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Artificial Dielectric Layers as Surface-Wave-Less Antenna Substrate

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

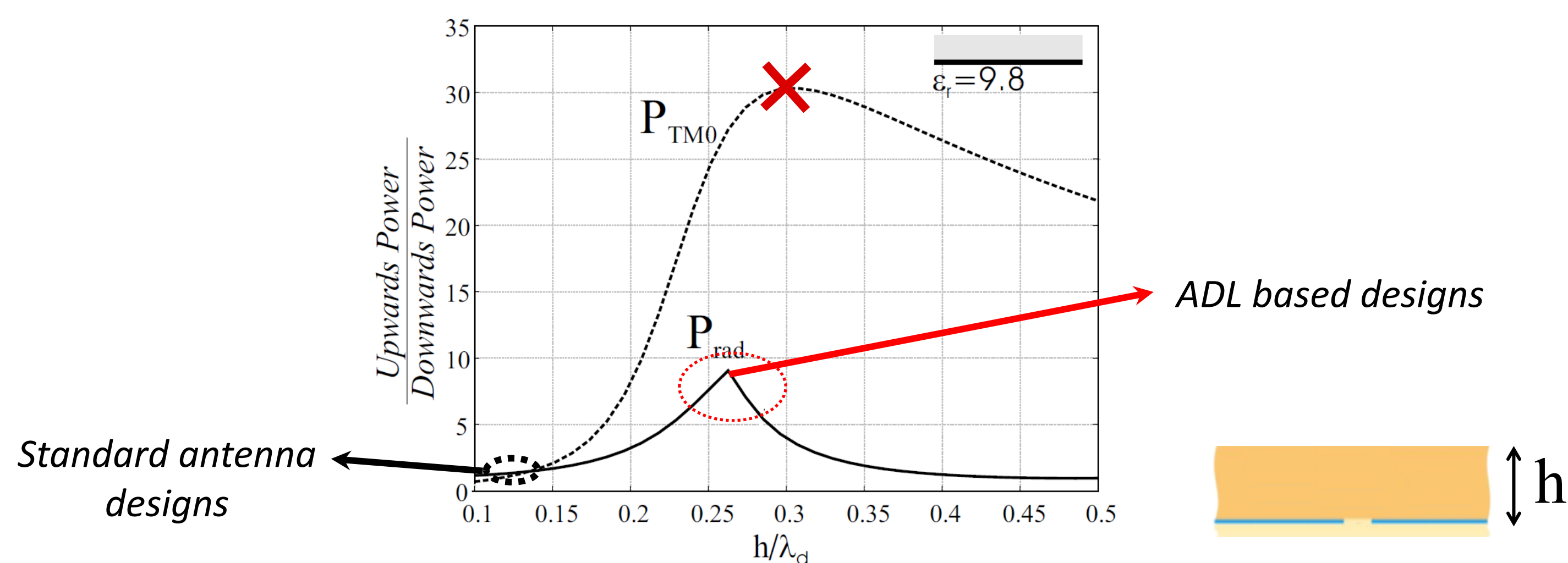
Surface waves issue in planar printed antenna

