Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of:	)	
	)	
Unlicensed White Space Device Operations in the Television Bands	)	ET Docket No. 20-36
	)	
	)	

COMMENTS OF THE NATIONAL ASSOCIATION OF BROADCASTERS

I. INTRODUCTION AND SUMMARY

The National Association of Broadcasters (NAB)[1] hereby submits comments in response to the Commission's Further Notice of Proposed Rulemaking (FNPRM) concerning unlicensed operations in the broadcast television band.[2] We urge the Commission not to permit the use of a "terrain-based" deterministic propagation model, such as Longley-Rice to determine television white spaces (TVWS) channel availability. Use of such a model would lead to harmful interference to television service in pursuit of marginal, and likely illusory, gains in spectrum efficiency.

Over the last decade, over-the-air television viewership has increased by nearly 50 percent.[3] At the same time, the Commission has set the stage for the future of television by

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[1] The National Association of Broadcasters (NAB) is the nonprofit trade association that advocates on behalf of free local radio and television stations and broadcast networks before Congress, the Federal Communications Commission and other federal agencies, and the courts.

[2] *Unlicensed White Space Device Operations in the Television Bands*, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd 12603 (2020) (FNPRM).

[3] Sarah Perez, "Nielsen: 16M U.S. homes now get TV over-the-air, a 48% increase over past 8 years," Tech Crunch (Jan. 15, 2019), available at:

authorizing voluntary deployment of the Next Gen TV standard, and broadcasters have responded by deploying ATSC 3.0 service in 24 markets – with dozens of additional launches planned in 2021. This new technology opens the door to a better experience for viewers, promising innovative new service offerings and enhanced mobile reception. The Commission has also made it easier for broadcasters to serve viewers in hard-to-reach areas by providing greater flexibility in the rules governing the use of distributed transmission systems (DTS).[4]

At the same time, the Commission has also taken significant steps to loosen the rules for TVWS devices by authorizing higher power levels, greater antenna heights above average terrain, high-power mobile operations within geo-fenced areas and narrowband operations to facilitate Internet-of-things applications.[5] The confluence of these developments makes now precisely the wrong time to change the method to determine channel availability. Using deterministic terrain-based models could risk more interference in the very areas where television coverage is already challenging at the very moment when broadcasters are trying to improve it. We urge the Commission to reject this proposal.

II. DETERMINISTIC TERRAIN-BASED MODELS GIVE THE ILLUSION OF ACCURACY BUT WILL FAIL TO CORRECTLY PREDICT TELEVISION RECEPTION FOR ALL VIEWERS

The FNPRM seeks comment on the use of a terrain-based propagation model to determine TVWS channel availability.[6] Underlying this proposal is the assumption that a terrain-based model will provide materially greater accuracy in determining channel

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https://techcrunch.com/2019/01/15/nielsen-16m-u-s-homes-now-get-tv-over-the-air-a-48-increase-over-past-8-years/.

[4] *Rules Governing the Use of Distributed Transmission System Technologies*, Report and Order, MB Docket No. 20-74, GN Docket No. 16-142, FCC 21-21 (Jan. 19, 2021) (DTS Order).

[5] *Id.*

[6] *Id.* at ¶ 79.

availability for TVWS operations than the current rules, under which TVWS channel availability is determined by reference to a station's protected contour.[7] It will not. While point-to-point terrain-based models can provide superficially precise results, this illusion of precision grossly overstates the true accuracy of terrain-based models with respect to individual television receivers.

Any predictive model is ultimately limited when it comes to the particulars of individual receivers in a given area. Models, including Longley-Rice, may be broadly accurate on average but will inarguably be inaccurate in individual real-world cases. Terrain-based models do not, and are not intended to, reliably predict signal levels (whether desired or undesired) at specific locations. Rather, they predict only qualified results with a typical confidence level of just 50 percent. Stated different, these are blunt instruments that may be broadly accurate over a large number of predictions but are wildly inaccurate in specific situations.

