

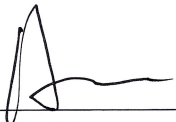
RADIO TEST REPORT

The device described below is tested by Dongguan Nore Testing Center Co., Ltd. to determine the maximum emission levels emanating from the device, the severe levels which the device can endure and E.U.T.'s performance criterion. The test results, data evaluation, test procedures, and equipment of configurations shown in this report were made in accordance with the RED directive 2014/53/EU.

Applicant : SHENZHEN FENDA TECHNOLOGY CO., LTD.
Address : Fenda Hi-Tech Park, Zhoushi Road, Shiyan Town, Baoan District,
Shenzhen City, Guangdong, China
Manufacturer /Factory : SHENZHEN FENDA TECHNOLOGY CO., LTD.
Address : Fenda Hi-Tech Park, Zhoushi Road, Shiyan Town, Baoan District,
Shenzhen City, Guangdong, China
E.U.T. : Computer Multimedia Speaker
Brand Name : F&D
Model No. : F7700X, F770X, F780X, F770UZ, F440X, F610X, F650X, F4400X, F7700,
F7700BT, F6600X, F3000X (For model difference refer to section 1)
Measurement Standard : Final Draft ETSI EN 303 345 v 1.1.7 (2017)
Date of Receiver : September 21, 2019
Date of Test : September 23, 2019 to October 28, 2019
Date of Report : October 28, 2019

This Test Report is Issued Under the Authority of :

Prepared by


Alina Guo / Engineer

Approved / Authorized Signer


Iori Fan / Authorized Signatory

This test report is for the customer shown above and their specific product only. This report applies to above tested sample only and shall not be reproduced in part without written approval of Dongguan Nore Testing Center Co., Ltd.

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Revision History of This Test Report

Report Number	Description	Issued Date
NTC1909261EV00	Initial Issue	2019-10-28

1. GENERAL INFORMATION

PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST

E.U.T.	: Computer Multimedia Speaker
Main model number	: F7700X
Additional Model number	: F770X, F780X, F770UZ, F440X, F610X, F650X, F4400X, F7700, F7700BT, F6600X, F3000X
Brand Name	: F&D
Power Supply	: AC 100-240V 50/60Hz
Adapter	: N/A
Test Voltage	: AC 230V 50Hz
Cable	: Audio Line: 1 to 1: 1.20m unshielded AC Mains: 1.50m unshielded
Operating Temperature Range	: 0°C to 35°C (Declaration by manufacturer)
Model Difference Description	: These models have the same circuit schematic, construction, PCB Layout and critical components. The difference is model number only due to trading purpose.
Note	: According to the model difference, all tests were performed on model F7700X.

Technical Specification:

Frequency Range	: FM: 87.5~108MHz
Antenna Type	: Built-in Antenna
Modulation Type	: Analogue for FM
EUT Type	: Class B
HW	: V1.0
SW	: V1.0

SUMMARY OF TEST RESULTS		
Section (ETSI EN 303 345)	Description of Test	TEST RESULT
4.2.4	Sensitivity	Compliant
4.2.5	Receiver adjacent channel selectivity and blocking	Compliant
4.2.6	Unwanted emissions in the spurious domain	Compliant

2. DESCRIPTION OF TEST MODES

The EUT has been tested under Normal Operating condition.

3. TEST METHODOLOGY

All measurements contained in this report were conducted with Final Draft ETSI EN303 345 v1.1.7 (2017) and EN 55032: 2015

4. TEST FACILITY

Site Description

EMC Lab : Listed by CNAS, August 13, 2018
The certificate is valid until August 13, 2024
The Laboratory has been assessed and proved to be in compliance with CNAS/CL01
The Certificate Registration Number is L5795.

Listed by A2LA, November 01, 2017
The certificate is valid until December 31, 2019
The Laboratory has been assessed and proved to be in compliance with ISO17025
The Certificate Registration Number is 4429.01

Listed by FCC, November 06, 2017
The Designation Number is CN1214
Test Firm Registration Number: 907417

Listed by Industry Canada, June 08, 2017
The Certificate Registration Number. Is 46405-974343

Name of Firm : Dongguan Nore Testing Center Co., Ltd.
(Dongguan NTC Co., Ltd.)

