Measurement Report

Class II Permissive Change

Product.....: REMOTE CONTROL TRANSMITTER
Manufacture.....: FEGO PRECISION INDUSTRIAL CO., LTD.
FCC ID.....: M8CBC9006
Model.....: BC-9062
Report No.....: MLT0009P15002
Test Date.....: October 02.2000

Test By

Max Light Technology Co.,Ltd.

Room 5, 8F, No.125, Section 3 Roosevelt Road,

Taipei, Taiwan., R.O.C.

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Table of Contents :

I. General ---------- *4.*

II. Conducted Emissions Requirements ---------- *6.*

III. Radiated Emissions Requirements ---------- *7.*

IV.Transmitter Bandwidth Measurements ---------- *13.*

V. Transmitter Duty Cycle Measurements ---------- *15.*

Appendix I (EUT Test Setup) ---------- *17.*

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 C63.4-1992. 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.

EUT	**: REMOTE CONTROL TRANSMITTER**
Applicant	**: FEGO PRECISION INDUSTRIAL CO., LTD. NO. 947 LIN-SEN RD., WU FONG SHIANG, TAICHUNG HSIEN, TAIWAN**
Manufacturer	**: FEGO PRECISION INDUSTRIAL CO., LTD. NO. 947 LIN-SEN RD., WU FONG SHIANG, TAICHUNG HSIEN, TAIWAN**
Model No	**: BC-9062**
FCC ID	**: M8CBC9006**

Prepared by : *Country Huang* *Approved by :* *Roger Chen*

I. GENERAL

1.1 Introduction

The following measurement report is submitted on behalf of Fego Precision Industrial Co., Ltd. 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 Description of EUT

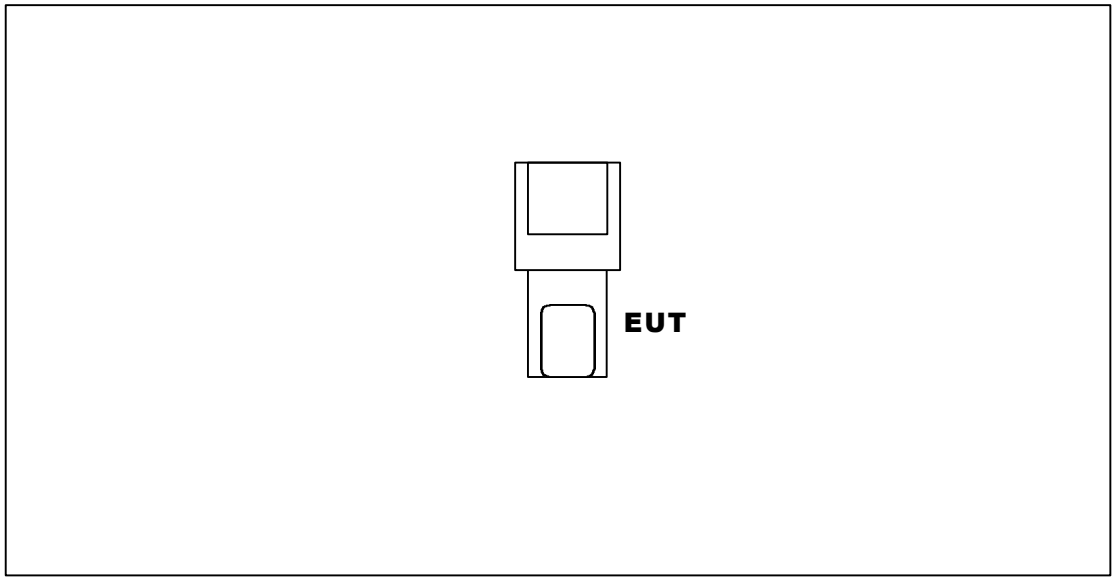
EUT	: REMOTE CONTROL TRANSMITTER
Applicant	: FEGO PRECISION INDUSTRIAL CO., LTD. NO. 947 LIN-SEN RD., WU FONG SHIANG, TAICHUNG HSIEN, TAIWAN
Manufacturer	: FEGO PRECISION INDUSTRIAL CO., LTD. NO. 947 LIN-SEN RD., WU FONG SHIANG, TAICHUNG HSIEN, TAIWAN
Model No	: BC-9062
FCC ID	: M8CBC9006
Power Type	: Powered by DC 9V Battery

The EUT(BC-9062) is Remote Control of Lamp/Fan Controller. The operation frequency is 327.65Mhz.Press the button on remote transmitter, can set the FAN / LIGHT / TEMP / DELAY OFF / FAN(Auto) / LIGHT(Auto) button.

