EMC Test Report

Applicant	:	Matias Corporation
Applicant Address	:	221 Narinia Cres., Newmarket, Ontario, L3X 2E1, Canada
Product Type	:	Matias Wireless Aluminum Keyboard, Wireless Aluminum Keyboard, Clavier Aluminium Sans Fil, Kabellose Aluminium Tastatur
Trade Name	:	matias
Model Number	:	FK418BTS, FK418BTxx-yy, FK418PCBTxx-yy (Where xx and yy can be A-Z, a-z, 0-9, or nothing.)
Applicable Standard	:	ETSI EN 301 489-1 V1.9.2 (09-2011) ETSI EN 301 489-17 V2.2.1 (09-2012)
Receive Date	:	Feb. 17, 2016
Test Period	:	Feb. 17 ~ Mar. 01, 2016
Issue Date	:	Mar. 11, 2016

Issue by

A Test Lab Techno Corp.
No. 140-1, Changan Street, Bade District,
Taoyuan City 33465, Taiwan (R.O.C)
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Taiwan Accreditation Foundation accreditation number: 1330

Revision History

Rev.	Issue Date	Revisions	Revised By
00	Mar. 11, 2016	Initial Issue	

Verification of Compliance

Issued Date: Mar. 11, 2016

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Trade Name	:	matias
Model Number	:	FK418BTS, FK418BTxx-yy, FK418PCBTxx-yy (Where xx and yy can be A-Z, a-z, 0-9, or nothing.)
EUT Rated Voltage	:	DC 5.0V
Test Voltage	:	230 Vac / 50 Hz
Applicable Standard	:	ETSI EN 301 489-1 V1.9.2 (09-2011) ETSI EN 301 489-17 V2.2.1 (09-2012)
Test Result	:	Complied
Performing Lab.	:	A Test Lab Techno Corp. No. 140-1, Changan Street, Bade District, Taoyuan City 33465, Taiwan (R.O.C) Tel：+886-3-2710188 / Fax：+886-3-2710190 Taiwan Accreditation Foundation accreditation number: 1330 http://www.atl-lab.com.tw/e-index.htm

The above equipment has been tested by A Test Lab Techno Corp., and found compliance with the requirements set forth in the R&TTE Directive 1999/5/EC and technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved By	: Misty Wu	Reviewed By	: Terry Liao
(Manager)	(Misty Wu)	(Testing Engineer)	(Terry Liao)

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1 General Information

1.1. Summary of Test Result

Emission			
Standard	Item	Result	Remark
EN 55022: 2010 +AC: 2011	Conducted Emission	PASS	Meet Class B limit
EN 55022: 2010 +AC: 2011	Radiated Emission	PASS	Meet Class B limit
EN 61000-3-2: 2014	Harmonic Current Emissions	N/A	The EUT power is from PC
EN 61000-3-3: 2013	Voltage Fluctuations & Flicker	N/A	The EUT power is from PC

Immunity			
Standard	Item	Result	Remark
EN 61000-4-2: 2009	ESD	PASS	Meets the requirements of Criterion B
EN 61000-4-3: 2006 +A1:2008 +A2:2010	RS	PASS	Meets the requirements of Criterion A
EN 61000-4-4: 2012	EFT	PASS	Meets the requirements of Criterion B
EN 61000-4-5: 2014	Surge	NA	The signal cable dose not used outdoor
EN 61000-4-6: 2014	CS	PASS	Meets the requirements of Criterion A
EN 61000-4-11: 2004	Voltage Dips & Voltage Variations	N/A	The EUT power is from PC

The test results of this report relate only to the tested sample(s) identified in this report. Manufacturer or whom it may concern should recognize the pass or fail of the test result.

1.2. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty (dB)
Conducted Emission	AC Power Port	9kHz ~ 150kHz	2.7
		150kHz ~ 30MHz	2.8
	Telecommunication Port	150kHz ~ 30MHz	3.1

Test Item	Test Site	Frequency Range		Uncertainty (dB)
Radiated Emission	TE06	30MHz ~ 1000MHz	Horizontal	5.2
			Vertical	5.5
	TE01	1000MHz ~ 6000MHz		4.7
	TE09	1000MHz ~ 6000MHz		4.3
Note: The Vertical and Horizontal measurement uncertainty of 1GHz to 6GHz is evaluated and choose which polarity is worst value.				

Test Item		Uncertainty
Harmonic Current Emission		36 mA/A
Voltage Fluctuations And Flicker		4.4 mV/V
Electrostatic Discharge	Voltage	0.86 %
	Current	2.5 %
	Timing	6.0 %
Radiated Susceptibility		3.2 dB.
Electrical Fast Transient/Burst		2 %
Surge	Voltage	3%
	Current	3%
	Timing	3%
Conducted Susceptibility	CDN	3.8 dB
	EM Clamp/Direct Injection	2.8 dB
Voltage Dips and Interruption	Voltage	1.004 %
	Timing	1.004 %

2 EUT Description

Applicant	Matias Corporation 221 Narinia Cres., Newmarket, Ontario, L3X 2E1, Canada			
Manufacturer	Lita Electronics Technology Co., Ltd. No.6, Kun Ming Road, Yao Le Village, Liaobu Town, Dongguan City, Guangdong Province, China			
Product type	Matias Wireless Aluminum Keyboard, Wireless Aluminum Keyboard, Clavier Aluminium Sans Fil, Kabellose Aluminium Tastatur			
Different description	Those model numbers differ from each other in selling region			
Trade name	matias			
Model number	FK418BTS, FK418BTxx-yy, FK418PCBTxx-yy (Where xx and yy can be A-Z, a-z, 0-9, or nothing.)			
Different description	Those model numbers differ from each other in selling region and appearance colors.			
Component List				
Battery	Trade Name	HAILEI	Model Number	GSP082294
	3.7Vdc, 1600mAh			

I/O port description：

I/O Port Types	Q'TY	Test Description
1). USB Port	1	Connected to PC

3 Test Methodology

3.1. Decision of Test Mode

3.1.1. The following test mode(s) were scanned during the preliminary test:

Pre-Test Mode
Mode 1: IDLE mode
Mode 2: Normal operation with charge mode
Mode 3: Normal operation (For RE)

3.1.2. After the preliminary scan, the following test mode was found to produce the highest emission level.

Final Test Mode			
EMI	Conducted Emission		Mode 2
	Radiated Emission	Below 1GHz	Mode 2
		Above 1GHz	Mode 2
	Harmonic Current Emissions		N/A
	Voltage Fluctuations & Flicker		N/A
EMS	ESD		Mode 2
	RS		Mode 2
	EFT		Mode 2
	Surge		N/A
	CS		Mode 2
	Voltage Dips & Voltage Variations		N/A

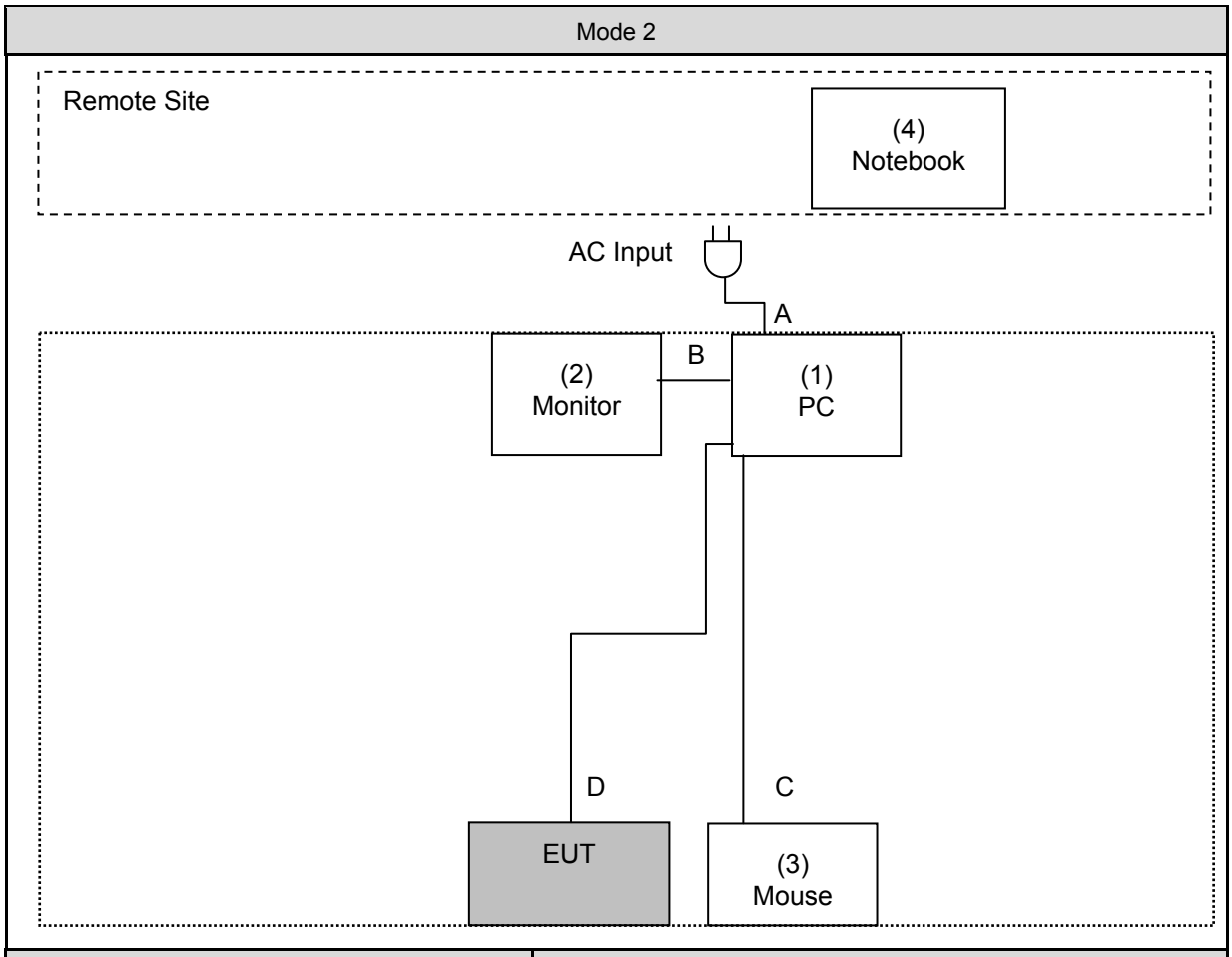
Then, the above highest emission mode of the configuration of the EUT and cable was chosen for all final test items.

3.2. EUT Exercise Software

Mode 2

1	Setup the EUT and simulators as shown on 3.3.
2	Turn on the power of all equipment.
3	Data will be communicated between Notebook and EUT by Bluetooth.
4	Start to test and get the worst reading.

