

FCC Test Report

Product Name : Private land mobile radio

Model No. : ST-3118C

FCC ID. : M38-ST-3118C

Applicant : RANGER COMMUNICATIONS (M) SDN, BHD.

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

Date of Receipt : 2014/09/16

Issued Date : 2016/01/19

Report No. : 1490406R-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

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Manufacturer : RANGER COMMUNICATIONS (M) SDN, BHD.

Model No. : ST-3118C

FCC ID. : M38-ST-3118C

EUT Voltage : DC 13.8V

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 :

(Demi Chang / Engineering Adm. Specialist)

Reviewed By :

(Bruno Tsai / 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/english/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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1. General Information

1.1. EUT Description

Product Name	Private land mobile radio
Trade Name	SMAR TRUNK
Model No.	ST-3118C
Frequency Range	421-470MHz
Channel Spacing	12.5kHz, 6.25kHz
Type of Modulation	FM, FDMA, TDMA
Antenna Gain	N/A
Antenna Type	N/A (by Terminator)

Component	
Microphone	Non-shielded, 1.5m
Power Line	Cable Out: Non-shielded, 2m

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 1490406R-RFUSP01V00 under Declaration of Conformity.

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
----	------------------

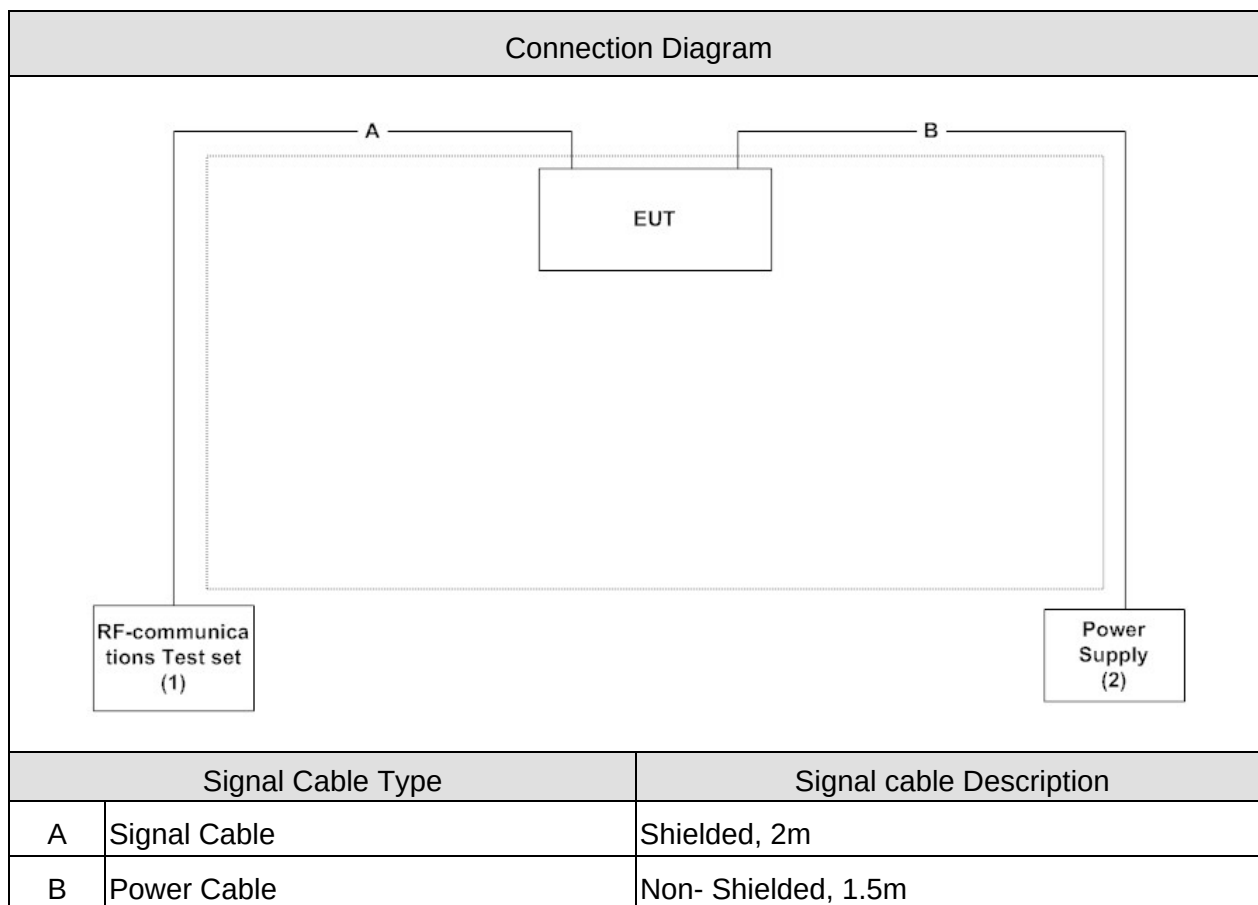
Test Items	Section	Frequency (MHz)	Mode	Result
RF Power Output	90.205	421/450/470	1	Complies
Modulation Characteristics	90.242(b)	421/450/470	1	Complies
Modulation Limiting	90.210	421/450/470	1	Complies
Occupied Bandwidth	90.209 & 90.210	421/450/470	1	Complies
Spurious Emissions at Antenna Terminals (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
2 Power Supply	Chroma	62024P-8060	A01034	DoC	--

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

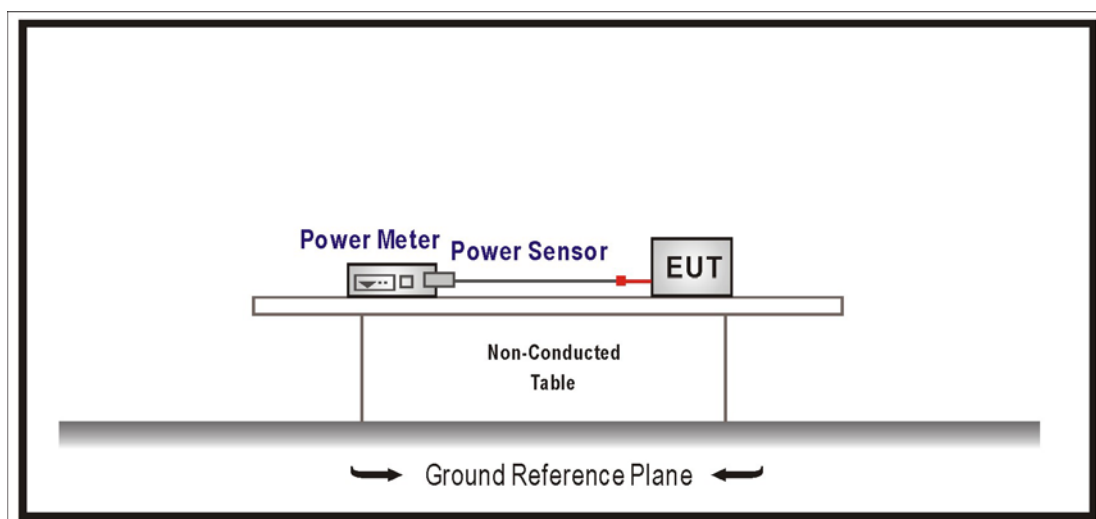
The following test equipments are used during the test:

RF Power Output / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Power Meter	Agilent	N1911A	MY45101353	2015/10/31
Power Sensor	Agilent	N1921A	MY45241670	2015/10/31

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	2015/01/04	Test Site	SR7

12.5KHz

Channel No.	Frequency (MHz)	Measure Level (dBm)	Measure Level (W)	Limit (dBm)	Result
Low	421	46.050	40.272	Reference 90.205	Pass
Mid	450	46.040	40.179	Reference 90.205	Pass
High	470	46.030	40.087	Reference 90.205	Pass

6.25KHz

Channel No.	Frequency (MHz)	Measure Level (dBm)	Measure Level (W)	Limit (dBm)	Result
Low	421	41.40	13.804	Reference 90.205	Pass
Mid	450	41.63	14.568	Reference 90.205	Pass
High	470	41.69	14.745	Reference 90.205	Pass

3. Modulation Characteristics

3.1. Test Equipment

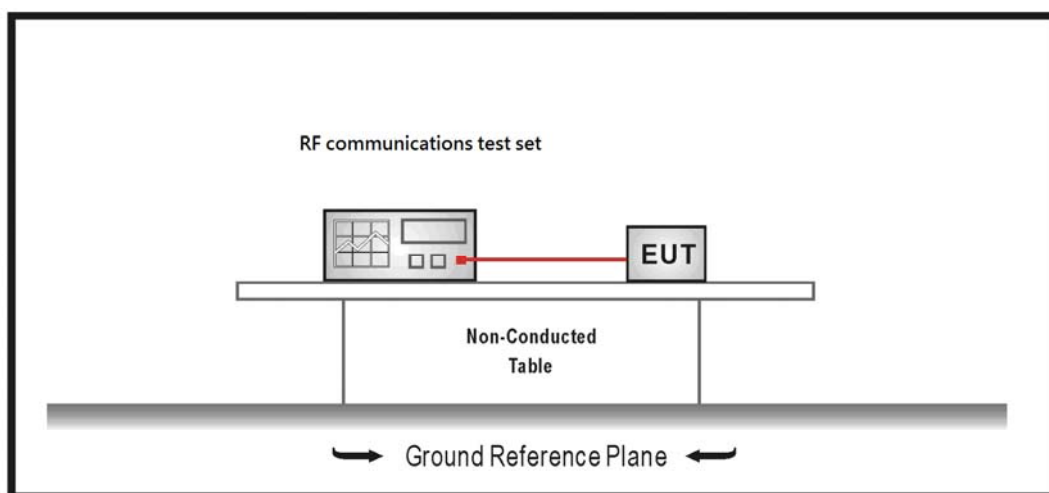
The following test equipments are used during the radiated emission tests:

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

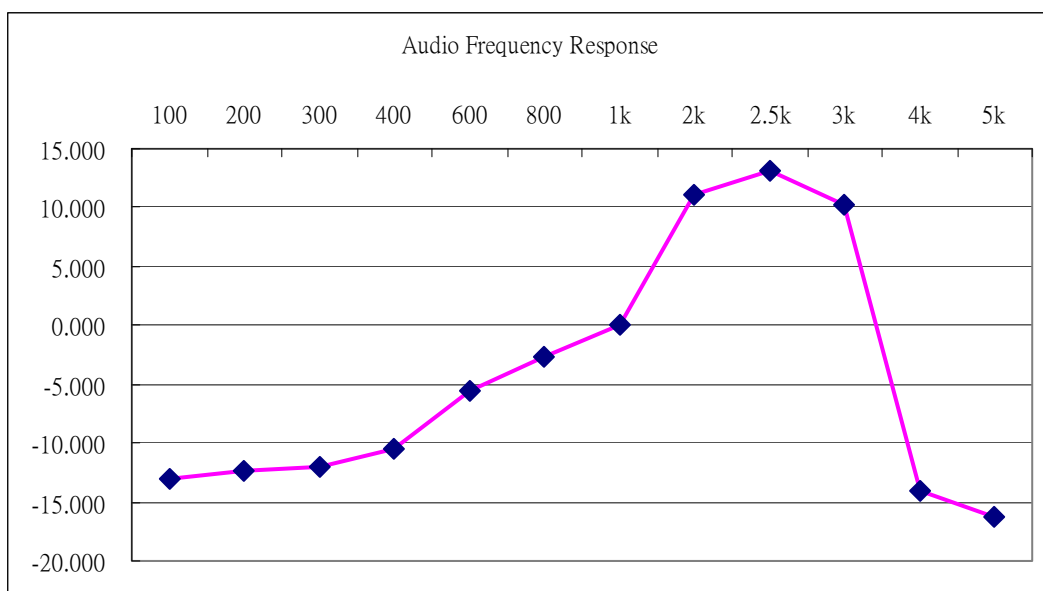
The audio input level needed for a particular percentage of modulation was measured in accordance with ANSI/TIA 603-C: 2004.

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

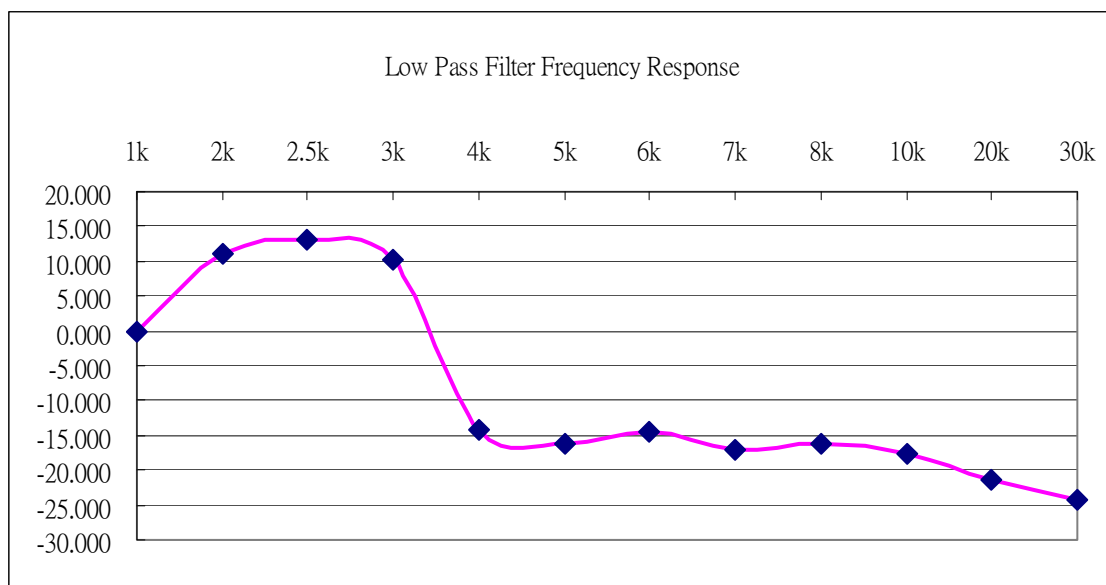
12.5KHz

Audio Frequency (Hz)	Deviation	dB
100	0.026	-12.990
200	0.028	-12.346
300	0.029	-12.041
400	0.035	-10.408
600	0.061	-5.583
800	0.085	-2.701
1k	0.116	0.000
2k	0.413	11.030
2.5k	0.531	13.213
3k	0.374	10.168
4k	0.023	-14.055
5k	0.018	-16.184



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	0.116	0.000
2k	0.413	11.030
2.5k	0.531	13.213
3k	0.374	10.168
4k	0.023	-14.055
5k	0.018	-16.184
6k	0.022	-14.441
7k	0.016	-17.207
8k	0.018	-16.184
10k	0.015	-17.767
20k	0.01	-21.289
30k	0.007	-24.387



