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RADIO TEST REPORT

Report No:STS1805189W01

Issued for

HAMATON AUTOMOTIVE TECHNOLOGY CO., LTD

12 East Zhenxing Road, Linping,Yuhang, Hangzhou, China

Product Name:	TPMS Sensor
Brand Name:	Hamaton
Model Name:	HTS-5100
Series Model:	N/A
FCC ID:	2AFH7PHT510
IC ID:	20466-PHT510
Test Standard:	FCC Part 15.231
	RSS 210 Issue 9

Shenzhen STS Test Services Co., Ltd.
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TEST REPORT CERTIFICATION

Applicant's name :	HAMATON AUTOMOTIVE TECHNOLOGY CO., LTD
Address :	12 East Zhenxing Road, Linping,Yuhang, Hangzhou, China
Manufacture's Name :	HAMATON AUTOMOTIVE TECHNOLOGY CO., LTD
Address :	12 East Zhenxing Road, Linping,Yuhang, Hangzhou, China

Product description

Product Name .....:	TPMS Sensor
Brand Name .....:	Hamaton
Model Name.....:	HTS-5100
Series Model .....:	N/A
Test Standards .....:	FCC Part 15.231
	RSS 210 Issue 9
Test procedure :	ANSI C63.10-2013

This device described above has been tested by STS, the test results show that the equipment under test (EUT) is in compliance with the FCC&IC requirements. And it is applicable only to the tested sample identified in the report.
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Date of Test :	
Date of performance of tests :	21 May 2018~ 28 May 2018
Date of Issue :	31 May 2018
Test Result :	**Pass**

Testing Engineer : Chris chen
(Chris chen)

Technical Manager : Sean She
(Sean she)

Authorized Signatory : Vita Li
(Vita Li)

TABLE OF CONTENTS Page

TABLE OF CONTENTS **Page**

Revision History

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	31 May 2018	STS1805189W01	ALL	Initial Issue

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part 15.231,Subpart C RSS 210 Issue 9			
Standard Section	Test Item	Judgment	Remark
15.207 RSS-Gen Issue 4 (8.8)	Conducted Emission	N/A	--
15.205(a)/15.209/ 15.231.(e) RSS 210 Issue 9 (A.1.4)	Radiated Spurious Emission	PASS	--
15.231 RSS 210 Issue 9 (A.1.1)	Transmission requirement	PASS	--
15.231(C) RSS 210 Issue 9 (A.1.3)	Bandwidth	PASS	--
15.203 RSS-Gen Issue 4	Antenna Requirement	PASS	--

NOTE: (1)"N/A" denotes test is not applicable in this Test Report

(2) All tests are according to ANSI C63.4-2014 and ANSI C63.10-2013

1.1 TEST FACTORY

Shenzhen STS Test Services Co., Ltd.
1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road,
Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

CNAS Registration No.: L7649; FCC Registration No.: 625569

IC Registration No.: 12108A; A2LA Certificate No.: 4338.01;

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U** , where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2** , providing a level of confidence of approximately **95** %。

No.	Item	Uncertainty
1	Conducted Emission (9KHz-150KHz)	±2.88dB
2	Conducted Emission (150KHz-30MHz)	±2.67dB
3	RF power,conducted	±0.71dB
4	Spurious emissions,conducted	±0.63dB
5	All emissions,radiated (9KHz-30MHz)	±3.02dB
6	All emissions,radiated (30MHz-200MHz)	±3.80dB
7	All emissions,radiated (200MHz-1000MHz)	±3.97dB

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name	TPMS Sensor
Trade Name	Hamaton
Model Name	HTS-5100
Series Model	N/A
Model Difference	N/A
Product Description	The EUT is a TPMS Sensor Product Type: Low Power Communication Device Transmitter Operation Frequency: 315MHz Modulation Type: ASK,FSK Number Of Channel: 1CH. Antenna Designation: Internal antenna Antenna Gain(Peak): 2 dBi More details of EUT technical specification, please refer to the User's Manual.
Battery	CR2050HR: Rated Voltage: DC3V CR2050B: Rated Voltage: DC3V
Hardware version number	H18.01
Software version number	S50.02.01
Connecting I/O Port(s)	Please refer to the User's Manual

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. The EUT is assembled with three kinds of valves with different materials and structure, not affect the RF characteristics.
3. Table for filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	Hamaton	HTS-5100	Internal Ant.	N/A	2	Antenna

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX Mode

	For Radiated Emission
Final Test Mode	Description
Mode 1	TX Mode

Note:

(1) The measurements are performed at the highest, middle, lowest available channels.

(2) The measurements are performed at all Bit Rate of Transmitter, the worst data was reported

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters

E-1
EUT

2.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
N/A	N/A	N/A	N/A	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
N/A	N/A	N/A	N/A	N/A

Note:

(1)The support equipment was authorized by Declaration of Confirmation.

(2)For detachable type I/O cable should be specified the length in cm in『Length』column.

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
EMI Test Receiver	R&S	ESCI	102086	2017.10.15	2018.10.14
Bilog Antenna	TESEQ	CBL6111D	34678	2017.11.02	2018.11.01
Horn Antenna	Schwarzbeck	BBHA 9120D (1201)	9120D-1343	2017.10.27	2018.10.26
PreAmplifier (1G-26.5GHz)	Agilent	8449B	60538	2017.10.15	2018.10.14
Passive Loop (9K--30MHz)	ZHNAN	ZN3090C	16035	2018.03.11	2019.03.10
USB RF power sensor	DARE	RPR3006W	15I00041SNO03	2017.10.15	2018.10.14
Semi-anechoic chamber	Changling	966	N/A	2017.10.15	2018.10.14

Conduction Test equipment

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Test Receiver	R&S	ESCI	101427	2017.10.15	2018.10.14
LISN	R&S	ENV216	101242	2017.10.15	2018.10.14
conduction Cable	EM	C01	N/A	2018.03.11	2019.03.10
Shielding Room	Changling	854	N/A	2017.10.15	2018.10.14

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION LIMITS

operating frequency band. In case the emission fall within the restricted band specified on Part 15. 207(a)& RSS-Gen Issue 4 (8.8) limit in the table below has to be followed.

FREQUENCY (MHz)	Class B (dBuV)		Standard
	Quasi-peak	Average	
0.15 -0.5	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	56.00	46.00	CISPR
5.0 -30.0	60.00	50.00	CISPR

0.15 -0.5	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	56.00	46.00	FCC
5.0 -30.0	60.00	50.00	FCC

