Radio Test Report

Report No.:	FCC_IC_RF_SL20090102-MED-064R1 Rev_3.0
FCC ID:	LF58667
IC:	3408D-866720 3408D-866740
Test Model:	8667-20/8667-40
Series Model:	8667 serie
Received Date:	12/04/2020
Test Date:	12/11/2020-12/16/2020
Issued Date:	08/30/2022
Applicant:	Medtronic, Inc.
Address:	710 Medtronic Parkway N.E., Minneapolis, MN 55432
Manufacturer:	Medtronic, Inc.
Address:	710 Medtronic Parkway N.E., Minneapolis, MN 55432
Issued By:	Bureau Veritas Consumer Products Services, Inc.
Lab Address:	775 Montague Expressway, Milpitas, CA 95035
Test Location (1):	775 Montague Expressway, Milpitas, CA 95035
FCC Registration / Designation Number:	540430
IC Registration / Designation Number:	4842D

ACCREDITED
TESTING CERT # 2742-01

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Release Control Record

Issue No.	Description	Date Issued
FCC_IC_RF_SL20090102-MED-064R1	Original Release	01/11/2021
FCC_IC_RF_SL20090102-MED-064R1 Rev_1.0	Add FCC ID/IC ID and update per client review	03/11/2021
FCC_IC_RF_SL20090102-MED-064R1 Rev_2.0	Correction	06/10/2022
FCC_IC_RF_SL20090102-MED-064R1 Rev_3.0	Update per TCB review	08/30/2022

1 Technical Declaration of Conformity

Product:	Programmable Infusion Pump (ULP-AMI)
Brand:	Medtronic
Test Model:	8667-20/8667-40
Series Model:	8667 serie
Sample Status:	Engineering sample
Applicant:	Medtronic, Inc.
Test Date:	12/11/2020-12/16/2020
Standards:	47 CFR FCC Part 15, Subpart C (Section 15.209) RSS-Gen Issue 5, RSS-210 ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services, Inc., Milpitas Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : _____ , **Date:** 03/11/2021

Ellen Chu / Test Engineer

Approved by : _____ , **Date:** 03/11/2021

Deon Dai / Engineer Reviewer

2 Summary of Test Results

The EUT has been tested according to the following specifications:

47 CFR 15.209			
FCC/IC Clause	Test Item	Result	Remarks
15.203/ RSS-Gen	Antenna Requirement	PASS	The EUT has an internal antenna which is not user accessible
15.209/ RSS-210	Radiated Spurious Emissions	PASS	Meet the requirement of limit.
15.215/ RSS-Gen	Occupied Bandwidth	PASS	Complies

Note:

1. All measurement uncertainties are not taken into consideration for all presented test result.
2. The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual.
3. EUT is a DC powered device.

2.1 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
EMI Receiver Keysight	N9038A	MY55330108	07/07/2020	07/07/2021
Passive Loop Antenna (9k-30MHz)	6512	49120	11/25/2019	11/25/2021
Preamplifier RF-BAY	LPA-6-30	11170602	04/27/2019	04/27/2021

NOTE: The calibration interval of the above test instruments is 12 months, and the calibrations are traceable to NML/ROC and NIST/USA.

Test performed on 08/30/2022

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Rohde & Schwarz	ESW 2Hz – 44 GHz	10SL0390	09-22-2021	09-22-2022
Passive Loop Antenna (9k-30MHz)	6512	49120	03/08/2022	03/08/2024

2.2 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	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	3.51dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	3.73dB

2.3 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Programmable Infusion Pump (ULP-AMI)
Brand	Medtronic
Test Model	8667-20/8667-40
Identification No. of EUT	NTW000158H
Series Model	8667 serie
Model Difference	Model difference is related to therapy volume only. Model 8667-20 reservoir capacity is 20 ml. Model 8667-40 is more massive reservoir with 40 ml capacity.
Status of EUT	Engineering sample
Power Supply Rating	3Vdc
Modulation Type	OOK burst
Operating Frequency	175kHz
Number of Channel	1
Antenna Type	Integral loop antenna
Antenna Gain	None

Note:

1. The above EUT information is declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.
2. The antenna gain is provided by applicant/manufacturer. Lab has not performed any testing on antenna, assumes no responsibility or liability for accuracy this value

3.2 Description of Test Modes

Operated in 175kHz band:

