FCC Co-Location Test Report

FCC ID	:	**O62-DL200**
Equipment	:	**DATA LOGGER**
Model No.	:	**DL200**
Multiple Listing	:	**DL200XX (X=0-9, A-Z or Blank)** **(Only for marketing purpose.)**
Brand Name	:	**Darfon**
Applicant	:	**Darfon Electronics Corp**
Address	:	**167, ShanYing Road, Gueishan, Taoyuan 33341, Taiwan**
Standard	:	**47 CFR FCC Part 15.247** **47 CFR FCC Part 22** **47 CFR FCC Part 24**
Received Date	:	**Sep. 20, 2016**
Tested Date	:	**Sep. 22, 2016**

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by: **Approved by:**

Along Chen / Assistant Manager **Gary Chang / Manager**

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Release Record

Report No.	Version	Description	Issued Date
FR692001CO	Rev. 01	Initial issue	Oct. 19, 2016

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.247(d) 15.209 22.917(a) 24.238(a)	Radiated Emissions	[dBuV/m at 3m]: 52.95MHz 36.93(Margin -3.07dB) - QP	Pass

1 General Description

1.1 Information

1.1.1 Specification

Operating Frequency	802.11b/g/n: 2412 MHz ~ 2462 MHz
Modulaton Type	DSSS (DBPSK / DQPSK / CCK) OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.1.2 Antenna Details

Model	Type	Gain (dBi)	Connector	Remark
11320Y11008B1	Dipole	3.38	R-SMA	---

1.1.3 Accessories

Accessories		
No.	**Equipment**	**Description**
1	AC adapter	Brand Name: Powertron Electronics Corp. Model Name: PA1024-120IB200 Power Rating: I/P: 100-240Vac, 50-60Hz, 0.6A O/P: 12Vdc, 2.0A, 24W Max DC 1.4m non-shielded without core
2	RJ45 cable	1.4m non-shielded without core
3	Power Terminal Block	---
4	Wall Mount Kits DIN-Rail Bracket	---
5	RS485 cable	1.7m shielded without core
6	USB flash drive	Brand: SanDisk Model: SDCZ33 Capacity: 8GB

1.1.4 Certified WWAN module

Below certified WWAN module will be installed in this device

FCC ID	Q78-MF226
Product	HSPA+ LGA Module
Antenna	Dipole antenna 1dBi gain @850 MHz 2.5 dBi gain @1900 MHz

1.2 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	R&S	FSV40	101498	Dec. 13, 2015	Dec. 12, 2016
Receiver	R&S	ESR3	101658	Nov. 04, 2015	Nov. 03, 2016
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Aug. 04, 2016	Aug. 03, 2017
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 16, 2015	Dec. 15, 2016
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2015	Nov. 03, 2016
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 16, 2015	Nov. 15, 2016
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 10, 2015	Dec. 09, 2016
Preamplifier	EMC	EMC02325	980225	Aug. 05, 2016	Aug. 04, 2017
Preamplifier	Agilent	83017A	MY39501308	Oct. 02, 2015	Oct. 01, 2016
Preamplifier	EMC	EMC184045B	980192	Aug. 24, 2016	Aug. 23, 2017
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 10, 2015	Dec. 09, 2016
LF cable 1M	EMC	EMCCFD400-NM-NM-1000	16052	Dec. 10, 2015	Dec. 09, 2016
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 10, 2015	Dec. 09, 2016
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 10, 2015	Dec. 09, 2016
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.3 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.247
47 CFR FCC Part 22
47 CFR FCC Part 24
ANSI C63.10-2013
ANSI TIA-603-D 2010
FCC KDB 558074 D01 DTS Meas Guidance v03r05
FCC KDB 662911 D01 Multiple Transmitter Output v02r01
FCC KDB 412172 D01 Determining ERP and EIRP v01r01

1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty	
Parameters	**Uncertainty**
Radiated emission ≤ 1GHz	±3.66 dB
Radiated emission > 1GHz	±5.63 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
Radiated Emissions	03CH01-WS	24°C / 62%	Kevin Lee

- FCC site registration No.: 181692
- IC site registration No.: 10807A-1

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Test Configuration
Radiated Emissions	GPRS850 836.6MHz+2.4G 11G	CH190 + CH1	---
	GPRS1900 1909.8MHz+2.4G 11G	CH810 + CH1	---

NOTE:

The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **X-plane** results were found as the worst case and were shown in this report.

