## TEST REPORT On behalf of

# Savant Technologies LLC, dba GE Lighting, a Savant company

## Product Name: LED Strip

## Model No.: CSTN16CDID

# FCC ID: PUU-STN16-CDID

Prepared For: Savant Technologies LLC, dba GE Lighting, a Savant company 1975 Noble Road, Cleveland, OH 44112

Prepared By: Audix Technology (Shanghai) Co., Ltd. 3F and 4F, 34Bldg, 680 Guiping Rd., Caohejing Hi-Tech Park, Shanghai 200233, China

Tel: +86-21-64955500



File No.:C1D2207007Report No.:ACI-F22118Date of Test:2021.12.10-2022.07.05Date of Report:2022.08.02

The statement is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

# TABLE OF CONTENTS

# Page

1	SUMMARY OF STANDARDS AND RESULTS 5		
	1.1 Description of Standards and Results	5	
2	GENERAL INFORMATION	6	
	2.1 Description of Equipment Under Test	6	
	2.2 EUT Specifications Assessed in Current Report		
	2.3 Test Information		
	2.4 Sample Description	7	
	2.5 Supported equipment	8	
	2.6 Description of Test Facility	8	
3	CONDUCTED EMISSION TEST	9	
	3.1 Test Equipment	9	
	3.2 Block Diagram of Test Setup		
	3.3 Conducted Emission Limits (§15.207)		
	3.4 Test Configuration	10	
	3.5 Operating Condition of EUT	10	
	3.6 Test Procedures	10	
	3.7 Test Results	11	
4	RADIATED EMISSION TEST	13	
	4.1 Test Equipment	13	
	4.2 Block Diagram of Test Setup	13	
	4.3 Radiated Emission Limit (§15.209)	14	
	4.4 Test Configuration	14	
	4.5 Operating Condition of EUT		
	4.6 Test Procedures		
	4.7 Test Results		
5	6 DB BANDWIDTH MEASUREMENT		
	5.1 Test Equipment	23	
	5.2 Block Diagram of Test Setup		
	5.3 Specification Limits (§15.247(a)(2))		
	5.4 Operating Condition of EUT		
	5.5 Test Procedure		
	5.6 Test Results		
6	MAXIMUM PEAK OUTPUT POWER MEASUREMENT	27	
	6.1 Test Equipment		
	6.2 Block Diagram of Test Setup		
	6.3 Specification Limits ((§15.247(b)(3))		
	6.4 Operating Condition of EUT		
	6.5 Test Procedure		
	6.6 Test Results		
7	EMISSION LIMITATIONS MEASUREMENT	31	
	7.1 Test Equipment		
	7.2 Block Diagram of Test Setup		
	7.3 Specification Limits (§15.247(d))	31	

		rating Condition of EUT	
	7.5 Test	t Procedure	31
	7.6 Test	t Results	33
8	POWER	SPECTRAL DENSITY MEASUREMENT	42
	8.1 Test	t Equipment	42
	8.2 Bloc	ck Diagram of Test Setup	42
	8.3 Spec	cification Limits (§15.247(e))	42
	8.4 Ope	rating Condition of EUT	42
	8.5 Test	t Procedure	42
	8.6 Test	t Results	43
9	DEVIAT	TION TO TEST SPECIFICATIONS	46
1(	0 MEASU	REMENT UNCERTAINTY LIST	47

# **TEST REPORT**

Applicant :	Savant Technologies LLC, dba GE Lighting, a Savant company		
EUT Description :	LED Strip		
	(A) Model No.	:	CSTN16CDID
	(B) Power Supply	:	120V AC 60Hz
	(C) Test Voltage	:	120V/60Hz

#### **Test Procedure Used:**

### FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10-2013

The device described above is tested by Audix Technology (Shanghai) Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits.

The test results are contained in this test report and Audix Technology (Shanghai) Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. This report also shows that the EUT (M/N: Refer to Sec2.1), which was tested is technically compliance with the FCC limits.

This report applies to above tested Sample only. This report shall not be reproduced in part without written approval of Audix Technology (Shanghai) Co., Ltd.

#### The test results for EUT's WIFI function are contained in No.ACI-F22119 report.

Date of Test : 2021.12.10-2022.07.05		Date of Report :	2022.08.02
Producer :	Mandy Wang		
	MINDY WANG / Assistant		
Reviewer :	Byron Vie BYRON WU/ Deputy Assistant Manager	<u>.</u>	
	and on behalf of		
Audix Technology (Sh	anghai) Co., Ltd.		
Signatory : Authorized Signature(i	BYRON KWO/Assistant General Manager	r	

# **1 SUMMARY OF STANDARDS AND RESULTS**

# 1.1 Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

Description / Test Item Test Standard		Results	Meets Limit
	EMISSION		
	FCC RULES AND REGULATIONS PART 15	D	15 207
Conducted Emission	SUBPART C AND ANSI C63.10:2013	Pass	15.207
	FCC RULES AND REGULATIONS PART 15		15.209(a)
Radiated Emission	SUBPART C AND ANSI C63.10:2013	Pass	15.205(a)(c)
	FCC RULES AND REGULATIONS PART 15		
6 dB Bandwidth Measurement	SUBPART C	Pass	15.247(a)(2)
	AND ANSI C63.10:2013		
Maximum Peak Output	FCC RULES AND REGULATIONS PART 15	Deee	15.047(h)(2)
Power Measurement	SUBPART C AND ANSI C63.10:2013	Pass	15.247(b)(3)
Enclosie a L'actions	FCC RULES AND REGULATIONS PART 15		
Emission Limitations Measurement	SUBPART C	Pass	15.247(d)
Measurement	AND ANSI C63.10:2013		
Band Edge	FCC RULES AND REGULATIONS PART 15		
Measurement	SUBPART C	Pass	15.247(d)
	AND ANSI C63.10:2013		
Power Spectral Density	FCC RULES AND REGULATIONS PART 15	р	15047()
Measurement	SUBPART C	Pass	15.247(e)
AND ANSI C63.10:2013			
N/A is an abbreviation for Not Applicable.			

# **2** GENERAL INFORMATION

# 2.1 Description of Equipment Under Test

Description	:	LED Strip	
Type of EUT	:	$\square$ Production $\square$ Pre-product $\square$ Pro-type	
Model Number	:	CSTN16CDID	
Radio Tech	:	BLE 4.2; IEEE 802.11 b/g/n.	
Note:	:	802.11n-HT40 not support.	
Channel Freq.	:	BLE: 2402MHz-2480MHz; 802.11b/g/n: 2412MHz-2462MHz.	
Modulation	:	BLE: GFSK; 802.11b: DSSS (CCK, DQPSK, DBPSK); 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK).	
Antenna Info.	:	Antenna Type: PCB Antenna Antenna Gain: 1.5 dBi The Antenna was a permanently attached antenna that is comply with 15.203 requirement.	
Test Mode	:	The EUT was set at continuous TX during all the test in the report.	
Applicant	:	Savant Technologies LLC, dba GE Lighting, a Savant company 1975 Noble Road, Cleveland, OH 44112	
Manufacturer	:	same as Applicant	
Factory #1	:	VIETNAM CHANGHONG ELECTRIC COMPANY LIMITED Workshop W4 (leased by WWWHP), Land plot 4.2B, Dinh Vu Industrial Zone, Dong Hai 2 Ward, Hai An District, Haiphong City, VN.	
Factory #2	:	Sichuan Hongrui Electric Co., Ltd Mianyan Export Processing Zone, Mianyan, Sichuan, China	

# 2.2 EUT Specifications Assessed in Current Report

Mode	Modulation	Data Rate(Mbps)
BLE	GFSK	1

Channel List				
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	
00	2402	20	2442	
01	2404	21	2444	
02	2406	22	2446	
		•••		
		•••		
		•••		
17	2436	37	2476	
18	2438	38	2478	
19	2440	39	2480	

# 2.3 Test Information

The test software "RTLBTAPP.exe" was used to control EUT work in TX mode, Power Setting and select test channel.

