

## ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

### INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

|                       |                                                                                                             |
|-----------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Product Name:</b>  | <b>Laser Presenter</b>                                                                                      |
| <b>Brand Name:</b>    | <b>INFINITER</b>                                                                                            |
| <b>Model Name:</b>    | <b>LR2</b>                                                                                                  |
| <b>FCC ID:</b>        | <b>S751433LR2</b>                                                                                           |
| <b>Report No.:</b>    | <b>ER/2005/20012</b>                                                                                        |
| <b>Issue Date:</b>    | <b>Apr. 04, 2005</b>                                                                                        |
| <b>FCC Rule Part:</b> | <b>§15.231</b>                                                                                              |
| <b>Prepared for</b>   | <b>Quarton Inc.</b><br><br><b>5F, 175, Sec. 2, Ta-Tung Rd., Hsi-Chih,<br/>Taipei Hsien, Taiwan, R.O.C.</b>  |
| <b>Prepared by</b>    | <b>SGS Taiwan Ltd.</b><br><br><b>No. 134, Wu Kung Rd., Wuku Industrial<br/>Zone, Taipei County, Taiwan.</b> |

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## VERIFICATION OF COMPLIANCE

**Applicant:** Quarton Inc.  
5F, 175, Sec. 2, Ta-Tung Rd., Hsi-Chih, Taipei Hsien, Taiwan, R.O.C.

**Product Description:** Laser Presenter

**FCC ID Number:** S751433LR2

**Brand Name:** INFINITER

**Model No.:** LR2

**Model Difference:** N/A

**File Number:** ER/2005/20012

**Date of test:** Feb. 23, 2005 ~ Mar. 31, 2005

**Date of EUT received:** Feb. 21, 2005

## We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. 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 (2003) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.231.

The test results of this report relate only to the tested sample identified in this report.

|                     |                   |             |                      |
|---------------------|-------------------|-------------|----------------------|
| <b>Test By:</b>     | <u>Alex Hsieh</u> | <b>Date</b> | <u>Apr. 04, 2005</u> |
|                     | Alex Hsieh        |             |                      |
| <b>Prepared By:</b> | <u>Eva Kao</u>    | <b>Date</b> | <u>Apr. 04, 2005</u> |
|                     | Eva Kao           |             |                      |
| <b>Approved By:</b> | <u>Vincent Su</u> | <b>Date</b> | <u>Apr. 04, 2005</u> |
|                     | Vincent Su        |             |                      |

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## Version

| Version No. | Date          |
|-------------|---------------|
| 00          | Apr. 04, 2005 |
|             |               |
|             |               |

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## 1. GENERAL INFORMATION

### 1.1 Product Description

The Quarton Inc., Model: LR2 (referred to as the EUT in this report) is a Laser Presenter.

A major technical descriptions of EUT is described as following:

- A). Operation Frequency: 433.92 MHz
- B). Modulation: Pulse Modulation
- C). Antenna Designation: Non-User Replaceable (Fixed)
- D). Power Supply: 1.5 Vdc from AAA battery.
- E). Transmitting Time: Periodic  $\leq 5$  seconds

### 1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **S751433LR2** filing to comply with Section 15.231 of the FCC Part 15, Subpart C Rules. The composite system (receiver) is compliance with Subpart B is authorized under a DoC procedure.

### 1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2003). Radiated testing was performed at an antenna to EUT distance 3 meters.

### 1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the address of SGS Taiwan Ltd. No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan. The Open Area Test Sites and the Line Conducted labs are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003 and CISPR 22/EN 55022 requirements. Site No. 1(3 &10 meters) Registration Number: 94644, Anechoic chamber (3 meters) Registration Number: 573967

### 1.5 Special Accessories

Not available for this EUT intended for grant.

### 1.6 Equipment Modifications

Not available for this EUT intended for grant.

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## 2. System Test Configuration

### 2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### 2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. the Tx frequency was fixed which was for the purpose of the measurements.

### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions (Not apply in the report)

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7 & 13 of ANSI C63.4-2003. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

#### 2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 8 & 13 of ANSI C63.4-2003.

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## 2.4 Limitation

### (1) Conducted Emission (Not applicable in this report)

According to section 15.207(a) Conducted Emission Limits is as following.

| Frequency range<br>MHz                                                                                                                                                         | Limits<br>dB (uV) |          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|
|                                                                                                                                                                                | Quasi-peak        | Average  |
| 0.15 to 0.50                                                                                                                                                                   | 66 to 56          | 56 to 46 |
| 0.50 to 5                                                                                                                                                                      | 56                | 46       |
| 5 to 30                                                                                                                                                                        | 60                | 50       |
| Note<br>1. The lower limit shall apply at the transition frequencies<br>2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz. |                   |          |

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**(2) Radiated Emission**

According to 15.231(b), the field strength of emissions from Intentional Radiators operated under this section shall not exceed the following:

| Fundamental Frequency (MHz) | Field Strength of Fundamental |                  | Field Strength of Spurious |              |
|-----------------------------|-------------------------------|------------------|----------------------------|--------------|
|                             | (dBuV/m)                      | (uV/m)           | (dBuV/m)                   | (uV/m)       |
| 40.66 - 40.70               | 67.04                         | 2,250            | 40                         | 100          |
| 70 - 130                    | 61.94                         | 1,250            | 34                         | 50           |
| 130 - 174                   | * 61.94 - 71.48               | * 1,250 - 3,750  | * 34 - 43.5                | * 50 to 150  |
| 174 - 260                   | 71.48                         | 3,750            | 43.5                       | 150          |
| 260 - 470                   | * 71.48 - 81.94               | * 3,750 - 12,500 | * 43.5 - 54                | * 150 to 500 |
| above 470                   | 81.94                         | 12,500           | 74                         | 500          |

