

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT



Applicant:	Axon Enterprise, Inc. 17800 N 85th St. Scottsdale, AZ 85255, United States
Product Name:	Fleet 3 Wireless Mic
Brand Name:	Axon
Model No.:	AX1035
Model Difference:	N/A
Report Number:	E2/2021/90024
FCC ID	X4GS01351
IC:	8803A-S01351
Issue Date:	Oct. 15, 2021
Date of Test:	Sep. 14, 2021~Sep 24, 2021
Date of EUT Received:	Sep. 14, 2021

Approved By

Jay Lin

#### We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

Australian/New Zealand Standard AS/NZS 4268:2017. Test report to determine compliance with AS/NZS 4268 requirements.

The test results of this report relate only to the tested sample identified in this report.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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Revision History						
Report Number	Revision	Description	Issue Date	Remark		
E2/2021/90024	Rev.00	Original.	Oct. 15, 2021	Susan Lin		

#### Note:

1. Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

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#### **GENERAL INFORMATION** 1

#### 1.1 **Product description**

Product Name:	Fleet 3 Wireless Mic
Brand Name:	Axon
Model No.:	AX1035
Model Difference:	N/A
Hardware Version:	DVT
Software Version:	N/A
Main chip FW Version:	v23.00
TI RF chip FW Version:	24.14
EUT Series No.:	PJ219089005
Power Supply:	3.2Vdc from battery

Radio Technology:	Wireless Microphone
Frequency Range (FCC):	902.4 – 927.6MHz
Frequency Range (AS/NZS 4268):	915 – 928MHz
Channel number:	64 channels
Modulation type:	2FSK
Transmit Power:	20.70 dBm (Peak)
Dwell Time:	<= 0.4s
Operating Mode:	Point-to-Point
Antenna Designation:	PIFA Antenna , Peak Gain: 0.0dBi

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#### 1.2 **Test Methodology of Applied Standards** FCC Part 15, Subpart C §15.247 FCC KDB 558074 D01 15.247 Meas Guidance v05r02 RSS-247 issue 2 Feb. 2017 RSS-Gen, Issue 5 (Amendment 2, February 2021) ANSI C63.10:2013

AS/NZS 4268:2017, - Radio equipment and systems - Short range devices - Limits and methods of measurement.

#### 1.3 **Test Facility**

Laboratory	Test Site Address	Test Site Name	FCC Designa- tion number	IC CAB identifier
		SAC 1		
		SAC 3		
		Conduction 1		
	No.134, Wu Kung Road, New Taipei	Conducted 1		
	Industrial Park, Wuku District, New	Conducted 2	TW0027	
	Taipei City, Taiwan.	Conducted 3		
		Conducted 4		
		Conducted 5		TW3702
SCS Taiwan Ltd		Conducted 6		
Control PE Lob		Conduction C		
(TAE code 3702)		SAC C		
(1AI COULE 5702)		SAC D	TW0028	
	No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333	SAC G		
		Conducted A		
		Conducted B		
		Conducted C		
		Conducted D		
		Conducted E		
		Conducted F		
		Conducted G		
Note: Test site na	ame is remarked on the equipmen	t list in each sectio	n of this report a	s an indica-

tion where measurements occurred in specific test site and address.

#### 1.4 **Special Accessories**

There is no special accessory used while test was conducted.

#### 1.5 **Equipment Modifications**

There was no modification incorporated into the EUT.

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#### SYSTEM TEST CONFIGURATION 2

#### 2.1 **EUT Configuration**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

#### 2.2 **EUT Exercise**

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

#### 2.3 **Test Procedure**

#### 2.3.1 **Conducted Emissions**

The EUT is a placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz. The CISPR Quasi-Peak and Average detector mode is employed. The two LISNs provide 50uH/50 ohm of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

#### 2.3.2 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

#### 2.3.3 **Radiated Emissions**

The EUT is a placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

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### 2.4 Measurement Results Explanation Example

# 2.4.1 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m\*9m\*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

#### 2.4.2 For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

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#### 2.5 **Configuration of Tested System**





Fig. 2-3 Radiated Emission



|--|

ltem	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Notebook	Lenovo	L440	P0000367	N/A	N/A
2.	Adapter	FSP GROUP INC.	FSP120-AHAN3	N/A	N/A	N/A

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#### SUMMARY OF TEST RESULTS 3

AS/NZS 4268 Rule	Description	Result
Row 54	Frequency hopping transmit- ters	Compliant

FCC Rules	IC Rules	Description Of Test	Result
§15.207(a)	RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.247(b)(2)	RSS-247 §5.4 b	Peak Output Power	Compliant
§15.247(a)(1)(i)	RSS-247 §5.1 b RSS-Gen §6.7	20dB & 99% Bandwidth	Compliant
§15.205 §15.209 §15.247(d)	RSS-247 §5.5 RSS-Gen §8.9 RSS-Gen §8.10	Conducted & Radiated Band Edge and Spurious Emission	Compliant
§15.247(a)(1)(i)	RSS-247 §5.1 c	Frequency Separation Number of hopping frequency Time of Occupancy	Compliant
§15.203	N/A	Antenna Requirement	Compliant

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#### **DESCRIPTION OF TEST MODES** 4

#### 4.1 Operated in 902.4 ~ 927.6MHz Band

#### 64 Channels are provided

	СН	Freq.(MHz)	СН	Freq. (MHz)	СН	Freq. (MHz)	CH	Freq. (MHz)
	0	902.4	19	910	38	917.6	57	925.2
	1	902.8	20	910.4	39	918	58	925.6
	2	903.2	21	910.8	40	918.4	59	926
	3	903.6	22	911.2	41	918.8	60	926.4
	4	904	23	911.6	42	919.2	61	926.8
	5	904.4	24	912	43	919.6	62	927.2
	6	904.8	25	912.4	44	920	63	927.6
	7	905.2	26	912.8	45	920.4		
Channel	8	905.6	27	913.2	46	920.8		
List	9	906	28	913.6	47	921.2		
	10	906.4	29	914	48	921.6		
	11	906.8	30	914.4	49	922		
	12	907.2	31	914.8	50	922.4		
	13	907.6	32	915.2	51	922.8		
	14	908	33	915.6	52	923.2		
	15	908.4	34	916	53	923.6		
	16	908.8	35	916.4	54	924		
	17	909.2	36	916.8	55	924.4		
	18	909.6	37	917.2	56	924.8		

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### 4.2 The Worst Test Modes and Channel Details

- 1 The EUT has been tested under operating condition.
- 2 Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
- 3 Investigation has been done on all the possible configurations for searching the worst case.

