

# TEST REPORT



**DT&C Co., Ltd.**

42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea, 17042  
Tel : 031-321-2664, Fax : 031-321-1664

1. Report No : DRTTEC2210-0078

2. Customer

- Name : Heartland.Data Inc.
- Address : 361 Fukui-cho, Ashikaga-shi, Tochigi 326-0338 Japan

3. Use of Report : MIC Certification

4. Product Name / Model Name : RADAR Module / HRS-R7

5. Test Method Used : Refer to appended test report.

6. Date of Test : 2022.10.04 ~ 2022.10.14

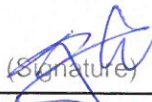
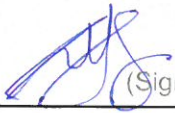
7. Location of Test : ☒ Permanent Testing Lab ☐ On Site Testing

8. Testing Environment : Refer to appended test report.

9. Test Result : PASS.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

This test report is not related to KOLAS accreditation.

Affirmation	Tested by	Technical Manager
	Name : JaeHyeok Bang  (Signature)	Name : JaeJin Lee  (Signature)

2022 . 10 . 25 .

**DT&C Co., Ltd.**

If this report is required to confirmation of authenticity, please contact to [report@dtnc.net](mailto:report@dtnc.net)

## Test Report Version

Test Report No.	Date	Description	Revised By	Review By
DRTTEC2210-0078	Oct. 25, 2022	Initial issue	JaeHyeok Bang	JaeJin Lee

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## 1. GENERAL INFORMATION

<b>Applicant name</b>	: Heartland.Data Inc.
<b>Address</b>	: 361 Fukui-cho, Ashikaga-shi, Tochigi 326-0338 Japan
<b>Radio Equipment Name</b>	: Specified low-power radio equipment (60 GHz band Detection sensor of moving objects)
<b>Model number</b>	: HRS-R7
<b>Variation of the family model(s)</b>	: -
<b>Serial number</b>	: No Specified
<b>Power supply</b>	: DC 5.0 V
<b>Size</b>	: W55.00 * D55.00 * H11.60 (mm)
<b>Frequency range</b>	: 60 ~ 64 GHz
<b>Number of RF channels</b>	: 1 channel
<b>Modulation method</b>	: FMCW (Frequency Modulated Continuous Wave)
<b>Data rate</b>	: NA

## 2. INTRODUCTION

### 2.1 EUT DESCRIPTION

The Equipment under Test (EUT) supports 60 GHz band Detection sensor of moving objects.

### 2.2 TESTING ENVIRONMENT

Ambient Condition	
▪ Temperature	+21 °C ~ +24 °C
▪ Relative Humidity	46 % ~ 49 %

### 2.3 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

### 2.4 TEST LABORATORY

#### DT&C Co., Ltd.

The 3 m test site and conducted measurement facility used to collect the radiated data are located at the 42, Yurim-ro, 154beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea 17042. The site is constructed in conformance with the requirements.

[www.dtcn.net](http://www.dtcn.net)

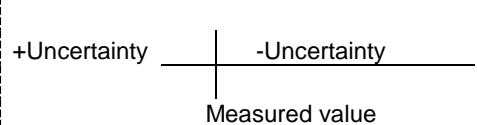
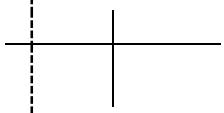
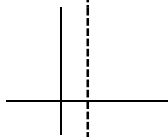
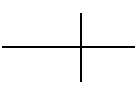
Telephone : + 82-31-321-2664

FAX : + 82-31-321-1664

Accreditation and Registration		
VLAC	Accreditation No.: N/A	
NVLAP	LAB CODE.: N/A	
BSMI	LAB CODE.: TL652	
Industry Canada	ISED#: 5740A, Expiration Date: 2024-04-07	
VCCI council	Registration No.: C-11427	Expiration date : 2025-05-27
	Registration No.: G-10338	Expiration date : 2023-04-24
	Registration No.: G-10754	Expiration date : 2022-12-18
	Registration No.: G-10815	Expiration date : 2023-09-15
	Registration No.: G-20051	Expiration date : 2024-06-17
	Registration No.: R-13385	Expiration date : 2025-05-27
	Registration No.: R-14496	Expiration date : 2024-04-22
	Registration No.: R-14076	Expiration date : 2022-11-24
KOLAS	Registration No.: KT393, Expiration Date: 2025-01-21	

## 2.5 MEASUREMENT UNCERTAINTY

Parameter	Measurement uncertainty
Radiated Disturbance (Below 1 GHz)	4.9 dB
Radiated Disturbance (1 GHz ~ 18 GHz)	5.0 dB
Radiated Disturbance (Above 18 GHz)	5.3 dB
Temperature	0.9 °C
Humidity	3.0 % R.H.

Judge	Measured value and standard limit value	
PASS	<b>Case1</b> <div>  </div> <p>Even if it takes uncertainty into consideration, a standard limit value is fulfilled.</p>	
	<b>Case2</b> <div>  </div> <p>Although measured value is in a standard limit value, a limit value won't be fulfilled if uncertainty is taken into consideration.</p>	
FAIL	<b>Case3</b> <div>  </div> <p>Although measured value exceeds a standard limit value, a limit value will be fulfilled if uncertainty is taken into consideration.</p>	
	<b>Case4</b> <div>  </div> <p>Even if it takes uncertainty into consideration, a standard limit value isn't fulfilled.</p>	

### 3. INFORMATION ABOUT TEST ITEMS

#### 3.1 Test mode

This device has been tested with the below test modes;

Test Mode	Modulation	Operating configuration
TM1	FMCW	Transceiver
TM2	-	Receiver

- All transmitting configuration were investigated and the worst case configuration results are reported.

### 4. SUMMARY OF TEST

#### 4.1 Purpose of test

Ordinance on Technical Standards Conformity Certification of Specified Radio Equipment  
Specified low-power radio equipment (60 GHz band Detection sensor of moving objects)

#### 4.2 Standards

Certification Ordinance (Article 2 Paragraph 1 of Item 8)

##### -Test Methods

MIC notification. No88 Appendix 22-16

##### - Deviation from standards

None

### 4.3 List of applied test to the EUT

RCB submitted to the MIC	Classification of EUT		Test Condition	Status <small>Note 1</small>
Article 49-14. 12 Article 49-14. 13	Antenna Power		Radiated	Comply
Article 14	Antenna Power Tolerance		Radiated	Comply
Article 14	Transmitter Antenna Gain		NA	NA
Article 6	Occupied Bandwidth		Radiated	Comply
Article 6	Frequency Tolerance		Radiated	Comply
Article 7	Unwanted Emission Strength		Radiated	Comply
Article 24.2	Secondary Radiated Emission Strength		Radiated	Comply
Article 49-14. 12	Transmission Time Restriction		Radiated	Comply
Article 15.1	Condition for Frequency Stabilization	Voltage fluctuation	Radiated	Comply
<b>Note 1:</b> C=Comply   NC=Not Comply   NT=Not Tested   NA=Not Applicable				

