

FCC Test Report

Product Name : Private land mobile radio

Model No. : ST-2112C

FCC ID. : M38-ST-2112C

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-A

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-2112C

FCC ID. : M38-ST-2112C

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-2112C
Frequency Range	421-470MHz
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 $\approx$ 1000mA Cable Out: Non-shielded, 1.5m

Note:

1. This device is a Private land mobile radio, which including 421-470MHz 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
----	------------------

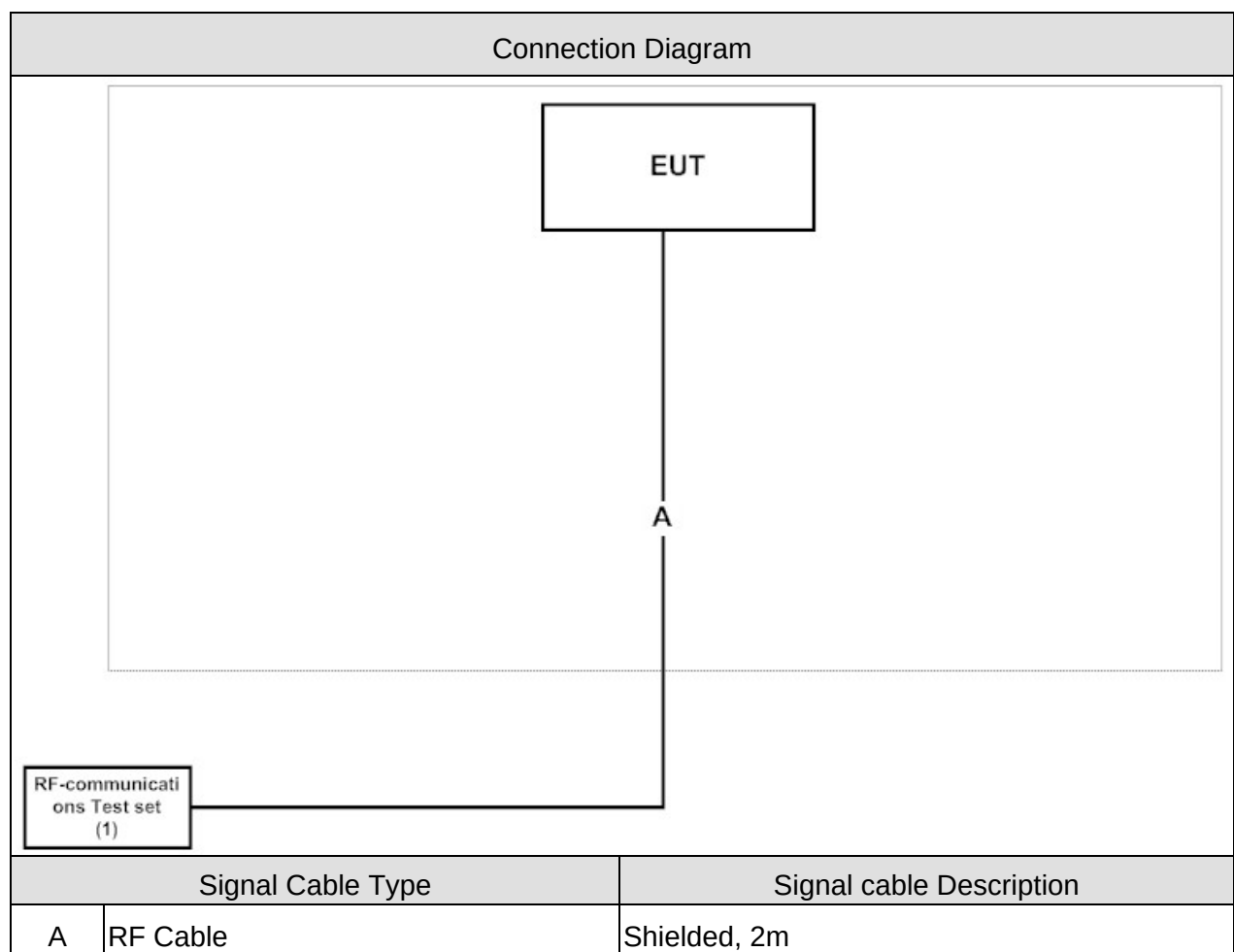
Test Items	Section	Frequency (MHz)	Mode	Result
RF Power Output	90.205	421/450/470	1	Complies
Modulation Characteristics	90.242(b)	421/450/470	1	Complies
Modulation Limiting	90.210	421/450/470	1	Complies
Occupied Bandwidth	90.209 & 90.210	421/450/470	1	Complies
Spurious Emissions at Antenna Terminals (Conducted)	90.210	421/450/470	1	Complies
Field Strength of Spurious Emissions	90.210	421/450/470	1	Complies
Frequency Stability	90.213	421/450/470	1	Complies
Transient Frequency Behavior	90.214	421/450/470	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

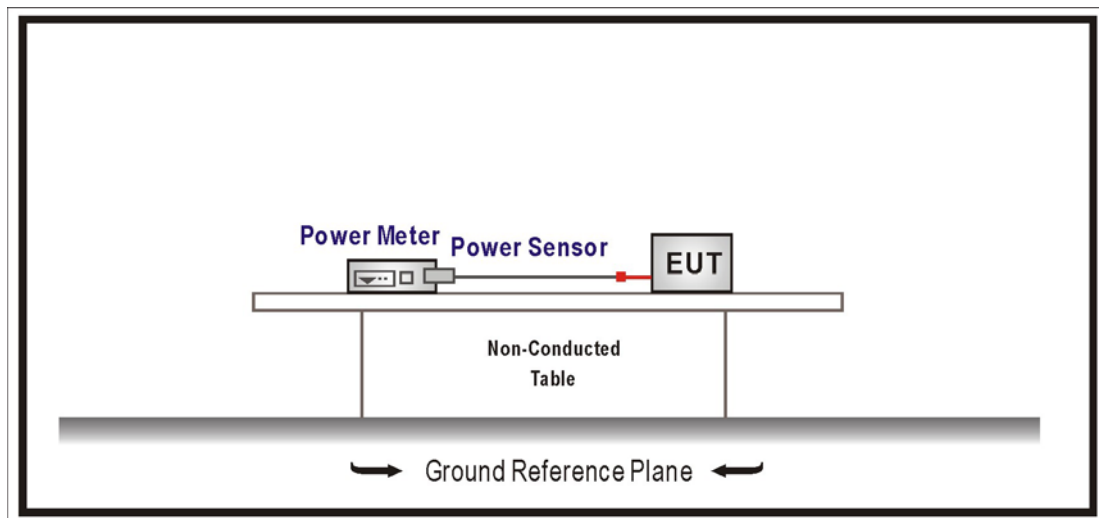
The following test equipments are used during the test:

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	421	36.040	4.018	Reference 90.205
Mid	450	36.090	4.064	Reference 90.205
High	470	36.080	4.055	Reference 90.205

6.25KHz

Channel No.	Frequency (MHz)	Measure Level (dBm)	Measure Level (W)	Limit (dBm)
Low	421	31.42	1.387	Reference 90.205
Mid	450	31.29	1.347	Reference 90.205
High	470	31.84	1.529	Reference 90.205

3. Modulation Characteristics

3.1. Test Equipment

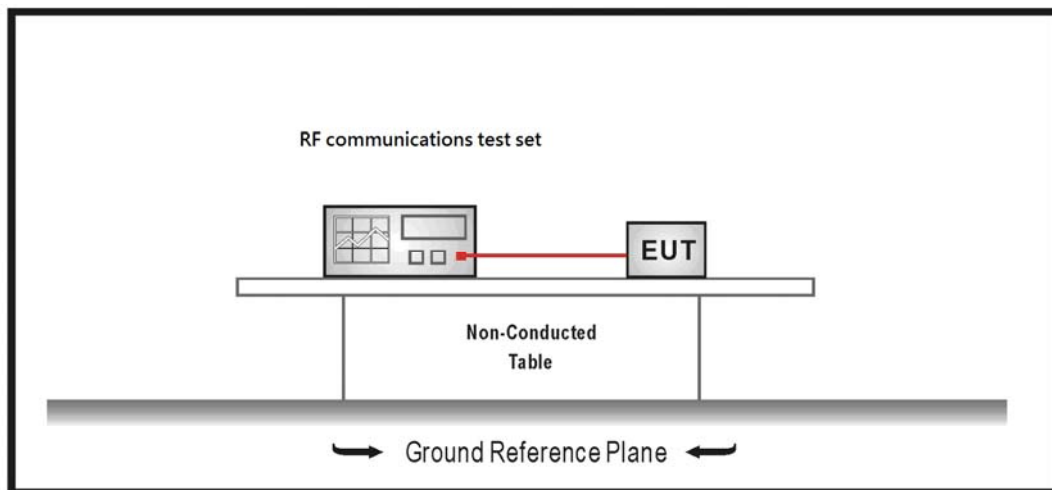
The following test equipments are used during the radiated emission tests:

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.

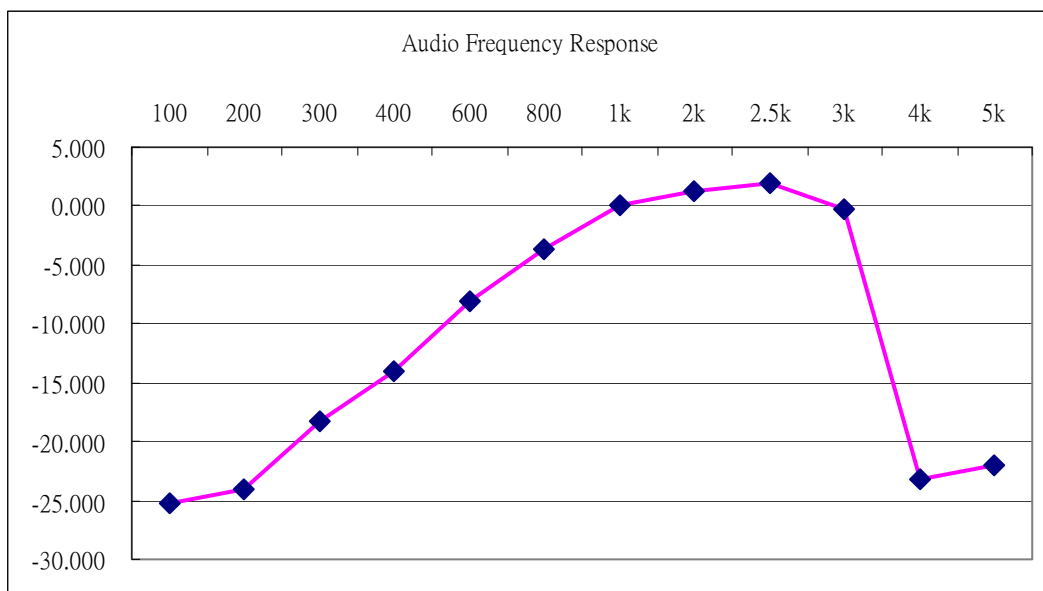
Audio Input versus modulation

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

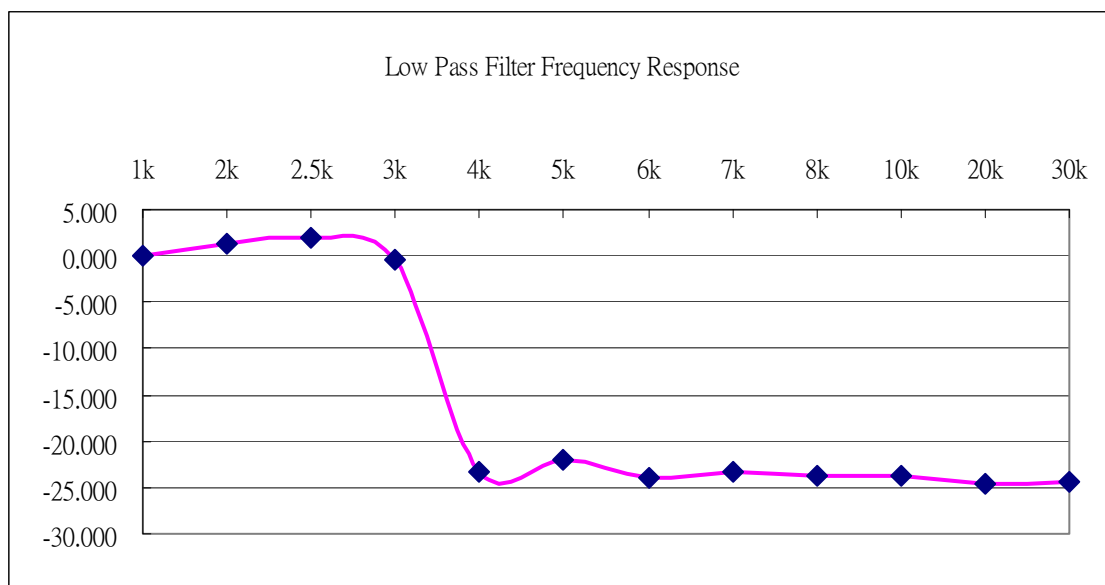
Product	Private land mobile radio		
Test Item	Audio Frequency Response		
Test Mode	Mode 1: Transmit		
Date of Test	2015/01/04	Test Site	SR7

Audio Frequency (Hz)	Deviation	dB
100	0.088	-25.290
200	0.101	-24.093
300	0.197	-18.290
400	0.324	-13.969
600	0.635	-8.124
800	1.051	-3.748
1k	1.618	0.000
2k	1.866	1.239
2.5k	2.036	1.996
3k	1.562	-0.306
4k	0.111	-23.273
5k	0.128	-22.035



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

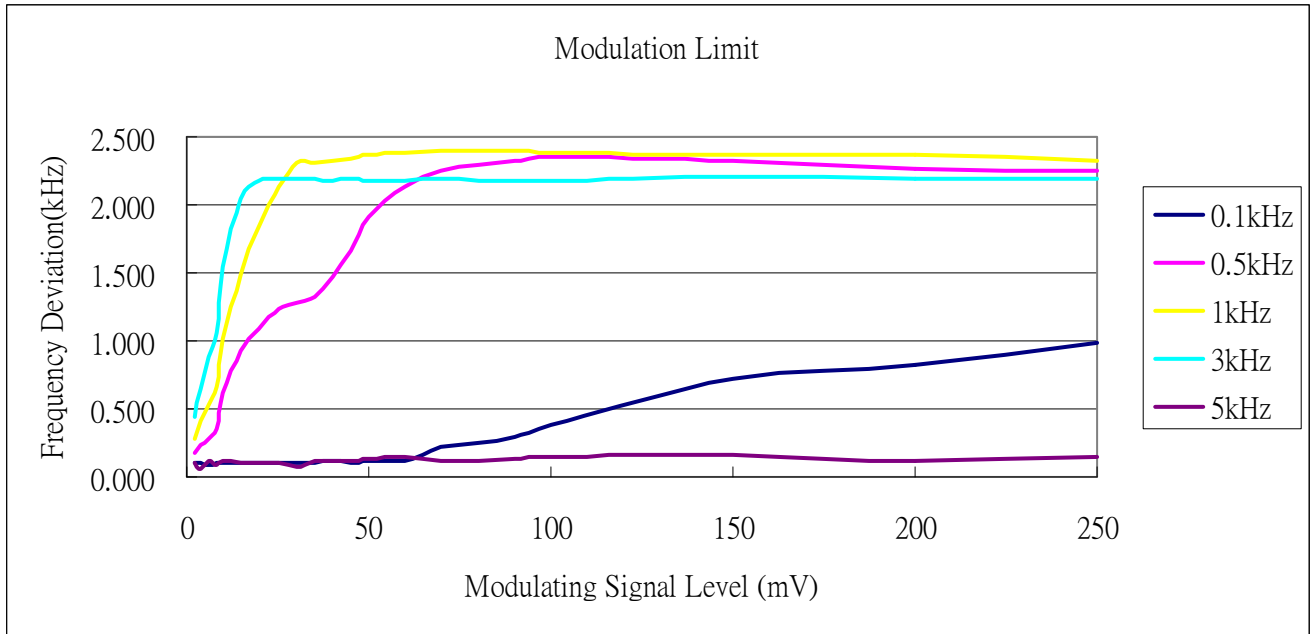
Audio Frequency (Hz)	Deviation	dB
1k	1.618	0.000
2k	1.866	1.239
2.5k	2.036	1.996
3k	1.562	-0.306
4k	0.111	-23.273
5k	0.128	-22.035
6k	0.102	-24.008
7k	0.112	-23.195
8k	0.104	-23.839
10k	0.105	-23.756
20k	0.096	-24.534
30k	0.097	-24.444



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

Modulating Signal Level	Peak Frequency Deviation (kHz) at the following modulating frequency:					Maximum Limit
	0.1kHz	0.5kHz	1kHz	3kHz	5kHz	
mV						kHz
2	0.094	0.176	0.269	0.439	0.089	2.5
4	0.099	0.233	0.406	0.662	0.064	2.5
6	0.098	0.279	0.540	0.870	0.052	2.5
8	0.095	0.351	0.655	1.070	0.082	2.5
10	0.100	0.613	1.022	1.554	0.101	2.5
15	0.098	0.920	1.497	2.053	0.076	2.5
20	0.105	1.085	1.826	2.166	0.093	2.5
25	0.103	1.239	2.135	2.194	0.101	2.5
30	0.112	1.274	2.313	2.175	0.075	2.5
35	0.106	1.317	2.301	2.169	0.124	2.5
40	0.108	1.472	2.322	2.192	0.115	2.5
45	0.112	1.670	2.351	2.188	0.101	2.5
50	0.111	1.920	2.351	2.180	0.110	2.5
60	0.118	2.127	2.392	2.178	0.129	2.5
70	0.212	2.242	2.406	2.189	0.112	2.5
80	0.252	2.295	2.389	2.172	0.139	2.5
90	0.304	2.327	2.404	2.177	0.141	2.5
100	0.373	2.355	2.382	2.199	0.144	2.5
150	0.714	2.318	2.379	2.204	0.123	2.5
200	0.817	2.263	2.362	2.208	0.138	2.5
250	0.981	2.252	2.324	2.180	0.147	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