3.3. Configuration of Test System Details



Signal Cable Type		Signal Cable Description
A	AC Power Cable	Non-Shielded,1.8m
B	HDMI Cable	Non-Shielded,1.8m
C	USB Cable	Shielded,1.8m
D	USB Cable	Shielded,1.0m

Devices Description					
Product		Manufacturer	Model Number	Serial Number	Power Cord
(1)	PC	DELL	T3610	F5XBW02	Non-Shielded, 1.8 m
(2)	Monitor	DELL	U3011t	CN-0PH5NY-74445-1A8-092L	Non-Shielded, 1.8m
(3)	Mouse	DELL	MOC5UO	I0S02OO9	Power by PC
(4)	Notebook	DELL	D830	CN-OHN341-48643-88Q -1221	Non-Shielded, 0.8m

3.4. Test Site Environment

Items	Test Item	Required (IEC 60068-1)	Actual
Temperature (°C)	Conducted Emission	15-35	26.0
Humidity (%RH)		25-75	60.0
Barometric pressure (mbar)		860-1060	950
Temperature (°C)	Radiated Emission	15-35	26.0
Humidity (%RH)		25-75	60.0
Barometric pressure (mbar)		860-1060	950
Temperature (°C)	ESD	15-35	24.6
Humidity (%RH)		30-60	49.2
Barometric pressure (mbar)		860-1060	1016
Temperature (°C)	RS	--	20.6
Humidity (%RH)		--	49.8
Barometric pressure (mbar)		--	1009
Temperature (°C)	EFT	15-35	21.4
Humidity (%RH)		30-60	51.2
Barometric pressure (mbar)		860-1060	1009
Temperature (°C)	CS	--	24.2
Humidity (%RH)		--	51.4
Barometric pressure (mbar)		--	1011

4 Measurement Procedure

4.1. Conducted Emission

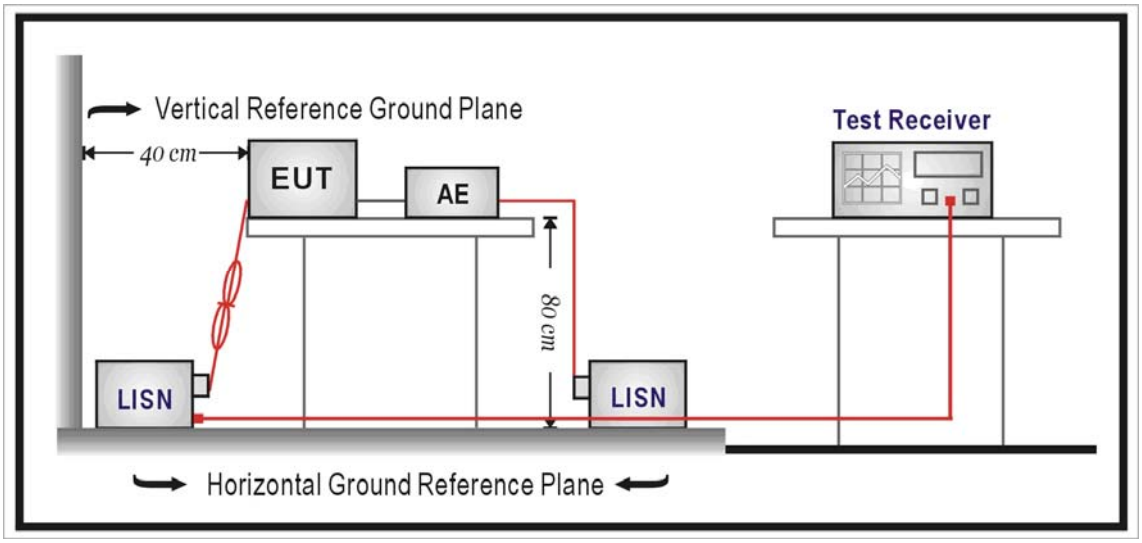
■ **Test Instruments**

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Test Receiver	R&S	ESCI	100367	06/16/2015	1 year
LISN	R&S	ENV216	101040	03/10/2015	1 year
LISN	R&S	ENV216	101041	03/06/2015	1 year
T-LISN	FCC	FCC-TLISN-T2-02	20574	04/02/2015	1 year
ISN	TESEQ	ISN T444A	28576	06/12/2015	1 year
ISN	TESEQ	ISN-T8	34413	04/27/2015	1 year
Test Site	ATL	TE02	TE02	N.C.R.	-----

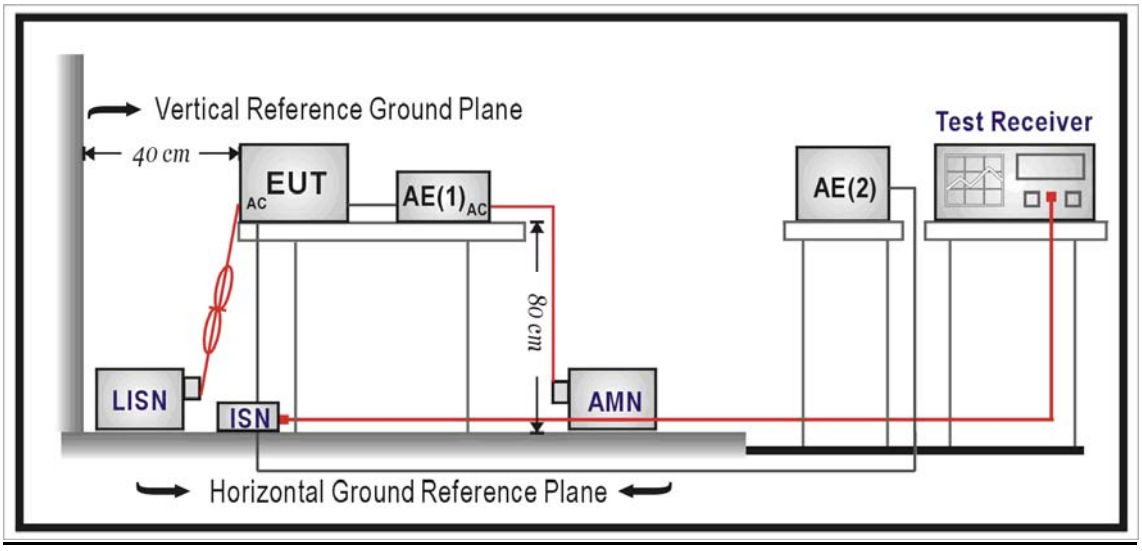
Note: N.C.R. = No Calibration Request.

■ Test Setup

Power input/output ports setup



Telecommunication port setup



■ **Test Procedure**

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.

The mains voltage shall be supplied to the EUT via the LISN when the measurement of telecommunication port is performed. The common mode disturbances at the telecommunication port shall be connected to the ISN.

For A.C. mains conducted interference, measured both sides of A.C. lines and carried out using quasi-peak and average detector receivers of maximum conducted interference.

For telecommunication port interference measurement, using ISNs with suitable longitudinal conversion losses (LCL) as defined in the port of specification from manufacture, and the LCL shall be meet the related standard requirement. Measured the line and carried out using quasi-peak and average detector receivers of maximum conducted interference.

Conducted emissions were invested over the frequency range from 0.15 MHz to 30 MHz using a receiver bandwidth of 9 kHz. The equipment under test (EUT) shall be meet the limits in section 4.1.2, as applicable, including the average limit and the quasi-peak limit when using respectively (A.C. mains and telecommunication port), an average detector and quasi-peak detector measured in accordance with the methods described of related standard. Either the voltage limits or the current limits shall be met. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.

If the reading of the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 s at each measurement frequency; the higher reading shall be recorded with the exception of any brief isolated high reading which shall be ignored.

4.2. Radiated Emission

■ **Test Instruments**

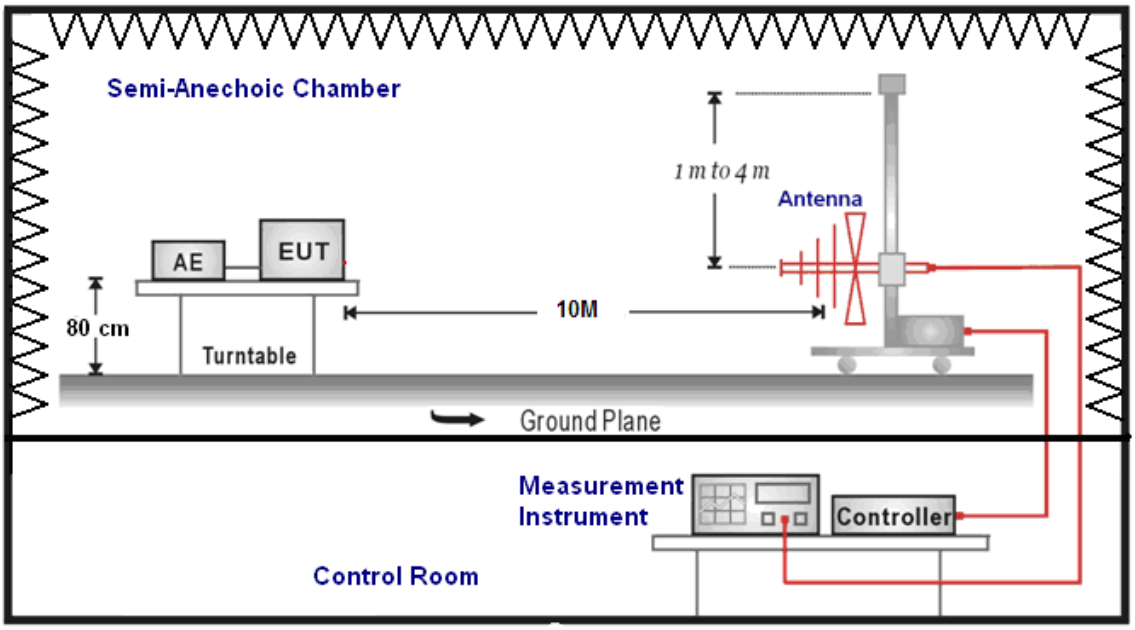
10 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Pre Amplifier	Agilent	8447D	2944A11120	12/31/2015	1 year
Pre Amplifier	Agilent	8447D	2944A11119	01/11/2016	1 year
Test Receiver	R&S	ESCI	100722	10/29/2015	1 year
Test Receiver	R&S	ESCI	101000	12/07/2015	1 year
Broadband Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	416	09/23/2015	1 year
Broadband Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	419	10/28/2015	1 year
Test Site	ATL	TE06	TE06	08/09/2015	1 year

3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Spectrum Analyzer	Agilent	E4445A	MY46181986	05/14/2015	1 year
Amplifier	EM	EM330	060545	11/16/2015	1 year
Amplifier	Agilent	8449B	3008A02237	10/07/2015	1 year
Pre Amplifier	EMCI	EMC012645SE	980289	12/09/2015	1 year
Pre Amplifier	EMCI	EMC2654045	980028	08/13/2015	1 year
RF Pre-selector	Agilent	N9039A	MY46520255	05/14/2015	1 year
Double Ridged Horn Antenna (1~18GHz)	ETS	3117	00152321	08/14/2015	1 year
Pre-Amplifier	ETS	3117-PA	00165297	03/18/2015	1 year
Test Site	ATL	TE09	TE09	05/05/2015	1 year

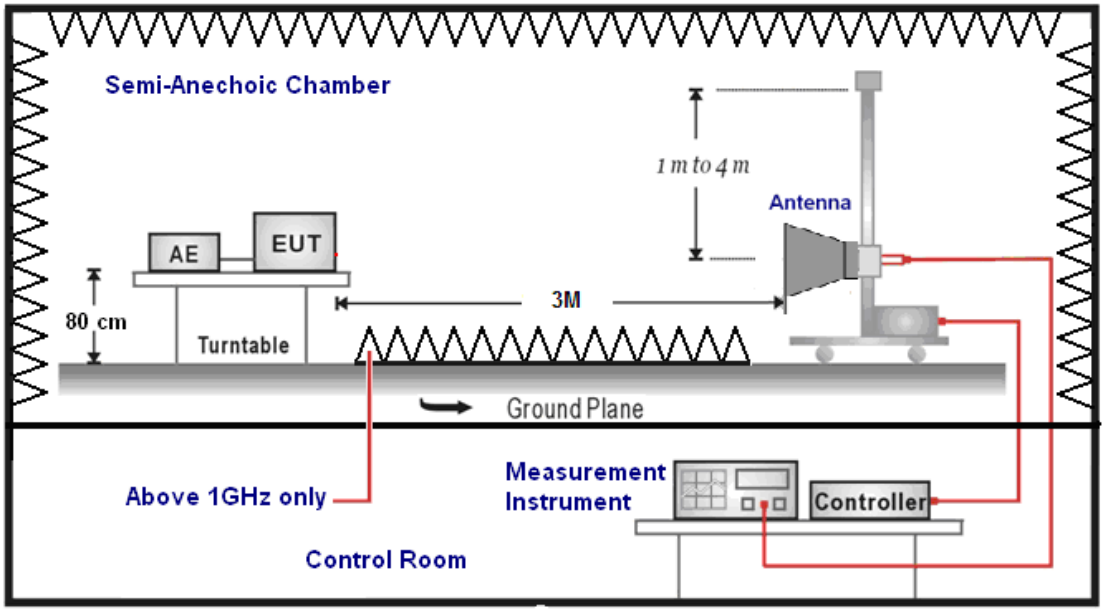
Note: N.C.R. = No Calibration Request.

■ **Setup**

Below 1GHz



Above 1GHz



■ **Test Procedure**

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. When the EUT is floor-standing equipment, it is placed on the ground plane which has a 15 cm non-conductive covering to insulate the EUT from the ground plane.

The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 10 meters for under 1GHz, and 3 meter for above 1GHz if the highest internal source frequency of the EUT is higher than 108 MHz.

The highest internal source of a EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes. If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz. If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz. If the highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz. If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated on radiated measurement.

Radiated emissions were invested over the frequency range from 30MHz to1GHz using a receiver bandwidth of 120 kHz. Radiated was performed at an antenna to EUT distance of 10 meters.

