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# FCC PART 15 Test Report

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Report No.: AGC02A121101-1F2

**FCC ID** : YMU-12LN

**PRODUCT DESIGNATION** : TCF200-12LN

**BRAND NAME** : RFRemotech

**TEST MODEL** : TCF200-12LN

**CLIENT** : RFRemotech Company

**DATE OF ISSUE** : Dec.27, 2012

**STANDARD(S)** : FCC PART 15 RULES

**Attestation of Global Compliance (Shenzhen) Co., Ltd.**

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## VERIFICATION OF COMPLIANCE

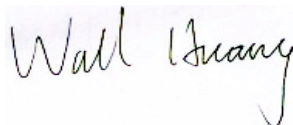
Applicant	RFRemotech Company
	18E, No.445, Tianhe Bei Rd., Guangzhou, China
Manufacturer	RFRemotech Company
	18E, No.445, Tianhe Bei Rd., Guangzhou, China
Product Designation	TCF200-12LN
Brand Name	RFRemotech
Model Name	TCF200-12LN
FCC ID	YMU-12LN
Report Number	AGC02A121101-1F2
Date of Test	Dec.11~Dec.15, 2012

### WE HEREBY CERTIFY THAT:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., 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). The sample tested as described in this report is in compliance with the FCC Rules Part 15 requirements.

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

Tested By



Huang Wall

Dec.27, 2012


Reviewed By



Forrest Lei

Dec.27, 2012

Approved By



Solger Zhang

Dec.27, 2012

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## 1. GENERAL INFORMATION

### 1.1 PRODUCT DESCRIPTION

The EUT is a short range, lower power, wide band Wireless transmitter.  
A major technical description of EUT is described as following

<b>Product Designation:</b>	TCF200-12LN
<b>Brand Name:</b>	RFRemotech
<b>Test Model:</b>	TCF200-12LN
<b>Hardware Version:</b>	V1.0
<b>Software Version:</b>	V1.0
<b>Operation Frequency:</b>	433.92MHz
<b>Modulation Bandwidth:</b>	323.712 KHz
<b>Modulation:</b>	FSK
<b>Number of Channels</b>	1 Channel
<b>Antenna Designation:</b>	Integral antenna which designed as an indispensable part of the equipment
<b>Power Supply:</b>	DC 12V by battery
<b>Note:</b> The EUT is a manually operated transmitter. The EUT independent no matter how long any button is pressed, it transmits only for a very short time (0.3s)	

### 1.2 RELATED SUBMITTAL(S) / GRANT (S)

This submittal(s) (test report) is intended for FCC ID: YMU-12LN, filing to comply with the FCC Part 15 requirements.

### 1.3 TEST METHODOLOGY

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 test site used to collect the radiated data is located on the address of Attestation of Global Compliance (Shenzhen) Co., Ltd. 2/F., Building 2, No.1-No.4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District, Shenzhen, Guangdong, China. The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003.

FCC register No.: 259865.

#### **1.5 SPECIAL ACCESSORIES**

Refer to section 2.2.

#### **1.6 EQUIPMENT MODIFICATIONS**

Not available for this EUT intended for grant.

2. SYSTEM TEST CONFIGURATION

2.1 CONFIGURATION OF TESTED SYSTEM

Configure 1



2.2 EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Mfr/Brand	Model/Type No.	Remark
1	RFRomotech	N/A	TCF200-12LN	EUT

### 3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.231/§15.209	Radiated Emission	Compliant
§15.231	20dB Bandwidth	Compliant
§15.231	Transmission Cease Time	Compliant
§15.203	Antenna Requirement	Compliant
§15.207	Conducted Emission	N/A

**NOTE:**

1. N/A- Not Applicable.

#### 4. DESCRIPTION OF TEST MODES

The EUT has been operated in one modulation: FSK independently.

The following operating modes were applied for the related test items.

Three axles had been tested.

No.	TEST MODES
1	TX on 433.92MHz
2	Standby

**Note:** *All the test modes can be supply by a new battery.  
Only the result of the worst case was recorded in the report.*



## 5 DUTY CYCLE

### 5.1 LIMIT

*No dedicated limit specified in the rules.*

### 5.2 TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer=operating frequency.
4. Set the spectrum analyzer as RBW, VBW=100KHz, Span=0Hz
5. Repeat above procedures until all frequency measured were complete.

