

Test Report No. 7191166853-EEC17/04
dated 23 Oct 2017



PSB Singapore

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FORMAL REPORT ON TESTING IN ACCORDANCE WITH
47 CFR FCC Parts 2, 15, 22 and 24
OF A/AN
E-Log & Fleet Management Device [Model : DC700]
[FCC ID : A4C01006A Contains FCC IDs : A4C01005A & QIPXS8]

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FCC REG. NO. 994109 (Test Firm Registration Number)
SG0002 (Designation Number)

IND. CANADA REG. NO. 2932I-1 (3m and 10m Semi-Anechoic Chamber, Science Park)
2932N-1 (10m Semi-Anechoic Chamber, International Business Park)

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QUOTATION NUMBER 2191066483

JOB NUMBER 7191166853

TEST PERIOD 17 Aug 2017 – 22 Oct 2017

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

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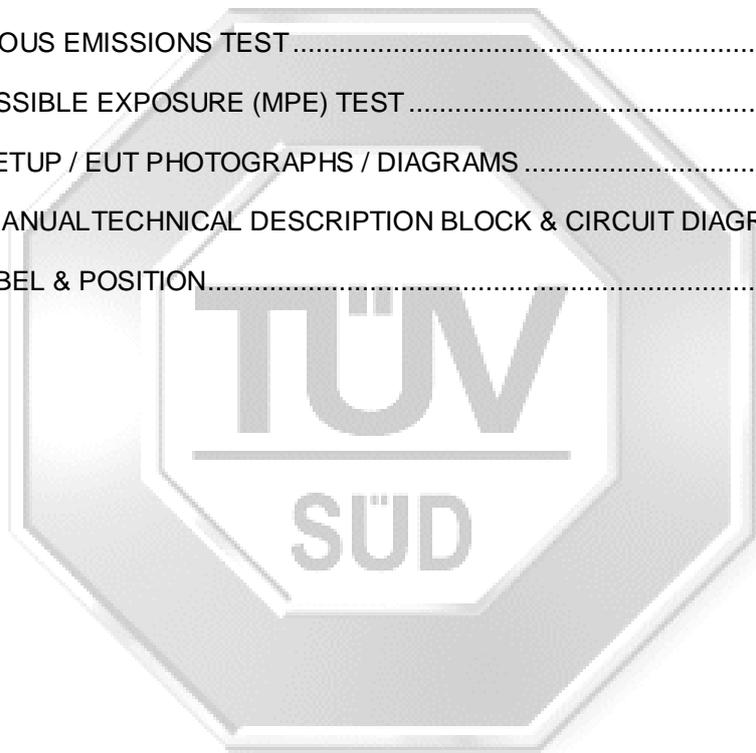
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TEST SUMMARY

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

Test Results Summary

Test Standard	Description	Pass / Fail
47 CFR FCC Parts 2 and 22 (PCS 850)		
22.913(a)(2), 2.1046	RF Power Output	Not Tested *See Note 7
22.917(b), 2.1049	Occupied Bandwidth	Not Tested *See Note 7
22.917(a), 22.917(b), 2.1053	Band Edge Compliance (Radiated)	Not Tested *See Note 7
22.917(a), 22.917(b), 2.1051	Out of Band Emissions (Conducted)	Not Tested *See Note 7
22.917(a), 22.917(b), 2.1053	Out of Band Emissions (Radiated)	Pass
47 CFR FCC Parts 2 and 24 (PCS 1900)		
24.232(c), 2.1046	RF Power Output	Not Tested *See Note 7
24.238(b), 2.1049	Occupied Bandwidth	Not Tested *See Note 7
24.238(a), 24.238(b), 2.1053	Band Edge Compliance (Radiated)	Not Tested *See Note 7
24.238(a), 24.238(b), 2.1051	Out of Band Emissions (Conducted)	Not Tested *See Note 7
24.238(a), 24.238(b), 2.1053	Out of Band Emissions (Radiated)	Pass
47 CFR FCC Parts 1 and 15		
15.107	Conducted Emissions	Not Applicable *See Note 6
15.109	Receiver Spurious Emissions	Pass
1.1310	Maximum Permissible Exposure	Pass

TEST SUMMARY

Notes

1. Three channels as listed below, which respectively represent the lower, middle and upper channels of the Equipment Under Test (EUT) when it was configured to operate under PCS 850 and/or PCS 1900 operating conditions. For each channel, the EUT was configured to operate in the test mode.