Dense dielectric, e.g. silicon

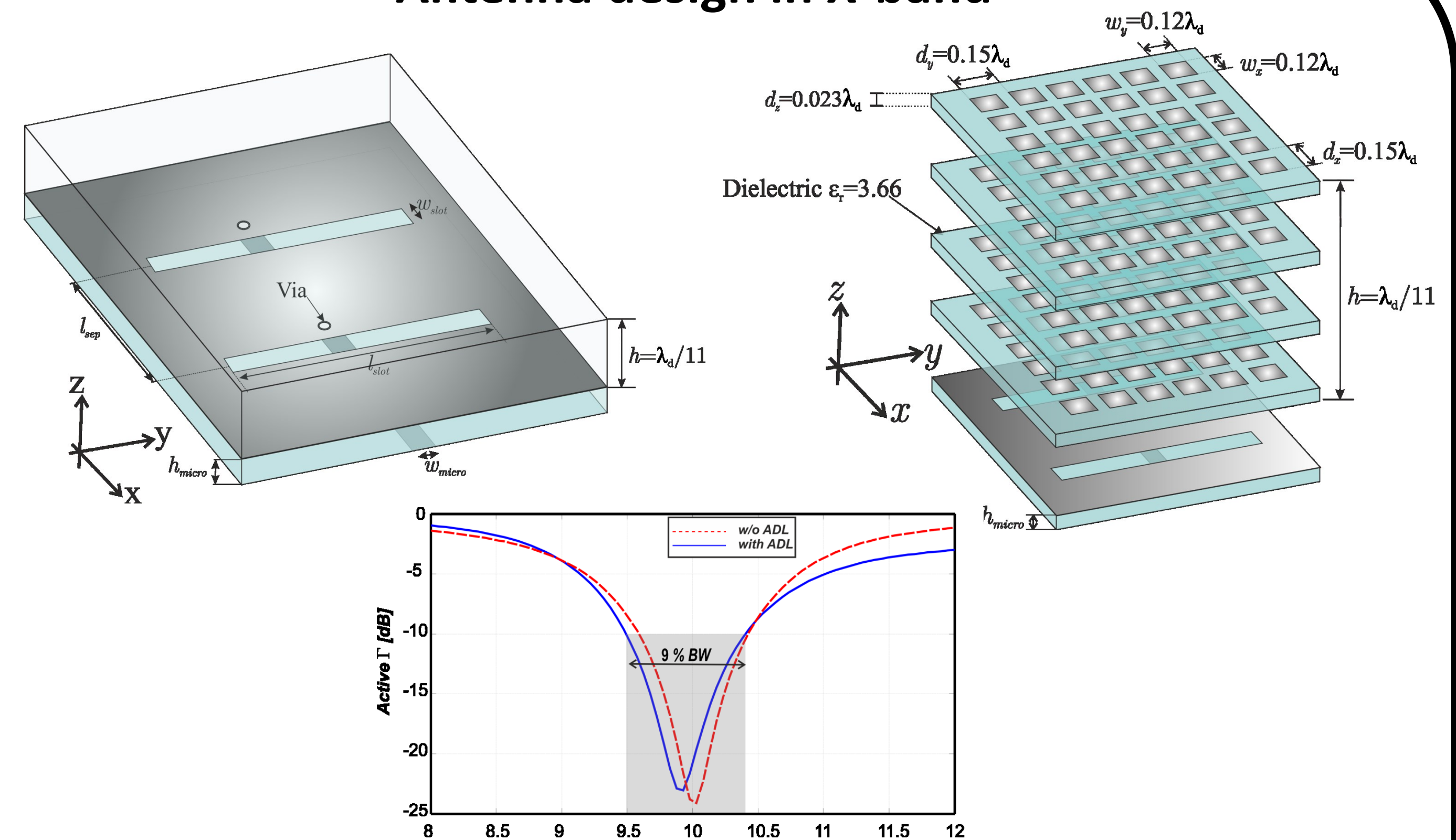
- ☺ Increase front to back ratio
- ☹ More power in surface waves