#### -Test Set up

Radiated measurement

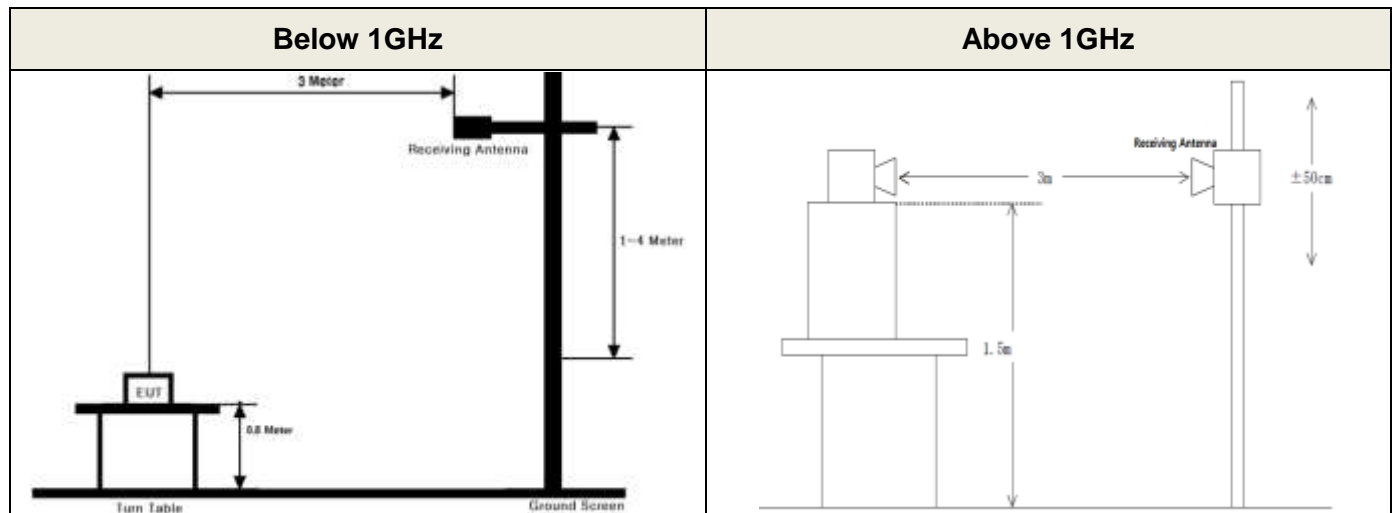
#### - Modification to the EUT by laboratory

None



## 5. TEST CONFIGURATION

- **Antenna Power tolerance, Frequency Tolerance, Occupied Bandwidth**, Spurious Emission Strength(Out-band area), Unwanted Emission Strength(Spurious area), Secondary Radiated Emission Strength



## 6. TEST RESULTS

### 6.1 Antenna Power Tolerance

Description	Value	Limit
Declaration Antenna Power (mW)	2.50	-
EIRP (dBm)	12.64	≤ 13 dBm
Antenna Gain (dBi)	9.79	-
Antenna Power (dBm)	2.85	≤ 10 dBm (Peak)
Antenna Power (mW)	1.93	≤ 10 mW (Peak)
Antenna Power Tolerance (%)	-22.90	+50 %, -70 %

#### \*Antenna power calculation

Mode	Measurement distance(D)	Frequency (MHz)	ANT Pol	Measured Level(dBm)	AFCLAG (dB/m)	E (dBuV/m)	EIRP (dBm)	Gain of the EUT Antenna	Antenna Power (dBm)
TM1	2.0 m	63 433.19	V	-15.14	19.56	111.42	12.64	9.79	2.85

Where,

$E(\text{dBuV/m}) = \text{Measured level}(\text{dBm}) + 107 + \text{AFCLAG}(\text{dB/m})$

where, E=field strength / AFCLAG = Antenna Factor(dB/m) + Cable Loss(dB) – Amp Gain(dB)

$\text{EIRP}(\text{dBm}) = E(\text{dBuV/m}) + 20\log(D) - 104.8$ ; where, D is measurement distance in m.

$\text{Antenna Power}(\text{dBm}) = \text{EIRP}(\text{dBm}) - \text{Gain of the EUT Antenna}$

#### Antenna Power(Measured Level) (TM1)



#### Instrument Settings

- Detector: Peak
- RBW: 40 MHz
- VBW: 40 MHz
- Trace: Max hold

## 6.2 Occupied Bandwidth

Mode	Frequency Range(GHz)	OBW F <sub>L</sub> (GHz)	OBW F <sub>H</sub> (GHz)	Occupied Bandwidth(GHz)	Limit
TM1	60 ~ 64	60.069	63.607	3.538	Within 7 GHz

### Occupied Bandwidth (TM1)



### Instrument Settings

- Detector: Peak
- RBW: 10 MHz
- VBW: 10 MHz
- Trace: Max hold

### 6.3 Frequency Tolerance

Decription	Measured Value F <sub>L</sub> (MHz)	Measured Value F <sub>H</sub> (MHz)
Normal	60 069.288	63 606.977
Limit (frequency allocations band)	57 000.000	64 000.000

F<sub>L</sub>: OBW lower frequency, F<sub>H</sub>: OBW higher frequency

#### Frequency Tolerance(Normal)



#### Instrument Settings

- Detector: PEAK
- RBW: 10 MHz
- VBW: 10 MHz
- Trace: Max hold

## 6.4 Unwanted Emission Strength

Frequency Range: 30 MHz ~ 1 000 MHz (TM1)

Measurement distance(D)	Frequency (MHz)	ANT Pol	Measured Level(dBuV)	AFCLAG (dB/m)	E (dBuV/m)	Result (dBm)	Limit (dBm)
3 m	220.12	H	42.90	-8.10	34.80	-60.46	-30.00
3 m	260.86	H	47.40	-6.10	41.30	-53.96	-30.00
3 m	269.59	H	45.20	-5.70	39.50	-55.76	-30.00
3 m	277.35	H	43.80	-5.30	38.50	-56.76	-30.00
3 m	286.08	H	44.40	-5.00	39.40	-55.86	-30.00

