ASSOCIATION FOR **MAXIMUM SERVICE TELEVISION, INC.**

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October 17, 2008

VIA ELECTRONIC FILING

Ms. Marlene Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

RE: Authorized Ex Parte Communications: Unlicensed Operation in the TV Broadcast Bands (ET Dockets No. 04-186 and 02-380)

Dear Ms. Dortch:

On Thursday, October 16, 2008, David L. Donovan, president of the Association for Maximum Service Television ("MSTV"), Victor Tawil, MSTV's senior vice president, and Bruce Franca, MSTV's vice president of technology and policy, met with Charles Mathias, legal advisor to Chairman Martin. We discussed several issues in the above-captioned docket.

First, we presented MSTV's plan to resolve the TV White Spaces proceeding, relying on geolocation. We noted that devices must avoid operation on the first adjacent channel to avoid interfering with consumers' digital television sets. We also urged a spectrum set aside for wireless microphones.

Second, referencing the Chairman's most recent press statements, we voiced our strong objection to the proposal to rely on "sensing" to protect over-the-air television viewers. We asked whether the OET Report would be put out for public comment. We noted the dramatic inconsistencies between purported conclusions in the OET Report and the actual data contained in the Report. Given the failure of these devices to operate, we questioned how one could conclude that the "concept" of sensing had been proved.

Third, we asked how the Chairman concluded that 40 milliwatts was the appropriate power level for unlicensed devices operating on the first adjacent channel. We then asked if the FCC knew how many viewers would be harmed in order to reach a "compromise" position. We noted that real viewers are harmed when policy makers reach compromises on engineering issues.

Fourth, we discussed Google's proposal to allow high power operation of unlicensed devices especially on the first adjacent channel. We noted that Google's approach would

result in significant interference to viewers living in urban and high density areas. We presented Mr. Mathias with a copy of our previous ex parte submitted on this issue.

Attached, please find copies of the other documents submitted during the meeting.

Sincerely,

David Donovan

CC: The Honorable Kevin Martin
The Honorable Michael Copps
The Honorable Jonathan Adelstein
The Honorable Deborah Tate
The Honorable Robert McDowell
Mr. Julius Knapp
Mr. Alan Stillwell
Mr. Charles Mathias

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FCC Data Does Not Support "Proof of Concept" for Sensing

October 16, 2008

Sensing Concept

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- Can spectrum sensing be used to accurately determine whether a TV channel is occupied or vacant?
  - If device not sensitive enough, device operates on occupied channel causing interference (Failure A)
  - If device too sensitive, no channels are available (Failure B)
- Proof of concept must avoid both types of failures

See, for example, *Fundamental Design Tradeoffs in Cognitive Radio Systems* or *Fundamental Limits on Detection in Low SNR Under Noise Uncertainty by Department of Electrical Engineering and Computer Science, University of California at Berkley*

OET Report

Co-channel Interference from Tx3 to TV at Rx at less than ½ mW

FIGURE 4-4. Site Orientation for Co-Channel Interference Tests in Rx Back- and Side-Lobes.

- For co-channel operation DTV "can experience interference at significant separation distances (data extrapolation indicates up to 1.2 km) from the WSD transmitter"
- OET Report at p. 37.

Co-channel Interference

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- FCC WSD proposals premised on no co-channel operation within protected contour of DTV station

- Interference distance of 1 km means sensing must ensure no operation in DTV contour
  - Fact that DTV signal is not present at specific location does not matter
  - DTV signal must not be present over entire interference distance to avoid interference

OET DTV Field Test Results

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- FCC Field Test Conditions
  - Condition I - Within the contour and DTV signal can be displayed using simple DTV receiver
  - Condition II – Within the contour but DTV signal not viewable using simple DTV receiver at specific location
- Interference Impact on DTV Service

	Unlicensed Device Fails to detect a DTV signal	Interference Radius to TV reception
Condition I	Yes	Up to 1.2 Km
Condition II	Yes	Up to 1.2 Km

Field Test Results

(Condition I)

- 3 out of 4 of the unlicensed devices (Adaptrum, I2R, and Motorola) FAILED to accurately detect DTV signals even when they were receivable by a simple $40 NTIA coupon eligible converter box
  - *Failure A*