GOALS:

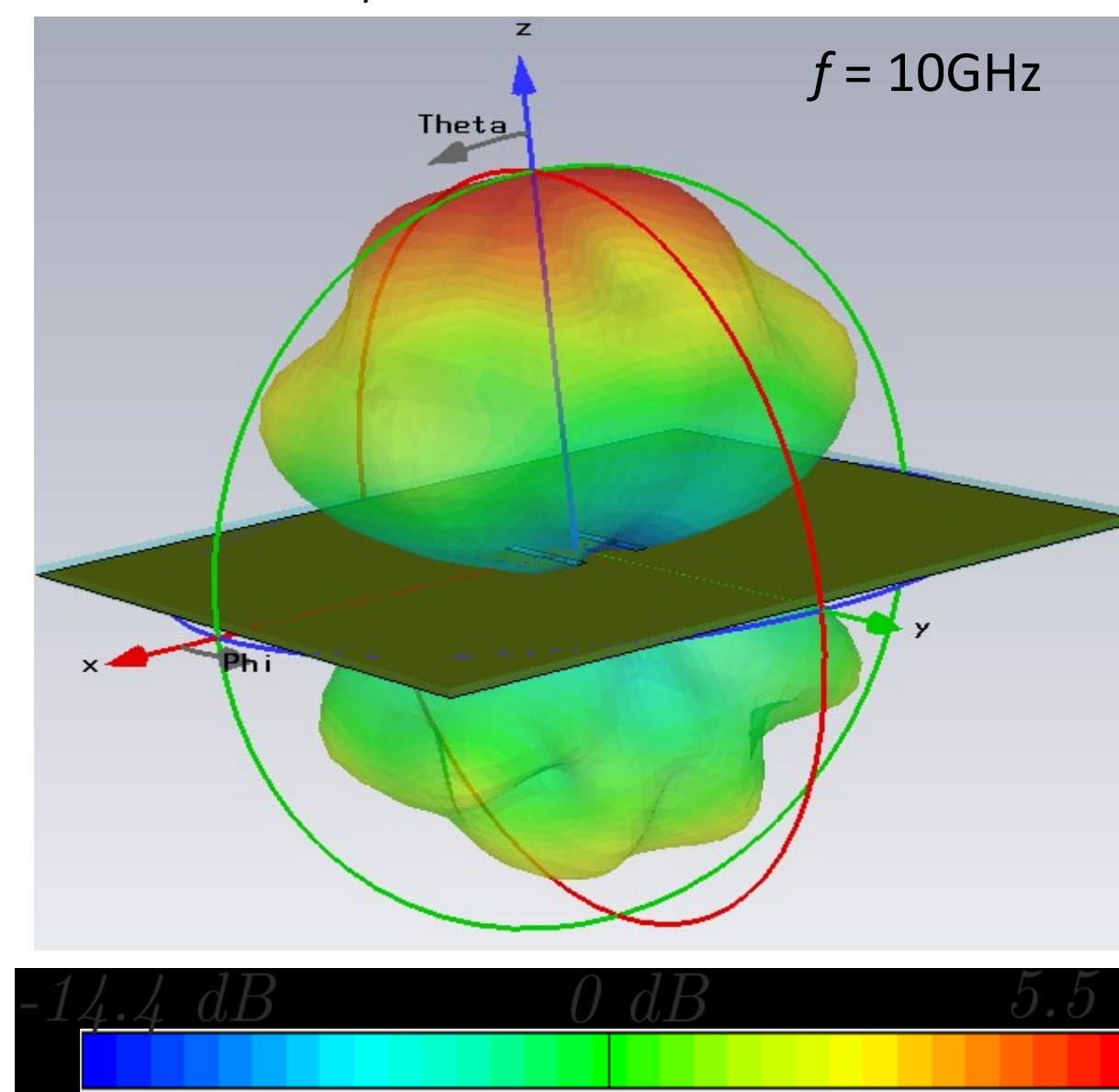
- Maximize front-to-back ratio
- No excitation of surface waves



