



STC Test Report

Date: 2015-09-01

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No.: DM120755

Applicant: Spin Master Toys Far East Ltd.
Room 1113, 11/F., Chinachem Golden Plaza, 77 Mody Road,
Tsim Sha Tsui East, Kowloon, Hong Kong

Manufacturer: Spin Master Toys Far East Ltd.
Room 1113, 11/F., Chinachem Golden Plaza, 77 Mody Road,
Tsim Sha Tsui East, Kowloon, Hong Kong

Description of Sample(s): Submitted sample(s) said to be
Product: 44541 ARH RDC Batmobile
Brand Name: Air Hogs
Model Number: 44541TX
FCC ID: PQN44541TX2G4

Date Sample(s) Received: 2015-08-21

Date Tested: 2015-08-25 to 2015-08-26

Investigation Requested: Perform ElectroMagnetic Interference measurement in
accordance with FCC 47CFR [Codes of Federal Regulations]
Part 15: 2014 and ANSI C63.4: 2009 for FCC Certification.

Conclusion(s): The submitted product COMPLIED with the requirements of
Federal Communications Commission [FCC] Rules and
Regulations Part 15. The tests were performed in accordance
with the standards described above and on Section 2.2 in this
Test Report.

Remark(s): ---



LONG Yun Jian, Along
Authorized Signatory
ElectroMagnetic Compatibility Department
For and on behalf of
STC (Dongguan) Company Limited

STC (Dongguan) Company Limited

68 Fumin Nan Road, Dalang, Dongguan, China. (Zip Code : 523 770)

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1.0 General Details

1.1 Equipment Under Test [EUT] Description of Sample(s)

Product:	44541 ARH RDC Batmobile
Manufacturer:	Spin Master Toys Far East Ltd.
Brand Name:	Air Hogs
Model Number:	44541TX
Rating:	3.0Vd.c. (AA*2 battery)

1.2 Description of EUT Operation

The Equipment Under Test (EUT) is a controller of a remote control model car of Spin Master Toys. The transceiver operating in the 2.4GHz ISM frequency band. The RF signal is modulated by IC, the type of modulation used is FSK.

1.3 Date of Order

2015-08-21

1.4 Submitted Sample(s):

1 Sample

1.5 Test Duration

2015-08-25 to 2015-08-26

1.6 Country of Origin

China

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2.0 **Technical Details**

2.1 **Investigations Requested**

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2014 Regulations and ANSI C63.4:2009 for FCC Certification. The device was realized by test software.

2.2 **Test Standards and Results Summary Tables**

EMISSION Results Summary						
Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Fail	N/A
Field Strength of Fundamental & Harmonics Emissions	FCC 47CFR 15.249	ANSI C63.4:2009	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiated Emissions	FCC 47CFR 15.209	ANSI C63.4:2009	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note: N/A - Not Applicable

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3.0 Test Results

3.1 Emission

3.1.1 Radiated Emissions

Test Requirement:	FCC 47CFR 15.249 & FCC 47CFR 15.209
Test Method:	ANSI C63.4:2009
Test Date:	2015-08-25
Mode of Operation:	TX mode

Test Method:

The sample was placed 0.8m above the ground plane of semi-anechoic Chamber*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

*: Semi-anechoic chamber located on the STC (Dongguan) Company Ltd. 68 Fumin Nan Road, Dalang, Dongguan, Guangdong, PRC with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 629686.

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Spectrum Analyzer Setting:

9KHz – 30MHz (Pk & Av)

RBW: 10kHz
VBW: 30kHz
Sweep: Auto
Span: Fully capture the emissions being measured
Trace: Max. hold

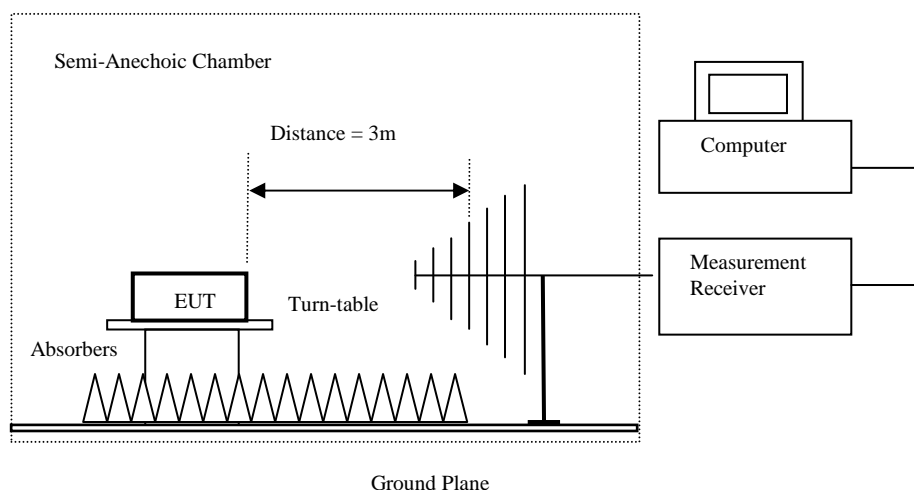
30MHz – 1GHz (QP)

RBW: 120kHz
VBW: 120kHz
Sweep: Auto
Span: Fully capture the emissions being measured
Trace: Max. hold

Above 1GHz (Pk & Av)

RBW: 1MHz
VBW: 1MHz
Sweep: Auto
Span: Fully capture the emissions being measured
Trace: Max. hold

Test Setup:



- Absorbers placed on top of the ground plane are for measurements above 1000MHz only.
- Measurements between 30MHz to 1000MHz made with Bi-log antennas, above 1000MHz horn antennas are used, 9kHz to 30MHz loop antennas are used.

