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FCC ID: CWTWB1U429

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EMC Equipment List

	DEVICE	MFGR	MODEL	SERNO	CAL/CHAR DATE	DUE DATE or STATUS
X	3-Meter OATS	TEI	N/A	N/A	Listed 1/13/03	1/13/06
	3/10-Meter OATS	TEI	N/A	N/A	Listed 3/26/01	3/26/04
	Receiver, Beige Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 8/31/01	8/31/03
	RF Preselector	HP	85685A	3221A01400	CAL 8/31/01	8/31/03
	Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 8/31/01	8/31/03
X	Receiver, Blue Tower Spectrum Analyzer	HP	8568B	2928A04729	CAL	4/15/05
X				2848A18049	4/15/03	
X	RF Preselector	HP	85685A	2926A00983	CAL 4/15/03	4/15/05
X	Quasi-Peak Adapter	HP	85650A	2811A01279	CAL 4/15/03	4/15/05
	Receiver, Silver/Grey Tower Spectrum Analyzer	HP	8566B Opt 462	3552A22064 3638A08608	CAL 10/14/02	10/14/04
	RF Preselector	HP	85685A	2620A00294	CAL 10/14/02	10/14/04
	Quasi-Peak Adapter	HP	85650A	3303A01844	CAL 10/14/02	10/14/04
	Preamplifier	HP	8449B	3008A01075	CHAR 1/28/02	1/28/04
X	Biconnical Antenna	Electro-Metrics	BIA-25	1171	CAL 4/26/01	4/26/03
	Biconnical Antenna	Eaton	94455-1	1096	CAL 10/1/01	10/1/03
	Biconnical Antenna	Eaton	94455-1	1057	CAL 3/18/03	3/18/05
	BiconiLog Antenna	EMCO	3143	9409-1043		
X	Log-Periodic Antenna	Electro-Metrics	LPA-25	1122	CAL 10/2/01	10/2/03
	Log-Periodic Antenna	Electro-Metrics	EM-6950	632	CHAR 10/15/01	10/15/03
	Log-Periodic Antenna	Electro-Metrics	LPA-30	409	CAL 3/4/03	3/4/05
	Dipole Antenna Kit	Electro-Metrics	TDA-30/1-4	152	CAL 3/21/01	3/21/04
	Dipole Antenna Kit	Electro-Metrics	TDA-30/1-4	153	CAL 9/26/02	9/26/05

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	DEVICE	MFGR	MODEL	SERNO	CAL/CHAR DATE	DUE DATE or STATUS
	Double-Ridged Horn Antenna	Electro-Metrics	RGA -180	2319	CAL 2/17/03	2/17/05
	Horn Antenna	Electro-Metrics	EM-6961	6246	CAL 3/31/03	3/31/05
	Horn Antenna	ATM	19-443-6R	None	No Cal Required	
	Passive Loop Antenna	EMC Test Systems	EMCO 6512	9706-1211	CHAR 7/10/01	7/10/03
	Line Impedance Stabilization . . .	Electro-Metrics	ANS-25/2	2604	CAL 10/9/01	10/9/03
	Line Impedance Stabilization . . .	Electro-Metrics	EM-7820	2682	CAL 3/12/03	3/12/05
	Termaline Wattmeter	Bird Electronic Corporation	611	16405	CAL 5/25/99	5/25/01
	Termaline Wattmeter	Bird Electronic Corporation	6104	1926	CHAR 12/12/01	12/12/03
	Oscilloscope	Tektronix	2230	300572	CHAR 2/1/01	2/1/03
	System One	Audio Precision	System One	SYS1-45868	CHAR 4/25/02	4/25/04
	Temperature Chamber	Tenney Engineering	TTRC	11717-7	CHAR 1/22/02	1/22/04
	AC Voltmeter	HP	400FL	2213A14499	CAL 10/9/01	10/9/03
	AC Voltmeter	HP	400FL	2213A14261	CHAR 10/15/01	10/15/03
	AC Voltmeter	HP	400FL	2213A14728	CHAR 10/15/01	10/15/03
X	Digital Multimeter	Fluke	77	35053830	CHAR 1/8/02	1/8/04
	Digital Multimeter	Fluke	77	43850817	CHAR 1/8/02	1/8/04
	Digital Multimeter	HP	E2377A	2927J05849	CHAR 1/8/02	1/8/04
	Multimeter	Fluke	FLUKE-77-3	79510405	CHAR 9/26/01	9/26/03
	Peak Power Meter	HP	8900C	2131A00545	CHAR 1/26/01	1/26/03
	Power Meter	HP	432A	1141A07655	CAL 4/15/03	4/15/05
	Power Meter And Sensor	Bird	4421-107 4022	0166 0218	CAL 4/16/03	4/16/05
	Power Sensor	HP	478A	72129	CAL 4/15/03	4/15/05
	Digital Thermometer	Fluke	2166A	42032	CAL 1/16/02	1/16/04
	Thermometer	Traulsen	SK-128		CHAR 1/22/02	1/22/04

