



Shenzhen Asia Test Technology Co., Ltd.

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FCC RADIO TEST REPORT

FCC ID: 2ADJ2TXMULTI

Product : REMOTE

Trade Name : N/A

Model Name : TX MULTI F

Serial Model : N/A

Prepared for

Rolling Code Limited

21/F C C WU BLDG, 302-308 HENNESSY RD WANCHAI, HONG KONG

Prepared by

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TEST RESULT CERTIFICATION

Applicant's name : Rolling Code Limited

Address : 21/F C C WU BLDG, 302-308 HENNESSY RD WANCHAI, HONG KONG

Manufacture's Name..... : Rolling Code Limited

Address : 21/F C C WU BLDG, 302-308 HENNESSY RD WANCHAI, HONG KONG

Product description

Product Name..... : REMOTE

Model and/or type reference : TX MULTI F

Serial Model : N/A

Standards : FCC Part15.231:2017

Test procedure ANSI C63.10-2013

This device described above has been tested by ATT, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test :

Date (s) of performance of tests : Jan. 11 2017 ~Apr. 10 2017

Date of Issue..... : Apr. 10 2017

Test Result..... : **Pass**

Testing Engineer :

(Seal Chen)

Technical Manager :

(Jackie Deng)



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1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15, Subpart C (15.231)			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	N/A	Note(1)
15.203	Antenna Requirement	Pass	
15.231	Radiated Spurious Emission	Pass	
15.231	Occupied Bandwidth	Pass	
15.231	Transmitter Timeout	Pass	

NOTE:

(1) "N/A" denotes test is not applicable in this Test Report.



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1.1 TEST FACILITY

Shenzhen Asia Test Technology Co.,Ltd.

7 / F, Xinwei Building, Gushu Village, Xixiang Town, Baoan District, Shenzhen, China

FCC Registration No.: 348715; IC Registration No.: 12198A

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
2	RF power,conducted	$\pm 0.16\text{dB}$
3	Spurious emissions,conducted	$\pm 0.21\text{dB}$
4	All emissions,radiated(<1G)	$\pm 4.68\text{dB}$
5	All emissions,radiated(>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^{\circ}\text{C}$
7	Humidity	$\pm 2\%$



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2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	REMOTE	
Trade Name	N/A	
Model Name	TX MULTI F	
Serial Model	N/A	
Model Difference	N/A	
Product Description	The EUT is a REMOTE	
	Product Type	Remote Control
	Operation Frequency:	315MHz, 318MHz, 390MHz
	Modulation Type:	FSK
	Number Of Channel	3CH.
	Antenna Designation:	Printed antenna
	Antenna Gain(Peak)	0 dBi
Channel List	N/A	
Adapter	N/A	
Battery	DC 3V	
Software version	V1.0	
Hardware Version	V1.1	

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. The RF chip CC1101 support the data rate from 600bps to 600000bps. because the firmware limitation, this product only supports 800bps (for 315MHz)/ 1200bps (for 318MHz) /1600bps (for 390MHz). And users can not enable other RF function by themselves.

2.

Table for Filed Antenna

Ant	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
1	N/A	N/A	PCB Antenna	NA	0	Antenna



2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generated from EUT, the test system was pre-scanning tested based on the consideration of following EUT operation mode or test configuration mode which possibly have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	TX

For Conducted Emission	
Final Test Mode	Description
Mode 1	N/A

For Radiated Emission	
Final Test Mode	Description
Mode 1	TX

Note:

- (1) The EUT used new battery during the measurement.
- (2) After the pre-test All button emission frequency, modulation mode and power. Only recorded the worst case result in this report. Key1, key2, key3, key4 are all test, only reported the worst case key1 for 800bps (for 315MHz), key3 for 1200bps (for 318MHz), and key4 for 1600bps (for 390MHz).
- (3) All test mode perform on continuous transmission mode. Use the test software test_cc1101.exe provide by manufacturer.



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2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Radiated Spurious Emission Test

E-1 EUT



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2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	REMOTE	N/A	TX MULTI F	N/A	EUT

Item	Shielded Type	Ferrite Core	Length	Note

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.



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2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Equipment No.	Instrument	Manufacturer	Model Name	Serial Number	Specification	Cal. Data
1	Semi-anechoic chamber	Changzhou Chengyu	EC3088	N/A	9*6*6m	10/25/2016
2	Broadband antenna	R&S	VULB 9160	VULB91 60-516	30MHz-1500 MHz	10/25/2016
3	Horn antenna	R&S	BBHA 9120D	10087	1GHz-18GH z	06/05/2016
4	EMI Measuring Receiver	R&S	ESR	101660	9KHz-40GHz	10/25/2016
5	Multi-device controller	MF	MF-7868	MF78680 8762	N/A	10/25/2016
6	Amplifier	EM	EM-30180	060538	1GHz-18GH z	10/25/2016
7	Amplifier	Schwarzbeck	BBV 9475	BBV 9475-663	1GHz-18GH z	06/05/2016
8	Spectrum Analyzer	agilent	E4440B	US44300368	1GHz-26.5GH z	06/05/2016
9	loop antenna	ARA	PLA-1030/B	1029	9k-30MHz	10/25/2016
10	Radiated Cable 1#	FUJIKURA	5D-2W	01	30MHz-1GHz	10/25/2016
11	Radiated Cable 2#	FUJIKURA	10D2W	02	1GHz -25GHz	10/25/2016
12	SMA Antenna connector	Dosin	Dosin-SMA	N/A	N/A	10/25/2016

Note: The SMA antenna connector is soldered on the PCB board in order to perform conducted tests and this SMA antenna connector is listed in the equipment list.
The Cal.Interval was one year



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3. ANTENNA REQUIREMENT

3.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

3.2 EUT ANTENNA

The EUT antenna is PCB Antenna. It comply with the standard requirement.



