

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Product Name: Brushless Dc Tubular Motor and Remote controller

Brand Name: San Hsin

Model Name: SS4006-R22(Receiver);
SS4006-RC(Transmitter)

Model Different: N/A

FCC ID: YUYSS4006RC

Report No.: ER/2010/90002

Issue Date: Oct. 11, 2010

Rule Part: §15.231

Prepared by: SAN HSIN PLASTECH CO., LTD.

NO. 17 Jian Guo E. RD., Tao Yuan City, Tao
Yuan County 330, Taiwan, R.O.C.

Prepared by: SGS Taiwan Ltd.

Electronics & Communication Laboratory

No. 134, Wu Kung Rd., Wuku Industrial
Zone, Taipei County, Taiwan.



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VERIFICATION OF COMPLIANCE

Applicant: SAN HSIN PLASTECH CO., LTD.
NO. 17 Jian Guo E. RD., Tao Yuan City, Tao Yuan County 330,
Taiwan, R.O.C.

Product Name: Brushless Dc Tubular Motor and Remote controller

Brand Name: San Hsin

FCC ID: YUYSS4006RC

Model No.: SS4006-R22(Receiver);SS4006-RC(Transmitter)

Model Difference: N/A

File Number: ER/2010/90002

Date of test: Sep. 06, 2010 ~ Oct. 08, 2010

Date of EUT Received: Sep. 06, 2010

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.

Test By:	<u>Brian Chang</u>	Date:	<u>Oct. 11, 2010</u>
	Brain Chang / Engineer		
Prepared By:	<u>Gigi yeh</u>	Date:	<u>Oct. 11, 2010</u>
	Gigi Yeh / Clerk		
Approved By:	<u>Arno Hsieh</u>	Date:	<u>Oct. 11, 2010</u>
	Arno Hsieh / Asst. Supervisor		

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Version

Version No.	Date	Description
00	Oct. 11, 2010	Initial creation of document

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1. GENERAL INFORMATION

1.1 Product Description

Product Name	Brushless Dc Tubular Motor and Remote controller
Brand Name	San Hsin
Model Name	SS4006-R22(Receiver);SS4006-RC(Transmitter)
Model Difference:	N/A
Power Supply	Tx: 12V *1 by battery

SRD 433.92MHz TX:

Operating Frequency	433.92 MHz
Transmit Power	< 80.8dBuV/m Max.
Modulation Technique	ASK
Number of Channels	1
Operating Mode	Point-to-Point

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **YUYSS4006RC** 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-4

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.

2.4 Limitation

(1) Conducted Emission

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

Frequency range MHz	Limits 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		
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 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	47	225
70 - 130	61.94	1,250	41.9	125
130 - 174	* 61.94 - 71.48	* 1,250 - 3,750	* 41.9 - 51.48	* 125 to 375
174 - 260	71.48	3,750	51.48	375
260 - 470	* 71.48 - 81.94	* 3,750 - 12,500	* 51.48 - 54	* 375 to 1250
above 470	81.94	12,500	74	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 § 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, 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 = $41.6667 * 433.92 - 7083.3333 = 10996.681 uV/m$
= 80.8dBuV/m

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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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)	N/A
§ 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 433.92 MHz is chosen for testing.

