



Building the U.S. Economy

Spectrum for Advanced Mobile Services





Fundamental Principles for Allocating Spectrum for Advanced Mobile Services

- **Sufficient contiguous spectrum must be allocated.**
 - An additional 200 MHz (beyond existing Cellular, PCS, and SMR spectrum) will be needed by 2010.
- **Spectrum should be harmonized.**
 - WRC-2000 identified 1710-1850 and 2500-2690 MHz.
- **Spectrum should be made available in time to meet market needs.**
- **Access to spectrum must be unencumbered.**

DoD/NTIA Spectrum Study



- **March 2001 Report assessed availability of 1710-1850 MHz.**
 - 1710-1755 MHz: Available in 2004. Study addressed moving grandfathered systems out of band, and clearing protected sites.
 - 1755-1850 MHz: Evaluated several band segmentation options, including moving DoD out of entire band.
- **Current effort focuses 1710-1770 MHz / 2110-2170 MHz.**
 - Consistent with out-of-band option identified in March 2001 Report.
 - Dramatically simplifies interference situation with Federal systems.
 - Satisfies industry short-term needs, but not all spectrum requirements through 2010.



DoD Systems

- Satellite
- Conventional Fixed Microwave
- Air Combat Training
- Tactical Radio Relay
- Land Warrior
- Combat Identification for the Dismounted Soldier
- Precision Guided Munitions



Satellite Control Stations

- **System Description: Uplink for Tracking Telemetry & Control (TT&C)**
 - Primarily launch, early operation & anomaly resolution.
 - Operates at 1761-1842 MHz.
- **Issues with Full-Band Use (1710-1850 MHz)**
 - Potential Interference from IMT-2000 (base and mobile) into satellite receivers and from satellite earth stations into IMT-2000 receivers.
 - Could require relocation of approximately 10 earth stations to remote areas to promote near-term sharing and eventual relocation of all satellite systems to alternate spectrum.



Satellite Control Stations – cont.

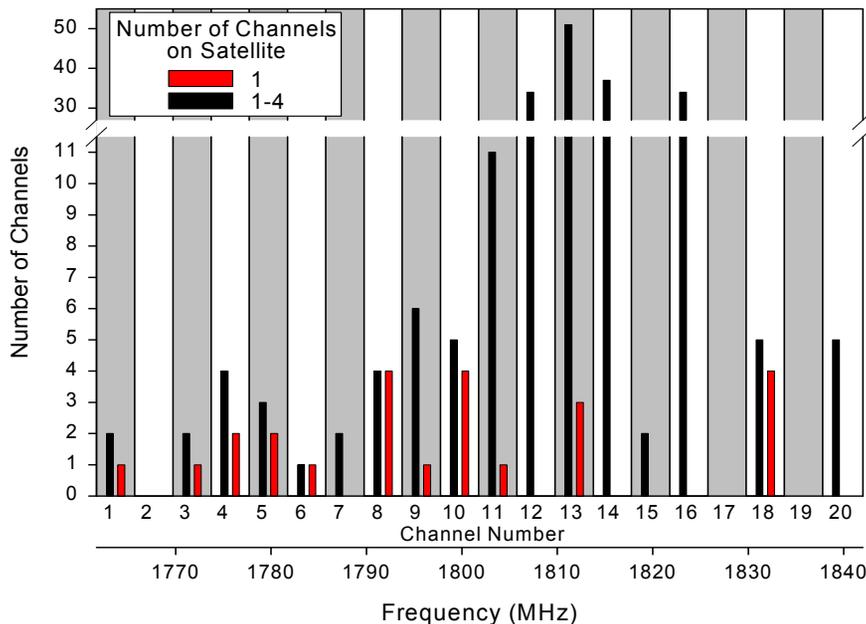
- **Issues with NTIA Plan (1710-1770/2110-2170 MHz)**
 - No harmful interference to satellites.
 - IMT 2000 base stations operate out-of-band.
 - No unacceptable interference into satellites from mobiles.
 - Potential interference from satellite earth stations into IMT-2000 base stations
 - Any such interference can be effectively managed due to low number of satellites operating at 1755-1770 MHz (see next slide).

Satellite Control Stations - cont.



Interference From Satellite Earth Stations Into IMT-2000 Base Stations Can Be Managed

- Bands under study overlap with only three satellite channels.



- Only a small number of NGSO satellites operate on these channels.
- Only a small number of satellite earth stations affected.
- TT&C requirements are limited
- Relevant satellites are aging.
- Relevant satellites can be controlled from multiple locations.
- Some satellites show availability of alternate control channels.



Satellite Control Stations – cont.

Solution: Interference into commercial mobile systems can be controlled to an acceptable level by straightforward mitigation and sharing, *e.g.*,

- Nature of TT&C use is sporadic, and for small number of satellites, thus potential for interference is limited.
- IMT-2000 base stations can be positioned and shielded to minimize interference.
- Filter emissions from adjacent channel satellite operations.
- Relevant satellites are aging and could potentially be replaced in another band by the time IMT 2000 systems are built out.