Modulation	data rate (Mbps)	Power Setting	Test Channel		Frequency (MHz)
		Default	Low:	00	2402
BLE	1	Default	Middle:	20	2442
		Default	High:	39	2480

#### 2.4 Sample Description

Test Item	Model Number	Sample Number	Date of receipted
Conducted Emission	CSTN16CDID	E2207395-01/01	2022.07.04
Radiated Emission	CSTN16CDID	E211118441a-01/02	2021.12.08
Conducted RF Test	CSTN16CDID	E211118441a-02/02	2021.12.08

# 2.5 Supported equipment

Brand	:	Acer
Product Name:	:	Notebook PC
Model Name	:	TravelMate P238 series
Model Number	:	N15W8

# 2.6 Description of Test Facility

Name of Firm	: Audix Technology (Shanghai) Co., Ltd.
Site Location	: 3F and 4F, 34Bldg, 680 Guiping Rd., Caohejing Hi-Tech Park, Shanghai 200233, China.
Accredited by NVLAP, Lab Code	: 200371-0
FCC Designation Number	: CN5027
Test Firm Registration Number	: 954668

# **3** CONDUCTED EMISSION TEST

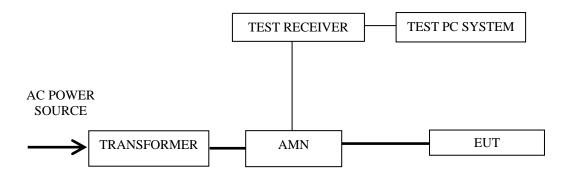
## 3.1 Test Equipment

The following test equipments are used during the conducted emission test in a shielded room:

Item	Туре	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Test Receiver	R&S	ESCI	100841	2022.01.25	1 Year
2.	Artificial Mains Network (AMN)	R&S	ESH2-Z5	843890/011	2022.01.06	1 Year
3.	Software	Audix	e3	6.2009-1-15		

# 3.2 Block Diagram of Test Setup

3.2.1 Conducted Disturbance Test Setup



— : Signal Line

— : Power Line

Frequency Range	Limits $dB(\mu V)$					
(MHz)	Quasi-peak	Average				
0.15 ~ 0.5	66~56	56~46				
0.5 ~ 5	56	46				
5 ~ 30	60	50				
5~ 306050NOTE 1 – The lower limit shall apply at the transition frequencies.NOTE 2 – The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz~0.50 MHz						

## 3.3 Conducted Emission Limits (§15.207)

#### 3.4 Test Configuration

The EUT (listed in Sec.2.1) was installed as shown on Sec.3.2 to meet FCC requirement and operating in a manner which tends to maximize its emission level in a normal application.

## 3.5 Operating Condition of EUT

- 3.5.1 Setup the EUT as shown in Sec. 3.2.
- 3.5.2 Turn on the power of all equipment.
- 3.5.3 Turn the EUT on the test mode, and then test.

#### 3.6 Test Procedures

The EUT was placed upon a non-metallic table, which is 0.8 m above the horizontal conducting ground plane and 0.4 m from a vertical reference plane. The EUT was connected to the power mains through an Artificial Mains Network (AMN) to provide a 50  $\Omega$  coupling impedance for the measuring equipment. Both sides of AC line (Line & Neutral) were checked to find out the maximum conducted emission according to FCC Part 15 Subpart C and ANSI C63.10: 2013 requirements during conducted disturbance test.

The I.F. bandwidth of Test Receiver ESCI was set at 9 kHz.

The frequency range from 150 kHz to 30 MHz was checked.

Test with a dummy load in lieu of the antenna to determine compliance with Section 15.207 limits within the transmitter's fundamental emission band. (According to KDB 174176 D01 Line Conducted FAQ)

The test modes were done on conducted disturbance test and all the test results are listed in Sec. 3.7

#### 3.7 Test Results

#### < PASS >

The frequency and amplitude of the highest conducted emission relative the limit is reported. All the emissions not reported below are too low against the FCC limit.

Worst case emission:

No.	Operation	Modulation	Channel	Frequency (MHz)	Data Page
1.	Transmitting				P12

NOTE 1 – Level = Read Level + AMN Factor + Cable Loss

NOTE 2 – "QP" means "Quasi-Peak" values

NOTE 3 – The emission levels which not reported are too low against the official limit.

# Worst case emission

EUT	:	LED Strip	Temperature :	22°C
Model No.	:	CSTN16CDID	Humidity :	51%RH
Test Mode	:	Transmitting	Date of Test :	2022.07.05

Polarization	Frequency (MHz)	Meter Reading dB (µV)	AMN Factor (dB)	Cable Loss (dB)	Emission Level dB (µV)	Limits dB (µV)	Margin (dB)	Remark
	0.1884	42	0.17	0.03	42.2	64.11	21.91	QP
	0.1884	23.87	0.17	0.03	24.07	54.11	30.04	Average
	0.3217	37.8	0.19	0.03	38.02	59.66	21.64	QP
	0.3217	19.9	0.19	0.03	20.12	49.66	29.54	Average
	0.5407	37.94	0.2	0.04	38.18	56	17.82	QP
Line	0.5407	23.34	0.2	0.04	23.58	46	22.42	Average
Line	2.962	39.2	0.26	0.11	39.57	56	16.43	QP
	2.962	26.9	0.26	0.11	27.27	46	18.73	Average
	3.436	37.91	0.26	0.11	38.28	56	17.72	QP
	3.436	24.11	0.26	0.11	24.48	46	21.52	Average
	21.83	34.95	0.36	0.28	35.59	60	24.41	QP
	21.83	22.85	0.36	0.28	23.49	50	26.51	Average
	0.1844	36.56	0.12	0.03	36.71	64.28	27.57	QP
	0.1844	18.03	0.12	0.03	18.18	54.28	36.1	Average
	0.3217	32.16	0.16	0.03	32.35	59.66	27.31	QP
	0.3217	13.88	0.16	0.03	14.07	49.66	35.59	Average
	0.6108	36.15	0.22	0.05	36.42	56	19.58	QP
Neutral	0.6108	21.9	0.22	0.05	22.17	46	23.83	Average
Ineutiai	3.565	39	0.41	0.12	39.53	56	16.47	QP
	3.565	23.8	0.41	0.12	24.33	46	21.67	Average
	11.807	34.5	0.59	0.21	35.3	60	24.7	QP
	11.807	20.7	0.59	0.21	21.5	50	28.5	Average
	22.655	35.15	0.8	0.29	36.24	60	23.76	QP
	22.655	22.34	0.8	0.29	23.43	50	26.57	Average

# **4** RADIATED EMISSION TEST

# 4.1 Test Equipment

The following test equipment are used during the radiated emission test in a semi-anechoic chamber:

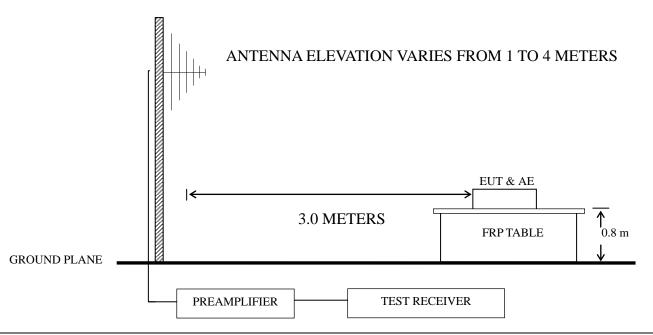
Item	Туре	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Preamplifier	Agilent	8447D	2944A10548	2022.06.06	1 Year
2.	Preamplifier	HP	8449B	3008A00864	2022.06.06	1 Year
3.	Spectrum Analyzer	Agilent	N9010A	MY52221182	2021.09.16	1 Year
4.	Test Receiver	R&S	ESCI	101303	2022.06.06	1 Year
5.	Bilog Antenna+6dB Attenuator	Schwarz beck	VULB 9168+EMCI- N-6-06	707+AT-N0637	2021.12.13	1 Year
6.	Horn Antenna	EMCO	3115	9607-4878	2021.07.27	1 Year
7.	Horn Antenna	EMCO	3116	00062643	2021.10.10	1 Year
8.	Cavity Band Rejection Filter	Microwave	WT-A3882-R 10	WT200312-1-1	2021.09.15	1 Year
9.	Software	Audix	e3	SET00200 9912M295-2		

# 4.2 Block Diagram of Test Setup

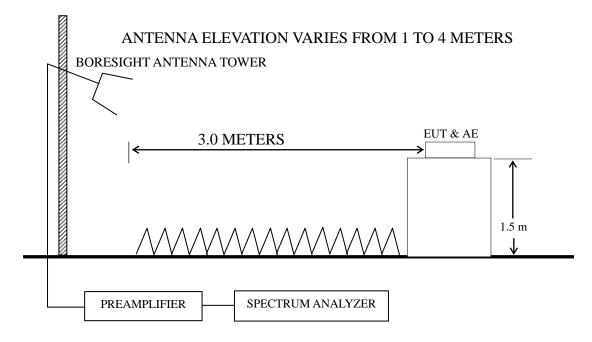
4.2.1 EUT & Peripherals



4.2.2 Below 1GHz



#### 4.2.3 Above 1GHz



## 4.3 Radiated Emission Limit (§15.209)

Frequency	Distance	Field strength limits ( $\mu V/m$ )					
(MHz)	(m)	$(\mu V/m)$	dB(µV/m)				
30 ~ 88	3	100	40.0				
88 ~ 216	3	150	43.5				
216 ~ 960	3	200	46.0				
Above 960	3	500	54.0				
NOTE 2 - The NOTE 3 - Dis ins sys	e tighter limit appli stance refers to the trument antenna an stem.	V/m) = 20 log Emission es at the band edges. distance in meters betwe d the closed point of any	en the measuring part of the device or				
NOTE 4 - The limits shown are based on Quasi-peak value detector below or equal to 1GHz and Average value detector above 1GHz.							
		1	NOTE 5 - Above 1 GHz, the limit on peak emission is 20 dB above the maximum permitted average emission limit applicable to the EUT				

## 4.4 Test Configuration

The EUT (listed in Sec.2.1) and the simulators (listed in Sec.2.2) were installed as shown on Sec.4.2 to meet FCC requirements and operating in a manner that tends to maximize its emission level in a normal application.

## 4.5 Operating Condition of EUT

- 4.5.1 Setup the EUT as shown in Sec. 4.2.
- 4.5.2 Turn on the power of all equipment.
- 4.5.3 Turn the EUT on the test mode, and then test.
- 4.6 Test Procedures

Radiated emission test applies to harmonics/spurs that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209. A pre-amp is necessary for this measurement. For measurement above 1 GHz, set RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation.

The EUT was placed on a turntable. Below 1 GHz, the table height is 80 cm above the reference ground plane. Above 1 GHz, the table height is 1.5 m. The turntable rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. The antenna moved up and down between 1 meter and 4 meters to find out the maximum emission level. Broadband antenna (Calibrated Bilog Antenna) or Horn antenna was used as receiving antenna. Both horizontal and vertical polarizations of the antenna were set on measurement. In order to find the maximum emission, all of the interference cables were manipulated according to ANSI C63.10: 2013 requirements during radiated emission test.

The bandwidth of Test Receiver R&S ESCI was set at 120 kHz from 30MHz to 1000MHz.

The bandwidth of Agilent N9010A was set at 1MHz for above 1GHz.

The frequency range from 30 MHz to 25 GHz (Up to 10<sup>th</sup> harmonics from fundamental frequency) was checked.

All the test results are listed in Sec.4.7.

## 4.7 Test Results

#### <PASS>

The frequency and amplitude of the highest radiated emission relative the limit is reported. All the emissions not reported below are too low against the FCC limit.

No.	Operation	Modulation	Channel	Frequency	Data Page
1.			00	2402 MHz	P17
2.	Transmitting	BLE	20	2442 MHz	P17
3.			39	2480 MHz	P18

#### Frequency range: below 1GHz (Worst case emission)

Frequency range: above 1GHz

No.	Operation	Modulation	Channel	Frequency	Data Page
1.			00	2402 MHz	P19
2.	Transmitting	BLE	20	2442 MHz	P19
3.			39	2480 MHz	P20

#### Band-Edge:

No.	Operation	Modulation	Channel	Frequency	Data Page
1.	Transmitting	DLE	00	2402 MHz	P21
2.	Transmitting	BLE	39	2480 MHz	P21

#### Restricted bands:

No.	Operation	Modulation	Channel	Frequency	Data Page
1.	Transmitting	BLE	00	2402 MHz	P22
2.	Transmitting	DLE	39	2480 MHz	P22

NOTE 1 – Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor

- NOTE 2 "QP" means "Quasi-Peak" values
- NOTE  $3 0^{\circ}$  was the table front facing the antenna. Degree is calculated from  $0^{\circ}$  clockwise facing the antenna.
- NOTE 4 The emission levels which not reported are too low against the official limit.
- NOTE 5 The emission levels recorded below is data of EUT configured in Standing direction, for Standing direction was the maximum emission direction during the test. The data of Side & Lying direction are too low against the official limit to be reported.
- NOTE 6 All reading are Quasi-Peak values below or equal to 1GHz, Peak and Average values above 1GHz.

For above 1GHz test, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.

NOTE 7 – The frequency range 2310-2390MHz & 2483.5-2500MHz were tested for Restricted bands.

