

Artificial Dielectric Layers as Surface-Wave-Less Antenna Substrate

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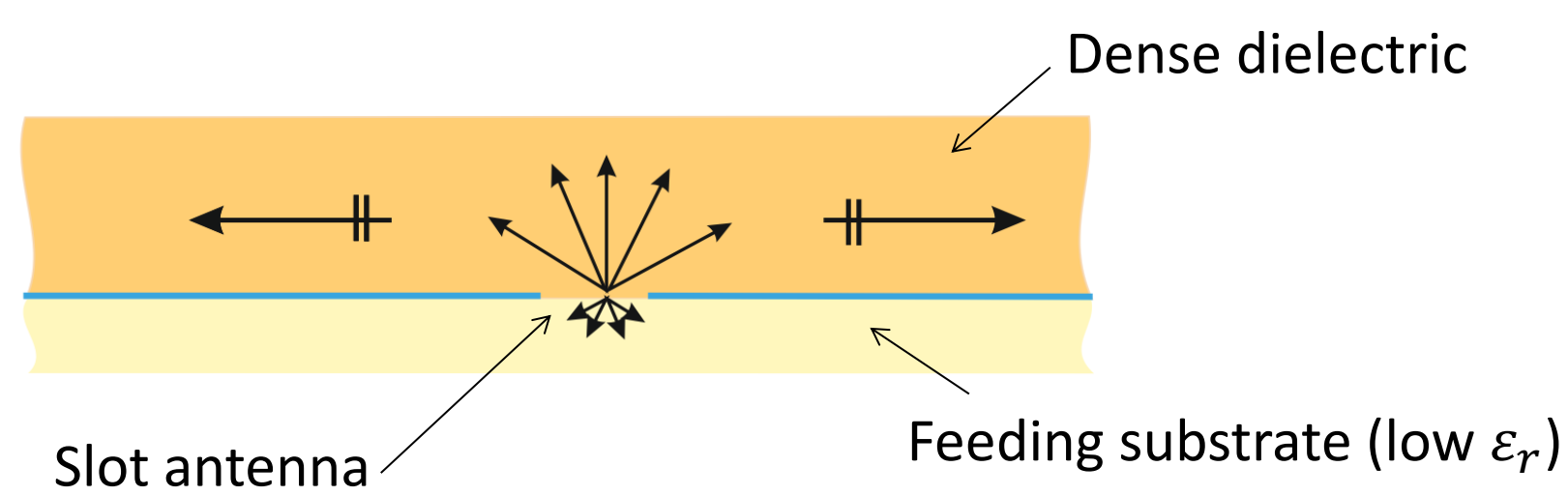
Artificial Dielectric Layers as Surface-Wave-Less Antenna Substrate

