



FCC Test Report

FOR:

Model Name: Fusion
Ambulatory Arrhythmia Monitoring System
FCC ID: HHMFUSIONMCT
FCC- Part 15B

TEST REPORT #: EMC_BRAEM_008_10001_FCC15B_Rev3
DATE: 2010-11-16



FCC listed:
A2LA Accredited

IC recognized #
3462B-1

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Board of Directors: Dr. Harald Ansorge, Hans Peter May, Gerhard Schirra

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1 Assessment

The following is in compliance with the applicable criteria specified in FCC rules Part 15B of the Code of Federal Regulations.

Company	Description	Model #
Braemar Inc	Ambulatory Arrhythmia Monitoring System	Fusion

Responsible for Testing Laboratory:

Marc Douat			
2010-11-16	Compliance	(Test Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

Christopher Torio			
2010-11-16	Compliance	(EMC Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section 3. CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM Inc USA.



2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Address:	411 Dixon Landing Road Milpitas, CA 95035 U.S.A.
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Test Lab Director:	Heiko Strehlow
Responsible Project Leader:	Clarence Ip

2.2 Identification of the Client

Applicant's Name:	Braemar Inc.
Street Address:	1285 Corporate Center Drive
City/Zip Code	Eagan, MN 55121
Country	USA
Contact Person:	Paul Brinda
Phone No.	651-286-8620
Fax:	651-286-8630
e-mail:	Paul.Brinda@braemarinc.com

2.3 Identification of the Manufacturer

Same as above applicant

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name / Model No:	Fusion / Fusion
HW / SW Revision :	520 / 7.43
FCC-ID / IC-ID:	HHMFUSIONMCT / 9158A FUSION
Product Description:	Fusion Wireless Recorder - a battery operated, solid state recorder designed to record symptomatic heart arrhythmias. Incorporates pre-certified Quad Band GSM/GPRS/EGPRS module with FCC-ID: N7NQ2687 PP, pre-certified Bluetooth v2.1+EDR module with FCC ID: T9JRN41-1
Frequency Range / number of channels:	GSM 850: 824.2-848.8MHz / 125; PCS 1900: 1850.2-1909.8MHz / 300; Bluetooth: 2400-2483.5MHz / 79;
Type(s) of Modulation:	2G: GMSK, 8PSK; Bluetooth: GFSK, DQPSK, 8DPSK;
Modes of Operation:	GPRS/EGPRS MS Class 10, GPRS Capability Class B, Data only
Antenna Type / gain / position / min. distance to other antenna (if appl):	GSM: Wire ¼ Wave Antenna / 850band 1dBi, 1900 band 1.5 dBi; Bluetooth: Integral Chip antenna / -2.83dBi; distance GSM-BT antennas: 4mm (measured, see appendix C);
Output Powers:	GSM850 GMSK Conducted: 32.0 dBm, 1584.9mW; GSM850 8PSK Conducted: 29.4dBm, 871.0mW; GSM850 GMSK Radiated: 33.02dBm, 2004.5mW; GSM850 8PSK Radiated: 30.9dBm, 1230.3mW; GSM1900 GMSK Conducted: 29.5dBm, 891.3mW; GSM1900 8PSK Conducted: 28.6dBm, 724.4mW; GSM1900 GMSK Radiated: 31.01dBm, 1261.8mW; GSM1900 8PSK Radiated: 29.91dBm, 979.5mW; Bluetooth EDR conducted: 10.14 dBm; <i>conducted values are from module test reports</i>
power supply	AA lithium battery pack (dedicated), 3.6V DC;
operating temperature range	0°C to 45°C
Prototype / Production unit	Production

3.2 Identification of the Equipment Under Test (EUT)



EUT #	Serial Number	Cetecom ID	HW Version	SW Version
1	01000129	C007401	520	7.43

3.3 Identification of Accessory equipment

AE #	Type	Manufacturer	Model	Cetecom ID
1	Battery	Braemar Inc.	ER14505M	C007402

4 Subject of Investigation



Testing was performed on the *Fusion with a Telit-GE865 QUAD* module according to FCC 15 subpart B.

Radiated Emission tests are carried out to show that the EUT complies with FCC15.109 (a) radiated emissions limit for Class B device.

