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ELECTROMAGNETIC EMISSIONS COMPLIANCE **REPORT**

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

Product Name: TiltMon

N/A **Brand:**

Model Name: TLM-101

Model Different: N/A

FCC ID: X58-TLM101

Report No.: ER/2009/A0027

Issue Date: Feb. 26, 2010

Rule Part: §15.231

Prepared by: digiO2 International Co., Ltd.

4F-13, No. 79, Sec. 1, Hsin Tai Wu Rd.,

Hsi-Chih, Taipei Hsien 221, Taiwan

SGS Taiwan Ltd. Prepared by:

Electronics & Communication Laboratory

No. 134, Wu Kung Rd., Wuku Industrial

Zone, Taipei County, Taiwan.



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VERIFICATION OF COMPLIANCE

Applicant: digiO2 International Co., Ltd.

4F-13, No. 79, Sec. 1, Hsin Tai Wu Rd., Hsi-Chih, Taipei Hsien 221,

Taiwan

Product Name: TiltMon

Brand / Marketing Name: N/A

FCC ID: X58-TLM101

Model No.: TLM-101

Model Difference: N/A

File Number: ER/2009/A0027

Oct. 13, 2009 ~ Feb. 09, 2010 Date of test:

Oct. 13, 2009 Date of EUT Received:

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory 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.

11

Test By:	Jazz Huang	Date:	Feb. 26, 2010	
Prepared By:	Jazz Huang / Engineer	Date:	Feb. 26, 2010	
Approved By:	Mark Chung / Project Engineer Vincent Su / Manager	Date:	Feb. 26, 2010	

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Version

Version No.	Date	Description
00	Feb. 26, 2010	Initial creation of document

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1. GENERAL INFORMATION

1.1 Product Description

The digiO2 International Co., Ltd., Model: X58-TLM101 (referred to as the EUT in this report) is the Remote System of Security Alarm.

A major technical descriptions of EUT is described as following:

- A). Operation Frequency: 433.92 MHz
- B). Modulation: ASK
- C). Antenna Designation: Non-User Replaceable (Fixed)
- D). Power Supply: 12 Vdc from AA battery.
- E). Transmitting Time: Periodic ≤ 5 seconds

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **X58-TLM101** filing to comply with Section 15.231 of the FCC Part 15, Subpart C Rules.

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 measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003. FCC Registration Number are: 990257 and 236194, Canada Registration Number: 4620A-1

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. No. 29, Pau-Tou-Tsuo Valley Chia-Pau Tsuen, Linkou Hsiang, Taipei county, which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. SGS Site No. 1(3 &10 meters) and FCC Registration Number: 94644.

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 and 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 and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna. according to the requirements in Section 8 and 13 and Subclause 8.3.1.2 of ANSI C63.4-2003.

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2.4 Limitation

(1) Conducted Emission

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

Frequency range	Limits dB (uV)					
MHz	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

^{1.} The lower limit shall apply at the transition frequencies

^{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	Field Str	ength of	Field Strength of		
Frequency	Fundar	nental	Spu	rious	
(MHz)	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m)	
40.66 - 40.70	67.04	2,250	47.04	225	
70 - 130	61.94	1,250	41.94	125	
130 - 174	* 61.94 - 71.48	* 1,250 -3,750	* 41.94 to	* 125-375	
174 - 260	71.48	3,750	51.48	375	
260 - 470	* 71.48 - 81.94	* 3,750 - 12,500	* 51.48 to 61.94	* 375-1250	
above 470	81.94	12,500	61.94	1250	

Remark: 1. Emission level in dBuV/m=20 log (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 ξ 15.205
- 4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of ξ 15.205, then the general radiated emission limits in ξ 15.209 apply.
- 5. For the band 130-174MHz, uV/m at 3meters = 56.81818(F) 6136.3636; For the band 260-470MHz uV/m at 3meters = 41.6667(F) 7083.3333; Where F is the frequency in MHz.
- 6. 433.92MHz limit = 41.6667 * 433.92 7083.33333 = 10996.681 uV/m = 80.8dBuV/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/ Type No.	Series No.	Data Cable	Power Cord
1.	N/A					

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SUMMARY OF TEST RESULTS 3.

