EMC Services Pty Ltd

ABN 42 072 235 306

EMC Services Pty Ltd
12/8 Tilley Lane
Frenchs Forest NSW 2086
Ph: 9975 4555 Fax: 9876 2796
Web: www.emc.net.au

Report No. FCC 120210a

Compliance Testing Report for SL-100 Machine Controller / Information Gateway with FCC Part 15 (B) Class A (ANSI C63.4:2003) and FCC part 15 (C) Para 15.247 (ANSI C63.4:2003)

FCC ID: O43-SL-100
IC ID: 6050D-SL-100

For

Topcon Positioning Systems (Aust) Pty Ltd

by

M Matevski
EMC Services

12 June 2012

Contents:

1. Client Information

Company: Topcon Positioning Systems (Aust) Pty. Limited
Unit 3, 54 Turbo Drive
PO Box 1537
Coorparoo, Qld, 4151

Contact: Sue Hunter

2. Equipment Under Test (EUT)

2.1 Identification of EUT

Equipment Description:	Machine Controller / Information Gateway
FCC ID:	O43-SL-100
IC ID:	6050D-SL-100
Model:	SL-100
Part No:	1000082-03
Make:	Topcon
Serial Number:	955-PP00002
Supply Rating:	Battery 12V DC

2.2 Operating Conditions of EUT

The EUT was tested together with the supplied cables and GPS Antenna (Topcon model PG-A1). This condition produced maximum emissions from the unit under test.

3. Test Specifications

3.1 Standard Selected

ANSI C63.4:2003 was selected to demonstrate compliance with the applicable EMC requirements of FCC Part 15 (b) and FCC part 15 (C) Para 15.247 as the EUT is within the scope of this standard, and ANSI C63.4 is the preferred method of compliance with 47CFR Part 15 rules.

3.2 Changes from the Selected Standard

None

3.3 Test Facility

All EMI tests reported within this document were performed by EMC Services Pty Ltd measurement facility located in Sydney, NSW at the following location:

Laboratory and Open Area Test Site: Hampton Grove
Rydal Road
Hampton, NSW, 2790

10m OATS, equipped with 360 degree remote control turntable and 6 metre remote control antenna mast.

A description of the test facility is on file with the FCC under Registration # 480861.

3.4 Test Equipment

The following were the principal items used for the tests, all were within their current calibration period and/or confirmed to be within their specified uncertainty.

Description	Type No.
Antenna set – dipoles 0.02-1.7GHz (working set)	MP534, MP651
Antenna set – dipoles 0.02-1.7GHz (reference)	MP534, MP651
Antenna – bilog (Chase) 0.02-2GHz	CPN CBL6141A
Antenna – double ridged waveguide horn 1-18GHz	BBHA 9120
LISN	EMCS-15
Spectrum analyser (26GHz)	Agilent 4407
Cable Succoflex104	955604/4
Cable Succoflex104	955604/4
Attenuator 20dB	HAT 20
Auto transformer	V4780
EMI Test receiver, R&S 9kHz - 2.75GHz	ESCS30
Cable 10 metre	EMCS 10-1
Cable test site/control room	TS/CR

4. Test Summary

Radiated Emissions (unintentional) FCC Part 15 (B) Class A, se figures 1,2,3 and 4

EMC Tests	Result	Note
Conducted Emissions	***Pass***	-
Radiated Emissions (unintentional)	***Pass***	-

Notes (applicable to column 3 of the above summary table)

- EUT Complies when fitted with the following modifications as described in section 5 of this report

The results in this report apply only to the tested sample described in section 2 and depicted in the photographs attached.

Radiated Emissions (intentional) to FCC part 15 (C) Para 15.247, see figures 5 to 10

	Limit	***Measured***	***Result***
Frequency :	2400 – 2483.5 MHz	2400.3 – 2483.1 MHz	***Pass***
EIRP :	1 W (30dBm) (125.23 dBµV/m at 3m)	0.754 mW (-1.23 dBm) 94.0 dBµV/m at 3m	***Pass***
Spurious with Tx on	-20 dBc	<-28 dBc	***Pass***
20dB BW of modulated o/p	1.0 MHz	0.760 Mhz	***Pass***
Number of hopping channels	At least 75	79	***Pass***
Time occupancy is any channel	0.4s in any 30s period	0.248s(1)	***Pass***
Peak power spectral density	No greater than 8 dBm in a 3 kHz BW	Less than -1.23 dBm (2)	***Pass***

Note:

(1) Average time of occupancy in the specified 31.6 second period (79 channels x 0.4sec) is equal to 100 x (no of pulses in .316 sec). Measured PW is 80us, number of pulses in .316 sec is 31. Average time of occupancy is 80us x 31 x 100 =0.248s (limit is .4sec)

(2) Measured EIRP (dBm) = -1.23dBm (in a 300 kHz BW). In 3 kHz BW the level will be even lower.

5. Modifications: None

6. Test Results

6.1 Test Conditions

Date of test	22 , 1 May 2012
Temperature	12^{o}C
Humidity	60%
Supply Voltage	12V DC
Location	Hampton Test Site
Test Officer	M Matevski

Emissions tests were performed in accordance with the standard referenced in section 3.

Where the spectrum was occupied by other transmissions (i.e. ambient signals that approached or exceeded the limit), 'close-up' probing and similar investigative procedures were executed to establish the emission signature of the EUT and whether masked emissions would approach or exceed the limit at these frequencies. The EUT was operated to produce maximum emissions at all times.

6.2 Radiated Emissions

The radiated emission plots and results are shown in figure 2. The minimum margin for Electromagnetic Radiation Disturbance was greater than 10 dB below the respective limit. Signals exceeding these levels in the plots were ambients.

6.3 Conducted Emissions

The conducted emission was measured on the DC power line with a voltage probe for continuous and discontinuous disturbance where required.

The conducted emission plot and results are shown in figure 1. The minimum margin for Electromagnetic Radiation Disturbance was greater than 10 dB below the respective limit.

