

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

In the Matter of)	
)	
Amendment of Part 15 of the Commission’s Rules for Unlicensed White Space Devices)	ET Docket No. 16-56 RM-11745

To: The Commission

**REPLY COMMENTS OF CARLSON WIRELESS TECHNOLOGIES, INC., KOOS
TECHNICAL SERVICES, INC., and MELD TECHNOLOGY, INC.**

Carlson Wireless Technologies, Inc. (CWT), Koos Technical Services, Inc., and MELD Technology, Inc. (collectively, the “TVWS Manufacturers”), pursuant to Sections 1.415 and 1.419 of the Commission’s Rules, submits these reply comments in the above-captioned proceeding initiated by the Commission’s Notice of Proposed Rulemaking (“*NPRM*”) of February 26, 2016.¹

The TVWS Manufacturers support in substance the FCC’s proposed rule changes to Section 15.711(c) regarding the geo-location requirements for fixed TV white spaces devices (WSD), and suggests below some further clarifications that may alleviate concerns of some commenters. The TVWS Manufacturers do not support, however, the proposed Section 15.713(g)(4) email address and telephone number confirmation rule; the additional and vague regulatory burdens on TV white spaces database administrators would not contribute meaningfully to the accuracy of the databases but would likely slow the TV white space (TVWS) service initiation process and discourage otherwise useful updates to the registration information.

¹ See *Amendment of Part 15 of the Commission’s Rules for Unlicensed White Space Devices*, FCC 16-23 (rel. Feb. 26, 2016) (“*NPRM*”).

I. Introduction.

This proceeding is the outgrowth of the March 19, 2015 Petition filed by the National Association of Broadcasters (NAB) seeking a rulemaking and various extreme Commission actions – including an immediate suspension of the operations of the TV white spaces (TVWS) databases, new enforcement mechanisms, periodic audits, and temporary certification requirements – to address alleged data errors in the registrations records for fixed devices in the TVWS databases. The success of TVWS Manufacturers to deliver on the promises of TVWS in the United States turns, in part, on the proper functioning of the TVWS database registration process: if there is a problem with that process as NAB alleged, we want to fix it.

So, CWT investigated NAB’s allegations with its own review of the registrations and by attempting to contact almost all of those WSD registrants directly who appeared to have entered erroneous data.² Based on these efforts, CWT concluded that:

- Most of NAB’s claims regarding WSD users’ registrations were insignificant or hyperbolic;
- NAB’s arguments regarding registrations of WSD for testing purposes were misplaced;
- A minority of NAB’s assertions reflected erroneous data entry by WSD users, but there was no support for allegations that the data was entered willfully to obtain clearance to operate on TVWS channels that would have not been authorized had correct location data been entered into the database;

² CWT also investigated the allegations made in the three *ex parte* letters filed by NAB on June 11, 20 and 30, 2015.

- Of those WSD users whom CWT contacted, most agreed to correct the errors but some refused to do so largely because they claimed they were too busy or because they objected to being told an error had been made and CWT was asking them to fix it.

As a result, the TVWS Manufacturers decided to reach out directly to NAB to determine if there may be some common ground for resolving this matter. The outcome of those discussions was the July 17, 2015 joint letter to the FCC from NAB and the TVWS Manufacturers (“Joint Letter”) proposing a compromise that both sides we can live with and, in our view, enhances the likelihood of delivering on the great promise TVWS under the rubric of dynamic spectrum sharing using an independent database approach.

