FCC EVALUATION REPORT FOR CERTIFICATION

Manufacturer : NEXTECH Co., Ltd.

E&C Venture Dream Tower the 3rd, 13th floor,

197-3 Guro-Gu , Seoul, 152-050, South Korea.

Attn : Mr. Young Hak Kwon / Assistant Manager

Date of Issue : April 19, 2011

Order Number: GETEC-C1-11-077

Test Report Number: GETEC-E3-11-031

Test Site: Gumi College EMC Center

FCC Registration Number: (100749, 443957)

FCC ID. : TBJNT-TPMS100

Applicant : NEXTECH Co., Ltd.

Rule Part(s)	**: FCC Part 15 Subpart B 15.109** **FCC Part 15 Subpart C 15.209**
Equipment Class	**: Part 15 Low Power Transmitter Below 1705 kHz (DCD)**
EUT Type	**: TPMS Module**
Type of Authority	**: Certification**
Model Name	**: NT-TPMS100**

This equipment has been shown to be in compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2003

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the vest of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested by,

Soon Hoon

Soon-Hoon Jeong, Associate Engineer
GUMI College EMC center

Reviewed by,

Jae-Hoon Jeong, Senior Engineer
GUMI College EMC center

CONTENTS

Scope: *Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and / or unintentional radiators for compliance with technical rules and regulations of the Federal Communications Commission.*

1. General Information

Applicant: NEXTECH Co., Ltd.
Applicant Address: E&C Venture Dream Tower the 3rd, 13th floor, 197-3 Guro-Gu, Seoul, 152-050, South Korea.
Manufacturer: NEXTECH Co., Ltd.
Manufacturer Address: E&C Venture Dream Tower the 3rd, 13th floor, 197-3 Guro-Gu, Seoul, 152-050, South Korea.
Contact Person: Mr. Young Hak Kwon / Assistant Manager
Tel. Number: +82-2-3140-2532

- **FCC ID.** TBJNT-TPMS100
- **Equipment Class** Part 15 Low Power Transmitter Below 1705 kHz (DCD)
- **EUT Type** TPMS Module
- **Model Name** NT-TPMS100
- **Trade Name** UNIVERSAL Remote Control
- **Serial Number** Prototype
- **Rule Part(s)** FCC Part 15 Subpart B section 15.109
  FCC Part 15 Subpart C section 15.209
- **Type of Authority** Certification
- **Test Procedure(s)** ANSI C63.4 (2003)
- **Dates of Test** April 2 ~ 8, 2011
- **Place of Test** **Gumi College EMC Center** (FCC Registration No.: 100749, 443957)
  407, Bugok-dong, Gumi-si, Gyeongbuk, Korea.
- **Test Report Number** GETEC-E3-11-031
- **Dates of Issue** April 19, 2011

2. Introduction

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Nose Emissions From Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ASNI C63.4-2003) was used in determining radiated and conducted emissions emanating from **NEXTECH Co., Ltd. TPMS Module(Model Name: NT-TPMS100) FCC ID.: TBJNT-TPMS100**

These measurement tests were conducted at **Gumi College EMC Center**.
The site address is 407, Bugok-dong, Gumi-si, Gyeongbuk, Korea.
This test site is one of the highest point of Gumi 1 college at about 200 km away from Seoul city and 40 km away from Daegu city. It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures. The detailed description of the measurement facility was found to be in compliance with the requirements of FCC §2.948 according to ANSI C63.4 (2003)

