

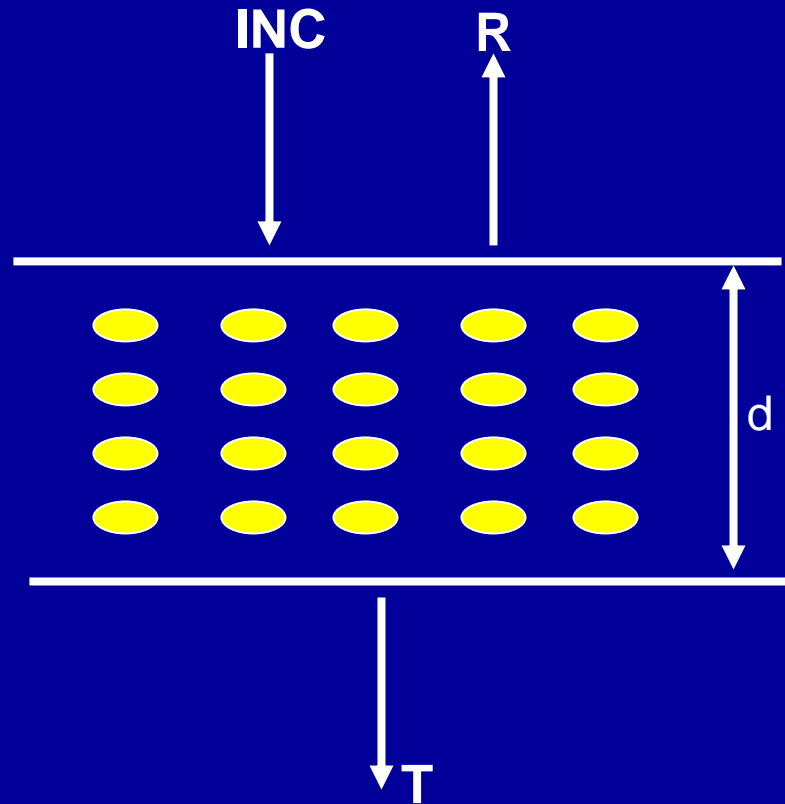
# Challenging the Popular Notions of Metamaterial characteristics in the Microwave Frequency Regime

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## Notion # 1

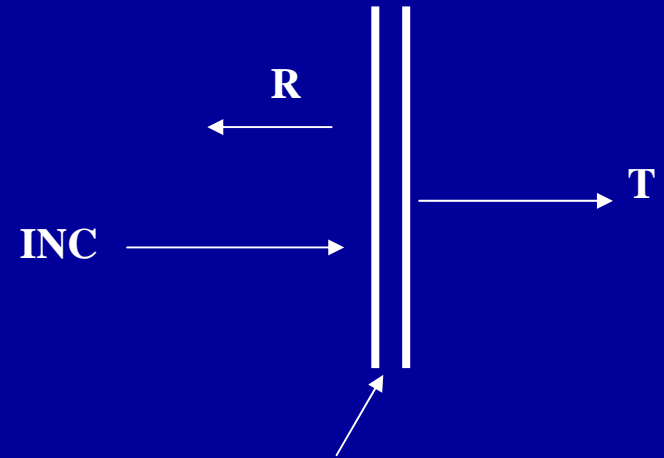
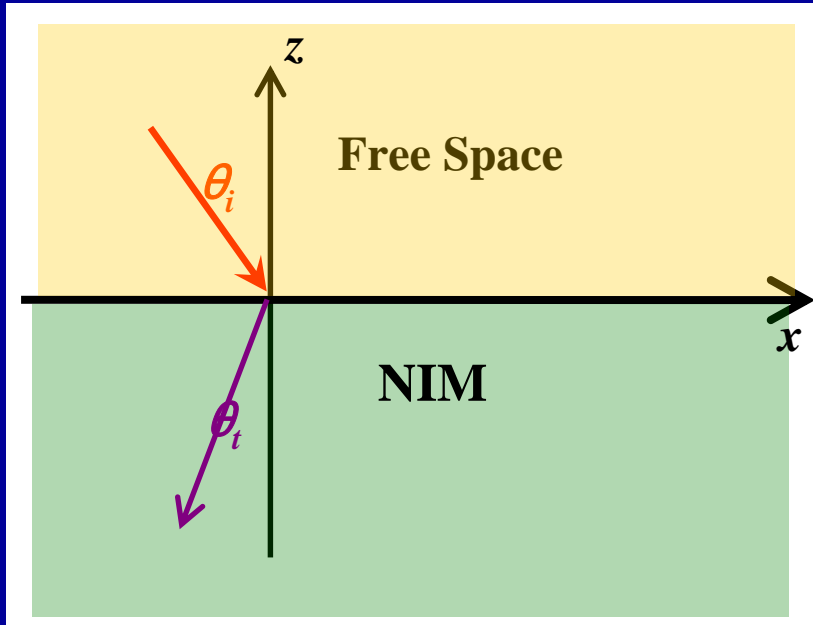