W. H. Syed, A. Neto, D. Cavallo

Surface waves issue in planar printed antenna

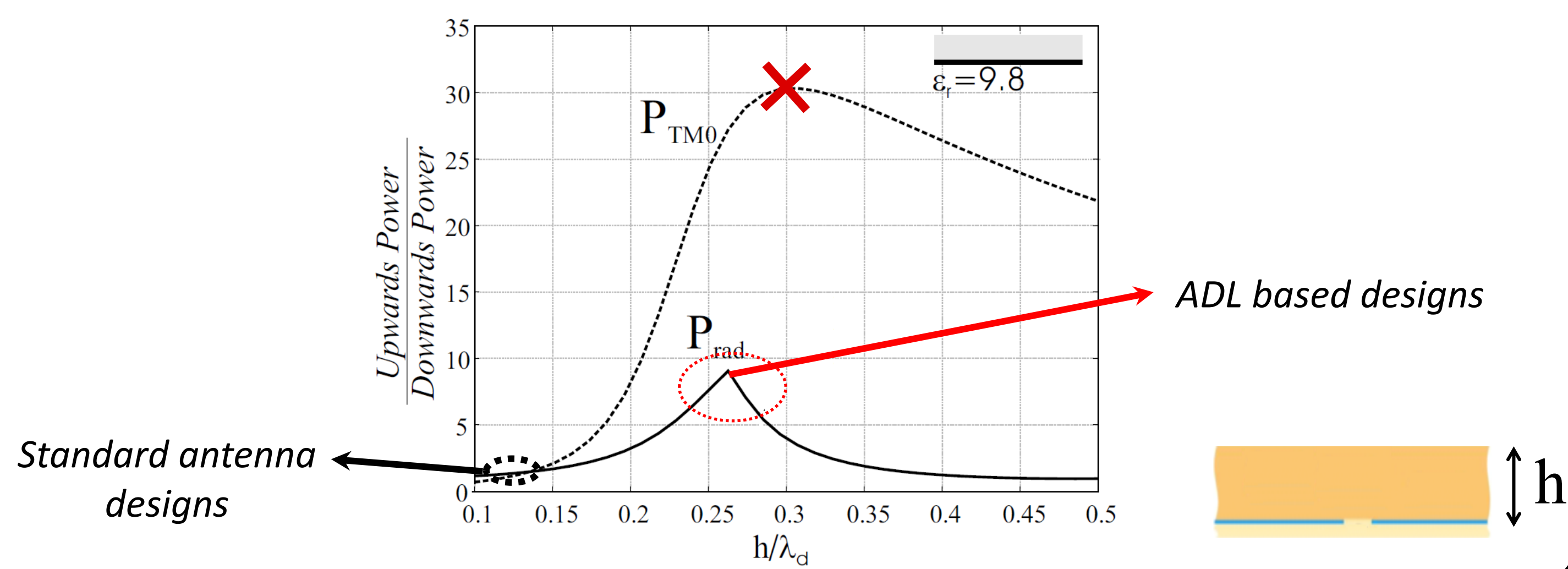
Dense dielectric, e.g. silicon

- ☺ Increase front to back ratio
- ☹ More power in surface waves

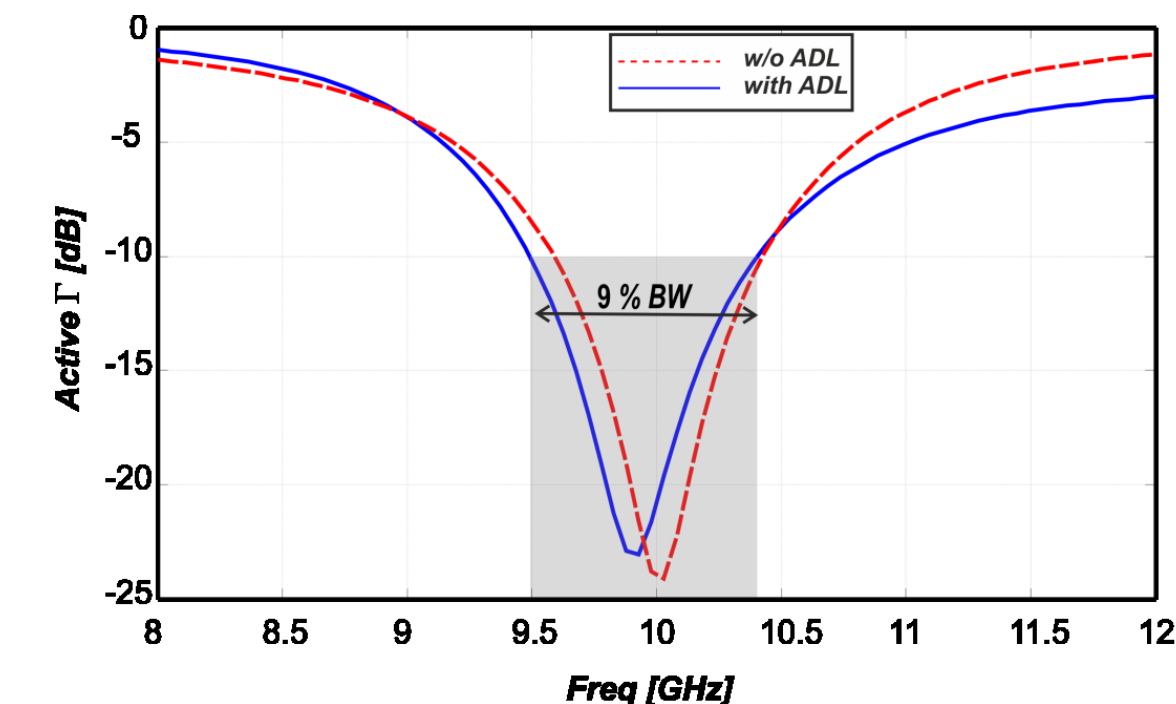
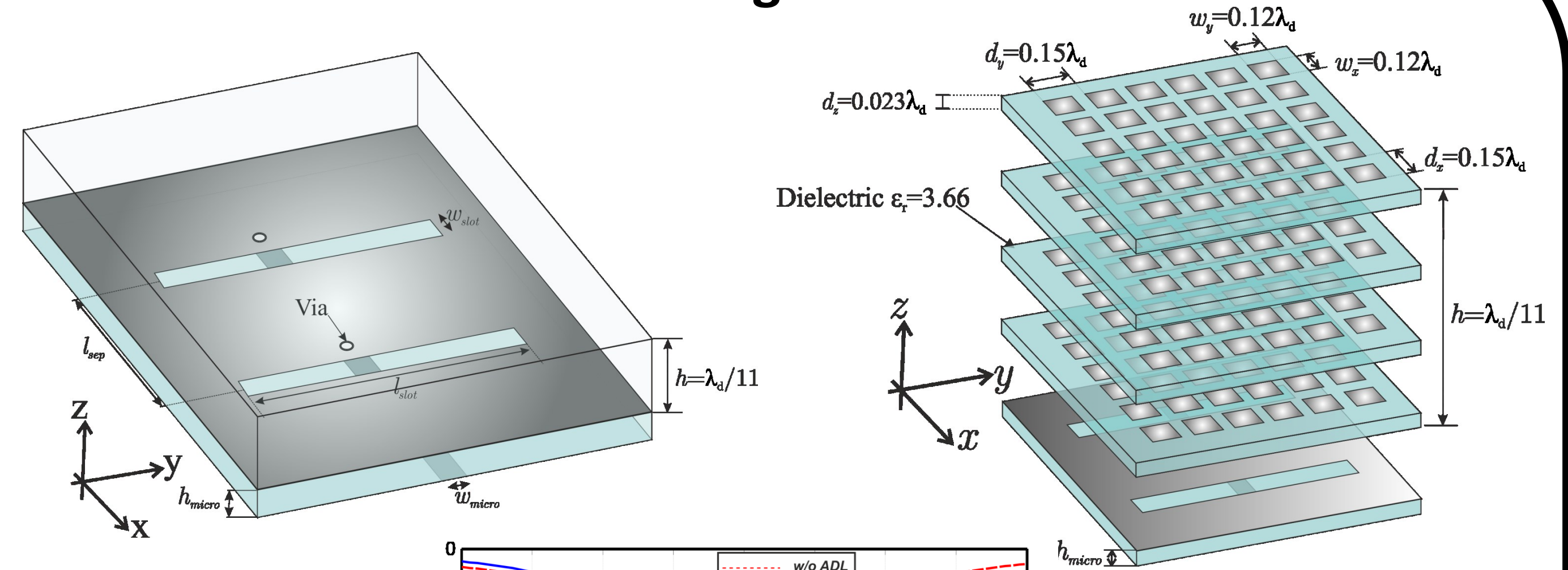


GOALS:

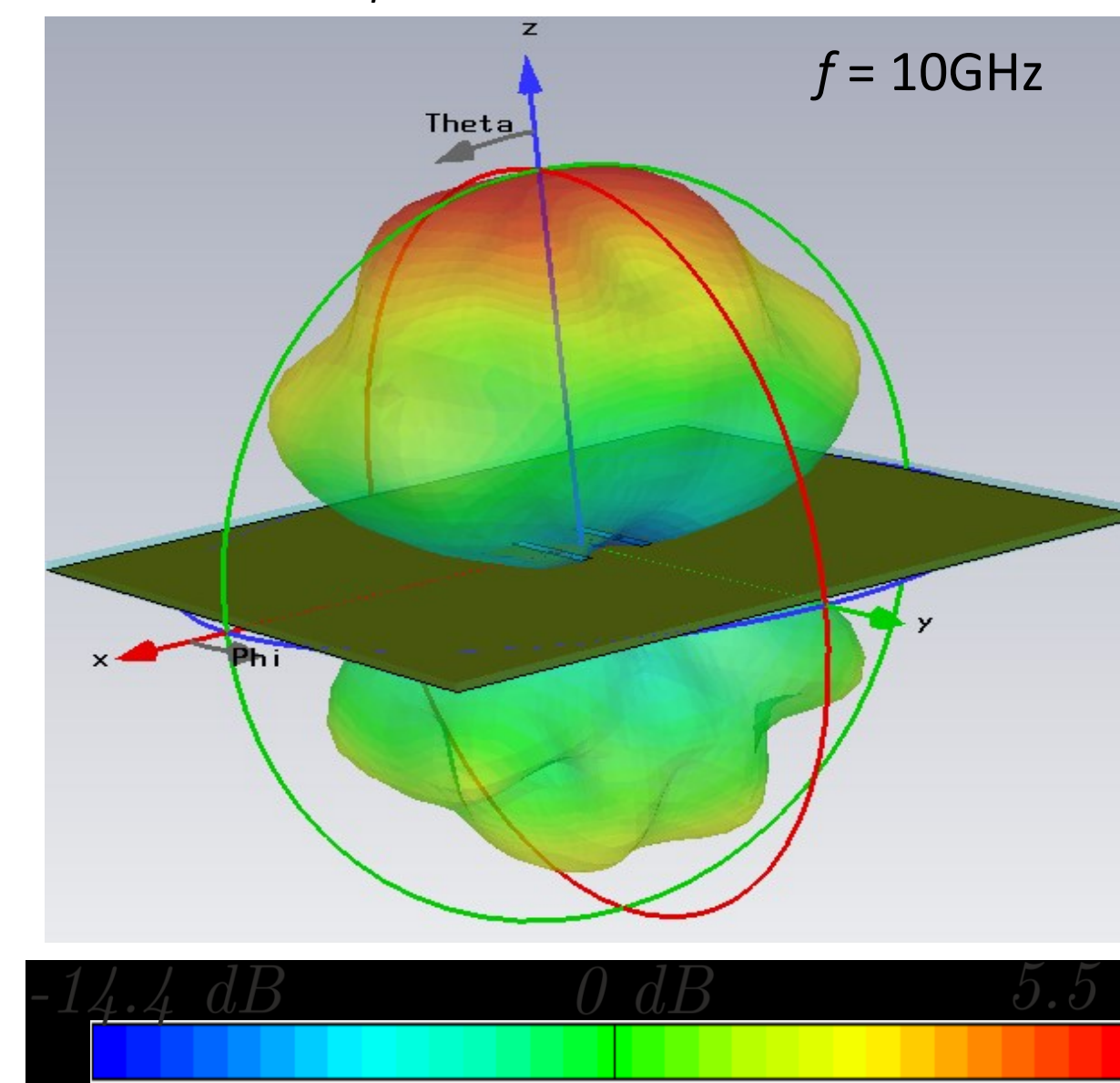
- Maximize front-to-back ratio
- No excitation of surface waves



