Shenzhen Global Test Service Co.,Ltd.
No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong

FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No. .....:	**GTS20201016009-1-1**
FCC ID. ..... :	**OYURF900I-8**
Compiled by (position+printed name+signature) .:	File administrators Peter Xiao
Supervised by (position+printed name+signature) .:	Test Engineer Moon Tan
Approved by (position+printed name+signature) .:	Manager Simon Hu
Date of issue .....:	Nov.16, 2020

Representative Laboratory Name.:	**Shenzhen Global Test Service Co.,Ltd.**
Address .....:	No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong,China

Applicant's name.....:	**ID-Teck Co Ltd**
Address .....:	684-1, Deaungchon-Dong, Gangsuh-Gu, Seoul, South Korea

Test specification.....**:**	
Standard.....:	**FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz**
TRF Originator.....:	Shenzhen Global Test Service Co.,Ltd.
Master TRF .....:	Dated 2014-12

Test item description .....:	**UHF Integrated Reader**
Trade Mark.....:	IDTECK
Manufacturer .....:	ID-Teck Co Ltd
Model/Type reference .....:	RF900I-8
Listed Models .....:	RF900I-12
Modulation Type.....:	ASK
Operation Frequency .....:	From 902.75MHz to 927.25MHz
Hardware Version .....:	N/A
Software Version.....:	N/A
Rating .....:	DC 9.0V/3A by Adapter
Result .....:	**PASS**

T E S T R E P O R T

Test Report No. :	**GTS20201016009-1-1**	Nov.16, 2020 Date of issue

Equipment under Test	:	UHF Integrated Reader
Model /Type	:	RF900I-8
Listed Models	:	RF900I-12
Applicant	:	**ID-Teck Co Ltd**
Address	:	684-1, Deaungchon-Dong, Gangsuh-Gu, Seoul, South Korea
Manufacturer	:	**ID-Teck Co Ltd**
Address	:	684-1, Deaungchon-Dong, Gangsuh-Gu, Seoul, South Korea

Test Result:	**PASS**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents

1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices
DA 00-705: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

2. SUMMARY

2.1. General Remarks

Date of receipt of test sample	:	Nov.01, 2020
Testing commenced on	:	Nov.01, 2020
Testing concluded on	:	Nov.16, 2020

2.2. Product Description

Product Name:	UHF Integrated Reader
Trade Mark:	N/A
Model/Type reference:	RF900I-8
List Model:	RF900I-12
Model Declaration	PCB board, structure and internal of these model(s) are the same, So no additional models were tested.
Power supply:	DC 9.0V/3A by Adapter
Sample ID	GTS20201016009-1-1#
RFID	
Operation frequency	902.75-927.25MHz
Channel Number	50 Channels
Channel Spacing	0.5MHz
Modulation Type	ASK
Antenna Type	Internal Antenna
Antenna Gain	8.0dBi(Max.)

2.3. Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	230V / 50 Hz	○	120V / 60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 9.0V

2.4. Short description of the Equipment under Test (EUT)

This is a UHF Integrated Reader

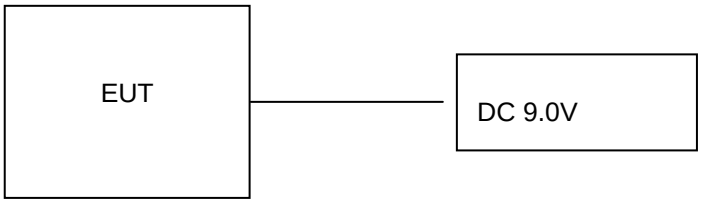
For more details, refer to the user's manual of the EUT.

2.5. EUT operation mode

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing .There are 50 channels provided to the EUT. Channel 01/25/50 was selected to test.

Channel	Frequency(MHz)	Channel	Frequency(MHz)
01	**902.75**	**26**	**915.25**
02	903.25	27	915.75
03	903.75	28	916.25
--	--	--	--
--	--	--	--
24	914.25	49	926.75
25	914.75	**50**	**927.25**

2.6. Block Diagram of Test Setup



2.7. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: OYURF900I-8** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.8. EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by software (UHFReader188demomain) provided by application.

2.9. Special Accessories

Manufacturer	Description	Model	Serial Number	Certificate
SHENZHEN JUYUANHAI ELECTRONIC CO.,LTD	Adapter	JYH32-0903000	--	SDOC
TOSHIBA	PC	Satellite S40Dt-A	--	SDOC

Note: The Adapter and PC is only used for auxiliary testing.

2.10. External I/O Cable

I/O Port Description	Quantity	Cable
DC IN Port	1	N/A
VGA	1	N/A

2.11. Modifications

No modifications were implemented to meet testing criteria.

3. TEST ENVIRONMENT

3.1. Address of the test laboratory

Shenzhen Global Test Service Co.,Ltd.
No.7-101 and 8A-104, Building 7 and 8, DCC Cultural and Creative Garden, No.98, Pingxin North Road, Shangmugu Community, Pinghu Street, Longgang District, Shenzhen, Guangdong,China,China.

3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS (No. CNAS L8169)
Shenzhen Global Test Service Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2019 General Requirements) for the Competence of Testing and Calibration Laboratories.
A2LA (Certificate No. 4758.01)
Shenzhen Global Test Service Co., Ltd. has been assessed by the American Association for Laboratory Accreditation (A2LA). Certificate No. 4758.01.
Industry Canada Registration Number. is 24189.
FCC Designation Number is CN1234.
FCC Registered Test Site Number is165725.

3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

3.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen Global Test Service Co.,Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.
Hereafter the best measurement capability for Shenzhen GTS laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10 dB	(1)
Radiated Emission	1~18GHz	4.32 dB	(1)
Radiated Emission	18-40GHz	5.54 dB	(1)
Conducted Disturbance	0.15~30MHz	3.12 dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.5. Summary of measurement results

Applied Standard: FCC Part 15 Subpart C				
FCC Rules	Description of Test	Test Sample	Result	Remark
§15.247(b)(2)	Maximum Conducted Output Power	GTS20201016009-1-1#	Compliant	Note 1
§15.247(c)	Frequency Separation And 20 dB Bandwidth	GTS20201016009-1-1#	Compliant	Note 1
§15.247(b)(2)	Number Of Hopping Frequency	GTS20201016009-1-1#	Compliant	Note 1
§15.247(a)(1)(i)	Time Of Occupancy (Dwell Time)	GTS20201016009-1-1#	Compliant	Note 1
§15.209, §15.247(d)	Radiated and Conducted Spurious Emissions	GTS20201016009-1-1#	Compliant	Note 1
§15.205	Emissions at Restricted Band	GTS20201016009-1-1#	Compliant	Note 1
§15.207(a)	Conducted Emissions	GTS20201016009-1-1#	Compliant	Note 1
§15.203	Antenna Requirements	GTS20201016009-1-1#	Compliant	Note 1
§15.247(i)§2.1091	RF Exposure	N/A	Compliant	Note 1

Remark:
1. The measurement uncertainty is not included in the test result.
2. NA = Not Applicable; NP = Not Performed
3. Note 1 – Test results inside test report;
4. Note 2 – Test results in other test report (RF Exposure Report).
5. There are eight antenna ports, every port has been tested, and list the worst result(Antenna 1) in this report.

3.6. Equipments Used during the Test

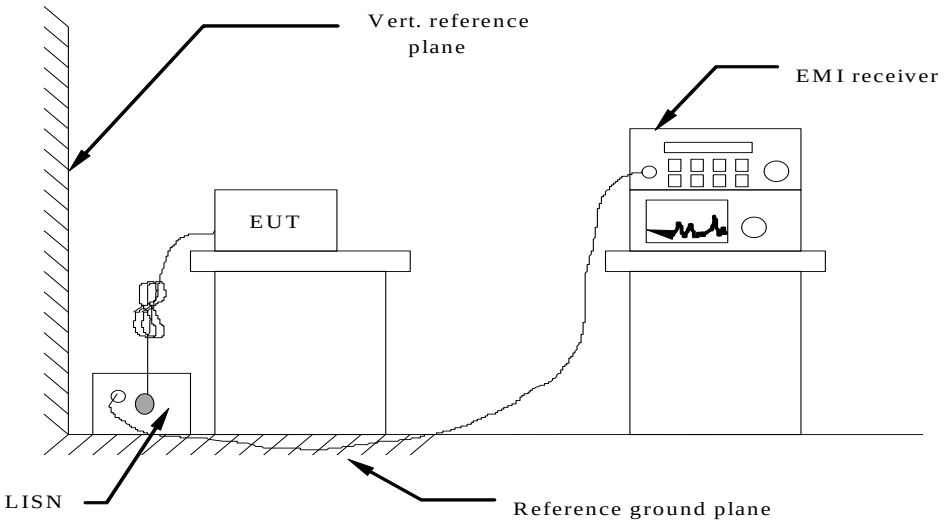
Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	3560.6550.08	2020/09/19	2021/09/18
LISN	R&S	ESH2-Z5	893606/008	2020/09/19	2021/09/18
EMI Test Receiver	R&S	ESPI3	101841-cd	2020/09/19	2021/09/18
EMI Test Receiver	R&S	ESCI7	101102	2020/09/19	2021/09/18
Spectrum Analyzer	Agilent	N9020A	MY48010425	2020/09/19	2021/09/18
Spectrum Analyzer	R&S	FSV40	100019	2020/09/19	2021/09/18
Vector Signal generator	Agilent	N5181A	MY49060502	2020/09/19	2021/09/18
Signal generator	Agilent	E4421B	3610AO1069	2020/09/19	2021/09/18
Climate Chamber	ESPEC	EL-10KA	A20120523	2020/09/19	2021/09/18
Controller	EM Electronics	Controller EM 1000	N/A	N/A	N/A
Horn Antenna	Schwarzbeck	BBHA 9120D	01622	2020/09/19	2021/09/18
Active Loop Antenna	Beijing Da Ze Technology Co.,Ltd.	ZN30900C	15006	2020/09/19	2021/09/18
Bilog Antenna	Schwarzbeck	VULB9163	000976	2020/05/25	2021/05/24
Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2020/09/19	2021/09/18
Amplifier	Schwarzbeck	BBV 9743	#202	2020/09/19	2021/09/18
Amplifier	Schwarzbeck	BBV9179	9719-025	2020/09/19	2021/09/18
Amplifier	EMCI	EMC051845B	980355	2020/09/19	2021/09/18
Temperature/Humidity Meter	Gangxing	CTH-608	02	2020/09/19	2021/09/18
High-Pass Filter	K&L	9SH10-2700/X12750-O/O	KL142031	2020/09/19	2021/09/18
High-Pass Filter	K&L	41H10-1375/U12750-O/O	KL142032	2020/09/19	2021/09/18
RF Cable(below 1GHz)	HUBER+SUHNER	RG214	RE01	2020/09/19	2021/09/18
RF Cable(above 1GHz)	HUBER+SUHNER	RG214	RE02	2020/09/19	2021/09/18
Data acquisition card	Agilent	U2531A	TW53323507	2020/09/19	2021/09/18
Power Sensor	Agilent	U2021XA	MY5365004	2020/09/19	2021/09/18
Test Control Unit	Tonscend	JS0806-1	178060067	2020/06/19	2021/06/18
Automated filter bank	Tonscend	JS0806-F	19F8060177	2020/06/19	2021/06/18
EMI Test Software	Tonscend	JS1120-1	Ver 2.6.8.0518	/	/
EMI Test Software	Tonscend	JS1120-3	Ver 2.5.77.0418	/	/
EMI Test Software	Tonscend	JS32-CE	Ver 2.5	/	/
EMI Test Software	Tonscend	JS32-RE	Ver 2.5.1.8	/	/

Note: The Cal.Interval was one year.

4. TEST CONDITIONS AND RESULTS

4.1. AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
2 Support equipment, if needed, was placed as per ANSI C63.10-2013.
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013.
4 The EUT received DC 9V power, the adapter received AC120V/60Hz or AC 240V/50Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

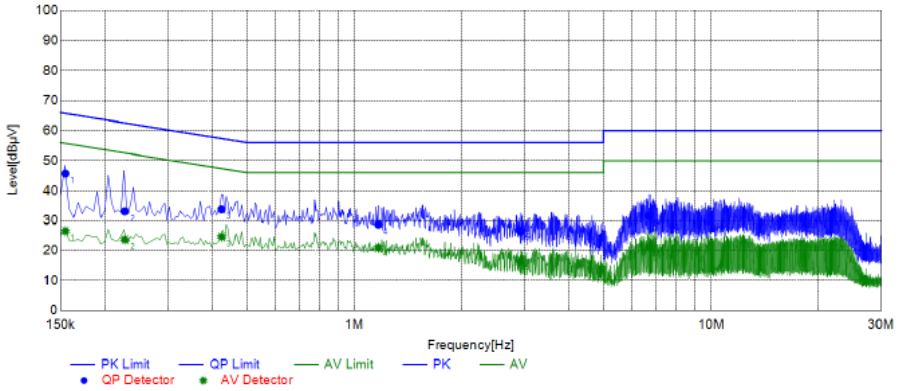
TEST RESULTS

Remark: We measured Conducted Emission at ASK mode in AC 120V/60Hz and AC 240V/50Hz, the worst case was recorded .

