

Measurements for Risk Analysis and Detecting Hazards by Active Wearables

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Abstract : Intelligent wearables (illuminated vests or hand and foot-bands, smart watches with a laser diode, Bluetooth smart glasses) overflow the market today. They are integrated with complex electronics and are worn very close to the body. Optical measurements and limitation of the maximum light density are needed. Smart watches are equipped with a laser diode or control different body currents. Special glasses generate readable text information that is received via radio transmission. Small high-performance batteries (lithium-ion/polymer) supply the electronics. All these products have been tested and evaluated for risk. These products must, for example, meet the requirements for electromagnetic compatibility as well as the requirements for electromagnetic fields affecting humans or implant wearers. Extensive analyses and measurements were carried out for this purpose. Many users are not aware of these risks. The result of this study should serve as a suggestion to do it better in the future or simply to point out these risks. Commercial LED warning vests, LED hand and foot-bands, illuminated surfaces with inverter (high voltage), flashlights, smart watches, and Bluetooth smart glasses were checked for risks. The luminance, the electromagnetic emissions in the low-frequency as well as in the high-frequency range, audible noises, and nervous flashing frequencies were checked by measurements and analyzed. Rechargeable lithium-ion or lithium-polymer batteries can burn or explode under special conditions like overheating, overcharging, deep discharge or using out of the temperature specification. Some risk analysis becomes necessary. The result of this study is that many smart wearables are worn very close to the body, and an extensive risk analysis becomes necessary. Wearers of active implants like a pacemaker or implantable cardiac defibrillator must be considered. If the wearable electronics include switching regulators or inverter circuits, active medical implants in the near field can be disturbed. A risk analysis is necessary.

Keywords : safety and hazards, electrical safety, EMC, EMF, active medical implants, optical radiation, illuminated warning vest, electric luminescent, hand and head lamps, LED, e-light, safety batteries, light density, optical glare effects

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