Produkte
Products

TÜVRheinland®

Prüfbericht - Nr.: 16800377 001
Test Report No.:

Auftraggeber: *Client:*	**Siemens AG** Hofmannstr.51,Munich,Germany
Gegenstand der Prüfung: *Test item:*	**SiPARK Ground Sensor**
Bezeichnung: *Identification:*	**GS-915**
Serien-Nr.: *Serial No.:*	**Engineering sample**
Wareneingangs-Nr.: *Receipt No.:*	**1143005323**
Eingangsdatum: *Date of receipt:*	**2010-12-30**
Zustand des Prüfgegenstandes bei Anlieferung: **Condition of test item at delivery:**	**The sample is ok for test and not damaged.**
Prüfort: *Testing location:*	**Refer to section 1.1**
Prüfgrundlage: *Test specification:*	**FCC Part 15 Subpart C Section 15.209** **FCC Part 15 Subpart C Section 15.247**
Prüfergebnis: *Test Result:*	**Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).** *The test item passed the test specification(s).*
Prüflaboratorium: *Testing Laboratory:*	**Refer to section 1.1**

geprüft/ *tested by:*

Datum *Date*	Name/Stellung *Name/Position*	Unterschrift *Signature*
2012-4-13	Yang, Kai/PE	Yang Kai

kontrolliert/ *reviewed by:*

Datum *Date*	Name/Stellung *Name/Position*	Unterschrift *Signature*
2012-4-13	Sun, Lixun/Reviewer	Sun Lixun

Sonstiges/ *Other Aspects:*

Abkürzungen:				*Abbreviations:*			
	P(ass)	=	*entspricht Prüfgrundlage*		*P(ass)*	=	*passed*
	F(ail)	=	*entspricht nicht Prüfgrundlage*		*F(ail)*	=	*failed*
	N/A	=	*nicht anwendbar*		*N/A*	=	*not applicable*
	N/T	=	*nicht getestet*		*N/T*	=	*not tested*

TEST SUMMARY

4.1.1 ANTENNA REQUIREMENT
RESULT: Passed

4.1.2 PEAK OUTPUT POWER
RESULT: Passed

4.1.3 6DB BANDWIDTH
RESULT: Passed

4.1.4 CONDUCTED SPURIOUS EMISSIONS IN 100KHZ BANDWIDTH
RESULT: Passed

4.1.5 POWER SPECTRAL DENSITY
RESULT: Passed

4.1.6 SPURIOUS EMISSION
RESULT: Passed

4.2.1 ELECTROMAGNETIC FIELDS
RESULT: Passed

Contents

1. Test Sites

1.1 Test Facilities

Laboratory: The State Radio_Monitoring_Center Testing (SRTC) (FCC Registration No.: 910917)

Address: No.98 BeiLishi Road, Xicheng District, Beijing 100037

The used test equipment is in accordance with CISPR 16-1 for measurement of radio interference.

1.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Type	S/N	Calibrated until
Spurious Radiated Emissions				
Bi-log Antenna	Rohde & Schwarz	HL562	100016	2012-08-20
Horn Antenna	Rohde & Schwarz	HF906	100030	2012-08-20
EMI Test Receiver	Rohde & Schwarz	ESI40	100015	2012-08-20
Pre/Power Amplifier	Rohde & Schwarz	HP2800	800584	2012-08-20
Radio Frequency Test Suite				
EMI Test Receiver	Rohde & Schwarz	ESI40	100015	2012-08-20

1.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institude of Metrology P.R. China) or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

1.4 Calibration

Equipment requiring calibration is calibrated periodically by the lab or according to lab's specifications. Additionally all equipment is verified for proper performance on a regular basics using in house standards or comparisons.

1.5 Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO/IEC 17025 are:

Table 2: Measurement Uncertainty

Items		Extended Uncertainty
RE (30-1000MHz)	Field strength (dBuV/m)	U=±4.94dB, k=2, σ=95%
RE (1-12.75GHz)	Field strength (dBuV/m)	U=±4.34dB, k=2, σ=95%

2. General Product Information

2.1 Product Function and Intended Use

The EUT (equipment under test) is a SiPARK Ground Sensor (GS) that to be installed in parking places to detect the parking status. The flush-mounted GS will detect the presence of vehicle above it and report the current parking status to the parking management system by wireless communication.

2.2 Ratings and System Details

Table 3: Rating of EUT

Kind of Equipment:	SiPARK Ground Sensor
Type Designation:	GS-915
FCC ID	ZSJ-E915-A10
Rated Input Voltage	DC 3.6V (lithium battery)

Table 4: Technical Specification

Item	**Description**
Operating Frequency band	903-927MHz
Channel Number	13
Channel Center Frequency	903.0 MHz, 905.0 MHz, 907.0 MHz, 909.0 MHz, 911.0 MHz, 913.0 MHz, 915.0 MHz, 917.0 MHz, 919.0 MHz, 921.0 MHz, 923.0 MHz, 925.0 MHz, 927.0MHz
Modulation	GFSK
Antenna	Integrated Antenna
Antenna Gain (dBi)	1.8

2.3 Independent Operation Modes

The basic operation modes are:

A. On, transmitting
B. On, standby
C. Off

2.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

2.5 Submitted Documents

- Bill of Material
- PCB Layout
- Photo Document
- Circuit Diagram
- Instruction Manual
- Rating Label

3. Test Set-up and Operation Modes

3.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use. And prior to the measurements, the test object operated about 5 minutes (warm-up) in order to stabilize its operating conditions and to ensure reliable measurement values.

3.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All testing were performed according to the procedures in ANSI C63.4: 2003.

3.3 Special Accessories and Auxiliary Equipment

Table 5: Test Auxiliary Equipments

No.	Name	Model	Manufactory
1	Notebook computer	Probook6550B	HP
2	Repeater	WN-R-915	Siemens

3.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

3.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test

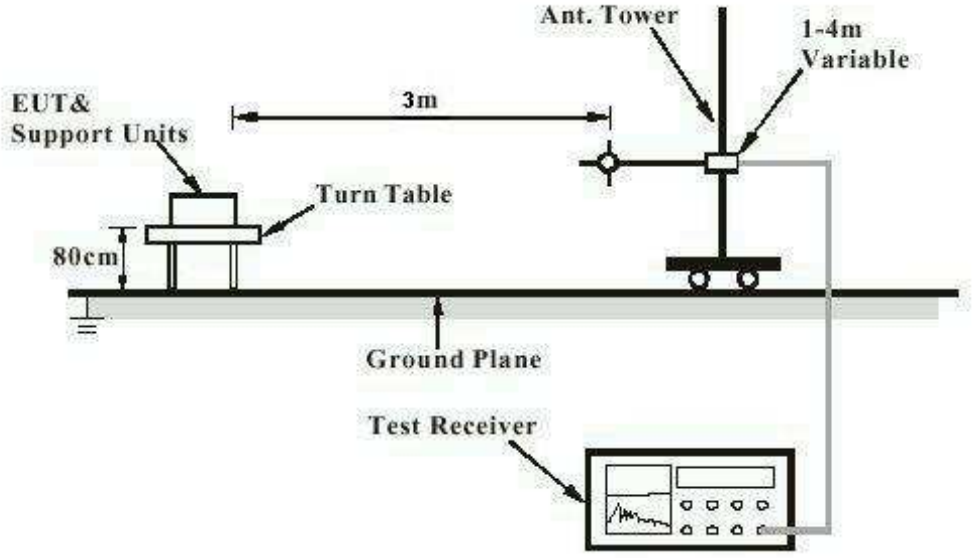


Diagram of Measurement Equipment Configuration for Conduction Measurement

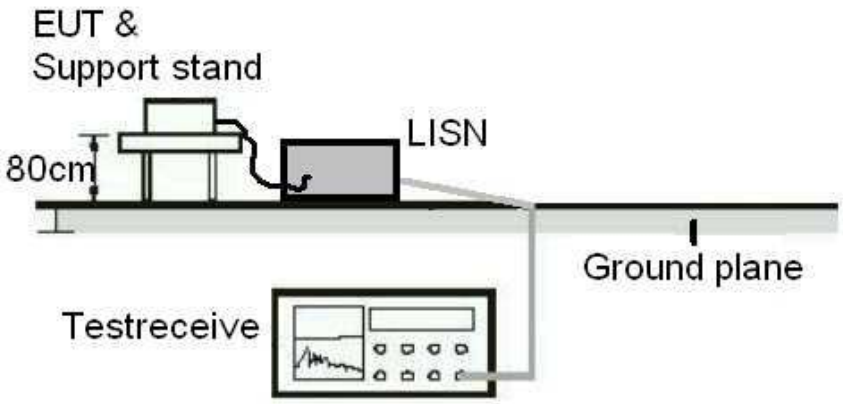
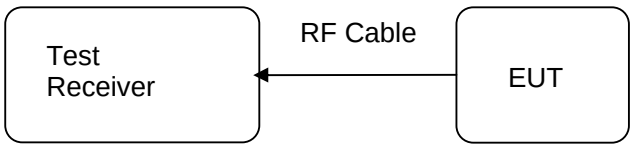


Diagram of Measurement Equipment Configuration for Transmitter Measurement



4. Test Results

4.1 Transmitter Requirement & Test Suites

4.1.1 Antenna Requirement

RESULT: **Passed**

Test date	:	2011-06-15
Test standard	:	FCC Part 15.247(b)(4) and Part 15.203
Limit	:	the use of antennas with directional gains that do not exceed 6 dBi

According to the manufacturer declared, the EUT has an internal antenna, the directional gain of antenna is 1.8dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