Channel	Freq. (kHz)
1	175

4 Test Results

4.1 **Antenna Requirement**

Spec	Requirement	Applicable
§15.203	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. Antenna requirement must meet at least one of the following: a) Antenna must be permanently attached to the device. b) The antenna must use a unique type of connector to attach to the device. c) Device must be professionally installed. The installer shall be responsible for ensuring that the correct antenna is employed by the device.	☒
Remark	The EUT has an integrated antenna which meets the requirement.	
Result	Pass	

4.2 Spurious Emissions for Transmitter Measurement

4.2.1 Requirement(s):

FCC 15.209, Item 1: Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges

Frequency range (MHz)	Field Strength (uV/m)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30

Frequency (KHz)	(microvolts/meter)	dBuV/m	Conversion Factor in dB	Limit dBuV/m
9	266.67	48.52	80	128.52
490	4.90	13.80	80	93.80
490	48.98	33.80	40	73.80
1705	14.08	22.97	40	62.97
1.705-30.0	30.00	29.54	40	69.54

RSS-210, Item 8.9 Trasmitter emission limits: Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

Table 6 – General field strength limits at frequencies below 30 MHz

Frequency range (MHz)	Field Strength (uA/m)	Measurement distance (meters)
0.009-0.490	6.37/F(kHz)	300
0.490-1.705	63.7/F(kHz)	30
1.705-30.0	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

Frequency (KHz)	(uA/meter)	dBuA/m	dBuV/m	Conversion Factor in dB	Limit dBuV/m
9	0.71	-3.00	48.50	80	128.50
490	0.01	-37.72	13.78	80	93.78
490	0.13	-17.72	33.78	40	73.78
1705	0.04	-28.55	22.95	40	62.95
1.705-30.0	0.08	-21.94	29.56	40	69.56

Note: the limit for FCC & IC (RS210) are the same.

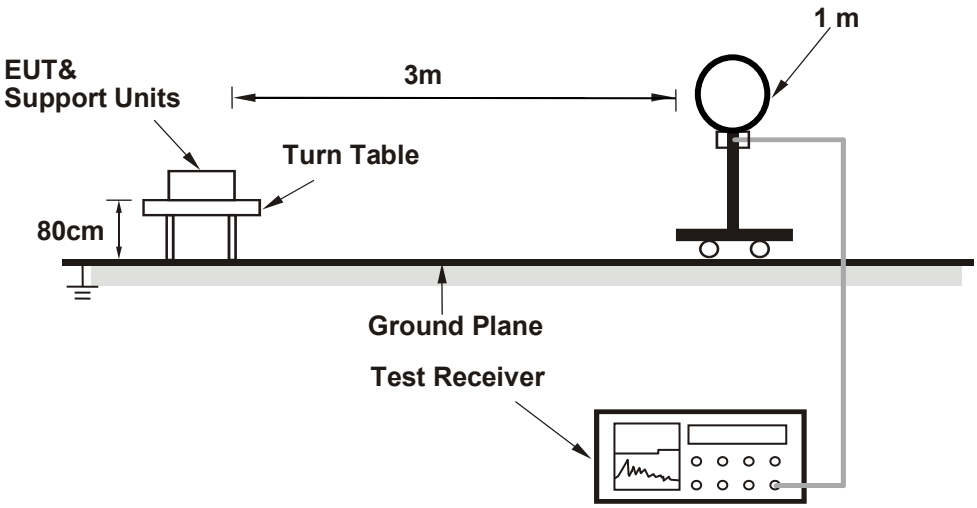
4.2.2 **Test Procedures**

For Radiated emission below 30MHz

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
    a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
    b. The EUT was then rotated to the direction that gave the maximum emission.
    c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. A Quasi-peak measurement was then made for that frequency point.
4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.

4.2.3 **Test Setup**

For Radiated emission below 30MHz



4.2.4 **Test Results**

BELOW 30MHz DATA:

CHANNEL	175kHz	**DETECTOR FUNCTION**	Quasi Peak
FREQUENCY RANGE	100kHz – 30MHz plot, Loop antenna at 0 degree		