7. Measurement Uncertainty

The uncertainty of the quantities measured or applied were not greater than:

Conducted Emissions	$\pm$ 2 dB,
Radiated Emissions	$\pm$ 6 dB
RF Field Strength:	$\pm$ 3 dB

8. Test Plots

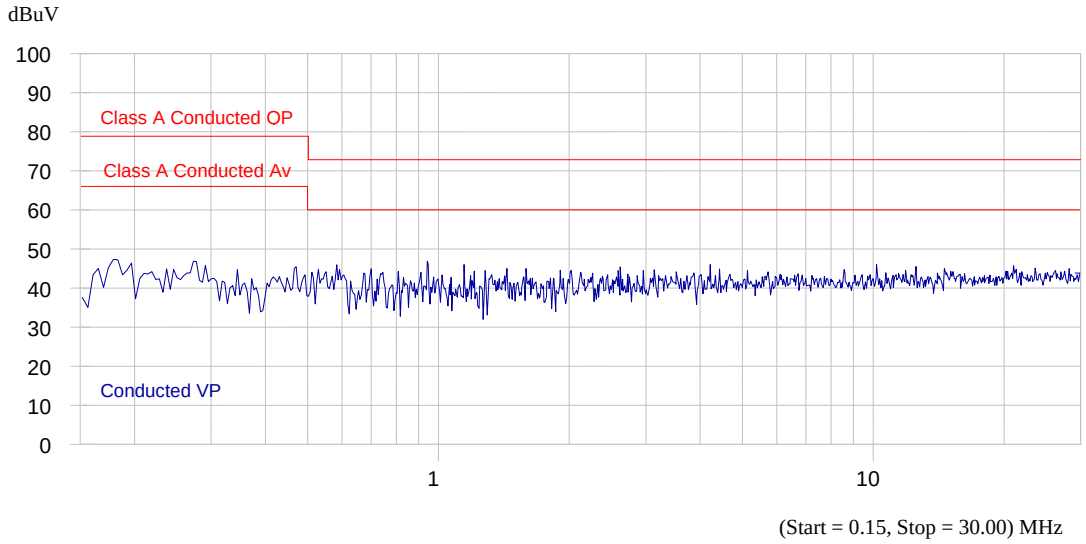
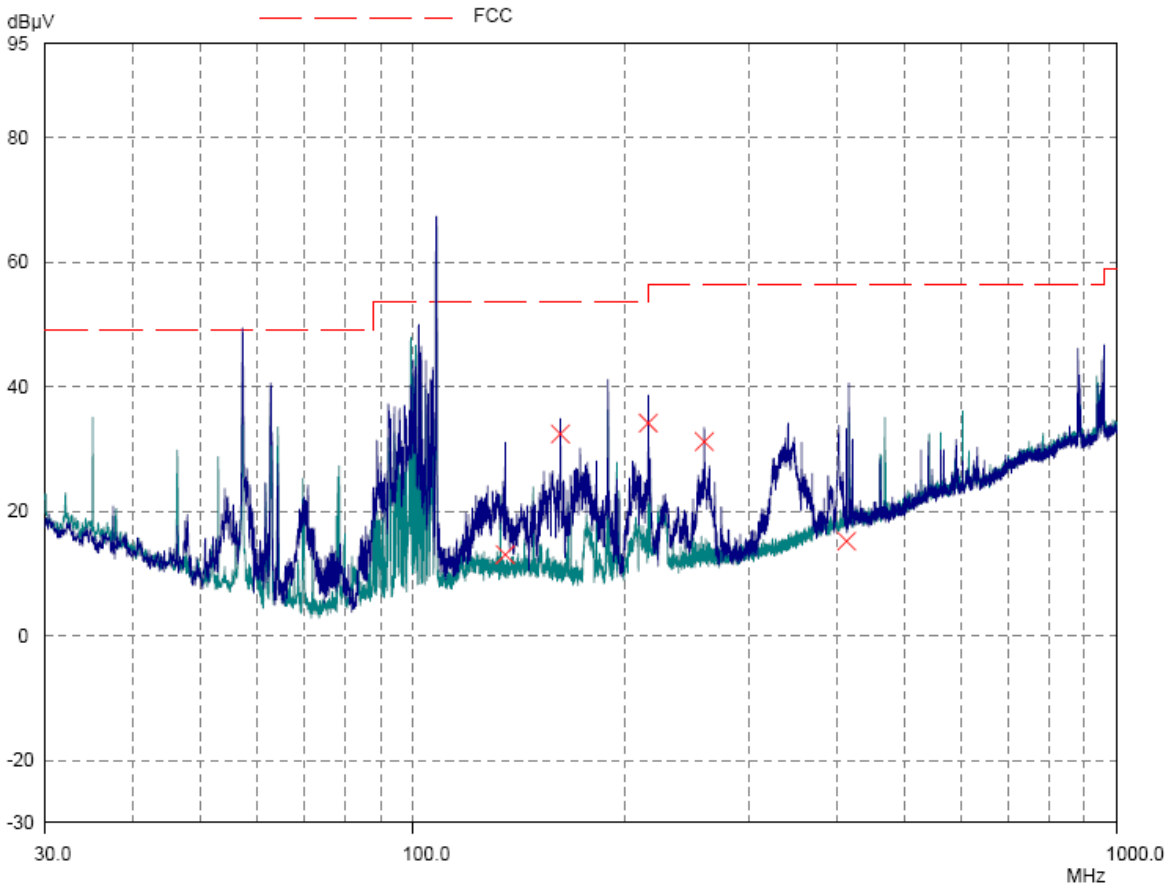


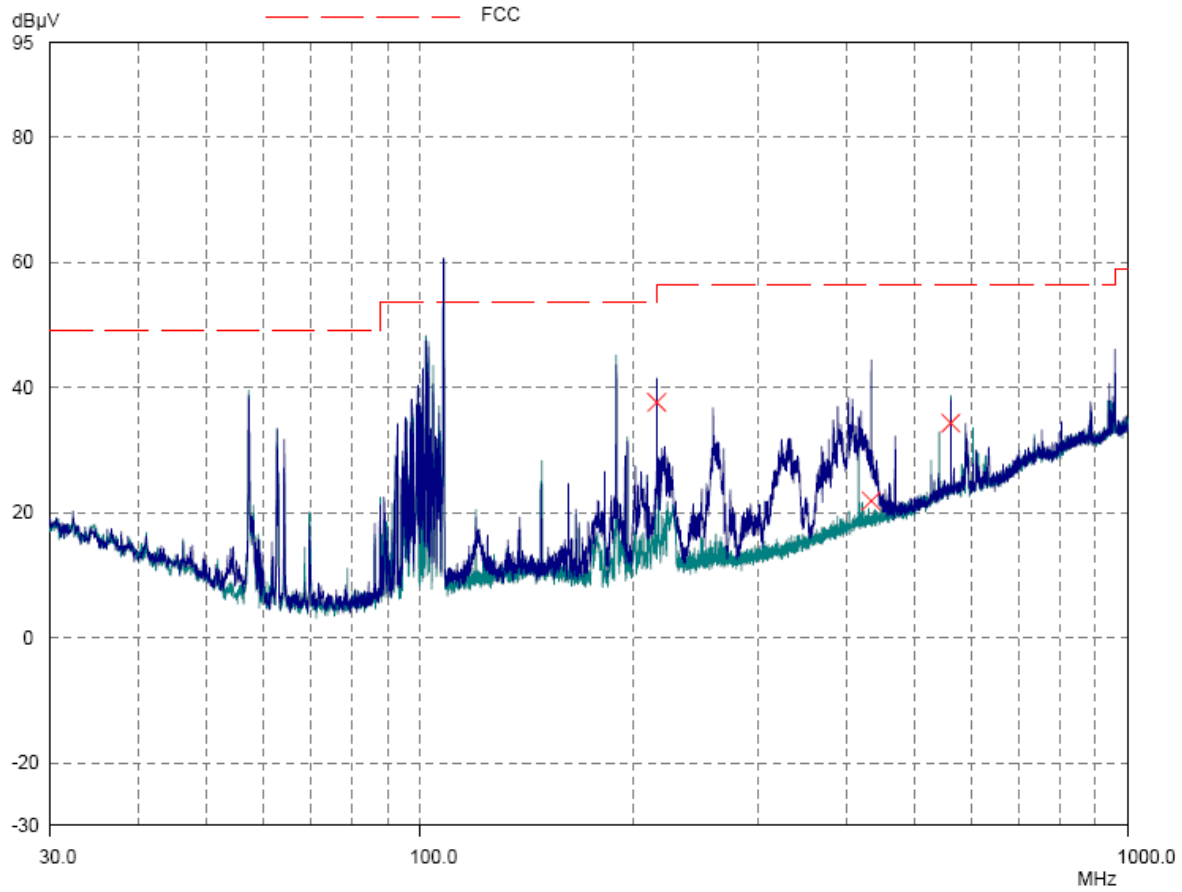
Figure 1. DC Terminals Conducted Emissions, 150 kHz – 30 MHz



