Portable MM-Wave Sensors for Detecting Contraband Weapon and Explosives: active and passive
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Portable passive W-band sensor

By measuring the thermally radiated and reflected power at millimeter wave frequencies it is possible to ascertain information on concealed objects by a variety of methods. In the context of ‘non-imaging’ sensors this can be by measuring the total power radiated into the sensor, integrated over the entire bandwidth for which the sensor operates. Using this technique, objects concealed under clothing are apparent by their screening effect on the thermal emission from the human body.

The basic detection phases

The schematic of the passive mm-wave sensor

Passive mm wave imager on the programmable Az-El scanner

Reconstructed passive thermal radiation of the human hand

Comparison optical and passive mm-wave images man with the gun


Portable active W-band sensor

A low cost MMW active non-imaging sensor operating in W-band is presented. Experiments demonstrated that both metallic and non-metallic objects (plastics, ceramics, woods, carton, soap, cheese as well as their combinations) were detected at the distance up to 3m. The W-band sensor is based on synchronised amplitude modulated (AM) detector analysing the power back-scattered by a target. Time-gating algorithm combined with the preliminary determined threshold level is suggested to increase the detection probability and to reduce the false alarm rate (FAR).

Simplified block-diagram of the mm-wave sensor based on synchronized detection

Comparison reflected signals from a human body without a gun (a) and with the hidden gun (b).

B. Kapilevich, B. Litvak, M. Einat, Passive mm-wave sensor for in-door and outdoor homeland security applications, IEEE International Conference on Sensor Technologies and Applications, Spain, pp.20-23, 2007

Comparison optical and mm-wave passive images (out-door)

The passive mm-wave image recorded at night period

B. Kapilevich and Einat, "Hand-held device and method for detecting concealed weapons and hidden objects," International Application, patent # 148327, June 18, 2007

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