

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT

Test Report No. : OT-227-RED-034
Reception No. : 2207002152
Applicant : SJI Co., Ltd.
Address : 54-33, Dongtanhana 1-gil, Gyeonggi-do, Hwaseong-si, Gyeonggi-do, Republic of Korea
Manufacturer : SJI Co., Ltd.
Address : 54-33, Dongtanhana 1-gil, Gyeonggi-do, Hwaseong-si, Gyeonggi-do, Republic of Korea
Type of Equipment : Asset Tracker
Model Name : IET10MO
Multiple Model Name : N/A
Serial number : N/A
Total page of Report : 14 pages (including this page)
Date of Incoming : May 13, 2020
Date of Issuing : July 11, 2022

SUMMARY

The equipment complies with the requirement of *FCC CFR 47 PART 15 SUBPART B, Section 15.101*.

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

Reviewed by:

Hee-Joong, Kim / General Manager
ONETECH Corp.

Approved by:

Eung-Chan, Kim / General Manager
ONETECH Corp.

CONTENTS

Page

1. VERIFICATION OF COMPLIANCE	4
2. TEST FACILITY.....	5
3. PRODUCT INFORMATION.....	6
3.1 DESCRIPTION OF EUT	6
3.2 MODEL DIFFERENCES.....	6
3.3 SUPPORT EQUIPMENT	6
3.4 SYSTEM CONFIGURATION.....	6
3.5 CABLE DESCRIPTION FOR THE EUT	7
3.6 EQUIPMENT MODIFICATIONS.....	7
3.7 INFORMATION OF MEASUREMENT SOFTWARE.....	7
4. DESCRIPTION OF TESTS.....	7
4.1 TEST METHODOLOGY.....	7
4.2 TEST CONDITION	7
4.3 CONDUCTED EMISSION	8
4.4 RADIATED EMISSION.....	8
5. FINAL RESULT OF MEASUREMENT.....	9
5.1 RADIATED EMISSION TEST	9
5.1.1 Operating Environment	9
5.1.2 Test Setup	9
5.1.3 Measurement uncertainty.....	9
5.1.4 Limit	10
5.1.5 Test Equipment used.....	10
5.1.6 Test Data for Radiated Emission.....	11
6. SAMPLE CALCULATIONS.....	14
APPENDIX A – TEST SET-UP PHOTOGRAPHS	
APPENDIX B – EXTERNAL PHOTOGRAPHS	
APPENDIX C – INTERNAL PHOTOGRAPHS	
APPENDIX D – LABELLING REQUIREMENTS / INFORMATION TO THE USER IN USER’S MANUAL	

Revision History

Rev. No.	Issued Report No.	Issued Date	Revisions	Section Affected
0	OT-206-RED-051	June 04, 2020	Initial Issue	All
1	OT-227-RED-034	July 11, 2022	Change of applicant's name and manufacturer's name	Page 1, 4, 6

1. VERIFICATION OF COMPLIANCE

-. Applicant : SJI Co., Ltd.
 -. Address : 54-33, Dongtanhana 1-gil, Gyeonggi-do, Hwaseong-si, Gyeonggi-do, Republic of Korea
 -. Manufacturer : SJI Co., Ltd.
 -. Address : 54-33, Dongtanhana 1-gil, Gyeonggi-do, Hwaseong-si, Gyeonggi-do, Republic of Korea

 -. MODEL NAME : IET10MO
 -. SERIAL NUMBER : N/A
 -. BRAND/TRADE NAME : N/A
 -. DATE : July 11, 2022

EQUIPMENT CLASS	Other Class B digital devices & peripherals
E.U.T. DESCRIPTION	Asset Tracker
MEASUREMENT PROCEDURES	Original Grant
TYPE OF EQUIPMENT TESTED	ANSI C63.4: 2014
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Supplier's Declaration of Conformity (SDoC)
STANDARDS	FCC PART 15 (Class B)
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	None
FINAL TEST WAS CONDUCTED ON	10 m Semi anechoic chamber

ONETECH Corp. tested the above equipment in accordance with the requirements set forth in the above standard. The test results show that equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

3. PRODUCT INFORMATION

3.1 Description of EUT

The SJI Co., Ltd., Model IET10MO (referred to as the EUT in this report) is a Asset Tracker.

Product specification described herein was obtained from product data sheet or user's manual.

