Test Report No. 56S070115/02A
dated 27 Jul 2007

Note: This report is issued subject to TÜV SÜD PSB'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 2, 15, 22 and 24 : 2006
OF A
GPRS / GPS MOBILE TRACKING DEVICE
[Model MTD1000-EEDN3F]
[FCC ID : VDQMTD1000]

TEST FACILITY	TÜV SÜD PSB Corporation Pte Ltd, Telecoms & EMC, Testing Group, 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	Daviscomms (S) Pte Ltd Blk 70 Ubi Crescent #01-07, Ubi Techpark Singapore 408570
	Tel :65 65471127 Fax : 65 65471129
QUOTATION NUMBER	56Q0700065
JOB NUMBER	56S070115
TEST PERIOD	14 Mar 2007 – 26 Mar 2007

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LA-2007-0380-A
LA-2007-0380-A-1
LA-2007-0381-F
LA-2007-0382-B
LA-2007-0383-G
LA-2007-0384-G
LA-2007-0385-E
LA-2007-0386-C

The results reported herein have been performed in accordance with the laboratory's terms of accreditation under the Singapore Accreditation Council - Singapore Laboratory Accreditation Scheme. Tests/Calibrations marked "Not SAC-SINGLAS Accredited" in this Report are not included in the SAC-SINGLAS Accreditation Schedule for our laboratory.

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TEST SUMMARY

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

Test Results Summary

Test Standard	Description	Pass / Fail
FCC Parts 2 and 22: 2006 (GSM 850)		
22.913(a)(2), 2.1046	RF Power Output	Pass
22.917(b), 2.1049	Occupied Bandwidth	Pass
22.917(a), 22.917(b), 2.1053	Band Edge Compliance (Radiated)	Pass
22.917(a), 22.917(b), 2.1051	Out of Band Emissions (Conducted)	Pass
22.917(a), 22.917(b), 2.1053	Out of Band Emissions (Radiated)	Pass
FCC Parts 2 and 24: 2006 (PCS 1900)		
24.232(c), 2.1046	RF Power Output	Pass
24.238(b), 2.1049	Occupied Bandwidth	Pass
24.238(a), 24.238(b), 2.1053	Band Edge Compliance (Radiated)	Pass
24.238(a), 24.238(b), 2.1051	Out of Band Emissions (Conducted)	Pass
24.238(a), 24.238(b), 2.1053	Out of Band Emissions (Radiated)	Pass
FCC Parts 1 and 15: 2006		
15.107	Conducted Emissions	Pass
15.109	Receiver Spurious Emissions	Pass
1.1310	Maximum Permissible Exposure	See page 64

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 GSM 850 and/or PCS 1900 operating conditions. For each channel, the EUT was configured to operate in the test mode.

GSM 850

Transmit Channel	Frequency (MHz)
Channel 128	824.2
Channel 189	836.4
Channel 251	848.8

PCS 1900

Transmit Channel	Frequency (MHz)
Channel 512	1850.2
Channel 661	1880.0
Channel 810	1909.8

2. FCC Parts 22 and 24 measurement procedures are according to ANSI TIA-603-B: 2002 while FCC Part 15 measurement procedures are according to ANSI C63.4 : 2003.

3. The EUT is a Class B device when in non-transmitting and receiving states and meets the FCC Part15B Class B requirements.

4. The RF module of the Equipment Under Test (EUT) is a qualified RF module, which bears the FCC ID: QPB-TR8000506. As such, only limited tests as mentioned above were evaluated.

5. Daviscomms (S) Pte Ltd states that **MTD1000-EEDN3F, MTD1000-EIDN3F, MTD1000-IE2N3F** and **MTD1000-IIDN3F** are similar models in term of components, circuitry designs, PCB layouts and mechanical structures. The differences among these models are
   a. MTD1000-EEDN3F is using external antenna for both GPS and GSM.
   b. MTD1000-EIDN3F is using internal antenna for GPS and external antenna for GSM.
   c. MTD1000-IE2N3F is using internal antenna for GPS and external antenna for GSM.
   d. MTD1000-IIDN3F is using internal antenna for both GPS and GSM.

   The model **MTD1000-EEDN3F** is the worst case model among these models in view of RF and EMC performances with the highest supported antenna gain of 2.5dBi. Shall the model **MTD1000-EEDN3F** passes the above mentioned tests, the models **MTD1000-EIDN3F**, **MTD1000-IE2N3F** and **MTD1000-IIDN3F** are deemed to meet the same requirements.

Modifications

The EUT was brought to compliance to Conducted Emissions by following modifications:
- two chokes 82uH were added in series to the supply positive and ground.
- additional 1uF caps decoupling caps were placed before and after the chokes.

PRODUCT DESCRIPTION

Description	:	The Equipment Under Test (EUT) is a **GPRS / GPS MOBILE TRACKING DEVICE.**
Manufacturers	:	Daviscomms (S) Pte Ltd Blk 70 Ubi Crescent #01-07, Ubi Techpark Singapore 408570
Model Number	:	MTD1000-EEDN3F
FCC ID	:	VDQMTD1000
Serial Number	:	Nil
Microprocessor	:	Refer to manufacturer
Operating / Transmitting Frequency	:	GSM 850 824.0MHz - 849.0MHz (uplink) 869.0MHz - 894.0MHz (downlink) GSM 900 (P-GSM) 890.0MHz - 915.0MHz (uplink) 935.0MHz - 960.0MHz (downlink) GSM 900 (E-GSM) 880.0MHz - 915.0MHz (uplink) 925.0MHz - 960.0MHz (downlink) DCS 1800 1710.0MHz - 1785.0MHz (uplink) 1805.0MHz - 1880.0MHz (downlink) DCS 1900 1850.0MHz - 1910.0MHz (uplink) 1930.0MHz - 1990.0MHz (downlink) GPS 1567.00MHz - 1587.42MHz
Clock / Oscillator Frequency	:	Refer to manufacturer
Modulation / Emissions Designator	:	300KGXW (GSM 850) 300KGXW (PCS 1900)

PRODUCT DESCRIPTION

Antenna Gain	:	External Antenna 2.5dBi (GSM 850) 2.5dBi (PCS 1900) Internal Antenna 0dBi (GSM 850) 0dBi (PCS 1900)
Port / Connectors	:	Refer to manufacturer's user manual / operating manual.
Rated Input Power	:	Oriental Hero Ele. Co., Ltd AC/DC Switching Power Adapter Model – 0H-1048A1201500U-VDE Input 100V-240V, 60Hz/50Hz Output 12Vdc, 1.5A
Accessories	:	Nil

SUPPORTING EQUIPMENT DESCRIPTION

Equipment Description (Including Brand Name)	**Model, Serial & FCC ID Number**	**Cable Description** (List Length, Type & Purpose)
Fujitsu Notebook	M/N: FPC04045D2 S/N: R1200844 FCC ID: DoC	2.00m unshielded power cable 1.80m RS232 cable
Power Adapter (Notebook)	M/N: CA01007-0850 S/N: 03Y09258B FCC ID: Nil	2.00m unshielded power cable
Rohde & Schwarz Universal Radio Communication Tester	M/N: CMU200 S/N: 837728/071 FCC ID: Nil	1.50m unshielded power cable
GPS Antenna	M/N: ASP3561 S/N: 92099031 FCC ID: Nil	2.00m antenna cable

EUT OPERATING CONDITIONS

FCC Parts 2 and 22
1. RF Output Power **2. Occupied Bandwidth** **3. Band Edge Compliance (Radiated)** **4. Out of Band Emissions (Conducted)** **5. Out of Band Emissions (Radiated)**
The EUT was exercised by operating in continuous loopback mode with maximum transmission at lower, middle and upper channels one at a time. The R&S CMU200 was used as a simulated GSM 850 base station.
FCC Parts 2 and 24
1. RF Output Power **2. Occupied Bandwidth** **3. Band Edge Compliance (Radiated)** **4. Out of Band Emissions (Conducted)** **5. Out of Band Emissions (Radiated)**
The EUT was exercised by operating in continuous loopback mode with maximum transmission at lower, middle and upper channels one at a time. The R&S CMU200 was used as a simulated PCS 1900 base station.
FCC Part 15
1. Conducted Emissions **2. 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 GSM 850 and PCS 1900 base station.

FCC Parts 22.913(a)(2) and 2.1046 RF Output Power Limits

The EUT shows compliance to the requirements of this section, which states the Effective Radiated Power (ERP) of the mobile transmitters and auxiliary test transmitters must not exceed 7 Watts (38.4dBm).

FCC Parts 22.913(a)(2) and 2.1046 RF Output Power Test Instrumentation

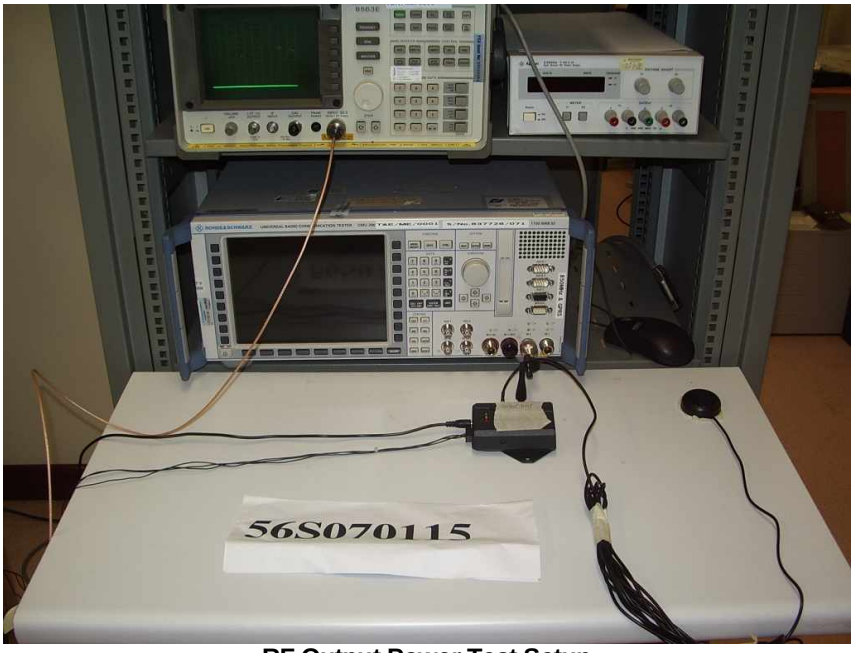
Instrument	Model	S/No	Cal Due Date
HP Spectrum Analyzer-SA3	8591E	3325A01626	26 May 2007
R&S Universal Radio Communication Tester	CMU 200	837587/068	24 Mar 2007
R&S Test Receiver (20Hz –26.5GHz) – ESMI1	ESMI	849182/003 848926/007	04 Jul 2007
Schaffner Preamplifier (9kHz-2GHz) – PA19	CPA9231A	18763	12 Jan 2008
TESEQ Preamplifier (1GHz-18GHz) – PA16	LNA6018	70214	09 Jan 2008
Schaffner Bilog Antenna –BL4	CBL6112B	2593	12 May 2007
EMCO Horn Antenna – H14	3115	0003-6087	19 May 2007

FCC Parts 22.913(a)(2) and 2.1046 RF Output Power 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 Universal Radio Communication Tester, which set into power analyser mode via a low-loss coaxial cable.
4. All other supporting equipment were powered separately from another filtered mains.

FCC Parts 22.913(a)(2) and 2.1046 RF Output Power 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 maximum peak and average power of the transmitting frequency were detected and recorded with the known antenna gain was then added to the measured levels.
3. The step 2 was repeated with the EUT was set to operate at middle and upper channels respectively.



RF Output Power Test Setup

FCC Parts 22.913(a)(2) and 2.1046 RF Output Power Results

Operating Mode	GSM 850 Transmit	Temperature	24°C
Test Input Power	110V 60Hz	Relative Humidity	59%
Antenna Gain	2.5dBi	Atmospheric Pressure	1030mbar
		Tested By	Johnsen Tia

Frequency (MHz)	Channel	Peak Output Power (dBm)		Average Output Power (dBm)	
		EIRP	ERP	EIRP	ERP
824.2000	128	33.4	31.3	33.3	31.2
836.4000	189	33.6	31.5	33.5	31.4
848.8000	251	33.6	31.5	33.5	31.4

Notes

1. Power analyser of Universal Radio Communication Tester was used for power measurement. The power analyser mode supports a wideband power measurement ranging from 100kHz to 2700MHz.
2. RF Output Power Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of 95% is ±1.0dB.

OCCUPIED BANDWIDTH TEST

FCC Parts 22.917(b) and 2.1049 Occupied Bandwidth Limits

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

FCC Parts 22.917(b) and 2.1049 Occupied Bandwidth Test Instrumentation

Instrument	Model	S/No	Cal Due Date
HP Spectrum Analyzer-SA3	8591E	3325A01626	26 May 2007
R&S Universal Radio Communication Tester	CMU 200	837587/068	24 Mar 2007
R&S Test Receiver (20Hz –26.5GHz) – ESMI1	ESMI	849182/003 848926/007	04 Jul 2007
Schaffner Preamplifier (9kHz-2GHz) – PA19	CPA9231A	18763	12 Jan 2008
TESEQ Preamplifier (1GHz-18GHz) – PA16	LNA6018	70214	09 Jan 2008
Schaffner Bilog Antenna –BL4	CBL6112B	2593	12 May 2007
EMCO Horn Antenna – H14	3115	0003-6087	19 May 2007

OCCUPIED BANDWIDTH TEST

FCC Parts 22.917(b) and 2.1049 Occupied Bandwidth 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.

FCC Parts 22.917(b) and 2.1049 Occupied Bandwidth 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 with span wide enough to capture the 26dB bandwidth of the transmitting frequency. For EUT which is a portable device, the bandwidth measurement was carried out by rotating the EUT through three orthogonal axes to determine which altitude and equipment arrangement produces the widest bandwidth.
4. The test antenna was then raised or lowered through the specified range of heights (1m – 4m) until a maximum bandwidth profile was captured on the test receiver.
5. The EUT was then rotated through 360º in the horizontal plane until the maximum bandwidth profile was captured. The captured bandwidth profile was recorded and plotted.
6. The steps 2 to 5 were repeated with the receiving antenna was set to horizontal polarization.
7. Comparison was made on both measured bandwidths with vertical and horizontal polarizations; with the antenna was kept at the polarization where the wider bandwidth profile could be received.
8. A known reference path loss was then added to the found wider bandwidth profile in step 7.
9. The peak of the found bandwidth profile (peak of transmitting frequency) was detected with the marker peak function of the spectrum analyser. The frequencies below the 26dB 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.
10. The 26dB bandwidth of the transmitting frequency is the frequency difference between the marked lower and upper frequencies, $| f_H - f_L |$.
11. The steps 2 to 10 were repeated with the EUT was set to operate at middle and upper channels respectively.