3 Transmitter Test Results

3.1 Unwanted Emissions into Restricted Frequency Bands

3.1.1 Limit of Unwanted Emissions into Restricted Frequency Bands

Restricted Band Emissions Limit			
Frequency Range (MHz)	**Field Strength (uV/m)**	**Field Strength (dBuV/m)**	**Measure Distance (m)**
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit
Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.1.2 Test Procedures

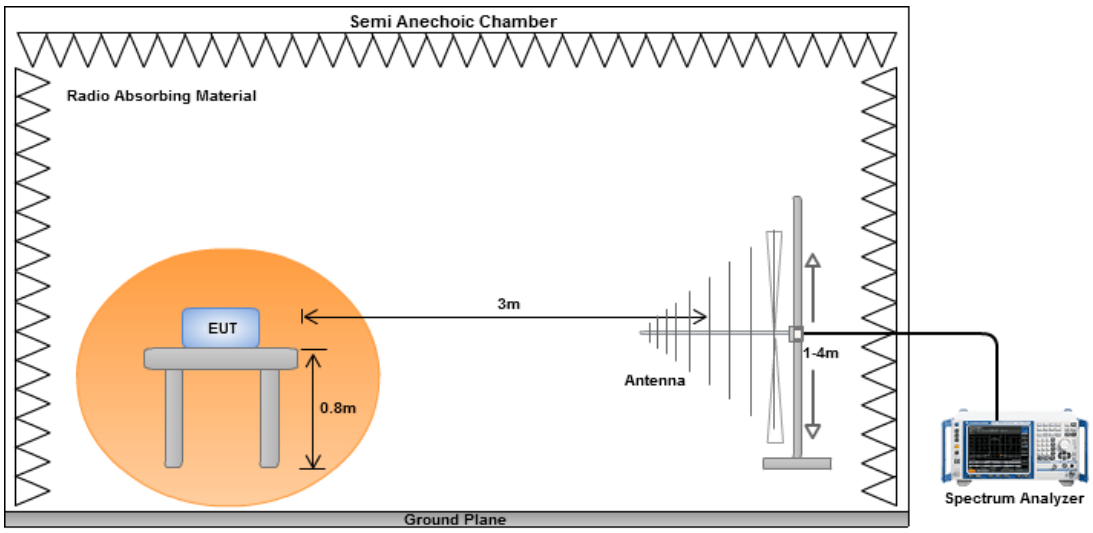
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m.
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