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	Compliant
	Modulation)	
§15.231(a)(2)	Release Time Measurement	Compliant

Description of test modes 4.

The EUT has been tested under engineering test mode condition, and the EUT staying in continuous transmitting mode. The Frequency 433.92 MHz is chosen for testing.

The X, Y and Z-axis of EUT were pre-test; EUT placing with Z axis was found to generate highest emission close to the regulatory limit. Therefore, it is considered the worse case and chosen to be reported.

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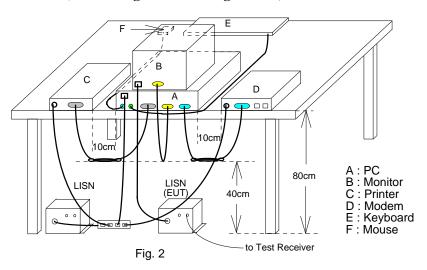
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5. CONDUCTED EMISSIONS TEST (NOT APPLY IN THE REPORT)

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)



5.3 Measurement Equipment Used:

Conducted Emission Test Site									
EQUIPMENT	MFR	MODEL	ODEL SERIAL		CAL DUE.				
ТҮРЕ		NUMBER	NUMBER	CAL.					
EMC Analyzer	HP	8594EM	3624A00203	09/02/2009	09/03/2010				
EMI Test Receiver	R&S	ESCS30	828985/004	06/09/2009	06/10/2010				
Transient Limiter	HP	11947A	3107A02062	09/02/2009	09/03/2010				
LISN	Rolf-Heine	NNB-2/16Z	99012	12/31/2009	12/30/2010				
LISN	Rolf-Heine	NNB-2/16Z	99013	12/24/2009	12/23/2010				
Coaxial Cables	FCC	FCC-LISN-50/250-25-2-01	04034	12/01/2009	12/01/2010				

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5.4 Measurement Result:

N/A

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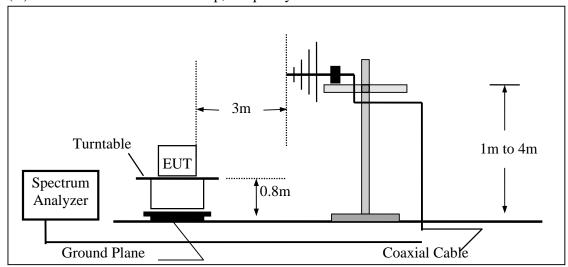
6. RADIATED EMISSION TEST

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



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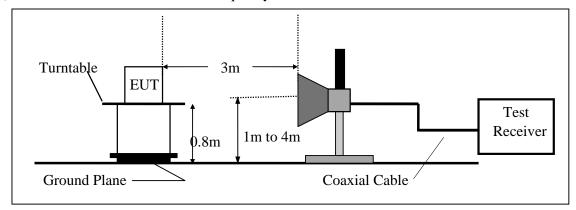
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(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



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6.3 Measurement Equipment Used:

966 Chamber									
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.				
TYPE		NUMBER	NUMBER	CAL.					
Spectrum Analyzer	R&S	FSP 40	100034	02/22/2009	02/21/2010				
Spectrum Analyzer	Agilent	E7405A	US41160416	07/04/2009	07/03/2010				
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/19/2008	04/18/2010				
Bilog Antenna	SCHWAZBECK	VULB9160	9160-3158	11/29/2009	11/28/2010				
Horn antenna	Schwarzbeck	BBHA 9120D	309/320	03/14/2009	03/13/2010				
Horn antenna	Schwarzbeck	BBHA 9170	184/185	12/31/2009	12/30/2010				
Pre-Amplifier	HP	8447F	3113A06892	01/04/2010	01/03/2011				
Pre-Amplifier	HP	8494B	3008A00578	01/04/2010	01/03/2011				
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+SUHNER	SUCOFLEX 104PEA-10M	10m	02/13/2009	02/12/2010				
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	02/13/2009	02/12/2010				