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Limits for Field Strength of Fundamental & Harmonics Emissions [FCC 47CFR 15.249]:

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emission [microvolts/meter]	Field Strength of Harmonics Emission [microvolts/meter]
902-928	50,000 [Quasi-Peak]	500 [Average]
2400-2483.5	50,000 [Average]	500 [Average]

Results of Tx mode (Lowest Frequency Channel-2420 MHz): Pass

Field Strength of Fundamental Emissions Peak Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
2420.00	54.6	36.8	91.4	37,153.5	500,000	Vertical
2420.00	57.3	36.4	93.7	48,417.2	500,000	Horizontal

Field Strength of Fundamental Emissions Average Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
2420.00	52.7	36.8	89.5	29,853.8	50,000	Vertical
2420.00	52.2	36.4	88.6	26,915.3	50,000	Horizontal

Field Strength of Harmonics Emission Peak Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
4840.0	9.8	41.5	51.3	367.3	5,000	Vertical
4840.0	12.3	42.4	54.7	543.3	5,000	Horizontal
7260.0	7.8	45.1	52.9	441.6	5,000	Vertical
7260.0	6.8	46.2	53.0	446.7	5,000	Horizontal
9628.0	4.7	48.0	52.7	431.5	5,000	Vertical
9628.0	4.1	48.8	52.9	441.6	5,000	Horizontal
12035.0	4	51.5	55.5	595.7	5,000	Vertical
12035.0	3.4	52.4	55.8	616.6	5,000	Horizontal

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Field Strength of Harmonics Emission						
Average Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
4840.0	2.4	41.5	43.9	156.7	500	Vertical
4840.0	4.1	42.4	46.5	211.3	500	Horizontal
7260.0	-1.0	45.1	44.1	160.3	500	Vertical
7260.0	-1.1	46.2	45.1	179.9	500	Horizontal
9628.0	-9.1	48.0	38.9	88.1	500	Vertical
9628.0	-13.0	48.8	35.8	61.7	500	Horizontal
12035.0	-11	51.5	40.5	105.9	500	Vertical
12035.0	-11.7	52.4	40.7	108.4	500	Horizontal

Results of Tx mode (Middle Frequency Channel- 2435MHz): Pass

Field Strength of Fundamental Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
2435.00	55.1	36.8	91.9	39,355.0	500,000	Vertical
2435.00	57.0	36.4	93.4	46,773.5	500,000	Horizontal

Field Strength of Fundamental Emissions						
Average Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
2435.00	50.2	36.8	87.0	22,387.2	50,000	Vertical
2435.00	52.1	36.4	88.5	26,607.3	50,000	Horizontal

Field Strength of Harmonics Emission						
Peak Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
4870.0	11.6	41.6	53.2	457.1	5,000	Vertical
4870.0	12.5	42.5	55.0	562.3	5,000	Horizontal
7305.0	7.6	45.2	52.8	436.5	5,000	Vertical
7305.0	6.2	46.3	52.5	421.7	5,000	Horizontal
9740.0	5.4	48.1	53.5	473.2	5,000	Vertical
9740.0	5.5	48.9	54.4	524.8	5,000	Horizontal
12175.0	3.9	51.6	55.5	595.7	5,000	Vertical
12175.0	3.6	52.5	56.1	638.3	5,000	Horizontal

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Field Strength of Harmonics Emission						
Average Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
4870.0	3.4	41.6	45.0	177.8	500	Vertical
4870.0	4.7	42.5	47.2	229.1	500	Horizontal
7305.0	-0.3	45.2	44.9	175.8	500	Vertical
7305.0	-1.9	46.3	44.4	166.0	500	Horizontal
9740.0	-8.4	48.1	39.7	96.6	500	Vertical
9740.0	-8.4	48.9	40.5	105.9	500	Horizontal
12175.0	-10.9	51.6	40.7	108.4	500	Vertical
12175.0	-10.8	52.5	41.7	121.6	500	Horizontal

Results of Tx mode (Highest Frequency Channel – 2450MHz): Pass

Field Strength of Fundamental Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
2450.00	56.0	36.8	92.8	43,651.6	500,000	Vertical
2450.00	57.1	36.4	93.5	47,315.1	500,000	Horizontal

Field Strength of Fundamental Emissions						
Average Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
2450.00	51.1	36.8	87.9	24,831.3	50,000	Vertical
2450.00	52.3	36.4	88.7	27,227.0	50,000	Horizontal