3.3 CONDUCTED EMISSION MEASUREMENT

3.3.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5			66 - 56 *	56 - 46 *	CISPR
0.50 -5.0			56.00	46.00	CISPR
5.0 -30.0			60.00	50.00	CISPR

0.15 -0.5			66 - 56 *	56 - 46 *	LP002.
0.50 -5.0			56.00	46.00	LP002.
5.0 -30.0			60.00	50.00	LP002.

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz



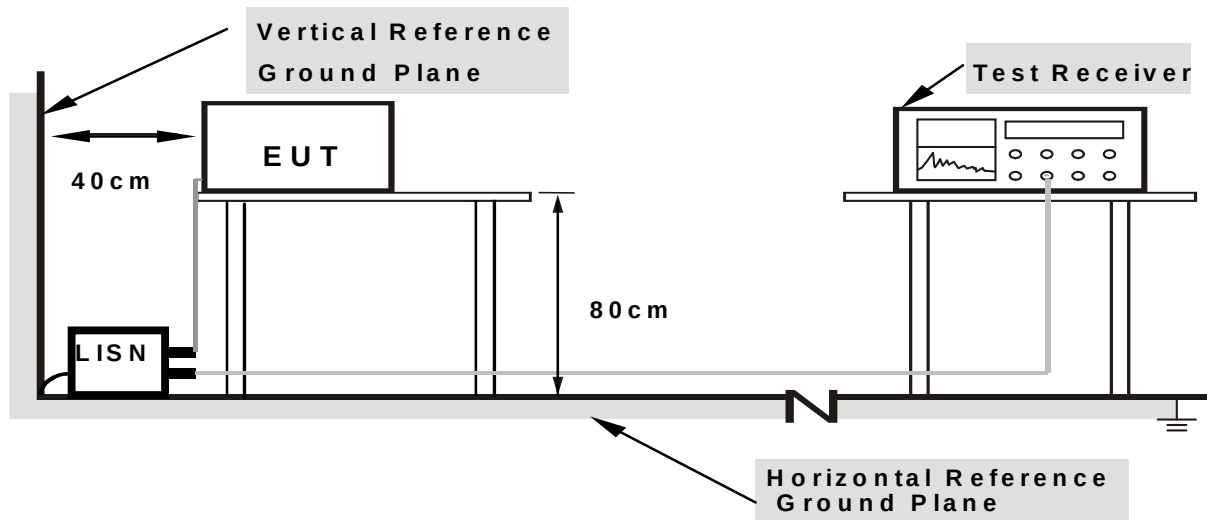
3.3.2 TEST PROCEDURE

- a. The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.3.3 DEVIATION FROM TEST STANDARD

No deviation

3.3.4 TEST SETUP



Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes



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3.2.5 TEST RESULT

EUT :	REMOTE	Model Name. :	TX MULTI F
Temperature :	26 °C	Relative Humidity :	54%
Pressure :	1010hPa	Phase :	N/A
Test Voltage :	N/A	Test Mode :	N/A

Note : Due to this EUT is powered by batteries only, this test item is not applicable.



3.4 RADIATED EMISSION MEASUREMENT

3.4.1 Radiated Emission Limits (FCC 15.209)

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Note:

- (1) The tighter limit applies at the band edges.
- (2) Emission level (dBuV/m)=20log Emission level (uV/m).

LIMITS OF RADIATED EMISSION MEASUREMENT (FCC 15.231)

Fundamental Frequency (MHz)	Field Strength of fundamental (microvolts/meter)	Field Strength of Unwanted Emissions (microvolts/meter)
40.66 - 40.70	2250.00	225.00
70 - 130	1250.00	125.00
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3750.00	375.00
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12500.00	1250.00

Notes:

- (1) ** linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 56.81818(F) - 6136.3636; for the band 260-470 MHz, uV/m at 3 meters = 41.6667(F) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in 93 Section 15.209, whichever limit permits a higher field strength.



