What's New With Unlicensed National Information Infrastructure (U-NII)?

NPRM + KDB Revisions

TCB Workshop
April 10, 2013
Steve Martin

Outline

- ***U-NII Notice of Proposed Rulemaking (NPRM)*** -- Summary

- ***U-NII KDB Publication #789033*** -- Revisions
  "Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E"

U-NII NPRM

Notice of Proposed Rule Making (NPRM): FCC 13-22 of February 20, 2013

http://www.fcc.gov/document/5-ghz-unlicensed-spectrum-unii or

http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-13-22A1.pdf

<u>Proposes</u> new rules
and asks about new rule concepts*.
After public comments, reply comments, and internal deliberation, a Report and Order will be issued with the <u>actual</u> rules.
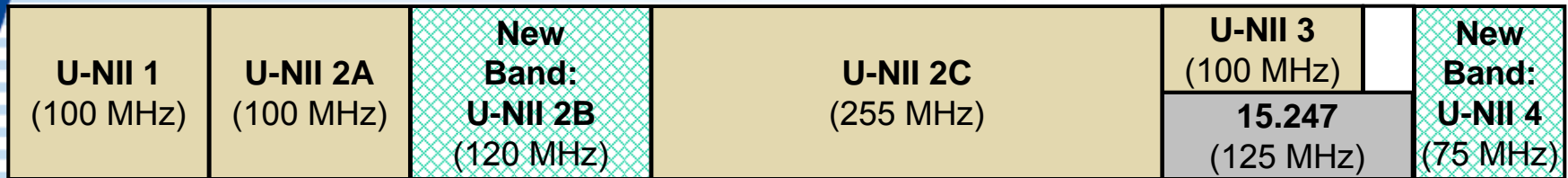
* Denoted by "?" in this presentation

U-NII NPRM (¶ 75-112): New Bands—U-NII 2B and 4

Power & PSD Limits same as U-NII-2A & 2C

Power & PSD Limits same as U-NII-3

| U-NII 1 (100 MHz) | U-NII 2A (100 MHz) | New Band: U-NII 2B (120 MHz) | U-NII 2C (255 MHz) | U-NII 3 (100 MHz) / 15.247 (125 MHz) | New Band: U-NII 4 (75 MHz) |

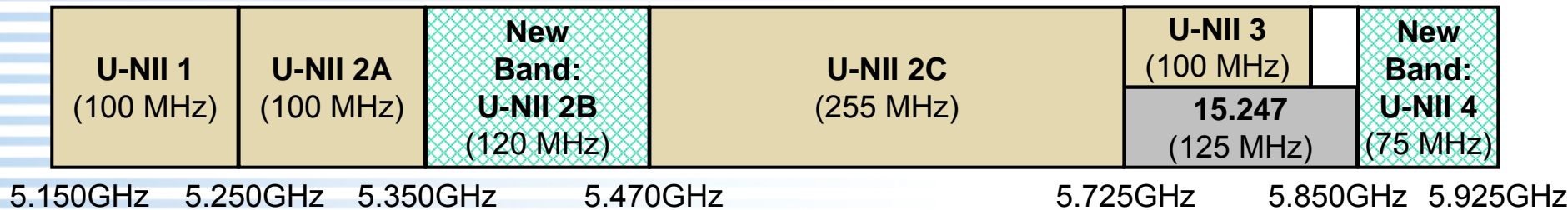5.150GHz   5.250GHz   5.350GHz   5.470GHz   5.725GHz   5.850GHz   5.925GHz

Dynamic Frequency Selection (DFS) or other methods to protect:

- Radars (some with pulse width < 1 µs)
- Non-radars (e.g., UAVs, Fixed Satellite Services, Dedicated Short Range Communications Service)

U-NII NPRM (¶ 36-41): U-NII 1

- ● Raise limits to match U-NII 2A or even U-NII 3?
  - – Power: 50 mW ➜ 250 mW or 1 W?
  - – PSD: 4 dBm/MHz ➜ 11 dBm/MHz or 17 dBm/MHz?

- ● Allow outdoor operation?
  - – Restrict higher power to indoors?

U-NII 1 (100 MHz)	U-NII 2A (100 MHz)	New Band: U-NII 2B (120 MHz)	U-NII 2C (255 MHz)	U-NII 3 (100 MHz)	New Band: U-NII 4 (75 MHz)
				15.247 (125 MHz)	

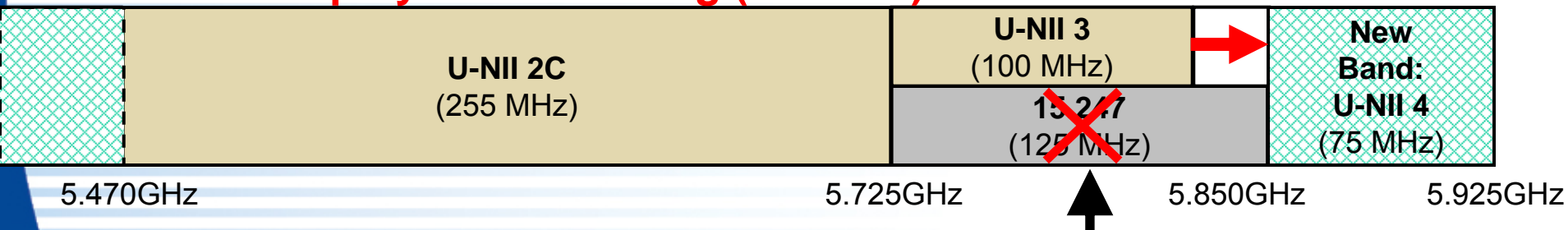5.150GHz 5.250GHz 5.350GHz 5.470GHz 5.725GHz 5.850GHz 5.925GHz

