Test Report No. 7191018162-EEC11/02
dated 25 Oct 2011

PSB Singapore

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FORMAL REPORT ON TESTING IN ACCORDANCE WITH
47 CFR FCC Parts 15B & C : 2011
OF A
RFID READER
[Model : HH-MR2]
[FCC ID : VTZHH-MR2]

TEST FACILITY	TÜV SÜD PSB Pte Ltd, Electrical & Electronics Centre (EEC), Product Services, No. 1 Science Park Drive, Singapore 118221 TÜV SÜD PSB Pte Ltd, Electrical & Electronics Centre (EEC), Product Services, 13 Internatonal Business Park #01-01, Singapore 609932
FCC REG. NO.	99142 (3m and 10m Semi-Anechoic Chamber, Science Park) 160581 (3m and 10m Semi-Anechoic Chamber, International Business Park)
IND. CANADA REG. NO.	2932I-1 (3m and 10m Semi-Anechoic Chamber, Science Park) 2932N-1 (10m Semi-Anechoic Chamber, International Business Park)
PREPARED FOR	Kenetics Innovations Pte Ltd 2 Tannery Road #03-01 CENCON Building Singapore 347720 Tel : +65 6749 0083 Fax : +65 6749 0093
QUOTATION NUMBER	219132768 & 219136948
JOB NUMBER	7191013430 & 7191018162
TEST PERIOD	08 Aug 2011 – 22 Aug 2011

PREPARED BY

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APPROVED BY

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TÜV SÜD PSB

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 Equipment Under Test (EUT) was configured to operate in the test mode at 13.56MHz
2. The measurements in section 15.225(e) were done based on conducted measurements.
3. The EUT is a Class B device when in non-transmitting state and meets the 47 CFR FCC Part15B Class B requirements.
4. All test measurement procedures are according to ANSI C63.4: 2003.

Modifications

No modifications were made.

PRODUCT DESCRIPTION

Description	:	The Equipment Under Test (EUT) is a **RFID READER.**
Manufacturer	:	TJS USA Inc. 24 School Street, Suite 501 Boston, Massachusetts 02108, USA
Model Number	:	HH-MR2
FCC ID	:	VTZHH-MR2
Serial Number	:	Nil
Microprocessor	:	AT91SAM7
Operating / Transmitting Frequency	:	13.56MHz. Bandwidth: 500kHz.
Clock / Oscillator Frequency	:	RFID: 27.12MHz. Microprocessor: 18.432MHz.
Modulation	:	Amplitude Shift Keying (ASK)
Antenna Gain	:	2.0 dBi
Port / Connectors	:	Refer to manufacturer's user manual / operating manual.
Rated Input Power	:	110 V 60Hz
Accessories	:	Power Adapter Model GPE188-120150Z

SUPPORTING DESCRIPTION DESCRIPTION

Equipment Description (Including Brand Name)	Model, Serial & FCC ID Number	Cable Description (List Length, Type & Purpose)
Lenovo S10	M/N: 20015 S/N: EB10802918 FCC ID: DoC	2.00m unshielded power cable 2.00m USB cable
Li Shin International Power Adapter (Laptop)	M/N: 0225A2040 S/N: F20K57LF-A806 FCC ID: Nil	2.00m unshielded power cable
HP Photosmart 7260	M/N: Q3005A S/N: CN4683Z424 FCC ID: DoC	2.00m unshielded power cable 2.00m USB cable
HP Power Adapter (Printer)	M/N: 0950-4401 S/N: 4604620203 FCC ID: Nil	2.00m unshielded power 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**
The EUT was exercised by operating in maximum continuous transmission in following modes: 1. RFID Transmit mode, i.e transmitting at 13.56MHz continuously and 2. RFID + BT Transmit mode, i.e transmitting at 13.56MHz together with Bluetooth transmitting continuously.

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

Frequency Range (MHz)	Limit Values (dBµV)	
	Quasi-peak (QP)	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 2012
Agilent EMC Analyzer-SA7	E7403A	US41160167	27 May 2012
Schaffner LISN –LISN7 (Ref)	NNB42	00008	16 Jun 2012
EMCO LISN (for supporting) – LISN6	3825/2	9309-2127	29 Jul 2012

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 (Class B) = 1000 μV = 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 = 40.0 - 60.0 = -20.0	i.e. 20.0 dB below Q-P limit

Conducted Emissions Test Setup (Front View)

Conducted Emissions Test Setup (Rear View)

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

Operating Mode	RFID Transmit	Temperature	25°C
Test Input Power	110V 60Hz	Relative Humidity	60%
Line Under Test	AC Mains	Atmospheric Pressure	1030mbar
		Tested By	Li Chelmin

Frequency (MHz)	Q-P Value (dBμV)	Q-P Margin (dB)	AV Value (dBμV)	AV Margin (dB)	Line
0.1663	48.4	-16.7	31.7	-23.4	Live
0.3743	41.5	-16.9	30.5	-17.9	Neutral
0.7646	53.6	-2.4	36.4	-9.6	Neutral
13.1850	49.7	-10.3	26.9	-23.1	Neutral
13.9338	50.4	-9.6	27.8	-22.2	Neutral
27.1238	52.0	-8.0	31.1	-18.9	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 "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
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	29.5 @ 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
Rohde & Schwarz EMI Test Receiver (20Hz - 7GHz)	ESI	100015	05 Jul 2012
TDK RF Solutions Hybrid Log Periodic Antenna (30MHz-3GHz)	HLP-3003C	130238	19 Mar 2012
EMCO Loop Antenna	6502	9108-2673	24 Jul 2012
Sonoma Preamplifier (9kHz – 1GHz)	310N	270640	13 Sep 2012
NPF-25 Fliter	NPF-25	Nil	13 Sep 2012
NPF-250 Fliter	NPF-250	Nil	13 Sep 2012

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.

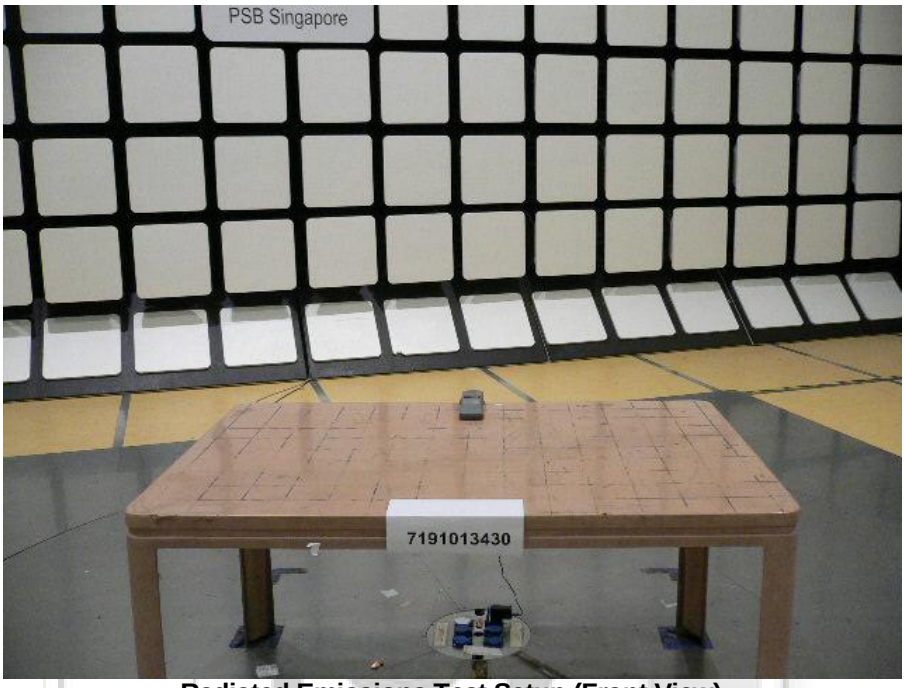
47 CFR FCC Parts 15.109(a), 15.209 and 5.225(d) Radiated Emission Test Method

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.

