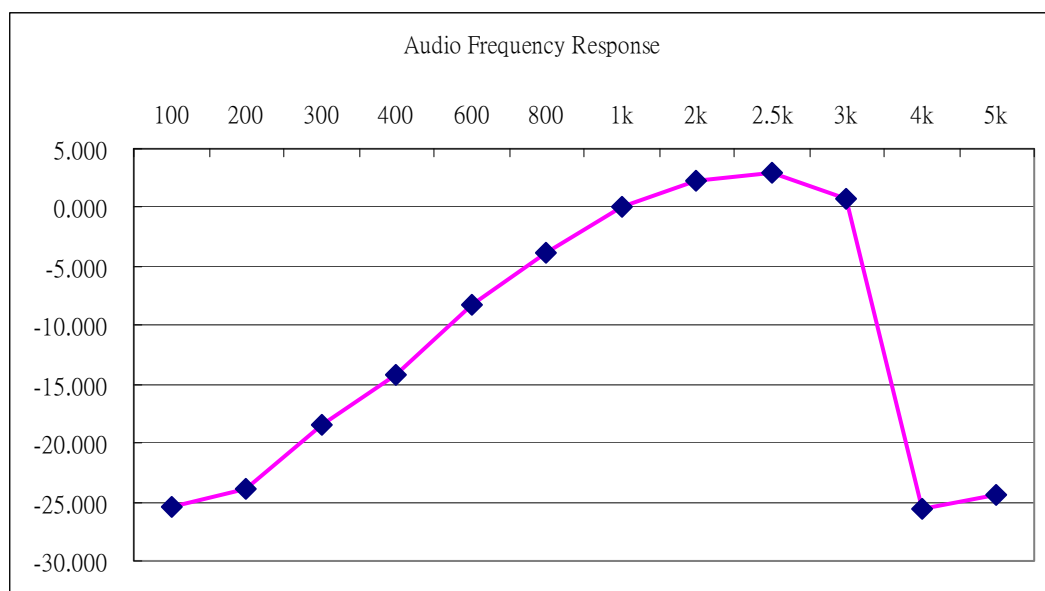
The audio input level needed for a particular percentage of modulation was measured in accordance with ANSI/TIA 603-C: 2004.

3.5. Test Result

Product	Private land mobile radio		
Test Item	Audio Frequency Response		
Test Mode	Mode 1: Transmit		
Date of Test	2015/01/04	Test Site	SR7

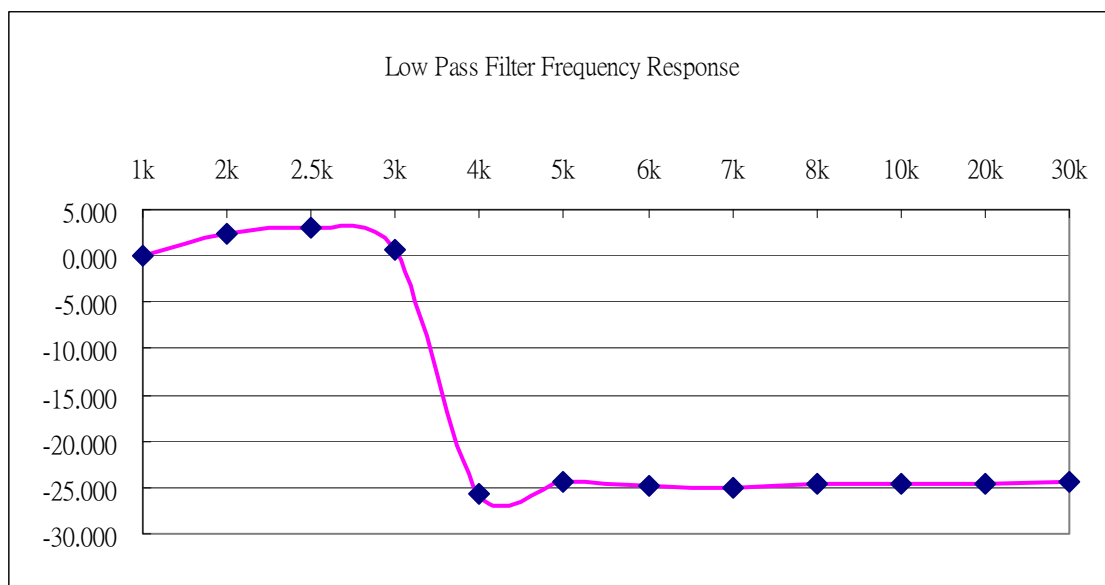
12.5KHz

Audio Frequency (Hz)	Deviation	dB
100	0.091	-25.459
200	0.110	-23.812
300	0.204	-18.447
400	0.333	-14.191
600	0.657	-8.288
800	1.102	-3.796
1k	1.706	0.000
2k	2.227	2.315
2.5k	2.407	2.990
3k	1.855	0.727
4k	0.089	-25.652
5k	0.103	-24.383



Product	Private land mobile radio		
Test Item	Low Pass Filter Frequency Response		
Test Mode	Mode 1: Transmit		
Date of Test	2015/01/04	Test Site	SR7

Audio Frequency (Hz)	Deviation	dB
1k	1.706	0.000
2k	2.227	2.315
2.5k	2.407	2.990
3k	1.855	0.727
4k	0.089	-25.652
5k	0.103	-24.383
6k	0.097	-24.904
7k	0.096	-24.994
8k	0.100	-24.640
10k	0.101	-24.553
20k	0.101	-24.553
30k	0.103	-24.383



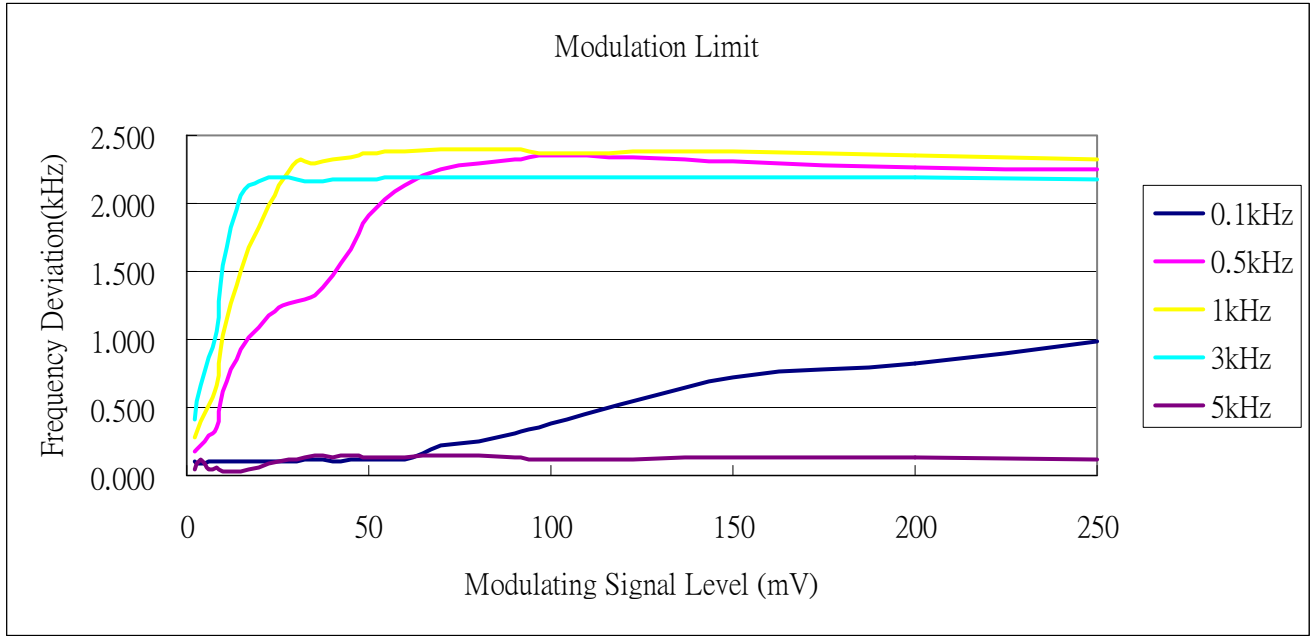
Product	Private land mobile radio		
Test Item	Voice Modulation Limiting for 12.5KHz Channel Spacing		
Test Mode	Mode 1: Transmit		
Date of Test	2015/01/04	Test Site	SR7

12.5KHz

Modulating Signal Level	Peak Frequency Deviation (kHz) at the following modulating frequency:					Maximum Limit
	0.1kHz	0.5kHz	1kHz	3kHz	5kHz	
mV						kHz
2	0.095	0.180	0.273	0.436	0.089	2.5
4	0.101	0.230	0.399	0.646	0.124	2.5
6	0.102	0.285	0.529	0.880	0.145	2.5
8	0.098	0.352	0.659	1.057	0.089	2.5
10	0.098	0.622	1.024	1.542	0.079	2.5
15	0.098	0.921	1.485	2.038	0.123	2.5
20	0.106	1.083	1.832	2.166	0.038	2.5
25	0.104	1.242	2.127	2.185	0.143	2.5
30	0.105	1.277	2.303	2.173	0.144	2.5
35	0.104	1.320	2.316	2.172	0.146	2.5
40	0.110	1.478	2.319	2.184	0.124	2.5
45	0.112	1.661	2.352	2.190	0.117	2.5
50	0.111	1.919	2.358	2.180	0.109	2.5
60	0.109	2.124	2.382	2.193	0.128	2.5
70	0.218	2.244	2.390	2.170	0.129	2.5
80	0.252	2.295	2.397	2.199	0.150	2.5
90	0.305	2.320	2.402	2.182	0.121	2.5
100	0.381	2.353	2.379	2.191	0.140	2.5
150	0.719	2.314	2.383	2.204	0.156	2.5
200	0.820	2.266	2.353	2.201	0.136	2.5
250	0.982	2.254	2.316	2.174	0.149	2.5

Product	Private land mobile radio		
Test Item	Voice Modulation Limiting for 12.5KHz Channel Spacing		
Test Mode	Mode 1: Transmit		
Date of Test	2015/01/04	Test Site	SR7

12.5KHz



Product	Private land mobile radio		
Test Item	Voice Modulation Limiting for 12.5KHz Channel Spacing		
Test Mode	Mode 1: Transmit		
Date of Test	2015/01/04	Test Site	SR7

12.5KHz

Modulation Frequency (kHz)	Peak Deviation (kHz)	Maximum Limit (kHz)
100	0.091	2.5
200	0.11	2.5
300	0.204	2.5
400	0.333	2.5
600	0.657	2.5
800	1.102	2.5
1k	1.706	2.5
2k	2.227	2.5
2.5k	2.407	2.5
3k	1.855	2.5
4k	0.089	2.5
5k	0.103	2.5
6k	0.097	2.5
7k	0.096	2.5
8k	0.1	2.5
10k	0.101	2.5
20k	0.101	2.5
30k	0.103	2.5

3.6. Digital Modulation

Max Deviation measured for 6.25KHz Channel Spacing F1E&F1D = 837Hz

4. Occupied Bandwidth

4.1. Test Equipment

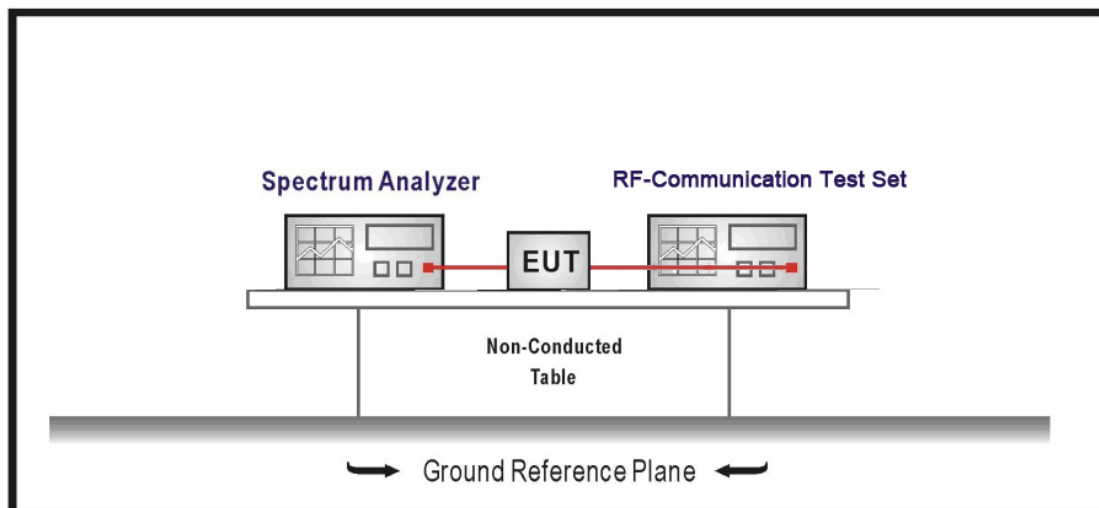
The following test equipments are used during the radiated emission tests:

Occupied Bandwidth / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	R&S	FSV 40	101049	2015/07/14
RF-communications Test set	HP	8920A	3614A08091	2015/04/27
Receiver	Agilent	N9038A	MY53220121	2015/07/26

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

4.2. Test Setup



4.3. Limits

Emissions shall be attenuated below the mean output power of the transmitter as follows:

Frequency Range (MHz)	Maximum Authorized BW (KHz)	Channel Spacing (KHz)	Recommended Frequency Deviation (KHz)	FCC Applicable Mask
156-174, 421-512	11.25	12.5	2.5	Mask D – Voice & Data
150-174, 421-512	6	6.25	1.25	Mask E – Voice & Data

4.4. Test Procedure

The test procedure used was ANSI/TIA 603-C: 2004.

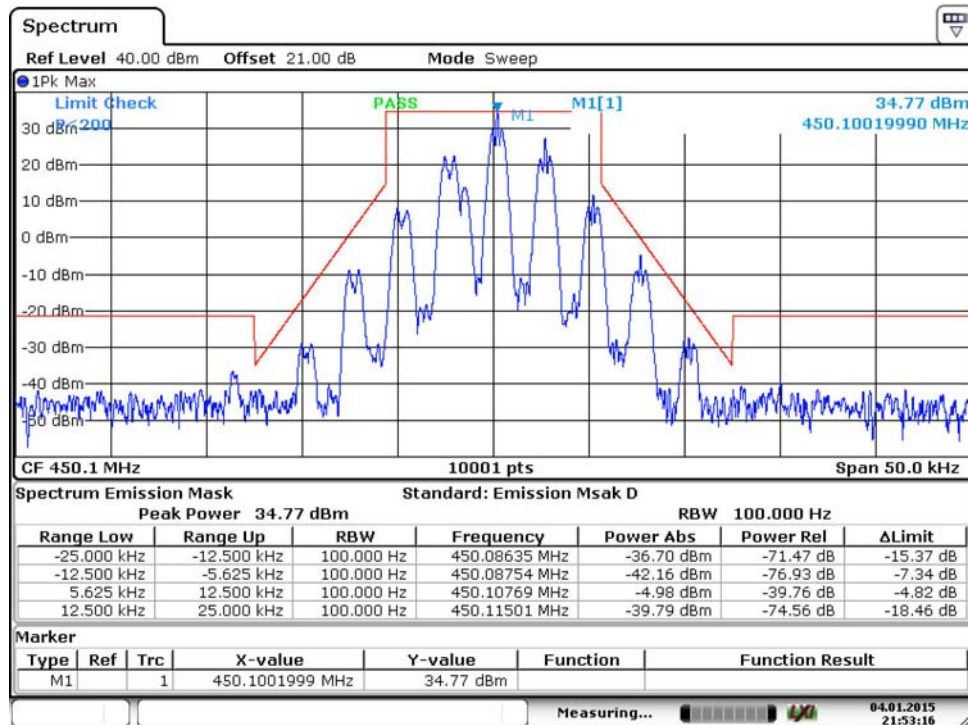
4.5. Uncertainty

The measurement uncertainty is defined as ± 150 Hz

4.6. Test Result

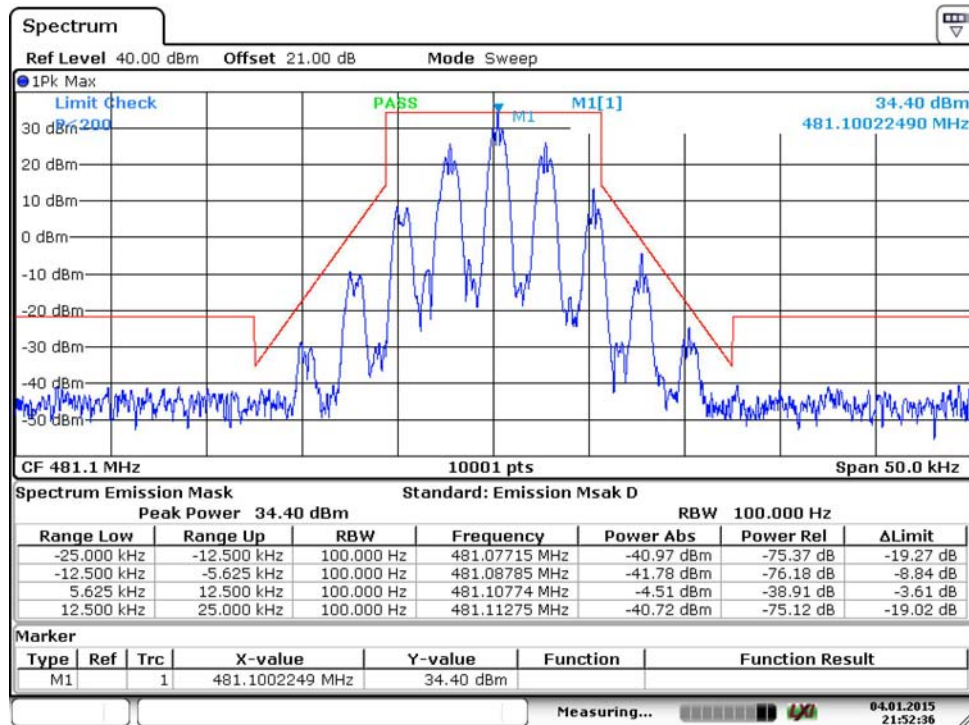
Product	Private land mobile radio		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2015/01/04	Test Site	SR7

450.1MHz (Modulation)