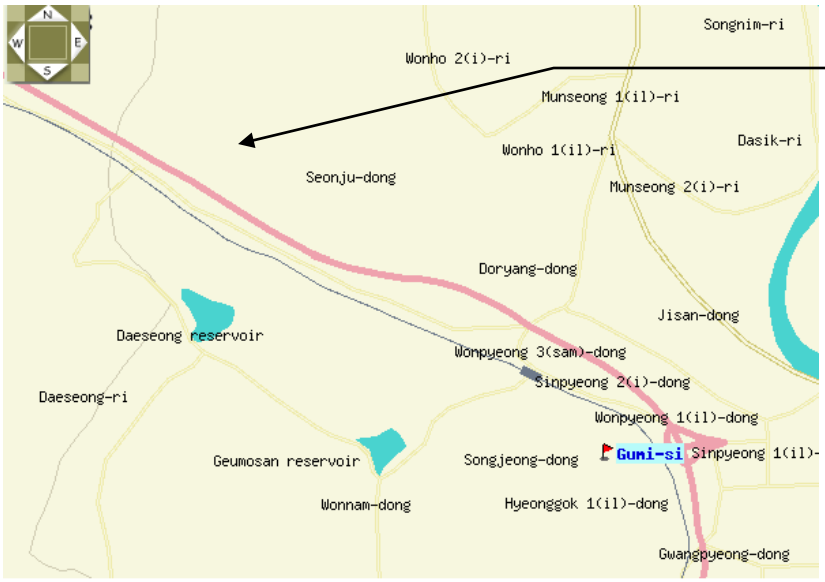

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Fig 1. The map above shows the Gumi College in vicinity area.

3. Product Information

3.1 Description of EUT

The Equipment under Test (EUT) is the **NEXTECH Co., Ltd. TPMS Module (Model Name: NT-TPMS100) FCC ID.: TBJNT-TPMS100**

-. CPU	: STM32F, ARM 32-bit Cortex-M3 CPU
-. Memory	: 256 kbyte FLASH MEMORY
-. RF Receiver	: 315 MHz ASK/FSK, 433 MHz ASK/FSK
-. LF Transmitter	: 125 kHz
-. Operating Voltage	: DC 8 V ~ 24 V
-. Size	: 106 mm × 76 mm × 14 mm

3.2 Support Equipment / Cables used

3.2.1 Used Support Equipment

Description	Manufacturer	Model Name	S/N & FCC ID
None.	-	-	S/N: - FCC ID: -

See "Appendix D– Test Setup Photographs" for actual system test set-up

3.2.2 System configuration

Description	Manufacturer	Model Name	S/N & FCC ID.
None.	-	-	S/N: - FCC ID.: -

3.2.3 Used Cable(s)

Cable Name	Condition	Description
None.	-	-

3.3 Modification Item(s)

- None

4. Antenna Requirement - §15.203

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the applicant can be used with the device. The use of permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with this requirement.

4.1 Description of Antenna

The **NEXTECH Co., Ltd. / LF Transmitter** comply with the requirement of §15.203 with a built-in IC antenna permanently attached to the transmitter.

5. Description of tests

5.1 Test Condition

The EUT was installed, arranged and operated in a manner that is most representative of equipment as typically used. The measurements were carried out while varying operating modes and cable positions within typically arrangement to determine maximum emission level.
The representative and worst test mode(s) were noted in the test report.

- Test Voltage / Frequency
  : DC 12 V (The EUT power is fed from the host unit (Main body: CARMAN SCAN NEO), and the host unit power is fed from the car battery. So, the conducted emission test was skipped.)

- Test Mode(s): Continuous RF transmitting mode

5.2 Conducted Emission

The Line conducted emission test facility is inside a 4 m × 8 m × 2.5 m shielded enclosure. (FCC Registration No.: 100749)
The EUT was placed on a non-conducting 1.0 m by 1.5 m table, which is 0.8 m in height and 0.4 m away from the vertical wall of the shielded enclosure.
The EUT is powered from the Rohde & Schwarz LISN (ESH2-Z5) and the support equipment is powered from the Rohde & Schwarz LISN (ESH3-Z5). Powers to the LISN are filtered by high-current high insertion loss power line filter.
Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.
The RF output of the LISN was connected to the EMI test receiver (Rohde & Schwarz, ESCS30).
The EMI test receiver was scanned from 150 kHz to 30 MHz with 20 ms sweep time to determine the frequency producing the maximum EME from the EUT. The frequency producing the maximum level was re-examined using Quasi-Peak mode of the EMI test receiver.
The bandwidth of Quasi-peak mode was set to 9 kHz. Each emission was maximized consistent with typical applications by varying the configuration of the test sample. Interface cables were connected to the available interface ports of the test unit. The effect of varying the position of cables was investigated to find the configuration that produces maximum diagram emission. Excess cable lengths were bundled at center with 30 cm ~ 40 cm.
Each EME reported was calibrated using the R/S signal generator

