CSMAC
Search for 500 MHz Working Group

UPDATED Interim Report
Boulder, Colorado
August __, 2011

Initial Recommendations

I. NTIA should utilize the LTE Technical Characteristics attached as an Appendix hereto for its initial interference and other analyses, and should work closely with industry to fully understand system impacts and refine analysis and sharing solutions.

II. NTIA should implement an informal process, consistent with all applicable laws, to directly exchange data and have a dialogue between government and industry in order to facilitate and implement the spectrum recommendations in this Report.

III. NTIA should stage the availability of the 1755-1850 MHz band for commercial use, with a priority on the early availability of 1755-1780 MHz, and extending in contiguous stages as necessary to accommodate the relocation and retuning of government users.

IV. NTIA should make spectrum available such that commercial users have exclusive use of the spectrum; however, given existing government uses, industry supports making spectrum available subject to pre-defined sharing zones where the commercial users accept reasonable and defined levels of interference.

1(e) - What percentage of time can Industry live with interference? Is there a way to estimate the impact of increasing interference on spectrum value? (prior slide 7)

- **No Simple Answer to What Percentage of Time for Interference is Acceptable**
  - It will depend on the area and intensity of interference
    - Interference in highly populated areas will generally have greater impact and be less acceptable than more rural areas.
  - Some operations and operators may be able to accept more interference than others
    - Impact can be technology dependent
    - Acceptable impact influenced by a variety of factors, including: overall system configuration, other spectrum holdings and exact nature of interference
  - Limited Interference and sharing will generally be preferable over exclusion zones
    - Interference potential is limited in time and/or intensity
    - As much information regarding the nature and timing of interference should be provided in order to allow planning and certainty
    - Access to population centers should be prioritized

- **NTIA Should Work with Industry to Understand Impact of Interference on a Government System-by-System Basis**

1(g) - If there will be interference to industry at some locations or time within an agreed sharing approach, what is needed in terms of service rules to incorporate the interference into the terms of the license and licensee expectations?

(prior slide 9)

- **Rules Will Vary Based on Level and Structure of Interference and Sharing**
  - Exclusion zones are worst case and have greatest negative impact on use of spectrum
    - May be acceptable if limited or in geographically remote areas
  - Creation of "Sharing Zones" based on cooperative sharing mechanism providing coordination between sharing entities will help maximize spectrum use by both parties and minimize disruption to operations
    - Database information or prior signaling of intent
    - Use of streamlined information sharing methods should be investigated (e.g., DoD portal)
  - Uncoordinated sharing feasible in some cases
    - 5 GHz unlicensed example
  - Numerous lessons learned and experience with 1710 – 1755 MHz band
- **More Information From Involved Parties (both Interfering and Interferee) is Necessary**
  - Information regarding the expected level, rate of occurrence and location of interference
  - Power, antenna characteristics and height, bandwidth, anticipated timing , etc.
- **Rules Should Define Expected Interference Level and the Relative Responsibilities of the Sharing Parties as Closely as Possible**
  - 800 MHz rebanding example
    - Rules (90.672) define conditions, including signal strength and receiver performance requirements, under which unacceptable interference should not be received
    - Provides coordination requirements (90.675), assigns responsibly for resolving interference (90.673) and mitigation procedures (90.674)
- **Rules should provide flexibility for resolving interference**
  - Overly prescriptive rules will not yield optimum solutions or allow for new approaches as technology changes
  - 2GHz BAS example where industry provided filters to ENG operations

1(i) - Band pairing of 1780-1850/separation requirements – What will industry do in terms of band pairing with 1780-1850 MHz if NTIA can free that portion of the spectrum, or will it implement TDD?

(prior slide 10)

- **The Entire 1755-1850 MHz Band Meets Principles for Spectrum Identification and Use**
  - **Paired Spectrum**
    - CMRS traditionally uses FDD technology - requires paired spectrum
    - FDD technology remains preferred over TDD for mobile broadband and should be a priority
      - TDD may have advantages to support asymmetric traffic, but can create uplink/downlink interference issues with adjacent operations and ultimate mix of traffic is not clear.
    - Optimal pairing - downlink/uplink bands close enough to enable efficient device and antenna design, but not so close that interference problems within the device are created
  - **Interference Issues**
    - Minimize the risk of harmful interference
    - Services with similar attributes make good neighbors, while services with very different characteristics can lead to interference
      - For example – Mobile broadband adjacent to high power broadcast
  - **Equipment Design Issues**
    - Allocating spectrum adjacent to current mobile broadband frequency bands facilitates leveraging R&D and investment
    - Allocations consistent with current uses, (e.g. duplex spacing) simplifies equipment design and promotes compatibility with existing systems
  - **Spectrum Harmonization**
    - International harmonization helps drive greater economies of scale
      - Reduces costs of equipment and services
      - promotes global roaming
      - eases frequency management efforts near international borders
    - US efforts should be promoted within the ITU

1(i) Response Cont. - 1780-1850 MHz – Allocate Consistent with Principles

(prior slide 12)

- **Paired Spectrum**
  - Preference for mobile uplink paired with suitable downlink band
  - Priority on extending spectrum in contiguous blocks from 1780 MHz
  - Potential downlinks paired bands identified for study or migration to terrestrial use
    - 2 GHz MSS bands (2000-2020/2180-2200 MHz), 2200-2290 MHz
      - Potential exists to build mobile broadband spectrum consistent with AWS and PCS use
      - Should be a priority for consideration
    - Other options possible as search for 500 MHz continues
- **Interference Issues**
  - TDD use would create interference problems with AWS and PCS uplinks
    - Require large guardbands
- **Equipment Design**
  - Within range of existing AWS and PCS bands
  - Similar duplex spacing if paired properly
- **Harmonization**
  - Identified globally for mobile broadband
- **Include as Part of a long-term spectrum plan**

Aeronautical Mobile Telemetry (AMT)

(prior slide 20)

- **Downlinks operate from manned aircraft, unmanned aerial vehicles (UAV), and missiles or other ordnance devices**
  - Flight characteristic data and video are transmitted to the ground for analysis
  - Telemetry signals are designed to be robust to completely capture the downlink data
  - Because of the operating altitude of some of the aircraft, a wide area may be illuminated by telemetry signals

- **383 AMT assignments identified in the band**
  - It would be helpful to have more information on these assignments:
    - Do they occupy the entire band
    - Are they are constrained to specific areas of operation

- **Possible sharing scenario based upon framework developed for Medical Body Area Networks to coexist with AMT in the 2360 – 2390 MHz band**
  - Viability depends on exclusion zones and details of use
  - May be feasible on transitional basis