1-11.8 Circularly Polarized Huygens Source Polarization

A circularly polarized reflector feed has a single phase cycle with Phi rotation that produces a zero integral when the pattern is reflected into the aperture of a paraboloidal reflector if the pattern has the same level for all Phi at a given Theta. Even when the pattern varies with Phi for a fixed Theta, the integral in the aperture is reduced. The linearly polarized Huygens source removes the feed phasing so that the aperture field no longer has the phasing which reduces the integrals over Phi. We use the Huygens source polarization for computing the reflector aperture field. In a similar manner we define the circular polarization Huygens source polarization from the linear co-polarized and cross-polarized fields.

$$E_{hRHC} = \frac{1}{\sqrt{2}}(E_C + jE_X) \text{ and } E_{hLHC} = \frac{1}{\sqrt{2}}(E_C - jE_X)$$

These circular polarizations specified from linear Huygens source polarizations remove the phase rotation measured on circularly polarized antennas as Phi rotates. We apply Eq. (1-37) to the normally measured Theta and Phi linear polarizations to obtain the linear Huygens source polarization and then apply the equations above to eliminate the single cycle phase rotation of a mode 1 antenna (see Section 11-1). When generating a tabulated (measured) feed input for the reflector analysis program GRASP (TICRA), we need to use the circular polarization Huygens source polarization for the feed. Likewise, the TICRA output of the reflector analysis with a circularly polarized feed is in the same polarization. To directly compare the output to measurement of a reflector with a circularly polarized feed requires adding in the rotation phase to the analysis.