Demonstration of a Dual-Depletion-Region Electro-Absorption Modulator (DDR EAM) at 1.55 μm Wavelength for High-Speed and Low-Driving-Voltage Performance

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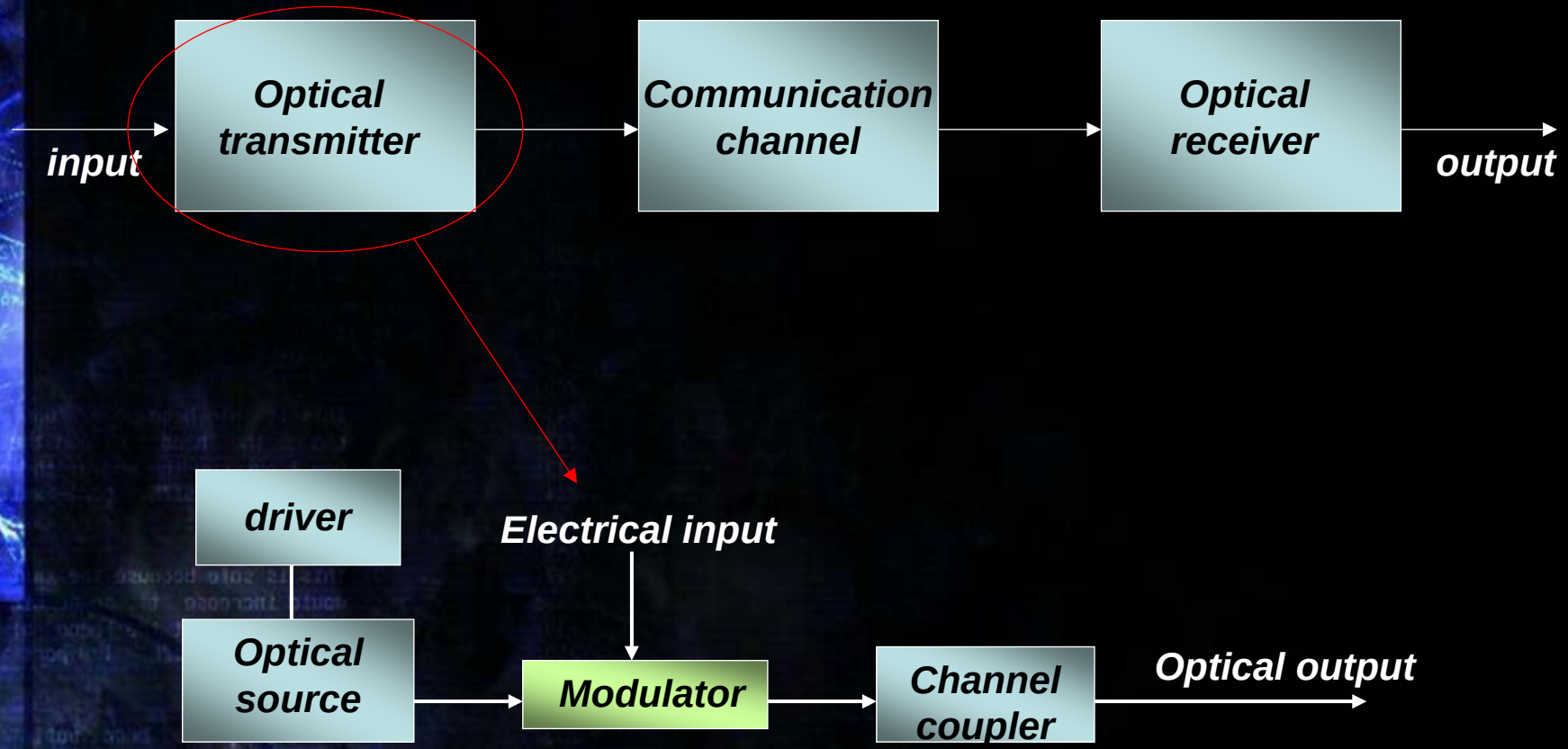
Optical communication systems



