

TEST REPORT



CTK Co., Ltd.
(Ho-dong), 113, Yejik-ro, Cheoin-gu,
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Tel: +82-31-339-9970
Fax: +82-31-624-9501

Report No.:
CTK-2022-01327
Page (1) / (21) Pages

1. Applicant

- Name : MOBASE ELECTRONICS CO., LTD.
- Address : 100, Saneop-ro 156beon-gil, Gwonseon-gu, Suwon-si, Gyeonggi-do, Republic of Korea
- Date of Receipt : 2020-03-14

2. Manufacturer

- Name : MOBASE ELECTRONICS CO., LTD.
- Address : 100, Saneop-ro 156beon-gil, Gwonseon-gu, Suwon-si, Gyeonggi-do, Republic of Korea

3. Use of Report : For FCC Certification, For ISED Certification

4. Test Sample / Model : TRANSMITTER_SMART KEY / MBECFOB2211

5. Date of Test : 2022-03-22 to 2022-03-29

6. Test Standard(method) used : FCC 47 CFR part 15 subpart C 15.225
RSS-Gen Issue 5, RSS-210 Issue 10

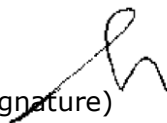

7. Testing Environment: Temp.: (24.8 ± 1) °C, Humidity: (47 ± 3) % R.H.

8. Test Results : Compliance

9. Location of Test : Permanent Testing Lab On Site Testing

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

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Approval	Tested by Bong-seok Kim: (Signature) 	Technical Manager Young-taek Lee: (Signature) 
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Remark. This report is not related to KOLAS accreditation and relevant regulation.

2022-05-04

CTK Co., Ltd.



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Report No.:
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Page (2) / (21) Pages

REPORT REVISION HISTORY

Date	Revision	Page No
2022-05-04	Issued (CTK-2022-01327)	all

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Report No.:
CTK-2022-01327
Page (3) / (21) Pages

CONTENTS

1. General Product Description	4
1.1 Client Information	4
1.2 Product Information	4
1.3 Antenna Information	4
2. Facility and Accreditations	5
2.1 Test Facility	5
2.2 Laboratory Accreditations and Listings	5
2.3 Calibration Details of Equipment Used for Measurement	5
3. Test Specifications	6
3.1 Standards	6
3.2 Mode of operation during the test	7
3.3 Peripheral Devices	8
3.4 Maximum Measurement Uncertainty	8
4. Technical Characteristic Test	9
4.1 Technical requirements	9
4.2 Emission Bandwidth	11
4.3 Field strength emissions	13
APPENDIX A – Test Equipment Used For Tests	21



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Page (4) / (21) Pages

1. General Product Description

1.1 Client Information

Company	MOBASE ELECTRONICS CO., LTD.
Contact Point	100, Saneop-ro 156beon-gil, Gwonseon-gu, Suwon-si, Gyeonggi-do, Republic of Korea
Contact Person	Name : Hee tack Ryu E-mail : shadow@mobaseelec.com Tel : +82-31-8090-2611

1.2 Product Information

FCC ID	NYOMBECFOB2211
IC	3109A-MBECFOB2211
Product Description	TRANSMITTER_SMART KEY
Hardware Version Identification Number(HVIN) or Model name	MBECFOB2211
Variant Model name	-
Firmware Version Identification Number (FVIN)	-
Operating Frequency Range	433.92 MHz
RF Output Power	74.2 dBuV/m @ 3 m
Antenna Type	Integral antenna
Power Source	DC 3 V (Battery)

1.3 Antenna Information

<input checked="" type="checkbox"/>	Integral antenna (antenna permanently attached)
<input type="checkbox"/>	Temporary RF connector provided
<input type="checkbox"/>	No temporary RF connector provided Transmit chains bypass antenna and soldered temporary RF connector provided for connected measurement. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator and correct for all losses in the RF path.
<input type="checkbox"/>	External antenna (dedicated antennas)



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Report No.:
CTK-2022-01327
Page (5) / (21) Pages

2. Facility and Accreditations

2.1 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea.

2.2 Laboratory Accreditations and Listings

Country	Agency	Registration Number
USA	FCC	805871
CANADA	ISED	8737A
KOREA	NRRA	KR0025

2.3 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.



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Report No.:
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 Page (6) / (21) Pages

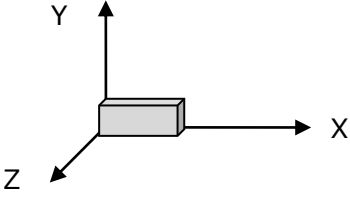
3. Test Specifications

3.1 Standards

FCC Part Section(s)	RSS Section(s)	Requirement(s)	Status (Note 1)	Report Clause
15.203	RSS-Gen 6.8	Antenna Requirement	C	1.3
15.231(a)	RSS-210 Annex A.1.1	Technical requirements	C	4.1
15.231(c)	RSS-210 Annex A.1.3	Emission Bandwidth	C	4.2
15.231(b)	RSS-210 Annex A.1.2 (a)	Field strength emission	C	4.3
15.231(b)	RSS-210 Annex A.1.2 (b)	Unwanted emissions	C	4.3
15.207	RSS-Gen 8.8	AC Power line Conducted Emissions	NA(Note 2)	-
<i>Note 1:</i> C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable				
<i>Note 2:</i> The equipment is operated on battery power only.				
<i>Note 3:</i> The sample was tested according to the following specification: ANSI C63.10-2013.				