RADIATED EMISSION TEST (BELOW 1 GHz)						
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	DATA RATE (Mbps)			
902.4~927.6	902.4~927.6	915.2	0.2			
RADIATED EMISSION TEST (ABOVE 1 GHz)						
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	DATA RATE (Mbps)			
902.4~927.6	902.4~927.6	902.4 \ 915.2 \ 927.6	0.2			
<b>Note:</b> The field strength of radiation emission was measured as EUT three or- thogonal planes, E1 / E2 / H, are positioned to pre-scan the emission generating the highest one. The worst position is tested and recorded.						

Peak ouput power					
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	DATA RATE (Mbps)		
902.4~927.6	902.4~927.6	902.4 \ 915.2 \ 927.6	0.2		

20dB Band width					
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	DATA RATE (Mbps)		
902.4~927.6	902.4~927.6	902.4 \ 915.2 \ 927.6	0.2		

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Band Edge				
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	DATA RATE (Mbps)	
902.4~927.6	902.4~927.6	902.4 \ 927.6	0.2	

Frequency Separation					
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	DATA RATE (Mbps)		
902.4~927.6	902.4~927.6	902.4 \ 902.8 \ 903.2	0.2		

Number of hopping frequency				
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	DATA RATE (Mbps)	
902.4~927.6	902.4~927.6	902.4~927.6	0.2	

Dwell time					
MODE	AVAILABLE FREQUENCY (MHz)	TESTED FREQUENCY (MHz)	DATA RATE (Mbps)		
902.4~927.6	902.4~927.6	915.2	0.2		

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### **5 MEASUREMENT UNCERTAINTY**

Test Items		Jncertai	nty
AC Power Line Conducted Emission	+/-	2.34	dB
Peak Output Power	+/-	1	dB
20dB Bandwidth & 99% Bandwidth	+/-	1.53	Hz
100 kHz Bandwidth Of Frequency Band Edges	+/-	1.69	dB
Frequency Separation	+/-	1.53	Hz
Number of hopping frequency	+/-	1.53	Hz
Time of Occupancy	+/-	1.53	Hz
Temperature	+/-	0.4	°C
Humidity	+/-	3.5	%
DC / AC Power Source	+/-	1	%

Radiated Spurious Emission Measurement Uncertainty				
	+/-	2.64	dB	9kHz~30MHz
Polarization: Vertical	+/-	4.93	dB	30MHz - 1000MHz
	+/-	4.81	dB	1GHz - 18GHz
	+/-	4.52	dB	18GHz - 40GHz
	+/-	2.64	dB	9kHz~30MHz
Polarization: Horizontal	+/-	4.45	dB	30MHz - 1000MHz
	+/-	4.81	dB	1GHz - 18GHz
	+/-	4.52	dB	18GHz - 40GHz

#### Note:

- 1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
- 2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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#### CONDUCTED EMISSION TEST 6

#### 6.1 **Standard Applicable**

Frequency within 150 kHz to 30MHz shall not exceed the limit table as below.

	Limits			
Frequency range	dB(*	uV)		
MHz	Quasi-peak	Average		
0.15 to 0.50	66 to 56	56 to 46		
0.50 to 5	56	46		
5 to 30	60	50		
Note				

1. The lower limit shall apply at the transition frequencies

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

#### 6.2 Measurement Equipment Used:

Radiated Emission Test Site: Conduction C					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Test Software	audix	e3	Ver. 6.11- 20180419c	N.C.R	N.C.R
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	973	03/25/2021	03/24/2022
EMI Test Receiver	R&S	ESCI	101342	04/28/2021	04/27/2022
Coaxial Cable	EC Lab	RF-HY-CAB-250	RF-HY-CAB- 250-01	03/27/2021	03/26/2022
Pulse Limiter	EC Lab	VTSD 9561F-N	485	03/27/2021	03/26/2022
Adapter	FSP GROUP INC.	FSP120-AHAN3	N/A	N.C.R	N.C.R

#### 6.3 **EUT Setup**

- 1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
- 2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- 3. The LISN was connected with 120Vac/60Hz power source.

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### 6.4 Test SET-UP (Block Diagram of Configuration)



#### 6.5 Measurement Procedure

- 1. The EUT was placed on a table which is 0.8m above ground plane.
- 2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 3. Repeat above procedures until all frequency measured were complete.

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24.271

QP

### Report No.: E2/2021/90024 Page: 16 of 54

#### 6.6 Measurement Result

Report Number	:E2/2021/90024	Test Site	:Conduction C
Test Mode	:Wireless Microphone LoRa	Test Date	:2021-09-17
Power	:120V/60Hz	Temp./Humi.	:22.1/62
Probe	:L1	Engineer	:Enzo Chang
Note:	: FSP120-AHAN3		



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29.60

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10.97

40.57

60.00

-19.43



24.015

QP

Report Number	:E2/2021/90024	Test Site	:Conduction C
Test Mode	:Wireless Microphone LoRa	Test Date	:2021-09-17
Power	:120V/60Hz	Temp./Humi.	:22.1/62
Probe	:N	Engineer	:Enzo Chang
Note:	: FSP120-AHAN3		



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29.70

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11.08

40.78

60.00

-19.22



# 7 PEAK OUTPUT POWER MEASUREMENT

### 7.1 Standard Applicable

For frequency hopping systems operating in the 902-928 MHz band employing at least 50 hopping channels, conducted output power shall not exceed 1Watt and EIRP shall not exceed 4W. For systems employing less than 50 hopping channels, conducted output power shall not exceed 0.25Watt and EIRP shall not exceed 1W.

### 7.2 Measurement Equipment Used

	Conducted	d Emission Test S	ite: Conducted E	3	
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	07/07/2021	07/06/2022
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R
Attenuator	Marvelous	MVE2213-10	RF09	11/19/2020	11/18/2021
DC Block	PASTERNACK	PE8210	RF151	11/19/2020	11/18/2021

### 7.3 Test Set-up:



### 7.4 Measurement Procedure:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows ANSI C63.10.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Max Hold, Detector = Peak, RBW >=20dB bandwidth)
- 4. Record the max. reading.
- 5. Repeat above procedures until all default test channel is completed.

