

TEST REPORT

of

FCC Part 15 Subpart C AND CANADA RSS-210

New Application; Class I PC; Class II PC

Product : Dust Collector Remote Control
Brand: N/A
Model: IC-315CT
Model Difference: N/A
FCC ID: ANZ-IC-315CT
IC: 1194A-IC315CT
FCC Rule Part: §15.231 (a1)
IC Rule Part: RSS-210 issue 8: Dec. 2010, Annex 1.1
Applicant: CHANG TJER MACHINERY CO., LTD.
Address: NO. 195-12, CHUNG CHENG RD., TA YA DIST.,
TAICHUNG 42850, TAIWAN, R.O.C.

Test Performed by:

International Standards Laboratory

<Lung-Tan LAB>

*Site Registration No.

BSMI: SL2-IN-E-0013; MRA TW1036; TAF: 0997; IC: IC4067B-3;

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Report No.: **ISL-15LR182FC**

Issue Date : **2015/07/24**



Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein.

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VERIFICATION OF COMPLIANCE

Applicant: CHANG TJER MACHINERY CO., LTD.
Product Description: Dust Collector Remote Control
Brand Name: N/A
Model No.: IC-315CT
Model Difference: N/A
FCC ID: ANZ-IC-315CT
IC: 1194A-IC315CT
Date of test: 2015/07/15 ~ 2015/07/22
Date of EUT Received: 2015/07/15

We hereby certify that:

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

Test By:	 _____	Date:	2015/07/24 _____
	<i>Dion Chang / Engineer</i>		
Prepared By:	 _____	Date:	2015/07/24 _____
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	<i>Vincent Su / Technical Manager</i>		

Version

Version No.	Date	Description
00	2015/07/24	Initial creation of document

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1. GENERAL INFORMATION

1.1 Product Description

Product Name	Dust Collector Remote Control
Brand Name	N/A
Model Name	IC-315CT
Model Difference	N/A
Power Supply	3Vdc (AAA*2)
Product SW/HW version	201507 / 201507
Radio SW/HW version	201507 / 201507

TX:

Operating Frequency	315 MHz
Transmit Power	57.75dBuV/m at 3m
Modulation Technique	FSK
Number of Channels	1
Antenna Type	Monopole Antenna

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: ANZ-IC-315CT filing to comply with Section 15.231 of the FCC Part 15, Subpart C Rules and IC: 1194A-IC315CT filing to comply with Industry Canada RSS-210 issue 8:2010 Annex 1.1.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.10: 2013 and RSS-Gen Issue 4: 2014. 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 **International Standards Laboratory** <Lung-Tan LAB> No. 120, Lane 180, Hsin Ho Rd., Lung-Tan Dist., Tao Yuan City 325, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.10: 2013. FCC Registration Number is: 872200; Designation Number is: TW1036, Canada Registration Number: 4067B-3.

1.5 Special Accessories

Not available for this EUT intended for grant.

1.6 Equipment Modifications

Not available for this EUT intended for grant.

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 EUT (Transmitter) was tested with a test program to fix the Tx frequency that was for the purpose of the measurements. For more information please see test data and APPENDIX 1 for set-up photographs.

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 6.2 of ANSI C63.10: 2013. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR 16-1-1 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/1.5m(Frequency above 1GHz) 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 6 and 11 of ANSI C63.10: 2013.

2.4 Limitation

(1) Conducted Emission

According to section 15.207(a) & RSS-Gen §8.8 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.

(2) Radiated Emission

According to 15.231(b) & RSS-210 issue 8, A1.1.2 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	2,25
70 - 130	61.94	1,250	41.9	1,25
130 - 174	* 61.94 - 71.48	* 1,250 -3,750	* 41.94 -51.48	* 1,25 -3,75
174 - 260	71.48	3,750	51.48	3,75
260 - 470	* 71.48 - 81.94	* 3,750 - 12,500	* 51.48 - 61.94	* 3,75 - 12,50
above 470	81.94	12,500	61.94	12,50

- 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. 315MHz AV limit = 41.6667 * 315 – 7083.33333= 6041.667 uV/m
= 75.62 dBuV/m
 7. 315MHz Peak limit = AV Limit + 20dB