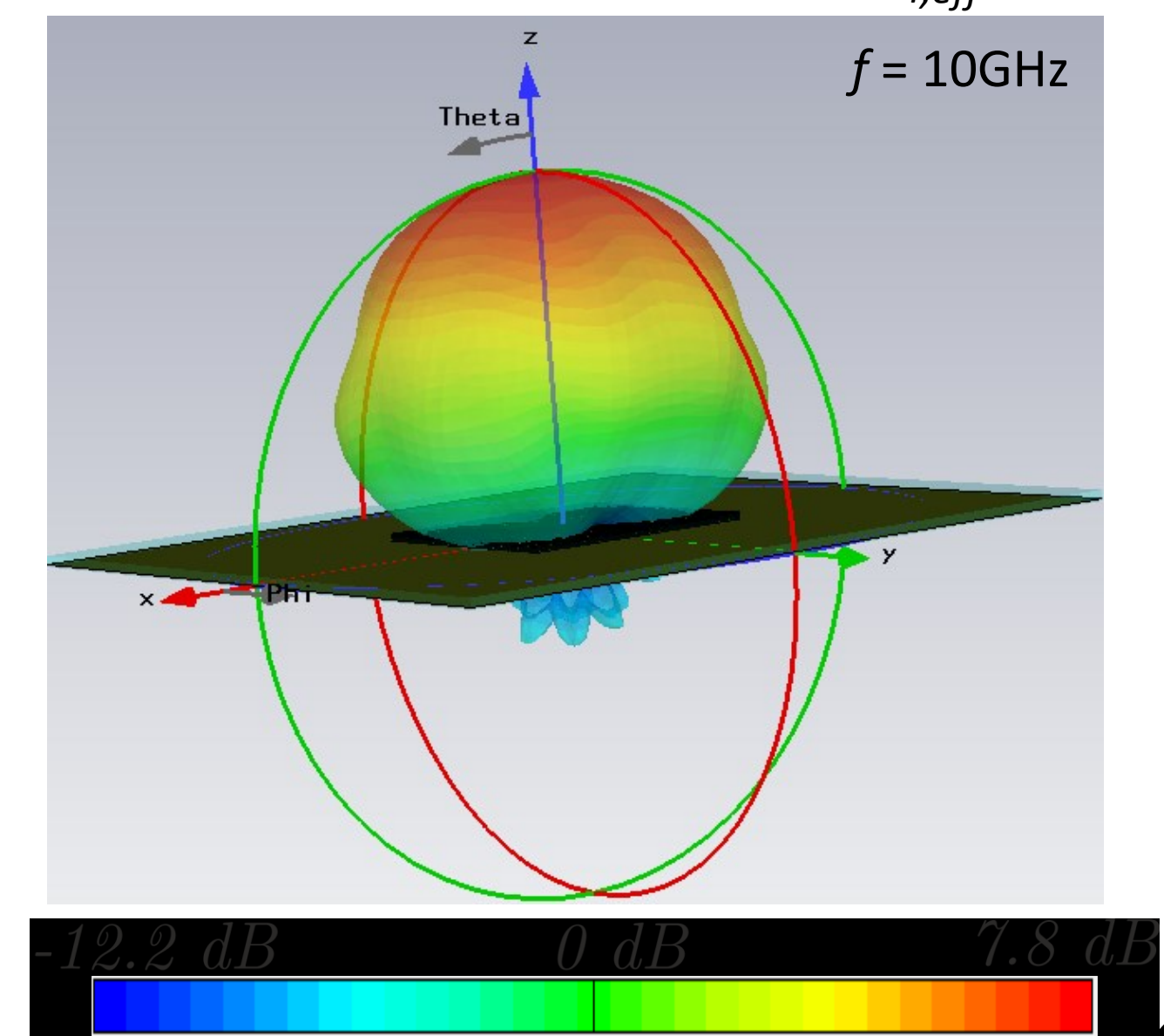
Antenna design in X-band



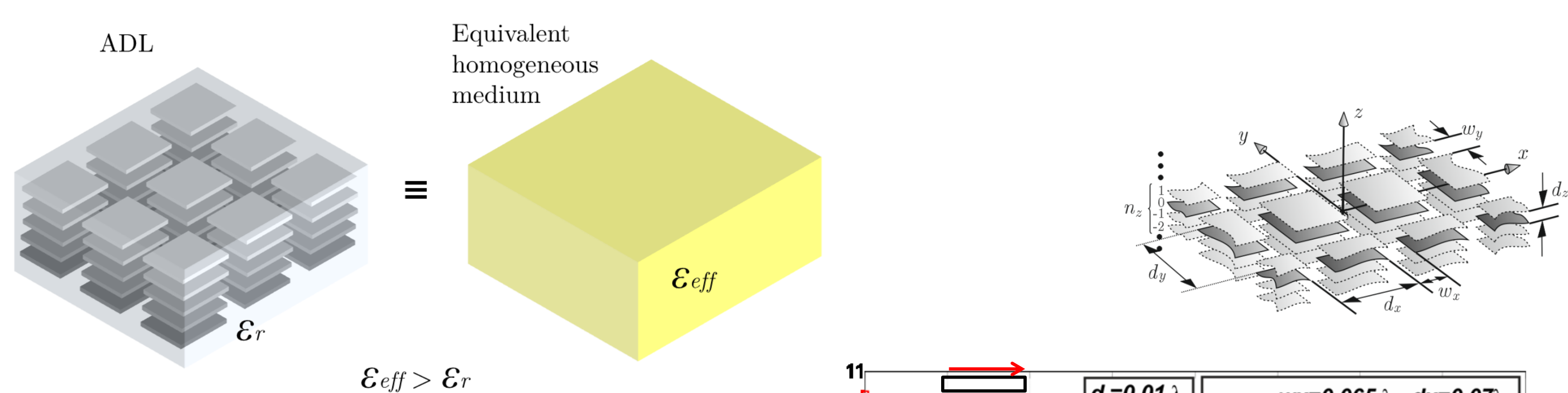
Slab only, $\epsilon_r = 3.66$