Device Type	Asset Tracker	
LIST OF EACH OSC. OR CRY. FREQ.(FREQ.>=1 MHz)	32.768 kHz, 26 MHz, 32 MHz	
Electrical Rating	DC 3.6 V, 50 mA/5 400 mAh	
RF Spec.	Sig Fox	902.137 5 MHz ~ 904.662 5 MHz (RC2) 902.737 5 MHz ~ 923.262 5 MHz (RC4)
	Bluetooth LE	2 402 MHz ~ 2 480 MHz
	WLAN 2.4 GHz	2 412 MHz ~ 2 472 MHz (802.11b/g/n(HT20))
EXTERNAL CONNECTOR	-	

3.2 Model Differences

-. None

3.3 Support Equipment

The model numbers for all the equipments that were used in the tested system is:

Description	Model	Manufacturer	Connected to
Asset Tracker (EUT)	IET10MO	SJI Co., Ltd.	-
Notebook PC	Ideapad 350	LENOVO	BT Jig
BT Jig	N/A	N/A	Notebook PC
Signal Generator	GSS7000	Spirent Communications Plc	-

3.4 System Configuration

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER
Asset Tracker	SJI Co., Ltd.	IET10MO

3.5 Cable Description for the EUT

Cable	Shielded	Ferrite Bead	Metal Shell	Length (m)	Connected to
-	-	-	-	-	-

3.6 Equipment Modifications

-. None

3.7 Information of Measurement Software

	Software name	Software version
Radiated Emission	Radiated Emission Measurement	2.00.0201

4. DESCRIPTION OF TESTS

4.1 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4: 2014.

Radiated testing was performed at a distance of 3 m from EUT to the antenna.

4.2 Test Condition

The test conditions of the noted test mode(s) in this test report are;

- . Checked the GPS reception status.
- . Input power conditions during the measurements was DC 3.6 V Lithium Battery
- . Test Mode(s)

Operating Mode 1	GPS
------------------	-----

4.3 Conducted Emission

The EUT was placed on a non-conductive 1.0 m × 1.5 m table, which is 0.8 m in height above the reference ground plane and 0.4 m away from the vertical conducting plane (over 2 m × 2 m) that is bonded to the reference ground plane.

The power of EUT is fed through a 50 Ω/ 50 μH + 5 Ω LISN and all support equipment is powered from another LISN. Powers to the LISN are filtered by high-current high insertion loss power line filter.

Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

The RF output of the LISN was connected to the EMI test receiver.

Exploratory measurements were conducted to identify the highest emission by operating the EUT in a range of typical modes of operation, cable positions, system configuration and arrangement.

Based on exploratory measurements, the final measurements were conducted at the worst test conditions.

Exploratory measurements were scanned using Peak mode of EMI Test receiver from 150 kHz to 30 MHz with 20 ms sweep time. The final measurements were measured with Quasi-Peak and CISPR Average mode.

The bandwidth of EMI Test Receiver was set to 9 kHz. Interface cables were connected to the available interface ports of the test unit. Excess cable lengths were bundled at center with 30 cm ~ 40 cm.

4.4 Radiated Emission

Exploratory Radiated measurements were conducted at the 10 m semi anechoic chamber in order to identify the highest emission by operating the EUT in a range of typical modes of operation, cable positions, system configuration and arrangement.

Based on exploratory measurements, the final measurements were conducted at the worst test conditions.

Final measurements were made at 10 m semi anechoic chamber that complies with CISPR 16/ANSI C63.4/ ICES-003.

Exploratory measurements were scanned using Peak mode of EMI Test receiver and final measurements were measured with Quasi-Peak mode (Below 1 GHz) and Peak & CISPR Average mode (Above 1 GHz).

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.

5. FINAL RESULT OF MEASUREMENT

Exploratory measurement 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 Operating Environment

Ambient temperature : (23.3 ~ 24.8) °C
Relative humidity : (49.3 ~ 51.2) % R.H.

5.1.2 Test Setup

The radiated emissions measurements were on the 10 m semi anechoic chamber. The EUT and all local support equipments were placed on a non-conductive turntable approximately 0.8 m above the ground plane.

The frequency spectrum from 30 MHz to 18 000 MHz 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.

