Test Report No. 7191034619-EEC12/03
dated 23 Jul 2012

PSB Singapore

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FORMAL REPORT ON TESTING IN ACCORDANCE WITH
47 CFR FCC Parts 15B & C : 2011
OF A
NFC READER MODULE (FFC TYPE)
[Model : TR33MUE013]
[FCC ID : ORK-TR33MUE013]

TEST FACILITY	TÜV SÜD PSB Pte Ltd, Electrical & Electronics Centre (EEC), Product Services, No. 1 Science Park Drive, Singapore 118221
FCC REG. NO.	99142 (3m and 10m Semi-Anechoic Chamber, Science Park) 871638 (3m Semi-Anechoic Chamber, Science Park)
IND. CANADA REG. NO.	2932I-1 (3m and 10m Semi-Anechoic Chamber, Science Park)
PREPARED FOR	STYL Solutions Pte. Ltd. UB One #05-07, 81 Ubi Avenue 4 Singapore 408830 Tel : +65 6258 8551 Fax : +65 6258 0771
QUOTATION NUMBER	219151844
JOB NUMBER	7191034619
TEST PERIOD	29 May 2012 – 24 Jul 2012

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ilac-MRA

ACCREDITED LABORATORY SAC-SINGLAS

LA-2007-0380-A
LA-2007-0381-F
LA-2007-0382-B
LA-2007-0383-G
LA-2007-0384-G
LA-2007-0385-E
LA-2007-0386-C
LA-2010-0464-D

The results reported herein have been performed in accordance with the laboratory's terms of accreditation under the Singapore Accreditation Council - Singapore Laboratory Accreditation Scheme. Tests/Calibrations marked "Not SAC-SINGLAS Accredited" in this Report are not included in the SAC-SINGLAS Accreditation Schedule for our laboratory.

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TEST SUMMARY

The product was tested in accordance with the customer's specifications.

Test Results Summary

Test Standard	Description	Pass / Fail
47 CFR FCC Part 15: 2011		
15.107(a), 15.207	Conducted Emissions	Pass
15.109(a), 15.205, 15.209, 15.225(d)	Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement)	Pass
15.225(a)	Radiated Emissions (Fundamental)	Pass
15.225(e)	Frequency Stability Versus Temperature	Pass
15.225(e)	Frequency Stability Versus Input Voltage	Pass

Notes

1. The EUT was configured to operate in the test mode at 13.56MHz.
2. The EUT is a Class B device when in non-transmitting state and meets the 47 CFR FCC Part15B Class B requirements.
3. All test measurement procedures are according to ANSI C63.4: 2003.
4. The maximum measured RF power of the Equipment Under Test is -34.9dBm.

Modifications

The NFC Reader Module (FFC Type) was brought to compliance Radiated Emissions test by the following modifications:

1. The value of capacitors C67 and C68 were changed to 15pF to ensure the oscillator frequency stays within 50ppm.
2. Card type: ToppanForms Felica card was used. Suica Felica card was not a standard Felica card.
3. USB interface to the FFC cable via a USB cable with ferrite core
4. HMU108C EMC Test Tool (version 2.0.0) software was used for EMC testing purposes.

PRODUCT DESCRIPTION

Description	:	The Equipment Under Test (EUT) is a **NFC READER MODULE (FFC TYPE).**
Manufacturer	:	Toppan Forms Co. Ltd 1-7-3 Higashi Shimbashi, Minato-Ku, Tokyo 105-8311, Japan
Model Number(s)	:	TR33MUE013
FCC ID	:	ORK-TR33MUE013
Serial Number(s)	:	Nil
Microprocessor(s)	:	NXP PR533 Contactless Interface Controller
Operating Frequency	:	13.56MHz
Clock / Oscillator Frequency	:	27.12MHz
Modulation	:	ASK 10%/100% Selectable
Port / Connectors	:	FFC connector
Rated Input Power	:	110V 60Hz
Accessories	:	Nil

SUPPORTING EQUIPMENT DESCRIPTION

Equipment Description (Including Brand Name)	Model, Serial & FCC ID Number	Cable Description (List Length, Type & Purpose)
Dell Latitude Laptop	M/N: D600 S/N: FZ2W81S FCC ID: DoC	Nil
Dell Power Adapter (Laptop)	M/N: NADP-90KB S/N: CN-0C2894-48661-43H-1E2Z FCC ID:Nil	2.00m unshield power cable
Lenovo R400 Laptop	M/N: 7440-C97 S/N: L3-ALB2F 09/03 FCC ID:DoC	Nil
Lenovo Power Adapter (Laptop)	M/N: PA-1650-16I S/N: 11S92P1158Z1ZD2H9371JD FCC ID:Nil	2.00m unshield power cable
Hewlett Packard Scientific Graphing Calculator	M/N: 48G+ S/N: ID94033114 FCC ID: DoC	2.00m unshield USB cable

EUT OPERATING CONDITIONS

47 CFR FCC Part 15
1. Conducted Emissions **2. Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement)** **3. Radiated Emissions (Fundamental)** **4. Frequency Stability Versus Temperature** **5. Frequency Stability Versus Input Voltage** **6. Duty Cycle Factor Computation**
The EUT was exercised by operating in maximum continuous transmission in test mode, i.e transmitting at 13.56MHz continuously.

CONDUCTED EMISSION TEST

47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Limits

Frequency Range (MHz)	Limit Values (dBµV)	
	Quasi-peak (Q-P)	Average (AV)
0.15 - 0.5	66 – 56 *	56 – 46 *
0.5 - 5.0	56	46
5.0 - 30.0	60	50
* Decreasing linearly with the logarithm of the frequency		

47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Test Instrumentation

Instrument	Model	S/No	Cal Due Date
R&S Test Receiver – ESI3	ESIB7	100015	05 Jul 2013
Agilent EMC Analyzer-SA7	E7403A	US41160167	28 May 2013
Schaffner LISN –LISN7 (Ref)	NNB42	00008	16 Jun 2013
EMCO LISN (for supporting) – LISN6	3825/2	9309-2127	29 Jul 2013

CONDUCTED EMISSION TEST

47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Test Setup

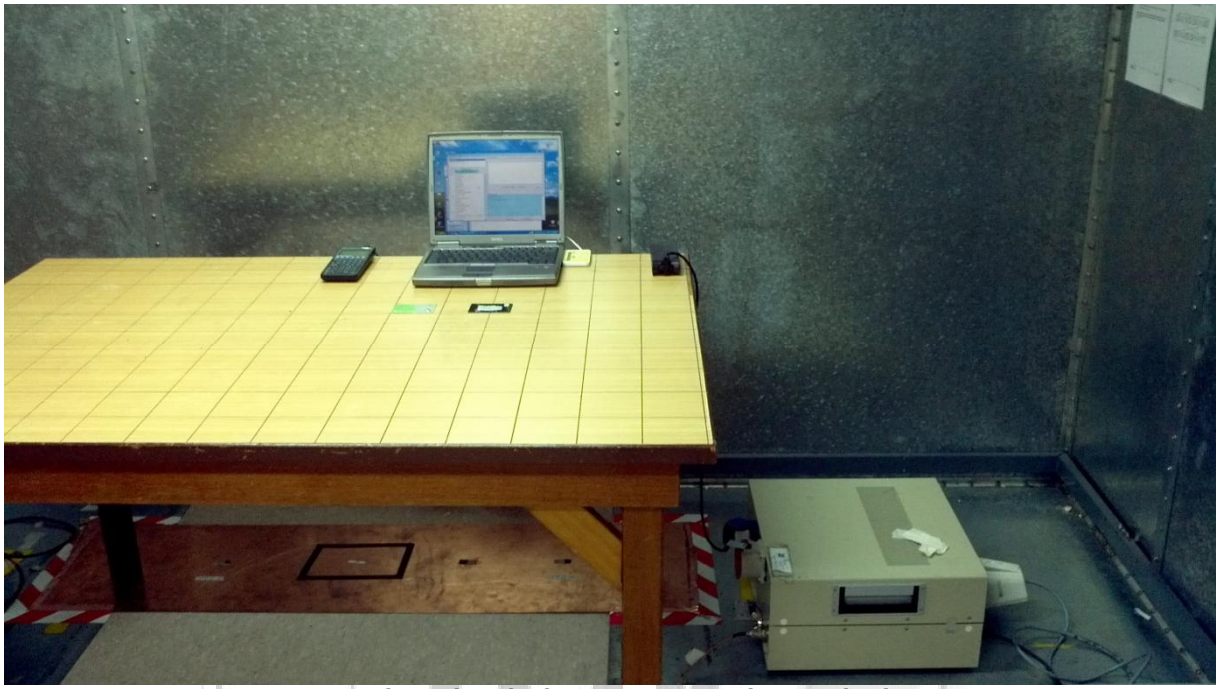
1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipment were powered separately from another LISN.