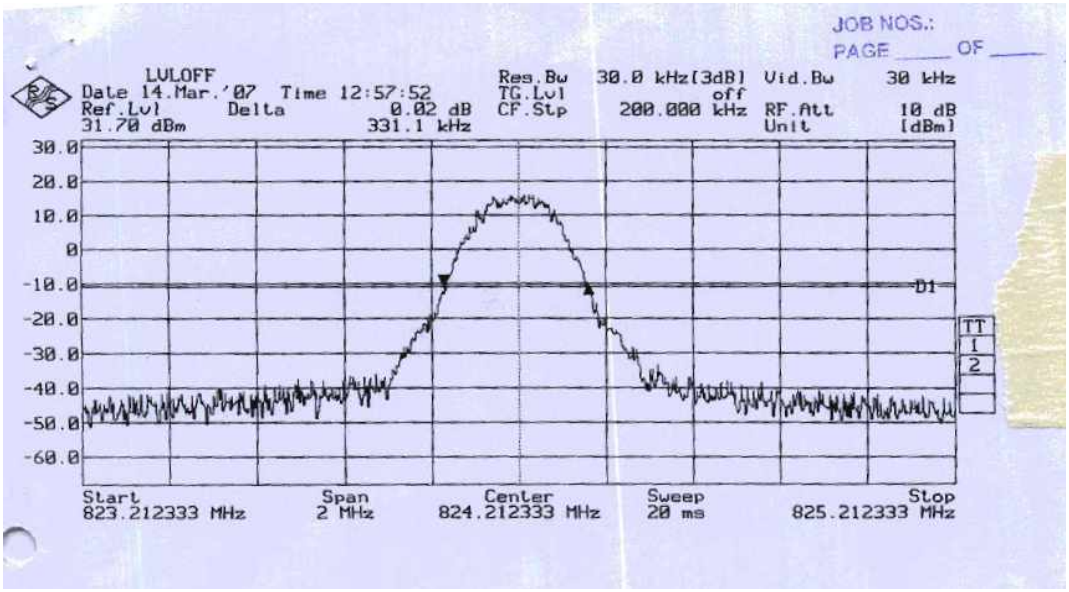
Occupied Bandwidth Test Setup

FCC Parts 22.917(b) and 2.1049 Occupied Bandwidth Results

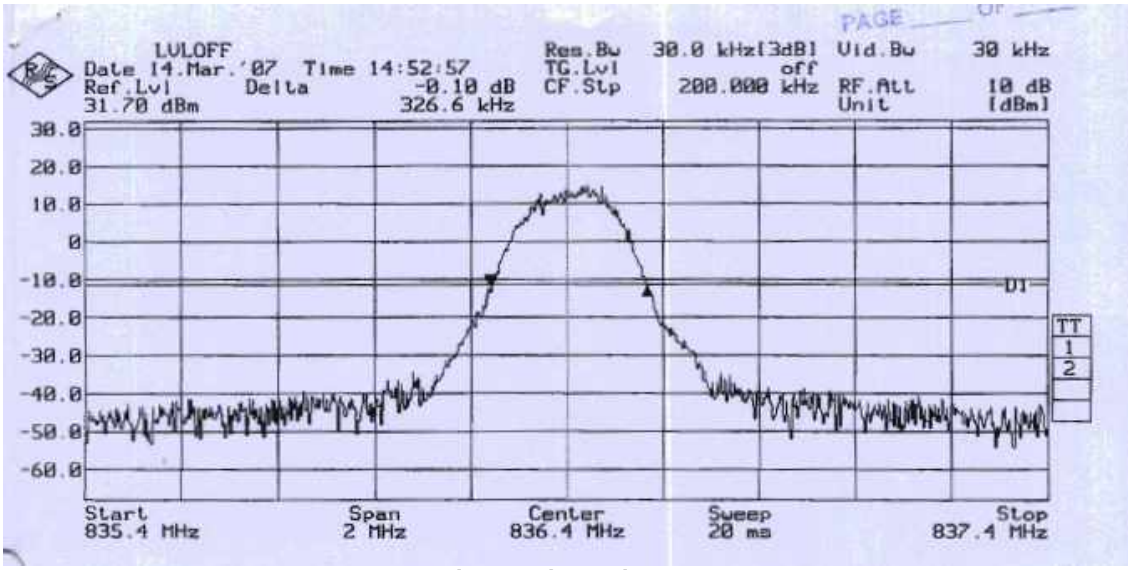
Operating Mode	GSM 850 Transmit	Temperature	24°C
Test Input Power	110V 60Hz	Relative Humidity	59%
Test Distance	3m	Atmospheric Pressure	1030mbar
Attached Plots	1 - 3	Tested By	Johnsen Tia

Channel	Channel Frequency (MHz)	26dB Bandwidth (kHz)
824.2000	128	331.3
836.4000	189	326.6
848.8000	251	326.6

26dB Bandwidth Plots



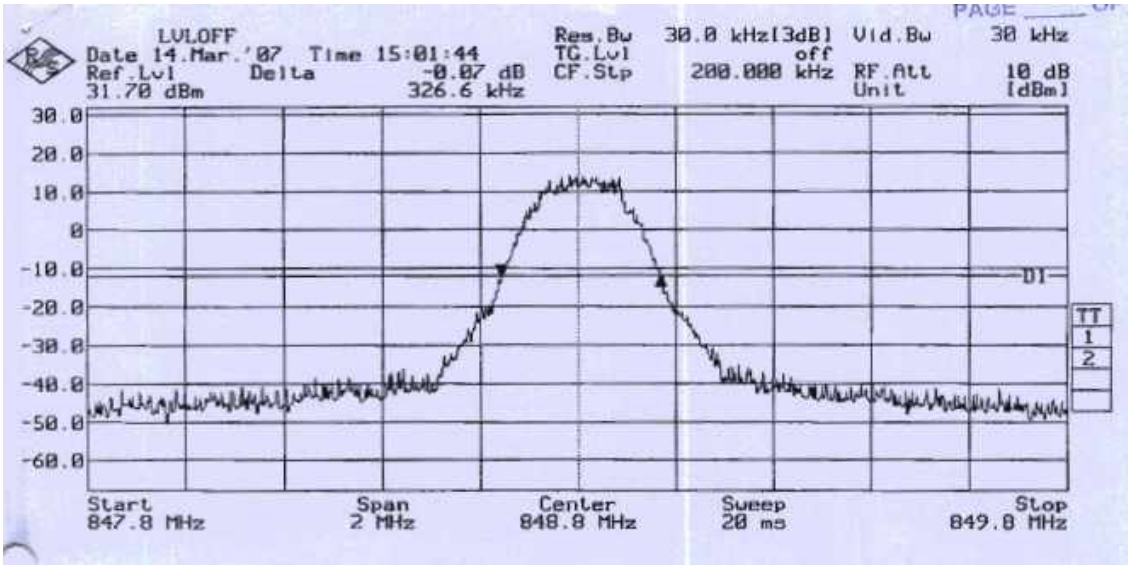
Plot 1 - Channel 128



Plot 2 - Channel 189

OCCUPIED BANDWIDTH TEST

26dB Bandwidth Plots



Plot 3 - Channel 251

BAND EDGE COMPLIANCE (RADIATED) TEST

FCC Parts 22.917(a), 22.917(b) and 2.1053 Band Edge Compliance (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.

FCC Parts 22.917(a), 22.917(b) and 2.1053 Band Edge Compliance (Radiated) Test Instrumentation

Instrument	Model	S/No	Cal Due Date
HP Spectrum Analyzer-SA3	8591E	3325A01626	26 May 2007
R&S Universal Radio Communication Tester	CMU 200	837587/068	24 Mar 2007
R&S Test Receiver (20Hz –26.5GHz) – ESMI1	ESMI	849182/003 848926/007	04 Jul 2007
Schaffner Preamplifier (9kHz-2GHz) – PA19	CPA9231A	18763	12 Jan 2008
TESEQ Preamplifier (1GHz-18GHz) – PA16	LNA6018	70214	09 Jan 2008
Schaffner Bilog Antenna –BL4	CBL6112B	2593	12 May 2007
EMCO Horn Antenna – H14	3115	0003-6087	19 May 2007

BAND EDGE COMPLIANCE (RADIATED) TEST

FCC Parts 22.917(a), 22.917(b) and 2.1053 Band Edge Compliance (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 the following setting:
   RBW = VBW ≥ 1% of the 26dB Bandwidth of the modulated carrier signal
5. All other supporting equipment were powered separately from another filtered mains.

FCC Parts 22.917(a), 22.917(b) and 2.1053 Band Edge Compliance (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 with span wide enough to capture the lower band edge of the transmitting band, and any spurious emissions at the band edge. For EUT which is a portable device, the band edge measurement was carried out by rotating the EUT through three orthogonal axes to determine which altitude and equipment arrangement produces the highest emission.
4. The test antenna was then raised or lowered through the specified range of heights (1m – 4m) until maximum band edge emissions were captured and recorded on the test receiver.
5. The EUT was then rotated through 360º in the horizontal plane until the maximum band edge emissions were received. The maximum received emissions profile was recorded and plotted.
6. The steps 2 to 5 were repeated with the receiving antenna was set to horizontal polarization.
7. Comparison was made on both measured results with vertical and horizontal polarizations; with the antenna was kept at the polarization where the higher band edge emissions could be captured.
8. A known reference path loss was then added to the found band edge emission levels in step 7.
9. The “corrected” band emission profile was compared against the allowable limit.
10. The steps 2 to 9 were repeated with the frequency span of the spectrum analyser was set to wide enough to capture the upper band edge frequency of the transmission band, and the any spurious emissions at the band edge.

BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance Test Setup

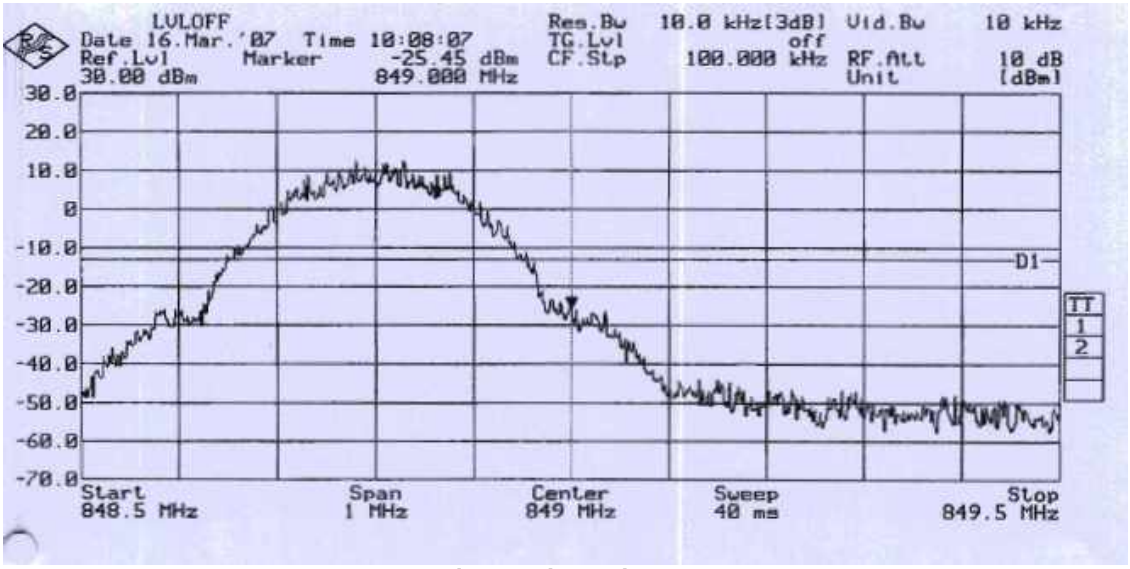
FCC Parts 22.917(a), 22.917(b) and 2.1053 Band Edge Compliance (Radiated) Results

Operating Mode	GSM 850 Transmit	Temperature	24°C
Test Input Power	110V 60Hz	Relative Humidity	59%
Test Distance	3m	Atmospheric Pressure	1030mbar
Antenna Gain	2.5 dBi	Tested By	Johnsen Tia
Attached Plots	4 - 5		

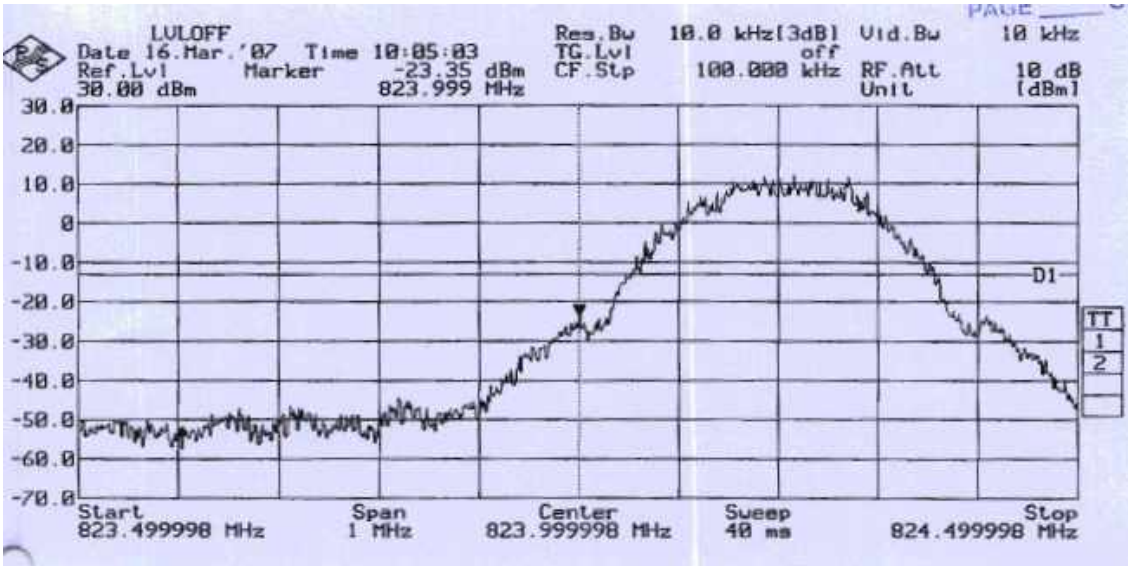
No significant signal was found and they were below the specified limit.

