

## COMPLIANCE WORLDWIDE INC. TEST REPORT

In Accordance with the Requirements of  
**FCC PART 2.1093 Radio Frequency Exposure Evaluation:  
Portable Devices**

Issued to  
**Philips Medical Systems  
3000 Minuteman Drive  
Andover, MA 01810  
978-659-2800**

for the  
**MX40 SH CTS and SRR Radios**

**FCC ID: PQC-MX40SH2C4**

**Report Issued on June 16, 2022**

Tested by

  
\_\_\_\_\_  
Brian F. Breault

Reviewed by

  
\_\_\_\_\_  
Larry K. Stillings

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## 1. Scope

This test report certifies that the Philips Medical Systems MX40 2.4 GHz SH CTS and SRR Radios, as tested, meets the FCC Part 2.1093 requirements exempting the device from a SAR Evaluation.

The scope of this test report is limited to the test sample provided by the client, only in as much as that sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated, and a retest may be required.

## 2. Product Details

2.1. Manufacturer:	Philips Medical Systems
2.2. Model Number:	Model 865351/MX40-2C4
2.3 Serial Number:	US156Z7318 (conducted), US156Z7319 (radiated)
2.4 Description of EUT:	Wireless ECG/SpO2 patient monitor
2.5 Power Source:	3 AA batteries
2.6 Hardware Revision:	B.01.02
2.7 Software Revision:	C.01.54
2.8 Firmware Revision:	A.06.40
2.9. Modulation Type:	Smart Hopping, GFSK and DECT
2.10. Operating Frequencies.:	2400 MHz to 2483.5 MHz
2.11. EMC Modifications:	None

## 3. Product Configuration

### 3.1. Operational Characteristics & Software

The MX40 transmits to the Philips Clinical Network located outside the field of test. Patient information will be displayed on an IntelliVue Information Center also located outside the field of test.

### 3.2. Operating Instructions

The MX40 will be in normal monitoring mode transmitting patient data and waveforms to a frequency corresponding wireless access point where the patient data will be transferred through the IntelliVue Telemetry infrastructure and displayed on the IntelliVue Information Center display. Patient waveforms and data are also displayed on the MX40 display for local monitoring.

For Radiated Emissions testing, fan out the ECG leads and connect them to a termination plate. Extend the SpO2 transducer across the table opposite the ECG leads. The SpO2 transducer will be connected to an SpO2 simulator. Ensure the SpO2 function is set to continuous:

Select "**PATIENT WINDOW**" for the bed being monitored on the PIIC display. From the menu button choices across the bottom of the display, select "**Telemetry Setup**". A window will open and in the "**SpO2 Equipped Devices Only**" section, select the "**Enable SpO2**" checkbox. Below that checkbox, under "**SpO2 Mode**" click the dropdown menu and select "**Continuous**". Below that, ensure the "**Pleth**", "**Pulse**" and "**SpO2 Alarm**" boxes are also checked. For all other tests, the ECG leads will be connected to an ECG simulator.

### 3. Product Configuration (continued)

#### 3.2. Operating Instructions (continued)

##### Channel Selection:

1. Press Alt + F11 – A list of menu items and a “Login to access Windows Desktop Access” window will appear. Enter the username: PhilipsBD<sup>1</sup> (case sensitive) and password: <<Removed>>. The Taskbar should appear at the bottom of the screen.
2. Click the Start button at the left side of Taskbar and select Internet Explorer from the list.
3. Either use the Internet Explorer dropdown or manually enter the Access Point Controller address: 172.31.225.8<sup>1</sup>. The System Access Configuration screen should appear.
4. Click on the access point controller in the list on the left side of the window to expand the list and then click on the access point. The 2.4 GHz Smart Hopping AP Configuration should be available on the right side of the window.
5. At the bottom of the window, select the “[click here](#)” to access advanced channel configuration options. The channel selection check boxes should appear. Click on the corresponding box to the channel you wish to select. If the channel is selected, click to deselect. Once complete, click save. The access point will reset to the selected channels.

#### 3.3. EUT Hardware

Block Diag. #	Manufacturer	Model/Part # / Options	Serial Number/ Other	Input Voltage Range (V)	Input Freq. Range (Hz)	Description/Function
1a	Philips	865351/MX40-2C4/C01, C03, J46, M02, S02	US156Z7318	3.7 - 4.5	DC	2.4 GHz CTS Patient Worn telemetry transceiver
1b	Philips	865351/MX40-2C4/C01 C03 J46 M02 S02	US156Z7319	3.7 - 4.5	DC	2.4 GHz CTS Patient Worn telemetry transceiver

#### 3.4. EUT Cables/Transducers

Diagram Block Letter	Manufacturer	Model/Part #	Length (m)	Shield Y/N	Description/Function
A	PHILIPS	989803171871	0.9	Y	ECG 6 LEAD /SPO2 LEAD SET
B	PHILIPS	M11191A	2.5	N	SPO <sub>2</sub> TRANSDUCER

