

MEASUREMENT REPORT


(FCC : Part 15 Subpart C / ANSI C63.4-2003)




Testing Laboratory
1288

Product.....: Transmitter
Trade Name.....: Skytech II
Model No.....: SKY-5001/SKY-5301/SKY-5310/SKY-5010
Applicant.....: Skytech II, Inc.
Applicant Address.....: 9230 Conservation Way, Ft. Wayne, IN
46809, U.S.A.

Report Number	MLT0711P15003
Applicant	Skytech II, Inc.
Product	Transmitter
Sample Received Date	2007/11/20

Report Prepared By	Jesse Tien
Signature	
Date Prepared	2007/11/21 ~ 2007/11/26

Report Authorized By	Roger Chen
Signature	
Date Authorized	2007/11/27

Test By

Max Light Technology Co., Ltd.
 Room 5, 8F, No.125, Section 3 Roosevelt Road,
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 laboratory.

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CERTIFICATION

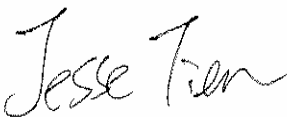
We here by verify that :


The test data, data evaluation, test procedures and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4-2003. All test were conducted by MLT(Max Light Technology Co.,Ltd) Room 5, 8F, No.125, Section 3 Roosevelt Road, Taipei, Taiwan, R.O.C Also, we attest to the accuracy of each.

We further submit that the energy emitted by the sample EUT tested as described in the report is in compliance with radiated emission limit of FCC Rules Part 15 Subpart C Section 15.231.

Applicant Name	Skytech II, Inc.
Applicant Address	9230 Conservation Way,Ft. Wayne,IN 46809,U.S.A.
Manufacturer Name	FEGO Precision Industrial Co., Ltd.
Manufacturer Address	947 LIN SEN RD., WU-FENG SHIANG TAICHUNG HSIEN R.O.C.

Equipment	Transmitter
Model No	SKY-5001 / SKY-5301 / SKY-5310 / SKY-5010
FCC ID	K9L5001

Report Prepared By	Jesse Tien
Signature	

Report Authorized By	Roger Chen
Signature	

I. GENERAL

1.1 Introduction

The following measurement report is submitted on behalf of Skytech II, Inc. In support of an Intentional Periodic Radiator certification in accordance with Part 2 Subpart J and Part 15 Subpart A And C of the Commission's and Regulations.

1.2 Customer Details

Applicant Name	Skytech II, Inc.
Applicant Address	9230 Conservation Way, Ft. Wayne, IN 46809, U.S.A.
Manufacturer Name	FEGO Precision Industrial Co., Ltd.
Manufacturer Address	947 LIN SEN RD., WU-FENG SHIANG TAICHUNG HSIEN R.O.C.

1.3 Technical data of EUT

Equipment	Transmitter
Model No	SKY-5001 / SKY-5301 / SKY-5310 / SKY-5010
FCC ID	K9L5001
Power Type	Powered by 6V Battery (AAA Size X4).

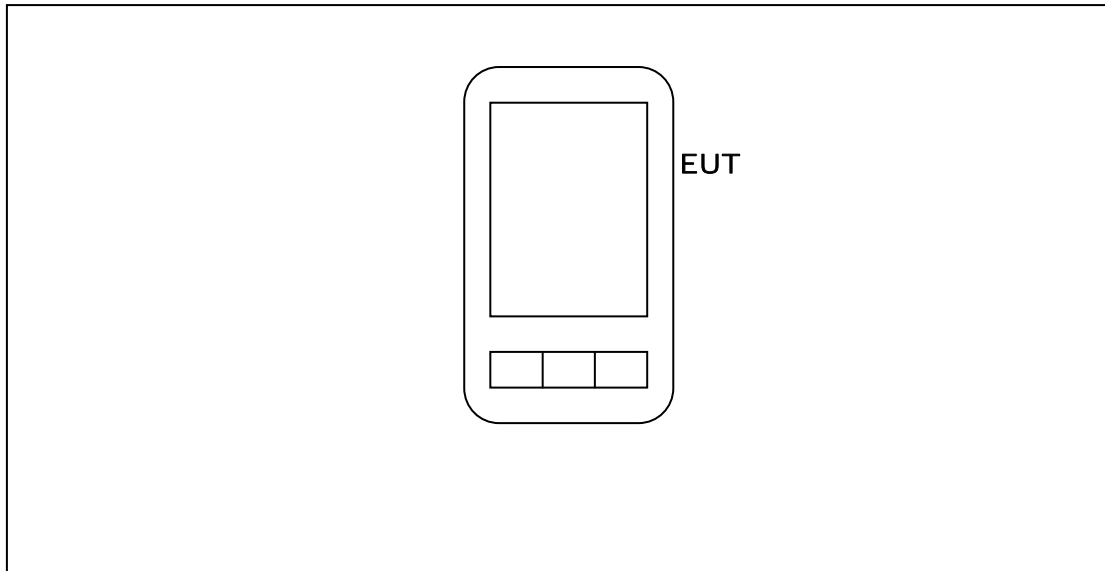
The EUT (SKY-5001 / SKY-5301) is remote transmitter. The operation frequency is 303.8Mhz. Press the button on remote transmitter, can set the Program ON / ON THERMO / THERMO OFF / OFF Continuous Pilot button.

Both of two samples have the same circuit and PCB layout, the only difference is model 5301 has 3 functions key and 5001 has none, the test result was obtained from the measurement of model 5301.

1.4 Description of Support Equipment

The EUT itself forms a system. No support equipment is required for its normal operation.

1.5 Configuration of System Under Test



1.6 Test Procedure

All measurements contained in this report were performed according to the techniques described in Measurement procedure ANSI C63.4: 2003 "Measurement of Intentional Radiators."

1.7 General Test Condition

The conditions under which the EUT operates were varied to determine their effect on the equipment's emission characteristics. The final configuration of the test system and the mode of operation used during these tests was chosen as that which produced the highest emission levels. However, only those conditions which the EUT was considered likely to encounter in normal use were investigated.



II. Conducted Emissions Requirements

The EUT operates solely by the battery. According to the rule of Section 15.207(d), the EUT is exempt from the power line conducted test.