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Field Strength of Harmonics Emission Peak Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
4900.0	10.5	41.4	51.9	393.6	5,000	Vertical
4900.0	13.1	42.7	55.8	616.6	5,000	Horizontal
7350.0	7.6	45.6	53.2	457.1	5,000	Vertical
7350.0	6.5	46.5	53.0	446.7	5,000	Horizontal
9800.0	6.0	48.6	54.6	537.0	5,000	Vertical
9800.0	5.2	49.7	54.9	555.9	5,000	Horizontal
12250.0	3.8	51.7	55.5	595.7	5,000	Vertical
12250.0	3.2	52.7	55.9	623.7	5,000	Horizontal

Field Strength of Harmonics Emission Average Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
4900.0	2.3	41.4	43.7	153.1	500	Vertical
4900.0	5.0	42.7	47.7	242.7	500	Horizontal
7350.0	-0.5	45.6	45.1	179.9	500	Vertical
7350.0	0.3	46.5	46.8	218.8	500	Horizontal
9800.0	-8.9	48.6	39.7	96.6	500	Vertical
9800.0	-9.5	49.7	40.2	102.3	500	Horizontal
12250.0	-11.2	51.7	40.5	105.9	500	Vertical
12250.0	-11.9	52.7	40.8	109.6	500	Horizontal

Remarks:

No additional spurious emissions found between lowest internal used/generated frequency and 30 MHz

Calculated measurement uncertainty (9kHz - 30MHz): 3.3dB
 (30MHz - 1GHz): 4.6dB
 (1GHz - 26GHz): 4.4dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

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Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [$\mu\text{V}/\text{m}$]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

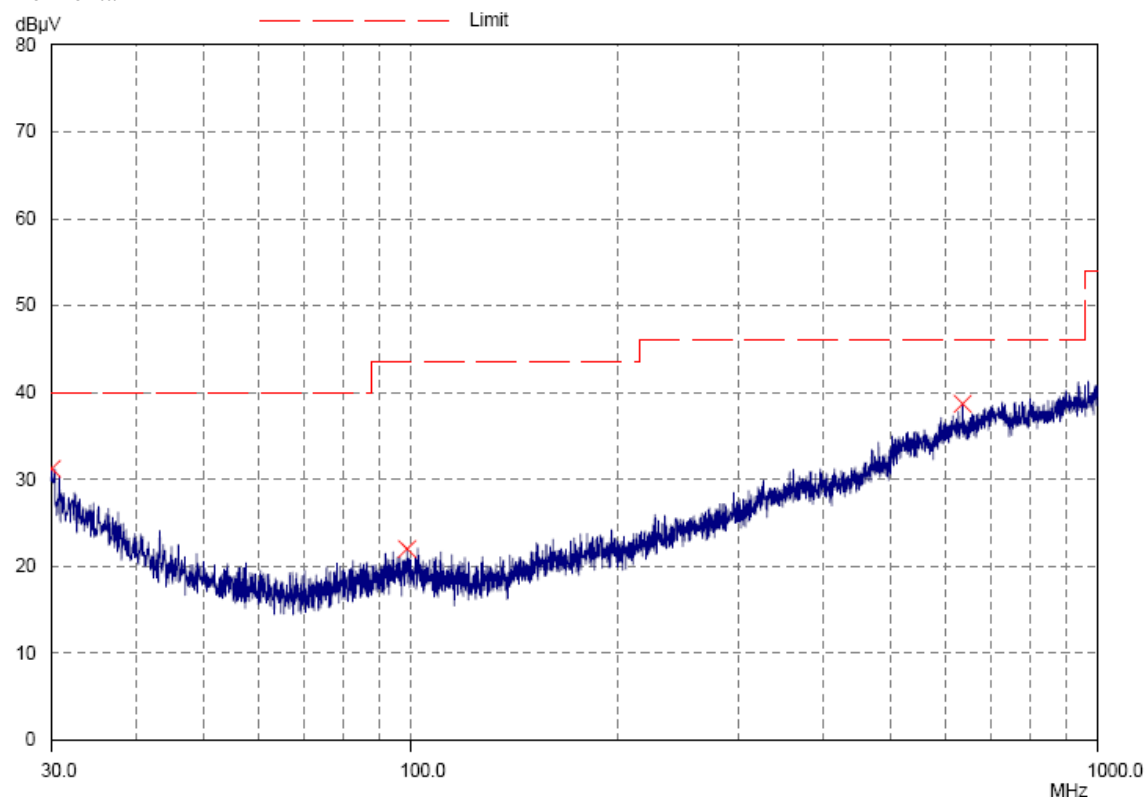
The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Results of TX mode (9kHz – 30MHz): PASS

Emissions detected are more than 20 dB below the FCC Limits

Results of TX mode (30MHz – 1GHz): PASS

Horizontal



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Results of TX mode (30MHz – 1GHz): PASS

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dB μ V/m	Limit @3m dB μ V/m	Level @3m μ V/m	Limit @3m μ V/m
30.1	Horizontal	31.2	40.0	36.3	100
98.9	Horizontal	22.0	43.5	12.6	150
636.9	Horizontal	38.7	46.0	86.1	200

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Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [$\mu\text{V/m}$]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

