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ATTORNEYS AT LAW

October 13, 2008

**Ex Parte**

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

*Re: Unlicensed Operation in the TV Broadcast Bands*
*ET Docket Nos. 04-186, 02-380*

Dear Ms. Dortch:

On October 11, 2008, Craig Mundie, Chief Research and Strategy Officer for Microsoft Corp., spoke via telephone with Chairman Martin regarding the television white spaces proceeding. During this meeting, Mr. Mundie discussed proposed operating parameters for white space devices previously set forth in the record, and reiterated the importance of allowing devices to transmit at lower power levels using only spectrum sensing technology. In addition, Mr. Mundie stressed the importance of permitting devices to transmit at power levels sufficient to enable a wide range of innovative white space uses. Examples of white space device operating ranges and scenarios are attached hereto.

Pursuant to the Commission's rules, a copy of this notice is being filed electronically in the above-referenced dockets. If you require any additional information please contact the undersigned.

Sincerely yours,

Edmond J. Thomas
Senior Technology Policy Advisor

Encl.

cc: Chairman Martin's Office

# ATTACHMENT
# Television White Space Range & Scenarios

## I. White Space Range

Unlicensed use of the television white spaces will address the propagation limitations of Wi-Fi and provide additional broadband Internet access mechanisms cost-effectively. Improved device range increases the likelihood that a particular device can reach a broadband access point and improves the overall economics of those providing broadband services and products because a particular access point can cover a larger area. Making the white spaces available for use also increases the overall amount of unlicensed spectrum available which means more opportunities for innovation and increased connectivity. Increasing the transmission power from 100mW to 4W in the white spaces improves the link budget by 16dB, which represents a two to threefold improvement in range.

The following tables[1] illustrate radio range performance at different transmit powers and frequencies. This table assumes a moderately impeded open space similar to farmland or a sparse suburban neighborhood, as well as a relatively clear Fresnel zone which means it is not valid for indoor use or scenarios where the device antennas are obscured in any way. Distances are in meters:

| | 30 mW | 50 mW | 100 mW | 1 W | 2 W |
|---|---|---|---|---|---|
| 473 MHz (Ch 14) | 187 | 230 | 303 | 762 | 1006 |
| 599 MHz (Ch 35) | 155 | 190 | 251 | 631 | 833 |
| 695 MHz (Ch 51) | 138 | 169 | 223 | 560 | 739 |
| 2437 MHz (2.4 GHz ISM) | 51 | 62 | 82 | - | - |
| 5300 MHz (5 GHz ISM) | 27 | 33 | 44 | - | - |

This table assumes a much stricter operating environment where the signal must penetrate thick foliage and more structures, typical of a dense urban neighborhood and indoor use. Distances are again in meters:

| | 30 mW | 50 mW | 100 mW | 1 W | 2 W |
|---|---|---|---|---|---|
| 473 MHz (Ch 14) | 60 | 70 | 87 | 179 | 222 |
| 599 MHz (Ch 35) | 51 | 60 | 75 | 154 | 191 |
| 695 MHz (Ch 51) | 47 | 55 | 68 | 140 | 174 |
| 2437 MHz (2.4 GHz ISM) | 21 | 25 | 31 | - | - |
| 5300 MHz (5 GHz ISM) | 13 | 15 | 19 | - | - |

[1] Range numbers in these tables are calculated with the modified Friis transmission equation, using n=2.5 for the first scenario (moderately impeded open space) and n=3.2 for the second scenario (dense urban environment). We assume unity antenna gain on either end, receiver sensitivity of -88 dBm, and add a 10dB reserve for link stability and 10 dB reserve for penetrating two typical stick-frame walls. As with any RF range calculation, these numbers should be taken as a guide only because conditions in the real world will impact actual results. Existing 2.4 and 5 GHz ISM-band products are limited to 100 mW maximum power so their range data is not calculated over this limit.

## II. White Space Scenarios

Below are a few scenarios that help to illustrate the value of television white space. They would each be possible if the Commission adopts the proposal of the White Spaces Coalition.

### A. Internet Access

Devices will be able to connect to the Internet using a white space radio connection to an access point over distances significantly higher than those available with current 2.4 and 5 GHz ISM products. This scenario involves radios operating with geo-location and database lookup capabilities allowing it to avoid incumbent users. With one hop on a mesh network at 100mW on 599 MHz (Ch 35), the urban range of a white space access point would be ~150m (~450ft), whereas a similar 2.4 GHz ISM configuration could only reach 60m (180ft) today. A similarly operating (high power) white space access point at 1W could reach ~300m (>900ft) for considerably-increased range over 2.4 GHz ISM devices.

### B. Peer-to-Peer Sensor Networks

Low power wireless sensors will use the white spaces for a range of information management tasks. For example, farmers will be able to deploy white space wireless sensors across their farms to manage irrigation and fertilizing to maximize the farm's productivity. Because these will be low power devices with very little risk of interfering with incumbent users, they rely on strict sense-and-avoid technologies. Requiring geo-location in addition to sensing is therefore unnecessary. An operational limit of 50mW on these devices, in the open space of a farm field, means a broadcast range of ~200m (~600ft) whereas a limit of 100mW yields ~250m (~775ft) when operating at 599 MHz (Ch 35).

### C. Smart Device Communication

Smart devices such as a smart phones, automobiles, and game machines will operate as clients of the white space-based Internet access scenario described above, but these devices will communicate with each other rather than back to the Internet, using a low power sensing-only mode. For example, they will be used for voice and data exchange and messaging. If these devices communicate with another device that has geo-location and channel lookup capabilities, they can transmit at higher power (because they can use the geo-location and channel lookup information to further protect incumbent broadcasters). These devices will see range improvements as described in the Internet Access scenario without incurring the additional cost and power consumption demands of having a native geo-location and channel lookup capability built into the device. If no other device can offer geo-location and channel lookup information, these smart devices will still operate in a low power pure spectrum-sensing mode. Scenarios here include outdoor recreation or operation in remote locations.

### D. Device-Device Media Sharing

Media playback devices will also rely on white spaces technology, piggy-backing on the access point's geo-location and channel lookup capabilities and experiencing similar range improve-

ments as described in the high power Internet access scenario. These devices will use the white space for media exchange, communication, and Internet access.

These devices will operate in a low power pure spectrum-sensing mode if no other device can offer geo-location and channel lookup capabilities.