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	0.088	2.5
200	0.101	2.5
300	0.197	2.5
400	0.324	2.5
600	0.635	2.5
800	1.051	2.5
1k	1.618	2.5
2k	1.866	2.5
2.5k	2.036	2.5
3k	1.562	2.5
4k	0.111	2.5
5k	0.128	2.5
6k	0.102	2.5
7k	0.112	2.5
8k	0.104	2.5
10k	0.105	2.5
20k	0.096	2.5
30k	0.097	2.5

3.6. Digital Modulation

Max Deviation measured for 6.25KHz Channel Spacing F1E&F1D = 840Hz

4. Occupied Bandwidth

4.1. Test Equipment

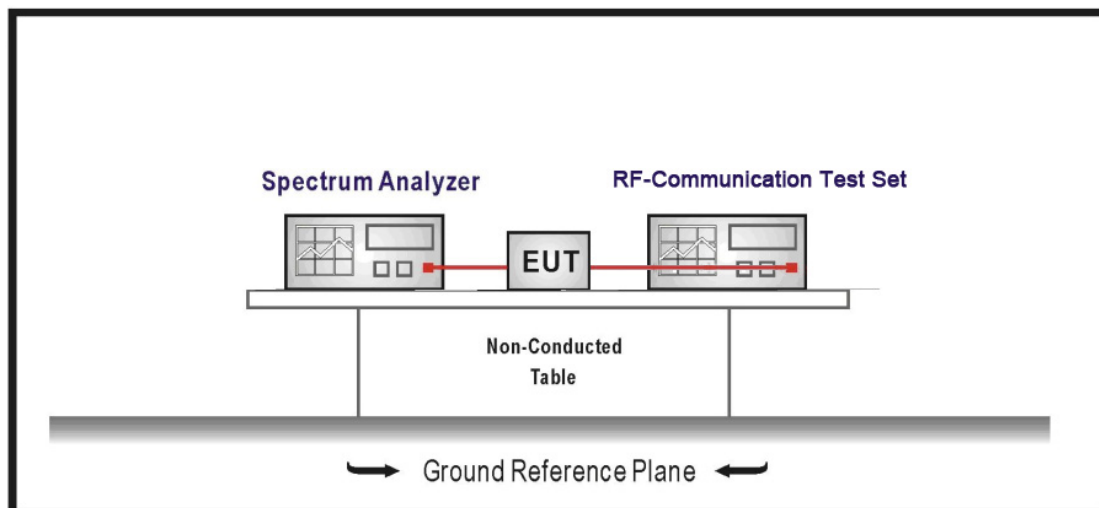
The following test equipments are used during the radiated emission tests:

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.

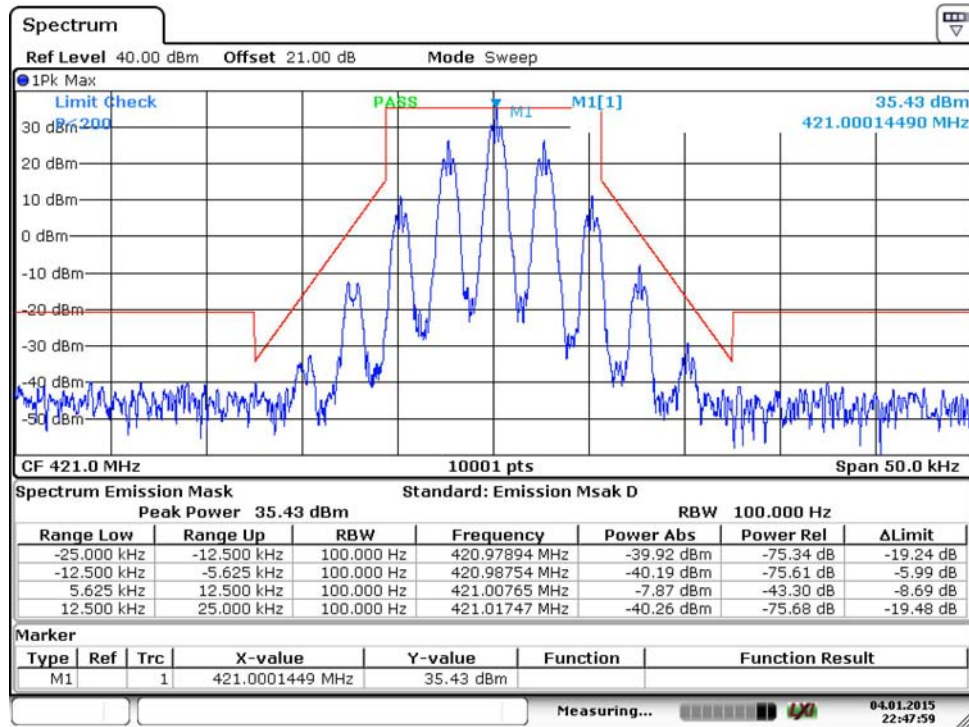
4.5. Uncertainty

The measurement uncertainty is defined as ± 150 Hz

4.6. Test Result

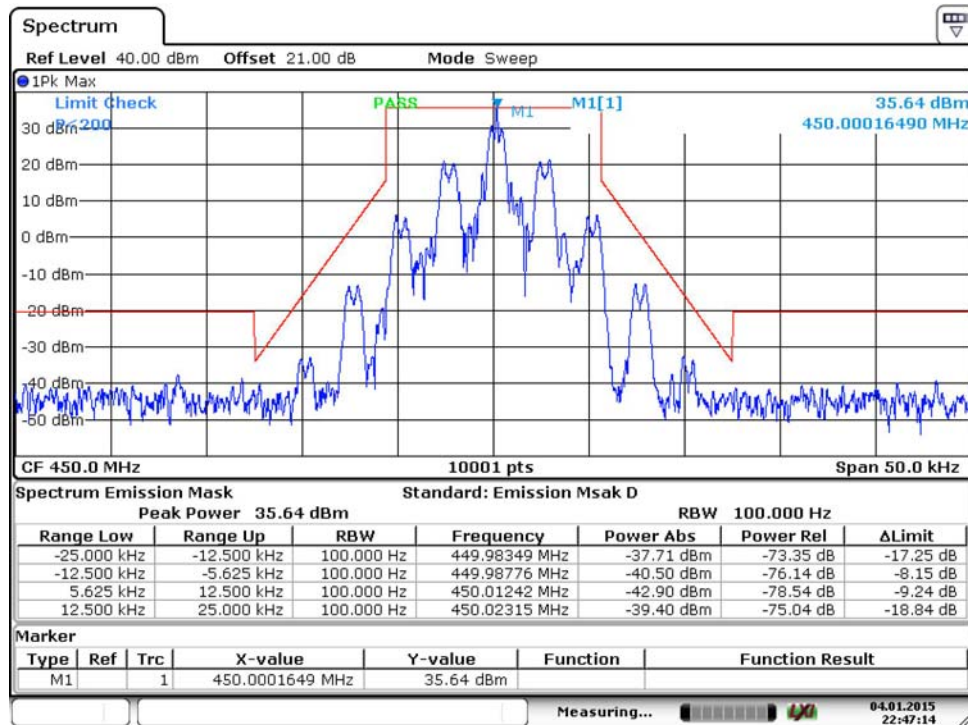
Product	Private land mobile radio		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2015/01/04	Test Site	SR7

421MHz(Modulation)



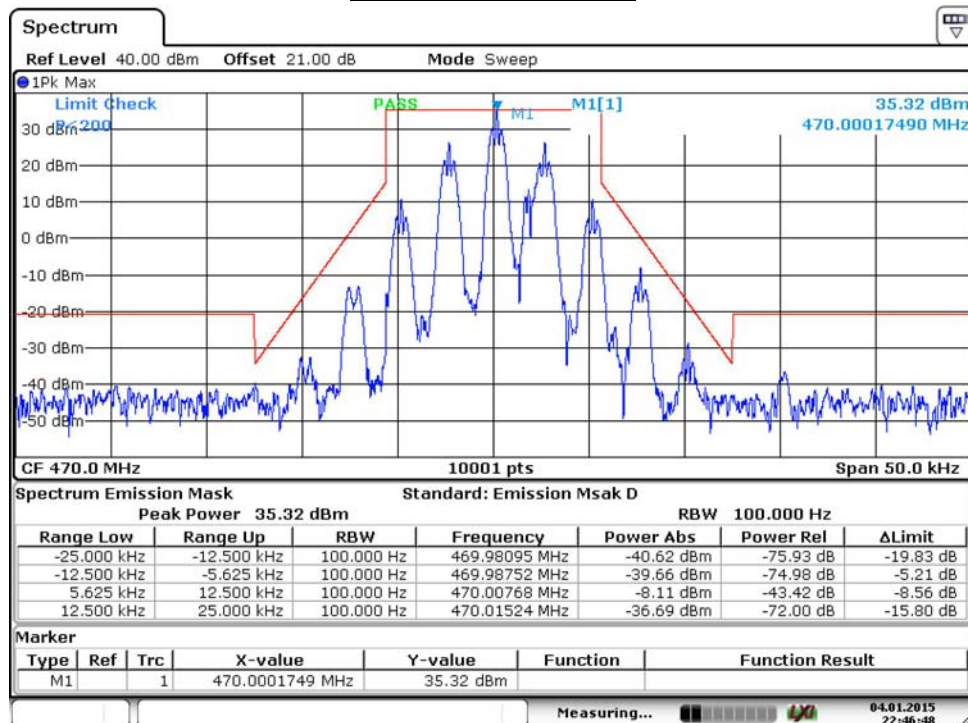
Date: 4.JAN.2015 22:47:59

450MHz(Modulation)



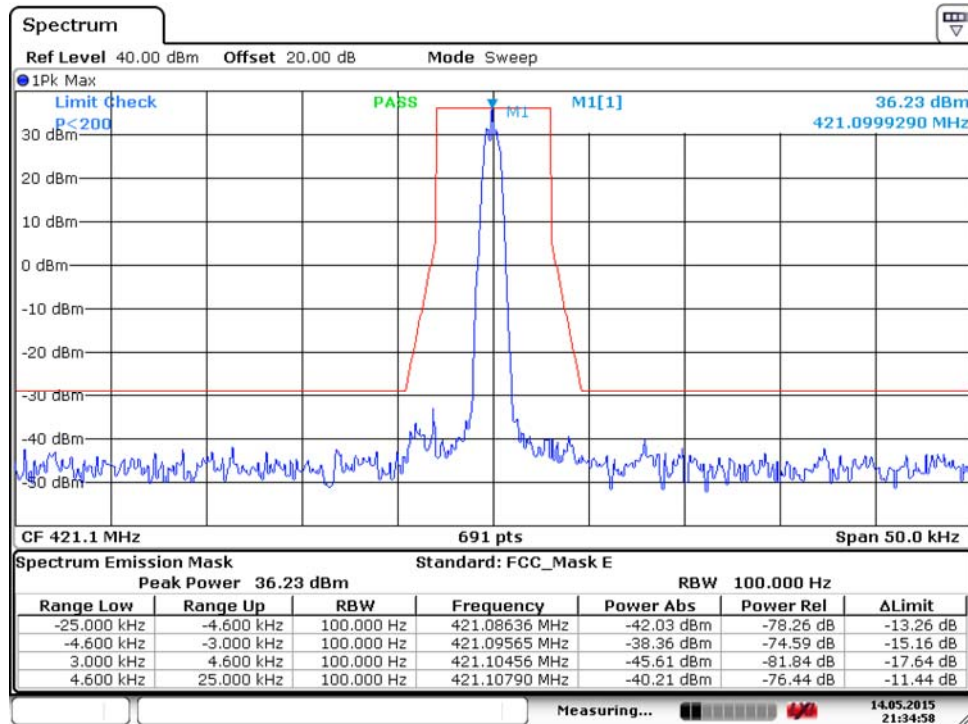
Date: 4.JAN.2015 22:47:14

470MHz(Modulation)