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	DEVICE	MFGR	MODEL	SERNO	CAL/CHAR DATE	DUE DATE or STATUS
	Thermometer	Extech	4028	14871-2	CAL 3/7/03	3/7/05
X	Hygro-Thermometer	Extech	445703	0602	CAL 10/4/02	10/4/04
	Frequency Counter	HP	5352B	2632A00165	CAL 11/28/01	11/28/03
	Frequency Counter	HP	5385A	2730A03025	CAL 3/7/03	3/7/05
	Power Sensor	Agilent Technologies	84811A	2551A02705	CHAR 1/26/01	1/26/03
	Service Monitor	IFR	FM/AM 500A	5182	CAL 11/22/00	11/22/02
	Comm. Serv. Monitor	IFR	FM/AM 1200S	6593	CAL 5/12/02	5/12/04
	Signal Generator	HP	8640B	2308A21464	CAL 2/15/02	2/15/04
	Sweep Generator	Wiltron	6648	101009	CAL 4/15/03	4/15/05
	Sweep Generator	Wiltron	6669M	007005	CAL 3/3/03	3/3/05
	Modulation Analyzer	HP	8901A	3435A06868	CAL 9/5/01	9/5/03
	Modulation Meter	Boonton	8220	10901AB	CAL 4/15/03	4/15/05
	Near Field Probe	HP	HP11940A	2650A02748	CHAR 2/1/01	2/1/03
	BandReject Filter	Lorch Microwave	5BR4-2400/ 60-N	Z1	CHAR 3/2/01	3/2/03
	BandReject Filter	Lorch Microwave	6BR6-2442/ 300-N	Z1	CHAR 3/2/01	3/2/03
	BandReject Filter	Lorch Microwave	5BR4-10525/ 900-S	Z1	CHAR 3/2/01	3/2/03
	High Pass Filter	Microlab	HA-10N		CHAR 10/4/01	10/4/03
	High Pass Filter	Microlab	HA-20N		CHAR 2/7/03	2/7/05
	Audio Oscillator	HP	653A	832-00260	CHAR 3/1/01	3/1/03
	Frequency Counter	HP	5382A	1620A03535	CHAR 3/2/01	3/2/03
	Frequency Counter	HP	5385A	3242A07460	CAL 3/7/03	3/7/05
	Preamplifier	HP	8449B-H02	3008A00372	CHAR 3/4/01	3/4/03
	Amplifier	HP	11975A	2738A01969	CHAR 3/1/01	3/1/03
	Egg Timer	Unk			CHAR 8/31/01	8/31/03

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	DEVICE	MFGR	MODEL	SERNO	CAL/CHAR DATE	DUE DATE or STATUS
	Measuring Tape, 20M	Kraftixx	0631-20		CHAR 2/1/02	2/1/04
	Measuring Tape, 7.5M	Kraftixx	7.5M PROFI		2/1/02	2/1/04
	Coaxial Cable #51	Insulated Wire Inc.	NPS 2251-2880	Timco #51	CHAR 1/23/02	1/23/04
	Coaxial Cable #64	Semflex Inc.	60637	Timco #64	CHAR 1/24/02	1/24/04
	Coaxial Cable #65	General Cable Co.	E9917 RG233/U	Timco #65	CHAR 1/23/02	1/23/04
	Coaxial Cable #106	Unknown	Unknown	Timco #106	CHAR 1/23/02	1/23/04

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TEST PROCEDURE

GENERAL: This report shall NOT be reproduced except in full without the written approval of TIMCO ENGINEERING, INC.

