

NSF Workshop on Spectrum Measurement Infrastructure

Meeting Objectives &
Spectrum Measurement Requirements Survey

(Available on http://www.cs.albany.edu/~mariya/nsf_smsmw/)

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Meeting Objectives

- ❑ Great interest in spectrum utilization and efficiency
 - ❑ Spectrum Sharing and beyond
- ❑ Initial efforts towards large-scale measurements
- ❑ Measurements need to support multiple objectives
 - ❑ But, cost has to be affordable
- ❑ Design space is not well explored
- ❑ Goal of this workshop – take the first steps
- ❑ Explore Infrastructure options in RF, data, analytics
 - ❑ Not an exploration of policy
- ❑ Post Workshop:
 - ❑ Meeting Report
 - ❑ Guide research investments and policy decisions

Spectrum Measurement Requirements Survey Outcomes

- ❑ Application Area, Deployment Area, Types of Signals to be Measured, Measurement System Capabilities and Features, System Costs
 - ❑ Thanks to Mark McHenry (Shared Spectrum Inc)
 - ❑ Around 40 responses from attendees

- ❑ Survey Aggregate Responses will be posted on website

- ❑ Will also be incorporated in workshop report
 - ❑ Please complete the survey, if you have not done so.

Application Area

- ❑ Agreement that measurement systems should help:
 - ❑ Process of validating analytical methods and assumptions
 - ❑ Entrants and incumbents of availability to make real-time decisions
 - ❑ The enforcement process in case of unauthorized use
 - ❑ Perform many functions simultaneously

- ❑ Mild support for:
 - ❑ Identification of anomalous propagation loss phenomena

Deployment Area

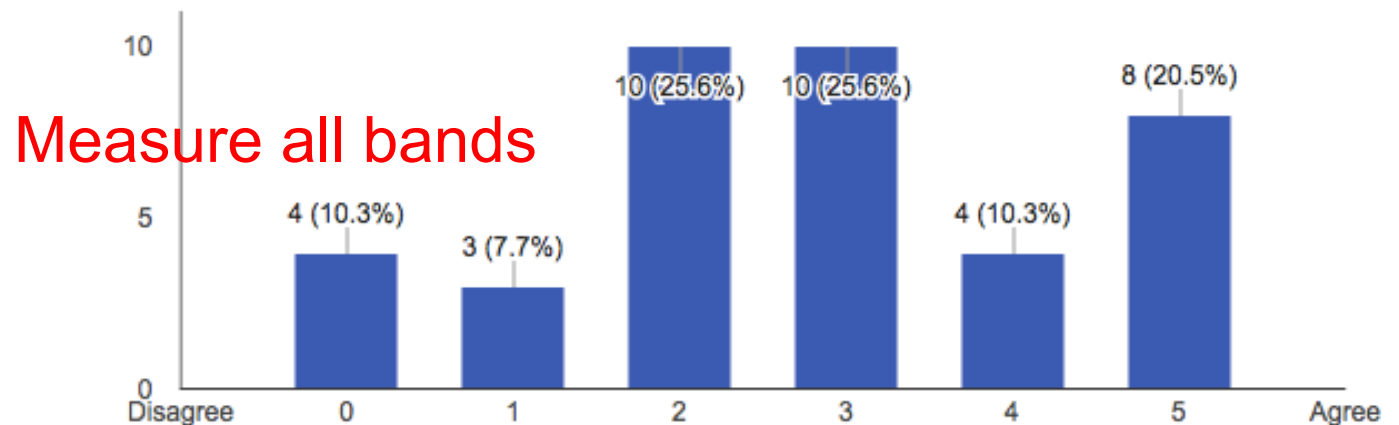
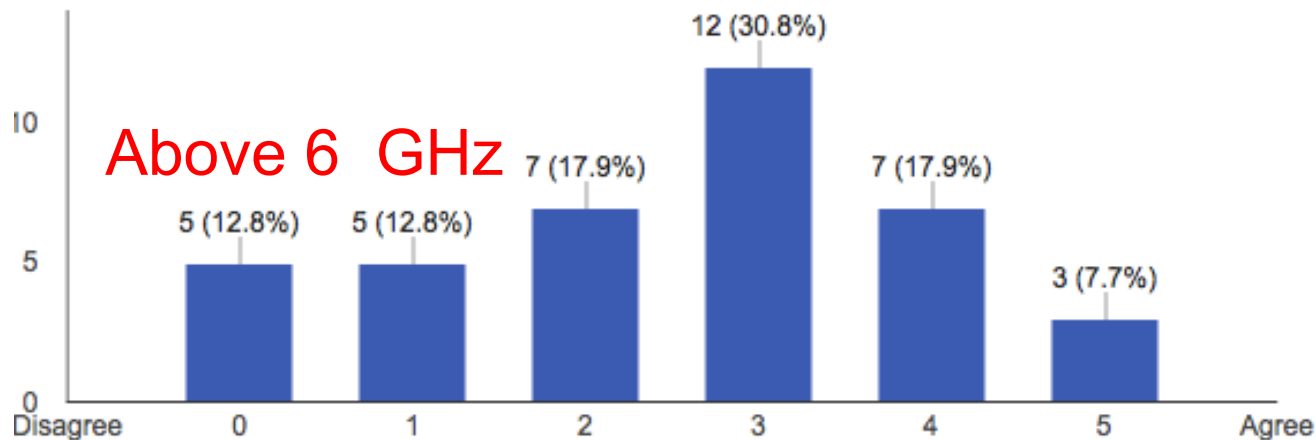
- Mixed opinions on rural coverage
 - Not strong disagreement
- More support for urban coverage
- Everyone agrees on the need for near continuous spatial coverage

Types of Signals to be Measured (1)

- ❑ Strong support for measuring ground mobile and fixed terrestrial transmitters
- ❑ Not much support for airborne transmitter measurements
- ❑ Mild-to-strong support for intermittent transmitters or those with directional antennas
 - ❑ Perhaps reflecting the challenges involved?
- ❑ Very mild support for measurement of spurious emissions and unintended signals

Types of Signals to be Measured (2)

- ❑ Strong support for measuring bands from 100 MHz to 6 GHz
- ❑ Mixed-to-little support for higher bands



Measurement System Capability & Features

Agreement on

- Need not be time-synchronized as long as alignment is post-facto
- Ability to determine emission type of signals
- Localization with 100 meter accuracy
- Localization accuracy should depend on signal being measured
- Need to have high dynamic range in measurement system
- Need to react to events within seconds (e.g. 30 seconds)
- Ability to provide log files, I/Q history and detailed reports

No agreement on

- Calibration levels
- Need to have tight time synchronization goals across units
- Low/high localization accuracies (10 meters, 1 km, 10km)
- Limiting I/Q data collection (for privacy)

Moderate support for high detection sensitivity

System Costs



- ❑ Key issue for a city-scale infrastructure
 - ❑ \$1 M to install and \$0.5M per year to operate
 - ❑ \$10 M to install and \$1 M per year to operate
 - ❑ Less than \$1M to install and \$250 K per year to operate
- ❑ No agreement
 - ❑ Reflects more of the uncertain nature of architecture
 - ❑ Let's work on this, so we can get better at figuring out the cost



THANK YOU