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# Radio TechCheck

The Weekly NAB Newsletter for Radio Broadcast Engineers



## Accounting for Receiver Performance in Improving Spectrum Efficiency: The GAO Report

The 'Middle Class Tax Relief and Job Creation Act of 2012 (referred to informally by broadcasters as the Spectrum Act) was signed into law on February 22 2012 and, among other things, authorized the use of "incentive auctions" of broadcast spectrum. As a result, the FCC has issued a Notice of Proposed Rule Making on various aspects of conducting incentive auctions of broadcast spectrum; comments were filed on January 25 and reply comments are due on March 12. However, another part of the Spectrum Act that perhaps got fewer headlines, headed "Study on Receiver Performance and Spectrum Efficiency," required the U.S. Comptroller General (essentially the Government Accountability Office or GAO), to conduct a study that has just been released on the effect of adjacent spectrum on wireless transmission systems, encompassing all telecommunications, broadcast, satellite, commercial mobile service, or other communications systems that employ radio spectrum.

Specifically, the GAO study was required to consider:

"(1) the value of—

- (A) improving receiver performance as it relates to increasing spectral efficiency;
- (B) improving the operation of services that are located in adjacent spectrum; and
- (C) narrowing the guard bands between adjacent spectrum use;

(2) the role of manufacturers, commercial licensees, and government users with respect to their transmission systems and the use of adjacent spectrum;

(3) the feasibility of industry self-compliance with respect to the design and operational requirements of transmission systems and the reasonable use of adjacent spectrum; and

### Donate a Door Prize for the HAM Reception at the 2013 NAB Show

One of the "go-to" events at the 2013 NAB Show is the Amateur Radio Operator's Reception (called the "HAM" reception) which is open to all NAB Show attendees. This year's event is being held on Wednesday, April 10 from 6-8 p.m. in Ballroom B of the Las Vegas Hotel and Casino (formerly the Las Vegas Hilton). Sponsored by [Broadcast Supply Worldwide](#), [Heil Sound, Ltd.](#), and [Turner Engineering](#), this event also relies upon the generosity of dozens of companies and individuals who donate door prizes which are then raffled off during the event (you must be present to win).

If you would like to contribute to the evening's festivities by donating a door prize, please contact Katy Armstrong at NAB ([karmstrong@nab.org](mailto:karmstrong@nab.org)). All prize donors will be recognized in a scrolling video display at the event and in the *NAB Radio* and *TV TechCheck* newsletters published just preceding the event. Prizes can be of any size and value but should be selected to appeal to technically inclined individuals who have a passion for their craft. Last year, prizes valued at over \$14,000 were donated and raffled off before an enthusiastic crowd of over 700 NAB Show attendees!

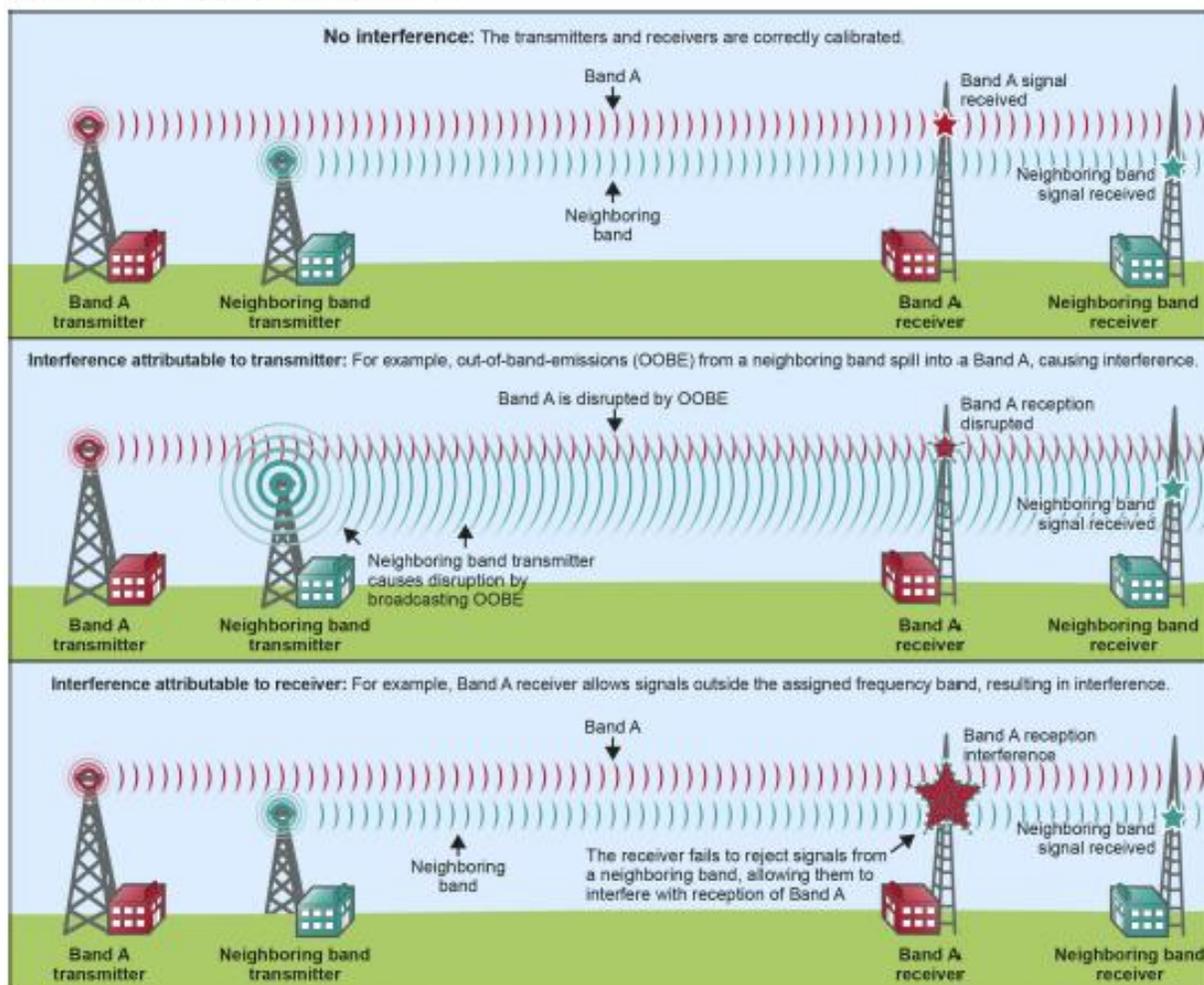
(4) the value of action by the Commission and the Assistant Secretary to establish, by rule, technical requirements or standards for non-Federal and Federal use, respectively, with respect to the reasonable use of portions of the radio spectrum that are adjacent to each other.”

