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Compliance Test of the “BMM Activator” to FCC Rule Part 15 Subpart C (15) and Innovation Science and Economic Development Canada (ISED) RSS 210 (Issue 9)

for

Blast Movement Technologies Pty Ltd

Unit 2 / 67 Bluestone Circuit
Seventeen Mile Rocks
Brisbane QLD 4073
AUSTRALIA

Prepared by:



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Signed: 12th July 2018

Geoffrey Garrett BE (Elect) Hons.
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1. Client Information

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 AUSTRALIA

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 Web: www.bmt.com.au

2. Equipment Under Test (EUT)

2.1 Identification of EUT

Description:	The BMM Activator is hand held push button transmitter operating on 111.1 kHz. It is used to turn on BMM sensors prior to installation in blast holes in the mining industry.
Make:	Blast Movement Technologies
Model:	BMM Activator
Antenna:	Internal, PCB mounted loop antenna
Operating frequency of SRD:	111.1 kHz
Frequency characteristics:	Single fixed frequency
Modulation:	OOK
Serial No.:	35126249
Auxiliary equipment:	AC Adapter- Make: Samsung, Model No.: ETA-U90
EUT Supply:	Internal rechargeable lithium polymer battery, 3.7 VDC
Mains Supply:	120 VAC, 60 Hz

2.2 Auxiliary Equipment

AC Adapter- Make: Samsung, Model No.: ETA-U90
(Used to charge the internal battery, while charging the EUT is automatically turned off)

2.3 Operating Conditions of EUT

The tests were performed with the EUT powered by the internal battery and when being charged by the external AC adapter (while charging the EUT is automatically turned off) The EUT was orientated and operated to create the condition that produced the maximum emissions as required by the standard. All the measurements were performed at an open area test site. Tests requiring temperature and input power supply voltage variation were performed in a temperature chamber.

3. Test Specifications

3.1 Standard Selected

The test measurements contained in this report are to the requirements detailed in FCC Part 15, and these results have been cross referenced to the requirements of Innovation, Science and Economic Development Canada (ISED) RSS GEN, Issue 5. The test measurement method used in this test report is in accordance with ANSI C63.10: 2013.

3.2 Changes from the Selected Standard

None

3.3 Test Facility

All final radiated tests reported within this document were performed by EMC Services Pty Ltd measurement facility located at the following location:

Laboratory and Open Area Test Site (OATS): Hampton Grove
251 Hampton Road
Hampton, NSW,
Australia, 2790

10m open area test site (OATS), equipped with 360 degree remote control turntable and 6 metre remote control antenna mast.

Accredited Test Site Registration Numbers: -

1. Innovation, Science and Economic Development Canada (ISED): # 22809-1
2. Federal Communications Commission (FCC) : # 513680

The tests in Section 4.3 requiring temperature variation were performed in a temperature chamber.

3.4 Test Equipment

Test equipment used is from the list below. All equipment was within the current calibration period and/or confirmed to be within the specified uncertainty.

Spectrum Analysers -	R&S ESCS 30, Agilent 4407B, HP 8591EM, R&S FSP40
LISN -	EMCS Type LISN15, Line Impedance Stabilization Network
CDN -	CDN01, Coupling/Decoupling Network
Attenuator -	Sanders type 6535.4
Transient Protector -	EMCS type TP15
EFT Simulator -	UCS 500M
ESD Simulator -	SFN 432
Signal Generators -	HP 8620C/86222B and 86290B, HP 83050A, Marconi 2022E, Farnell LFP1, SD1702, Hung Chang 9205C, Marconi 6055, 6056B, 6058B, 6059A
Preamplifier -	HP 8447E, Mini Circuits ZKL-1R5, CBM02183030-01
RF Power Amplifiers -	TIA 100 1R8, BBM4G50CJ, BBM2E4AHM,
Antennas -	CA1213, EMCS RE/S 101-1, Schaffner CBL6141, ATD 61932500, Schwarzbeck BBHA 9120 D, R&S HFH2-Z2 EMCS ABL30E
Current probes	Ailtech 94111, Fairchild MFB25
Directional coupler -	HP 773D
AF Power Amplifier -	Biema 2 x 400W Amplifier Q400
Induction Coil-	50 Hz 1m square loop
Strength Meters -	W&G EMR 200, W&G EFA 300
Absorbing Clamp -	AC 300-1
Van Veen Loop -	EMCS tube VVL2
Megger -	BM12

