FCC / IC – Test report

Report Number	: **60/760.11.318.04**	Date of Issue:	October 23, 2014
Model	: **SGY-CS500**		
Product Type	: Speed & Cadence Sensor		
Applicant	: Pioneer Corporation.		
Address	: 1-1, Shin-ogura, Saiwai-ku, Kawasaki-shi, Kanagawa-ken, Japan		
Production Facility	: Kendy Enterprise Ltd.		
Address	: 2-12 Kwai Fat Road, 11-A Kwai Chung, New Territories, Hong Kong		
Test Result	: ■ **Positive** ☐ **Negative**		
Total pages including Appendices	: 29		

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Product Information

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2 Details about the Test Laboratory

Details about the Test Laboratory

Company name: TÜV SÜD HONG KONG LTD.
3/F, West Wing, Lakeside 2,
10 Science Park West Avenue,
Science Park, Shatin
HK.

Telephone: 852 2776 1323
Fax: 852 2776 1372

Test site

Company name: Neutron Engineering Inc.
3,Jinshagang 1st Road,
ShiXia, Dalang Town,
DongGuan, China

FCC Registered Test Site Number 319330
Open area test site Industry Canada Number: 4428B

3 Description of the Equipment Under Test

Description of the Equipment Under Test

Product:	Speed & Cadence Sensor
Model no.:	SGY-CS500
Serial number:	NIL
Options and accessories:	NIL
FCC ID:	AJDK084
IC:	775E-K084
Opreating Frequency:	2457MHz
Rated Voltage:	3 VDC
Rated Current:	NIL
Rated Power:	NIL
Frequency:	NIL
Description of the EUT:	EUT Main unit size: 6 cm x 5 cm x 2 cm Supply by 1 x 3 VDC (CR2032 battery cell)

4 Summary of Test Standards and Results

Test Condition	Pages	Test Result		
		Pass	Fail	N/A
Conducted Emission (47 CFR 15.207, 15.209 & RSS-GEN 7.2.4)	NIL	☐	☐	☒*
Radiated Emission (47 CFR 15.249, 15.209 & RSS-210 A2.9, GEN 7.2.5 & RSS-GEN 6.1)	7	☒	☐	☐
20dB Bandwidth (47 CFR 15.215)	16	☒	☐	☐
99% occupied bandwidth (RSS-GEN 4.6.1)	16	☒	☐	☐
Bandedge Emission (47 CFR 15.249)	18	☒	☐	☐

Remark: 1. NA: Battery operated only.
2.For Spurious Radiated Emissions test, three set-up directions(X,Y,Z) were pretested, but only direction X test data was recorded in this report for it is the worst case.

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5 General Remarks

Remarks
NIL

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date: October 3, 2014

Testing Start Date: October 6, 2014

Testing End Date: October 16, 2014

- TÜV SÜD HONG KONG LTD. -

Reviewed by: Prepared by:

Edmond FUNG CHAN Kwong Ngai

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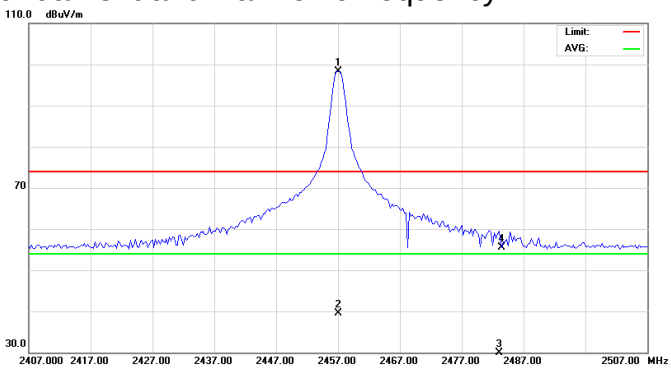
6 Emission Test Results

6.1 Radiated Emission Test (Fundamental and Harmonic)

Date of test	:	14 October 2014
Test requirement	:	FCC Part 15.249 & RSS-210, A2.9
Operating mode	:	Transmitting mode
Antenna polarity	:	Horizontal
Remarks	:	Fundament and Harmonic frequency

Test Result
☒ Passed
☐ Not Passed



Freq. (MHz)	Ant.Pol. H/V	Reading Peak (dBuV/m)	Ant./CF CF(dB)	Average factor (dB)	Act. Peak (dBuV/m)	Act. AV (dBuV/m)	Limit Peak (dBuV/m)	Limit AV (dBuV/m)
2457.00	**H**	**66.44**	**-31.84**	**51.06**	**98.28**	**47.22**	**114.00**	**94.00**

Remark: The EUT was placed on the top of the turntable in test site area.
The resolution bandwidth setting on the test receiver was 9 KHz, Detector function peak (9kHz～30MHz).
The resolution bandwidth setting on the test receiver was 120 KHz, Detector function peak (30 MHz～1000MHz).
The resolution bandwidth setting on the test receiver was 1MHz, Detector function peak (1 GHz～26.5GHz).
The test shall be made in the operation mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
For emissions measurement, the receiving antenna was placed 3 meters far away from the turntable.
The antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization.
Adjust the emission and slightly rotate the turntable to locate the position with maximum reading.
Adjust the emission and slightly height of the antenna to locate the position with maximum reading.
If the peak scan value lower limit more than 20dB, then this signal data does not show in graph
9kHz -30MHz and 18500 MHz to 26500MHz only have the background noise, the test date and graph does not show on the test report

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Radiated Emission Test (Fundamental)

Date of test : 14 October 2014

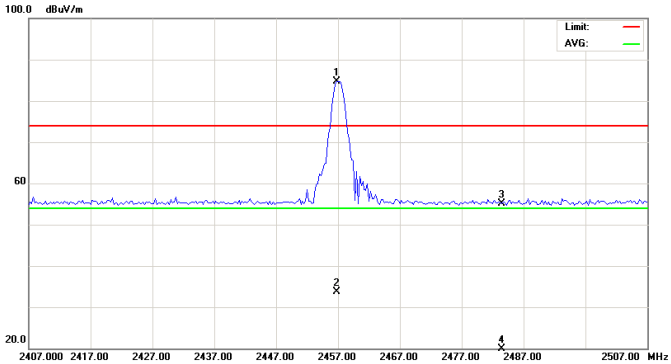
Test requirement : FCC Part 15.249 & RSS-210, A2.9

Operating mode : Transmitting mode

Antenna polarity : Vertical

Remarks : Fundament and

Test Result
☒ Passed
☐ Not Passed



Freq. (MHz)	Ant.Pol. H/V	Reading Peak (dBuV/m)	Ant./CF CF(dB)	Average factor (dB)	Act. Peak (dBuV/m)	Act. AV (dBuV/m)	Limit Peak (dBuV/m)	Limit AV (dBuV/m)
2456.75	**V**	**52.95**	**-31.84**	**51.06**	**84.79**	**33.73**	**114.00**	**94.00**

