

Chapter 4

The Television White Space Opportunity in Southern Africa: From Field Measurements to Quantifying White Spaces

Albert A. Lysko¹, David Lloyd Johnson¹, Moshe T. Masonta²

1 Council for Industrial and Scientific Research (CSIR) - Meraka, P O Box 395, 0001, Pretoria, South Africa, alysko@csir.co.za, djohnson@csir.co.za

2 Department of Electrical Engineering, Tshwane University of Technology, Pretoria, South Africa, mmasonta@csir.co.za

Abstract

The lack of sufficient fixed-line communication infrastructure in African rural areas has resulted in wireless communication being the only cost effective alternative solution for broadband connectivity. However, access to valuable spectrum—specifically sub-1 GHz spectrum—is mostly allocated to broadcasting or mobile telephony. The global digital switch over (DSO) of television (TV) broadcasting systems will see more sub-1 GHz TV band spectrum being made available for the digital dividend and also result in more TV white space (TVWS) spectrum. In order to ensure dynamic and efficient utilization of the TV white space spectrum, there is an increasing trend to use cognitive radiosystems that use geo-location spectrum databases and spectrum sensing as an enabling technology. In this paper, we overview the relevant signals and standards and present field measurement results showing the actual usage of TV bands before the DSO in selected urban and rural areas of Southern Africa. Measurements were conducted using low-cost and high-grade radio instruments. The low-cost spectrum analyser was built in-house using the Universal Software Radio Peripheral (USRP-2) and GNU Radio software. A metric to quantify available TV white space, based on the minimum acceptable field strength, is introduced and applied to quantify the availability of TV white space. Our results show medium spectrum usage in urban areas and very low spectrum usage in rural areas, making TVWS an attractive solution for rural broadband connectivity.