1.3 Description of Support Equipment

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

1.4 Configuration of System Under Test



1.5 Related Submittal / Grant)

This submittal is intended for filing a ClassII Permissive Change for the certified equipment FCC ID : M8CBC9006 (Data of grant:11/04/99)

1.6 Change Description

The differences between the BC-9062 and the BC9006 (FCC ID: M8CBC9006) are:

a) The layout of the PCB is different.
b) The BC-9062 has the larger LCD
c) The BC-9062 has four extra function keys.
d) The smaller RF module of the BC-9062 is laid on the PCB directly.

1.7 Test Procedure

All measurements contained in this report were performed according to the techniques described in Measurement procedure ANSI C63.4-1992 "Measurement of Intentional Radiators."

1.8 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(c), the EUT exempt to 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 4 GHz in order to cover the whole spectrum below10th harmonic which could generate from the EUT. During the test,EUT was set to transmit continuously and the switch was positioned to yield the maximum duty cycle which had measured before radiated emissions test.

A nonconductive material surrounded the EUT to supporting the EUT for standing on tree 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 3142) at 3 Meter and the EMCO Double Ridged Guide Antenna (model 3115) was used in frequencies 1 4 GHz at a distance of I meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

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 3 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 following procedures were used to convert the emission levels measured in decibels referenced to 1 microvlt (dBuV) into field intensity in microvolts pre meter(uV/m).
The actual field intensity in decibels referenced to 1 microvolt in to field intensity in microcolts per meter (dBuV/m).

The actual field is 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, duty cycle correction factor (dB), and distance extrapolation Factor (dB) at the appropriate frequency.

(1) Amplitude (dBuV/m)= FI(dBuV)+AF(dBuV)+CL(dBuV)-Gain(dB)

FI= Reading of the field intensity.
AF= Antenna factor.
CL= Cable loss.

P.S Amplitude is auto calculate in spectrum analyzer.

(2) Actual Amplitude (dBuV/m)= Amplitude (dBuV)-Duty(dB)-Dis(dB)

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

(1) For fundamental frequency :

$$\text{Emission Limit(uV/m)} = [F_{EUT}(\text{MHz}) - 260(\text{MHz})] \times \frac{12500(\text{uV/m}) - 3750(\text{uV/m})}{470(\text{MHz}) - 260(\text{MHz})} + 3750(\text{uV/m})$$

F_{EUT}= EUT Operating Frequency.

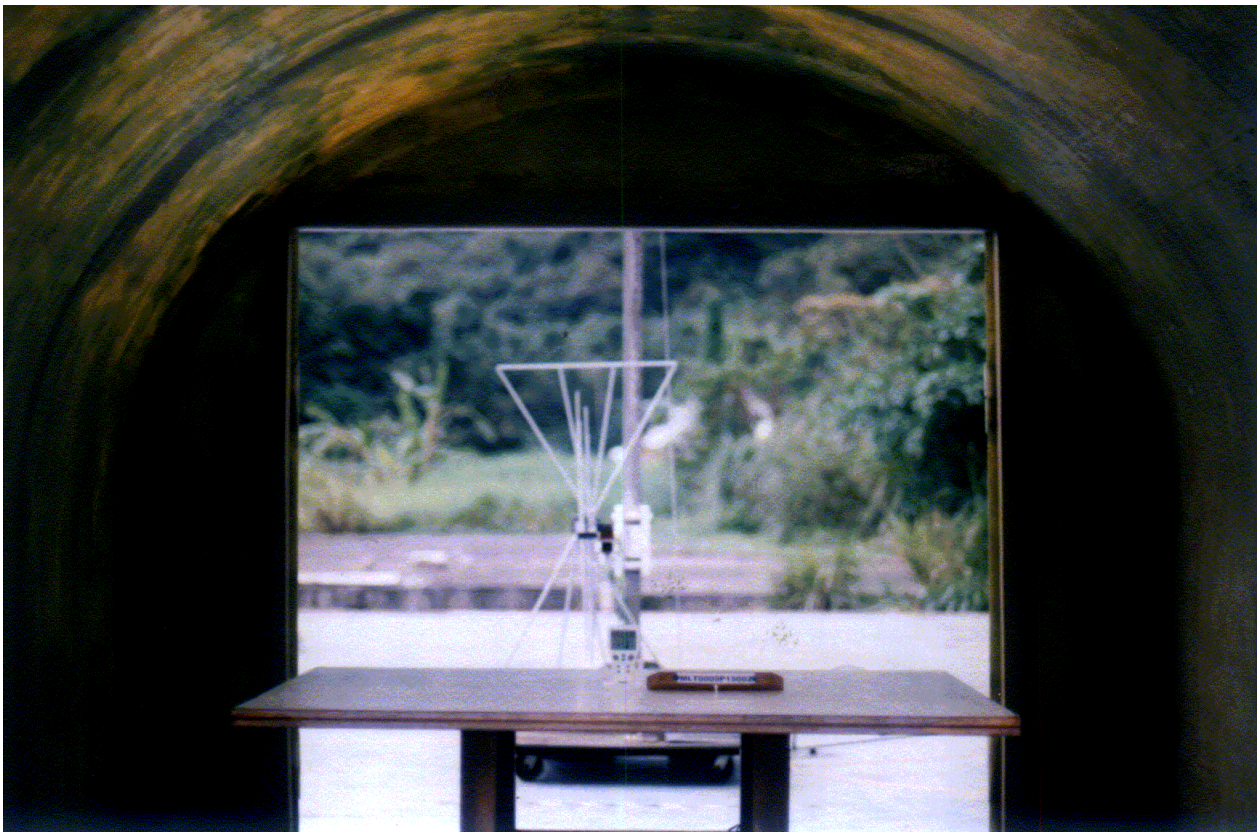
(2) For spurious frequency :

