Introduction to Active imaging

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Introduction

One of the most common ways of categorizing imaging systems is to consider whether they are “active” or “passive”. Standard night vision systems are based on thermal or intensified cameras and usually operate as passive systems. This means that the system does not send out any energy, but only act as a receiver. This energy, which could be emitted by warm bodies or ambient light reflected from the objects, is then concentrated on the detector.

On the other hand, when using a light source to illuminate a target and collect the reflection from an object, the camera becomes an active system. In this case, the camera can acquire imagery, day and night, in various lighting conditions.

The majority of night vision systems are passive. To operate adequately, intensified cameras require moonlight or ambient light sources. Active systems do not require ambient light to perform adequately, as are all radar devices, LIDAR systems, and the ARGC-2400 camera.

Obzerv’s innovative night vision systems are based on two core technologies: range gating and the DALIS™ illuminator.

Range Gating Technology

Obzerv’s active imaging systems incorporate range-gating technology, also known as time gating technology.

The range gating technology combines two key components: a pulsed laser beam (the DALIS™ illuminator) and a specially designed camera intensifier that opens and closes at very high speeds.

Here is how we can illustrate range-gating technology: A laser pulse is sent toward the target; when the reflection is back from the target, the integrated high-speed electronic shutter will turn on at just the right instant. Gating technology lets operators select a specific slice of space, so they view the target site, minus parasitic lights and backscattering from aerosol particles. Intense parasitic lighting in the field of view is never a problem, thanks to range-gating technology and laser illumination. By selecting a gate width (slice of space that is narrow enough), Obzerv improves the signal to noise ratio significantly.

Details of the principle of operation

_ At t_0 , a laser pulse is emitted(while the camera is closed)
_ At t_1, the laser pulse is reflected by the targeted object
_ At t_2, the camera is opened for a short period (Δt) corresponding to the desired depth of view

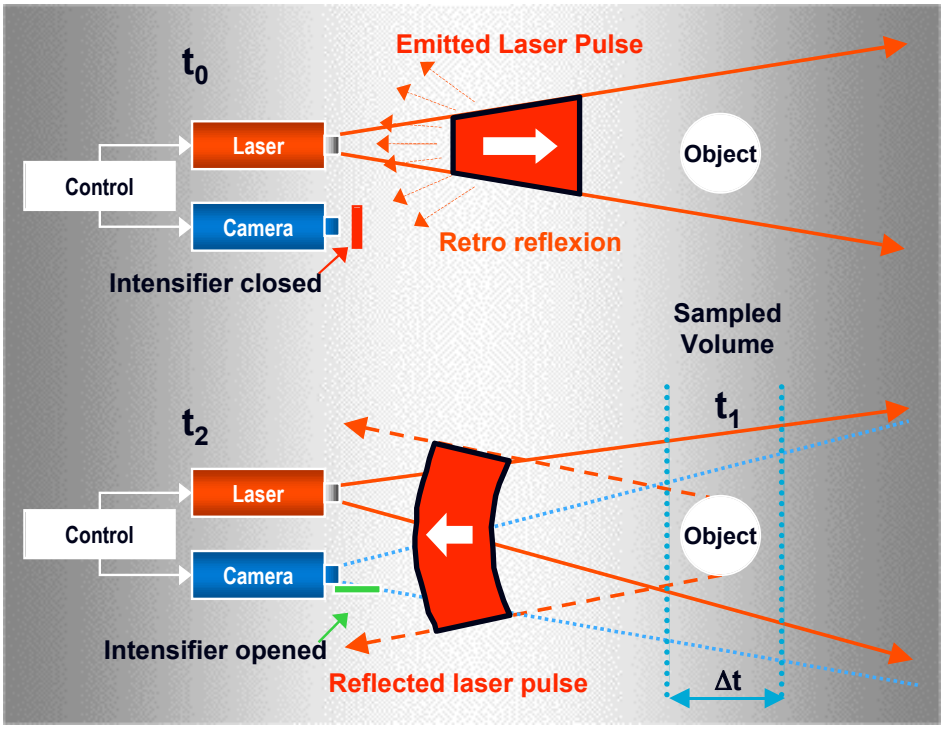

Figure 1. Diagram of the range gating technology

Excess Light Never A Problem

Interference from strong parasitic light or water vapor from rain, fog, or snow (which can reflect the illuminator laser beam in front of the selected scene) is greatly reduced. This is the result of the synchronization between the light source and the camera sensor. The camera is perfectly synchronized with the laser pulse. If the laser pulse is reflected back by snow or fog particles, these reflections will arrive too early at the camera while the shutter is closed. Since the sensor is turned off most of the time, the camera is not affected by parasitic light sources.

The result: the light from the pulsed laser in the camera cuts through bad weather and obstacles such as glass more cleanly than any other night vision technology on the market. The Obzerv camera is never blinded by parasitic light, unlike intensified cameras.