4.1.2 Peak Output Power

RESULT: **Passed**

Test date	:	2011-06-15
Test standard	:	FCC Part 15.247(b)(1)
Basic standard	:	ANSI C63.4: 2003
Limit	:	1 Watt
Kind of test site	:	Shielded room

Test setup

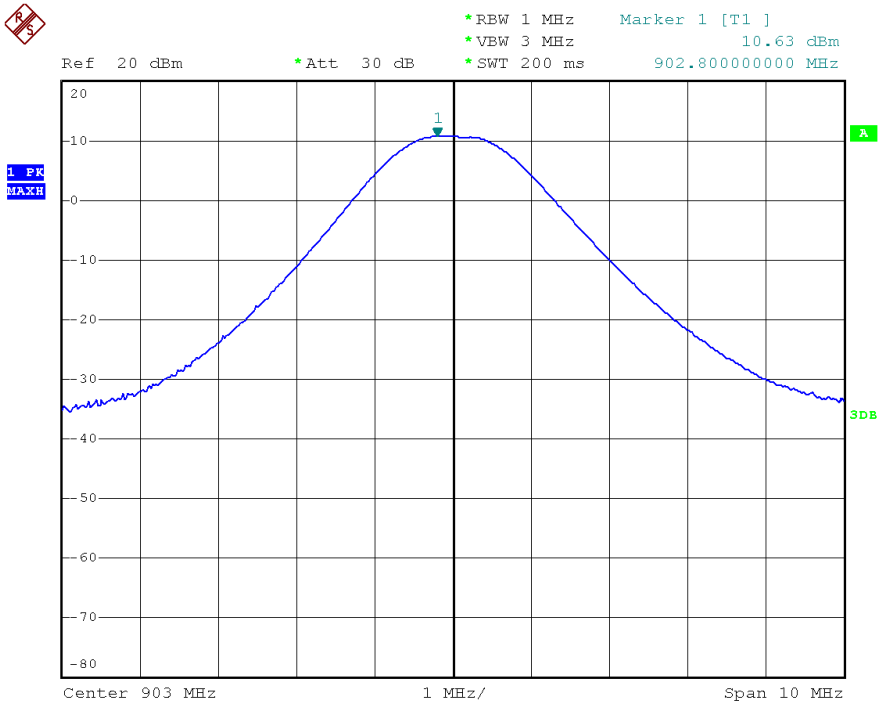
Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	24℃
Relative humidity	:	53%
Atmospheric pressure	:	101 kPa

Table 6: Test result of Peak Output Power

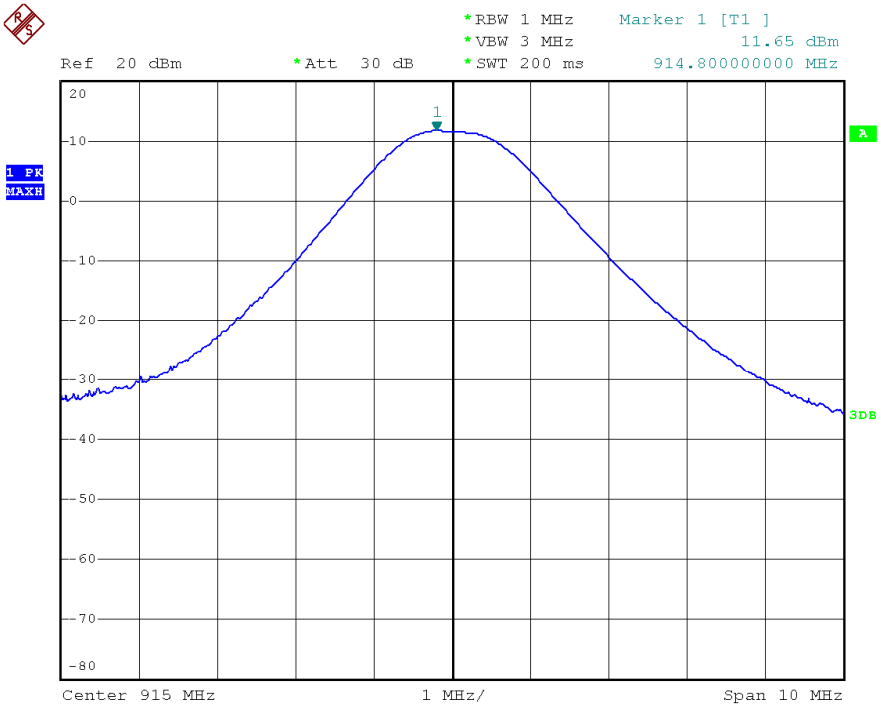
Channel	Channel Frequency (MHz)	Peak Output Power		Limit
		(dBm)	(mW)	(W)
Low Channel	903	10.63	11.56	1
Middle Channel	915	11.65	14.62	1
High Channel	927	12.62	18.28	1

Test Graph of Peak Output Power

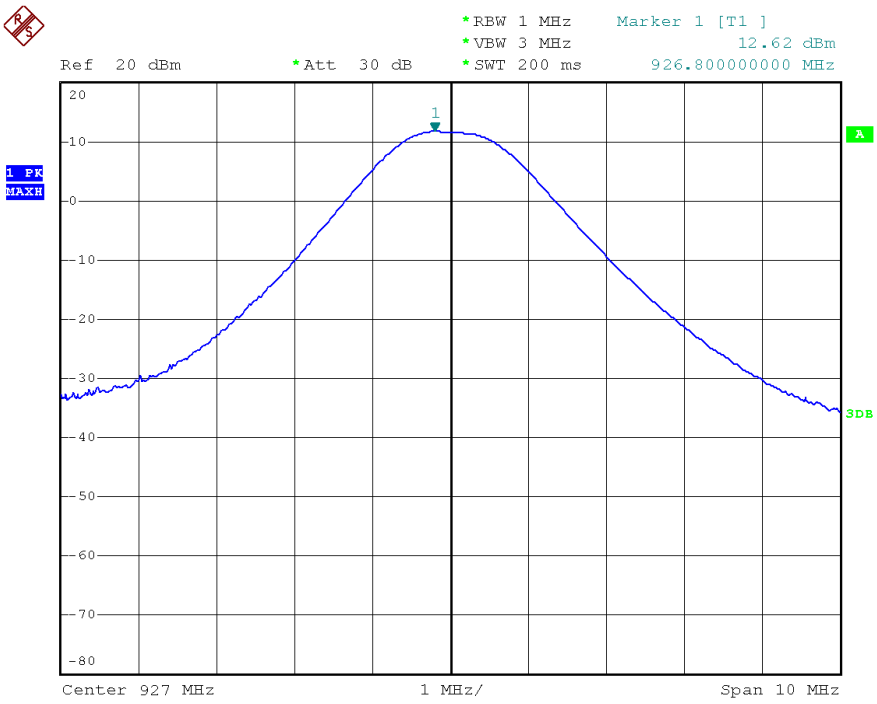
Low Channel



Middle Channel



High Channel



4.1.3 6dB Bandwidth

RESULT: **Passed**

Date of testing	:	2011-06-15
Test standard	:	FCC Part 15.247(a)(2)
Basic standard	:	ANSI C63.4: 2003
Kind of test site	:	Shielded room

Test setup

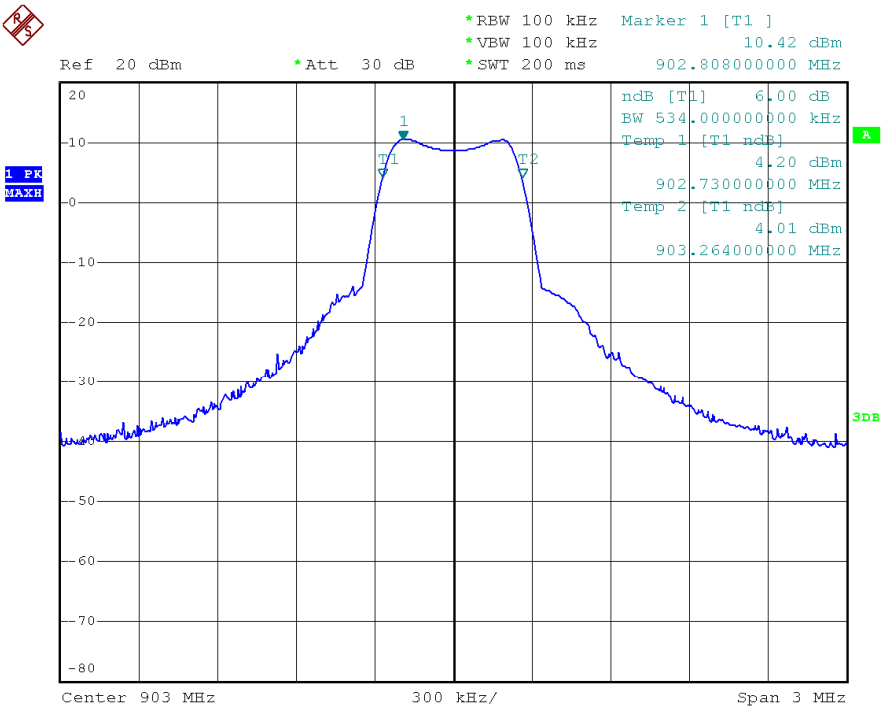
Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	24℃
Relative humidity	:	53%
Atmospheric pressure	:	101 kPa