5.1.3 Measurement uncertainty

Radiated emission electric field intensity, 30 MHz ~ 1 000 MHz : ± 4.4 dB

Radiated emission electric field intensity, 1 000 MHz ~ 18 000 MHz : ± 5.3 dB

Radiated emission electric field intensity, 18 000 MHz ~ 40 000 MHz : ± 5.3 dB

Measurement uncertainty is calculated in accordance with CISPR 16-4-2. The measurement uncertainty is given with a confidence of 95 % with the coverage factor, $k = 2$.

5.1.4 Limit

Frequency of Emission (MHz)	Resolution bandwidth	Field strength @ 3 m (dB μ V/m)	
30 ~ 88 88 ~ 216 216 ~ 230 230 ~ 960 960 ~ 1 000	120 kHz	Quasi-peak	
		40.0	
		43.5	
		46.0	
		46.0	
		54.0	
> 1 000	1 MHz	Peak Limit	CISPR Average Limit
		74.0	54.0

*Alternative to Limits for radiated disturbance of CISPR22 class B ITE at a measuring distance of 10 m

Frequency of Emission (MHz)	Resolution bandwidth	Field strength @ 10 m (dB μ V/m)	
30 ~ 230 230 ~ 1 000	120 kHz	Quasi-peak	
		30.0	
		37.0	

5.1.5 Test Equipment used

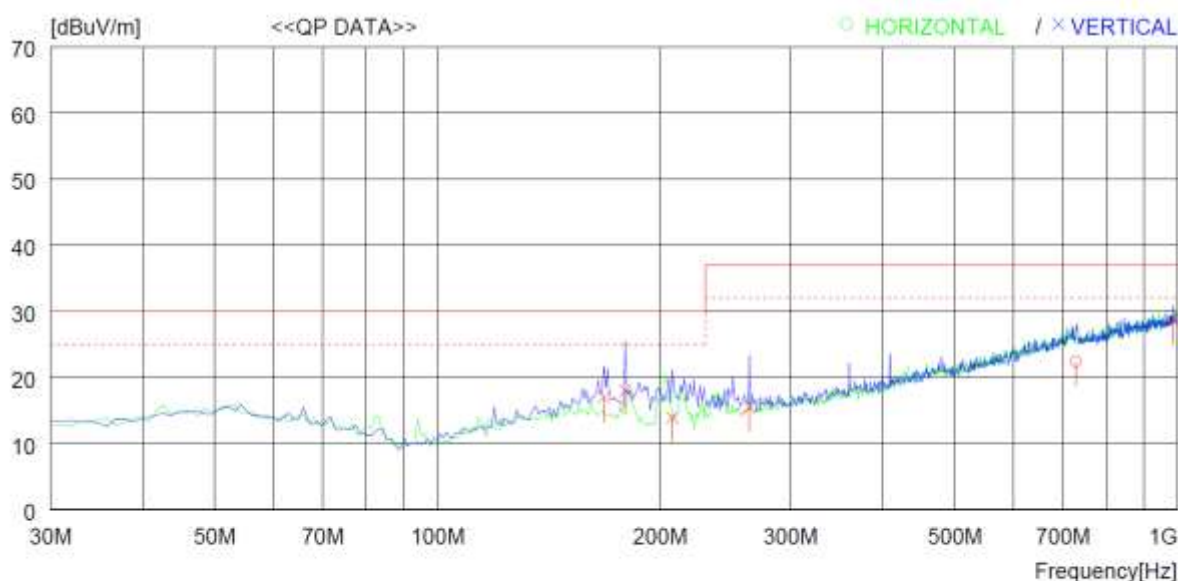
Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
■ - ESR	Rohde & Schwarz	Test Receiver	101470	Oct. 22, 2019 (1Y)
■ - VULB9168	Schwarzbeck	Trilog Broadband Antenna	01088	Dec. 09, 2019 (2Y)
■ - BBHA9120D	Schwarzbeck	Horn Antenna	BBHA9120D295	Mar. 11, 2020 (1Y)
■ - 310N	Sonoma Instrument	Amplifier	312544	Mar. 16, 2020 (1Y)
■ - BBV 9718 B	Schwarzbeck	Amplifier	00009	Mar. 16, 2020 (1Y)
■ - CO3000	Innco Systems GmbH	Controller	N/A	N/A
■ - DT3000	Innco Systems GmbH	Turn Table	N/A	N/A

All test equipment used is calibrated on a regular basis.

