

# „Technology trend of Optronics System for Submarines“

SERO / OMS

REALITY CHECK - “Seeing is Believing”

January 2020

# Impacts on Technology Trends

## Submarine Operational Trends:

A periscope and optronics mast perspective

### ❑ Independent operations → Force multiplier in a Task Group

- Network enabled operations - increased communication (high data rates)
- Intelligence gathering and recording - “Real Time Transfer” to Task Force
- Co – located surface sensors - optronics with EW (and communication)

### ❑ Specific high intensity missions → Broad variety low intensity missions

- Extended time at periscope depth
- Greater demand on surface sensors - Electromagnetic spectrum and optronics
- Detection, classification (finger printing) - optronics mast (image processing)
- Classification/ evidence recording – prosecution in court of law

### ❑ Blue water operations → Littoral operations (shallow waters)

- More time at periscope depth – safety, navigation
- **All light** conditions: from sunlight to deep dark
- **All weather** conditions – haze, fog & mist
- Increased detection risk - stealth (visual, radar, IR and laser)

### ❑ Training at Sea (Experience) → Simulator (Learned Skills)

- Less time at sea
- Higher levels of Integration
- Automated operations



Integrated Solutions



Image Processing

High Resolution Sensors



Sensors for adverse conditions



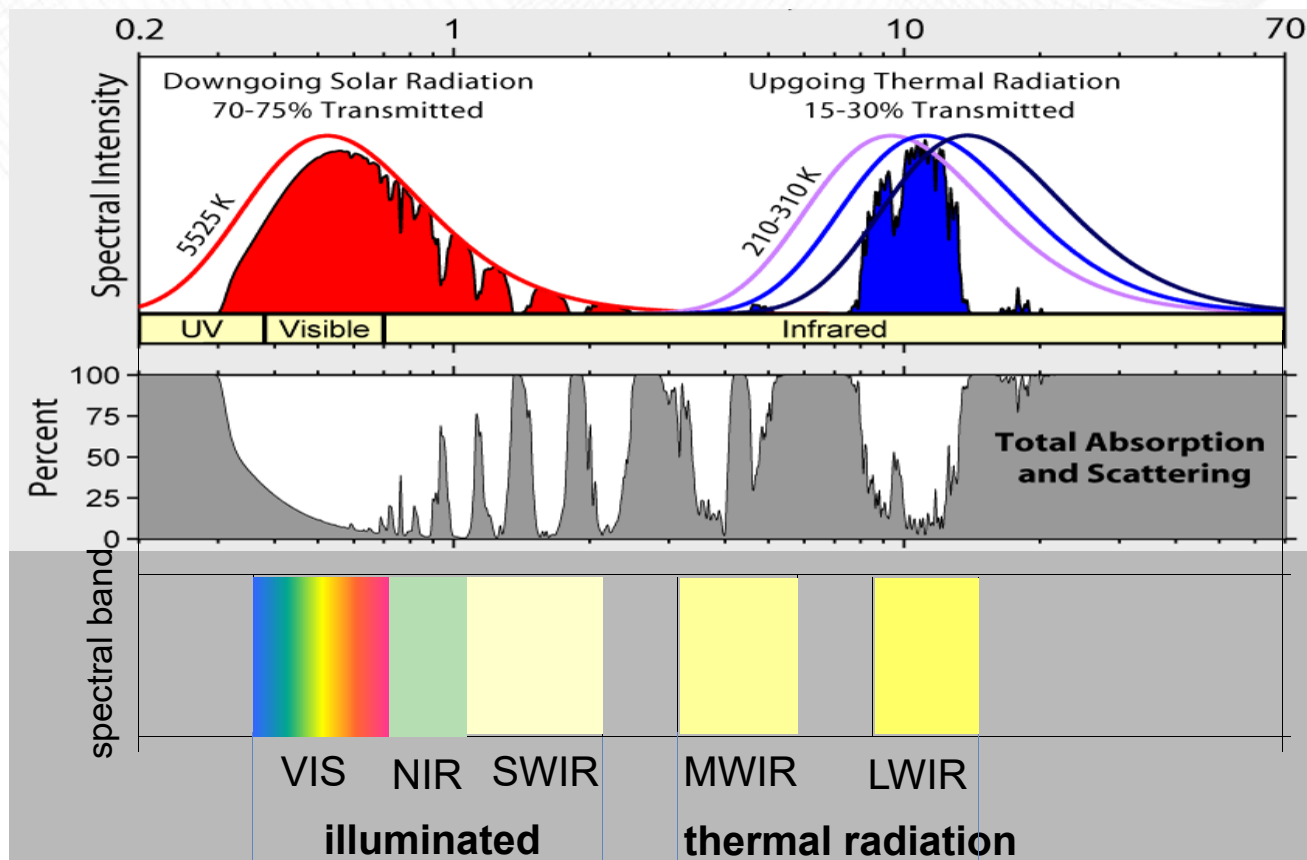
Simulators

# „Technology trend of Optronics System for Submarines“



## Maritime Solutions – SERO / OMS

### Wavelength Spectrum – Relevant Wavelength range



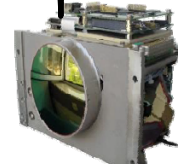
Eye-Safe  
Laser



Visual



Blue Kite



For all relevant Wavelengths, Sensors are available and can be implemented in the Periscopes and Optronics Mast Systems

**Sensor Highlight:  
Covering the SWIR range**

# „Technology trend of Optronics System for Submarines“

## Maritime Solutions – SERO / OMS

### Sensoric Features



**Benefit of SWIR**

#### SWIR - Short Wave InfraRed vs. Day TV



#### Day TV

High-resolution cameras offer optimum image performance at "clear view".

Limitations to be expected under atmospheric conditions like:

- fog, haze
- Smoke
- Heavy rain, driving snow, etc.



#### Short Wave Infrared (SWIR)

SWIR Image shows images which are not visible for the Day TV Camera:

- Hull Number of the Seagoing tug is visible
- Different color coats at the hull
- Surface cruising Submarine in the background

