

**Sound Innovation Development Limited**

Application  
For  
Certification  
**(FCC ID: U7J-BKWMSIPOD-TX)**

Transmitter

07036402  
TC/el  
June 29, 2007

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**Intertek Testing Services Hong Kong Ltd.**

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# INTERTEK TESTING SERVICES

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## MEASUREMENT / TECHNICAL REPORT

**Sound Innovation Development Limited – MODEL: BROOKSTONE BL647**

**FCC ID: U7J-BKWMSIPOD-TX**

**June 29, 2007**

This report concerns (check one:)      Original Grant       Class II Change

Equipment Type: Low Power Transmitter (example: computer, printer, modem, etc.)

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Deferred grant requested per 47 CFR 0.457(d)(1)(ii)?      Yes       No

If yes, defer until: \_\_\_\_\_  
date

Company Name agrees to notify the Commission by: \_\_\_\_\_

date

of the intended date of announcement of the product so that the grant can be issued on that date.

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Transition Rules Request per 15.37?      Yes       No

If no, assumed Part 15, Subpart C for intentional radiator – the new 47 CFR [04-05-05 Edition] provision.

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Report prepared by:

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### List of attached file

Exhibit Type	File Description	Filename
Test Report	Test Report	report.pdf
Operation Description	Technical Description	descri.pdf
Test Setup Photo	Radiated Emission	radiated photos.pdf
Test Setup Photo	Conducted Emission	conducted photos.pdf
Test Report	Conducted Emission Test Result	conducted.pdf
Test Report	Bandwidth Plot	bw.pdf
External Photo	External Photo	external photos.pdf
Internal Photo	Internal Photo	internal photos.pdf
Block Diagram	Block Diagram	block.pdf
Schematics	Circuit Diagram	circuit.pdf
ID Label / Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf

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**EXHIBIT 1**

**GENERAL DESCRIPTION**

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## 1.0 General Description

### 1.1 Product Description

The Equipment Under Test (EUT) is a 900MHz stereo wireless transmitter for it corresponding speakers and using two discrete (left and right channel) radio carriers rather than the conventional FM multiplex system. Transmit carriers are generated by two VCO circuits which is controlled by a small microprocessor. There are three difference channels available which can be selected by the channel switch, Channel 1, Channel 2 and Channel 3 and the frequencies are L903.4/R926.6, L902.6/R925.8 and L904.2/R927.4MHz respectively. The transmitter is powered an AC/DC adaptor (Model: KSS04-7.5-600, Input: 100-240VAC, Output: DC 7.5V 600mA). The channel switch is located at the bottom of the product and the audio signals can be connected via audio input jack on the rear of the product. Beside, an iPod Player docking at the top of the unit is used to transmit the music in yours iPod Player. A MONO/STEREO switch at the bottom of the product is used to maximizes the sound when using multiple speakers with the same transmitter. To use this function, slide it to the STEREO position.

Antenna Type: Internal, Integral

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

### 1.2 Related Submittal(s) Grants

The Certification procedure of receiver for this transmitter (with FCC ID: U7J-BKWMSIPOD-RX) is being processed as the same time of this application.

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### 1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2003). Radiated Emission measurement was performed in Open Area Test Sites and Conducted Emission was performed in Shield Room. Preliminary scans were performed in the Open Area Test Sites only to determine worst case modes. For each scan, the procedure for maximizing emissions in Appendices D and E were followed. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

### 1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong. This test facility and site measurement data have been fully placed on file with the FCC.

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**EXHIBIT 2**

**SYSTEM TEST CONFIGURATION**

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### 2.0 System Test Configuration

#### 2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2003).

The EUT was powered by an AC/DC adaptor (Model: KSS04-7.5-600, Input: 100-240V, Output: 7.5V 600mA).

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. The step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The rear of unit shall be flushed with the rear of the table.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was placed on turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

#### 2.2 EUT Exercising Software

There was no special software to exercise the device. Once the unit is powered up, it transmits the RF signal continuously.

#### 2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

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### 2.4 Equipment Modification

Any modifications installed previous to testing by Sound Innovation Development Limited will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Hong Kong Ltd.

### 2.5 Measurement Uncertainty

When determining the test conclusion, the Measurement Uncertainty of test has been considered.