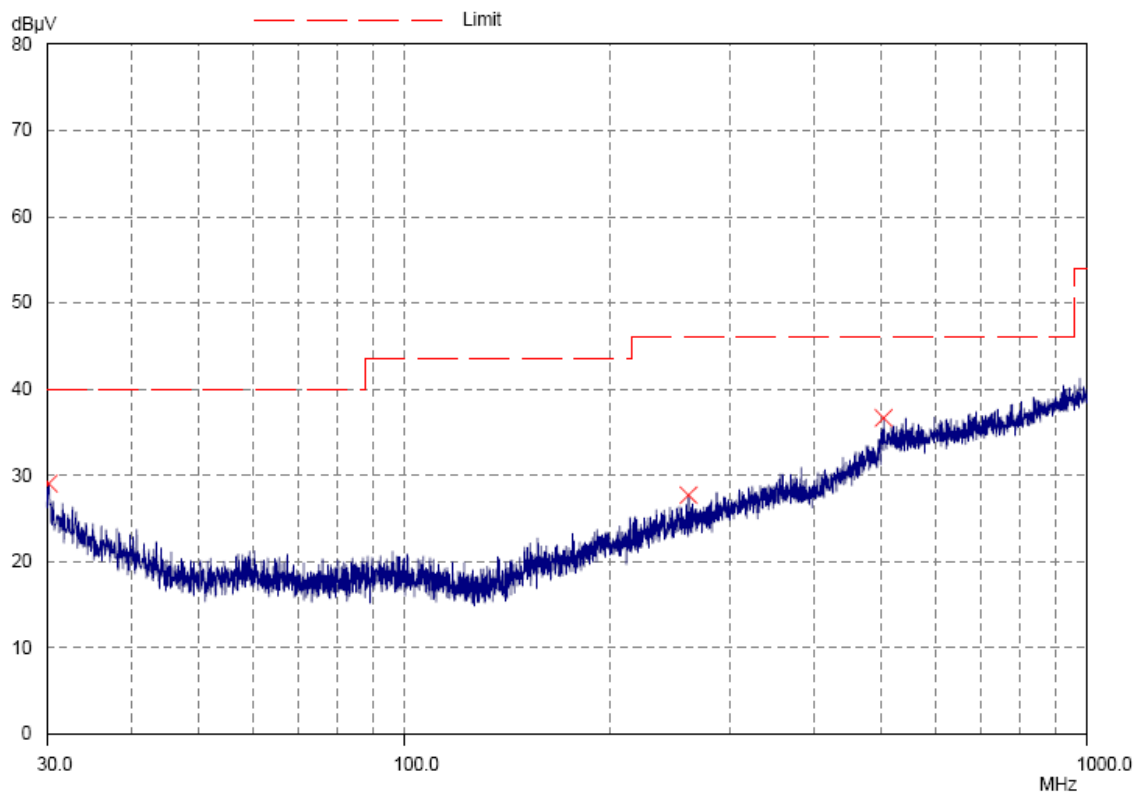
The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Results of TX mode (9kHz – 30MHz): PASS

Emissions detected are more than 20 dB below the FCC Limits

Results of TX mode (30MHz – 1GHz): PASS

Vertical



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Results of TX mode (30MHz – 1GHz): PASS

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dB μ V/m	Limit @3m dB μ V/m	Level @3m μ V/m	Limit @3m μ V/m
30.2	Vertical	29.0	40.0	28.2	100
261.3	Vertical	27.7	46.0	24.3	200
504.3	Vertical	36.7	46.0	68.4	200

Remarks:

Calculated measurement uncertainty (9kHz - 30MHz): 3.3dB
(30MHz – 1GHz): 4.6dB
(1GHz - 26GHz): 4.4dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

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3.2 20dB Bandwidth of Fundamental Emission

Test Requirement:	FCC 47 CFR 15.249
Test Method:	ANSI C63.4:2009
Test Date:	2015-08-25
Mode of Operation:	Tx mode

Test Method:

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

Test Setup:

As Test Setup of clause 3.1.1 in this test report.

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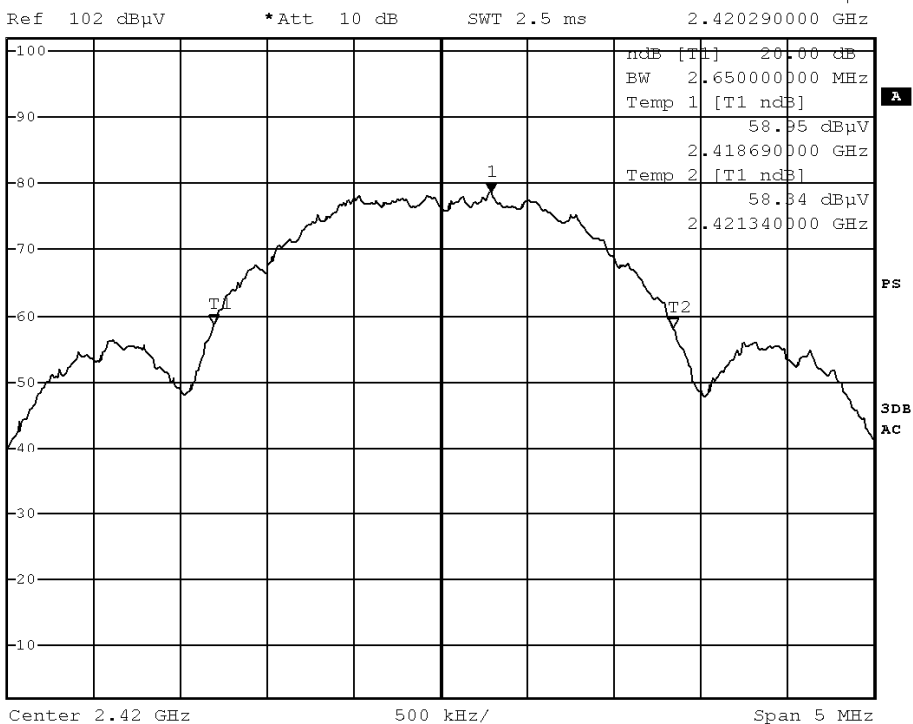
Limits for 20dB Bandwidth of Fundamental Emission (Low Frequency Channel):

