

Project Objective

We need to re-write a new project objective for this page.

About Infiniti

Infiniti Electro-Optics combines the most advanced infrared electro-optics and video surveillance technologies to create customized solutions for high-end surveillance, perimeter defense, and 24/7 threat detection. We work with MWIR & LWIR thermal infrared imaging, ZLID laser illumination, SWIR, HD long-range visible and NIR imaging, gyro stabilization, radar integration, and more.

Most companies only offer fixed configuration solutions, however, because of the high cost and complexity of these technologies, we prefer to custom-build complete end-to-end solutions based directly on the customer's specifications and budget. This ensures the customer is getting the best value solution for their budget as they are not paying for features they do not need.

Marketing of products in this industry can be misleading when it comes to the performance of the products. Often decisions are made based on best-use-scenario specifications without considering how that performance will change in the project environment. We believe in providing an effective and honest solution and are wholeheartedly committed to the quality and performance of our products in your specific situation.

Infiniti Electro-Optics is a division of Ascendent Technology Group Inc., a manufacturer of CCTV cameras, PC-based DVRs/NVRs and IR night vision cameras founded in 2000. In 2008, Ascendent was one of the pioneers in long-range IR laser illumination when they released ZLID technology integrated into a turnkey PTZ system. Due to growth and demand for long-range EO/IR cameras, in 2011 Ascendent realized the need for a focused division specifically dedicated to R&D, support, and production of long-range electro-optics, and Infiniti Electro-Optics was created.

Infiniti has produced some of the highest quality and longest range electro-optics systems, including systems with 1200mm cooled thermal, 5500mm visible/IR lens, 5km ZLID illumination and Elliptical Synchronous Drive pan tilt systems with advanced gyro stabilization. We have worked on numerous military, MOD, marine, and critical infrastructure projects, and sold systems to over half of the top ten US defense contractors. Our camera systems have endured some of the harshest environments, with deployment by the US military in desert, marine and arctic conditions.

Some of our clients have included:

- › US Navy
- › US Army
- › US Police
- › MOD Vietnam
- › MOD Indonesia
- › Thailand Army
- › Morocco Military
- › South Korea Navy
- › Special Forces Vietnam
- › Shell Oil Rigs
- › Australian Consulate
- › RCMP (Royal Canadian Mounted Police)
- › CBSA (Canada Border Services Agency)
- › Army South Africa
- › US Border
- › South Korea Border
- › BAE Systems
- › SAIC
- › Leidos
- › Thales Group
- › Northrop Grumman
- › Sperry Marine
- › Lockheed Martin
- › Raytheon
- › General Dynamics