Table 7: Test result of 6dB Bandwidth

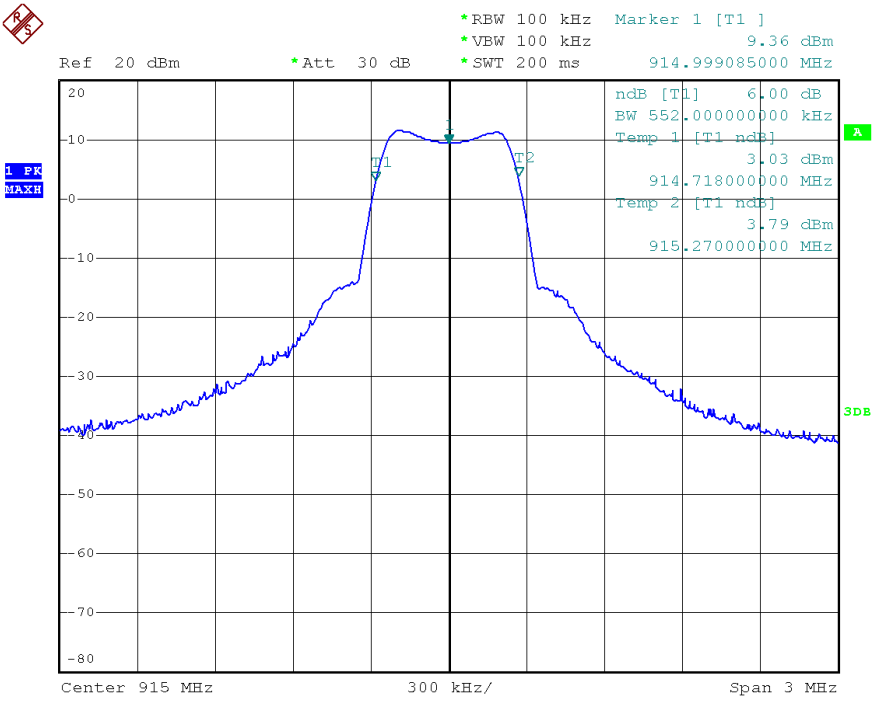
Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Limit(kHz)
Low Channel	903	534	>500
Mid Channel	915	552	>500
High Channel	927	528	>500

Test Graph of 6dB Bandwidth

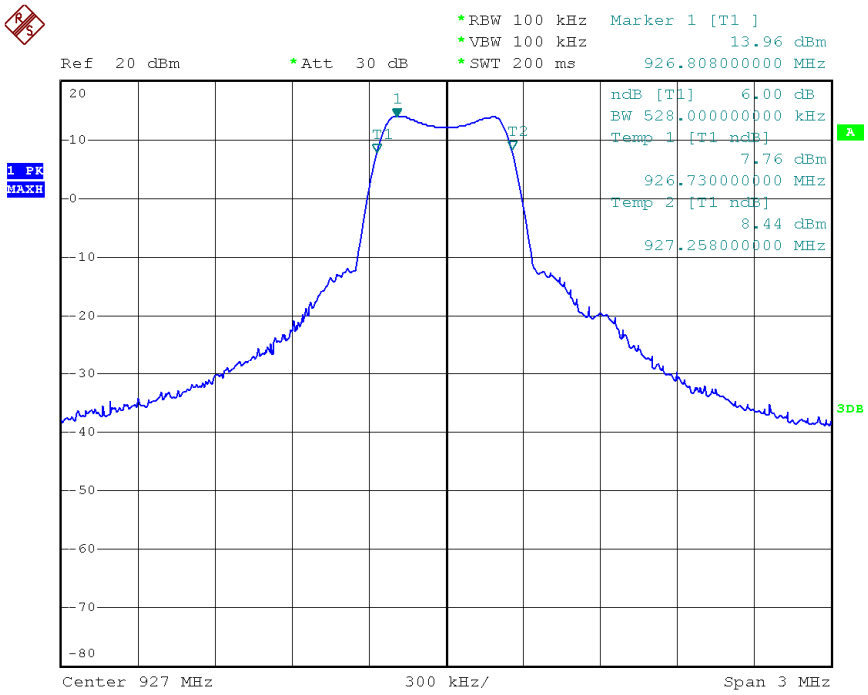
Low Channel



Middle Channel



High Channel



4.1.4 Conducted Spurious Emissions in 100kHz Bandwidth

RESULT: **Passed**

Date of testing	:	2011-06-15
Test standard	:	FCC part 15.247(d)
Basic standard	:	ANSI C63.4: 2003
Limit	:	20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power); In addition, radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in 15.209(a)
Kind of test site	:	Shield room

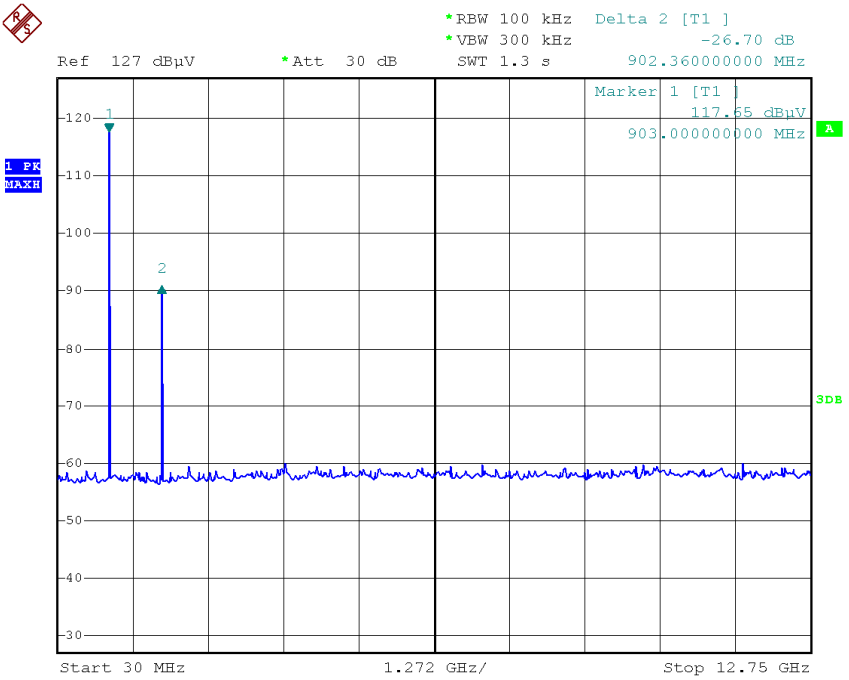
Test setup

Test Channel	:	Low/ Mid/High
Operation mode	:	A
Ambient temperature	:	24℃
Relative humidity	:	53%
Atmospheric pressure	:	101 kPa

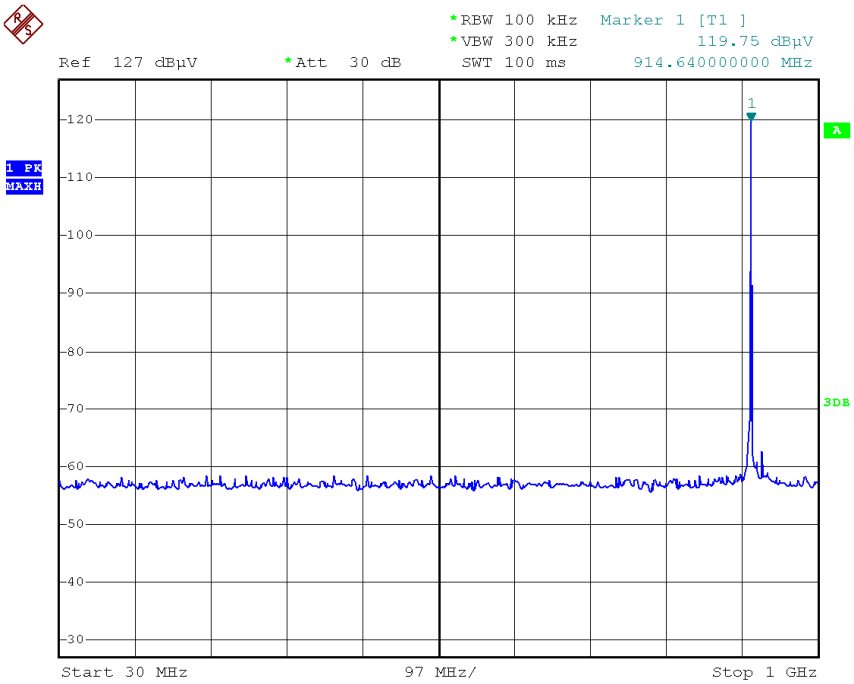
All emissions are more than 20dB below fundamental, details refer to following test Graph, and compliance is achived as well.

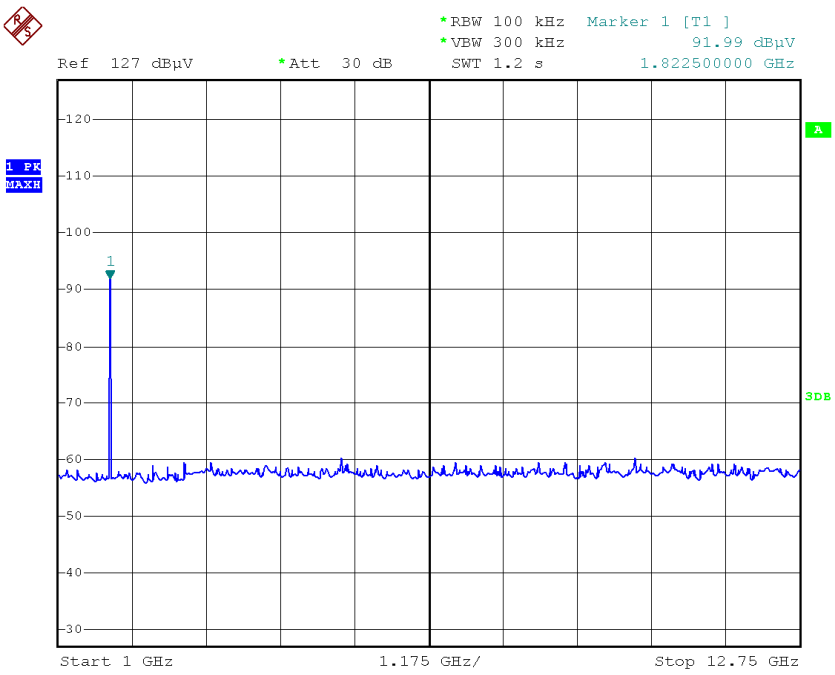
Test Graph of Conducted Spurious Emissions measured in 100kHz Bandwidth