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#### 7.5 Measurement Result

#### Wireless Microphone (Peak):

СН	Freq. (MHz)	Peak Output Power (dBm)	Output Power (mW)	Limit (mW)
Low	902.4	20.57	114.025	1000
Mid	915.2	20.58	114.288	1000
High	927.6	20.70	117.490	1000

NOTE: cable loss as 10.6dB that offsets in the spectrum

#### Wireless Microphone (Average):

СН	Freq. (MHz)	Max. Output include tune up tolerance Power (dBm)	Output Power (mW)	Limit (mW)
Low	902.4	20.52	112.720	1000
Mid	915.2	20.53	112.980	1000
High	927.6	20.64	115.878	1000

\*Note: Max. Output include tune up tolerance Power measured by using average detector.

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# 8 20dB & 99% BANDWIDTH

### 8.1 Standard Applicable

For frequency hopping systems operating in the 902 MHz-928 MHz : if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies.

### 8.2 Measurement Equipment Used

	Conducted	d Emission Test S	ite: Conducted E	3	
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	07/07/2021	07/06/2022
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R
Attenuator	Marvelous	MVE2213-10	RF09	11/19/2020	11/18/2021
DC Block	PASTERNACK	PE8210	RF151	11/19/2020	11/18/2021

### 8.3 Test Set-up



### 8.4 Measurement Procedure:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set the spectrum analyzer as RBW=3 kHz, VBW = 9.1 kHz, Span= large enough to capture all products of the modulation process, Sweep=auto, Detector = Peak, and Max hold for 20dB Bandwidth test.
- 4. Mark the peak frequency and –20dB (upper and lower) frequency and Turn on the 99% bandwidth function, max reading.
- 5. Repeat above procedures until all test default channel is completed

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#### 8.5 20dB Bandwidth

#### Wireless Microphone

Frequency	20dB
	BW
	(MHz)
902.4	0.2084
915.2	0.2139
927.6	0.2078

### 8.6 99% Bandwidth

#### Wireless Microphone

Frequency (MHz)	99%Bandwidth (MHz)
902.4	0.20792
915.2	0.21723
927.6	0.20705

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#### OBW 20dB\_Wireless Microphone\_Low



#### OBW 20dB\_Wireless Microphone\_Mid



#### OBW 20dB\_Wireless Microphone\_High

📕 Keysight S	pectrum Analyzer - Oc	cupied BW									
CXI R	RF 50 Ω	DC		Center F	NSE:INT	000 MHz	ALIGN AUTO	08:52:50 A	M Sep 24, 2021	Fr	equency
	1			Trig: Fre	e Run	Avg Hold	1: 100/100			1	
		#IF	Gain:Low	#Atten: 3	0 dB			Radio Dev	vice: BTS		
	Ref Offset	10.6 dB					Mkr1	927.70	045 MHz		
10 dB/div	Ref 30.0	0 dBm						-0.194	05 aBM		
20.0											Center Fred
10.0				many	harmon		<b>µ</b> 1			927	600000 MHz
0.00			Lun	eter a		1 mm	₩'				.000000 11112
10.00		N					m				
-10.0	Barris	1					m m	andred	A.	1	
-20.0	74 M	1					1	Jun 1	Mr.	1	
-30.0		ſ						r	J.	1	
-40.0										1	
-50.0										1	
-60.0										1	
								- Croo	500 kHz	<u> </u>	
#Res BV	3 kHz			#VE	SW 9.1 ki	H7		Sween	53.07 ms		CF Step
								encop	00101 1110	Auto	50.000 KHZ
Occu	pied Band	width			Total P	ower	27.9	dBm			
		207	05 kH	47							
		201	.00 11	12						1 1	FreqOffset
Trans	mit Freq Err	ror	704	Hz	OBW P	ower	99	.00 %			0 Hz
x dB l	Bandwidth		207.8	Hz	x dB		-20.	00 dB			
										I	
MSG							STATUS				

#### IC OBW 99%\_ Wireless Microphone\_Low



#### IC OBW 99%\_ Wireless Microphone\_Mid



#### IC OBW 99%\_ Wireless Microphone\_High

📕 Keysight Spect	trum Analyzer - Occ	upied BW									- 6 ×
R	RF 50 Ω	DC		Center F	NSE:INT reg: 927.600	000 MHz	ALIGN AUTO	08:52:50 A Radio Std	M Sep 24, 2021 : None	Fre	equency
		410	Gain:Low	Trig: Fre #Atten: 3	e Run 0 dB	Avg Hold:	: 100/100	Radio Dev	ice: BTS		
			Gam.cow	written. e			Mkr1	027 70			
10 dB/div	Ref Offset Ref 30.00	10.6 dB D dBm						-0.194	05 dBm		
20.0											enter Fred
10.0	_		0.00	approved and	llamon	two i	1			927	.600000 MH;
0.00		N	For .			· · · · · · · · · · · ·	m			<u> </u>	
-10.0	hour	14					- m	mond	١.		
-30.0	m	ſ					\	V <sup>ar</sup>	www		
40.0									~~~		
-50.0	_										
-60.0											
Center 92	7.6 MHz 3 kHz			#VF	3W/9.1k	H7		Spar Sween	1 500 kHz 53.07 ms		CF Step
								p		Auto	50.000 KH: Mar
Occup	ied Band	width			Total P	ower	27.9	dBm			
		207	.05 kl	Ηz						F	req Offset
Transm	it Freq Err	or	704	Hz	OBW P	ower	99	.00 %			0 H:
x dB Ba	ndwidth		207.8	(Hz	x dB		-20.	00 dB			
ISG							STATUS				

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# 9 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

### 9.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) and RSS-Gen §8.10, must also comply with the radiated emission limits specified in §15.209(a) and RSS-Gen §8.9.

