Report No.: 130614076GZU-001
Issued: 22 July 2013

TEST REPORT

Applicant Name & Address	:	Zhongshan Grand Enterprise Co.,Ltd No.2 Yihui North Road,Zone B, Maohui Industry,Henglan Town, Zhongshan City, Guangdong, China. 528478
Sample Description		
Product	:	Super switch
Model No.	:	CZ2003-2+3
Electrical Rating	:	12V DC(1 x L1028)
FCC ID	:	2AAK4FCGRAND
Date Received	:	14 June 2013
Date Test Conducted	:	18 June 2013 – 16 July 2013
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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22 July 2013 Date

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1 General Description

1.1 Product Description

The equipment under test (EUT) is a controller for Wireless Wall Outlet at 315 MHz. The EUT is powered by 12V DC.

During normal use, it sends the signal to control the on/off of the Wall Outlet by manual.

Antenna Type: wire antenna.

1.2 Related Submittal(s) Grants

The FCC ID of corresponding receiver for this transmitter is 2AAK4GRAND.

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:
Keyway Technology Co.,Ltd. located at Baishun Industrial Zone, Zhangmotou Town, Dongguan, Guangdong, China 523638. This test facility and site measurement data have been fully placed on file with the FCC, test firm registration number is 370994.

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 center 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 Zhongshan Grand Enterprise Co.,Ltd 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 3.16 dB at 631.40MHz

Test mode: transmitting mode

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

Below 1GHz

Polarization	Frequency (MHz)	QP Reading (dBµV)	Correction Factor (dB)	QP Net at 3m (dBµV/m)	QP Limit at 3m (dBµV/m)	QP Margin (dB)
Horizontal	34.85	28.56	-14.88	13.68	40.00	-26.32
Horizontal	248.25	32.65	-16.41	16.24	46.00	-29.76
Horizontal	786.60	30.48	-3.47	27.01	46.00	-18.99
Vertical	99.84	32.05	-20.82	11.23	43.50	-32.27
Vertical	224.00	34.97	-17.27	17.70	46.00	-28.30
Vertical	493.66	32.02	-9.22	22.80	46.00	-23.20

Polarization	Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB)	Peak Net at 3m (dBµV/m)	AV Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	316.15	78.72	-14.68	64.04	75.63	-11.59
Horizontal	631.40	58.39	-5.92	52.47	55.63	-3.16
Horizontal	946.65	46.69	-0.12	46.57	55.63	-9.06
Vertical	316.15	66.44	-14.68	51.76	75.63	-23.87
Vertical	631.40	54.32	-5.92	48.40	55.63	-7.23
Vertical	946.65	37.02	-0.12	36.90	55.63	-18.73

