New Generation of InGaN Layers, Quantum Wells and Wires Grown on Vicinal GaN Substrates for Optoelectronics and Photovoltaics WiseGaN

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Visegrad Group (V4) + Japan
- Innovation and Industry -

Joint Science Diplomacy Seminar

9th March 20222

GaNification

Gallium nitride based devices: second (after silicon-based) semiconductor market

Institute of High Pressure Physics
Director Iza Grzegory

GaN substrate growth, M. Bockowski +15+ Ammono (20)

MBE growth, C. Skierbiszewski+15

MOVPE growth, Electronic devices,
Microstructure, M. Leszczynski+12

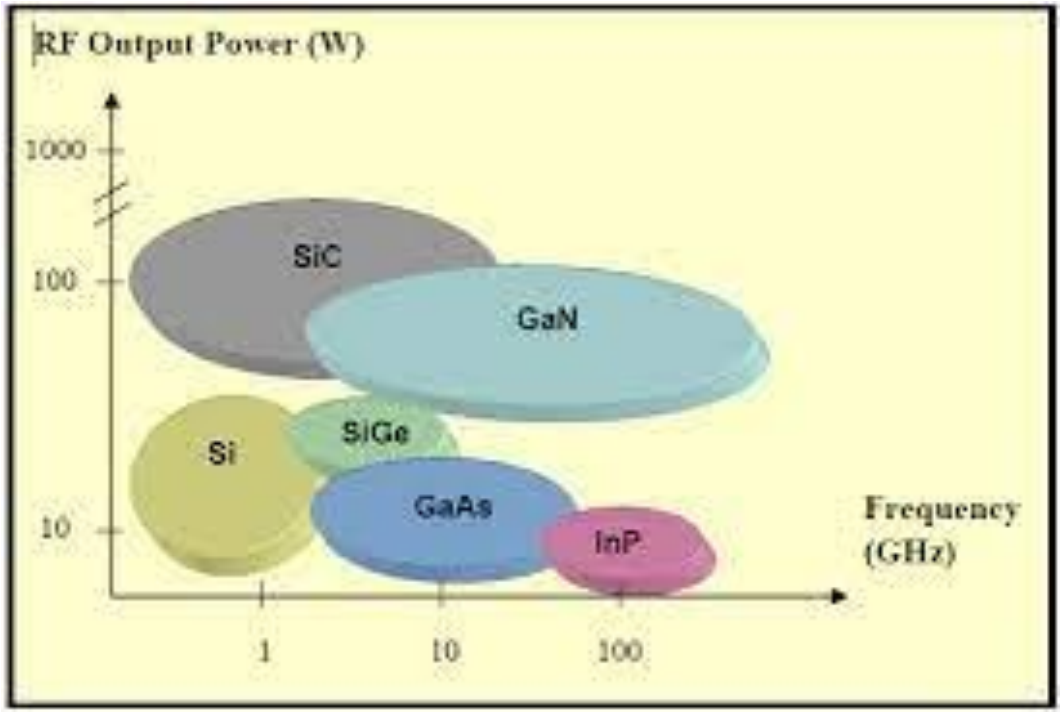
Laser processing, P. Perlin+12

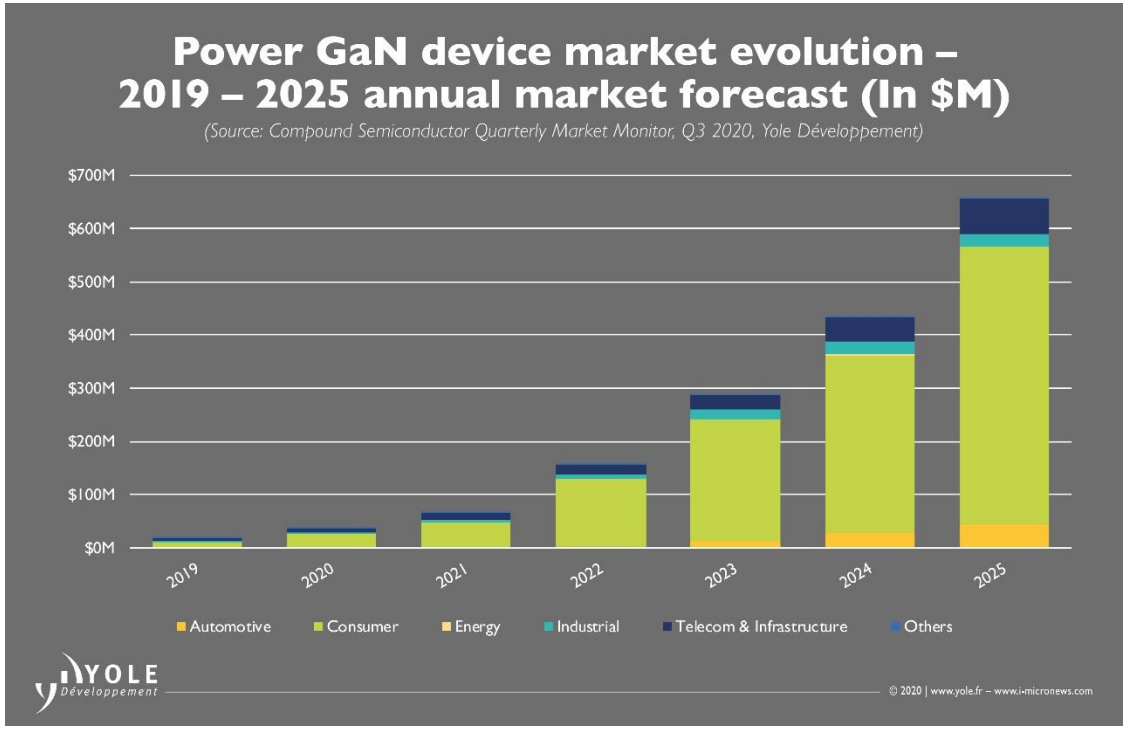
Physics of semiconductors, T. Suski+8

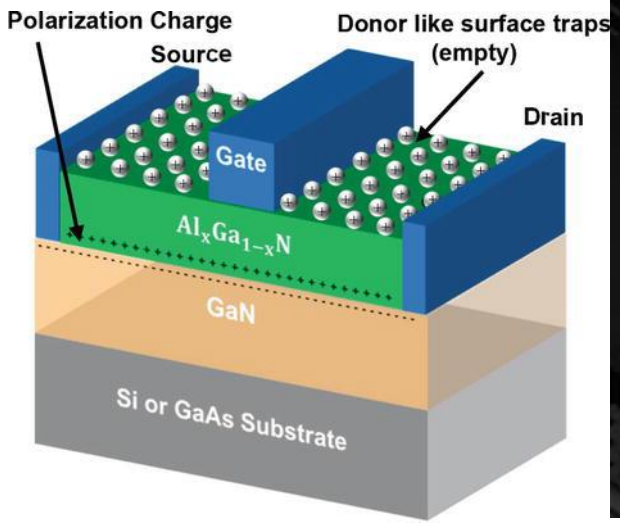
Manufacturing, A. Kasprowiak,
K. Wegrzyn, M. Leszczynski,
P. Perlin +15

