

APAM Photonics

Silicon optics beyond the telecom region

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Introduction

Goal: Determine efficacy of engineered APAM structures to manipulate IR-THz radiation on CMOS-compatible platform

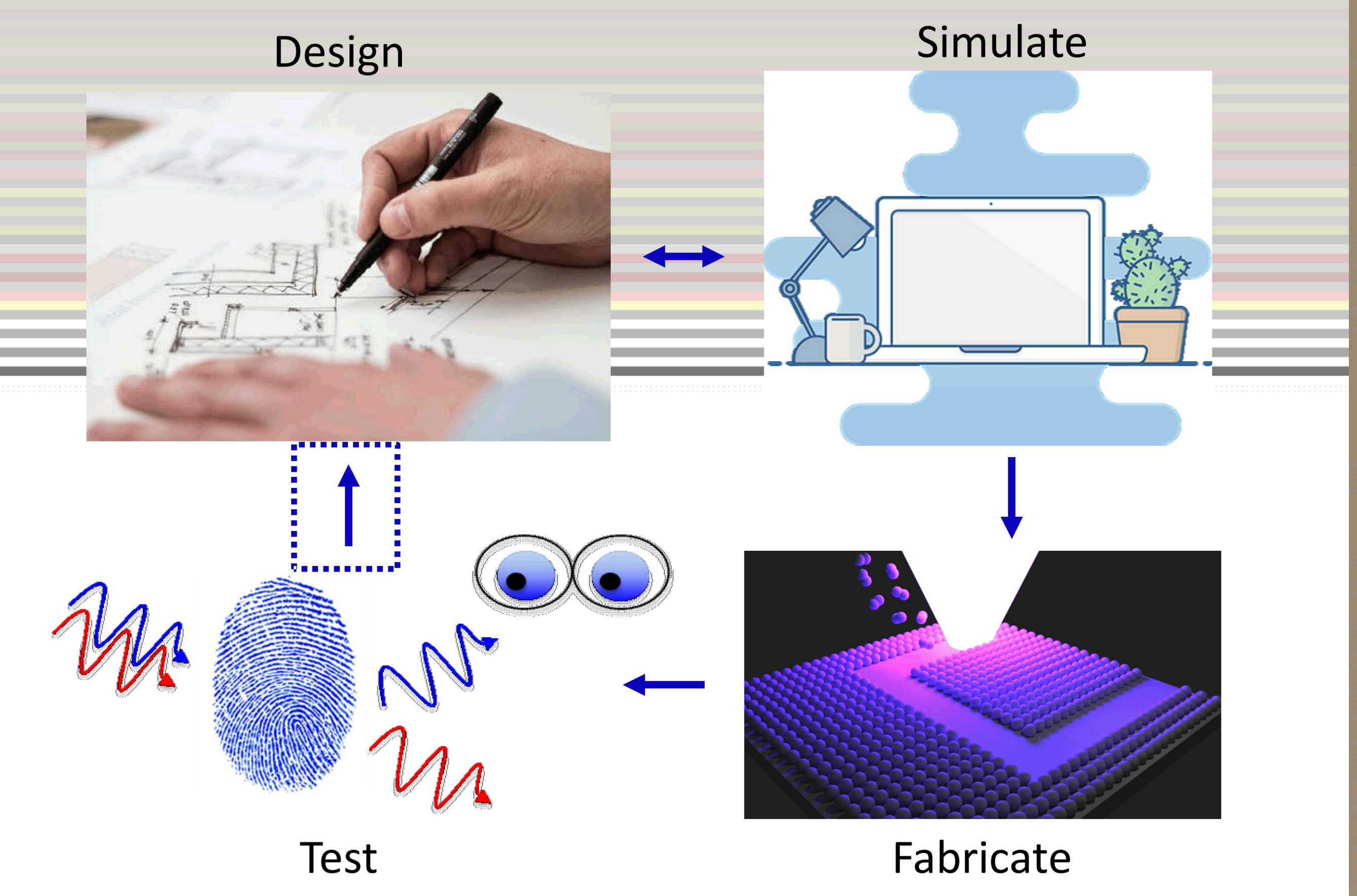
Premise: Engineer "fingerprint" for device identification, user must know imaging parameters for observation

Impact: Success yields useful application and toolbox for developing others in new frequency range for Si, typically requiring incompatible and/or exotic materials

Gaps: Permittivity model robust for predictive design?
Design for sufficient specificity?
Lithographic requirements?