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:

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

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 Test Date: Feb. 09, 2010

Fundamental Frequency: 433.92 MHz Z mode Test By: Jazz Temperature: 25 °C Pol: Vertical

65 % Humidity:

			Peak	AV		Pe ak	AV	Pe ak	AV		
Freq.	F	Ant.Pol.	Reading	Correct	Ant/CL	Le ve l	Level	Limit	Limit	Margin	
(MHz)	/S	(H/V)	(dBuV)	dB	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	_
433.92	F	V	86.43	-11.87	-9.04	77.39	65.52	100.80	80.80	-15.28	AV
867.84	S	V		-11.87				80.80	60.80		
1301.76	*S	V		-11.87				74.00	54.00		
1735.68	S	V	46.58	-11.87	- 4.75	41.83	29.96	80.80	60.80	-30.84	AV
2169.60	S	V		-11.87				80.80	60.80		AV
2603.52	S	V		-11.87				80.80	60.80		
3037.44	S	V	47.11	-11.87	0.56	47.67	35.80	80.80	60.80	-25.00	AV
3471.36	S	V		-11.87				80.80	60.80		
3905.28	*S	V		-11.87				74.00	54.00		
43 39.20	S	V		-11.87				80.80	60.80		

Remark:

- F: denotes Fundamental Frequency; S: denotes Spurious Frequency (1) + F/S
- (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 ξ 15.205, then the general radiated emission limits in ξ 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 Test Date: Feb. 09, 2010

Fundamental Frequency: 433.92MHz Z mode Test By: Jazz

Temperature: Pol: Horizontal 25 °C

Humidity: 65 %

			Peak	AV		Pe ak	AV	Pe ak	AV		
Freq.	F	Ant.Pol.	Reading	Correct	Ant/CL	Le ve l	Level	Limit	Limit	Margin	
(MHz)	/S	(H/V)	(dBuV)	dB	CF(dB)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	_
433.92	F	Н	79.31	-11.87	-9.04	70.27	5 8.40	100.80	80.80	-22.40	AV
867.84	S	Н	53.86	-11.87	-1.63	52.23	40.36	80.80	60.80	-20.44	AV
1301.76	*S	H	60.85	-11.87	- 6.81	54.04	42.17	74.00	54.00	-11.83	AV
17 35.68	S	H	53.43	-11.87	- 4.75	48.68	36.81	80.80	60.80	-23.99	AV
2169.60	S	Н		-11.87				80.80	60.80		
2603.52	S	Н		-11.87				80.80	60.80		
3037.44	S	Н	46.34	-11.87	0.56	46.90	35.03	80.80	60.80	-25.77	AV
3471.36	S	H	41.53	-11.87	1.97	43.50	31.63	80.80	60.80	-29.17	AV
3905.28	*S	H		-11.87				74.00	54.00		
43 39.20	S	H		-11.87				80.80	60.80		

Remark:

- F: denotes Fundamental Frequency; S: denotes Spurious Frequency (1) + F/S
- (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 ξ 15.205, then the general radiated emission limits in ξ 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. 20DBOCCUPIED 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:

$$433.92 \times 0.0025 = 1.0848(MHz)$$

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

$$f_{(U)} = f_c + \Delta f/2 = 433.92 + 0.5424 = 434.46(MHz)$$

$$f_{(L)} = f_c - \Delta f/2 = 433.92 - 0.5424 = 433.377 \text{ (MHz)}$$

Measurement Result:

-20dB bandwidth = 40.449kHz within allowed frequency range.