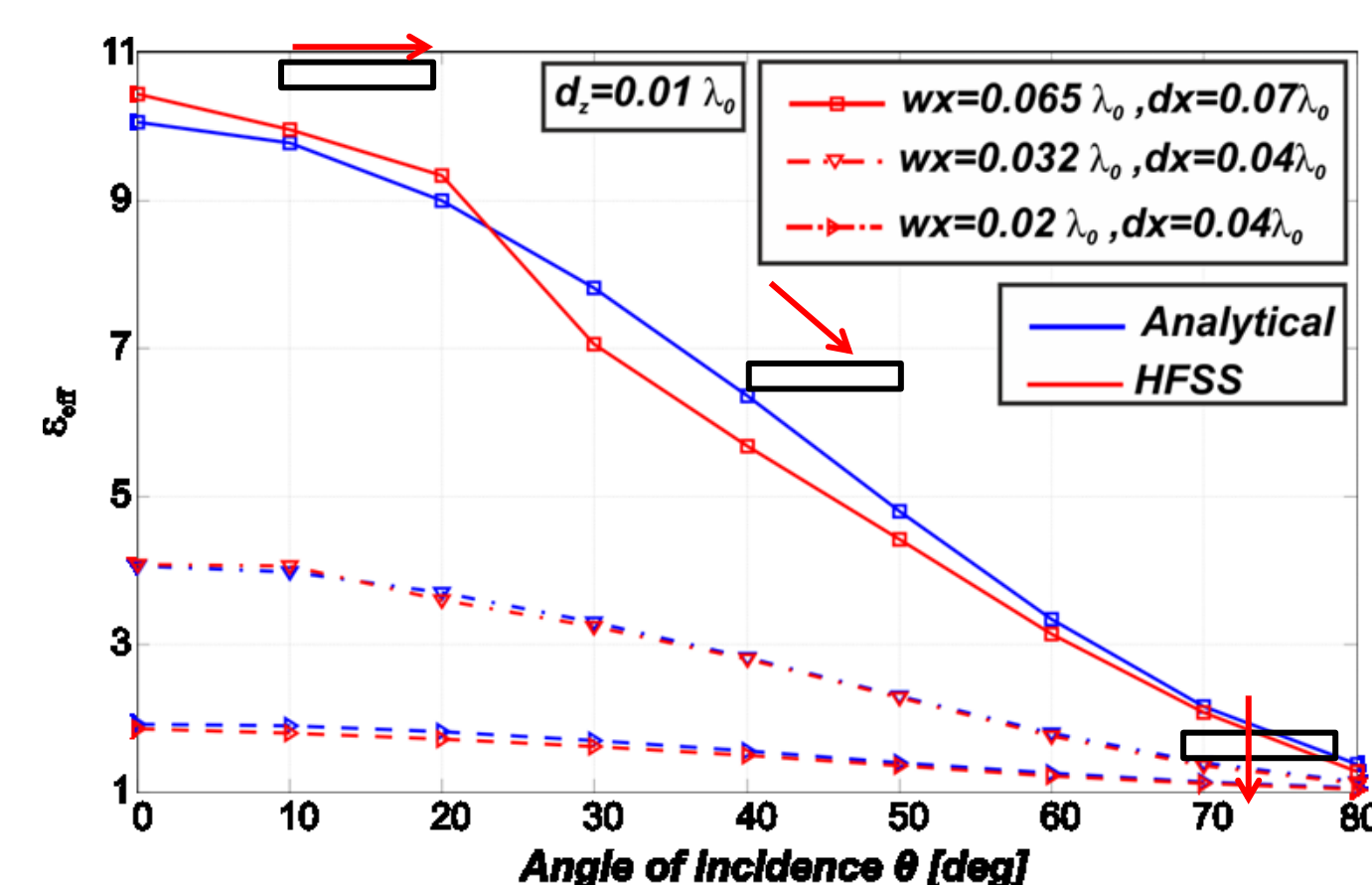
Slab + ADL, $\epsilon_{r,eff} = 24$



Solution: Artificial Dielectric Layers (ADL)