- Remaining device (Philip) FAILED to detect 85% of all vacant channels
  - *Failure B*

Field Test Results
(Condition II)

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- Device performance was even worse:
  - Adaptrum and Motorola devices FAILED to identify almost 50% of DTV channels (Table 5-61)
  - I2R device FAILED to identify 70% of DTV channels
  - Philips device FAILED to identify almost 10% of DTV channels and almost 30% of DTV channels when an attenuator was used to decrease its sensitivity so that vacant channels could be better identified

Conclusion

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- Such results DO NOT SUPPORT A finding that these devices meet the "proof of concept" burden
- Nor do such results give any technical support to or shed any light on what is an appropriate "sensing threshold" to protect DTV viewers

Google Power Proposal

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- Google proposes Coalition formula of "received power of weakest protected channel + 85 dB"

- Google argues would allow higher power for unlicensed devices and provide more protection to broadcasting in weak signal conditions

Google Power Proposal

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- Google formula based on D/U ratio of -37 dB or 11 dB *less protection* that proposed by the FCC and used for licensed broadcast interference calculations
  - Unlicensed devices should not provide viewers less protection than licensed operations
  - Formula also ignores the additional 7 dB margin required to account for transmitter splatter (see Martin report at 4-2)
  - Formula also ignores that the fact that the D/U is further reduced as desired signal level is increased

Google Power Proposal

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- Google also fails to show how DTV signal variability is taken into account and viewers are protected
  - FCC Letter from Ed Thomas, Chief of OET suggests signal variability factor of 15.19 dB needed to protect 90% of viewers
  - NAF data shows even larger variability is possible
- Google also fails to show how viewers receiving weaker signals due to the use of indoor antennas are protected

Conclusion

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- Google power formula will allow higher power and cause interference where indoor antenna use and DTV signal variation is most likely

- Fixed power limit rather than Google formula will better protect DTV viewers
  - MSTV's proposed 5 mW power limit will better protect DTV viewers in both high and low DTV signal conditions

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White Space Proposal

A Solution Supported by the Science and Test Results

October 7, 2008

Background

- Broadcasters have supported and continue to support rural broadband deployment
  - Rural broadband deployment is being delayed as FCC waits for White spaces proponents to develop workable technology
  - Personal/portable devices and "sensing" technology are not necessary for the deployment of rural broadband systems

Test Results

- Laboratory and field tests demonstrate that "sensing" is not an effective means of avoiding interference to TV reception or wireless microphones
  - Even in limited laboratory and field tests, all devices failed to accurately detect whether channels are occupied or vacant
- Cable DPU interference was observed in the laboratory and the field

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Solution Possible

- Solution needs to be based on the science and test results
  - A single "one size fits all" approach will not provide solution
- Geolocation (as opposed to sensing) can provide co-channel interference protection to TV viewers
- However, solutions needed for other interference mechanisms:
  - Adjacent channel interference to over-the-air viewers
  - Cable TV DPU interference
  - Continued operation of licensed wireless microphones
- Must have effective interference resolution and enforcement mechanisms

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Solution Framework

- All white space operations based on geo-location and "trusted" database to protect all incumbent operations
  - Protection should include all TV, Class A, LPTV and translator operations, TV production and studios, cable head ends, satellite receive sites, sports and entertainment (such as Broadway) venues, etc.
  - Safe harbor/limited number of TV channels set aside for licensed wireless microphones
  - Beacons are not a viable option to protect wireless microphones used in news gathering

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Solution Framework

- Broadband High Power Fixed Use
  - High power fixed permitted under Part 90 "light licensing" (ala 3650 MHz)
  - No transmission on co- or adjacent TV channels to protect TV viewers (and licensed wireless microphones on adjacent channels)
  - Professional installation/licensing to protect cable viewers
- Part 15 Unlicensed Use
  - No transmission on co-channel TV operation to protect TV viewers
  - Max. 10 mW to protect cable viewers
  - Max. 5 mW on first adjacent to *minimize* interference to TV viewers (Generally, permits device to operate with more power than Motorola proposed calculations)

