Proposals Based on Protection of Authorized Services

NPRM states:

• “Our experience with the development and deployment of TV white space devices in the TV bands leads us to consider changes to our Part 15 rules that will allow for more robust service and efficient spectral use without increasing the risk of harmful interference to authorized users.” (para. 3)

• “The Notice proposes and seeks comment on rules to permit those (unlicensed) operations while also protecting authorized licensed services from harmful interference.” (para. 4)

• Now that we have some experience with white space devices in the TV bands, we are proposing changes that will enhance the ability of these devices to provide broadband services to a wide variety of consumers ... without increasing the risk of harmful interference to authorized services. (para. 21)
Experience with TVWS devices and databases:
• NAB documented numerous false registrations and database entries
  – More than 10% of device registrations deleted at the request of OET
• NAB documented additional questionable registrations
• NAB documented numerous TVWS devices operating at incorrect locations
• NAB documented TVWS database provider and TVWS devices operating on invalid channels
• NAB documented sales of questionable (non-FCC approved) TVWS devices

Fix Existing TVWS Problems Before Making Changes
NPRM Proposal (Wireless Mics)

Proposal
• Eliminate two reserved channels for licensed wireless microphones and make them available for TVWS devices when new rules become effective
• Require TVWS devices to cease operation within 30 minutes after new registration entered

Response
• At a minimum, effective date should be delayed until alternative microphone spectrum identified and actually available for use
• Proposal does not protect licensed ENG operations
• No wireless internet or ability to register a microphone may be available during emergencies, e.g., Boston bombings
• Current TVWS device registered locations unreliable
NPRM Proposal (40 mW Fixed Devices on Adjacent Channels)

Proposal
• Allow fixed devices to operate adjacent to occupied TV channels (i.e., within their service contour provided power reduced to 40 mW EIRP similar to personal portable devices)

Response
• There is no technical justification for this proposal
• Proposal increases risk of harmful interference and does not protect viewers
• Fixed and personal/portable devices have very different technical characteristics
• Fixed devices at 40 mW could produce 16dB (or 40 times) higher interfering signals than personal portable devices
• Based on FCC’s own analysis, 40 mW for personal/portable device only provides “marginal” protection to TV
FCC’s Personal/Portable Outdoor Interference Model

8 meters
16 meters
18 meters
Personal/Portable Outdoor Interference Model

- FCC Technical Analysis in 2008 TVWS Second Report and Order based on:
  - Separation distance of 16 meters (50 feet) on ground but 18 meters (60 feet) with slant angle
  - Portable device outside main receive pattern of TV antenna (Gain towards TV antenna = -2 dBd vs. +10 dBd)
  - Assumes 3 dB polarization mismatch (from near ground level transmission)
  - 2nd R&O Conclusion: 40 mW limit for personal/portable TVWS device provides “adequate” protection for indoor TV reception and “marginal” protection for outdoor TV reception
Actual Fixed TVWS Installations
Outdoor Fixed Interference Model

16 meters
Outdoor Interference Model Analysis

- Analysis shows interference potential of 40 mW fixed device is very different than 40 mW personal/portable device
- Fixed device at 40 mW has much greater potential to cause interference to TV reception
  - Can be in main beam of TV receive antenna - resulting in 12 dB stronger interfering signal
  - 3 dB polarization difference in signals unlikely - resulting in 15 dB stronger interfering signal (12 dB + additional 3 dB)
  - 1 dB additional free space propagation loss because there is no slant angle – resulting in 16 dB or 40 times stronger interference signal than personal portable device
  - Other factors (body absorption, intermittent battery operation) also make personal/portable less of an interference threat, but do not apply to fixed device
Impact of 16 dB

- FCC estimates show 84% of TV station’s coverage could be impacted by 16 dB reduction in margin
- Figure shown from FCC Laboratory DTV Receiver Studies
NPRM Proposal (4W Fixed Devices on Adjacent Channels)

Proposal

• Allow fixed devices to operate at 4W where there are two contiguous vacant channels rather than three channels
• Proposal allows only a 3 MHz separation between interfering TVWS signal and desired TV signals
• Assumes TV receiver has the same capability to reject interference from a signal that is 3 MHz away as when the interfering signal is 6 MHz away from the desired signal
• Cites South Africa and Ghana studies as justification
No Studies of DTV Receiver Interference Rejection Capability Support Proposal

- No technical studies or measurement of DTV receivers support FCC proposal
- Previous FCC tests and studies contradict assertion of no interference and show 1 MHz signal centered in adjacent channel has same interference as 5 or 6 MHz adjacent signal
- No studies have been conducted to show that TV receivers will reject can support the ability
Proposal Not Supported by Previous FCC DTV Tests

FCC tests showed a 1 MHz signal centered in the adjacent channel (i.e., 2.5 MHz from band edge) had same interference potential as 6 MHz signal at the band edge:

“For most tests, the undesired signal filled most of the 6-MHz width of a TV channel. Tests were also performed on one TV using a narrower signal – Gaussian noise bandlimited to a 3 dB bandwidth of 1 MHz. D/U ratios with this reduced-bandwidth signal were comparable to those for the wider undesired signals except in channel offsets where significant narrowband interference effects occurred.”
South African TVWS Studies Do Not Support FCC Proposal

- Studies were based on 8 MHz PAL analog TV system
- Studies measured and developed protection ratios for interference between TVWS devices and TV reception
- Study found “the strength of WSD signal should not exceed the strength of TV signal by more than:
  - 5 dB (if one used DVB-T criterion) or
  - By more than 8 dB for WSD signal being on the left-hand-side of the TV signal, and
  - 14 dB for WSD signal being on the right-hand-side of the TV signal.”
- Most importantly, study calculated an interference area around each TVWS device and ensured that no TV receivers where located within those areas
  - For example “interference … is likely to be restricted to 160m radius for the main beam of the BS antenna … over an open area.”
- South African studies do not suggest that adjacent channel interference does not occur. Rather, its point-to-point system was engineered to be located in places to avoid interference within the TV station’s contour after careful measurements were made
- TV white space databases cannot guarantee there would be no TV receivers within 160 meters of any TVWS device deployment
Definition of Rural Area
Is Cleveland Really Rural?

- NAB is supportive of TVWS for \textit{rural} broadband
- Cleveland meets the proposed “at least half of the TV channels are unused and available for TVWS definition”
- Cleveland is not a “rural area” and should not be as such for TVWS purposes
No Need for Haste

- Current timeline for post-auction transition and repacking is 39 months
- There are no guard bands and no duplex gap until after repacking
- Plenty of time to fix current TVWS system first, before relaxing rules
“When the situation was manageable it was neglected, and now that it is thoroughly out of hand we apply too late the remedies which then might have effected a cure.”

-Winston Churchill