Radiated Emissions

Pursuant to FCC 15.231(a): Emissions Requirement

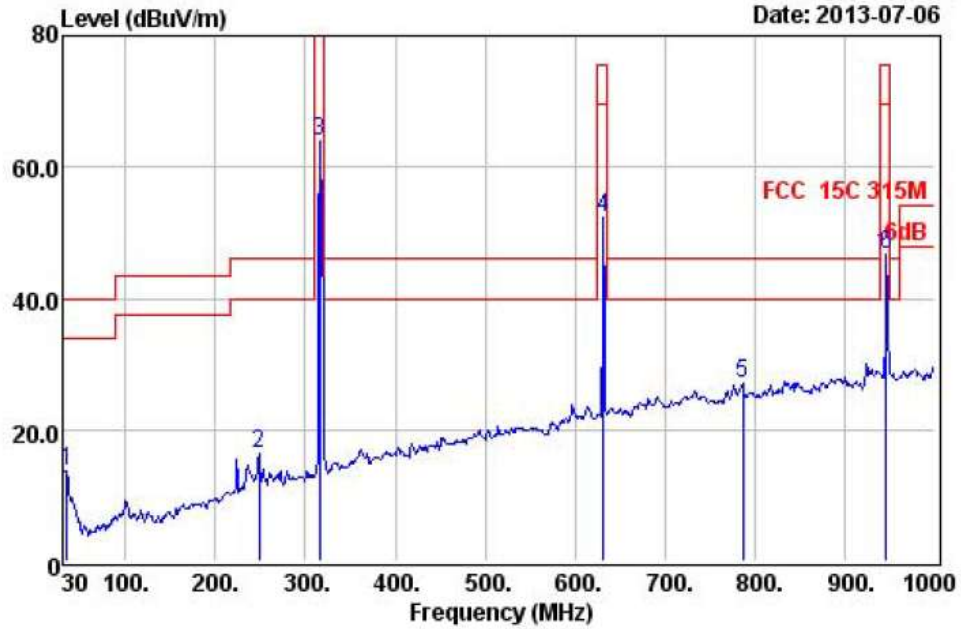
Above 1GHz

Polarization	Frequency (MHz)	Peak Reading (dBµV)	Correction Factor (dB)	Peak Net at 3m (dBµV/m)	AV Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	1770.00	32.30	6.73	39.03	54.00	-14.97
Horizontal	2770.00	28.47	11.85	40.32	54.00	-13.68
Horizontal	3795.00	28.29	14.43	42.72	54.00	-11.28
Vertical	1849.00	26.17	12.18	38.35	54.00	-15.65
Vertical	2761.00	26.43	13.15	39.58	54.00	-14.42
Vertical	3811.00	26.91	15.19	42.10	54.00	-11.90

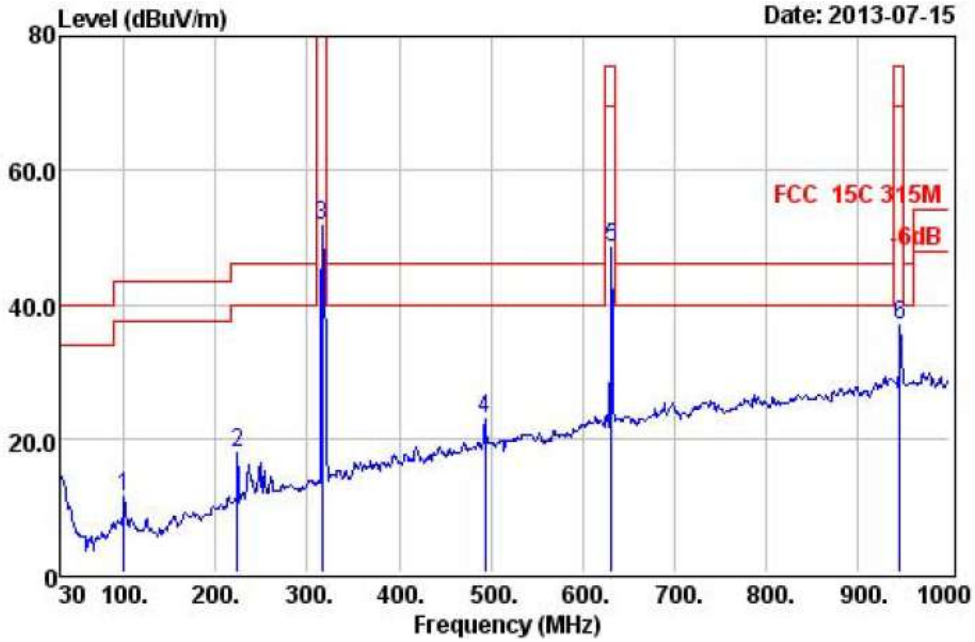
Notes:
1. For fundamental and spurious below 1GHz, Peak detector was used; Other emissions below 1GHz, QP detector was used. For above 1GHz: Peak detector was used.
2. All measurements were made at 3 meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.
5. Peak value complied with AV limit, so no AV value was measured.

Test Curve below 1GHz :

Horizontal:



Vertical:

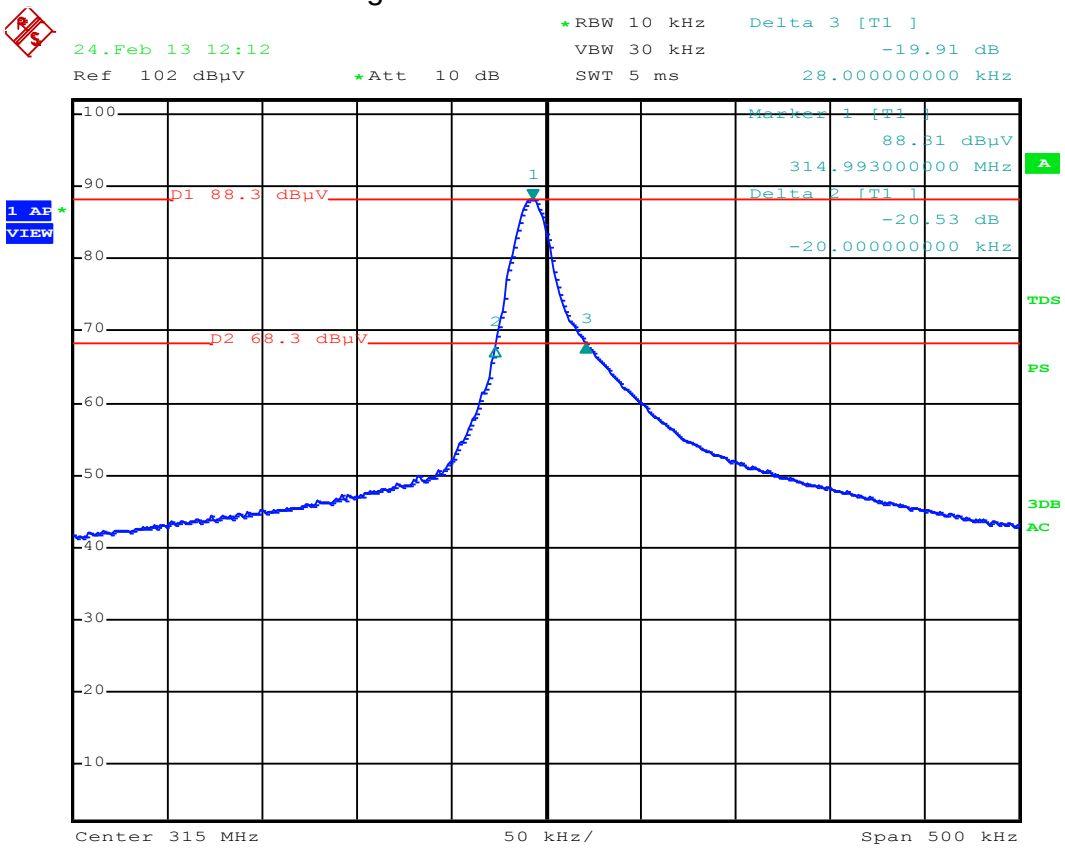


4 Bandwidth and Timing

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

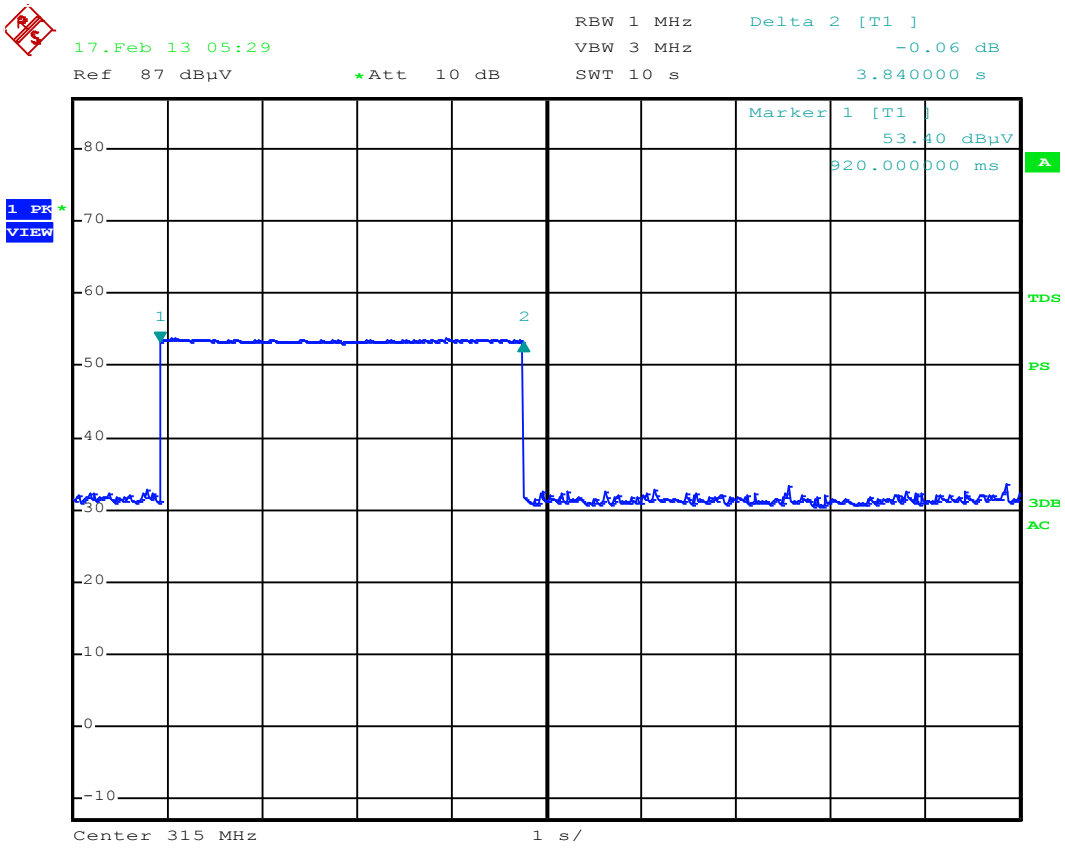
4.1 Bandwidth Plot

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 48.0kHz at 20 dB where the bandwidth limit is 314.993 x 0.0025 = 787.48MHz.

4.2 *Timing Plot*



The plot shows the fundamental emission when modulated.

