



Spectrum Research
& Testing Lab., Inc.
No. 101-10, Ling 8,
Shan-Teng Li, Chung-Li
City, Taoyuan, Taiwan,
R.O.C.

TEST REPORT

ReferenceNo.:A05072601
Report No.:FCCA05072601
Page:1 of 20
Date:Sep 10, 2005

Product Name: Automated Control and Entry System with Ignition
(ACE with Ignition)
Model Number: UT-KIT-001
Applicant: SPAL-USA
1731 SE Oralabor Road Ankeny, Iowa 50021
Date of Receipt: Aug. 03,2005
Finished date of Test: Sep. 08, 2005
Applicable Standards: 47 CFR Part 15, Subpart C
ANSI C63.4:2003

We, **Spectrum Research & Testing Laboratory Inc.**, hereby certify that one sample of the above was tested in our laboratory with positive results according to the above-mentioned standards. The records in the report are an accurate account of the results. Details of the results are given in the subsequent pages of this report.

Checked By : 2/12/2005, Date: 9/10/2005
(Julian Chiang)

Approved By : 2/12/2005, Date: 9/10/2005
(Johnson Ho, Director)

| | | |
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| <p>Spectrum Research & Testing Lab., Inc.  No. 101-10, Ling 8, Shian-Tong Li, Chung-Li City, Taoyuan, Taiwan, R.O.C. </p> | <p>TEST REPORT</p> | Reference No.:A05072601 Report No.:FCCA05072601 Page:2 of 20 Date:Sep 10, 2004 |
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1. DOCUMENT POLICY AND TEST STATEMENT

1.1 DOCUMENT POLICY

- The report shall not be reproduced except in full, without the written approval of SRT Lab, Inc.
- The report must not be used by the applicant to claim that the product is endorsed by NVLAP.
- The NVLAP logo applies only to the applicable standards specified in this report.

1.2 TEST STATEMENT

- The test results in the report apply only to the unit tested by SRT Lab.
- There was no deviation from the requirements of test standards during the test.
- The new battery power source 12 Vdc, was used during the test.
- The antennas were soldered on the PCB..

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2. DESCRIPTION OF EUT AND TEST MODE

2.1 GENERAL DESCRIPTION OF EUT

| | |
|---------------------------------|---|
| PRODUCT | Automated Control and Entry System with Ignition (ACE with Ignition) |
| MODEL NO. | UT-KIT-001 |
| POWER SUPPLY | 12Vdc(Battery) |
| CABLE | N/A |
| I/O PORT/INTERFACE | N/A |
| FREQUENCY BAND | 433.94MHz |
| CARRIER FREQUENCY | 433.94MHz |
| NUMBER OF CHANNEL | 1 |
| CHANNEL SPACING | N/A |
| RF OUTPUT POWER | 10mW=10dBm |
| I.F. & L.O. | L.O. 433.94MHz |
| MODULATION TYPE | ASK |
| BIT RATE OF TRANSMISSION | 4 kHz |
| ANTENNA TYPE | Integral Antenna |

NOTE: The EUT is the transmitter part of a remote controller which includes a receiver part. For more detailed information, please refer to the specifications or User's manual provided by manufacturer.

2.2 DESCRIPTION OF EUT INTERNAL DEVICE

| DEVICE | BRAND / MAKER | MODEL # | FCC ID/DOC | REMARK |
|--------|---------------|---------|------------|--------|
| N/A | | | | |
| | | | | |
| | | | | |

2.3 DESCRIPTION OF TEST MODE

The EUT was operated in continuously transmitting mode.

| | | |
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2.4 DESCRIPTION OF SUPPORT UNIT

The EUT was configured by the requirement of ANSI C63.4 and CISPR 22. All interface ports were connected to the appropriate support units via specific cables. The support units and cables are listed below.

| NO | DEVICE | BRAND | MODEL # | FCC ID/DOC | CABLE |
|----|--------|-------|---------|------------|-------|
| 1 | N/A | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

NOTE: For the actual test configuration, please refer to the photos of testing.

3. DESCRIPTION OF APPLIED STANDARDS

The EUT is a kind of wireless product and according to the specifications provided by the applicant, must comply with the requirements of the following standards:

47 CFR Part 15, Subpart C

All tests have been performed and recorded as per the above standards.

4. CONDUCTED EMISSION TEST

The test item was not performed, because the EUT uses 12Vdc battery as power source.

