ONETECH

# RADIO PERFORMANCE TEST REPORT

Test Report No.	: OT-222-RWD-028
Reception No.	: 2201000227
Applicant	: 3i Inc
Address	: 3-321 523, Dongdaegu-ro, Dong-gu, Daegu, 41228, South Korea
Manufacturer	: Nteklogic
Address	: 42, Maehwa-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
Type of Equipment	: Pivo Remote Control 2.0
FCC ID.	: 2AS3Q-PV-ERC2
Model Name	: PV-ERC2
Serial number	: N/A
Total page of Report	: 32 pages (including this page)
Date of Incoming	: January 21, 2022
Date of issue	: February 21, 2022

# SUMMARY

The equipment complies with the regulation; *FCC PART 15 SUBPART C Section 15.247* This test report only contains the result of a single test of the sample supplied for the examination. It is not a generally valid assessment of the features of the respective products of the mass-production.

Tested by Young-Yong, Kim / Manager ONETECH Corp.

Reviewed by Tae-Ho, Kim / General Manager ONETECH Corp.

Approved by Ki-Hong, Nam / General Manager ONETECH Corp.

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OTC-TRF-RF-001(0)

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)



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# **Revision History**

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-222-RWD-028	February 21, 2022	Initial Release	All



# **1. VERIFICATION OF COMPLIANCE**

Applicant : 3i Inc

Address : 3-321 523, Dongdaegu-ro, Dong-gu, Daegu, 41228, South Korea

Contact Person: Sinho, Kim / Manager

Telephone No. : +82-10-4312-5197

FCC ID : 2AS3Q-PV-ERC2

Model Name : PV-ERC2

Brand Name : -

Serial Number : N/A

Date : February 21, 2022

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	Pivo Remote Control 2.0
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2020
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247 KDB 558074 D01 15.247 Meas Guidance v05r02
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. TEST SUMMARY

#### 2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
15.247 (a) (2)	Minimum 6 dB Bandwidth	Met the Limit / PASS
15.247 (b) (3)	Maximum Peak Conducted Output Power	Met the Limit / PASS
15.247 (d)	100 kHz Bandwidth Outside the Frequency Band	Met the Limit / PASS
15.247 (d)	Radiated Emission which fall in the Restricted Band	Met the Limit / PASS
15.247 (e)	Peak Power Spectral Density	Met the Limit / PASS
15.209	Radiated Emission Limits	Met the Limit / PASS
15.207	Conducted Limits	N/A (See Note)
15.203	Antenna Requirement	Met requirement / PASS

Note: This test is not performed because the EUT is operated by DC Battery.

#### 2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

#### 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 15.247.

#### 2.5 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10: 2020. 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-20122/ C-14617/ G-10666/ T-11842

ISED (Innovation, Science and Economic Development Canada) - Registration No. Site# 3736A-3

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

FCC (Federal Communications Commission) - Accreditation No. KR0013

RRA (Radio Research Agency) - Designation No. KR0013



# **3. GENERAL INFORMATION**

## **3.1 Product Description**

The 3i Inc, Model PV-ERC2 (referred to as the EUT in this report) is a Pivo Remote Control 2.0. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Pivo Remote Control 2.0
OPERATING FREQUENCY	2 402 MHz ~ 2 480 MHz
MODULATION TYPE	DSSS Modulation(GFSK)
RF OUTPUT POWER	-0.83 dBm
NUMBER OF CHANNEL	40 Channel
ANTENNA TYPE	PCB Antenna
ANTENNA GAIN	1.48 dBi
Electrical Rating	DC 3.0 V
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)	38.4 MHz

## 3.2 Alternative type(s)/model(s); also covered by this test report.

-. None

# 4. EUT MODIFICATIONS

-. None



# **5. SYSTEM TEST CONFIGURATION**

## 5.1 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	Nteklogic	BAND3_MAIN_A_G1921	N/A

## 5.2 Peripheral equipment

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

Model	Manufacturer	Description	Connected to
PV-ERC2	Nteklogic	Pivo Remote Control 2.0 (EUT)	-

## 5.3 Mode of operation during the test

For the testing, software used to control the EUT for staying in continuous transmitting is programmed.

For final testing, the EUT was set at 2 402 MHz, 2 440 MHz, and 2 480 MHz to get a maximum emission levels from the EUT. The EUT was moved throughout the XY, XZ, and YZ planes and the worst case is "XY" axis, but the worst data was recorded in this report.

### -. Channel List (Bluetooth LE)

Channel	Frequency[MHz]	Channel	Frequency[MHz]	Channel	Frequency[MHz]
0	2 402.00	14	2 430.00	28	2 458.00
1	2 404.00	15	2 432.00	29	2 460.00
2	2 406.00	16	2 434.00	30	2 462.00
3	2 408.00	17	2 436.00	31	2 464.00
4	2 410.00	18	2 438.00	32	2 466.00
5	2 412.00	19	2 440.00	33	2 468.00
6	2 414.00	20	2 442.00	34	2 470.00
7	2 416.00	21	2 444.00	35	2 472.00
8	2 418.00	22	2 446.00	36	2 474.00
9	2 420.00	23	2 448.00	37	2 476.00
10	2 422.00	24	2 450.00	38	2 478.00
11	2 424.00	25	2 452.00	39	2 480.00
12	2 426.00	26	2 454.00		
13	2 428.00	27	2 456.00		

