

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

In re Application of)
)
BALTIMORE (WNUV-TV) LICENSEE,) File No. BPEXDT-20130116AFF
INC.)
)
For an Renewal of Experimental Broadcast)
License to Evaluate New Broadcast)
Technologies)

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AUG 15 2013

To: Chief, Video Division, Media Bureau

Federal Communications Commission
Bureau / Office

APPLICATION FOR RENEWAL OF EXPERIMENTAL BROADCAST LICENSE

Pursuant to 47 C.F.R. § 74.113, Baltimore (WNUV-TV) Licensee, Inc. (“Applicant” or “WNUV”) , licensee of WNUV(TV), Channel 40, Baltimore, Maryland, hereby requests the renewal of its Experimental Broadcast License (“Experimental License”), granted on February 15, 2013.¹ The Experimental License authorizes WNUV to conduct technical tests and other experiments in its licensed broadcast spectrum to evaluate interference and performance parameters for new broadcast technologies in a real-world environment. WNUV, which incorporates by reference the details of the procedures and goals provided in its original application, attached hereto,² seeks to continue such tests and experiments and hereby provides the requisite supplementary Engineering Report mandated by Section 74.113 of the Commission’s rules.³

WNUV reiterates that there will be no commercial service component involved in this experimental effort. This request for renewal of WNUV’s experimental authority to test and

¹ See FCC File No. BPEXDT-20130116AFF, 1800E1-KRH, granted pursuant to 47 C.F.R. §73.1510.

² See Exhibit A.

³ See Exhibit B for a copy of the Engineering Report providing the Media Bureau with the current results of the station’s experimentation study and results.

evaluate the performance, and potential benefits, of OFDM standards for broadcast television is in the public interest because the information obtained will be valuable in evaluating the potential for the future use and development of this new technology.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "John K. Hane". The signature is fluid and cursive, with a large initial "J" and a long horizontal stroke at the end.

By: _____
Miles M. Mason
John K. Hane
Pillsbury Winthrop Shaw Pittman LLP
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August 15, 2013

Exhibit A

ORIGINAL

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JAN 16 2013

Federal Communications Commission
Bureau / Office

In re Application of)
)
BALTIMORE (WNUV-TV) LICENSEE,) File No. _____
INC.)
)
For an Experimental Broadcast License to)
Evaluate New Broadcast Technologies)

To: Chief, Video Division, Media Bureau

APPLICATION FOR EXPERIMENTAL BROADCAST LICENSE

Pursuant to Section 73.1510 of the Commission's Rules, Baltimore (WNUV-TV) Licensee, Inc. ("Applicant" or "WNUV") hereby requests an authorization to conduct technical tests and other experiments in its licensed broadcast spectrum to evaluate interference and performance parameters for new broadcast technologies in a real-world environment.

Background

Television broadcasting and the range of valuable programming it provides have driven many of the major consumer product advancements of the last decade in a variety of ways. Perhaps none of these advancements has been more important than high definition television ("HDTV"), which is now the gold standard for all in-home television viewing over broadcast, cable, fixed media and even streaming. HDTV was an innovation developed by and for the broadcast television industry.

But almost twenty years after the development of the broadcast HDTV standard, consumers are demanding more flexibility. The existing ATSC A/53 transmission standard was designed and engineered to permit large format digital video, including high definition, to fixed receivers. Two decades later, large format/fixed location ("LFFL") usage is still vitally important, but it is no longer the exclusive mode of television usage. Viewing of video on

computers, tablets and smartphones is routine. Viewing devices are portable, and consumers use them nomadically and while on the go. Yet the advancements that might allow broadcasting to stay ahead of consumers' needs and preferences today are precluded by inherent constraints that limit the ability of the current television broadcast technical standard to evolve. New and far more sophisticated transmission methods promise to provide high data rate links under more challenging conditions, permitting, for example, delivery of high definition and other television content to indoor locations without bulky external antennas. The next generation standard will allow broadcasters to better meet consumer needs and preferences and better serve the public interest.

Proposed Experimentation

The proposed experimentation is aimed at benchmarking technologies that could make over-the-air television service far more accessible and bring sweeping improvements in service to the viewing public. WNUV, with the support of others, will evaluate the performance of the Second Generation Digital Video Broadcasting – Terrestrial (“DVB-T2”) standard and future extensions of that standard for broadcast digital television use. The Applicant proposes to test and evaluate the performance of DVB-T2 and future Orthogonal Frequency Division Multiplex (“OFDM”) modulation extensions within the licensed coverage area of WNUV.