Spurious emission limits = fundamental emission limit /10

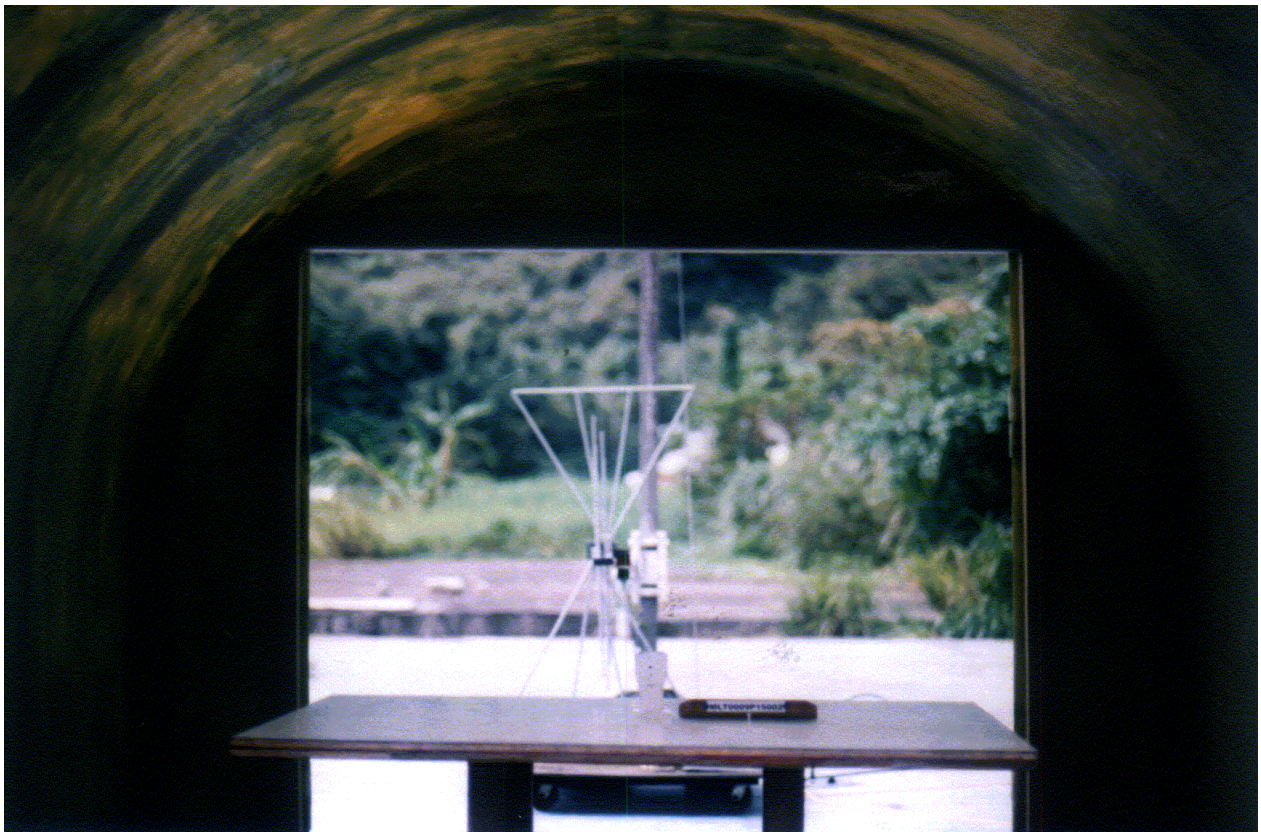
3.3 Test Equipment List:

A. **HP 8591EM 9KHz-1.8GHz Spectrum Analyzer (S/N:73412A00230)**
B. **HP 8447D Pre Amplifier (S/N:2944A08954)**
C. **HP 8449B Pre Amplifier (S/N:2813A19931)**
D. **EMCO 3142 Biconilog Antenna (S/N:1184)**
E. **EMCO 3115 Double Ridged Guide Antenna (S/N:0871)**
D. **HP 8592A 50KHz-22GHz Spectrum Analyzer (S/N:12314A010415)**
E. **HP 9872B Plotter (S/N:20447A03436)**

