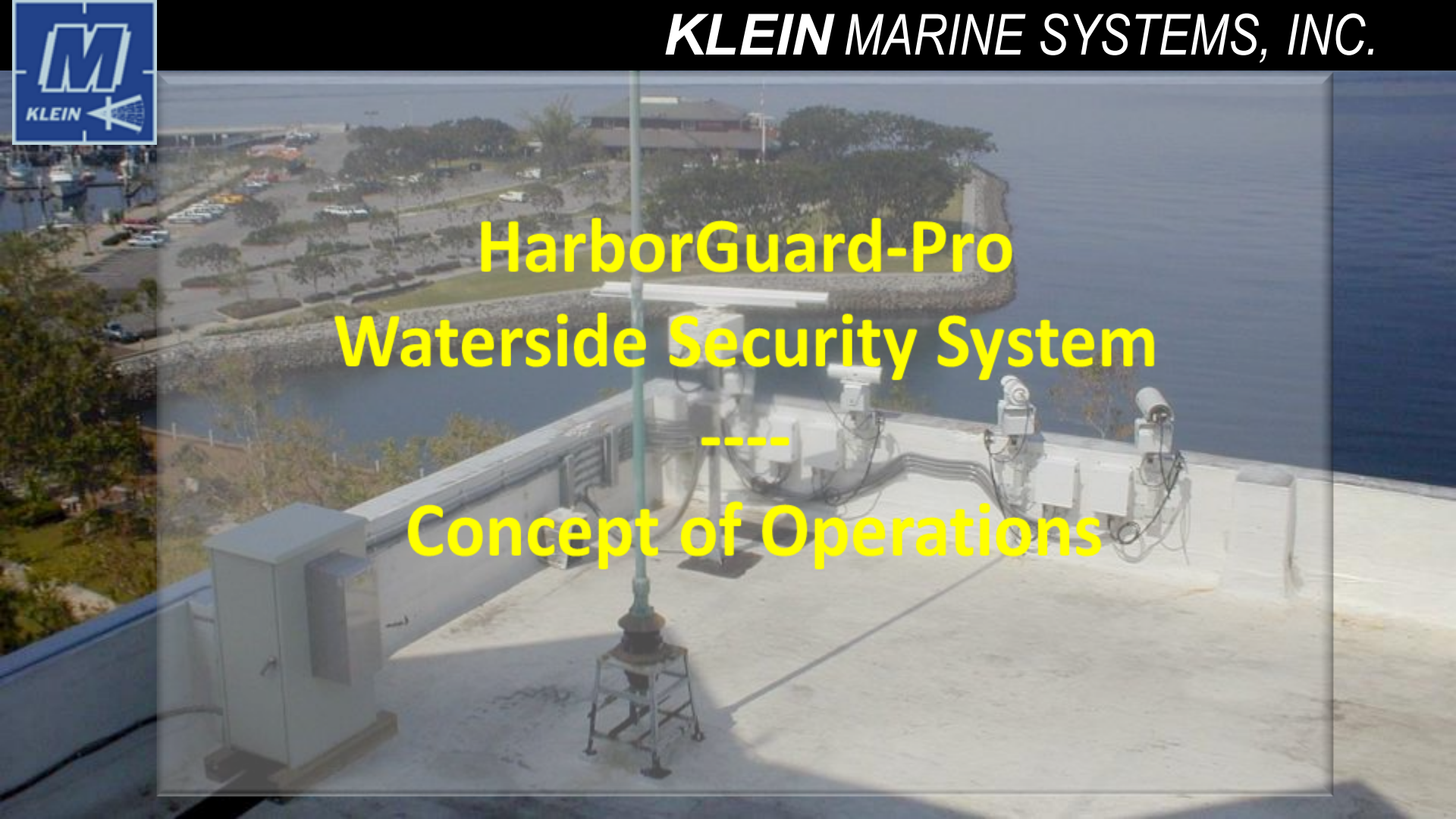




***KLEIN MARINE SYSTEMS, INC.***

# HarborGuard-Pro Waterside Security System

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**Concept of Operations**





## Waterside Security System Concept

- Protection Requirements
  - Constant monitoring of unattended waterside approaches to critical facilities
  - Detect and identify vessels within the areas of interest surrounding critical facilities
  - Warn and alarm when intruders enter security zones
  - Provide Situational Awareness
  - Capability of integrating with external security system
- Virtual site survey
  - Determine possible sensor locations
  - Coverage and visibility analysis of candidate sites
- Klein Marine Baseline System
  - HarborGuard-Pro with Series 2000 Micro-Radar
    - Radar detection/tracking capabilities
    - HarborGuard-Pro site security features/functionality
  - FLIR EO/IR Camera System
    - Features and functionality