Conducted Emission tests were not carried out. The device is powered by internal batteries and is not powered through the AC power line.

5 Radiated Emissions

5.1 §15.109 Radiated emission limits- Unintentional Radiators:

(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of emission (MHz)	Field strength ($\mu\text{V/m}$)
30–88	100
88–216	150
216–960	200
Above 960	500

(b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following:

Frequency of emission (MHz)	Field strength ($\mu\text{V/m}$)
30–88	90
88–216	150
216–960	210
Above 960	300

5.2 Measurement Procedure:

ANSI C63.4 Section 8.3.1.1: Exploratory radiated emission measurements

Exploratory radiated measurements shall be performed at the measurement distance or at a closer distance than that specified for compliance to determine the emission characteristics of the EUT. At near distances, for EUTs of comparably small size, it is relatively easy to determine the spectrum signature of the EUT and, if applicable, the EUT configuration that produces the maximum level of emissions. A shielded room may be used for exploratory testing, but may have anomalies that can lead to significant errors in amplitude measurements.

Broadband antennas and a spectrum analyzer or a radio-noise meter with a panoramic display are often useful in this type of testing. It is recommended that either a headset or loudspeaker be connected as an aid in detecting ambient signals and finding frequencies of significant emission from the EUT when the exploratory and final testing is performed in an OATS with strong ambient signals. Caution should be taken if either antenna height between 1 and 4 meters or EUT azimuth is not fully explored. Not fully exploring these parameters during exploratory testing may require complete testing at the OATS or semi-anechoic chamber when the final full spectrum testing is conducted.

The EUT should be set up in its typical configuration and arrangement, and operated in its various modes. For tabletop systems, cables or wires should be manipulated within the range of likely arrangements. For floor-standing equipment, the cables or wires should be located in the same manner as the user would install them and no further manipulation is made. For combination EUTs, the tabletop and floor-standing portions of the EUT shall follow the procedures for their respective setups and cable manipulation. If the manner of cable installation is not known, or if it changes with each installation, cables or wires for floor-standing equipment shall be manipulated to the extent possible to produce the maximum level of emissions.

For each mode of operation required to be tested, the frequency spectrum shall be monitored. Variations in antenna height between 1 and 4 m, antenna polarization, EUT azimuth, and cable or wire placement (each variable within bounds specified elsewhere) shall be explored to produce the emission that has the highest amplitude relative to the limit. A step-by-step technique for determining this emission can be found in Annex C.

When measuring emissions above 1 GHz, the frequencies of maximum emission shall be determined by manually positioning the antenna close to the EUT and by moving the antenna over all sides of the EUT while observing a spectral display. It will be advantageous to have prior knowledge of the frequencies of emissions above 1 GHz. If the EUT is a device with dimensions approximately equal to that of the measurement antenna beamwidth, the measurement antenna shall be aligned with the EUT.

ANSI C63.4 Section 8.3.1.2: Final radiated emission measurements

Based on the measurement results in 8.3.1.1, the one EUT, cable and wire arrangement, and mode of operation that produces the emission that has the highest amplitude relative to the limit is selected for the final measurement. The final measurement is then performed on a site meeting the requirements of 5.3, 5.4, or 5.5 as appropriate without variation of the EUT arrangement or EUT mode of operation. If the EUT is relocated from an exploratory test site to a final test site, the highest emission shall be remaximized at the final test location before final radiated emissions measurements are performed. However, antenna height and polarity and EUT azimuth are to be varied. In addition, the full frequency spectrum (for the range to be checked for meeting compliance) shall be investigated.

This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. During the full frequency spectrum investigation, particular focus should be made on those frequencies found in exploratory testing that were used to find the final test configuration, mode of operation, and arrangement (associated with achieving the least margin with respect to the limit). This full spectrum test constitutes the compliance measurement.

For measurements above 1 GHz, use the cable, EUT arrangement, and mode of operation determined in the exploratory testing to produce the emission that has the highest amplitude relative to the limit. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the antenna in the “cone of radiation” from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response. The antenna may have to be higher or lower than the EUT, depending on the EUT’s size and mounting height, but the antenna should be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane. If the transmission line for the measurement antenna restricts its range of height and polarization, the steps needed to ensure the correct measurement of the maximum emissions, shall be described in detail in the report of measurements. Data collected shall satisfy the report requirements of Clause 10.

