TEST REPORT

Your Ref: 56Q0601132 | Date: 22 Sep 2006

Our Ref: 56S060894/01 | Page: 1 of 19

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NOTE: This report is issued subject to PSB Corporation's "Terms and Conditions Governing Technical Services". The terms and conditions governing the issue of this report are set out as attached within this report.

FORMAL REPORT ON TESTING IN ACCORDANCE WITH
FCC Parts 15B & C : 2006
OF A
RF REMOTE CONTROL
[Model : RC1984703/00]
[FCC ID : RCSRC1984703]

TEST FACILITY	Telecoms & EMC, Testing Group, PSB Corporation Pte Ltd 1 Science Park Drive, Singapore 118221
FCC REG. NO.	90937 (3m & 10m OATS) 99142 (10m Anechoic Chamber) 871638 (5m Anechoic Chamber) 325572 (10m Anechoic Chamber)
IND. CANADA REG. NO.	IC 4257 (3m and 10m Anechoic Chambers)
PREPARED FOR	Philips Electronics Singapore Pte Ltd Remote Control Systems 620A Lorong 1 Toa Payoh Singapore 319762 Tel : (65) 6882 3321 Fax : (65) 6254 1691
JOB NUMBER	56S060894
TEST PERIOD	14 Sep 2006 - 20 Sep 2006

PREPARED BY	**APPROVED BY**
Quek Keng Huat Associate Engineer	Lim Cher Hwee Assistant Vice President

PSB TEST Your Peace of Mind

ISO 9001 JQA-QMA 10040

ilac-MRA ACCREDITED LABORATORY SAC-SINGLAS

LA-2001-0212-A
LA-2001-0213-F
LA-2001-0214-E
LA-2001-0215-B
LA-2001-0216-G
LA-2001-0217-G

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 marked "Not SAC-SINGLAS Accredited" in this Report are not included in the SAC-SINGLAS Accreditation Schedule for our laboratory.

TEST SUMMARY

PRODUCT DESCRIPTION

SUPPORTING EQUIPMENT DESCRIPTION

EUT OPERATING CONDITIONS

RADIATED EMISSION TEST

20dB BANDWIDTH TEST

DUTY CYCLE FACTOR COMPUTATION

ANNEX A - EUT PHOTOGRAPHS / DIAGRAMS

ANNEX B - FCC LABEL & POSITION

ANNEX C - USER MANUAL, TECHNICAL DESCRIPTION, BLOCK & CIRCUIT DIAGRAMS

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

Test Results Summary

Test Standard	Description	Pass / Fail
FCC Part 15: 2006		
15.107(a), 15.207	Conducted Emissions	Not Applicable *See Note 2
15.109(a), 15.205, 15.209	Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement)	Pass
15.231(b)	Radiated Emissions (Fundamental and Harmonics)	Pass
15.231(c)	20dB Bandwidth	Pass
15.231(d)	Band Edge Compliance	Not Applicable *See Note 3
15.231(d)	Frequency Stability Versus Temperature	Not Applicable *See Note 3
15.231(d)	Frequency Stability Versus Input Voltage	Not Applicable *See Note 3
15.35(c)	Duty Cycle Factor Computation	Refer to page 18 for details

Notes

1. The EUT is a Class B device when in non-transmitting state and meets the FCC Part15B Class B requirements.

2. The Equipment Under Test (EUT) is a battery-operated device and contains no provision for public utility connections.

3. The Band Edge and Frequency Tolerance tests are not applicable, as the carrier of the Equipment Under Test (EUT) is not in 40.66MHz - 40.70MHz band.

Modifications

1. No modifications were made.

Description	:	The Equipment Under Test (EUT) is a **RF REMOTE CONTROL.**
Manufacturer	:	Philips Electronics Singapore Pte Ltd Remote Control Systems 620A Lorong 1 Toa Payoh Singapore 319762
Model Number	:	RC1984703/00
FCC ID	:	RCSRC1984703
Serial Number	:	3139 228 50131
Microprocessor	:	Samsung - S3C80F9BRX
Operating / Transmitting Frequency	:	RF – 433.92MHz ± 14kHz
Clock / Oscillator Frequency	:	8MHz & 13.56MHz
Modulation	:	Frequency Shift Keying (FSK)
Port / Connectors	:	Nil
Rated Input Power	:	3V DC Battery Powered (2×1.5V AA size batteries)
Accessories	:	Nil

The EUT was tested as a stand-alone unit without any supporting equipment.

FCC Part 15
1. Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement) **2. Radiated Emissions (Fundamental and Harmonics)** **3. 20dB Bandwidth** **4. Duty Cycle Factor Computation**
The EUT was exercised by operating in maximum continuous transmission in test mode, i.e transmitting at 433.92MHz continuously.

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			

FCC Parts 15.109(a) and 15.209 Radiated Emission Limits

Frequency Range (MHz)	Quasi-Peak Limit Values (dBµV/m) @ 3m
30 - 88	40.0
88 - 216	43.5
216 - 960	46.0
Above 960	54.0*
* Above 1GHz, average detector was used. A peak limit of 20dB above the average limit does apply.	

FCC Parts 15.109(a) and 15.209 Radiated Emission Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Rohde & Schwarz EMI Test Receiver	ESMI	849182-003 848926-007	04 Jul 2007
Schaffner Preamplifier	CPA9231A	3422	01 Apr 2007
Schaffner Bilog Antenna	CBL6112B	2549	12 May 2007

FCC Parts 15.109(a) and 15.209 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.

FCC Parts 15.109(a) and 15.209 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 attitude 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 30MHz to 10th harmonics of the EUT fundamental frequency, using the Bi-log antenna for frequencies from 30MHz up to 3GHz, and the Horn antenna above 3GHz.

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)

FCC Parts 15.109(a), 15.205 and 15.209 Radiated Emission Results

Test Input Power	3V DC Battery Powered	Temperature	22°C
Test Distance	3m	Relative Humidity	60%
		Atmospheric Pressure	1040mbar
		Tested By	Anthony Toh

Spurious Emissions ranging from 30MHz – 1GHz

Frequency (MHz)	Q-P Value (dBμV/m)	Q-P Margin (dB)	Azimuth (Degrees)	Height (cm)	Polarisation (H/V)
88.2000	21.9	-21.6	0	100	V
219.1500	21.5	-24.5	0	100	V
356.8900	21.8	-24.2	0	100	V
467.4700	21.0	-25.0	0	100	V
639.1600	24.4	-21.6	0	100	V
651.7700	23.8	-22.2	0	100	V

Spurious Emissions above 1GHz

Frequency (GHz)	Peak Value (dBμV/m)	Average Value (dBμV/m)	Average Margin (dB)	Azimuth (Degrees)	Height (cm)	Pol (H/V)	Channel
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--

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. "--" indicates no emissions were found and shows compliance to the limits.
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 averaging over a complete cycle of the pulse train, including the blanking interval as the pulse train duration does not exceed 0.1 second.
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:
   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 & Section 15.33(b) for unintentional 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 (QP only @ 3m & 10m) is ±4.3dB (for EUTs < 0.5m X 0.5m X 0.5m).