Why did we do that if only a minority of a minority of NAB’s allegations were not easily remedied and we found NAB’s other claims were exaggerated? For four reasons. *First*, while the number of errors is low now, the number of registered WSDs is currently in the hundreds. As registered WSDs are more widely deployed and numbers rise to millions, the persistent minority of unfixed errors will surely grow proportionally into a serious regulatory difficulty for the growth of the TVWS ecosystem at a time when the problem will be more complex to solve. *Second*, regardless of the underlying likelihood of NAB’s success of obtaining the requested relief, another legal and regulatory “cloud” overhanging the TVWS industry only serves to deter investors in the early stages of the TVWS ecosystem, discourage research and development by those companies already in that ecosystem, and weighs against the commitment of ISP customers to use TVWS technology as a part of their broadband network, especially in rural underserved and underserved areas. *Third*, as further explained below, the proposed rule changes and implementation timetables in the Joint Letter and the *NPRM* are flexible and achievable without significant impacts on the

costs of manufacturing WSDs. *Finally*, for the TVWS ecosystem to reduce significantly the production costs of WSDs, TVWS manufacturers and vendors, especially major chip manufacturers, must have products they can sell into the U.S. and worldwide markets, including the United Kingdom and other countries that have adopted regulations favoring automatic geolocation capacity of WSDs over manual input of the location data.

We stress that our positions in this proceeding and CWT's investigation apply only to TVWS, and should not be misconstrued as support for changing or eliminating the role of professional installers in any other wireless services or other frequency bands, including the CBR 3.5 GHz band. Our positions regarding the proper role of professional installers in the FCC's TVWS rules are solely based on the unique characteristics of TVWS spectrum, its proximity to TV band spectrum, and the current FCC TVWS regulatory scheme.

II. Discussion.

A. WSD Location Information “*determined automatically by an incorporated geo-location capability*” Leaves Significant Flexibility and Innovative Opportunities for TVWS Equipment Designs

The language “*determined automatically by an incorporated geo-location capability*” in the proposed Rule Section 15.711(c) of the *NPRM* and the Joint Letter is deliberately broad. It does not specify that any one geo-location technology or technique must be utilized. Some commenters seem to believe that the rule would mandate that GPS receivers must be incorporated into every WSD or that use of GPS is the only practical way for the TVWS Manufacturers to comply with the proposed rule, but that it is plainly not the case. The TVWS Manufacturers agree with the general principle espoused by Google that the rule “should not mandate detailed procedures or specific technologies

for geolocation” and that rule should allow devices and technologies to “change and improve.” The proposed rule is fully consistent with those general principles.

As Google points out, “multi-band devices could rely on a cellular network to monitor and compute their location” and crowd sourcing from the signal of the WSD with other devices. Google Comments at 5. Both triangulation and crowdsourcing techniques rely fundamentally on the detection of the Wi-Fi or TVWS signal transmitting from the WSD client unit and/or the TVWS base station antennae. Every WSD, for example, listens for and transmits TVWS signals and typically Wi-Fi signals, which are essential components in a location solution such as triangulation. Then, either the TVWS client unit or the base station performs the calculations to determine latitude, longitude and antenna height and transmits that location information directly to the database administrator. Therefore, a WSD functioning in this manner meets the requirements of the proposed rule because the WSD plays an integrated and essential role in the delivery of the automatic geo-location information to the database. Another example meeting the proposed rule would be use of triangulation of signals by two or more TVWS base stations or TDD range finding combined with directional beam-forming antennae to determine the location of the TVWS client unit. In that scenario, the TVWS network itself incorporates the entire geo-location capability without relying on other networks, and so can be used in remote areas where there are no cellular network towers or neighboring Wi-Fi networks. Indeed, during the TVWS Manufacturers’ discussions with NAB leading to the Joint Letter, these alternative approaches were discussed and the proposed language was deliberately chosen to permit such approaches.

Further, the proposed rule would force no rigid dichotomy between the use of a totally external or a totally internal automatic location capability. While some commenters seem

concerned that the proposed rule would preclude use of a “hybrid” technique, all location technologies are essentially hybrid techniques. GPS, for example, relies on a terrestrial device antenna receiving signals from the independent GPS satellite network. Whether one technique yielding acceptable levels of accuracy is viewed as more “hybrid” or “internal” than another is not important, and the proposed rule does not and should not stipulate that the geo-location capability must be *totally* housed or incorporated within the WSD itself.

