

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT

Test Report No. : OT-191-RWD-013
AGR No. : A18DA-006
Applicant : ImGATE, Inc.
Address : B-404, 25 Pangyo-ro 256beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do 13487
South Korea
Manufacturer : ImGATE, Inc.
Address : B-404, 25 Pangyo-ro 256beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do 13487
South Korea
Type of Equipment : Digital Door Lock
FCC ID : 2AM9GIG720
Model Name : IG720
Multiple Model Name : IG700, IG701
Serial number : N/A
Total page of Report : 19 pages (including this page)
Date of Incoming : December 06, 2018
Date of Issuing : January 07, 2019

SUMMARY

The equipment complies with the requirements of **FCC CFR 47 PART 15 SUBPART C Section 15.225**

This test report contains only the result of a single test of the sample supplied for the examination.

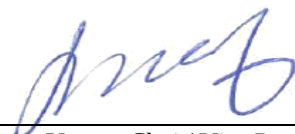
It is not a general valid assessment of the features of the respective products of the mass-production.

Reviewed by:



Jae-Ho Lee / Chief Engineer
ONETECH Corp.

Approved by:



Keun-Young, Choi / Vice President
ONETECH Corp.

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REVISION HISTORY

Issued Report No.	Issued Date	Revisions	Effect Section
OT-191-RWD-013	January 07, 2019	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

-. APPLICANT : ImGATE, Inc.
 -. ADDRESS : B-404, 25 Pangyo-ro 256beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do 13487 South Korea
 -. CONTACT PERSON : YoungJae Im / HW Team Leader
 -. TELEPHONE NO : +82-31-696-0499
 -. FCC ID : 2AM9GIG720
 -. MODEL NO/NAME : IG720
 -. SERIAL NUMBER : N/A
 -. DATE : January 07, 2019

DEVICE TYPE	DXX – Low Power Communication Device Transmitter
E.U.T. DESCRIPTION	Digital Door Lock
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC CFR47 Part 15 Subpart C Section 15.225
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	None
FINAL TEST WAS CONDUCTED ON	3 m Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. GENERAL INFORMATION

2.1 Product Description

The ImGATE, Inc., Model IG720 (referred to as the EUT in this report) is a Digital Door Lock, Product specification information described herein was obtained from product data sheet or user's manual.

Device Type	Digital Door Lock	
Operating Frequency	BLE	2 402 MHz ~ 2 480 MHz
	NFC	13.562 7 MHz
RF Output Power	BLE	-3.49 dBm
Number of Channel	BLE	40 Channels
	NFC	1 Channel
Modulation Type	BLE	GFSK
	NFC	ASK
Antenna Type	BLE	PCB Antenna
	NFC	PCB Loop antenna
Antenna Gain	BLE	0.11 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	16 MHz, 27.12 MHz	
Rated Supply Voltage	DC 6.0 V	

2.2 Model Differences:

-. The following lists consist of the added models and their differences.

Model Name	Differences	Tested
IG720	Basic Model.	☒
IG700	This model is identical to the basic model except MOTIS and Color.	☐
IG701		☐

Note: 1. Applicant consigns only basic model to test. Therefore this test report just guarantees the units, which have been tested.

2. The Applicant/manufacturer is responsible for the compliance of all variants.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in FCC PART 15 SUBPART C Section 15.225.

2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2013. Radiated testing was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The Onetech Corp. has been designated to perform equipment testing in compliance with ISO/IEC 17025.

The Electromagnetic compatibility measurement facilities are located at 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea

-. Site Filing:

VCCI (Voluntary Control Council for Interference) – Registration No. R-4112/ C-14617/ G-10666 / T-1842

IC (Industry Canada) – Registration No. Site# 3736A-3

-. Site Accreditation:

KOLAS (Korea Laboratory Accreditation Scheme) - Accreditation NO. KT085

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) – Designation No. KR0013

3. SYSTEM TEST CONFIGURATION

3.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER	FCC ID
Main Board	N/A	N/A	-
Front Board	N/A	N/A	-

3.2 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	Description	Connected to
G6-1121TV	HP	Notebook PC	EUT, AC/DC Adapter
PPP009C	HP	AC/DC Adapter	Notebook PC

3.3 Mode of operation during the test

-. The EUT has Bluetooth, program was used for making continuous transmission mode during the test.