Summary

- White space solution should include:
  - Geo-location
  - Trusted data base
  - Safe harbor for wireless microphones
  - Interference resolution and enforcement mechanisms
- White space solutions should not include :
  - Sensing
  - Beacon

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October 14, 2008

VIA ELECTRONIC FILING

Ms. Marlene Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

RE: Authorized Ex Parte Communications: Unlicensed Operation in the TV Broadcast Bands (ET Dockets No. 04-186 and 02-380)

Dear Ms. Dortch:

On Friday, October 10, 2008, David L. Donovan, president of the Association for Maximum Service Television ("MSTV") and Victor Tawil, MSTV's senior vice president, met with Julius Knapp, Alan Stillwell and Robert Weller of the Office of Engineering and Technology. The purpose of the visit was to discuss a proposal by Google regarding use of the first adjacent channel by white space devices ("WSDs") in the TV broadcast band.

At the outset, we applaud Google's recognition that sensing is not a viable means to prevent interference to over-the-air broadcast television, cable television, and wireless microphones. Unfortunately, Google's unscientific attempt to enact a variable power regime to govern operating on the first adjacent channel will cause significant interference to over-the-air television and cable viewing.

The concept underpinning the proposal is not new. It is based on an earlier proposal submitted by the White Spaces Coalition ("Coalition") in 2007. The Coalition plan envisioned using signal strength to allow unlicensed devices to increase power as the devices moved closer to a broadcast tower. The problems with the Coalition plan were explained fully by MSTV at that time.[1]

Google's proposal substitutes geolocation for sensing to control the power levels of unlicensed devices operating on a first adjacent channel. It employs a predictive methodology based on location, as determined by GPS, to control the power levels of these devices. WSDs operating on first adjacent channels would be allowed to increase

[1] *Ex Parte Letter, Baseline Protections Needed to Protect DTV Viewers,* submitted by the Association for Maximum Service Television, Inc. and the National Association of Broadcasters, in OET Docket Nos. 04-186 and 02-380, April 20, 2007 at 2.

power significantly as the device moves closer to a broadcast tower and exceed the FCC's proposed first adjacent channel D/U ratio by more than 10 dB.

We noted that Google's approach significantly increases interference to both broadcast and cable digital television reception. Earlier proposals used this variable power approach for personal and portable devices with 100 milliwatt power levels. Google's proposal envisions expanding this approach for high powered, fixed unlicensed devices that may operate up to 4 watts. This approach has not been examined, much less tested by the FCC. Moreover, Google provides no specific data, methodology or assumptions it would employ. In addition, instead of analyzing multiple adjacent channels, as the earlier proposal by the Coalition, the Google proposal merely increases the probability for error by reducing the number of channels examined to only one channel.

Operating such devices on the first adjacent channel will cause interference to digital television sets and government subsidized digital to analog converter boxers. Analyzing data reported by the FCC last year clearly demonstrated that WSD devices operating at 100 milliwatts on the first adjacent channel would cause interference in 84% of a TV station's service area. Allowing higher power fixed devices (up to 4 watts) would cause significantly more interference to consumers' digital television viewing. Indeed, the fixed unlicensed approach outlined by IEEE 802.22 does not allow fixed unlicensed devices to operate on the first adjacent channel. .

The problem with Google's approach is fundamental to signal propagation. Any predictive methodology presumes, wrongly, that broadcast signals remain uniformly constant throughout the service area. It assumes there are no variations in propagation, as well as consistent flat terrain with no buildings or obstructions. It assumes that consumers living near a broadcast tower will use an outdoor antenna that is 30 feet off the ground. In fact, OET's own DTV receiver report states that "the signal level at the TV's RF input can easily vary over a 26-dB range simply by changing from an indoor antenna to an outdoor, mast-mounted antenna."[2]

Such assumptions are wholly inappropriate to predict interference inside a station's contour. Indeed, signal strength can vary significantly from one house to another and even room to room in the same structure. We provided the Office of Engineering and Technology with copies of an analysis presented previously by the New America Foundation, which demonstrated significant differences in signal strength at locations only one or two miles apart in Los Angeles. Moreover, NAF presented data showing a difference in signal strength of 15 dB to 20 dB at the same residence.[3] Simply stated, data submitted in the record by white spaces proponents, documents that one cannot adopt a "one size" predetermined methodology that can govern the power levels of

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[2] OET Report, FCC/OET 07-TR-1003, Interference Rejection Thresholds of Consumer Digital Television Receivers Available in 2005 and 2006 dated March 30, 2007 at 2-7.