Low Channel

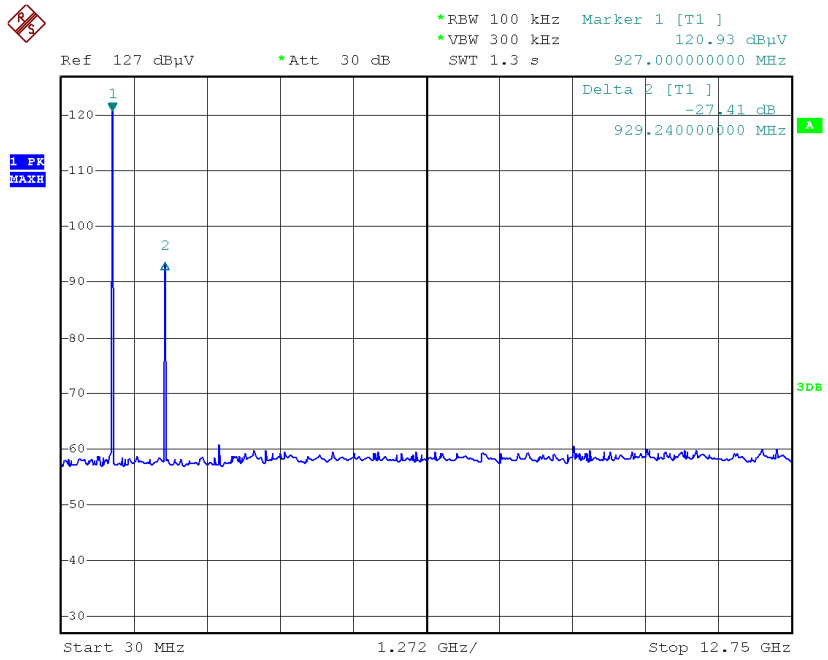


Middle Channel



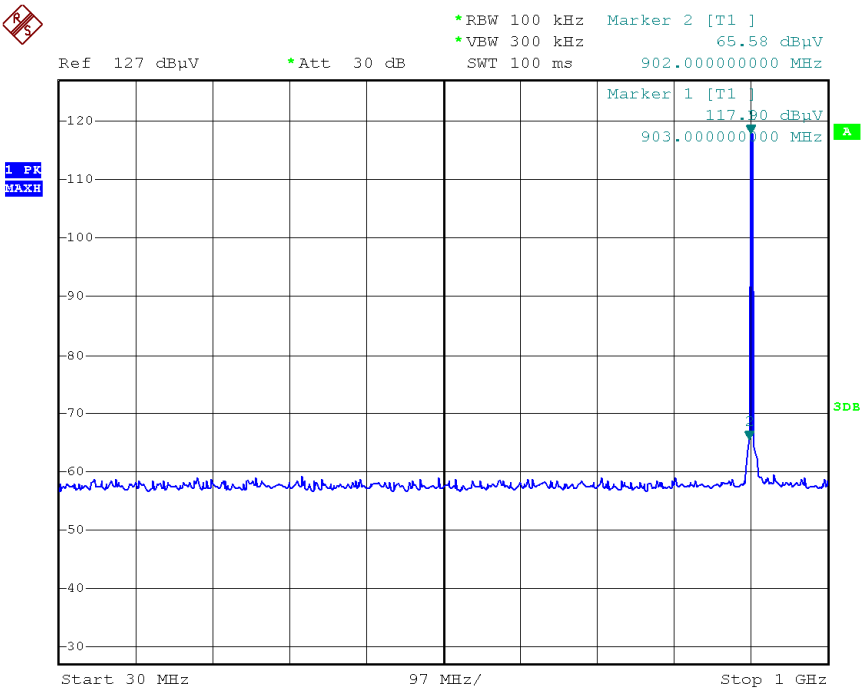


High Channel

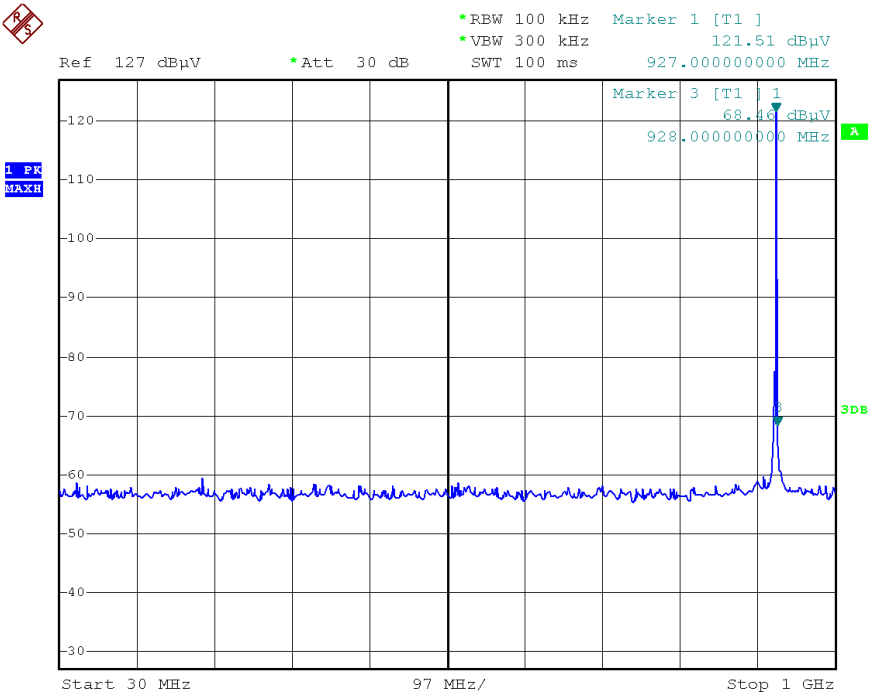


Test Graph of Band Edge measured in 100kHz Bandwidth

Low Channel



High Channel



4.1.5 Power Spectral Density

RESULT: **Passed**

Date of testing	:	2011-06-15
Test standard	:	FCC part 15.247(e)
Basic standard	:	ANSI C63.4: 2003
Limits	:	8.0 dBm (in any 3kHz band)
Kind of test site		Shield room

Test Setup

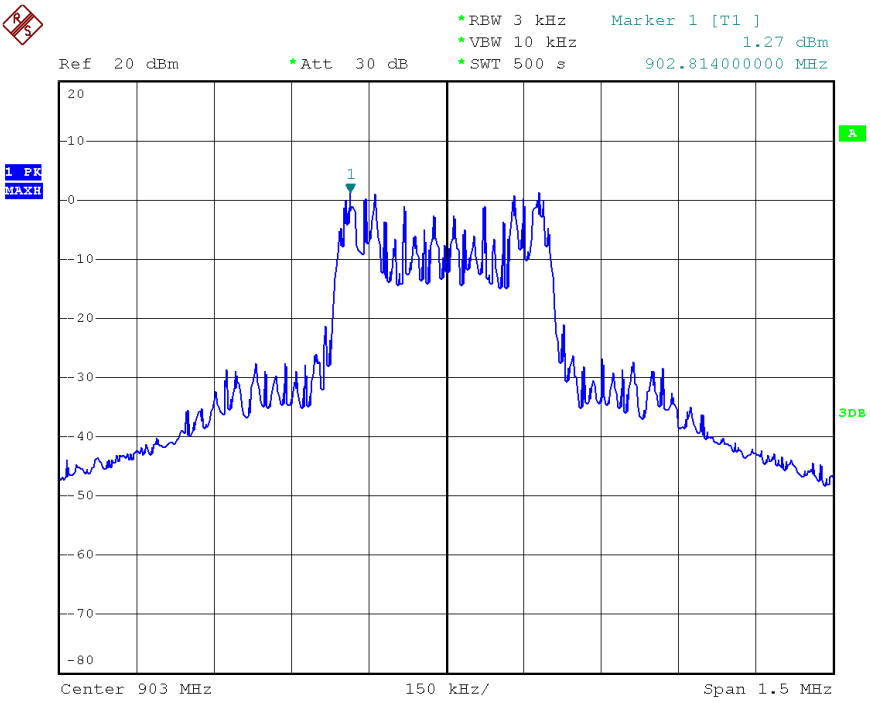
Test Channel	:	Low/ Middle/ High
Operation mode	:	A
Ambient temperature	:	24℃
Relative humidity	:	53%
Atmospheric pressure	:	101 kPa