ANTENNA POLARITY & test distance: 0 Degree at 3 m											
No	Freq.	Raw	Factor	Level	Measurement Type	Pol	Hgt	Azt	Limit	Margin	Pass /Fail
	[MHz]	(dB)	dB(1/m)	(dBuV/m)			(cm)	Deg	(dBuV/m)	(dB)	
1	0.107	14.1	30.7	44.8	Quasi Max	0	100	3.1	107.0	-62.2	Pass
2	0.122	17.8	29.6	47.4	Ave	0	100	346.1	105.9	-58.5	Pass
3	0.523	25.4	18.0	43.4	Quasi Max	0	100	357	73.2	-29.8	Pass
4	0.727	23.5	15.5	39.0	Quasi Max	0	100	0.1	70.4	-31.4	Pass
5	2.538	6.7	6.2	12.9	Quasi Max	0	100	79.7	69.5	-56.6	Pass
6	3.523	14.3	4.0	18.3	Quasi Max	0	100	78.9	69.5	-51.2	Pass

Note: The Spurious emission plots show QP detector for all emissions. Then re-measured 0.122 MHz with Ave detector.

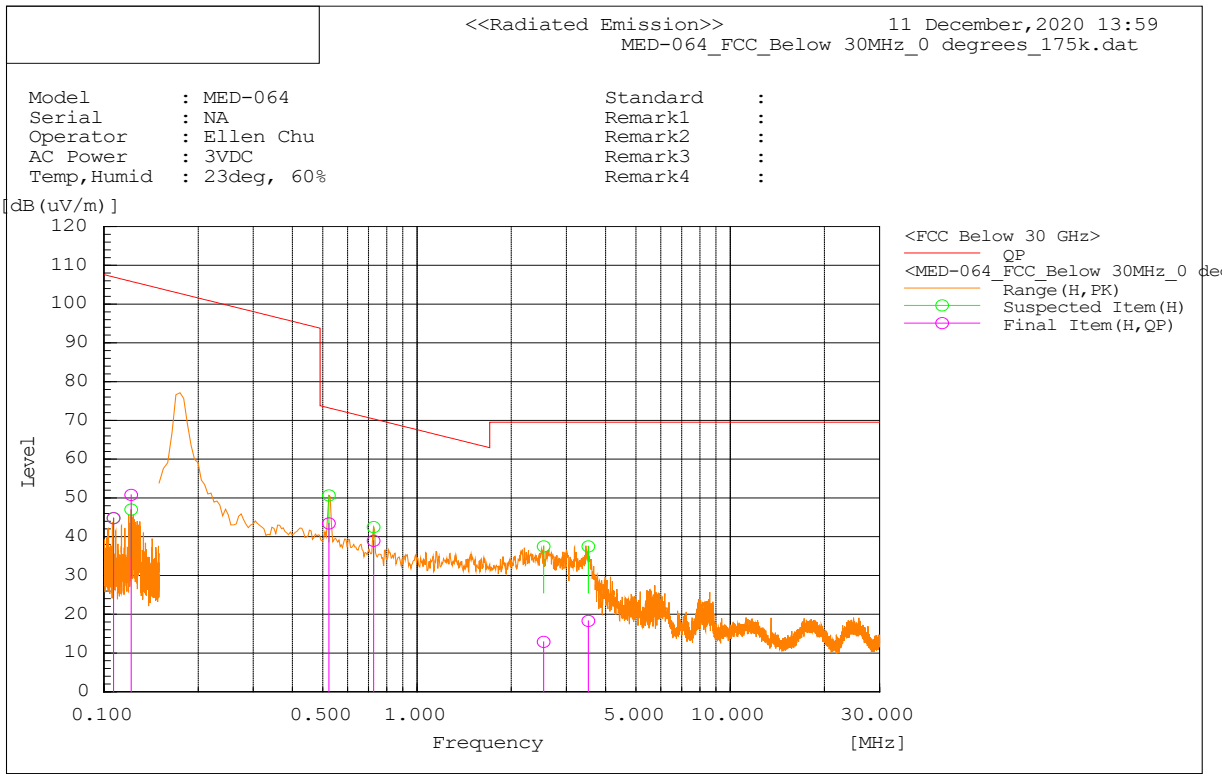
IC: See note on P.10 (The limit for FCC & IC (RS210) are the same).

ANTENNA POLARITY & test distance: 0 Degree at 3 m											
No	Freq.	Raw	Factor	Level	Measurement Type	Pol	Hgt	Azt	Limit	Margin	Pass /Fail
	[MHz]	(dB)	dB(1/m)	(dBuV/m)			(cm)	Deg	(dBuV/m)	(dB)	
1	0.107	14.1	30.7	44.8	Quasi Max	0	100	3.1	107.12	-62.32	Pass
2	0.122	17.8	29.6	47.4	Ave	0	100	346.1	106.02	-58.62	Pass
3	0.523	25.4	18.0	43.4	Quasi Max	0	100	357	73.32	-29.92	Pass
4	0.727	23.5	15.5	39.0	Quasi Max	0	100	0.1	70.52	-31.52	Pass
5	2.538	6.7	6.2	12.9	Quasi Max	0	100	79.7	69.62	-56.72	Pass
6	3.523	14.3	4.0	18.3	Quasi Max	0	100	78.9	69.62	-51.32	Pass

Note: The Spurious emission plots show QP detector for all emissions. Then re-measures 0.122 MHz with Ave detector.

