Gallium

Critical & Strategic Raw Material!

20-May-2026

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IMAT e.V.

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Content

Our daily life is unthinkable without the use of semiconductors

Innovative **MAT**erials for sustainable high-tech electronics, photonics and related industries!

The IMAT e.V. association is a network of companies and research institutions in the context of III-V semi-conductors.
The members cover all stages of the value and supply chain from the wafer through the chip, up to the module and its final applications.

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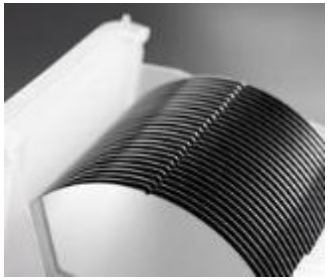
Supply Chain of III-V products

Raw materials/ Auxiliaries	III-V - Substrates	Epitaxy	Chip-design/ manufacturing	Final products
Gallium 6N Arsenic 6N Chemicals, Boron oxide, Crucibles etc.	GaAs Wafer GaSb Wafer (SiC Wafer)	Al/Ga/As/; In/Ga/As; Ga/Sb/As; GaN on SiC; GaN on Silicon … Heteroepitaxy with TMG (Trimethyl-gallium)	**Optoelectronic:** LED, Laser, Solar cells, VCSEL, … **Electronic:** HBT, HEMT, HALL, PIN, MESFET, ..	**Energy, efficient Lighting technologies,** **Displays, Mobile phones** **Wireless & Fiber Comms.** **Data centers & AI,** **Radar,** **Quantum technologies,** **Highly eff. solar cells,** **Industrial (fusion) lasers** **Optoelectronic sensors,** **Consumer electronics**



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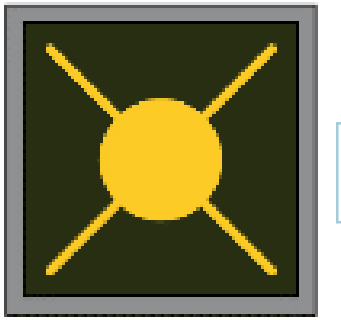
III-V material resources are limited, but their potential is “unlimited” and the demand is increasing continuously

GaAs technologies

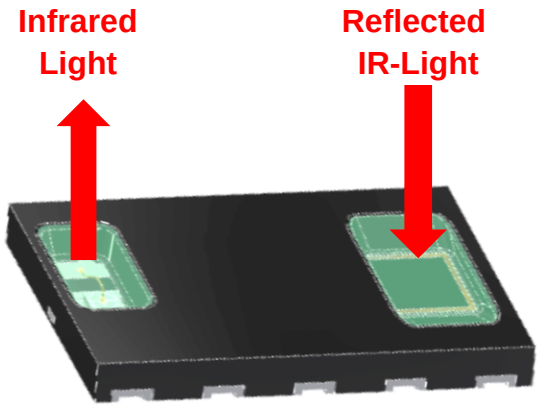
- Gallium is a rare element on Earth and does not occur in its elemental form, but only in a compound form, mainly in aluminum ores.
- Gallium semiconductor compounds can emit light from the infrared to the ultraviolet spectrum.

Silicon technologies

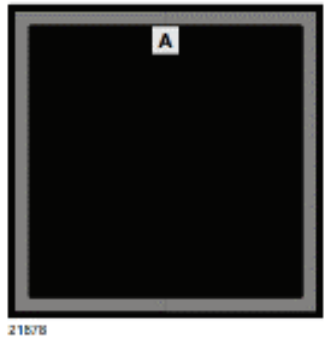
- Silicon is available “unlimited” and has a lot of physical properties for cheap volume production.
- Silicon can´t emit light, but can detect it.



