

How well does your curing light perform?



As a dentist your goal is to provide your patients with the best possible care.

You've chosen your light, you use it every day, and you want to know how it's performing.

Your curing light may be on, but is it doing its job?

Light curing improvement opportunities

A study¹ of 915 curing lights in 422 dental clinics found that **66%** needed to modify their light curing protocols – or get a new curing light – in order to reduce recall rates:

30% delivered less than half of the energy dose required for the selected dental material when curing a posterior restoration.



43% used extended curing times (to ensure an adequate cure), unknowingly risking heat damage.



Curing times ranged from 3–90 seconds, regardless of the material selected by the dentist.

MORE THAN



of curing lights had outputs \pm 20% or more outside specifications.²

Fast facts about light curing

- **Every brand and shade** of light-cured composite requires a specific “dose” of blue light to polymerise.
- **Under-curing** (incomplete polymerisation) leads to increasing clinical problems^{3,4} such as fracture, secondary decay, de-bonding, discolouration and post-op sensitivity.
- **Over-curing** risks heat damage and post-op sensitivity for the patient.

Here are some of the frequently asked questions on monitoring light performance, and our answers:

Q: How do I know if my light is “good”?

A: Your light is performing well if it can safely cure your materials. Many dentists ask us for a target irradiance/number — we’ll go into details on this further down (as a broad benchmark, know that <400 mW/cm² is too low⁶ and 4000 mW/cm² is too high⁷).

Q: How often should I check my light?

A: Best practices indicate you should check your light every time you use it. This is backed by most instructions for use (IFUs) that come with any light curing unit (LCU). Some clinicians may choose to test once per week in line with other equipment, but the longer you go without testing your light, the greater the gamble of restoration quality.

The importance of routinely monitoring, tracking and documenting the performance of LCUs is similar to that of x-ray machines and sterilisation units. Malfunction/failure/leakage with any of these can have serious consequences for the patient and the treatment team.

Q: Why am I checking, what am I looking for?

A: All LCUs experience a drop in irradiance over time. Although this might not be apparent as the LCU still appears to emit blue light, it may not effectively reach to and through the materials being light cured. Sometimes a light is dropped, damaged or otherwise affected; irradiance can differ dramatically and look the same to the naked eye, so you need to test regularly.

Q: What do I check my light with?

A: Regardless of the light measurement device you use, be consistent! Use the same light measurement device and same light guide for each test to understand your relative results over time. A radiometer is an example of a commonly found light measurement device, but it’s important to understand that many of these devices are designed to be used with only one light model and can give inaccurate results otherwise, so be cautious!

For accuracy, we recommend measuring with a device that accounts for the active diameter of the light tip, the light wavelength and a device that doesn’t saturate (“max out”) with high outputs.

Q: “What is a good irradiance?”

A: A “good irradiance” is not just a number. A “Good Irradiance” considers the following variables:

✓ **Is relative to stated irradiance**

Your light IFU should indicate an expected output/irradiance, and this is the manufacturer’s own benchmark for “good” when it comes to their product. Your light test result should be within +/-20% of the manufacturer’s stated irradiance.*

If your stated irradiance isn’t provided in your manufacturer’s IFU, you might not have sufficient information, making it more important to test your light regularly.

If you’re still looking for irradiance values, experts have recommended the following ranges:

500 — 2000 mW/cm².⁸

750 — 2000 mW/cm².⁸

Absolute minimum: 400 mW/cm².⁶

Absolute maximum: 4000 mW/cm².⁷

✓ **Meets your materials’ needs**

Your light cured materials have minimum energy requirements tested by manufacturers to fully cure the material. If your material needs 600 mW/cm² of blue light, your output must meet or exceed this minimum.

✓ **Accounts for distance**

Many restorations are not cured with the light tip in close contact with the material; understand that light disperses more as distance increases, and as a result some lights will need longer curing times to compensate. This can be dramatically improved with a high quality light guide, and is important for those deep posterior restorations where light travels a greater distance to reach the bottom increment and/or with bulk fill materials.

✓ **Does not introduce unnecessary heat**

Heat generation can be a consequence of a high output curing light. You may need to manage heat by breaking up longer curing times into multiple exposures with some breaks in between, particularly when the light is overlapping gingiva or facing a vulnerable pulp chamber. Elevated irradiances may boast a quicker cure, but all materials have a limit on how fast they can cure; exceeding that limit can put the material properties at risk, and heat can cause damage that anesthetized patients feel later.⁹

✓ **Is applied effectively**

A “good” irradiance is only as good as the technique used to apply it. If your light isn’t over your restoration and providing a stable, even, coverage where it’s needed, it isn’t curing your restoration effectively.

