IEEE 802.19.1a  
Wireless Coexistence

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| Text proposal on the coexistence management over a region by controlling the number of cochannel GCOs | | | | |
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Abstract

This contribution provides text proposals for coexistence management over a region by controlling the number of cochannel GCOs based on 802.19.1 standard and approved text.

1. Coexistence mechanisms and algorithms
   1. Coexistence algorithms
      1. Coexistence decision algorithms

***Insert the following text***

7.2.2.x Algorithm for coexistence management over a region by controlling the number of cochannel GCOs

7.2.2.x.1 Introduction

Instead of providing the avaialbel channels for a sngile location, the GCO can provide the available channels that are valid for a certain region. When there are multiple GCOs that operate within a common region, the coexistence manager which manages the GCOs such as small cells over an area, e.g., a residential area. A statisical model can be used to model the random location withn the given region. From this information, the CM can calculate the each GCO’s individual capacity as well as the sum capacity of all GCOs taking into account the interference among these GCOs. Given the expected QoS from the GCOs, the CM can determine the minimum number of assigned channels to CRSs while achieving a satisfactory QoS of individual GCO and sum capacities of GCOs.

7.2.2.x.2 Capacity calculation of randomly located GCOs over a region

Figure XX describes the system model where the GCOs are assumed to the WSDs operting in the TV band. The WSDs in a given residential area are grouped into one management area with radius R. Without loss of generality, we can assume that there is one WSD at the center of the management area. The distance between the center of the management area and the closest point on the TV broadcast contour (also referred to as critical point in ECC 186 [xx]) is denoted as . The WSD at the center of the management area is denoted as WSD-0 and it’s the n-th nearest neighbor is denoted as WSD-n. *N* is the maximum number of the WSDs. The distance between them is denoted as . The angle between and is , which is uniformly distributed from 0 to 2π. The distance from WSD-n to the critical point denoted by as shown in the figure can be calculated as , which is for determining the pathloss in the emission limit calculation . According to [5], we can write the probability density function of as follows

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where denotes the Gamma function. The density of the WSD in the management area is calculated as , where M is the total number of randomly distributed WSDs in a given management area.



**Figure XX** System model

To give a radio access technology agnostic analysis, we use Shannon channel capacity to evaluate the performance of WSDs’ spectrum usage. As mentioned previously, we assume that the each WSD employs dynamic channel access by choosing one out of the total available channels. If all WSDs are given an identical set of N available channels, each WSD using the same channel only with its *kN*-th neighbor WSD, k = 1, 2, ... K, where K is the maximum number WSDs operating on a particular TVWS channel. The instantaneous capacity of WSD-0 can be written as follows.

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where is the distance between end user and the WSD while β is the associated pathloss exponent. Here, is the noise power at the end user’s receiver. And, w is the channel bandwidth of a TVWS channel. Note that the capacity is a function of the distance from WSD to the critical point on the TV service contour and the distance between its co-channel neighbor WSDs. Since the locations of the WSDs are randomly distributed, we calculate the mean capacity of each WSD as

Without loss of generality, assume *M = (K+1)N*. Then, the network capacity turns into . We can see that the individual capacity and the network are dependent on density of WSDs and the number of available channels for Dynamic Frequency Selection (DFS).

7.2.2.x.3 Algorithm description

The flowchar is shown in Figure YY. The processes are as follows.

* P#1  
  P#1 is the procedure operated at the CDIS where the CDIS obtains the receiver information of the WSO through the WSO registration procedure as specified in 5.2.3.1 WSO registration procedure.
* P#2  
  In this stage the CM obtains the information on the number of GCOs that will potentially operate in the same region and using the same channels by checking GCOs’ available frequencies over operationRange. The information can be obtained through the WSO Registration Procedure in 5.2.2.1. When there are multiple CMs, the information can be obtained through the Obtaining Operator Frequency Information procedure in 5.2.18 and Obtaining Operating Frequency Information procedure over Coordination Enabler in 5.2.19.
* P#3  
  In the process, the CM use the statistical model and described in the previous subclause to determine the individual and network capacity for different number of GCOs. Given the desired QoS, the CM can decide a limit on the number of GCOs that can operate simultaneously in the same channel at any location withn the region.
* P#4  
  In P#4 CM use the 5.2.10.1 WSO Reconfigure procedure to send the limit on the number to the GCOs. When there are multiple CMs, the information on the number limit can be sent with parameter coChGCOLimit using 5.2.10.2 Sending reconfiguration request from CM to another CM.



Figure YY Flowchart of the coexistence management by controlling the number of cochannel GCOs