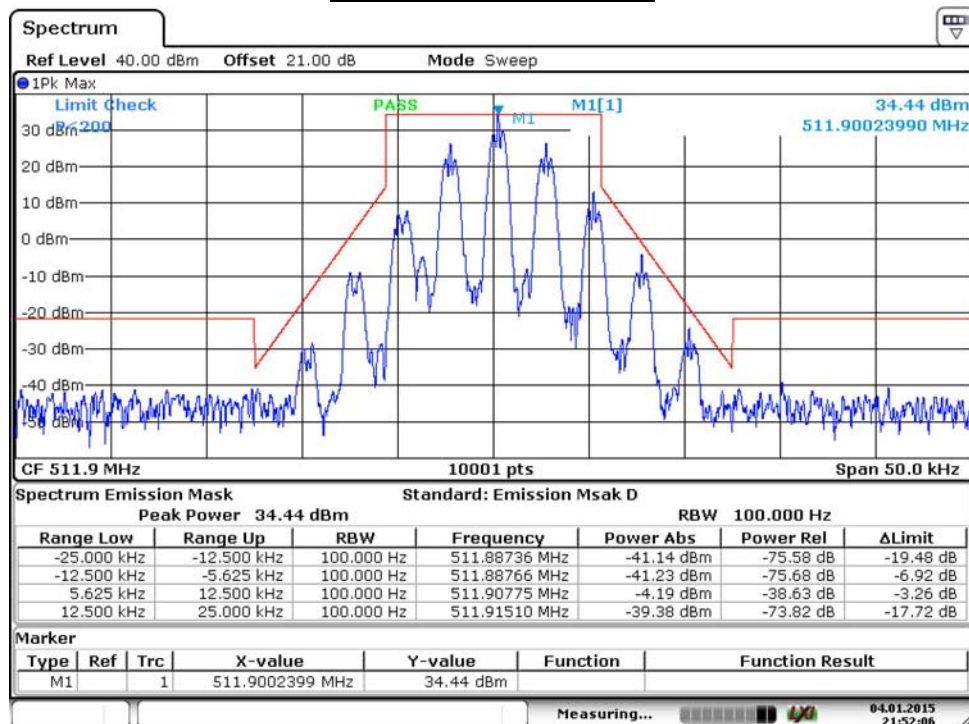
Date: 4.JAN.2015 21:53:16

481.1 MHz (Modulation)



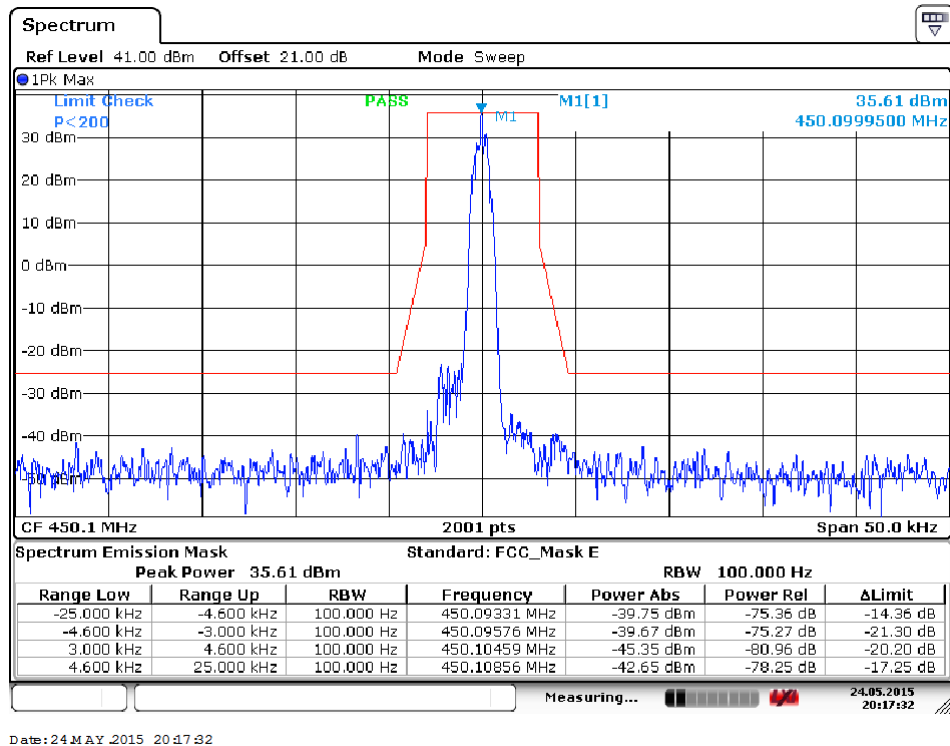
Date: 4.JAN.2015 21:52:37

511.9 MHz (Modulation)

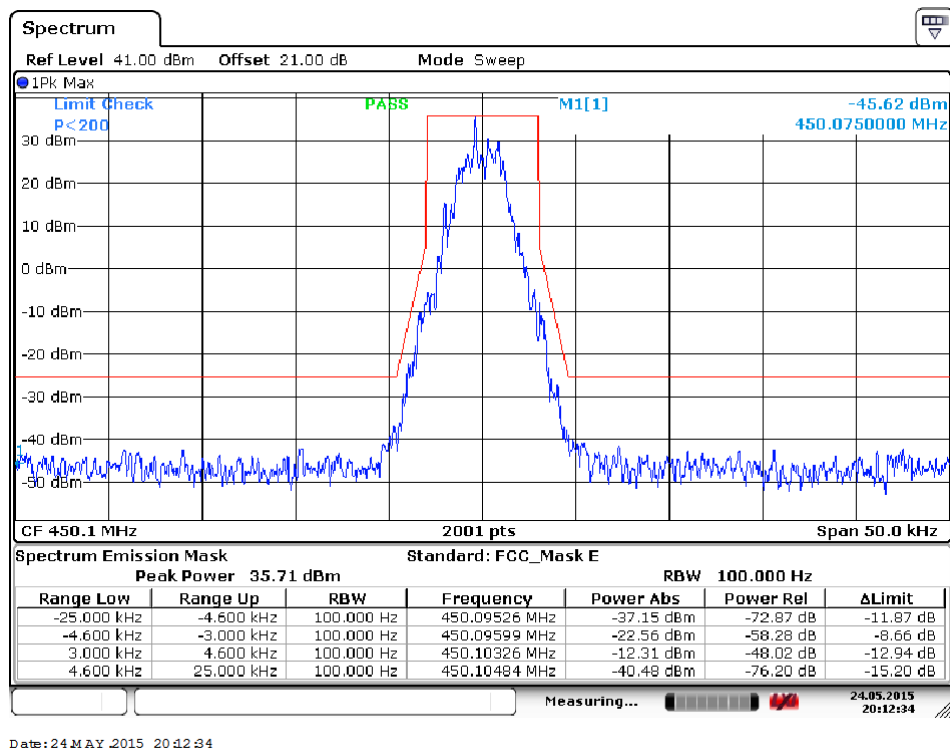


Date: 4.JAN.2015 21:52:06

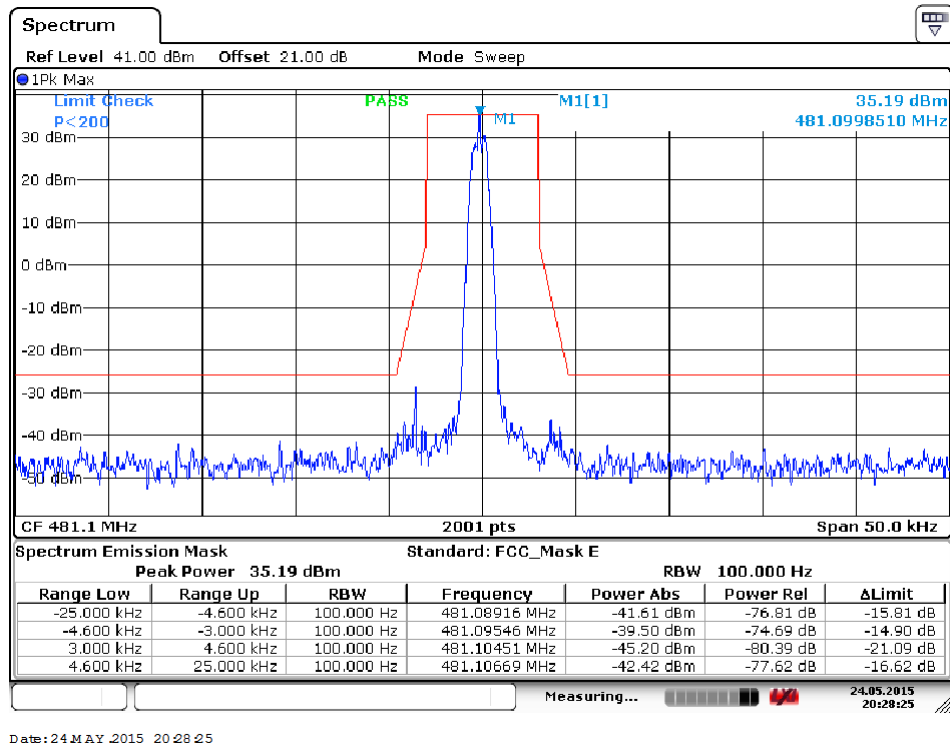
450.1 MHz (Carr Mask)



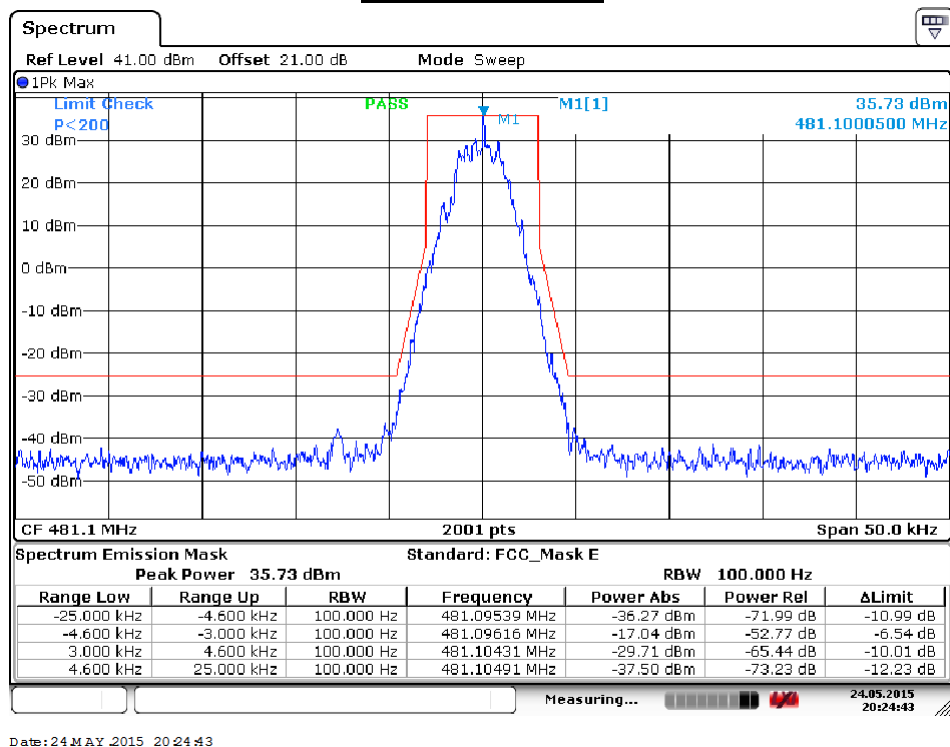
450.1 MHz (Mask)



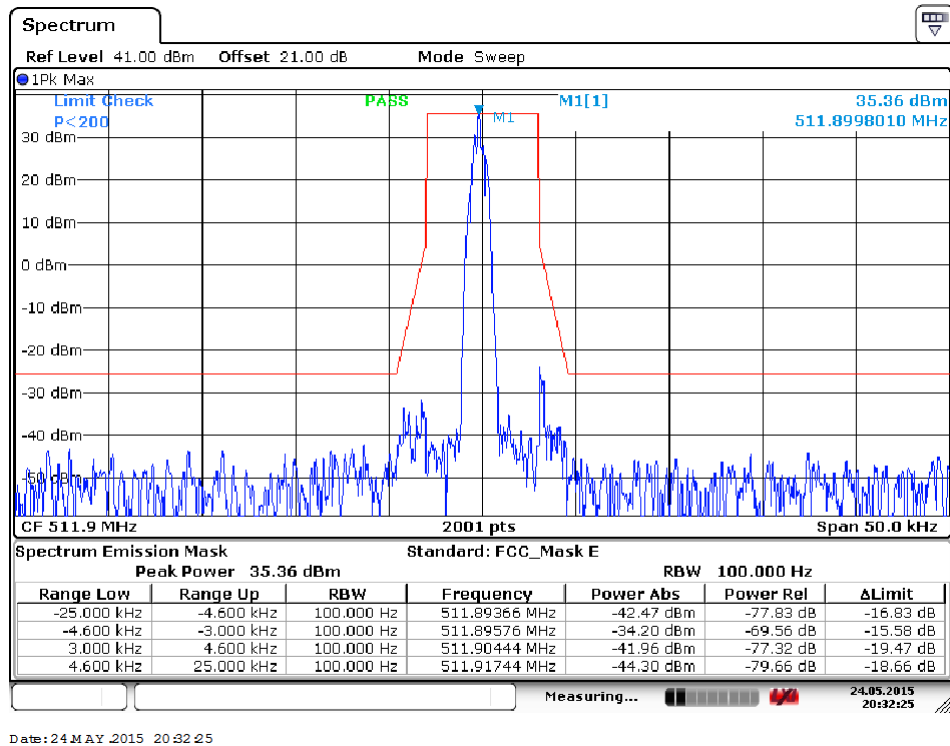
481.1 MHz (Carr Mask)



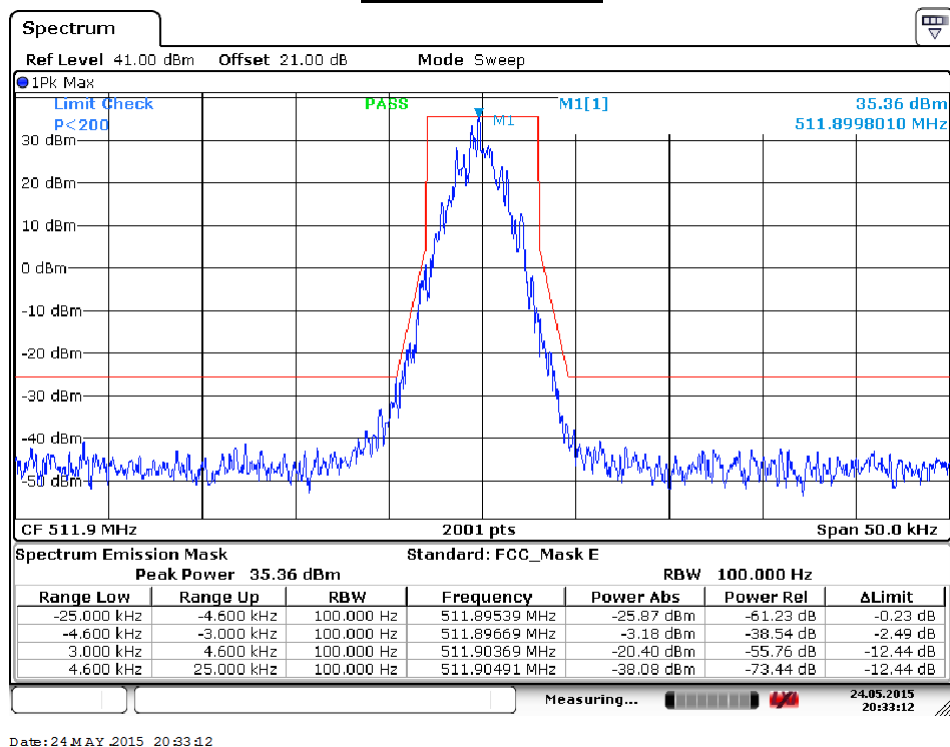
481.1 MHz (Mask)



511.9 MHz (Carr Mask)



511.9 MHz (Mask)

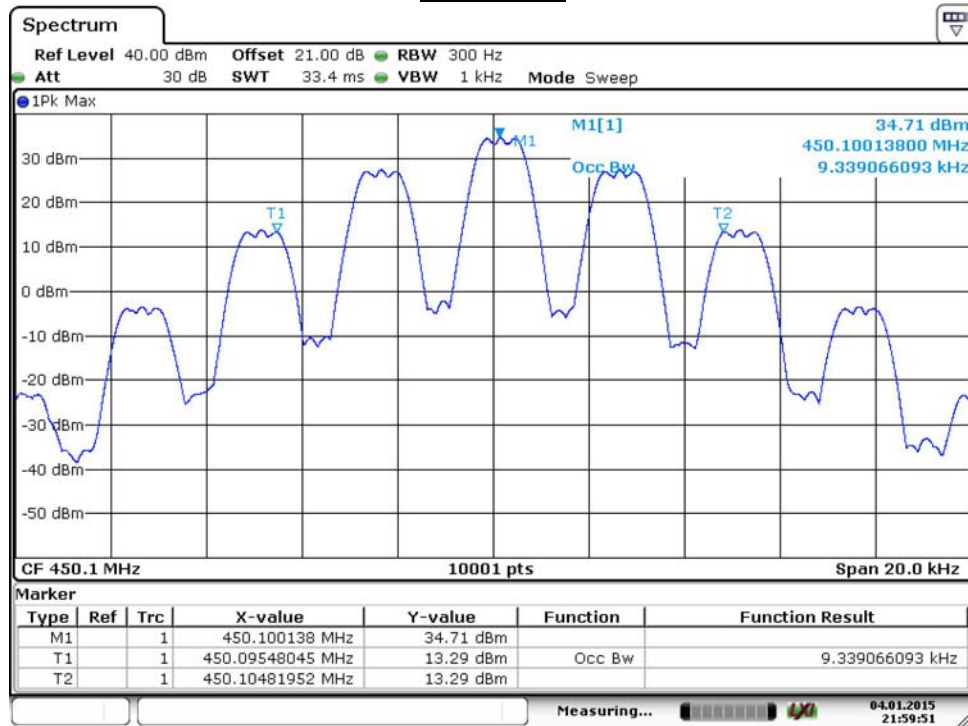


Product	Private land mobile radio		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2015/01/04	Test Site	SR7