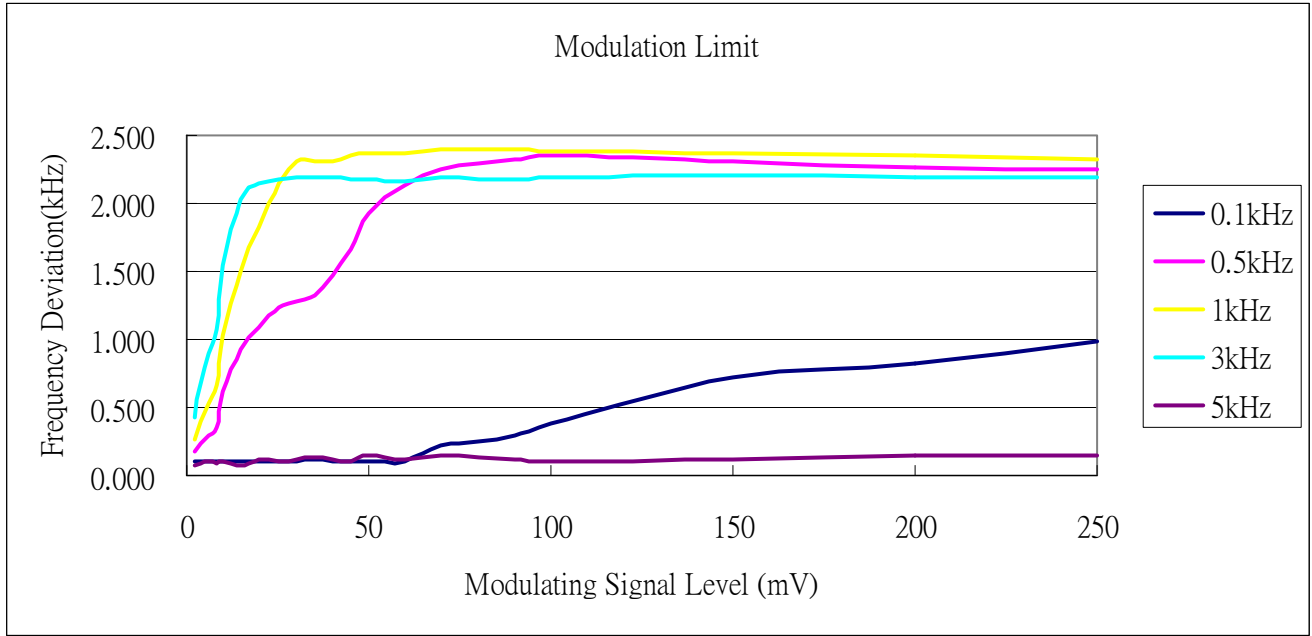
Product	Private land mobile radio		
Test Item	Voice Modulation Limiting for 12.5KHz Channel Spacing		
Test Mode	Mode 1: Transmit		
Date of Test	2015/01/04	Test Site	SR7

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	0.104	0.179	0.288	0.424	0.108	2.5
4	0.095	0.234	0.410	0.656	0.100	2.5
6	0.101	0.288	0.534	0.870	0.140	2.5
8	0.104	0.353	0.668	1.079	0.089	2.5
10	0.101	0.613	1.028	1.540	0.068	2.5
15	0.102	0.922	1.498	2.049	0.100	2.5
20	0.099	1.086	1.827	2.170	0.133	2.5
25	0.099	1.239	2.128	2.178	0.041	2.5
30	0.109	1.275	2.297	2.185	0.061	2.5
35	0.110	1.319	2.303	2.188	0.111	2.5
40	0.112	1.475	2.311	2.174	0.151	2.5
45	0.110	1.668	2.338	2.197	0.111	2.5
50	0.115	1.918	2.351	2.182	0.124	2.5
60	0.117	2.129	2.377	2.192	0.138	2.5
70	0.213	2.248	2.406	2.171	0.146	2.5
80	0.252	2.294	2.401	2.199	0.158	2.5
90	0.300	2.321	2.388	2.183	0.129	2.5
100	0.381	2.348	2.385	2.183	0.128	2.5
150	0.712	2.315	2.384	2.183	0.145	2.5
200	0.822	2.266	2.350	2.193	0.130	2.5
250	0.979	2.250	2.330	2.195	0.105	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	0.026	2.5
200	0.028	2.5
300	0.029	2.5
400	0.035	2.5
600	0.061	2.5
800	0.085	2.5
1k	0.116	2.5
2k	0.413	2.5
2.5k	0.531	2.5
3k	0.374	2.5
4k	0.023	2.5
5k	0.018	2.5
6k	0.026	2.5
7k	0.022	2.5
8k	0.021	2.5
10k	0.018	2.5
20k	0.021	2.5
30k	0.022	2.5

3.6. Digital Modulation

Max Deviation measured for 6.25KHz Channel Spacing F1E&F1D = 847 Hz

4. Occupied Bandwidth

4.1. Test Equipment

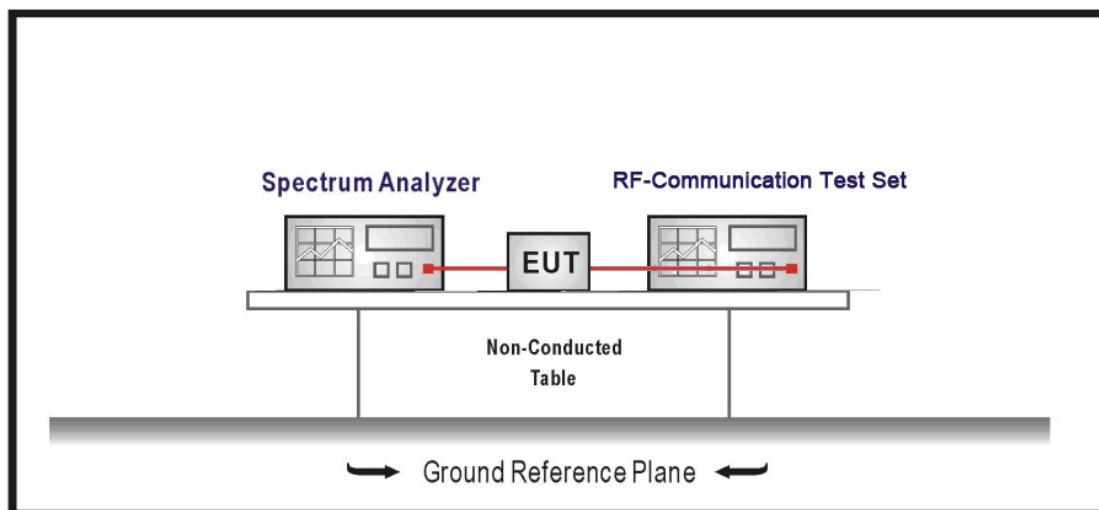
The following test equipments are used during the radiated emission tests:

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

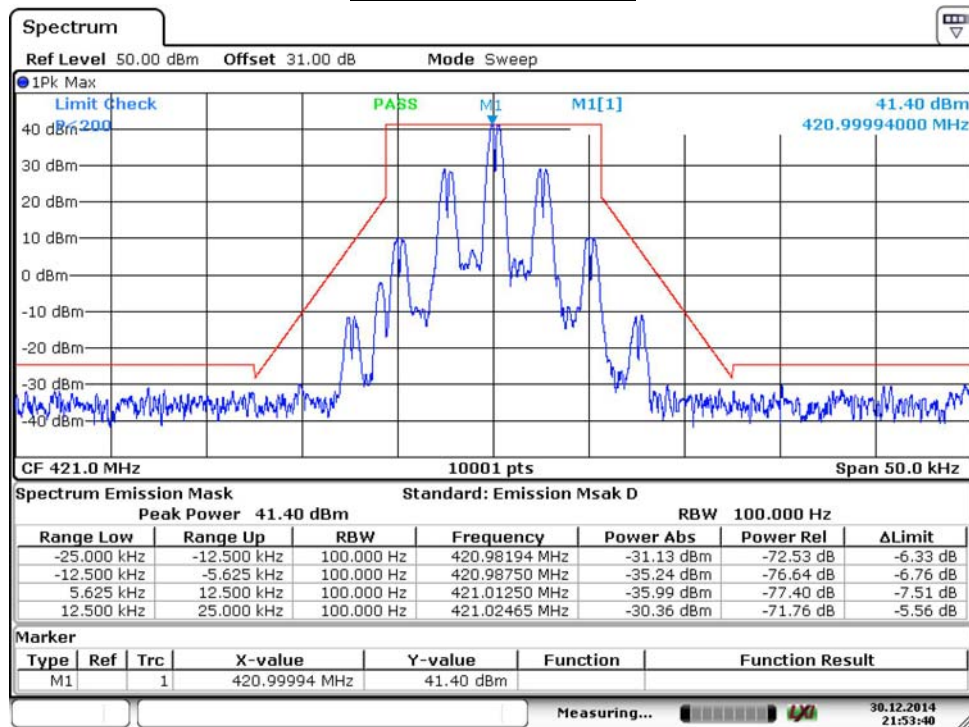
4.5. Uncertainty

The measurement uncertainty is defined as ± 150 Hz

4.6. Test Result

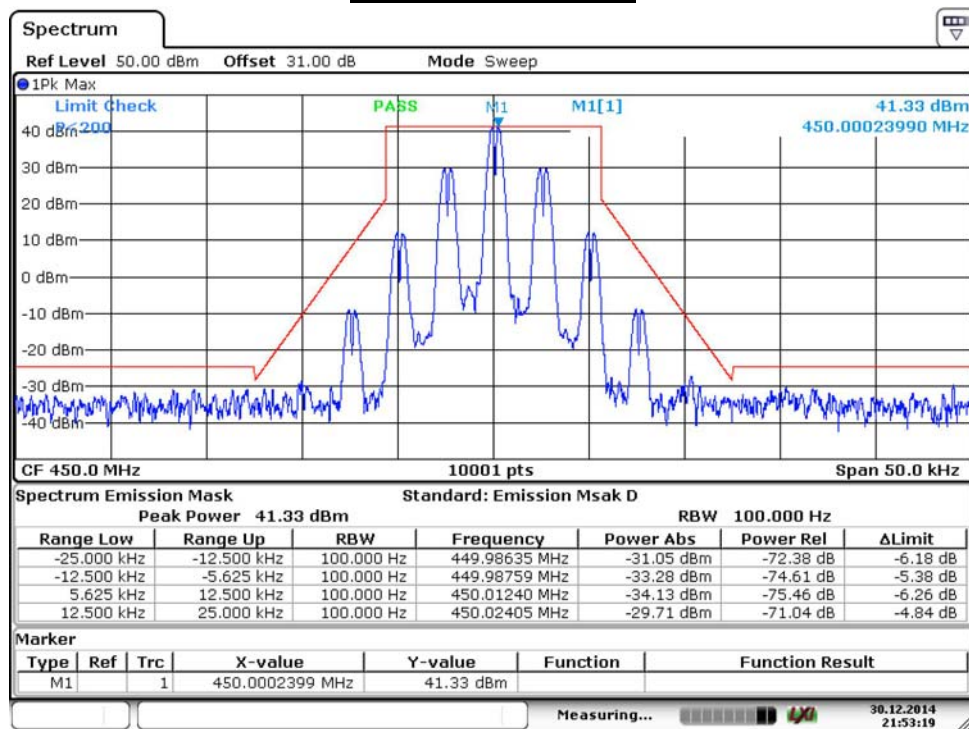
Product	Private land mobile radio		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2015/01/04	Test Site	SR7

421MHz(Modulation)



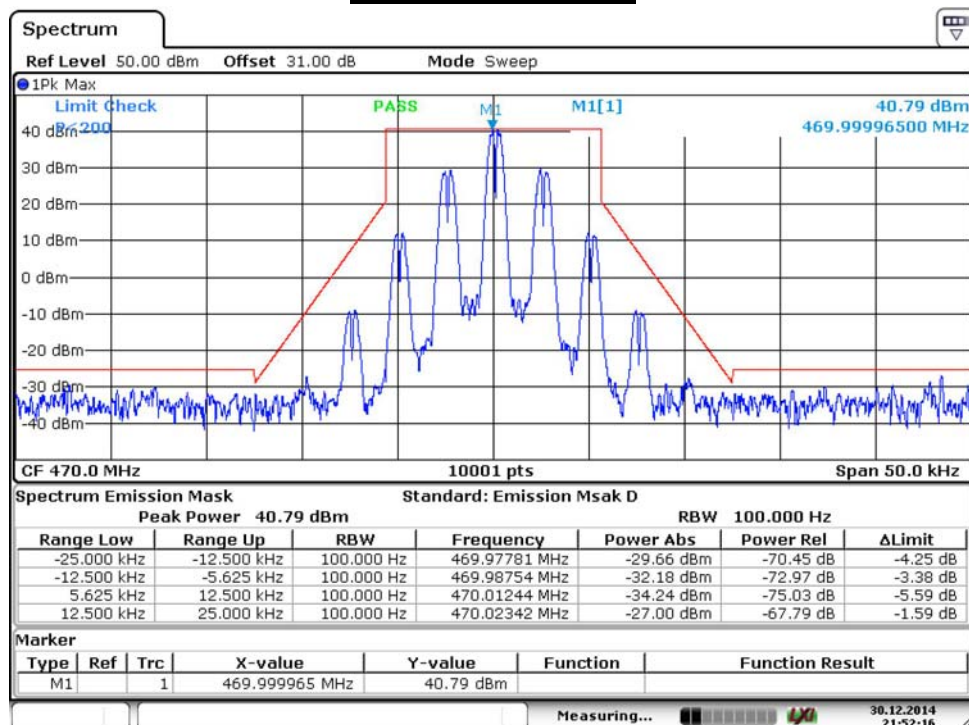
Date: 30.DEC.2014 21:53:40

450MHz(Modulation)



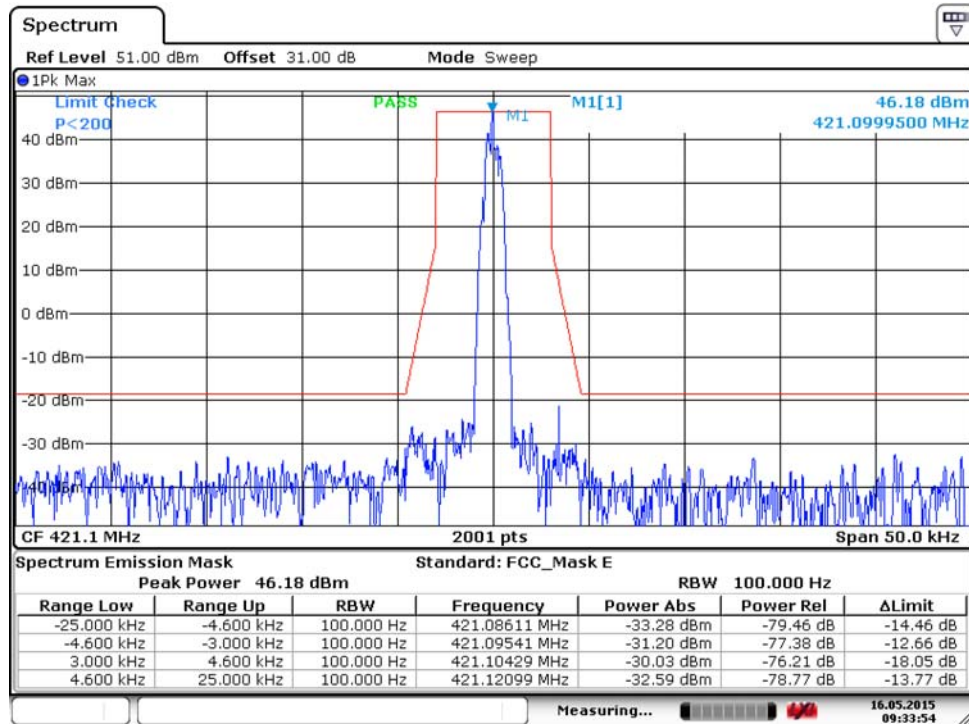
Date: 30.DEC.2014 21:53:19

470MHz(Modulation)