- Remark:
1. Emission level in dBuV/m =  $20 \log (\text{uV/m})$
  2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
  3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of § 15.205
  4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of § 15.205, then the general radiated emission limits in § 15.209 apply.
  5. For the band 130-174MHz,  $\text{uV/m at 3meters} = 56.81818(F) - 6136.3636$ ;  
For the band 260-470MHz  $\text{uV/m at 3meters} = 41.6667(F) - 7083.3333$ ;  
Where F is the frequency in MHz.
  6.  $433.92\text{MHz limit} = 41.6667 * 433.92 - 7083.3333 = 10996.681 \text{ uV/m}$   
 $= 80.8\text{dBuV/m}$

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## 2.5 Configuration of Tested System

**Fig. 2-1 Configuration of Tested System**

EUT  
(TX)

**Table 2-1 Equipment Used in Tested System**

| Item | Equipment | Mfr/Brand | Model/<br>Type No. | FCC ID | Series No. | Data Cable | Power<br>Cord |
|------|-----------|-----------|--------------------|--------|------------|------------|---------------|
| 1.   | N/A       |           |                    |        |            |            |               |

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### 3. Summary Of Test Results

| FCC Rules      | Description Of Test                | Result    |
|----------------|------------------------------------|-----------|
| § 15.207       | Conducted Emission                 | N/A       |
| § 15.231       | Radiated Emission                  | Compliant |
| § 15.231(c)    | 20dB Bandwidth                     | Compliant |
|                | Duty Cycle Test (Pulse Modulation) | Compliant |
| § 15.231(a)(1) | Release Time Measurement           | Compliant |

### 4. Description of test modes

The EUT has been tested under engineering test mode condition. and the EUT staying in continuous transmitting mode.

The Frequency 433.92MHz is chosen for testing.

The X, Y and Z-axis of EUT were pre-test; X and Y mode were the worse case and report.

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## 5. Conducted Emissions Test (Not apply in the report)

### 5.1 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

### 5.2 Test SET-UP (Block Diagram of Configuration)

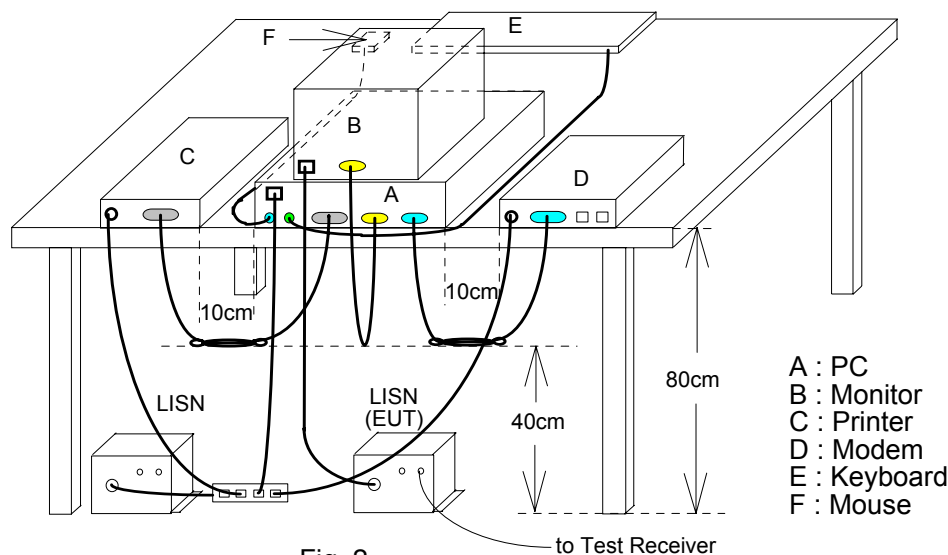


Fig. 2

### 5.3 Measurement Equipment Used:

| Conducted Emission Test Site |            |              |               |            |            |
|------------------------------|------------|--------------|---------------|------------|------------|
| EQUIPMENT TYPE               | MFR        | MODEL NUMBER | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
| EMC Analyzer                 | HP         | 8594EM       | 3624A00203    | 12/31/2004 | 12/30/2005 |
| EMI Test Receiver            | R&S        | ESCS30       | 828985/004    | 01/15/2005 | 01/14/2006 |
| LISN                         | Rolf-Heine | NNB-2/16Z    | 99012         | 12/30/2004 | 12/29/2005 |
| LISN                         | Rolf-Heine | NNB-2/16Z    | 99013         | 11/06/2004 | 11/05/2005 |

### 5.4 Measurement Result:

N/A

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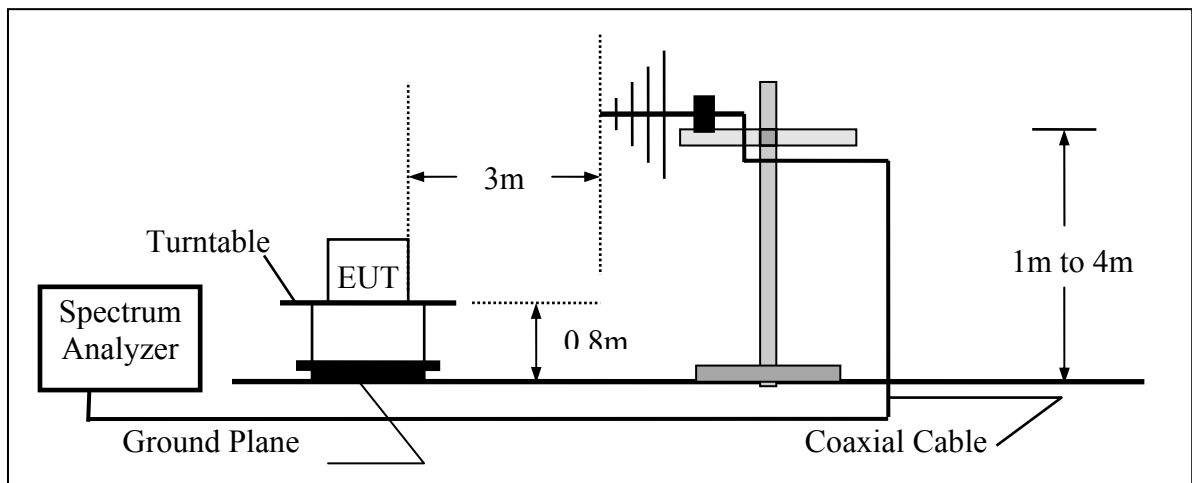
## 6. Radiated Emission Test