# Worst case emission < 1GHz

EUT	:	LED Strip	Temperature :	22°C
Model No.	:	CSTN16CDID	Humidity :	51%RH
Test Mode	:	Transmitting	Date of Test :	2022.02.14

#### BLE CH2402MHz

Polarization	Frequency (MHz)	Meter Reading dB (µV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level dB (µV/m)	Limits dB (µV/m)	Margin (dB)	Remark
	50.409	22.79	19.54	0.76	28.2	14.89	40	25.11	QP
	65.803	22.71	18.5	0.88	28.14	13.95	40	26.05	QP
Horizontal	141.83	22.91	18.6	1.28	27.82	14.97	43.5	28.53	QP
Horizontai	239.99	30.21	17.2	1.65	27.2	21.86	46	24.14	QP
	431.03	23.7	22.05	2.24	27.72	20.27	46	25.73	QP
	810.27	22.21	28.1	3.09	26.85	26.55	46	19.45	QP
	43.506	22.38	19.15	0.7	28.23	14	40	26	QP
	62.431	22.94	19.06	0.86	28.15	14.71	40	25.29	QP
Vartical	124.57	22.71	17.15	1.21	27.88	13.19	43.5	30.31	QP
Vertical	230.91	26.23	15.85	1.63	27.24	16.47	46	29.53	QP
	482.22	22.99	22.93	2.43	27.86	20.49	46	25.51	QP
	689.57	24.05	26.3	2.84	27.45	25.74	46	20.26	QP

#### BLE CH2442MHz

Polarization	Frequency (MHz)	Meter Reading dB (µV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level dB (µV/m)	Limits dB (µV/m)	Margin (dB)	Remark
	44.587	22.57	19.26	0.71	28.22	14.32	40	25.68	QP
	62.431	22.53	19.06	0.86	28.15	14.3	40	25.7	QP
Horizontal	167.82	23.3	18.8	1.39	27.67	15.82	43.5	27.68	QP
Horizontai	239.15	29.8	17.1	1.65	27.21	21.34	46	24.66	QP
	312.18	25.79	19.32	1.94	27.08	19.97	46	26.03	QP
	549.02	23.85	23.97	2.52	27.9	22.44	46	23.56	QP
	43.506	23.58	19.15	0.7	28.23	15.2	40	24.8	QP
	60.069	23.12	19.2	0.84	28.16	15	40	25	QP
Vartical	123.7	22.86	17.1	1.21	27.88	13.29	43.5	30.21	QP
Vertical	236.65	25.22	16.8	1.64	27.22	16.44	46	29.56	QP
	382.59	22.43	20.9	2.12	27.5	17.95	46	28.05	QP
	760.7	22.21	27.8	2.94	27.16	25.79	46	20.21	QP

Polarization	Frequency (MHz)	Meter Reading dB (µV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level dB (µV/m)	Limits dB (µV/m)	Margin (dB)	Remark
	38.752	23.72	18.7	0.66	28.25	14.83	40	25.17	QP
	54.261	23.43	19.62	0.79	28.18	15.66	40	24.34	QP
Horizontal	145.86	23.2	18.9	1.29	27.81	15.58	43.5	27.92	QP
Horizontai	237.48	30.72	16.9	1.65	27.21	22.06	46	23.94	QP
	396.24	24.29	21.1	2.15	27.58	19.96	46	26.04	QP
	691.99	22.95	26.3	2.84	27.45	24.64	46	21.36	QP
	43.506	24.5	19.15	0.7	28.23	16.12	40	23.88	QP
	61.132	24.16	19.1	0.84	28.16	15.94	40	24.06	QP
Vertical	139.36	23.91	18.45	1.27	27.83	15.8	43.5	27.7	QP
vertical	277.09	25.32	18.38	1.8	27.1	18.4	46	27.6	QP
	444.85	24.33	22.6	2.28	27.78	21.43	46	24.57	QP
	760.7	23.08	27.8	2.94	27.16	26.66	46	19.34	QP

## BLE CH2480MHz

# **Radiated Emission > 1GHz**

EUT	:	LED Strip	Temperature :	22°C
Model No.	:	CSTN16CDID	Humidity :	51%RH
Test Mode	:	Transmitting	Date of Test :	2022.02.14

#### BLE CH2402MHz

Polarization	Frequency (MHz)	Meter Reading dB (µV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level dB (µV/m)	Limits dB (µV/m)	Margin (dB)	Remark
	2656	43.66	29.03	5.61	35.6	42.7	74	31.3	Peak
	3673	42.65	31.73	6.49	35.09	45.78	74	28.22	Peak
Horizontal	4582	40.08	32.3	7.36	34.82	44.92	74	29.08	Peak
Horizoittai	5716	38.47	34.19	8.2	34.7	46.16	74	27.84	Peak
	6859	39.6	35.26	9.18	34.79	49.25	74	24.75	Peak
	8371	39.04	38.39	10.4	34.76	53.07	74	20.93	Peak
	2863	42.4	29.69	5.78	35.41	42.46	74	31.54	Peak
	4024	40.57	32.47	6.81	34.99	44.86	74	29.14	Peak
Vertical	5077	38.83	34.02	7.78	34.7	45.93	74	28.07	Peak
vertical	6454	38.76	34.39	8.76	34.75	47.16	74	26.84	Peak
	7714	39.37	37.21	10.01	34.8	51.79	74	22.21	Peak
	8830	38.47	38.32	10.64	34.71	52.72	74	21.28	Peak

#### BLE CH2442MHz

Polarization	Frequency (MHz)	Meter Reading dB (µV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level dB (µV/m)	Limits dB (µV/m)	Margin (dB)	Remark
	2764	43.74	29.39	5.71	35.5	43.34	74	30.66	Peak
	4042	41.06	32.46	6.81	34.99	45.34	74	28.66	Peak
Homizontol	4996	39.82	34	7.73	34.7	46.85	74	27.15	Peak
Horizontal	5806	38.76	34.23	8.25	34.7	46.54	74	27.46	Peak
	7228	40.28	36.15	9.47	34.8	51.1	74	22.9	Peak
	8389	39.2	38.43	10.4	34.76	53.27	74	20.73	Peak
	2773	43.46	29.41	5.71	35.5	43.08	74	30.92	Peak
	3898	41.44	32.27	6.71	35.03	45.39	74	28.61	Peak
Vartical	5113	40.01	34.02	7.78	34.7	47.11	74	26.89	Peak
Vertical	6355	39.09	34.37	8.68	34.74	47.4	74	26.6	Peak
	7687	40.01	37.17	9.9	34.8	52.28	74	21.72	Peak
	8785	38.83	38.36	10.64	34.72	53.11	74	20.89	Peak

BLE	CH2480MHz
-----	-----------

Polarization	Frequency (MHz)	Meter Reading dB (µV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level dB (µV/m)	Limits dB (µV/m)	Margin (dB)	Remark
	2782	43.55	29.44	5.71	35.49	43.21	74	30.79	Peak
	4096	41.22	32.38	6.87	34.97	45.5	74	28.5	Peak
Horizontal	5050	39.9	34.01	7.73	34.7	46.94	74	27.06	Peak
Horizontai	6418	38.96	34.38	8.76	34.74	47.36	74	26.64	Peak
	7624	40.21	37.05	9.9	34.8	52.36	74	21.64	Peak
	8893	38.61	38.28	10.64	34.71	52.82	74	21.18	Peak
	2773	42.4	29.41	5.71	35.5	42.02	74	31.98	Peak
	3655	41.88	31.68	6.49	35.1	44.95	74	29.05	Peak
Vartical	4978	39.37	33.89	7.67	34.7	46.23	74	27.77	Peak
Vertical	6580	38.84	34.59	8.93	34.76	47.6	74	26.4	Peak
	7768	39.68	37.29	10.01	34.8	52.18	74	21.82	Peak
	8866	38.4	38.3	10.64	34.71	52.63	74	21.37	Peak

# **Band-Edge:**

EUT	:	LED Strip	Temperature :	22°C
Model No.	:	CSTN16CDID	Humidity :	51%RH
Test Mode	:	Transmitting	Date of Test :	2021.12.10

#### BLE CH2402MHz

Polarization	Frequency (MHz)	Meter Reading dB (µV)		Cable Loss (dB)	Preamp Factor (dB)	Emission Level dB (µV/m)	Limits dB (µV/m)	Margin (dB)	Remark
Horizontal	2390	49.43	28.21	5.36	35.86	47.14	74	26.86	Peak
Horizoiltai	2390	34.23	28.21	5.36	35.86	31.94	54	22.06	Average
Vertical	2390	44.87	28.21	5.36	35.86	42.58	74	31.42	Peak
vertical	2390	33.23	28.21	5.36	35.86	30.94	54	23.06	Average