Temperature	23.6℃	Humidity	53.9%
Test Engineer	Moon Tan	Configurations	RFID

Power supply:	AC 120V/60Hz	Polarization	L

Test Graph



Final Data List

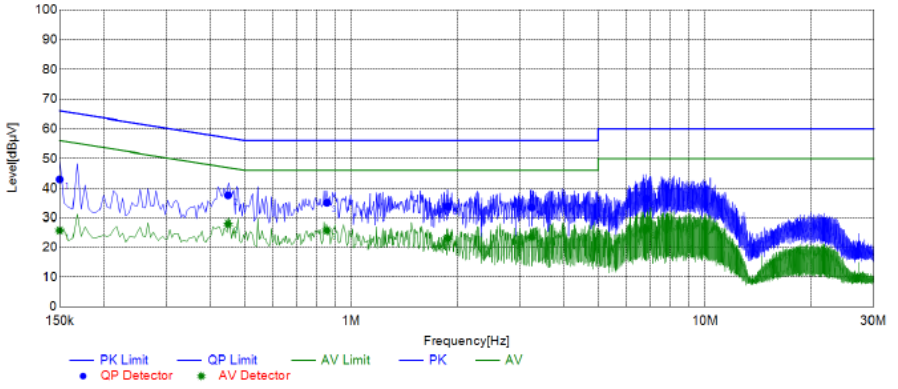
NO.	Frequency [MHz]	QP Reading [dBµV]	AVG. Reading [dBµV]	Factor [dB]	QP Result [dBµV]	AVG. Result [dBµV]	QP Limit [dBµV]	AVG. Limit [dBµV]	QP Margin [dB]	AVG. Margin [dB]	Line	Remark
1	0.1551	35.62	16.50	10.05	45.67	26.55	65.72	55.72	20.05	29.17	L1	PASS
2	0.2275	23.02	13.61	10.04	33.06	23.65	62.54	52.54	29.48	28.89	L1	PASS
3	0.4243	23.74	14.59	10.03	33.77	24.62	57.36	47.36	23.59	22.74	L1	PASS
4	1.1662	18.61	10.90	10.09	28.70	20.99	56.00	46.00	27.30	25.01	L1	PASS
5	2.9209	16.23	6.40	10.28	26.51	16.68	56.00	46.00	29.49	29.32	L1	PASS
6	6.7042	21.03	10.56	10.58	31.61	21.14	60.00	50.00	28.39	28.86	L1	PASS

Note: 1. Result (dBµV) = Reading (dBµV) + Factor (dB).

2. Factor (dB) = Cable loss (dB) + LISN Factor (dB).

Power supply:	AC 120V/60Hz	Polarization	N

Test Graph



Final Data List

NO.	Frequency [MHz]	QP Reading [dBµV]	AVG. Reading [dBµV]	Factor [dB]	QP Result [dBµV]	AVG. Result [dBµV]	QP Limit [dBµV]	AVG. Limit [dBµV]	QP Margin [dB]	AVG. Margin [dB]	Line	Remark
1	0.1500	32.82	15.72	10.05	42.87	25.77	66.00	56.00	23.13	30.23	N	PASS
2	0.4496	27.59	17.89	10.04	37.63	27.93	56.88	46.88	19.25	18.95	N	PASS
3	0.8544	25.02	15.73	10.06	35.08	25.79	56.00	46.00	20.92	20.21	N	PASS
4	1.8774	23.66	12.94	10.14	33.80	23.08	56.00	46.00	22.20	22.92	N	PASS
5	3.2340	23.14	13.24	10.31	33.45	23.55	56.00	46.00	22.55	22.45	N	PASS
6	6.8269	25.86	15.66	10.58	36.44	26.24	60.00	50.00	23.56	23.76	N	PASS

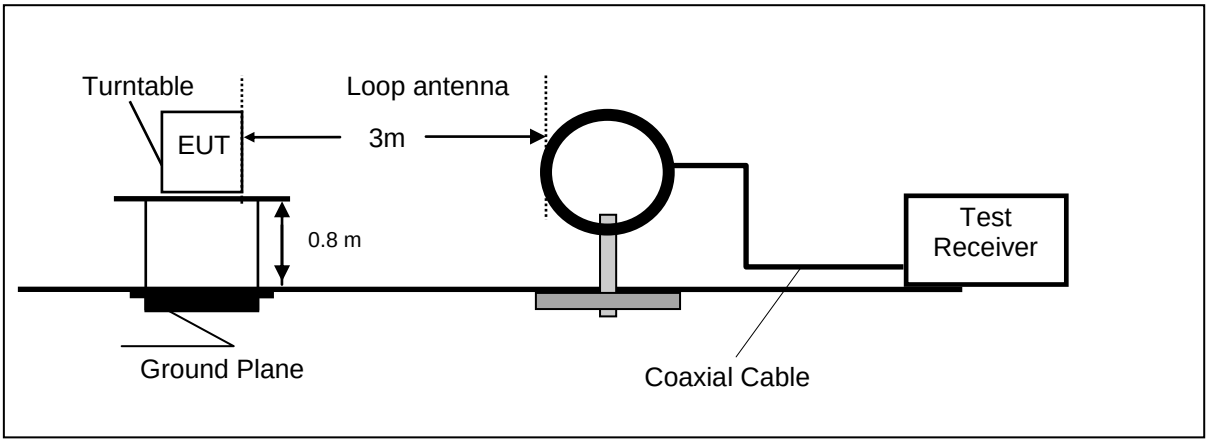
Note: 1. Result (dBµV) = Reading (dBµV) + Factor (dB).

2. Factor (dB) = Cable loss (dB) + LISN Factor (dB).

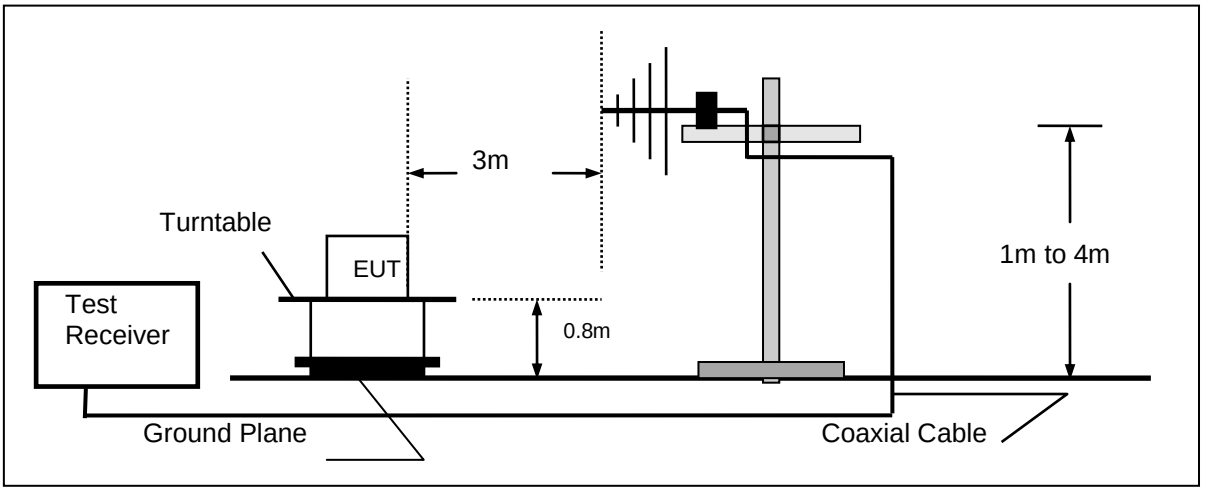
4.2. Radiated Emission

TEST CONFIGURATION

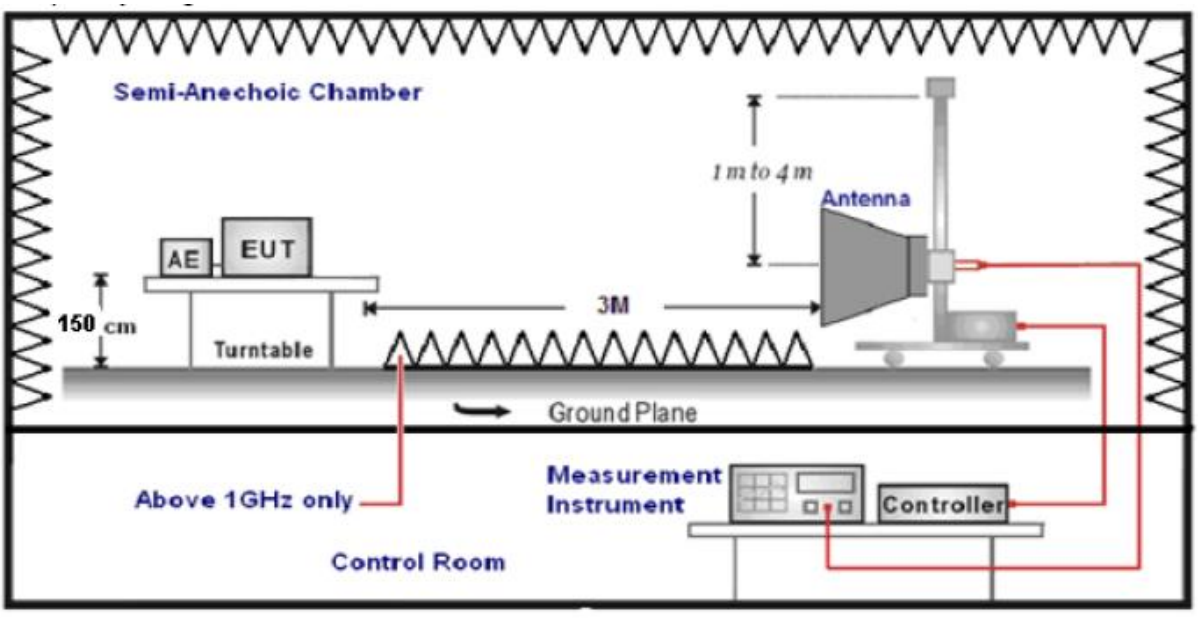
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT.
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 measurements have been completed.
5. The EUT minimum operation frequency was 32.768KHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Anternna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

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

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

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.
The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST RESULTS

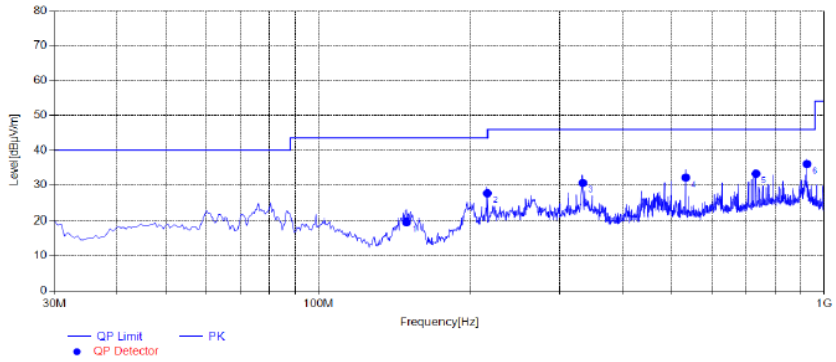
Remark: We measured Radiated Emission at ASK mode from 30MHz to 25GHz and recorded worst case at ASK mode.