3.2 Mode of operation during the test

The Worst Case Measurement Configuration

Tests Item	Radiated Emissions
Condition	Radiated measurement
User Position	<input type="checkbox"/> EUT will be placed in fixed position. <input type="checkbox"/> EUT will be placed in mobile position and operating multiple positions. <input checked="" type="checkbox"/> EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions.
EUT faces identified relative to view from receiving antenna	

Test signal Duty Cycle

Duty cycle(On time/Period)	1 (100 %)
Duty cycle factor [20log(duty cycle)]	0 dB

3.3 Peripheral Devices

No.	Device	Manufacturer	Model No.	Serial No.
1	-	-	-	-

3.4 Maximum Measurement Uncertainty

The value of the measurement uncertainty for the measurement of each parameter.
Coverage factor $k = 2$, Confidence levels of 95 %

Test Item	Uncertainty
Radiated emissions (below 1 GHz)	3.98 dB (C.L.: Approx. 95 %, $k=2$)
Radiated emissions (above 1 GHz)	4.42 dB (C.L.: Approx. 95 %, $k=2$)



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Report No.:
CTK-2022-01327
Page (9) / (21) Pages

4. Technical Characteristic Test

4.1 Technical requirements

Requirement

Requirements	
<input checked="" type="checkbox"/>	A manually operated transmitter shall be equipped with a push-to-operate switch and be under manual control at all times during transmission. When released, the transmitter shall cease transmission within no more than 5 seconds of being released.
<input type="checkbox"/>	A transmitter that has been activated automatically shall cease transmission within 5 seconds of activation.
<input type="checkbox"/>	Periodic transmissions at regular, predetermined intervals are not permitted, except as specified in section A.1.4. However, polling or supervision transmissions that determine system integrity of transmitters used in security or safety applications are permitted, provided the total duration of transmission does not exceed 2 seconds per hour for each transmitter.
<input type="checkbox"/>	Intentional radiators used for radio control during emergencies involving fire, security of goods (e.g. burglar alarms) and safety-of-life, when activated to signal an alarm, may operate during the interval of the alarm condition.

Test Procedures

Refer ANSI C63.10-2013, clause 7.4(Procedure for determining compliance of unlicensed wireless devices having periodic operation).



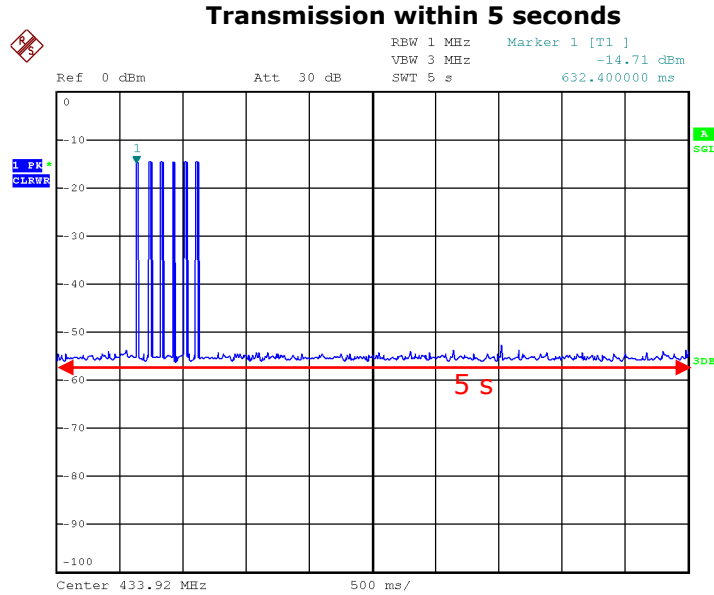
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Report No.:
CTK-2022-01327
Page (10) / (21) Pages

Test results

The requirements are:

Complies



Date: 29.MAR.2022 17:07:19

4.2 Emission Bandwidth

Requirement

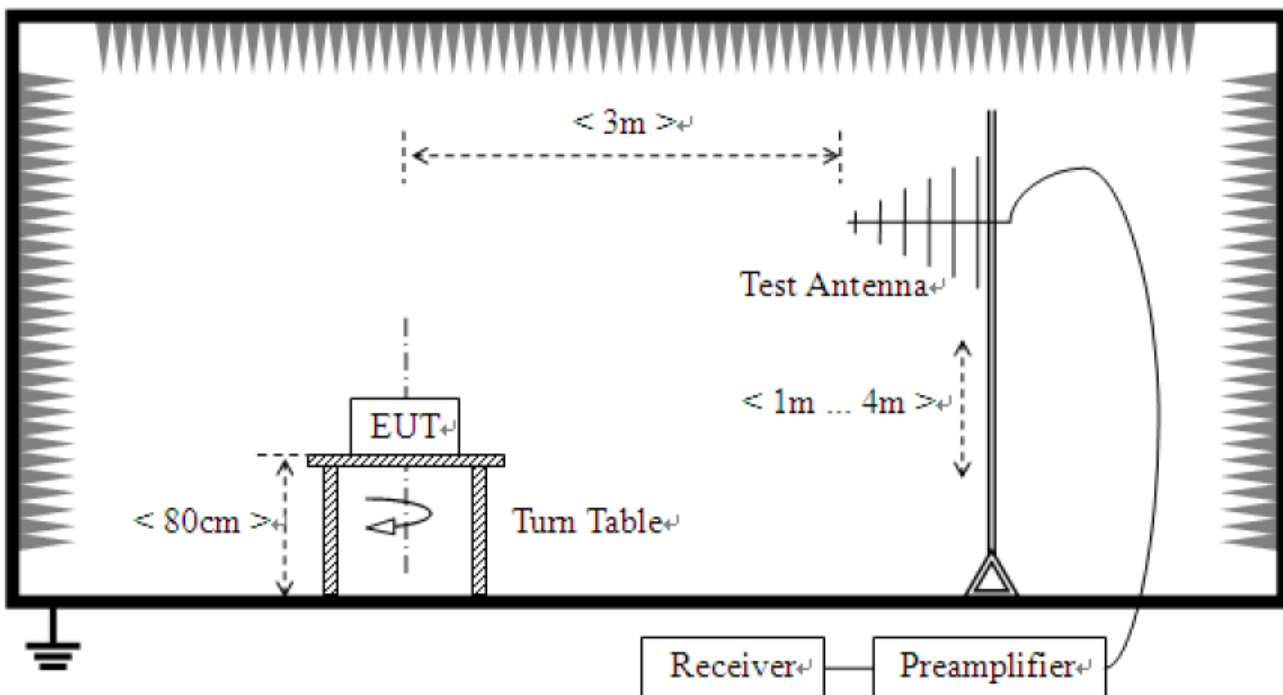
The occupied bandwidth of momentarily operated devices shall be less than or equal to 0.25% of the centre frequency for devices operating between 70 MHz and 900 MHz. For devices operating above 900 MHz, the occupied bandwidth shall be less than or equal to 0.5% of the centre frequency.

Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Procedures

For the emission bandwidth refer ANSI C63.10-2013, clause 6.9(Occupied bandwidth).

Test Setup





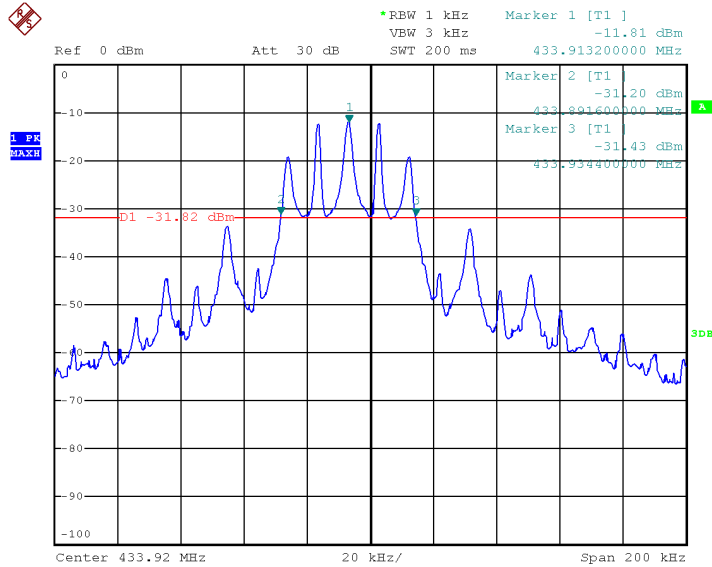
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 CTK-2022-01327
 Page (12) / (21) Pages

Test results

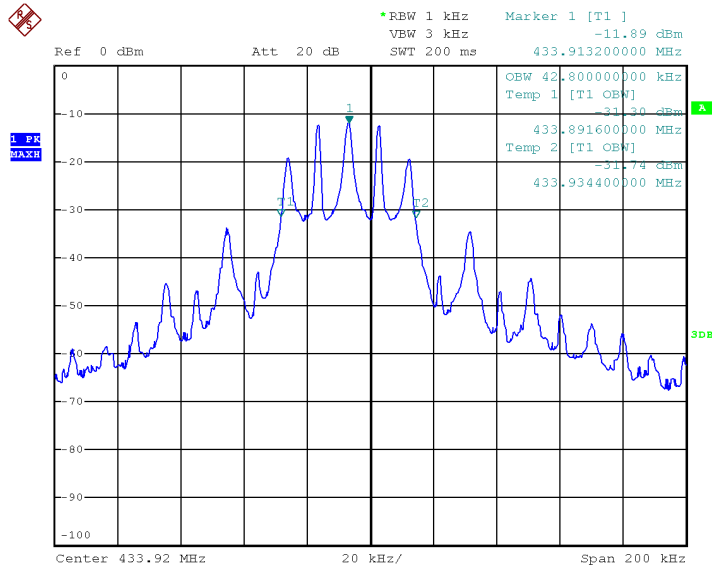
Emission Bandwidth	Result	Limit
20dB Bandwidth	42.8 kHz	1.0848 MHz
99% Bandwidth	42.8 kHz	N/A

Emission Bandwidth Plot 20dB Bandwidth



Date: 29.MAR.2022 16:50:04

Emission Bandwidth Plot 99% Bandwidth



Date: 29.MAR.2022 16:50:35

4.3 Field strength emissions

Requirement

- (a) The field strength of emissions from momentarily operated intentional radiators shall not exceed the limits in table A1, based on the average value of the measured emissions. The requirements of the "Pulsed operation" section of RSS-Gen apply for averaging pulsed emissions and limiting peak emissions.

Alternatively, compliance with the limits in table A1 may be demonstrated using an International Special Committee on Radio Interference (CISPR) quasi-peak detector

Table A1 : Permissible field strength limits for momentarily operated devices

Fundamental frequency(MHz), excluding restricted frequency bands specified in RSS-Gen	Field strength of fundamental emissions (uV/m at 3 m)	Field strength of fundamental emissions (dBuV/m at 3 m)
70 - 130	1 250	61.9
130 - 174	1 250 to 3 750*	61.9 - 71.5
174 - 260**	3 750	71.5
260 - 470**	3 750 to 12 500*	71.5 - 81.9
Above 470	12 500	81.9
433.92	10 998	80.8

* Linear interpolation with frequency, f, in MHz:

- For 130 - 174 MHz : Field Strength (uV/m) = (56.82 x f) - 6136

- For 260 - 470 MHz : Field Strength (uV/m) = (41.67 x f) - 7083

** Frequency bands 225-328.6 MHz and 335.4-399.9 MHz are designated for the exclusive use of the Government of Canada. Manufacturers should be aware of possible harmful interference and degradation of their licence-exempt radio equipment in these frequency bands.

- (b) Unwanted emissions shall be 10 times below the fundamental emissions field strength limits in table A1 or comply with the limits specified in RSS-Gen, whichever is less stringent.

