

## RF EXPOSURE TEST REPORT

**Report Number:** 103291273LEX-017  
**Project Number:** G103291273

**Report Issue Date:** 12/18/2017

**Model(s) Tested:** External Pulse Generator

**Standards:** FCC Title 47 CFR Part 2.1093  
RSS-102 Issue 5

**Tested by:**  
Intertek Testing Services NA, Inc.  
731 Enterprise Drive  
Lexington, KY 40510  
USA

**Client:**  
SPR Therapeutics, Inc.  
22901 Millcreek Blvd, Suite 110  
Cleveland, OH 44122

Report prepared by



Brian Lackey, Project Engineer

Report reviewed by



Bryan Taylor, Team Leader

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## 1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the External Pulse Generator was exempt from the SAR testing outlined in FCC Title 47 CFR § 2.1093 and RSS-102 Issue 5. Intertek does not make any claims of compliance for samples or variants which were not tested.

## 2 Test Summary

Section	Test full name	Result
5	Duty Cycle Calculation	-
6	SAR Exemption Calculation (FCC) (FCC Title 47 CFR § 2.1093)	Exempt from SAR
7	SAR Exemption Calculation (ISED) (RSS-102 Issue 5)	Exempt from SAR
8	Revision History	

### 3 Client Information

This EUT was tested at the request of:

**Client:** SPR Therapeutics, Inc.  
22901 Millcreek Blvd, Suite 110  
Cleveland, OH 44122

**Contact:** Matt Wunzin

**Manufacturer:** SPR Therapeutics, Inc.  
22901 Millcreek Blvd, Suite 110  
Cleveland, OH 44122  
USA

### 4 Description of Equipment Under Test and Variant Models

Description of Equipment Under Test (provided by client)			
This is the body worn 2-channel pulse generator that provides stimulus current to 1 or 2 MicroLeads (Percutaneous Electrodes).			
Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
External Pulse Generator	SPR Therapeutics, Inc.	9610	17440002

Receive Date:	11/10/2017
Received Condition:	Good
Type:	Production

**Variant Models:**

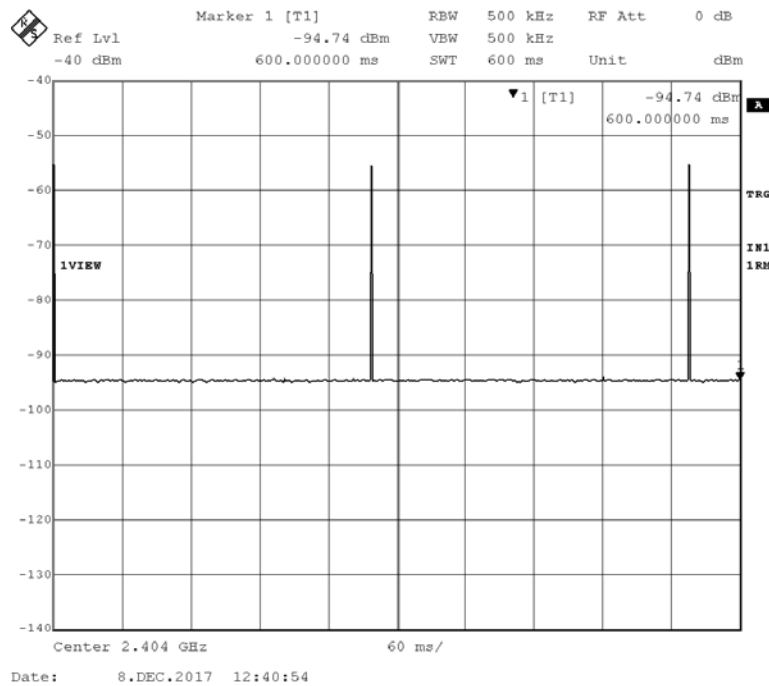
There were no variant models covered by this evaluation.

**4.1 EUT Photo:**

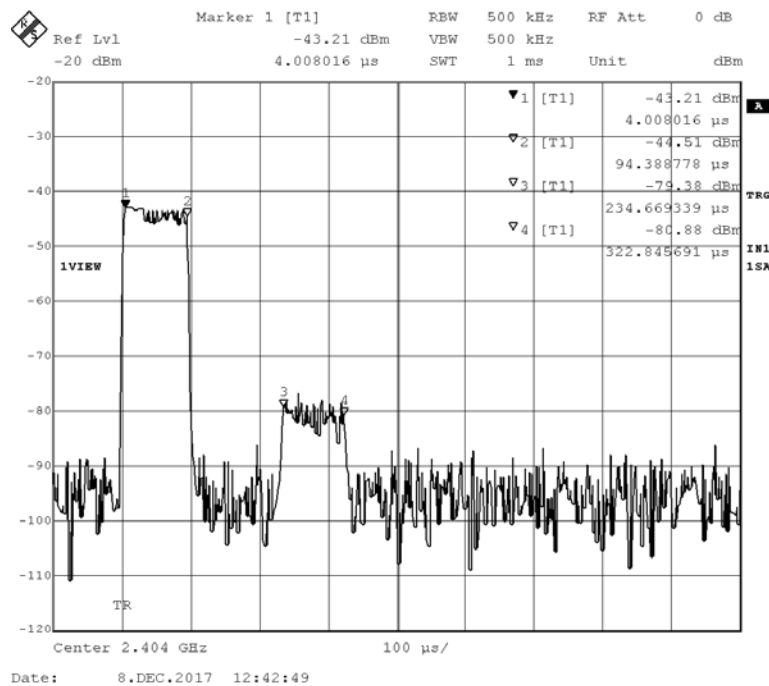


## 5 Duty Cycle Calculation

The device is a frequency hopping spread spectrum (FHSS) transmitter. The time to repeat the hopping sequence was measured to be 277.5ms:



The device utilizes 37 unique hopping channels once per hopping sequence, for an occupation time of 277.5ms / 37 = 7.5ms per hopping channel. At each hopping channel, the total transmit time was measured to be 178.5µs:



$$(94.4\mu\text{s} - 4.0\mu\text{s}) + (322.8\mu\text{s} - 234.7\mu\text{s}) = 178.5\mu\text{s} = 0.1785\text{ms}$$

Therefore the average duty cycle is calculated as  $0.1785\text{ms} / 7.5\text{ms} = 0.0238 = \mathbf{2.38\%}$

## 6 SAR Exemption Calculation (FCC)

### 6.1 Test Limits

**§ 1.1310:** The criteria listed in table 1 shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

#### Part 1.1310 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)
<b>(A) Limits for Occupational/Controlled Exposures</b>				
0.3–3.0 .....	614	1.63	*(100)	6
3.0–30 .....	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>(B) Limits for General Population/Uncontrolled Exposure</b>				
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.

## 6.2 Test Procedure

ANSI C63.10: 2013. The peak output power was measured using the marker to peak function of the spectrum analyzer.

KDB 447498 D01 General RF Exposure Guidance v06 § 4.3.1 *Standalone SAR test exclusion considerations*

## 6.3 Test Equipment Used

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	9/20/2017	9/20/2018

## 6.4 Test Results

The device was found to be **exempt**. The SAR exclusion threshold was less than the 1-g SAR limit.

## 6.5 Test Conditions

Test Personnel: Brian Lackey  
Supervising/Reviewing  
Engineer:  
(Where Applicable) NA  
Input Voltage: Battery

Test Date: 11/10/2017  
Ambient Temperature: 22.1C  
Relative Humidity: 35.2%  
Atmospheric Pressure: 992.0mbar



**6.6 Test Data (1-g SAR Exclusion Threshold):**

Frequency (GHz)	Maximum Declared EIRP (dBm)	Duty Cycle (%)	Source Based Output Power (mW)
2.402	10	2.38	0.238
2.440	10	2.38	0.238
2.480	10	2.38	0.238

Source based output power, mW =  $10^{((\text{EIRP, dBm}) / 10)} \cdot (\text{Duty cycle, \%}) / 100$

Frequency (GHz)	Source Based Output Power (mW)	Minimum Separation Distance (mm)	SAR Exclusion Threshold	1-g SAR Limit	Exempt?
2.402	1 <sup>(1)</sup>	7	0.221	3.0	Exempt
2.440	1 <sup>(1)</sup>	7	0.223	3.0	Exempt
2.480	1 <sup>(1)</sup>	7	0.225	3.0	Exempt

SAR exclusion threshold =  $(\text{Maximum source based output power, mW}) \cdot \sqrt[3]{(\text{Frequency, GHz}) / (\text{Minimum separation distance, mm})}$

<sup>1</sup> Source based output power rounded up to 1mW

## 7 SAR Exemption Calculation (ISED)

### 7.1 Test Limits

#### RSS-102 § 2.5.1

SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

**Table 1: SAR evaluation — Exemption limits for routine evaluation based on frequency and separation distance**

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

**Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)**

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m <sup>2</sup> )	Reference Period (minutes)
0.003-10 <sup>21</sup>	83	90	-	Instantaneous *
0.1-10	-	$0.73/f$	-	6 **
1.1-10	$87/f^{0.5}$	-	-	6 **
10-20	27.46	0.0728	-2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$
<b>Note:</b> $f$ is frequency in MHz. * Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

## 7.2 Test Procedure

ANSI C63.10: 2013. The peak output power was measured using the marker to peak function of the spectrum analyzer.

RSS-102 Issue 5 § 2.5.1 *Exemption Limits for Routine Evaluation – SAR Evaluation*

## 7.3 Test Equipment Used

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	10887490.26	Rohde & Schwarz	ESI26	9/20/2017	9/20/2018

## 7.4 Test Results

The device was found to be **exempt**. The source based output power was less than the SAR exemption limit.

## 7.5 Test Conditions

Test Personnel: Brian Lackey  
Supervising/Reviewing  
Engineer:  
(Where Applicable) NA  
Input Voltage: Battery

Test Date: 11/10/2017  
Ambient Temperature: 22.1C  
Relative Humidity: 35.2%  
Atmospheric Pressure: 992.0mbar

**7.6 Test Data (SAR Exemption Limits):**

Frequency (GHz)	Maximum Declared EIRP (dBm)	Duty Cycle (%)	Source Based Output Power (mW)
2.402	10	2.38	0.238
2.440	10	2.38	0.238
2.480	10	2.38	0.238

Source based output power, mW =  $10^{((\text{EIRP, dBm}) / 10)} \cdot (\text{Duty cycle, \%}) / 100$

Frequency (GHz)	Minimum Separation Distance (mm)	Source Based Output Power (mW)	SAR Exemption Limit (mW)	Exempt?
2.402	7	0.238	5.46 <sup>(2)</sup>	Exempt
2.440	7	0.238	5.25 <sup>(2)</sup>	Exempt
2.480	7	0.238	5.15 <sup>(2)</sup>	Exempt

<sup>2</sup> SAR exemption limits linearly interpolated by distance and frequency from RSS-102 Issue 5 Table 1

**8 Revision History**

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	12/18/2017	103291273LEX-017	BZ	BCT	Original Issue