Remark: The EUT was placed on the top of the turntable in test site area.
The resolution bandwidth setting on the test receiver was 9 KHz, Detector function peak (9kHz～30MHz).
The resolution bandwidth setting on the test receiver was 120 KHz, Detector function peak (30 MHz～1000MHz).
The resolution bandwidth setting on the test receiver was 1MHz, Detector function peak (1 GHz～26.5GHz).
The test shall be made in the operation mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
For emissions measurement, the receiving antenna was placed 3 meters far away from the turntable.
The antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization.
Adjust the emission and slightly rotate the turntable to locate the position with maximum reading.
Adjust the emission and slightly height of the antenna to locate the position with maximum reading.
If the peak scan value lower limit more than 20dB, then this signal data does not show in graph
9kHz -30MHz and 18500 MHz to 26500MHz only have the background noise, the test date and graph does not show on the test report

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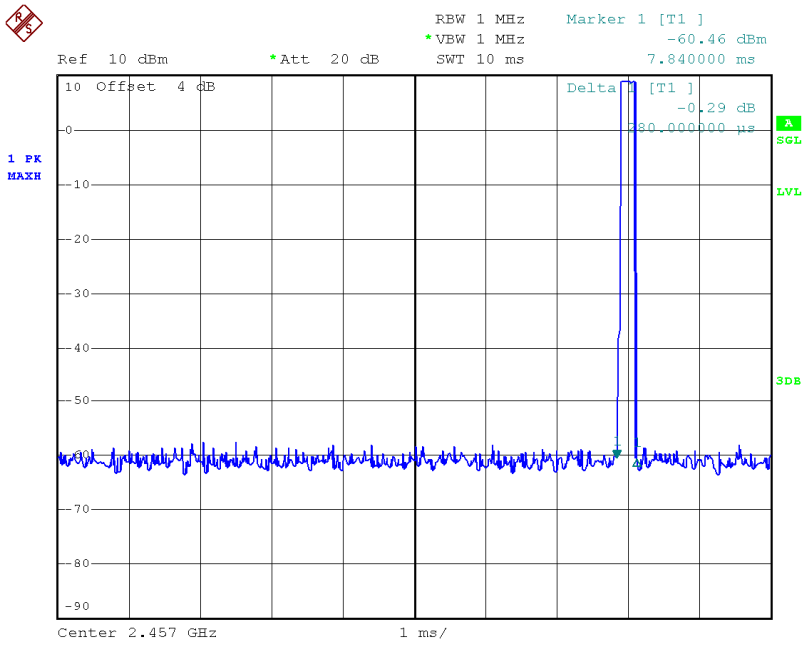
Radiated Emission Test (Duty cycle)

Date of test	:	14 October 2014
Test requirement	:	FCC Part 15 & RSS-210
Operating mode	:	Transmitting mode
Remarks	:	Detector function = peak

Test Result
☒ Passed
☐ Not Passed



EUT data packet 1 has the period of 0.28ms

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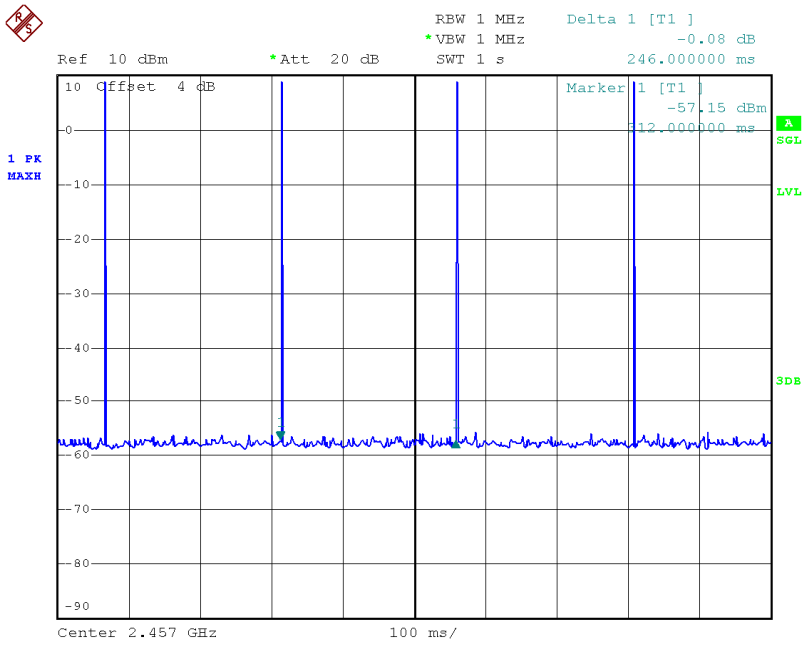
Radiated Emission Test (Duty cycle)

Date of test	:	14 October 2014
Test requirement	:	RSS-210
Operating mode	:	Transmitting mode
Remarks	:	Detector function = peak

Test Result
☒ Passed
☐ Not Passed



EUT data packet off has the period of 246 ms

Therefore, the total signal "on" time of on successful period is = 246 ms.

And the pulse train time should be 100ms according to FCC and IC rules.

Average factor: 20 log 1/(0.28/100) = 51.06 dB Average = Peak – Average Factor

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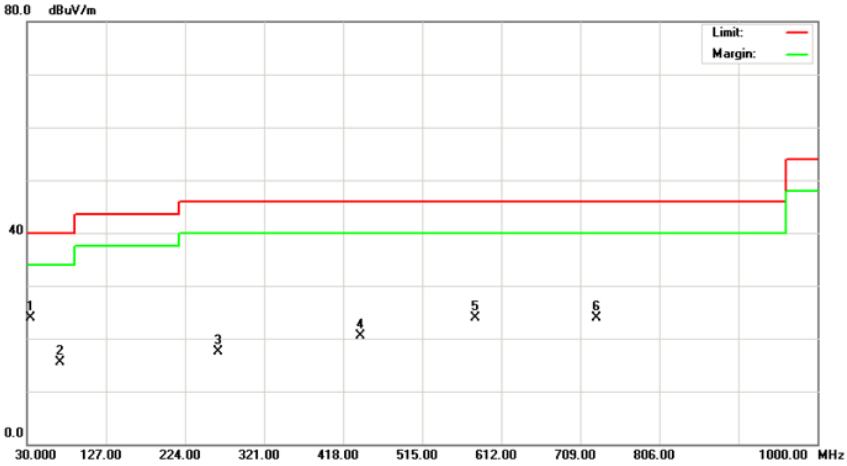
Radiated Emission Test 9kHz – 1000MHz