state - of - the - art

# „Technology trend of Optronics System for Submarines“

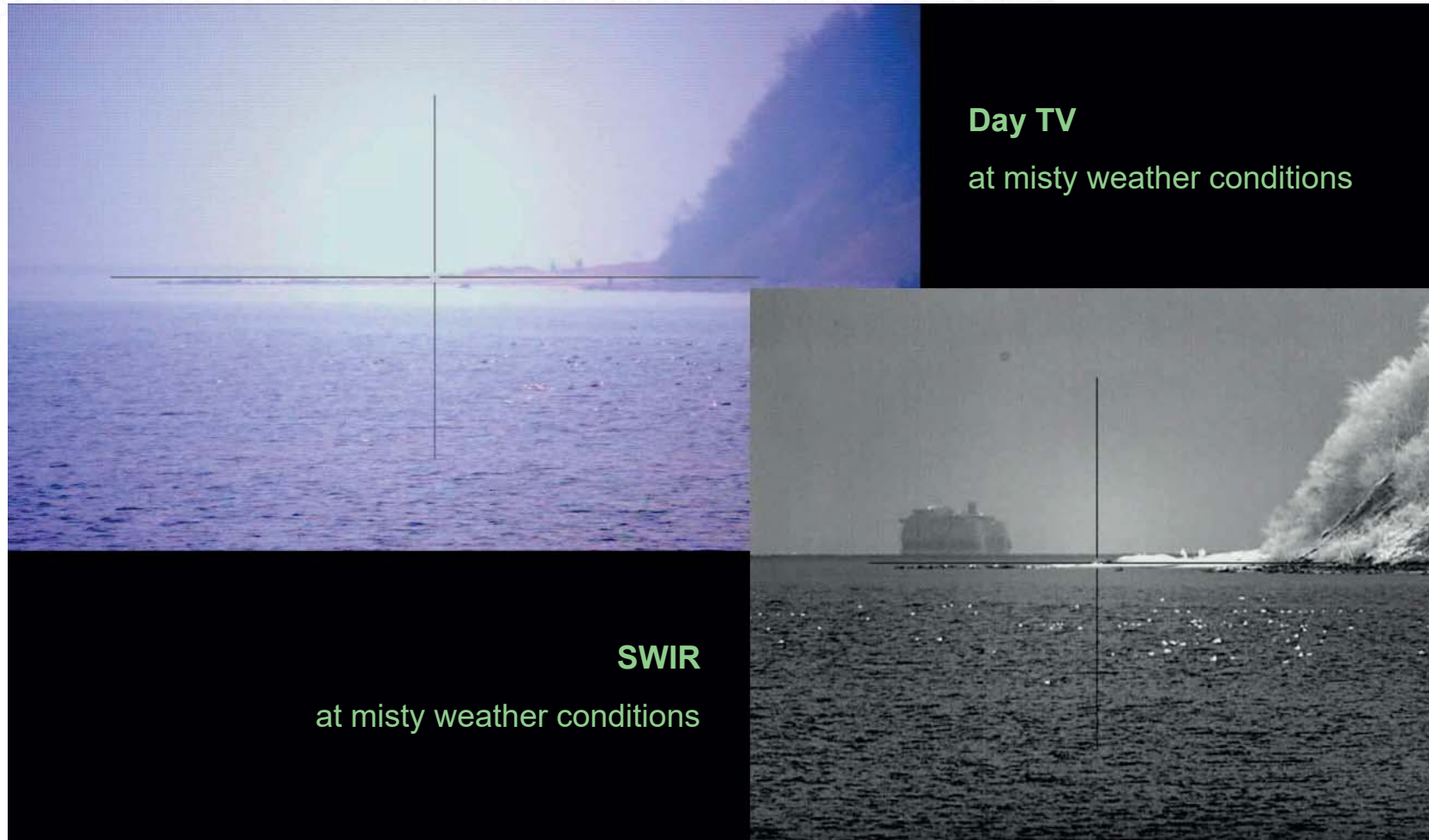


## Maritime Solutions – SERO / OMS

Sensoric Features

**Benefit of SWIR**

**SWIR - Short Wave InfraRed vs. Day TV**



state - of - the - art

# „Technology trend of Optronics System for Submarines“