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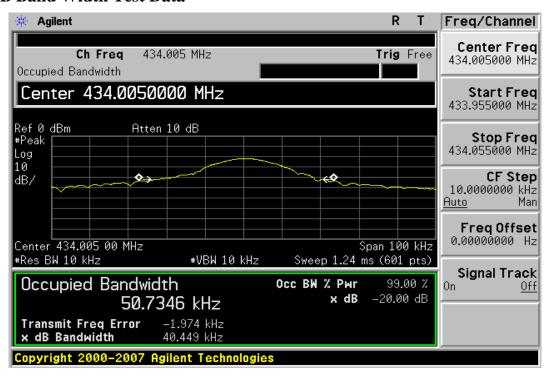
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20dB Band Width Test Data



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8. **DUTY CYCLE MEASUREMENT**

8.1 Measurement Procedure

- The EUT was placed on a turn table which is 0.8m above ground plane.
- Set ETU normal operating mode.
- Set SPA Center Frequency = fundamental frequency, RBW, VBW= 1MHz, Span =0 Hz. Adjacent sweep.
- 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:

Ton = 0.2283(ms)*7 +0.4851(ms)*6 = 4.5087(ms) Tp = 17.68(ms),Average Correction Factory = $20\log (Ton/Tp) = 20\log (4.5087/17.68)$ =-11.87 dB

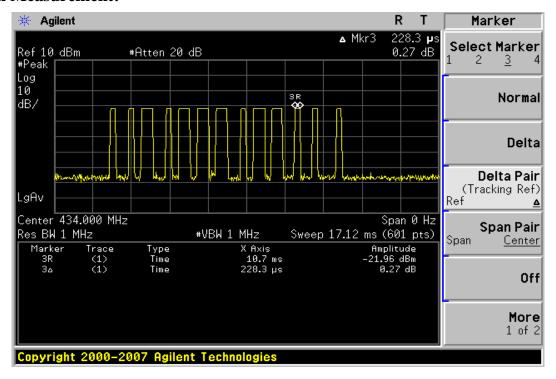
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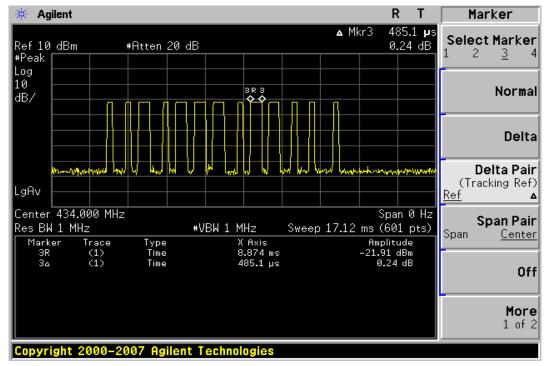


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Ton Measurement:





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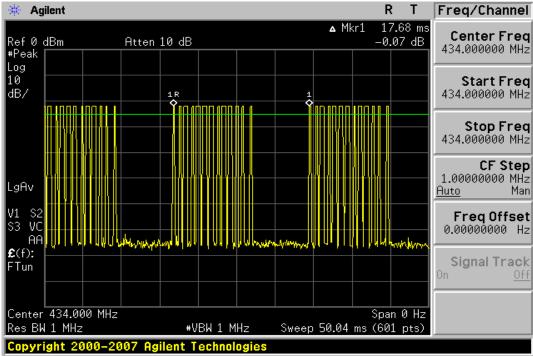
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Tp = 50.04ms



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9. RELEASE TIME MEASUREMENT:

15.231 (a) (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

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= 100 KHz, Span =0Hz. Sweep Time= 20s.
- 3. Set EUT as normal operation and hook up the device of Tx with Rx to monitor the time of transmission.
- 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.

Measurement Results

The release time less than 5 s.

Refer to attached data chart.