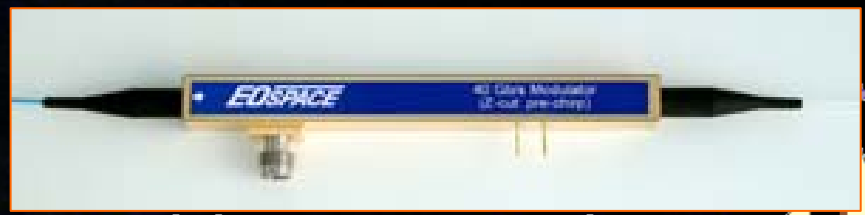
Two types of modulator

- Electro-absorption modulators (EAM) =>

Which is defined as the change of material absorption under the presence of an electric field.

- Electro-optic modulators (EOM) =>

Which is defined as the change of material refractive index under the presence of an electric field

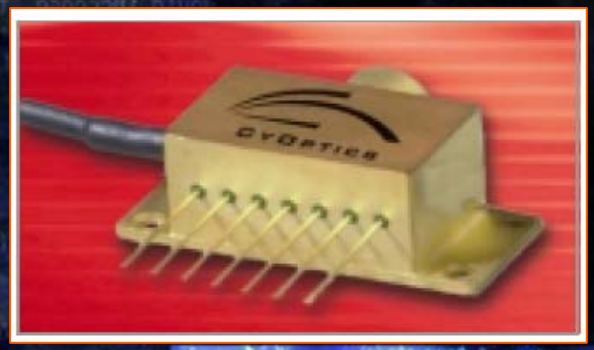


EAM V.S EOM

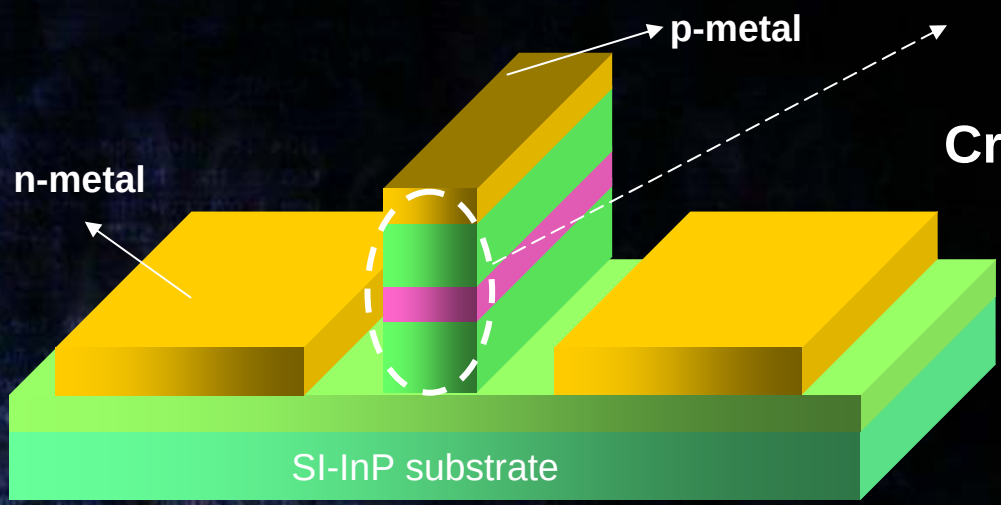
The EAM have several unique advantages =>

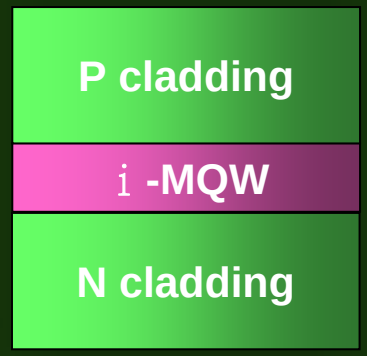
1. Low drive-voltage
2. Ultra-high speed performance
3. Short length of device
4. Superior capability to be monolithic integrated with other optoelectronic devices