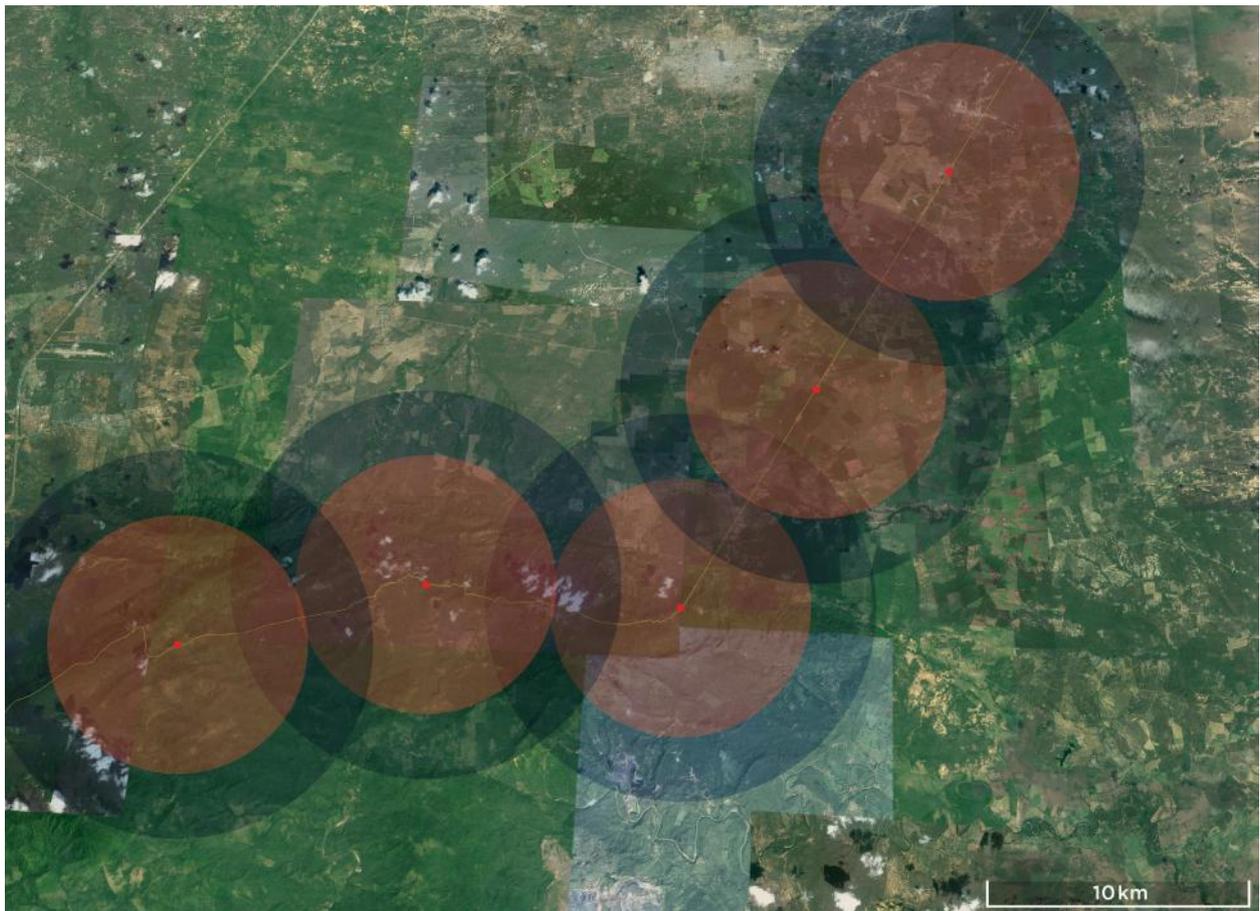
Proposed System

Our EO/IR PTZ camera systems with integrated ground surveillance radar are capable of covering up to 1200km² of vehicle detection and 300km² of human detection. The system can also be integrated with other surveillance measures, for example relaying GPS information of targets for automated drone deployment.

Option 1:

We propose 35m towers placed roughly 10km apart. (Note that detection of targets requires line of sight; in mountainous terrain more frequent towers may be needed.) Each tower would be topped with an Infiniti Viper PTZ camera system configured with a 2050mm NIR/visible camera, 5km ZLID illumination system and 10km radar.

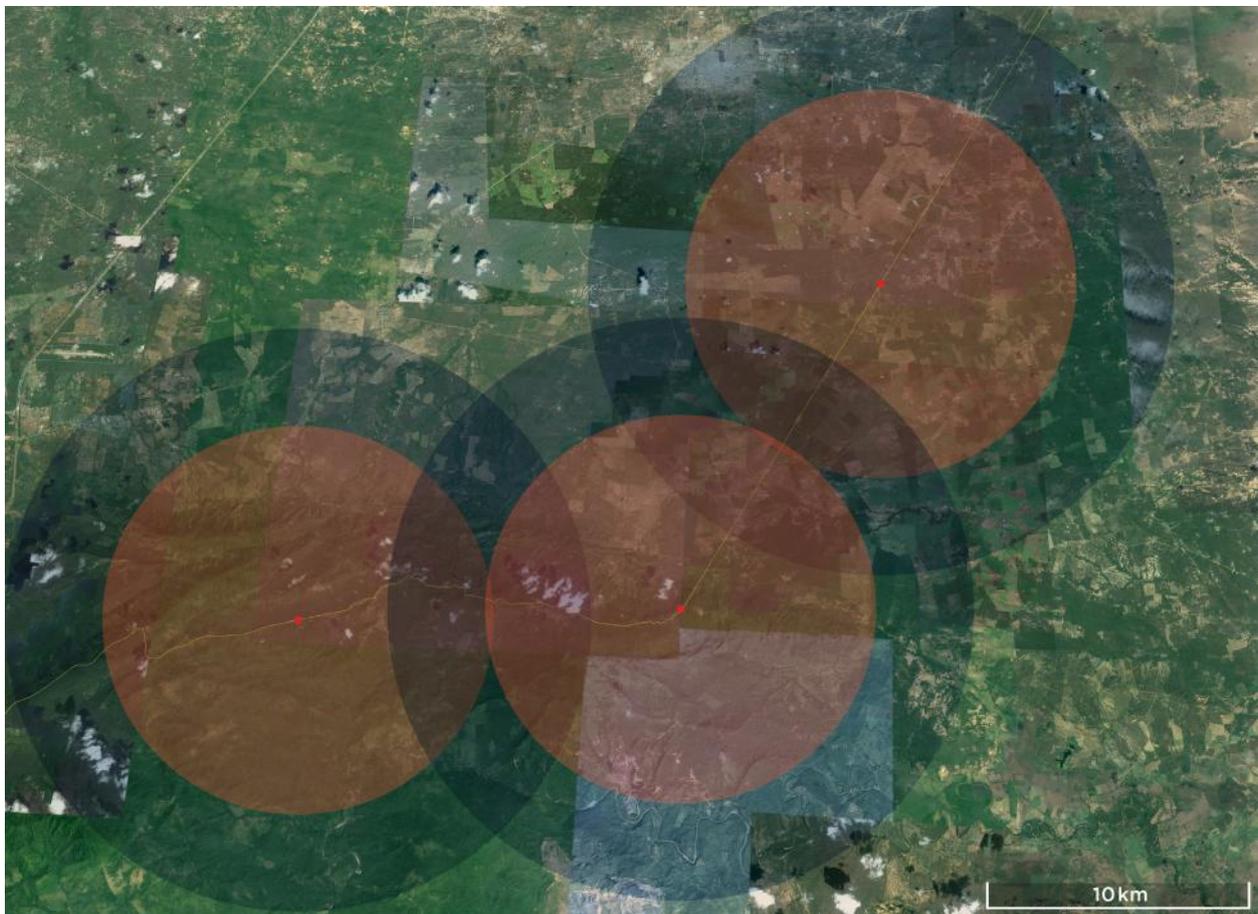
The radar is capable of detecting humans at a 5km radius (half-way to the next tower). The visible camera at full zoom will show a human 5km away at 20% of the height of the screen height (230px high).



Option 2:

We propose 35m towers placed roughly 15km apart. (Note that detection of targets requires line of sight; in mountainous terrain more frequent towers may be needed.) Each tower would be topped with an Infiniti Viper PTZ camera system configured with a 2050mm NIR/visible camera, 715mm cooled thermal camera, and 20km radar.