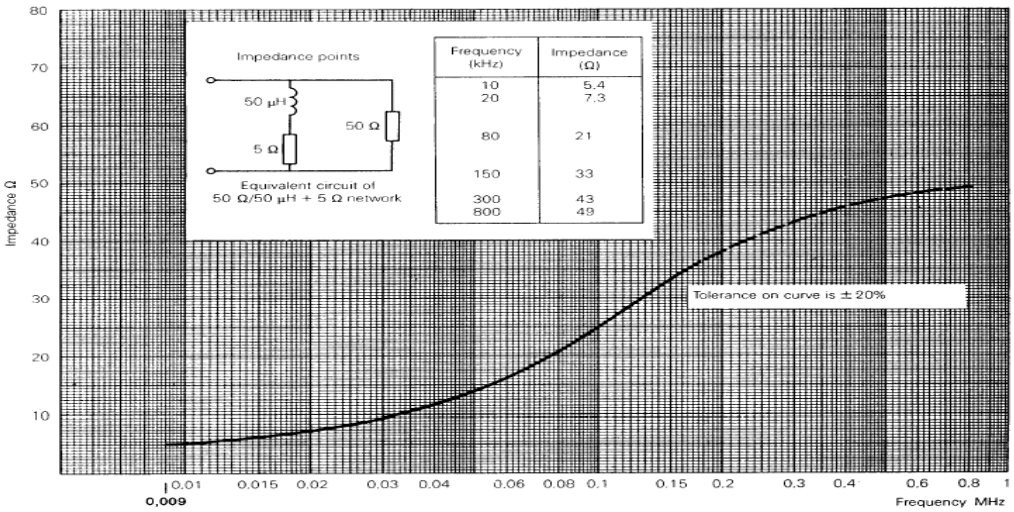


Fig 2. Impedance of LISN

5.3 Radiated Emission

Preliminary measurements were conducted 3 m semi anechoic chamber using broadband antennas to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The technology configuration, mode of operation and turntable azimuth with respect to antenna was note for each frequency found.

Final measurements were made 3 m chamber (FCC registration No.: 443957) and/or 10 m OATS (FCC registration No.: 100749).

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

Each frequency found during pre-scan measurements was re-examined and investigated using EMI test receiver. The detector function was set to CISPR quasi-peak mode average mode and the bandwidth of the receiver was set to 120 kHz or 1 MHz depending on the frequency or type of signal.

The EUT, support equipment and interconnecting cables were reconfigured to the setup producing the maximum emission for the frequency and were placed on top of a 0.8 m high non-metallic 1.0 m × 1.5 m table.

The turntable containing the test sample was rotated; the antenna height was varied 1 to 4 meter and stopped at the azimuth or height producing the maximum emission.

Each EME reported was calibrated using the R/S signal generator

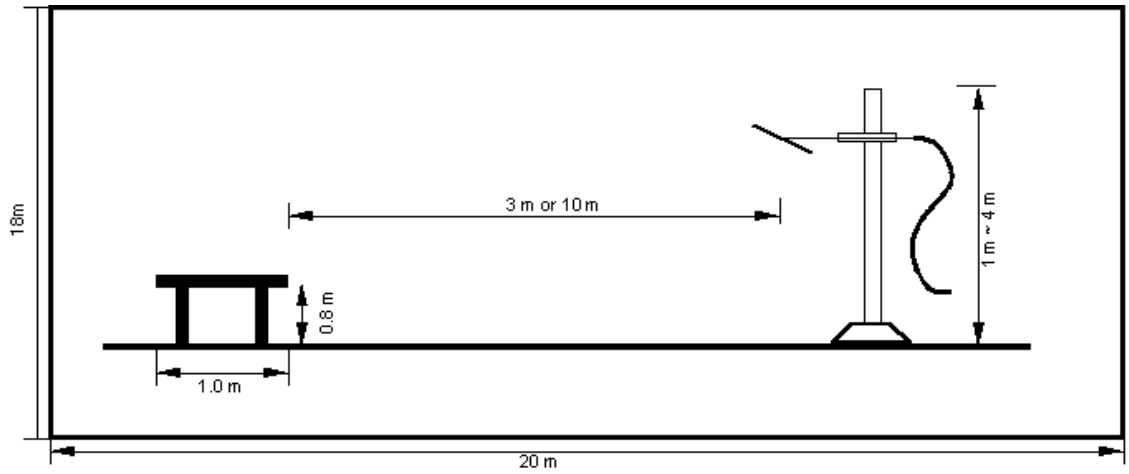


Fig 3. Dimensions of test site.

