

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)
)
Establishment of an Interference Temperature) ET Docket No. 03-237
Metric to Quantify and Manage Interference)
to Expand Available Unlicensed Operation in)
Certain Fixed, Mobile and Satellite Frequency)
Bands)

To: The Commission

Comments of the Society of Broadcast Engineers, Inc.

The Society of Broadcast Engineers, Incorporated (SBE), the national association of broadcast engineers and technical communications professionals, with more than 5,000 members world wide, hereby respectfully submits its comments in the above-captioned Notice of Proposed Rulemaking (NPRM) relating to a noise temperature criteria for unlicensed, Part 15 devices.

I. A Noise Temperature Criteria Would Be Impractical and Unworkable

1. The NPRM notes, at Paragraph 2, that the Spectrum Policy Task Force (Task Force)¹ had previously investigated the concept of establishing a noise temperature criteria for various licensed services, and then to allow unlicensed Part 15 devices to transmit on those frequencies, on the presumption that the signals from such unlicensed devices would be below the sensitivity, or "noise temperature," of the receivers used by the licensed services, in which case no interference to the license services would be caused. However, the NPRM goes on to note that several parties opposed such a plan as "impractical and unworkable."

2. SBE agrees with those parties, Agere, AT&T, Cingular and Verizon Wireless: A noise temperature criteria would indeed be impractical and unworkable, for reasons these SBE comments will explore in depth. The short answer is the location and number of such Part 15 devices can never be known with certainty, and there is no guarantee that all, or even most, of the favorable-to-Part 15-device assumptions made in the NPRM for the 12.75–13.15 GHz TV Broadcast Auxiliary Services (BAS) band (one of two bands targeted for higher power Part 15

¹ ET Docket 02-135.

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devices), would in fact be the case. SBE can think of several just as plausible cases (to be discussed) showing that interference to licensed stations *would* be caused.

3. Because there would be no going back once higher power Part 15 devices have been sold to the public, there would be no practical recourse available to the users of licensed TV BAS stations entitled to protection from interference from unlicensed, Part 15 devices. The damage would have been done. For this reason SBE strongly opposes the proposed relaxation of the Part 15 Rules.

II. Higher Power Part 15 Devices Are Potential Band-Destroying Time Bombs

4. The NPRM bases its conclusion that higher power Part 15 devices at 13 GHz would not cause actual interference to licensed 13 GHz TV BAS links by making several assumptions, none of which can be guaranteed. These assumptions are:

4a. The unlicensed Part 15 device would be at least 100 meters (328 feet) from the receiving antenna of a licensed Part 74 TV BAS station.

4b. The licensed Part 74 TV BAS station will be using a highly directive receiving antenna.

4c. The unlicensed Part 15 device would be at least 20° off-axis to the main beam of this highly directional receiving antenna.

4d. Even if condition 4c does not apply, the unlicensed Part 15 device would be inside a structure that would provide "sufficient attenuation" to nevertheless ensure that no interference to the licensed facility is caused.

4e. That a co-channel desired-to-undesired (D/U) signal ratio of "30 dB to 50 dB" will be adequate to ensure that harmful interference is not caused to the licensed TV BAS station.

5. The NPRM concludes that, based on these assumptions, unlicensed Part 15 devices could have their allowable equivalent isotropic radiated power (EIRP) increased from the present limit of -41.25 dBm², to 30 to 36 dBm³, an increase of more than 77 dB. SBE will now provide its own real-world examples, based on the above assumptions, and demonstrate why the assumptions are not valid, or that harmful interference would be the result, even if the assumptions were not flawed.

² NPRM, at Paragraph 37.

³ NPRM, at Paragraph 47.

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6. First, the D/U ratios assumed in the NPRM are unrealistically low; a 60 dB D/U ratio has been typically and traditionally used as standard good engineering practice for Part 74 to calculate if interference from a co-channel signal will result. Further, Section 101.105(c), applying to the prior coordination notice (PCN) rules now mandatory for 13 GHz TV BAS stations, stipulates a 90 dB D/U co-channel interference criteria ratio "where the development of the carrier-to-interference (C/I) ratio is not covered by generally acceptable procedures, or where the applicant does not wish to develop the carrier-to-interference ratio." Since any Part 15 use of 13 GHz spectrum would have a wide choice of modulation methods, it follows that, as a minimum, the industry practice of at least a 60 dB D/U ratio should be used. Arguably, a case could be made for the Part 101 90 dB D/U criteria. Certainly a 30 to 50 dB D/U criteria would not only be dangerously lenient, but would exist in glaring and damaging conflict with Section 101.105(c) of the FCC Rules.