2.5 Configuration of Tested System

Fig. 1 Configuration of Tested System

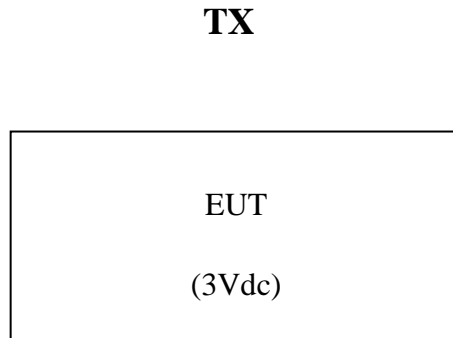


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1.	N/A					

3. SUMMARY OF TEST RESULTS

FCC /IC Rules	Description Of Test	Result
§ 15.207 RSS-Gen §7.2.2	Conducted Emission	N/A
§ 15.231(a)(3) § 15.231(b) RSS-Gen § RSS-210 A1.1 Table A	Radiated Emission	Compliant
§ 15.231(c) RSS-Gen § RSS-210 A1.1	20dB Bandwidth	Compliant
RSS-Gen §4.6.1 RSS-210 A1.1.3(c)	99% Power Bandwidth	Compliant
	Duty Cycle Test (Pulse Modulation)	N/A
§ 15.231(a1) RSS-210 A1.1.1(c)	Release Time	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 315 MHz is chosen for testing.

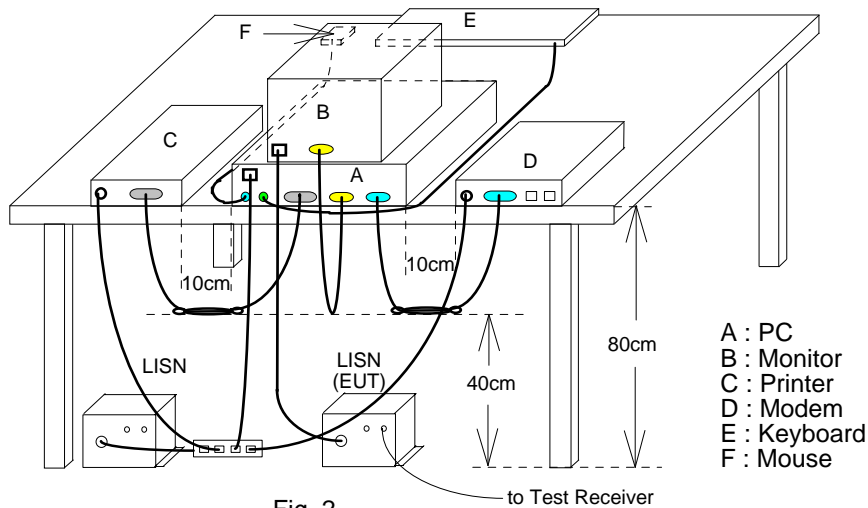
The X, Y and Z-axis of EUT were pre-test; Y mode were the worse case and report.

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 TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Conduction 04-3 Cable	WOKEN	CFD 300-NL	Conduction 04 -3	07/24/2014	07/23/2015
EMI Receiver 17	Rohde & Schwarz	ESCI 7	100887	09/03/2014	09/02/2015
LISN 18	ROHDE & SCHWARZ	ENV216	101424	02/11/2015	02/10/2016
LISN 19	ROHDE & SCHWARZ	ENV216	101425	03/12/2015	03/11/2016

