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RADIO TEST REPORT

Report No: STS1711214W02

Issued for

No NDA Inc

320 Mountainview Avenue, Mountainview California, United States, 94041

Product Name:	ZUS Universal HD Car Audio Adapter
Brand Name:	ZUS
Model Name:	ZUMABKSAV
Series Model:	N/A
FCC ID:	2AFZB-ZUMABKSAV
Test Standard:	FCC Part 15.239



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TEST REPORT CERTIFICATION

Applicant's name: No NDA Inc
Address: 320 Mountainview Avenue, Mountainview California, United States, 94041
Manufacture's Name: WBE Industrail
Address: Gaotian Area, Zhenlong Town, Huiyang, Huizhou City, Guangdong 516200 PRC

Product description

Product Name.....: ZUS Universal HD Car Audio Adapter
Brand Name: ZUS
Model Name: ZUMABKSAV
Series Model.....: N/A

Test Standards: FCC Part15.239

Test procedure ANSI C63.10: 2013,ANSI C63.4: 2014

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 requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test:

Date (s) of performance of tests: 22 Nov. 2017~06 Dec. 2017

Date of Issue.....: 06 Dec. 2017

Test Result.....: **Pass**

Testing Engineer :

(Sean she)

Technical Manager :

(Hakim.hou)

Authorized Signatory :

(Vita Li)





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**Revision History**

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	06 Nov. 2017	STS1711214W02	ALL	Initial Issue





1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 15.239			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	--
15.209 15.239(b) (c)	Radiated Emission	PASS	--
15.239(b)	field strength emission	PASS	--
15.203	Antenna Requirement	PASS	--
15.239(a)	20dB Bandwidth	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 $y \pm U$, where expanded 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)	$\pm 2.88\text{dB}$
2	Conducted Emission (150KHz-30MHz)	$\pm 2.67\text{dB}$
3	RF power,conducted	$\pm 0.71\text{dB}$
4	Spurious emissions,conducted	$\pm 0.63\text{dB}$
5	All emissions,radiated (9KHz-30MHz)	$\pm 3.02\text{dB}$
6	All emissions,radiated (30MHz-200MHz)	$\pm 3.80\text{dB}$
7	All emissions,radiated (200MHz-1000MHz)	$\pm 3.97\text{dB}$



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Product Name	ZUS Universal HD Car Audio Adapter								
Trade Name	ZUS								
Model Name	ZUMABKSAV								
Serial Model	N/A								
Model Difference	N/A								
Product Description	<div>The EUT is a ZUS Universal HD Car Audio Adapter</div> <table><tr><td>Operation Frequency:</td><td>91MHz</td></tr><tr><td>Modulation Type:</td><td>FM</td></tr><tr><td>Antenna Designation:</td><td>Please see Note 3.</td></tr><tr><td>Antenna Gain (dBi)</td><td>0dBi</td></tr></table>	Operation Frequency:	91MHz	Modulation Type:	FM	Antenna Designation:	Please see Note 3.	Antenna Gain (dBi)	0dBi
Operation Frequency:	91MHz								
Modulation Type:	FM								
Antenna Designation:	Please see Note 3.								
Antenna Gain (dBi)	0dBi								
Power Rating	DC 5V								
Hardware version number	1.0								
Software version number	1.0								
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. Table for filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
A	ZUS	ZUMABKSAV	Dipole Antenna	N/A	0	ANT



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 Conducted Test
Final Test Mode	Description
Mode 1	TX Mode

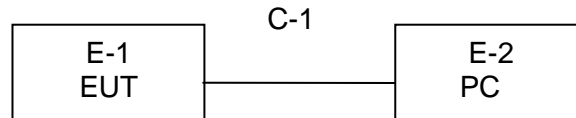
	For Radiated Emission
Final Test Mode	Description
Mode 1	TX Mode

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
- (3) We have be tested for all avaiable U.S. voltage and frequencies(For 120V,50/60Hz and 240V, 50/60Hz) for which the device is capable of operation.



2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

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
E-2	PC	HP	N/A	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
C-1	unshielded	NO	100cm	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	ESW	101535	2017.06.01	2018.05.31
Bilog Antenna	TESEQ	CBL6111D	34678	2017.03.24	2018.03.23
Horn Antenna	Schwarzbeck	BBHA 9120D (1201)	9120D-1343	2017.03.06	2018.03.05
Operational Manual Passive Loop (9K--30MHz)	ETS	6512	00165355	2017.03.06	2018.03.05
Pre-mpifier (0.1M-3GHz)	EM	EM330	60538	2017.03.12	2018.03.11
PreAmplifier	Agilent	8449B	60538	2017.10.15	2018.10.14
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	2017.03.12	2018.03.11
Temperature & Humidity	Mieo	HH660	N/A	2017.10.15	2018.10.14
Signal Analyzer	Agilent	N9020A	MY49100060	2017.03.11	2018.03.10



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) 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.