## **Protection Requirements**

- **MTSA or ISPS Code Compliance**
- **Monitor Scheduled Vessel Movements**
- **Protect Unattended Waterfront Approaches to Critical Facilities**
  - **Small High Speed Craft Threats**
  - **Swimmer & low observable threats**
  - **Floating IED Threats**
- **Real-time Information Presented to Security Stakeholders**
  - **Small Target Detection Maritime Radar(s)**
  - **EO/IR Sensor(s)**
  - **AIS**
  - **Perimeter surveillance radar(s)**

**Harbor Security  
Zone**

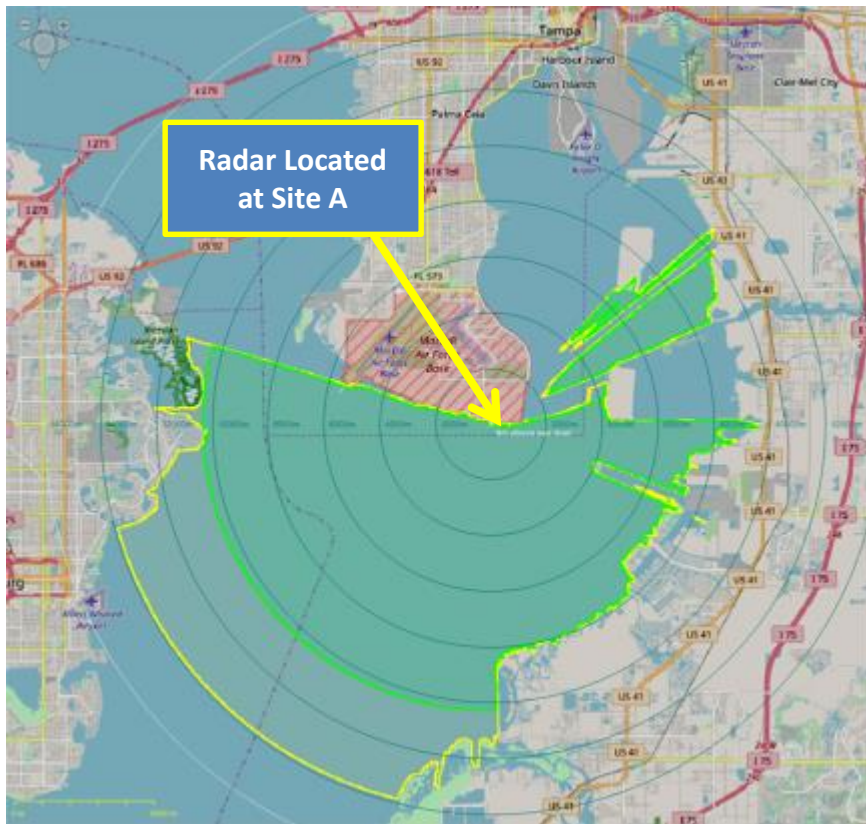
**Harbor Entrance  
Security Zone**



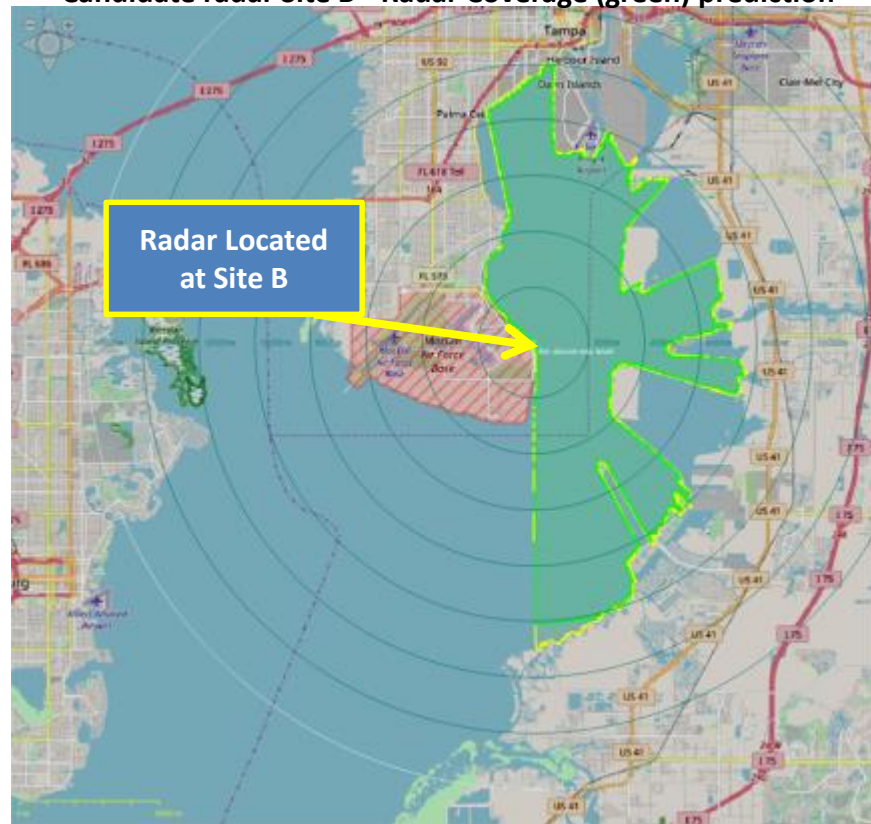


## Radar Line of Sight Visibility Analysis Tool Example

Candidate radar Site A - Radar Coverage (green) prediction



Candidate radar Site B - Radar Coverage (green) prediction





## **Klein Marine Baseline System**

### **HarborGuard-Pro with Series 2000 Micro-Radar**



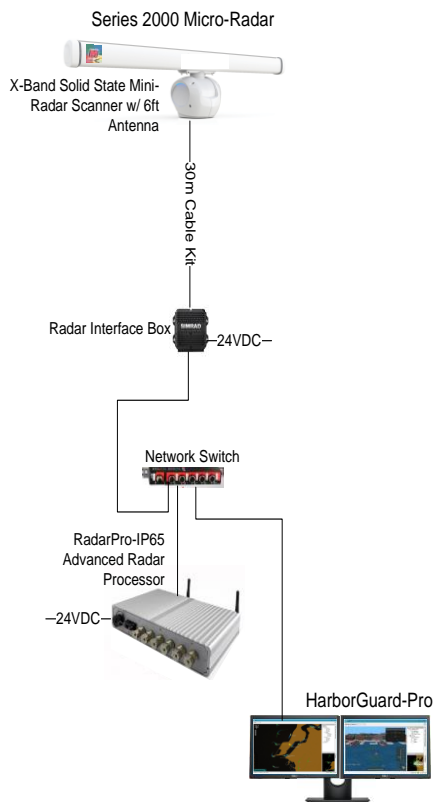
- Flexible situational awareness display
- Integrated presentation of radar data, camera video & data, AIS, mapping and alarm processing
- Configurable “Multi-view” windows may be freely moved and resized
- Capability for defining alarms that occur on user configurable events:
  - Targets entering user defined areas
  - Targets passing through controlled gate
  - Targets being in close proximity to another target or to a reference point
- Alarm event may be reported using audible or visual alarms, and/or by sending messages to other sub-systems, i.e. to initiate recording
- Manual or automatic control of pan/tilt cameras
  - Camera controlled through on-screen joystick
  - Camera controlled automatically from Radar or AIS derived tracks (slew-to-track)
  - Camera controlled automatically based on incoming threat or triggered alarm event



# KLEIN MARINE SYSTEMS, INC.

## Series 2000 Micro-Radar

**Light Weight - Low Power – High Performance**



### Series 2000 Micro Radar sensor

- Light Weight with soft start motor
  - Antenna/Scanner weight: 41 lbs (18.75kg)
  - Ideal for mobile applications (vehicles, vessels)
- Enhanced Capability Radar sensor
- Solid State X-Band Transceiver (no Magnetron)
- Coherent, Pulse Compression
- 6ft Antenna Array, 1.2° horizontal beam
- Optional 4ft Antenna Array, 1.8° horizontal beam
- COTS design with enhanced capabilities for small target detection
- High performance Receiver – 5dB noise figure
- 22-48 RPM scanner
- IP Network interface
  - Simplifies remote operation
- Power Requirements: 12-24VDC, 40W

