HCT CO., LTD.

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CERTIFICATE OF COMPLIANCE

TEST REPORT

Hyundai Autonet Co.,Ltd

San 136-1, Ami-ri, Bubal-eup, Ichon-si, Kyoungki-do,

467-701, South Korea

Date of Issue: June, 16, 2008
Test Report No.: HCT-R08-070
Test Site: HCT CO., LTD.

FCC	:	**PINHSN-1A**
IC	:	**4018A-HSN1A**
APPLICANT	:	**Hyundai Autonet Co.,Ltd**

EUT Type:	Tire Presure Monitoring System
Tx Frequency:	315 MHz
Trade Name/Model(s):	Hyundai Autonet Co.,Ltd / HSN-1A
FCC Classification:	Security/Remote Control Transmitter
Application Type:	Certification
FCC Rule Part(s):	§2, §15 Subpart C
IC Rule Part(s):	RSS-210 Issue 7
Antenna Type:	Integral Type
Emission Designator(s):	132KF1D

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ∮ 2.947.

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 best 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.

HCT Co., Ltd. Certifies that no party to this application has been denied FCC benefits pursuant to section 5301 of the Anti- Drug Abuse Act of 1998, 21 U.S. C. 853(a)

Chang Seok Choi

Report prepared by
: Chang Seok Choi
Test engineer of RF Part

Sang Jun Lee

Approved by
: Sang Jun Lee
Manager of RF Part

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Table of Contents

MEASUREMENT REPORT

1. SCOPE

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

General Information

Company Name:	Hyundai Autonet Co.,Ltd
Address:	San 136-1, Ami-ri, Bubal-eup, Ichon-si, Kyoungki-do, 467-701, South Korea
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- FCC: PINHSN-1A
- IC: 4018A-HSN1A
- EUT Type: Tire Pressure Monitoring System
- Trade Name: Hyundai Autonet Co., Ltd
- Model(s): HSN-1A
- Tx Frequency: 315 MHz
- Application Type: Certification
- FCC Classification: Security/Remote Control Transmitter
- FCC Rule Part(s): §2, §15 Subpart C
- IC Rule Part(s): RSS-210 Issue 7
- Modulation(s): FSK
- Date(s) of Tests: June 10, 2008 – June 15, 2008
- Place of Tests: HCT CO., LTD.
  Icheon, Kyounki-Do, KOREA
- Report Serial No.: HCT-R08-069

2. INTRODUCTION

EUT DESCRIPTION

The Hyundai Autonet HSN-1A Tire Pressure Monitoring System.

HSN-1A is periodically measure and transfer to ECU the pressure and temperature inside of tire.

It also monitors and transfers the condition of Battery and Sensor.

Following is the major functionalities.

► Measure and transfer the tire pressure

► Measure and transfer inside temperature of tire.

► Measure and transfer tire rotating condition by acceleration value.

► Measure and transfer voltage of mounted battery

► Measure and transfer abnormal condition of sensor (pressure and accelerometer)

► Decide existence and nonexistence of abnormal pressure change occurs inside of tire.

MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

Test Facility

The open area test site and conducted measurement facility used to collect the radiated data are located at the 254-1,Maekok-Ri, Hobup-Myun, Ichon-Si, Kyoungki-Do, 467-701, KOREA. The site is constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 6, 2006(Registration Number: 90661)