The radar is capable of detecting humans at a 10km radius (over half-way to the next tower). The visible camera at full zoom will show a human 7.5km away (half-way to the next tower) at 14% of the screen height (154px high). The cooled thermal camera at full zoom will show a human 7.5km away at 2% of the screen height (10px high).



Maximum Zoom FOV Simulations

Option 1:

Human height @ 5km would be 21% of the vertical field-of-view in both visible and NIR.

Vehicle width @ 5km would be 16% of the horizontal field-of-view in both visible and NIR.



Option 2:

Human height @ 7.5km would be 21% of the vertical field-of-view in visible and 2% of the vertical field-of-view in thermal.

Vehicle width @ 7.5km would be 11% of the horizontal field-of-view in visible and 2% of the horizontal field-of-view in thermal.



Tower Equipment Recommendations

Other equipment on the tower would consist of the following:

IP Radio

With a range of km and bandwidth of Mbps, this radio can wirelessly transmit live video from the cameras and information from the radar to a central monitoring location. (Note that a wireless connection requires line-of-sight to the receiver.)

4 IP Cameras

These four 6MP IP Cameras mounted around the bottom of the tower will provide 24MP of 360° coverage to ensure that the blind spot of the radar and PTZ camera are being monitored 24/7.

NVR/Encoder

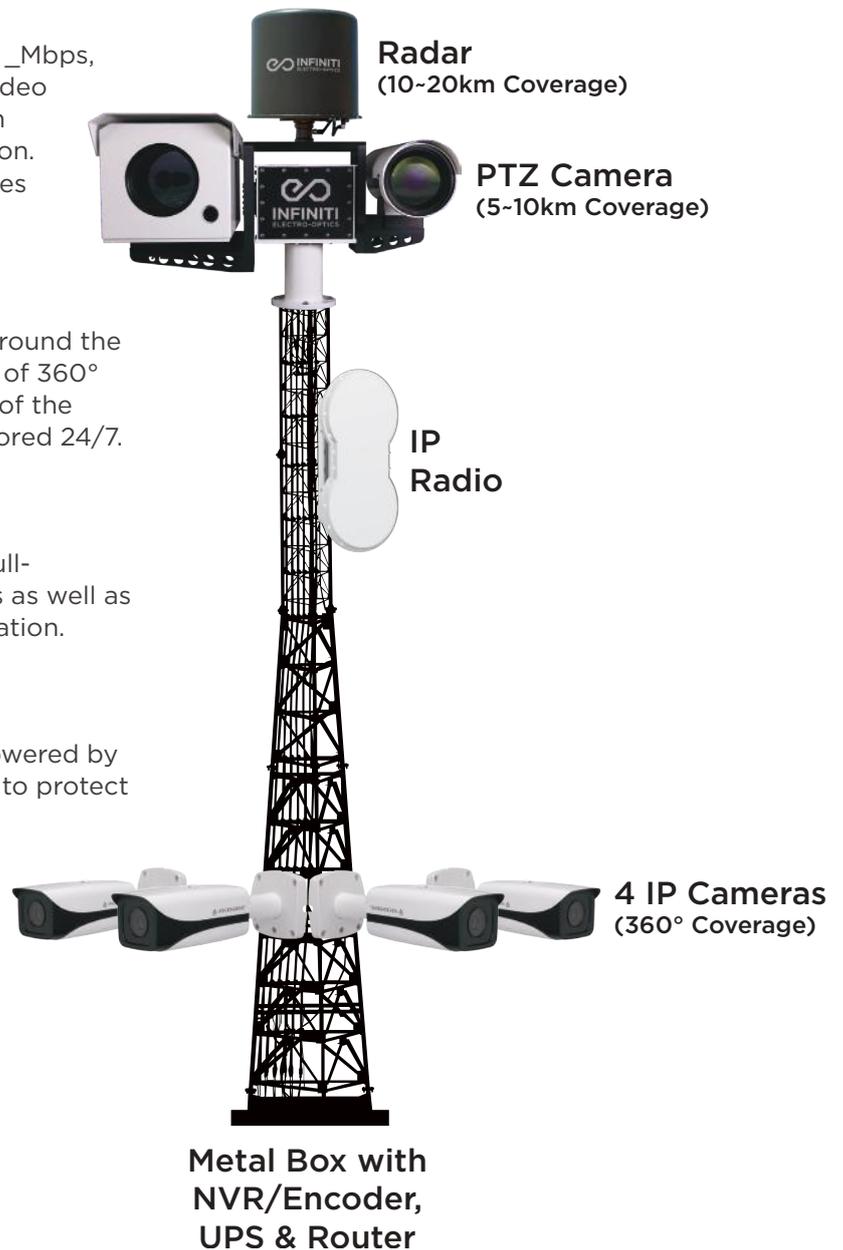
The NVR and encoder will record the full-resolution video feeds from all cameras as well as stream the video to the monitoring location.

UPS

Infiniti requires that all equipment is powered by an uninterruptible power supply (UPS) to protect from power surges and interruptions.

Router

Connects all IP protects together.