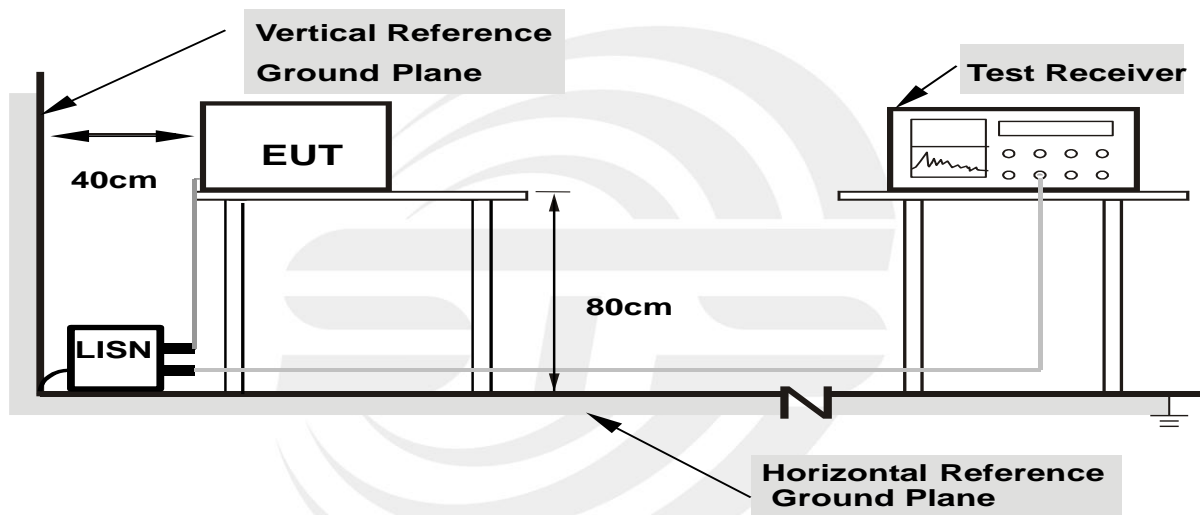
The following table is the setting of the receiver

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 0.8 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 cm 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

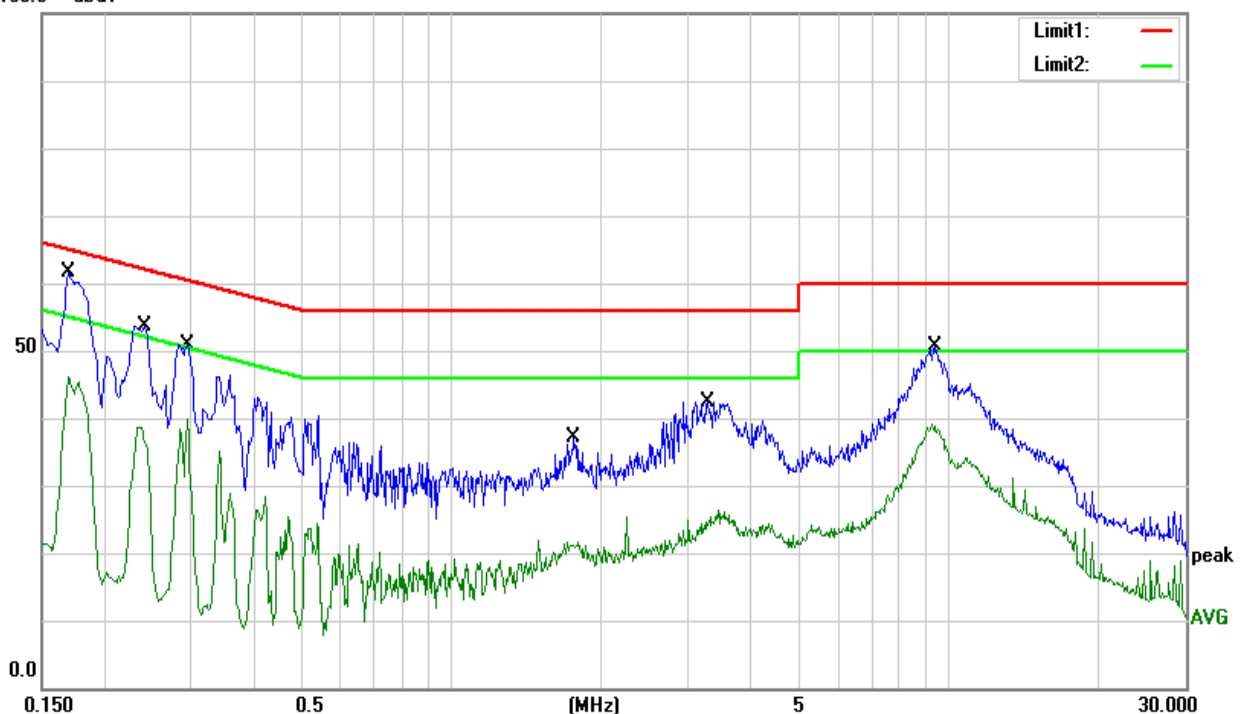
Temperature:	26 °C	Relative Humidity:	54%
Pressure:	1010hPa	Phase:	L
Test Voltage:	AC 120V/60Hz	Test Mode:	Mode 1