FCC Part 15.231(b) Radiated Emission (Fundamental and Harmonics) Limits

Fundamental Frequency (MHz)	Field Strength of Fundamental Limit Values @ 3m (dBµV/m) *	Field Strength of Harmonics Limit Values @ 3m (dBµV/m) *
40.66 - 40.70	67.0	47.0
70 - 130	62.0	42.0
130 - 174	62.0 to 71.5 **	42.0 to 51.5 **
174 - 260	71.5	51.5
260 - 470	71.5 to 82.0 **	51.5 to 62.0 **
Above 470	82.0	62.0
* Average detector employed. A peak limit of 20dB above the average limit does apply.		
** Liner interpolations (in µV/m).		

Note:
Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows. The maximum permitted unwanted emission level (harmonic) is 20dB below the maximum permitted fundamental level.

- Band 130MHz - 174MHz
  20 log [56.81818(F) - 6136.3636]
- Band 260MHz - 470MHz
  20 log [41.6667(F) - 7083.3333]

FCC Parts 15.231(b) Radiated Emission (Fundamental and Harmonics) Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Rohde & Schwarz EMI Test Receiver	ESMI	849182-003 848926-007	04 Jul 2007
Schaffner Preamplifier	CPA9231A	3422	01 Apr 2007
Schaffner Bilog Antenna	CBL6112B	2549	12 May 2007

FCC Part 15.231(b) Radiated Emission (Fundamental and Harmonics) 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.

FCC Part 15.231(b) Radiated Emission (Fundamental and Harmonics) 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 and harmonics 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 attitude 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 EUT fundamental frequency until its 10th harmonics, using the Bi-log antenna for frequencies from 30MHz up to 3GHz, and the Horn antenna above 3GHz.

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
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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)

FCC Part 15.231(b) Radiated Emission (Fundamental and Harmonics) Results

Test Input Power	3V DC Battery Powered	Temperature	22°C
Test Distance	3m	Relative Humidity	60%
		Atmospheric Pressure	1040mbar
		Tested By	Anthony Toh

Frequency (GHz)	Peak Value (dBμV/m)	Average Value (dBμV/m)	Average Margin (dB)	Azimuth (Degrees)	Height (cm)	Pol (H/V)	Note
433.9460	78.5	73.6	-7.2	0	100	H	Fundamental
867.0500	49.8	44.9	-15.9	0	100	H	Harmonics
1301.0000	50.6	45.7	-15.1	0	100	V	Harmonics
1735.7900	45.0	40.1	-20.7	0	100	V	Harmonics
2169.5400	49.0	44.1	-16.7	0	100	V	Harmonics
2603.6700	54.0	49.1	-11.7	0	100	V	Harmonics

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. The average measurement was done by averaging over a complete cycle of the pulse train, including the blanking interval as the pulse train duration does not exceed 0.1 second.
3. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
4. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
   30MHz - 1GHz
   RBW: 120kHz VBW: 1MHz
   >1GHz
   RBW: 1MHz VBW: 1MHz
5. 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.
6. 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 (QP only @ 3m & 10m) is ±4.3dB (for EUTs < 0.5m X 0.5m X 0.5m).

FCC Part 15.231(c) 20dB Bandwidth Limits

The EUT shows compliance to the requirements of this section, which states that the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. For devices operating above 900MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20dB down from the modulated carrier.

FCC Part 15.231(c) 20dB Bandwidth Test Instrumentation

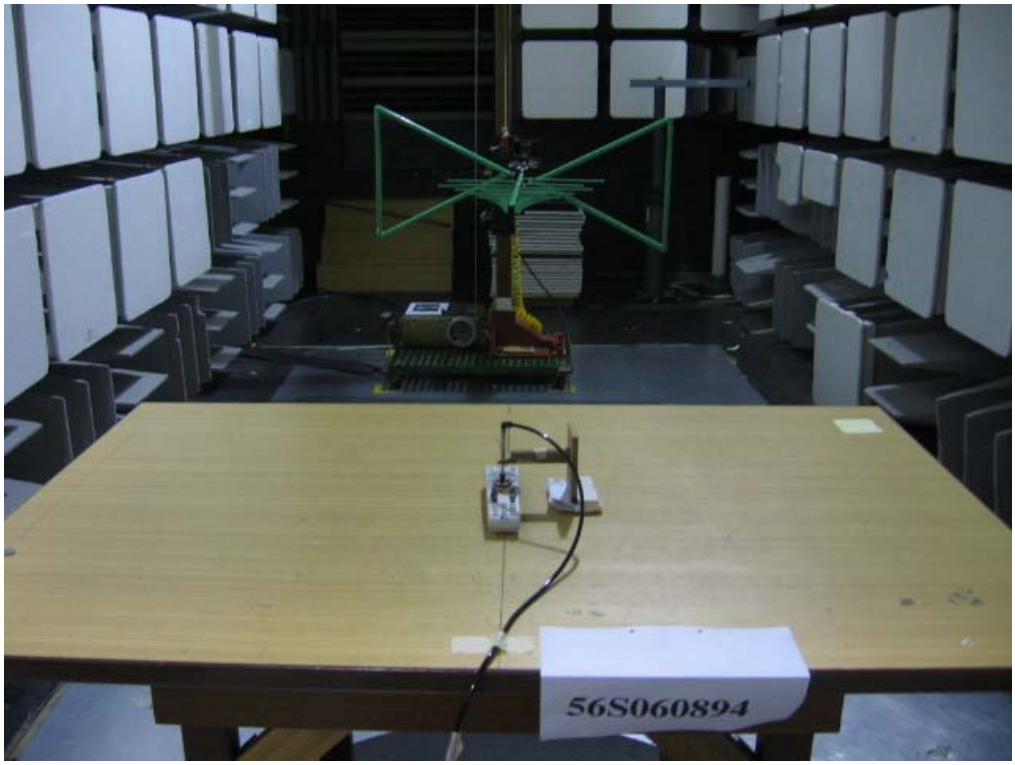
Instrument	Model	S/No	Cal Due Date
Rohde & Schwarz EMI Test Receiver	ESMI	849182-003 848926-007	04 Jul 2007
Schaffner Preamplifier	CPA9231A	3422	01 Apr 2007
Schaffner Bilog Antenna	CBL6112B	2549	12 May 2007

FCC Part 15.231(c) 20dB Bandwidth Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 120kHz and 1000kHz.
5. All other supporting equipment were powered separately from another filtered mains.

