The raleigh-hellholes reciprocity theorem essay

Thus this receiving/transmitting “ reciprocity” greatly amplifies antenna calculations and measurements. Reciprocity can be understood via Maxwell equations or by thermodynamic arguments. The Raleigh-Hellholes reciprocity theorem has been generalized by Carson to include continuous media. This theorem as applied to antennas may be stated as follows: “ If an Neff applied to the terminal of the antenna A and the current measured at the terminal of antenna B, then an equal current (in both amplitude and phase) will be obtained at the terminals of antenna A if the same Neff is applied to the terminals of antenna B. Figurer : reciprocity theorem of antenna The strong reciprocity theorem implies that the transmitter voltages VA and VI are related to the receiver currents IA and B by V AiI B -V A for any pair of antennas A and B. It is assumed that the embers are of the same frequency and that the media are linear, passive and also isotropic. An important consequence of this theorem is the fact that under these conditions the transmitting and receiving patterns of an antenna are the same. Also, for matched impedances, the power flow is the same either way.

For most radio astronomical applications, we are not concerned with the detailed phase relationships of voltages and currents, and e can use a weak reciprocity theorem that relates the angular dependences of the transmitting power pattern and the receiving collecting area of any antenna: “ The power pattern of an antenna is the same for transmitting and receiving. ” That is: G( ) Ay( ) 2. Radiation Pattern: It is a mathematical function or graphical representation of the radiation properties of the antenna as a function of space co-ordinates.

In other word it is directional (angular) dependence of radiation from the antenna or other source. A trace of the received power at a constant radius is called power pattern Figure 2: radiation pattern of directional antenna. The radiation pattern or antenna pattern describes the relative strength of the radiated field in various directions from the antenna, at a constant distance. The radiation pattern is a reception pattern as well, since it also describes the receiving properties of the antenna.

The radiation pattern is three-dimensional, but usually the measured radiation patterns are a two- dimensional slice of the three-dimensional pattern, in the horizontal or vertical planes. These pattern measurements are presented in either a rectangular or a polar format. Polar coordinate systems are used almost universally. In the polar-coordinate graph, points are located by projection along a rotating axis (radius) to an intersection with one of several concentric circles. System Analysis: For the propagation, the frequency of both transmitting and receiving antenna should be matched.

Because of the antenna size, we kept the frequency of transmitter to be 600 Maze. Hence the wavelength of wave, = 0. 5 m= 50 CM. The input power to the transmitter directional antenna is 110 db. 20 db attenuator is connected at the point of input so that some minor portion of input power is attenuated. At receiver end power received is measured for Omni directional and directional antenna for O to 360 degree angle at the step of 5 degree. That’s means it is radiation pattern in azimuth plane (I. E. In tap- direction), I. E. Bird eye view (top view).