

TEST REPORT

On behalf of

JOHNSON INDUSTRIES (SHANGHAI) CO.,LTD

Product Name: IDC CONSOLE

Model No.: IDC CONSOLE

FCC ID: 2AOTTIDC

Prepared For: JOHNSON INDUSTRIES (SHANGHAI) CO.,LTD
A1 NO.4500 BAOQIAN ROAD, ZHUQIAN TOWN,
JIADING DISTRICT, SHANGHAI

Prepared By: Audix Technology (Shanghai) Co., Ltd.
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Date of Test : 2020.01.17-05.21
Date of Report : 2020.05.21

The statement is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

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TEST REPORT

Applicant : JOHNSON INDUSTRIES (SHANGHAI) CO.,LTD
EUT Description : IDC CONSOLE
(A) Model No. : Refer to Sec.2.1
(B) Power Supply : DC 3V
(C) Test Voltage : DC 3V

Test Procedure Used:

*FCC RULES AND REGULATIONS PART 15 SUBPART C
AND ANSI C63.10-2013*

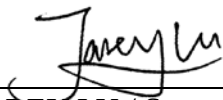
The device described above is tested by Audix Technology (Shanghai) Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits.

The test results are contained in this test report and Audix Technology (Shanghai) Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. This report also shows that the EUT to be technically compliance with the FCC limits.

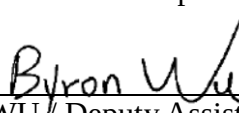
This report applies to above tested Sample only. This report shall not be reproduced in part without written approval of Audix Technology (Shanghai) Co., Ltd.

Date of Test : 2020.01.17-05.21 Date of Report : 2020.05.21

Producer :

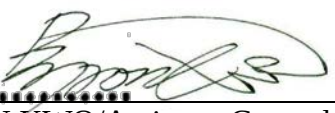

JAREY LU / Supervisor

Reviewer :


BYRON WU / Deputy Assistant Manager

 For and on behalf of
Audix Technology (Shanghai) Co., Ltd.

Signatory :


Authorized Signature(s) BYRON KWO/Assistant General Manager

1 SUMMARY OF STANDARDS AND RESULTS

1.1 Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

Description / Test Item	Test Standard	Results	Meets Limit
EMISSION			
Conducted Emission	FCC Rules And Regulations Part 15 Subpart C And ANSI C63.10:2013	N/A	15.207
Radiated Emission and Fundamental Frequency	FCC Rules And Regulations Part 15 Subpart C And ANSI C63.10:2013	Pass	15.209(a) 15.231(b)
Emission Bandwidth	FCC Rules And Regulations Part 15 Subpart C And ANSI C63.10:2013	Pass	15.231(c)
Time measurement	FCC Rules And Regulations Part 15 Subpart C And ANSI C63.10:2013	Pass	15.231(a)(1)
Antenna Requirement	FCC Rules And Regulations Part 15 Subpart C And ANSI C63.10:2013	Pass	15.203
N/A is an abbreviation for Not Applicable.			

2 GENERAL INFORMATION

2.1 Description of Equipment Under Test

Description : IDC CONSOLE

Type of EUT : ☒ Production ☐ Pre-product ☐ Pro-type

Model Number : IDC CONSOLE

Test Model : IDC CONSOLE

Operating Freq. : 433.92MHz

Tested Freq. : 433.92MHz

Modulation : ASK

Antenna : Antenna Type: PCB Antenna
Antenna Gain: 0 dBi
The Antenna is permanently attached that is comply with 15.203.

Test Mode : The EUT was a transmitter.

Applicant : JOHNSON INDUSTRIES (SHANGHAI) CO.,LTD
A1 NO.4500 BAOQIAN ROAD, ZHUQIAN TOWN,
JIADING DISTRICT, SHANGHAI

Manufacturer : same as Applicant

Factory : same as Applicant

2.2 Description of Test Facility

Name of Firm : Audix Technology (Shanghai) Co., Ltd.

Site Location : 3F and 4F, 34Bldg, 680 Guiping Rd.,
Caohejing Hi-Tech Park,
Shanghai 200233, China.