<input checked="" type="checkbox"/>	10 times below fundamental emissions field strength limits : 60.8 dBuV/m
<input type="checkbox"/>	Limits specified in RSS-Gen

※ RSS-Gen limit

Frequency(MHz)	Field Strength	Field Strength dBuV/m	Measurement Distance (meters)
0.009-0.490	6.37/F (F in kHz) uA/m	48.5 - 13.8	300
0.490-1.705	63.7/F (F in kHz) uA/m	33.8 - 23	30
1.705-30	0.08 uA/m	29.5	30
30-88	100 uV/m	40	3
88-216	150 uV/m	43.5	3
216-960	200 uV/m	46	3
Above 960	500 uV/m	54	3



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Report No.:
 CTK-2022-01327
 Page (14) / (21) Pages

Test Location

10 m SAC (test distance : 10 m, 3 m)

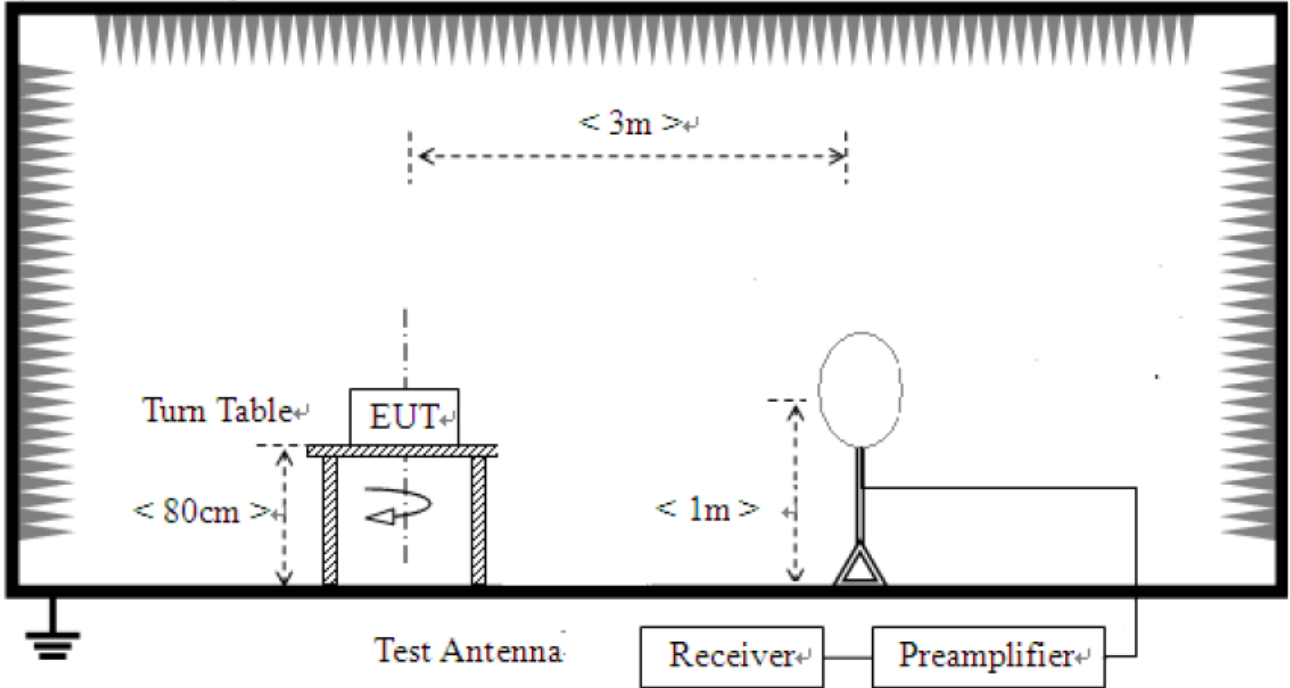
Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Refer as ANSI C63.10-2013, clause 6.4(Radiated emissions from unlicensed wireless devices below 30 MHz).
<input checked="" type="checkbox"/>	Radiated emission tests shall be performed in the frequency range of 9 kHz to 30 MHz, using a calibrated loop antenna. When perpendicular to the ground plane, the lowest height of the magnetic antenna shall be 1 m above the ground and shall be positioned at the specified distance from the EUT. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
<input checked="" type="checkbox"/>	The results shall be by using the square of an inverse linear distance extrapolation factor(40 dB/decade).
<input checked="" type="checkbox"/>	Refer as ANSI C63.10-2013, clause 6.5(Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz).
<input checked="" type="checkbox"/>	Refer as ANSI C63.10-2013, clause 6.6(Radiated emissions from unlicensed wireless devices above 1 GHz).
<input checked="" type="checkbox"/>	Test Antenna height is carried from 1m to 4m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.
<input checked="" type="checkbox"/>	Emissions more than 20 dB below the limit do not need to be reported.

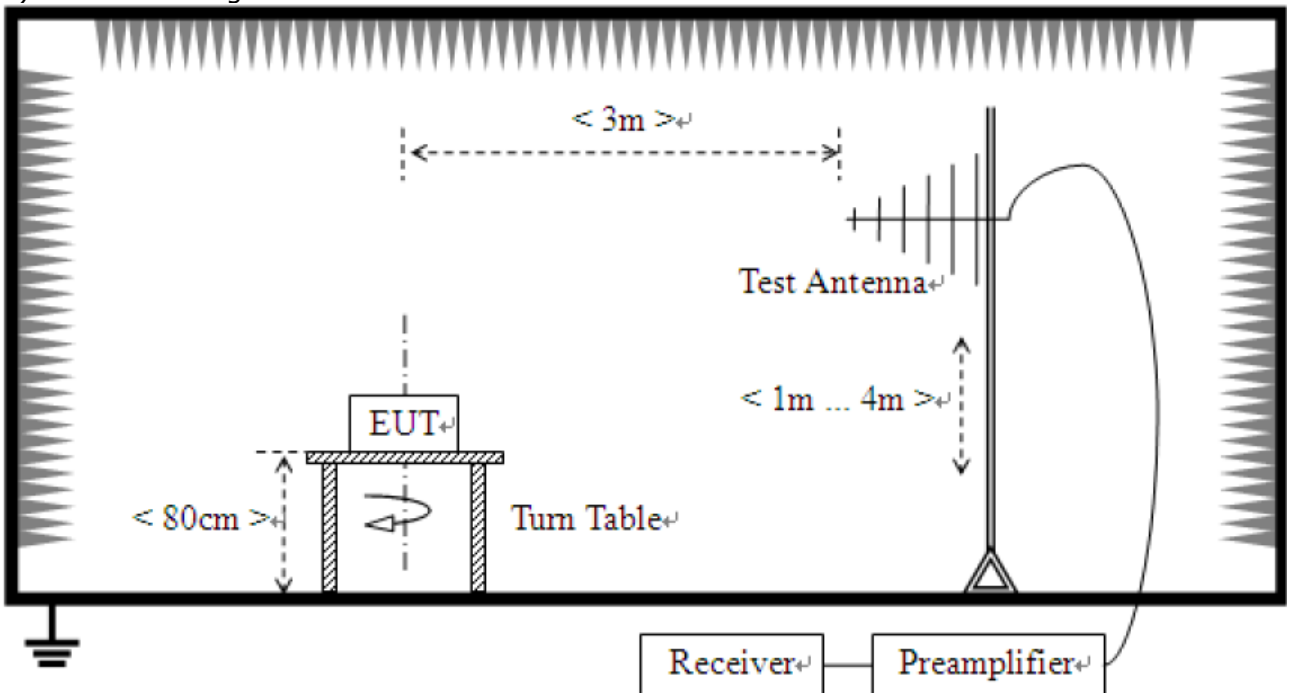
Measuring instrument Settings	
Frequency Range	9 kHz - 5 GHz
RBW	200 Hz (9 kHz - 150 kHz) 9 kHz (150 kHz - 30 MHz) 120 kHz (30 MHz - 1 000 MHz) 1 MHz (above 1 GHz)
VBW	≥ RBW
Sweep time	auto couple