BAND EDGE COMPLIANCE (RADIATED) TEST

Band Edge Compliance Plots



Plot 4 - Channel 128



Plot 5 - Channel 251

OUT OF BAND EMISSIONS (CONDUCTED) TEST

FCC Parts 22.917(a), 22.917(b) and 2.1051 Out of Band Emissions (Conducted) 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.

FCC Parts 22.917(a), 22.917(b) and 2.1051 Out of Band Emissions (Conducted) Test Instrumentation

Instrument	Model	S/No	Cal Due Date
HP Spectrum Analyzer-SA3	8591E	3325A01626	26 May 2007
R&S Universal Radio Communication Tester	CMU 200	837587/068	24 Mar 2007

OUT OF BAND EMISSIONS (CONDUCTED) TEST

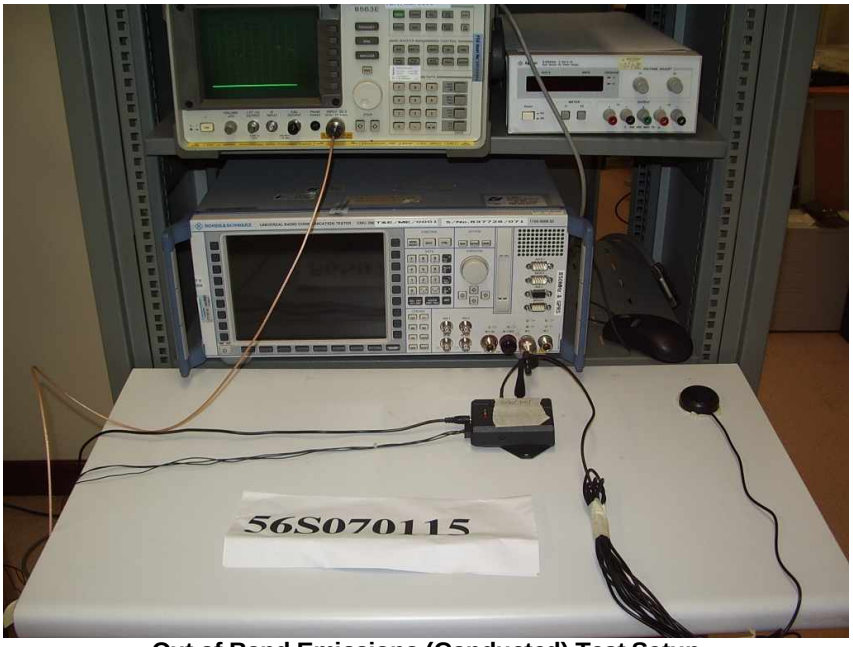
FCC Parts 22.917(a), 22.917(b) and 2.1051 Out of Band Emissions (Conducted) Test Setup

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 following setting:
   RBW = VBW = 1MHz (30MHz – 10th harmonics of the carrier frequency)
   RBW = VBW ≥ 1% of the 26dB Bandwidth of the modulated carrier signal (immediately outside and adjacent to transmitting frequency band)
5. All other supporting equipment were powered separately from another filtered mains.

FCC Parts 22.917(a), 22.917(b) and 2.1051 Out of Band Emissions (Conducted) 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 start and stop frequencies of the spectrum analyser were set to 30MHz and 10GHz.
3. The spectrum analyser was set to max hold to capture any spurious emissions within the span. The signal capturing was continuous until no further spurious emissions were detected.
4. The steps 2 to 3 were repeated with frequency span was set from 10GHz to 10th harmonics of the carrier frequency.
5. The steps 2 to 4 were repeated with the EUT was set to operate at middle and upper channels respectively.

OUT OF BAND EMISSIONS (CONDUCTED) TEST



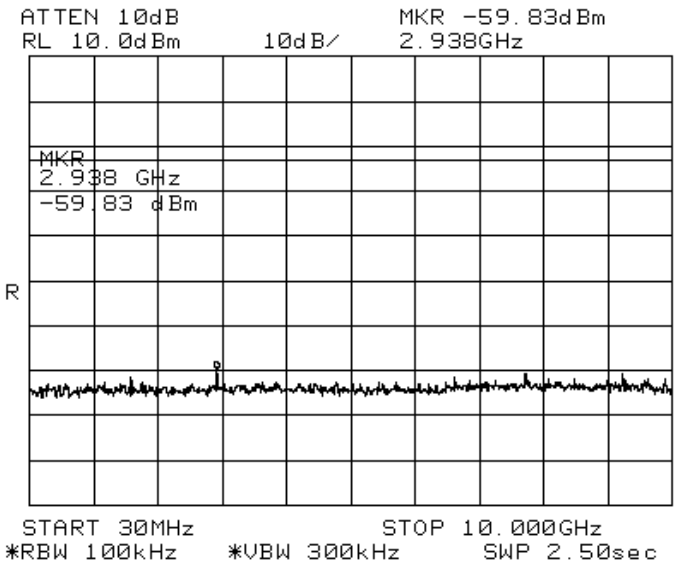
Out of Band Emissions (Conducted) Test Setup

FCC Parts 22.917(a), 22.917(b) and 2.1051 Out of Band (Conducted) Results

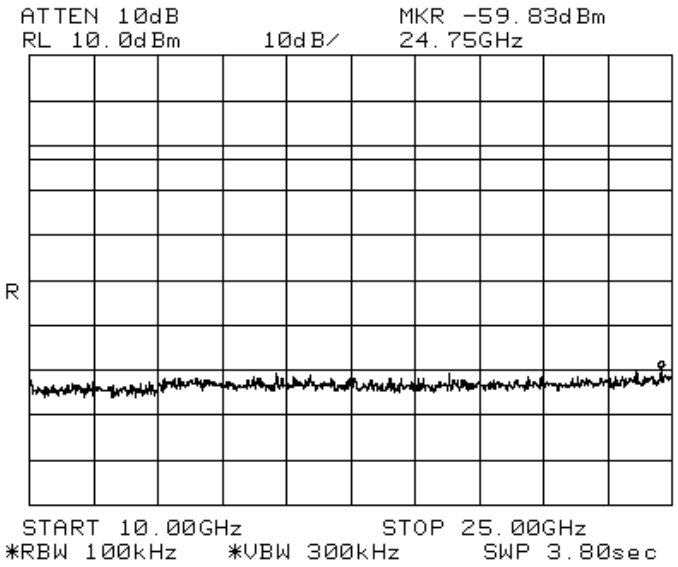
Operating Mode	GSM 850 Transmit	Temperature	23°C
Test Input Power	110V 60Hz	Relative Humidity	59%
Attached Plots	6 - 11	Atmospheric Pressure	1030mbar
		Tested By	Johnsen Tia

All spurious signals found were below the specified limit. Please refer to the attached plots.

Out of Band Emissions (Conducted) Plots

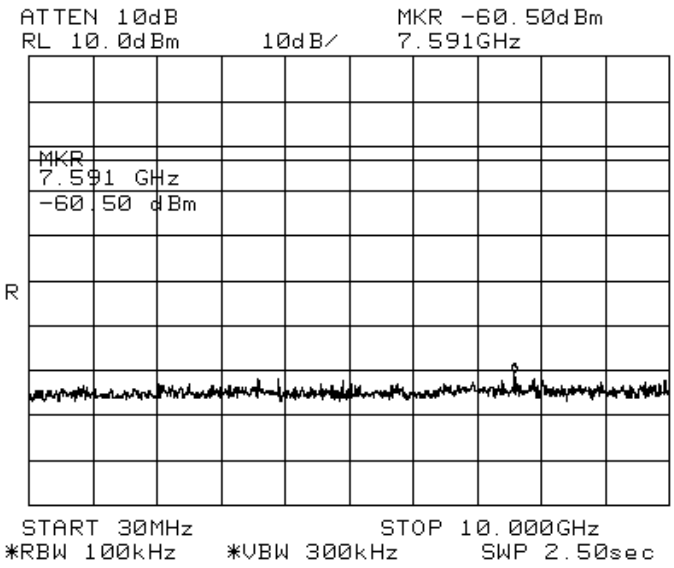


Plot 6 – Channel 128

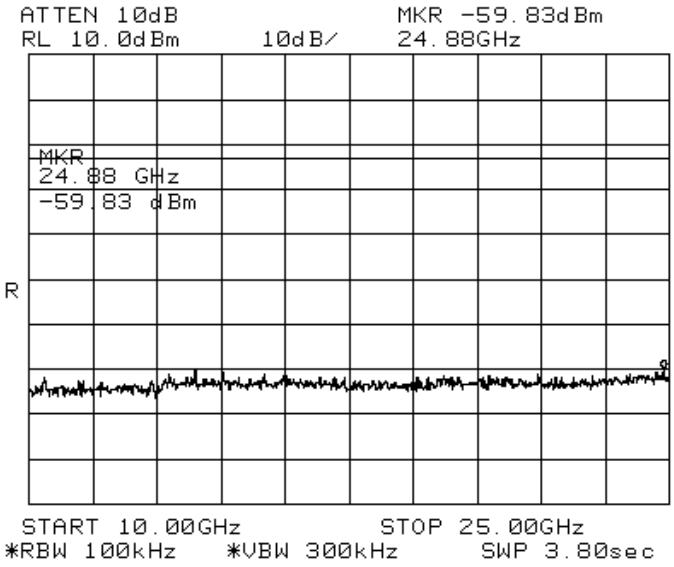


Plot 7 – Channel 128

Out of Band Emissions (Conducted) Plots

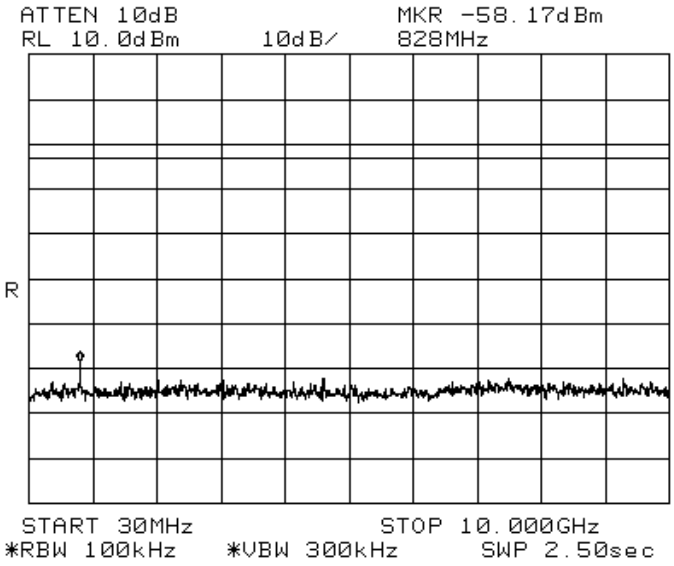


Plot 8 – Channel 189

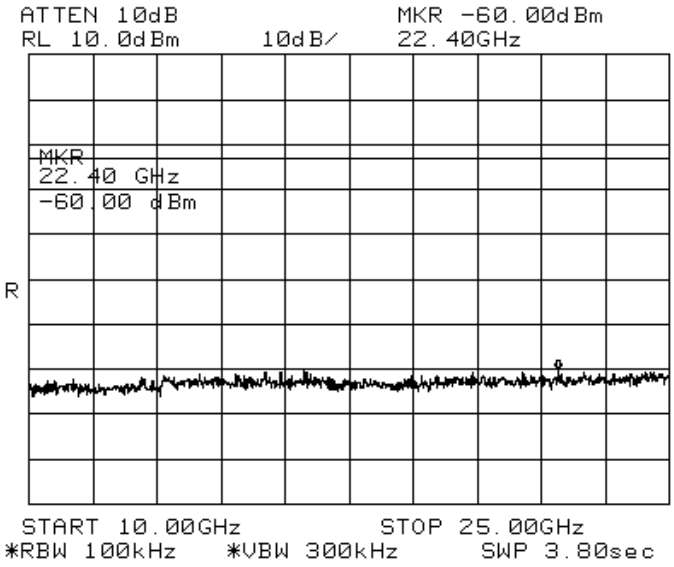


Plot 9 – Channel 189

Out of Band Emissions (Conducted) Plots



Plot 10 – Channel 251



Plot 11 – Channel 251

OUT OF BAND EMISSIONS (RADIATED) TEST

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.

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
HP Spectrum Analyzer-SA3	8591E	3325A01626	26 May 2007
R&S Universal Radio Communication Tester	CMU 200	837587/068	24 Mar 2007
R&S Test Receiver (20Hz –26.5GHz) – ESMI1	ESMI	849182/003 848926/007	04 Jul 2007
Schaffner Preamplifier (9kHz-2GHz) – PA19	CPA9231A	18763	12 Jan 2008
TESEQ Preamplifier (1GHz-18GHz) – PA16	LNA6018	70214	09 Jan 2008
Schaffner Bilog Antenna –BL4	CBL6112B	2593	12 May 2007
EMCO Horn Antenna – H14	3115	0003-6087	19 May 2007

OUT OF BAND EMISSIONS (RADIATED) TEST

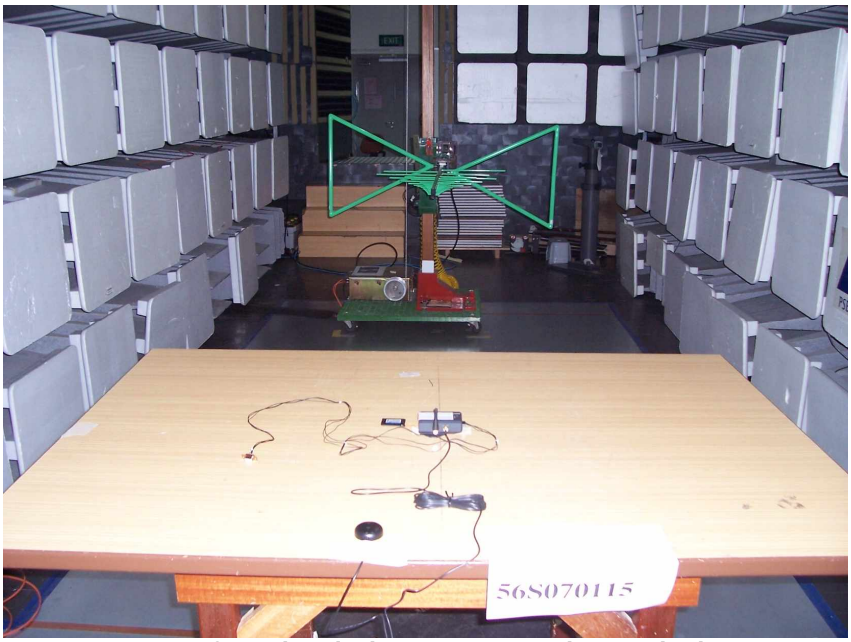
FCC Parts 22.917(a), 22.917(b) and 2.1053 Out of Band Emissions (Radiated) Test Setup

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.

