



# Wireless Data Transmission from Inside Electromagnetic Fields

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## ABSTRACT

This paper describes analytical and experimental work developed to evaluate the effects of the electromagnetic fields produced by high-voltage lines (400kV) on wireless data transmission at the 900MHz band. In this work the source of the data transmission is located inside the electromagnetic field and the reception station is located at different distances from the power lines. Different atmospheric conditions are considered.

**KEYWORDS:** Wireless data transmission, high-voltage lines, electromagnetic field.

## INTRODUCTION

One of the most expensive activities performed by the companies in charge of the distribution of the electrical energy is the maintenance of the high voltage power transmission lines (230 and 400 kV). Routinely these companies supervise thousands of kilometers of power lines by helicopter or by land looking for faulty points under risky conditions for the involved personnel. As alternative solution several works has been done developing robotic systems to automate this labor [Nakashima et al., 1995; Wang et al., 2003; Li et al., 2004].

Sensors of vibration frequency, surface temperature and vision are used to diagnose the operative conditions of the power transmission lines, especially in the tower joining points.

One of the tasks that these robotic systems will perform is the transmission of the data, collected through the diverse sensors, from the interior of the electromagnetic field generated by the power lines to near mobile stations or remote central stations. Data transmission is required to be bidirectional, to distances greater than 100 m, in real time, and with high reliability levels. Table I presents a comparison of the different available data transmission technologies. None of them have been designed to be operated under the effect of the electromagnetic fields interference generated by high voltage transmission lines. The reviewed state-of-the-art technical literature does not report the effects of electromagnetic fields on wireless data transmission as a function of atmospheric conditions. This information is essential for the design of telecommunications systems operating under these circumstances.

To address this need, the present document describes an analytical and experimental work developed to describe and quantify the effect of the electromagnetic noise generated around the 400kV transmission lines, as function of the atmospheric conditions, on wireless telecommunications systems when they operate from inside the electromagnetic field.