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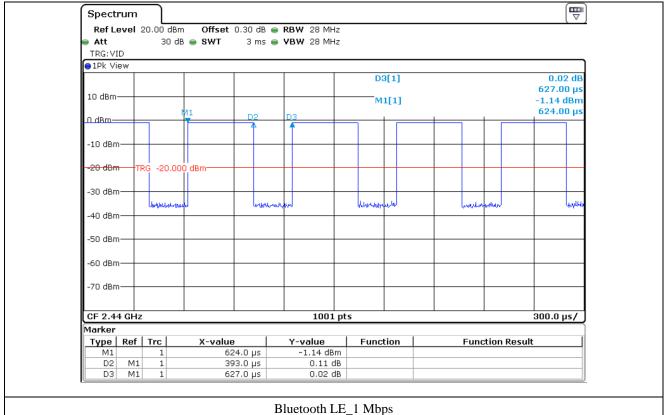
-. Duty Cycle

Mode	Tx On Time	Tx Off Time	Duty Cycle	Correction Factor
Wide	[ ms ]	[ ms ]	[%]	[ dB ]
Bluetooth LE_1 Mbps	0.395	0.625	63.20	1.99

Note - Duty Cycle : (Tx On Time / (Tx On Time + Tx Off Time)) \* 100

Correction Factor : 10 \* Log(1 / (Duty Cycle / 100))

-. Test Plot





#### 5.4 Configuration of Test System

**Line Conducted Test**: It is not need to test this requirement, because the EUT shall be operated by DC Battery.

Radiated Emission Test:Preliminary radiated emissions test were conducted using the procedure in ANSI C63.10:<br/>2020 to determine the worse operating conditions. Final radiated emission tests were<br/>conducted at 3 meter Semi Anechoic Chamber.<br/>The turntable was rotated through 360 degrees and the EUT was tested by positioned<br/>three orthogonal planes to obtain the highest reading on the field strength meter. Once<br/>maximum reading was determined, the search antenna was raised and lowered in both<br/>vertical and horizontal polarization.

#### **5.5 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 antenna of the EUT is a PCB Antenna on the main Board in the EUT, so that it cannot be replaced by the user.

## 6. PRELIMINARY TEST

#### 6.1 AC Power line Conducted Emissions Tests

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)	
It is not need to test this requirement, because the power of the EUT is supplied by DC Battery.		

### **6.2 General Radiated Emissions Tests**

During Preliminary Test, the following operating mode was investigated.

Operation Mode	The Worse operating condition (Please check one only)
Transmitting Mode	Х



# 7. MINIMUM 6 dB BANDWIDTH

## 7.1 Operating environment

Temperature	: 21 °C
Relative humidity	: 49 % R.H.

## 7.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, and peak detection was used. The 6 dB bandwidth is defined as the total spectrum over which the power is higher than the peak power minus 6 dB.



## 7.3 Test Date

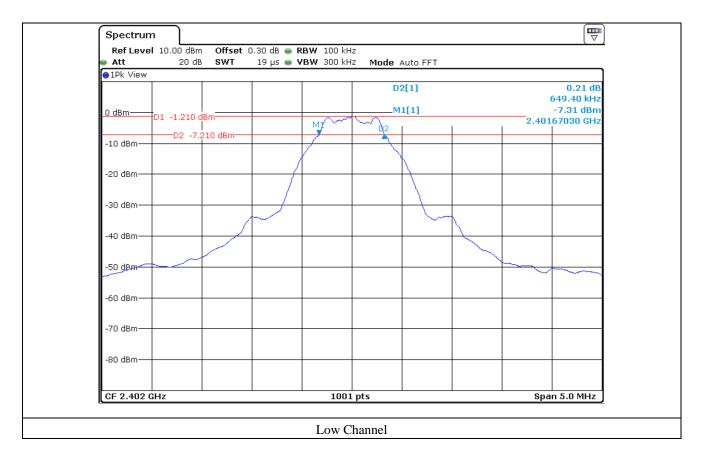
January 21, 2022 ~ January 28, 2022



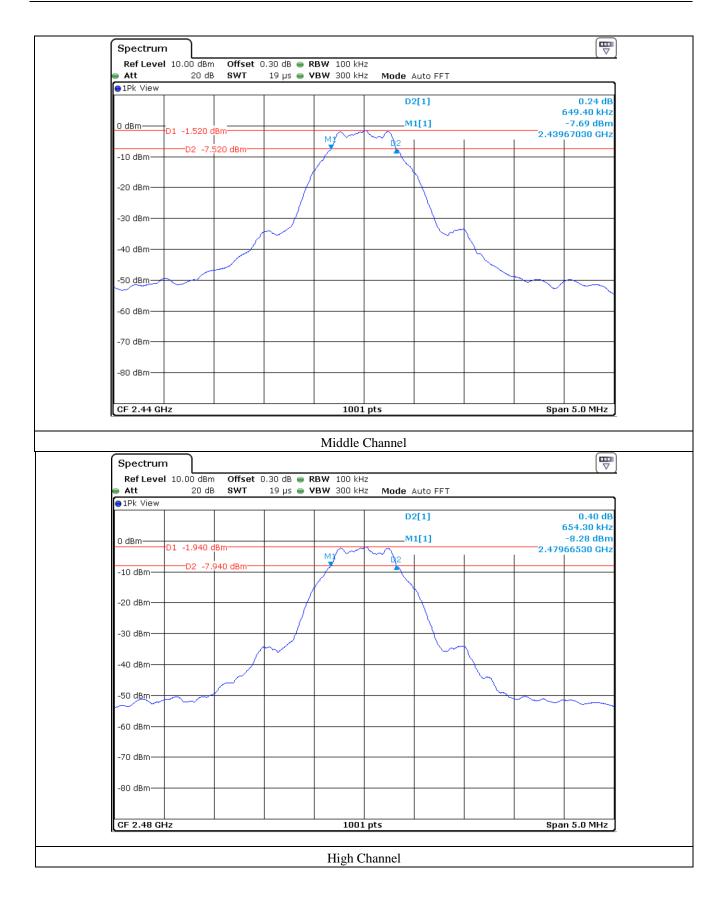
# 7.4 Test data for 1 Mbps

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (kHz)	LIMIT (kHz)	MARGIN (kHz)
Low	2 402.00	649.40	500.00	149.40
Middle	2 440.00	649.40	500.00	149.40
High	2 480.00	654.30	500.00	154.30

Remark. Margin = Measured Value - Limit









# 8. MAXIMUM PEAK OUTPUT POWER

## 8.1 Operating environment

Temperature	: 21 °C
Relative humidity	: 49 % R.H.