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5. RADIATED EMISSION TEST

5.1 RADIATED EMISSION LIMIT

FCC part15C 15.209 limits of radiated emission measurement for frequency below 1000 MHz

| FREQUENCY (MHz) | DISTANCE (m) | FIELD STRENGTH (dB μ V/m) |
|-----------------|--------------|-------------------------------|
| 30 - 88 | 3 | 40.0 |
| 88 - 216 | 3 | 43.5 |
| 216 - 960 | 3 | 46.0 |
| ABOVE 960 | 3 | 54.0 |

FCC part15C 15.231(b) limit of fundamental and spurious emissions measurement.

| FREQUENCY (MHz) | Field Strength of Fundamental (microvolts/meter) | Field Strength of Spurious Emissions (microvolts/meter) |
|-----------------|--|---|
| 40.66-40.70 | 2250 | 225 |
| 70-130 | 1250 | 125 |
| 130-174 | 1250 to 3750 (NOTE 5) | 125 to 375 (NOTE 7) |
| 174-260 | 3750 | 375 (NOTE 7) |
| 260-470 | 3750 to 12500 (NOTE 6) | 375 to 1250 |
| Above 470 | 12500 | 1250 |

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dB μ V/m) = 20 log Emission level (μ V/m).
3. In the emission tables above, the tighter limit applies at the band edges.
4. Distance refers to the distance between measuring instrument, antenna, and the closest point of any part of the device or system.
5. Limit = $20\log(56.81818(F) - 6136.3636)$; F : Fundamental Frequency (MHz)
6. Limit = $20\log(41.667 \times F - 7083.3333)$; F : Fundamental Frequency (MHz)
7. Limit = The Limit of Fundamental Frequency - 20dB
8. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

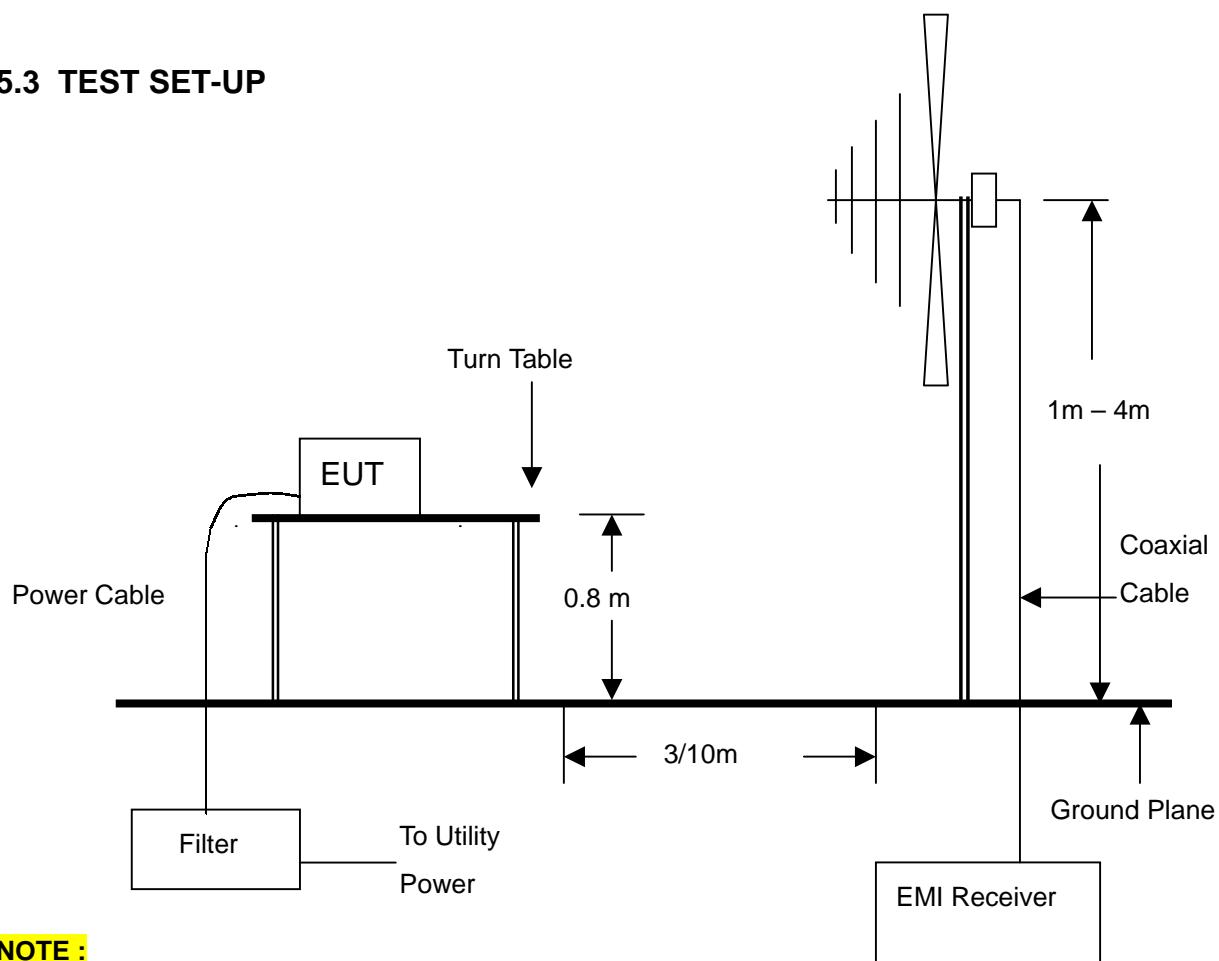
| | | |
|---|----------------------|---|
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5.2 TEST EQUIPMENT