3.4 Test Configuration:



Front View of The Test Configuration



Rear View of The Test Configuration

3.5 Measurement Data Of Radiated Emissions:

3.5.1 Open Field Radiated Emissions (Horizontal)

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

Manufacturer : *FEGO PRECISION INDUSTRIAL CO., LTD.*
Model No : *BC-9062*
EUT : *REMOTE CONTROL TRANSMITTER*

Radiated Emissions (HORIZONTAL)								
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Duty (dB)	Dist (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
327.65	56.17	1	90	1.30	0	54.87	76.35	-21.48
655.38	35.74	1.5	210	1.30	0	34.44	56.35	-21.91
982.93	46.19	2	300	1.30	0	44.89	54.00	-9.11
1310.61	40.83	1	270	1.30	9.54	29.99	54.00	-24.01
1638.29	39.43	1.5	360	1.30	9.54	28.59	56.35	-27.76
1965.91	38.89	1	350	1.30	9.54	28.05	56.35	-28.30
2293.52	38.67	1.5	180	1.30	9.54	27.83	54.00	-26.17

Notes : 1.**Margin= Amplitude - Limits**
2.**Distance of Measurement : 3 Meter (30-1000MHz)**
3.**Height of table for EUT placed: 0.8 Meter.**
4.**ANT= Antenna height.**
5.**Duty= Duty cycle correction factor.**
6.**Dis= Distance extrapolation factor.**
7.**Amplitude= Reading Amplitude Amplifier gain+Cable loss +Antenna factor**
(Auto calculate in spectrum analyzer)
8.**Actual Amp= Amplitude Duty Dis.**

3.5.2 Open Field Radiated Emissions (Vertical)

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

Manufacturer : FEGO PRECISION INDUSTRIAL CO., LTD.
Model No : BC9006
EUT : REMOTE CONTROL TRANSMITTER

Radiated Emissions (VERTICAL)								
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Duty (dB)	Dist (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
327.65	61.58	1.5	270	1.30	0	60.28	76.35	-16.07
655.38	37.89	1	350	1.30	0	36.59	56.35	-19.76
982.93	44.78	1.5	310	1.30	0	43.48	54.00	-10.52
1310.61	41.28	1	150	1.30	9.54	30.44	54.00	-23.56
1638.29	43.97	1.5	290	1.30	9.54	33.13	56.35	-23.22
1965.91	40.01	1	360	1.30	9.54	29.17	56.35	-27.18
2293.52	40.73	1	300	1.30	9.54	29.89	54.00	-24.11

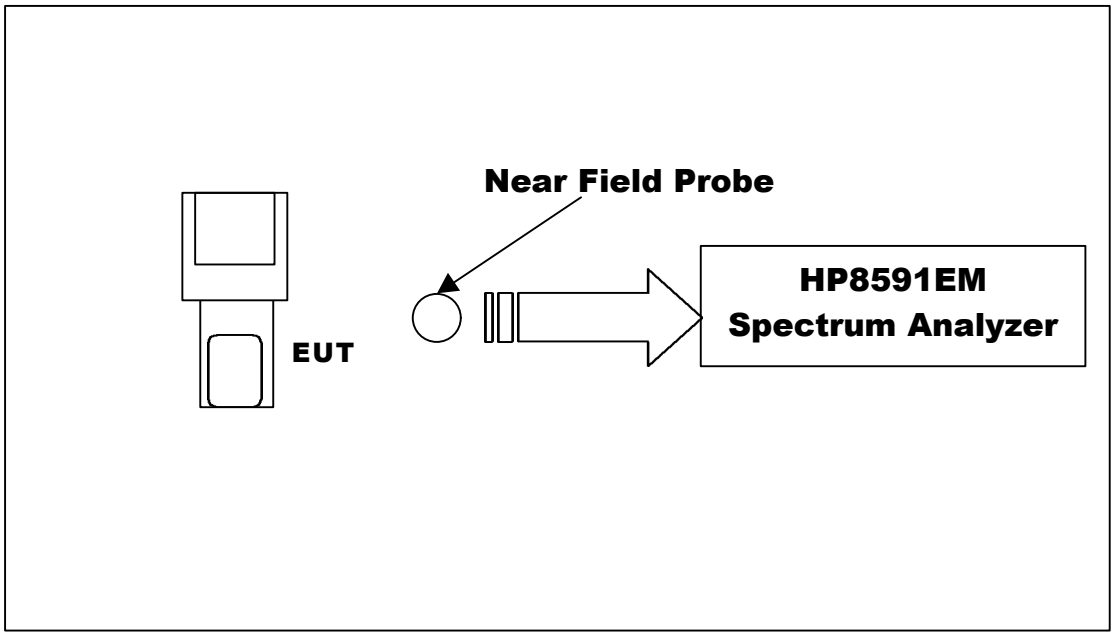
Notes : 1. **Margin= Amplitude - Limits**
2. **Distance of Measurement : 3 Meter (30-1000MHz)**
3. **Height of table for EUT placed: 0.8 Meter.**
4. **ANT= Antenna height.**
5. **Duty= Duty cycle correction factor.**
6. **Dis= Distance extrapolation factor.**
7. **Amplitude= Reading Amplitude Amplifier gain+Cable loss +Antenna factor**
(Auto calculate in spectrum analyzer)
8. **Actual Amp= Amplitude Duty Dis.**

