
TEST REPORT

Report No.: SRMC2008-H024-E0053

Product Name: Radio Frequency Identification Reader

Product Model: S1853

Applicant: Sense Technology Co., Ltd.

Manufacturer: Sense Technology Co., Ltd.

Specification: FCC PART15C

FCC ID: SDQSENSE1853

The State Radio Monitoring Center, Equipment Testing Division

The State Radio Spectrum Monitoring and Testing Center

No.80 Beilishi Road Xicheng District Beijing, China

Tel: 86-10-68009202 Fax: 86-10-68009205

CONTENTS

1. General information	3
1.1 Notes of the test report	3
1.2 Information about the testing laboratory	3
1.3 Applicant's details	3
1.4 Manufacturer's details	3
1.5 Application details	4
1.6 Reference specification	4
1.7 Information of EUT	4
1.7.1 General information	4
1.7.2 EUT details	5
1.7.3 Auxiliary equipment details	5
2. Test information:	6
2.1 Summary of the test results:	6
2.2 Test result	7
2.2.1 RF Output Power –FCC Part 15.247(b)(2)	7
2.2.2 Effective Radiated Power- FCC Part 15.247(b)(2)	10
2.2.3 20dB Bandwidth -FCC Part 15.247(a)(1)(i)	12
2.2.4 Spurious RF conducted emissions -FCC Part 15.209 §15.247 (C)	15
2.2.5 900MHz Band Edge -FCC Part 15.247(d)	24
2.2.6 Number of Hopping Channels-FCC Part 15.247(a)(1)(i)	26
2.2.6 Channel Spacing-FCC Part 15.247(a)(1)	29
2.2.7 Channel Dwell Time-FCC Part 15.247(a)(1)	30
2.2.8 Spurious radiated emissions-15.247(d), §15.35(b), §15.209	33
2.2.9 AC Line Conducted Emissions- §15.207	38
2.3. List of test equipments	40
Appendix	41

1. General information

1.1 Notes of the test report

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written permission of The State Radio Monitoring Center.

The test results relate only to individual items of the samples which have been tested.

1.2 Information about the testing laboratory

Company: The State Radio Monitoring Center, Equipment Testing Division
The State Radio Spectrum Monitoring and Testing Center
Address: No.80 Beilishi Road, Xicheng District, Beijing China
City: Beijing
Country or Region: China
Contacted person: Wang Junfeng
Tel: +86 10 68009181 +86 10 68009202
Fax: +86 10 68009195 +86 10 68009205
Email: Wangjf@srrc.org.cn

1.3 Applicant's details

Company: Sense Technology Co., Ltd
Address: 3F, Tower D, Tian Ji Plaza Tian An Cyber Industrial Park
518040
City: Shenzhen
Country or Region: P. R. China
Contacted person: Jerry XUE
Tel: +86 (755) 82924404
Fax: +86 (755) 82924433
Email: jerry@sense-hk.com

1.4 Manufacturer's details

Company: Sense Technology Co. ,Ltd
Address: 3F, Tower D, Tian Ji Plaza Tian An Cyber Industrial Park
518040
City: Shenzhen
Country or Region: P. R. China
Contacted person: Jerry Xue
Tel: +86 (755) 82924404
Fax: +86 (755) 82924433
Email: jerry@sense-hk.com

1.5 Application details

Date of reception of test sample: 16th July 2008

Date of test: 23th June 2008 to 16th July 2008

1.6 Reference specification

FCC PART15C

1.7 Information of EUT

1.7.1 General information

Name of EUT	Radio Frequency Identification Reader
FCC ID	SDQSENSE1853
Frequency range	902~928MHz
RF output power	26.10dBm
E.R.P.	25.31dBm
Modulation type	ASK
Emission Designator	N/A
Hopping Frequencies	50
Antenna type	Internal Integrated
Power Supply	Battery or charger
HW Version	V 2.2
SW Version	V 2.1.5

1.7.2 EUT details

Name	Model	Serial number
Radio Frequency Identification Reader	S1853	S185308050016

1.7.3 Auxiliary equipment details

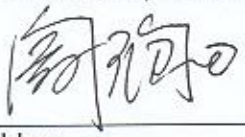

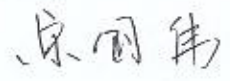
Equipment	Charger
Manufacturer	SHEN ZHEN HEREWIN TECHNOLOGY CO.,LTD
Model Number	DSA-0421S-05

Equipment	Battery
Manufacturer	SHEN ZHEN HEREWIN TECHNOLOGY CO.,LTD
Model Number	CC60010372501HY
Capacity	2500mAh
Rated Voltage	3.7V

2. Test information:

2.1 Summary of the test results:

No.	Test case	FCC reference	Verdict
1	RF Output Power	15.247(b)(2)	Pass
2	E.R.P.	15.247(b)(2)	Pass
3	20dB Bandwidth	15.247(a)(1)(i)	Pass
4	Spurious RF conducted emissions	15.109(f)	Pass
5	900MHz Band Edge	15.247(d)	Pass
6	Number of hopping channels	15.247(a)(1)(i)	Pass
7	Channel Spacing	15.247(a)(1)	Pass
8	Channel Dwell Time	15.247(a)(1)	Pass
9	Radiated Spurious Emissions	15.247(d), 15.35(b), 15.209	Pass
10	AC Line Conducted Emissions	15.207	Pass

This Test Report Is Issued by: Mr. Kan Runtian, Director of the test lab 	Checked by: 
Tested by: 	Issued date: 2008.8.13

Test report revision:

Revision	Report No.	Issue Date
0		
1		

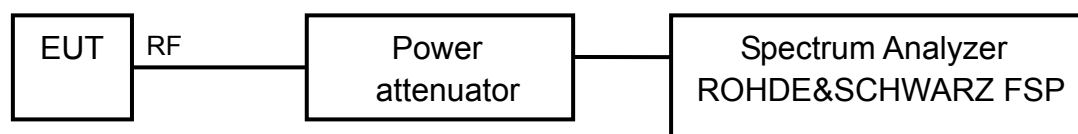
2.2 Test result

2.2.1 RF Output Power –FCC Part 15.247(b)(2)

Ambient condition:

Temperature	Relative humidity	Pressure
18°C	40%	102.5kPa

Test Setup:



Test procedure:

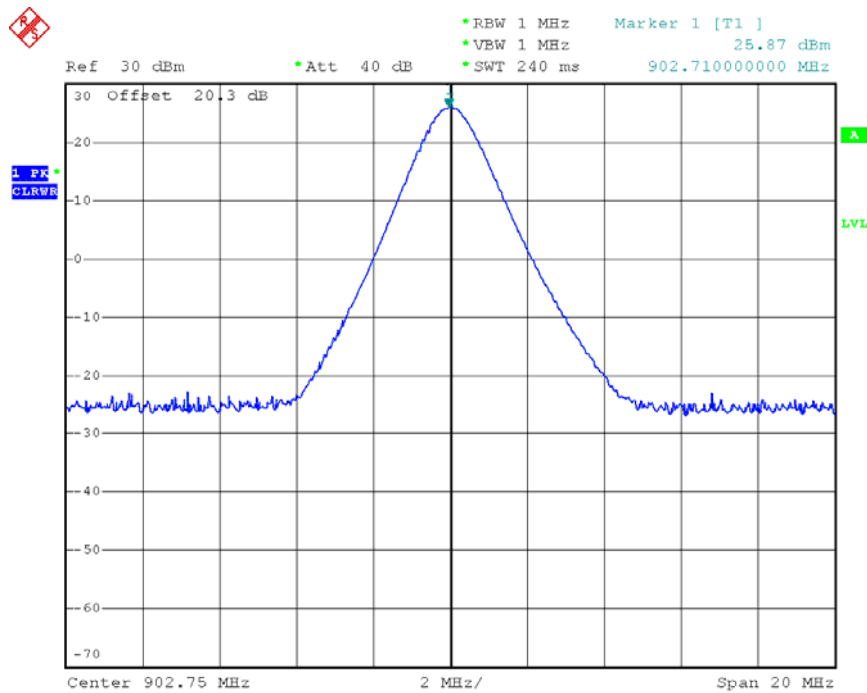
The test was configured as shown in the RF conducted bench top test setup. The unit was sequentially tuned to the test channels (Low, Mid and High) and configured to transmit random data. The RF transmit power was then measured on the spectrum analyzer.

Given that the channel BW is approximately 20MHz, the RBW and VBW was set to encompass the entire bandwidth of the channel and thus measure the total channel power. The RBW and VBW were set as follows: RBW 1 MHz, VBW 1 MHz, and the detector is PK model.

Limits	$\leq 30\text{dBm}$
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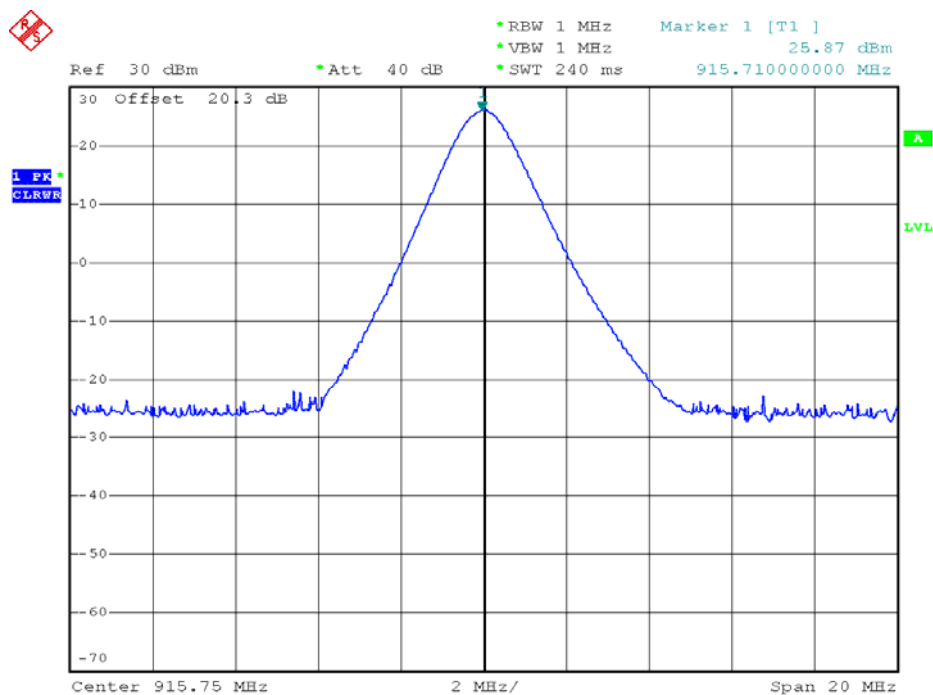
Test result:

Channel	Frequency (MHz)	RF Output Power (dBm)
LOW	902.75	25.87
MID	915.75	25.87
HIGH	927.25	26.10