OFDM is the technological foundation of almost every aspect of wireless communications. It is a key component of the global technology convergence that is bringing entertainment, communication, and information seamlessly to myriad devices across multiple delivery platforms. WNUV believes it is appropriate to test the positive impact OFDM would have on making broadcast television content more widely accessible to viewers. WNUV believes the FCC, too, should view the testing of emerging technologies as an essential step towards greatly improved television service that is receivable on devices in use today (*e.g.*

tablets, netbooks, laptops), and those yet to be introduced. The relevance and value of free “over-the-air” (“OTA”) television is unquestioned. Technology now allows broadcasters to provide OTA television services via a more flexible platform that better meets the needs of consumers who increasingly seek video service whenever they want and wherever they are with whatever device is at hand.

Specifically, the proposed experiments would, among other things:

- identify representative link budgets for a variety of use cases in different locations within the service area;
- determine how a scalable Quality of Service (“QoS”) offering combined with flexible transmission attributes might facilitate the simultaneous provision of television broadcast service to multiple “screens” to match the way Americans use television today;
- provide data to support development of coverage and service contour matching techniques;
- confirm the ability of OFDM to support “Ultra High-Definition” (as recently announced by CEA), the clear future of LFFL television in the home, within existing 6 MHz channel assignments; and
- explore technological capabilities that could lead to an ability to evolve a future standard over time, avoiding the disruptive nature of halting and shifting an entire industry.

Initial experiments will take place in late viewer “off hours”, typically from 0100-0500. The hours of initial tests will be limited to 4-6 hour durations (per test) or less. Once system optimization and calibration requirements (including FCC DTV emission mask compliance testing) have been met, and initial field testing and data/information gathering is verified, it is

expected that some daytime experimental activities will take place. These will include activities to demonstrate system performance and capabilities. Applicant will provide its existing, licensed Advanced Television Systems Committee (“ATSC”) A/53 service consistent with the minimum operating hours specified in Section 73.1740 of the Commission’s Rules.

The Applicant proposes to use its existing facilities with one modification. During periods of experimentation, the Applicant will replace the station’s existing ATSC A/53 standard exciter with a standard software programmable exciter capable of supporting the DVB-T2 and future iterations of related OFDM standards. This exciter will provide a signal that complies with the emission constraints as specified in the Commission’s Rules. Operations will be located wholly within WNUV’s protected service area. It is therefore anticipated that no interference should result from the proposed experimental operation. However, the proposed experimental operations will be promptly terminated upon notice of any impermissible interference upon occurrence to any other authorized facility.

The facility will function as an open platform for testing that will focus on the interrelationship of various OFDM configurations and the operational characteristics that impact reception of services to a variety of receiving devices in various usage scenarios (*e.g.*, fixed indoor with and without outdoor antennas, nomadic, portable) across a diverse variety of terrain and environments.

The goal of the proposed experiment is to assess the advanced broadcast delivery capabilities of OFDM for television services in the United States. The first stage testing will be performed using three modulation types: QPSK, 64QAM and 256QAM. The FFT would be set to 8K, using a 1/16 Guard Interval, and 250 ms frame duration. Initial testing will run a Pseudo-random Noise (“PN”) sequence as “content”, a properly equipped mobile van will be the primary “reception” location. There will be multiple receive sites/locations defined and based on a need

to fully define reception and QoS support under various operation conditions. These sites will be matched to (more or less) typical field locations to support the acquisition of RF captures and data/information gathering along radials and clusters consistent with such experimental efforts.

In broad terms, WNUV anticipates that the project will progress in the following order:

- DVB-T2
- DVB-Lite
- DVB-NGH
- Non-standard variant derived from experimental outputs

The progression and timing will be driven by results of the experiments. The DVB standards are heavily laden with a series of backwards compatibility constraints, and that is why the progression steps through the DVB standard with increasing capabilities. Timing is driven by scarcity of test devices given the “newness” of NGH (for example). It is WNUV’s intent to participate in the development of, and demonstrate, “the art of the possible” and to engage the interest of many inter-related industries to help to define a future standard that is harmonized with components of global standards. We hope that this facility will be used as an extension of work ongoing throughout the broadcast industry globally (ATSC 3.0, FoBTv and others).

The first stage (DVB-T2) testing will be performed using three modulation types: QPSK, 64QAM and 256QAM. The FFT would be set to 8K, using a 1/16 Guard Interval, and 250 ms frame duration.

For QPSK, WNUV proposes testing 1/2 and 5/6 rate code. (If the test exciter supports DVB-T2 lite, 1/3 code rate, NGH has a 1/5 rate code that works at a negative C/N, but equipment to support that is not likely to be available for the first round of testing.). The ultimate goal is to see how the robust codes work with indoor and mobile reception.