Accredited by NVLAP, Lab Code : 200371-0

FCC Designation Number : CN5027

Test Firm Registration Number : 954668

3 RADIATED EMISSION AND FUNDAMENTAL FREQUENCY

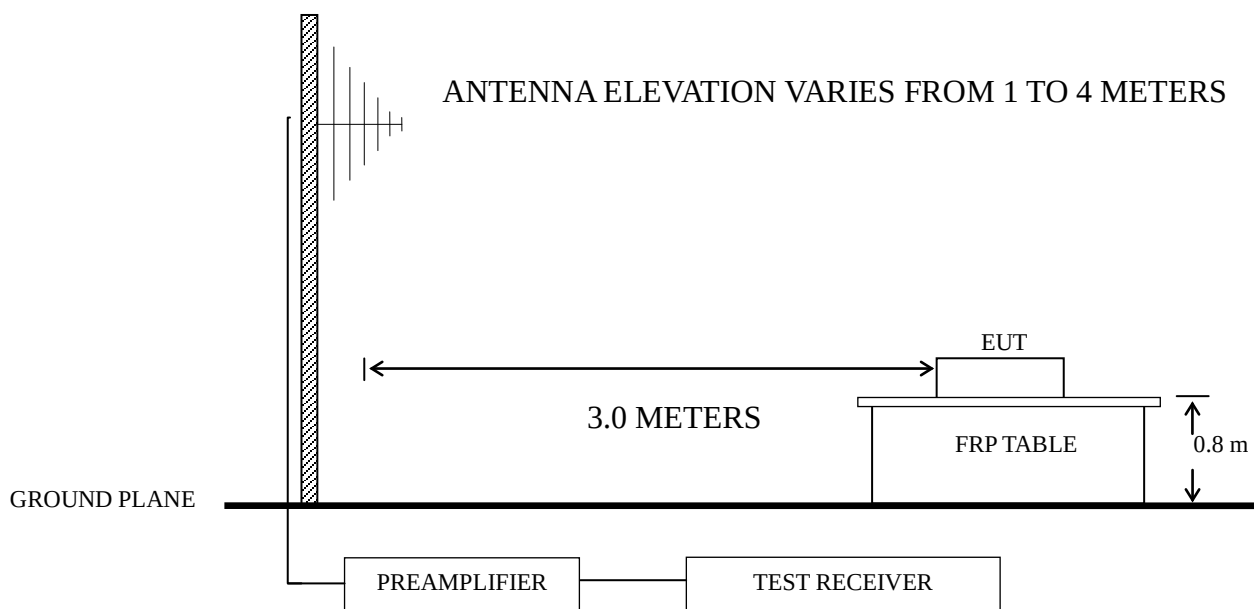
3.1 Test Equipment

The following test equipment are used during the radiated emission test in a semi-anechoic chamber:

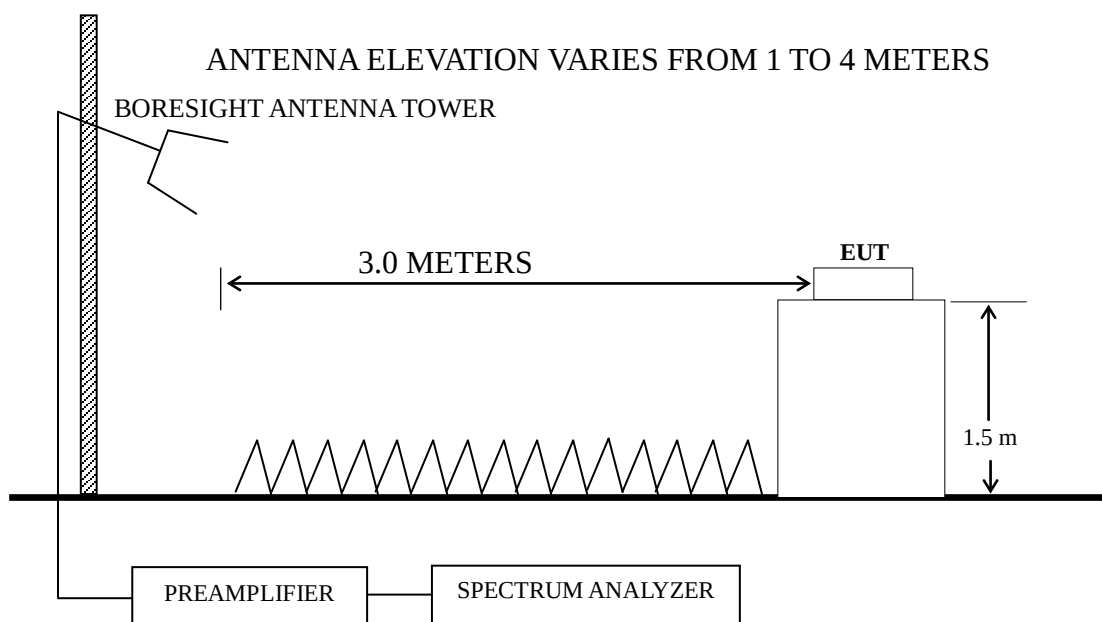
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Preamplifier	Agilent	8447D	2944A10548	Apr 26, 2019	Apr 27, 2020
2.	Preamplifier	HP	8449B	3008A00864	Mar 8, 2019	Mar 7, 2020
3.	Spectrum Analyzer	Agilent	N9010A	MY52221182	Sep 16, 2019	Sep 15, 2020
4.	Test Receiver	R&S	ESCI	101303	Apr 26, 2019	May 25, 2020
5.	Bi-log Antenna	Schwarz beck	VULB 9168+EMC I-N-6-06	708+AT-N06 38	May 17, 2019	May 16, 2020
6.	Horn Antenna	EMCO	3115	9607-4878	Jul 13, 2019	Jul 12, 2020
7.	Horn Antenna	EMCO	3116	00062643	Oct 10, 2019	Oct 09, 2020
8.	Software	Audix	E3	SET00200 9912M295-2	--	--

3.2 Block Diagram of Test Setup

3.2.1 Below 1GHz



3.2.2 Above 1GHz



3.3 Radiated Emission Limit (§15.209)

In any 100kHz bandwidth outside the frequency band, the radio frequency power produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205 must also comply with the radiated emission limits specified as below.