Analog

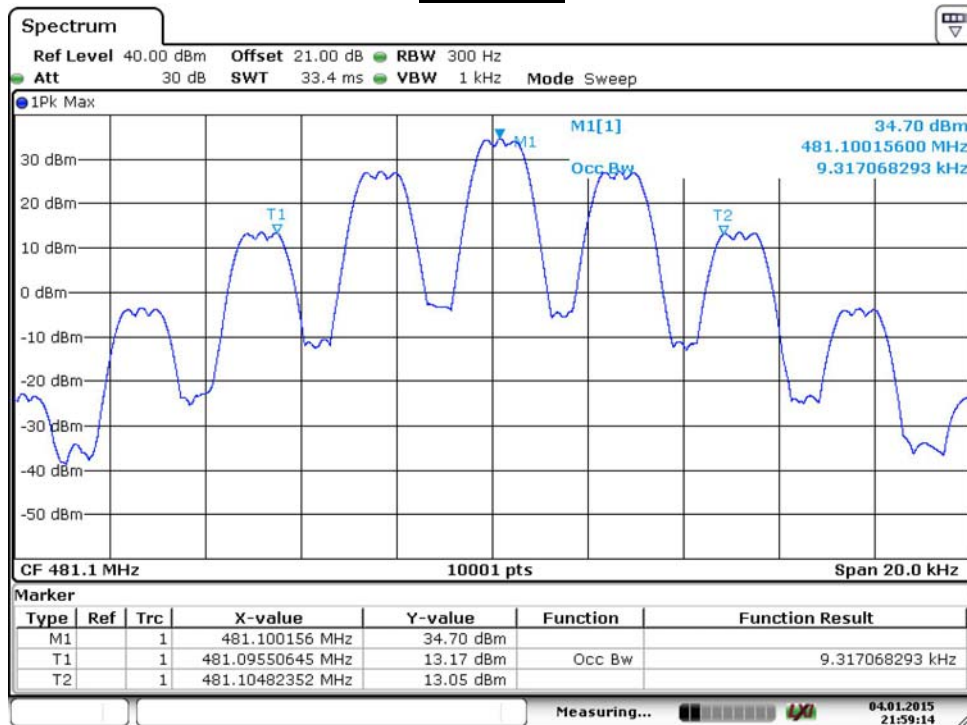
Channel	Frequency (MHz)	Measure Level(kHz)	Limit (kHz)	Result
Low	450.1	9.339	--	Pass
Mid	481.1	9.317	--	Pass
High	511.9	9.289	--	Pass

450.1MHz



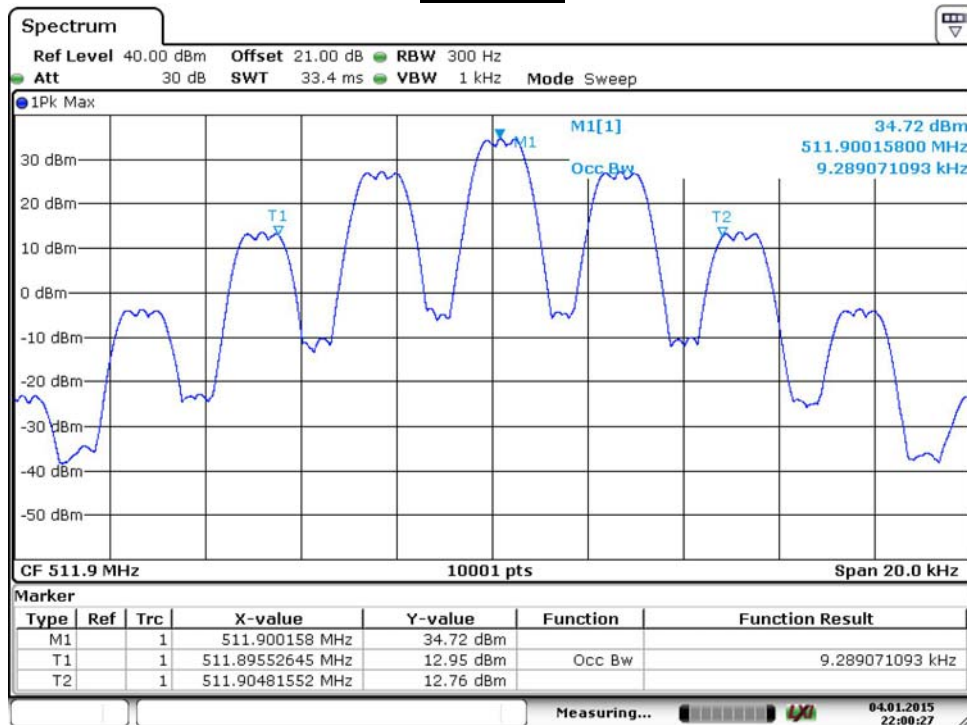
Date: 4.JAN.2015 21:59:51

481.1MHz



Date: 4.JAN.2015 21:59:13

511.9MHz



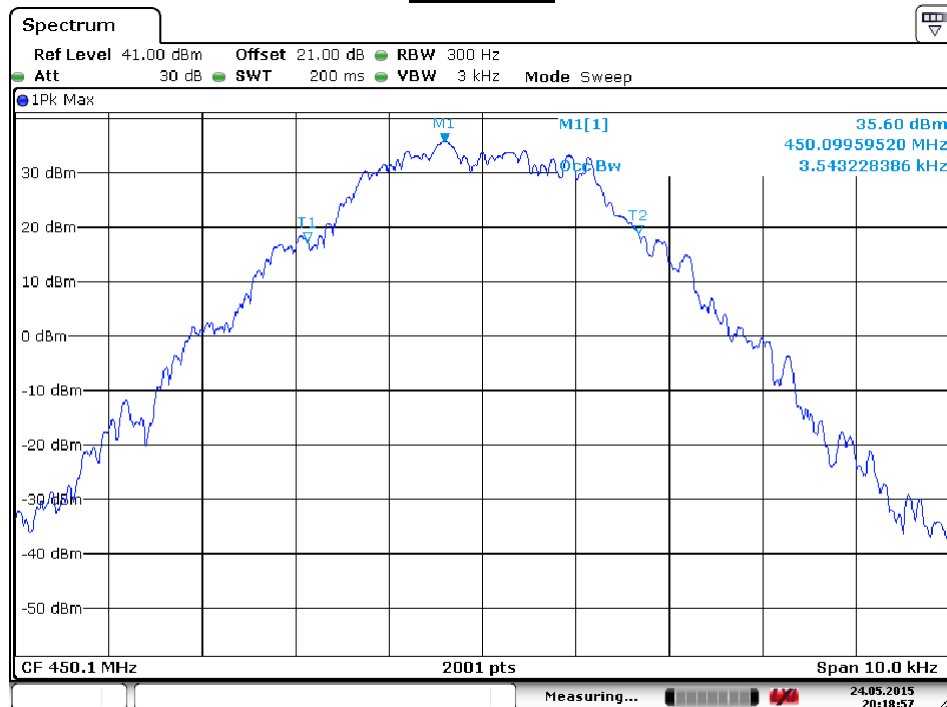
Date: 4.JAN.2015 22:00:27

Product	Private land mobile radio		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2015/05/24	Test Site	SR7

Analog

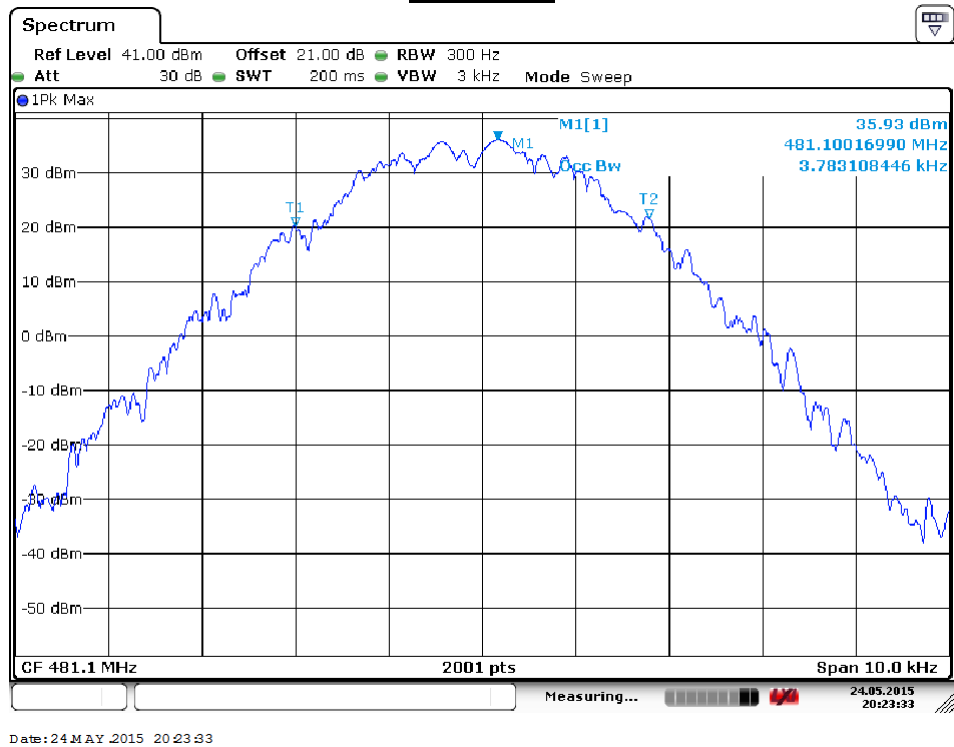
Channel	Frequency (MHz)	Measure Level(kHz)	Limit (kHz)	Result
Low	450.1	3.543	--	Pass
Mid	481.1	3.783	--	Pass
High	511.9	3.793	--	Pass

450.1MHz

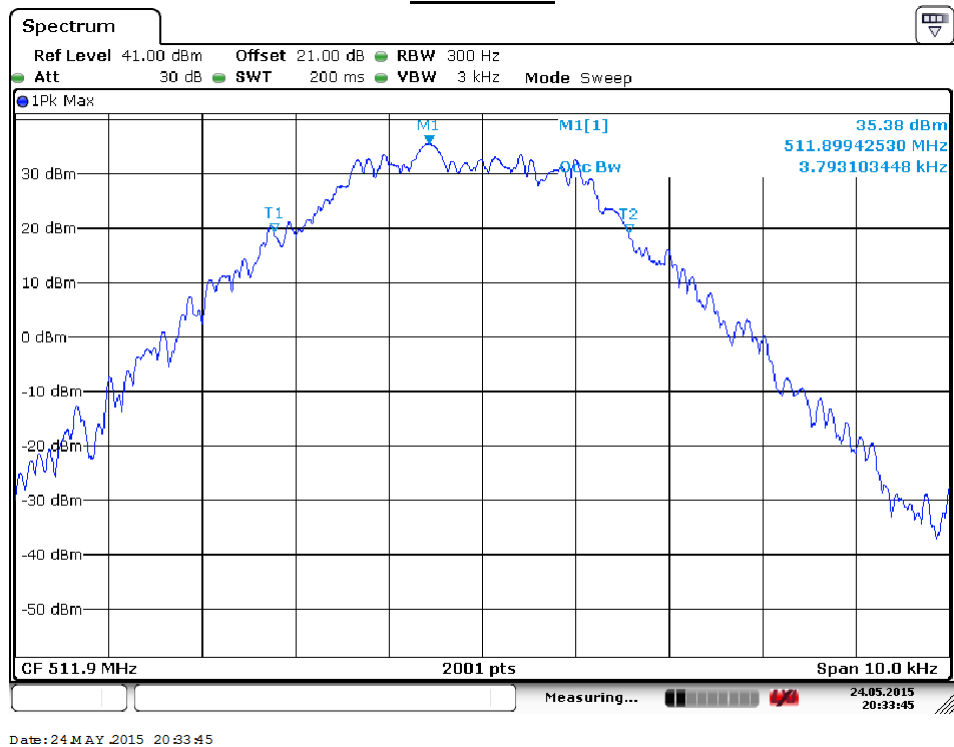


Date: 24 MAY 2015 20:18:57

481.1MHz



511.9MHz



5. Spurious Emissions at Antenna Terminals (Conducted)

5.1. Test Equipment

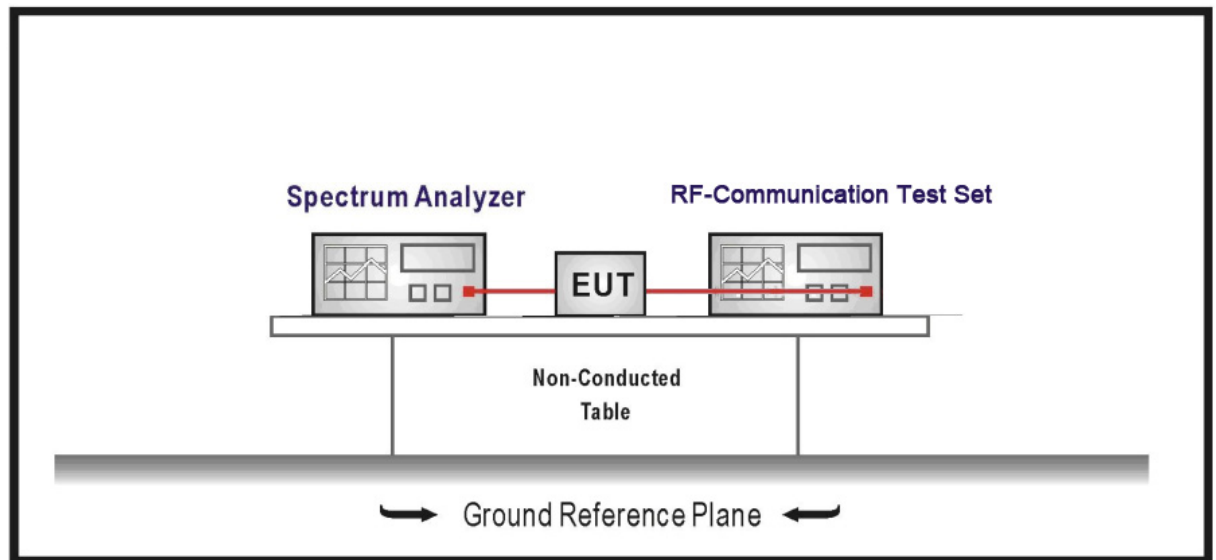
The following test equipments are used during the radiated emission test:

Spurious Emissions at Antenna Terminals (Conducted) / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	R&S	FSV 40	101049	2015/07/14
RF-communications Test set	HP	8920A	3614A08091	2016/04/15
Receiver	Agilent	N9038A	MY53220121	2015/07/26

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

5.2. Test Setup



5.3. Limits

Emissions shall be attenuated below the mean output power of the transmitter as follows:

FCC Rules	Attenuation Limit (dBc)
§ 90.210(b)	At least $43 + 10 \log (P)$ dB
§ 90.210(d)	At least $50 + 10 \log (P)$ dB or 70 dB, whichever is the lesser attenuation.
§ 90.210(e)	At least $55 + 10 \log (P)$ or 65 dB, whichever is the lesser attenuation.

5.4. Test Procedure

The carrier was modulated 100%. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 1MHz. The measurements were made in accordance with standard ANSI/TIA-603-C: 2004