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Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1MHz / 1MHz for Peak

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.4.2 TEST PROCEDURE

- The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- The EUT was placed on the top of a rotating table 0.8m(1.5m above 1G) above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment or of the substitution antenna shall be 0.8 m(1.5m above 1G); the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note: For radiated emission test above 1GHz:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

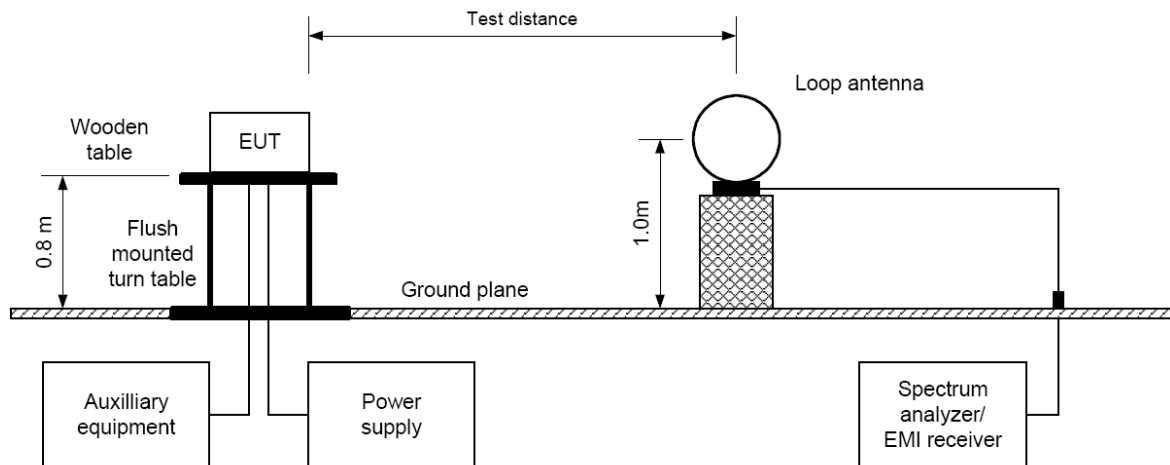
3.4.3 DEVIATION FROM TEST STANDARD

No deviation

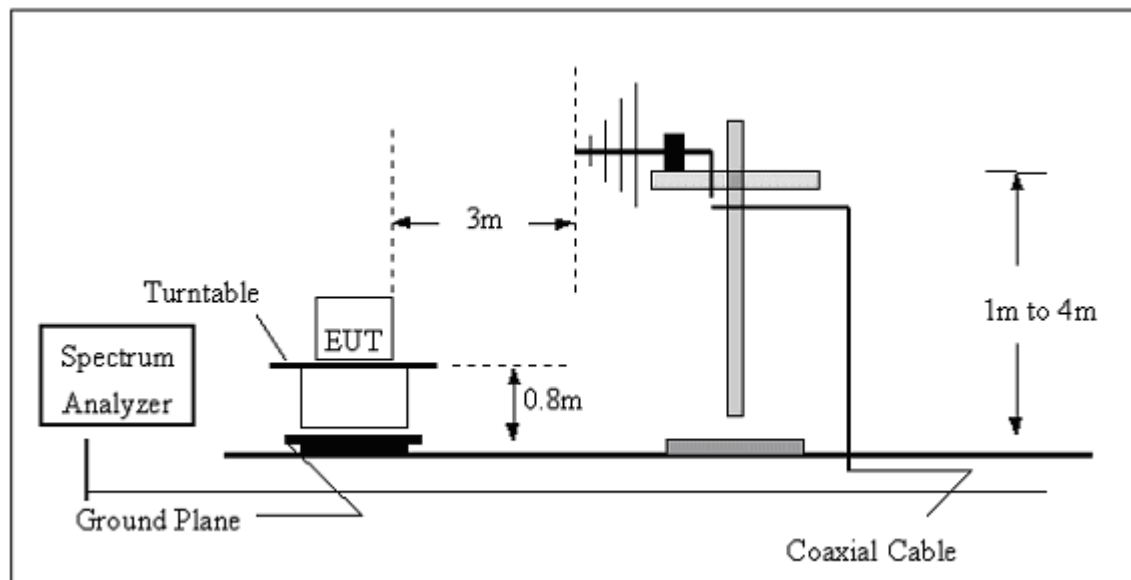


3.4.4 TEST SETUP

(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



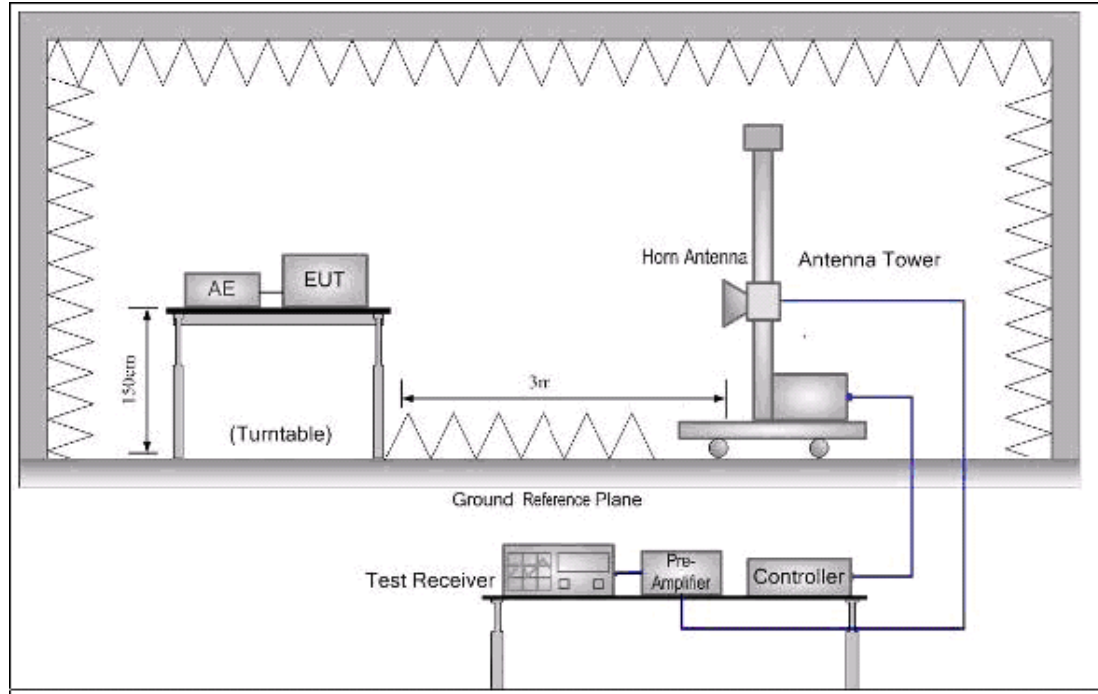


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(C) Radiated Emission Test-Up Frequency Above 1GHz





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3.4.5 TEST RESULTS (BELOW 30MHz)

EUT :	REMOTE	Model Name. :	TX MULTI F
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX	Polarization :	--

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

NOTE:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance/test distance})$ (dB);

Limit line = specific limits(dBuV) + distance extrapolation factor.



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3.4.6 TEST RESULTS (BETWEEN 30 – 4000 MHZ)

EUT :	REMOTE	Model Name :	TX MULTI F
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX 315	Polarization :	Horizontal

Frequency	Field Strength	Limit(PK)	Limit(AV)	State
MHz	dBuV/m (PK)	dBuV/m	dBuV/m	
315	70.28	95.6	75.6	pass
630.651	48.66	75.6	55.6	pass
945.479	43.17	75.6	55.6	pass
1260.302	39.67	74.00	54.00	pass
1575.128	42.18	74.00	54.00	pass
--	--	74.00	54.00	pass

Note: test perform from 30 – 4000 MHz, no EMI Spurious detected above 1600MHz.

EUT :	REMOTE	Model Name :	TX MULTI F
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX 315	Polarization :	Vertical

Frequency	Field Strength	Limit(PK)	Limit(AV)	State
MHz	dBuV/m (PK)	dBuV/m	dBuV/m	
315	72.95	95.6	75.6	pass
630.24	50.37	75.6	55.6	pass
