

- 7) The EUT passed the Frequency Stability vs. Temperature and Voltage requirements for the PCS band as per 47 CFR 2.1055(a), 2.1055(d), 24.235 and RSS-133. The maximum frequency error measured was less than 0.1 ppm.

The temperature range was from -30°C to +60°C in 10 degree temperature steps. The EUT was measured on low, middle and high channels at each temperature step. The EUT was measured at low (3.5 volts), nominal (3.8 volts) and high (4.1 volts) dc input voltage at each temperature step and channel at maximum output power.

See APPENDIX 3 for the test data.

- 8) The radiated spurious emissions/harmonics and ERP/EIRP were measured for both GSM850 and PCS bands. The results are within the limits. The EUT was placed on a nonconductive wooden table, 100 cm high that was positioned on a remotely rotatable turntable. The test distance used between the EUT and the receiving antenna was three metres. At this point the emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The turntable was rotated to determine the azimuth of the peak emissions. Both the horizontal and vertical polarisations of the emissions were measured.

The maximum emissions level was recorded. The EUT was then substituted with a substitution antenna placed in the same location as the EUT. A Dipole antenna was used for the ERP measurements and a Horn antenna was used for EIRP measurements. After the final maximum reading was obtained the Handheld was substituted with a dipole or horn antenna, which was placed in the same location as the Handheld. The substitution antenna was connected into a signal generator that was set to the test frequency. The emissions were maximized by elevating the antenna in the range of 1 to 4 metres. The signal generator output was then adjusted to match the Handheld output reading. The signal generator output was recorded. Both the horizontal and vertical polarisations of the emissions were measured.

The measurements were performed in a semi-anechoic chamber. The semi-anechoic chamber FCC registration number is **778487** and the Industry Canada file number is **IC4240**. The EUT was measured on the low, middle and high channels.

The highest ERP in the GSM850 band measured was 27.3 dBm at 837.6 MHz (channel 195). The highest EIRP in the PCS band measured was 31.9 dBm at 1880 MHz (channel 661).

The radiated carrier harmonics were measured up to the 10th harmonic for low, middle and high channels in the GSM850 band and PCS band.

The worst test margin for GSM850 band measured was 26.1 dB below the limit at 1648.4 MHz.

The worst test margin for PCS band measured was 25.3 dB below the limit at 3819.6 MHz.

The EUT's RF local oscillator (LO) emissions (transmit mode) were measured in the GSM850 band and PCS band in the standalone configuration in the upright position on the low and high channels. Both the horizontal and vertical polarizations were measured. The RF LO emissions were in the noise floor (NF).

The EUT's IF LO emissions were measured in the GSM band in the standalone configuration in the upright position on middle channel. Both the horizontal and vertical polarizations were measured. The highest emissions measured had a test margin of 8.6 dB at 896.0 MHz.

The EUT's IF local oscillator emissions were measured in the PCS band in the standalone configuration in the upright position on the middle channel. Both the horizontal and vertical polarizations of the emissions were measured. The IF LO was in the NF.

The radiated carrier harmonics were measured up to the 10th harmonic for low, middle and high channels in the GSM850 band and PCS band with Bluetooth transmitting.

The worst test margin for GSM850 band measured was 30.3 dB below the limit at 3296.8 MHz.

The worst test margin for PCS band measured was 16.2 dB below the limit at 5640 MHz.

The radiated harmonics for Bluetooth in frequency hopping mode were measured in simultaneous transmission with the GSM850 and then the PCS band up to the 10th harmonics. Both the horizontal and vertical polarizations were measured. The harmonics emissions above the 4th harmonics were in the NF for the GSM850 band and above the 3rd harmonics for the PCS band.

Sample Calculation:

Field Strength (dB μ V/M) is calculated as follows:

FS = Measured Level (dB μ V) + A.F. (dB/m) + Cable Loss (dB) - Preamp (dB) + Filter Loss (dB)

Measurement Uncertainty ± 4.0 dB

To view the test data see APPENDIX 4.