H. KAWANISHI, et al, "EAM-INTEGRATED DFB LASER MODULES WITH MORE THAN 40-GHZ BANDWIDTH", IEEE PHOTON. TECHNOL. LETT., VOL. 13, 954-956, (2001)



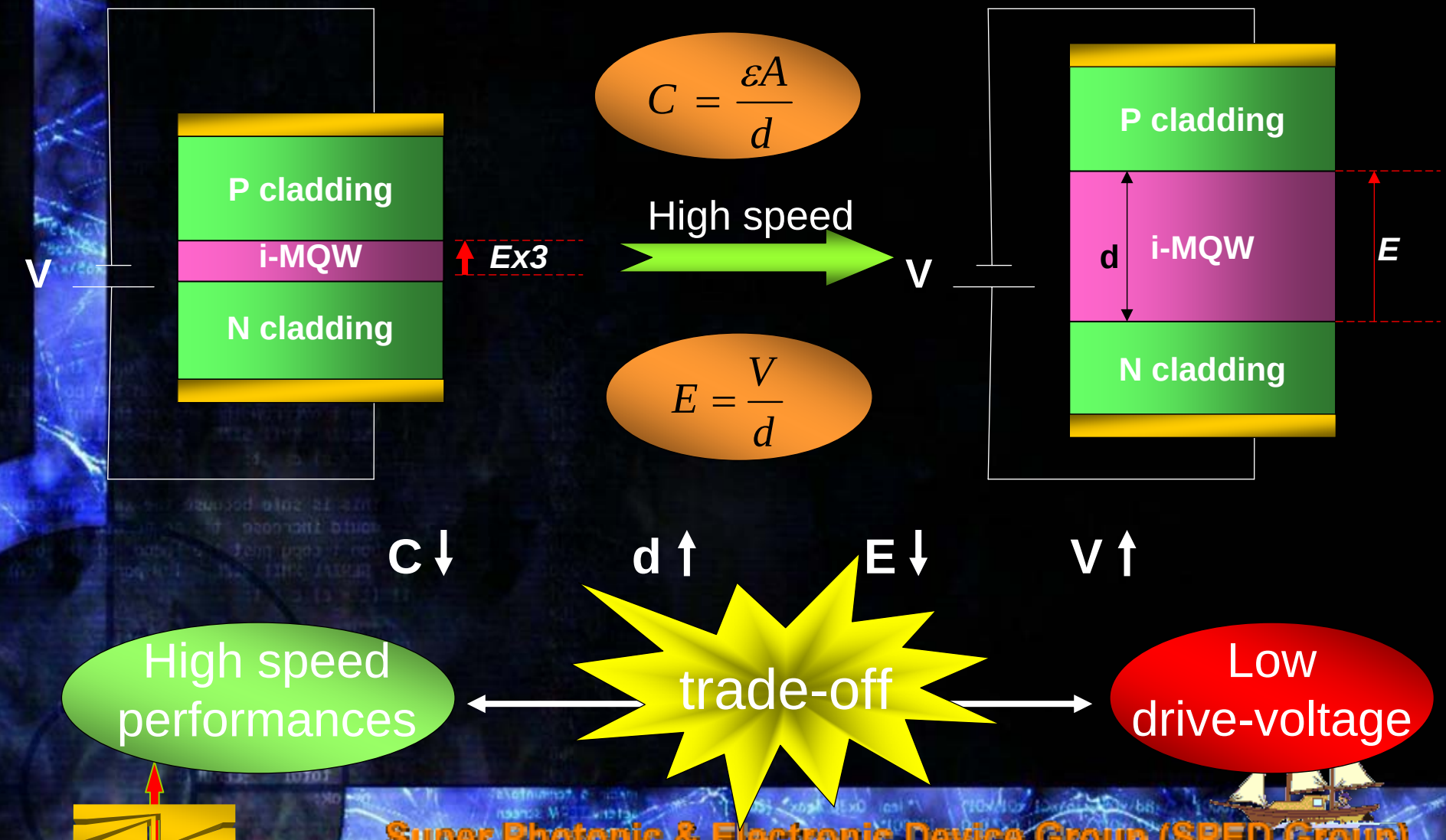
Traditional P-I-N structure





Cross-sectional view of waveguide

high speed performances & Low drive-voltage

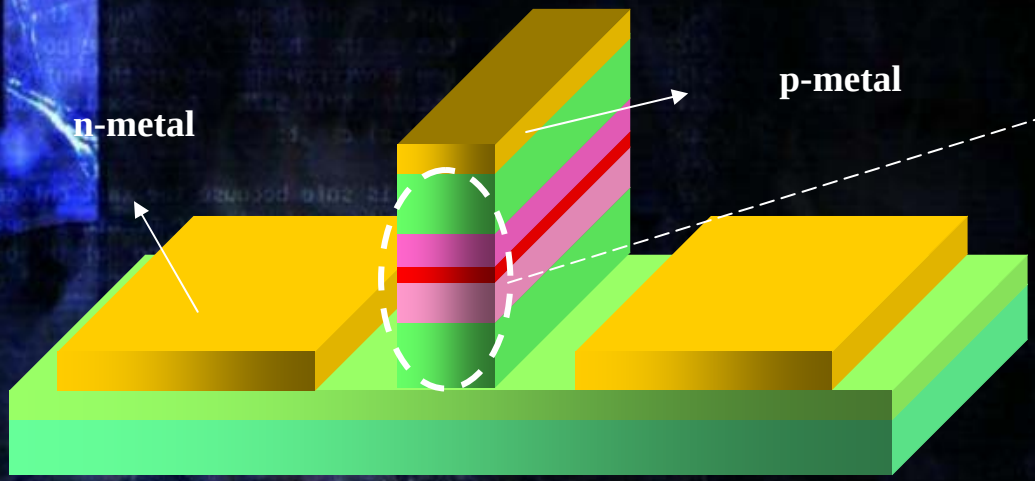