6. Radiated Emission

6.1 Operating environment

Temperature : 24.0 ℃
Relative humidity : 43.0 % R.H.

6.2 Test set-up

A preliminary and final measurement was at 3 m anechoic chamber.
The EUT was placed on a non-conductive turntable approximately 0.8 m above the ground plane.
The turntable with EUT was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels.
This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

6.3 Measurement uncertainty

The measurement uncertainty was calculated in accordance with ISO “Guide to the expression of uncertainty in measurement”.
The measurement uncertainty was given with a confidence of 95 %.

Test items(Anechoic Chamber)	Uncertainty	Remark
Radiated emission (30 MHz ~ 300 MHz, 3 m, Vertical)	± 4.38 dB	Confidence levels of 95 % (k = 2)
Radiated emission (30 MHz ~ 300 MHz, 3 m, Horizontal)	± 3.50 dB	Confidence levels of 95 % (k = 2)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Vertical)	± 3.75 dB	Confidence levels of 95 % (k = 2)
Radiated emission (300 MHz ~ 1 000 MHz, 3 m, Horizontal)	± 3.59 dB	Confidence levels of 95 % (k = 2)

6.4 Limit

Frequency (MHz)	FCC Limit(μV/m) / Distance
0.009 ~ 0.490	2400/F(kHz) @ 300 m
0.490 ~ 1.705	24000/F(kHz) @ 30 m
1.705 ~ 30	30 @ 30 m
30 ~ 88	100 @ 3 m
88 ~ 216	150 @ 3 m
216 ~ 960	200 @ 3 m
Above 960	500 @ 3 m

[Limit at 3 m] = [Limit at 300 m] -40 × log (3 [m] / 300 [m])

[Limit at 3 m] = [Limit at 30 m] -40 × log (3 [m] / 30 [m])

6.5 Test Equipment used

	Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ -	ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	12. 10. 2011
■ -	VULB9160	Schwarzbeck	Broadband Test Antenna	3193	03. 15. 2012
■ -	HFH2-Z2	Rohde & Schwarz	Loop antenna	100041	12. 15. 2011
■ -	BBHA9120D	Schwarzbeck	Horn Antenna	207	12. 22. 2011
■ -	MCU066	maturo GmbH	Position Controller	1390306	N/A
■ -	TT2.5SI	maturo GmbH	Turntable	1390307	N/A
■ -	AM 4.0	maturo GmbH	Antenna Mast	1390308	N/A
■ -	AFS 44 00101800-25-10P-44	MITEQ	Preamplifier	1258943	11. 12. 2011

