Examination of Dynamic Spectrum Access Sharing Techniques

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Overview

- Background
- What is Dynamic Spectrum Access (DSA) Technology
- DSA Measurement Challenges
- Spectrum Sharing Innovation Test-Bed Pilot Program
- Overview of Phase I Testing
- Summary

Background

- The long standing practice of spectrum management is to respect the rights of incumbent users.

- New technologies are being developed that employ DSA techniques to access spectrum while not causing interference to the incumbent users.

- To accommodate these new technologies while protecting the incumbents it is necessary to ensure that the DSA sharing techniques are well understood.

What is DSA Technology?

- DSA technology allows a device to:

  - evaluate its radio frequency environment using spectrum sensing, geo-location, or a combination of spectrum sensing and geo-location techniques;

  - determine which frequencies are available for use on a non-interference basis;

  - reconfigure itself to operate on the identified frequencies.

DSA Measurement Challenges

- Measurements to verify that the concept of DSA actually works:
  - controlled laboratory testing; and
  - field testing.

- Compliance measurements:
  - defining test signals;
  - measuring DSA device response to test signals; and
  - defining pass/fail criteria.

Spectrum Innovation Sharing Test-Bed Pilot Program

- The National Telecommunications and Information Administration (NTIA) and the Federal Communications Commission (FCC) have established a spectrum sharing Test-Bed Pilot Program where federal and non-federal users can study the feasibility of increasing the efficient use of the spectrum.

- As part of establishing the spectrum sharing Test-Bed Pilot Program NTIA and the FCC identified 10 MHz of spectrum for shared federal and non-federal use.

- The spectrum sharing Test-Bed Pilot Program will provide a means for evaluating emerging technologies to improve sharing between federal and non-federal users.

Spectrum Innovation Sharing Test-Bed Pilot Program

- Through a series of Federal Register Notices NTIA requested public comment on the implementation of the Test-Bed Pilot Program.

- The Commerce Spectrum Advisory Committee provided recommendations to NTIA on how the Test-Bed Pilot Program should be implemented.

- NTIA sought advice from the federal agencies on the Interdepartment Radio Advisory Committee on implementing the Test-Bed Pilot Program.

Spectrum Innovation Sharing
Test-Bed Pilot Program

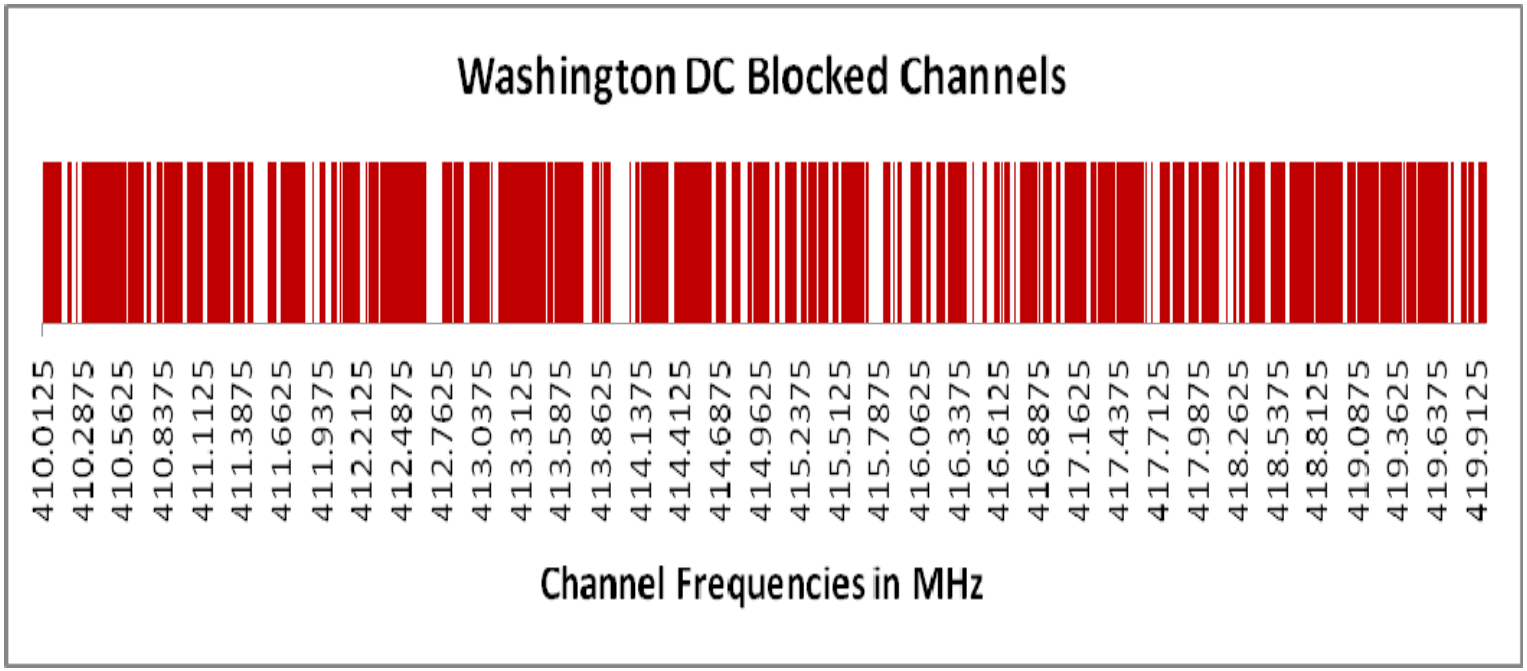
- Equipment employing DSA sharing techniques will be considered in the Test-Bed Pilot Program.