### 5.3 TEST RESULT

$Ton1=15ms$

$Ton2=9.5ms$

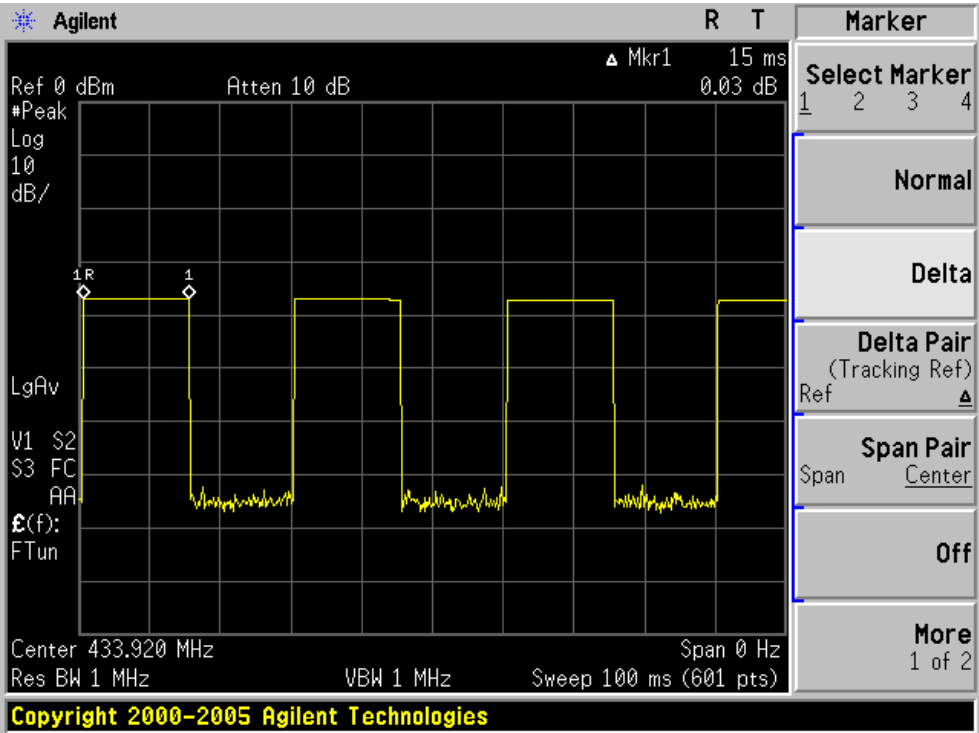
$Ton=Ton1*3+Ton2=15*3+9.5=54.5ms$

$Duty\ cycle=Ton/100ms=54.5/100=0.55$

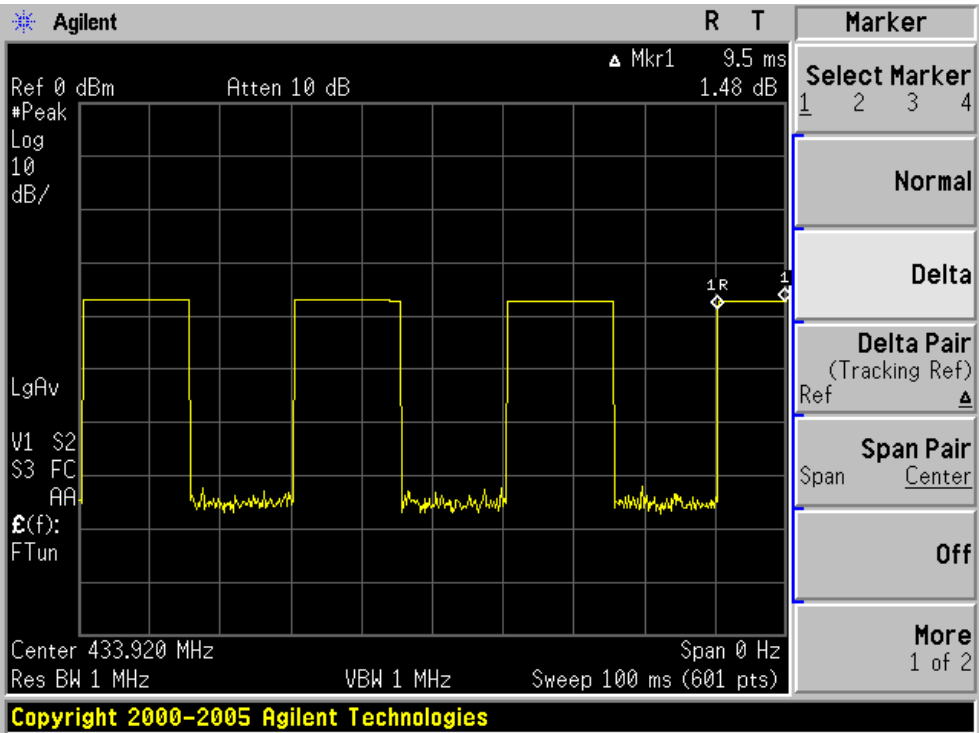
$Factor=20\log(duty\ cycle)=20\log0.55=-5.2dB$

**Note:** 1  $Tp$  is whole transmitting time and  $Ton1$  is one burst time.

2  $Tp$  is any pressed button transmitting time.