Site Location : Building D, Gaosheng Science and Technology Park, Hongtu Road, Nancheng District, Dongguan City, Guangdong Province, China

5. SUPPORT EQUIPMENT

FM : Manufacturer: LEADER
Signal Generator M/N: 3214
S/N: 1100164

6. MEASUREMENT UNCERTAINTY

Parameter	Uncertainty
Uncertainty in conducted measurements	$\pm 0.62\text{dB}$
Uncertainty in radiated measurements	$\pm 3.83\text{dB}$
Spurious emissions	$\pm 3.4\text{dB}$

7. DEVIATIONS AND ABNORMALITIES FROM STANDARD CONDITIONS

No additions, deviations and exclusions from the standard.

8. Sensitivity

8.1 Limits:

Sensitivity requirements

Test	De-modulation	Tuned frequency band	Wanted signal centre frequency (MHz)	Required sensitivity limit	
				Conducted (dBm)	Radiated (dBuV/m)
1	AM	LF	0.216	-65	74
2		MF	0.999	-65	66
3		HF	9.9	-65	60
4	FM	VHF band II	98	-90	50(note 1)
5	DAB	VHF band III	202,928	-98	33(note 2)
6	DRM	LF	0.216	-101	58
7		MF	0.999	-101	52
8		HF1	4	-101	44
9		HF2	19	-101	40
10		VHF band I	65	-102	45
11		VHF band II	100	-102	46
12		VHF band III	200	-102	51

Note 1: For products with an integral antenna, the requirement is relaxed to 67 dBuV/m.

Note 2: For products with an integral antenna, the requirement is relaxed to 50 dBuV/m.

Impairment criteria for sensitivity tests

Demodulation	Impairment criteria
AM	SNR \geq 28 dBQ ref 40% AM
FM	SNR \geq 40dBQ ref \pm 60,8 kHz deviation; clean audio (see note 1)
DAB	Clean audio (see note 2)
DRM	Clean audio (see note 2)

NOTE 1: Clean audio is defined as 10 seconds of audio with no subjective impairments (e.g. clicks resulting from FM threshold effects).

NOTE 2: Clean audio is defined as 10 seconds of audio with no subjective impairments (e.g. muting, clicks, warbles or squeaks).

8.2 Test Signal configurations:

FM configuration

Parameter	FM signals		AM signal
	<i>Wanted</i>	<i>Unwanted</i>	<i>Blocking</i>
Audio modulation	1 kHz tone	Weighted noise Recommendation ITU-R BS.559-2 [5] , clause 1	1 kHz tone
	Band-limited to 15 kHz		
Other modulation parameters	±60,8 kHz peak deviation	32 kHz quasi-peak deviation (see note)	80% depth
Pilot tone	None	None	
NOTE: This is equivalent to $19 / \sqrt{2} = 13,4$ kHz RMS deviation in the absence of pre-emphasis.			

