Report No.: 131217045GZU-001
Issued: 03 Jan., 2014

TEST REPORT

Applicant Name & Address	:	SimpliSafe, Inc. 1035 Cambridge St Suite 18A
Sample Description		
Product	:	Glassbreak Sensor
Model No.	:	SSGB1
Electrical Rating	:	3V DC(CR123 lithium battery)
FCC ID	:	U9K-GB1000
Date Received	:	20 Dec., 2013
Date Test Conducted	:	20 Dec., 2013 – 03 Jan., 2014
Test standards	:	FCC Part 15:2011
Test Result	:	Pass
Conclusion	:	The submitted samples complied with the above rules/standards.
Remark		None.

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Prepared and Check By:

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03 Jan., 2014 Date

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1 General Description

1.1 Product Description

The equipment under test (EUT) is a Glassbreak Sensor, it is programmed to “listen” for the specific frequency of glass breaking, when a glass breaking is detected, the EUT will transmit a signal at 433.92MHz to the Base Station.
The EUT is powered by 3V DC.

Antenna Type: PCB antenna.

1.2 Related Submittal(s) Grants

N/A.

1.3 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.10 (2009). Radiated Emission measurement was performed in a Semi-anechoic chamber. Preliminary scans were performed in the Semi-anechoic chamber only to determine worst case modes. For each scan, the procedure for maximizing emissions in clause 6.5 & 6.6 of ANSI C63.10 (2009) were followed. All Radiated tests were performed at an antenna to EUT distance of 3 meters unless stated otherwise.

1.4 Test Facility

All of the tests are performed at:
Intertek Testing Services Shenzhen Ltd. Guangzhou Branch located at Block E, No.7-2 Guang Dong Software Science Park, Caipin Road, Guangzhou Science City, GETDD Guangzhou, China. This test facility and site measurement data have been fully placed on file with the FCC, test firm registration number is 549654.

2 System Test Configuration

2.1 Justification

The equipment under test (***EUT***) was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.10 (2009).

The EUT was operated standalone and placed in the centre of the turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes. For maximizing emission at and above 30 MHz, 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. This step by step procedure for maximizing emissions led to the data of clause 3.3 in the report.

2.2 EUT Exercising Software

There was no special software to exercise the device.

2.3 Special Accessories

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

2.4 Equipment Modification

Any modifications installed previous to testing by SimpliSafe, Inc. will be incorporated in each production model sold/leased in the United States. No modifications were installed by Intertek Testing Services Shenzhen Ltd. Guangzhou Branch.

2.5 Measurement Uncertainty

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

2.6 Support Equipment List and Description

N/A

3 Radiated 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.

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

→ FS = RA + Correct Factor + AV

Where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
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
Correct Factor = AF + CF – AG + PD

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

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

RA = 62.0 dBµV
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0 dB
AV = -10 dB

Correct Factor = 7.4 + 1.6 – 29.0 + 0 = -20 dB
FS = 62 + (-20) + (-10) = 32 dBµV/m
Level in µV/m = Common Antilogarithm [(32 dBµV/m)/20] = 39.8 µV/m

3.2 Radiated and Spurious Emission Data

The following data shows the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.
Judgement: Passed by 3.8 dB at 433.9MHz.

Test mode: transmitting mode

Radiated Emissions
Pursuant to FCC 15.231(a): Emissions Requirement

Below 1GHz

Polarization	Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB)	Peak Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	433.9	52.2	18.8	71.0	80.8	-9.8
Horizontal	730.2	19.4	23.3	42.7	60.8	-18.1
Horizontal	867.9	23.3	26.3	49.6	60.8	-11.2
Vertical	542.4	23.9	20.7	44.6	60.8	-16.2
Vertical	651.0	19.2	22.2	41.4	60.8	-19.4
Vertical	867.8	25.7	26.3	52.0	60.8	-8.8

Polarization	Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB)	Peak Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Vertical	433.9	65.5	18.8	84.3	100.8	-16.5