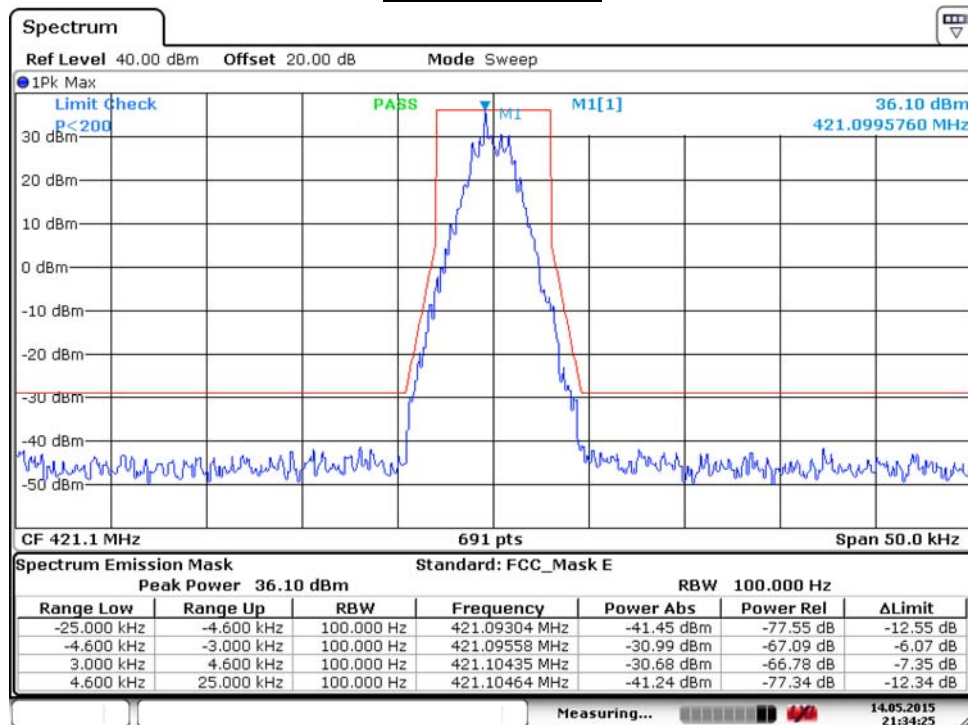
Date: 4.JAN.2015 22:46:48

421 MHz (Carr Mask)



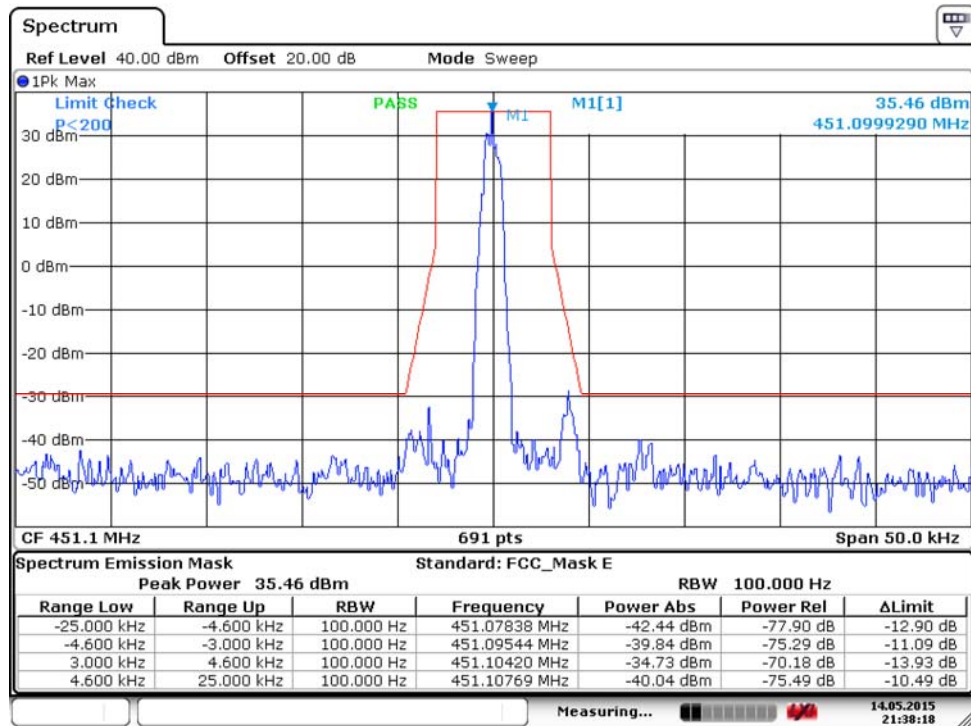
Date: 14.MAY.2015 21:34:58

421 MHz (Mask)



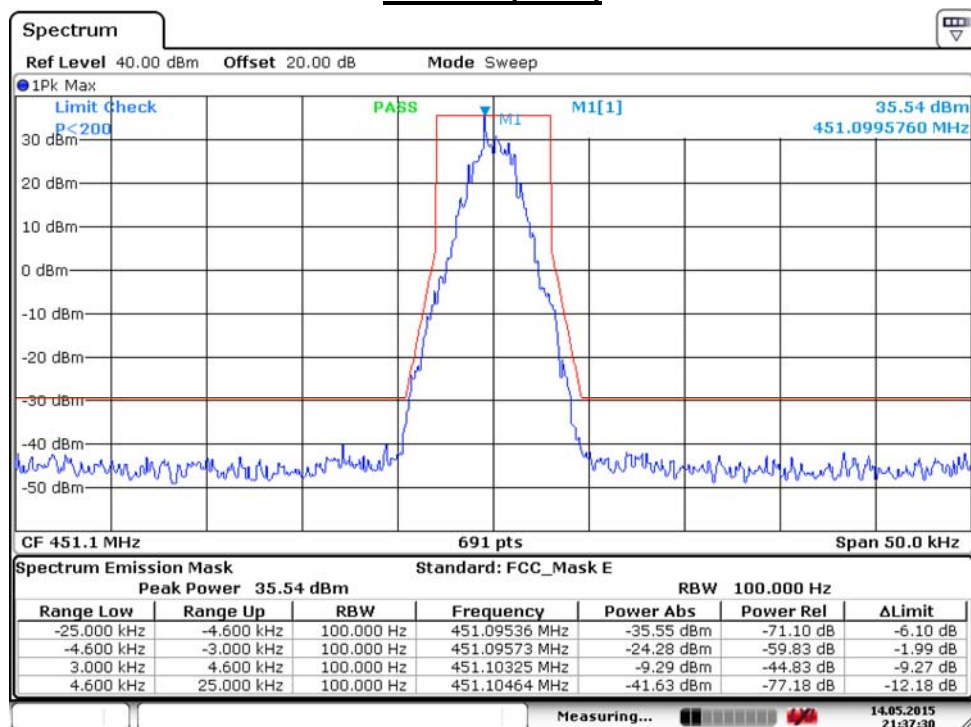
Date: 14.MAY.2015 21:34:24

450 MHz (Carr Mask)



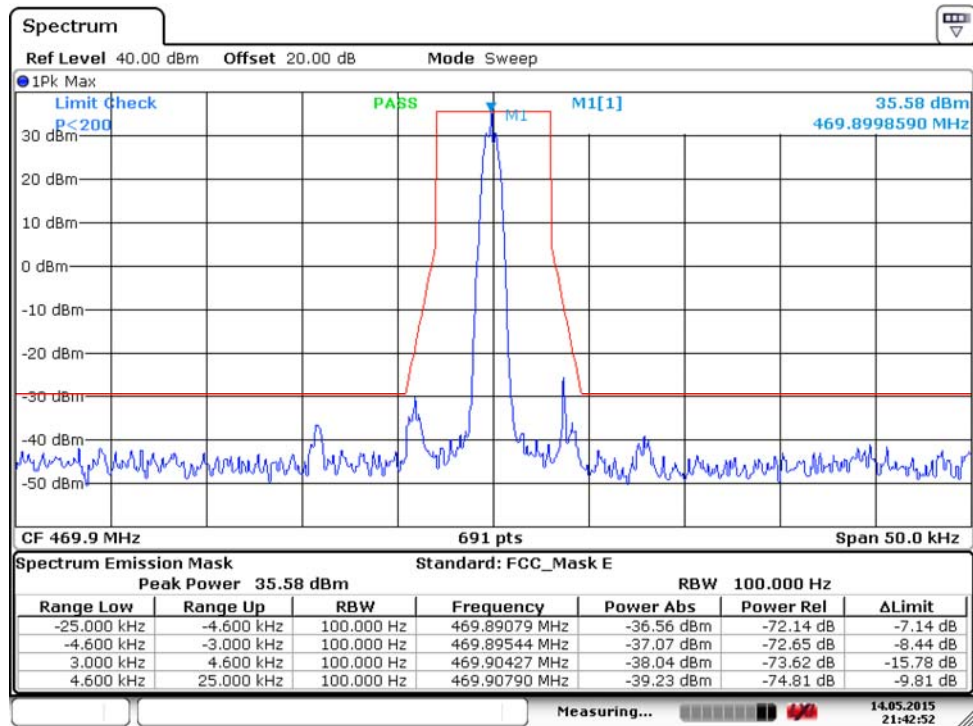
Date: 14.MAY.2015 21:38:18

450 MHz (Mask)



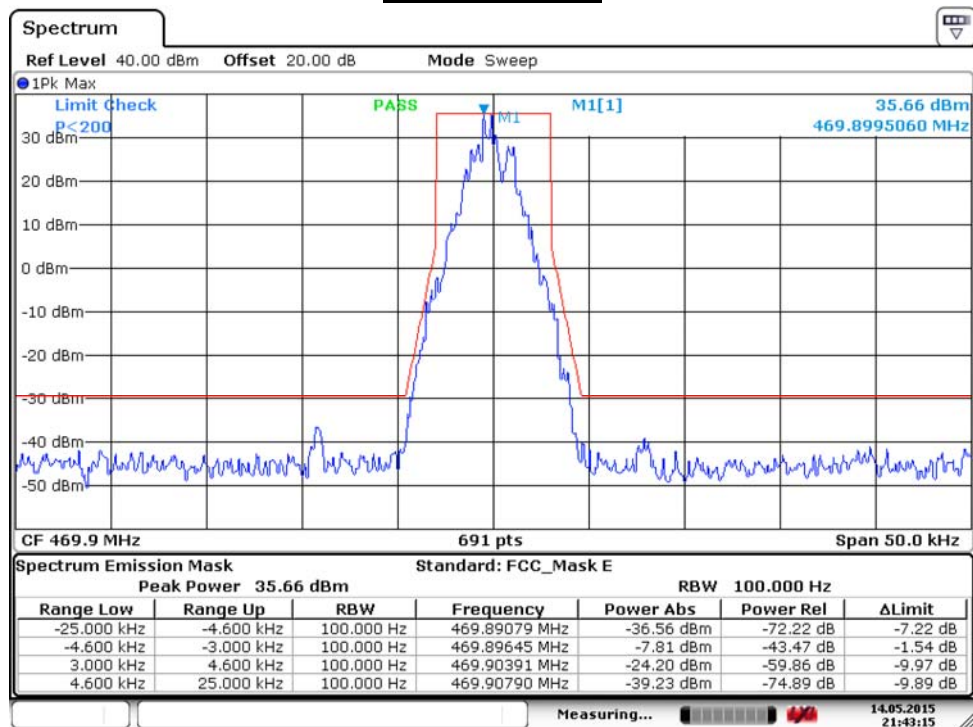
Date: 14.MAY.2015 21:37:31

470 MHz (Carr Mask)



Date: 14.MAY.2015 21:42:51

470 MHz (Mask)



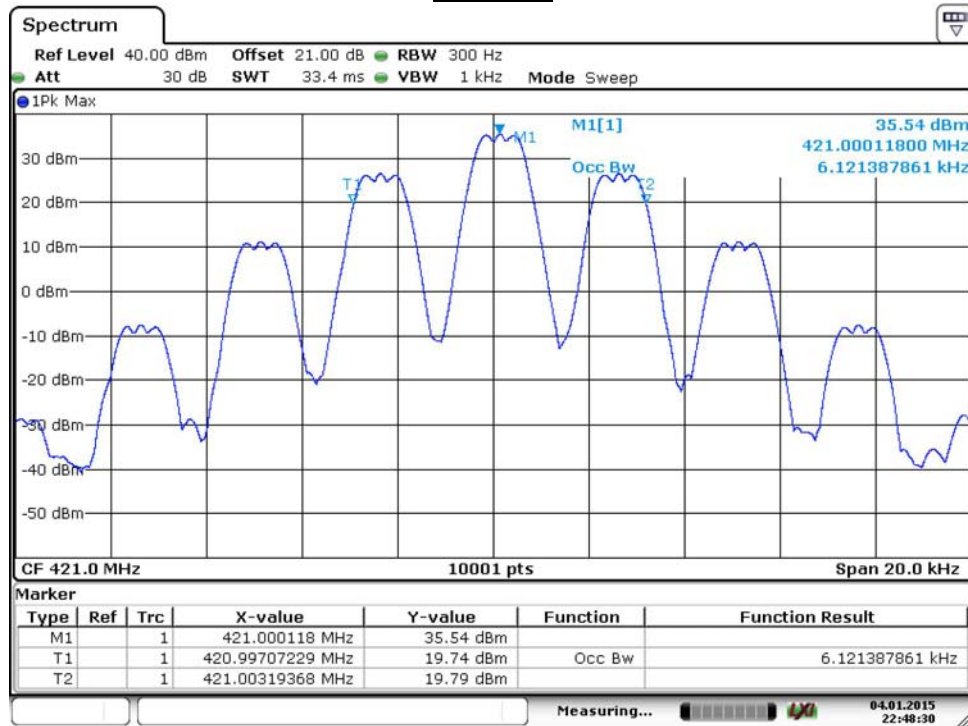
Date: 14.MAY.2015 21:43:15

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

Analog

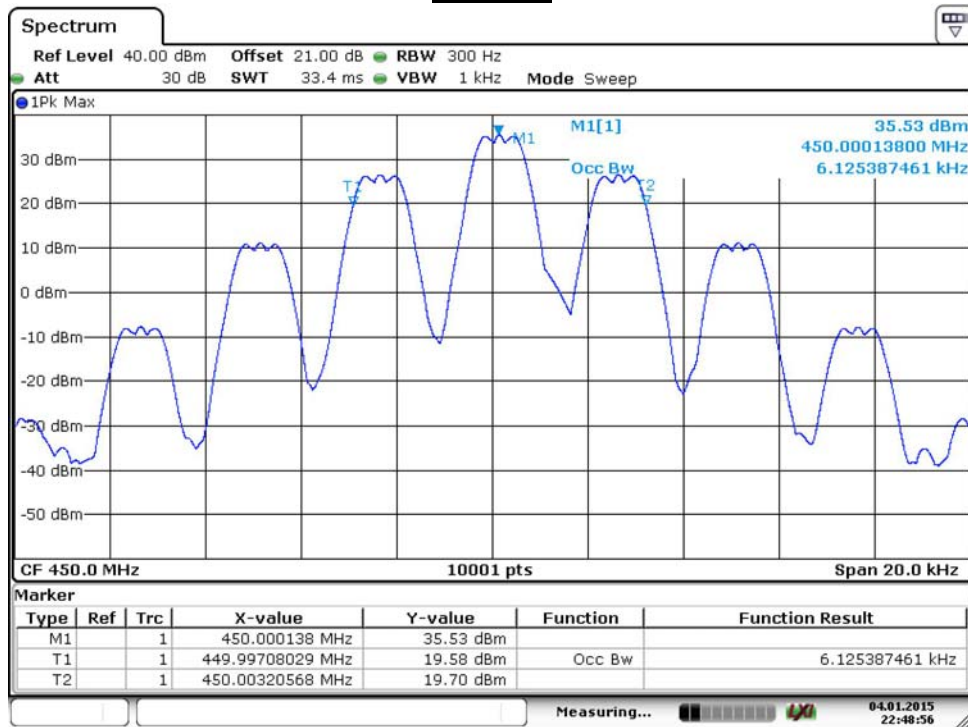
Channel	Frequency (MHz)	Measure Level(kHz)	Limit (kHz)	Result
Low	421	6.121	--	Pass
Mid	450	6.125	--	Pass
High	470	6.125	--	Pass

421MHz



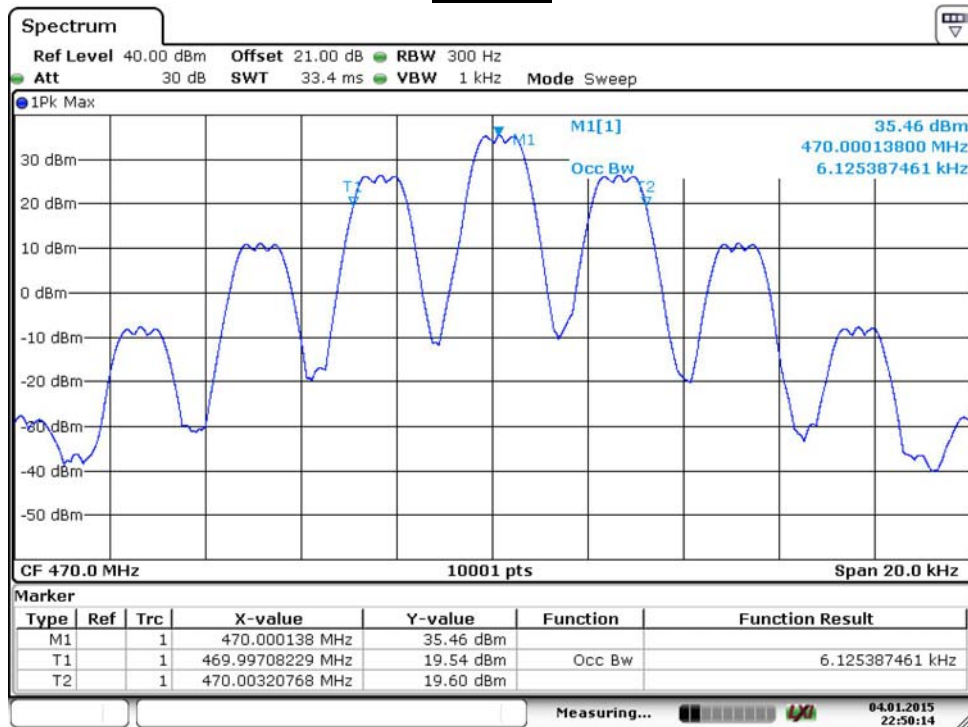
Date: 4.JAN.2015 22:48:30

450MHz



Date: 4.JAN.2015 22:48:57

470MHz



Date: 4.JAN.2015 22:50:15

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	421	3.518	--	Pass
Mid	450	3.798	--	Pass
High	470	3.688	--	Pass

421MHz



Date: 14.MAY.2015 21:32:01

450MHz



Date: 14.MAY.2015 21:38:46

470MHz



Date: 14.MAY.2015 21:39:32

5. Spurious Emissions at Antenna Terminals (Conducted)

5.1. Test Equipment

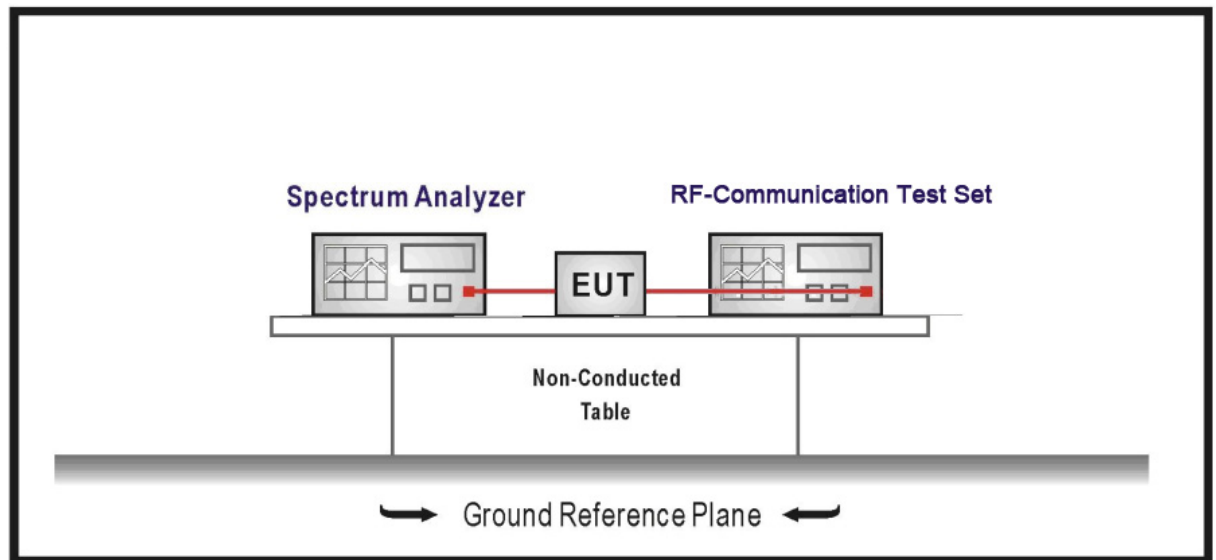
The following test equipments are used during the radiated emission test:

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

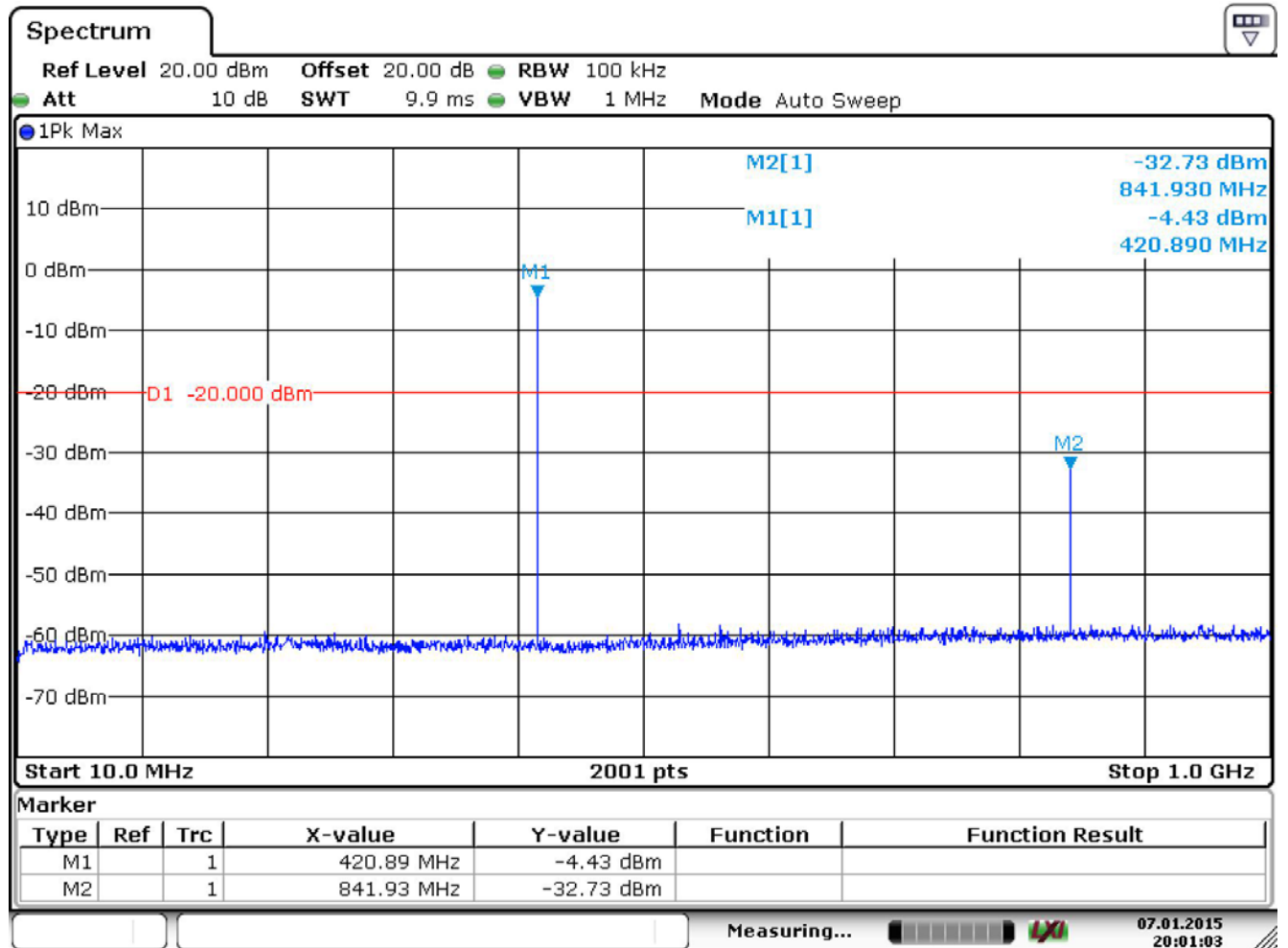
5.5. Uncertainty

The measurement uncertainty is defined as ± 1.27 dB

5.6. Test Result

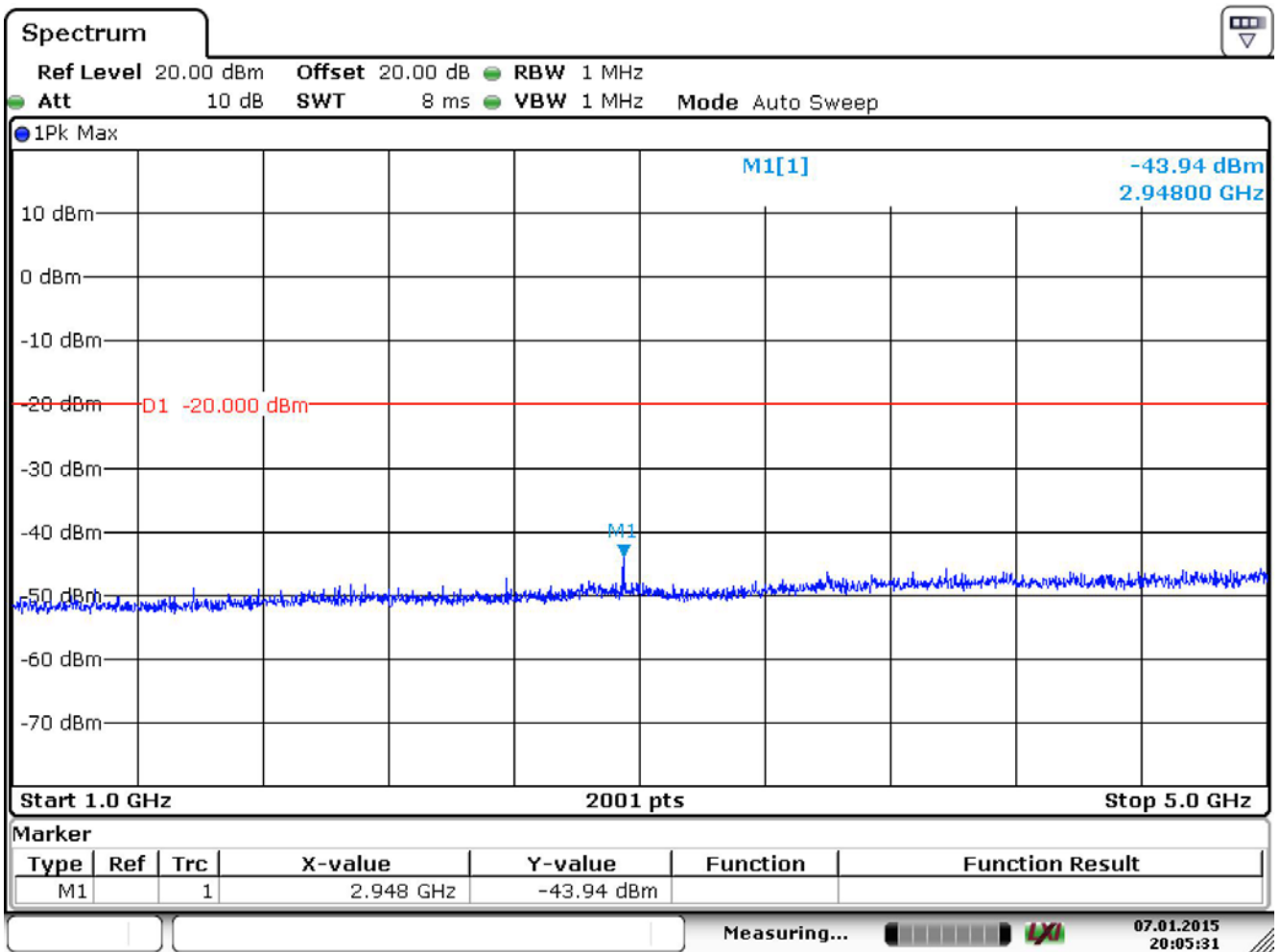
Product	Private land mobile radio		
Test Item	Spurious Emissions at Antenna Terminals (Conducted)		
Test Mode	Mode 1: Transmit		
Date of Test	2015/05/25	Test Site	SR7