### 3. Product Configuration (continued)

#### 3.5. Support Equipment

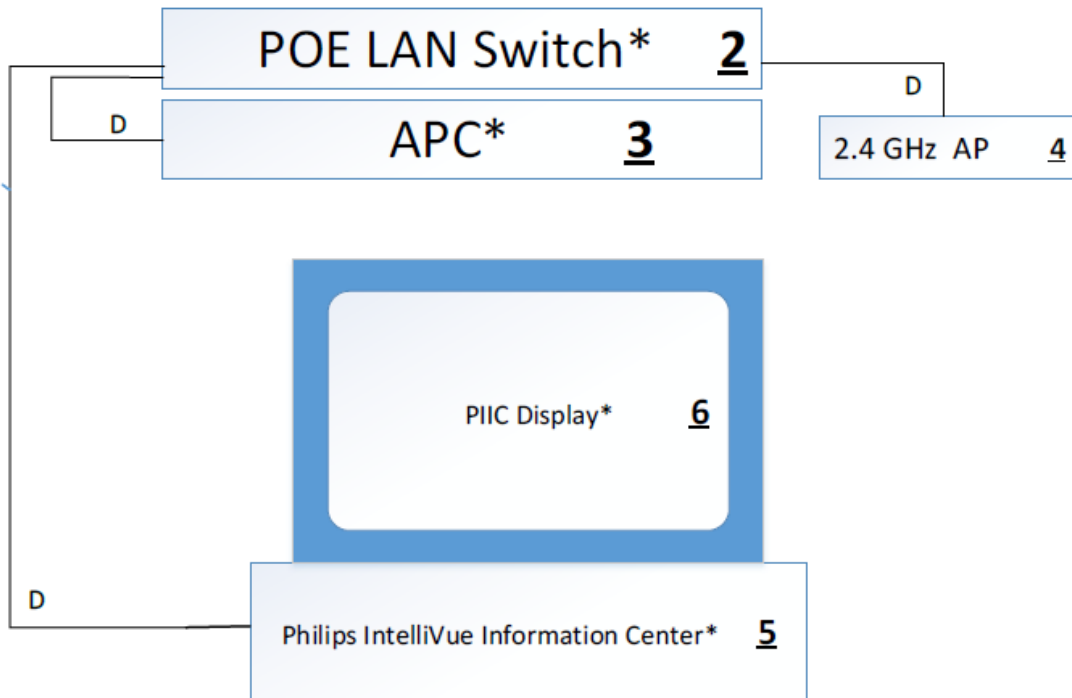
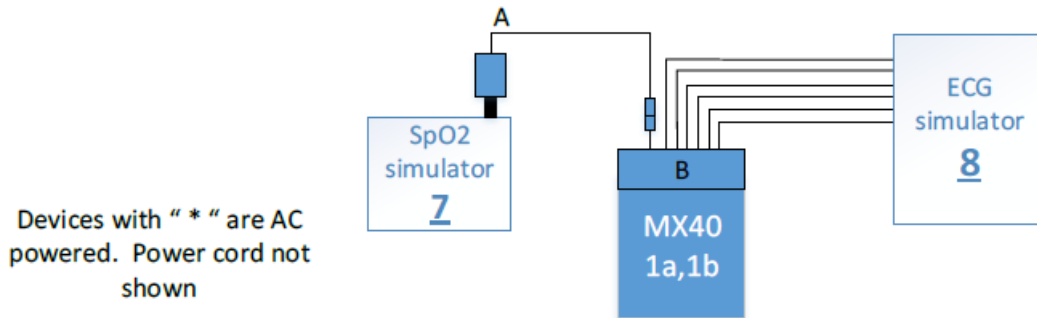
Diagram Block #	Manufacturer	Model/Part # / Options	Input Voltage Range	Input Freq. Range (Hz)	Description/Function
2	Cisco	WS-C2960+24PC-S V02	100-240	50-60	Power Over LAN Ethernet Switch S/N FOC2137Y584
3	Philips	453564195161/ ITS3171A	100-240	50-60	Access Point Controller (2.4 GHz) S/N SG71509672
4	Philips	989803171221	48	DC	2.4 GHz CTS Access Point S/N US51736275
5	Philips	453564195161	100-240	50-60	Philips IntelliVue Information Center S/N 2UA8081BX0
6	AXM	AXM2418	12	DC	24" Monitor JTA2017010045
7	Pronk Tech	OxiTest Ox-2	1.5	DC	SpO2 simulator S/N OX5497
8	Biotek	LionHeart2	9	DC	ECG simulator S/N 158997

#### 3.6. Support Equipment Cables / Transducers

Diagram Block #	Manufacturer	Model/Part #	Length (m)	Shield Y/N	Description/Function
D	N/A	N/A	Various	N	Cat 5 UTP LAN cable

### 3. Product Configuration (continued)

#### 3.7. Block Diagram



## 4. Measurements Parameters

### 4.1. Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due	Interval
EMI Test Receiver, 9kHz - 7GHz <sup>1</sup>	Rohde & Schwarz	ESR7	101156	10/16/2022	2 Years
EMI Test Receiver, 10 Hz - 7GHz <sup>1</sup>	Rohde & Schwarz	ESR7	101770	7/17/2022	2 Years
Spectrum Analyzer, 2 Hz to 26.5 GHz <sup>2</sup>	Rohde & Schwarz	FSW26	102057	9/13/2021	3 Years
Spectrum Analyzer, 9 kHz to 40 GHz <sup>3</sup>	Rohde & Schwarz	FSV40	100899	8/12/2022	2 Years
Spectrum Analyzer 10 Hz – 40 GHz <sup>4</sup>	Rohde & Schwarz	FSVR40	100909	9/18/2022	2 Years
Dbl Ridged Guide Antenna 1- 18 GHz	ETS-Lindgren	3117	00143292	3/21/2022	2 Years
Preamplifier, 1 GHz to 26.5 GHz	Hewlett Packard	8449B	3008A01323	9/11/2021	3 Years
Digital Barometer	Control Company	4195	ID236	4/30/2021	3 Years

<sup>1</sup> ESR7 Firmware revision: V3.48 SP3, Date installed: 09/30/2020 Previous V3.48 SP2, installed 07/23/2020.

<sup>2</sup> FSW26 Firmware revision: V4.71 SP1, Date installed: 11/16/2020 Previous V4.61, installed 08/11/2020.

<sup>3</sup> FSV40 Firmware revision: V2.30 SP4, Date installed: 05/04/2016 Previous V2.30 SP1, installed 10/22/2014.

<sup>4</sup> FSVR40 Firmware revision: V2.23 SP1, Date installed: 08/19/2016 Previous V2.23, installed 10/22/2014.