III. Radiated Emissions Requirements

3.1 General Configuration:

Prior to open-field testing, the EUT was placed in a shielded enclosure and scanned at a close distance to determine its emission characteristics. The physical arrangement of the EUT was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude, directivity, and frequency. The exact system configuration which produced the highest emissions was noted so it could be reproduced later during the open-field tests. This was done to ensure that the final measurements would demonstrate the worst-case interference potential of the EUT.

3.2 General Configuration:

Final radiation measurements were made on a three-meter, open-field test site. The EUT system was placed on a nonconductive turntable which is 0.8 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 30 MHz to 5 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

A nonconductive material surrounded the EUT to supporting the EUT for standing on three orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

The field strength below 1 GHz was measured by EMCO Biconilog Antenna (mode 3142C) at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna (model BBHA9120D&9170) was used in frequencies 1 – 40 GHz at a distance of 3 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The actual field intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

$$(1) \text{ Amplitude (dBuV/m)} = \text{FI(dBuV)} + \text{AF(dBuV)} + \text{CL(dBuV)} - \text{Gain(dB)}$$

FI= Reading of the field intensity.

AF= Antenna factor.

CL= Cable loss.

P.S Amplitude is auto calculate in spectrum analyzer.

$$(2) \text{ Actual Amplitude (dBuV/m)} = \text{Amplitude (dBuV)} - \text{Duty(dB)} - \text{Dis(dB)}$$

The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:

(1) For fundamental frequency :

FUNDAMENTAL FREQUENCY (MHz), excluding restricted band frequencies of Table 2	FIELD STRENGTH OF FUNDAMENTAL microvolts/m at 3 metres, (watts, EIRP)(1)	FIELD STRENGTH OF UNWANTED EMISSIONS(1) microvolt/metre at 3 metres
40.66-40.70	See RSS-210 section 6.2.2(g).	
70-130	1,250 (470 nW)	125
130-174	1,250 to 3,750*	125 to 375
174-260 (note 1)	3,750 (4.2 uW)	375
260-470 (note 1)	3,750 to 12,500*	375 to 1,250
Above 470	12,500 (47 uW)	1250

Note : Use quasi-peak or averaging meter.

* Linear interpolation with frequency F in MHz:

For 130-174 MHz: FS (microvolts/m) = (56.82 x F) - 6136

For 260-470 MHz: FS (microvolts/m) = (41.67 x F) - 7083

nW = nanowatt (EIRP) ; uW = microwatt (EIRP).

(2) For spurious frequency :

Spurious emission limits = fundamental emission limit /10

3.3 Test Equipment List:

Item	Mfr/Brand	Instruments	Serial No.	Model/Type No.	Calibrated Date	Next Cali. Date
1.	HP	Spectrum Analyzer	73412A00110	8591EM	2007/03/28	2008/03/28
2.	HP	Pre Amplifier	2944A08954	8447D	2007/03/28	2008/03/28
3.	HP	Pre Amplifier	3113A05475	8447F	2007/03/28	2008/03/28
4.	EMCO	Biconilog Antenna	00044568	3142C	2007/07/27	2008/07/27
5.	Agilent	Spectrum Analyzer	US44300422	E4446A	2007/04/23	2008/04/23
6.	HP	Pre Amplifier	3008A01463	8449B	2007/03/22	2008/03/22
7.	SCHWARZBECK	Horn Antenna	304	BBHA 9120 D	2007/09/04	2008/09/04
8.	EMCO	Biconilog Antenna	1334	3142B	2007/07/27	2008/07/26

3.4 Measurement Data Of Radiated Emissions:

3.4.1 Open Field Radiated Emissions (Horizontal/X-axis)

The highest peak values of radiated emissions from the EUT at various antenna heights, antenna polarization, EUT orientation , etc. are recorded on the following

Test Mode : Transmitter

Radiated Emissions (HORIZONTAL)							
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Duty (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
303.80	68.27	1.2	250	7.20	61.07	74.92	-13.77
607.60	44.26	1.5	300	7.20	37.06	54.92	-17.78
911.40	30.54	1	240	7.20	23.34	54.92	-31.50
1215.00	35.34	1	120	7.20	28.14	54.00	-25.86
1519.00	34.51	1	240	7.20	27.31	54.00	-26.69

Notes : 1.Margin= Amplitude - Limits

2.Distance of Measurement : 3 Meter (30MHz~26.5GHz)

3.Height of table for EUT placed: 0.8 Meter.

4.ANT= Antenna height.

5.Duty= Duty cycle correction factor.

6.Amplitude= Reading Amplitude – Amplifier gain + Cable loss + Antenna factor
(Auto calculate in spectrum analyzer)

7.Actual Amp= Amplitude – Duty.

8. EUT Orthogonal Axes : X denotes Laid on Table ; Z denotes Side Stand ;
Y denotes Vertical Stand.

3.4.2 Open Field Radiated Emissions (Vertical/X-axis)

The highest peak values of radiated emissions from the EUT at various antenna heights, antenna polarization, EUT orientation , etc. are recorded on the following

Test Mode : Transmitter

Radiated Emissions (VERTICAL)							
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Duty (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
303.80	66.60	1	320	7.20	59.40	74.92	-15.52
607.60	51.53	1.4	200	7.20	44.33	54.92	-10.59
911.40	43.20	1.2	250	7.20	36.00	54.92	-18.92
1215.00	35.61	1	240	7.20	28.41	54.00	-25.59
1519.00	35.34	1	150	7.20	28.14	54.00	-25.86

Notes : 1.Margin= Amplitude - Limits

2.Distance of Measurement : 3 Meter (30MHz~26.5GHz)

3.Height of table for EUT placed: 0.8 Meter.

4.ANT= Antenna height.

5.Duty= Duty cycle correction factor.

6.Amplitude= Reading Amplitude – Amplifier gain + Cable loss + Antenna factor
(Auto calculate in spectrum analyzer)

7.Actual Amp= Amplitude – Duty.