421MHz(10MHz-1GHz) – 12.5KHz



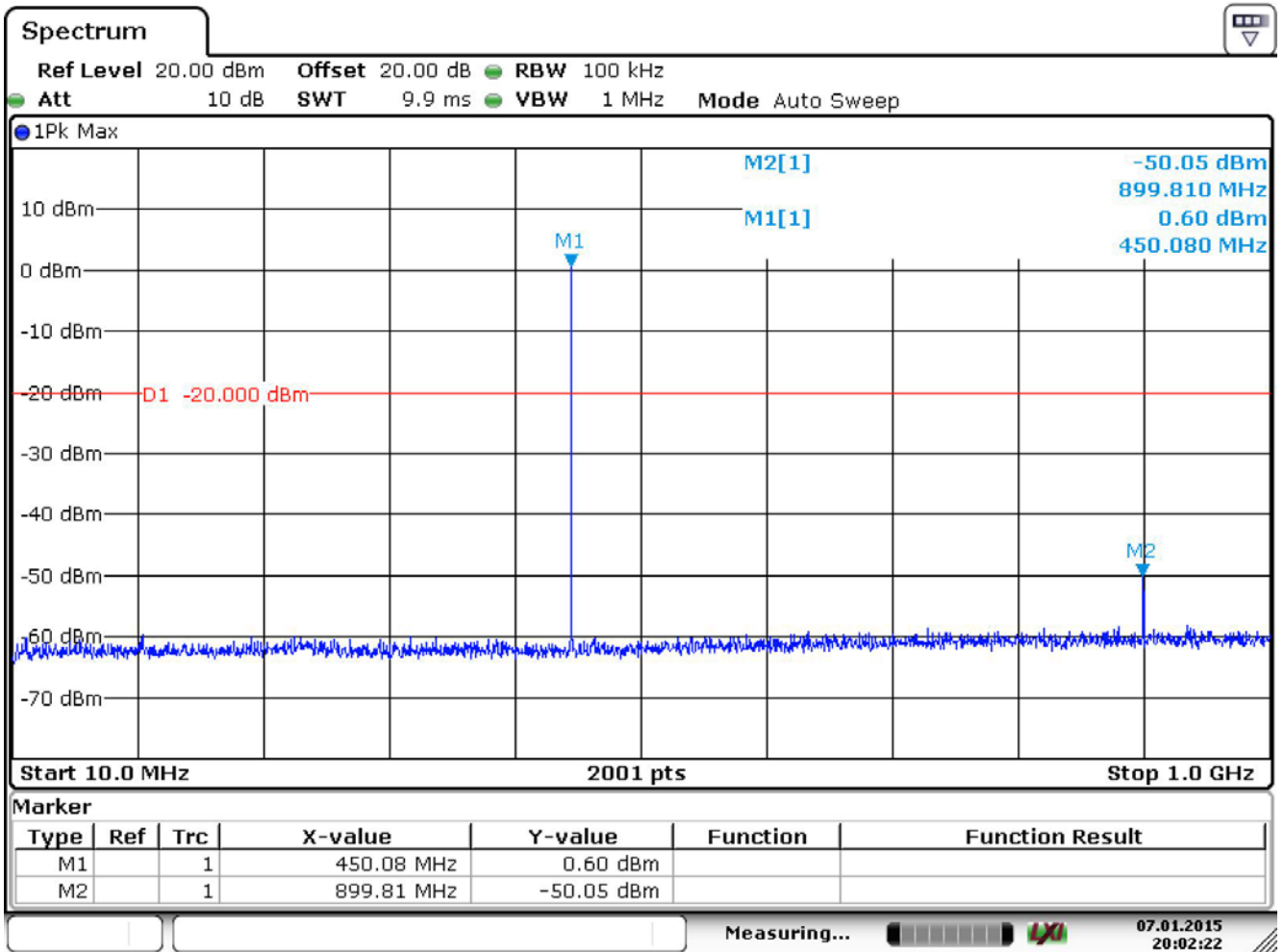
Date: 7.JAN.2015 20:01:04

421MHz(1GHz-5GHz) – 12.5KHz



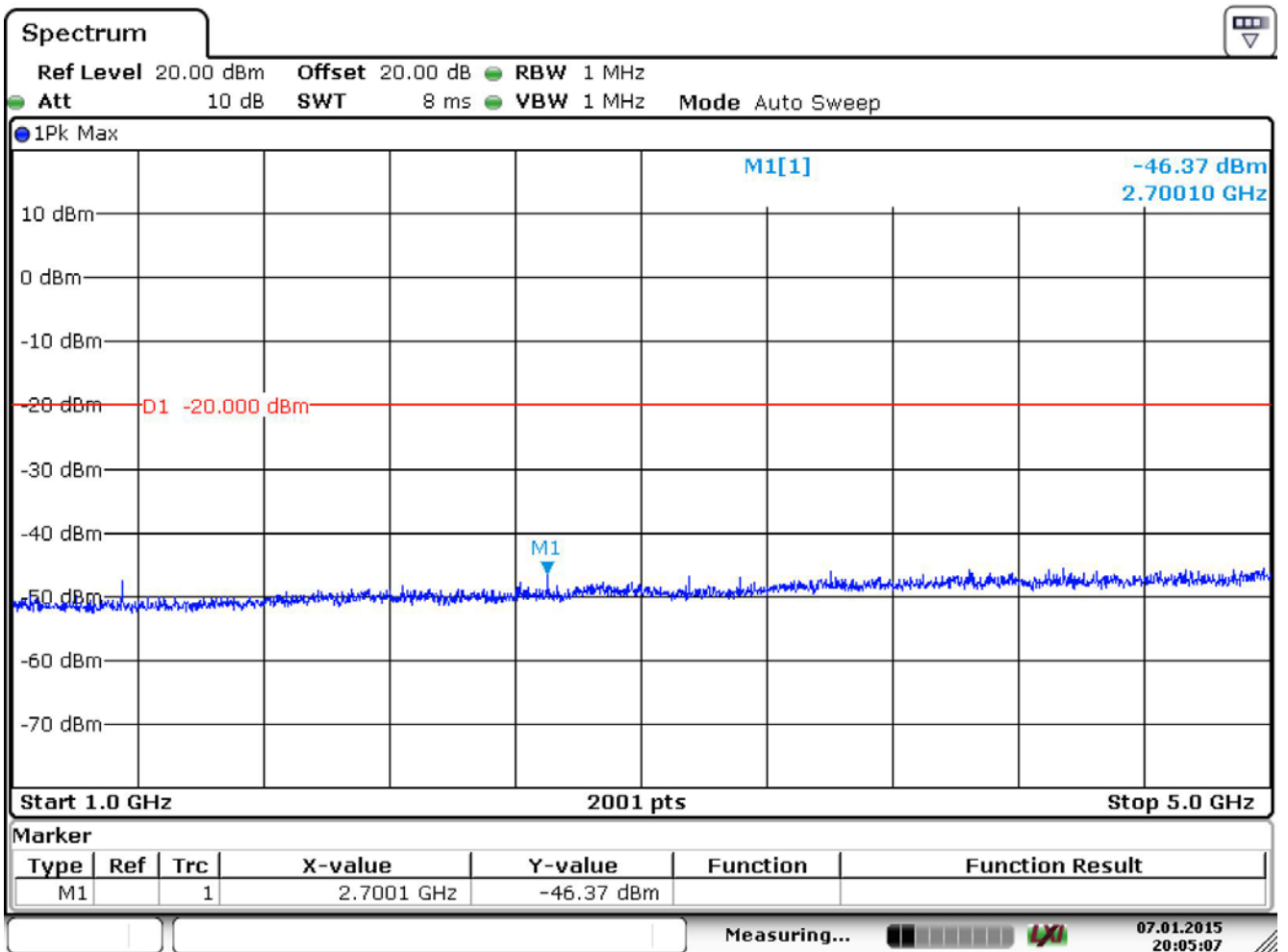
Date: 7.JAN.2015 20:05:31

450MHz(10MHz-1GHz) – 12.5KHz



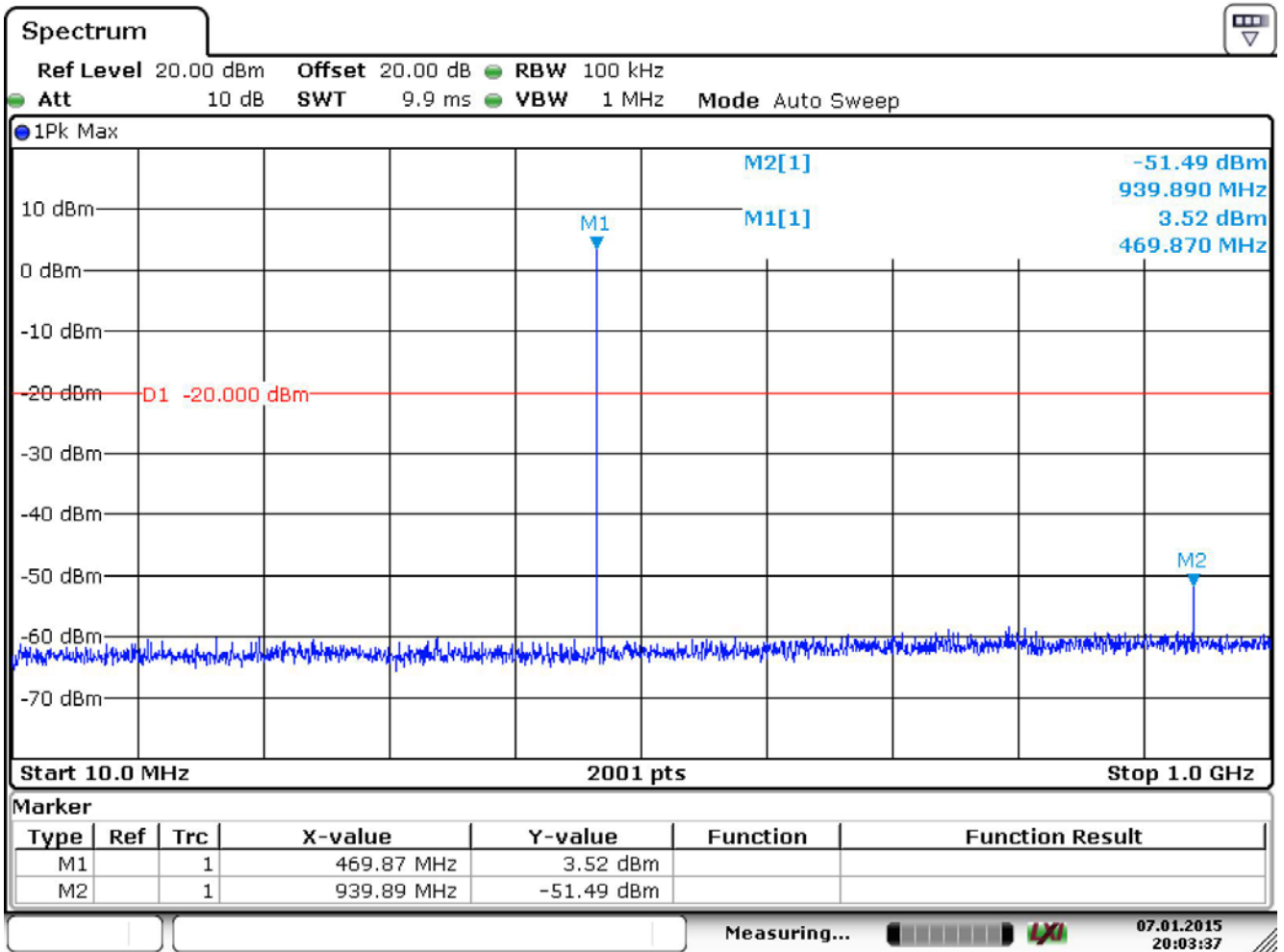
Date: 7.JAN.2015 20:02:21

450MHz(1GHz-5GHz) – 12.5KHz



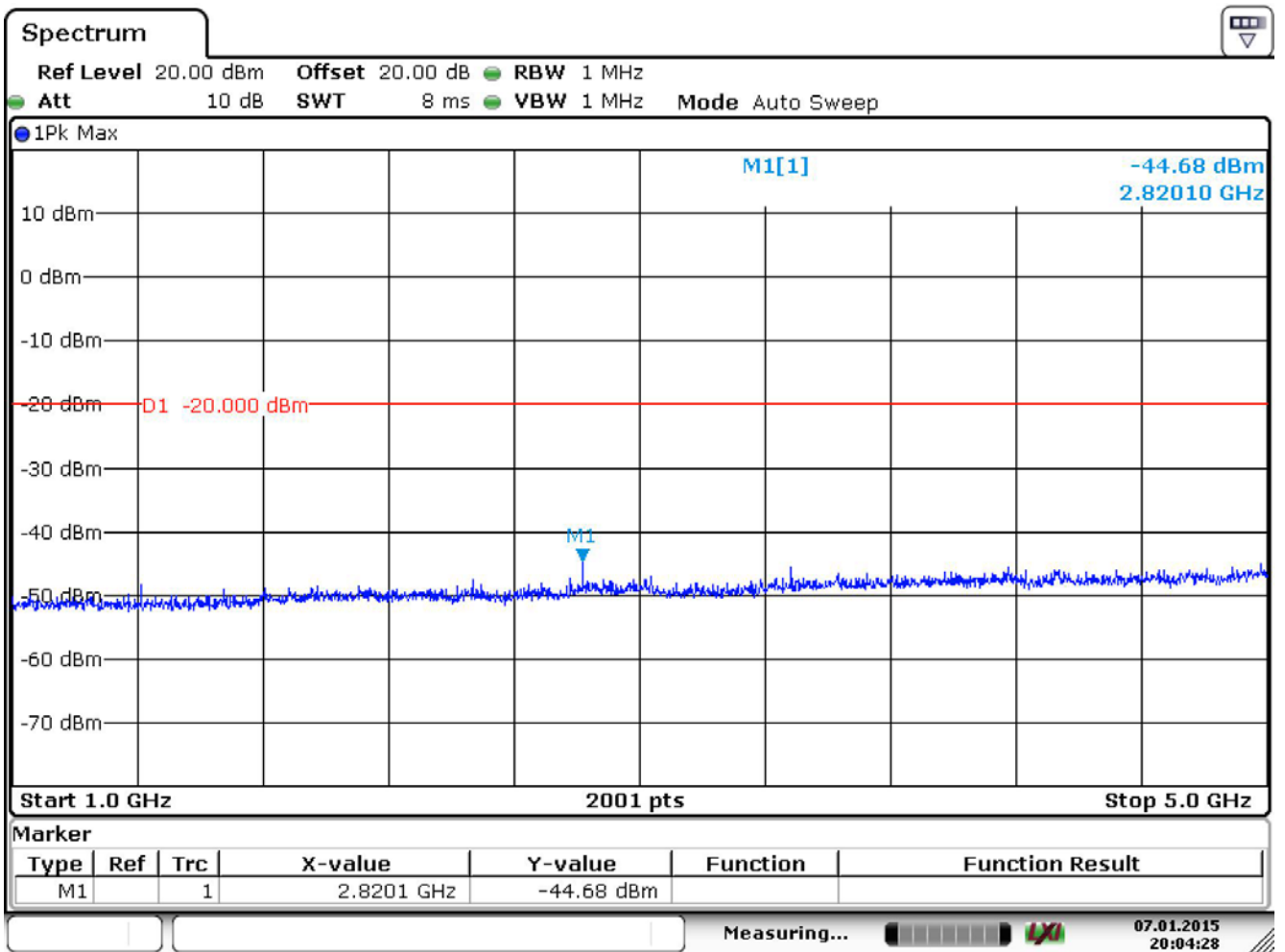
Date: 7.JAN.2015 20:05:07

470MHz(10MHz-1GHz) – 12.5KHz



Date: 7.JAN.2015 20:03:37

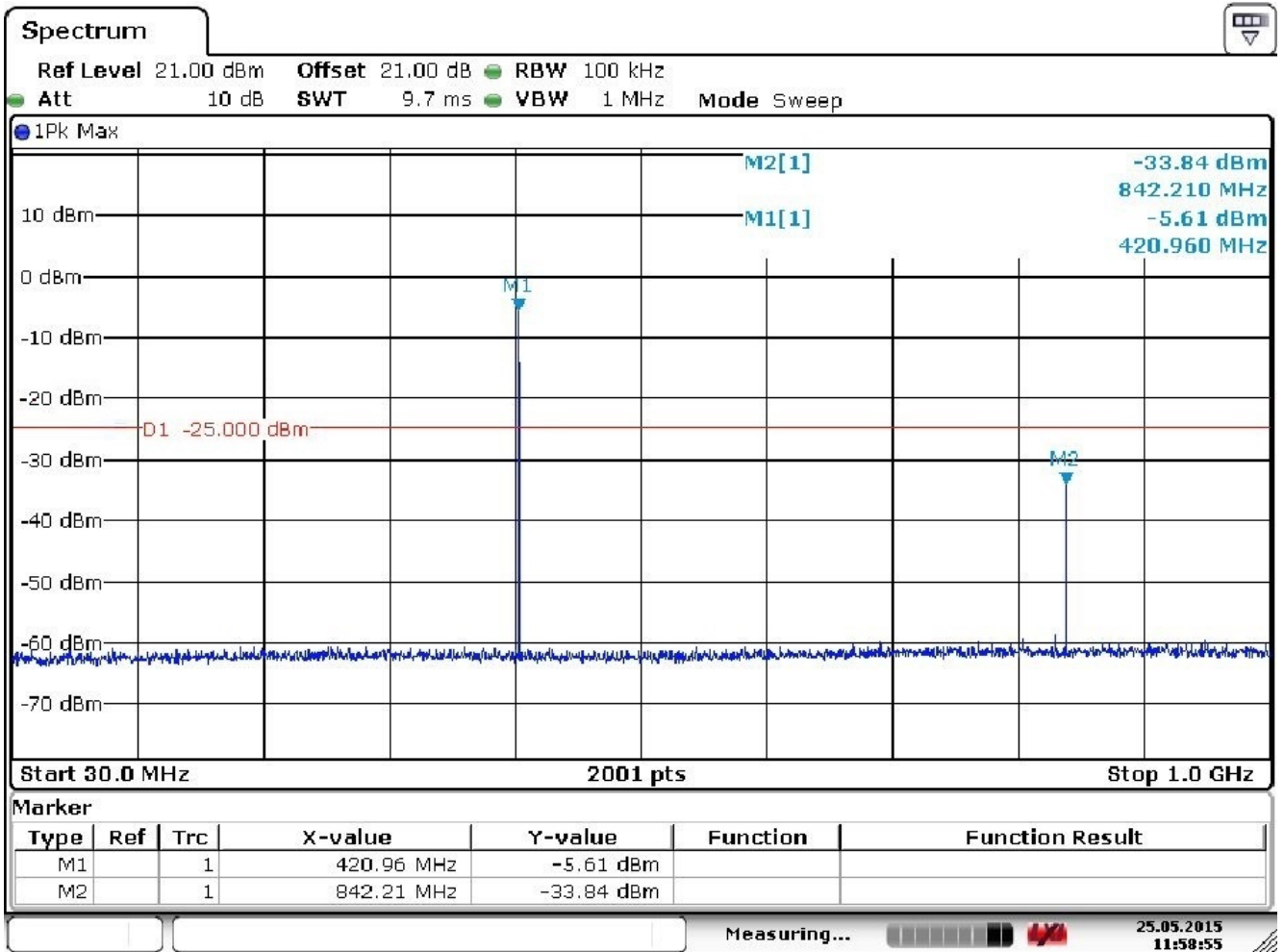
470MHz(1GHz-5GHz) – 12.5KHz



Date: 7.JAN.2015 20:04:28

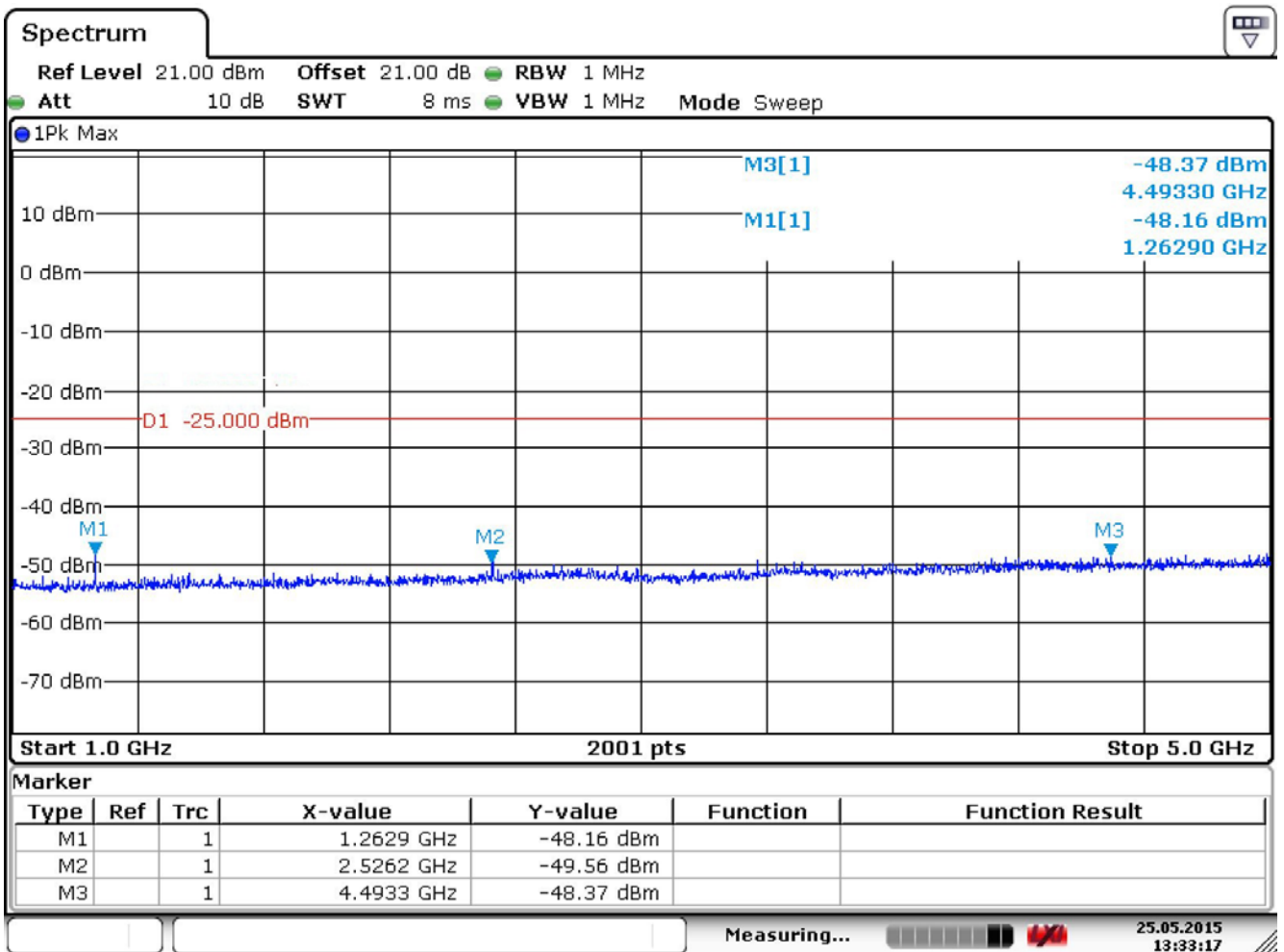
]