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
0.1700	51.92	9.79	61.71	64.96	-3.25	QP
0.1700	36.36	9.79	46.15	54.96	-8.81	AVG
0.2420	43.65	9.97	53.62	62.03	-8.41	QP
0.2420	26.46	9.97	36.43	52.03	-15.60	AVG
0.2940	40.69	10.20	50.89	60.41	-9.52	QP
0.2940	29.76	10.20	39.96	50.41	-10.45	AVG
1.7700	27.38	9.78	37.16	56.00	-18.84	QP
1.7700	11.27	9.78	21.05	46.00	-24.95	AVG
3.2820	32.61	9.82	42.43	56.00	-13.57	QP
3.2820	14.51	9.82	24.33	46.00	-21.67	AVG
9.3580	40.37	10.14	50.51	60.00	-9.49	QP
9.3580	28.76	10.14	38.90	50.00	-11.10	AVG

Remark:

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

100.0 dBuV





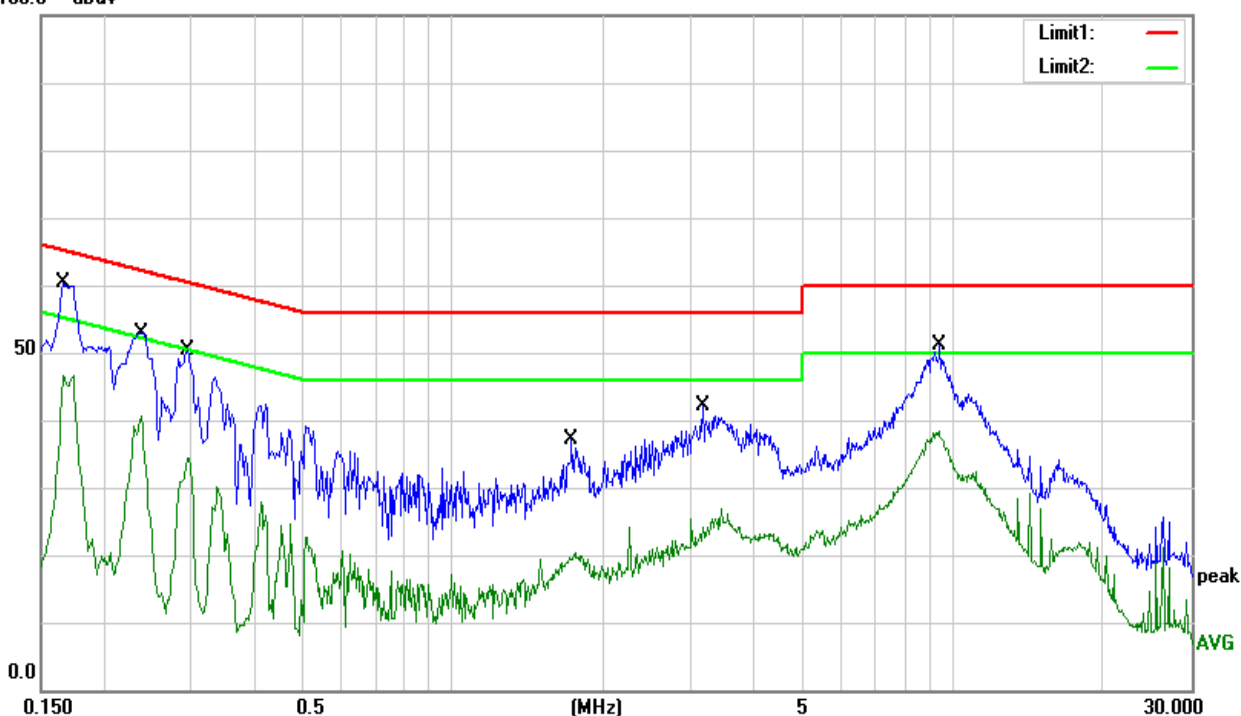
Temperature:	26 °C	Relative Humidity:	54%
Pressure:	1010hPa	Phase:	N
Test Voltage:	AC 120V/60Hz	Test Mode:	Mode 1

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
0.1660	50.49	9.79	60.28	65.16	-4.88	QP
0.1660	36.96	9.79	46.75	55.16	-8.41	AVG
0.2380	42.81	10.02	52.83	62.17	-9.34	QP
0.2380	30.49	10.02	40.51	52.17	-11.66	AVG
0.2940	40.14	10.25	50.39	60.41	-10.02	QP
0.2940	24.01	10.25	34.26	50.41	-16.15	AVG
1.7340	27.18	9.85	37.03	56.00	-18.97	QP
1.7340	9.62	9.85	19.47	46.00	-26.53	AVG
3.1620	32.16	9.91	42.07	56.00	-13.93	QP
3.1620	14.16	9.91	24.07	46.00	-21.93	AVG
9.4260	41.11	9.92	51.03	60.00	-8.97	QP
9.4260	27.93	9.92	37.85	50.00	-12.15	AVG

Remark:

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

100.0 dBuV





4. RADIATED EMISSION MEASUREMENT

4.1 RADIATED EMISSION LIMITS

RADIATED EMISSION LIMITS (FCC 15.209)

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (microvolts/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
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

NOTE:

- a) Field Strength (dB μ V/m) = 20*log[Field Strength (μ V/m)].
- b) In the emission tables above, the tighter limit applies at the Band edge.



