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innovating photonics

LED light sources as narrow or broadband emitter in medical devices

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Agenda

- Key facts about our company and products
- Non-invasive oxygen monitoring of premature children
- Chip selection by wavelength and spectrum
- Non-invasive hemoglobin measurement with LEDs
- Broadband emitters for multispectral imaging and diagnostic support

Key Facts about our company

EPIGAP OSA
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Industrial leader
in the field of LED technology

- Location Berlin Germany
- Cleanrooms
- 80 Employees

focused on
the specific requirements
of our customers

TÜV SÜD ISO 9001

Chip production

SMD production

Our products

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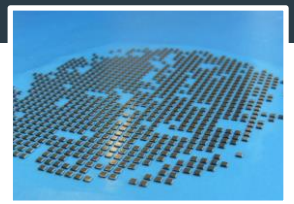
LED-CHIPs



SMD-LEDs

Chip on Board - CoB

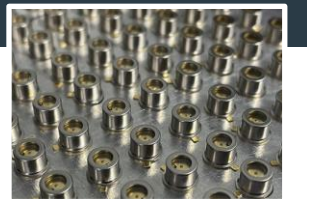
UV-LEDs

- Hermetically sealed TO-Packages with flat window or lens cap
- UVC & UVB wavelength
  230 nm | 265 nm | 275 nm | 308 nm
  325 nm | 340nm

High Power SWIR-LEDs

- Size 6.0 (L) x 4.6 (W) x 4.3 (H) mm
- Circuit substrat: AIN Ceramics
- Lens with 20° viewing angle
- up to 400 mW output power
- Wavelength 980 nm- 2300 nm

TO-LEDs



- High-power, high-speed infrared LED
- Hermetically sealed TO-46 package
- Mounted on reflector header for beamforming
- Operating temperature -40° - +120°C

LED applications in the medical field

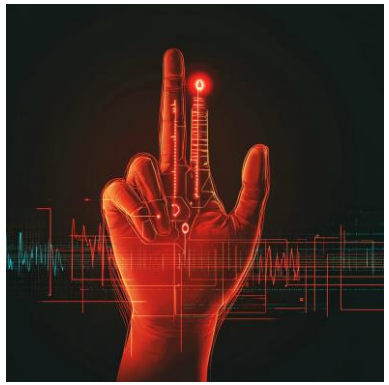
Disinfection of
air, fluids and surfaces
UV LEDs

Therapy
UV, Red and IR LEDs

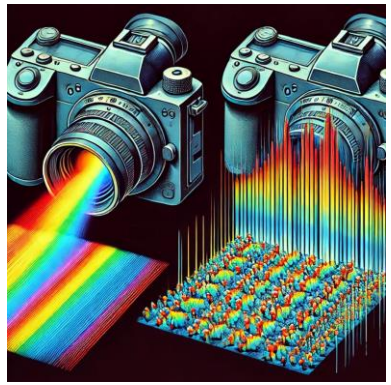
Ophthalmology
Blue, Red and IR LEDs

Drug discovery
Fluorescence
UV & Blue LEDs

In this presentation the focus is on:



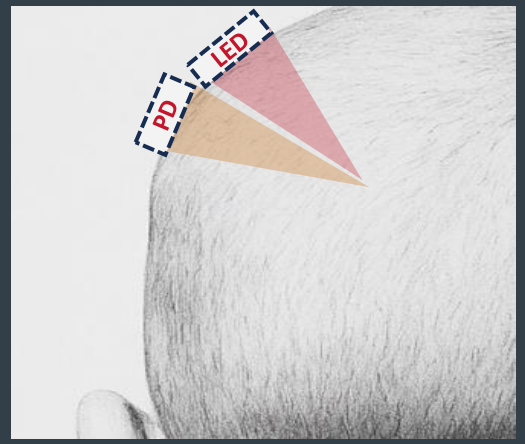
Vital signs sensing
Multi-LED Modules



Hyperspectral Imaging
Broadband LEDs

Non-invasive oxygen monitoring of premature children

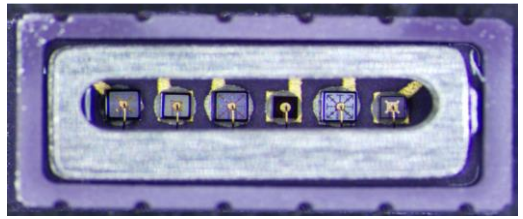
Absorption and Reflection



Miniaturized flexible sensor based on LED-Chips and Photodiode-Chip

A lack of oxygen has a negative effect and leads to the death of brain cells, while an overdose acts like a cell poison and can lead to blindness in patients.