47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A scan was made on the NEUTRAL line over the required frequency range using an EMI test receiver.
3. High peaks, relative to the limit line, were then selected.
4. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 9kHz. Both Quasi-peak and Average measurements were made.
5. Steps 2 to 4 were then repeated for the LIVE line.

Sample Calculation Example

At 20 MHz	Q-P limit = 60.0 dBμV
Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.2 dB	
Q-P reading obtained directly from EMI Receiver = 40.0 dBμV (Calibrated for system losses)	
Therefore, Q-P margin = 60.0 - 40.0 = 20.0	i.e. 20.0 dB below Q-P limit



Conducted Emissions Test Setup (Front View)

Conducted Emissions Test Setup (Rear View)

CONDUCTED EMISSION TEST

47 CFR FCC Parts 15.107(a) and 15.207 Conducted Emission Results

Test Input Power	110V 60Hz	Temperature	18°C
Line Under Test	AC Mains	Relative Humidity	55%
		Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Frequency (MHz)	Q-P Value (dBµV)	Q-P Limit (dBµV)	Q-P Margin (dB)	AV Value (dBµV)	AV Limit (dBµV)	AV Margin (dB)	Line
0.5790	35.8	56.0	20.2	29.3	46.0	16.7	Live
0.7016	40.1	56.0	15.9	32.5	46.0	13.5	Live
0.7629	44.2	56.0	11.8	35.0	46.0	11.0	Live
0.8255	44.1	56.0	11.9	35.3	46.0	10.7	Live
0.8870	40.5	56.0	15.5	32.0	46.0	14.0	Live
27.1198	48.0	60.0	12.0	47.8	50.0	2.2	Neutral

Notes

1. All possible modes of operation were investigated from 150kHz to 30MHz. Only the worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "positive" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a “negative” margin indicates a FAIL.
3. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
   9kHz - 30MHz
   RBW: 9kHz VBW: 30kHz
4. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 9kHz – 30MHz is ±2.2dB.

47 CFR FCC Part 15.205 Restricted Bands

MHz			MHz			MHz			GHz		
0.090	-	0.110	16.42	-	16.423	399.9	-	410	4.5	-	5.15
0.495	-	0.505	16.69475	-	16.69525	608	-	614	5.35	-	5.46
2.1735	-	2.1905	16.80425	-	16.80475	960	-	1240	7.25	-	7.75
4.125	-	4.128	25.5	-	25.67	1300	-	1427	8.025	-	8.5
4.17725	-	4.17775	37.5	-	38.25	1435	-	1626.5	9.0	-	9.2
4.20725	-	4.20775	73	-	74.6	1645.5	-	1646.5	9.3	-	9.5
6.215	-	6.218	74.8	-	75.2	1660	-	1710	10.6	-	12.7
6.26775	-	6.26825	108	-	121.94	1718.8	-	1722.2	13.25	-	13.4
6.31175	-	6.31225	123	-	138	2200	-	2300	14.47	-	14.5
8.291	-	8.294	149.9	-	150.05	2310	-	2390	15.35	-	16.2
8.362	-	8.366	156.52475	-	156.52525	2483.5	-	2500	17.7	-	21.4
8.37625	-	8.38675	156.7	-	156.9	2690	-	2900	22.01	-	23.12
8.41425	-	8.41475	162.0125	-	167.17	3260	-	3267	23.6	-	24.0
12.29	-	12.293	167.72	-	173.2	3332	-	3339	31.2	-	31.8
12.51975	-	12.52025	240	-	285	3345.8	-	3358	36.43	-	36.5
12.57675	-	12.57725	322	-	335.4	3600	-	4400	Above 38.6		
13.36	-	13.41									

47 CFR FCC Parts 15.109(a), 15.209 and 15.225(d) Radiated Emission Limits

Frequency Range (MHz)	Quasi-Peak Limit Values (dBµV/m)
0.009 - 0.490	20 log [2400 / F (kHz)] @ 300m
0.490 - 1.705	20 log [24000 / F (kHz)] @ 30m
1.705 - 30.0	30 @ 30m
30 - 88	40.0 @ 3m
88 - 216	43.5 @ 3m
216 - 960	46.0 @ 3m
Above 960	54.0* @ 3m
* Above 1GHz, average detector was used. A peak limit of 20dB above the average limit does apply.	

47 CFR FCC Parts 15.109(a), 15.209 and 15.225(d) Radiated Emission Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Agilent Spectrum Analyzer	E4440A	MY45304764	10 Jun 2013
EMCO Loop Antenna	6502	9108-2673	29 Jul 2012
Schaffner Bilog Antenna –(30MHz-2GHz) BL3 (Ref)	CBL6112B	2549	19 Jan 2013
Teseq Preamplifier (9kHz-1GHz)	LNA6901	72267	22 Jun 2013

47 CFR FCC Parts 15.109(a), 15.209 and 15.225(d) Radiated Emission Test Setup

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.

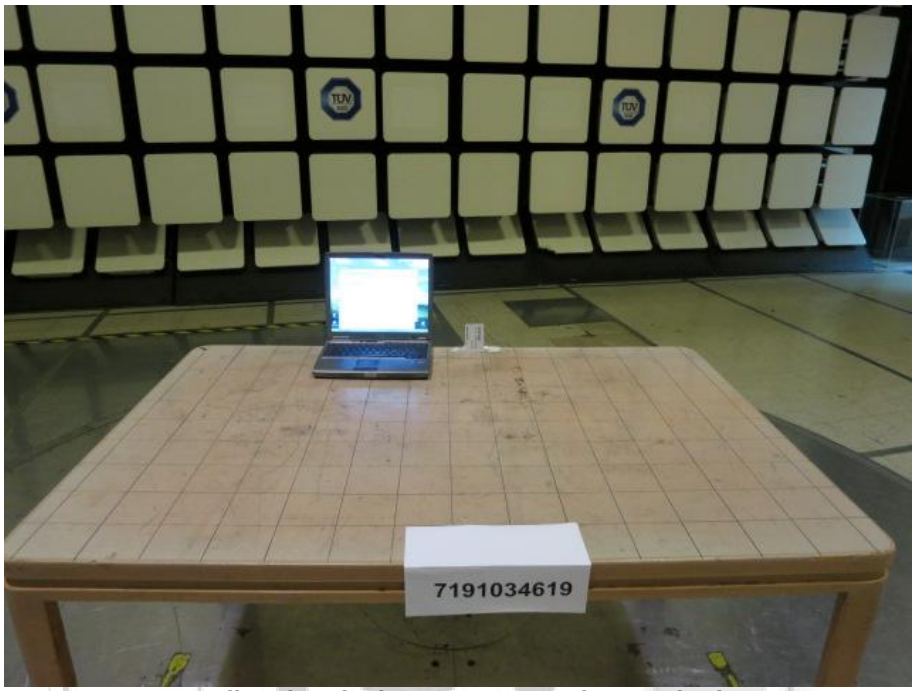
47 CFR FCC Parts 15.109(a), 15.209 and 5.225(d) Radiated Emission Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A prescan was carried out to pick the worst emission frequencies from the EUT. For EUT which is a portable device, the prescan was carried out by rotating the EUT through three orthogonal axes to determine which altitude and equipment arrangement produces such emissions.
3. The test was carried out at the selected frequency points obtained from the prescan in step 2. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
   a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
   b. The EUT was then rotated to the direction that gave the maximum emission.
   c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
4. A Quasi-peak measurement was made for that frequency point if it was less than or equal to 1GHz. For frequency point that above 1GHz, both Peak and Average measurements were carried out.
5. Steps 3 and 4 were repeated for the next frequency point, until all selected frequency points were measured.
6. The frequency range covered was from the lowest radio frequency signal generated from the EUT, without going below 9kHz to 10th harmonics of the EUT fundamental frequency, using the loop antenna for frequency below 30MHz, Bi-log antenna for frequencies from 30MHz up to 1GHz, and the Horn antenna above 1GHz.