5.1.6 Test Data for Radiated Emission

Tested by: Sang-Hyun, Jeong / Manager

Operating Mode 1			
Frequency range	: 30 MHz ~ 1 000 MHz	Test Date	: May 14, 2020
Resolution bandwidth	: 120 kHz	Measurement distance	: 10 m
Detector Mode	: Quasi-Peak		

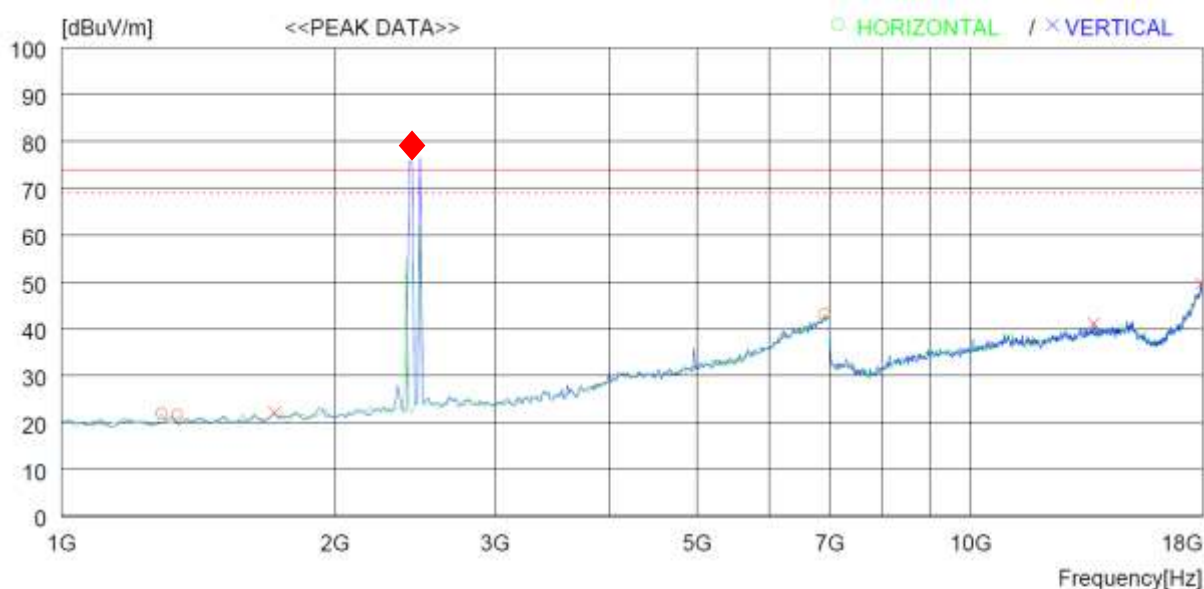


No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	FACTOR	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	728.394	22.5	27.2	6.0	33.3	22.4	37.0	14.6	300	359
----- Vertical -----										
2	167.740	28.4	18.8	2.8	33.0	17.0	30.0	13.0	100	0
3	179.380	30.4	17.7	2.9	33.0	18.0	30.0	12.0	300	264
4	207.510	28.0	15.8	3.1	33.0	13.9	30.0	16.1	200	359
5	263.770	26.7	18.1	3.5	32.8	15.5	37.0	21.5	100	0
6	984.466	24.3	29.7	6.9	32.3	28.6	37.0	8.4	100	0

Remark: Margin (dB) = Limit – Result and Result = Reading Quasi-Peak + Antenna Factor + Loss – Gain

Loss and Gain in above table means Cable Loss and Pre-amplifier gain.

Operating Mode 1			
Frequency range	: 1 GHz ~ 18 GHz	Test Date	: May 29, 2020
Resolution bandwidth	: 1 MHz	Measurement distance	: 3 m
Detector Mode	: Peak		



No.	FREQ [MHz]	READING [dBuV]	ANT PEAK FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA TABLE [cm]	TABLE [DEG]
----- Horizontal -----										
1	1289.000	28.7	24.9	1.2	32.9	21.9	74.0	52.1	100	0
2	1340.000	28.3	25.0	1.2	32.9	21.6	74.0	52.4	100	46
3	6899.000	35.3	35.5	5.2	32.9	43.1	74.0	30.9	100	0
----- Vertical -----										
4	1714.000	28.1	25.5	1.4	32.9	22.1	74.0	51.9	100	359
5	13648.000	25.7	41.2	5.8	31.6	41.1	74.0	32.9	100	359
6	17915.000	25.9	48.1	5.9	30.3	49.6	74.0	24.4	100	359