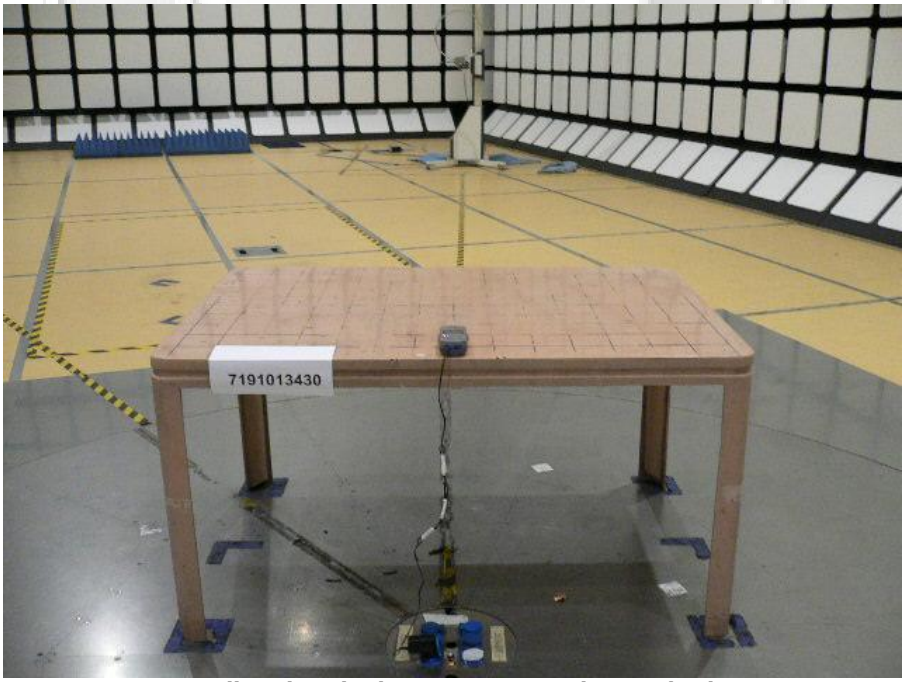
Sample Calculation Example

At 300 MHz	Q-P limit (Class B) = 200 μV/m = 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 = 40.0 - 46.0 = -6.0	i.e. 6 dB below Q-P limit

9kHz to 30MHz @ 10m

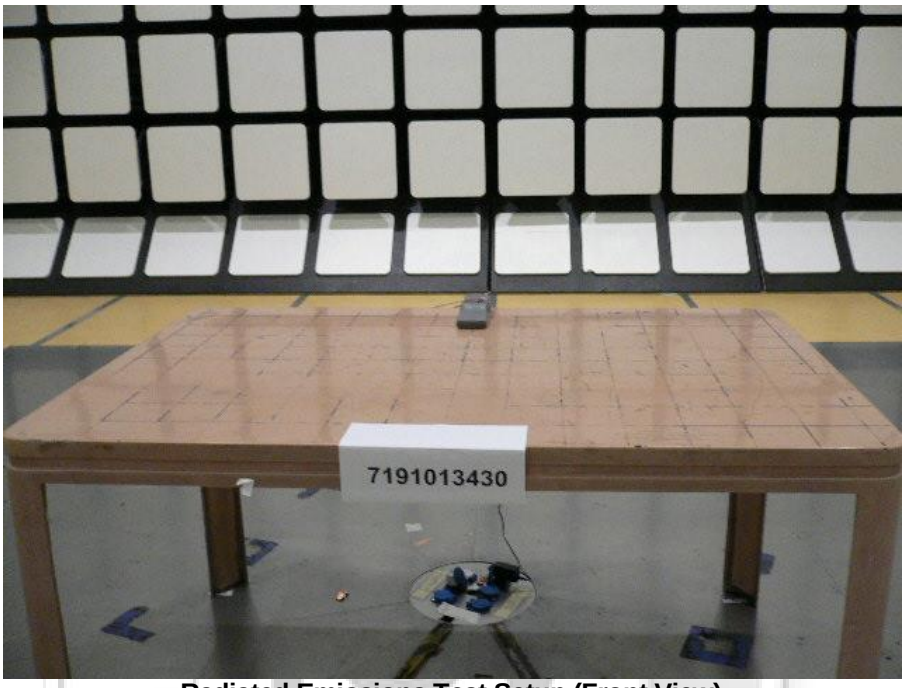


Radiated Emissions Test Setup (Front View)

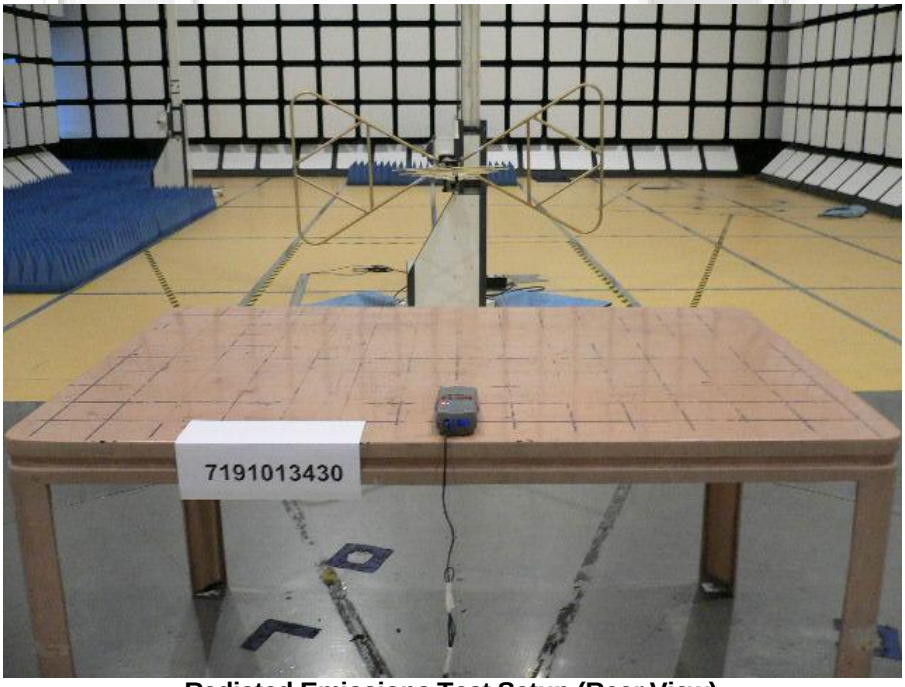


Radiated Emissions Test Setup (Rear View)

30MHz to 1GHz @ 3m



Radiated Emissions Test Setup (Front View)



Radiated Emissions Test Setup (Rear View)

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

Operating Mode	RFID Transmit	Temperature	18°C
Test Input Power	110V 60Hz	Relative Humidity	58%
Test Distance	10m *See Note 2	Atmospheric Pressure	1040mbar
		Tested By	Jason Lai

Spurious Emissions ranging from 9kHz - 30MHz

Frequency (MHz)	Peak Value (dBµV/m)	Q-P Value (dBµV/m)	Q-P Margin (dB)	Azimuth (Degrees)	Height (cm)
0.1510	49.6	49.5 *See Note 3	-33.6	111	120
0.2110	46.3	45.7 *See Note 3	-34.5	291	110
0.3320	43.8	41.3 *See Note 3	-35.0	346	103
0.5140	-	34.9	-17.6	182	102
0.6350	-	34.2	-16.4	18	102
0.7560	-	32.3	-16.8	214	102

Operating Mode	RFID Transmit	Temperature	18°C
Test Input Power	110V 60Hz	Relative Humidity	58%
Test Distance	3m	Atmospheric Pressure	1040mbar
		Tested By	Jason Lai

Spurious Emissions ranging from 30MHz – 1GHz

Frequency (MHz)	Q-P Value (dBµV/m)	Q-P Margin (dB)	Azimuth (Degrees)	Height (cm)	Polarisation (H/V)
732.2440	38.0	-8.0	73	120	H
786.4730	38.4	-7.6	91	110	H
840.7210	39.9	-6.1	71	103	H
894.9500	42.4	-3.6	132	102	H
922.0840	37.5	-8.5	137	102	H
949.1880	40.7	-5.3	101	102	H

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

Operating Mode	RFID + BT Transmit	Temperature	18°C
Test Input Power	110V 60Hz	Relative Humidity	58%
Test Distance	10m *See Note 2	Atmospheric Pressure	1040mbar
		Tested By	Jason Lai