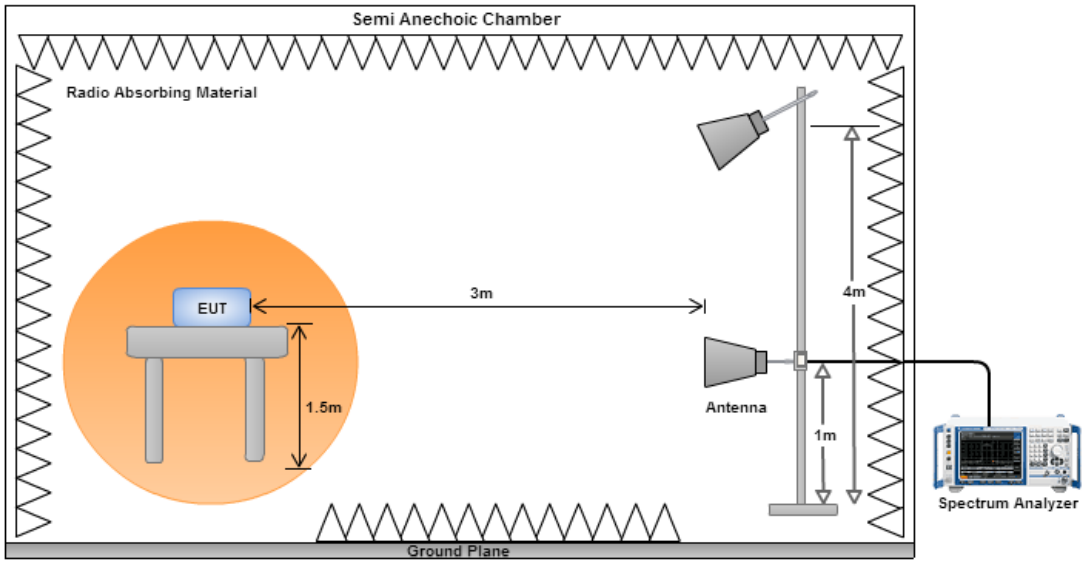
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