### 6.1 Measurement Procedure

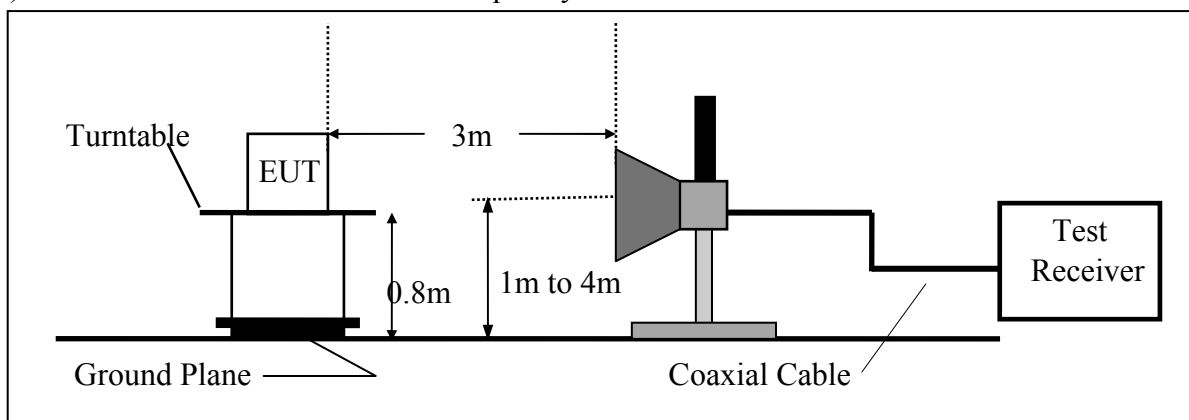
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

### 6.2 Test SET-UP (Block Diagram of Configuration)

#### (A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



#### (B) Radiated Emission Test Set-Up Frequency Over 1 GHz



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### 6.3 Measurement Equipment Used:

| 966 Chamber       |               |                     |               |            |            |
|-------------------|---------------|---------------------|---------------|------------|------------|
| EQUIPMENT TYPE    | MFR           | MODEL NUMBER        | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
| Spectrum Analyzer | R&S           | FSP 40              | 100034        | 05/27/2004 | 05/26/2005 |
| Spectrum Analyzer | Agilent       | E7405A              | US41160416    | 08/27/2004 | 08/27/2005 |
| Bilog Antenna     | SCHWAZBECK    | VULB9163            | 152           | 06/03/2004 | 06/02/2005 |
| Bilog Antenna     | SCHWAZBECK    | VULB9160            |               | 06/03/2004 | 06/02/2005 |
| Horn Antenna      | SCHWAZBECK    | BBHA 9120D          | 309/320       | 08/16/2004 | 08/15/2005 |
| Pre-Amplifier     | HP            | 8447D               | 2944A09469    | 07/19/2004 | 07/18/2005 |
| Pre-Amplifier     | HP            | 8449B               | 3008A00578    | 02/26/2005 | 02/25/2006 |
| Turn Table        | HD            | DT420               | N/A           | N.C.R      | N.C.R      |
| Antenna Tower     | HD            | MA240-N             | 240/657       | N.C.R      | N.C.R      |
| Controller        | HD            | HD100               | N/A           | N.C.R      | N.C.R      |
| Low Loss Cable    | HUBER+SUHNE R | SUCOFLEX 104PEA-10M | 10m           | 10/09/2004 | 10/08/2005 |
| Low Loss Cable    | HUBER+SUHNE R | SUCOFLEX 104PEA-3M  | 3m            | 10/09/2004 | 10/08/2005 |
| Site NSA          | SGS           | 966 chamber         | N/A           | 11/17/2004 | 11/16/2005 |
| Site NSA          | SGS           | 10m Open-Site       | N/A           | 10/02/2004 | 10/01/2005 |

### 6.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Average Value = Peak Value + 20 Log (Ton/Tp) ..... Pulse Modulation

|                           |                                            |
|---------------------------|--------------------------------------------|
| Where FS = Field Strength | CL = Cable Attenuation Factor (Cable Loss) |
| RA = Reading Amplitude    | AG = Amplifier Gain                        |
| AF = Antenna Factor       |                                            |

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## 6.5 Measurement Result

Operation Mode: Transmitting Mode  
 Fundamental Frequency: 433.92 MHz X mode  
 Temperature : 25 °C  
 Humidity : 65 %

Test Date: Mar. 08, 2005  
 Test By: Alex  
 Pol: Vertical

| Freq.<br>(MHz) | F<br>/S | Ant.Pol.<br>(H/V) | Peak<br>Reading<br>(dBuV) | AV<br>Correct<br>dB | Ant./CL<br>CF(dB) | Peak<br>Level<br>(dBuV/m) | AV<br>Leel<br>(dBuV/m) | Peak<br>Lim it<br>(dBuV/m) | AV<br>Lim it<br>(dBuV/m) | Margin<br>(dB) | AV |
|----------------|---------|-------------------|---------------------------|---------------------|-------------------|---------------------------|------------------------|----------------------------|--------------------------|----------------|----|
| 433.9          | F       | V                 | 52.95                     | - 3.07              | -10.03            | 42.92                     | 39.85                  | 100.80                     | 80.80                    | -40.95         | AV |
| 867.8          | S       | V                 | --                        | - 3.07              | --                | --                        | --                     | 74.00                      | 54.00                    |                |    |
| 1301.8         | *S      | V                 | --                        | - 3.07              | --                | --                        | --                     | 74.00                      | 54.00                    |                |    |
| 1735.7         | S       | V                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                      | 60.80                    |                |    |
| 2169.6         | S       | V                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                      | 60.80                    |                |    |
| 2603.5         | S       | V                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                      | 60.80                    |                |    |
| 3037.4         | S       | V                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                      | 60.80                    |                |    |
| 3471.4         | S       | V                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                      | 60.80                    |                |    |
| 3905.3         | *S      | V                 | --                        | - 3.07              | --                | --                        | --                     | 74.00                      | 54.00                    |                |    |
| 4339.2         | *S      | V                 | --                        | - 3.07              | --                | --                        | --                     | 74.00                      | 54.00                    |                |    |

