

## VALO MARC TESTING

### Objectives:

A research study conducted at a leading North American university measured the ability of the following five lights to deliver light to a restoration in one location in MARC. The following lights were used in a random sequence.

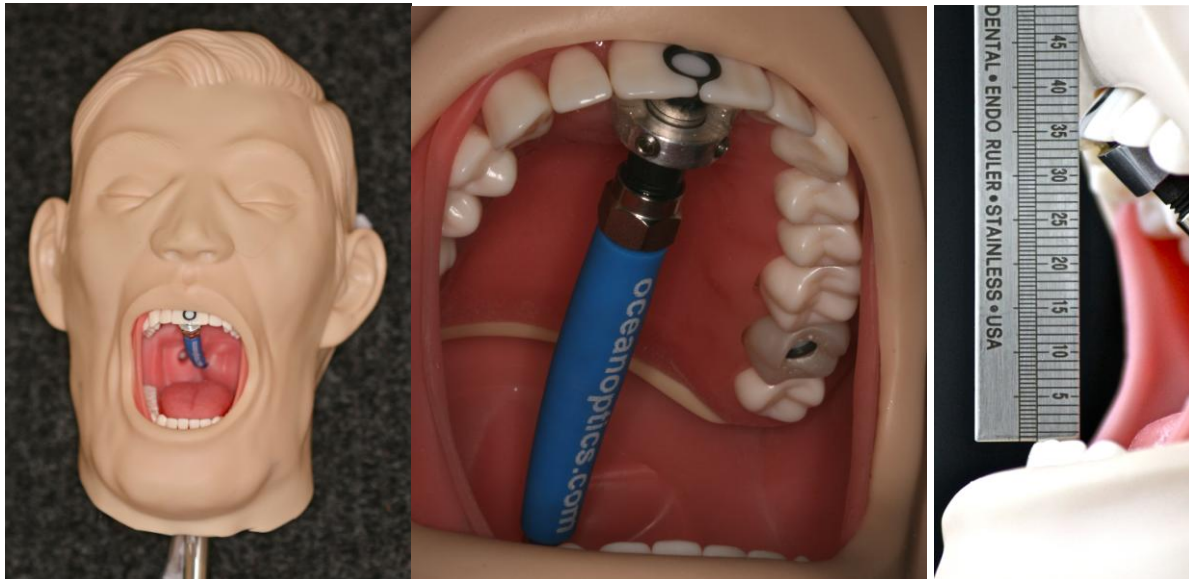
Lights, power values and curing times:

- Kerr Demi – 1 x 10 Seconds
- Ivoclar BluePhase 20i – Turbo Power – 1 x 5 Seconds
- 3M Elipar S10 – 1 x 10 Seconds
- DentMat Sapphire Plus – 1 x 5 Seconds
- Ultradent VALO – Plasma Emulation Mode – 2 x 3 Seconds
- Ultradent VALO – High Power – 3 x 4 Seconds
- Ultradent VALO – Standard Power – 1 x 20 Seconds

### Materials and Methods:

A device called Management of Accuracy when Resin Curing (MARC) measures how much light a dentist delivers to a simulated restoration in a dental mannequin. MARC is a fiber-optic spectrometer based system that measures how much light an operator delivers to a resin restoration in the mouth in real-time. The opening was restricted to 35mm at the incisors. The images below show the position of the sensors in the MARC unit.

**Figure 1: MARC interface and the mannequin head.**



The amount light delivered to the detector by each of the dental curing lights was measured. In total, twenty-one participants (dentists and their assistants) were tested. The instruction given to each volunteer was to position the mannequin head and dental chair as they would for a patient and then to cure the Class I restoration in tooth #2.7 **simulating what they would do for a patient**. Orange glasses were readily available for eye protection, but were often not used.

Statistical analysis utilized a three way ANOVA examining the effect of operator, location and LCU on the total energy received by the detector. The Fishers PLSD post-hoc comparison test was used to examine pair-wise differences in the total energy delivered by the LCUs. All statistical testing was performed at a pre-set alpha of 0.05.

**Results:**

The greatest amount of light energy that could be delivered was 25.4 J/cm<sup>2</sup> using VALO in the standard mode for 20 seconds.

**Table 1: Lights ranked according to energy delivered by 21 operators to the Class I in tooth #2.7.**

Light	Mode	Mean Irradiance	Irradiance Max	Mean	S.D.	Low	High
	Time	mW/cm <sup>2</sup>		J/cm <sup>2</sup>	J/cm <sup>2</sup>	J/cm <sup>2</sup>	J/cm <sup>2</sup>
Bluephase 20i	Turbo 5s	1440		7.2	2.5	2.7	11.6
DEMI	Standard 10s	860		8.6	3.4	2.1	13.0
Sapphire	Standard 5s	1820		9.1	2.8	0.4	11.5
Elipar S10	Standard 10s	1020		10.2	3.9	1.6	15.1
VALO	High 3x4s	1258		15.1	6.4	0.6	21.9
VALO	Plasma Emulation 2x3s	2683		16.1	4.0	5.9	20.0
VALO	Standard 20s	945		18.9	5.4	8.1	25.4

**Table 2: Energy delivered to the anterior tooth #1.1/2.1 (n= 20 repeats) using VALO.**

Light	Mode	Mean	S.D.	Low	High
	Time (s)	J/cm <sup>2</sup>	J/cm <sup>2</sup>	J/cm <sup>2</sup>	J/cm <sup>2</sup>
VALO	Plasma Emulation 2x3s	20.5	2.9	12.3	24.1
VALO	High 3x4s	22.4	1.8	17.5	26.2
VALO	Standard 20s	24.2	1.6	21.0	28.9

**Summary:**

1. There was a large range (between 7.9 to 18.9 J/cm<sup>2</sup>) in the amount of light energy delivered to a Class I restoration in the #2.7 using these lights.
2. There was a smaller range (between 20.5 to 24.2 J/cm<sup>2</sup>) in the amount of light energy delivered to a facial Class III restoration in the #1.1/2.1 using VALO.
3. The most energy was delivered in the anterior facial Class III restoration. This was due to the improved access to the restoration.
4. VALO used in Standard mode for 20 seconds delivered the most energy in both locations (p<0.05).
5. The 20i used for 5 seconds in Turbo mode delivered the least amount of energy (posterior 7.2 J/cm<sup>2</sup>)