Polarization	Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB)	Average Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Vertical	433.9	65.5	18.8	-7.3	77.0	80.8	-3.8

Radiated Emissions

Pursuant to FCC 15.231(a): Emissions Requirement

Above 1GHz

Polarization	Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB)	Peak Net at 3m (dBµV/m)	AV Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	2603.4	66.9	-7.2	59.7	60.8	-1.1
Horizontal	3037.3	61.5	-4.0	57.5	60.8	-3.4
Vertical	1301.6	54.0	-12.8	41.2	54.0	-12.8
Vertical	2603.6	62.2	-7.2	55.0	60.8	-5.8
Vertical	3037.6	62.1	-4.0	58.1	60.8	-2.8

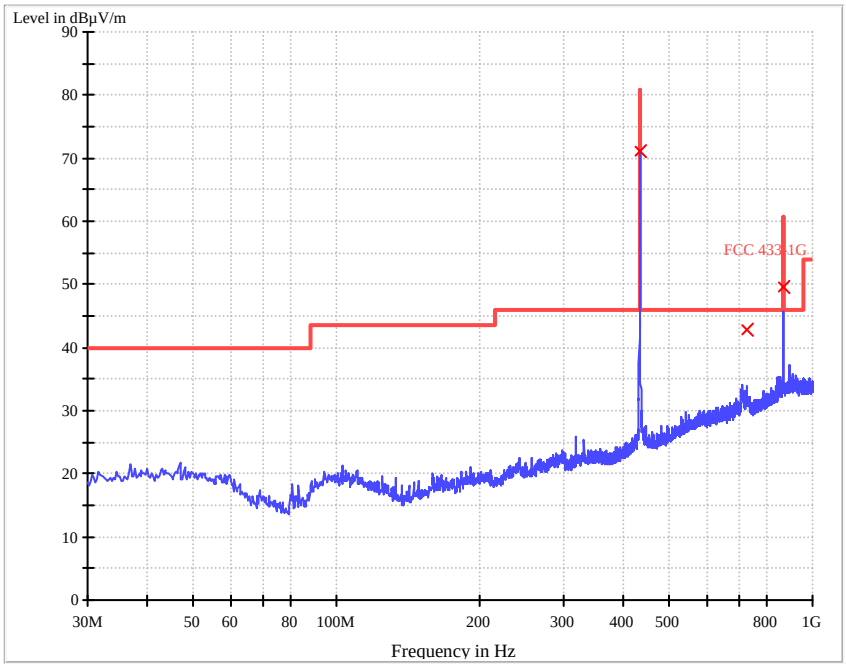
Polarization	Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB)	Peak Net at 3m (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	1301.9	66.9	-12.8	54.1	74.0	-19.9

Polarization	Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB)	Average Factor (dB)	Net at 3m (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	1301.9	66.9	-12.8	-7.3	46.8	54.0	-7.2

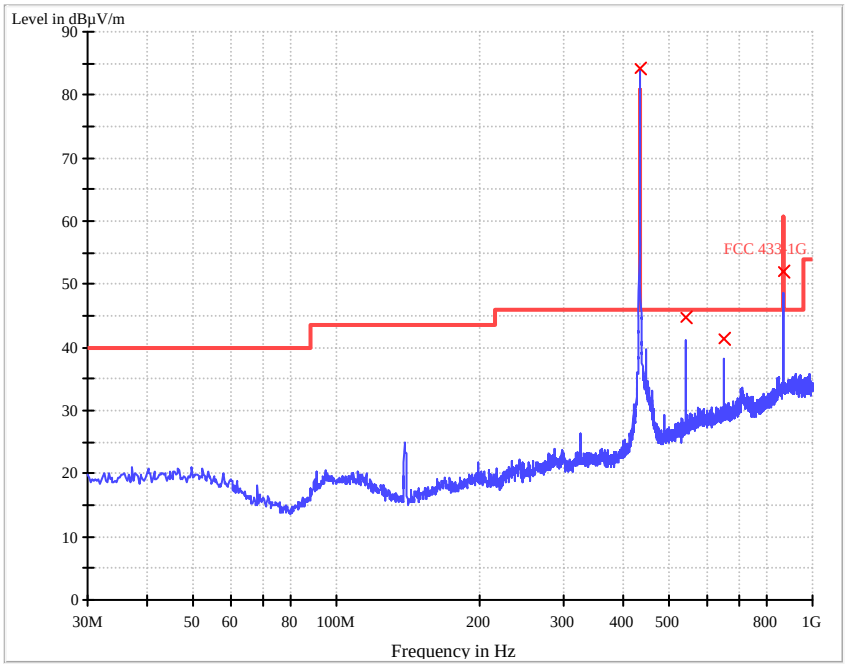
Notes:
1. Peak detector was used for measurement.
2. All measurements were made at 3 meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.