### Remark :

- (1) + F/S F : denotes Fundamental Frequency ; S : denotes Spurious Frequency
- (2) EUT Orthogonal Axes : X denotes Laid on Table ; Y denotes Vertical Stand .
- (3) Measuring frequencies from 30 MHz to the 10th harmonic of fundamental frequency of 433.92 MHz .
- (4) Dates of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) \* Denotes spurious frequency, which falls within the Restricted Bands specified in provision of §15.205, then the general radiated emission limits in § 15.209 apply.
- (6) Peak Setting: 30MHz – 1000MHz, RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.  
1GHz- 5GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms

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Operation Mode: Transmitting Mode  
Fundamental Frequency: 433.92 MHz X mode  
Temperature : 25 °C  
Humidity : 65 %

Test Date: Mar. 08, 2005  
Test By: Alex  
Pol: Horizontal

| Freq.<br>(MHz) | F<br>/S | Ant.Pol.<br>(H/V) | Peak<br>Reading<br>(dBuV) | AV<br>Correct<br>dB | Ant./CL<br>CF(dB) | Peak<br>Level<br>(dBuV/m) | AV<br>Leel<br>(dBuV/m) | Peak<br>Limit<br>(dBuV/m) | AV<br>Lim it<br>(dBuV/m) | Margin<br>(dB) |    |
|----------------|---------|-------------------|---------------------------|---------------------|-------------------|---------------------------|------------------------|---------------------------|--------------------------|----------------|----|
| 433.9          | F       | H                 | 66.02                     | - 3.07              | -10.03            | 55.99                     | 52.92                  | 100.80                    | 80.80                    | -27.88         | AV |
| 867.8          | S       | H                 | 40.06                     | - 3.07              | -2.61             | 37.45                     | 34.38                  | 80.80                     | 60.80                    | -26.42         | AV |
| 1301.8         | *S      | H                 | --                        | - 3.07              | --                | --                        | --                     | 74.00                     | 54.00                    |                |    |
| 1735.7         | S       | H                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                     | 60.80                    |                |    |
| 2169.6         | S       | H                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                     | 60.80                    |                |    |
| 2603.5         | S       | H                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                     | 60.80                    |                |    |
| 3037.4         | S       | H                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                     | 60.80                    |                |    |
| 3471.4         | S       | H                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                     | 60.80                    |                |    |
| 3905.3         | *S      | H                 | --                        | - 3.07              | --                | --                        | --                     | 74.00                     | 54.00                    |                |    |
| 4339.2         | *S      | H                 | --                        | - 3.07              | --                | --                        | --                     | 74.00                     | 54.00                    |                |    |

#### Remark :

- (1) + F/S F : denotes Fundamental Frequency ; S : denotes Spurious Frequency
- (2) EUT Orthogonal Axes : X denotes Laid on Table ; Y denotes Vertical Stand .
- (3) Measuring frequencies from 30 MHz to the 10th harmonic of fundamental frequency of 433.92 MHz .
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- (6) Peak Setting: 30MHz – 1000MHz, RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.  
1GHz- 5GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms

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Operation Mode: Transmitting Mode  
 Fundamental Frequency: 433.92 MHz Y mode  
 Temperature : 25 °C  
 Humidity : 65 %

Test Date: Mar. 08, 2005  
 Test By: Alex  
 Pol: Vertical

| Freq.<br>(MHz) | F<br>/S | Ant.Pol.<br>(H/V) | Peak<br>Reading<br>(dBuV) | AV<br>Correct<br>dB | Ant./CL<br>CF(dB) | Peak<br>Level<br>(dBuV/m) | AV<br>Leel<br>(dBuV/m) | Peak<br>Limit<br>(dBuV/m) | AV<br>Limit<br>(dBuV/m) | Margin<br>(dB) |    |
|----------------|---------|-------------------|---------------------------|---------------------|-------------------|---------------------------|------------------------|---------------------------|-------------------------|----------------|----|
| 433.9          | F       | V                 | 66.47                     | - 3.07              | -10.03            | 56.44                     | 53.37                  | 100.80                    | 80.80                   | -27.43         | AV |
| 92.1           | S       | V                 | 51.50                     | - 3.07              | -17.77            | 33.73                     | 30.66                  | 80.80                     | 60.80                   | -30.14         | AV |
| 870.0          | S       | V                 | 41.83                     | - 3.07              | -2.65             | 39.18                     | 36.11                  | 80.80                     | 60.80                   | -24.69         | AV |
| 1297.0         | *S      | V                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                     | 60.80                   |                |    |
| 1735.0         | S       | V                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                     | 60.80                   |                |    |
| 2170.0         | S       | V                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                     | 60.80                   |                |    |
| 2608.0         | S       | V                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                     | 60.80                   |                |    |
| 3043.0         | S       | V                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                     | 60.80                   |                |    |
| 3472.0         | S       | V                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                     | 60.80                   |                |    |
| 3907.0         | *S      | V                 | --                        | - 3.07              | --                | --                        | --                     | 74.00                     | 54.00                   |                |    |
| 4340.0         | *S      | V                 | --                        | - 3.07              | --                | --                        | --                     | 74.00                     | 54.00                   |                |    |

