

PROJECT TEST REPORT

09-18-07

Title: Competitive Battery Analysis between Demi Light and Competitor's Curing Lights

Equipment: Demi Curing Light S/N 752000974, Demi battery pack 3.7V @ 2.4 A-H capacity, G- Light S/N 07199, G- light battery 7.2VDC @ 1700 mA-H, Elipar FreeLight 2 S/N 939826016292, Freelight battery pack 4.8V, Smart Lite PS with battery S/N CU 02850, Bluephase Ivoclar Vivadent S/N 1621912, with battery pack (0648) 7.2 VDC, BK Precision Power Supply Model 9123, Fluke 87 ID 117784, Ophir Laser Star 01607

Background:

Demi Curing Light ----- Capable of 500 5 sec cures
20 sec ON/ 1 min OFF
Interchangeable Lithium Ion Battery
Charge 16 hours prior to first use
See number 6
<http://kerrdental.com/index/kerrdental-products-curinglights-demi>

G – Light ----- Capable of 400 10 sec cures
5 min ON/ 10 min OFF
Lithium Ion Battery
See Battery
<http://www.gcamerica.com/gcglight.html>

Elipar ----- Capable of 7 min of continuous operation
Total operation time typically 20 min
Nickel Metal Hydride
Several cycle of charging/discharging before the optimum cure time per charge is obtained.
See Summary
<http://multimedia.mmm.com/mws/mediawebserver.dyn?6666660Zjcf6IVs6EVs666OB0COrrrQ->

SmartLite ----- Capable of 150 10 sec cures approx. 25 min of continuous operation
10 sec ON/ 30 sec OFF
Nickel Metal Hydride
Several cycle of charging/discharging before the optimum cure time per charge is obtained.
Charge for at least 10 hours prior to first use.
See Installation and Charging section 4
<http://www.dentsply.de/bausteine.net/file/showfile.aspx?downaid=6919&sp=E&domid=1042&fd=2>

Bluephase ----- Maximum curing time is approximately 60 min
6 min ON/ 4 min OFF (intermittently)
Lithium Ion
See Product Specifications
http://www.getbluephase.com/images/bluephase_IFU.pdf

Procedure:

Fully charge all the batteries. Measure the voltage making sure it's over the nominal value for best possible performance.

1. Test each battery according to their corresponding normal operation, do this continuously until the battery is totally drained then record the findings. Test the units in the mode/time selection as recommended by the manufacturer. Take note if the unit shuts off because of overheating.
2. Test all batteries in typical dental office use, test all the curing lights by doing 4 consecutive 10 sec cures every hour for 8 hours.
3. Test all the batteries while inside their respective guns/wands and in stand by/idle mode. Record how long it takes the battery to drain. Record the current draw and calculate the time based on battery capacity.
4. Record the re-charge time for each battery. Battery should be completely drained first before re-charging.

Results: See Data Results

Discussion: The Demi Curing light's battery stayed true to its promise of 500 five sec cures minimum of continuous use, it in fact even surpass it by 238 more five sec cures for a total of 738 five sec cures. Upon the execution of procedure 1 and 2 the Demi did not overheat. With 4.1 VDC @ 2400 mAH capacity with a stand by current of 21 mA the battery will last for 4.28 days. While in the sleep mode and having a current draw of 2 mA the Demi's battery will last for approximately 45 days @ 90% capacity. Under procedure number 2 the Demi managed to produce 264 cures.

With respect to its operating procedure, the G-Light's battery was efficient until the 102nd cure of continuous use. After that, the battery became erratic and will sporadically finish a 10- second cycle. The G-Light exhibited an increase in temperature on top of the gun and is most likely the reason why the unit would shut off and not finish a cycle. With 8.3 VDC, 1700 mA capacity and with 8 mA current draw the G Light's battery will last for 7.96 days on stand by mode. While at sleep mode where there is no current pull it will last for 63.75 days. The G- Light's battery performance under procedure 2 was 507 cures.

With respect to its operating procedure, the Elipar's battery was efficient until the 301st cure on continuous use. The battery was completely drained after that mark. This unit did not overheat during the test process. With a 5.54 VDC at fully charged state and a current capacity of 800 mAH and with a current draw of 0.032A the Elipar's battery will last for less than 24 hours on stand by mode. While at sleep mode when it's not drawing any current, the battery will last for 30 days. The Elipar was able to produce 206 cures under procedure 2.

With respect to its operating procedure, the SmartLite PS was efficient until the 140th cure of continuous use. The battery was completely drained after that mark. The manufacturer's claim is 150 ten sec cures. This unit did not overheat in the process. At 5.01 VDC, 500 mAH capacity and with a current draw of 800 mA, the Smartlite's battery will last for 33.12 minutes on standby mode. While on sleep mode with out any current pull, the battery will last for 18.75 days. The Smartlite was able to produce 109 cures under procedure 2.