VPR-2050-128-715-CTZ-GS

THE VIPER

INFINITI

Long Range Camera



Key Features:

- › Turn-key long-range military grade multi-sensor system
- › Multi-Sensor payload: HD visible & thermal infrared
- › Day/Night 1080p HD IP ONVIF 1/2.8" or 1/1.8" CMOS sensor
- › 16-2050mm Zoom Lens (with motorized 2x doubler)
- › 128X zoom range for an incredible 19°-0.15° field of view
- › Auto focus and motorized fog/parasitic light filter
- › Image enhancements: DWDR, HLC, ROI, EIS, 3DNR, Fog/Haze
- › Color: 0.06 Lux; B&W: 0.005 Lux (0 Lux with IR ZLID)
- › 640x480 15µm, 30Hz real-time InSb cooled thermal imager
- › 35-715mm auto-focus germanium thermal lens
- › Cooled thermal sensor provides extremely sharp thermal imagery
- › Up to 27km of human detection and 45km of vehicle detection*
- › Rugged -40°-+60°C and IP67 sealed with anti-corrosion finish
- › Elliptical Synchronous Drive pan tilt for unparalleled positioning
- › Endless 360° rotation with speeds up to 70°/s and 0.00025° resolution
- › State of the art 2-axis gyro stabilization & EIS DSP image stabilization
- › Meets and exceeds MIL-STD-810F for shock and vibration
- › EMI MIL-STD-461E for electromagnetic interference

HFOV at 25km:

- › Thermal Lens at 715mm: 335m wide field of view
- › Visible Lens at 2050mm: 66m wide field of view

Notes: Components can be upgraded or replaced without returning whole system. Spare components can be purchased to keep things operational when cooled thermal is being repaired (every 9,000-12,000 hours).

1080p
FULL HD

High Definition Visible/NIR Sensor

128X
ZOOM

16-2050mm Zoom Lens

COOLED
InSb
THERMAL

Cooled Thermal

20X
Ge ZOOM

Thermal Zoom Lens

PTZ

PTZ Controls

MIL-STD 810F

Military Grade Protection

*DRI detection ratings are based on industry-wide standards (Johnson's Criteria) that should be fully understood for proper expectations. For more information, please see our whitepaper about understanding DRI measurements.

THE VIPER'S
HD Visible Camera
 with **ZLID**



Visible/NIR Optical HD Camera

The Viper's visible camera was designed and optimized for long range surveillance. It uses a 1/2.8" progressive scan CMOS sensor with an HD resolution of 1920x1080 and a fantastic signal to noise ratio of 55dB. The 1/2.8" sensor has excellent spectral sensitivity for both visible and NIR wavelengths and features an automatic IR cut filter, making it a true day/night camera providing clear color images by day and black and white images at night. The 1/2.8" sensor provides the best balance between light sensitivity and maximum zoom, making it particularly suited for long range surveillance. The Viper also integrates the latest technology in real-time image processing such as BLC, HLC, DWDR, EIS, ROI, 3D DNR, ABF, Defog/Haze etc. Each of these image enhancements can be automatic or user-defined and calibrated based on the application requirements. Since the camera is native IP, all of these settings can be changed and configured remotely, along with remote PTZ and zoom control.

Long Range 128X Zoom Lens

The Viper comes equipped with a precision engineered 16-1025mm IR-corrected continuous zoom lens with motorized HD doubler, offering an incredible 128X zoom range from 19° through to a very narrow 0.15° FOV when paired with the 1/2.8" sensor. That's equivalent to a "full-frame" DSLR camera using a 13,500mm lens! Infiniti's zoom optics are built with the highest quality Japanese fluorite ELD low dispersion glass, and the integrated rapid auto focus allows long range recognition and identification of targets without operator intervention. The lens also incorporates a motorized fog filter that is used with the camera's monochrome mode and de-haze image processing to see through fog, smoke, smog and haze that render standard optical cameras unusable. Infiniti's HD Zoom camera is a perfect synergy between precision craftsmanship, state of the art sensor hardware and the latest image processing for unparalleled range and performance.

1-5km IR ZLID Laser Illumination (Optional)

Many laser illuminators overexpose the center of the screen and leave the edges dark. Our laser has an adjustable 0.5° to 19.5° angle of view, and Infiniti's ZLID (Zoom Laser IR Diode) technology synchronizes IR intensity and area illumination with the zoom lens for outstanding active IR performance, eliminating over-exposure, washout, and hot-spots for clear images in complete darkness. An optional LRF is also available that can automatically turn off the laser if an object is detected within 95m of the active ZLID.



no Fog Filter



with Fog Filter



See through windows with ZLID



Ship at night with ZLID



THE VIPER'S Thermal Imager



See It All

Infiniti's cooled thermal cameras let you see further than any other night vision technology, using heat rather than light to see objects. This cooled thermal imaging camera is equipped with a midwave, cooled Indium Antimonide (InSb) detector, producing ultra-sharp thermal images of 640x480 pixels. This will satisfy users that want to see the smallest of details and demand the best possible image quality. It allows the user to see more detail and detect smaller objects from a further distance. Coupled with a high sensitivity, and leading germanium optics, this camera offers extreme long-range performance and excellent image quality.



Cooled InSb Thermal Imager

The Viper contains a high sensitivity 15µm cooled InSb sensor with a resolution of 640x480 and an ultra-long cooler lifetime of 20,000 hours. The cooled sensor is able to detect differences in temperature as small as ±0.025°C, providing more detail for tracking of targets at extreme ranges in total darkness and through most obscurants, with performance on par with 1500mm thermal systems.



20X Continuous Zoom Germanium Lens

The cooled InSb thermal core is paired with a precision-engineered f/4.0 germanium zoom lens allowing you to view targets with a 20X optical zoom range from 35mm to 715mm. This allows for long-range detection of thermal targets by offering anything from a 15.6° to 0.8° field of view. These lenses also feature auto focus capabilities, delivering crisp, clear images even when adjusting zoom, ensuring optimal performance and situational awareness in the wide field of view and crisp details in the narrow field of view.