945.47	45.61	75.6	55.6	pass
1260.31	43.25	74.00	54.00	pass
1575.58	40.88	74.00	54.00	pass
--	--	74.00	54.00	pass

Note: test perform from 30 – 4000 MHz, no EMI Spurious detected above 1600MHz.



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EUT :	REMOTE	Model Name :	TX MULTI F
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX 318	Polarization :	Horizontal

Frequency	Field Strength	Limit(PK)	Limit(AV)	State
MHz	dBuV/m (PK)	dBuV/m	dBuV/m	
318	71.25	95.8	75.8	pass
636.113	49.31	75.8	55.8	pass
954.24	42.67	75.8	55.8	pass
1272.56	45.38	74.00	54.00	pass
1590.36	40.87	74.00	54.00	pass
--	--	74.00	54.00	pass

Note: test perform from 30 – 4000 MHz, no EMI Spurious detected above 1600MHz.

EUT :	REMOTE	Model Name :	TX MULTI F
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX 318	Polarization :	Vertical

Frequency	Field Strength	Limit(PK)	Limit(AV)	State
MHz	dBuV/m (PK)	dBuV/m	dBuV/m	
318	72.21	95.8	75.8	pass
636.35	50.22	75.8	55.8	pass
954.62	45.67	75.8	55.8	pass
1272.79	42.19	74.00	54.00	pass
1590.88	40.18	74.00	54.00	pass
--	--	74.00	54.00	pass

Note: test perform from 30 – 4000 MHz, no EMI Spurious detected above 1600MHz.



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EUT :	REMOTE	Model Name :	TX MULTI F
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX 390	Polarization :	Horizontal

Frequency	Field Strength	Limit(PK)	Limit(AV)	State
MHz	dBuV/m (PK)	dBuV/m	dBuV/m	
390	72.64	99.24	79.24	pass
780.32	51.72	79.24	59.24	pass
1170.45	44.88	79.24	59.24	pass
1260.302	42.97	74.00	54.00	pass
1575.128	40.18	74.00	54.00	pass
--	--	74.00	54.00	pass

Note: test perform from 30 – 4000 MHz, no EMI Spurious detected above 1600MHz.

EUT :	REMOTE	Model Name :	TX MULTI F
Temperature :	20 °C	Relative Humidity :	48%
Pressure :	1010 hPa	Test Voltage :	DC 3V
Test Mode :	TX 390	Polarization :	Vertical

Frequency	Field Strength	Limit(PK)	Limit(AV)	State
MHz	dBuV/m (PK)	dBuV/m	dBuV/m	
390	74.33	99.24	79.24	pass
780.66	53.17	79.24	59.24	pass
1170.25	50.33	79.24	59.24	pass
1260.15	48.75	74.00	54.00	pass
1575.73	43.51	74.00	54.00	pass
--	--	74.00	54.00	pass

Note: test perform from 30 – 4000 MHz, no EMI Spurious detected above 1600MHz.