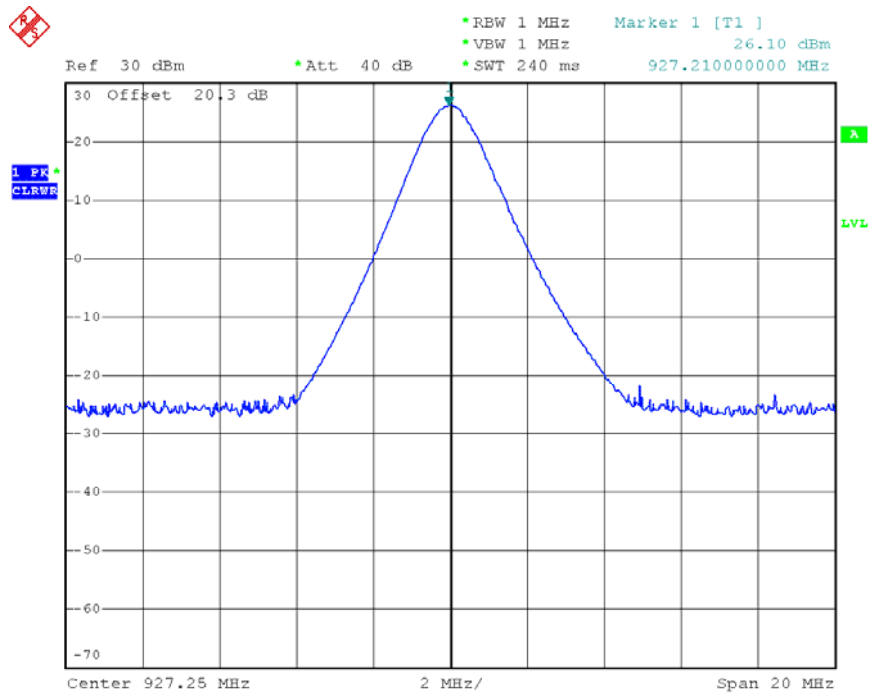
Date: 16.JUL.2008 17:01:18

RF Output Power, LOW Channel



Date: 16.JUL.2008 17:02:03

RF Output Power, MID Channel



Date: 16.JUL.2008 17:02:57

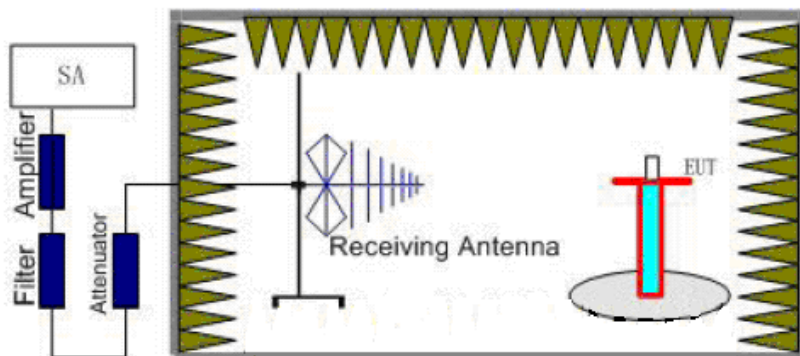
RF Output Power, HIGH Channel

2.2.2 Effective Radiated Power- FCC Part 15.247(b)(2)

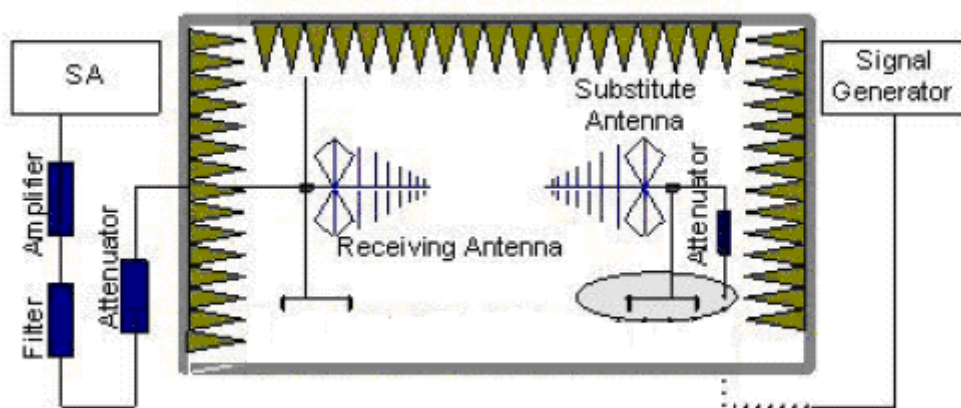
Ambient condition:

Temperature	Relative humidity	Pressure
18°C	40%	102.5kPa

Test setup



Step 1



Step 2

Test procedure:

Step 1:

The measurement is carried out in the semi-anechoic chamber. EUT was placed on a 0.8 meters high non-conductive table at a 3 meters test distance from the test receive antenna. A receiving antenna was placed on the antenna mast 3 meters from the EUT. The output power of the cell signal of the tester was in a maximum value. A peak detector is used, while RBW and VBW are both set to 1MHz. During the measurement, the highest emission was recorded from analyzer power level (LVL) from the 360 degrees rotation of the

turntable and the test antenna moved up and down over a range from 1 to 4 meters in both horizontally and vertically polarized orientations.

Step 2:

A dipole antenna shall be substituted in place of the EUT. The antenna will be driven by a signal generator with a known power S.G. applied through a Tx cable. Then the maximum Analyzer reading is recorded while the antenna was moving up and down. The E.R.P. /E.I.R.P. of the EUT can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.

The correction factor (in dB)=S.G. - Tx Cable loss + Substitution antenna gain - Analyzer reading – 2.15. Then the EUT's E.R.P. was calculated with the correction factor, E.R.P. = LVL + Correction factor.

Limits	$\leq 36\text{dBm}$
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Test Result

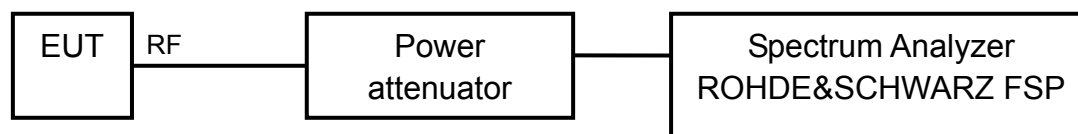
Channel	Frequency (MHz)	E. R. P. (dBm)
LOW	902.75	25.23
MID	915.75	25.31
HIGH	927.25	24.47

2.2.3 20dB Bandwidth -FCC Part 15.247(a)(1)(i)

Ambient condition:

Temperature	Relative humidity	Pressure
18°C	40%	102.5kPa

Test setup



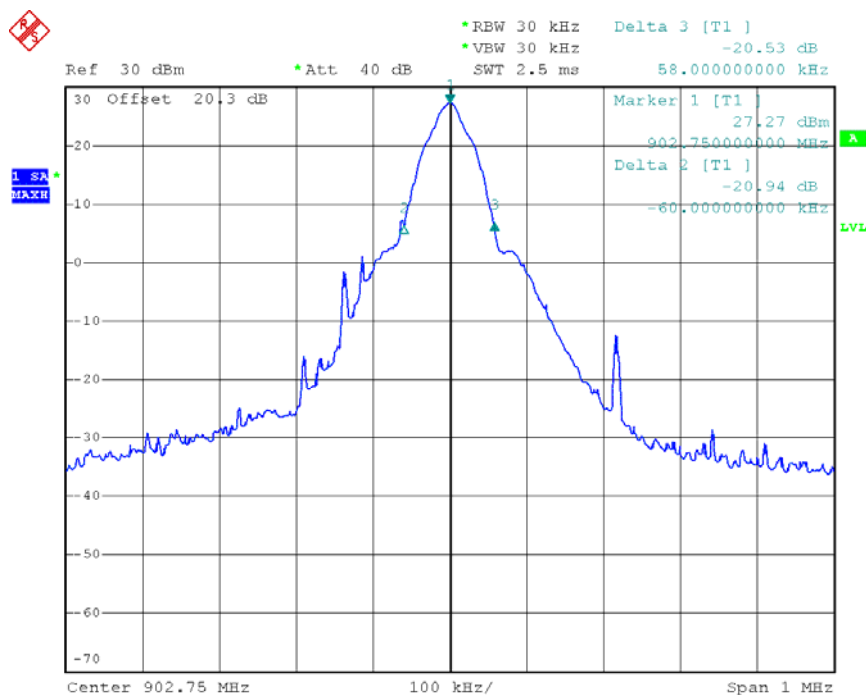
Test procedure:

The 20 dB bandwidth was measured on the low middle and high channels of the 900 MHz band using the conducted RF test setup. The spectrum analyzer was configured for MAX HOLD and the trace allowed to stabilize. A peak search with the frequency and the level was performed, then we got the “Delta 2” and “Delta 3”,and they were both located the points at -20dB below the peak. With these we tested the “20 dB Bandwidth”.

Limits	$\leq 250\text{kHz}$
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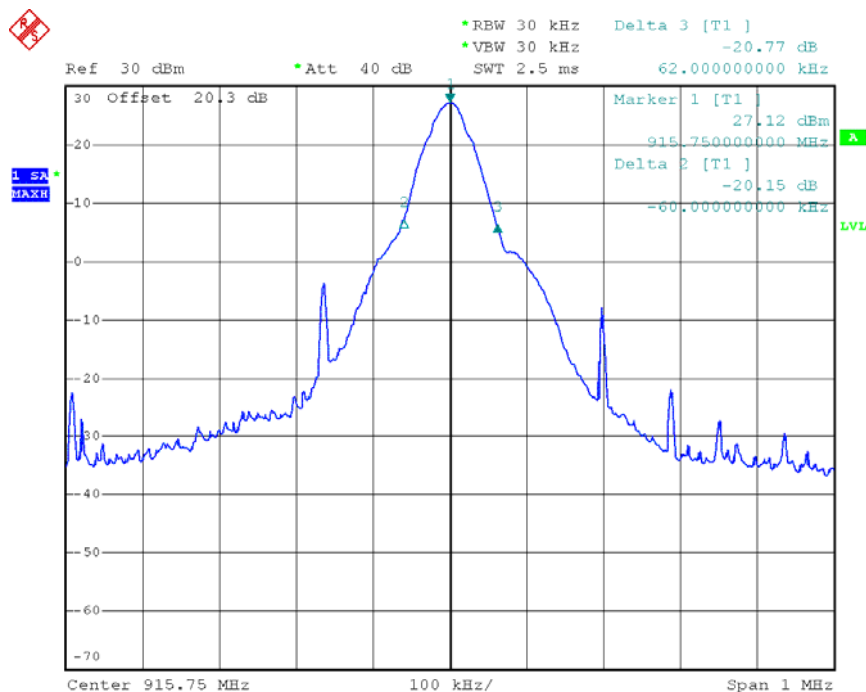
Test result:

Channel	Frequency (MHz)	Delta 2 (kHz)	Delta 3 (kHz)	20 dB BW (kHz)
LOW	902.75	58	60	118
MID	915.75	62	60	122
HIGH	927.25	58	60	118



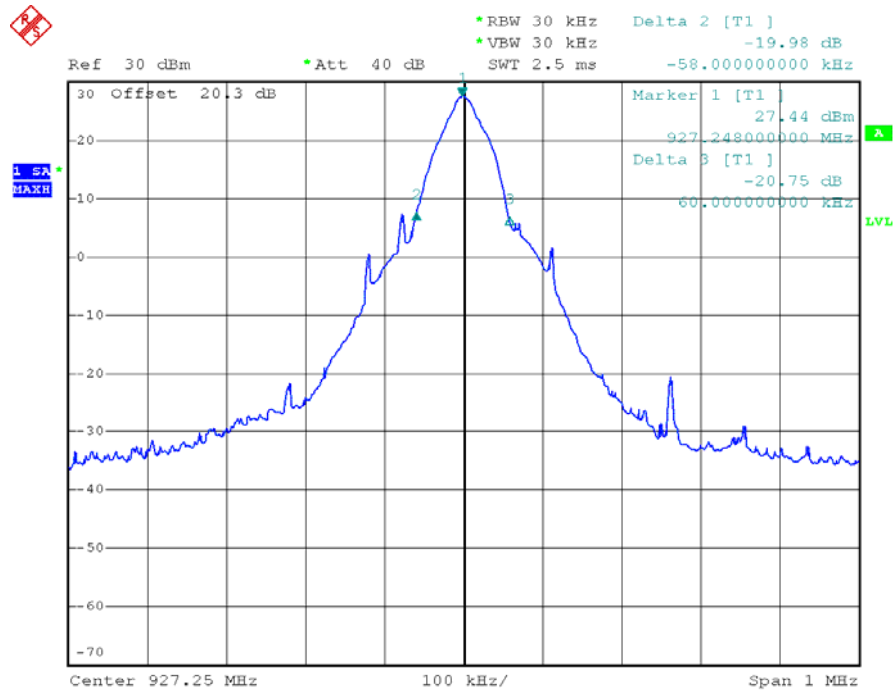
Date: 16.JUL.2008 17:32:53

20dB Bandwidth, LOW Channel



Date: 16.JUL.2008 17:31:43

20dB Bandwidth, MID Channel



Date: 16.JUL.2008 17:30:25

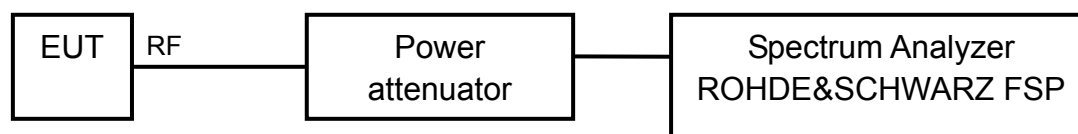
20dB Bandwidth, HIGH Channel

2.2.4 Spurious RF conducted emissions -FCC Part 15.209 §15.247 (C)

Ambient condition:

Temperature	Relative humidity	Pressure
18°C	40%	102.5kPa

Test Setup:



Test procedure:

The test was configured as shown in the RF conducted bench top test setup. The unit was sequentially tuned to the test channels (Low, Mid and High) and configured to transmit random data. The measurement is carried out using a spectrum analyzer. The spectrum analyzer scans from 30MHz to 10GHz (higher than the 10th harmonic of the carrier). The peak detector is used on spectrum analyzer.

The Spurious Emissions at antenna terminals was measured on the low middle and high channels of the 900 MHz band using the conducted RF test setup.

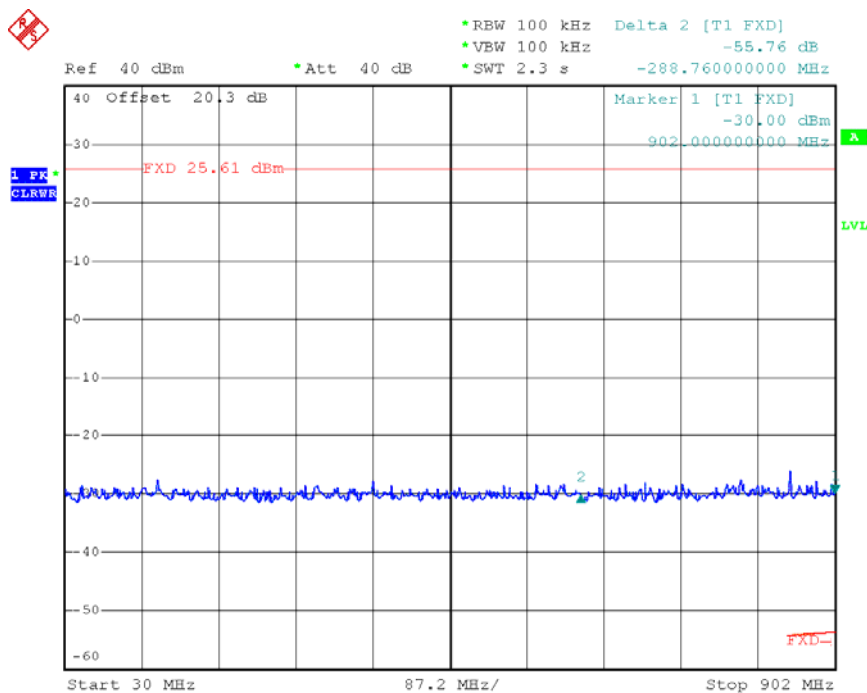
Test Limits:

FCC Specification: Part15. 109(f)

In any 500 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 500 kHz bandwidth within the band that contains the highest level of the desired power.

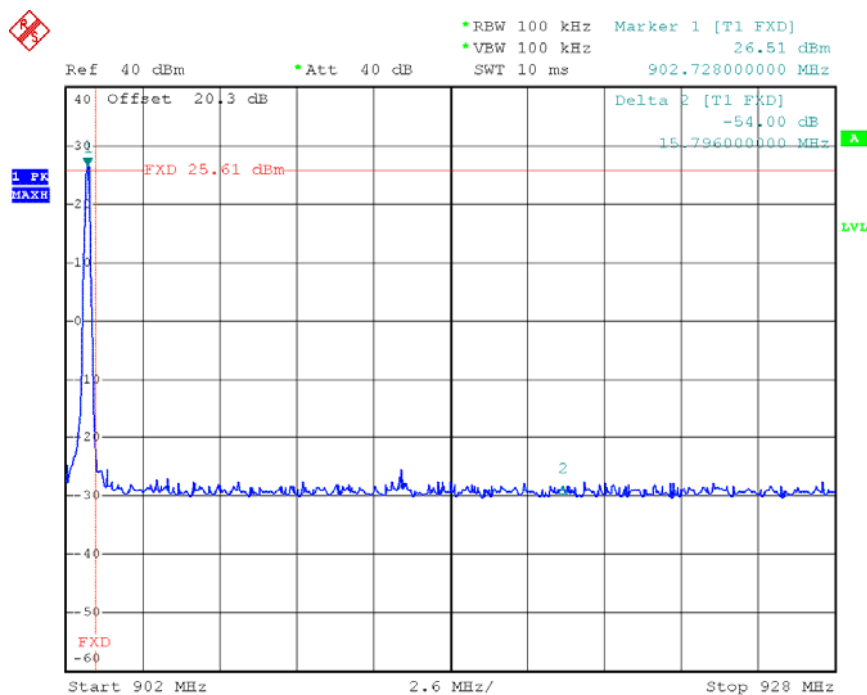
Test Results

Refer to the following figures



Date: 16.JUL.2008 18:22:58

LOW Channel, Spurious Emissions 30MHz~902MHz



Date: 16.JUL.2008 18:25:56

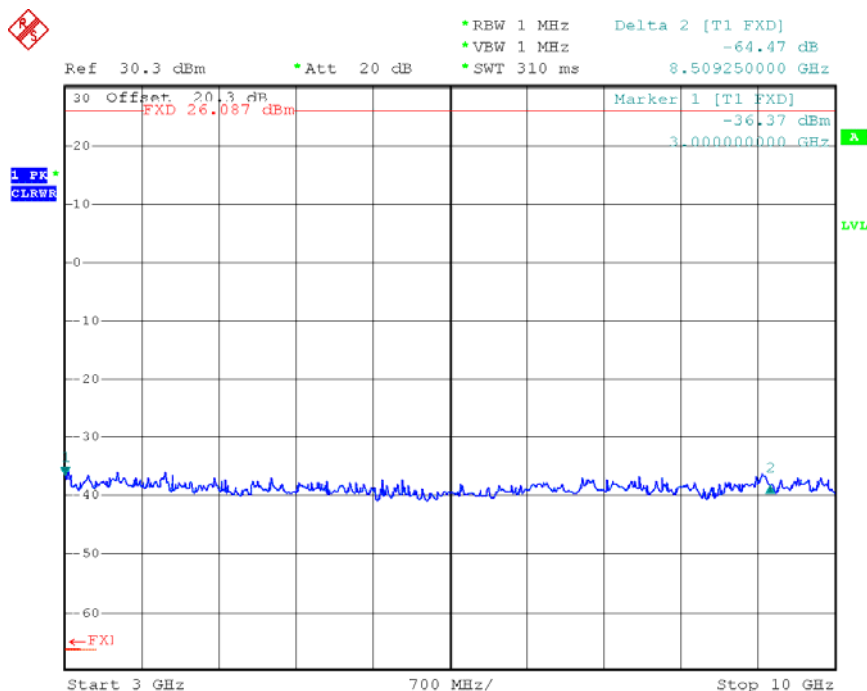
LOW Channel, Spurious Emissions 902MHz~928MHz