- For 64QAM, the proposal is for two code rates, 3/5 rate, which provides 19.1 Mbps with a 12.0 dB AWGN C/N (ATSC “equivalent bandwidth”) and 3/4 rate, which provides 23.9 Mbps with a 15.1 dB C/N (ATSC “equivalent coverage”).
- For 256QAM, a 3/5 code rate, which provides a 16.1 dB AWGN C/N and 25.4 Mbps of bandwidth, was recommended. The goal is to determine if there is any advantage to using higher order modulation with more robust coding compared to 64QAM with less robust coding at a similar C/N.
- WNUV is seeking to demonstrate to the industry and its leaders that there exists a path to more effective distribution of current and future television content, to provide a higher QoS to our future viewers on multiple platforms, and therefore to make best use of our spectrum as a television service.

WNUV plans to start with DVB-T2 as a proxy to certain advanced capabilities (better noise threshold, immunity to multipath, portability, use of advanced codecs, true SFN (synchronization capability)), and will advance to some of the parameters supported in DVB-Lite. The Applicant will then move to DVB-NGH (a newly ratified standard) and related extensions that begin to align/harmonize with other global standards, and hope to explore/implement MISO/MIMO capabilities.

There will be a small number of receiving devices. The most important devices will be a Rohde & Schwarz ETL (a software defined and programmable professional receiver) and an RF capture device that we expect will be provided via a television trade organization. A number of 6MHz capable receivers will be used in a laboratory to gauge some of the performance results based on the RF captures. There will be no receivers that are outside the control of the professionals performing the experiments. WNUV will not make any receiving devices available to members of the general public and does not expect that the general public will

otherwise have access to receiving devices.¹ There is no two-way component involved in any of the experimental activity.

The testing will be conducted as field trials and will include live reception testing and RF captures for subsequent evaluation and may include some demonstrations, as feasible, for industry and government officials. The Applicant intends to share RF captures and related information would be shared across the industry by and through organizations such as National Association of Broadcasters (“NAB”), North American Broadcasters Association, and the Advanced Television Systems Committee. Such information would better inform all stakeholders as to the opportunities to best serve Americans within the television spectrum bands. Out of these experiments, with work that is already underway, WNUV will be better able to define the attributes of a truly new Third Generation DTV television platform for consideration of industry consensus.

During testing periods, WNUV will ensure that multichannel video programming distributors will have access to a feed of the programming normally aired on WNUV. In addition, Sinclair Broadcast Group, Inc., has agreed to carry WNUV’s (the “CW”) programming OTA in its entirety on WBFF on a suitably PSIP identified sub-channel of the Channel 54.1 programming, yet to be identified. Accordingly, although the DVB-T2 standard is not compatible with ATSC receivers, the vast majority of viewers will continue to have access to the programming broadcast on WNUV. Prior to any testing WNUV will advise its over-the-air

¹ No “traditional” mobile devices (cell phones, tablets, etc.) will be part of the experiment. WNUV is not aware of any existing devices generally available or in use in the United States that would be capable of receiving and rendering the experimental transmissions even with modifications. Practically speaking, the required modifications (which would likely include a new RF front end, new chips and new codecs, new application software and likely a new operating system) are not possible or worth the cost. However, it is possible that extensions of current “mobile device” standards (3GPP for example) could lead to future devices that could directly support reception of broadcast TV services. In that case, the other elements might be developed and incorporated into future devices. However, we do not believe this is likely or even possible during the time frame of the experiments contemplated in this application.

viewers that the possibility exists for periods of interruption and the station will provide advance notice of times for such outages. WNUV will emphasize to the station's viewers that the alternate (WBFF) feed will provide uninterrupted, 24x7 basis. The commercial viability of WNUV as Baltimore's CW network affiliate depends on the station's viewers, and the station will strive to ensure that its audience is not inconvenienced by the testing.

Conclusion

WNUV believes that upon FCC consideration and grant of this request, it will obtain the commitment of many others in the industry to participate in this effort. Discussions (under nondisclosure agreements) have already taken place. Those discussions give WNUV confidence that this effort will have the participation of a large number of major industry players, including television broadcasters, vendors and standards bodies. This effort already has the stated participation/observation/support of Capitol Broadcasting Company, Univision and other broadcasters. WNUV expects that this facility will be made use of by many parties (NAB, ATSC, manufacturers and others), always subject to the supervision and control of WNUV. WNUV intends to provide the FCC and other parties negotiated access to results prior to public publication, and invite the broadest participation from within this industry. We are open to discussing with the FCC areas of specific interest or need. WNUV expects that there will be a variety of reports and event summaries, as well as RF captures that can be made available. WNUV hopes that the work undertaken pursuant to the requested experimental authority will result in a recommendation to the industry to advance a Third Generation standard with specific capabilities and operational attributes/technologies.