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

According to ANSI C63.10-2013, clause 8.1, General FM Transmitter Emission Procedure.

According to ANSI C63.10-2013, clause 8.2, Wireless transmission between FM source and vehicle antenna.

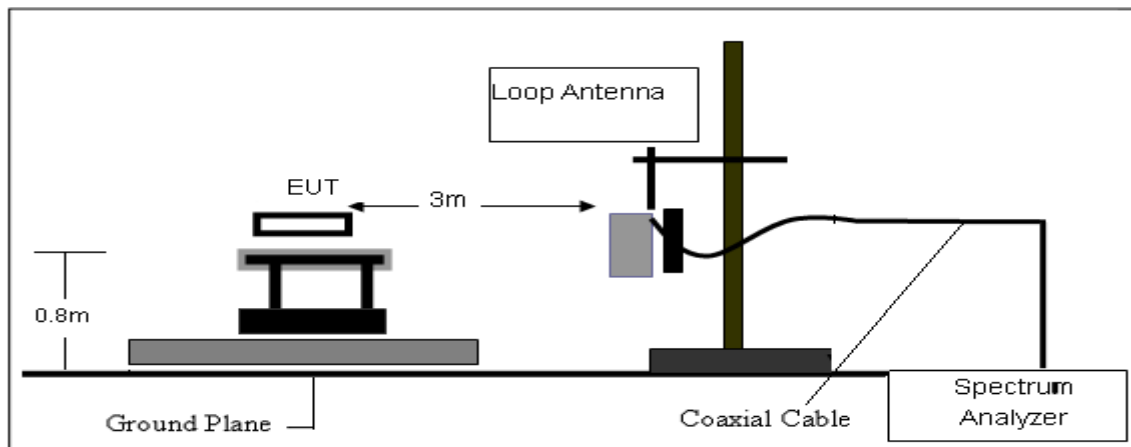
- The test is performed in a 3m Semi-Anechoic Chamber; the antenna factor, cable loss and so on of the site (factors) is calculated to correct the reading. The EUT is placed on a 0.8m high insulating Turn Table, and keeps 3m away from the Test Antenna, which is mounted on a variable-height antenna master tower. For the test Antenna
- In the frequency range of 9KHz to 30MHz, magnetic field is measured with Loop Test Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

NOTE:

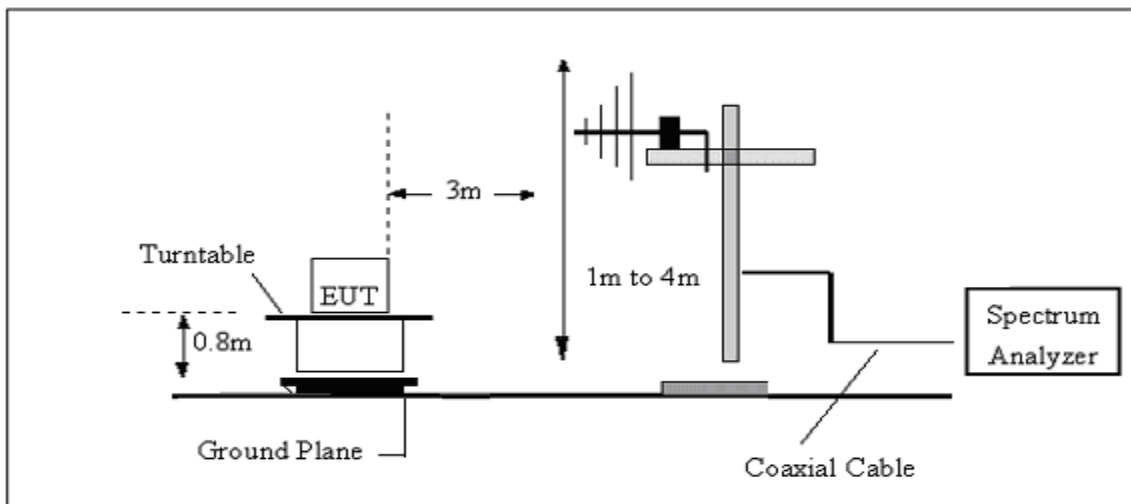
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