5.5 x 2.4 mm x 1.4mm



Wavelength selection

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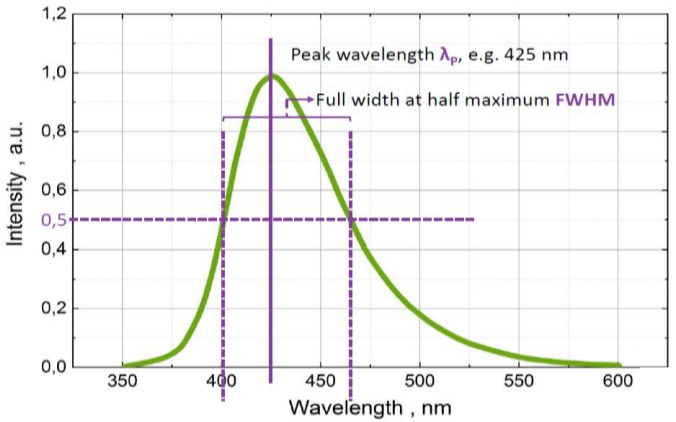
Clear definition of the specific wavelength and spectral behaviour of the chips

- 10 different wavelength
  550 nm – 1300 nm

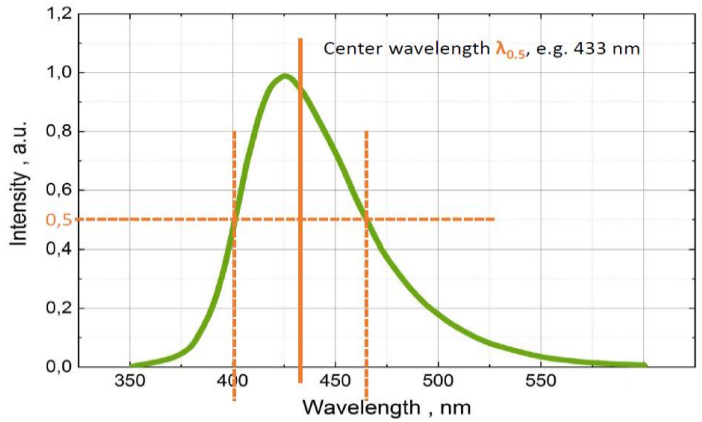
- Low forward current
  10 – 100 mA
- Output power
  2 – 10mW
- Harmless light (NIRS) to determine absolute haemoglobin oxygen

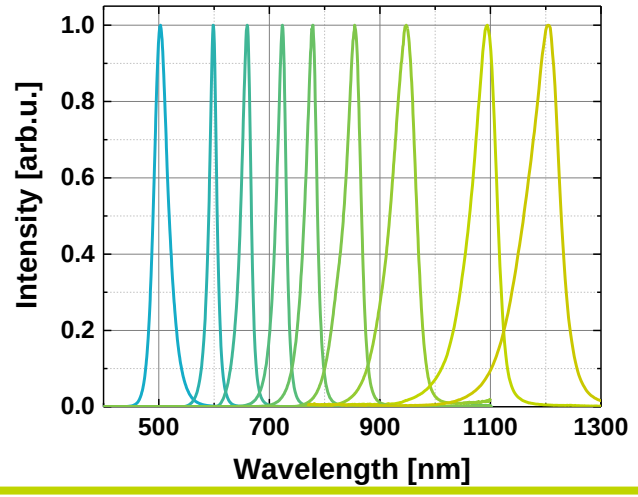
- Glue-free fixation
- Very soft silicone hull
- Reusable