APPENDIX 4

RADIATED EMISSIONS TEST DATA

Radiated Emissions Test Data Results

Test distance is 3.0 metres

June 25, 2004

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method				
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) (dBuV)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to dipole)	Limit (dBm)	Diff to Limit (dB)
GSM850 Band (ERP)												
Handheld Standalone, on its side												
F0	128	824.20	850	Dipole	V	78.0	86.4	V V	7.7	24.05	27.78	-3.73
F0	128	824.20	850	Dipole	H	86.4		H H	6.1			
F0	195	837.60	850	Dipole	V	78.6	87.7	V V	10.9	27.25	27.78	-0.53
F0	195	837.60	850	Dipole	H	87.7		H H	8.8			
F0	251	848.80	850	Dipole	V	80.6	88.7	V V	9.9	26.25	27.78	-1.53
F0	251	848.80	850	Dipole	H	88.7		H H	7.8			

ERP = Tracking Generator Level + Antenna Gain – Cable Loss + Preamp

Example: 824.20 MHz = 7.7 (Tracking Generator Level) – 7.7 (Antenna Loss) – 2.15 (Dipole Factor) – 3.8 (Cable Loss) + 30.0 (Preamp Gain) = 24.05 dBm (Reading Relative to Dipole)

Radiated Emissions Test Data Results cont'd

Test distance is 3.0 metres

June 25, 2004

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method				
						Tracking Generator						
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) (dBuV)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to dipole)	Limit (dBm)	Diff to Limit (dB)
GSM850 Band (Harmonics)												
Handheld Standalone, upright position												
Low Channel – 824.2 MHz												
2 nd	128	1648.40	850	Horn	V	60.8	60.8	V-V	-41.8	-39.1	-13	-26.1
2 nd	128	1648.40	850	Horn	H	58.9		H-H	-42.1			
3 rd	128	2472.60	850	Horn	V	NF	NF	V-V				
3 rd	128	2472.60	850	Horn	H	NF		H-H				
4 th	128	3296.80	850	Horn	V	43.2	43.2	V-V	-51.0	-47.5	-13	-34.5
4 th	128	3296.80	850	Horn	H	43.1		H-H	-51.4			
The harmonics were investigated up to the 10 th harmonic. Emissions above the 4 th harmonic were in the noise floor (NF)												
Middle Channel – 837.6 MHz												
2 nd	195	1675.20	850	Horn	V	55.7	55.7	V-V	-47.3	-44.6	-13	-31.6
2 nd	195	1675.20	850	Horn	H	54.4		H-H	-47.7			
3 rd	195	2512.80	850	Horn	V	NF	NF	V-V				
3 rd	195	2512.80	850	Horn	H	NF		H-H				
4 th	195	3350.40	850	Horn	V	44.4	45.0	V-V	-49.3	-45.7	-13	-32.7
4 th	195	3350.40	850	Horn	V	45.0		H-H	-49.2			
The harmonics were investigated up to the 10 th harmonic. Emissions above the 4 th harmonic were in the NF												

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Radiated Emissions Test Data Results cont'd

Test distance is 3.0 metres

June 25, 2004

Test distance is 300 metres

June 25, 2007

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method				
								Tracking Generator				
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) (dBuV)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to dipole)	Limit (dBm)	Diff to Limit (dB)
High Channel – 848.8 MHz												
2 nd	251	1697.60	850	Horn	V	51.4	51.4	V-V	-52.9	-50.2	-13	-37.2
2 nd	251	1697.60	850	Horn	H	48.0		H-H	-53.1			
3 rd	251	2546.40	850	Horn	V	NF	NF	V-V				
3 rd	251	2546.40	850	Horn	H	NF		H-H				
4 th	251	3395.20	850	Horn	V	46.3	46.3	V-V	-45.8	-42.3	-13	-29.3
4 th	251	3395.20	850	Horn	H	45.8		H-H	-46.3			
The harmonics were investigated up to the 10 th harmonic. Emissions above the 4 th harmonic were in the noise floor (NF)												