Temperature	23.5℃	Humidity	54.2%
Test Engineer	Moon Tan	Configurations	RFID

For 30MHz-1GHz

Horizontal

Test Graph



Quasi-peak Final Data List

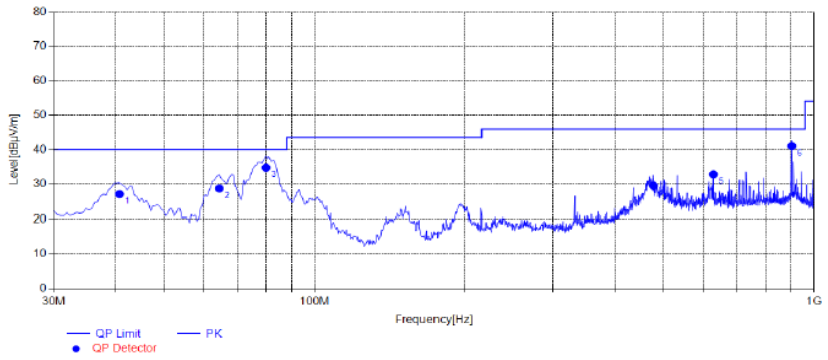
NO.	Frequency [MHz]	Reading [dBµV/m]	Factor [dB]	Result [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Remark
1	149.3100	32.48	-12.81	19.67	43.50	23.83	100	82	Horizontal	PASS
2	215.7550	37.12	-9.46	27.66	43.50	15.84	100	302	Horizontal	PASS
3	333.1250	37.19	-6.56	30.63	46.00	15.37	100	319	Horizontal	PASS
4	532.4600	35.21	-3.05	32.16	46.00	13.84	100	339	Horizontal	PASS
5	733.2500	33.18	0.08	33.26	46.00	12.74	100	99	Horizontal	PASS
6	925.3100	33.22	2.85	36.07	46.00	9.93	100	326	Horizontal	PASS

Note: 1. Result (dBµV/m) = Reading(dBµV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

Vertical

Test Graph



Quasi-peak Final Data List

NO.	Frequency [MHz]	Reading [dBµV/m]	Factor [dB]	Result [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Remark
1	40.6700	34.59	-7.45	27.14	40.00	12.86	100	345	Vertical	PASS
2	64.4350	37.94	-9.19	28.75	40.00	11.25	100	132	Vertical	PASS
3	79.9550	47.21	-12.44	34.77	40.00	5.23	100	264	Vertical	PASS
4	476.6850	33.49	-3.90	29.59	46.00	16.41	100	358	Vertical	PASS
5	628.9750	34.21	-1.35	32.86	46.00	13.14	100	234	Vertical	PASS
6	903.0000	38．06	3.05	41.05	46.00	4.95	100	34	Vertical	PASS

Note: 1. Result (dBµV/m) = Reading(dBµV/m) + Factor (dB) .

2. Factor (dB) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB).

For 1GHz to 25GHz

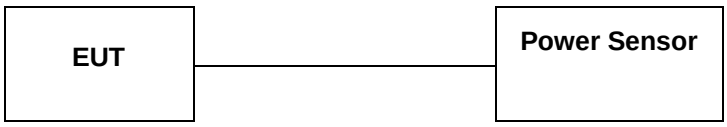
Frequency	Meter Reading	Antenna Factor	Cable loss	Preamp factor	Emission Level	Limits	Margin	Detector Type	Comment
(MHz)	(dBμV)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		
TX-902.75									
1805.5	50.08	32.44	30.25	7.95	60.22	74.00	-13.78	Pk	Vertical
1805.5	35.77	32.44	30.25	7.95	45.91	54.00	-8.09	AV	Vertical
1805.5	53.52	32.44	30.25	7.95	63.66	74.00	-10.34	Pk	Horizontal
1805.5	34.97	32.44	30.25	7.95	45.11	54.00	-8.89	AV	Horizontal
TX-915.25									
1829.5	50.10	32.52	30.31	8.12	60.43	74.00	-13.57	Pk	Vertical
1829.5	36.80	32.52	30.31	8.12	47.13	54.00	-6.87	AV	Vertical
1829.5	51.44	32.52	30.31	8.12	61.77	74.00	-12.23	Pk	Horizontal
1829.5	35.78	32.52	30.31	8.12	46.11	54.00	-7.89	AV	Horizontal
TX-927.25									
1854.5	50.93	32.68	30.27	7.88	61.22	74.00	-12.78	Pk	Vertical
1854.5	36.83	32.68	30.27	7.88	47.12	54.00	-6.88	AV	Vertical
1854.5	49.26	32.68	30.27	7.88	59.55	74.00	-14.45	Pk	Horizontal
1854.5	31.37	32.68	30.27	7.88	41.66	54.00	-12.34	AV	Horizontal

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

4.3. Maximum Peak Output Power

TEST CONFIGURATION



TEST PROCEDURE

According to ANSI C63.10:2013 Maximum peak conducted output power for HFSS devices:
The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the HFSS bandwidth and shall utilize a fast-responding diode detector.
The maximum Average conducted output power may be measured using a wideband RF power meter with a thermocouple derector or equivalent. The power meter shall have a video bandwidth that is greater than or equal to the HFSS bandwidth and shall utilize a fast-responding diode detector.

LIMIT

According to §15.247(b)(2),For frequency hopping systems operating in the 902–928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

TEST RESULTS

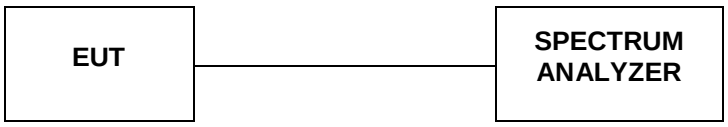
Temperature	23.9℃	Humidity	54.1%
Test Engineer	Moon Tan	Configurations	RFID

Modulation	Channel	Peak Output power (dBm)	Average Output power (dBm)	Limit (dBm)	Result
ASK	01	18.93	17.63	28.0	Pass
	26	18.65	17.53		
	50	18.42	17.46		

Note: The test results including the cable lose.

4.4. 20dB Bandwidth

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=30KHz and VBW=100KHz.
The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

LIMIT

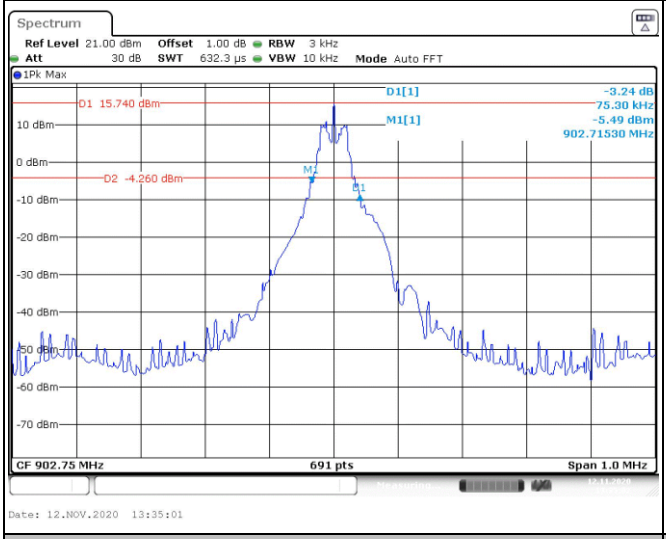
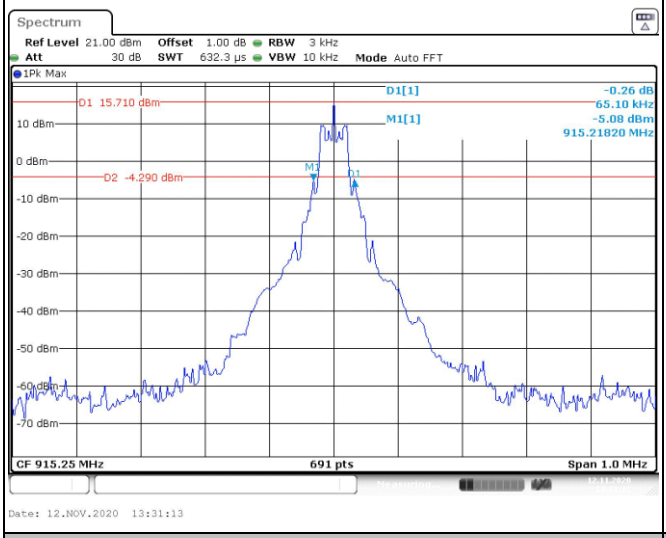
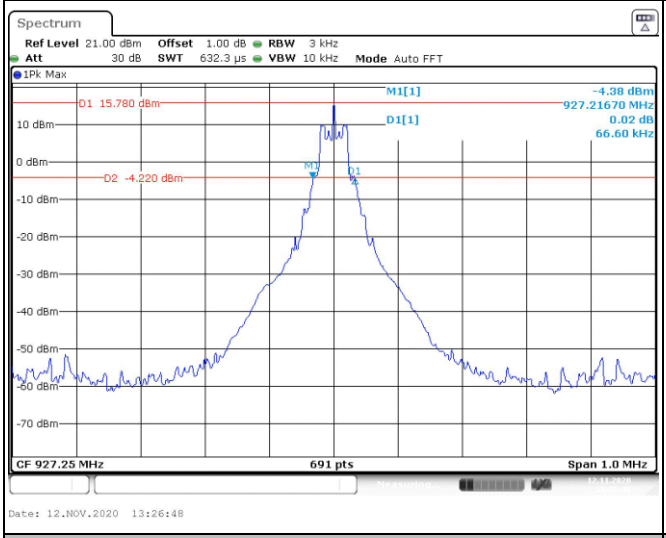
According to §15.247(i),For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

TEST RESULTS

Temperature	23.9℃	Humidity	54.1%
Test Engineer	Moon Tan	Configurations	RFID

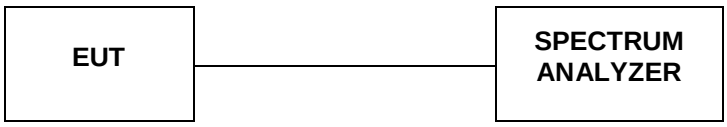
Modulation	Channel	20dB Bandwidth (MHz)	Result
ASK	01	0.0753	PASS
	26	0.0651	PASS
	50	0.0666	PASS

Test plot as follows:

ASK	
	
Channel 01	
	
Channel 26	
	
Channel 50	

4.5. Frequency Separation

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=30KHz and VBW=100KHz.

LIMIT

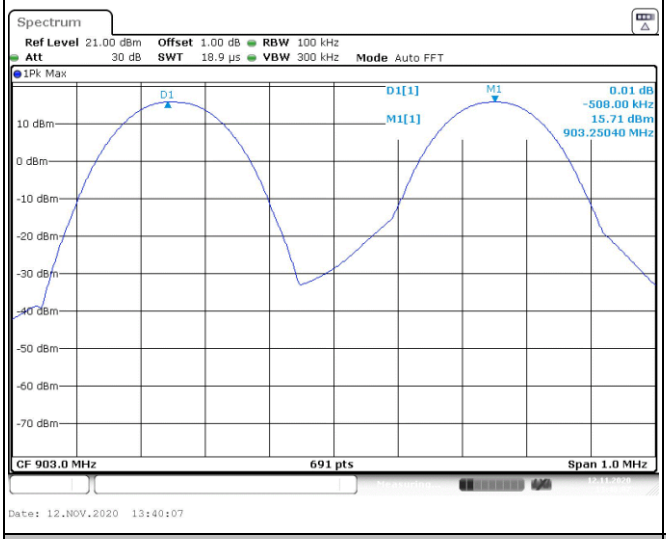
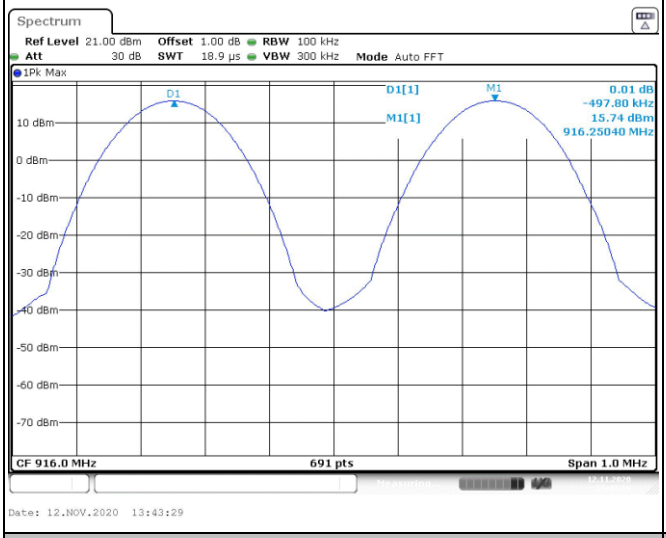
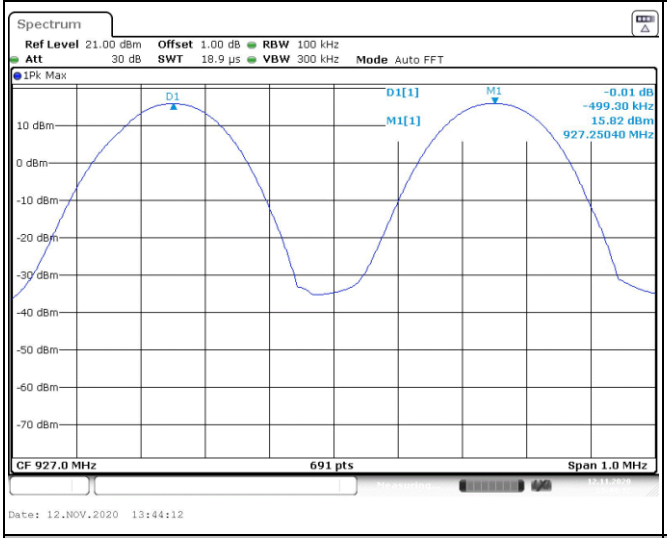
According to 15.247(a)(1),frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.