There will be no commercial service component involved in this experimental effort. The Applicant requests a waiver of any and all rules the Commission may deem necessary for purposes of this Application. This request for experimental authority to test and evaluate the

performance, and potential benefits, of OFDM standards for broadcast television is in the public interest because the information obtained will be valuable in evaluating the potential for the future use and development of this new technology.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "John Hane", written over a horizontal line.

By: _____

Miles M. Mason

John K. Hane

Christine A. Reilly

Pillsbury Winthrop Shaw Pittman LLP

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January 16, 2013

Exhibit B

WNUV OFDM EXPERIMENTAL FACILITY REPORT (BPEXDT-20130116AFF)

August 12, 2013

This report of events and timeline for the “on-air” activity at WNUV in connection with its above-referenced experimental license is submitted pursuant to Section 74.113 of the Commission’s Rules. There is ongoing laboratory activity, as well as ongoing work to ensure uninterrupted service to WNUV’s viewers during more extensive testing which is planned for the future.

The WNUV facility makes use of a multi-channel combiner and switch matrix being shared with WBFF, so switching of the WNUV system for servicing in some modes momentarily interrupts WBFF programming. To date, work has been undertaken during late night/early morning hours in order to develop best procedures and conditions for anticipated longer term activity. Activity to date has been limited to 3 hours of experimental transmission during early morning hours of operation when viewing is minimal. Anticipated longer term activity (possibly including daytime operational hours) is expected to take place within the next quarter. To date, all testing of various OFDM configurations have resulted in minimal loss of signals to over-the-air (“OTA”) dependent viewers.

For the initial test WNUV was not able to, as had been planned, provide WNUV programming OTA via another (alternate) station provider as a sub-channel. WNUV has discovered an issue with the way Nielsen typically accounts for designation of primary viewing that could cause adverse under-reporting. However, the station is working on a resolution that will then provide for the longer term activities anticipated. With proper planning and solutions being sought, the station expects to be able to conduct experimental activities and continue to provide uninterrupted service to all viewers via alternative delivery OTA as a properly configured and designated ‘virtual channel’ (sub-channel).

A. BPEXDT-20130116AFF (WNUV) First Operational Event 3/27/2013

WNUV’s ATSC over-the-air service was shut-down from 1:02am through 4:15am the morning of 3/27/2013. From the period of 3:35am 4:15am, the WNUV system was operated using DVB-T2. Because of the nature of the work being performed, WBFF was also off the air from 1:02 for 18 minutes (back up at 1:20 a.m.) and was off the air for 5 minutes (between 3:30-3:35) so that the system could be configured for normal operation.

From the period of 1:02am through 3:30am, the WNUV transmitter was fitted with a ‘Screen Services’ multi-standard capable exciter/modulator fed via a ‘Nevion’ DVB gateway device. This gateway device was fed an ASI loop-through transport stream that fed of the primary system with HDTV content.

The time was used to characterize the transmitter and IOT tube linear and non-linear equalization requirements and operating parameters. The intent was to determine the level

of FCC emission compliant power the system was capable of developing, the primary objective being to match the 36kW of average power upon which the system is licensed to operate. The full 36kW was developed and transmitted in one specific mode at the following DVB-T2 parameters:

- 16k ext FFT
- Guard Interval (cyclic prefix) 1/32
- 64 Quadrature Amplitude Modulation (QAM)
- Forward Error Corection (FEC) 3/4
- Pilot Pattern (PP) 7

The system was run to rated output requirements (18kW per tube) to achieve a modulation error ratio (MER) of better than 32dB. Individual tube sideband emissions (which were virtually identical) were reflective of that level of in-band noise, with shoulders of slightly better than 32 dB. The combined output of the parallel amplifiers is depicted (Figure1).

Total system performance through the 'mask filter' into the station dummy load was then measured. The resultant 'very favorable' level of shoulder emissions are the result of a sharp filter and not typical of a standard "mask filter".

The out of band emissions performance exceeded requirements out of the system after filtering. Of particular interest, the near 'shoulder' performance as defined by the FCC exceeded requirements by 16dB or more with the 'mask filter' in service (Figure2).

