High-Power High-Speed Photodiode for LIGO (LASER Interferometer Gravitational Wave Observatory)

- **Goal:**
  - Develop a 1-10W Rear-Illuminated Photodiode (at 1064nm) for Advanced LIGO
  - >90% Quantum Efficiency (QE), ≤180MHz Modulation
  - LIGO hopes to be the first instrument capable of detecting gravitational waves

- **Current Results:**
  - InGaAs/GaAs P-I-N diodes grown using MBE (Molecular Beam Epitaxy)
  - Graded buffer incorporated to isolate defects away from active PIN layers
  - Anti-Reflection Silicon Nitride coating deposited using PECVD (at SNF)
  - Ohmic Gold-based contacts deposited using evaporation (at SNF)
  - Achieved ~70% QE, ~5MHz Bandwidth

- **Future Directions:**
  - Thin GaAs substrate to obtain higher QE
  - Further lower concentration of defects in active region to improve performance

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