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 360º 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 10^{th} 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 Test Setup (Front View)



Out of Band Emissions Test Setup (Front View)

OUT OF BAND EMISSIONS (RADIATED) TEST

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

Operating Mode	GSM 850 Transmit	Temperature	23°C
Test Input Power	110V 60Hz	Relative Humidity	59%
Test Distance	3m	Atmospheric Pressure	1030mbar
Antenna Gain	2.5 dBi	Tested By	Johnsen Tia

LOWER CHANNEL (CHANNEL 128)

Frequency (MHz)	Amplitude (dBm)	Limit (dBm)
890.4000	-42.0	-13.0
2386.6000	-62.9	-13.0
5000.0000	-62.7	-13.0

MIDDLE CHANNEL (CHANNEL 189)

Frequency (MHz)	Amplitude (dBm)	Limit (dBm)
890.4000	-42.0	-13.0
2100.6000	-63.0	-13.0
5000.0000	-62.7	-13.0

UPPER CHANNEL (CHANNEL 251)

Frequency (MHz)	Amplitude (dBm)	Limit (dBm)
872.3500	-39.0	-13.0
2200.0000	-63.05	-13.0
5055.5000	-64.54	-13.0

Notes

1. "--" indicates no emissions were found and shows compliance to the limits.
2. 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 ±4.6dB.

RF OUTPUT POWER TEST

FCC Parts 24.232(c) and 2.1046 RF Output Power Limits

The EUT shows compliance to the requirements of this section, which states mobile / portable stations are limited to 2 watts EIRP peak power and the equipment must employ means to the limit the power to the minimum necessary for successful communications.

FCC Parts 24.913(c) and 2.1046 RF Output Power Test Instrumentation

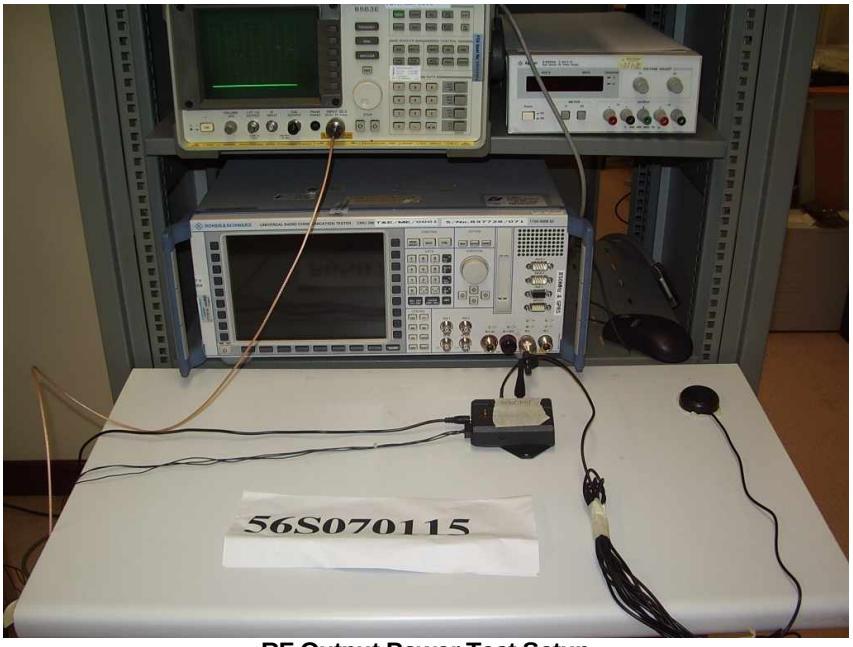
Instrument	Model	S/No	Cal Due Date
HP Spectrum Analyzer-SA3	8591E	3325A01626	26 May 2007
R&S Universal Radio Communication Tester	CMU 200	837587/068	24 Mar 2007
R&S Test Receiver (20Hz –26.5GHz) – ESMI1	ESMI	849182/003 848926/007	04 Jul 2007
Schaffner Preamplifier (9kHz-2GHz) – PA19	CPA9231A	18763	12 Jan 2008
TESEQ Preamplifier (1GHz-18GHz) – PA16	LNA6018	70214	09 Jan 2008
Schaffner Bilog Antenna –BL4	CBL6112B	2593	12 May 2007
EMCO Horn Antenna – H14	3115	0003-6087	19 May 2007

FCC Parts 24.232(c) and 2.1046 RF Output Power 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 Universal Radio Communication Tester, which set into power analyser mode via a low-loss coaxial cable.
4. All other supporting equipment were powered separately from another filtered mains.

FCC Parts 24.232(c) and 2.1046 RF Output Power 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 maximum peak and average power of the transmitting frequency were detected and recorded with the known antenna gain was then added to the measured levels.
3. The step 2 was repeated with the EUT was set to operate at middle and upper channels respectively.



RF Output Power Test Setup

FCC Parts 24.232(c) and 2.1046 RF Output Power Results

Operating Mode	PCS 1900 Transmit	Temperature	24°C
Test Input Power	110V 60Hz	Relative Humidity	59%
Test Distance	3m	Atmospheric Pressure	1030mbar
Antenna Gain	2.5dBi	Tested By	Johnsen Tia

Frequency (MHz)	Channel	Peak Output Power (dBm)		Average Output Power (dBm)	
		EIRP	ERP	EIRP	ERP
1850.2000	512	29.6	27.5	29.5	27.4
1880.0000	661	29.4	27.3	29.4	27.3
1909.8000	810	29.6	27.5	29.5	27.4

Notes

1. Power analyser of Universal Radio Communication Tester was used for power measurement. The power analyser mode supports a wideband power measurement ranging from 100kHz to 2700MHz.
2. RF Output Power Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of 95% is ±1.0dB.

OCCUPIED BANDWIDTH TEST

FCC Parts 24.238(b) and 2.1049 Occupied Bandwidth Limits

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

FCC Parts 24.238(b) and 2.1049 Occupied Bandwidth Test Instrumentation

Instrument	Model	S/No	Cal Due Date
HP Spectrum Analyzer-SA3	8591E	3325A01626	26 May 2007
R&S Universal Radio Communication Tester	CMU 200	837587/068	24 Mar 2007
R&S Test Receiver (20Hz –26.5GHz) – ESMI1	ESMI	849182/003 848926/007	04 Jul 2007
Schaffner Preamplifier (9kHz-2GHz) – PA19	CPA9231A	18763	12 Jan 2008
TESEQ Preamplifier (1GHz-18GHz) – PA16	LNA6018	70214	09 Jan 2008
Schaffner Bilog Antenna –BL4	CBL6112B	2593	12 May 2007
EMCO Horn Antenna – H14	3115	0003-6087	19 May 2007

FCC Parts 24.238(b) and 2.1049 Occupied Bandwidth 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.

FCC Parts 24.238(b) and 2.1049 Occupied Bandwidth 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 with span wide enough to capture the 26dB bandwidth of the transmitting frequency. For EUT which is a portable device, the bandwidth measurement was carried out by rotating the EUT through three orthogonal axes to determine which altitude and equipment arrangement produces the widest bandwidth.
4. The test antenna was then raised or lowered through the specified range of heights (1m – 4m) until a maximum bandwidth profile was captured on the test receiver.
5. The EUT was then rotated through 360º in the horizontal plane until the maximum bandwidth profile was captured. The captured bandwidth profile was recorded and plotted.
6. The steps 2 to 5 were repeated with the receiving antenna was set to horizontal polarization.
7. Comparison was made on both measured bandwidths with vertical and horizontal polarizations; with the antenna was kept at the polarization where the wider bandwidth profile could be received.
8. A known reference path loss was then added to the found wider bandwidth profile in step 7.
9. The peak of the found bandwidth profile (peak of transmitting frequency) was detected with the marker peak function of the spectrum analyser. The frequencies below the 26dB 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.
10. The 26dB bandwidth of the transmitting frequency is the frequency difference between the marked lower and upper frequencies, $| f_H – f_L |$.
11. The steps 2 to 10 were repeated with the EUT was set to operate at middle and upper channels respectively.

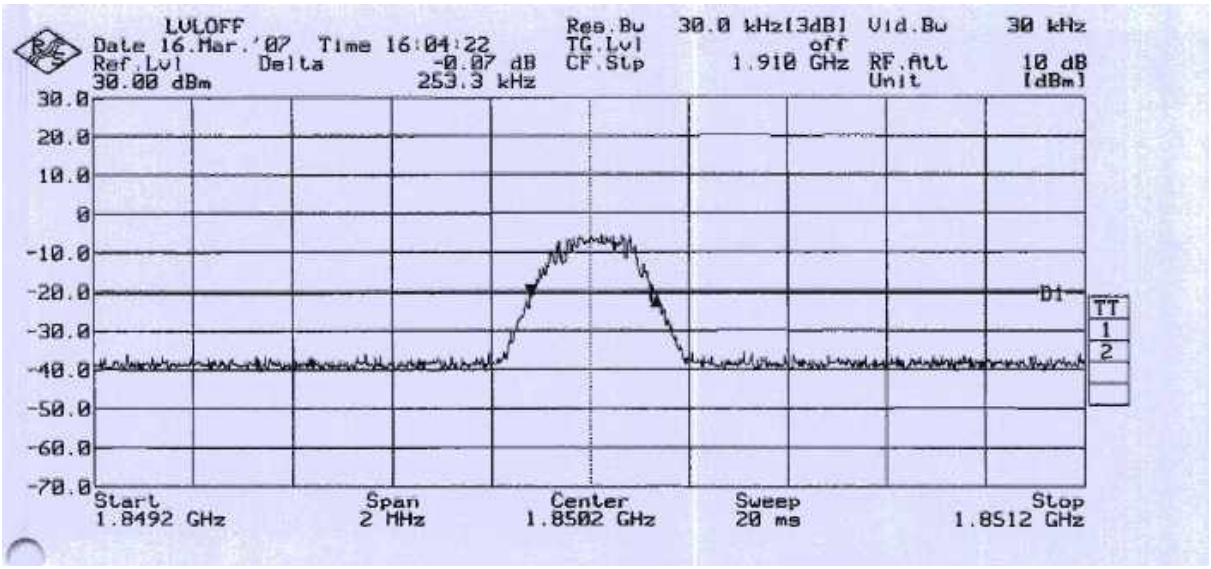
Occupied Bandwidth Test Setup

FCC Parts 24.238(b) and 2.1049 Occupied Bandwidth Results

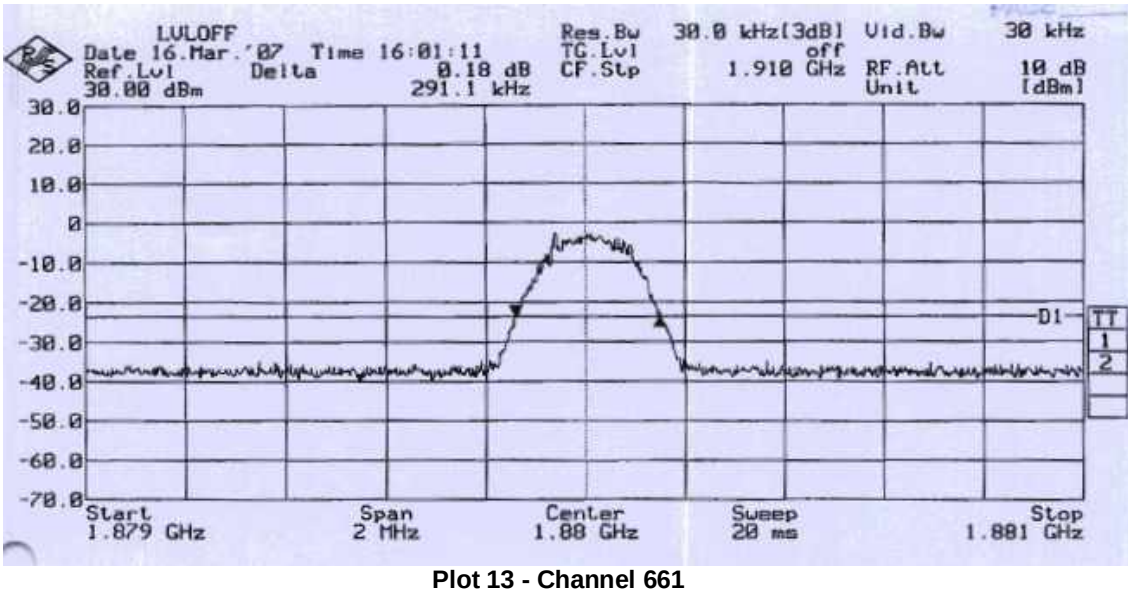
Operating Mode	PCS 1900 Transmit	Temperature	24°C
Test Input Power	110V 60Hz	Relative Humidity	59%
Test Distance	3m	Atmospheric Pressure	1030mbar
Attached Plots	12 - 14	Tested By	Johnsen Tia

Channel	Channel Frequency (MHz)	26dB Bandwidth (KHz)
512	1850.2000	253.3
661	1880.0000	291.1
810	1909.8000	297.7

26dB Bandwidth Plots

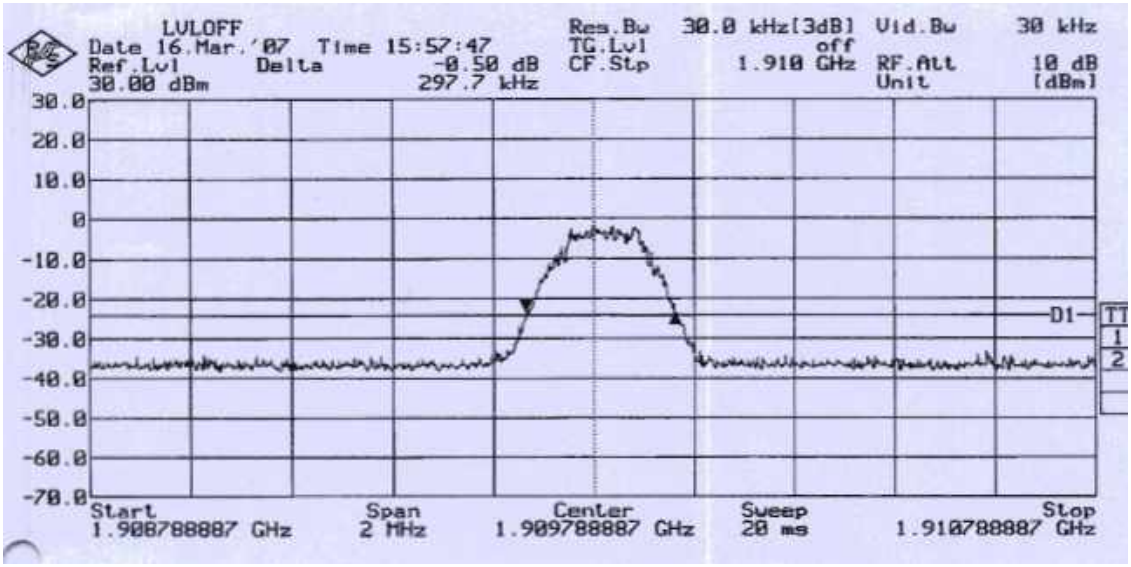


Plot 12 - Channel 512



Plot 13 - Channel 661

26dB Bandwidth Plots



Plot 14 - Channel 812

BAND EDGE COMPLIANCE (RADIATED) TEST

FCC Parts 24.238(a), 24.238(b) and 2.1053 Band Edge Compliance (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.