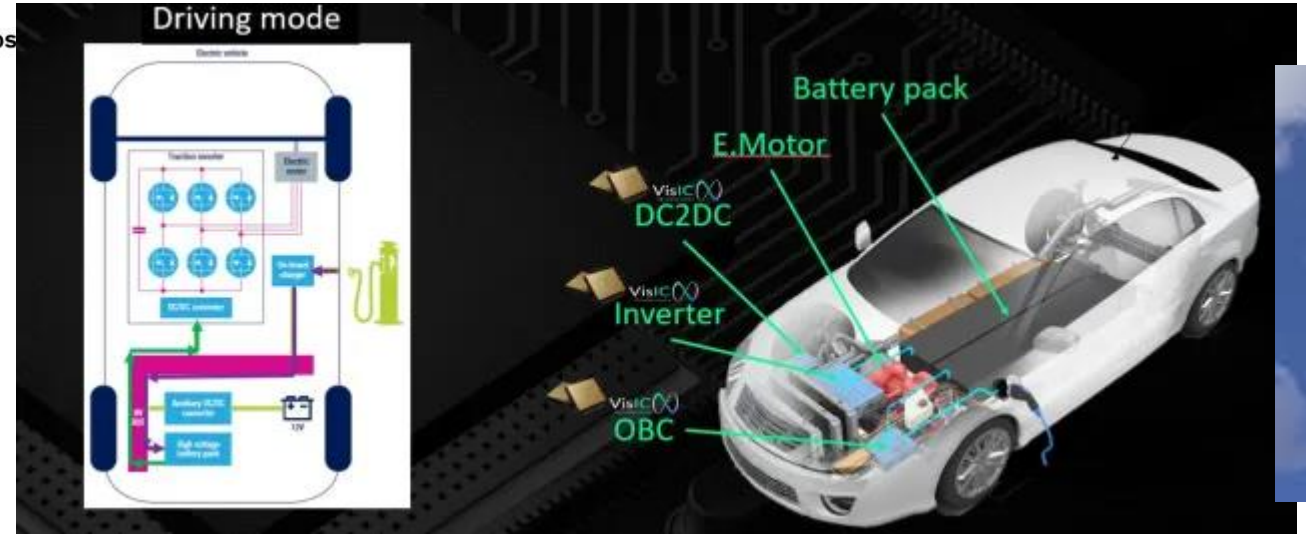
In total, about 100 engineers and scientists