*3M™ Elipar™ DeepCure Light Curing Devices should be within -10/+20%.

Illustrative costs in a \$200 filling*

Curing lights may be just a fraction of your overhead, but half of all dental income⁵ relies on the successful use of light-cured dental materials.

* American Dental Association, 2012 Estimates.



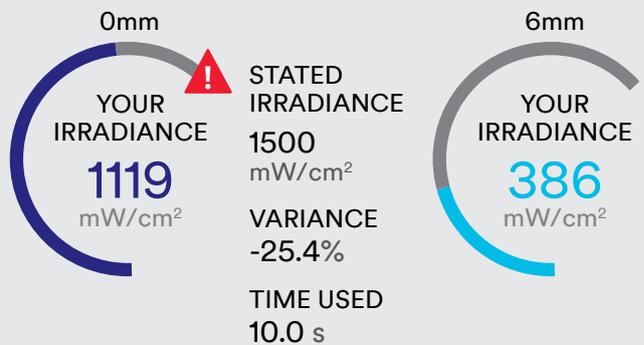
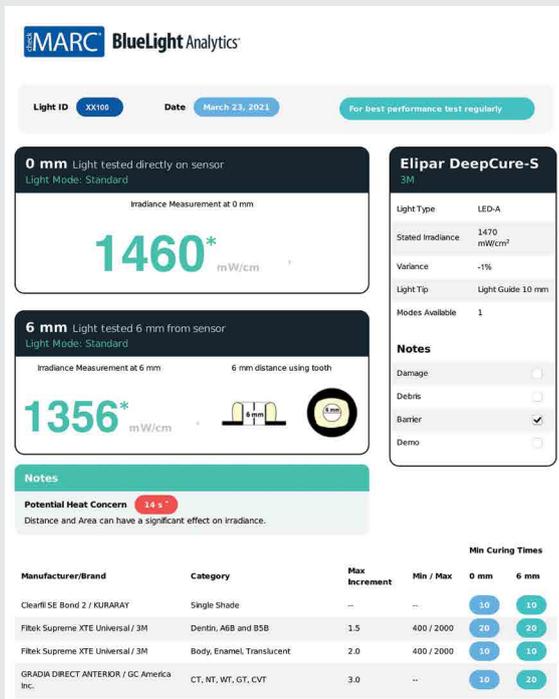
Advantages of the CheckMARC Service

Scientifically accurate

The CheckMARC device is accurate to within 2% of an Integrating Sphere, which is the gold standard in laboratory equipment, according to a study published in the leading scientific journal, Dental Materials¹⁰. CheckMARC takes this accurate measurement and compares it to the curing light manufacturer's specification (the light is just below manufacturer specification in this example).

Clinically relevant

A CheckMARC test provides evidence as to how well a curing light performs when used intra-orally on a larger restoration, (e.g., 6mm diameter), where the surface of the resin composite is at a clinically relevant distance, (e.g., 6mm away from the light tip). The example provided is very common and illustrates that curing light intensity often drops by 50+% over this 6mm distance.



Clinic specific

The CheckMARC report provides minimum curing times for the adhesives and resin composites used in a specific dental clinic. It also warns as to when heat management techniques should be employed. The CheckMARC report can be retained as a reference that the curing light was performing within specification and that the light curing protocols selected by the dentist are aligned with the requirements of the specific dental materials used.

CheckMARC service

You request the test – we'll do the rest. A 3M representative will visit your clinic and work with you to identify evidence-based opportunities to improve clinical outcomes and patient satisfaction.

This NIST-traceable professional service will:

- ✓ Determine the required curing times for your dental materials
- ✓ Test the performance of your curing lights compared to manufacturer specifications and clinically relevant scenarios
- ✓ Evaluate the curing protocols currently in practice
- ✓ Deliver a custom report on curing times, heat management techniques and other insights for you to use as a reference



How does the test work?

- ✓ Spectrometer-based test accurate to within 2% of an Integrating Sphere: the gold standard in laboratory equipment¹⁰
- ✓ Accounts for active diameter, wavelength and saturation for maximum accuracy
- ✓ Calibrated to work with all major lights on the market

Find illuminating answers:

- ✓ How does my curing light perform compared to manufacturer specifications?
- ✓ Can my current light properly cure a larger restoration (e.g. 6mm diameter) when used intraorally at a clinically relevant distance (e.g. 6mm away from the light tip)?

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