Frequency (MHz)	Distance (m)	Field strength limits ($\mu\text{V/m}$)	
		($\mu\text{V/m}$)	dB($\mu\text{V/m}$)
0.009 ~ 0.490	300	$67.6 - 20 \log f(\text{kHz})$	$2400/f \text{ kHz}$
0.490 ~ 1.705	30	$87.6 - 20 \log f(\text{kHz})$	$24000/f \text{ kHz}$
1.705 ~ 30	30	29.5	30
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
Above 960	3	500	54.0

- NOTE 1 - Emission Level dB ($\mu\text{V/m}$) = 20 log Emission Level ($\mu\text{V/m}$)
- NOTE 2 - The tighter limit applies at the band edges.
- NOTE 3 - Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
- NOTE 4 - The limits shown are based on Quasi-peak value detector below or equal to 1GHz and Average value detector above 1GHz.
- NOTE 5 - Above 1 GHz, the limit on peak emission is 20 dB above the maximum permitted average emission limit applicable to the EUT

In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	¹ 1,250 to 3,750	¹ 125 to 375
174-260	3,750	375
260-470	¹ 3,750 to 12,500	¹ 375 to 1,250
Above 470	12,500	1,250

¹:Linear Interpolations

- NOTE 1 - Emission Level dB ($\mu\text{V/m}$) = 20 log Emission Level ($\mu\text{V/m}$)
- NOTE 2 - The tighter limit applies at the band edges.
- NOTE 3 - Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
- NOTE 4 - Where limit of Fundamental Freq. is calculated by:
 $41.6667 \times 433.92 - 7083.3333 = 10996.681164 \mu\text{V/m} = 80.83 \text{dB}\mu\text{V/m}$
- NOTE 5 - The limits in this table are based on CFR 47 Part 15.231(b).

3.4 Test Configuration

The EUT (listed in Sec.2.1) and the simulators (listed in Sec.2.2) were installed as shown on Sec.4.2 to meet FCC requirements and operating in a manner that tends to maximize its emission level in a normal application.

3.5 Operating Condition of EUT

3.5.1 Setup the EUT as shown in Sec. 4.2.

3.5.2 Turn on the power of all equipment.

3.5.3 Turn the EUT on the test mode, and then test.

3.6 Test Procedures

Radiated emission test applies to harmonics/spurs that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209. A pre-amp is necessary for this measurement. For measurement above 1 GHz, set RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average

correction factor, derived from the appropriate duty cycle calculation.

The EUT was placed on a turntable. Below 1 GHz, the table height is 80 cm above the reference ground plane. Above 1 GHz, the table height is 1.5 m. The turntable rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. The antenna moved up and down between 1 meter and 4 meters to find out the maximum emission level. Broadband antenna (Calibrated Bilog Antenna) or Horn antenna was used as receiving antenna. Both horizontal and vertical polarizations of the antenna were set on measurement. In order to find the maximum emission, all of the interference cables were manipulated according to ANSI C63.10: 2013 requirements during radiated emission test.

The bandwidth of Test Receiver R&S ESCI was set at 9 kHz from 9kHz to 30MHz.

The bandwidth of Test Receiver R&S ESCI was set at 120 kHz from 30MHz to 1000MHz.

The bandwidth of Agilent N9010A was set at 1MHz for above 1GHz.

The frequency range from 30 MHz to 25 GHz (Up to 10th harmonics from fundamental frequency) was checked.

For Emission above 1GHz, Average Emission Level = Peak Emission Level + DCCF, as DCCF(Duty Cycle Correction Factor) = $20\log(TX_{on} / TX_{on+off})$.

