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Hong Kong SAR, China.

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TEST REPORT

Report No.: 20060073HKG-001

Fizz Creations Ltd.

Application For Certification
(Original Grant)

FCC ID: 2AIPD1678

Transceiver

Prepared and Checked by:	**Approved by:**
Signed On File Chan Hin Man, Oscar Assistant Engineer	Digitally signed by Kenneth Wong Location: Intertek Testing Services Hong Kong Ltd. Wong Kwok Yeung, Kenneth Senior Lead Engineer Date: July 06, 2020

TEST REPORT

GENERAL INFORMATION

Grantee:	Fizz Creations Ltd.
Grantee Address:	Unit 6, Commerce Way, Lancing, West Sussex, BN15 8TA, United Kingdom.
Contact Person:	Jo Best
Tel:	+44(0) 1903 327006
Fax:	+44(0) 1903 327006
e-mail:	n/a
Manufacturer:	Fizz Creations Ltd.
Manufacturer Address:	Unit 6, Commerce Way, Lancing, West Sussex, BN15 8TA, United Kingdom.
Brand Name:	Narwhal Shower Speaker
Model:	1678
FCN Code:	0129
Type of EUT:	Transceiver
Description of EUT:	Narwhal Shower Speaker
Serial Number:	N/A
FCC ID:	2AIPD1678
Date of Sample Submitted:	June 02, 2020
Date of Test:	June 02, 2020 to July 02, 2020
Report No.:	20060073HKG-001
Report Date:	July 06, 2020
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%
Conclusion:	Test was conducted by client submitted sample. The submitted sample as received complied with the 47 CFR Part 15 Certification.

TEST REPORT

SUMMARY OF TEST RESULT

Test Specification	Reference	Results
Transmitter Power Line Conducted Emissions	15.207	Pass
Radiated Emission Radiated Emission on the Bandedge	15.249, 15.209	Pass
Radiated Emission in Restricted Bands	15.205	Pass

The equipment under test is found to be complying with the following standards:
FCC Part 15, October 1, 2019 Edition

Note: 1. The EUT uses a permanently attached antenna which, in accordance to section 15.203, is considered sufficient to comply with the pervisions of this section.
2. Pursuant to FCC part 15 Section 15.215(c), the 20 dB bandwidth of the emission was contained within the frequency band designated (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over excepted variations in temperature and supply voltage were considered.

TEST REPORT

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TEST REPORT

1.0 GENERAL DESCRIPTION

1.1 Product Description

The Equipment Under Test (EUT) is the Narwhal Shower Speaker which is the audio speaker for audio playing. The EUT is a “Bluetooth 5” device which operates at frequency range between 2402MHz and 2480MHz. The EUT is powered by an internal 3.7V rechargeable battery. The USB port is for charging internal battery purpose only that does not have data transfer. This “Bluetooth 5” device that without support data rate of 2Mbps.

Antenna Type: Internal, Integral

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

1.2 Related Submittal(s) Grants

This is a single application for certification of a transceiver.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.10 (2013). All radiated measurements were performed in an 3m Chamber . Preliminary scans were performed in the 3m Chamber only to determine worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **“Justification Section”** of this Application.

1.4 Test Facility

The 3m Chamber and conducted measurement facility used to collect the radiated data is located at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong SAR, China. This test facility and site measurement data have been placed on file with the FCC.

TEST REPORT

2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.10 (2013).

The device was powered by fully charged 3.7VDC internal battery.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The rear of unit shall be flushed with the rear of the table.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was mounted to a plastic stand if necessary and placed on the wooden turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

2.2 EUT Exercising Software

The EUT exercise program (if any) used during radiated testing was designed to exercise the various system components in a manner similar to typical use.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

2.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

2.5 Support Equipment List and Description

1. USB cable of 0.4m in length (Provided by Applicant)
2. HP Notebook (IT label: C4082 Model: 820G1) – Provided by Intertek)

TEST REPORT

3.0 EMISSION RESULTS

Data is included of the worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG - AV

where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

FS = RR + LF

where FS = Field Strength in dBµV/m
RR = RA - AG - AV in dBµV
LF = CF + AF in dB

Assume a receiver reading of 52.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 27 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 52.0 dBµV/m
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
AV = 5.0 dB
FS = RR + LF
FS = 18 + 9 = 27 dBµV/m

RR = 18.0 dBµV
LF = 9.0 dB

Level in µV/m = Common Antilogarithm [(27 dBµV/m)/20] = 22.4 µV/m

TEST REPORT

3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 2442 MHz

For electronic filing, the worst-case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgment: Passed by 4.0 dB

3.4 Conducted Emission Configuration Photograph

The worst case in line-conducted emission was found at 0.155 MHz

For electronic filing, the worst-case line-conducted configuration photographs are saved with filename: conducted photo.pdf.

