FCC Report for Gentian

on

EMC Measurements for Alanya Animal Health Monitor

Project Number EMT17P012

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1. Executive Summary

The EUT (Equipment Under Test) meets the FCC Telecommunication Regulations 47 Part 15. FCC 15.247 defines the radiation limits for the switched frequency technique used.

1.1. Emissions tests called out by the product standard

Test	Standard and year	Result	Comment
Radiated Emissions	ANSI C63.10 (2013)	Pass	-

1.2. Declaration of Conformity.

The following statement can be added to the DoC.

This equipment complies with the FCC 47 Part 15.

Equipment Classification: Class B

2. Introduction

2.1. Time and Place

The measurements took place at the laboratories and the test site of ElectroMagnetic Technologies Ltd., (EMT), Inniscarra, Co. Cork, on 24th February, and 6th, 8thand 10thMarch 2017.

2.2. Calibration

All EMT equipment is regularly calibrated and full details can be traced through the serial number of each device.

2.3. Present

Tom O'Brien	ElectroMagnetic Technologies Ltd.
Naoise Mc Sweeney	ElectroMagnetic Technologies Ltd.
Tim Hannon	Alanya Ltd.

2.4. Equipment Under Test

EUT	Alanya HerdInsights monitor collar.
Comprising	Alanya HerdInsights monitor collar with separate USB receiver. EUT transmitted to USB base station connected to PC where software monitors for dropped packets. No cables attached to EUT. The EUT has an intentional radiator at 915MHz.

2.5. Manufacturer Contact Point

Gentian Services Ltd.
Bay 89.1,
Shannon Free Zone,
Co Clare.

The results of this report refer only to the item tested.

2.6. Reproductions

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3. Radiated Emissions, Conducted Measurement Technique.

3.1. Test Equipment

Rohde & Schwarz FSP 30 Spectrum Analyser (S/N 100025)
Rohde & Schwarz Sig, Gen. SMR 20 (1017150)
EMT Laboratory Anechoic Chamber

3.2. Measurements

Tests were performed in accordance with the radiated emissions aspect of 15.247 as conducted emissions into a 50 ohm load. Cable loss was measured at 0.3 dB attenuation at 1GHz and 1.5dB attenuation at 6.4GHz.

3.3. § 15.247

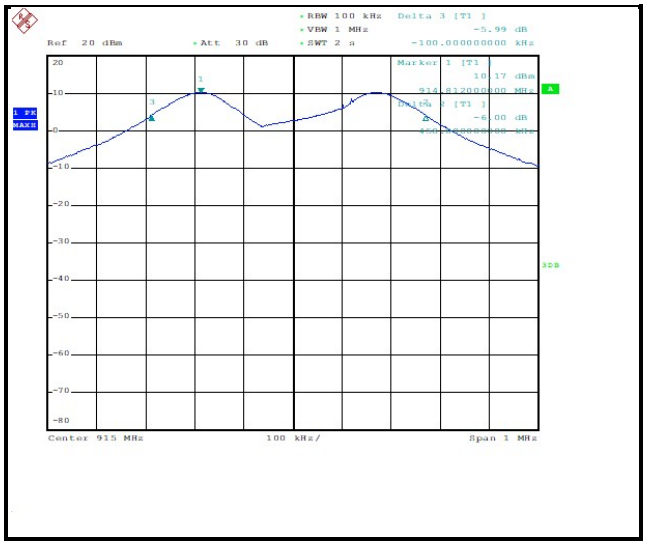
Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.

3.4. § 15.247 b (3)

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Note 1 watt is +30dBm. When a conducted measurement into a 50Ω load this is 39dBm.

3.4.1. Result

Maximum conducted output power is 10.2dB@ 914.81MHz. When cable loss is included (0.3dB) the system is well below the limit.



Graph 1 100kHz resolution bandwidth setting on spectrum analyzer while measuring maximum conducted power and 6dB bandwidth.

3.5. § 15.247 a(2)

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850MHz bands. The minimum 6 dB bandwidthshall be at least 500 kHz.

