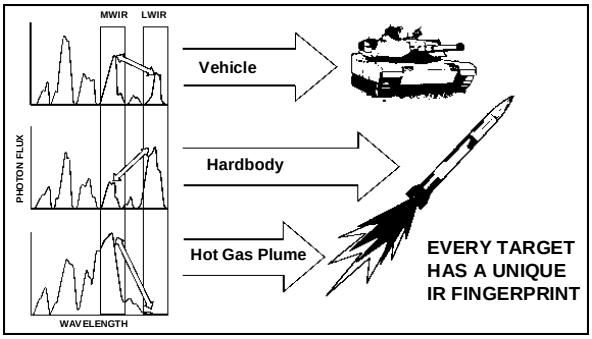
known as Medium Wavelength Infrared (MWIR). Space systems use this band to detect and track objects through booster burn out against an Earth background [Below the Horizon (BTH)]. From 8-14 mm, is an area known as Long Wavelength Infrared (LWIR). The long wave band is used by space sensors to see objects Above the Horizon (ATH) against a cold space background. The final region of the infrared, Very Long Wavelength Infrared (VLWIR), is located beyond 14 mm and typically ends around 30 mm. This band is used to track extremely cold targets against a space background.

Because all heated objects emit infrared radiation, the infrared is an excellent spectral region to use for object detection and tracking. Using an




infrared detector, an object's emitted radiation can be detected, measured and plotted. Since every object has a unique infrared signature or "fingerprint," a positive object identification can be made based on the received energy.

## -- Infrared Detectors --

In order to detect the infrared radiation emitted from heated objects, a material sensitive to infrared radiation is needed. Current space based systems use photon detectors in order to "see" this thermal radiation.

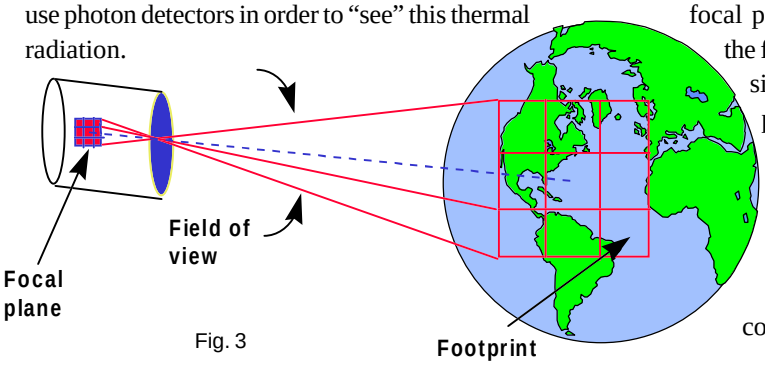
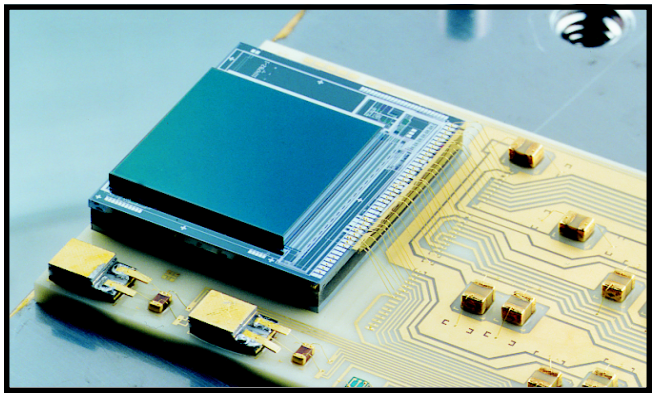



Fig. 3



Basic infrared detector

Photon detectors consist of a semiconducting material that is sensitive to infrared radiation. The radiation consists of energy packets called "photons" that interact directly with the material and generate electrical signals. The detector material is divided into small sections called "pixels," and a detector's resolution is determined by the size, spacing and number of these pixels. The name given to a material segregated into pixels is a "Sensor Chip Assembly."

Today, most SWIR, MWIR, and LWIR detectors are made of either Mercury-Cadmium-Telluride (HgCdTe) or Indium-Antimonide (InSb); however, Silicon (Si) and Germanium (Ge) are still used for VLWIR detectors.

These infrared sensitive materials can be integrated into a larger device called an "infrared sensor system."

## -- Infrared Sensor System --

An infrared sensor system is a collection of optical elements and electronic hardware connected to an infrared detector. The optical elements reflect and focus incident radiation from an object onto a focal plane, and electronic hardware attached to the focal plane is used to "read out" the electrical signals generated by each pixel of the focal plane. Signal processors are used to convert these analog voltage signals into digital images that can be used by a computer to determine which infrared signature(s) the detector is receiving.

On a space based sensor, each detector collects photons from a particular area on the