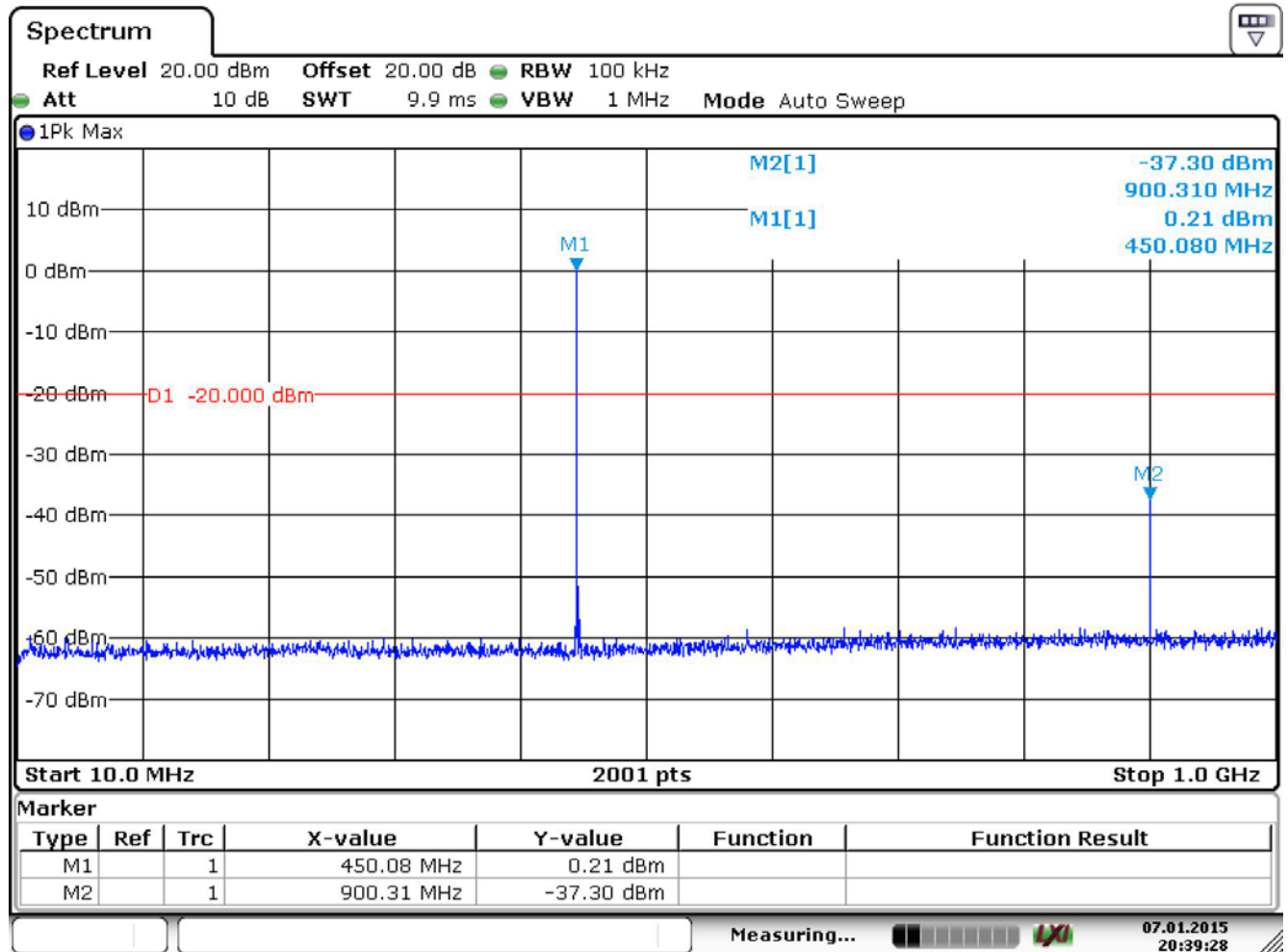
5.5. Uncertainty

The measurement uncertainty is defined as ± 1.27 dB

5.6. Test Result

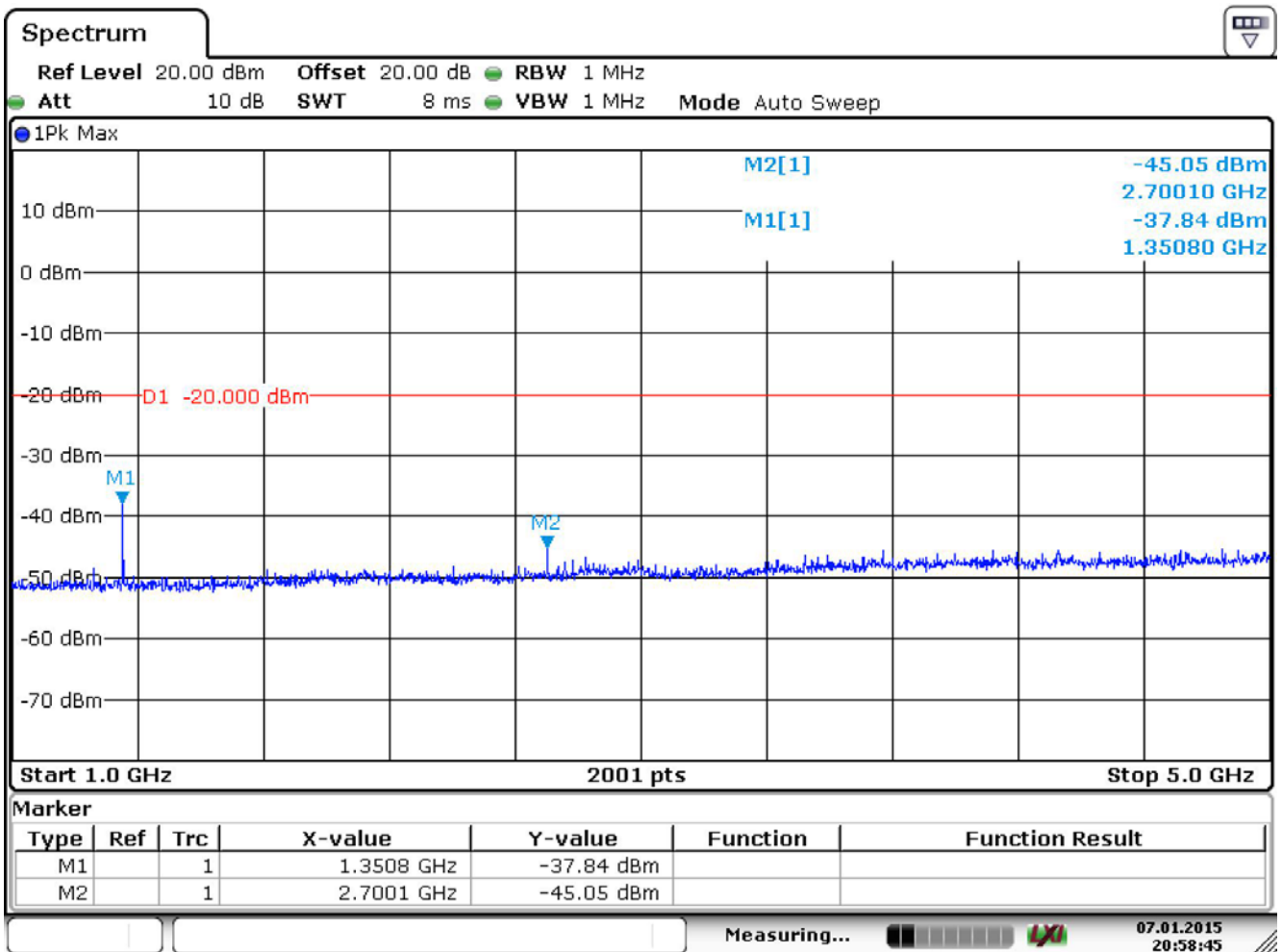
Product	Private land mobile radio		
Test Item	Spurious Emissions at Antenna Terminals (Conducted)		
Test Mode	Mode 1: Transmit		
Date of Test	2015/05/25	Test Site	SR7