#### BLE CH2480MHz

Polarization	Frequency (MHz)	Meter Reading dB (µV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level dB (µV/m)	Limits dB (µV/m)	Margin (dB)	Remark
Horizontal	2483.5	46.25	28.46	5.43	35.76	44.38	74	29.62	Peak
Horizoiltai	2483.5	34.21	28.46	5.43	35.76	32.34	54	21.66	Average
Vertical	2483.5	43.39	28.46	5.43	35.76	41.52	74	32.48	Peak
vertical	2483.5	30.24	28.46	5.43	35.76	28.37	54	25.63	Average

# **Emissions in restricted frequency bands:**

EUT	:	LED Strip	Temperature :	22°C
Model No.	:	CSTN16CDID	Humidity :	51%RH
Test Mode	:	Transmitting	Date of Test :	2021.12.10

#### BLE CH2402MHz

Polarization	Frequency (MHz)	Meter Reading dB (µV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level dB (µV/m)	Limits dB (µV/m)	Margin (dB)	Remark
	2321.8	45.36	28.03	5.29	35.93	42.75	74	31.25	Peak
	2321.8	38.43	28.03	5.29	35.93	35.82	54	18.18	Average
Horizontal	2368.5	48.08	28.15	5.32	35.89	45.66	74	28.34	Peak
Horizontai	2368.5	38.22	28.15	5.32	35.89	35.8	54	18.2	Average
	2377.5	47.88	28.19	5.32	35.88	45.51	74	28.49	Peak
	2377.5	42.6	28.19	5.32	35.88	40.23	54	13.77	Average
	2340.4	43.42	28.08	5.29	35.92	40.87	74	33.13	Peak
	2340.4	35.25	28.08	5.29	35.92	32.7	54	21.3	Average
Vertical	2370.1	44.43	28.17	5.32	35.89	42.03	74	31.97	Peak
verucai	2370.1	35.45	28.17	5.32	35.89	33.05	54	20.95	Average
	2389.2	47.86	28.21	5.36	35.86	45.57	74	28.43	Peak
	2389.2	33.68	28.21	5.36	35.86	31.39	54	22.61	Average

#### BLE CH2480MHz

Polarization	Frequency (MHz)	Meter Reading dB (µV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level dB (µV/m)	Limits dB (µV/m)	Margin (dB)	Remark
	2488.1	43.99	28.46	5.47	35.76	42.16	74	31.84	Peak
Horizontal	2488.1	34.59	28.46	5.47	35.76	32.76	54	21.24	Average
	2493.5	44.45	28.48	5.47	35.76	42.64	74	31.36	Peak
Horizontai	2493.5	34.35	28.48	5.47	35.76	32.54	54	21.46	Average
	2498.5	44.54	28.5	5.47	35.76	42.75	74	31.25	Peak
	2498.5	33.25	28.5	5.47	35.76	31.46	54	22.54	Average
	2487.2	44.41	28.46	5.47	35.76	42.58	74	31.42	Peak
	2487.2	31.44	28.46	5.47	35.76	29.61	54	24.39	Average
Vertical	2492.8	44.18	28.48	5.47	35.76	42.37	74	31.63	Peak
vertical	2492.8	31.42	28.48	5.47	35.76	29.61	54	24.39	Average
	2496.9	43.42	28.5	5.47	35.76	41.63	74	32.37	Peak
	2496.9	32.64	28.5	5.47	35.76	30.85	54	23.15	Average

# **5 6 dB BANDWIDTH MEASUREMENT**

## 5.1 Test Equipment

The following test equipment was used during the Emission Bandwidth measurement:

Item	Туре	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A	MY52221182	2021.09.15	1 Year
2.	Coaxial Cable	WOKEN	SFL402-105F LEX	F02-150819-0 45	2021.03.08	1 Year
3.	10 dB Attenuator	Mini-Circuits	VAT-10W2+	001	2021.08.06	1 Year

## 5.2 Block Diagram of Test Setup

Spectrum Analyzer	[	EUT	<u> </u>	Notebook PC	
-------------------	---	-----	----------	-------------	--

## 5.3 Specification Limits (§15.247(a)(2))

The minimum 6 dB bandwidth shall be at least 500 kHz.

#### 5.4 Operating Condition of EUT

The switch ON/OFF was used to enable the EUT to change the channel one by one.

#### 5.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with settings: RBW = 100kHz,  $VBW \ge 3 \times RBW$ .

The 6 dB bandwidth is defined as the total spectrum the power of which is lower than peak power minus 6 dB.

The test procedure is defined in ANSI C63.10-2013 (the 11.8.2 Measurement Procedure "Option 2" was used).

# 5.6 Test Results **PASSED.**

All the test results are attached in next pages.

(Test Date: 2021.12.10 Temperature: 23°C Humidity: 51 %)

Modulation	Channel	Frequency (MHz)	6dB Bandwidth (kHz)	Limit
	00	2402	652.4	500 kHz
BLE	20	2442	695.9	500 kHz
	39	2480	649.8	500 kHz

#### **BLE CH2402MHz**



#### **BLE CH2442MHz**

🌉 Agilent Spectru	m Analyzer - Occupied BW					
Center Fre	RF 50 Ω DC eq 2.442000000		sense:INT ter Freq: 2.442000000 GHz	Radio Sto	PM Dec 10, 2021 I: None	Frequency
			:FreeRun Avg Ho ten:20 dB	ld:>10/10 Radio De	vice: BTS	
	Ref Offset 11 dB					
10 dB/div	Ref 20.00 dBm					
Log 10.0						Center Freq
0.00						2.442000000 GHz
-10.0						
-20.0						
-30.0						
-40.0						
-50.0						
-60.0						
-70.0						
-70.0						CF Step 200.000 kHz
Center 2.4				S	oan 2 MHz	
#Res BW 1	100 KHZ		#VBW 300 kHz	SW	eep 1 ms	
Occup	ied Bandwidt	h	Total Power	11.5 dBm		Freq Offset
	1.	0511 MHz				0 Hz
Transm	it Freq Error	-10.364 kHz	<b>OBW</b> Power	99.00 %		
	ndwidth	695.9 kHz	x dB	-6.00 dB		
MSG				STATUS		

## BLE CH2480MHz

🌉 Agilent Spectrum Analyzer - Occupied BW	1				
(20	#IFGain:Low #Atter	SENSE:INT r Freq: 2.480000000 GHz Free Run Avg Hol n: 20 dB	Radio St d:>10/10	5 PM Dec 10, 2021 td: None evice: BTS	Frequency
10 dB/div Ref 20.00 dB/ Log 10.0 0.00	m				Center Freq 2.48000000 GHz
-10.0 -20.0 -30.0 -40.0					
-50.0 -60.0 -70.0					CF Step
Center 2.48 GHz #Res BW 100 kHz	#	VBW 300 kHz	Sv Sv	pan 2 MHz veep 1 ms	200.000 kHz <u>Auto</u> Man
Occupied Bandwid	<sup>th</sup> .0455 MHz	Total Power	11.4 dBm		<b>Freq Offset</b> 0 Hz
Transmit Freq Error x dB Bandwidth	-7.227 kHz 649.8 kHz	OBW Power x dB	99.00 % -6.00 dB		
MSG			STATUS		

# **6 MAXIMUM PEAK OUTPUT POWER MEASUREMENT**

#### 6.1 Test Equipment

The following test equipment was used during the maximum peak output power measurement:

Item	Туре	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A	MY52221182	2021.09.15	1 Year
2.	Coaxial Cable	WOKEN	SFL402-105F LEX	F02-150819-0 45	2021.03.08	1 Year
3.	10 dB Attenuator	Mini-Circuits	VAT-10W2+	001	2021.08.06	1 Year

#### 6.2 Block Diagram of Test Setup

The Same as Section. 5.2.