3.4 Equipment Modifications

-. None

3.5 Configuration of Test System

Radiated Emission Test : Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10: 2013 to determine the worse operating conditions. The radiated emissions measurements were performed on the 10 m Semi Anechoic Chamber.

For frequencies from 150 kHz to 30 MHz measurements were made of the magnetic H field. The measuring antenna is an electrically screened loop antenna.

The frequency spectrum from 30 MHz to 1 000 MHz was scanned and maximum emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in the height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

3.6 Antenna Requirement

For intentional device, according to 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.

Antenna Construction:

The transmitter antenna of the EUT is a PCB antenna so there is no consideration of replacement by the user.

4. PRELIMINARY TEST

4.1 AC Power line Conducted Emissions Tests

As this product is only using DC power, AC conducted emission test has not been performed.

4.2 Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

Operation Mode	The Worse operating condition (Please check one only)
Tx Mode	X

5. FINAL RESULT OF MEASUREMENT

Preliminary test was done in normal operation mode. And the final measurement was selected for the maximized emission level.

5.1 RADIATED EMISSION TEST

5.1.1 Operation frequency band: 13.553 ~ 13.567 MHz

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 43 % R.H. Temperature: 23 °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209
 Type of Test : Low Power Transmitter below 1 705 kHz
 Result : PASSED

EUT : Digital Door Lock Date: December 12, 2018

Operating Condition : Transmitting Mode

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)

Distance : 3 m

Radiated Emission		Ant	Correction Factors		Total	FCC	
Freq. (MHz)	Amplitude (dBμV)	Pol.	Antenna (dB/m)	Cable (dB)	Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
13.562 7	27.95	H	19.8	0.3	48.05	124	75.95
13.562 7	22.37	V	19.8	0.3	42.47	124	81.53

Remark. The EUT was tested at 3 m, so conversion factor was included at above limit.