FCC Part 15.231(c) 20dB Bandwidth Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode, non-hopping with transmitting frequency at 433.92MHz.
2. The center frequency of the spectrum analyser was set to the transmitting frequency with the frequency span wide enough to capture the 20dB bandwidth of the transmitting frequency.
3. The spectrum analyser was set to max hold to capture the transmitting frequency. The signal capturing was continuous until no further changes were observed.
4. The peak of the transmitting frequency was detected with the marker peak function of the spectrum analyser. The frequencies below the 20dB peak frequency at lower (f_L) and upper (f_H) sides of the transmitting frequency were marked and measured by using the marker-delta function of the spectrum analyser.
5. The 20dB bandwidth of the transmitting frequency is the frequency difference between the marked lower and upper frequencies, $| f_H – f_L |$.



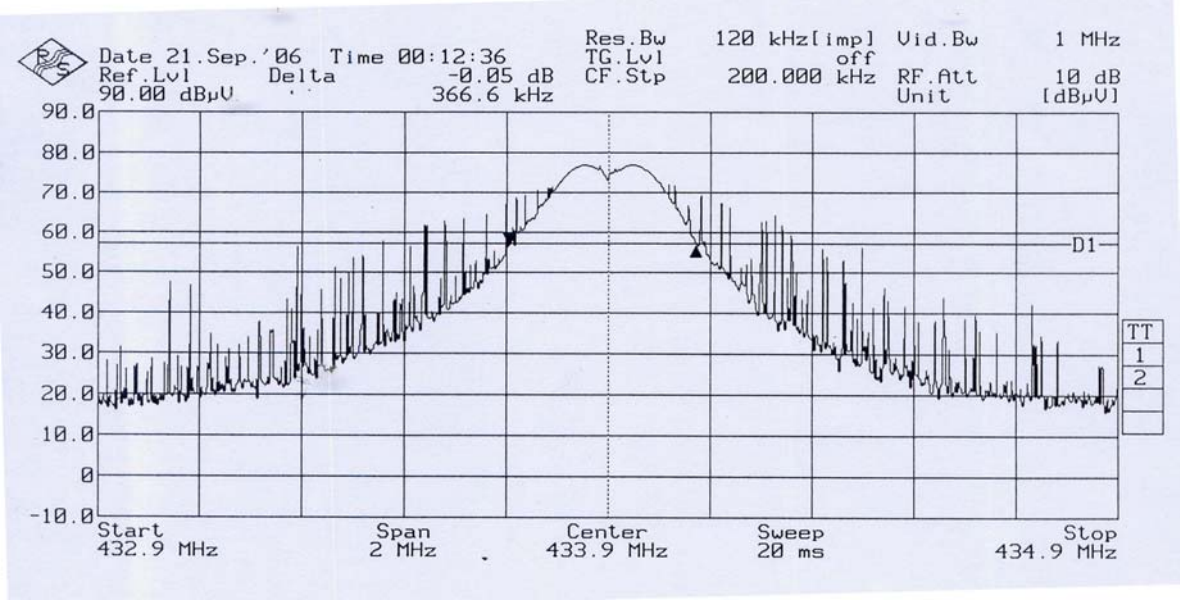
20dB Bandwidth Test Setup

FCC Part 15.231(c) 20dB Bandwidth Results

Test Input Power	3V DC Battery Powered	Temperature	22°C
Attached Plot	1	Relative Humidity	60%
		Atmospheric Pressure	1040mbar
		Tested By	Anthony Toh

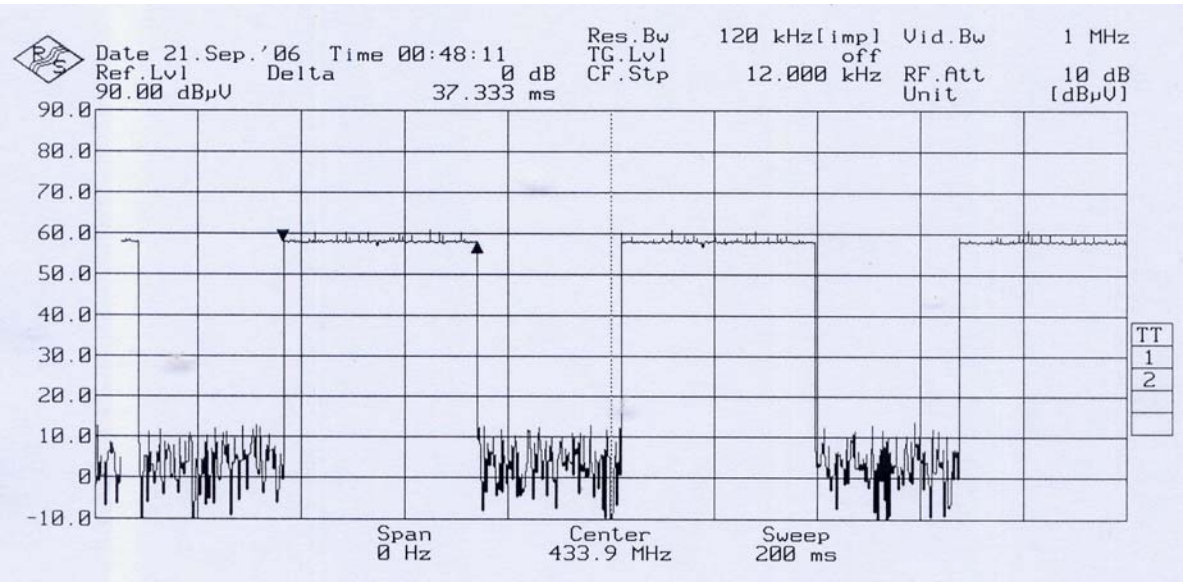
Channel Frequency (MHz)	20dB Bandwidth (MHz)
433.9200	0.3666