Test Setup

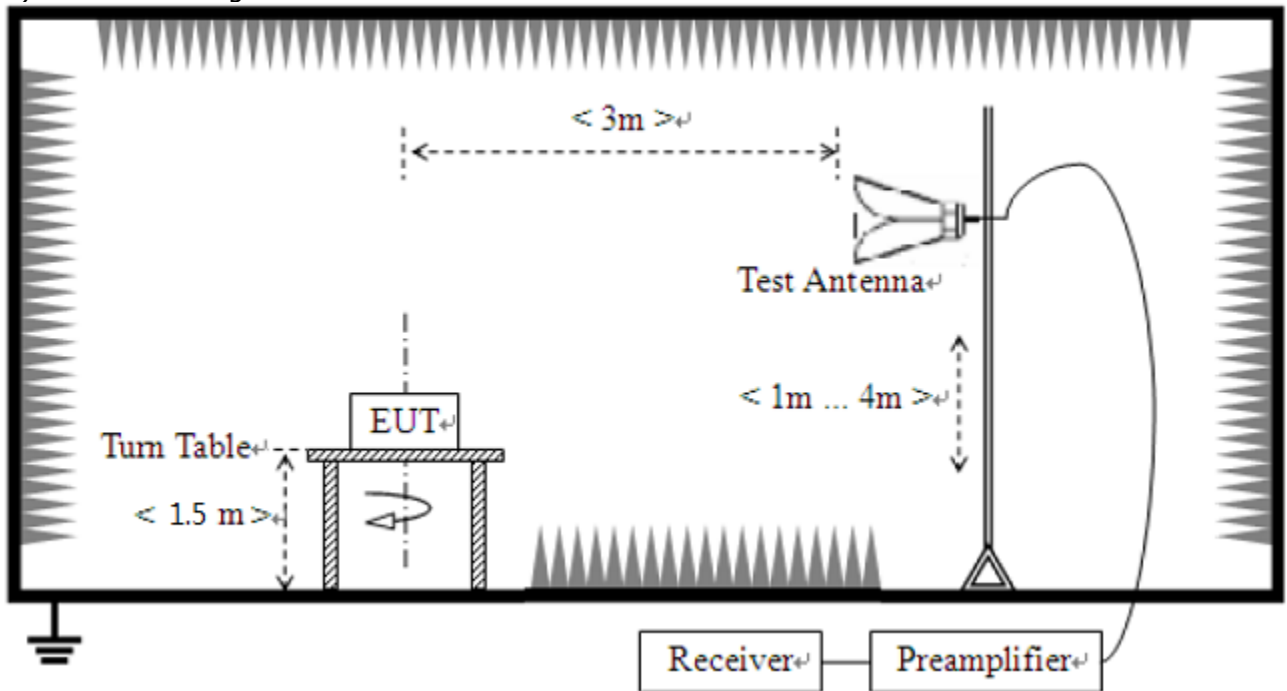
1) For field strength of emissions from 9 kHz to 30 MHz