The following test equipment was used during the radiated emission test :

| EQUIPMENT/ FACILITIES | SPECIFICATIONS | MANUFACTURER | MODEL#/ SERIAL# | DUE DATE OF CAL. & CAL. CENTER |
|--------------------------|---------------------------------|--------------------|-----------------------|-----------------------------------|
| EMI TEST RECEIVER | 9 kHz TO 2750 MHz | ROHDE & SCHWARZ | ESCS30/ 836858/008 | AUG. 2006 ETC |
| BI-LOG ANTENNA | 25 MHz TO 2 GHz | EMCO | 3142/ 9701-1124 | APR. 2006 SRT |
| PRE-AMPLIFIER | 1GHz-26.5GHz Gain:30dB(typ.) | HP | 8449B/ 3008A01019 | DEC. 2006 ETC |
| SPECTRUM | 9KHz TO 26.5GHz | HP | 8953E/ 3710A03220 | MAY 2006 ETC |
| HORN ANTENNA | 1GHz TO 18GHz | EMCO | 3115/ 9602-4681 | NOV. 2006 ETC |
| OATS | 3 – 10 M MEASUREMENT | SRT | SRT-1 | APR. 2006 SRT |

1. The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.
2. The Open Area Test Site (SRT-1) is registered by FCC with No. 90957 and VCCI with No. R-1081.
3. The Open Area Test Site (SRT-2) is registered by FCC with No. 98458 and VCCI with No. R-1168.

5.3 TEST SET-UP**NOTE :**

1. The EUT system was put on a wooden table with 0.8m heights above a ground plane.
2. For the actual test configuration, please refer to the photos of testing.

5.4 TEST PROCEDURE

The EUT was tested according to the requirement of ANSI C63.4 and CISPR 22. The measurements were made at an open area test site with 3 meter measurement distance under 1 GHz and with 3m distance above 1GHz. The frequency spectrum measured started from 30 MHz. Under 1 GHz, all readings were quasi-peak values with 120 kHz resolution bandwidth of the test receiver. Above 1 GHz, the measurements were made at an open area test site with 3 meter measurement distance and all readings were peak or average values with 1 MHz resolution bandwidth of the test receiver. The EUT system was operated in all typical methods by users. The cables connected to EUT and support units were moved to find the maximum emission levels for each frequency.

5.5 EUT OPERATING CONDITION

Same as section 2.3 of this report.

5.6 Maximum Modulation Percentage

Duty Cycle = 50%

FCC ID: KNF4TX433

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5.7 RADIATED EMISSION TEST RESULT

| | | | |
|--------------------|--------------|--------------------|----------|
| Temperature: | 25C | Humidity: | 55%RH |
| Ferquency Range: | 30MHz – 5GHz | Measured Distance: | 3m |
| Receiver Detector: | Peak/QP/AV | Tested By: | Hugo Yeh |

Fundamental

| Frequency (MHz) | Correct Factor (dB) | Antenna Factor (dB/m) | Polarization | Reading (dB μ V) | | Emission Level (dB μ V/m) | | Limit (dB μ V/m) | | Margin (dB) | | AZ (°) | EL (m) |
|-----------------|---------------------|-----------------------|--------------|----------------------|-------|-------------------------------|------|----------------------|-------|-------------|------|--------|--------|
| | | | | peak | av | peak | av | peak | av | peak | av | | |
| 434.152 | 3.00 | 15.64 | H | 68.90 | 56.40 | 87.50 | 75.0 | 100.83 | 80.83 | -13.3 | -5.8 | 223.7 | 1.42 |
| 434.154 | 3.00 | 15.64 | V | 67.30 | 56.20 | 85.9 | 74.8 | 100.83 | 80.83 | -14.9 | -6.0 | 265.7 | 1.04 |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

