EMC TEST REPORT

Applicant:	Evoko Unlimited AB
Address:	Hastholmsvagen 32, 5th floor,Nacka ,Sweden, 131 30

Manufacturer or Supplier	Shenzhen Baiqiancheng Electronic Co., Ltd
Address	Room 609, Huihong Building, Building 18, Nanshan Ruiyuan, Shenzhen
Product	Evoko Naso
Brand Name	N/A
Model Name	ENX1001
Additional Model & Model Difference	N/A
Date of tests	Feb. 15, 2019 ~ Feb. 27, 2019

The submitted sample of the above equipment has been tested for according to the requirements of the following standards:

☒ **FCC Part 15, Subpart B, Class B**
☒ **ANSI C63.4:2014**

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Issued by Evans He Engineer / Mobile Department	Approved by David Huang Manager / Mobile Department
Date: Feb. 27, 2019	Date: Feb. 27, 2019

TABLE OF CONTENTS

RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
FS190215N004	Original release	Feb. 27, 2019

Remark: The previous versions shall be replaced by latest revised version.

1 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD			
Standard Section	**Test Item**	**Result**	**Remark**
FCC Part 15, Subpart B, Class B (sDoC)	Conducted test	PASS	Meets limits minimum passing margin is -12.08dB at 0.1656 MHz.
	Radiated Emission Test (30MHz ~ 1GHz)	PASS	Meets Class B Limit Minimum passing margin is -4.95dB at 726.8052 MHz
	Radiated Emission Test (Above 1GHz)	PASS	Meets Class B Limit Minimum passing margin is -20.19dB at 1556.08 MHz

Remark 1: Please refer to FCC part 2 2.1077 for sDoC compliance information requirement

Remark 2: **Test Lab Information:**

Lab: Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch

Test Lab Address: Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao'an District Shenzhen, Guangdong, 518108, People's Republic of China

1.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emission test	0.15MHz ~ 30MHz	+/-3.11 dB
Radiated emissions	30MHz ~ 1GHz	+/-5.12dB
	Above 1GHz	+/-5.34dB

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Evoko Naso
MODEL NO.	ENX1001
ADDITIONAL MODEL	N/A
POWER SUPPLY	DC 5.2V from adapter or DC 48V from POE
CABLE SUPPLIED	DC Line: Unshielded, Detachable 2.4m
THE HIGHEST OPERATING FREQUENCY	2.4GHz

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions, but only the worst case was shown in test report.
3. Please refer to the EUT photo document (Reference No.: 190215N004) for detailed product photo.

2.2 DESCRIPTION OF TEST MODES

The EUT were tested under the following modes, the final worst mode was marked in boldface and recorded in this report.

CONDUCTED EMISSION TEST:

DESCRIPTION OF TEST MODE	TEST VOLTAGE
Adapter+RJ45+MPEG4+NFC	DC 5.2V from Adapter
PoE+MPEG4+NFC	
BLE Link Normal Working	
WIFI Link Normal Working	

RADIATED EMISSION TEST (BELOW 1GHZ):

DESCRIPTION OF TEST MODE	TEST VOLTAGE
Adapter+RJ45+MPEG4+NFC	DC 5.2V from Adapter, Input 120 Vac, 60 Hz or DC 48V from PoE
PoE+MPEG4+NFC	
Standby	
BLE Link Normal Working	
WIFI Link Normal Working	

RADIATED EMISSION TEST (ABOVE1GHZ):

DESCRIPTION OF TEST MODE	TEST VOLTAGE
BT Link Normal Working	DC 5.2V from Adapter, Input 120 Vac, 60 Hz or DC 48V from PoE
WIFI Link Normal Working	

2.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit without any other necessary accessories or support units.

3 EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

TEST STANDARD: FCC Part 15, Subpart B (Section: 15.107)

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	60	50

NOTE: 1.The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

3.1.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCS30	8471241027	Jan. 04, 2019	Jan. 04, 2020
Artificial Mains Network	SCHWARZBECK	8127	8127713	Jan. 04, 2019	Jan. 04, 2020
ISN	Com-Power	ISN T800	34373	Jan. 04, 2019	Jan. 04, 2020
Test software	EZ-EMC	ICP-03A1	N/A	N/A	N/A

NOTE: 1. The test was performed in CE shielded room.