3.7 Test Results

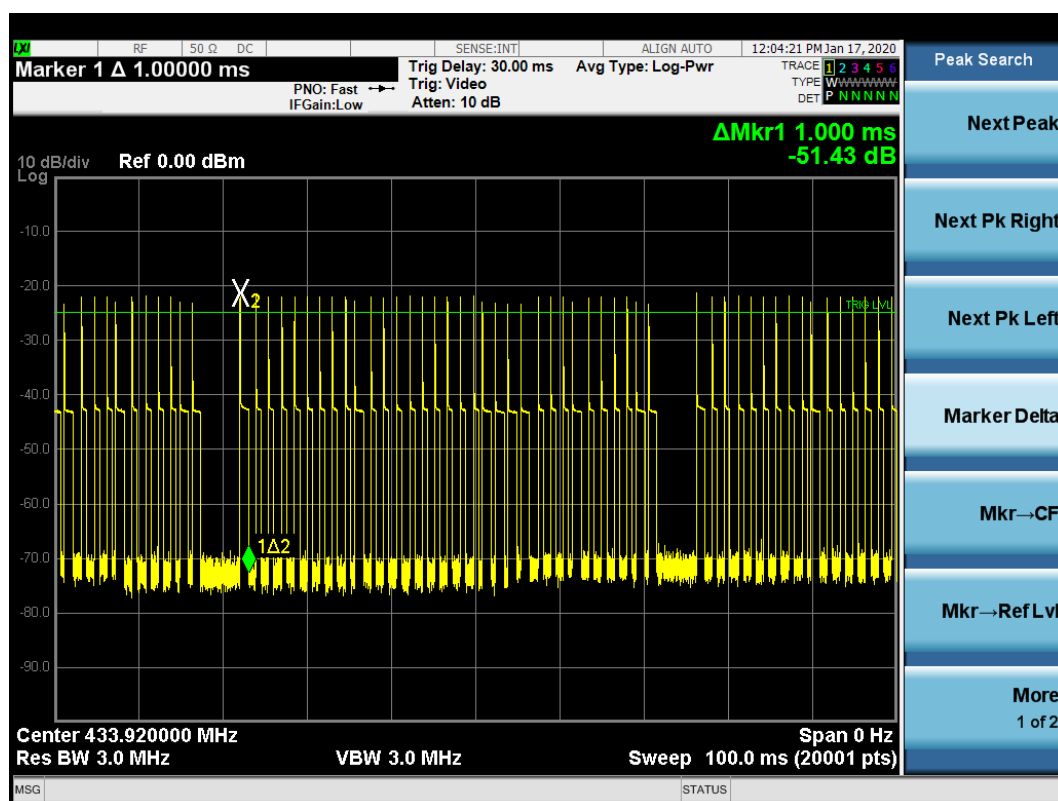
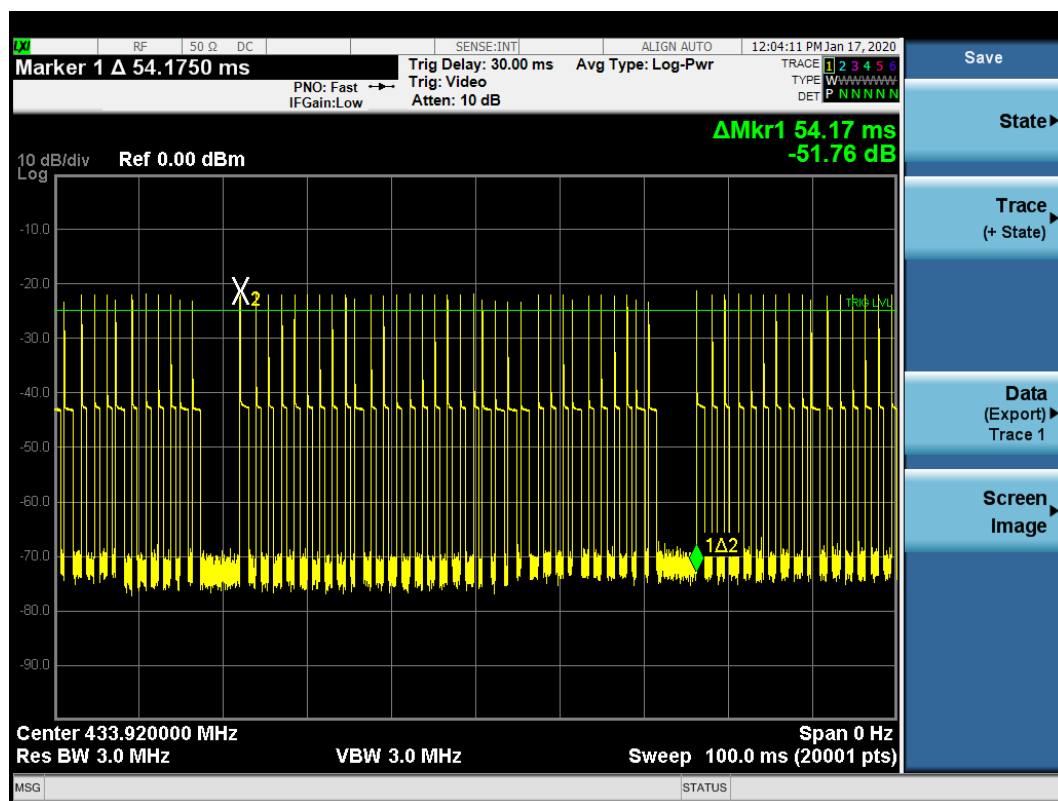
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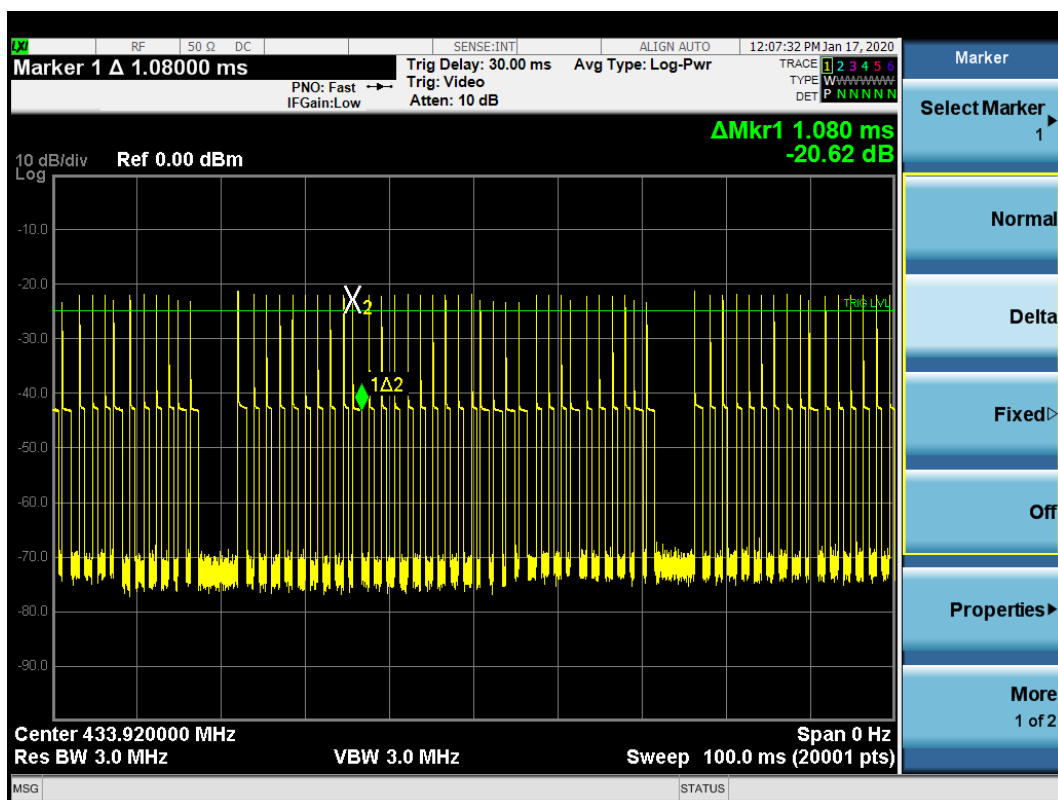
