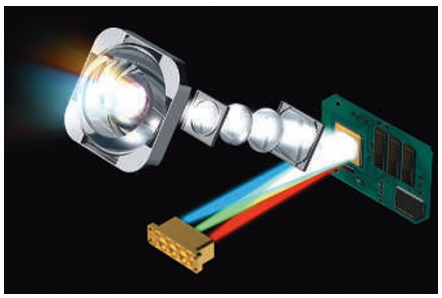
The story behind the screen

Could laser televisions be the next big market opportunity for semiconductor lasers? *Nature Photonics* spoke to Jean-Michel Pelaprat, the chief executive officer of Novalux, a Californian company investigating the idea, to find out.

Tell me about your lasers and the concept of laser television.
Our laser technology is called Necsel. Similar to the technology in CD and DVD players, the lasers are made out of the same semiconductor material — GaAlAs. The major difference is that Necsel is a surface-emitting laser and CD and DVD players use edge-emitting lasers. Conventionally, filtered white-light lamps are used in most display-projection systems. Edge-emitting lasers have not been used for consumer displays because they cannot be produced in green and blue wavelengths and have not been cheap enough. Our approach is to combine Necsel with periodically poled $LiNbO_3$ nonlinear crystal to change the colour emitted from GaAlAs from invisible infrared to three fundamental visible colours — red, green and blue. By using a laser cavity made of glass, we are able to generate high power in these colours. When integrated into a digital-light-processing (DLP) projection engine, for example, these amplified lasers shine on a mirror array containing thousands of micromirrors, each representing a single pixel. By controlling the tilting angles of the mirrors to form 'on' and 'off' signals as fast as thousands of times a second, these mirrors combine the light into new colours of different intensities, leading to a huge gamut of colours. Necsel works equally well with liquid crystal on silicon and the 3-LCD projection engine. Apart from laser television, it can also be used in many projection-display applications, such as mobile phones and digital-cinema projection to name a few.

What makes laser television a better choice?
In a nutshell, it's all about providing a viewing experience that no one has had before. With Necsel technology, laser televisions are able to give more than 90% of the colour range that our eyes can see and in high definition. This range of colour covers the spectrum that, at present, is unavailable from plasma displays and LCDs, whose colour gamut reaches only 40% and 35%, respectively. Unlike these displays, whose colour quality and brightness fade with time, laser televisions are able to give us a very bright, true-to-life and faithful colour presentation from the first day to after more than 50,000 hours of use. Another advantage is the green-labelled environmental issue of power consumption. For instance, a 65-inch plasma television consumes around 850 W, whereas a laser television of the same size needs only 250 W; it has a power-saving capability of almost 75%. Besides, laser televisions are as thin as plasma displays and LCDs, which are about four to six inches thick depending on the size of the screen. Also, as a simple lighting design, laser television has half the weight and half the cost of plasma displays and LCDs with screen sizes greater than 50 inches. For example, only three lasers, one for each colour (red, green and blue), are needed in a 52-inch television. The simple lighting design also offers high scalability to the television size. It can easily scale up to 70-inch, 80-inch and even 100-inch screens.


NOVALUX

Integration of Necsel lasers into a DLP projection engine.

When is laser television going to be commercially available and what features will it have?
A small volume will be available on the market for the Christmas of 2007 and high-volume shipments will begin in spring 2008. Probably, North America will be the first destination to see the commercial products, followed by worldwide deployment. We will enter the market with televisions that have screens of 50 inches and above. Larger screen sizes are mainly for the signage displays in airports and train stations to compete with the monopoly of plasma displays used today. Laser televisions will have the highest resolution so far, with a 1,920 × 1,080-pixel resolution. They will be complemented by a contrast ratio of better than 5,000:1 and a brightness of 600–700 cd m^{-2} for 50-inch and larger screen sizes, which is about 30% to 40% brighter than plasma displays and LCDs. The brightness can be easily scaled up by adding slightly larger Necsel lasers into the configuration. The response time will be in the range of a couple of tens of nanoseconds, which will provide a truly instant 'on' and 'off' switching capability.

What challenges will laser television face in the competitive market?
We envisage that LCDs will probably dominate the market with television sizes of up to 50 inches, and laser television will, over time, lead the market for sizes of 50 inches and above. But, the Necsel laser is a lighting platform. We have recently introduced it, for the very first time, into LCDs as an alternative backlight unit to the current cold-cathode fluorescent-lamp backlighting. The major advantage is again its ability to deliver 90% of the colour content that our eyes can see, compared with 35% from LCDs. Moreover, it potentially reduces more than 30% of the cost of the backlight unit owing to the simple design. Thus, as a lighting-platform provider, we would say that Necsel laser technology will complement plasma-display and LCD technologies in the future.

What are the future applications for Necsel Technology?
We are now focusing on laser television and another application called 'pico projector' for small displays. A year later, we will extend the technology to pocket projectors. Two years from now our aim is to use Necsel as a backlighting unit for LCDs.

Interview by Rachel Won.