8. EUT Orthogonal Axes : X denotes Laid on Table ; Z denotes Side Stand ;
Y denotes Vertical Stand.

3.4.3 Open Field Radiated Emissions (Horizontal/Y-axis)

The highest peak values of radiated emissions from the EUT at various antenna heights, antenna polarization, EUT orientation , etc. are recorded on the following

Test Mode : Transmitter

Radiated Emissions (HORIZONTAL)							
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Duty (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
303.80	68.45	2	250	7.20	61.25	74.92	-13.67
607.60	53.50	1.5	300	7.20	46.30	54.92	-8.62
911.40	41.32	1.6	160	7.20	34.12	54.92	-20.80
1215.00	35.22	1	190	7.20	28.02	54.00	-25.98
1519.00	33.82	1	270	7.20	26.62	54.00	-27.38

Notes : 1.Margin= Amplitude - Limits

2.Distance of Measurement : 3 Meter (30MHz~26.5GHz)

3.Height of table for EUT placed: 0.8 Meter.

4.ANT= Antenna height.

5.Duty= Duty cycle correction factor.

6.Amplitude= Reading Amplitude – Amplifier gain + Cable loss + Antenna factor
(Auto calculate in spectrum analyzer)

7.Actual Amp= Amplitude – Duty.

8. EUT Orthogonal Axes : X denotes Laid on Table ; Z denotes Side Stand ;
Y denotes Vertical Stand.

3.4.4 Open Field Radiated Emissions (Vertical/Y-axis)

The highest peak values of radiated emissions from the EUT at various antenna heights, antenna polarization, EUT orientation , etc. are recorded on the following

Test Mode : Transmitter

Radiated Emissions (VERTICAL)							
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Duty (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
303.80	68.42	1.1	290	7.20	61.22	74.92	-13.70
607.60	36.02	1.5	240	7.20	28.82	54.92	-26.10
911.40	32.17	1.1	150	7.20	24.97	54.92	-29.95
1215.20	35.48	1	300	7.20	28.28	54.00	-25.72
1519.00	33.49	1	320	7.20	26.29	54.00	-27.71

Notes : 1.Margin= Amplitude - Limits

2.Distance of Measurement : 3 Meter (30MHz~26.5GHz)

3.Height of table for EUT placed: 0.8 Meter.

4.ANT= Antenna height.

5.Duty= Duty cycle correction factor.

6.Amplitude= Reading Amplitude – Amplifier gain + Cable loss + Antenna factor
(Auto calculate in spectrum analyzer)

7.Actual Amp= Amplitude – Duty.

8. EUT Orthogonal Axes : X denotes Laid on Table ; Z denotes Side Stand ;
Y denotes Vertical Stand.

3.4.5 Open Field Radiated Emissions (Horizontal/Z-axis)

The highest peak values of radiated emissions from the EUT at various antenna heights, antenna polarization, EUT orientation , etc. are recorded on the following

Test Mode : Transmitter

Radiated Emissions (HORIZONTAL)							
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Duty (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
303.80	67.56	1.8	230	7.20	60.36	74.92	-14.56
607.60	52.61	1.2	210	7.20	45.41	54.92	-9.51
911.40	39.00	1	280	7.20	31.80	54.92	-23.12
1215.20	35.14	1	270	7.20	27.94	54.00	-26.06
1519.00	34.27	1	100	7.20	27.07	54.00	-26.93

Notes : 1.Margin= Amplitude - Limits

2.Distance of Measurement : 3 Meter (30MHz~26.5GHz)

3.Height of table for EUT placed: 0.8 Meter.

4.ANT= Antenna height.

5.Duty= Duty cycle correction factor.

6.Amplitude= Reading Amplitude – Amplifier gain + Cable loss + Antenna factor
(Auto calculate in spectrum analyzer)

7.Actual Amp= Amplitude – Duty.

8. EUT Orthogonal Axes : X denotes Laid on Table ; Z denotes Side Stand ;
Y denotes Vertical Stand.

3.4.6 Open Field Radiated Emissions (Vertical/Z-axis)

The highest peak values of radiated emissions from the EUT at various antenna heights, antenna polarization, EUT orientation , etc. are recorded on the following

Test Mode : Transmitter

Radiated Emissions (VERTICAL)							
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Duty (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
303.80	68.31	1.1	160	7.20	61.11	74.92	-13.81
607.60	38.27	1.8	300	7.20	31.07	54.92	-23.85
911.40	33.75	1.3	320	7.20	26.55	54.92	-28.37
1215.20	34.72	1	280	7.20	27.52	54.00	-26.48
1519.00	33.00	1	110	7.20	25.80	54.00	-28.20

Notes : 1.Margin= Amplitude - Limits

2.Distance of Measurement : 3 Meter (30MHz~26.5GHz)

3.Height of table for EUT placed: 0.8 Meter.

4.ANT= Antenna height.

5.Duty= Duty cycle correction factor.

6.Amplitude= Reading Amplitude – Amplifier gain + Cable loss + Antenna factor
(Auto calculate in spectrum analyzer)

7.Actual Amp= Amplitude – Duty.

8. EUT Orthogonal Axes : X denotes Laid on Table ; Z denotes Side Stand ;
Y denotes Vertical Stand.

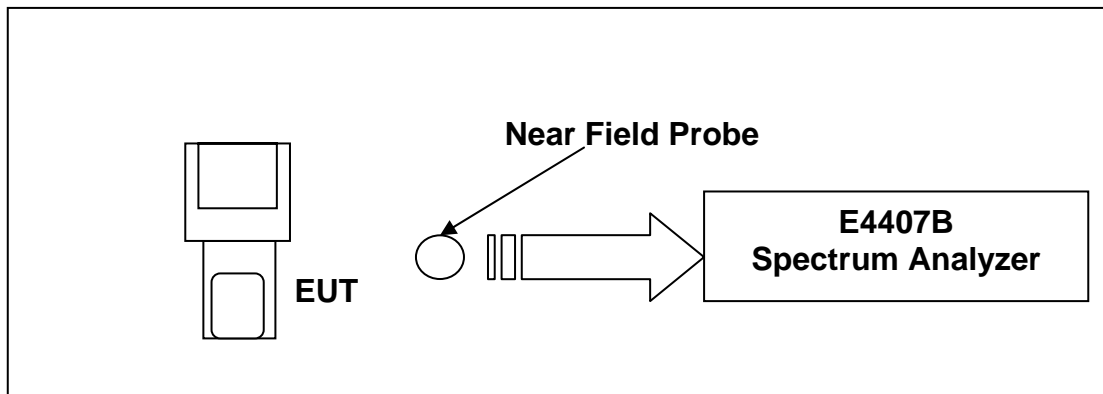
IV. Transmitter Bandwidth Measurement

4.1 Test Condition & Setup :

The transmitter bandwidth measurements were performed in a shielded enclosure. The EUT was placed on a wooded table which is 0.8 meters height and a near field probe was used at a distance about 20 cm for receiving. While testing, EUT was set to transmit continuously.

