

PhD THESIS ABSTRACT
**„CONTRIBUTIONS ON PLANNING A BROADBAND RADIO NETWORK
FOR MISSION CRITICAL COMMUNICATIONS”**

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The communications development determined people and institutions to interact more easily. The usage of mobile communication systems helped to increase managerial and action efficiency in all areas of social life. In order to increase the efficiency of the actions carried out, the institutions that are part of security, public order and national security forces have developed their mobile communication networks, besides the commercial ones.

This research work is part of the telecommunications scientist's studies to develop dedicated emergency communications networks which can assure high data rates in order to increase operational efficiency.

From the first generation of mobile communications systems, which were able to provide only voice calls until today when the 4G systems are completely developed, commercial mobile communications systems have evolved over the years. Also with 5G systems that can support a lot of applications, it will change the way goods are produced and distributed.

Studying the propagation mechanisms is an important step in the process of planning a radio network. Factors that influence the propagation of electromagnetic waves have a strong impact on the design of a radio network and at the same time on the parameters that such a network can provide to the users: radio coverage, signal-to-noise ratio, and capacity.

Identifying the right propagation model that can be used for providing coverage maps will improve the way transmitting parameters are chosen and at the same time will optimize the way radio spectrum is used. The decision of using a particular propagation model for the calculation of the received field strength is influenced by several factors: frequency band, the distance between the transmitter and the receiver, height of antennas, the propagation channel, or type of signal that is transmitted.

The practical part of this research work is based on planning a broadband radio network used for emergency situations, starting from a real situation, meaning a narrowband TETRA radio network installed all over the country.

The entire process of planning a radio network is a complex activity that will provide the proper locations for installing the network equipment. In order to approach this scenario I used a modified propagation model that was tuned using 22932 measurement points for the existing TETRA network and 7271 measurement points for an LTE network installed, based on the free space propagation model and propagation with diffraction. Following the above steps I have developed a tuned propagation model that can be used, together with ICS Telecom software, to provide coverage maps for mobile communications systems operating in 400 MHz and 700 MHz bands. The obtained propagation model was validated using different measurement sets: 12045 measurement points for the TETRA network and 1542 measurement points for LTE. The next step was to estimate the range of a 4G cell based on the link budget which was calculated for a broadband network, this way I proposed a scenario in order to develop a broadband emergency radio network for a county region identifying the proper locations for radio network elements installation.