Infrared Emitter Chip
e.g. (L x W x H in mm):
0.260 x 0.260 x 0.17
λ = 855 nm (890nm, 940nm)

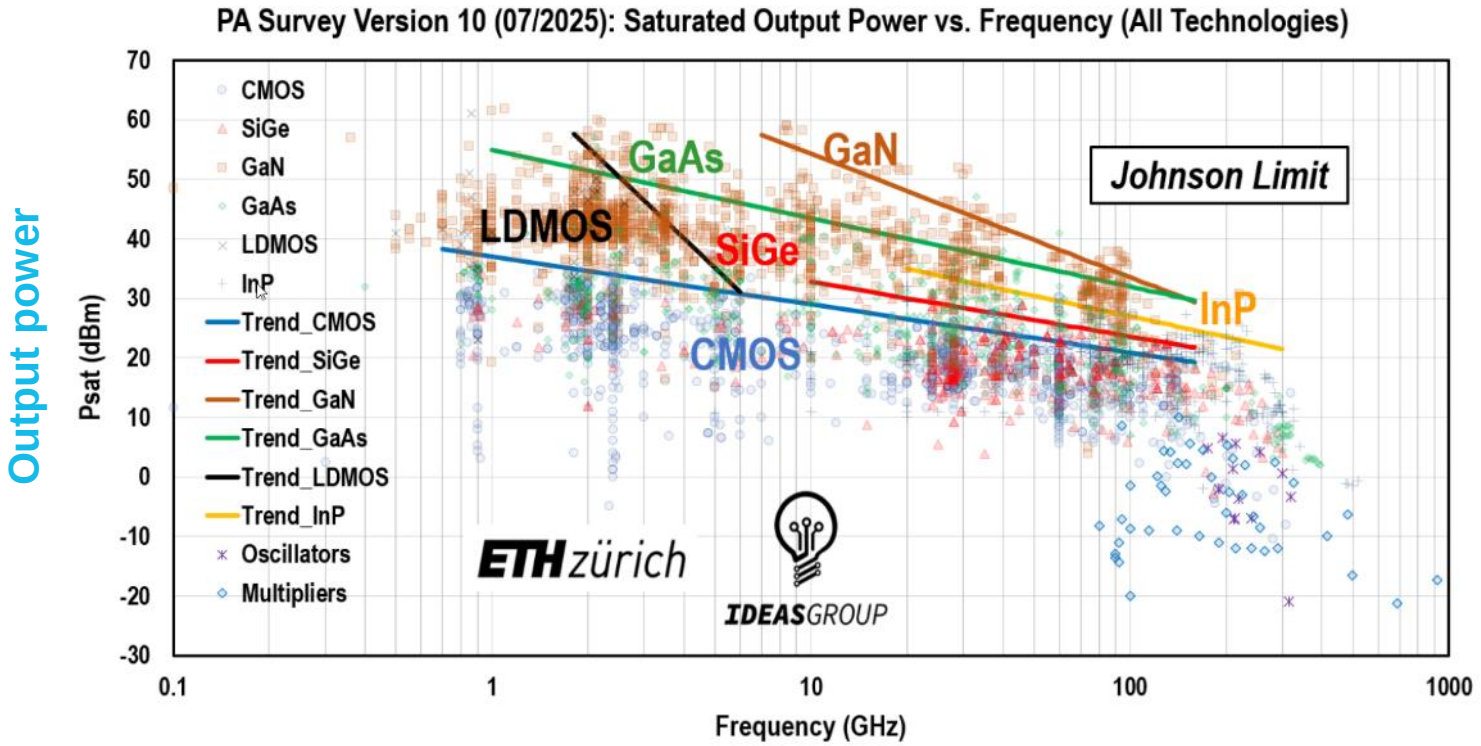


Proximity sensor in package



Photodetector Chip
e.g. (L x W x H in mm):
2.37 x 2.37 x 0.28
Radiant sensitive area: 4.4 mm²

GaAs / GaN enables high RF output power



PA Survey Version 10: Saturated Output Power vs. Frequency (All Technologies). Hua Wang