The resolution bandwidth of the spectrum analyzer was set to 10KHz. The detector function was set to peak and hold mode to clearly observe the components. The maximum permitted bandwidth at -20dB with respect to the reference level specified by the rule was 0.25 % of the center frequency of the EUT.

4.2 Test Instruments Configuration:



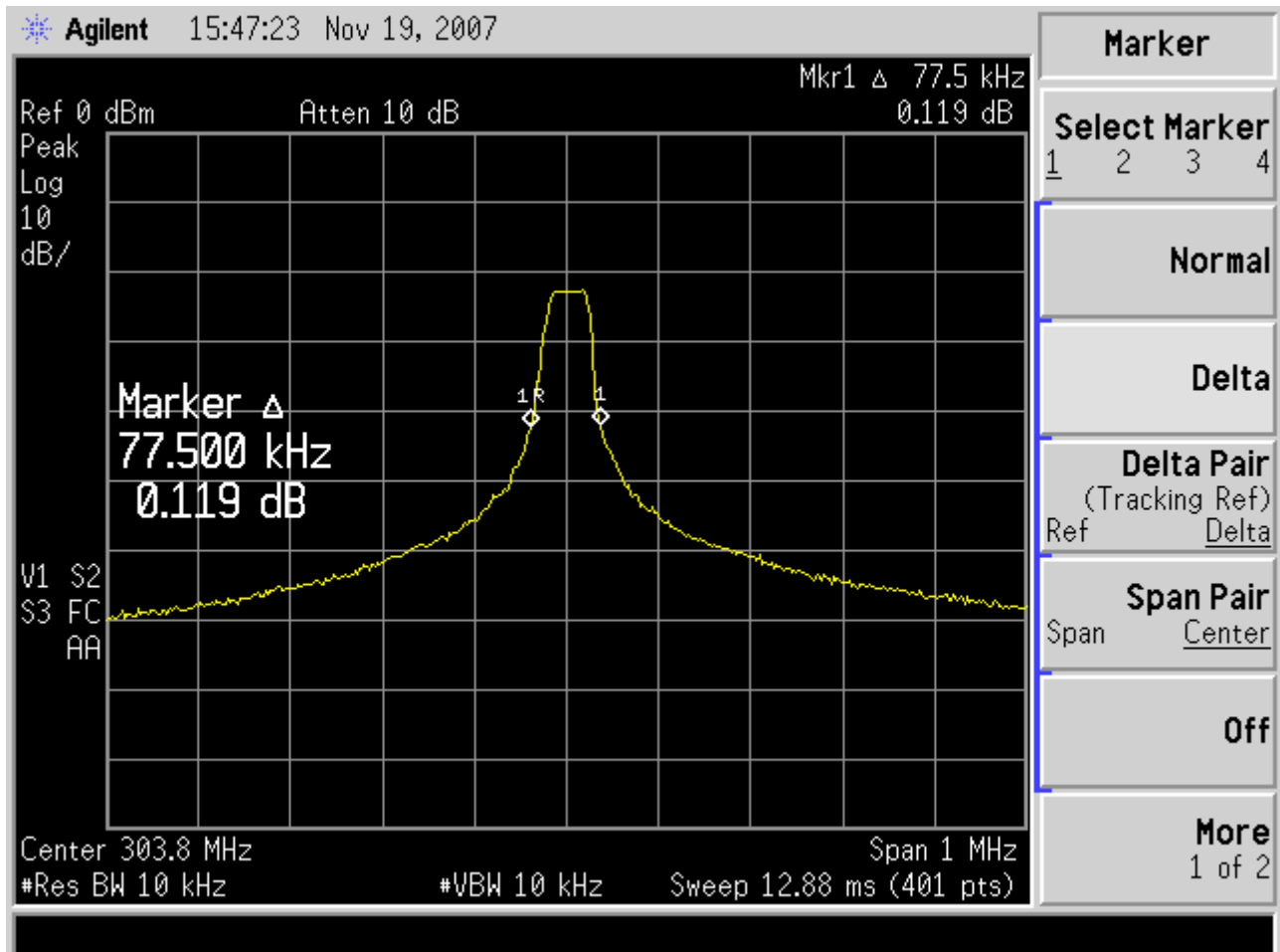
4.3 Test Equipment List:

Item	Mfr/Brand	Instruments	Serial No.	Model/Type No.	Calibrated Date	Next Cali. Date
1.	Agilent	Spectrum Analyzer	US44300422	E4446A	2007/04/23	2008/04/23
2.	Agilent	Spectrum Analyzer	US39240419	E4407B	2007/02/14	2008/02/14
3.	HP	Pre Amplifier	1937A00786	8447F	2007/04/27	2008/04/27
4.	EMCO	Biconilog Antenna	1334	3142B	2007/07/27	2008/07/26
5.	EM	Probe	107328	EM-6992	N/A	N/A

4.4 Test Result:

Permitted Maximum Bandwidth	759.50	KHz
Bandwidth Measurement	77.50	KHz

4.5 Test Graphs:



V. Transmitter Duty Cycle Measurement

5.1 Test Condition & Setup :

The transmitter bandwidth measurements were performed in a shielded enclosure. The EUT was placed on a wooded table which is 0.8 meters height and a near field probe was used at a distance about 20 cm for receiving. While testing, EUT was set to transmit continuously. Various key configurations were also investigated to find the maximum duty cycle.

The spectrum analyzer resolution bandwidth and video bandwidth were all set to 1 MHz to encompass all Significant spectral components during the test. The analyzer was operated in linear scale and zero span mode after tuning to the transmitter carrier frequency. A digital oscilloscope was connected to the aux video output of the spectrum analyzer for measuring pulse width. The pulse width was determined by the difference between the half voltage points on a pulse.