NOTES

- 1— Where limits are specified by agencies for both average and peak (or quasi-peak) detection, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.
- 2—Use of waveguide and flexible waveguide may be necessary at frequencies above 10 GHz to achieve usable signal-to noise ratios at required measurement distances. If so, it may be necessary to restrict the height search of the antenna, and special care should be taken to ensure that maximum emissions are correctly measured.
- 3—All presently known devices causing emissions above 10 GHz are physically small compared with the beam-widths of typical horn antennas used for EMC measurements. For such EUTs and frequencies, it may be preferable to vary the height and polarization of the EUT instead of the receiving antenna to maximize the measured emissions.

5.3 Results

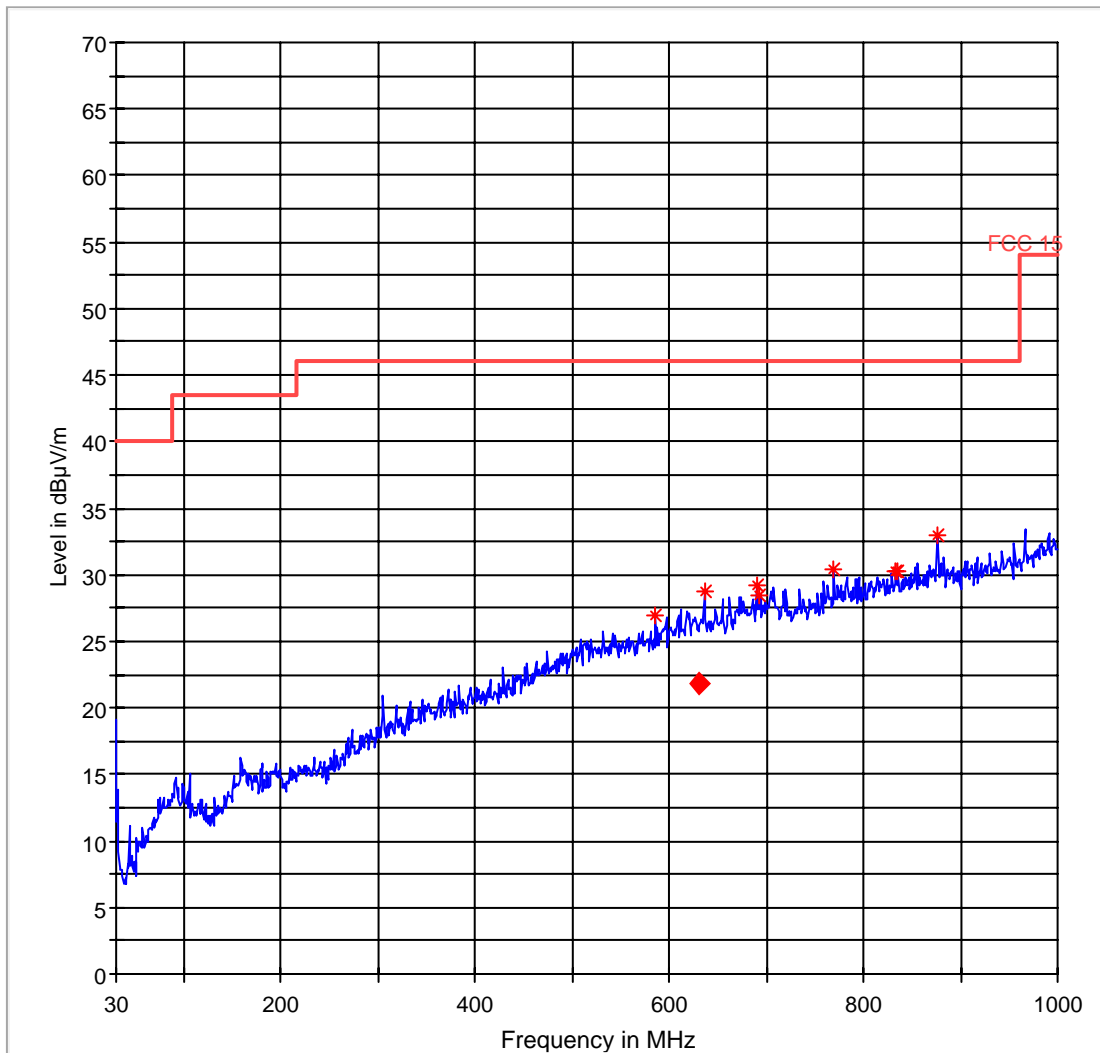
EUT Information

Description:

EUT Name: Fusion
Manufacturer: Braemar Inc.
Serial Number: 01000129
Hardware Rev: 520
Software Rev: 7.43
Test Engineer: Sam M.

