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**APPLICANT**: ALPS ELECTRIC CO., LTD.

**FCC ID**: CWTWB1U429

**TEST REPORT CONTAINING**:



**EXHIBIT ATTACHMENTS**:

# 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<br>X | Receiver, Blue Tower Spectrum Analyzer | HP | 8568B | 2928A04729 2848A18049 | CAL 4/15/03 | 4/15/05 |
| 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 |

| | 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 |

| | 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 |

| | 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 |

## 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 98.3ºF 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.

**FCC ID**: CWTWB1U429

**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 |

**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

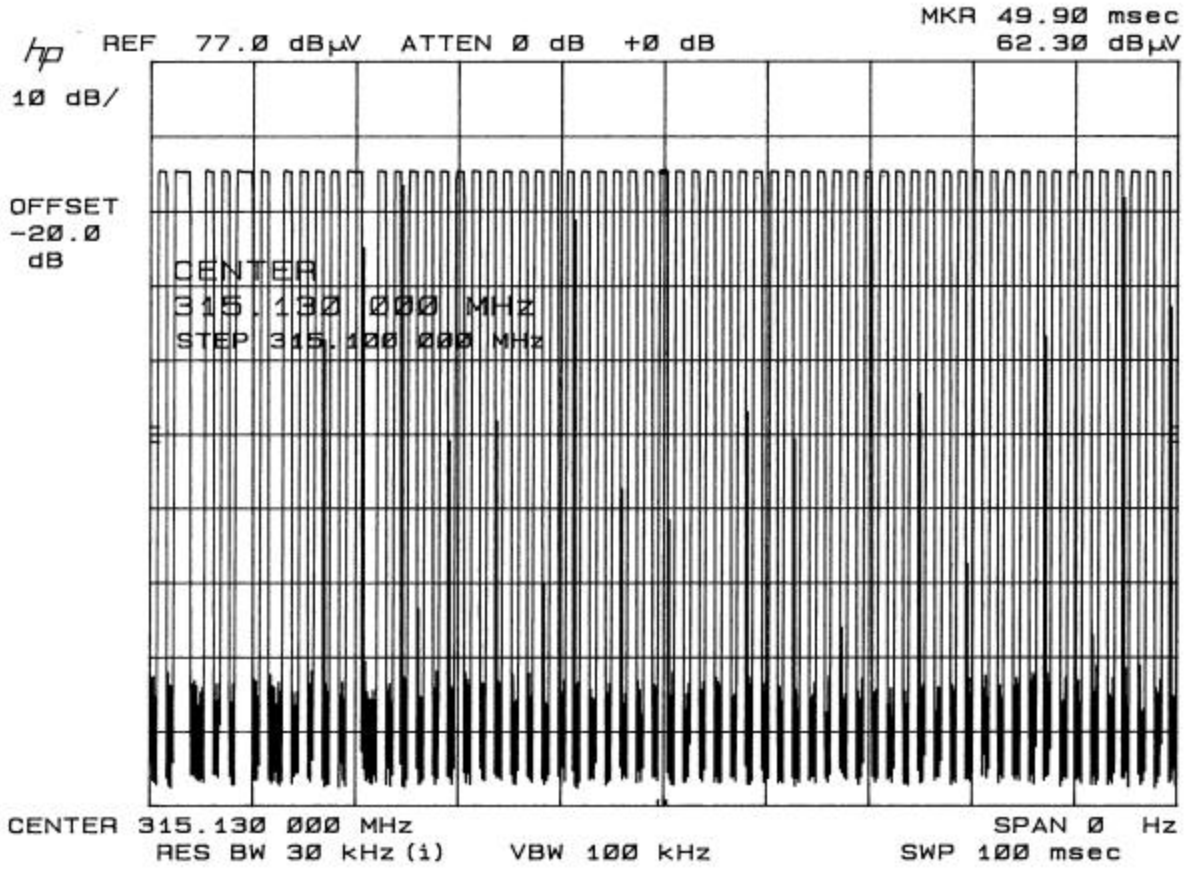
**APPLICANT**: ALPS ELECTRIC CO., LTD.