### RadarPro-SPx Advanced Radar Processor




- PC Based system
  - Two versions: 2U rack-mount chassis and rugged, weatherproof IP65 housing
- Windows 10 with KMS RadarPro-SPx software
- Unique signal processing
  - Pulse Processor matched to antenna beam pattern
  - Improves target S/N
  - Suppresses radar interference
  - Reduces rain clutter
  - Scan Average Processor
  - Scan-to-scan integration
- Tracker
  - 1000 targets
  - MHT – Multiple hypothesis tracker
- Client/Server Support (HarborGuard® Client/Server)
  - Controls the RadarPro server; returns status, receives radar data, plots and tracks
- Image Format
  - scan converted output
  - Image compression
- Network Protocols  
TCP/IP, UDP



# KLEIN MARINE SYSTEMS, INC.

## Small Target Detection Performance

Series 2000-Micro Radar 6ft Antenna at 48 RPM

<i>Target Description</i>	<i>Radar Cross Section RCS</i>	<i>Radar Antenna 20m Above Sea Level</i>	<i>Example target:</i>
Small open boats, fiberglass, wood or rubber at least 4 meters long... target at 1m above the surface	1 m <sup>2</sup>	3.6 nautical miles 6.7 km	
Inshore fishing vessels, sailing boats, speed boats... target at 2m above the surface	3 m <sup>2</sup>	4.9 nautical miles 9.1 km	
Low observable vessel, kayak, jet ski, canoe... target less than 1m above the surface	0.25 - 0.5 m <sup>2</sup>	2.5 nautical miles 4.6 km	



# KLEIN MARINE SYSTEMS, INC.

## HarborGuard-Pro with Series 2000 Micro-Radar Small Target Detection & Tracking



Radar tracking  
Kayaker at 1.1 nm  
(2200 yds)







## **FLIR EO/IR Camera Systems** **Short or Long Range EO/IR Camera Options**



### **Option 1**

#### **1 - Long Range, cooled Mid Wave IR**

##### **FLIR Model PT-602CZ-HD Multi-Sensor, PAN/TILT/ZOOM Camera System including:**

- MWIR, cooled Thermal Sensor with 19-275mm continuous zoom lens, 640x512 resolution
- Color Daylight Camera, CCD low light 1080 HD sensor
- Pan/Tilt Mechanism, 360 deg continuous pan,  $\pm$  90-deg tilt
- 24VAC operation
- PT-Series Power Supply Assy, 110/220VAC to 24VAC
- AXIS P7214, 4-Channel Video Encoder (interface for HarborGuard/Radar)
- PT-Series Pedestal Mount Assembly with adapted plate