Extreme Long Range Detection

The Viper is a Mid-Wave Infrared (MWIR) thermal camera which means it operates on 3,000nm-5,000nm wavelengths where terrestrial temperature targets emit most of their infrared energy. Using the built-in Digital Detail Enhancement (DDE) for increased contrast and image clarity, this system is capable of detecting vehicles up to 45km away.* While thermal is a significant investment, its superior range and performance allows it to replace and outperform all other solutions, making it a viable option for many applications.

DRI Ranges:

27km
Human Detection*

45km
Vehicle Detection*

*DRI detection ratings are based on industry-wide standards (Johnson's Criteria) that should be fully understood for proper expectations. For more information, please see our whitepaper about understanding DRI measurements.



THE VIPER'S Other Features

Elliptical Synchronous Drive P/T Positioner

The Viper has a weapons systems grade positioner designed for military applications and is able to withstand shock and vibration for use on tanks and navy vessels. The pan tilt implements an Elliptical Synchronous Drive for high torque to handle large payloads while providing micro steps as precise as 0.00025° for smooth manual control or automatic slew to cue tracking when used with Video Analytics, VTMS systems, Radar, AIS and weapon systems. The integrated multi-axis gyro stabilization uses a high-rate MEMS gyro in combination with the pan/tilt to mechanically stabilize the payload, reducing the effects of vibration, oscillation, pitch and roll for unparalleled stabilization on tanks, humvees, assault vehicles and more.

Intuitive And User Friendly

While the Viper is an extremely sophisticated multi-sensor system it is also a user friendly plug-and-play solution controllable by touch screen, mouse, VMS systems, DVR/NVR or 3-axis joystick. This allows the Viper to be operated by any individual with little or no training and ensures compatibility with new and existing equipment.

Rugged And Robust

The Viper is comprised of military grade, precision engineered components and manufactured using unique processes to offer absolute performance. It uses a military style connector to supply power, video, and communication over a single cable and does not require a junction box or external electronics of any kind, increasing reliability and the amount of time required to install the system. The entire system is designed for the most demanding mobile applications. It is MIL-STD-810F/G tested and certified and is sealed to a minimum of IP66 making it water and dust proof. Its internal heater/blower allows it to operate in conditions from -40°C to +60°C and both the pan/tilt and enclosure use a tough anti corrosion finish for continued operation in the most brutal and harsh climatic conditions.

Remote Connectivity

The Viper is an IP system that allows you to instantly and remotely connect, and control it through the internet in real-time from anywhere in the world using Ascendent Remote Management Software (ARMS) on your laptop, iPhone, or Android device. For remote or mobile applications Internet bandwidth is often limited, which why our DVRs, NVRs and IP cameras can record at one resolution and stream at another. Our web client also allows you to change your settings, update firmware and activate image enhancements in real time even including backfocus lens adjustment.



Gyro Stabilized



Voltage Regulation



Military Connectors



Military Grade & IP66



Radar Integration

OPTIONAL ACCESSORIES:



PTZ Controller



LRF (up to 20km range)



Blindmate Connectors



Rapid Deployment Kit

GSR-360-10KM
RADAR

INFINITI

Ground Surveillance Radar



Infiniti's GSR-360-10km Ground Surveillance Radar uses the latest generation pulse-Doppler solid state technology to provide complete 360° coverage for 24/7 day night situational awareness with up to 1200km² of vehicle detection and 300km² of human detection. Infiniti GSR series are military-grade commercially available high performance ground & marine surveillance radar. All of this comes in small, rugged IP67 lightweight package, making it ideal for tower, mast, shipboard and mobile deployment.

Key Features:

- › High-performance military-grade GSR (Ground Surveillance Radar)
- › 360° long-range (up to 1200km²) radar with high refresh rate
- › K_u pulse-based (HD) radar technology reduces clutter and false alarms
- › 24/7 day/night detection even in climatic weather and through light foliage and camo nets
- › Provides speed, size, bearing, and GPS position of all moving targets
- › Customized zones of interest with user-defined alerts and responses
- › Embedded high-performance analytics and target tracker
- › Slew-to-cue auto-tracking with thermal and visible EO/IR PTZ cameras
- › Detects a moving vehicle up to 20km away and people up to 10km away
- › Reduced SWaP design: less than 20kg and less than 100W
- › Rugged military grade IP67 sealed enclosure, rated for -40°-+60°C
- › Solid state radar requires no regular maintenance
- › IP digital system for operation over wired or wireless networks
- › SDK for integration with C2, VMS, PIDS and other third party systems

Applications:

- › Force protection military compound
- › Rapid deployment man portable and mast
- › Critical infrastructure protection
- › Perimeter security and oil & gas pipelines
- › Border surveillance & homeland security
- › Wide area situational awareness & threat detection



K_u Band Solid State Radar



20km Vehicle Detection



GPS Target Positioning



STC Slew-to-cue Integration



IP67 Fully Weatherproof



Mobile Portability



No ITAR Restrictions

THE GSR'S Advanced Technology



The GSR uses the latest K_u pulse-Doppler technology that has been optimized for long range detection even when targets are moving very slowly to avoid detection. The K_u band utilizes 12-18 GHz microwaves resulting in superior range compared to traditional C and X-band radars and is very resistant to radar clutter for low false alarm rates. The GSR will function even in bad weather and through light foliage like tall grass, camo nets etc, to detect targets that would be invisible using imaging technologies such as Thermal, visible, SWIR, NIR, NVG etc. Its solid state design has a number of advantages over legacy megatron systems, such as maintenance requirements. Megatron systems require costly maintenance every 3,000-8,000 hours compared with up to 35,000 hours of lifetime for solid state, making it vastly superior in both reliability and cost of ownership.