From the plot, the active timing is observed to be 3.84s, where required by clause 15.231 of FCC Part 15: “A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.” The product is deemed to fulfill the requirement.

4.3 *Calculation of Average Factor*

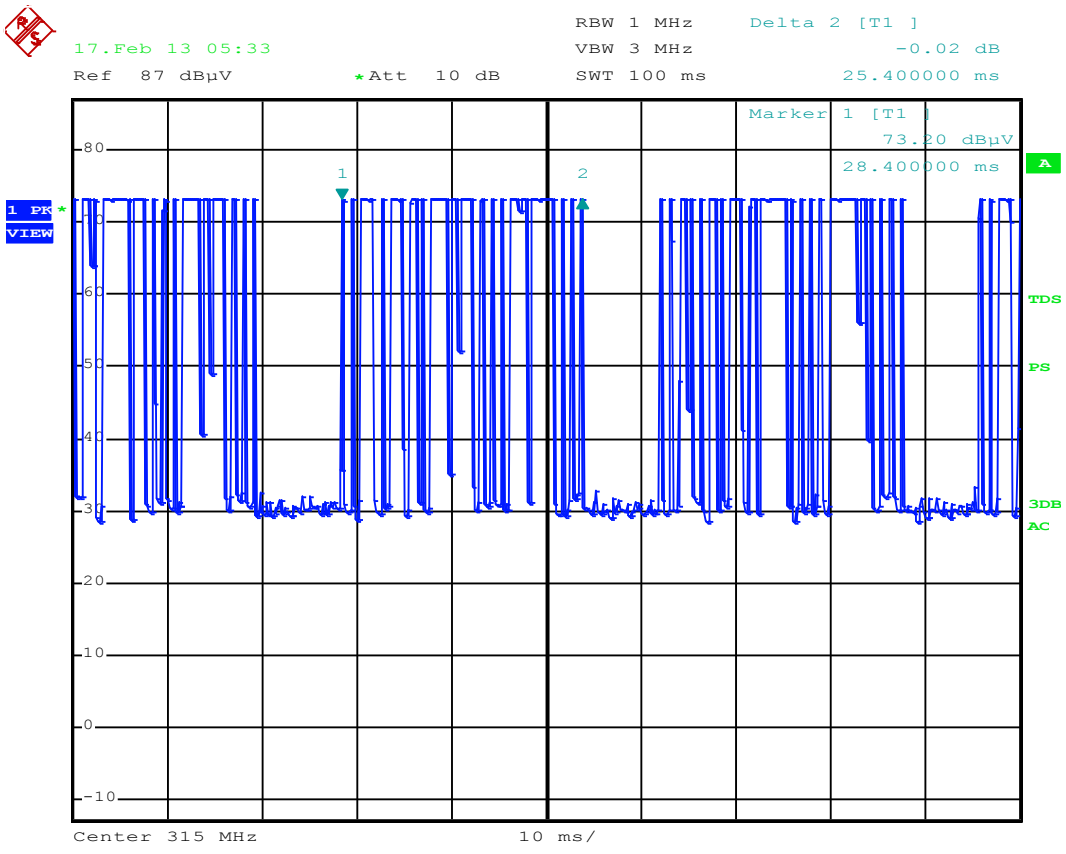
Averaging factor in dB = 20 log (duty cycle)

