Advanced Wireless Services (AWS) – 4 New Service Rules

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What is AWS?

- Advanced Wireless Services (AWS) is a collective term used to refer to new and advanced wireless applications, such as voice, data and broadband services to be provided over a variety of high-speed fixed and mobile networks.
- AWS licensees operate subject to the regulations specified in Part 27 of Title 47 of the Code of Federal Regulations (§27).

Background

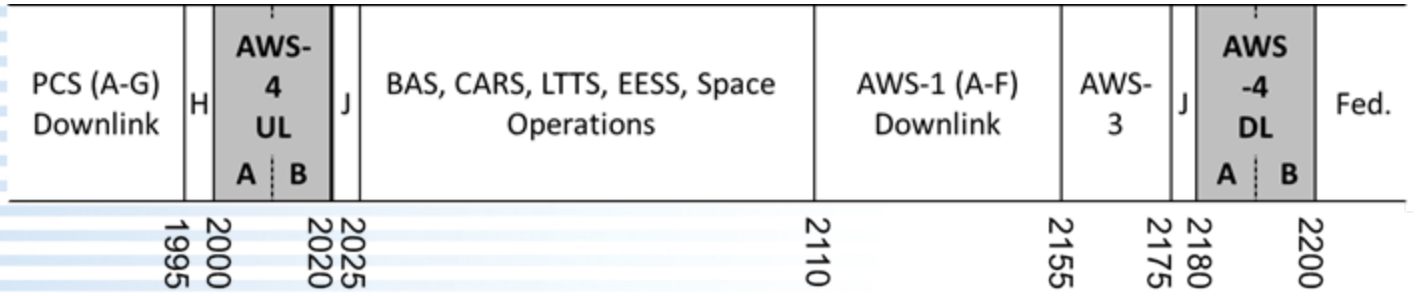
- **AWS-1**
  - In 2003, the FCC released a Report and Order (FCC 03-251) that established rules to license AWS-1 in the 1710–1755 and 2110–2155 MHz frequency bands.
  - The AWS-1 rules are defined in §27.
- **AWS-2**
  - A Notice of Proposed Rulemaking (FCC 04-218) was released in 2004 proposing rules for AWS-2 spectrum in the 1915–1920, 1995–2000, 2020–2025, and 2175–2180 MHz frequency bands.
  - An NPRM (FCC 12-152), proposing rules for the use of the 1915-1920 and 1995-2000 MHz bands (H block) was released on Dec 17th, 2013.
  - The AWS-2 rules are pending.
- **AWS-3**
  - Two NPRM's (FCC 07-164 and FCC 08-158) have been released regarding proposed rules for AWS-3 spectrum in the 2155–2175 MHz frequency band.
  - The AWS-3 rules are pending.

Background
(continued)

- **AWS-4**
  - In March, 2012, FCC released a Notice of Proposed Rulemaking (FCC 12-32) seeking comment on service rules for additional AWS (AWS-4) spectrum in the 2000-2020 and 2180-2200 MHz frequency bands
  - In December, 2012, the FCC released a Report and Order and Order of Proposed Modification (FCC 12-151) that established rules to license AWS-4 operations in the 2000-2020 and 2180-2200 MHz frequency bands.
  - Certain AWS-4 rules became effective on March 7th, 2013 and are currently available in the electronic version of Code of Federal Regulations (eCFR) under the Part 27 rules.

Summary of Selected AWS-4 Technical Specifications

- **§27.5(j) AWS-4 Frequencies and Band Plan**
  - 2000-2020 MHz uplink band, paired with 2180-2200 MHz downlink band, configured in two consistently-spaced 10 MHz blocks (A & B).
    - Block A: 2000-2010 MHz and 2180-2190 MHz
    - Block B: 2010-2020 MHz and 2190-2200 MHz



Frequencies in MHz

Summary of Selected AWS-4 Technical Specifications

- **§27.50 Base Station Output Power Limits**
  - (d)(1) Output power of fixed and base stations operating in the 2180-2200 MHz band limited to:
    - EIRP ≤ 3280 watts/MHz (35 dBW/MHz) if located in county with population density of 100 or fewer persons per square mile.
    - EIRP ≤ 1640 watts/MHz (32 dBW/MHz) if located in any geographic location other than above.
    - Note that limit is expressed in terms of power spectral density (PSD)
  - (d)(5),(6) Output power can be measured as either peak or average to demonstrate compliance to the applicable limit.
    - If average output power is measured then a peak-to-average power ratio (PAPR) limit of 13 dB applies.

Summary of Selected AWS-4 Technical Specifications (continued)

- **§27.50 Fixed, Mobile and Portable Output Power Limits**
  - (d)(7) Output power of fixed, mobile, and portable (handheld) stations operating in the 2000-2020 MHz band are limited to:
    - EIRP ≤ 2 watts (33 dBm), except that the total power of any portion of an emission that falls within the 2000-2005 MHz band may not exceed 5 milliwatts (7 dBm).
    - An AWS-4 licensee may enter into private operator-to-operator agreements with all 1995-2000 MHz licensees to operate in 2000-2005 MHz at power levels above 5 milliwatts EIRP but the total power may not exceed 2 watts EIRP.
    - Note that limit is expressed in terms of total band/channel power.
  - (d)(5),(6) Output power can be measured as either peak or average to demonstrate compliance to the applicable limit.
    - If average output power is measured then a peak-to-average power ratio (PAPR) limit of 13 dB also applies.

Summary of Selected AWS-4 Technical Specifications (continued)

- **§27.53 Emission limits**
  - (h)(1) General protection levels
    - The power of any emission outside of a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10log(P) dB.
  - (h)(2) Additional protection levels
    - Operations in the 2180-2200 MHz band are subject to the out-of-band emission requirements specified in §27.1134.
    - For operations in the 2000-2020 MHz band, the power of any emissions below 2000 MHz shall be attenuated below the transmitter power (P) in watts by at least 70 + 10log(P) dB (-40 dBm).

Summary of Selected AWS-4 Technical Specifications (continued)

- **§27.53 Emission limits (continued)**
  - (h)(3) Measurement procedure
    - General reference bandwidth is 1 MHz
    - Reference bandwidth of at least (no less than) one percent of the emission bandwidth can be used in the first 1 MHz immediately outside and adjacent to the licensees frequency block.
    - Emission bandwidth specified as relative to the -26 dB points.
    - When measuring to demonstrate compliance to the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.
    - The measurements of emission power can be expressed in peak or average values, provided that they are expressed in the same parameters as the transmitter power.
  - (h)(4) Private agreements
    - Provides for relaxation of the specified emission limit under private coordination and agreement with affected licensees (must meet at least the default requirement)
    - For devices to be used under such agreement, the equipment authorization application must provide a description of how the two limits are satisfied.

Compliance Measurement Guidance

- KDB 971168 provides guidance applicable to AWS-4 equipment certification, including recommended measurement procedures for demonstrating compliance to each of the AWS-4 technical specifications.
- KDB 662911 may also offer applicable guidance for determining the effective array gain for devices employing multiple transmit antennas (*e.g.*, MIMO).

Questions and Answers

Thanks!