

THIS IS NOT YOUR FATHER'S FCC

**Ed Thomas, Chief
Office of Engineering & Technology**





How are Things Different?

- ★ **Regulation as the last resort**
- ★ **Flexible use of spectrum**
- ★ **Enabling versus controlling**



How are Things Different?

- ★ **Free market forces viewed as the differentiator not regulation**
- ★ **Caution important, but so is speed of action**
- ★ **Skilled Staff, Skilled Staff, Skilled Staff**



Spectrum Policy

Challenges:

- ★ **Expand Useable Spectrum and Spectrum Availability**
- ★ **Enable Technology Experimentation**
- ★ **Encourage Spectrum Efficient Technologies**
- ★ **Protect Incumbents Against “*Unacceptable*” interference**
- ★ **Ensure Public Safety Needs are Safeguarded**



Spectrum Policy

Problems with Current Spectrum Policy:

- ★ Demand exceeds supply with present procedures
- ★ Present procedures do not keep pace with technological advances
- ★ Command and control does not work well
- ★ Incentives for spectrum efficiency are overlooked



Spectrum Policy

FCC Spectrum Policy Task Force Formed

- ★ **Lead by Office of Engineering & Technology**
- ★ **Dr. Paul Kolodzy will Chair**
- ★ **Inter-agency representation**



Spectrum Policy

Sample Issues Before the Task Force:

- ★ **Should there be different policies above and below 4 GHz given congestion levels?**
- ★ **What rights do present/future incumbents have for protection against interference protection?**
- ★ **What obligations do incumbents have, if any, for system design to facilitate spectrum efficiency?**
- ★ **What policies, if any, should be adopted to insure spectrum efficiency?**



Spectrum Policy

Specific Spectrum Issues Currently Being Addressed:

- ★ **Advanced Wireless (3G) Communications**
- ★ **Ultra-Wideband (UWB) Technology**
- ★ **Software-Defined Radios**



Advanced Wireless Communications

- ★ **Next Generation Mobile Operations**
- ★ **Wireless Internet/Broadband Applications**
 - **Data Rates from 144 kbps to 384 kbps**
- ★ **World-wide Compatibility/Roaming**
 - **IMT-2000, CDMA-2000, UWC-136**
 - **GPRS/EDGE, W-CDMA**



Advanced Wireless Communications

Spectrum Availability

- ★ **90 MHz Identified for 3G**

 - 1710-1755 MHz & 2110-2150 MHz & 2160-2165 MHz

 - Industry Argues for Additional Spectrum

- ★ **FCC & NTIA Currently Studying Additional Spectrum for 3G**



Advanced Wireless Communications

Summary of US 3G Landscape:

- ★ **Several candidate spectrum bands identified for advanced wireless services**
- ★ **FCC rules permit first and second generation systems to migrate to 3G services**
- ★ **U.S. wireless industry continued interest in additional spectrum at 1.7 GHz currently allocated to military**
- ★ **Final spectrum decision expected end of 2002**
 - **Some policy/technical issues remaining**



Ultra-Wideband (UWB)

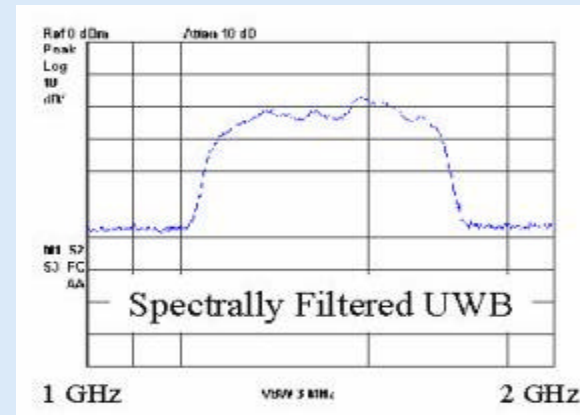
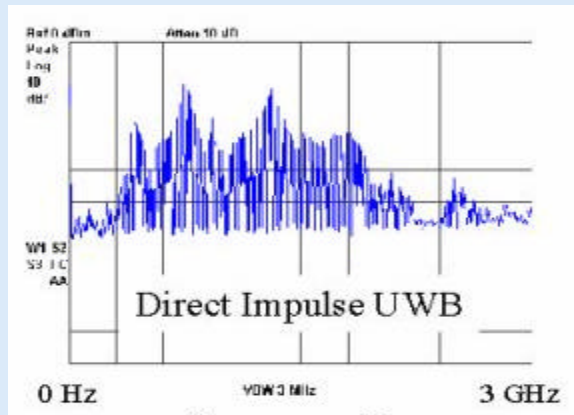
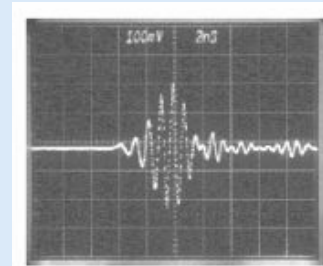
First R&O Adopted February 14, 2002

- ★ **Conservative “First-step”**
- ★ **Enables the introduction of UWB technology**
 - Provides numerous benefits to the public
 - Maintain U.S. technical leadership
- ★ **Ensures protection against harmful interference**
 - GPS/E-911
 - “Restricted Bands”
- ★ **6-12 month review**