REMARKS:

1. Level (dBuV/m) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB)
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin against the limit.


<<Radiated Emission>>
11 December,2020 13:59
MED-064_FCC_Below 30MHz_0 degrees_175k.dat
Model : MED-064
Serial : NA
Operator : Ellen Chu
AC Power : 3VDC
Temp,Humid : 23deg, 60%
Standard :
Remark1 :
Remark2 :
Remark3 :
Remark4 :
[dB(uV/m)]
120
110
100
90
80
70
60
50
40
30
20
10
0
Level
0.100
0.500
1.000
5.000
10.000
30.000
Frequency
[MHz]
<FCC Below 30 GHz>
QP
<MED-064_FCC_Below 30MHz_0 deg
Range(H,PK)
Suspected Item(H)
Final Item(H,QP)

CHANNEL	175kHz	**DETECTOR FUNCTION**	Quasi Peak
FREQUENCY RANGE	100kHz – 30MHz plot, Loop antenna at 90 degree		

ANTENNA POLARITY & test distance: 90 Degree at 3 m											
No	Freq.	Raw	Factor	Level	Measurement Type	Pol	Hgt	Azt	Limit	Margin	Pass /Fail
	[MHz]	(dB)	dB(1/m)	(dBuV/m)			(cm)	Deg	(dBuV/m)	(dB)	
1	0.364	12.3	21.1	33.4	Ave	90	100	0.1	96.4	-63.0	Pass
2	0.404	10.2	20.3	30.5	Ave	90	100	53.3	95.5	-65.0	Pass
3	0.727	23.2	15.5	38.7	Quasi Max	90	100	0	70.4	-31.7	Pass
4	0.817	17.5	14.6	32.1	Quasi Max	90	100	88.6	69.4	-37.3	Pass
5	3.409	17.4	4.2	21.6	Quasi Max	90	100	92.8	69.5	-47.9	Pass
6	3.468	15.6	4.1	19.7	Quasi Max	90	100	93.6	69.5	-49.8	Pass

Note: The Spurious emission plots show QP detector for all emissions. Then re-measured 0.364 MHz & 0.404 MHz with Ave detector.