Final Measurement Results

Frequency MHz	QP Level dBµV	QP Limit dBµV	QP Delta dB	Ref. Offset dB
135.25	13.00	53.50	40.50	-1.88
162.0	32.37	53.50	21.13	-21.78
216.0	34.14	56.40	22.26	-15.42
259.375	31.15	56.40	25.25	-19.68
413.1875	15.18	56.40	41.22	1.57

Figure 2A. Radiated Emissions – 30 MHz to 1000 MHz (Vertical)



Final Measurement Results

Frequency MHz	QP Level dBµV	QP Limit dBµV	QP Delta dB	Ref. Offset dB
216.0	37.60	56.40	18.80	-25.46
433.9375	21.83	56.40	34.57	-3.30
562.25	34.26	56.40	22.14	4.39

Figure 2B. Radiated Emissions – 30 MHz to 1000 MHz (Horizontal)

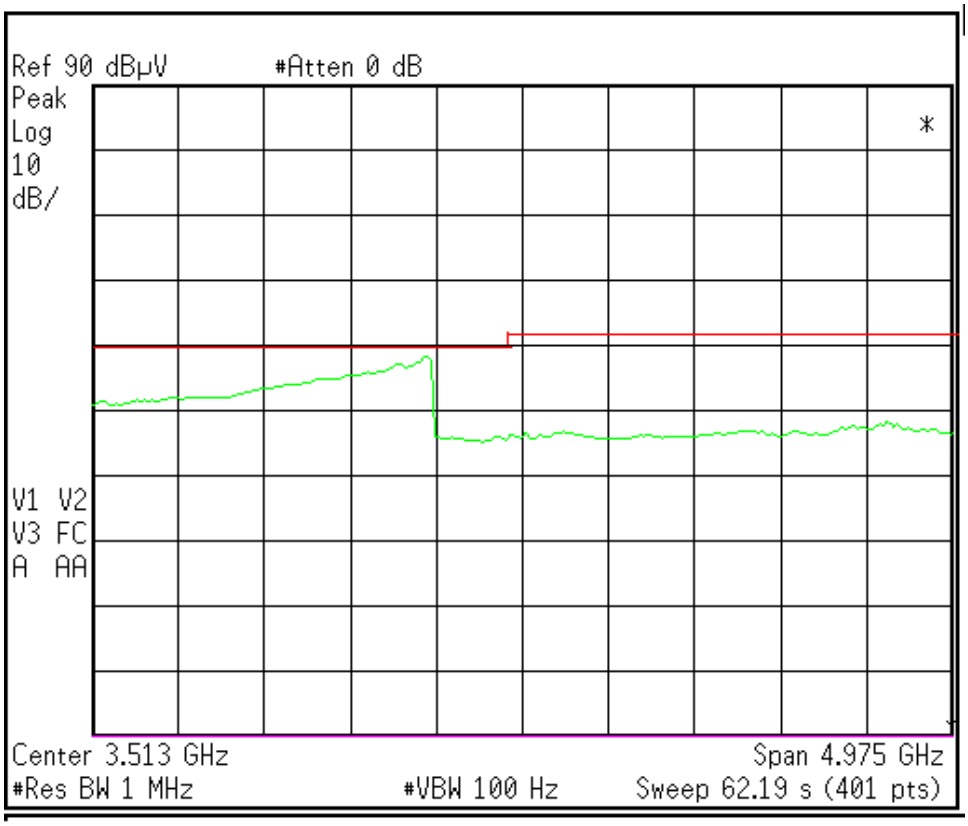


Figure 3A Radiated Emissions – 1 GHz to 6 GHz Average (Horizontal)

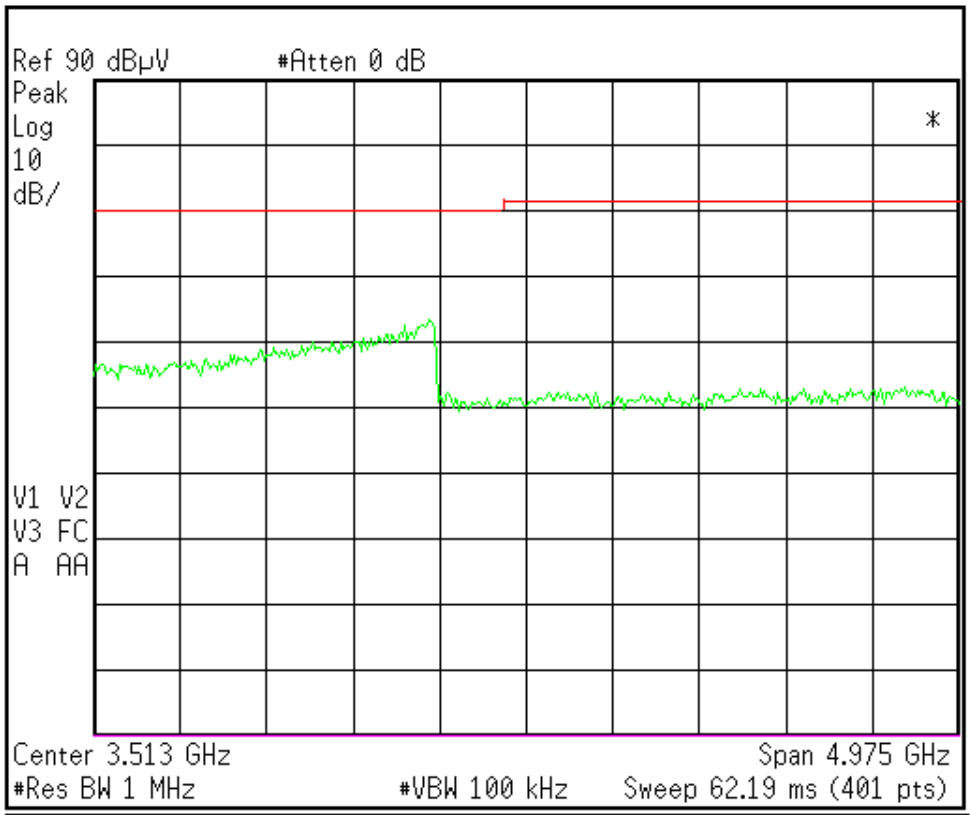


Figure 3B Radiated Emissions – 1 GHz to 6 GHz Peak (Horizontal)