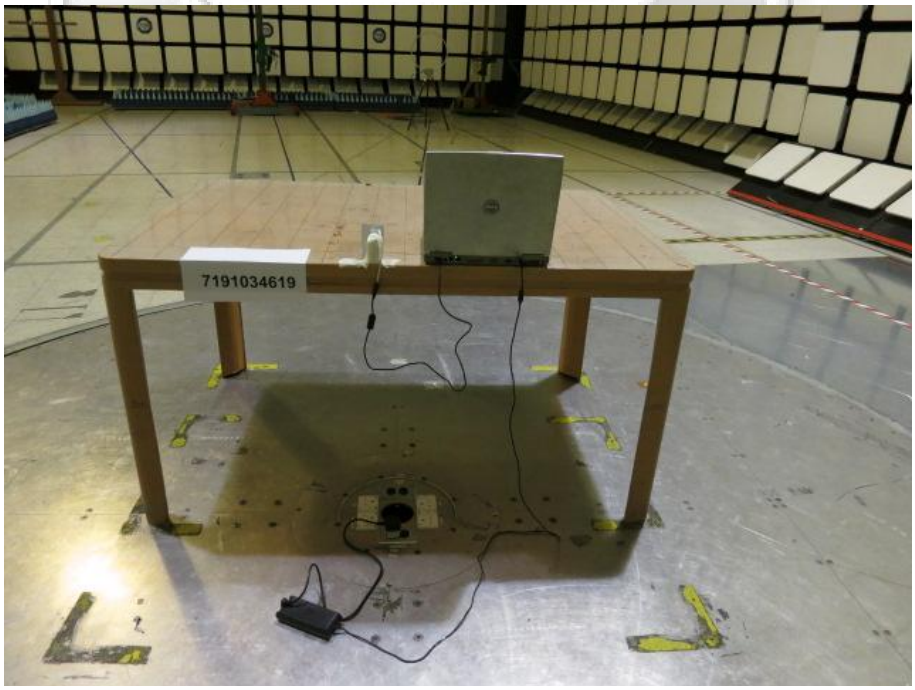
Sample Calculation Example

At 300 MHz	Q-P limit = 46.0 dBμV/m
Log-periodic antenna factor & cable loss at 300 MHz = 18.5 dB	
Q-P reading obtained directly from EMI Receiver = 40.0 dBμV/m (Calibrated level including antenna factors & cable losses)	
Therefore, Q-P margin = 46.0 - 40.0 = 6.0	i.e. 6.0 dB below Q-P limit

9kHz - 30MHz

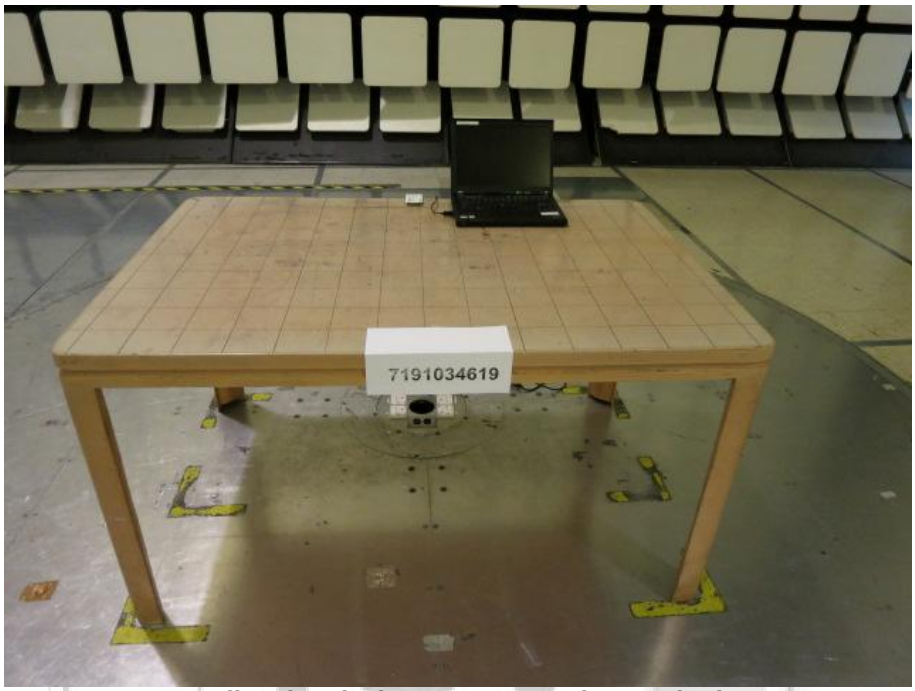


Radiated Emissions Test Setup (Front View)

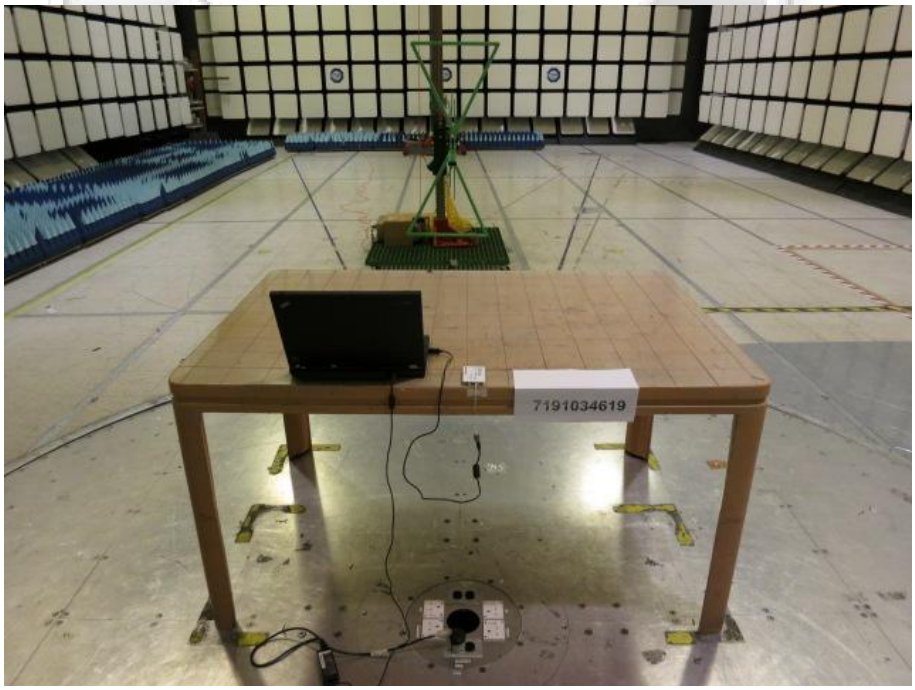


Radiated Emissions Test Setup (Rear View)

30MHz – 1GHz



Radiated Emissions Test Setup (Front View)



Radiated Emissions Test Setup (Rear View)

RADIATED EMISSION TEST

47 CFR FCC Parts 15.109(a), 15.205, 15.209 and 15.225(d) Radiated Emission Results

Test Input Power	110V 60Hz	Temperature	19°C
Test Distance	10m *See Note 2	Relative Humidity	55%
		Atmospheric Pressure	1030mbar
		Tested By	Tan Keng Xin

Spurious Emissions ranging from 9kHz - 30MHz

Frequency (MHz)	Q-P Value (dBµV/m)	Q-P Limit (dBµV/m)	Q-P Margin (dB)	Height (cm)	Azimuth (Degrees)
27.1120	3.1	30	26.9	101	63
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Test Input Power	110V 60Hz	Temperature	19°C
Test Distance	3m	Relative Humidity	55%
		Atmospheric Pressure	1030mbar
		Tested By	Tan Keng Xin