The deadline for the report was one year after the date of enactment of the Spectrum Act, and GAO released its report to Congress and the public on time on February 22, 2013.

The 48-page report details the results of GAO’s interviews with industry and government representatives and their own analysis conducted between July 2012 and February 2013 on the relationship of receiver performance with interference mitigation and spectrum efficiency.

Figure 4 from the report, copied below, shows pictorially the interference situation that is attributable to receiver performance in adjacent channel situations.

**Figure 4: Types of Adjacent Band Interference**



Source: GAO.

The report notes that the FCC and NTIA have primarily focused on setting emission limits on transmitters and/or establishing spectrum guard bands to control interference. Mandates on receiver performance have been routinely used by NTIA for federal spectrum users, but rarely used by the FCC for commercial services. NTIA indicated that their mandatory standards for receivers apply to about 60 percent of federal spectrum assignments. In commercial industry, it has been more popular for industry-led organizations to adopt voluntary standards for receivers. For instance, for television service, the

Advanced Television Systems Committee (ATSC) developed and maintains the A/74 “Recommended Practice on Receiver Performance Guidelines.”

The GAO report summarized their research and found several challenges to further improvements in receiver performance:

*Lack of coordination across industries:*

While members of a particular industry coordinate with each other, they may have little or no communication with services operating in adjacent spectrum bands. The report uses the FM radio industry and the aviation community (which operates above the FM radio band), as an example where there are discussions within the groups but a general lack of coordination and information sharing between the groups.

*Lack of incentives to improve receivers:*

Manufacturers generally have little incentive to build more robust receivers, primarily because the manufacturers will not receive the benefits. Rather, those who want to make more spectrum available or share spectrum will benefit. Improved receiver performance can result in increased size, weight, power consumption and/or cost, all of which may competitively disadvantage a receiver product.

*Difficulty accommodating a changing spectrum environment:*

Incumbent services function well with receivers that don't have interference problems in the current spectrum environment. However, if that environment changes, for example when previously unused adjacent spectrum is occupied by a new user, receivers currently in use may experience increased interference. Manufacturers, on the other hand, find it difficult to build receivers to accommodate an unknown future, where predictability of the future interference environment is not certain.

The report documents various efforts that have been taken over the years by industry and the FCC with regard to receiver performance. However, the Recommendation at the end of the report implies that more needs to be done at the government level:

“To improve receiver performance and spectrum efficiency, we recommend that the Chairman of the FCC consider collecting information on the practical effects of various options to improve receiver performance, including consideration of small-scale pilot tests of these options.”

The GAO report “Spectrum Management: Further Consideration of Options to Improve Receiver Performance Needed” can be downloaded [here](#).

In the year that the GAO report was being prepared, work in other venues on the subject was also ongoing. On November 29, 2012 the House Energy and Commerce Committee's Subcommittee on Communications and Technology held a hearing on [“The Role of Receivers in a Spectrum Scare World.”](#) During that hearing, the FCC's Deputy Chief of the Office of Engineering and Technology noted that “receiver performance is becoming increasingly important as a limiting factor as we move to repurpose spectrum and pack services closer together on the spectrum chart.” He also indicated that the FCC planned to review the upcoming report from GAO, as well as output expected from the FCC Technological Advisory Council (TAC).

The FCC TAC consists of approximately 50 telecommunications experts that provide technical advice and recommendations to the FCC. At the December 10 TAC meeting, the TAC Working Group on Receivers and Spectrum recommended that the FCC investigate implementing an “interference limits”

policy. This refers to establishing ceilings, called harm claim thresholds, on in-band and out-of-band interfering signals that must be exceeded before a radio system can claim that it is experiencing harmful interference. Manufacturers then determine on their own how to build receivers that can tolerate such interference, or choose to ignore these limits. Following a peer review process within the TAC, a white paper on the topic was made publicly available from the TAC working group in early February. The FCC TAC white paper “Interference Limits Policy: The Use of Harm Claim Thresholds to Improve the Interference Tolerance of Wireless Systems” can be downloaded [here](#).

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