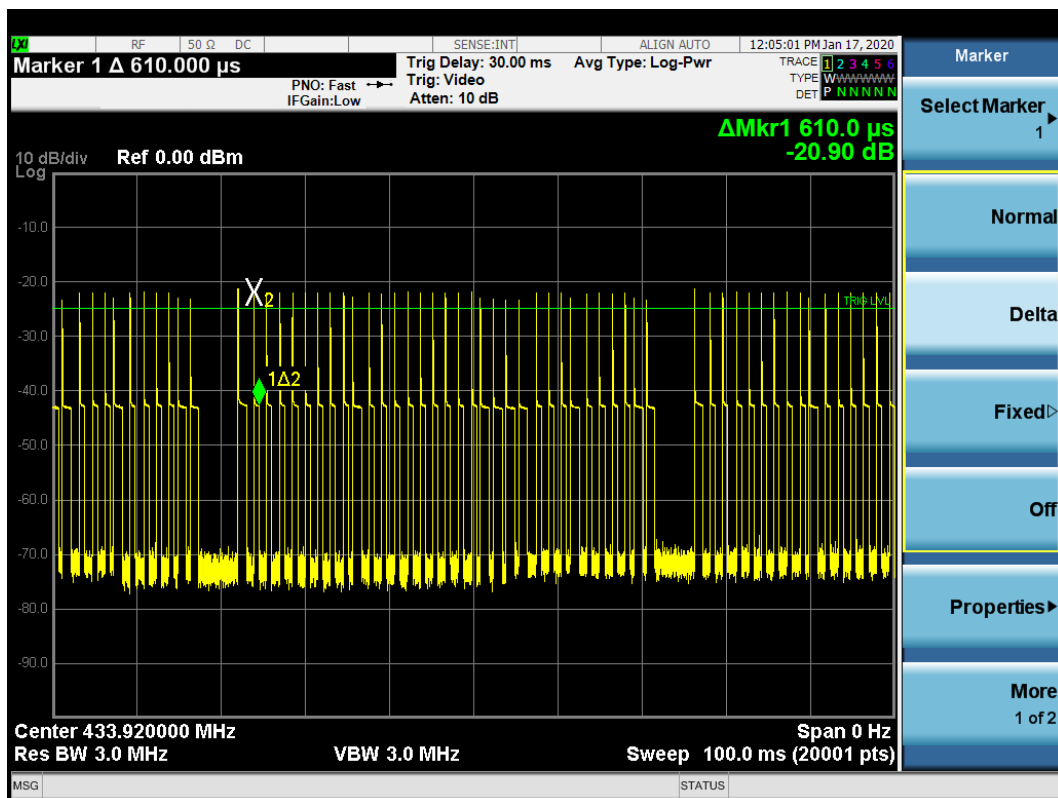
The frequency and amplitude of the highest radiated emission relative the limit is reported. All the emissions not reported below are too low against the FCC limit.

