

Spectrum Utilization and Management in Cognitive Radio Network

Kishor P Patil

kpp@es.aau.dk

Supervisor

Prof.Knud Erik Skouby

CTiF,AAU

Co-supervisors

Prof.Ramjee Prasad

CTiF,AAU

Prof.U.B.Desai

IIT,Hyderabad,India

Outline

- Current spectrum management
- Spectrum scarcity
- Cognitive Radio Technology
- Significance of the project
- Project Objectives
- Key Methods
- Framework for spectrum measurement
- Summary

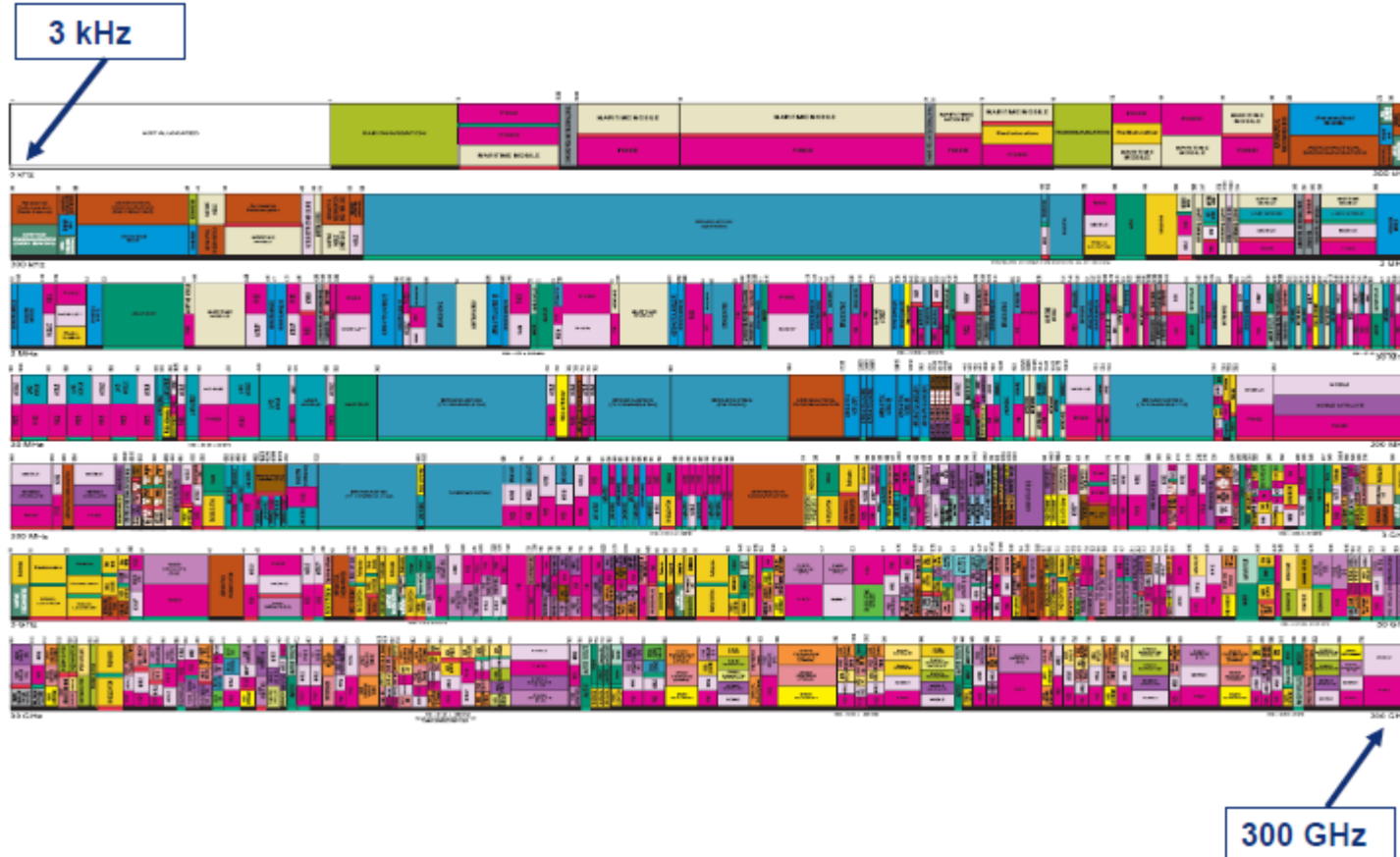
Current Spectrum management

- Radio spectrum regulation controlled by Government
- Command and control
- Rigid
- Highly inefficient
- Unable to accommodate the new services
- Successful in avoiding interference