4. Test Summary

Test Requirement	FCC Section Tested	ISED RSS Cross Reference	Test Report Sect.	Result	Comment
Antenna Requirement	15.203	RSS-GEN 6.8	8.1	Compliant	EUT has a permanently mounted internal antenna.
99% Occupied Bandwidth	2.1049	RSS-GEN 6.7	8.2	Compliant	
Transmitter Radiated Emissions 9kHz to 30MHz	15.209	RSS-GEN 8.9	8.3	Compliant	
Transmitter Radiated Emissions 30MHz to 1000MHz	15.209	RSS-GEN 8.9	8.4	Compliant	Transmitter Radiated Emissions 9kHz to 30MHz
AC Power-line Conducted Emission Measurements	15.107	RSS-GEN 8.8	8.5	Compliant	EUT is off when the AC adapter is connected to charge the internal battery
Transmitter Frequency Stability	2.1049	RSS-GEN 6.11	8.6	Compliant	

5. Modifications :

Nil

6. Test Conditions

6.1 Test Conditions

Date of test:	11 th August to 22 th August 2017 18 th & 19 th June 2018
Temperature:	15°C to 20°C
Humidity:	43% to 48%

Emissions emission tests were performed in accordance with the standard referenced in Section 3. Preliminary emission measurements were performed in a semi anechoic chamber and final measurements were performed at an open area test site (OATS). During the measurement the EMI receiver automatically sets the required resolution bandwidth as specified in CISPR 16-1-1

For the radiated emissions a CISPR quasi-peak detector was used except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz in which an average detector was used.

The conducted emissions were measured using a LISN on the mains terminals. Where the peak level was below the quasi-peak and average limits, results are given for peak levels only.

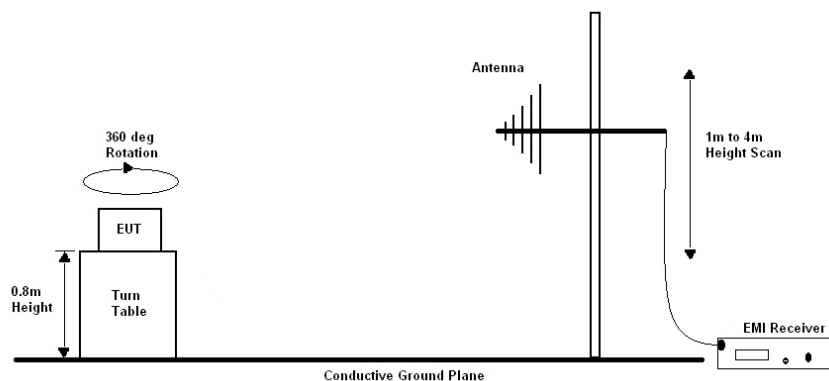


Diagram 6.1. Test set up for radiated emissions measurements

7. Measurement Uncertainty

The uncertainty of the quantities measured or applied were within the tolerances described below:

Conducted emissions:	± 6 dB
Radiated Emissions:	± 6 dB
Frequency	$\pm 4.1 \times 10^{-7}$

8. Test Data

8.1 Antenna Requirement (FCC Section 15.203)

Requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section.