421MHz(30MHz-1GHz) – 6.25KHz



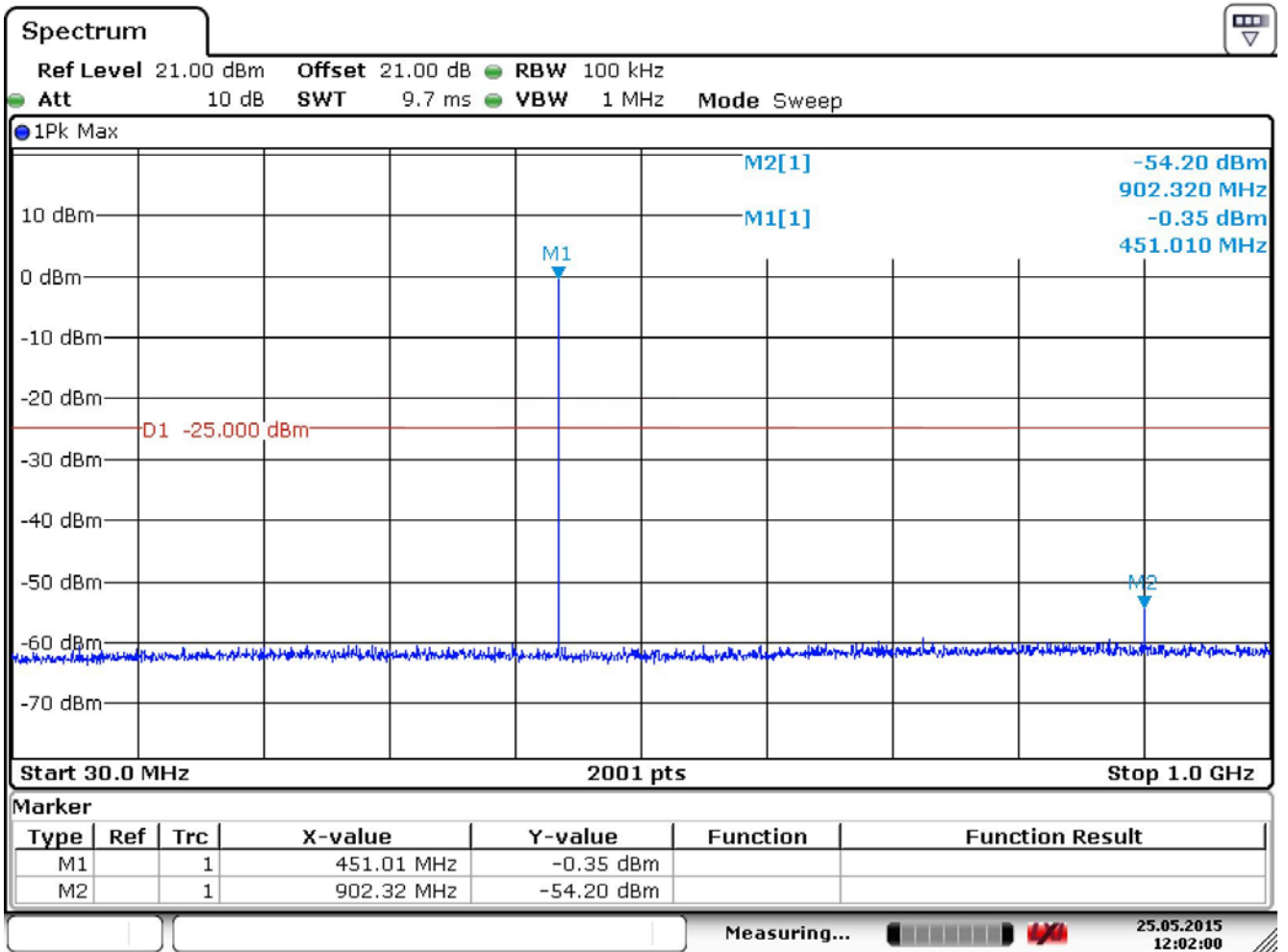
Date: 25 MAY 2015 11:58:55

421MHz(1GHz-5GHz) – 6.25KHz



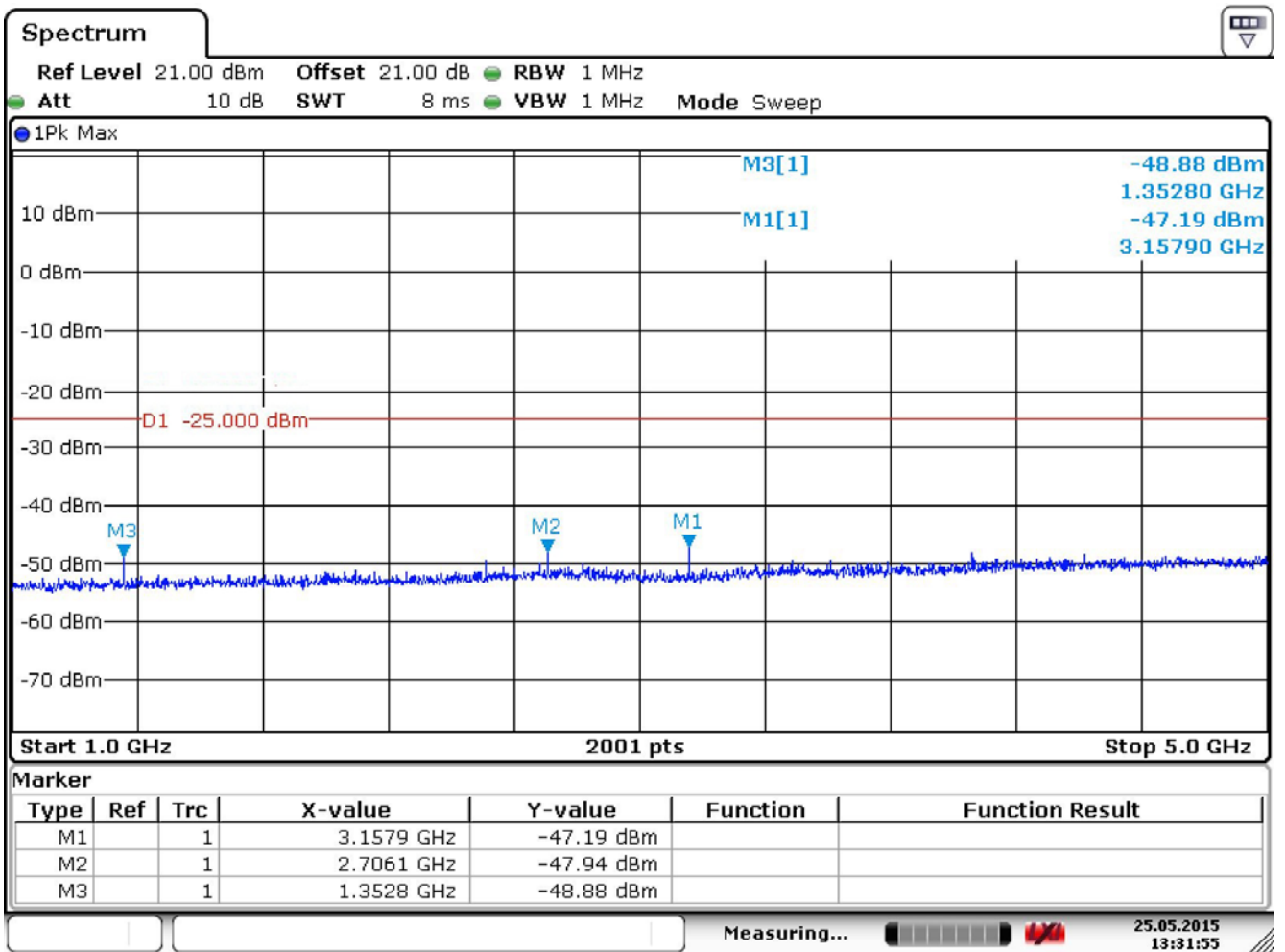
Date: 25.MAY.2015 13:33:17

450MHz(30MHz-1GHz) – 6.25KHz



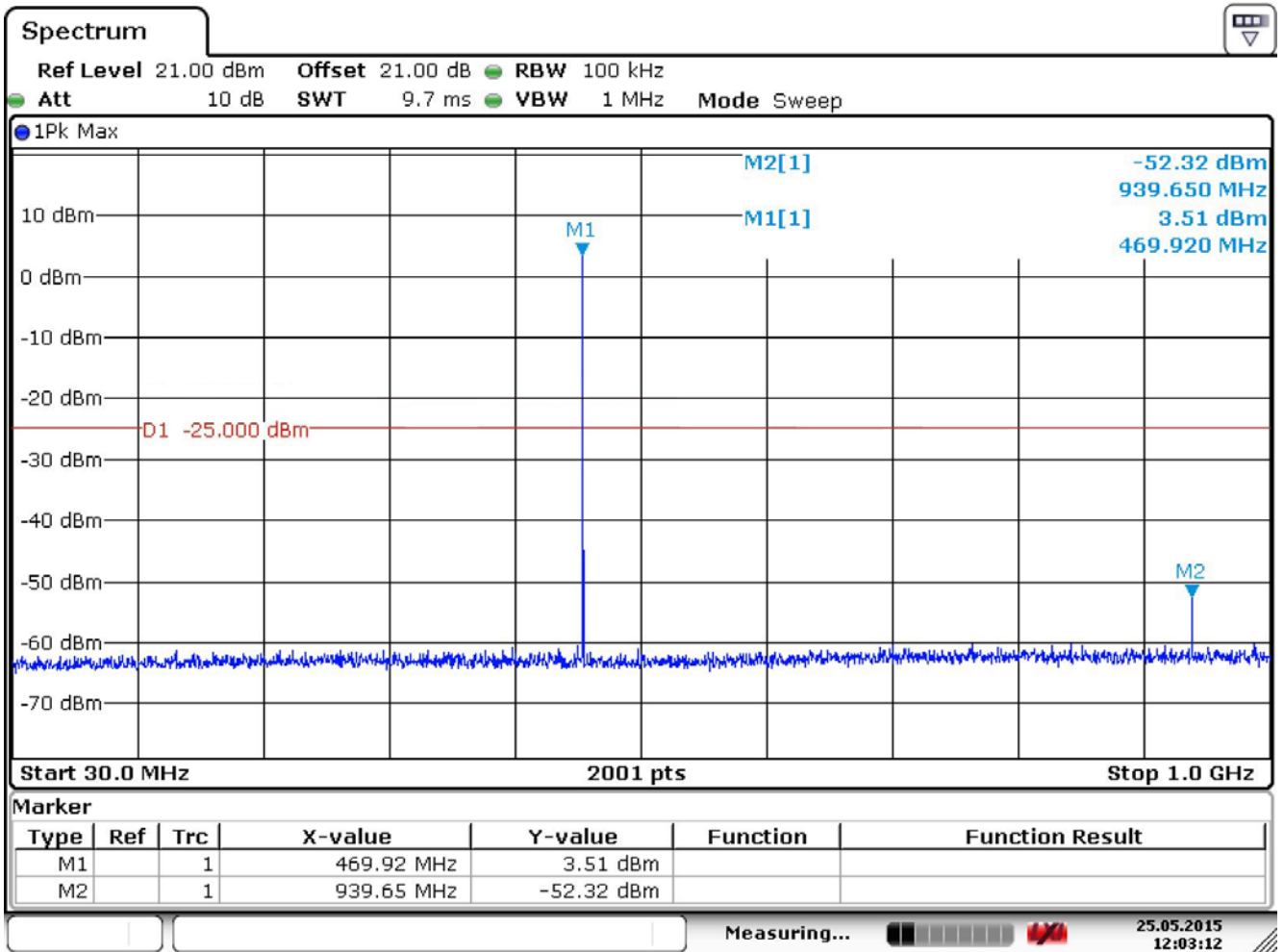
Date: 25.MAY.2015 12:02:00

450MHz(1GHz-5GHz) – 6.25KHz



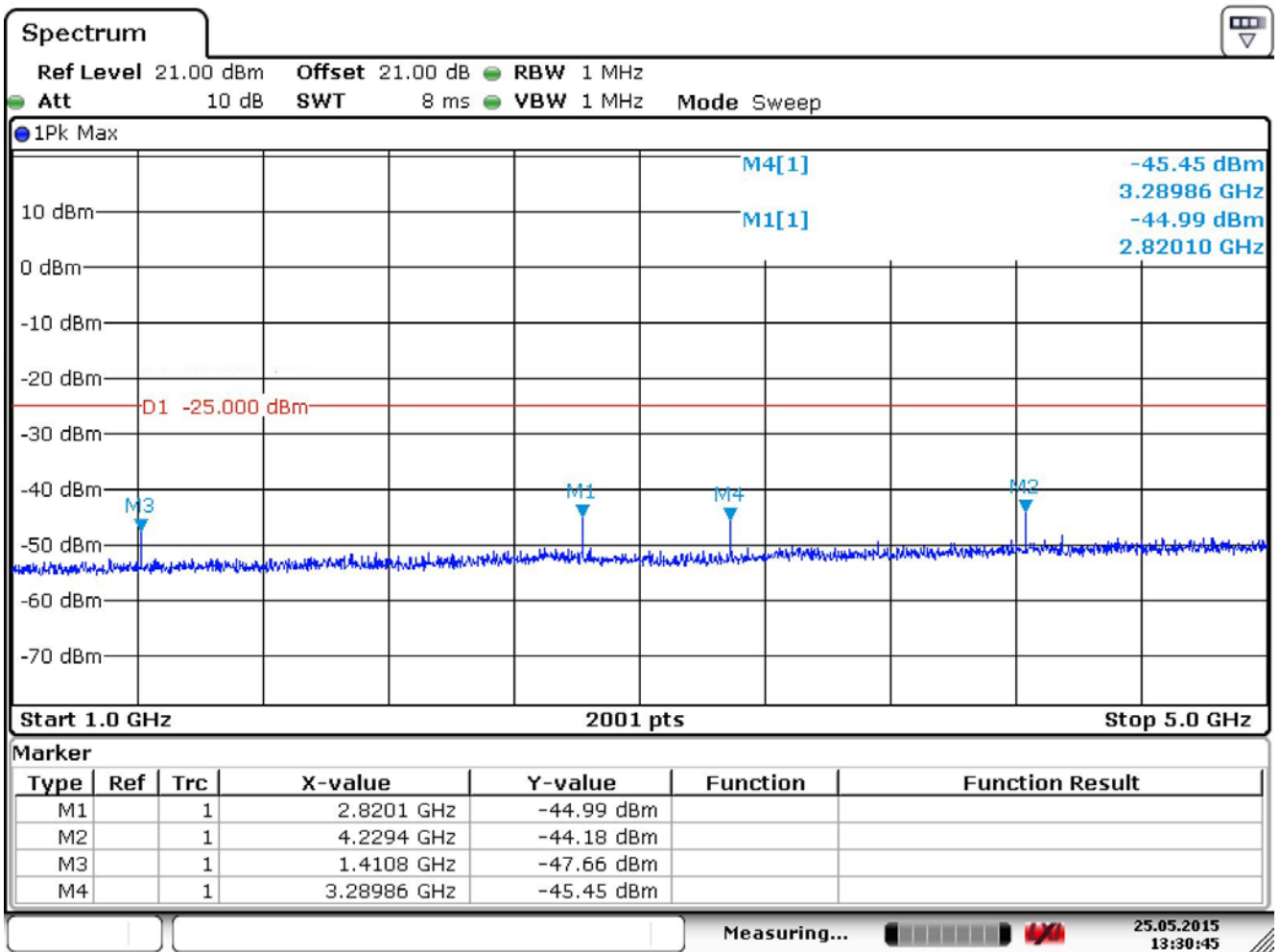
Date: 25.MAY.2015 13:31:55

470MHz(30MHz-1GHz) – 6.25KHz



Date: 25.MAY.2015 12:03:12

470MHz(1GHz-5GHz) – 6.25KHz



Date: 25.MAY.2015 13:30:45

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

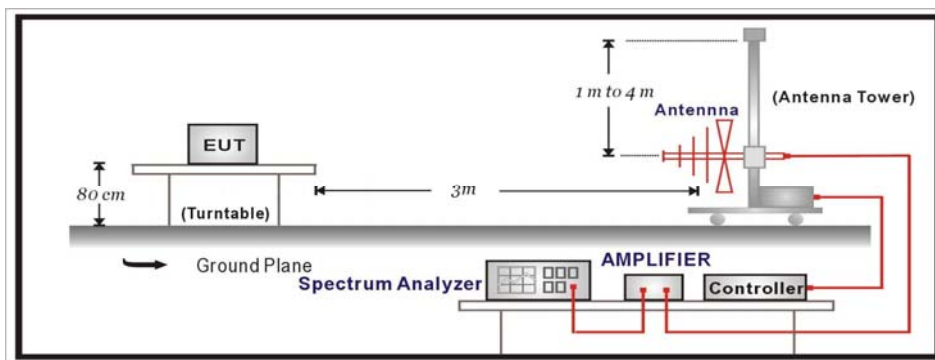
Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Bilog Antenna	SCHAFFNER	CBL6112B	2895	2015/08/14
Double Ridged Guide Horn Antenna	Schwarzbeck	BBHA 9120	D743	2015/02/12
Pre-Amplifier	Quietek	AMF-4D.	888003	2015/06/02
Pre-Amplifier	QuieTek	AP-025C	CHM-0706049	2015/02/06
k Type Cable	Huber Suhner	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.

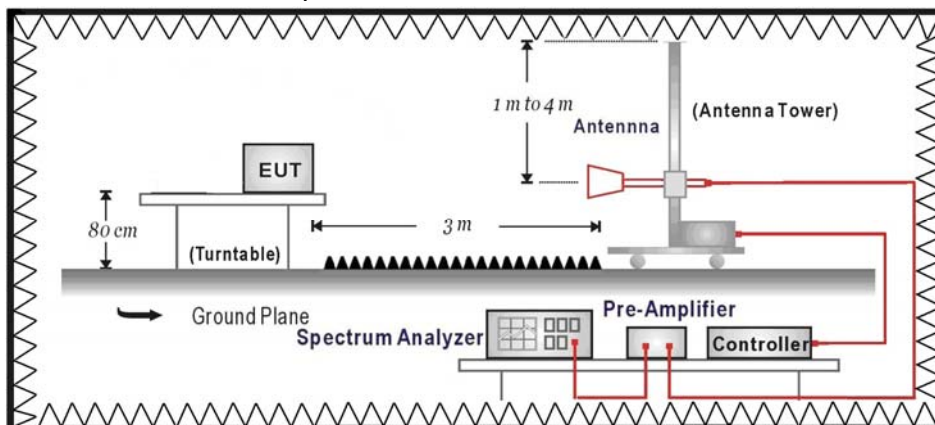
6.2. Test Setup

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.

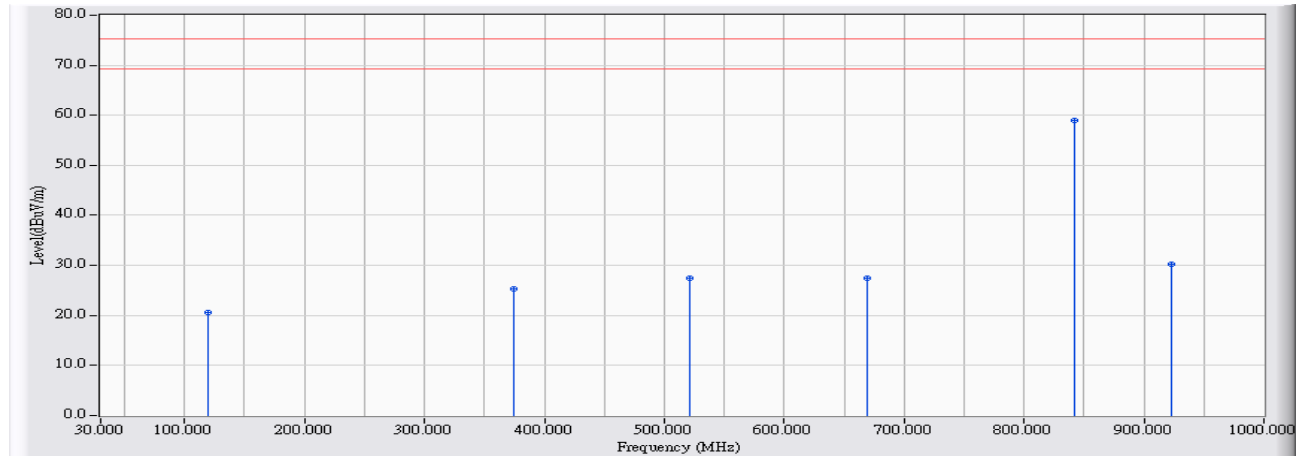
6.5. Uncertainty

The measurement uncertainty is defined as ± 3.65 dB

6.6. Test Result

30MHz-1GHz Spurious

Site : CB1	Time : 2015/01/08 - 00:21
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 : 421MHz

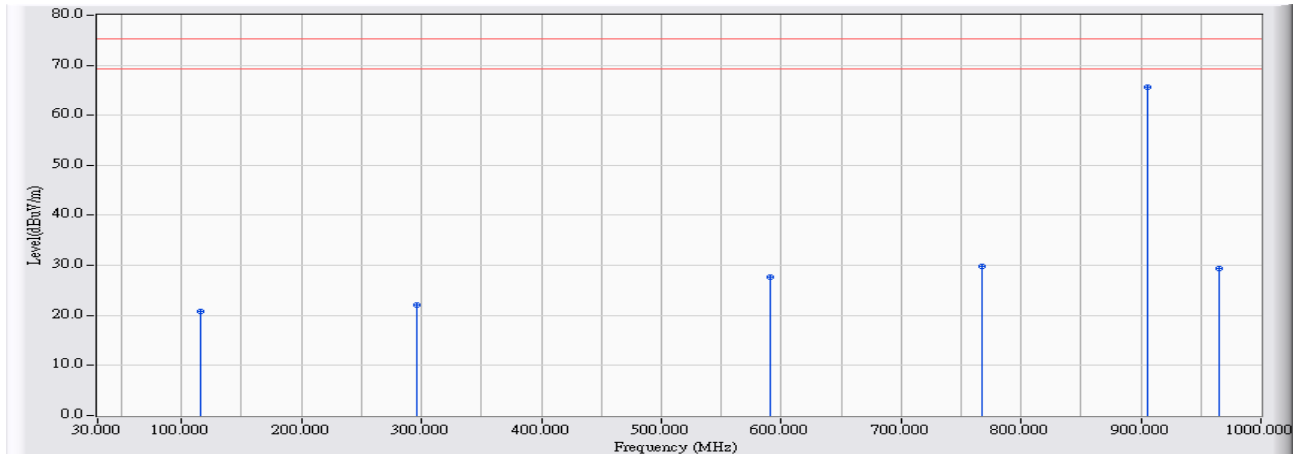


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		119.683	11.146	9.397	20.543	-54.657	75.200	PEAK
2		374.168	14.534	10.744	25.278	-49.922	75.200	PEAK
3		521.538	17.181	10.301	27.482	-47.718	75.200	PEAK
4		669.389	18.158	9.280	27.438	-47.762	75.200	PEAK
5	*	841.959	19.542	39.360	58.902	-16.298	75.200	PEAK
6		922.925	20.003	10.228	30.231	-44.969	75.200	PEAK