TEST RESULTS

Temperature	23.9℃	Humidity	54.1%
Test Engineer	Moon Tan	Configurations	RFID

Modulation	Channel	Ch. Separation (MHz)	Limit (MHz)	Result
ASK	01	0.508	≥0.0753	Complies
	26	0.498	≥0.0651	Complies
	50	0.499	≥0.0666	Complies

Ch. Separation Limits: > 20dB bandwidth

ASK	
	
Channel 01	
	
Channel 26	
	
Channel 50	

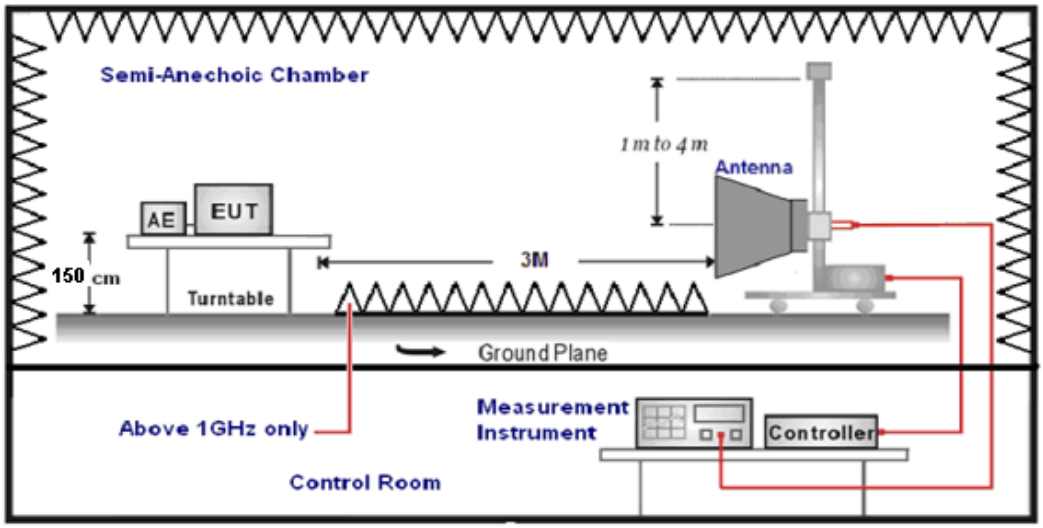
4.6. Band Edge Compliance of RF Emission

TEST REQUIREMENT

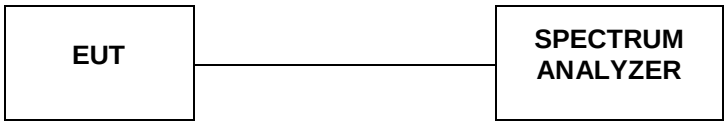
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

TEST CONFIGURATION

For Radiated



For Conducted



TEST PROCEDURE

1. The EUT was placed on a turn table which is 1.5m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
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 measurements have been completed..
5. The distance between test antenna and EUT was 3 meter:
6. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

LIMIT

Below -20dB of the highest emission level in operating band.
Radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)

TEST RESULTS

Remark: we measured all conditions and recorded worst case at report.

4.6.1 For Radiated Bandedge Measurement

Remark: we tested radiated bandedge at both hopping and no-hopping modes,recorded worst case at no-hopping mode

Temperature	23.5℃	Humidity	54.2%
Test Engineer	Moon Tan	Configurations	RFID

ASK

Frequency(MHz):			**902.75**			**Polarity:**			**HORIZONTAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
902.00	46.24	PK	74.00	-27.76	1	225	51.55	27.49	3.32	36.12	-5.31
902.00	34.75	AV	54.00	-19.25	1	225	40.06	27.49	3.32	36.12	-5.31
Frequency(MHz):			**902.75**			**Polarity:**			**VERTICAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
902.00	45.52	PK	74.00	-28.48	1	164	50.83	27.49	3.32	36.12	-5.31
902.00	33.93	AV	54.00	-20.07	1	164	39.24	27.49	3.32	36.12	-5.31
Frequency(MHz):			**927.25**			**Polarity:**			**HORIZONTAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
928.00	48.97	PK	74.00	-25.03	1	107	54.69	27.45	3.38	36.55	-5.72
928.00	36.22	AV	54.00	-17.78	1	107	41.94	27.45	3.38	36.55	-5.72
Frequency(MHz):			**927.25**			**Polarity:**			**VERTICAL**		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier	Correction Factor (dB/m)
928.00	48.95	PK	74.00	-25.05	1	91	54.67	27.45	3.38	36.55	-5.72
928.00	35.05	AV	54.00	-18.95	1	91	40.77	27.45	3.38	36.55	-5.72

REMARKS:

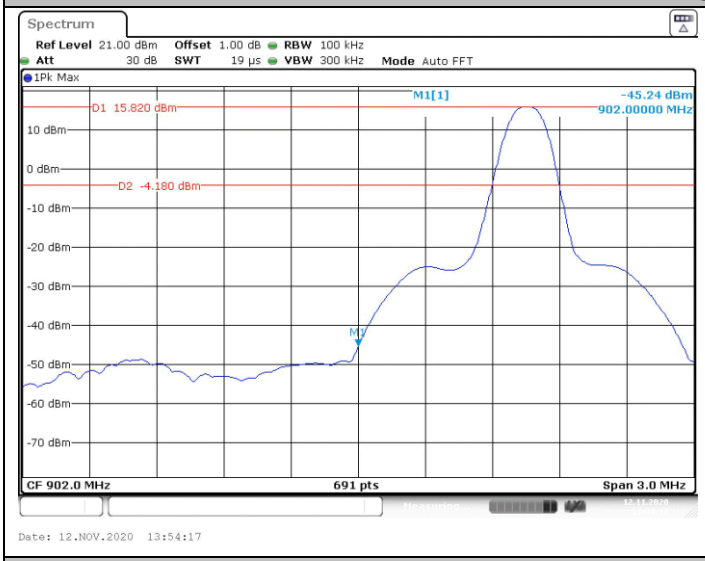
1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

4.6.2 For Conducted Bandedge Measurement

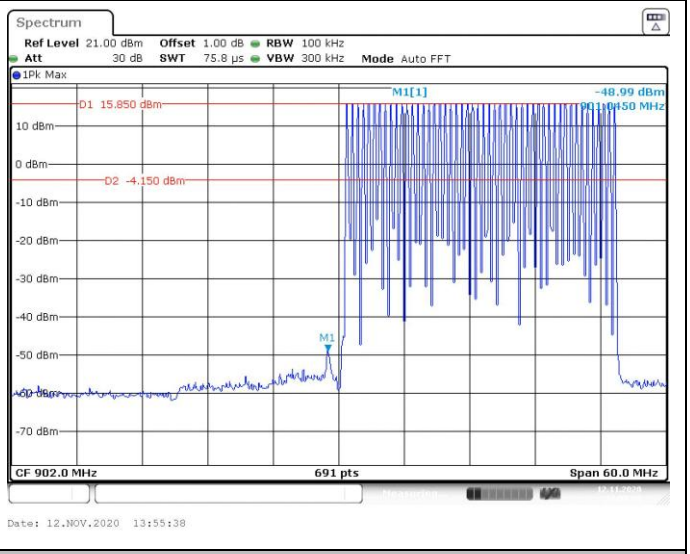
Temperature	23.9℃	Humidity	54.1%
Test Engineer	Moon Tan	Configurations	RFID

Band-edge for RF conducted emissions

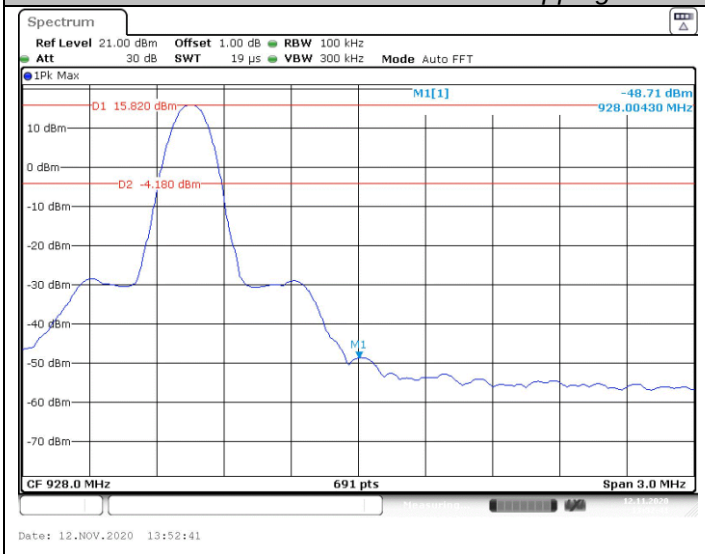
ASK



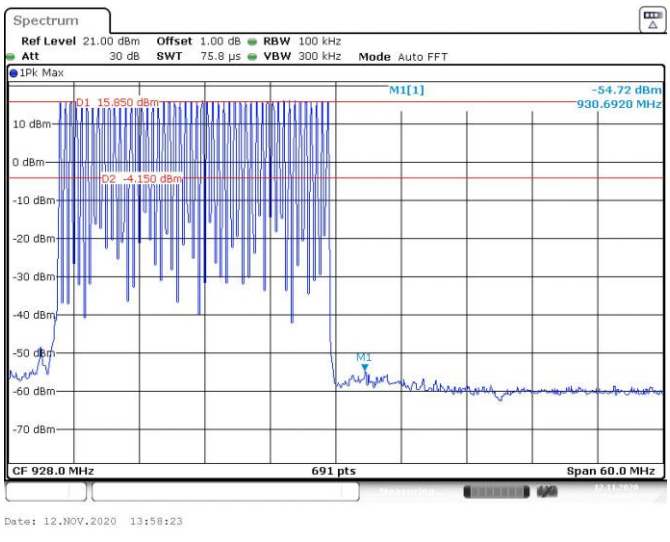
Channel 01 / 902.75MHz – Non-Hopping



Channel 01 / 902.75MHz – Hopping



Channel 50 / 927.25 MHz – Non-Hopping

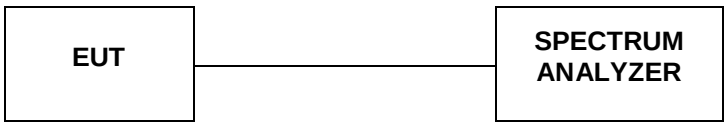


Channel 50 / 927.25 MHz – Hopping

NOTE: Hopping enabled and disabled have evaluated, and the worst data was reported.

4.7. Number of hopping frequency

TEST CONFIGURATION



TEST PROCEDURE

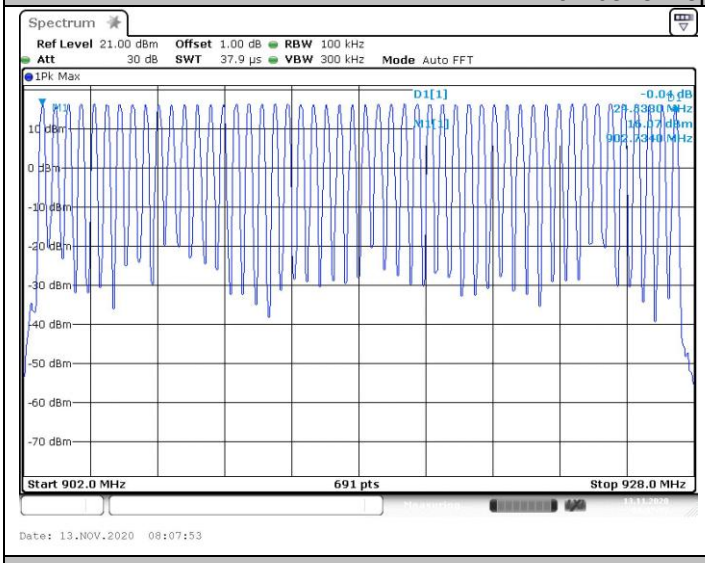
The transmitter output was connected to the spectrum analyzer through an attenuator.Set spectrum analyzer start 902MHz to 928MHz with RBW=1MHz and VBW=3MHz.

LIMIT

According to §15.247(b)(2), For frequency hopping systems operating in the 902–928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

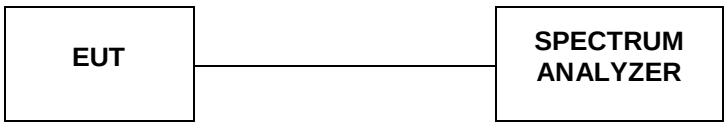
Temperature	23.9℃	Humidity	54.1%
Test Engineer	Moon Tan	Configurations	RFID

Modulation	Number of Hopping Channel	Limit	Result
ASK	50	≥50	Pass

Number of hopping frequency	
	
ASK	

4.8. Time Of Occupancy(Dwell Time)

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with RBW=1MHz and VBW=3MHz,Span=0Hz.