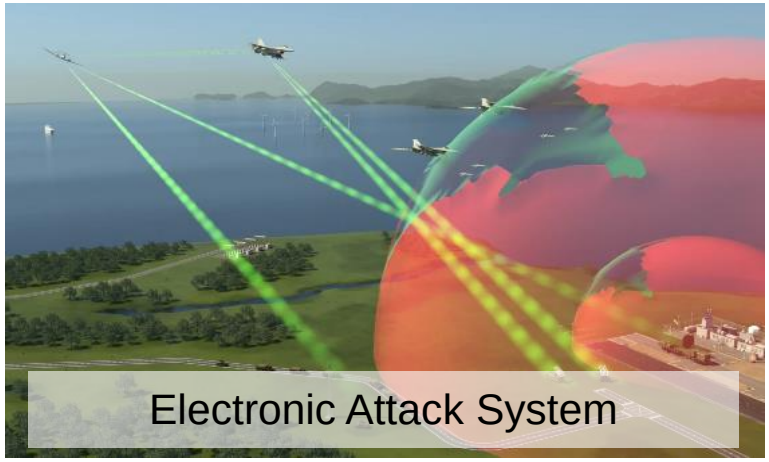
Only GaN / GaAs based HPAs are capable to deliver Watt level output power at high frequencies

GaAs / GaN – RF Power Electronics


Eurofighter Common Radar System


Very Short Range Air Defence Radar


Air Surveillance & Target Acquisition Radar


Electronic Attack System

European GaAs / GaN Supply chain – for Defense RF Electronics in Europe

Gallium

!

Arsenic

PPM Pure Metals
PPM Reinstmetalle Osterwieck GmbH

Freiberger Compound Materials

No European Source for semi-insulating SiC substrates

IQE

SWEGAN

soitec

United Monolithic Semiconductors

LEONARDO

MACOM Partners from RF to Light

AIRBUS DEFENCE & SPACE

HENSOLDT Detect and Protect.

THALES

SAAB

elt ELETTRONICA GROUP

INDRA

MBDA

LEONARDO

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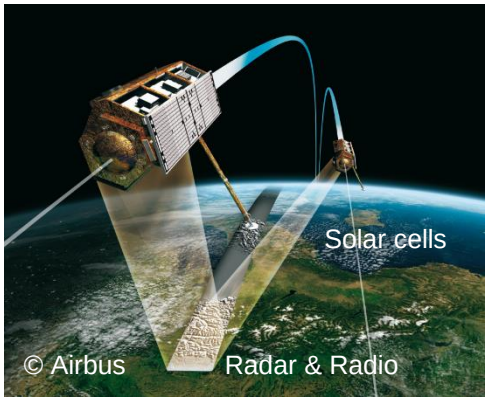
GaAs and GaN enable high-performance technologies

Smartphone

Power Conversion, Electric Drive & assistance

Defense and Space



Quantum Technology

Laser for material processing / laser fusion

LEDs for displays and illumination

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European GaAs Supply chain for international markets – for Optoelectronics

Gallium

!

Arsenic

PPM Pure Metals
PPM Reinstmetalle Osterwieck GmbH

Freiberger Compound Materials

ams OSRAM

AZURSPACE SOLAR POWER GMBH

JENOPTIK

ams OSRAM

VISHAY

JENOPTIK

WD Photonics

AZURSPACE SOLAR POWER GMBH

7CCESI 1956 2026 Inspired with innovation

SAMSUNG

JENOPTIK

HUAWEI

ERICSSON

DELL

LG Life's Good

SONY

esa

dhv technology

OHB

ThalesAlenia Space

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Without GaAs and GaN, energy demand and carbonization in Europe will rise sharply

GaN Power Electronics

- **Fast chargers:** Compact, high-performance power adapters for laptops and cell phones use GaN transistors. Without them, chargers would once again become large and heavy.
- **Electric mobility:** GaN inverters convert electricity more efficiently in electric cars. A shortage would reduce the range of electric vehicles and increase charging times.
- **AI Data Centers:** 800V power conversion technology from electric mobility is the basis for current AI Data Center architectures.

Modern LED Lighting

- With limitations in Gallium, there would be less **blue LEDs**. Since white light in modern lamps is usually generated by blue LEDs with a phosphor coating, modern, energy-efficient lighting would disappear!
- **Displays:** Production of nearly all modern screens (LCDs with LED backlighting) would be disrupted.
- **AI Data Centers:** Optical communications are key for high data rates at low power consumption

Future of GaAs and GaN applications

1. There are an increasing number of new applications for which components containing GaAs or GaN are essential. This functionality cannot be replaced by any other material.

2. The performance of existing devices must and will be further developed and improved. Where silicon-based components can be used, this has already been implemented for cost reasons alone.