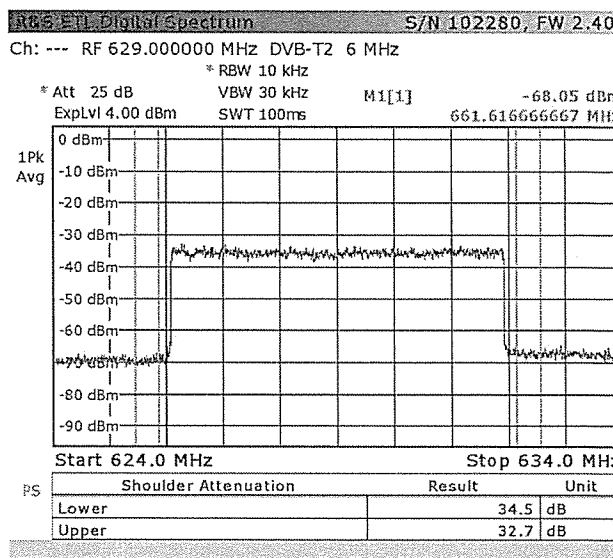


Figure 1

The system, operating DVB-T2, was placed on the air from 3:35am till 4:15am, and then was switched back to ‘normal’ ATSC operation.

The test identified the need to better understand various trade-offs in performance with respect to PAPR techniques available, and this work will be performed in the laboratory.

The complementary cumulative distribution function (CCDF) results indicate that some level of optimization is possible, and should yield even better shoulder performance (Figure3) when PAPR techniques are optimized and/or transmitter linear operating characteristics are changed. That work is being conducted in the laboratory along with several other investigations prior to the next ‘on-the-air’ activity.

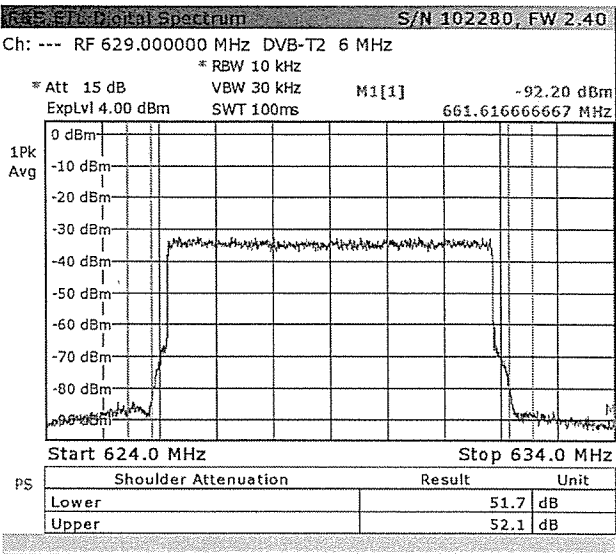


Figure 2

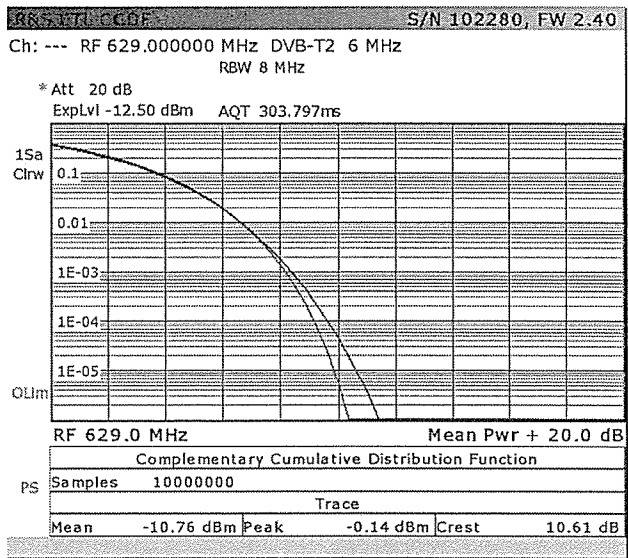


Figure 3

B. ADDITIONAL WORK

Additional testing has taken place on several occasions for the purpose of testing field acquisition equipment and collection of RF samples for verification in the laboratory, and to test equipment from other providers (COMARK, Thomson and others).

Validation of collection methods, ability to transfer files and data, and defining a testing process that includes the capability to provide remote selection of operational modes have been accomplished. This activity will lead to the ability to collect field data

from a variety of locations and receive environments over the coming months.

As stated above, extenuating circumstances regarding Nielsen issues have limited activities to late evening hours and to only several occasions so as to not have a meaningful impact on the OTA services and programming provided. WNUV is working diligently to address these issues so that testing can be undertaken in other day-parts.