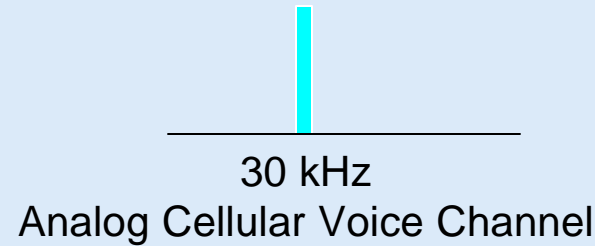
Ultra-Wideband (UWB)

UWB devices can have
“GHz” Bandwidths

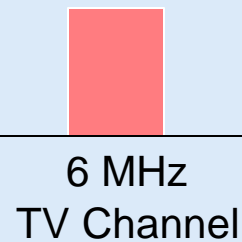




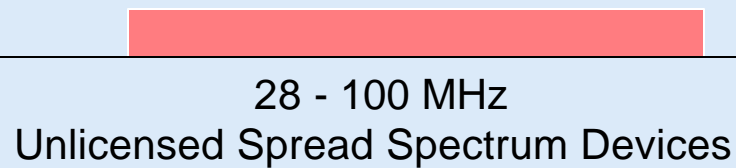
Ultra-Wideband (UWB)



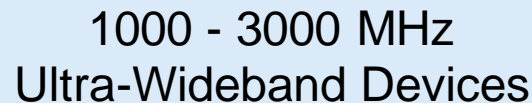
30 kHz
Analog Cellular Voice Channel

The diagram shows a vertical cyan bar representing a 30 kHz channel, positioned above a horizontal line.

6 MHz
TV Channel

The diagram shows a vertical red bar representing a 6 MHz channel, positioned above a horizontal line.

28 - 100 MHz
Unlicensed Spread Spectrum Devices

The diagram shows a horizontal red bar representing a 28 - 100 MHz channel, positioned above a horizontal line.

1000 - 3000 MHz
Ultra-Wideband Devices

The diagram shows a long horizontal red bar representing a 1000 - 3000 MHz channel, positioned above a horizontal line.



Ultra-Wideband (UWB)

Potential UWB Applications

1. **Ground Penetrating Radars**
2. **Through-the-Wall Imaging Systems**
3. **Vehicular Radar Systems**
4. **Peer-to-Peer Communication Systems***

* **Commercially difficult under present rules.**



Software Defined Radios (SDR)

- ★ **Functions previously performed in hardware, such as, generation of transmitted radio signal, are performed in software**
- ★ **SDR can be programmed to operate on or with any frequency, any bandwidth, any modulation or transmission format**



Software Defined Radios (SDR)

- ★ **DoD's "SPEAKeasy" Project**
 - **Faster Digital Signal Processors (DSPs) and A/D conversion allow modulation and other radio characteristics to be software controlled**

- ★ **SDR Forum**
 - **Formerly Modular Multifunction Information Transfer System (MMITS) Forum**
 - **Over 50 US and foreign companies**

- ★ **FCC's Technology Advisory Council**



Software Defined Radios (SDR)

FCC Equipment Authorization

- ★ **Traditional Approach**

- **Technical characteristics defined by hardware.**
- **Any change requires new authorization.**

- ★ **SDR**

- **Challenge: Balance interference control objectives with SDR flexibility**



Software Defined Radios (SDR)

New flexible FCC equipment authorization rules for software-defined or “smart” radios permitted by the FCC under certain conditions:

- ★ **Radio must meet authentication/security requirements for re-programming**
- ★ **Proposed software changes must be authorized by original equipment grantee who is responsible for compliance**
- ★ **Each hardware/software combination that can impact the frequency, modulation, or power must be tested**



Software Defined Radios (SDR)

Benefits of SDR:

- ★ **Facilitate interoperability**
- ★ **Spectrum Efficiency**
- ★ **Support Secondary Markets**



Relationship Building

Network Reliability & Interoperability Council (NRIC)

- ★ **Chaired by Joe Nacchio, CEO of Qwest**
- ★ **Comprised of about 50 CEO/CTO industry representatives**
- ★ **Focus Areas**
 - **Homeland Security**
 - **Network Reliability**
 - **Network Interoperability**
 - **Broadband Deployment**
 - **Best Practices**



Relationship Building

Technology Advisory Council (TAC)

- ★ **Chaired by Dr. Bob Lucky**
- ★ **Comprised of about 30 Senior Technology Experts from Industry**
- ★ **Focus Areas:**
 - **Spectrum Management**
 - **Optical Networking**
 - **Access to Telecommunications for the Disabled**
 - **Consumer and Home Networking**
 - **Network Security**



Relationship Building

Government

- ★ **DOC/NTIA**
- ★ **DOD**
- ★ **FAA**
- ★ **FBI**
- ★ **ETC**



Excellence in Engineering

Enhance Technology Fluency

★ Technical Staffing

- Recruit and train entry level engineers
- Continuing education for mid-level engineers
- Hire new senior industry experts

★ Continue to Provide Training



Excellence in Engineering

Technical Staffing

- ★ **Increased Engineering Staff by 10%**
- ★ **Enhanced OET's networking expertise**
 - **Doubled the size of Network Technology Division**
- ★ **Hired 3 very senior industry experts**
 - **More to come!**



Excellence in Engineering

Training [FCC University]

- ★ **Tutorials conducted by outside industry experts**
- ★ **Courses for technical staff that address communications issues relevant to current work underway at the FCC**
- ★ **Courses for non-technical staff to provide knowledge of basic concepts underlying the technical matters**
- ★ **Advanced Engineering Course Work at Universities**
- ★ **Web-based training**
- ★ **Attendance at Technical Conferences Encouraged**
- ★ **Development of a technical reference library**



Conclusion

Question Time