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

In the Matter of:	)	
	)	
Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz	)	GN Docket No. 17-183
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	)	

COMMENTS OF IEEE BROADCAST TECHNOLOGY SOCIETY

November 2, 2017

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I. INTRODUCTION AND SUMMARY

The Institute of Electrical and Electronics Engineers (IEEE) is the world's largest technical professional organization dedicated to advancing technology for the benefit of humanity. The IEEE Broadcast Technology Society (IEEE-BTS) serves engineering professionals involved with devices, equipment, techniques, and systems related to broadcast technology including production, distribution, wired and wireless transmission, propagation and reception.

At least two of the bands identified in the Commission's Notice of Inquiry[1] in the captioned proceeding, 6425–6525 and 6875–7125 MHz, are used extensively by the broadcast industry in the USA. While some well-engineered sharing may be possible in these bands, IEEE-BTS believes that these bands should not be designated for unlicensed use at this time. The Commission's own records clearly demonstrate that the use of database or dynamic frequency selection (DFS) techniques to prevent interference to incumbent services has been ineffective.

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[1] *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Inquiry, GN Docket No. 17-183, FCC 17-104 (rel. Aug. 3, 2017).

The Fixed-Satellite Service (FSS) in the C-band downlink band at 3700–4200 MHz is also used extensively by the broadcasting industry. We also take this opportunity to support many commenters on this proceeding who state the importance of continuing to protect this use from interference.

II. THE COMMISSION SHOULD PROTECT EXISTING USERS OF THE 6.425–6.525 GHZ AND 6.875–7.125 GHZ BANDS AND SHOULD NOT ALLOW UNLICENSED OPERATIONS IN THESE BANDS

Broadcast stations, programming networks, and video production companies make extensive and routine use of the spectrum at 6425–6525 MHz (the "6.5 GHz band") for electronic news-gathering (ENG) and wireless video links. These operations occur frequently and throughout the USA, including in remote areas that do not have cellular coverage or internet access. Much of the use facilitates coverage of breaking news, which obviously cannot be scheduled in advance with respect to either time or place. While real-time, on-scene coordination between broadcasters generally is successful, there is no known mechanism by which other users, particularly unlicensed users, can reliably detect broadcaster transmissions and avoid interfering with them. The broadcast uses typically are unidirectional, often with a path length of tens of miles between a transmitter and receiver, so uncoordinated operations that may be positioned with different distances, paths, and obstructions would be unable to detect the broadcast transmitter while still causing interference to its associated receiver. This is a well-known but unsolved challenge called the "hidden node problem." It should also be recognized that the number of authorized ENG transmitters is unknown because there are many thousands of transmitters that are not individually licensed by the FCC but are nonetheless utilized by broadcasters, networks and other entities under the provisions of Section 74.24 of the Commission's rules.

The 6.875–7.125 GHz band (the "7 GHz band"), too, is used extensively by broadcasters – for fixed point-to-point links as well as for mobile and temporary operations. This band also

recently was identified by the FCC for use by wireless microphones to compensate for loss of access to significant portions of the UHF Television band in the wake of the incentive auction.[2] Moreover, fixed wireless backhaul recently was added to this band.[3] Alternatives to the 6.5 GHz and 7 GHz bands are limited and inadequate. The 2 GHz band is overcrowded with users and limited by out-of-band interference due to adjacent Advanced Wireless Services (AWS-1) operations. Any alternate spectrum that is even higher in frequency than the 7 GHz band must overcome greater propagation losses, limiting its usefulness to relatively short paths. Additionally, higher-frequency spectrum typically uses highly directional antennas, which can make transmit-to-receive antenna alignment impossible to maintain for mobile operations.

III. DFS AND DATABASE APPROACHES TO SHARING HAVE PROVEN INEFFECTIVE IN PREVENTING INTERFERENCE WITH INCUMBENT USERS

Dynamic Frequency Selection ("DFS") is an RF environment sensing technique, requiring an unlicensed user seeking access to particular spectrum to listen first for specified authorized transmissions and not to transmit if such transmissions are detected. DFS is specified for "Wi-Fi" access to certain Unlicensed National Information Infrastructure (U-NII) bands at 5 GHz. After more than five years, DFS has proven completely ineffective at preventing interference. The FCC has fined a number of companies operating illegally modified DFS equipment that caused interference to FAA radars. For example, in 2011, a wireless Internet service provider (WISP) in

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[2] *Promoting Spectrum Access for Wireless Microphone Operations,* Report and Order, GN Docket 14-166, Adopted August 5, 2015.