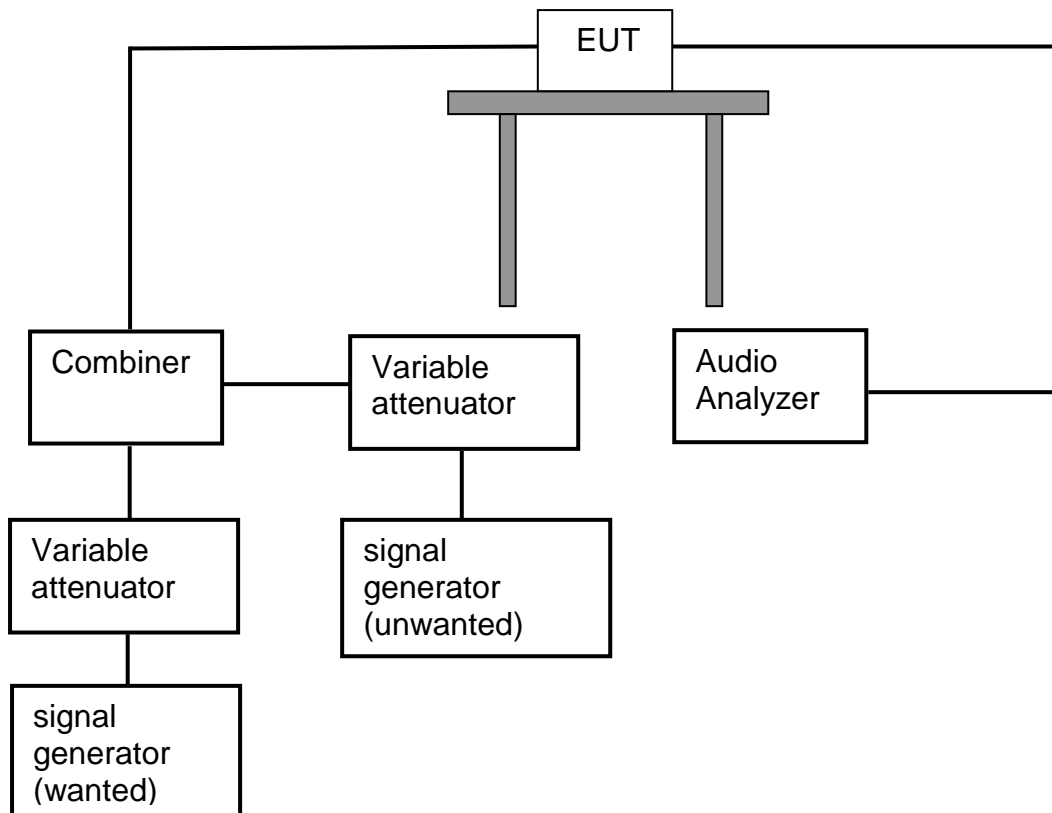
DAB configuration

Parameter	DAB signal	AM signal
	<i>Wanted and Unwanted</i>	<i>Blocking</i>
Audio modulation	Service label: "Sine+" 1KHz tone at a level of -3 dBFS Coding: mono, 128 kbit/s AAC	1 kHz tone
Other modulation parameters	DAB signal with EEP-3A to ETSI EN 300 401 [1] clause 15	80% depth

8.3 Test procedures:

- 1) The EUT is placed in the environment that high field-strengths from potential interferers should be avoided.
- 2) The 'unwanted' signal generator remains switched off for the duration of the test.
- 3) The 'wanted' signal generator is set to the required modulation method and test configuration and to the frequency specified. The signal level is adjusted to provide the level, as measured at ©, specified in plus 30 dB.
- 4) The EUT is tuned to the frequency of the 'wanted' signal generator. For a receiver without a digital frequency display, the receiver shall be tuned for optimum THD+N. The receiver's audio level shall be set so as to provide clean 1 kHz audio tone at the audio output (that is less than 10 % total harmonic distortion) but of sufficient level to drive the measurement device.
- 5) The level of the 'wanted' signal generator is adjusted to provide the level, as measured at ©.
- 6) The 'unwanted' signal generator remains switched off for the duration of the test.
- 7) The modulating audio signal for the 'wanted' signal generator is removed. The audio output, measured using the measurement device, is recorded as the noise level, N.
- 8) If the impairment criteria given are met then the receiver has passed the test.

8.4 Test Configuration:



8.5 Test Results:

Test Data:	2019-10-24	Humidity :	54 %			
Test By:	Elias	Temperature :	24 °C			
Test Voltage:	AC 230V/50Hz	Test Mode:	FM			
FM (Built-in antenna) VHF band II 98MHz						
Wanted Signal Level at © (dBm)	Total Harmonic Distortion (%)	S (mV)	N (mV)	SNR (dBQ)	SNR Limit (dBQ)	Result
50	0.75	651	4.2	43.81	≥40	Pass