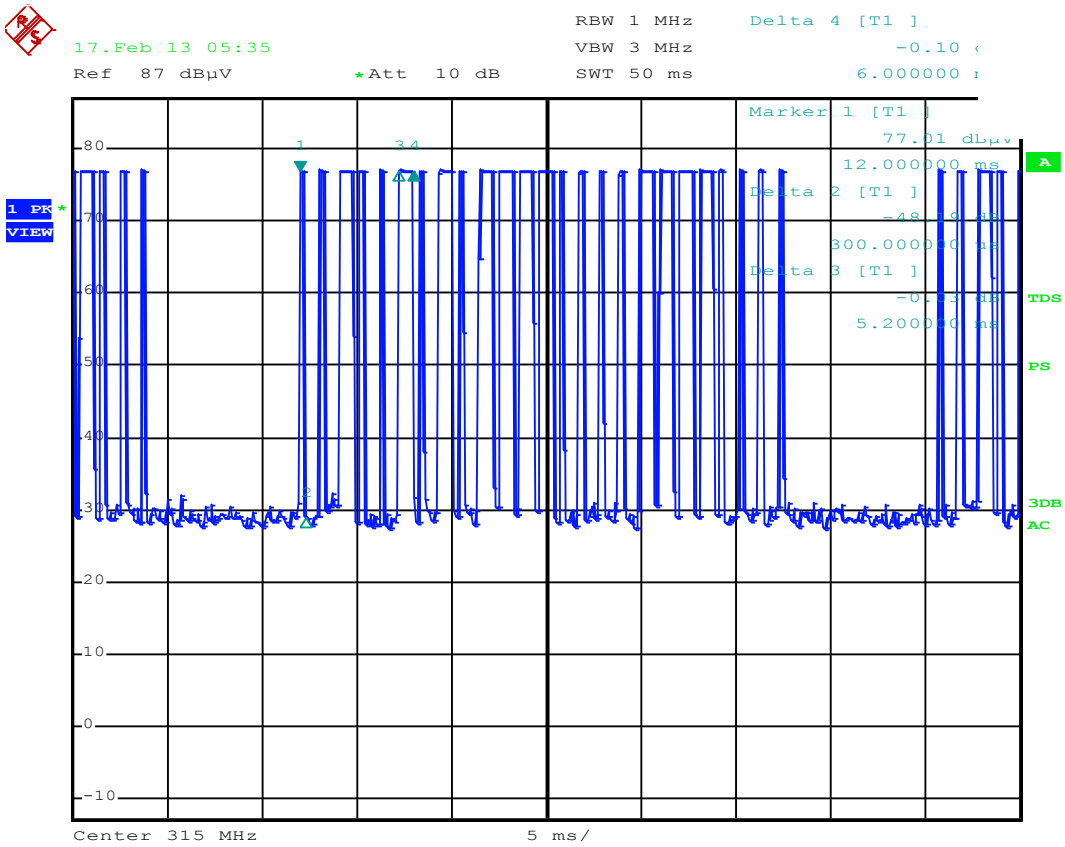
The specification for output field strengths in accordance with the FCC rules specify measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor

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 =25.4ms
Effective period of the cycle =(0.3x14+0.8x11) ms=13 ms

DC =13/25.4=0.5118 or 51.18%

Therefore, the averaging factor is found by 20lg0.5118=-5.82

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
101156	EMI Test Receiver	Rohde&Schwarz	ESCI	07 Jul. 2013	07 Jul. 2014
00135452	Bilog Antenna	ETS-LINDGREN	3142D	28 Jun. 2013	28 Jun. 2014
3911A04271	Spectrum Analyzer	Agilent	8593E	28 Nov. 2012	28 Nov. 2013
KW01	3m Semi-anechoic Chamber	ETS-LINDGREN	966	07 Jul. 2013	07 Jul. 2014
187303	Signal Amplifier	SONOMA	310	07 Jul. 2013	07 Jul. 2014
966 Cable 1#	RF Cable	IMRO	IMRO-400	07 Jul. 2013	07 Jul. 2014
11003	Horn Antenna	DAZE	ZN30701	11 Jul. 2013	11 Jul. 2014
11001	Signal Amplifier	DAZE	ZN3380C	07 Jul. 2013	07 Jul. 2014
966 Cable 1#	RF Cable	IMRO	IMRO-400	07 Jul. 2013	07 Jul. 2014