20dB Bandwidth Plots

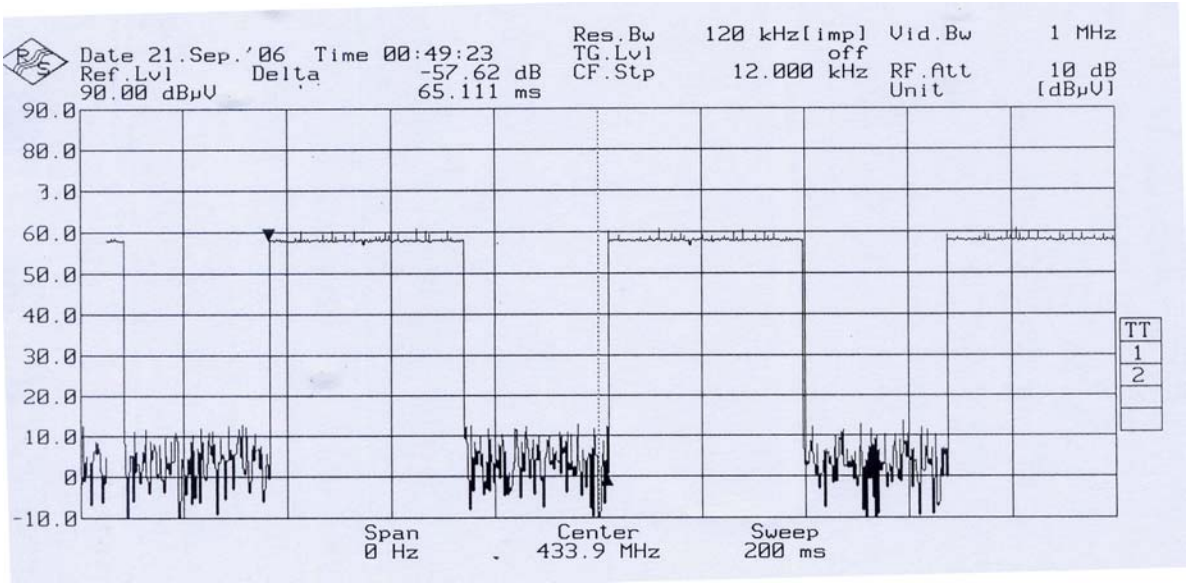


Plot 1

FCC Part 15.35(c) Duty Cycle Correction Factor



On Time



Period

Duty Cycle Factor (worst- case) = 20 log [Total On time / Period]
= 20 log [(37.3330 / 65.1110)]
= **-4.9dB**

This Report is issued under the following conditions:

1. Results of the testing/calibration in the form of a report will be issued immediately after the service has been completed or terminated.

2. Unless otherwise requested, a report shall contain only technical results. Analysis and interpretation of the results and professional opinion and recommendations expressed thereupon, if required, shall be clearly indicated and additional fee paid for, by the Client.

3. 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 PSB Corporation approves, recommends or endorses the manufacturer, supplier or user of such product/equipment, or that PSB Corporation in any way "guarantees" the later performance of the product/equipment.

4. The sample/s mentioned in this report is/are submitted/supplied/manufactured by the Client. PSB Corporation therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.

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9. This report shall not be reproduced wholly or in parts and no reference shall be made by the Client to PSB Corporation or to the report or results furnished by PSB Corporation in any advertisements or sales promotion.

10. Unless otherwise stated, the tests are carried out in PSB Corporation Pte Ltd, No.1 Science Park Drive Singapore 118221.