[3] Sturza, Mark and Farzad Ghazvinian, *Can Cognitive Radio Technology Operating in the TV White Spaces Completely Protect Licensed TV Broadcasting,* New America Foundation, January 2007 at 35, 36, 44 and 53.

unlicensed devices operating on the adjacent channel. Any attempt to do so will underestimate TV broadcast signals strengths and cause harmful interference.

In high-density urban and metro areas, most consumers rely on indoor antennas. The broadcast signal strength at the indoor antenna will be significantly less than that predicted by Google's methodology. As a result, a WSD using Google's geographic model will significantly overestimate the strength of the broadcast signal and WSDs operating on the first adjacent channel will operate at power levels that ***will*** interfere with TV reception.

We observed that Google's plan would impose significant hardship on consumers living in high-density, urban areas. In other words, it would cause significant problems for low income, minority and elderly consumers who generally live in apartments, condominiums and higher density environments. These viewers not only depend heavily on over-the-air television, but also in many cases rely on indoor antennas in urban areas. In addition, the predictive model approach envisioned by Google would result in significant interference in markets where signals vary considerably due to terrain or buildings.

MSTV has already documented the parameters under which the Commission can both authorize WSDs that rely on geolocation technology *and* protect reception of DTV signals, wireless microphones and cable services.[4] These parameters are based on sound engineering principles and the results of the FCC's own tests in 2007 and 2008. Google's untested variable power concept, however, is fatally flawed, and does not form a basis on which to adopt rules authorizing WSDs in the public's digital broadcast spectrum.

A copy of the attached MSTV power point was submitted for the record. Copies of MSTV's Ex Parte letter dated April 20, 2007, and the New America Foundation's data, attached hereto, were presented to OET as well.

Sincerely,

David L. Donovan
President

CC: The Honorable Kevin Martin
The Honorable Michael Copps
The Honorable Jonathan Adelstein
The Honorable Deborah Tate
The Honorable Robert McDowell
Mr. Julius Knapp
Mr. Alan Stillwell
Mr. Robert Weller

[4] *See, e.g.,* MSTV, Notice of Ex Parte Communications, ET docket Nos. 04-186, 02-380 (Oct, 1, 2008).