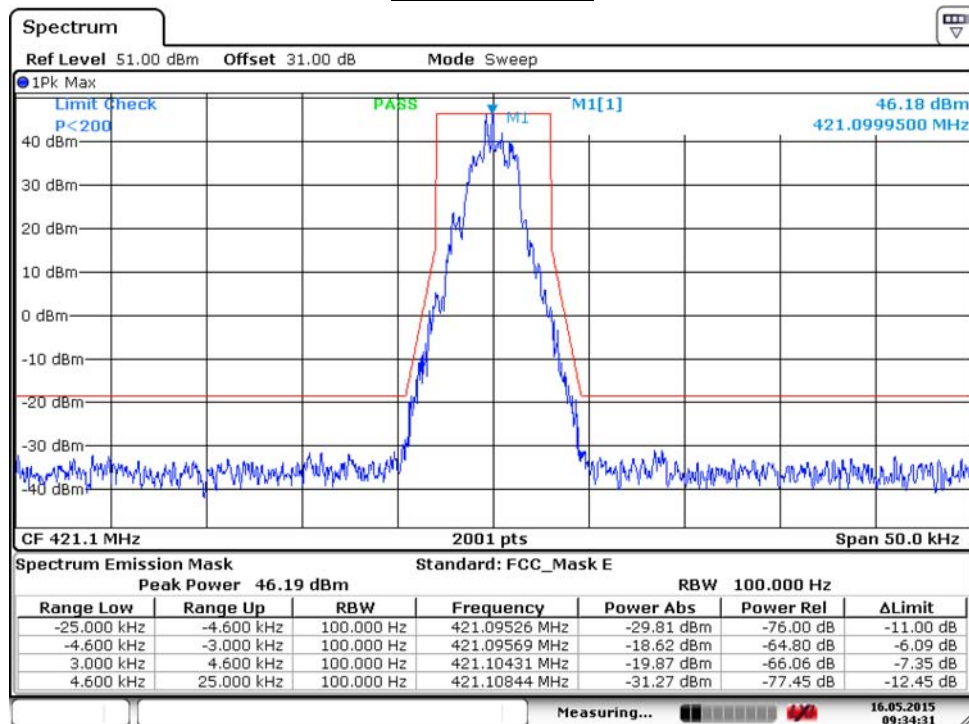
Date: 30.DEC.2014 21:52:16

421MHz(Carr Mask)



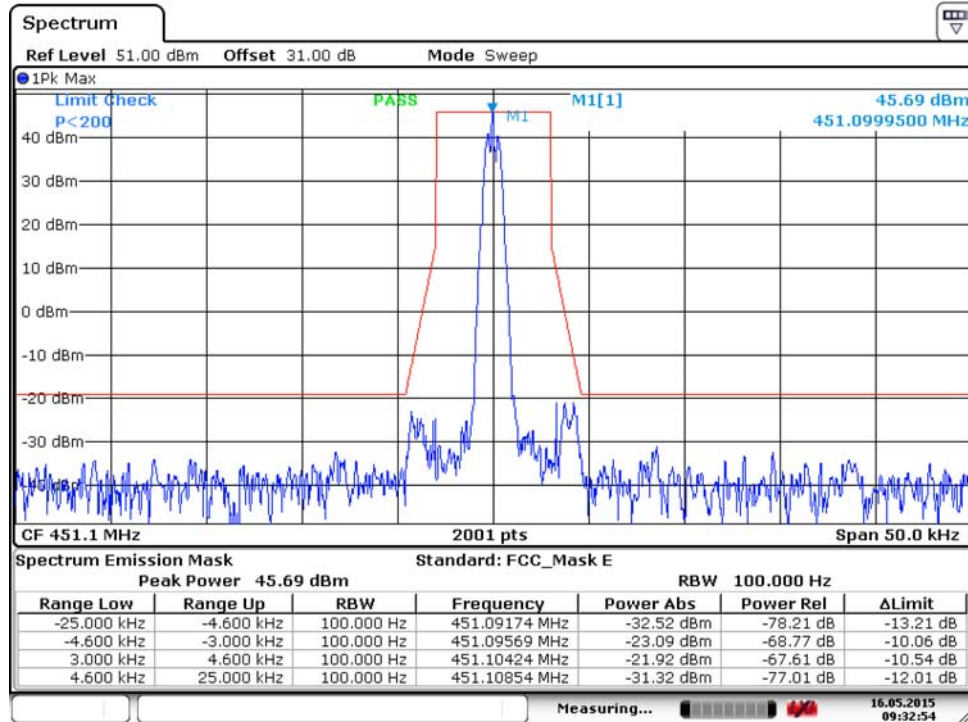
Date: 16.MAY.2015 09:33:53

421MHz(Mask)



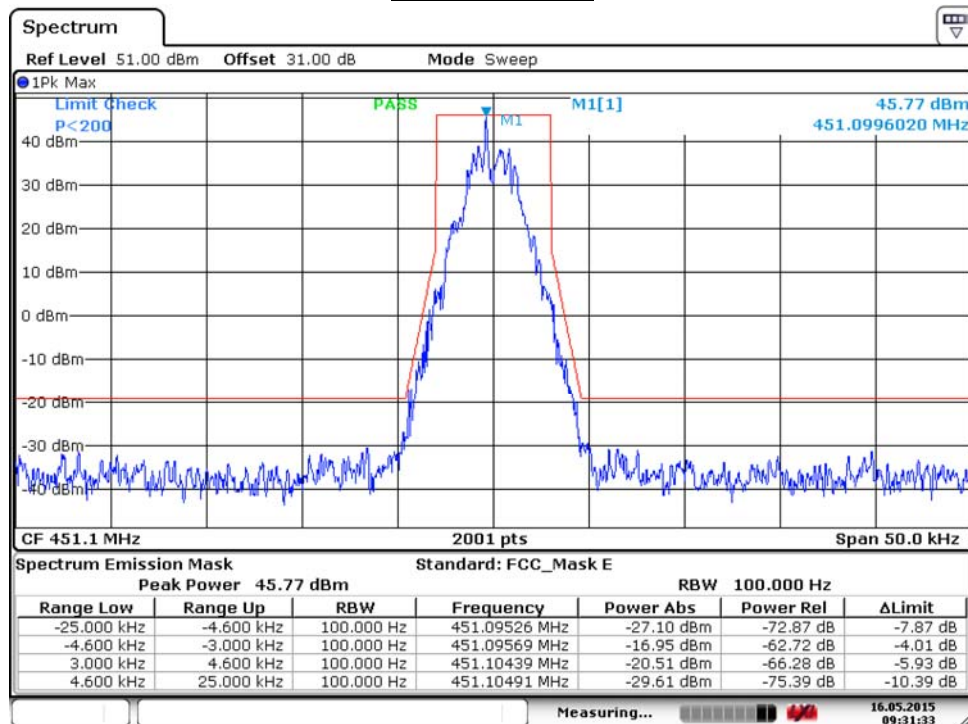
Date: 16.MAY.2015 09:34:31

450MHz(Carr Mask)



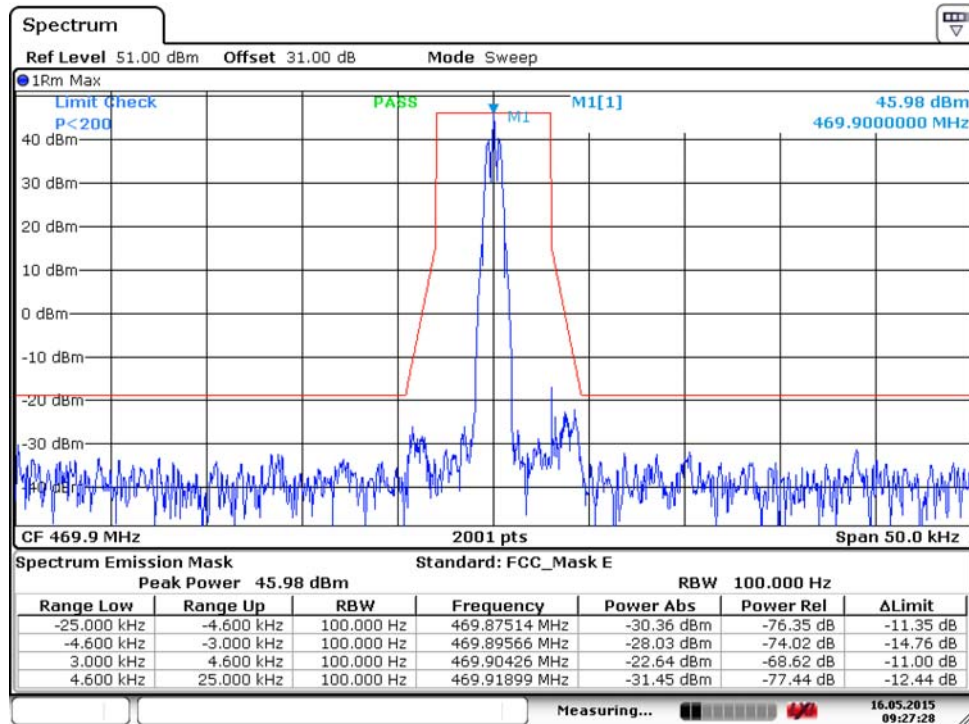
Date: 16.MAY.2015 09:32:54

450MHz(Mask)



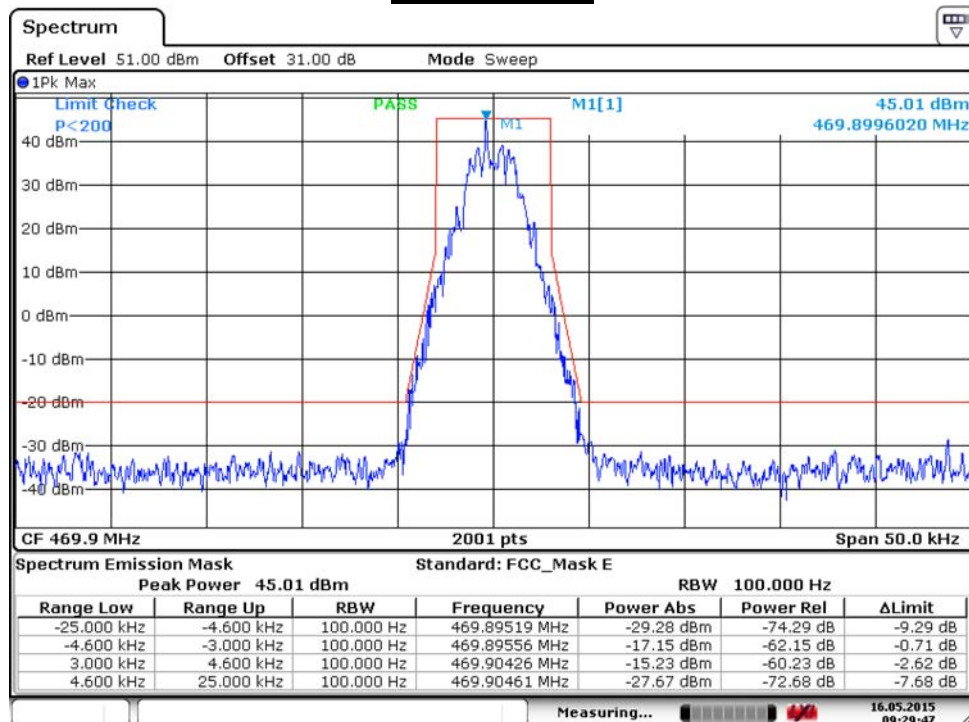
Date: 16.MAY.2015 09:31:33

471MHz(Carr Mask)



Date: 16.MAY.2015 09:27:28

471MHz(Mask)