Summary – take away

- Gallium is a critical and strategic raw material enabling many essential product applications, crucial in the further Digitalization, Clean Energy, Defense Readiness and Green Deal goals.
- In areas where silicon is technically competitive, it is taking over due to cost efficiency.
- European defense capabilities depend on GaAs / GaN high RF output power.
- Energy efficiency depends on GaN through efficient lighting and power electronics with AI data center impact on the rise.
- Many current sensor applications and future quantum photonics sensing rely on mature GaAs (opto-) electronics and lasers.
- It is crucial to foster the full value chain in Europe to increase resilience and reduce dependencies w.r.t. Asia / China / US geopolitical interests.

THANK YOU

Questions? Please contact us!

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A member of EUROPEAN METALS The European non-ferrous metals association. CRM Alliance Critical Raw Materials

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Annex

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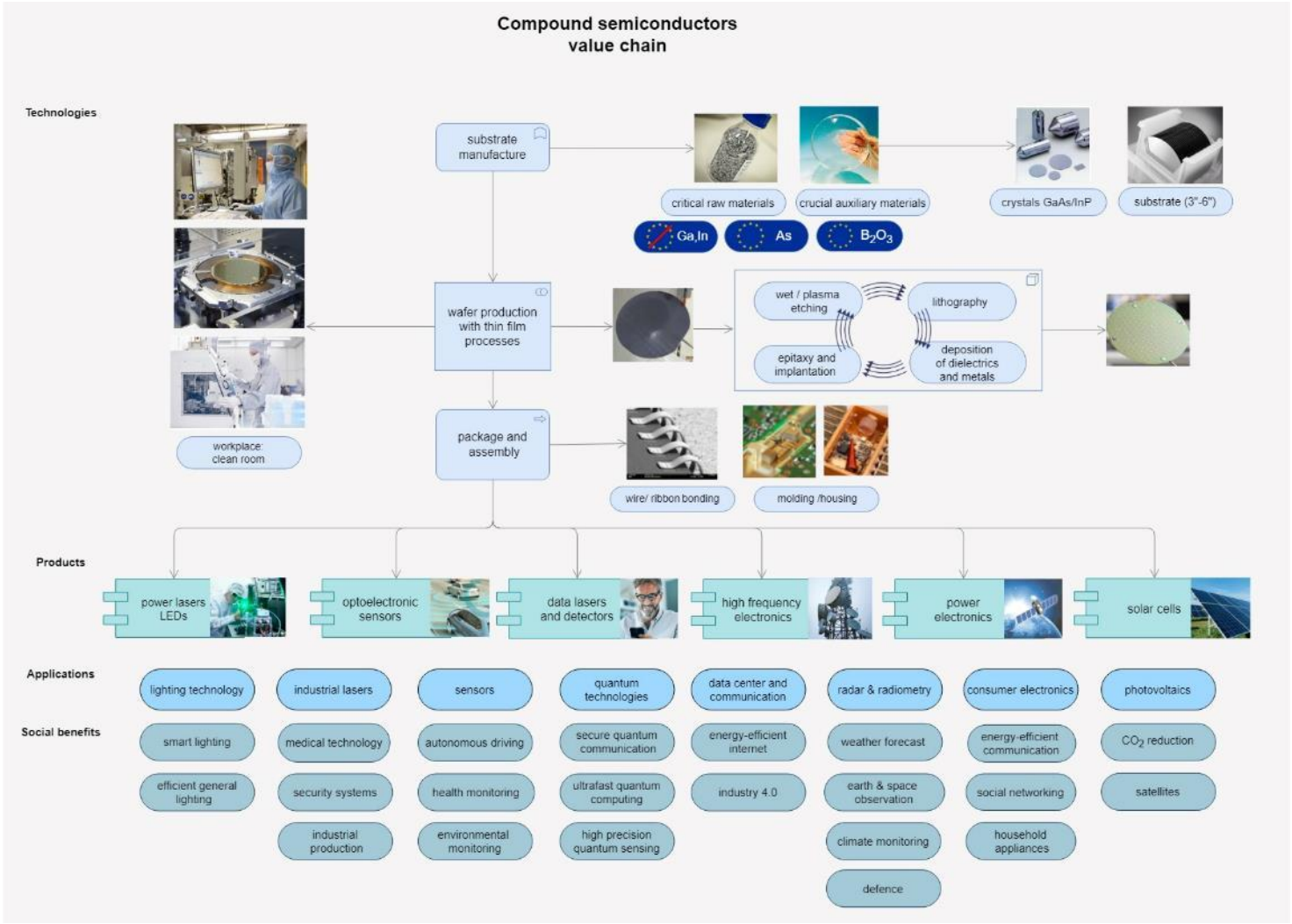
Supply Chain