Remark :

- (1) + F/S F : denotes Fundamental Frequency ; S : denotes Spurious Frequency
- (2) EUT Orthogonal Axes : X denotes Laid on Table ; Y denotes Vertical Stand .
- (3) Measuring frequencies from 30 MHz to the 10th harmonic of fundamental frequency of 310 MHz °
- (4) Dates of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) \* Denotes spurious frequency, which falls within the Restricted Bands specified in provision of §15.205, then the general radiated emission limits in § 15.209 apply.
- (6) Peak Setting: 30MHz – 1000MHz, RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.  
1GHz- 5GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms

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Operation Mode: Transmitting Mode  
 Fundamental Frequency: 433.92 MHz Y mode  
 Temperature : 25 °C  
 Humidity : 65 %

Test Date: Mar. 08, 2005  
 Test By: Alex  
 Pol: Horizontal

| Freq.<br>(MHz) | F<br>/S | Ant.Pol.<br>(H/V) | Peak<br>Reading<br>(dBuV) | AV<br>Correct<br>dB | Ant./CL<br>CF(dB) | Peak<br>Level<br>(dBuV/m) | AV<br>Leel<br>(dBuV/m) | Peak<br>Limit<br>(dBuV/m) | AV<br>Limit<br>(dBuV/m) | Margin<br>(dB) |    |
|----------------|---------|-------------------|---------------------------|---------------------|-------------------|---------------------------|------------------------|---------------------------|-------------------------|----------------|----|
| 433.9          | F       | H                 | 52.06                     | - 3.07              | -10.03            | 42.03                     | 38.96                  | 100.80                    | 80.80                   | -41.84         | AV |
| 92.1           | S       | H                 | 49.97                     | - 3.07              | -17.77            | 32.20                     | 29.13                  | 80.80                     | 60.80                   | -31.67         | AV |
| 867.9          | S       | H                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                     | 60.80                   |                |    |
| 1301.8         | *S      | H                 | --                        | - 3.07              | --                | --                        | --                     | 74.00                     | 54.00                   |                |    |
| 1735.8         | S       | H                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                     | 60.80                   |                |    |
| 2169.7         | S       | H                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                     | 60.80                   |                |    |
| 2603.7         | S       | H                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                     | 60.80                   |                |    |
| 3037.6         | S       | H                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                     | 60.80                   |                |    |
| 3471.6         | S       | H                 | --                        | - 3.07              | --                | --                        | --                     | 80.80                     | 60.80                   |                |    |
| 3905.5         | *S      | H                 | --                        | - 3.07              | --                | --                        | --                     | 74.00                     | 54.00                   |                |    |
| 4339.5         | *S      | H                 | --                        | - 3.07              | --                | --                        | --                     | 74.00                     | 54.00                   |                |    |

## Remark :

- (1) + F/S F : denotes Fundamental Frequency ; S : denotes Spurious Frequency
- (2) EUT Orthogonal Axes : X denotes Laid on Table ; Y denotes Vertical Stand .
- (3) Measuring frequencies from 30 MHz to the 10th harmonic of fundamental frequency of 433.92 MHz .
- (4) Dates of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) \* Denotes spurious frequency, which falls within the Restricted Bands specified in provision of §15.205, then the general radiated emission limits in § 15.209 apply.
- (6) Peak Setting: 30MHz – 1000MHz, RBW= 100KHz, VBW=100KHz, Sweep time = 200 ms.  
1GHz- 5GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms

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## 7. Occupied Bandwidth

### 7.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation
3. Set SPA Center Frequency = fundamental frequency, RBW, VBW= 10KHz, Span =100KHz.
4. Set SPA Max hold. Mark peak, -20dB.

### 7.2 Test SET-UP (Block Diagram of Configuration)

Same as 6.3 Radiated Emission Measurement.

### 7.3 Measurement Equipment Used:

Same as 6.3 Radiated Emission Measurement.

### 7.4 Measurement Results

Refer to attached data chart.

The center frequency  $f_c$  is **433.92Mhz**, according to the Rules, section 15.231(C), the Bandwidth of Center Frequency at-20dB should be calculated as following:

$$432.9 \times 0.0025 = 1.0823(\text{MHz})$$

So, the Uper/Lower frequencies limit should be specified as:

$$f_{(U)} = f_c + \Delta f/2 = 432.9 + 0.5411 = 433.44(\text{MHz})$$

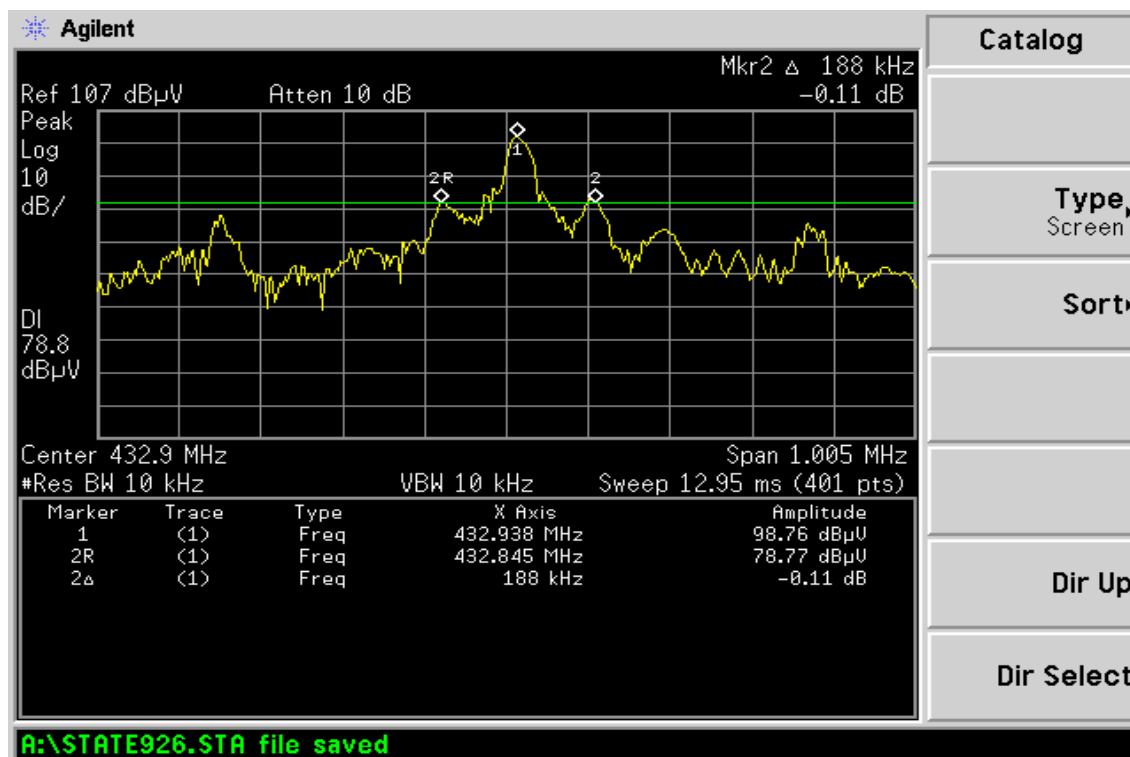
$$f_{(L)} = f_c - \Delta f/2 = 432.9 - 0.5411 = 432.36 (\text{MHz})$$

Measurement Result:

-20dB bandwidth = 188kHz within allowed frequency range.

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## 20dB Band Width Test Data



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## 8. Duty Cycle Measurement

### 8.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set ETU normal operating mode.
3. Set SPA Center Frequency = fundamental frequency, RBW, VBW= 100KHz, Span =0 Hz. Adjacent sweep.
4. Set SPA View. Mark delta.

### 8.2 Test SET-UP (Block Diagram of Configuration)

Same as 6.3 Radiated Emission Measurement.

### 8.3 Measurement Equipment Used:

Same as 6.3 Radiated Emission Measurement.

### 8.4 Measurement Results:

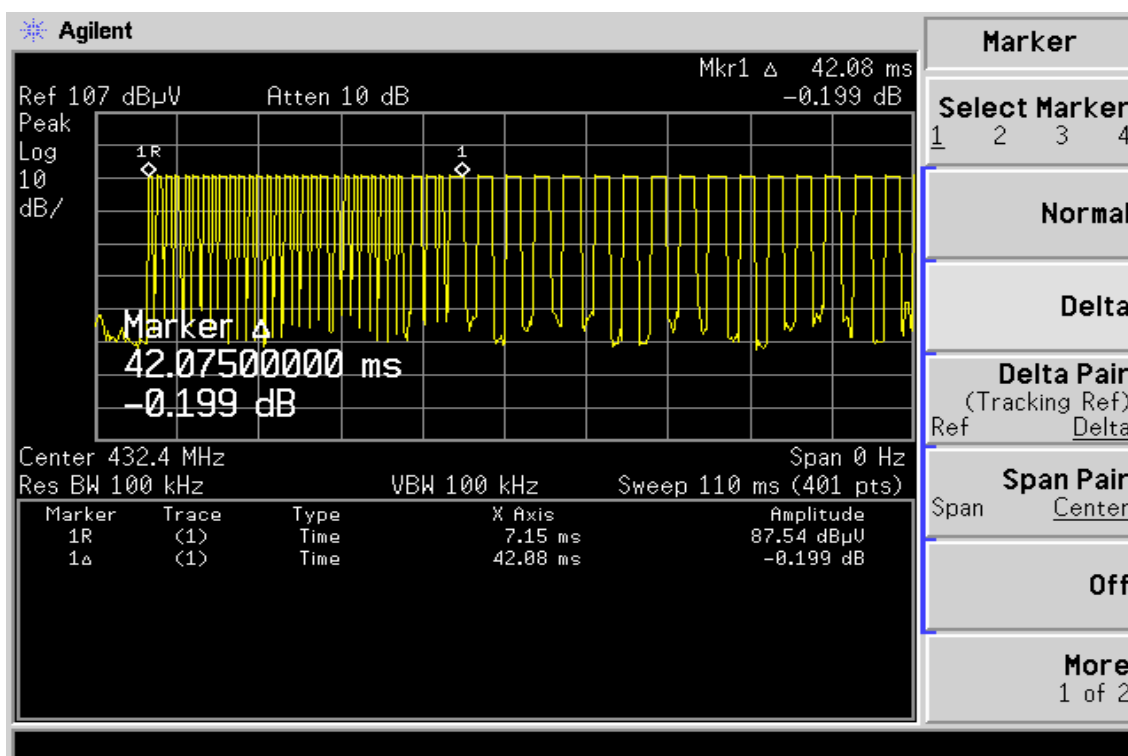
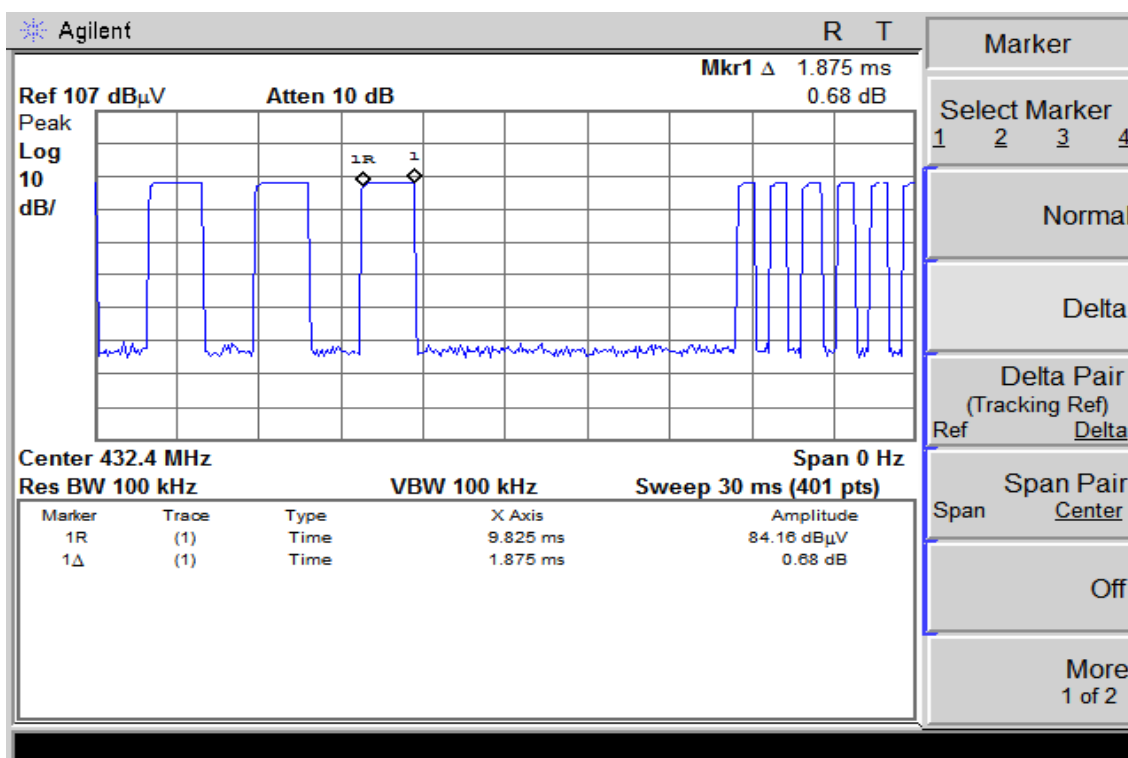
$$\begin{aligned} \text{Ton(worst case during 100ms)} &= 42.08 + 1.875(\text{ms}) * 15 \\ &= 42.08 + 28.125(\text{ms}) \\ &= 72.205 (\text{ms}) \end{aligned}$$