Spectrum scarcity

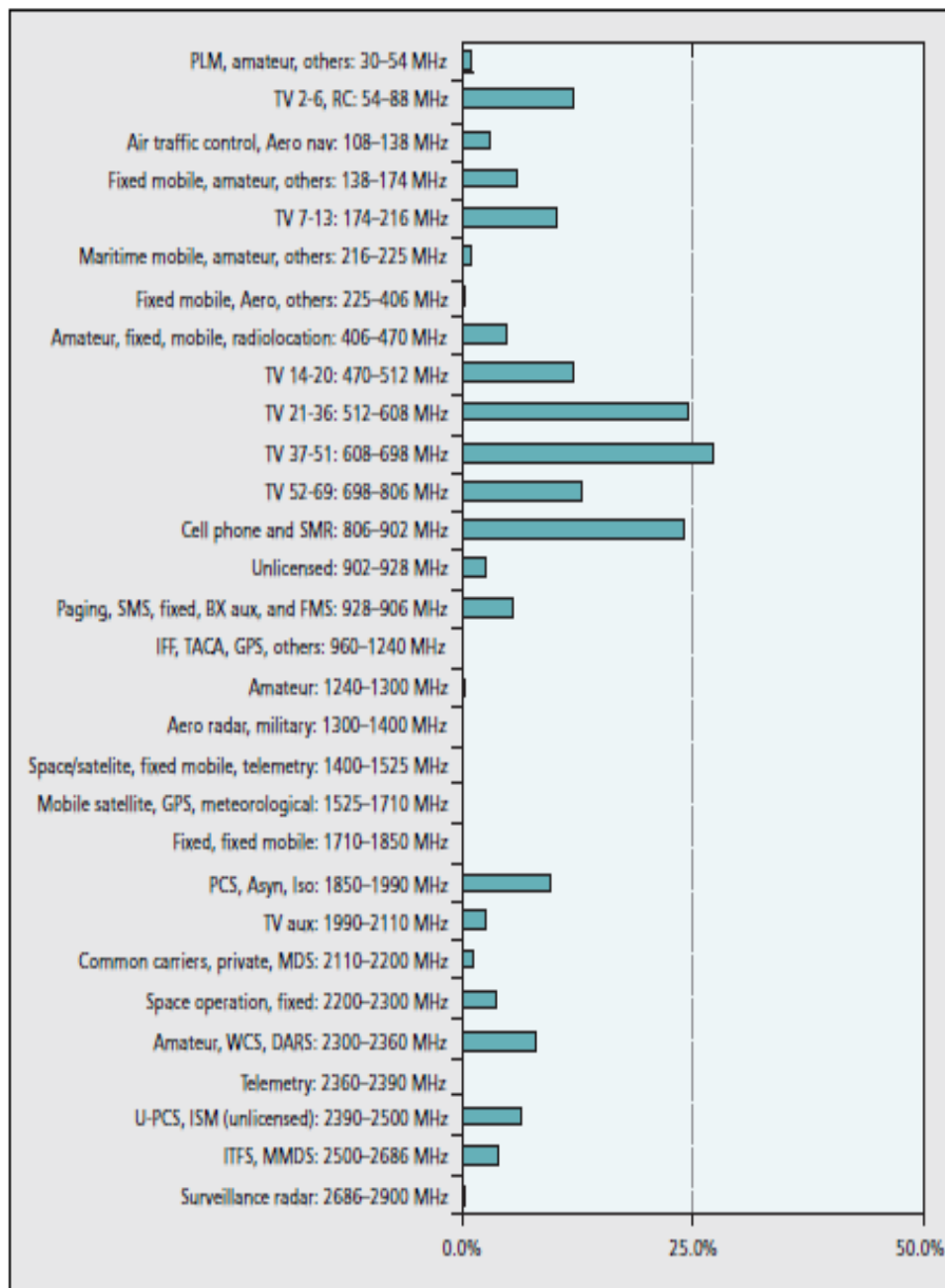
- Emerging bandwidth hungry wireless technologies
- Inefficient fixed frequency allocation
 - Underutilization of licensed RF spectrum