- NTIA identified the 410-420 MHz band and the FCC designated 10 MHz in the 470-512 MHz band for the Test-Bed Pilot Program.

- The Test-Bed Pilot Program will be implemented in three phases:

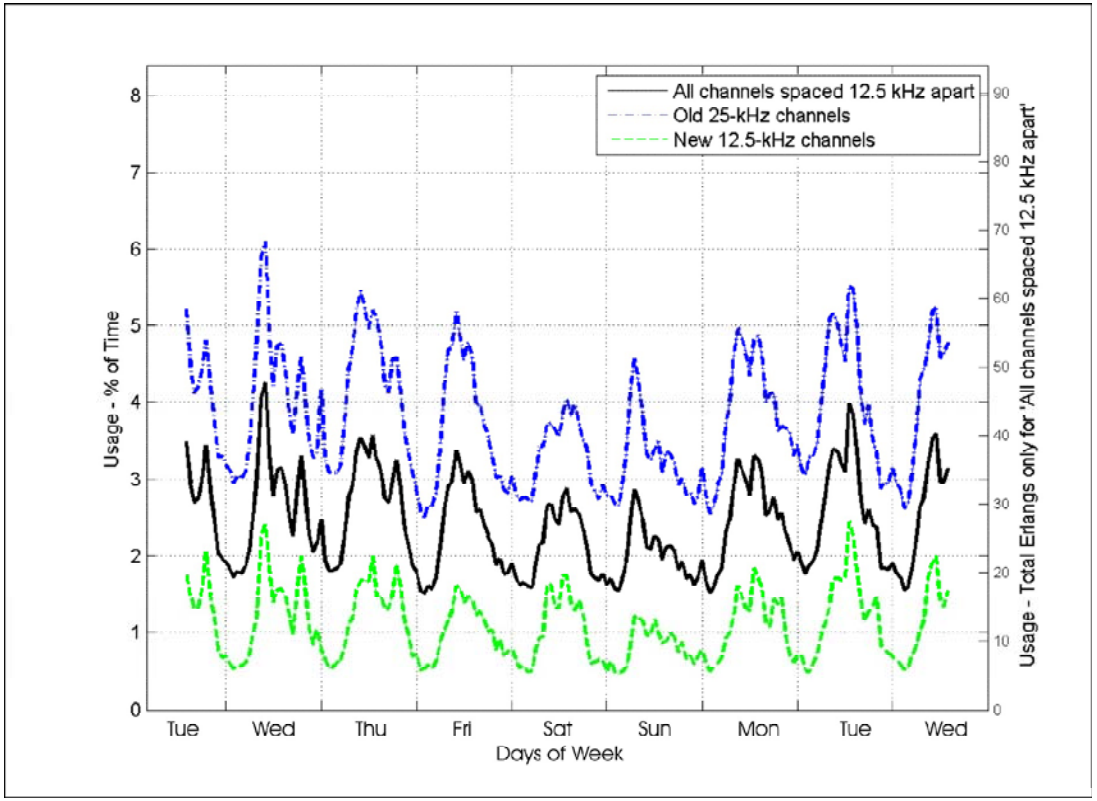
  - Phase I : Equipment Characterization
  - Phase II : Evaluation of Capabilities
  - Phase III : Field Operation Evaluation