Tested by: Ha-Ram, Lee / Assistant Manager

5.1.2 Operation frequency band: Below 13.553 MHz and above 13.567 MHz

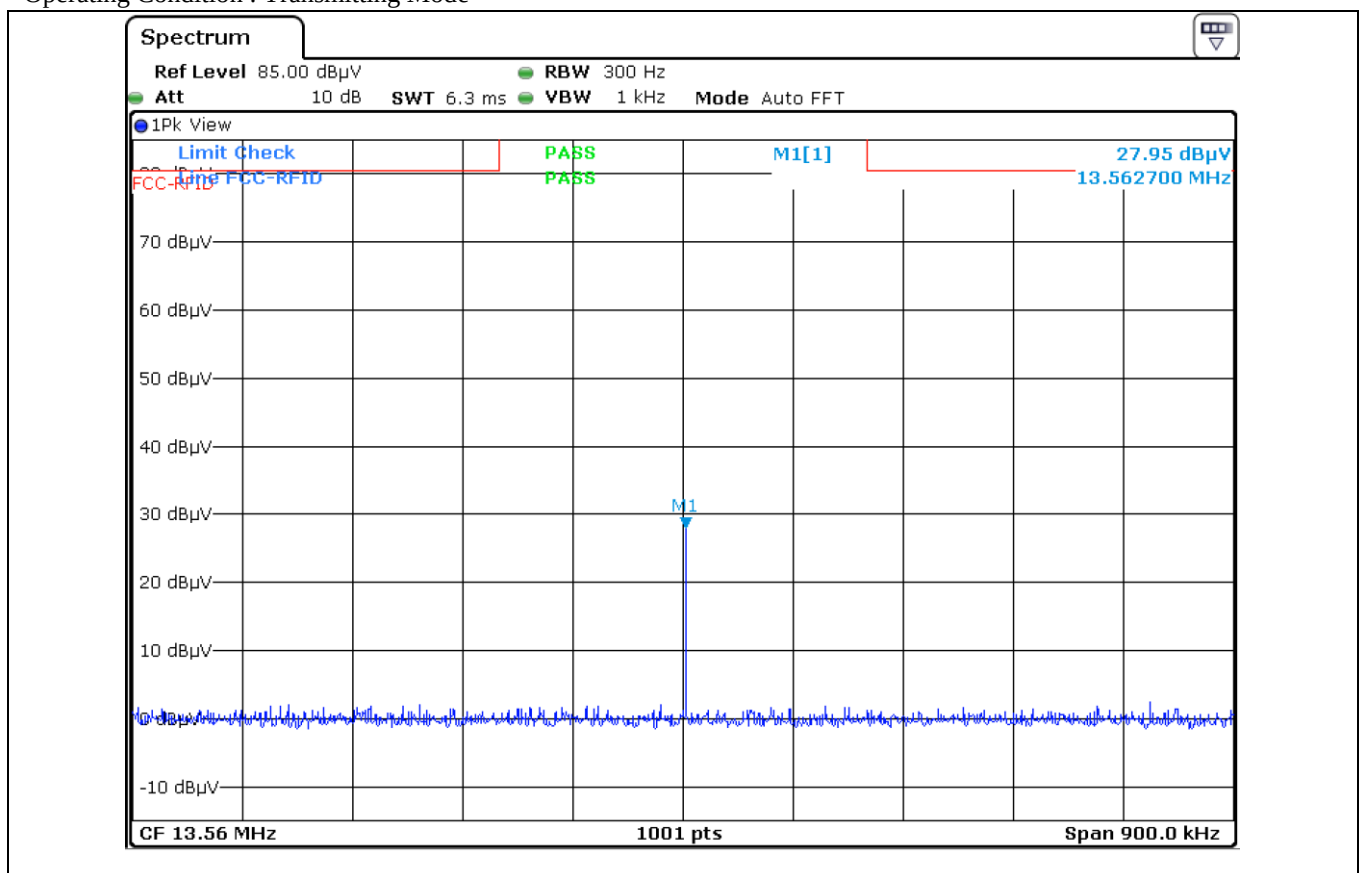
The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

Humidity Level : 43 % R.H. Temperature: 23 °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209
 Type of Test : Low Power Transmitter below 1 705 kHz
 Result : PASSED

EUT : Digital Door Lock

Date: December 12, 2018

Operating Condition : Transmitting Mode



cc. to above test data, the field strength level of 13.562 7 MHz is 27.95 dBuV/m and the worst limit subject to 15.225 (b) and (c) is 80.5 dBuV/m, so the EUT meets the requirement.

Tested by:  / Assistant Manager

5.2 SPURIOUS EMISSION TEST

5.2.1 Spurious Radiated Emission Below 30 MHz

Humidity Level : 43 % R.H. Temperature: 23 °C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209
Type of Test : Low Power Transmitter below 1 705 kHz
Frequency Range : 9 kHz ~ 30 MHz
Result : PASSED

EUT : Digital Door Lock Date: December 12, 2018

Operating Condition : Transmitting Mode

Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
Any emissions were not observed from the EUT.									



Tested by: Ha-Ram, Lee / Assistant Manager

5.2.2 Spurious Radiated Emission below 1 GHz

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.