Spurious Emissions ranging from 9kHz - 30MHz

Frequency (MHz)	Peak Value (dBµV/m)	Q-P Value (dBµV/m)	Q-P Margin (dB)	Azimuth (Degrees)	Height (cm)
0.1510	45.5	46.1 *See Note 3	-37.0	53	113
0.2110	43.6	43.7 *See Note 3	-36.5	225	113
0.3320	40.9	39.8 *See Note 3	-36.5	162	113
0.5140	-	34.6	-17.9	209	113
0.6350	-	33.9	-16.7	124	113
0.7560	-	32.0	-17.1	94	113

Operating Mode	RFID + BT Transmit	Temperature	18°C
Test Input Power	110V 60Hz	Relative Humidity	58%
Test Distance	3m	Atmospheric Pressure	1040mbar
		Tested By	Jason Lai

Spurious Emissions ranging from 30MHz – 1GHz

Frequency (MHz)	Q-P Value (dBµV/m)	Q-P Margin (dB)	Azimuth (Degrees)	Height (cm)	Polarisation (H/V)
648.8180	42.9	-3.1	356	117	H
752.0440	20.4	-25.6	10	105	H
766.7840	37.3	-8.7	279	104	H
884.7490	32.7	-13.3	1	383	H
894.9500	41.6	-4.4	131	102	H
949.1880	38.3	-7.7	17	102	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. The measurement was carried out at 10m distance and the measured data was extrapolated to 300m and 30m for frequency ranges 0.009-0490MHz and 0.49-1.705MHz respectively.
3. The following frequencies are measured employing the average detector in accordance to 15.209(d).
4. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
5. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
   9kHz - 150kHz
   RBW: 200Hz VBW: 1kHz
   150kHz - 30MHz
   RBW: 10kHz VBW: 30kHz
   30MHz - 1GHz
   RBW: 120kHz VBW: 1MHz
   >1GHz
   RBW: 1MHz VBW: 1MHz
6. The upper frequency of radiated emission investigations was according to requirements stated in Section 15.33(a) for intentional radiators.
7. 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), 15.225(b) and 15.225(c) Radiated Emission (Fundamental) Limits

Fundamental Frequency (MHz)	Field Strength of Fundamental Limit Values @ 30m (dBµV/m)
13.553 - 13.567	84.0
13.410 -13.553	50.5
13.567 -13.710	50.5
13.110 -13.410	40.5
13.710 -14.010	40.5

47 CFR FCC Parts 15.225(a), 15.225(b) and 15.225(c) Radiated Emission (Fundamental) Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Rohde & Schwarz EMI Test Receiver (20Hz - 7GHz)	ESI	100015	05 Jul 2012
TDK RF Solutions Hybrid Log Periodic Antenna (30MHz-3GHz)	HLP-3003C	130238	19 Mar 2012
EMCO Loop Antenna	6502	9108-2673	24 Jul 2012
Sonoma Preamplifier (9kHz – 1GHz)	310N	270640	13 Sep 2012
NPF-25 Fliter	NPF-25	Nil	13 Sep 2012
NPF-250 Fliter	NPF-250	Nil	13 Sep 2012

RADIATED EMISSION (FUNDAMENTAL) TEST

47 CFR FCC Parts 15.225(a), 15.225(b) and 15.225(c) Radiated Emission (Fundamental) Test Setup

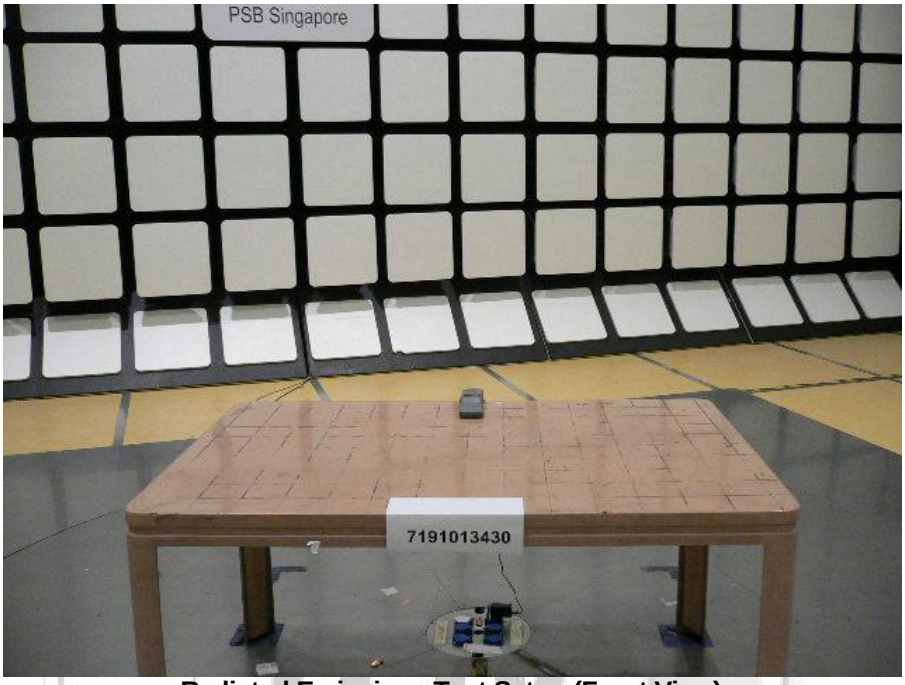
1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The 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), 15.225(b) and 15.225(c) Radiated Emission (Fundamental) Test Method

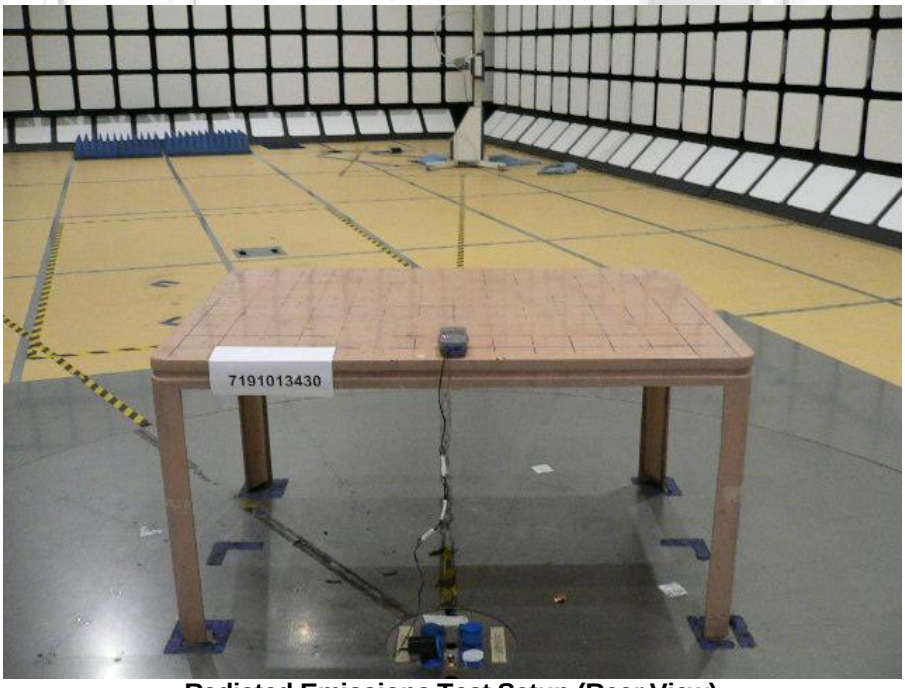
1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A prescan was carried out to pick the fundamental frequency from the EUT. For EUT which is a portable device, the prescan was carried out by rotating the EUT through three orthogonal axes to determine which altitude 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 (Class B) = 200 μV/m = 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 = 40.0 - 46.0 = -6.0 i.e. 6 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

Operating Mode	RFID Transmit	Temperature	18°C
Test Input Power	110V 60Hz	Relative Humidity	58%
Test Distance	10m *See Note 2	Atmospheric Pressure	1040mbar
		Tested By	Jason Lai

Frequency (MHz)	Q-P Value (dBµV/m)	Q-P Margin (dB) *see Note 3	Azimuth (Degrees)	Height (cm)
13.5600	53.9	-30.1	301	133