Note: $SNR (dBQ) = 20\log(S/N)$

9. Adjacent Channel Selectivity and Blocking

9.1 Limits:

Channel spacing for adjacent channel selectivity and blocking

Demodulation	Tuned frequency band	Unwanted frequency (N = 1, 2, 3)	Unwanted frequency (blocking)
AM	LF	$\pm N \times 9 \text{ kHz}$	$\pm 90 \text{ kHz}$
	MF	$\pm N \times 9 \text{ kHz}$	$\pm 90 \text{ kHz}$
	HF	$\pm N \times 10 \text{ kHz}$	$\pm 100 \text{ kHz}$
FM	VHF band II	$\pm (N + 1) \times 100 \text{ kHz}$	$\pm 800 \text{ kHz}$
DAB	VHF band III	$\pm N \times 1\,712 \text{ kHz}$	$\pm 12 \text{ MHz}$
DRM	LF	$\pm N \times 9 \text{ kHz}$	$\pm 90 \text{ kHz}$
	MF	$\pm N \times 9 \text{ kHz}$	$\pm 90 \text{ kHz}$
	HF	$\pm N \times 10 \text{ kHz}$	$\pm 100 \text{ kHz}$
	VHF band I	$\pm N \times 100 \text{ kHz}$	$\pm 800 \text{ kHz}$
	VHF band III	$\pm N \times 100 \text{ kHz}$	$\pm 800 \text{ kHz}$
	VHF band II	$\pm N \times 100 \text{ kHz}$	$\pm 800 \text{ kHz}$

Adjacent channel selectivity and blocking requirements

Test	De-modulation	Tuned frequency band	C Wanted signal centre frequency (MHz)	C Wanted signal level		Required I/C ratio (see notes 1 and 2)			
				Conducted (dBm)	Radiated (dBμV/m)	N = 1 (dB)	N = 2 (dB)	N = 3 (dB)	Blocking (dB)
1R	AM (built-in or integral antenna, see note 4)	LF	0,216	n/a	80	-30	10	20	20
2R		MF	0,999	n/a	72	-30	10	20	20
3R		HF	9,9	n/a	66	-30	10	20	20
1C	AM (external antenna)	LF	0,216	-59	n/a	-5	25	35	40
2C		MF	0,999	-59	n/a	-5	25	35	40
3C		HF	9,9	-59	n/a	-5	25	35	40
4R	FM (built-in or integral antenna, see note 4)	VHF band II	98	n/a	56 (see note 3)	-15	-3	8	20
4C	FM (external antenna)	VHF band II	98	-84	n/a	3	17	30	30
5	DAB	VHF band III	202,928	-70	61	35	40	45	40
6	DRM	LF	0,216	-91	68	25	35	45	50
7		MF	0,999	-91	62	25	35	45	50
8		HF1	4	-91	54	25	35	45	50
9		HF2	19	-91	54	25	35	45	50
10		VHF band I	65	-91	50	35	40	45	50
11		VHF band II	100	-92	55	35	40	45	50
12		VHF band III	200	-92	61	35	40	45	50

NOTE 1: The frequency of the interferer shall be calculated using the channel spacing data in table 7 for each of the 6 defined adjacent channels $N = \{-3, -2, -1, +1, +2, +3\}$ and the two blocking offsets. Each row of table 8 thus defines 8 individual tests.

NOTE 2: The minimum level of I for the relevant level of impairment is calculated by adding the I/C ratio to the wanted C level.

NOTE 3: The wanted signal level for receivers with integral antenna is 73 dBμV/m.

NOTE 4: The ACS and blocking requirements for AM and FM devices are currently separated into different limits for radiated and conducted testing methods. These limits are likely to be unified in a future revision of the present document. Users of the present document should consult frequently the latest list published in the Official Journal of the European Union.

Impairment criteria for adjacent channel selectivity and blocking tests

Demodulation	Impairment criteria
AM	SNR ≥ 28 dBQ ref 40% AM
FM	SNR ≥ 40 dBQ ref $\pm 60,8$ kHz deviation; clean audio (see note 1)
DAB	Clean audio (see note 2)
DRM	Clean audio (see note 2)

NOTE 1: Clean audio is defined as 10 seconds of audio with no subjective impairments (e.g. clicks resulting from FM threshold effects).

NOTE 2: Clean audio is defined as 10 seconds of audio with no subjective impairments (e.g. muting, clicks, warbles or squeaks).