3.5 Conducted Emission Data

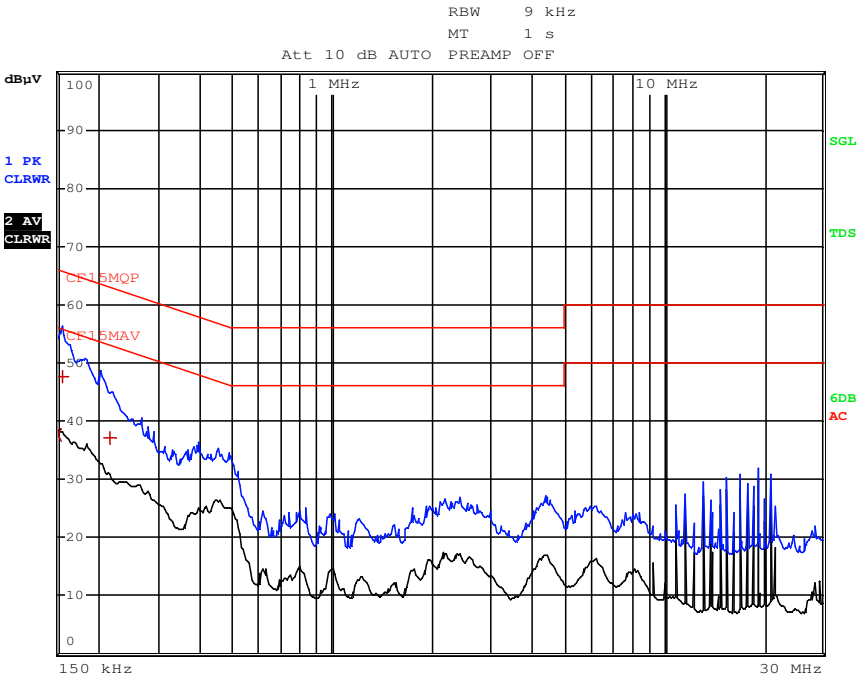
For electronic filing, the graph and data table of conducted emission is saved with filename: conducted.pdf.

Judgment: Pass by 18 dB

TEST REPORT

CONDUCTED EMISSION

Model: 1678
Date of Test: July 02, 2020
Worst-Case Operating Mode: Powered by PC + Bluetooth Audio Playing



EDIT PEAK LIST (Final Measurement Results)

Trace1: CF15MQP
Trace2: CF15MAV
Trace3: ---

TRACE	FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
2 CISPR Average	150 kHz	37.53	L1	-18.46
1 Quasi Peak	154.5 kHz	47.75	N	-18.00
1 Quasi Peak	217.5 kHz	37.20	N	-25.70

Note: Measurement Uncertainty is ±4.2dB at a level of confidence of 95%.

TEST REPORT

RADIATED EMISSIONS

Model: 1678
Date of Test: July 02, 2020
Worst-Case Operating Mode: Transmitting (BDR)

Table 1
Pursuant to FCC Part 15 Section 15.249 Requirement

Lowest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
V	2402.000	87.9	33	29.4	84.3	94.0	-9.7
H	***4804.000***	***36.2***	***33***	***34.9***	***38.1***	***54.0***	***-15.9***
V	7206.000	27.1	33	37.9	32.0	54.0	-22.0
H	9608.000	24.1	33	40.4	31.5	54.0	-22.5
H	***12010.000***	***23.2***	***33***	***40.5***	***30.7***	***54.0***	***-23.3***
H	14412.000	22.9	33	40.0	29.9	54.0	-24.1

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
V	2402.000	95.6	33	29.4	92.0	114.0	-22.0
H	***4804.000***	***45.4***	***33***	***34.9***	***47.3***	***74.0***	***-26.7***
V	7206.000	36.3	33	37.9	41.2	74.0	-32.8
H	9608.000	33.3	33	40.4	40.7	74.0	-33.3
H	***12010.000***	***32.5***	***33***	***40.5***	***40.0***	***74.0***	***-34.0***
H	14412.000	32.4	33	40.0	39.4	74.0	-34.6

NOTES:
1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters.
3. Average measurement is according to ANSI C63.10.
4. Negative sign in the column shows value below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: 1678
Date of Test: July 02, 2020
Worst-Case Operating Mode: Transmitting (BDR)

Table 2
Pursuant to FCC Part 15 Section 15.249 Requirement

Middle Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2442.000	93.6	33	29.4	90.0	94.0	-4.0
V	***4884.000***	***36.4***	***33***	***34.9***	***38.3***	***54.0***	***-15.7***
V	***7326.000***	***26.4***	***33***	***37.9***	***31.3***	***54.0***	***-22.7***
H	9768.000	23.6	33	40.4	31.0	54.0	-23.0
H	***12210.000***	***22.4***	***33***	***40.5***	***29.9***	***54.0***	***-24.1***
H	14652.000	24.5	33	38.4	29.9	54.0	-24.1