2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.

3.1.3 TEST PROCEDURES

The basic test procedure was in accordance with ANSI C63.4:2014 (section 7).

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

c. The frequency range from 150 kHz to 30MHz was searched. Emission levels under (Limit - 20dB) were not recorded.

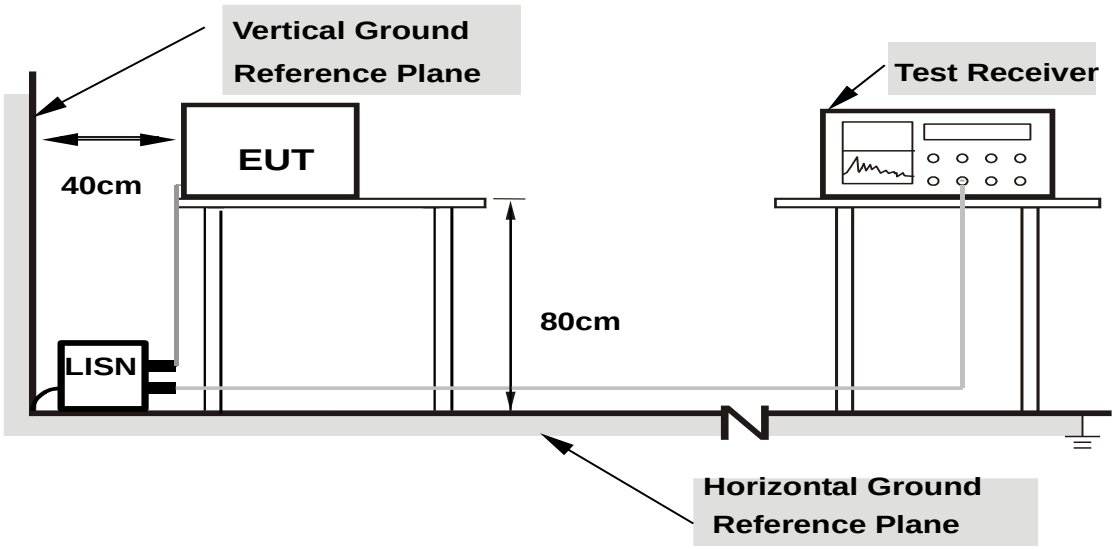
NOTE:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Margin value = Result level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Result Level = Correction Factor + Reading Value

3.1.4 DEVIATION FROM TEST STANDARD

No deviation.

3.1.5 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

For the actual test configuration, please refer to the attached file (Test Setup Photo).

3.1.6 EUT OPERATING CONDITIONS

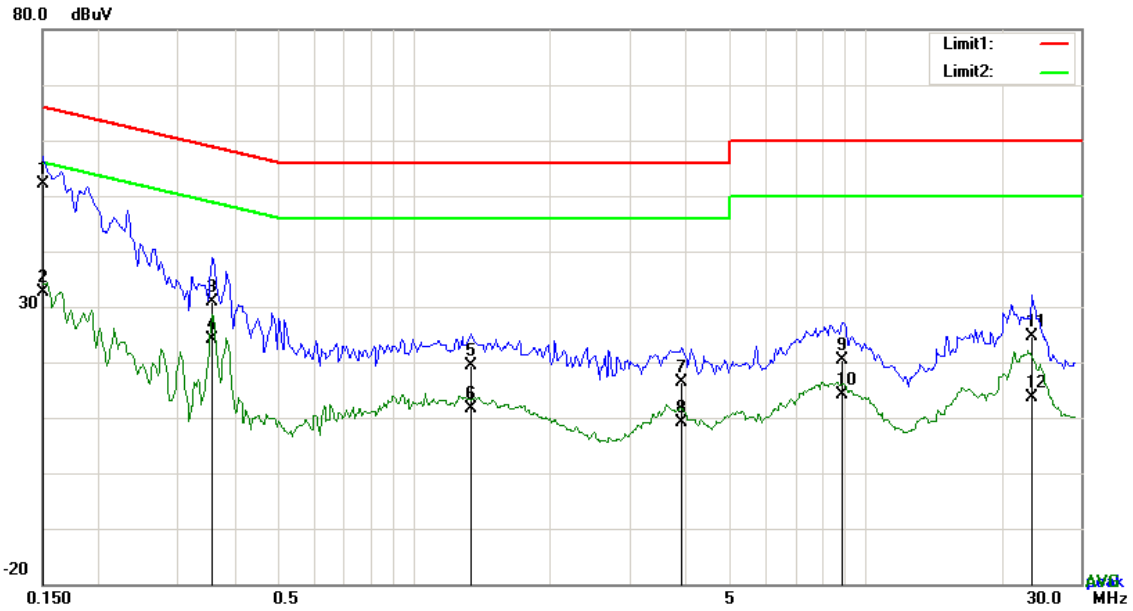
a. Turned on the power and connected of all equipment.
b. EUT was operated according to the use type described in the manufacturer's specifications or the user's manual.