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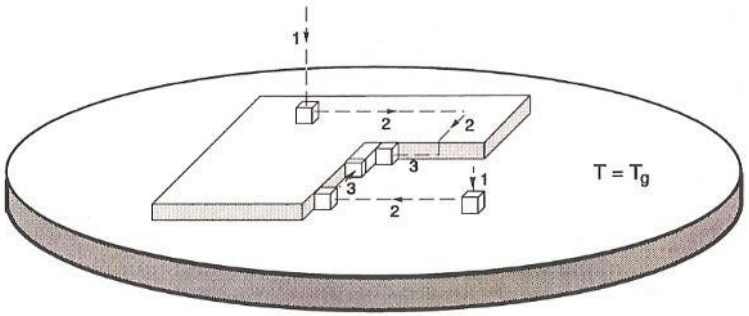
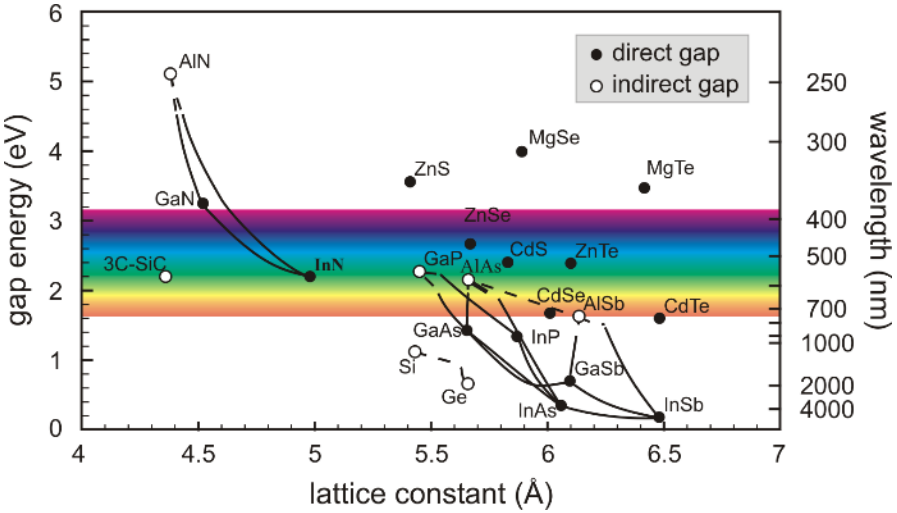
…, but their potential & demand are “unlimited”.

Hetero epitaxy is the key process for mot of the IIIV devices and technologies



State of the art optical and electronic devices can be build on GaAs and other substrates using the full spectrum of direct and indirect band gap semicon-ductors shown below.



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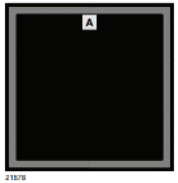
One optical example: Proximity Sensor

Photo Detector
Material: **Silicon**

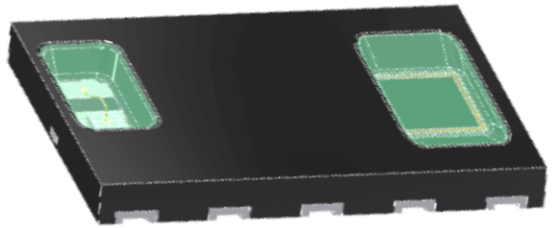


Photodetector Chip
e.g. (L x W x H in mm):
2.37 x 2.37 x 0.28
Radiant sensitive area: 4.4 mm²