#### 8.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to  $\geq$  DTS Bandwidth, the video bandwidth is set to 3 times the resolution bandwidth.



### 8.3 Test Date

January 21, 2022 ~ January 28, 2022



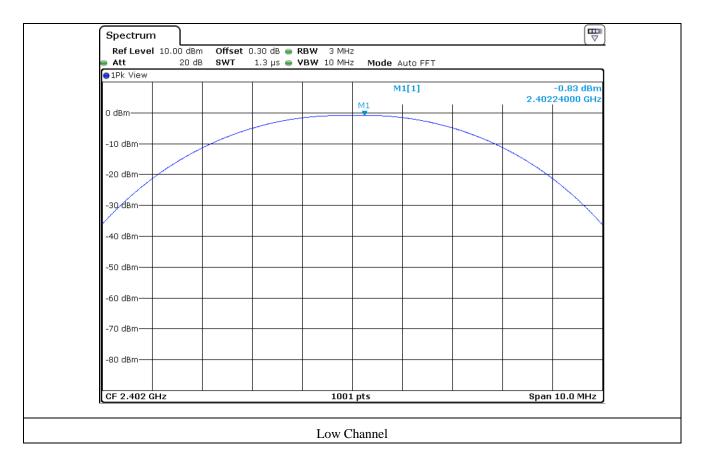
# 8.4 Test data for 1 Mbps

-. Test Result

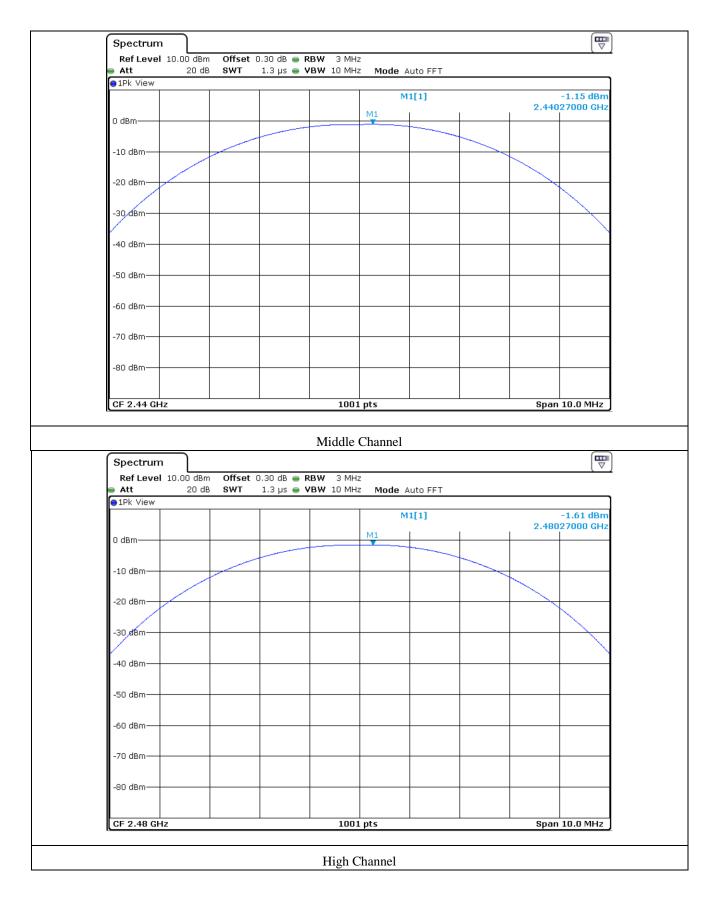
: Pass

CHANNEL	FREQUENCY	MEASURED VALUE	LIMIT	MARGIN
	(MHz)	(dBm)	(dBm)	(dB)
LOW	2 402.00	-0.83	30.00	30.83
MIDDLE	2 440.00	-1.15	30.00	31.15
HIGH	2 480.00	-1.61	30.00	31.61

Remark. Margin = Limit – Measured Value (=Receiver Reading + Cable Loss)











# 9. 100 kHz BANDWIDTH OUTSIDE THE FREQUENCY BAND

### 9.1 Operating environment

Temperature	: 21 °C
Relative humidity	: 49 % R.H.

### 9.2 Test set-up for conducted measurement

The antenna output of the EUT was connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz, the video bandwidth is set to 3 times the resolution bandwidth and peak detection was used.



### 9.3 Test set-up for radiated measurement

The radiated emissions measurements were performed on the 3 m semi anechoic chamber. The EUT was placed on turntable approximately 1.5 m above the ground plane.

The frequency spectrum from 30 MHz to 26.5 GHz was scanned and maximum emission levels 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 horizontal and vertical polarization of the receiving antenna.