### 4.2. Measurement & Equipment Setup

Test Dates:	11/4/2020 - 11/20/2020, 2/4/2021, 2/5/2021, 2/12/2021, 2/18/2021, 2/19/2021, 2/23/2021, 3/11/2021, 3/17/2021, 4/6/2021, 4/7/2021
Test Engineers:	Brian Breault, Sean Defelice
Normal Site Temperature (15 - 35°C):	21.2
Relative Humidity (20 -75%RH):	35
Frequency Range:	10 kHz to 25 GHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	200 Hz - 9 kHz to 150 kHz 9 kHz - 150 kHz to 30 MHz 120 kHz - 30 MHz to 1 GHz 1 MHz - Above 1 GHz
EMI Receiver Average Bandwidth:	≥3 x RBW (IFBw)
Detector Function:	Peak, Quasi-Peak & average

## 4. Measurements Parameters (continued)

### 4.3. Measurement Procedure

Testing was performed in accordance with the requirements detailed in FCC Part 15.247 using ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

In addition, FCC KDB 558074, D01: 15.247 Measurement Guidance v05r02, April 2, 2019 and FCC KDB 447498 D01 General RF Exposure Guidance v06, October 23, 2015 are referenced for the testing and requirements detailed in this report.

The SH CTS radio can utilize 48 channels. In accordance with ANSI C63.10, section 5.6, three channel frequencies were selected for measurement:

Channel 0	2401.056 MHz (Low)
Channel 24	2442.520 MHz (Middle)
Channel 47	2482.252 MHz (High)

The SRR Radio can utilize 16 channels. In accordance with ANSI C63.10, section 5.6, three channel frequencies were selected for measurement:

Channel 11	2405 MHz (Low)
Channel 18	2440 MHz (Middle)
Channel 26	2480 MHz (High)

During all radiated mode measurement testing, the MX40 was mounted on a polystyrene form to facilitate rotating the device through three orthogonal axes as required by ANSI C63.10-2013, section 5.10.1, for a handheld or body worn device. The three axes were defined as follows:

- X-Axis Horizontal with the top of the MX40 facing to the left. The front of MX40 was facing the antenna at 0° turntable azimuth.
- Y-Axis Vertical with the top of MX40 facing up. The front of the MX40 was facing the antenna at 0° turntable azimuth.
- Z-Axis The front of the MX40 was facing up. The bottom of the MX40 was facing the antenna at 0° turntable azimuth.



X-Axis



Y-Axis



Z-Axis

## 4. Measurements Parameters (continued)

### 4.4. Measurement Uncertainty

The following uncertainties are expressed for an expansion/coverage factor of K=2.

RF Frequency	$\pm 1 \times 10^{-8}$
Radiated Emission of Transmitter	$\pm 4.55$ dB
Radiated Emission of Receiver	$\pm 4.55$ dB
Temperature	$\pm 0.91^{\circ}$ C
Humidity	$\pm 5\%$

## 5. Choice of Equipment for Test Suits

### 5.1 Choice of Model

This test report is based on the test sample supplied by the manufacturer and is reported by the manufacturer to be equivalent to the production units.

### 5.2 Presentation

This test sample was tested complete with all required ancillary equipment. Refer to Section 3 of this report for product equipment configuration.

### 5.3 Choice of Operating Frequencies

The Philips MX40 IntelliVue Patient Worn Monitor, as tested, utilizes 48 channels. Refer to Section 4.3 for the selected test frequencies.

### 5.4 Modes of Operation

The Philips MX40 IntelliVue Patient Worn Monitor has a single mode of operation which is determined by the system software.



## 6. Measurement Data

### 6.1. Maximum Peak Conducted Output Power (15.247 (b) (1), RSS-247 5.4 (d))

Requirement: The maximum peak conducted output power of the intentional radiator shall not exceed the following: For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

Procedure: FCC 558074 D01 DTS Measurement Guidance, v05r02, April 2, 2019, Section 8.3.1: Maximum peak conducted output power, RBW  $\geq$  DTS bandwidth, was referenced for the maximum peak conducted output power measurements detailed in this section of this report.

Test Notes: The maximum peak conducted output power measurements were performed as conducted mode measurements. All insertion loss factors are included in the test measurements and factored as amplitude offset values.

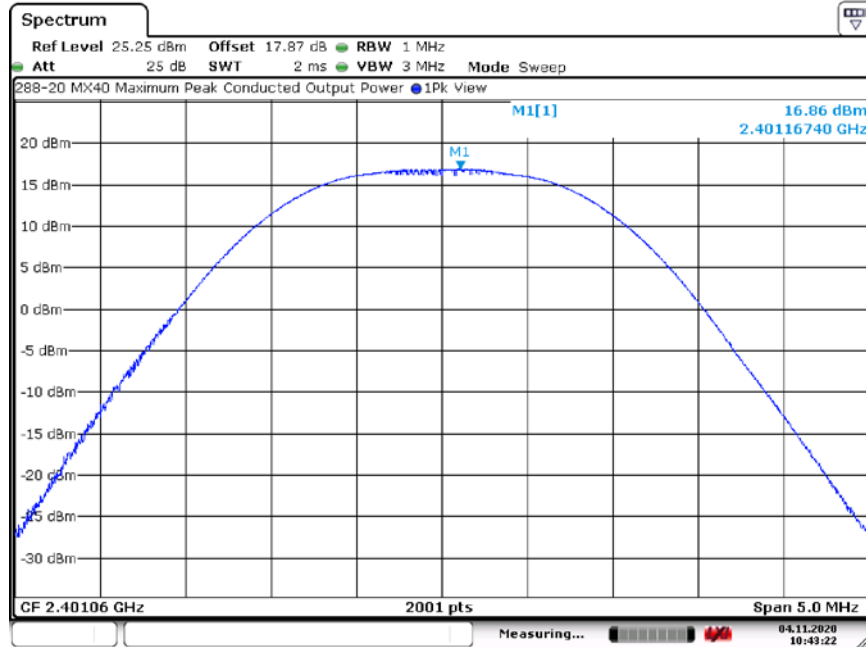
#### EIRP Measurement Results

Frequency (MHz)	Measured Peak Output Power		Output Power Limit (mW)	Result
	(dBm)	(mW)		
2401.060	16.86	48.53	1000.0	Compliant
2442.520	16.57	45.39	1000.0	Compliant
2482.252	14.20	26.30	1000.0	Compliant