### 9.2 Measurement Equipment Used

### 9.2.1 Conducted Emission at antenna port:

	Conducted	d Emission Test S	ite: Conducted E	3	
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	07/07/2021	07/06/2022
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R
Attenuator	Marvelous	MVE2213-10	RF09	11/19/2020	11/18/2021
DC Block	PASTERNACK	PE8210	RF151	11/19/2020	11/18/2021

### 9.3 Test SET-UP:



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#### 9.4 **Measurement Procedure**

### **Conducted Band Edge:**

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows ANSI C63.10:2013.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set center frequency of spectrum analyzer = operating frequency.
- 5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Sweep = auto
- 6. Mark Peak, 902MHz and 928MHz and record the max. level.
- 7. Repeat above procedures until all frequency measured were complete.

### **Conducted Spurious Emission:**

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. The testing follows ANSI C63.10:2013.
- 3. Set RBW = 100 kHz & VBW = 300 kHz, Detector = Peak, Sweep = Auto
- 4. Allow trace to fully stabilize.
- 5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
- 6. Repeat above procedures until all default test channel measured were complete.

### NOTE: cable loss as 10.30 dB that offsets in the spectrum

#### 9.5 Measurement Result

See next page for test plots

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#### Band Edge\_Wireless Microphone\_Low

🚺 Ke	ysight	Specti	rum A	knalyzer -	Swept	SA													- 6
(XX) R			RF	5	0 Q	DC				Tring	SENSE:	INT	Avg	Туре	LIGN AUTO	04:07:41 TR	PM Sep 23, 2021	5	Frequency
10 d	B/div	,	Ref Ref	Offset	: 10.6 0 de	dB 3m	IFG	IO: Fas Jain:Lo	st 🔸	#Atten	: 30 d	B	Avgir	1010.	Mk	r1 902. 20.1	375 MHz 329 dBm	Ĺ	Auto Tune
20.0 10.0 0.00																	0.83 dBm		Center Freq 892.000000 MHz
-10.0 -20.0 -30.0																			Start Freq 879.500000 MHz
-40.0 -50.0 -60.0	5.00m	~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			~ <b>.</b>		someniky	~~~~	-		·	~~~	and the second s				Stop Freq 904.500000 MHz
Cen #Re	ter s Bl	892 N/1	.00 00	MHz kHz		X		#	VBW	300 kl	łz	FUN	CITION	Ş	Sweep 2 Gronword	Span .400 ms	25.00 MHz (1001 pts)	AL	CF Step 2.500000 MHz Ito Man
1 2 3 4 5 6 7 8 9 10 11	N	1	1			90	2.375	5 MHz ) MHz		20.829 -9.900	dBm dBm								Freq Offset 0 Hz
MSG															STATUS	5			

#### Band Edge\_Wireless Microphone\_High

	sysight	speci	rum	Analyzer - Swi	ерсэн												
(XX) R			RF	50 Ω	DC			SET	ISE:INT		Avg	ہ Type:	LIGN AUTO	08:51:36 A	M Sep 24, 2021	FI	requency
	D/46		Ref	Offset 10	P IF	NO: Fasi Gain:Loi	•	d' Trig: Free #Atten: 3	e Run 0 dB		Avg H	lold:	100/100 Mki	۳ 1 927.6 21.1	25 MHz		Auto Tune
20.0 10.0		_		2											1.14 dBm	938	Center Freq 8.000000 MHz
-10.0 -20.0 -30.0		/														928	Start Freq 5.500000 MHz
-40.0 -50.0 -60.0					Jacob Market		-	-	www.	x <b>7</b> .,.19	mona		+.M~46.59	************		950	Stop Freq 0.500000 MHz
Cer #Re	nter Is B	938 W 1	.00 00	MHz kHz	x	#\	/BW	300 kHz		FUNC	TION	S	weep 2	Span 2 .400 ms (	5.00 MHz 1001 pts)	Auto	CF Step 2.500000 MHz Man
1 2 3 4 5 6 7 8 9 10 11 11	N	1	f		927.62 928.00	5 MHz 0 MHz		21.140 df -7.207 df	3m 3m								Freq Offset 0 Hz
MSG													STATUS				

#### Hopping Band Edge\_Wireless Microphone\_Low

K         NF         SO D         D         SERVE ENTITY         ALSIA MO         (NO MOTO         (NO MOTOO         (NO	uto Tun nter Free 20000 MH
PRO: Fast	uto Tun nter Free 20000 MH
Ref Offset 10.6 dB         Mkr3 901.82 MHz         A           09         -35.167 dBm         -36.167 dBm         Cei           00	nter Free
	nter Free
	JOOOD MH
800 000 000 000 000	Stop Fre
tart \$90.00 MHz Stop 910.00 MHz Res BW 100 kHz #VBW 300 kHz Sweep 1.933 ms (1001 pts)	CF Ste
KR MODE TRC SCL X Y FUNCTION FUNCTION WIDTH FUNCTION VALUE	ma
1 N 1 f 999.60 MHz 20.842 0Bm 2 N 1 f 992.000 00 MHz - 35.040 0Bm 3 N 1 f 991.02 MHz - 35.167 0Bm 4	eq Offse

#### Hopping Band Edge\_Wireless Microphone\_High

Keysight Spectrum Analyzer - Swept SA			
20 R RF 50Ω DC	SENSE:INT	ALIGN AUTO 09:07:18 AM Sep 24, Avg Type: Log-Pwr TRACE 1 2 3	Frequency
Ref Offset 10.6 dB	PNO: Fast Trig: Free Run IFGain:Low #Atten: 30 dB	Mkr3 928.08 M -9.633 dl	Auto Tune
		1.1	Center Freq 930.000000 MHz
-10.0			Start Freq 920.000000 MHz
-40.0	h h h h h h h h h h h h h h h h h h h	Maren Marine Marine Marine	Stop Freq 940.000000 MHz
Start 920.00 MHz #Res BW 100 kHz	#VBW 300 kHz	Stop 940.00 N Sweep 1.933 ms (1001	Hz CF Step 2.000000 MHz Auto Man
1 N 1 f 92 2 N 1 f 92 3 N 1 f 92 4 5	26.44 MHz 21.125 dBm 28.00 MHz -30.372 dBm 28.08 MHz -9.633 dBm		Freq Offset
0         7           8         9           10         11			
MSG		STATUS	<b>F</b>

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#### Spurious Emission Wireless Microphone Low