NOTE:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.



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2. *: Denotes restricted band of operation.

Measurements were made using a peak detector and average detector(if peak emi less then average limit,only record the peak emi data). Any emission falling within the restricted bands of FCC Part 15 Section 15.205 were compliance with the emission limit of FCC Part 15 Section 15.209.

3. FCC Limit for Average Measurement = 41.6667(Center frequency)-7083.3333

4. $1/PW = 1/0.55ms = 1.82 < RBW(120KHz)$, PDCF is not needed



4. BANDWIDTH TEST

4.1 TEST PROCEDURE

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Limit: center frequency *0.25%

4.2 DEVIATION FROM STANDARD

No deviation.

4.3 TEST SETUP





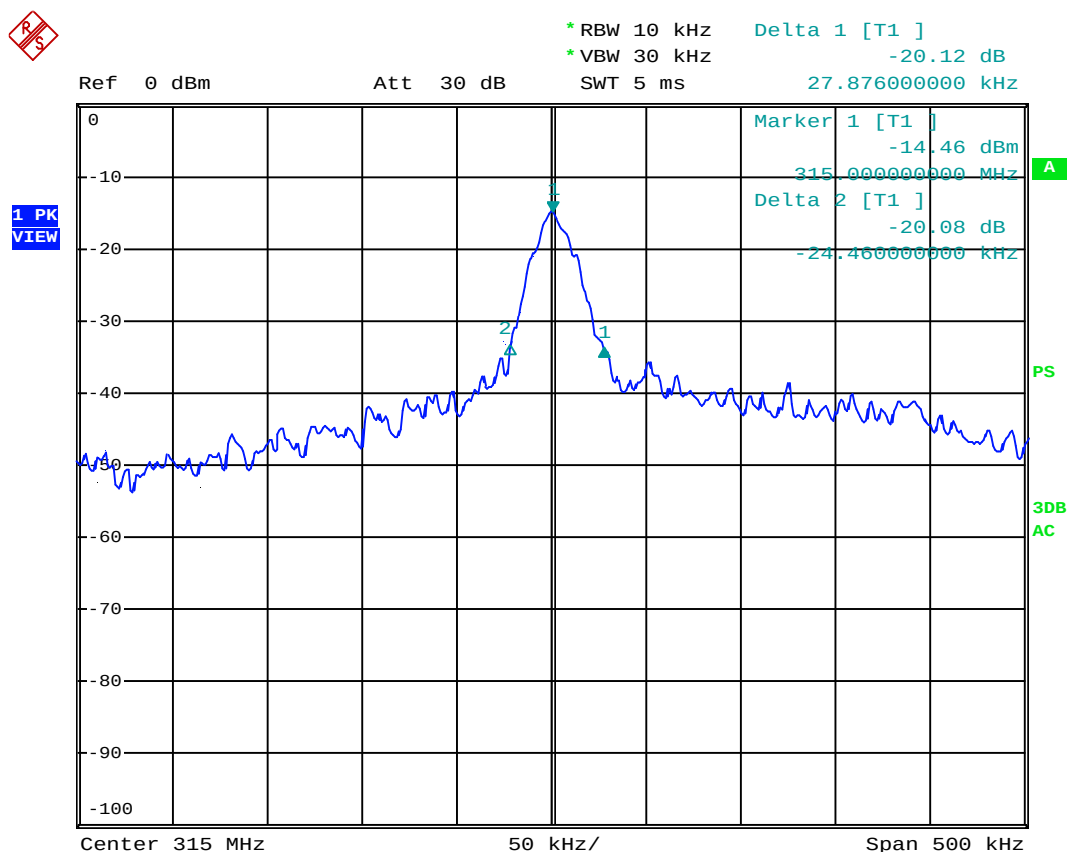
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4.4 TEST RESULTS

EUT :	REMOTE	Model Name :	TX MULTI F
Temperature :	26 °C	Relative Humidity :	53%
Pressure :	1020 hPa	Test Power :	DC 6V
Test Mode :	TX		

Test Channel	Frequency (MHz)	20 dBc Bandwidth (kHz)	Limit (kHz)
CH01	315	52.336	787.5