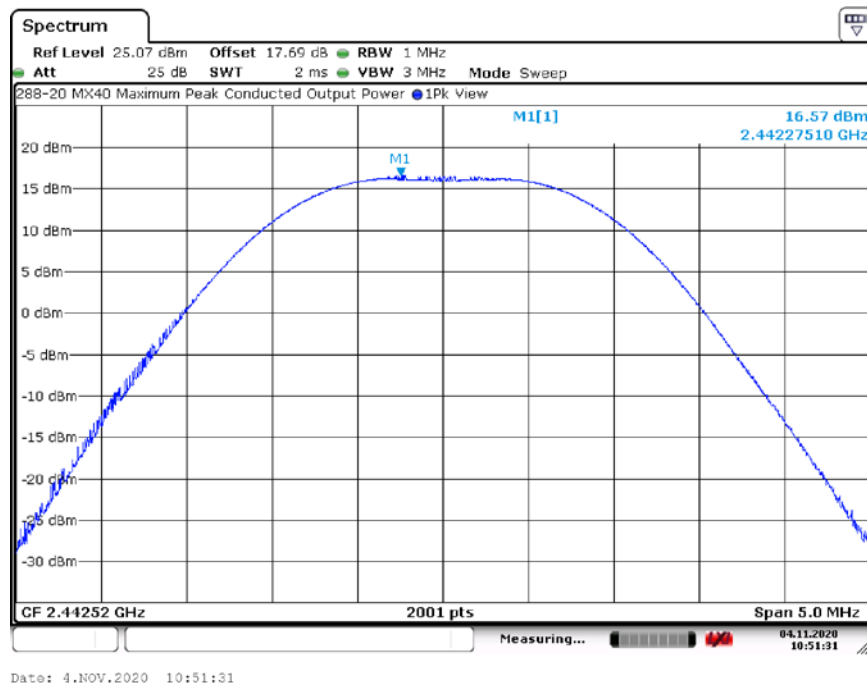
## 6. Measurement Data (continued)

### 6.1. Maximum Peak Conducted Output Power (15.247 (b) (3), RSS-247 5.4 (d)) (cont.)

#### 6.1.1. Maximum Peak Field Strength, Low Channel 0



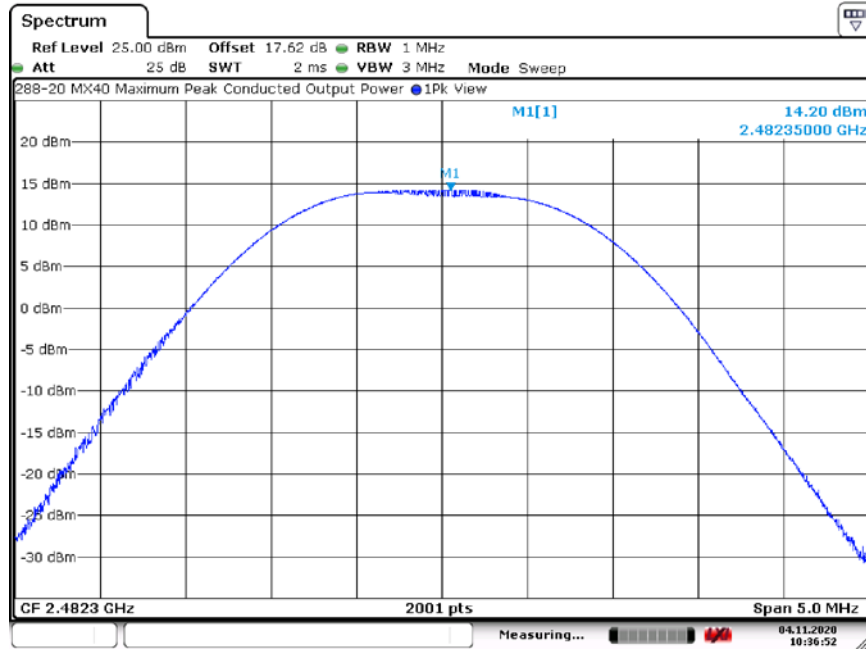
#### 6.1.2. Maximum Peak Field Strength, Middle Channel 24



## 6. Measurement Data (continued)

### 6.4. Maximum Peak Conducted Output Power (15.247 (b) (3), RSS-247 5.4 (d)) (cont.)

#### 6.1.3. Maximum Peak Field Strength, High Channel 47



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## 6. Measurement Data (continued)

### 6.2. Duty Cycle Correction Factor (FCC Part 15.35(c), RSS-GEN 8.2)

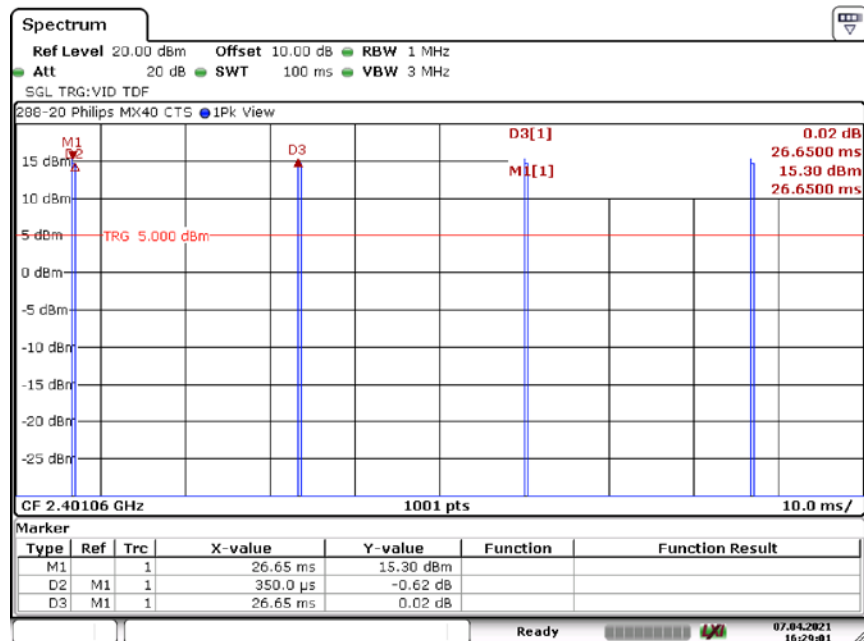
**Requirement:** When the field strength or envelope power is not constant or it is in pulses, and an average detector is specified to be used, the value of field strength or power shall be determined by averaging over one complete pulse train during which the field strength or power is at its maximum value, including blanking intervals within the pulse train, provided that the pulse train does not exceed 0.1 seconds. In cases where the pulse train exceeds 0.1 seconds, the average value of field strength or output power shall be determined during a 0.1 seconds interval during which the field strength or power is at its maximum value.