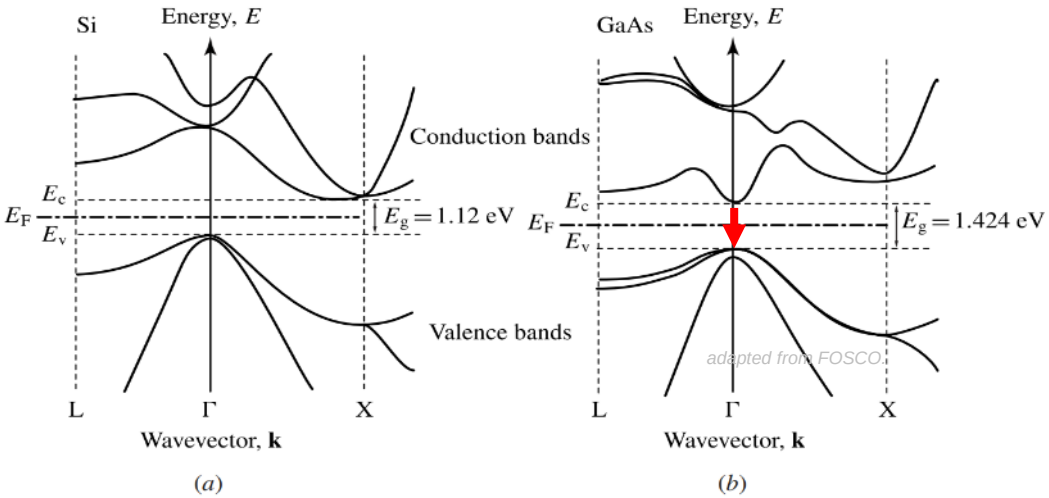
Infrared Emitter (IR-LED)
Material: **GaAs (III-V)**

Infrared Emitter Chip
e.g. (L x W x H in mm):
0.260 x 0.260 x 0.17
λ = 855 nm (890nm, 940nm)

Joined package



band structure



indirect bandgap

direct bandgap

- LEDs are made from direct bandgap semiconductors like GaAs
- Indirect bandgap materials like Silicon are unsuitable for light emission and can instead be used for detectors.

crystal structure

diamond lattice

zinc blende lattice

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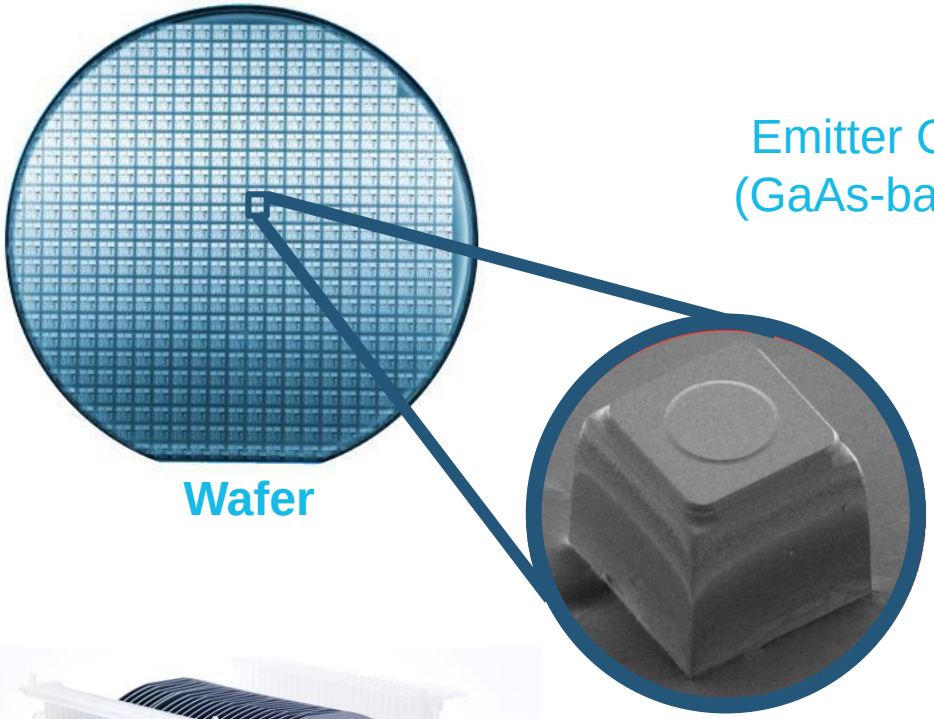
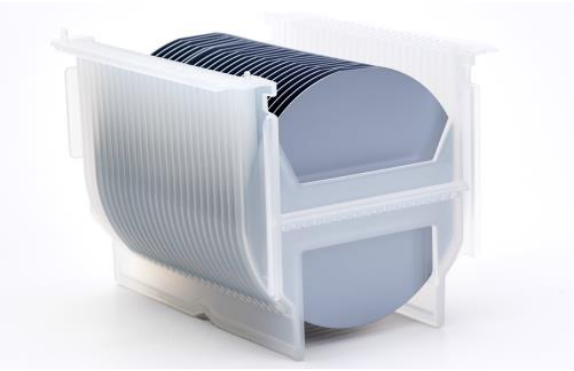
One optical example: Proximity Sensor