### Note.

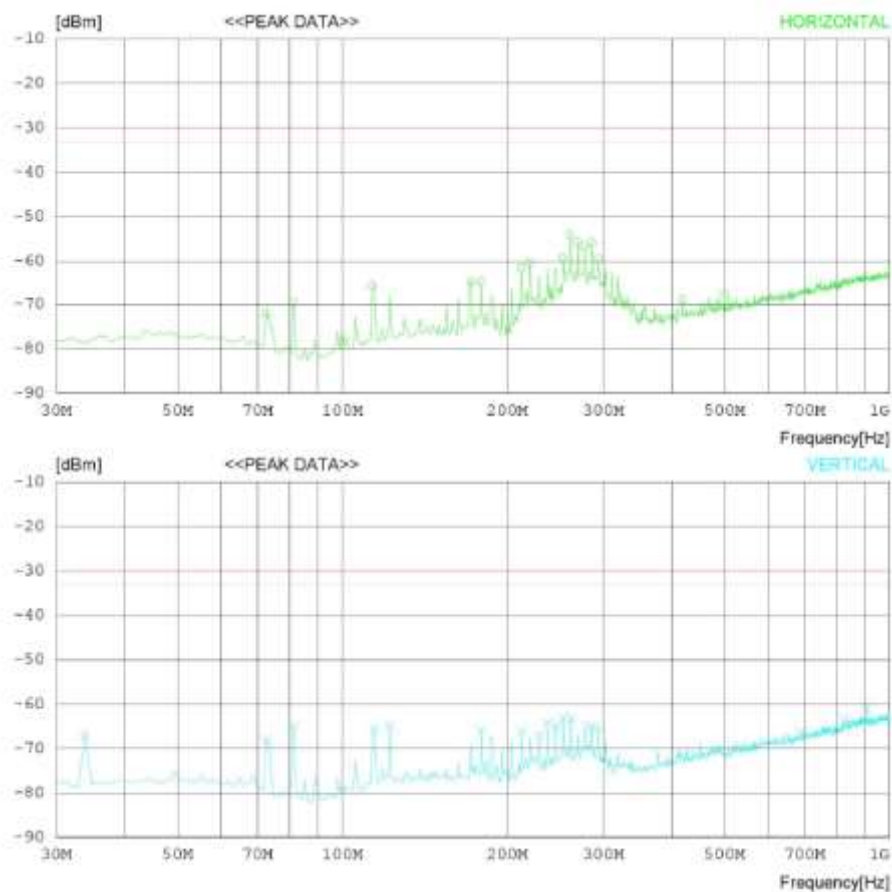
#### 1. Sample Calculation.

$$E(\text{dBuV/m}) = \text{Measured level}(\text{dBuV}) + \text{AFCLAG}(\text{dB/m})$$

$$\text{where, } E = \text{field strength} / \text{AFCLAG} = \text{Antenna Factor}(\text{dB/m}) + \text{Cable Loss}(\text{dB}) - \text{Amp Gain}(\text{dB})$$

$$\text{Result}(\text{dBm}) = E(\text{dBuV/m}) + 20\log(D) - 104.8; \text{ where, } D \text{ is measurement distance in m.}$$

Plot – E(dBm) (TM1)



**Frequency Range: 1 GHz ~ 18 GHz (TM1)**

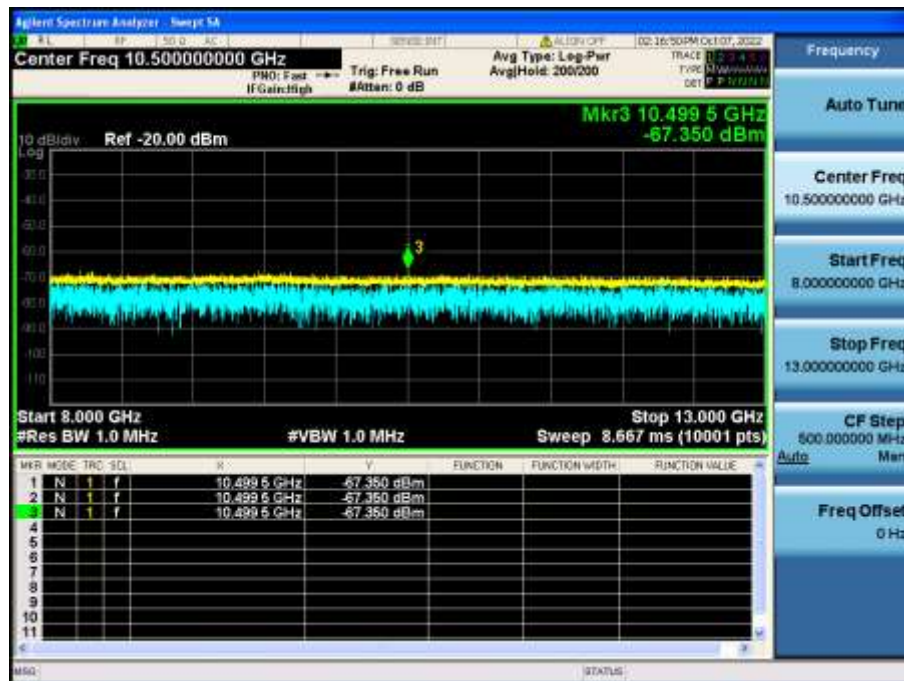
Measurement distance(D)	Frequency (MHz)	ANT Pol	Measured Level(dBm)	AFCLAG (dB/m)	E (dBuV/m)	Result (dBm)	Limit (dBm)
3 m	*1 006.21	H	-63.36	-1.15	42.49	-52.77	-30.00
3 m	*1 300.15	H	-64.09	-1.29	41.62	-53.64	-30.00
3 m	*3 649.68	H	-65.37	5.69	47.32	-47.93	-30.00
1.5 m	*10 499.50	H	-67.35	15.71	55.36	-45.92	-30.00

**Note.**
**1. Sample Calculation.**

$$E(\text{dBuV/m}) = \text{Measured level}(\text{dBm}) + 107 + \text{AFCLAG}(\text{dB/m})$$

where, E=field strength / AFCLAG = Antenna Factor(dB/m) + Cable Loss(dB) - Amp Gain(dB)

Result(dBm) = E(dBuV/m) + 20log(D) - 104.8; where, D is measurement distance in m.

**2. \* is noise floor.**
**Unwanted Emission Strength**
**Worst case plot (Measured Level) (TM1)**


**Frequency Range: 18 GHz ~ 40 GHz (TM1)**

Measurement distance(D)	Frequency (MHz)	ANT Pol	Measured Level(dBm)	AFCLAG (dB/m)	E (dBuV/m)	Result (dBm)	Limit (dBm)
1.5 m	19 999.72	H	-57.55	8.00	57.45	-43.83	-30.00
1.5 m	28 799.63	V	-51.02	9.62	65.60	-35.68	-30.00