3. DESCRIPTION OF TESTS

Summary of Test Results

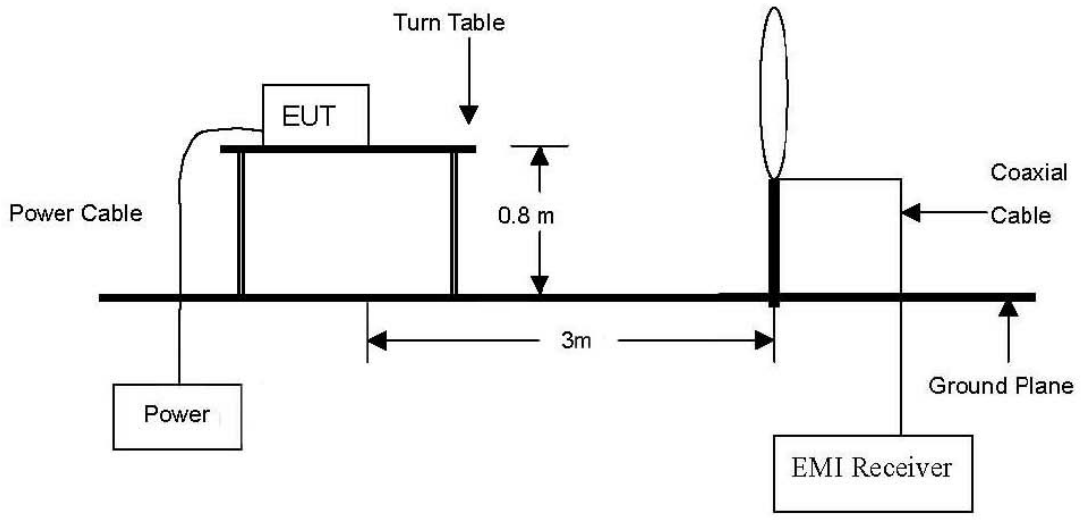
The EUT has been tested according to the following specifications:

APPLIED STANDARD			
Section in FCC 15 Subpart C §15.209	**Section in RSS-210, Issue 7 : 2007**	**Test Item**	**Result**
15.231(e) 15.231(b)	RSS-210, Issue 7, Table 5	Radiated emission, Spurious Emission and Field Strength of Fundamental	Complied
-	RSS-Gen, Issue 2, 7.2.3	Receiver Spurious Emission (Radiated)	-
15.231(c)	RSS-210, Issue 7, A1.1.3	Bandwidth of Operation frequency	Complied
15.231(e)	RSS-210, Issue 7, A1.1.1	Transmission Time	Complied
-	RSS-Gen, Issue 2, 4.6.1	Occupied Bandwidth	Complied