Ton1



Ton2

## 6. RADIATED EMISSION

### 6.1 LIMITS

FCC §15.231 and §15.209

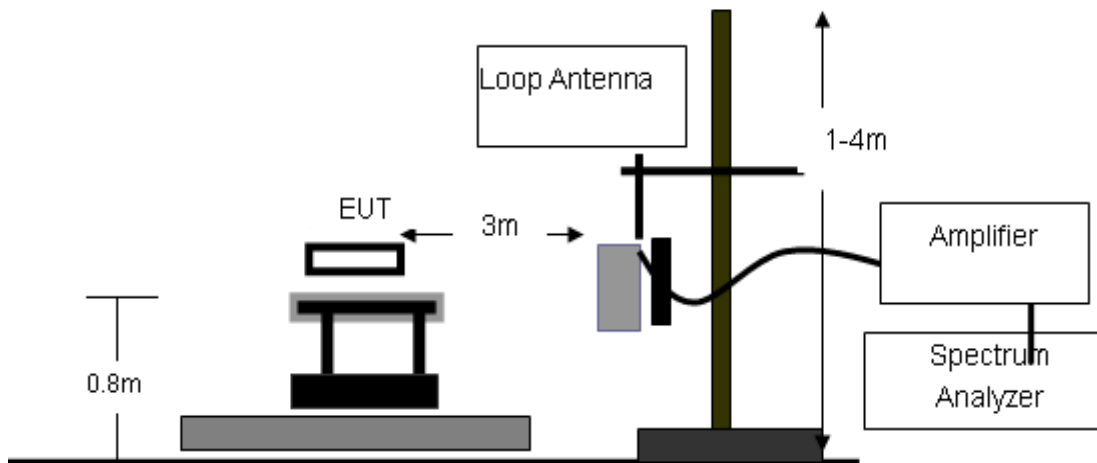
### 6.2 MEASUREMENT PROCEDURE

- 1). The EUT is placed on a turntable, which is 0.8m above ground plane.
- 2). The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.  
EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- 3). Maximum procedure was performed on the six highest emissions to ensure EUT compliance.  
And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 4). Set the spectrum analyzer in the following setting as:  
Below 1GHz: RBW=100 kHz / VBW=300 kHz / Sweep=AUTO  
Above 1GHz: (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO  
(b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO

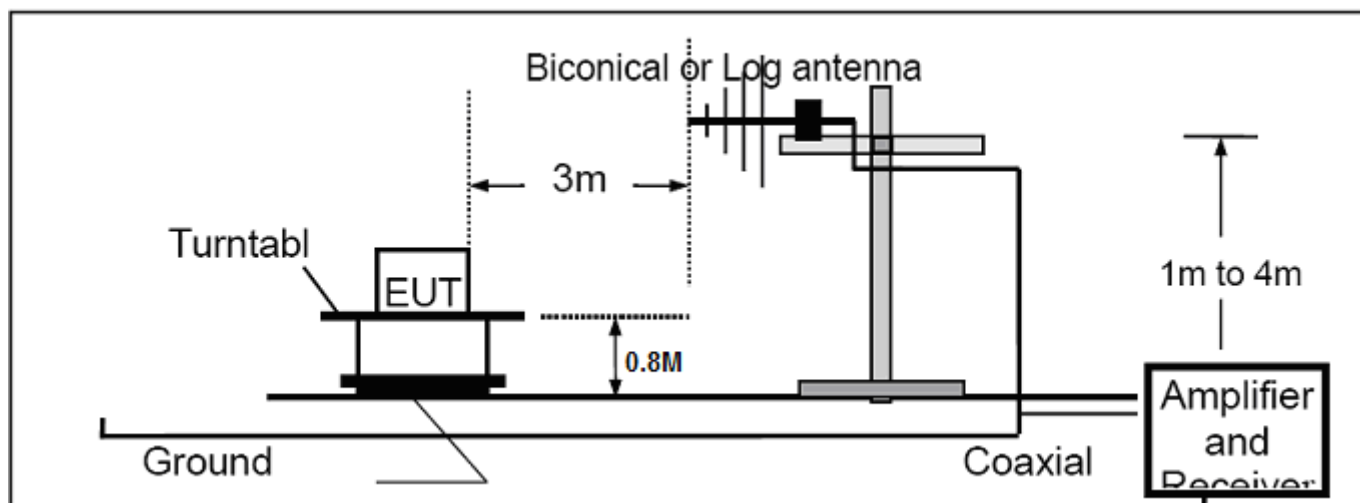
Repeat above procedures until the measurements for all frequencies are complete

### 6.3 TEST SETUP

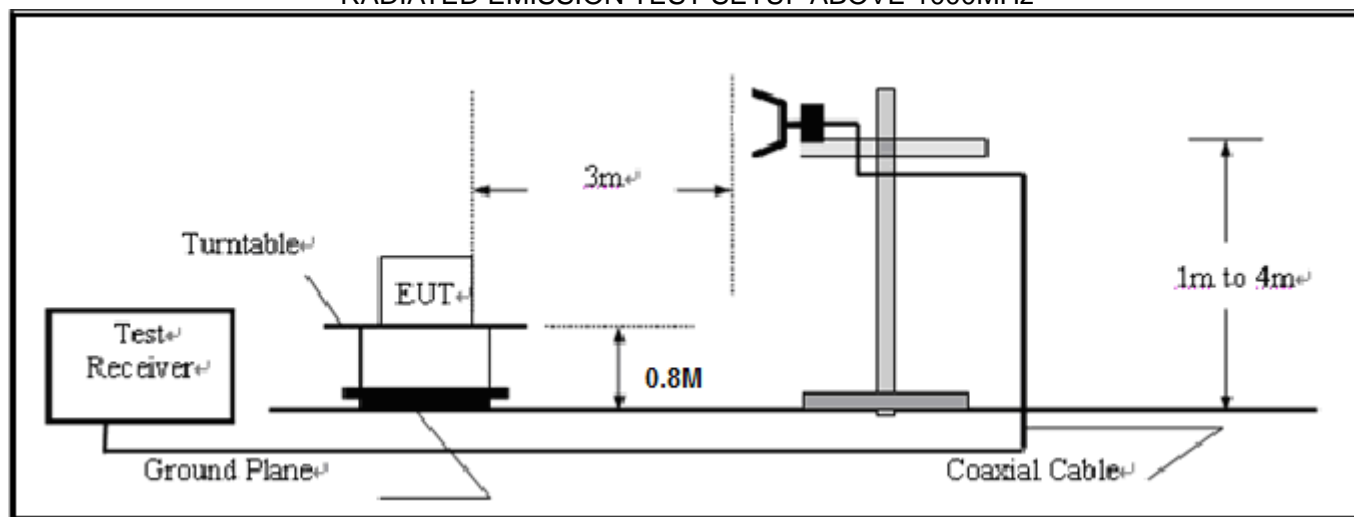
#### RADIATED EMISSION TEST SETUP BELOW 30MHz



