Industry Roadmap to Assessing the 1755-1850 MHz Band

Objective:

Using input from the NTIA 1755-1850 MHz Band Feasibility Report, CSMAC Working Group (WG) effort, and the Industry-sponsored monitoring study, develop a plan that assesses the entire 1755-1850 MHz band in a manner that considers making the lower band available first, but also addresses the rest of the band up to 1850 MHz in order to meet federal agencies' concerns.[1] The plan takes into account the NTIA instructions given to the CSMAC WGs, which were to consider a plan that lowers the repurposing costs and/or improves or facilitates industry access while protecting federal operations from adverse impact.

Approach:

Through a combination of sharing, relocation and channel prioritization for the majority of operations in the 1755-1850 MHz band it appears feasible to provide industry early access to the 1755-1780 MHz portion of the band. In some cases, additional analysis may need to continue to further refine long-term arrangements for the entire 1755-1850 MHz band, including potential long-term sharing in the 1755-1850 MHz band and/or other frequency bands as appropriate. The additional analysis could not only further refine the static exclusion zone sizes as needed but also develop innovative spectrum sharing techniques that exploit the more dynamic nature of the use of the spectrum and the advanced features in the LTE standards that we have started to discuss in CSMAC WG-5 in particular.

The proposal presented below relocates a number of systems for which viable relocation spectrum has been identified. This includes Aeronautical Telemetry operations, which as noted in the DoD analysis included in the NTIA March 2012 report, alleviates spectrum crowding pressure on lower bands and provides channelization and prioritization of remaining systems in a way that facilitates the availability of the 1755-1780 MHz band. In some cases, such as SGLS, sharing is feasible with no modification to federal operations. In other cases some change in channel prioritization would be necessary to facilitate sharing, with federal assignments prioritizing selection of channels above 1780 MHz, but with continued access to spectrum at 1755-1780 MHz in a limited number of areas to support large scale training operations.

In addition, work on sharing or relocation options for systems in the 1780-1850 MHz band should continue, including exploration of advanced technology options or relocation bands. The approach should recognize the legitimate requirements of Government operations, including the need for systems to have long term access to the 1780-1850 MHz band if other spectrum is not available for relocating those systems.

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[1] See *NTIA Instructions to CSMAC Working Groups, July 28th 2012, and Framework for work within CSMAC* http://www.ntia.doc.gov/files/ntia/meetings/framework_for_work_within_csmac_20120525.pdf

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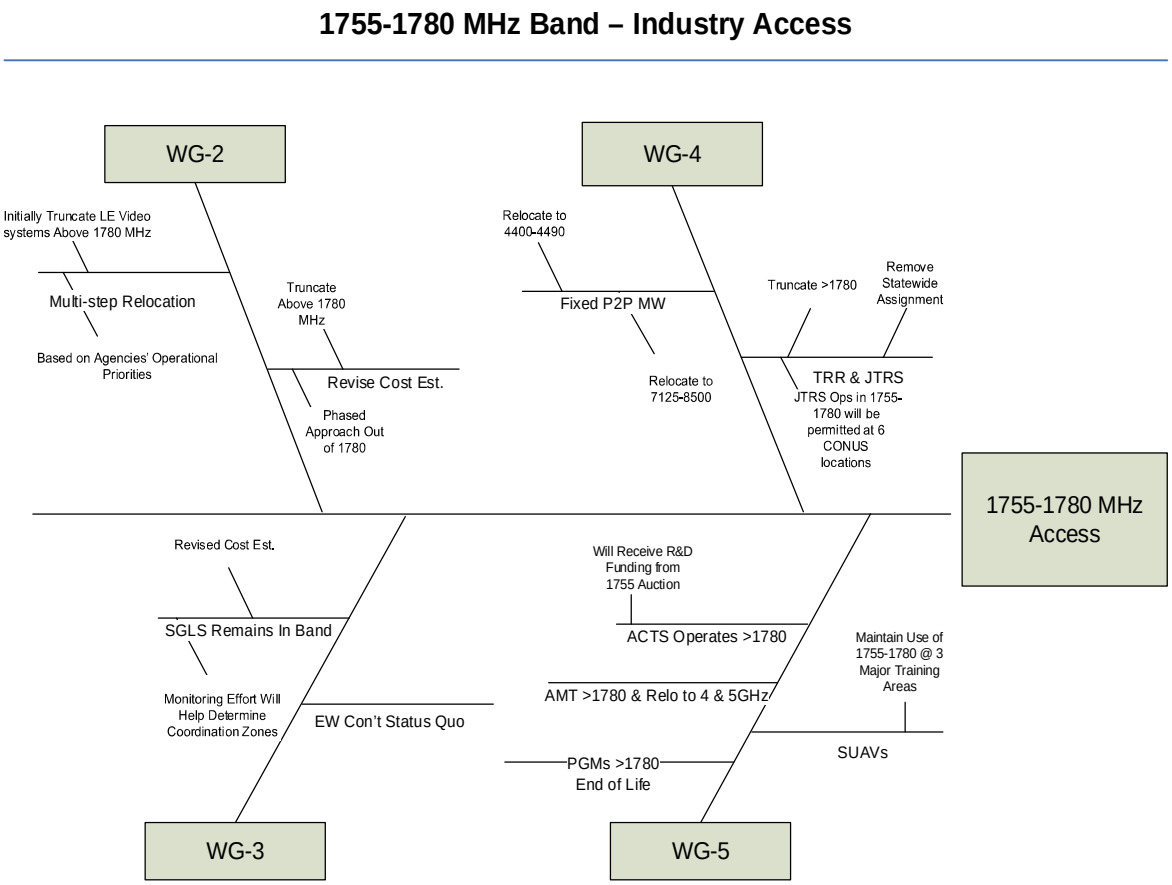
Proposal:



Working Group 2:

Law Enforcement Video Surveillance – Phased relocation based on WG report[2]

- Sharing not feasible.
- All agencies can vacate the 1755-1780 MHz band within five years.
- WG developed a prioritized list of Economic Areas (EAs) according to industry market priorities for the potential relocation of video surveillance systems, prioritize clearing the 1755-1780 MHz band and second, the 1780-1850 MHz band.
- Relocation priorities will be based on the federal agencies' operational requirements and may vary from the industry priority.
- Agencies working to revise cost estimates to relocate from the 1755-1780 MHz band within 5 years - expected to be revised downward.

[2] NTIA, CSMAC (2013, January). *Working Group 2: 1755-1850 MHz, Law enforcement surveillance, explosive ordnance disposal, and other short distance links*. Retrieved from http://www.ntia.doc.gov/files/ntia/publications/csmac_wg-2_final_report_jan-4-2012.pdf

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Working Group 3:

Space Ground Link Sub-system (SGLS) – remain in place and operate throughout the 1755-1850 MHz band – WG-3 Report[3]

- Interference from commercial mobile devices into satellite receivers shows that interference is acceptable.
- Based on current analysis there will be zones around the satellite earth terminals where interference into commercial base stations is above the acceptable levels.
- Mitigation methods can significantly reduce the zone of interference, both geographically and in time.

Electronic Warfare (EW) – Operate on a secondary, Non-Interfering Basis

- Continue status quo EW operations in the 1755-1850 MHz band.
- DoD requests a *more formalized coordination and EW operating procedure* that would permit EW testing and training in and around DOD ranges, and other approved operating areas when required.

Working Group 4:

Fixed Point-to-Point Microwave, Tactical Radio Relay (TRR), and Joint Tactical Radio System (JTRS)

Fixed Point-to-Point Microwave – relocate out of entire band

- All affected agencies selected either the 4400-4490 MHz band or the 7125-8500 MHz band for relocation of their fixed point-to-point microwave operations.[4]
- Most agencies, if not all, can relocate or truncate their systems within 5 years.
- Prioritization of markets will use the Top 100 MSAs, which was identified in WG-2, as a guide to relocate or truncate agency operations.

Tactical Radio Relay – relocate/truncate operations above 1780 MHz

- The DoD determined it can accommodate commercial broadband systems in the 1755-1780 MHz band within five years except for the Navy and Marine Corps, which will require exclusion zones at critical test and training locations.[5]

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[3] NTIA, CSMAC. (2013, February 11th). *CSMAC WG-3 – Status Report*. Retrieved from http://www.ntia.doc.gov/files/ntia/publications/csmac_wg3_status_report_14feb13_final.pdf

[4, 5] NTIA. (2012, March 27th). *An assessment of the viability of accommodating wireless broadband in the 1755-1850 MHz band*. Retrieved from http://www.ntia.doc.gov/files/ntia/publications/ntia_1755_1850_mhz_report_march2012.pdf

- Critical test and training locations, particularly around major metropolitan areas, may need to be relocated if determined coordination zones to be impractical.
- Rationalize all statewide assignments to their appropriate military training location.
- If comparable spectrum is required, relocate to 2200-2290 MHz.[6]

Joint Tactical Radio System (JTRS) – truncate operations above 1780 MHz

- Compression of operations into the 1780-1850 MHz band is technically feasible in low-density environments.
- Need to rationalize assignment data – currently operating on experimental assignments.
- All efforts will be made to prioritize operations in the 1780-1850 MHz portion of the band, in and around the 6 locations yet to be identified.

Working Group 5:

Aeronautical Telemetry Systems: Air Combat Training System (ACTS), Air Mobile Telemetry (AMT), Small Unmanned Aerial Vehicles (SUAVs), Precision Guided Munitions (PGMs)[7]

Air Combat Training System (ACTS) – truncate operations above 1780 MHz

- Truncation of operations is predicated on the prioritized relocation of the AMT system.
- Re-channelize operations above 1780 MHz while maintaining operational pairing requirements.[8]
- Transitional sharing will need to be coordinated (e.g., coordination zones, frequency assignments, etc.).
- Seek Spectrum Relocation Funding (SRF) for system R&D from proceeds from the 1755-1780 MHz auction to study multi-band or new technology redesign.