<u>PCS 850</u>	
<u>Transmit Channel</u>	<u>Frequency (MHz)</u>
Channel 128	824.2000
Channel 189	836.4000
Channel 251	848.8000

<u>PCS 1900</u>	
<u>Transmit Channel</u>	<u>Frequency (MHz)</u>
Channel 512	1850.2000
Channel 661	1880.0000
Channel 810	1909.8000

2. The Equipment Under Test (EUT) supports PCS 850 / PCS 1900 only.
3. 47 CFR FCC Parts 22 and 24 measurement procedures are according to ANSI TIA-603-B : 2002 while 47 CFR FCC Part 15 measurement procedures are according to ANSI C63.4 : 2014.
4. The maximum measured RF power of the Equipment Under Test is 33.75dBm.
5. The EUT is a Class B device when in non-transmitting and receiving states and meets the 47 CFR FCC Part15B Class B requirements.
6. The Equipment Under Test (EUT) is a battery operated device / DC operated device and contains no provision for public utility connections.
7. The RF module of the Equipment Under Test (EUT) is a qualified RF module, which bears the FCC ID: QIPRPS8. As such, only limited tests as mentioned above were evaluated.

Modifications

No modifications were made.

PRODUCT DESCRIPTION

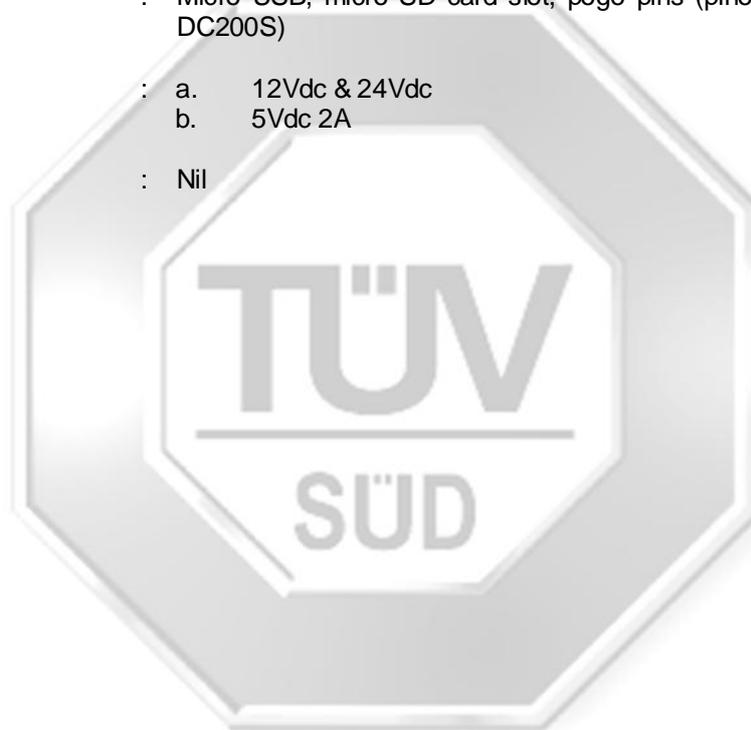
Description	: The Equipment Under Test (EUT) is an E-Log And Fleet Management Device . It consists of a. DC200S. b. Tablet.
Applicant	: A4C-RM Acquisition LLC 855 Woods Drive Skokies IL 60077, USA
Manufacturer	: PCI Limited 35 Pioneer Road North Singapore 628475
Factory (ies)	: Pt PCI Elektronik Internasional Panbil Industrial Estate Factory C Lot 2-3 Jalan Ahmad Yani, Muka Kuning, Batam 29433 Indonesia
Model Number	: DC700
FCC ID	: A4C01006A Contains FCC IDs : A4C01005A & QIPPS8
Serial Number	: Nil
Microprocessor	: a. STMicroelectronics STM32F767ZIT6 & IC ARM CORTEX M7 STM32 32-Bit LQFP144 b. MTK8163
Operating / Transmitting Frequency	: a. PCS850 - 824MHz – 849MHz (uplink) - 869MHz – 894MHz (downlink) PCS1900 - 1850MHz – 1910MHz (uplink) - 1930MHz – 1990MHz (downlink) b. 2402MHz-2480MHz (Bluetooth) c. 2412MHz-2462MHz (WiFi)
Clock / Oscillator Frequency	: 16MHz & 1.3GHz
Modulation / Emissions Designator	: a. PCS 850 - 300KGXW (PCS 850) b. PCS1900 - 300KGXW c. Bluetooth - Gaussian Frequency Shift Keying (GFSK) - $\pi/4$ -Differential Quadrature Phase-Shift Keying (DQPSK) - 8 Differential Phase Shift Keying (DPSK)