#### RADIATED EMISSION TEST SETUP 30MHz-1000MHz



#### RADIATED EMISSION TEST SETUP ABOVE 1000MHz



#### 6.4 TEST EQUIPMENT LIST

Description	Manufacturer	Model	SERIAL NUMBER	Cal. Date	Cal. Due
SPECTRUM ANALYZER	Agilent	E4440A	N/A	07/18/2012	07/17/2013
AMPLIFIER	EM	EM30180	0607030	07/18/2012	07/17/2013
HORN ANTENNA	EM	EM-AH-10180	N/A	07/18/2012	07/17/2013
HORN ANTENNA	A.H. Systems Inc.	SAS-574	--	07/18/2012	07/17/2013
EMI TEST RECEIVER	Rohde & Schwarz	ESCI	N/A	07/18/2012	07/17/2013
AMPLIFIER	EM	EM30180	N/A	07/18/2012	07/17/2013
BIOLOGICAL ANTENNA	A.H. Systems Inc.	SAS-521-4	N/A	07/18/2012	07/17/2013
LOOP ANTENNA	Daze	ZN30900N	SEL0097	07/18/2012	07/17/2013
ISOLATION TRANSFORMER	LETEAC	LTBK	--	07/18/2012	07/17/2013

## 6.5 TEST RESULT

### RADIATED EMISSION BELOW 30MHZ

Frequency	antenna	reading level(Peak	Factor	AV	Measurement level(dBuV/m)	Limit (dBuV/m)	Margin(dB)		
(MHz)	Polarization	(dBuV/m)	(dB)	(dB)	Peak	AVG	Peak	AVG	Peak
--	H	--	--	--	--	--	--	--	--
--	H	--	--	--	--	--	--	--	--
--	H	--	--	--	--	--	--	--	--
--	H	--	--	--	--	--	--	--	--
--	H	--	--	--	--	--	--	--	--
--	H	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--
--	V	--	--	--	--	--	--	--	--