Status: The unit under test employs a permanent, internally mounted antenna (Complies)

8.2 Occupied Bandwidth (FCC Section 2.1049)

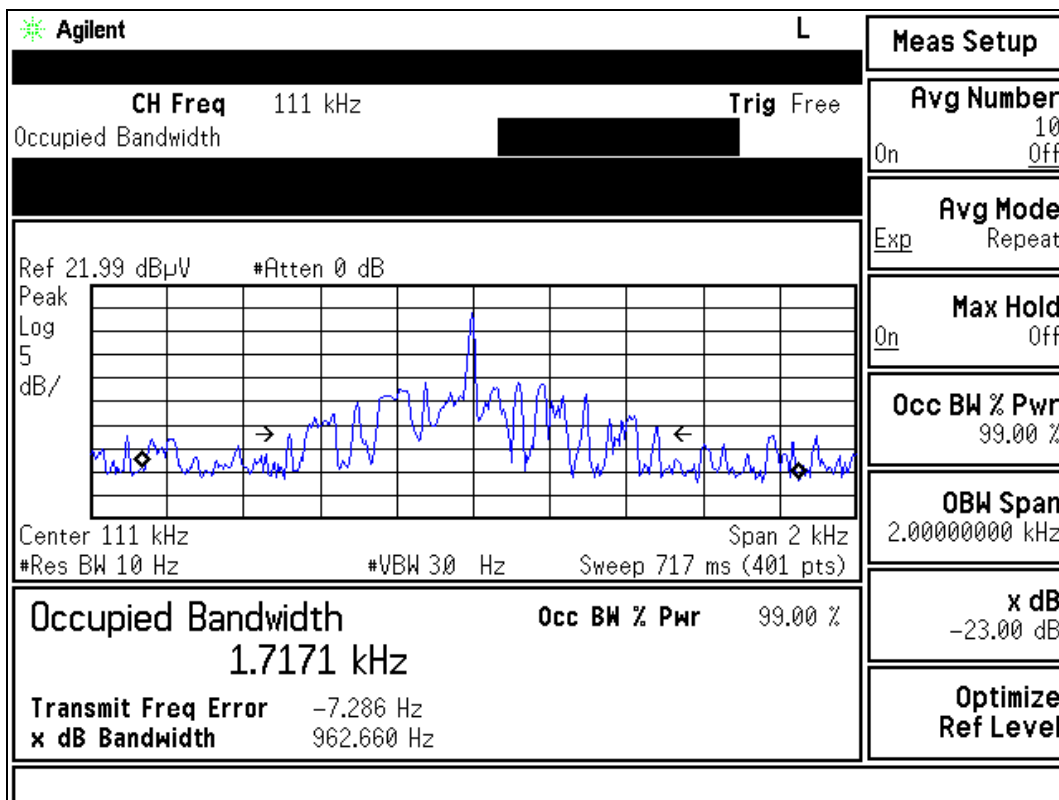
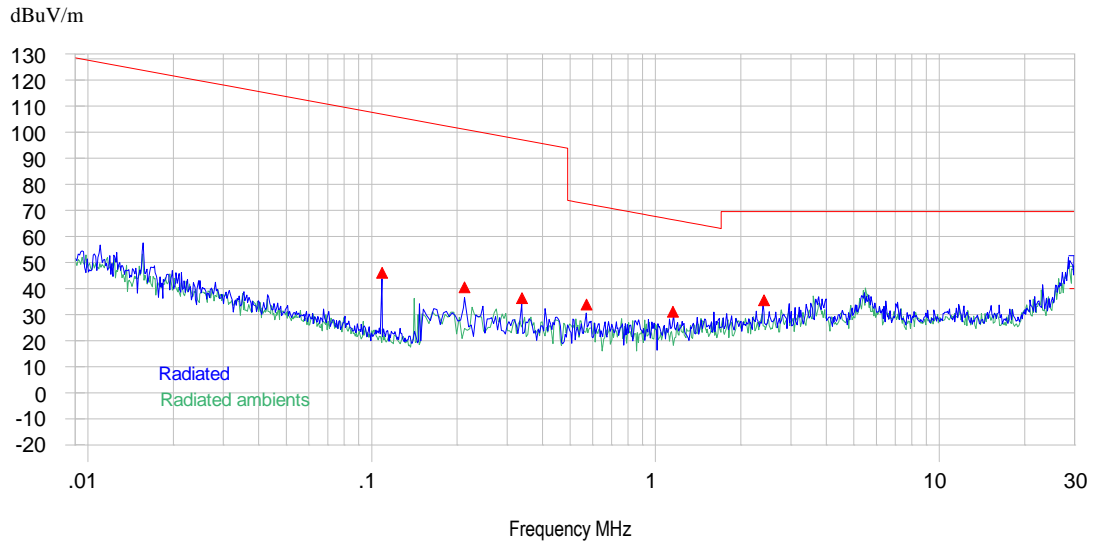