GaN-based Transistors



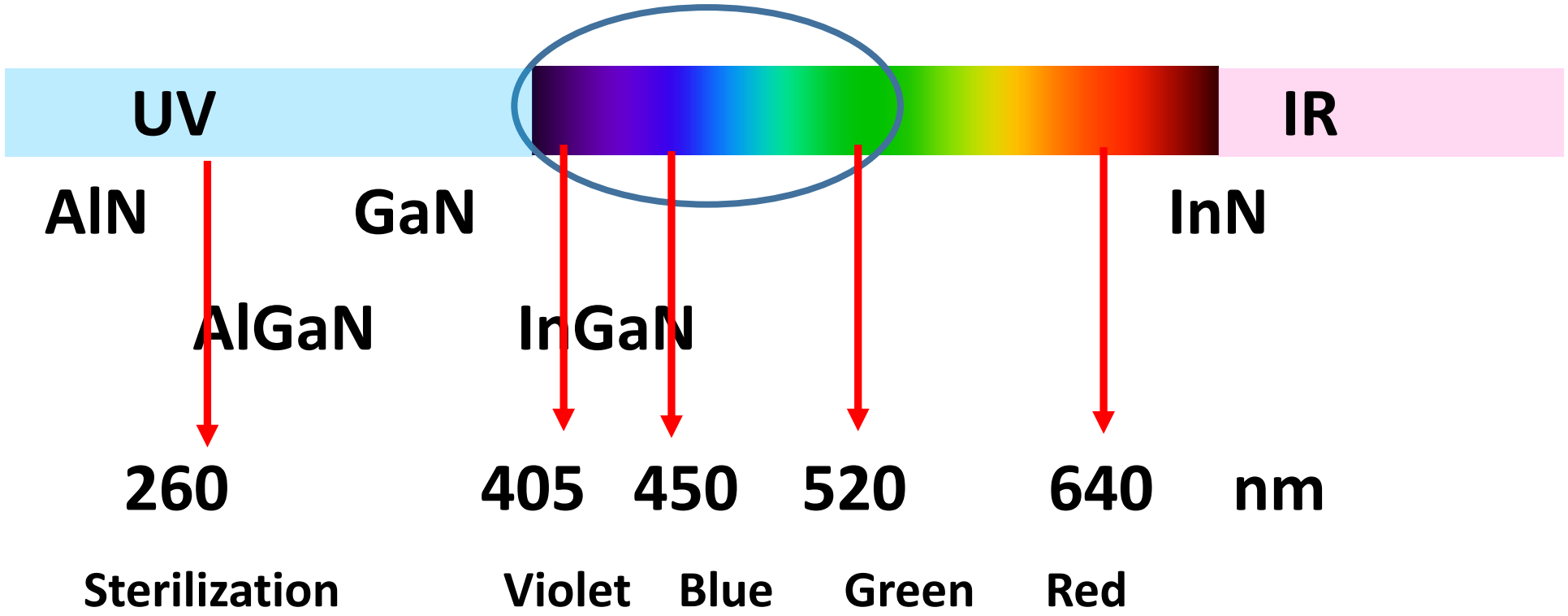




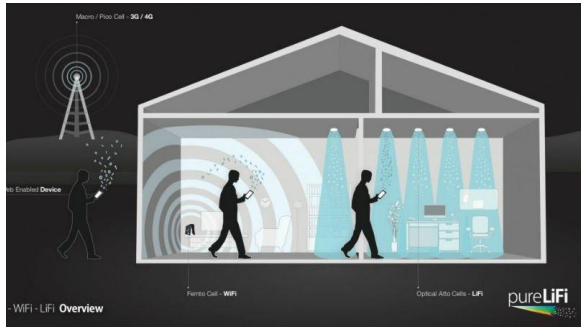


Nitrides:

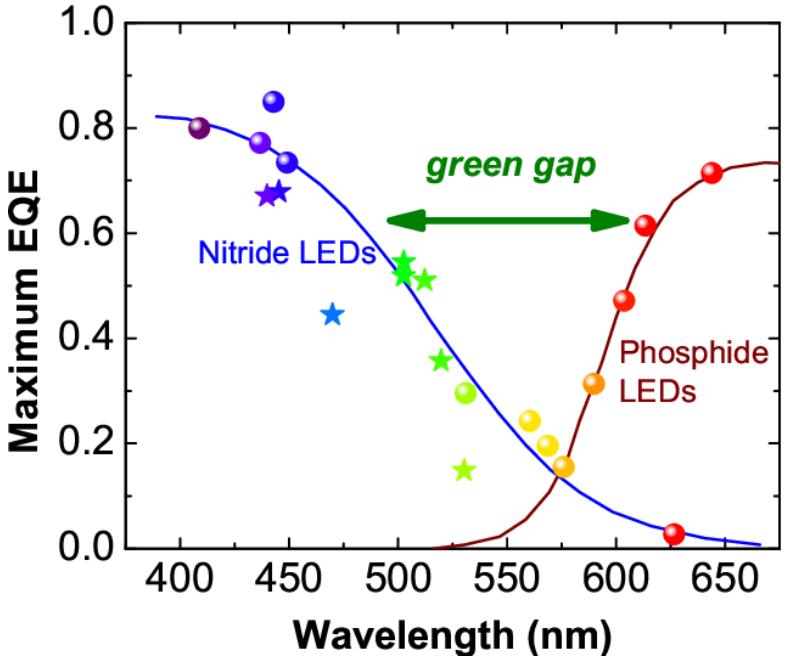
Energy gap from IR to UVC, strong bonds

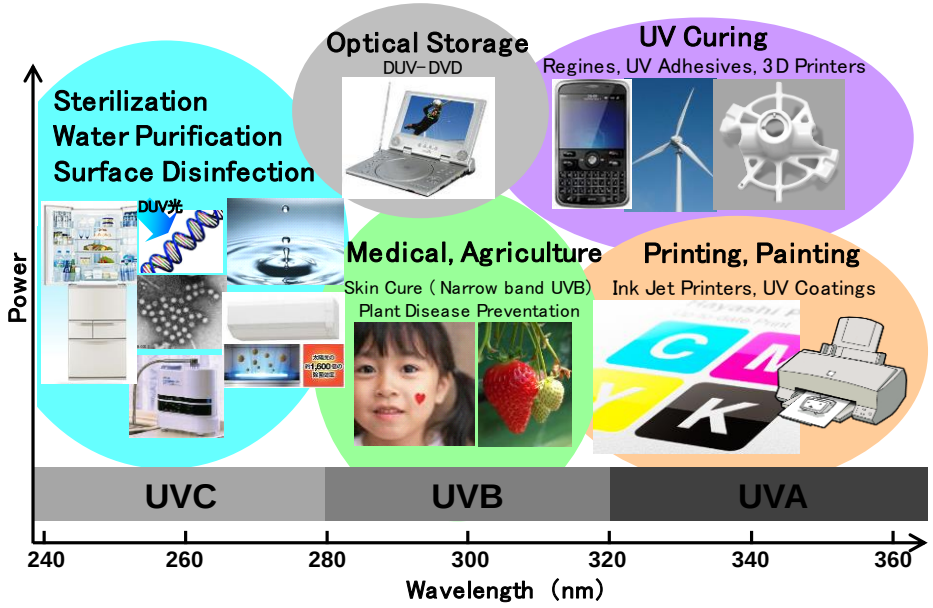


LEDs


pureLiFi

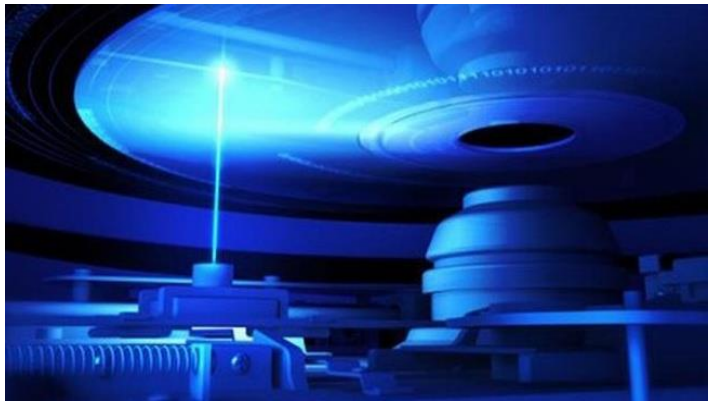

$25,000
$20,000
$15,000
$10,000
$5,000
$0
7% CAGR
$15,565
$21,572
Revenues ($M)
2013
2014
2015
2016
2017
2018
2019
Others
Lighting
Automotive
Signs
Mobile
Display


1.0
0.8
0.6
0.4
0.2
0.0
Maximum EQE
400
450
500
550
600
650
Wavelength (nm)
green gap
Nitride LEDs
Phosphide LEDs


Optical Storage
DUV-DVD
UV Curing
Regines, UV Adhesives, 3D Printers
Sterilization
Water Purification
Surface Disinfection
DUV光
Medical, Agriculture
Skin Cure (Narrow band UVB)
Plant Disease Prevention
Printing, Painting
Ink Jet Printers, UV Coatings
Power
UVC
UVB
UVA
240
260
280
300
320
340
360
Wavelength (nm)

260

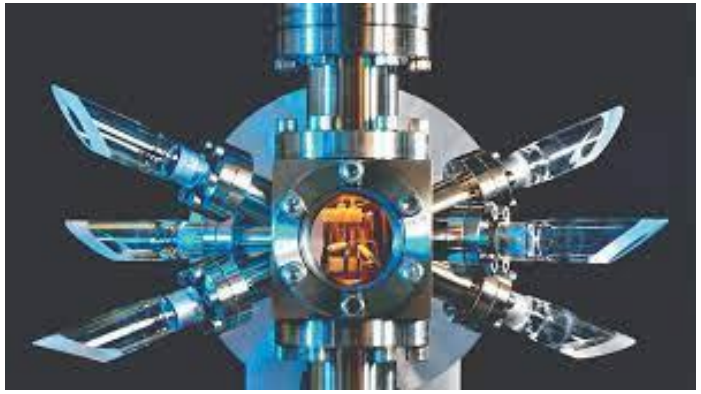
Laser Diodes (LDs)