The Longley-Rice model, for example, is a reasonably accurate approach as an allotment tool to determining coverage of a high-power broadcast station over a large area. No one would seriously dispute, however, that Longley-Rice (or any other terrain-based model) will inevitably predict no coverage in a particular area where viewers are in fact able to successfully receive a television signal. NTIA's analysis of Longley Rice suggests that the mean error of prediction can exceed 17 dB and the standard deviation of prediction errors can be as high as 25.7 dB.[8] That is an entirely unacceptable level of error and uncertainty that will inevitably lead to interference.

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[7] The "protected" contour of a DTV station is its noise-limited service contour. 47 CFR § 73.622(e).

[8] Alakanda Paul, Paul McKenna and Frederick Najmy, "Evaluation of Two Site-Specific Radio Propagation Models," NTIA (2003): available at: https://www.its.bldrdoc.gov/isart/art03/slides03/pau_a/pau_paper_jeanne.pdf.

There are at least two reasons for this. First, coverage in the real world cannot be perfectly predicted. Seasonal foliage differences, atmospheric conditions, building morphology, individual receive antenna parameters and performance characteristics all introduce uncertainty into the prediction. Even in a simple scenario, the fact that the model is two-dimensional but we live in a three-dimensional world means that an average or median receiver may be predicted not to receive coverage in a given area, but many individual receivers will. If the Commission allows TVWS users to rely on average performance and predictions to determine if coverage is not available in a given area, and thus TVWS operations could be permitted, those TVWS operations will in fact cause harmful interference to individual receivers that do not fit the average assumptions.

Second, there is no remotely accurate way of determining the precise location of individual television receivers that might allow for more granular determinations of coverage. This is all the more so in the case of mobile television service that would be facilitated by ATSC 3.0.

Further complicating the use of terrain-based models to determine TVWS channel availability is the growing number of Next Generation TV deployments. ATSC 3.0, unlike ATSC 1.0, will not present a static operating environment. ATSC 1.0 presents broadcasters and viewers with an all or nothing proposition – viewers can either receive the signal or they cannot. This is because ATSC 1.0 uses a single operating point (*i.e.*, the signal to noise required for successful reception). ATSC 3.0, however, allows broadcasters to select different operating points in order to tailor their transmissions to best suit their needs and their communities, providing, for example, greater throughput or a more robust over-the-air signal. Different broadcasters in the same market may make different determinations and those determinations may change at different times. Even more critically, *individual broadcasters*

may make different determinations in different parts of the market – targeting stronger signals to hard-to-reach areas and higher throughput levels to other areas. Indeed, individual broadcasters can use different operating parameters *at the same time and place* within a market through layered division multiplexing. Simply put, it is not the case that a broadcaster will have a single, static set of operating parameters that can always be used to predict coverage to specific locations within a market.

The reality is that predicting coverage and TVWS channel availability even in an ATSC 1.0 environment is ultimately an imprecise exercise where the only instruments available are blunt. Given this, the only reasonable approach is for the Commission to retain the methodology it has consistently used to determine broadcasters' protection from interference by continuing to define TVWS exclusion zones based on service contours. Selecting a blunt instrument that happens to favor TVWS channel availability at the expense of television service would turn Part 15 of the Commission's rules on its head.

As NAB has previously noted, the fundamental principle of the TV white spaces rules and, indeed, the Commission's framework for unlicensed operation more generally, is that such operations must not cause interference to licensed services and must accept any interference received from licensed services. The purpose of the white spaces rules is to allow opportunistic use of spectrum that would otherwise lie fallow, not to provide a new allocation at the expense of licensed television stations seeking to better serve viewers. Indeed, when the Commission first proposed to allow unlicensed operation in the television bands, it

expressly stated that the unlicensed uses it proposed were "not intended to limit future licensed use or to guarantee spectrum access rights for this band."[9]

The Commission has consistently upheld this view. According to the Commission, "[i]t is, of course, most important that we ensure that new unlicensed devices do not interfere with the incumbent licensed services in the TV bands."[10] In particular, the Commission has noted that, "future broadcast uses of the television band will have the right to interference protection from TV band devices."[11] The Commission has rejected efforts to limit expanded licensed operations to provide more opportunities for unlicensed operations in the television band, concluding that the "TV services for which this spectrum is allocated on primary and secondary bases are important media for the provision of news, information, and entertainment that warrant priority over those unlicensed broadband devices."[12] If the Commission allows TVWS operations to rely on a terrain-based model, those TVWS operations will inevitably clash with television service to the detriment of viewers. This would be contrary to the Communications Act and would constitute a reversal of the commitments the FCC originally made when authorizing unlicensed operations in the television band.