Frequency Range [MHz]	20dB Bandwidth [MHz]
2420	2.65

20dB Bandwidth of Fundamental Emission



*RBW 100 kHz Marker 1 [T1]
 *VBW 300 kHz 78.76 dBμV
 *Att 10 dB SWT 2.5 ms 2.420290000 GHz



BMP

Date: 25.AUG.2015 16:27:13

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No.: DM120755

Limits for 20dB Bandwidth of Fundamental Emission (Middle Frequency Channel):

Frequency Range [MHz]	20dB Bandwidth [MHz]
2435	2.66

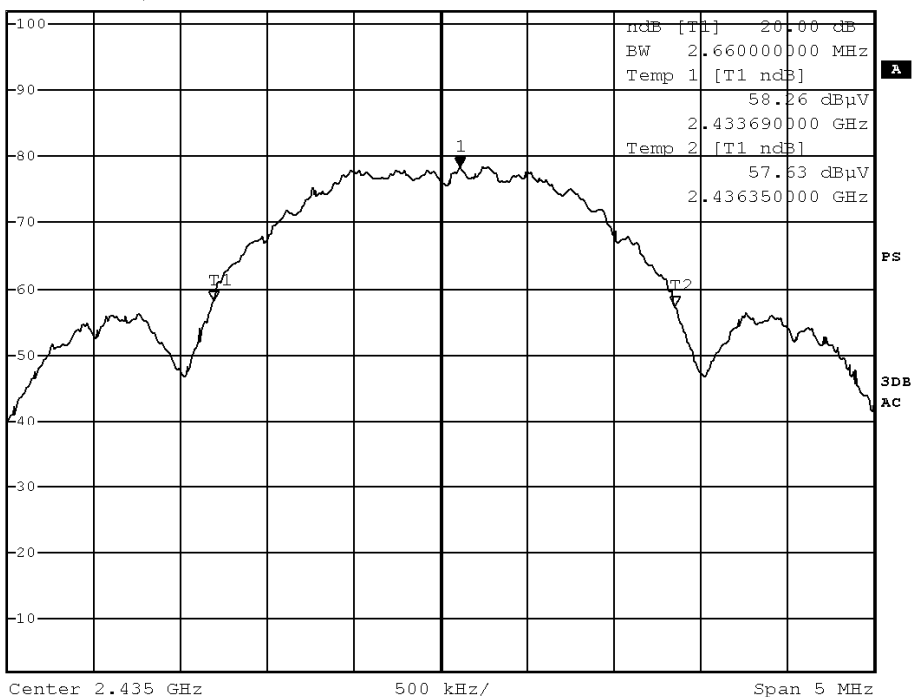
20dB Bandwidth of Fundamental Emission



*RBW 100 kHz Marker 1 [T1]
 *VBW 300 kHz 78.41 dBμV
 *Att 10 dB SWT 2.5 ms 2.435110000 GHz

Ref 102 dBμV

1 PK
MAXH



BMP

Date: 25.AUG.2015 16:31:46

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Limits for 20dB Bandwidth of Fundamental Emission (High Frequency Channel):