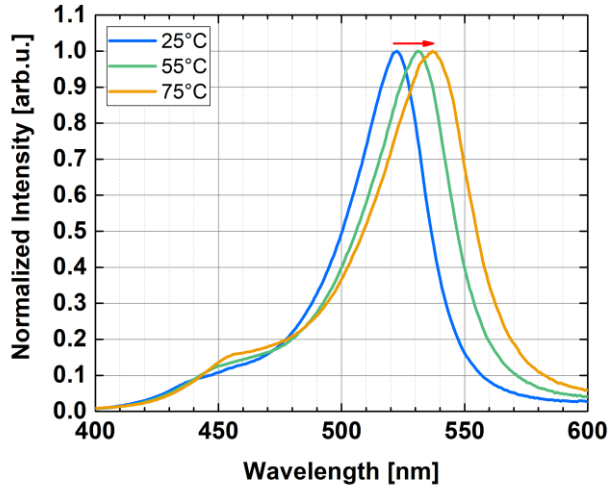
Peak wavelength λ_p



Center wavelength $\lambda_{0.5}$







Non-invasive hemoglobin measurement with LEDs

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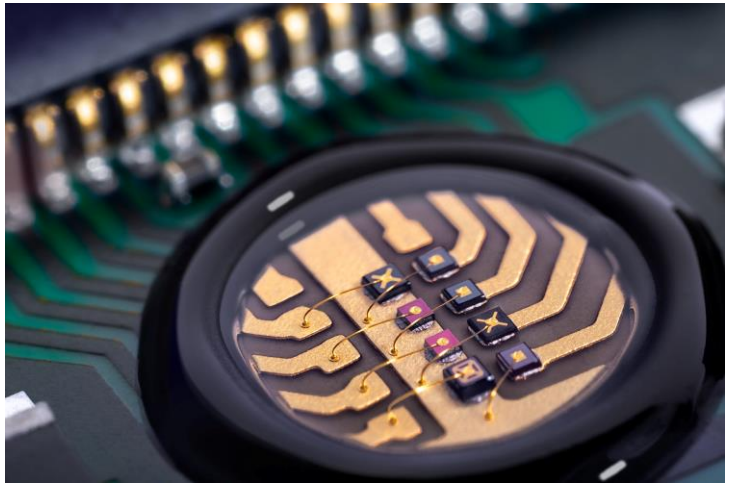
Advantages:

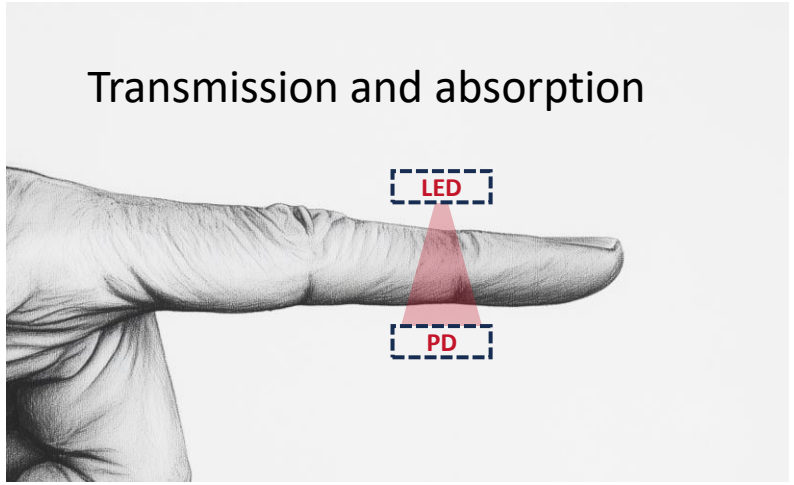
- **Strong and stable optical signal**
- **Painless screening**
- **Easy and safe to use**
- **Environmentally friendly**
- **Cost effective**



8 different LED-Chips (600 nm – 950 nm)
VIS – NIR
Selection of peak wavelength to +/- 3 nm
wire-bonded and ecapsulated with optical epoxy

Dimension within less than Ø 4 mm

Every chip separat adressable



- Penetration depth depends on the wavelength
- The determination of Hemoglobin concentration is based on the light absorbance and reflectance characteristics of the skin.
- The amount of absorbance is related to the concentration and can be calculated.
- Small compact sensor with high signal-to-noise ratio for reliable measurement
- Temperature stability by heating up the LED module up to a certain constant temperature level