Note:

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

Site : CB1	Time : 2015/01/08 - 00:21
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 : 421MHz

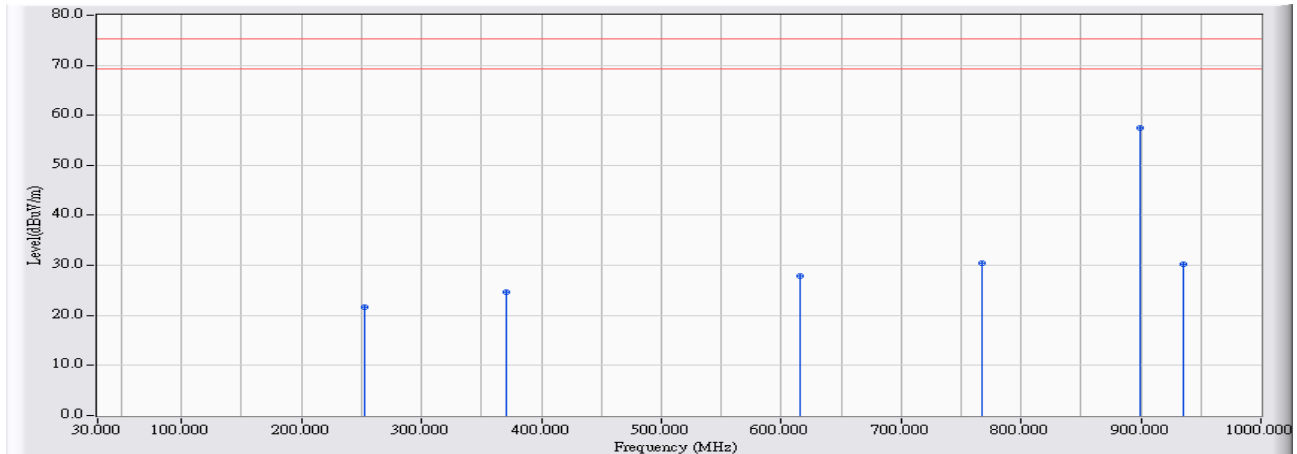


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	115.308	10.784	10.022	20.806	-54.394	75.200	PEAK
2	296.137	12.464	9.615	22.079	-53.121	75.200	PEAK
3	591.342	17.860	9.849	27.709	-47.491	75.200	PEAK
4	767.793	18.999	10.727	29.726	-45.474	75.200	PEAK
5	* 905.464	19.850	45.696	65.547	-9.653	75.200	PEAK
6	965.573	20.377	8.900	29.277	-45.923	75.200	PEAK

Note:

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

Site : CB1	Time : 2015/01/08 - 00:21
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 : 450MHz

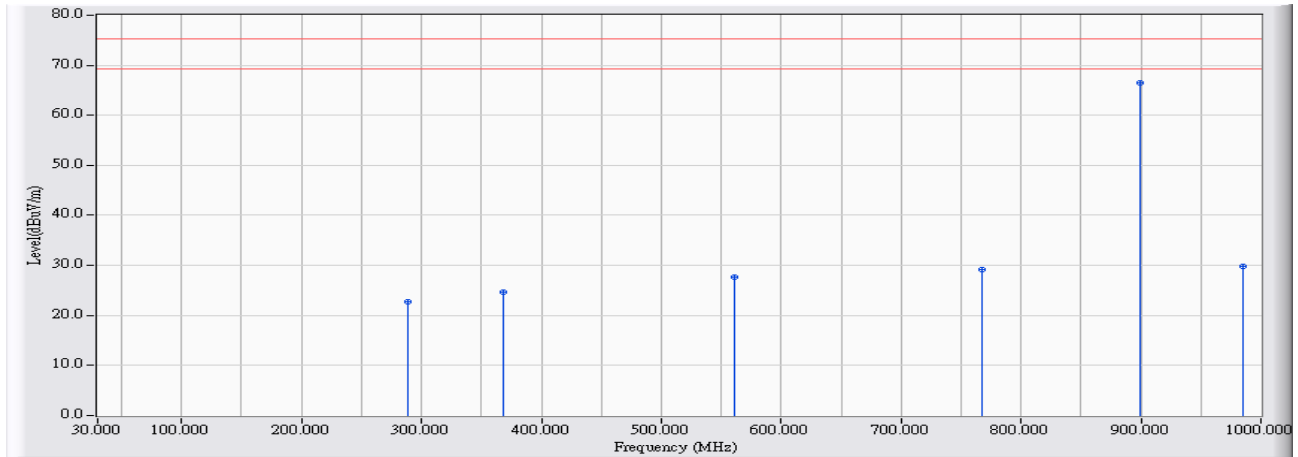


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		252.992	11.818	9.892	21.710	-53.490	75.200	PEAK
2		371.272	14.455	10.283	24.738	-50.462	75.200	PEAK
3		615.581	17.991	9.815	27.806	-47.394	75.200	PEAK
4		767.806	18.999	11.498	30.497	-44.703	75.200	PEAK
5	*	899.658	19.801	37.768	57.569	-17.631	75.200	PEAK
6		935.527	20.113	10.153	30.266	-44.934	75.200	PEAK

Note:

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

Site : CB1	Time : 2015/01/08 - 00:21
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 : 450MHz

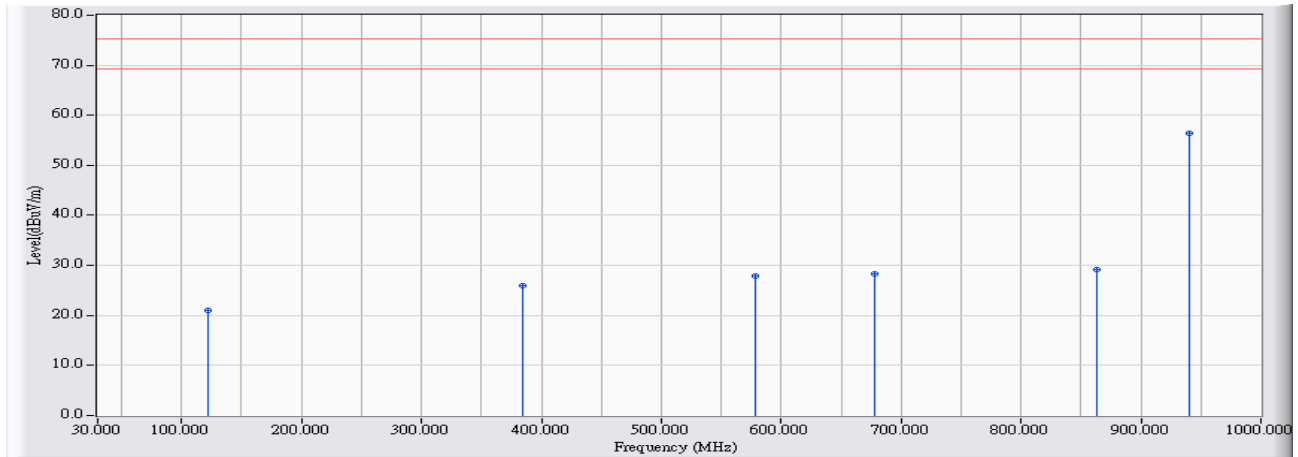


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		288.370	12.348	10.325	22.673	-52.527	75.200	PEAK
2		368.365	14.377	10.382	24.759	-50.441	75.200	PEAK
3		561.297	17.567	10.143	27.710	-47.490	75.200	PEAK
4		767.792	18.999	10.086	29.085	-46.115	75.200	PEAK
5	*	899.660	19.801	46.790	66.591	-8.609	75.200	PEAK
6		984.975	20.547	9.370	29.917	-45.283	75.200	PEAK

Note:

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

Site : CB1	Time : 2015/01/08 - 00:21
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 : 470MHz

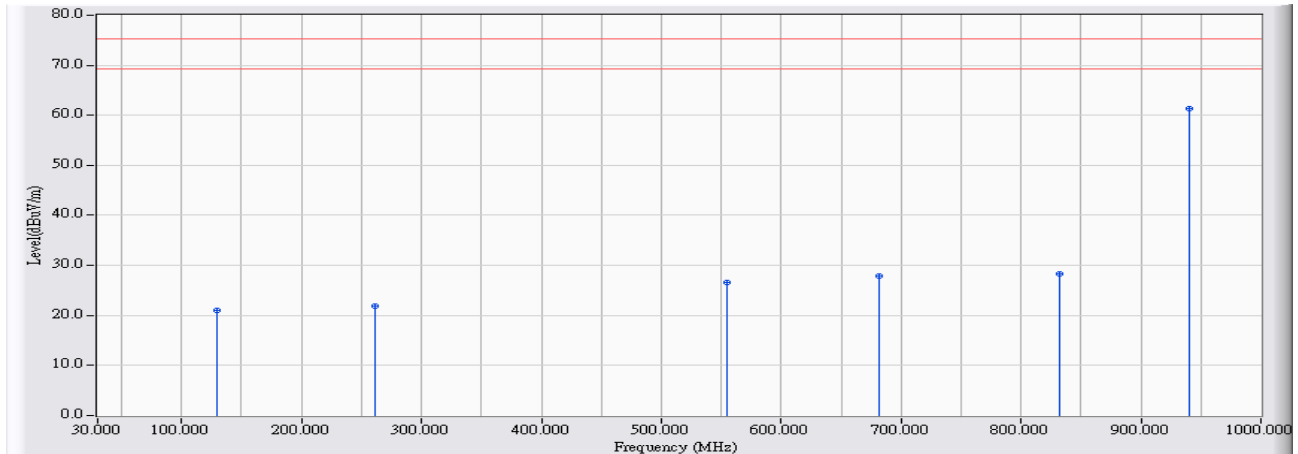


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		122.105	11.065	9.935	21.000	-54.200	75.200	PEAK
2		383.868	14.797	11.077	25.874	-49.326	75.200	PEAK
3		578.263	17.732	10.214	27.946	-47.254	75.200	PEAK
4		678.116	18.184	10.163	28.347	-46.853	75.200	PEAK
5		863.301	19.638	9.478	29.116	-46.084	75.200	PEAK
6	*	939.882	20.152	36.297	56.449	-18.751	75.200	PEAK

Note:

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

Site : CB1	Time : 2015/01/08 - 00:21
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 : 470MHz



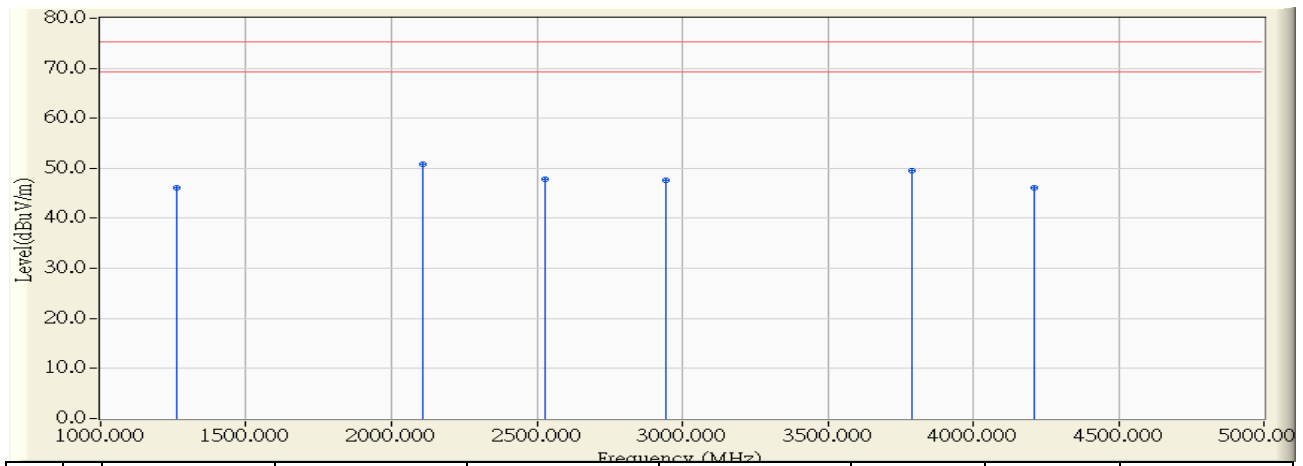
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		128.895	10.670	10.350	21.020	-54.180	75.200	PEAK
2		261.705	11.949	9.965	21.914	-53.286	75.200	PEAK
3		554.510	17.502	9.073	26.575	-48.625	75.200	PEAK
4		681.518	18.196	9.621	27.817	-47.383	75.200	PEAK
5		831.791	19.496	8.759	28.255	-46.945	75.200	PEAK
6	*	939.891	20.152	41.091	61.243	-13.957	75.200	PEAK

Note:

1. All Reading Levels are Quasi-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 - 19:14
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 : 421MHz

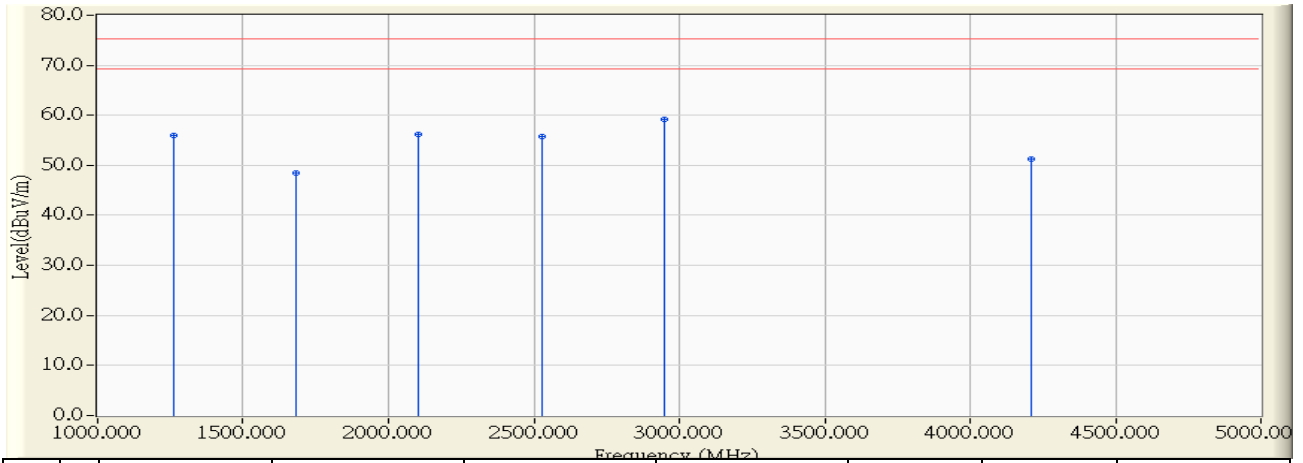


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		1264.000	-23.213	69.223	46.010	-29.190	75.200	PEAK
2	*	2106.000	-19.144	69.939	50.795	-24.405	75.200	PEAK
3		2526.000	-15.073	62.943	47.870	-27.330	75.200	PEAK
4		2946.000	-16.122	63.768	47.645	-27.555	75.200	PEAK
5		3788.000	-14.943	64.549	49.605	-25.595	75.200	PEAK
6		4210.000	-13.877	59.983	46.106	-29.094	75.200	PEAK

Note:

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

Site : CB1	Time : 2015/01/06 - 19:19
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 : 421MHz

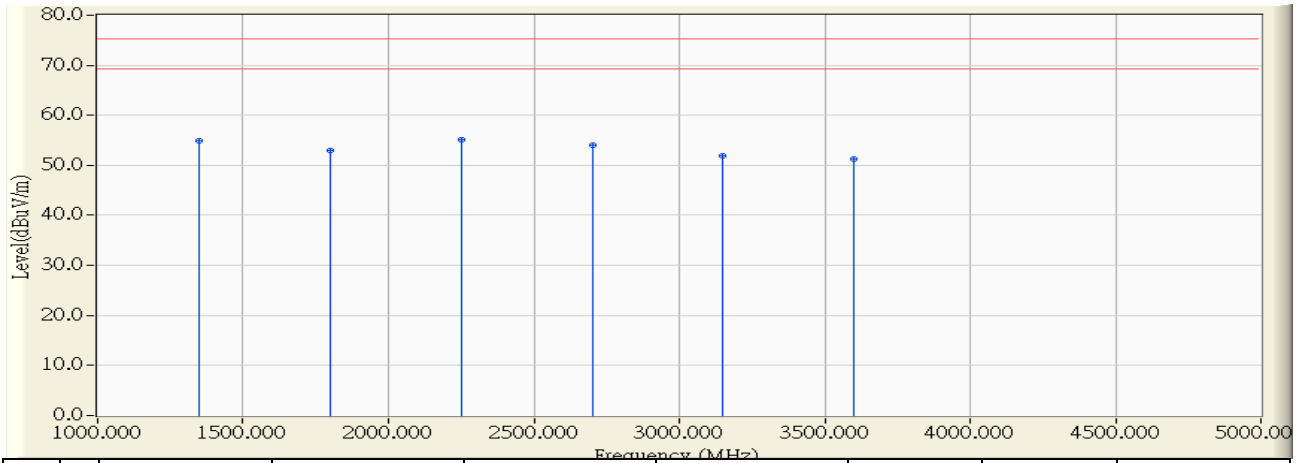


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	1264.000	-23.213	79.177	55.964	-19.236	75.200	PEAK
2	1684.000	-21.717	70.278	48.561	-26.639	75.200	PEAK
3	2104.000	-19.167	75.400	56.233	-18.967	75.200	PEAK
4	2528.000	-15.078	70.844	55.766	-19.434	75.200	PEAK
5	* 2948.000	-16.128	75.265	59.137	-16.063	75.200	PEAK
6	4210.000	-13.877	65.140	51.263	-23.937	75.200	PEAK