Test Curve below 1GHz :

Horizontal:



Vertical:

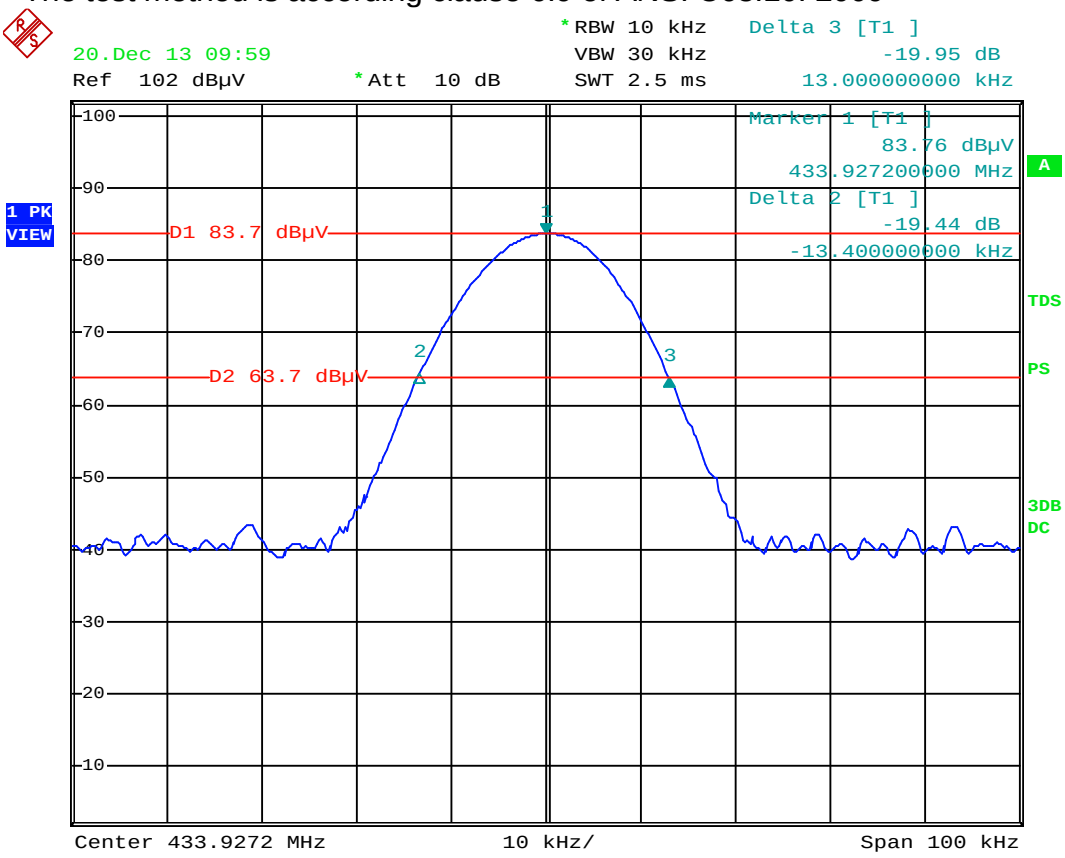


4 Bandwidth and Timing

This miscellaneous information includes details of the measured bandwidth and Timing plot.