Date of test	:	14 October 2014
Test requirement	:	FCC Part 15 & ICES-003
Test method	:	CISPR 22
Operating mode	:	Operating (During the measurement of the speed, it will transmit the corresponding data) (worst case)
Antenna Polarity	:	Horizontal
Remarks	:	Other than the Fundament

Test Result
☒ Passed
☐ Not Passed



Freq. (MHz)	Ant. H/V	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits(QP) (dBuV/m)	Margin (dB)	Note
34.85	H	41.05	-17.22	23.83	40.00	-16.17	
71.23	H	33.75	-18.21	15.54	40.00	-24.46	
265.23	H	29.80	-12.20	17.60	46.00	-28.40	
439.83	H	29.59	-9.00	20.59	46.00	-25.41	
580.48	H	29.64	-5.76	23.88	46.00	-22.12	
728.40	H	28.73	-4.91	23.82	46.00	-22.18	

Remark: The EUT was placed on the top of the turntable in test site area.
The resolution bandwidth setting on the test receiver was 120 KHz, Detector function peak (30 MHz～1000MHz).
The resolution bandwidth setting on the test receiver was 1MHz, Detector function peak (1 GHz～5GHz).
The test shall be made in the operation mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
For emissions measurement, the receiving antenna was placed 10 meters far away from the turntable.
The antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization.
Adjust the emission and slightly rotate the turntable to locate the position with maximum reading.
Adjust the emission and slightly height of the antenna to locate the position with maximum reading.
If the peak scan value lower limit more than 20dB, then this signal data does not show in graph

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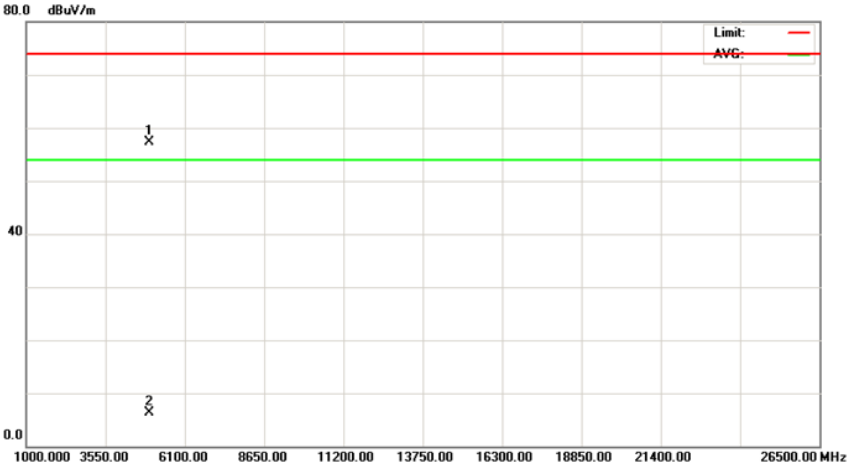
Radiated Emission Test 1000MHz – 25000MHz

Date of test	:	14 October 2014
Test requirement	:	FCC Part 15 & ICES-003
Test method	:	ANSI C63.4:2009
Operating mode	:	Operating (During the measurement of the speed, it will transmit the corresponding data) (worst case)
Antenna Polarity	:	Horizontal
Remarks	:	Other than the Fundament

Test Result
☒ Passed
☐ Not Passed



Freq. (MHz)	Ant.Pol. H/V	Reading Peak (dBuV/m)	Ant./CF CF(dB)	Average factor (dB)	Act. Peak (dBuV/m)	Act. AV (dBuV/m)	Limit Peak (dBuV/m)	Limit AV (dBuV/m)
2483.50	H	23.75	-31.80	51.06	55.55	4.49	74.00	54.00
4914.11	H	51.64	-5.71	51.06	57.35	6.29	74.00	54.00

Remark: The EUT was placed on the top of the turntable in test site area.
The resolution bandwidth setting on the test receiver was 120 KHz, Detector function peak (30 MHz～1000MHz).
The resolution bandwidth setting on the test receiver was 1MHz, Detector function peak (1 GHz～5GHz).
The test shall be made in the operation mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
For emissions measurement, the receiving antenna was placed 10 meters far away from the turntable.
The antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization.
Adjust the emission and slightly rotate the turntable to locate the position with maximum reading.
Adjust the emission and slightly height of the antenna to locate the position with maximum reading.
If the peak scan value lower limit more than 20dB, then this signal data does not show in graph

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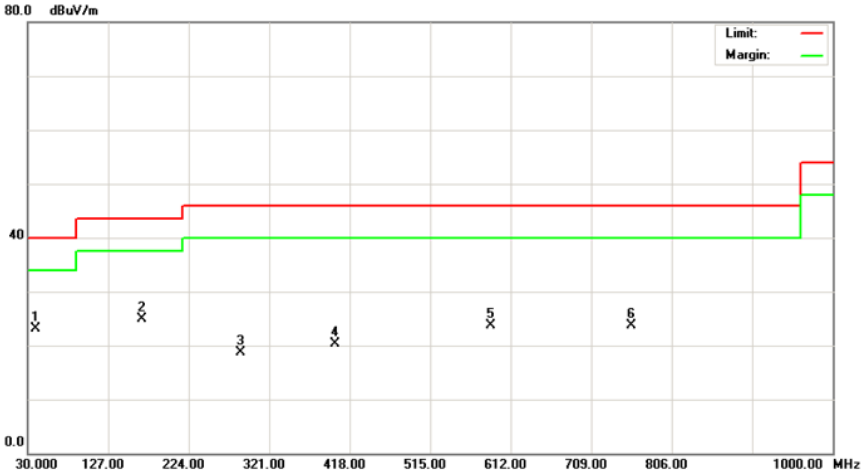
Radiated Emission Test 9kHz – 1000MHz

Date of test	:	14 October 2014
Test requirement	:	FCC Part 15 & ICES-003
Test method	:	ANSI C63.4:2009
Operating mode	:	Operating (During the measurement of the speed, it will transmit the corresponding data) (worst case)
Antenna Polarity	:	Vertical
Remarks	:	Other than the Fundament and Harmonic frequency

Test Result
☒ Passed
☐ Not Passed



Freq. (MHz)	Ant. H/V	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits(QP) (dBuV/m)	Margin (dB)	Note
39.70	V	40.33	-17.18	23.15	40.00	-16.85	
168.23	V	39.28	-14.40	24.88	43.50	-18.62	
287.05	V	29.87	-11.26	18.61	46.00	-27.39	
401.03	V	29.92	-9.71	20.21	46.00	-25.79	
587.75	V	29.39	-5.64	23.75	46.00	-22.25	
757.50	V	28.47	-4.82	23.65	46.00	-22.35	

