Coexistence of TV White Space Devices and DTV Services in Ethiopian Geolocation White Space Spectrum Database

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Abstract
Due to the favorable propagation characteristics of the spectrum allocated for broadcast Television in the Very High Frequency (VHF) and Ultra High Frequency (UHF) spectrum bands; new innovative wireless technologies have emerged capable to operate on a secondary basis in the unused spectrum portions assigned to incumbent Television broadcasters. Television White Spaces (TVWS) is an umbrella term used to describe the unused portions of spectrum in the broadcast Television bands. Regulatory authorities require that White Space Devices (WSDs) must protect receivers of the incumbent services at the edge of the incumbent broadcast Television coverage contours from possible harmful interference. In this paper, we present a detailed mathematical framework for calculating the sufficient keep-out-distance (d_k) between Digital TV (DTV) services and WSDs to allow the use of TVWS spectrum without causing interference to the receivers of the incumbent services in the Ethiopian context. The framework includes the calculation of co-channel and adjacent distance d_k from the DTV contour using the ITU-R P.1546-5 and ITU-R P.1411-9 propagation models respectively. The paper elaborates on how to compute the desired distance ($d_{desired}$) of DTV services using the interpolation approach. In addition, we simulate the adjacent and co-channel distance d_k with respect to antenna Height Above Average Terrain (HAAT) values.