TX

| Frequency (MHz) | Correct Factor (dB) | Antenna Factor (dB/m) | Polarization | Reading (dB μ V) Peak/QP | Emission Level (dB μ V/m) peak/QP | Limit (dB μ V/m) Peak/QP | Margin (dB) Peak/QP | AZ (°) | EL (m) |
|-----------------|---------------------|-----------------------|--------------|---------------------------------|--|---------------------------------|------------------------|--------|--------|
| 66.8640 | 1.10 | 5.16 | H | 13.8 | 20.1 | 60.83 | -40.8 | 267.2 | 3.36 |
| 200.7250 | 2.15 | 9.40 | H | 13.6 | 25.2 | 60.83 | -35.7 | 262.3 | 3.31 |
| 299.6700 | 2.37 | 14.05 | H | 13.7 | 30.1 | 60.83 | -30.7 | 195.6 | 1.40 |
| 305.4520 | 2.44 | 14.21 | H | 13.6 | 30.2 | 60.83 | -30.6 | 134.8 | 1.28 |
| 702.2400 | 4.01 | 18.20 | H | 14.4 | 36.6 | 60.83 | -24.2 | 124.5 | 2.21 |
| 868.5480 | 4.60 | 21.30 | H | 31.3 | 57.2 | 60.83 | -3.6 | 124.5 | 2.21 |
| 33.8840 | 0.50 | 3.32 | V | 14.7 | 18.5 | 60.83 | -42.3 | 241.6 | 1.00 |
| 66.8680 | 1.10 | 5.16 | V | 15.4 | 21.7 | 60.83 | -39.2 | 91.20 | 1.00 |
| 101.3840 | 1.35 | 7.58 | V | 16.2 | 25.1 | 60.83 | -35.7 | 51.45 | 1.05 |
| 200.3520 | 2.15 | 9.40 | V | 17.4 | 29.0 | 60.83 | -31.9 | 75.25 | 1.25 |
| 299.2850 | 2.37 | 14.05 | V | 17.3 | 33.7 | 60.83 | -27.1 | 125.6 | 1.32 |
| 868.5634 | 4.60 | 21.30 | V | 30.6 | 56.5 | 60.83 | -4.3 | 125.6 | 1.32 |
| | | | | | | | | | |

Note: Above 1GHz and up to 4.5GHz, The noise is very small.

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RX

Antenna Polarization : Horizontal

| Frequency (MHz) | Correct Factor (dB) | Antenna Factor (dB/m) | Reading Data(dB μ V) (Peak) | Emission Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) | AZ (°) | EL (m) |
|-----------------|---------------------|-----------------------|---------------------------------|-------------------------------|----------------------|-------------|--------|--------|
| 79.4740 | 1.04 | 6.17 | 17.3 | 24.5 | 40.0 | -15.5 | 82.7 | 1.27 |
| 101.5717 | 1.10 | 7.66 | 13.5 | 22.3 | 43.5 | -21.2 | 12.4 | 1.43 |
| 169.8068 | 1.43 | 8.65 | 12.6 | 22.7 | 43.5 | -20.8 | 175.1 | 1.84 |
| 316.9920 | 1.99 | 14.74 | 10.1 | 26.8 | 46.0 | -19.2 | 152.4 | 1.72 |
| 568.1600 | 2.87 | 19.80 | 7.4 | 30.1 | 46.0 | -15.9 | 248.6 | 1.46 |
| 601.2416 | 2.88 | 20.71 | 8.6 | 32.2 | 46.0 | -13.8 | 75.5 | 1.51 |

Antenna Polarization : Vertical

| Frequency (MHz) | Correct Factor (dB) | Antenna Factor (dB/m) | Reading Data(dB μ V) (Peak) | Emission Level (dB μ V/m) | Limit (dB μ V/m) | Margin (dB) | AZ (°) | EL (m) |
|-----------------|---------------------|-----------------------|---------------------------------|-------------------------------|----------------------|-------------|--------|--------|
| 60.3200 | 0.85 | 6.60 | 17.3 | 24.8 | 40.0 | -15.3 | 81.3 | 1.00 |
| 101.6740 | 1.10 | 7.66 | 16.7 | 25.5 | 43.5 | -18.0 | 57.6 | 1.12 |
| 233.3120 | 1.69 | 10.56 | 16.8 | 29.0 | 46.0 | -17.0 | 347.6 | 1.00 |
| 401.4629 | 2.29 | 15.82 | 9.10 | 27.2 | 46.0 | -18.8 | 52.7 | 1.20 |
| 579.3248 | 2.87 | 20.11 | 11.4 | 34.4 | 46.0 | -11.6 | 167.8 | 1.27 |
| 703.0019 | 3.08 | 21.65 | 8.20 | 32.9 | 46.0 | -13.1 | 92.4 | 1.52 |

NOTE :

1. Measurement uncertainty is +/-2dB.
2. **: Measurement value was too low to be detected.
3. Emission Level = Reading Value + Ant. Factor + Cable Loss.
4. The field strength of other emission frequencies were very low against the limit.
5. The emission level is lower than equipment's noise.