With respect to its operating procedure the Bluephase Ivoclar Vivadent ran for under 2 hours of continuous use. The battery managed to produce 348 twenty sec cures (HIP) before it drained. This unit did not overheat. At 8.15 VDC, 1000 mAH capacity and with a current draw of 21 mA, the Bluephase's battery will last for 1.78 days on standby mode, while on sleep mode where there is no current pull, the battery will last for 37.5 days. The Bluephase was able to produce 485 cures under procedure 2.

Battery Capacity per Hour X (% Charge Capacity) / Current Draw / 24 hr

Manufacturer's re-charge time:

Demi 3 hours
 G-Light 2 hours
 Elipar approx 2 hours
 SmartLite 10 hours
 Bluephase approx 2 hours

Calculation for battery drain time in stand by mode:

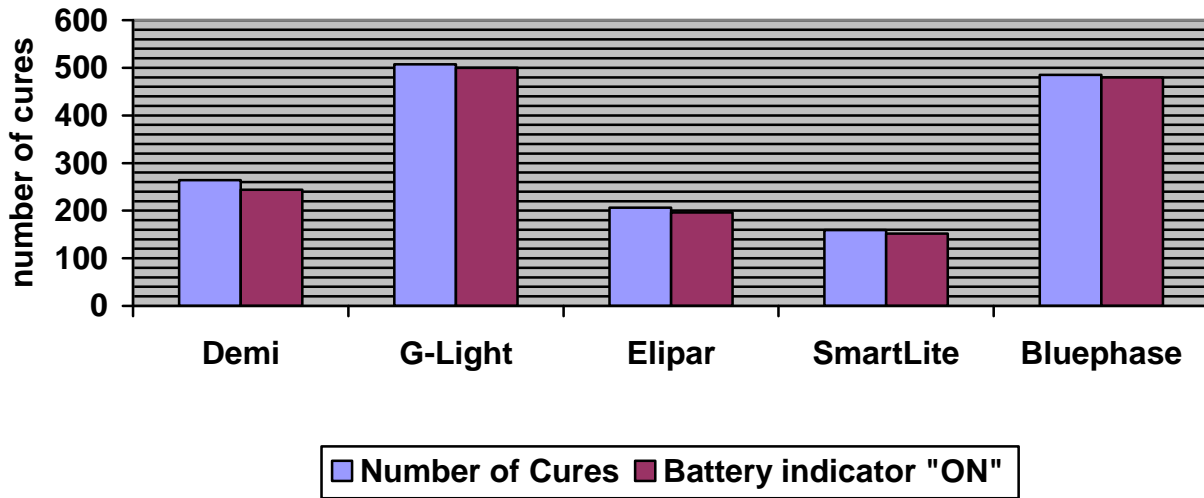
2400 mAh (.9)/21mA/24 hr = 4.28 days @ 90%capacity
 1700 mAh (.9)/8mA/24 hr = 7.96 days @ 90% capacity
 800 mAh (.9)/32mA/24 hr = 0.9375 days @ 90% capacity
 500 mAh (.9)/800mA/24 hr = 0.023 days @90% capacity
 1000 mAh (.9)/21mA/24 hr = 1.78 days @ 90% capacity

DATA RESULTS:

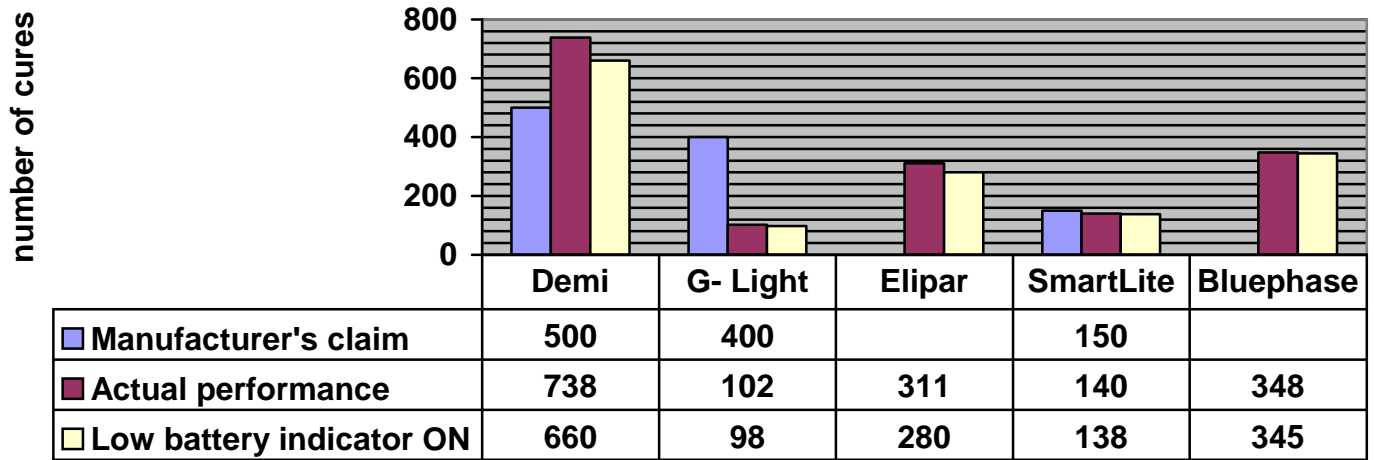
| Curing light | Battery voltage when fully charged | Current capacity | Type of battery | No. of cures before the battery drained | Comment | Light output using ophir 01607 | 4 consecutive 10 sec cures every hour for 8 hours | Drain time in standby mode @ 90% capacity | Actual Re-charge time |
|--------------|------------------------------------|------------------|----------------------|---|--|--------------------------------|---|---|-----------------------|
| | | Current draw | | | | | | | |
| Demi | 4.1 VDC | 2100 mAH | Lithium Ion | 738 five sec cures | 238 more than listed. 61.6 min. total cure of continuous use | 1100 mw/cm ² | Able to produce 264 cures (4 days off Weekend) | 4.28 days | 2 hours 17 min |
| | | 21 mA | | | | | | | |
| G- Light | 8.3 VDC | 1700 mAH | Lithium Ion | 102 ten sec cures | After 102 nd cure battery became erratic and intermittently finish a 10 sec cycle | 870 mw/cm ² | Able to produce 507 cures (6 days off Weekend) | 7.96 days | 2 hours |
| | | 8 mA | | | | | | | |
| Elipar | 5.54 VDC | 800 mAH | Nickel Metal Hydride | 311 ten sec cures | 50.1 min of continuous use | 870 mw/cm ² | Able to produce 206 cures (2 days off Weekend) | 0.9375 days | 1 hr 50 min |
| | | 32 mA | | | | | | | |
| SmartLite | 5.01 VDC | 500 mAH | Nickel Metal Hydride | 140 ten sec cures | 10 cures short of what was Promised. 23.33 min continuous use | 1100 mw/cm ² | Able to produce 159 cures (2 days off Weekend) | 0.23 days | 10 hours |
| | | 800 mA | | | | | | | |
| Bluephase | 8.15 VDC | 1000 mAH | Lithium Ion | 348 twenty sec cures | Listed at maximum 60 min of continuous use. When tested total usage time was 116 min | 1180 mw/cm ² | Able to produce 485 cures (6 days off Weekend) | 1.78 days | 2 hours 36 min |
| | | 21 mA | | | | | | | |

BATTERY RUN TIME COMPARISON

4 Consecutive 10 sec Cures Every hour for 8 hours



CONTINUOUS USE COMPARISON



Demi 5 sec cure mode
 G- Light 10 sec cure mode
 Elipar 10 sec cure mode
 SmartLite 10 sec cure mode
 Bluephase 20 sec cure mode

Conclusion:

Under continuous operation the Demi is the only product that surpassed its manufacturer's claim on its performance. Demi promised to give 500 five sec cures and easily surpassed that by giving 238 more five sec cures while never overheating in the process.

| Brand Name | Cost (Feb 2006) | Intensity (CRA Irradiance method) | Cures all Resins | Handpiece | Battery | Cure Modes | Timer | Controls | Light Guide | Radiometer | Cooling Fan |
|-----------------------|-----------------|-----------------------------------|--------------------|----------------------------|--|--|--|--|--|--|-------------|
| Avanté LED | \$999 | 945 mW/cm ² | No, CQ only | Cordless, gun style 259 g | Run time: 69 min with minimal loss of power. Low battery warning at 50 min. Charger in base unit | High power | Adjustable 1, 10, 20, 40 sec | Trigger: on/off with multiple unlabeled functions to change time. Simple, but tedious | 7 mm turbo, 55° angle, glass fiber, sterilizable, rotating | Yes. 3 level indicators (red, yellow, green) | None |
| bluephase 16i | \$1,495 | 945 mW/cm ² | Yes, non-CQ slowly | Cordless, gun style 290 g | Run time: 45 min with minimal loss of power. Low battery warning at 40 min. Charger in base unit. User replaceable | High power, Low power, Ramp/step (5 sec) | Adjustable 5, 10, 20, 30 sec. Beeps every 10 sec. Count up display | Trigger: on/off Time: plus/minus Mode: forward/back LCD shows mode, time, & battery charge. Simple, intuitive, labeled | 7 mm turbo, 60° angle, glass fiber, sterilizable, rotating | Yes, 5 level indicators | Yes, quiet |
| Celalux | \$995 | 680 mW/cm ² | No, CQ only | Cordless, wand style 179 g | Run time: 12 min with minimal loss of power. Charger in base unit. | High power, Ramp (5 sec) | Adjustable 10, 20, 30, 40 sec | Button: on/off. Button: Time selection. Button: Mode. Simple, intuitive, labeled | 7 mm, 60° angle, glass fiber, sterilizable, rotating | Yes. Pass/fail indicator (green/red) | None |
| The Cure 24 | \$595 | 870 mW/cm ² | No, CQ only | Cordless, wand style 75 g | Not applicable | High power, Low Power | Adjustable 2, 4, 6, 8, 10, 12, 16, 20 sec. Beeps every 2 sec. Count down display | Button: on/off with multiple unlabeled functions to change mode and time. Simple, easily learned | 8mm fixed lens, 70° angle | No | None |
| FLASHlite 1401 | \$395 | 334 mW/cm ² | No, CQ only | Cordless, wand style 102 g | Run time: 112 min with minimal loss of power. Low battery warning at 112 min. Charger in base unit | High power | Incrementing beeps every 10 sec indicate elapsed time | Button: on/off. Simple intuitive | 8mm fixed lens, 60° angle | Yes, 4 level indicators | None |
| G-Light | \$1,350 | 810 mW/cm ² | Yes | Cordless, gun style 406 g | Run time: 75 min with minimal | High power | Adjustable 5, 10, 20 sec or continuous | Trigger: on/off, Button: time selection, LEDs | 7mm turbo, 55° angle, glass fiber, | No | None |