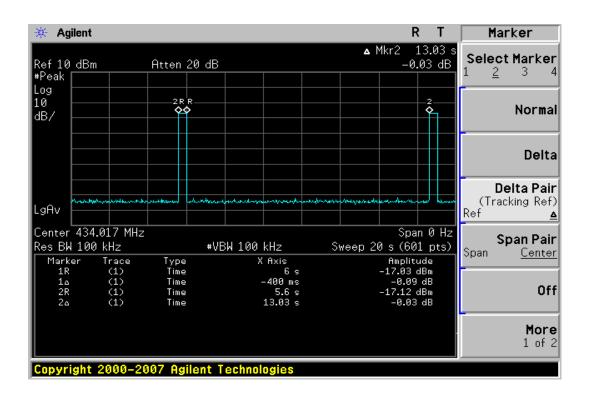
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APPENDIX 1 PHOTOGRPHS OF SET UP

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Radiated Emission Setup Photos - Tx





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Radiated Emission Setup Photos - Rx





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APPENDIX 2 PHOTOGRPHS OF EUT

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All EUT - Device On



All EUT - Device Off

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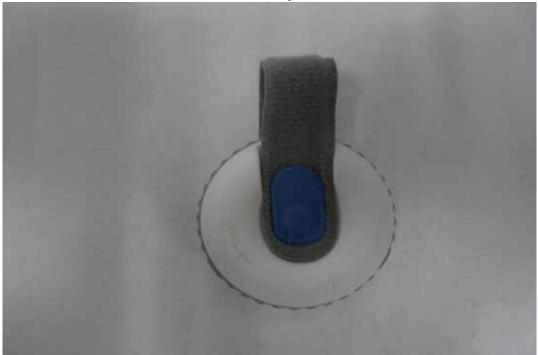
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Front View of EUT



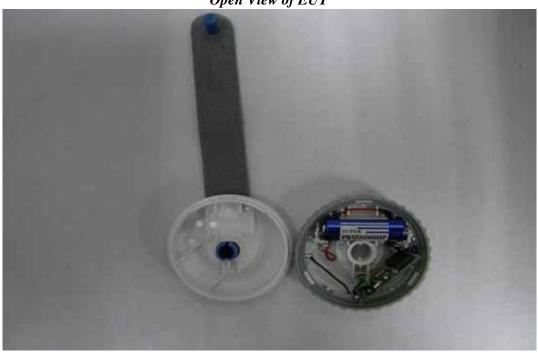
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Open View of EUT



Open View of EUT - 2



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Battery of EUT



Internal of EUT – 1



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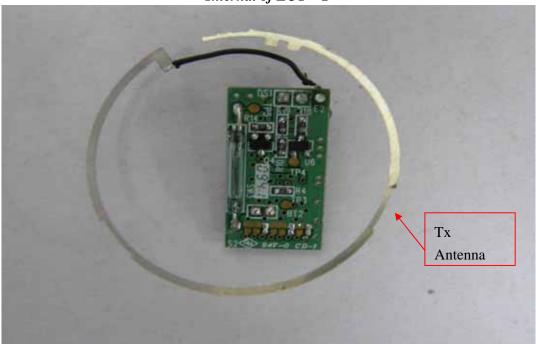
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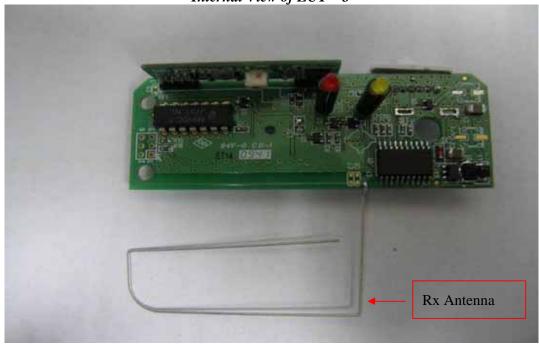
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Internal of EUT – 2



Internal View of EUT - 3



~ End of Report ~

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