Spurious Emissions ranging from 30MHz – 1GHz

Frequency (MHz)	Q-P Value (dBµV/m)	Q-P Limit (dBµV/m)	Q-P Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)
271.2160	37.5	46.0	8.5	100	209	H
284.7680	37.0	46.0	9.0	109	83	H
325.4310	37.6	46.0	8.4	100	68	H
542.4210	35.3	46.0	10.7	100	297	V
922.0580	35.5	46.0	10.5	100	138	V
949.1800	37.3	46.0	8.7	100	297	H

Notes

1. All possible modes of operation were investigated. Only the worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A closer test distance of 10m was used for the measurement instead of 30m as the fundamental (carrier) electric field strength of the EUT at the 10m distance shows compliance to the limit of 30m test distance.
3. Quasi-peak measurement was used for frequency measurement up to 1GHz. Average and peak measurements were used for emissions above 1GHz. The average measurement was done by measuring the absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
4. A "positive" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a “negative” margin indicates a FAIL.
5. “--” indicates no emissions were found and shows compliance to the limits.
6. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
   9kHz - 150kHz
   RBW: 100Hz VBW: 300Hz
   150kHz - 30MHz
   RBW: 10kHz VBW: 30kHz
   30MHz - 1GHz
   RBW: 120kHz VBW: 1MHz
   >1GHz
   RBW: 1MHz VBW: 1MHz
7. The upper frequency of radiated emission investigations was according to requirements stated in Section 15.33(a) for intentional radiators & Section 15.33(b) for unintentional radiators.
8. Radiated Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 30MHz – 25GHz is ±4.0dB.

RADIATED EMISSION (FUNDAMENTAL) TEST

47 CFR FCC Parts 15.225(a) Radiated Emission (Fundamental) Limits

Fundamental Frequency (MHz)	Field Strength of Fundamental Limit Values @ 30m (dBµV/m)
13.553 - 13.567	84.0

47 CFR FCC Parts 15.225(a) Radiated Emission (Fundamental) Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Agilent Spectrum Analyzer	E4440A	MY45304764	10 Jun 2013
EMCO Loop Antenna	6502	9108-2673	29 Jul 2012

RADIATED EMISSION (FUNDAMENTAL) TEST

47 CFR FCC Parts 15.225(a) Radiated Emission (Fundamental) Test Setup

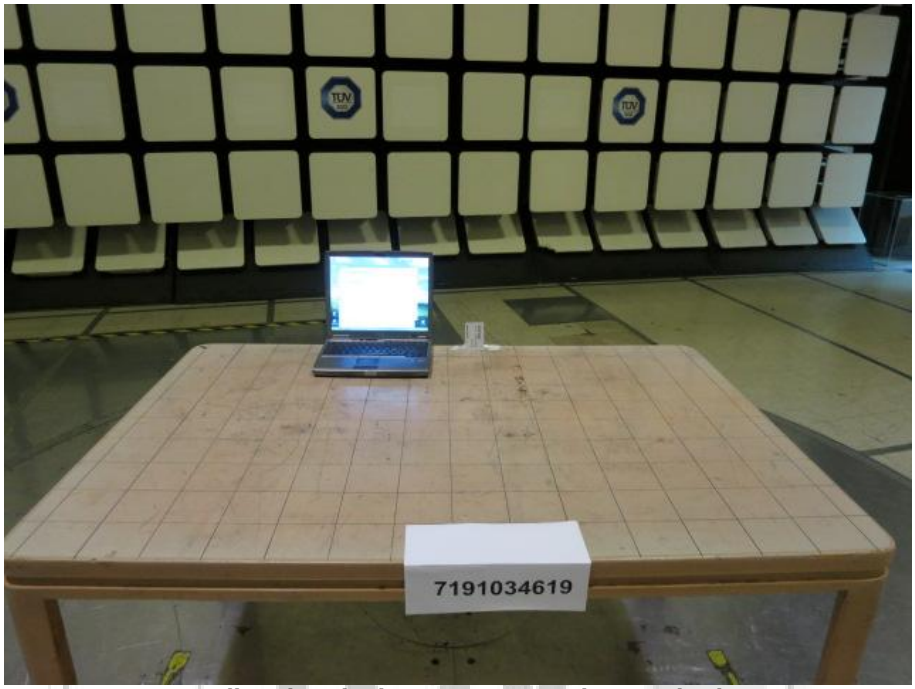
1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.

47 CFR FCC Parts 15.225(a) Radiated Emission (Fundamental) Test Method

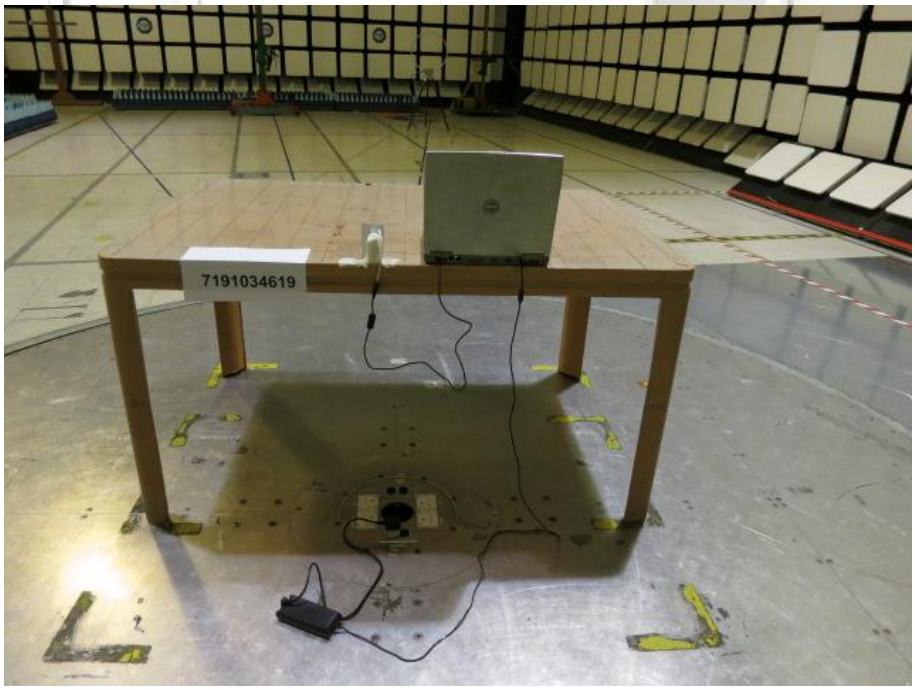
1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A prescan was carried out to pick the fundamental frequency from the EUT. For EUT which is a portable device, the prescan was carried out by rotating the EUT through three orthogonal axes to determine which altitude and equipment arrangement produces such emissions.
3. The test was carried out at the selected frequency points obtained from the prescan in step 2. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
   a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
   b. The EUT was then rotated to the direction that gave the maximum emission.
   c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
4. A Quasi-peak measurement was made for that frequency point if it was less than or equal to 1GHz. For frequency point that above 1GHz, both Peak and Average measurements were carried out.
5. Steps 3 and 4 were repeated for the next frequency point, until all selected frequency points were measured.

Sample Calculation Example

At 300 MHz Q-P limit = 46.0 dBμV/m
Log-periodic antenna factor & cable loss at 300 MHz = 18.5 dB
Q-P reading obtained directly from EMI Receiver = 40.0 dBμV/m (Calibrated level including antenna factors & cable losses)
Therefore, Q-P margin = 46.0 - 40.0 = 6.0 i.e. 6.0 dB below Q-P limit



Radiated Emissions Test Setup (Front View)



Radiated Emissions Test Setup (Rear View)

47 CFR FCC Part 15.225(a) Radiated Emission (Fundamental) Results

Test Input Power	110V 60Hz	Temperature	19°C
Test Distance	10m *See Note 2	Relative Humidity	55%
		Atmospheric Pressure	1030mbar
		Tested By	Tan Keng Xin

Frequency (MHz)	Q-P Value (dBµV/m)	Q-P Limit (dBµV/m)	Q-P Margin (dB)	Height (cm)	Azimuth (Degrees)
13.5600	49.9	84.0	34.1	101	170

Notes

1. All possible modes of operation were investigated. Only the worst case emissions measured, using the average and peak detectors, are reported. All other emissions were relatively insignificant.
2. A closer test distance of 10m was used for the measurement instead of 30m as the fundamental (carrier) electric field strength of the EUT at the 10m distance shows compliance to the limit of 30m test distance.
3. The EUT was found to be in the worst case condition when it was orientated in a vertical upright standing position.
4. The margin shows the margin of the measured value against the limit at 30m test distance.
5. A "positive" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a “negative” margin indicates a FAIL.
6. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
   150kHz - 30MHz
   RBW: 10kHz VBW: 30kHz
   30MHz - 1GHz
   RBW: 120kHz VBW: 1MHz
   >1GHz
   RBW: 1MHz VBW: 1MHz
7. Radiated Emissions (Fundamental) Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 30MHz – 25GHz is ±4.0dB.