6.6 Test data for Radiated Emission

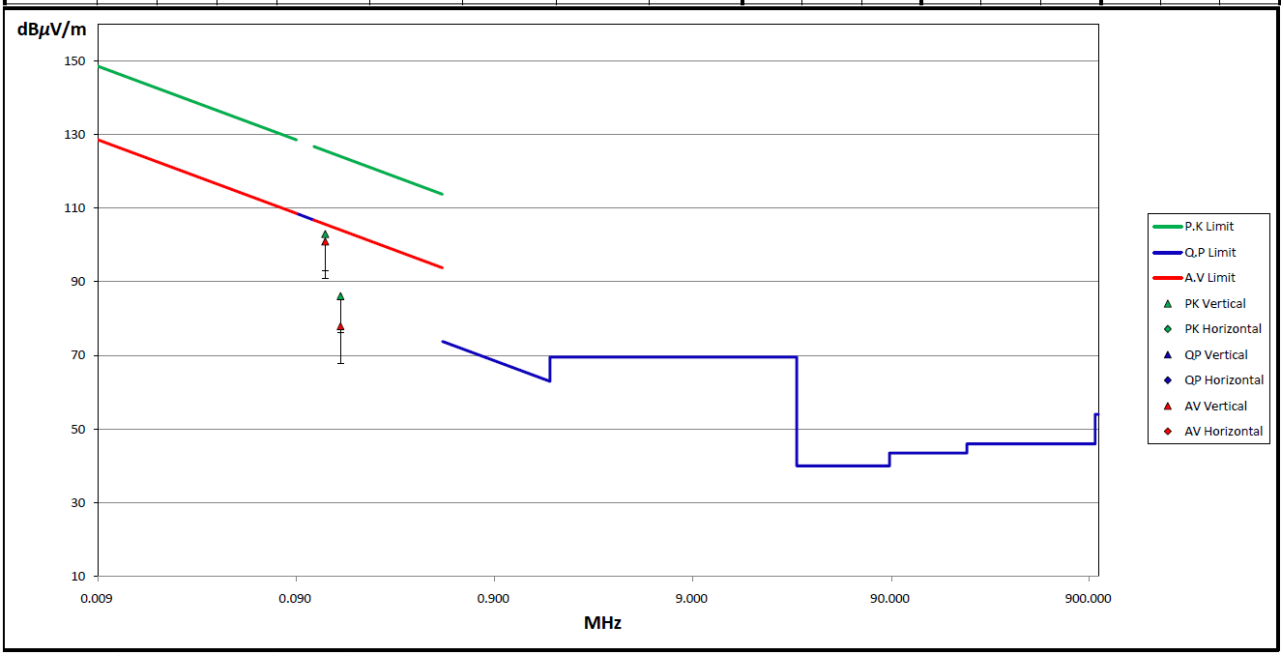
-. Test Date : April 5 ~ 6, 2011
-. Reference Standard : Part 15 Subpart B, Sec.15.109 / Part 15 Subpart C, Sec.15.209
-. Measuring Distance : 3 m
-. Note : Through three orthogonal axes were investigated and the worst case is reported.
-. Measurement

Frequency range	9 kHz ~ 90 kHz, 110 kHz ~ 150 kHz	90 kHz ~ 110 kHz	150 kHz ~ 490 kHz	490 kHz ~ 30 MHz	30 MHz ~ 1 GHz	1 GHz ~ 2 GHz
Detector type	Peak / Average	Quasi peak	Peak / Average	Quasi peak	Quasi peak	Peak / Average[1)]
IF bandwidth	200 Hz	200 Hz	9 kHz	9 kHz	120 kHz	1 MHz

1) When using spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

♦ Field Strength of the fundamental & harmonic frequencies.

Frequency [MHz]	Reading value [dBμV]			Polarization (H/V)	Height [cm]	azimuth [°]	correction factor		Limit [dBμV/m]			result [dBμV/m]			Margin [dB]		
	P.K	Q.P	A.V				ANT. [dB/m]	cable [dB]	P.K	Q.P	A.V	P.K	Q.P	A.V	P.K	Q.P	A.V
0.125433	84.19		82.17	V	100	0	18.68	0.11	125.63	-	105.63	102.98	-	100.96	22.65	-	4.67
0.15	67.36		59.12	V	100	0	18.67	0.11	124.08	-	104.08	86.14	-	77.90	37.94	-	26.18



*Comment Polarization : H (Horizontal), V (Vertical)
Correction factor : ANT (Antenna)
Correction factor : cable + (Preamp or pass filter (if application)))
<<"" : The margin is more than 30 dB"

7. -26 dB Bandwidth and 99 % Occupied Bandwidth Measurement

7.1 Operating Environment

Temperature : 23.0 ℃
Relative humidity : 40.0 %R.H.

7.2 Test Set-up

This measurement is performed with the antenna located close enough to give a full-scale deflection of the modulated carrier on the spectrum analyzer. The plot is taken at 200 kHz/division frequency span, 100 kHz 3 dB resolution bandwidth and 5 dB/division logarithmic display from an ESI spectrum analyzer.
The measuring bandwidth shall be set to a value greater than 5 % of the allowed bandwidth (ANSI C63.4-1992 I6)

7.3 Limit

None.