Wafer

Chip

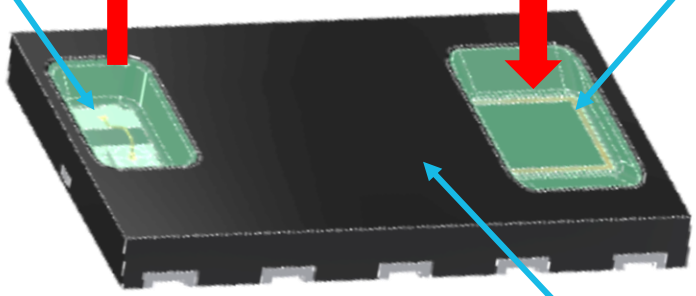


Emitter Chip
(GaAs-based)

Infrared
Light

Reflected
IR-Light

Detector
Chip
(Si-based)



Electronic Component

ASIC
Analog Signal
Integrated Circuit
(i.e. converting an analog signal
to digital output)

GaAs Opto-Electronics are already part of your daily life. If we lose them, we´ll go back to the “Stone Age”

Force sensing

Proximity sensors

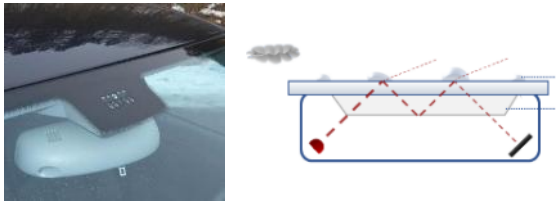
Air Quality/smoke dec.