Broadband emitters for multispectral imaging and diagnostic

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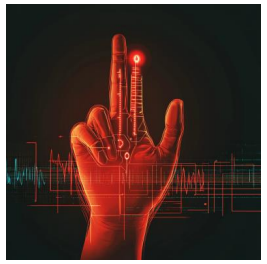
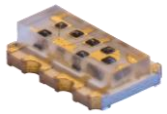
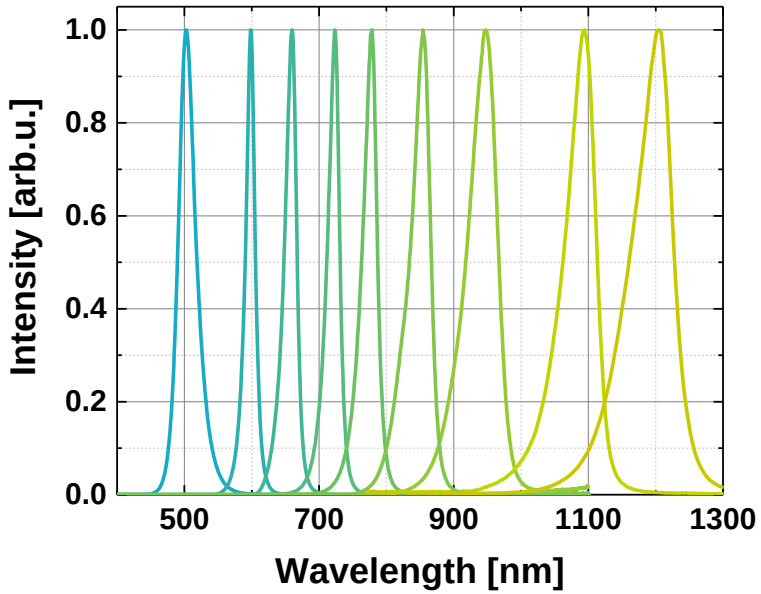
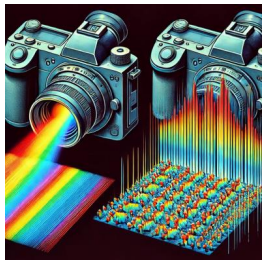