FREQUENCY STABILITY VERSUS TEMPERATURE TEST

47 CFR FCC Part 15.225(e) Frequency Stability Versus Temperature Limits

The EUT shows compliance to the requirements of this section, which states that the frequency tolerance of the carrier frequency shall be ± 0.01% for a temperature variation of -20°C to +50°C at normal supply voltage.

47 CFR FCC Part 15.225(e) Frequency Stability Versus Temperature Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Agilent Universal Counter	53132A	3736A0628	25 Mar 2013
Voltac Variable Voltage Transformer	SB-10	6239	Output Monitor

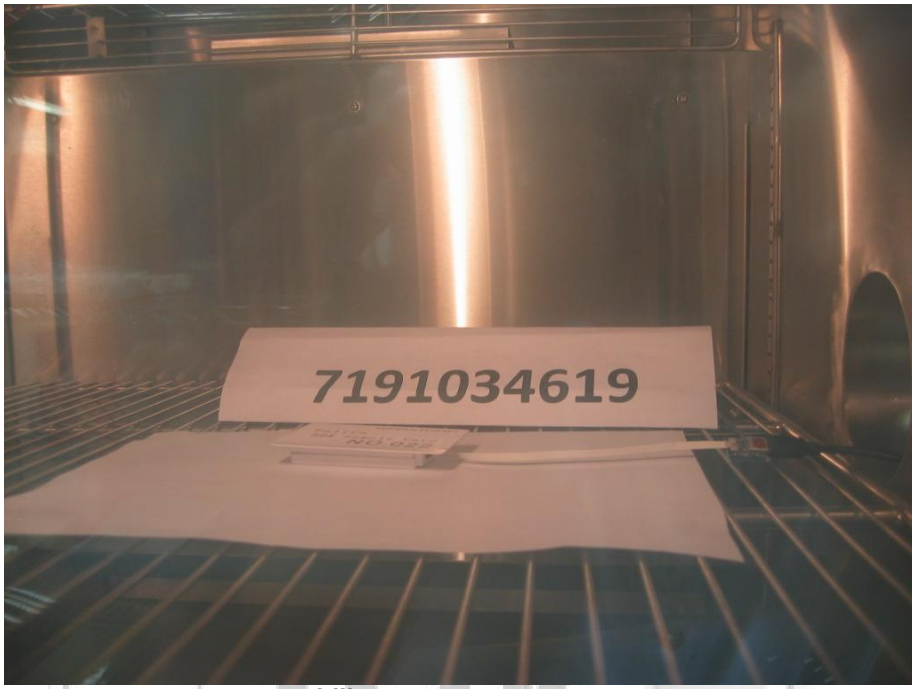
47 CFR FCC Part 15.225(e) Frequency Stability Versus Temperature Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo. The EUT was placed in an environmental temperature chamber with a nominal supply voltage. For the battery operated EUT, a new battery was used.
2. The RF antenna connector of the EUT was connected to the frequency counter via a low-loss coaxial cable.

47 CFR FCC Part 15.225(e) Frequency Stability Versus Temperature Test Method

1. The EUT was switched off and the environmental temperature was set to the highest temperature, i.e, +50°C.
2. Upon reaching the highest set temperature with 30 minutes of stabilisation period, the EUT was switched on and configured to operate in the test mode with transmitting frequency at 13.56MHz.
3. The EUT's transmitting frequency was then measured at startup, and two, five and ten minutes after startup with the frequency counter until no further changes were observed. Four measurements were made in total.
4. Repeat steps 1 to 4 with the temperature set to the lowest temperature, i.e, -20°C.

FREQUENCY STABILITY VERSUS TEMPERATURE TEST



Frequency Stability Versus Temperature Test Setup

FREQUENCY STABILITY VERSUS TEMPERATURE TEST

47 CFR FCC Part 15.225(e) Frequency Stability Versus Temperature Results

Test Input Power	110V 60Hz	Temperature	50°C
		Relative Humidity	60%
		Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Channel Frequency (MHz)	± 0.01% Carrier Tolerance (Hz)	Measured Tolerance (Hz)	Measurement with respects to Startup Time (Mins)
13.5600	±1356.0000	-291.920	0
13.5600	±1356.0000	-291.900	2
13.5600	±1356.0000	-291.970	5
13.5600	±1356.0000	-291.950	10

Test Input Power	110V 60Hz	Temperature	-20°C
		Relative Humidity	60%
		Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Channel Frequency (MHz)	± 0.01% Carrier Tolerance (Hz)	Measured Tolerance (Hz)	Measurement with respects to Startup Time (Mins)
13.5600	±1356.0000	-292.070	0
13.5600	±1356.0000	-292.170	2
13.5600	±1356.0000	-292.210	5
13.5600	±1356.0000	-292.400	10

FREQUENCY STABILITY VERSUS INPUT VOLTAGE TEST

47 CFR FCC Part 15.225(e) Frequency Stability Versus Input Voltage Limits

The EUT shows compliance to the requirements of this section, which states that the frequency tolerance of the carrier frequency shall be ± 0.01% for variation of a primary voltage from 85% to 115% of the rated supply voltage at a temperature of 20°C. For a battery operated equipment, the equipment tests shall be performed using a new battery.

47 CFR FCC Part 15.225(e) Frequency Stability Versus Input Voltage Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Agilent Universal Counter	53132A	3736A0628	25 Mar 2013
Voltac Variable Voltage Transformer	SB-10	6239	Output Monitor

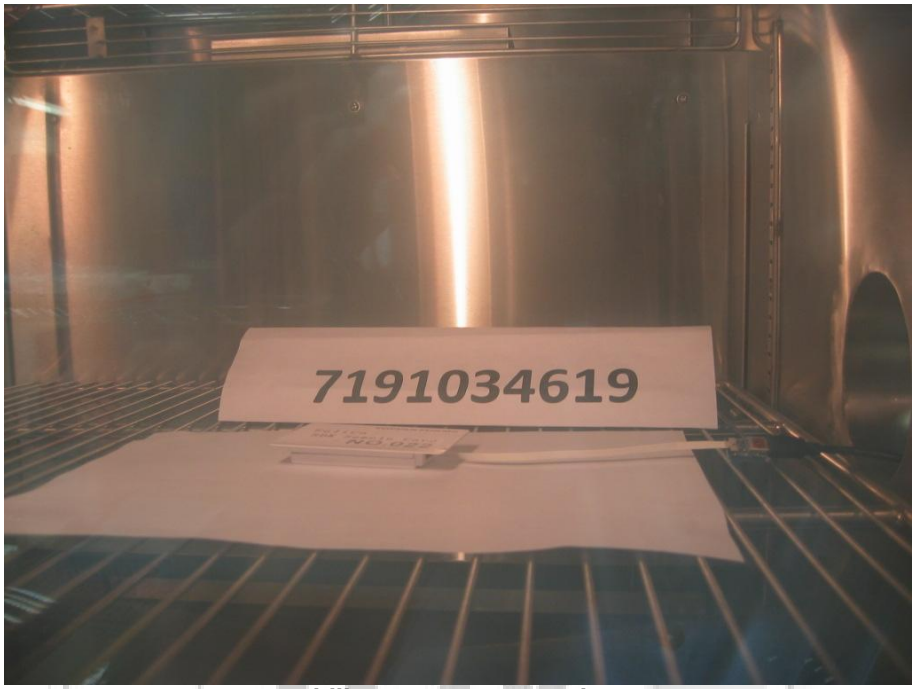
47 CFR FCC Part 15.225(e) Frequency Stability Versus Input Voltage Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo. The EUT was placed in an environmental temperature chamber with a nominal supply voltage. For the battery operated EUT, a new battery was used.
2. The RF antenna connector of the EUT was connected to the frequency counter via a low-loss coaxial cable.