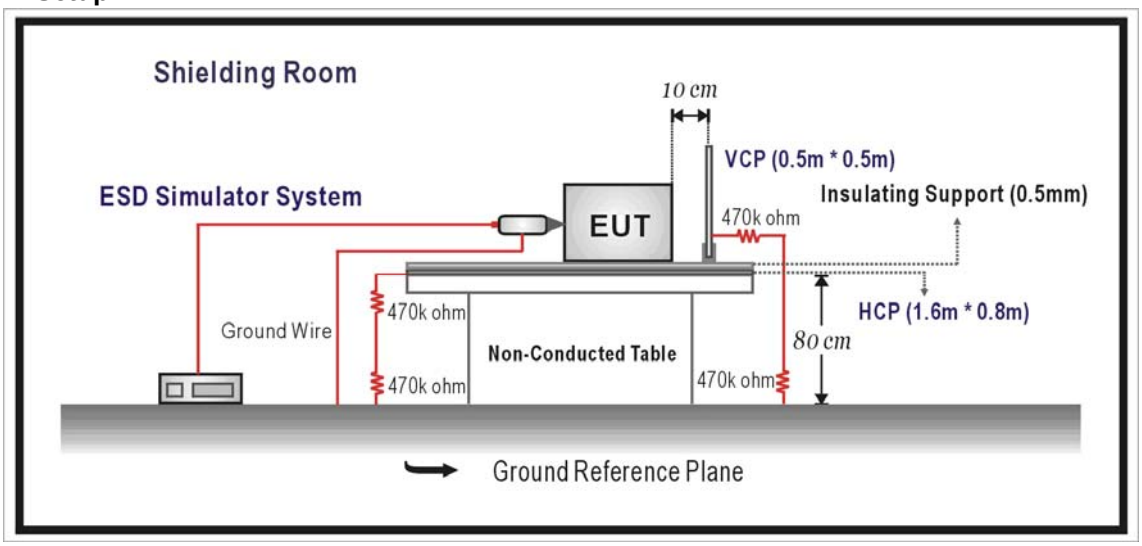
4.3. Electrostatic Discharge (ESD)

■ **Test Instrument**

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Discharge Gun	Noiseken	ESS-2002	ESS05Y4736	05/14/2015	1 year
0.8m Height Wooden Table	N/A	N/A	N/A	N.C.R.	-----
Test Site	ATL	TE04	TE04	N.C.R.	-----

Note: N.C.R. = No Calibration Request.

■ **Setup**



■ Test Procedure

The discharges shall be applied in two ways:

a) Contact discharges to the conductive surfaces and coupling planes:
The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the Horizontal Coupling Plane (HCP). The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test point be available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

b) Air discharges at slots and apertures and insulating surfaces:
On those parts of the EUT where it is not possible to perform contact discharge testing, the equipment should be investigated to identify user accessible points where breakdown may occur. Such points are tested using the air discharge method. This investigation should be restricted to those area normally handled by the user. A minimum of 10 single air discharges shall be applied to the selected test point for each such area.

The basic test procedure was in accordance with EN 61000-4-2:

a) The EUT was located 0.1 m minimum from all side of the HCP (dimensions 1.6m x 0.8m).

b) The support units were located another table 30 cm away from the EUT, but direct support unit was/were located at same location as EUT on the HCP and keep at a distance of 10 cm with EUT.

c) The time interval between two successive single discharges was at least 1 second.

d) Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.

e) Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.

f) At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each HCP opposite the center point of each unit of the EUT and 0.1 meters from the front of the EUT. The long axis of the discharge electrode was in the plane of the HCP and perpendicular to its front edge during the discharge.

g) At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane (VCP) in sufficiently different positions that the four faces of the EUT were completely illuminated. The VCP (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.

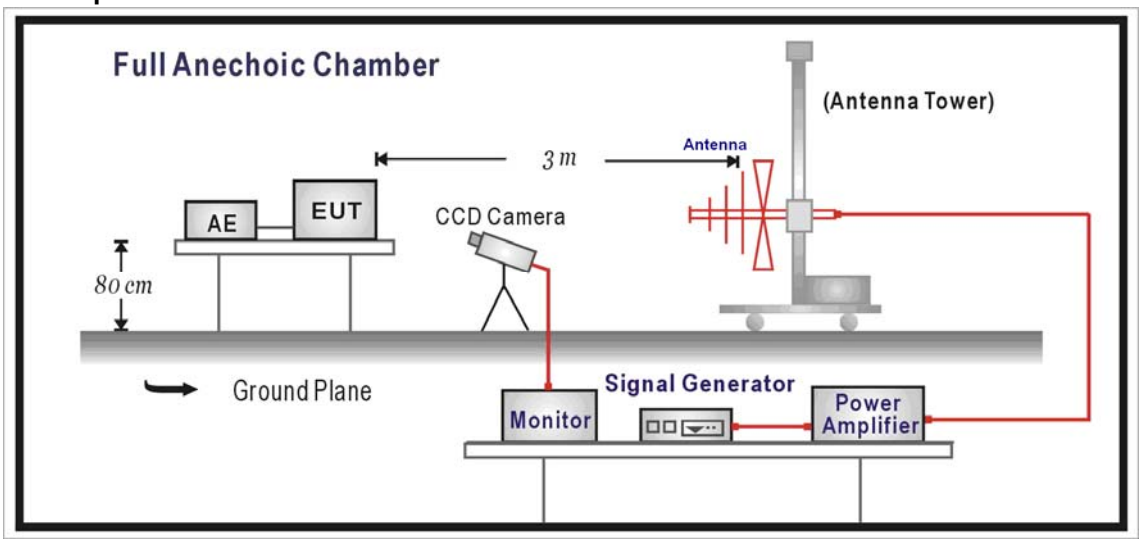
4.4. Radiated Electromagnetic Field (RS)

■ **Test Instrument**

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
SMB 100A SIGNAL GENERATOR	R&S	SMB100A	100724	03/11/2015	1 year
NRP-Z91 POWER SENSOR	R&S	NRP-Z91	100611	07/24/2015	1 year
NRP-Z91 POWER SENSOR	R&S	NRP-Z91	100612	07/24/2015	1 year
NRP POWER METER	R&S	NRP	101591	07/17/2015	1 year
Solid State Power Amplifier	BONN ELEKTRONIK	BLWA 0830-160/100/40D	87050	N.C.R.	-----
Signal Generator Module	R&S	SM300 Module	102209	N.C.R.	-----
Broad-Band Horn Antenna	Schwarzbeck Mess-Elektronik	BBHA 9120	BBHA 9120 E388	N.C.R.	-----
Test Site	ATL	TE07	888009	N.C.R.	-----

Note: N.C.R. = No Calibration Request.

■ **Setup**



■ **Test Procedure**

The test procedure was in accordance with EN 61000-4-3

a) The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.

b) The frequency range is swept from 80-1000 MHz and 1400-2700 MHz, with the signal 80% amplitude modulated with a 1kHz sine-wave. The rate of sweep did not exceed 1.5 x 10^{-3} decade/s, where the frequency range is swept incrementally, the step size was 1% of preceding frequency value.

c) The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

d) The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

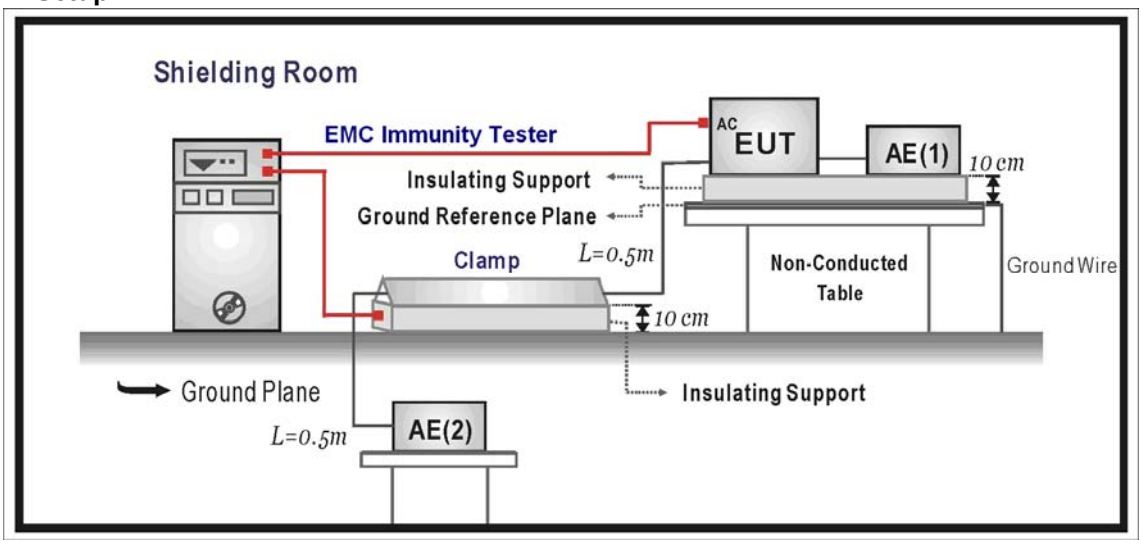
4.5. Electrical Fast Transient/Burst (EFT)

■ **Test Instrument**

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
EMC Immunity Tester	EMC-PARTNER AG	TRANSIENT 2000IN6	952	02/05/2015	1 year
Test Site	ATL	TE08	TE08	N.C.R.	-----

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.
Note: N.C.R. = No Calibration Request.

■ **Setup**



■ **Test Procedure**

a) Both positive and negative polarity discharges were applied.

b) The length of the "hot wire" from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 1 meter.

c) The duration time of each test sequential was 1 minute.

d) The transient/burst waveform was in accordance with EN 61000-4-4, 5/50ns.

4.6. Conducted Susceptibility (CS)

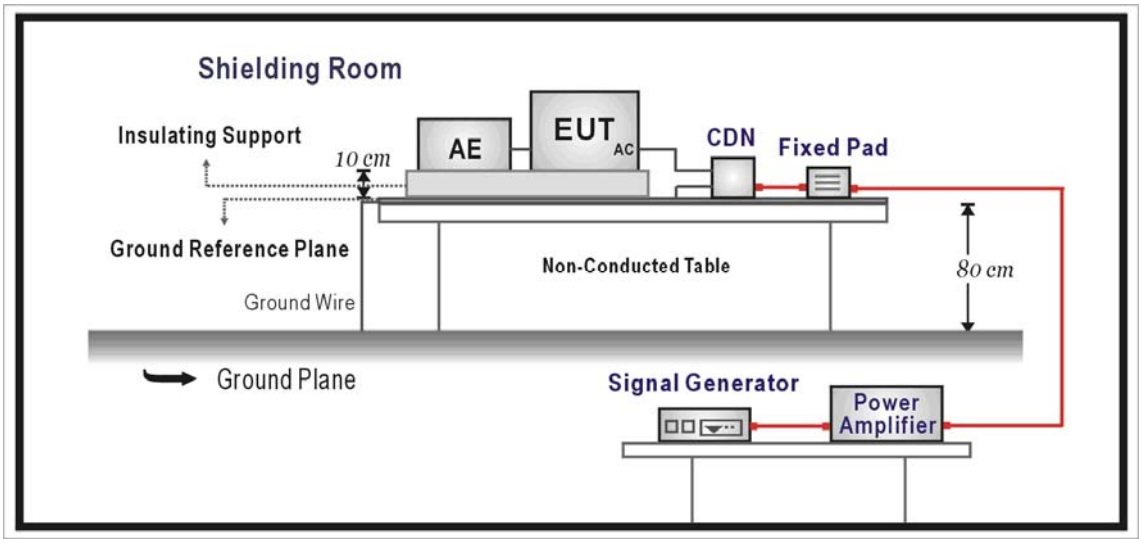
■ **Test Instrument**

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
Signal Line Coupling Decoupling Network	FCC	FCC-801--T2-RJ11	8017	07/21/2015	1 year
Signal Line Coupling Decoupling Network	FCC	FCC-801--T4-RJ45	8018	07/21/2015	1 year
Signal Line Coupling Decoupling Network	FCC	FCC-801-M2/M3-16A 8030	8030	07/21/2015	1 year
EM Injection Clamp	FCC	F-203I-23MM	8576	07/21/2015	1 year
Power Meter	Boonton	4242-01	15205	10/16/2015	1 year
Power Sensor	Boonton	51013A-4E	36160	10/16/2015	1 year
Power Sensor	Boonton	51013A-4E	36161	10/16/2015	1 year
Signal Generator	R&S	SMJ100A	101061	06/12/2015	1 year
Dual Directional Coupler	ar	DC2600M2	329049	07/17/2015	1 year
CDN	TESEQ	CDN T8-10	41245	12/08/2015	1 year
Amplifiers	ar	75A250A	328729	N.C.R.	-----
De-coupling Network	FCC	F-203I-23MM-DCN	8234	N.C.R.	-----
Test Site	ATL	TE08	TE08	N.C.R.	-----