Figure 8.2 Occupied Bandwidth Plot

8.3 Transmitter Radiated Emissions, 9 kHz to 30 MHz
(FCC Section 15.209)

- The measurement distance is 3m with a shielded loop antenna.
- The EUT was positioned in the three orthogonal planes to determine the worst case emissions, and rotated 360 deg.
- The receive loop antenna was positioned (vertical) perpendicular and parallel to the EUT to measure the worst case emissions form the EUT.



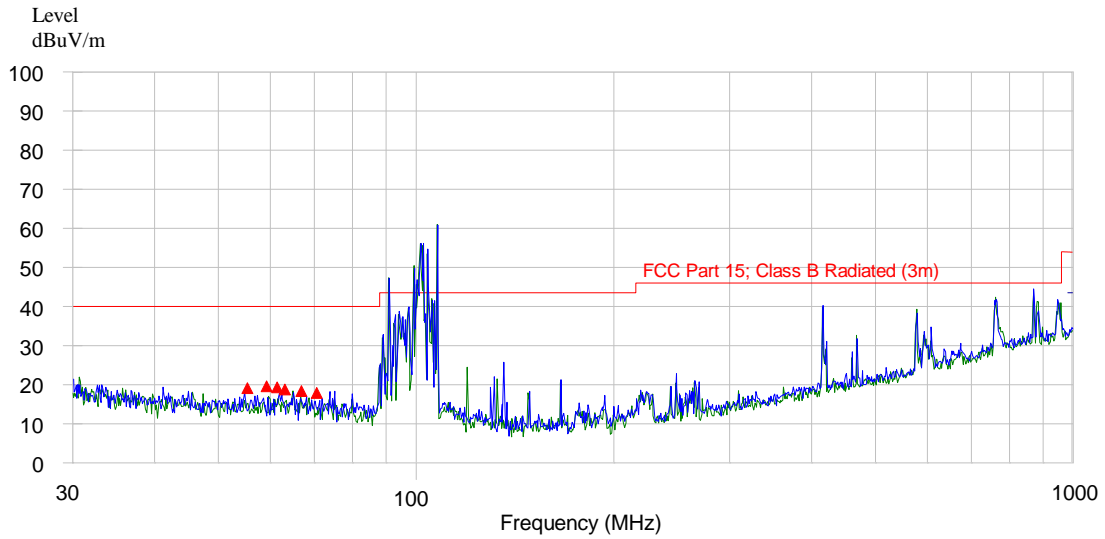
Frequency MHz	Measured, dBuV/m	Limit dBuV/m
0.111	46.5	107
0.222	40.2	101
0.333	35.1	94
0.666	33.2	71
1.25	30.3	67
2.48	35.0	69.5