2) For field strength of emissions from 30 MHz to 1 GHz



3) For field strength of emissions above 1 GHz

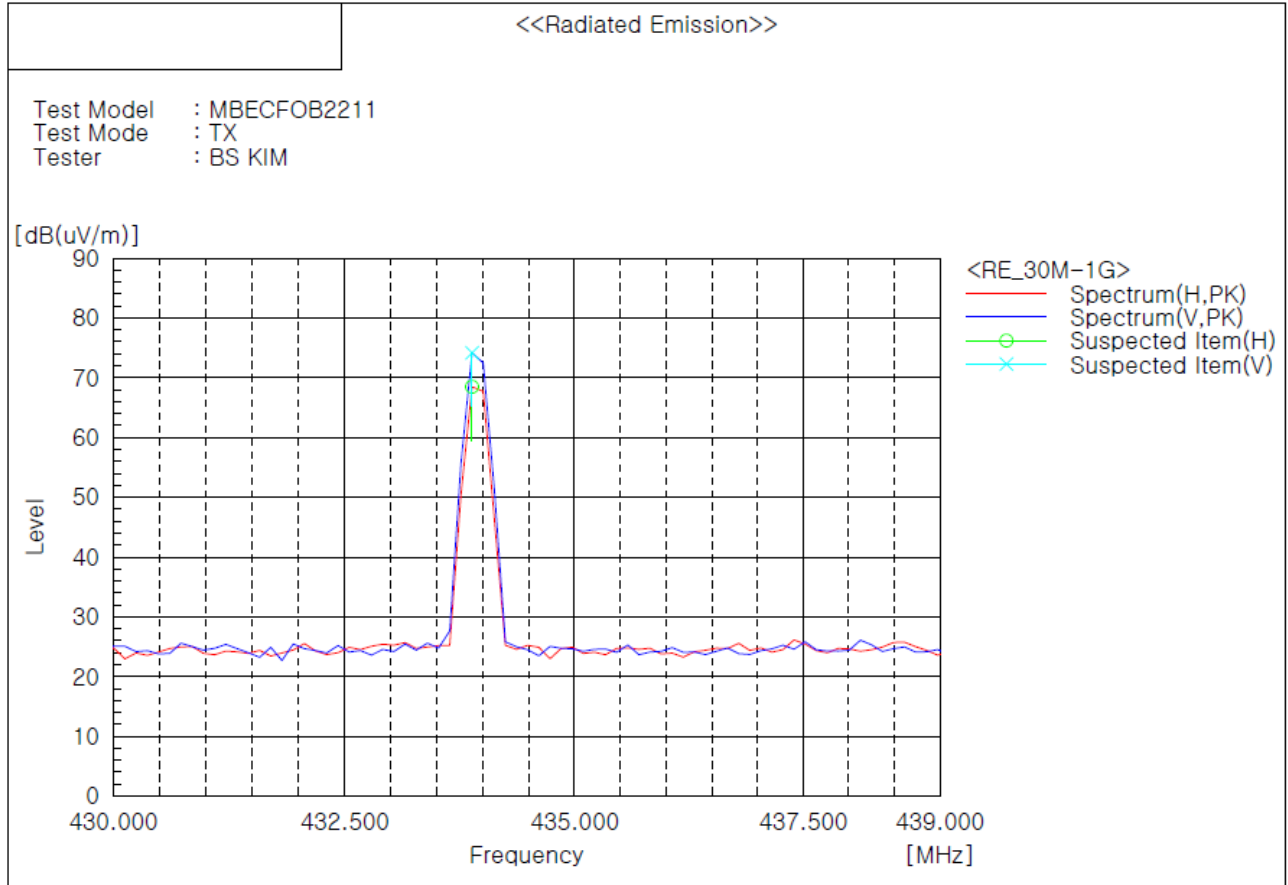


Test results

1) Fundamental frequency emissions

The requirements are:

Complies



Frequency [MHz]	Polarization	Reading [dBuV]	c.f [dB/m]	Result [dBuV/m]	Limit [dBuV/m]	Margin[dB]	Remark
433.92	V	78.1	-3.9	74.2	80.8	6.6	Peak
433.92	H	72.4	-3.9	68.5	80.8	12.3	Peak

Remark :

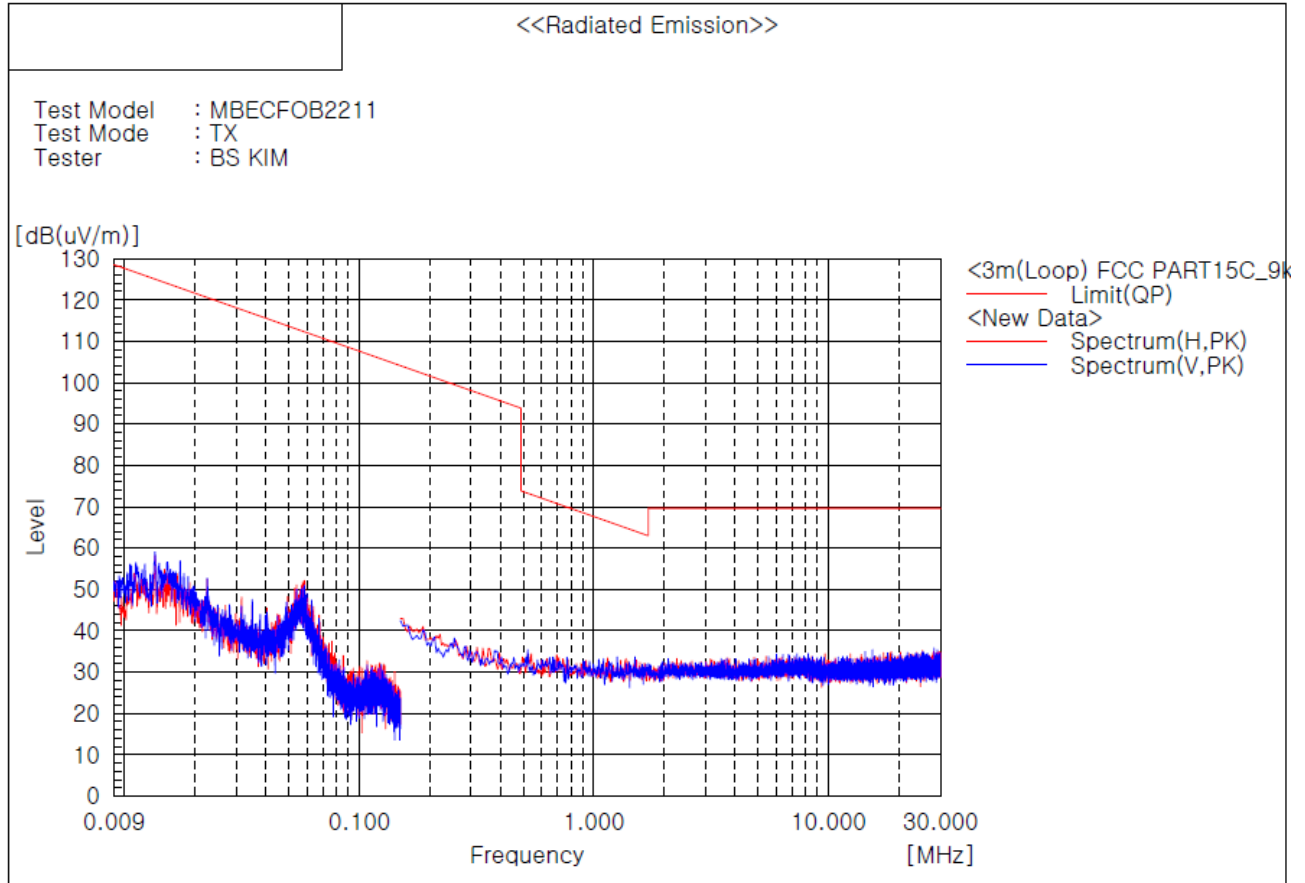
1. Result = Reading + c.f(correction factor)
2. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp. Gain
3. The Test result in peak detector is less than Quasi-peak limit.