Frequency Range [MHz]	20dB Bandwidth [MHz]
2450	2.62

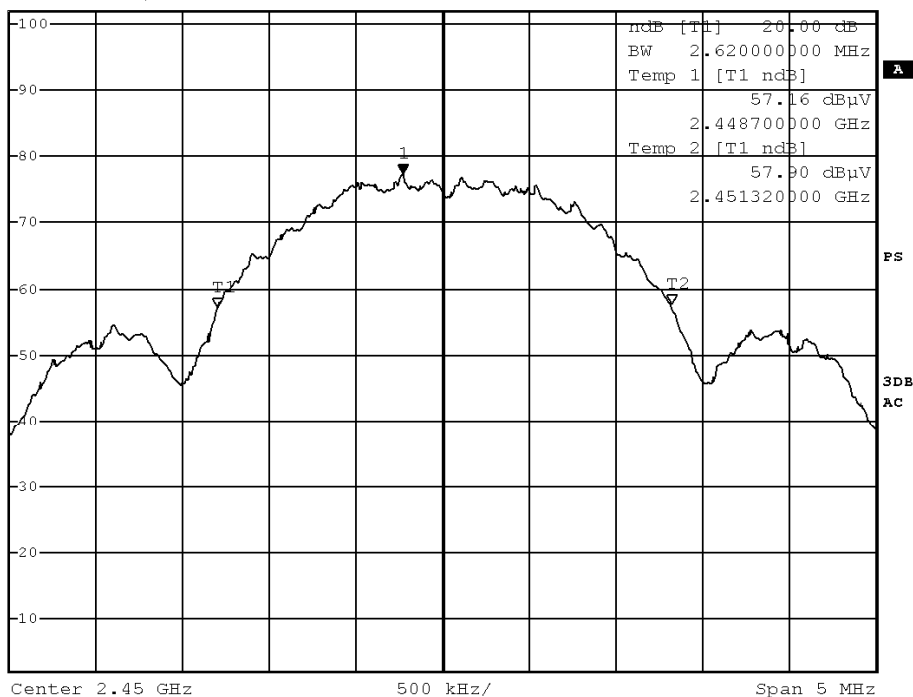
20dB Bandwidth of Fundamental Emission



*RBW 100 kHz Marker 1 [T1]
 *VBW 300 kHz 77.37 dBμV
 *Att 10 dB SWT 2.5 ms 2.449770000 GHz

Ref 102 dBμV

L PK
MAXH



BMP

Date: 25.AUG.2015 16:32:54

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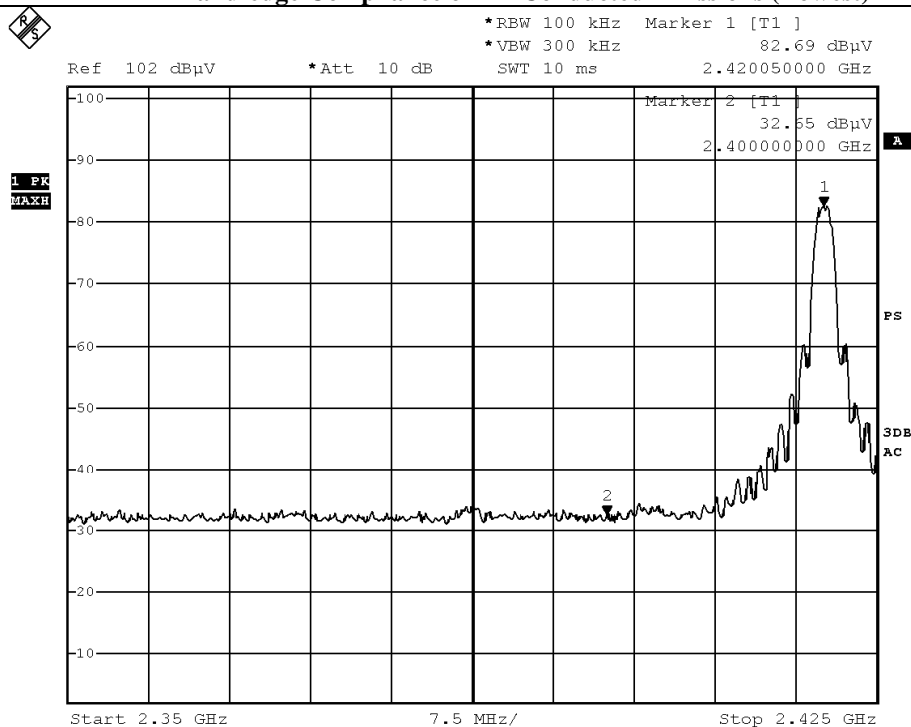
Band-edge Compliance of RF Conducted Emissions Measurement:

Limit :

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2420)	50.04

Band-edge Compliance of RF Conducted Emissions (Lowest)



BMP

Date: 25.AUG.2015 16:46:22

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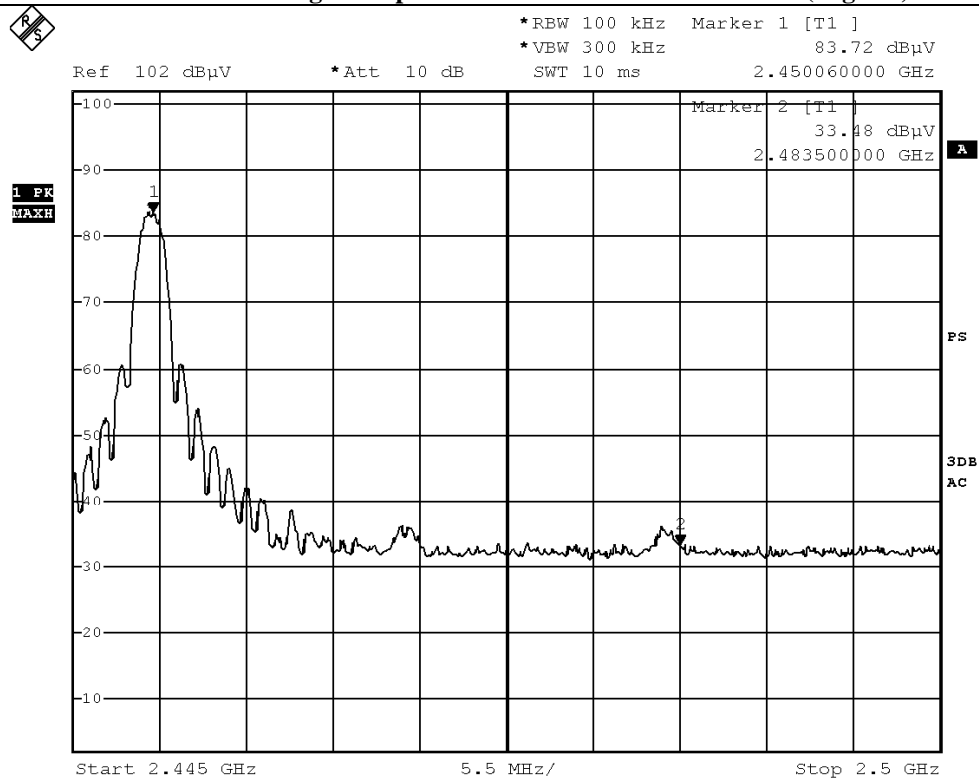
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Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
Highest Fundamental (2450) - 2483.5	50.24