5.4 Measurement Result:

N/A

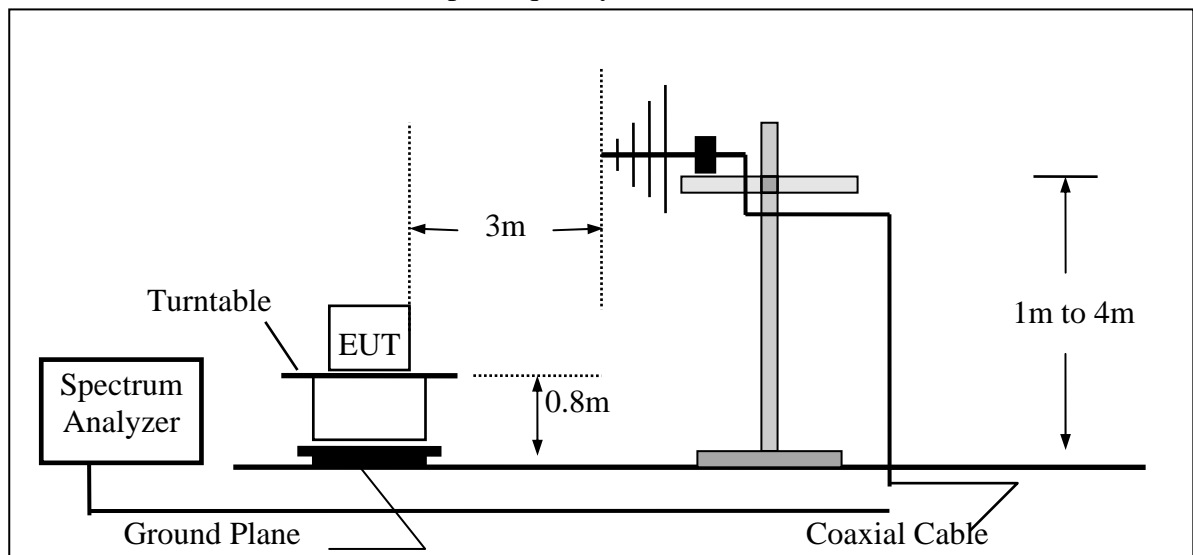
6. RADIATED EMISSION TEST

6.1 Measurement Procedure

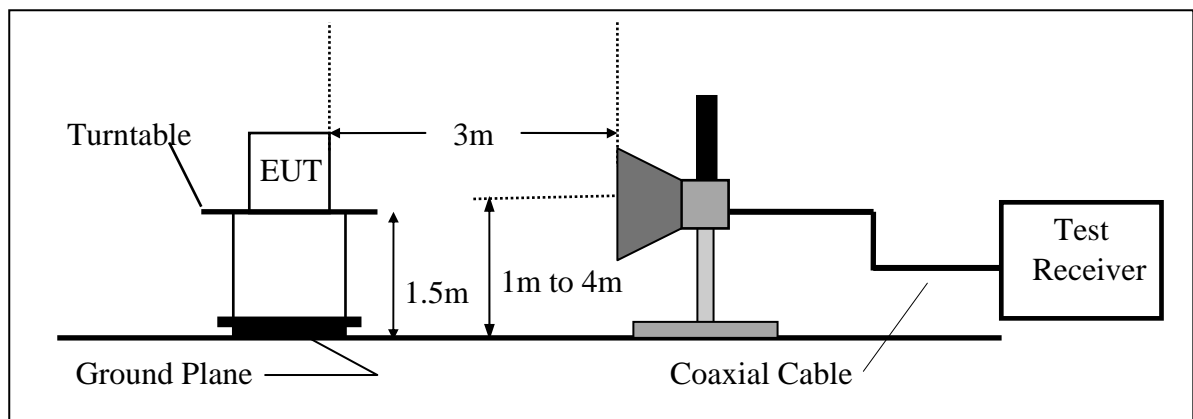
1. The EUT was placed on a turntable which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above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



6.3 Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer 21(26.5GHz)	Agilent	N9010A	MY49060537	07/29/2014	07/28/2015
Spectrum Analyzer 20(6.5GHz)	Agilent	E4443A	MY48250315	05/21/2015	05/20/2016
Spectrum Analyzer 22(43GHz)	R&S	FSU43	100143	05/07/2015	05/06/2016
Bilog Antenna30-1G	Schaffner	CBL 6112B	2756	12/30/2014	12/29/2015
Horn antenna1-18G	ETS	3117	00066665	11/27/2014	11/26/2015
Horn antenna18-26G(04)	Com-power	AH-826	081001	05/15/2015	05/14/2017
Preamplifier9-1000M	HP	8447D	NA	03/12/2015	03/11/2016
Preamplifier1-18G	MITEQ	AFS44-001018 00-25-10P-44	1329256	07/30/2014	07/29/2015
Preamplifier1-26G	EM	EM01M26G	NA	03/11/2015	03/10/2016
Cable1-18G	HUBER SUHNER	Sucoflex 106	NA	12/02/2014	12/01/2015
Cable UP to 1G	HUBER SUHNER	RG 214/U	NA	10/17/2014	10/16/2015
SUCOFLEX 1GHz~40GHz cable	HUBER SUHNER	Sucoflex 102	27963/2&3742 1/2	10/03/2013	10/02/2015