3.1.3 Test Setup

Radiated Emissions below 1 GHz

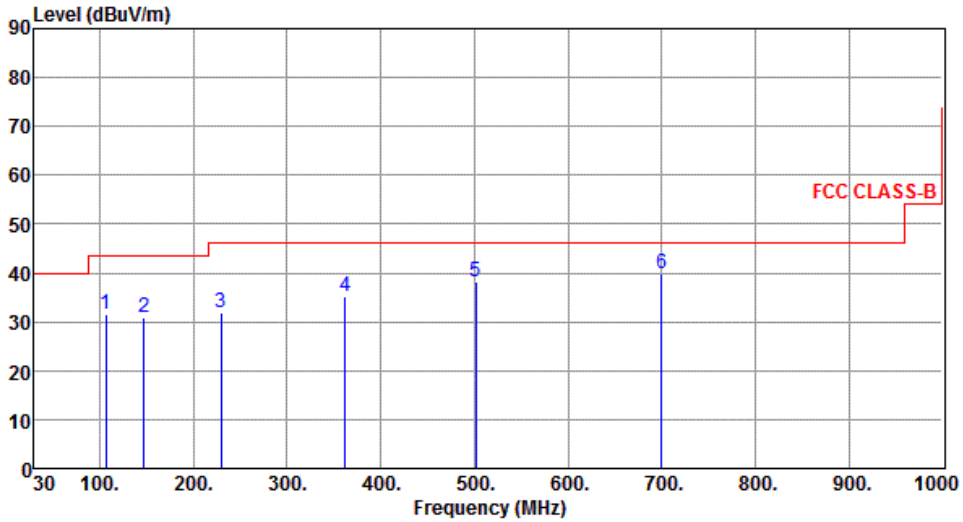


Radiated Emissions above 1 GHz



3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

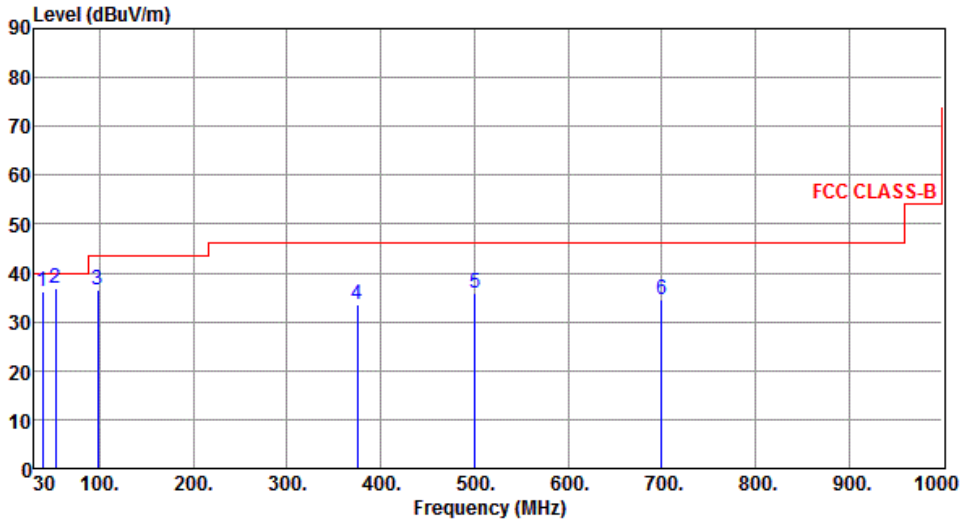
Modulation	GPRS850 836.6MHz+2.4G 11G	**Test Freq. (MHz)**	CH190 + CH1
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	106.63	31.71	43.50	-11.79	43.60	-11.89	Peak	---	---
2	147.37	30.76	43.50	-12.74	39.14	-8.38	Peak	---	---
3	229.82	31.89	46.00	-14.11	41.43	-9.54	Peak	---	---
4	361.74	35.17	46.00	-10.83	41.33	-6.16	Peak	---	---
5	501.42	38.09	46.00	-7.91	41.14	-3.05	Peak	---	---
6	700.27	39.94	46.00	-6.06	39.47	0.47	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

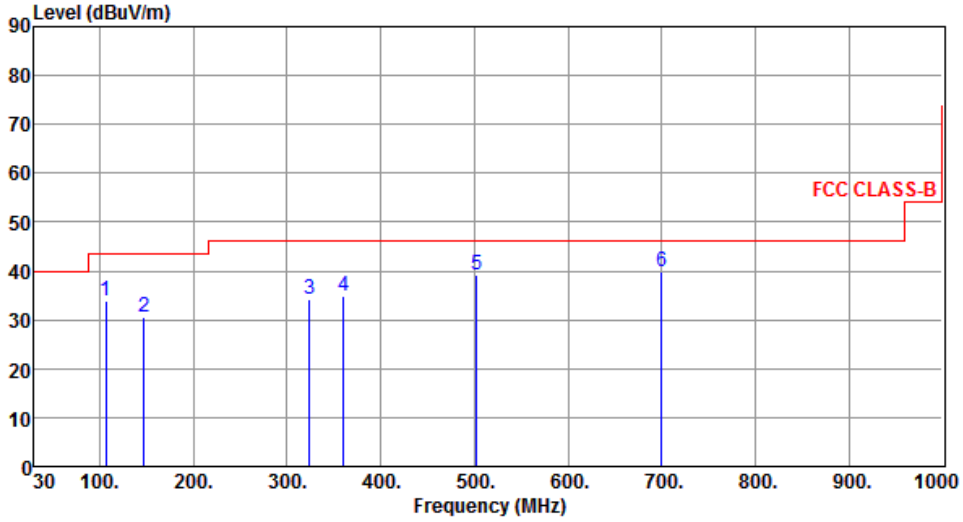
Modulation	GPRS850 836.6MHz+2.4G 11G	Test Freq. (MHz)	CH190 + CH1
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	38.73	36.03	40.00	-3.97	44.06	-8.03	Peak	---	---
2	52.95	36.93	40.00	-3.07	45.00	-8.07	QP	100	194
3	97.90	36.47	43.50	-7.03	49.81	-13.34	Peak	---	---
4	375.32	33.65	46.00	-12.35	39.47	-5.82	Peak	---	---
5	500.45	35.92	46.00	-10.08	38.99	-3.07	Peak	---	---
6	700.27	34.65	46.00	-11.35	34.18	0.47	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