2) Unwanted emissions

Frequency range : 9 kHz - 30 MHz

The requirements are:

Complies



Result : Emissions more than 20 dB below the limit don't need to be reported.

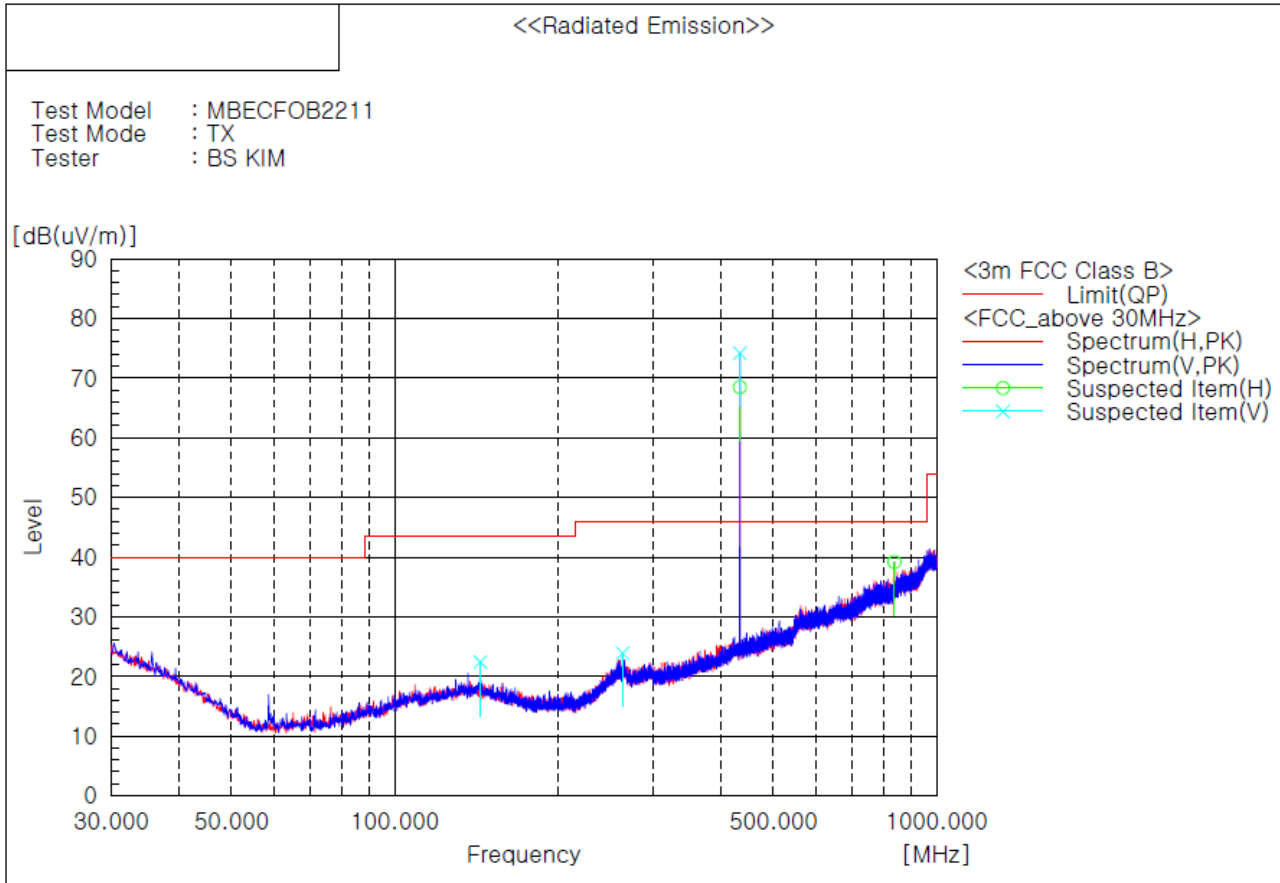
Remark :

1. Result = Reading + c.f(correction factor)
2. Correction factor = Antenna factor + Cable loss + 6 dB attenuator

Frequency range : 30 MHz - 1 GHz

The requirements are:

Complies



Spectrum Selection

No.	Frequency [MHz]	(P)	Reading [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	143.975	V	34.2	-11.8	22.4	43.5	21.1	193.0	308.0
2	263.649	V	32.1	-8.2	23.9	46.0	22.1	295.0	226.0
3	433.884	H	72.4	-3.9	68.5	46.0	-22.5	307.0	21.0
4	433.884	V	78.1	-3.9	74.2	46.0	-28.2	101.0	266.0
5	837.040	H	35.2	4.0	39.2	46.0	6.8	206.0	13.0

Remark :

1. Result = Reading + c.f(correction factor)
2. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp. Gain
3. Test result in peak detector is less than Quasi-peak limit.
4. No.3 and No.4 are the fundamental frequencies.



