Optical detectors are devices used to detect the electromagnetic radiation near of or from the visible spectrum. The large majority of optical detectors are solid state devices but there are also some other types of optical detectors. All of the optical detectors are based on the external or internal photoelectric effect, which means that a photon incident at the surface or that enters in the bulk of the material is able to expel an electron (if it has enough energy) and leave in place a hole (if the material is semiconductor).

A very often encountered type of optical detectors are the **CCD (charged coupled devices)** from which are made the video cameras. The CCD are in fact FET transistors that are connected in series (coupled one after the other). On illumination the resistance of the substrate decreases because of the internal generation of charge carriers and thus additional charge builds up. This charge is then transferred from one FET to another by applying a suitable changing potential to successive FETs. The maximum sensible wavelength is in the visible spectrum (around 500 nm) and the sensitivity is usually very good the some CCDs being able to work almost without light.

Another type of optical detectors (which are made using vacuum tubes not from solid state devices) are the **phototubes**. These tubes have a light sensitive photocathode that emits electrons under illumination (by external photoelectric effect). These electrons emitted are then collected at the anode of the tube by applying a suitable potential. The working potential is some Volts and the current produced (sensitivity) is some micro Amps/W depending on the substance from which is made the photocathode (usually made of cesium antimony). The maximum sensible wavelength is in ultraviolet and they found applications in reading the sound tracks from movies. Their sensitivity is thus very reduced and their applications not so numerous.

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Page 1 of 1

The third type of optical detectors are the **semiconductor detectors used to detect the X and gamma rays**. Some of them work also as particle detectors. They have applications just in X and gamma ray scientific spectrometry and they are usually made of Silicon or Germanium. They are not sensible at all in the visible spectrum and they are engineered to work just to detect a small portion of the electromagnetic spectrum.

There are also many other optical detectors on the market, and each of them has its particular application and detection sensitivity. Among these we can tell the **photodiodes**, the **phototransitors,** the special dedicated **infrared detectors**, etc. Each of them has a special construction that is suitable for its particular applications. For example photodiodes and phototransitors are mainly used as detectors for presence or for threshold conditions.