Remark 1: Margin (dB) = Limit – Result and Result = Reading Peak + Antenna Factor + Loss – Gain

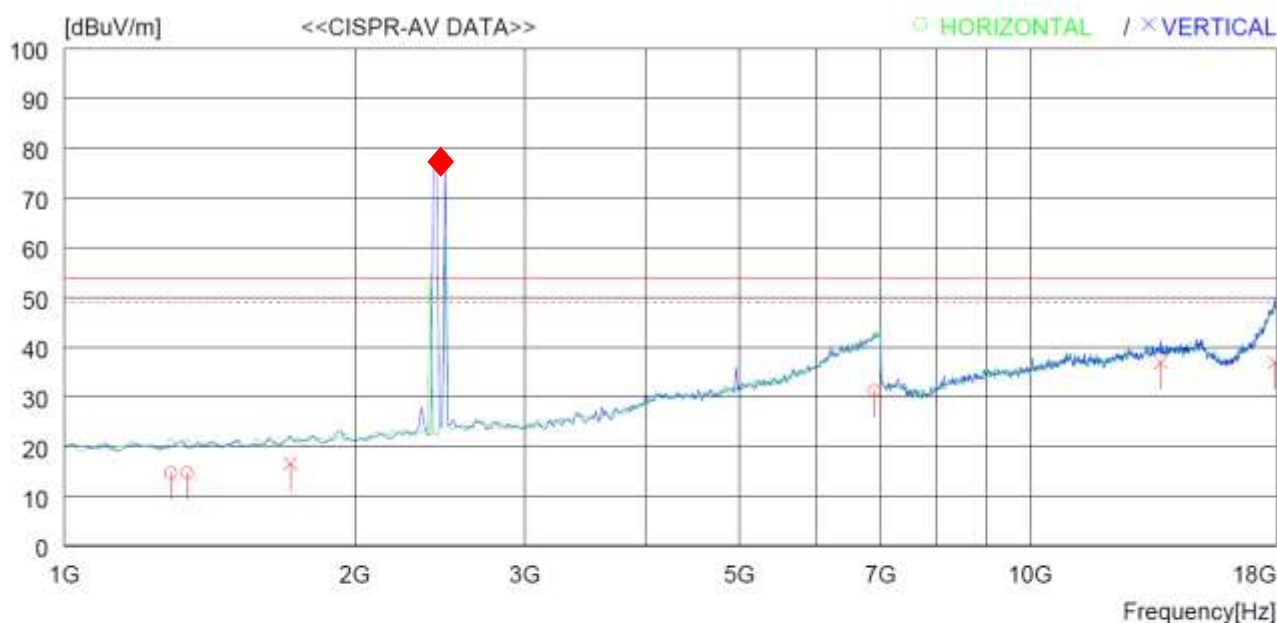
Loss and Gain in above table means Cable Loss and Pre-amplifier gain.

Remark 2: Radiated emissions (Tx/Rx frequencies) from the transceiver shall be ignored.

Bluetooth – (2 402 ~ 2 480) MHz

Remark 3: ◆ - Exclusion band Carrier Frequency, ◆ - Exclusion band Harmonic Frequency

Operating Mode 1			
Frequency range	: 1 GHz ~ 18 GHz	Test Date	: May 29, 2020
Resolution bandwidth	: 1 MHz	Measurement distance	: 3 m
Detector Mode	: CISPR-Average		



No.	FREQ	READING	ANT	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
		C-AV	FACTOR							
	[MHz]	[dBuV]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal -----										
1	1289.000	21.5	24.9	1.2	32.9	14.7	54.0	39.3	100	0
2	1340.000	21.4	25.0	1.2	32.9	14.7	54.0	39.3	100	46
3	6899.000	23.4	35.5	5.2	32.9	31.2	54.0	22.8	100	0
----- Vertical -----										
4	1714.000	22.5	25.5	1.4	32.9	16.5	54.0	37.5	100	359
5	13648.000	21.5	41.2	5.8	31.6	36.9	54.0	17.1	100	359
6	17915.000	13.2	48.1	5.9	30.3	36.9	54.0	17.1	100	359

Remark 1: Margin (dB) = Limit – Result and Result = Reading CISPR-Average + Antenna Factor + Loss – Gain

Loss and Gain in above table means Cable Loss and Pre-amplifier gain.