**Note.**

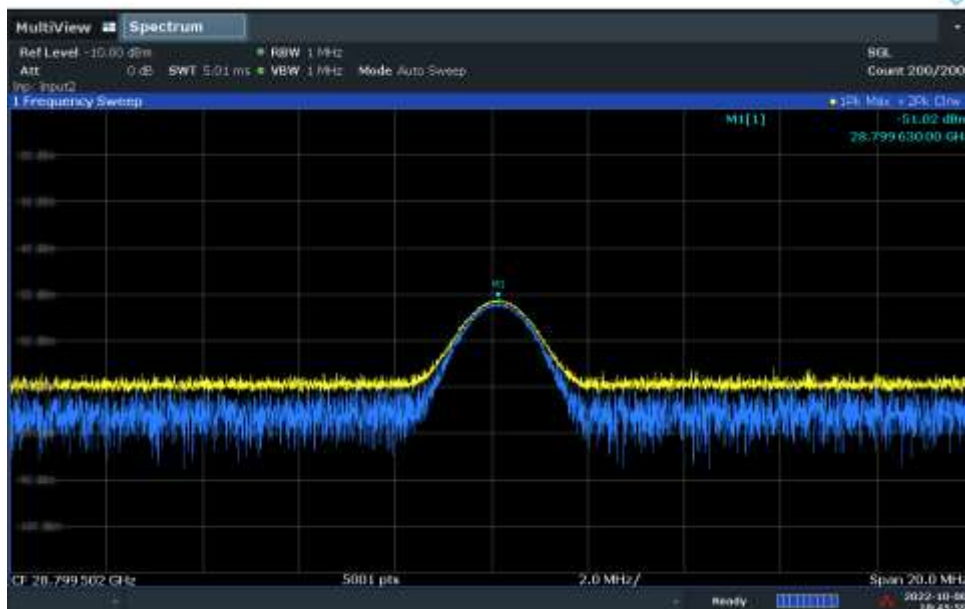
## 1. Sample Calculation.

$$E(\text{dBuV/m}) = \text{Measured level}(\text{dBm}) + 107 + \text{AFCLAG}(\text{dB/m})$$

where, E=field strength / AFCLAG = Antenna Factor(dB/m) + Cable Loss(dB) - Amp Gain(dB)

$$\text{Result}(\text{dBm}) = E(\text{dBuV/m}) + 20\log(D) - 104.8; \text{ where, D is measurement distance in m.}$$

## 2. \* is noise floor.

**Unwanted Emission Strength****Worst case plot (Measured Level) (TM1)**

**Frequency Range: 40 GHz ~ 55.62 GHz, 55.62 GHz ~ 57 GHz, 64 GHz ~ 67.5 GHz , 67.5 GHz ~ 85 GHz (TM1)**

Measurement distance(D)	Frequency (MHz)	ANT Pol	Measured Level(dBm)	AFCLAG (dB/m)	E (dBuV/m)	Result (dBm)	Limit (dBm)
1.4	*50 128.05	V	-65.60	5.79	47.19	-54.69	-30.00
2.0	*55 860.01	V	-68.41	14.75	53.34	-45.44	-26.00
2.0	*66 728.45	V	-63.06	21.00	64.94	-33.84	-26.00
1.4	*82 313.78	V	-51.27	-1.25	54.48	-47.40	-30.00

**Note.**

## 1. Sample Calculation.

$$E(\text{dBuV/m}) = \text{Measured level}(\text{dBm}) + 107 + \text{AFCLAG}(\text{dB/m})$$

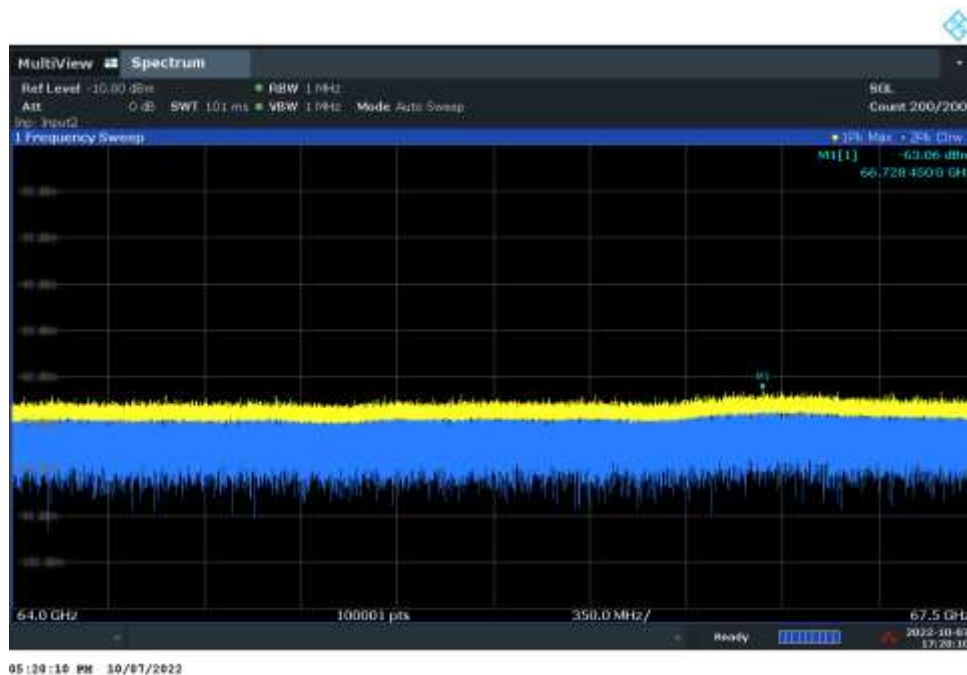
where, E=field strength / AFCLAG = Antenna Factor(dB/m) + Cable Loss(dB) - Amp Gain(dB)

$$\text{Result}(\text{dBm}) = E(\text{dBuV/m}) + 20\log(D) - 104.8; \text{ where, D is measurement distance in m.}$$

## 2. \* is noise floor.

## 3. Except "Designated Frequency Band"

Designated Frequency Band : 57 GHz to 64 GHz

**Unwanted Emission Strength****Worst case plot (Measured Level) (TM1)**



**Frequency Range: 85 GHz ~ 140 GHz (TM1)**

Measurement distance(D)	Frequency (MHz)	ANT Pol	Measured Level(dBm)	AFCL (dB/m)	E (dBuV/m)	Result (dBm)	Limit (dBm)
0.20 m	*87 502.13	V	-72.14	45.23	80.09	-38.69	-30.00
0.03 m	*90 081.11	V	-62.26	47.45	92.19	-43.07	-30.00
0.03 m	*128 322.32	V	-54.05	48.24	101.19	-34.07	-30.00
0.03 m	*130 011.25	V	-56.91	48.16	98.25	-37.01	-30.00