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.2 TEST PROCEDURE

a.The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

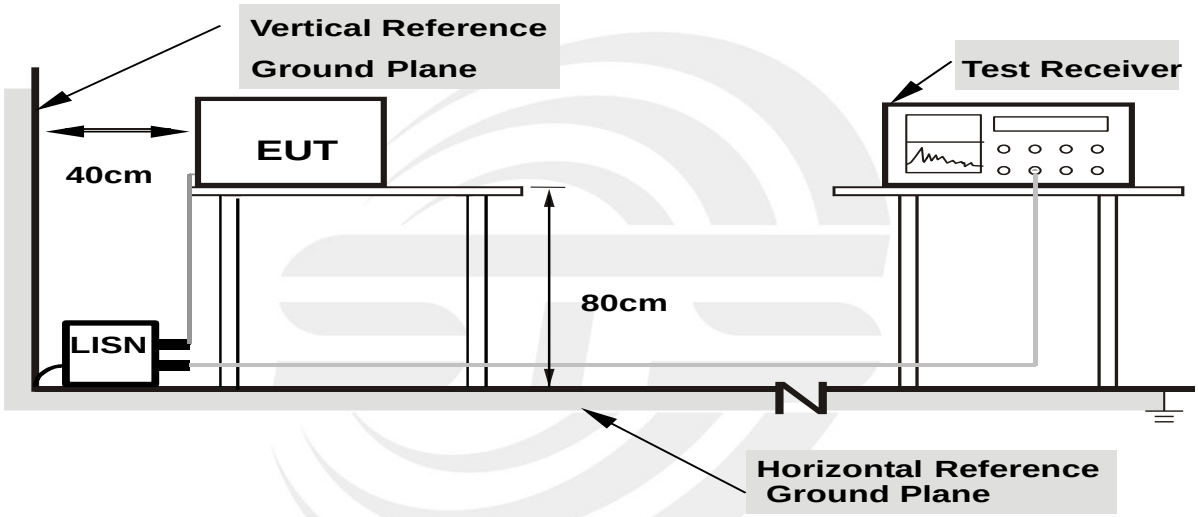
b.Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

c.I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

d.LISN at least 80 cm from nearest part of EUT chassis.

e.For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.3 TEST SETUP



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.4 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.5 TEST RESULTS

Temperature:	26 ℃	Relative Humidity:	54%
Phase:	L/N	Test Mode:	N/A

Note: EUT is only power by battery, So it is not applicable for this test.

4. RADIATED EMISSION MEASUREMENT

4.1 RADIATED EMISSION LIMITS

In case the emission fall within the restricted band specified on Part 15.205(a), then the Part 15.209(a)and Part 15.231(e)& RSS-Gen Issue 4, and RSS 210 Issue 9 (A.1.4) limit in the table below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~40.66	100	3
40.66~40.70	100	3
40.70~70	100	3

LIMITS OF RADIATED EMISSION MEASUREMENT

Fundamental Frequency (MHz)	Field Strength of fundamental (microvolts/meter)	Field Strength of Unwanted Emissions (microvolts/meter)
40.66 - 40.70	1,000	100
70 - 130	500	50
130 - 174	500 to 1,500 **	50 to 1,50 **
174 - 260	1,500	1,50
260 - 470	1,500 to 5,000 **	1,50 to 5,00 **
Above 470	5,000	5,00

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

NOTE:** linear interpolations
[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental
field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 22.72727(F) - 2454.545;
for the band 260-470 MHz, uV/m at 3 meters = 16.6667(F) - 2833.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]
The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in 93 Section 15.209, whichever limit permits a higher field strength.

Spectrum Parameter	Setting
Detector	Peak
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 3 MHz

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

4.2 TEST PROCEDURE

a. The measuring distance of 3m shall be used for measurements. The EUT was placed on the top of arotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation(Below 1GHz)

b. The measuring distance of 3m shall used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation(Above 1GHz)

c. The height of the test antenna shall vary between 1m to 4m.Both horizontal and vertical polarization Of the antenna are set to make the measurement.

d. The initial step in collecting radiated emission data is a receive peak detector mode. Pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.

e. All readings are peak unless otherwise stated QP in column of Note. Peak denoted that the Peak reading compliance with the QP limits and then QP Mode measurement didn't perform (Below 1GHz)

f. All readings are Peak mode value unless otherwise stated AVG in column of Note. If the Peak mode measured value compliance with the Peak limits and lower than AVG Limits, the EUT shall be deemed to meet Peak & AVG limits and then only Peak mode was measured, but AVG mode didn't perform.(Above 1GHz)

g. For the actual test configuration, please refer to the related Item –EUT Test Photos.

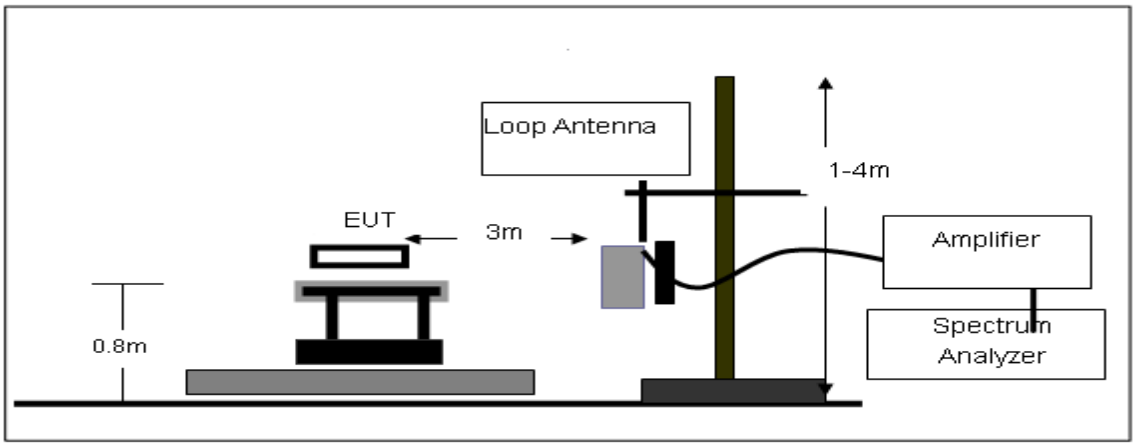
Note: Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