Remark: The EUT was placed on the top of the turntable in test site area.
The resolution bandwidth setting on the test receiver was 120 KHz, Detector function peak (30 MHz～1000MHz).
The resolution bandwidth setting on the test receiver was 1MHz, Detector function peak (1 GHz～5GHz).
The test shall be made in the operation mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
For emissions measurement, the receiving antenna was placed 10 meters far away from the turntable.
The antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization.
Adjust the emission and slightly rotate the turntable to locate the position with maximum reading.
Adjust the emission and slightly height of the antenna to locate the position with maximum reading.
If the peak scan value lower limit more than 20dB, then this signal data does not show in graph

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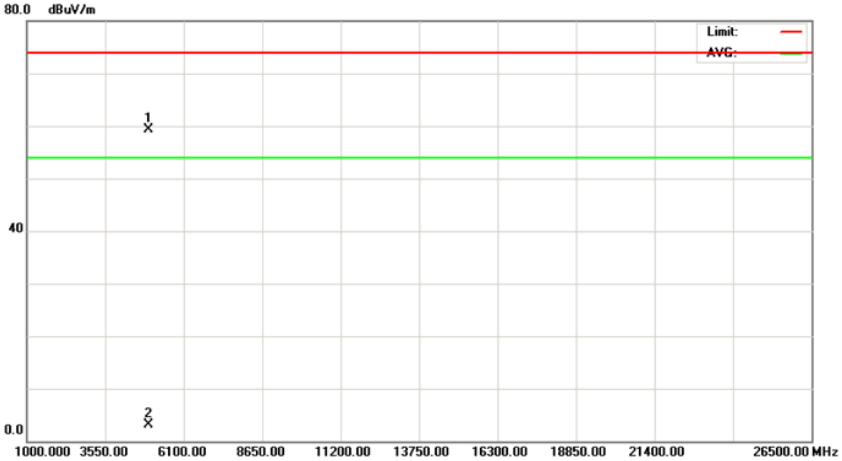
Radiated Emission Test 1000MHz – 25000MHz

Date of test	:	14 October 2014
Test requirement	:	FCC Part 15 & ICES-003
Test method	:	ANSI C63.4:2009
Operating mode	:	Operating (During the measurement of the speed, it will transmit the corresponding data) (worst case)
Antenna Polarity	:	Vertical
Remarks	:	Other than the Fundament and Harmonic frequency

Test Result
☒ Passed
☐ Not Passed



Freq. (MHz)	Ant.Pol. H/V	Reading Peak (dBuV/m)	Ant./CF CF(dB)	Average factor (dB)	Act. Peak (dBuV/m)	Act. AV (dBuV/m)	Limit Peak (dBuV/m)	Limit AV (dBuV/m)
2483.50	V	23.26	-31.80	51.06	55.06	4.00	74.00	54.00
4914.04	V	53.62	-5.71	51.06	59.33	8.27	74.00	54.00

Remark: The EUT was placed on the top of the turntable in test site area.
The resolution bandwidth setting on the test receiver was 120 KHz, Detector function peak (30 MHz～1000MHz).
The resolution bandwidth setting on the test receiver was 1MHz, Detector function peak (1 GHz～5GHz).
The test shall be made in the operation mode. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
For emissions measurement, the receiving antenna was placed 10 meters far away from the turntable.
The antenna was fixed on the same height with the EUT to find each suspected emissions of both horizontal and vertical polarization.
Adjust the emission and slightly rotate the turntable to locate the position with maximum reading.
Adjust the emission and slightly height of the antenna to locate the position with maximum reading.
If the peak scan value lower limit more than 20dB, then this signal data does not show in graph

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Test Equipment List

Radiated Emission Test

Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
Horn Antenna	ETS	3115	00075789	May.11.2015
Amplifier	Agilent	8449B	3008A02274	May.25.2015
Spectrum	Agilent	E4408B	US39240143	Nov.15.2014
Test Cable	HUBER+SUHNER	CB03 High Fre	N/A	May.02.2015
Bi-log Antenna	Schwarbeck	VULB9160	9160-3232	May.25.2015
Amplifier	HP	8447D	2944A09673	May.25.2015
Test Receiver	R&S	ESCI	100895	May.25.2015
Test Cable	N/A	C-01_CB03	N/A	Jul.04.2015
Controller	CT	SC100	N/A	N/A
Triple Loop Antenna	R&S	HFH2-Z2	830749/020	May.26.2015
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170319	May.11.2015

Uncertainty:

Contribution	Probability Distribution	Uncertainty (dB)
Total uncertainty at a minimum confidence level of 95%	Normal (k=2)	± 2.66 (correct to 1 decimal place)

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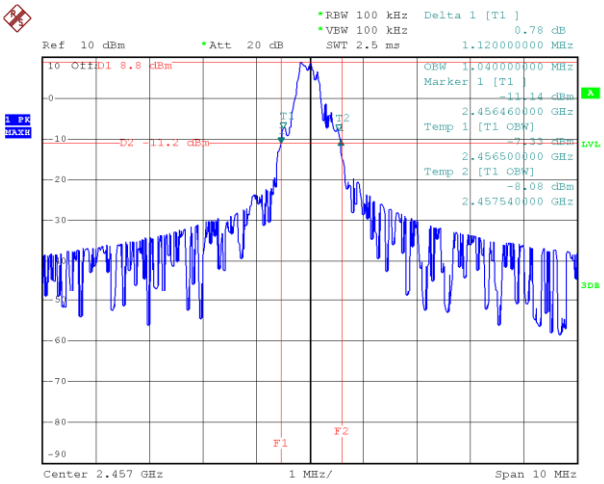
6.2 20dB down and 99% Occupied Bandwidth measurement

Date of test	:	14 October 2014
Test requirement	:	FCC Part 15.215 & RSS-210
Test method	:	ANSI C63.4:2009
Operating mode	:	Transmitting mode
Remarks	:	NIL

Test Result
☒ Passed
☐ Not Passed



20 dBc Bandwidth : 1.12 MHz
99% Occupied BW: 1.04 MHz

Remark: Span: the minimum span to fully display the emission and approximately 20 dB below the peak level
Resolution BW: Set to 1% to 3% of the approximate emission width
Video BW: 3 times the Resolution BW
Video Averaging: None
Sweep time: Coupled
Detector: Sample
Compute the combined power of all signal responses contained in the trace by recovering all the data points, converting them to power and summing all the values. For 99% occupied BW, place the markers at the frequency at which 0.5% of the power lies to the right of the right marker and 0.5% of the power lies to the left of the left marker. The 99% of the power lies between the markers. The 20dB measurement method is a secondary alternative to the 99% Occupied BW method, if it is performed as illustrated below. The spectrum analyzer is set to a resolution and video bandwidth far greater than the emission bandwidth and the peak of the signal is set to the top line of the analyzer. The marker is placed on the trace at the point left of centre that displays a value that is 20 dB below the value of the reference level. The delta marker is evoked and placed at the point to the right of centre that displays 0 dB differential. The frequency differential is the occupied bandwidth as shown.