7.4 Test Equipment used

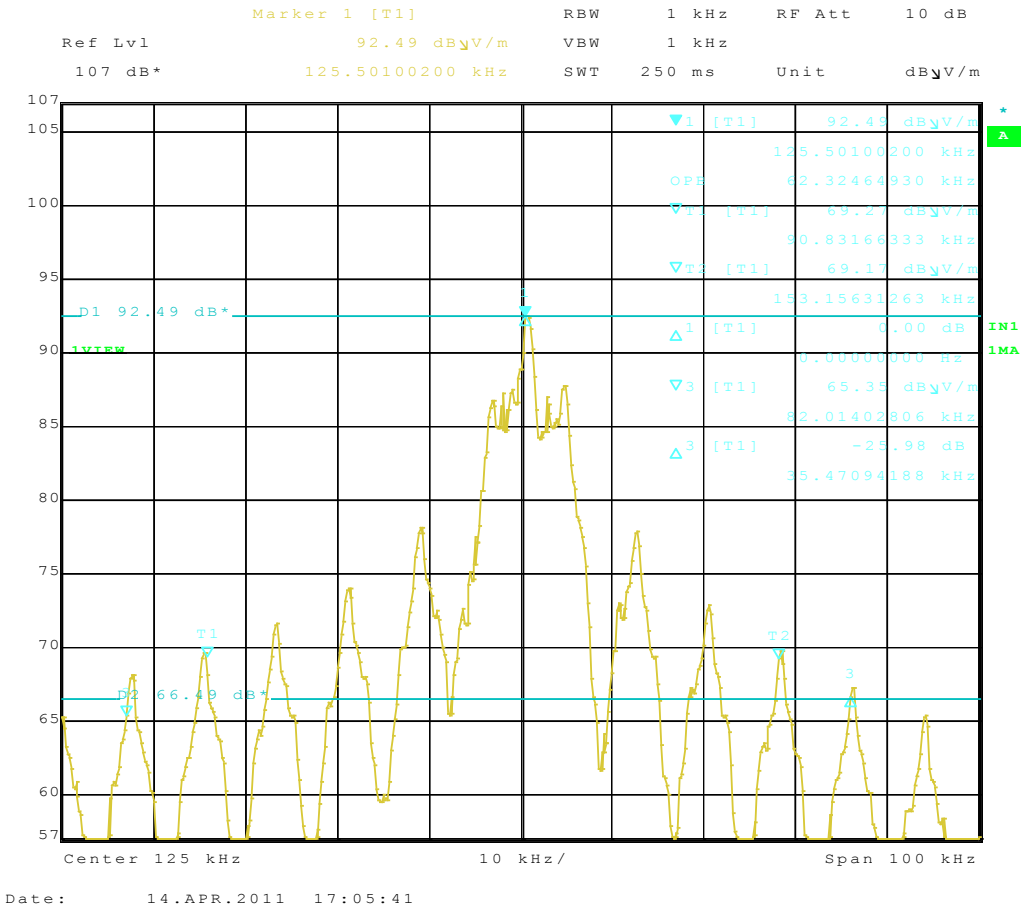
	Model Name	Manufacturer	Description	Serial Number	Due to Calibration
■ -	ESIB26	Rohde & Schwarz	EMI Test Receiver	830482/010	12. 10. 2011
■ -	VULB9160	Schwarzbeck	Broadband Test Antenna	3193	03. 15. 2012

7.5 Test result of occupied bandwidth

-. Test Date : April 14, 2011
-. Operating condition : RF transmitting mode
-. Spectrum resolution bandwidth(3dB) : 1 kHz

7.5.1 Test Frequency: LF transmitter (125 kHz)

Frequency (kHz)	-26 dB bandwidth	99 % occupied bandwidth
125	82.014 kHz	62.324 kHz



8. Sample Calculations

$$dB\mu V = 20 \text{ Log }_{10}(\mu V/m)$$
$$dB\mu V = dBm + 107$$
$$\mu V = 10^{(dB\mu V/20)}$$

8.1 Example 1 :

■ **20.3 MHz**

Class B Limit = 250 μV = 48 dBμV

Reading = 39.2 dBμV

$10^{(39.2dB\mu V/20)}$ = 91.2 μV

Margin = 48 dBμV - 39.2 dBμV

= 8.8 dB

8.2 Example 2 :

■ **66.7 MHz**

Class B Limit = 100 μV/m = 40.0 dBμV/m

Reading = 31.0 dBμV

Antenna Factor + Cable Loss = 5.8 dB

Total = 36.8 dBμV/m

Margin = 40.0 dBμV/m – 36.8 dBμV/m

= 3.2 dB

9. Recommendation & Conclusion

The data collected shows that the **NEXTECH Co., Ltd. TPMS Module (Model Name: NT-TPMS100)** was complies with §15.109, 15.209 of the FCC Rules.