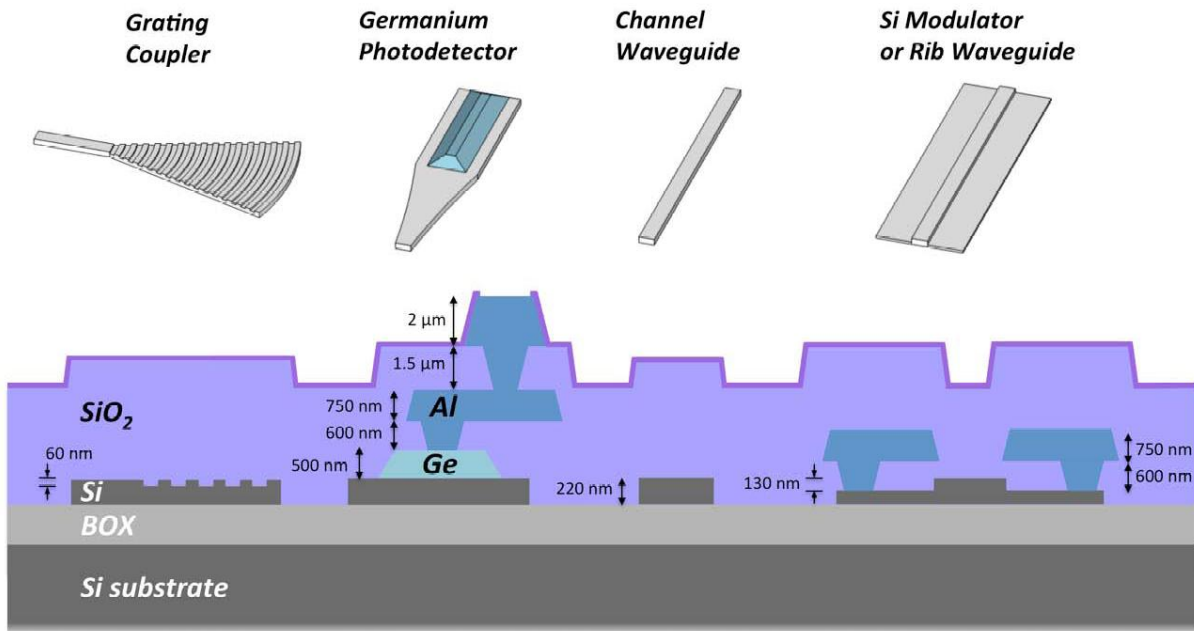


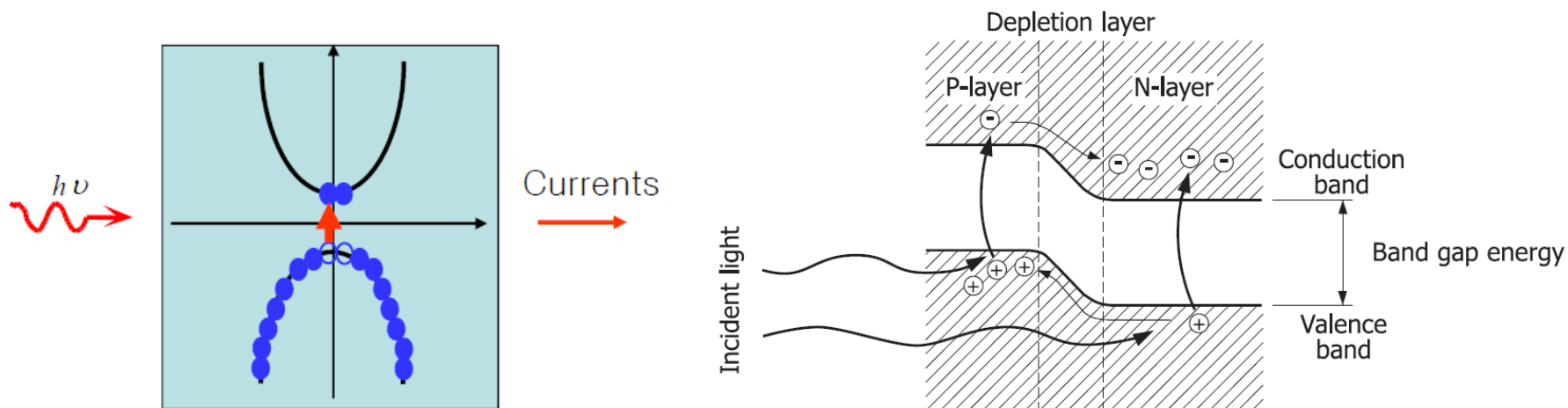
Si Photonics

- Research topic for Si photonics:
 - **Photodetector: VPD, LPD (이정민)**
 - Optical modulator: MZM, ring modulator (유병민, 반유진)
 - Passive devices: waveguide (strip, rib), coupler (grating, directional, edge), ...
- Fabrication plan:
 - **2013: OpSIS-IME 002**
 - Others: Luxtera, IMEC, LETI, IHP, ...



Si Photonics – Photodetector

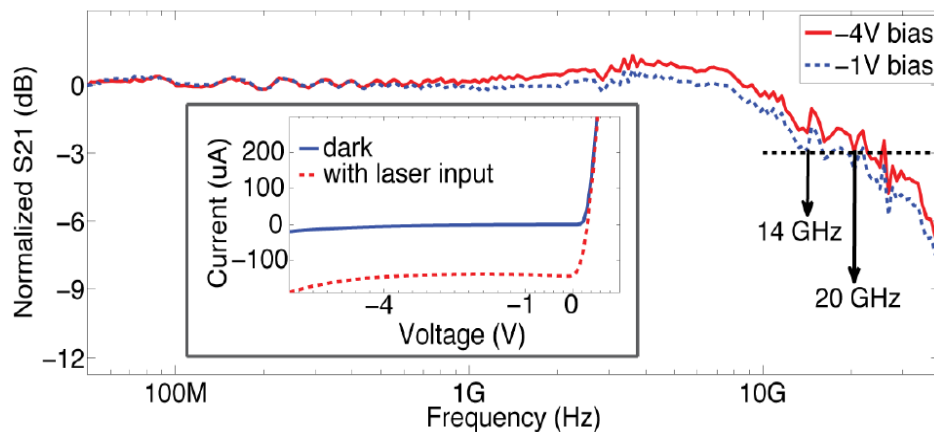
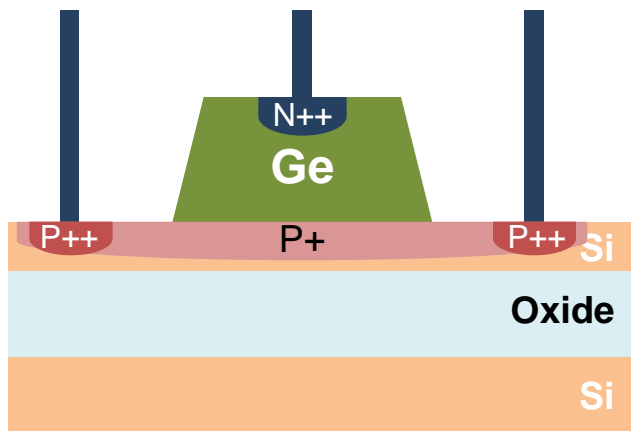
- What is a **photodetector**?
 - Photodetection: absorption ($E_g < h\nu$) \rightarrow current generation



- E-O conversion: high electric field present in the depletion region \rightarrow photo-generated carriers \rightarrow photocurrent
- High-speed photodetector in optical receiver \rightarrow Realize high-speed optical interconnection

Si Photonics – Photodetector

- Vertical photodetector (VPD)



- Specification

Bias	DC responsivity @ 1550 nm	Bandwidth	Darkcurrent
-1 V	0.49 A/W	13.1 GHz	428 nA
-4 V	0.54 A/W	20.2 GHz	4.8 μ A

- Design consideration for high speed and responsivity

Research Plan in 2013

- Chip-to-chip interconnect
 - PD + TIA
 - Modulator + Modulator driver
 - 20-GHz board design with MKo and KDH
- On-chip electrical coupler design for SSB modulation
 - Objective: to generate 90 degree phase shift signal for SSB
 - Type: CPW coupler, ...
 - Considerations: size, phase tolerance
- Establish optical measurement setup (SAIT)
 - Optical probe stage, fiber array, ...
- Conference (2012)
 - ISOCC, "60-GHz Voltage-Controlled Oscillator and Frequency Divider in 0.25- μ m SiGe BiCMOS Technology", Nov, 2012