Vital signs sensing
Multi-LED Modules

LED Module with Multiple LEDs

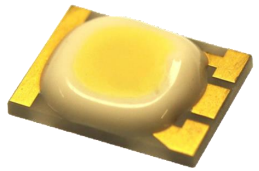


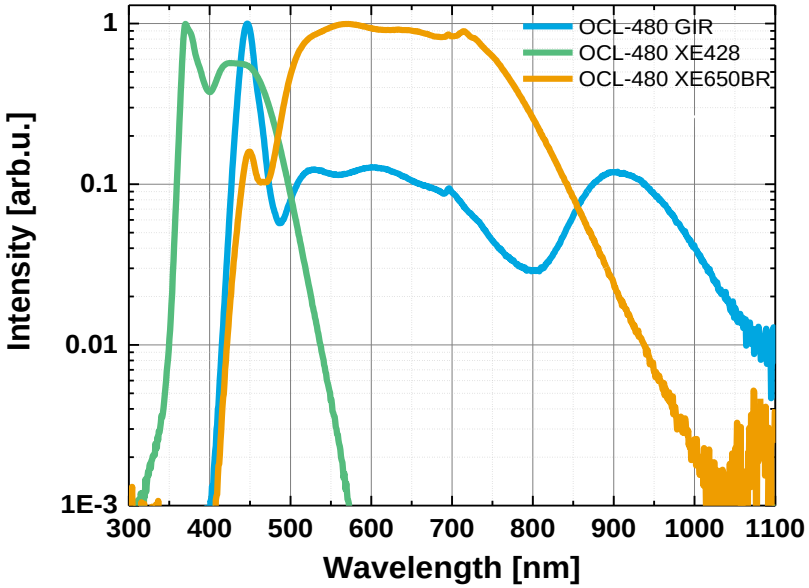


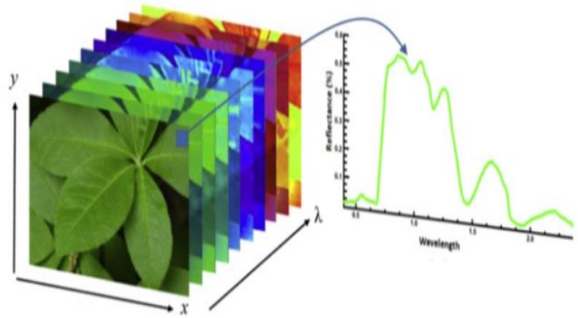


Hyperspectral Imaging
Broadband LEDs

Single Broadband LED

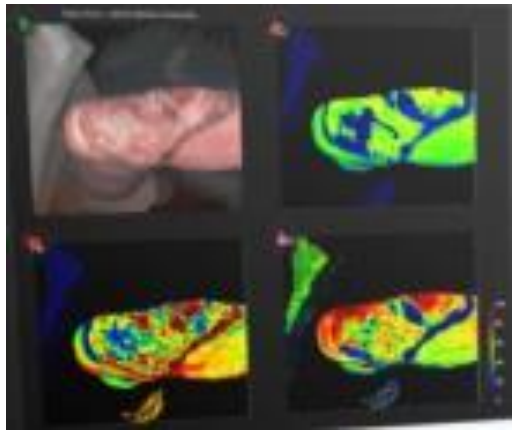


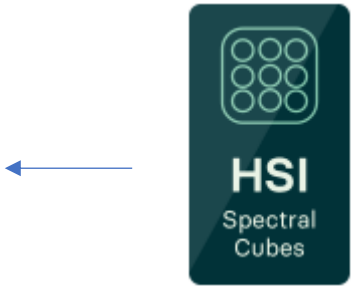




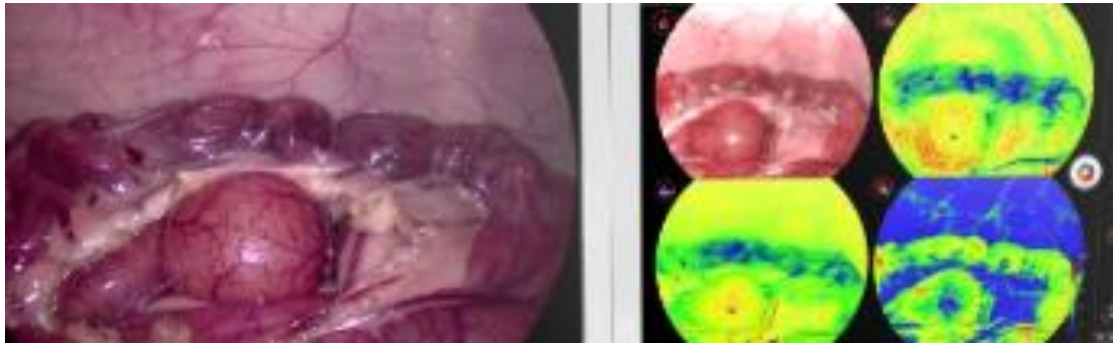
Hyperspectral imaging is the intensity of reflected light for each pixel of an image.
Each pixel contains detailed **spectral information**, allowing for the identification and analysis of objects Data Cube.

LED illumination supports camera systems for wound medicine



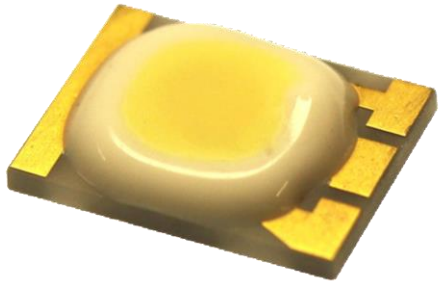


Hyperspectral imaging for minimally invasive procedures



The HSI cubes in the wavelength range from 500 to 1000 nm with SMD OCL-480-GIR.
This visual and near-infrared wavelength range contains various chemical information of the tissue.

- Oxygen saturation in superficial tissue layers
- Perfusion in deeper tissue layers
- Hemoglobin content
- Water content
- Fat content

