

## **Optical Probes for Driver Drowsiness Monitoring**

Road safety is one of the main public health problems. The World Health Organization has in fact estimated that over one million people lose their lives every year in road accidents, with an incidence of around 2% of global mortality in the world.

Among the factors underlying each accident, together with the environment (weather conditions and infrastructure) and the vehicle itself (mechanical characteristics and maintenance), the "human" one is the main cause of a percentage between 20 and 40% of the fatal episodes.

The non-optimal psycho-physical conditions of the driver who, despite tiredness and drowsiness, remains at the wheel, determine the effective reduction of his threshold of attention and lucidity. As a result, the real-time analysis of an individual's state of supervision can be a strategic element to improve road safety.

We present a device whose working principle is based on photoplethysmography (PPG), an optical technique, widely used clinically for the detection of blood oxygenation percentage (oximetry). The device we designed derives the psycho-physical state of the driver from the processing of the sphygmic pulse wave signal detected on the palm of the hand. Placing a few optical probes on the wheel, we can have PPG signal unobtrusively. The technique has been tested with a trial on 90 healthy subjects. The results show clearly that the mood of the driver influence physical parameters that we can easily get from PPG signals.