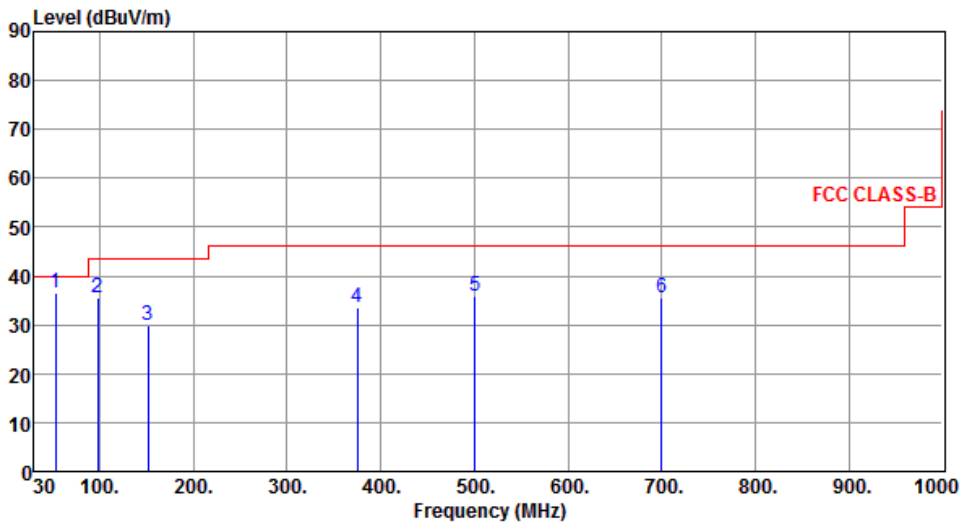
Modulation	GPRS1900 1909.8MHz+2.4G 11G	Test Freq. (MHz)	CH810 + CH1
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	106.63	33.76	43.50	-9.74	45.65	-11.89	Peak	---	---
2	147.37	30.56	43.50	-12.94	38.94	-8.38	Peak	---	---
3	323.91	34.25	46.00	-11.75	41.35	-7.10	Peak	---	---
4	360.77	34.94	46.00	-11.06	41.12	-6.18	Peak	---	---
5	502.39	39.07	46.00	-6.93	42.11	-3.04	Peak	---	---
6	700.27	39.82	46.00	-6.18	39.35	0.47	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	GPRS1900 1909.8MHz+2.4G 11G	Test Freq. (MHz)	CH810 + CH1
Polarization	Vertical		

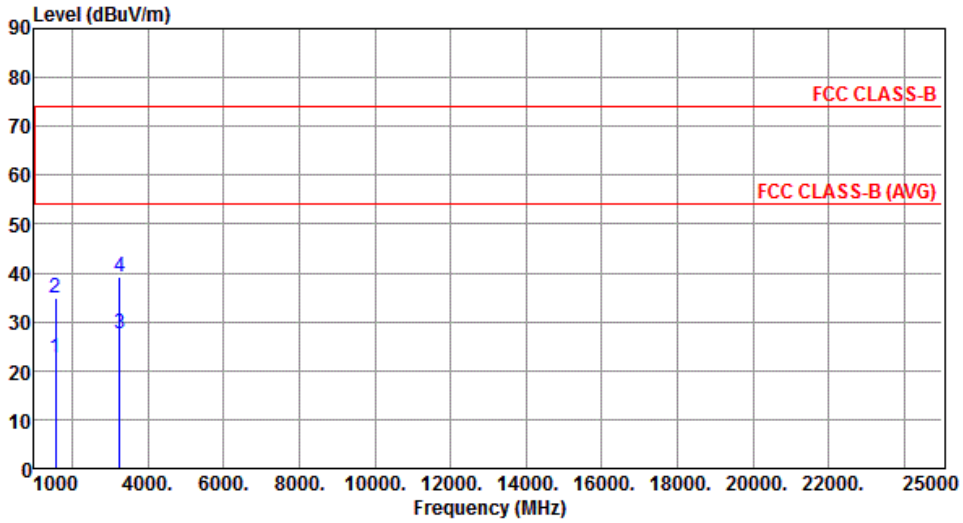


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	52.67	36.56	40.00	-3.44	44.60	-8.04	QP	100	133
2	97.90	35.60	43.50	-7.90	48.94	-13.34	Peak	---	---
3	151.25	29.78	43.50	-13.72	38.12	-8.34	Peak	---	---
4	375.32	33.61	46.00	-12.39	39.43	-5.82	Peak	---	---
5	500.45	35.89	46.00	-10.11	38.96	-3.07	Peak	---	---
6	700.27	35.43	46.00	-10.57	34.96	0.47	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

