Rancang bangun wireless dental LED light curing unit dengan kendali LED berbasis pulse width modulation = Design of wireless dental LED light curing unit width pulse width modulation based LED control

Manalu, Gabriel Anderson, author

Abstrak

Peralatan biomedis yang beredar di Indonesia sebagian besar masih diimpor dari luar negeri, termasuk Dental LED Light Curing Unit (LCU). Padahal kebutuhan akan peralatan biomedis seperti LED LCU selalu meningkat. LED LCU sendiri memiliki sistem kerja yang sederhana, sehingga sangat mungkin untuk menciptakan LED LCU di Indonesia. Penelitian ini berfokus pada realisasi serta evaluasi rancangan wireless dental LED LCU. Wireless dental LED LCU merupakan jenis dental LED LCU yang menggunakan sumber energi baterai sehingga mudah untuk digunakan dalam keadaan apapun. Evaluasi pemilihan frekuensi, duty cycle, serta durasi penyinaran dilakukan setelah melakukan berbagai pengukuran dan pengujian pada penelitan ini.

Beberapa jenis pengukuran dan pengujian yang dilakukan, seperti irradiansi LCU, suhu, kekerasan material hasil polimerisasi serta karakteristik kelistrikan yang semuanya dilakukan terhadap 6 buah LCU dengan 2 jenis LED Dental berbeda. Pulse Width Modulation (PWM) digunakan untuk mengendalikan tingkat irradiansi pada LCU. Hasil akhir rancangan LCU dalam penelitian ini mampu menghasilkan irradiansi lebih dari 800 mW/cm2, suhu tidak lebih dari 50°C, dan harga komponen yang sekitar Rp. 337.000. Rancangan LCU memiliki kinerja yang lebih baik bila dibandingkan dengan LCU komersial yang memiliki rentang harga yang sama, dengan sistem optimal LCU adalah durasi 5 detik dan level duty cycle 0,6 atau 60% yang mampu melakukan polimerisasi resin dental sampai mencapai tingkat kekerasan standar material terpolimerisasi.

.....The biomedical equipment in Indonesia is mostly still being imported from overseas, including a Dental LED Light Curing Unit (LCU). The need for biomedical equipment such as LED LCU is always increasing. LED LCU itself has a simple working system, so it is very possible to create LED LCU in Indonesia. This research focuses on the realization and evaluation of the wireless dental LED LCU. Wireless dental LED LCU is a type of LCU dental LED that uses a battery energy source, so it is easy to use in any condition. Selection evaluation of the frequency, duty cycle, and the irradiation duration is carried out after measurements and test on this research.

In this research, there are several types of measurements and tests carried out, such as LCU irradiance, temperature, the hardness of the polymerized material and electrical characteristics which all are carried out on 6 LCUs with two different types of Dental LEDs. Pulse Width Modulation (PWM) is used to control the level of irradiance at LCU. The final results of the LCU design in this study were able to produce irradiance of more than 800 mW / cm2, a temperature of no more than 50°C, and a component price of around Rp. 337,000. The LCU design has a better performance when compared to commercial LCU which has the same price range, with an optimal LCU system that is 5 seconds in duration and a duty cycle level of 0.6 or 60% that is capable of polymerizing dental resins to the standard hardness level of polymerized material.