

TEM Consulting, LP

Conformity Assessment of Policy-Based Adaptive Radio Systems

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Purpose of Presentation

This presentation discusses the elements common to conformity assessment systems.

It further explores the structures that will be necessary for Policy Based Adaptive Radio Systems to be deployed

Certification of a product is a means of providing assurance that it complies with specified standards and other normative documents.

Several types of certification systems exist:

- Some comprise type testing only***
- Other systems include initial testing and field surveillance***
- Still others include initial testing of a product and assessment of its suppliers' quality systems, followed by routine audits that take into account the factory quality system and the testing of samples from the factory and the open market.***

Key Issues for Certification System

- *What is a minimal acceptable system?*
- *Are the testing lab/testers/lab assessors qualified?*
- *Will the vendor deliver units within manufacturing tolerances to those tested?*
- *How will the election officials know if non-compliant units are delivered and what corrective actions can it take?*
- *Will election officials and poll workers use the systems as intended?*

Public Interest vs Performance

- *A significant trend among regulators is to confine regulations to the minimum required to protect the public interest?*
- *Do No Harm – Regulators may stop after they have satisfactory assurance that a system will do no harm?*
- *Purchasers and network authorities will want assurance of performance, reliability and operational stability?*
- *Conclusion – It is likely that separate specification sets will be required to serve the differing purposes of the regulators and the network authority. Each specification set will require a test suite used to validate compliance.*

Probabilistic Characteristic of PBAR Systems

- *Adaptability means that potentially a large number of test scenarios must be tested.*
- *PBAR are envision as allowing independent combination of hardware, software and policies.*
- *Conclusion – Final result of verification will be probabilistic not deterministic*

Matrix Reduction

- *Adaptability means that potentially a large number of test scenarios must be tested.*
- *Conclusion – To achieve acceptable test time and effort a carefully selected sparse matrix will be necessary.*
- *Therefore a method for selecting the sparse matrix will be necessary.*

Probabilistic Characteristic of PBAR Systems

- *PBAR are envision as allowing independent combination of hardware, software and policies.*
- *Conclusion – To allow arbitrary combination of hardware, software and policies the conformity assessment system must provide adequate assurance that all combinations will remain compliant.*