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|  <p>Spectrum Research & Testing Lab., Inc. No. 101-10, Ling 8, Chun-Tong Li, Chung-Li City, Taoyuan, Taiwan, R.O.C.</p> | <h1>TEST REPORT</h1> | Reference No.:A05072601 Report No.:FCCA05072601 Page:11 of 20 Date:Sep 10, 2004 |
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6. BAND EDGE TEST

6.1 BAND EDGE LIMIT

FCC part15C 15.231(b) limit of fundamental and spurious emissions measurement.

| FREQUENCY (MHz) | Field Strength of Fundamental (microvolts/meter) | Field Strength of Spurious Emissions (microvolts/meter) |
|-----------------|--|---|
| 40.66-40.70 | 2250 | 225 |
| 70-130 | 1250 | 125 |
| 130-174 | 1250 to 3750 (NOTE 4) | 125 to 375 (NOTE 6) |
| 174-260 | 3750 | 375 |
| 260-470 | 3750 to 12500 (NOTE 5) | 375 to 1250 (NOTE 6) |
| Above 470 | 12500 | 1250 |

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (μ V/m) = 20 log Emission level (μ V/m).
3. In the emission tables above, the tighter limit applies at the band edges.
4. Limit = $20\log(56.81818(F) - 6136.3636)$; F : Fundamental Frequency (MHz)
5. Limit = $20\log(41.667 \times F - 7083.3333)$; F : Fundamental Frequency (MHz)
6. Limit = The Limit of Fundamental Frequency – 20dB
7. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

6.2 TEST EQUIPMENT

The following test equipment was used during the radiated emission test :

| EQUIPMENT/ FACILITIES | SPECIFICATIONS | MANUFACTURER | MODEL#/ SERIAL# | DUE DATE OF CAL. & CAL. CENTER |
|-----------------------|----------------|-----------------|-----------------|--------------------------------|
| SPECTRUM | 9 kHz TO 7GHz | ROHDE & SCHWARZ | FSP7/839511/010 | MAR. 2005 ETC |

NOTE:

1. The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

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6.3 TEST SET-UP

The EUT was connected to Receiver(or spectrum) by 50Ω coaxial cable.



6.4 TEST PROCEDURE

Please refer to FCC Part15C 15.231.

6.5 EUT OPERATING CONDITION

Same as section 2.3 of this report.

6.6 BAND EDGE TEST RESULT

EUT: ACE with Ignition MODEL: UT-KIT-001 MODE: Tx

TEST STANDARD: FCC part15 Subpart C 15.231 TEST SITE: SHIELDED ROOM

AMBIENT TEMPERATURE : 20 RELATIVE HUMIDITY : 65 %RH

TEST PERSONNEL : Hugo APPROVED BY: Hugo

| Frequency (MHz) | RF LEVEL 120kHz BW (dBuV) | Limit of Power(dBuV) | MARGIN (dB) | PASS/FAIL |
|-----------------|------------------------------|----------------------|-------------|-----------|
| 433.94 | 43.52 | 65.5 | -21.98 | PASS |
| | | | | |
| | | | | |

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7. FREQUENCY BANDWIDTH

7.1 FREQUENCY BANDWIDTH LIMIT

| FREQUENCY (MHz) | BANDWIDTH LIMIT(kHz) |
|-----------------|--------------------------------------|
| Above 70-900 | 0.25% \times Center Frequency(MHz) |
| Above 900 | 0.5% \times Center Frequency(MHz) |

NOTE:

1. Bandwidth is determined at the points 20dB down from the modulated carrier.

7.2 TEST EQUIPMENT

The following test equipment was used during the radiated emission test :

| EQUIPMENT/ FACILITIES | SPECIFICATIONS | MANUFACTURER | MODEL#/ SERIAL# | DUE DATE OF CAL. & CAL. CENTER |
|-----------------------|----------------|-----------------|---------------------|--------------------------------|
| SPECTRUM | 9 kHz TO 7GHz | ROHDE & SCHWARZ | FSP7/ 839511/010 | MAR. 2005 ETC |

NOTE:

1. The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

7.3 TEST SET-UP

The EUT was connected to receiver(or spectrum) by 50Ω coaxial cable.



7.4 TEST PROCEDURE

Please refer to FCC Part15C 15.231.