If  $T \sim e^{-j\varphi}$ , and  $\varphi$  is negative, then the material is DNG

because  $n = \varphi / k_0 d$ ;

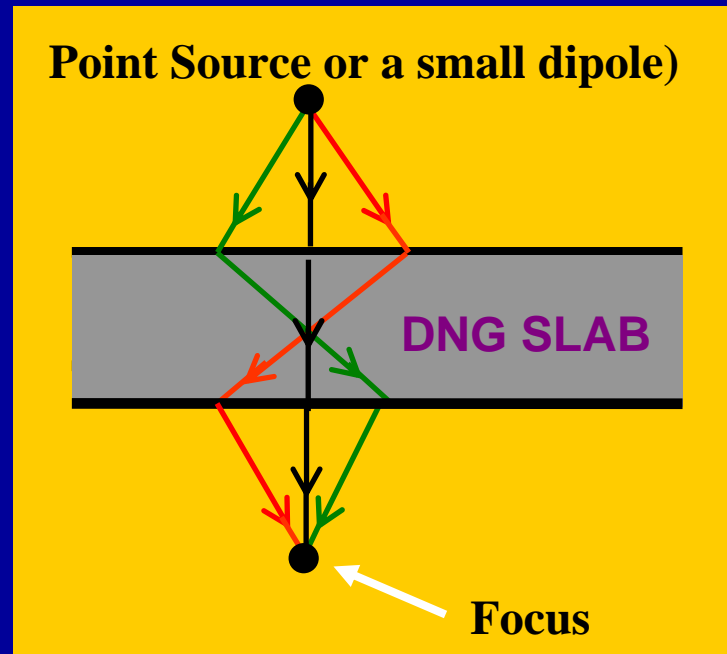
Also, if  $n$  is negative then  $\mu$  and  $\epsilon$  must both be negative.

## Notion # 2



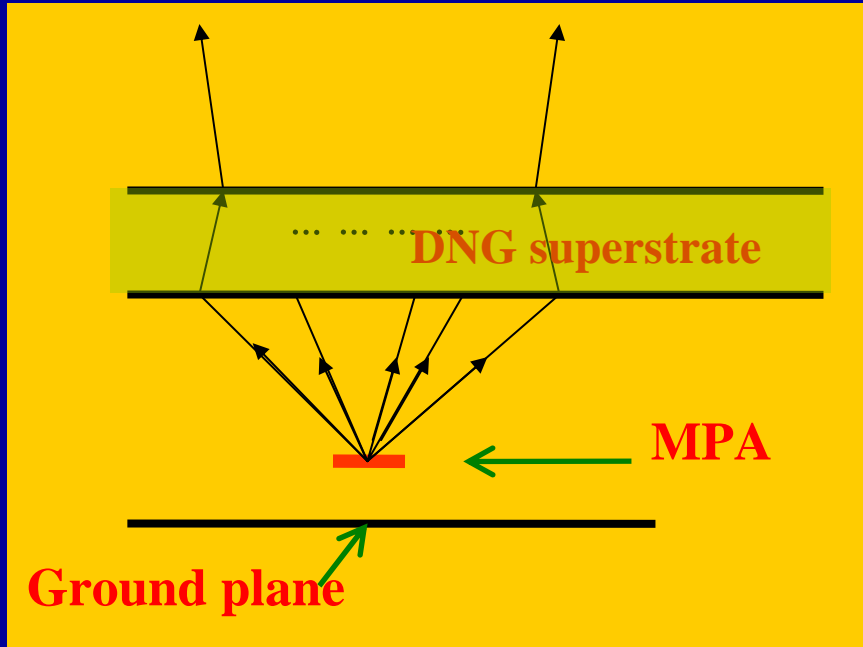
**The rays and the Poynting Vector in a medium whose  $n$  is negative (on the basis of its R and T at normal incidence) refract negatively as shown in the figure.**