360 Degree Situational Awareness

The GSR provides 360° panoramic situational awareness and long-range target detection making it the ideal solution for covering large areas for applications like critical infrastructure protection, border surveillance, perimeter security and mobile force protection. The GSR-360 can detect vehicles up to 20km away and humans up to 10km away, allowing a single radar to cover an area of over 300-1200km².

Intelligent Embedded Radar Processing

Not only does the GRS-360 boast long-range detection, it also has built-in processing and analytics that provide detailed information on the target, such as size, speed, bearing and GPS position. The radar processor can track targets in its view simultaneously with a target discrimination of 4.8m and range accuracy of 9.5m. No third-party target extractor or radar processor is required. The GSR also supports user-defined zones of interest and exclusions that allow for automated monitoring or customized events and triggers. With this operator assisted operation, a 1- or 2-person team is able to manage many sites.

Auto-Tracking Slew to Cue Camera

The GSR-360 can either be used as a standalone solution or it can be integrated with long-range EO/IR thermal and visible zoom cameras. Targets picked up by the radar that are in zones of interest or want to be investigated by an operator can be automatically centered on the target to provide recognition and identification. The GSR will provide real time GPS coordinates to the PTZ cameras for automated tracking of targets, so that if a target moves out of range of one camera it can be picked up by the next camera, providing seamless target recognition and identification day or night.

Detection Ranges:

1.2km
Drone Detection*

5km
Human Detection*

10km
Vehicle Detection*

*Detection ranges based on RCS values of 0.1m² for drone, 1m² for human and 10m² for vehicle.

THE GSR'S Options

Rugged Rapid Deployment

The GSR is a complete plug-and-play turnkey solution that combines radar, antenna, rotator and processing in a small, light weight and low profile self-contained system that can be set up in minutes. The internal scanner and rotator are weather protected and IP67 sealed. It is SWaP rated, meaning it has a small size, weight and power draw. It is also rugged and designed for rigors of military use in extreme weather (-40°~+65°C) from dessert to arctic resulting in a solution that is versatile and portable without sacrificing performance.

IP Digital format

The GSR-360 is completely digital solution that communicates using TCIP over RJ45 LAN or WAN (wired or wireless) network. This future-friendly design streamlines the integration and installation process with C2 softwares, PTZ cameras and other third party solutions for new installations or upgrades of existing systems.



GSR-360-10KM

Specifications

| Signal | | |
|--|----------------------------------|--------------|
| Operation Frequency | Ku Band | |
| Waveforms | LFM Coherent Pulse, Single Pulse | |
| Signal Processing | Pulse Compression, Pulse-Doppler | |
| Performance | GSR-360-10KM | GSR-360-20KM |
| Human Detection Range (1m ² RCS) | 5km | 10km |
| Vehicle Detection Range (10m ² RCS) | 11km | 20km |
| Detection Probability | 96% | |
| False Alarm Probability | 10 ^{-3.8} | |
| Range Resolution | 9.8m | |
| Range Accuracy | 5.2m | |
| Azimuth | 3.2° | |
| Azimuth Accuracy | 1.6° | |
| General | | |
| Power Supply | 24V DC, 220V AC | |
| Power Consumption | 105W | |
| Weight | 18.5kg | |
| Dimensions | 385mm × 325mm | |
| Environmental Certifications | IP67 | |

*Specifications subject to change.

INFINITI WHITEPAPER

Range Performance

How far can I see?



“I need a camera that can see this far.” It’s a request we receive daily. The problem with this question is that there is simply no way to state how far a camera can see without more information.

To help explain, here is the “technically correct” answer: our cameras can see over 150 million miles. The reason for this answer is that cameras are a passive detector of light. This means the ability to see an object depends on light from that object reaching the camera, and not the camera reaching the light. If there is enough light hitting the camera’s sensor, it can “see” it. So while a scene lit by candlelight may not be visible from 1 kilometre away (because not enough light is reaching the sensor), the sun is clearly visible from a much farther distance of 150 million kilometres (93 million miles) away.

Now, obviously our customers aren’t asking for a camera that can see the sun. When someone requires a camera to “see” a certain distance, they have a specific situation in mind. For example, one inquirer may want to recognize a person’s face 5km away, while another simply needs to see an oil tanker at that distance. The context is different for everyone, and a different camera is often required for each scenario.

More information is needed to determine the best solution

There are a number of aspects that play into this type of request. The information required to determine the ideal camera starts with what the customer needs to see. Is it a person, a vehicle, a license plate? How large is the object, and how much detail is needed? We also need to know the details of the environment. How far away is the object? What are the lighting conditions? What are the atmospheric conditions? How high is the camera going to be mounted? All of these factors affect camera performance.

The two main camera specifications that affect “zoom” performance are field of view (determined by lens size and sensor size) and resolution. Other factors (such as lens brightness and sensor sensitivity) will affect image clarity and visibility, but for this paper we will focus on the factors specifically related to zoom performance.



The X number does not determine how far a camera can see

When a camera’s zoom range is displayed as “10X” or “39X”, this is communicating the wide to narrow ratio of a camera’s zoom capabilities. These numbers do not tell us how small a field of view the camera will have. In other words, the “X” numbers are not measurements of how “far” it can see and can not be used to calculate this information.

For example, a lens with a zoom range of 5mm to 500mm would be a 100X lens, because it can zoom to 100 times its widest focal point. Yet a lens that measures 500mm to 1000mm would only be a 2X lens, even though it “sees” twice as far as the 5-500mm lens does.