### **Option 2**

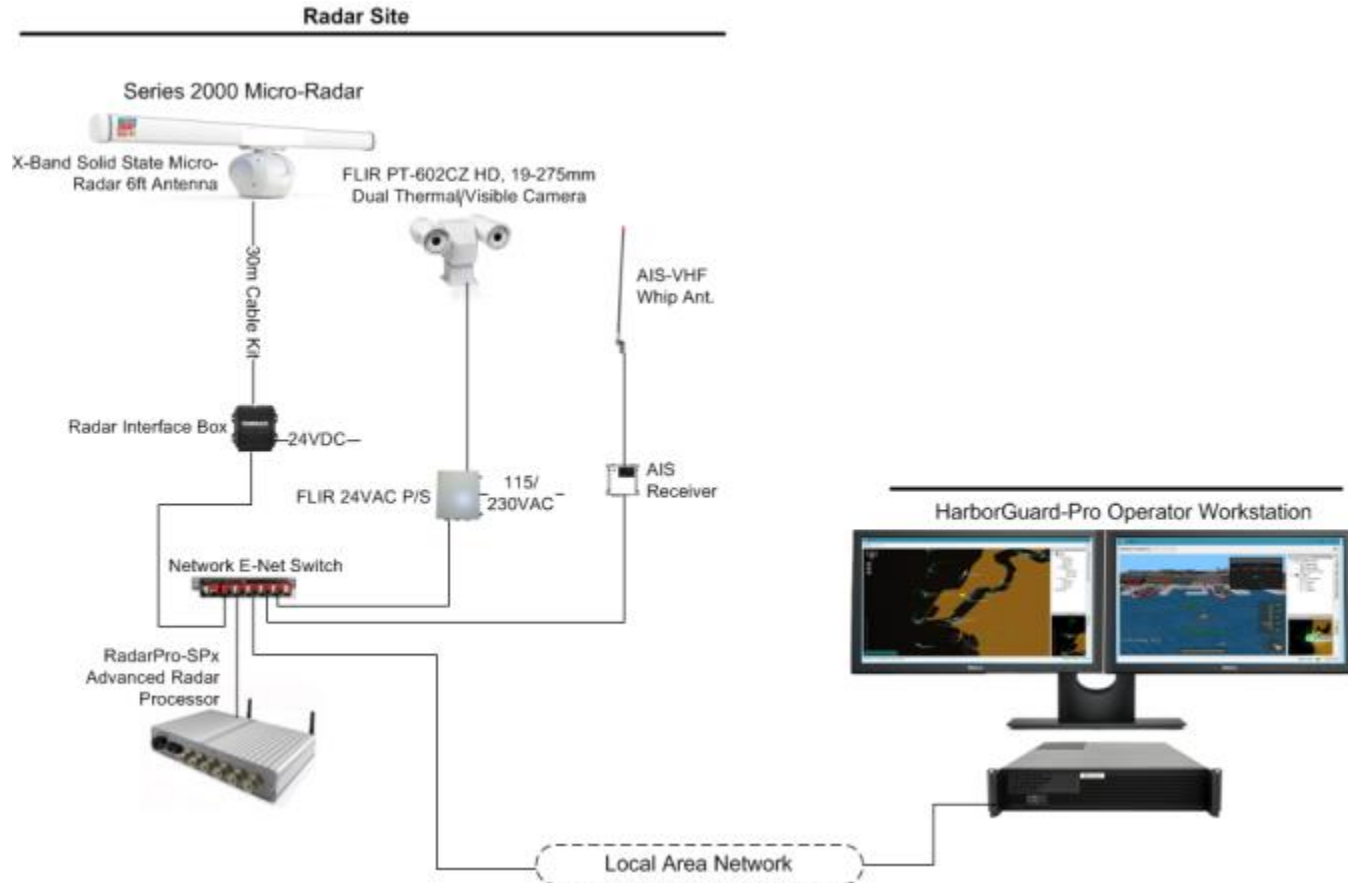
#### **2 - Short Range, un-cooled Long Wave IR**

##### **FLIR Model PT-608-HD Multi-Sensor, PAN/TILT/ZOOM Camera System including:**

- LWIR, un-cooled Thermal Sensor with 75mm lens, 640x480 resolution
- Color Daylight Camera, CCD low light 1080 HD sensor
- Pan/Tilt Mechanism, 360 deg continuous pan,  $\pm$  90-deg tilt
- 24VAC operation
- PT-Series Power Supply Assy, 110/220VAC to 24VAC
- AXIS P7214, 4-Channel Video Encoder (interface for HarborGuard/Radar)
- PT-Series Pedestal Mount Assembly with adapted plate



## Baseline System - Notional Diagram





## **Expert Services & Support**

- ❑ **Concept of Operations Support**
  - Maritime Surveillance SME's
  - Compliance with relevant rules & regs (IEC, IMO, IALA, MTSA, ISPS)
- ❑ **Site survey**
  - Identify candidate sensor sites for optimal system performance
  - Detailed predictive performance analysis (radar, viewshed, GIS tools)
- ❑ **System Design and Integration**
  - Custom engineering; software integration and hardware integration
  - Detailed installation, cabling and structural drawings
- ❑ **Installation support**
  - Installation supervision, set-to-work and commissioning
  - FCC licensed radar technicians
- ❑ **Operator and maintainer training**
  - Factory or on-site training
- ❑ **Life cycle support**
  - 24/7/365 phone & email support
  - Detailed maintenance plans
  - Extended warranty and service contract options
  - Spare parts support



***KLEIN MARINE SYSTEMS, INC.***

***Thank you!***

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