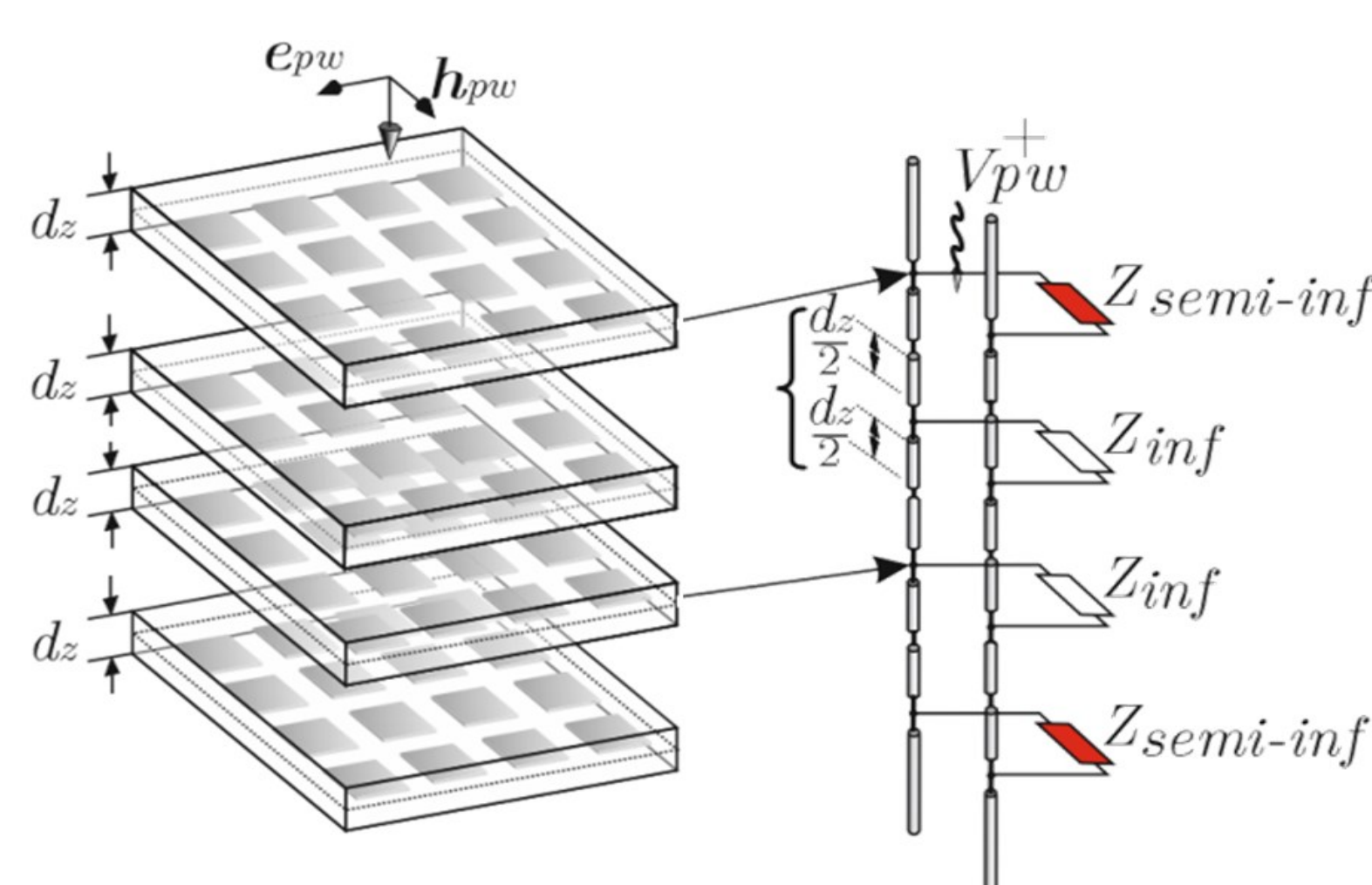


Equivalent homogeneous and anisotropic medium

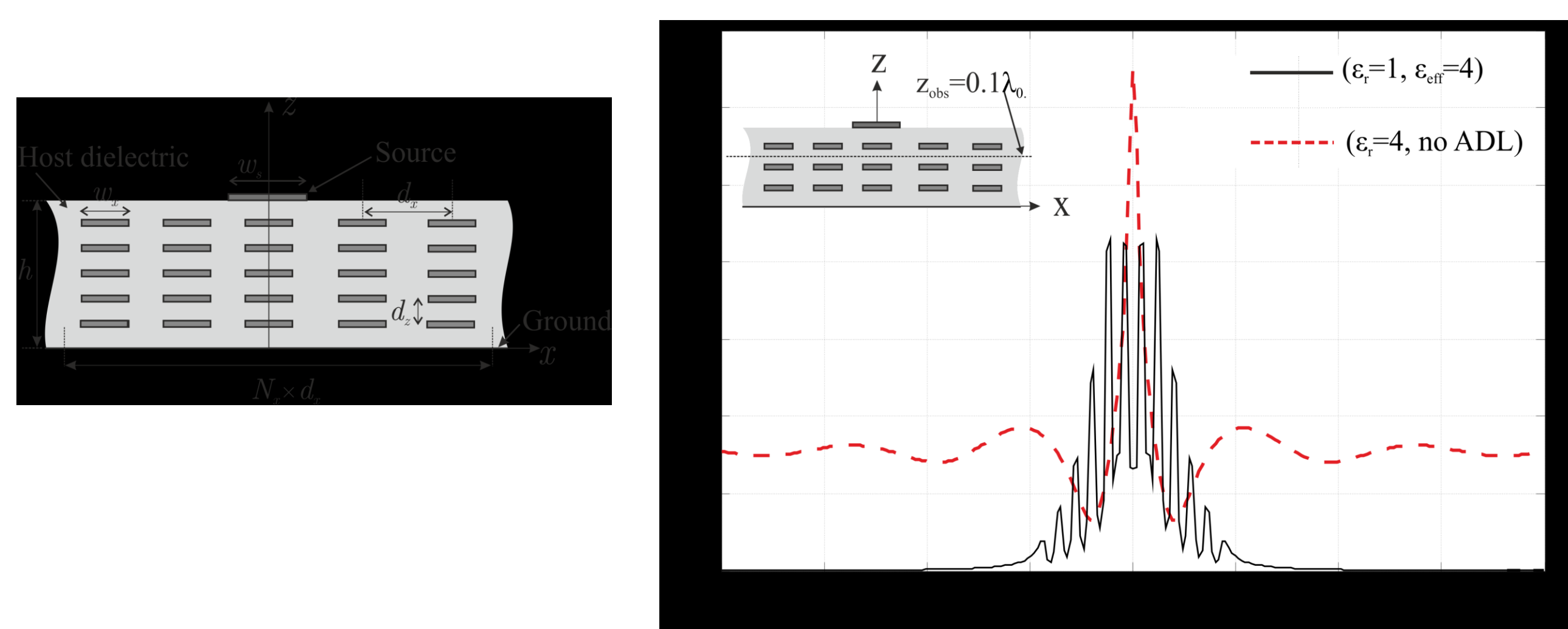


Green's function based analytical equivalent circuit

- Theory Based on 'connected array of slots'
- Valid for every plane of incidence
- Finiteness of layers taken into account