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 margin refers to the margin against the test limit at 30m test distance.
4. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
5. 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
6. 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	23 Aug 2012
Elgar Power Supply – Elgar2	SW5250A	0044A1024	Output monitored

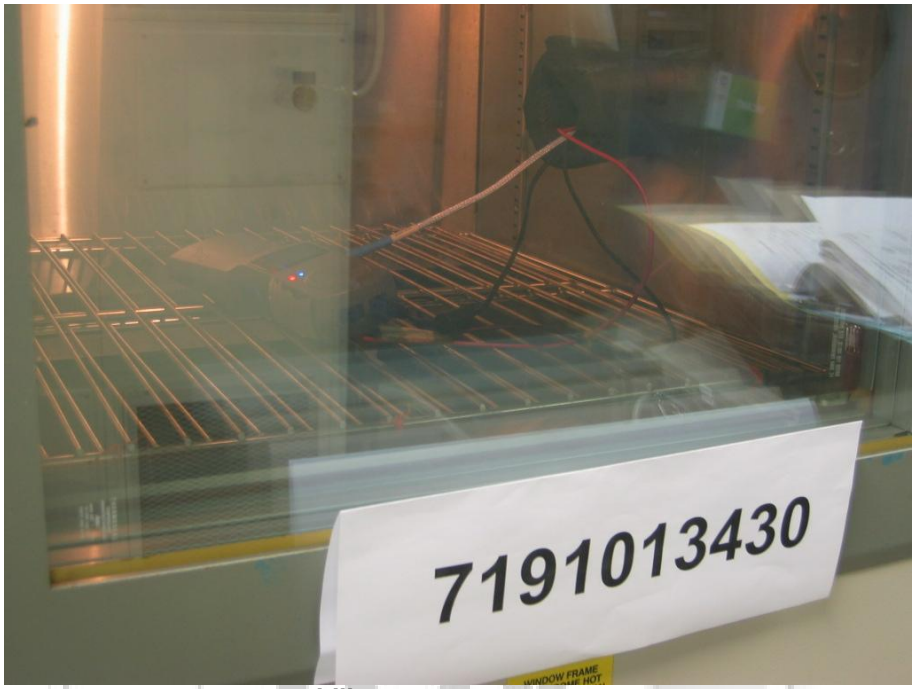
47 CFR FCC Part 15.225(e) Frequency Stability Versus Temperature Test Setup

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 universal 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.
3. The EUT's transmitting frequency was then measured at startup, and two, five and ten minutes after startup with the universal counter to capture the transmitting frequency. 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 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

Operating Mode	RFID Transmit	Temperature	-20°C
Test Input Power	110V 60Hz	Relative Humidity	60%
		Atmospheric Pressure	1030mbar
		Tested By	Chang Wai Kit

Channel Frequency (kHz)	± 0.01% Carrier Tolerance (kHz)	Measured Tolerance (kHz)	Measurement with respects to Startup Time (Mins)
13560.0000	1.356	0.158	0
13560.0000	1.356	0.156	2
13560.0000	1.356	-1.282	5
13560.0000	1.356	0.151	10

Operating Mode	RFID Transmit	Temperature	50°C
Test Input Power	110V 60Hz	Relative Humidity	60%
		Atmospheric Pressure	1030mbar
		Tested By	Chang Wai Kit

Channel Frequency (MHz)	± 0.01% Carrier Tolerance (MHz)	Measured Tolerance (MHz)	Measurement with respects to Startup Time (Mins)
13560.0000	1.356	0.050	0
13560.0000	1.356	0.049	2
13560.0000	1.356	0.049	5
13560.0000	1.356	0.048	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	23 Aug 2012
Elgar Power Supply – Elgar2	SW5250A	0044A1024	Output monitored

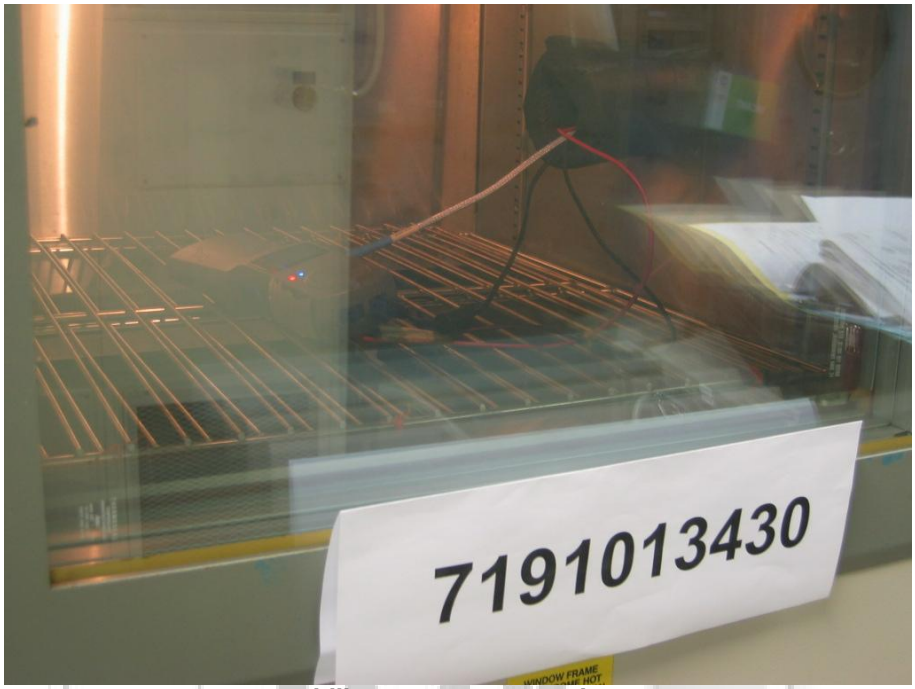
47 CFR FCC Part 15.225(e) Frequency Stability Versus Input Voltage Test Setup

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 universal 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.
3. The EUT's transmitting frequency was then measured at startup, and two, five and ten minutes after startup with the spectrum analyser was set to max hold to capture the transmitting frequency. For each measurement, the signal capturing was continuous until no further changes were observed. Four measurements were made in total.
5. 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

Operating Mode	RFID Transmit	Temperature	20°C
Test Input Power	110V 60Hz (Nominal Voltage)	Relative Humidity	60%
		Atmospheric Pressure	1030mbar
		Tested By	Chang Wai Kit

Channel Frequency (kHz)	± 1% Carrier Tolerance (kHz)	Measured Tolerance (MHz)	Measurement with respects to Startup Time (Mins)
13560.0000	135.600	0.084	0
13560.0000	135.600	0.086	2
13560.0000	135.600	0.084	5
13560.0000	135.600	0.083	10

Operating Mode	RFID Transmit	Temperature	20°C
Test Input Power	93.5V 60Hz (85% of the Nominal voltage)	Relative Humidity	60%
		Atmospheric Pressure	1030mbar
		Tested By	Chang Wai Kit

Channel Frequency (kHz)	± 1% Carrier Tolerance (kHz)	Measured Tolerance (kHz)	Measurement with respects to Startup Time (Mins)
13560.0000	135.600	0.056	0
13560.0000	135.600	0.059	2
13560.0000	135.600	0.061	5
13560.0000	135.600	0.079	10

Operating Mode	Transmit	Temperature	20°C
Test Input Power	126.5V 60Hz (115% of the Nominal voltage)	Relative Humidity	60%
		Atmospheric Pressure	1030mbar
		Tested By	Chang Wai Kit

Channel Frequency (kHz)	± 1% Carrier Tolerance (kHz)	Measured Tolerance (kHz)	Measurement with respects to Startup Time (Mins)
13560.0000	135.600	0.073	0
13560.0000	135.600	0.072	2
13560.0000	135.600	0.070	5
13560.0000	135.600	0.065	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