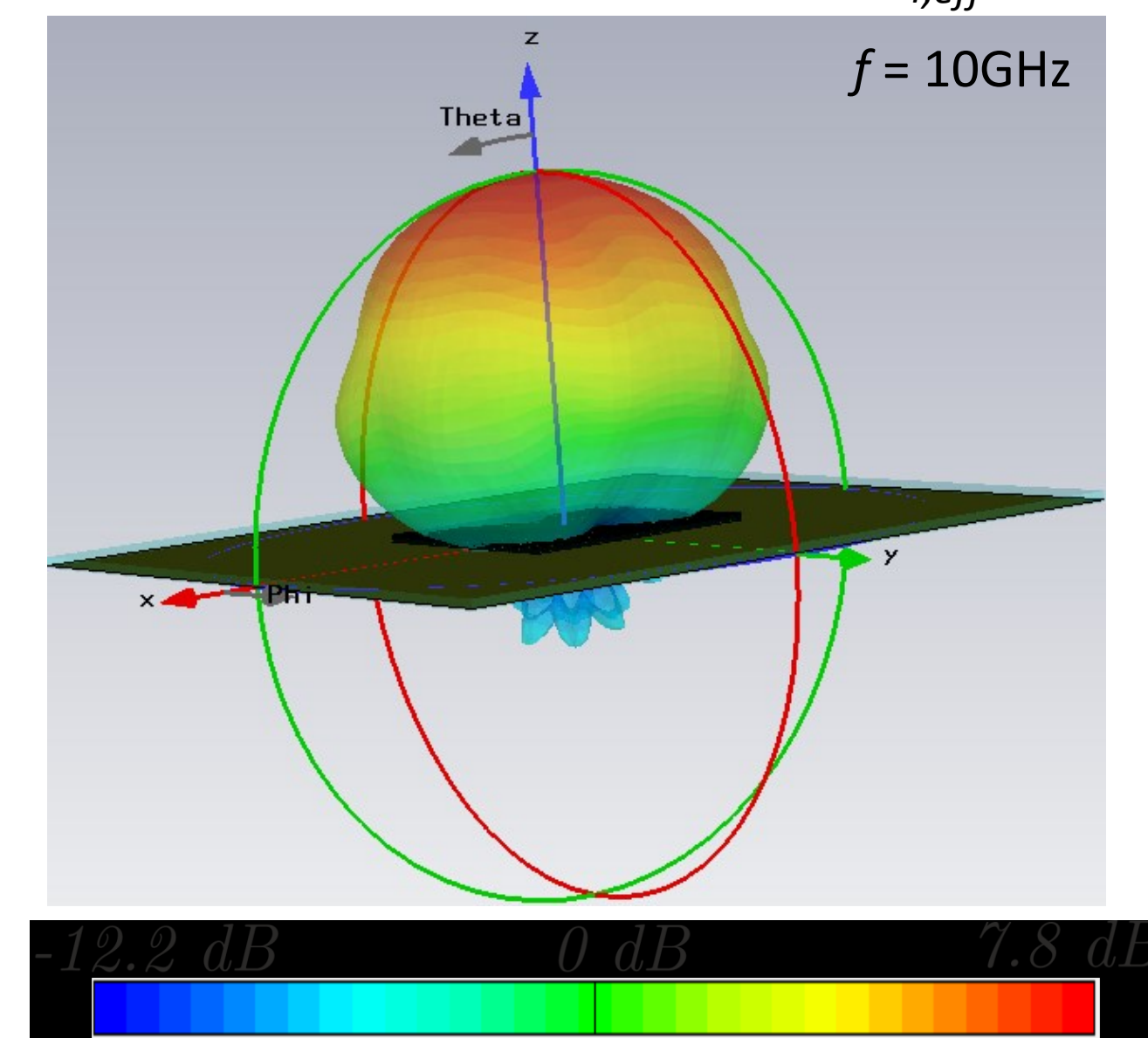
Antenna design in X-band



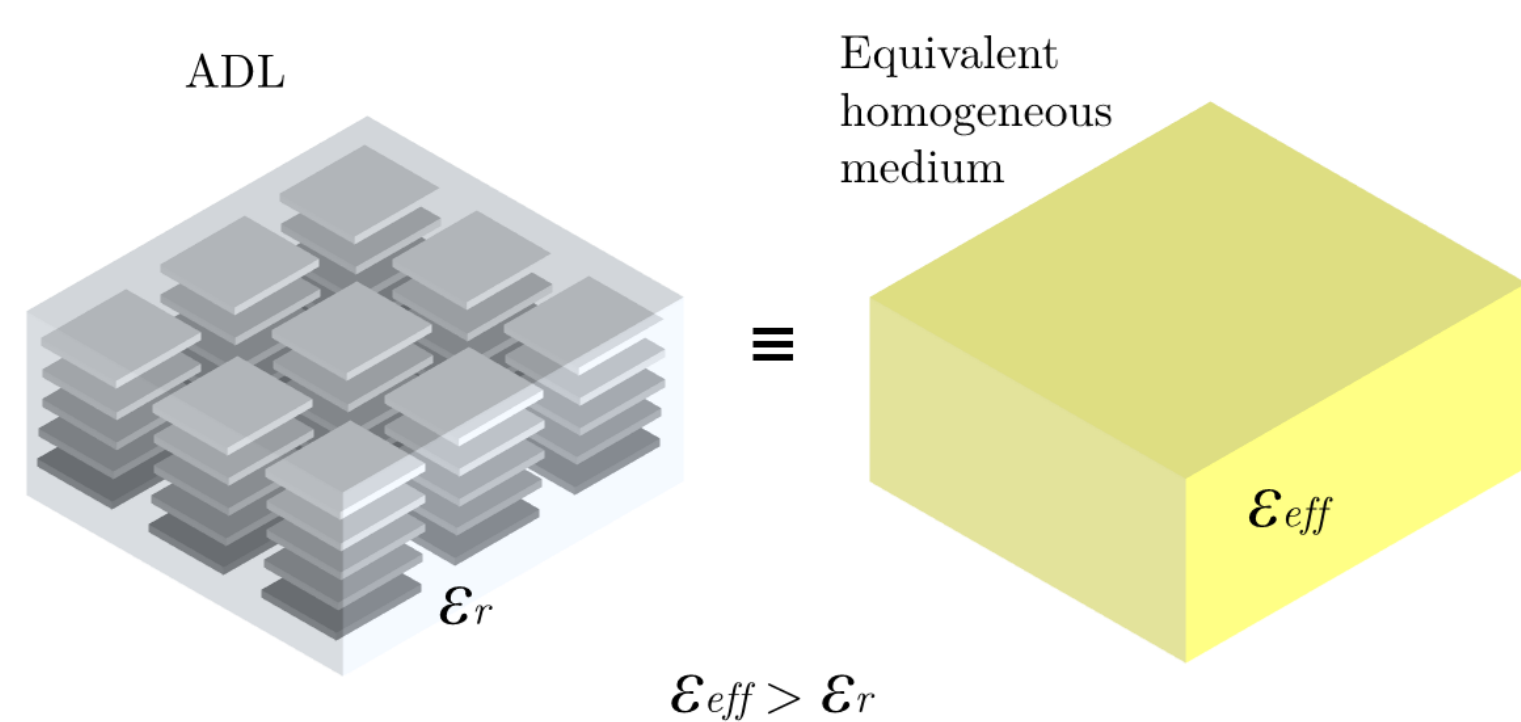
Slab only, $\epsilon_r = 3.66$