450.1MHz (10MHz-1GHz) – 12.5KHz



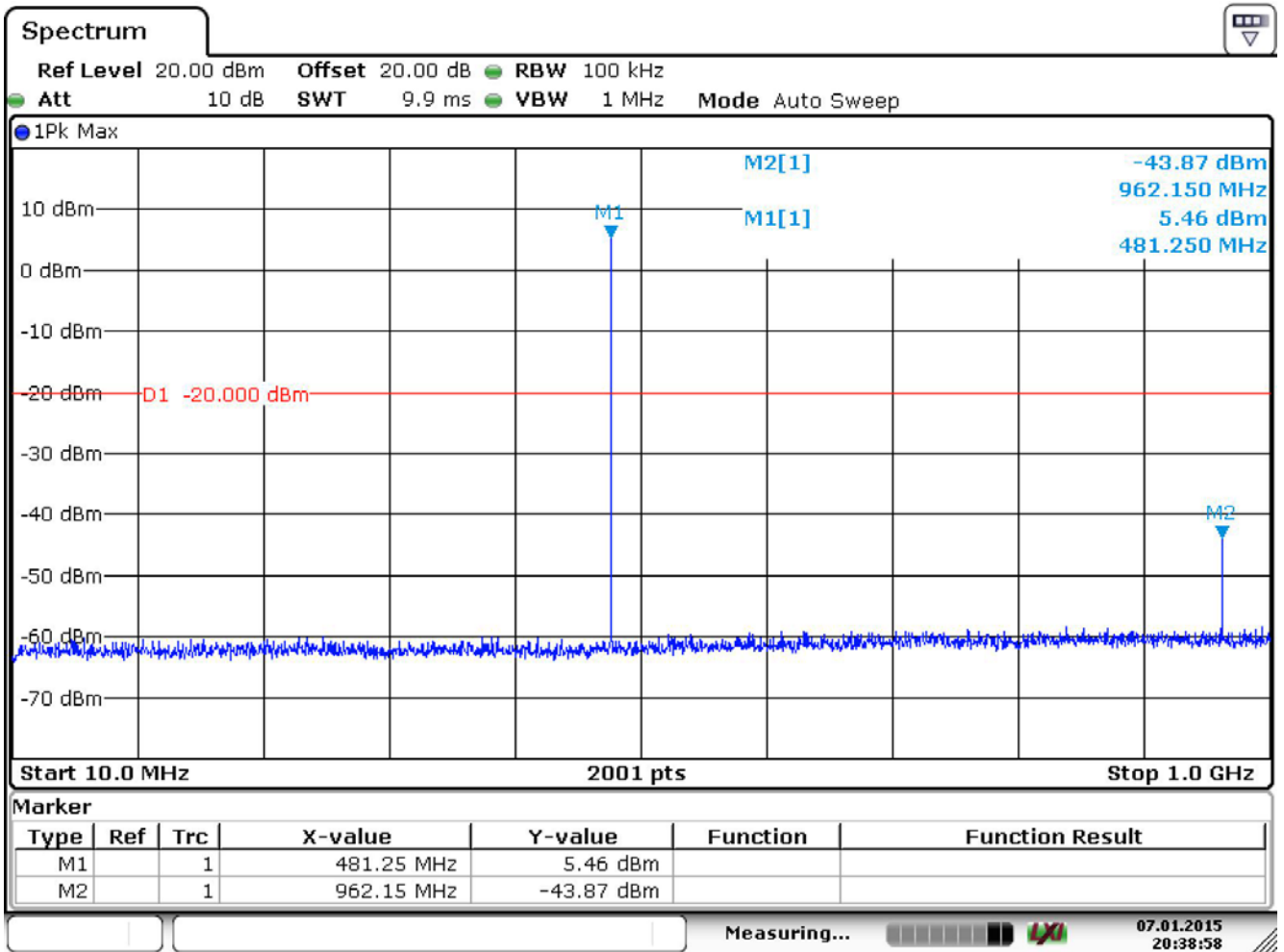
Date: 7.JAN.2015 20:39:28

450.1MHz (1GHz-5GHz) – 12.5KHz



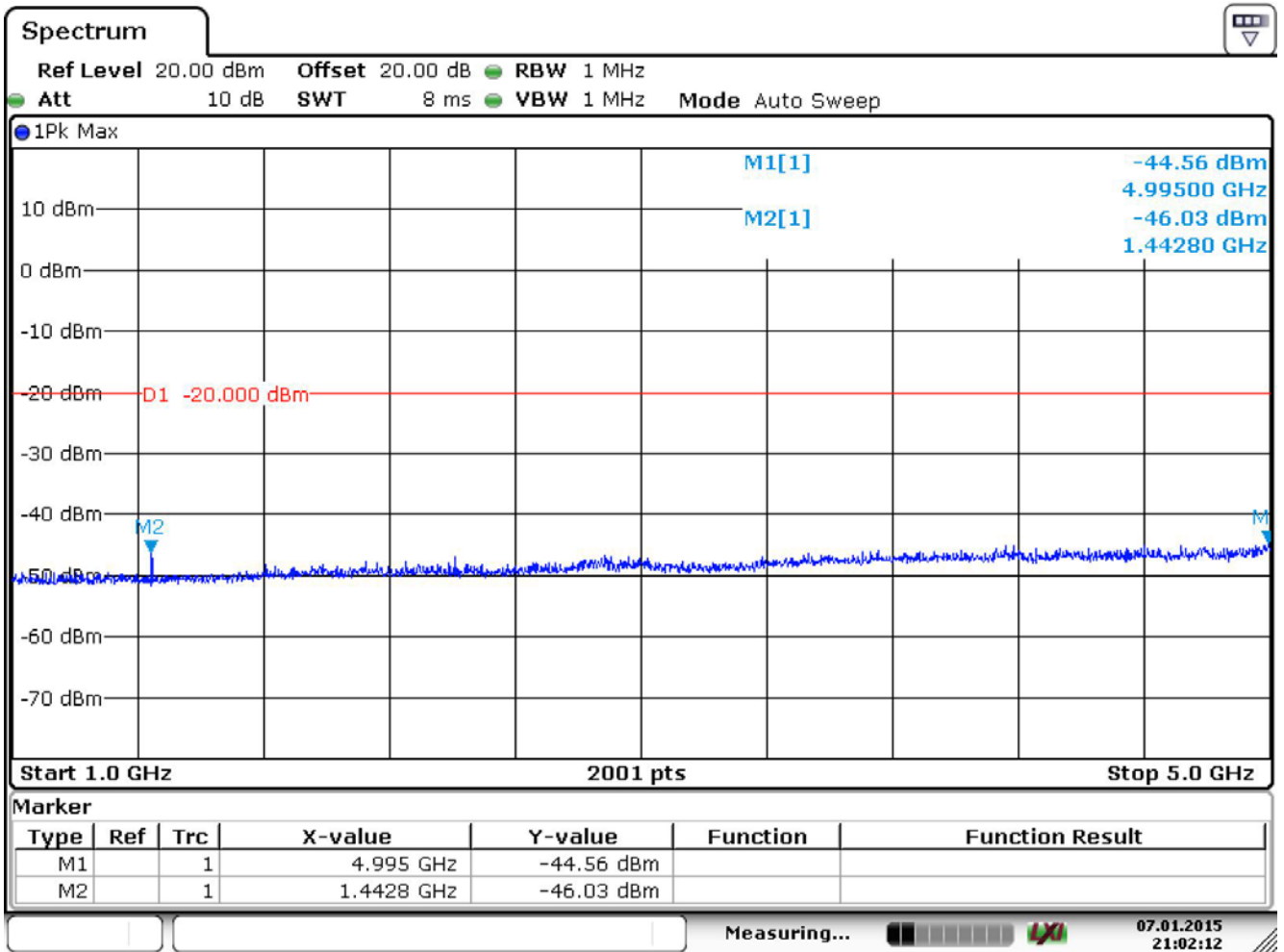
Date: 7.JAN.2015 20:58:45

481.1 MHz (10MHz-1GHz) – 12.5KHz



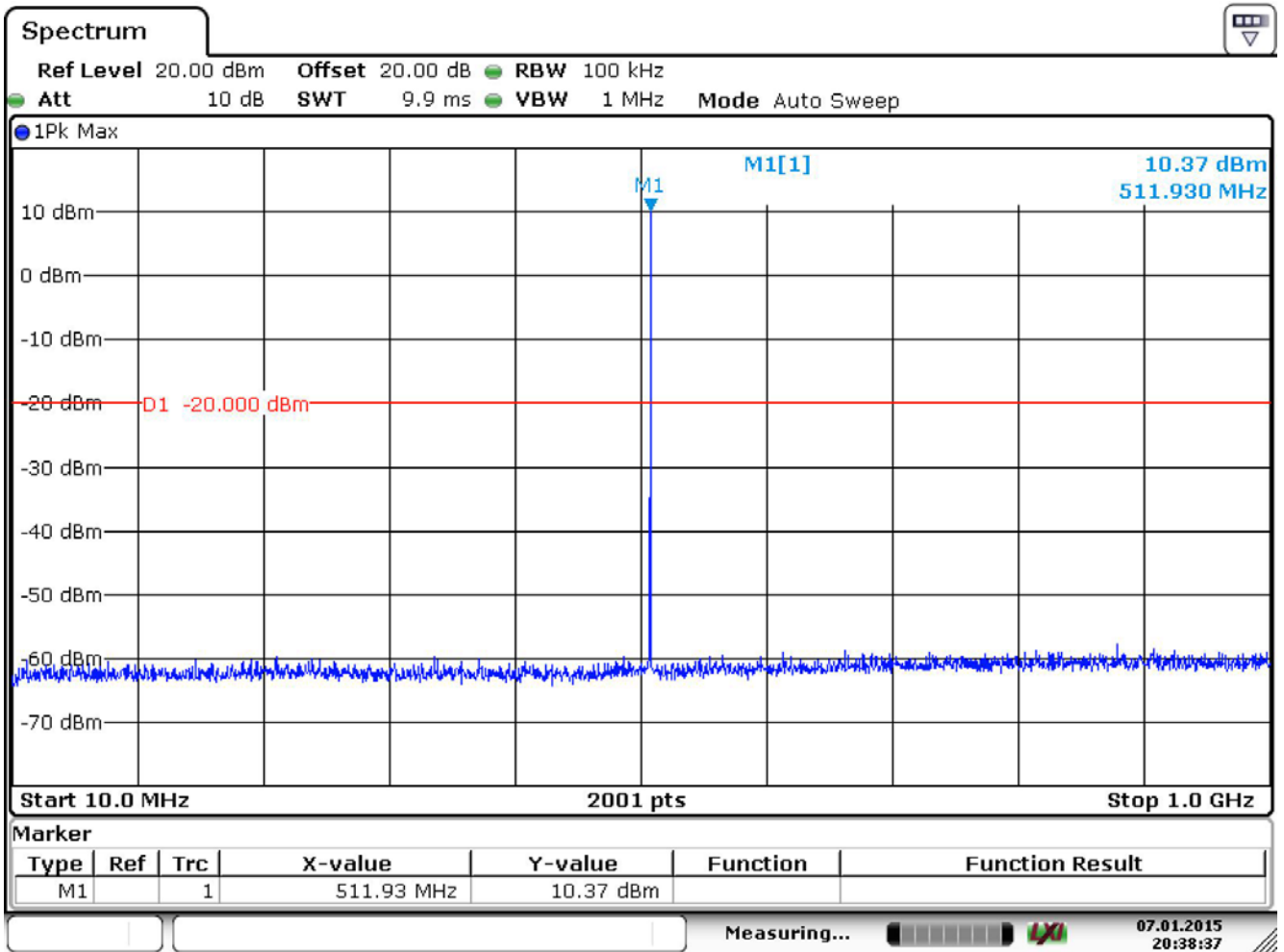
Date: 7.JAN.2015 20:38:58

481.1 MHz (1GHz-5GHz) – 12.5KHz



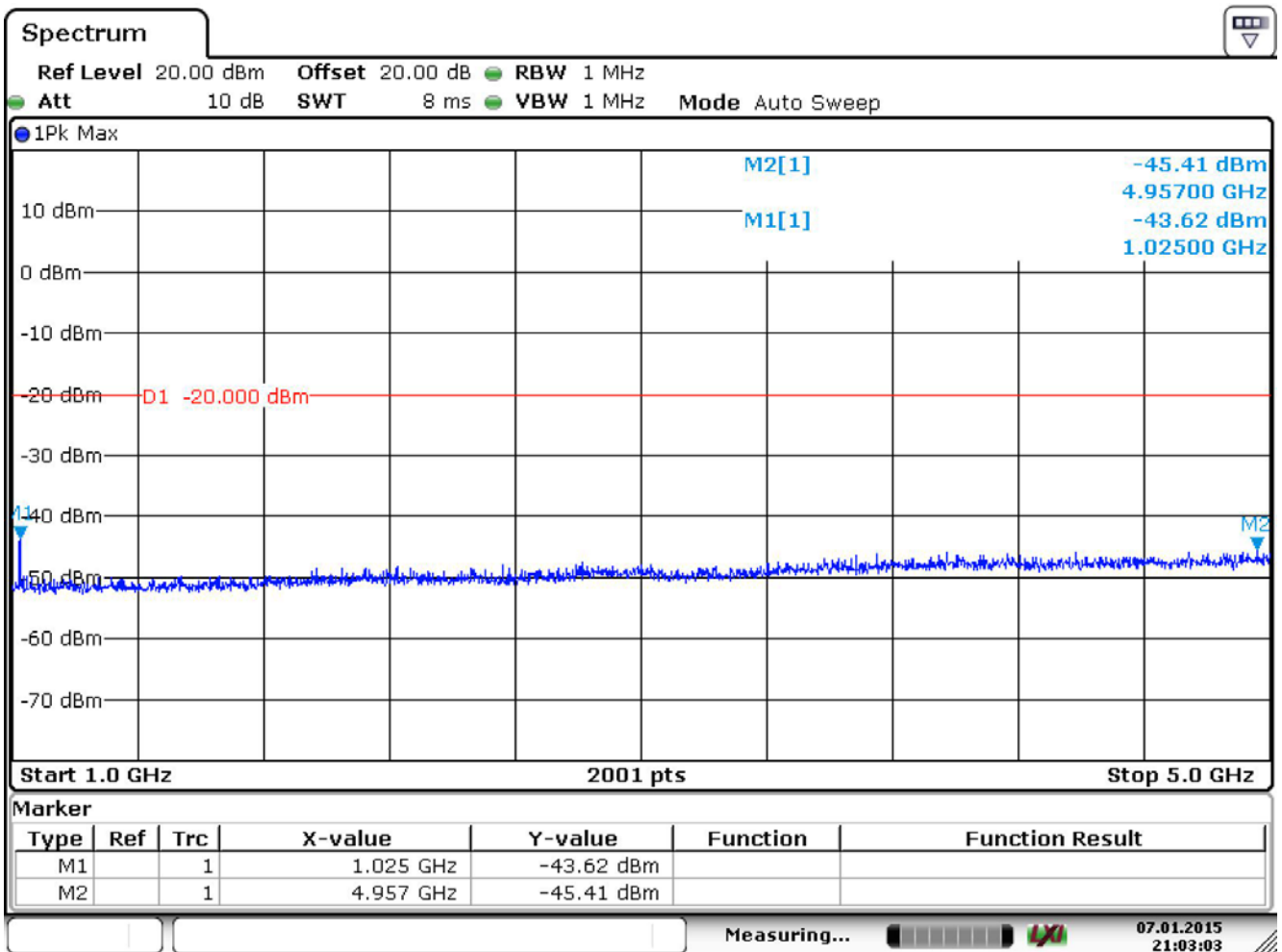
Date: 7.JAN.2015 21:02:12

511.9 MHz (10MHz-1GHz) – 12.5KHz



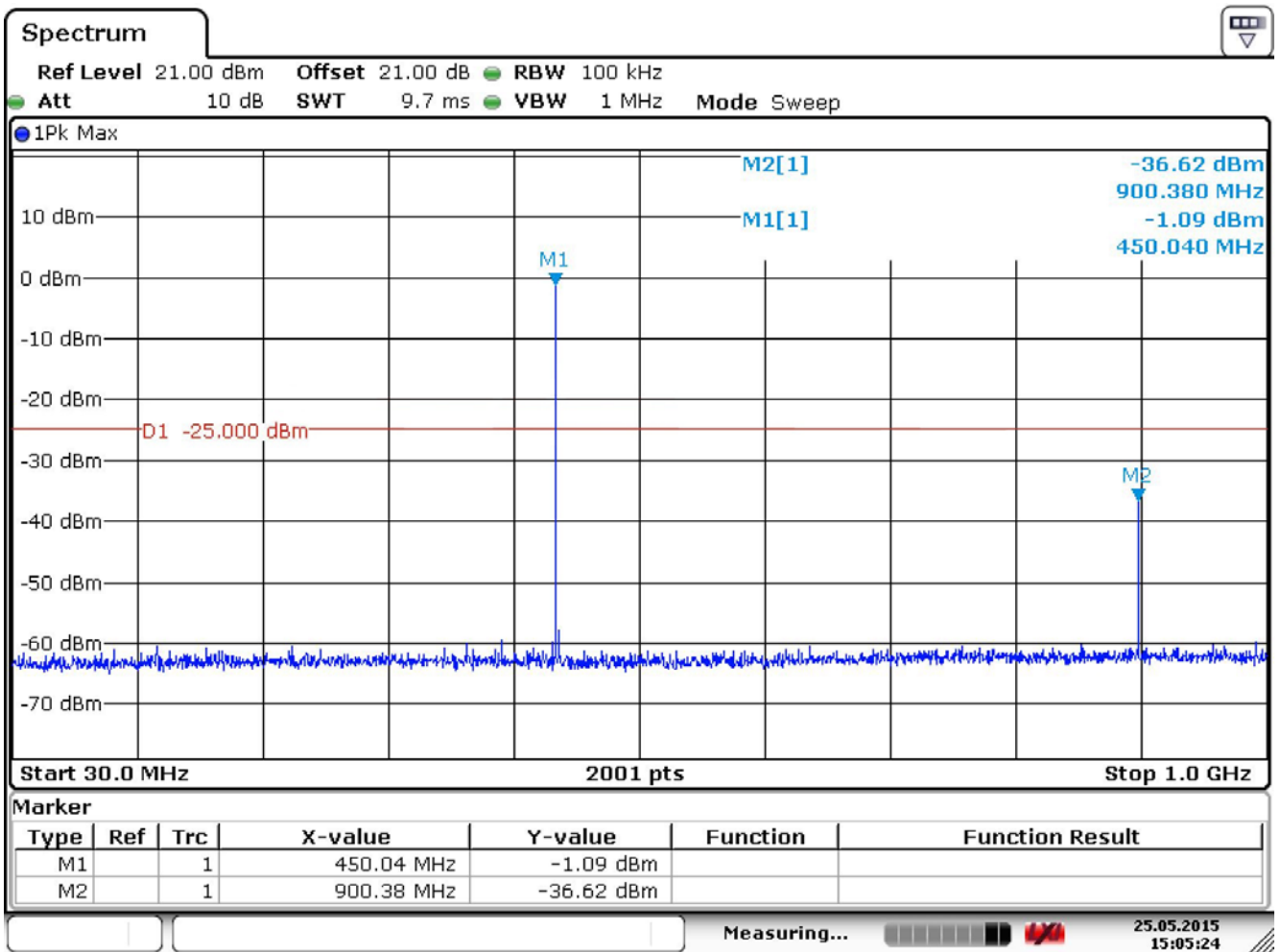
Date: 7.JAN.2015 20:38:36

511.9 MHz (1GHz-5GHz) – 12.5KHz



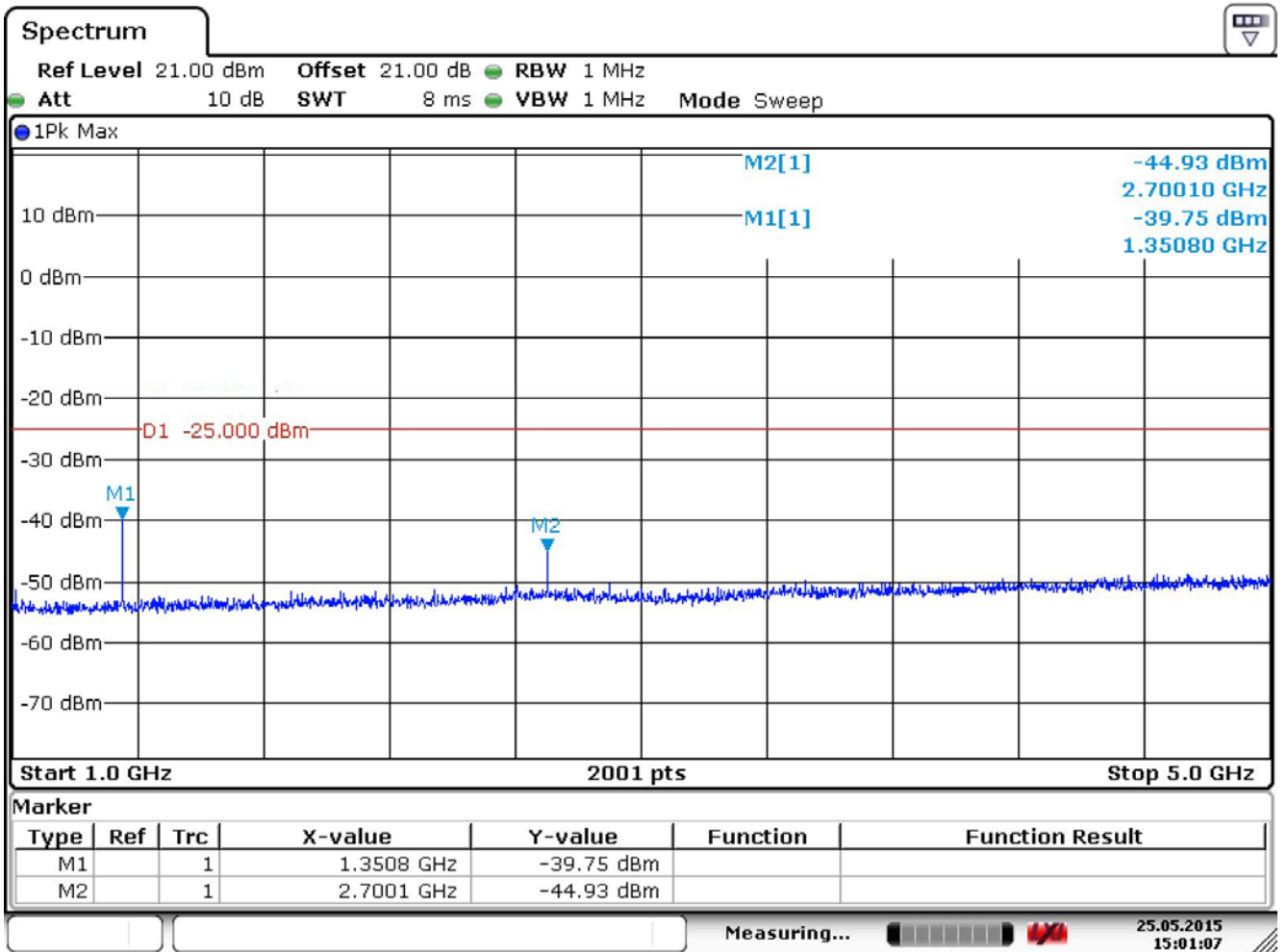
Date: 7.JAN.2015 21:03:03

450.1MHz (30MHz-1GHz) -6.25KHz



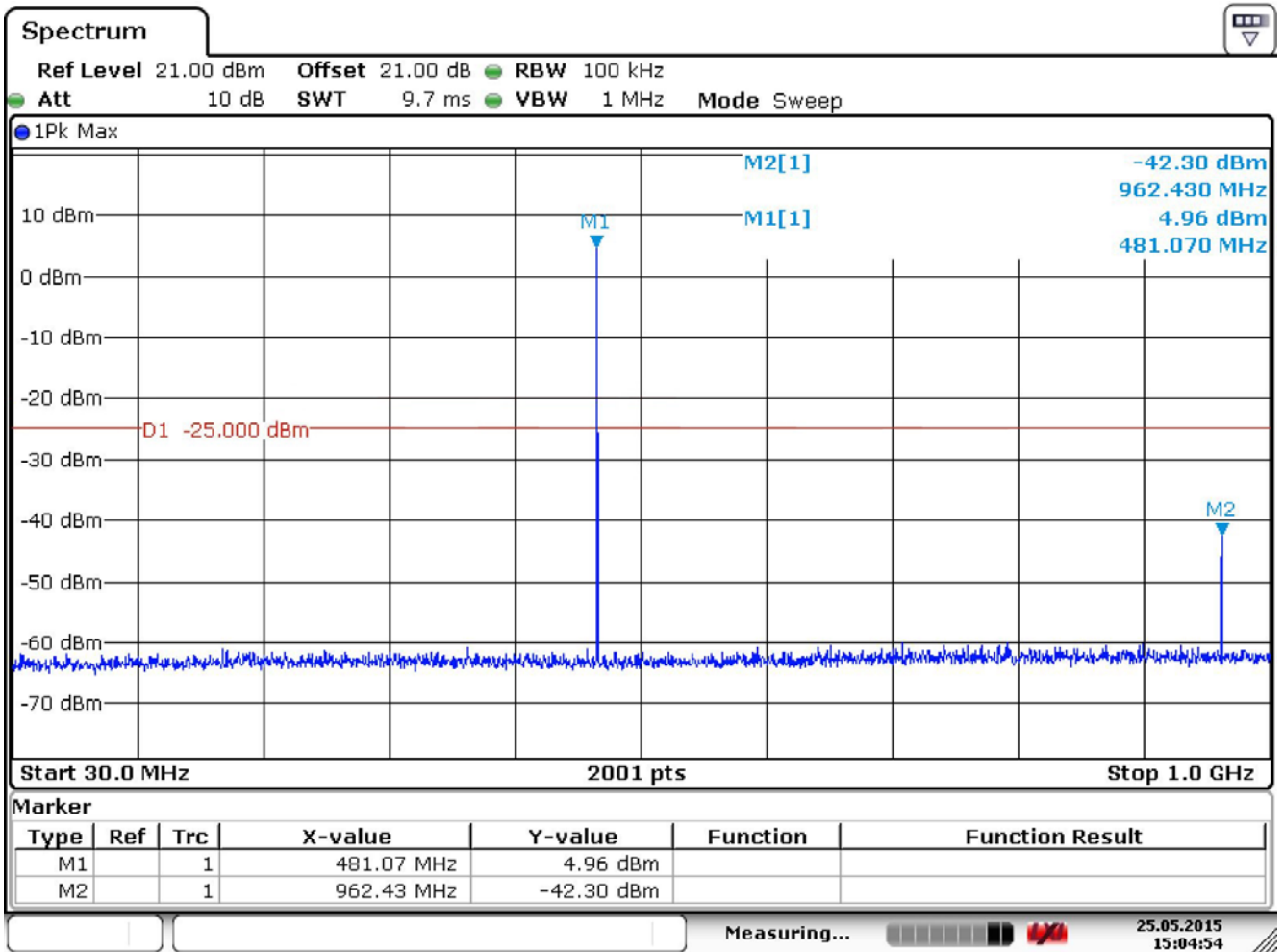
Date: 25.MAY.2015 15:05:25

450.1MHz (1GHz-5GHz) – 6.25KHz



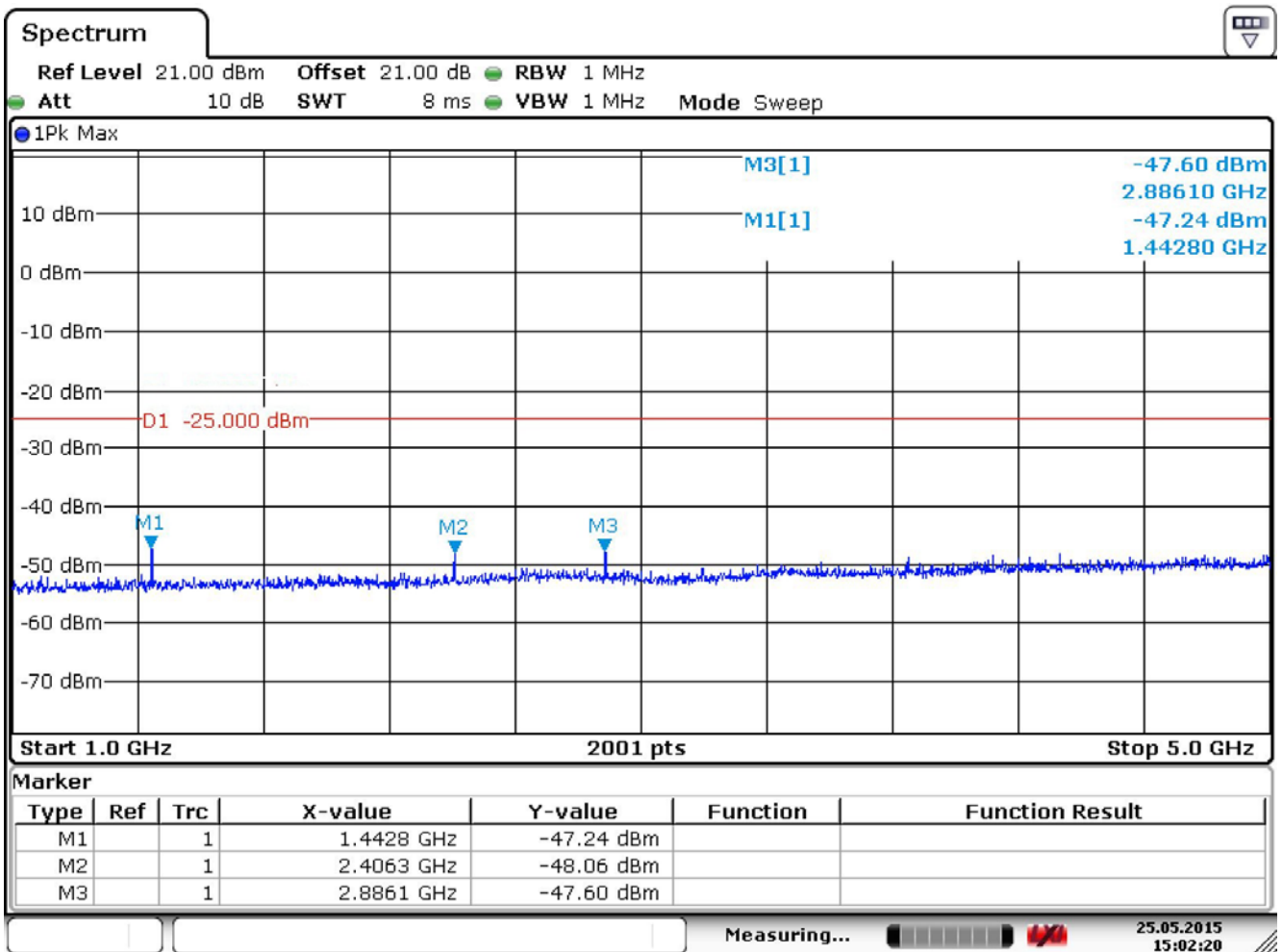
Date: 25.MAY.2015 15:01:07

481.1 MHz (30MHz-1GHz) – 6.25KHz



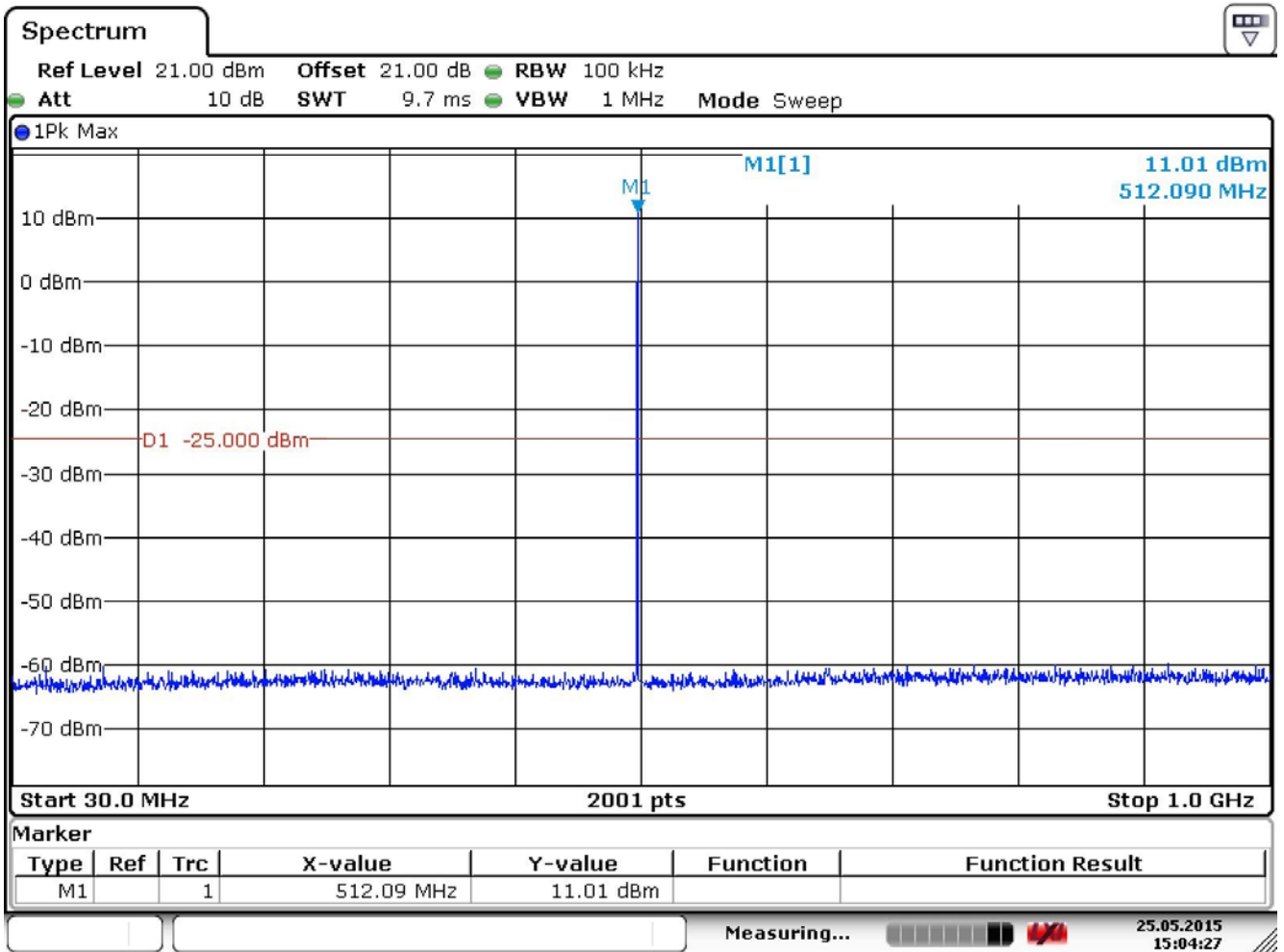
Date: 25.MAY.2015 15:04:54

481.1 MHz (1GHz-5GHz) – 6.25KHz



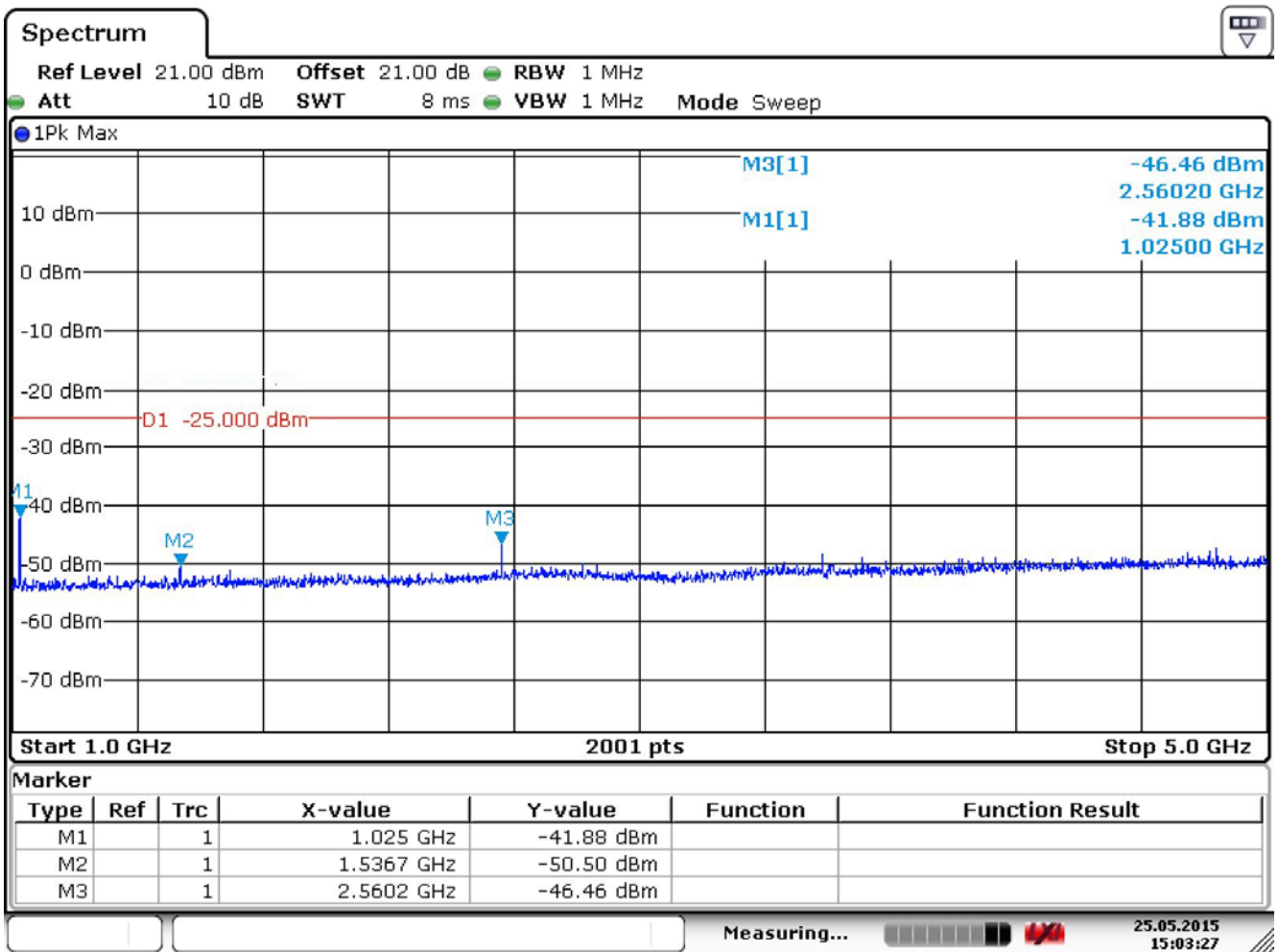
Date: 25.MAY.2015 15:02:20

511.9 MHz (30MHz-1GHz) – 6.25KHz



Date: 25.MAY.2015 15:04:27

511.9 MHz (1GHz-5GHz) – 6.25KHz



Date: 25.MAY.2015 15:03:27

6. Field Strength of Spurious Emissions

6.1. Test Equipment

The following test equipments are used during the band edge tests:

Field Strength of Spurious Emissions / CB1

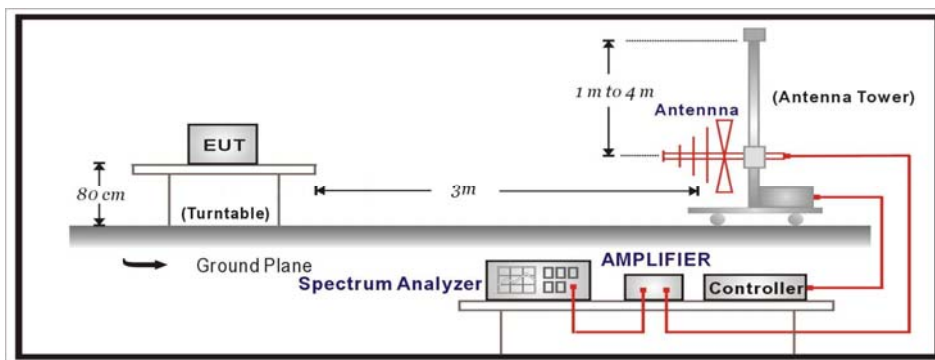
Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Bilog Antenna	SCHAFFNER	CBL6112B	2895	2015/08/14
Double Ridged Guide Horn Antenna	Schwarzbeck	BBHA 9120	D743	2015/02/12
Pre-Amplifier	Quietek	AMF-4D.	888003	2015/06/02
Pre-Amplifier	QuieTek	AP-025C	CHM-0706049	2015/02/06
k Type Cable	Huber Suhner	Sucoflex 102	25623/2	2015/02/10
Spectrum Analyzer	R&S	FSV 40	101049	2015/07/14
RF-communications Test set	HP	8920A	3614A08091	2015/04/27

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

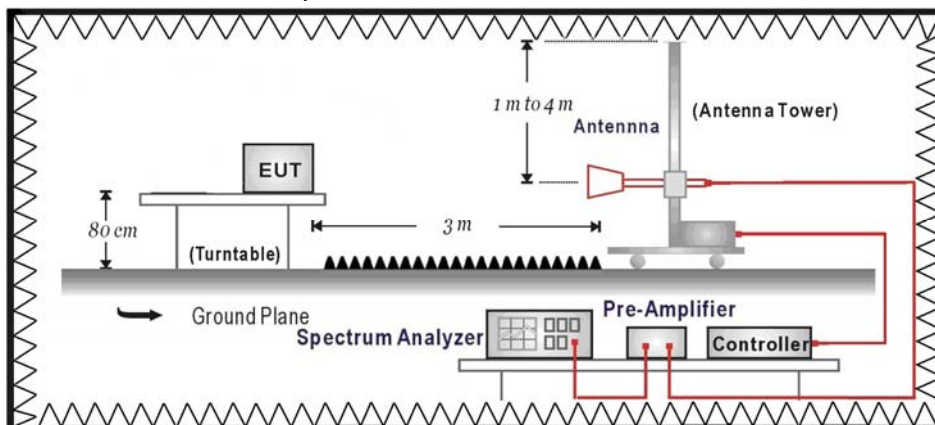
6.2. Test Setup

RF Radiated Measurement:

Under 1GHz Test Setup:



Above 1GHz Test Setup:



6.3. Limits

Emissions shall be attenuated below the mean output power of the transmitter as follows:

FCC Rules	Attenuation Limit (dBc)