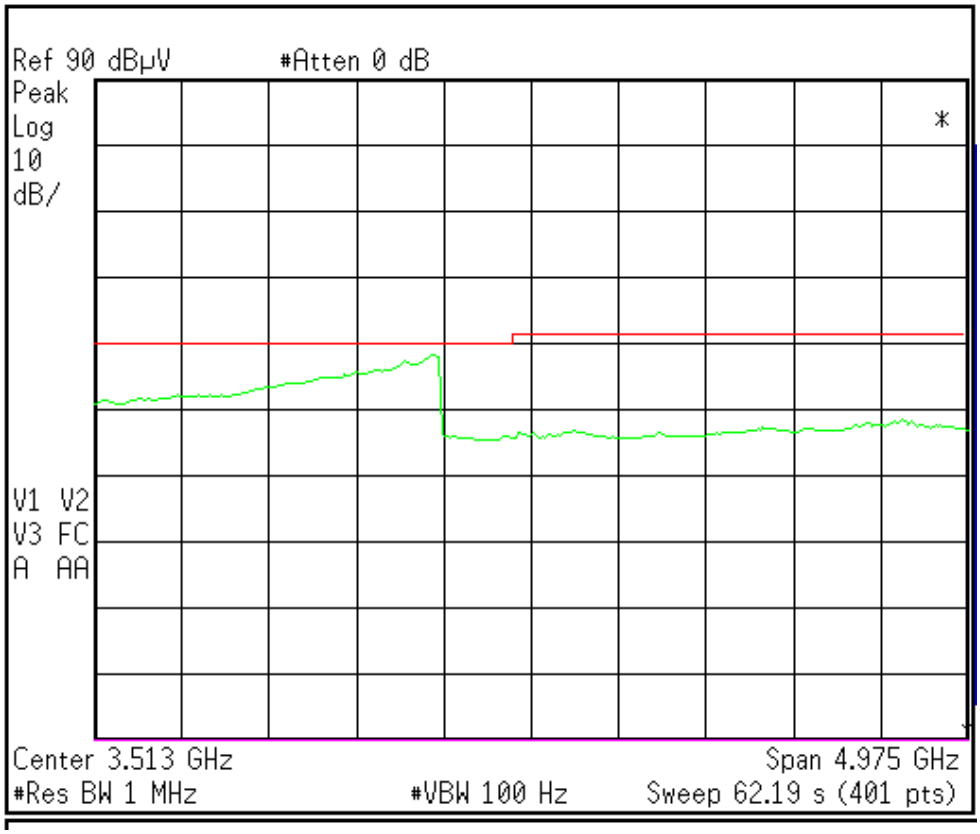


Figure 4A Radiated Emissions – 1 GHz to 6 GHz Average (Vertical)

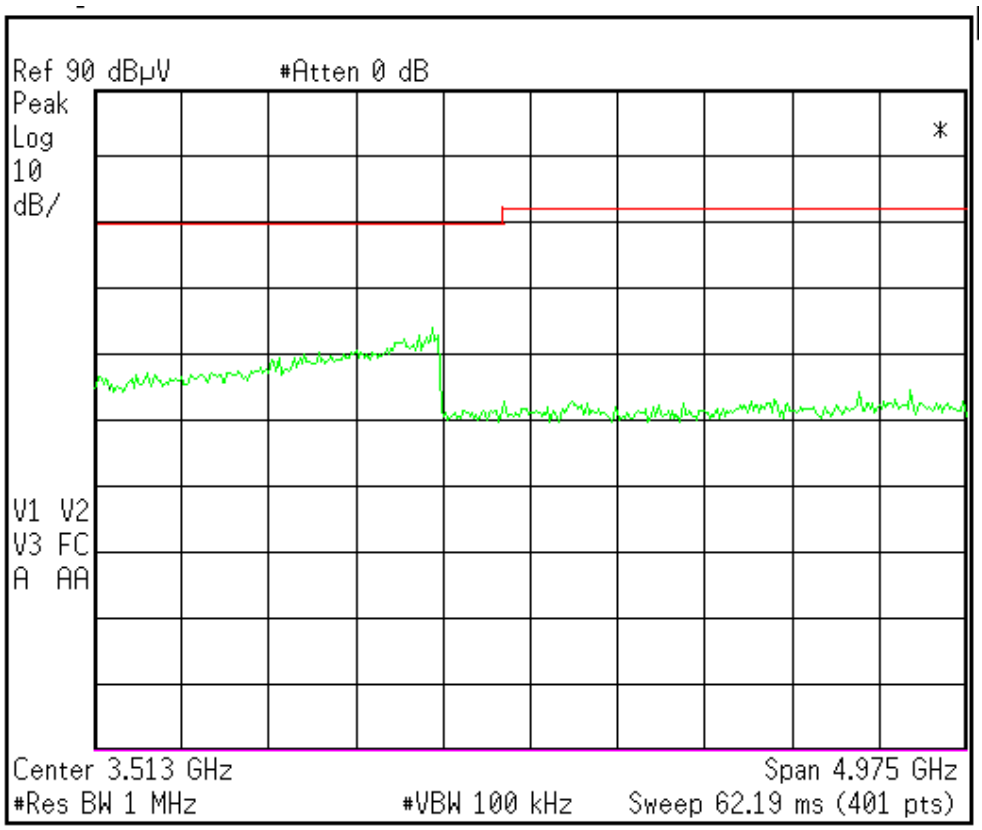


Figure 4B Radiated Emissions – 1 GHz to 6 GHz Peak (Vertical)