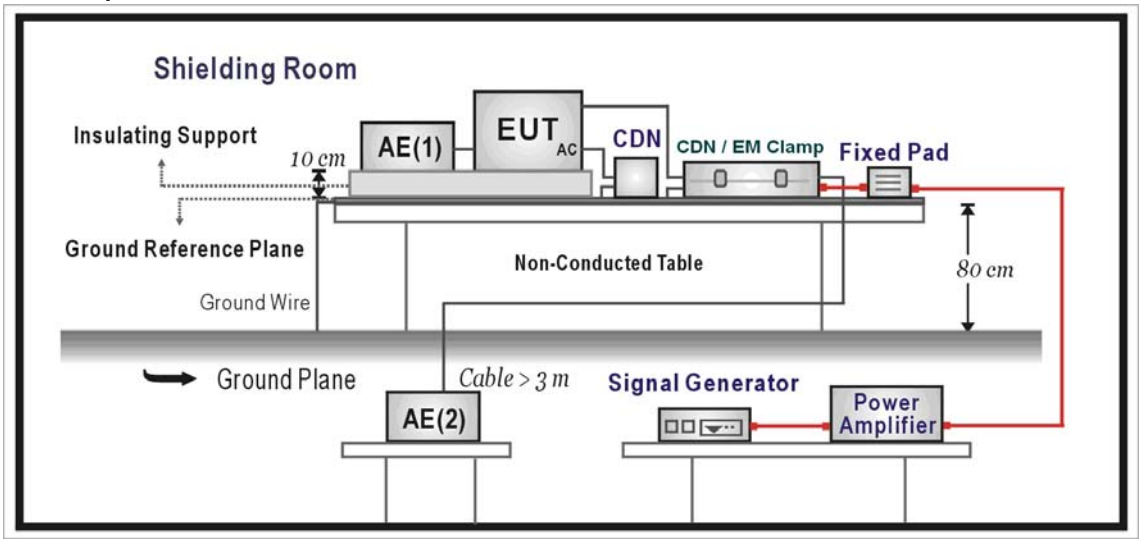
Note: N.C.R. = No Calibration Request.

■ **Setup**

CDN Method



EM Clamp Method



■ Test Procedure

The EUT shall be tested within its intended operating and climatic conditions.

The test shell performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.

The frequency range was swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal was modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate was 1.5 x 10^{-3} decades/s. Where the frequency range is swept incrementally, the step size was 1 % of preceding frequency value from 150 kHz to 80 MHz.

The dwell time at each frequency was less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequency and harmonics or frequencies of dominant interest, was analyzed separately.

Attempts was made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

5 Test Results

5.1. Conducted Emission

■ **Limit**

AC mains power input/output ports limit：

EN 55022				
Frequency (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	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 0.15 to 0.50 MHz.

DC power input/output ports limit：

Frequency (MHz)	Quasi-peak (dBuV)	Average (dBuV)
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

Telecommunication port limits:

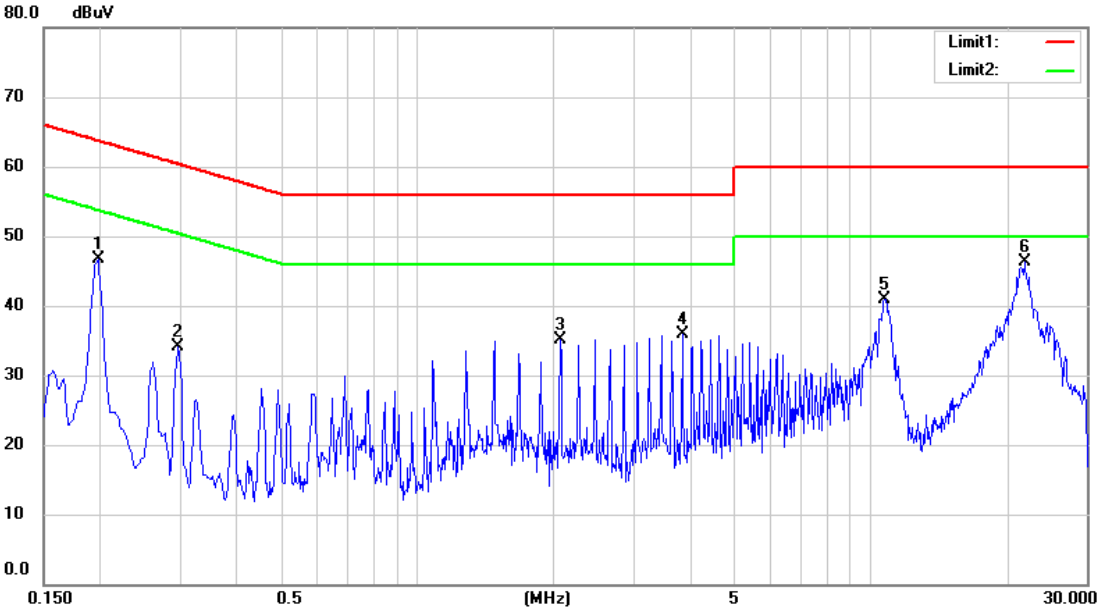
EN 55022								
Requirement (MHz)	Class A Equipment				Class B Equipment			
	Voltage Limit (dBμV)		Current Limit (dBμA)		Voltage Limit (dBμV)		Current Limit (dBμA)	
	QP	Avg.	QP	Avg.	QP	Avg.	QP	Avg.
0.15 to 0.50	97 to 87	84 to 74	53 to 43	40 to 30	84 to 74	74 to 64	40 to 30	30 to 20
0.50 to 30	87	74	43	30	74	64	30	20

Limits for conducted emissions of equipment intended to be used in telecommunication centres only:

Frequency (MHz)	Quasi-peak (dBuV)	Average (dBuV)
0.15 - 0.5	79	66
0.50 - 30.0	73	60

■ **Test Result**

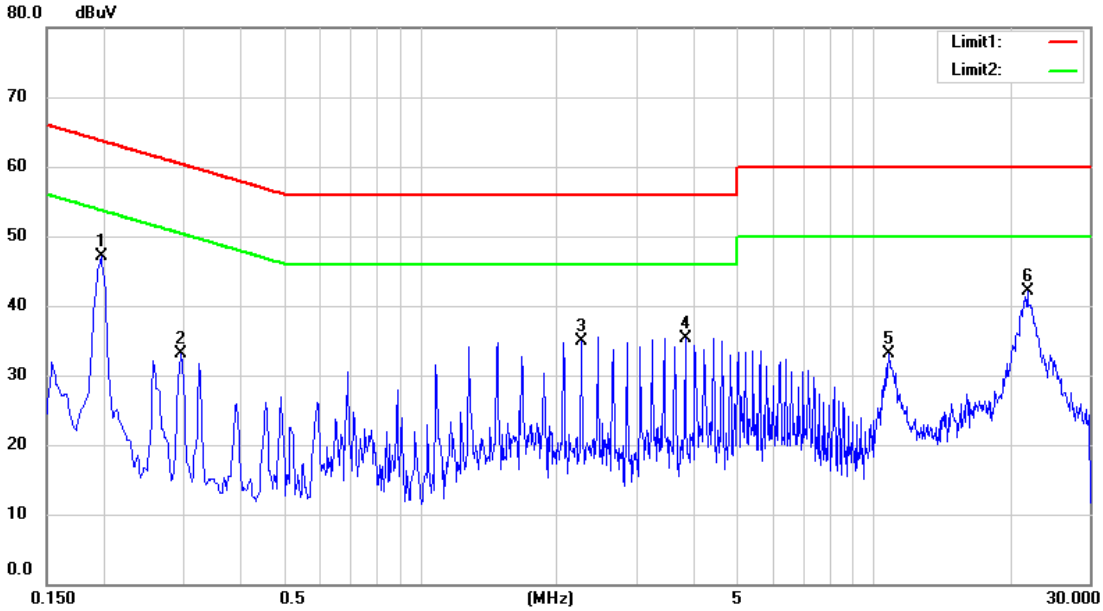
Standard:	EN 55022	Line:	L1
Test item:	Conducted Emission	Power:	AC 230V/50Hz
Model Number:	FK418BTS	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Test Mode:	Mode 2	Date:	2015/02/17
		Test By:	Terry Liao
Description:			



No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.1980	35.95	31.61	9.68	45.63	41.29	63.69	53.69	-18.06	-12.40	Pass
2	0.2980	22.73	22.26	9.69	32.42	31.95	60.30	50.30	-27.88	-18.35	Pass
3	2.0740	24.10	19.82	9.77	33.87	29.59	56.00	46.00	-22.13	-16.41	Pass
4	3.8540	24.05	17.75	9.83	33.88	27.58	56.00	46.00	-22.12	-18.42	Pass
5	10.7340	28.90	19.98	9.99	38.89	29.97	60.00	50.00	-21.11	-20.03	Pass
6	21.9180	33.10	24.01	10.06	43.16	34.07	60.00	50.00	-16.84	-15.93	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

Standard:	EN 55022	Line:	N
Test item:	Conducted Emission	Power:	AC 230V/50Hz
Model Number:	FK418BTS	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Test Mode:	Mode 2	Date:	2015/02/17
		Test By:	Terry Liao
Description:			



No.	Frequency (MHz)	QP reading (dBuV)	AVG reading (dBuV)	Correction factor (dB)	QP result (dBuV)	AVG result (dBuV)	QP limit (dBuV)	AVG limit (dBuV)	QP margin (dB)	AVG margin (dB)	Remark
1	0.1980	36.70	33.04	9.65	46.35	42.69	63.69	53.69	-17.34	-11.00	Pass
2	0.2980	21.46	20.87	9.66	31.12	30.53	60.30	50.30	-29.18	-19.77	Pass
3	2.2700	24.12	22.71	9.75	33.87	32.46	56.00	46.00	-22.13	-13.54	Pass
4	3.8500	25.21	19.29	9.81	35.02	29.10	56.00	46.00	-20.98	-16.90	Pass
5	10.7980	20.60	13.26	10.00	30.60	23.26	60.00	50.00	-29.40	-26.74	Pass
6	21.8540	27.80	19.03	10.17	37.97	29.20	60.00	50.00	-22.03	-20.80	Pass

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).
2. Correction factor (dB) = Cable loss (dB) + L.I.S.N. factor (dB).

5.2. Radiated Emission

■ **Limit**

Frequency (MHz)	dBuV/m (Distance 10m)	
	Class A	Class B
30 ~ 230	40	30
230 ~ 1000	47	37

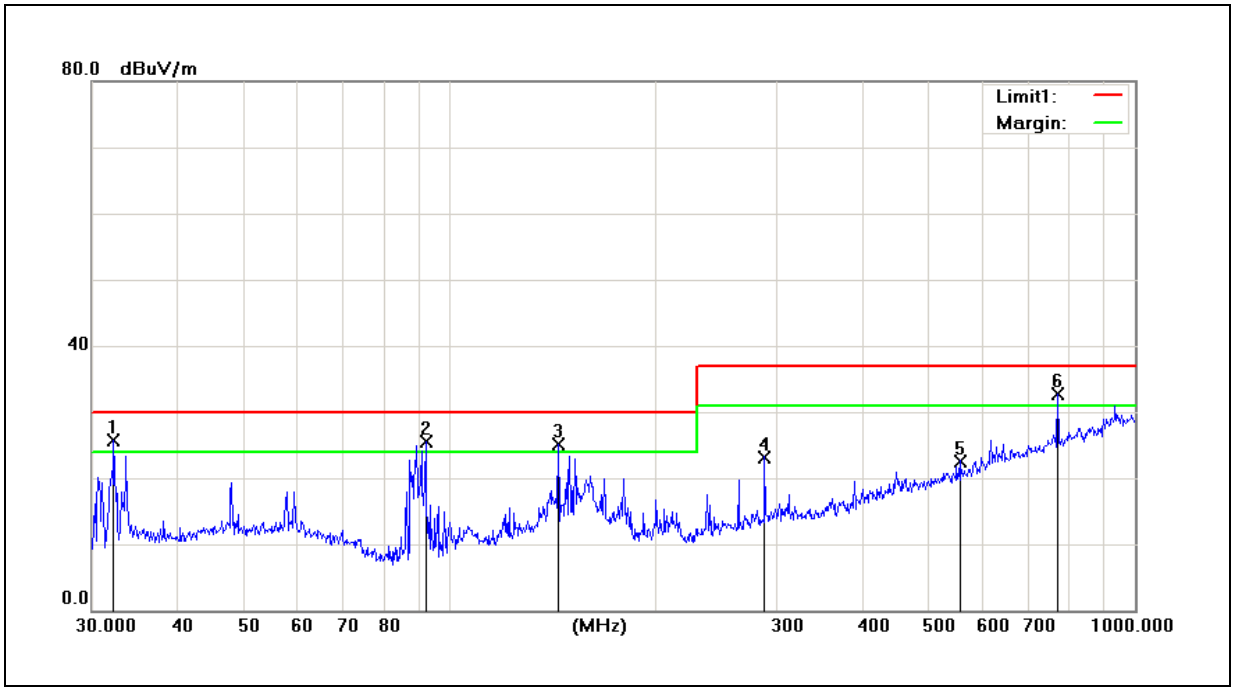
Note: The lower limit shall apply at the transition frequencies.