Conventional Fixed Microwave



- **System Description: Fixed Point-to-Point**
 - Similar to commercial pt-to-pt that were relocated as necessary to accommodate PCS.
 - Public safety fixed links and systems operated by the Federal Power Agencies in 1710-1755 MHz band are grandfathered.
- **Issues with Full-Band Use (1710-1850 MHz)**
 - March 2001 NTIA/DOD Report concluded that relocation of systems to Federal bands at 4 GHz and 7/8 GHz was feasible.

Conventional Fixed Microwave – cont.



- Issues with NTIA Plan (1710-1770/2110-2170 MHz)

- NTIA Plan – Interference Concerns
 - Some fixed systems would create interference and need to be relocated
 - Impact fewer systems than full band use
- Solution
 - Relocate to 4 and 7/8 GHz, including systems grandfathered under NTIA final report (OBRA '93)
 - Relocate systems only as necessary – some systems could share geographically

Air Combat Training Systems



- **System Description: Air Combat Maneuvering Instrumentation (ACMI) & Tactical Air Combat Training Systems (TACTS)**
 - Two channels aircraft-to-ground at 1778 and 1788 MHz
 - Two channels ground-to-aircraft at 1830 and 1840 MHz
- **Issues with Full-Band Use (1710-1850 MHz)**
 - Band sharing with current TACTS/ACMI not feasible
 - Requires upgrade to Joint Tactical Combat Training System (JTCTS) with frequencies limited to guard bands or relocated to alternate spectrum
- **Issues with NTIA Plan (1710-1770/2110-2170)**
 - No frequency overlap, so no interference potential
 - JTCTS upgrade could be in bands compatible with global training mission

Tactical Radio Relay



- **System Description: Tactical Radio Relay (TRR)**
 - Transportable fixed operation.
- **Issues with Full-Band Use (1710-1850 MHz)**
 - Potential interference from IMT-2000 (base and mobile) into TRR and from TRR into IMT-2000 receivers.
 - TRR requirements greatest in rural areas; commercial requirements greatest in urban areas.
 - Geographic sharing may be feasible solution.
 - Upgrades to next generation systems with greater frequency agility are planned.
 - Relocation to alternate spectrum may be feasible.

Tactical Radio Relay – cont.



- **Issues with NTIA Plan (1710-1770/2110-2170 MHz)**
 - NTIA Plan – Interference Concerns
 - Interference potential limited to IMT-2000 mobiles into TRR & TRR into IMT-2000 base receivers.
 - Solution
 - Significant band sharing potential through strategic placement of IMT-2000 base stations.
 - TRR requirements greatest in rural areas; commercial requirements greatest in urban areas.
 - Geographic sharing may be a feasible solution in many circumstances.
 - Shielding of IMT 2000 base stations could further minimize interference.
 - Relocation to alternate spectrum bands and migration to next generation systems can address remaining interference.



Land Warrior

- **System Description: Land Warrior**
 - Soldier-mounted WLAN enabling access to communication and information
 - 2.4 GHz spread-spectrum technology intended to be rebanded to operate in 1772-1822 MHz
- **Issues with Full-Band Use (1710-1850 MHz)**
 - Potential for interference in 1772-1822 MHz band.
 - Operate in the current 2.4 GHz unlicensed band as cost effective solution.
- **Issues with NTIA Plan (1710-1770/2110-2170 MHz)**
 - No frequency overlap, so no interference potential.
 - Operation at 2.4 GHz is still cost effective vs. rebanding.



Combat Identification for the Dismounted Soldier

- **System Description: CIDDS**
 - Developmental system that operates in 1772-1822 MHz band.
- **Issues with Full-Band Use (1710-1850 MHz)**
 - Potential for interference in 1772-1822 MHz band.
 - Would require relocation to 1435-1525 MHz.
- **Issues with NTIA Plan (1710-1770/2110-2170 MHz)**
 - No frequency overlap, so no interference potential.
 - Consider development in alternate bands consistent with global deployment.

Precision Guided Munitions



- **System Description: Precision Guided Munitions (PGM)**
 - Remotely-launched air-to-ground missiles
 - Operates in 1710-1850 MHz
- **Issues with Full-Band Use (1710-1850 MHz)**
 - Geographic sharing possible in short term.
 - DoD/Raytheon study indicates systems can be relocated to 7258-8400 MHz over the long term.
- **Issues with NTIA Plan (1710-1770/2110-2170 MHz)**
 - Geographic sharing possible in short term.
 - Relocate to 7258-8400 in accordance with DoD/Raytheon study. Would also prevent interference outside of U.S.

Industry Recommendations



- Reallocate 1710-1770 MHz now with availability in 2005 timeframe.
- Develop plan for relocating Federal systems, including currently grandfathered systems and systems in 16 protected sites, in a way that makes 1710-1770 MHz fully available for CMRS.
- Modify reimbursement provisions to fund relocations through auction process.
- Identify additional harmonized spectrum to make up for spectrum shortfall in 2010 timeframe, focusing on spectrum identified at WRCs for IMT 2000.
- Develop spectrum planning process to ensure future allocations meet the needs of commercial and Government users and are harmonized to the greatest extent possible.