The proposed rule Section 15.711(c)(2) also contemplates another “proxy” technique – an external geo-location source that is connected to the fixed WSD -- in the relatively rare cases where other more direct techniques, including those described above, cannot accurately determine the IDU’s in-building location. The TVWS Manufacturers note that the proposed rule in the Joint Letter would also permit another technique for low power indoor units (“IDUs”), if needed:

“(c) *Special consideration for indoor operation of low power fixed devices.* For fixed low power devices that operate indoors at 40 mW or less, the accuracy of the incorporated geo-location capability shall be ± 100 meters.

Note: Because some geo-location technologies may be less accurate in certain indoor locations, the initial location of the device can be established at a location immediately outside the indoor location of the device and that location stored internally in TVBD along with the time location data was obtained. The device must then be installed and registered with database within 30 minutes of the time the location data was obtained. All location data must be supplied automatically by the TVBD.”

The Commission should permit this alternative technique for low power IDUs agreed to by NAB, because it would provide additional flexibility for certain IDU scenarios where no other feasible option is available.

The TVWS Manufacturers also agree with Google and other commenters that the language of proposed Rule Section 15.711(c)(2) -- “external geo-location source that is *connected* to the fixed device” -- should be interpreted to include any secure *wireless or wired* connection. There is no

legitimate reason to require only a wireline connection. A short-range wireless connection will function in an equally secure and reliable manner and, in many cases, can avoid the additional costs and time of installing a wireline connection. In fact, the Joint Letter signed by NAB makes clear that the connection can be by “Ethernet, USB, serial port, or *other connection*.” (Emphasis added.) The language chosen by NAB and the TVWS Manufacturers is intentionally broad and flexible.

Finally, the TVWS Manufacturers do not believe it is necessary for low power WSDs to re-check location information with the database on a daily basis.³ As the NAB Comments (at 8) acknowledge, the parties to the Joint Letter never contemplated that low power devices that are not powered down or moved would need to re-check location information with the database every day. And, there is no legitimate need to do so since moving a low power WSD will likely require it to be powered down, in which case the rules already require a re-check with and information update to the database when it is powered up again. Moreover, a daily re-check is unnecessary since it is highly unlikely that a WSD transmitting at a maximum of 40 mW and located within the shielding of a building could cause harmful interference to TV viewers. Further, unlike the proposed rule, the Joint Letter did not state that the WSD must re-transmit its location information with the database daily. Instead, NAB and the TVWS Manufacturers agreed that “[t]he fixed device must use its geolocation capability to check its location at least once every day, except while it is not in operation, and confirm its location has not changed *with the location information stored internally* and previously reported to the database.” (Emphasis added.)

³ The TVWS Manufacturers believe that daily location information re-checks with the database for higher power TVWS base stations would be acceptable. The likelihood of potential interference from a base station is higher than that of an IDU, since base stations are typically located outdoor, at higher elevations and antenna heights, and operate at considerably higher power.

B. The Proposed Rule Section 15.711(c) Will Reduce Costs of TVWS Network Deployment and Increase Adoption of TVWS-Based Broadband Services

Some commenters state that the proposed rule replacing professional installation with automatic geo-location will raise the costs of production of WSDs and, therefore, deter the deployment of TVWS networks. Runcom, for example, estimates that the proposed rule would increase the cost of WSD manufacturing by more than \$30.00 per unit. CWT is incorporating such capability into its Generation 3 WSDs now and it estimates that the incremental costs will be less than \$10.00 per unit.

Moreover, in many cases, the per-unit incremental cost is more than offset by the cost savings that TVWS network operators will enjoy by avoiding truck rolls to customers' premises and related costs solely for the purpose of determining a WSD's location and manually inputting that information into the database, which is estimated to be at least \$200.00 per installation. As demonstrated by wireline deployment of DSL self-installed routers, ISPs using a self-installation process avoided significant truck roll costs and also experienced other benefits such as higher customer satisfaction, lower churn, and quicker average start times of the customer billing cycle. The ISPs' cost savings and greater profitability, in turn, benefit American consumers by allowing ISPs to construct TVWS networks cost-efficiently in "greenfield" areas where the construction of broadband networks using existing wireline or line-of-sight wireless network technologies is not economically and/or technically feasible.