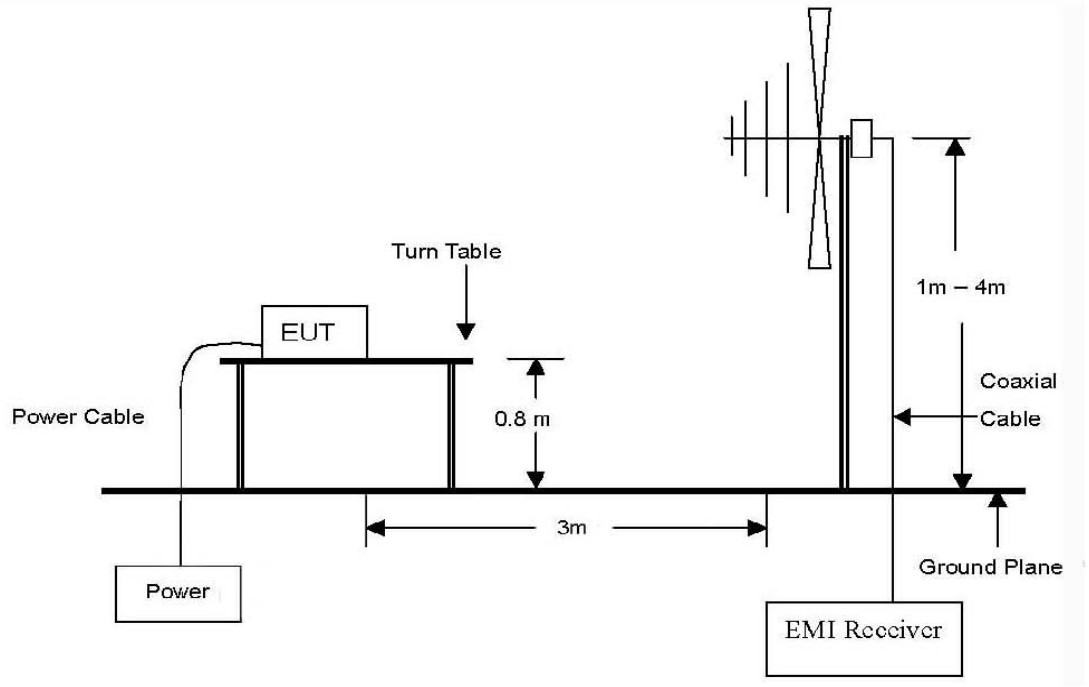
3.1 Field Strength of Fundamental

Test Set-up

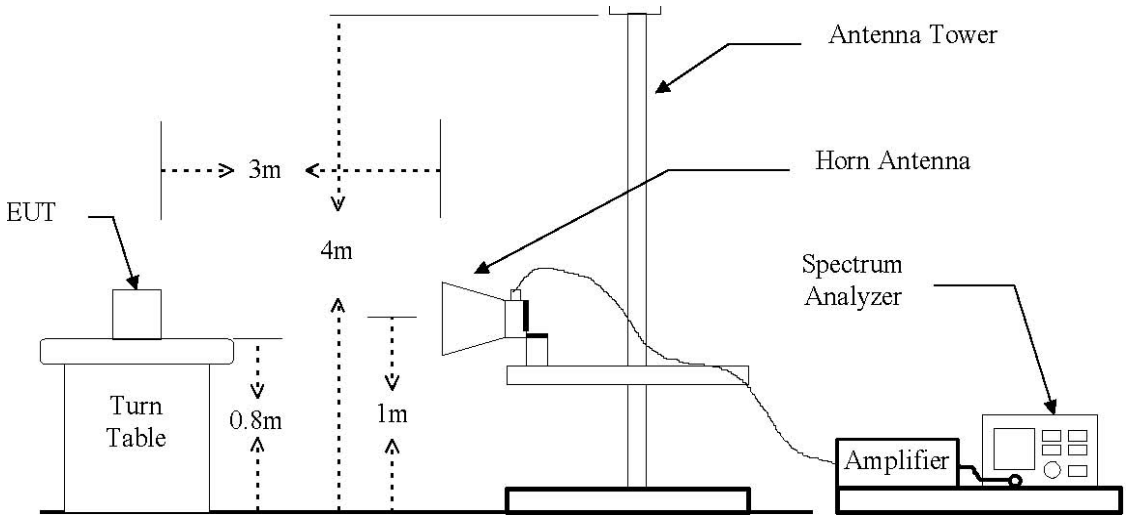
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 18 GHz Emissions.



Limit

Radiated emission limits, general requirements

According to 15.231(a), Periodic operation in the band 40.66-40.70 MHz and above 70 MHz, except as shown in paragraph 15.231(e), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Frequency Band (MHz)	Field strength of Fundamental (uV/m)	Field strength of Spurious (uV/m)
40.66-40.70	2250	225
70-130	1250	125
130-174	*1,250 to 3,750	*125 to 375
174-260	3750	375
260-470	*3,750 to 12,500	*375 to 1250
Above 470	12500	1250

* Linear interpolations.

According to 15.231(e), Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) and may be employed for any type of operation, including operation prohibited in paragraph (a), provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this Section, except the field strength table in paragraph (b) is replaced by the following:

Frequency Band (MHz)	Field strength of Fundamental (uV/m)	Field strength of Spurious (uV/m)
40.66-40.70	1,000	100
70-130	500	50
130-174	*500 to 1,500	*50 to 150
174-260	1,500	150
260-470	*1,500 to 5,000	*150 to 500
Above 470	5,000	500

* Linear interpolations

Field strength limits are at the distance of 3 meters, emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209,as following table:

Other Frequencies (MHz)	Field Strength μV/meter	of Fundamental dBμV/meter
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

Test Procedures for emission from 9 kHz to 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
b. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
c. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
d. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Test Procedures for emission from 30 MHz to 1000 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.

b. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Test Result

Ambient temperature : 23 ℃ Relative humidity : 47 %

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical

Radiated Emissions				Ant	FCC Limit	
Frequency (MHz)	Field Strength (dBuV)	Detect Mode	Duty Cycle Factor	Pol.	Limit (dBuV/m)	Margin (dB)
315.028	78.83	Peak	14.8	H	87.48	8.65
315.026	64.03	Avg	14.8	V	67.48	3.45
315.026	64.27	Peak	14.8	V	87.48	23.21
315.026	49.47	Avg	14.8	V	67.48	18.01

Remark:

To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

Note:

1. A Peak limit is 20 dB above the average limit.
2. 3m Limit(dBuV/m) = $20\log[16.6667(F_{(MHz)})-2833.3333]$

   =67.48

3.2 Spurious Emission

Test Setup

Same as section 3.1 of this report

Limit

Same as section 3.2 of this report

Test Procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

Test Procedures for emission from 9 kHz to 30 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
b. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement.
c. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
d. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Test Procedures for emission from 30 MHz to 1000 MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
b. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Test Result

Ambient temperature : 23 ℃ Relative humidity : 47 %

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical

Radiated Emissions			Ant	FCC Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	Limit (dBuV/m)	Margin (dB)
105	29.95	Peak	H	43.50	13.55
631	45.91	Peak	H	47.70	1.79
2973	38.98	Peak	H	74.00	35.02
629	38.22	Peak	V	47.70	9.48
2950	37.66	Peak	V	74.00	36.34

Remark:

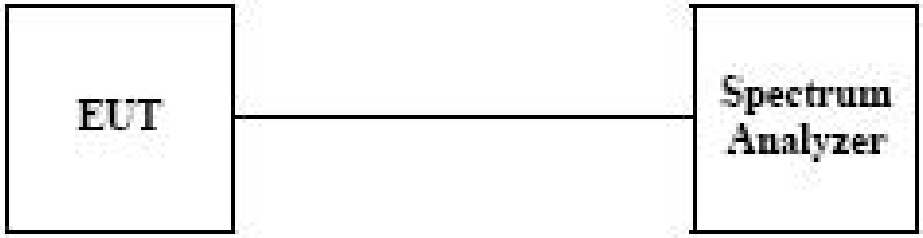
To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

Note:

1. A Peak limit is 20 dB above the average limit.
2. Other spurious Frequencies were not detected up to 4000 MHz

3.3 Bandwidth of Operation Frequency

Test Set-up



Limit

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

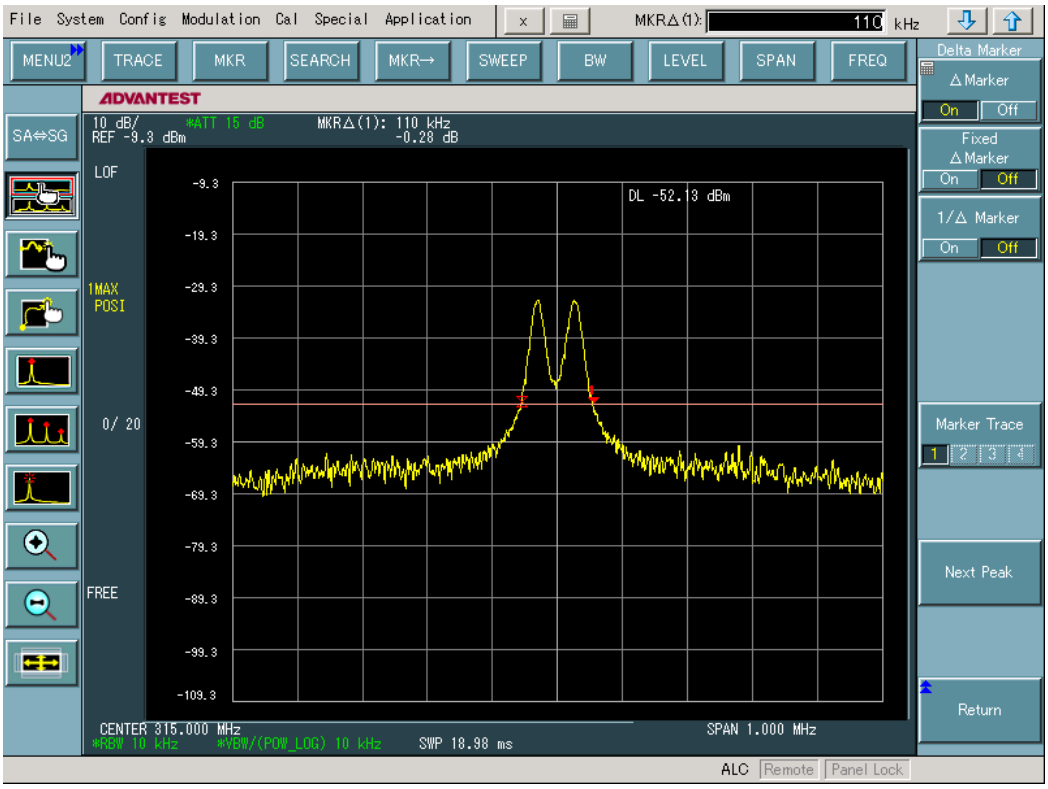
Test Procedure

1. The transmitter output is connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW=10 kHz, VBW=10 kHz and Span=1 MHz.
3. The bandwidth of fundamental frequency was measured and recorded.

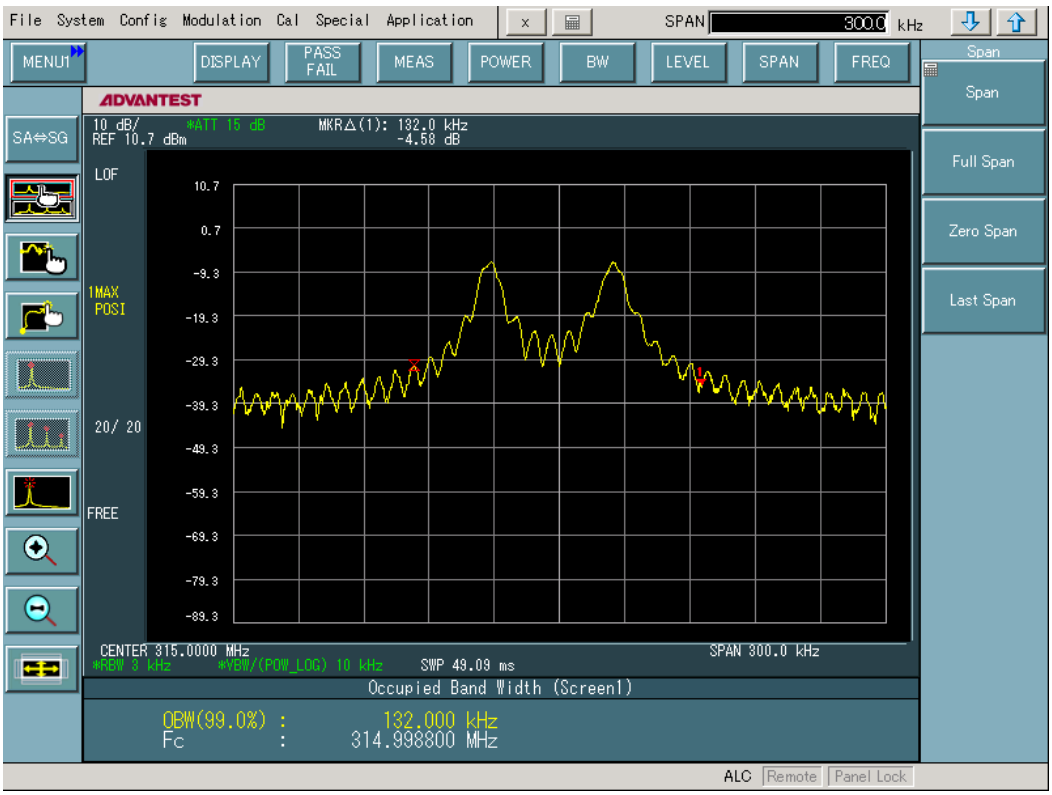
Test Result

Ambient temperature : 23 ℃ Relative humidity : 47 %

Carrier Frequency (MHz)	Bandwidth of the emission (kHz)	Limit (kHz)	Remark
315.00	110.00	787.50	The point 20 dB down from the modulated carrier
Carrier Frequency (MHz)	**Occupied Bandwidth (kHz)**	**Limit (kHz)**	**Remark**
315.00	132.00	-	99 % Occupied bandwidth