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White Spaces

Response to Google Ex-parte filed on October 9, 2008

October 11, 2008

Google Adjacent Channel Proposal

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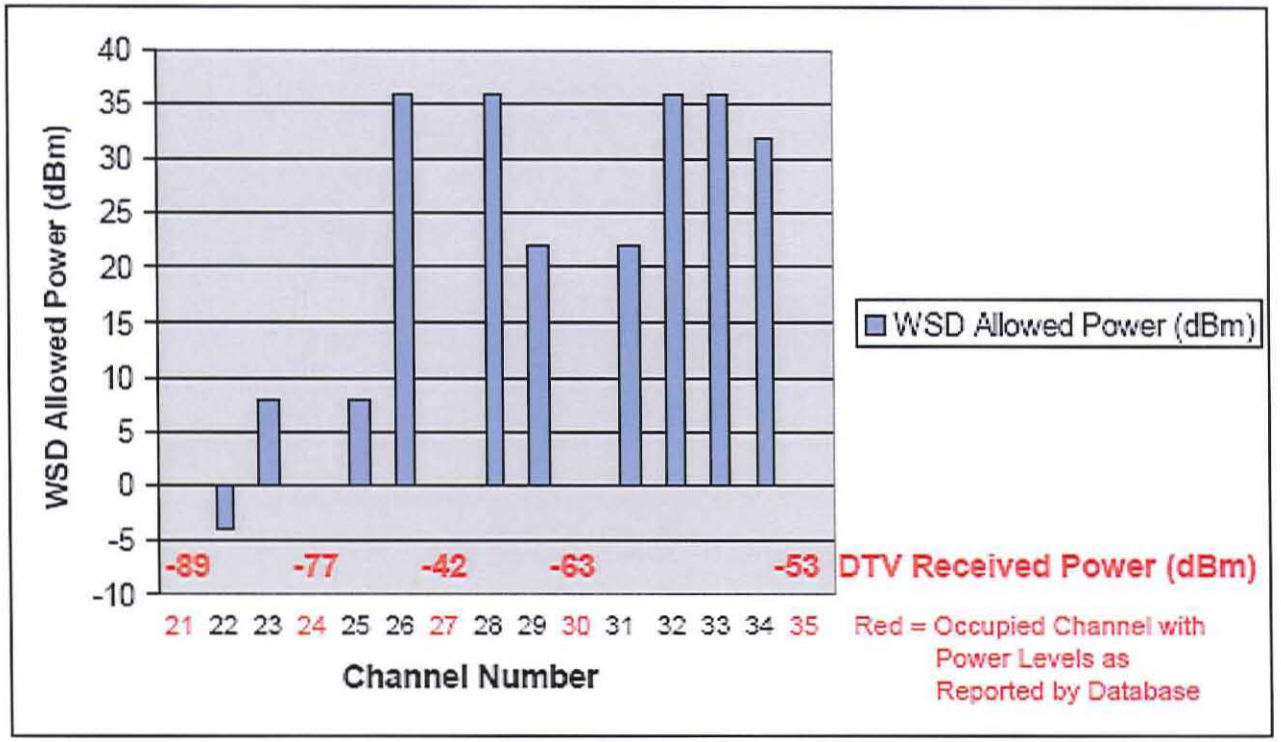
- Use a database and a predictive propagation model to identify what adjacent channels need to be protected
- Determine the field strength level of the TV stations based on a predictive model at the location of the WSD and use a predetermined D/U ratio to compute the power of WSD
- WSD device could operate up to +36 dBm (4 watts) WITHIN a TV adjacent channel contour

Google Illustration

Adjacent Channel: Proposed Rules



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MSTV Response

- Google proposal is rehash of earlier submission where Google is substituting predictive modeling instead of sensing to operate on adjacent channel of TV station
- In April 20, 2007 filing, MSTV rebutted earlier proposal using actual *measured data* submitted by NAF (handouts)
- New proposal is deliberate attempt by Google to allow high power devices on the adjacent channel and is not supported by science and data
- Result will be interference to TV reception and wireless microphones

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NAF TV Field data

- Measurements made by NAF in January 2007 in Los Angeles at three separate residences within approximately one mile of each other, and approximately 25 miles from all the DTV stations in Los Angeles
- NAF data showed that reception of DTV signals on the same channel varied within a residence by as much as 15 dB, and by 20 dB and more between the three residences (see attached NAF data)

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Bottom line

- The Google proposal is not supported by the science and their own measurement data
- The proposal will cause significant interference to TV reception and wireless microphones in the heart of broadcasters' service areas

Comparison of Predictive Modeling vs. Measurements

Channel 32 Residence 1	NAF TV Measurements*	Longley-Rice Prediction	Tirem Prediction
Bedroom # 1	-74.8 dBm	-23.2 dBm	- 21.0 dBm
Bedroom # 5	- 92.1 dBm	-23.2 dBm	- 21.0 dBm
Kitchen	-84.5 dBm	-23.2 dBm	- 21.0 dBm

* Note that the NAF measurements were DTV pilot measurement and should be lower by 11 dB to account for the full 6 MHz signal

Comparison of Predictive Modeling vs. Measurements

Channel 32 Bedroom 1	NAF TV Measurements*	Longley-Rice Prediction	Tirem Prediction
Residence # 1	-74.5 dBm	-23.2 dBm	- 21.0 dBm
Residence # 2	-67.1 dBm	-23.4 dBm	- 21.2 dBm
Residence # 3	-86. 9 dBm	-23.5 dBm	- 21.3 dBm

* Note that the NAF measurements were DTV pilot measurement and should be lower by 11 dB to account for the full 6 MHz signal