Test Mode: Idle; 30M-1GHz

FCC 15 30-1000MHz



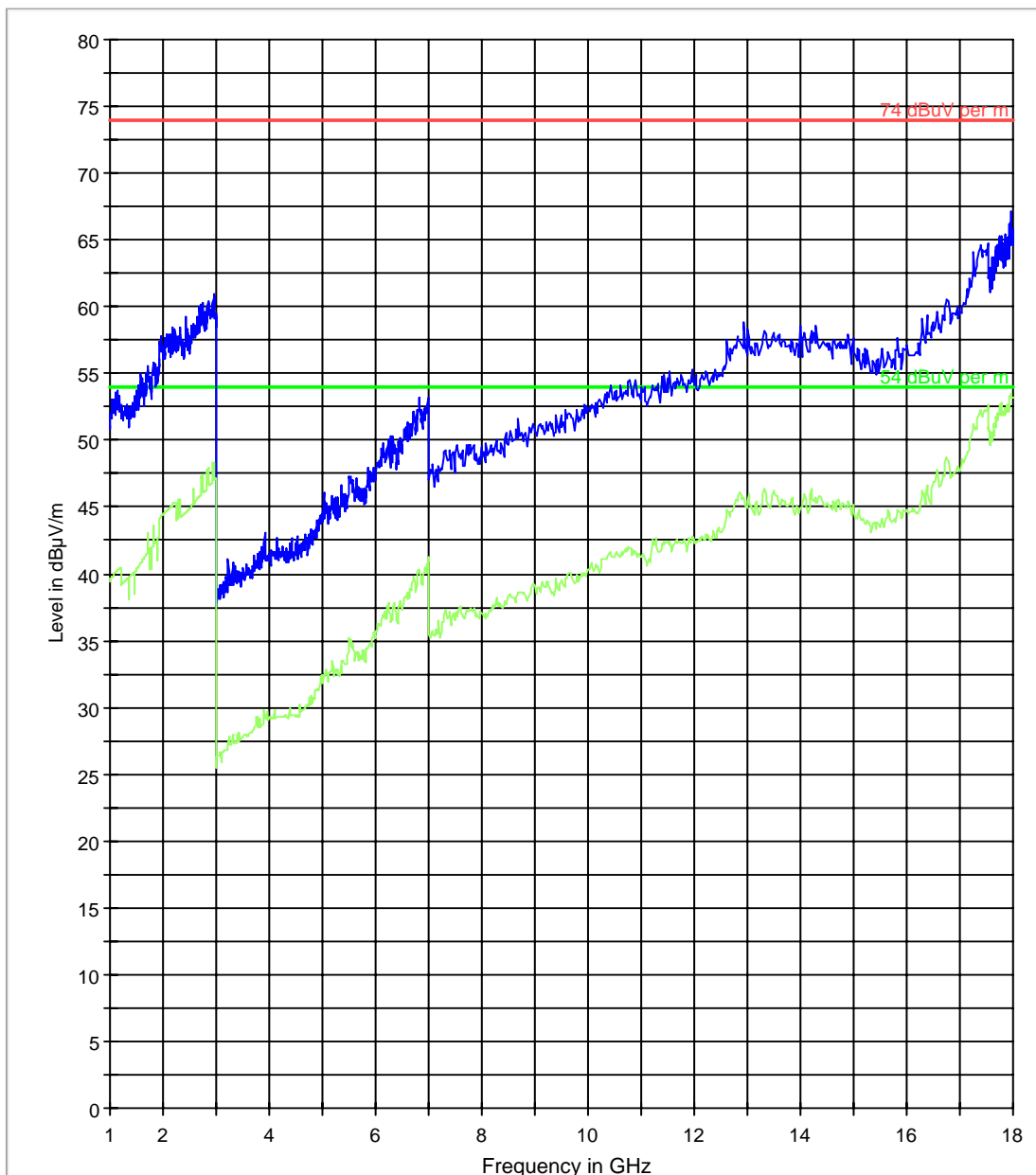
EUT Information

Description:

EUT Name: Fusion
Manufacturer: Braemar Inc.
Serial Number: 01000129
Hardware Rev: 502
Software Rev: 7.43
Test Engineer: Sam M.