| | | | | | | | | | | | |
|----------------------------|---------|-------------------------|-------------|-------------------------------------|--|-------------------------------|---|---|---|--|------------|
| | | | | | loss of power. Low battery warning at 73 min. Separate battery charger. User replaceable | | | show time & battery charge. Simple and intuitive | sterilizable, rotating | | |
| LED Blast | \$749 | 1030 mW/cm ² | No. CQ only | Corded or cordless, gun style 460 g | Run time: 102 min with stable output for 70 min. Low battery warning at 100 min. Charger in base unit | High power | Adjustable 5, 10, 20, 30 sec. Beeps every 5 sec | Trigger: on/off, Button: Time selection. LEDs show time. Simple, intuitive | 7mm turbo, 55° angle, glass fiber, sterilizable, rotating | No | None |
| L.E.Demetron II | \$1,267 | 1010 mW/cm ² | No. CQ only | Cordless gun style 370 g | Run time: 43 min with minimal loss of power. Low battery warning at 43 min. Seperate charger. User replaceable | High power (pulsing at 1Hz) | Adjustable 5, 10, 20 sec. Beeps every 5 sec. Count up display | Trigger: on/off, Button: main power & time selection. Display shows time. LEDs show battery charge. Simple, intuitive | 7mm turbo, 60° angle, glass fiber, sterilizable, rotating | Yes. 4 level indicators(8, 10, 12, 14 x 100 mW/cm ²) | Yes, quiet |
| Nova Pulse | \$795 | 460 mW/cm ² | No. CQ only | Cordless, wand style 179 g | Run time: 27 min with moderately stable output for 15 min. Charger in base unit | High power (pulsing at 100Hz) | Adjustable: 0.5, 2.5 sec | Button: main power, Button on/off with multiple unlabeled functions to change time. Simple, easily learned | 5.5 mm hemispherical fixed lens attachment. 90° angle, rotating | No | None |
| Radii Plus | \$795 | 340 mW/cm ² | No. CQ only | Cordless, wand style 179 g | Run time: 160 min with moderately stable output for 127 min. Charger in base unit. User replaceable | High power, Ramp (5 sec) | 60 sec. Beeps every 10 sec | Button: on/off with multiple unlabeled functions to change mode. Simple, easily learned | 7 mm fixed lens attachment, 90° angle, rotating | Yes. 5 level indicators | None |
| Translux Power Blue | \$1,139 | 400 mW/cm ² | No. CQ only | Cordless, wand style 140 g | Run time: 80 min with minimal loss of power. Low battery warning at 59 min. Charger in the base unit | High power, Ramp (2 sec) | Adjustable: 10, 20 sec. Beeps every 10 sec | Button: on/off with multiple unlabeled functions to change mode & time. Simplistic, but non-intuitive | 7mm, 60° angle, glass fiber, sterilizable, rotating | Yes. Pass/fail indicator (green/red) | None |

PRODUCTS EVALUATED:

DEMI



<http://www.kerrdental.com/index/kerrdental>

G-LIGHT



<http://www.gcamerica.com>

ELIPAR



http://solutions.3m.com/wps/portal/3M/en_WW/3MESPE

SMARTLITE



<http://www.dentalcompare.com/details/5682/SmartLiteAnd>

BLUEPHASE



<http://www.ivoclar.co.nz/pages/products/clinical/bluephase.htm>