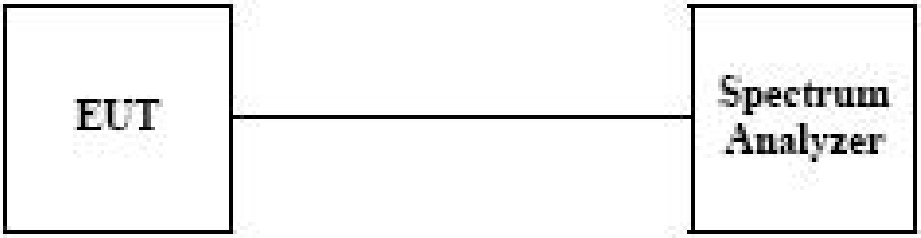
(Plot of 20 dB Bandwidth)



(Plot of 99% Bandwidth)

3.4 Transmission Time

Test Set-up



Limit

Devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

Test Procedure

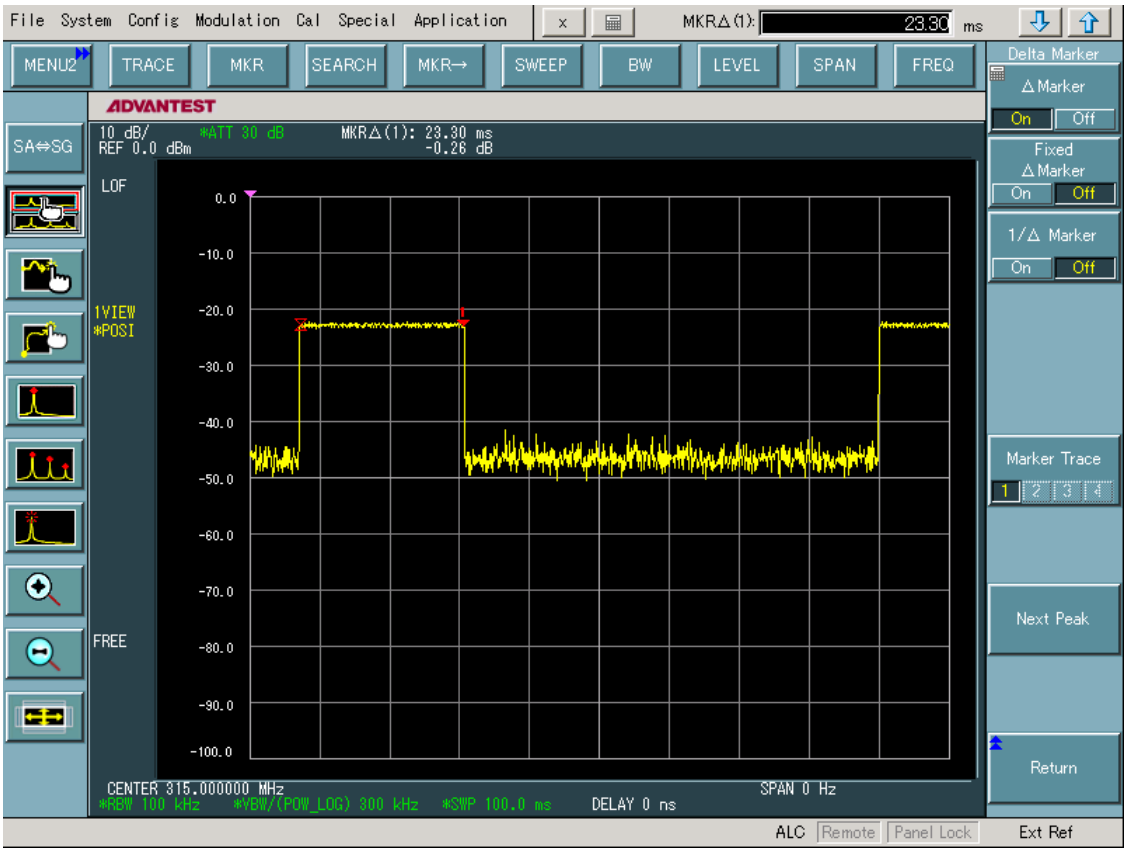
1. The transmitter output is connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW=1 MHz, VBW=1 MHz, Span=0 Hz, Sweep Time=100 msec
3. The bandwidth of fundamental frequency was measured and recorded.