LIMIT

According to §15.247(a)(1)(i),For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

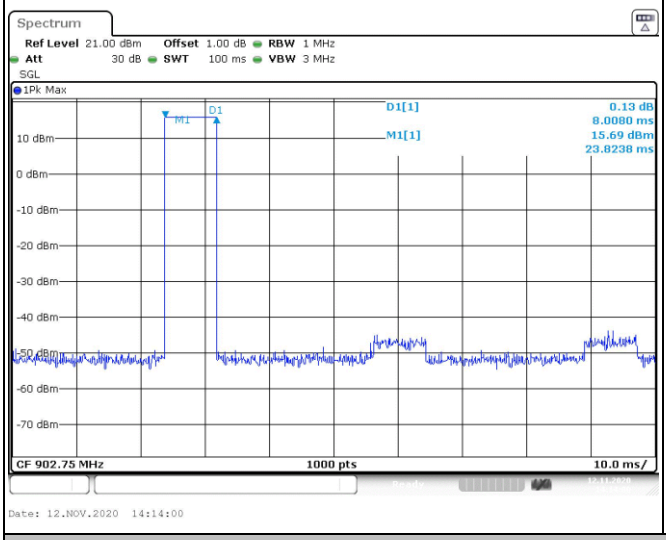
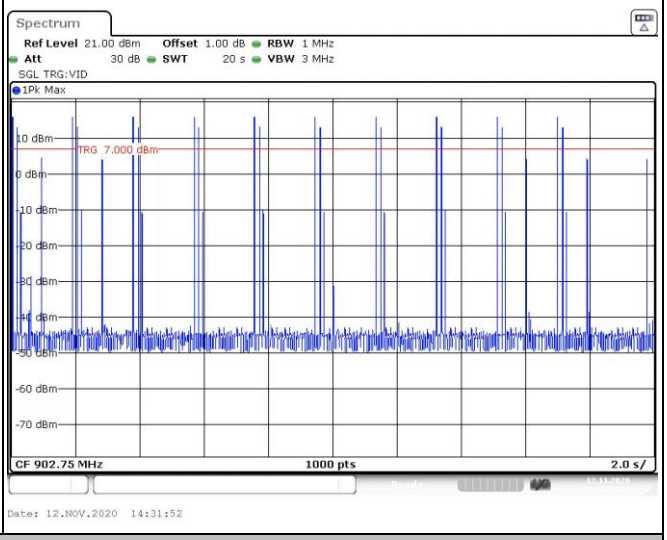
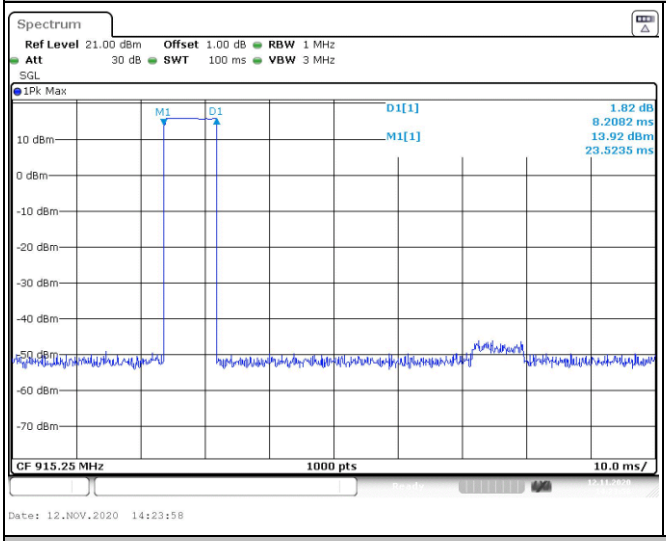
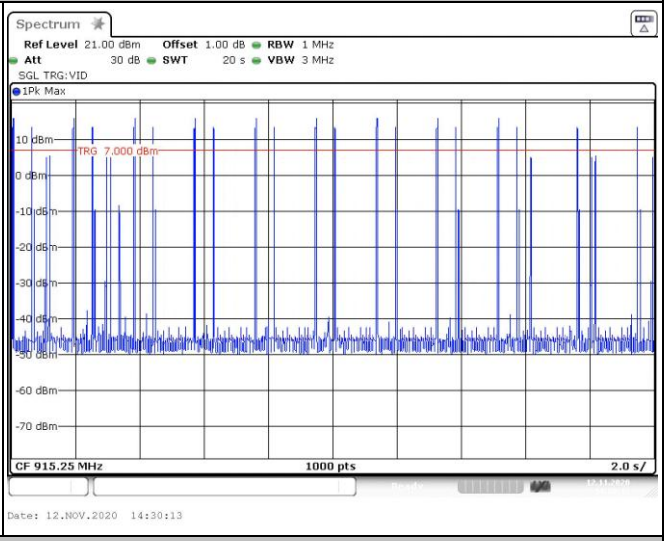
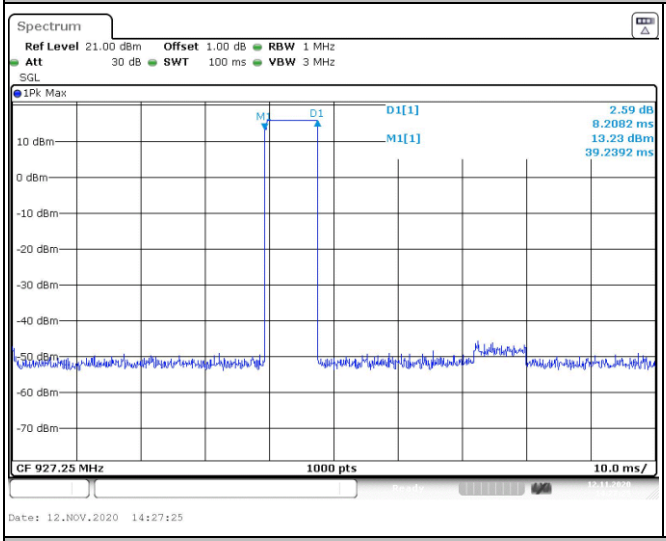
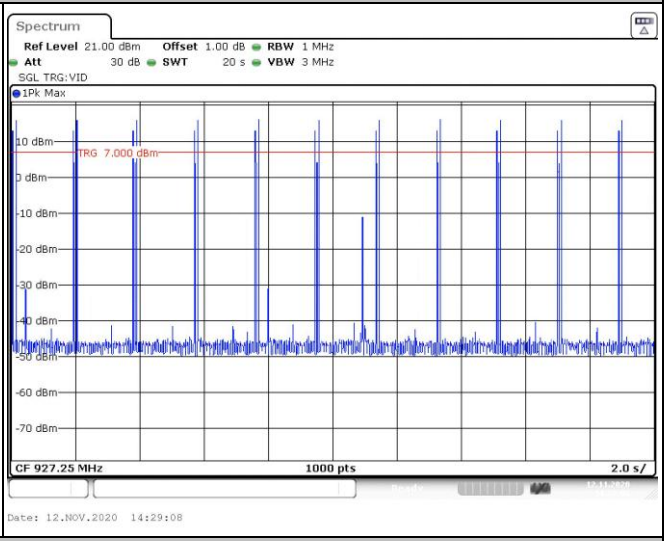
TEST RESULTS

Temperature	23.9℃	Humidity	54.1%
Test Engineer	Moon Tan	Configurations	RFID

Modulation	Channel	Frequency	Pulse Duration	Dwell Time	Limits
			(ms)	(s)	(s)
ASK	01	902.75 MHz	8.01	0.28	0.4
	26	914.75 MHz	8.21	0.33	0.4
	50	927.25 MHz	8.21	0.23	0.4

Remark:

1. *The Dwell Time=Burst Width*Total Hops. The detailed calculations are showed as follows:*
2. *Test results including cable loss;*
3. *please refer to following plots;*
4. *Measured at difference Packet Type for each mode and recorded woest case for each mode.*
5. *Dwell Time Calculate formula:*
   Dwell time=Pulse time (ms) ×20 second pulse count
6. *Measured at low, middle and high channel, recorded worst at middle channel;*

ASK	
	
Channel 01	
	
Channel 26	
	
Channel 50	

4.9. Antenna Requirement

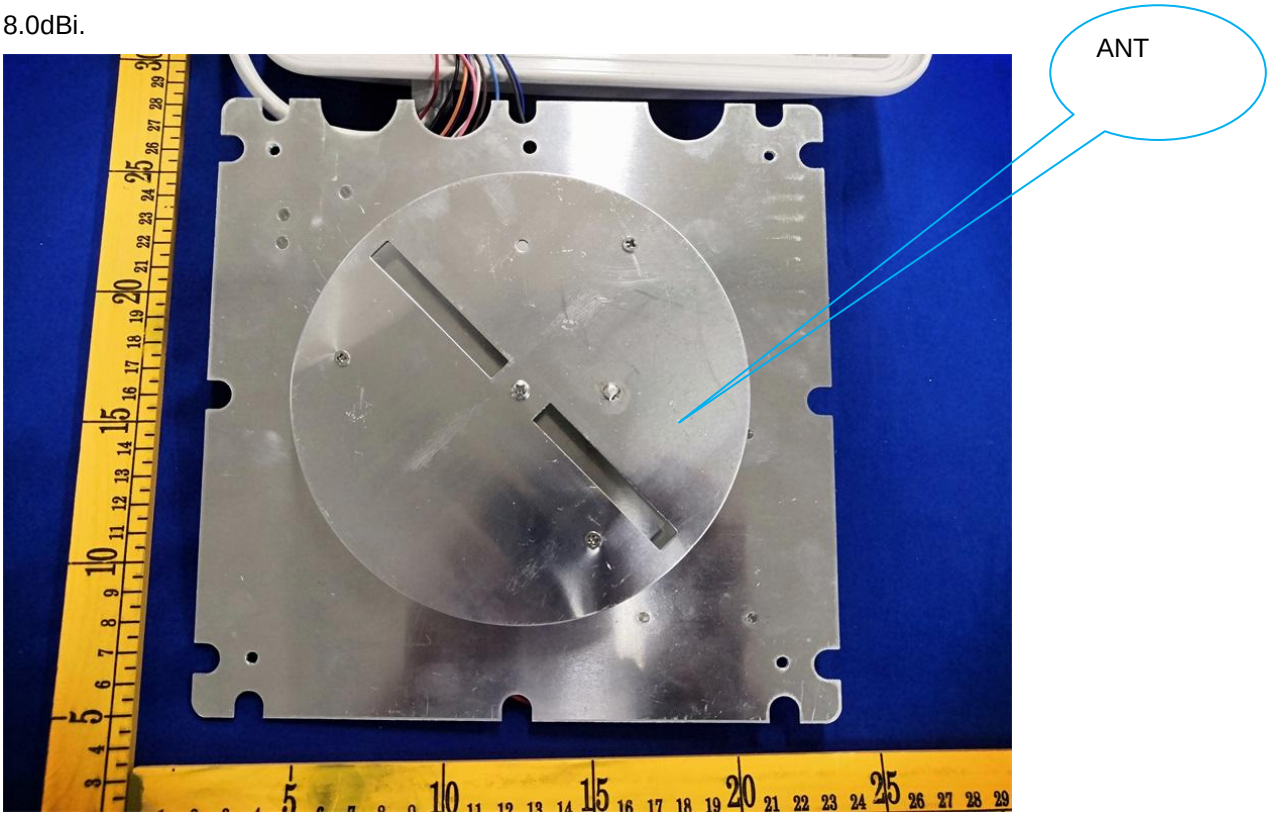
Standard Applicable

For intentional device, according to FCC 47 CFR Section 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.

And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Test Result

The antenna used for this product is Internal Antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 8.0dBi.