#### 6.3 Specification Limits ((§15.247(b)(3))

The Limits of maximum Peak Output Power for digital modulation in 2400-2483.5 MHz is: 1 Watt. (30 dBm)

#### 6.4 Operating Condition of EUT

The switch ON/OFF was used to enable the EUT to change the channel one by one.

#### 6.5 Test Procedure

The transmitter output was connected to the spectrum analyzer.

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

- a) RBW  $\geq$  DTS Bandwidth.
- b) VBW  $\geq$  [3 × RBW].
- c) Span  $\geq$  [3 × RBW].
- d) Sweep time = auto.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

The test procedure is defined in ANSI C63.10-2013 ( 11.9.1.1 Measurement Procedure " RBW  $\geq$  DTS bandwidth" was used).

# 6.6 Test Results **PASSED.**

All the test results are listed below.

(Test Date: 2021.12.10 Temperature: 23°C Humidity: 51 %)

Modulation	Channel	Frequency (MHz)	Peak Output Power (dBm)	Limit
	00	2402	5.448	30 dBm
BLE	20	2442	5.181	30 dBm
	39	2480	5.283	30 dBm

#### BLE CH2402MHz

M Agilent Spectrum Analyzer - Occupied BW				_ 0 <mark></mark>
X RF 50 Ω DC Marker 1 2.40182600000	0 GHz PNO: Fast C Trig: Free	Avg Type: Run Avg Hold:	Log-Pwr TRAG	PMDec 10, 2021 Peak Search   Peak Search Peak Search   Peak Search Peak Search
Ref Offset 11 dB 10 dB/div Ref 20.00 dBm	IFGain:Low Atten: 20	ab	Mkr1 2.401 8	
10.0	↓1			Next Pk Right
-10.0				Next Pk Left
-20.0				Marker Delta
-40.0				Mkr→CF
-50.0				Mkr→RefLv
-70.0 Center 2.402000 GHz			Span 2	More .000 MHz 1 of 2
#Res BW 1.0 MHz	#VBW 3.0 MHz		Sweep 1.00 ms (	(1001 pts)

## BLE CH2442MHz

🌉 Agilent Spect	rum Analyzer - Occupied BW							- 0 ×
<mark>w</mark> Marker 1	RF 50 Ω DC 2.441802000000	PNO: Fast	SENSE:INT Trig: Free Run Atten: 20 dB	Avg Type: Avg Hold:		12:10:59 PMI TRACE TYPE DET	Dec 10, 2021 1 2 3 4 5 6 M WWWW P S N N N N	Peak Search
10 dB/div Log	Ref Offset 11 dB Ref 20.00 dBm	I Guineow			Mkr1	2.441 80 5.18	2 GHz 1 dBm	Next Peak
10.0			1					Next Pk Right
-10.0								Next Pk Left
-20.0								Marker Delta
-40.0								Mkr→CF
-60.0								Mkr→RefLv
-70.0	142000 GHz					Span 2.0	00 MH2	More 1 of 2
#Res BW		#VBW	3.0 MHz			Spar 2.0 1.00 ms (10	001 pts)	
MSG					STATUS			

#### BLE CH2480MHz

📜 Agilent Spec	trum Analyzer - Occupied BW							
Marker 1	RF 50 Ω DC 2.479796000000	OGHZ PNO: Fast G IFGain:Low			ALIGN AUTO : Log-Pwr >100/100	TRAC	M Dec 10, 2021 E 123456 PE MWWWW T P S N N N N	Peak Search
10 dB/div	Ref Offset 11 dB Ref 20.00 dBm				Mkr1	2.479 7 5.2	'96 GHz 83 dBm	NextPeak
10.0			1					Next Pk Righ
-10.0								Next Pk Lei
-20.0								Marker Delt
-40.0								Mkr→C
-60.0								Mkr→RefL
	480000 GHz					Span 2	.000 MHz	<b>Mor</b> 1 of:
#Res BW	1.0 MHz	#VBW	3.0 MHz		Sweep	1.00 ms	1001 pts)	
ISG					STATUS	6		

# 7 EMISSION LIMITATIONS MEASUREMENT

## 7.1 Test Equipment

#### The following test equipment was used during the emission limitations test:

Item	Туре	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A	MY52221182	2021.09.15	1 Year
2.	Coaxial Cable	WOKEN	SFL402-105F LEX	F02-150819-0 45	2021.03.08	1 Year
3.	10 dB Attenuator	Mini-Circuits	VAT-10W2+	001	2021.08.06	1 Year

#### 7.2 Block Diagram of Test Setup

The Same as Section. 5.2.

7.3 Specification Limits (§15.247(d))

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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

In addition, radiated emissions which fall in the restricted bands, as defined in \$15.205(a), must also comply with the radiated emission limits specified in \$15.209(a) (see \$15.205(c)). (% This test result attaching to Section. 3.7)

## 7.4 Operating Condition of EUT

The switch ON/OFF was used to enable the EUT to change the channel one by one.

#### 7.5 Test Procedure

The transmitter output was connected to the spectrum analyzer.

Establish a reference level by using the following procedure:

- a) Set instrument center frequency to DTS channel center frequency.
- b) Set the span to  $\geq 1.5$  times the DTS bandwidth.
- c) Set the RBW = 100 kHz.
- d) Set the VBW  $\geq$  [3 × RBW].
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum PSD level.
- Note that the channel found to contain the maximum PSD level can be used to

establish the reference level.

Establish an emission level by using the following procedure:

a) Set the center frequency and span to encompass frequency range to be measured.

b) Set the RBW = 100 kHz.

c) Set the VBW  $\geq$  [3 × RBW].

d) Detector = peak.

e) Sweep time = auto couple.

f) Trace mode = max hold.

g) Allow trace to fully stabilize.

h) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

Scan up through 10<sup>th</sup> harmonic.

The test procedure is defined in ANSI C63.10-2013 (11.11.2 Reference level measurement and 11.11.3 Emission level measurement was used).

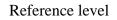
# 7.6 Test Results **PASSED**.

The test data was attached in the next pages.