LOW Channel, Spurious Emissions 928MHz~1G

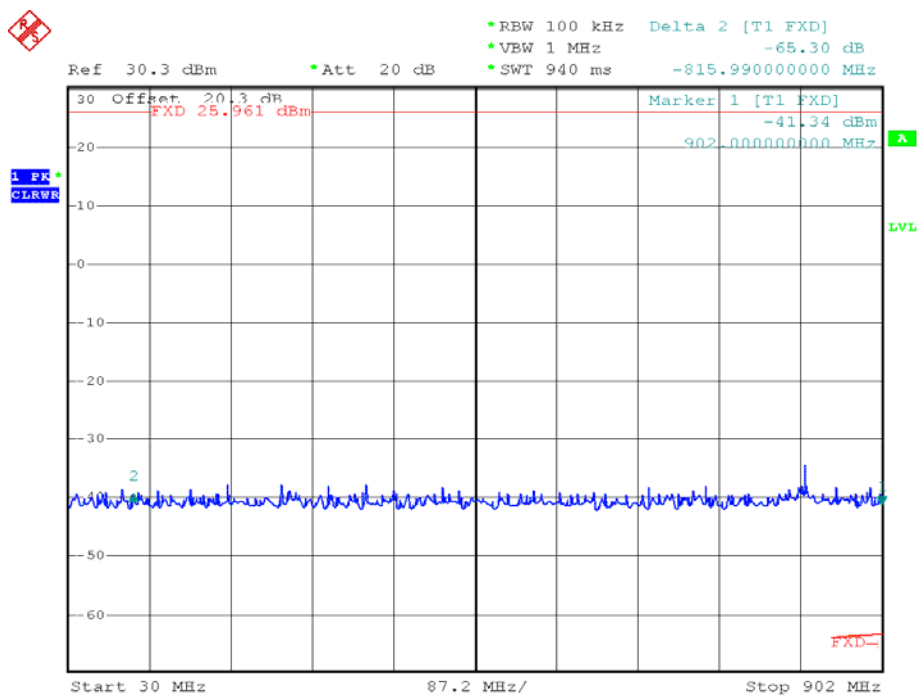


LOW Channel, Spurious Emissions 1G~3G



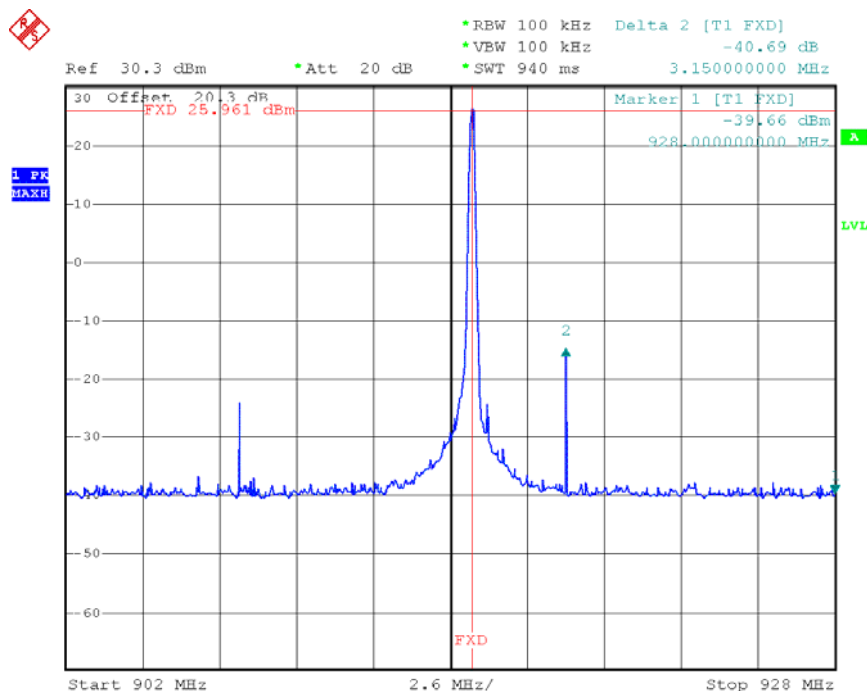
Date: 16.JUL.2008 18:36:52

LOW Channel, Spurious Emissions 3G~10G



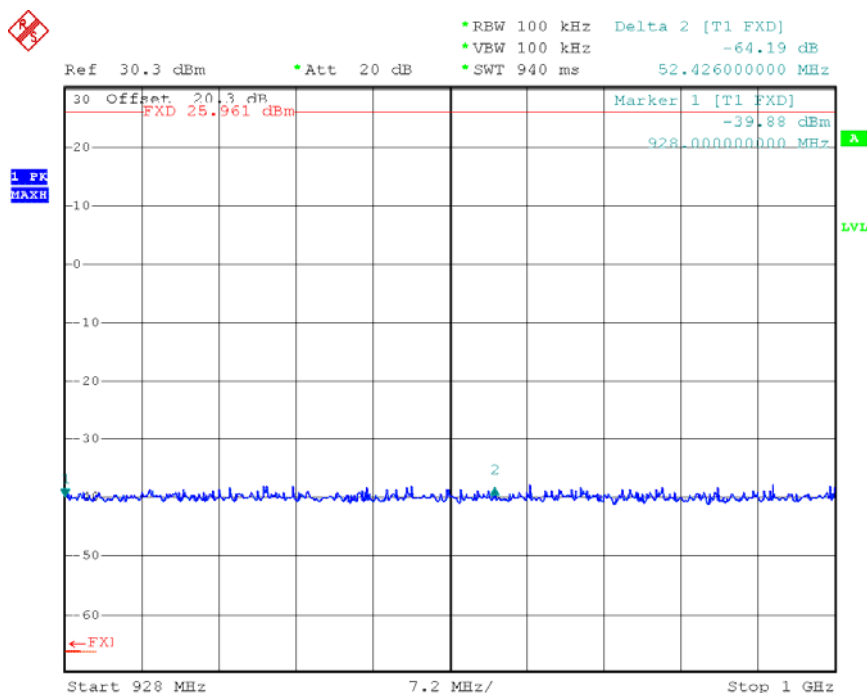
Date: 16.JUL.2008 18:40:25

MID Channel, Spurious Emissions 30MHz~902MHz



Date: 16.JUL.2008 18:43:23

MID Channel, Spurious Emissions 902MHz~928MHz

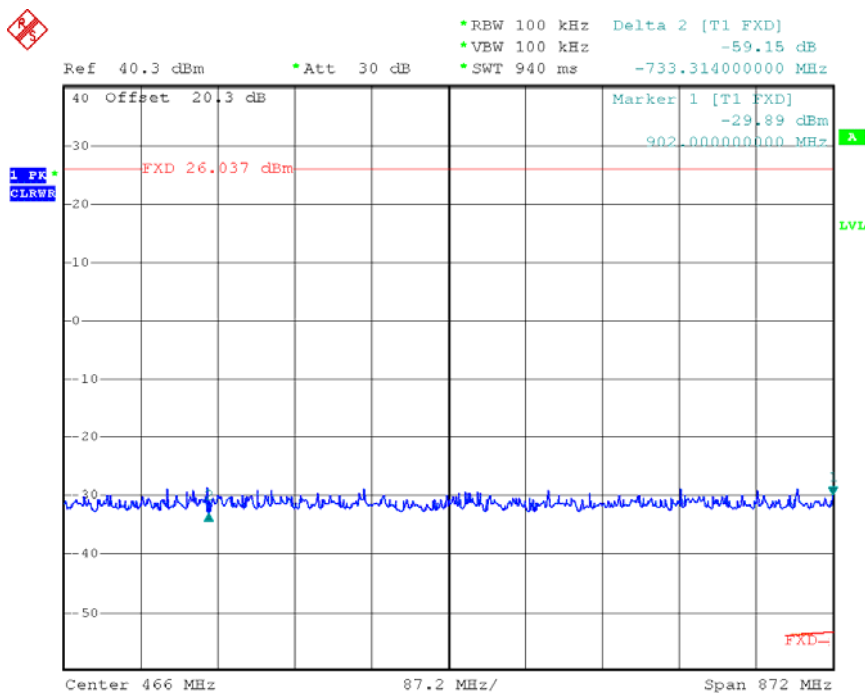


Date: 16.JUL.2008 18:43:59

MID Channel, Spurious Emissions 928MHz~1G

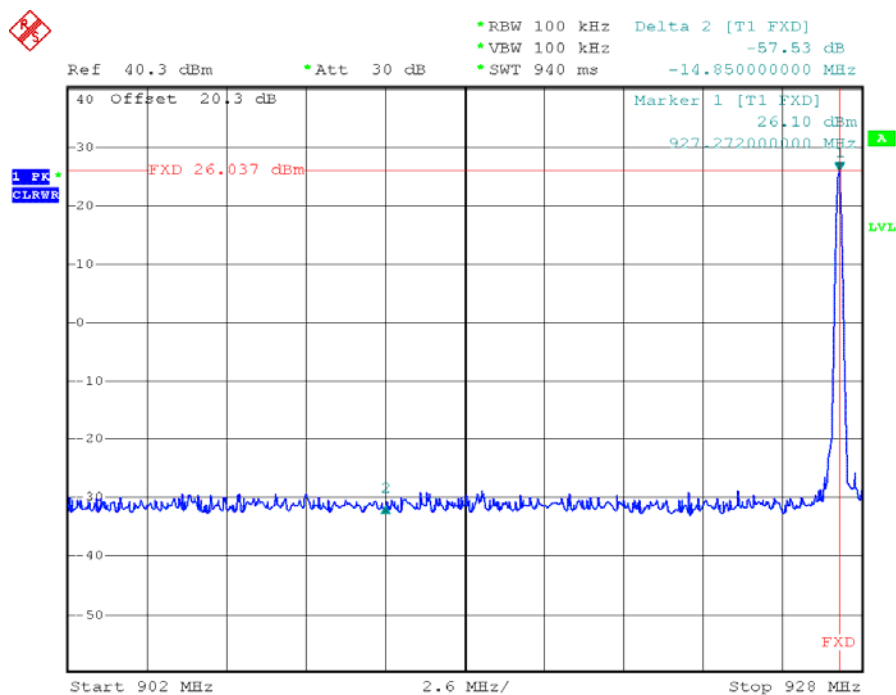


MID Channel, Spurious Emissions 3G~10G



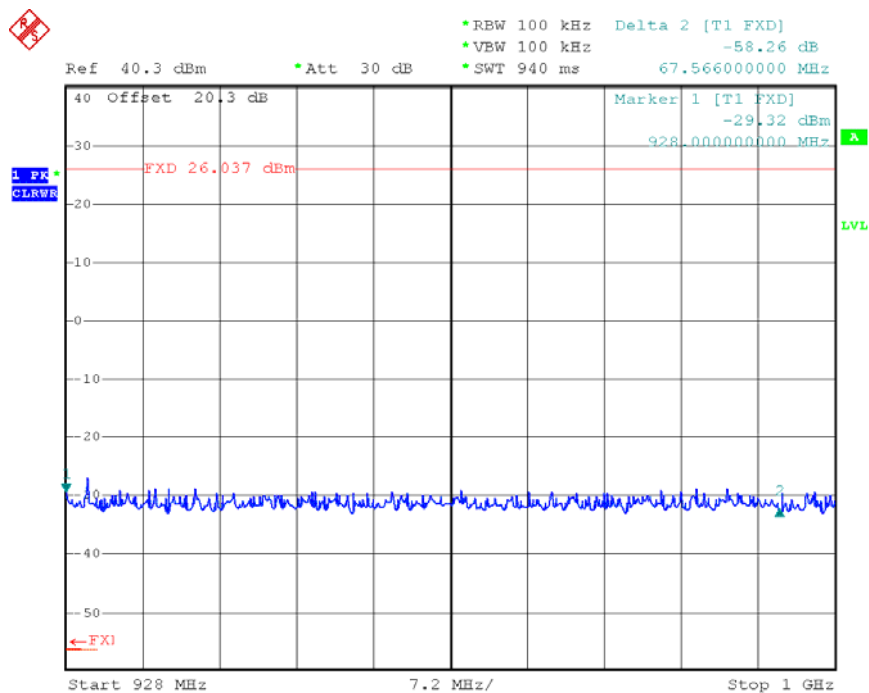
Date: 16.JUL.2008 18:48:51

HIGH Channel, Spurious Emissions 30MHz~902MHz



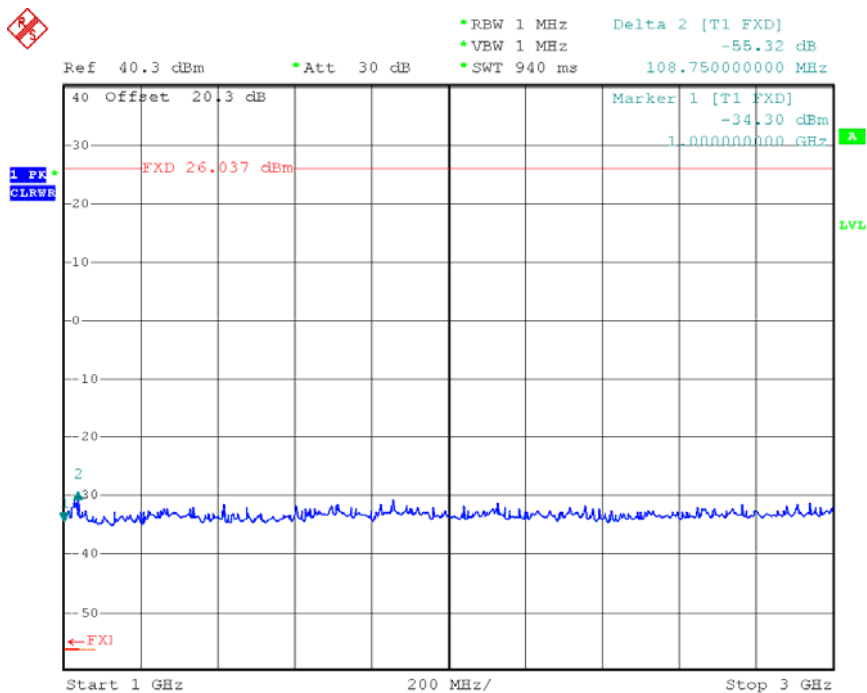
Date: 16.JUL.2008 18:49:44

HIGH Channel, Spurious Emissions 902MHz~928MHz



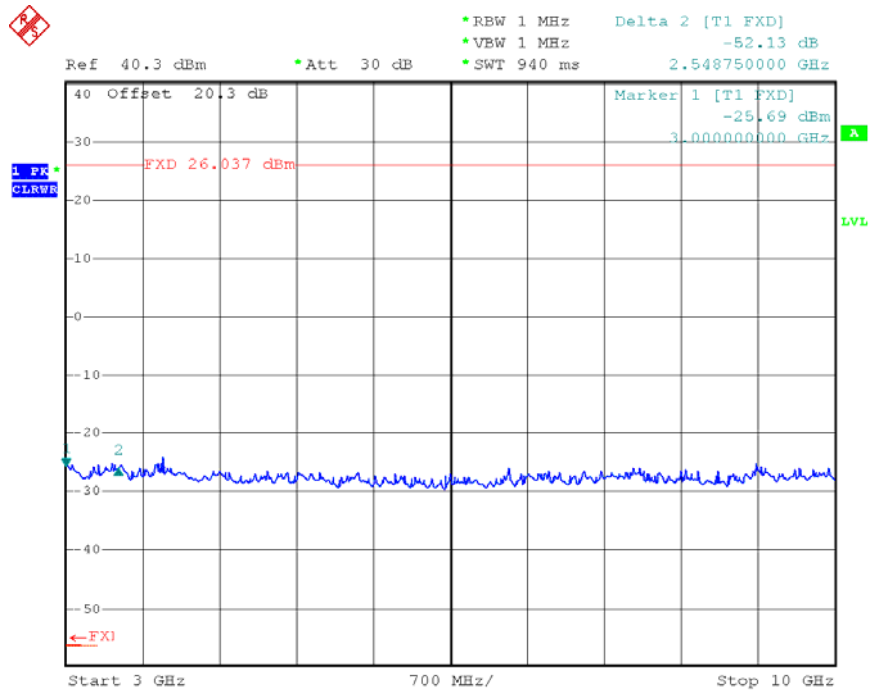
Date: 16.JUL.2008 18:50:25

HIGH Channel, Spurious Emissions 928MHz~1G



Date: 16.JUL.2008 18:51:34

HIGH Channel, Spurious Emissions 1G~3G



Date: 16.JUL.2008 18:52:06

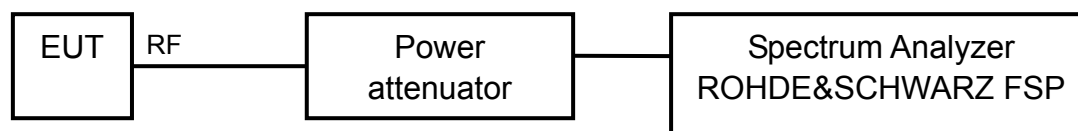
HIGH Channel, Spurious Emissions 3G~10G

2.2.5 900MHz Band Edge -FCC Part 15.247(d)

Ambient condition:

Temperature	Relative humidity	Pressure
18°C	40%	102.5kPa

Test Setup:



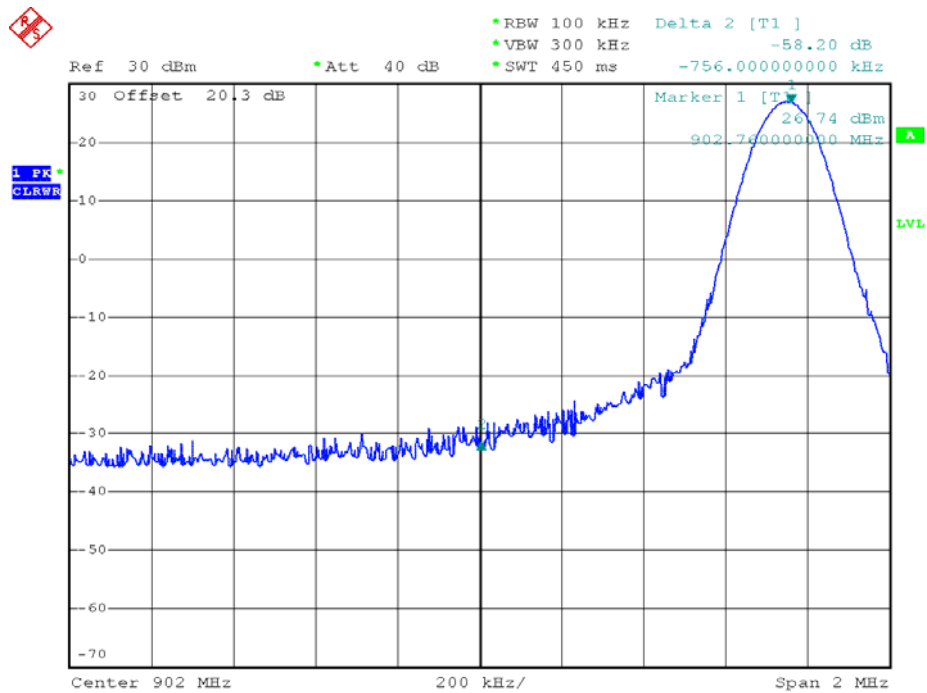
Test procedure:

The test setup was configured as shown in the conducted test setup. The EUT was configured to continuously transmit random data on the low, and then the high test channel. The span of the analyzer was centered on the 902 and 928 MHz band edge respectively.

The RBW & VBW were set to 100 kHz. The trace was allowed to stabilize then a Peak-search and a marker delta measurement to the band edge was performed to verify that the RF power at the band edge was at least 20 dB below the peak of the fundamental level.

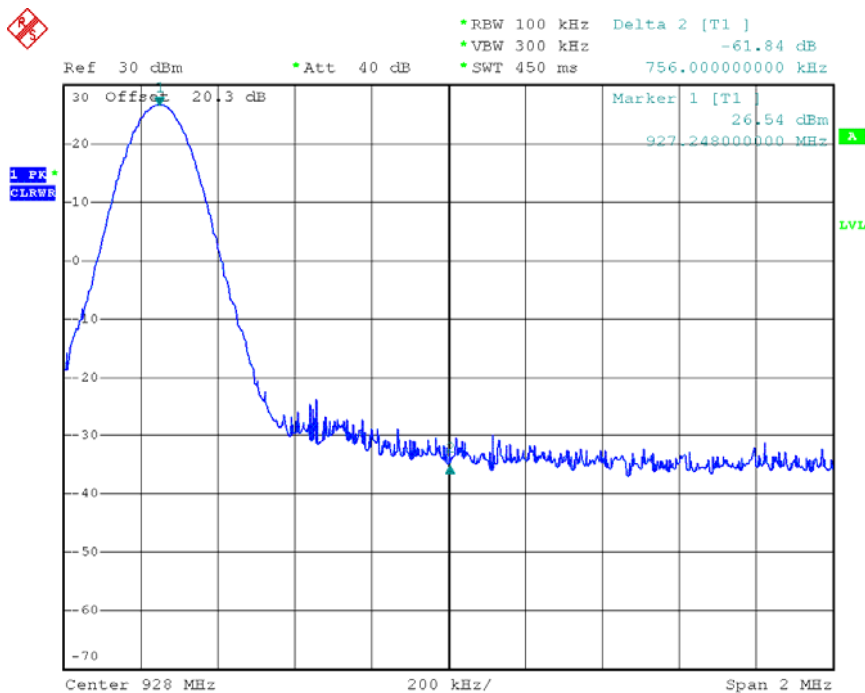
Test result:

Frequency(MHz)	Level(dBc)	Limits(dBc)
902	-58.20	-20.00
928	-61.84	-20.00



Date: 16.JUL.2008 17:37:38

902 MHz Band edge



Date: 16.JUL.2008 17:39:33

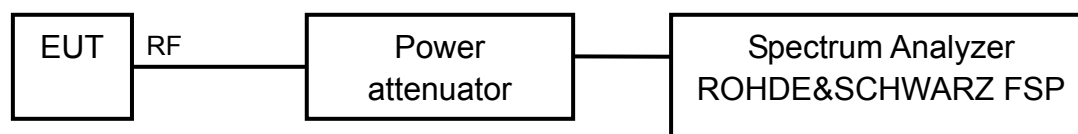
928 MHz Band edge

2.2.6 Number of Hopping Channels-FCC Part 15.247(a)(1)(i)

Ambient condition:

Temperature	Relative humidity	Pressure
18°C	40%	102.5kPa

Test Setup:



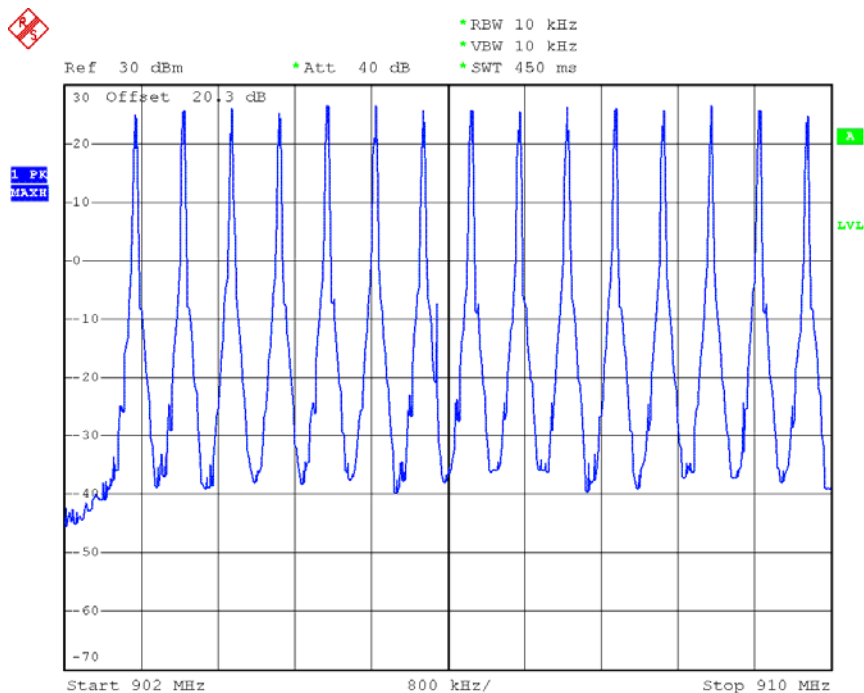
Test procedure:

The test setup is as shown in the Conducted RF bench setup. The EUT was configured to hop sequentially through all of its channels. The spectrum analyzer was set to MAX HOLD to capture the number of hopping channels. The entire 902 - 928 MHz band was examined in three sub-bands, 902 - 910 MHz, 910 - 920MHz and 920 -928 MHz.

Test result:

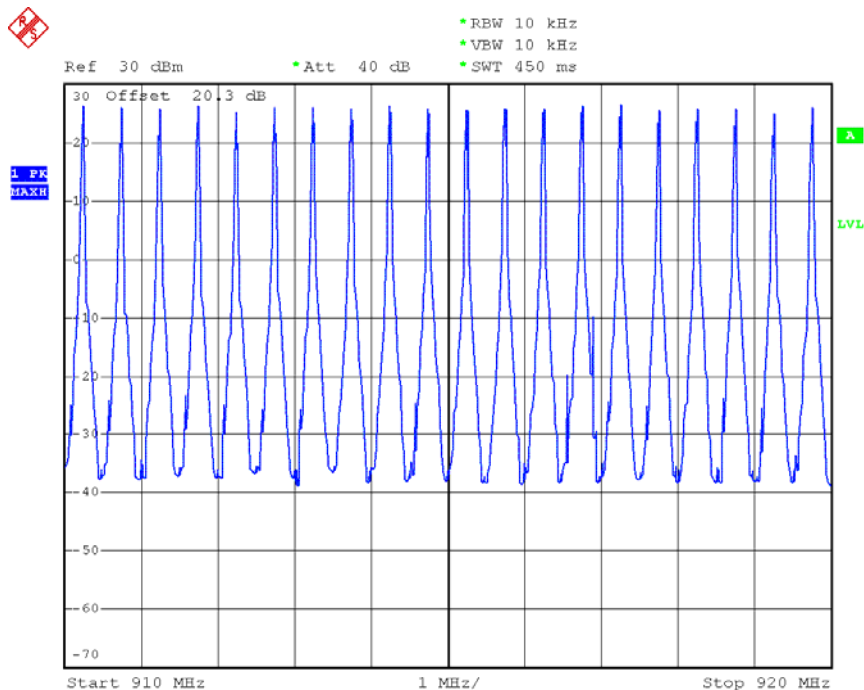
All 50 hopping channels were recorded.

