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Measurements of Wideband Spectrum

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Abstract: ***The word spectrum refers to a collection of various types of electromagnetic radiations of different wavelengths In recent years, the demand for radio spectrum for wireless communication is growing due to increase in number of users and popularity of data and multimedia services. This has been observed in the recent auctions completed word wide for the vestige of radio spectrum. The radio spectrum has been assigned to different services and it is very much difficult for the emerging wireless technologies to get entry due to rigid spectrum policy and heavy opportunity cost. The inefficient prevailing spectrum management causes the artificial spectrum scarcity. The measurement campaigns conducted worldwide have confirmed this by showing that the considerable amount of radio spectrum is underutilized. We evaluate the spectrum usage in different bands allocated to wireless services based on the real time data collected from the measurement. We find a significant amount of spectrum is underutilized and opportunities for the secondary use.***

Keywords: CR, Spectrum Analyzer,

1. Introduction

The rapid development of wireless standards and bandwidth hungry technologies has led to a perceived shortage of spectrum. In order to satisfy the growing demand for new spectrum, the spectrum management policy needs to be changed. Currently, the administrative or command and control approach to spectrum management has proven to be ineffective The fast increasing use of mobile devices has almost led to a need for efficient usage of spectrum. Cognitive radio is a promising technology for the efficient spectrum utilization due to its ability to modify operating parameters such as transmits power, operating frequency and modulation schemes etc.[2] The spectrum utilisation of the bands assigned to different wireless services is not clear in India. Therefore it is essential to evaluate the frequency usage of different bands for cognitive radio operation to counteract the problem of spectrum scarcity. With reference to this, previous measurement campaigns are studied along with the methodological aspects. The spectrum measurement was performed in solapur ,India for the extent to which the wireless services are utilizing their frequency bands. This empirical work was performed to identify the underutilized frequency bands for cognitive radio operation.

In fact, frequency spectrum background measurement is not a novelty in the field. In a cognitive radio system spectrum sensing is mostly performed by the techniques listed[1]

Energy detection – Does not need knowledge of the detected signal and has low costs, but cannot work with low SNR and cannot distinguish users sharing the same channel.

Matched filter – Optimal detection performance, low computation costs, but requires knowledge of the primary users.

Cyclostationary detection – Robust to interferencecand low SNR, but also requires partial information of detected users.[03]
This paper is organized as follows. Section II discusses measurement setup. Section III presents measurement results to quantify spectrum occupancy for cellular in solapur. Finally, conclusion is given in the last section

2. Measurement Setup

The measurement setup used consists of an LIGNex1 NS-30A spectrum analyzer with a range of 1khz To 3GHz, an antenna with of 3GHz a laptop system that is connected to the spectrum analyzer via a USB cable, and an SAR software specially designed to run on LIGNex1 NS-30A spectrum analyzers. The setup is connected as shown in figure 1. MATLAB software package was used to process and analyze the data and the results presented in later sections.

Figure 1: Setup To me sure spectrum

A Location:
The measurement was conducted indoors at solapur District a primarily residential district in Maharashtra, India. These measurements were conducted indoors as part of larger measurement campaign which we hope will provide an insight into the utilization level of the spectrum in Solapur.

In spectrum occupancy measurements, determining the decision threshold upon which a particular channel can be deemed as free or busy is very important especially when energy detection is employed. In energy detection, no prior knowledge of the signal is known therefore it’s very important to correctly determine the threshold for accurate readings. Setting the threshold metric too high will lead to under estimation of the spectrum while low decision metric will lead to over estimation of the spectrum. The normal convention is to keep the decision metric some certain dB above the equipment's noise floor level. The noise floor for the setup was obtained by replacing antenna with a 50ohm resistor we can similarly measure the noise floor by removing the antenna and not replacing it with anything The spectrum analyzer configuration parameters settings are explained in table 1

Table 1: Parameter

Sr No	Parameter	Value
1	Frequency Span	0-3000MHZ
2	Video Bandwidth	1MHZ
3	Resolution Bandwidth	3 MHz
4	Sweep Period	1MHZ
5	Scale	Log Scale
6	Instrument	LIG Nex1

3. Methodology

To measure the spectrum of wide band using spectrum analyzer is necessary task for cognitive radio in spectrum detection purpose. This can be carried out by using the spectrum analyzer, we use LIGNeX1 spectrum analyzer. We used single dipole antenna to detect the spectrum this antenna is connected to the spectrum analyzer through cable. Then we can use full band to detect to makes changes in spectrum setting, In LIGNeX 1 have the facility to save the readings in comma separated values(.CSV) format. also we can connect the spectrum analyzer to laptop through SAR Software .

4. Conclusion

From this paper we have suggest de new technique to detect the empty spectrum from 1 hz to 2500Mhz.By using this we can detect the empty spectrum.

We have taken a reading and draw the periodgram of power spectral density.

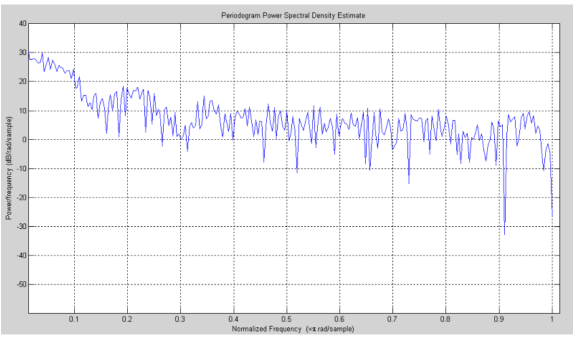

Figure 2: Periodgram of power spectral density

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