9.2 Test procedures:

- 1) The EUT is placed in the environment that high field-strengths from potential interferers should be avoided.
- 2) The 'wanted' signal generator is set to the required modulation method and test configuration as specified, and to the frequency specified. The signal level is adjusted to provide the level, as measured at ©, specified at above table, with the 'unwanted' generator switched off.
- 3) The 'unwanted' signal generator is set to the required modulation method and test configuration as specified, and to the frequency calculated from the wanted signal centre frequency and the required offset specified. The signal level is adjusted to provide the level, as measured at ©, specified in clause 4.2.5, with the 'wanted' generator switched off. For the blocking test only, the audio modulation of the 'unwanted' signal shall be removed whilst measuring the level at ©..
- 4) The 'wanted' signal generator is switched back on.
- 5) The receiver is tuned to the frequency of the 'wanted' signal generator. For a receiver without a digital frequency display, the receiver shall be tuned for optimum THD+N (i.e. as it would be tuned by a user for best quality). The receiver's audio level shall be set so as to provide clean 1 kHz audio tone at the audio output (that is less than 10 % total harmonic distortion) but of sufficient level to drive the measurement device.
- 6) The audio output, measured using the measurement device, is recorded as the signal level, S.
- 7) The modulating audio signal for the 'wanted' signal generator is removed. The audio output, measured using the measurement device, is recorded as the noise level, N.
- 8) If the impairment criteria given in above table are met then the receiver has passed the test.

9.3 Test Configuration:

Same as section 7.4 of this report.

9.4 Test Result:

Test Data:	2019-10-24	Humidity :	54 %
Test By:	Elias	Temperature :	24 °C
Test Voltage:	AC 230V/50Hz	Test Mode:	FM

**FM (Built-in antenna)
VHF band II 98MHz**

Adjacency	C Wanted signal level at © (dBm)	I Unwanted signal level at © (dBuV/m)	Required I/C ratio (dB)	S (mV)	N (mV)	SNR (dBQ)	SNR Limit (dBQ)	Result
N = -1 97.8 MHz	56	41	-15	653	4.3	43.63	≥40	Pass
N = -2 97.7 MHz	56	53	-3	651	3.8	44.68	≥40	Pass
N = -3 97.6 MHz	56	64	8	652	4.2	43.82	≥40	Pass
N = 1 98.2 MHz	56	41	-15	652	4.2	43.82	≥40	Pass
N = 2 98.3 MHz	56	53	-3	650	3.9	44.44	≥40	Pass
N = 3 98.4 MHz	56	64	8	653	4.0	44.26	≥40	Pass
Blocking 97.2 MHz	56	76	20	651	4.1	44.02	≥40	Pass
Blocking 98.8 MHz	56	76	20	650	4.1	44.00	≥40	Pass

NOTE 1 : S= Measured audio level when wanted signal on and modulation on; unwanted signal on and modulation on. For blocking signal, the unwanted signal modulation is off.

N= Measured audio level when wanted signal on but modulation off; unwanted signal on and modulation on. For blocking signal, the unwanted signal modulation is off.

NOTE 2: Measured I/C ratio (dB) = Unwanted Field Level (dBuV/m) - Wanted Field Level (dBuV/m)
SNR (dBQ) = 20log (S/N)

10. Unwanted emissions in the spurious domain

10.1 Limits:

Requirements for radiated emissions from FM receivers

Frequency Range MHz	Measurement			Class B Limit (dBuV/m)	
	Facility	Distance	Detector type / Bandwidth	Fundamental	Harmonics
30 to 230	SAC	10	Quasi Peak / 120	50	42
230 to 300	SAC	10			42
300 to 1000	SAC	10			46
30 to 230	SAC	3	Quasi Peak / 120	60	52
230 to 300	SAC	3			52
300 to 1000	SAC	3			56

Note : These relaxed limits apply only to emissions at the fundamental and harmonic frequencies of the LO. Signals at all other frequencies shall be compliant with the limits given in Table 2.

Requirements for radiated emissions at frequencies up to 1 GHz for class B equipment (Table 2)

Frequency Range MHz	Measurement			Class B Limit (dBuV/m)
	Facility	Distance	Detector type / Bandwidth	
30 to 230	SAC	10	Quasi Peak / 120	30
230 to 1000	SAC	10		37
30 to 230	SAC	3	Quasi Peak / 120	40
230 to 1000	SAC	3		47

Note : These relaxed limits apply only to emissions at the fundamental and harmonic frequencies of the LO. Signals at all other frequencies shall be compliant with the limits given in Table 2.