4.3 DEVIATION FROM TEST STANDARD

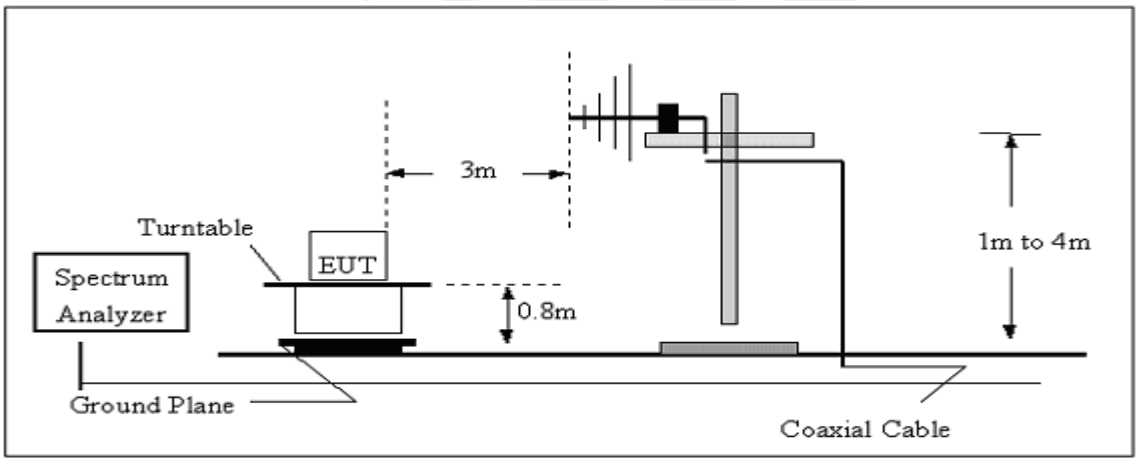
No deviation

4.4 TEST SETUP

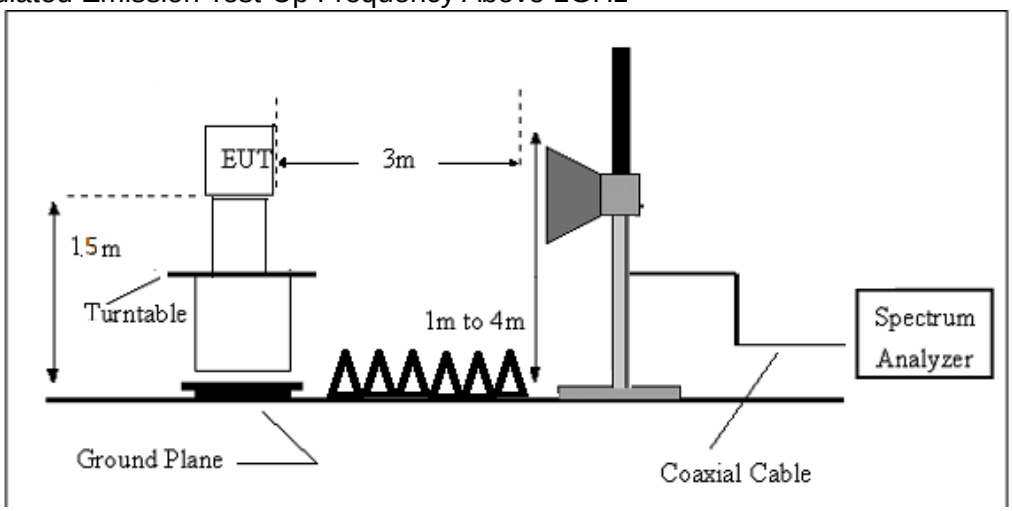
（A）Radiated Emission Test-Up Frequency Below 30MHz



（B）Radiated Emission Test-Up Frequency 30MHz~1GHz



（C）Radiated Emission Test-Up Frequency Above 1GHz



4.5 EUT OPERATING CONDITIONS

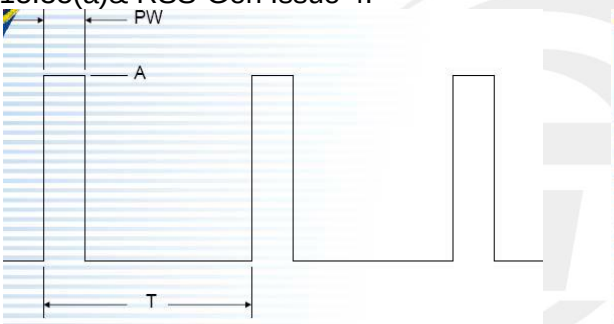
The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

4.6 TEST RESULTS

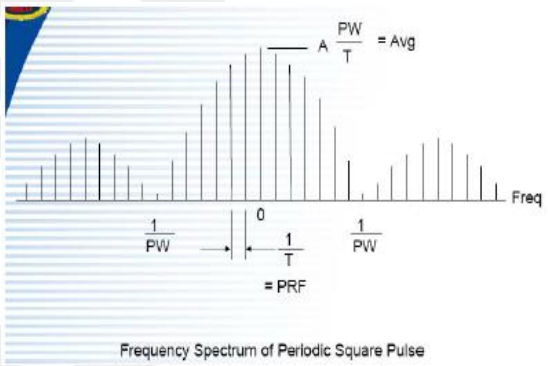
INTRODUCTION TO PDCF

reference: (§15.35 & RSS-Gen Issue 4 Measurement detector functions and bandwidths.)

a. Part 15 of the FCC Rules provides for the operation of low power communication devices without an individual license (e.g., intrusion detectors, pulsed water tank level gauges, etc.), subject to certain requirements. Some of these devices use extremely narrow pulses to generate wideband emissions, which are measured to determine compliance with the rules. These measurements are typically performed with a receiver or spectrum analyzer. Depending on a number of factors (e.g., resolution bandwidth, pulsewidth, etc.), the spectrum analyzer may not always display the true peak value of the measured emission. This effect, called “pulse desensitization,” relates to the capabilities of the measuring instrument. For the measurement and reporting of the true peak of pulsed emissions, it may be necessary to apply a “pulse desensitization correction factor” (PDCF) to the measured value, pursuant to 47 CFR 15.35(a)& RSS-Gen Issue 4.



Periodic Square Pulse



Frequency Spectrum of Periodic Square Pulse

If using spectrum analyzer to measure pulse signal , it have to make sure the RBW use is at least 2/PW.

•When RBW is less than 2/PW , you are able to measure the true peak level of the pulse signal. If this is the case , PDCF is required to compensate to determine true peak value.

Pulse desensitization(ASK):

PW =28700usec,Period=100000usec, Level=A

RBW>2/PW=0.07K , PRF=1/T=0.01K ,

Pulse desensitization(FSK):

PW =29200usec,Period=100000usec, Level=A

RBW>2/PW=0.07K , PRF=1/T=0.01K ,

NOTE: 2 / PW < RBW, first don't need

b. For the actual test, please refer to the ANSI C63.10,Annex C
refer to section 7 for more detail

4.7 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where

FS = Field Strength

CL = Cable Attenuation Factor (Cable Loss)

RA = Reading Amplitude

AG = Amplifier Gain

AF = Antenna Factor

For example

Frequency	FS	RA	AF	CL	AG	Factor
(MHz)	(dBμV/m)	(dBμV/m)	(dB)	(dB)	(dB)	(dB)
300	40	58.1	12.2	1.6	31.9	-18.1

Factor=AF+CL-AG

4.8 TEST RESULTS (EMISSION)

(Radiated Emission<30MHz (9KHz-30MHz, H-field))

Temperature:	20 ℃	Relative Humidtity:	48%
Test Mode:	Mode 1	Polarization:	--

Note: Vertical level have a test this is the worst.

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

Note:The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
Distance extrapolation factor =40 log (specific distance/test distance)(dB);
Limit line = specific limits(dBuv) + distance extrapolation factor.

Between 30MHz – 5000 MHz

ASK

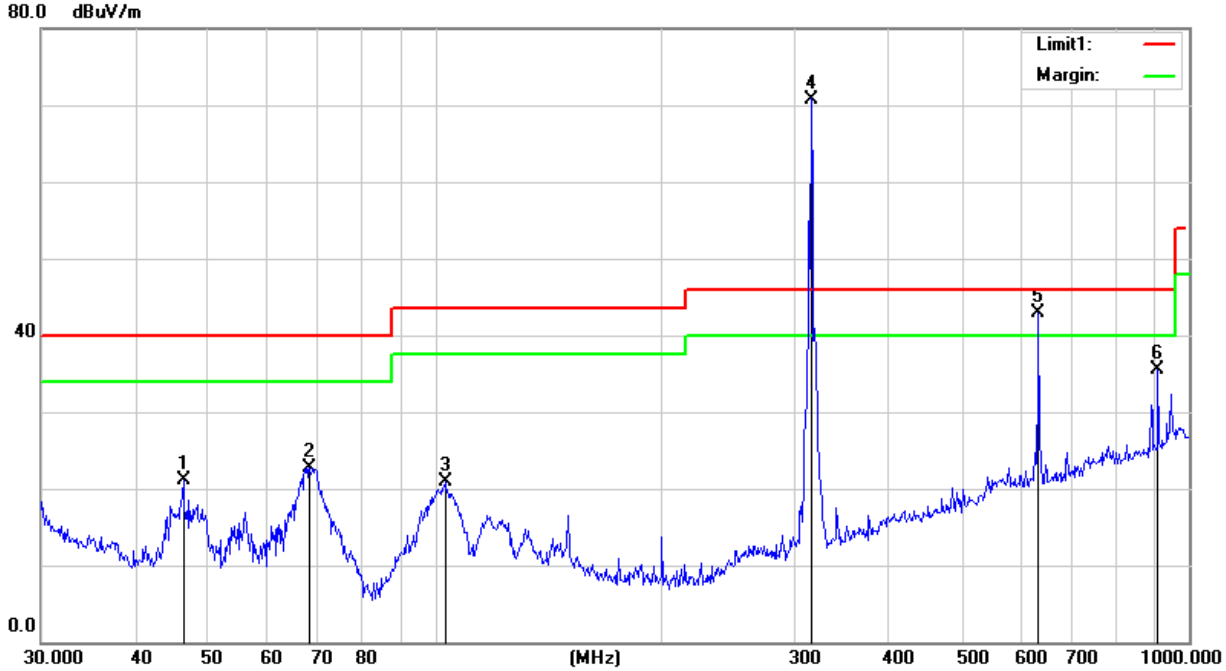
Temperature:	25.7 ℃	Relative Humidity:	63%
Phase:	Horizontal	Test Mode:	Mode 1