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[9] *Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band*, Notice of Inquiry, 17 FCC Rcd 25632, ¶ 14 (2002).

[10] *Unlicensed Operation in the TV Broadcast Bands*, Second Report and Order and Memorandum Opinion and Order, 23 FCC Rcd 16807, ¶ 33 (2010) (TVWS Second Report and Order).

[11] *Id.* at ¶ 50.

[12] *Digital Television Distributed Transmission System Technologies*, Report and Order, 23 FCC Rcd 16731, ¶ 19 (2008).

III. THIS IS THE WRONG TIME TO AUTHORIZE CHANGES IN THE WAY THE COMMISSION PREDICTS TVWS CHANNEL AVAILABILITY

As the Commission is well aware, NAB generally supported the changes the Commission has made in this proceeding to provide TVWS operators with additional flexibility. These changes included the authorization of higher power levels, higher antenna heights, rules to facilitate narrowband Internet of Things operations, and higher power mobile operations within geo-fenced areas. We oppose alteration of the methodology for determining TVWS channel availability at this time, however, because it is not yet clear how these recent changes will affect broadcast operations in practice and because the broadcast industry is in a period of dynamic technological change.

The central concern of broadcasters with respect to TVWS operations is that if a TVWS device causes harmful interference to a television receiver, the most likely outcome is that the interference is never remedied. Viewers unable to receive a broadcast television signal they previously enjoyed will have no reason to suspect interference from an unlicensed device and will simply assume they can no longer receive the signal and give up. In the unlikely event that a viewer does actually complain about a loss of coverage, however, FCC enforcement will likely be insufficient to promptly remedy interference from certain types of TVWS operations – specifically higher power mobile operations. Unlicensed mobile transmissions will be particularly difficult to identify and remedy because by the time a broadcaster or the FCC is even made aware of a viewer's complaint the interference source will likely have moved. Until the FCC, broadcasters and Microsoft better understand these recent rule changes, it is premature to make significant changes in how channel availability is determined.

More generally, broadcasters already face a challenging environment with respect to providing over-the-air service to viewers in hard-to-reach areas. Small increases in the noise floor caused by nearby TVWS operations will only exacerbate these challenges, particularly for

indoor reception, precisely at the time when broadcasters finally have the opportunity to improve service in those areas.

As described above, ATSC 3.0 allows broadcasters to make tradeoffs to improve coverage in hard-to-reach areas or drive higher rates of throughput. Together with the Commission's recent decision to provide broadcasters with greater flexibility to deploy distributed transmission systems technology, broadcasters finally have the ability to meaningfully improve coverage within their service area to viewers that were previously difficult or impossible to reach. Broadcasters can improve service both for viewers at the edge of a station's service area and for those viewers in areas that are shielded by hills or other terrain features, and they can do this without relying on spectrally inefficient translators.[13]

Accordingly, even if the Commission were convinced that there is some small degree of marginally improved accuracy to be gained by relying on terrain-based models to determine channel availability (which there is not) this would be the wrong time to make such a change. At a minimum, we urge the Commission to wait until it has a clearer picture of: (1) the changes to the noise floor caused by relaxed TVWS rules; and (2) the evolving state of coverage as broadcasters continue to deploy ATSC 3.0 service.

IV. CONCLUSION

Terrain-based modelling is not intended to, and cannot, provide accurate information about service with respect to individual receivers. For this reason, it is not the case that use of a terrain-based model to determine TVWS channel availability would lead to materially more accurate results – indeed, it is far more likely that use of such a model would increase the risks of harmful interference to television viewers who would be left without an effective

[13] DTS Order at ¶ 13.

remedy. Even if there is some marginal perceived increase in accuracy, however, the Commission should not take action that would risk undermining broadcasters' ability to meaningfully improve service to viewers without the use of additional channels. We urge the Commission to retain its existing rules for determining the availability of TVWS channels, at least until all stakeholders have a clearer picture of the impacts of the recent changes to the TVWS rules and the state of ATSC 3.0 deployments.

Respectfully submitted,

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