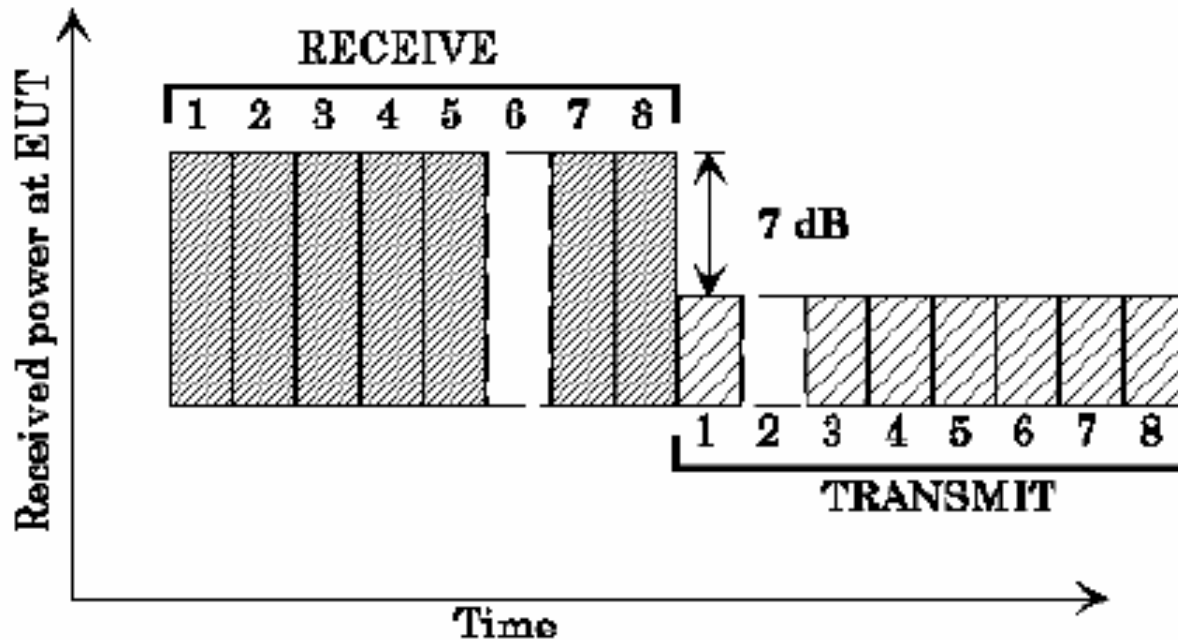
Characteristics of CAS for PBAR Systems

- **Abstracted Evaluation**
- **Diverse Spectral Presentations**
- **Multiple Variables**
- **Statistical Results**
- **Repeatability and Uncertainty**

Physical Testing of PBAR Systems

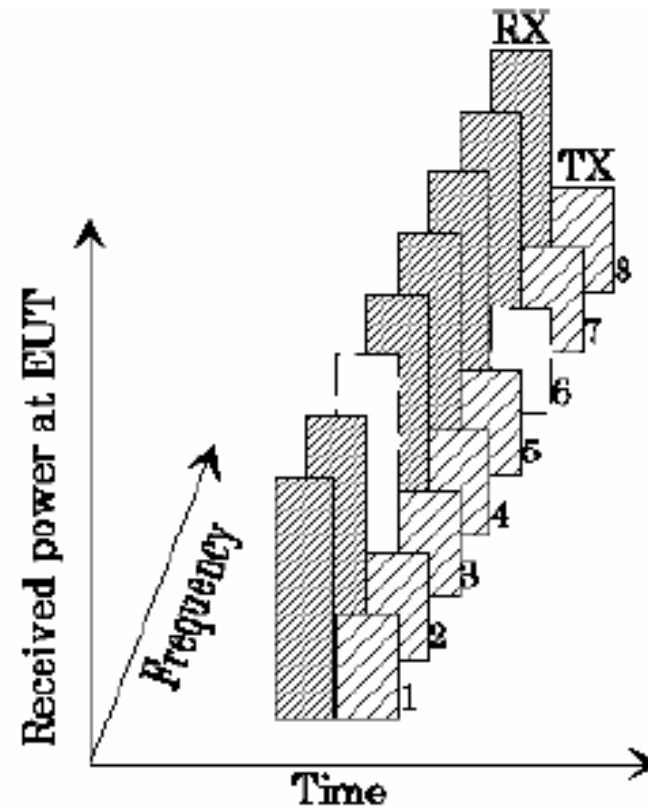
- **Conducted Testing**
- **Radiated Test Environments**
 - **GTEM**
 - **Reverberation Chamber**
 - *Field Tests*

TDMA w/ TDD Testing



**(a) Time Division Multiple Access (TDMA)
with Time Division Duplexing (TDD)**

FDMA w/ TDD Testing



**(b) Frequency Division
Multiple Access (FDMA)
with TDD**

Evaluation Regiment

- **PBAR systems *may* be best evaluated using new test and old tools in new configurations.**
- **Physical Testing**
conducted and over the air
- **Software Testing**
IEEE 1900.3
- **Modeling & simulation**
Physical testing might validate a model and simulation used to test the model against many scenarios

Conclusion

- **There is a need for specifications to support regulatory and operations / performance of PBAR systems**
- **Validation methodology is needed to provide high confidence of specification compliance**
- **Regulators and other authorities must be increasingly accepting of the probabilistic nature of conformance.**

Currently a lot of organizations are working on different aspects of next generation radio and spectrum management.

It is difficult to keep track and undoubtedly some efforts are duplicative or even in opposition.

