



# LSRESEARCH, LLC

Wireless Product Development

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## ENGINEERING TEST REPORT # 312288 B

**LSR Job #: C-1611**

**RF Exposure Compliance of:**

Cavitron PLUS Foot Pedal

**Test Date(s):**

May 30-31 and June 1, 4, 6, 10 2013

**Prepared For:**

Dentsply Professional

Attn: Kevin Lint

1301 Smile Way

York, PA 17404

**This Test Report is issued under the Authority of:** Adam Alger, EMC Engineer

Signature:

Date: 09-23-13

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Prepared For: Dentsply Professional	Name: Cavitron PLUS Foot Pedal
Report: TR 312288 B	Model: DPD81861
LSR: C-1611	Serial: N/A (engineering sample)

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## LS Research, LLC in Review

As an EMC Testing Laboratory, our Accreditation and Assessments are recognized through the following:

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TESTING CERT #1255.01

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025: 2005 with Electrical (EMC) Scope of Accreditation  
A2LA Certificate Number: 1255.01

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Federal Communications Commission (FCC) – USA

Listing of 3 Meter Semi-Anechoic Chamber based on Title 47 CFR – Part 2.948  
FCC Registration Number: 90756

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Industrie  
Canada

Canada

Industry Canada

On file, 3 Meter Semi-Anechoic Chamber based on RSS-212 – Issue 1  
File Number: IC 3088-A  
On file, 3 and 10 Meter OATS based on RSS-212 – Issue 1  
File Number: IC 3088

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U. S. Conformity Assessment Body (CAB) Validation

Validated by the European Commission as a U. S. Competent Body operating under the U. S./EU, Mutual Recognition Agreement (MRA) operating under the European Union Electromagnetic Compatibility – Council Directive 2004/108/EC (formerly 89/336/EEC, Article 10.2).  
Date of Validation: January 16, 2001

Validated by the European Commission as a U.S. Notified Body operating under the U.S. /EU, Mutual Recognition Agreement (MRA) operating under the European Union Telecommunication Equipment – Council Directive 99/5/EC, Annex V.  
Date of Validation: November 20, 2002  
Notified Body Identification Number: 1243

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## 1.0 Conformance Summary

The EUT was found to MEET the 5mm minimum test separation distance threshold for SAR test exclusion per FCC §2.1091(mobile) and §2.1093(portable) using methods of FCC KDB 447498 D01 General RF Exposure Guidance v05r01 as a standalone device.

## 2.0 SAR Test Exclusion Threshold

SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm

1-g SAR test exclusion threshold equation:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * [\sqrt{f(\text{GHz})}] \leq 3.0$$

10-g SAR test exclusion threshold equation:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * [\sqrt{f(\text{GHz})}] \leq 7.5$$

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### 3.0 Equipment Under Test (EUT) Information

*The following information has been supplied by the applicant.*

<b>Product Name:</b>	Cavitron PLUS Foot Pedal
<b>Model Number:</b>	DPD81861
<b>Serial Number:</b>	N/A (Engineering Sample)
<b>FCC ID</b>	TF3-DPD81861
<b>IC Number</b>	4681B-DPD81861

### 3.1 Product Description

Foot pedal used in system with base unit to control various dental tools.

### 3.2 Additional Information

EUT was set into test mode via a ribbon cable attached to a programming board that connected to a computer running a hyper terminal program. Menu selections for channel, power, and continuous transmit were available.