RADIATION INTERFERENCE: The test procedure used was ANSI STANDARD C63.4-1992 using a HEWLETT PACKARD spectrum analyzer with a preselector. The bandwidth of the spectrum analyzer was 100 kHz with an appropriate sweep speed. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100 kHz and the video bandwidth was 300 kHz. The ambient temperature of the UUT was 98.3°F with a humidity of 40%.

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the Spectrum Analyzer Meter Reading.

Example:

Freq (MHz) METER READING + ACF = FS
33 20 dBuV + 10.36 dB = 30.36 dBuV/m @ 3m

ANSI STANDARD C63.4-1992 10.1.7 MEASUREMENT PROCEDURES: The UUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The UUT was placed in the center of the table. The table used for radiated measurements is capable of continuous rotation. The spectrum was scanned from 30 MHz to 10th harmonic of the fundamental.

Peak readings were taken in three (3) orthogonal planes and the highest readings were converted to average readings based on the duration of "ON" time.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

Measurements were made by TIMCO ENGINEERING INC. at the registered open field test site located at 849 N.W. State Road 45, Newberry, FL 32669.

APPLICANT: ALPS ELECTRIC CO., LTD.

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NAME OF TEST: RADIATION INTERFERENCE

RULES PART NO.: 15.231

REQUIREMENTS:

Fundamental Frequency MHz	Field Strength of Fundamental dBuV	Field Strength of Harmonics and Spurious Emissions (dBuV/m @ 3m)
40.66 to 40.70	67.04	47.04
70 to 130	61.94	41.94
130 to 174	61.94 to 71.48	41.94 to 51.48
174 to 260	71.48	51.48
260 to 470	71.48 to 81.94	51.48 to 61.94
470 and above	81.94	61.94

THE LIMIT FOR AVERAGE FIELD STRENGTH dBuV/m FOR THE FUNDAMENTAL FREQUENCY = 75.63 dBuV/m. NO FUNDAMENTAL IS ALLOWED IN THE RESTRICTED BANDS.

THE LIMIT FOR AVERAGE FIELD STRENGTH dBuV/m FOR THE HARMONICS AND SPURIOUS FREQUENCIES = 55.63 dBuV/m. SPURIOUS IN THE RESTRICTED BANDS MUST BE LESS THAN 54dBuV/m OR 15.209.

TEST DATA:

Emission Frequency MHz	Meter Reading dBuV	ANT. POLARITY	Coax Loss dB	Correction Factor dB	Duty Cycle Factor dB	Field Strength dBuV/m	Margin dB
315.10	45.4	V	2.29	16.33	6.80	57.22	18.41
315.10	51.9	H	2.29	16.33	6.80	63.72	11.91
315.10	52.1	H	2.29	16.33	6.80	63.92	11.71
315.10	56.0	V	2.29	16.33	6.80	67.82	7.81
315.10	56.3	V	2.29	16.33	6.80	68.12	7.51
315.10	56.8	H	2.29	16.33	6.80	68.62	7.01
630.20	18.3	V	3.49	19.90	6.80	34.89	20.74
630.20	25.1	H	3.49	19.90	6.80	41.69	13.94
630.20	25.7	H	3.49	19.90	6.80	42.29	13.34
630.20	26.5	V	3.49	19.90	6.80	43.09	12.54
630.20	27.0	H	3.49	19.90	6.80	43.59	12.04
630.20	27.5	V	3.49	19.90	6.80	44.09	11.54
945.30	11.5	V	3.18	25.62	6.80	33.50	22.13
945.30	13.9	V	3.18	25.62	6.80	35.90	19.73
945.30	15.3	V	3.18	25.62	6.80	37.30	18.33
945.30	15.3	H	3.18	25.62	6.80	37.30	18.33
945.30	16.9	H	3.18	25.62	6.80	38.90	16.73
945.30	17.2	H	3.18	25.62	6.80	39.20	16.43
1,260.40	13.1	H	2.22	26.09	6.80	34.61	21.02
1,260.40	13.6	H	2.22	26.09	6.80	35.11	20.52
1,260.40	14.3	V	2.22	26.09	6.80	35.81	19.82
1,260.40	14.6	V	2.22	26.09	6.80	36.11	19.52
1,260.40	15.2	H	2.22	26.09	6.80	36.71	18.92
1,260.40	19.4	V	2.22	26.09	6.80	40.91	14.72