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	46.3402	40.64	-19.60	21.04	40.00	-18.96	QP
2	68.1512	46.93	-24.15	22.78	40.00	-17.22	QP
3	103.0800	39.75	-18.93	20.82	43.50	-22.68	QP
4	315	85.12	-14.32	70.80	87.67	-16.87	peak
5	630	49.34	-6.40	42.94	47.67	-4.73	QP
6	945	37.38	-1.93	35.45	47.67	-12.22	QP

AV

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
7	315	70.80	-10.84	59.96	67.67	-7.71	AV

Remark:
1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result =Reading + Factor)–Limit



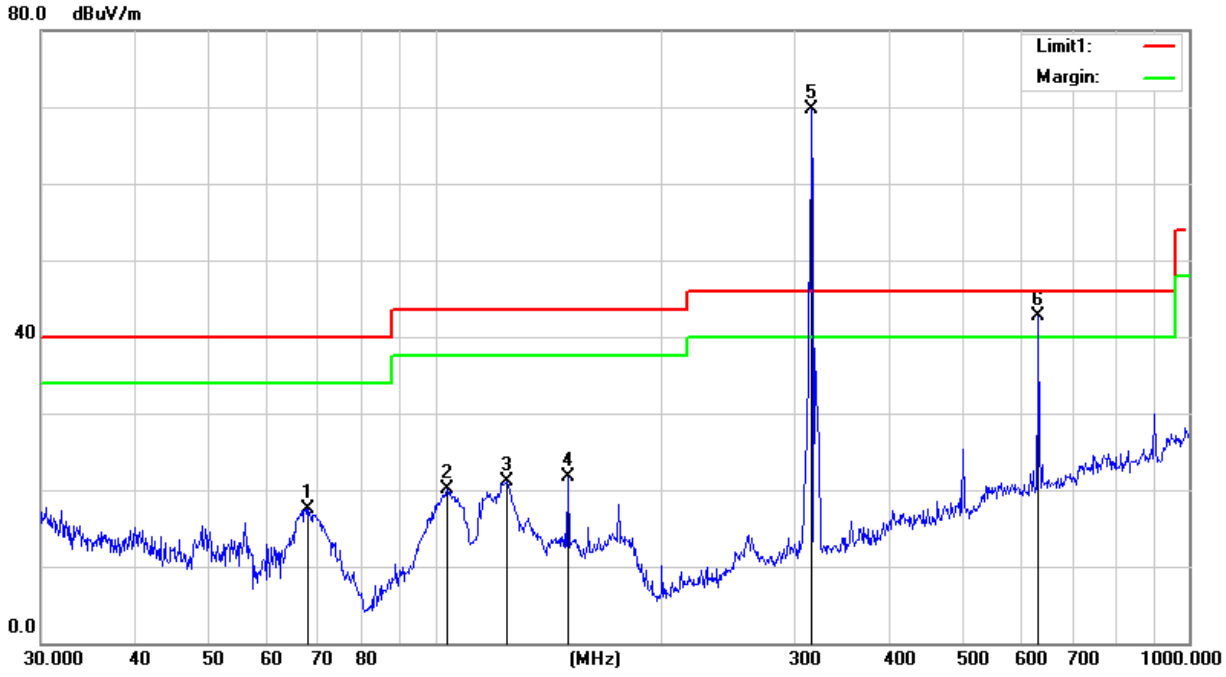
Temperature:	25.7 ℃	Relative Humidity:	63%
Phase:	Vertical	Test Mode:	Mode 1

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	67.9128	41.61	-24.15	17.46	40.00	-22.54	QP
2	103.8054	38.96	-18.87	20.09	43.50	-23.41	QP
3	124.5690	38.66	-17.63	21.03	43.50	-22.47	QP
4	150.0107	39.66	-17.97	21.69	43.50	-21.81	QP
5	315	84.01	-14.32	69.69	87.67	-17.98	peak
6	630	49.14	-6.40	42.74	47.67	-4.93	QP

AV

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
7	315	69.69	-10.84	58.85	67.67	-8.82	AV

Remark:
1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result =Reading + Factor)–Limit



FSK

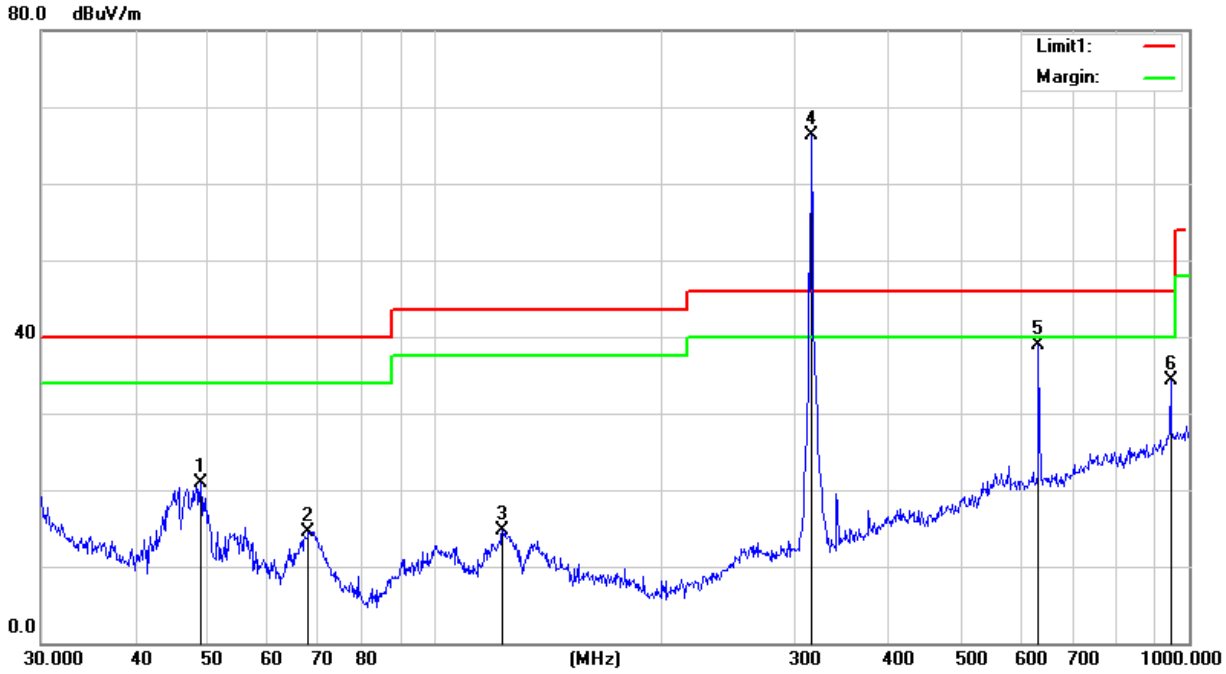
Temperature:	25.7 ℃	Relative Humidity:	63%
Phase:	Horizontal	Test Mode:	Mode 1