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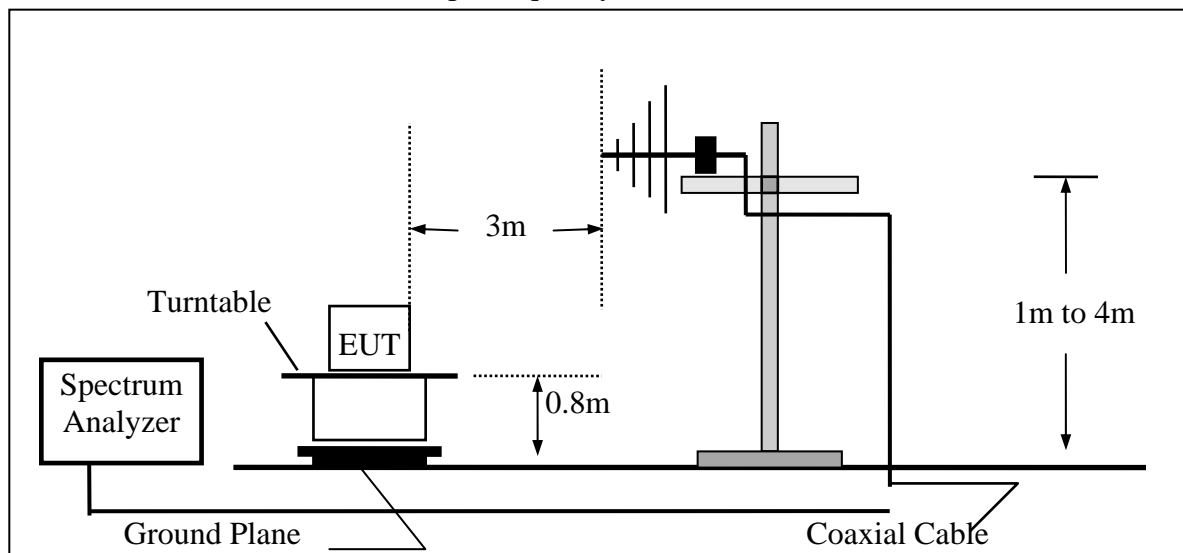
6. RADIATED EMISSION TEST

6.1 Measurement Procedure

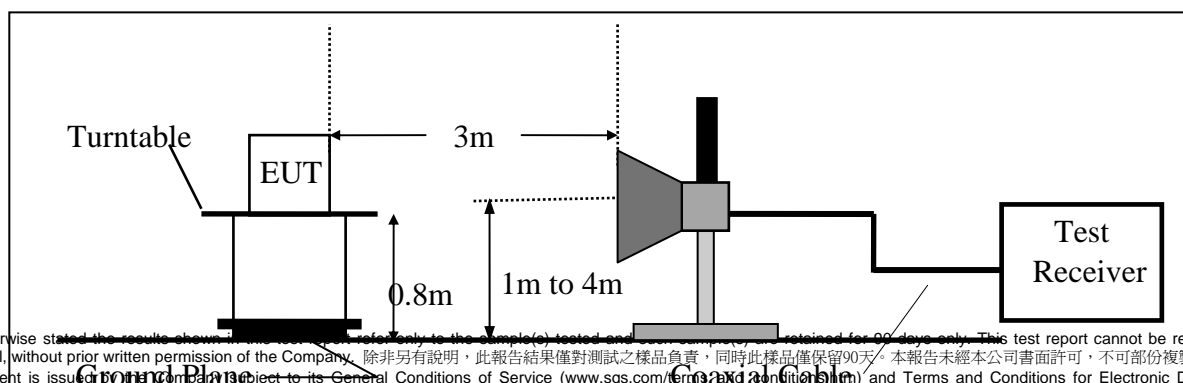
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above 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	02/12/2010	02/11/2011
Bilog Antenna	SCHWAZBECK	VULB9160	3136	11/19/2009	11/18/2010
Horn antenna	SCHWAZBECK	BBHA 9120D	309/320	03/09/2009	03/08/2011
Pre-Amplifier	Agilent	8447D	1937A02834	11/28/2009	11/28/2010
Pre-Amplifier	Agilent	8449B	3008A01973	01/05/2010	01/04/2011
Radio Communication Analyzer	R & S	CMU200	111787	10/31/2008	10/30/2010
DC Block	Agilent	BLK-18	155452	07/05/2010	07/04/2011
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	01/05/2010	01/04/2011
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	01/05/2010	01/04/2011
3m Site	SGS	966 chamber	N/A	11/08/2010	11/09/2011

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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SGS Taiwan Ltd.