(Test Date: 2022.02.16 Temperature: 23°C Humidity: 51 %)

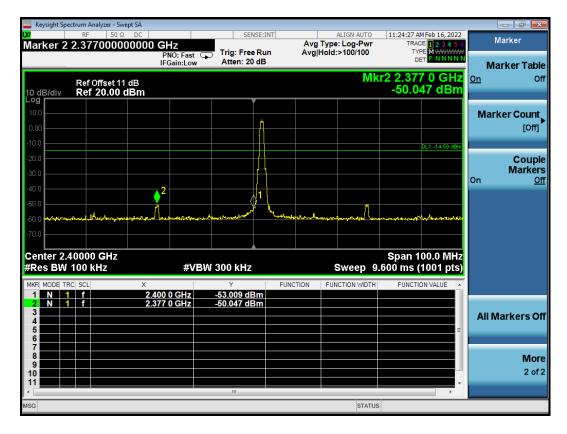
Modulation	Channel	Frequency (MHz)	Data Page
	00	2402	P34-36
BLE	20	2442	P37-38
	39	2480	P39-41

#### **BLE CH2402MHz**





#### Emission level



Keysight Spect	trum Analyzer - Swept SA						
<mark>IXI</mark> Markor 1 3	RF 50 Ω DC 3.22074000000	CH2	SENSE		ALIGN AUTO e: Log-Pwr	11:26:17 AM Feb 16, 2022 TRACE 1 2 3 4 5 6	Marker
	5.220740000000	PNO: Fast IFGain:Low	Trig: Free R Atten: 20 d	un Avg Hold	1:>100/100	TYPE MWWWW DET PNNNN	Select Marker
	Ref Offset 11 dB Ref 20.00 dBm				Mkr	1 3.220 74 GHz -53.027 dBm	1
10.0							Normal
0.00							Delta
-10.0						DL1 -14.59 dBm	Dena
-20.0							Fixed⊳
-40.0							Off
-50.0				Almonto and a state of the stat	ide alter fret altrace	www.wei.wei.wei.weiter	
-60.0 Hartan	hanganan dipikatahan pikan	fashiangentendamin					Properties►
						0400 5 000 OUT	More 1 of 2
Start 30 MI #Res BW 1		#VBW	300 kHz		Sweep 4	Stop 5.000 GHz 75.0 ms (1001 pts)	
MSG					STATUS	;	

								trum Analyzer - Sw	🔤 Keysight Spe
Peak Search	11:29:21 AM Feb 16, 2022 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P N N N N N	ALIGN AUTO pe: Log-Pwr ld:>100/100				GHz NO: Fast Gain:Low	Р	RF 50 Ω 10.600000	<mark>×</mark> Marker 1
Next Peal	/kr1 10.60 GHz -54.098 dBm				Atten. 20	Galli:Low	dB	Ref Offset 11 Ref 20.00 (	10 dB/div
Next Pk Righ									10.0
Next Pk Let	DL1 -14.59 dBm								-10.0
Marker Delt									-20.0
Mkr→C				1_					40.0
Mkr→RefLv	warneser art worker the torough we	and any other strategy of the second s	herewold have	whether the south	weldlerstandere	wellerholder	Willneuten Marcal	H <sup>LLE</sup> WARD	60.0 <b>**</b>
<b>Mor</b> 1 of	Stop 15.000 GHz 55.7 ms (1001 pts)	Sweep 9			300 kHz	#VBW			70.0 Start 5.00 #Res BW
		STATU							ISG

Keysight Spe	ectrum Analyzer - Swept SA RF 50 Ω DC		SENSE:INT	ALIGN AUTO	11:38:09 AM Feb 16, 2022	
larker 1	23.7000000000	PNO: Fast	rig: Free Run Atten: 20 dB	Avg Type: Log-Pwr Avg Hold:>100/100		Peak Search
0 dB/div	Ref Offset 11 dB Ref 20.00 dBm				Mkr1 23.70 GHz -49.884 dBm	Next Pea
10.0						Next Pk Righ
10.0					DL1 -14.59 dBm	Next Pk Le
20.0 <b></b> 30.0 <b></b>						Marker Delt
40.0 50.0					1	Mkr→C
i0.0	a, Mutan Andrew Salaha Sala	wenter de la companya and an	ประชาญ (1997) 	المسوالية معرفة من المسلم المسلم المسلم المسلم	######################################	Mkr→RefL
10.0		4) ID W 2/			Stop 25.000 GHz	Moi 1 of
Res BW	100 kHz	#VBW 30	JU KHZ	Sweep	955.7 ms (1001 pts)	

#### **BLE CH2442MHz**

Reference level



#### Emission level



Keysight Spe	ectrum Analyzer - Swept S								
<mark>×</mark> Marker 1	RF 50 Ω D 9.7400000000		SEN	SE:INT		ALIGN AUTO Log-Pwr	TRAC	Feb 16, 2022	Peak Search
maritor		PNO: Fast	Trig: Free Atten: 20		Avg Hold:	>100/100	TYF		
10 dB/div	Ref Offset 11 dB Ref 20.00 dBr						Mkr1 9. -53.9	74 GHz 83 dBm	Next Peak
10.0									Next Pk Right
-10.0								DL1 -14.50 dBm	Next Pk Left
-20.0									Marker Delta
-40.0									Mkr→CF
-50.0	white and the state of the stat	hours of an internation	Caller Call	÷าะลูกสูงที่เ <sup>ป็นป</sup> ีเสียงให้	nny fan de fan te de fan de	of fat while and the	highwalaa hi <sup>goo</sup> alih	kindra-vijthajiliyu	Mkr→RefLv
-70.0	0 GHz						Stop 15	.000 GHz	More 1 of 2
#Res BW		#VBW	300 kHz			Sweep	955.7 ms (	1001 pts)	
MSG						STATU	JS		

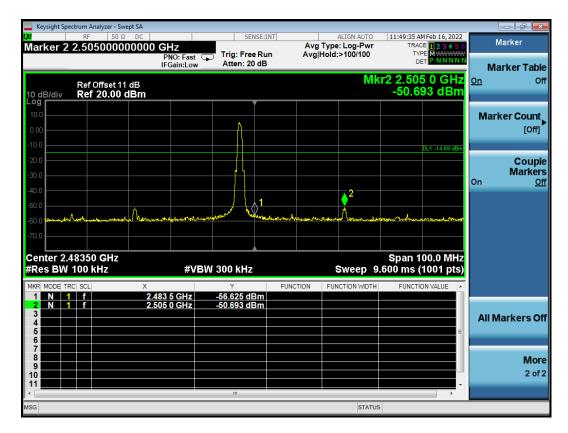
							ctrum Analyzer - Sw	🔤 Keysight Sp
Peak Search	11:48:18 AM Feb 16, 2022 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P N N N N N	ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>100/100			OGHZ PNO: Fast ⊂	Ω DC D000000	RF 50 Ω 23.640000	<mark>x</mark> Marker 1
NextPeak	/kr1 23.64 GHz -49.844 dBm	Ν		Atten. 20	IFGain:Low		Ref Offset 11 Ref 20.00 d	10 dB/div
Next Pk Righ								10.0
Next Pk Lef	DL1 -14.50 dBm							0.00
Marker Delta								-20.0
Mkr→Ci	1							-40.0
Mkr→RefLv	hilyonn <sup>allyin</sup> sedenen open pline.	ระกรมระชาญปังหรัง	hald managed	ad lade Mary	المربوبية (الاسمر <mark>ية المراجع</mark>	stop-levelande	نرم <sub>ا</sub> ينديوليهما <mark>ليروار</mark> الديللاند <sub>وليا</sub>	-60.0
<b>Mor</b> o 1 of 2	Stop 25.000 GHz 55.7 ms (1001 pts)	Sweep 9		300 kHz	#VBW			-70.0 Start 15.0 #Res BW
		STATUS						MSG