5. Test Setup Photos of the EUT

Radiated Emission Test

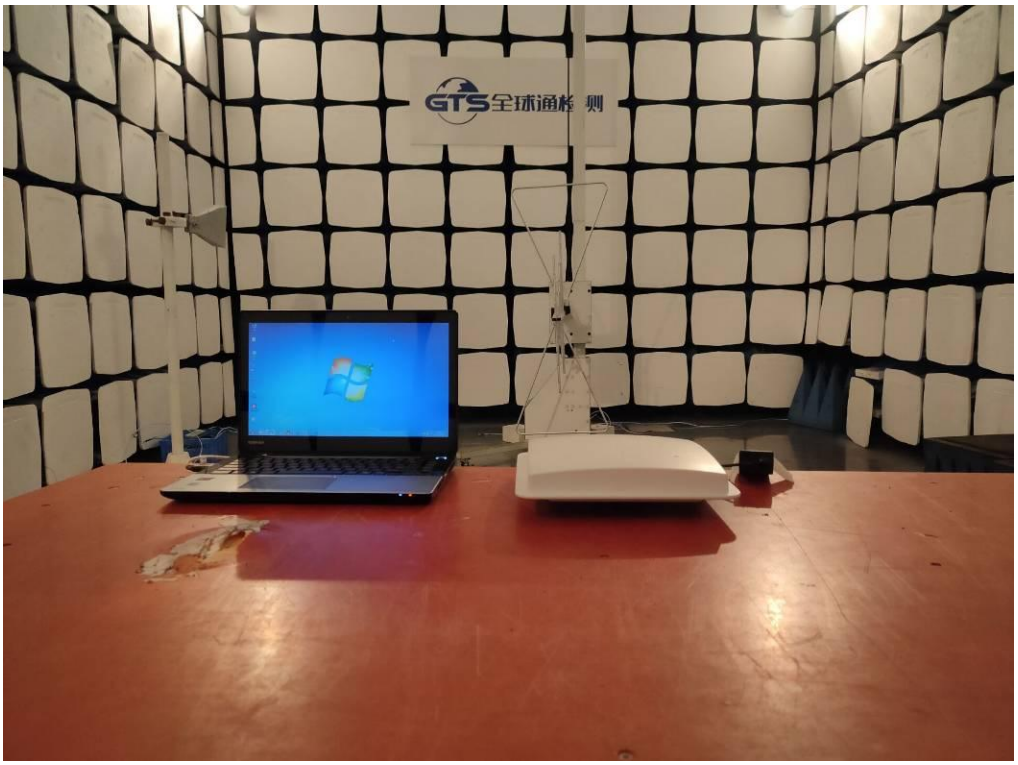


Fig.1

Fig.2

Conducted Emission

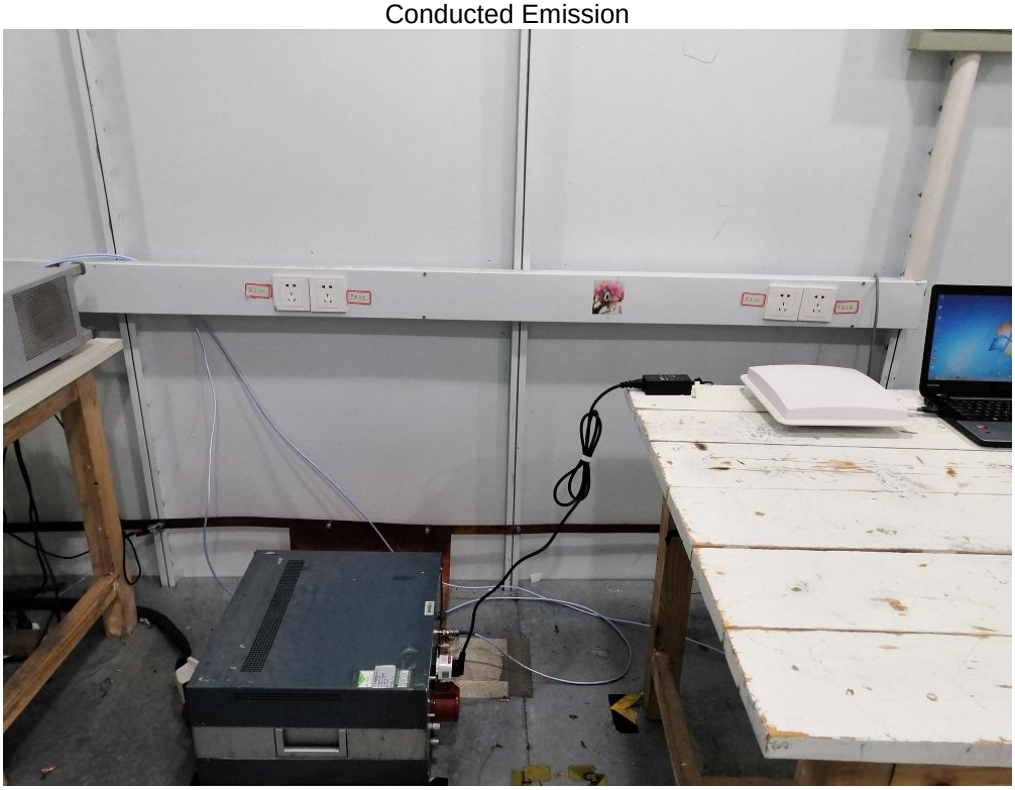


Fig.3

6. External and Internal Photos of the EUT

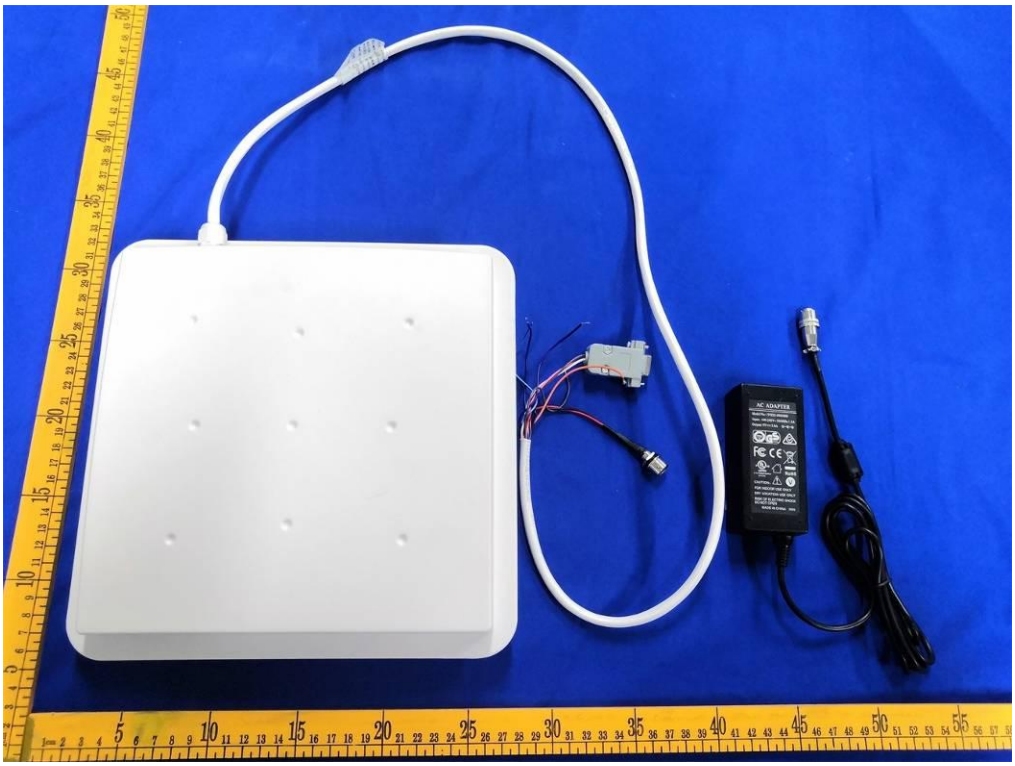


Fig. 1

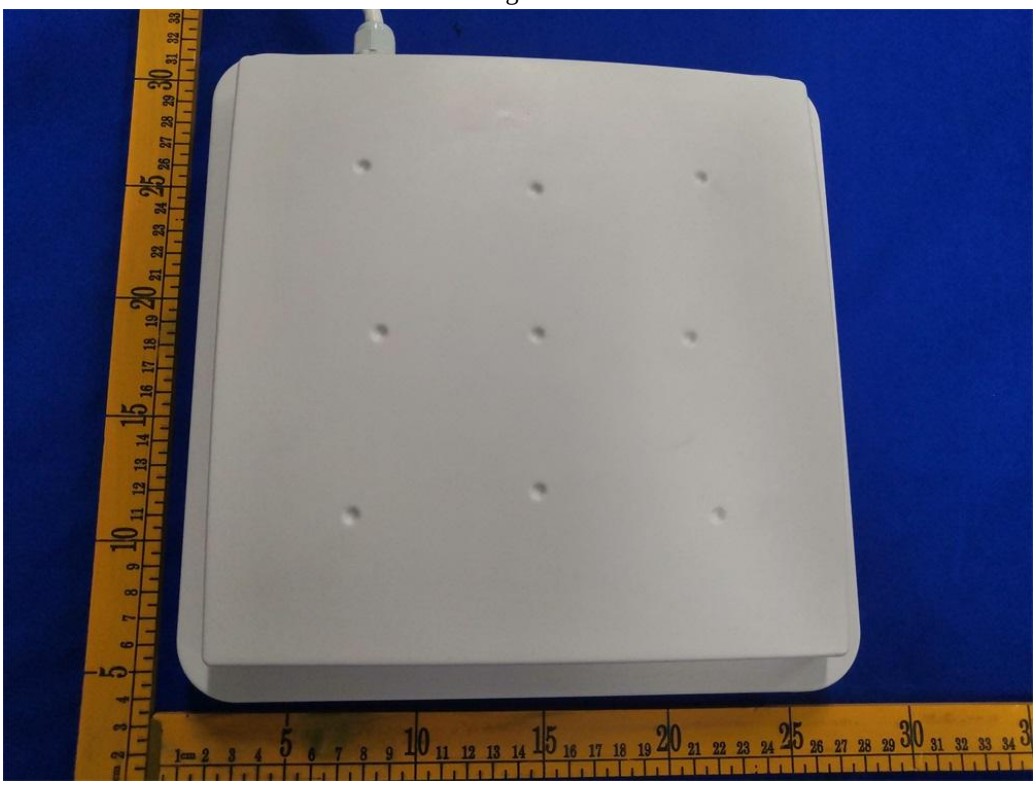