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:

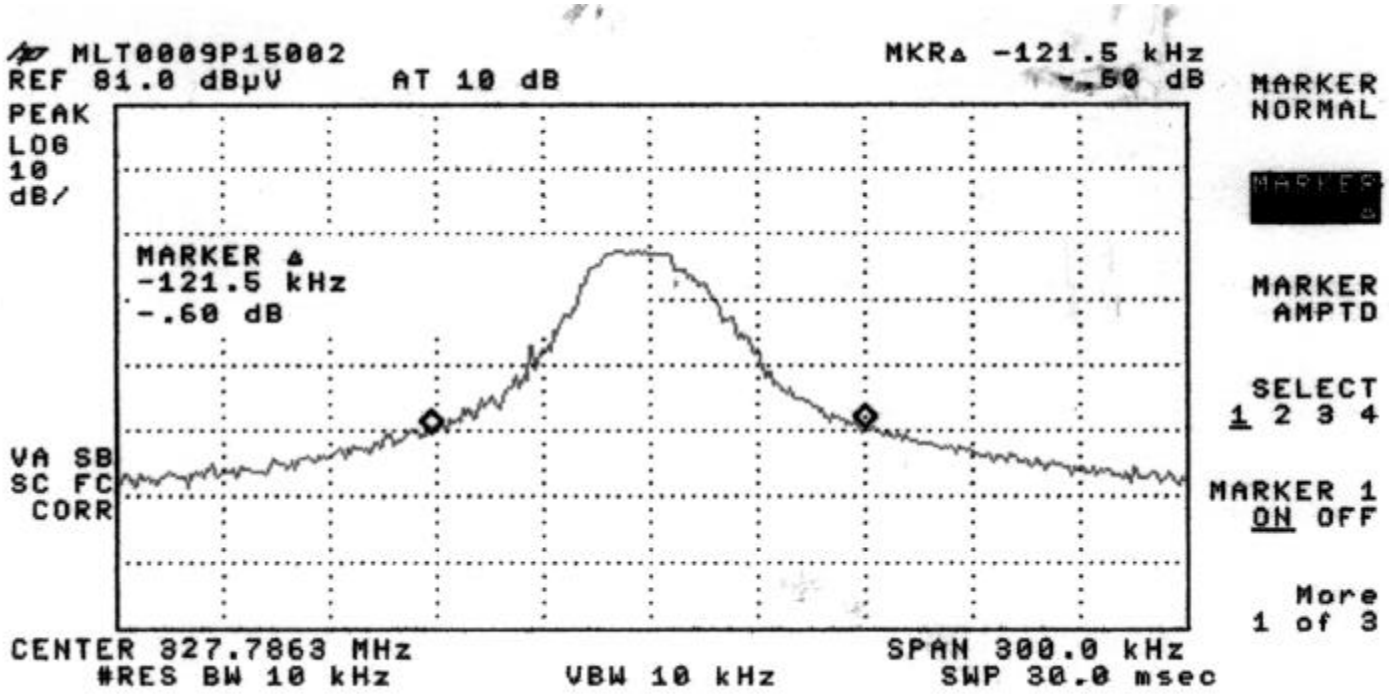
A. **Tektronix FG504 0.1H~40MHz (S/N:43AS251)**
B. **EMCO Near Field Probe (S/N:7901-291)**
C. **HP 8591EM 9KHZ-1.8GHz Spectrum Analyzer (S/N:73412A00110)**
D. **Shielded Room (MLT-SR1)**

4.4 Test Result:

Permitted Maximum Bandwidth	**819.18KHz**
Bandwidth Measurement	**121.50KHz**

4.5 Test Graphs:

See next page.


MLT0009P15002
REF 81.0 dBµV
AT 10 dB
MKR△ -121.5 kHz
-.60 dB
PEAK
LOG
10
dB/
MARKER △
-121.5 kHz
-.60 dB
VA SB
SC FC
CORR
CENTER 327.7863 MHz
#RES BW 10 kHz
VBW 10 kHz
SPAN 300.0 kHz
SWP 30.0 msec
MARKER
NORMAL
MARKER
AMPTD
SELECT
1 2 3 4
MARKER 1
ON OFF
More
1 of 3

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.