§ 90.210(b)	At least $43 + 10 \log (P)$ dB
§ 90.210(d)	At least $50 + 10 \log (P)$ dB or 70 dB, whichever is the lesser attenuation.
§ 90.210(e)	At least $55 + 10 \log (P)$ or 65 dB, whichever is the lesser attenuation.

6.4. Test Procedure

The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental.

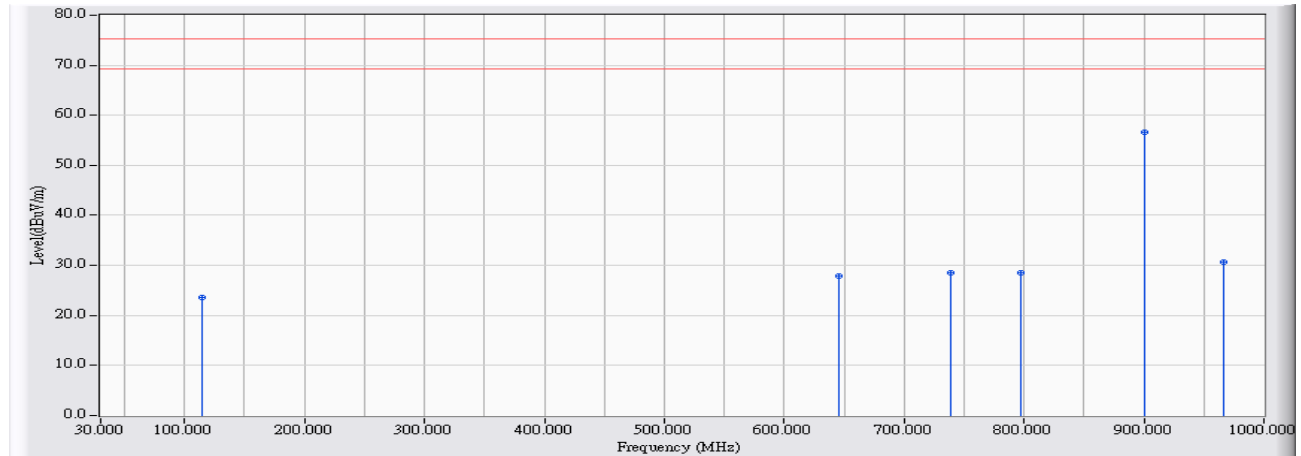
6.5. Uncertainty

The measurement uncertainty is defined as ± 3.65 dB

6.6. Test Result

30MHz-1GHz Spurious

Site : CB1	Time : 2015/01/08 - 00:41
Limit : FCC_PART90_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_30-1G-1_0901 - HORIZONTAL	Power : DC 7.4V (Power by Battery)
EUT : Private land mobile radio	Note : 450.1MHz

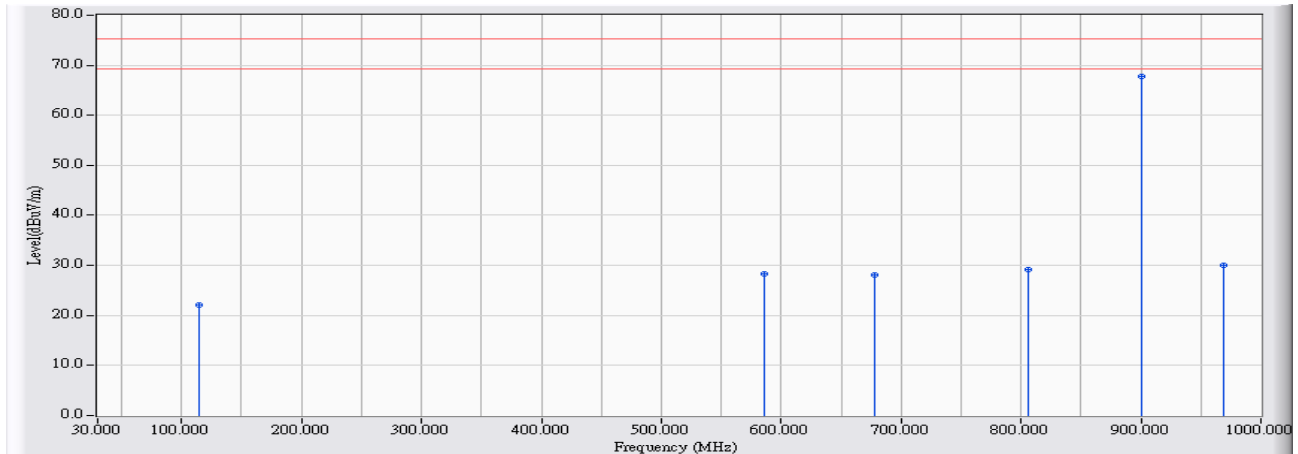


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		114.827	10.742	12.775	23.517	-51.683	75.200	PEAK
2		645.645	18.085	9.693	27.778	-47.422	75.200	PEAK
3		739.192	18.684	9.905	28.589	-46.611	75.200	PEAK
4		797.849	19.331	9.191	28.522	-46.678	75.200	PEAK
5	*	900.144	19.803	36.826	56.629	-18.571	75.200	PEAK
6		966.061	20.382	10.222	30.604	-44.596	75.200	PEAK

Note:

1. All Reading Levels are Peak value.
2. “ * ”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Site : CB1	Time : 2015/01/08 - 00:49
Limit : FCC_PART90_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_30-1G-1_0901 - VERTICAL	Power : DC 7.4V (Power by Battery)
EUT : Private land mobile radio	Note : 450.1MHz

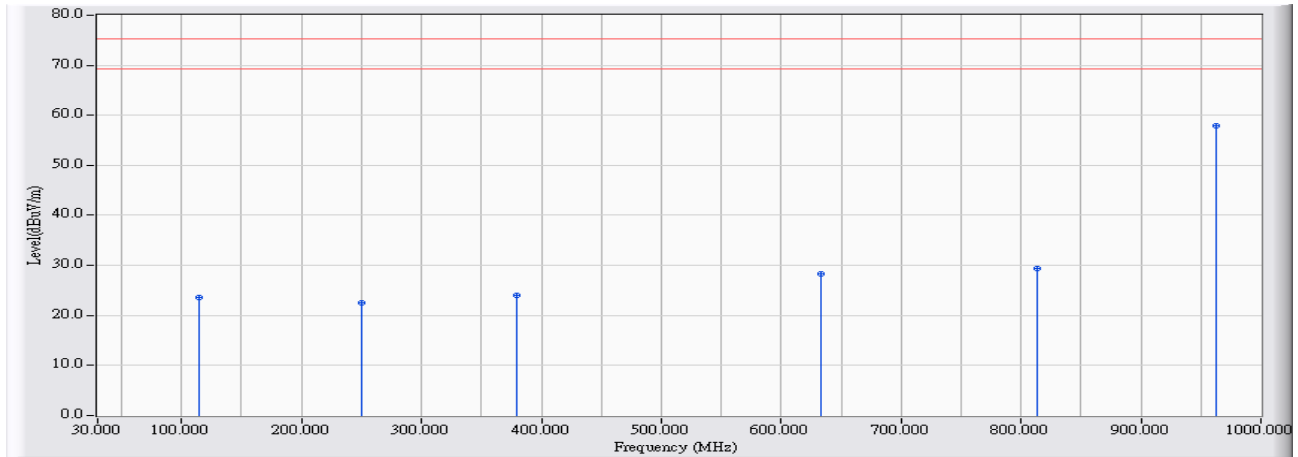


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		114.835	10.742	11.453	22.195	-53.005	75.200	PEAK
2		586.020	17.807	10.560	28.367	-46.833	75.200	PEAK
3		677.639	18.183	9.967	28.150	-47.050	75.200	PEAK
4		806.099	19.381	9.700	29.081	-46.119	75.200	PEAK
5	*	900.133	19.803	47.868	67.671	-7.529	75.200	PEAK
6		969.455	20.412	9.569	29.981	-45.219	75.200	PEAK

Note:

1. All Reading Levels are Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Site : CB1	Time : 2015/01/08 - 00:57
Limit : FCC_PART90_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_30-1G-1_0901 - HORIZONTAL	Power : DC 7.4V (Power by Battery)
EUT : Private land mobile radio	Note : 481.1MHz