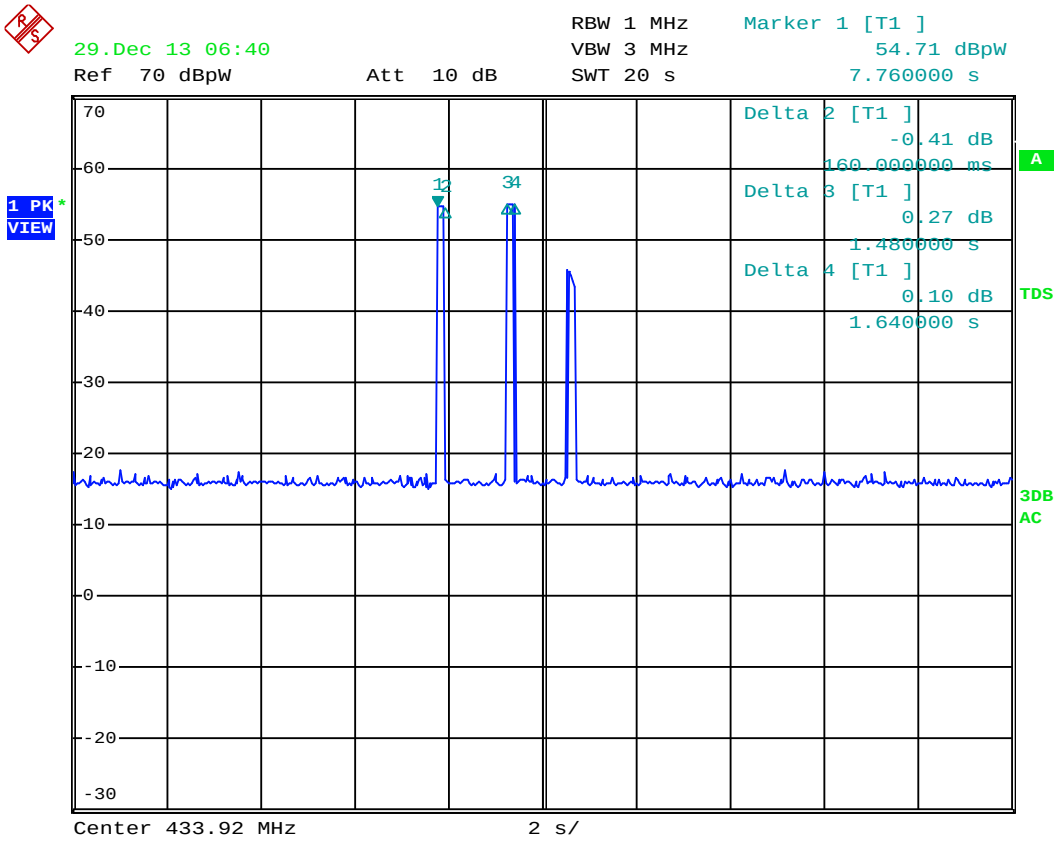
4.1 Bandwidth Plot

The test method is according clause 6.9 of ANSI C63.10: 2009



The plot shows the fundamental emission when modulated.
From the plot, the bandwidth is observed to be 26.4kHz at 20 dB where the bandwidth limit is 433.92 x 0.0025 = 1.08MHz.

4.2 *Timing Plot*



The plot shows the fundamental emission when modulated.

From the plot, the active timing is observed to 160ms, where required by clause 15.231 of FCC Part 15: “A transmitter activated automatically shall cease transmission within 5 seconds after activation.” The product is deemed to fulfill the requirement.