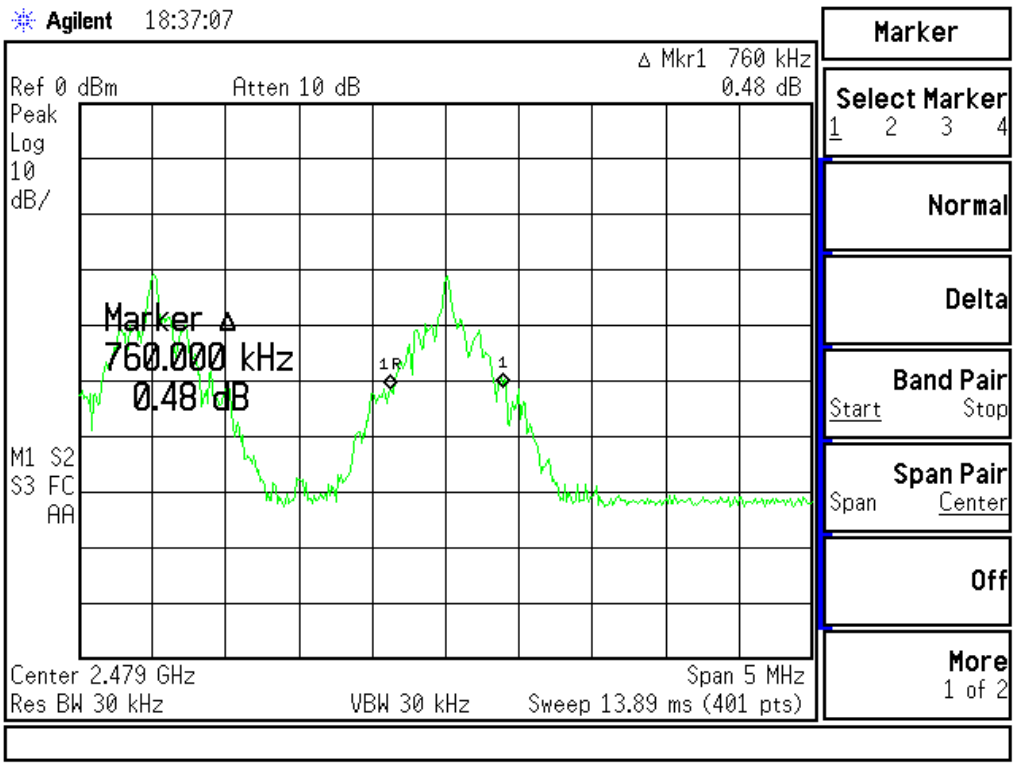


Figure 5. Modulated output 20dB bandwidth

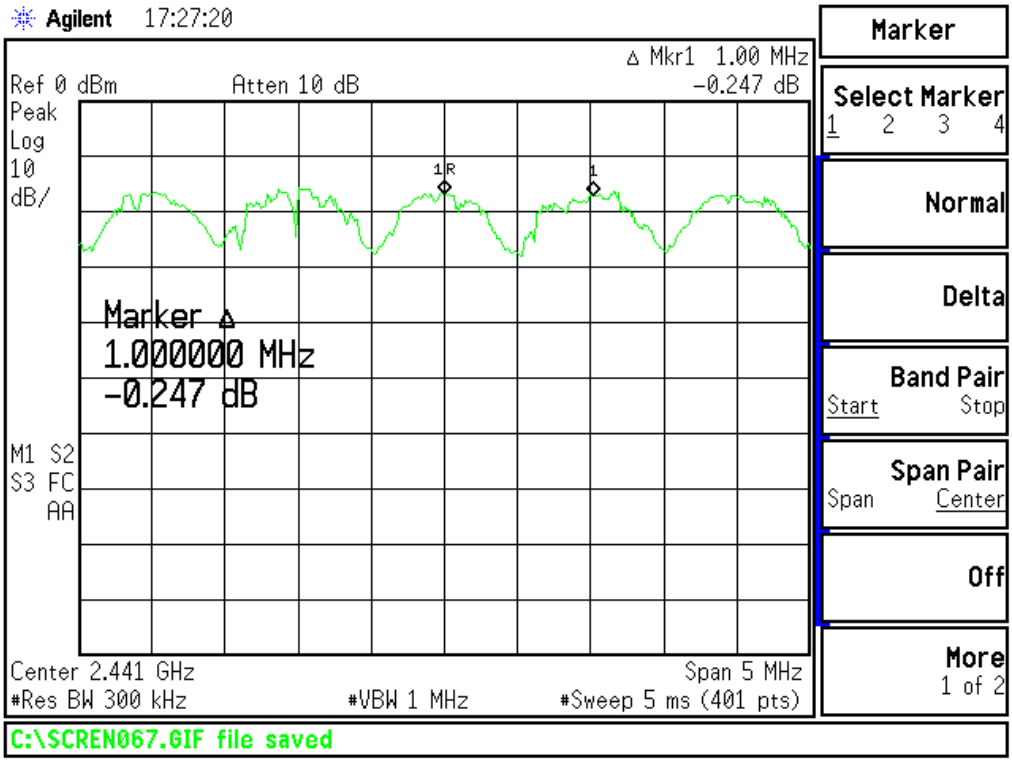


Figure 6. Carrier frequency channel separation

