EE 500 GRADUATE COLLOQUIUM

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You are cordially invited to

"Impulse Radiating Antennas with Illustrative Examples"

By

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Date: February 11, 2014

Time: 4:00 pm

Location: 160 Willard Bldg

Abstract

We start this presentation with a four-band classification of high-power electromagnetic (HPEM) waveforms based on bandwidth that has been recently proposed and formalized. An antenna system that radiates impulse-like waveforms making use of reflectors has been called the impulse radiating antenna (IRA). This paper presents such antennas along with some representative applications.

1. HYPERBAND SYSTEMS (163.64 % < *percent bandwidth* < 200%) or (*band ratio* > 10)

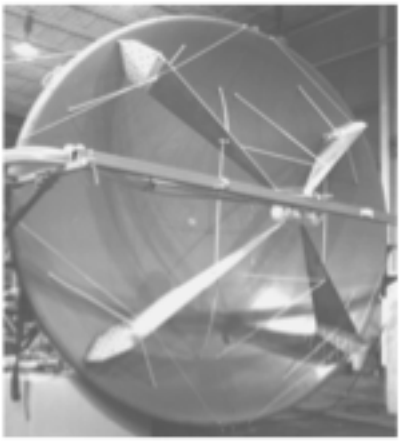

Figure 1. Prototype 3.67m

Since it was first proposed by Baum [Sensor and Simulation Note 321, November 1989], paraboloidal reflectors fed by TEM transmission lines have received a lot of attention, owing to their main attractive property of extremely wide bandwidth, without the adverse effects of dispersion. They have been called the impulse radiating antennas (IRAs) and a photograph of an example, the prototype IRA can be seen in Figure 1.

2 . ILLUSTRATIVE APPLICATIONS

Hyperband systems can be built in many forms such as reflector IRAs described above [D. V. Giri, "High- **Power Electromagnetic Radiators: Nonlethal Weapon and Other Applications",** Harvard University Press, 2004], or TEM horns, and lens IRAs They have useful applications such as:

- **Disrupter** (Disrupting **Integrated System, Releasing Ultra-Power Transient Electromagnetic Radiation)**
- Buried target detection such as demining
- Hostile target detection and identification
- Space debris detection
- Periscope detection
- Source for vulnerability studies via transfer functions
- High-power, hyper-wideband jammers
- Law-enforcement applications such as "seeing through walls"
- Electrical characterization of materials (e.g., wave propagation measurements in materials such as rock, concrete)
- Industrial applications (detection of leaky or defective pipes)

- Searching for victims of natural disasters such as earth quake rubble and avalanche These antennas can be designed to operate from 10's of MHz to several GHz. This is an extremely wideband spectrum where critical military and civilian operations take place in the field of radar and communication engineering. We will briefly discuss some of the above mentioned applications.

Biography

Dr. Giri has over 35 years of work experience in the general field of electromagnetic theory and its applications in NEMP (Nuclear Electromagnetic Pulse), HPM (High- Power Microwaves), Lightning, and UWB (Ultra Wideband).

A complete description of his academic training and work experience may be seen at his website: www.dvgiri.com

He obtained the B.Sc., Mysore University, India, (1964), B.E., M.E., Indian Institute of Science, (1967) (1969), M.S., Ph.D., Harvard University, (1973) (1975), Certificate, Harvard Introduction to Business Program, (1981). Dr. Giri has taught graduate and undergraduate courses in the Dept. of EECS, University of California, Berkeley campus. Since 1984, he is a self-employed consultant doing business as Pro-Tech, in Alamo, CA, performing R&D work for U.S. Government and Industry. From May 1978 to September 1984, he was a staff scientist at LuTech, Inc., in Berkeley, CA. Prior to his association with LuTech, Inc., Dr. Giri was a Research Associate for the National Research Council at the Air Force Research Laboratory (AFRL), Kirtland AFB, New Mexico, where he conducted research in EMP and other aspects of electromagnetic theory. Dr. Giri is a **LIFE FELLOW of the Institute of Electrical and Electronic Engineers (IEEE),** a Charter Member of the Electromagnetics Society, and Associate Member of Commission B, URSI and International Vice-Chairman of Commission E, URSI. He has served on the editorial board of the Journal of Electromagnetics, published by the Electromagnetics Society. He has also served as an Associate Editor for the IEEE Transactions on Electromagnetic Compatibility. He was elected to the grade of FELLOW by the awards committee of Summa Foundation in 1994 for his contributions to EMP simulator design and HPM antenna design. He has coauthored a book titled **High-Power Microwave Systems and Effects** published by Taylor and Francis in 1994. His second book titled **High-Power Electromagnetic Radiators: Nonlethal Weapons and Other Applications** has been published by Harvard University Press in 2004. He is a recipient of IEEE John Kraus Antenna Award for 2006. He has also published over 100 papers, reports etc.