3.5.1. Result

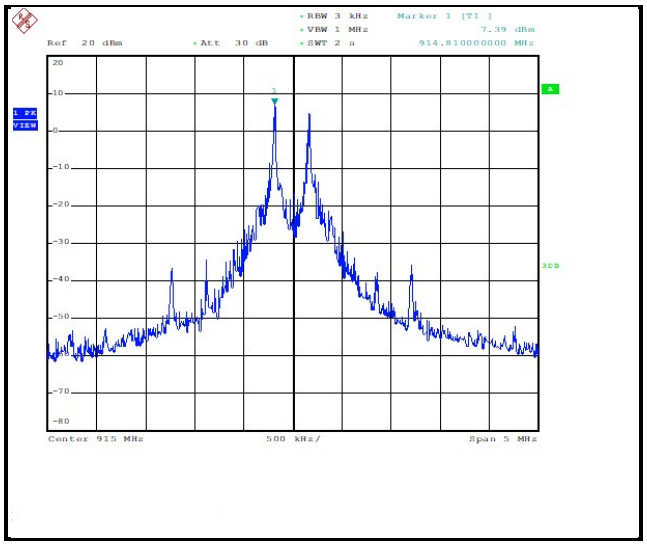
6dB bandwidth is 558kHz and is also shown in the previous graph.

3.6. § 15.247 e

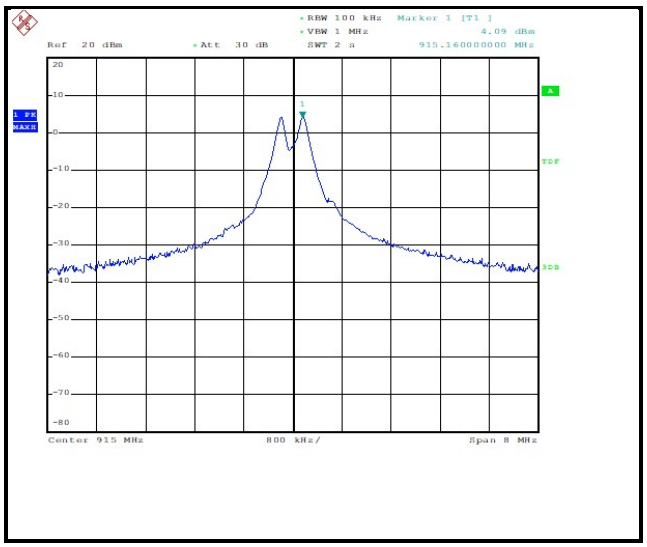
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

3.6.1. Result

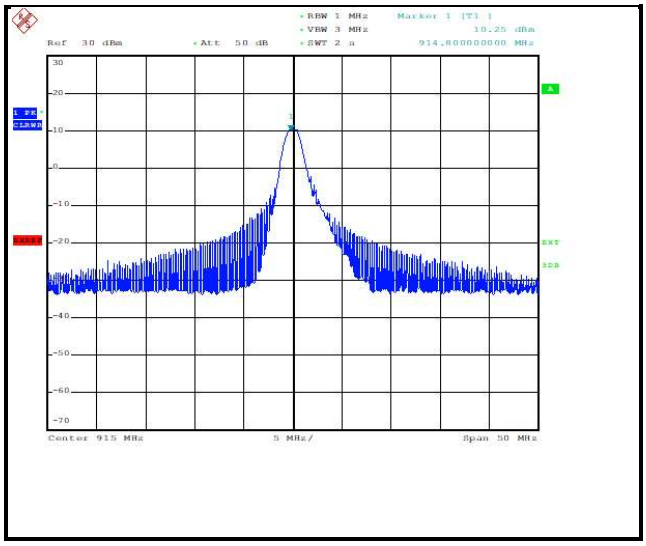
Maximum power spectral density over any given 1MHz RBW was 11dBm (This figure takes all losses into account)



Graph 2 Power Spectral Density measurement with 3kHz resolution bandwidth on spectrum analyzer.



Graph 3 Power Spectral Density measurement with 100kHz resolution bandwidth on spectrum analyzer.



Graph 4 Power Spectral Density measurement with 1MHz resolution bandwidth on spectrum analyzer

3.7. Comment

With the measured level at 11dBm this is considerably under the 1Watt limit.

3.8. § 15.247 d

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radiofrequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

3.8.1. Result

Harmonics up to 9.15GHz were measured. The highest level measured outside the band of the intentional radiator being the second harmonic. The second harmonic was 39.62dB lower than the level of the intentional radiator, well within the 20dB limit.