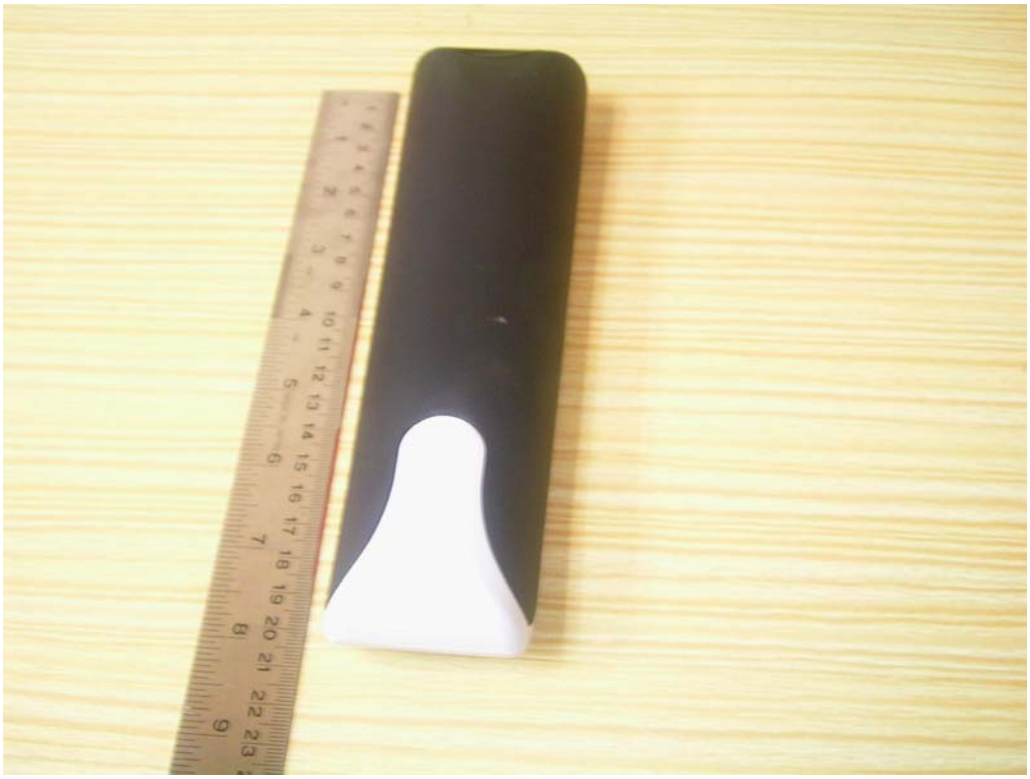
June 2006

ANNEX A

EUT PHOTOGRAPHS / DIAGRAMS

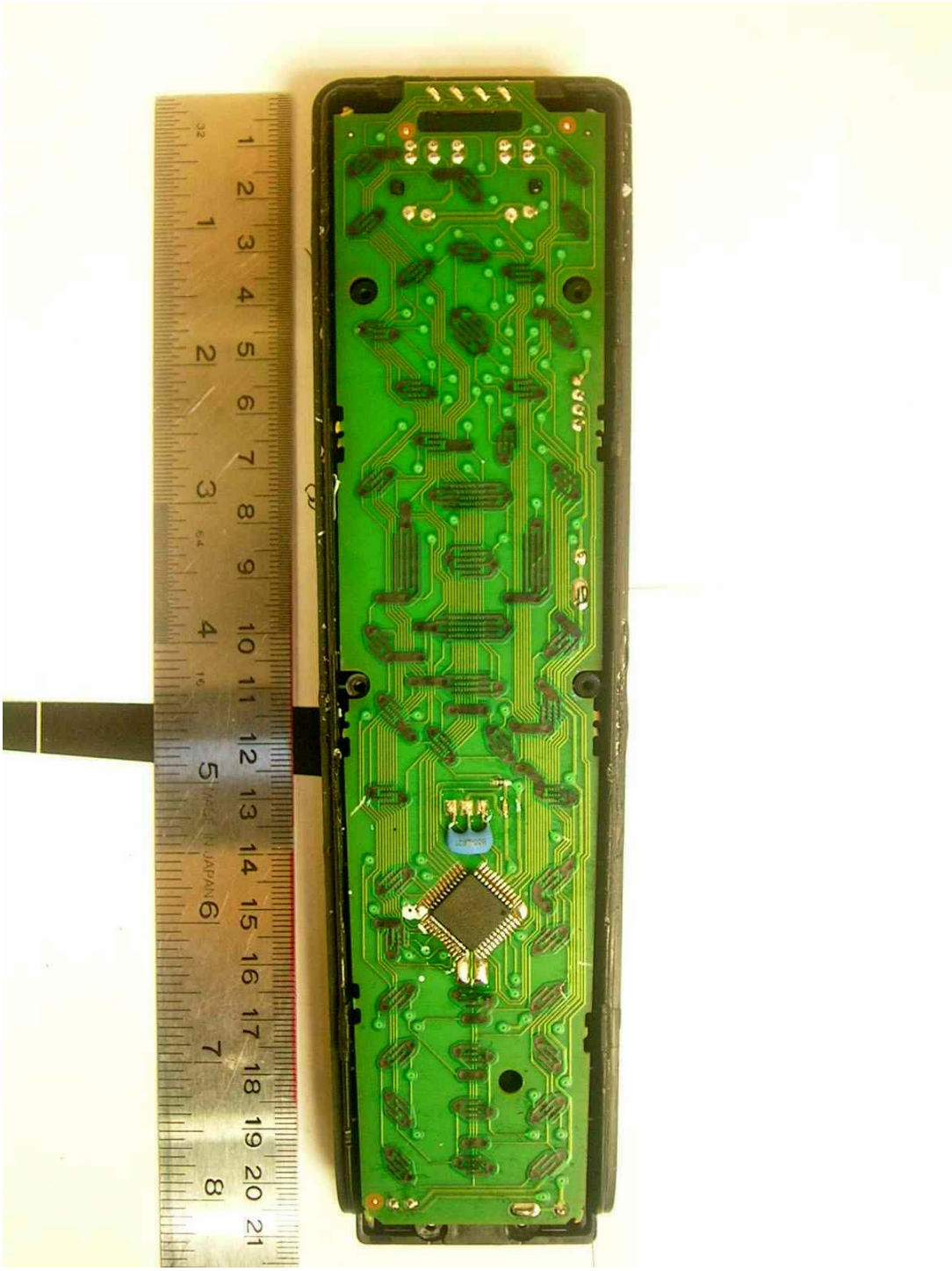
EUT PHOTOGRAPHS

Front View



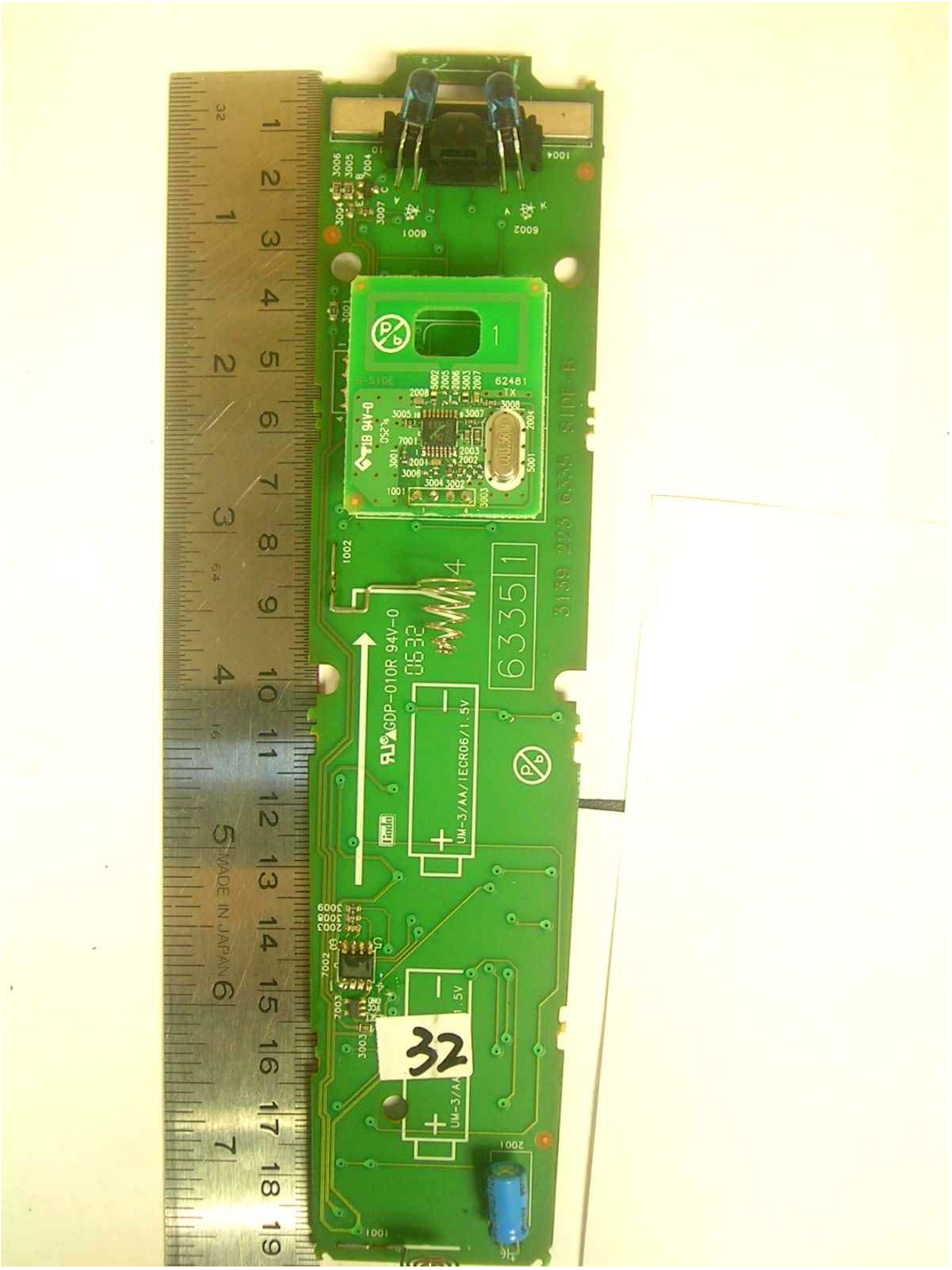
Rear View

EUT PHOTOGRAPHS