Frequency (MHz)	dBuV/m (Distance 3m)			
	Class A		Class B	
	Average	Peak	Average	Peak
1000 ~ 3000	56	76	50	70
3000 ~ 6000	60	80	54	74

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

■ **Test Result**

Standard:	EN 55022	Test Distance:	10m
Test item:	Radiated Emission	Power:	AC 230V/50Hz
Model Number:	FK418BTS	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Test Mode:	Mode 2 (30MHz~1GHz)	Date:	2015/02/19
Ant.Polar.:	Horizontal	Test By:	Terry Liao
Description:			

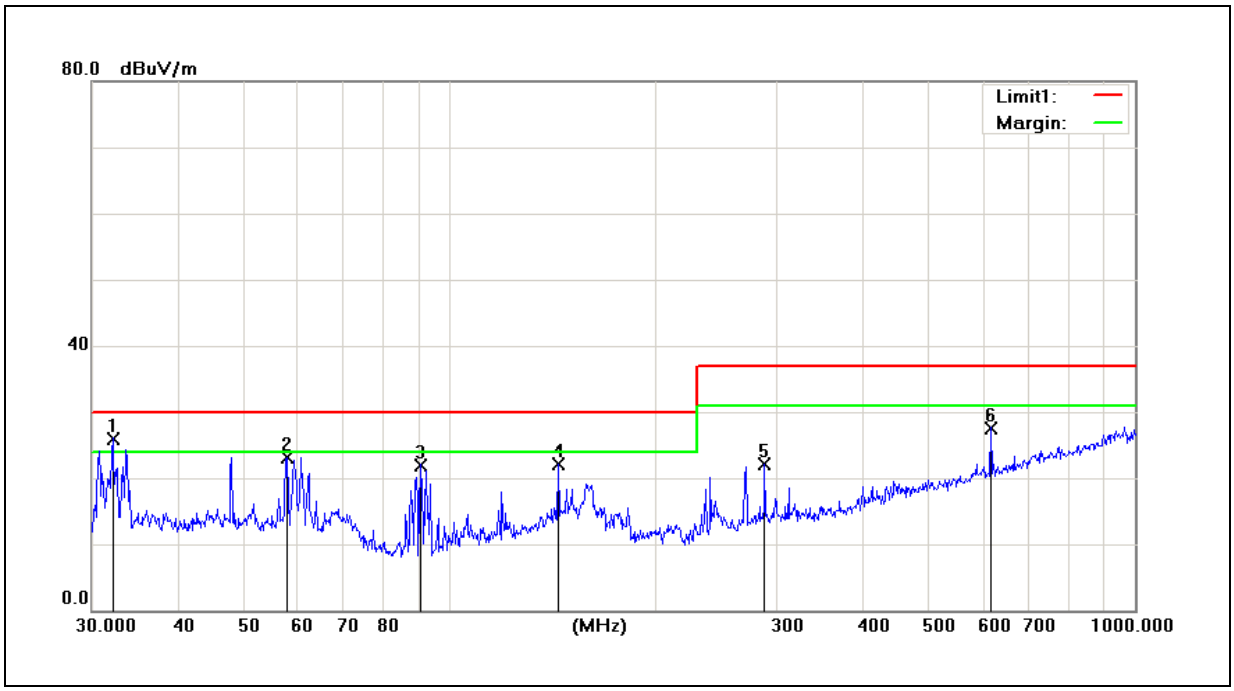


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	32.2925	44.52	-18.82	25.70	30.00	-4.30	400	62	QP
2	92.1388	47.85	-22.25	25.60	30.00	-4.40	400	315	QP
3	143.8295	41.63	-16.53	25.10	30.00	-4.90	400	325	QP
4	287.9904	38.35	-15.15	23.20	37.00	-13.80	400	177	QP
5	554.8254	30.92	-8.32	22.60	37.00	-14.40	364	0	QP
6	771.4486	36.80	-4.10	32.70	37.00	-4.30	400	33	QP

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

Standard:	EN 55022	Test Distance:	10m
Test item:	Radiated Emission	Power:	AC 230V/50Hz
Model Number:	FK418BTS	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Test Mode:	Mode 2 (30MHz~1GHz)	Date:	2015/02/19
Ant.Polar.:	Vertical	Test By:	Terry Liao
Description:			

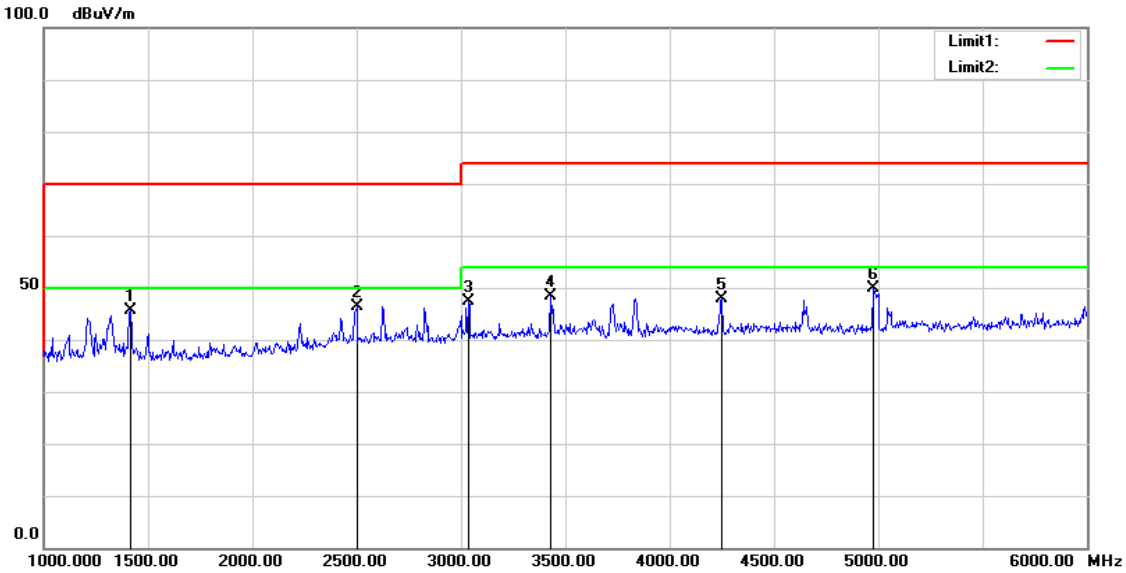


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	32.1795	43.91	-17.91	26.00	30.00	-4.00	100	344	QP
2	57.7962	40.01	-16.91	23.10	30.00	-6.90	101	0	QP
3	90.5374	43.93	-21.93	22.00	30.00	-8.00	100	325	QP
4	143.8295	37.72	-15.62	22.10	30.00	-7.90	100	263	QP
5	287.9904	36.49	-14.39	22.10	37.00	-14.90	100	268	QP
6	616.3718	34.20	-6.60	27.60	37.00	-9.40	100	359	QP

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

Standard:	EN 55022	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 230V/50Hz
Model Number:	FK418BTS	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Test Mode:	Mode 2 (1GHz~6GHz)	Date:	2015/02/18
Ant.Polar.:	Horizontal	Test By:	Terry Liao
Description:			

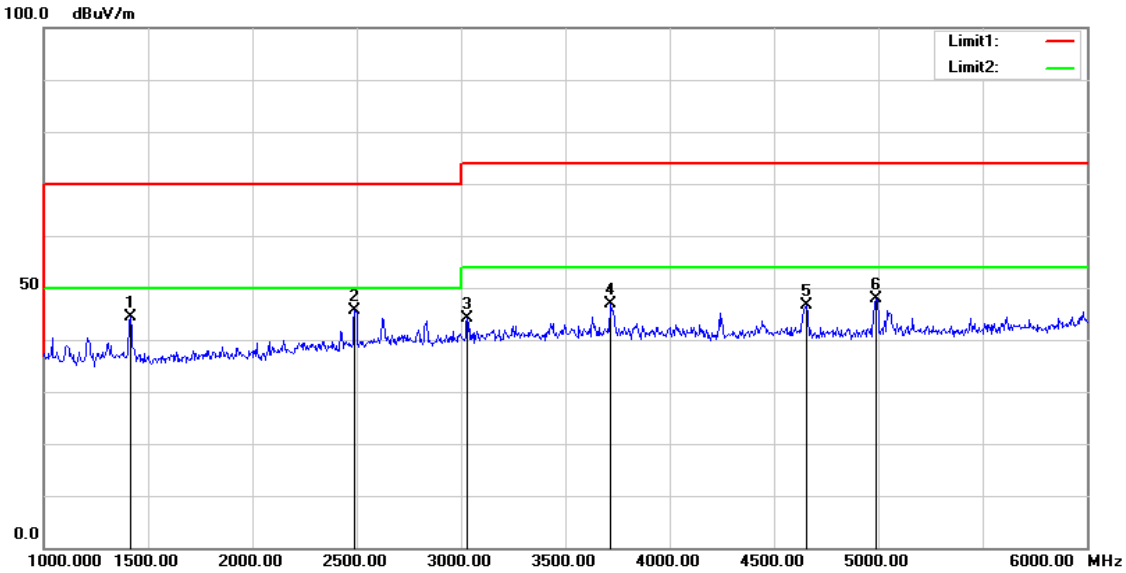


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	1415.000	61.48	-15.87	45.61	70.00	-24.39	100	125	peak
2	2500.000	57.34	-10.97	46.37	70.00	-23.63	100	194	peak
3	3035.000	56.82	-9.42	47.40	74.00	-26.60	100	139	peak
4	3430.000	56.74	-8.45	48.29	74.00	-25.71	100	125	peak
5	4250.000	54.28	-6.36	47.92	74.00	-26.08	100	148	peak
6	4975.000	54.65	-4.76	49.89	74.00	-24.11	100	148	peak

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

Standard:	EN 55022	Test Distance:	3m
Test item:	Radiated Emission	Power:	AC 230V/50Hz
Model Number:	FK418BTS	Temp.(℃)/Hum.(%RH):	26(℃)/60%RH
Test Mode:	Mode 2 (1GHz~6GHz)	Date:	2015/02/18
Ant.Polar.:	Vertical	Test By:	Terry Liao
Description:			



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (°)	Remark
1	1415.000	60.16	-15.87	44.29	70.00	-25.71	100	21	peak
2	2490.000	56.65	-11.04	45.61	70.00	-24.39	100	199	peak
3	3030.000	53.51	-9.43	44.08	74.00	-29.92	100	7	peak
4	3715.000	54.33	-7.48	46.85	74.00	-27.15	100	103	peak
5	4655.000	51.87	-5.34	46.53	74.00	-27.47	100	171	peak
6	4990.000	52.71	-4.73	47.98	74.00	-26.02	100	185	peak

Note: 1. Result (dBuV) = Correction factor (dB) + Reading(dBuV).