Remark 2: Radiated emissions (Tx/Rx frequencies) from the transceiver shall be ignored.

Bluetooth – (2 402 ~ 2 480) MHz

Remark 3: ◆ - Exclusion band Carrier Frequency, ◆ - Exclusion band Harmonic Frequency

* Reading value was measured on manual as changing at the height of antenna and the angle of table.

6. SAMPLE CALCULATIONS

$$\text{dB}\mu\text{V} = 20 \text{ Log}_{10} (\mu\text{V})$$

$$\text{Margin} = \text{Limit} - \text{Result}$$

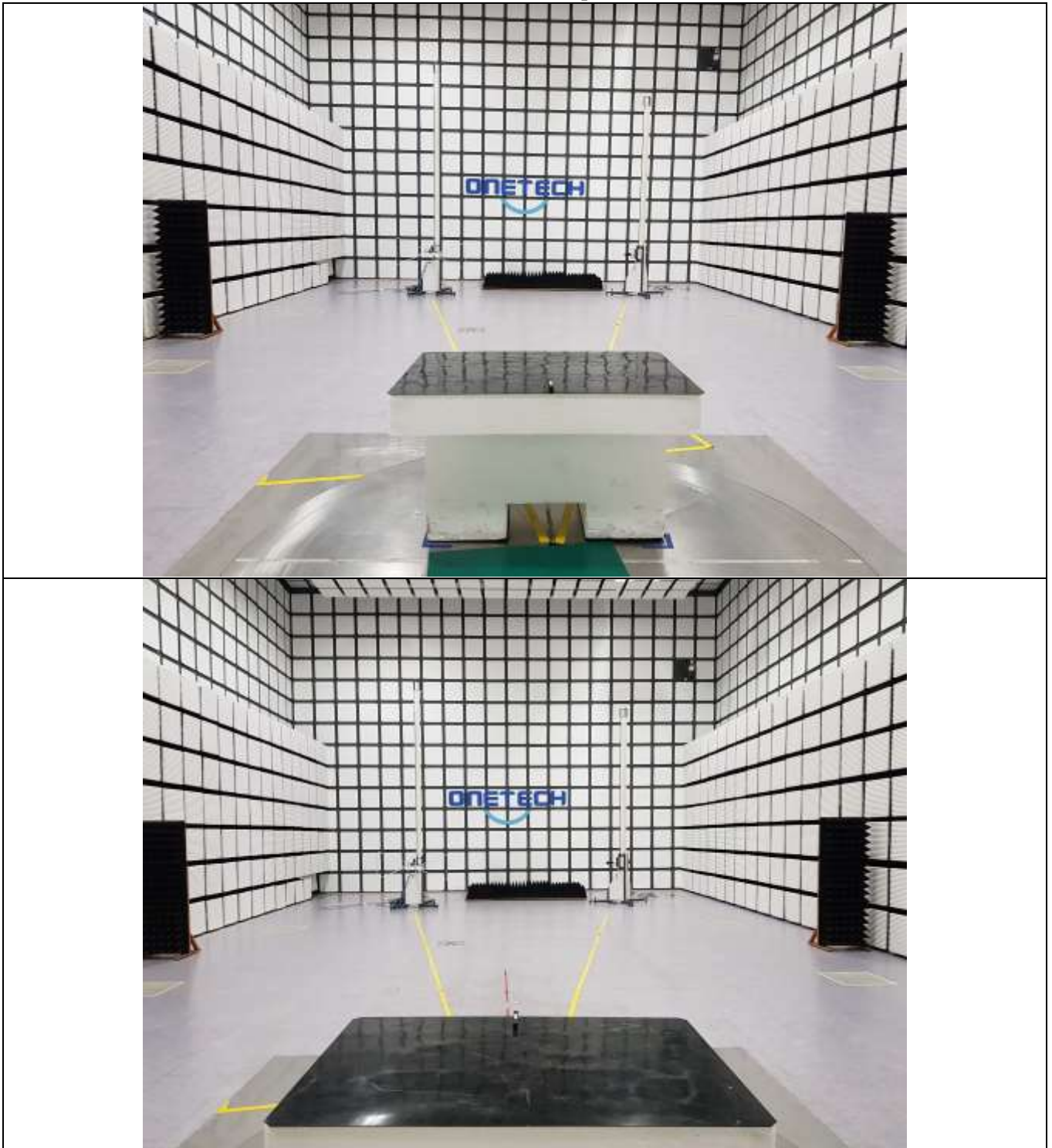
-. Example 1: 984.466 MHz

Class B Limit	= 37.0 dB μ V/m (Quasi-peak)
Reading	= 24.3 dB μ V
Correction Factor	= Antenna Factor (29.7 dB/m) + Cable Loss (6.9 dB) - Amp. Gain (32.3 dB)
	= 4.3 dB
Total	= 28.6 dB μ V/m
Margin	= 37.0 dB μ V/m – 28.6 dB μ V/m
	= 8.4 dB

