

## **DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)**

Modern technology, which is the driving force of our civilization, tends to miniaturization and energy efficiency of everyday use devices. One manifestation of this tendency is the use of the light in many aspects of our lives, for example, to transmit information, to create communication interfaces between humans and devices, in medical diagnostics and in many other areas. This is due to many virtues of the light: speed of the light the greatest possible speed, light beam is not affected by other beams as is the case of electric pulses transmitted by the copper wires. All those properties make light ideal for transmission of information through optical fibres or in the free space. Moreover the specific wavelengths of light can be emitted or absorbed by specific atoms or molecules, which allows their recognition. This fact allows to determine the concentration of specific particles. That mechanism is particularly important for example in detection of specific compounds appearing during disorders in human exhaled air. There is huge amount of lighting applications in modern technology and many of them are related to specific wavelengths.

Let me focus on visible light and green color in particular, which generation is the essence of our proposal. The green light is one of three components of white light. Mixing three colors: blue, red and green generates white light. The phenomenon of this type are used in modern lightning systems, all kinds of flat displays used in TV sets, computers, cell phones, etc. The small size of displaying devices and their high energy efficiency is possible by using LEDs. LEDs emit a specific color under a very broad angle of emission. However, many applications require far narrower angle of emission. Only few construction modifications of LEDs are necessary to fabricate diode laser. However, those modifications can be of high complexity and fabrication of the laser can be significantly hindered as it is in the case of green lasers. Although there is no efficient green laser sources there are clearly defined applications for them: generation of light pulses in flexible plastic optical fiber systems used in airplanes, cars, etc, different kinds of projectors - from pico-projectors used in mobile phones to theater projectors. Green lasers are highly desired in many applications related to medical diagnostics etc.

Specific issues that we want to solve in our project relate to more efficient light generation, formation of efficient waveguide effect and reduction of crosstalk in the case of laser arrays. The green lasers are fabricated of nitride materials: gallium nitride combined with aluminum and indium. For the same material system UV and blue lasers are already successfully used in many applications. Green light emission requires larger amount of indium in the active regions of lasers. Its higher content causes a decrease in the efficiency of light generation. In addition, refractive indices of laser layers manifests lower contrast in the case of green light with respect to blue one. This fact deteriorates waveguide effect which reduces the laser efficiency. We believe that the construction modifications which we propose will solve above mentioned problems and will provide a roadmap for fabrication of green emitting lasers.