

Marcus Spectrum Solutions



# Enforcement in the Digital Age

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The views in this presentation are those of the speaker only  
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# Background

- Responsible for key unlicensed decisions:



1985 ISM Band Decision  
(Wi-Fi, Bluetooth, etc).



1995 60 GHz Decision

- Spent 7 interim years as Associate Chief, FOB (EB predecessor) working on technical enforcement issues





# Why should ACIL members care?

- A fair, effective and growing wireless market is good for *all* industry players
- It is likely that some manufacturers and importers are avoiding testing now required
- New types of testing are needed to address new problems
- Improved compliance helps ACIL members and their legitimate clients!



# Key Issues

- **Compliance** is the real goal, but **enforcement** is usually a key step in gaining compliance
- Technology moves at “internet speed”, governments move at “government speed”

**IS >> GS**

- FCC is a “multicommodity firm”
  - Spectrum “product line” is the corporate stepchild and is not well understood by high officials
  - Leaders generally fear policy initiatives unless there is clear support from regulatees
  - “Squeaky wheel gets the grease”
    - ACIL should make itself heard on these issues!





# Compliance and Enforcement

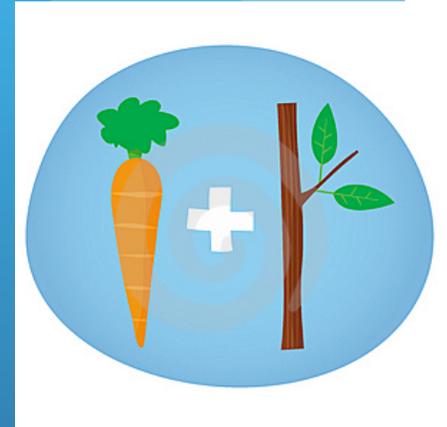
- Are a key part of spectrum policy and essential to effective spectrum use
- *BUT* have little natural constituency because subjects of enforcement are usually unhappy
  - It is easier to get resources for authorizing new services than enforcing existing rules
- 1993 downsizing of FOB and creation of EB has created morale *and* leadership problem that lingers in technical enforcement





# Compliance and Enforcement

- **Effective compliance is the goal,**
- Enforcement is a necessary tool
  - But both carrots and sticks are needed
- How much effort is FCC spending to engage manufacturers, distributors, and retailers in their responsibilities and liabilities for equipment marketing?
  - It appears no one from EB or OET attended recent CES even though there were resources for 8<sup>th</sup> Floor





# A Practical Example of (Non)Enforcement



- During the UWB deliberations a decade ago, I wondered how UWB emissions compared to actual PC emissions in the frequency domain
- I called FCC Lab and ask for data from recent tests and from spot checks of PC DoC data. I learned:
  - There had been no FCC tests of PCs in several years
  - There had been no requests to PC manufacturers for data since PCs moved to DoC
  - FCC staff had no idea what models were on the market
  - FCC staff had no precedent for letter to request data
- How much has changed in 10 years?



# Updates Needed to Make Enforcement Credible

- Emerging interference trends tracking & action
- Receivers > 960 MHz
- Control “lab queens” by requiring FCC direct access to inventory or products in retail locations
- Credible sampling of production equipment
- All labeling must clearly identify responsible party who has test documentation and spots checks must be made regularly
- Create options for ACLR-like demonstration of OOB compliance



# Compliant Emerging Interference Sources Also Need Timely Attention

- FCC dragged feet for over 10 years on VSAT interference from compliant radar detectors
- FCC inaction, coupled with odd CTIA strategy, has delayed for over 5 years rule fix to prevent cellular phone interference from *some* models of compliant bidirectional amplifiers





# Tracking Emerging Interference Issues

- FCC should produce a regular report on emerging interference issues that is not colored by policy viewpoints
  - What are the actual trends in new interference sources?
  - Are they from sources currently legal or from noncompliance?
- For example, there are indications that presently unregulated active TV antennas are both a recurring interference sources *and* are much more common than a decade ago

RCA ANT1650R Flat Digital Amplified Indoor TV Antenna



<http://www.shakespeare-marine.com/antennas/safetyalert-tvantennas.asp>

<http://www.uscg.mil/auxiliary/publications/alcoast/alcoast-298-03.asp>

[http://www.broadcastingcable.com/blog/BC\\_DC\\_Eggerton\\_on\\_Washington/32627First\\_Person\\_FCC.php](http://www.broadcastingcable.com/blog/BC_DC_Eggerton_on_Washington/32627First_Person_FCC.php)



# U-NII/TDWR Interference Lessons Learned?



## Subpart E—Unlicensed National Information Infrastructure Devices

### § 15.401 Scope.

This subpart sets out the regulations for unlicensed National Information Infrastructure (U-NII) devices operating in the 5.15–5.35 GHz, 5.47–5.725 GHz and 5.725–5.825 GHz bands.