EUT PHOTOGRAPHS / DIAGRAMS **ANNEX A**

ANNEX A

EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS / DIAGRAMS — ANNEX A

EUT PHOTOGRAPHS

Front View

Rear View

EUT PHOTOGRAPHS / DIAGRAMS — ANNEX A

EUT PHOTOGRAPHS

Front View

Rear View

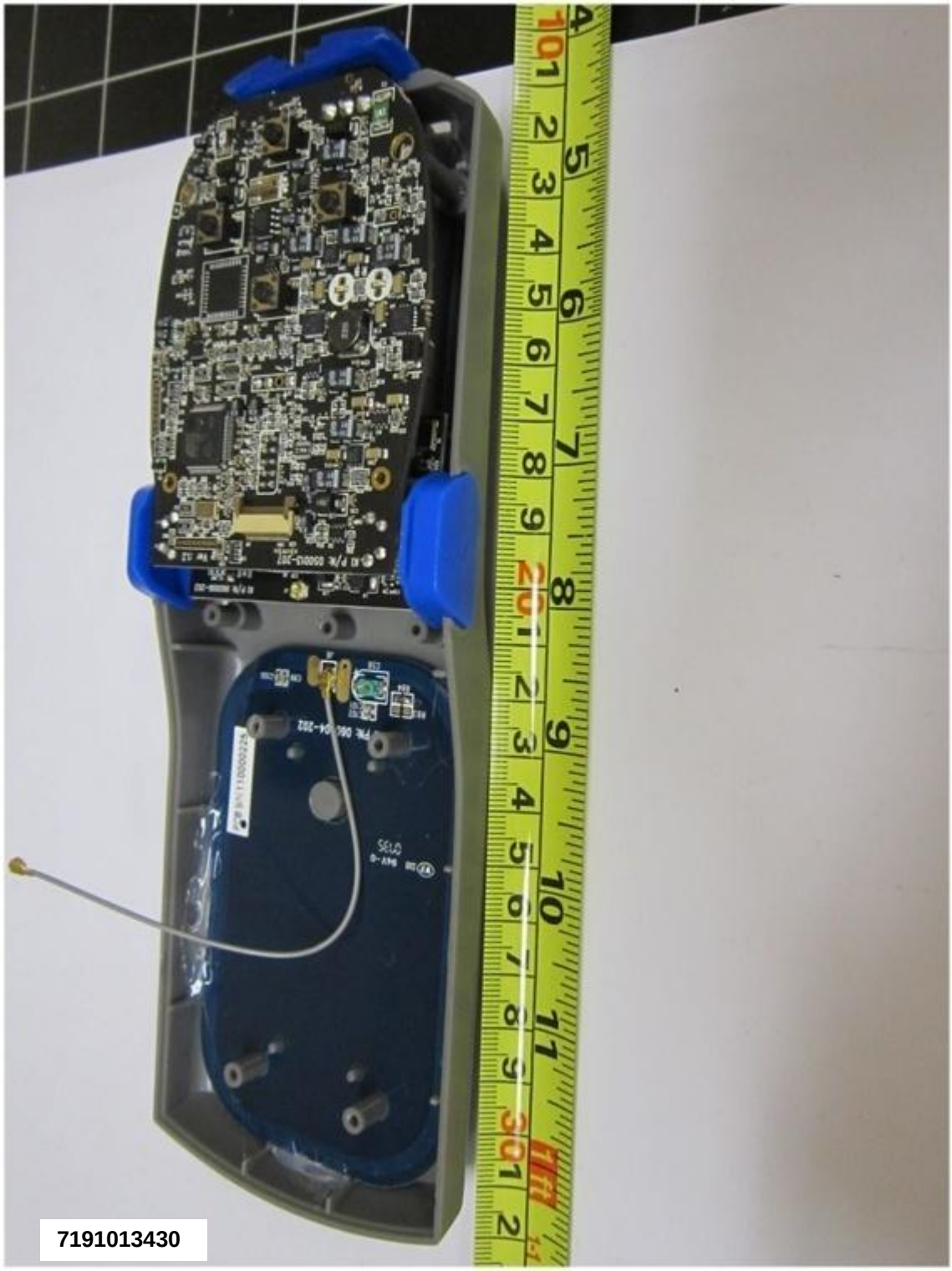
EUT PHOTOGRAPHS / DIAGRAMS — ANNEX A

EUT PHOTOGRAPHS

Rechargeable Battery Label View

EUT PHOTOGRAPHS / DIAGRAMS — ANNEX A