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	2442.000	100.3	33	29.4	96.7	114.0	-17.3
V	***4884.000***	***45.6***	***33***	***34.9***	***47.5***	***74.0***	***-26.5***
V	***7326.000***	***36.0***	***33***	***37.9***	***40.9***	***74.0***	***-33.1***
H	9768.000	32.7	33	40.4	40.1	74.0	-33.9
H	***12210.000***	***31.7***	***33***	***40.5***	***39.2***	***74.0***	***-34.8***
H	14652.000	33.7	33	38.4	39.1	74.0	-34.9

NOTES:
1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters.
3. Average measurement is according to ANSI C63.10.
4. Negative sign in the column shows value below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: 1678
Date of Test: July 02, 2020
Worst-Case Operating Mode: Transmitting (BDR)

Table 3
Pursuant to FCC Part 15 Section 15.249 Requirement

Highest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2480.000	93.2	33	29.4	89.6	94.0	-4.4
V	***4960.000***	***33.1***	***33***	***34.9***	***35.0***	***54.0***	***-19.0***
V	***7440.000***	***23.9***	***33***	***37.9***	***28.8***	***54.0***	***-25.2***
V	9920.000	21.0	33	40.4	28.4	54.0	-25.6
H	***12400.000***	***20.0***	***33***	***40.5***	***27.5***	***54.0***	***-26.5***
H	14880.000	21.6	33	38.4	27.0	54.0	-27.0

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	2480.000	100.1	33	29.4	96.5	114.0	-17.5
V	***4960.000***	***43.7***	***33***	***34.9***	***45.6***	***74.0***	***-28.4***
V	***7440.000***	***33.9***	***33***	***37.9***	***38.8***	***74.0***	***-35.2***
V	9920.000	30.9	33	40.4	38.3	74.0	-35.7
H	***12400.000***	***30.2***	***33***	***40.5***	***37.7***	***74.0***	***-36.3***
H	14880.000	31.7	33	38.4	37.1	74.0	-36.9

NOTES:
1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters.
3. Average measurement is according to ANSI C63.10.
4. Negative sign in the column shows value below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: 1678
Date of Test: July 02, 2020
Worst-Case Operating Mode: Transmitting (1Mbps)

Table 4
Pursuant to FCC Part 15 Section 15.249 Requirement

Lowest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2402.000	86.5	33	29.4	82.9	94.0	-11.1
V	***4804.000***	***32.2***	***33***	***34.9***	***34.1***	***54.0***	***-19.9***
H	7206.000	27.9	33	37.9	32.8	54.0	-21.2
H	9608.000	32.8	33	40.4	40.2	54.0	-13.8
V	***12010.000***	***27.1***	***33***	***40.5***	***34.6***	***54.0***	***-19.4***
V	14412.000	30.2	33	40.0	37.2	54.0	-16.8

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	2402.000	98.3	33	29.4	94.7	114.0	-19.3
V	***4804.000***	***46.3***	***33***	***34.9***	***48.2***	***74.0***	***-25.8***
H	7206.000	42.2	33	37.9	47.1	74.0	-26.9
H	9608.000	44.0	33	40.4	51.4	74.0	-22.6
V	***12010.000***	***40.2***	***33***	***40.5***	***47.7***	***74.0***	***-26.3***
V	14412.000	43.9	33	40.0	50.9	74.0	-23.1

NOTES:
1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters.
3. Average measurement is according to ANSI C63.10.
4. Negative sign in the column shows value below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: 1678
Date of Test: July 02, 2020
Worst-Case Operating Mode: Transmitting (1Mbps)

Table 5
Pursuant to FCC Part 15 Section 15.249 Requirement

Middle Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2442.000	87.9	33	29.4	84.3	94.0	-9.7
V	***4884.000***	***32.3***	***33***	***34.9***	***34.2***	***54.0***	***-19.8***
H	***7326.000***	***30.7***	***33***	***37.9***	***35.6***	***54.0***	***-18.4***
H	9768.000	33.4	33	40.4	40.8	54.0	-13.2
V	***12210.000***	***26.8***	***33***	***40.5***	***34.3***	***54.0***	***-19.7***
H	14652.000	31.1	33	38.4	36.5	54.0	-17.5

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	2442.000	99.8	33	29.4	96.2	114.0	-17.8
V	***4884.000***	***45.4***	***33***	***34.9***	***47.3***	***74.0***	***-26.7***
H	***7326.000***	***45.0***	***33***	***37.9***	***49.9***	***74.0***	***-24.1***
H	9768.000	45.0	33	40.4	52.4	74.0	-21.6
V	***12210.000***	***40.4***	***33***	***40.5***	***47.9***	***74.0***	***-26.1***
H	14652.000	44.6	33	38.4	50.0	74.0	-24.0

NOTES:
1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters.
3. Average measurement is according to ANSI C63.10.
4. Negative sign in the column shows value below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: 1678
Date of Test: July 02, 2020
Worst-Case Operating Mode: Transmitting (1Mbps)

