Paper ID: 28608
oral

66th International Astronautical Congress 2015

EARTH OBSERVATION SYMPOSIUM (B1)
Interactive Presentations (IP)

Author: Dr. Ariela Donval
Israel, adonval@kilolambda.com

OPTICAL POWER CONTROL FILTERS FOR EARTH OBSERVATION SENSORS

Abstract

Earth observation is the gathering of information about planet Earth's physical, chemical and biological systems via remote sensing technologies. In recent years, Earth observation has become technologically more and more sophisticated. Most remote sensing systems (built around cameras, scanners, radiometers, CCD-based detectors, etc.) of various kinds are the most widely used tools for acquiring information about Earth. These normally look at their targets from a distance with imaging systems everywhere, from simple observation and up to very sophisticate warning and offensive systems, with cameras integrated in almost all systems. However, those optical sensors, cameras and imaging systems are susceptible to blindness and/or damages due to high power signal entering their optics. Since the direction of viewing is not always known and can be in certain cases in toward the sun, events of camera blinding due to the sun are very likely to occur. Regulating optical power levels within cameras [ ], requires today an electronic feedback control or offline data processing, which introduces complex and expensive systems. When regulation of light power fails, a blooming effect is created. Sometimes the blooming is such that data is lost and cannot be recovered by any sophisticated software. Other threats such as lasers countermeasures against optics are widely spread in the recent years as well. With the development of more powerful lasers, in some scenarios, laser radiation may seriously interrupt the signal, from transient saturation and can lead to permanent damage. The problem exists in imaging sensors comprising of CCDs and other matrix detectors or other imaging and non-imaging sensors in the visible and the IR range. Smart protection is needed, a filter that is transparent for low input intensities and limit or block the high input intensities, and is effective over a wide band of wavelengths. This paper presents a family of non-linear, solid-state passive wideband optical protection filters. These filters have advantages over fixed spectral filters, which permanently block only specific wavelengths, the wideband filter is transparent at all wavelengths until it is hit by damaging light. At input powers below threshold, the filter has high transmission over the whole spectral band. However, when the input power exceeds the threshold power, transmission is decreased dramatically. We present a novel technology for protection of any imaging system, sensors and the human eye against laser threats as well as sun blindness from the visible and up to the infrared (IR).