Test Equipment List

Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
Spectrum Analyzer	R&S	FSP 40	100185	Nov.26.2014

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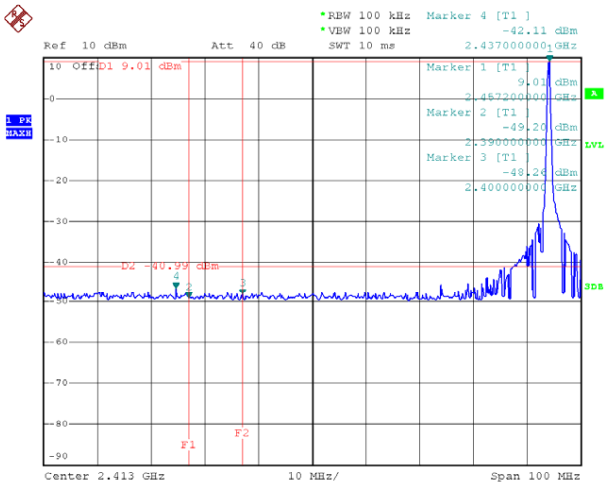
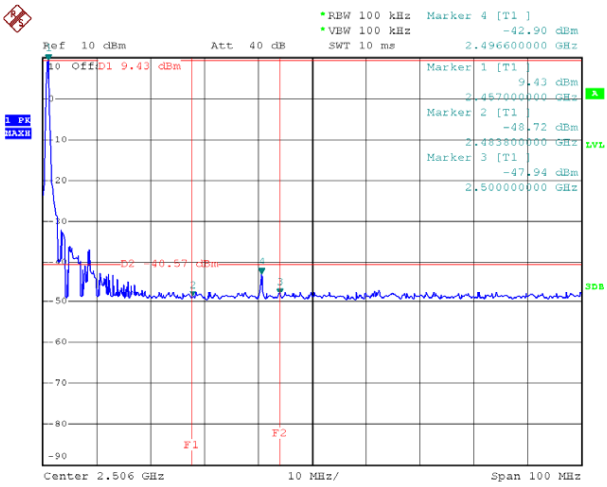
6.3 Bandedge measurement

Date of test	:	14 October 2014
Test requirement	:	FCC Part 15 & RSS-210
Test method	:	
Operating mode	:	Transmitting mode
Remarks	:	NIL

Test Result
☒ Passed
☐ Not Passed





Remark: Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation
RBW ≥ 1% of the span
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold
Allow the trace to stabilize. Set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. The marker-delta value now displayed must comply with the limit specified in this Section. Submit this plot. Now, using the same instrument settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit. Submit this plot.

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Test Equipment List

Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
Spectrum Analyzer	R&S	FSP 40	100185	Nov.26.2014

Uncertainty:

Contribution	Probability Distribution	Uncertainty (dB)
Total uncertainty at a minimum confidence level of 95%	Normal (k=2)	± 2.66 (correct to 1 decimal place)

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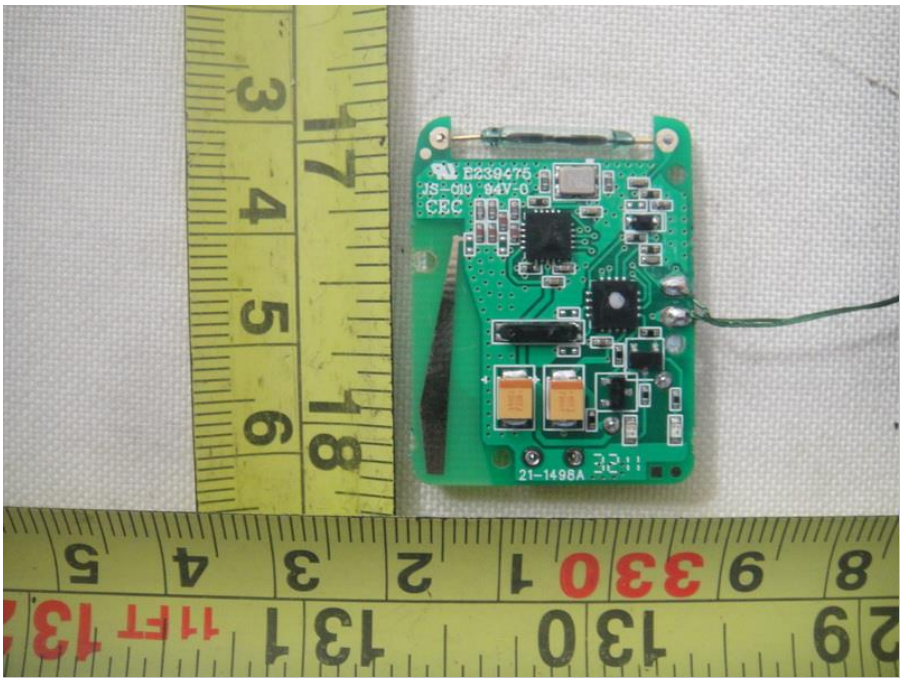
7 Appendix A