Table 6
Pursuant to FCC Part 15 Section 15.249 Requirement

Highest Channel

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Average (dBµV/m)	Average Limit at 3m (dBµV/m)	Margin (dB)
H	2480.000	88.8	33	29.4	85.2	94.0	-8.8
V	***4960.000***	***30.2***	***33***	***34.9***	***32.1***	***54.0***	***-21.9***
V	***7440.000***	***25.9***	***33***	***37.9***	***30.8***	***54.0***	***-23.2***
H	9920.000	28.1	33	40.4	35.5	54.0	-18.5
H	***12400.000***	***27.4***	***33***	***40.5***	***34.9***	***54.0***	***-19.1***
H	14880.000	30.9	33	38.4	36.3	54.0	-17.7

Polari-zation	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m - Peak (dBµV/m)	Peak Limit at 3m (dBµV/m)	Margin (dB)
H	2480.000	100.4	33	29.4	96.8	114.0	-17.2
V	***4960.000***	***43.7***	***33***	***34.9***	***45.6***	***74.0***	***-28.4***
V	***7440.000***	***40.2***	***33***	***37.9***	***45.1***	***74.0***	***-28.9***
H	9920.000	41.5	33	40.4	48.9	74.0	-25.1
H	***12400.000***	***40.6***	***33***	***40.5***	***48.1***	***74.0***	***-25.9***
H	14880.000	45.2	33	38.4	50.6	74.0	-23.4

NOTES:
1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters.
3. Average measurement is according to ANSI C63.10.
4. Negative sign in the column shows value below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

Model: 1678
Date of Test: July 02, 2020
Worst-Case Operating Mode: Play + Charging

Table 7
Pursuant to FCC Part 15 Section 15.209 Requirement

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-amp (dB)	Antenna Factor (dB)	Net (peak) at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
V	35.820	34.3	16	10.0	28.3	40.0	-11.7
V	82.501	35.9	16	7.0	26.9	40.0	-13.1
H	***165.315***	***28.1***	***16***	***17.0***	***29.1***	***43.5***	***-14.4***
H	734.584	20.6	16	30.0	34.6	46.0	-11.4
H	576.474	22.4	16	28.0	34.4	46.0	-11.6
H	945.801	18.5	16	33.0	35.5	46.0	-10.5

NOTES:
1. Peak Detector Data unless otherwise stated.
2. All measurements were made at 3 meters.
3. Average measurement is according to ANSI C63.10.
4. Negative sign in the column shows value below limit.
5. Horn antenna is used for the emission over 1000MHz.
6. Emission (the row indicated by ***bold italic***) within the restricted band meets the requirement of FCC Part 15 Section 15.205.
7. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

TEST REPORT

4.0 EQUIPMENT PHOTOGRAPHS

For electronic filing, the photographs are saved with filename: external photos.pdf and internal photos.pdf.

5.0 PRODUCT LABELLING

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

6.0 TECHNICAL SPECIFICATIONS

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

7.0 INSTRUCTION MANUAL

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

TEST REPORT

8.0 MISCELLANEOUS INFORMATION

The miscellaneous information includes details of the test procedure and measured bandwidth / calculation of factor such as pulse desensitization and averaging factor (calculation and timing diagram).