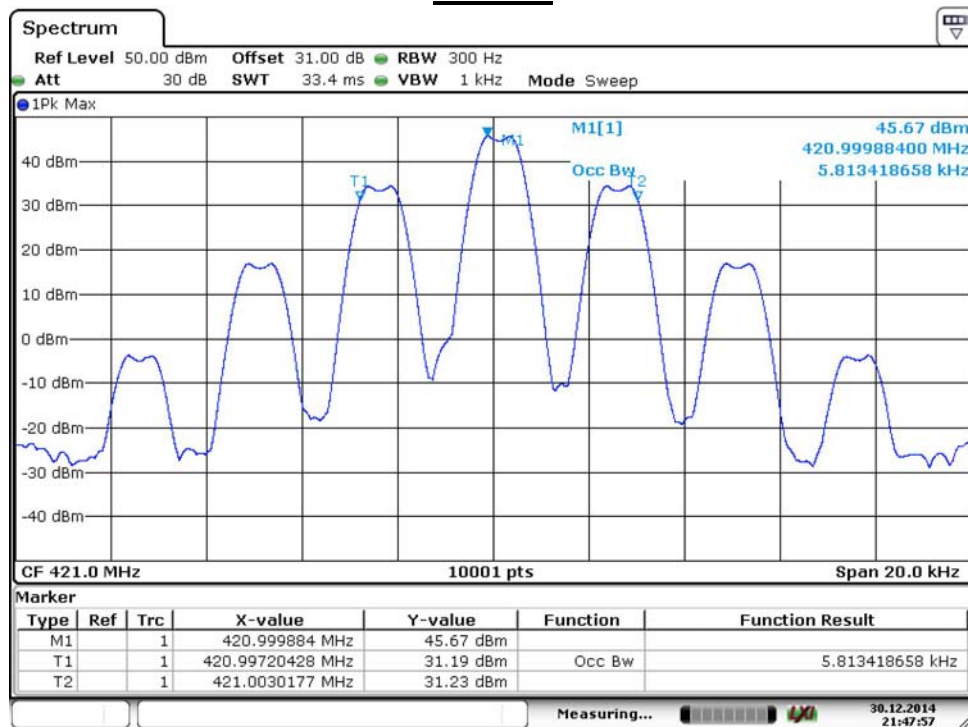
Date: 16.MAY.2015 09:29:47

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

Analog

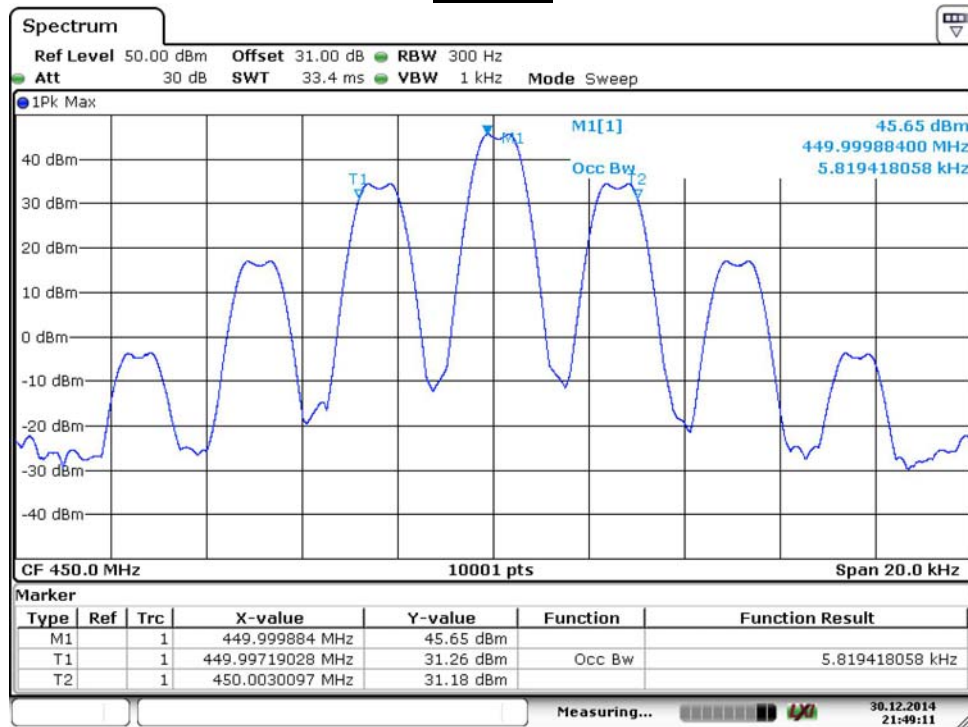
Channel	Frequency (MHz)	Measure Level(kHz)	Limit (kHz)	Result
Low	421	5.813	--	Pass
Mid	450	5.819	--	Pass
High	471	5.821	--	Pass

421MHz



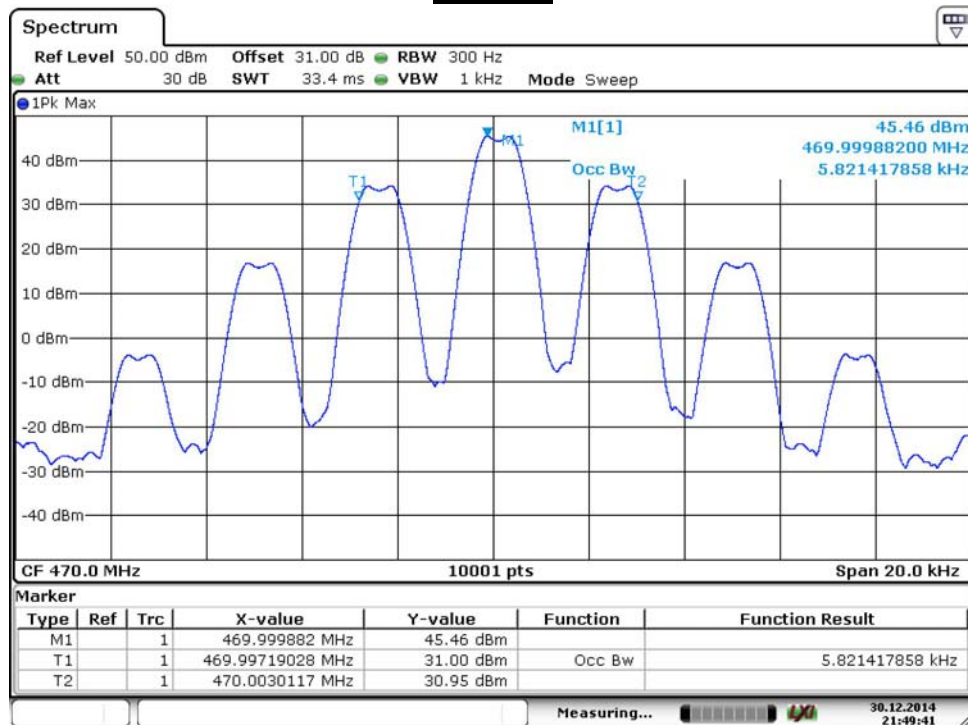
Date: 30.DEC.2014 21:47:57

450MHz



Date: 30.DEC.2014 21:49:12

471MHz



Date: 30.DEC.2014 21:49:41

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	3.468	--	Pass
Mid	450	3.648	--	Pass
High	471	3.703	--	Pass

421MHz



Date: 16.MAY.2015 09:36:35

450MHz



Date: 16.MAY.2015 09:31:01

471MHz



Date: 16.MAY.2015 09:30:12

5. Spurious Emissions at Antenna Terminals (Conducted)

5.1. Test Equipment

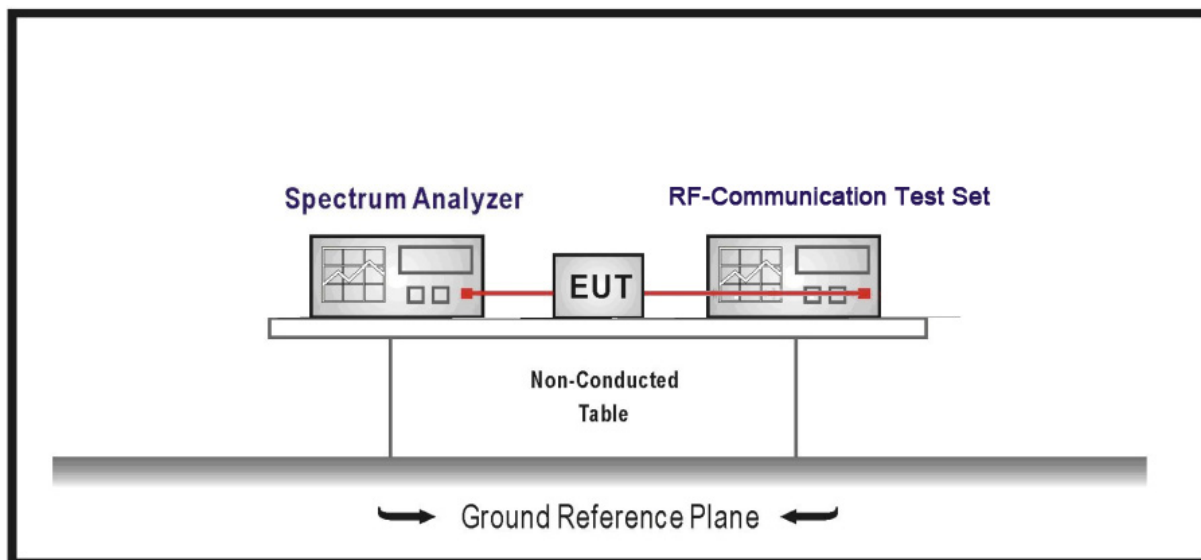
The following test equipments are used during the radiated emission test:

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	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.

5.2. Test Setup



5.3. Limits

High power 12.5 kHz Spacing = $50 + 10 \log(P)$

P= RF Power Output

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

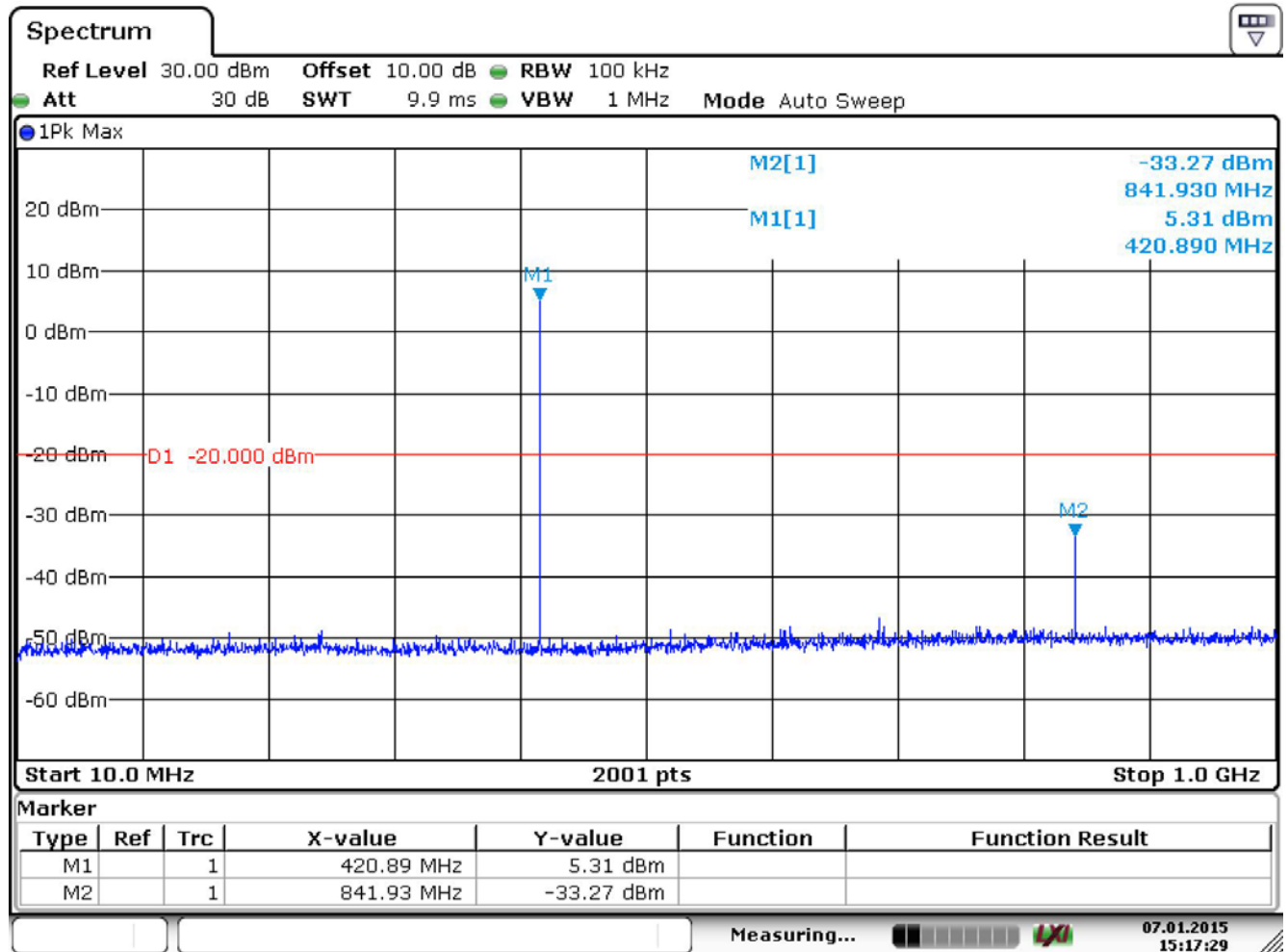
5.5. Uncertainty

The measurement uncertainty is defined as $\pm 1.27\text{dB}$

5.6. Test Result

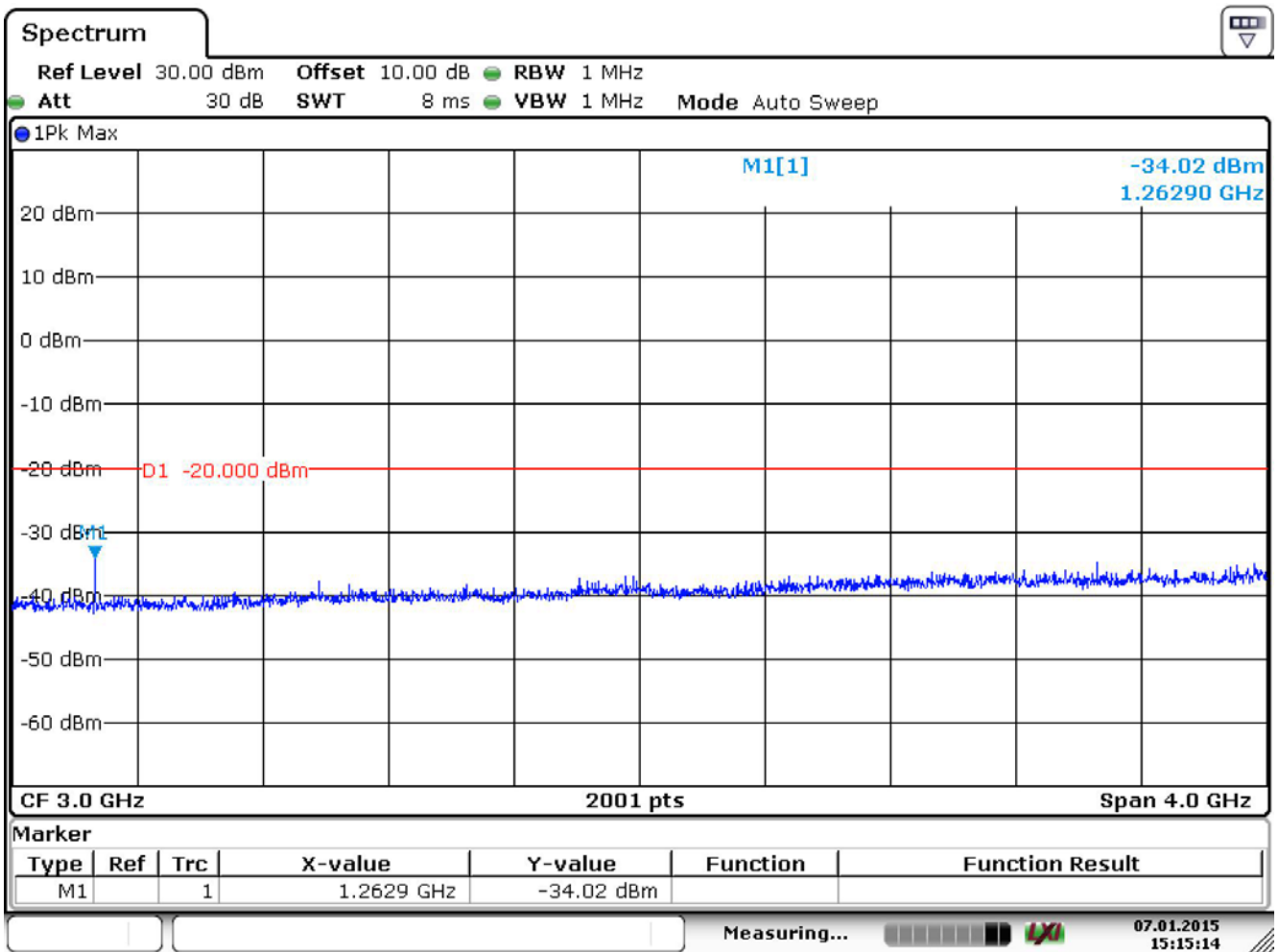
Product	Private land mobile radio		
Test Item	Spurious Emissions at Antenna Terminals (Conducted)		
Test Mode	Mode 1: Transmit		
Date of Test	2015/01/07	Test Site	SR7