4.3 TEST SETUP

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



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



4.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



4.5 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)	(dB μ V/m)	(dB μ V/m)	(dB)	(dB)	(dB)	(dB)
300	40	58.1	12.2	1.6	31.9	-18.1

$$\text{Factor} = \text{AF} + \text{CL} - \text{AG}$$



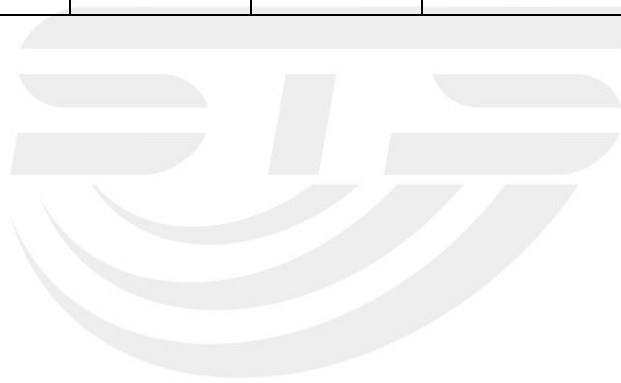


4.6 TEST RESULTS

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

Temperature:	20 °C	Relative Humidity:	48%
Pressure:	1010 hPa	Test Voltage:	DC 5V
Test Mode:	Mode 1	Polarization:	--

Freq.	Reading	Correct factor	calculation results	Limit	Margin	State
(MHz)	(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)	P/F
0.1898	50.31	11.97	38.34	102.04	-63.70	PASS
0.7867	49.30	11.90	37.40	69.69	-32.29	PASS
2.4584	48.31	11.25	37.06	69.54	-32.48	PASS
3.5330	45.10	11.18	33.92	69.54	-35.62	PASS
13.4432	47.36	11.05	36.31	69.54	-33.23	PASS



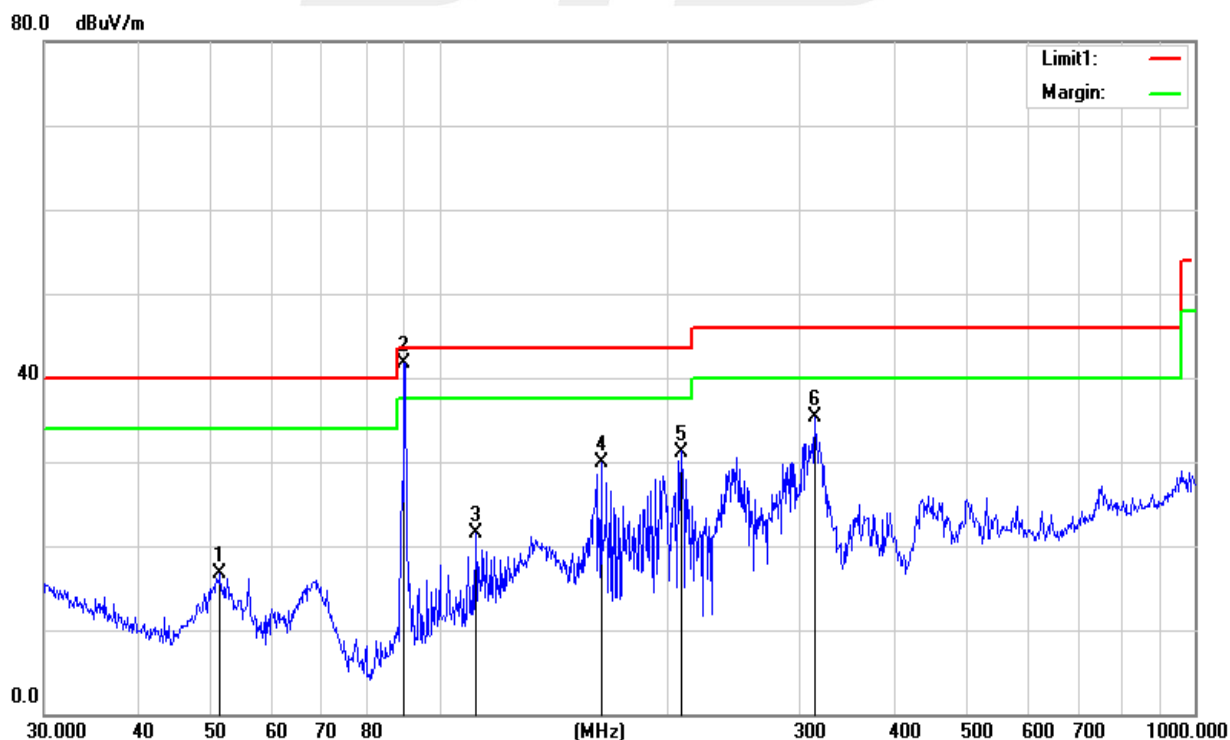
**Between 30-1000MHz**

Temperature:	26 °C	Relative Humidity:	54%
Pressure:	1010hPa	Phase:	Horizontal
Test Voltage:	DC 5V	Test Mode:	Mode 1

Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
51.3004	38.46	-21.85	16.61	40.00	-23.39	QP
91.0000	61.93	-20.22	41.71	67.96	-26.25	QP
111.7380	39.75	-18.23	21.52	43.50	-21.98	QP
163.7550	48.76	-18.81	29.95	43.50	-13.55	QP
209.3130	50.98	-19.78	31.20	43.50	-12.30	QP
314.3765	49.72	-14.35	35.37	46.00	-10.63	QP

Remark:

1. Margin = Result (Result = Reading + Factor)-Limit





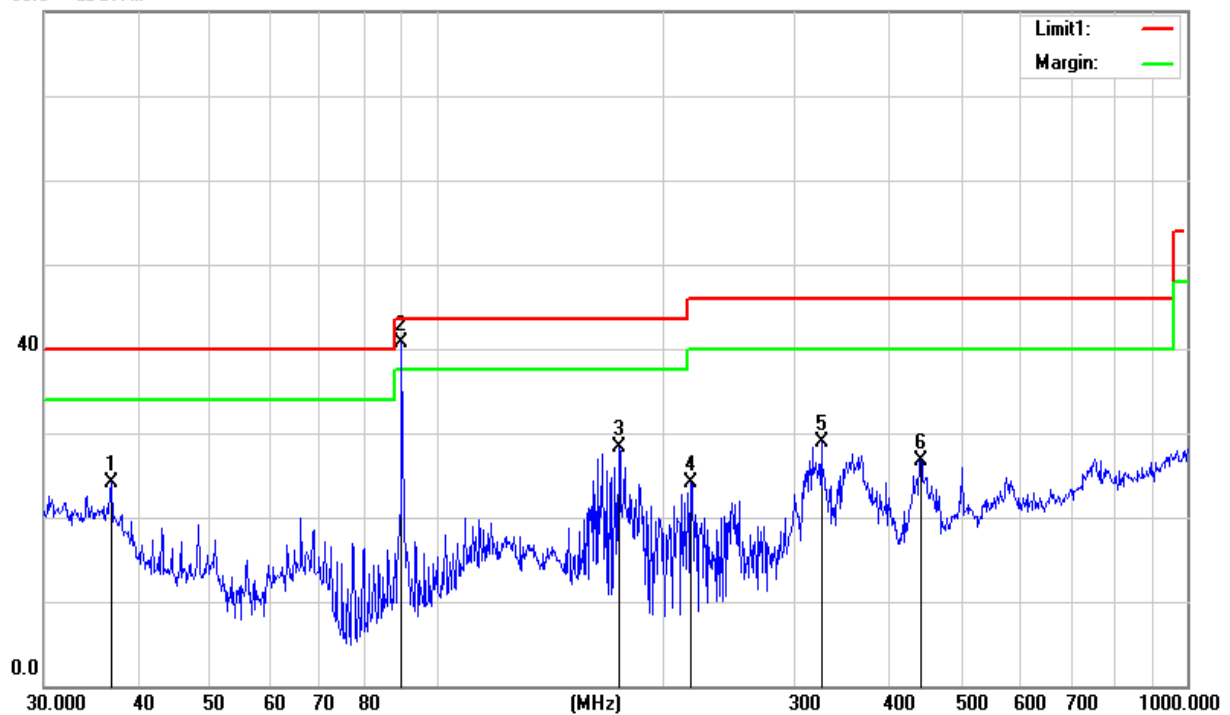
Temperature:	26 °C	Relative Humidity:	54%
Pressure:	1010hPa	Phase:	Vertical
Test Voltage:	DC 5V	Test Mode:	Mode 1

Frequency	Reading	Correct	Result	Limit	Margin	Remark
(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
36.8953	38.83	-14.73	24.10	40.00	-15.90	QP
91.0000	60.90	-20.22	40.68	67.96	-27.28	QP
175.0368	47.66	-19.38	28.28	43.50	-15.22	QP
218.3085	43.29	-19.22	24.07	46.00	-21.93	QP
325.5958	43.05	-14.12	28.93	46.00	-17.07	QP
441.7426	37.59	-10.82	26.77	46.00	-19.23	QP

Remark:

1. Margin = Result (Result =Reading + Factor)–Limit

80.0 dBuV/m

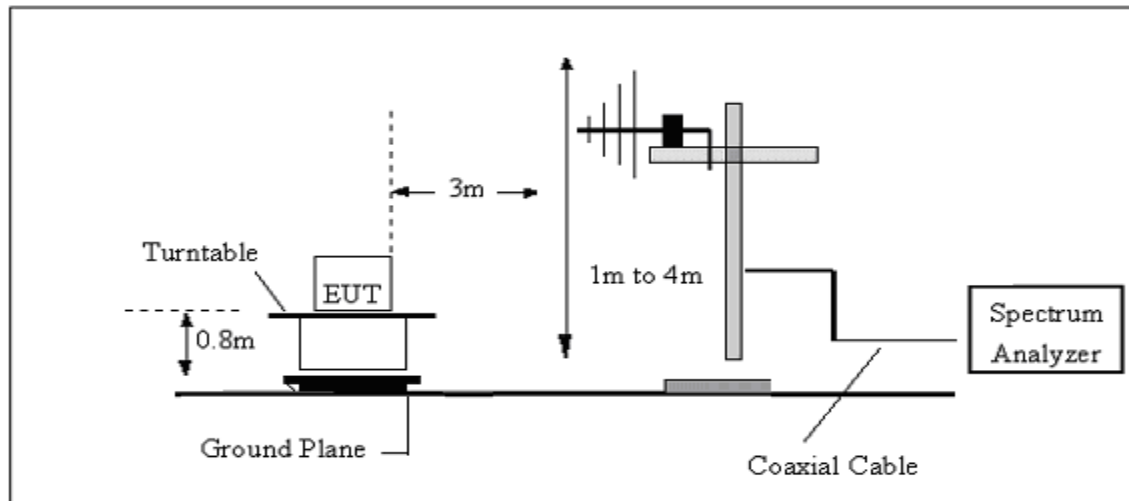


5. FIELD STRENGTH EMISSION

5.1 REQUIREMENT

The field strength of any emissions within the permitted 200 kHz band shall not exceed 250 microvolts/meter at 3 meters. The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

5.2 TEST SETUP



5.3 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



5.5 TEST RESULTS

Temperature:	25 °C	Relative Humidity:	50%
Pressure:	1012 hPa	Test Voltage:	DC 5V
Test Mode:	TX Mode		

3m distance measured

Test frequency	detector	Antenna polarity	Reading	factor	Corrected level	Limit	Margin
(MHz)			(dBuV/m)	dB	(dBuV/m)	(dBuV/m)	(dB)
91.00	Peak	Horizontal	61.93	-20.22	41.71	67.96	-26.25
	Avg	Horizontal	53.41	-20.22	33.19	47.96	-14.77
	Peak	Vertical	60.90	-20.22	40.68	67.96	-27.28
	Avg	Vertical	50.36	-20.22	30.14	47.96	-17.82



6. 20DB BANDWIDTH

6.1 APPLIED PROCEDURES / LIMIT

Emissions from the intentional radiator shall be confined within a band 200 kHz wide centered on the operating frequency. The 200 kHz band shall lie wholly within the frequency range of 88-108 MHz.

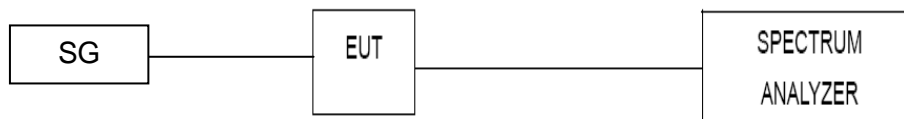
6.2 TEST PROCEDURE

According to ANSI C63.10-2013, clause 8.7

For the purposes of occupied bandwidth measurements, the input signal shall be a 2.5 kHz tone. The level of the tone shall be 16 dB higher than that required to produce a frequency deviation of 75 kHz, or 50% of the manufacturer's rated deviation, whichever is less.

1. Set RBW = 3kHz.
2. Set the video Mobile Phonewidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.3 TEST SETUP



6.4 EUT OPERATION CONDITIONS

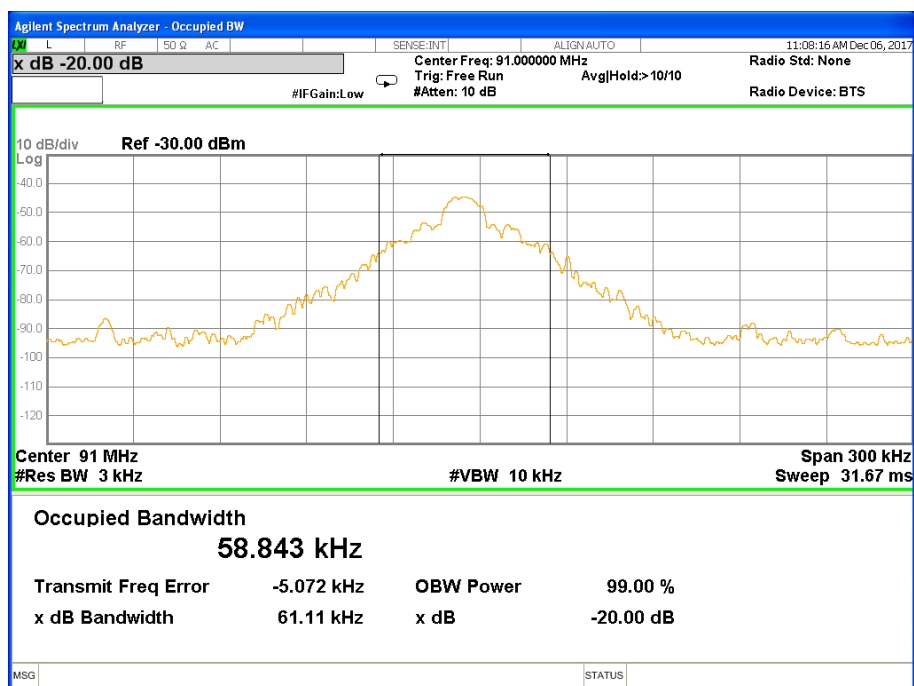
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.