PRODUCT DESCRIPTION

Continued

- Antenna Gain : a. DC200S
- 0.11dBi (PCS 850)
- 2.38dBi (PCS 1900)
- 3 dBi (WLAN, Bluetooth)
b. Tablet
- 2.75dBi (WLAN, Bluetooth)
- Port / Connectors : Micro USB, micro SD card slot, pogo pins (pinout is the same as mating DC200S)
- Rated Input Power : a. 12Vdc & 24Vdc
b. 5Vdc 2A
- Accessories : Nil





SUPPORTING EQUIPMENT DESCRIPTION

Equipment Description (Including Brand Name)	Model, Serial & FCC ID Number	Cable Description (List Length, Type & Purpose)
Rohde & Schwarz Universal Radio Communication Tester	M/N: CMU200 S/N: 112123 FCC ID: Nil	2.00m unshielded power cable
Unbranded GSM Antenna	M/N: Nil S/N: Nil FCC ID: Nil	0.50m unshielded BNC cable



EUT OPERATING CONDITIONS

47 CFR FCC Part 15

1. Receiver Spurious Emissions

The EUT was exercised by operating in continuous loopback mode with the reception level is above the receiver minimum sensitivity at lower, middle and upper channels one at a time. The R&S CMU200 was used as a simulated PCS 850 and PCS 1900 base station.

At the same time, the EUT was exercised by operating in file transfer mode with maximum data transmission rate + Video Playback + LED Continuous ON.





OUT OF BAND EMISSIONS (RADIATED) TEST

47 CFR FCC Parts 22.917(a), 22.917(b) and 2.1053 Out of Band Emissions (Radiated) Limits

The EUT shows compliance to the requirements of this section, which states:

- (a) The power of any emission outside the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.
- (b) Compliance with these rules is based on the use of measurement instrumentation employing resolution bandwidth of 100kHz or greater. In the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attempted at least 26dB below the transmitter power.

47 CFR FCC Parts 22.917(a), 22.917(b) and 2.1053 Out of Band Emissions (Radiated) Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Agilent EMC Analyzer (9kHz-26.5GHz)	E7405A	US40240195	20 Mar 2018
Schaffner Bilog Antenna -(30MHz-2GHz)	CBL6112B	2947	19 Oct 2018
Com-Power Preamplifier (1MHz-1GHz)	PAM-103	441056	22 Jul 2018
EMCO Horn Antenna(1GHz-18GHz)	3115	0003-6088	24 Mar 2018
R&S Preamplifier (1GHz -18GHz)	SCU18	102191	10 Mar 2018
Micro-Tronics Bandstop Filter (2.4-2.5 GHz)	BRM50701	17	27 Nov 2017
K&L Microwave Tunable Band Reject Filter	3TNF-1000/2000-N/N	436	07 Nov 2017
Micro-tronics Bandstop Filter (900MHz)	BRM14753	002	13 Aug 2018