Frequency (GHz)	Level (dBm)	Spectrum Analyzer internal attenuation	Delta from highest value (min 20 dB required)	Cable Attenuation (dB)
0.915	+7.4	30 dB	-	0.3
1.83	-32.22	30 dB	39.62	
2.745	-48.8	30 dB	56.2	
3.66	-61.96	20 dB	69.36	
4.575	-63.18	10 dB	70.58	
5.49	-46.82	10 dB	54.22	
6.405	-42.83	10 dB	50.23	1.5
7.32	-55.13	10 dB	62.53	
8.235	-68.66	10 dB	76.06	
9.15	-55	10 dB	50.2	

Table 1 Harmonics measured directly into the 50Ω of SA.

3.9. Photographs

Photo 1 Connection to Antenna and battery during conducted power measurements.

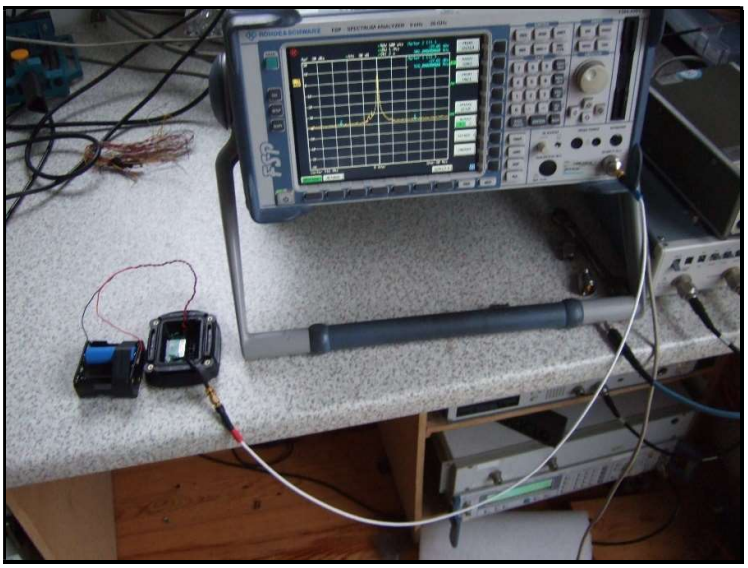


Photo 2 Setup for conducted power measurements

3.10. Conclusion

The EUT meets the requirements of intentional radiators of FCC 47 Part 15.247 for Operation within the bands 902–928 MHz.

4. Radiated Emissions tests.

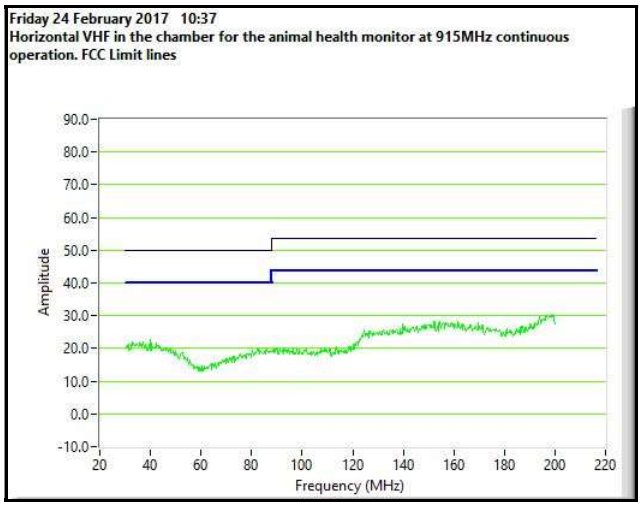
4.1. Test Equipment

EMT 3m site in Inniscarra, Co. Cork.
Belling Lee Anechoic Chamber (S/N 60512)
Biconical Antenna -Eaton 94455-1 (S/N 1220)
Log periodic Antenna - EMCO 3146 (S/N 9210-3462)
Bi log antenna (S/N EMT#030)
Rhode and Schwarz ESVS 30 receiver (S/N 826006/004)
Rohde & Schwarz FSP 30 Spectrum Analyser (S/N 100025)
Hewlett Packard 8447F amplifier. (S/N 3113A06542)
RF Spin Horn Antenna 800MHz to 10GHz (S/N 130604A10)
Low loss 3m cable
Bonn Electronik pre-amplifier (S/N 108084)