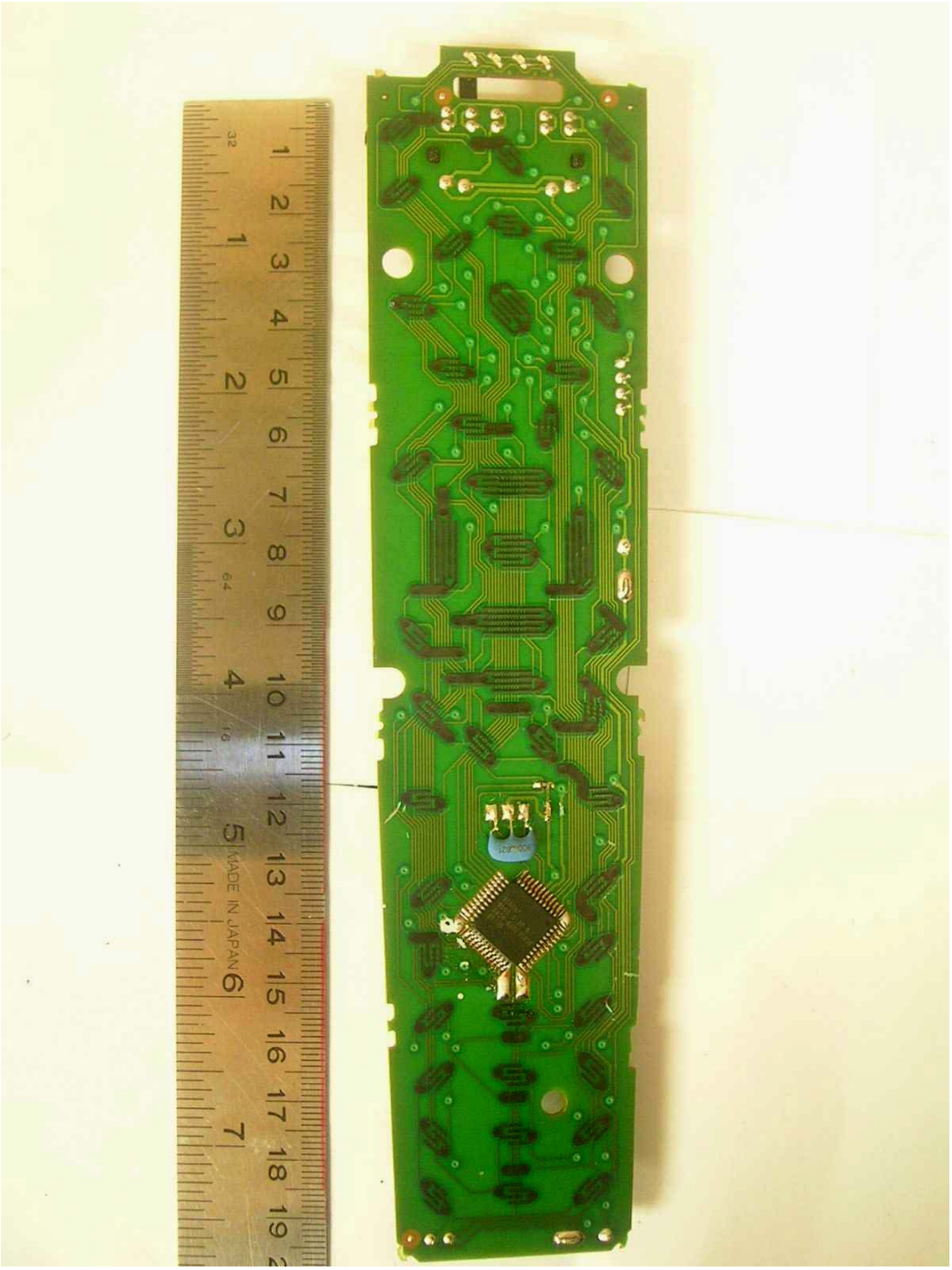
EUT Internal View

EUT PHOTOGRAPHS



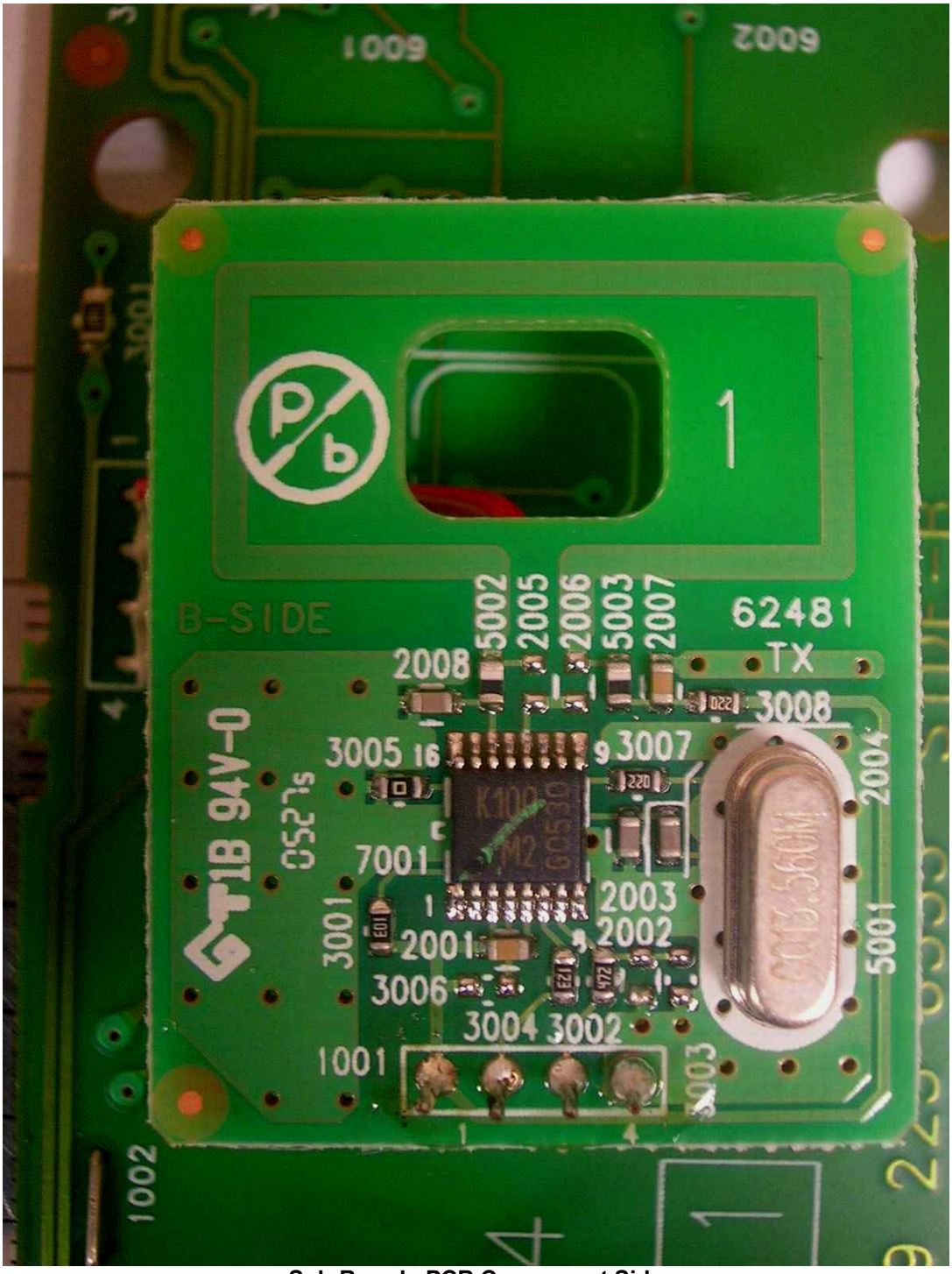
Main-Board - PCB Component Side

EUT PHOTOGRAPHS



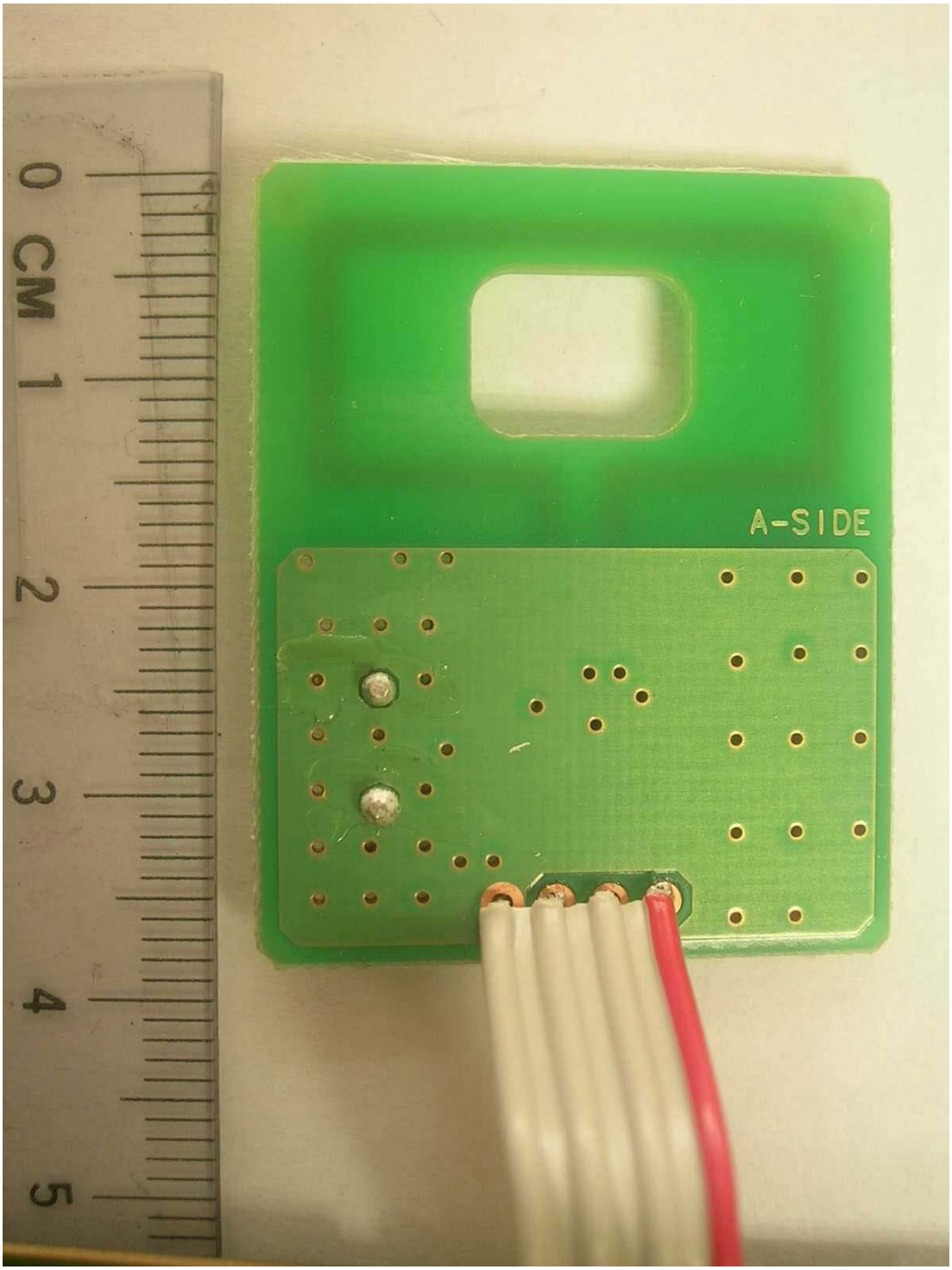
Main-Board - PCB Trace Side

EUT PHOTOGRAPHS