The emission levels recorded below is data of EUT configured in Lying direction, for Lying direction was the maximum emission direction during the test. The data of Side & Standing direction are too low against the official limit to be reported.

DCCF:

TX _{on} (ms)	TX _{on+off} (ms)	DCCF
$1.000*2 + 0.610*24 + 1.080*7$ = 24.2	54.17	-7.00
DCCF(Duty Cycle Correction Factor) = $20\log(TX_{on} / TX_{on+off})$		





Worst case emission < 1GHz

EUT : IDC CONSOLE Temperature : 22°C

Model No. : IDC CONSOLE Humidity : 51%RH

Test Mode : Transmitting Date of Test : 2020.01.18

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	40.135	24.79	18.61	0.74	27.61	16.53	40	23.47	QP
	56.197	24.65	18.33	0.85	27.6	16.23	40	23.77	QP
	144.335	24.24	19.87	1.34	27.28	18.17	43.5	25.33	QP
	166.068	24.38	20.13	1.44	27.16	18.79	43.5	24.71	QP
	327.887	23.21	21.18	2.05	27.03	19.41	46	26.59	QP
	836.244	24.78	28.28	3.12	27.77	28.41	46	17.59	QP
Vertical	55.805	24.43	18.5	0.85	27.6	16.18	40	23.82	QP
	146.888	24.42	20	1.36	27.26	18.52	43.5	24.98	QP
	752.743	23.56	28.19	2.99	28	26.74	46	19.26	QP
	332.519	22.32	21.18	2.06	27.05	18.51	46	27.49	QP
	39.854	24.05	18.67	0.74	27.61	15.85	40	24.15	QP
	184.49	29.57	17.6	1.5	27.07	21.6	43.5	21.9	QP

Radiated Emission > 1GHz

EUT : IDC CONSOLE Temperature : 22°C

Model No. : IDC CONSOLE Humidity : 51%RH

Test Mode : Transmitting Date of Test : 2020.01.18

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	1735	55.03	26.97	4.49	37.17	49.32	74	24.68	Peak
	2605	51.57	29.71	5.48	36.74	50.02	74	23.98	Peak
	2170	47.35	28.65	4.97	36.92	44.05	74	29.95	Peak
	3420	48.08	31.12	6.33	36.55	48.98	74	25.02	Peak
	4085	46.61	32.78	6.95	36.5	49.84	74	24.16	Peak
	4720	45.59	33.02	7.51	36.5	49.62	74	24.38	Peak
Vertical	1345	47.79	25.35	3.96	37.46	39.64	74	34.36	Peak
	1975	47.21	27.99	4.75	37.02	42.93	74	31.07	Peak
	2715	47.35	29.83	5.6	36.7	46.08	74	27.92	Peak
	3320	48.74	30.89	6.18	36.56	49.25	74	24.75	Peak
	4075	46.63	32.78	6.95	36.5	49.86	74	24.14	Peak
	4890	45.36	33.25	7.62	36.5	49.73	74	24.27	Peak

Polarization	Frequency (MHz)	Peak Emission Level dB (μV/m)	Duty Cycle Correction Factor (dB)	Average Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	1735	49.32	-7.00	42.32	54	11.68	Average
	2605	50.02	-7.00	43.02	54	10.98	Average
	2170	44.05	-7.00	37.05	54	16.95	Average
	3420	48.98	-7.00	41.98	54	12.02	Average
	4085	49.84	-7.00	42.84	54	11.16	Average
	4720	49.62	-7.00	42.62	54	11.38	Average
Vertical	1345	39.64	-7.00	32.64	54	21.36	Average
	1975	42.93	-7.00	35.93	54	18.07	Average
	2715	46.08	-7.00	39.08	54	14.92	Average
	3320	49.25	-7.00	42.25	54	11.75	Average
	4075	49.86	-7.00	42.86	54	11.14	Average
	4890	49.73	-7.00	42.73	54	11.27	Average

Fundamental frequency:

EUT : IDC CONSOLE Temperature : 22°C

Model No. : IDC CONSOLE Humidity : 51%RH

Test Mode : Transmitting Date of Test : 2020.01.18

Polarization	Frequency (MHz)	Meter Reading dB (μV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	433.949	77.38	22.77	2.32	27.67	74.8	100.83	26.03	Peak
Vertical	433.941	61.39	22.77	2.32	27.67	58.81	100.83	42.02	Peak