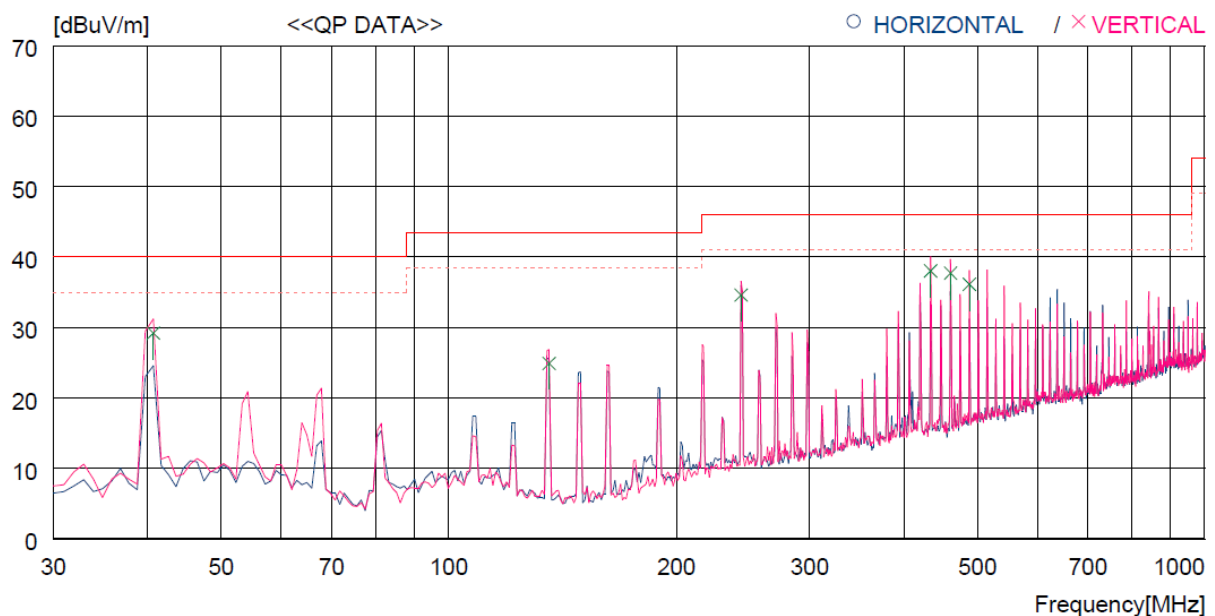
Humidity Level : 43 % R.H. Temperature: 23 °C
 Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209
 Type of Test : Low Power Transmitter below 1 705 kHz
 Frequency range : 30 MHz ~ 1 000 MHz
 Result : PASSED

EUT : Digital Door Lock

Date: December 12, 2018

Operating Condition : Transmitting Mode

Distance : 3 m



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	QP	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
		[dBuV]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Vertical -----										
1	40.670	47.0	13.8	1.5	33.1	29.2	40.0	10.8	100	266
2	135.730	46.4	8.8	2.7	33.0	24.9	43.5	18.6	100	135
3	243.400	51.5	12.4	3.6	32.9	34.6	46.0	11.4	200	324
4	433.521	49.9	16.4	4.8	33.1	38.0	46.0	8.0	100	27
5	460.681	49.6	16.3	4.9	33.1	37.7	46.0	8.3	100	176
6	487.841	47.1	17.1	5.1	33.2	36.1	46.0	9.9	100	176

Tested by: Ha-Ram, Lee / Assistant Manager

5.3 20 dB BANDWIDTH

5.3.1 Operating environment

Temperature : 23 °C
Relative humidity : 43 % R.H.