3.1.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

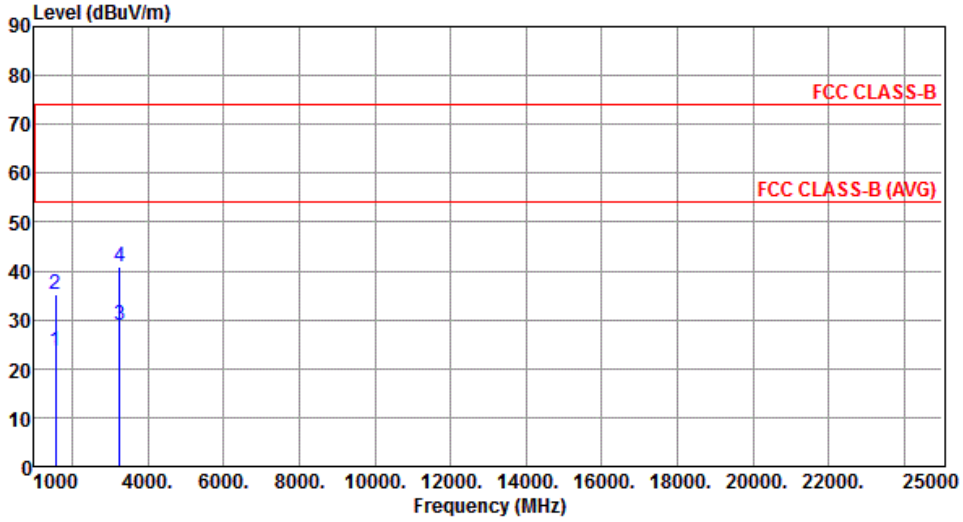
Modulation	GPRS850 836.6MHz+2.4G 11G	**Test Freq. (MHz)**	CH190 + CH1
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1575.40	22.60	54.00	-31.40	29.14	-6.54	Average	100	211
2	1575.40	34.76	74.00	-39.24	41.30	-6.54	Peak	100	211
3	3248.60	27.61	54.00	-26.39	28.11	-0.50	Average	100	154
4	3248.60	39.06	74.00	-34.94	39.56	-0.50	Peak	100	154

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

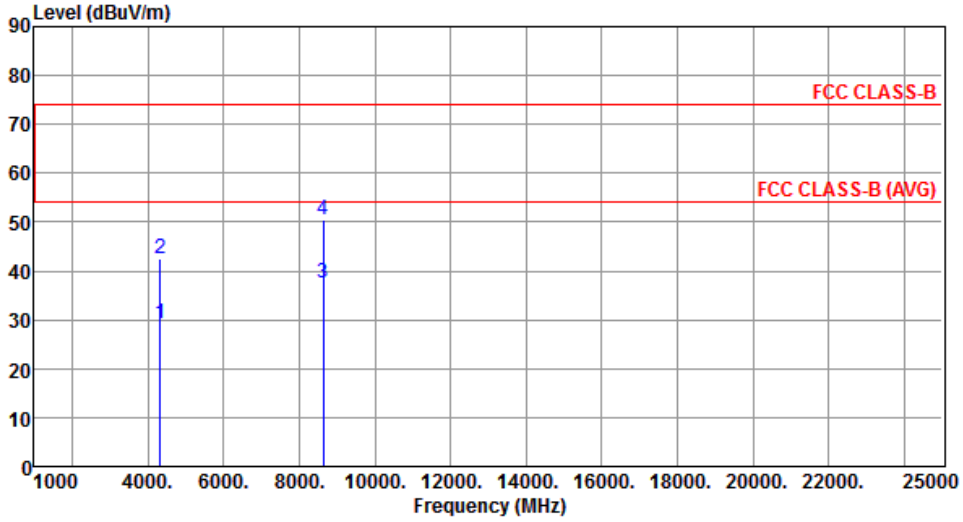
Modulation	GPRS850 836.6MHz+2.4G 11G	Test Freq. (MHz)	CH190 + CH1
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	1575.40	23.71	54.00	-30.29	30.25	-6.54	Average	100	163
2	1575.40	35.24	74.00	-38.76	41.78	-6.54	Peak	100	163
3	3248.60	28.90	54.00	-25.10	29.40	-0.50	Average	100	216
4	3248.60	40.80	74.00	-33.20	41.30	-0.50	Peak	100	216