**Procedure:** The duty cycle correction was determined using the information provided in ANSI C63.10-2013, Section 7.5: Procedure for determining the average value of pulsed emissions.

**Note:** This is the maximum duty cycle allowed by the operational software/firmware for the device.

Channel Frequency	Time On	Time per Period	Duty Cycle (DC)		Maximum Peak Conducted Power	Duty Cycle Correction (10 log(DC))	Corrected Conducted Power	
	T <sub>on</sub>	T <sub>on</sub> + T <sub>off</sub>	T <sub>on</sub> /(T <sub>on</sub> + T <sub>off</sub> )	(%)			dBm	mW
(MHz)	(mS)	(mS)			(dBm)	dB	dBm	mW
2401.060	0.350	26.65	0.01313	1.3	16.86	-18.82	-1.9563	0.6373
2442.520	0.350	26.65	0.01313	1.3	16.57	-18.82	-2.2463	0.5962
2482.252	0.350	26.65	0.01313	1.3	14.20	-18.82	-4.6163	0.3454

#### 6.2.1. T<sub>on</sub> and T<sub>on</sub> + T<sub>off</sub>, Lowest Channel, 0

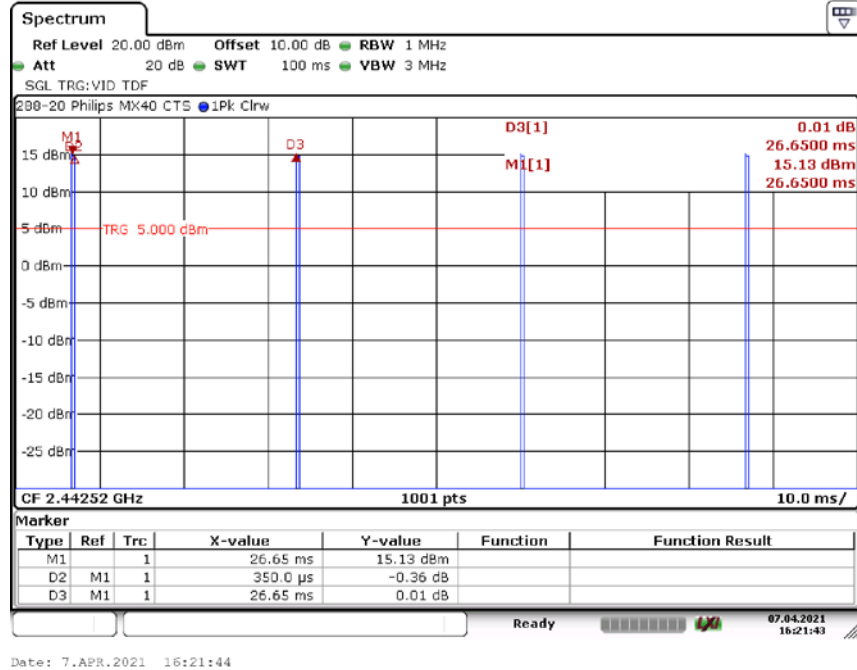


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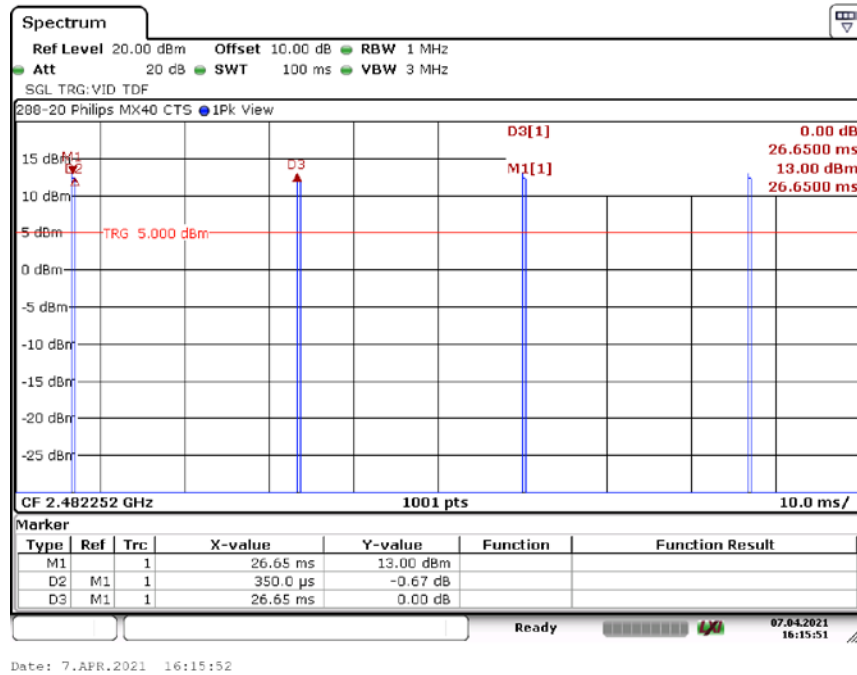
## 6. Measurement Data (continued)

### 6.2. Duty Cycle Correction Factor (FCC Part 15.35(c), RSS-GEN 8.2) (continued)

#### 6.2.2. $T_{on}$ and $T_{on} + T_{off}$ , Middle Channel, 24



#### 6.2.3. $T_{on}$ and $T_{on} + T_{off}$ , Upper Channel, 47



## 6. Measurement Data (continued)

### 6.3. Maximum Peak Conducted Output Power (15.247 (b) (1), RSS-247 5.4 (d))

**Requirement:** The maximum peak conducted output power of the intentional radiator shall not exceed the following: For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

**Procedure:** FCC 558074 D01 DTS Measurement Guidance, v05r02, April 2, 2019, Section 8.3.1: Maximum peak conducted output power, RBW  $\geq$  DTS bandwidth, was referenced for the maximum peak conducted output power measurements detailed in this section of this report.