5.3.2 Test set-up

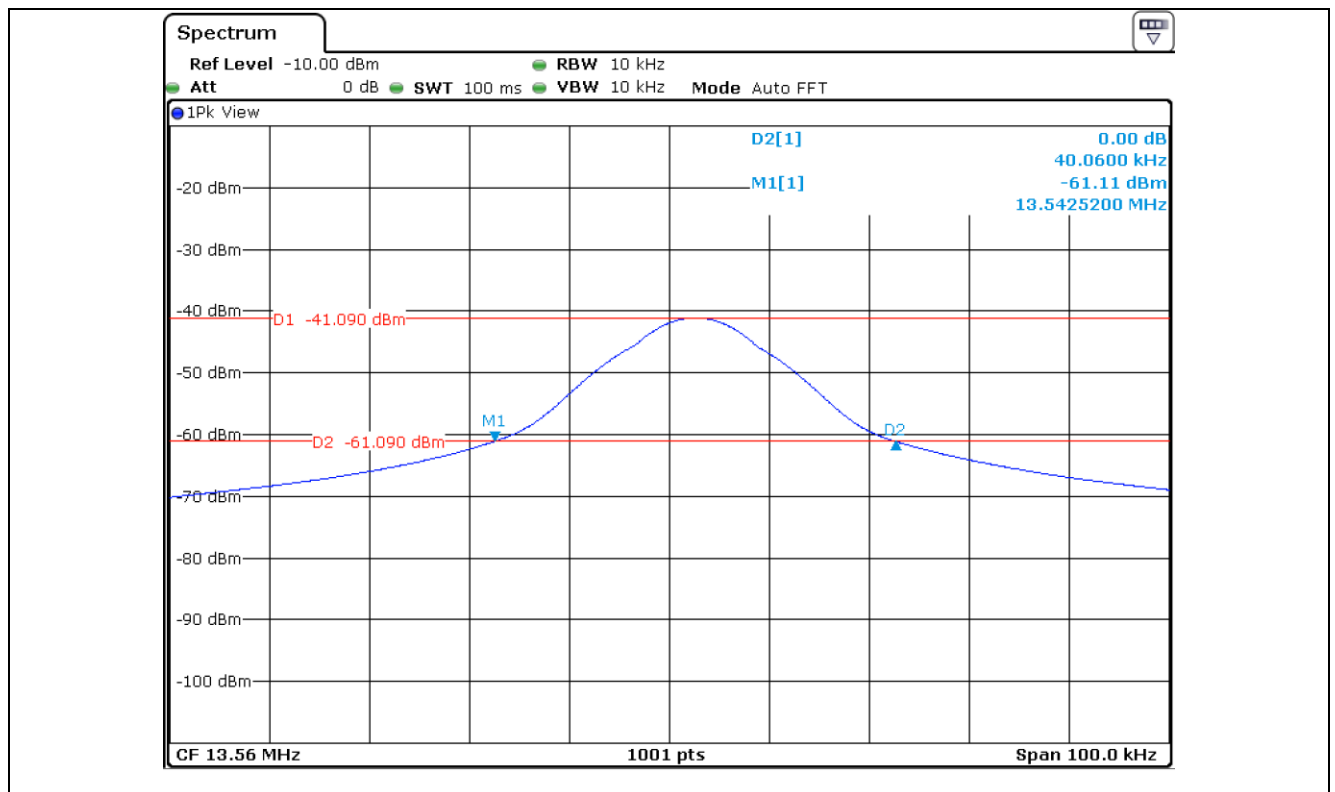
The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 10 kHz, and peak detection was used. The 20 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 20 dB.



5.3.3 Test data

- . Test Date : December 12, 2018
- . Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209

Operating Freq. (MHz)	Measured Value (kHz)	Assigned Operating Frequency Band (kHz)	Result
13.56	40.06	900	PASS





Tested by: Ha-Ram, Lee / Assistant Manager

5.4 FREQUENCY STABILITY WITH TEMPERATURE VARIATION

5.4.1 Operating environment

Temperature : 23 °C
Relative humidity : 43 % R.H.

5.4.2 Test set-up

Turn EUT off and set chamber temperature to -20 °C and then allow sufficient time (approximately 20 to 30 minutes after chamber reach the assigned temperature) for EUT to stabilize. Turn ON EUT and measure the EUT operating frequency and then turn off the EUT after the measurement. The temperature in the chamber was raised 10 °C step from -20 °C to +50°C. Repeat above method for frequency measurements every 10 °C step and then record all measured frequencies on each temperature step.