Test Mode: Idle; 1G-18GHz

FCC 15 1-18GHz



6 AC Power Line Conducted Emissions

6.1 § 15.107 Conducted limits- Unintentional Radiators

(a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

(b) For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms LISN. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15–0.5	79	66
0.5–5	73	60

6.2 Measurement Procedure:

ANSI C63.4 Section 7.3.1: Measurements at a test site

Tabletop devices shall be placed on a nonconducting platform, of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane, when used, or wall of a screened room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground plane or on insulating material. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs. AC power-line adapters that are used with EUTs, such as notebook computers, should be placed as typically used (i.e., on the tabletop) if the adapter-to-EUT cord is too short to allow the power adapter to reach the floor. Each current-carrying conductor of the EUT power cord(s), except the ground (safety) conductor(s), shall be individually connected through a LISN to the input power source. All 50 Ω ports of the LISN shall be resistively terminated into 50 Ω loads when not connected to the measuring instrument. When the test configuration consists of multiple units (EUT and associated/peripheral equipment, or EUT consisting of multiple equipment) that have their own power cords, ac power-line conducted emissions measurements shall be performed with the ac power-line cord of the particular unit under test connected to one LISN that is connected to the measuring instrument. Those power cords for the units in the remainder of the configuration not under measurement shall be connected to a separate LISN or LISNs. This connection may be made using a multiple-receptacle device. Emissions from each current-carrying conductor of the EUT shall be individually measured. Where multiple portions of the EUT receive ac power from a common power strip, which is furnished by the manufacturer as part of the EUT, measurements need only be made on the current-carrying conductors of the common power strip. Adapters or extension cords connected between the EUT power cord plug and the LISN power receptacle shall be included in the LISN setup, such that the calibration of the combined adapter or extension cord with an adapter and the LISN meets the requirements of 5.2.3.

If the EUT consists of a number of devices that have their own separate ac power connections, e.g., a floorstanding frame with independent power cords for each shelf, that are able to connect directly to the ac power network, each current-carrying conductor of one device is measured while the other devices are

connected to a second (or more) LISN(s). All devices shall be separately measured. If the manufacturer provides a power strip to supply power to all of the devices making up the EUT, only the conductors in the common power cord to the power strip shall be measured.

If the EUT is normally operated with a ground (safety) connection, the EUT shall be connected to the ground at the LISN through a conductor provided in the lead from the ac power to the LISN.

The excess length of the power cord between the EUT and the LISN receptacle (or ac power receptacle where a LISN cannot be used), or an adapter or extension cord connected to and measured with the LISN, shall be folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length. If the EUT does not have a flexible power lead, the EUT shall be placed at a distance of 80 cm from the LISN (or power receptacle where a LISN cannot be used) and connected thereto by a power lead or appropriate connection no more than 1 m long. The measurement shall be made at the LISN end of this power lead or connection.

The LISN housing, measuring instrument case, reference ground plane, vertical conducting plane, if used, shall be bonded together.

ANSI C63.4 Section 7.3.3: Exploratory ac power-line conducted emission measurements

Exploratory measurements shall be used to identify the frequency of the emission that has the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable positions, and with a typical system equipment configuration and arrangement. For each mode of operation and for each ac power current-carrying conductor, cable manipulation may be performed within the range of likely configurations. For this measurement or series of measurements, the frequency spectrum of interest shall be monitored looking for the emission that has the highest amplitude relative to the limit. Once that emission is found for each current-carrying conductor of each power cord associated with the EUT (but not the cords associated with non-EUT equipment in the overall system), the one configuration and arrangement and mode of operation that produces the emission closest to the limit across all the measured conductors is recorded.