### 2.6 Support Equipment List and Description

1. Associated Receiver (FCC ID: U7J-BKWMSIPOD-RX)
2. Cassette Player (Provided by Intertek)
3. 0.47m Audio Cable
4. iPod Player EW-2272 (Provided by Intertek)

All the items listed under section 2.0 of this report are

*Confirmed by:*

*Ho Wai Kin, Ben  
Supervisor  
Intertek Testing Services Hong Kong Ltd.  
Agent for Sound Innovation Development Limited*



*Signature*

June 29, 2007

*Date*

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**EXHIBIT 3**

**EMISSION RESULTS**

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### 3.0 Emission Results

Data is included worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

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### 3.1 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

$$FS = RA + AF + CF - AG + PD + AV$$

where FS = Field Strength in  $\text{dB}\mu\text{V}/\text{m}$

RA = Receiver Amplitude (including preamplifier) in  $\text{dB}\mu\text{V}$

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

PD = Pulse Desensitization in dB

AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

$$FS = RA + AF + CF - AG + PD + AV$$

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### 3.1 Field Strength Calculation (cont'd)

#### Example

Assume a receiver reading of 62.0dB $\mu$ V is obtained. The antenna factor of 7.4dB and cable factor of 1.6dB is added. The amplifier gain of 29dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0dB, and the resultant average factor was -10dB. The net field strength for comparison to the appropriate emission limit is 32dB $\mu$ V/m. This value in dB $\mu$ V/m was converted to its corresponding level in  $\mu$ V/m.

$$RA = 62.0 \text{dB}\mu\text{V}$$

$$AF = 7.4 \text{dB}$$

$$CF = 1.6 \text{dB}$$

$$AG = 29.0 \text{dB}$$

$$PD = 0 \text{dB}$$

$$AV = -10 \text{dB}$$

$$FS = 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32 \text{dB}\mu\text{V/m}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32 \text{dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

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### **3.2 Radiated Emission Configuration Photograph**

**Worst Case Radiated Emission  
at  
2782.221MHz**

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: radiated photos.pdf.

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### 3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by 3.5dB margin

### **TEST PERSONNEL:**



*Signature*

Terry C. H. Chan, Compliance Engineer  
*Typed / Printed Name*

June 29, 2007

*Date*

## INTERTEK TESTING SERVICES

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Company: Sound Innovation Development Limited

Date of Test: April 14, 2007

Model: BROOKSTONE BL647

Worst Case Operating Mode: Transmitting (Channel 02)

**Table 1**

### Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp (dB)	Antenna factor (dB)	Net at 3m (dB $\mu$ V/m)	Limit at 3m (dB $\mu$ V/m)	Margin (dB)
H	902.500	52.9	16	32.0	68.9	94.0	-25.1
H	1805.000	53.8	33	27.2	48.0	54.0	-6.0
V	2707.500	52.9	33	30.4	50.3	54.0	-3.7
V	3610.000	46.5	33	33.3	46.8	54.0	-7.2
V	4512.500	45.7	33	34.9	47.6	54.0	-6.4
V	5415.000	45.8	33	35.7	48.5	54.0	-5.5
V	6317.500	40.2	33	36.9	44.1	54.0	-9.9
V	7220.000	38.1	33	37.9	43.0	54.0	-11.0
V	8130.580	36.0	33	39.0	42.0	54.0	-12.0

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. All emissions below the peak limit.

Test Engineer: Terry C. H. Chan

## INTERTEK TESTING SERVICES

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Company: Sound Innovation Development Limited

Date of Test: April 14, 2007

Model: BROOKSTONE BL647

Worst Case Operating Mode: Transmitting (Channel 02)

**Table 1 (Cont'd)**

### Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp (dB)	Antenna factor (dB)	Net at 3m (dB $\mu$ V/m)	Limit at 3m (dB $\mu$ V/m)	Margin (dB)
H	925.800	52.0	16	33.0	69.0	94.0	-25.0
H	1851.600	53.6	33	27.2	47.8	54.0	-6.2
V	2777.400	52.6	33	30.4	50.0	54.0	-4.0
V	3703.200	46.3	33	33.3	46.6	54.0	-7.4
V	4629.000	45.0	33	34.9	46.9	54.0	-7.1
V	5554.800	45.9	33	36.6	49.5	54.0	-4.5
V	6480.600	41.1	33	36.9	45.0	54.0	-9.0
V	7406.400	38.6	33	37.9	43.5	54.0	-10.5
V	8332.200	36.5	33	39.0	42.5	54.0	-11.5

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. All emissions below the peak limit.

Test Engineer: Terry C. H. Chan

## INTERTEK TESTING SERVICES

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Company: Sound Innovation Development Limited

Date of Test: April 14, 2007

Model: BROOKSTONE BL647

Worst Case Operating Mode: Transmitting (Channel 03)

**Table 2**

### Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp (dB)	Antenna factor (dB)	Net at 3m (dB $\mu$ V/m)	Limit at 3m (dB $\mu$ V/m)	Margin (dB)
H	904.210	53.6	16	32.0	69.6	94.0	-24.4
H	1808.420	53.8	33	27.2	48.0	54.0	-6.0
V	2712.630	52.6	33	30.4	50.0	54.0	-4.0
V	3616.840	46.8	33	33.3	47.1	54.0	-6.9
V	4521.050	45.1	33	34.9	47.0	54.0	-7.0
V	5425.260	45.8	33	35.7	48.5	54.0	-5.5
V	6329.470	41.6	33	36.9	45.5	54.0	-8.5
V	7233.680	39.5	33	37.9	44.4	54.0	-9.6
V	8137.890	37.1	33	39.0	43.1	54.0	-10.9

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. All emissions below the peak limit.