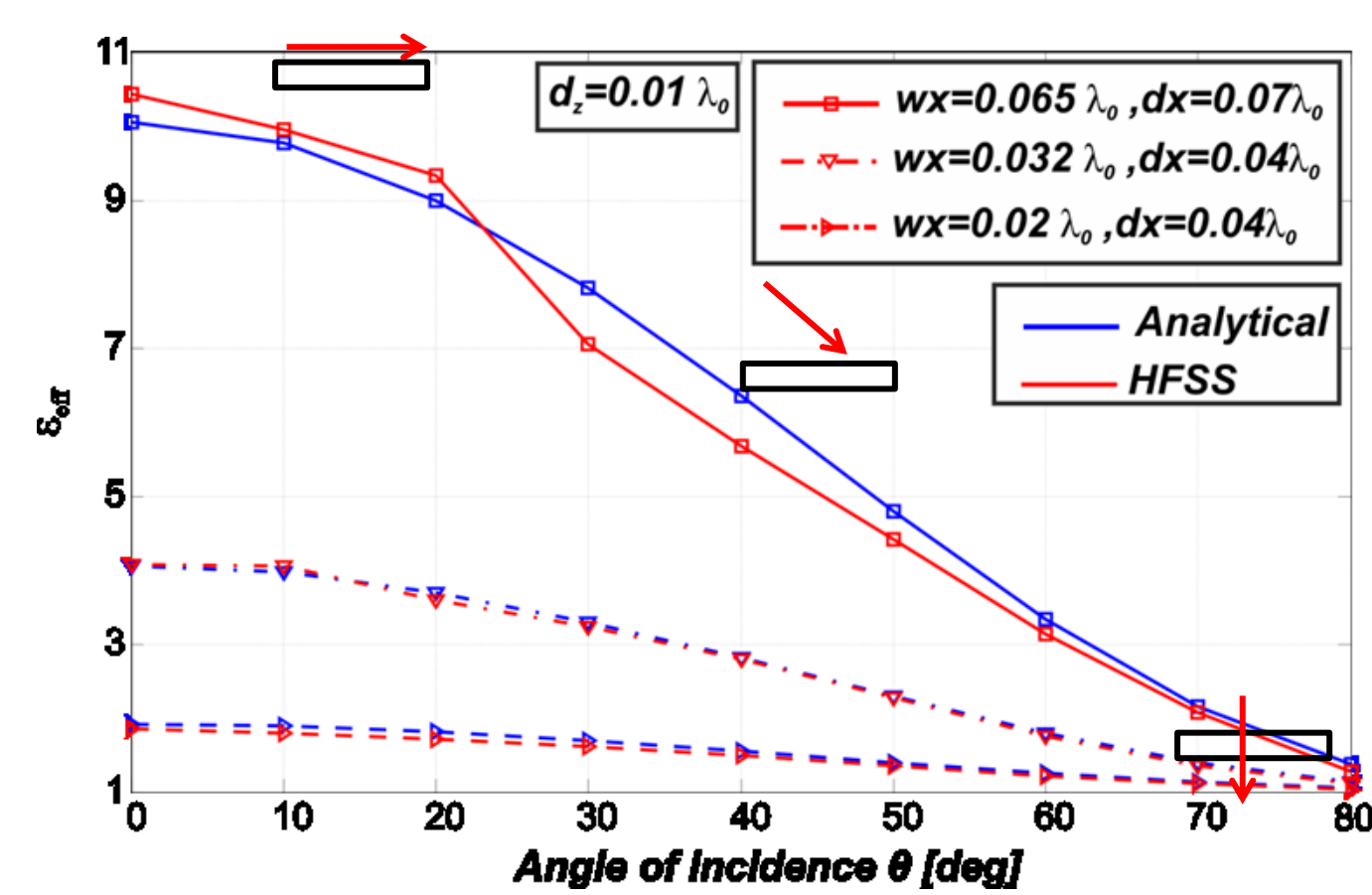
Slab + ADL, $\epsilon_{r,eff} = 24$



Solution: Artificial Dielectric Layers (ADL)