Figure 8.3 Transmitter Radiated Emissions, 30 MHz to 1000 MHz



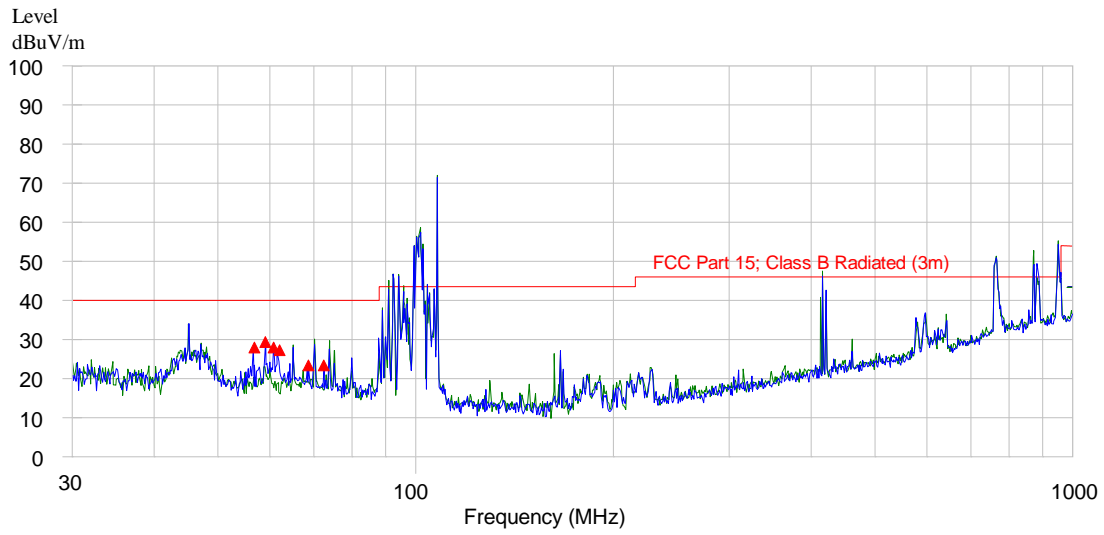
8.4 Transmitter Radiated Emissions, 30 MHz to 1000 MHz
(FCC Section 15.209)

- The measurement distance is 3m with a Bilog antenna.
- The EUT was positioned in the three orthogonal planes to determine the worst case emissions, and rotated 360 deg.
- The receive antenna was positioned vertical and horizontal to the EUT to measure the worst case emissions form the EUT



Frequency MHz	Measured, dBuV/m	Limit dBuV/m
56.7	18.5	40
58.5	19.6	40
61.6	19.4	40
63.1	17.5	40
68.8	16.7	40
73.9	16.1	40

Figure 9.5a. Radiated emissions, 30 MHz to 1000 MHz (Horizontal)



Frequency MHz	Measured, dBuV/m	Limit dBuV/m
56.7	27.1	40
58.5	28.6	40
61.6	25.7	40
63.1	25.1	40
68.8	23.7	40
73.9	24.3	40

Figure 9.5b. Radiated emissions, 30 MHz to 1000 MHz (Vertical)

8.5 Conducted Emissions
(FCC Section 15.107)

- The EUT is turned off automatically when it's being charged through the USB connector. Only the charging circuit in the EUT is operating when charging. The conducted mains measurements were performed when a fully discharged battery was being charged by the AC Adapter Model No.: ETA-U90.