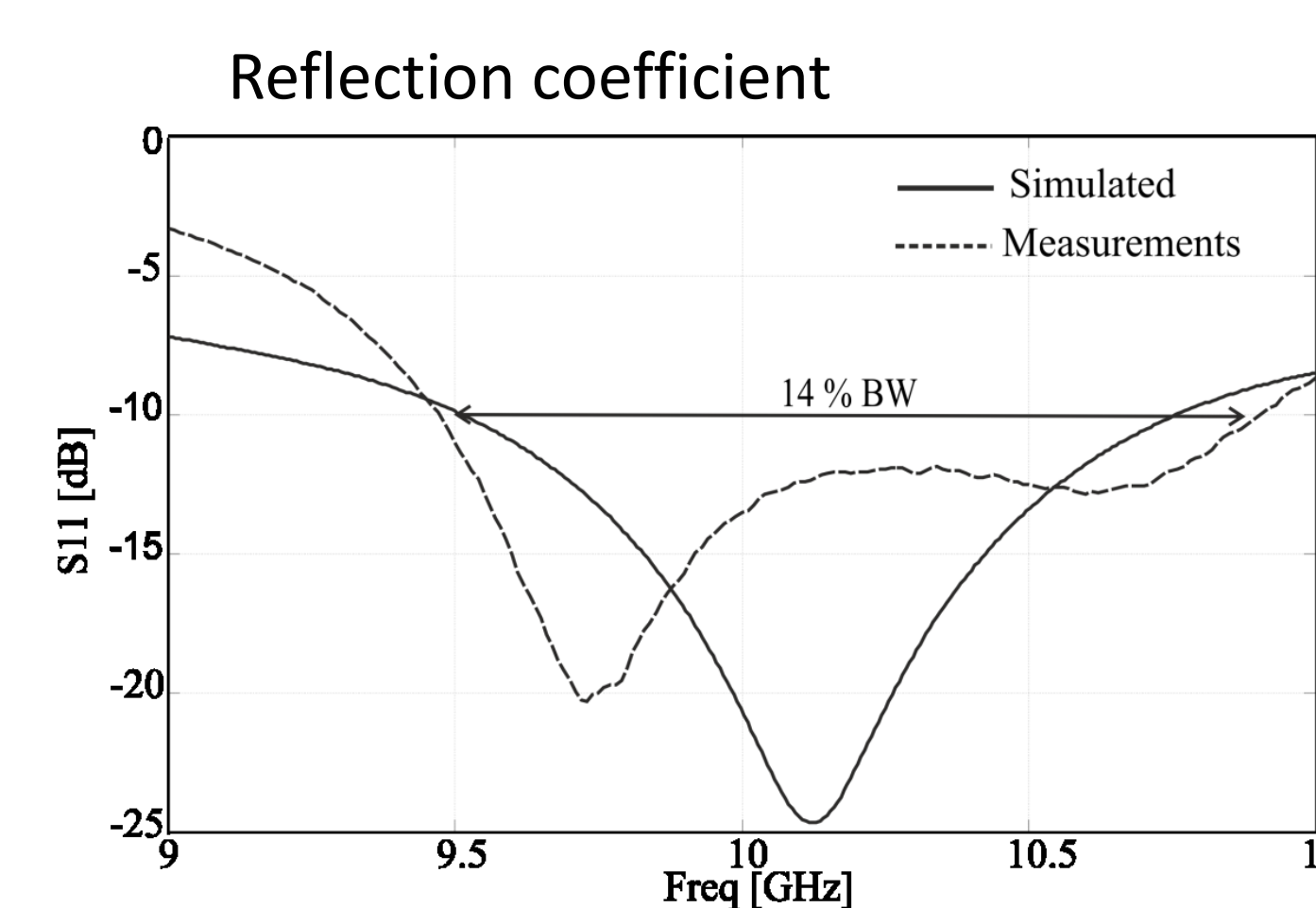
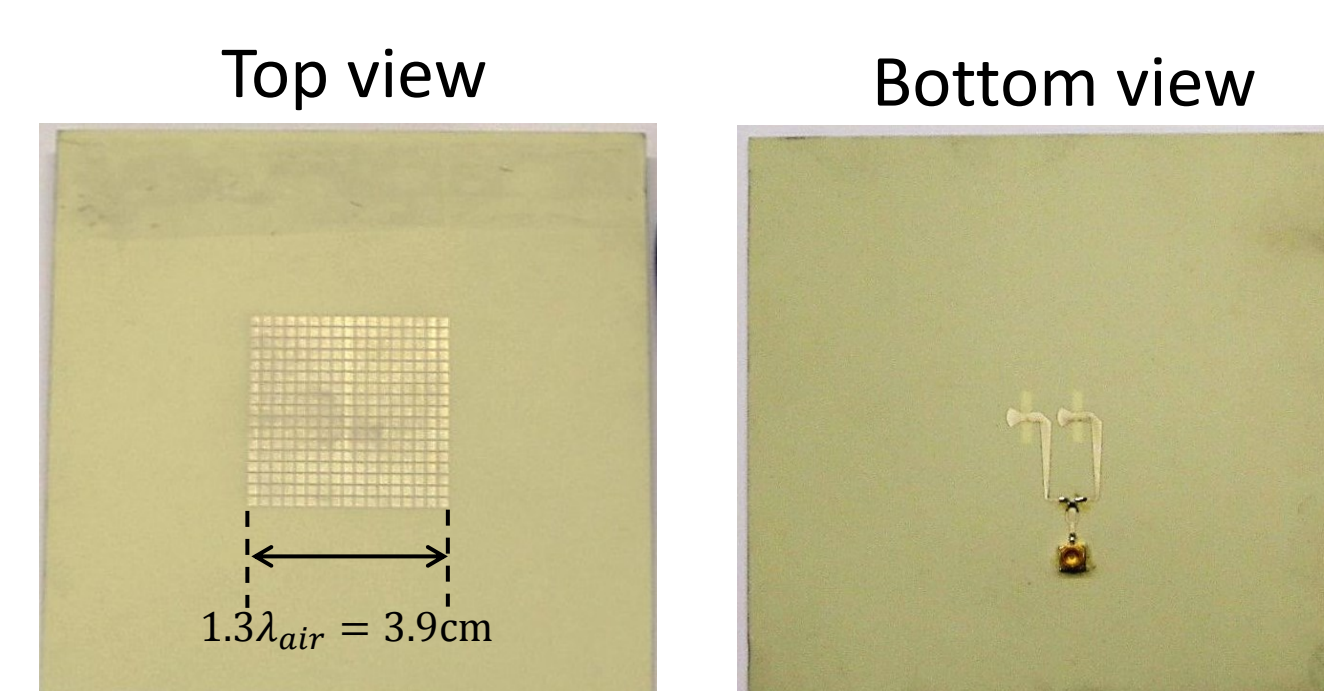