3.1.7 TEST RESULTS

TEST MODE	See section 2.2	**6DB BANDWIDTH**	9 kHz
TEST VOLTAGE	DC 5.2V From Adapter Input 120 Vac, 60 Hz	**PHASE**	Line (L)
ENVIRONMENTAL CONDITIONS	27.9deg. C, 61RH	**TESTED BY**	Evans He

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	L1	0.1500	42.02	QP	10.03	52.05	66.00	-13.95
2	L1	0.1500	22.71	AVG	10.03	32.74	56.00	-23.26
3	L1	0.3567	20.89	QP	10.03	30.92	58.80	-27.88
4	L1	0.3567	14.09	AVG	10.03	24.12	48.80	-24.68
5	L1	1.3356	9.24	QP	10.03	19.27	56.00	-36.73
6	L1	1.3356	1.63	AVG	10.03	11.66	46.00	-34.34
7	L1	3.9048	6.31	QP	10.07	16.38	56.00	-39.62
8	L1	3.9048	-1.02	AVG	10.07	9.05	46.00	-36.95
9	L1	8.8851	10.17	QP	10.13	20.30	60.00	-39.70
10	L1	8.8851	4.04	AVG	10.13	14.17	50.00	-35.83
11	L1	23.3268	14.37	QP	10.36	24.73	60.00	-35.27
12	L1	23.3268	3.19	AVG	10.36	13.55	50.00	-36.45

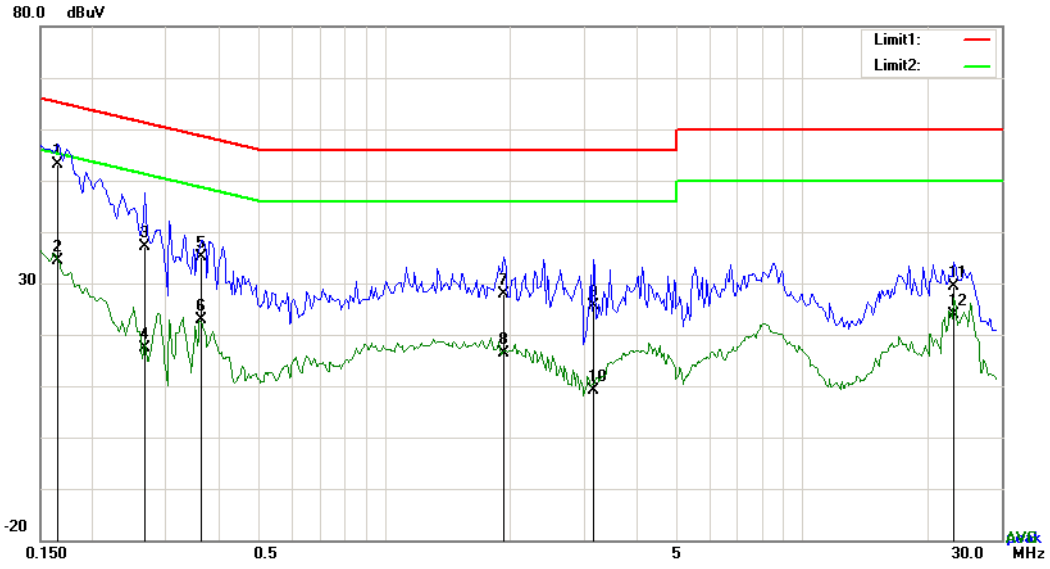
REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.