**Test Notes:** The maximum peak conducted output power measurements were performed as conducted mode measurements. All insertion loss factors are included in the test measurements and factored as amplitude offset values.

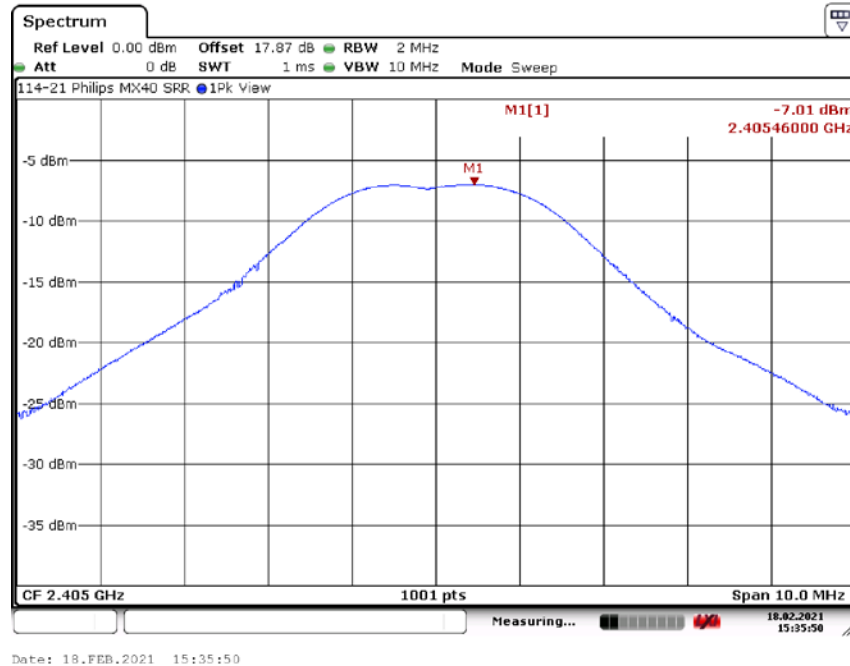
#### EIRP Measurement Results

Frequency	Measured Peak Output Power		Output Power Limit	Result
	(MHz)	(dBm)		
2405	-7.01	0.20	1000.0	Compliant
2440	-5.56	0.28	1000.0	Compliant
2480	-3.41	0.46	1000.0	Compliant

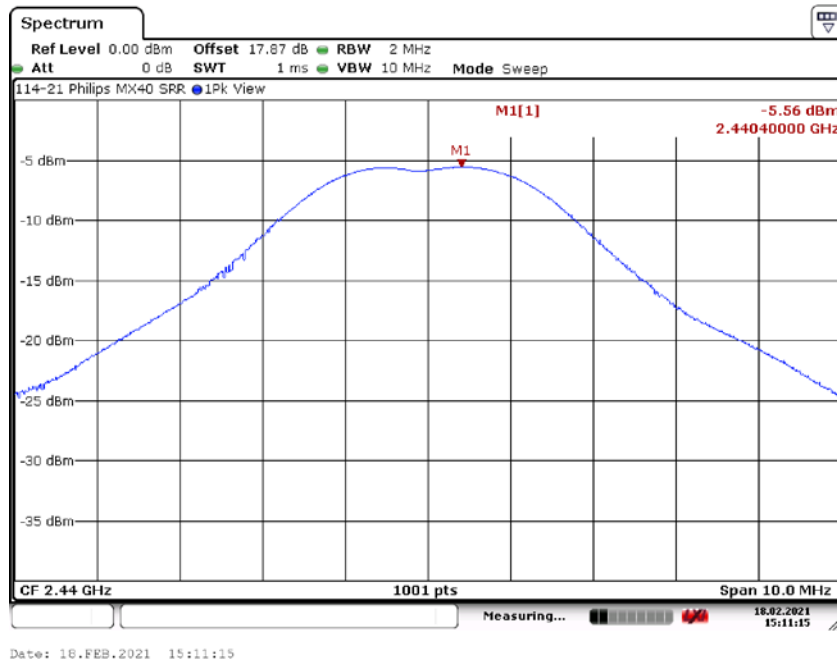
## 6. Measurement Data (continued)

### 6.3. Maximum Peak Conducted Output Power (15.247 (b) (3), RSS-247 5.4 (d)) (cont.)

#### 6.3.1. Maximum Peak Field Strength, Low Channel 11



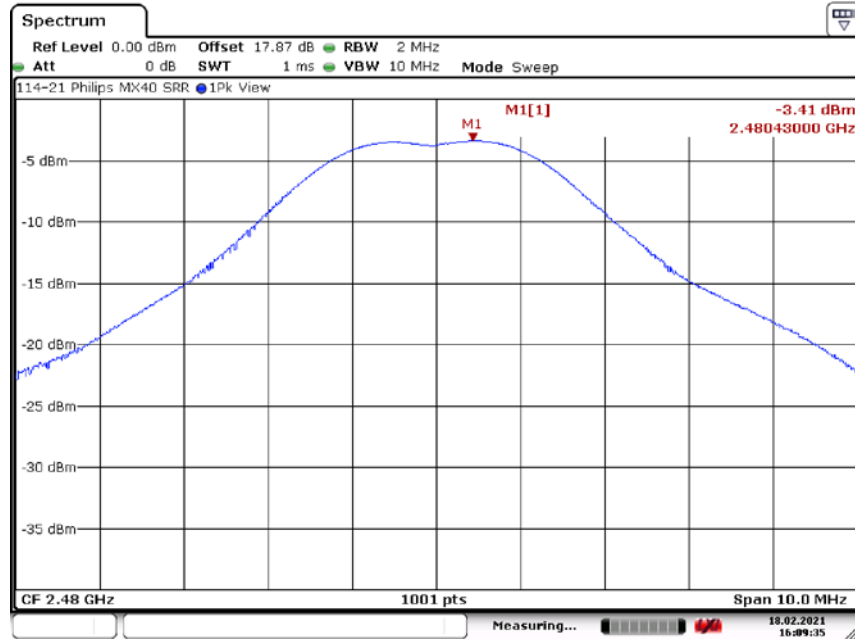
#### 6.3.2. Maximum Peak Field Strength, Middle Channel 18