4.3 *Calculation of Average Factor*

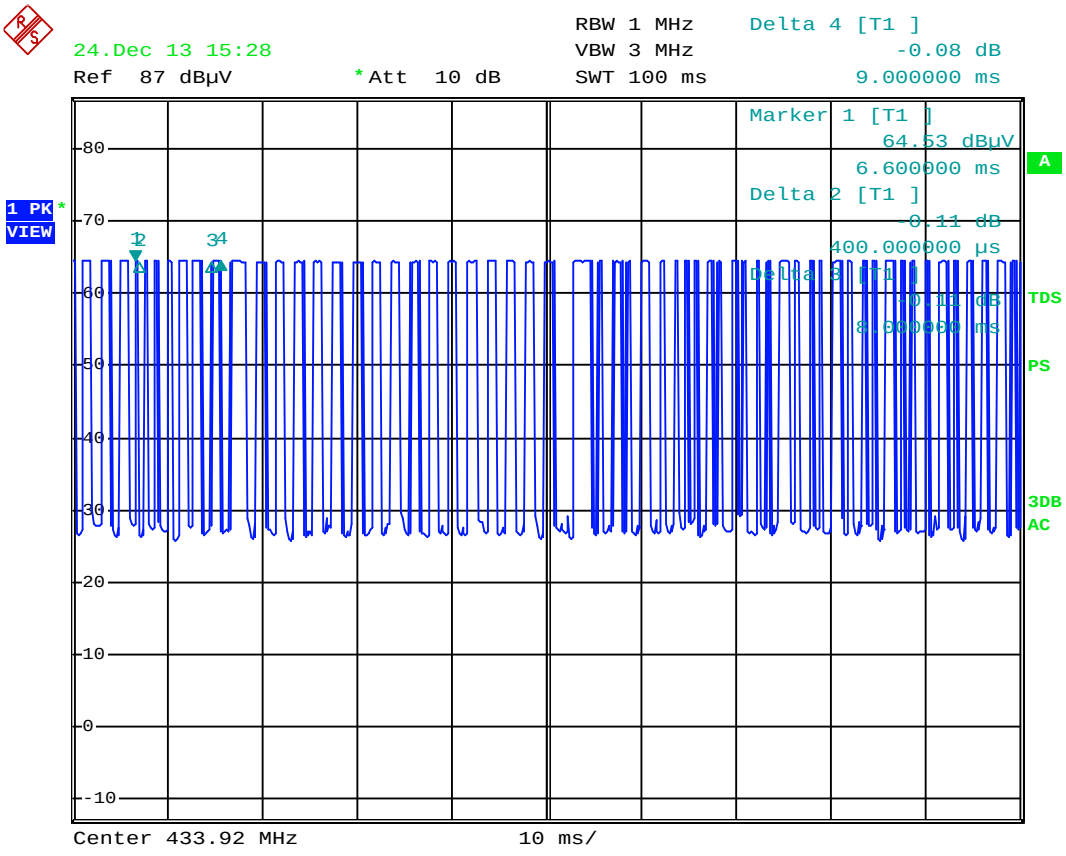
Averaging factor in dB = 20 log (duty cycle)