No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號

台灣檢驗科技股份有限公司

t (886-2) 2299-3279

f (886-2) 2298-0488

www.tw.sgs.com

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6.5 Measurement Result

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

Test Date: Oct. 06, 2010
 Test By: Brain
 Pol: Vertical

Freq. (MHz)	F /S	Ant.Pol. (H/V)	Peak Reading (dBuV)	AV Correct dB	Ant./CL CF(dB)	Peak Level (dBuV/m)	AV Level (dBuV/m)	Peak Lim it (dBuV/m)	AV Lim it (dBuV/m)	Margin (dB)	
433.92	F	V	92.67	- 8.95	-9.04	83.63	74.68	100.80	80.80	-6.12	AV
868.08	S	V	59.41	- 8.95	-1.63	57.78	48.83	80.80	60.80	-11.97	AV
1301.76	*S	V	62.73	- 8.95	-6.81	55.92	46.97	74.00	54.00	-7.03	AV
1735.68	S	V	52.03	- 8.95	-4.75	47.28	38.33	74.00	54.00	-15.67	AV
2169.60	S	V	49.90	- 8.95	-2.54	47.36	38.41	74.00	54.00	-15.59	AV
2603.52	S	V	49.95	- 8.95	-0.6	49.35	40.40	74.00	54.00	-13.60	AV
3037.44	S	V	39.28	- 8.95	0.56	39.84	30.89	74.00	54.00	-23.11	AV
3471.36	S	V	47.09	- 8.95	1.97	49.06	40.11	74.00	54.00	-13.89	AV
3905.28	*S	V	42.98	- 8.95	3.38	46.36	37.41	74.00	54.00	-16.59	AV
4339.20	*S	V	38.83	- 8.95	4.79	43.62	34.67	74.00	54.00	-19.33	AV
72.68	S	V	42.17	- 8.95	-16.62	25.55	16.60	80.80	60.80	-44.20	AV
90.14	S	V	51.78	- 8.95	-17.62	34.16	25.21	80.80	60.80	-35.59	AV
96.93	S	V	45.42	- 8.95	-17.16	28.26	19.31	80.80	60.80	-41.49	AV
101.78	S	V	42.93	- 8.95	-16.87	26.06	17.11	80.80	60.80	-43.69	AV

Remark:

- (1) + F/S F: denotes Fundamental Frequency; S: denotes Spurious Frequency
- (2) Measuring frequencies from 30 MHz to the 10th harmonic of fundamental frequency of 433.92 MHz.
- (3) 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.
- (4) * 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.
- (5) 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: 433.92MHz
Temperature : 25 °C
Humidity : 65 %

Test Date: Oct. 06, 2010
Test By: Brain
Pol: Horizontal

Freq. (MHz)	F	Ant.Pol. (H/V)	Peak Reading (dBuV)	AV Correct dB	Ant./CL CF(dB)	Peak Level (dBuV/m)	AV Level (dBuV/m)	Peak Lim it (dBuV/m)	AV Lim it (dBuV/m)	Margin (dB)	
433.92	F	H	73.49	- 8.95	-9.04	64.45	55.50	100.80	80.80	-25.30	AV
868.08	S	H	50.62	- 8.95	-2.96	47.66	38.71	80.80	60.80	-22.09	AV
1301.76	*S	H	57.55	- 8.95	-6.81	50.74	41.79	74.00	54.00	-12.21	AV
1735.68	S	H	51.91	- 8.95	-4.75	47.16	38.21	74.00	54.00	-15.79	AV
2169.60	S	H	48.70	- 8.95	-2.54	46.16	37.21	74.00	54.00	-16.79	AV
2603.52	S	H	42.23	- 6.58	-0.6	41.63	35.05	80.80	60.80	-25.75	AV
3037.44	S	H	41.20	- 8.95	0.56	41.76	32.81	74.00	54.00	-21.19	AV
3471.36	S	H	41.64	- 8.95	1.97	43.61	34.66	74.00	54.00	-19.34	AV
3905.28	*S	H	39.87	- 8.95	3.38	43.25	34.30	74.00	54.00	-19.70	AV
4339.20	*S	H	---	- 8.95	---	---	---	74.00	54.00	---	---
38.73	S	H	41.66	- 8.95	-13.84	27.82	18.87	80.80	60.80	-41.93	AV
72.68	S	H	39.15	- 8.95	-16.62	22.53	13.58	80.80	60.80	-47.22	AV
92.08	S	H	46.58	- 8.95	-17.38	29.20	20.25	80.80	60.80	-40.55	AV
97.90	S	H	38.85	- 8.95	-17.11	21.74	12.79	80.80	60.80	-48.01	AV

