Marstech Limited

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Authorized by: Professional Engineers Ontario

Engineering & Administrative

Certificated UL Testing

Testing For FCC Submissions/Verifications

Approved Test Facility

Qualified Facility

TEST REPORT

REPORT DATE:	16 October 2001		REPORT NO: 21360D
CONTENTS:	See Table of Contents		
SUBMITTOR:	ABACOM Technologies 32 Blair Athol Crescent Etobicoke, Ontario M9A 1X5 CANADA		
SUBJECT:	Model No:	LWCSD	
	FCC ID:	MEF-LWCSD	
TEST SPECIFICATION	47 CFR Part 15 Sections: 15.35, 15.109, 15.209 and 15.249 NOTE: Tests Conducted Are "Type" Tests.		
DATE SAMPLE RECEIVED:	02 October 2001	DATE TESTED:	10 October 2001
RESULTS:	Equipment tested complies with referenced specification.		
ALTERATIONS:	None		
Tested by:	Ed. Chang	Approved by:	Robert Marshall
	Edward Chang	Date:	Robert G. Marshall, P. Eng. Oct 23/01

REGISTERED PROFESSIONAL ENGINEER

TECHNICAL REPORT - FCC 2.1033(b)

Applicant and Manufacturer

ABACOM Technologies
32 Blair Athol Crescent
Etobicoke, Ontario
M9A 1X5 CANADA

FCC Identifier

MEF-LWCSD

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EXHIBIT D

[FCC Ref. 2.1033(b)(6)]

"Report of Measurements"

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TEST REPORT CONTAINING:

PRODUCT DESCRIPTION

The Model LWCSD is a wireless radio controlled sequential lighting system operating at 916.5MHz, for the purpose of directing traffic in road construction zones. The antennae used for transmitter and receiver are permanently attached to the EUT.

TEST FACILITY AND EQUIPMENT LIST

FACILITIES

Radiated — ANSI C63.4 (FCC OET/55) open field 3 metre test range. This test range is protected from the cold and moisture by a non-conductive enclosure.

EQUIPMENT

Anritsu 2601A Spectrum Analyzer
Advantest R3261A Spectrum Analyzer
Hewlett-Packard RF generator # 8640 B with an 002 doubler
A.H. Systems biconical antenna; ..... 20 MHz to 330 MHz
A.H. Systems log periodic antenna; ..... 300 MHz to 1.8 GHz
Eaton dipole antennas; T1, T2, T3 ..... 25 MHz to 1.0 GHz
Roberts dipole antennas; T1, T2, T3 & T4 25 MHz to 1.0 GHz
Compliance Design P950 Preamp (16 dB) ... 25 MHz to 1.0 GHz

NOTE:

The Anritsu 2601A Spectrum Analyzer and the Advantest R3261A Spectrum Analyzer are calibrated annually, and that calibration is directly traceable to the National Research Council of Canada. (NRC) This equipment is only used by qualified technicians and only for the purpose of EMI measurements. The three metre test range has been carefully evaluated to the ANSI document C63.4 and will be remeasured for reflections and losses every three years.

ADDITIONAL TEST EQUIPMENT LIST

1. Spectrum Analyzer: HP 8591EM, S/N 3639A00995, Calibrated April 2001
2. Spectrum Analyzer: ANRITSU 2601A, S/N MT64544, Calibrated May 2001
3. Spectrum Analyzer: IFR AN940, S/N 635001039, Calibrated March 2001
4. Preamp: HP 8449B, S/N 3008A00378, Calibrated August 2001
5. Horn Antenna: Q-PAR 6878/24, S/N 1721, 1.5-18GHz
6. Line Impedance Stabilization Network.: Marstech, Cal. July 2001

TEST PROCEDURE

GENERAL:

A test program was run which simulated a normal transmission.

BANDWIDTH 20dB:

The measurements were made with the spectrum analyzer's resolution bandwidth (RBW)=100KHz and the video bandwidth (VBW)=1.0MHz and the span set as shown on the plot.

POWER OUTPUT:

The radiated output power was measured, with the spectrum analyzer and Dipole Antenna, in the test mode which simulated normal operation. The harmonics were measured with a Horn Antenna.