## Maritime Solutions – SERO / OMS

Sensoric Features

**Benefit of SWIR**

**SWIR - Short Wave InfraRed vs. Day TV**



state - of - the - art

# „Technology trend of Optronics System for Submarines“



## Sensoric Features

### Overview

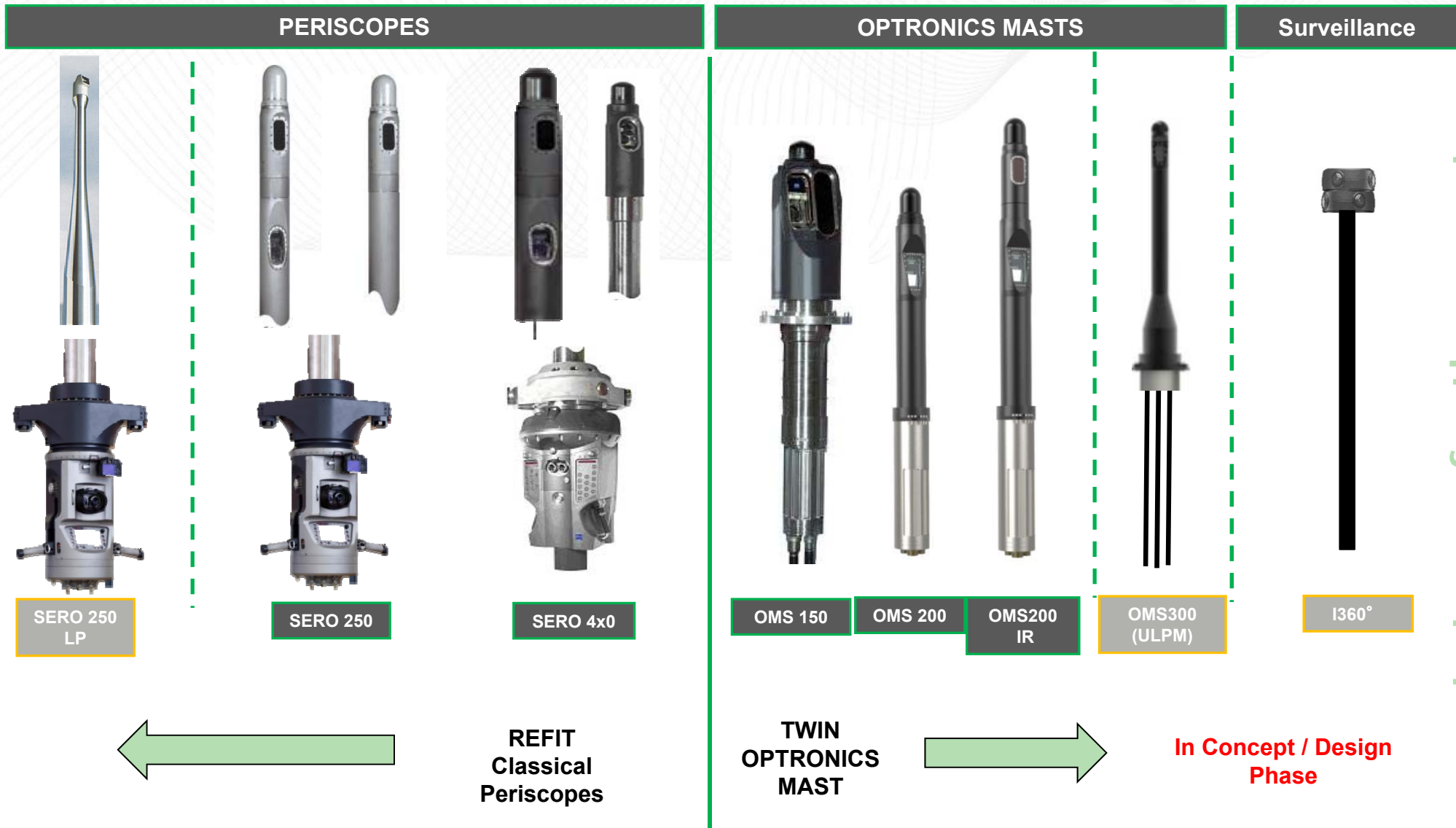
	LLL	Visual	SWIR	MWIR
Night				
Day				
Day + Fog				