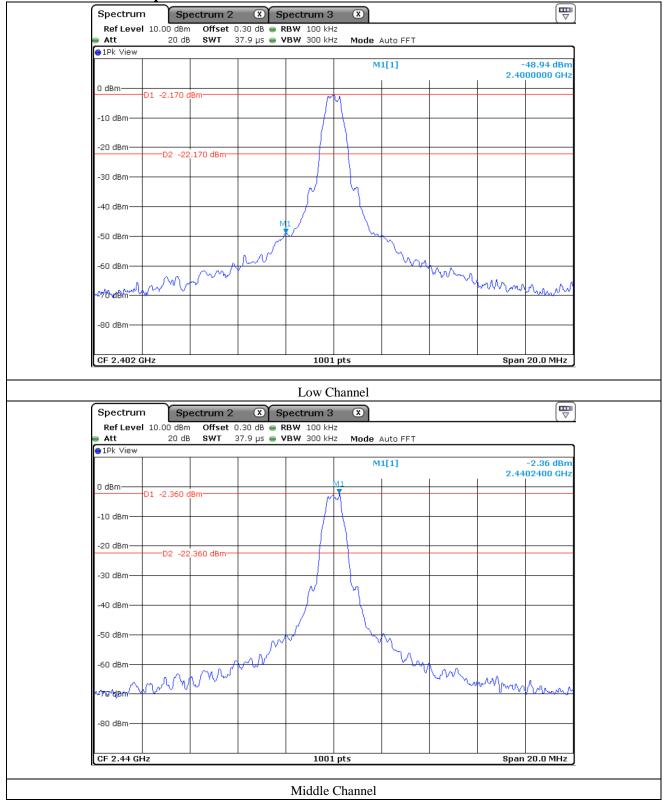
## 9.4 Test Date

January 21, 2022 ~ January 28, 2022



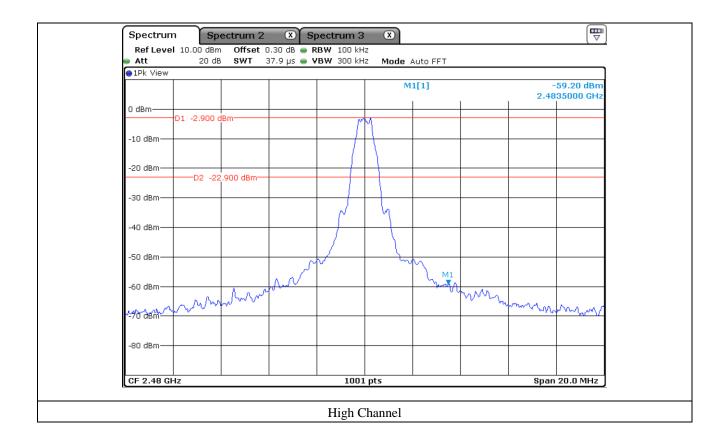
## 9.5 Test data for conducted emission

#### 9.5.1 Test data for 1 Mbps



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Spectrun		_	⊛ s						
Ref Leve Att	10.00 dBm 20 dB			RBW 100 kH VBW 300 kH		Auto Sweep			
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Start 30.0	MHz							50	p 2.5 GH2
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Spectrun Ref Leve Att 1Pk View 0 dBm	n Sp I 10.00 dBm 20 dE	dBm	0.50 dB • F 240 ms • V	Low C pectrum 3 RBW 100 kH 7BW 300 kH	hannel X   Z   Mode	1[1]			59.68 dBm 4.8140 GHz
Spectrun Ref Leve Att IPk View 0 dBm -10 dBm -20 dBm -30 dBm -50 dBm -60 dBm	n Sp I 10.00 dBm 20 dE	dBm	0.50 dB • F 240 ms • V	Low C pectrum 3 RBW 100 kH	hannel (X) Z Mode /	1[1]	Wildow Lotator U		59.68 dBm 4.8140 GHz
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Spectrun Ref Leve Att IPk View 0 dBm -10 dBm -20 dBm -30 dBm -50 dBm -60 dBm	n Sp I 10.00 dBm 20 dE	dBm	0.50 dB • F 240 ms • V	Low C pectrum 3 RBW 100 kH 7BW 300 kH	hannel X   Z   Mode	1[1]	villout on the		59.68 dBm 4.8140 GHz
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OTC-TRF-RF-001(0)