## Notion # 3

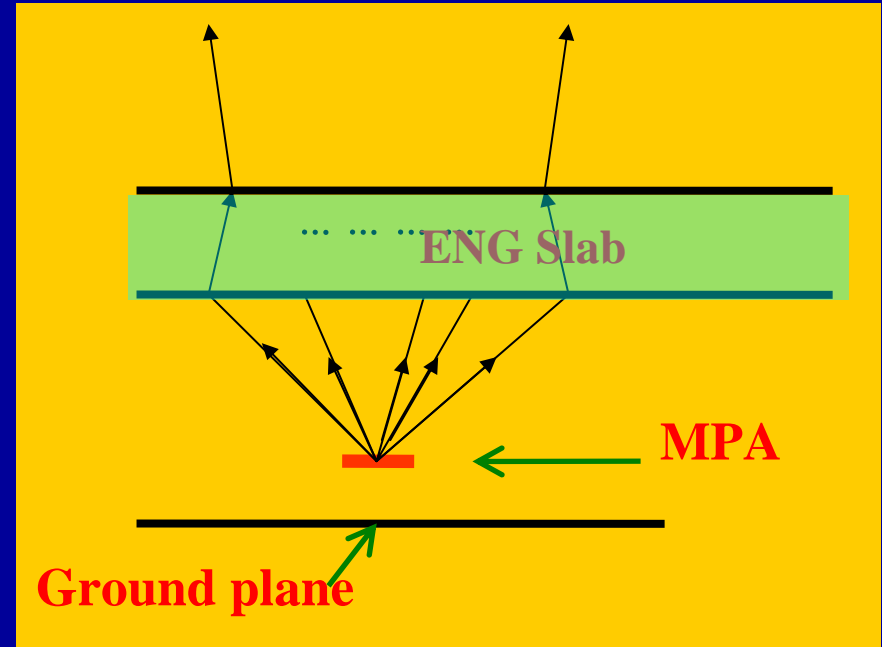


Fields excited by a Point Source exhibit cross-over inside a “DNG” Slab (So-defined on the basis of its Plane –wave R and T characteristics at normal incidence) and they focus again outside the slab as shown in the figure.

## Notion # 4



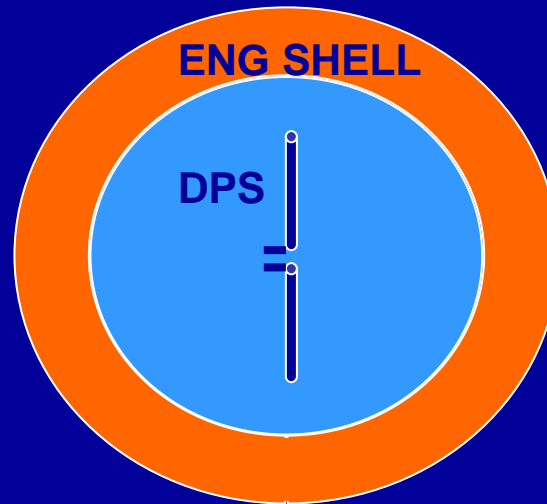
(a)



(b)

We must use a DNG slab to enhance the directivity of a Microstrip Patch Antenna, because ENG will not transmit signals Through and DPS slab wouldn't focus as would the DNG.

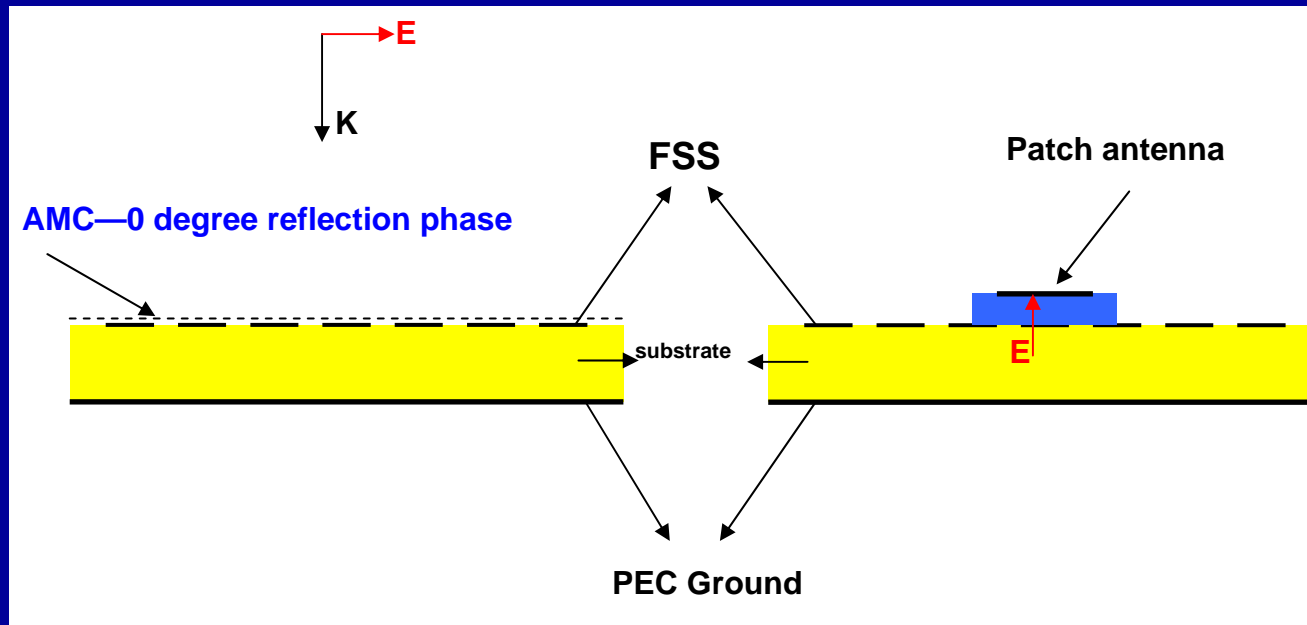
## Notion # 5



We can balance (compensate for) the positive reactive energy of the monopole with the corresponding negative reactive energy of the ENG Shell.

Notion#7

# AMC DESIGN



AMC designed by using the arrangement on the left would work in the expected manner for the antenna/AMC composite on the right.