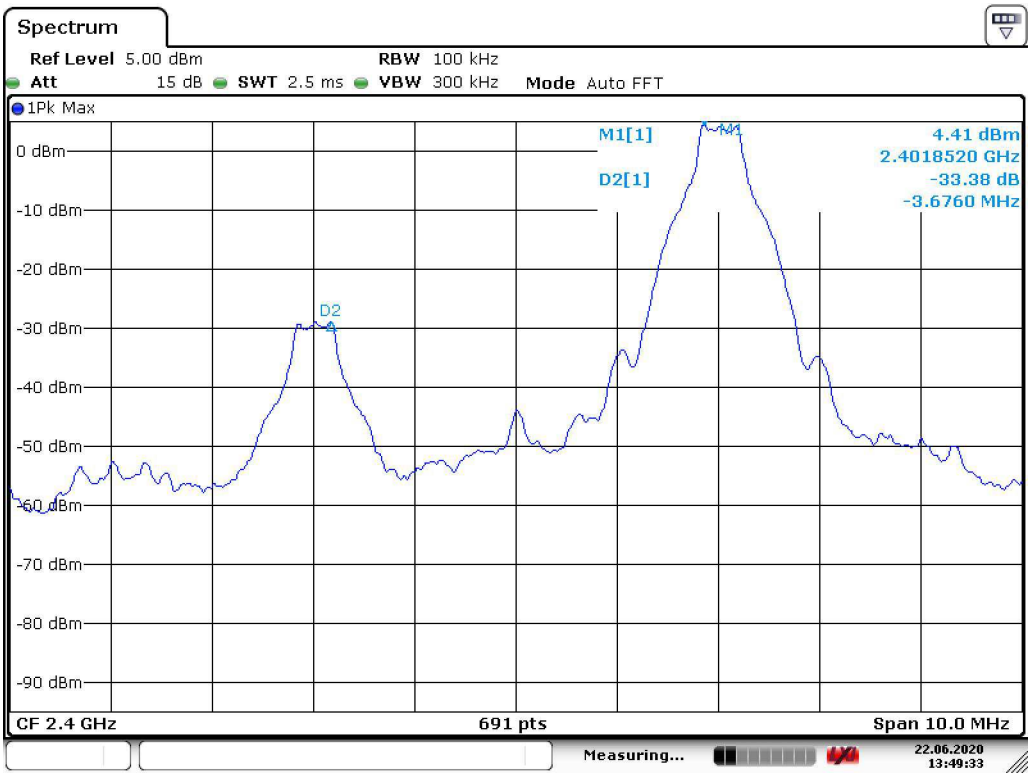
8.1 Radiated Emission on the Bandedge

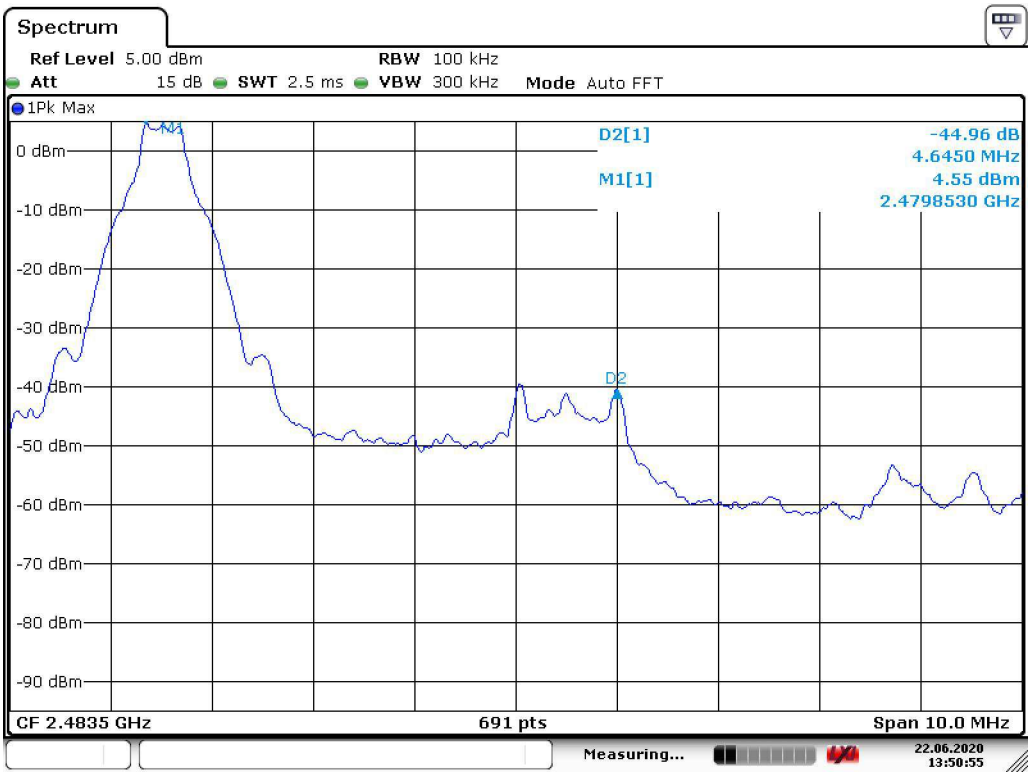
From the following plots, they show that the fundamental emissions are confined in the specified band (2400MHz to 2483.5MHz). In case of the fundamental emissions are within two standard bandwidths from the bandedge, the delta measurement technique is used for determining bandedge compliance. Standard bandwidth is the bandwidth specified by ANSI C63.10 (2013) for frequency being measured.

Emissions radiated outside of the specified frequency bands, except harmonics, are attenuated by 50dB below the level of the fundamental or to the general radiated emissions limits in Section 15.209 , whichever is the lesser attenuation, which meet the requirement of part 15.249(d).

TEST REPORT

PEAK MEASUREMENT (BDR)





TEST REPORT

PEAK MEASUREMENT (BDR)

Bandedge compliance is determined by applying marker-delta method, i.e. (Bandedge Plot).

Lower bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=92.0 dBµV/m – 33.4 dB
=58.6 dBµV/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=84.3 dBµV/m – 33.4 dB
=50.9 dBµV/m

Upper bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=96.5 dBµV/m – 45.0 dB
=51.5 dBµV/m