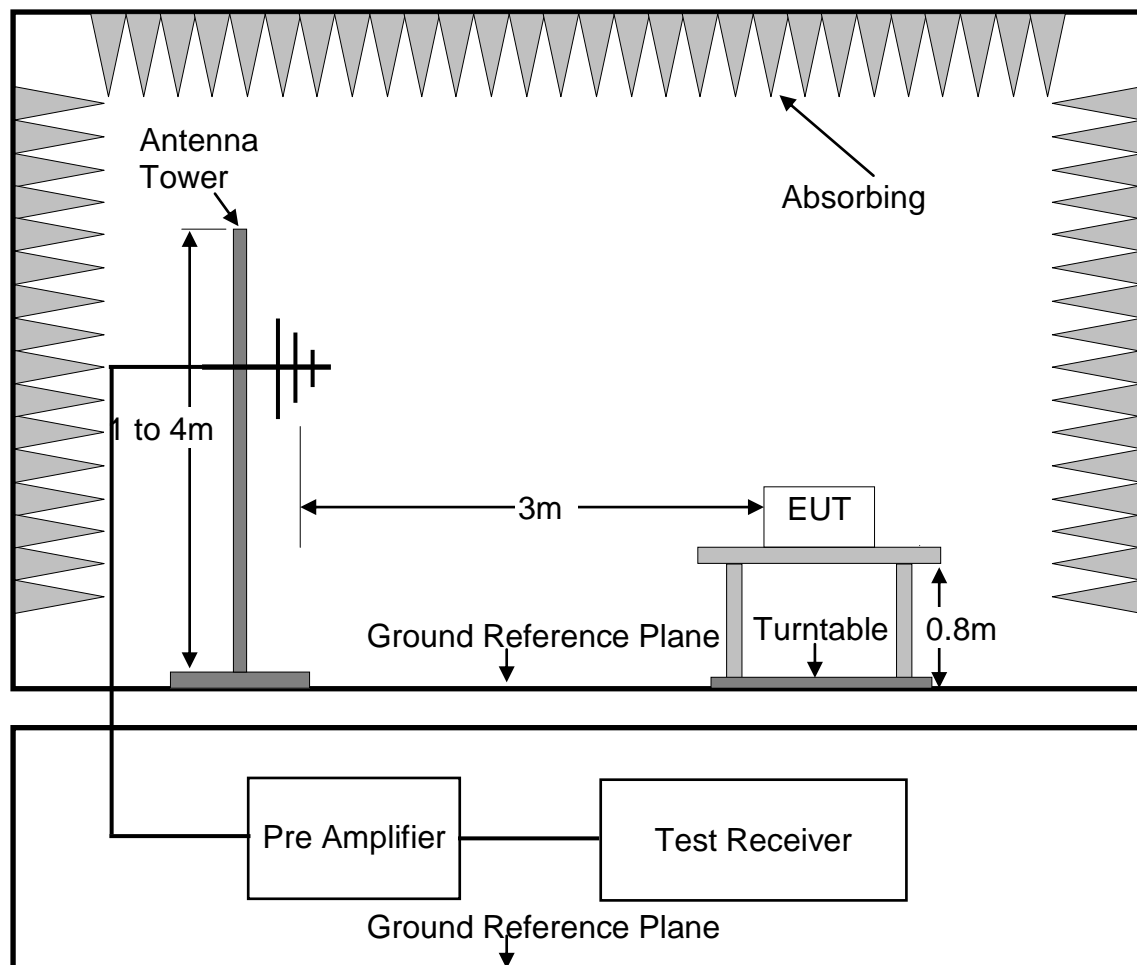
10.2 Test procedure:

E.U.T. and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. E.U.T. is set 3.0 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bilog antenna) is used as receiving antenna. Both horizontal and vertical polarization of the antenna is set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to EN 55032 on radiated emission measurement.

The bandwidth of the EMI test is set at 120 KHz.

The frequency range from 30 MHz to 1 GHz is checked.