ANSI C63.4 Section 7.3.4: Final ac power-line conducted emission measurements

Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit is selected for the final measurement. If the EUT is relocated from an exploratory test site to a final test site, the highest emissions shall be remaximized at the final test location before final ac power-line conducted emission measurements are performed. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment in the system) is then performed for the full frequency range for which the EUT is being tested for compliance without additional variation of the EUT arrangement, cable positions, or EUT mode of operation. If the EUT consists of equipment units that have their own separate ac power connections (e.g., a floor-standing frame with independent power cords for each shelf that are able to connect directly to the ac power network), then each current-carrying conductor of one unit is measured while the other units are connected to a second (or more) LISN(s). All units shall be measured separately. If the manufacturer provides a power strip to supply all the units making up the EUT, only the conductors in the power cord of the power strip shall be measured.



6.3 Results:

Conducted Emission tests were not performed. The device is powered by internal batteries and is not powered through the AC power line.

7 Test Equipment and Ancillaries used for tests

Instrument/Ancillary	Model	Manufacturer	Serial No.	Cal Date	Cal Interval
Radio Communication Tester	CMU 200	Rohde & Schwarz	101821	June 2010	1 year
Radio Communication Tester	CMU 200	Rohde & Schwarz	109879	June 2010	1 year
Radio Communication Tester	CMU 200	Rohde & Schwarz	110759	June 2010	1 year
Bluetooth Tester	CBT	Rohde & Schwarz	100212	May 2009	2 Years
EMI Receiver/Analyzer	ESIB 40	Rohde & Schwarz	100107	May 2010	1 year
Spectrum Analyzer	FSU	Rohde & Schwarz	200302	Dec 2009	1 year
Loop Antenna	6512	EMCO	00049838	April 2009	2 years
Biconilog Antenna	3141	EMCO	0005-1186	June 2009	2 years
Horn Antenna (1-18GHz)	3115	ETS	00035111	Jan 2009	3 years
Horn Antenna (18-40GHz)	3116	ETS	00070497	Jan 2009	3 years
Communication Antenna	IBP5-900/1940	Kathrein	n/a	n/a	n/a
High Pass Filter	5HC2700	Trilithic Inc.	9926013	Part of system calibration	
High Pass Filter	4HC1600	Trilithic Inc.	9922307	Part of system calibration	
6GHz High Pass Filter	HPM50106	Microtronics	001	Part of system calibration	
Pre-Amplifier	JS4-00102600	Miteq	00616	Part of system calibration	
LISN	50-25-2-08	FCC	08014	June 2010	1 year
LISN	R&S	ESH3-Z5	836679/003	May 2009	2 Years
LISN	R&S	ESH3-Z6	836154/011	May 2009	2 Years
Power Smart Sensor	R&S	NRP-Z81	100161	June 2010	1 Year
Power Smart Sensor	R&S	NRP-Z22	100223	May 2010	1 Year
Upconverter	PXI-5610	NI	E93740	May 2010	2 years
Waveform Generator	PXI-5421	NI	E965F1	May 2010	2 years
10dB attenuator	ATT-0298-10	MidwestMicrowave	n/a	n/a	n/a
Power Splitter	11667B	Hewlett Packard	645348	n/a	n/a
DC Power Supply	E3610A	Hewlett Packard	KR83021224	n/a	n/a
DC Power Supply	E3610A	Hewlett Packard	KR83023316	n/a	n/a
DC Power Supply	6632A	Hewlett Packard	3524A-12822	n/a	n/a
DC Power Supply	6655A	Hewlett Packard	3403A-00487	n/a	n/a
Multimeter	179	Fluke	N/A	Feb 2010	1 Year
Temp Hum Logger	TM320	Dickson	03280063	Feb 2010	1 Year
Temp Hum Logger	TM325	Dickson	5285354	Feb 2010	1 Year

Note:

Equipment calibration is performed by an accredited calibration lab according to ISO 17025 requirements.

Calibration intervals are determined from manufacturer recommendation and/or lab discretion.

Cetecom Inc takes all measures to calibrate equipment before the due date; for instances when the equipment has to be used beyond the calibration due date, necessary steps are taken for calibration verification and documented until accredited calibration can be performed- to meet the Quality System requirements.

8 Block Diagrams