FCC Parts 24.238(a), 24.238(b) and 2.1053 Band Edge Compliance (Radiated) Test Instrumentation

Test Performed on 19 Mar 2007			
Instrument	**Model**	**S/No**	**Cal Due Date**
HP Spectrum Analyzer-SA3	8591E	3325A01626	26 May 2007
R&S Universal Radio Communication Tester	CMU 200	837587/068	24 Mar 2007
R&S Test Receiver (20Hz –26.5GHz) – ESMI1	ESMI	849182/003 848926/007	04 Jul 2007
Schaffner Preamplifier (9kHz-2GHz) – PA19	CPA9231A	18763	12 Jan 2008
TESEQ Preamplifier (1GHz-18GHz) – PA16	LNA6018	70214	09 Jan 2008
Schaffner Bilog Antenna –BL4	CBL6112B	2593	12 May 2007
EMCO Horn Antenna – H14	3115	0003-6087	19 May 2007

BAND EDGE COMPLIANCE (RADIATED) TEST

FCC Parts 24.238(a), 24.238(b) and 2.1053 Band Edge Compliance (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 the following setting:
   RBW = VBW ≥ 1% of the 26dB Bandwidth of the modulated carrier signal
5. All other supporting equipment were powered separately from another filtered mains.

FCC Parts 24.238(a), 24.238(b) and 2.1053 Band Edge Compliance (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 with span wide enough to capture the lower band edge of the transmitting band, and any spurious emissions at the band edge. For EUT which is a portable device, the band edge measurement was carried out by rotating the EUT through three orthogonal axes to determine which altitude and equipment arrangement produces the highest emission.
4. The test antenna was then raised or lowered through the specified range of heights (1m – 4m) until maximum band edge emissions were captured and recorded on the test receiver.
5. The EUT was then rotated through 360º in the horizontal plane until the maximum band edge emissions were received. The maximum received emissions profile was recorded and plotted.
6. The steps 2 to 5 were repeated with the receiving antenna was set to horizontal polarization.
7. Comparison was made on both measured results with vertical and horizontal polarizations; with the antenna was kept at the polarization where the higher band edge emissions could be captured.
8. A known reference path loss was then added to the found band edge emission levels in step 7.
9. The “corrected” band emission profile was compared against the allowable limit.
10. The steps 2 to 9 were repeated with the frequency span of the spectrum analyser was set to wide enough to capture the upper band edge frequency of the transmission band, and the any spurious emissions at the band edge.

BAND EDGE COMPLIANCE (RADIATED) TEST

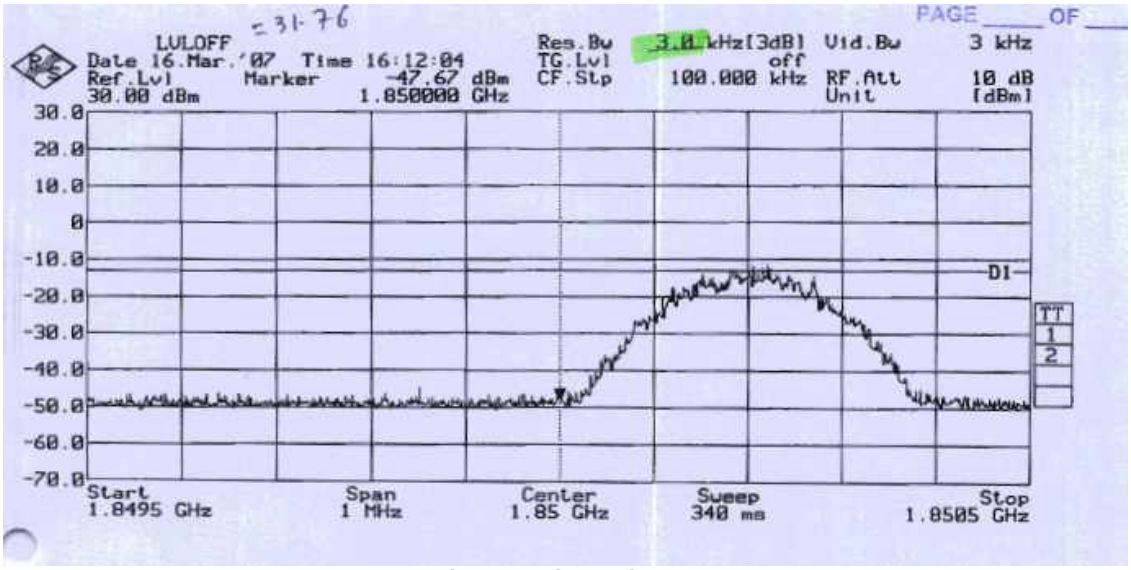
Band Edge Compliance Test Setup

FCC Parts 24.238(a), 24.238(b) and 2.1053 Band Edge Compliance (Radiated) Results

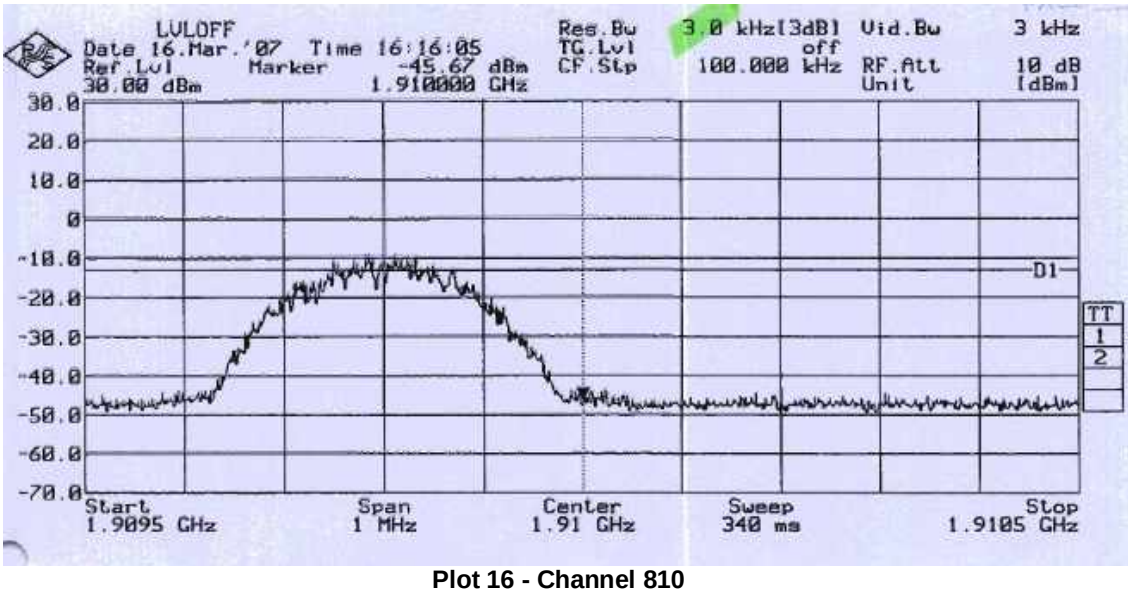
Operating Mode	PCS 1900 Transmit	Temperature	23°C
Test Input Power	110V 60Hz	Relative Humidity	59%
Test Distance	3m	Atmospheric Pressure	1030mbar
Antenna Gain	2.5dBi	Tested By	Johnsen Tia
Attached Plots	15 - 16		

No significant signal was found and they were below the specified limit.

Band Edge Compliance Plots



Plot 15 - Channel 512



Plot 16 - Channel 810

OUT OF BAND EMISSIONS (CONDUCTED) TEST

FCC Parts 24.238(a), 24.238(b) and 2.1051 Out of Band Emissions (Conducted) 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.

FCC Parts 24.238(a), 24.238(b) and 2.1051 Out of Band Emissions (Conducted) Test Instrumentation

Test Performed on 19 Mar 2007			
Instrument	**Model**	**S/No**	**Cal Due Date**
HP Spectrum Analyzer-SA3	8591E	3325A01626	26 May 2007
R&S Universal Radio Communication Tester	CMU 200	837587/068	24 Mar 2007

OUT OF BAND EMISSIONS (CONDUCTED) TEST

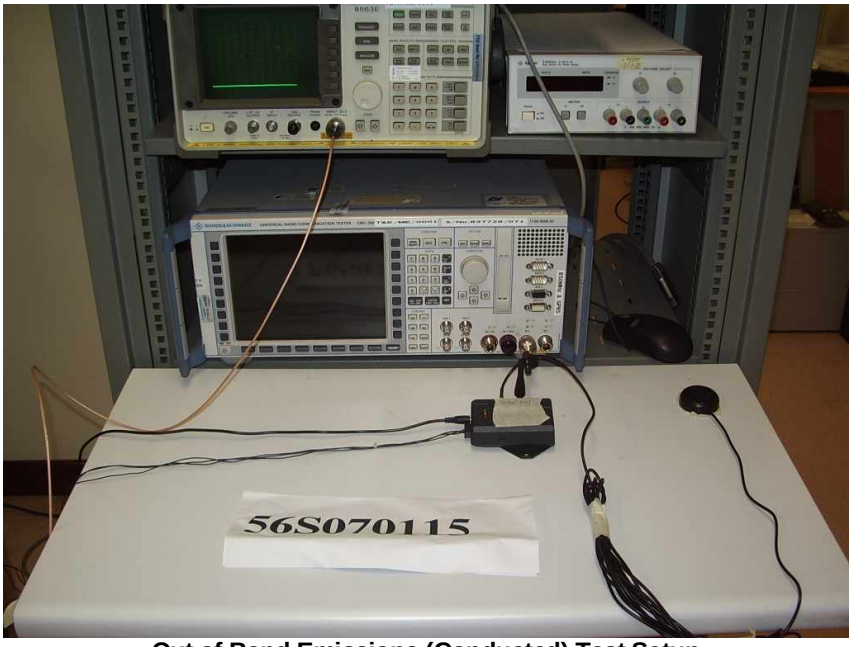
FCC Parts 24.238(a), 24.238(b) and 2.1051 Out of Band Emissions (Conducted) Test Setup

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 following setting:
   RBW = VBW = 1MHz (30MHz – 10th harmonics of the carrier frequency)
   RBW = VBW ≥ 1% of the 26dB Bandwidth of the modulated carrier signal (immediately outside and adjacent to transmitting frequency band)
5. All other supporting equipment were powered separately from another filtered mains.

FCC Parts 24.238(a), 24.238(b) and 2.1051 Out of Band Emissions (Conducted) 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 start and stop frequencies of the spectrum analyser were set to 30MHz and 10GHz.
3. The spectrum analyser was set to max hold to capture any spurious emissions within the span. The signal capturing was continuous until no further spurious emissions were detected.
4. The steps 2 to 3 were repeated with frequency span was set from 10GHz to 10th harmonics of the carrier frequency.
5. The steps 2 to 4 were repeated with the EUT was set to operate at middle and upper channels respectively.

OUT OF BAND EMISSIONS (CONDUCTED) TEST



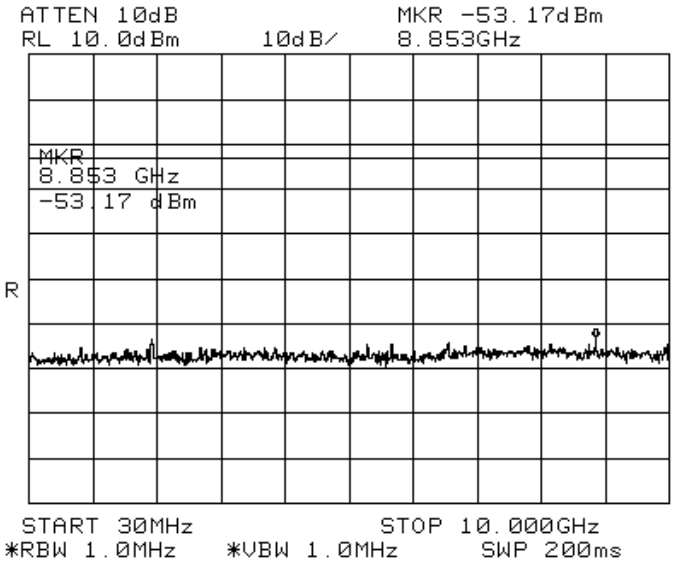
Out of Band Emissions (Conducted) Test Setup

FCC Parts 24.238(a), 24.238(b) and 2.1051 Out of Band (Conducted) Results

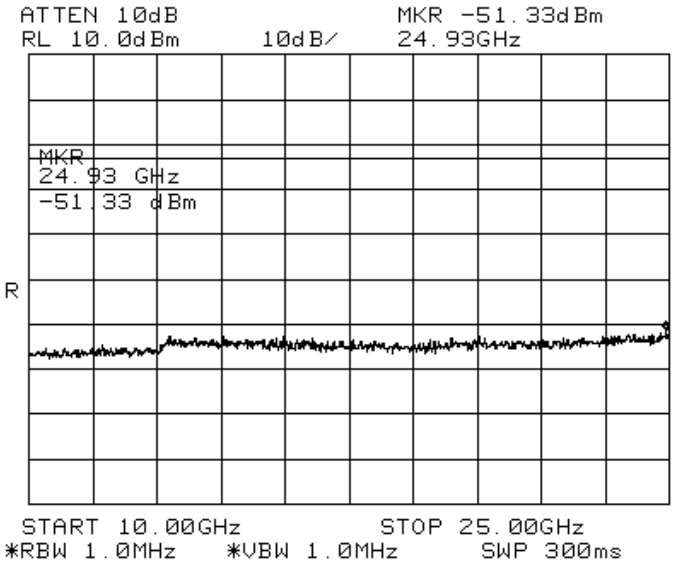
Operating Mode	PCS 1900 Transmit	Temperature	23°C
Test Input Power	110V 60Hz	Relative Humidity	59%
Antenna Gain	2.5dBi	Atmospheric Pressure	1030mbar
Attached Plots	17 - 22	Tested By	Johnsen Tia

All spurious signals found were below the specified limit. Please refer to the attached plots.