2. Correction factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) – Pre-Amplifier gain (dB).

5.3. Electrostatic Discharge (ESD)

■ **Test Specification**

EN 61000-4-2			
Environmental Phenomena	Units	Test Specification	Performance Criterion
Enclosure Port			
Electrostatic Discharge	kV (Charge Voltage)	±8 Air Discharge ±4 Contact Discharge	B

■ **Test Result**

Model Number	FK418BTS		
Test Item	Electrostatic Discharge		
Test Mode	Mode 2		
Date of Test	2016/03/01	Test Site	TE04

Air Discharge										
Test Points	Test Levels						Results		
	± 2 kV	Performance Criterion	± 4 kV	Performance Criterion	± 8 kV	Performance Criterion	Pass	Fail	Observation
USB power	☒	☒A ☐B	☒	☒A ☐B	☒	☒A ☐B	☒	☐	---
CASE	☒	☒A ☐B	☒	☒A ☐B	☒	☒A ☐B	☒	☐	---
LED	☒	☒A ☐B	☒	☒A ☐B	☒	☒A ☐B	☒	☐	---
Power button	☒	☒A ☐B	☒	☒A ☐B	☒	☒A ☐B	☒	☐	---

Contact Discharge										
Test Points	Test Levels						Results		
	± 2 kV	Performance Criterion	± 4 kV	Performance Criterion	± 8 kV	Performance Criterion	Pass	Fail	Observation
---	☐	☐A ☐B	☐	☐A ☐B	☐	☐A ☐B	☐	☐	---

For the tested points to EUT, please refer to attached page.
(Blue arrow mark for Air Discharge and red arrow mark for Contact Discharge)

Discharge To Horizontal Coupling Plane									
Side of EUT	Test Levels				Results				
	± 2 kV	± 4 kV	± 6 kV	± 8 kV	Pass	Fail	Performance Criterion		Observation
Front	☒	☒	☐	☐	☒	☐	☒A	☐B	---
Back	☒	☒	☐	☐	☒	☐	☒A	☐B	---
Left	☒	☒	☐	☐	☒	☐	☒A	☐B	---
Right	☒	☒	☐	☐	☒	☐	☒A	☐B	---

Discharge To Vertical Coupling Plane									
Side of EUT	Test Levels				Results				
	± 2 kV	± 4 kV	± 6 kV	± 8 kV	Pass	Fail	Performance Criterion		Observation
Front	☒	☒	☐	☐	☒	☐	☒A	☐B	---
Back	☒	☒	☐	☐	☒	☐	☒A	☐B	---
Left	☒	☒	☐	☐	☒	☐	☒A	☐B	---
Right	☒	☒	☐	☐	☒	☐	☒A	☐B	---

Note: There was no change compared with initial operation during the test.

5.4. Radiated Electromagnetic Field (RS)

■ **Test Specification**

EN 61000-4-3			
Environmental Phenomena	Units	Test Specification	Performance Criterion
Enclosure Port			
Test Frequency Range RF Electromagnetic Field Amplitude Modulated	MHz V/m (Un-modulated, rms) % AM (1kHz)	80-1000 3 80	A
	MHz V/m (Un-modulated, rms) % AM (1kHz)	1400-2700 3 80	A

EUT tested in accordance with the specifications given by the standard of EN 61000-4-3.

Step : 1%

Step time : 3 Second

■ **Test Result**

Model Number	FK418BTS					
Test Item	Radiated Susceptibility					
Test Mode	Mode 2					
Date of Test	2016/02/22				Test Site	TE07
Min. level of Performance	Bluetooth	EUT link to Notebook by Bluetooth, engineer should be observed, the Data loss or not when active Bluetooth function.				
Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Performance Criterion	Test Result	Observation
80 ~ 1000	H / V	0	3	☒A ☐B	PASS	---
80 ~ 1000	H / V	90	3	☒A ☐B	PASS	---
80 ~ 1000	H / V	180	3	☒A ☐B	PASS	---
80 ~ 1000	H / V	270	3	☒A ☐B	PASS	---
1400 ~ 2700	H / V	0	3	☒A ☐B	PASS	---
1400 ~ 2700	H / V	90	3	☒A ☐B	PASS	---
1400 ~ 2700	H / V	180	3	☒A ☐B	PASS	---
1400 ~ 2700	H / V	270	3	☒A ☐B	PASS	---

Note 1: The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

Criterion A: Operate as intended during and after the test

Criterion B: Operate as intended after the test

Criterion C: Loss/Error of function

5.5. Electrical Fast Transient/Burst (EFT)

■ **Test Specification**

EN 61000-4-4				
Item	Environmental Phenomena	Units	Test Specification	Performance Criterion
I/O and communication ports				
	Fast Transients Common Mode	kV (Peak) Tr/Th ns Rep. Frequency kHz	±0.5 5/50 5	B
Input DC Power Ports				
	Fast Transients Common Mode	kV (Peak) Tr/Th ns Rep. Frequency kHz	±0.5 5/50 5	B
Input AC Power Ports				
	Fast Transients Common Mode	kV (Peak) Tr/Th ns Rep. Frequency kHz	±1 5/50 5	B

■ **Test Result**

Model Number	FK418BTS						
Test Item	Electrical Fast Transient/Burst						
Test Mode	Mode 2						
Date of Test	2016/03/01					Test Site	TE08
Test Point	Polarity	Test Level (kV)	Inject Time (Second)	Inject Method	Performance Criterion	Test Result	Observation
L	±	1	60	Direct	☒A ☐B	PASS	---
N	±	1	60	Direct	☒A ☐B	PASS	---
PE	±	1	60	Direct	☒A ☐B	PASS	---
L+N	±	1	60	Direct	☒A ☐B	PASS	---
L+PE	±	1	60	Direct	☒A ☐B	PASS	---
N+PE	±	1	60	Direct	☒A ☐B	PASS	---
L+N+PE	±	1	60	Direct	☒A ☐B	PASS	---

Note 1: The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

Criterion A: Operate as intended during and after the test

Criterion B: Operate as intended after the test

Criterion C: Loss/Error of function

5.6. Conducted Susceptibility (CS)

■ **Test Specification**

EN 61000-4-6			
Environmental Phenomena	Units	Test Specification	Performance Criterion
Signal Ports and Telecommunication Ports			
Radio-Frequency Continuous Conducted	MHz	0.15-80	A
	V (rms, Un-modulated)	3	
	% AM (1kHz)	80	
Input DC Power Ports			
Radio-Frequency Continuous Conducted	MHz	0.15-80	A
	V (rms, Un-modulated)	3	
	% AM (1kHz)	80	
Input AC Power Ports			
Radio-Frequency Continuous Conducted	MHz	0.15-80	A
	V (rms, Un-modulated)	3	
	% AM (1kHz)	80	

EUT tested in accordance with the specifications given by the standard of EN 61000-4-6.

Step : 1%

Step time : 3 Second

■ **Test Result**

Model Number	FK418BTS					
Test Item	Conducted Susceptibility					
Test Mode	Mode 2					
Date of Test	2016/03/01				Test Site	TE08
Min. level of Performance	Bluetooth	EUT link to Notebook by Bluetooth, engineer should be observed, the Data loss or not when active Bluetooth function.				
Frequency Band (MHz)	Field Strength (Vrms)	Inject Port	Inject Method	Performance Criterion	Test Result	Observation
0.15 ~ 80	3	AC Mains	CDN-M3	☒A ☐B	PASS	---

Note 1: The testing performed is from lowest level up to the highest level as required by standard, but only highest level is shown on the report.

Criterion A: Operate as intended during and after the test

Criterion B: Operate as intended after the test

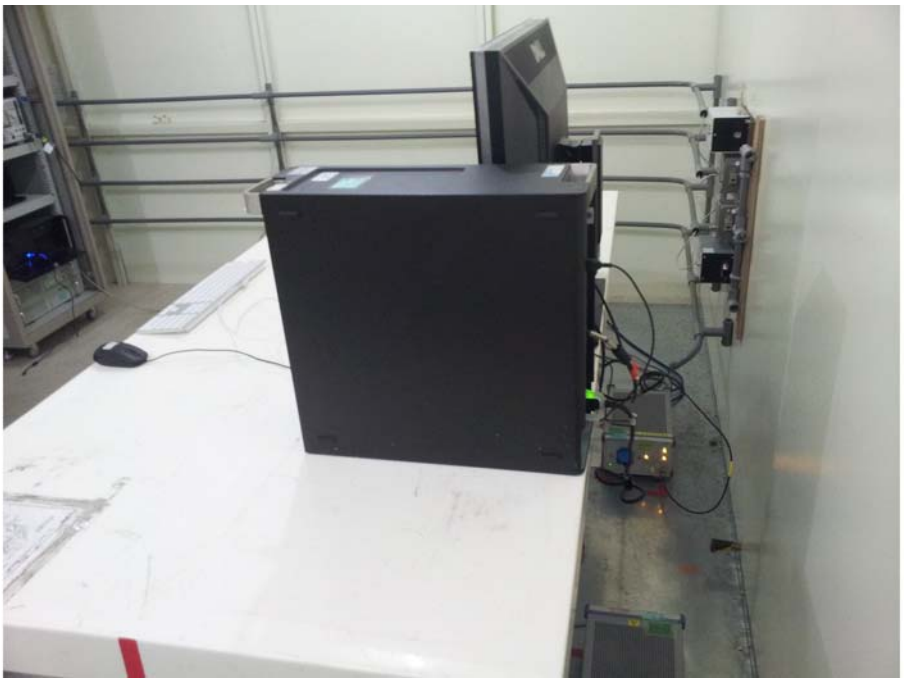
Criterion C: Loss/Error of function

6 Test Setup Photo

6.1. Conducted Emission

Test Mode:	Mode 2
Description:	Front View

Description:	Back View



6.2. Radiated Emission

Test Mode:	Mode 2
Description:	Below 1GHz _ Front View

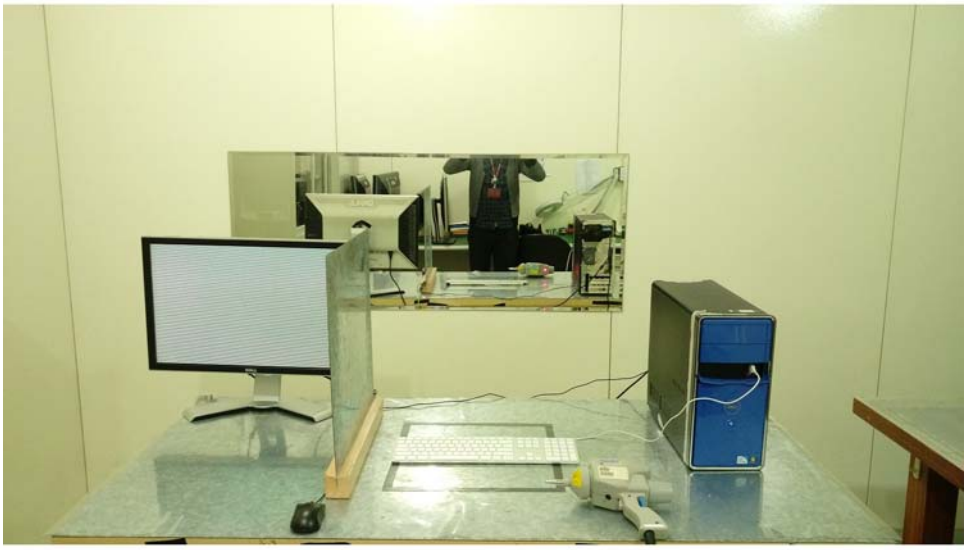
Description:	Below 1GHz _ Back View

Test Mode:	Mode 2
Description:	Above 1GHz _ Front View

Description:	Above 1GHz _ Back View

6.3. Electrostatic Discharge (ESD)

Test Mode:	Mode 2
Description:	Front View of ESD Test

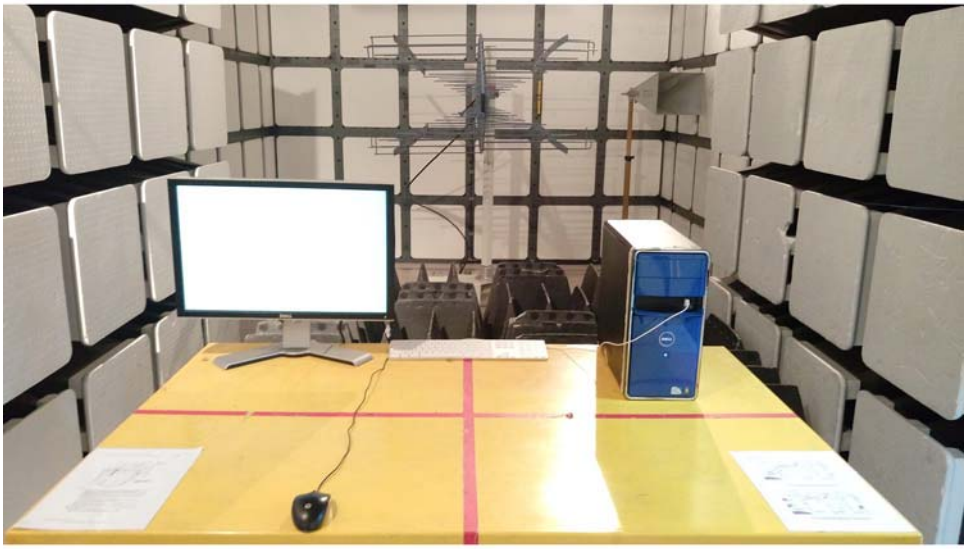


Description:	Close View of ESD Test

Test Mode:	Mode 2
Description:	Close View of ESD Test

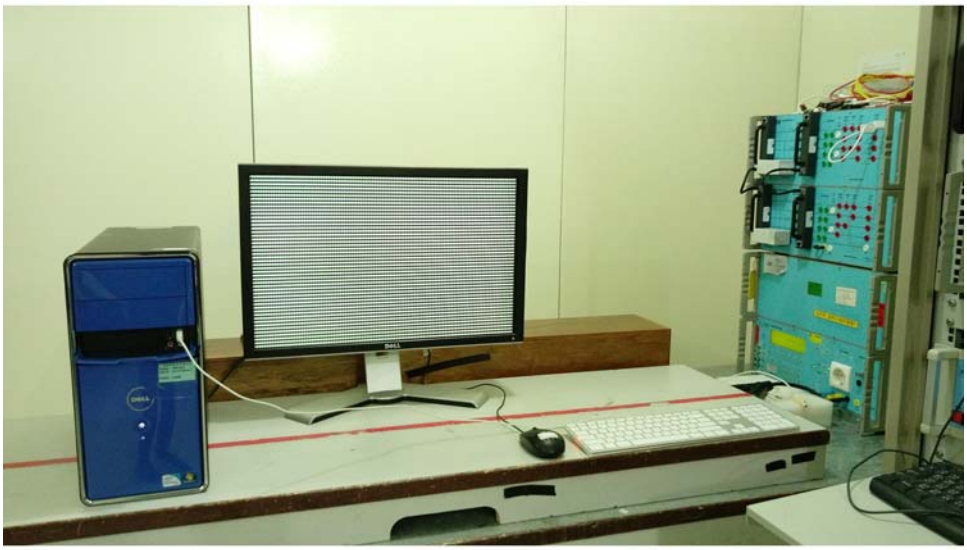
6.4. Radiated Electromagnetic Field (RS)

