Avalanche photodiodes (APDs)

Inventors: Joe Campbell et al.
Avalanche Multiplication

- APD is a highly sensitive semiconductor electronic device that exploits photoelectric effect to convert light to electricity
- $k$ factor is the ratio of the electron, $\alpha$, and hole, $\beta$, ionization coefficients

Problem:
- $k$ values can lead to high excess noise
- Certain $k$ values have gain-bandwidth products
- Sensitivity limitation stems from dark current
AllInAsSb Avalanche Photodiode

Solution: UVA researchers have developed APDs with optimal k values and excellent gain/noise characteristics similar to Si

- Good efficiency, low dark counts
- Lattice-matching extends operating wavelength to SWIR spectrum
Relevant Publications

Intellectual Property

• Tech ID: CAMPBELL-STAIRCASE
  – Title: AlInAsSb Staircase Avalanche Photodiode
  – US Patent 9748430 granted Aug. 29, 2017

• Tech ID: CAMPBELL-AVALANCHE
  – Title: AlInAsSb Avalanche Photodiode
  – US Patent 10032950 granted Jul. 24, 2018
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