#### **BLE CH2480MHz**

Reference level



#### Emission level



Keysight Spectrum Analyzer - Swept SA				
₩ RF 50 Ω DC Marker 1 3.17104000000	00 GHz	Avg Type:	Log-Pwr TRACE	IFeb 16, 2022 Peak Search   E 1 2 3 4 5 6
Ref Offset 11 dB 10 dB/div Ref 20.00 dBm	PNO: Fast 🍙 Trig: Free IFGain:Low Atten: 20		Mkr1 3.171	
10.0				Next Pk Rig
-10.0				Next Pk Le
-20.0				Marker De
-40.0				Mkr⊸C
	unon makeus na den den de de	and the second	and for a state of the state of	Mkr→RefL
-70.0 Start 30 MHz	#\/E\W/ 200 LUL		Stop 5.	000 GHz
#Res BW 100 kHz	#VBW 300 kHz		Sweep 475.0 ms ('	

							trum Analyzer - Swe	Keysight Sp
Peak Search	11:57:41 AM Feb 16, 2022 TRACE 1 2 3 4 5 6	ALIGN AUTO	NSE:INT		GHz	DC 000000	RF 50 Ω	<mark>x</mark> Marker 1
NextPeak	Mkr1 14.16 GHz -53.746 dBm	Hold:>100/100		Trig: Free Atten: 20	PNO: Fast FGain:Low	dB	Ref Offset 11 Ref 20.00 d	10 dB/div
Next Pk Right				`			Rei 20.00 0	
Next Pk Lef	DL1 -14.69 dBm							-10.0
Marker Delta								-20.0
Mkr→Cl	1							-40.0
Mkr→RefLv	Marin Horner water and the second for	nogelen gehander van de kander van de ka New de kander van de kander	and a specific of the second	agalland <sub>al t</sub> afaraya	NI HAR HINHON HIM	ALL CONTRACTION OF THE OWNER OF T	and the strength of the state o	-60.0
More 1 of:	Stop 15.000 GHz 55.7 ms (1001 pts)	Sweep 9		300 kHz	#VBW			Start 5.00
		STATUS						MSG

	n Analyzer - Swept SA							
	ef 50 Ω DC .67000000000000000000000000000000000000	PNO: Fast 🖵 Trig	SENSE:INT		ALIGN AUTO : Log-Pwr >100/100	TYPE	eb 16, 2022 <b>1 2 3 4 5 6</b> MWWWW P N N N N N	Peak Search
I0 dB/div Re	ef Offset 11 dB ef 20.00 dBm	IFGain:Low Atte	en: 20 dB		Ν	/lkr1 23.6 -49.70	67 GHz	Next Pea
10.0								Next Pk Righ
10.0						D	L1 -14.69 dBm	Next Pk Le
20.0								Marker Del
6.0						1 مىلىدىمى <sup>مەلىر</sup> لىلىلىم		Mkr→C
60.0	annyn yn de yn yn de gerydd dynarai	John Server Mar Mile of a Astan	uharringhmenten	alge frysoddillen beig frysod	Length of the second		************	Mkr→RefL
70.0 Start 15.000 ( Res BW 100		#VBW 300	kH7		Sween_0	Stop 25.0 55.7 ms (1		<b>Mo</b> i 1 of
ISG	2001/2	~~Dov 300	M1/2		status		oor pts)	

# 8 POWER SPECTRAL DENSITY MEASUREMENT

## 8.1 Test Equipment

The following test equipment was used during the power spectral density measurement:

Item	Туре	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9010A	MY52221182	2021.09.15	1 Year
2.	Coaxial Cable	WOKEN	SFL402-105F LEX	F02-150819-0 45	2021.03.08	1 Year
3.	10 dB Attenuator	Mini-Circuits	VAT-10W2+	001	2021.08.06	1 Year

#### 8.2 Block Diagram of Test Setup

The Same as section 5.2.

#### 8.3 Specification Limits (§15.247(e))

The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band.

## 8.4 Operating Condition of EUT

The switch ON/OFF was used to enable the EUT to change the channel one by one.

#### 8.5 Test Procedure

The transmitter output was connected to the spectrum analyzer.

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to 3 kHz  $\leq$  RBW  $\leq$  100 kHz.
- d) Set the VBW  $\ge$  [3 × RBW].
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.

i) Use the peak marker function to determine the maximum amplitude level within the RBW.

j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

The test procedure is defined in ANSI C63.10-2013 (11.10.2 Measurement Procedure "Method PKPSD (peak PSD)" was used).

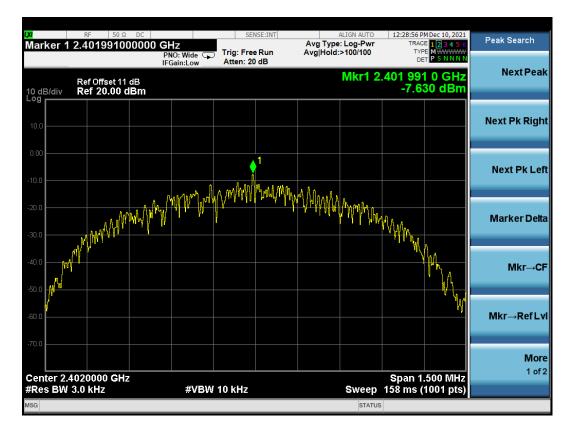
# 8.6 Test Results **PASSED**.

All the test results are attached in next pages.

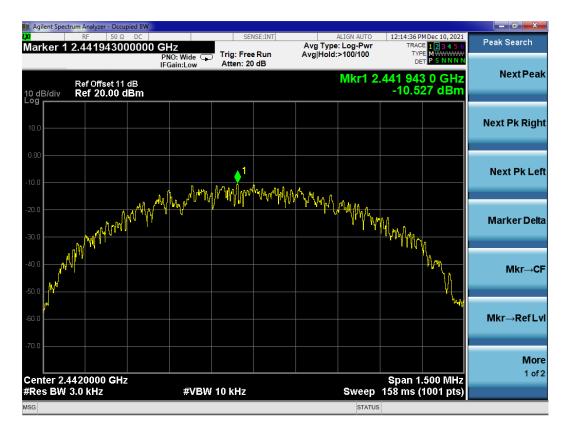
(Test Date: 2021.12.10 Temperature: 23°C Humidity: 51 %)

Modulation	Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit
	00	2402	-7.63	8 dBm
BLE	20	2442	-10.527	8 dBm
	39	2480	-9.452	8 dBm

#### **BLE CH2402 MHz**



#### **BLE CH2442 MHz**



#### BLE CH2480 MHz



# **9 DEVIATION TO TEST SPECIFICATIONS**

None.

# **10 MEASUREMENT UNCERTAINTY LIST**

The measurement uncertainty was estimated for test on the EUT according to CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage of K=2. The uncertainties value is not used in determining the PASS/FAIL results.

Test Items/Facilities	Frequency/Equipment/Unit	Uncertainty
Conducted Emission	9kHz~150kHz	±3.1 dB
No.1 Shielded Room	150kHz~30MHz	±2.6 dB
Conducted Emission	9kHz~150kHz	±3.1 dB
No.3 Shielded Room	150kHz~30MHz	±2.6 dB
Radiated Emission	30MHz~200MHz, Horizontal	±3.8 dB
	30MHz~200MHz, Vertical	±4.1 dB
	200MHz~1000MHz, Horizontal	±3.6 dB
	200MHz~1000MHz, Vertical	±5.1 dB
	1GHz~6GHz	±5.3 dB
	6GHz~18GHz	±5.3 dB
	18GHz~40GHz	±3.5 dB
Output Power Test	50MHz~18GHz	0.77 dB
Power Density Test	9kHz~6GHz	1.08 dB
RF Frequency Test	9kHz~40GHz	6*10 <sup>-4</sup>
Bandwidth Test	9kHz~6GHz	$1.5*10^{-3}$
RF Radiated Power Test	30MHz~1000MHz	3.06 dB
Conducted Output Power Test	50MHz~18GHz	0.83 dB
AC Voltage(<10kHz) Test	120V~230V	0.04 %
DC Power Test	0V~30V	0.4 %
Temperature	-40°C~+100°C	0.52 °C
Humidity	30%~95%	2.6 %