



LS RESEARCH LLC

Wireless Product Development

W66 N220 Commerce Court • Cedarburg, WI 53012 USA • Phone: 262.375.4400 • Fax: 262.375.4248 • www.lsr.com

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:

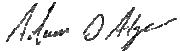
Dentsply Professional

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

This Test Report may not be reproduced, except in full, without written approval of LS Research, LLC.

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

Table of Contents

i.	Title Page	1
ii.	Table of Contents	2
iii.	LS Research, LLC	3
1.0	Conformance Summary	4
2.0	SAR Test Exclusion Threshold.....	4
3.0	Equipment Under Test (EUT) Information.....	5
3.1	Product Description	5
3.2	Additional Information	5
4.0	RF Conducted Measurement Data	6
5.0	SAR Test Exclusion Calculation	7
6.0	Industry Canada Low Power Exemption	8
7.0	MPE Calculation	9

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

LS Research, LLC in Review

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



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



Federal Communications Commission (FCC) – USA

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



Industrie Canada

Industry 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



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

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

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:

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

Prepared For: Dentsply Professional	Name: Cavitron PLUS Foot Pedal
Report: TR 312288 B	Model: DPD81861
LSR: C-1611	Serial: N/A (engineering sample)
Page 4 of 10	

3.0 Equipment Under Test (EUT) Information

The following information has been supplied by the applicant.

Product Name:	Cavitron PLUS Foot Pedal
Model Number:	DPD81861
Serial Number:	N/A (Engineering Sample)
FCC ID	TF3-DPD81861
IC Number	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.

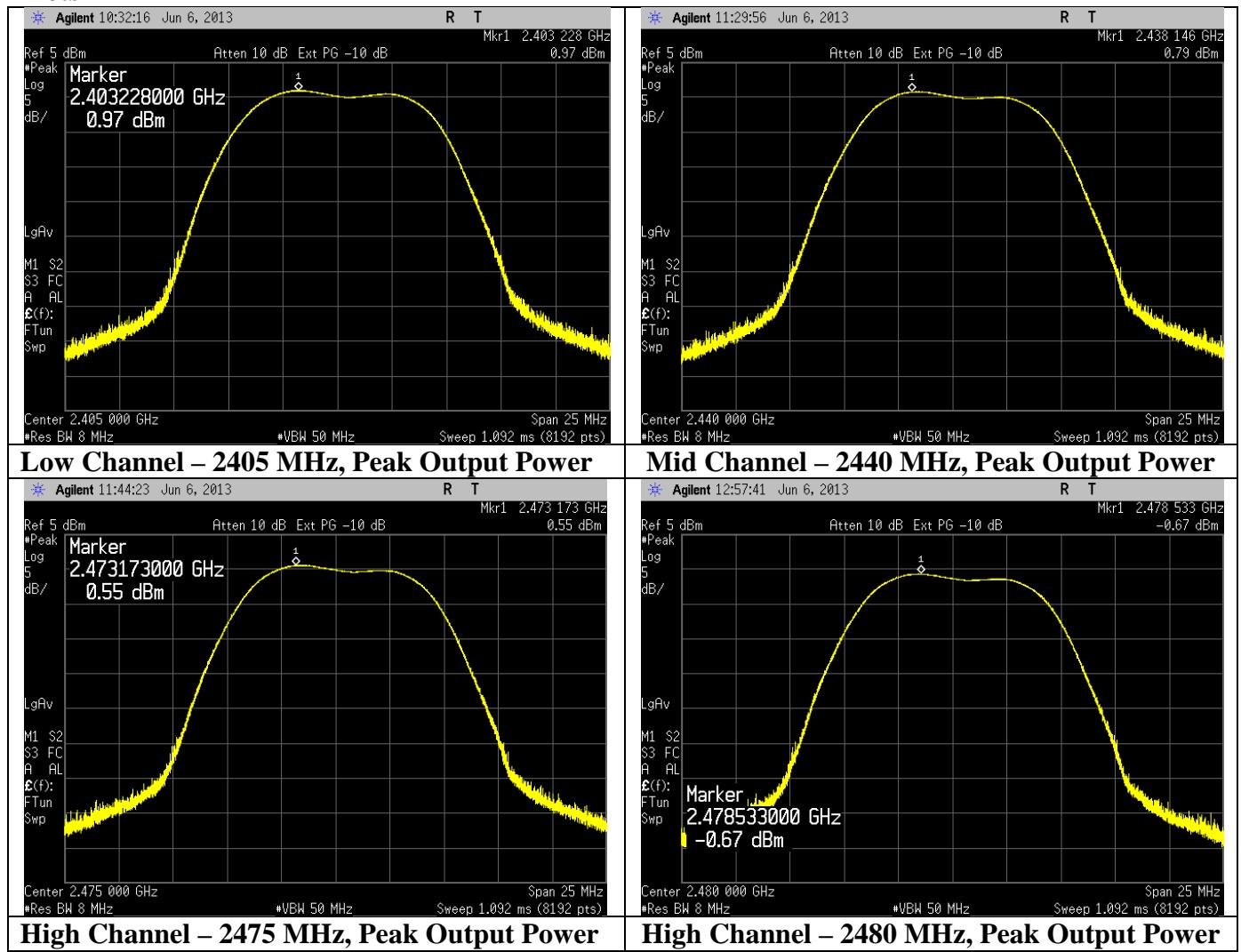
Prepared For: Dentsply Professional	Name: Cavitron PLUS Foot Pedal
Report: TR 312288 B	Model: DPD81861
LSR: C-1611	Serial: N/A (engineering sample)

4.0 RF Conducted Measurement Data

Table

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

Plots



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

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)

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

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: *<20cm*

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

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

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

Prepared For: Dentsply Professional	Name: Cavitron PLUS Foot Pedal
Report: TR 312288 B	Model: DPD81861
LSR: C-1611	Serial: N/A (engineering sample)
Page 8 of 10	

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/cm²)

Power density at prediction frequency: 0.000360 (mW/cm²)

Maximum allowable antenna gain: 36.0 (dBi)

Margin of Compliance at 20 cm = 34.4 dB

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

END OF REPORT

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

Prepared For: Dentsply Professional	Name: Cavitron PLUS Foot Pedal
Report: TR 312288 B	Model: DPD81861
LSR: C-1611	Serial: N/A (engineering sample)
Page 10 of 10	