Table 8: Test result of power spectral density

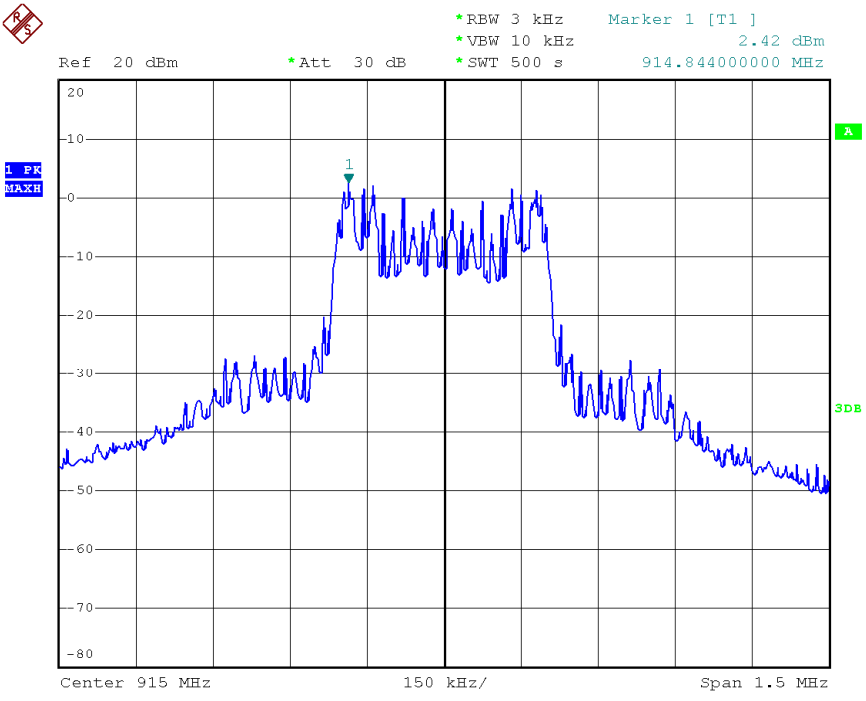
Maximum power spectral density			
Low Channel (dBm/3kHz)	Middle Channel (dBm/3kHz)	High Channel (dBm/3kHz)	Limit (dBm/3kHz)
1.27	2.42	4.86	8

Test Graph of Power Spectral Density

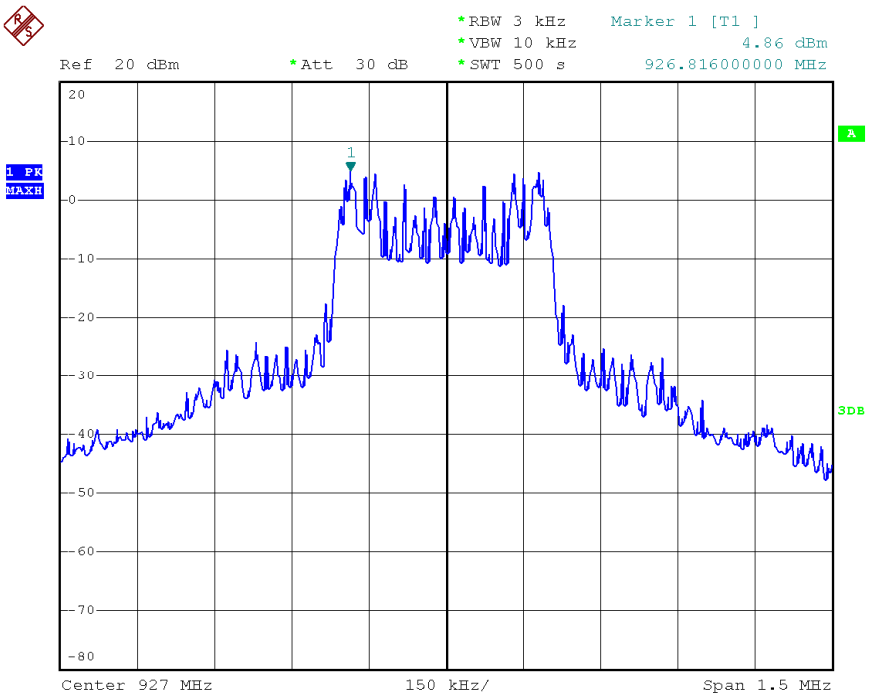
Low Channel



Middle Channel



High Channel



4.1.6 Spurious Emission

RESULT: **Passed**

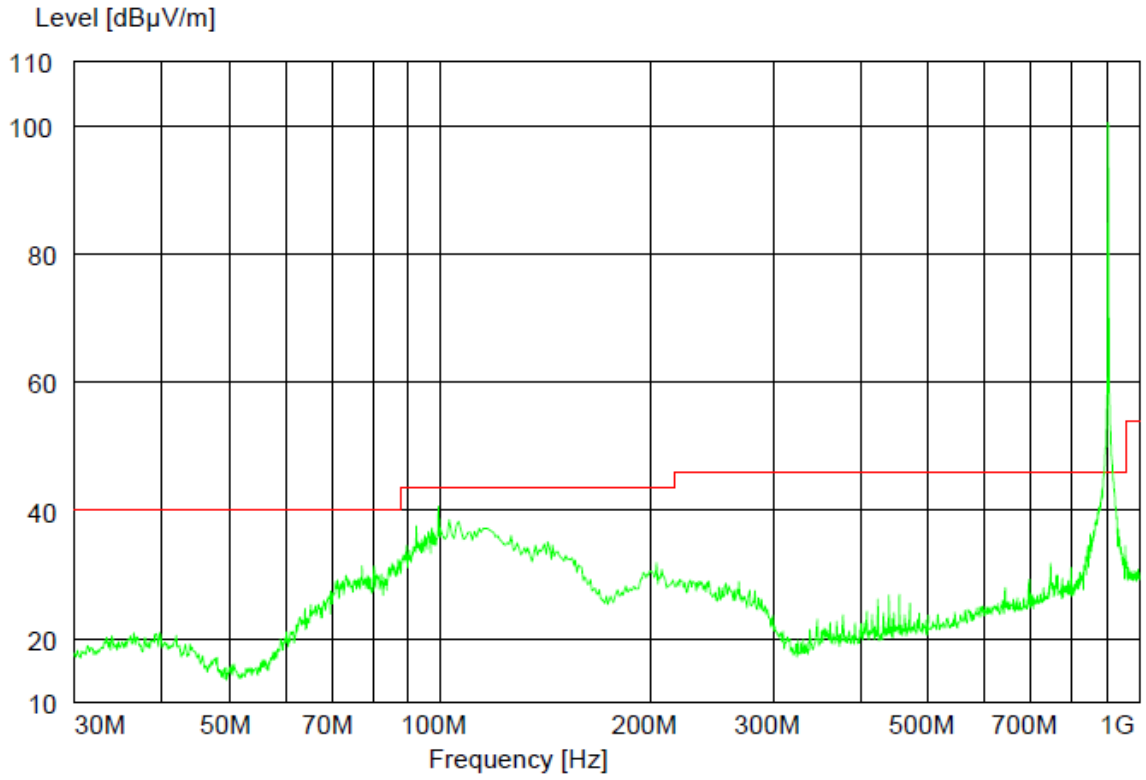
Date of testing	:	2011-07-23
Test standard	:	FCC part 15.247(d)
Basic standard	:	ANSI C63.4: 2003
Limits	:	Refer to 15.209(a)
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/ Middle/ High
Operation mode	:	A
Ambient temperature	:	23℃
Relative humidity	:	51%
Atmospheric pressure	:	100 kPa

During the test, the wooden table was rotated 360° around and the antenna was varied from 1m to 4m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations.
The following figures and tables were those measured by an automatic measurement system. The vertical results are marked with red, and the horizontal ones are marked with blue.
Plots of the band edge are also shown.

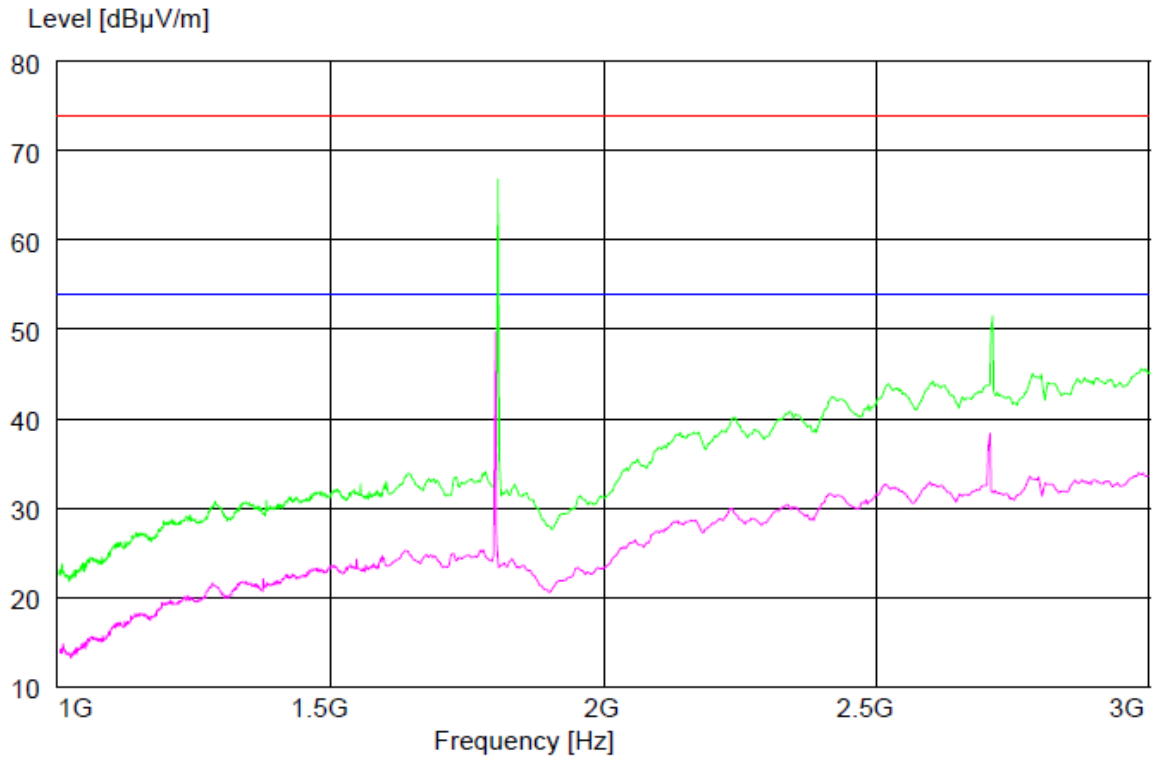
Figure 1: Spurious emission measurement results, low channel, 30-1000MHz, vertical and horizontal polarization