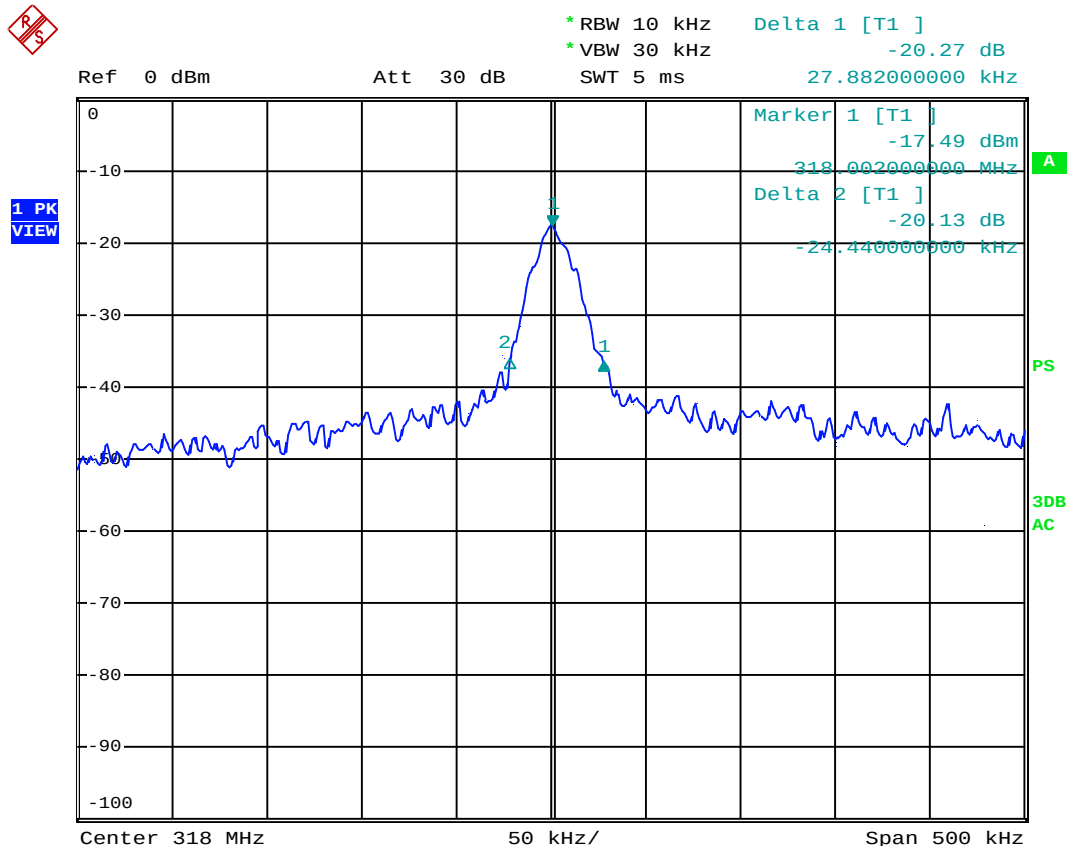
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Test Channel	Frequency (MHz)	20 dBc Bandwidth (kHz)	Limit (kHz)
CH02	318	52.322	795



Date: 13.FEB.2017 14:19:36

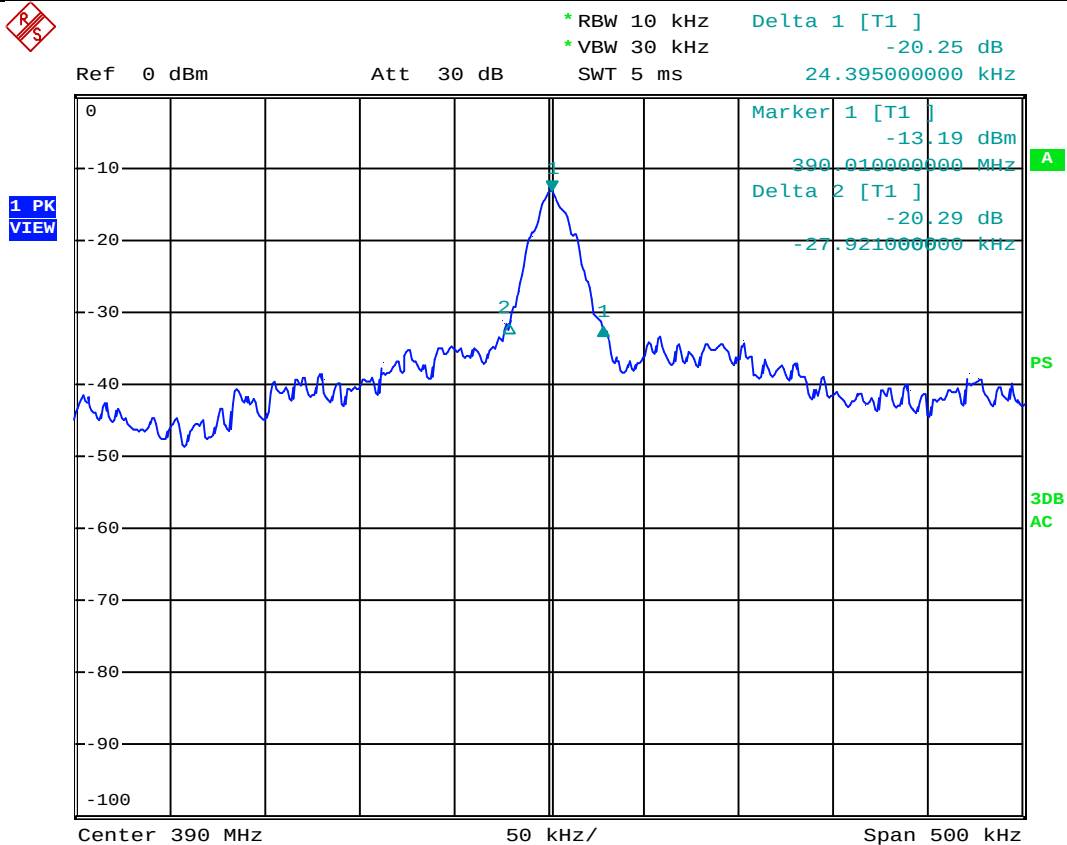


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Test Channel	Frequency (MHz)	20 dBc Bandwidth (kHz)	Limit (kHz)
CH03	390	52.316	975



Date: 13.FEB.2017 13:51:29



5. TRANSMITTER TIMEOUT

5.1 REQUIREMENTS

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

Result: The EUT has a manually activated transmitter, please refer to below detail data

- 2 A transmitter activated automatically shall cease transmission within 5 seconds after activation.

