

Analysis of an Impulse Radiating Antenna (IRA) with a Prolate Spheroidal Reflector

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A reflector IRA with a prolate spheroidal mirror instead of a paraboloidal mirror has an attractive feature of being able to produce a large, fast transient electromagnetic field in a small region. Such an antenna was numerically analyzed by K. Kim and W. R. Scott, Jr. and reported in Sensor and Simulation Note 481 dated 31 October 2003. C.E. Baum also presented a conceptual notion of such an antenna in Sensor and Simulation Note 501 dated August 2005. For a nearby target, focusing the transient field in the near field is accomplished by using a prolate spheroidal reflector. Both papers cited above do not provide an analytical formulation for the focused field on the nearby target. This is the subject of this paper. Starting from an earlier analytical formulation for a paraboloidal mirror reported by Mikheev et al., (IEEE EMC Transactions, Volume 39, Number 1, February 1997, pp 48-54), we present an analytical formulation for the field that concentrates at the second focal point of the prolate spheroid, given a transient voltage source present at the other focal point.