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November 17, 2006

Mr. Milton Brown
Office of the Chief Counsel
NTIA
1401 Constitution Avenue
Room 4713
Washington, DC 20230

Re: Notice of Ex Parte Presentation
Digital to Analog Converter Box Coupon Program
NTIA Docket No. 060512129-6129-01

Dear Mr. Brown:

On November 15, 2006, John F.X. Browne and the undersigned, on behalf of the Metropolitan Television Association ("MTVA"), met with various staff members of the NTIA to discuss the MTVA's comments submitted in response to the NTIA's *Request for Comments and Notice of Proposed Rules to Implement and Administer a Coupon Program for Digital-to-Analog Converter Boxes*, 71 *Fed. Reg.* 42067 (July 25, 2006).

During the meeting, the parties discussed various aspects of the MTVA's proposed converter box performance standards, including dynamic range sensitivity, first adjacent channel D/U ratios and recommended converter box testing criteria In response to a request by NTIA staff, the MTVA submits the attached document that clarifies portions of its original comments.

Please direct any questions regarding this matter to the undersigned.

Sincerely,

Thomas P. Van Wazer

Attachment

cc: Ms. Anita Wallgren
Mr. David Murray
Mr. Tony Wilhelm
Mr. William Cooperman
Mr. Charles Mellone, Jr.

This document has been prepared by the Metropolitan Television Alliance, LLC (MTVA) in response to a request by the NTIA staff to clarify the initial comments provided by the MTVA in the converter box proceeding.

DYNAMIC RANGE

The ATSC A/74 document (dated June 18, 2004) indicates that the threshold of visibility (TOV) should not be reached for an input signal level between -83 dBm and –8 dBm (as measured in 6 MHz) for both VHF and UHF bands (as measured with no external interference or impairments). However, A/74 does indicate that it is desirable to extend this range beyond these bounds when possible.

The FCC's channel allocation planning factors, which are set forth in 47 C.F.R. sections 73.622 and 73.623 and clarified in Office of Engineering & Technology (OET) Bulletin 69 ("Longley-Rice Methodology for Evaluating TV Coverage and Interference, updated on February 6, 2004), provides the technical details regarding spectrum planning with Longley-Rice field strength prediction software as initiated in the Sixth Report and Order (MM Docket No. 87-268, FCC 97-115, adopted April 3, 1997), Bulletin 69 also clearly describes the expected performance parameters of the "typical" DTV *receive* system for the three television bands (low-VHF, high-VHF, and UHF), such as antenna gain, downlead line loss, system noise figure, and white noise threshold. By applying these receive system planning factors along with the antenna dipole factor (field strength to voltage to power conversion); a *minimum* DTV field strength can be determined for DTV service. These factors were used to allocate a second 6 MHz channel for replication of NTSC coverage by digital transmission to all qualifying television stations.

But these same planning factors can also be used to determine a *maximum* UHF signal level that might be expected at the input of a DTV tuner. For example, a receiver input value of -8 dBm (in 6 MHz) reflects a DTV field strength level of about 117 dBuV/m. This level can occur in a line-of-sight reception scenario just five miles from a 1 Megawatt maximized UHF DTV transmitter when using the standard FCC UHF planning factors of a 10 dBd gain antenna and 4 dB of coaxial feedline loss. This might occur in a highly urbanized area, especially if the receive sites were in buildings that had more than one or two stories (i.e., greater than 30' AGL). Thus, applying the FCC's channel allocation planning factors, a converter box should at *least* handle a 75-dB dynamic range (-83 dBm to -8 dBm) for a single interferer.

However, MTVA believes that an even larger dynamic range should be required since *multiple* undesired signals of -8 dBm may occur in a highly urbanized environment (such as New York City). If four such large interfering signals should be present simultaneously (e.g., all co-located on the same transmitter tower or building) with a lower level desired signal (e.g., from a different transmit location with some kind of terrain or man-made blockage reducing its level at the receive site), it is suggested that perhaps a maximum value of -2 dBm would be a better design goal for AGC circuits. That is, the average power of the four interferers would be 6 dB greater than the -8 dBm level (i.e., the -2 dBm level). This situation is further exacerbated prior to the end of the DTV transition when large *analog* NTSC signals will still be present along with all the DTV signals (or even after the transition where unlicensed devices might be deployed in the TV bands or the continued operation of analog LPTV and TV Translator stations).

The AGC specification is extremely important to the MTVA. In the Digital Television Transition and Public Safety Act of 2005, Congress authorized the MTVA to construct a Distributed Transmission System (DTS) network to help replicate current indoor analog reception. In such a DTS network, multiple transmitters might be located close to a receiver so the ability to receive strong signals without overload is critical.

When broadband AGC is employed in a DTV tuner, it includes any adjacent channel interference signal energy that passes through the finite bandwidth of the receiver's front-end tracking filter to determine the total signal energy that reaches the input of the first mixer. This front end gain reduction reduces the level of the both desired and undesired signals, helping to protect the first mixer from overload and extending DTV reception under these strong interference conditions. By sensing the amount of energy passing through the tracking filter, and then using this information to reduce the signals at the mixer input, extended DTV reception range of operation is possible (and desirable).