Result: The EUT does not have a automatically activated transmitter

- 3 Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour

Result: The EUT does not employ periodic transmission.

- 4 Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.

Result: The section is not applicable to EUT.

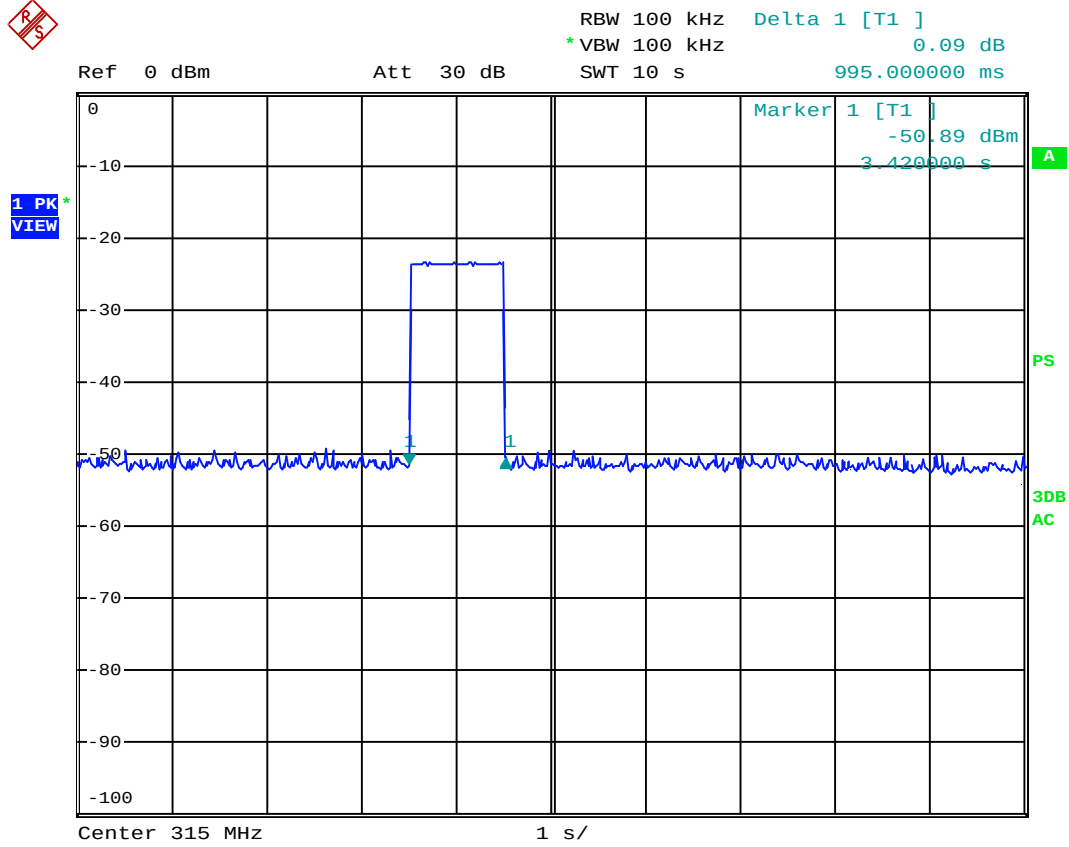
Note: The transmission time of signal will not be affected no matter how long the button was pressed
Test data