Blue ray

Headlight lamps

Copper welding



Atomic clocks

Laser projectors

Underwater communication

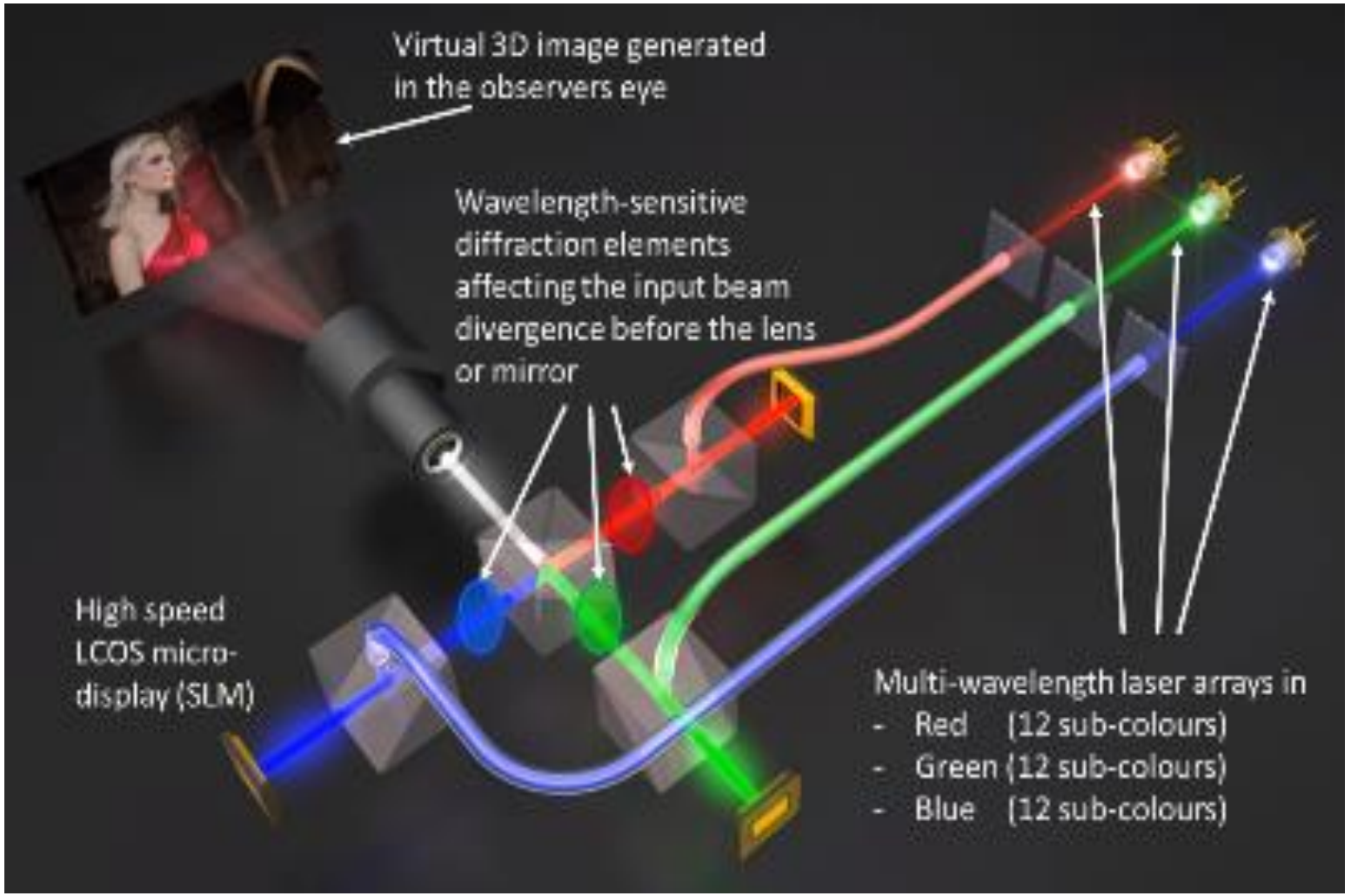
WiseGaN

Mike Leszczynski
Unipress

Hiroshi Amano Nagoya University
Nobel Prize 2014

Vaclav Holy Charles University
Famous X-ray Specialist

3-D Projectors without goggles- Holy Grail of optoelectronics



Nitrides:
Blue 450-460 nm, step 1 nm
Green 520-530 nm, step 1 nm

Arsenides/phosphides
Red 630-640 nm, step 1 nm

Project WiseGaN was an important step towards 3D projectors, but still many problems must be solved.

In 4-5 years, such 3D laser projectors should be on the markets. There is a chance that they will be based on WiseGaN technology.