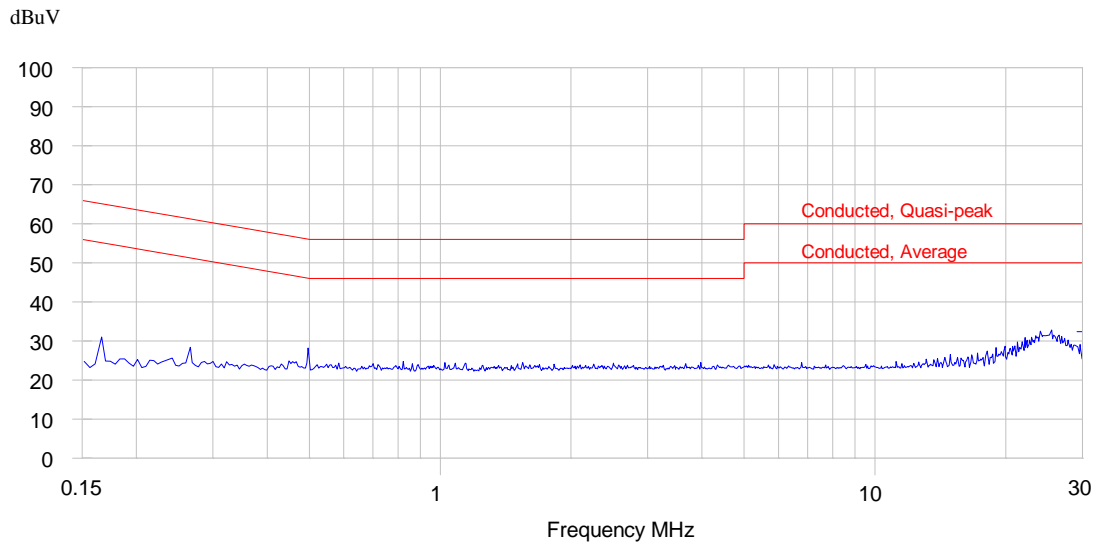


Figure 1a. Mains conducted emissions, 0.15 MHz to 30 MHz (Neutral line)

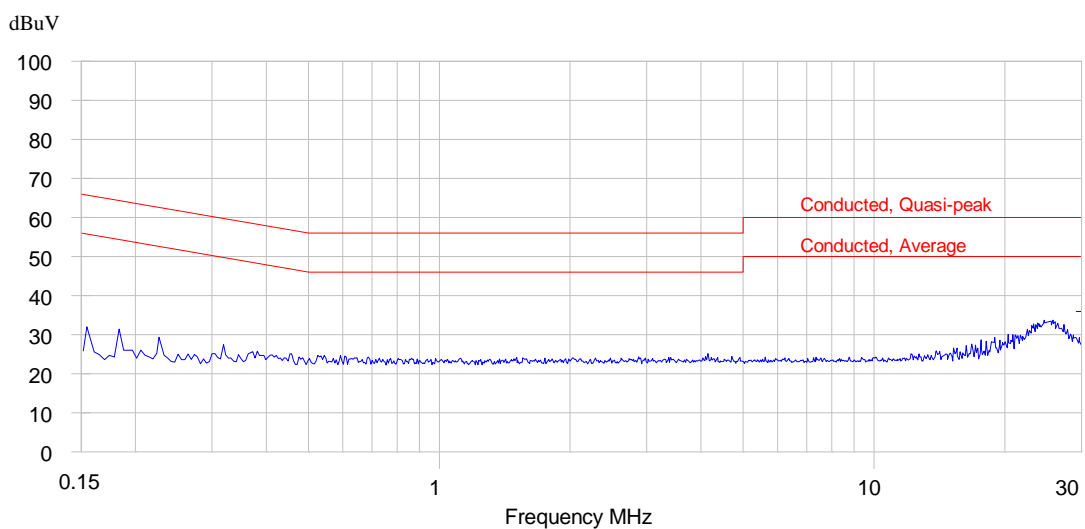


Figure 1b. Mains conducted emissions, 0.15 MHz to 30 MHz (Active Line)



8.6 Transmitter Frequency Stability
(FCC Section 2.1049)

Test conditions		Test Result	
		Frequency kHz (F_L)	Frequency kHz (F_H)
Temp (-30)°C	3.7 VDC, V_{mom}	110.16	111.88
Temp (20)°C	3.7 VDC, V_{mom}	110.14	111.86
Temp (55)°C	3.7 VDC, V_{mom}	110.13	111.85
Temp (-30)°C	3.15 VDC, V_{min}	110.14	111.84
Temp (20)°C	3.15 VDC, V_{min}	110.16	111.85
Temp (55)°C	3.15 VDC, V_{min}	110.15	111.84
Limit:		Information only	Information only
Result:		Pass	Pass