Test Engineer: Terry C. H. Chan

## INTERTEK TESTING SERVICES

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Company: Sound Innovation Development Limited

Date of Test: April 14, 2007

Model: BROOKSTONE BL647

Worst Case Operating Mode: Transmitting (Channel 03)

**Table 2 (Cont'd)**

### Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB $\mu$ V)	Pre-Amp (dB)	Antenna factor (dB)	Net at 3m (dB $\mu$ V/m)	Limit at 3m (dB $\mu$ V/m)	Margin (dB)
H	927.407	53.6	16	33.0	70.6	94.0	-23.4
H	1854.814	53.8	33	27.2	48.0	54.0	-6.0
V	2782.221	53.1	33	30.4	50.5	54.0	-3.5
V	3709.628	47.2	33	33.3	47.5	54.0	-6.5
V	4637.035	45.4	33	34.9	47.3	54.0	-6.7
V	5564.442	46.0	33	36.6	49.6	54.0	-4.4
V	6491.849	40.6	33	36.9	44.5	54.0	-9.5
V	7419.256	39.1	33	37.9	44.0	54.0	-10.0
V	8346.663	36.9	33	39.0	42.9	54.0	-11.1

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. All emissions below the peak limit.

Test Engineer: Terry C. H. Chan

## INTERTEK TESTING SERVICES

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Company: Sound Innovation Development Limited  
Model: BROOKSTONE BL647  
Worst Case Operating Mode: Standby

Date of Test: April 14, 2007

**Table 3**

### Radiated Emissions

Polarization	Frequency (MHz)	Net at 3m (dB $\mu$ V/m)	Limit at 3m (dB $\mu$ V/m)	Margin (dB)
V	35.150	28.9	40.0	-11.1
V	39.116	29.9	40.0	-10.1
V	42.155	30.1	40.0	-9.9
V	48.330	28.9	40.0	-11.1
V	53.120	28.5	40.0	-11.5
V	59.001	29.0	40.0	-11.0

NOTES: 1. Peak Detector Data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. All emissions below the peak limit.

Test Engineer: Terry C. H. Chan

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### **3.4 Conducted Emission Configuration Photograph**

**Worst Case Line-Conducted Emission  
at  
1.546MHz**

For electronic filing, the worst case line-conducted configuration photographs are saved with filename: conducted photos.pdf.

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### 3.5 Conducted Emission Data

For electronic filing, the graph and data table of conducted emission are saved with filename: conducted.pdf. The data table lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by 5.1dB margin

### ***TEST PERSONNEL:***



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*Signature*

Terry C. H. Chan, Compliance Engineer  
*Typed / Printed Name*

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June 29, 2007

*Date*

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**EXHIBIT 4**

**EQUIPMENT PHOTOGRAPHS**

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### 4.0 Equipment Photographs

For electronic filing, photographs of the tested EUT are saved with filename: external photos.pdf and internal photos.pdf.

**EXHIBIT 5**

**PRODUCT LABELLING**

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### 5.0 Product Labelling

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

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**EXHIBIT 6**

**TECHNICAL SPECIFICATIONS**

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### 6.0 **Technical Specifications**

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

**EXHIBIT 7**

**INSTRUCTION MANUAL**

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### 7.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold / leased in the United States.

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**EXHIBIT 8**

**MISCELLANEOUS INFORMATION**

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### 8.0 Miscellaneous Information

The miscellaneous information includes details of the measured bandwidth and the test procedure.

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### 8.1 Radiated Emission on the Bandedge

From the following plots, they show that the fundamental emissions are confined in the specified band (902MHz and 928MHz). In case of the fundamental emissions are within two standard bandwidths from the bandedge, the delta measurement technique is used for determining bandedge compliance. Standard bandwidth is the bandwidth specified by ANSI C63.4 (2003) for frequency being measured.

Emissions radiated outside of the specified frequency bands, except harmonics, are attenuated by 50dB below the level of the fundamental or to the general radiated emissions limits in Section 15.209, whichever is the lesser attenuation, which meet the requirement of part 15.249(d).

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### **8.2 Discussion of Pulse Desensitization**

Pulse desensitivity is not applicable for this device. Since the transmitter transmits the RF signal continuously.

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### **8.3 Calculation of Average Factor**

The average factor is not applicable for this device as the transmitted signal is a continuously signal.

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### 8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitters operating under Part 15, Subpart C rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 – 2003.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axes to obtain maximum emission levels. The antenna height and polarization are varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9kHz to the tenth harmonic of the highest fundamental frequency or 40GHz, whichever is lower. For line-conducted emissions, the range scanned is 150kHz to 30MHz.

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### 8.4 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements are made as described in ANSI C63.4 – 2003.

The IF bandwidth used for measurement of radiated signal strength was 100kHz or greater when frequency is below 1000MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.