Spectrum		ectrum 2		pectrum 3					
Ref Level Att	l 10.00 dBm 20 dB			RBW 100 k⊢ ∕BW 300 k⊢		Auto Sweep	)		
⊖1Pk View									
					M	1[1]			65.67 dBm 38280 GHz
0 dBm									
-10 dBm									
-20 dBm	D1 -22.360	dBm							
-30 dBm									
-40 dBm									
-50 dBm									
60 db									
-60 dBm									M1
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-80 dBm									
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Spectrum	n Sp	ectrum 2	× Sp	Middle pectrum 3	<u> </u>				
Ref Level Att	n Spo I 10.00 dBm 20 dB	Offset 0	).50 dB 😑 R		<b>x</b>	Auto Sweep			
Ref Level	10.00 dBm	Offset 0	).50 dB 😑 R	pectrum 3 RBW 100 kH	Z Z Z Mode #				,
Ref Level Att 1Pk View	10.00 dBm	Offset 0	).50 dB 😑 R	pectrum 3 RBW 100 kH	Z Z Z Mode #	Auto Sweep 1[1]	1		58.52 dBm -5860 GHz
Ref Level Att	10.00 dBm	Offset 0	).50 dB 😑 R	pectrum 3 RBW 100 kH	Z Z Z Mode #				.58.52 dBm
Ref Level Att 1Pk View 0 dBm	10.00 dBm	Offset 0	).50 dB 😑 R	pectrum 3 RBW 100 kH	Z Z Z Mode #				.58.52 dBm
Ref Level Att 1Pk View	10.00 dBm	Offset 0	).50 dB 😑 R	pectrum 3 RBW 100 kH	Z Z Z Mode #				.58.52 dBm
Ref Level       Att       1Pk View       0 dBm       -10 dBm       -20 dBm	1 10.00 dBm 20 dB	Offset 0	).50 dB 😑 R	pectrum 3 RBW 100 kH	Z Z Z Mode #				.58.52 dBm
Perf Level       Att       1Pk View       0 dBm       -10 dBm       -20 dBm	10.00 dBm	Offset 0	).50 dB 😑 R	pectrum 3 RBW 100 kH	Z Z Z Mode #				.58.52 dBm
Ref Level       Att       1Pk View       0 dBm       -10 dBm       -20 dBm	1 10.00 dBm 20 dB	Offset 0	).50 dB 😑 R	pectrum 3 RBW 100 kH	Z Z Z Mode #				.58.52 dBm
Ref Level       Att       1Pk View       0 dBm       -10 dBm       -20 dBm       -30 dBm	1 10.00 dBm 20 dB	Offset 0	).50 dB 😑 R	pectrum 3 RBW 100 kH	Z Z Z Mode #				.58.52 dBm
Perf Level       Att       1Pk View       0 dBm       -10 dBm       -20 dBm	1 10.00 dBm 20 dB	Offset 0	).50 dB 😑 R	pectrum 3 RBW 100 kH	Z Z Z Mode #				.58.52 dBm
Ref Level       Att       1Pk View       0 dBm       -10 dBm       -20 dBm       -30 dBm	1 10.00 dBm 20 dB	Offset 0	).50 dB 😑 R	pectrum 3 RBW 100 kH	Z Z Z Mode #				.58.52 dBm
Ref Level       Att       1Pk View       0 dBm       -10 dBm       -20 dBm       -30 dBm       -40 dBm	D1 -22.360	Offset 0	).50 dB 😑 R	pectrum 3 RBW 100 kH	Z Z Z Mode #				.58.52 dBm
Ref Level       Att       1Pk View       0 dBm       -10 dBm       -20 dBm       -30 dBm       -40 dBm       -50 dBm	D1 -22.360	dBm	0.50 dB • R 240 ms • V	pectrum 3 RBW 100 kH /BW 300 kH	X Mode /	1[1]			58.52 dBm 4.8860 GHz
Ref Level       Att       • 1Pk View       0 dBm       -10 dBm       -20 dBm       -30 dBm       -40 dBm       -50 dBm	D1 -22.360	dBm	0.50 dB • R 240 ms • V	pectrum 3 RBW 100 kH	X Mode /	1[1]			.58.52 dBm
Ref Level       Att       1Pk View       0 dBm       -10 dBm       -20 dBm       -30 dBm       -40 dBm       -50 dBm	D1 -22.360	dBm	0.50 dB • R 240 ms • V	pectrum 3 RBW 100 kH /BW 300 kH	X Mode /	1[1]			58.52 dBm 4.8860 GHz
Ref Level       Att       1Pk View       0 dBm       -10 dBm       -20 dBm       -30 dBm       -30 dBm       -50 dBm       -60 dBm       -80 dBm	D1 -22.360	dBm	0.50 dB • R 240 ms • V	pectrum 3 RBW 100 kH /BW 300 kH	X Mode /	1[1]			58.52 dBm 4.8860 GHz
Ref Level       Att       • 1Pk View       0 dBm       -10 dBm       -20 dBm       -30 dBm       -40 dBm       -50 dBm	D1 -22.360	dBm	0.50 dB • R 240 ms • V	pectrum 3 RBW 100 kH /BW 300 kH	X Mode /	1[1]			58.52 dBm 4.8860 GHz
Ref Level       Att       1Pk View       0 dBm       -10 dBm       -20 dBm       -30 dBm       -30 dBm       -50 dBm       -60 dBm       -80 dBm	10.00 dBm 20 dB D1 -22.360	dBm	0.50 dB • R 240 ms • V	pectrum 3 RBW 100 kH /BW 300 kH	X Mode /	1[1]		land and based on the	58.52 dBm 4.8860 GHz

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OTC-TRF-RF-001(0)



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Ref Leve Att	el 10.00 dBm 20 dB			<b>RBW</b> 100 kH ✔ <b>BW</b> 300 kH		Auto Sweep			
●1Pk View									
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0 dBm									
-10 dBm—									
-20 dBm—									
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Ref Leve	el 10.00 dBm	Offset (	).50 dB 👄 R	pectrum 3 RBW 100 kH	x	Auto Swoon			(The second seco
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Ref Leve Att	el 10.00 dBm	Offset (	).50 dB 👄 R	pectrum 3 RBW 100 kH	Z Z Z Mode /	Auto Sweep			55.86 dBm
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Ref Leve Att 1Pk View	el 10.00 dBm	Offset (	).50 dB 👄 R	pectrum 3 RBW 100 kH	Z Z Z Mode /				55.86 dBm
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Ref Leve Att 1Pk View 0 dBm	20 dBm 20 dB	Offset (	).50 dB 👄 R	pectrum 3 RBW 100 kH	Z Z Z Mode /				55.86 dBm
Ref Leve       Att       1Pk View       0 dBm       -10 dBm       -20 dBm       -30 dBm       -40 dBm	20 dBm 20 dB	Offset (	).50 dB 👄 R	pectrum 3 RBW 100 kH	Z Z Z Mode /				55.86 dBm
Ref Leve       Att       1Pk View       0 dBm       -10 dBm       -20 dBm       -30 dBm       -40 dBm	10.00 dBm 20 dB 20 dE	dBm	0.50 dB • R 240 ms • V	pectrum 3 xBW 100 kH /BW 300 kH	X Mode /	1[1]			55.86 dBm +.9580 GHz
Ref Leve       Att       1Pk View       0 dBm       -10 dBm       -20 dBm       -30 dBm       -40 dBm       -50 dBm       r	10.00 dBm 20 dB 20 dE	dBm	0.50 dB • R 240 ms • V	pectrum 3 xBW 100 kH /BW 300 kH	X Mode /	1[1]			55.86 dBm +.9580 GHz
Ref Leve       Att       1Pk View       0 dBm       -10 dBm       -20 dBm       -30 dBm       -40 dBm	10.00 dBm 20 dB 20 dE	dBm	0.50 dB • R 240 ms • V	pectrum 3 RBW 100 kH	X Mode /	1[1]			55.86 dBm +.9580 GHz
Ref Leve       Att       1Pk View       0 dBm       -10 dBm       -20 dBm       -30 dBm       -40 dBm       -50 dBm       -60 dBm	10.00 dBm 20 dB 20 dE	dBm	0.50 dB • R 240 ms • V	pectrum 3 xBW 100 kH /BW 300 kH	X Mode /	1[1]			55.86 dBm +.9580 GHz
Ref Leve       Att       1Pk View       0 dBm       -10 dBm       -20 dBm       -30 dBm       -40 dBm       -50 dBm       r	10.00 dBm 20 dB 20 dE	dBm	0.50 dB • R 240 ms • V	pectrum 3 xBW 100 kH /BW 300 kH	X Mode /	1[1]			55.86 dBm +.9580 GHz
Ref Leve       Att       1Pk View       0 dBm       -10 dBm       -20 dBm       -30 dBm       -40 dBm       -50 dBm       -60 dBm	10.00 dBm 20 dB 20 dB	dBm	0.50 dB • R 240 ms • V	pectrum 3 xBW 100 kH /BW 300 kH	X Mode /	1[1]			55.86 dBm +.9580 GHz