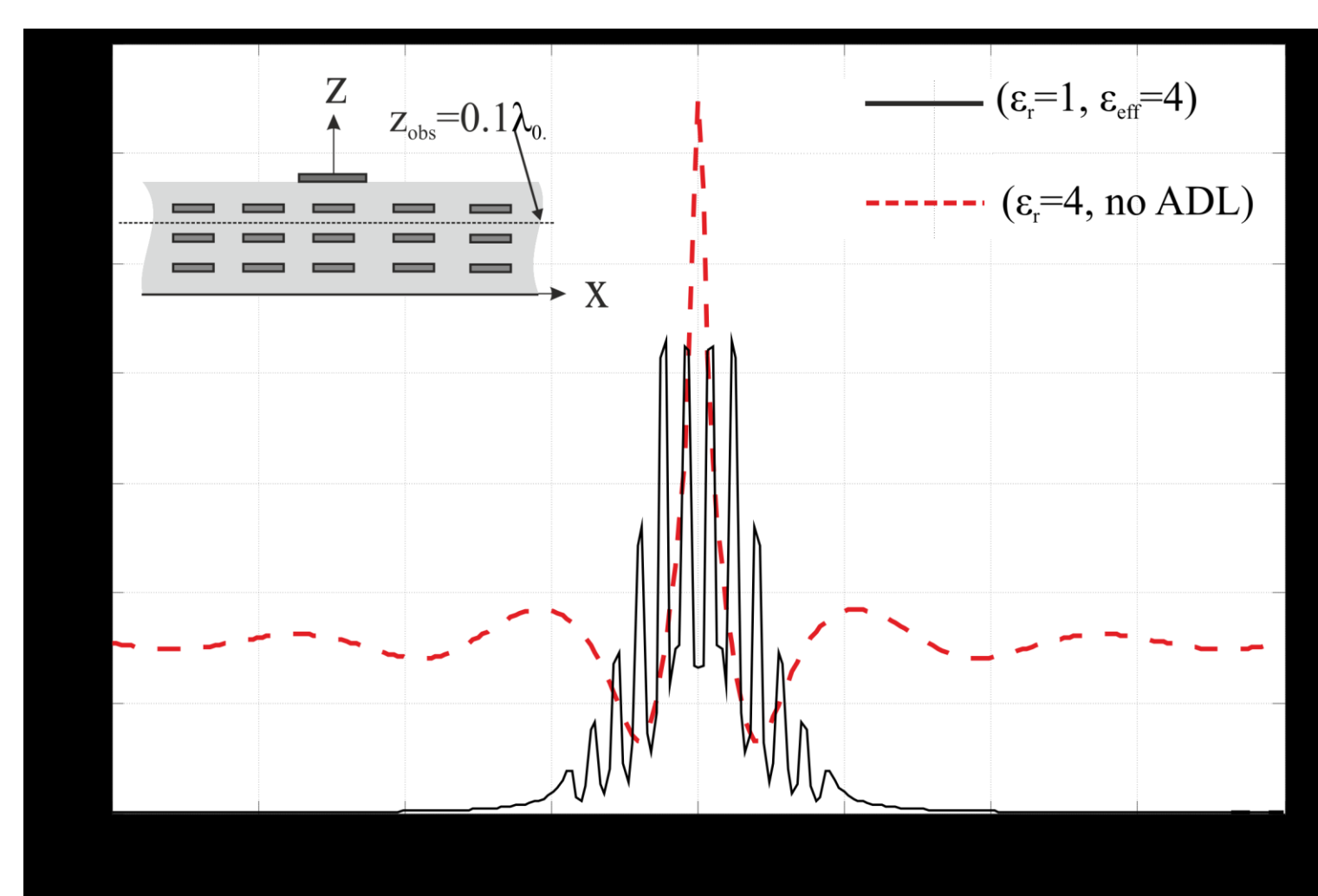
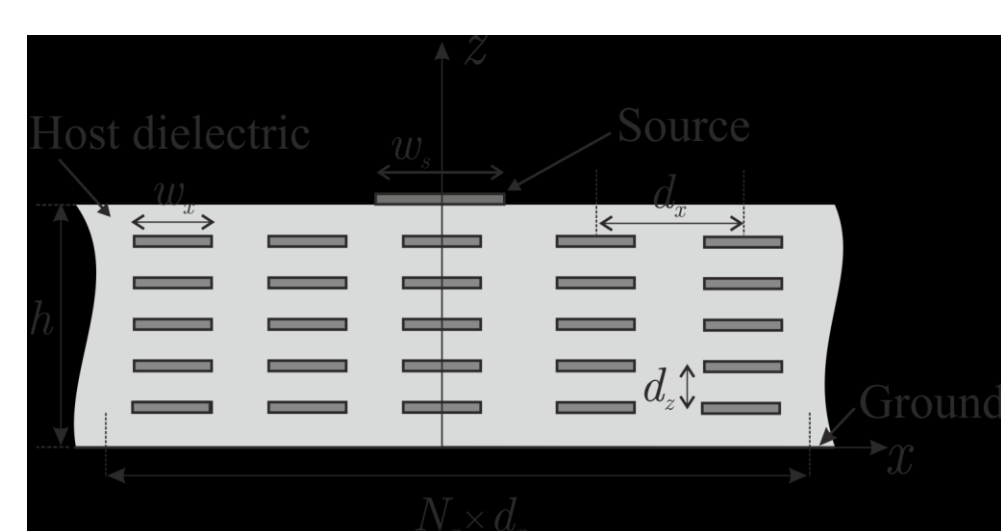
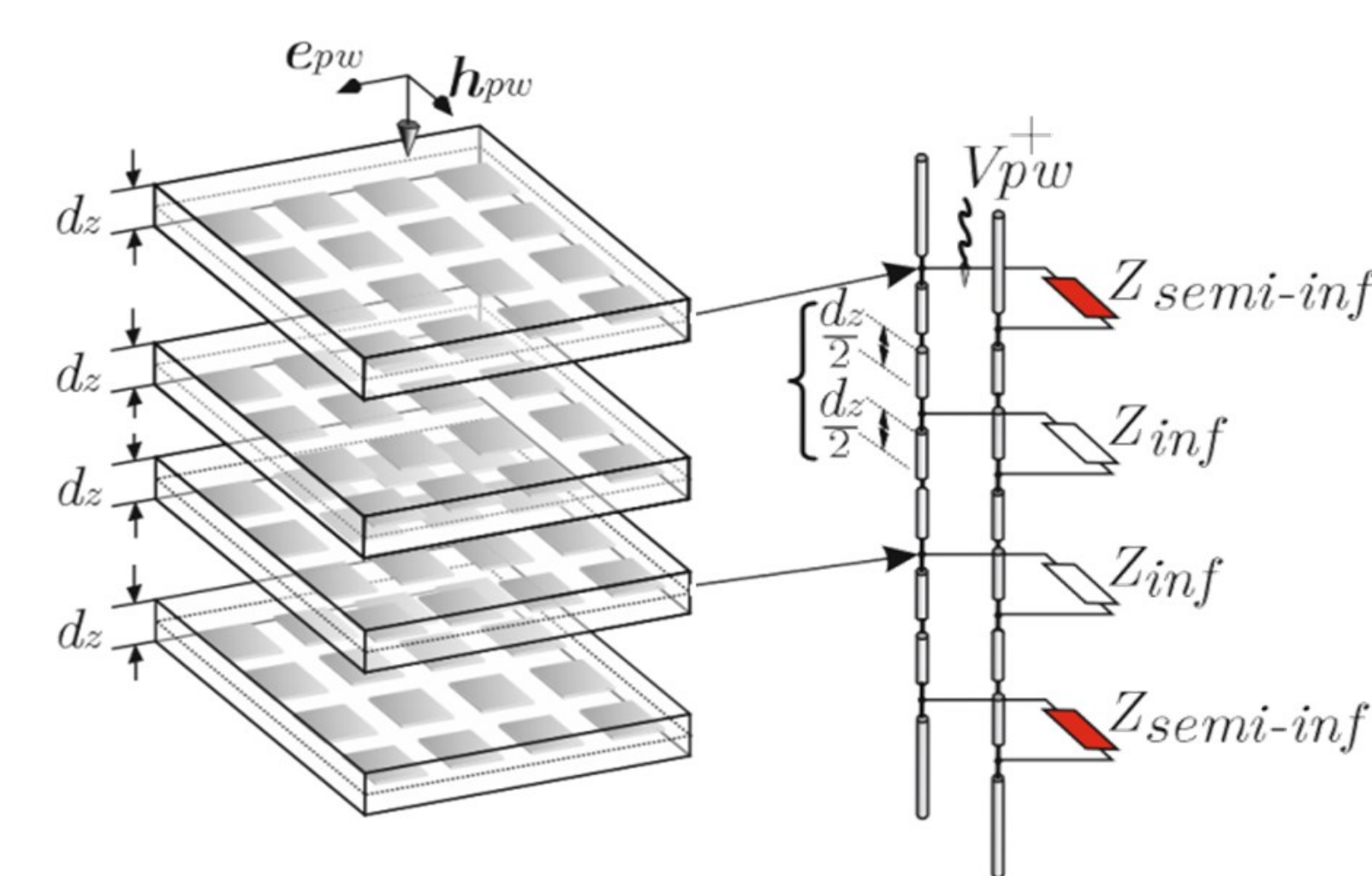


