EM Implosion Memos

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Experimental Setup for a Prolate-Spheroidal IRA

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Abstract

An experimental setup is used to obtain better focusing for a prolate-spheroidal IRA.

1 Introduction

This paper is a documentary of an experimental setup and the dimensions of this setup are based on [1,2]. This setup will be used for a biological application [3]. Experimental setup and problems related with measurements or devices are discussed.

2 Experimental Setup

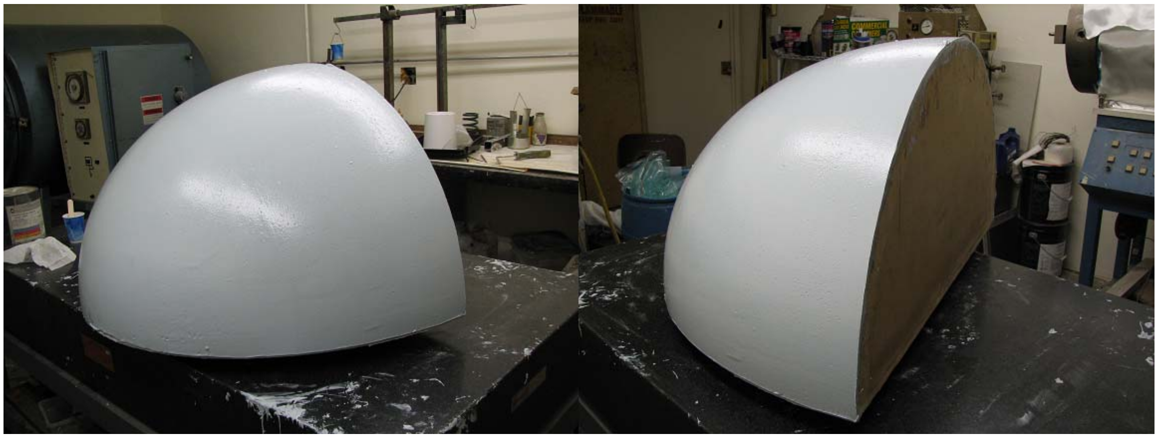

Figure 1: Reflector of the Prolate-Spheroidal IRA

The reflector in fig.1 is manufactured by Composite Graphite Company (Dave Laury, 505 2948120, CL@graphite.com). Fiber is used for manufacturing.