## 9.6 Test data for radiated emission

#### 9.6.1 Radiated Emission which fall in the Restricted Band

#### 9.6.1.1 Test data for 1 Mbps

- -. Resolution bandwidth 21 MHz and Peak Detector for Peak Mode
  - 1 MHz and RMS Detector for Average Mode
- -. Video bandwidth : 3 MHz for Peak and Average Mode
- -. Measurement distance : 3 m
- -. Duty Cycle : 63.20 %
- -. Result : <u>PASSED</u>

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Gain	AMP Factor	Duty Factor (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
				Test D	ata for L	low Cha	nnel				
2 336.86	52.27	Peak	Н	28.30	6.03	45.14	10.48	-	51.94	74.00	22.06
2 348.01	41.61	Average	Н	28.30	6.03	45.14	10.48	1.99	43.27	54.00	10.73
2 483.50	57.23	Peak	v	28.30	6.03	45.14	10.48	-	56.90	74.00	17.10
2 347.20	41.39	Average	v	28.30	6.03	45.14	10.48	1.99	43.05	54.00	10.95
				Test D	ata for H	ligh Cha	nnel				
2 360.40	51.52	Peak	Н	28.70	6.12	45.79	10.51	-	51.06	74.00	22.94
2 485.20	42.04	Average	Н	28.70	6.12	45.79	10.51	1.99	43.57	54.00	10.43
2 483.80	51.91	Peak	V	28.70	6.12	45.79	10.51	-	51.45	74.00	22.55
2 483.50	41.05	Average	V	28.70	6.12	45.79	10.51	1.99	42.58	54.00	11.42

Remark: "H": Horizontal, "V": Vertical

Margin (dB) = Limits (dB $\mu$ V/m) - Total Level (dB $\mu$ V/m)

Total Level = Reading + Antenna Factor + Cable Loss - AMP Gain + Duty Factor + AMP Factor



#### 9.6.2 Spurious & Harmonic Radiated Emission

#### 9.6.2.1 Test data for 1 Mbps

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,

1 MHz for Peak Mode for the emissions outside restricted band

- -. Video bandwidth : 3 MHz for Peak and Average Mode
- -. Frequency range : 1 GHz ~ 26.5 GHz
- -. Measurement distance : 3 m
- -. Duty Cycle : 63.20 %
- -. Result : <u>PASSED</u>

Frequency (MHz)	Reading (dBµV)	Detector Mode	Ant. Pol. (H/V)	Ant. Factor	Cable Loss	AMP Gain	AMP Factor	Duty Factor (dB)	Total (dBµV/m)	Limits (dBµV/m)	Margin (dB)
				Test D	ata for L	ow Chai	nnel				
4 804.00	49.44	Peak	Н	33.40	7.91	45.10	-	-	45.65	74.00	28.35
4 804.00	40.02	Average	Н	33.40	7.91	45.10	-	1.99	38.22	54.00	15.78
4 804.00	48.96	Peak	V	33.40	7.91	45.10	-	-	45.17	74.00	28.83
4 804.00	39.24	Average	V	33.40	7.91	45.10	-	1.99	37.44	54.00	16.56
				Test Dat	ta for Mi	iddle Cha	annel				
4 880.00	48.70	Peak	Н	33.50	8.08	45.08	-	-	45.20	74.00	28.80
4 880.00	41.34	Average	Н	33.50	8.08	45.08	-	1.99	39.83	54.00	14.17
4 880.00	49.40	Peak	V	33.50	8.08	45.08	-	-	45.90	74.00	28.10
4 880.00	39.13	Average	V	33.50	8.08	45.08	-	1.99	37.62	54.00	16.38
				Test Da	ata for H	ligh Cha	nnel				
4 960.00	48.69	Peak	Н	33.30	8.14	45.03	-	-	45.10	74.00	28.90
4 960.00	40.56	Average	Н	33.30	8.14	45.03	-	1.99	38.96	54.00	15.04
4 960.00	49.37	Peak	V	33.30	8.14	45.03	-	-	45.78	74.00	28.22
4 960.00	39.01	Average	V	33.30	8.14	45.03	-	1.99	37.41	54.00	16.59

Remark: "H": Horizontal, "V": Vertical

Margin (dB) = Limits (dB $\mu$ V/m) - Total Level (dB $\mu$ V/m)

Total Level = Reading + Antenna Factor + Cable Loss - AMP Gain + Duty Factor

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# **10. PEAK POWER SPECTRAL DENSITY**

## **10.1 Operating environment**

Temperature: 21 °CRelative humidity: 49 % R.H.