Turn knobs

Remote controls

Battery Management

Rain sensors



Driver assistance

Wearables / AR glasses

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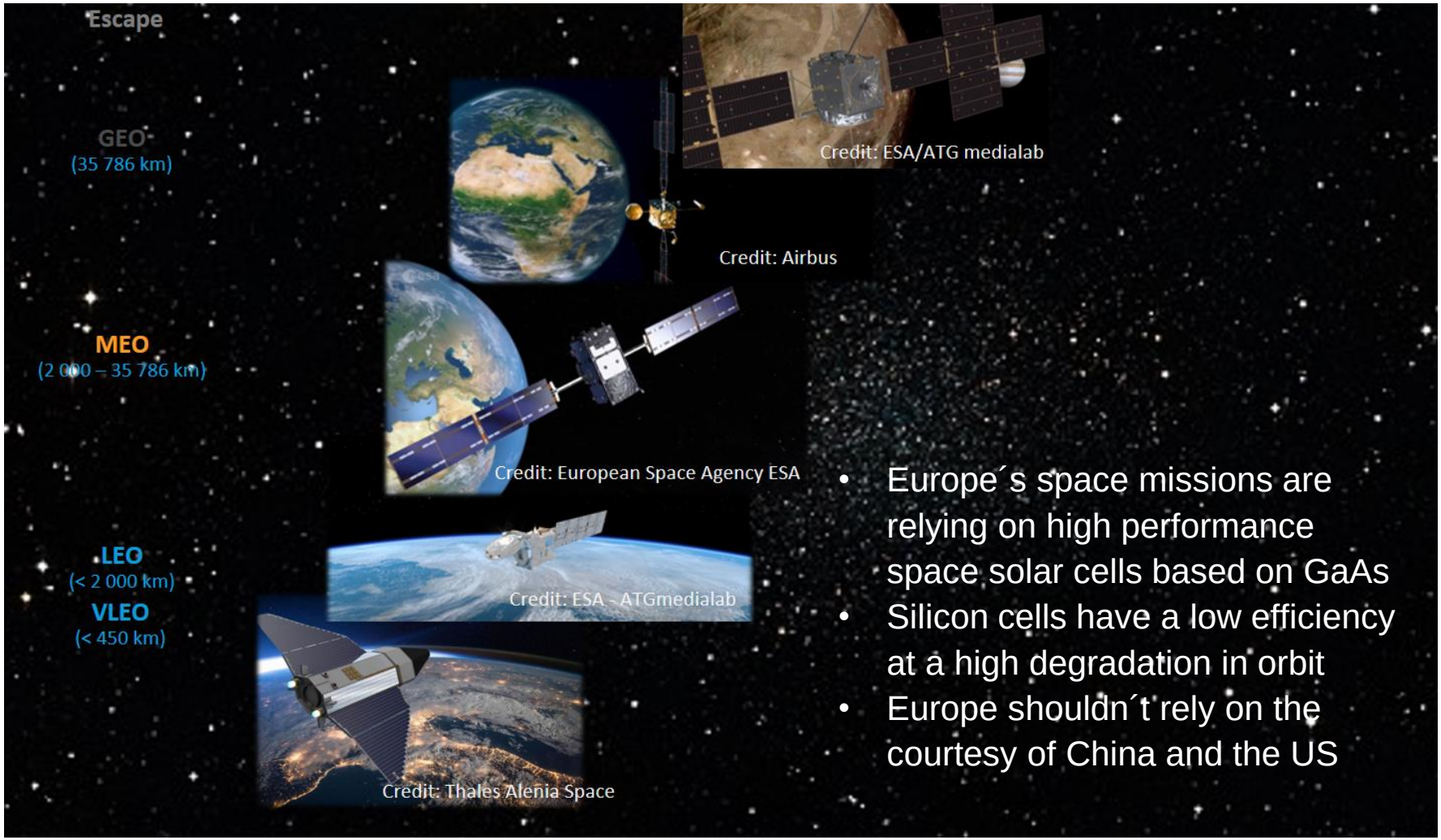
European Space Missions are Depending on Highly-Efficient GaAs-Based Solar Cells

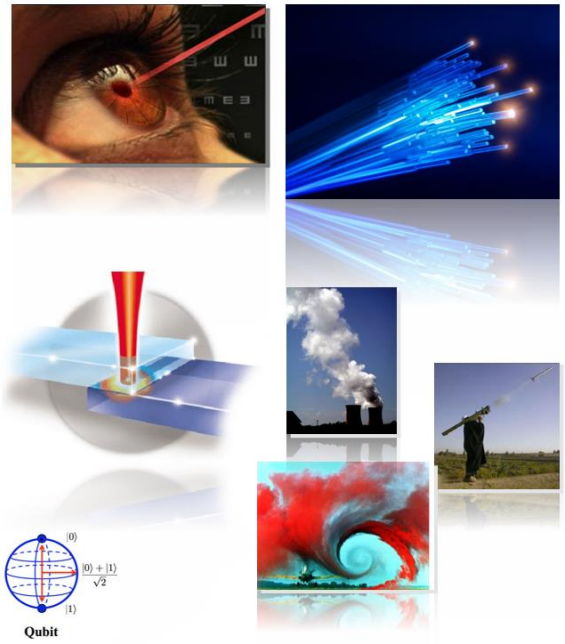


- Europe´s space missions are relying on high performance space solar cells based on GaAs
- Silicon cells have a low efficiency at a high degradation in orbit
- Europe shouldn´t rely on the courtesy of China and the US

Other Opto-Electronics

GaSb

2.X µm Semiconductor Disk Lasers (IR)



Type-II Superlattice IR-Detectors (IR)

GaN

Blue light and Lightening