



## SC13 | Low light level vision and photon counting imaging



NIVEAU : ADVANCED

**Publics :** People from private or public companies in the field military, security, microscopy, bioscience and astronomy

**Prérequis :** Basic knowledge in optics, notions in radiometry or photometry, notions in imaging or video or photography

**Responsable(s) pédagogique(s) :** Thierry Midavaine - Ingénieur expert THALES Optronique

**Langue de la formation :** French

**Capacité maximum :** 12

**Prix :** 1380€ HT - **Durée :** 3 days - 21 h

### Objectifs

- ▶ Tutorial dedicated on Low Light Level imaging technologies in the spectral band from 0,4 $\leftrightarrow$ m up to 2 $\leftrightarrow$ m
- ▶ Be able to design a low light level imaging system with component selections
- ▶ Be able to specify low light level components and perform the related acceptance test
- ▶ Identify new technologies allowing the enhancement of imaging systems

### Thèmes abordés

Needs and Challenges

Night illumination contributors, sensor technologies, Light Intensifiers

LLL digital video imaging, active imaging with laser illumination

Applications and future roadmaps



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### Le programme

#### The night vision

- ▶ Visible Imaging
- ▶ Eye sighting
- ▶ Night illumination contributors and night levels

#### Imaging sensors technologies

- ▶ Light intensifier tubes
- ▶ Intensified digital sensors
- ▶ CCD sensors
- ▶ CMOS sensors
- ▶ SWIR sensors from 1 $\mu$ m to 2 $\mu$ m
- ▶ Perspective of photon counting enabled imaging technologies
- ▶ Read data sheets

#### Active imaging

- ▶ Active imaging principle
- ▶ Illumination sources
- ▶ Fitted imaging sensors
- ▶ Speckle and atmospheric propagation
- ▶ Albedos, LCS, cat's eye effect

#### Applications and challenges

- ▶ Demonstrations
- ▶ Range modelisation
- ▶ Military applications
- ▶ Surveillance and security
- ▶ Scientific imaging from microscopy to astronomy
- ▶ Futur technological challenges

### Méthodologie et évaluation

Lectures and exercices

Experiments and live demonstrations

Practical hands-on on instruments