Band-edge Compliance of RF Conducted Emissions (Highest)



BMP

Date: 25.AUG.2015 16:44:51

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Band-edge Compliance of RF Radiated Emissions Measurement:

Limit :

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).

Result: Band-edge Compliance of RF Radiated Emissions (Lowest)

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
2390.0	4.7	36.8	41.5	74.0	32.5	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
2390.0	-6.1	36.8	30.7	54.0	23.3	Vertical

Result: Band-edge Compliance of RF Radiated Emissions (Highest)

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
2483.5	4.4	36.4	40.8	74.0	33.2	Horizontal

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
2483.5	-5.9	36.4	30.5	54.0	23.5	Horizontal

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Appendix A

List of Measurement Equipment

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EMD004	LISN	ROHDE & SCHWARZ	ESH3-Z5	100102	2015.3.24	2016.3.24
EMD022	EMI Test Receiver	ROHDE & SCHWARZ	ESCS30	100314	2015.3.24	2016.3.24
EMD035	EMI Test Receiver	ROHDE & SCHWARZ	ESCI	100441	2015.3.24	2016.3.24
EMD036	EMI Test Receiver	ROHDE & SCHWARZ	ESIB 26	100388	2015.3.24	2016.3.24
EMD041	TWO-LINE V-NETWORK	ROHDE & SCHWARZ	ENV216	100261	2015.3.24	2016.3.24
EMD061	Biconilog Antenna	ETS.LINDGREN	3142C	00060439	2014.11.29	2016.11.29
EMD062	Double-Ridged Waveguide (1GHz – 18GHz)	ETS.LINDGREN	3117	00075933	2014.11.15	2015.11.15
EMD084	MULTI-DVICE CONTROLLER	ETS.LINDGREN	2090	00060107	N/A	N/A
EMD088	Video Contol Unit	ETS.LINDGREN	Y21953A	2601073	N/A	N/A
EMD093	Monitor	ViewSonic	VA9036	Q8X064201876	N/A	N/A
EMD102	Intelligent Frequency	Ainuo Instrument Co., Ltd	AN97005SS	79707454	N/A	N/A
EMD103	Intelligent Frequency	Ainuo Instrument Co., Ltd	AN97005SS	79707455	N/A	N/A
EMD105	FACT-3 EMC Chamber	ETS.LINDGREN	FACT-3	3803	N/A	N/A
EMD106	Shielding Room #1	ETS.LINDGREN	RFD-100	3802	N/A	N/A
	100V Insertion Unit	ROHDE & SCHWARZ	URV5-Z4	100464	2015.3.24	2016.3.24
EMD113	Pre-Amplifier	ROHDE & SCHWARZ	N/A	1129588	2015.3.24	2016.3.24
EMD124	Loop Antenna	ETS-Lindgren	6502	00104905	2014.04.28	2016.04.28
EMD131	Standard Gain Horn Antenna (18GHz – 26.5GHz)	Chengdu AINFO Inc.	JTXSLB-42-15-C-KF	J2021100721001	2015.06.27	2017.06.27