TEST MODE	See section 2.2	6DB BANDWIDTH	9 kHz
TEST VOLTAGE	DC 5.2V From Adapter Input 120 Vac, 60 Hz	PHASE	Neutral (N)
ENVIRONMENTAL CONDITIONS	27.9deg. C, 61RH	TESTED BY	Evans He

No.	P/L	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
		(MHz)	(dBuV)		(dB}	(dBuV)	(dBuV)	(dB)
1	N	0.1656	43.08	QP	10.02	53.10	65.18	-12.08
2	N	0.1656	24.27	AVG	10.02	34.29	55.18	-20.89
3	N	0.2670	27.08	QP	10.02	37.10	61.21	-24.11
4	N	0.2670	7.30	AVG	10.02	17.32	51.21	-33.89
5	N	0.3645	25.06	QP	10.02	35.08	58.63	-23.55
6	N	0.3645	12.96	AVG	10.02	22.98	48.63	-25.65
7	N	1.9362	17.96	QP	10.04	28.00	56.00	-28.00
8	N	1.9362	6.29	AVG	10.04	16.33	46.00	-29.67
9	N	3.1638	15.69	QP	10.05	25.74	56.00	-30.26
10	N	3.1638	-1.02	AVG	10.05	9.03	46.00	-36.97
11	N	23.0694	19.06	QP	10.31	29.37	60.00	-30.63
12	N	23.0694	13.49	AVG	10.31	23.80	50.00	-26.20

REMARKS: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Correction factor = Insertion loss + Cable loss
6. Emission Level = Correction Factor + Reading Value.



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

TEST STANDARD: FCC Part 15, Subpart B (Section: 15.109)

Emissions radiated outside of the specified bands, shall be according to the general radiated limits as following:

Radiated Emissions Limits at 10 meters (dBμV/m)				
Frequencies (MHz)	**FCC 15B/ ICES-003, Class A**	**FCC 15B / ICES-003, Class B**	**CISPR 22, Class A**	**CISPR 22, Class B**
30-88	39	29.5	40	30
88-216	43.5	33.1		
216-230	46.4	35.6		
230-960			47	37
960-1000	49.5	43.5		

Radiated Emissions Limits at 3 meters (dBμV/m)		
Frequencies (MHz)	**FCC 15B / ICES-003, Class A**	**FCC 15B / ICES-003, Class B**
30-88	49.5	40
88-216	54	43.5
216-230	56.9	46
230-960		
960-1000	60	54
1000-3000	Avg: 60 Peak: 80	Avg: 54 Peak: 74

FREQUENCY RANGE OF RADIATED MEASUREMENT
(For unintentional radiators)

Highest frequency generated or Upper frequency of measurement used in the device or on which the device operates or tunes (MHz)	Range (MHz)
Below 1.705	30
1.705 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower

Note: (1) The lower limit shall apply at the transition frequencies.

(2) Emission level (dBuV/m) = 20 log Emission level (uV/m).

(3) All emanation from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

3.2.2 TEST INSTRUMENTS

Frequency range below1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESL6	1300.5001K06-100262-eQ	Jan. 04, 2019	Jan. 03, 2020
Bilog Antenna	Sunol Sciences	JB6	A110712	Feb. 07, 2019	Feb. 06, 2020
Signal Amplifier	HP	8447E	443008	Jan. 24, 2019	Jan. 23, 2020
3m Semi-anechoic Chamber	SAEMC	9m*6m*6m	N/A	Oct. 18, 2018	Oct. 17, 2019
Test Software	EZ-EMC	ICP-03A1	N/A	N/A	N/A