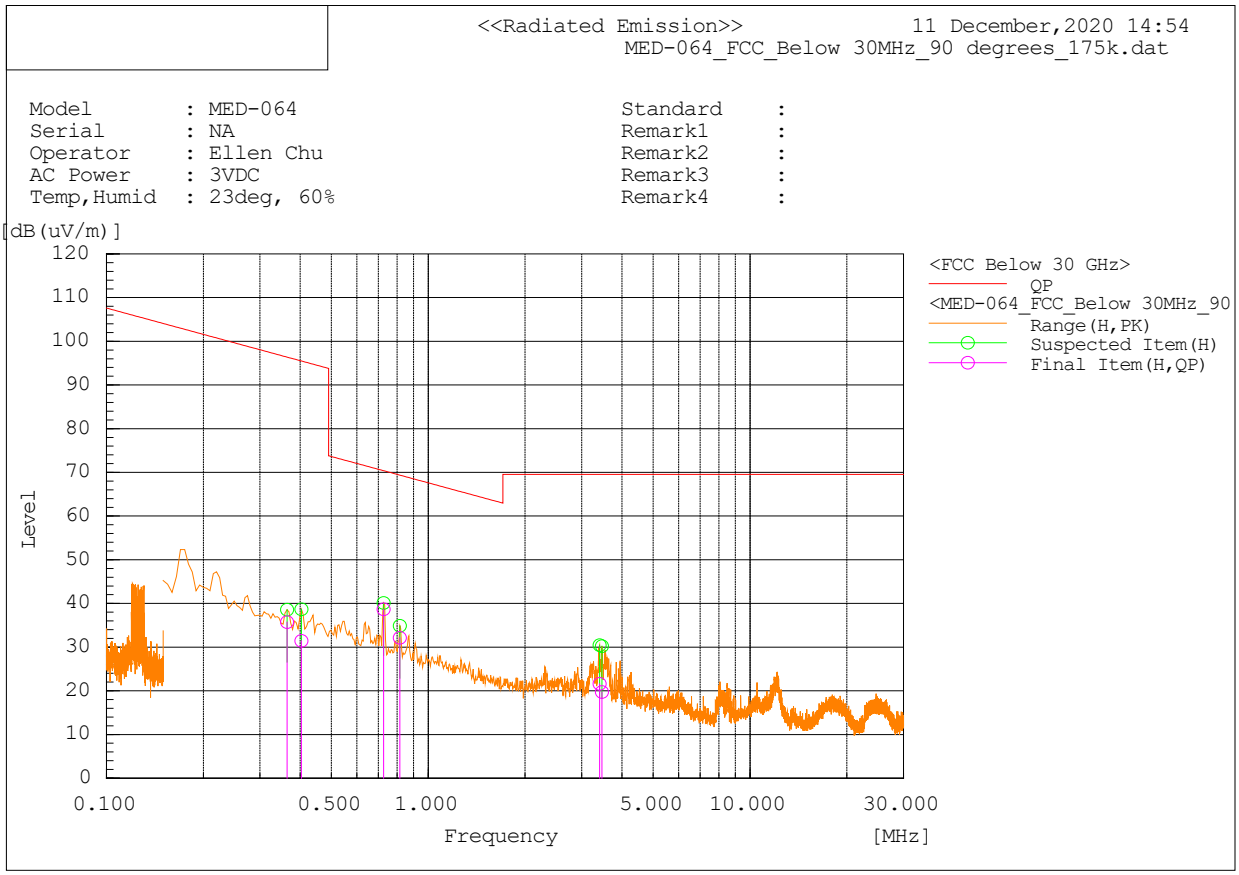
IC: See note on P.10 (The limit for FCC & IC (RS210) are the same).

ANTENNA POLARITY & test distance: 90 Degree at 3 m											
No	Freq.	Raw	Factor	Level	Measurement Type	Pol	Hgt	Azt	Limit	Margin	Pass /Fail
	[MHz]	(dB)	dB(1/m)	(dBuV/m)			(cm)	Deg	(dBuV/m)	(dB)	
1	0.364	12.3	21.1	33.4	Ave	90	100	0.1	96.52	-63.12	Pass
2	0.404	10.2	20.3	30.5	Ave	90	100	53.3	95.62	-65.12	Pass
3	0.727	23.2	15.5	38.7	Quasi Max	90	100	0	70.52	-31.82	Pass
4	0.817	17.5	14.6	32.1	Quasi Max	90	100	88.6	69.52	-37.42	Pass
5	3.409	17.4	4.2	21.6	Quasi Max	90	100	92.8	69.62	-48.02	Pass
6	3.468	15.6	4.1	19.7	Quasi Max	90	100	93.6	69.62	-49.92	Pass

Note: The Spurious emission plots show QP detector for all emissions. Then remeasurd 0.364 MHz & 0.404 MHz with Ave detector.

REMARKS:

1. Level (dBuV/m) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB)
3. Margin value = Emission level – Limit value.
4. The emission levels of other frequencies were less than 20dB margin against the limit.



4.3 **Field Strength**

Loop antenna at 0-degree, Worst Case

Freq.	Raw	Factor	Level	Measurement Type	Pol	Hgt	Azt	Limit	Margin	Pass /Fail
[MHz]	(dB)	dB(1/m)	(dBuV/m)			(cm)	Deg	(dBuV/m)	(dB)	
0.175	50.4	27.1	77.5	Quasi Max	0	100	359.4	102.7	-25.2	Pass

Freq.	Raw	Factor	Level	Measurement Type	Pol	Hgt	Azt	Limit	Margin	Pass /Fail
[MHz]	(dB)	dB(1/m)	(dBuV/m)			(cm)	Deg	(dBuV/m)	(dB)	
0.175	47.2	27.1	74.3	Ave	0	100	359.4	102.7	-28.4	Pass

Note: The Spurious emission plots show QP detector, then remeasured 0.175 MHz fundamental with Ave detector.

4.3.1 **SAR Exclusion Results**

Per § 1.1307(b)(3)(i)(A), 1mW exemption may be used for medical implant.

(3) Determination of exemption.