47 CFR FCC Part 15.225(e) Frequency Stability Versus Input Voltage Test Method

1. The EUT was switched off and the environmental temperature was set to 20°C.
2. Upon reaching the set temperature with 30 minutes of stabilisation period, the EUT was switched on and configured to operate in the test mode with transmitting frequency at 13.56MHz.
3. The EUT's transmitting frequency was then measured at startup, and two, five and ten minutes after startup with the frequency counter. For each measurement, the signal capturing was continuous until no further changes were observed. Four measurements were made in total.
4. Repeat steps 1 to 4 with the supply voltage set to 85% and 115% of the nominal voltage supply respectively. For the battery operated EUT, this step is not applicable.

FREQUENCY STABILITY VERSUS INPUT VOLTAGE TEST



Frequency Stability Versus Input Voltage Test Setup

FREQUENCY STABILITY VERSUS INPUT VOLTAGE TEST

47 CFR FCC Part 15.225(e) Frequency Stability Versus Input Voltage Results

Test Input Power	110V 60Hz (Nominal Voltage)	Temperature	20°C
		Relative Humidity	60%
		Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Channel Frequency (MHz)	± 1% Carrier Tolerance (Hz)	Measured Tolerance (Hz)	Measurement with respects to Startup Time (Mins)
13.5600	±1356.0000	-290.011	0
13.5600	±1356.0000	-290.025	2
13.5600	±1356.0000	-290.028	5
13.5600	±1356.0000	-290.038	10

Test Input Power	93.5V 60Hz (85% of the Nominal voltage)	Temperature	20°C
		Relative Humidity	60%
		Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Channel Frequency (MHz)	± 1% Carrier Tolerance (Hz)	Measured Tolerance (Hz)	Measurement with respects to Startup Time (Mins)
13.5600	±1356.0000	-290.070	0
13.5600	±1356.0000	-290.072	2
13.5600	±1356.0000	-290.075	5
13.5600	±1356.0000	-290.082	10

Test Input Power	126.5V 60Hz (115% of the Nominal voltage)	Temperature	20°C
		Relative Humidity	60%
		Atmospheric Pressure	1030mbar
		Tested By	Kyaw Soe Hein

Channel Frequency (MHz)	± 1% Carrier Tolerance (Hz)	Measured Tolerance (Hz)	Measurement with respects to Startup Time (Mins)
13.5600	±1356.0000	-290.058	0
13.5600	±1356.0000	-290.062	2
13.5600	±1356.0000	-290.071	5
13.5600	±1356.0000	-290.089	10

Please note that this Report is issued under the following terms :

1. This report applies to the sample of the specific product/equipment given at the time of its testing/calibration. The results are not used to indicate or imply that they are applicable to other similar items. In addition, such results must not be used to indicate or imply that TÜV SÜD PSB approves, recommends or endorses the manufacturer, supplier or user of such product/equipment, or that TÜV SÜD PSB in any way "guarantees" the later performance of the product/equipment. Unless otherwise stated in this report, no tests were conducted to determine long term effects of using the specific product/equipment.

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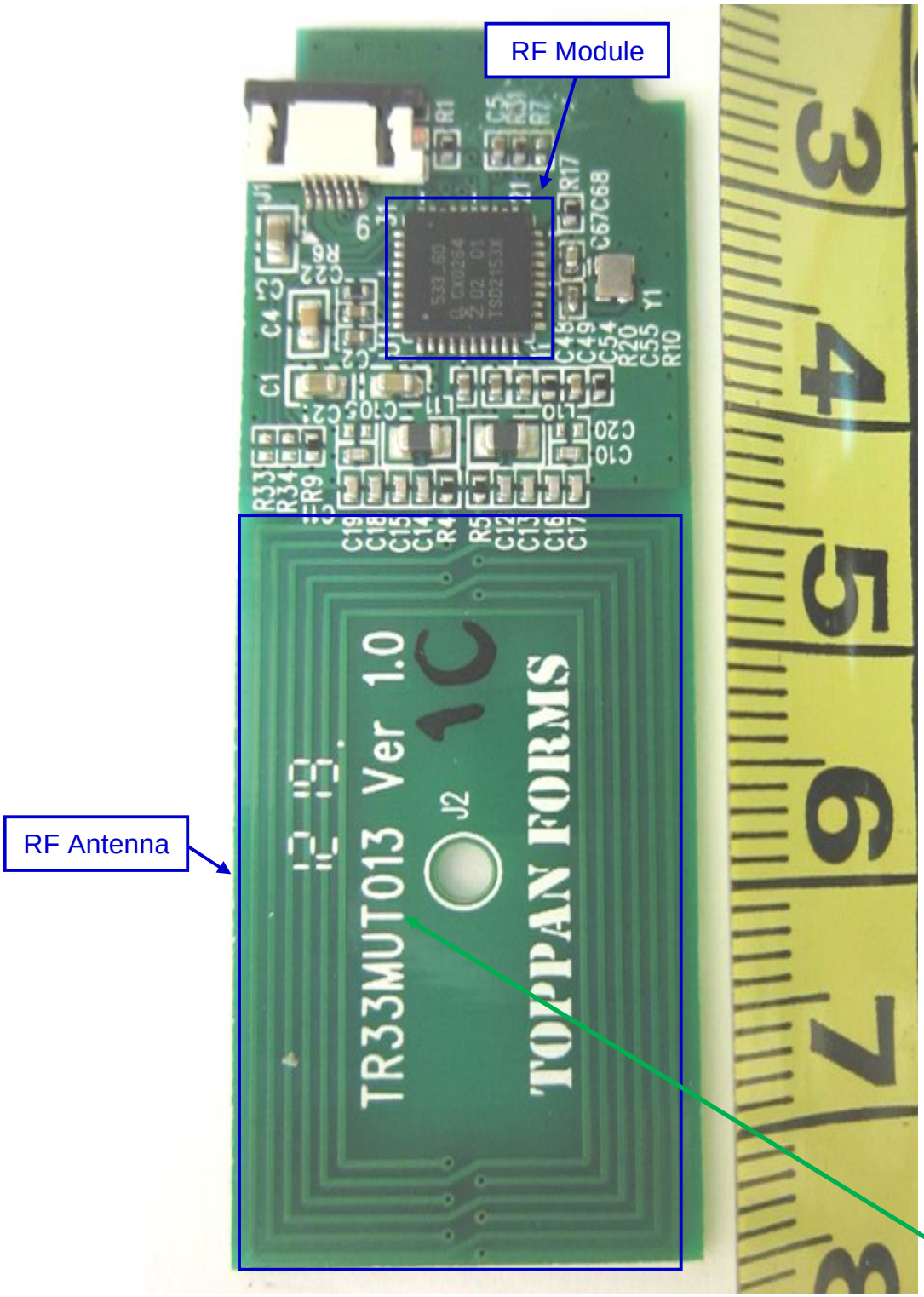
5. Unless otherwise stated, the tests were carried out in TÜV SÜD PSB Pte Ltd, No.1 Science Park Drive Singapore 118221.