Note:

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

Site : CB1	Time : 2015/01/06 - 19:23
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 : 450MHz

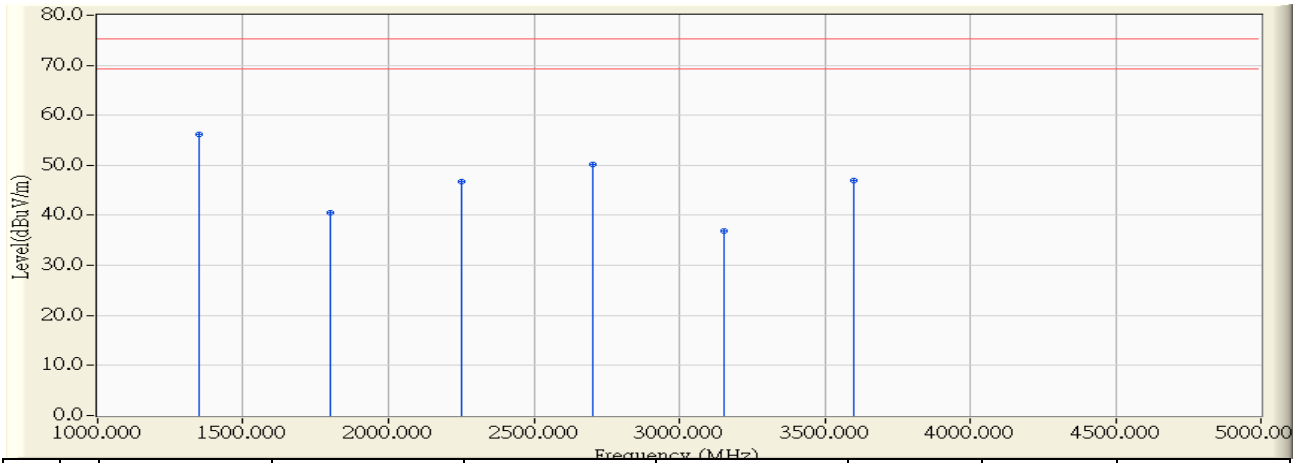


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	1350.000	-22.882	77.682	54.800	-20.400	75.200	PEAK
2	1800.000	-21.334	74.254	52.920	-22.280	75.200	PEAK
3	* 2250.000	-17.455	72.651	55.196	-20.004	75.200	PEAK
4	2700.000	-15.508	69.468	53.960	-21.240	75.200	PEAK
5	3150.000	-15.961	67.768	51.807	-23.393	75.200	PEAK
6	3600.000	-15.325	66.614	51.289	-23.911	75.200	PEAK

Note:

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

Site : CB1	Time : 2015/01/06 - 19:28
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 : 450MHz

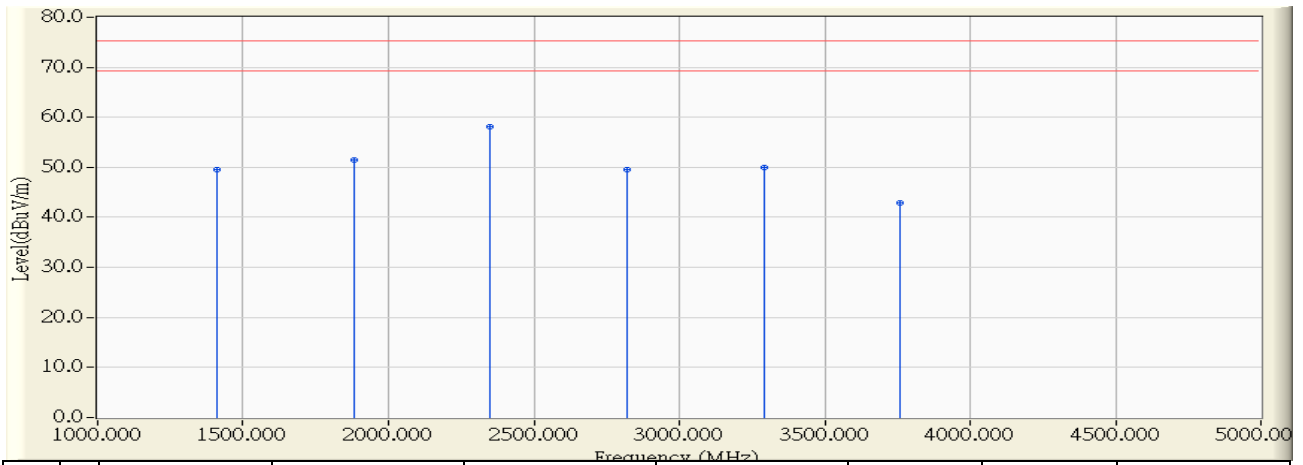


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	1350.000	-22.882	79.132	56.250	-18.950	75.200	PEAK
2		1800.000	-21.334	61.938	40.604	-34.596	75.200	PEAK
3		2250.000	-17.455	64.299	46.844	-28.356	75.200	PEAK
4		2700.000	-15.508	65.608	50.100	-25.100	75.200	PEAK
5		3152.000	-15.958	52.889	36.931	-38.269	75.200	PEAK
6		3600.000	-15.325	62.378	47.053	-28.147	75.200	PEAK

Note:

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

Site : CB1	Time : 2015/01/06 - 19:32
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 : 470MHz

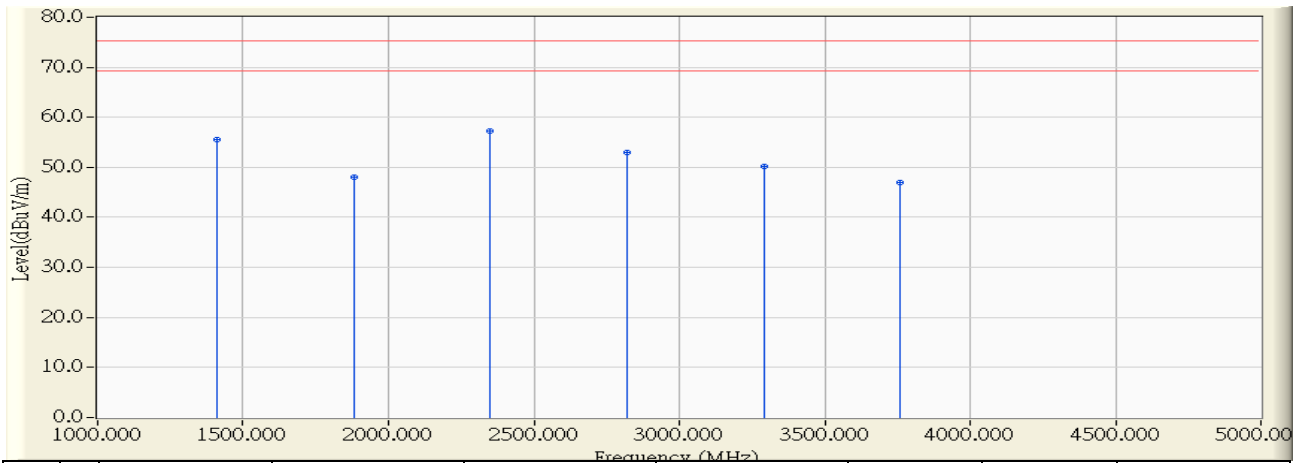


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	1410.000	-22.652	72.168	49.516	-25.684	75.200	PEAK
2	1880.000	-21.070	72.519	51.449	-23.751	75.200	PEAK
3	* 2350.000	-16.282	74.472	58.190	-17.010	75.200	PEAK
4	2820.000	-15.808	65.395	49.587	-25.613	75.200	PEAK
5	3290.000	-15.800	65.716	49.917	-25.283	75.200	PEAK
6	3760.000	-15.001	57.881	42.881	-32.319	75.200	PEAK

Note:

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

Site : CB1	Time : 2015/01/06 - 19:36
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 : 470MHz



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	1410.000	-22.652	78.098	55.446	-19.754	75.200	PEAK
2	1880.000	-21.070	69.006	47.936	-27.264	75.200	PEAK
3	* 2350.000	-16.282	73.466	57.184	-18.016	75.200	PEAK
4	2820.000	-15.808	68.689	52.881	-22.319	75.200	PEAK
5	3290.000	-15.800	65.964	50.165	-25.035	75.200	PEAK
6	3760.000	-15.001	61.907	46.907	-28.293	75.200	PEAK

Note:

1. All Reading Levels are Quasi-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

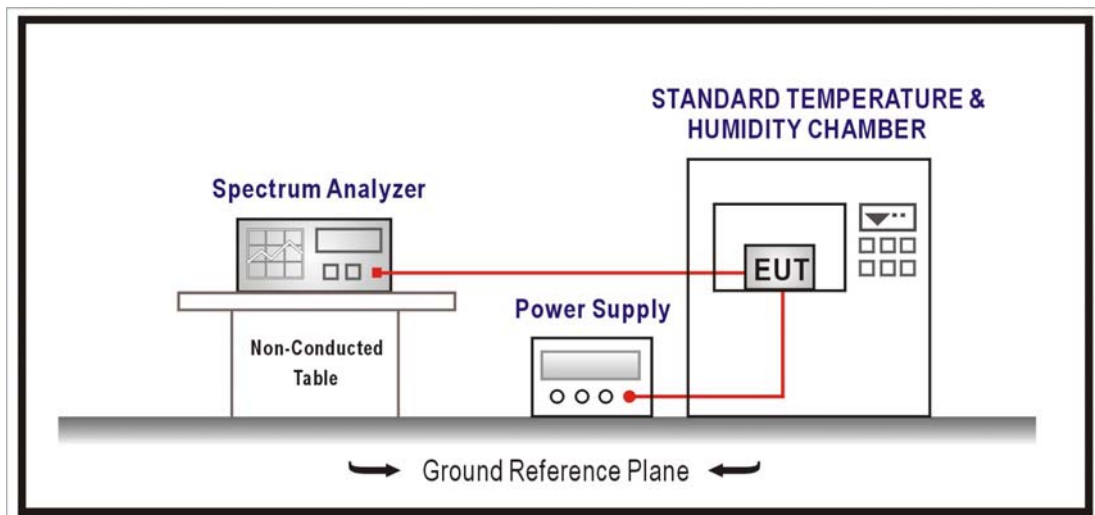
The following test equipments are used during the radiated emission tests:

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-421MHz		
Date of Test	2015/05/27	Test Site	SR7

Temperature Interval (°C)	DC Voltage (V)	Frequency (MHz)	Deviation (ppm)	Result
-30	7.40	421.000035	0.0831	PASS
-20		421.000039	0.0926	PASS
-10		421.000013	0.0309	PASS
0		420.999988	-0.0285	PASS
10		420.999989	-0.0261	PASS
20		420.999995	-0.0119	PASS
30		420.999970	-0.0713	PASS
40		420.999951	-0.1164	PASS
50		420.999886	-0.2708	PASS

Temperature Interval (°C)	AC Voltage (V)	Frequency (MHz)	Deviation (ppm)	Result
25	8.51	420.999995	-0.0119	PASS
	7.40	420.999999	-0.0024	PASS
	6.29	420.999998	-0.0048	PASS

Product	Private land mobile radio		
Test Item	Frequency Stability		
Test Mode	Mode 1: Transmit-450MHz		
Date of Test	2015/05/27	Test Site	SR7

Temperature Interval (°C)	DC Voltage (V)	Frequency (MHz)	Deviation (ppm)	Result
-30	7.40	450.000001	0.0022	PASS
-20		450.000035	0.0778	PASS
-10		450.000003	0.0067	PASS
0		449.999993	-0.0156	PASS
10		449.999997	-0.0067	PASS
20		449.999958	-0.0933	PASS
30		449.999957	-0.0956	PASS
40		449.999956	-0.0978	PASS
50		449.999906	-0.2089	PASS

Temperature Interval (°C)	AC Voltage (V)	Frequency (MHz)	Deviation (ppm)	Result
25	8.51	449.999997	-0.0067	PASS
	7.40	449.999998	-0.0044	PASS
	6.29	449.999996	-0.0089	PASS

Product	Private land mobile radio		
Test Item	Frequency Stability		
Test Mode	Mode 1: Transmit-470MHz		
Date of Test	2015/05/27	Test Site	SR7

Temperature Interval (°C)	DC Voltage (V)	Frequency (MHz)	Deviation (ppm)	Result
-30	7.40	470.000075	0.1596	PASS
-20		470.000016	0.0340	PASS
-10		470.000013	0.0277	PASS
0		469.999988	-0.0255	PASS
10		469.999992	-0.0170	PASS
20		469.999978	-0.0468	PASS
30		469.999968	-0.0681	PASS
40		469.999970	-0.0638	PASS
50		469.999913	-0.1851	PASS

Temperature Interval (°C)	AC Voltage (V)	Frequency (MHz)	Deviation (ppm)	Result
25	8.51	469.999999	-0.0021	PASS
	7.40	470.000000	0.0000	PASS
	6.29	469.999997	-0.0064	PASS

8. Transient Frequency Behavior

8.1. Test Equipment

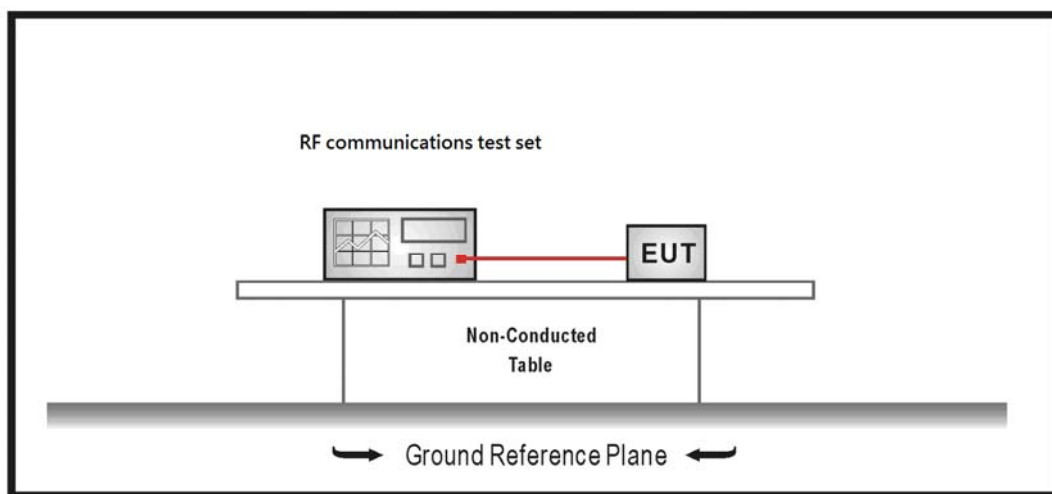
The following test equipments are used during the radiated emission tests:

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

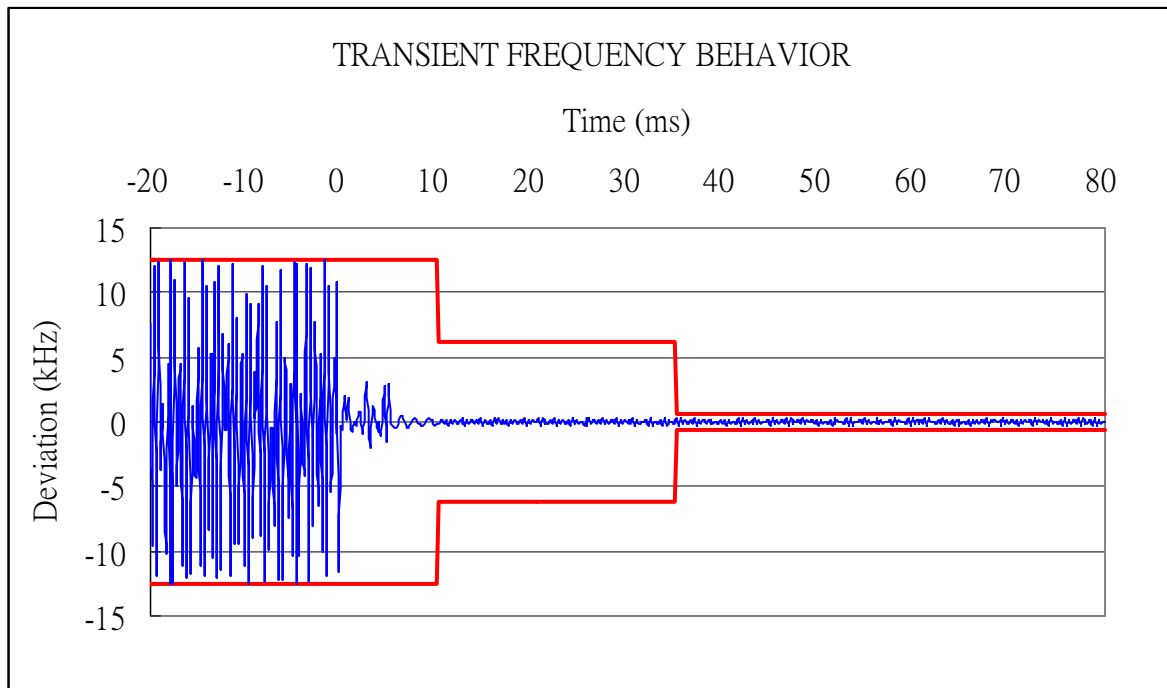
8.5. Uncertainty

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