(i) For single RF sources (*i.e.,* any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

4.4 Maximum RF Power

Frequency Range (KHz)	Peak FS at 3m (dBµV/m)	Note
175	77.5	FS measurement Loop antenna at 0-degree, Worst Case

Pt = (ED) Square / 30 Gt

Where:
Pt is power conducted in Watt
E is field strength in V/m
D is distance in meter
Gt is Numeric Gain of antenna

Note: Antenna gain below 0 is consider as 0 dBi.

Pt = (ED) Square / 30 Gt = 0.0169 mW

So, the maximum output power is 0.0169 mW < 1 mw exemption may be used for medical implant.

Note: There is separate test report for SPR-002.

4.5 Occupied Bandwidth

4.5.1 Requirements

FCC 15.215 / RSS-GEN

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

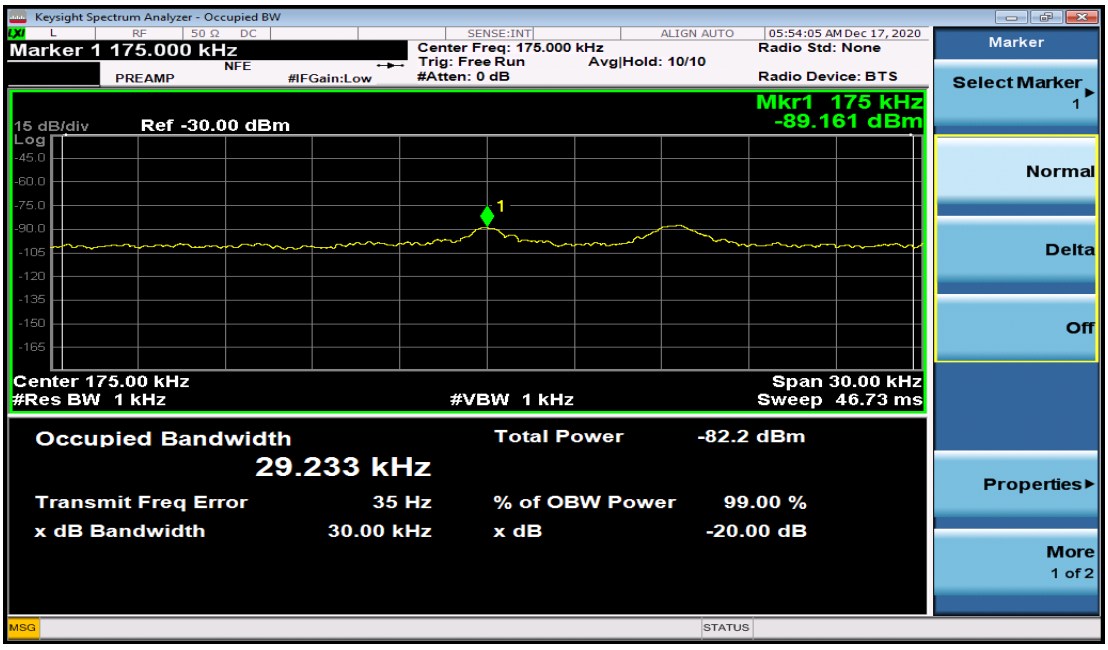
4.5.2 Test Procedure

The EUT was setup to transmit in normal operating condition.

Measurements were made with the loop antenna in close proximity of the EUT. Following the procedures of ANSI 63.10: 2013, the 20dB bandwidth measurements were taken. The following plots show Occupied Bandwidth.

4.5.3 Test Result

Frequency (KHz)	-20 dB Channel Bandwidth (KHz)	99% Channel Bandwidth (KHz)
175	30.00	29.23



Appendix - Information on the Testing Laboratories

Bureau Veritas is a global leader in testing, inspection and certification (TIC) services. We help businesses improve safety, sustainability and productivity; and our clients include the majority of leading brands in retail, manufacturing and other industries. With a presence in every major country around the world, our quality assurance and compliance solutions are vital in helping our customers enhance product quality and concept-to-consumer journeys. We also assist with increasing speed to market, profitability and brand equity throughout the supply chain. Bureau Veritas is a leading wireless/IoT testing, inspection, audit and certification provider, with a global network of test laboratories to support the IoT industry in areas of connectivity, security, interoperability as well as quality, health & safety, and environmental/chemical requirements.

If you have any comments, please feel free to contact us at the following:

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Email: sales.eaw@us.bureauveritas.com
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The address and road map of all our labs can be found in our web site also.

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