OUT OF BAND EMISSIONS (RADIATED) TEST

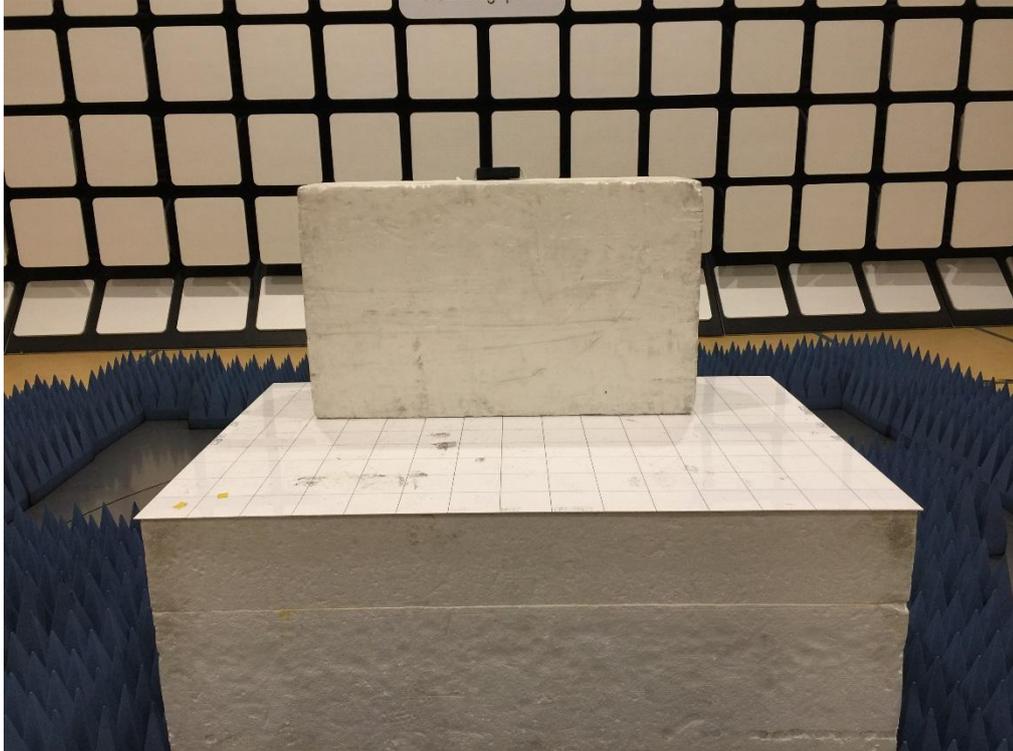
47 CFR FCC Parts 22.917(a), 22.917(b) and 2.1053 Out of Band Emissions (Radiated) Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
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 antenna was set at the required test distance away from the EUT and supporting equipment boundary.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 1MHz.
5. All other supporting equipment were powered separately from another filtered mains.

47 CFR FCC Parts 22.917(a), 22.917(b) and 2.1053 Out of Band Emissions (Radiated) Test Method

1. The EUT was set to transmit at the maximum power at the lower channel with the modulation on at normal test condition.
2. The receiving antenna (test antenna) was set at vertical polarization with the height of 1m.
3. With the spectrum analyser was set to max hold enabled the emissions outside the operating frequency range (spurious emissions) were searched and recorded. For EUT which is a portable device, the spurious emission search was carried out by rotating the EUT through three orthogonal axes to determine which altitude and equipment arrangement produces worst emissions.
4. For each spurious emission found, the test antenna was raised or lowered through the specified range of heights (1m – 4m) until a maximum signal level was detected on the test receiver.
5. The EUT was then rotated through 360° in the horizontal plane until the maximum signal was received. The maximum received signal level was recorded.
6. The steps 2 to 5 were repeated with the receiving antenna was set to horizontal polarization.
7. Comparison was made on both measured spurious emission results with vertical and horizontal polarizations. The highest value out of vertical and horizontal polarizations was recorded as A dBm.
8. A known reference path loss was then added to the A (measured level in step 7) to obtain the measured spurious emission power.
9. The steps 2 to 8 were repeated until all the spurious emissions (up to 10th harmonics of the carrier frequency) were measured.
10. The steps 2 to 9 were repeated with the EUT was set to operate at the middle and upper channels respectively.