421MHz(10MHz-1GHz)



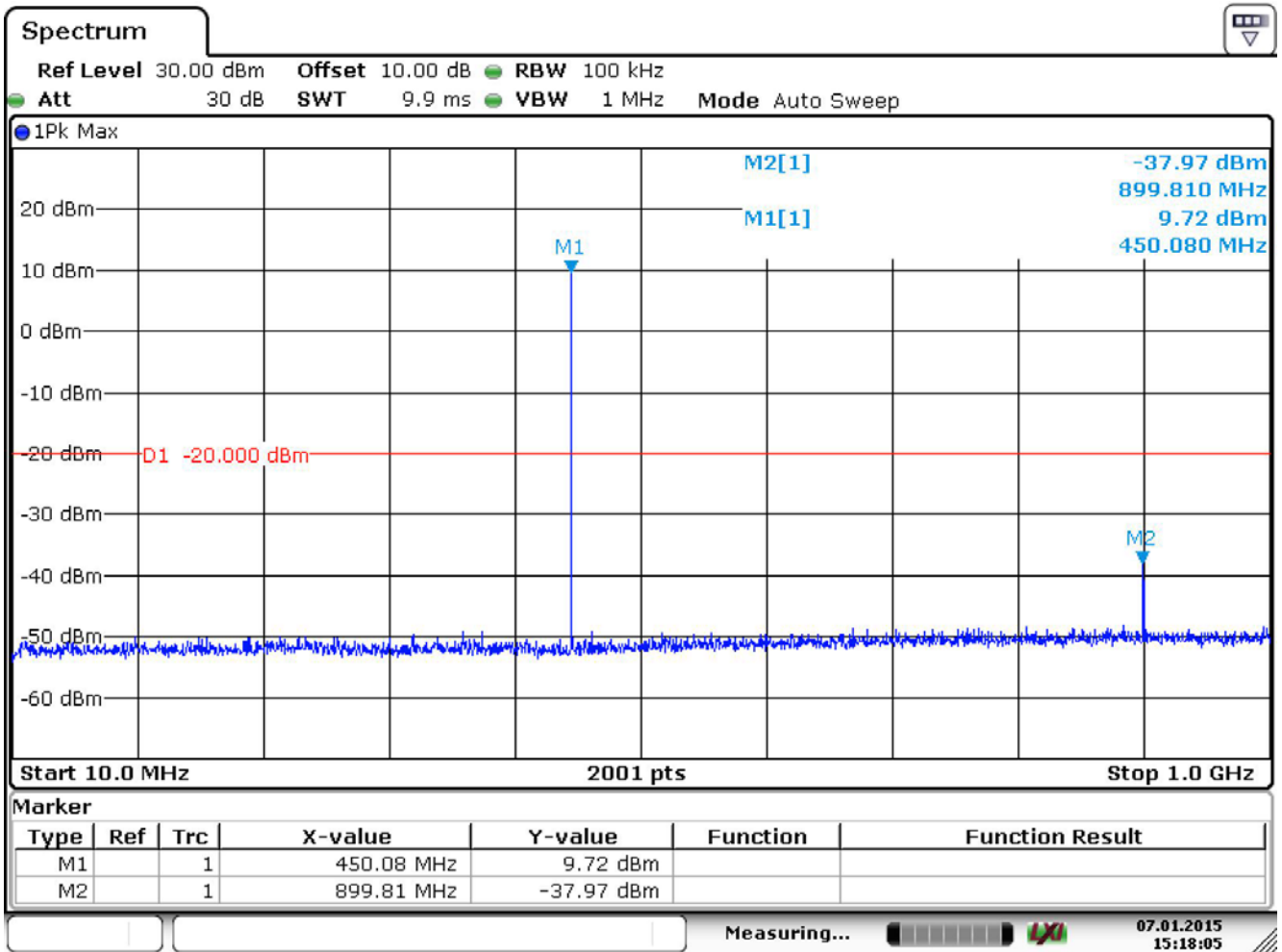
Date: 7.JAN.2015 15:17:29

421MHz(1GHz-5GHz)



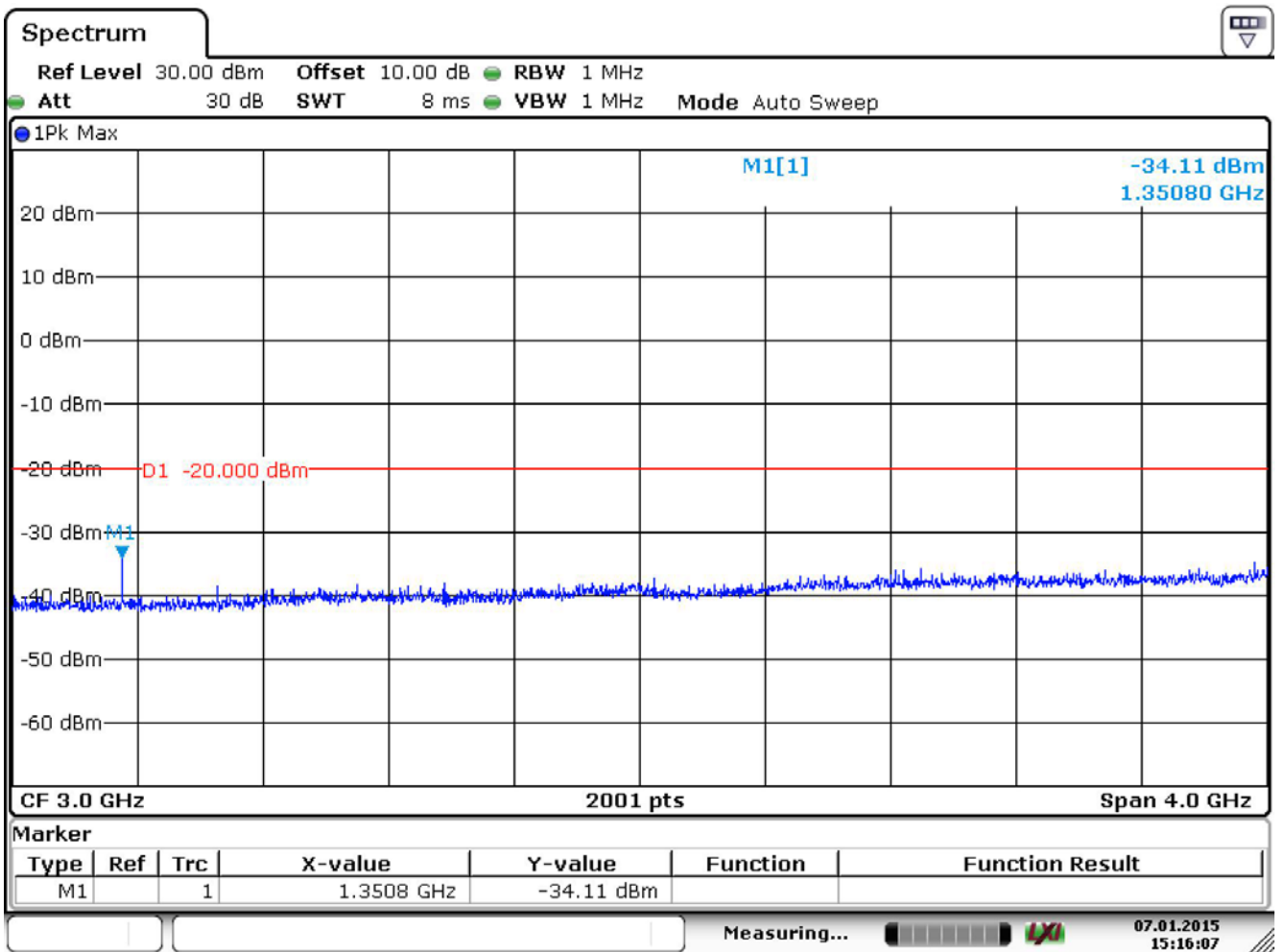
Date: 7.JAN.2015 15:15:14

450MHz(10MHz-1GHz)



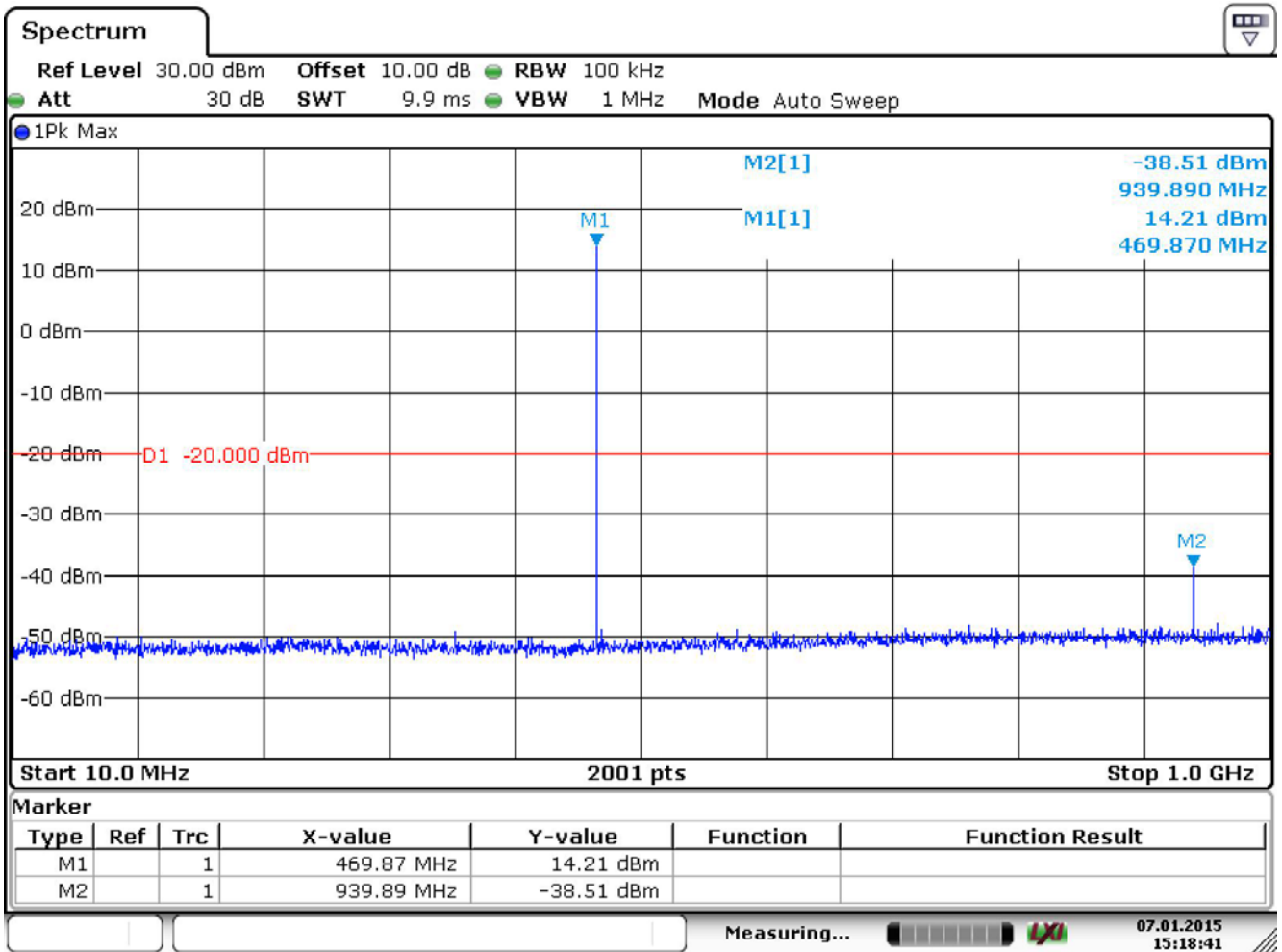
Date: 7.JAN.2015 15:18:05

450MHz(1GHz-5GHz)



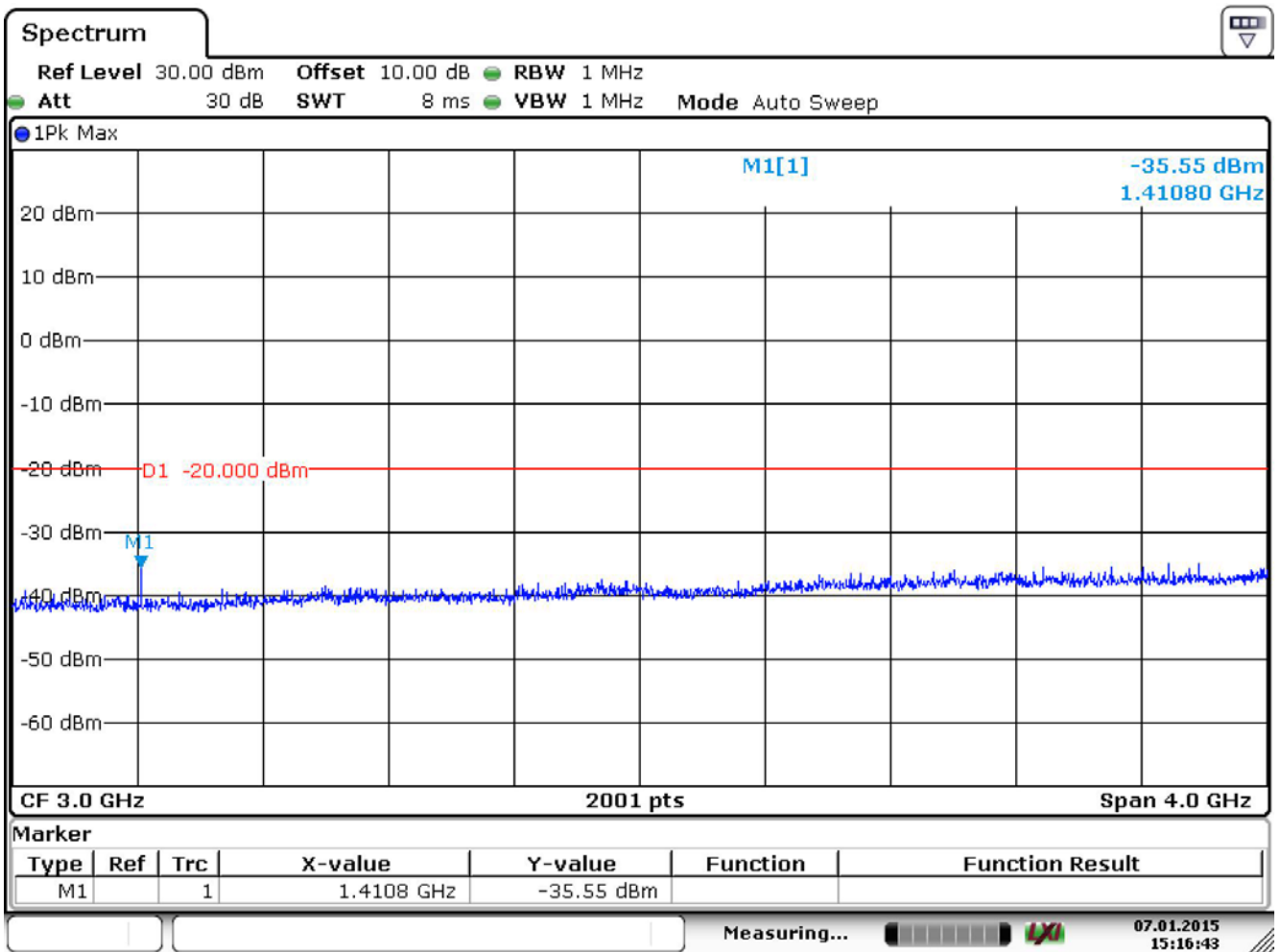
Date: 7.JAN.2015 15:16:08

470MHz(10MHz-1GHz)