Fig. 2

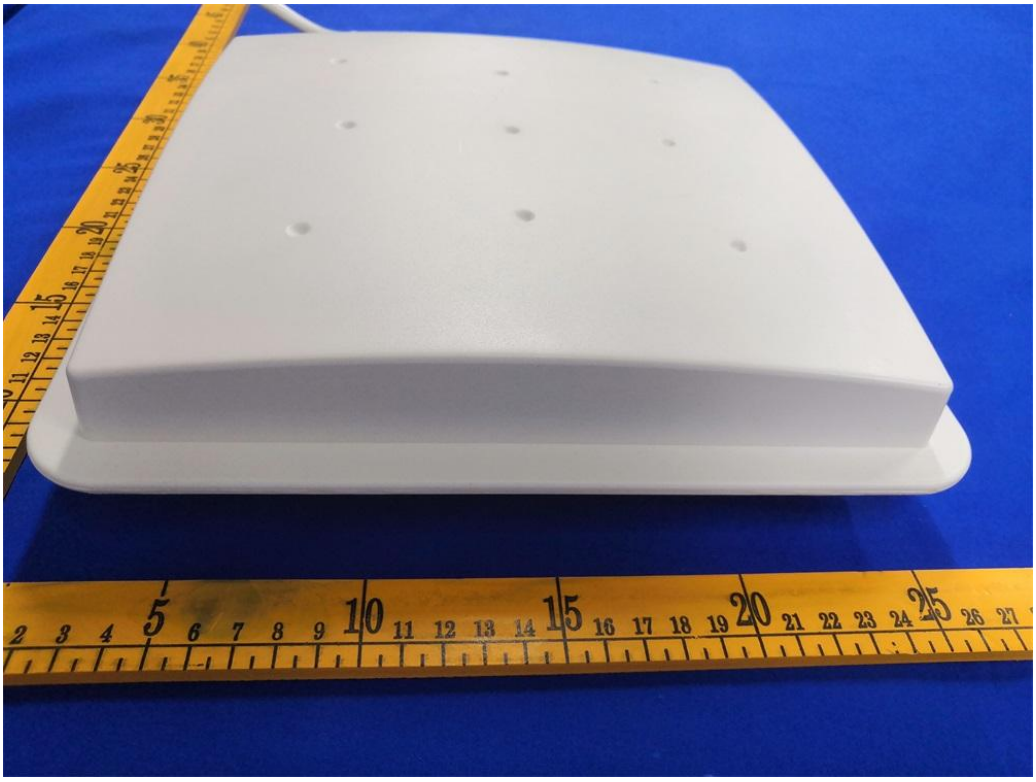


Fig. 3

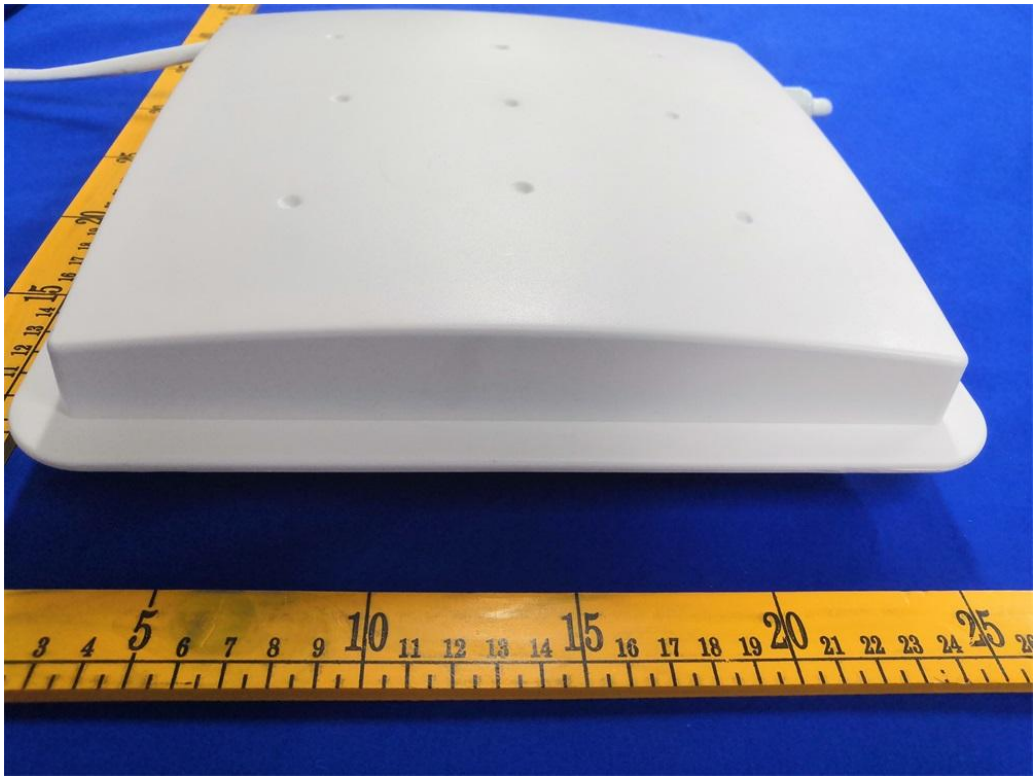


Fig. 4

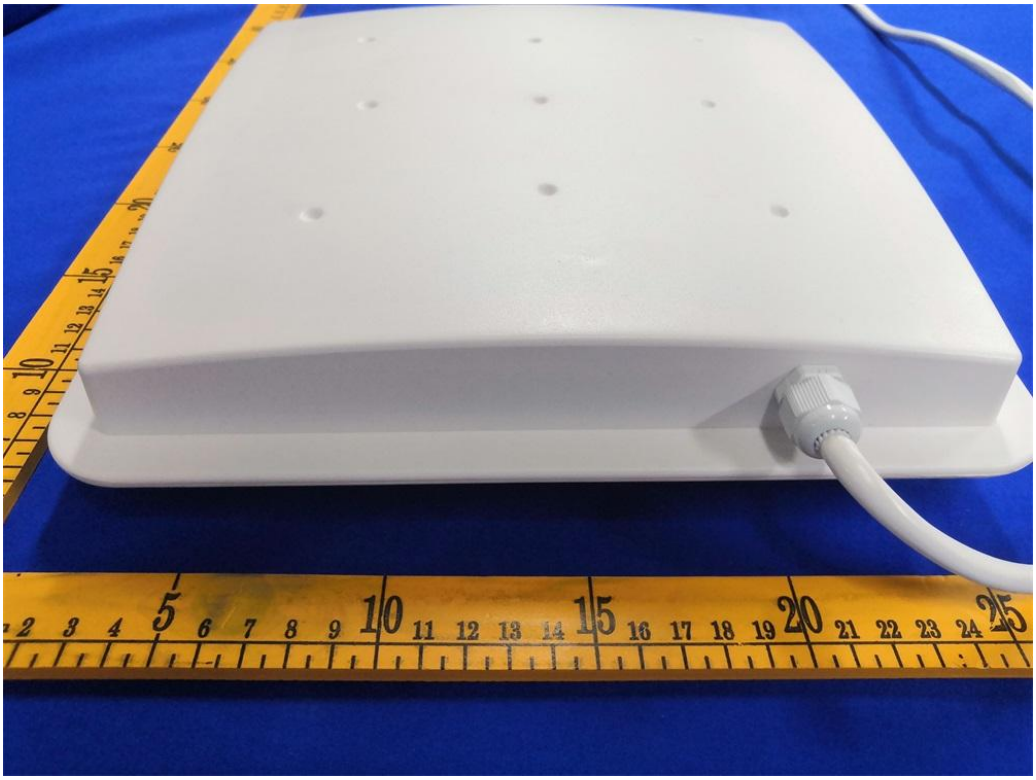


Fig. 5

Fig. 6

Fig. 7

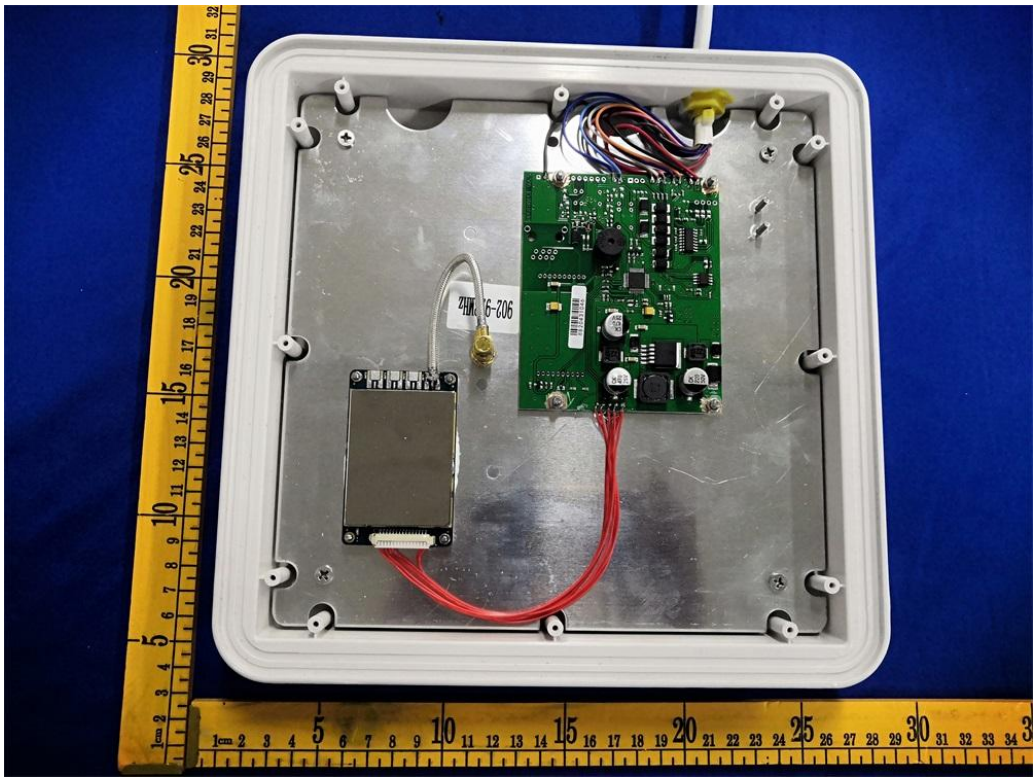


Fig. 8

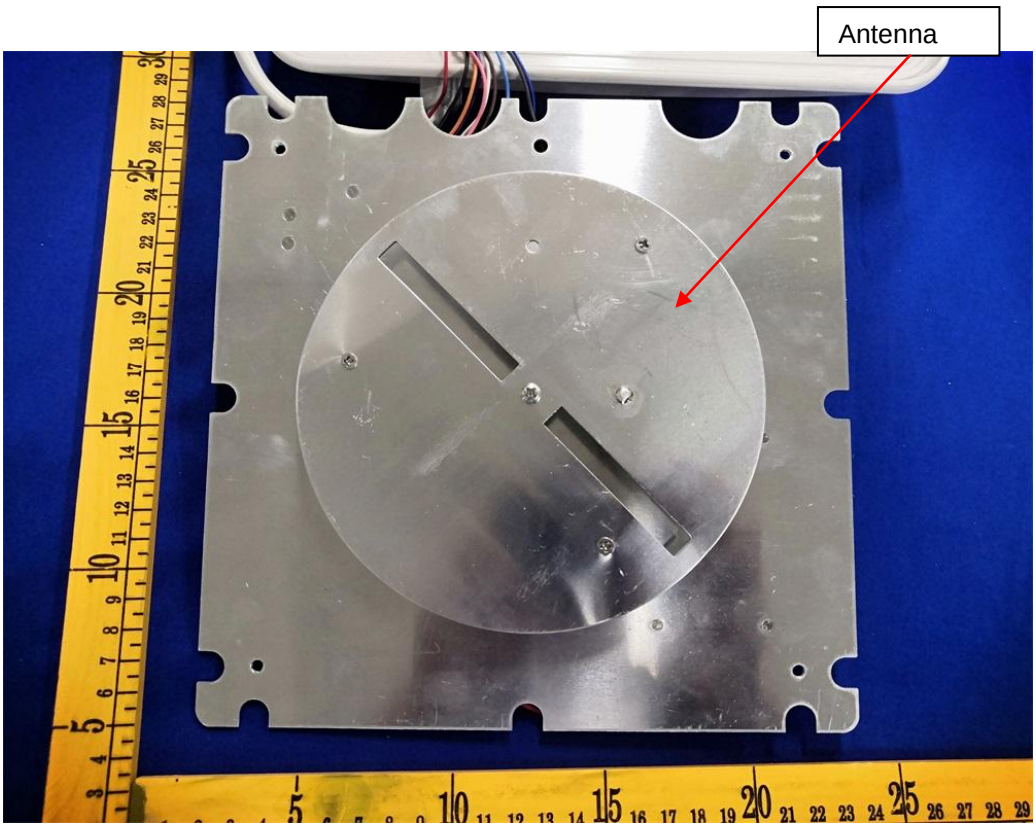


Fig. 9

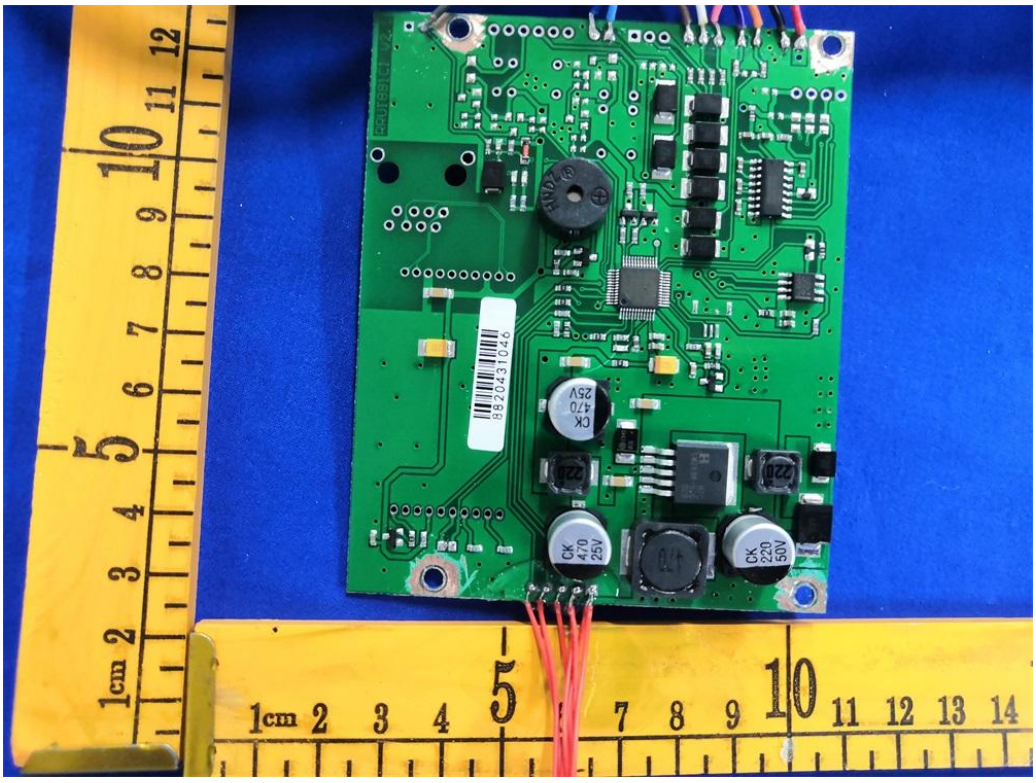