OUT OF BAND EMISSIONS (RADIATED) TEST



Out of Band Emissions Test Setup (Front View)



Out of Band Emissions Test Setup (Front View)



OUT OF BAND EMISSIONS (RADIATED) TEST

47 CFR FCC Parts 22.917(a), 22.917(b) and 2.1053 Out of Band Emissions (Radiated) Results

Operating Mode	PCS 850 Transmit	Temperature	24°C
Test Input Power	12.5Vdc	Relative Humidity	60%
Test Distance	3m	Atmospheric Pressure	1030mbar
Antenna Gain	0.11dBi (Worst)	Tested By	Dylan Lin

LOWER CHANNEL (CHANNEL 128)

Frequency (MHz)	Amplitude (dBm)	Limit (dBm)
1527.4450	-63.4	-13.0
9582.1330	-47.0	-13.0
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MIDDLE CHANNEL (CHANNEL 189)

Frequency (MHz)	Amplitude (dBm)	Limit (dBm)
1454.5000	-59.3	-13.0
7723.7340	-52.3	-13.0
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UPPER CHANNEL (CHANNEL 251)

Frequency (MHz)	Amplitude (dBm)	Limit (dBm)
1684.5560	-67.2	-13.0
13581.7300	-49.8	-13.0
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Notes

- The upper frequency of radiated emission investigations was according to requirements stated in Section 15.33(a) for intentional radiators.
- Out of band (Radiated) 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.



OUT OF BAND EMISSIONS (RADIATED) TEST

47 CFR FCC Parts 24.238(a), 24.238(b) and 2.1053 Out of Band Emissions (Radiated) Limits

The EUT shows compliance to the requirements of this section, which states:

- (a) The power of any emission outside the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.
- (b) Compliance with these rules is based on the use of measurement instrumentation employing resolution bandwidth of 1MHz or greater. In the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attempted at least 26dB below the transmitter power.

47 CFR FCC Parts 24.238(a), 24.238(b) and 2.1053 Out of Band Emissions (Radiated) Test Instrumentation

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K&L Microwave Tunable Band Reject Filter	3TNF-1000/2000-N/N	436	07 Nov 2017
Micro-tronics Bandstop Filter (900MHz)	BRM14753	002	13 Aug 2018



OUT OF BAND EMISSIONS (RADIATED) TEST

47 CFR FCC Parts 24.238(a), 24.238(b) and 2.1053 Out of Band Emissions (Radiated) Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
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 antenna was set at the required test distance away from the EUT and supporting equipment boundary.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 1MHz.
5. All other supporting equipment were powered separately from another filtered mains.

47 CFR FCC Parts 24.238(a), 24.238(b) and 2.1053 Out of Band Emissions (Radiated) Test Method

1. The EUT was set to transmit at the maximum power at the lower channel with the modulation on at normal test condition.
2. The receiving antenna (test antenna) was set at vertical polarization with the height of 1m.
3. With the spectrum analyser was set to max hold enabled the emissions outside the operating frequency range (spurious emissions) were searched and recorded. For EUT which is a portable device, the spurious emission search was carried out by rotating the EUT through three orthogonal axes to determine which altitude and equipment arrangement produces worst emissions.
4. For each spurious emission found, the test antenna was raised or lowered through the specified range of heights (1m – 4m) until a maximum signal level was detected on the test receiver.
5. The EUT was then rotated through 360° in the horizontal plane until the maximum signal was received. The maximum received signal level was recorded.
6. The steps 2 to 5 were repeated with the receiving antenna was set to horizontal polarization.
7. Comparison was made on both measured spurious emission results with vertical and horizontal polarizations. The highest value out of vertical and horizontal polarizations was recorded as A dBm.
8. A known reference path loss was then added to the A (measured level in step 7) to obtain the measured spurious emission power.
9. The steps 2 to 8 were repeated until all the spurious emissions (up to 10th harmonics of the carrier frequency) were measured.
10. The steps 2 to 9 were repeated with the EUT was set to operate at the middle and upper channels respectively.