Date: 7.JAN.2015 15:18:41

470MHz(1GHz-5GHz)



Date: 7.JAN.2015 15:16:43

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

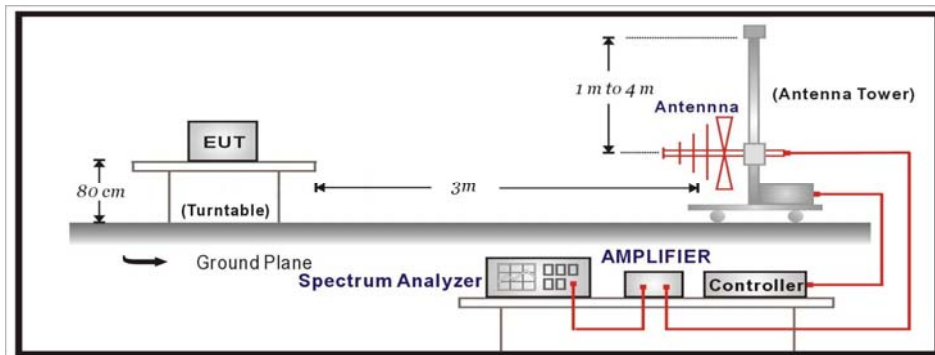
Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Bilog Antenna	SCHAFFNER	CBL6112B	2895	2015/08/14
Double Ridged Guide Horn Antenna	Schwarzback	BBHA 9120	D743	2015/02/12
Pre-Amplifier	Quietek	AMF-4D.	888003	2015/06/02
Pre-Amplifier	Quietek	AP-025C	CHM-0706049	2015/02/06
k Type Cable	Huber Suhner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

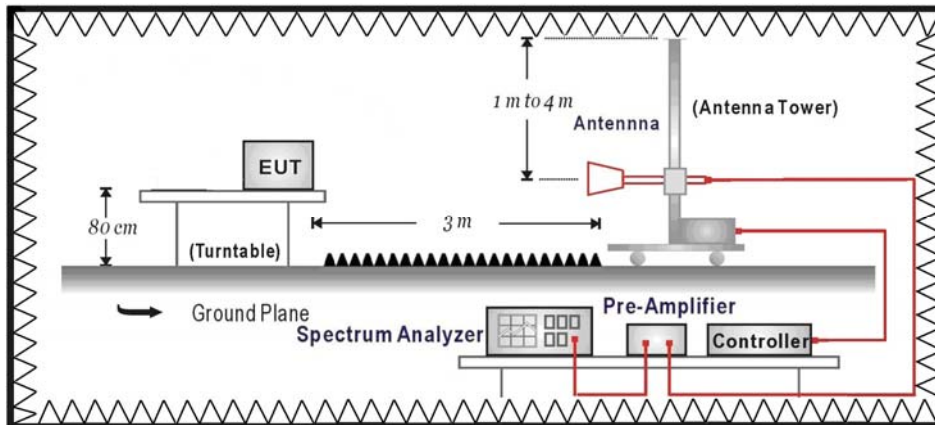
6.2. Test Setup

RF Radiated Measurement:

Under 1GHz Test Setup:



Above 1GHz Test Setup:



6.3. Limits

$12.5 \text{ kHz Spacing} = 50 + 10 \log [P(\text{Watt})]$

P=Max power output (Watt) at 0m

Limit (dBm) at 0m = (12.5 kHz Spacing) - P(dBm)

Limit (dBuV/m) at 3m = Limit(dBm) at 0m + 95.2

6.4. Test Procedure

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

12.5kHz is the worst case yielding the measurement results closet to the limit.

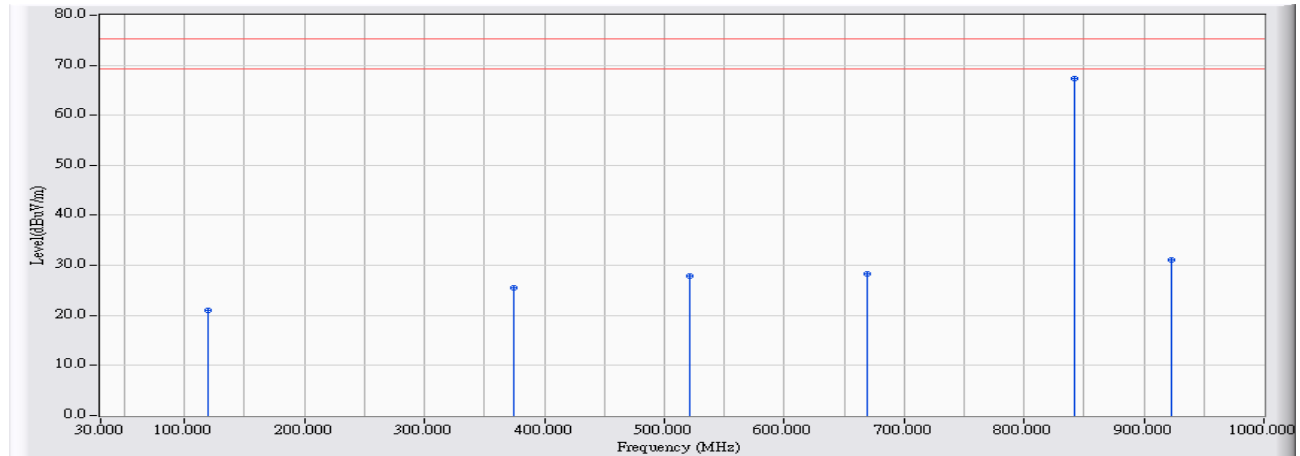
6.5. Uncertainty

The measurement uncertainty is defined as $\pm 3.65\text{dB}$

6.6. Test Result

30MHz-1GHz Spurious

Site : CB1	Time : 2015/01/07 - 22:47
Limit : FCC_PART90_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_30-1G-1_0901 - HORIZONTAL	Power : DC 13.8V
EUT : Private land mobile radio	Note : 421MHz

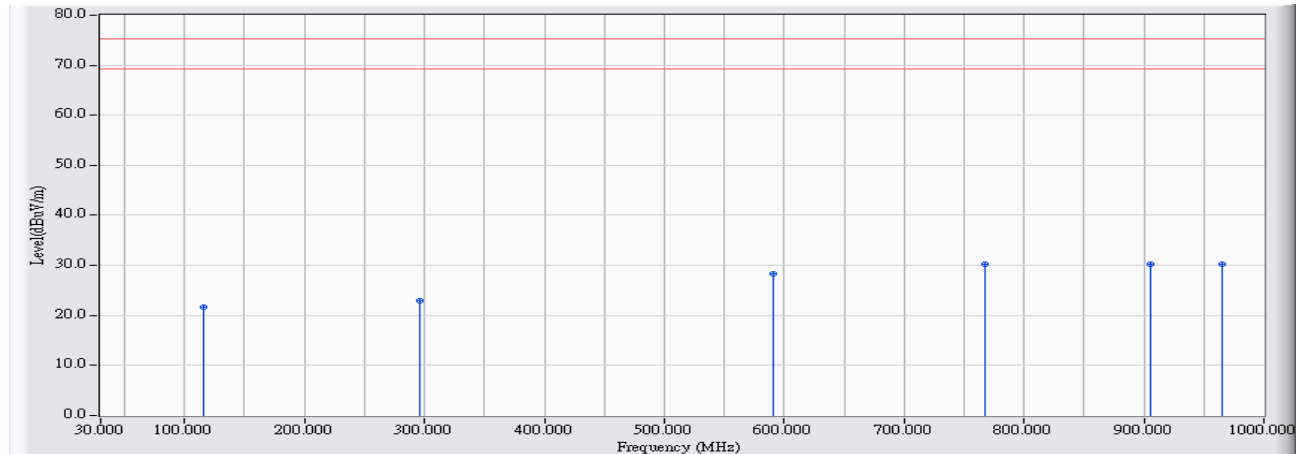


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		119.680	11.146	9.822	20.968	-54.232	75.200	PEAK
2		374.178	14.534	11.005	25.539	-49.661	75.200	PEAK
3		521.544	17.181	10.646	27.828	-47.372	75.200	PEAK
4		669.395	18.158	10.104	28.262	-46.938	75.200	PEAK
5	*	841.969	19.542	47.858	67.400	-7.800	75.200	PEAK
6		922.924	20.003	11.024	31.027	-44.173	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 : 2015/01/07 - 22:51
Limit : FCC_PART90_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_30-1G-1_0901 - VERTICAL	Power : DC 13.8V
EUT : Private land mobile radio	Note : 421MHz

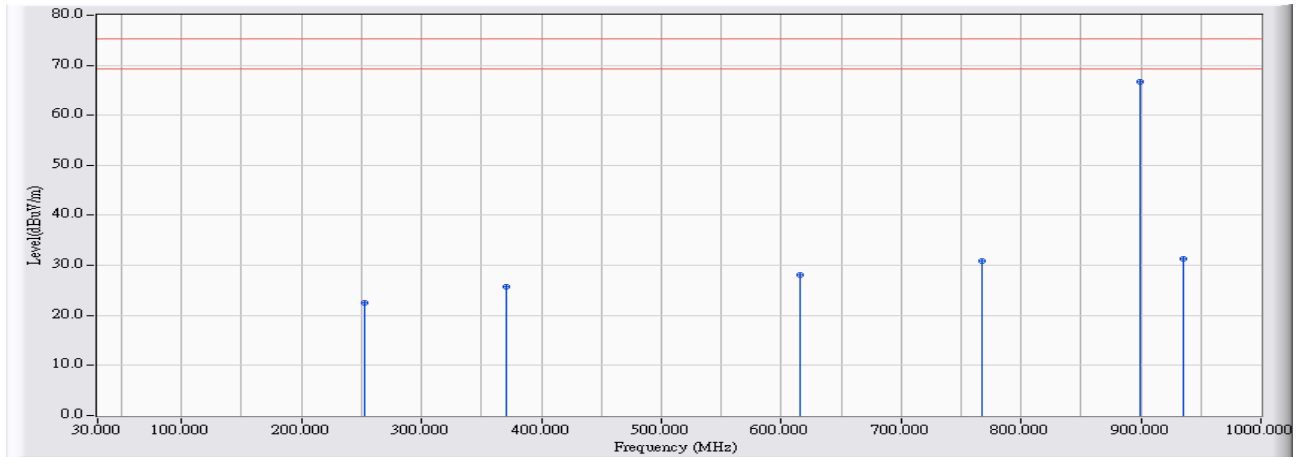


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		115.317	10.784	10.809	21.593	-53.607	75.200	PEAK
2		296.132	12.464	10.418	22.882	-52.318	75.200	PEAK
3		591.349	17.860	10.442	28.301	-46.899	75.200	PEAK
4		767.801	18.999	11.211	30.210	-44.990	75.200	PEAK
5		905.472	19.850	10.345	30.195	-45.005	75.200	PEAK
6	*	965.582	20.377	9.839	30.216	-44.984	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 : 2015/01/07 - 22:54
Limit : FCC_PART90_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_30-1G-1_0901 - HORIZONTAL	Power : DC 13.8V
EUT : Private land mobile radio	Note : 450MHz

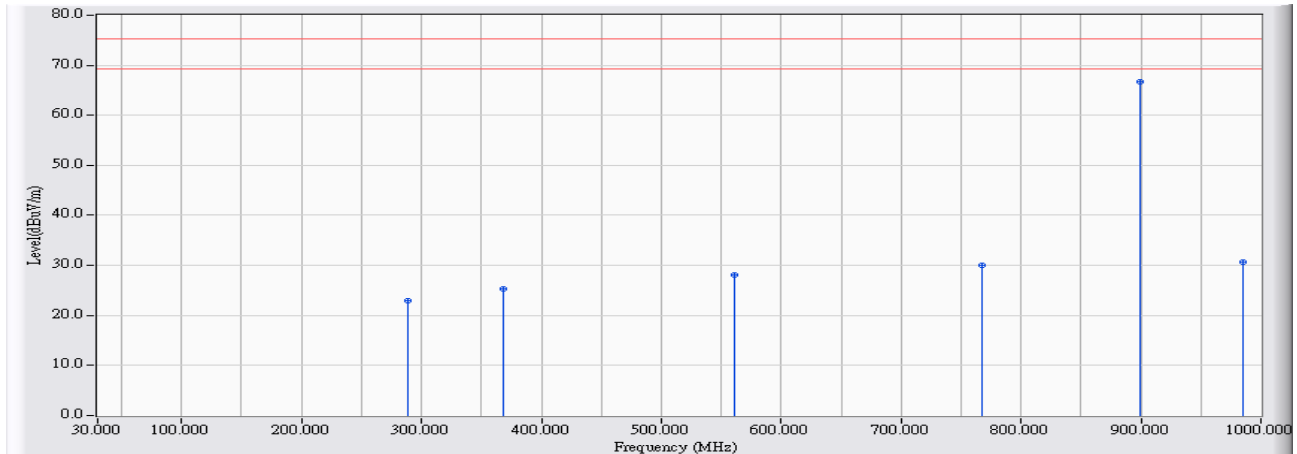


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		252.989	11.818	10.730	22.548	-52.652	75.200	PEAK
2		371.269	14.455	11.261	25.716	-49.484	75.200	PEAK
3		615.587	17.991	10.182	28.174	-47.026	75.200	PEAK
4		767.801	18.999	11.964	30.963	-44.237	75.200	PEAK
5	*	899.655	19.801	47.003	66.804	-8.396	75.200	PEAK
6		935.527	20.113	11.122	31.236	-43.964	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 : 2015/01/07 - 22:58
Limit : FCC_PART90_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_30-1G-1_0901 - VERTICAL	Power : DC 13.8V
EUT : Private land mobile radio	Note : 450MHz