6.5 TEST RESULTS

Temperature:	25 °C	Relative Humidity:	60%
Pressure:	1012 hPa	Test Voltage:	DC 5V
Test Mode:	TX Mode		

Centre Frequency	Measurement	
	20dB Bandwidth (KHz)	Limit (KHz)
91.00	61.11	200





7. ANTENNA REQUIREMENT

7.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203: 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.

7.2 EUT ANTENNA

The EUT antenna is Dipole Antenna. It comply with the standard requirement.

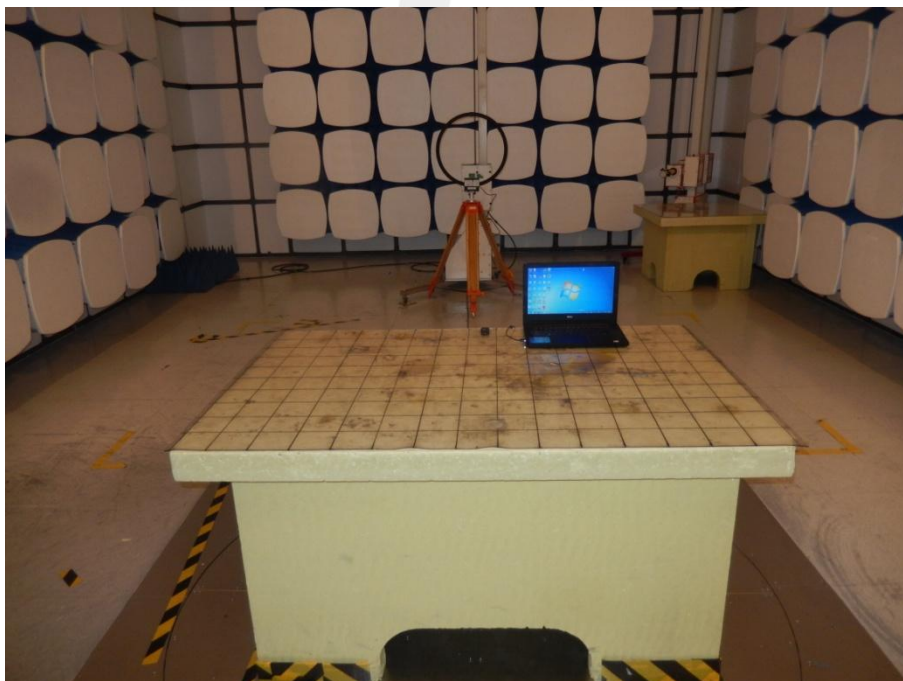


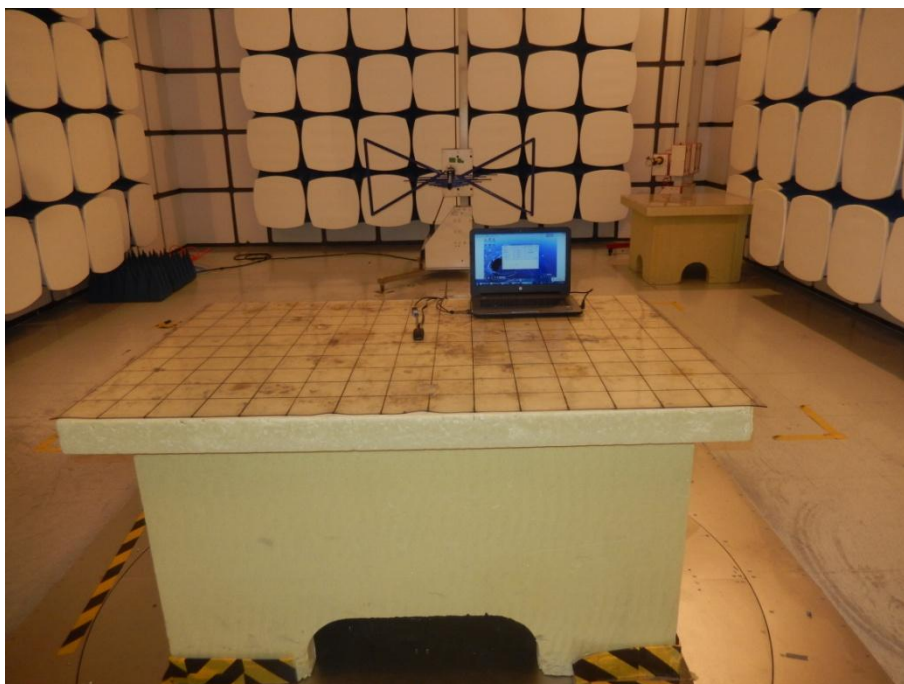
APPENDIX 1- PHOTOS OF TEST SETUP

Conduction Measurement Photos



Radiated Measurement Photos





*****END OF THE REPORT*****