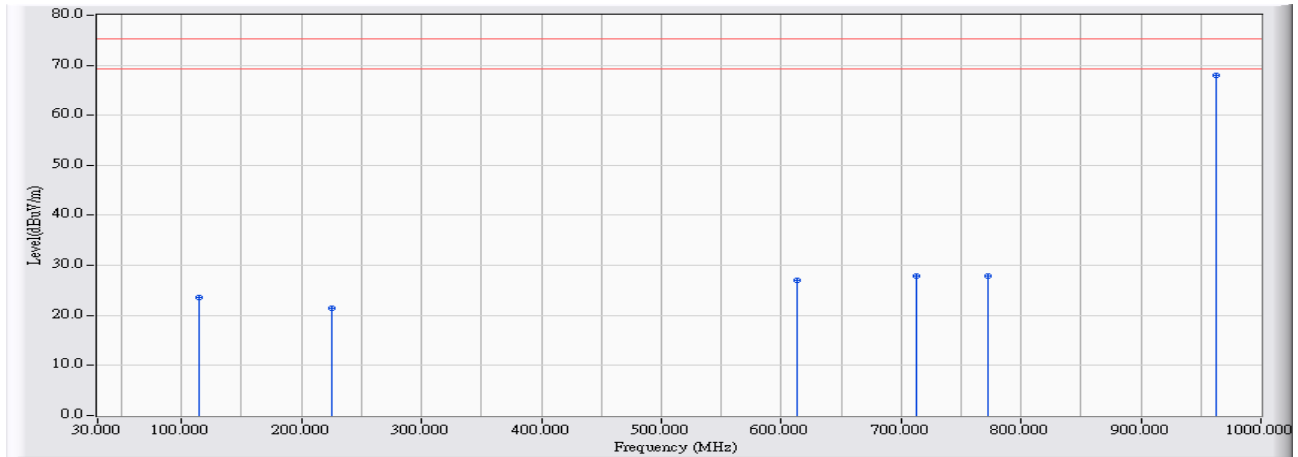


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		114.351	10.700	12.839	23.539	-51.661	75.200	PEAK
2		249.597	11.740	10.839	22.579	-52.621	75.200	PEAK
3		379.019	14.666	9.289	23.955	-51.245	75.200	PEAK
4		632.548	18.044	10.201	28.245	-46.955	75.200	PEAK
5		812.886	19.411	9.989	29.400	-45.800	75.200	PEAK
6	*	962.192	20.348	37.472	57.819	-17.381	75.200	PEAK

Note:

1. All Reading Levels are Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Site : CB1	Time : 2015/01/08 - 01:06
Limit : FCC_PART90_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_30-1G-1_0901 - VERTICAL	Power : DC 7.4V (Power by Battery)
EUT : Private land mobile radio	Note : 481.1MHz

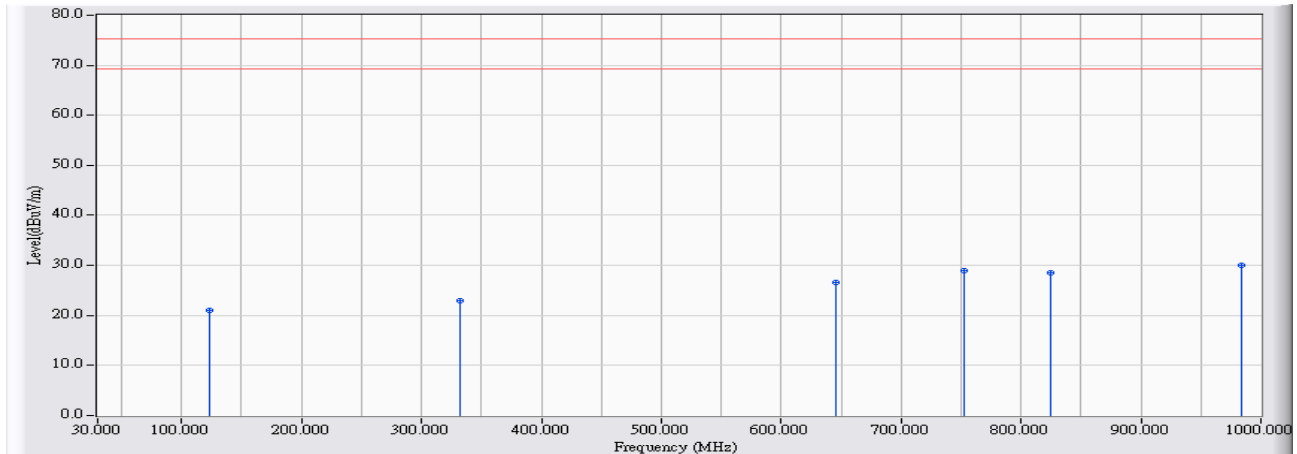


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		114.349	10.700	12.826	23.526	-51.674	75.200	PEAK
2		224.865	9.945	11.449	21.394	-53.806	75.200	PEAK
3		612.670	17.982	9.089	27.071	-48.129	75.200	PEAK
4		713.027	18.396	9.418	27.814	-47.386	75.200	PEAK
5		772.166	19.048	8.930	27.978	-47.222	75.200	PEAK
6	*	962.180	20.348	47.538	67.886	-7.314	75.200	PEAK

Note:

1. All Reading Levels are Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Site : CB1	Time : 2015/01/08 - 01:14
Limit : FCC_PART90_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_30-1G-1_0901 - HORIZONTAL	Power : DC 7.4V (Power by Battery)
EUT : Private land mobile radio	Note : 511.9MHz

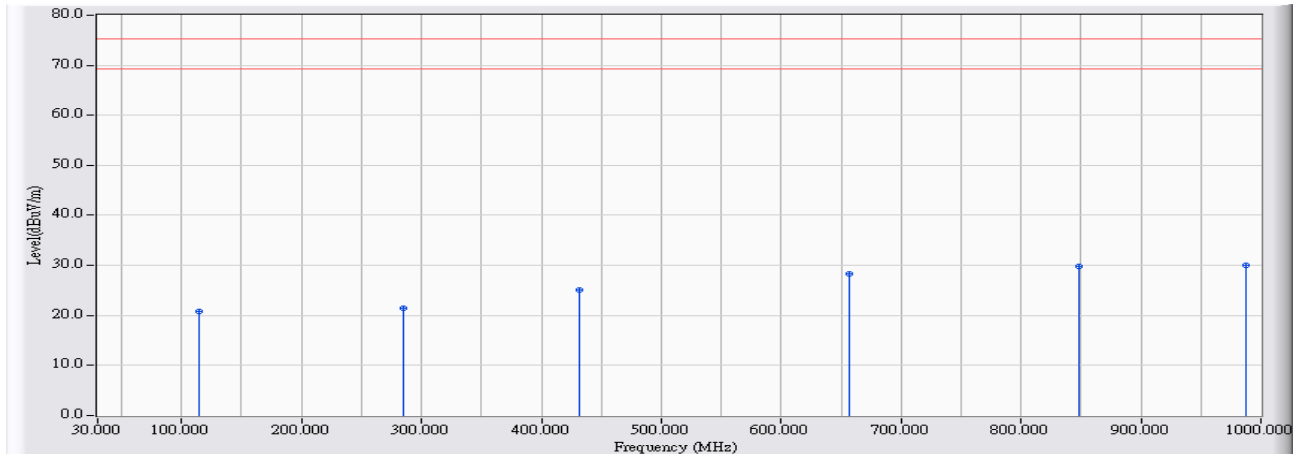


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		123.067	11.009	10.101	21.110	-54.090	75.200	PEAK
2		331.994	13.390	9.649	23.039	-52.161	75.200	PEAK
3		646.121	18.086	8.526	26.612	-48.588	75.200	PEAK
4		752.290	18.829	10.174	29.003	-46.197	75.200	PEAK
5		824.520	19.464	9.099	28.563	-46.637	75.200	PEAK
6	*	983.520	20.535	9.430	29.965	-45.235	75.200	PEAK

Note:

1. All Reading Levels are Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Site : CB1	Time : 2015/01/08 - 01:21
Limit : FCC_PART90_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_30-1G-1_0901 - VERTICAL	Power : DC 7.4V (Power by Battery)
EUT : Private land mobile radio	Note : 511.9MHz



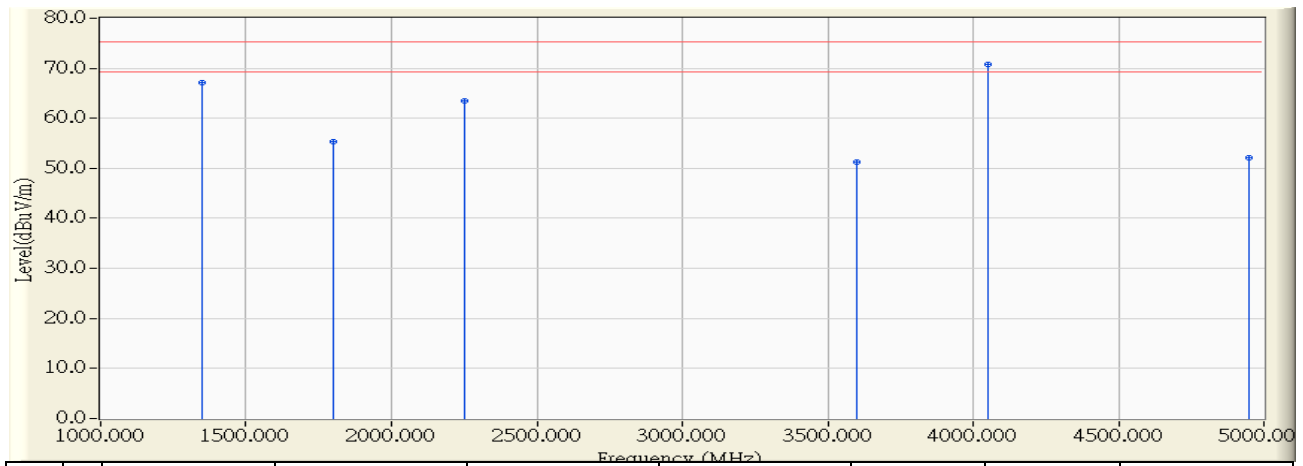
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		114.837	10.742	9.996	20.738	-54.462	75.200	PEAK
2		284.975	12.298	9.087	21.385	-53.815	75.200	PEAK
3		431.865	15.788	9.207	24.995	-50.205	75.200	PEAK
4		656.300	18.117	10.150	28.267	-46.933	75.200	PEAK
5		848.758	19.572	10.251	29.823	-45.377	75.200	PEAK
6	*	987.398	20.569	9.410	29.979	-45.221	75.200	PEAK

Note:

1. All Reading Levels are Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Harmonic & Spurious:

Site : CB1	Time : 2015/01/06 - 20:11
Limit : FCC_Part90_H_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	Power : DC 7.4V (Power by Battery)
EUT : Private land mobile radio	Note : 450.1MHz

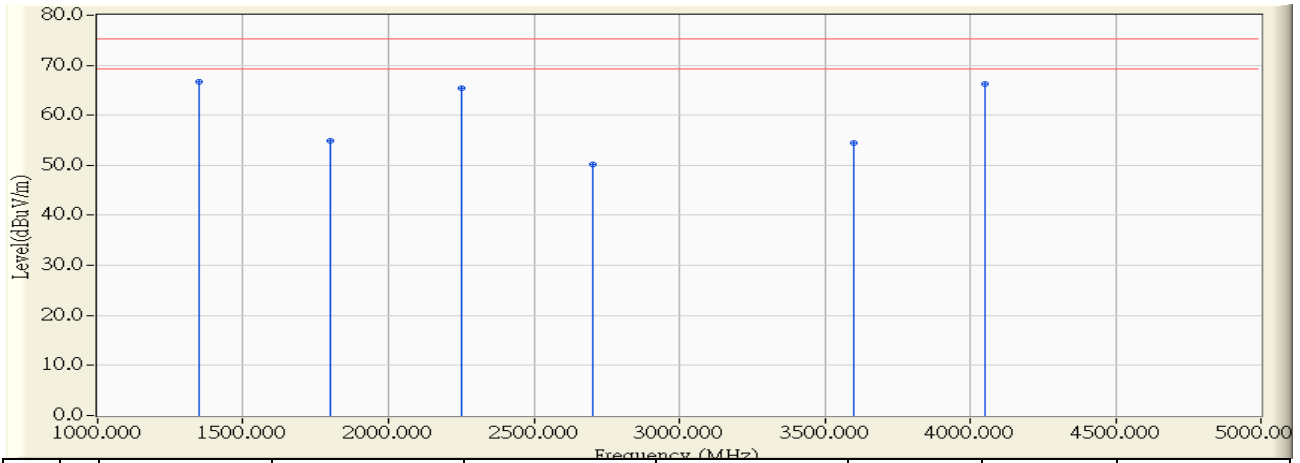


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	1350.000	-22.882	89.980	67.098	-8.102	75.200	PEAK
2	1800.000	-21.334	76.704	55.370	-19.830	75.200	PEAK
3	2250.000	-17.455	80.954	63.499	-11.701	75.200	PEAK
4	3600.000	-15.325	66.610	51.285	-23.915	75.200	PEAK
5	* 4050.000	-14.340	85.068	70.728	-4.472	75.200	PEAK
6	4950.000	-11.821	64.012	52.191	-23.009	75.200	PEAK

Note:

1. All Reading Levels are Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Site : CB1	Time : 2015/01/06 - 20:13
Limit : FCC_Part90_H_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	Power : DC 7.4V (Power by Battery)
EUT : Private land mobile radio	Note : 450.1MHz

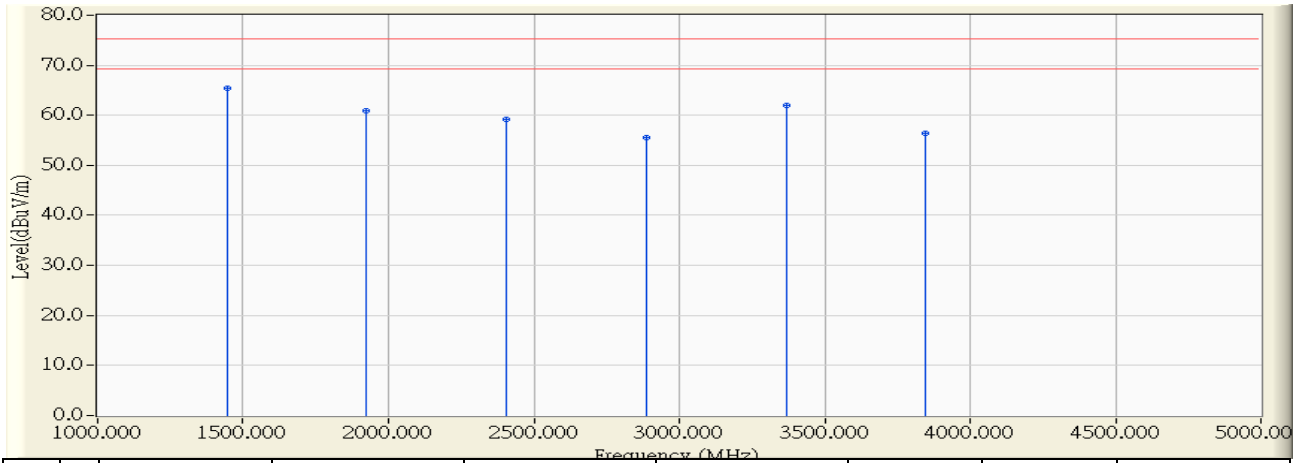


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	1350.000	-22.882	89.546	66.664	-8.536	75.200	PEAK
2		1800.000	-21.334	76.319	54.985	-20.215	75.200	PEAK
3		2250.000	-17.455	82.958	65.503	-9.697	75.200	PEAK
4		2700.000	-15.508	65.745	50.237	-24.963	75.200	PEAK
5		3600.000	-15.325	69.846	54.521	-20.679	75.200	PEAK
6		4050.000	-14.340	80.522	66.182	-9.018	75.200	PEAK

Note:

1. All Reading Levels are Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Site : CB1	Time : 2015/01/06 - 20:16
Limit : FCC_Part90_H_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	Power : DC 7.4V (Power by Battery)
EUT : Private land mobile radio	Note : 481.1MHz

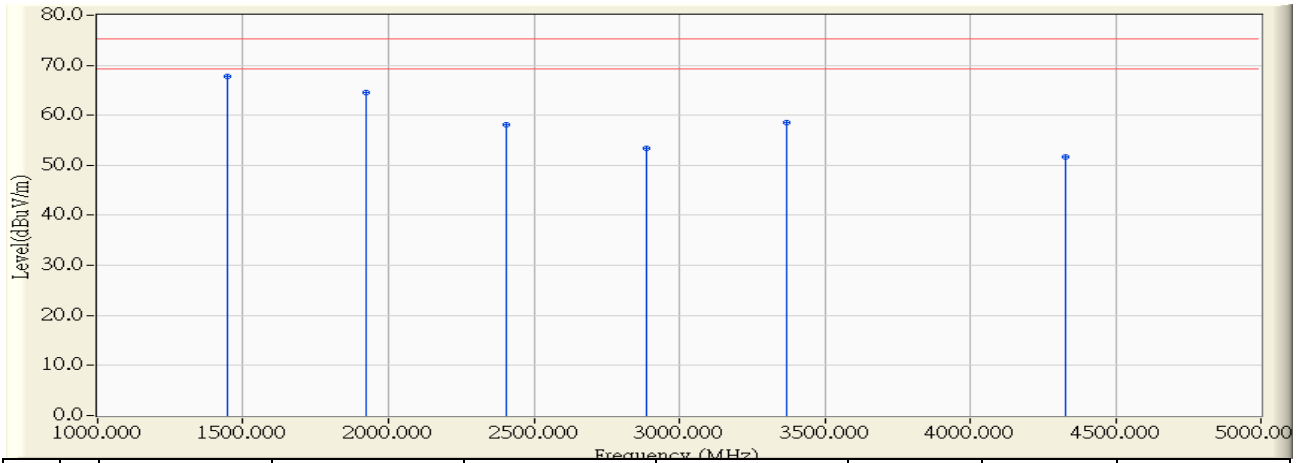


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	1444.000	-22.521	87.934	65.413	-9.787	75.200	PEAK
2		1924.000	-20.925	81.739	60.814	-14.386	75.200	PEAK
3		2406.000	-15.625	74.755	59.130	-16.070	75.200	PEAK
4		2886.000	-15.973	71.486	55.513	-19.687	75.200	PEAK
5		3368.000	-15.709	77.599	61.889	-13.311	75.200	PEAK
6		3848.000	-14.822	71.132	56.310	-18.890	75.200	PEAK

Note:

1. All Reading Levels are Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Site : CB1	Time : 2015/01/06 - 20:19
Limit : FCC_Part90_H_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	Power : DC 7.4V (Power by Battery)
EUT : Private land mobile radio	Note : 481.1MHz