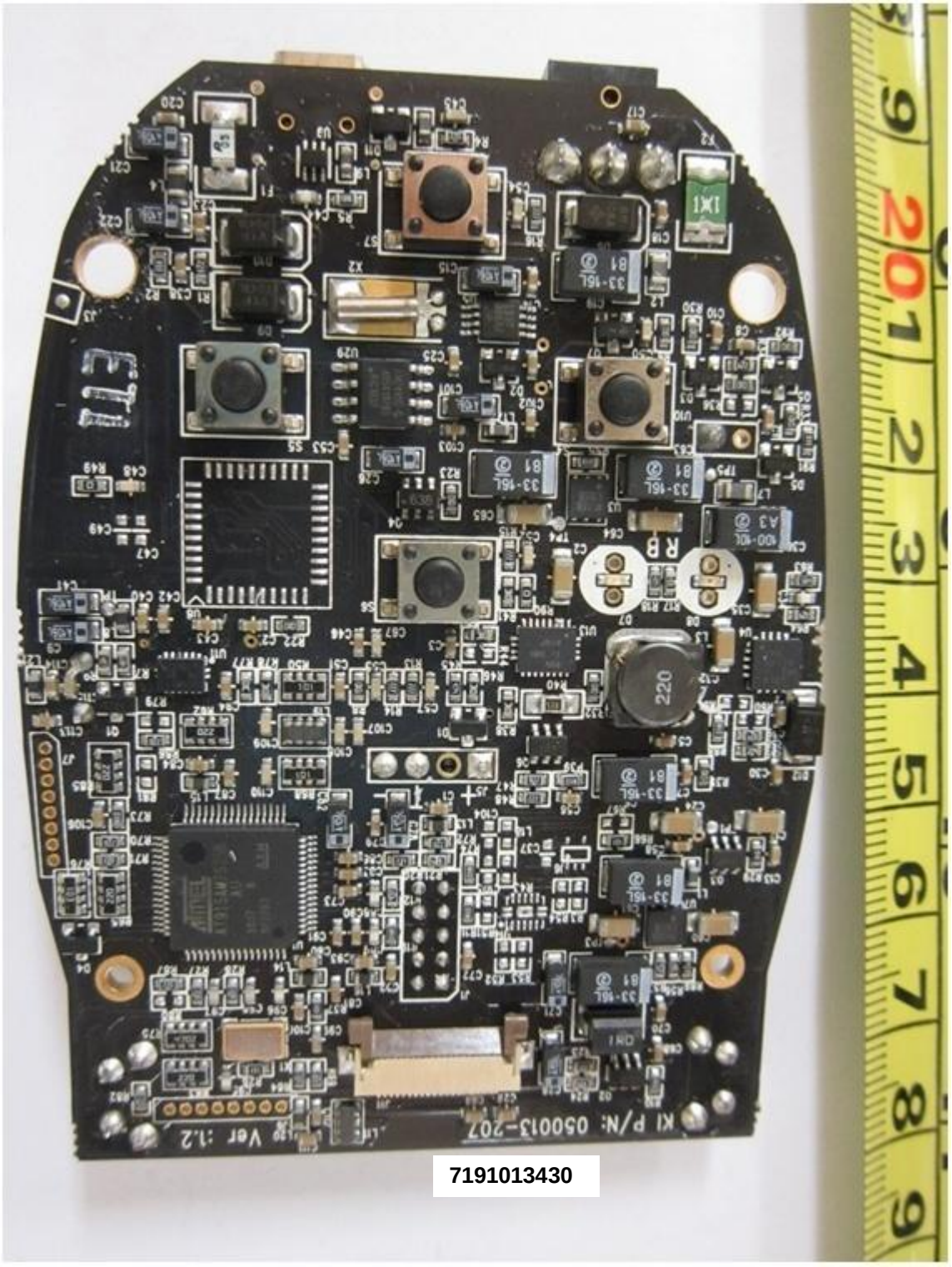
EUT PHOTOGRAPHS



EUT Internal View 1

EUT PHOTOGRAPHS / DIAGRAMS — ANNEX A

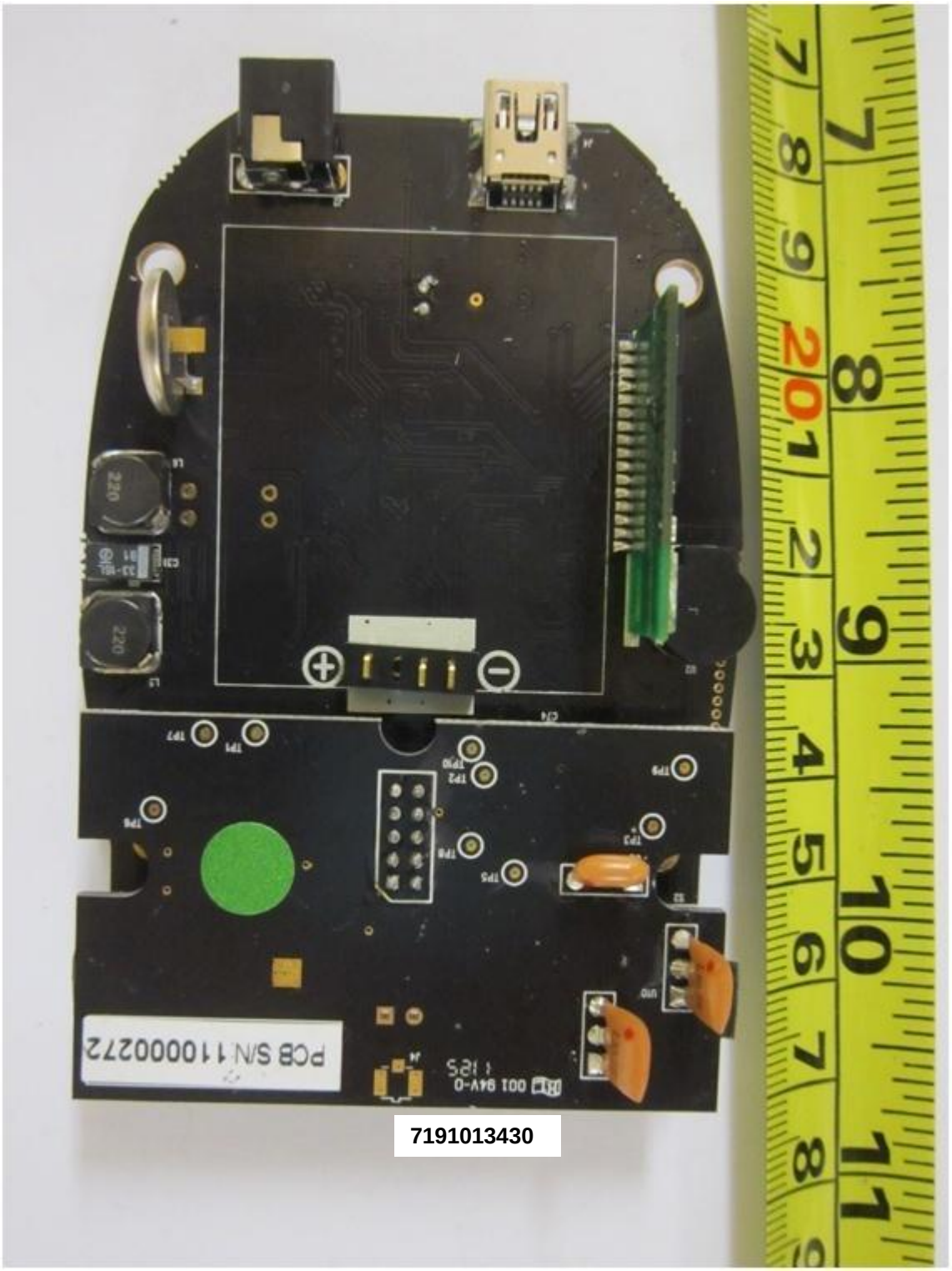
EUT PHOTOGRAPHS



Main-Board PCB Component Side

EUT PHOTOGRAPHS / DIAGRAMS — ANNEX A

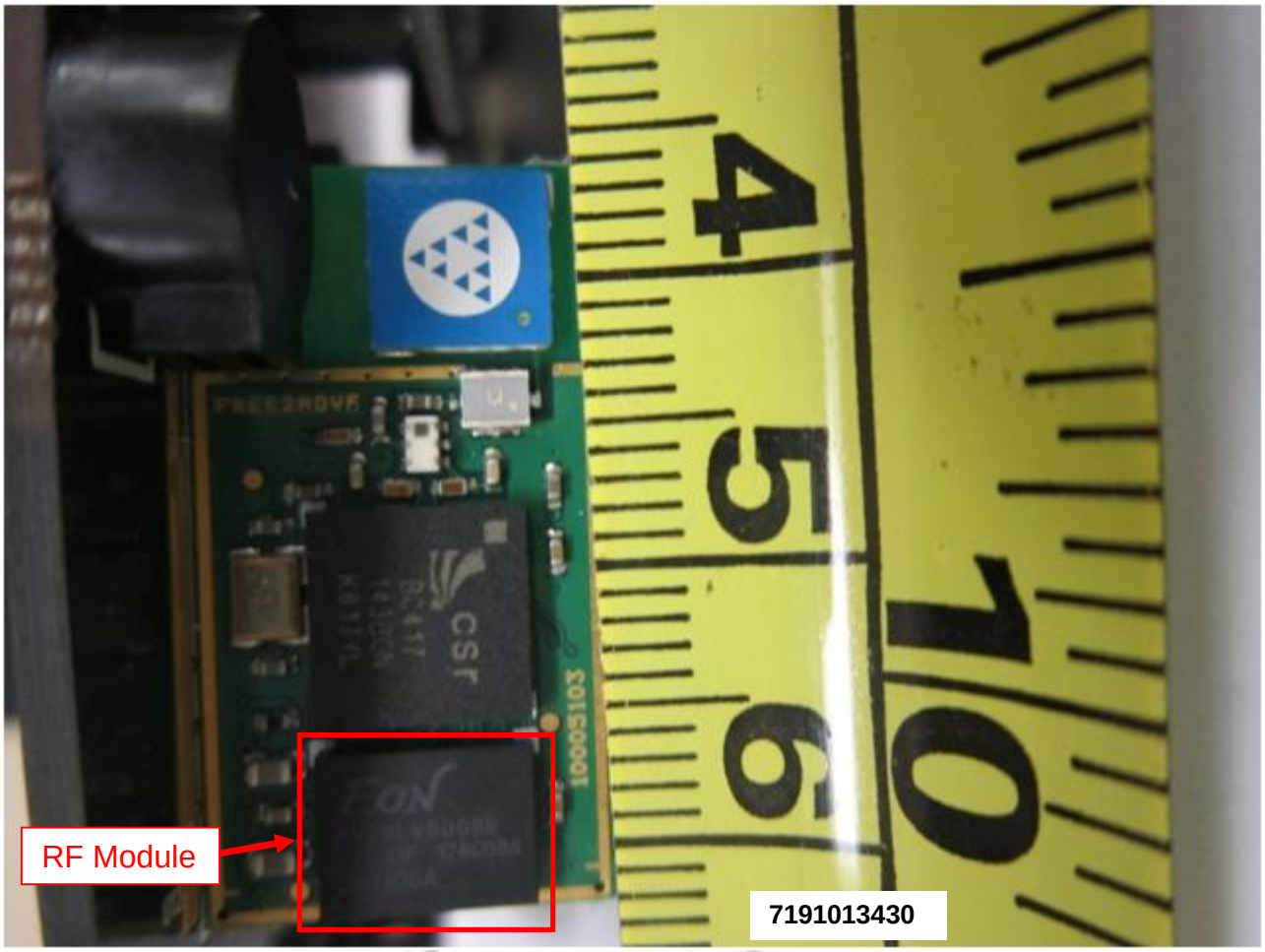
EUT PHOTOGRAPHS



Main-Board PCB Trace Side

EUT PHOTOGRAPHS / DIAGRAMS — ANNEX A

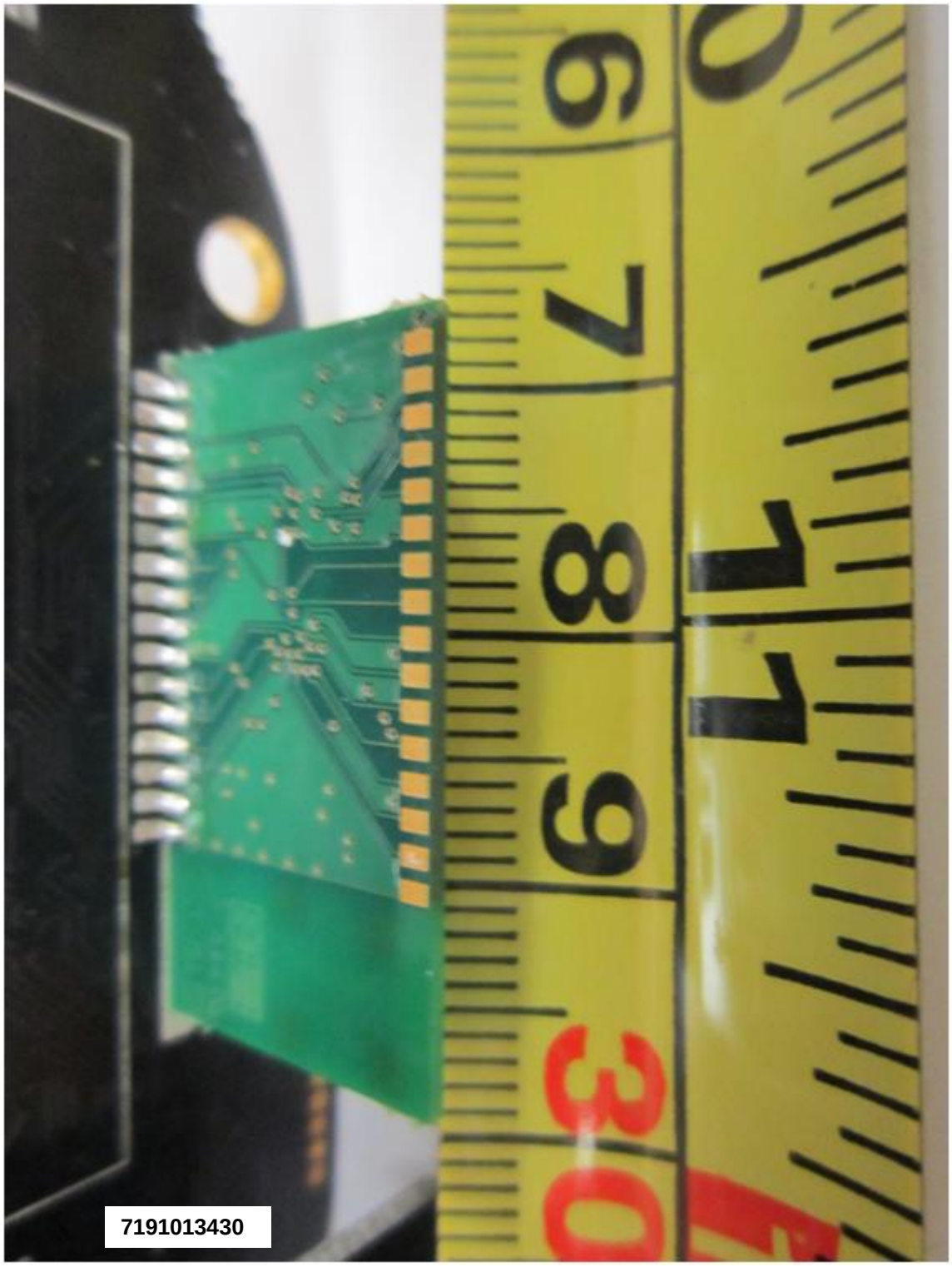