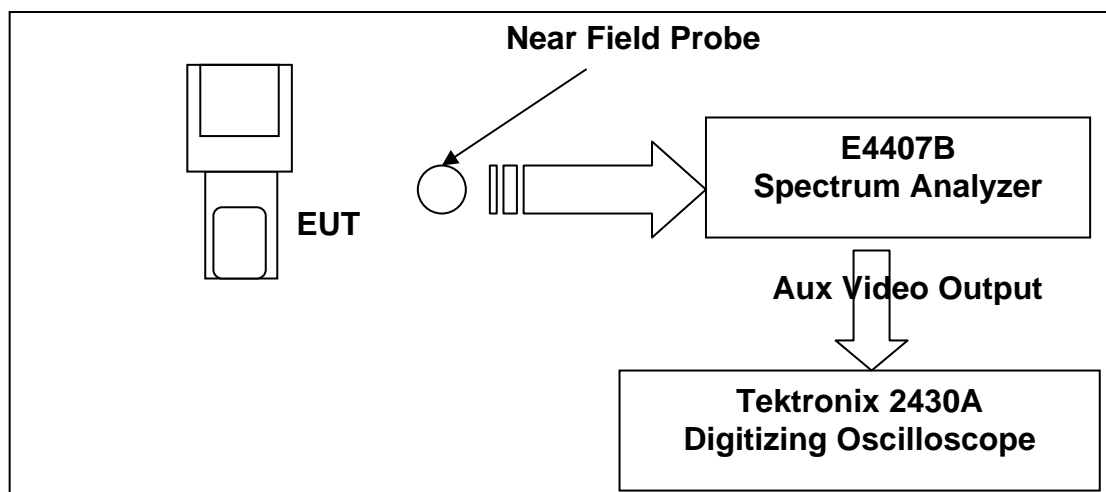
The duty cycle was determined by the following equation :

TO calculate the actual field intensity, the duty cycle correction factor in decibel is needed for later use and can be obtained from following conversion :

$$\text{Duty Cycle(\%)} = \frac{\text{(Total On Interval in a Complete Pulse Train)}}{\text{(Length of a Complete Pulse Train)}} \times 100\%$$

$$\text{Duty Cycle Correction Factor (dB)} = 20 \times \text{Log}_{10} (\text{Duty Cycle(\%)})$$

5.2 Test Instruments Configuration:



5.3 Test Equipment List:

Item	Mfr/Brand	Instruments	Serial No.	Model/Type No.	Calibrated Date	Next Cali. Date
1.	Agilent	Spectrum Analyzer	US44300422	E4446A	2007/04/23	2008/04/23
2.	Agilent	Spectrum Analyzer	US39240419	E4407B	2007/02/14	2008/02/14
3.	HP	Pre Amplifier	1937A00786	8447F	2007/04/27	2008/04/27
4.	EMCO	Biconilog Antenna	1334	3142B	2007/07/27	2008/07/26
5.	EM	Probe	107328	EM-6992	N/A	N/A

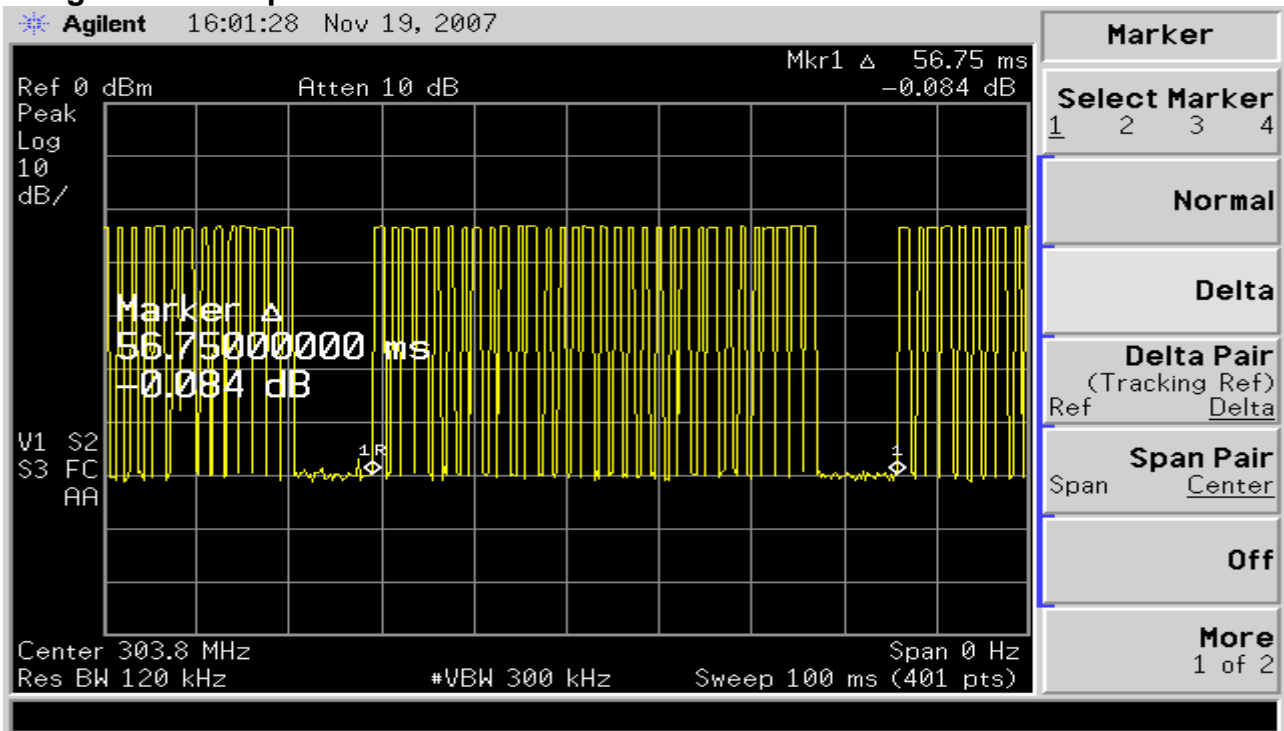
5.4 Test Result:

Pulse Train	Number of Pulse	T(ms)	Total Time (ms)	
Long Pulse	12	1.125	13.50	msec
Short Pulse	20	0.5625	11.25	msec