Test Mode:	Mode 2



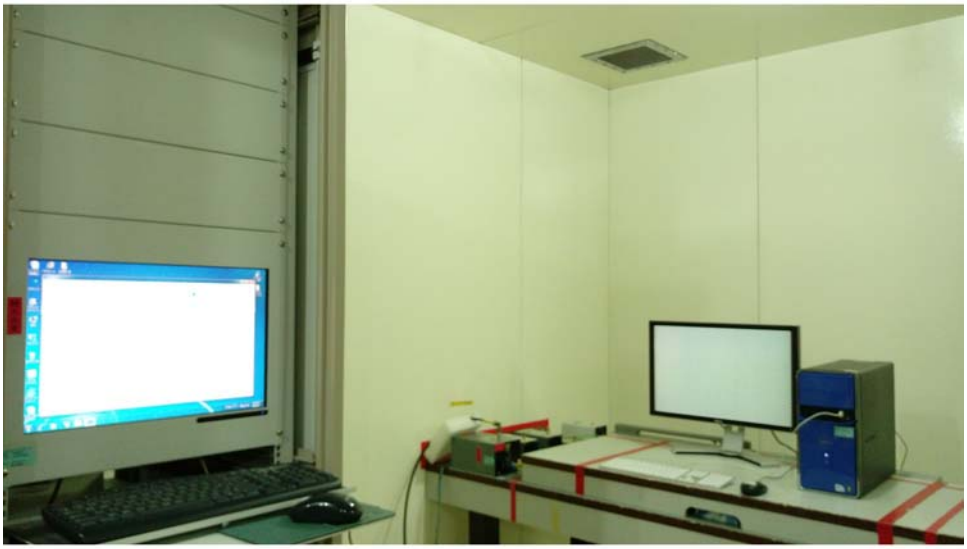
6.5. Electrical Fast Transient/Burst (EFT)