Fig. 10

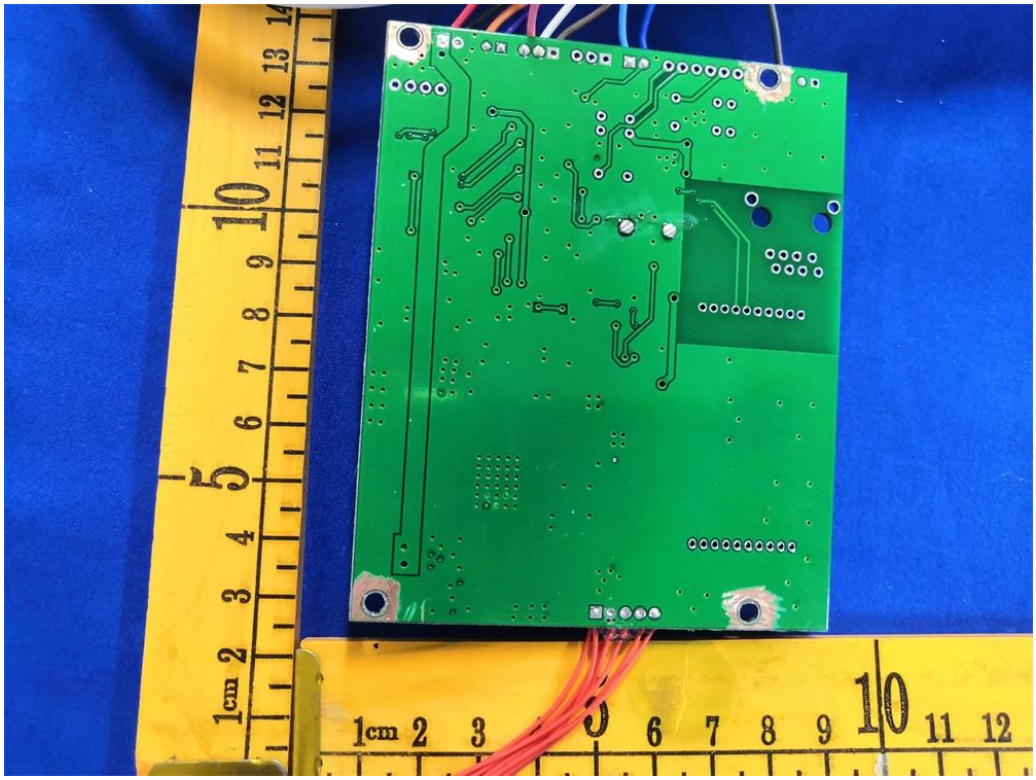


Fig. 11

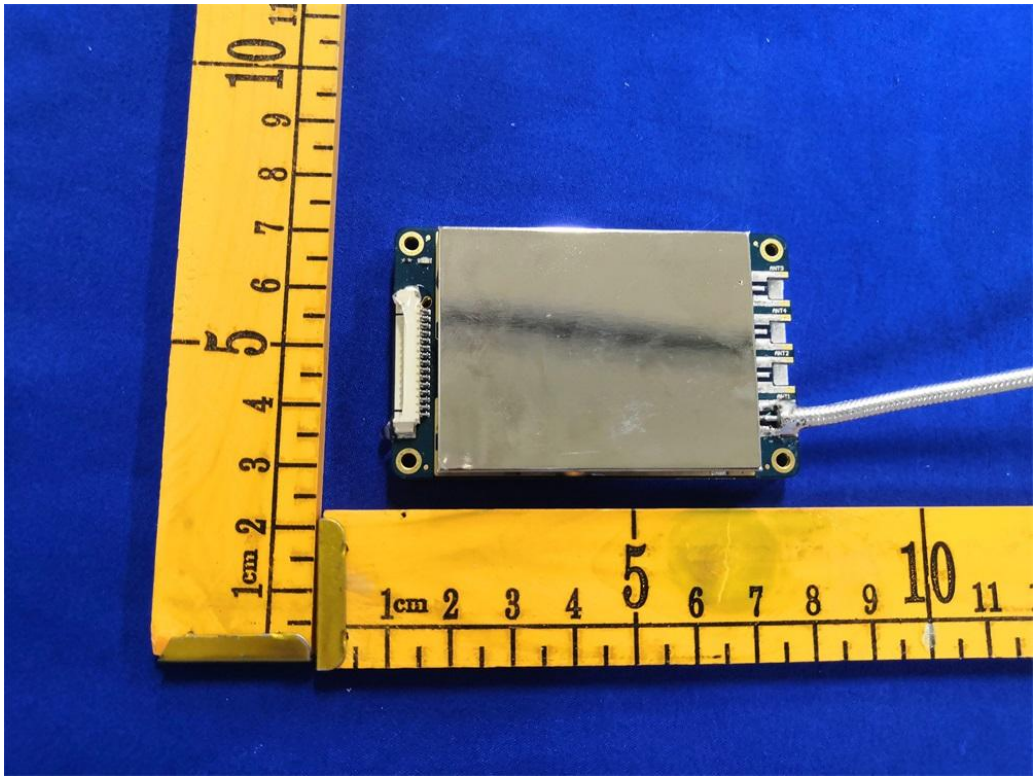


Fig. 12

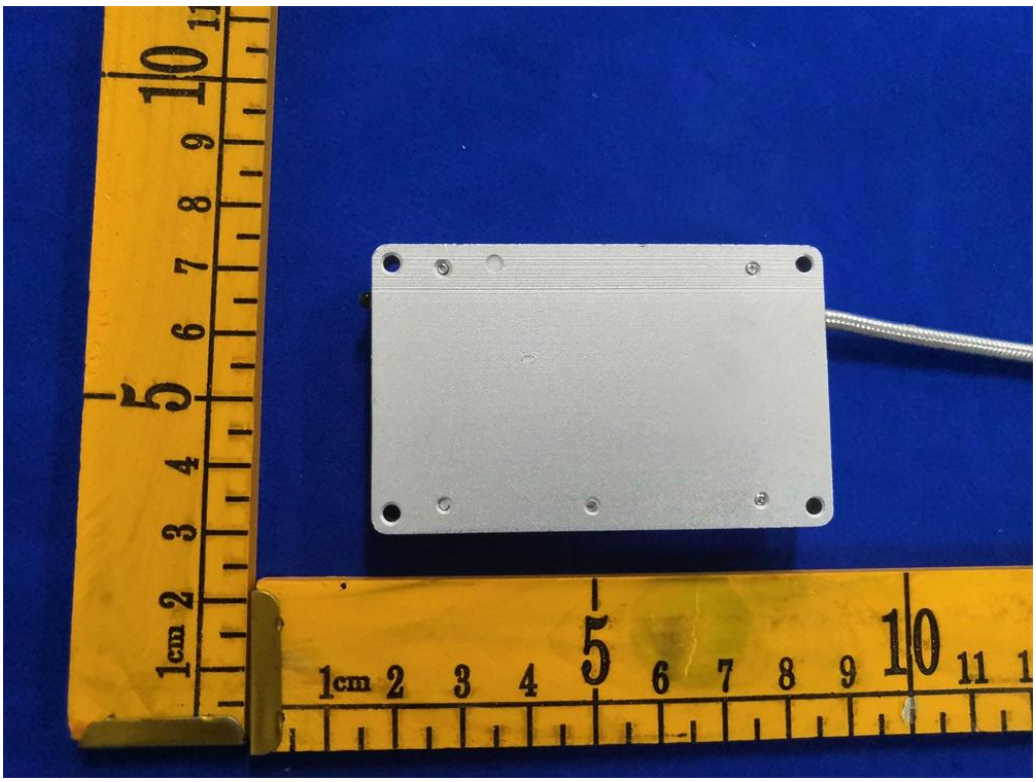


Fig. 13

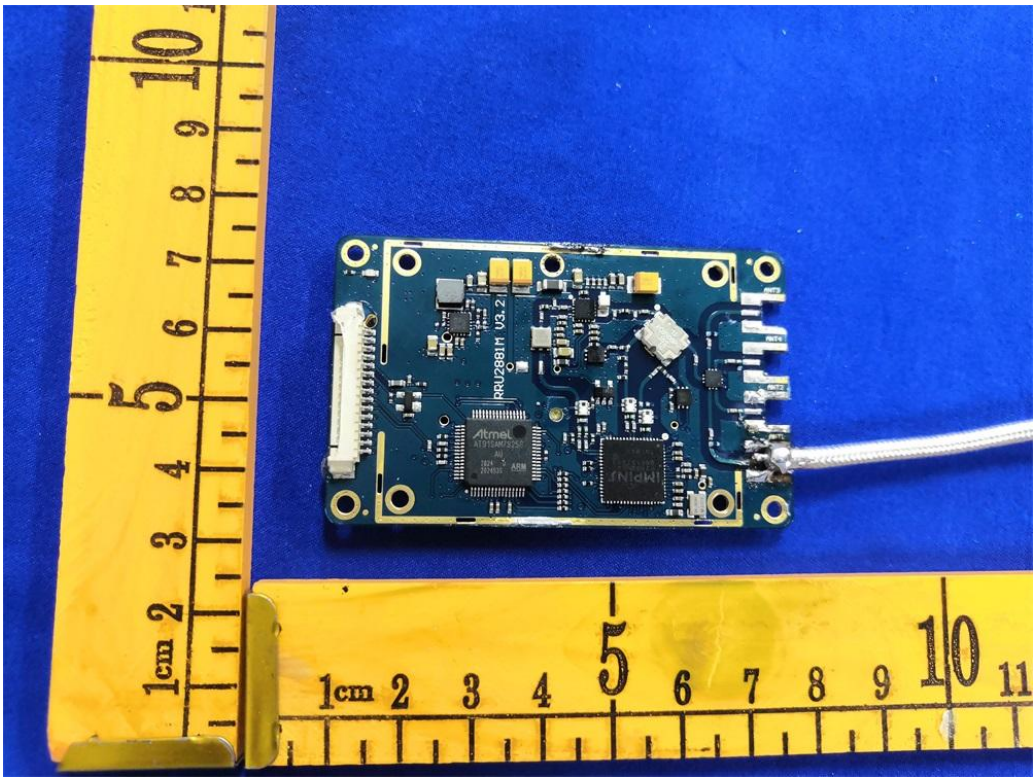


Fig. 14

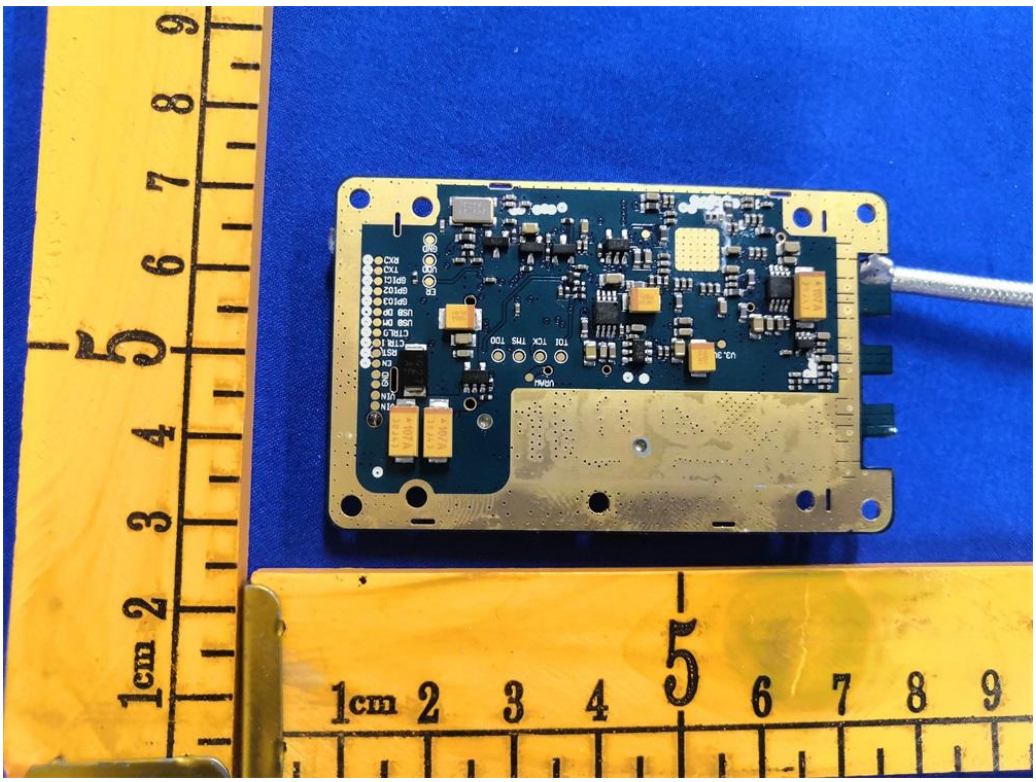


Fig. 15

Fig. 16

.....End of Report.....