Out of Band Emissions (Conducted) Plots

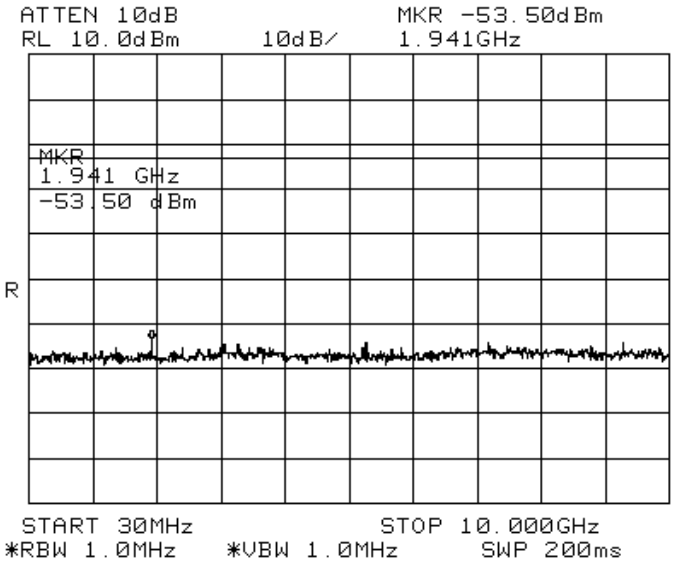


Plot 17 – Channel 512

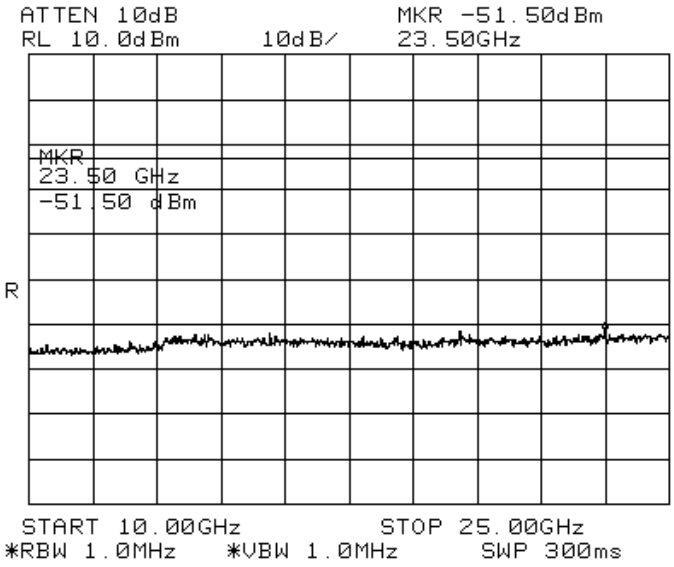


Plot 18 – Channel 512

Out of Band Emissions (Conducted) Plots

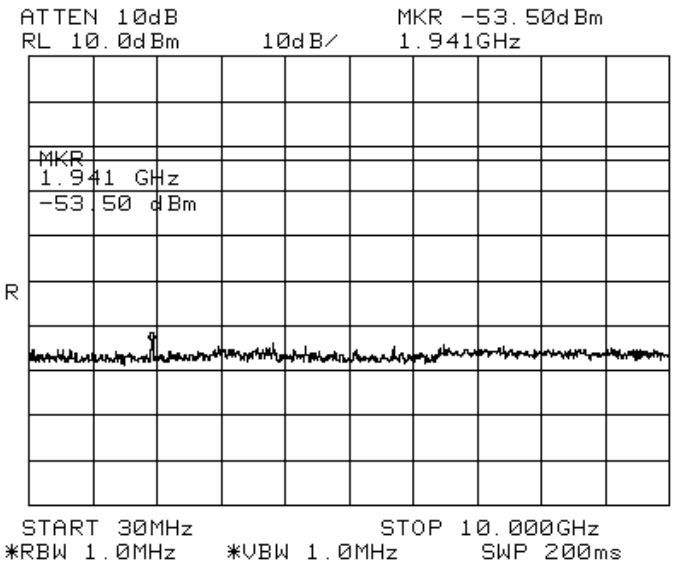


Plot 19 – Channel 661

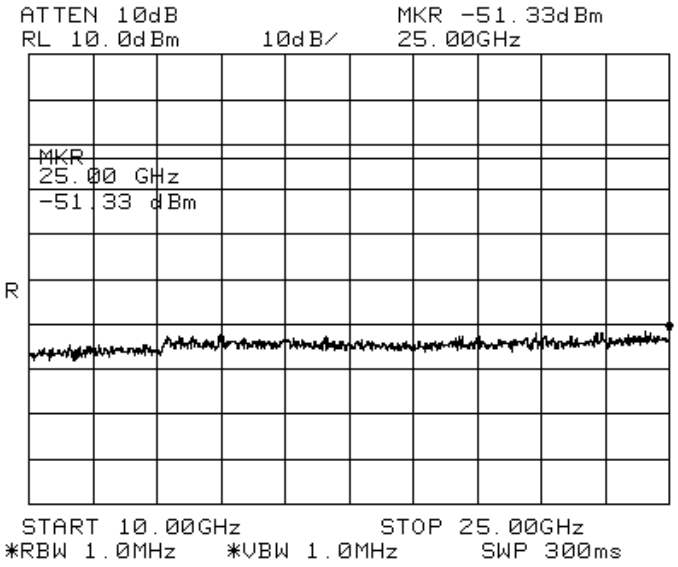


Plot 20 – Channel 661

Out of Band Emissions (Conducted) Plots



Plot 21 – Channel 810



Plot 22 – Channel 810

OUT OF BAND EMISSIONS (RADIATED) TEST

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.

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

Test Performed on 19 Mar 2007			
Instrument	**Model**	**S/No**	**Cal Due Date**
HP Spectrum Analyzer-SA3	8591E	3325A01626	26 May 2007
R&S Universal Radio Communication Tester	CMU 200	837587/068	24 Mar 2007
R&S Test Receiver (20Hz –26.5GHz) – ESMI1	ESMI	849182/003 848926/007	04 Jul 2007
Schaffner Preamplifier (9kHz-2GHz) – PA19	CPA9231A	18763	12 Jan 2008
TESEQ Preamplifier (1GHz-18GHz) – PA16	LNA6018	70214	09 Jan 2008
Schaffner Bilog Antenna –BL4	CBL6112B	2593	12 May 2007
EMCO Horn Antenna – H14	3115	0003-6087	19 May 2007

OUT OF BAND EMISSIONS (RADIATED) TEST

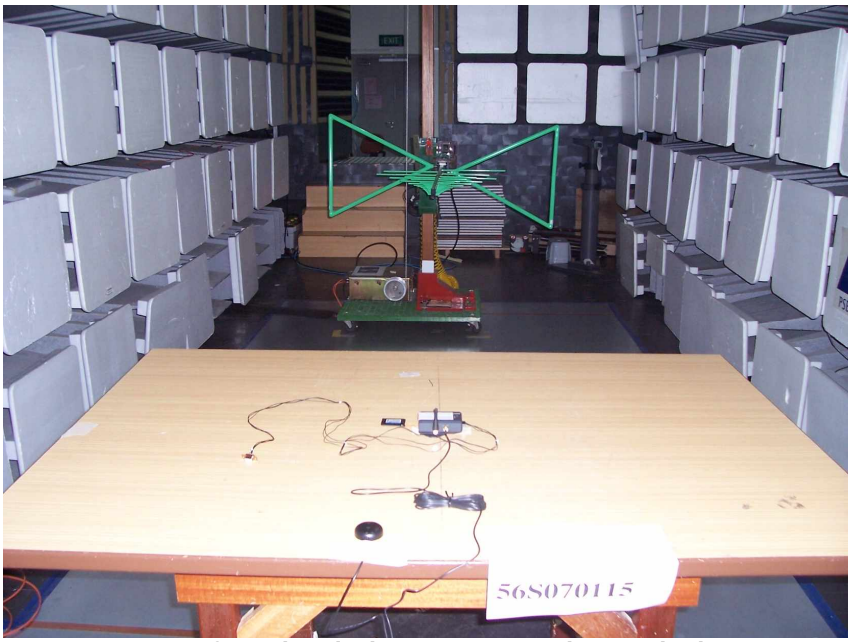
FCC Parts 24.238(a), 24.238(b) and 2.1053 Out of Band Emissions (Radiated) Test Setup

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.

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 360º 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 10^{th} 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 Test Setup (Front View)



Out of Band Emissions Test Setup (Front View)

OUT OF BAND EMISSIONS (RADIATED) TEST

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

Operating Mode	PCS 1900 Transmit	Temperature	23°C
Test Input Power	110V 60Hz	Relative Humidity	59%
Test Distance	3m	Atmospheric Pressure	1030mbar
Antenna Gain	2.5 dBi	Tested By	Johnsen Tia

LOWER CHANNEL (CHANNEL 512)

Frequency (MHz)	Amplitude (dBm)	Limit (dBm)
913.7000	-38.4	-13.0
2120.0000	-63.2	-13.0
4950.0000	-60.0	-13.0

MIDDLE CHANNEL (CHANNEL 661)

Frequency (MHz)	Amplitude (dBm)	Limit (dBm)
901.9000	-39.55	-13.0
2123.0000	-63.5	-13.0
5533.3000	-63.5	-13.0

UPPER CHANNEL (CHANNEL 810)

Frequency (MHz)	Amplitude (dBm)	Limit (dBm)
891.1000	-40.1	-13.0
1946.6000	-62.4	-13.0
5531.0000	-63.1	-13.0

Notes

1. "--" indicates no emissions were found and shows compliance to the limits.
2. 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 ±4.6dB.

CONDUCTED EMISSION TEST

FCC Part 15.107 Conducted Emission Limits (Class B)

AC Port

Frequency Range (MHz)	Limit Values (dBµV)	
	Quasi-peak (QP)	Average (AV)
0.15 - 0.5	66 – 56 *	56 – 46 *
0.5 - 5.0	56	46
5.0 - 30.0	60	50
* Decreasing linearly with the logarithm of the frequency		

FCC 15.107 Conducted Emission Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Schaffner EMI Receiver – SCR1	SCR 3501	238	06 Nov 2007
Agilent EMC Analyzer-SA7	E7403A	US41160167	22 May 2007
EMCO LISN (for EUT) – LISN9	3825/2	9309-2128	15 May 2007
EMCO LISN (for supporting) – LISN6	3825/2	9309-2127	15 May 2007
R&S Pulse Limiter – PL2	ESH3-Z2	100347	15 Apr 2007

CONDUCTED EMISSION TEST

AC Port

FCC 15.107 Conducted Emission 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 power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipment were powered separately from another LISN.

FCC 15.107 Conducted Emission Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A scan was made on the NEUTRAL line over the required frequency range using an EMI test receiver.
3. High peaks, relative to the limit line, were then selected.
4. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10kHz. Both Quasi-peak and Average measurements were made.
5. Steps 2 to 4 were then repeated for the LIVE line.

Sample Calculation Example

At 20 MHz	Q-P limit (Class B) = 1000 μV = 60.0 dBμV
Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.2 dB	
Q-P reading obtained directly from EMI Receiver = 40.0 dBμV (Calibrated for system losses)	
Therefore, Q-P margin = 40.0 - 60.0 = -20.0	i.e. **20.0 dB below Q-P limit**

CONDUCTED EMISSION TEST

Conducted Emission Test Setup (Front View)

Conducted Emission Test Setup (Rear View)

CONDUCTED EMISSION TEST

FCC 15.107 Conducted Emission Results

Operating Mode	GSM 850 Transmit / Receive	Temperature	24°C
Test Input Power	110V 60Hz	Relative Humidity	59%
Line Under Test	AC Mains	Atmospheric Pressure	1030mbar
Class	B	Tested By	Johnsen Tia

Frequency (MHz)	Q-P Value (dBμV)	Q-P Margin (dB)	AV Value (dBμV)	AV Margin (dB)	Line
0.1506	31.7	-34.3	30.2	-25.8	Live
0.2107	28.0	-35.2	28.3	-24.9	Live
0.6348	27.6	-28.4	27.5	-18.5	Neutral
3.7229	21.0	-35.0	19.9	-26.1	Neutral
16.6518	27.1	-32.9	24.2	-25.8	Live
17.4885	23.8	-36.2	24.5	-25.5	Neutral

Operating Mode	PCS 1900 Transmit / Receive	Temperature	24°C
Test Input Power	110V 60Hz	Relative Humidity	59%
Line Under Test	AC Mains	Atmospheric Pressure	1030mbar
Class	B	Tested By	Johnsen Tia

Frequency (MHz)	Q-P Value (dBμV)	Q-P Margin (dB)	AV Value (dBμV)	AV Margin (dB)	Line
0.1500	31.3	-34.7	30.9	-25.1	Live
0.2157	28.8	-34.2	29.0	-24.0	Neutral
0.6308	26.6	-29.4	23.7	-22.3	Neutral
2.9499	21.0	-35.0	20.4	-25.7	Neutral
3.1560	21.4	-34.6	19.2	-26.8	Live
3.9303	21.9	-34.1	22.1	-23.9	Live

CONDUCTED EMISSION TEST

Notes

1. All possible modes of operation were investigated from 150kHz to 30MHz. Only the worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
   9kHz - 30MHz
   RBW: 10kHz VBW: 30kHz
4. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 9kHz – 30MHz (Average & Quasi-peak) is ±3.0dB.