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INFINITI WHITEPAPER

Range Performance

How far can I see?

As mentioned on the previous page, the measurements that determine the “zoom” performance and detail of a camera are angle of view and resolution. These two measurements combine to form the pixels per metre (PPM). This is a nice, simple measurement to use when comparing camera zoom capabilities.

Field of View

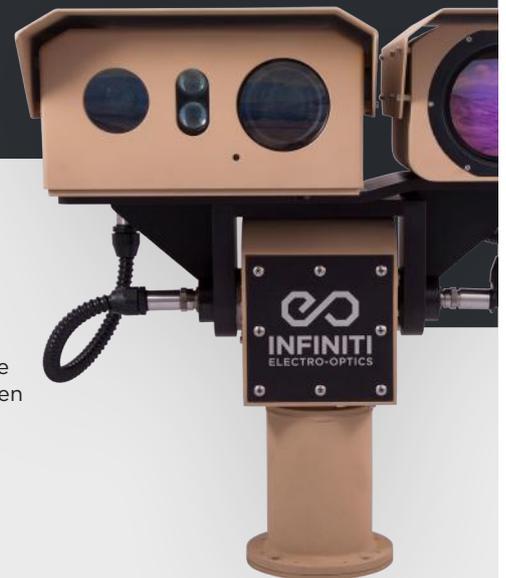
The field of view (FOV, also called angle of view) is the width of the image in relation to the location of the camera. It is determined by the focal length of the lens in relation to the sensor size. Longer lenses or smaller sensors produce narrower fields of view, while shorter lenses or larger sensors produce wider fields of view.

A smaller field of view means that a camera is more “zoomed in”. For example, a camera with a 90° horizontal field of view (HFOV) will see a 1000m wide section of a wall that is 500m in front of it. If you then adjust that camera’s HFOV to only 1°, it will fill the screen with an 8.7m wide portion of that same wall. This second “zoomed in” field of view is what customers are looking for when they want a camera that can see a long distance. They want a narrow field of view.

Resolution and Pixels Per Metre

Another contributor to camera zoom performance which is sometimes overlooked is the sensor resolution. This determines the level of detail in a camera’s image. For example, using the 1° HFOV result from the previous paragraph, a newer HD sensor and an old analog CCTV sensor will both produce images that fill the screen with 8.7m of the wall. The analog sensor has a horizontal resolution of 640 pixels, which means it displays 640 segments of detail across that 8.7m scene. This works out to 73.5 pixels per meter. The HD sensor on the other hand, with a horizontal resolution of 1920 pixels, provides 3 times that level of detail with a value of 221 pixels per meter.

The images to the right show the importance of taking resolution into consideration. In the previous example, a North American license plate would take up 3.5% of the screen width on both cameras (it would be the same field of view), however the analog sensor would render that plate with only 242 pixels (22×11), while the HD sensor would render it with over 2,200 pixels (67×33). This distinction is the difference between a blur of pixels and a clearly readable plate.



License Plate @ 73ppm
(22×11 pixels)



License Plate @ 221ppm
(67×33 pixels)

INFINITI WHITEPAPER

Range Performance

How far can I see?

PPM of Common Lenses

Here are some calculations for the pixels per metre (ppm) values of our most common cameras. We've also provided comparisons against two common standard definition (SD) analog sensor cameras from other manufacturers to highlight the difference that resolution can make.

These numbers are consistent in any conditions, meaning the pixels per meter value is always the same at these distances. However, whether you will clearly see your target is dependent on weather, camera stability, and scene brightness.



License Plate @ 450ppm
(138x69 pixels)

| | 250m | 500m | 1000m | 2000m | 5000m | 10km |
|---------------------------------------|----------|--------|--------|--------|--------|-------|
| 2MP 1/2.8" w/315mm (Infiniti Phoenix) | 444ppm | 222m | 111ppm | 56ppm | 22ppm | 11ppm |
| SD 1/4" w/122mm (FLIR PT Series) | 87ppm | 43ppm | 22ppm | 11ppm | 4ppm | 2ppm |
| 2MP 1/2.8" w/1000mm lens | 1,412ppm | 706ppm | 353ppm | 176ppm | 71ppm | 35ppm |
| SD 1/2" w/1000mm lens | 400ppm | 200ppm | 100ppm | 50ppm | 20ppm | 10ppm |
| 2MP 1/2.8" w/2050mm lens | 2,909ppm | 1,446m | 725ppm | 362ppm | 144ppm | 72ppm |

Size on Screen

If you don't want to spend time learning about pixels per meter, we find it's easier for the average end user to understand performance distances based on how much of the screen is filled by the target object. The following calculations are based on an average human height of 1.7m and vehicle width of 2.2m. All calculations are made assuming a 1080p 1/2.8" sensor and display resolution of 1920x1080.

| | 315mm | 1000mm | 2050mm |
|-----------------------------|-------|--------|--------|
| Human 5% of screen height | 3.5km | 11.1km | 22.7km |
| Human 10% of screen height | 1.7km | 5.5km | 11.4km |
| Human 50% of screen height | 350m | 1.1km | 2.2km |
| Vehicle 5% of screen width | 2.5km | 8.1km | 16.5km |
| Vehicle 10% of screen width | 1.2km | 4.0km | 8.3km |
| Vehicle 50% of screen width | 255m | 800m | 1.6km |



License Plate @ 225ppm
(69x35 pixels)



License Plate @ 150ppm
(46x23 pixels)



License Plate @ 50ppm
(16x8 pixels)

Keep in mind that we have many other lens options available, and we excel at designing customized systems to suit specific needs. Contact us today for expert advice on the ideal solution for you.