Frequency range above 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESL6	1300.5001K06-100262-eQ	Jan. 04, 2019	Jan. 03, 2020
MXA signal analyzer	Agilent	N9020A	MY49100060	Jan. 04, 2019	Jan. 03, 2020
Horn Antenna	COM-POWER	HAH-118	71259	Jan. 25, 2019	Jan. 24, 2020
Horn Antenna	COM-POWER	HAH-118	71283	Feb. 01, 2019	Jan. 31, 2020
AMPLIFIER	EM Electornic Corporation	EM01G26G	60613	Jan. 24,1209	Jan. 23, 2020
AMPLIFIER	Emc Instruments Corporation	Emc012645	980077	Jan. 04, 2019	Jan. 03, 2020
3m Semi-anechoic Chamber	SAEMC	9m*6m*6m	N/A	Oct. 18, 2018	Oct. 17, 2019
Test Software	EZ-EMC	ICP-03A1	N/A	N/A	N/A

NOTE: 1. The test was performed in 3m chamber.
2. The calibration interval of the above test instruments is 12 months or 24 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
3. The FCC Site Registration No. is 749762.

3.2.3 TEST PROCEDURE

<Frequency Range below 1GHz>

The basic test procedure was in accordance with ANSI C63.4:2014 (section 12).

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

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from 1 meter to 4 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1GHz.

NOTE:

1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. Result level (dBuV/m)= Reading level(dBuV/m) + Correction Factor(dB/m)
3. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) (if the raw value not contains the amplifier);
4. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain(dB) (if the raw value contains the amplifier).
5. Margin value = Result level – Limit value.

<Frequency Range above 1GHz>

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

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna 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. The bore sight should be used during the test above 1GHz.

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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz

NOTE:

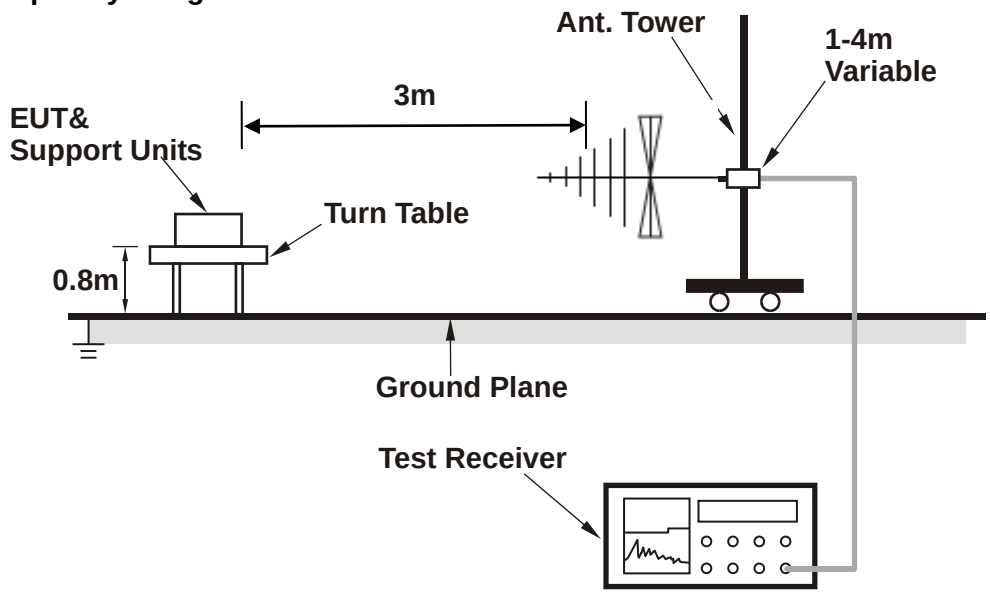
1. The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth of test receiver/spectrum analyzer is 10Hz for Average detection (AV) at frequency above 1GHz.
3. For measurement of frequency above 1000 MHz, the EUT was set 3 meters away from the receiver antenna.
4. Result level(dBuV/m)=ReadingValue(dBuV) + Correction Factor(dB/m)
5. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) (if the raw value not contains the amplifier);
6. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain(dB) (if the raw value contains the amplifier)
7. Margin value = Result level – Limit value.