**Note:** Data 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.

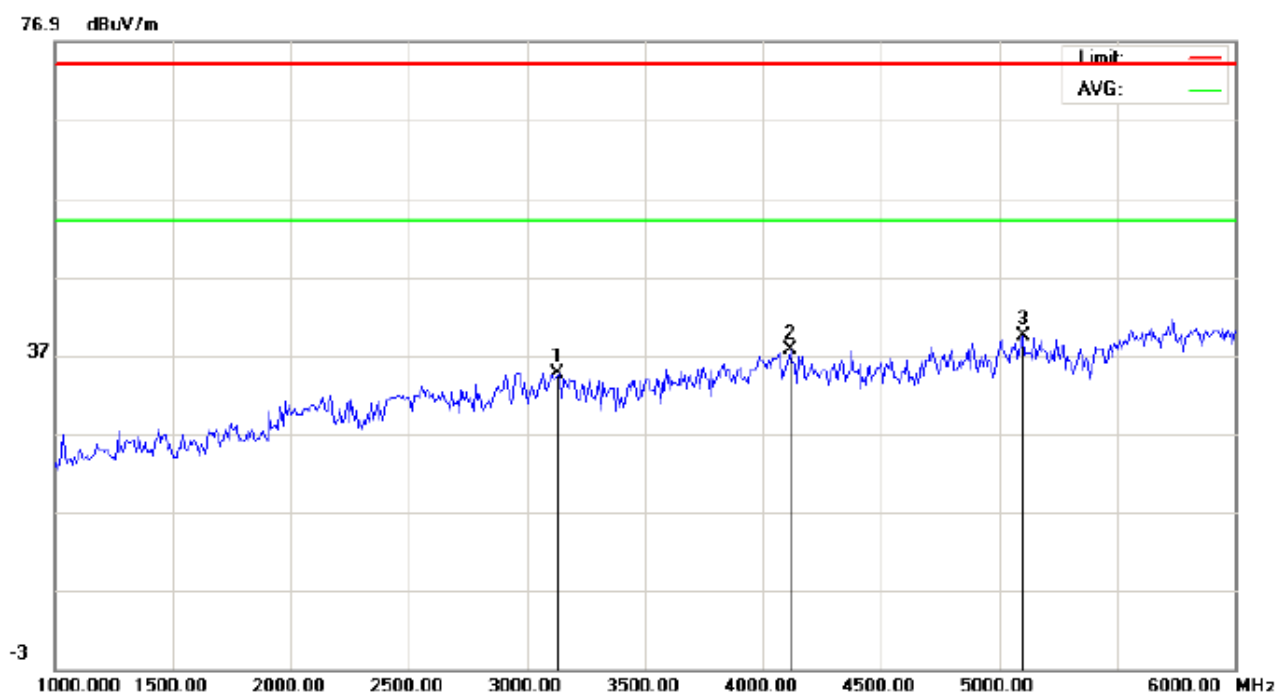
### RADIATED EMISSION BELOW 1GHZ

Frequency	antenna	Reading level(Peak	Factor	AV	Measurement level(dBuV/m)		Limit (dBuV/m)		Margin(dB)	
(MHz)	Polarization	(dBuV/m)	(dB)	(dB)	Peak	AVG	Peak	AVG	Peak	AVG
433.92	H	64.81	19.67	-5.2	84.48	79.28	100.8	80.8	-16.32	-1.52
575.32	H	61.64	20.75	-5.2	82.39	77.19	100.8	80.8	-18.41	-3.61
869.24	H	55.77	22.43	-5.2	78.2	73	100.8	80.8	-22.6	-7.8
--	H	--	--	--	--	--	--	--	--	--
433.92	V	62.46	18.52	-5.2	80.98	75.78	100.8	80.8	-19.82	-5.02
575.32	V	58.67	21.33	-5.2	80	74.8	100.8	80.8	-20.8	-6
869.24	V	55.44	22.86	-5.2	78.3	73.1	100.8	80.8	-22.5	-7.7
--	V	--	--	--	--	--	--	--	--	--

**Note:** Measurement level (Peak) = Reading level + Factor  
Measurement level (AVG) = Measurement level (Peak) + AV Factor  
Margin (Peak) = Measurement level (Peak) - Limit (Peak)  
Margin (AVG) = Measurement level (AVG) - Limit (AVG)

Data 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.

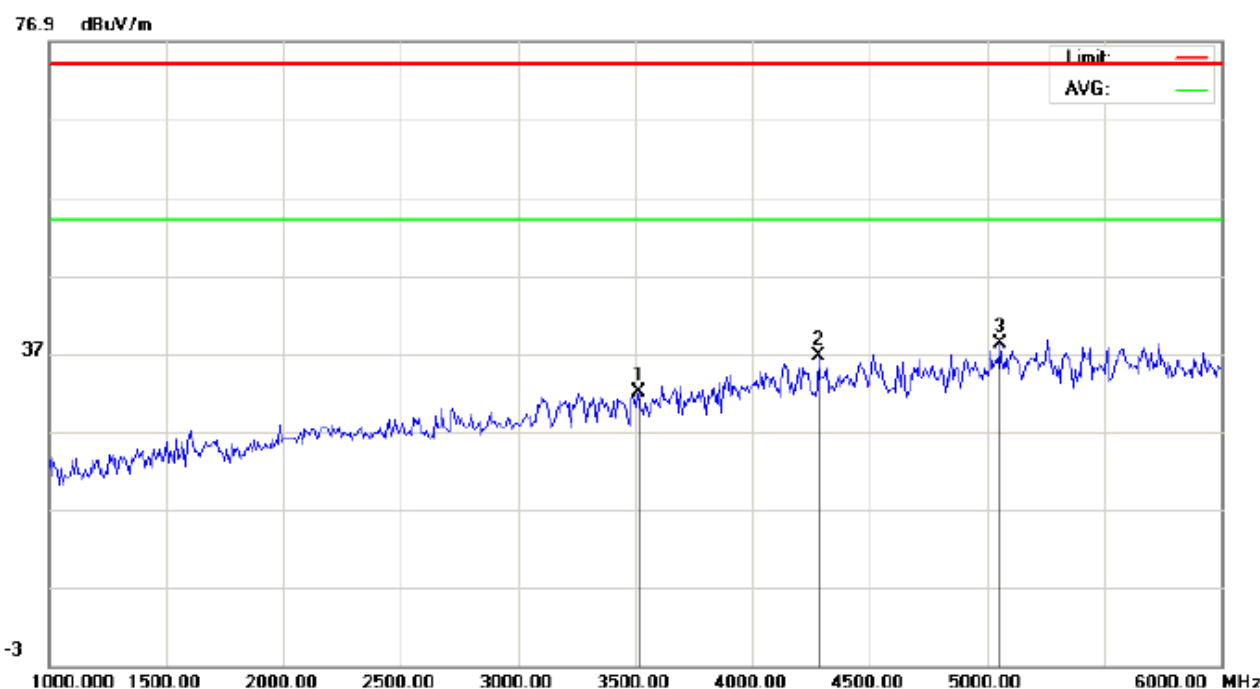
## RADIATED EMISSION ABOVE 1GHZ- HORIZONTAL