7. A typical receive carrier level (RCL) for a fixed-link 13 GHz TV BAS path is -30 dBm. Applying the Section 101.105(c)(2)(i) 90 dB criteria means that the RCL of the undesired Part 15 device would have to be -120 dBm. However, the noise threshold (not interference temperature) of a typical analog 13 GHz radio (taken from the manufacturer's data) is -85 dBm. Applying a 90 dB D/U ratio criteria would yield an RCL 35 dB below the receiver's noise threshold. Therefore, the noise temperature approach would be the less restrictive criterion applying to shared use of the 13 GHz TV BAS band with unlicensed Part 15 devices.

8. The receiver threshold is defined as the level at which the video signal-to-noise (S/N) level has degraded to 37 dB. Although a video feed with a S/N of only 37 dB would normally not be anything a broadcaster would want to put on the air, in some situations, especially breaking news or emergency coverage, a marginal video feed would still be far better than no video feed at all. As a consequence of this fact of broadcast life, SBE will treat the "noise temperature" of a 13 GHz radio receiving an FM video TV signal as 10 dB below the manufacturer's stated noise threshold, resulting in an RCL of -95 dBm for the "noise temperature" of a 13 GHz analog TV BAS radio.

9. The NPRM assumes a single 13 GHz Part 15 device would be at least 100 meters from the receiving antenna of a licensed 13 GHz TV BAS link, and at least 20° off axis. For a Category B 4-foot diameter standard-performance parabolic dish⁴, the minimally directive antenna allowed for fixed-link 13 GHz TV BAS stations, a 20° off axis angle represents a receiving antenna

⁴ The radiation pattern envelope (RPE) corresponding to an Andrew Model PX4-127C parabolic dish antenna was used.

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discrimination of 30.5 dB if parallel-polarized, and 55.0 dB if cross-polarized. However, since the polarization of a Part 15 device can never be guaranteed, only the 30.5 dB parallel-polarized value will be used.

10. For the +36 dBm EIRP proposed in the NPRM for a Part 15 device at 13 GHz, a 100-meter separation has a free space path loss (FSPL) of 94.7 dB. Adding the 30.5 dB of off-axis receiving antenna rejection gives -89.2 dBm. If we assume 1.8 dB of waveguide loss between the 13 GHz TV BAS receiving antenna and the receiver, corresponding to 15.7 meters (51 feet) of Andrew Type EWP127A elliptical waveguide, an RCL of -91.0 dBm for the undesired, interfering, Part 15 signal results. This fails to meet the receiver noise temperature criteria by 4.0 dB. And, if there is a preamplifier used to overcome the waveguide loss, then the failure magnitude becomes almost 6 dB. But wait, there's more.

11. The NPRM ignores the case of multiple high power Part 15 devices operating simultaneously. SBE submits one plausible scenario where a 13 GHz Part 15 device becomes highly popular amongst college students in a 300-student, 10-story dormitory on the campus of a college or university that also is the licensee of a noncommercial educational TV station. The TV studios are also located on campus. SBE further assumes that the NCETV station has a 13 GHz transmitter-to-studio (TSL) or inter-city relay (ICR) with its receiving dish only slightly off axis to the nearby dormitory, thus meeting the 20° off axis assumption. But, our scenario postulates, instead of just one 13 GHz Part 15 device radiating an interfering signal into the licensed TSL/ICR receiving antenna, there are ten such devices. Now the interference level is 10 dB worse— an order of magnitude worse. The RCL of the combined interfering Part 15 signals is now -81.0 dBm, and interference will be caused to the licensed TSL/ICR.

12. SBE must concede in its debate that there would likely be some attenuation of the signals from the ten 13 GHz Part 15 devices operating inside a dormitory, perhaps as high as 10 dB, possibly canceling out the aggregation effect of multiple Part 15 devices simultaneously operating. But, what if some of those devices are being operated next to a window, or even an open window? So much for the hoped for building attenuation. Further, as with any Part 15 device, there is always the possibility that the device will be operated in a manner or location not anticipated by the manufacturer, or in contravention of the operating protocols for the device; this is the inherent risk for any Part 15 device. And, for this scenario, assuming some of the users are enterprising engineering majors, the likelihood of such un-intended or un-anticipated operation is not heightened, it is raised to a virtual certainty in SBE's professional opinion.

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13. There have been many real-world cases experienced by SBE members over the years involving interference from 2.4 GHz wireless local area network (WLAN) Part 15 devices to licensed TV BAS operations on Channels A8 (2,450–2,487 MHz) and A9 (2,487–2,483.5 MHz), mostly to portable/itinerant TV Pickup stations. The TV BAS frequency coordinator for the Phoenix, Arizona, TV market reports numerous instances where wireless internet providers had installed 2.4 GHz WLAN links at mountaintop electronic news gathering (ENG) sites and made TV BAS channels temporarily unusable at those sites. Interference cases have also occurred at indoor venues such as consumer electronic trade shows, covered sports stadiums, and convention centers. Some of these reports were made to FCC field offices that verified complaints and then took correct enforcement action, although many times the distant location of the reduced number of FCC Enforcement Bureau facilities and staff did not allow for enforcement action.