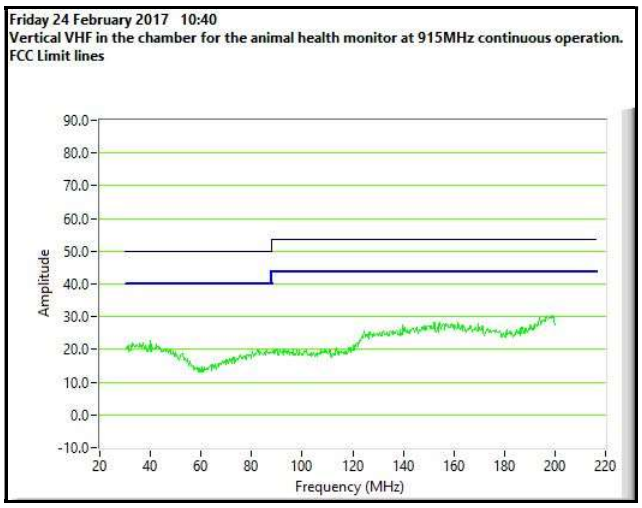
4.2. Measurements

Tests were performed in accordance with the radiated emissions aspect of IEC 55016-2-3 with the limits defined in FCC 47 Part 15.209.

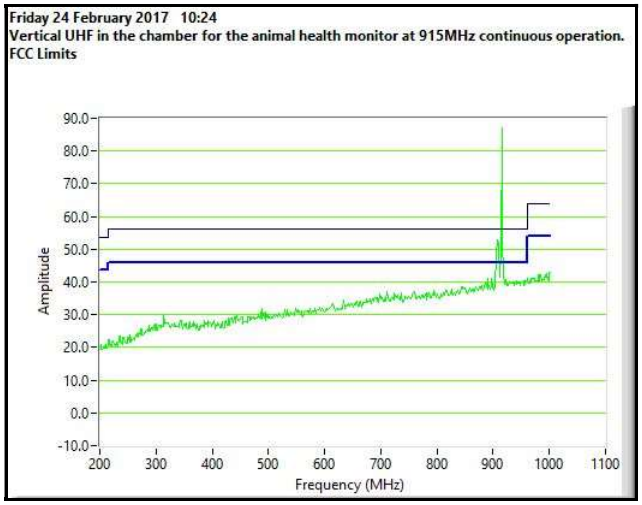
NB = Narrowband, BB = Broadband, QP = Quasi Peak



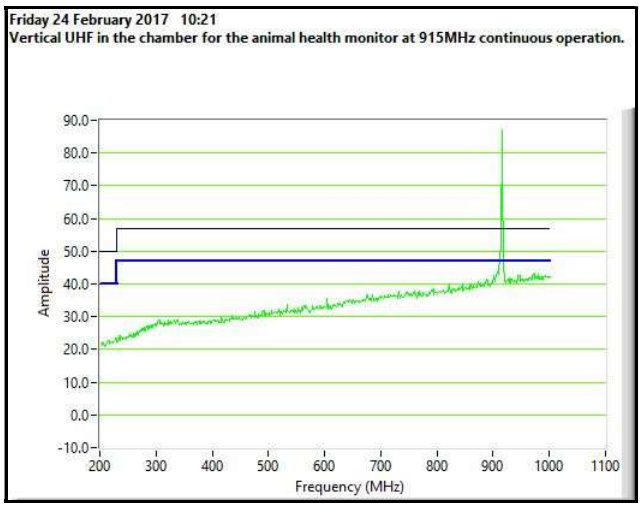
Graph 5



Graph 6



Graph 7



Graph 8

4.3. Comment

The device showed very clearly that it had very low radiated emissions when measured in the chamber. The intentional radiator at 915MHz is the only frequency that crosses the limit.

The EUT was checked on all 3 orientations and the only signals of note were the intentional radiation and its harmonics. Only harmonics of the transmit signal were visible above the noise floor when checking above 1 GHz.

At the 902MHz and 928MHz the levels of signals were below the noise floor for the spectrum analyser.