Site: site #1	Polarization: <i>Horizontal</i>	Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK)	Power:	Humidity: 60 %
EUT: TCF200-12LN	Distance: 3m	
M/N: TCF200-12LN		
Mode: Mode 1		
Note:		

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		3133.333	42.81	-8.23	34.58	74.00	-39.42	peak			
2		4116.667	42.06	-4.41	37.65	74.00	-36.35	peak			
3	*	5100.000	41.12	-1.80	39.32	74.00	-34.68	peak			

# RADIATED EMISSION ABOVE 1GHZ-VERTICAL



Site: site #1	Polarization: <b>Vertical</b>	Temperature: 26
Limit: FCC Class B 3M Radiation above 1GHZ(PK)	Power:	Humidity: 60 %
EUT: TCF200-12LN	Distance: 3m	
M/N: TCF200-12LN		
Mode: Mode 1		
Note:		

No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		3516.667	39.75	-7.79	31.96	74.00	-42.04	peak			
2		4283.333	40.49	-3.85	36.64	74.00	-37.36	peak			
3	*	5058.333	39.93	-1.80	38.13	74.00	-35.87	peak			



## 7. 20DB BANDWIDTH

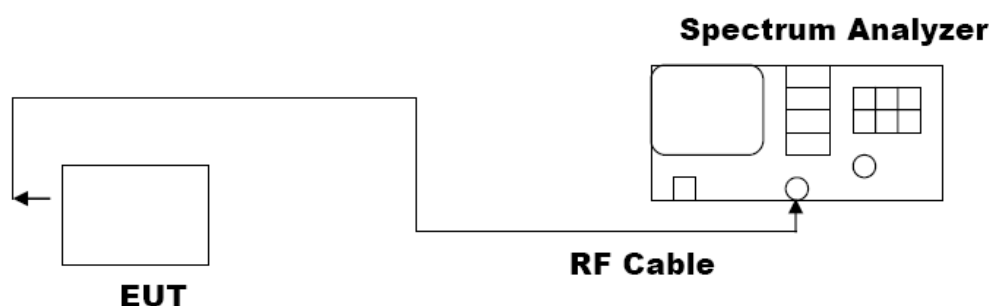
### 7.1 LIMITS

According to FCC §15.231(c), the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900MHz.

### 7.2 MEASUREMENT PROCEDURE

- 1). The EUT was placed on a table which is 0.8m above ground plane.
- 2). Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 3). Set the EUT Work on the top, the middle and the bottom operation frequency individually.
- 4). Set SPA Centre Frequency = Operation Frequency, RBW= 100 KHz,VBW= 300KHz.
- 5). Set SPA Trace 1 Max hold, then View.

### 7.3TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



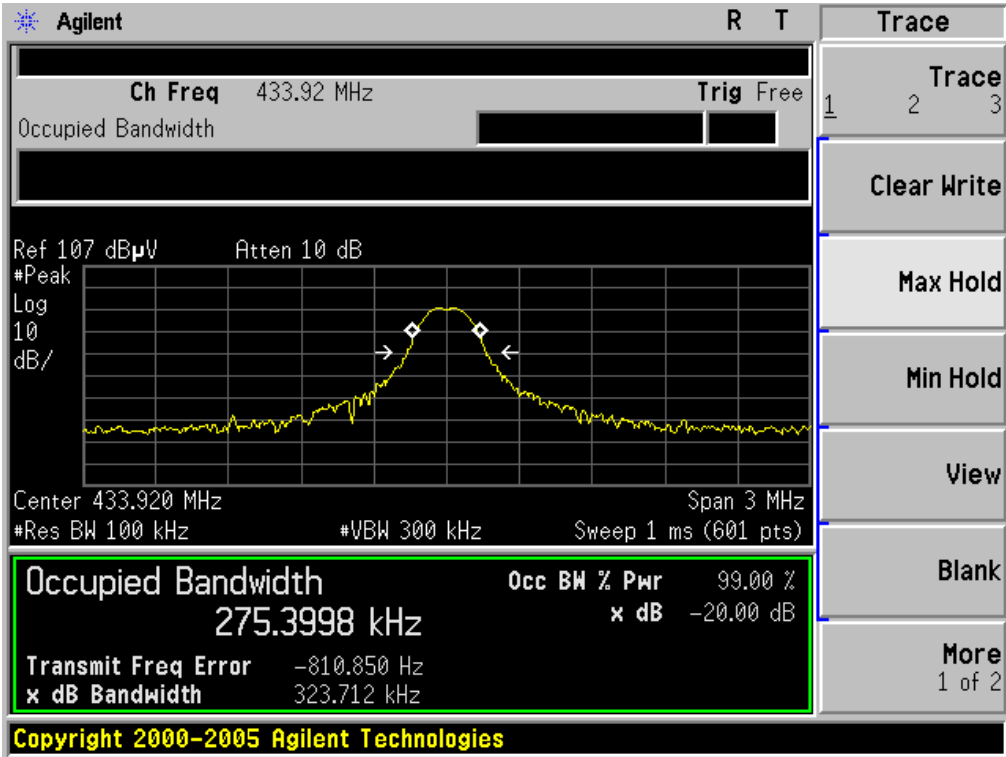
### 7.4 MEASUREMENT EQUIPMENT USED

Description	Manufacturer	Model	SERIAL NUMBER	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E4440A	N/A	07/18/2012	07/17/2013
RF attenuator	N/A	RFA20db	N/A	N/A	N/A