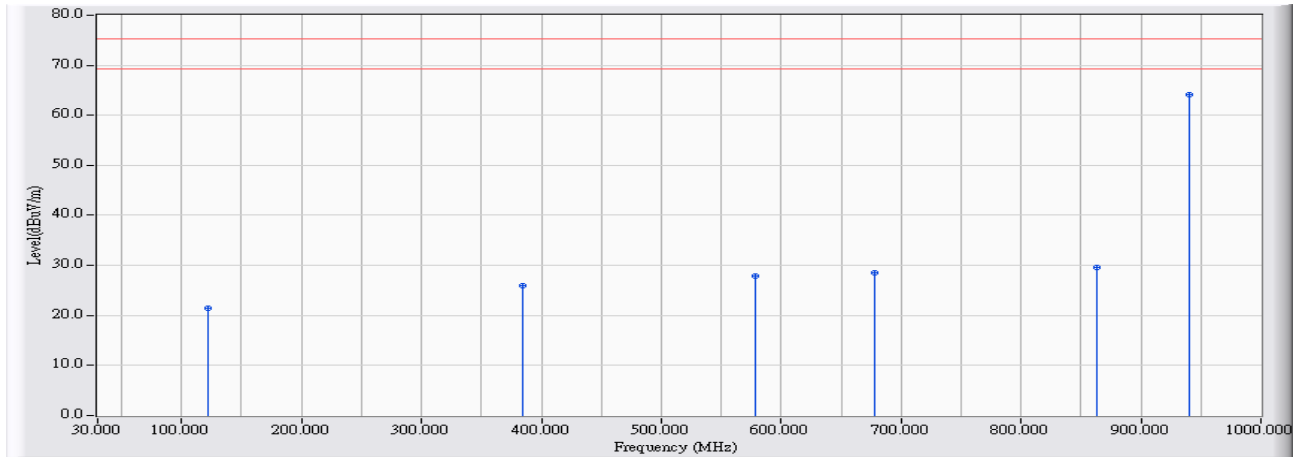


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		288.376	12.348	10.591	22.939	-52.261	75.200	PEAK
2		368.361	14.377	10.845	25.221	-49.979	75.200	PEAK
3		561.294	17.567	10.603	28.171	-47.029	75.200	PEAK
4		767.801	18.999	11.036	30.035	-45.165	75.200	PEAK
5	*	899.655	19.801	46.914	66.715	-8.485	75.200	PEAK
6		984.973	20.547	10.093	30.640	-44.560	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 : 2015/01/07 - 23:03
Limit : FCC_PART90_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_30-1G-1_0901 - HORIZONTAL	Power : DC 13.8V
EUT : Private land mobile radio	Note : 470MHz

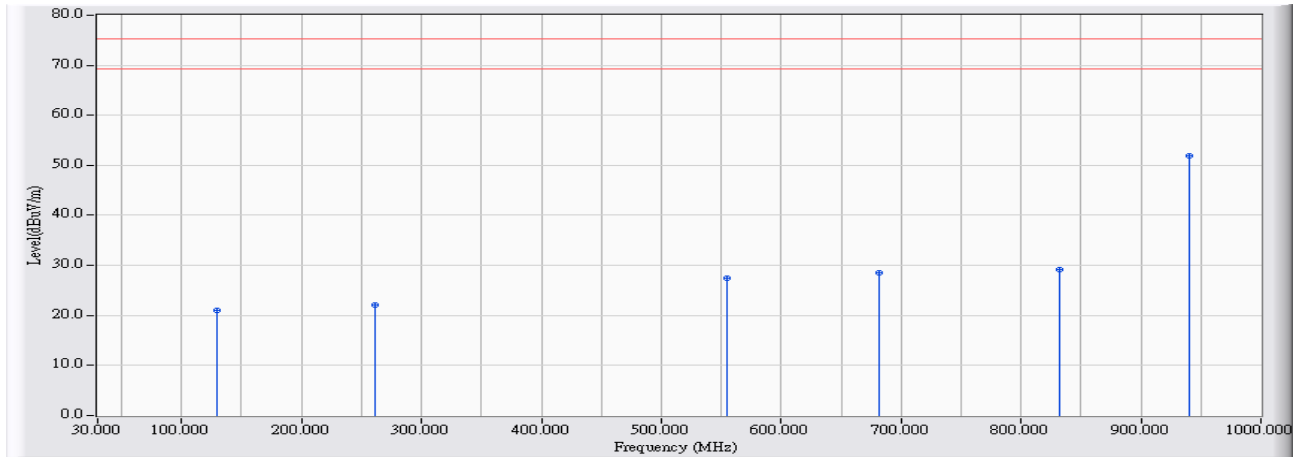


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		122.104	11.065	10.446	21.511	-53.689	75.200	PEAK
2		383.873	14.797	11.117	25.914	-49.286	75.200	PEAK
3		578.261	17.732	10.245	27.977	-47.223	75.200	PEAK
4		678.121	18.184	10.446	28.631	-46.569	75.200	PEAK
5		863.298	19.638	9.908	29.546	-45.654	75.200	PEAK
6	*	939.890	20.152	43.944	64.096	-11.104	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 : 2015/01/07 - 23:08
Limit : FCC_PART90_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_30-1G-1_0901 - VERTICAL	Power : DC 13.8V
EUT : Private land mobile radio	Note : 470MHz



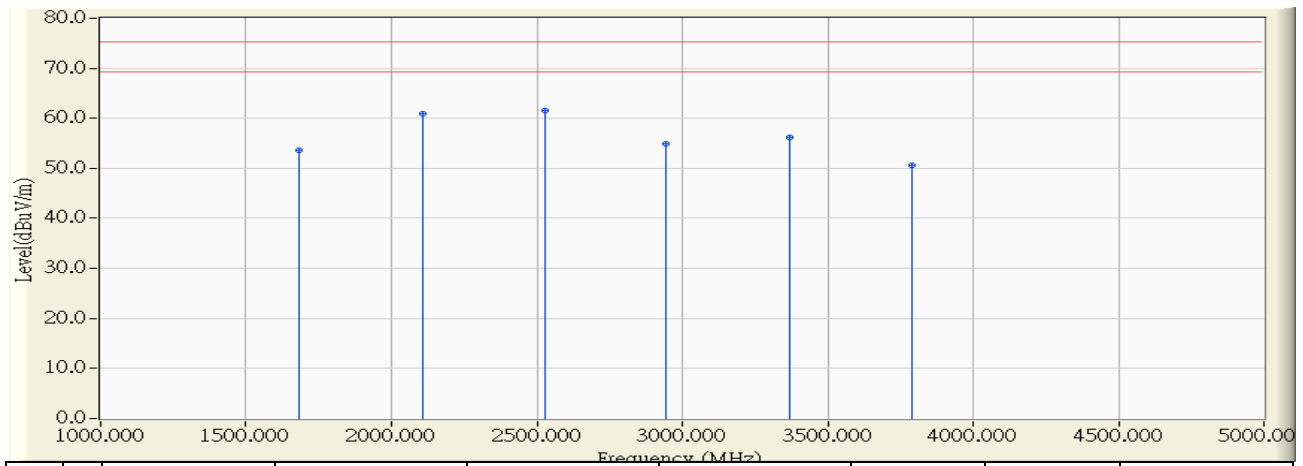
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		128.891	10.670	10.398	21.067	-54.133	75.200	PEAK
2		261.714	11.949	10.176	22.125	-53.075	75.200	PEAK
3		554.508	17.502	10.008	27.510	-47.690	75.200	PEAK
4		681.514	18.196	10.332	28.527	-46.673	75.200	PEAK
5		831.789	19.496	9.685	29.181	-46.019	75.200	PEAK
6	*	939.890	20.152	31.815	51.967	-23.233	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 - 22:30
Limit : FCC_Part90_H_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	Power : DC 13.8V
EUT : Private land mobile radio	Note : 421MHz

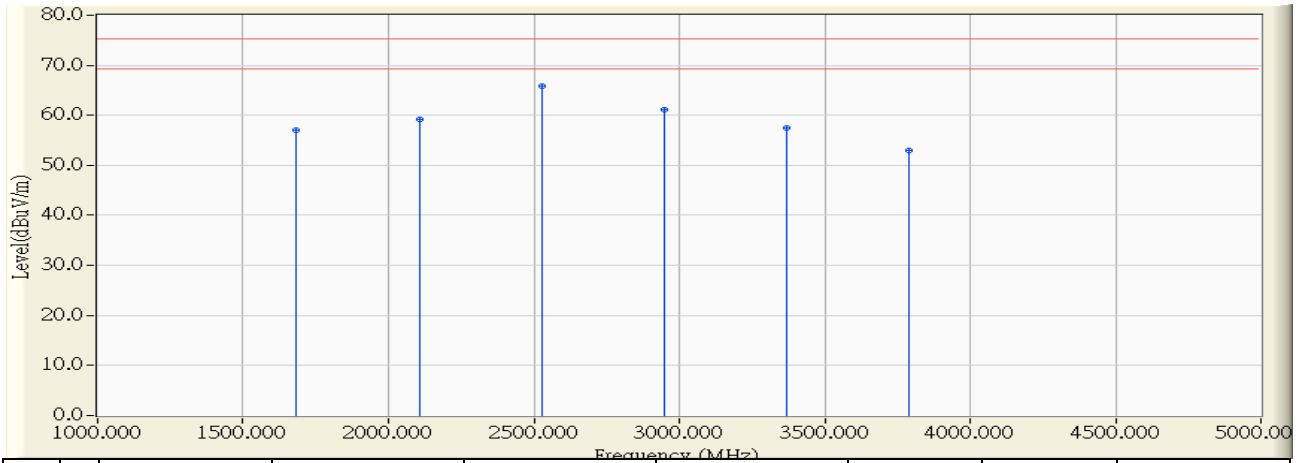


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		1684.000	-21.717	75.437	53.720	-21.480	75.200	PEAK
2		2106.000	-19.144	79.985	60.841	-14.359	75.200	PEAK
3	*	2526.000	-15.073	76.719	61.646	-13.554	75.200	PEAK
4		2946.000	-16.122	71.021	54.898	-20.302	75.200	PEAK
5		3368.000	-15.709	71.869	56.159	-19.041	75.200	PEAK
6		3788.000	-14.943	65.630	50.686	-24.514	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 - 22:33
Limit : FCC_Part90_H_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	Power : DC 13.8V
EUT : Private land mobile radio	Note : 421MHz

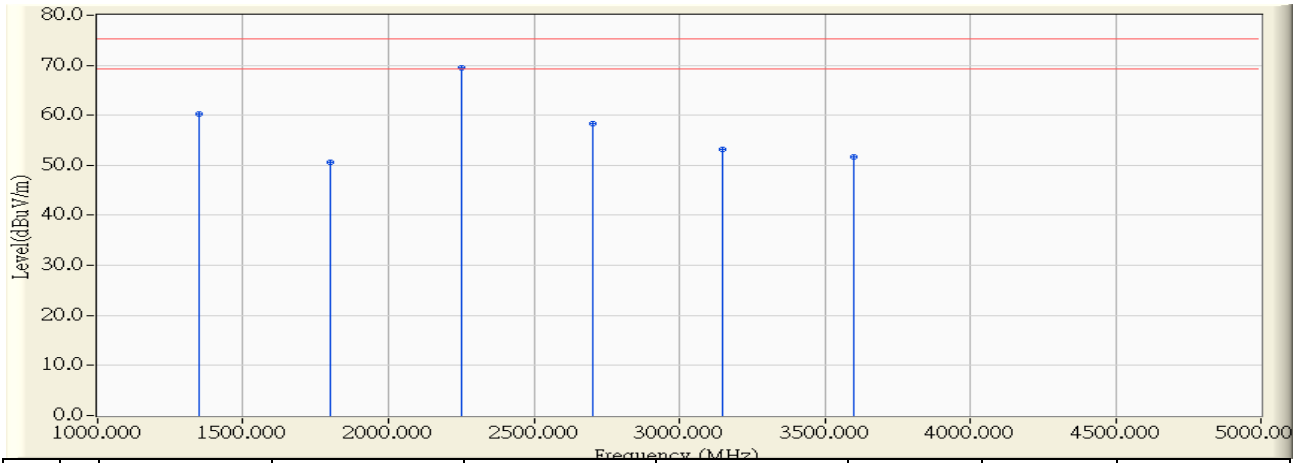


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	1684.000	-21.717	78.822	57.105	-18.095	75.200	PEAK
2	2106.000	-19.144	78.428	59.284	-15.916	75.200	PEAK
3	* 2526.000	-15.073	80.847	65.774	-9.426	75.200	PEAK
4	2948.000	-16.128	77.262	61.134	-14.066	75.200	PEAK
5	3368.000	-15.709	73.153	57.443	-17.757	75.200	PEAK
6	3788.000	-14.943	67.965	53.021	-22.179	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 - 22:36
Limit : FCC_Part90_H_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	Power : DC 13.8V
EUT : Private land mobile radio	Note : 450MHz

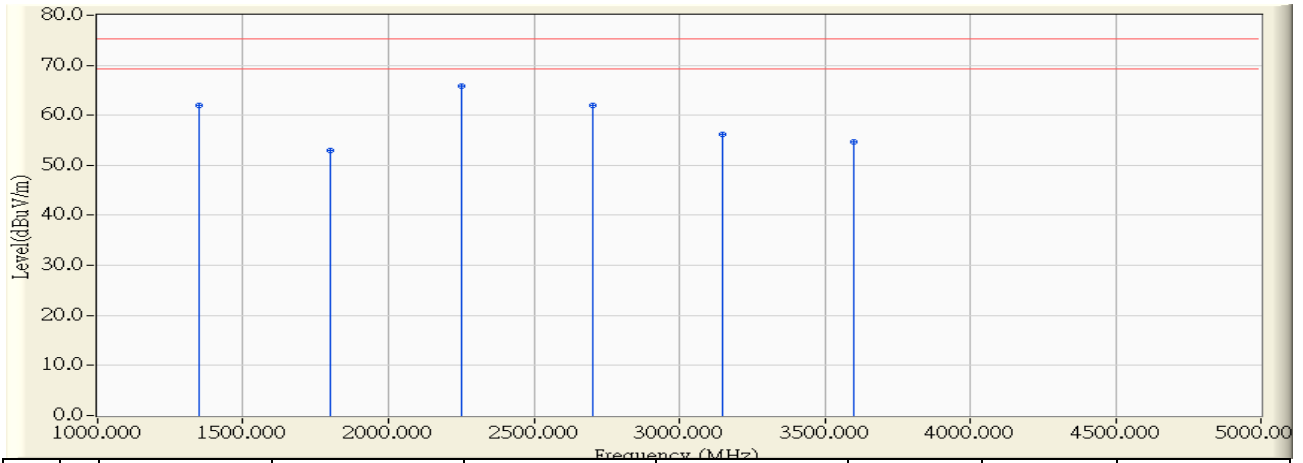


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	1350.000	-22.882	83.047	60.165	-15.035	75.200	PEAK
2	1800.000	-21.334	72.035	50.701	-24.499	75.200	PEAK
3	* 2250.000	-17.455	86.970	69.515	-5.685	75.200	PEAK
4	2700.000	-15.508	73.787	58.279	-16.921	75.200	PEAK
5	3150.000	-15.961	69.212	53.251	-21.949	75.200	PEAK
6	3600.000	-15.325	66.982	51.657	-23.543	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 - 22:39
Limit : FCC_Part90_H_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	Power : DC 13.8V (Power by Battery)
EUT : Private land mobile radio	Note : 450MHz