Remark:

- (1) + F/S F: denotes Fundamental Frequency; S: denotes Spurious Frequency
- (2) Measuring frequencies from 30 MHz to the 10th harmonic of fundamental frequency of 433.92 MHz.
- (3) 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.
- (4) * 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.
- (5) 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. 20DB 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 =500KHz.
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:

$$433.92 \times 0.0025 = 1.0848(\text{MHz})$$

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

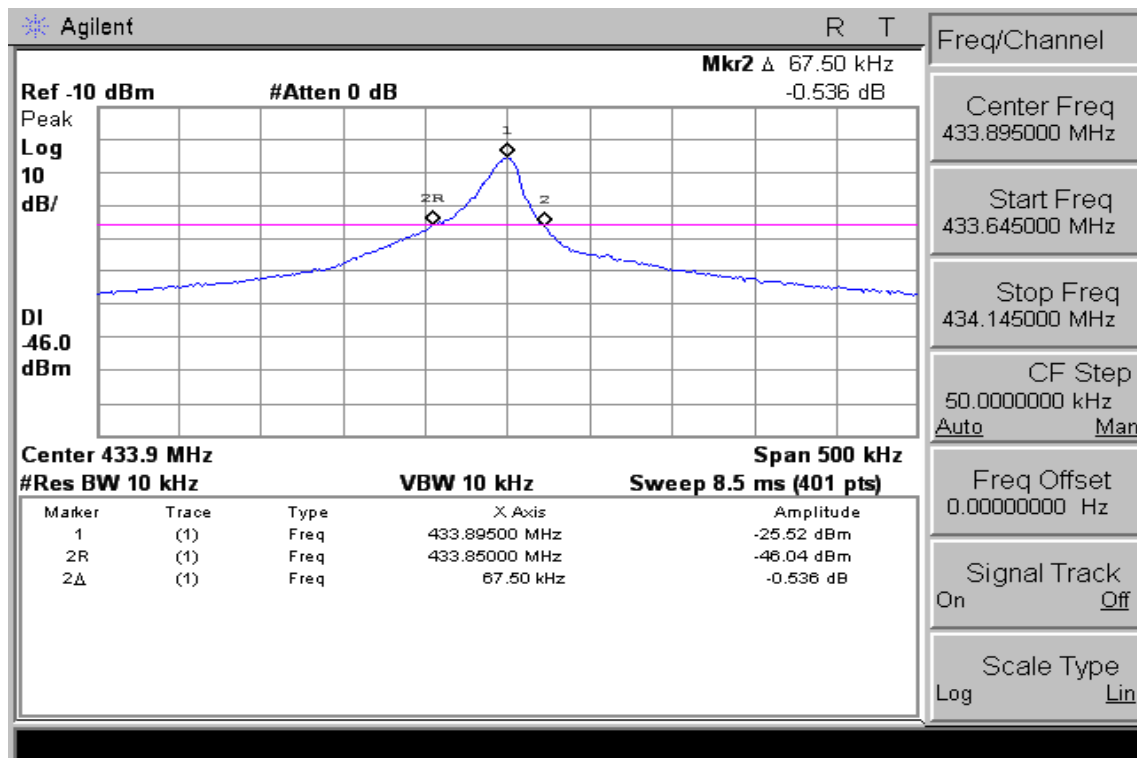
$$f_{(U)} = f_c + \Delta f/2 = 433.92 + 0.5424 = 434.46(\text{MHz})$$

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

Measurement Result:

-20dB bandwidth = 67.50kHz which within allowed frequency range.