OUT OF BAND EMISSIONS (RADIATED) TEST

47 CFR FCC Parts 24.238(a), 24.238(b) and 2.1053 Out of Band Emissions (Radiated) Results

Operating Mode	PCS 1900 Transmit	Temperature	24°C
Test Input Power	12.5Vdc	Relative Humidity	60%
Test Distance	3m	Atmospheric Pressure	1030mbar
Antenna Gain	2.38dBi	Tested By	Dylan Lin

LOWER CHANNEL (CHANNEL 512)

Frequency (MHz)	Amplitude (dBm)	Limit (dBm)
1404.0000	-64.9	-13.0
10538.2700	-52.8	-13.0
16665.6000	-51.2	-13.0
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MIDDLE CHANNEL (CHANNEL 661)

Frequency (MHz)	Amplitude (dBm)	Limit (dBm)
1880.9450	-66.0	-13.0
17567.8700	-48.8	-13.0
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UPPER CHANNEL (CHANNEL 810)

Frequency (MHz)	Amplitude (dBm)	Limit (dBm)
8424.0000	-53.1	-13.0
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Notes

- The upper frequency of radiated emission investigations was according to requirements stated in Section 15.33(a) for intentional radiators.
- Out of band (Radiated) 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.

RECEIVER SPURIOUS EMISSIONS TEST

47 CFR FCC Part 15.109 Receiver Spurious Emissions Limits (Class B)

Frequency Range (MHz)	Quasi-Peak Limit Values (dB μ V/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.

47 CFR FCC Part 15.109 Receiver Spurious Emissions Test Instrumentation

Instrument	Model	S/No	Cal Due Date
R&S EMI Test Receiver	ESU40	100355	14 Sep 2018
EMCO Loop Ant	6502	134413	28 Oct 2017
TDK RF Solutions Hybrid Log Periodic Antenna (30MHz-3GHz)	HLP-3003C	130237	21 Oct 2018
Eletro-Metrics Double Ridged Antenna (Horn) Antenna (1-18GHz)	EM-6961	6525	08 Apr 2018
ETS Horn Antenna (18GHz-40GHz) (Ref)	3116	0004-2474	18 Oct 2018
Sonoma Preamplifier (9kHz – 1GHz)	310N	270640	27 Dec 2017
R&S Preamplifier (1GHz -18GHz)	SCU18	102191	10 Mar 2018
Agilent Preamplifier(1GHz-26.5GHz) (PA18)	8449D	3008A02305	12 Oct 2018
Toyo Preamplifier (26.5GHz-40GHz)	HAP26-40W	00000005	18 Oct 2018
Micro-tronics Bandstop Filter (2.4GHz)	BRM50701-02	007	13 Aug 2018

RECEIVER SPURIOUS EMISSIONS TEST

47 CFR FCC Part 15.109 Receiver Spurious Emissions Test Setup

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard as shown in the setup photos.
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 Part 15.109 Receiver Spurious Emissions 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 30MHz to 5th harmonic of the highest frequency used or generated by the EUT, 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 = 37.0 dB μ V/m
Log-periodic antenna factor & cable loss at 300 MHz = 18.5 dB	
Q-P reading obtained directly from EMI Receiver = 31.0 dB μ V/m (Calibrated level including antenna factors & cable losses)	
Therefore, Q-P margin = 37.0 - 31.0 = 6.0	i.e. 6.0 dB below Q-P limit

RECEIVER SPURIOUS EMISSIONS TEST

47 CFR FCC Part 15.109 Receiver Spurious Emissions Results

Operating Mode	PCS 850 Receive	Temperature	24°C
Test Input Power	12.5Vdc	Relative Humidity	60%
Test Distance	3m	Atmospheric Pressure	1030mbar
Class	B	Tested By	Chang Wai Kit, Dylan Lin