U-NII NPRM (¶ 23-35):
5.8-GHz 15.247 DTS Merges Into U-NII 3

- Extend band to match 15.247
- 1 watt limit (up to 6 dBi) with no bandwidth dependence
- 6 dB bandwidth ≥ 500 kHz (26 dB measurement not required)
- Fixed point-to-point: Reduce power & PSD for gain > 23 dBi (more restrictive than 15.247)
- PSD limit = 8 dBm / 3kHz (comments invited)
  - Other bandwidths, e.g., 100 kHz? (1 MHz➜33 dBm, meaningless limit)
- Out-of-band limit: no change to U-NII (stricter than 15.247)
  - Peak vs Average -- footnote 43

Will simplify 802.11 testing (& KDBs)

U-NII 2C (255 MHz)	U-NII 3 (100 MHz)		New Band: U-NII 4 (75 MHz)
	15.247 (125 MHz)		

5.470GHz   5.725GHz   5.850GHz   5.925GHz

Remove 5.8 GHz DTS from 15.247 (Frequency hopping remains)

U-NII NPRM (¶ 42-56): Interference Avoidance & Mitigation

- Require security features to prevent reprogramming by 3rd parties (country code, frequency range, modulation type, maximum output power, …)

- Require U-NII devices to transmit identifying information to facilitate finding sources of interference?

- Geographic and frequency separation requirements from TDWR & other radars in U-NII 2C
  - Professional installation or internal GPS + geolocation database?
  - Only for "high power" "outdoor" U-NII devices?
    - What is "high power"?
    - How to define "indoor device". How to enforce.

U-NII NPRM (¶ 57-61, 96): Interference Avoidance & Mitigation

- "Out-of-<u>channel</u>"* emission limits? U-NII 2A, 2B, & 2C (in addition to out-of-band limits)
  - Indoor (or low power)   -27 dBm/MHz EIRP?
  - Outdoor (or high power):   -41 dBm/MHz EIRP?**
    - -27 dBm/MHz peak‡ if > 53 km from TDWR?

Notes

*   *Out-of-channel = outside of occupied bandwidth but in U-NII band of operation (footnote 78)*

** *15.209 = -41.2 dBm/MHz average EIRP.*

‡   *Peak vs average for unwanted emissions is mentioned:*

-- Here (¶ 61) peak is mentioned for out-of-<u>channel</u> emissions; and

-- In footnote 43, peak is mentioned for out-of-<u>band</u> emissions.

Reference the appropriate section if commenting.

U-NII NPRM (¶ 62-74):
Dynamic Frequency Selection (DFS)

- Sensing
  - Sensing requirements
    - 80% ➔ 100% of occupied bandwidth?
    - Adjacent channel?
  - Relaxed threshold (-62 dBm)
    - Permit only when EIRP < 200 mW and *EIRP spectral density < 10 dBm/MHz*
- Prevent disabling of DFS
- Require radar detection for any device capable of initiating a network
- New Bin 1 radar waveforms
- Eliminate uniform channel loading requirement

U-NII NPRM (¶ 113): Rule Cleanup

- **Power and PSD**: average over interval of continuous transmission (not peak)
  - Maximum conducted output power
    - Remove references to "detector response times" and "true peak"
  - "Peak power spectral density" ➔ "Maximum Power Spectral Density"

  Matches guidance since 2002.

- **Peak excursion** = $\dfrac{\text{Max of peak-detected spectrum\ \ (1 MHz RBW)}}{\text{Max of average-detected spectrum (1 MHz RBW)}}$

  rather than ratio in same 1 MHz

  Matches guidance since original U-NII KDB pub 789033 (2011)

- 15.215: Emission bandwidth of U-NII devices may span across **multiple U-NII bands**

  Matches guidance since original 802.11ac KDB pub 644545 (April 2012)

Revisions to U-NII KDB Publication #789033

"Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E"

See KDB Publication # 789033 for details

Revisions to KDB 789033

- New sections
  - Spectrum analyzer headroom guidance
  - Occupied bandwidth (required for use of band-edge techniques)
  - Gated RF average power meter
- Other additions
  - "Spectrum analyzer _or EMI receiver_"
  - Maximum conducted output power—Integrate across:
    - 26-dB emission bandwidth
    - _or 99% occupied bandwidth_
  - Guidance for limiting the number of tests: peak excursion only
  - Band edge measurements for unwanted emissions
    - Two techniques
      - Marker delta method
      - _Integration method_
    - Restrictions on using band-edge techniques:
      - Use only within 2 MHz of band edge, and
      - _Use only if 99% occupied bandwidth edge < 2 MHz from band edge_

Revisions to KDB 789033

- Corrections and clarifications
  - Added Table of Contents
  - Maximum conducted output power
    - Corrected sweep duration requirement from > T to ≤ T
    - Defined constant duty cycle (variations < ± 2 percent.)
    - Clarified manual sweep time setting must be ≥ automatic default sweep time for Method SA-1 Alternative
  - Power spectral density (PSD).
    Added RBW & VBW settings for RBW<1 MHz w/integration over 1 MHz
  - Average Unwanted Emissions Measurements above 1000 MHz:
    - Adjustments based on duty cycle are not required for an emission that is continuous (independent of transmit cycle)

See CHANGE NOTICE at end of KDB publication for details.

Questions and Answers

Thanks!