

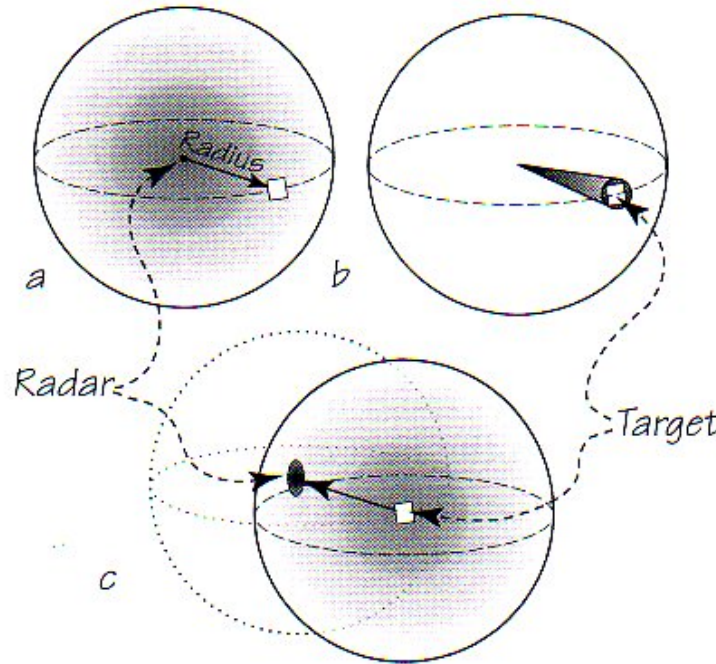
Isotropic vs. directional transmitted power from a radar and isotropic scattering by point target

a. Isotropic antenna transmission

(this is used for conceptual development of gain, g)

c. Point target scatters (i.e., re-radiates) power isotropically with some power, of course, going back to radar (i.e., backscattering).

NOTE: most real targets including hydrometeors are NOT isotropic scatterers more shortly



b. Transmitted power using a directional radar antenna with gain (g)
(this is reality)

Figure 4.1 a) Power transmitted by an isotropic antenna expands to cover a sphere of radius r . b) Using an antenna, the power at a point on the beam axis is increased. c) The power intercepted by an area A_g is reradiated isotropically in all directions, with some of it received back at the radar.

Let's now deal with how real targets, at least spherical ones, actually scatter back to the radar...

Normalized Backscattering X-sectional Area =

$$\left[\frac{\text{“Radar X-sectional Area”}}{\text{“Geometric X-sectional Area”}} \right]$$

Size Parameter = $x =$

$$\left[\frac{\text{“Geometric Circumference”}}{\text{“Wavelength”}} \right]$$

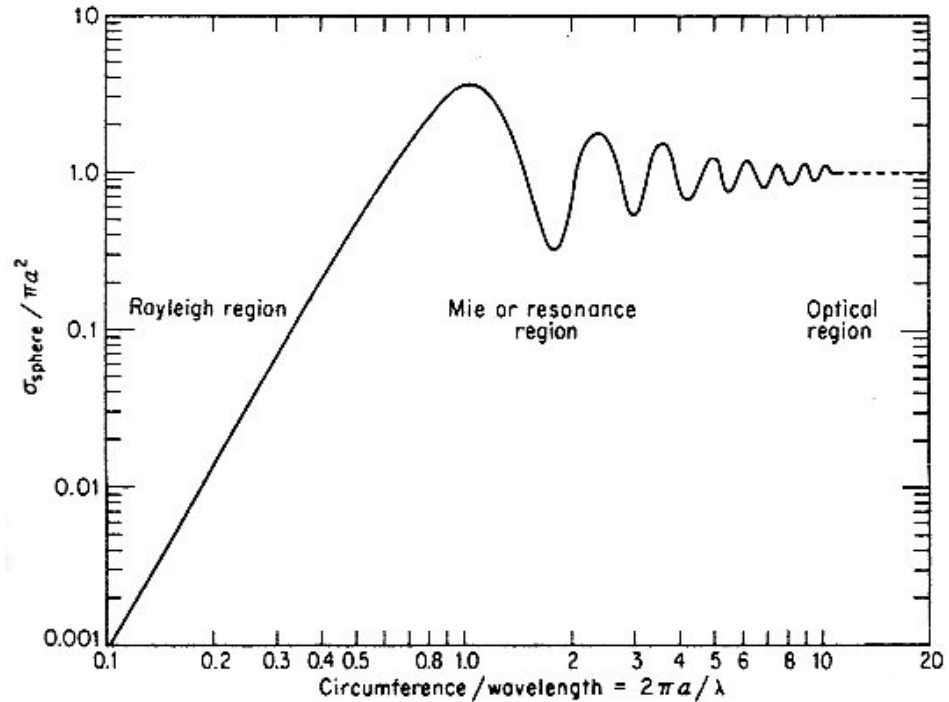


Figure 4.2 Normalized backscattering cross-sectional area of a sphere as a function of circumference normalized by radar wavelength λ , $a =$ radius. From Skolnik, 1980, Introduction to Radar Systems, with permission of McGraw-Hill, Inc.

BACKSCATTERING OF A SPHERE USING MIE SCATTERING THEORY