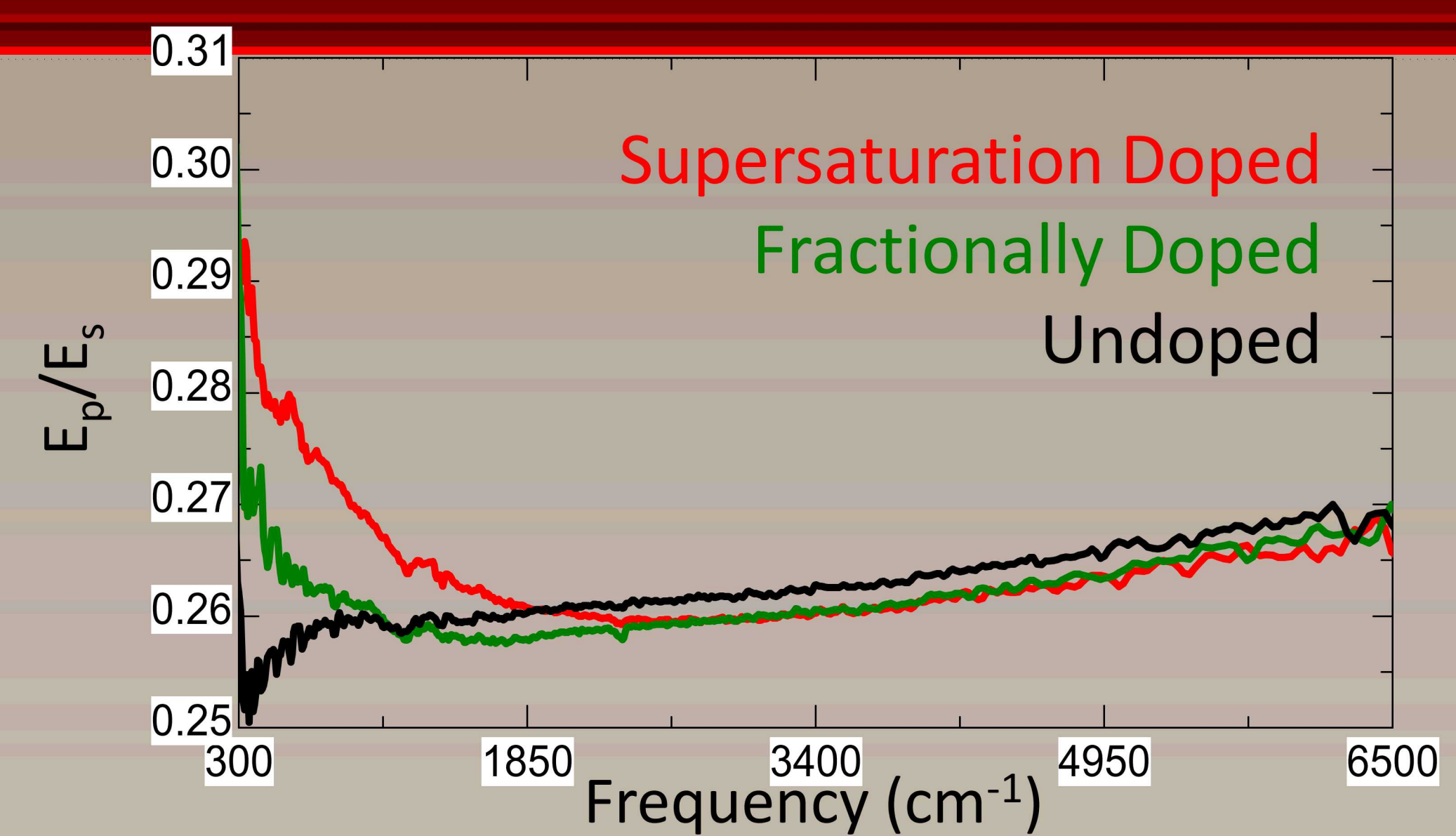
Methodology

- Approach:**
- Engineer simple metasurfaces to validate understanding of delta-layer EM response
 - Implement process flow for fingerprint application development:



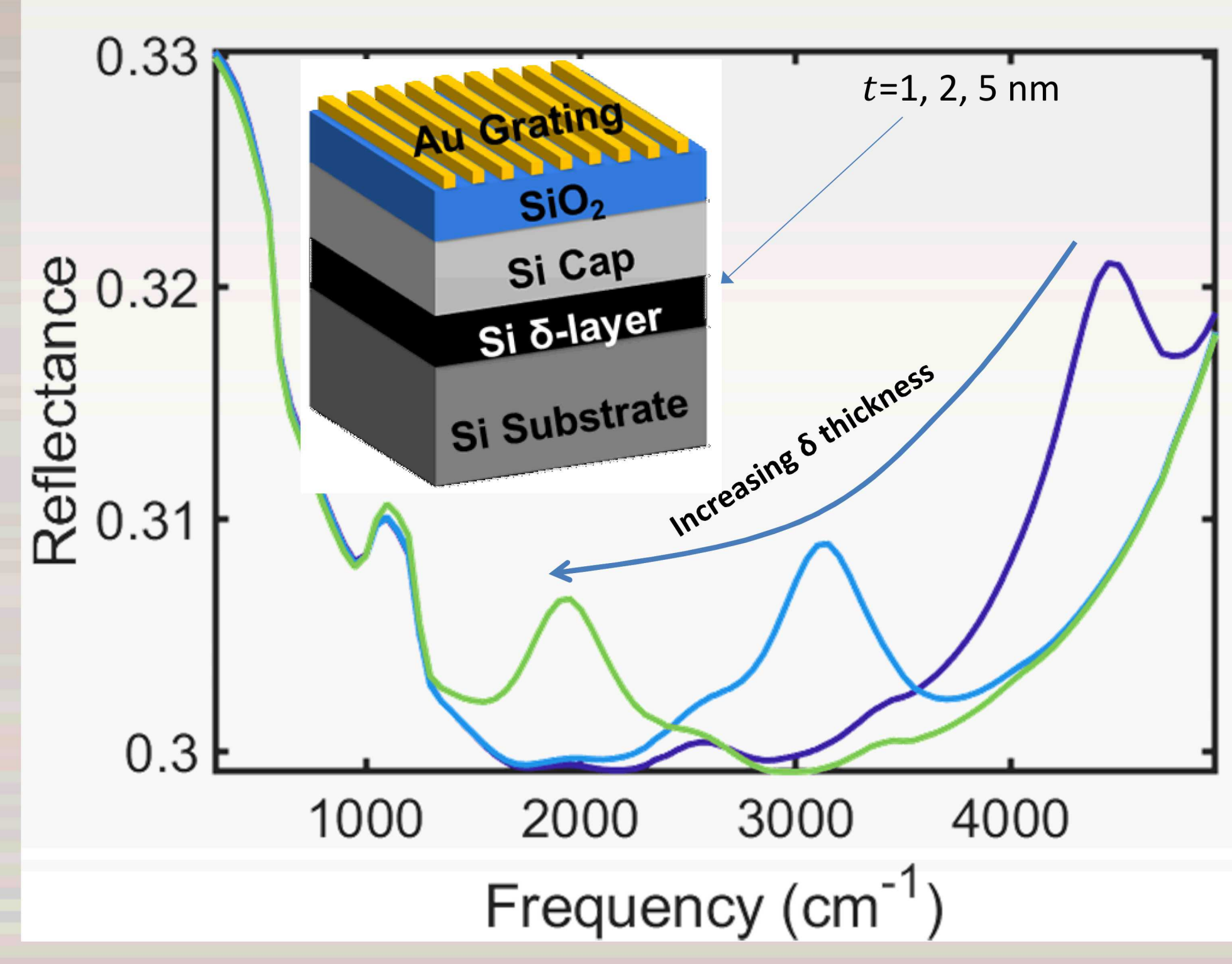
Path: Expertise developed for design, simulation, and testing of graphene metasurfaces will be leveraged for this material class, fabrication methods in development

Accomplishments



Takeaway: Delta-layers have interesting IR-THz response at RT, not yet reported or explored

- EM simulation of patterned structures:**
- Falsifiable predictions of spectral response
 - Builds toward engineering unique behavior



Future Directions

Integration: After proof of concept, fingerprint must be incorporated within complex architectures. Likely requires refinement for non-ideal scenarios

APAM Expansion: Accelerate process development for complementary dopant chemistries

Broadened Horizons: Fingerprint demonstration is tip of the iceberg, apply to new applications of integrated silicon photonics in undeveloped and technologically critical frequency regime