$$T_p = 245.2(\text{ms})$$

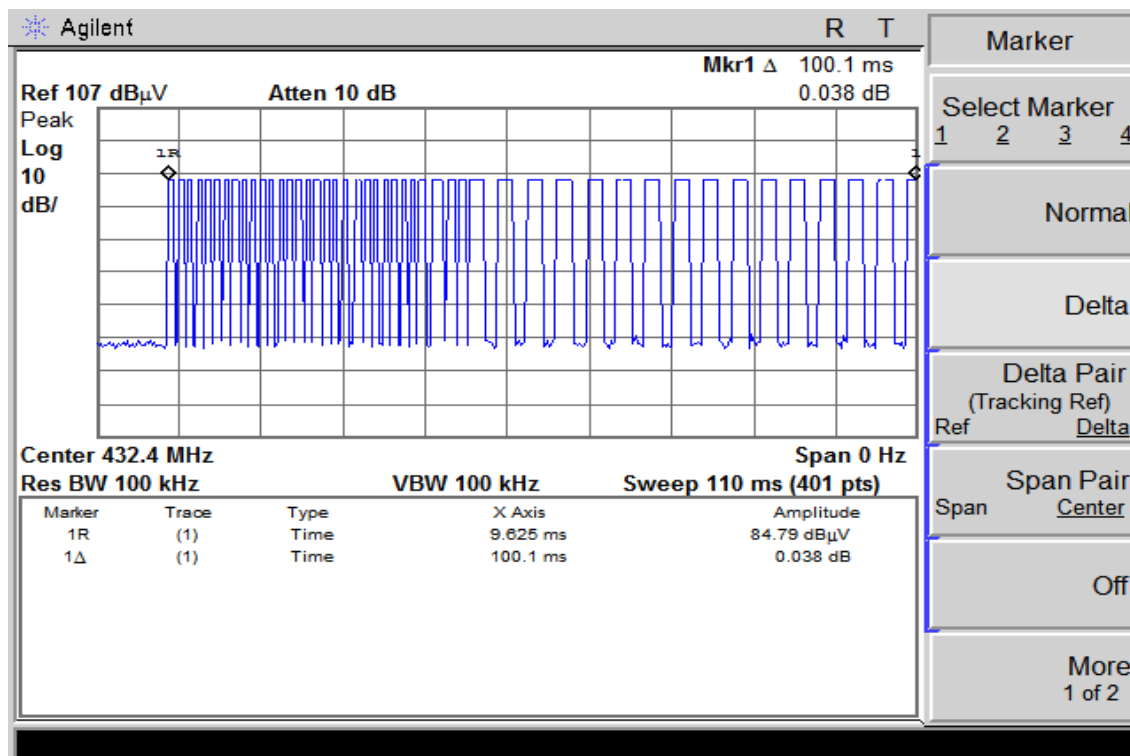
$$\begin{aligned} \text{Average Correction Factory} &= 20\log(\text{Ton}/T_p) = 20\log(72.08/100) \\ &= -3.073\text{dB} \end{aligned}$$

Refer to attached data chart.