INFINITI WHITEPAPER

Range Performance

DRI Ratings Explained

Detection, Recognition, and Identification (DRI) are terms used to compare the performance of thermal infrared cameras. This paper explains these standards that have been set in place by The Night Vision Thermal Imaging Systems Performance Model. This model, also referred to as the Johnson criteria, is the universal standard for measuring thermal cameras.



What is DRI?

DRI is a universally accepted set of standards that provides a means of measuring the distance at which a thermal sensor can produce an image of a specific target. These standards were initially developed by the US Army and take into consideration many different criterion such as noise, array size, optical blur, lens depletion, aperture, atmospheric depletion, detector pitch and many more.

It is important to read all of the following definitions, as they are not always what people expect when they see these words.

Detection

Detection refers to the distance at which a target initially appears in the image. This “target” is something out of the ordinary that is warmer or cooler than the ambient environment. Specifically, it will be visible on at least two pixels, so there will not be enough information to confirm what the target is at this distance.



Detection (human)

Recognition

Contrary to common use, recognition does not mean that you can recognize an individual. Recognition refers to the distance at which you can determine an object’s class (is it a human or a car, a truck or a tank, etc).



Recognition (human)

Identification

Identification refers to the distance at which you can differentiate between objects within a class. For example, identifying the type of vehicle (truck, SUV, or car) or whether the human is a soldier or civilian.



Identification (human)

Note that these measurements do not take many atmospheric conditions into consideration. Weather is almost never ideal so in reality these distances are usually reduced.

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Range Performance

DRI Ratings Explained



It's all in the pixels

As you can see, the terms detection, recognition, and identification can be misleading, especially to end users without a military or electro-optics background.

To make matters worse, the original 1950s specifications were based on much older screen display technologies. While the standards have been updated from line pairs to pixels in an effort to modernize them, the increasing resolution of thermal sensors has shrunk the size of the DRI areas in relation to the overall field of view.

For example, our high-res uncooled thermal sensors have a resolution of 640x480, which is over 300,000 pixels. Human "detection" only requires 3.6 of those pixels and "identification" only requires 230 pixels. This is an extraordinarily small portion of the screen that can easily go unnoticed by the human eye. In fact, if this page were the size of your video feed, the area required for a human detection rating would be equivalent to the size of this rectangle:  Even when magnified, the amount of detail visible at the DRI distances is not as high as one might expect, as seen in the chart below.

Industry Standard DRI Requirements

| | Detection | Recognition | Identification |
|----------------|---|---|--|
| Human |  3.6 pixels by 1 pixel (Something is there) |  13 pixels by 5 pixels (A person is there) |  28.8 pixels by 8 pixels (The person looks like a soldier) |
| Vehicle |  2.8 pixels by 1 pixel (Something is there) |  13 pixels by 5 pixels (A vehicle is there) |  28.8 pixels by 8 pixels (The vehicle looks like a humvee) |
| Boat |  4.5 pixels by 1 pixel (Something is there) |  18 pixels by 2 pixels (Some kind of boat is there) |  36 pixels by 4 pixels (The boat is a small inflatable boat) |

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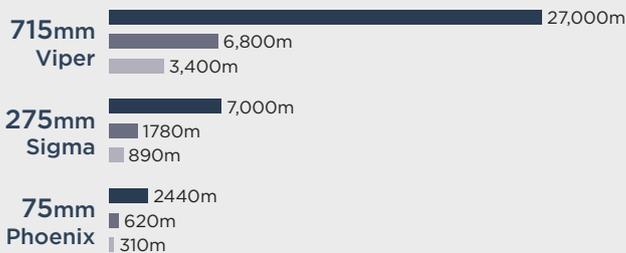
Other considerations

Another often overlooked aspect is that these ratings are based on “ideal conditions” which rarely happen in the real world. In reality, the average application will get 25% less than the rated distance and in extreme conditions can be 90% less.

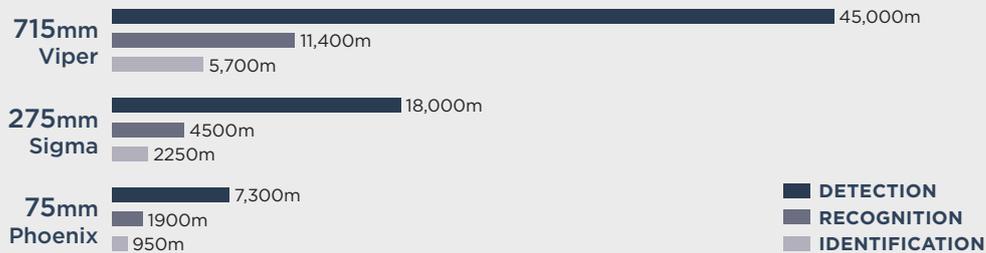
We wrote this white paper to give end users the ability to understand the actual performance they can expect from their thermal cameras. In addition to thermal imaging, Ininiti also offers active IR, SWIR, and visible sensors. We do not limit our customers to any one technology; rather we custom build solutions that typically use multiple sensors depending on the project.

The examples below are DRI calculations for three of our popular camera systems. Keep in mind that we have many other lens options available, and we excel at designing customized systems to suit specific needs. Contact us today for expert advice on the ideal solution for you.

Human DRI Examples:



Vehicle DRI Examples:



■ DETECTION
 ■ RECOGNITION
 ■ IDENTIFICATION

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