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TEST DATA CONTINUED:

Emission Frequency MHz		Meter Reading dBuV	ANT. POLARITY	Coax Loss dB	Correction Factor dB	Duty Cycle Factor dB	Field Strength dBuV/m	Margin dB
1,575.50	**	14.5	H	2.55	27.16	6.80	37.41	16.59
1,575.50	**	14.6	V	2.55	27.16	6.80	37.51	16.49
1,575.50	**	17.7	V	2.55	27.16	6.80	40.61	13.39
1,575.50	**	17.8	V	2.55	27.16	6.80	40.71	13.29
1,575.50	**	19.2	H	2.55	27.16	6.80	42.11	11.89
1,575.50	**	19.7	H	2.55	27.16	6.80	42.61	11.39
1,890.60		12.3	H	2.89	28.23	6.80	36.62	19.01
1,890.60		17.0	V	2.89	28.23	6.80	41.32	14.31
1,890.60		18.7	H	2.89	28.23	6.80	43.02	12.61
1,890.60		19.6	H	2.89	28.23	6.80	43.92	11.71
1,890.60		20.5	V	2.89	28.23	6.80	44.82	10.81
1,890.60		24.4	V	2.89	28.23	6.80	48.72	6.91
2,205.70	**	16.0	V	3.16	28.93	6.80	41.29	12.71
2,205.70	**	16.0	V	3.16	28.93	6.80	41.29	12.71
2,205.70	**	17.0	H	3.16	28.93	6.80	42.29	11.71
2,205.70	**	25.6	V	3.16	28.93	6.80	50.89	3.11
2,205.70	**	27.9	H	3.16	28.93	6.80	53.19	0.81
2,205.70	**	28.4	H	3.16	28.93	6.80	53.69	0.31
2,520.80		16.6	H	3.42	29.45	6.80	42.67	12.96
2,520.80		17.7	V	3.42	29.45	6.80	43.77	11.86
2,520.80		19.7	V	3.42	29.45	6.80	45.77	9.86
2,520.80		22.4	H	3.42	29.45	6.80	48.47	7.16
2,520.80		23.2	V	3.42	29.45	6.80	49.27	6.36
2,520.80		24.6	H	3.42	29.45	6.80	50.67	4.96
2,835.90	**	18.3	H	3.67	30.14	6.80	45.31	8.69
2,835.90	**	18.8	V	3.67	30.14	6.80	45.81	8.19
2,835.90	**	19.7	V	3.67	30.14	6.80	46.71	7.29
2,835.90	**	23.9	V	3.67	30.14	6.80	50.91	3.09
2,835.90	**	26.5	H	3.67	30.14	6.80	53.51	0.49
2,835.90	**	26.7	H	3.67	30.14	6.80	53.71	0.29
3,151.00		19.1	V	3.95	30.83	6.80	47.08	8.55
3,151.00		19.6	H	3.95	30.83	6.80	47.58	8.05
3,151.00		24.5	H	3.95	30.83	6.80	52.48	3.15
3,151.00		25.6	H	3.95	30.83	6.80	53.58	2.05
3,151.00		25.7	V	3.95	30.83	6.80	53.68	1.95
3,151.00		27.0	V	3.95	30.83	6.80	54.98	0.65

SAMPLE CALCULATION OF LIMIT @ 303 MHz:

(470 - 260)Mhz = 210 MHz

(12500 - 3750)uV/m = 8750 uV/m

8750uV/m/210MHz = 41.67 uV/m/MHz

(303-260)MHz = 43 MHz

43 MHz * 41.67 uV/m/MHz = 1791.81 uV/m

(1791.81 + 3750)uV/m = 5541.81 uV/m limit @ 303 MHz

The transmitter ceases transmitting when the button is released.