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.

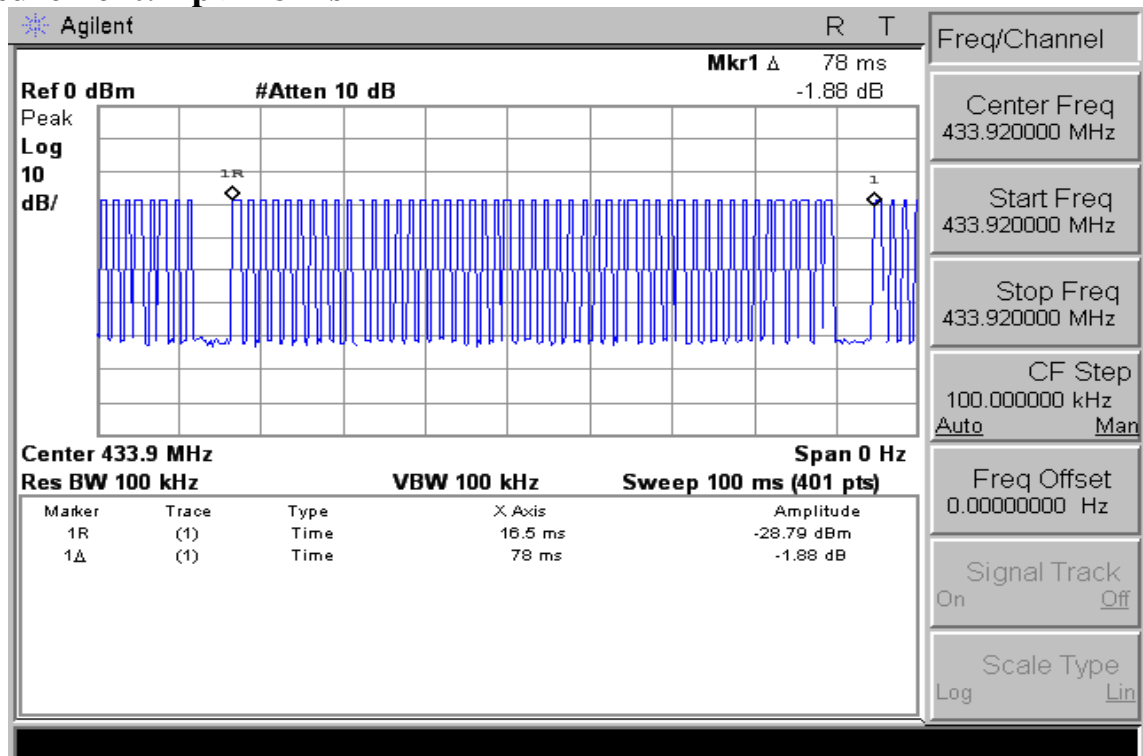
8.4 Measurement Results:

$$T_{on} = 0.975(\text{ms}) * 7 + 0.525(\text{ms}) * 40 = 27.825(\text{ms})$$

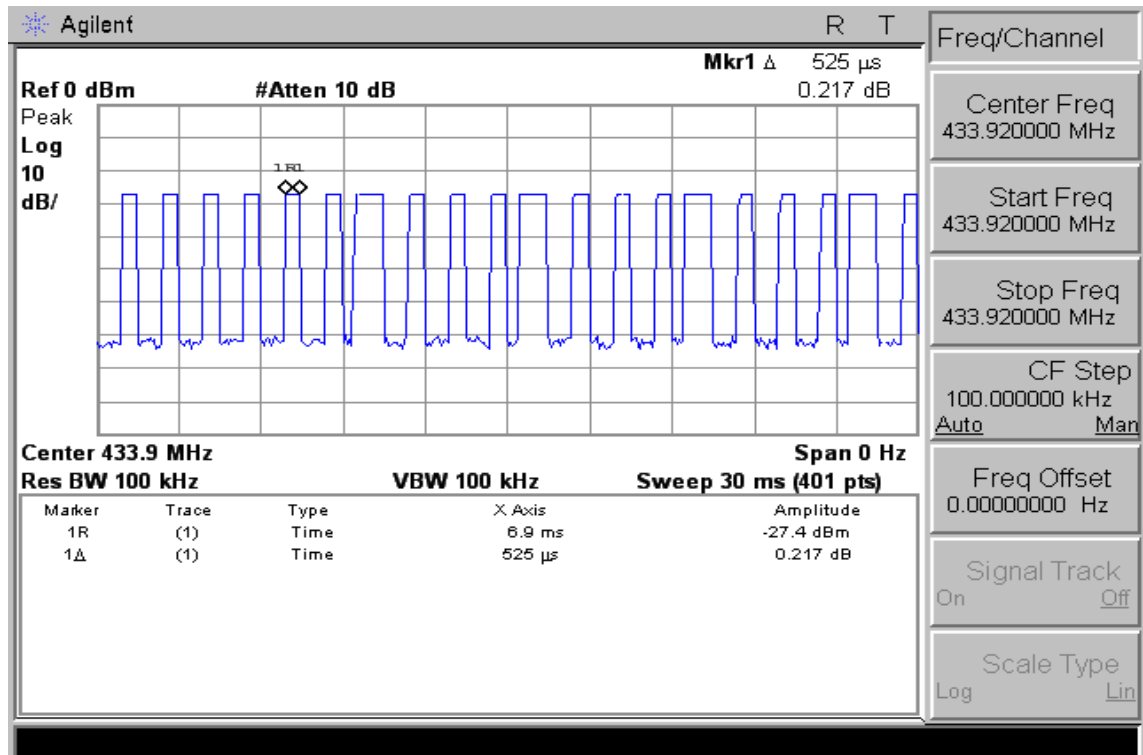
$$T_p > 78(\text{ms}),$$

$$\begin{aligned} \text{Average Correction Factory} &= 20\log(T_{on}/T_p) = 20\log(27.825/78) \\ &= -8.95 \text{ dB} \end{aligned}$$