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	48.8430	41.71	-20.89	20.82	40.00	-19.18	QP
2	67.9130	38.73	-24.15	14.58	40.00	-25.42	QP
3	122.8340	32.36	-17.65	14.71	43.50	-28.79	QP
4	315	80.54	-14.32	66.22	87.67	-21.45	peak
5	630	45.24	-6.40	38.84	47.67	-8.83	QP
6	945	34.90	-0.54	34.36	47.67	-13.31	QP

AV

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
7	315	66.22	-10.69	55.53	67.67	-12.14	AV

Remark:
1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result =Reading + Factor)–Limit



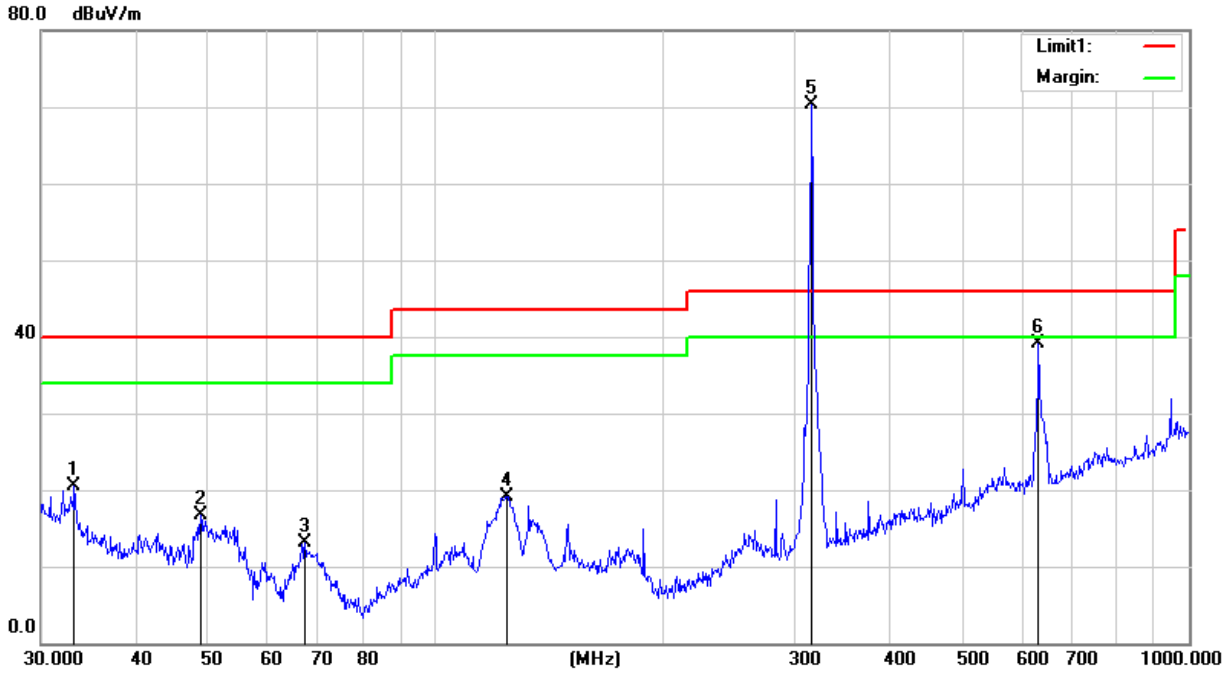
Temperature:	25.7 ℃	Relative Humidity:	63%
Phase:	Vertical	Test Mode:	Mode 1

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	33.2112	33.31	-12.84	20.47	40.00	-19.53	QP
2	48.8430	37.65	-20.89	16.76	40.00	-23.24	QP
3	67.2022	37.22	-24.17	13.05	40.00	-26.95	QP
4	124.5690	36.77	-17.63	19.14	43.50	-24.36	QP
5	315	84.61	-14.32	70.29	87.67	-17.38	peak
6	630	45.54	-6.40	39.14	47.67	-8.53	QP

AV

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
7	315	70.29	-10.69	59.60	67.67	-8.07	AV

Remark:
1. All readings are Quasi-Peak and Average values.
2. Margin = Result (Result =Reading + Factor)–Limit



ASK

PEAK TEST RESULTS:

Frequency	Reading	Detector	Amplifier	Loss	Antenna Factor	Corrected Factor	Corrected Amplitude	FCC Part 15.231/15.209/205		RX Antenna
								Limit	Margin	Polar
(MHz)	(dBμV/m)	(PK/QP/AV)	（dB）	（dB）	（dB）	（dB）	(dBμV/m)	(dBμV/m)	(dB)	(H/V)
1260.00	62.79	PK	44.1	5.3	25	-13.80	48.99	74	-25.01	H
1260.00	64.24	PK	44.1	5.3	25	-13.80	50.44	74	-23.56	V
1575.00	61.31	PK	43.8	5.4	25.9	-12.47	48.84	74	-25.16	H
1575.00	62.16	PK	43.8	5.4	25.9	-12.47	49.69	74	-24.31	V
1890.00	57.31	PK	44.4	6.0	27.6	-10.77	46.54	74	-27.46	H
1890.00	57.17	PK	44.4	6.0	27.6	-10.77	46.40	74	-27.60	V

Note: Above 1.5GHz The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

AVG TEST RESULTS:

AV = Peak +20Log10(duty cycle) =PK+(-10.84) [refer to section 7 for more detail]

Frequency	PK Reading	Duty cycle	Corrected Amplitude	FCC Part 15.231/15.209/205		RX Antenna
				Limit	Margin	Polar
(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(H/V)
1260.00	48.99	-10.84	38.15	54	-15.85	H
1260.00	50.44	-10.84	39.60	54	-14.40	V
1575.00	48.84	-10.84	38.00	54	-16.00	H
1575.00	49.69	-10.84	38.85	54	-15.15	V
1890.00	46.54	-10.84	35.70	54	-18.30	H
1890.00	46.40	-10.84	35.56	54	-18.44	V

FSK

PEAK TEST RESULTS:

Frequency	Reading	Detector	Amplifier	Loss	Antenna Factor	Corrected Factor	Corrected Amplitude	FCC Part 15.231/15.209/205		RX Antenna
								Limit	Margin	Polar
(MHz)	(dBμV/m)	(PK/QP/AV)	（dB）	（dB）	（dB）	（dB）	(dBμV/m)	(dBμV/m)	(dB)	(H/V)
1260.00	65.00	PK	45.1	4.0	25.1	-16.00	49.00	74	-25.00	H
1260.00	65.43	PK	45.1	4.0	25.1	-16.00	49.43	74	-24.57	V
1575.00	62.83	PK	44.1	5.3	25	-13.80	49.03	74	-24.97	H
1575.00	64.12	PK	44.1	5.3	25	-13.80	50.32	74	-23.68	V
1890.00	61.56	PK	43.8	5.4	25.9	-12.47	49.09	74	-24.91	H
1890.00	62.23	PK	43.8	5.4	25.9	-12.47	49.76	74	-24.24	V

Note: Above 1.5GHz The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

AVG TEST RESULTS:

AV = Peak +20Log10(duty cycle) =PK+(-10.69) [refer to section 7 for more detail]

Frequency	PK Reading	Duty cycle	Corrected Amplitude	FCC Part 15.231/15.209/205		RX Antenna
				Limit	Margin	Polar
(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(H/V)
1260.00	49.00	-10.69	38.31	54	-15.69	H
1260.00	49.43	-10.69	38.74	54	-15.26	V
1575.00	49.03	-10.69	38.34	54	-15.66	H
1575.00	50.32	-10.69	39.63	54	-14.37	V
1890.00	49.09	-10.69	38.40	54	-15.60	H
1890.00	49.76	-10.69	39.07	54	-14.93	V

5. BANDWIDTH TEST

5.1 APPLIED PROCEDURES / LIMIT

FCC Part 15.231,Subpart C RSS 210 Issue 9				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.231(C) A.1.3	20dB&99% Bandwidth	The 20dB&99% bandwidth of the emissions shall not exceed 0.25% of the center frequency	315	PASS

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth
RB	10 kHz (20dB Bandwidth)
VB	30 kHz (20dB Bandwidth)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

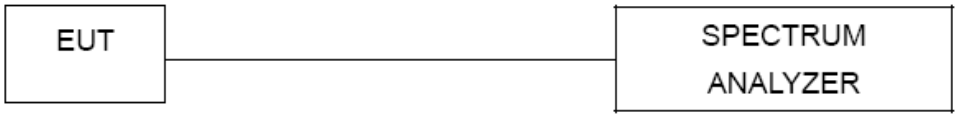
5.2 TEST REQUIREMENTS

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. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

5.3 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. Spectrum Setting : RBW= 10KHz, VBW=30KHz, Sweep time = Auto.

5.4 TEST SETUP



5.5 EUT OPERATION CONDITIONS

TX mode.

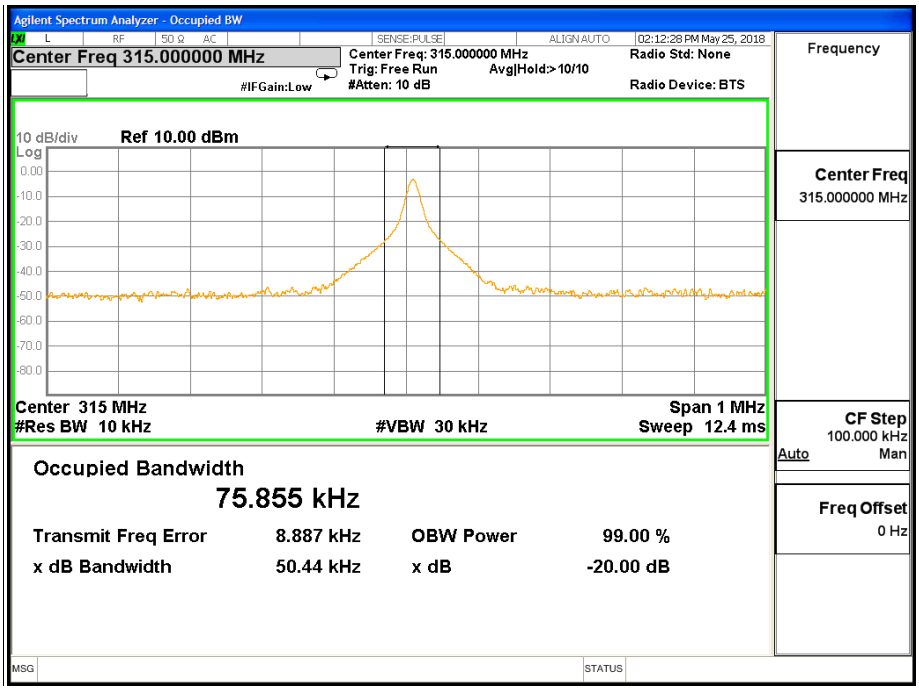
5.6 TEST RESULTS

Temperature:	25 ℃	Relative Humidity:	60%
Test Mode:	TX Mode		

ASK

Centre Frequency	Measurement			
	20dB Bandwidth (KHz)	99% Bandwidth (KHz)	Limit(kHz)	Frequency Range (MHz)
315 MHz	50.44	75.855	787.5	PASS

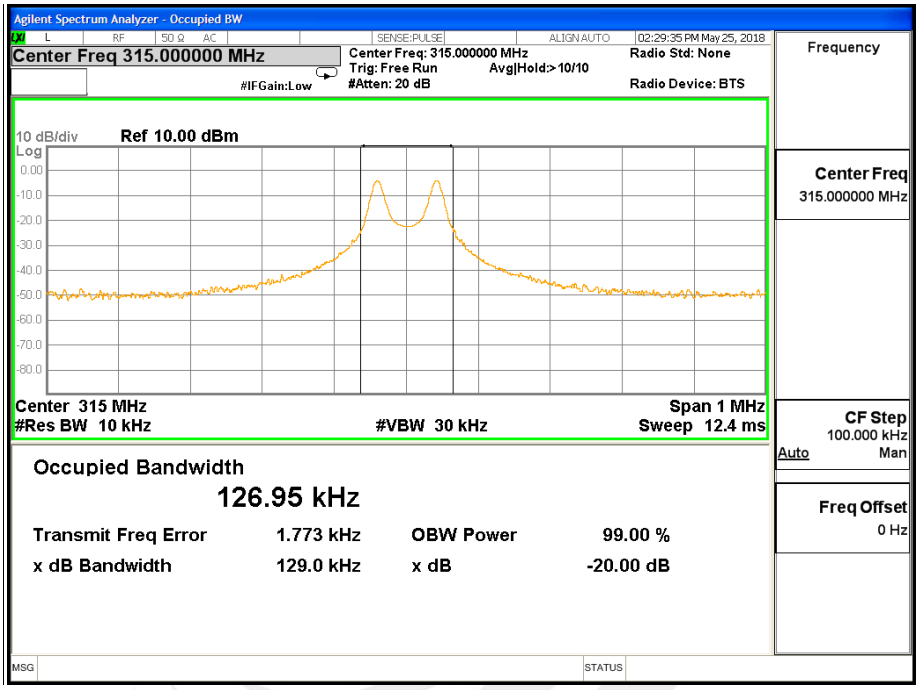
CH00 -1Mbps



FSK

Centre Frequency	Measurement			
	20dB Bandwidth (KHz)	99% Bandwidth (KHz)	Limit(kHz)	Frequency Range (MHz)
315 MHz	129.0	126.95	787.5	PASS

CH00 -1Mbps



6. TRANSMITTER TIMEOUT

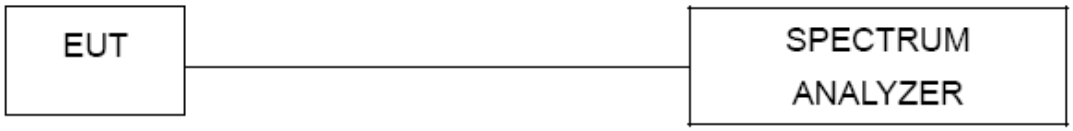
6.1 LIMIT

In addition, 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 but in no case less than 10 seconds.