3.2.4 DEVIATION FROM TEST STANDARD

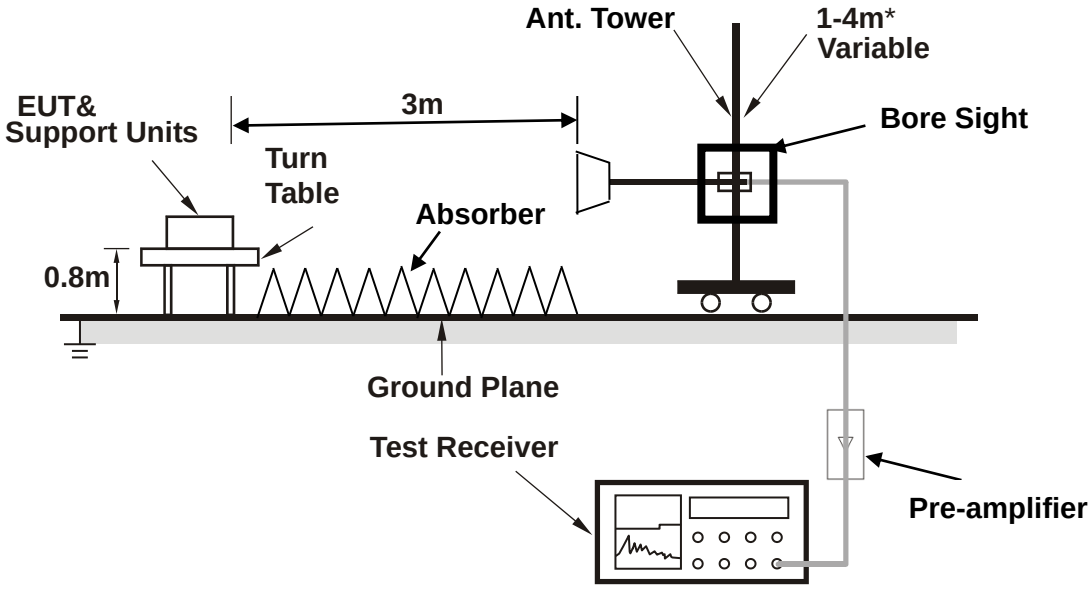
No deviation.

3.2.5 TEST SETUP

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



***** : depends on the EUT height and the antenna 3dB beamwidth both, refer to section 7.3 of CISPR 16-2-3.

3.2.6 EUT OPERATING CONDITIONS

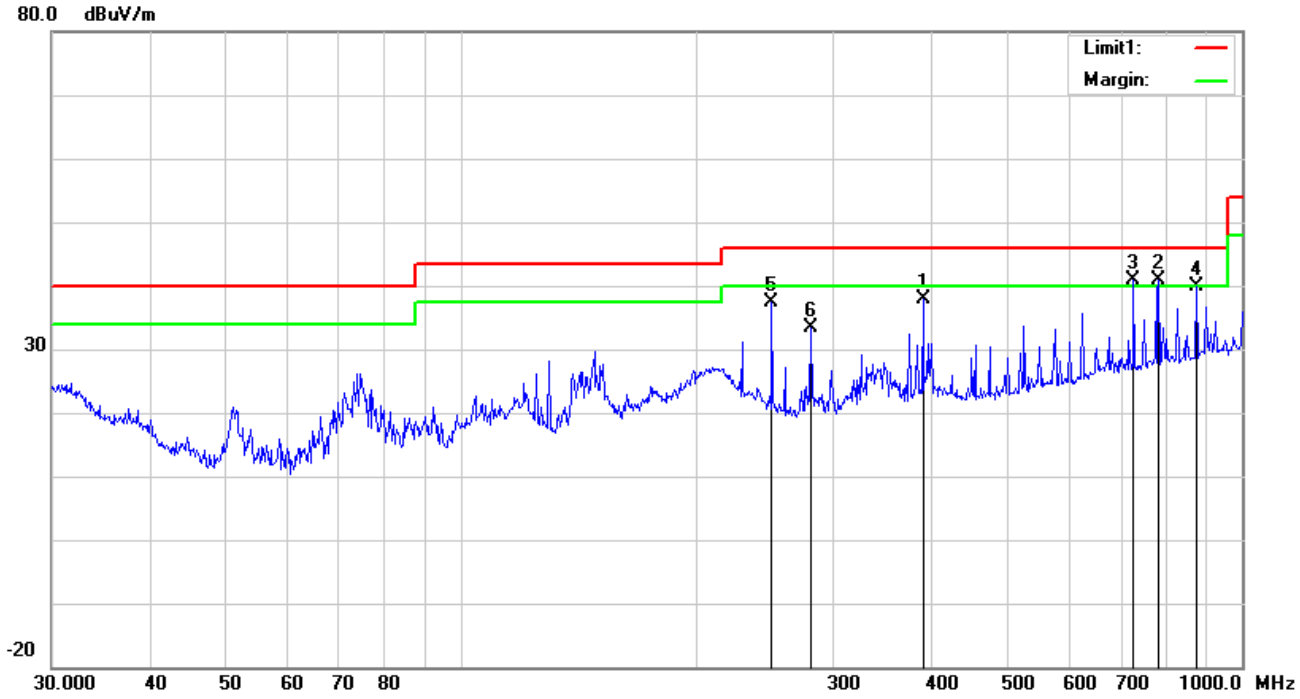
Same as item 3.1.6.