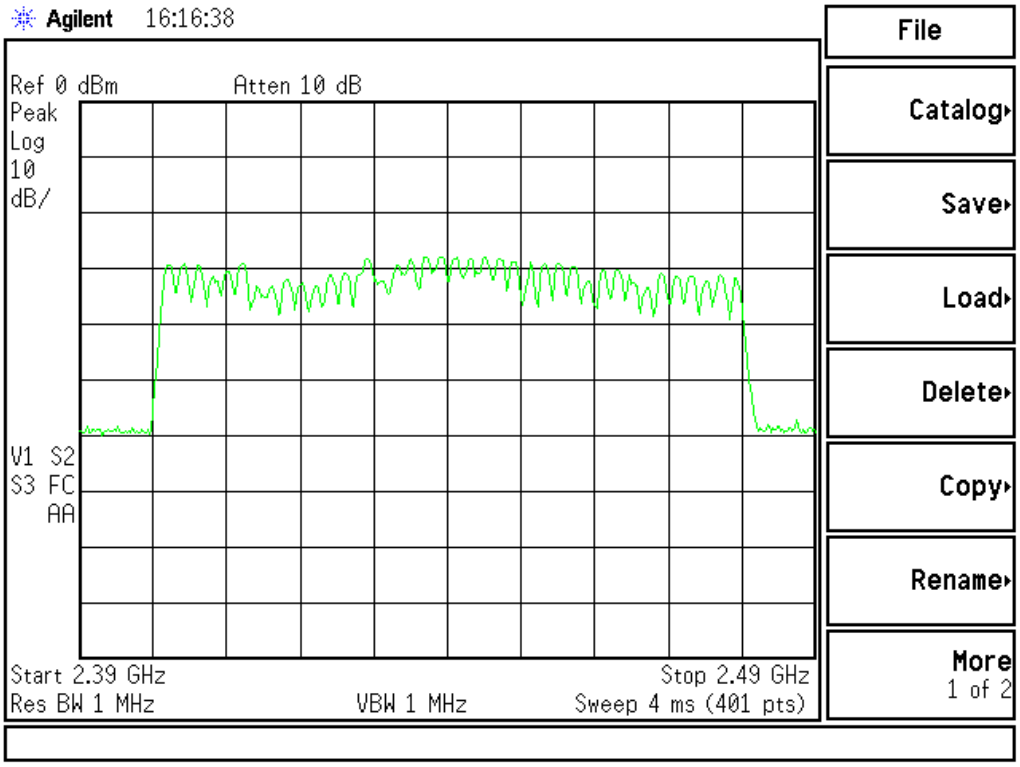


Figure 7. Number of channels, band edges

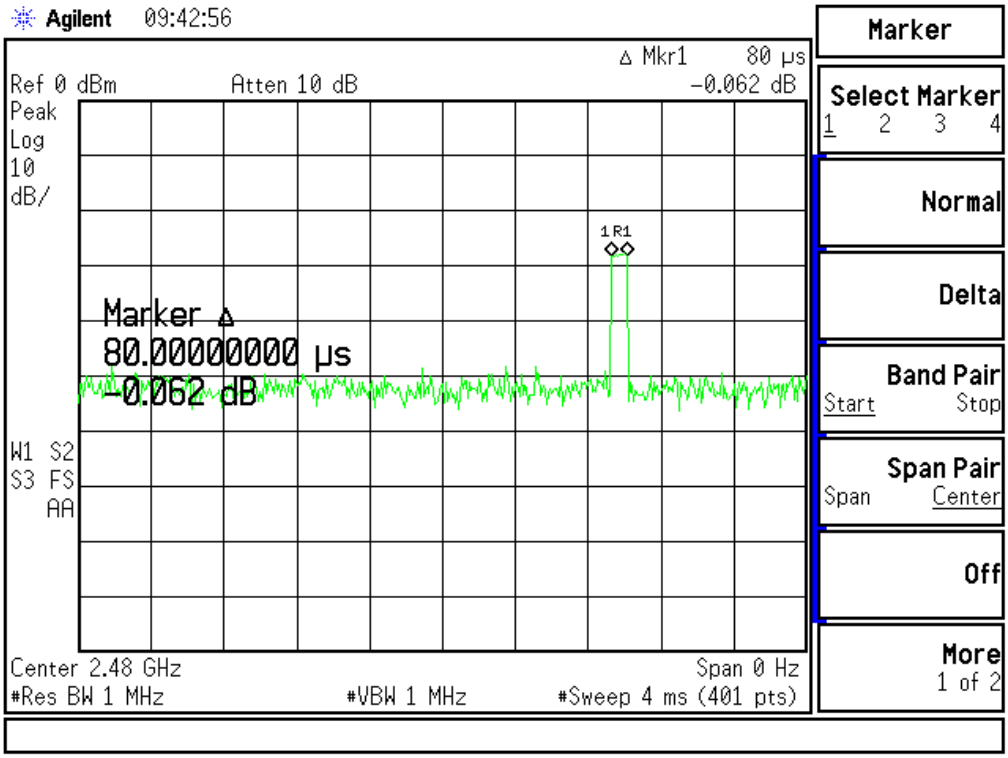


Figure 8. Pulse width of modulation