#### 10.2 Test set-up

The antenna output of the EUT was connected to the spectrum analyzer.

The resolution bandwidth is set to 3 kHz  $\leq$  RBW  $\leq$  100 kHz, the video bandwidth is set to 3 times the resolution bandwidth.



#### 10.3 Test Date

January 21, 2022 ~ January 28, 2022



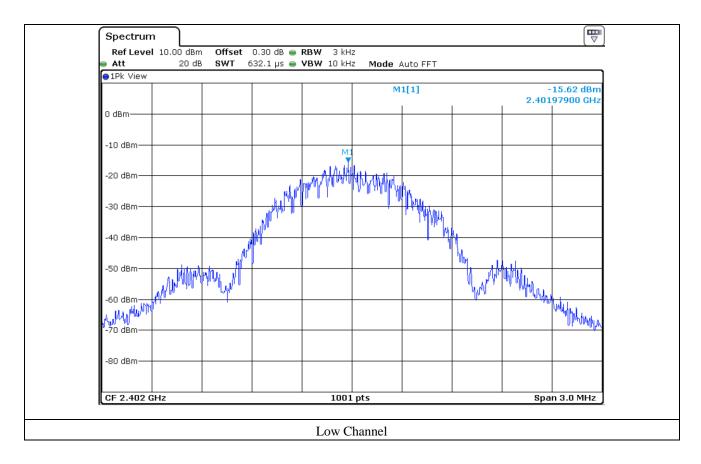
# 10.4 Test data for 1 Mbps

-. Test Result : Pass

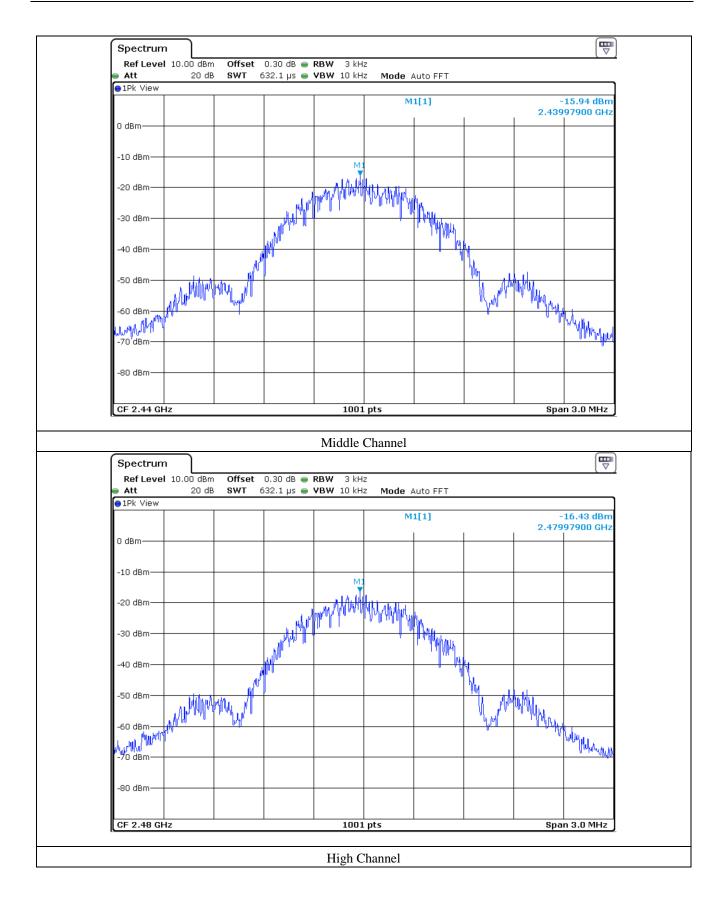
-. Operating Condition : Continuous transmitting mode

CHANNEL	FREQUENCY(MHz)	MEASURED VALUE (dBm)	LIMIT (dBm)	MARGIN (dB)
Low	2 402.00	-15.62	8.00	23.62
Middle	2 440.00	-15.94	8.00	23.94
High	2 480.00	-16.43	8.00	24.43

Remark. Margin = Limit – Measured value









# **11. RADIATED EMISSION TEST**

## **11.1 Operating environment**

Temperature	: 21 °C
Relative humidity	: 49 % R.H.

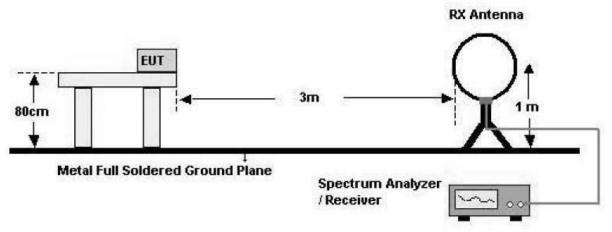
#### 11.2 Test set-up

The radiated emissions measurements were on the 3 m semi anechoic chamber. The EUT and other support equipment were placed on a non-conductive turntable above the ground plane. The interconnecting cables from outside test site were inserted into ferrite clamps at the point where the cables reach the turntable.