Frequency range (MHz)	Num of Channels
902 - 910	15
910 – 920	20
920 - 928	15



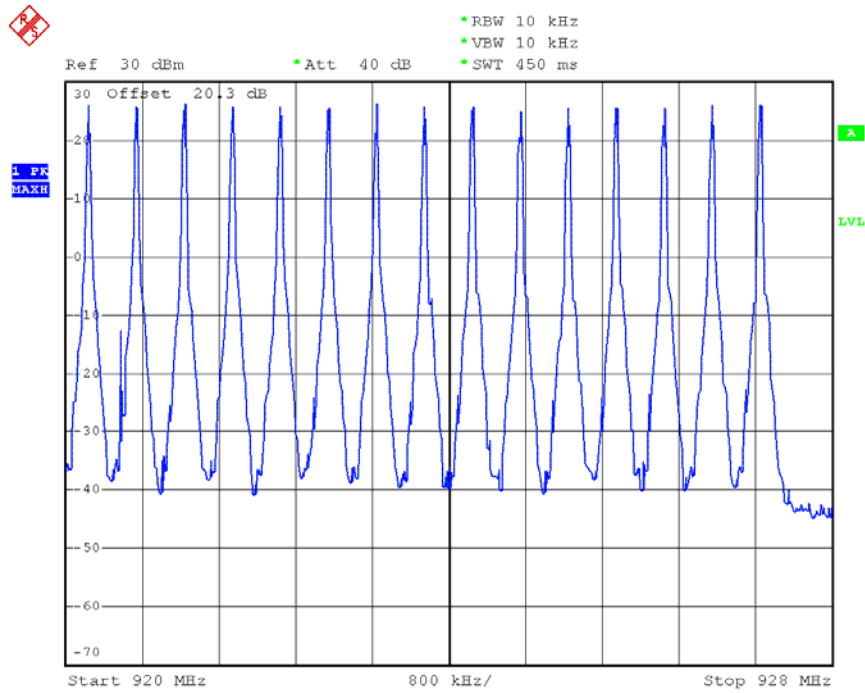
Date: 16.JUL.2008 17:45:43

902 - 910 MHz (15Chan)



Date: 16.JUL.2008 17:47:30

910 - 920 MHz (20Chan)



Date: 16.JUL.2008 17:48:55

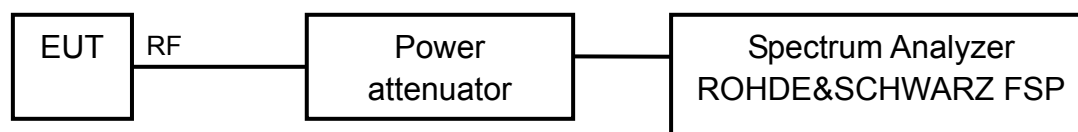
920 - 928 MHz (15Chan)

2.2.6 Channel Spacing-FCC Part 15.247(a)(1)

Ambient condition:

Temperature	Relative humidity	Pressure
18°C	40%	102.5kPa

Test setup:



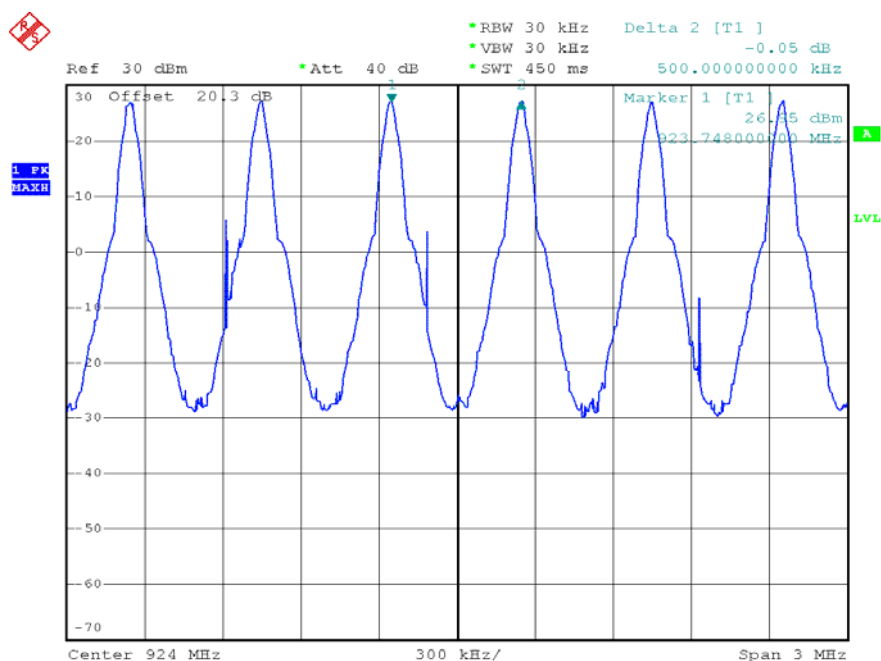
Test Procedure:

The test setup is as shown in the Conducted RF bench setup. The EUT was configured to hop sequentially through all of its channels. The spectrum analyzer was set to MAX HOLD to capture a few of the sequential channel frequencies. The spectrum analyzer markers were used to determine the channel spacing.

Test Result:

The specification requires that the channel spacing be greater than the measured 20 dB BW. The 20 dB BW was measured at a maximum of 122 kHz.

Channel spacing result measured was 500kHz.



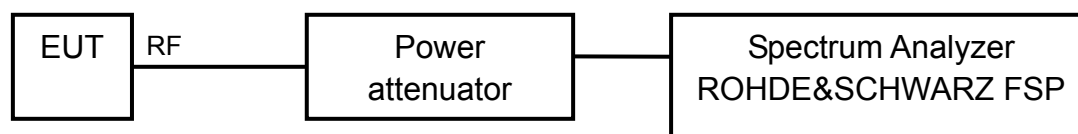
Date: 16.JUL.2008 17:55:51

2.2.7 Channel Dwell Time-FCC Part 15.247(a)(1)

Ambient condition

Temperature	Relative humidity	Pressure
18°C	40%	102.5kPa

Test Setup:



Test procedure:

The test setup is as shown in the Conducted RF bench setup. The EUT was configured to hop sequentially through all of its channels. Random data packets were transmitted over the link at a fixed packet size.

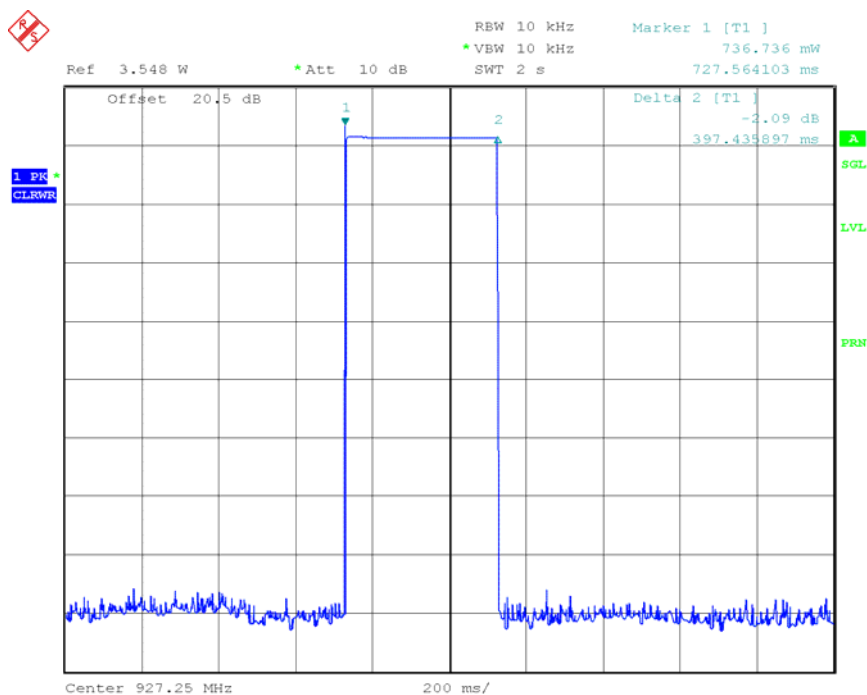
The spectrum analyzer was used to determine the transmission time for each packet firstly. And then the LOW, MID and HIGH channel were monitored with the spectrum analyzer on zero span and set to a 20S sweep time. RBW was set to 10 kHz to prevent hits on adjacent channels appearing as hits on the test channel.

Test Results:

There was only one packet in 20S on each channel (LOW ,MID and HIGH), So we get the results.

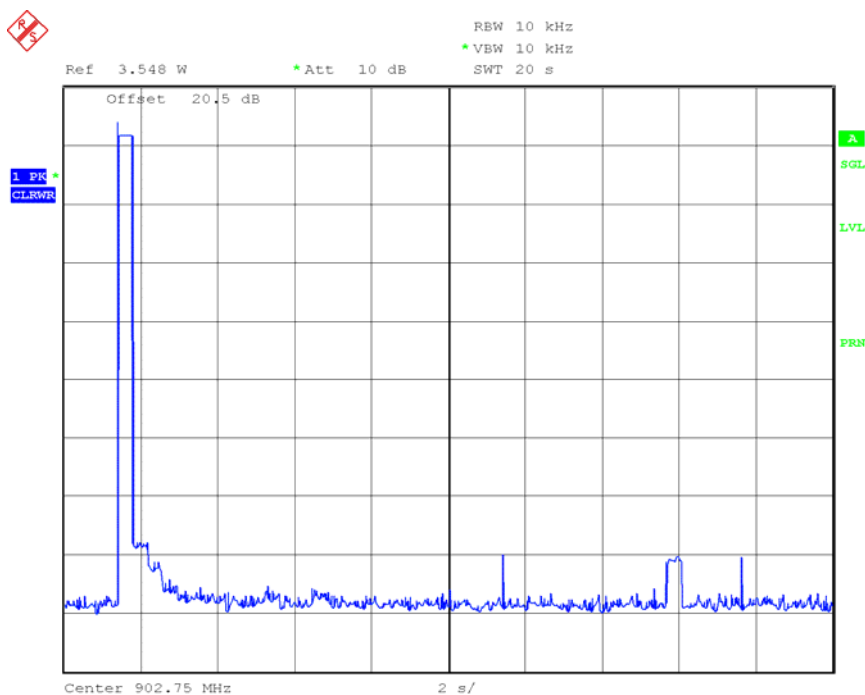
Limit(ms)	Frequency (MHz)	Channel Dwell Time(ms)	Result
400	902.75	397.5	Pass
400	915.75	397.5	Pass
400	927.25	397.5	Pass

:



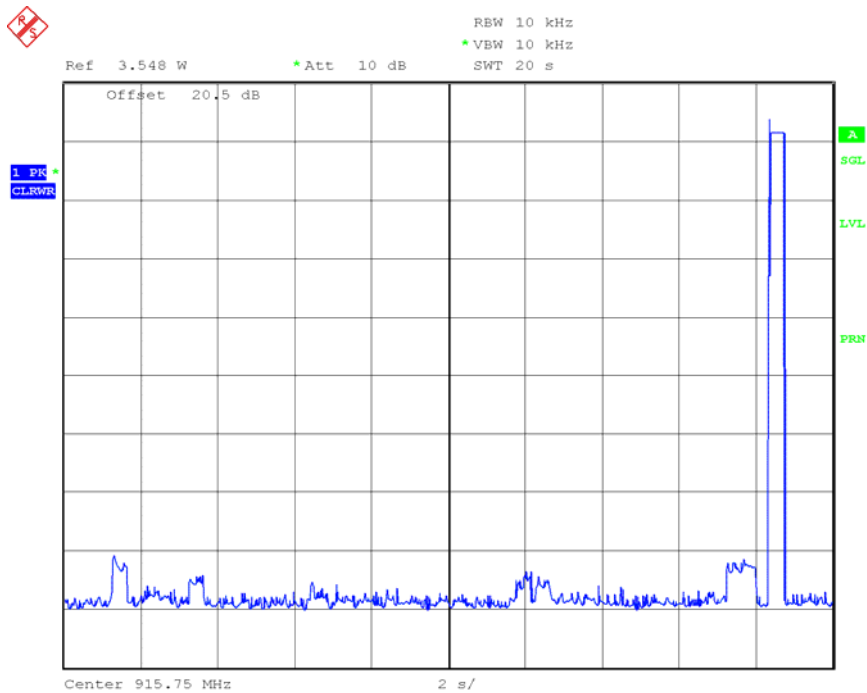
Date: 5.AUG.2008 11:02:26

Transmission time per burst: 397.5ms



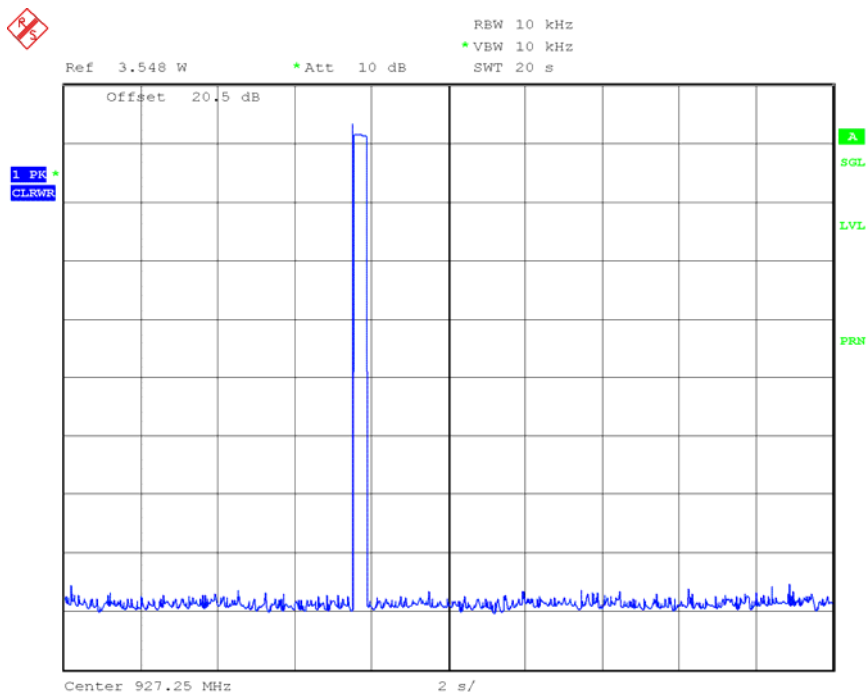
Date: 5.AUG.2008 10:29:22

LOW channel 902.75MHz, Dwell time per 20s: 397.5mS



Date: 5.AUG.2008 10:51:48

MID channel 915.75MHz, Dwell time per 20s: 397.5mS



Date: 5.AUG.2008 10:55:00

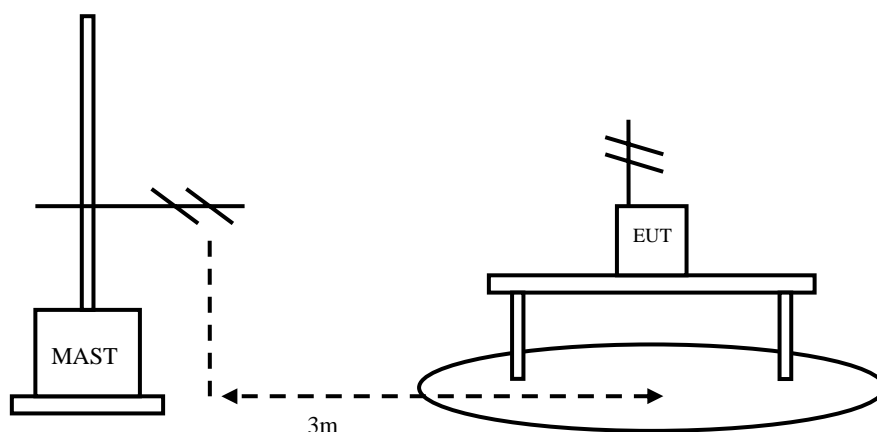
LOW channel 927.25MHz, Dwell time per 20s: 397.5mS

2.2.8 Spurious radiated emissions-15.247(d), §15.35(b), §15.209

Ambient condition

Temperature	Relative humidity	Pressure
18°C	40%	102.5kPa

Test Setup:



Test procedure:

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2003.

The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna.

The radiated emissions measurements were made in a typical installation configuration.

Then start the test software ES-K1. Sweep the whole frequency band through the range from 30MHz to 1GHz or above, using receive log period antenna HL562 or Ridge horn antenna HF906.

During the test, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna.

The data of cable loss and antenna factor has been calibrated in full testing

frequency range before the testing.

Test Limits

FCC Part 15, Subpart C, §15.247 (d)

... In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

FCC Part 15, Subpart C, §15.209, Radiated Emission Limits

Frequency Range (MHz)	Class B Limit (dB μ V/m)
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
above 960	54.0

§15.35(b)

..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....

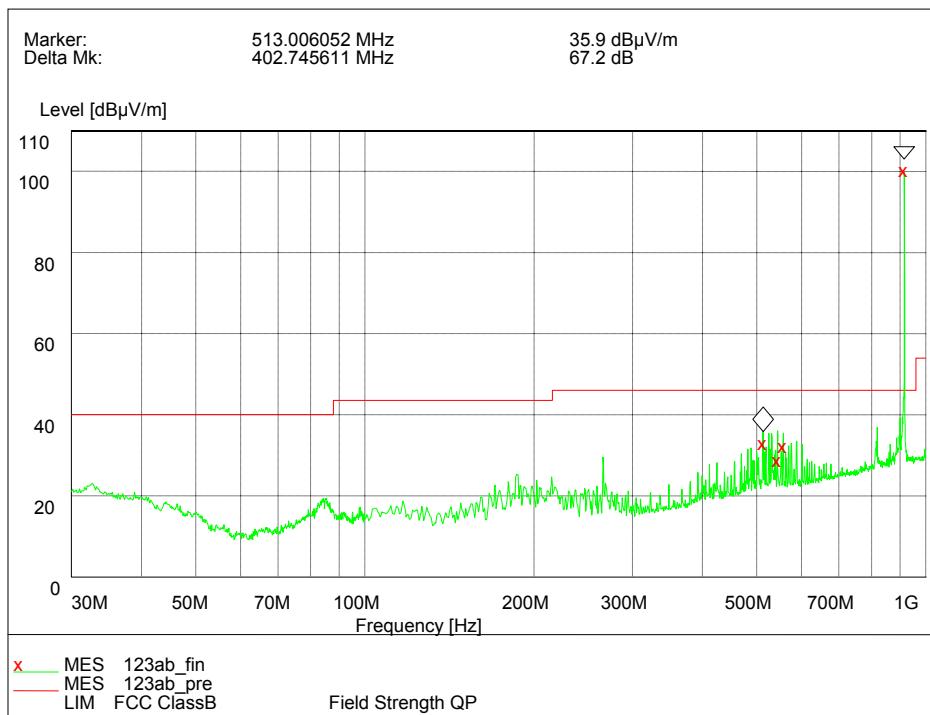
Used conversion factor: Limit (dB μ V/m) = 20 log (Limit (μ V/m)/1 μ V/m)

Test result:

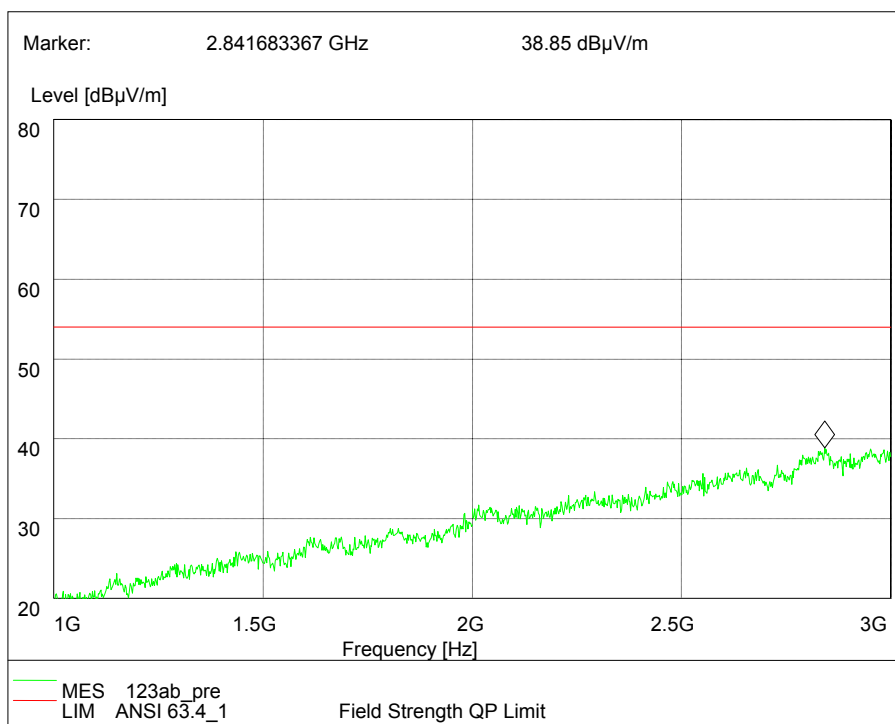
Test Results:

Refer to the following figures.