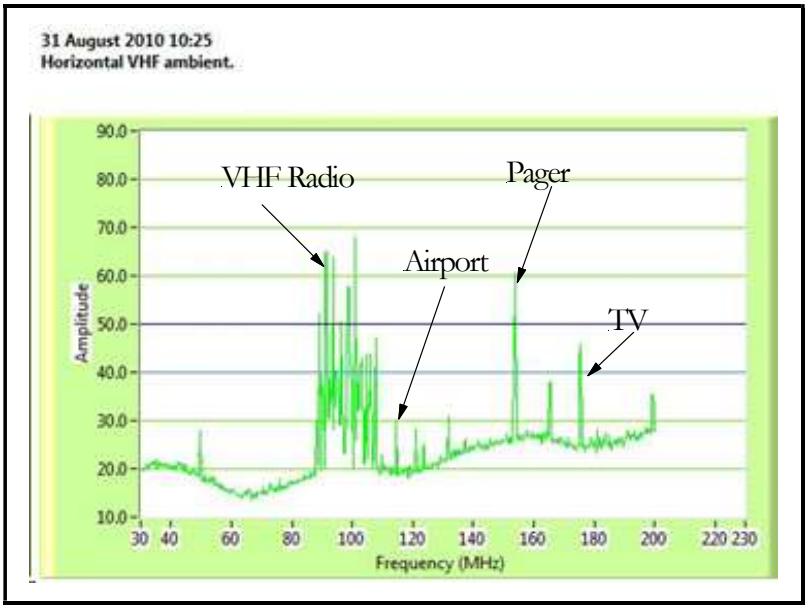
4.4. Conclusion

The EUT meets the radiated emissions requirements of FCC 47 Part 15.209.

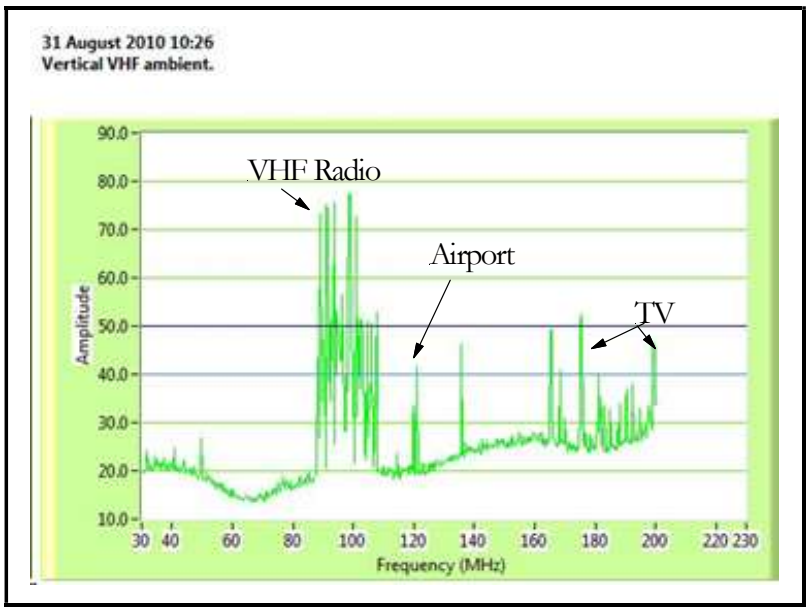
Appendices

Reading the graphs.

When viewing a graph of the signals present at an Open Area Test Site (OATS) you must first get familiar with the signals that are present all the time even when the equipment under test is not there. The principle signals at the EMT OATS site from external sources are VHF radio, Airport, Pagers, Police services and emergency services. Then there are the TV and mobile phones. Recently we have Audio and TV digital signals. Most of these external signals exceed the EMC limits, and this is necessary for people to broadcast and communicate. External signals are easily located by switching off and on the EUT. Part of EMT's expertise is knowing which signals are not from external sources but from the EUT. This is made easier by first checking the emissions from the EUT in the EMT Anechoic Chamber where there are no external signals. However, for an accurate assessment of the emissions level it is necessary to measure the signal at the OATS. As some of these external signals are very stable EMT also uses them to do a brief check that no errors have crept into the measurement set up.



Graph 9 The antenna in horizontal polarity.



Graph 10 The antenna in vertical polarity.

Note the level differences in signals between horizontal and vertical polarities.

END OF REPORT