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 Duty Cycle Correction Factor

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

6.5 Measurement Result

Fundamental Measurement Result

Operation Mode:	Transmitting Mode	Test Date:	2015/07/17
Fundamental Frequency:	315MHz	Test By:	Dino
Temp:	25 °C	Hum.:	60%

Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
315.04	53.86	-10.81	43.05	75.62	-32.57	Peak	VERTICAL
315.04	68.56	-10.81	57.75	75.62	-17.87	Peak	HORIZONTAL

Remark:

- 1 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 2 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.
- 3 Average Value = Peak Value + 20 Log (Ton/Tp)Pulse Modulation Duty Cycle Correction Factor

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode: Transmitting Mode

Test Date: 2015/07/17

Fundamental Frequency: 315MHz

Test By: Dino

Temperature : 25 °C

Humidity : 65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	42.61	37.47	-12.26	25.21	40.00	-14.79	Peak	VERTICAL
2	120.21	48.24	-15.03	33.21	43.50	-10.29	Peak	VERTICAL
3	247.28	28.56	-12.96	15.60	46.00	-30.40	Peak	VERTICAL
4	473.29	36.26	-7.63	28.63	46.00	-17.37	Peak	VERTICAL
5	630.43	40.58	-5.08	35.50	55.62	-20.12	Peak	VERTICAL
6	945.00	27.02	0.27	27.29	46.00	-18.71	Peak	VERTICAL
1	119.24	55.71	-15.12	40.59	43.50	-2.91	Peak	HORIZONTAL
2	443.22	36.63	-7.97	28.66	46.00	-17.34	Peak	HORIZONTAL
3	526.64	39.13	-7.00	32.13	46.00	-13.87	Peak	HORIZONTAL
4	540.22	37.04	-6.79	30.25	46.00	-15.75	Peak	HORIZONTAL
5	630.00	50.19	-5.09	45.10	55.62	-10.52	Peak	HORIZONTAL
6	945.00	39.79	0.27	40.06	46.00	-5.94	Peak	HORIZONTAL

Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak / QP detector mode.
- 4 Measurement result 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 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode:	Transmitting Mode	Test Date:	2015/07/17
Fundamental Frequency:	315MHz	Test By:	Dino
Temperature :	25 °C	Humidity :	65 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	1260.00	50.77	-15.59	35.18	55.62	-20.44	Peak	VERTICAL
2	1575.00	49.75	-14.37	35.38	54.00	-18.62	Peak	VERTICAL
3	1890.00	49.64	-12.71	36.93	55.62	-18.69	Peak	VERTICAL
4	2205.00	48.18	-11.36	36.82	54.00	-17.18	Peak	VERTICAL
5	2520.00	47.39	-10.24	37.15	55.62	-18.47	Peak	VERTICAL
6	2835.00	47.17	-9.55	37.62	54.00	-16.38	Peak	VERTICAL
7	3150.00	46.92	-8.79	38.13	55.62	-17.49	Peak	VERTICAL
1	1260.00	56.42	-15.59	40.83	55.62	-14.79	Peak	HORIZONTAL
2	1575.00	54.25	-14.37	39.88	54.00	-14.12	Peak	HORIZONTAL
3	1890.00	49.08	-12.71	36.37	55.62	-19.25	Peak	HORIZONTAL
4	2205.00	47.60	-11.36	36.24	54.00	-17.76	Peak	HORIZONTAL
5	2520.00	47.02	-10.24	36.78	55.62	-18.84	Peak	HORIZONTAL
6	2835.00	47.25	-9.55	37.70	54.00	-16.30	Peak	HORIZONTAL
7	3150.00	47.71	-8.79	38.92	55.62	-16.70	Peak	HORIZONTAL

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 “F” denotes fundamental frequency; “H” denotes harmonics frequency. “S” denotes spurious frequency.
- 4 Measurement of data 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 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 6 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

7. 20DB & 99% OCCUPIED BANDWIDTH

RSS 210 A1.1.3 Bandwidth of Momentary Signals

For the purpose of Section A1.1, the 99% bandwidth shall be no wider than 0.25% of the center frequency for devices operating between 70 MHz and 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency.