Equivalent homogeneous and anisotropic medium



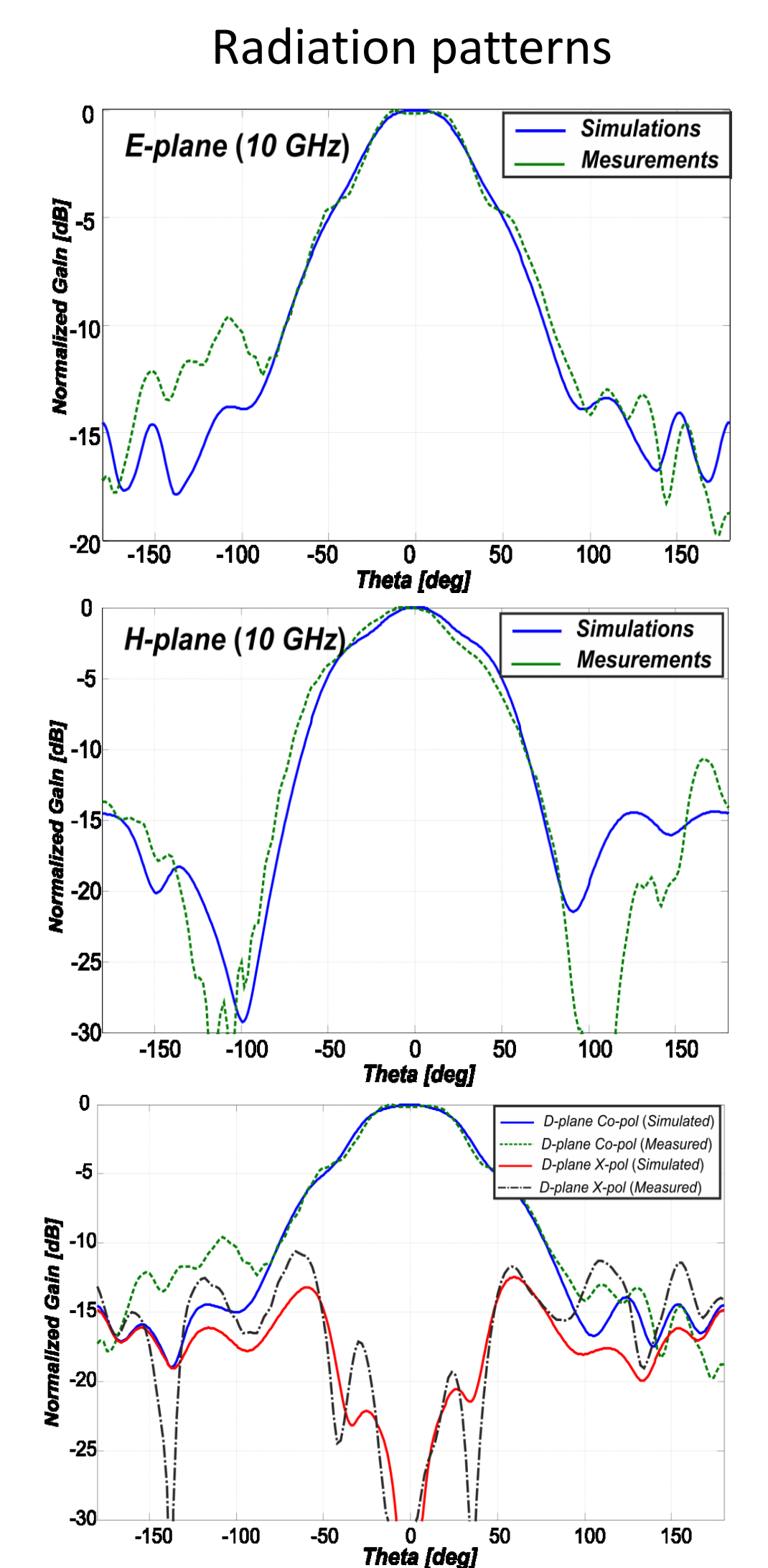
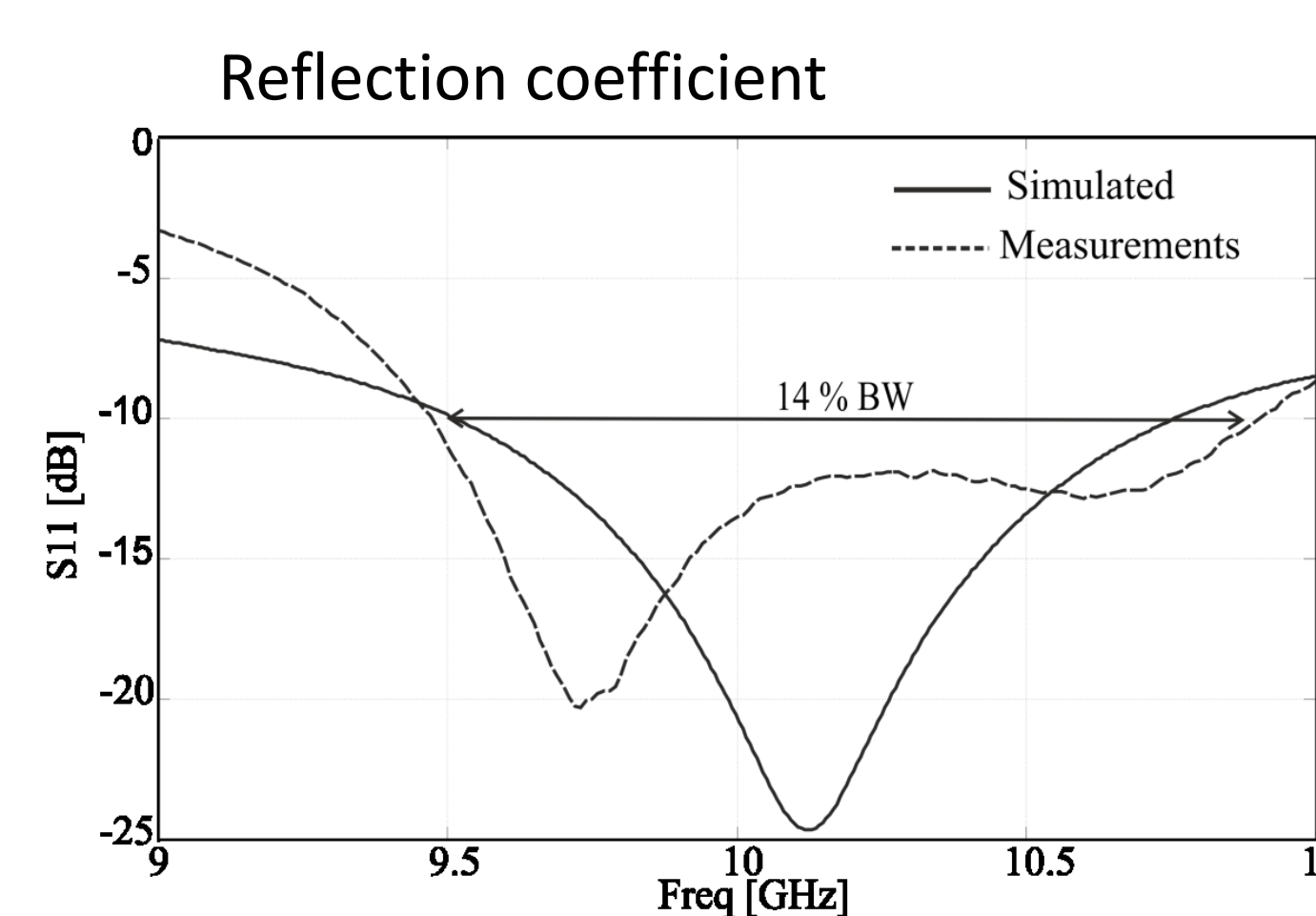
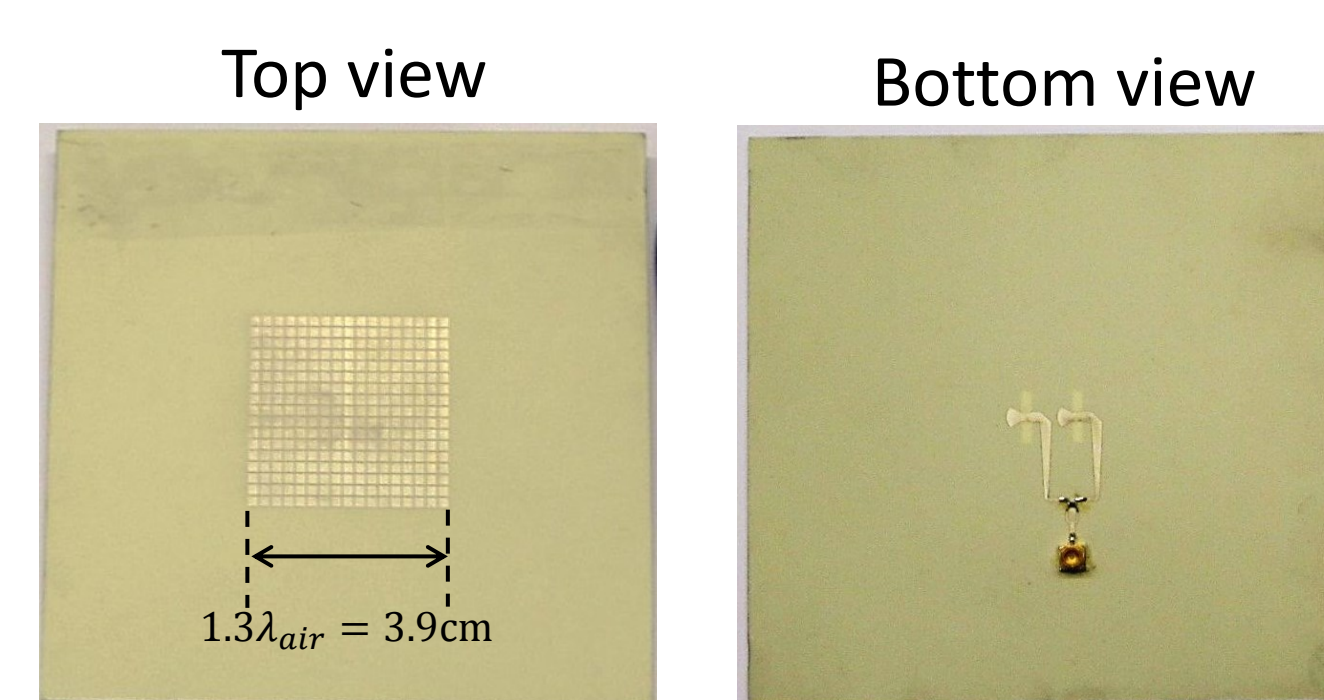
Green's function based analytical equivalent circuit

- Theory Based on **'connected array of slots'**
- Valid for every plane of incidence
- Finiteness of layers taken into account
- Extension to near source excitation



Angular selectivity is the key!!

Low frequency prototype demonstrator



High Frequency Prototype (230 GHz- 325 GHz)

- In-house IC process
- Collaboration with DIMES