Report No. RIM-0086-0404-01

Test Date: April 20 to June 25, 2004

Radiated Emissions Test Data Results cont'd

Test distance is 3.0 metres

June 25, 2004

EUT				Rx Antenna		Spectrum Analyzer			Substitution Method				
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Corrected Reading (dBuV)	Max (V,H) (dBuV)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to dipole) (dBm)		
GSM BAND													
RF Local Oscillator 1 (LO ₁)													
Low Channel													
F0	128	1272.20	850	Horn	V	NF	NF		V-V			-13	
F0	128	1272.20	850	Horn	H	NF			H-H				
No Emissions could be seen.													
High Channel													
F0	251	1296.80	850	Horn	V	NF	NF		V-V			-13	
F0	251	1296.80	850	Horn	H	NF			H-H				
No Emissions could be seen.													
RF LO ₂													
Low Channel													
F0	128	1738.20	850	Horn	V	NF	NF		V-V			-13	
F0	128	1738.20	850	Horn	H	NF			H-H				
No Emissions could be seen.													
High Channel													
F0	251	1787.40	850	Horn	V	NF	NF		V-V			-13	
F0	251	1787.40	850	Horn	H	NF			H-H				
No Emissions could be seen.													

Radiated Emissions Test Data Results cont'd

Test distance is 3.0 metres

The measurements were performed with the handheld in standalone upright position.

EUT				Rx Antenna		Spectrum Analyzer			Substitution Method				
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Corrected Reading (dBuV)	Max (V,H)	Pol. Tx- Rx	Reading (dBm)	Corrected Reading (relative to dipole)	Limit (dBm)	Diff to Limit (dB)
IF (LO)													
IF LO Channel 195, (837.6 MHz)													
FO	195	896.00	850	HLP	V	52.1	51.56	51.56	V V	-37.1	-21.65	-13	-8.65
FO	195	896.00	850	HLP	H	47.8	47.26		H H	-37.3			

Radiated Emissions Test Data Results cont'd

Test distance is 3.0 metres

June 25, 2004

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method				
						Tracking Generator						
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) (dBuV)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to dipole)	Limit (dBm)	Diff to Limit (dB)
GSM850 and Bluetooth transmitting in frequency hopping mode												
Handheld Standalone, upright position												
Low Channel – 824.2 MHz												
2 nd	128	1648.40	850	Horn	V	51.3	51.3	V-V	-52.5	-49.8	-13	-36.8
2 nd	128	1648.40	850	Horn	H	47.8		H-H	-53.2			
3 rd	128	2472.60	850	Horn	V	NF	NF	V-V				
3 rd	128	2472.60	850	Horn	H	NF		H-H				
4 th	128	3296.80	850	Horn	V	45.1	46.2	V-V	-46.8	-43.3	-13	-30.3
4 th	128	3296.80	850	Horn	H	46.2		H-H	-47.0			
The harmonics were investigated up to the 10 th harmonic.												
Emissions above the 4 th harmonic were in the noise floor (NF)												
Middle Channel – 837.6 MHz												
2 nd	195	1675.20	850	Horn	V	56.3	56.3	V-V	-46.4	-43.7	-13	-30.7
2 nd	195	1675.20	850	Horn	H	52.3		H-H	-46.7			
3 rd	195	2512.80	850	Horn	V	NF	NF	V-V				
3 rd	195	2512.80	850	Horn	H	NF		H-H				
4 th	195	3350.40	850	Horn	V	42.3	42.6	V-V	-52.3	-48.8	-13	-35.8
4 th	195	3350.40	850	Horn	V	42.6		H-H	-53.1			
The harmonics were investigated up to the 10 th harmonic.												
Emissions above the 4 th harmonic were in the NF												

Radiated Emissions Test Data Results cont'd

Test distance is 3.0 metres

June 25, 2004

EUT				Rx Antenna		Spectrum Analyzer		Substitution Method				
								Tracking Generator				
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) (dBuV)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to dipole)	Limit (dBm)	Diff to Limit (dB)
High Channel – 848.8 MHz												
2 nd	251	1697.60	850	Horn	V	49.2	49.2	V-V	-55.4	-52.5	-13	-39.5
2 nd	251	1697.60	850	Horn	H	47.8		H-H	-55.2			
3 rd	251	2546.40	850	Horn	V	NF	NF	V-V				
3 rd	251	2546.40	850	Horn	H	NF		H-H				
4 th	251	3395.20	850	Horn	V	44.7	44.7	V-V	-48.2	-44.7	-13	-31.7
4 th	251	3395.20	850	Horn	H	44.0		H-H	-49.0			
The harmonics were investigated up to the 10 th harmonic. Emissions above the 4 th harmonic were in the noise floor (NF)												

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Radiated Emissions Test Data Results cont'd

Test Distance was 3.0 metres.