10.3 Test Configuration:



10.4 Test Results:

Pass

Please refer to following test plots.



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Radiated Emission Measurement

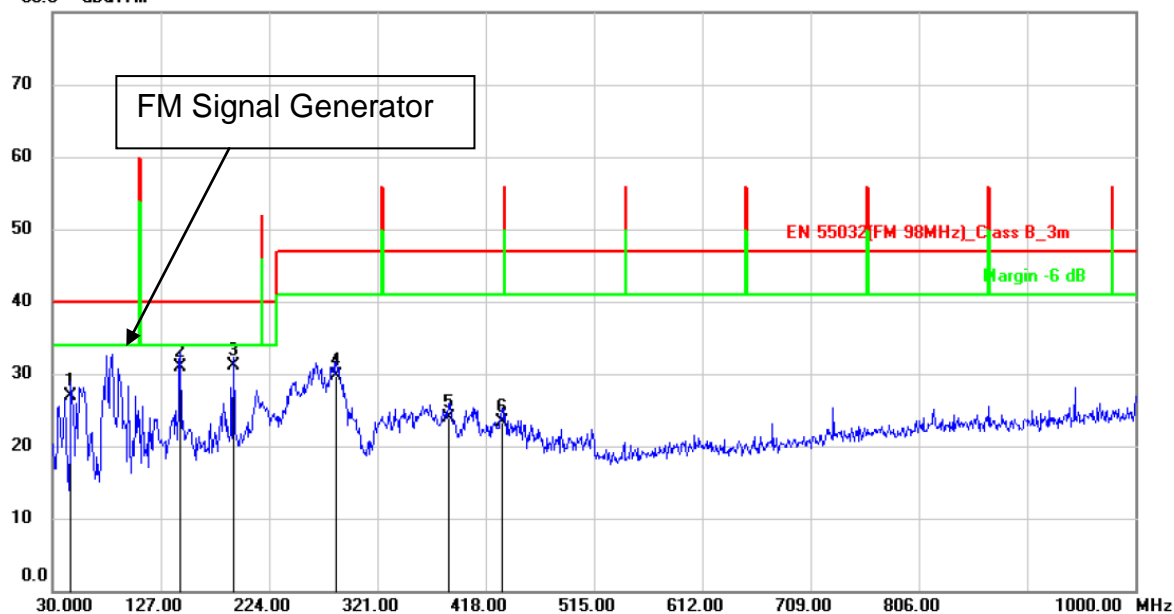
File :F7700X

Data :#9

Date: 2019/10/23

Time: 14:07:33

80.0 dBuV/m



Site: 3m Chamber

Polarization: **Horizontal**

Temperature: 26

Limit: EN 55032(FM 98MHz)_Class B_3m

Power: AC230V/50Hz

Humidity: 47 %

EUT: Computer multimedia speaker

Distance: 3m

M/N: F7700X

Mode: FM Mode (98MHz)

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1		46.4900	46.50	-19.60	26.90	40.00	-13.10	QP			
2		144.4600	46.60	-15.60	31.00	40.00	-9.00	QP			
3	*	191.9900	44.71	-13.51	31.20	40.00	-8.80	QP			
4		284.1400	40.59	-10.89	29.70	47.00	-17.30	QP			
5		385.0200	33.08	-9.18	23.90	47.00	-23.10	QP			
6		432.5500	31.67	-8.37	23.30	47.00	-23.70	QP			