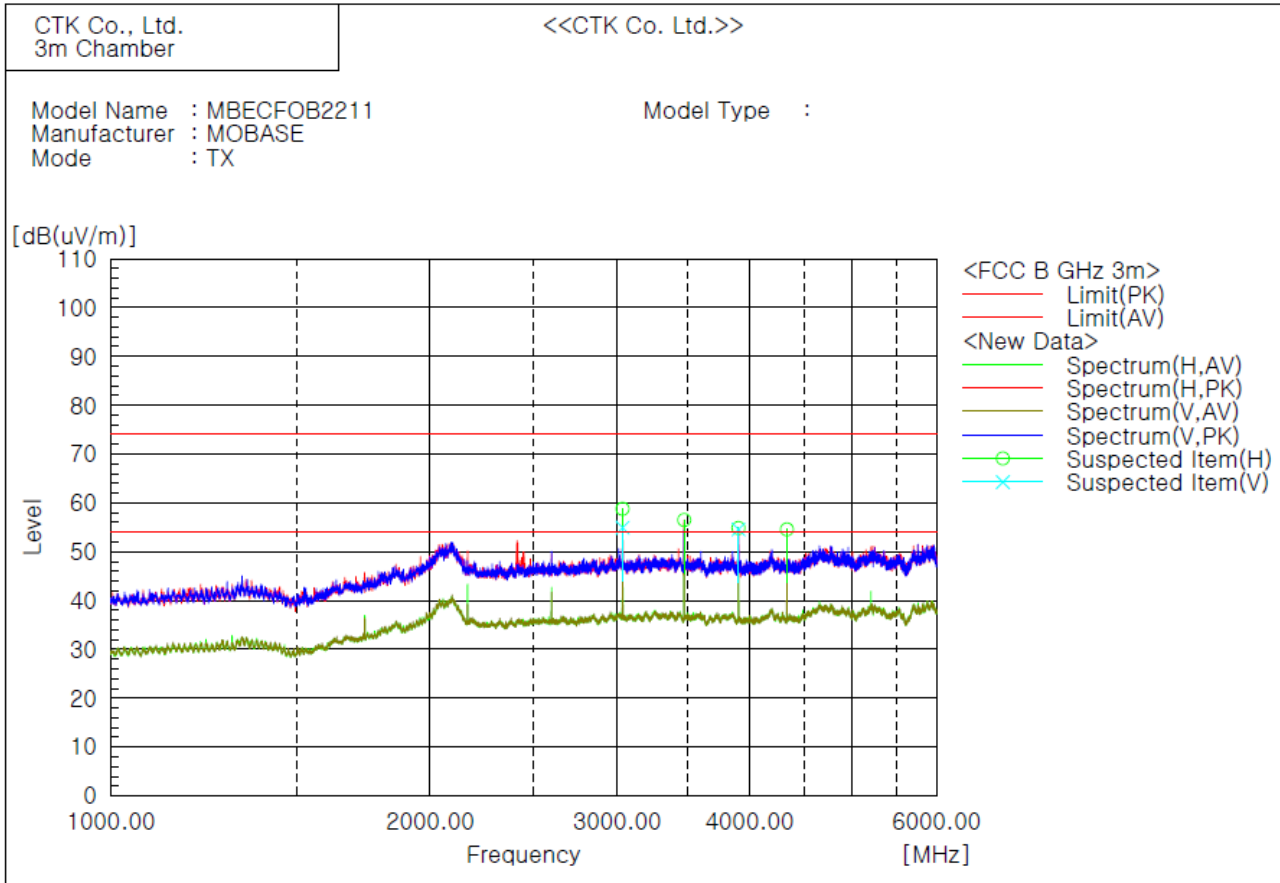
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Report No.:
 CTK-2022-01327
 Page (20) / (21) Pages

Frequency range : 1 GHz - 5 GHz

The requirements are:

Complies



No.	Frequency [MHz]	Polarization	Reading [dBuV]	c.f [dB/m]	Result [dBuV/m]	Limit [dBuV/m]	Magin[dB]	Remark
1	3 037.500	H	51.0	7.8	58.8	60.8	2.0	
2	3 037.500	V	47.1	7.8	54.9	60.8	5.9	
3	3 471.875	H	47.7	8.8	56.6	60.8	4.2	
4	3 905.625	H	44.7	10.1	54.8	60.8	6.0	
5	3 905.625	V	44.5	10.1	54.6	60.8	6.2	
6	4 339.375	H	43.8	10.8	54.6	60.8	6.2	

Remark :

1. Result = Reading + c.f(Correction factor)
2. Correction factor = Antenna factor + Cable loss - Amp. Gain
3. Test result is peak value.



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 CTK-2022-01327
 Page (21) / (21) Pages

APPENDIX A – Test Equipment Used For Tests

Instrument for Radiated emission

No.	Name of Equipment	Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date
1	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2021-10-20	2022-10-20
2	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2020-05-20	2022-05-20
4	Bilog Antenna	TESEQ	CBL6111D	58490	2021-03-03	2023-03-03
5	AMPLIFIER	SONOMA	310	291721	2022-01-21	2023-01-21
6	6dB Attenuator	BIRD	5W 6dB	1744	2021-11-18	2022-11-18
7	ATTENUATOR	PASTERNAK	PE7047-6	NONE	2022-02-22	2023-02-22
8	Double Ridged Guide Antenna	ETS-Lindgren	3117	00154525	2021-10-21	2022-10-21
9	Preamplifier	Agilent	8449B	3008A02011	2021-11-24	2022-11-24
10	EMI Test Receiver	R&S	ESU40	100336	2022-01-11	2023-01-11
11	Spectrum Analyzer	R&S	FSP-30	100994	2021-10-12	2022-10-12

Cable

No.	Cable	Manufacturer	Model No.	Serial No.	Check Date
1	RF Cable (1 GHz below Radiated)	HUBER+SUHNER	SUCOFLEX 104	MY27558/4	2022-02-22
2	RF Cable (1 GHz below Radiated)	CANARE	10m 1G below-1	N/A	2022-02-22
3	RF Cable (1 GHz below Radiated)	CANARE	10m 1G below-2	N/A	2022-02-22
4	3m Loop Cable (1 GHz below Radiated)	CANARE	3m loop	N/A	2021-11-18
5	Cable	HUBER+SUHNER	SUCOFLEX 106	N/A (above 1 GHz)	2021-11-24
6	Cable	HUBER+SUHNER	SUCOFLEX 102	MY2374/2	2021-11-24
7	Cable	HUBER+SUHNER	SUCOFLEX 102	MY4728/2	2021-11-24

-END-