**Note.**

## 1. Sample Calculation.

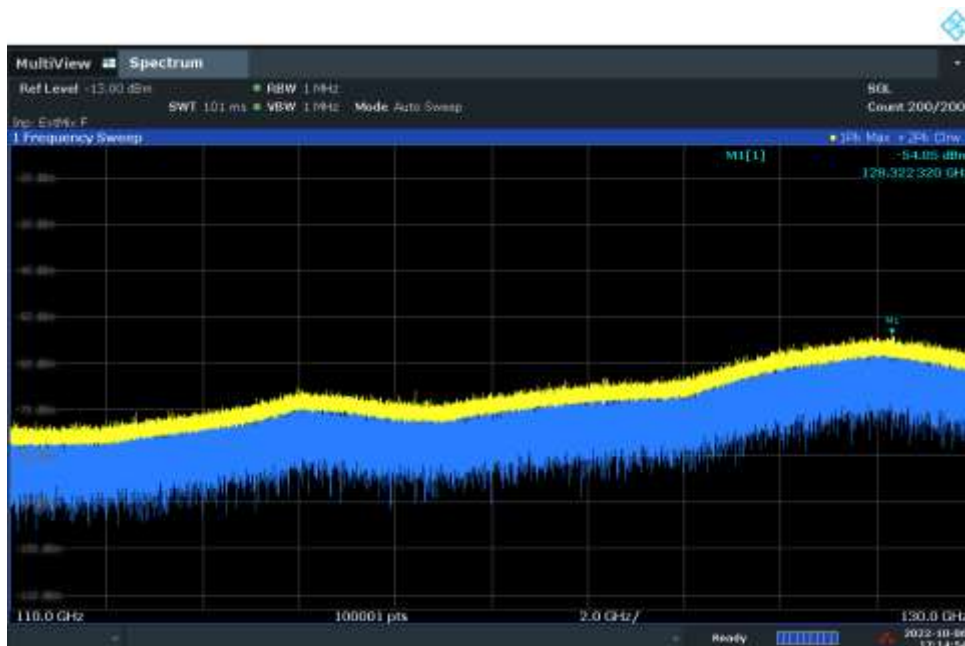
$$E(\text{dBuV/m}) = \text{Measured level}(\text{dBm}) + 107 + \text{AFCL}(\text{dB/m})$$

The mixer loss was applied to the measured level by SA correction factor.

where, E=field strength / AFCL = Antenna Factor(dB/m) + Cable Loss(dB)

Result(dBm) = E(dBuV/m) + 20log(D) - 104.8; where, D is measurement distance in m.

## 2. \* is noise floor.

**Unwanted Emission Strength****Worst case plot (Measured Level) (TM1)**

## 6.5 Secondary Radiated Emission Strength

Frequency Range: 30 MHz ~ 1000 MHz (TM2)

Measurement distance(D)	Frequency (MHz)	ANT Pol	Measured Level(dBuV)	AFCLAG (dB/m)	E (dBuV/m)	Result (dBm)	Limit (dBm)
3 m	716.75	H	25.40	3.90	29.30	-65.96	-30.00
3 m	750.70	H	25.70	4.90	30.60	-64.66	-30.00
3 m	853.52	H	24.90	6.80	31.70	-63.56	-30.00
3 m	893.29	V	24.60	7.60	32.20	-63.06	-30.00
3 m	973.80	H	25.70	8.60	34.30	-60.96	-30.00

### Note.

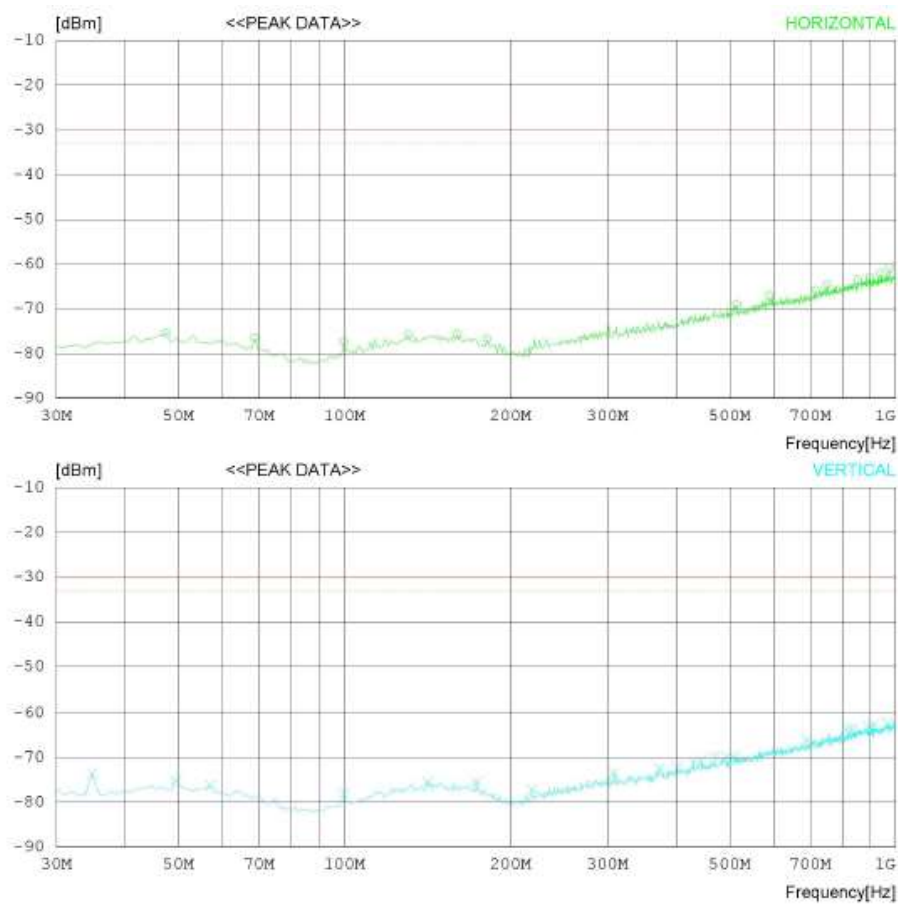
#### 1. Sample Calculation.

$$E(\text{dBuV/m}) = \text{Measured level}(\text{dBuV}) + \text{AFCLAG}(\text{dB/m})$$

where, E=field strength / AFCLAG = Antenna Factor(dB/m) + Cable Loss(dB) – Amplifier Gain(dB)

$$\text{Result}(\text{dBm}) = E(\text{dBuV/m}) + 20\log(D) - 104.8; \text{ where, D is measurement distance in m.}$$

Plot – E(dBuV/m)