state - of - the - art

# „Technology trend of Optronics System for Submarines“



## Product Family Overview



state - of - the - art



# „Technology trend of Optronics System for Submarines“



## Maritime Solutions

### Optronic Mast Systems and Optronics Surveillance System

#### Extended Future Portfolio - Submarine Systems

##### OPTRONIC MASTS



OMS 150

OMS 300 LP

5 SENSORS

STEALTH

##### Optronics Surveillance System



i360OS

state - of - the - art

# „Technology trend of Optronics System for Submarines“

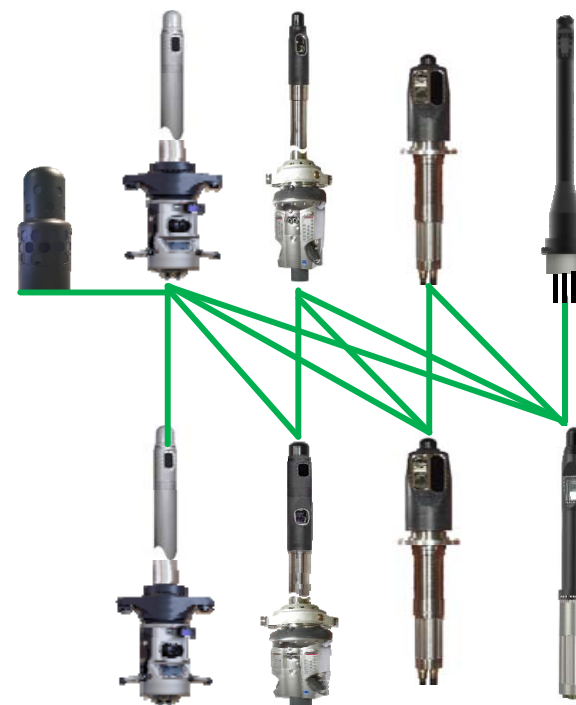


## Main features / variants prioritisation

### Main Features: SERO / OMS

- **Cutting edge technology** integrated into Periscopes and Optronics Masts
- Solutions for **new-built** and **refit** submarines
- Operating as **stand-alone** solution or **fully integrated** into the combat management system
- Providing in country **workshop facilities** to allow full support of our systems
- Modular set-up -> sub-systems can be used in different configurations
- Combining multiple sensors for **all light / all weather conditions**

Each combination  
SERO/OMS is possible.



state - of - the - art

	LLL	Visual	SWIR	MWIR
Night				
Day				
Day + Fog				

**Takk for  
oppmerksomheten!**