Appendix A

Appendix A



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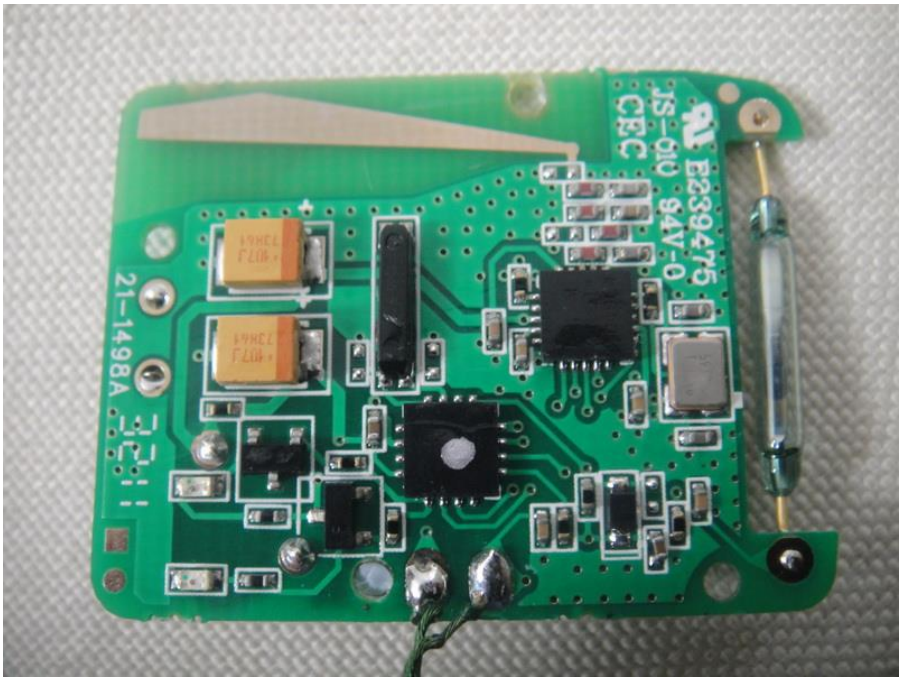
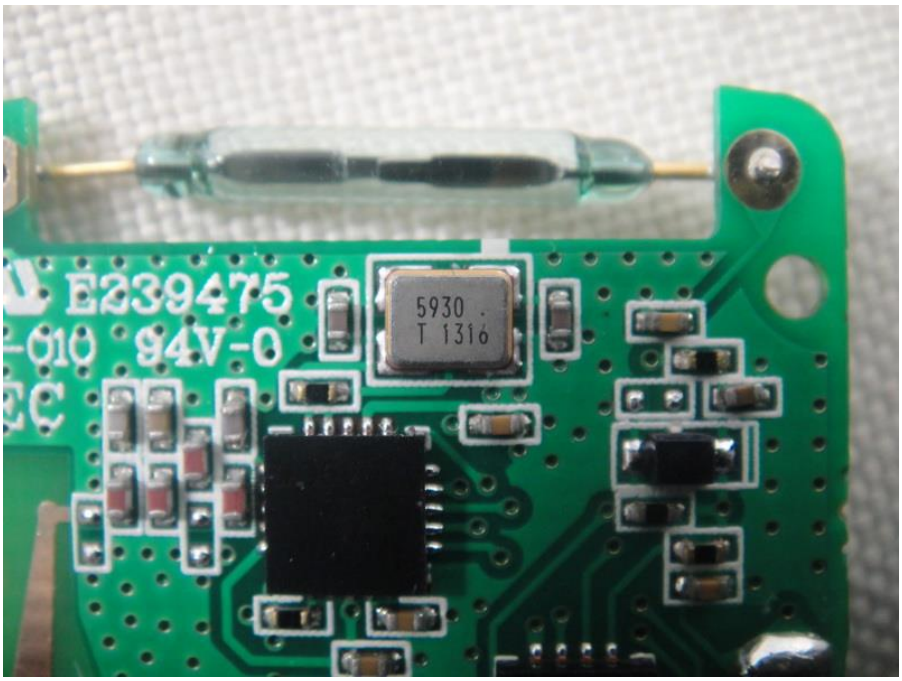
Appendix A





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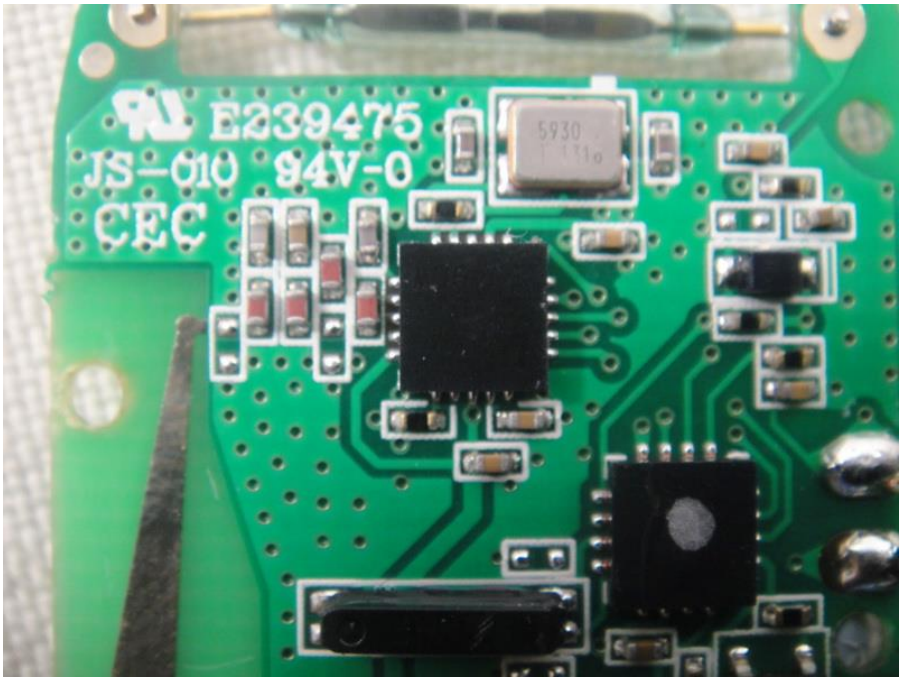
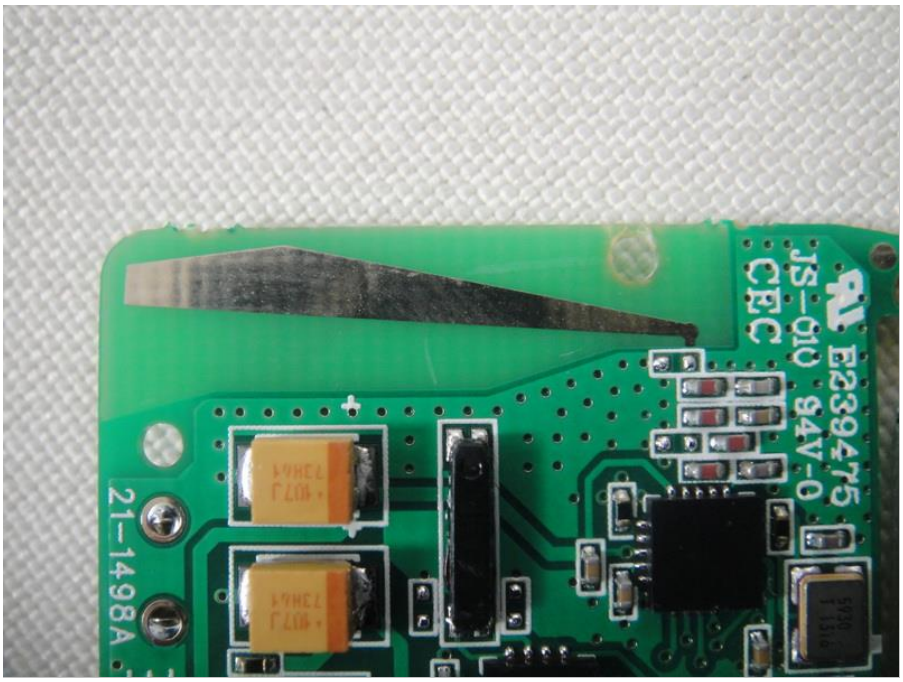
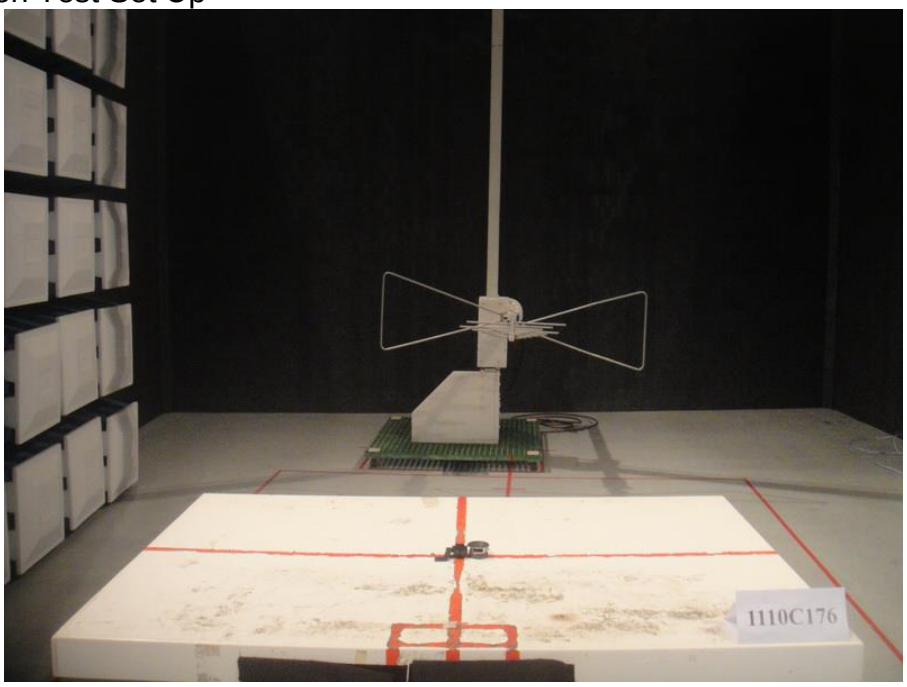
Appendix A