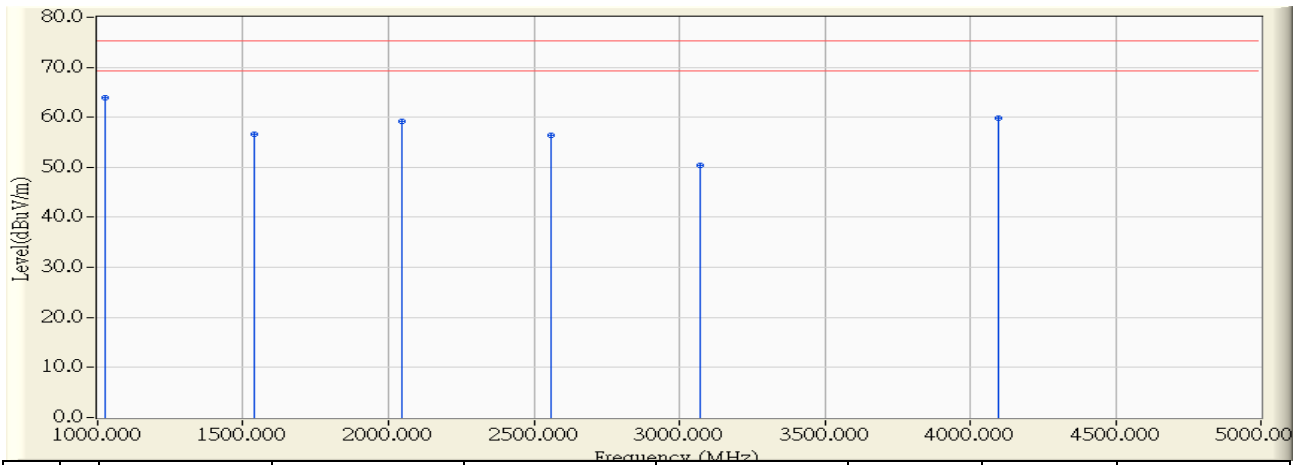


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	1444.000	-22.521	90.327	67.806	-7.394	75.200	PEAK
2		1924.000	-20.925	85.421	64.496	-10.704	75.200	PEAK
3		2406.000	-15.625	73.703	58.078	-17.122	75.200	PEAK
4		2886.000	-15.973	69.329	53.356	-21.844	75.200	PEAK
5		3368.000	-15.709	74.238	58.528	-16.672	75.200	PEAK
6		4330.000	-13.530	65.253	51.723	-23.477	75.200	PEAK

Note:

1. All Reading Levels are Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Site : CB1	Time : 2015/01/06 - 20:22
Limit : FCC_Part90_H_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	Power : DC 7.4V (Power by Battery)
EUT : Private land mobile radio	Note : 511.9MHz

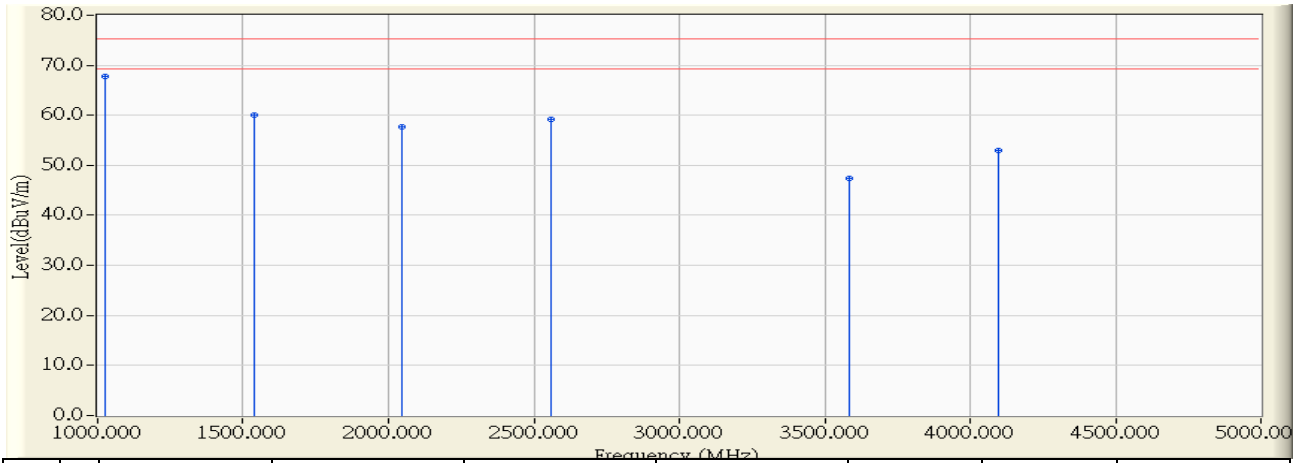


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	1024.000	-24.136	88.025	63.890	-11.310	75.200	PEAK
2		1536.000	-22.205	78.842	56.637	-18.563	75.200	PEAK
3		2048.000	-19.824	78.981	59.157	-16.043	75.200	PEAK
4		2560.000	-15.158	71.522	56.364	-18.836	75.200	PEAK
5		3072.000	-16.051	66.481	50.430	-24.770	75.200	PEAK
6		4096.000	-14.206	73.961	59.754	-15.446	75.200	PEAK

Note:

1. All Reading Levels are Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Site : CB1	Time : 2015/01/06 - 20:26
Limit : FCC_Part90_H_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	Power : DC 7.4V (Power by Battery)
EUT : Private land mobile radio	Note : 511.9MHz



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	1024.000	-24.136	91.915	67.780	-7.420	75.200	PEAK
2		1536.000	-22.205	82.165	59.960	-15.240	75.200	PEAK
3		2048.000	-19.824	77.615	57.791	-17.409	75.200	PEAK
4		2560.000	-15.158	74.304	59.146	-16.054	75.200	PEAK
5		3584.000	-15.357	62.825	47.467	-27.733	75.200	PEAK
6		4096.000	-14.206	67.276	53.069	-22.131	75.200	PEAK

Note:

1. All Reading Levels are Peak value.
2. “ * ”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

7. Frequency Stability

7.1. Test Equipment

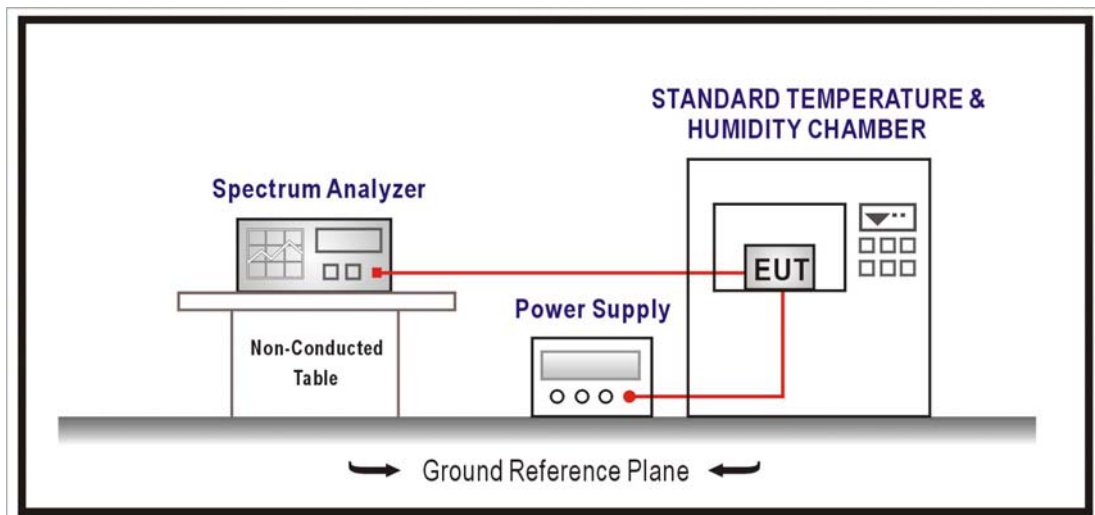
The following test equipments are used during the radiated emission tests:

Frequency Stability / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A-EXA	US47140172	2015/07/14
Temperature & Humidity Chamber	WIT	TH-1S-B	1082101	2016/01/22

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

7.2. Test Setup



7.3. Limits

§Transmitters used must have minimum frequency stability as specified in the following table.

Frequency Range (MHz)	Channel Bandwidth (KHz)	Frequency Tolerance (ppm)		
		Fixed and Base Stations	Mobile Stations	
			> 2 W	≤ 2 W
150-174 MHz	6.25	1.0	2.0	2.0
	12.5	2.5	5.0	5.0
	25	5.0	5.0	50.0*
421-512 MHz	6.25	0.5	1.0	1.0
	12.5	1.5	2.5	2.5
	25	2.5	5.0	5.0

- Stations operating in the 154.45 to 154.49 MHz or the 173.2 to 173.4 MHz bands must have a frequency stability of 5 ppm.
- Paging transmitters operating on paging-only frequencies must operate with frequency stability of 5 ppm in the 150-174 MHz band and 2.5 ppm in the 421-512 MHz band.

7.4. Test Procedure

The frequency stability was measured per ANSI/TIA 603-C: 2004

7.5. Uncertainty

The measurement uncertainty is defined as ± 150 Hz

7.6. Test Result

Product	Private land mobile radio		
Test Item	Frequency Stability		
Test Mode	Mode 1: Transmit-450.1MHz		
Date of Test	2015/05/27	Test Site	SR7

Temperature Interval (°C)	DC Voltage (V)	Frequency (MHz)	Deviation (ppm)	Result
-30	7.40	450.100040	0.0889	PASS
-20		450.100021	0.0467	PASS
-10		450.100009	0.0200	PASS
0		450.099988	-0.0267	PASS
10		450.099999	-0.0022	PASS
20		450.099986	-0.0311	PASS
30		450.099973	-0.0600	PASS
40		450.099980	-0.0444	PASS
50		450.099926	-0.1644	PASS

Temperature Interval (°C)	AC Voltage (V)	Frequency (MHz)	Deviation (ppm)	Result
25	8.51	450.099999	-0.0022	PASS
	7.40	450.099997	-0.0067	PASS
	6.29	450.099997	-0.0067	PASS

Product	Private land mobile radio		
Test Item	Frequency Stability		
Test Mode	Mode 1: Transmit-481.1MHz		
Date of Test	2015/05/27	Test Site	SR7

Temperature Interval (°C)	DC Voltage (V)	Frequency (MHz)	Deviation (ppm)	Result
-30	7.40	481.100041	0.0852	PASS
-20		481.100015	0.0312	PASS
-10		481.100008	0.0166	PASS
0		481.099996	-0.0083	PASS
10		481.099989	-0.0229	PASS
20		481.099964	-0.0748	PASS
30		481.099985	-0.0312	PASS
40		481.099963	-0.0769	PASS
50		481.099969	-0.0644	PASS

Temperature Interval (°C)	AC Voltage (V)	Frequency (MHz)	Deviation (ppm)	Result
25	8.51	481.099999	-0.0021	PASS
	7.40	481.099997	-0.0062	PASS
	6.29	481.099998	-0.0042	PASS

Product	Private land mobile radio		
Test Item	Frequency Stability		
Test Mode	Mode 1: Transmit-511.9MHz		
Date of Test	2015/05/27	Test Site	SR7

Temperature Interval (°C)	DC Voltage (V)	Frequency (MHz)	Deviation (ppm)	Result
-30	7.40	511.900070	0.1367	PASS
-20		511.900022	0.0430	PASS
-10		511.900000	0.0000	PASS
0		511.899985	-0.0293	PASS
10		511.899993	-0.0137	PASS
20		511.899991	-0.0176	PASS
30		511.899965	-0.0684	PASS
40		511.899980	-0.0391	PASS
50		511.899994	-0.0117	PASS

Temperature Interval (°C)	AC Voltage (V)	Frequency (MHz)	Deviation (ppm)	Result
25	8.51	511.899997	-0.0059	PASS
	7.40	511.899998	-0.0039	PASS
	6.29	511.899999	-0.0020	PASS

8. Transient Frequency Behavior

8.1. Test Equipment

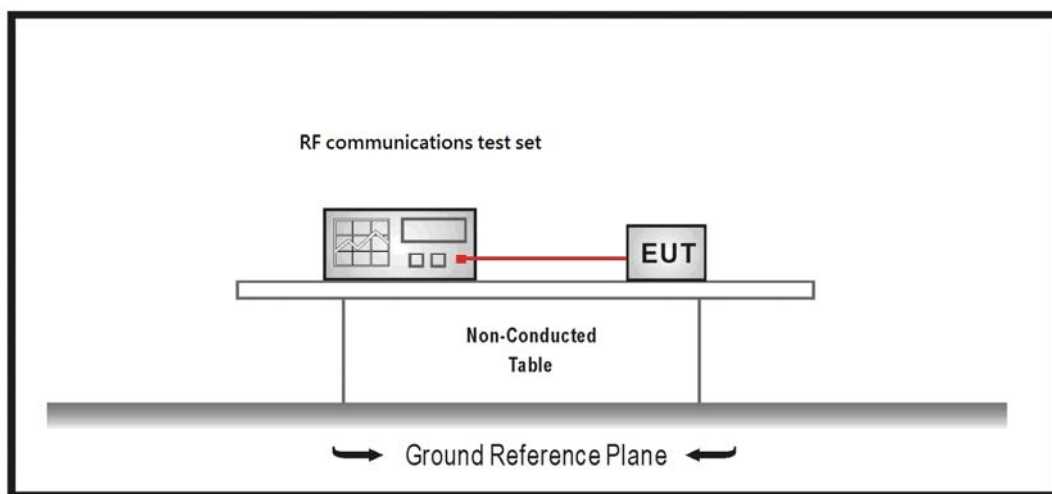
The following test equipments are used during the radiated emission tests:

Transient Frequency Behavior / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
RF-communications Test set	HP	8920A	3614A08091	2015/04/27

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

8.2. Test Setup



8.3. Limits

Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain transient frequencies within the maximum transient frequencies difference limits in the time intervals indicated:

Time Intervals	Maximum frequency difference	All Equipment	
		150-174 MHz	421-512 MHz

Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels

t_1^4	± 25.0 kHz	5.0 ms	10.0 ms
t_2	± 12.5 kHz	20.0 ms	25.0 ms
t_3^4	± 25.0 kHz	5.0 ms	10.0 ms

Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels

t_1^4	± 12.5 kHz	5.0 ms	10.0 ms
t_2	± 6.25 kHz	20.0 ms	25.0 ms
t_3^4	± 12.5 kHz	5.0 ms	10.0 ms

Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels

t_1^4	± 6.25 kHz	5.0 ms	10.0 ms
t_2	± 3.125 kHz	20.0 ms	25.0 ms
t_3^4	± 6.25 kHz	5.0 ms	10.0 ms

- (1) Ton is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.
 t_1 is the time period immediately following ton.
 t_2 is the time period immediately following t_1 .
 t_3 is the time period from the instant when the transmitter is turned off until toff.
toff is the instant when the 1kHz test signal starts to rise.
- (2) During the time from the end of t_2 to the beginning of t_3 , the frequency difference must not exceed the limits specified in §90.214.
- (3) Difference between the actual transmitter frequency and the assigned transmitter frequency.
- (4) If the transmitter carrier output power rating is 6watts or less, the frequency difference during this time may exceed the maximum frequency difference for this period.

8.4. Test Procedure

The test procedure was ANSI/TIA 603-C: 2004. Using the variable attenuator. The transmitter level was set to 40 dB below the test receivers maximum input level. Then the transmitter was turned off. With the transmitter off the signal generator was set 20dB below the level of the transmitter in the above step, this level will be maintained with the signal generator through-out the test.

Reduce the attenuation between the transmitter and the RF detector by 30 dB.

With the levels set as above the transient frequency behavior was observed

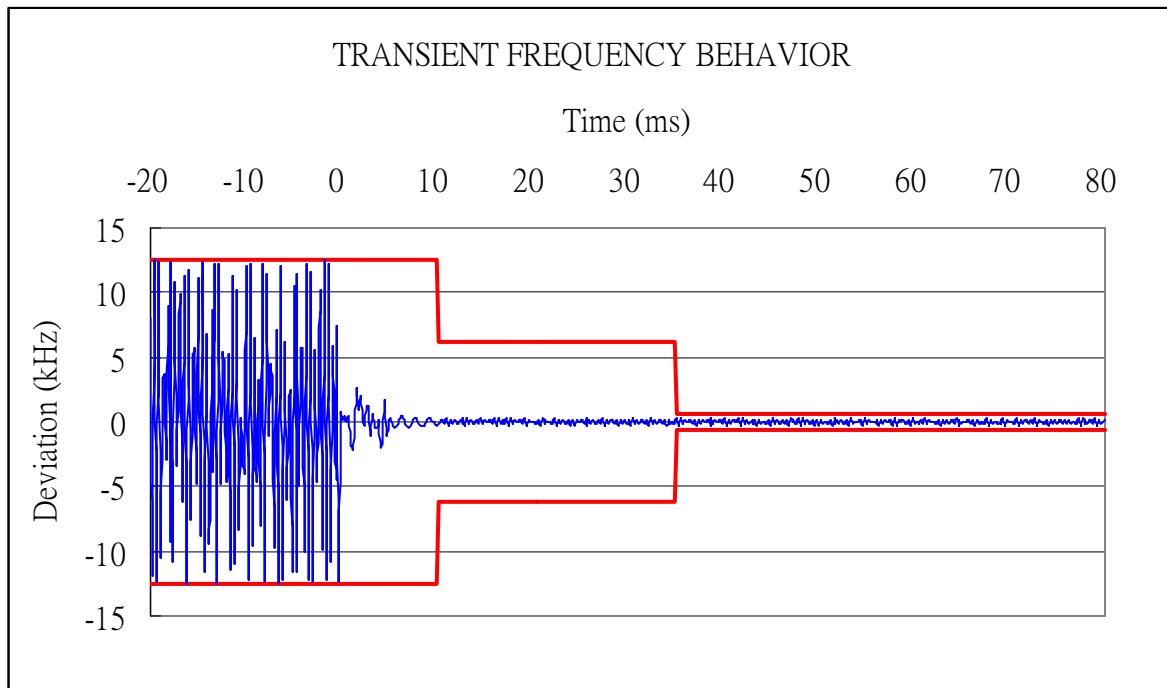
8.5. Uncertainty

The measurement uncertainty is defined as ± 150 Hz

8.6. Test Result

Product	Private land mobile radio		
Test Item	Transient Frequency Behavior		
Test Mode	Mode 1: Transmit		
Date of Test	2015/01/04	Test Site	SR7

Channel on



Channel off

