



# **Network Protection Standard for Consumer Signal Boosters**

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# Signal Booster Report and Order

- FCC recently released a Report and Order (FCC 13-21) that establishes new rules for the operation of signal boosters to enhance wireless coverage for consumers.
- The Signal Booster R&O introduces a Network Protection Standard (NPS) that specifies the technical requirements necessary to minimize the potential for interference to wireless networks.
  - These are the requirements to which compliance must be demonstrated by all consumer signal boosters seeking FCC authorization for operation



# Network Protection Standard

- The NPS provides technical requirements for two types of consumer signal boosters.
  - Wideband signal boosters that may operate on the frequencies and in the market areas of multiple licensees (service providers)
  - Provider-specific (frequency-selective) signal boosters that may operate only on the frequencies and in the market area of specific licensee(s).
- The NPS requirements are specified in §20.21(e)(8) for wideband consumer signal boosters and §20.21(e)(9) for provider-specific (frequency-selective) consumer signal boosters.



# NPS Technical Requirements

- No attempt is made in this summary to distinguish between those requirements applicable to wideband vs. those applicable to provider-specific consumer signal boosters.
  - In general, the requirements are common between the two categories of consumer signal boosters although the specific limits might differ
- Noise Limits
  - Maximum and variable signal booster noise limits are established at the uplink and downlink ports for fixed and mobile booster deployments
  - Maximum noise limit is frequency-dependent
  - Variable noise limit is location-dependent, where one or more of the following parameters serve as indicators of the booster location relative to base station(s), or the client device location relative to the booster antenna:
    - Received Signal Strength Indication (RSSI)
    - Mobile Station Coupling Loss (MSCL)
    - Booster Station Coupling Loss (BSCL)



# NPS Technical Requirements

## (continued)

- Bidirectional Capability
  - Boosters must be bidirectional, i.e., unidirectional boosters are prohibited
  - Uplink and downlink gain factors must be equivalent
  
- Booster Gain Limits
  - Maximum and variable signal booster gain limits are established at the uplink and downlink ports for fixed and mobile booster deployments
  - Maximum gain limit is frequency-dependent and in the case of mobile applications, is also coupling-dependent
  - Variable gain limit is location-dependent, where one or more of the following parameters serve as indicators of the booster location relative to base station(s), or the location of the client device relative to the booster antenna:
    - Received Signal Strength Indication (RSSI)
    - Mobile Station Coupling Loss (MSCL)
    - Booster Station Coupling Loss (BSCL)



# NPS Technical Requirements (continued)

- Power Limits
  - Uplink and downlink power limits are specified in terms of composite conducted power and/or EIRP
  - Note that new consumer signal booster requirements limit maximum power to 1 watt conducted or EIRP
- Out-of-Band Emission Limits
  - The out-of-band (unwanted) emissions limits are expressed relative to the mobile emission limits specified by the applicable rule part
  - Compliance must be demonstrated using high peak-to-average signal types
  - Note this is one parameter where the limits differ significantly for wideband vs. provider-specific consumer boosters.
- Out-of-Band Gain Limits
  - Applicable only to frequency-selective signal boosters
  - Gain limits specified at the band edge and within 1 and 5 MHz offset from the band edge
- Intermodulation Limits
  - Limits specified at the uplink and downlink ports for supported bands of operation



# NPS Technical Requirements

## (continued)

- **Booster Antenna Kitting**
  - Boosters must be sold with user manuals specifying all antennas and cables that meet the NPS technical requirements
  - All consumer boosters must be sold together with antennas, cables, and/or coupling devices that meet the technical requirements of the NPS
  - Technical documentation must be submitted with the application that demonstrates compliance with all antennas, cables, and/or coupling devices with the NPS requirements, including any existing or future upgrade options that may be available
- **Transmit Power Off Mode**
  - At any time that the booster cannot comply with the NPS noise and gain limits, it must operate in a “Transmit Power OFF Mode”
  - Noise and gain limits are specified for this mode



# NPS Technical Requirements (continued)

- Uplink Inactivity
  - Limit specified for uplink noise power that must be observed after 5 minutes of inactivity
- Interference Safeguards
  - Anti-oscillation
    - Boosters must be able to detect and mitigate any oscillations in uplink and downlink bands within a specified time interval
    - Specifies maximum mitigation duration and shut-down requirement if mitigation is unsuccessful
  - Gain Control
    - Boosters must implement automatic limiting control to protect against excessive input signals that will result in output and emissions power levels in excess of the NPS limits
  - Interference Avoidance for Wireless Subsystems
    - Boosters using unlicensed or other frequency bands must employ interference avoidance methods to prevent interference into authorized CMRS frequency bands





# Compliance Measurement Procedures

- The FCC is working on an expedited basis with the appropriate C63.26 task group, signal booster manufacturers, and service provider representatives to develop standardized test procedures for demonstrating compliance to the applicable technical requirements.
- If interested in participating in this effort please contact me at *steve.jones@fcc.gov* or Art Wall at *awall@atlanticbb.net* to be added into the group.
- While efforts are underway to develop standard test procedures, the Commission will accept applications for approval of signal boosters and will evaluate them on a case-by-case basis.
  - This evaluation may include FCC testing of the device.



# Questions and Answers

**Thanks!**