Test Mode:	Mode 2



6.6. Conducted Susceptibility (CS)

Test Mode:	Mode 2



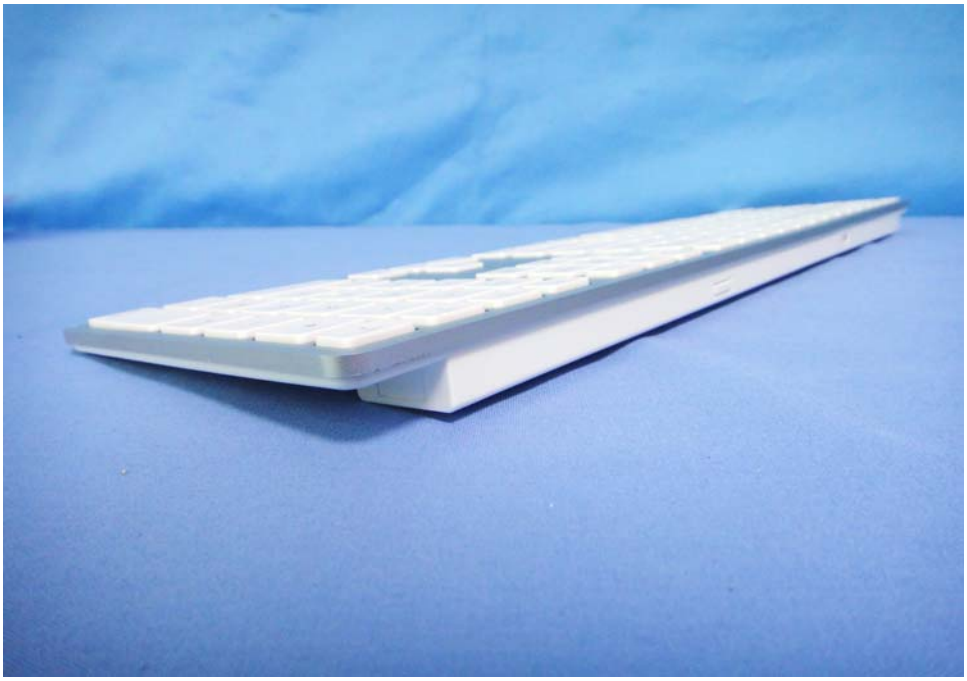
7 EUT Photograph

(1) EUT Photo

(2) EUT Photo

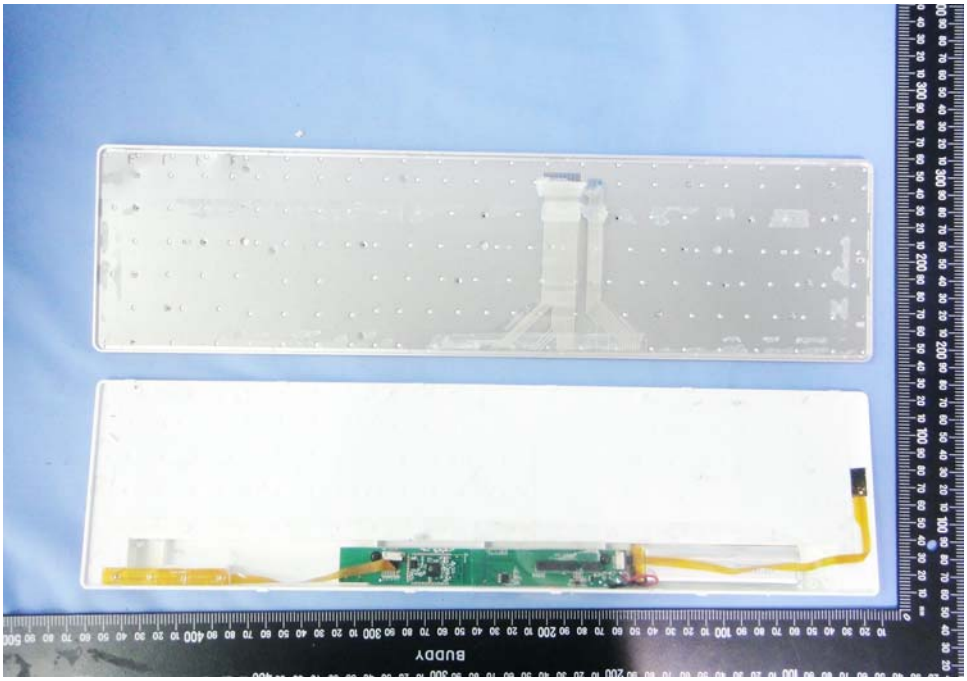
(3) EUT Photo

(4) EUT Photo

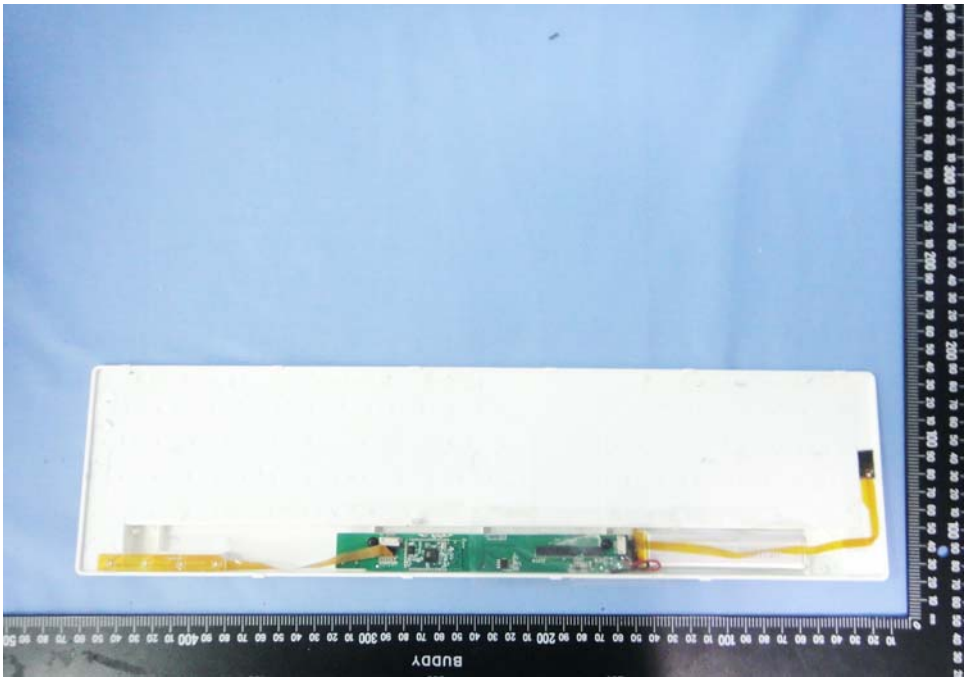


(5) EUT Photo

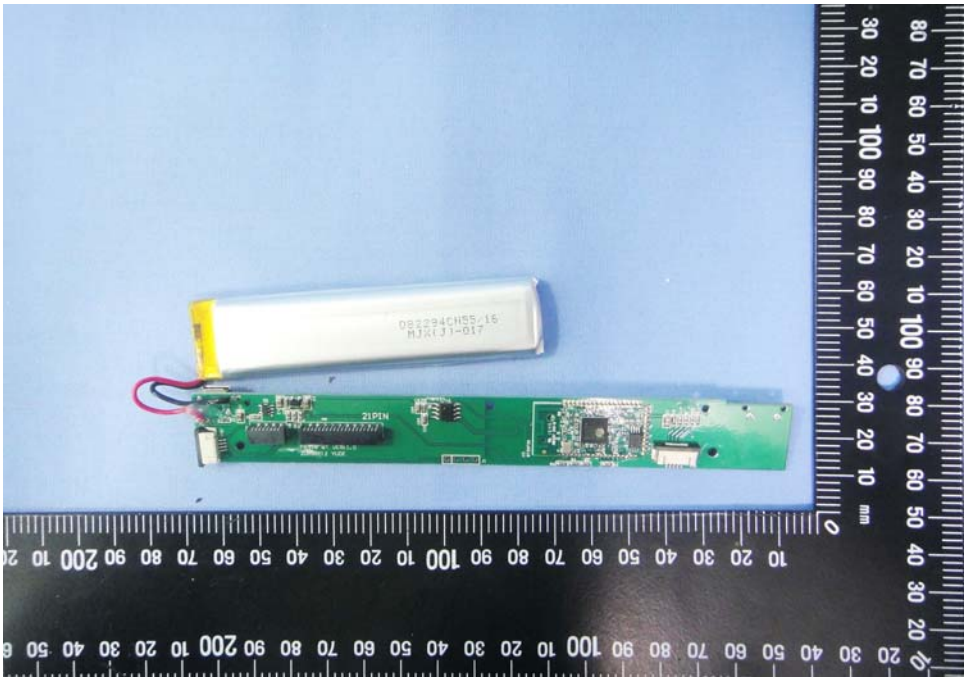
(6) EUT Photo



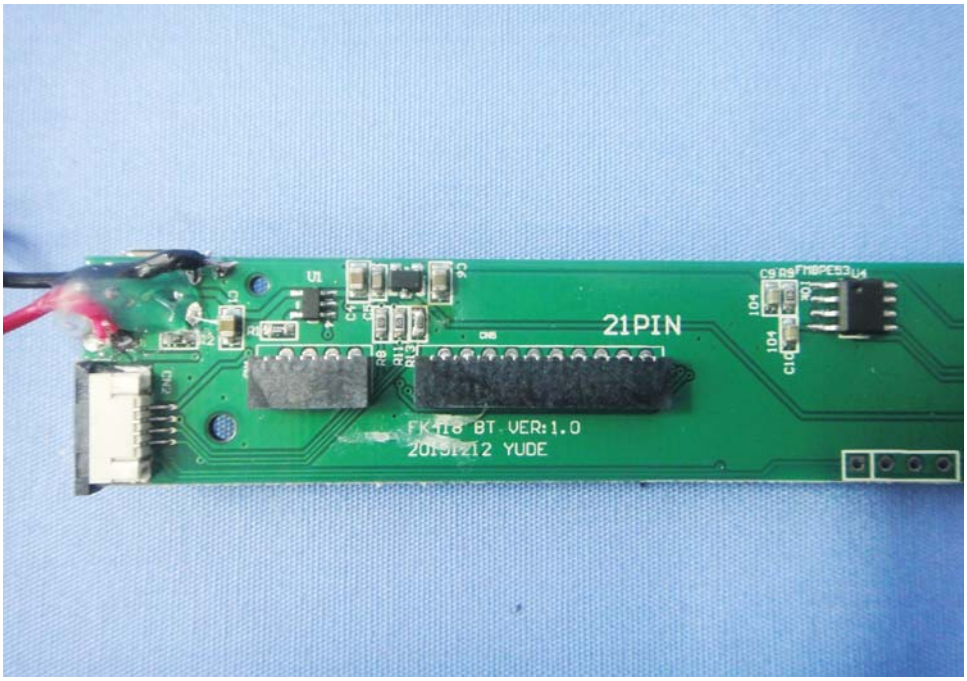
(7) EUT Photo



(8) EUT Photo



(9) EUT Photo



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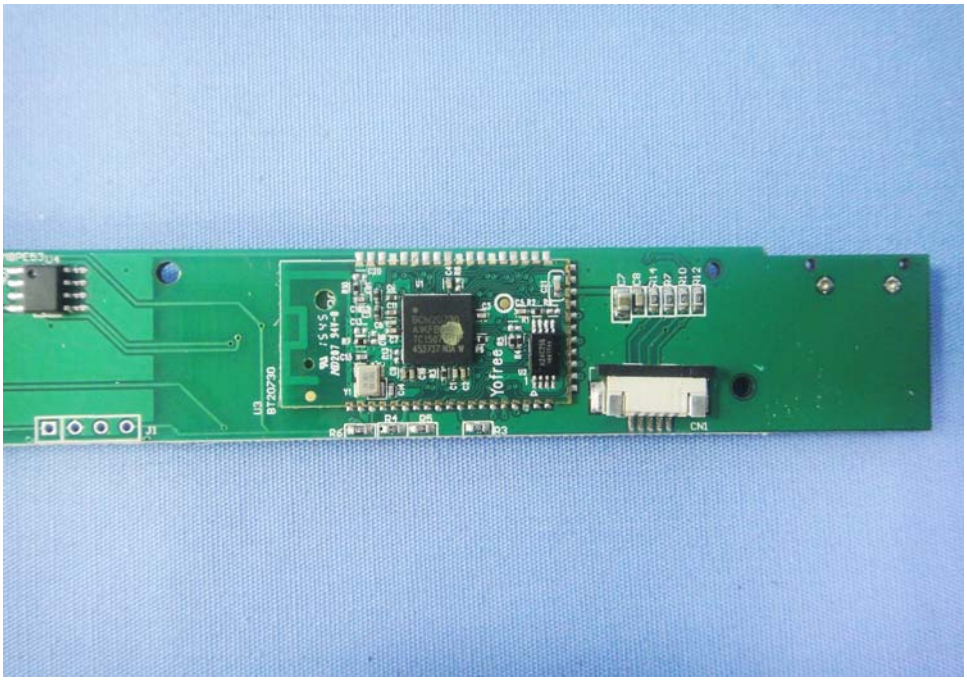

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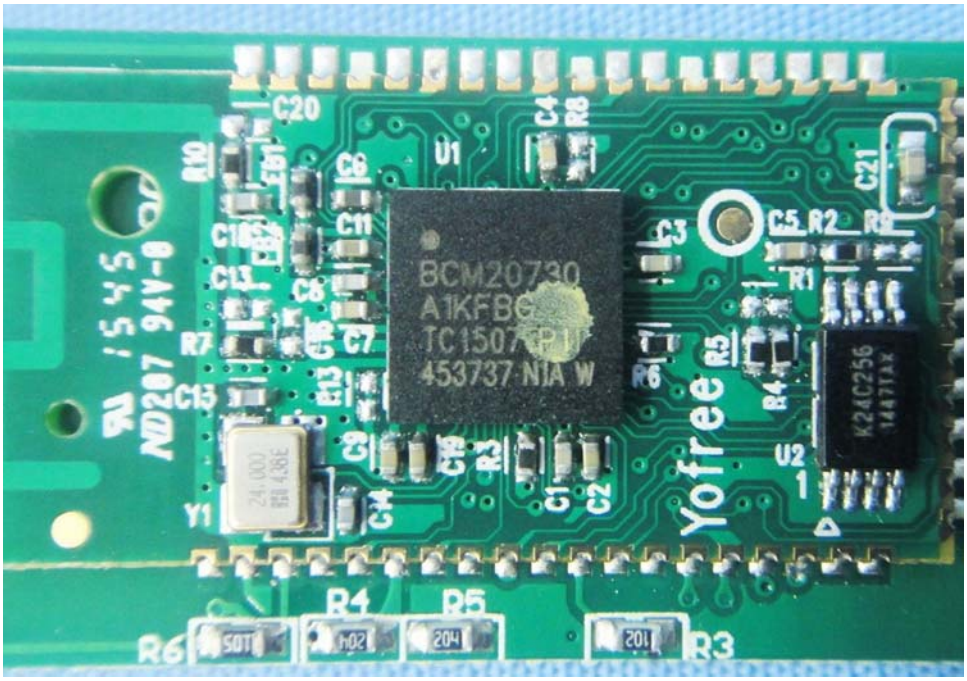

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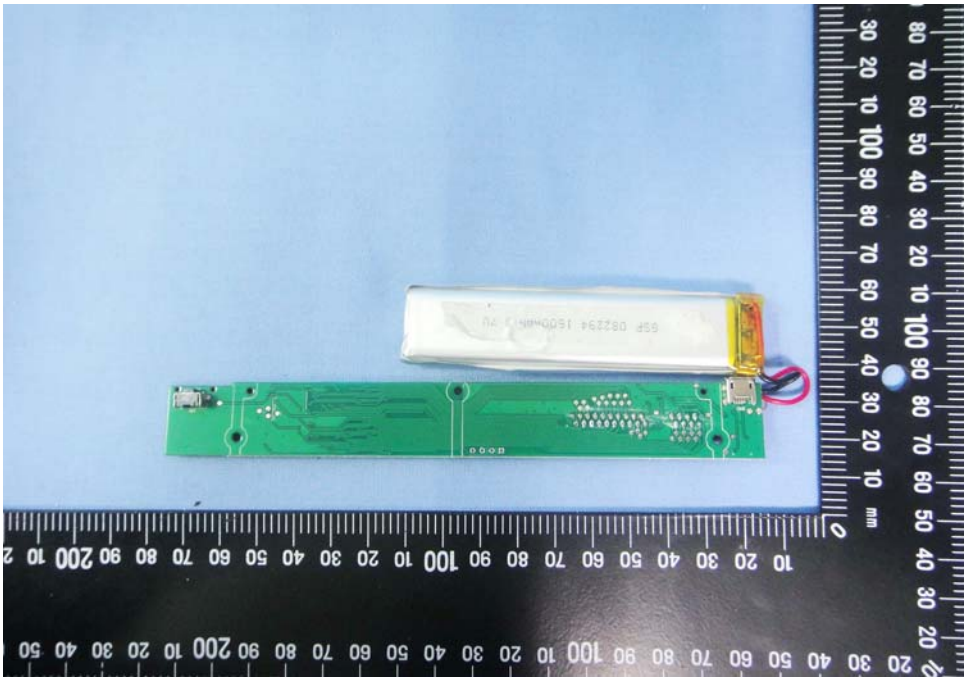
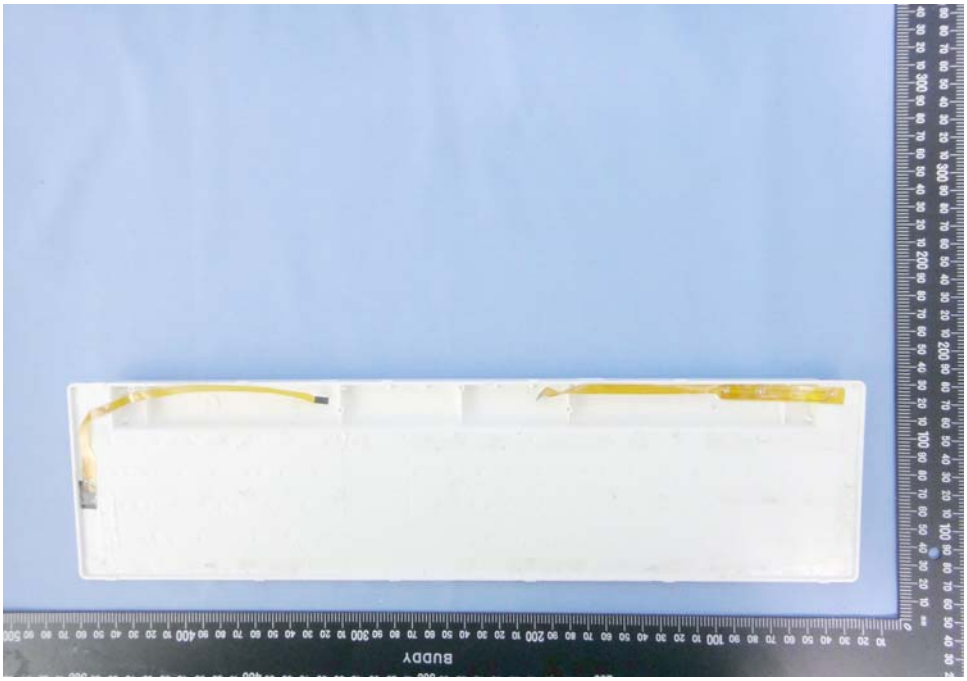


(13)EUT Photo

(14)EUT Photo

(15)EUT Photo



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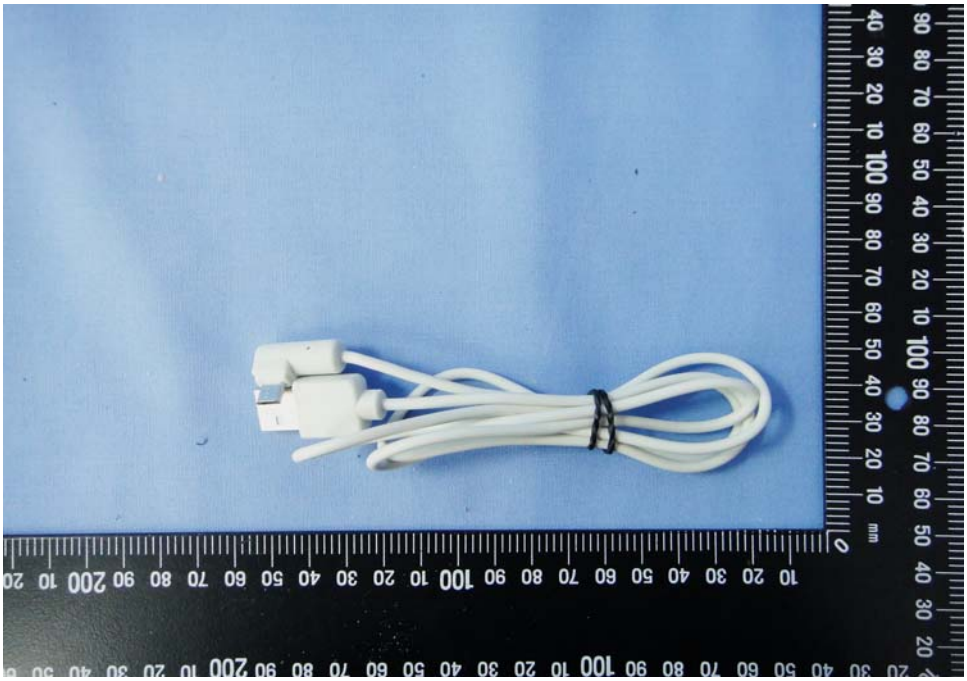

(17)EUT Photo