Measurement: $T_p > 78$ ms

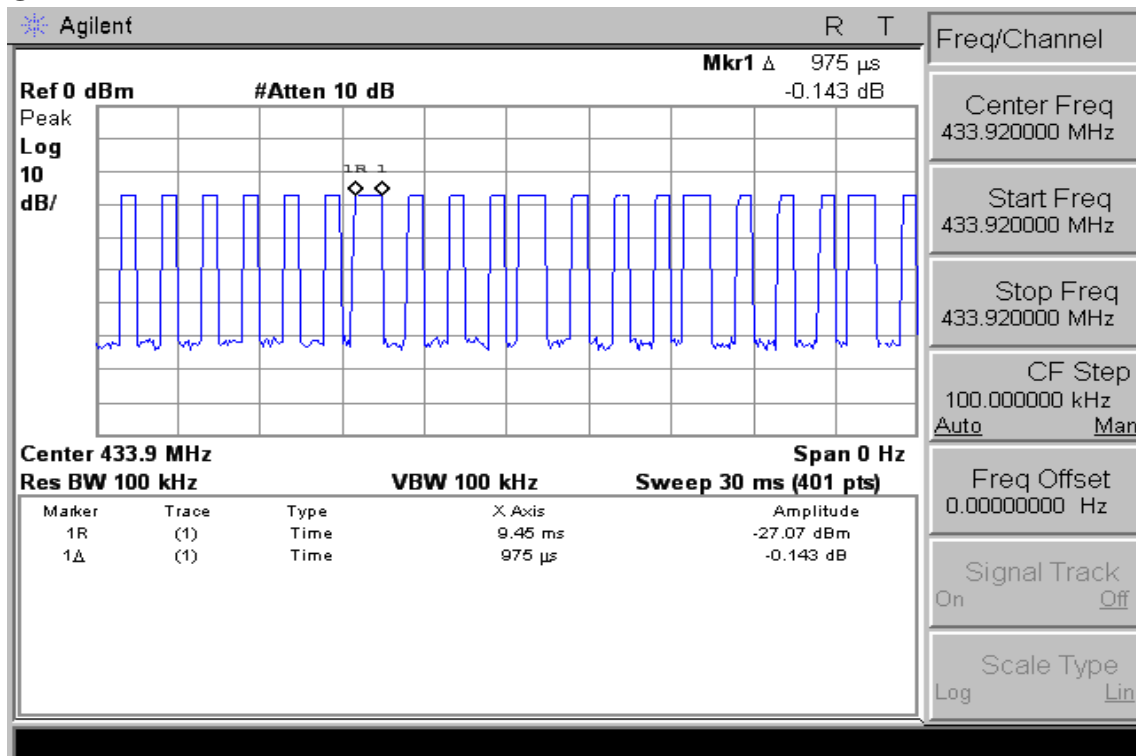


TO 1



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TO 2



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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= 100 KHz, 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.

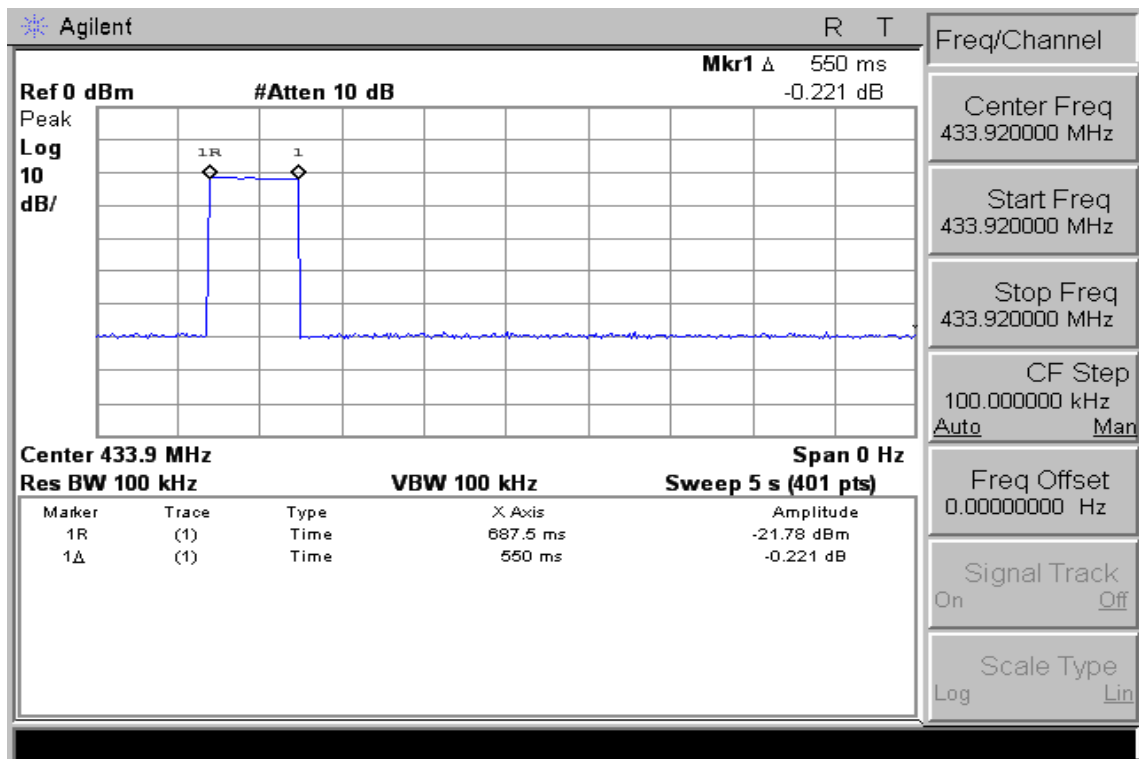
9.3 Measurement Equipment Used:

Same as 6.3 Radiated Emission Measurement.

Measurement Results

The release time less than 5 s.

Refer to attached data chart.



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