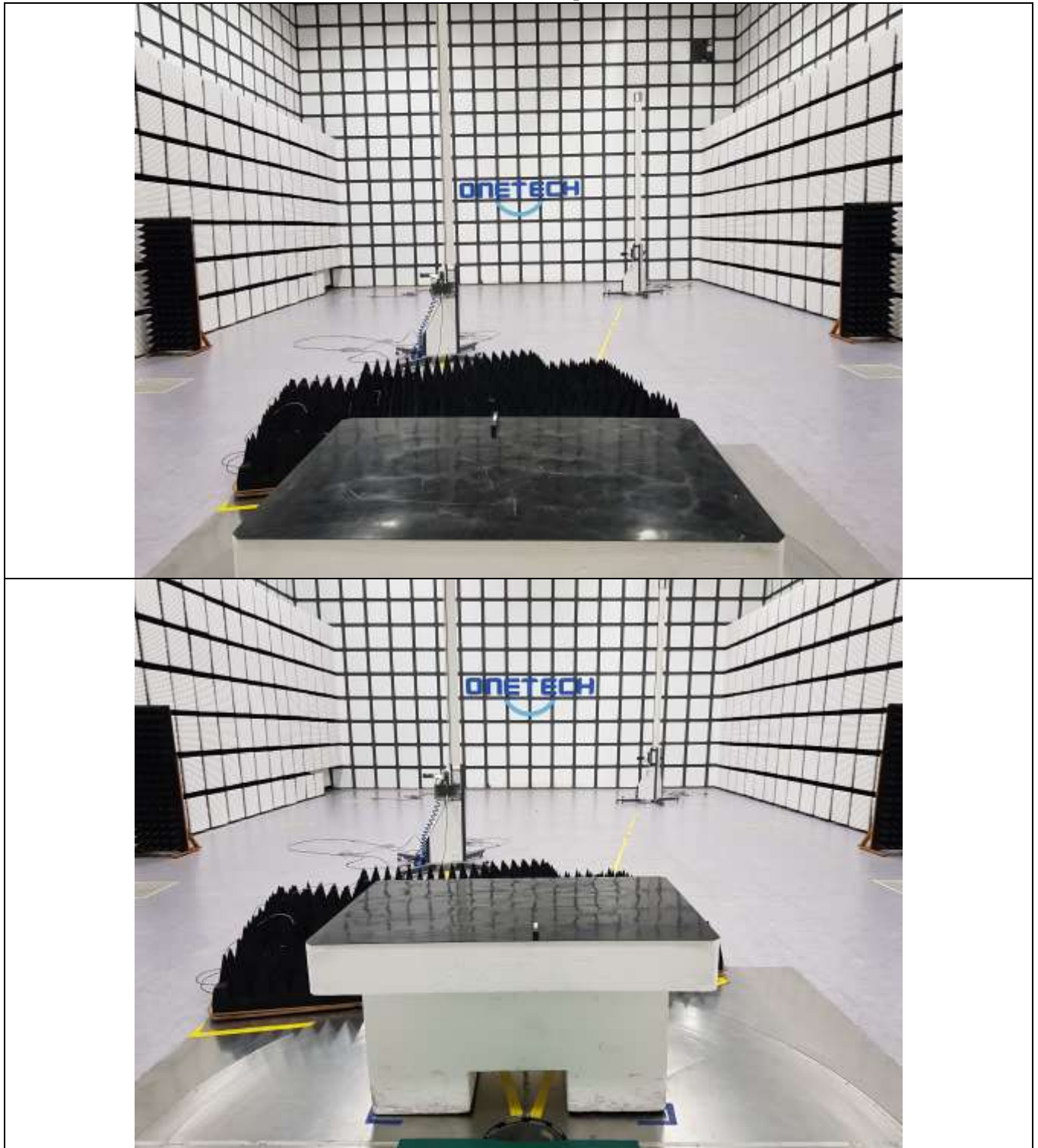
APPENDIX A

[TEST SET UP PHOTOGRAPHS]