July 2011

ANNEX A

EUT PHOTOGRAPHS / DIAGRAMS

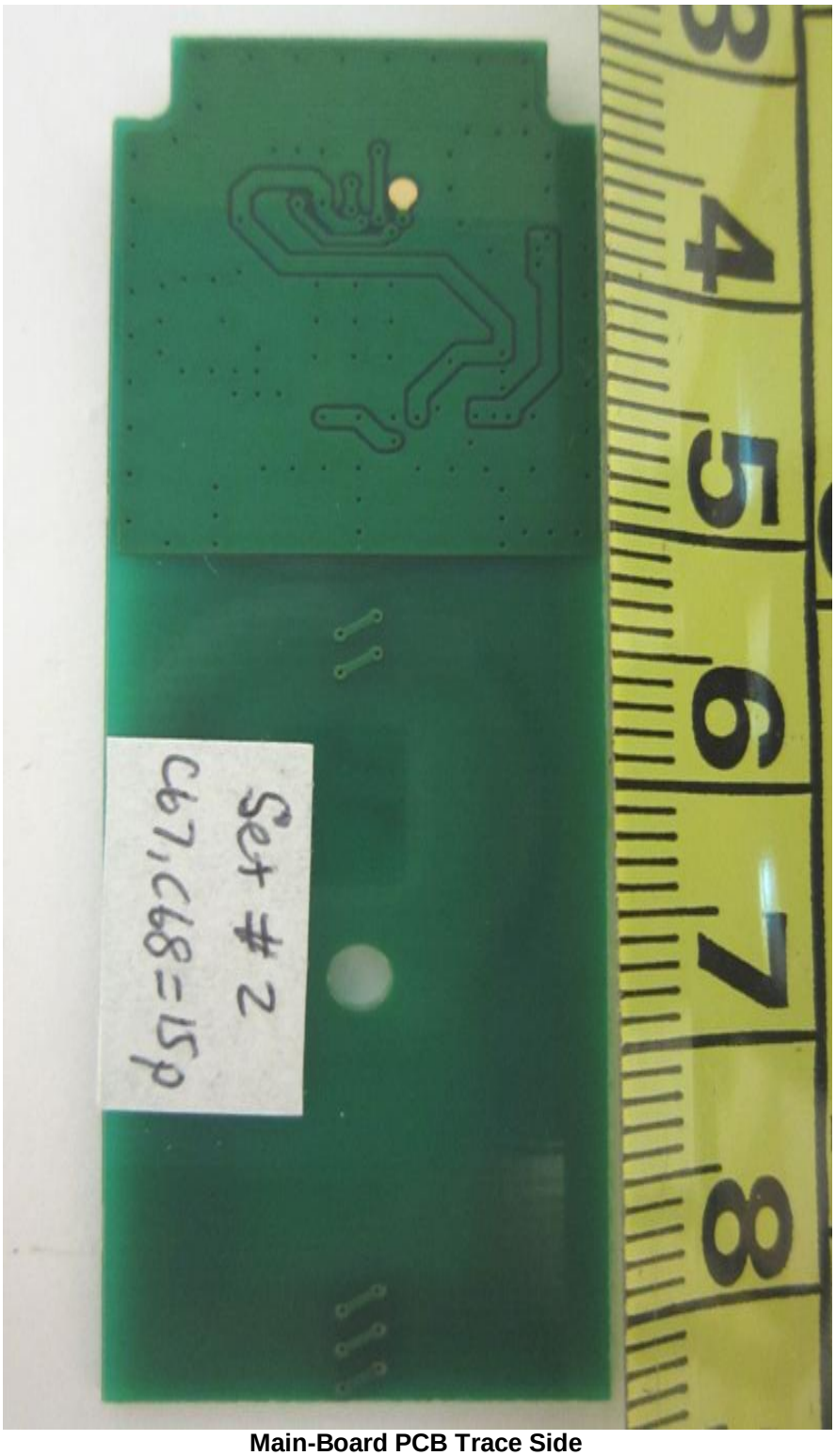
EUT PHOTOGRAPHS



error in the silkscreen and the final product silkscreen shall bear the correct product number: TR33MUE013