6.2 TEST PROCEDURE

(1) Put the EUT on the support in its standard position with associated equipment and switched on.
(2) Set center frequency of spectrum analyzer = operating frequency.
(3) Set the spectrum analyzer as RBW=100kHz, VBW=100kHz, Span=0Hz, Adjust Sweep=120s.
(4) record the duration time

6.3 TEST SETUP



6.4 TEST RESULTS

Temperature:	26 ℃	Relative Humidity:	53%
Test Mode:	TX CH 1		

ASK

Frequency(MHz)	Each transmission time(s)	silent period between transmissions(s)
315	0.39	14.58
Limit	<1s	>10s and > 30*(duration of transmission)
Result	Pass	

FSK

Frequency(MHz)	Each transmission time(s)	silent period between transmissions(s)
315	0.39	15.09
Limit	<1s	>10s and > 30*(duration of transmission)
Result	Pass	

7. PERIODIC OPERATION

7.1 TEST PROCEDURE

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
The Duty Cycle Was Determined By The Following Equation: To Calculate The Actual Field Intensity,The Duty Cycle Correction Factor In Decibel Is Needed For Later Use And Can Be Obtained From Following Conversion
Duty Cycle(%)=Total On Interval In A Complete Pulse Train/ Length Of A Complete Pulse Train * %
Duty Cycle Correction Factor(Db)=20 * Log10(Duty Cycle(%)

7.2 TEST SETUP

7.3 EUT OPERATION CONDITIONS

TX mode.

7.4 TEST RESULTS

ASK

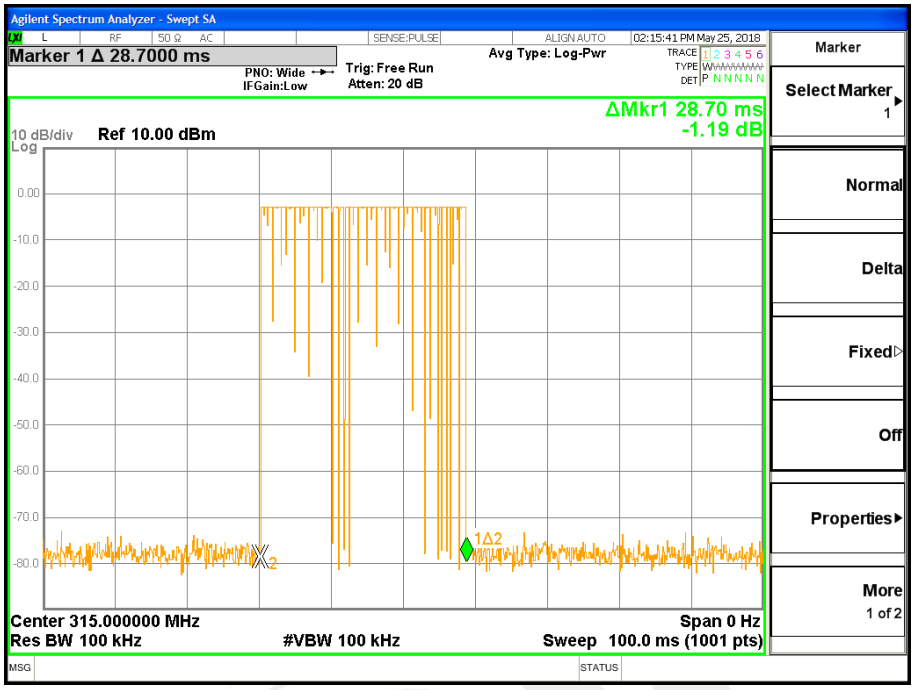
FCC Part15.231(e) RSS 210 Issue 9	
Total On interval in a complete pulse train(ms)	28.7
Length of a complete pulse train(ms)	100
Duty Cycle(%)	28.70%
Duty Cycle Correction Factor(dB)	-10.84

Refer to the duty cycle plot (as below),This device meets the FCC requirement. Length of a complete pulse train

Remark:FCC part15.35(c)& RSS 210 Issue 9 required that a complete pulse train is more than 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.

TX Mode

TX Mode


Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 28.7000 ms
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
02:15:41 PM May 25, 2018
ΔMkr1 28.70 ms
-1.19 dB
10 dB/div
Log
Ref 10.00 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 315.000000 MHz
Res BW 100 kHz
#VBW 100 kHz
Span 0 Hz
Sweep 100.0 ms (1001 pts)
Marker
Select Marker
Normal
Delta
Fixed
Off
Properties
More
1 of 2
MSG
STATUS

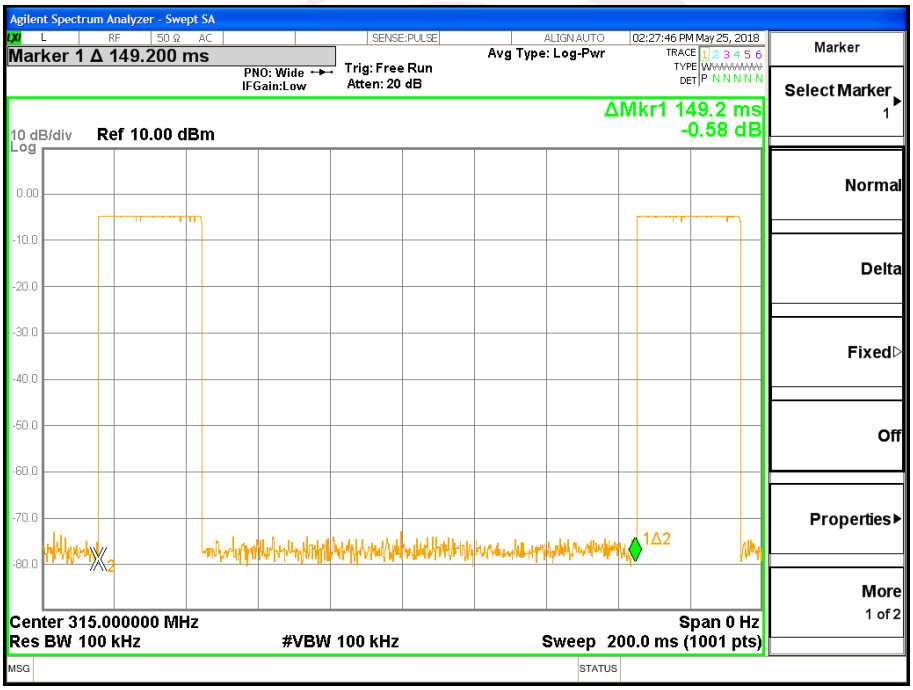
FSK

FCC Part15.231(e) RSS 210 Issue 9	
Total On interval in a complete pulse train(ms)	29.2
Length of a complete pulse train(ms)	100
Duty Cycle(%)	29.20%
Duty Cycle Correction Factor(dB)	-10.69