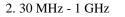
The frequency spectrum from 30 MHz to 26.5 GHz was scanned and emission levels maximized at each frequency recorded. The system was rotated 360°, and the antenna was varied in height between 1.0 m and 4.0 m in order to determine the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

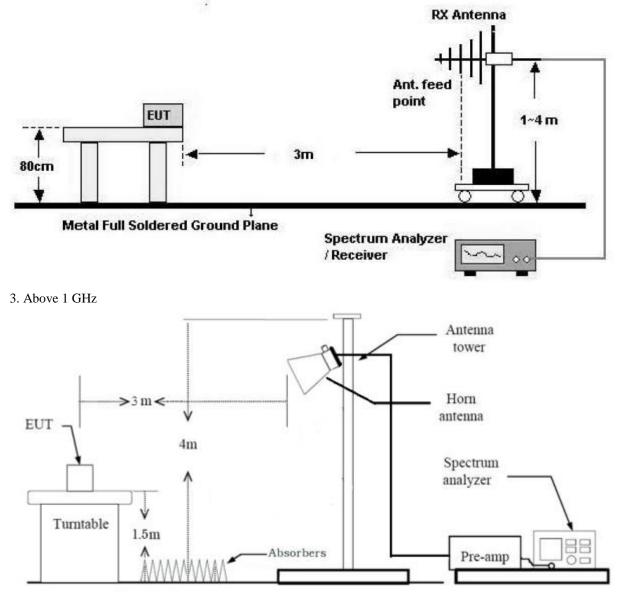
#### - Test Configuration

1. Below 30 MHz









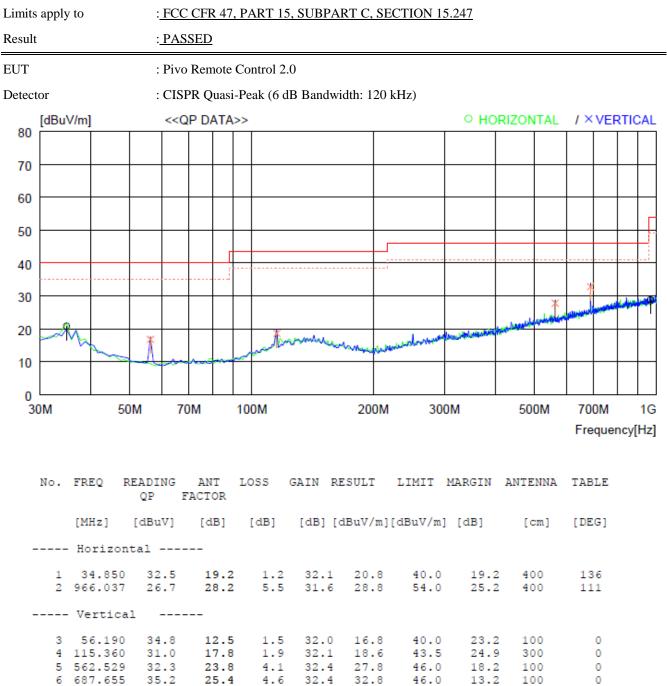
### 11.3 Test Date

January 21, 2022 ~ January 28, 2022



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# 11.4 Test data for 30 MHz ~ 1 GHz



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## 11.5 Test data for Below 30 MHz

-. Resolution bandwidth : 200 Hz (from 9 kHz to 0.15 MHz), 9 kHz (from 0.15 MHz to 30 MHz)

-. Frequency range : 9 kHz ~ 30 MHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

Frequency	Reading	Ant. Pol.	Ant.	0	Ant. Factor	Cable	Emission	Limits	Margin
(MHz)	(dBµV)	(H/V)	Height (m)		(dB/m)	Loss	Level(dBµV/m)	(dBµV/m)	(dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.									

### **11.6 Test data for above 1 GHz**

-. Resolution bandwidth : 1 MHz for Peak and Average Mode for the emissions fall in restricted band,

1 MHz for Peak Mode for the emissions outside restricted band

-. Video bandwidth : 3 MHz for Peak and Average Mode

-. Frequency range : 1 GHz ~ 26.5 GHz

-. Measurement distance : 3 m

-.Operating mode : Transmitting mode

Frequency	Reading	Ant. Pol.	Ant.	Angle	Ant. Factor	Cable	Emission	Limits	Margin
(MHz)	(dBµV)	(H/V)	Height (m)	(°)	(dB/m)	Loss	Level(dBμV/m)	(dBµV/m)	(dB)
Emission from the EUT more than 20 dB below the limit in each frequency range.									



# **12. LIST OF TEST EQUIPMENT**

Model Number	Manufacturer	Description	Serial Number	Last Cal.(Interval)	
FSV40-N	Rohde & Schwarz	Signal Analyzer	102196	Apr. 16, 2021 (1Y)	
ESU	Rohde & Schwarz	EMI Test Receiver	100261	Mar. 15, 2021 (1Y)	
310N	Sonoma Instrument	Pre-Amplifier	392756	Oct. 14, 2021 (1Y)	
PAM-118A	COM-POWER	Pre-Amplifier	18040081	Oct. 12, 2021 (1Y)	
SCU18	Rohde & Schwarz Pre-Amplifier 102266		102266	Jul. 14, 2021 (1Y)	
SCU40A	Rohde & Schwarz	Signal Conditioning unit	100436	Feb. 08, 2022 (1Y)	
DT3000-3t	Innco System	Turn Table	DT3000/093	N/A	
MA-4000XPET	Innco System	Antenna Master	MA4000/509	N/A	
VULB9163	Schwarzbeck	TRILOG Broadband Antenna	777	Apr. 08, 2020 (2Y)	
BBHA 9120D	Schwarzbeck	Horn Antenna	9120D-1366	Jul. 20, 2021 (1Y)	
BBHA9170	Schwarzbeck	Horn Antenna	BBHA9170178	Jan. 06, 2022 (1Y)	
FMZB 1513	Schwarzbeck	Loop Antenna	1513-235	Mar. 24, 2020 (2Y)	