TEST RESULTS: The unit DOES meet the FCC requirements.

PERFORMED BY: JOSEPH SCOGLIO

DATE TESTED: JUNE 17, 2003

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CALCULATION OF DUTY CYCLE:

The period of the pulse train is determined by observing it on an oscilloscope or a spectrum analyzer with zero (0) frequency span. A plot is then made of the pulse train with a sweep time of 100msec. This sweep determines the duration of the pulse train, which in this case is milliseconds. This sweep allows the determination of the number of and type of pulses, i.e. long & short. Plots are then made showing the duration of each type of pulse and its duration. From the 100millisecond Plot the number of a given type of pulse is then multiplied by the duration of that type pulse. This allows the calculation of the amount of time the UUT is on within 100 msec. If the pulse train is longer than 100milliseconds then this number is multiplied by 100 to determine the percentage ON TIME. If the pulse train is less than 100milliseconds the total on time is divided by the length of the pulse train and then multiplied by 100 to determine the percentage ON TIME. In this case there were 3 pulses 1.4 msec long and 59 pulses .7 msec long for a total of 45.5 msec on time within either the 100milliseconds or the pulse train. The average field strength is determined by multiplying the peak field strength by the percent on time. In this case the percentage ON time was 45.5% percent.

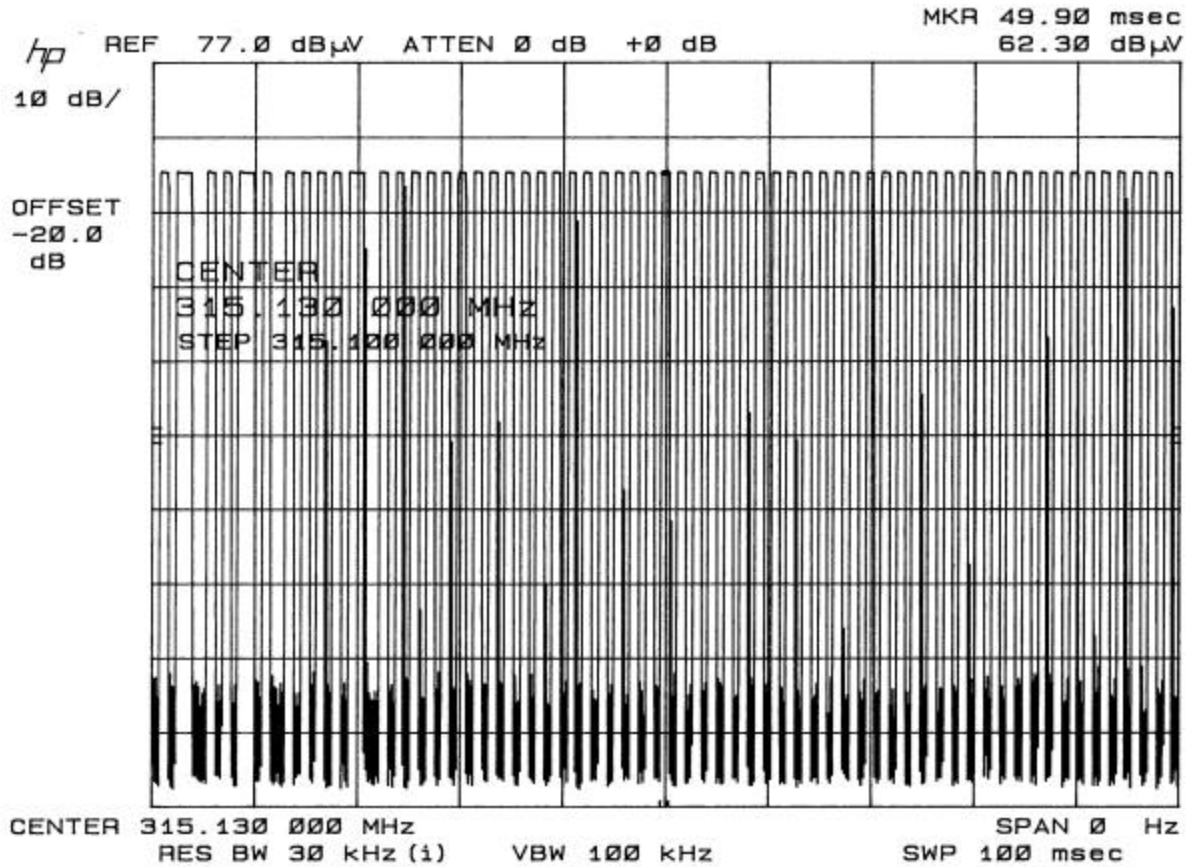
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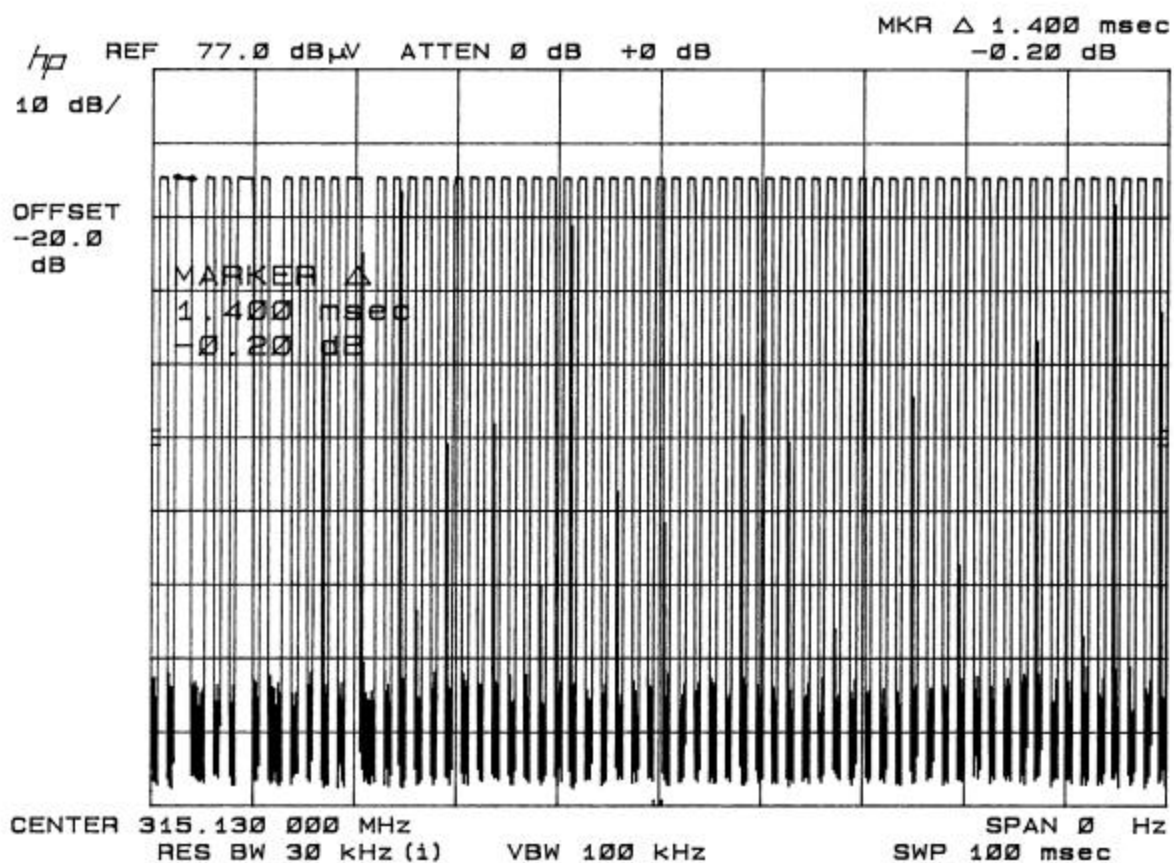
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DUTY CYCLE PLOT - PULSE TRAIN
DURATION GREATER THAN 100 mSEC