**Frequency Range: 1 GHz ~ 18 GHz (TM2)**

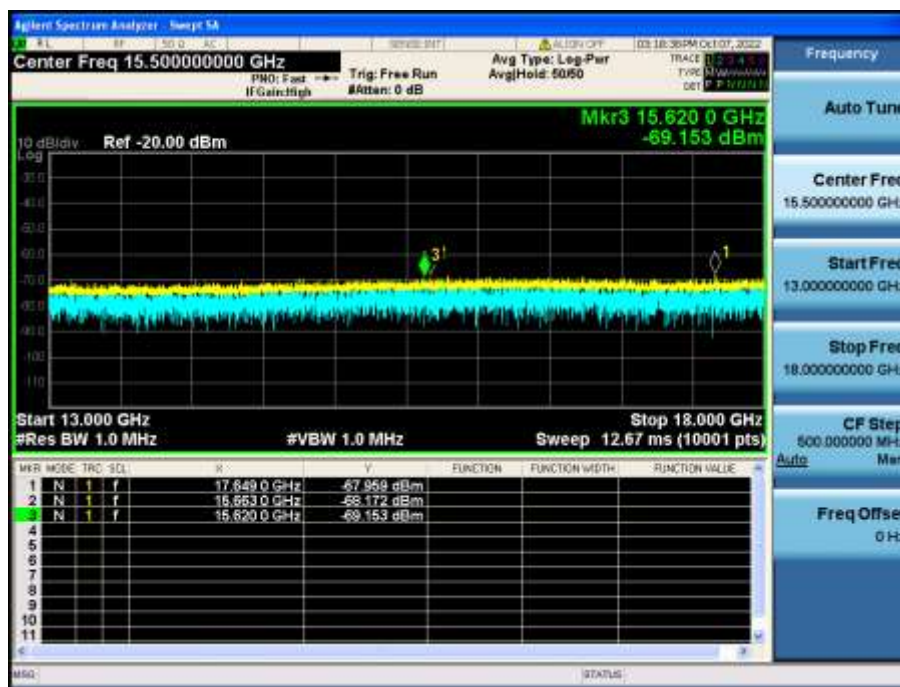
Measurement distance(D)	Frequency (MHz)	ANT Pol	Measured Level(dBm)	AFCLAG (dB/m)	E (dBuV/m)	Result (dBm)	Limit (dBm)
3 m	*3 261.13	V	-64.58	4.72	47.14	-48.12	-30.00
3 m	*3 849.43	V	-66.25	5.98	46.74	-48.52	-30.00
1.5 m	*9 459.00	V	-68.11	13.37	52.26	-49.01	-30.00
1.5 m	*17 649.00	V	-67.96	23.22	62.26	-39.02	-30.00

**Note.**
**1. Sample Calculation.**

$$E(\text{dBuV/m}) = \text{Measured level}(\text{dBm}) + 107 + \text{AFCLAG}(\text{dB/m})$$

where, E=field strength / AFCLAG = Antenna Factor(dB/m) + Cable Loss(dB) - Amp Gain(dB)

Result(dBm) = E(dBuV/m) + 20log(D) - 104.8; where, D is measurement distance in m.

**2. \* is noise floor.**
**Secondary Radiated Emission Strength**
**Worst case plot (Measured Level) (TM2)**


## Frequency Range: 18 GHz ~ 40 GHz (TM2)

Measurement distance(D)	Frequency (MHz)	ANT Pol	Measured Level(dBm)	AFCLAG (dB/m)	E (dBuV/m)	Result (dBm)	Limit (dBm)
1.5 m	*31 562.34	V	-64.12	11.95	54.83	-46.45	-30.00
1.5 m	*39 316.36	V	-61.11	15.73	61.62	-39.66	-30.00

**Note.**

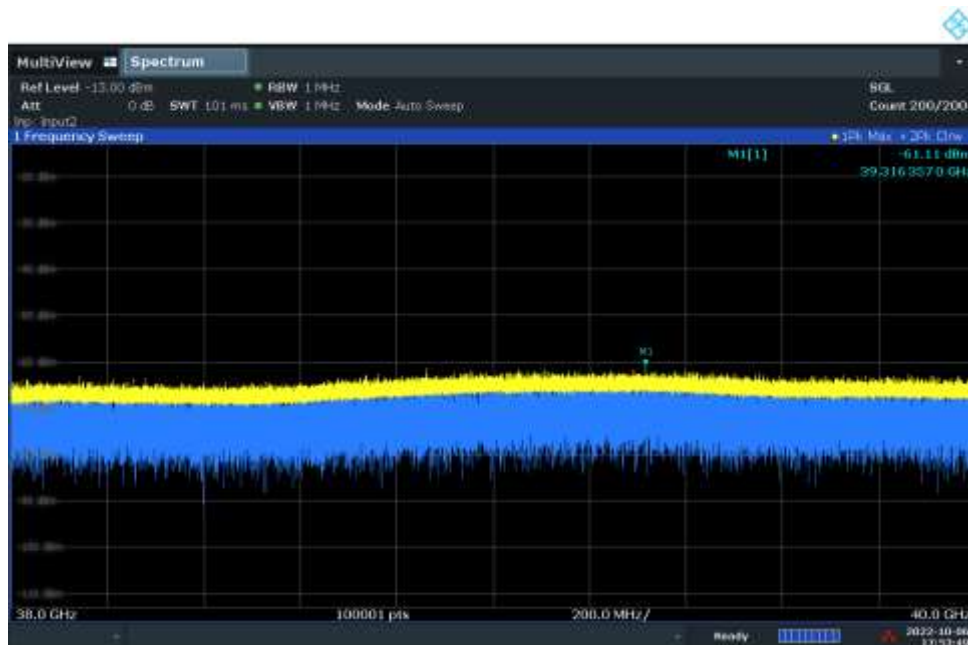
## 1. Sample Calculation.

$$E(\text{dBuV/m}) = \text{Measured level}(\text{dBm}) + 107 + \text{AFCLAG}(\text{dB/m})$$

$$\text{where, } E = \text{field strength} / \text{AFCLAG} = \text{Antenna Factor}(\text{dB/m}) + \text{Cable Loss}(\text{dB}) - \text{Amp Gain}(\text{dB})$$

$$\text{Result}(\text{dBm}) = E(\text{dBuV/m}) + 20\log(D) - 104.8; \text{ where, } D \text{ is measurement distance in m.}$$

## 2. \* is noise floor.

**Secondary Radiated Emission Strength****Worst case plot (Measured Level) (TM2)**

## Frequency Range: 40 GHz ~ 85 GHz (TM2)

Measurement distance(D)	Frequency (MHz)	ANT Pol	Measured Level(dBm)	AFCLAG (dB/m)	E (dBuV/m)	Result (dBm)	Limit (dBm)
1.5 m	*50 000.65	V	-65.82	5.44	46.62	-54.66	-30.00
1.4 m	*82 187.28	V	-50.97	-1.30	54.73	-47.15	-30.00