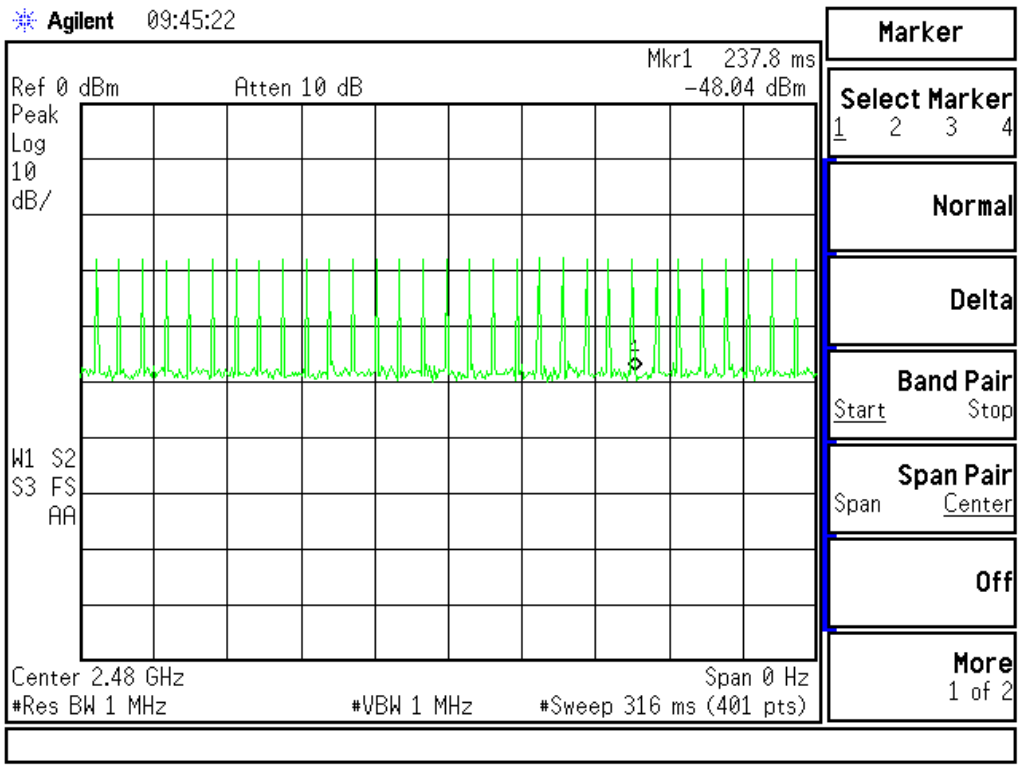


Figure 9. Number of pulses in .316 seconds observation period

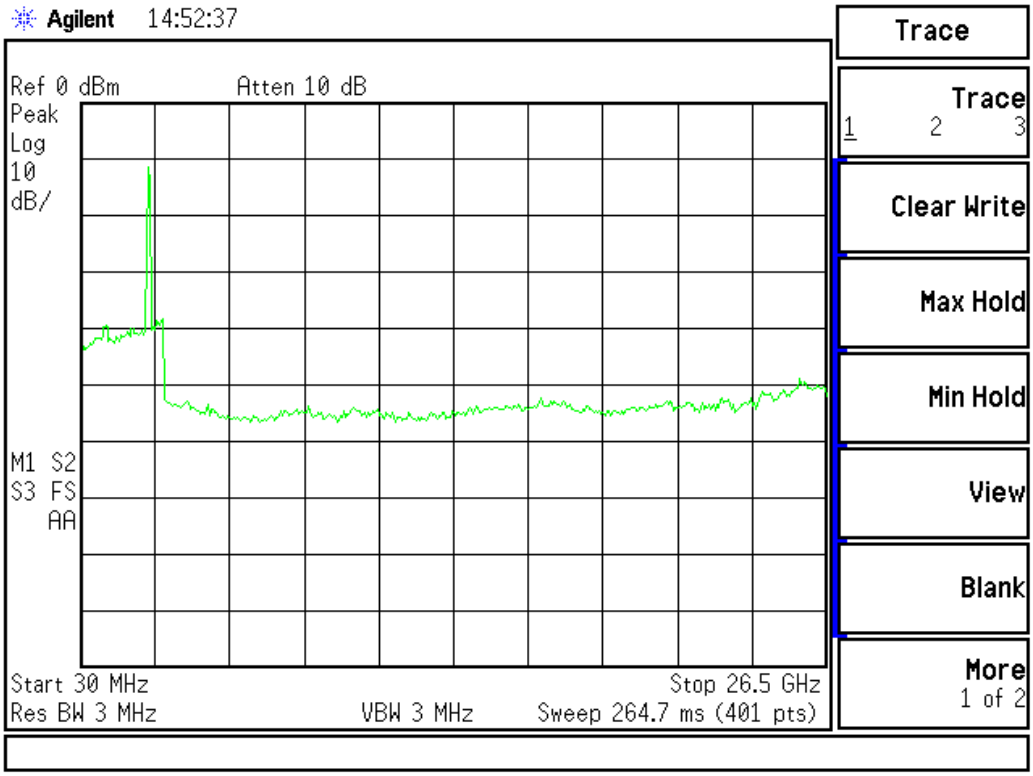
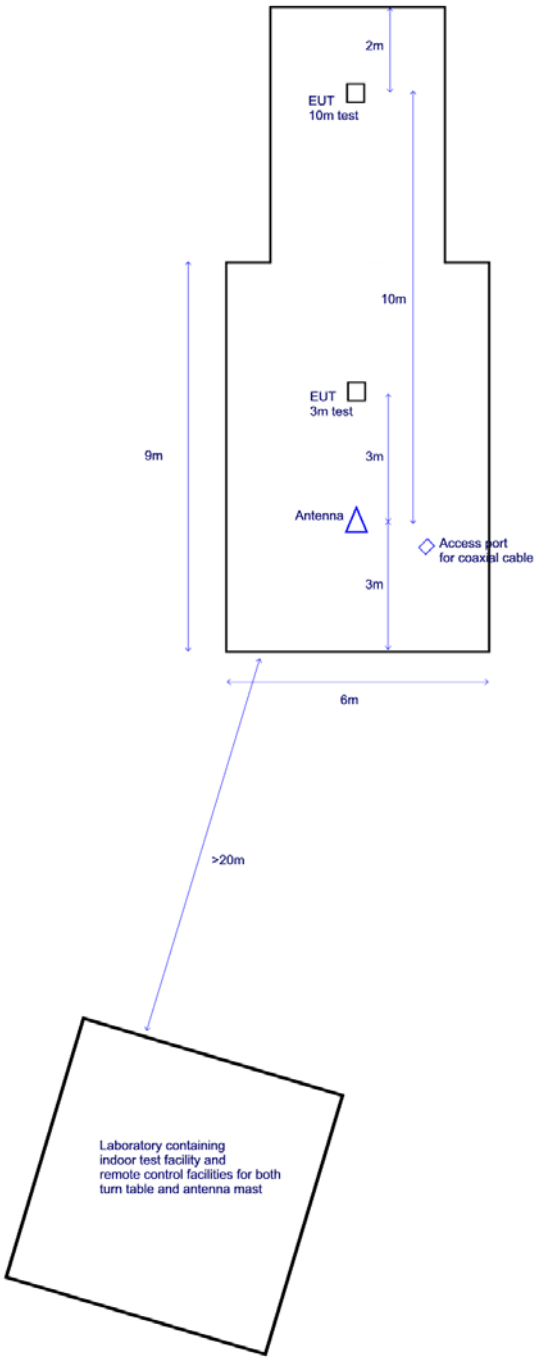


