Interference Temperature

Swrangsar Basumatary
swrangsar@iitb.ac.in

Indian Institute of Technology Bombay

April, 2013

Introduction

Introduction

- The concept of interference temperature was introduced by the FCC as a new metric for quantifying and managing interference.

Introduction

- The concept of interference temperature was introduced by the FCC as a new metric for quantifying and managing interference.
- Using this model, *Cognitive Radios* operating in licensed frequency bands would be able to measure their current interference environment and adjust their transmission characteristics so as not to raise the interference temperature over a regulatory limit.

Purpose of the metric

Purpose of the metric

- **The purpose of this metric is to remove the subjective context that has been the basis of interference analysis up to now.**

Purpose of the metric

- **The purpose of this metric is to remove the subjective context that has been the basis of interference analysis up to now.**
- Currently, they do a detailed analysis of the surroundings and rely on worst case analysis.
- But relying on worst case analysis leaves much of the spectrum unused.

Driving forces for interference metric

Driving forces for interference metric

- **Changing landscape**
  Technological advances have led to increased diversity of spectrum-based consumer applications. This has resulted in an increased demand for spectral resources. Static interference management does not work anymore.

Driving forces for interference metric

- **Changing landscape**
  Technological advances have led to increased diversity of spectrum-based consumer applications. This has resulted in an increased demand for spectral resources. Static interference management does not work anymore.
- **Increased density and mobility**
  People are owning more cellular devices. Density of mobile devices has increased and interference management has become more complicated.

Definition of Interference Temperature

Interference temperature, T_I is defined as

$$T_I(f_c, B) = \frac{P_I(f_c, B)}{kB}$$

where

- $P_I(f_c, B)$ is the average interference power centered at frequency, f_c, and covering bandwidth B.
- k is the Boltzmann's constant $k = 1.38 \times 10^{-23} J/K$

Definition of Interference Temperature

Interference temperature, T_I is defined as

$$T_I(f_c, B) = \frac{P_I(f_c, B)}{kB}$$

where

- $P_I(f_c, B)$ is the average interference power centered at frequency, f_c, and covering bandwidth B.
- k is the Boltzmann's constant $k = 1.38 \times 10^{-23} J/K$

In SI system, the unit of interference temperature turns out to be *degrees Kelvin*.

Interference Temperature Models

There is ambiguity regarding whether to represent T_I in terms of the transmitter parameters or the receiver parameters. This results into two models [1]:

[1] T. Charles Clancy, *Formalizing the Interference Temperature Model*. Wiley Journal On Wireless Communications And Mobile Computing, 2006.

Interference Temperature Models

There is ambiguity regarding whether to represent T_I in terms of the transmitter parameters or the receiver parameters. This results into two models [1]:

1. Ideal model
2. Generalized model

[1] T. Charles Clancy, *Formalizing the Interference Temperature Model*. Wiley Journal On Wireless Communications And Mobile Computing, 2006.

References