Final quasi-peak measurement result:

Frequency(MHz)	polarization (horizontal H/ vertical V)	Height(m) (cm)	Angle (°)	Limit (dBuV/m)	Level (dBuV/m)	Margin (dB)
92.424	H	200.0	270.5	43.5	37.67	5.83
99.438	H	200.0	272.0	43.5	40.68	2.82
116.833	V	200.0	348.2	43.5	37.27	6.23
207.414	H	100.0	90.7	43.5	30.89	12.61
699.398	V	100.0	182.1	49.5	27.01	22.49
747.494	H	100.0	119.3	49.5	31.78	17.72

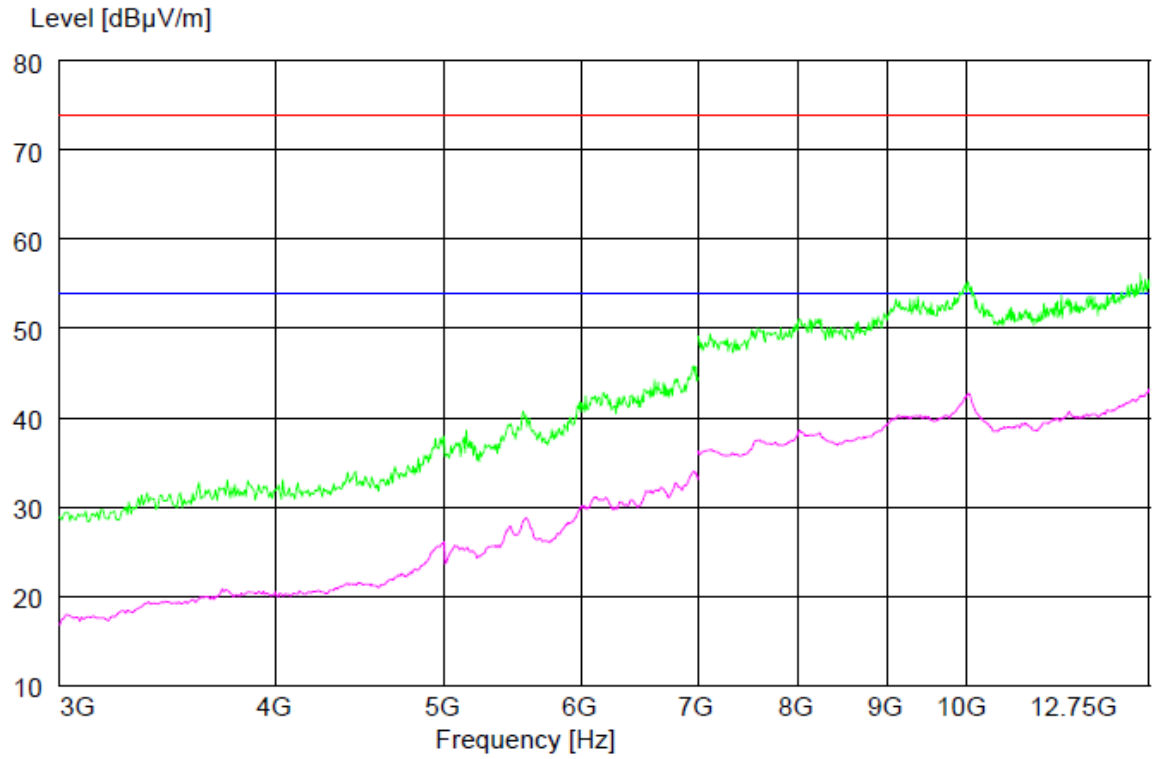
Figure 2: Spurious emission measurement results, low channel, 1-3GHz, vertical and horizontal polarization



Final measurement result:

Frequency(MHz)	polarization (horizontal H/ vertical V)	Detector	Limit (dBuV/m)	Level (dBuV/m)	Margin (dB)
1812.505	H	Peak	74.0	66.46	7.54
1812.505	H	AV	54.0	49.97	4.03
2711.162	V	Peak	74.0	52.49	21.51
2711.162	V	AV	54.0	38.12	15.88

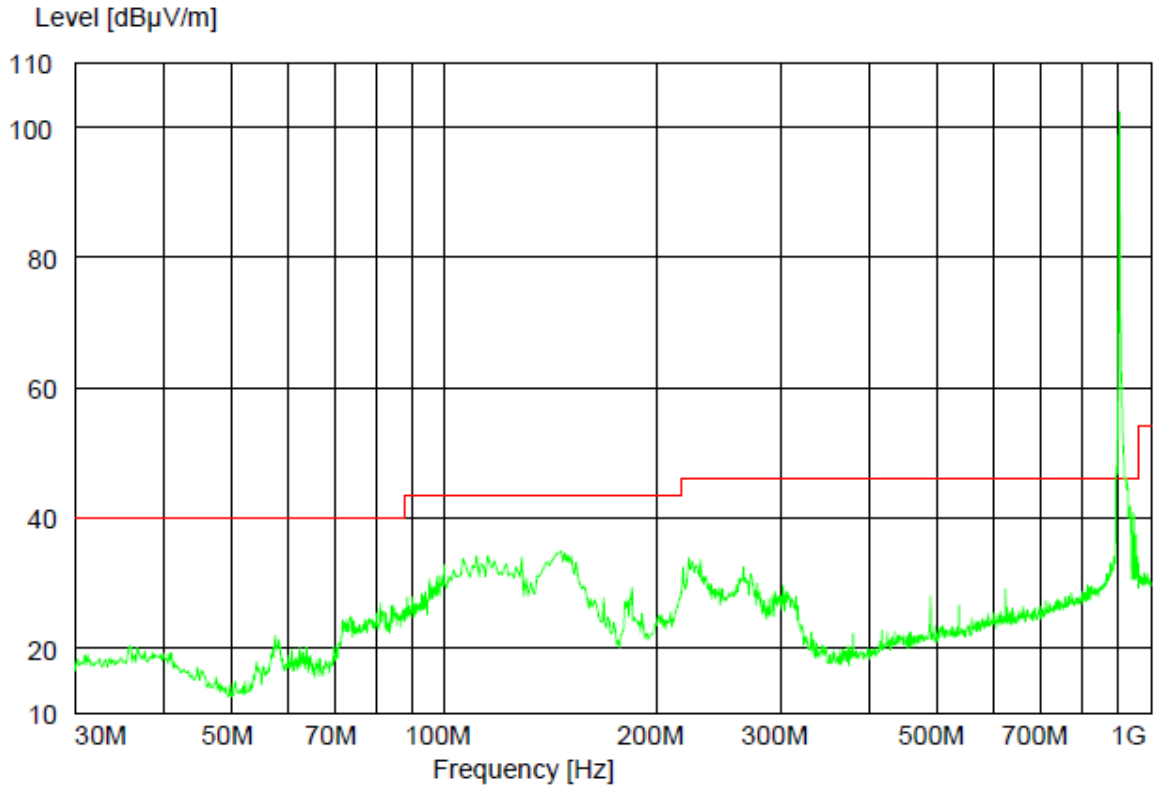
Figure 3: Spurious emission measurement results, low channel, 3-12.75GHz, vertical and horizontal polarization



Final measurement result:

Frequency(MHz)	polarization (horizontal H/ vertical V)	Detector	Limit (dBuV/m)	Level (dBuV/m)	Margin (dB)
3609.218	V	Peak	74.0	32.74	41.26
3609.218	V	AV	54.0	19.69	34.31
4539.078	V	Peak	74.0	33.35	40.65
4539.078	V	AV	54.0	21.30	32.7
10019.038	H	Peak	74.0	55.24	18.76
10019.038	H	AV	54.0	42.67	11.33

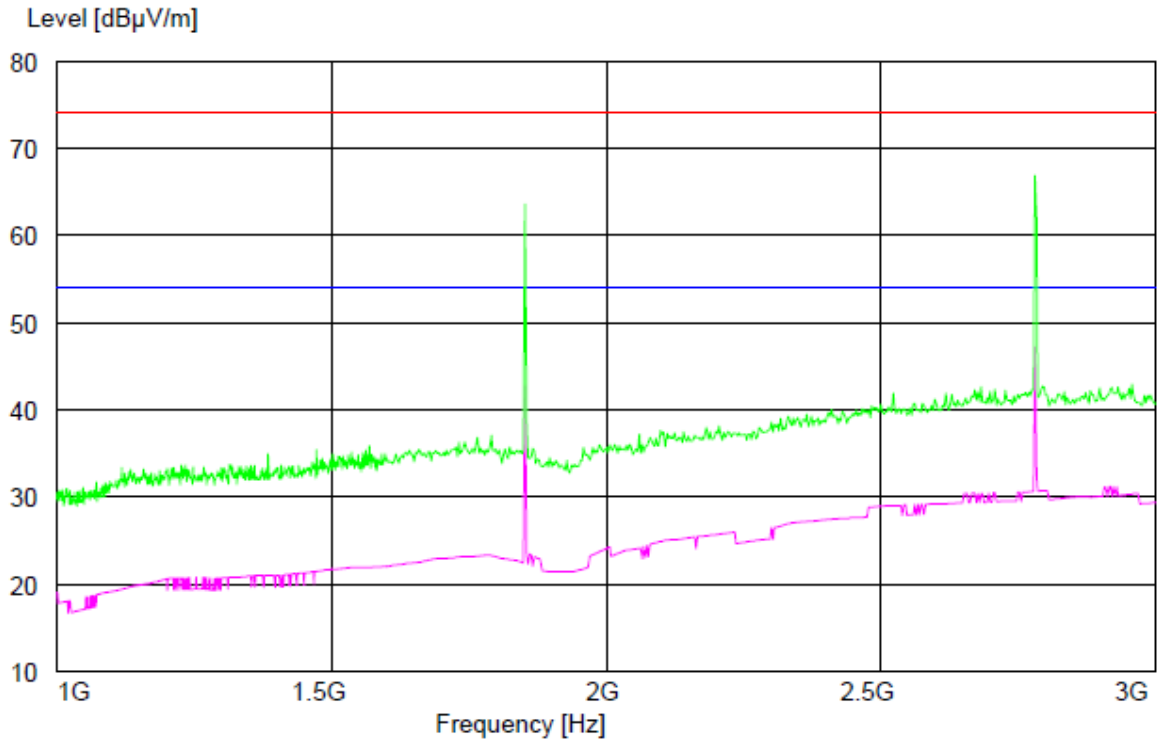
Figure 4: Spurious emission measurement results, mid channel, 30-1000MHz, vertical and horizontal polarization