Tale 9.4 Operating frequency range, measured under normal and extreme conditions

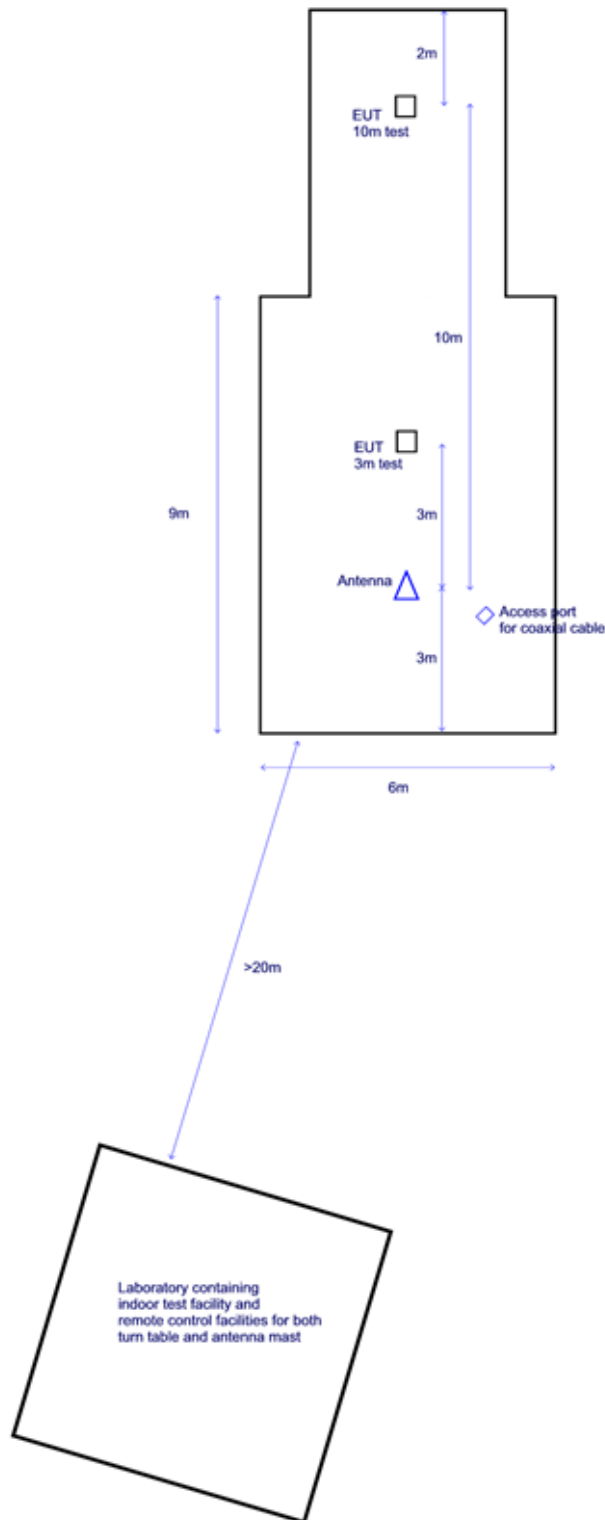
Note:

Note: F_L and F_H are the frequencies that define the upper and lower limits of the 99% signal bandwidth. F_L is taken from the 99% bandwidth plot for the lowest operating frequency and F_H from the 99% bandwidth plot for the highest operating frequency.



9. Test Facility

EMC Services Hampton Test Facility



10. Photographs

The unit tested is depicted in the photographs below.



Photo 1 – EUT, front view



Photo 2 – EUT, front view with top cover removed

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Photo 3 – EUT, internal view



Photo 4 – EUT, at OATS



Photo 5 – EUT, at OATS (close up)

11. Appendices

11.1 Labelling Requirements as Specified by the Standard

FCC Part 15.19 (20th Sep 2007) requires the following label to be affixed in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

If the device is so small as to make placement of this label impractical, the label must be presented in a prominent location in the user documentation, or on the container in which the product is marked.

Further, Section 15.21 (20th Sep 2007) requires the following information to be provided to the user:

The user's manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. In cases where the manual is provided only in a form other than on paper, such as on a computer disk or over the internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

11.2 Class A Equipment Requirements

Section 15.105 (20th Sep 2007) requires the following information to be provided to the user:

For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their sole expense.

11.3 Class B Equipment Requirements

Section 15.105 (20th Sep 2007) requires the following information to be provided to the user:

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.