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)	Channel
37.1540	24.0	40.0	16.0	100	88	V	128
47.7170	35.1	40.0	4.9	100	0	V	128
58.5800	37.4	40.0	2.6	100	0	V	128
167.9940	27.5	40.0	12.5	100	360	H	128
359.4350	32.6	47.0	14.4	100	100	V	128
479.9980	29.9	47.0	17.1	200	325	H	128

Spurious Emissions above 1GHz – 25GHz

Freq (GHz)	Peak Value (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	AV Value (dBµV/m)	AV Limit (dBµV/m)	AV Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Ch (Worst)
1.2693	28.8	74.0	45.2	15.6	54.0	38.4	101	227	V	128
5.3037	48.8	74.0	25.2	35.8	54.0	18.2	101	230	H	128
5.5843	49.2	74.0	24.8	35.6	54.0	18.4	101	350	V	128
6.1077	41.3	74.0	32.7	28.0	54.0	26.0	100	328	H	128
16.5444	46.8	74.0	27.2	33.3	54.0	20.7	100	175	H	128
17.7295	47.7	74.0	26.3	34.2	54.0	19.8	100	204	V	128

Notes

- 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.
- 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.
- EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
30MHz - 1GHz
 RBW: 120kHz VBW: 1MHz
>1GHz
 RBW: 1MHz VBW: 3MHz
- Receiver Spurious 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 – 25.0GHz is ±4.0dB.

RECEIVER SPURIOUS EMISSIONS TEST

47 CFR FCC Part 15.109 Receiver Spurious Emissions Results

Operating Mode	PCS 1900 Receive	Temperature	24°C
Test Input Power	12.5Vdc	Relative Humidity	60%
Test Distance	3m	Atmospheric Pressure	1030mbar
Class	B	Tested By	Chang Wai Kit, Dylan Lin

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)	Channel
48.5050	20.2	40.0	19.8	101	132	V	512
59.3910	24.7	40.0	15.3	101	94	V	512
70.2770	19.3	40.0	20.7	200	109	V	512
121.4390	24.3	40.0	15.7	101	167	V	512
366.3640	31.6	47.0	15.4	101	162	V	512
586.2520	32.6	47.0	14.4	100	71	H	512

Spurious Emissions above 1GHz – 25GHz

Freq (GHz)	Peak Value (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	AV Value (dBµV/m)	AV Limit (dBµV/m)	AV Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Ch (Worst)
5.0849	47.5	74.0	26.5	34.1	54.0	19.9	101	26	V	512
5.2925	48.0	74.0	26.0	34.9	54.0	19.1	101	282	V	512
5.5562	50.2	74.0	23.8	37.4	54.0	16.6	101	168	H	512
5.6516	49.5	74.0	24.5	36.3	54.0	17.7	101	7	V	512
5.7863	48.1	74.0	25.9	34.5	54.0	19.5	101	11	V	512
17.7295	47.3	74.0	26.7	34.2	54.0	19.8	100	180	V	512

Notes

- 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.
- 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.
- EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
30MHz - 1GHz
 RBW: 120kHz VBW: 1MHz
>1GHz
 RBW: 1MHz VBW: 1MHz
- Receiver Spurious 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 – 25.0GHz is ±4.0dB.