PCS Band

June 25, 2004

								Substitution Method				
EUT				Receive Antenna		Spectrum Analyzer		Tracking Generator				
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Max (V,H) dBuV	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Isotropic Radiator) (dBm)	Limit (dBm)	Diff to Limit (dB)
PCS BAND (EIRP)												
Handheld Standalone												
F0	512	1850.20	1900	Horn	V	94.4	94.4	V-V	-5.9	29.9	33	-3.1
F0	512	1850.20	1900	Horn	H	83.3		H-H	-4.8			
F0	661	1880.00	1900	Horn	V	95.3	95.3	V-V	-3.8	31.9	33	-1.1
F0	661	1880.00	1900	Horn	H	85.8		H-H	-2.8			
F0	810	1909.80	1900	Horn	V	95.0	95.0	V-V	-4.4	31.2	33	-1.8
F0	810	1909.80	1900	Horn	H	87.1		H-H	-3.5			

$$\text{EIRP} = \text{Tracking Generator Level} + \text{Antenna Factor} - \text{Cable Loss} + \text{Preamp Gain}$$

Example: 1850.20 MHz = -4.8 (Tracking Generator Level) + 7.7 (Antenna Factor) – 5.6 (Cable Loss) + 32.6 (Preamp Gain) = 29.9 dBm (Reading Relative to Isotropic Radiator)

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Test Date: April 20 to June 25, 2004

Radiated Emissions Test Data Results cont'd

Test Distance was 3.0 metres.

PCS Band

June 25, 2004

								Substitution Method				
EUT				Receive Antenna		Spectrum Analyzer		Tracking Generator				
Type	Ch	Frequency (MHz)	Band	Pol. Type	Pol.	Reading (dBuV)	Max (V,H) (dBuV)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Isotropic Radiator) (dBm)	Limit (dBm)	Diff to Limit (dB)
PCS BAND (Harmonics) Handheld Standalone, upright position												
Low Channel 1850.20 MHz												
2 nd	512	3700.40	1900	Horn	V	43.3	43.3	V-V	-44.8	-41.3	-13	-28.3
2 nd	512	3700.40	1900	Horn	H	41.0		H-H	-44.6			
The harmonics were investigated up to the 10th harmonic. Emissions above the 2 nd harmonic were in the NF												
Middle Channel 1880.00 MHz												
2 nd	661	3760.00	1900	Horn	V	42.6	42.6	V-V	-44.5	-40.6	-13	-27.6
2 nd	661	3760.00	1900	Horn	H	40.6		H-H	-43.9			
The harmonics were investigated up to the 10th harmonic. Emissions above the 2 nd harmonic were in the NF												
High Channel 1909.8 MHz												
2 nd	810	3819.60	1900	Horn	V	45.1	45.1	V-V	-41.6	-38.3	-13	-25.3
2 nd	810	3819.60	1900	Horn	H	43.8		H-H	-42.0			
The harmonics were investigated up to the 10th harmonic. Emissions above the 2 nd harmonic were in the NF												

Report No. RIM-0086-0404-01

Test Date: April 20 to June 25, 2004

Radiated Emissions Test Results cont'd

Test Distance was 3.0 metres.

PCS Band

June 25, 2004

The measurements were performed in transmit mode with the handheld in standalone upright position.