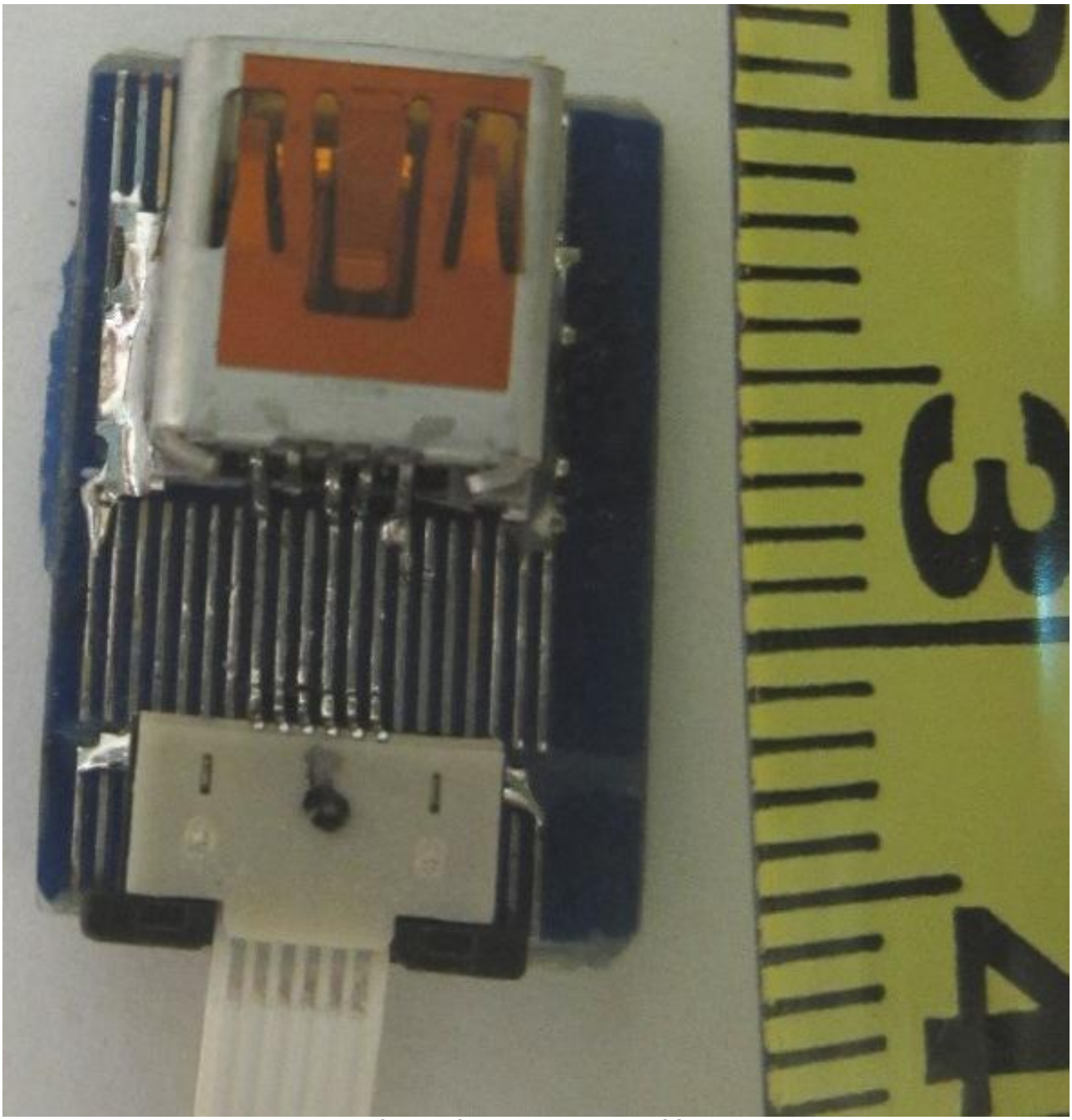
Main-Board PCB Component Side

EUT PHOTOGRAPHS



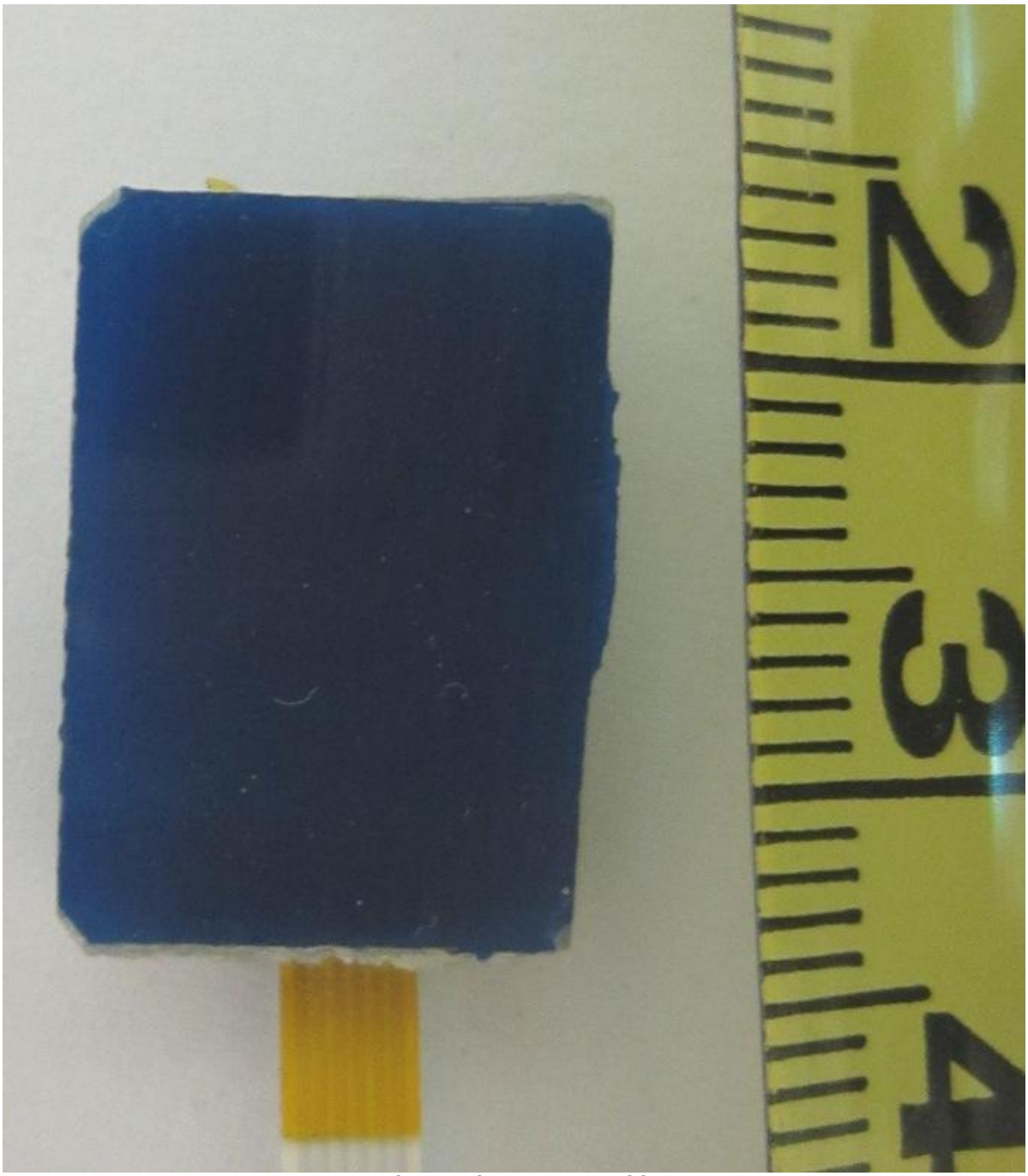
Main-Board PCB Trace Side

EUT PHOTOGRAPHS



Sub-Board PCB Component Side

EUT PHOTOGRAPHS



Sub-Board PCB Trace Side

ANNEX B

USER MANUAL
TECHNICAL DESCRIPTION
BLOCK & CIRCUIT DIAGRAMS

(Please refer to manufacturer for details)

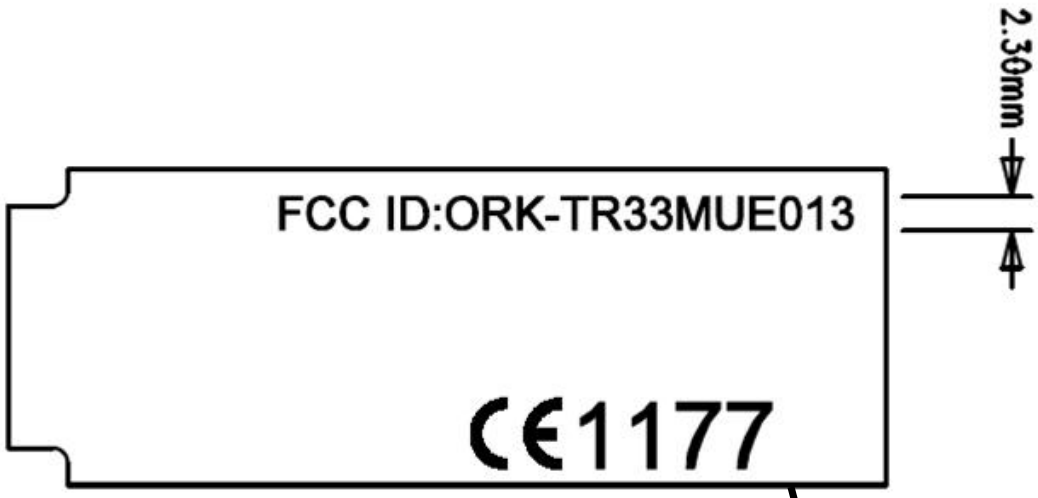
ANNEX C

FCC LABEL & POSITION

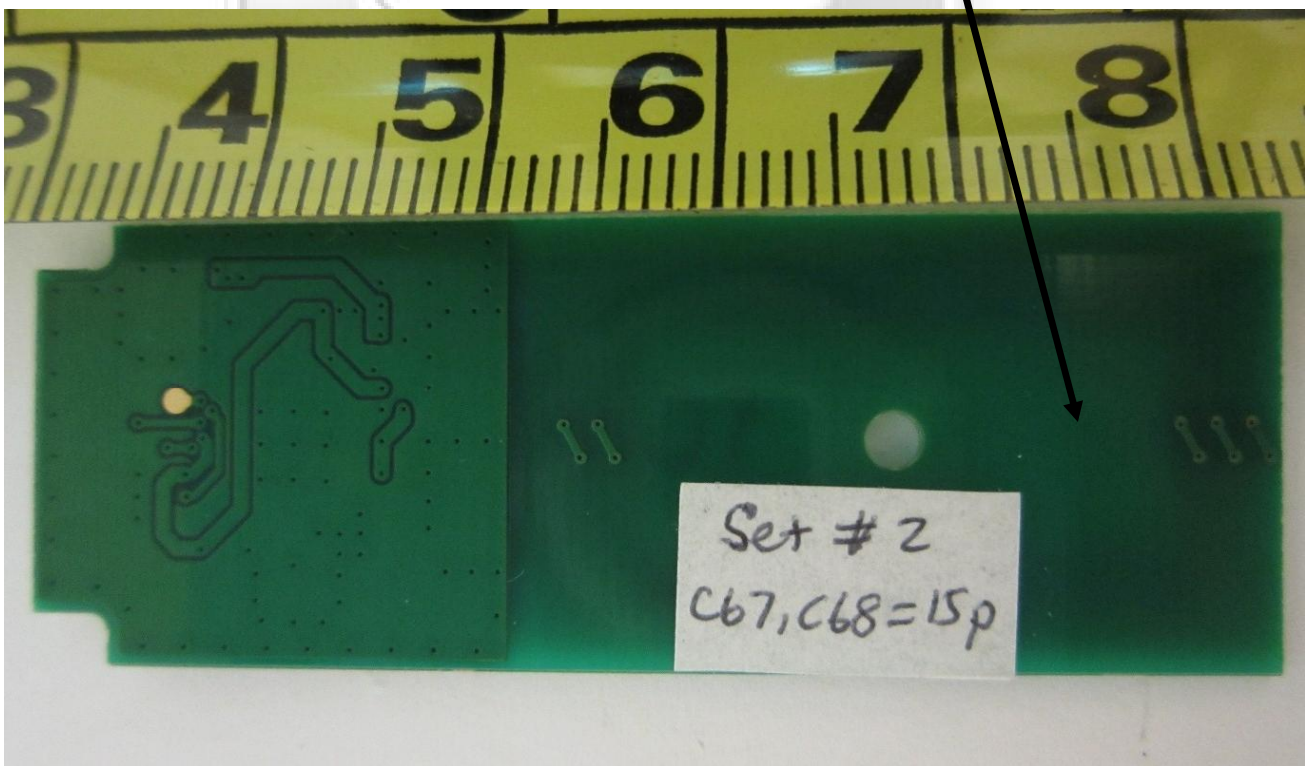
ANNEX C FCC LABEL & POSITION

Labelling requirements per Section 2.925 & 15.19

The label shown will be permanently affixed at a conspicuous location on the device and be readily visible to the user at the time of purchase.



Sample Label



Physical Location of FCC Label on EUT