[69 FR 2686, Jan. 20, 2004]

- Even though NTIA dictated terms of U-NII DFS rules, FAA TDWR have experienced interference
- Possibly 3 types of problems:
  - Compliant devices in unexpected high locations
  - Noncompliant devices
  - Compliant devices with unauthorized software changes
- Serious transparency problem with respect to lessons learned possibly due to NTIA & IRAC “CYA”
- FCC using nonrulemaking approach at present to contain problem:
  - <http://fjallfoss.fcc.gov/kdb/GetAttachment.html?id=33781>
  - <http://www.wispa.org/?p=2743>



# SDR Rules & Compliance

- When SDR rules were adopted in Docket 00-47, large companies that were SDR advocates strongly fought provisions that would control loading of unauthorized software into SDR hardware
  - SDR advocates felt only large, reputable companies would even make SDR systems so why should they be burdened?
  - Incumbent spectrum licensees/users did not counter SDR advocates on this issue
- But same **rules** apply to both reputable firms and questionable offshore operations!
- Lack of effective SDR safeguards a real threat in the case of **both** licensed and unlicensed systems



# SDR Software Regulation

- But in Docket 03-108 the SDR rules adopted in Docket 00-47 were watered down at the request of large US manufacturers
- In particular the former 2.932(e) was deleted
  - (e) Manufacturers must take steps to ensure that only software that has been approved with a software defined radio can be loaded into such a radio. The software must not allow the user to operate the transmitter with frequencies, output power, modulation types or other parameters outside of those that were approved. Manufacturers may use authentication codes or any other means to meet these requirements, and must describe the methods in their application for equipment authorization.
- *If the radio is not marketed as an SDR, then there is no need for a security showing!*
- Motorola said "trust us" and then turned around and violated that trust! [http://www.marcus-spectrum.com/Blog/files/U-NII\\_TDRW.html](http://www.marcus-spectrum.com/Blog/files/U-NII_TDRW.html)



# Expand Receiver Emission Regulation [§15.101(b)]

- **Not** to expand scope of government, but to recognize that present 960 MHz limits dates from days when there was no consumer equipment above 960 MHz!  
Assumption was that equipment > 960 MHz was professional equipment made by legitimate main stream manufacturers
  - Lots of people make equipment >960 MHz today and much of it is sold to consumers through mass market retailers
  - Was the root cause of radar detector/VSAT problem, yet FCC used only “bandaid solution”!



PREDICTION: There will be more cases of interference from receivers emissions!



# Control “lab queens”:

Require FCC direct access to inventory or products in retail locations

- While FCC can request samples of production equipment, this often leads to “lab queens”
  - Sometimes equipment at tail of distribution
  - Sometimes modified production equipment
- Criminalize submission of modified equipment and prosecute violators
- Require grantees to supply coupons for retail purchase upon request by FCC
  - Grantee must compensate dealer
  - FCC returns tested device to grantee
  - FCC must recognize reasonable production variability





# Market Surveillance

5/04

- As FCC decreased role in equipment authorization to accommodate increasing load and maintain speed, it promised to divert resources to market surveillance
- Questionable if this has happened
- Main surveillance is ill defined requirement for TCBs

## Modernizing FCC Technical Capabilities

Anechoic Chamber



State-of-the-Art Test Facility



*How much is this facility used for market surveillance?*



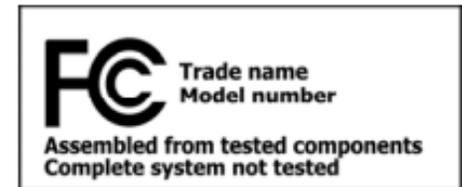
# TCBs and Market Surveillance: A Naïve Approach Adopted Out of Desperation

- Ref:
  - §2.962(g)(2) – Very vague
  - KDB Publication No. 628591  
(<https://apps.fcc.gov/kdb/GetAttachment.html?id=34756>)
  
- Problems of TCB-based surveillance
  - Basic conflict of interest
  - Sampling rate 5%
  - Samples not required to be purchased on open market – “lab queen”
  - Should ACIL propose more realistic processes?