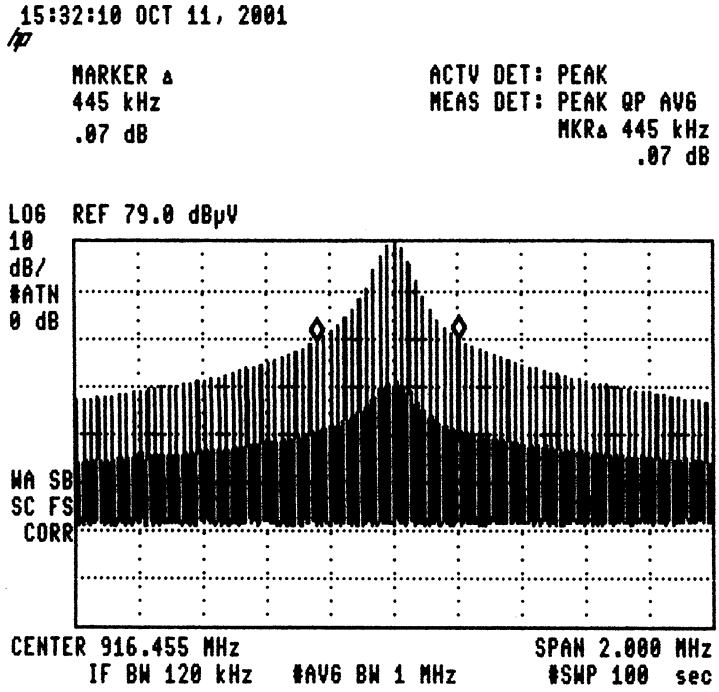
RADIATION INTERFERENCE:

The test procedure used was ANSI STANDARD C63.4-1992 using an appropriate spectrum analyzer, as listed in the Test Equipment List. The bandwidth (RBW) of the spectrum analyzer was 100KHz/120KHz up to 1GHz with an appropriate sweep speed. The RBW above 1.0GHz was = 1MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The ambient temperature of the EUT was 24°F with a humidity of 60%. The EUT was tested from 30MHz to 10GHz.

BANDWIDTH

The 20dB bandwidth is 445KHz [refer to D(1)-7] which is less than the limit .25% of 916MHz = 3664KHz.

20dB BANDWIDTH
ABACOM, MODEL LWCSD



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15.249

FIELD STRENGTH OF EMISSIONS

Requirements:

Field Strength of Fundamental		Field Strength of Harmonics	S15.209	
			30-88MHz	40 dBμV/m@ 3m
902 to 928MHz	94dBμV	54dBμV/m @ 3m Avg	88-216MHz	43.5
		74dBμV/m @ 3m Peak	216-960 MHz	46
			Above 960 MHz	54

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in 15.209, whichever is the lesser attenuation.

Emissions that fall in the restricted bands (15.205) must be less than 54dBμV/m

ABACOM, MODEL LWCSD

CARRIER RADIATED EMISSION RESULTS

Test Data:

Emission Frequency MHZ	Meter Reading @3m dBμV	Antenna	Cable and ACF dB	Field Strength dBμV/M	FCC Limit dBμV/M	Margin dB	Detector & BW KHz
916.50	52.52	RT4 V	33.6	86.12	94	-7.88	PK 100

ABACOM, MODEL LWCSD

HARMONIC EMISSIONS

Frequency Band MHz	Meter Reading @3m (dBμV)	Antenna	Cable & ACF (dB)	Peak F. S. (dBμV/M)	Peak Limit 15.35(b) (dBμV/M)	Pk/Av Ratio 15.35(c) (dB)	Average Corrected F.S. (dBμV/M)	Average FCC Limit (dBμV/M)	Margin dB	Detector & BW KHz
1833.10	32.92	Horn V	33.11	66.02	74	-26	40.02	54	-13.98	PK 1000
2749.50	13.03	Horn V	34.01	47.04	74	-26	21.04	54	-32.96	PK 1000
3666.00	14.36	Horn V	35.49	49.85	74	-26	23.85	54	-30.15	PK 1000
4582.50	13.72	Horn V	37.37	51.09	74	-26	25.09	54	-28.91	PK 1000
5499.00	11.72	Horn V	39.42	51.15	74	-26	25.15	54	-28.85	PK 1000

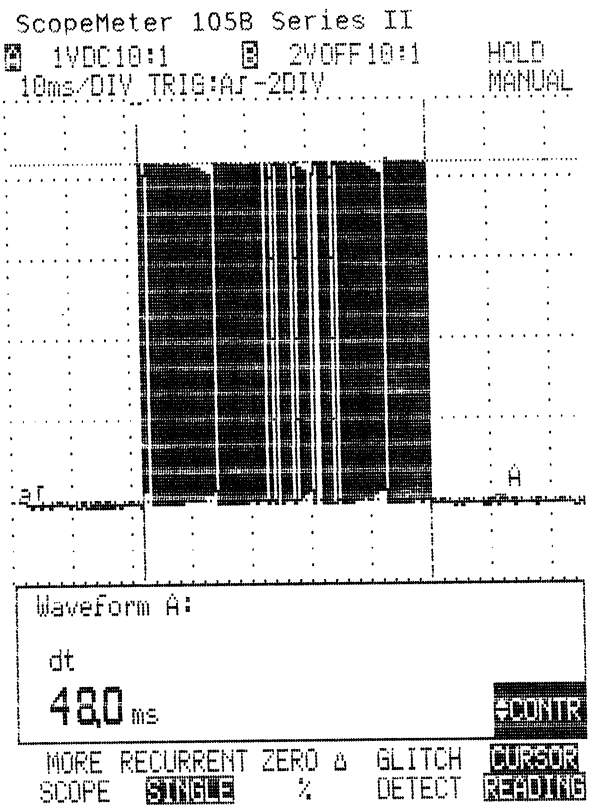
NOTES:

(1) 15.35(b) allows a peak value of 20dB above the average value. The average value per 15.249(d) is 20 log 500 = 54dBμV/M and the maximum peak value is 74dBμV/M.

(2) 15.35(c) allows averaging over one complete pulse train including the blanking interval when the pulse train does not exceed 0.1 seconds or 100mS. The Abacom, Model LWCSD has a measured pulse train of 48mS while the blanking period is 1052mS (Total Period 1.1S) refer to Exhibits D(1)-11 and -12.

The Peak to Average ratio is therefore $20 \log \frac{48}{1052} = -26\text{dB}$

PULSE TRAIN (ON TIME)
ABACOM, MODEL LWCSD



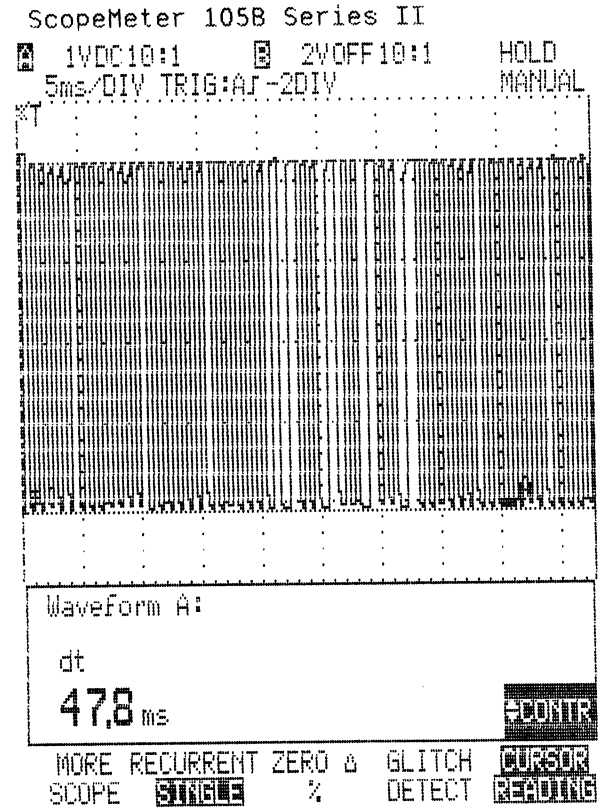


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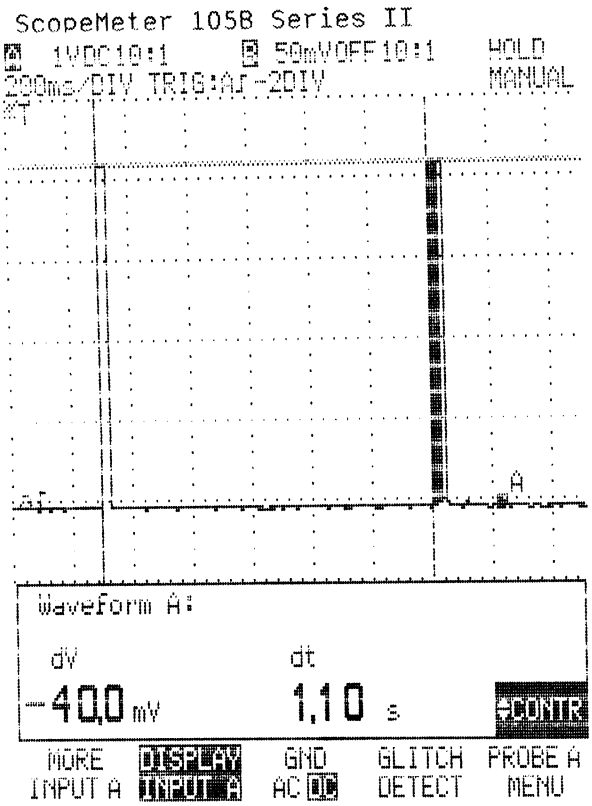
EXHIBIT D(1)-11



TOTAL PERIOD
ABACOM, MODEL LWCSD