## Ton Measurement:

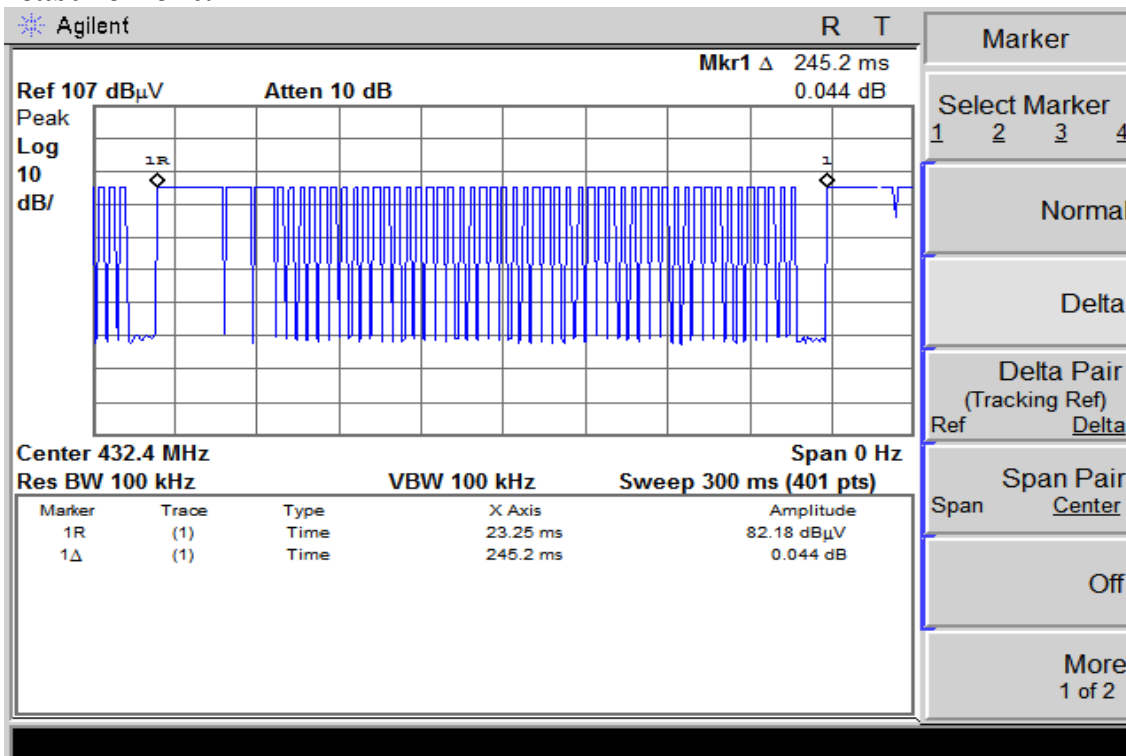


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## Tp Measurement:



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## 9. Release Time Measurement:

15.231 (a) (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

### 9.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set SPA Center Frequency = fundamental frequency, RBW, VBW= 100KHz, Span =0Hz. Sweep Time= 5s.
3. Set EUT as normal operation and press Transmitter bottom for 2 s,
4. Set SPA Max hold. Delta Mark.

### 9.2 Test SET-UP (Block Diagram of Configuration)

Same as 6.3 Radiated Emission Measurement.

### 9.3 Measurement Equipment Used:

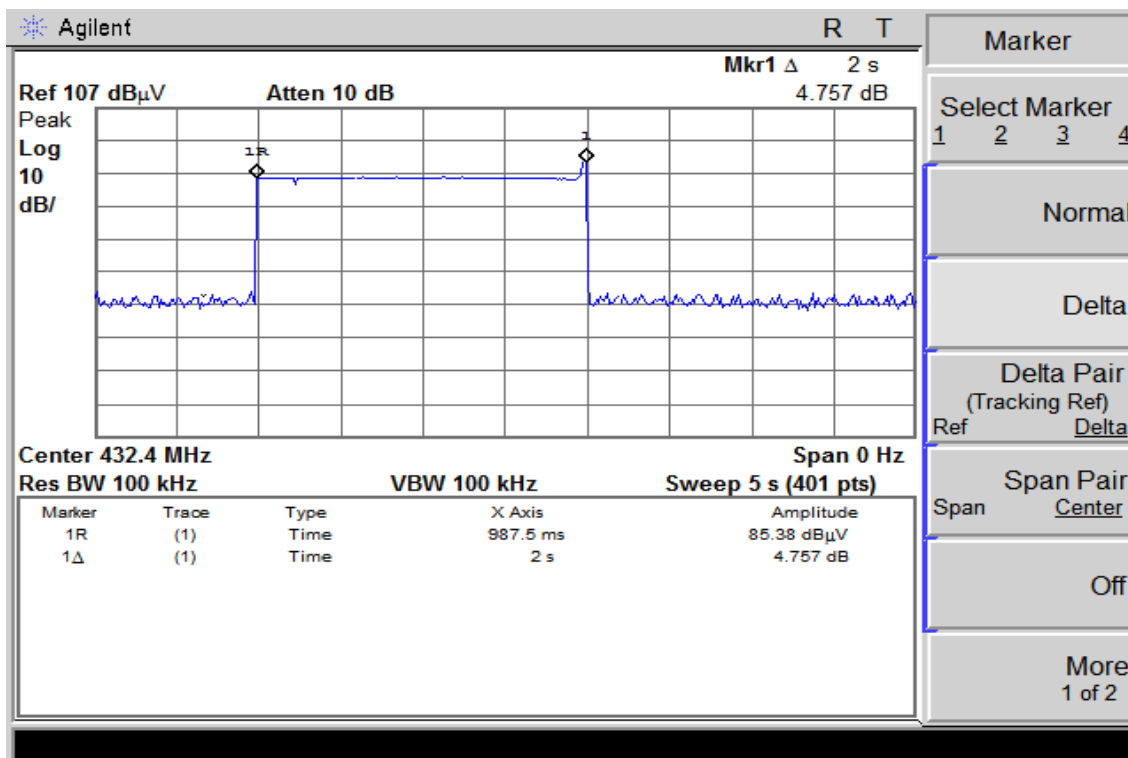
Same as 6.3 Radiated Emission Measurement.

### 9.4 Measurement Results

The release time less than 5 s.

Refer to attached data chart.

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