Air Mobile Telemetry (AMT) – relocate to 4400-4940 MHz or 5150-5250 MHz band[9] (5150-5250 is UNII-1 which is low power (50mW), indoor use only), or any other 5 GHz band that supports DFS capabilities

- DOD determined that it can relocate its aeronautical mobile telemetry systems within ten years and can accommodate commercial broadband systems in the 1755-1780 MHz band within five years, by continuing to use 1435-1525 MHz, 1780-1850 MHz, and 2200-2290 MHz bands.
- Transitional sharing - requires DOD continued access to and protection for test ranges served by the Western Area Frequency Coordinator (WAFC), the Atlantic Test Range at Naval Air Station (NAS) Patuxent River, and WSMR to allow continued use of the entire 1755-1850 MHz band until AMT systems can relocate to the 5150-5250 MHz band, or

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[6, 7, 9] NTIA. (2012, March 27th). *An assessment of the viability of accommodating wireless broadband in the 1755-1850 MHz band*. Retrieved from http://www.ntia.doc.gov/files/ntia/publications/ntia_1755_1850_mhz_report_march2012.pdf
[8] *See* findings from Comsearch & ITS Industry monitoring analyses at Eglin & Edwards AFBs.

other bands noted above. This will require further analysis of exclusion zone size and other techniques based off WG-5 deliberations.

- Determined that it can relocate the Standard Missile Kinetic Warhead Data Link capability from the 1755-1850 MHz band to the 1435-1525 MHz band in less than five years.[10]

Small Unmanned Aerial Vehicles (SUAVs) – truncate operations above 1780 MHz

- DOD determined that, as a transition to vacating SUAS and associated integrated capabilities out of the 1755-1850 MHz band within ten years, it can accommodate commercial broadband systems in the 1755-1780 MHz band within five years with exclusion zones for the entire 1755-1850 MHz band at three high-density training areas (Fort Irwin/NTC, Fort Polk/Joint Readiness Training Center (JRTC), and WSMR)[11]. This will require further analysis of exclusion zone size and other techniques based off WG-5 deliberations.
- Cost associated with the redesign and retuning of systems in the 1780-1850 MHz will come from any subsequent auction of that band.
- If comparable spectrum is required, move to 1435-1525 MHz or 2200-2290 MHz bands (with freed-up capacity in these bands from AMT relocation to 4 or 5 GHz).[12]

Precision Guided Munitions (PGMs) – truncate operations above 1780 MHz

- Navy can compress its operations into the 1780-1850 MHz band within five years.
- The Air Force does not need to take any action since the Air Force plans to cease operations of PGM systems that use the 1755-1850 MHz band within five years.

[10, 11] NTIA. (2012, March 27th). *An assessment of the viability of accommodating wireless broadband in the 1755-1850 MHz band*. Retrieved from http://www.ntia.doc.gov/files/ntia/publications/ntia_1755_1850_mhz_report_march2012.pdf

[12] NASA Response to NTIA re 1755-1850 MHz Comparable Bands, *Version 3c April 2011, Pg.13. See: http://www.ntia.doc.gov/files/ntia/publications/nasa_1.pdf*

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Cost to free-up the 1755-1780 MHz band:

Operation	**Estimated Cost ($M)**
Fixed Point-to-Point Microwave	186 (relocate – 4 & 7 GHz)[13]
Military Tactical Radio Relay	160 (relocate/truncate – remain in band at 6 CONUS locations) [14]
Air Combat Training System	*200 for R&D (Retunes above 1780)
Precision Guided Munitions	Retunes above 1780
Tracking, Telemetry, and Commanding	Remains in Band
Aeronautical Mobile Telemetry	3,140 (Relocate to 5 GHz)[15]
Video Surveillance	**1000 (est. needs revised)
Unmanned Aerial Systems	***Retunes above 1780 (Remain in band at select sites in CONUS – may require Comp Spectrum at 2200 MHz or 1435 MHz)
Other DOD Systems	Retunes above 1780 MHz
Total ($M)	**$4,686**

* Assumes moving AMT to 4 or 5 GHz will free-up capacity in the 1780-1850 MHz band thereby accommodating ACTS operations
**Expect DoJ and DHS cost estimates to be revised downward (approximately $1B?)
*** May require comparable spectrum for redesign – current cost estimate for the entire 1755-1850 MHz band is $1,511. NTIA report states that the relocation of SUAS can permit accommodation of commercial broadband systems in the 1755-1780 MHz band within ten years with continued access and protection for DOD in the entire band at three high-density training areas until it completes transition. DoD request comparable spectrum at 2025-2110 MHz; however, if AMT moves to 5 GHz the AMT system will gain an additional 75 megahertz of capacity, which would free –up assignments for SUAS and ACTS in the 1435-1525 MHz, 1780-1850 MHz and the 2200-2290 MHz bands, which is consistent with other aeronautical systems.

[13,14,15] NTIA. (2012, March 27th). *An assessment of the viability of accommodating wireless broadband in the 1755-1850 MHz band*. Retrieved from http://www.ntia.doc.gov/files/ntia/publications/ntia_1755_1850_mhz_report_march2012.pdf[13]