Radiated Emission Test Set Up (Below 1 GHz)



Radiated Emission Test Set Up (Above 1 GHz)



APPENDIX B

[EXTERNAL PHOTOGRAPHS]





APPENDIX C

[INTERNAL PHOTOGRAPHS]



APPENDIX D
[LABELLING REQUIREMENTS]
[INFORMATION TO THE USER IN USER'S MANUAL]

LABELLING REQUIREMENTS

FCC Part 15 SUBPART B § 15.19 Labeling requirements

(a) In addition to the requirements in part 2 of this chapter, a device subject to certification, or Supplier's Declaration of Conformity shall be labeled as follows:

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under part 73 of this chapter, land mobile operation under part 90 of this chapter, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is impracticable to label it with the statement specified under paragraph (a) of this section in a font that is four-point or larger, and the device does not have a display that can show electronic labeling, then the information required by this paragraph shall be placed in the user manual and must also either be placed on the device packaging or on a removable label attached to the device.

For FCC Certification

If the device is subject to Certification: (1) Section 2.925 contains information on identification of the equipment; (2) include a label bearing an FCC Identifier (FCC ID) (Section 2.926) and (3) include the appropriate compliance statement in Section 15.19(a). If the labelling area is considered too small and therefore it is impractical (smaller than the palm of the hand) to display the compliance statement, then the statement may be placed in the user manual or product packaging. However, the device must still be labelled with the FCC ID. If the device is unquestionably too small for the FCC ID to be readable (smaller than 4-6 points), the FCC ID may be placed in the user manual. However, it must be determined that the device itself is too small – the label area allocated to the FCC ID may not be reduced because of over crowded identification of other product and regulatory information. Justification for placing the FCC ID in the manual must be submitted with the initial application for certification for review and approval.

For FCC Supplier's Declaration of Conformity (SDOC)

(a) If a product must be tested and authorized under Supplier's Declaration of Conformity, a compliance information statement shall be supplied with the product at the time of marketing or importation, containing the following information:

- (1) Identification of the product, e.g., name and model number;
- (2) A compliance statement as applicable, e.g., for devices subject to part 15 of this chapter as specified in §15.19(a)(3) of this chapter, that the product complies with the rules; and
- (3) The identification, by name, address and telephone number or Internet contact information, of the responsible party, as defined in §2.909. The responsible party for Supplier's Declaration of Conformity must be located within the United States.

(b) If a product is assembled from modular components (e.g., enclosures, power supplies and CPU boards) that, by themselves, are authorized under a Supplier's Declaration of Conformity and/or a grant of certification, and the assembled product is also subject to authorization under Supplier's Declaration of Conformity but, in accordance with the applicable regulations, does not require additional testing, the product shall be supplied, at the time of marketing or importation, with a compliance information statement containing the following information:

- (1) Identification of the assembled product, e.g., name and model number.
- (2) Identification of the modular components used in the assembly. A modular component authorized under Supplier's Declaration of Conformity shall be identified as specified in paragraph (a)(1) of this section. A modular component authorized under a grant of certification shall be identified by name and model number (if applicable) along with the FCC Identifier number.
- (3) A statement that the product complies with part 15 of this chapter.
- (4) The identification, by name, address and telephone number or Internet contact information, of the responsible party who assembled the product from modular components, as defined in §2.909. The responsible party for Supplier's Declaration of Conformity must be located within the United States.
- (5) Copies of the compliance information statements for each modular component used in the system that is authorized under Supplier's Declaration of Conformity.

(c) The compliance information statement shall be included in the user's manual or as a separate sheet. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form. The information may be provided electronically as permitted in §2.935.

PROPOSED LABEL

The label included following statement will be attached on product or the compliance statement can be observed in a prominent location in the instruction manual.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

INFORMATION TO THE USER IN USER'S MANUAL

For FCC: The instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

For a **Class A** digital device or peripheral

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

WARNING

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

For a **Class B** digital device or peripheral

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one more of the following measures:

- . Reorient or relocate the receiving antenna.
- . Increase the separation between the equipment and receiver.
- . Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- . Consult the dealer or an experienced radio/TV technician for help.

WARNING

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.