**Note.**

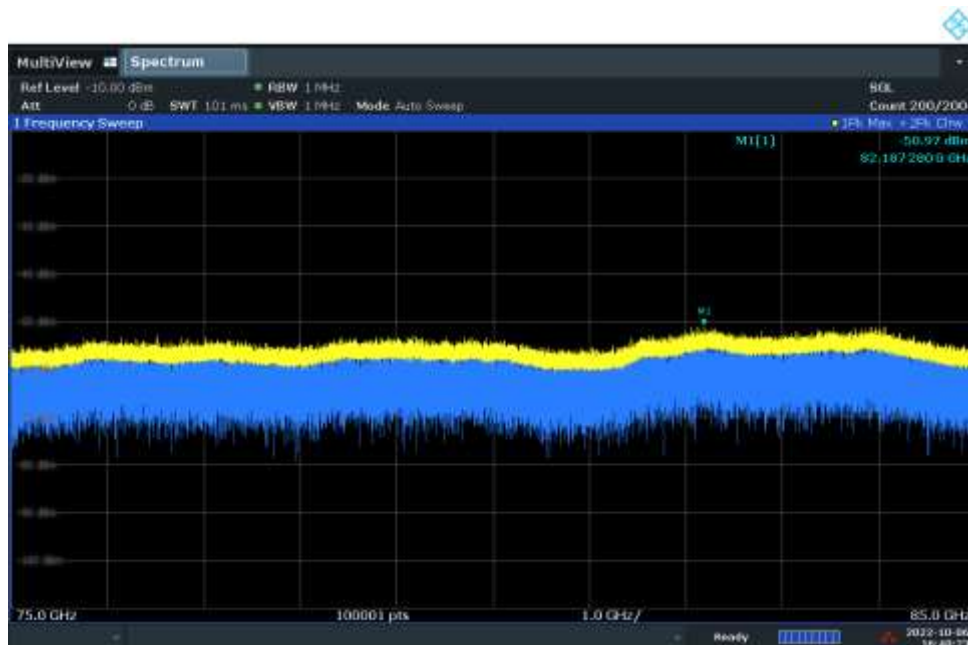
## 1. Sample Calculation.

$$E(\text{dBuV/m}) = \text{Measured level}(\text{dBm}) + 107 + \text{AFCLAG}(\text{dB/m})$$

where, E=field strength / AFCLAG = Antenna Factor(dB/m) + Cable Loss(dB) - Amp Gain(dB)

$$\text{Result}(\text{dBm}) = E(\text{dBuV/m}) + 20\log(D) - 104.8; \text{ where, D is measurement distance in m.}$$

## 2. \* is noise floor.

**Secondary Radiated Emission Strength****Worst case plot (Measured Level) (TM2)**

## Frequency Range: 85 GHz ~ 140 GHz (TM2)

Measurement distance(D)	Frequency (MHz)	ANT Pol	Measured Level(dBm)	AFCL (dB/m)	E (dBuV/m)	Result (dBm)	Limit (dBm)
0.20 m	*88 486.88	V	-72.58	45.26	79.68	-39.10	-30.00
0.03 m	*90 415.30	V	-61.51	47.42	92.91	-42.35	-30.00
0.03 m	*128 205.72	V	-53.50	48.25	101.75	-33.51	-30.00
0.03 m	*130 048.45	V	-57.16	48.16	98.00	-37.26	-30.00

## Note.

## 1. Sample Calculation.

$$E(\text{dBuV/m}) = \text{Measured level}(\text{dBm}) + 107 + \text{AFCL}(\text{dB/m})$$

The mixer loss was applied to the measured level by SA correction factor.

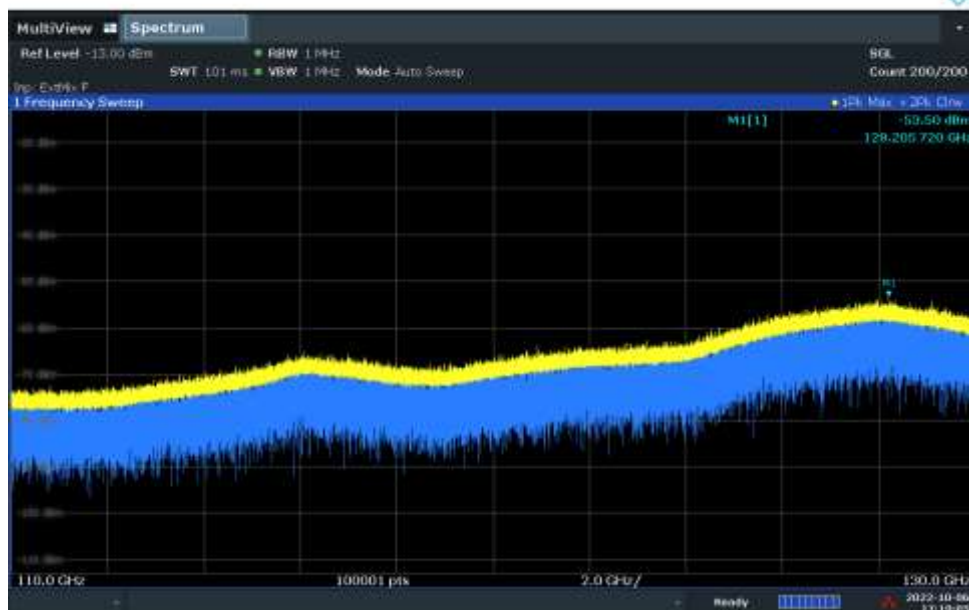
where, E=field strength / AFCL = Antenna Factor(dB/m) + Cable Loss(dB)

$$\text{Result}(\text{dBm}) = E(\text{dBuV/m}) + 20\log(D) - 104.8; \text{ where, D is measurement distance in m.}$$

## 2. \* is noise floor.

## Secondary Radiated Emission Strength

## Worst case plot (Measured Level) (TM2)

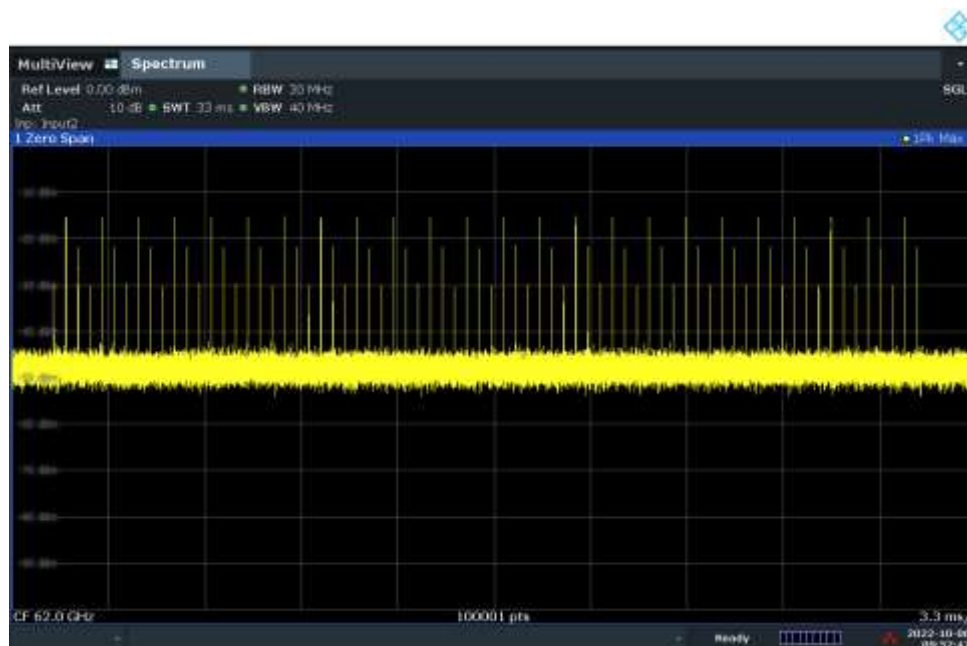


## 6.6 Transmission Time Restriction

Description	Value	Limit
Sweep Points	100 001	-
Sweep times	$\geq 33$ ms	-
On time sweep points	755	-
Time of one point	0.000 33 ms	-
Sum of on times	0.249 ms	$\leq 3.3$ ms per 33 ms