RECEIVER SPURIOUS EMISSIONS TEST

FCC Part 15.109 Receiver Spurious Emissions Limits (Class B)

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 Part 15.109 Receiver Spurious Emissions Test Instrumentation

Instrument	Model	S/No	Cal Due Date
R&S Test Receiver (20Hz –26.5GHz) – ESMI1	ESMI	849182/003 848926/007	04 Jul 2007
Schaffner Preamplifier (9kHz-2GHz) – PA19	CPA9231A	18763	12 Jan 2008
TESEQ Preamplifier (1GHz-18GHz) – PA16	LNA6018	70214	09 Jan 2008
Schaffner Bilog Antenna –BL4	CBL6112B	2593	12 May 2007
EMCO Horn Antenna – H14	3115	0003-6087	19 May 2007

RECEIVER SPURIOUS EMISSIONS TEST

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.

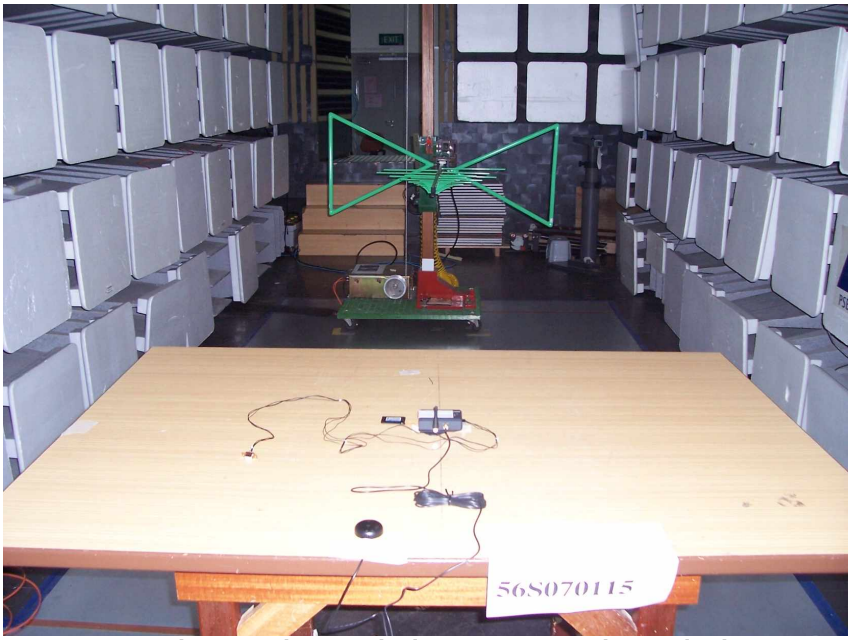
FCC Part 15.109 Receiver Spurious Emissions Test Method

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 (Class B) = 70.8 μV/m = 37.0 dBμV/m
Log-periodic antenna factor & cable loss at 300 MHz = 18.5 dB	
Q-P reading obtained directly from EMI Receiver = 31.0 dBμV/m (Calibrated level including antenna factors & cable losses)	
Therefore, Q-P margin = 31.0 - 37.0 = -6.0	i.e. **6 dB below Q-P limit**

Receiver Spurious Emissions Test Setup (Front View)



Receiver Spurious Emissions Test Setup (Rear View)

FCC Part 15.109 Receiver Spurious Emissions Results

Operating Mode	GSM 850 Receive	Temperature	23°C
Test Input Power	110V 60Hz	Relative Humidity	59%
Test Distance	3m	Atmospheric Pressure	1030mbar
Class	B	Tested By	Johnsen Tia

Spurious Emissions ranging from 30MHz – 1GHz

Frequency (MHz)	Q-P Value (dBµV/m)	Q-P Margin (dB)	Azimuth (Degrees)	Height (cm)	Polarisation (H/V)
53.1278	20.5	-19.5	100	100	H
96.2455	18.4	-25.1	221	100	H
124.9912	20.1	-23.4	316	100	H
175.0087	22.2	-21.3	88	100	H
210.3419	21.0	-22.5	299	113	H
364.2311	20.9	-25.1	205	121	H

Spurious Emissions above 1GHz

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

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. 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. 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 ±4.6dB.

FCC Part 15.109 Receiver Spurious Emissions Results

Operating Mode	PCS 1900 Receive	Temperature	24°C
Test Input Power	110V 60Hz	Relative Humidity	59%
Test Distance	3m	Atmospheric Pressure	1030mbar
Class	B	Tested By	Johnsen Tia

Frequency (MHz)	Q-P Value (dBµV/m)	Q-P Margin (dB)	Azimuth (Degrees)	Height (cm)	Polarisation (H/V)
54.0099	19.4	-20.6	137	100	H
96.2000	14.9	-28.6	262	310	H
123.4099	13.3	-30.2	347	100	H
170.8900	19.5	-24.0	94	118	H
209.4500	18.0	-25.5	314	100	H
365.5199	18.9	-27.1	180	100	H

Spurious Emissions above 1GHz

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

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. 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. 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 ±4.6dB.

RECEIVER SPURIOUS EMISSIONS TEST

FCC Part 15.109 Receiver Spurious Emissions Results

Operating Mode	GPS Receive	Temperature	24°C
Test Input Power	110V 60Hz	Relative Humidity	59%
Test Distance	3m	Atmospheric Pressure	1030mbar
Class	B	Tested By	Johnsen Tia

Frequency (MHz)	Q-P Value (dBµV/m)	Q-P Margin (dB)	Azimuth (Degrees)	Height (cm)	Polarisation (H/V)
54.2500	20.4	-19.6	0	100	V
95.9600	22.1	-21.4	0	100	V
124.0900	21.7	-21.8	0	100	V
170.6500	24.8	-18.7	0	100	V
209.4500	27.3	-16.2	0	100	V
260.8600	23.1	-22.9	0	100	V

Spurious Emissions above 1GHz

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

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. 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. 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 ±4.6dB.

MAXIMUM PERMISSIBLE EXPOSURE (MPE) COMPUTATION

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				

FCC Part 1.1310 Maximum Permissible Exposure (MPE) Computation Procedures

1. The power density of the EUT, P was computed based on following formula:
   d = √ [(30PG) / 377S]
   where P = Power in W
   S = Power density, W/m^2
   d = Test distance, m
   G = Numerical isotropic gain
3. The distance, d was computed. The distance d is the minimum distance between the EUT and user that must be maintained to ensure compliance of this requirement.

FCC Part 1.1310 Maximum Permissible Exposure (MPE) Computation Method

1. GSM 850MHz
   P = 2.291W (33.6dBm)
   S = $5.7W/m^2$ (limit)
   G = 1.7783 (2.5dBi)
   d = √ [(30PG) / 377S]
   = 0.24m

   ∴ The distance between the EUT and users shall be maintained at least 24cm to ensure a safe RF exposure when using the EUT.

2. PCS 1900MHz
   P = 0.912W (29.6dBm)
   S = $10 W/m^2$ (limit)
   G = 1.7783 (2.5dBi)
   d = √ [(30PG) / 377S]
   = 0.12m

   ∴ The distance between the EUT and users shall be maintained at least 12cm to ensure a safe RF exposure when using the EUT.

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

4. The sample/s mentioned in this report is/are submitted/supplied/manufactured by the Client. TÜV SÜD PSB 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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10. Unless otherwise stated, the tests are carried out in TÜV SÜD PSB Pte Ltd, No.1 Science Park Drive Singapore 118221.