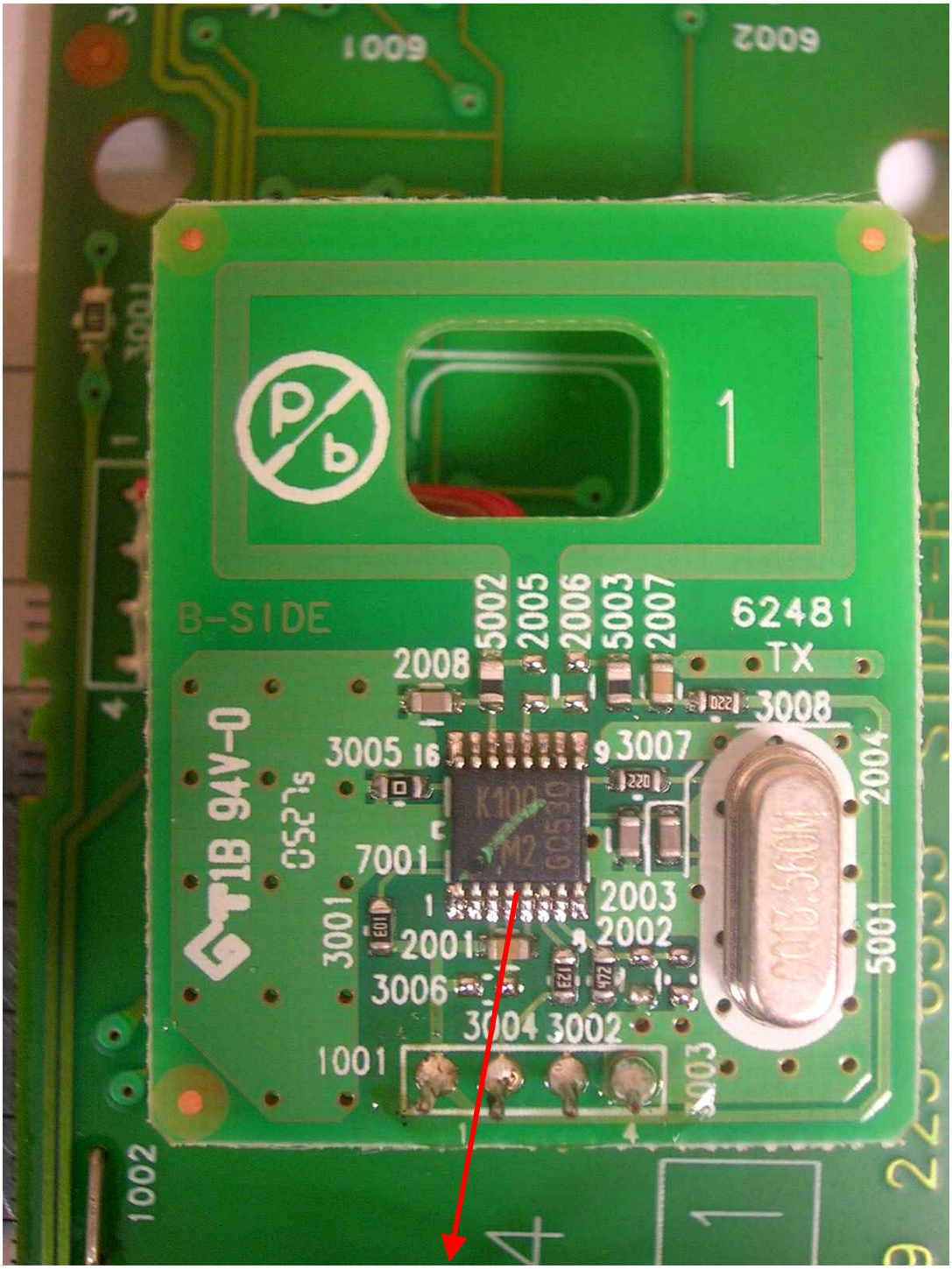
Sub-Board - PCB Component Side

EUT PHOTOGRAPHS



Sub-Board - PCB Trace Side

EUT PHOTOGRAPHS



RF Module Circuit with RF Shield Removed

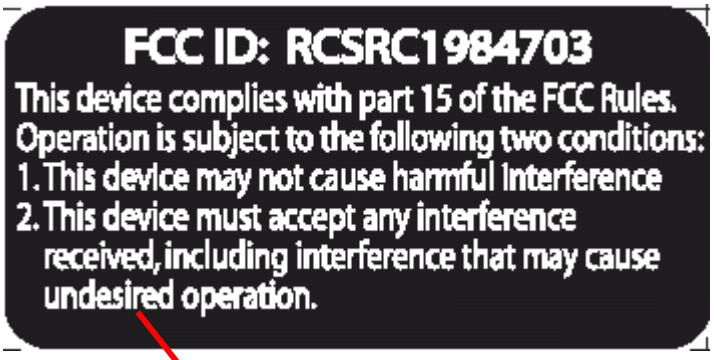
ANNEX B

FCC LABEL & POSITION