### 7.5 MEASUREMENT RESULTS

Frequency (MHz)	20 dB Bandwidth (KHz)	Limit (MHz)	Result
433.92	323.712	1.08	Pass

TEST PLOT OF 20dB BANDWIDTH



## 8. TRANSMISSION CEASE TIME

### 8.1 LIMITS

According to FCC Part 15 Section 15.231(a), in addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

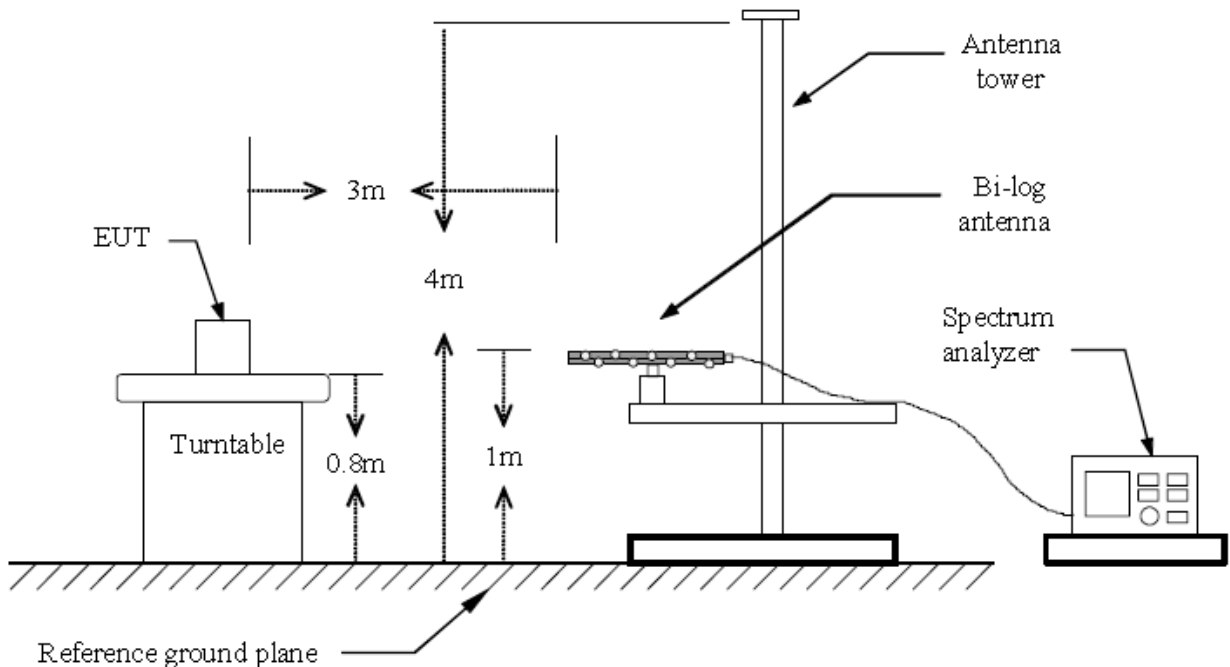
According to FCC section 15.231(a):

- (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
- (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.

### 8.2 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= 100KHz, VBW= 300KHz, Span =0 Hz.
- 3). Press the transmit switch and then released.
- 4). Record the transmission cease time.