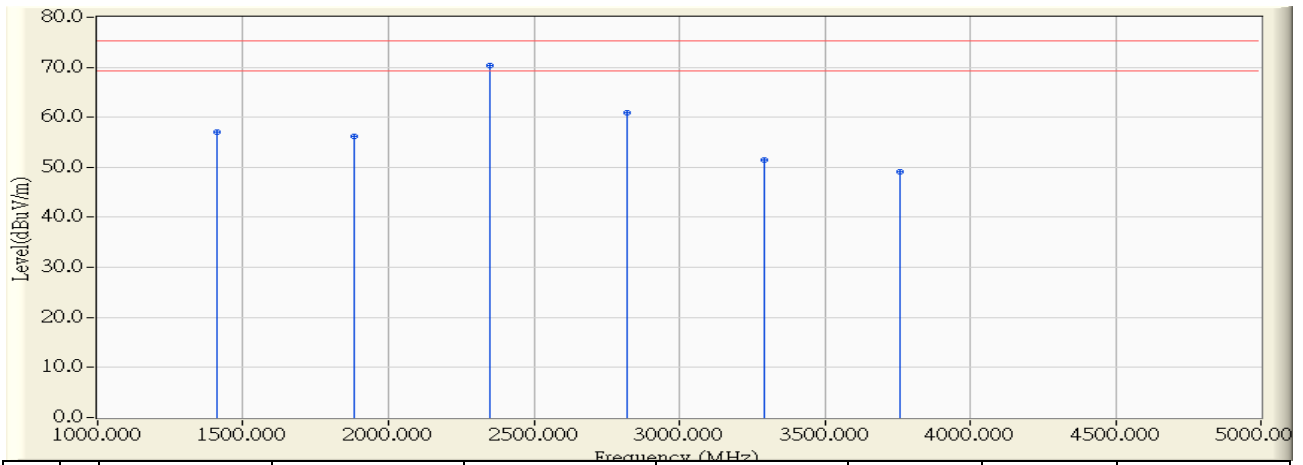


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	1350.000	-22.882	84.878	61.996	-13.204	75.200	PEAK
2	1800.000	-21.334	74.390	53.056	-22.144	75.200	PEAK
3	* 2250.000	-17.455	83.392	65.937	-9.263	75.200	PEAK
4	2700.000	-15.508	77.409	61.901	-13.299	75.200	PEAK
5	3150.000	-15.961	72.053	56.092	-19.108	75.200	PEAK
6	3600.000	-15.325	70.059	54.734	-20.466	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 - 22:42
Limit : FCC_Part90_H_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - HORIZONTAL	Power : DC 13.8V
EUT : Private land mobile radio	Note : 470MHz

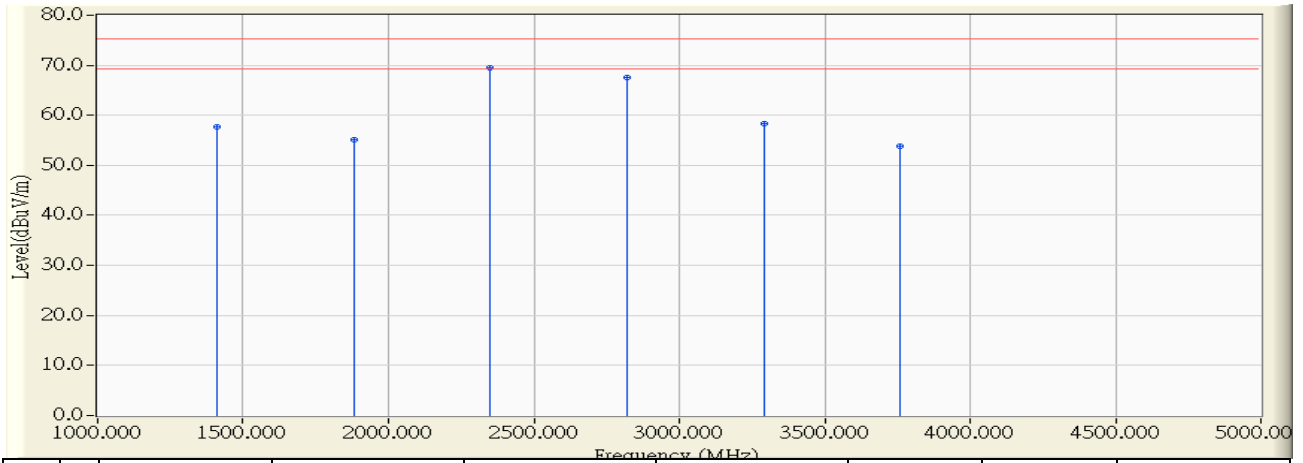


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	1410.000	-22.652	79.705	57.053	-18.147	75.200	PEAK
2	1880.000	-21.070	77.239	56.169	-19.031	75.200	PEAK
3	* 2350.000	-16.282	86.560	70.278	-4.922	75.200	PEAK
4	2820.000	-15.808	76.706	60.898	-14.302	75.200	PEAK
5	3290.000	-15.800	67.336	51.537	-23.663	75.200	PEAK
6	3760.000	-15.001	64.142	49.142	-26.058	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 - 22:46
Limit : FCC_Part90_H_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G-1_0901 - VERTICAL	Power : DC 13.8V
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	80.347	57.695	-17.505	75.200	PEAK
2	1880.000	-21.070	76.099	55.029	-20.171	75.200	PEAK
3	* 2350.000	-16.282	85.772	69.490	-5.710	75.200	PEAK
4	2820.000	-15.808	83.397	67.589	-7.611	75.200	PEAK
5	3290.000	-15.800	74.116	58.317	-16.883	75.200	PEAK
6	3760.000	-15.001	68.903	53.903	-21.297	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

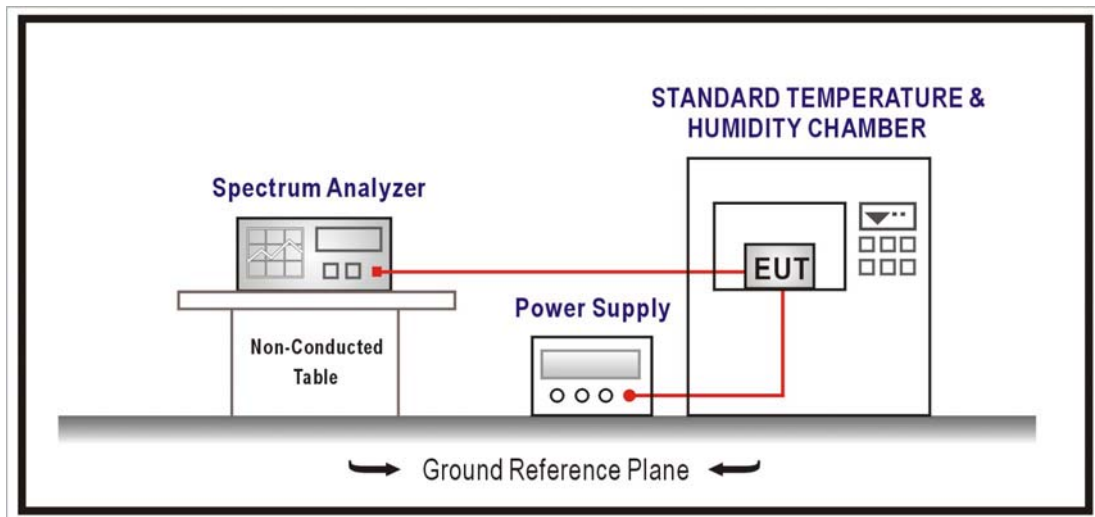
The following test equipments are used during the radiated emission tests:

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

Temperature range requirements: -30 to +50° C.

Voltage Variation +, -15%

±5 PPM

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	12.80	421.000036	0.0855	PASS
-20		421.000005	0.0119	PASS
-10		421.000006	0.0143	PASS
0		420.999993	-0.0166	PASS
10		420.999994	-0.0143	PASS
20		420.999984	-0.0380	PASS
30		420.999990	-0.0238	PASS
40		420.999959	-0.0974	PASS
50		420.999959	-0.0974	PASS

Temperature Interval (°C)	DC Voltage (V)	Frequency (MHz)	Deviation (ppm)	Result
25	14.72	420.999998	-0.0048	PASS
	12.80	420.999997	-0.0071	PASS
	10.88	420.999999	-0.0024	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	12.80	450.000015	0.0333	PASS
-20		450.000037	0.0822	PASS
-10		450.000005	0.0111	PASS
0		449.999998	-0.0044	PASS
10		449.999994	-0.0133	PASS
20		449.999997	-0.0067	PASS
30		449.999975	-0.0556	PASS
40		449.999991	-0.0200	PASS
50		449.999924	-0.1689	PASS

Temperature Interval (°C)	DC Voltage (V)	Frequency (MHz)	Deviation (ppm)	Result
25	14.72	449.999994	-0.0133	PASS
	12.80	449.999999	-0.0022	PASS
	10.88	449.999997	-0.0067	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	12.80	470.000024	0.0511	PASS
-20		470.000013	0.0277	PASS
-10		470.000011	0.0234	PASS
0		469.999997	-0.0064	PASS
10		470.000000	0.0000	PASS
20		469.999998	-0.0043	PASS
30		469.999980	-0.0426	PASS
40		469.999950	-0.1064	PASS
50		469.999888	-0.2383	PASS

Temperature Interval (°C)	DC Voltage (V)	Frequency (MHz)	Deviation (ppm)	Result
25	14.72	469.999999	-0.0021	PASS
	12.80	469.999997	-0.0064	PASS
	10.88	469.999994	-0.0128	PASS

8. Transient Frequency Behavior

8.1. Test Equipment

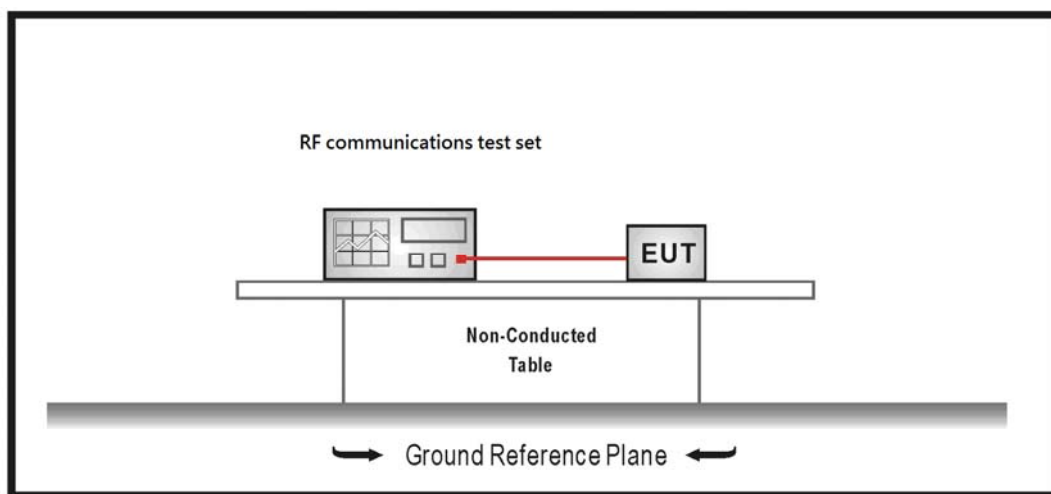
The following test equipments are used during the radiated emission tests:

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) t_{on} 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 t_{on} .
 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 t_{off} .
 t_{off} 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 §90.213.
- (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

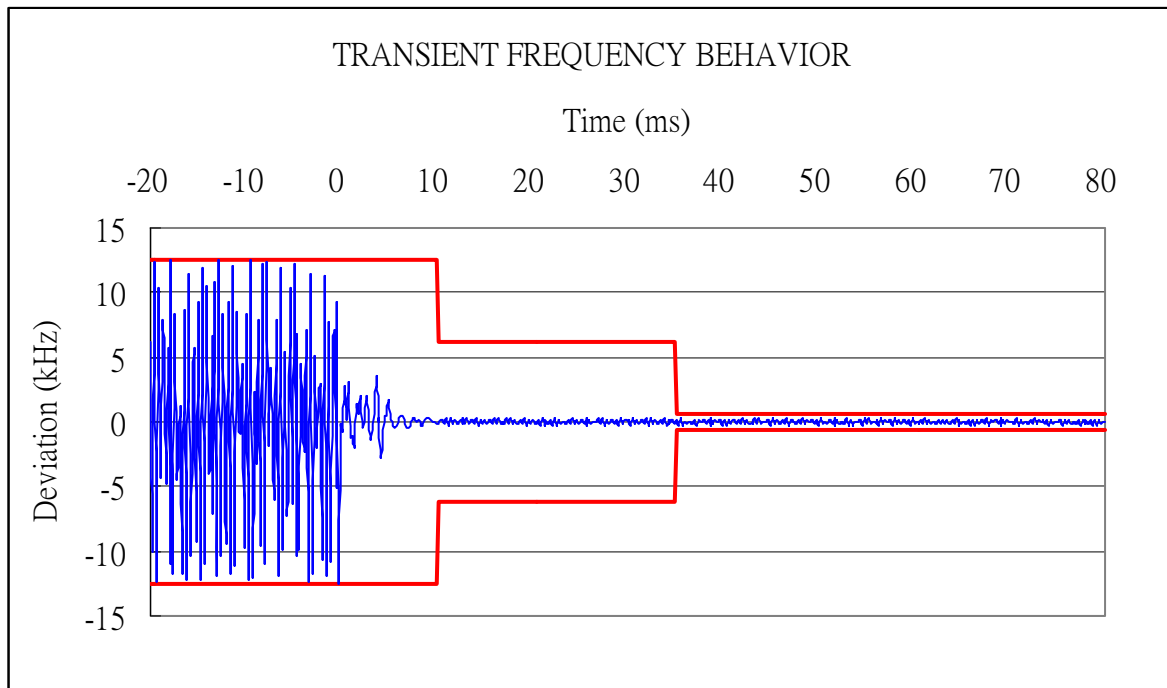
8.5. Uncertainty

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