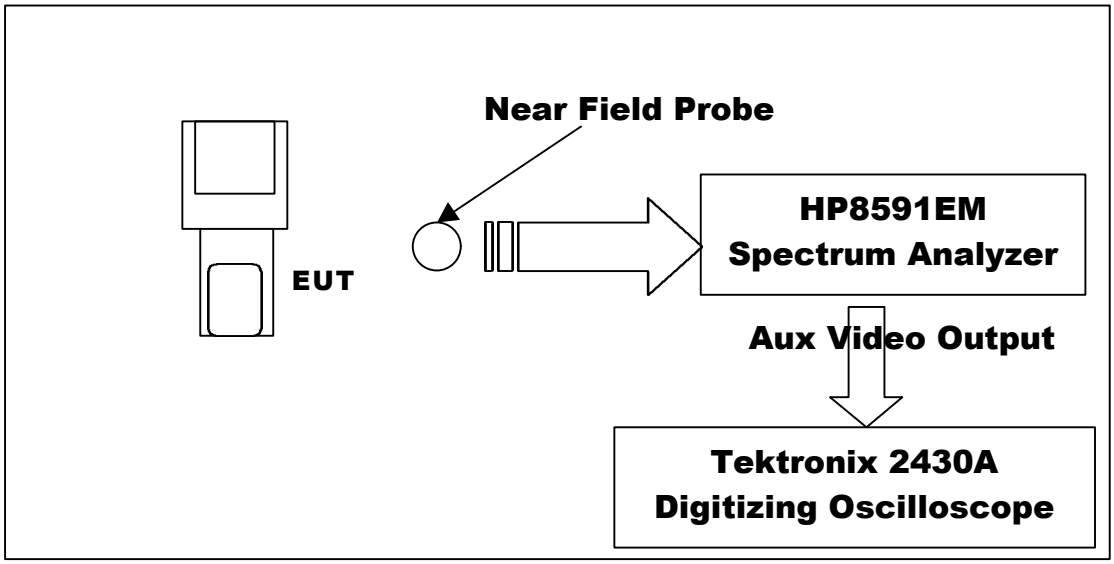
The duty cycle was determined by the following equation :

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 :

$$\text{Duty Cycle(\%)} = \frac{\text{(Total On Interval in a Complete Pulse Train)}}{\text{(Length of a Complete Pulse Train)}} \text{X100\%}$$

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

5.2 Test Instruments Configuration:



5.3 Test Equipment List:

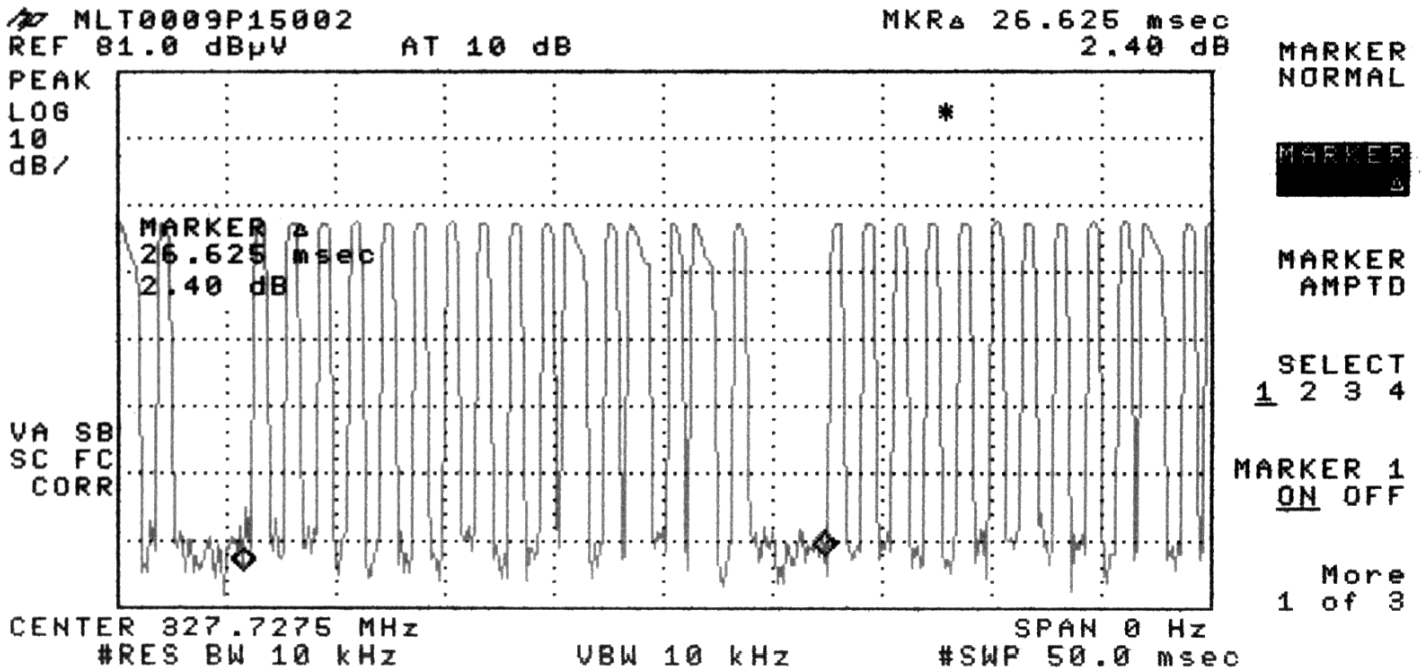
A. **Tektronix FG504 0.1H~40MHz (S/N:43AS251)**
B. **EMCO Near Field Probe (S/N:7901-291)**
C. **HP 8591EM 9KHZ-1.8GHz Spectrum Analyzer (S/N:73412A00110)**
D. **Tektronix 2230 Digitizing Oscilloscope (S/N:A13F148F09)**
E. **Shielded Room (MLT-SR1)**