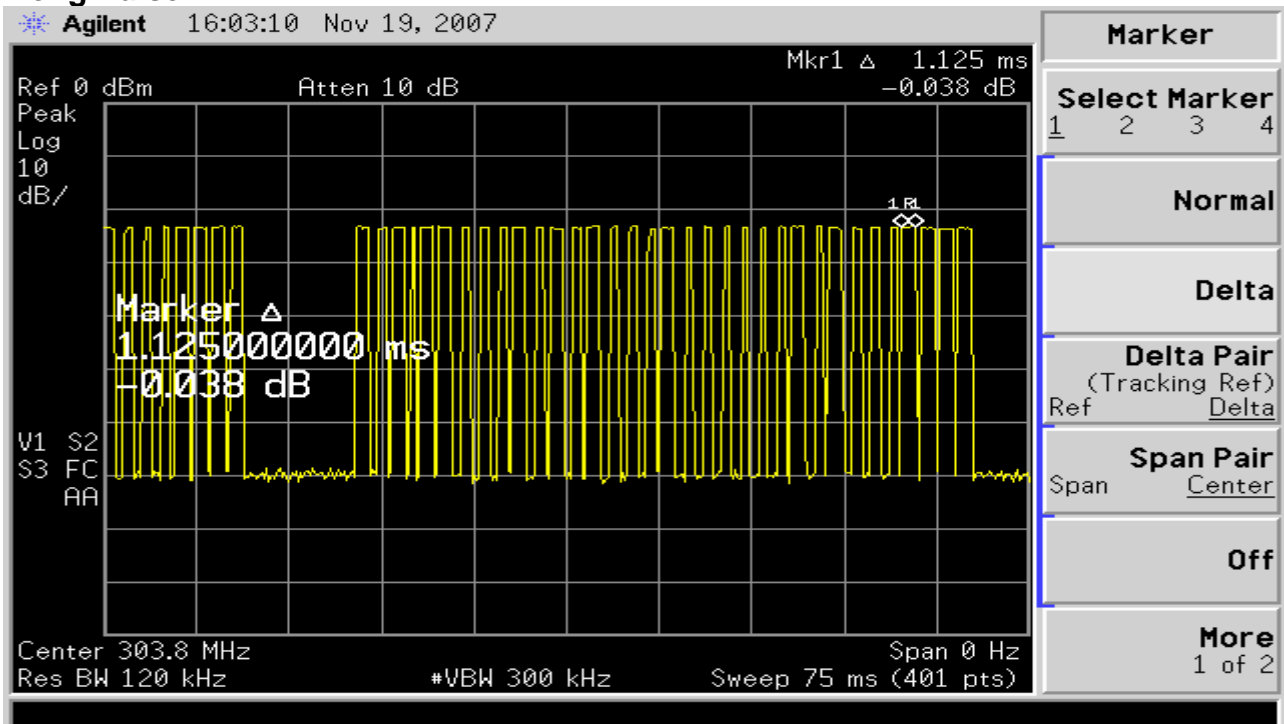
Total ON interval in a complete pulse train	24.75	msec
Length of a complete pulse train	56.75	msec
Duty Cycle (%)	43.61	%
Duty Cycle Correction Factor (dB)	7.20	dB