Spectrum Innovation Sharing Test-Bed Pilot Program



Channels Unavailable for Assignment in Washington, DC Based on Frequency Assignment Data in the Government Master File

Spectrum Innovation Sharing Test-Bed Pilot Program



Example of Daily Measured Channel Usage for the 406.1–420 MHz Band in Washington DC

Spectrum Innovation Sharing Test-Bed Pilot Program

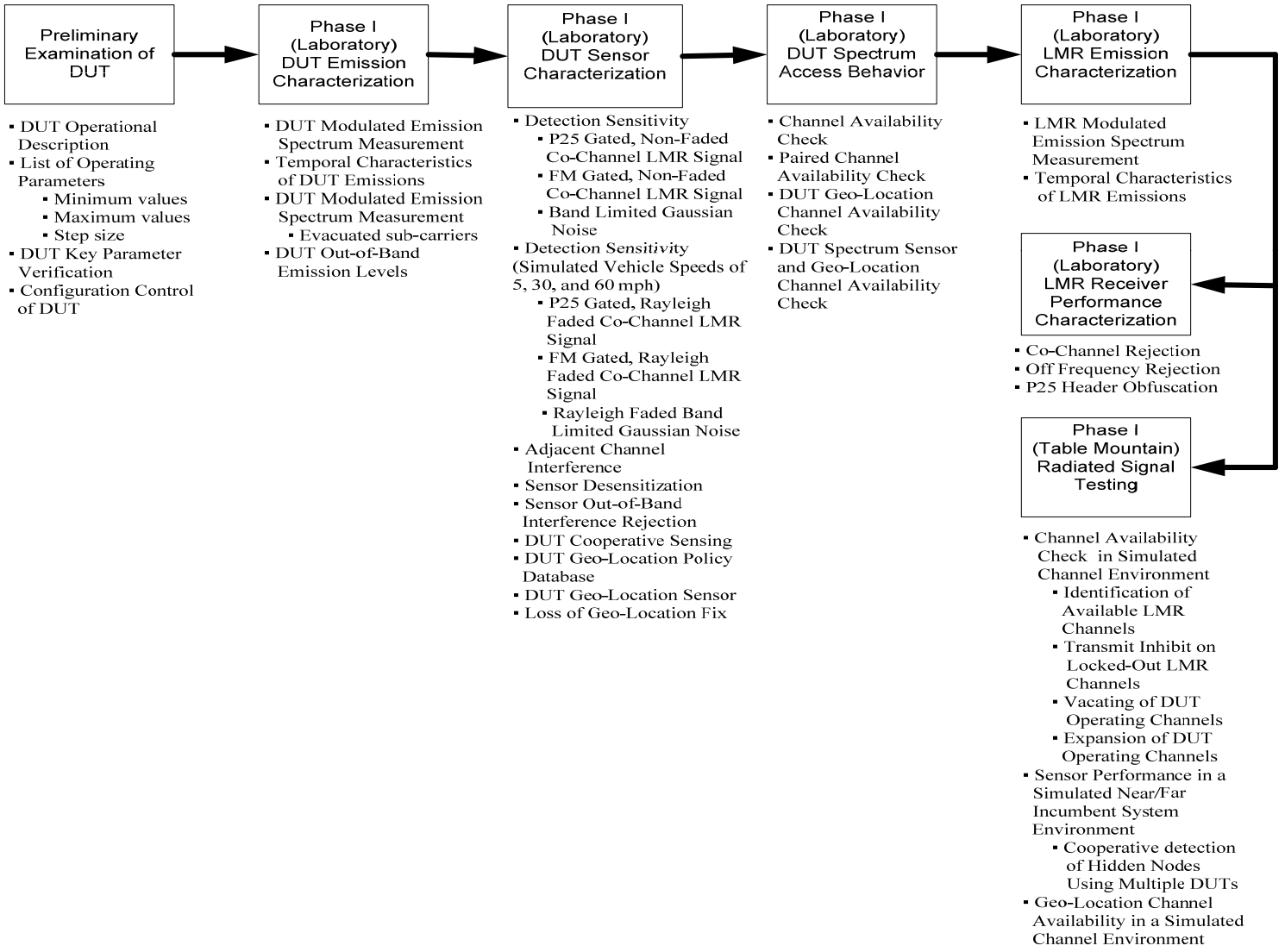
- The following organizations were selected to participate in the Test-Bed Pilot Program:

  - Adapt4 LLC
  - Adaptrum Inc.
  - BAE Systems
  - Motorola Inc.
  - Shared Spectrum Company
  - Virginia Polytechnic Institute and State University

Spectrum Innovation Sharing Test-Bed Pilot Program

Parameter	Test-Bed Participants					
	A	B	C	D	E	F
DSA Capabilities	Spectrum Sensing And Geo-Location	Spectrum Sensing	Spectrum Sensing	Spectrum Sensing	Spectrum Sensing and Geo-Location	Spectrum Sensing
Transmit Bandwidth	Fixed	Variable	Variable	Fixed	Fixed	Fixed
Channel Structure	Contiguous Channels	Non-Contiguous Channels	Non-Contiguous Channels	Single Channel	Single Channel	Single Channel
Monitoring Frequency Range	Variable	Fixed	Fixed	Fixed	Fixed	Fixed
Monitoring Time	Variable	Variable	Variable	Variable	Variable	Variable
Duplex Channel Monitoring Capability	Yes	No	No	No	No	No
Detection Method	Power Level Exceeding Threshold	Power Level Exceeding Threshold	Power Level Exceeding Threshold	Statistical Processing	Power Level Exceeding Threshold	Power Level Exceeding Threshold
Detection Threshold	Variable	Variable	Variable	Variable	Variable	Variable
Detection Time	Variable	Variable	Variable	Variable	Variable	Variable
Cooperative Sensing Capability	Yes	Yes	No	Yes	No	No
Feature Detection Capability	No	No	Yes	No	No	No
Control Channel	No	Yes	No	No	No	No
Channel Lock-Out Capability	Yes	Yes	Yes	Yes	Yes	Yes
Channel Clearance Time	Variable	Variable	Variable	Variable	Variable	Variable
Channel Re-Visit Time	Variable	Variable	Variable	Variable	Variable	Variable
Automatic Transmit Disable Capability	Yes	Yes	Yes	Yes	Yes	Yes

Overview of Phase I Testing



Summary

- The test plan for Phase I of the Test-Bed Pilot Program has been completed.

- Testing of the first DSA device at the NTIA Institute for Telecommunication Sciences Laboratory in Boulder Colorado has been completed and a report of the results is being prepared.

- Testing is underway for the second DSA device.

- Test plan for Phase II/III testing is being prepared

- Information on the Test-Bed Pilot Program is available at:

http://www.ntia.doc.gov/ntiahome/frnotices/2006/spectrumshare/comments.htm