Final measurement result:

Frequency(MHz)	polarization (horizontal H/ vertical V)	Height(m) (cm)	Angle (°)	Limit (dBuV/m)	Level (dBuV/m)	Margin (dB)
90.180	V	100.0	93.9	43.5	34.62	8.88
100.000	V	200.0	186.8	43.5	40.61	2.89
148.096	H	300.0	271.2	43.5	27.07	16.43
154.509	H	100.0	354.7	43.5	27.56	15.94
223.446	V	100.0	182.1	46.0	32.85	13.15
940.881	H	100.0	357.9	46.0	41.04	4.96

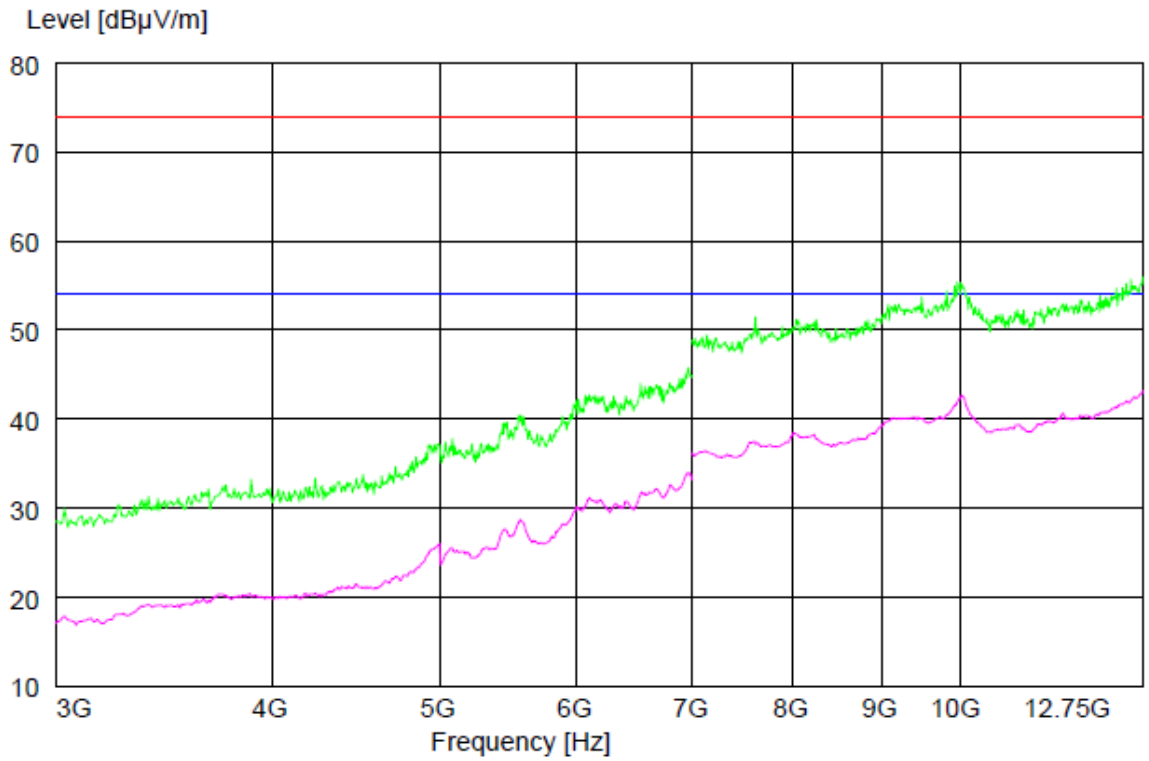
Figure 5: Spurious emission measurement results, mid channel, 1-3GHz, vertical and horizontal polarization



Final measurement result:

Frequency(MHz)	polarization (horizontal H/ vertical V)	Detector	Limit (dBuV/m)	Level (dBuV/m)	Margin (dB)
1832.505	H	Peak	74.0	63.46	10.54
1832.505	H	AV	54.0	38.66	15.34
2741.162	V	Peak	74.0	66.02	7.98
2741.162	V	AV	54.0	47.51	6.49

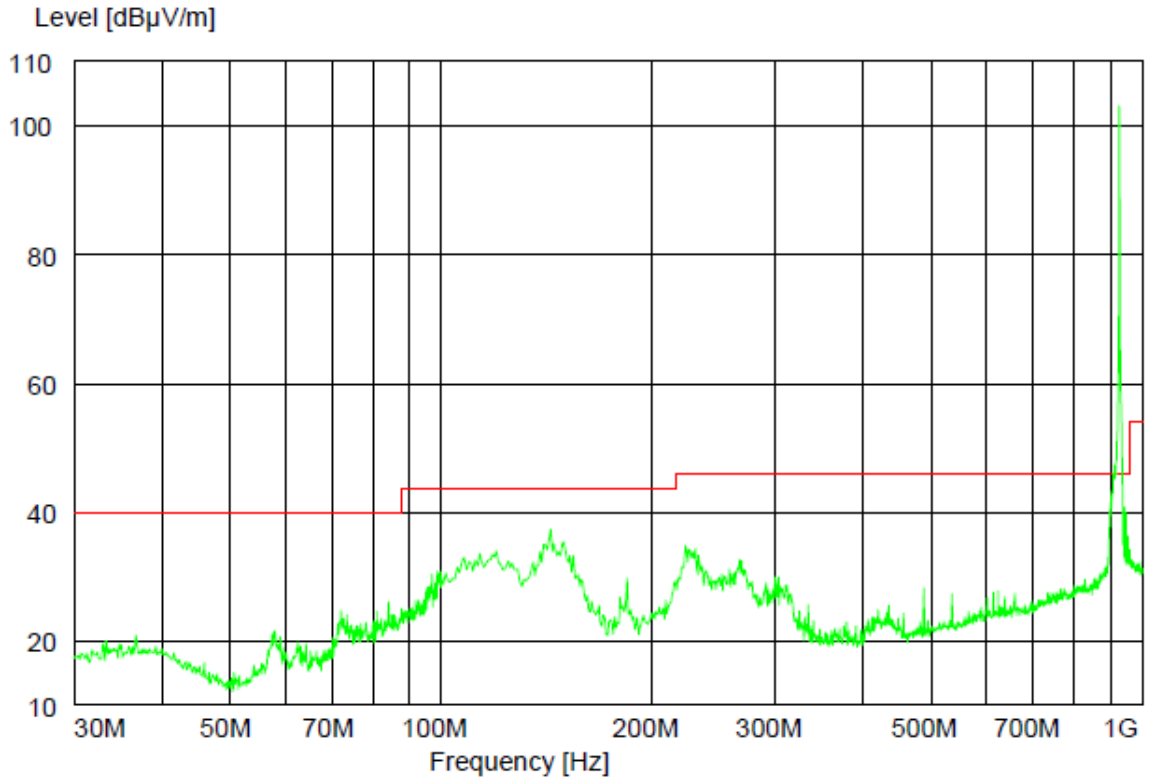
Figure 6: Spurious emission measurement results, mid channel, 3-12.75GHz, vertical and horizontal polarization



Final measurement result:

Frequency(MHz)	polarization (horizontal H/ vertical V)	Detector	Limit (dBuV/m)	Level (dBuV/m)	Margin (dB)
3641.282	V	Peak	74.0	31.82	42.18
3641.282	V	AV	54.0	19.59	34.41
4515.030	V	Peak	74.0	33.76	40.24
4515.030	V	AV	54.0	21.17	32.83
7610.721	H	Peak	74.0	51.46	22.54
10007.515	H	Peak	74.0	55.33	18.67
12312.124	H	Peak	74.0	54.72	19.28
10019.038	V	AV	54.0	42.67	11.33