C. Accuracy of Antenna Height Information.

The TVWS Manufacturers generally agree with NAB that it would be acceptable for WSDs to automatically input antenna height along with latitude and longitude data. NAB Comments at 4-6.

HAAT data will largely determine the extent of WSD potential interference with an operating TV station regardless of whether the WSD is at 5 meters or 30 meters above ground. NAB proposes that the database administrator could automatically replace antenna height data that is clearly inaccurate (*e.g.*, 100 meters above elevation or 50 meters below it) with a reasonable substitute of 10 meters (in the case of low height errors) or 30 meters (in the case of a high height errors). At the same time, the TVWS Manufacturers believe this approach is sensible *only if* the Commission clarifies that a WSD owner/operator or database administrator that follows NAB's proxy approach will not later be found to be operating in violation of FCC rules, including rules prohibiting harmful interference.

D. Additional Database Administrator Confirmation Rules Are Not Needed and Could Be Detrimental to TVWS Deployment.

The TVWS Manufacturers agree with the comments of Spectrum Bridge, Google and others that the *NPRM* proposed Rule Section 15.713(g)(4) would be overly burdensome, would slow or stall initiation of WSD services, would confuse consumers, and may cause broadband and VoIP service interruption issues. Moreover, if the Commission adopts Rule Section 15.711 as explained above, the strengthened accuracy of the database information lessens the need to confirm all contact information for each registration in order to detect an occasional and likely insignificant error. The Best Practices Guide (“Validation Requirements Fixed White Space Device Registrations”) released by the FCC on August 25, 2015 further minimizes the incidence of contact information errors.

It is no surprise that no commenter, including NAB, supported the proposed confirmation rule.

E. The FCC Should Act on NAB's Agreement to Support Increases in HAAT Limits

As part of the consensus and compromises made in the Joint Letter, NAB agreed to support rule changes “that permit such TV Band device to operate a[t] higher power levels and increased height above average terrain (HAAT) provided the same level of protections are maintained to TV viewers.” While this issue is raised in a related TVWS docket⁴ and was not raised in the *NPRM*, it is highly relevant to this proceeding because it reflects one of several *quid pro quo* compromises made by NAB and the TVWS Manufacturers to reach consensus on the Joint Letter. All parties to the Joint Letter believed that by strengthening rules on the accuracy of WSD location information, these would lessen the probability of harmful interference to TV viewers and, as a result, also warrant a relaxation of the FCC's current TVWS HAAT limits.

We urge the Commission to relax the HAAT rule expeditiously.

III. Conclusion.

This proceeding is about finding workable solutions to improve the long-run accuracy and integrity of WSD location information in the TVWS databases. Strengthening the rules now will

⁴ WISPA Petition for Reconsideration, ET Docket No. 14-165 & GN Docket No. 12-268 (filed Dec. 23, 2016) at 6-7.

better ensure TVWS networks can be deployed more rapidly throughout the United States to deliver broadband to unserved communities and new innovative wireless data services for IoT, public safety, industrial and agricultural applications. DSS or Dynamic Spectrum Sharing can work only through reasonable and timely compromises from all of the parties, licensed and unlicensed, who are privileged by FCC rules to use the uniquely valuable low-band TVWS spectrum.

Respectfully submitted,



James Carlson
Mark O'Connor
Carlson Wireless Technologies, Inc.
2700 Foster Avenue
Arcata, CA
moconnor@carlsonwireless.com
202-494-1505

/s/

Larry W. Koos
Koos Technical Services, Inc.
1025 Greenwood Blvd
Suite 391
Lake Mary, FL 32746

/s/

Jordan Du Val
MELD Technology, Inc.
Sunnyvale, CA

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