

# RF Exposure Evaluation

## of

E.U.T. : FM-RDS/SPOTIFY CONNECT/INTERNET  
RADIO/AIRMUSIC CONTROL PORTABLE DIGITAL RADIO  
Model No. : WFR-39  
FCC ID : BYG-WFR39

for

APPLICANT : SANGEAN ELECTRONICS INC.  
ADDRESS : NO.18, LANE 7, LI-DE STREET, CHUNG  
HO DISTRICT, NEW TAIPEI CITY,  
23584, TAIWAN, R.O.C.

Test Performed by

### **ELECTRONICS TESTING CENTER, TAIWAN**

NO. 34. LIN 5. DINGFU VIL., LINKOU DIST.,  
NEW TAIPEI CITY, TAIWAN, 24442, R.O.C.  
Tel : (02)26023052      Fax : (02)26010910  
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Report Number : 22-04-RBF-020-0

# TEST REPORT CERTIFICATION

Applicant : SANGEAN ELECTRONICS INC.  
NO.18, LANE 7, LI-DE STREET, CHUNG HO DISTRICT, NEW  
TAIPEI CITY, 23584, TAIWAN, R.O.C.

Manufacturer : SANGEAN ELECTRONICS INC.  
NO.18, LANE 7, LI-DE STREET, CHUNG HO DISTRICT, NEW  
TAIPEI CITY, 23584, TAIWAN, R.O.C.

## Description of EUT

- a) Type of EUT : FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIR MUSIC  
CONTROL PORTABLE DIGITAL RADIO
- b) Trade Name : SANGEAN
- c) Model No. : WFR-39
- d) Power Supply : 1.5V/2.4A USB Type C  
2. Built in Li Ion battery 3.65V/2.6A
- e) Frequency Range : 2412-2472 MHz

Regulation Applied : FCC KDB447498 D01. The equipment fulfills the requirements on power density for general population/uncontrolled exposure and therefore fulfills the requirements of section 1.1310 of FCC 47 CFR Part 1.

Note: 1. The result of the testing report relate only to the item tested.  
2. The testing report shall not be reproduced except in full, without the written approval of ETC

*Date Test Item Received* : Apr. 18, 2022  
*Date Test Campaign Completed* : May 16, 2022  
*Date of Issue* : Jun. 30, 2022

*Test Engineer*

: Vincent Chang  
(Vincent Chang, Engineer)

*Approve & Authorized*

: Kevin Lee  
Kevin Lee, Section Manager  
EMC Dept. II of TAIWAN TESTING  
AND CERTIFICATION CENTER



## Product Information:

Type of EUT: FM-RDS/SPOTIFY CONNECT/INTERNET RADIO/AIRMUSIC  
CONTROL PORTABLE DIGITAL RADIO

FCC ID: BYG-WFR39

Model: WFR-39

Description: The model of WFR-39 is a multi-function device with WiFi communication which can be used in FM-RDS, Spotify Connect, Internet Radio, AirMusic for a portable digital radio.

Maximum conducted output power (rated): 18.67 dBm or 73.621 mW

The following table lists the provided authorized antennas:

Model	Antenna Type	Antenna Gain	
		(dBi)	Numeric
BL-BSTB1114-1	PCB Antenna	2.3	1.698

Below is an example of the RF Exposure Statement:

**IMPORTANT NOTE:** To comply with the FCC RF exposure compliance requirements, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. No change to the antenna or the device is permitted. Any change to the antenna or the device could result in the device exceeding the RF exposure requirements and void user's authority to operate the device.

## Relative Requirement for Compliance

According to section 1.1310 of FCC 47 CFR Part 1, limits for maximum permissible exposure (MPE) are as following:

TABLE 1 – LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0 .....	614	1.63	*(100)	6
3-30 .....	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30-300 .....	61.4	0.163	1.0	6
300-1500 .....	.....	.....	f/300	6
1500-100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34 .....	614	1.63	*(100)	30
1.34-30 .....	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30-300 .....	27.5	0.073	0.2	30
300-1500 .....	.....	.....	f/1500	30
1500-100,000 .....	.....	.....	1.0	30

f = frequency in MHz

\* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational / controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

## RF Exposure Calculations:

The following information provides the minimum separation distance for the highest gain antenna provided. This calculation is based on the highest EIRP possible from the system, considering maximum power and antenna gain, and considering a 1.0 mW/cm<sup>2</sup> uncontrolled exposure limit. The formula shown in OET Bulletin 65 is used in the calculation.

Equation from page 19 of OET Bulletin 65, Edition 97-01 is:

$$S = PG / 4 \pi R^2$$

where: S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)

P = power input to the antenna (in appropriate units, e.g., mW)

G = power gain of the antenna in the direction of interest relative to  
an isotropic radiator

R = distance to the center of radiation of the antenna (appropriate  
units, e.g., cm)

hence

$$R = (PG / 4 \pi S)^{1/2}$$

For our device

P = 73.621 mW

G = 1.698

R = 20 cm

$$S = (73.621 * 1.698) / (4 * \pi * 20^2) = \underline{\underline{0.02487}} \text{ mW/cm}^2 < 1.0 \text{ mW/cm}^2$$

For complying the FCC limits for general population/uncontrolled exposure, the power density limit is 1.0 mW/cm<sup>2</sup>. The calculation result of the power density at a distance of 20 cm of our device is less than the limit.

This means that according to OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01), the equipment fulfills the requirements on power density for general population/uncontrolled exposure and therefore fulfills the requirements of section 1.1310 of FCC 47 CFR Part 1.

Test	Results
Evaluation	<b>Pass</b>

## Conducted Test Equipment

Equipment	Manufacturer	Model No.	Calibration Date	Next Cal. Date
Spectrum Analyzer	Rohde & Schwarz	FSP40 (13040903-001)	2021/06/16	2022/06/15
Attenuator	Mini-Circuits	BW-S10W2+/-	2021/10/28	2022/10/27

## Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Uncertainty
Conducted Measurement	9kHz ~ 40GHz	±0.88dB (9kHz ≤ f ≤ 30MHz)
		±0.88dB (30MHz < f ≤ 1GHz)
		±1.04dB (1GHz ≤ f ≤ 18GHz)
		±1.2dB (18GHz ≤ f ≤ 40GHz)

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

The test result(s) does not consider the uncertainty of measurement when the test standard(s) and/or test method which refer by the labs has the limit or judgments for the test result(s).

## Antenna Information

Brand	Model Name	Antenna Type	Gain (dBi)
LB-LINK	BL-BSTB1114-1	PCB	2.3

Note : The Antenna information was declared by manufacturer.