3.2.7 TEST RESULTS

TEST MODE	See section 2.2	FREQUENCY RANGE	30-1000MHz
TEST VOLTAGE	DC 5.2V From Adapter Input 120 Vac, 60 Hz	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	26deg. C, 60%RH	**TESTED BY**: Evans He	

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Frequency	Reading	Ant_F	PA_G	Cab_L	Result	Limit	Margin
	(MHz)	(dBuV/m)	(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
1	390.7226	42.34	15.51	22.04	2.02	37.83	46.00	-8.17
2	782.3453	37.89	21.19	21.19	2.93	40.82	46.00	-5.18
3	726.8052	38.85	20.52	21.30	2.72	40.79	46.00	-5.21
4	875.2470	35.70	22.23	20.95	2.97	39.95	46.00	-6.05
5	250.3012	46.45	11.41	22.29	1.70	37.27	46.00	-8.73
6	281.0075	41.03	12.76	22.29	1.76	33.26	46.00	-12.74

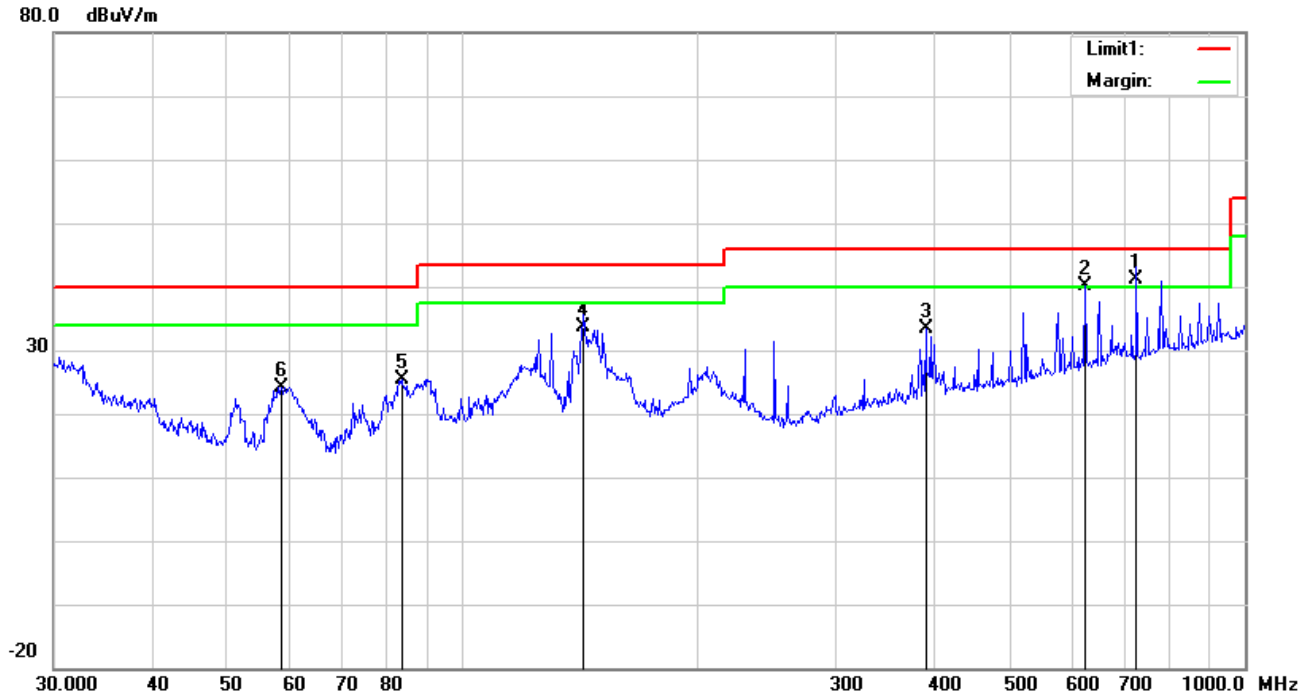
REMARKS:
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
2. Negative sign (-) in the margin column signify levels below the limit.
3. Frequency range scanned: 30MHz to 1000MHz.
4. Only emissions significantly above equipment noise floor are reported.