# Labeling & Compliance

- Today's labels for Verified and DOC equipment do not always give adequate information to show who is the responsible party/importer or manufacturer so it is credible that FCC can request data
- ***For practical compliance, enforcement must be credible***



**Part 15 Declaration of Conformity (DoC) Label Examples**

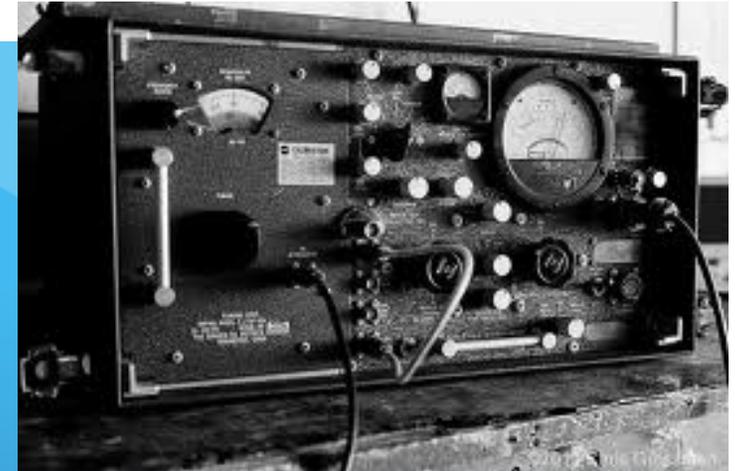
**§ 2.954 Identification.**

Devices subject only to verification shall be uniquely identified by the person responsible for marketing or importing the equipment within the United States. However, the identification shall not be of a format which could be confused with the FCC Identifier required on certified, notified or type accepted equipment. The importer or manufacturer shall maintain adequate identification records to facilitate positive identification for each verified device.

[62 FR 10472, Mar. 7, 1997]



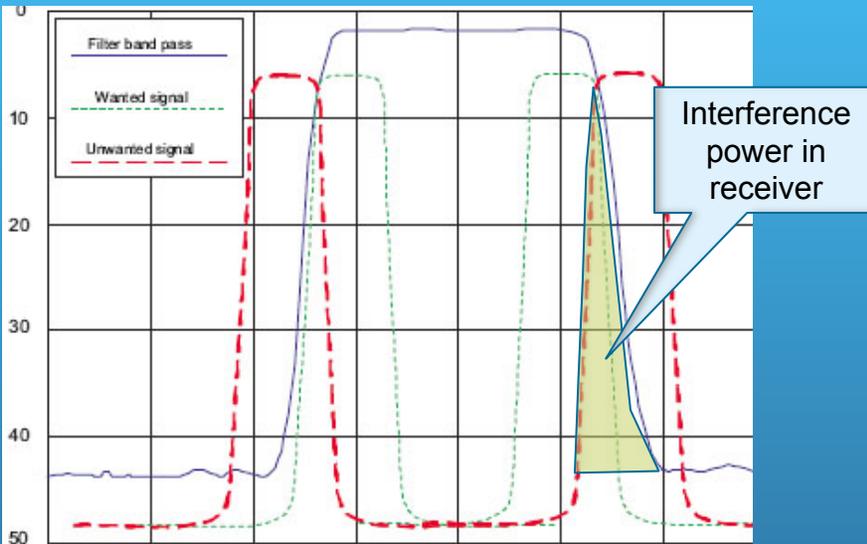
# ACLR-like Measurements



- We used to measure emissions with a Stoddert/Singer Noise Meter
- FCC focus on emission masks let's new spectrum analyzers emulate this old equipment
- In past ACIL has pressured FCC to minimize new lab equipment investment by focusing on traditional measurements
- Emission masks are not a complete model of interference and limit options to avoid interference in today's crowded and rapidly evolving spectrum



# ACLR-like Measurements



- If we make an assumption about the bandpass of the “victim” receiver, we can measure the OOB that results in interference
- This gives more flexibility for the new entrant than spectrum mask limitations
- FCC is reluctant to make such a radical change in part because of concerns that ACIL members might be too conservative
- But technical innovation helps everyone in wireless!



# Lighting Candles to a Better Compliance Approach



- ACIL & incumbent spectrum users need to work together to advocate an effective compliance/enforcement program at FCC
  - Recommend major trade groups form a compliance/enforcement advocacy consortium
- Enforcement must be credible and needs a proactive component
  - Current system almost entirely responsive to complaints
  - Current production sampling is unrealistic
- Emerging interference sources are inevitable and need attention!
- Engage retailers and distributors on need for compliance and their responsibilities/liabilities
- Tighten SDR rules for accountability of software for *all* SDRs



**Thanks for the Invitation!**

**Questions???**

Check out my blog for updates:



<http://www.marcus-spectrum.com/Blog/Blog.html>