**FCC ID**: CWTWB1U429

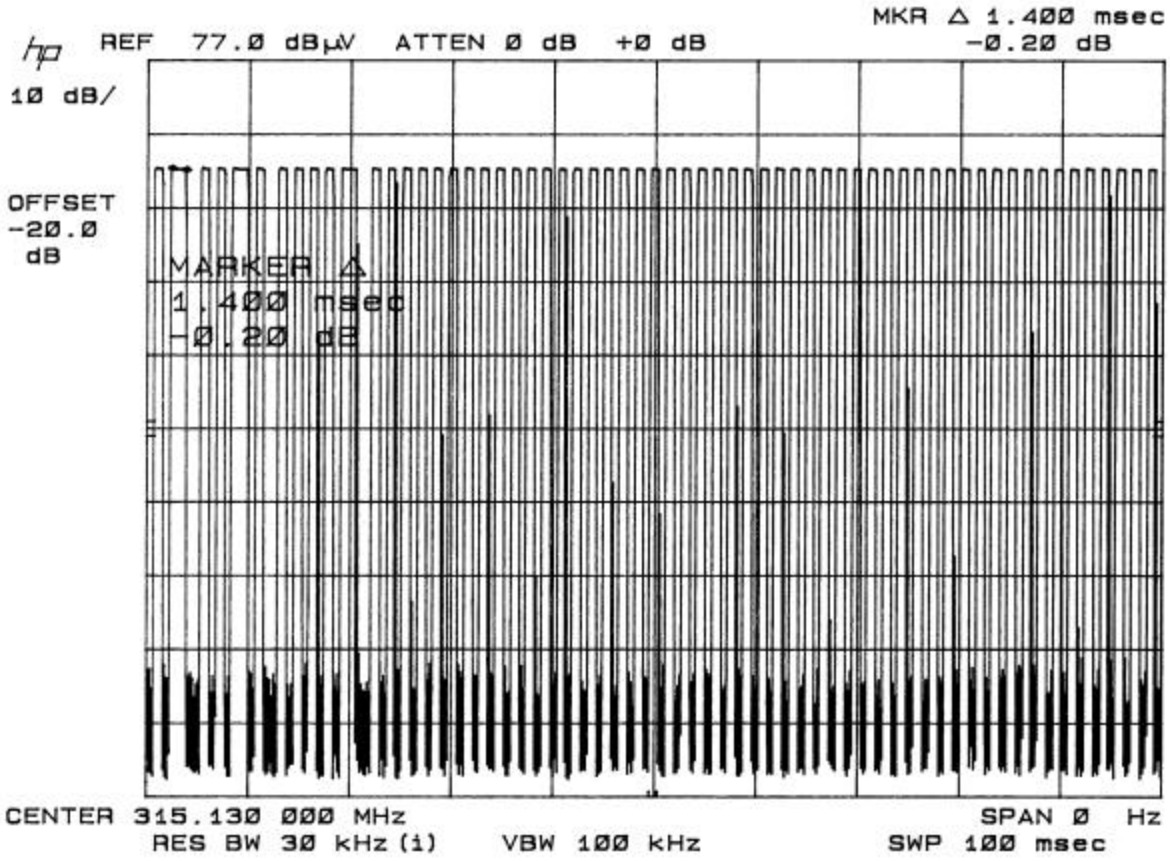
**CALCULATION OF DUTY CYCLE:**

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.

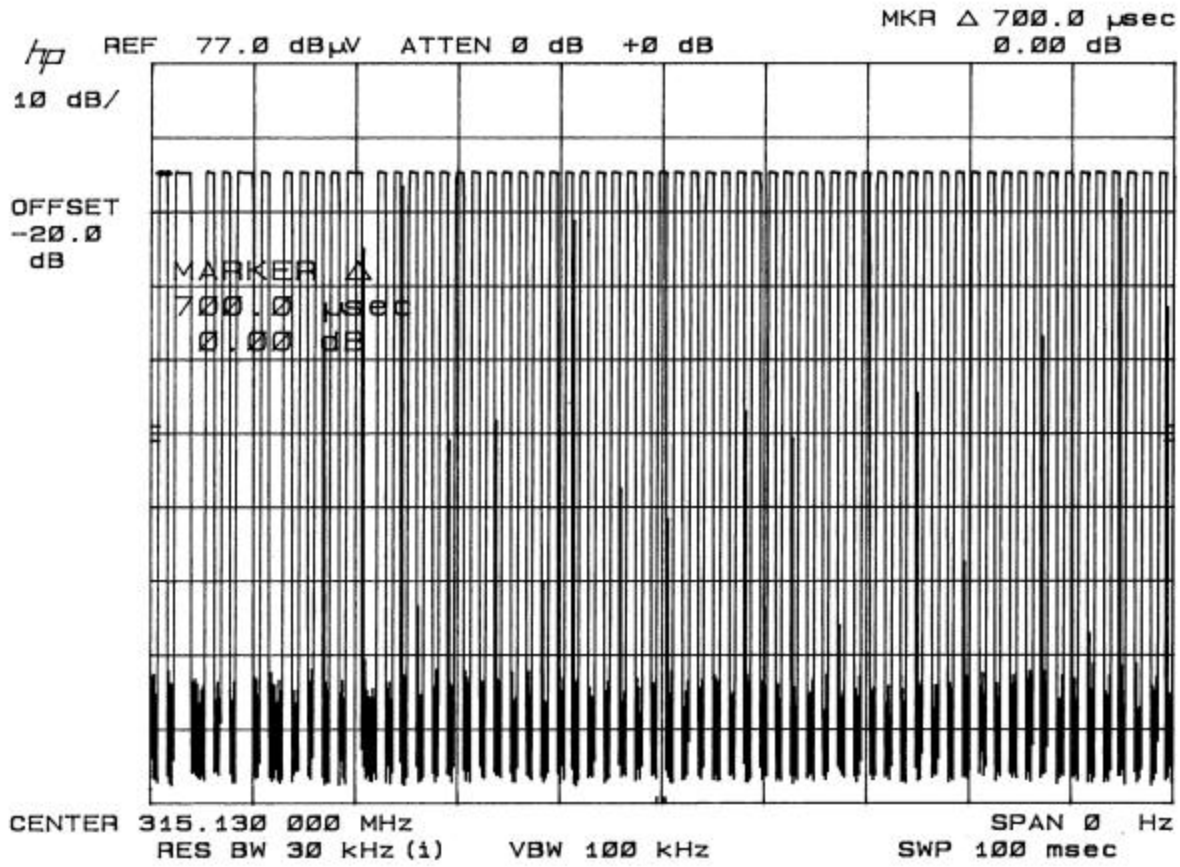
**DUTY CYCLE PLOT – PULSE TRAIN**
**DURATION GREATER THAN 100 mSEC**



**DUTY CYCLE PLOT – LONG PULSES**



**DUTY CYCLE PLOT – SHORT PULSES**



**APPLICANT**: ALPS ELECTRIC CO., LTD.

**FCC ID**: CWTWB1U429

**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.

315.10 MHz * .0025 = 0.78775 MHz
0.78775 MHz/2 = +/- 393.88 kHz

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

**OCCUPIED BANDWIDTH PLOT**