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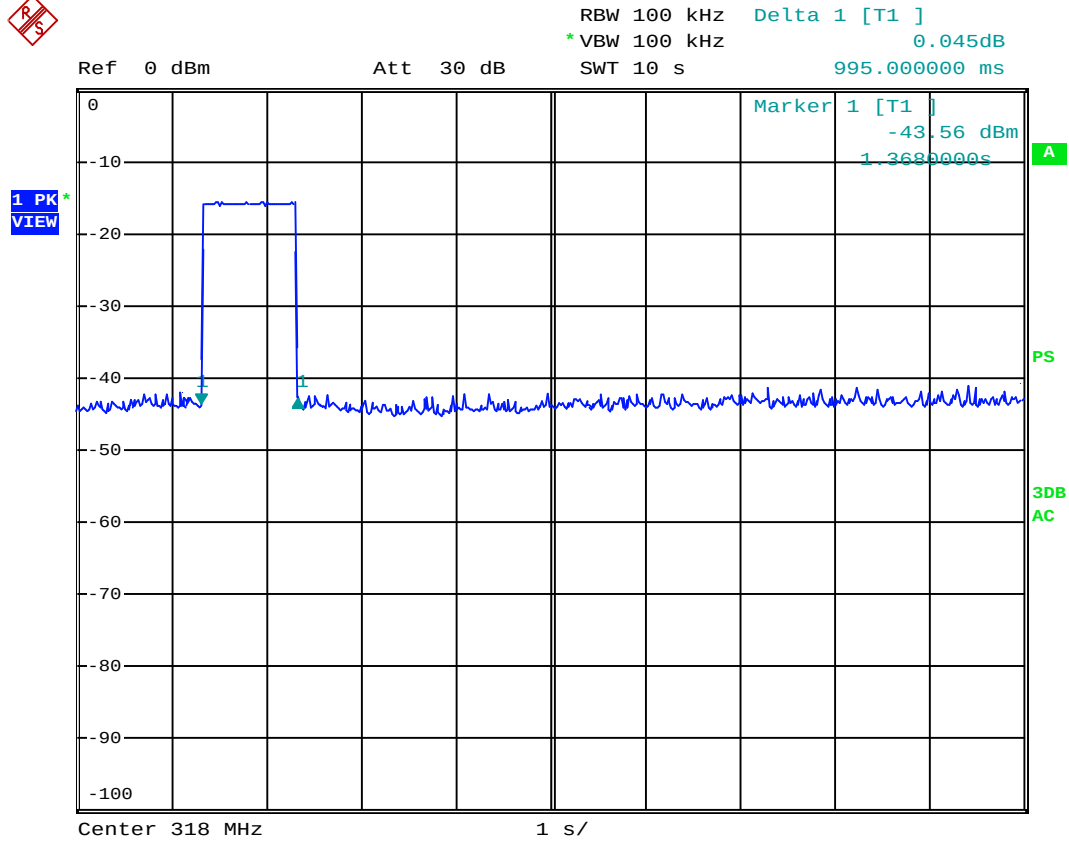
Date: 13.FEB.2017 09:41:10



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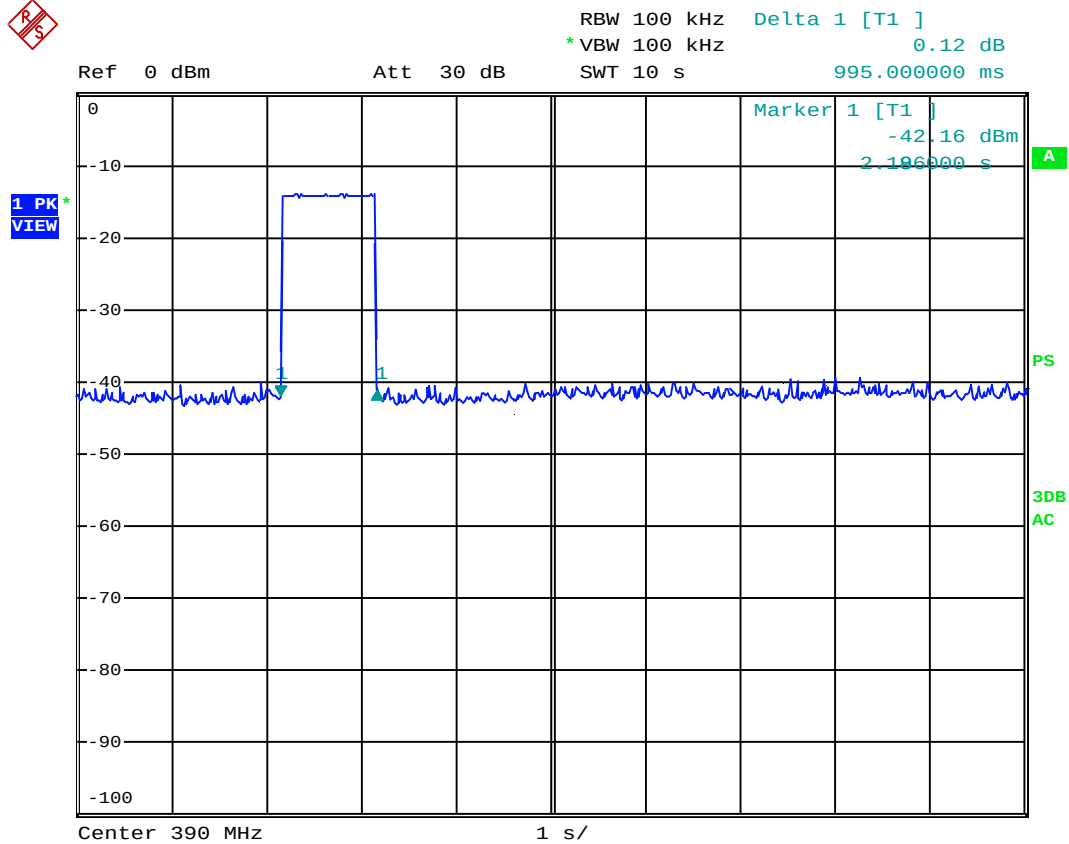
Date: 10.APR.2017 15:24:52



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Date: 10.APR.2017 15:33:04



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6. EUT TEST PHOTO

Radiated Measurement Photos