📕 Keysight Spectrum Analyzer - Sw	vept SA				- G X
R RF 50 G	2 DC	SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr	04:38:16 PM Sep 23, 2021 TRACE 1 2 3 4 5 6	Frequency
Ref Offset 10	PNO: Fast IFGain:Low 0.6 dB dBm	₩ Trig: Free Run #Atten: 30 dB	Avg Hold: 100/100	4 3.609 23 GHz -30.296 dBm	Auto Tune
20.0 10.0 0.00				0.56 dBm	Center Freq 5.015000000 GHz
10.0 20.0 30.0	3 ∳⁴				Start Free 30.000000 MH;
40.0 50.0 60.0 60.0		howerhout	manter manager	harring langes of the second on	Stop Free 10.000000000 GH
Start 30 MHz Res BW 100 kHz	#VB	W 300 kHz	Sweep 9	Stop 10.000 GHz 52.9 ms (1001 pts)	CF Step 997.000000 MH Auto Mar
More access factor         File           1         N         1           2         N         1           3         N         1           6         -           7         -           8         -           9         -	907.36 MHz 448.74 MHz 2.711 93 GHz 3.609 23 GHz	20.557 dBm -41.011 dBm -37.338 dBm -30.296 dBm			Freq Offset 0 Hz
		π.	STATUS	*	

#### Spurious Emission Wireless Microphone Mid

📕 Keys	sight Spec	trum	Analyzer - Sw	ept SA								
UXIR		RF	50 Ω	DC		SI	NSE:INT	Ava	ALIGN AUTO	04:44:10 PI	Sep 23, 2021	Frequency
				PI IF(	NO: Fast + Sain:Low	Trig: Fre #Atten:	e Run 30 dB	Avgit	fold: 100/100			Auto Tune
10 dB	l/div	Ref Re	f Offset 10 f 30.00 (	0.6 dB dBm					IVIK	-29.6	08 GHZ 42 dBm	
20.0		4						_	_			Center Fred
10.0											0.94 dBm	5.015000000 GH:
-10.0												Start Eron
-20.0		+			•		-	_	_			30.000000 MH;
-30.0					Ĭ							
-50.0	سليد	, da	دابسيوري		warander	man lang	n.m	-	a service a state of the second	estrasture or	<b>%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%</b>	Stop Free
-60.0		-				-			_			10.00000000000
Start #Res	30 M	Hz	kH7		#VB	W 300 kH	,		Sween	Stop 10	.000 GHz	CF Step
MKR M		SCI		x		Y	Fl	UNCTION	FUNCTION WDTH	I FUNCTI	NWALUE _	<u>Auto</u> Mar
1 2	N 1 N 1	1		917.3	3 MHz 1 MHz	20.940 c -40.683 c	Bm Bm				_	Freq Offse
4 5	N 1	1		3.659 0	8 GHz	-29.642 d	Bm					0 H:
67												
8 9 10	-										_	
11	1	1	1								•	
MSG									STATU	JS		t

#### Spurious Emission\_Wireless Microphone\_High

Kej	/sight	Spectr	rum A	Analyzer - Swe	pt SA												
UXI R			RF	50 Ω	DC			SEI	NSE:INT	r	Avg 1	/ ype:	LIGN AUTO	08:55:37 A	M Sep 24, 2021 CE 1 2 3 4 5 6		Frequency
10 di	3/div	,	Ref Ref	Offset 10.	6 dB	NO: Fast Sain:Low	+-	#Atten: 3	0 dB		Avgin	ioia.	Mkr	4 3.708 -32.7	93 GHz 08 dBm	Ĺ	Auto Tune
20.0 10.0 0.00															1.13 dBm		Center Freq 5.015000000 GHz
-10.0 -20.0 -30.0		2					<b>4</b>										Start Freq 30.000000 MHz
-40.0 -50.0 -60.0		Lunge		مامبنىدىنە	,	******		يەلىرىمەلەھ	~~~	µ <b>≹∼v</b> anala	يوري. الم	~~~	يويالاريوروار الإخر	*****	- بعيدان المحمد	1	<b>Stop Freq</b> 10.000000000 GHz
Star #Re	t 30 s B\	MH N 1	1z 00	kHz	×	#V	BW	300 kHz		FUNC	TION	S	weep 9	Stop 10 52.9 ms (	0.000 GHz (1001 pts)	A	CF Step 997.000000 MHz uto Man
1 2 3 4 5 6 7 8 9 10 11 1		1 1 1 1	f f f		927.3 468.6 2.781 7 3.708 9	0 MHz 8 MHz 2 GHz 3 GHz		21.127 di 41.696 di 41.772 di 32.708 di	8m 3m 3m 3m								Freq Offset 0 Hz
MSG													STATUS	5			

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f (886-2) 2298-0488



# **10 SPURIOUS RADIATED EMISSION TEST**

### 10.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 limit as below.

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

- 1. The lower limit shall apply at the transition frequencies.
- 2. Emission level (dB $\mu$ V/m) = 20 log Emission level ( $\mu$ V/m)

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#### 10.2 **Measurement Equipment Used:**

	Radiated Emission Test Site: SAC C						
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.		
Broadband Antenna	TESEQ	CBL 6112D	35240	10/10/2021	10/09/2022		
Horn Antenna	Schwarzbeck	BBHA9170	184	12/11/2020	12/10/2021		
Horn Antenna	Schwarzbeck	BBHA9120D	1187	01/11/2021	01/10/2022		
Loop Antenna	ETS.LINDGREN	6502	143303	05/07/2021	05/06/2022		
EMI Test Receiver	R&S	ESU 40	100363	04/28/2021	04/27/2022		
Pre-Amplifier	EMC Instruments	EMC330	980096	11/19/2020	11/18/2021		
Pre-Amplifier	EMC Instruments	EMC0011830	980199	11/19/2020	11/18/2021		
Pre-Amplifier	EMC Instruments	EMC184045B	980135	10/27/2020	10/26/2021		
Attenuator	Marvelous	WATT-218FS-10	RF20	11/19/2020	11/18/2021		
High Pass Filter	Woken	EWT-57-0209	RF171	11/19/2020	11/18/2021		
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	11/19/2020	11/18/2021		
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	11/19/2020	11/18/2021		
Test Software	audix	e3	20923 sgs Ver.9	N.C.R	N.C.R		

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### 10.3 Test SET-UP:

(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-Up, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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### 10.4 Measurement Procedure: Radiated Emission:

- 1. The testing follows ANSI C63.10:2013.
- 2. The EUT was placed on a turn table with 0.8m for frequency< 1GHz and 1.5m for frequency> 1GHz above ground plan.
- 3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- 5. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
- 6. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
- 7. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
- 8. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
- 9. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 10. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
- 11. Repeat above procedures until all default test channel measured were complete.