[3] WT Docket 10-153

Utah was fined $25,000.[4] Another company was fined over $160,000 in 2013 for a continuing pattern of illegal and interfering operations since 2009.[5]

There have been literally hundreds of DFS interference cases reported by the FAA to the FCC – so many that the FCC released an "Enforcement Advisory."[6] Despite that advisory, interference continues to be broadly reported to airport radars across the USA, including publicized FAA interference cases in New Jersey, New York, Florida, Illinois, and Puerto Rico.

DFS interference has not abated despite 8 years of investigation and enforcement by the FCC, nor are the interference problems limited to FAA radars. TV stations, which use the same spectrum as the FAA for weather radar and provide data to the National Weather Service as well as critical early warnings to the public, continue to experience interference from DFS devices. Specifically, during tornado season in Oklahoma in 2016, at least three TV stations filed complaints with the FCC, resulting in an on-scene investigation and shut-down of a number of DFS devices.[7] Interference resumed as soon as the FCC agents left the area and continues to this day.

The claim[8] that DFS has been effective in protecting radars from interference is not supported by the evidence presented herein and the FCC's own experience. Further, while it is unclear whether the massive and ongoing interference to critical radar systems is due to malfunctioning DFS systems or illegally modified equipment, it would be foolish and imprudent to

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http://www.radioworld.com/business-and-law/0009/faa-cites-unlicensed-5-ghz-in-radar-interference-case/327431

5 http://www.commlawblog.com/2016/07/articles/enforcement-activities-fines-forfeitures-etc/fcc-works-its-will-on-the-wisp-part-ii-sentence-suspended-somewhat/

6 https://apps.fcc.gov/edocs_public/attachmatch/DA-12-459A1.pdf

7 http://transition.fcc.gov/eb/FieldNotices/2003/DOC-341481A1.html

8 See, *e.g.*, Comments of IEEE 802, GN Docket 17-183.

rely on such capabilities for future spectrum sharing until the root cause(s) are identified and corrected.

The database approach used to facilitate unlicensed access to television broadcast spectrum by White Space Devices also has been proven flawed and inadequate. While there have been only a few reports of actual interference, this is due to the small number of devices (well under 1,000 and probably fewer than 400) actually in use so far – not due to a lack of potential for causing widespread interference.

The fundamental concept behind TV white space operation is use of a database to determine appropriate TV channels on which unlicensed devices can operate, at locations where such operations cannot cause interference to TV viewers or to other licensed operations. If the location information for a TV white space device in the database is unreliable or invalid, however, the entire TV white space approach fails. Several reviews[9] of the information contained in the TV white space database have found a very high fraction having false registration information and/or incorrect device location data. The lack of any meaningful verification of device locations or user contact information has frustrated even determining how many TVWS devices are in use, where they are located, and who is responsible for their operation. This database approach, if extended to a large universe of unlicensed devices, will surely lead to widespread and unavoidable interference.

IV. PROTECTION OF FSS SERVICES IN THE C-BAND DOWNLINK AT 3.7–4.2 GHZ

We take this opportunity to support many of the commenters who have stated that it is critical to continue to protect Fixed Satellite Services in the C-band downlink spectrum at 3.7–4.2

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[9] See, *e.g.*, Petition for Reconsideration, National Association of Broadcasters, ET Docket 14-165, "Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands …"

GHz from interference. We support generally the comments made by the Content Companies, the North American Broadcasters Association, SES, American Cable Association, iHeartMedia, Comsearch, Satellite Industry Association, NCTA – The Internet & Television Association, National Public Radio, and others[10] regarding the importance of continued protection of the FSS in the C-band downlink spectrum at 3.7–4.2 GHz. This band is used extensively in the broadcasting industry to distribute television and radio services not only domestically but also globally. A substantial percentage of domestic FSS C-band downlink earth station receivers are not contained in the FCC database since there is no requirement for their registration.

V. CONCLUSION

Broadcasters make daily use of the 6.5 GHz and 7 GHz bands for program distribution, electronic news gathering, and other purposes. While some sharing opportunities eventually may exist in these bands, the Commission must not allow unlicensed operations in these bands until proven mechanisms are available that can reliably prevent interference with incumbent users. Any new fixed or mobile services must recognize and protect the large number of existing facilities that are not contained in any FCC database but nonetheless serve critical functions to broadcasters, program producers, and, above all, the public.

Respectfully submitted,

IEEE Broadcast Technology Society

s/ William T. Hayes

William T. Hayes, President

November 2, 2017

[10] specific citations to comments in Docket 17-183 omitted.