Fixed spectrum allocation



Ref:Wikipedia

- Frequency band
30MHz-3GHz
- Maximum utilization ~26%
-TV channels
- Average usage ~ 5.2%



Ref: M.A.McHenry, "NSF Spectrum Occupancy Measurements Project Summary," August 2005

Ghasemi and Sousa,
IEEE Communications Magazine,
April 2008

Cognitive Radio Technology

- The idea of Cognitive radio was first coined by Joseph Mitola
- Capability to use licensed spectrum in opportunistic manner
- Greatly improve spectrum efficiency and alleviate spectrum scarcity
- A key enabling technology for Dynamic spectrum Access(DSA)
- FCC definition : A “Cognitive Radio” is a radio that can change its transmitter parameters based on interaction with the environment in which it operates.

Significance of the Project

- First spectrum occupancy measurement in India
- Spectrum occupancy measurement is one of the essential tools of spectrum management
- R & D investment for the Cognitive Radio Technology
- Policy changes to support the Cognitive Radio Technology

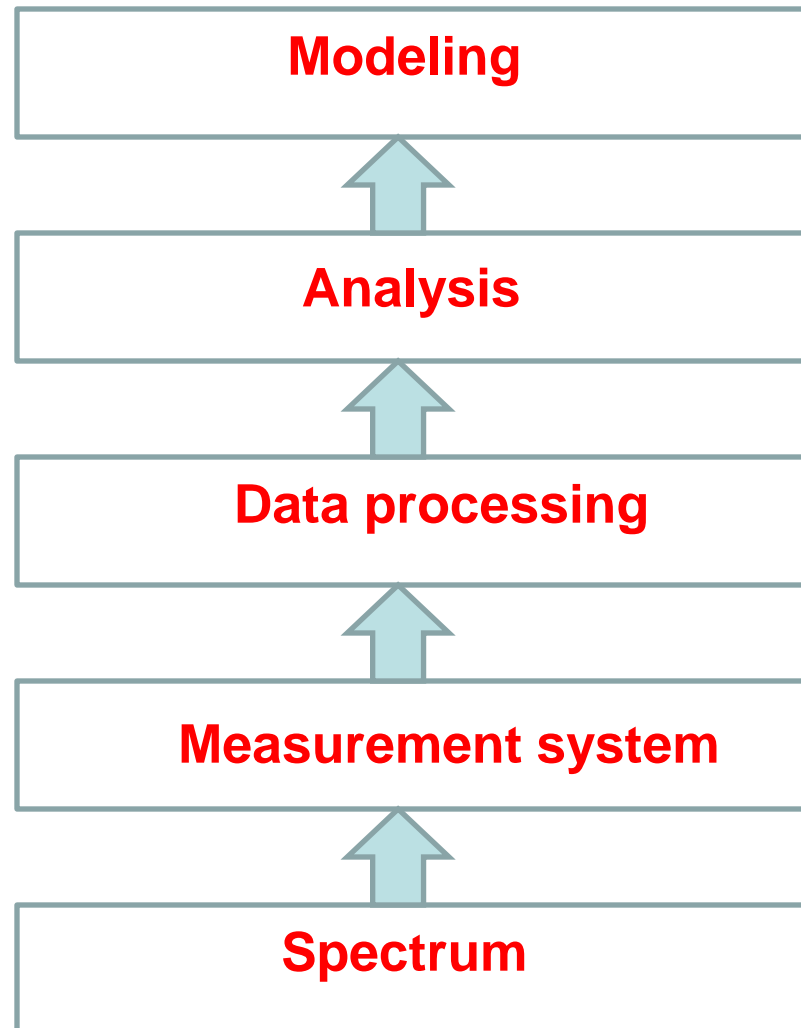
Project Objectives

- Spectrum occupancy measurement in India to identify the low occupancy bands
- Study for the deployment of the cognitive radio Network in Indian scenario
- Overview of the current spectrum management problems
- Study the implications of deploying Cognitive Radio on spectrum regulation in India

Key Methods

- Energy detection method for spectrum occupancy measurement
- Spectrum Modeling to determine spectrum utilization parameters
- Best practices used in Spectrum management

Frame work for RF spectrum measurement



Thank you!!