

APPH 6101 Plasma Physics I
Homework 3: Due 29 September, 2005.

Questions 1-3

Due problems 3.7, 3.9, and 3.10 in Gurnett and Bhattacharjee, p. 72-73.

Questions 4-5

Due problems 4.1 and 4.2 in Gurnett and Bhattacharjee, p. 131.

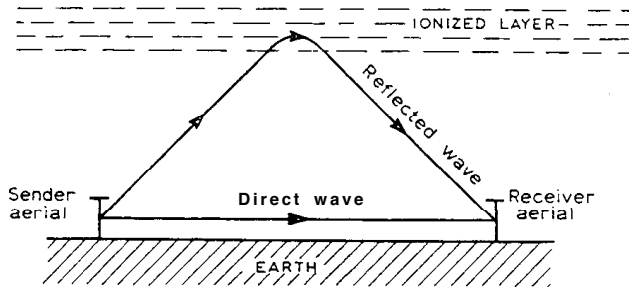


Fig. I.

Figure 1: Sir Edward Appleton (1892-1965) who was awarded the 1947 Nobel Prize in physics. (Right) Fig. 1 from his Nobel Lecture illustrating the paths of direct and reflected radio waves.

Question 6

Sir Edward Victor Appleton was awarded the Nobel Prize in physics in 1947 for his investigation of radio wave propagation in the ionosphere. In his Nobel Lecture, he described the variations in the reception of radio waves when the direct waves (near ground) interfered with waves reflected from the ionosphere.

Consider radio waves reflected from the so-called “E layer”. The E-layer has a plasma density of 10^5 cm^{-3} and is located at an altitude of about 100 km.

Part A

What frequency radio waves can reflect from the E-layer?

Part B

Describe (very approximately) how the received radio signals vary as the distance between the transmitting antenna and the receiving antenna changes.