Test Result

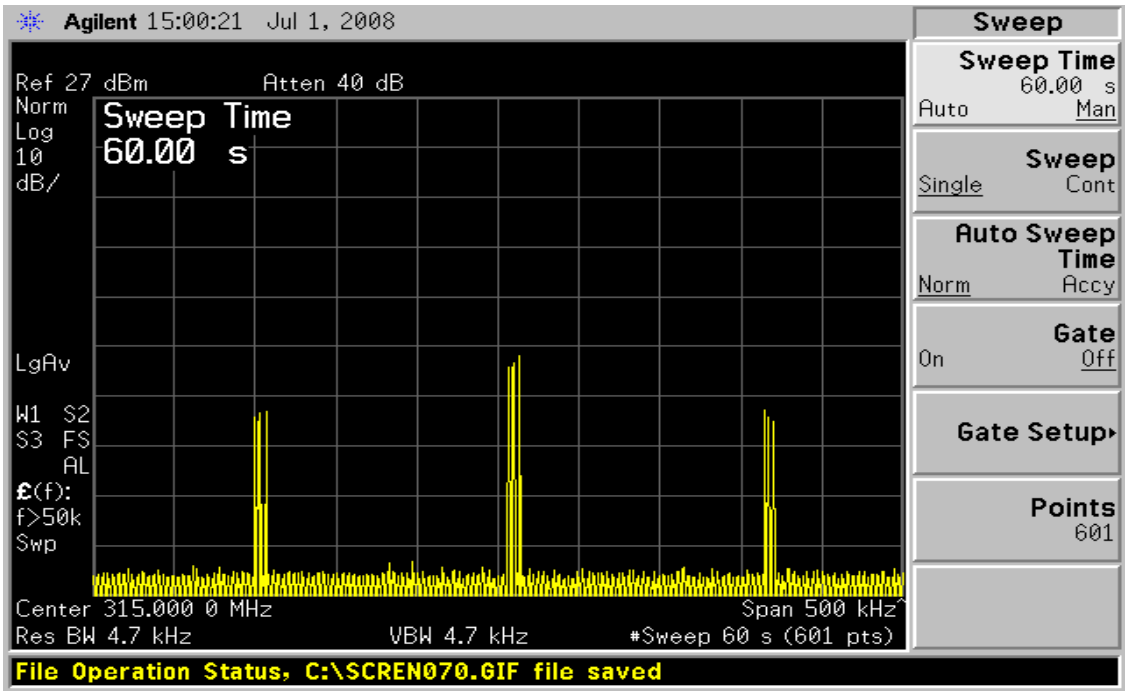
Ambient temperature : 23 ℃ Relative humidity : 47 %

Carrier Frequency (MHz)	Transmission Time (sec)	Limit (sec)	Remark
315.00	0.023	1	Pass
Carrier Frequency (MHz)	**Interval Time (sec)**	**Limit (sec)**	**Remark**
315.00	20.0	10	Pass

(Test Plot)



(Transmission Time)



(Silent Period)

4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Date	Calibration Interval	Calibration Due
Agilent	E7405A / Spectrum Analyzer	US40240209	10/02/2007	Annual	10/02/2008
Agilent	E4440A / Spectrum Analyzer	US45303008	01/08/2008	Annual	01/08/2009
Advantest	R3671 / Spectrum Analyzer	150900068	06/14/2008	Annual	06/14/2009
Schwarzbeck	UHAP / Dipole Antenna	630	11/13/2007	Annual	11/13/2008
Schwarzbeck	UHAP / Dipole Antenna	605	11/13/2007	Annual	11/13/2008
Schwarzbeck	VULB9160/ TRILOG Antenna	3150	04/20/2007	Biennial	04/20/2009
Schwarzbeck	VULB9160/ TRILOG Antenna	3125	05/16/2007	Biennial	05/16/2009
Schwarzbeck	BBHA 9120D/ Horn Antenna	147	03/31/2007	Biennial	03/31/2009
Schwarzbeck	BBHA 9120D/ Horn Antenna	1201	05/02/2007	Biennial	05/02/2009

5. CONCLUSION

The data collected shows that the TPMS **FCC ID: PINHSN-1A** complies with all the requirements of Parts 15C of the FCC rules and RSS- 210 Issue 7 of IC rules