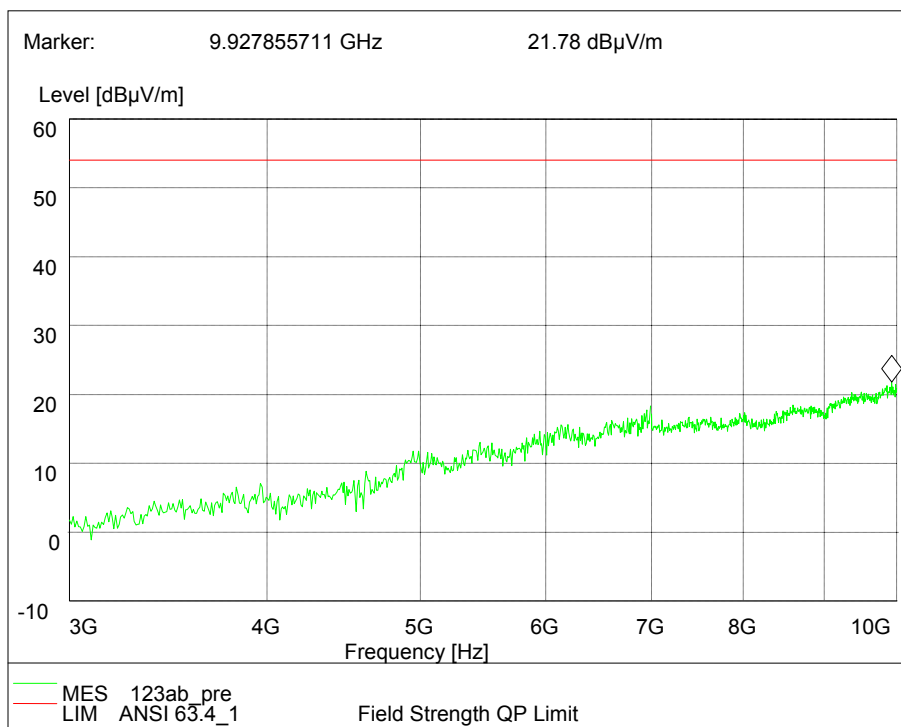
Carrier frequency (MHz): 915.750MHz



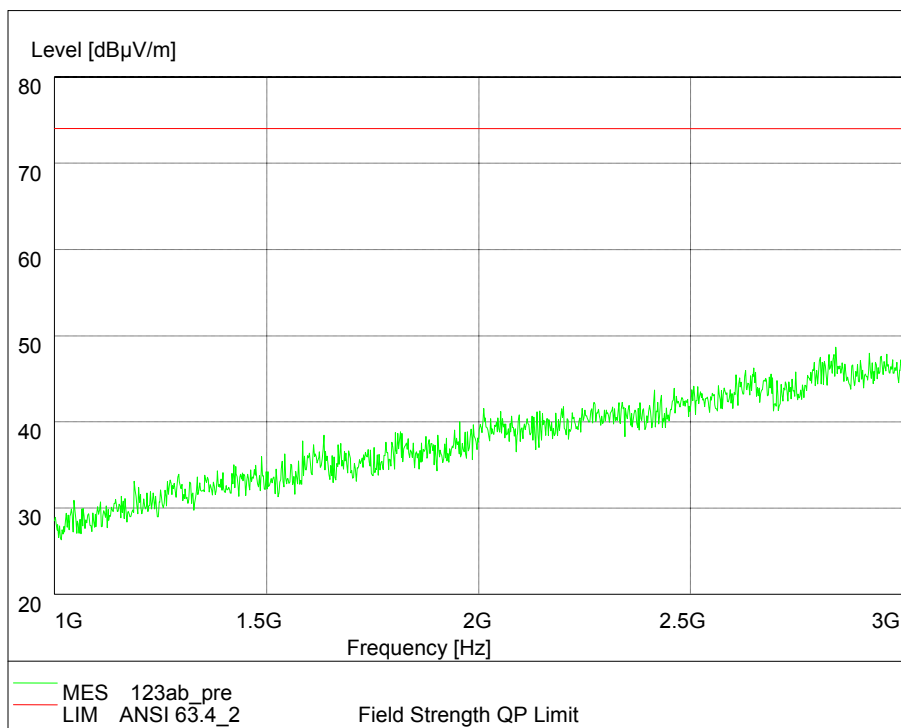
Frequency Range: 30MHz -1000 MHz; Detector: Quasi-peak mode
Note: The signal beyond the limit is the carrier.



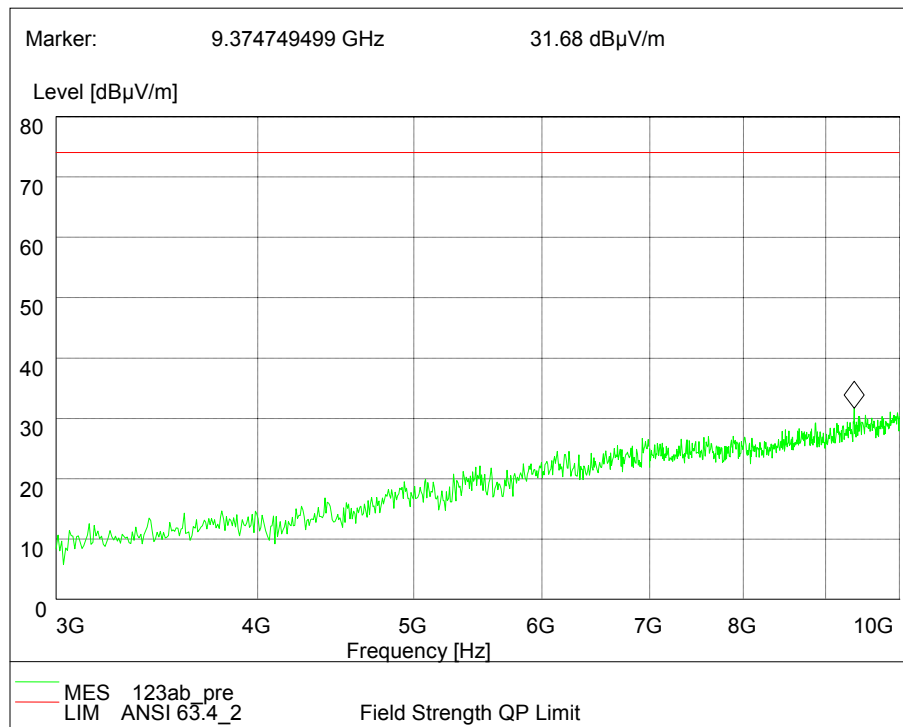
Frequency Range: 1GHz -3GHz; Detector: Av mode



Frequency Range: 3GHz-10GHz; Detector: Av mode



Frequency Range: 1GHz-3GHz; Detector: PK mode



Frequency Range: 3GHz-10GHz; Detector: PK mode

2.2.9 AC Line Conducted Emissions- §15.207

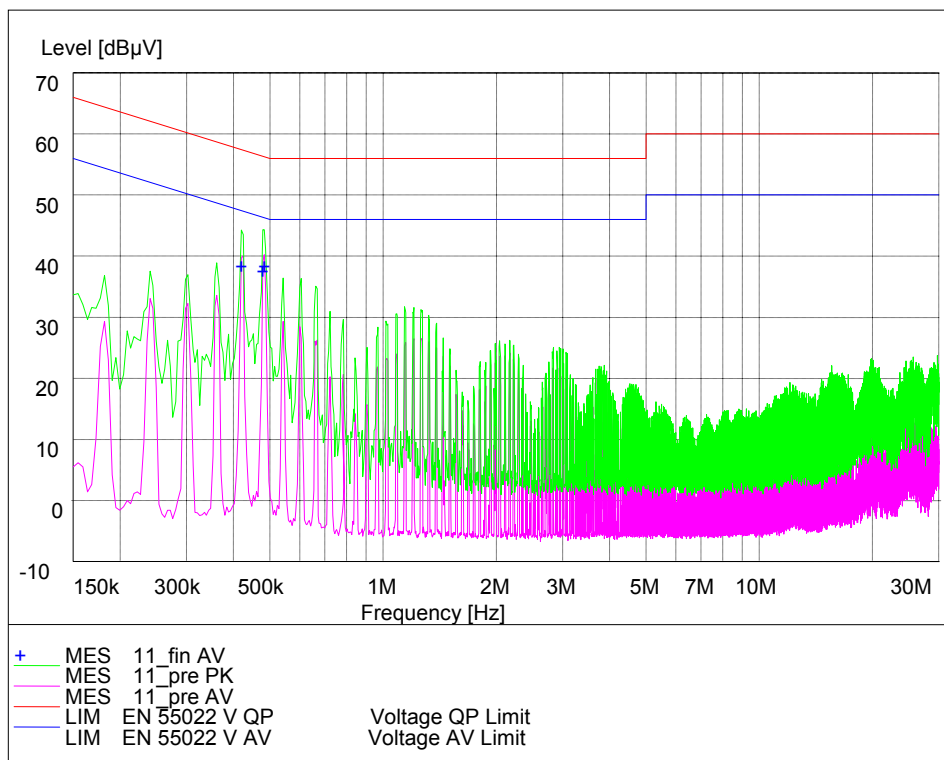
Ambient condition

Temperature	Relative humidity	Pressure
18°C	40%	102.5kPa

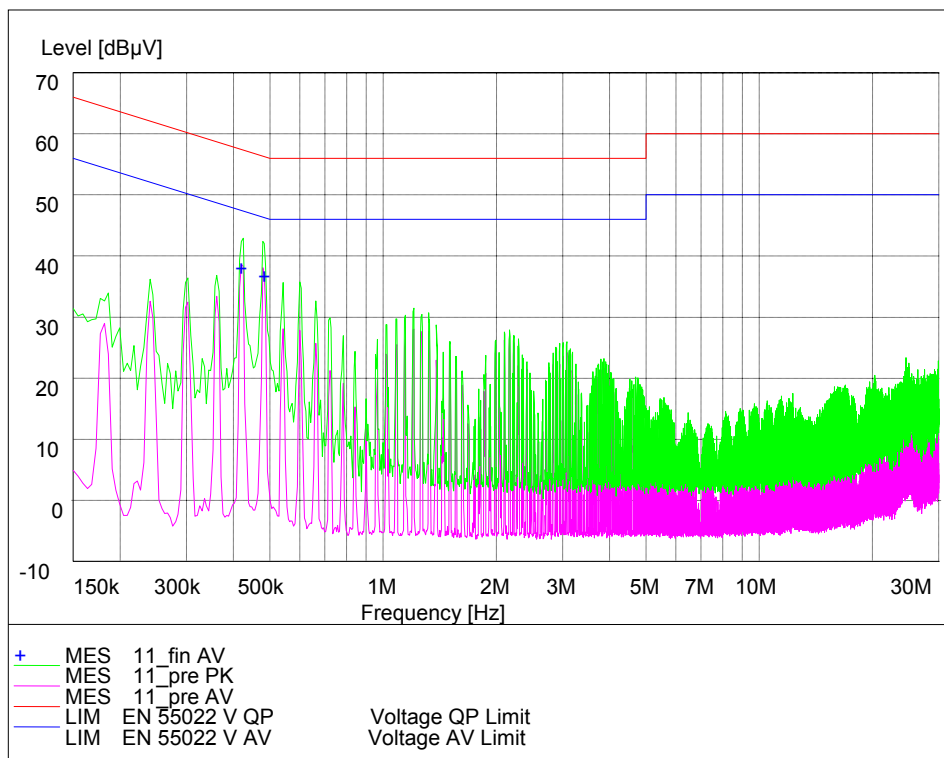
Test Procedure:

The EUT is placed on a non-metallic table 0.8m above the horizontal metal reference ground plane. The EUT is connected with LISN via the charger. The LISN is connected to the reference ground. The accessories of the EUT are connected with the EUT such as headset etc. The test set-up and the test methods are performed according to ANSI C63.4:2003. The measurement should be done both L line and N line. The receiver uses both average detector and Quasi-peak detector. The EUT works in transmission mode.

Test Result:



AC Line conducted emissions, L LINE



AC Line conducted emissions, N LINE

2.3. List of test equipments

No.	Name/Model	Manufacturer	S/N	Calibration Date
1	FSP 30	R&S	100356	19 th Aug. 2007
2	66309B DC Power Supply	Agilent	MY43000461	19 th Aug. 2007
5	1506A Power Splitter	Weinschel	MN154	19 th Aug. 2007
6	9.080m×5.255m×3.525m Shielding room	FRANKONIA	-----	19 th Aug. 2007
7	ESI 40 EMI test receiver	R&S	100015	19 th Aug. 2007
8	SMR 20 Signal generator	R&S	100086	19 th Aug. 2007
9	12.65m*8.03m*7.50m Fully-Anechoic Chamber	FRANKONIA	-----	19 th Aug. 2007
10	HL562 Ultra log test antenna	R&S	100016	19 th Aug. 2007
11	23.18m×16.88m×9.60m Semi-Anechoic Chamber	FRANKONIA	-----	19 th Aug. 2007
12	HF 906 Double-Ridged Waveguide Horn Antenna	R&S	100030	19 th Aug. 2007
13	HF 906 Double-Ridged Waveguide Horn Antenna	R&S	100029	19 th Aug. 2007
14	PS2000 Turn Table	FRANKONIA	-----	19 th Aug. 2007
15	MA260 Antenna Master	FRANKONIA	-----	19 th Aug. 2007
16	SH-241Climatic Chamber	ESPEC	92000389	19 th Aug. 2007
17	ES-K1EMI test software	R&S	-----	19 th Aug. 2007
18	HL562 Receive antenna	R&S	100167	19 th Aug. 2007

Appendix