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### 10.5 Field Strength Calculation

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

#### FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

The limit of the emission level is expressed in dBuV/m, which converts  $20*\log(uV/m)$ Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) – Pre Amplifier Gain(dB)

### 10.6 Test Results of Radiated Spurious Emissions form 9 KHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) & RSS-GEN §6.13.2 was not reported.

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#### 10.7 Measurement Result: 10.7.1 Radiated Bandedge Result

	-		
Report Number	:E2/2021/90024	Test Site	:SAC C
Operation Mode	:Wireless Microphone	Test Date	:2021-09-15
Test Frequency	:902.4 MHz	Temp./Humi.	:22.7/64
Test Mode	:BE CH LOW	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Enzo Chang



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Report Number	:E2/2021/90024	Test Site	:SAC C
Operation Mode	:Wireless Microphone	Test Date	:2021-09-15
Test Frequency	:902.4 MHz	Temp./Humi.	:22.7/64
Test Mode	:BE CH LOW	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Enzo Chang
130 Level (d	BuV/m)		
443.0			



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928.000

Peak

89.58

-6.46

Report Number	:E2/2021/9	90024	Te	est Site	:SA	СС	
Operation Mode	:Wireless	:Wireless Microphone			:202	21-09-15	
Test Frequency	:927.6 M⊢	z	Τe	emp./Hum	i. :22.	7/64	
Test Mode	:BE CH H	IGH	Ar	ntenna Po	I. :Ver	tical	
EUT Pol	:H Plane		Er	ngineer	:Enz	zo Chang	
130 Level (c	BuV/m)						
113.8							
97.5				_			
81.3							
65.0	-						
48.8							
32.5				_			
16.3							
921	936.8	952.6 Frequen	968.4 icy (MHz)	984	1.2	1000	
Freq.	Detector	Spectrum	Factor	Actua	al	Limit	Margin
	Mode	Reading Level		FS		@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/	/m	dBµV/m	dB

-6.27

83.12

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89.39

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Report Number	:E2/2021/90024	Test Site	:SAC C
Operation Mode	:Wireless Microphone	Test Date	:2021-09-15
Test Frequency	:927.6 MHz	Temp./Humi.	:22.7/64
Test Mode	:BE CH HIGH	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Enzo Chang



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Report Number	:E2/2021/90024
Operation Mode	:Wireless Microphone Hopping
Test Frequency	:902.4 MHz
Test Mode	:BE CH LOW
EUT Pol	:H Plane

Test Site	:SAC C
Test Date	:2021-09-15
Temp./Humi.	:22.7/64
Antenna Pol.	:Vertical
Engineer	:Enzo Chang



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Report Number	:E2/2021/90024
Operation Mode	:Wireless Microphone Hopping
Test Frequency	:902.4 MHz
Test Mode	:BE CH LOW
EUT Pol	:H Plane

Test Site	:SAC C
Test Date	:2021-09-15
Temp./Humi.	:22.7/64
Antenna Pol.	:Horizontal
Engineer	:Enzo Chang



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Report Number	:E2/2021/90024
Operation Mode	:Wireless Microphone Hopping
Test Frequency	:927.6 MHz
Test Mode	:BE CH HIGH
EUT Pol	:H Plane

Test Site	:SAC C
Test Date	:2021-09-15
Temp./Humi.	:22.7/64
Antenna Pol.	:Vertical
Engineer	:Enzo Chang



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Report Number	:E2/2021/90024
Operation Mode	:Wireless Microphone Hopping
Test Frequency	:927.6 MHz
Test Mode	:BE CH HIGH
EUT Pol	:H Plane

Test Site	:SAC C
Test Date	:2021-09-15
Temp./Humi.	:22.7/64
Antenna Pol.	:Horizontal
Engineer	:Enzo Chang



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#### 10.7.2 Radiated Spurious Emission form 30MHz to 1000MHz:

Report Number	:E2/2021/90024	Test Site	:SAC C
Operation Mode	:Wireless Microphone	Test Date	:2021-09-15
Test Frequency	:915.2 MHz	Temp./Humi.	:22.9/65
Test Mode	:TX CH MID	Antenna Pol.	:VERTICAL
EUT Pol	:H Plane	Engineer	:Enzo Chang



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SAC C



·F2/2021/90024

Report Number

595.833

897.404

Peak

Peak

rioport riambol		0021		1001 0110		
Operation Mode	:Wireless N	Vicrophone		Test Date	:2021-09-15	
Test Frequency	:915.2 MH	z		Temp./Humi.	:22.9/65	
Test Mode	:TX CH MI	D		Antenna Pol.	:HORIZONTAL	
EUT Pol	:H Plane			Engineer	:Enzo Chang	
100 Level (d 87.5 75.0 62.5 50.0 37.5 25.0 12.5	BuV/m)		5			
0 30	224.	418. Frequen	612. cy (MHz)	806.	1000	
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
56.426 95 288	Peak Peak	53.04 55.85	-23.67 -20 74	29.37 35.12	40.00 43 50	-10.63
241.410	Peak	51.76	-17.29	34.47	46.00	-11.53
392.196	Peak	36.40	-12.85	23.55	46.00	-22.45

-8.95

-5.70

23.03

24.60

46.00

46.00

-22.97

-21.40

Test Site

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31.98

30.29

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#### 10.7.3 **Radiated Spurious Emission above 1 GHz:**

Report Number	:E2/2021/90024	Test Site	:SAC C
Operation Mode	:Wireless Microphone	Test Date	:2021-09-15
Test Frequency	:902.4 MHz	Temp./Humi.	:23.6/58
Test Mode	:TX CH LOW	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Enzo Chang



	wode	Reading Level		F3	(@3m	
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
1804.800	Average	46.74	1.24	47.98	54.00	-6.02
1804.800	Peak	47.81	1.24	49.04	74.00	-24.96
2707.200	Average	22.63	6.38	29.01	54.00	-24.99
2707.200	Peak	32.30	6.38	38.68	74.00	-35.32
3609.600	Average	36.92	6.31	43.23	54.00	-10.77
3609.600	Peak	39.04	6.31	45.35	74.00	-28.65