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. 99% Bandwidth

7.2 Test SET-UP (Block Diagram of Configuration)

Same as 6.2 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 **315MHz**, according to the Rules, section 15.231(C), the Bandwidth of Center Frequency at-20dB should be calculated as following:

$$315 \times 0.0025 = 0.7875(\text{MHz})$$

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

$$f_{(U)} = f_c + \Delta f/2 = 315 + 0.3937 = 315.393(\text{MHz})$$

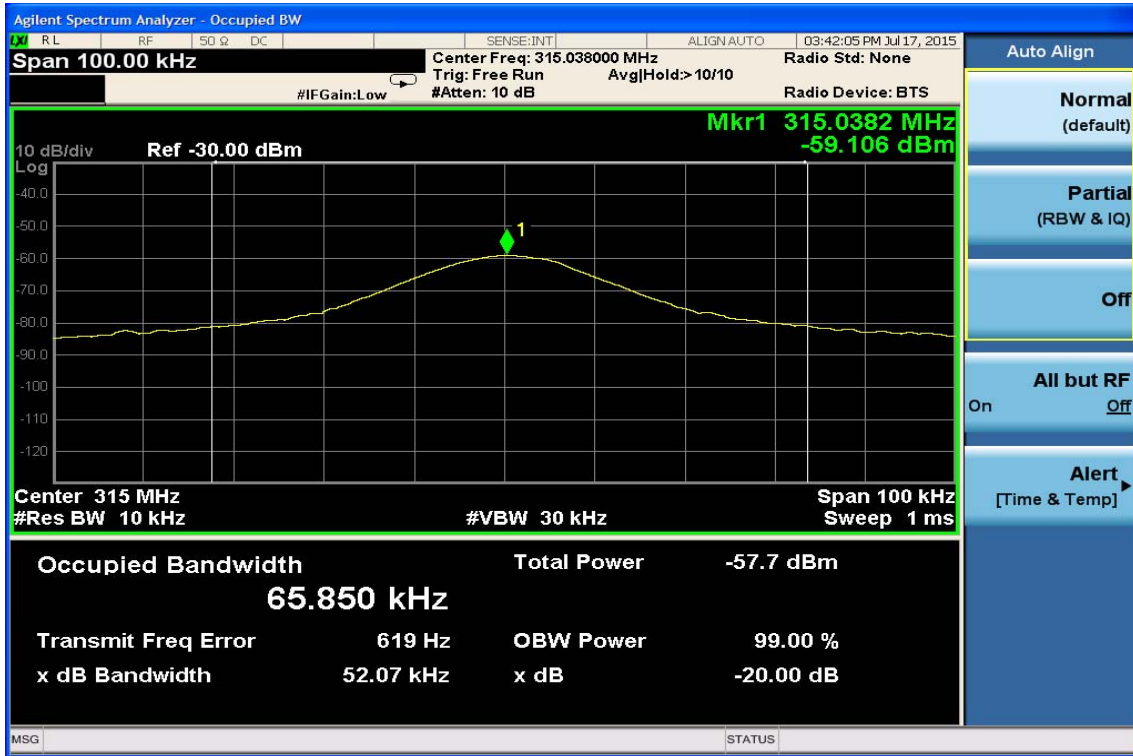
$$f_{(L)} = f_c - \Delta f/2 = 315 - 0.3937 = 314.6063 (\text{MHz})$$

7.5 Measurement Result:

-20dB bandwidth = 52.07 kHz within allowed frequency range.

99% bandwidth = 65.85 kHz less than 1.0848MHz.

20dB & 99% Band Width Test Data



8. 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.

RSS 210 A1.1.1 (a) A manually operated transmitter shall be equipped with a push-to-operate switch and be under manual control at all transmission times. When released, the transmitter shall cease transmission (holdover time of up to 5 seconds is permitted).

8.1 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= 200ms / 20s.
3. Set EUT as normal operation and press Transmitter bottom for 2 s,
4. Set SPA Max hold. Delta Mark.

8.2 Test SET-UP (Block Diagram of Configuration)

Same as 6.2 Radiated Emission Measurement.

8.3 Measurement Equipment Used:

Same as 6.3 Radiated Emission Measurement.

8.4 Measurement Results

The release time less than 5 s. Refer to attached data chart.