DALIS™ Laser Source Technology

The heart of the DALIS™ laser source is its patented collimation technology. With it, we're able to produce extremely powerful and efficient illuminators that deliver uniform beams. These properties are essential for illuminating objects at a distance and for generating high-quality images.

The DALIS™ laser source developed by INO for integration into active imaging systems provide the best performance for long-range image quality. Existing laser sources lack the power and beam uniformity to produce images with the quality needed to gather legal evidence.

DALIS™ Benefits

- Power and pulse capacity: surveillance in difficult weather conditions and significant reduction of parasitic light.
- Exclusive laser source: outperform competing products in image quality and range.
- Operating wavelength: See-through glass capacity and affordable telescopes (unlike thermal imagers that require specialized telescopes made of exotic material).

Difficult Light Conditions

Through range-gated technologies, Obzerv systems can allow efficient surveillance in difficult lighting conditions when other technologies have difficulties, particularly with parasitic light sources or contrasted lighting conditions.

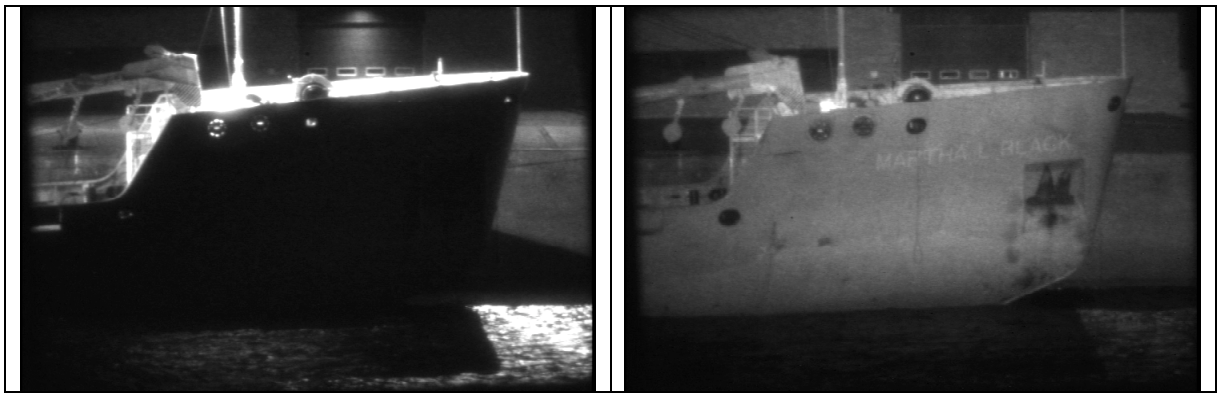

Figure 2. Comparison of intensified camera with active imaging camera.

The image on the left was captured from a top of the line, intensified camera (GEN III Omni 4) while looking at the "Martha L. Black" at 1.4 km. The image on the right was

captured from an Active Imaging camera. It is worth noticing the uniform image brightness, the lettering and details off the hull.

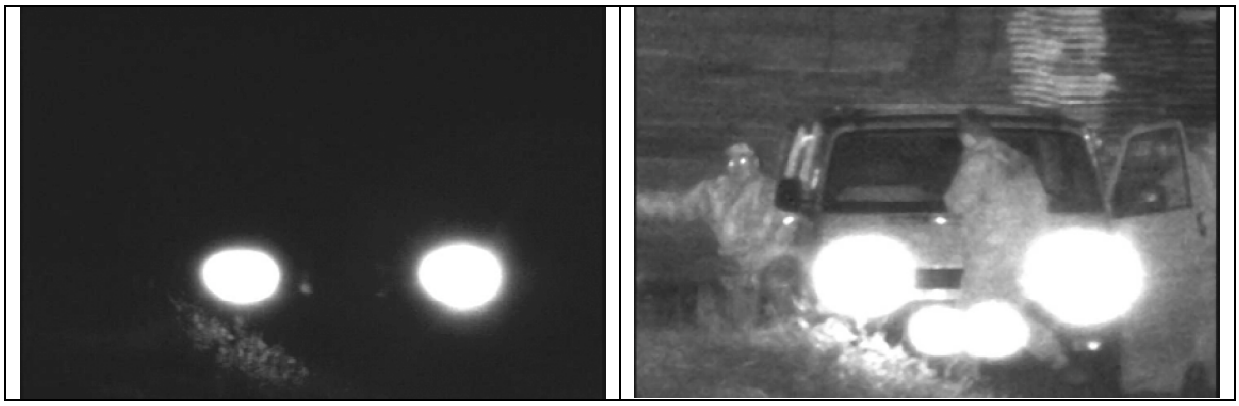

Figure 3. Comparison of intensified camera with active imaging camera.

The image on the left was captured from an intensified camera (GEN III Omni 4) while looking at a minivan at 750 meters with the headlights turned on and people walking around. The image on the right was captured from an Active Imaging camera. Despite the headlights being turned on, it is very easy to identify the movement and activities of the individuals.