EUT PHOTOGRAPHS



Sub-Board PCB Component Side

EUT PHOTOGRAPHS / DIAGRAMS — ANNEX A

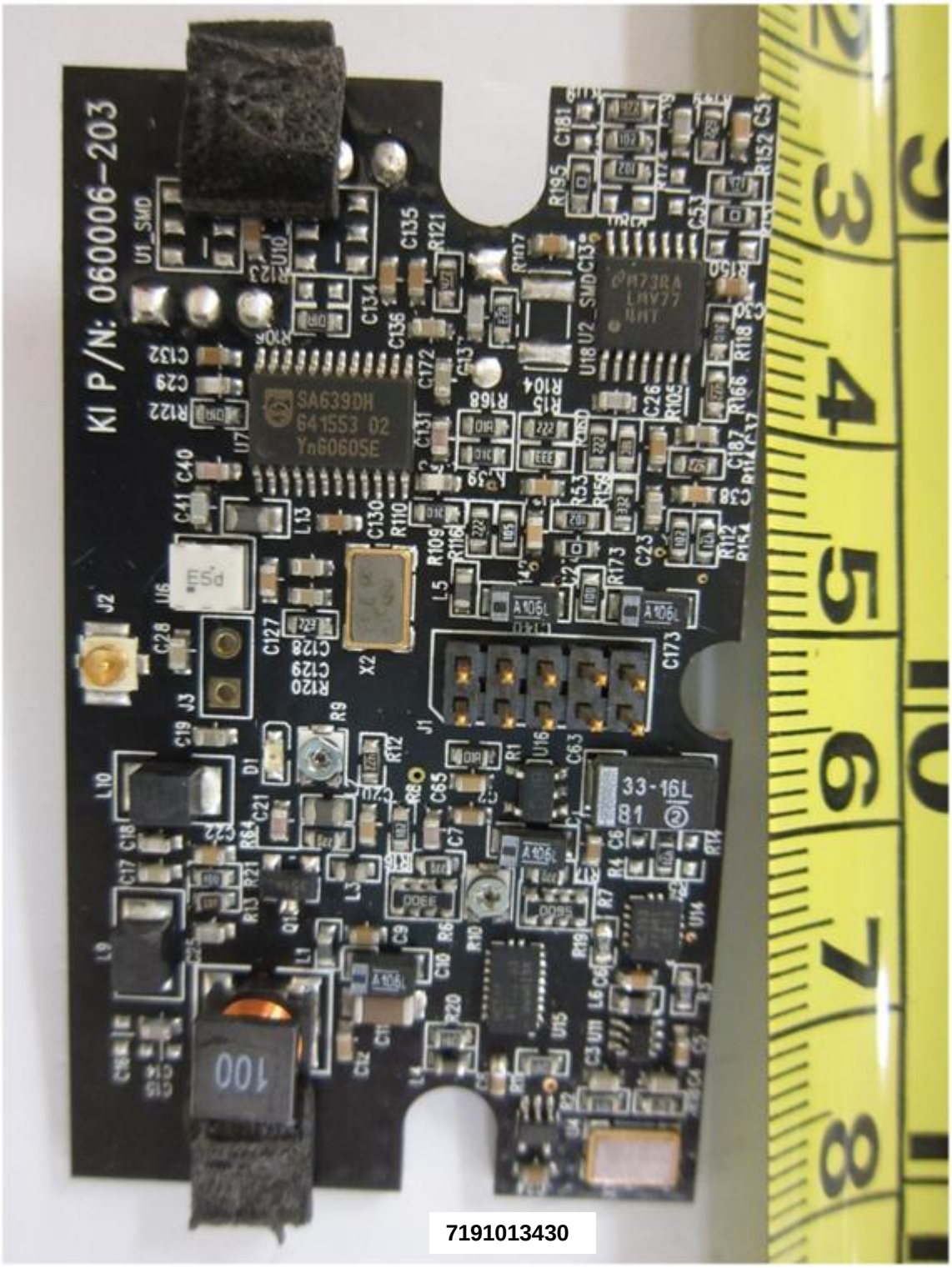
EUT PHOTOGRAPHS



Sub-Baord PCB Trace Side

EUT PHOTOGRAPHS / DIAGRAMS — ANNEX A

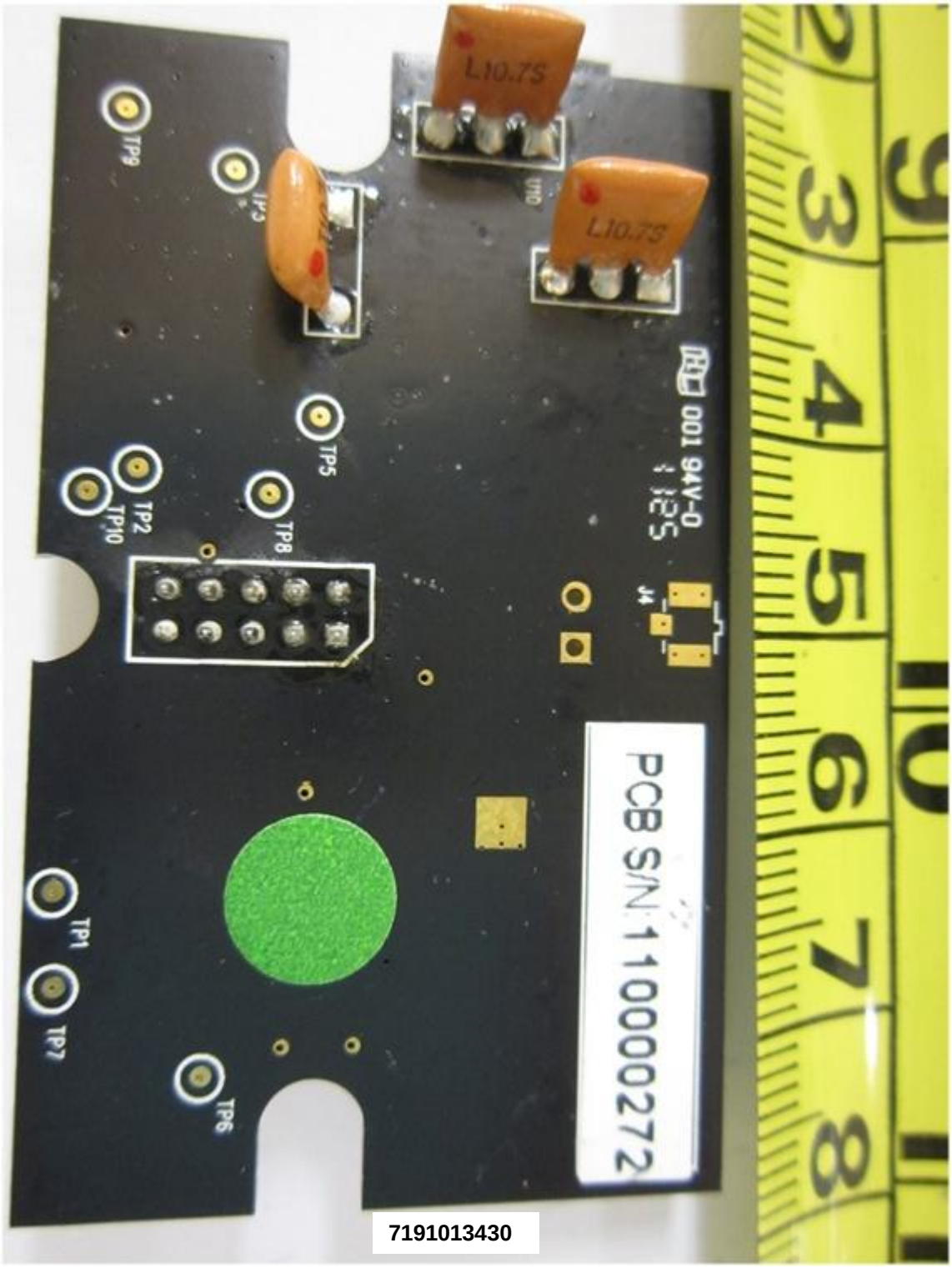
EUT PHOTOGRAPHS



Sub-Board 2 PCB Component Side

EUT PHOTOGRAPHS / DIAGRAMS — ANNEX A

EUT PHOTOGRAPHS



Sub-Board 2 PCB Trace Side

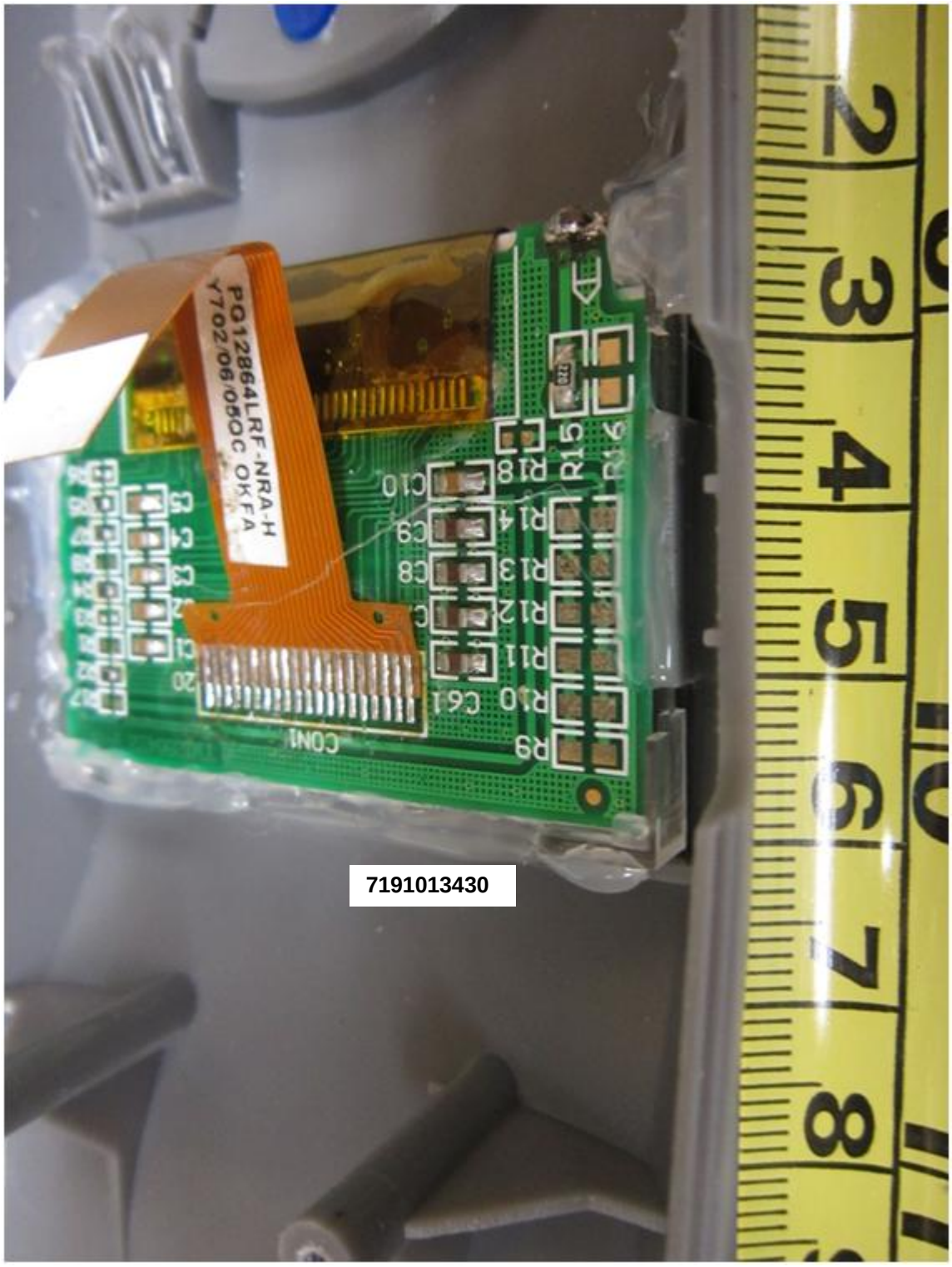
EUT PHOTOGRAPHS / DIAGRAMS — ANNEX A

EUT PHOTOGRAPHS

Antenna Board PCB Component Side

EUT PHOTOGRAPHS / DIAGRAMS — ANNEX A

EUT PHOTOGRAPHS



LCD Monitor PCB Trace Side

ANNEX B

FCC LABEL & POSITION

FCC LABEL & POSITION — ANNEX B

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

ANNEX C

USER MANUAL TECHNICAL DESCRIPTION BLOCK & CIRCUIT DIAGRAMS

(Please refer to manufacturer for details)