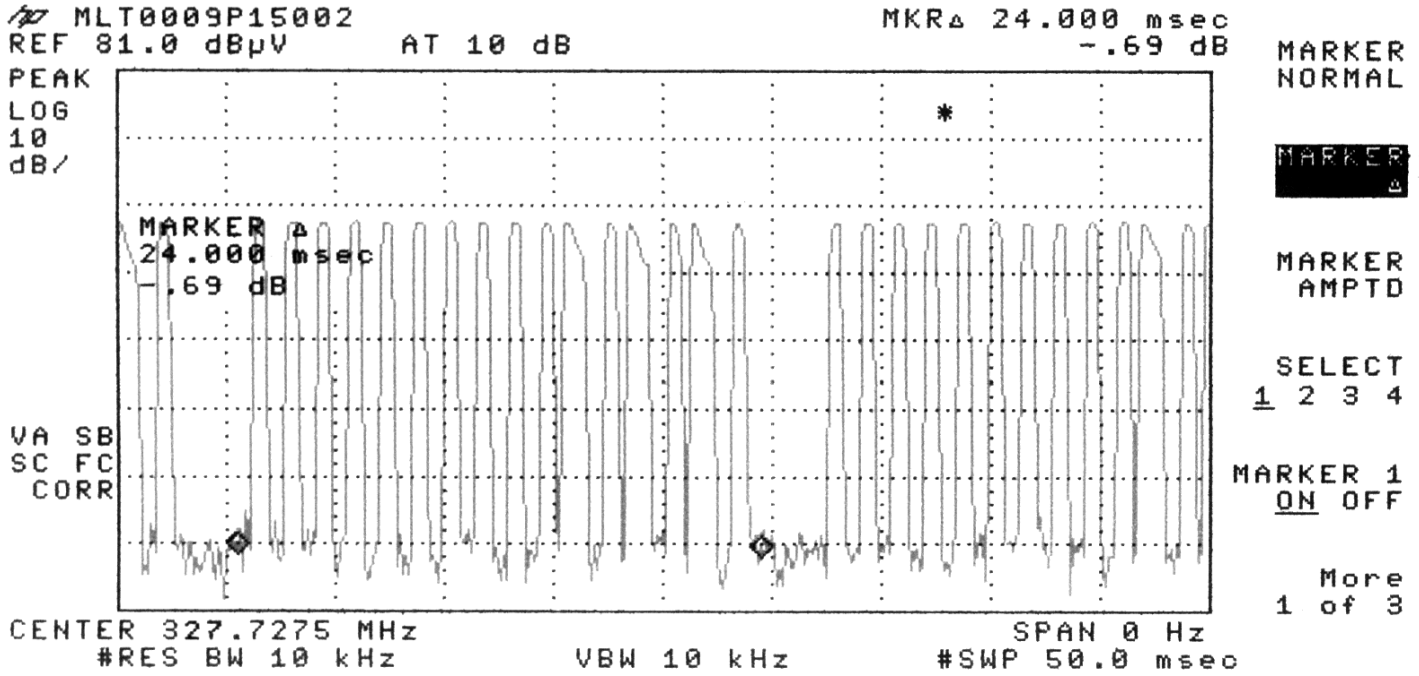
5.4 Test Result:

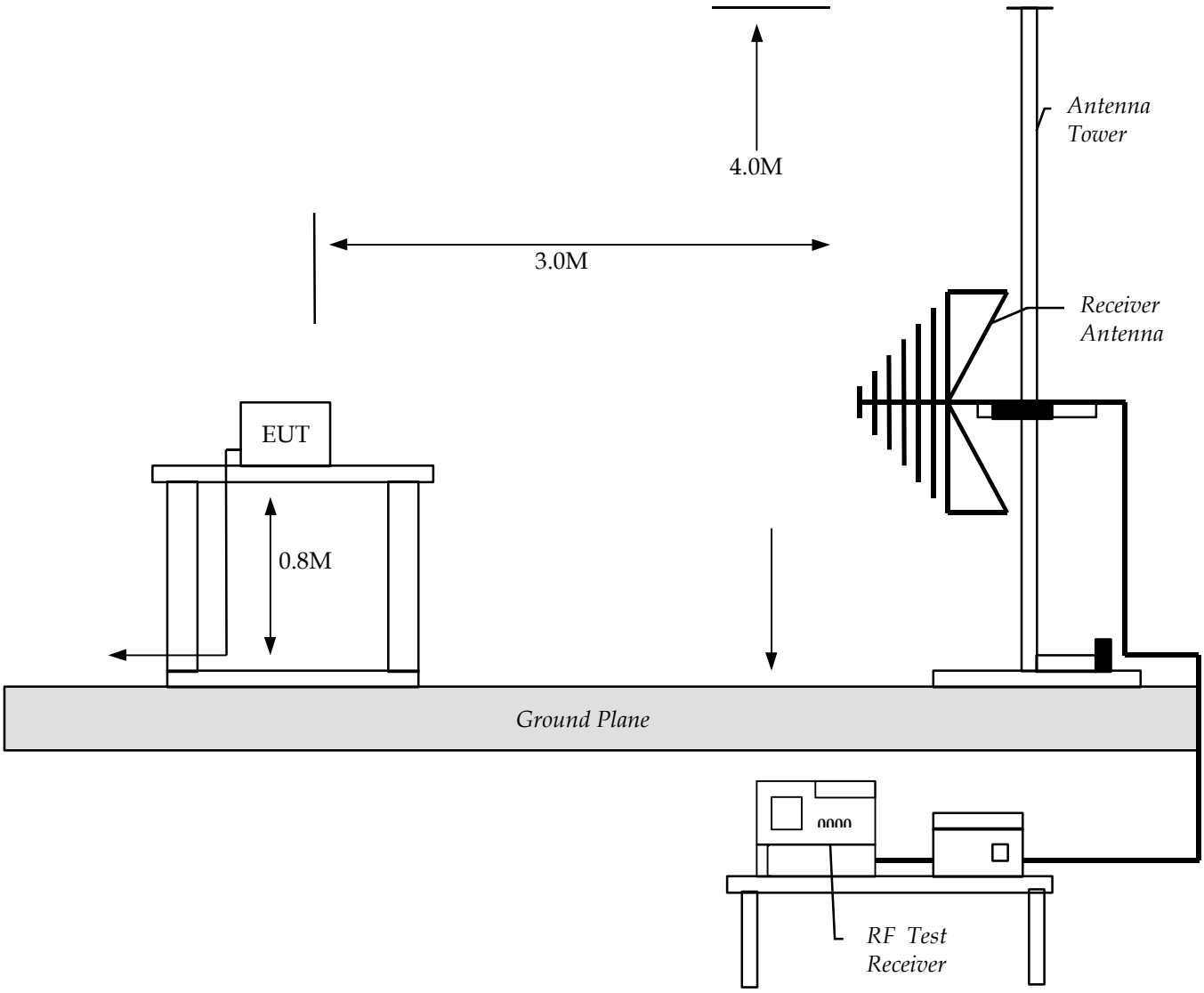
Total ON interval in a complete pulse train	**24.00 msec**
Length of a complete pulse train	**26.62 msec**
Duty Cycle (%)	**90.15%**
Duty Cycle Correction Factor (dB)	**1.30**

5.5 Test Graphs:

See next page.


MLT0009P15002
MKRΔ 26.625 msec
REF 81.0 dBμV
AT 10 dB
2.40 dB
PEAK
LOG
10
dB/
MARKER Δ
26.625 msec
2.40 dB
VA SB
SC FC
CORR
MARKER
NORMAL
MARKER Δ
MARKER
AMPTD
SELECT
1 2 3 4
MARKER 1
ON OFF
More
1 of 3
CENTER 327.7275 MHz
SPAN 0 Hz
#RES BW 10 kHz
VBW 10 kHz
#SWP 50.0 msec


MLT0009P15002
MKRΔ 24.000 msec
REF 81.0 dBμV
AT 10 dB
-.69 dB
PEAK
LOG
10
dB/
MARKER Δ
24.000 msec
-.69 dB
VA SB
SC FC
CORR
MARKER
NORMAL
MARKER Δ
MARKER
AMPTD
SELECT
1 2 3 4
MARKER 1
ON OFF
More
1 of 3
CENTER 327.7275 MHz
SPAN 0 Hz
#RES BW 10 kHz
VBW 10 kHz
#SWP 50.0 msec

Appendix I- EUT Test SETUP

MEASUREMENT OF RADIATED EMISSION