TEST MODE	See section 2.2	**FREQUENCY RANGE**	30-1000MHz
TEST VOLTAGE	DC 5.2V From Adapter Input 120 Vac, 60 Hz	**DETECTOR FUNCTION & RESOLUTION BANDWIDTH**	Quasi-Peak, 120kHz
ENVIRONMENTAL CONDITIONS	26deg. C, 60%RH	**TESTED BY**: Evans He	

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
No.	Frequency	Reading	Ant_F	PA_G	Cab_L	Result	Limit	Margin
	(MHz)	(dBuV/m)	(dB/m)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
1	726.8052	39.11	20.52	21.30	2.72	41.05	46.00	-4.95
2	625.0780	39.66	19.38	21.52	2.56	40.08	46.00	-5.92
3	390.7226	37.92	15.51	22.04	2.02	33.41	46.00	-12.59
4	142.8244	42.20	12.60	22.39	1.29	33.70	43.50	-9.80
5	83.5222	39.08	7.74	22.38	1.06	25.50	40.00	-14.50
6	58.6126	38.41	7.45	22.41	0.76	24.21	40.00	-15.79

REMARKS:
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
2. Negative sign (-) in the margin column signify levels below the limit.
3. Frequency range scanned: 30MHz to 1000MHz.
4. Only emissions significantly above equipment noise floor are reported.



TEST MODE	See section 2.2	FREQUENCY RANGE	Above 1GHz
TEST VOLTAGE	DC 5.2V From Adapter Input 120 Vac, 60 Hz	DETECTOR FUNCTION & RESOLUTION BANDWIDTH	Peak, Average 1MHz
ENVIRONMENTAL CONDITIONS	26deg. C, 60%RH	TESTED BY: Evans He	

Frequency (MHz)	Read_level (dBμV/m)	Azimuth	Height (cm)	Polarity (H/V)	Factors (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector (PK/AV)
2482.23	58.73	241	100	H	-13.9	44.83	74	-25.17	PK
2482.23	36.91	241	100	H	-13.9	23.01	54	-30.99	AV
1046.89	64.47	69	100	H	-19.69	44.78	74	-25.22	PK
1046.89	42.34	69	100	H	-19.69	22.65	54	-27.35	AV
1556.08	**67.96**	**19**	**100**	**H**	**-18.15**	**49.81**	**74**	**-20.19**	**PK**
1556.08	44.41	19	100	H	-18.15	26.26	54	-23.74	AV
2690.08	57.25	253	100	V	-13.03	44.22	74	-25.78	PK
2690.08	34.54	253	100	V	-13.03	21.51	54	-28.49	AV
1314.75	66.62	169	100	V	-19.76	46.86	74	-23.14	PK
1314.75	45.09	169	100	V	-19.76	25.33	54	-24.67	AV
3011.22	60.19	9	100	V	-12.82	47.37	74	-26.63	PK
3011.22	38.07	9	100	V	-12.82	25.25	54	-24.75	AV

REMARKS:
1. Peak detector quick scan is showed on the graph and final quasi-peak detector data is measured corresponding to relevant limit and recorded in the data table.
2. Negative sign (-) in the margin column signify levels below the limit.
3. Frequency range scanned: 1GHz to 6GHz.
4. Only emissions significantly above equipment noise floor are reported.

4 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No any modifications were made to the EUT by the lab during the test.

---END---