III. Overlooked Impact to 13 GHz TV Pickup Stations

14. Condition 4b, the assumption of a highly directive receiving antenna for the licensed station, is only valid for fixed, point-to-point links. TV Pickup stations also use the 13 GHz TV BAS band, and there is no requirement that the receiving antenna of a TV Pickup system use a directional antenna. Indeed, because of the mobile/portable nature of TV Pickup stations, in real-world situations a highly directional receiving antenna is purposely avoided. If a highly directional receiving antenna is used, it must be steerable, so that it can be aimed in the direction of the TV Pickup transmitter. But this is not always practical, as would be the case for a shore-based TV mobile unit trying to receive a signal from a boat or ship in a harbor.

15. Although the NPRM proposes to not allow 13 GHz Part 15 devices to use the 13.15–13.2125 GHz portion of the 13 GHz TV BAS band, noting that portion is reserved solely for the use of TV Pickup stations, this does not mean that broadcasters do not use TV Pickup stations in the remaining 12.75–13.15 GHz portion of the 13 GHz TV BAS band. Rather, it means that such TV Pickup operation is secondary to fixed-link paths in that portion of the 13 GHz TV BAS band. SBE asserts that this an allowable interpretation of the Rules for use of TV Pickup operations throughout the entire 13 GHz TV BAS band. Thus, the interference potential to TV Pickup receivers according to SBE's calculations is at least 30.5 dB worse than assumed by the Commission, and possibly much worse if the separation between a TV Pickup receiving antenna and a co-channel Part 15 device is less than the 100 meters optimistically assumed by the Commission.

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16. A good example for this case, in SBE's considerable experience, would be the use of 13 GHz TV Pickup links at political conventions, which are generally indoors, and accordingly low power 13 GHz TV Pickup transmitters can be, and routinely are, used without fear of causing impermissible interference to fixed-link 13 GHz TV BAS paths. This could also be a likely venue for the use of imprudently authorized 13 GHz Part 15 devices.

17. Outdoor venues for 13 GHz TV Pickup stations are also, of course, possible, where such use will not cause interference to licensed fixed-link 13 GHz TV BAS paths. Venues include events such as car races, marathons, sailing regattas, and more. Again, these are also locations where high power 13 GHz Part 15 devices, if authorized, could become a serious interference problem.

IV. Gambling with Other Peoples Spectrum

18. In effect, this NPRM proposes to gamble other peoples spectrum (OPS), to allow the FCC the kudos of opening more spectrum to unlicensed, Part 15 devices. Mind you, once such devices are out in the marketplace there will be no practical way to control them, and BAS licensees have learned long ago not to expect an Enforcement Bureau SWAT team to respond to interference complaints.

19. SBE suggests that, if the Commission truly thinks that the further opening the Part 15 floodgates is a good idea, it open a dialog with the National Telecommunications and Information Administration (NTIA) and the Interdepartment Radio Advisory Committee (IRAC) to conduct that experiment in the federal government's own spectrum backyard; say, for example, the 7,900–8,025 MHz Earth-to-space federal government fixed satellite band. The 36 dBm EIRP of an 8 GHz Part 15 device should be inconsequential at the input terminals of a spacecraft-based receiver compared to the signal that is received from the typical 100 dBm to 115 dBm EIRP of an Earth-to-space uplink station. This would give D/U ratios at the spacecraft receiver on the order of 64 to 79 dB, which should be sufficient to ensure no interference.

20. And, if the Commission is unwilling to propose to NTIA or IRAC placing such a risk on the users of federal government spectrum, or if NTIA or IRAC do not agree to the sharing of federal government spectrum with unlicensed, Part 15 devices, then SBE asks the Commission why it should expect civilian licensees to accept a risk that the federal government would not be willing to accept.

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V. Summary

21. In SBE's view, commenters to the SPTF rulemaking such as Agere, AT&T, Cingular and Verizon Wireless got it entirely right. This proposal is unsound technically, and impractical and unworkable in light of real-world situations not considered by the Commission. Although the NPRM notes that presently the authorization of new RF devices have to "wait for the completion of lengthy ad hoc rule makings or resolution of individual proceedings that hinge on disputes over interference," this Administrative Procedures Act (APA) requirement is there for a very good reason: To ensure that ill-conceived proposals such as this one do not get adopted. While improvements in RF devices are real and ongoing, they do not at this stage of development remotely justify the proposed 77 dB increase in the EIRP allowed for unlicensed, Part 15 devices at 13 GHz. In the interference debate above, SBE would have to declare Part 74 TV BAS licensees as winners of the debate *battle*, but losers in the interference *war* if this destructive rule relaxation is adopted. SBE accordingly urges the Commission to terminate this ill-conceived "noise temperature" rulemaking forthwith, or, lacking that, to not conduct the dangerous experiment in the 12.75–13.25 GHz TV BAS band.

Respectfully submitted,

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