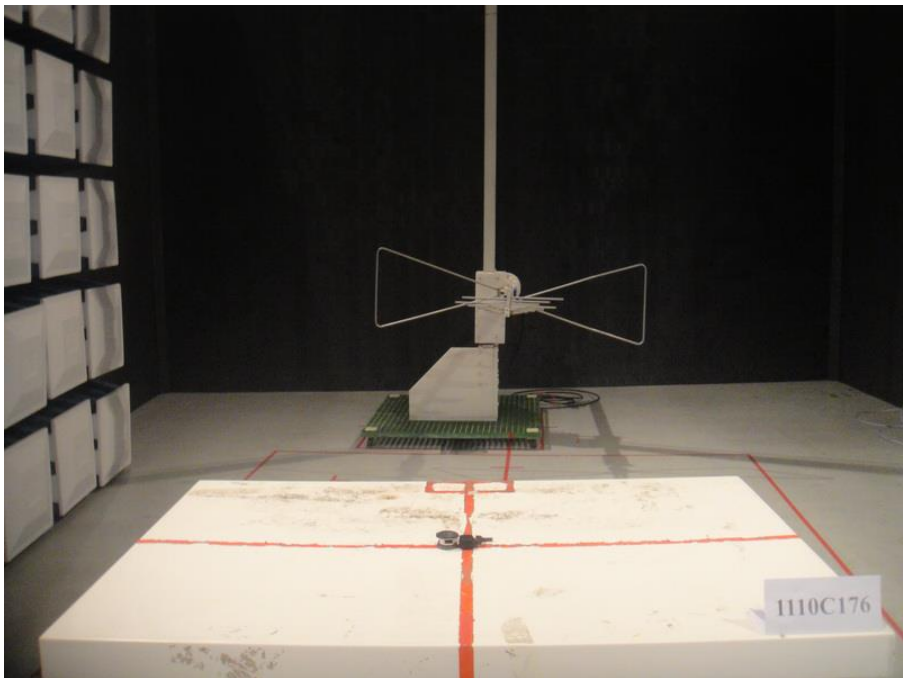




8 Appendix B

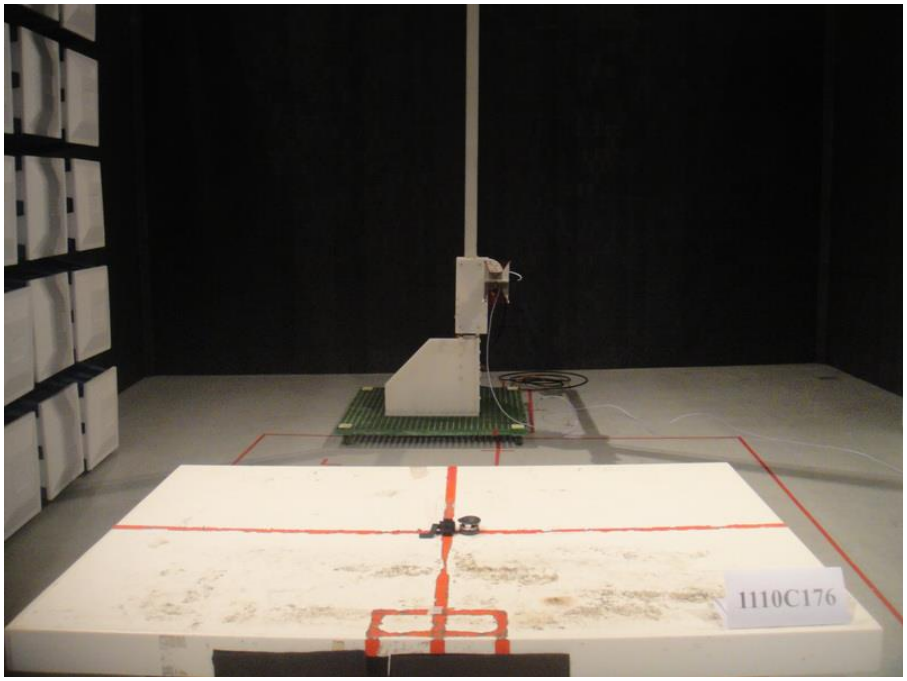
Radiated Emission Test Set Up

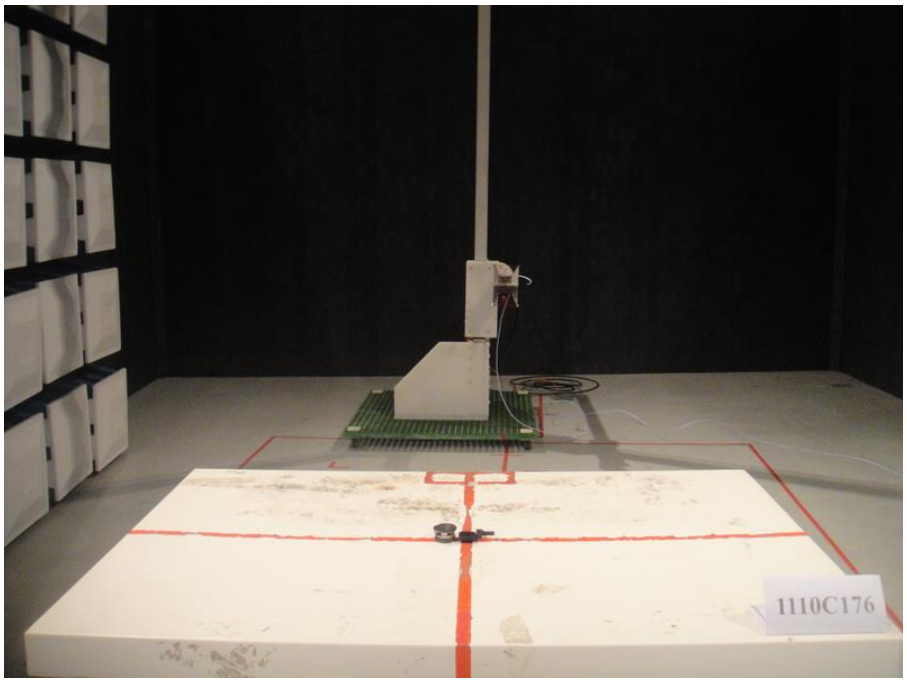




30MHz-1GHz

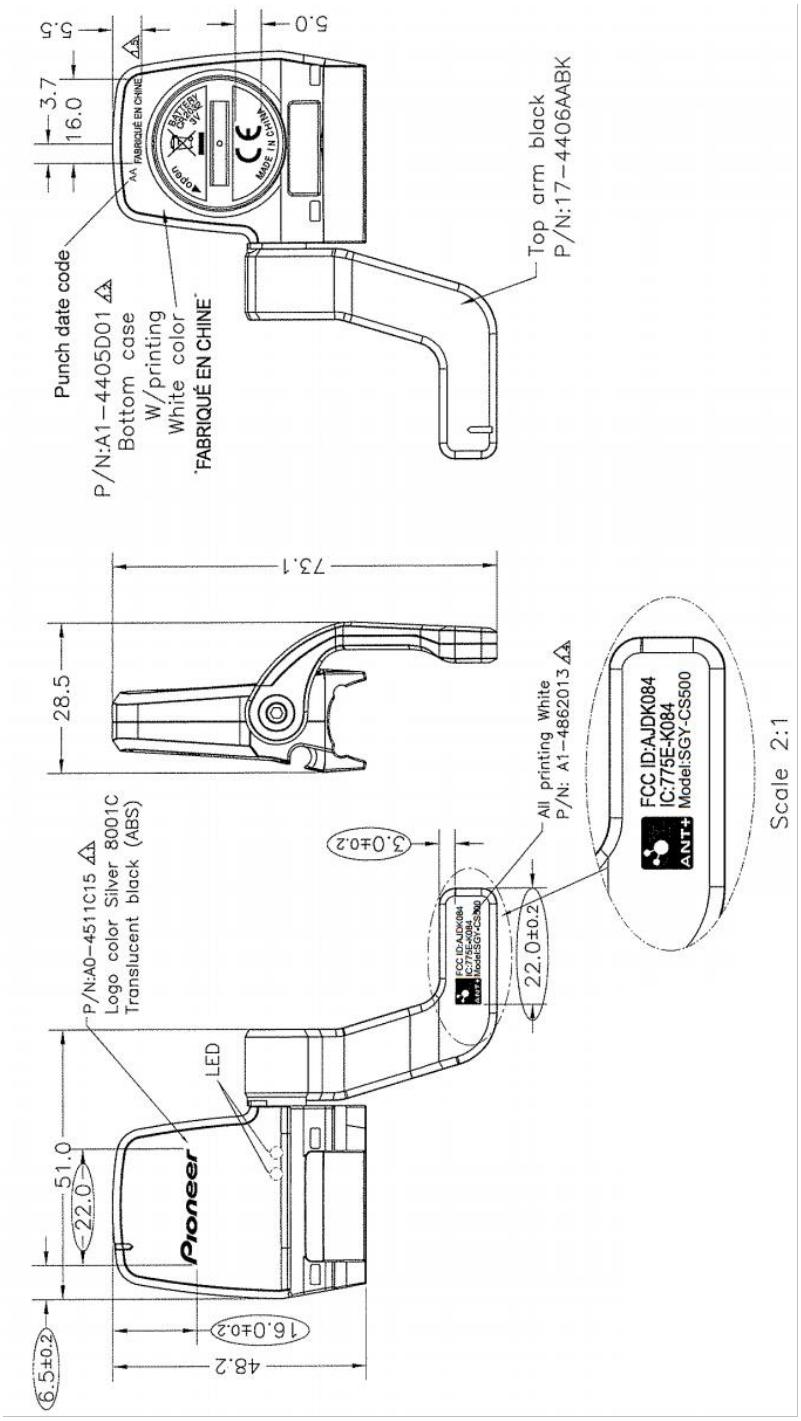
Appendix B





1GHz above

9 Appendix C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W/printing
White color
"FABRIQUÉ EN CHINE"
Top arm black
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3.7
16.0
5.0
73.1
28.5
P/N:A0-4511C15
Logo color Silver 8001C
Translucent black (ABS)
All printing White
P/N: A1-4862013
FCC ID:AJDK084
IC:775E-K084
Model:SGY-CS500
ANT+
Pioneer
LED
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22.0
16.0±0.2
48.2
6.5±0.2
5.0±0.2
22.0±0.2
Scale 2:1