

ABSTRACT

RODRIGUES, Christian Fragoas Fernandez. *contributions to the digital television project using optimization*. 2018. 149p. Dissertation (Masters Degree in Electronic Engineering) – Engineering College, Rio de Janeiro State University, Rio de Janeiro, 2018.

Considering the possible MIMO (Multiple Input Multiple Output) technology adoption for 8K resolution digital television broadcasting, this dissertation part from experiments with a MIMO OFDM (Orthogonal Frequency Division Multiplexing) 4096 QAM (Quadrature Amplitude Modulation) transmission system in urban environment. The experimental data allow to compare the attenuations measured in horizontal and vertical polarizations, in which small differences are observed. In a way to contribute with the projects of such systems, the broadcasting systems coverage, the experimental data is employed to optimize (tune) the ITU R-P.1546 propagation model parameters; to that end, descendent gradient and Newton-Raphson methods are used to find the parameter set which minimizes the quadratic medium error between the route loss foreseen by the model and the one measured. This optimization is realized in horizontal and vertical polarizations separate and conjunctionally. As a result, parameter sets that confer higher accuracy to the ITU R-P.1546 model are obtained. Next, the SFN (Single Frequency Network) coverage project is considered. An heuristic algorithm is proposed to obtain station positions that allow to cover an interest region with minimum signal intensity. The obtained coverage is evaluated and heuristics are employed to search for system configurations, SFN antennas localizations allocation, which improve performance. The heuristics consider terrain informations and coverage superpositions between different transmitting stations. The proposed algorithm is interactive and supplies as final result a transmitter quantity and its locations in order to supply a region satisfying an intensity signal baseline. Thus, this dissertation approaches aspects that facilitate broadcasting systems projects, mainly SFNs in the UHF bandwidth. The results are quite promising, the optimization of ITU-R P.1546 model parameters improves its coverage prediction accuracy and the proposed heuristic allows to obtain candidate positions to implement SFNs, to further survey.

Keywords: MIMO; 8K; Propagation; Optimization; ITU R-P1546; Coverage Project; Digital Television; SFN.