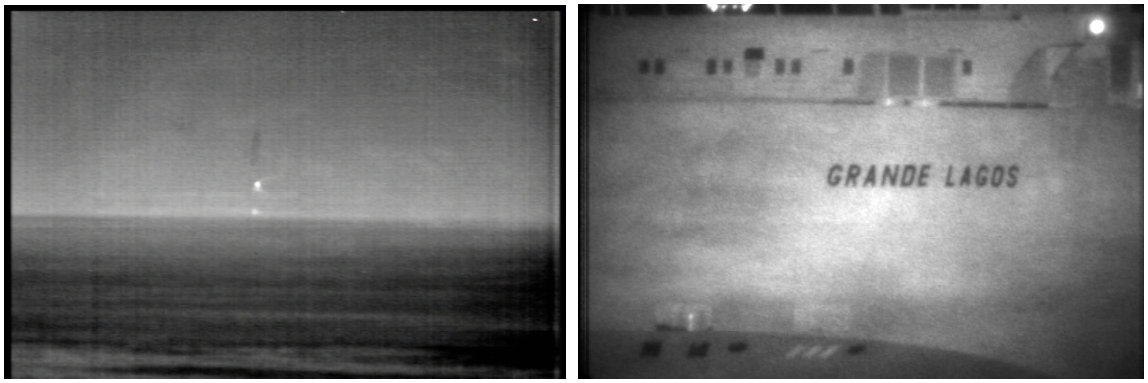

Figure 4. Comparison of thermal camera with active imaging camera. 6.4 km.

At 6.4 km, the first image on the left comes from a Thermal camera using an *f*/1, 200 mm length lens. The chimney and the profile of the ship can be seen. The second image was taken with Obzerv's range gated camera. 17-inch letters can easily be read.

See through glass

For surveillance and identification purposes, it is essential to be able to see as far as possible. As an example, if individuals sit inside a vehicle, seeing through glass becomes a significant advantage, which thermal imaging cannot deliver.

Figure 4. Observation through glass.

At 750 meters, with headlights turned on, it is possible to watch individuals sitting inside a car through the windshield. Here, we see an individual in the driver seat and another sitting at the back. Note the high return from the eyes of each person.

Degraded weather Conditions

Obzerv's range-gated technology is also critical for improving performance through weather conditions like snow, rain, dust, and fog. The following sequence of images is an example of the capacity of the gated system to reject annoyances caused by conventional lighting. This capability makes a tremendous difference for being able to maintain adequate surveillance during adverse weather conditions.

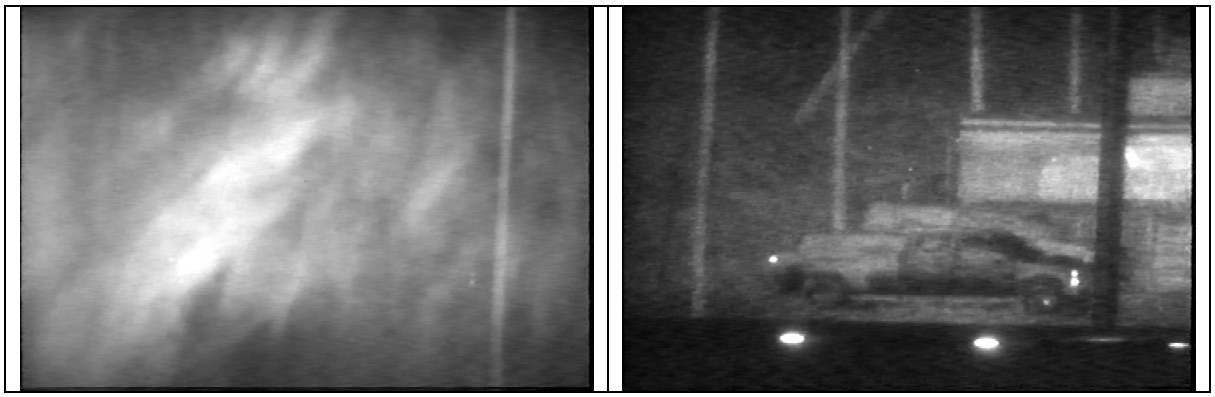

Figure 5. Observation in bad weather.
Looking at vehicles at 500 meters during a snowfall produced the above images. On the left, a CW non-gated active imaging system, which dazzles itself from the reflection of the falling snow. On the right, Obzerv's active range gated imaging removes those reflections and allows observation of the desired target.

The ARGC-2400 active range-gated system takes advantage of a series of cutting-edge technologies developed and integrated by OBZERV Technologies. Key features include the range gating technology and the DALIS™ illuminator with a near-infrared laser beam. Also included is a high magnification continuous motorized zoom telescope (60 to 240 magnification) and an intuitive user-friendly interface. Moreover, accessories like an aiming telescope, a laser range finder, a color CCD camera and a GPS facilitate operations and supply critical data in real time on the touch screen monitor and video recorder for further analysis or evidence.