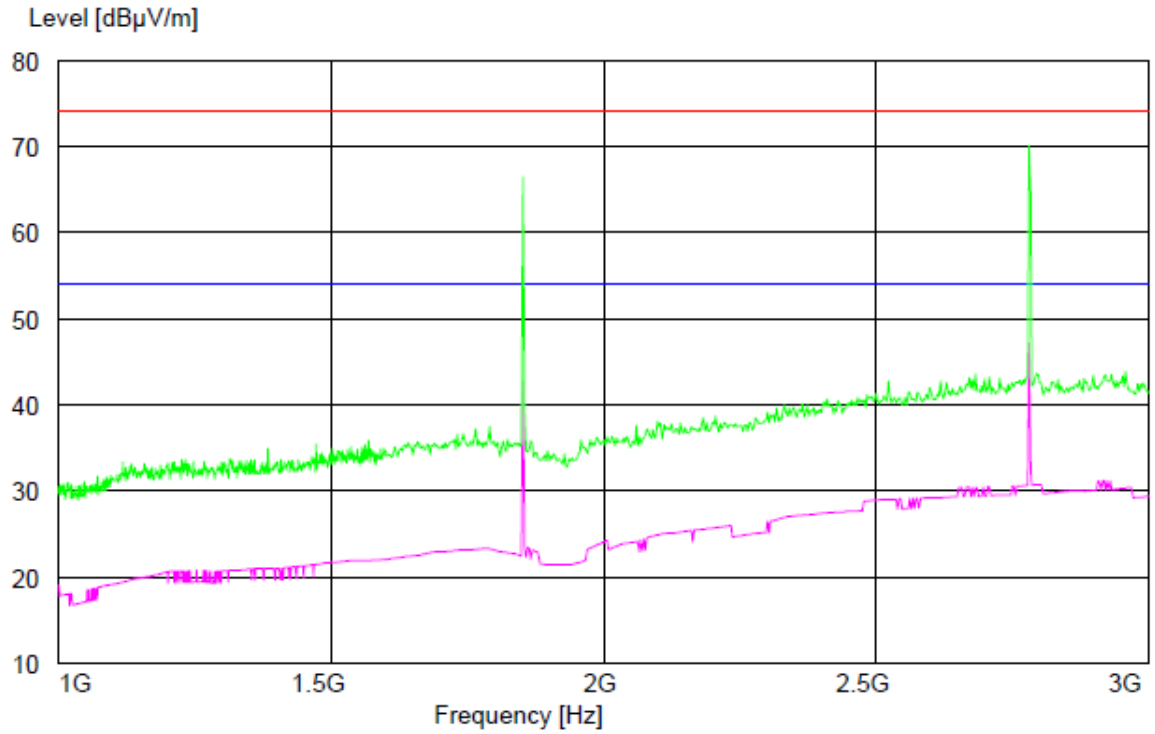
Figure 7: Spurious emission measurement results, high channel, 30-1000MHz, vertical and horizontal polarization



Final measurement result:

Frequency(MHz)	polarization (horizontal H/ vertical V)	Height(m) (cm)	Angle (°)	Limit (dBuV/m)	Level (dBuV/m)	Margin (dB)
73.486	H	100.0	93.9	40.0	24.12	15.88
84.288	H	300.0	278.2	40.0	26.09	13.91
143.286	V	100.0	354.7	43.5	37.33	6.17
230.661	V	100.0	172.1	43.5	34.29	9.21
487.975	V	100.0	357.9	46.5	28.16	18.34
613.226	H	100.0	89.3	46.5	27.52	18.98

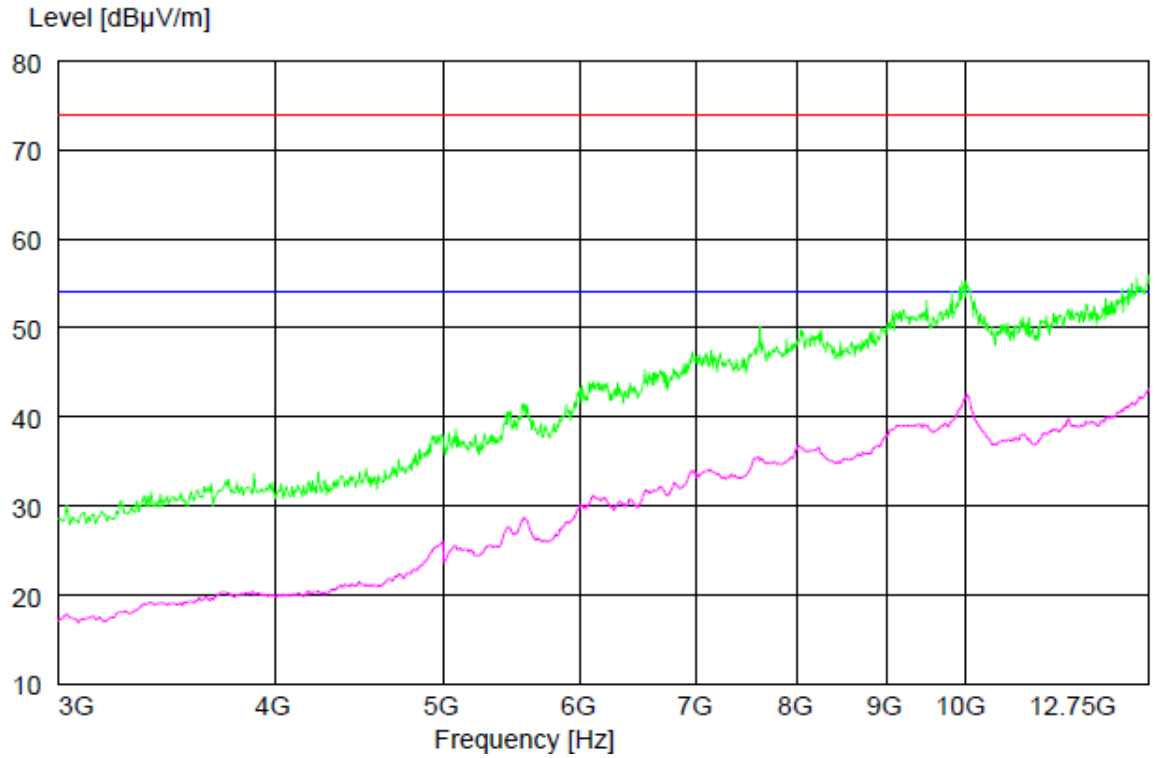
Figure 8: Spurious emission measurement results, high channel, 1-3GHz, vertical and horizontal polarization



Final measurement result:

Frequency(MHz)	polarization (horizontal H/ vertical V)	Detector	Limit (dBuV/m)	Level (dBuV/m)	Margin (dB)
1852.505	V	Peak	74.0	66.46	7.54
1852.505	V	AV	54.0	42.66	11.34
2781.162	V	Peak	74.0	70.02	3.98
2781.162	V	AV	54.0	47.12	6.88

Figure 9: Spurious emission measurement results, high channel, 3-12.75GHz, vertical and horizontal polarization



Final measurement result:

Frequency(MHz)	polarization (horizontal H/ vertical V)	Detector	Limit (dBuV/m)	Level (dBuV/m)	Margin (dB)
3673.346	H	Peak	74.0	32.16	41.84
3641.282	H	AV	54.0	19.79	34.21
4675.350	V	Peak	74.0	33.94	40.06
4675.350	V	AV	54.0	21.53	32.47
7610.721	H	Peak	74.0	52.56	21.44
9823.146	H	Peak	74.0	54.41	19.59
9972.945	H	Peak	74.0	54.88	19.12
12415.831	V	Peak	74.0	54.79	19.21
10019.038	V	AV	54.0	42.67	11.33

Band Edge measurement results

No significant harmonic emissions detected at the lower (614MHz) and upper (960MHz) restricted band.

4.2 Radio Frequency Exprosure Compliance

4.2.1 Electromagnetic Fields

RESULT: **Passed**

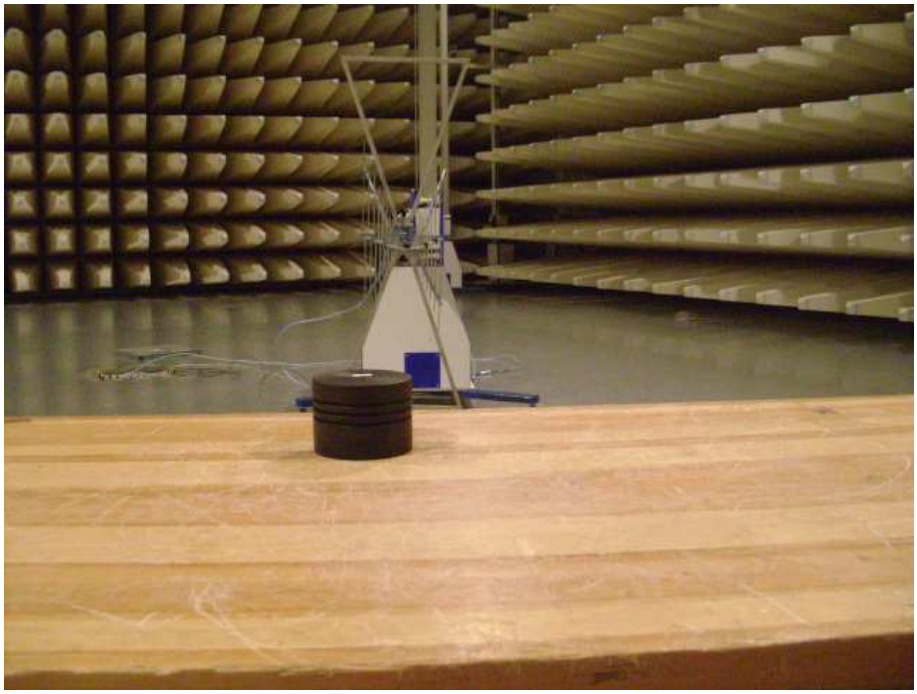
Date of testing : 2011-07-23
Test standard : FCC KDB publication 447498

Test setup

Since maximum peak output power of the transmitter is <60/f (GHz) mW, i.e. 18.28mW<64.72(=60/0.927) mW, hence the EUT is exclueded from SAR evaluation according to FCC KDB publication 447498 D01: Mobile Portable RF Exposure.

5. Photographs of the Test Set-Up

Photograph 1: Set-up for Spurious Emissions 30MHz – 1GHz



Photograph 2: Set-up for Spurious Emissions 1GHz – 12.75GHz

6. List of Tables

7. List of Figures

8. List of Photographs