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7.5 EUT OPERATING CONDITION

Same as section 2.3 of this report.

7.6 FREQUENCY BANDWIDTH TEST RESULT

EUT: ACE with Ignition MODEL: UT-KIT-001 MODE: Tx

TEST STANDARD: FCC part15 Subpart C 15.231 TEST SITE: SHIELDED ROOM

AMBIENT TEMPERATURE : 20 RELATIVE HUMIDITY : 65 %RH

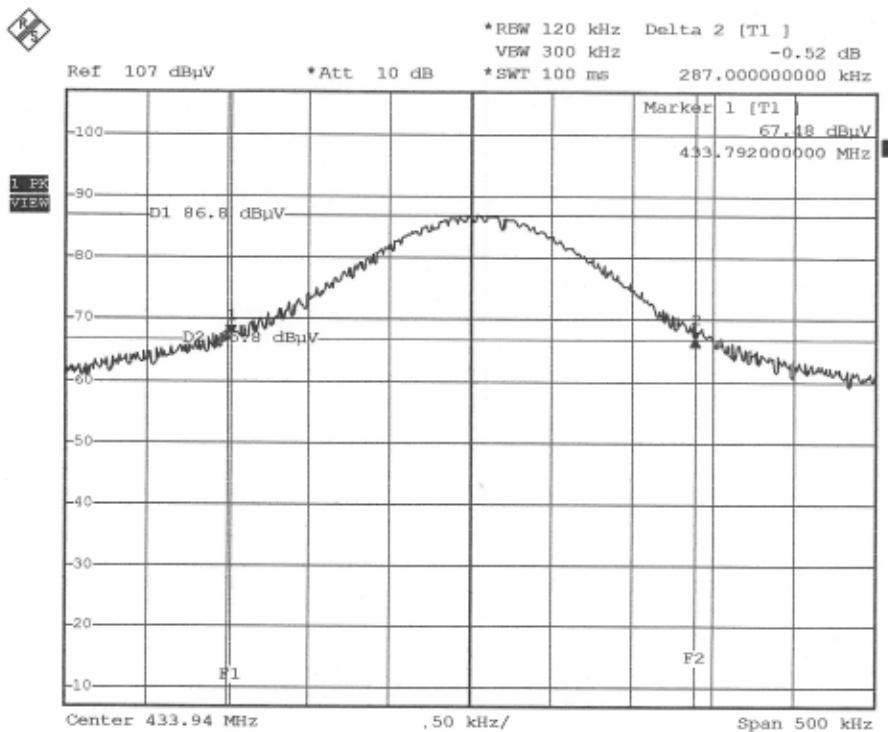
TEST PERSONNEL : Hugo APPROVED BY: Hugo

| CHANNEL NUMBER | CHANNEL FREQUENCY (MHz) | <u>20</u> dB DOWN BW (kHz) | MINIMUM LIMIT (kHz) | MAXIMUM LIMIT (kHz) | PASS/FAIL |
|----------------|-------------------------|----------------------------|---------------------|---------------------|-----------|
| 1 | 433.94 | 287.00 | | 1084.85 | PASS |
| | | | | | |



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Bandwidth

| | | |
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8. RELEASE OR OPERATING TIME

8.1 RELEASE TIME OR OPERATING LIMIT

1. A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
2. A transmitter activated automatically shall cease transmission within 5 seconds after activation.
- 3). Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the periodic rate of transmission does not exceed one transmission of not more than one second duration per hour for each transmitter.
4. Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

8.2 TEST EQUIPMENT

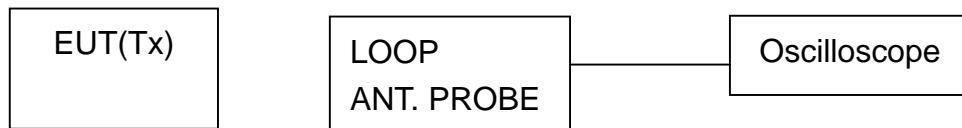
The following test equipment was used during the radiated emission test :

| EQUIPMENT/ FACILITIES | SPECIFICATIONS | MANUFACTURER | MODEL#/ SERIAL# | DUE DATE OF CAL. & CAL. CENTER |
|--------------------------|----------------|--------------|-----------------------|-----------------------------------|
| OSCILLOSCOPE | 500MHz | HP | 54616B/ US39150351 | APR. 2005 ETC |

NOTE:

1. The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

8.3 TEST SET-UP



| | | |
|---|----------------------|--|
|  <p>Spectrum Research & Testing Lab., Inc. No. 101-10, Ling 8, Chun-Tong Li, Chung-Li City, Taoyuan, Taiwan, R.O.C.</p> | <h1>TEST REPORT</h1> | Reference No.:A05072601 Report No.:FCCA05072601 Page:17 of 20 Date:Sep 10, 2004 |
|---|----------------------|--|

8.4 TEST PROCEDURE

A specific loop antenna was connected to oscilloscope to detect the EUT's release time.