## 6. Measurement Data (continued)

### 6.3. Maximum Peak Conducted Output Power (15.247 (b) (3), RSS-247 5.4 (d)) (cont.)

#### 6.3.3. Maximum Peak Field Strength, High Channel 26



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## 6. Measurement Data (continued)

### 6.4. Duty Cycle Correction Factor (FCC Part 15.35(c), RSS-GEN 8.2)

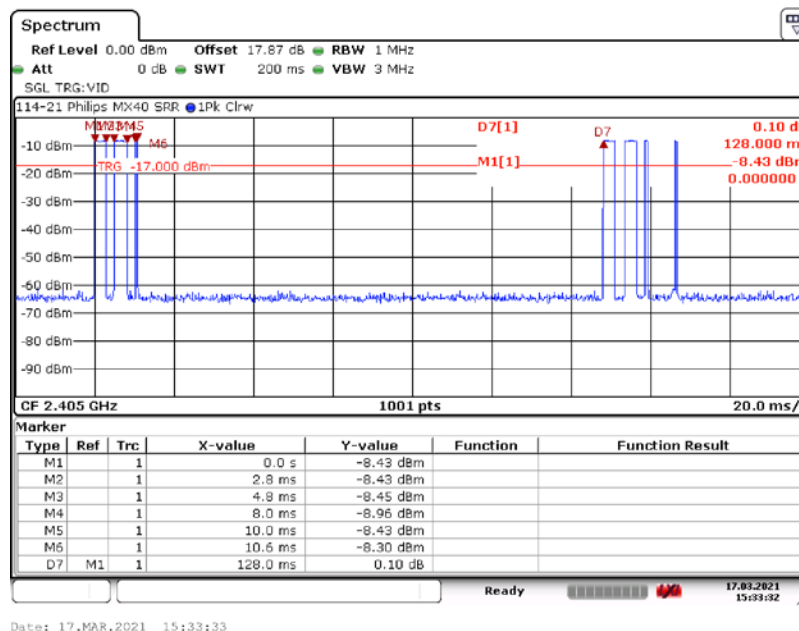
**Requirement:** When the field strength or envelope power is not constant or it is in pulses, and an average detector is specified to be used, the value of field strength or power shall be determined by averaging over one complete pulse train during which the field strength or power is at its maximum value, including blanking intervals within the pulse train, provided that the pulse train does not exceed 0.1 seconds. In cases where the pulse train exceeds 0.1 seconds, the average value of field strength or output power shall be determined during a 0.1 seconds interval during which the field strength or power is at its maximum value..

**Procedure:** The duty cycle correction was determined using the information provided in ANSI C63.10-2013, Section 7.5: Procedure for determining the average value of pulsed emissions.

**Note:** This is the maximum duty cycle allowed by the operational software/firmware for the device.

Channel Frequency	Time On (Sum)	Time per Period	Duty Cycle (DC)		Maximum Peak Conducted Power	Duty Cycle Correction (10 log(DC))	Corrected Conducted Power	
	T <sub>on</sub>	T <sub>on</sub> + T <sub>off</sub>	T <sub>on</sub> /(T <sub>on</sub> + T <sub>off</sub> )	(%)			dBm	mW
(MHz)	(mS)	(mS)			(dBm)	dB	dBm	mW
2405	6.40	128.00	0.05000	5.0	-7.01	-13.01	-20.020	0.0100
2440	7.80	128.20	0.06084	6.1	-5.56	-12.16	-17.718	0.0169
2480	7.00	128.80	0.05435	5.4	-3.41	-12.65	-16.058	0.0248

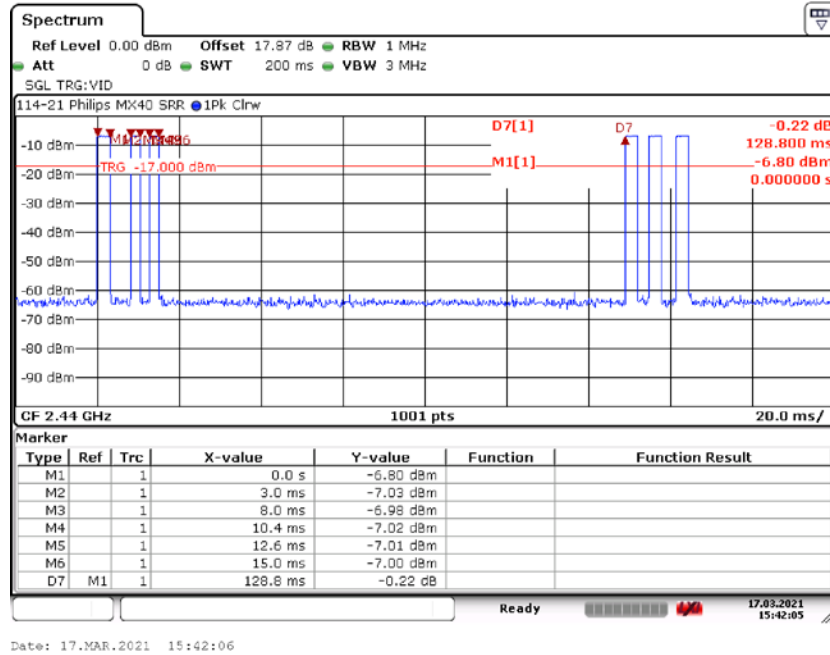
#### 6.4.1. T<sub>on</sub> and T<sub>on</sub> + T<sub>off</sub>, Lowest Channel, 11