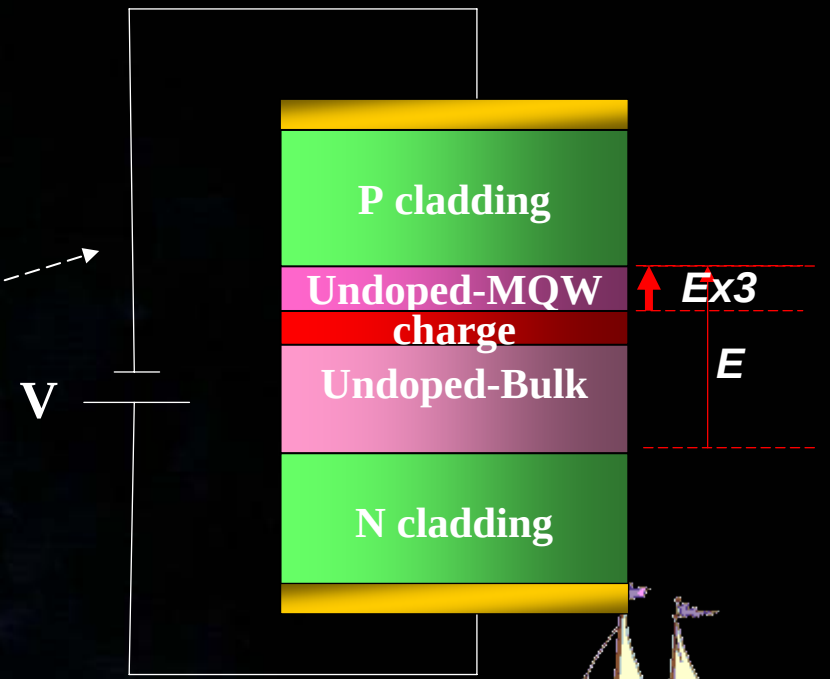
DDR EAM structure

High speed performances

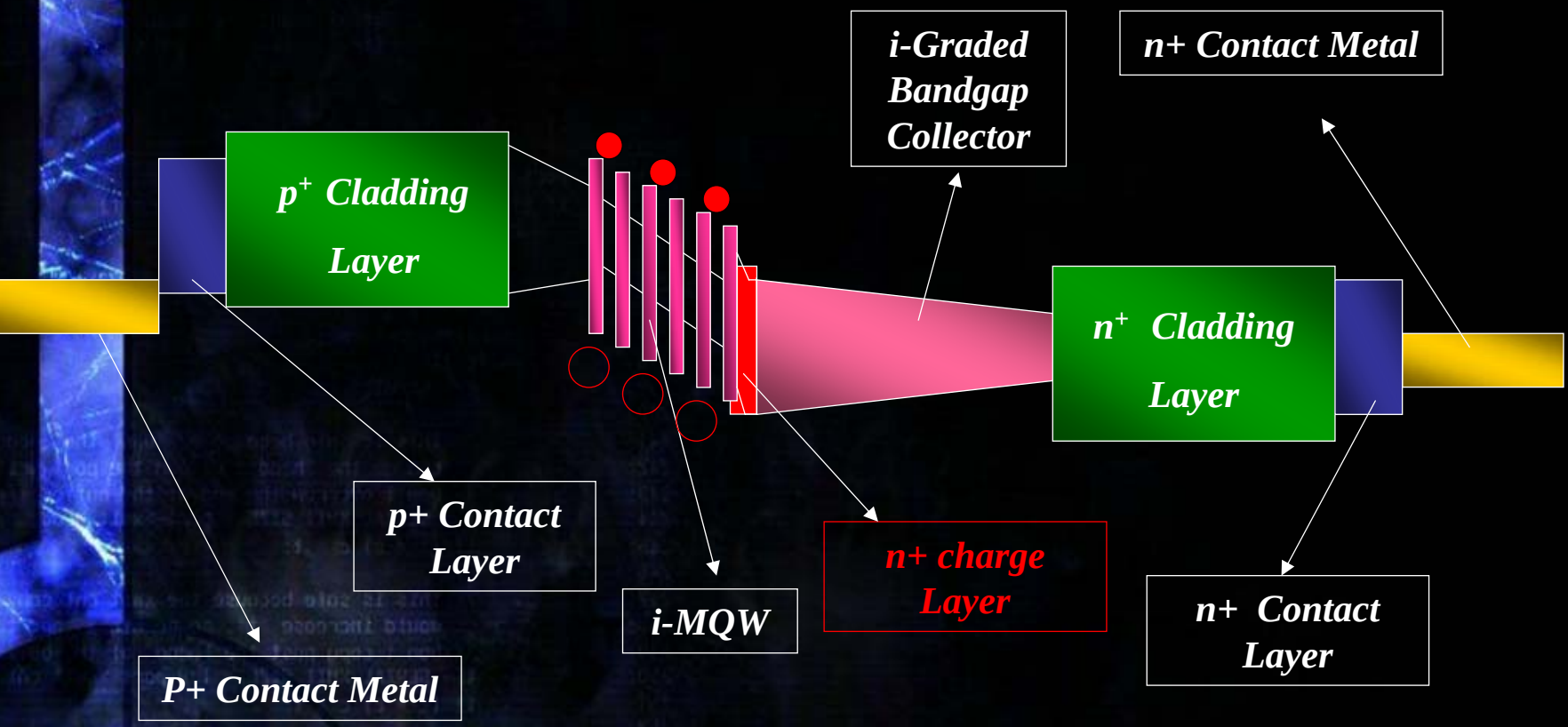
t DDR EAM ff

Drive-voltage





The conceptual band diagram of DDR EAM



Lightning Network Analyzers

Power supply

Tunable Laser

PD MN4765A

Port 1

Polarization Controller

EDFA

DUT

EDFA

Polarization Controller

Reduce the reflect microwave

Bias Tee

Load (50Ω)

Conclusion

- We demonstrate a novel epi-layer structure of EAM:

Dual Depletion Region EAM (DDR EAM).

- The trade-off between device capacitance, electrical-to-optical (EO) bandwidth, drive-voltage and optical/electrical insertion loss can be released effectively.