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

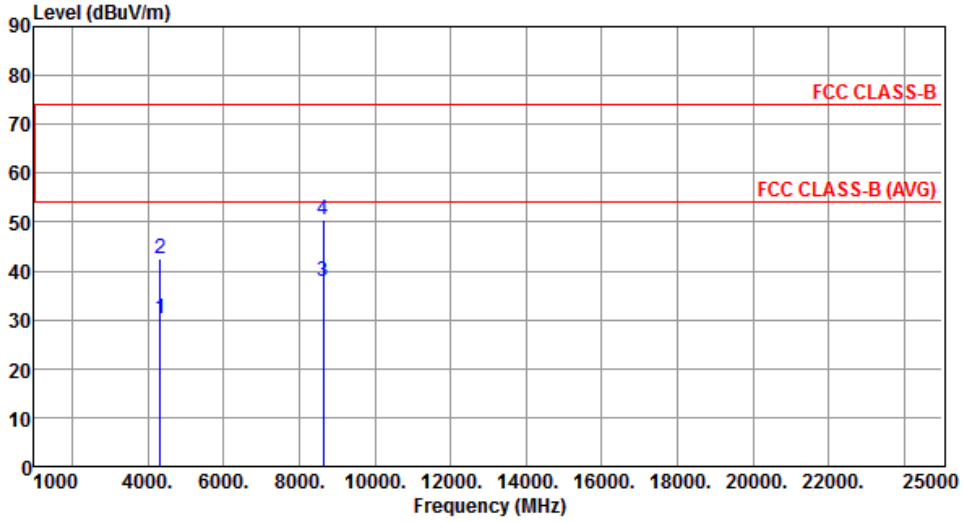
Modulation	GPRS1900 1909.8MHz+2.4G 11G	Test Freq. (MHz)	CH810 + CH1
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	4321.80	29.33	54.00	-24.67	27.08	2.25	Average	100	85
2	4321.80	42.65	74.00	-31.35	40.40	2.25	Peak	100	85
3	8643.60	37.45	54.00	-16.55	27.45	10.00	Average	100	85
4	8643.60	50.54	74.00	-23.46	40.54	10.00	Peak	100	85

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	GPRS1900 1909.8MHz+2.4G 11G	Test Freq. (MHz)	CH810 + CH1
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	4321.80	30.31	54.00	-23.69	28.06	2.25	Average	100	96
2	4321.80	42.67	74.00	-31.33	40.42	2.25	Peak	100	96
3	8643.60	37.92	54.00	-16.08	27.92	10.00	Average	100	147
4	8643.60	50.64	74.00	-23.36	40.64	10.00	Peak	100	147

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website http://www.icertifi.com.tw.

Linkou	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.	No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C..

If you have any suggestion, please feel free to contact us as below information

Tel: 886-3-271-8666
Fax: 886-3-318-0155
Email: ICC_Service@icertifi.com.tw

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