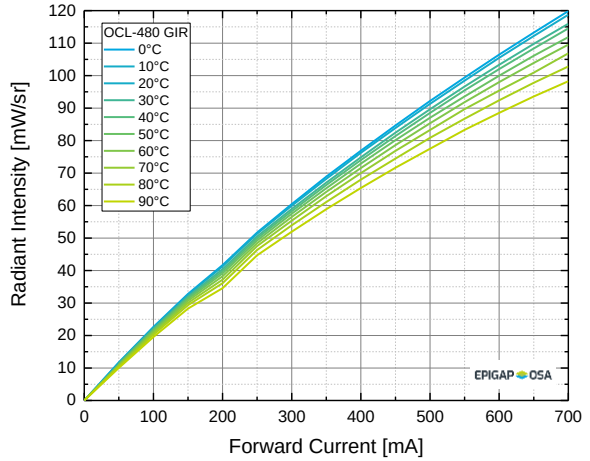


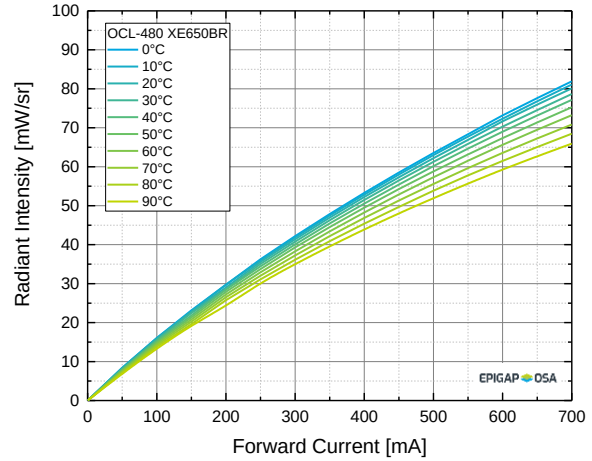
Advantages:

- **High Power SMD LED**
- **Single emitter**
- **Small footprint**
- **Dimension:**

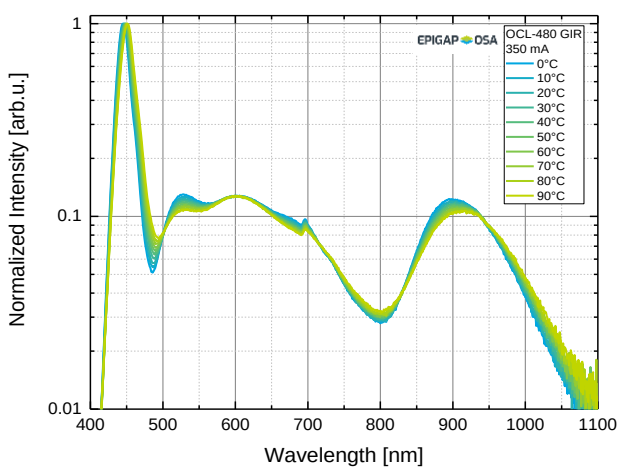
  6 mm x 4.6 mm x 1.1mm
- **Temperature stability**

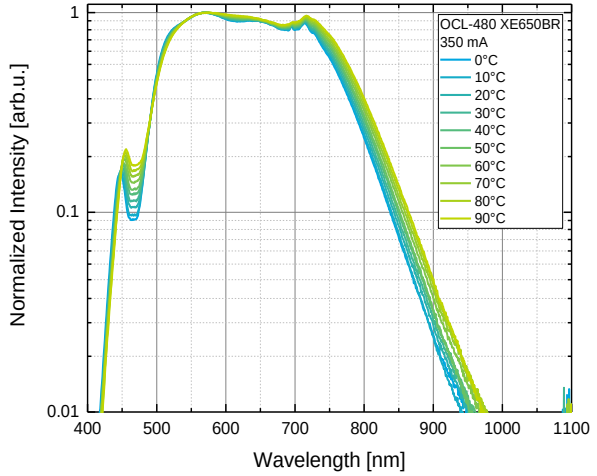
Temp (°C) Vs Current (mA) Plots of the SMD-LEDs

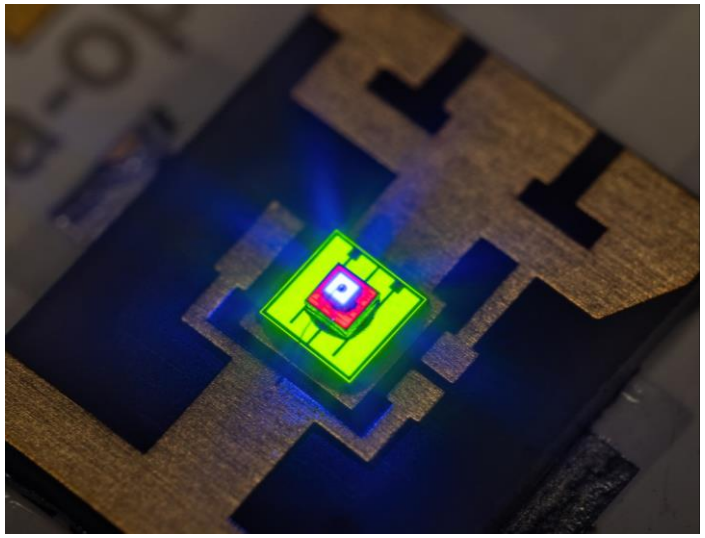




Temp (°C) Vs Spectrum (nm) Plots of the SMD-LEDs







THANK YOU FOR YOUR ATTENTION!

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