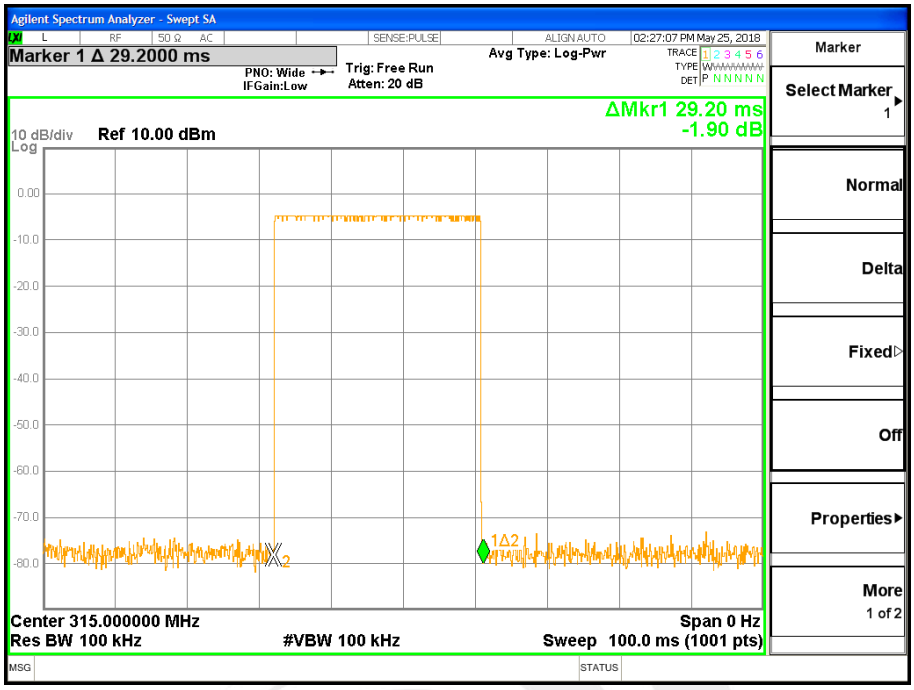
Refer to the duty cycle plot (as below),This device meets the FCC requirement. Length of a complete pulse train

Remark:FCC part15.35(c)& RSS 210 Issue 9 required that a complete pulse train is more than 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.

TX Mode



TX Mode


Agilent Spectrum Analyzer - Swept SA
Marker 1 Δ 29.2000 ms
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
02:27:07 PM May 25, 2018
ΔMkr1 29.20 ms
-1.90 dB
10 dB/div
Log
Ref 10.00 dBm
0.00
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
Center 315.000000 MHz
Res BW 100 kHz
#VBW 100 kHz
Span 0 Hz
Sweep 100.0 ms (1001 pts)
Marker
Select Marker
1
Normal
Delta
Fixed
Off
Properties
More
1 of 2
MSG
STATUS

8. ANTENNA REQUIREMENT

8.1 STANDARD REQUIREMENT

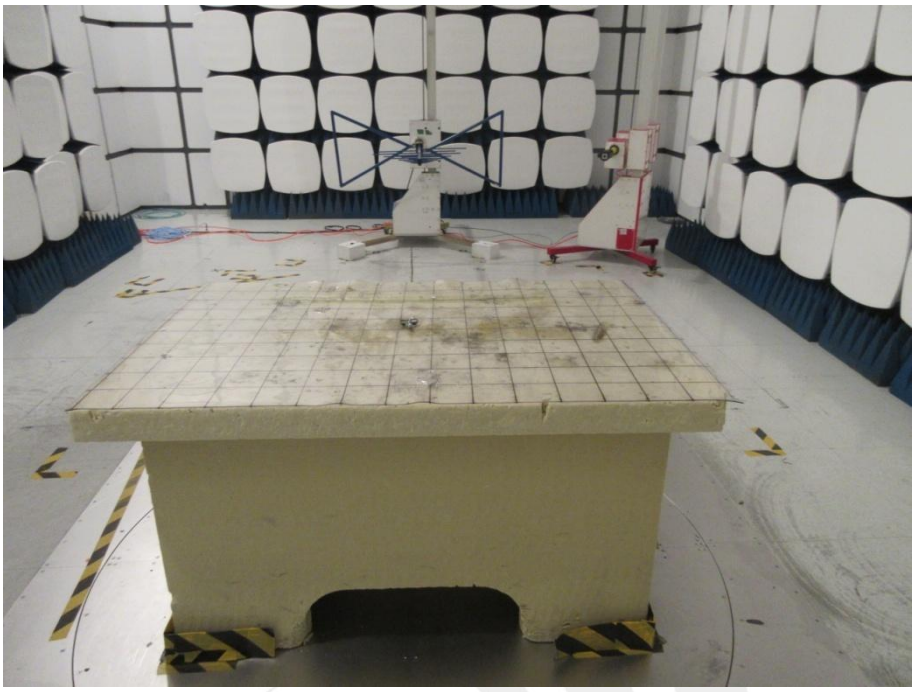
According to the FCC Part 15 Paragraph 15.203& RSS-Gen Issue 4, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna to the intentional radiator shall be considered sufficient to comply with the provisions of this section. This product use a permanent ceramic printed antenna, fulfill the requirement of this section

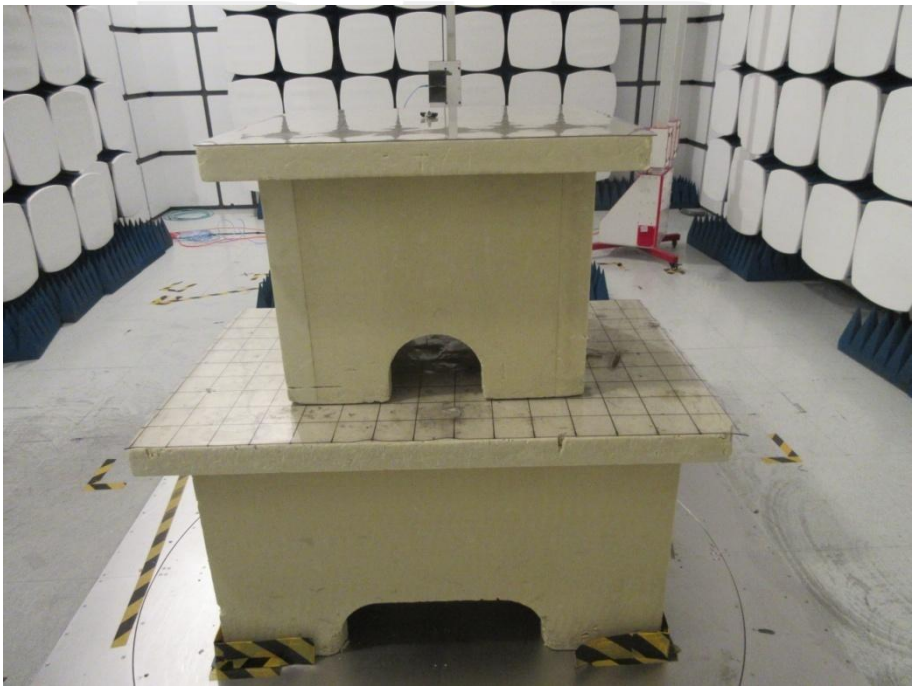
8.2 EUT ANTENNA

The EUT antenna is Internal antenna.It conforms to the standard requirements.

APPENDIX 1- PHOTOS OF TEST SETUP

Radiated Measurement Photos





※※※※※END OF THE REPORT※※※※※