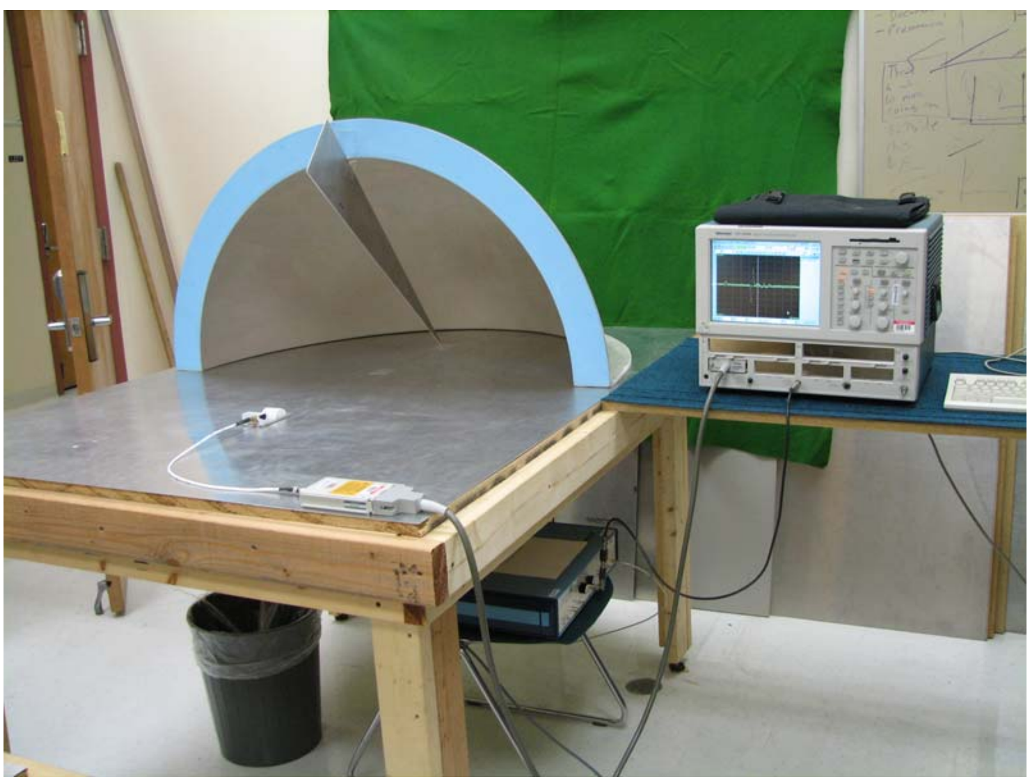

Figure 2: Experimental Setup for a Prolate-Spheroidal IRA

The experimental setup basically includes basic three parts. These are prolate-spheroidal reflector, sampling-oscilloscope and pulse generator and they are presented in fig.2.

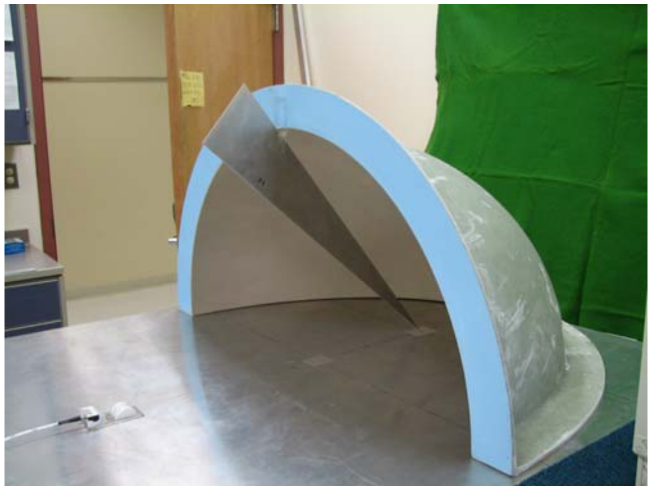

Figure 3: Reflector of a Prolate-Spheroidal IRA

The inside of the reflector is painted with copper conductive paint. The surface receptivity of the paint is a factor of 10 too high at about 5 ohms, it should have <0.3 ohm/square at 1 mil dry film thickness; <0.10 ohm/square at 2 mil dry film thickness, as indicated. The specification for the paint is wrong. This paint will still work for our application if it is uniform. The reflection coefficient would be 97%. However, we test the prolate-spheroidal reflector and found a few weak spots where the reflection coefficient was as low as ~ 70%. Oddly these spots were not places where the paint appeared to be thin. We will have to do something about this problem.

The feed arm that is located at the first focal point is aluminum. We use a B-Dot probe to measure the waveform at the second focal point. One can see the B-Dot probe that is located at the second focal point in fig. 3. However, this B-Dot probe is slow for our application; we need a faster probe.

Figure 4: Sampling-Oscilloscope and pulse Generator

One can see from fig. 4 that we use a Tekronix TDS 8000B Digital Sampling-Oscilloscope to measure the waveform at the second focal point. It has a calibration problem and in every 2.7 ns we miss 10ps data, it does not display that data. A Picosecond Pulse Labs Pulse generator is used for excitation. However it creates irregular waveforms.

References

1. Carl. E. Baum, “Focal Waveform of a Prolate-Spheroidal IRA”, Sensor and Simulation Note 509, February 2006.
2. S.Altunc and C.E.Baum. “Extension of the Analytic Results for the Focal Waveform of a Two-Arm Prolate-Spheroidal Impulse-Radiating Antenna (IRA)”, Sensor and Simulation Note 518, Nov 2006
3. K. H. Schoenbach, R. Nuccitelli and Stephen J. Beebe, “ZAP”, IEEE Spectrum, Aug 2006, Pg 20-26.