Polarization	Frequency (MHz)	Peak Emission Level dB (μV/m)	Duty Cycle Correction Factor (dB)	Average Emission Level dB (μV/m)	Limits dB (μV/m)	Margin (dB)	Remark
Horizontal	433.949	74.8	-7.00	67.80	80.83	13.03	Average
Vertical	433.941	58.81	-7.00	51.81	80.83	29.02	Average

TEST ENGINEER: Jarey

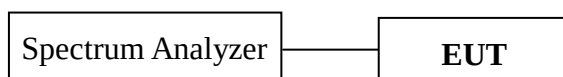
4 EMISSION BANDWIDTH

4.1 Test Equipment

The following test equipment was used during the measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	N9010A	MY52221182	Sep 16, 2019	Sep 15, 2020

4.2 Block Diagram of Test Setup



4.3 Specification Limits (§15.231(c))

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

4.4 Operating Condition of EUT

The switch ON/OFF was used to enable the EUT to change the channel one by one.

4.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of 99% power bandwidth was measure by spectrum analyzer with settings: Span = between 1.5 times and 5.0 times of the OBW, RBW = 1% to 5% of the OBW, VBW $\geq 3 \times$ RBW, Detector = Peak, Trace = Max Hold.

Use the -20dB power bandwidth function of the instrument and report the measured bandwidth.

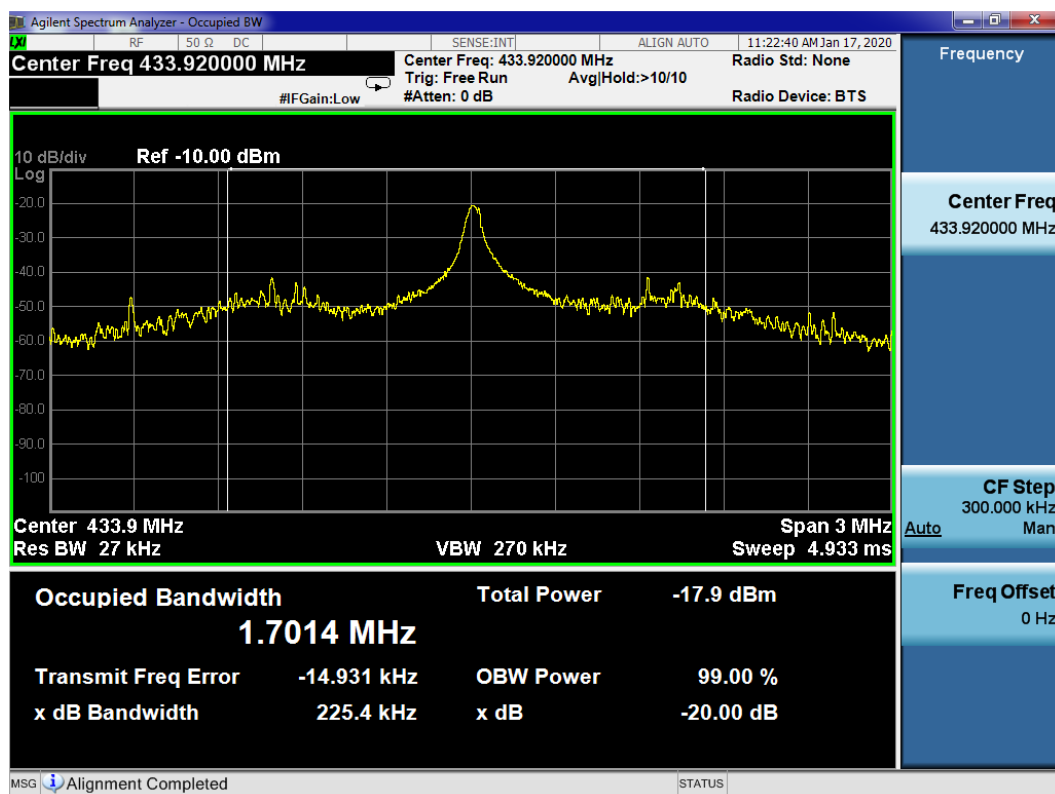
4.6 Test Results

PASSED.

All the test results are attached in next pages.

(Test Date: 2020.01.17 Temperature: 23°C Humidity: 51 %)

Modulation	Frequency (MHz)	20dB Bandwidth (kHz)	Tolerance (%)	Limit (%)
ASK	433.92	225.4	0.052	0.25



5 TIME MEASUREMENT

5.1 Test Equipment

The following test equipment was used during the measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	N9010A	MY52221182	Sep 16, 2019	Sep 15, 2020

5.2 Block Diagram of Test Setup

The Same as Section. 4.2.

5.3 Specification Limits (§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.

5.4 Operating Condition of EUT

The switch ON/OFF was used to enable the EUT to change the channel one by one.

5.5 Test Procedure

The transmitter output was connected to the spectrum analyzer.