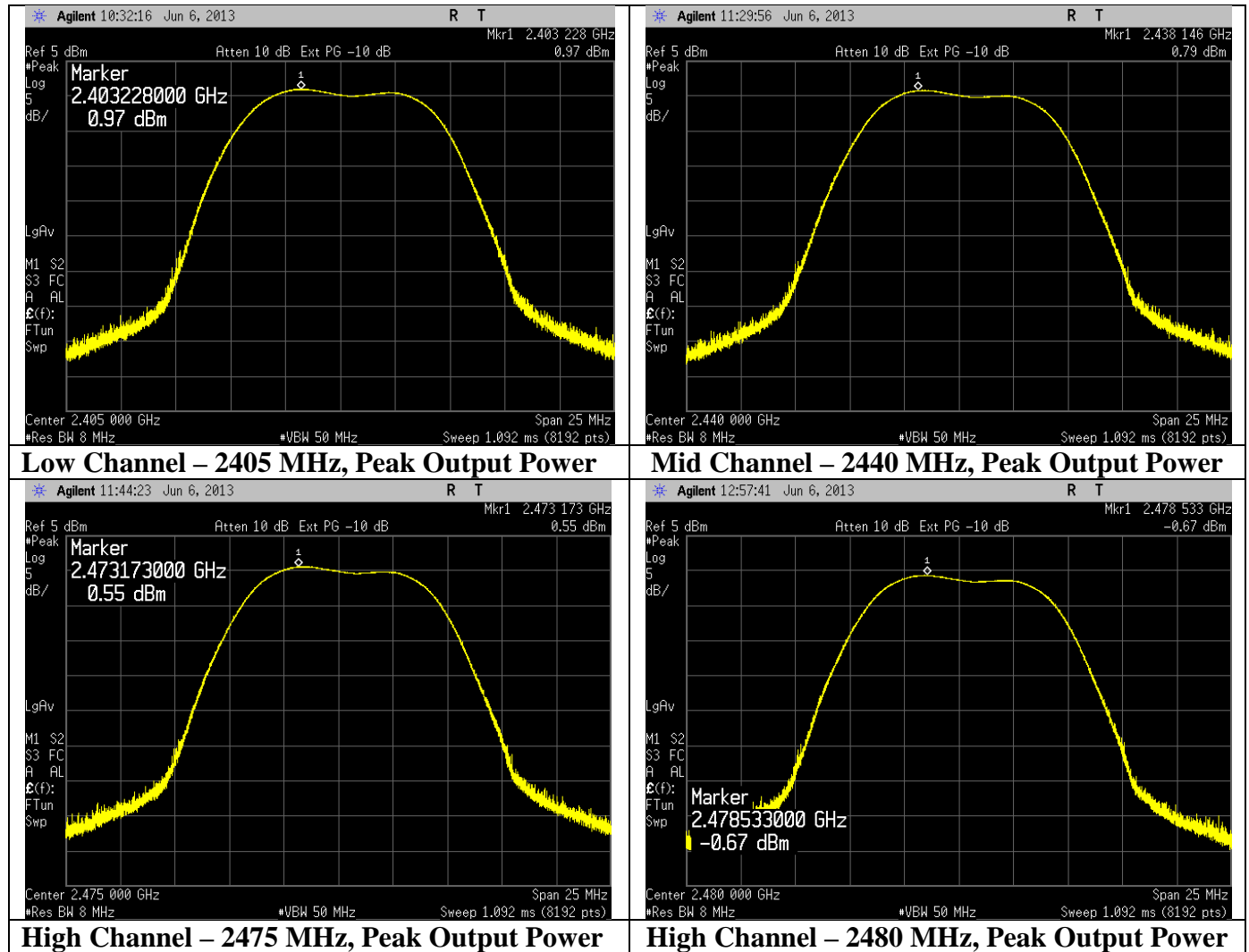
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## 4.0 RF Conducted Measurement Data

Table

Frequency (MHz)	Power (dBm)
2405	0.97
2440	0.79
2475	0.55
2480	-0.67

Plots



## 5.0 SAR Test Exclusion Calculation

**Note:** 100 % duty cycle

Description	Line #	Data	Unit	Additional Description
Transmit Packet on time:	1	100	(ms)	Worst case
Packet repetition time:	2	100	(ms)	Worst case
Duty factor:	3	1		Transmit Packet on time / Packet repetition time (1/2)
Maximum peak output power at antenna input terminal:	4	0.97	(dBm)	Measured worst case
Antenna gain:	5	1.6	(dBi)	Antenna gain (supplied by applicant)
Maximum peak radiated power:	6	2.570	(dBm)	Antenna terminal measured power + antenna gain (4+5)
Maximum peak radiated power:	7	1.807	(mW)	dBm to mW conversion
Prediction distance:	8	5	(mm)	Minimum test separation distance
Prediction frequency:	9	2.405	(GHz)	Measured frequency
Square root of frequency (GHz):	10	1.550806		Calculation
Duty factor applied to maximum peak radiated power (mW):	11	1.807174	(mW)	duty factor * maximum peak radiated power (11*7)
Source based power (mW) / min test separation distance (mm):	12	0.361435		Calculation (11/8)
SAR exclusion calculation:	13	0.56		Calculation (12*10)
Threshold:	14	3		
Margin:	15	2.44		Calculation (14-13)

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## 6.0 Industry Canada Low Power Exemption

RSS 102 Section 2.5 states that all transmitters that meet the output power requirements as stated in section 2.5.1 and 2.5.2 of RSS 102 are exempt from routine SAR and RF exposure evaluation.

### Output Power Evaluation.

Evaluation Frequency = 2405MHz

Device Operation separation distance:  $\leq 20\text{cm}$

Maximum Effective Isotropic Radiated Power (dBm) = 0.97 dBm + 1.6dBi = 2.57 dBm

Maximum Effective Isotropic Radiated Power (mW) =  $\log^{-1}(\text{EIRP}(\text{dBm})/10)$  = 1.807 mW

Section 2.5.2 general public use limit at for devices operating less than 20cm:

Frequency	Limit
2.2 to 3 GHz	20 mW

Conclusion:

Since the maximum effective radiated power (ERP) is less than the applicable section limit, the Product is exempt from SAR/RF Evaluation



## 7.0 MPE Calculation

### Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density

P = power input to the antenna

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

Maximum peak output power at antenna input terminal:	0.97 (dBm)
Maximum peak output power at antenna input terminal:	1.250 (mW)
Antenna gain(typical):	1.6 (dBi)
Maximum antenna gain:	1.445 (numeric)
Prediction distance:	20 (cm)
Prediction frequency:	2405 (MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1 (mW/cm^2)
Power density at prediction frequency:	0.000360 (mW/cm^2)
Maximum allowable antenna gain:	36.0 (dBi)
Margin of Compliance at 20 cm =	34.4 dB

## END OF REPORT

Date	Version	Comments	Person
9-27-13	V2	Final	Adam A

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