May 2007

ANNEX A

EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

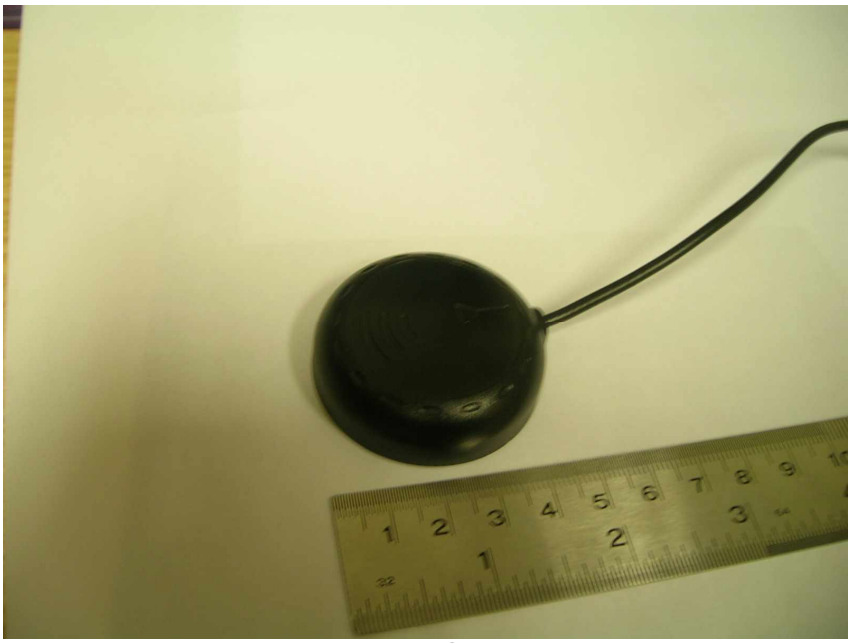
EUT PHOTOGRAPHS

Front View

Rear View

EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

EUT PHOTOGRAPHS



Front View

Rear View

EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

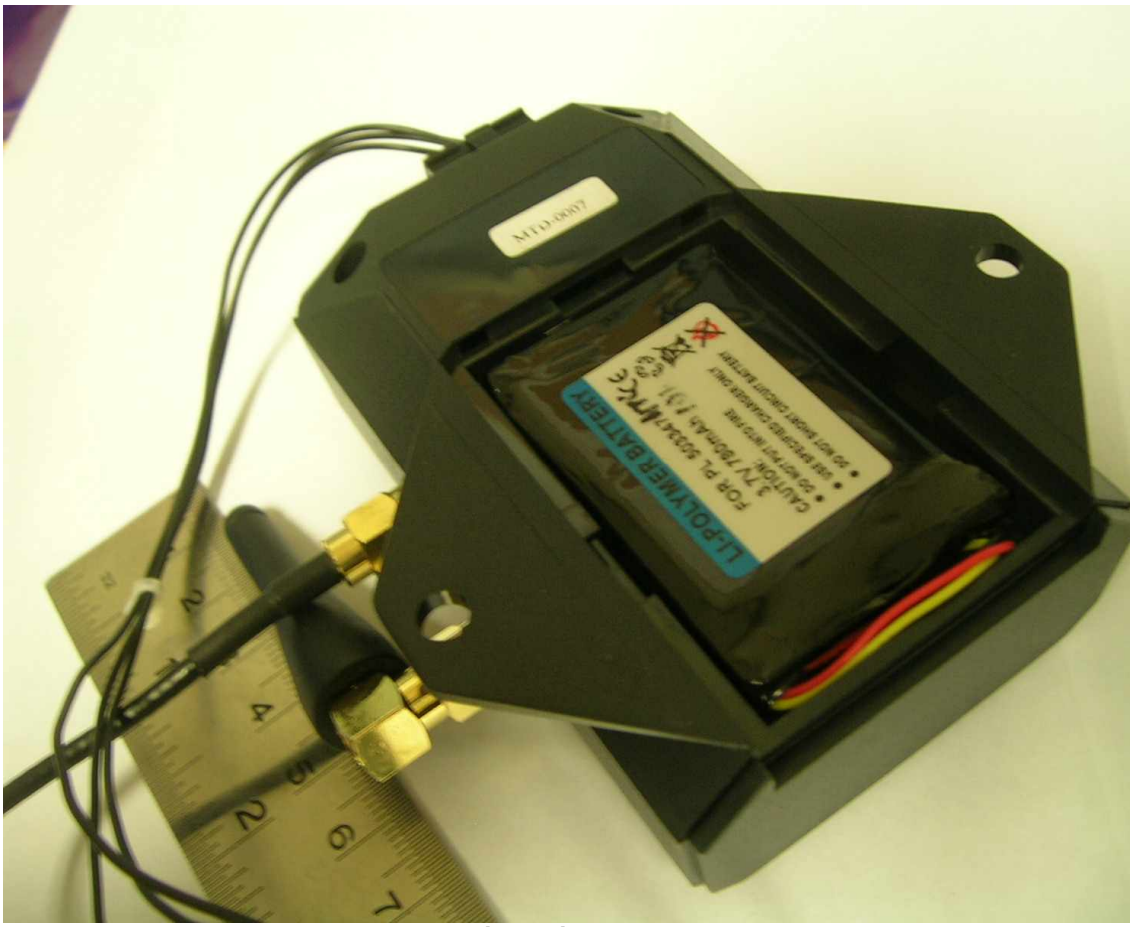
EUT PHOTOGRAPHS

Front View

Rear View

EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

EUT PHOTOGRAPHS



Internal LI-Polymer Battery

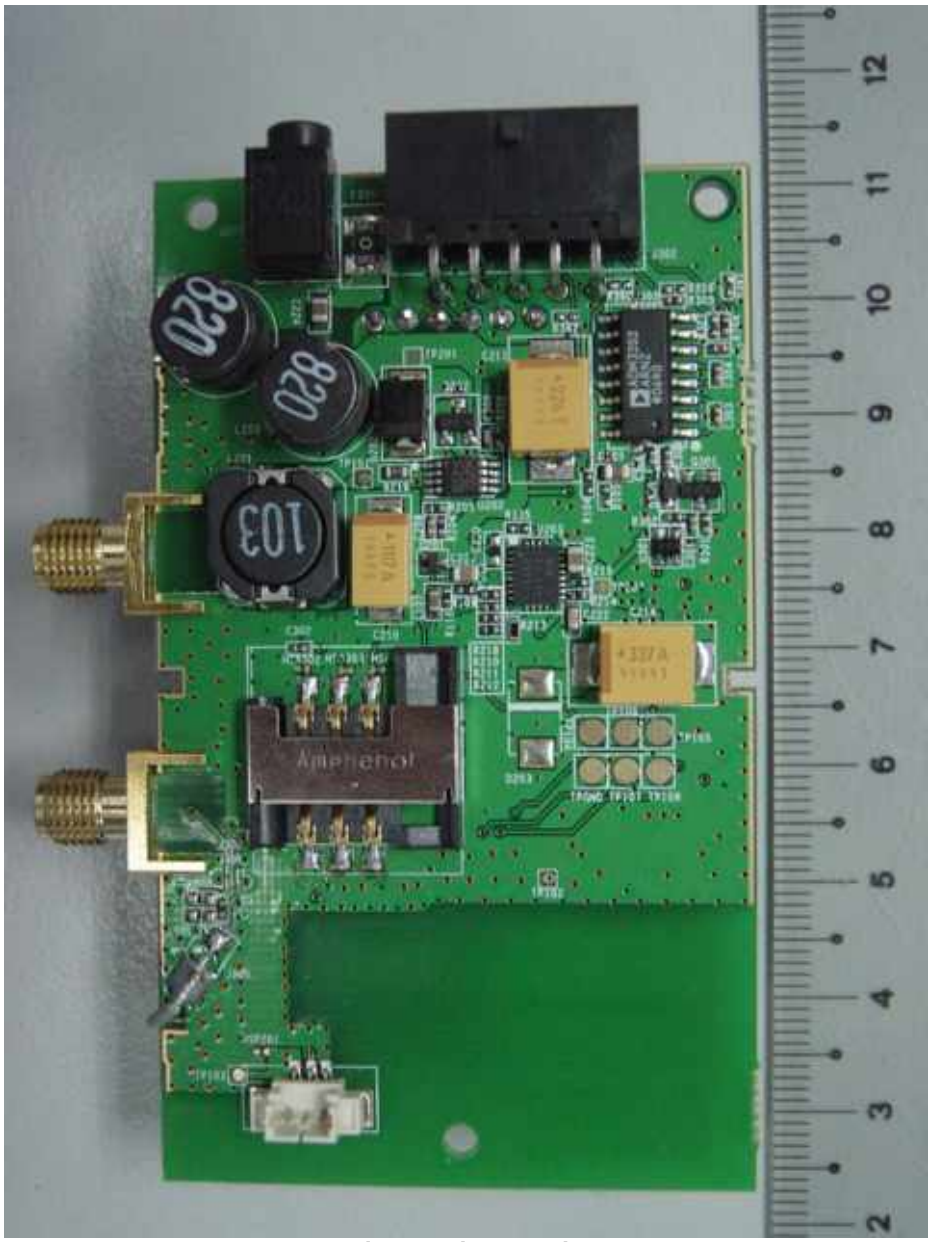
EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

EUT PHOTOGRAPHS

Internal View

EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

EUT PHOTOGRAPHS



Main-Board – Top View

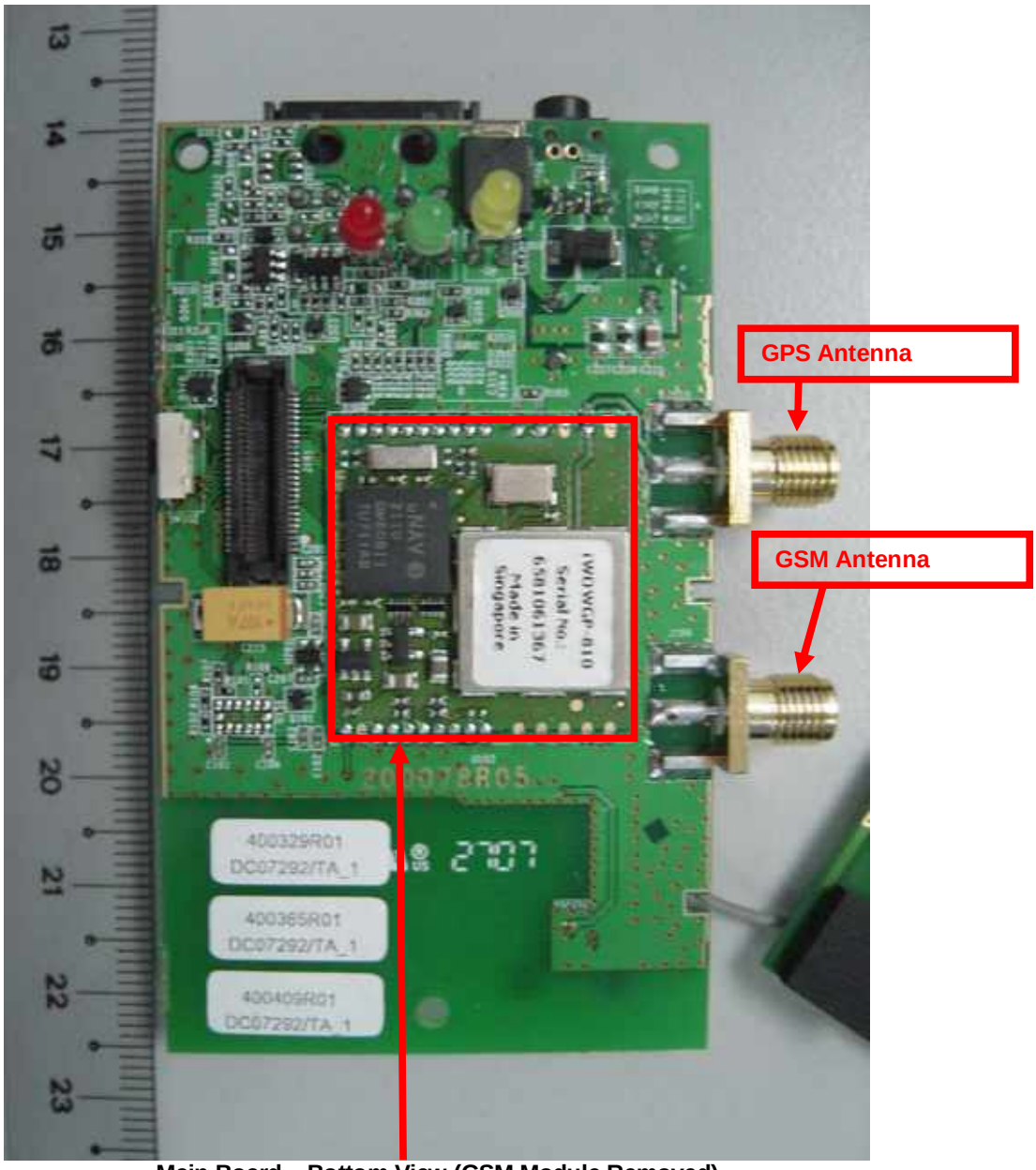
EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

EUT PHOTOGRAPHS

Main-Board – Bottom View

EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

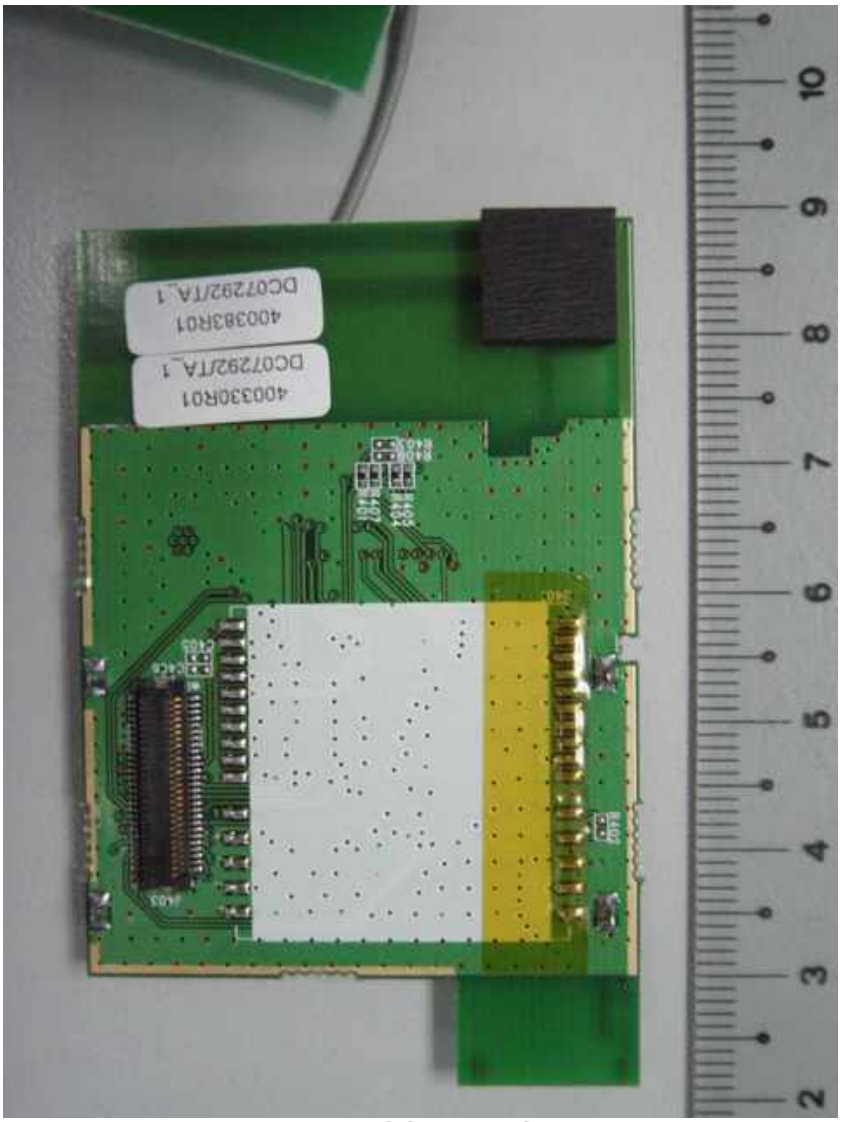
EUT PHOTOGRAPHS



Main Board – Bottom View (GSM Module Removed)

EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

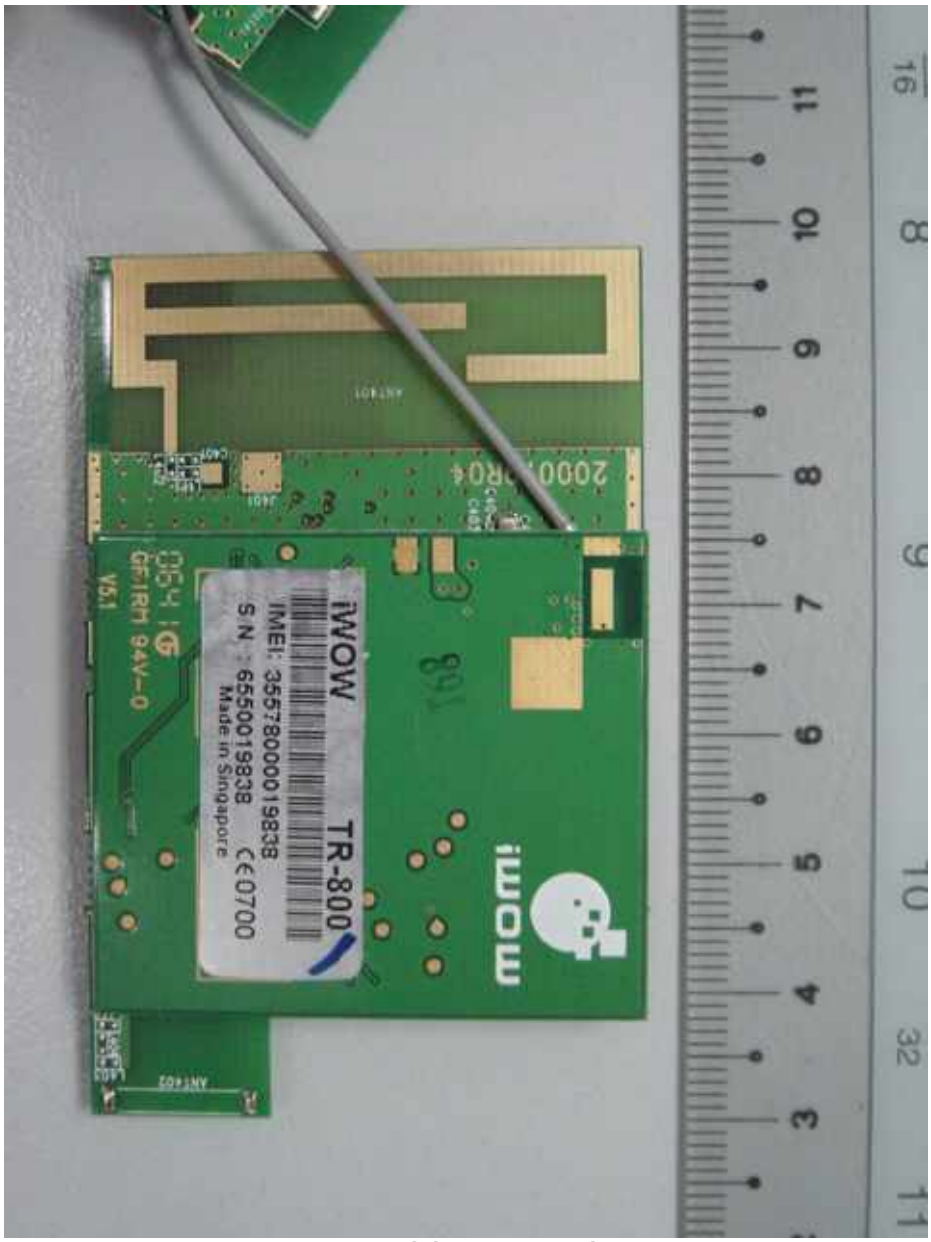
EUT PHOTOGRAPHS



GSM Module – Top View

EUT PHOTOGRAPHS / DIAGRAMS ANNEX A

EUT PHOTOGRAPHS



GSM Module – Bottom View

ANNEX B

FCC LABEL & POSITION

FCC LABEL & POSITION — ANNEX B

Labelling requirements per Section 2.925 & 15.19

The label shown will be permanently affixed at a conspicuous location on the device and be readily visible to the user at the time of purchase.

Sample Label & Physical Location of FCC Label on EUT

ANNEX C

USER MANUAL
TECHNICAL DESCRIPTION
BLOCK & CIRCUIT DIAGRAMS

(Please refer to manufacturer for details)