DUTY CYCLE PLOT - LONG PULSES



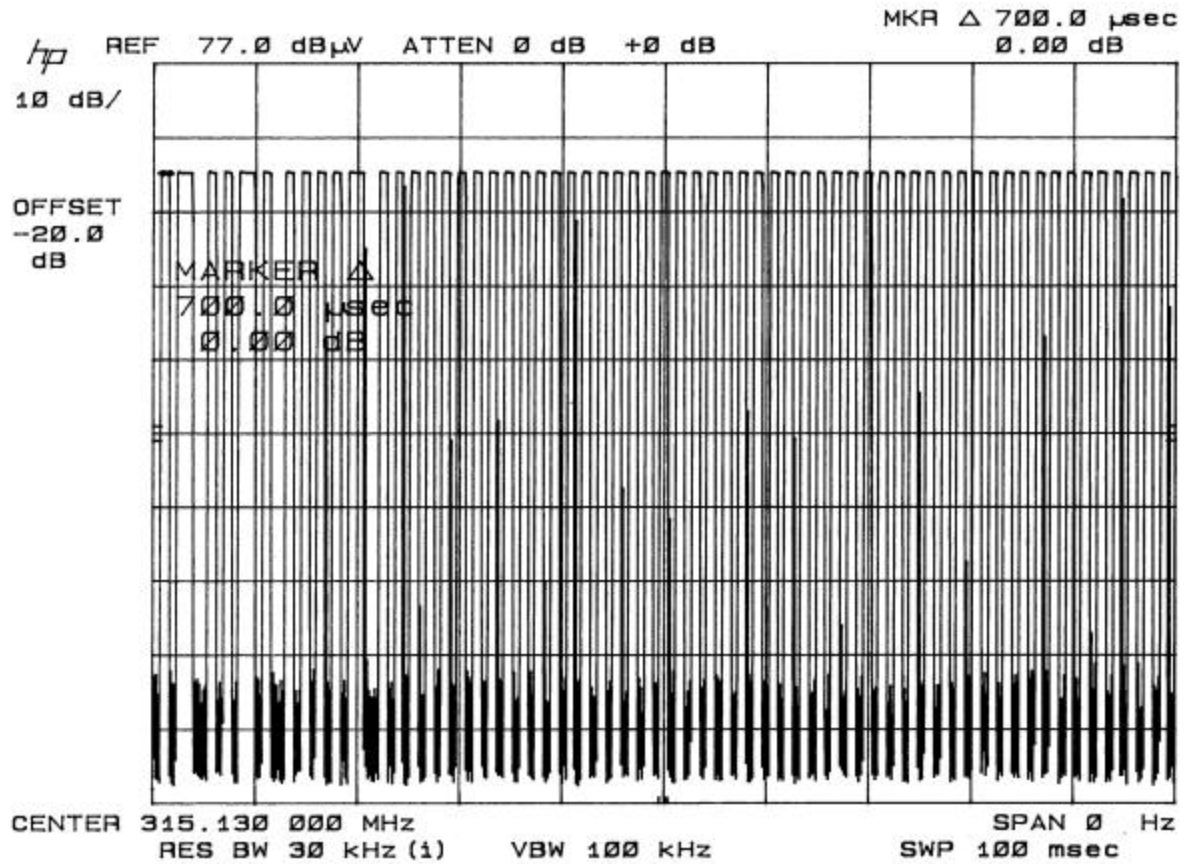
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DUTY CYCLE PLOT - SHORT PULSES



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NAME OF TEST: Occupied Bandwidth

RULES PART NO.: 15.231(C)

REQUIREMENTS: The bandwidth of the emission shall be no wider than .25% of the center frequency for devices operating between 70 and 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

$$\begin{aligned} 315.10 \text{ MHz} * .0025 &= 0.78775 \text{ MHz} \\ 0.78775 \text{ MHz}/2 &= +/- 393.88 \text{ kHz} \end{aligned}$$

THE GRAPH ON THE FOLLOWING PAGE REPRESENTS THE EMISSIONS TAKEN FOR THE DEVICE.