The setting of spectrum analyzer as followings:

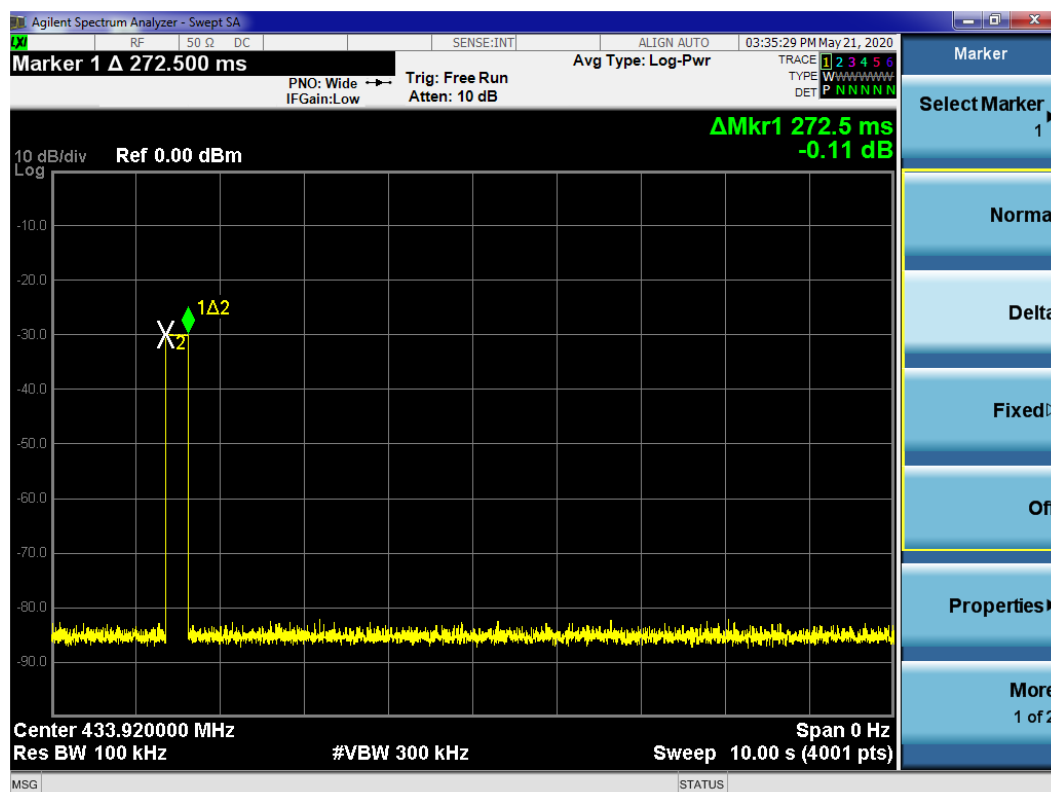
- Set the RBW $\geq 100\text{kHz}$.
- Set VBW $\geq [3 \times \text{RBW}]$.
- Set span = 0.
- Sweep time $\geq 5\text{s}$.
- Detector = peak.
- Trace mode = clear/write.
- Sweep = Single sweep.
- Use delta marker function to determine the transmitting time.

5.6 Test Results

PASSED. All the test results are listed below.

(Test Date: 2020.05.21 Temperature: 23°C Humidity: 51 %)

Modulation	Frequency (MHz)	Periodic Operated (ms)	Limit (s)
ASK	433.92	272.5	5



6 DEVIATION TO TEST SPECIFICATIONS

None.

7 MEASUREMENT UNCERTAINTY LIST

The measurement uncertainty was estimated for test on the EUT according to CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage of K=2.

The uncertainties value is not used in determining the PASS/FAIL results.

Test Items/Facilities	Frequency/Equipment/Unit	Uncertainty
Conducted Emission No.1 Shielded Room	9kHz~150kHz	±3.8dB
	150kHz~30MHz	±3.4dB
Conducted Emission No.3 Shielded Room	150kHz~30MHz	±3.4dB
Radiated Emission	30MHz~200MHz, Horizontal	±4.5dB
	30MHz~200MHz, Vertical	±4.5dB
	200MHz~1000MHz, Horizontal	±4.6dB
	200MHz~1000MHz, Vertical	±5.7dB
	1GHz~6GHz	±6.0dB
	6GHz~18GHz	±5.7dB
Output Power Test	50MHz~18GHz	0.77dB
Power Density Test	9kHz~6GHz	1.08dB
RF Frequency Test	9kHz~40GHz	6×10^{-4}
Bandwidth Test	9kHz~6GHz	1.5×10^{-3}
RF Radiated Power Test	30MHz~1000MHz	3.06dB
Conducted Output Power Test	50MHz~18GHz	0.83dB
AC Voltage(<10kHz) Test	120V~230V	0.04%
DC Power Test	0V~30V	0.4%
Temperature	-40°C~+100°C	0.52°C
Humidity	30%~95%	2.6%