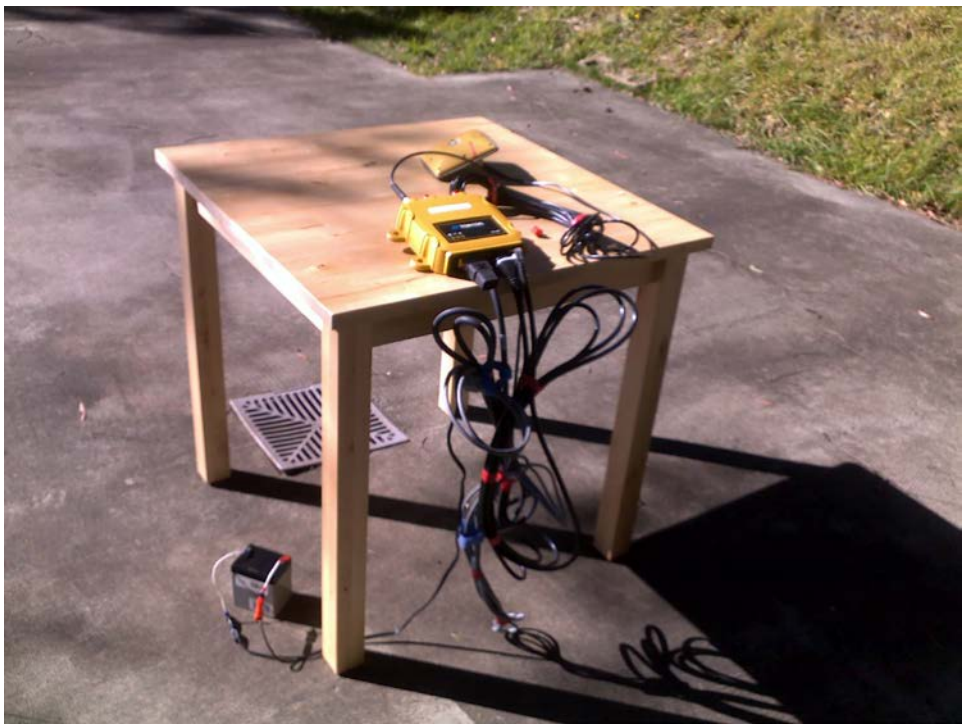
Figure 10. Spurious emissions TX on

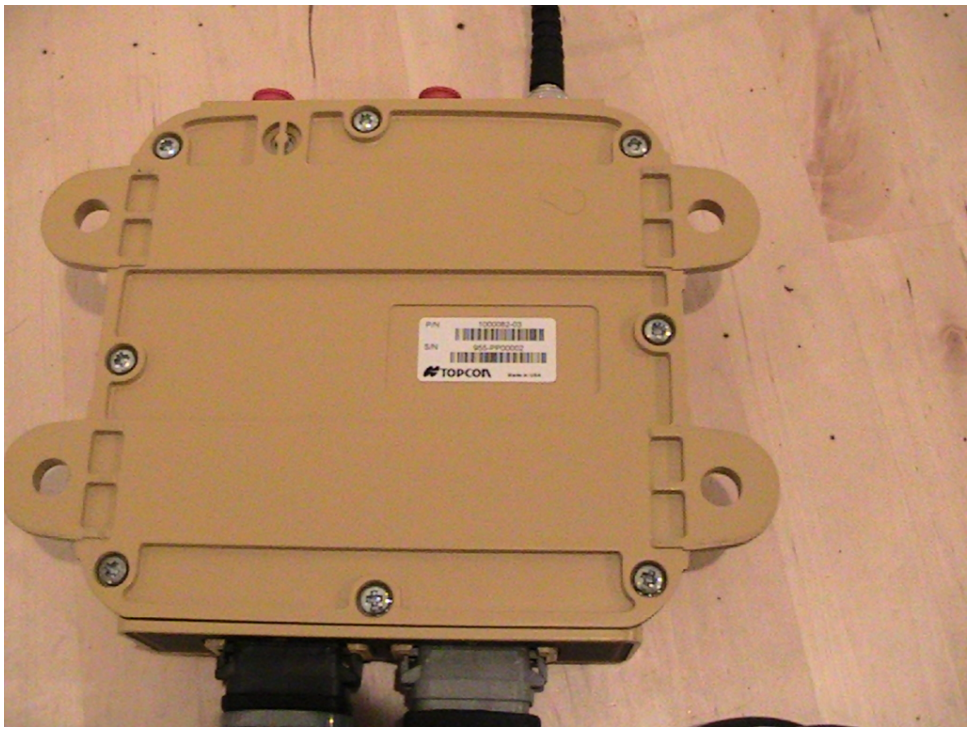
9. Test Facility

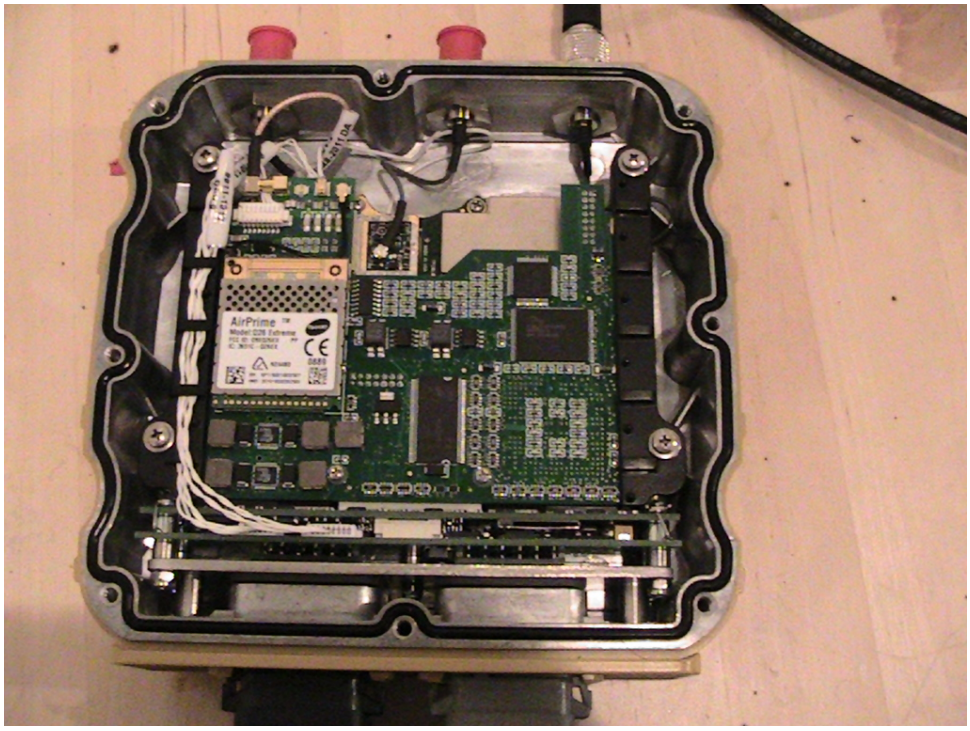
EMC Services Hampton Test Facility

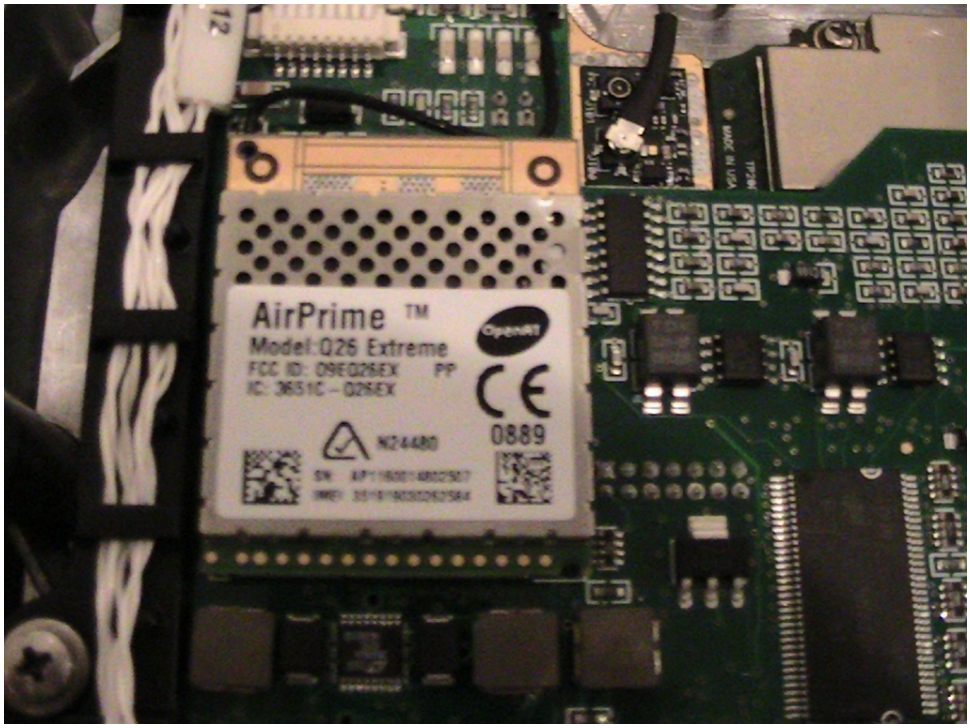


10. Photographs









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 his own 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.