

Laser light sources for micro-display illumination

R. Schulz, M. Kühnelt, U. Steegmüller, T. Schwarz
OSRAM Opto Semiconductors GmbH, Leibnizstr. 4, 93055 Regensburg, Germany

Visible lasers light sources could be the enabling technology for a new generation of micro-display based projectors. They promise projection with fully saturated colors, exceptionally wide color gamut and high contrast. Lasers are kind of perfect light sources with extremely low étendue (high brightness) allowing new efficient optical engine designs with even smaller imager diagonals. On the other hand the coherent nature of lasers, eye safety and interference effects need to be treated on system level.

For safety reasons laser front projection applications preferably address low power mobile devices like PDAs, iPods, cell phones and others. Such devices are able to record and playback high resolution images and video data, transmission of mobile TV and mobile internet access. Although suitable for mobile use (portable, cordless, compact), these devices today suffer from a small screen, where resolution and screen size is limited by the size of the actual unit itself. The use of embedded, add-on or accessory projection units may lead to an enlarged “carry-on screen” for handhelds. Mandatory for such applications are optical projection engines with much smaller size and lower power consumption than existing systems. We expect the advent of low lumen projection devices with an output brightness in the range of 10-20Lm in the near future, suitable for projected images with screen diagonals between 10-14 inches. With typical efficiencies for the optical path this leads to required laser powers in the range of 200mW – 300mW per color.

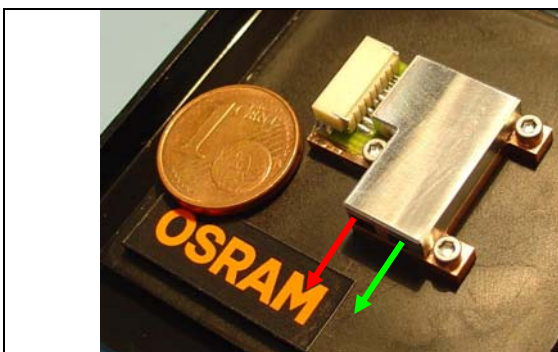


Fig. 1: compact laser prototype containing red and green color



Fig. 2: single color green laser prototype

We designed and built small form factor laser module prototypes (see fig. 1) consisting of a red diode laser and a green frequency doubled laser suitable to illuminate microdisplays. This module can be easily extended to include blue lasers as well. For mobile applications such laser units need to exhibit efficiencies between 10% and 20% from electrical power consumption to optical output power due to limited battery capacity.

In addition, we also built up single color modules (see fig. 2). Due to its low width outline, this package could conveniently be scaled to high output powers by building up an array of individual units. Power scaling is important when considering larger screen diagonals, such as TV or home cinema. The required power levels for this application are in the range of several Watts and free access to the laser beam must be avoided. The requirements for this application differ from the mobile application. Output power is much more important than size and wall-plug-efficiency. But due to the higher power levels thermal management becomes more important.

We greatly acknowledge funding from the European Commission within the project OSIRIS (IST-33799 IP).

[1] U. Steegmüller, M. Kühnelt, H. Unold, T. Schwarz, R. Schulz, F. Singer, “RGB Laser for Mobile Projection Devices”, SID 07 Digest, 3.5