MAXIMUM PERMISSIBLE EXPOSURE (MPE) TEST

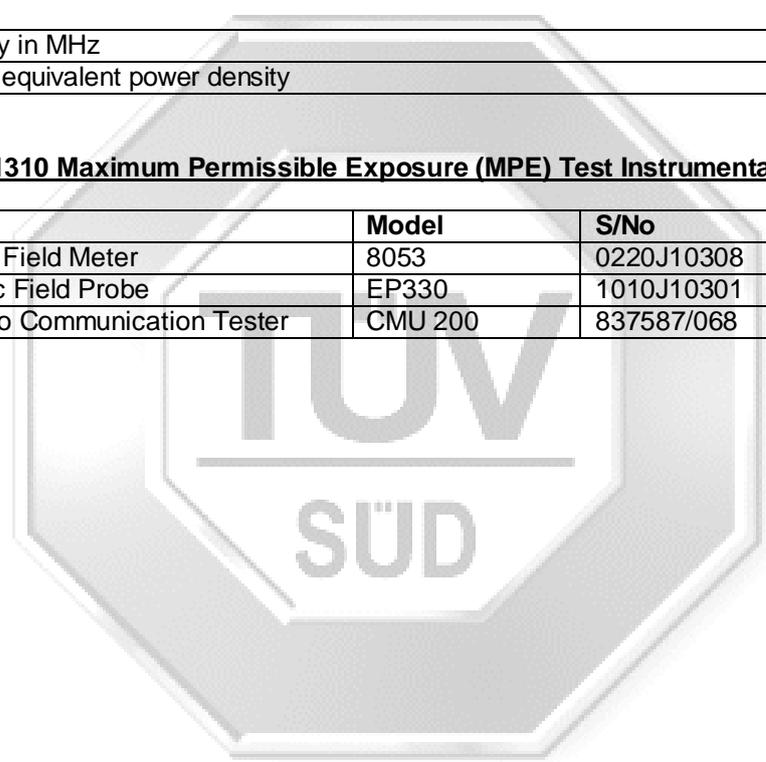
47 CFR FCC Part 1.1310 Maximum Permissible Exposure (MPE) Limits

The EUT shows compliance to the requirements of this section, which states the MPE limits for general population / uncontrolled exposure are as shown below:

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (min)
0.3 - 1.34	614	1.63	100 ^{Note 2}	30
1.34 - 30	824 / f	2.19 / f	180 / f ² ^{Note 2}	30
30 - 300	27.5	0.073	0.2	30
300 - 1500	-	-	f / 1500	30
1500 - 100000	-	-	1.0	30
Notes				
1. f = frequency in MHz				
2. Plane wave equivalent power density				

47 CFR FCC Part 1.1310 Maximum Permissible Exposure (MPE) Test Instrumentation

Instrument	Model	S/No	Cal Due Date
PMM 8053 Portable Field Meter	8053	0220J10308	20 Jan 2019
PMM EP330 Electric Field Probe	EP330	1010J10301	20 Jan 2019
R&S Universal Radio Communication Tester	CMU 200	837587/068	24 Dec 2017





MAXIMUM PERMISSIBLE EXPOSURE (MPE) TEST

47 CFR FCC Part 1.1310 Maximum Permissible Exposure (MPE) Results

Operating Mode	PCS 850 Transmit	Temperature	24°C
Test Input Power	12.5Vdc	Relative Humidity	60%
Test Distance	20cm	Atmospheric Pressure	1030mbar
Mode	GSM 850 + WiFi 802.11b @ 11MBps (Worst)	Tested By	Chelmin Li

Channel	Channel Frequency (MHz)	Power Density Value (mW/cm ²)	Averaging Time (min)	Limit (mW/cm ²)
128	824.2000	0.0369	30	0.56
189	836.4000	0.0006	30	0.56
251	848.8000	0.0016	30	0.56

Operating Mode	PCS 1900 Transmit	Temperature	24°C
Test Input Power	12.5Vdc	Relative Humidity	60%
Test Distance	20cm	Atmospheric Pressure	1030mbar
Mode	GSM 1900 + WiFi 802.11b @ 11MBps (Worst)	Tested By	Chelmin Li

Channel	Channel Frequency (MHz)	Power Density Value (mW/cm ²)	Averaging Time (min)	Limit (mW/cm ²)
512	1850.2000	0.0029	30	1.0
661	1880.0000	0.0005	30	1.0
810	1909.8000	0.0010	30	1.0

Notes

- All possible modes of operation were investigated. Only the worst case highest radiation levels were measured. Measurements were taken at the required averaging time. All other radiation levels were relatively insignificant.
- 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.
- The EUT shall maintain a minimum distance separation of 60cm from users during operation.
- Maximum Permissible Exposure (MPE) 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 0.1MHz – 3GHz is ±15%.



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