The oscilloscope displayed the EUT's release time and take a picture of measurement.

8.5 EUT OPERATING CONDITION

The EUT is normal use function.

8.6 RELEASE OR OPERATING TIME TEST RESULT

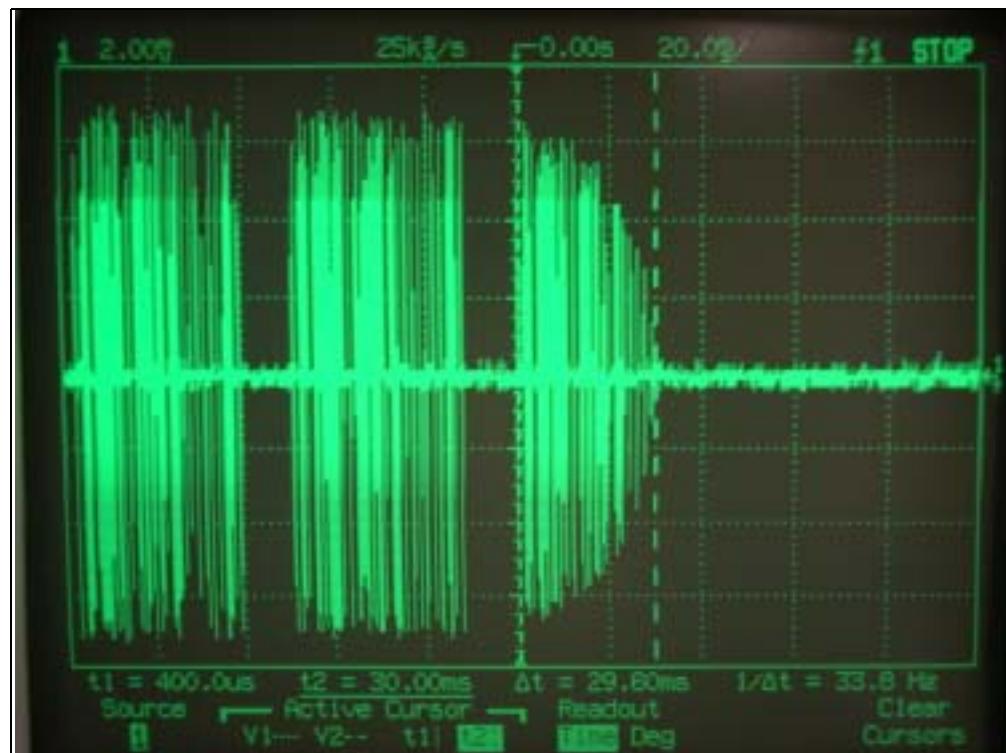
EUT: ACE with Ignition MODEL: UT-KIT-001 MODE: Tx