5.5 Test Graphs: See next page.

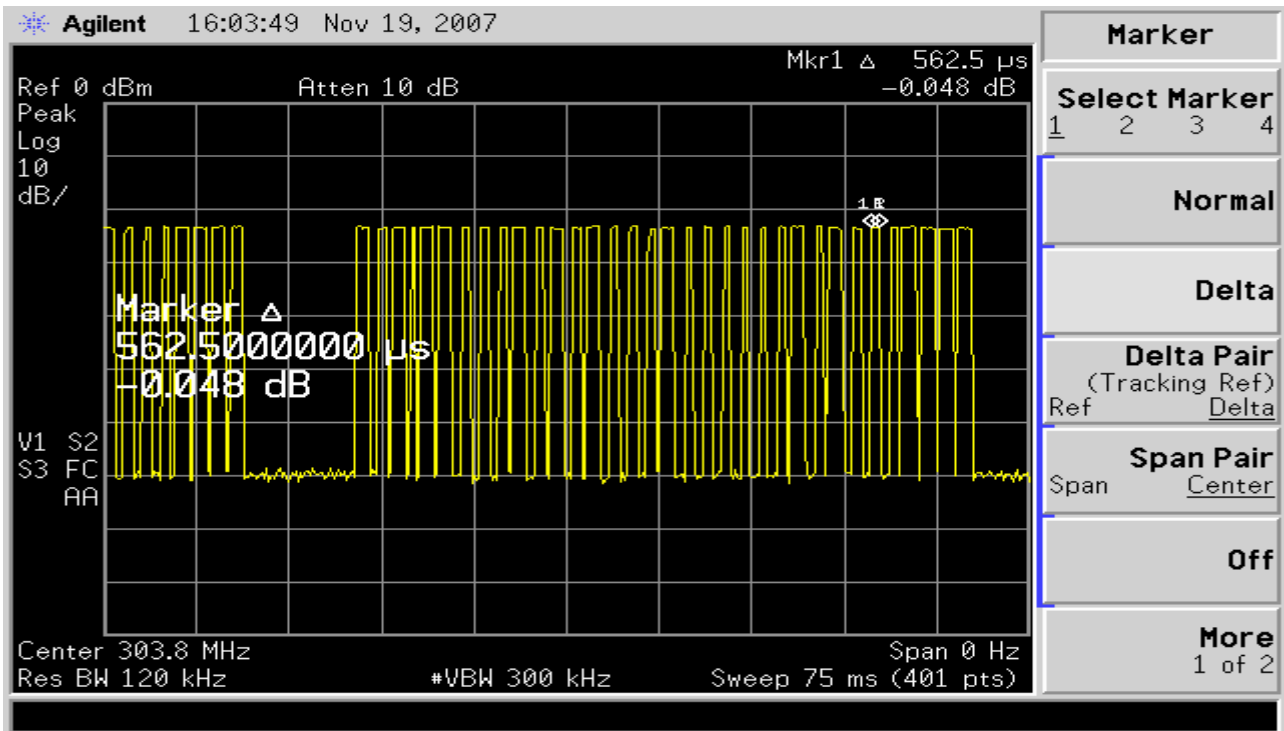
Length of A Complete Pulse Train



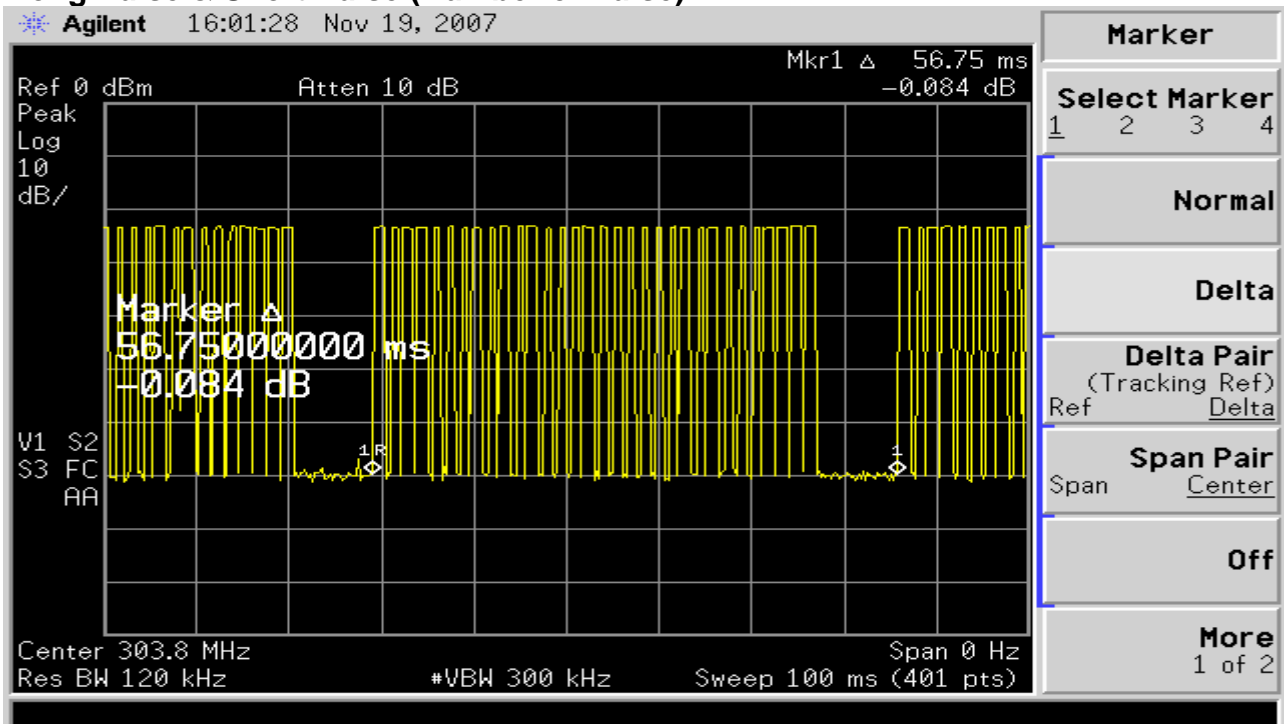
Long Pulse



Short Pulse



Long Pulse & Short Pulse (Number of Pulse)



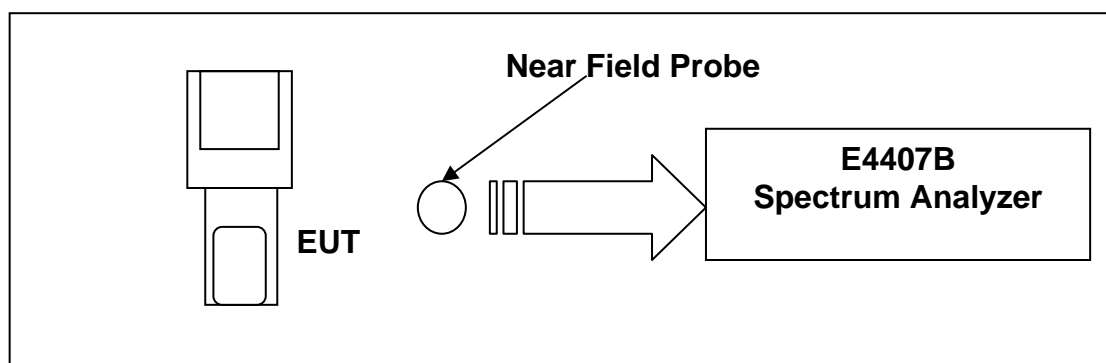
VI. Verification of De-activation after 5 seconds

6.1 Test Condition & Setup :

Verification of the transmitter de-activation after 5 seconds was performed in a shielded enclosure. The EUT was placed on a wooded table which is 0.8 meters height and a near field probe was used at a distance about 20 cm for receiving.

The spectrum analyzer resolution bandwidth and video bandwidth were all set to 100KHZ to encompass all Significant spectral components during the test. The analyzer was operated in linear scale and zero span mode after tuning to the transmitter carrier frequency.

