

The FCC has issued a Second Report and Order and Memorandum Opinion and Order (R&O) regarding the use of white spaces. White spaces have been a controversial topic for some time and will continue to be in the public discussions for the foreseeable future as the details of the FCC's direction are refined. It is important to note that the order does not address the migration from the 700 MHz (channels 52-69) spectrum that had its final auction early in 2008. Audio-Technica has been active in analyzing the regulatory environment and taken steps to protect our customers' interests since spectrum changes began in 1998, reducing and eliminating exposure to the changing regulations.

Overall the FCC has not changed the regulations regarding wireless microphones under Part 74. Wireless microphones maintain their protection as secondary devices for licensed users, and can operate for those users in channels 2-51. Wireless microphones may also still be licensed to operate under part 15 (very broad licenses available for "Traveling Band" VHF frequencies) and in 944-952 MHz under part 74 (much more broadcast specific licenses) without any changes. The concern now is how other devices entering the spectrum affect wireless microphone use.

In the R&O, there are some newer terms to understand:

- TVBD (Television Band Devices)** — Previously known as "white space devices," these devices come in two types:
- Fixed devices** — stationary, higher power transmit and receive devices designed to provide high speed DSL to rural areas ("the last mile").
 - Portable devices** — personal, lower power consumer devices yet to be designed that will offer expanded interface options (think blue tooth) and enhanced mobile functionality for a variety of applications such as entertainment, communication and accessories. Portable devices come in two classes:
 1. **Mode I devices**: controlled by a fixed device that predetermines the available channels on which the device can transmit and receive within its location.
 2. **Mode II devices**: independent devices that must use their own geolocation capabilities and look up its location within a geolocation database to determine available channels on which the device can transmit and receive.
- Geolocation database** — a database maintained by an FCC selected third party (or parties) that tracks the owner/operator, location, frequency, operating power, and dates/times of use for licensed devices. This will include television stations, fixed TVBD's, protected channels (e.g. channel 37), and registered licensed wireless microphones or large venues and events where wireless microphones are used.
- Spectrum sensing** — In addition to employing geo-location control, TVBD's will be required to "listen" to the spectrum and identify frequencies occupied by television stations and wireless microphones, and subsequently avoid these frequencies.
- Adaptive power** — portable devices will be required to reduce their output power when sensing other device's transmissions or operating in certain environments determined by the geo-location database.

The biggest concern of wireless microphone users has been what effect TVBD's will have on their equipment. The FCC has addressed this first and foremost by retaining their secondary use status under part 74 of the current regulations, protecting wireless mics from interference and preventing interference with primaries (e.g. TV stations). To support its continuation, several safeguards have been built into the emerging regulations.

The first safeguard is separating where they can operate. Fixed and portable TVBD's present different challenges to the spectrum. Portable TVBD's, which will likely grow in spectrum use over time, are limited to operation within channels 21-51 with certain power restrictions. Fixed TVBD's may operate in channels 2 and 5-51, but are prohibited from operating adjacent to an active TV channel and in channels 14-21 in or near the 13 metropolitan areas as identified by the FCC: Boston, MA; Chicago, IL; Cleveland, OH; Dallas/Fort Worth, TX; Detroit, MI; Houston, TX; Los Angeles, CA; Miami, FL; New York City, NY; Philadelphia, PA; Pittsburgh, PA; San Francisco, CA; and Washington, DC. It is important to note that the spectrum availability known today in these major metropolitan areas will remain similar to as it was prior to this report and order.

The FCC purposely allocated additional bands around channel 37 to allow for wireless microphone operation. No TVDB's can operate in channel 37 (reserved for radioastronomy), and all TVDBs will be prohibited from operation on the first available channel on both sides of channel 37 within a market. To illustrate, if a given market has a TV station on channel 36, TVDB's cannot operate on 35 or 38, leaving them open for part 74 devices.

Another safeguard is the geolocation database that will be implemented to govern how and when TVDB's operate. The details on the database structure and maintenance are still being worked out by the FCC, but it will be a central repository where licensed and registered wireless users and other spectrum-using entities log their location, frequency, days/times of operation, power levels, and other pertinent information. Before transmitting, a TVDB must first access the database, provide its location, and receive the frequency and power levels within which it can operate. A TVDB will not be allowed to operate within one kilometer (.6 miles) of the geographic coordinates of a registered user. The database design is complicated, and it will take some time for the FCC to complete plans for its structure and administration.

The geolocation database provides a safety net to prevent interference with wireless microphones. All TVDB devices which do not meet very strict spectrum sensing requirements verified by the FCC must, before transmitting, access the database via an internet connection to compare its location to the registered devices in the area. Spectrum sensing capabilities are intended to further refine where a TVDB can and cannot transmit. It can then change its transmission frequency to avoid interference with other part 74 devices. If a device will rely on spectrum sensing alone to avoid causing interference, the conditions and performance requirements for spectrum sensing will be set to very stringent levels and very rigorous testing prior to FCC approval.

The FCC also safeguarded wireless microphones by placing power restrictions on TVDBs. Fixed TVDB's can operate at 4W, but they will only be able to operate in a small number of mainly rural settings. Portable TVDB's can operate at 100mW, but if they are adjacent to a TV or protected band, power must be reduced to 40mW. These power levels and the database will limit interference with wireless microphones.

It is our view that the FCC listened to the wireless microphone community and enacted many safeguards to protect the public interest by preserving spectrum in the TV bands for this important function. In general, the regulations placed on TVDB's will leave at least two open channels in a market for wireless microphone use. The secondary status granted wireless microphone use under part 74 is amply protected by a series of regulations that guide the development and use of TVDB's.

It is likely to be several years before we see TVDB's entering the market due to product development times and the FCC completing the details of their plan. This will give current users time to license and register with the FCC and monitor the RF environment in their location. It also affords time to manufacturers to adjust their frequency plans to spectrum areas with less activity while developing more robust and agile systems.