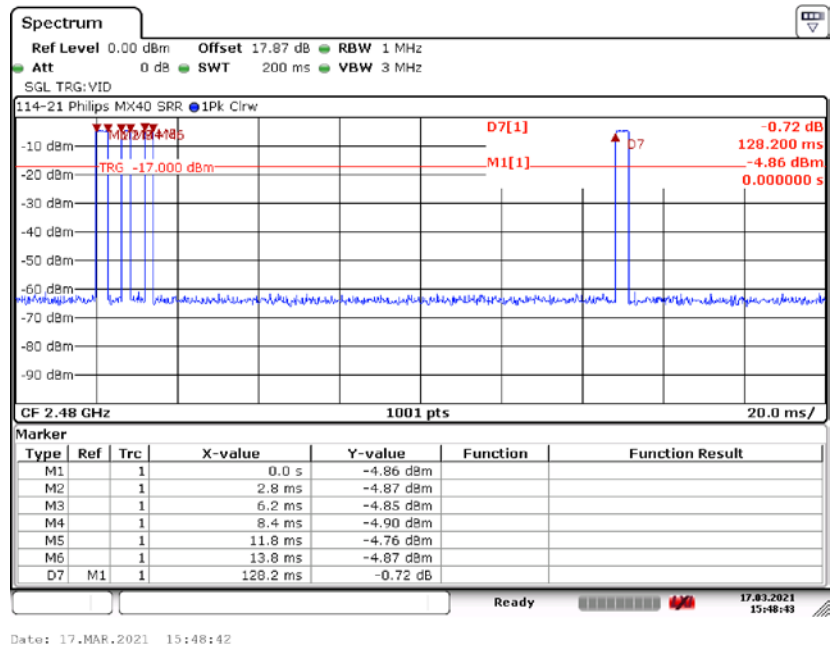
## 6. Measurement Data (continued)

### 6.4. Duty Cycle Correction Factor (FCC Part 15.35(c), RSS-GEN 8.2) Continued)

#### 6.4.2. $T_{on}$ and $T_{on} + T_{off}$ , Middle Channel, 18



#### 6.4.3. $T_{on}$ and $T_{on} + T_{off}$ , Upper Channel, 26



## 6. Measurement Data (continued)

### 6.5. Public Exposure to Radio Frequency Energy Levels (2.1093)

#### 6.5.1. 2.1093 Requirements

Requirement: Portable devices are subject to radio frequency radiation exposure requirements. For purposes of this section, a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user.

Time-averaging provisions of the MPE guidelines identified in § 1.1310 of this chapter may not be used in determining typical exposure levels for portable devices intended for use by consumers, such as hand-held cellular telephones, that are considered to operate in general population/uncontrolled environments as defined above. However, "source-based" time-averaging based on an inherent property or duty-cycle of a device is allowed.

For a 1-g SAR, the test exclusion result must be  $\leq 3.0$ .

Test Notes: The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by the following formula:

$$\text{SAR Test Exclusion} = \frac{P_{\text{MAX}}}{d_{\text{MIN}}} \times \sqrt{f_{(\text{GHz})}}$$

$P_{\text{MAX}}$  mW Maximum power of channel, including tune-up tolerance

$d_{\text{MIN}}$  mm Minimum test separation distance, mm ( $\leq 50$  mm)

$f_{(\text{GHz})}$  GHz  $f_{(\text{GHz})}$  is the RF channel transmit frequency in GHz ( $>100$  MHz and  $<6$  GHz)

Duty cycle values from Section 6.2 and Power levels from Section 6.1

Frequency	Ton	Ton+Toff	DC Ton/(Ton+Toff)	Peak Power	Duty Cycle Correction = 10 Log(DC)	Tune-Up Tolerance	Average Power	Average Power	RF Exposure Threshold at 5mm
MHz	ms	ms		dBm	dB	dB	dBm	mW	
2401.060	0.35	26.65	0.01313	16.86	-18.82	1.0	-0.96	0.8024	0.2487
2442.520	0.35	26.65	0.01313	16.57	-18.82	1.0	-1.25	0.7505	0.2346
2482.252	0.35	26.65	0.01313	14.20	-18.82	1.0	-3.62	0.4349	0.1370

## 6. Measurement Data (continued)

### 6.5. Public Exposure to Radio Frequency Energy Levels (2.1093)

#### 6.5.1. 2.1093 Requirements (continued)

Duty Cycle Measurement Data from Section 6.4

Frequency	M1	M2	M3	M4	M5	M6	D7	Ton	Ton+Toff	DC Ton/(Ton+Toff)
MHz	ms	ms	ms	ms	ms	ms	ms	ms	ms	
2405	0	2.8	4.8	8.0	10.0	10.6	128.0	6.6	128	0.05156
2440	0	3.0	8.0	10.4	12.6	15.0	128.8	7.8	128.8	0.06056
2480	0	2.8	6.2	8.4	11.8	13.8	128.2	7.0	128.2	0.05460

Measured Output Power Data from Section 6.3

Frequency	Peak Power	Duty Cycle Correction = 10 Log(DC)	Tune-Up Tolerance	Average Power	Average Power	RF Exposure Threshold at 5mm
MHz	dBm	dB	dB	dBm	mW	
2405	-7.01	-12.88	1.5	-18.39	0.0145	0.0045
2440	-5.56	-12.18	1.5	-16.24	0.0238	0.0074
2480	-3.41	-12.63	1.5	-14.54	0.0352	<b>0.0111</b>

The EUT is co-located with another radio that may operate simultaneously with this radio, therefore the worse case exclusion values from each radio are taken, summed, and compared against the SAR Exclusion limit

	SRR Radio		SH (CTS) Radio		Total	Exclusion
SUM Threshold =	<b>0.0111</b>	"+"	<b>0.2487</b>	"="	<b>0.2597</b>	<3

Conclusion: The device under test meets the exclusion requirement detailed in FCC OET 447498 D01, dated October 23, 2015 Clause 4.3.1 (a).