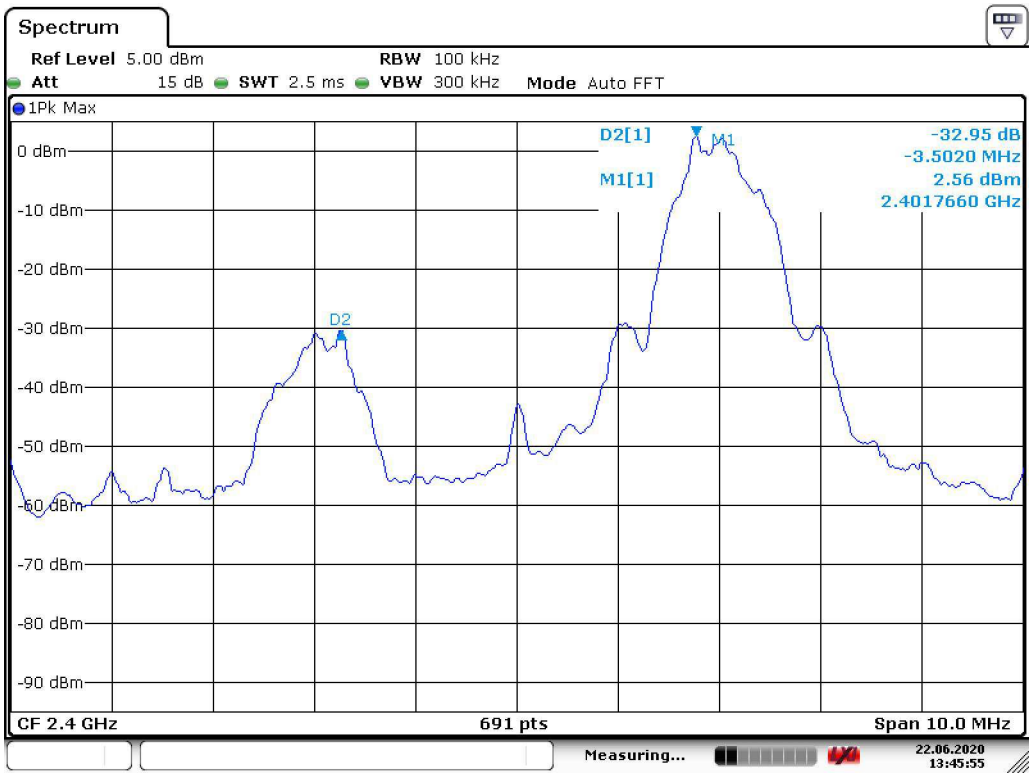
Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

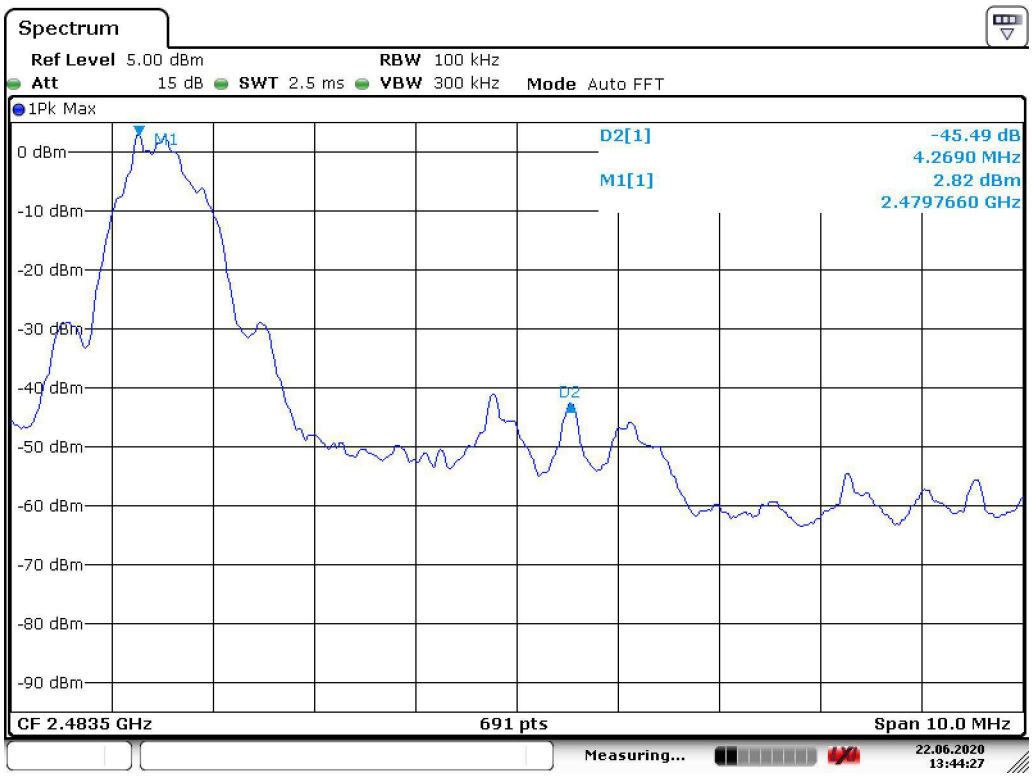
=89.6 dBµV/m – 45.0 dB
=44.6 dBµV/m

The resultant field strength meets the general radiated emission limit in Section 15.209, which does not exceed 74 dBµV/m (Peak Limit) and 54 dBµV/m (Average Limit).