5.4.3 Test data

-. Test Date : December 12, 2018

-. Result : PASSED

Temperature (°C)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
-20	13 562 700	13,562,781	81	± 1 356.27
-10		13,562,769	69	
0		13,562,756	56	
10		13,562,742	42	
20		13,562,700	0	
30		13,562,715	15	
40		13,562,732	32	
50		13,562,748	48	



Tested by: Ha-Ram, Lee / Assistant Manager

5.5 FREQUENCY STABILITY WITH VOLTAGE VARIATION

5.5.1 Operating environment

Temperature : 23 °C
Relative humidity : 43 % R.H.

5.5.2 Test set-up

An external DC power supply was connected to the input of the EUT. The voltage of EUT set to 115 % of the nominal value and then was reduced to 85 % of nominal voltage. The output frequency was recorded at each step.

5.5.3 Test data

-. Test Date : December 12, 2018
-. Result : PASSED

Voltage (Vdc)	Carrier Freq. (Hz)	Measured Freq. (Hz)	Margin (Hz)	Limit (Hz)
6.9(115 %)	13 562 700	13,562,763	63	± 1 356.20
6.0(100 %)		13,562,700	0	
5.1(85 %)		13,562,748	48	



Tested by: Ha-Ram, Lee / Assistant Manager

6. FIELD STRENGTH CALCULATION

Meter readings are compared to the specification limit correcting for antenna and cable losses.

+	Meter reading	(dB μ V)
-	Amplifier Gain	(dB)
+	Cable Loss	(dB)
-	Antenna Factor	(dB/m)
=	Corrected Result	(dB μ V/m)

Margin (dB)

	Specification Limit	(dB μ V/m)
-	Corrected Result	(dB μ V/m)
=	dB Relative to Spec	($\pm$ dB)

7. LIST OF TEST EQUIPMENT

No.	EQUIPMENTS	MFR.	MODEL	SER. NO.	LAST CAL	DUE CAL	USE
1.	Test receiver	R/S	ESCI	101012	Oct. 22, 2018	One Year	☐
2.		R/S	ESR	101470	Oct. 22, 2018	One Year	☒
3.	Spectrum analyzer	R/S	FSV30	101200	Aug. 23, 2018	One Year	☒
4.	Amplifier	Sonoma Instrument	310N	312544	Mar. 28, 2018	One Year	☒
5.	Amplifier	Sonoma Instrument	310N	312545	Mar. 28, 2018	One Year	☐
6.	BBV 9718 B	Schwarzbeck	Broadband Preamplifier	009	Mar. 16, 2018	One Year	☒
7.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-255	Jun. 05, 2018	Two Year	☒
8.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-419	Aug. 09, 2018	Two Year	☐
9.	Controller	Innco System	CO3000	CO3000/904/ 37211215/L	N/A	N/A	☒
10.	LISN	EMCO	3825/2	9109-1869	Apr. 11, 2018	One Year	☐
		Schwarzbeck	NSLK8126	8126-480	Oct. 22, 2018	One Year	☐
		Schwarzbeck	NSLK8126	8128-479	Oct. 22, 2018	One Year	☐
11.	Turn Table	Innco System	DT3000-3t	N/A	N/A	N/A	☒
12.	Antenna Master	Innco System	MA-4000XPET	MA4000/509/ 37211215/L	N/A	N/A	☒
13.	Antenna Master	Innco System	MA4000-EP	MA4000/332/ 27030611/L	N/A	N/A	☐
14.	Loop Antenna	Schwarzbeck	FMZB 1513	1513-235	May. 13, 2018	Two Year	☒
15.	Frequency Counter	HP	53152A	US39270295	Aug. 23, 2018	One Year	☒
16.	Chamber	ESPEC	PSL-2KP	14009407	Feb. 23, 2018	One Year	☒
17.	DC Power Supply	Protek	PWS-3003D	4020409	Aug. 24, 2018	One Year	☐