TEST STANDARD: FCC part15 Subpart C 15.231 TEST SITE: SHIELDED ROOM

AMBIENT TEMPERATURE: 20 RELATIVE HUMIDITY: 65 %RH

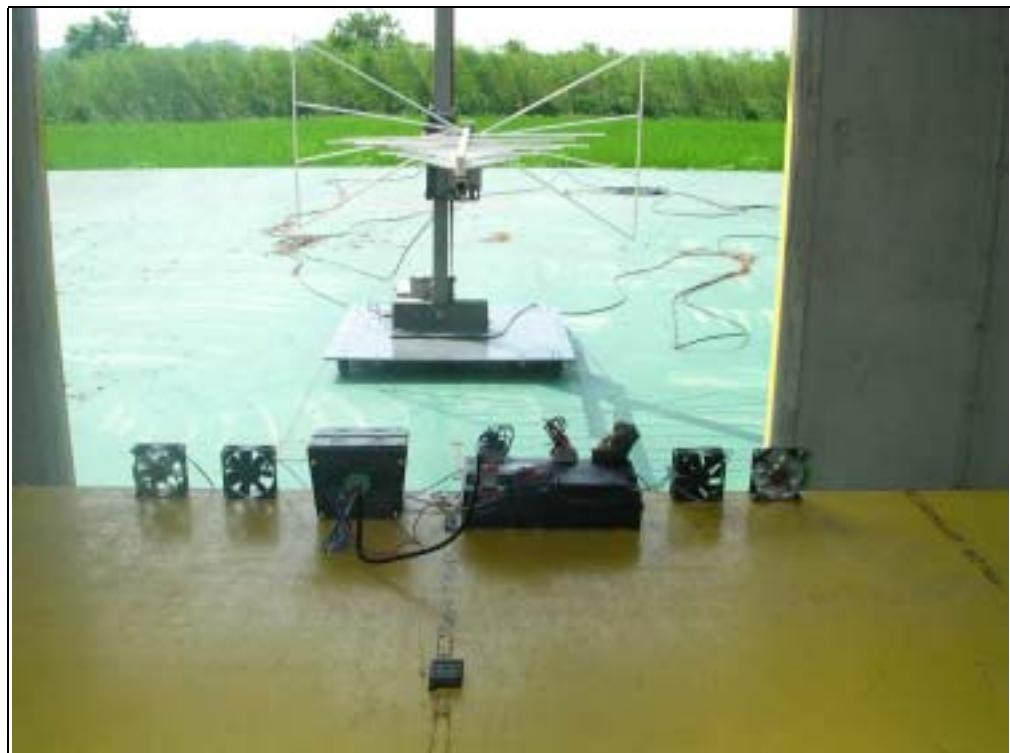
TEST PERSONNEL: Hugo APPROVED BY: Hugo

| Start release time(ms) | Stop time(ms) | Total release time(ms) | Limit of release time<(s) |
|------------------------|---------------|------------------------|---------------------------|
| 0.4 | 30 | 29.6 | 5 |

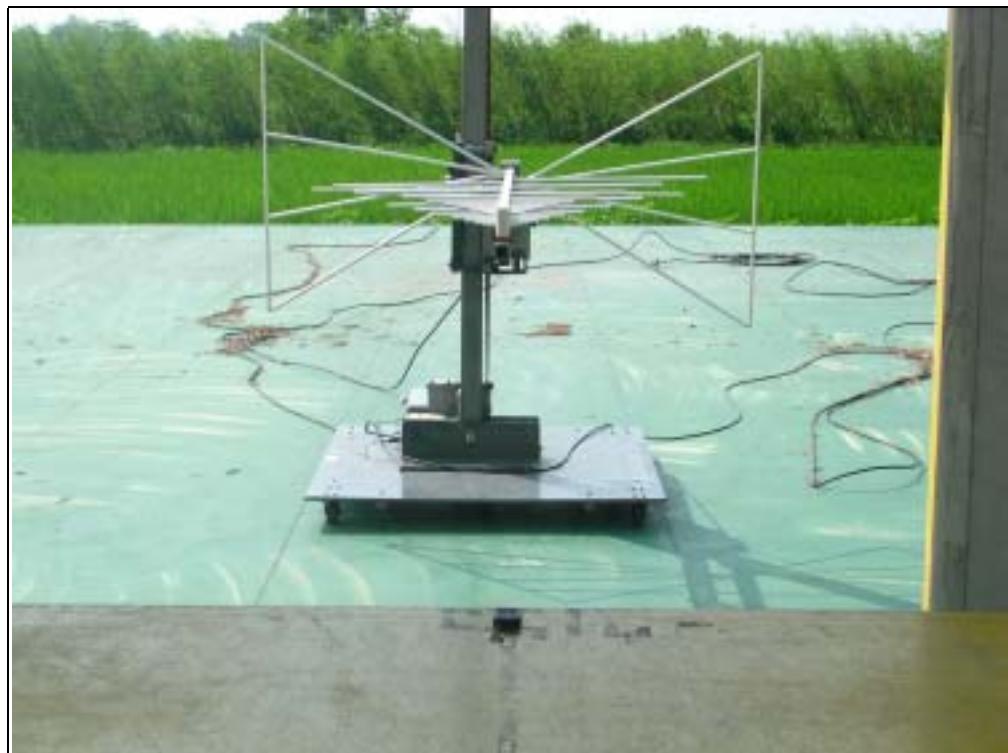


9. PHOTOS OF TESTING

- Radiated test-RX



- Radiated test- TX



| | | |
|---|----------------------|--|
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10. TERMS OF ABRIVATION

| | |
|----------|--|
| AV. | Average detection |
| AZ(°) | Turn table azimuth |
| Correct. | Correction |
| EL(m) | Antenna height (meter) |
| EUT | Equipment Under Test |
| Horiz. | Horizontal direction |
| LISN | Line Impedance Stabilization Network |
| NSA | Normalized Site Attenuation |
| PK. | Peak detection |
| Q.P. | Quasi-peak detection |
| SRT Lab | Spectrum Research & Testing Laboratory, Inc. |
| Vert. | Vertical direction |