TEST REPORT

PEAK MEASUREMENT (1MBps)





TEST REPORT

PEAK MEASUREMENT (1MBps)

Bandedge compliance is determined by applying marker-delta method, i.e. (Bandedge Plot).

Lower bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=94.7 dBµV/m – 33.0 dB
=61.7 dBµV/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=82.9 dBµV/m – 33.0 dB
=49.9 dBµV/m

Upper bandedge

Peak Resultant field strength = Fundamental emissions (peak value) – delta from the plot

=96.8 dBµV/m – 45.5 dB
=51.3 dBµV/m

Average Resultant field strength = Fundamental emissions (average value) – delta from the plot

=85.2 dBµV/m – 45.5 dB
=39.7 dBµV/m

The resultant field strength meets the general radiated emission limit in Section 15.209, which does not exceed 74 dBµV/m (Peak Limit) and 54 dBµV/m (Average Limit).

TEST REPORT

8.2 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. Since the transmitter transmits the RF signal continuously.

8.3 Calculation of Average Factor

The average factor is not applicable for this device as the transmitted signal is a continuously signal.

TEST REPORT

8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of transmitter operating under the Part 15, Subpart C rules.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately 0.8m in height above the ground plane for emission measurement at or below 1GHz and 1.5m in height above the ground plane for emission measurement above 1GHz. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axis to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 150 kHz to 30 MHz.

TEST REPORT

8.4 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.10 (2013).

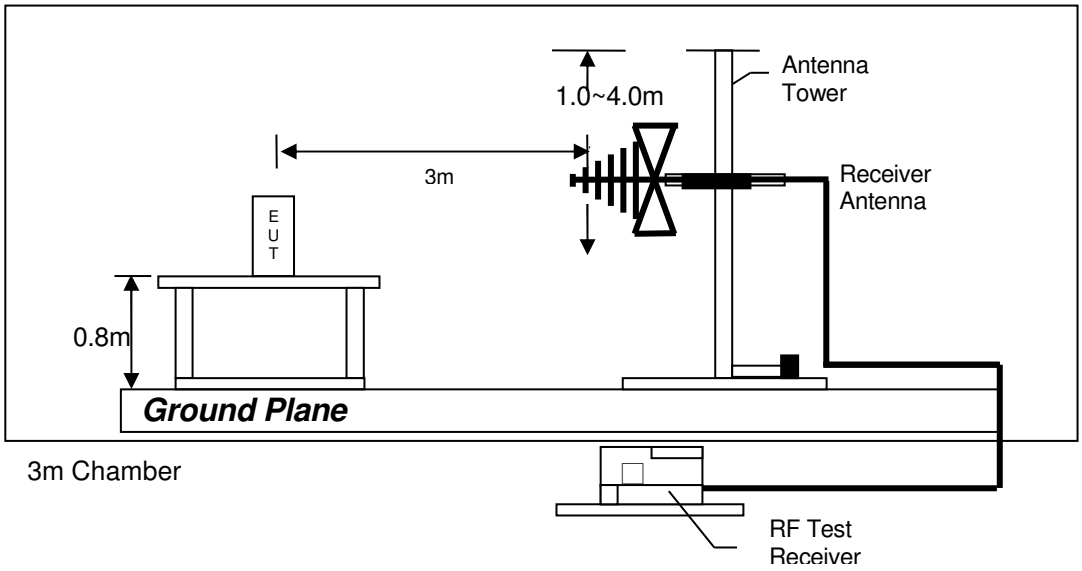
The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater when frequency is below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.1). Above 1000 MHz, a resolution bandwidth of 3 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.