EUT				Rx Antenna		Spectrum Analyzer			Substitution Method				
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Corrected Reading (dBuV)	Max (V,H) (dBuV)	Pol. Tx- Rx	Reading (dBm)	Corrected Reading (relative to Isotropic Radiator) (dBm)	Limit (dBm)	Diff to Limit (dB)
RF LO₁													
<u>Low Channel</u>													
F0	512	1423.20	1900	Horn	V	NF	NF		V-V			-13	
F0	512	1423.20	1900	Horn	H	NF			H-H				
No Emissions could be seen.													
<u>High Channel</u>													
F0	810	1482.80	1900	Horn	V	NF	NF		V-V			-13	
F0	810	1482.80	1900	Horn	H	NF			H-H				
No Emissions could be seen.													
RF LO₂													
<u>Low Channel</u>													
F0	512	1930.10	1900	Horn	V	NF	NF		V-V			-13	
F0	512	1930.10	1900	Horn	H	NF			H-H				
No Emissions could be seen.													
<u>High Channel</u>													
F0	810	1989.70	1900	Horn	V	NF	NF		V-V			-13	
F0	810	1989.70	1900	Horn	H	NF			H-H				
No Emissions could be seen.													

Report No. RIM-0086-0404-01

Test Date: April 20 to June 25, 2004

Radiated Emissions Test Results cont'd

Test Distance was 3.0 metres.

PCS Band

June 25, 2004

The measurements were performed in transmit mode with the handheld in standalone upright position.

EUT				Rx Antenna		Spectrum Analyzer			Substitution Method				
Type	Ch	Frequency (MHz)	Band	Type	Pol.	Reading (dBuV)	Corrected Reading (dBuV)	Max (V,H) (dBuV)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Isotropic Radiator) (dBm)	Limit (dBm)	Diff to Limit (dB)
IF (LO)													
F0	661	854.00	1900	HLP	V	NF	NF		V-V			-13	
F0	661	854.00	1900	HLP	H	NF			H-H				
No Emissions could be seen.													

Report No. RIM-0086-0404-01

Test Date: April 20 to June 25, 2004

Radiated Emissions Test Results cont'd

Test Distance was 3.0 metres.

June 25, 2004

								Substitution Method				
EUT				Receive Antenna		Spectrum Analyzer		Tracking Generator				
Type	Ch	Frequency (MHz)	Band	Pol. Type	Pol.	Reading (dBuV)	Max (V,H) (dBuV)	Pol. Tx-Rx	Reading (dBm)	Corrected Reading (relative to Isotropic Radiator) (dBm)	Limit (dBm)	Diff to Limit (dB)
PCS and Bluetooth transmitting in frequency hopping mode												
Handheld Standalone, upright position												
Low Channel 1850.20 MHz												
2 nd	512	3700.40	1900	Horn	V	42.2	42.4	V-V	-45.8	-42.5	-13	-29.5
2 nd	512	3700.40	1900	Horn	H	42.4		H-H	-46.1			
3 rd	512	5550.6	1900	Horn	V	42.5	42.5	V-V	-37.1	-34.9	-13	-21.9
3 rd	512	5550.6	1900	Horn	H	NF		H-H	-36.3			
The harmonics were investigated up to the 10th harmonic. Emissions above the 3 rd harmonic were in the NF												
Middle Channel 1880.00 MHz												
2 nd	661	3760.00	1900	Horn	V	41.5	41.5	V-V	-46.4	-42.5	-13	-29.5
2 nd	661	3760.00	1900	Horn	H	40.9		H-H	-45.8			
3 rd	661	5640.00	1900	Horn	V	46.0	46.0	V-V	-32.1	-29.2	-13	-16.2
3 rd	661	5640.00	1900	Horn	H	42.3		H-H	-30.6			
The harmonics were investigated up to the 10th harmonic. Emissions above the 3 rd harmonic were in the NF												
High Channel 1909.8 MHz												
2 nd	810	3819.60	1900	Horn	V	43.4	43.4	V-V	-44.4	-41.1	-13	-28.1
2 nd	810	3819.60	1900	Horn	H	42.6		H-H	-44.8			
3 rd	810	5729.40	1900	Horn	V	42.1	42.1	V-V	-36.5	-34.2	-13	-21.2
3 rd	810	5729.40	1900	Horn	H	NF		H-H	-35.6			
The harmonics were investigated up to the 10th harmonic. Emissions above the 3 rd harmonic were in the NF												