**Note.**

1. The number of points on time was calculated using trace data.



## 6.7 Voltage fluctuation

Power Supply( $\pm 10\%$ )	Result	Range ( $\pm 1\%$ )
DC 5.0 V(Rated Voltage)	DC 3.312 V	DC 3.267 ~ 3.333 V
DC 5.5V (+10 %)	DC 3.314 V	
DC 4.5 V (-10%)	DC 3.315 V	

### Note.

1. When the rated voltage of 5V was applied, it was confirmed that the fluctuation of the input voltage to the circuit of the radio part of the test device was  $\pm 1\%$  or less.



## 7. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	S/N	Calibrated by	Cal.Method Note1	Cal.Date (yy/mm/dd)	Next.Cal. Date (yy/mm/dd)
Signal Analyzer	Rohde Schwarz	FSW85	101530	KTL	c	21/12/16	22/12/16
Signal Analyzer	Rohde Schwarz	FSW85	101778	KTL	c	22/08/04	23/08/04
Spectrum Analyzer	Agilent Technologies	N9020A	US47360812	KTL	c	22/06/24	23/06/24
Spectrum Analyzer	KEYSIGHT	N9030B	MY55480168	KTL	c	21/12/16	22/12/16
Signal Generator	Rohde Schwarz	SMBV100A	255571	KTL	c	21/12/16	22/12/16
Signal Generator	ANRITSU	MG3695C	173501	KTL	c	21/12/16	22/12/16
Bilog Antenna	Schwarzbeck	VULB 9160	3362	KTL	c	21/12/16	22/12/16
Horn Antenna	ETS-Lindgren	3117	00140394	KTL	c	21/12/16	22/12/16
Horn Antenna	A.H. Systems Inc.	SAS-574	155	KTL	c	22/06/24	23/06/24
Horn Antenna	MI Wave	RX ANT-5 261U+410U	108	KTL	c	22/06/24	23/06/24
Horn Antenna	MI Wave	RX ANT-6 261V+410V	110	KTL	c	22/06/24	23/06/24
Horn Antenna	MI Wave	RX ANT-7 261E	112	KTL	c	22/06/24	23/06/24
Horn Antenna	MI Wave	RX ANT-8 261F	114	KTL	c	22/06/24	23/06/24
Horn Antenna	MI Wave	261W-25/387	743	MI Wave	c	22/06/24	23/06/24
PreAmplifier	H.P	8447D	2944A07774	KTL	c	21/12/16	22/12/16
PreAmplifier	Agilent Technologies	8449B	3008A02108	KTL	c	22/06/24	23/06/24
PreAmplifier	tsj	MLA-1840-J02-45	16966-10728	KTL	c	22/06/24	23/06/24
PreAmplifier (Note2)	Norden Millimeter Inc.	NA4060G50N8P12	1003	Norden Millimeter Inc.	d	21/02/18	23/02/18
				DT&C	d	22/02/18	23/02/18
PreAmplifier	ERAVABT	SBL-5037533550-151-E1-ET	10394-01	KTL	c	22/02/11	23/02/11
PreAmplifier (Note2)	Norden Millimeter Inc.	NN6090G-40N55P-2	1001	Norden Millimeter Inc.	d	21/02/18	23/02/18
				DT&C	d	22/02/18	23/02/18
Harmonic Mixers	KEYSIGHT	M1971W	MY56390126	HCT	c	21/12/16	22/12/16
Harmonic Mixers	Rohde Schwarz	FS-Z90	101714	KTL	c	22/08/04	23/08/04
Harmonic Mixers	Rohde Schwarz	FS-Z140	101009	KTL	c	22/08/04	23/08/04
High Pass Filter	Wainwright Instruments	WHKX12-935-1000-15000-40SS	7	KTL	c	22/06/24	23/06/24
High Pass Filter	Wainwright Instruments	WHKX10-2838-3300-18000-60SS	2	KTL	c	22/06/24	23/06/24
High Pass Filter	Wainwright Instruments	WHKX6-6320-8000-26500-40CC	2	KTL	c	22/06/24	23/06/24
mmW Multiplier	OML, Inc.	S15MS	170821-1	KTL	c	22/08/04	23/08/04
mmW Multiplier	OML, Inc.	S12MS	170821-1	KTL	c	22/08/04	23/08/04
mmW Multiplier	OML, Inc.	S08MS	170821-1	KTL	c	22/08/04	23/08/04
Digital Multimeter	FLUKE	17B+	36390701WS	KTL	c	21/12/16	22/12/16
Thermohygrometer	BODYCOM	BJ5478	120612-1	KTL	c	21/12/16	22/12/16
Thermohygrometer	BODYCOM	BJ5478	120612-2	KTL	c	21/12/16	22/12/16

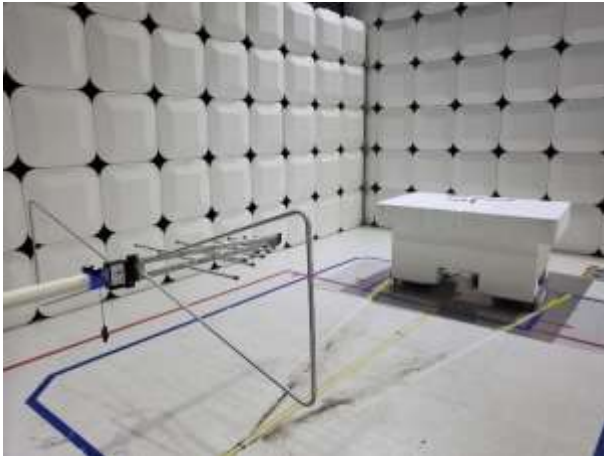
### Note 1: Cal. Method

- Calibration conducted by the National Institute of Information and Communications Technology~NICT~ or a designated calibration agency under Article 102-18 paragraph (1)~ TELECOM Engineering Center, Intertek Japan K.K., Keysight Technologies, Inc~.
- Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992)~Japan Calibration Service System~
- Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1)~ TELECOM Engineering Center, Intertek Japan K.K., Keysight Technologies, Inc~.
- Calibration conducted by using other equipment that listed above from a) to c)

Note 2: The instrument was calibrated every two years by the calibration laboratory.  
And in-house calibration was performed every one year.

## 8. TEST SET-UP PHOTO

**Radiated Measurement Photo**  
Below 1 GHz



Above 1 GHz



Above 1 GHz



Above 1 GHz