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Report Number	:E2/2021/90024	Test Site	:SAC C
Operation Mode	:Wireless Microphone	Test Date	:2021-09-15
Test Frequency	:902.4 MHz	Temp./Humi.	:23.6/58
Test Mode	:TX CH LOW	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Enzo Chang



F	req.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
N	1Hz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
180	4.800	Average	46.08	1.24	47.32	54.00	-6.68
180	4.800	Peak	47.74	1.24	48.97	74.00	-25.03
270	7.200	Average	38.91	6.38	45.29	54.00	-8.71
270	7.200	Peak	40.89	6.38	47.27	74.00	-26.73
360	9.600	Average	44.56	6.31	50.87	54.00	-3.13
360	9.600	Peak	47.19	6.31	53.50	74.00	-20.50

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Report Number	:E2/2021/90024	Test Site	:SAC C
Operation Mode	:Wireless Microphone	Test Date	:2021-09-15
Test Frequency	:915.2 MHz	Temp./Humi.	:23.6/58
Test Mode	:TX CH MID	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Enzo Chang



	Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
_	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
	1830.400	Average	47.04	0.99	48.03	54.00	-5.97
	1830.400	Peak	51.78	0.99	52.77	74.00	-21.23
	2745.600	Average	29.78	6.78	36.56	54.00	-17.44
	2745.600	Peak	35.85	6.78	42.63	74.00	-31.37
	3660.800	Average	37.49	5.98	43.47	54.00	-10.53
	3660.800	Peak	40.03	5.98	46.01	74.00	-27.99

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Report Number	:E2/2021/90024	Test Site	:SAC C
Operation Mode	:Wireless Microphone	Test Date	:2021-09-15
Test Frequency	:915.2 MHz	Temp./Humi.	:23.6/58
Test Mode	:TX CH MID	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Enzo Chang



			-				
	Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
_	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
	1830.400	Average	42.52	0.99	43.51	54.00	-10.49
	1830.400	Peak	45.07	0.99	46.07	74.00	-27.93
	2745.600	Average	41.52	6.78	48.30	54.00	-5.70
	2745.600	Peak	43.51	6.78	50.29	74.00	-23.71
	3660.800	Average	44.11	5.98	50.09	54.00	-3.91
	3660.800	Peak	46.56	5.98	52.54	74.00	-21.46

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Report Number	:E2/2021/90024	Test Site	:SAC C
Operation Mode	:Wireless Microphone	Test Date	:2021-09-15
Test Frequency	:927.6 MHz	Temp./Humi.	:23.6/58
Test Mode	:TX CH HIGH	Antenna Pol.	:Vertical
EUT Pol	:H Plane	Engineer	:Enzo Chang



		Frequen	Cy (MHZ)			
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
 MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
1855.200	Average	46.05	1.24	47.30	54.00	-6.71
1855.200	Peak	52.18	1.24	53.43	74.00	-20.57
2782.800	Average	31.41	7.13	38.54	54.00	-15.46
2782.800	Peak	38.60	7.13	45.73	74.00	-28.27
3710.400	Average	34.21	5.97	40.18	54.00	-13.82
3710.400	Peak	38.07	5.97	44.05	74.00	-29.95

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Report Number	:E2/2021/90024	Test Site	:SAC C
Operation Mode	:Wireless Microphone	Test Date	:2021-09-15
Test Frequency	:927.6 MHz	Temp./Humi.	:23.6/58
Test Mode	:TX CH HIGH	Antenna Pol.	:Horizontal
EUT Pol	:H Plane	Engineer	:Enzo Chang



			Frequen	Cy (Williz)			
	Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
_	MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
	1855.200	Average	26.92	1.24	28.17	54.00	-25.84
	1855.200	Peak	43.81	1.24	45.05	74.00	-28.95
	2782.800	Average	37.89	7.13	45.02	54.00	-8.98
	2782.800	Peak	40.73	7.13	47.86	74.00	-26.14
	3710.400	Average	38.85	5.97	44.82	54.00	-9.18
	3710.400	Peak	41.47	5.97	47.45	74.00	-26.55

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# **11 FREQUENCY SEPARATION**

### 11.1 Standard Applicable

Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25 kHz or the 2/3\*20dB bandwidth of the hopping channel, whichever is greater.

#### 11.2 Measurement Equipment Used:

	Conducted Emission Test Site: Conducted B									
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.					
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	07/07/2021	07/06/2022					
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R					
Attenuator	Marvelous	MVE2213-10	RF09	11/19/2020	11/18/2021					
DC Block	PASTERNACK	PE8210	RF151	11/19/2020	11/18/2021					

#### 11.3 Test Set-up:



### **11.4 Measurement Procedure:**

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows ANSI C63.10:2013.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set center frequency of spectrum analyzer = middle of hopping channel.
- 5. Set the spectrum analyzer as RBW, VBW=100 kHz, Adjust Span to 1.5MHz, Sweep = auto.
- 6. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

#### 11.5 Measurement Result:

Channel separation	Limit	Result
400K	>=25 kHz or 20dB bandwidth	PASS

Note: Refer to next page for plots.

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#### Frequency Separation Test Data 11.6

🍺 Keysight	Spectru	m Analyzer - S	wept SA								
(X) R		RF 50 9	Ω DC		SENS	E:INT	Avg T	ALIGN AUTO	04:15:31 PI TRAC	M Sep 23, 2021	Frequency
10 dB/div	, R	ef Offset 1 ef 30.00	0.6 dB dBm	NO: Wide ← Gain:Low	#Atten: 30	dB	Avgin	51a: 100/100	ΔMkr3 4 -0	400 kHz 135 dB	Auto Tune
20.0 10.0 0.00						2				3Δ4	Center Freq 902.400000 MHz
-10.0 -20.0	<del>,</del>	-p	•••••••••	to the second se							Start Fred 901.400000 MHz
-40.0 -50.0 -60.0											Stop Fred 903.400000 MH:
Center #Res BI	902.4 N/10	00 MHz 0 kHz	X	#VB	W 300 kHz	FUNC		Sweep 1	Span 2 .000 ms ( FUNCTION	.000 MHz 1001 pts) DN VALUE	CF Step 200.000 kH <u>Auto</u> Mar
1 Δ2 2 F 3 Δ4 4 F 5 6	1	f (Δ) f f (Δ) f	4 902.40 4 902.80	00 kHz (Δ 0 MHz 00 kHz (Δ 0 MHz	) -0.014 d 20.270 dB ) -0.135 d 20.255 dB	B m B m					Freq Offse 0 H
7 8 9 10 11 <					III						
MSG								STATUS	3		