Remarks:-

N/A Not Applicable or Not Available

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Appendix B

Photographs of EUT

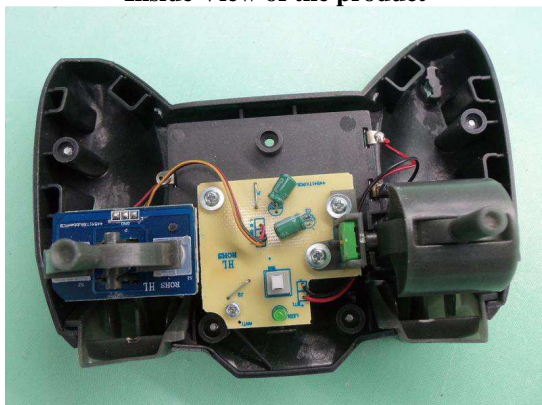
Front View of the product



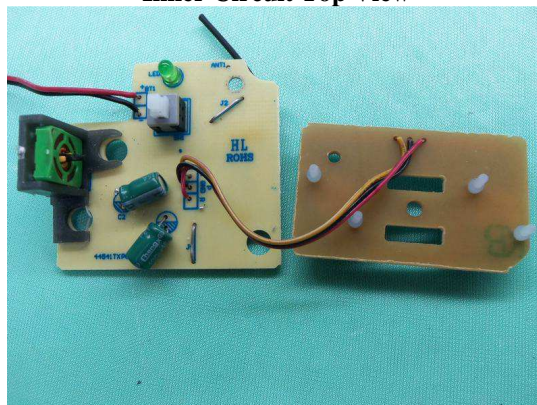
Rear View of the product



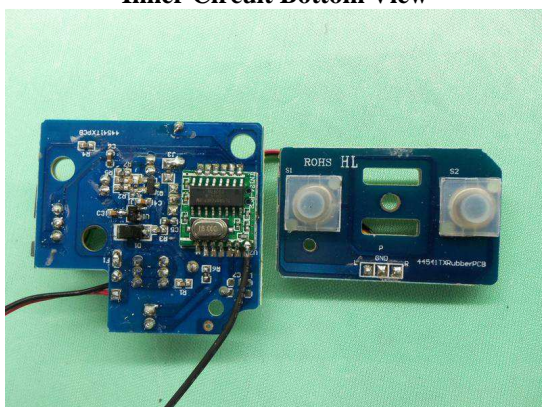
Inside View of the product



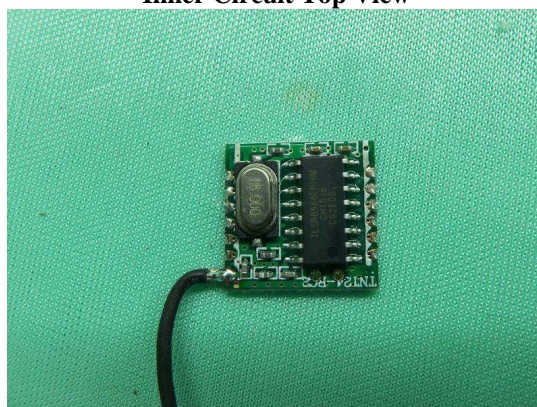
Inner Circuit Top View



Inner Circuit Bottom View



Inner Circuit Top View



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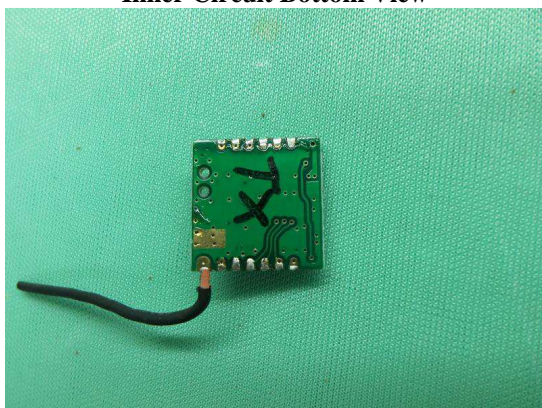
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Photographs of EUT

Inner Circuit Bottom View



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Photographs of EUT

Measurement of Radiated Emission Test Set Up



Measurement of Radiated Emission Test Set Up



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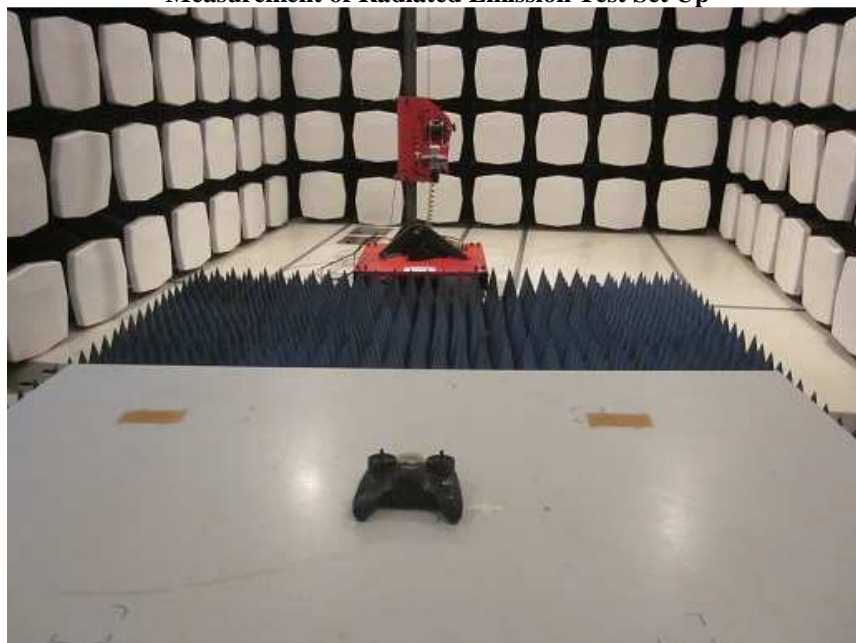
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Photographs of EUT

Measurement of Radiated Emission Test Set Up



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