If some compromise is required, then a maximum level of -5 dBm might be considered as this would allow at least *two* large signal interferers to be present at the DTV receiver input.

NTSC-into-DTV FIRST ADJACENT CHANNEL D/U RATIOS

Table 1 illustrates both the ATSC A/74 document recommendations and the FCC planning factors utilized in the allocation of broadcast spectrum during the transition.

Recommendations Source	**NTSC-into-DTV Interference**	**Lower Adjacent Channel**	**Upper Adjacent Channel**
(Name)	(Desired Signal Level)	(dB)	(dB)
OET 69	Weak, Moderate, Strong	-48	-49
ATSC A/74	Weak (-68 dBm)	-40	-40
	Moderate (-53 dBm)	-35	-35
	Strong (-28 dBm)	-26	-26
MTVA	Weak (-68 dBm)	-48	-48
	Moderate (-53 dBm)	-48	-48
	Strong (-28 dBm)	-26	-26

TABLE 1 Adjacent channel D/U ratios

The ATSC A/74 document recommends that a DTV receiver should meet or exceed the interference thresholds described above for each of the *three* desired signal levels. By contrast with the FCC's channel allocation planning factors use *one* constant D/U ratio value for all desired signal levels rather than a variable value that was dependent on the desired signal level.

OET Bulletin 69 describes the assumed desired-to-undesired (D/U) signal strength ratios for both analog and digital interference that could and should be expected in the field after all qualifying television stations have been granted a second 6 MHz channel for digital transmission. These D/U ratios were based on laboratory testing of the Grand Alliance prototype 8-VSB receiver during the ACATS era (the FCC's Advisory Committee on Advanced Television Services), and are shown in **Table 1**. However, the FCC decided to use a constant D/U ratio value for all desired signal levels rather than a variable value that was dependent on the desired signal level. It is generally accepted that real-world receivers have adjacent channel interference performance that changes with the desired signal level, as determined by the non-linear circuitry effects that cause the cross-modulation and intermodulation energy within the tuner. However, it is believed that with current technology, such as broadband AGC, the weak (-68 dBm) and moderate (-53 dBm) desired levels can be designed to provide equal interference performance, with interference performance (D/U) degradation as the desired signal increases beyond the moderate signal strength.

From **Table 1**, it can be seen that the ATSC A/74 document recommends first adjacent channel NTSC-into-DTV values that are 8 – 9 dB less stringent than those used in the FCC channel allocation process. While some would argue that adjacent channel interference may seem less relevant after the DTV transition is over, adjacent channel operations will exist during the time that consumers are purchasing and installing the NTIA D/A converter boxes (which is one year before the end of the February 17, 2009 analog shut-off date). However, It is important to note that Analog LPTV and TV Translator transmissions will continue for a yet undetermined period beyond the February 2009 analog shut-down date. And, it is likely that new services will exist in some of the adjacent channels to DTV stations (e.g., the FCC's proposed Unlicensed Devices for which rules are being developed). Therefore, the adjacent channel performance of the NTIA D/A converter box does not become less relevant after the full power analog transmissions end in 2009. In order to avoid a situation where consumers are left with a converter box that is inoperable, a more robust interference performance value should be required in the new converter boxes. It is for these reasons that the MTVA recommended the adjacent channel D/U Ratios listed in **Table 1**.

MULTIPATH ENSEMBLES

The multipath performance of the NTIA converter boxes should be at least as robust as the current fifth generation (5G) VSB decoder chips. A specified multipath performance of a lesser standard will be very problematic as many of these boxes will be expected to work with simple indoor antennas in highly urbanized areas. In order to make sure that proper testing is performed on all eligible boxes to verify 5G performance, there must be tests that will reliably differentiate between 5G and earlier generations of VSB decoder chips.

To stress the equalizers and verify that they have at least 5G performance, "Brazil Ensembles B, C, and D" can be utilized. While a good 4G receiver *might* handle Brazil Ensemble B, very few (if any) 4G receivers will handle Brazil Ensembles C and D. Brazil Ensemble C has 4 very strong short post-echoes and 1 strong pre-echo while Brazil Ensemble D has 4 very strong pre-echoes and 1 strong post echo. These represent indoor reception environments with a fairly non-directional antenna (e.g. rabbit ears, loop, or bow tie antennas) deep within a room (far from the window). These scenarios will be typical of the environment in highly urbanized areas (e.g., large cities where the DTV transmitter is located on one of the buildings downtown such as in New York or Chicago). Not only should the D/A converter box provide error-free video and audio for these ensembles, it should do so with a minimum amount of equalizer noise enhancement, i.e., at an SNR of 18 dB or less. If the SNR at threshold for one of these severe multipath locations is too large, then a very large signal will be required to be transmitted, which increases the chance for interference into analog or other DTV signals. Therefore, it is the recommendation of the MTVA that the NTIA should specify performance of the D/A converter box using Brazil Ensembles B, C, and D with error-free performance while maintaining a SNR of 18dB or less.