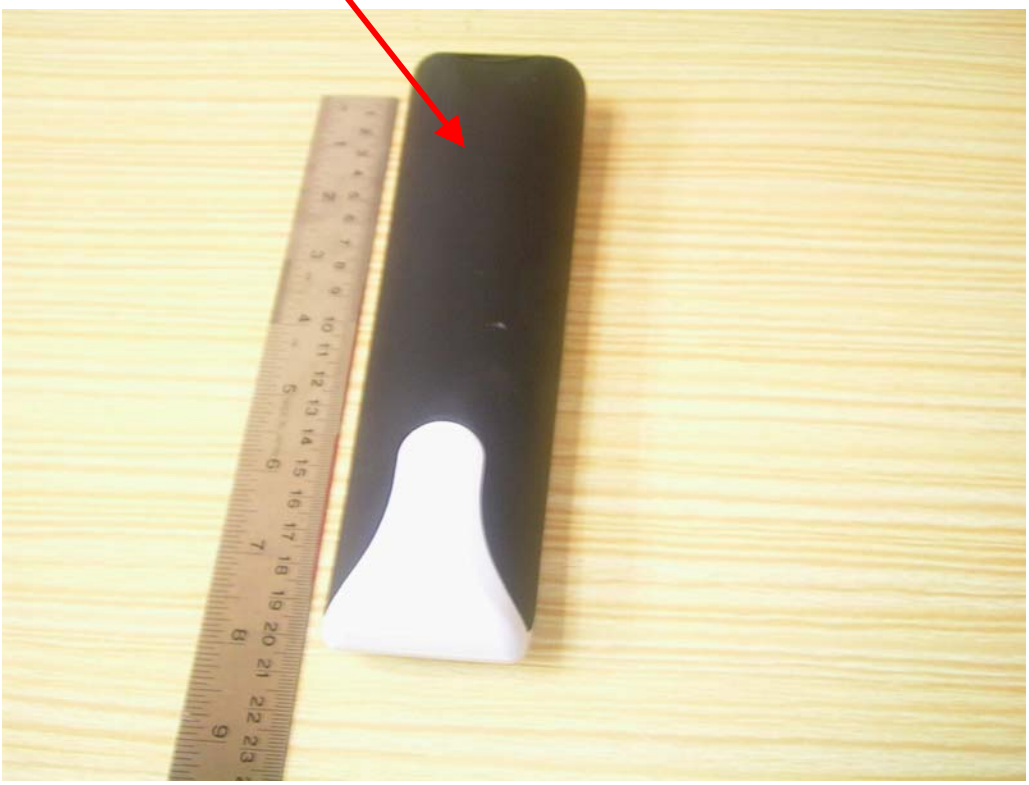
FCC LABEL & POSITION ANNEX B

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 Label

ANNEX C

USER MANUAL
TECHNICAL DESCRIPTION
BLOCK & CIRCUIT DIAGRAMS

(Please refer to manufacturer for details)