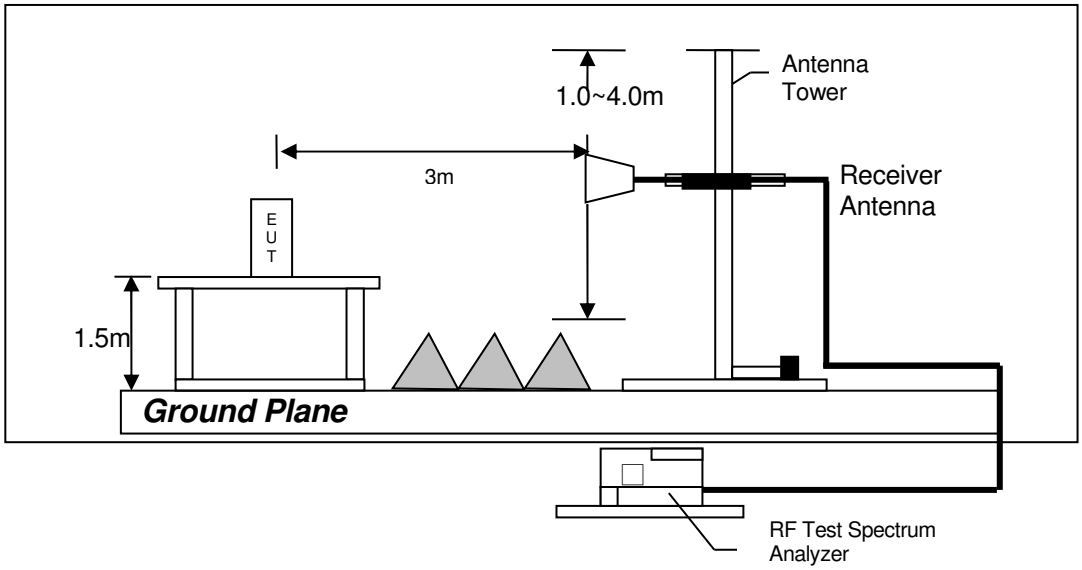
TEST REPORT

8.4.1 Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



Test setup of radiated emissions up to 1GHz



Test setup of radiated emissions above 1GHz

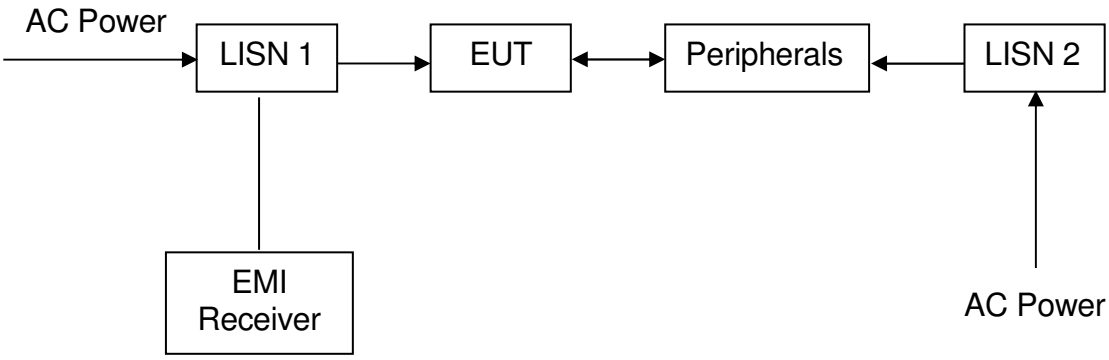
TEST REPORT

8.4.2 Conducted Emission Test Procedures

For tabletop equipment, the EUT along with its peripherals were placed on a 1.0m(W)×1.5m(L) and 0.8m in height wooden table. For floor-standing equipment, the EUT and all cables were insulated, if required, from the ground plane by up to 12 mm of insulating material. The EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were moved to find the maximum emission.

8.4.3 Conducted Emission Test Setup



TEST REPORT

9.0 EQUIPMENT LIST

1) Radiated Emissions Test

Equipment	EMI Test Receiver	Spectrum Analyzer	Biconical Antenna
Registration No.	EW-3156	EW-2253	EW-0571
Manufacturer	R&S	ROHDESCHWARZ	EMCO
Model No.	ESR26	FSP40	3104C
Calibration Date	August 01, 2019	November 18, 2019	July 23, 2019
Calibration Due Date	August 01, 2020	November 18, 2020	July 23, 2021

Equipment	Log Periodic Antenna	Double Ridged Guide Antenna	14m Double Shield RF Cable (20MHz - 6GHz)
Registration No.	EW-0447	EW-1015	EW-2528
Manufacturer	EMCO	EMCO	RADIALL
Model No.	3146	3115	Nm-RG142-
Calibration Date	September 25, 2019	May 16, 2019	September 30, 2019
Calibration Due Date	March 25, 2021	November 16, 2020	September 30, 2020

Equipment	Active Loop H-field (9kHz to 30MHz)	RF Preamplifier (9kHz to 6000MHz)	Solid State Low Noise Preamplifier Assembly (1 - 18)GHz
Registration No.	EW-3326	EW-3424	EW-431
Manufacturer	EMCO	SCHWARZBECK	BONN ELEKTRO
Model No.	6502	BBV9744	BLMA 0118-5G
Calibration Date	March 21, 2019	July 23, 2019	October 30, 2019
Calibration Due Date	September 21, 2020	July 23, 2020	October 30, 2020

Equipment	RF Cable 14m (1GHz to 26.5GHz)	Pyramidal Horn Antenna
Registration No.	EW-3151	EW-0905
Manufacturer	GREATBILLION	EMCO
Model No.	SMA m/SHF5MPU /SMA m ra14m,26G	3160-09
Calibration Date	March 04, 2020	July 23, 2019
Calibration Due Date	March 04, 2021	January 23, 2021

TEST REPORT

2) Conducted Emissions Test

Equipment	RF Cable 80cm (RG142) (9kHz to 30MHz)	Artificial Mains Network	EMI Test Receiver
Registration No.	EW-2451	EW-2874	EW-3156
Manufacturer	RADIALL	ROHDESCHWARZ	R&S
Model No.	bnc m st / 142 / bnc m st 80cm	ENV-216	ESR26
Calibration Date	December 08, 2019	July 05, 2019	August 01, 2019
Calibration Due Date	December 08, 2020	July 05, 2020	August 01, 2020

END OF TEST REPORT