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Web: <http://www.ntc-c.com>

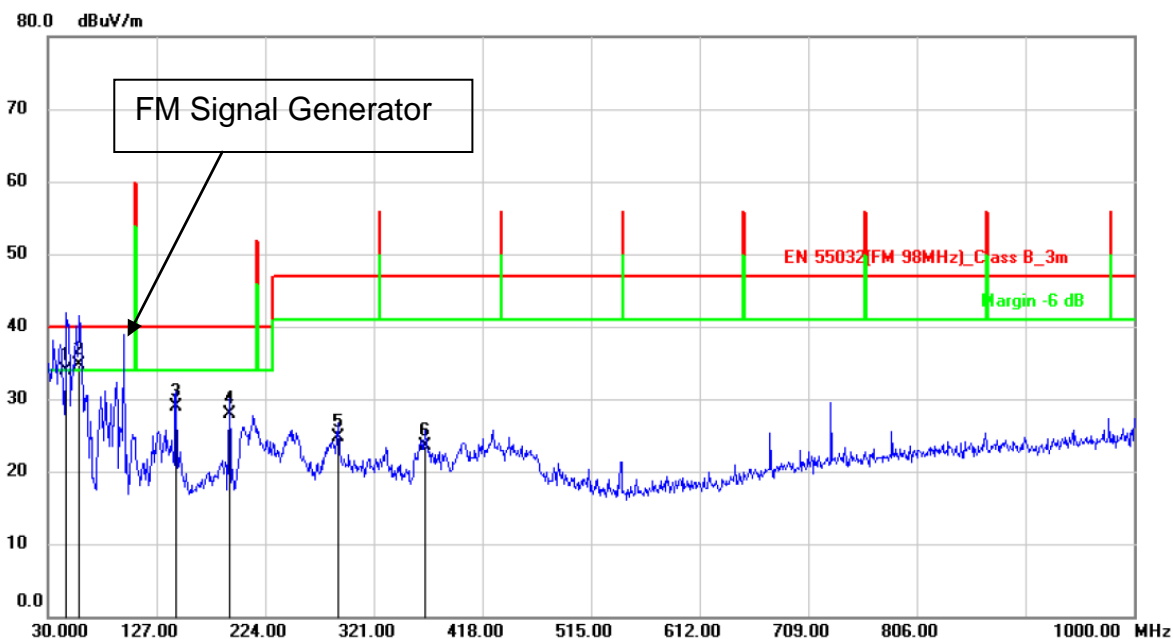
Radiated Emission Measurement

File : F7700X

Data : #10

Date: 2019/10/23

Time: 14:14:58



Site: 3m Chamber

Polarization: **Vertical**

Temperature: 26

Limit: EN 55032(FM 98MHz)_Class B_3m

Power: AC230V/50Hz

Humidity: 47 %

EUT: Computer multimedia speaker

Distance: 3m

M/N: F7700X

Mode: FM Mode (98MHz)

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB/m	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1		46.4900	47.60	-13.60	34.00	40.00	-6.00	QP		
2	*	58.1300	48.91	-14.11	34.80	40.00	-5.20	QP		
3		144.4600	47.60	-18.60	29.00	40.00	-11.00	QP		
4		191.9900	44.51	-16.51	28.00	40.00	-12.00	QP		
5		288.9900	37.48	-12.78	24.70	47.00	-22.30	QP		
6		366.5900	34.76	-11.16	23.60	47.00	-23.40	QP		

11. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI7	100837	Mar. 14, 2019	1 Year
2.	Antenna	Schwarzbeck	VULB9162	9162-010	Mar. 23, 2019	1 Year
3.	Loop Antenna	DAZE	ZA30900A	0708	Mar. 23, 2019	1 Year
4.	Signal generator	Agilent	E4421B	MY41000708	Mar. 14, 2019	1 Year
5.	Signal generator	Agilent	N5182A	MY48180739	Mar. 14, 2019	1 Year
6.	Signal generator	TELEVIEW	TVB593	23.36.20.10.1 2.00.00.05	N/A	N/A
7.	Signal generator	TELEVIEW	DTV800	D800-598170 62667	N/A	N/A
8..	Horn Antenna	COM-Power	AH-118	071078	Mar. 23, 2019	1 Year
9.	Pre-Amplifier	HP	HP 8449B	3008A00964	Mar. 14, 2019	1 Year
10.	Pre-Amplifier	HP	HP 8447D	1145A00203	Mar. 14, 2019	1 Year
11.	Audio Analyzer	Rohde & Schwarz	UPV	100894	Mar. 23, 2019	1 Year
12.	Band-Stop Filter	Erika Fiedler OHG	D-65396 Walluf	N/A	N/A	N/A
12.	Test Software	EZ	EZ_EMC	N/A	N/A	N/A

APPENDIX 1

PHOTOGRAPHS OF TEST SETUP

RADIATED EMISSION TEST



---End ---