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# **12 NUMBER OF HOPPING FREQUENCY**

### 12.1 Standard Applicable

Frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequencies and the average time of occupancy on any frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

### 12.2 Measurement Equipment Used:

Conducted Emission Test Site: Conducted B											
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.						
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	07/07/2021	07/06/2022						
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R						
Attenuator	Marvelous	MVE2213-10	RF09	11/19/2020	11/18/2021						
DC Block	PASTERNACK	PE8210	RF151	11/19/2020	11/18/2021						

### 12.3 Test Set-up:



### 12.4 Measurement Procedure:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows ANSI C63.10:2013.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set spectrum analyzer Start= 902.4MHz, Stop = 927.6MHz, Sweep = auto.
- 5. Set the spectrum analyzer as RBW=300 kHz, VBW= 1MHz., Detector = Peak
- 6. Max hold, view and count how many channel in the band.

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#### 12.5 Measurement Result:

Wireless Microphone		
Frequency (MHz)	Number of Hopping frequency	Limit (OBW < 250KHz)
902.4 - 927.6	64	> 50

#### 902.4 – 927.6 MHz

🊺 Key	/sight Spect	rum Analyzer - Sw	rept SA									
(X) R		RF 50 Ω	DC		SEI	NSE:INT	Avg Type	ALIGN AUTO	02:17:06 PM TRAC	E 1 2 3 4 5 6	Frequency	
	PNO: Fast											
10 dE Log	dB/div Ref 30.00 dBm 20.804 dBm											
20.0					I NNNN	NN		I	haaa		Center Freq 907.000000 MHz	
10.0			1444	ŶŸŸŸ	<u> </u>		<u> </u>	Ϋ́́ΥΨΎ			Start Freq 899.500000 MHz	
-10.0											Stop Freq	
-20.0											CF Step	
-30.0											1.500000 MHz <u>Auto</u> Man	
-50.0	ป\/"										Freq Offset 0 Hz	
-60.0												
Star #Res	t 899.5 s BW 1	00 MHz 30 kHz		#VBW	390 kHz			Sweep 1	Stop 914 .000 ms (	.500 MHz 1001 pts)		
MSG								STATUS	6			



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# 13 TIME OF OCCUPANCY (DWELL TIME)

### 13.1 Standard Applicable

Frequency hopping systems operating in the 902MHz-928MHz. The average time of occupancy on any frequency shall not greater than 0.4 s within a period of 20 seconds.

### 13.2 Measurement Equipment Used:

Conducted Emission Test Site: Conducted B												
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.							
Spectrum Analyzer	KEYSIGHT	N9010A	MY54510568	07/07/2021	07/06/2022							
Test Software	SGS Taiwan	Radio Test Software	Ver.21	N.C.R	N.C.R							
Attenuator	Marvelous	MVE2213-10	RF09	11/19/2020	11/18/2021							
DC Block	PASTERNACK	PE8210	RF151	11/19/2020	11/18/2021							

### 13.3 Test Set-up:



### 13.4 Measurement Procedure:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. The testing follows ANSI C63.10:2013.
- 3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 4. Set center frequency of spectrum analyzer = operating frequency.
- 5.Set the spectrum analyzer as RBW, VBW=100KHz, 300KHz, Span = 0Hz, Detector = Peak, Adjust Sweep = 50ms.
- 6. Repeat above procedures until all frequency of the interest measured were complete.
- 7. The measurements are using the normal operation of the equipment.

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#### 13.5 Tabular Result of the Measurement:

#### **Wireless Microphone**

Channel	Measurement Result(ms)	Limit within 20s (ms)
32	72.00	400

#### 13.6 Measurement Result:



### Dwell Time Wireless Microphone CH Mid-1

### Dwell Time\_ Wireless Microphone \_CH Mid-2

🊺 Ke	ysight	Spect	rum /	Analyzer - Swe	ept SA																			- 6 <del>x</del>
L <mark>XI</mark> R			RF	50 Ω	DC				Tria	SEN	NSE:II	NT	A١	g T	م ype:	LIG	n auto g-Pw	) r	10:4	13:50 A TRAC	M Sep 24	,2021		Frequency
10 d	PNC: Wide → IFGain:Low         Irrg: Free Kun #Atten: 30 dB         Offer           Ref Offset 10.6 dB         ΔMkr1 9.00           10 dB/div         Ref 30.00 dBm         -0.3												.000 0.37	ms dB		Auto Tune								
20.0 10.0 0.00									¥1∆2							F								Center Freq 915.200000 MHz
-10.0 -20.0 -30.0																			_					Start Freq 915.200000 MHz
-40.0 -50.0 -60.0	.hu,	mult	n	a spritusioner	When the second	tel <sup>la</sup> rrily	-	<b>Y</b> rqy,i-	nali/kyrr	Kryyt	<b>.</b>	m	lyl,hy	<u> </u>	hou	v	لليبهره	J.	<i>ب</i> ۳۸۳	m	a na	нþч		<b>Stop Freq</b> 915.200000 MHz
Cen Res	enter 915.200000 MHz Span 0 Hz les BW 100 kHz #VBW 300 kHz Sweep 500.0 ms (1001 pts)										Au	CF Step 100.000 kHz to Man												
1 2 3 4 5 6 7 8 9 10 11	<u>Δ2</u> F	1	t			9.0	00 ms 3.0 ms		20.	0.37 41 dE	dB 3m													Freq Offset 0 Hz
MSG																	STAT	rus						

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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### **14 ANTENNA REQUIREMENT**

#### 14.1 Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

### 14.2 Antenna Connected Construction

The antenna is designed with unique RF connector and no consideration of replacement. Please see EUT photo for details.

~ End of Report ~

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