METHOD OF MEASUREMENT: A small sample of the transmitter output was fed into the spectrum analyzer and the plot in exhibit 9 was generated. The vertical scale is set to 10 dB per division: the horizontal scale is set to 20 kHz per division.

TEST RESULTS: The unit meets the FCC requirements.

PERFORMED BY: JOSEPH SCOGLIO

DATE: JUNE 17, 2003

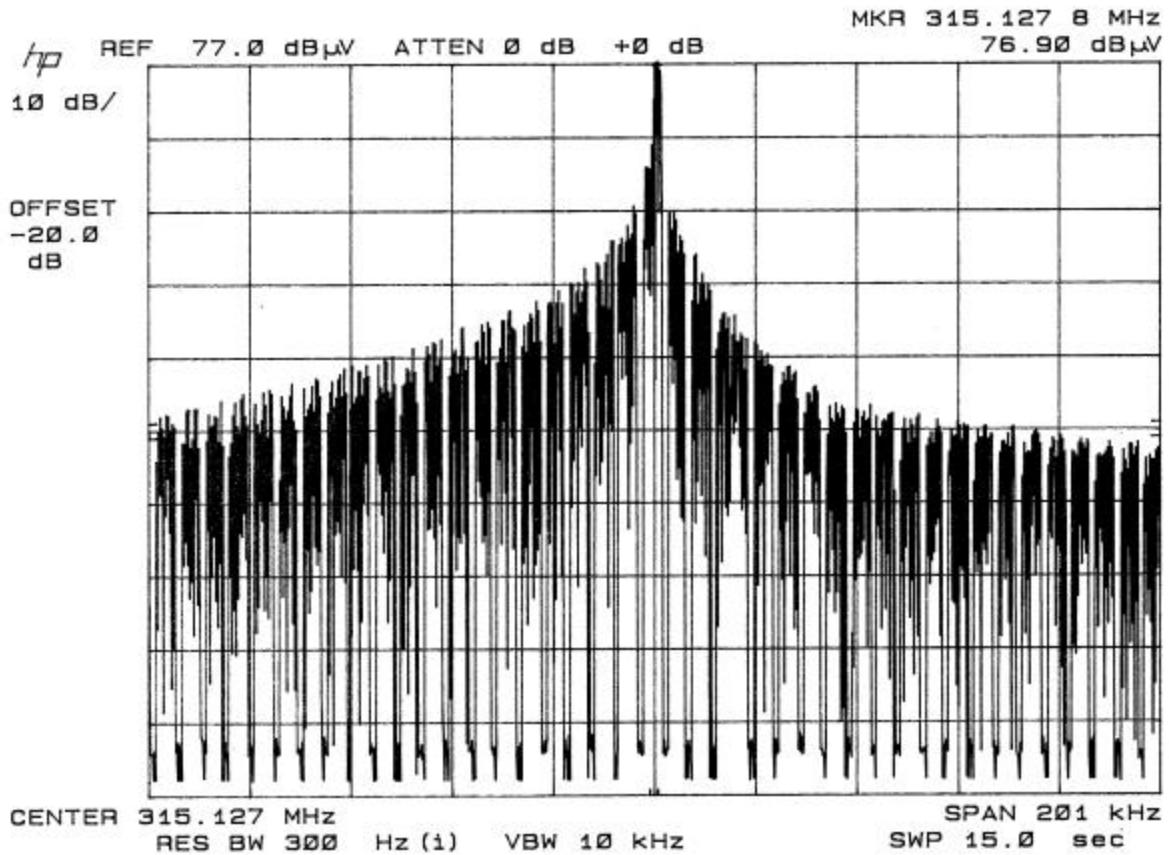
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OCCUPIED BANDWIDTH PLOT



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