### 8.3 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)



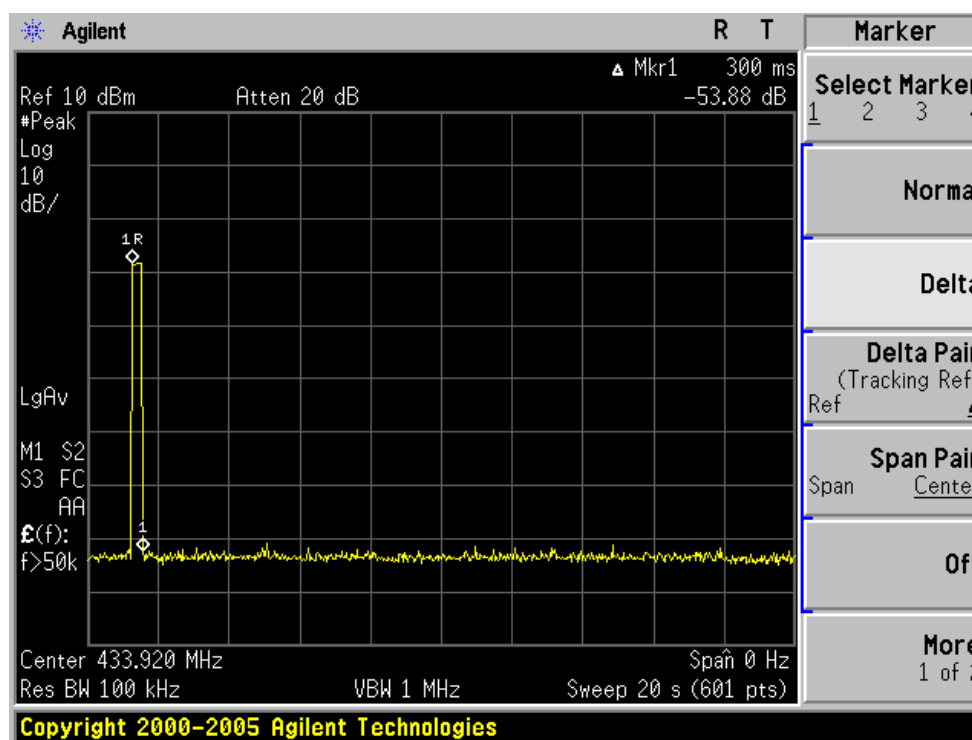
#### 8.4 MEASUREMENT EQUIPMENT USED

Description	Manufacturer	Model	SERIAL NUMBER	Cal. Date	Cal. Due
Spectrum Analyzer	Agilent	E4440A	N/A	07/18/2012	07/17/2013
RF attenuator	N/A	RFA20db	N/A	N/A	N/A

#### 8.5 MEASUREMENT RESULTS

Test Results	LIMIT	RESULT
0.3S	5S	PASS

TEST PLOT OF TRANSMISSION CEASE TIME



**Note:** The EUT Transmit only for a very short time no matter how long the button is pressed.

## **9. ANTENNA REQUIREMENT**

### **9.1 DEFINITION**

An analysis of the EUT was performed to determine compliance with FCC Section 15.203. This section requires specific handling and control of antennas used for devices subject to regulations.

### **9.2 EVALUATION PROCEDURE**

The structure and application of the EUT was analyzed with respect to the rules. The antenna is an internal antenna, and is not accessible to the user. An auxiliary antenna port is not present.

### **9.3 EVALUATION CRITERIA**

Section 15.203 of the rules states that the subject device must meet at least one of the following criteria:

- (a) Antenna must be permanently attached to the unit.
- (b) Antenna must use a unique type of connector to attach to the EUT.
- (c) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

### **9.4 EVALUATION RESULTS**

The EUT has fixed antenna, compliance with antenna requirement.

**APPENDIX I**  
**PHOTOGRAPHS OF THE EUT**  
TOP VIEW OF EUT



BOTTOM VIEW OF EUT



FRONT VIEW OF EUT



BACK VIEW OF EUT





LEFT VIEW OF EUT



RIGHT VIEW EUT





OPEN VIEW OF EUT



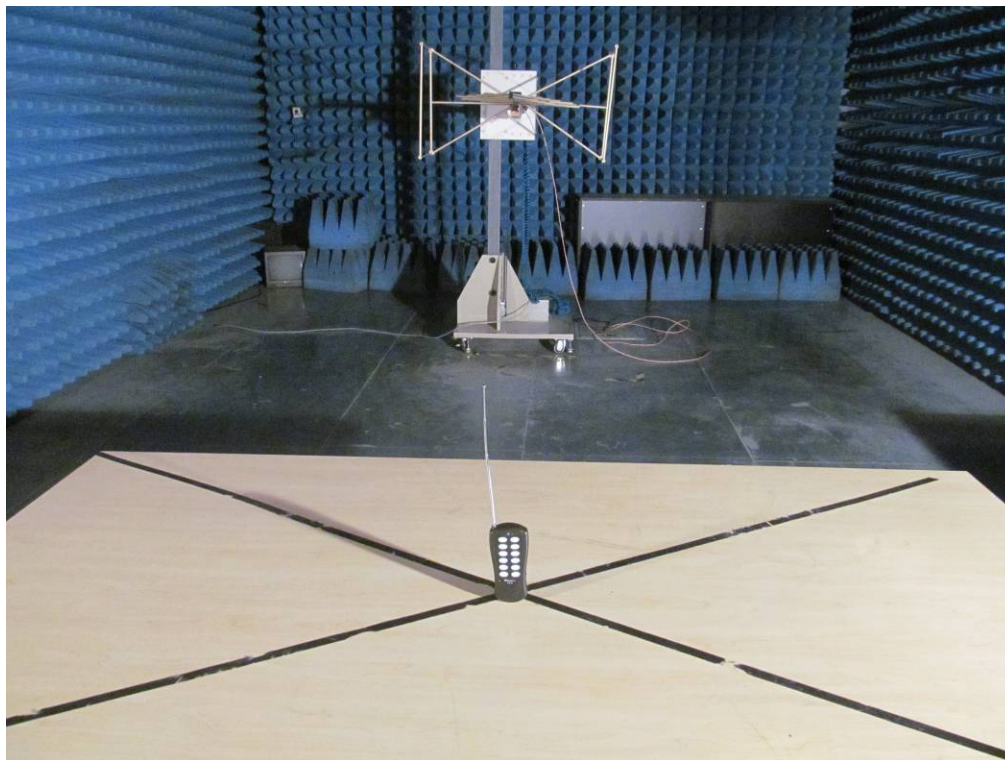
INTERNAL VIEW-1 OF EUT



INTERNAL VIEW-2 OF EUT



**APPENDIX II**  
**PHOTOGRAPHS OF THE TEST SETUP**  
RADIATED SPURIOUS EMISSION



----END OF REPORT----