6.2 Test Instruments Configuration:



6.3 Test Equipment List:

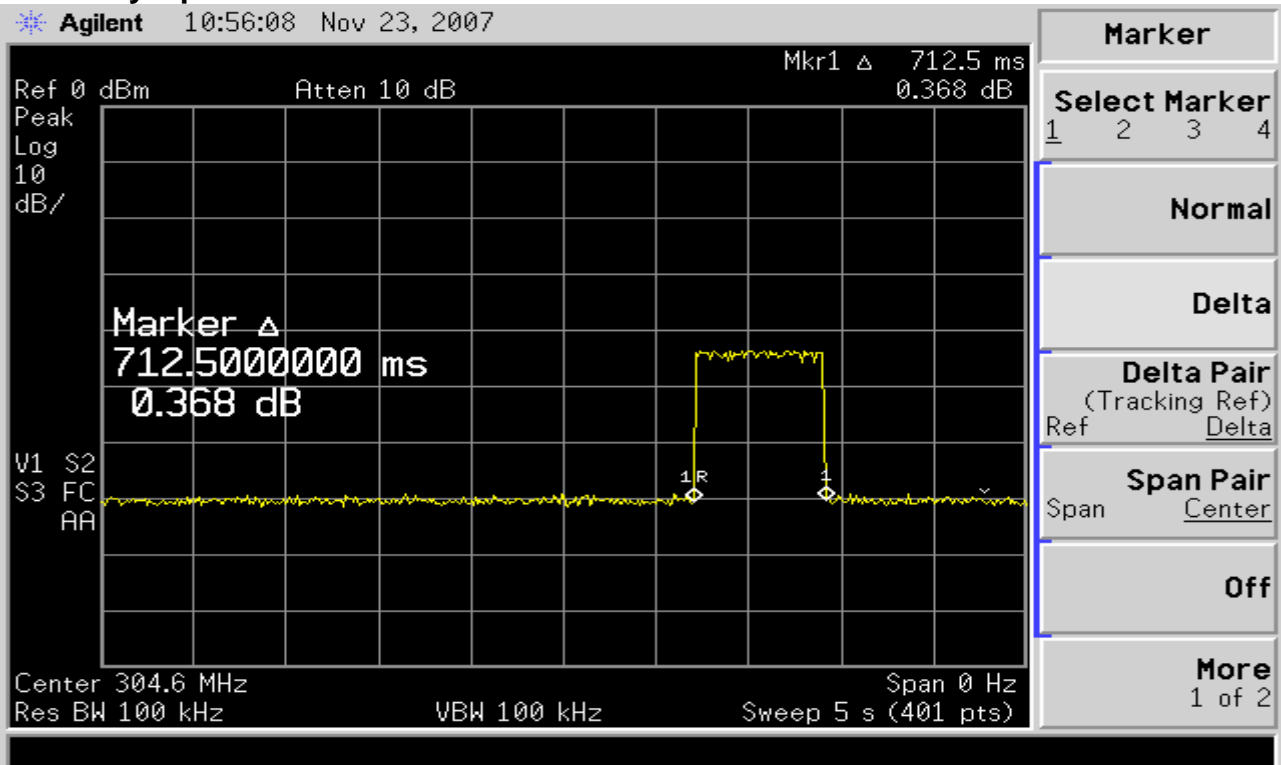
Item	Mfr/Brand	Instruments	Serial No.	Model/Type No.	Calibrated Date	Next Cali. Date
1.	Agilent	Spectrum Analyzer	US44300422	E4446A	2007/04/23	2008/04/23
2.	Agilent	Spectrum Analyzer	US39240419	E4407B	2007/02/14	2008/02/14
3.	HP	Pre Amplifier	1937A00786	8447F	2007/04/27	2008/04/27
4.	EMCO	Biconilog Antenna	1334	3142B	2007/07/27	2008/07/26
5.	EM	Probe	107328	EM-6992	N/A	N/A

6.4 Test Result:

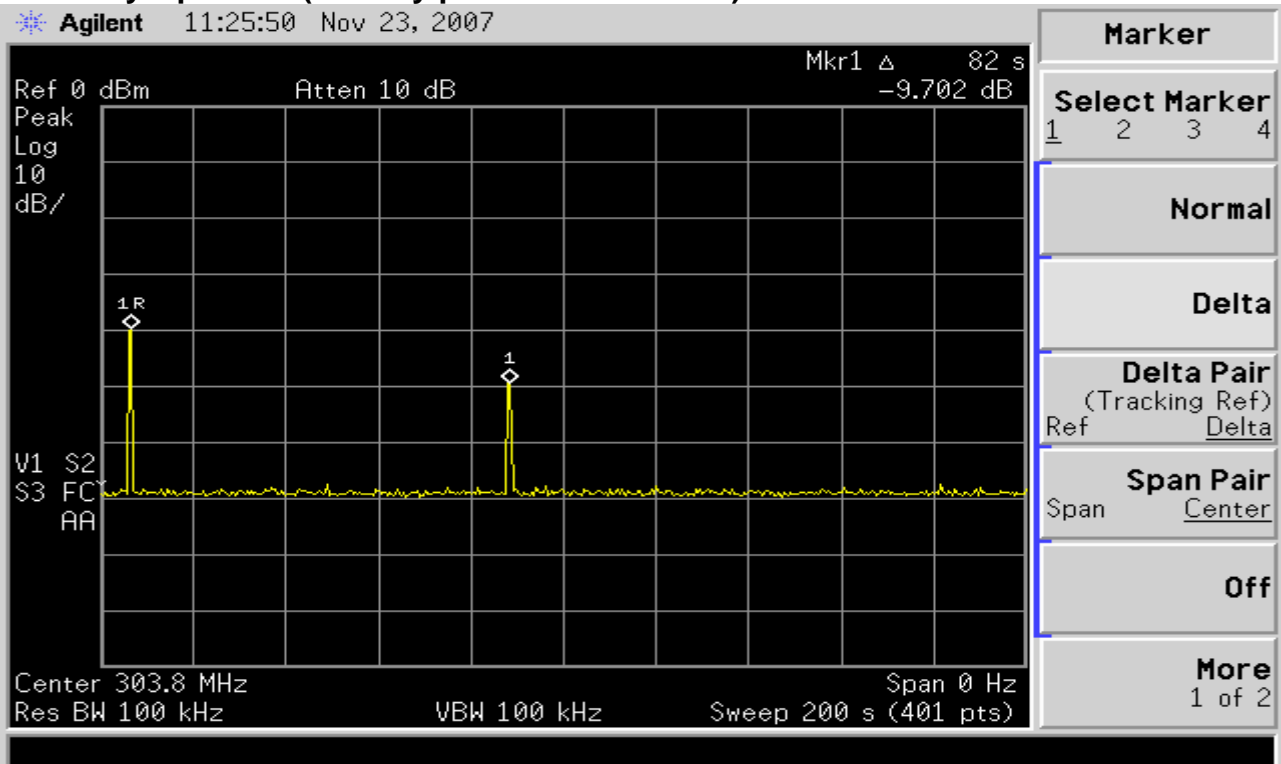
Compliant Conditions (Section 15.231)	EUT Status		
Was the EUT manually operated ?	x	Yes	No
If yes, did the EUT employ a switch that would automatically deactivate the transmitter within not more than 5 seconds of being released ?	x	Yes	No
Was the EUT automatically activated ?	x	Yes	No
The devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.	x	Yes (Note1)	No

Note1: This device is automatically activated under THERMOFF feature only.

Manually Operated



Manually Operated (Manally push EUT's button)



Appendix I- EUT Test SETUP

MEASUREMENT OF RADIATED EMISSION