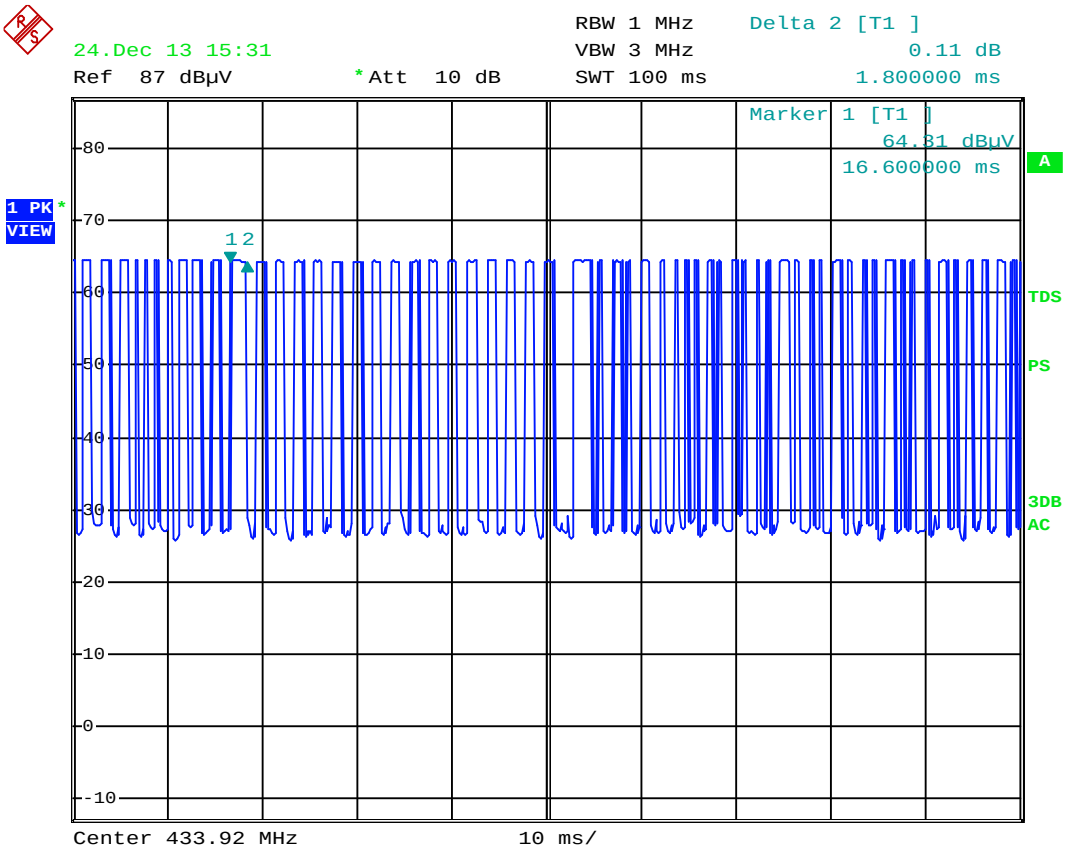
The specification for output field strengths in accordance with the FCC rules specify measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor

can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation. The duty cycle is measured by placing the spectrum analyzer in zero scan (receiver mode) and linear mode at maximum bandwidth (3 MHz at 3 dB down) and viewing the resulting time domain signal output from the analyzer on a Tektronix oscilloscope. The oscilloscope is used because of its superior time base and triggering facilities.

A plot of the worst-case duty cycle as detected in this manner is shown below.





The duty cycle is simply the on-time divided by the period:

The duration of one cycle =100ms
Effective period of the cycle = (0.4×27+1×29+1.8×2)ms=43.4ms

DC =43.4/100=0.434 or 43.4%

Therefore, the averaging factor is found by 20lg0.434=-7.25

4.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services 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 C63.10 : 2009.
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.
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. A detailed description for the calculation of the average factor can be found in 4.3 of the report.
The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.

4.5 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.

The IF bandwidth used for measurement of radiated signal strength was 10 kHz for emission below 30 MHz and 120 KHz for emission from 30 MHz to 1000 MHz. Where transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. Above 1000 MHz, a resolution bandwidth of 1 MHz is used.
Transmitter measurements are normally conducted at a measurement distance of three meters.

5 Equipment list

Equipment No.	Equipment	Manufacturer	Model No.	Cal. Date	Due Date
EM031-02	EMI Test Receiver	R&S	R&S ESR7	03-Jun-2013	03-Jun-2014
EM061-03	Bilog Antenna	SCHWARZBECK	VULB 9161	25-May-2013	25-May-2014
EM031-02-01	Coaxial cable	R&S	/	03-Jun-2013	03-Jun-2014
EM031-03	Spectrum Analyzer	R&S	R&S FSV40	03-Jun-2013	03-Jun-2014
EM033-02	Horn Antenna	R&S	R&S HF907	25-May-2013	25-May-2014
EM031-02-01	Coaxial cable	R&S	/	03-Jun-2013	03-Jun-2014
EM080-05	EMI receiver	R&S	ESCI	26-Oct-2013	26-Oct-2014
EM033-02-01	Signal Amplifier	R&S	R&S SCU-18	25-May-2013	25-May-2014