- Extension to near source excitation

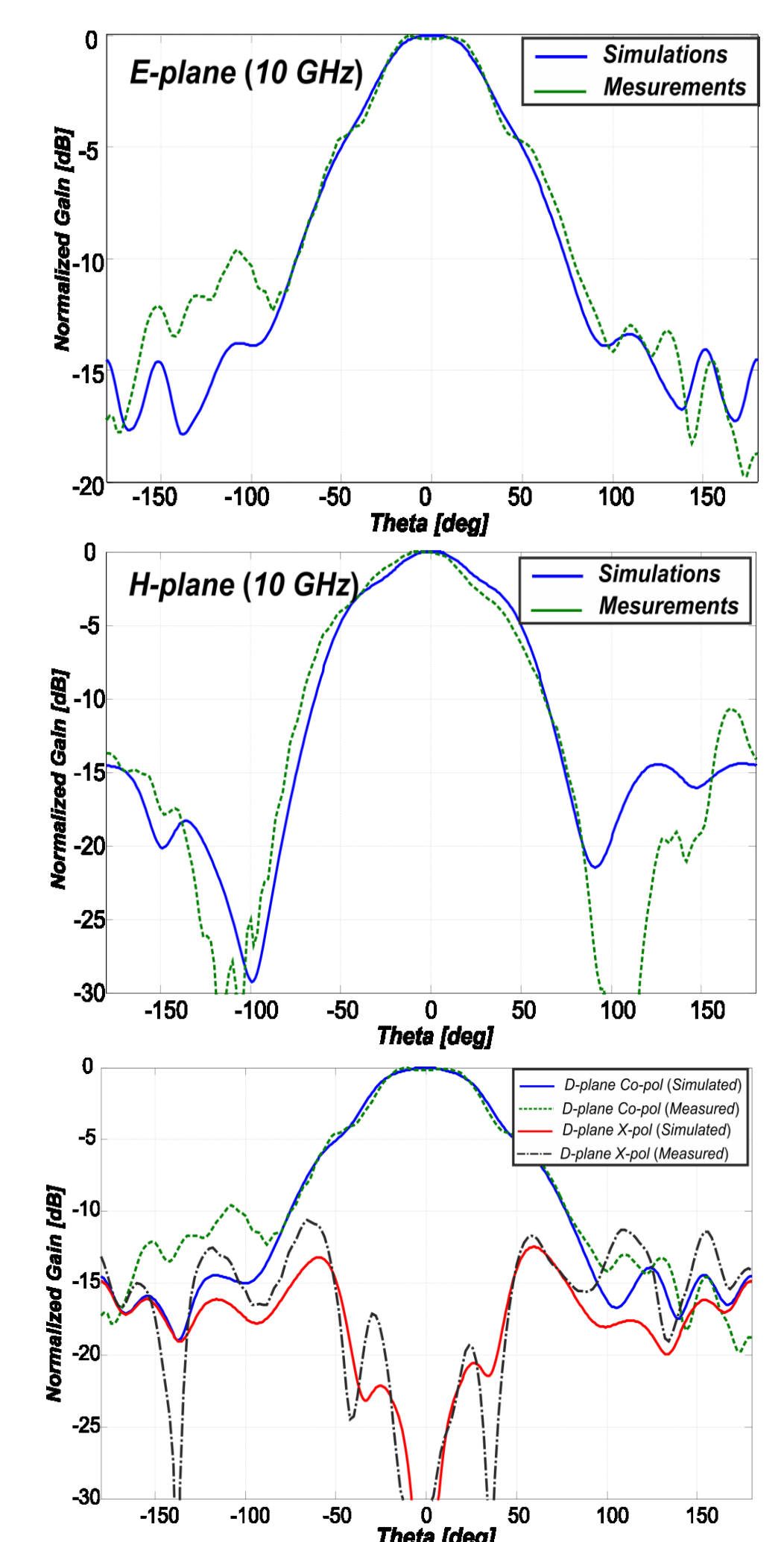


Angular selectivity is the key!!

Low frequency prototype demonstrator



Radiation patterns



High Frequency Prototype (230 GHz- 325 GHz)

- In-house IC process
- Collaboration with DIMES

