# THE STUDY ON DESIGN AND FABRICATION OF A LOG PERIODIC DIPOLE ARRAY ANTENNA FOR AVIATION INDUSTRY

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# ABSTRACT


## THE STUDY ON DESIGN AND FABRICATION OF A LOG PERIODIC DIPOLE ARRAY ANTENNA FOR AVIATION INDUSTRY

Antenna is the device that is the heart of communication systems, being used to transmit and receive radio signals. An antenna forms the interface between the free space and the transmitter/receiver. The choice of a particular antenna depends on factors such as gain, radiation pattern, polarization, bandwidth, resonant frequency and impedance.

In the last two decades, log periodic dipole arrays (LPDA's) have become the most popular commercial antennas for the reception of TV signals in the VHF and UHF bands in Europe. LPDA's have outnumbered Yagi-Uda antennas owing to their relatively simple construction and good broadband properties [3]. However, Yagi-Uda antennas typically have higher gain compared with LPDA's [3].

The LPDAs belongs to the class of wire antennas and commercial LPDAs consist of dipoles that are carried by a transmission line. An ideal LPDA consists of several symmetrical dipoles, whose dimensions form a geometric progression on a logarithmic scale.

Normally, this antenna operates in the range from 900 MHz to 1400 MHz, which is within the operational range for aviation usage. In order to construct a simple construction, low cost and good broadband properties antennas, it was decided that only log periodic dipole arrays (LPDA's) antenna has been taken for further investigation. At the end of project, the LPDA antenna is design to start radiating at 900 MHz and stop its radiation at 1400 Mhz. This will give a bandwidth of 500 MHz.

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# CHAPTER 1

# 1.0 INTRODUCTION

## 1.1 HISTORY

In telecommunication, a log-periodic antenna (LP, also known as a log-periodic array) is a broadband, multi-element, unidirectional, narrow-beam antenna that has impedance and radiation characteristics that are regularly repetitive as a logarithmic function of the excitation frequency. The individual components are often dipoles, as in a log-periodic dipole array (LPDA). Log-periodic antennas are designed to be self-similar and are thus also fractal antenna arrays. The log periodic antenna was invented by Dwight E. Isbell, Raymond DuHamel and variants by Paul Mayes. U of I had patented the Isbell and Mayes-Carrel antennas and licensed the design as a package exclusively to JFD electronics in New York. Lawsuits regarding the antenna patent which the UI Foundation lost evolved into the Blonder-Tongue doctrine. This precedent governs patent litigation. It is normal to drive alternating elements with 180° ($\pi$ radians) of phase shift from one another. This is normally done by connecting individual elements to alternating wires of a balanced transmission line. The length and spacing of the elements of a log-periodic antenna increase logarithmically from one end to the other. A plot of the input impedance as a function of logarithm of the excitation frequency shows a periodic variation. This antenna design is used where a wide range of frequencies is needed while still having moderate gain and directionality. It is sometimes used for a (VHF/UHF) television antenna.